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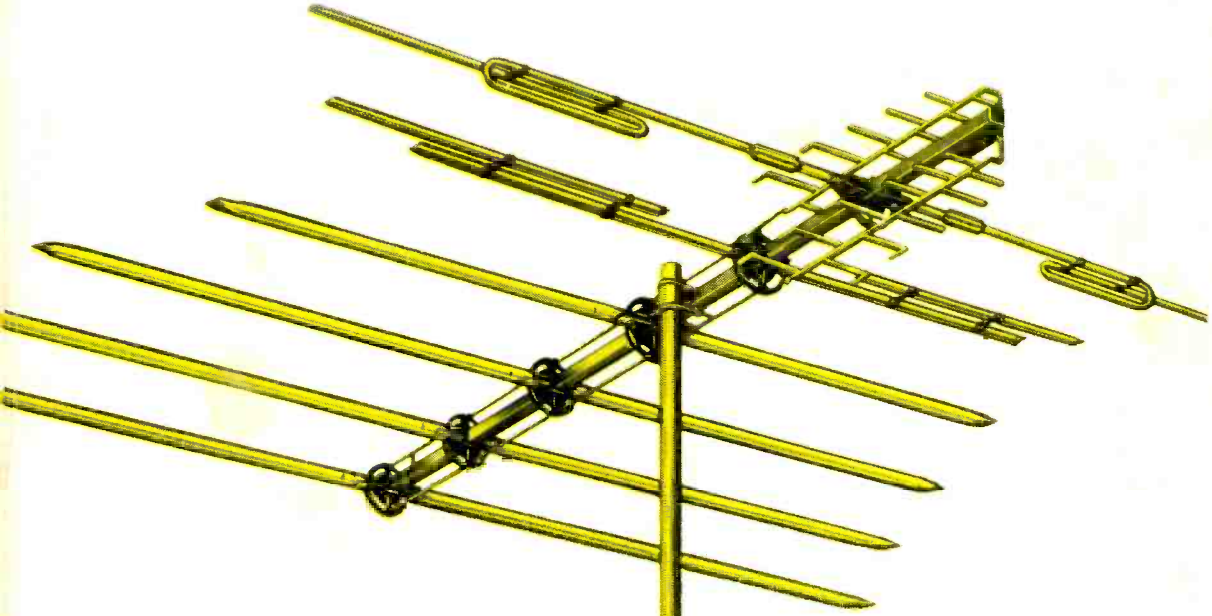

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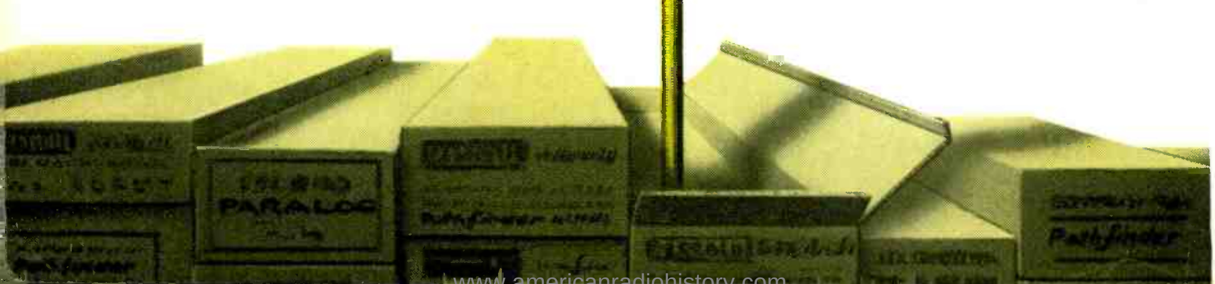

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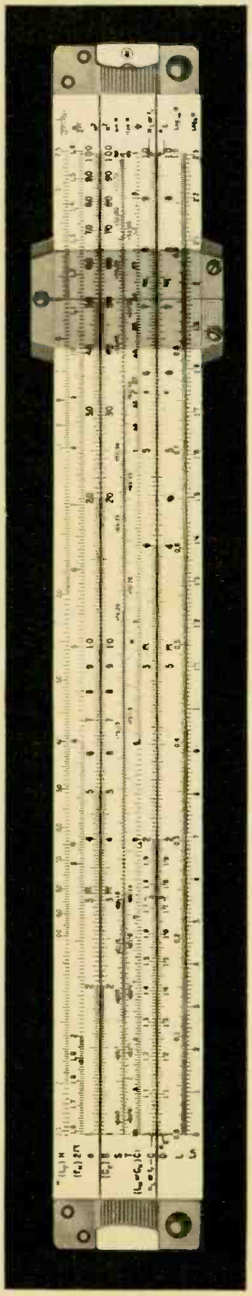

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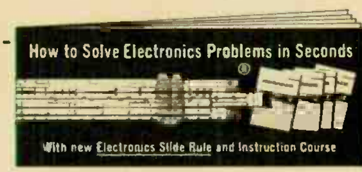

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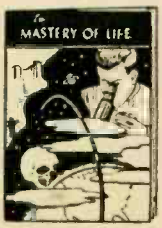

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FEEDBACK
from our readers

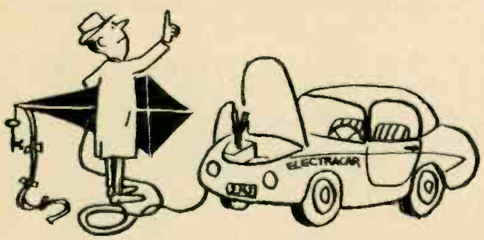
Write to: Letters Editor, Electronics Illustrated, 67 West 44th Street, New York, N.Y. 10036

● FILL 'ER UP

Your article on electric-powered cars [March '67 EI] was interesting but it says nothing about recharging time. The recharging time for the batteries in my portable radio is longer than the time I can use them for after they are charged. Does this mean that for every hour you drive you'll have to hang around somewhere for an hour and a half waiting for the batteries to be recharged?

Milton Horner
Encino, Calif.

Not necessarily. Initial designs, such as those in use in Britain and the one sketched by Ford and shown in our article, assume use primarily in urban areas where air pollution is at its worst and where runs tend to be short by comparison to storage time for the car. Under those circumstances it would be easy to plug the car in for recharge every time you drive into the garage and have it always ready to go. But those at work on the problem in this country already have their sights set higher. Assuming an electric car that can manage turnpike speeds in the first place, it should not be hard to provide batteries that soak up in a half-hour enough charge to last



a couple hours on the road. If you take the half-hour to have a snack it might not slow you down much on your overall trip. Beyond that, they tell us that high-speed recharging techniques similar to those currently applied to nickel-cadmium cells might be adapted to the lithium cell—making possible a five-minute recharge that would provide a use/refill cycle similar to gasoline.

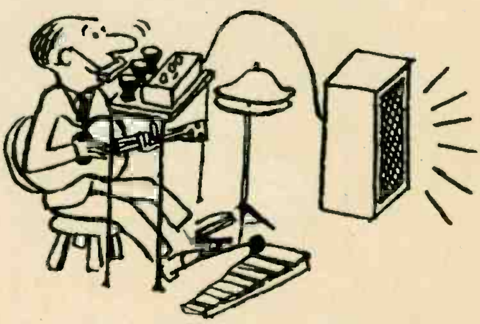
● HANG IT ALL

I want to build your rhombic antenna [March '67 EI] but my wife says why take up all that space if you can't even hang washing on it. Can you?

E. L. Spencer
Cincinnati, Ohio

Is your wife handy with stilts?

● NOSE FOR NEWS



For a good many years now I've been a one-man band. I keep looking for new ways to add extra instruments to my arrangements. I long ago found ways to use my feet and knees and elbows so it was great news to me when you published the article on the transistor bongos. Since they require only a tap, I could even play them with my nose.

D.R.
Needles, Calif.

● OFF BASE

I've got news for you, buddy. The electric bongos in your March issue won't work! The base of Q4 is grounded so how can there be any output?

D.D.G.
Westfield, N.J.

The bongos will work if you follow the pictorial diagram. But you're right that there is a mistake in the schematic. The base of Q4 should connect only to C10 and R19.

[*Continued on page* 8]

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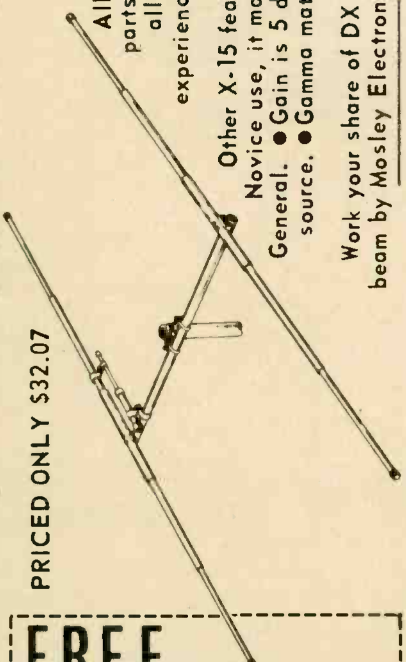

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FEEDBACK

Continued from page 6

● HELP! ! !

I have a problem. An older friend is going to help me on my FCC license but my parents will not let me do this. She said that I could not have any CB equipment until I was 21 years of age. Is there any way I can make her change her mind?

Ewing Waymire
Poteau, Okla.

None we can think of right now that wouldn't contribute to the delinquency of a minor.

● BIG HIT OF YESTERYEAR

I have obtained an old juke box speaker and I would like to use it with my existing hi-fi set. But the speaker has an electro-magnetic field coil. Is there any way I could build a power source to power the magnet and if so do you have a schematic?

Gary Kay
San Antonio, Tex.

Dynamic speakers were hot stuff back in the days before modern PMs, with their high-density magnetic fields. If you had the juke box model number it might be possible to track down the electrical requirements of the field coil but is it worth the bother?

● TIME OUT

Why, why, why did WWV leave dear old Greenbelt? Where else can I get such beautiful tones and ticks to lull me off to sleep?

Pat Murray
Washington, D.C.

Sounds like you've got a problem there.

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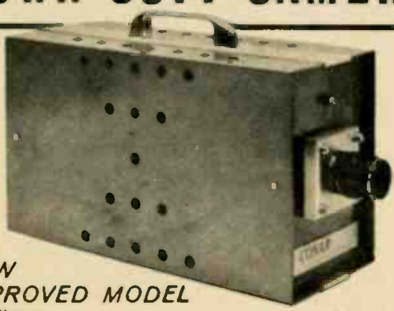

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A recent free brochure describing **amplifier and preamplifier kits** includes a power amplifier that has space on the chassis for installation of a preamp module later on. Write Acoustech, Inc., 139 Main St., Cambridge, Mass. 02142.

A guide to design characteristics, selection and use of **premium-quality tubes** is contained in a brochure available free from Amperex Electronic Corp., Tube Div., 230 Duffy Ave., Hicksville, N.Y. 11802.

There's something of interest for **almost any hobbyist** in catalog 671 which contains items ranging from nickel-cadmium cells to a stethoscope for diagnosing auto engine troubles. A free copy is available by writing Edmund Scientific Co., 101 E. Gloucester Pike, Barrington, N.J. 08007.

A catalog of **xenon flash tubes** from a West German manufacturer contains a good deal of useful information for experimenters. Typical circuits and tube characteristics are included as well as detailed specs. Write the importer, Epic, Inc., 150 Nassau St., New York, N.Y. 10038.

A brochure describing the Revox Mark III **tape recorder and accessories** is available from Elpa Marketing Industries, Inc., Thorens Bldg., New Hyde Park, N.Y. 11044.

Aside from listing the usual specifications, the Fisher Handbook for 1967 is a catalog of **stereo components** that includes a good deal of general information about high fidelity and how to groom it for even the most elegant of homes. Copy is available from Fisher Radio Corp., Customer Service Dept., 11-40 45th Rd., Long Island City, N.Y. 11101.

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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 Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for television, Hi-Fi and Electronics.

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

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

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

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

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build twenty 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 FCC 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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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."

PRINTED CIRCUITRY

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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New EICOCRAFT® easy-to-build solid-state electronic TruKits: great for beginners and sophisticates alike. As professional as the standard EICO line — only the complexity is reduced to make kit-building faster, easier, lower cost. Features: pre-drilled copper-plated etched printed circuit boards; finest parts; step-by-step instructions; no technical experience needed — just soldering iron and pliers. Choose from: Fire Alarm; Intercom; Burglar Alarm; Light Flasher; "Mystifier"; Siren; Code Oscillator; Metronome; Tremolo; Audio Power Amplifier; AC Power Supply. From $2.50 per kit.

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UNCLE TOM'S CORNER

Uncle Tom answers his most interesting letters in this column. Write him at Electronics Illustrated, 67 West 44th St., New York, N. Y. 10036.

By TOM KNEITEL, K2AES/KBG4303

★ *I've made the mistake of picking as my subject for a term paper the history of radio. I say mistake because I'm bogged down in a mass of confusion and conflicting facts. Which was the first broadcasting station, WWJ in Detroit or KDKA in Philadelphia? Both claim the title. Was it 1920 or '21?*

Richard S. Lewis
Dothan, Ala.

It was 1915 and the station was KQW in San Jose, Calif. Evidence recently dug up indicates that KQW, which had conducted an early two-way wireless telephone test in 1912, transmitted regular music programs to booths set up at the Panama Pacific Exposition in San Francisco. The transmitter consisted of a few electrical doodads, a piece of stove pipe, an old phonograph turntable and several bales of wire—a haywire lashup if there ever was one! The owner of the station was Dr. Charles D. Herrold. WWJ and KDKA both went on the air in 1920.

★ *A few nights ago I hooked up a diode and coil across the leads of a headset and antenna at one terminal and a ground at the other. I was able to hear signals from the Voice of America. They were even strong enough to drive a small speaker.*

David Thier
Baltimore, Md.

If you lived nearer to the VOA's North Carolina transmitter site the signals probably would be strong enough to drive a small car.

★ **Wired For Sound Dept.** For some time now I've been unhappy about the way the consumer is being misled by talk about hand-wired vs printed-circuit TV sets. The implication is that printed-circuit sets are banged out hastily on an automated production line while hand-wired sets reflect a personal touch in their manufacture and are, therefore, much more dependable.

Actually, less than half of any set's circuits are printed; a way still is being sought to do the entire set via the printing or etching method. Machines make far less goofs than humans and just about all of the circuitry used in spacecraft and satellites is printed or etched.

In actual fact, wiring problems constitute a minor part of TV servicing—most failures center around such components as tubes, capacitors, transformers, etc. Both types of sets will die when a tube blows.

★ *Which is the most dangerous to play around with, high voltage at low current or low voltage at high current?*

Randy Marcovici
Cedar Rapids, Iowa

Each has its own thrilling moments and, aside from the initial shock, can cause a number of annoying side effects, the most lasting of which is instant eternity.

★ *From the entire attitude of the answers you offer to your readers it seems obvious that you really think that you're quite a big deal. Did you ever stop to think that many readers may not like this treatment?*

Hank Prescott
Reading, Pa.

No.

★ **Little-Known Facts Dept.** From time to time Uncle Sammy reassures us that our air

[*Continued on page* 14]

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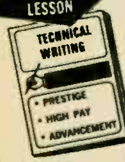

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UNCLE TOM'S CORNER

Continued from page 13

defenses are so highly developed that specialized electronic tracking devices keep a constant surveillance on all manner of satellites and other objects zipping around in space. It's a sobering thing, therefore, to note (in a privately distributed NASA Satellite Situation Report) that we have somehow accidentally managed to lose track of our own Explorer 10 satellite. What's even more frightening is that just recently NASA listed three orbiting objects that they define as coming from an unknown source. They have been assigned satellite catalogue Nos. 2428, 2429 and 2430. There probably are interesting stories behind the lost satellite and the three mystery objects—but I doubt you'll read much about them in your daily gazette.

★ *To elaborate on your recent comment on the outrageous price charged for stereo records, don't you think that this whole stereo business is badly overrated? Below the most expensive hi-fi setup, stereo means little more than extra cost. Are any quality solid-state mono amplifiers available?*

Mike Jungman
Randolph AFB, Tex.

In my opinion any person who can appreciate good fidelity should be prepared to spend a minimum of $300 for a stereo system. For less than that you'll get two channels of sound of sufficient quality to pass as hi-fi to a large segment of the buying public. Some nice solid-state mono amplifiers are put out by Mattes and Marantz.

★ *As a short-wave listener I frequently tune across the CB band and am shocked by the language I hear. How do you account for the FCC letting the CBers get away with so much of this?*

Fred L. Ackerman
Brooklyn, N. Y.

How do you account for the FBI letting Dillinger get away with so many holdups?

★ *I'm building a kilowatt linear for my ham rig. I noticed that the tube sockets shipped to me are made of Teflon and I want your advice on the wisdom of using these in my final because of the high heat in that part of*

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the unit. I've heard that Teflon gives off a poison gas when heated.

J. Bernard Wharton
Ann Arbor, Mich.

The Teflon poison-gas story is a tired rumor that should have been given gas years ago.

★ *What's the inside story on those spy-in-the-sky satellites I've heard about? Do such things really exist? If so, can their signals be heard on a communications receiver?*

Jim Gibson
Tulsa, Okla.

The Russians have a series of low-orbit Cosmos satellites that snap photos of our military installations and drop the film into the Soviet Union every nine days. The U.S. has had its Discoverer, Vela, Midas, Samos and other spy satellites on the job for years. Frequencies are classified. Rumors have it that our Gemini astronauts have taken close-up photos of some of the Cosmos satellites.

★ *Could you please tell me how to hook my ham gear to a tape recorder so that I can tape both sides of my contacts with equal volume? The way I have it now, the received signals play back loudly but my own voice is at a lower volume.*

James Fishel, K8IQS
New Philadelphia, Ohio

I suggest that you apply Kneitel's Law: if the damn thing works at all, leave it alone.

★ *Despite the fact that my car battery is only a few months old I have a dickens of a time getting the old buggy started. It doesn't seem right that a new battery should fail so soon.*

Jim Gibson
Forest Hills, N.Y.

It sure doesn't. Check the battery's charge. If it's low that could mean trouble in the voltage regulator or generator. If the battery has a full charge the bug is in the carburetor end.

★ *A few weeks ago I was operating my rig when a fellow came running over to my house and started banging on the front door, He told me that I was blasting through over the public-address system at the Sunday-night church meeting in a nearby park. How can I avoid this in the future?*

WB6PPT
Kingsburg, Calif.

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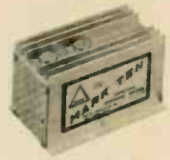

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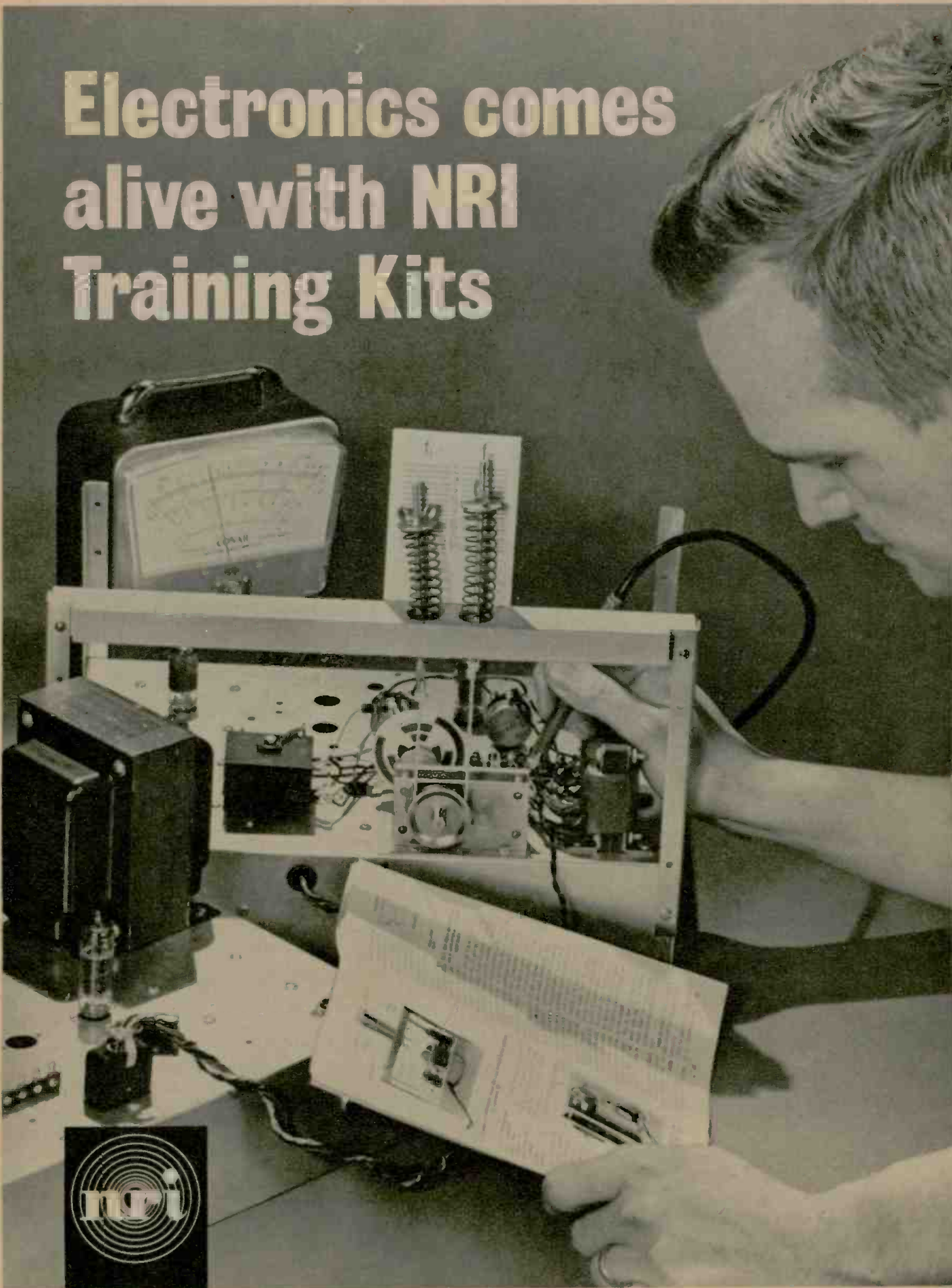

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10. **MOBILE COMMUNICATIONS ✱**—Learn to install, maintain mobile transmitters and receivers. Prepares for FCC License exams.

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✱ You must pass your FCC License exams (any Communications course) or NRI refunds in full the tuition you have paid.

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ELECTRONIC SWAP SHOP

Individual readers (not commercial concerns) may swap electronic gear by sending one listing, name and address to Swap Shop, ELECTRONICS ILLUSTRATED, 67 W. 44th St., New York, N.Y. 10036. Space is limited; only most interesting offers are published.

AMATEUR RADIO

HOMEBREW CW transmitter, 30 watt. Trade for 500-mw walkie-talkie or signal generator. Mark K. McHarry, 441 E. 20th, Apt. 3-B, New York, N.Y. 10010.

GLOBE Scout AM/CW transmitter, 40- & 80-meter. Swap for 2-meter transceiver or CB rig. Roger Kolakowski, WN1GGY, 51 Center St., Wethersfield, Conn. 06109.

RIDER recorded code course. Will swap for FM radio or amplifier. Richard Charnack, 34 Waddington Ave., West Orange, N.J. 07052.

HEATHKIT Apache transmitter, 80-10 meters. Will trade for gasoline-powered chain saw or rotary tiller. Paul M. Llewellyn, 106 Laurel St., Pocomoke City, Md. 21851.

HALLICRAFTERS S-120 receiver. Will trade for aqua-lung and regulator. Gregory L. Hingle, Rt. 2, Box 304, Port Sulphur, La. 70083.

EICO 753 transceiver with power supply. Will swap for Drake T4X transmitter or best offer. Ned Sebring, WA8OWL, Box 325, Owosso, Mich. 48867.

HEATH Sixer with homebrew power supply. Swap for VHF receiver. John B. Keally, 40 Julian Dr., Pittsburgh, Pa. 15235.

SURPLUS Transmitter, model T-17/ARC-5, 50-watt, 1.3-2.1 mc, with power supply. Trade for VHF receiver, 150-170 mc. James F. Ford, Box 839, Cape Girardeau, Mo. 63701.

WATERS Codax keyer Model 361. Will trade for VHF gear or scope. Bob Golder, 109-10 Park La. S., Richmond Hill, N.Y. 11418.

HEATHKIT HR-20 SSB receiver. Want 12-gauge Winchester model 12 shotgun. Roland Kulish, WA5LTV, 5075 Heisig St., Beaumont, Tex. 77705.

AMECO 6-meter converter with power supply. Swap for Johnson matchbox. Ron Lumachi, 73 Bay 26th St., Brooklyn, N.Y. 11214.

JOHNSON 6N2 VFO with power supply. Will swap for NC-300, 303 or best offer. John Bernstein, WB2GKT, 200 W. 86th St., New York. N.Y. 10024.

AMECO code-practice oscillator. Make swap offer. Danny Jamison, 3530 Woodmere Dr., Richmond, Va. 23234.

SHORT-WAVE LISTENING

EI PROJECT, S9er preselector. Make swap offer. Allan Dietemann, 407 Kerwin Rd., Silver Spring, Md. 20901.

HALLICRAFTERS SX-99 receiver. Will swap for 35-mm camera or tape recorder. Craig Cozart, 2248 Buckley Rd., Columbus, Ohio 43221.

SPAN MASTER receiver. Swap for electric piano, Go-Cart or organ. Dan Cole, 2652 Ivy Pl., Toledo, Ohio 43613.

HALLICRAFTERS S-38C receiver. Need Eico 324 RF signal generator or 6- & 12-volt power supply (battery eliminator). Troy N. Belote, Rte. 2, Box 10-A, Elkins, Ark. 72727.

NOVA-TECH VHF receiver. Want oscilloscope or signal generator. William Davis, Jr., 1260 Wilson Center Dr., Norman, Okla. 73069.

HALLICRAFTERS S-120 receiver. Will trade for telescope, stereo amplifier or 35-mm camera. Larry Hendricks, 285 College St. S.W., Valley City, N.D. 58072.

HEATHKIT HR-10 receiver. Will trade for tape recorder. Steve Ellis, 145 Radtke Rd. RD 1, Dover, N.J. 07801.

RCA T6-9 receiver. Will swap for Knight-kit Star Roamer. Joe Blaha, Box 214, Elkhart, Tex. 75839.

KNIGHT Space Spanner receiver. Swap for 100-mw CB walkie-talkie or VHF converter. William Via, 1870 Marshall Rd., Baltimore, Md. 21222.

HEATH GR-64 receiver. Trade for Lafayette HA-230 or HA-63. Mike Katzdorn, 2614 Belladonna St., Redding, Calif. 96001.

HALLICRAFTERS S-85 receiver. Swap for Heath Sixer. Cecil Baldwin, 4518 Quince Rd., Memphis, Tenn. 38117.

SILVERTONE BC/SW receiver. Want Ameco or other SW equipment. Don Birzer, RR1, Fennimore, Wis. 53809.

KNIGHT Span Master. Will swap for Hammarlund or Hallicrafters receiver. C. V. Crumrine, Jr., 929 N. Marsalis, Apt. 110, Dallas, Tex. 75203.

EMERSON 7BS-409 receiver. Want two Realistic TRC-33 walkie-talkies. Steven Bryant, Star Rt., Central Bridge, N.Y. 12035.

CITIZENS BAND

DAYSTROM DM-277 marine CB transceiver. Will swap for 1-watt walkie-talkie. Dr. L. J. Wiley, 1726 W. 40th, Erie, Pa.

SAMPSON CB model 1A with accessories. Want RTTY converter/keyer or ham gear. Bene Kurilow, WB6RJA, 556 Diamond Ave., San Francisco, Calif. 94080.

CB transceivers. Need business-band transceivers and ¼-kw AM broadcast transmitters. C. Bechtel, Box 813, Crystal River, Fla. 32629.

GLOBE transceiver model 100A. Will swap for SW receiver. Mike Meismer, 1311 Ave. C., El Campo, Tex. 77437.

LAFAYETTE HB-115A. Want VTVM or any wide-band oscilloscope. Forest N. Motto, 2240 Warren St., Petersburg, Va. 23803.

RADSON base and mobile units. Trade for 5-in. scope. R. Lavat, Box 743, Canon City, Colo. 81212.

AMECO transceiver. Make swap offer. Mike Bane, WB4DC, 4483 Quince Rd., Memphis, Tenn. 38117.

LAFAYETTE mechanical filter. Will swap for all-band vertical antenna. Norm Bridges, 2043 S. Gearhart, Fresno, Calif. 93702.

LAFAYETTE nuvistor preamp and accessories. Will swap for Knight Star Roamer. Elmer T. Shuler, 2043 Briggs St., Harrisburg, Pa. 17103.

AUDIO & HI-FI

MEISSNER record cutter with blanks. Will swap for ham or SW receiver. Mike Brenner, WB2VKS, 23 Cromwell Rd., Carle Place, N.Y. 11514.

INTERCOM, AM/FM. Swap for stereo amplifier or ham gear. Bob Blyzka, 1121 La Limonar, Santa Ana, Calif. 92705.

AMPLIFIER, 72-watt. Will trade for 8-, 16- or 35-mm movie outfit. Jimmie Jones, 725 Poplar, Abilene, Tex. 79602.

MASCO intercoms. Want Lafayette intercoms. Michael Haselmaier, Box 142, Mount Vernon, Ala. 36560.

MEISSNER tuner. Want SLR camera or 152-174 mc receiver. H. Kuell, 138 Clinton Ave., Newark, N.J. 07114.

TELECTRO R-12 & TP-12 tape preamps. Will swap for Dyna or Eico amplifier. Rudy Powell, Jr., 4473 W. 136th St., Cleveland, Ohio 44135.

STEREO changers. Swap for PA, intercom or photo gear. R. E. Bahnsen, 138 Rosalind Pl., Toledo, Ohio 43610.

STEREO Amplifier, 80-watt. Will swap for sweep generator or color-bar/dot generator. Vic Depelsmaeker, 401 N. Main, Yale, Mich. 48097.

ELECTRO-VOICE 911 Mercury crystal mike with cable. Make swap offer. Jack Borenstein, 1011 Sheridan Ave., Bronx, N.Y. 10465.

VM TURNTABLE with 12-watt stereo amplifier. Will swap for CB transceiver. Ken McClain, KPM-4904, 332 Ohio Ave., McDonald, Ohio 44437.

DEWALD amplifier, 15-watt. Need antenna rotator. Jeremy Donimirski, WB2VKU, 317 Brunswick Ave., E. Brunswick, N.J. 08816.

GENERAL ELECTRIC mono cartridge model 4G-052. Will swap for brand-name magnetic tape. Kenneth Kepler, 418 Pendegast St., Woodland, Calif. 95695.

ARKAY FM tuner. Will swap for test equipment or best offer. Nicholas Dondero, 2451 Bedford Ave., Brooklyn, N.Y. 11226.

EICO HF-81 stereo amplifier, 28-watt. Will trade for Polaroid close-up lens set, model 110A or best offer. Charles Crawford, 2328 Rockinghorse, San Pedro, Calif. 90732.

BELL stereo tape cartridge. Will swao for Sony 900A tape recorder. Larry Bonomo, 4441 Ranger Ave., El Monte, Calif. 91731.

STEREO Amplifier, 30-watt. Want FM tuner with

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multiplex jacks. Jeff Goldstein, 3399 4th St., Oceanside, N.Y. 11572.

TAPE RECORDER with tapes. Swap for CB transceiver. Don Ratcliff, Box 177, Spring Arbor, Mich. 49283.

HEATH AJ-41 AM/FM tuner. Trade for TV test equipment. Dick Ballou, Box 239 W. Carlisle Sta., Lubbock, Tex. 79401.

HEATH FM tuner, model 3A. Swap for 117-VAC or 12-VDC transceiver. Tim Meder, 1615 Wood St., Crete, Ill. 60417.

VM tape recorder. Want 100-1600 kc receiver. Wray Sheen, 3501 Lee St., Waukegan, Ill. 60085.

TV chassis. Make swap offer. Wayne Bice, 1777 S.W. 19th St., Miami, Fla. 33145.

ANTIQUE ELECTRONICS

ATWATER-KENT Model 5 receiver. Will swap for CB transceiver or other gear. Kim Nelson, RR 1, Dexter, Ia. 50070.

PHILCO receiver. Want code key or walkie-talkies. Tom Dettweiler, 200 S. California St., Hobart, Ind. 46342.

RADIO tubes. Will trade for 1-watt CB walkie-talkie. Ollie Peoples, Rt. 1, Farwell, Tex. 79325.

RCA SW receiver. Will swap for amateur receiver. Mike Fine, 6 Beechwood Tr., Poughkeepsie, N.Y. 12601.

ATWATER-KENT speakers, models H & E. Will trade for ham gear. Norm Goehring, WNØPNB, Box 5, Hitchcock, S.D. 57348.

ASSORTED Tubes. Will trade for Heathkit model O-9 oscilloscope. Greg Dockter, 335 Reed, Fargo, N.D. 58102.

PHILCO BC/SW receiver. Want SW receiver with BFO, Mark Wheeler, Willowbrook La., Sauquoit, N.Y. 13456.

RADIOS, battery powered, vintage pre-1930. Want toy trains and trolleys made before 1941. Tihamer Geng, 28 Division St., New Brunswick, N.J. 08901.

RADIO. Want CB transceiver or best offer. Donald Sanqunetti, RR 1 Box 226, Alexandria, Ind. 46001.

ATWATER-KENT, two model 20 radios. Make swap offer. Frank Molloy, 108 S. 26th St., Denison, Ia. 51442.

RADIOS. Want BC-348-H,-K,-L,-R receiver. Garnet W. Frank, Rt. 1, Potsdam, N.Y. 13676.

TV, early model. Swap for CB transceiver, 1-watt walkie-talkie or best offer. Jay Breakstone. 343 E. 94th St., Brooklyn, N.Y. 11212.

OTHER EQUIPMENT

EICO model 360 TV/FM sweep generator. Swap for ham gear, audio generator or other test equipment. Howard G. Mullinack, 21 Stuyvesant Oval, New York, N.Y. 10009.

ALLIANCE antenna rotor motor. Will trade for 6- or 2-meter converter or grid-dip meter. Lou Sabatini, 5820 W. 83rd St., Oak Lawn, Ill. 60453.

HEATH GD-125 Q-multiplier. Will swap for 100-mw walkie-talkies or best offer. C. A. Kalweit, 445 Parkdale Ave., Buffalo, N.Y.

REALISTIC VTVM. Swap for tube checker or mobile CB transceiver. Virgil Freebourn, 1307 Grant Ave., Erie, Pa. 16505.

MISCELLANEOUS equipment. Make swap offer. Walter Treftz, K4UDP, 3731-20th St. N., St. Petersburg. Fla. 33713.

GE superhet transistor radio. Want Big Ear. Derek Pietro, 112 Kenilworth Rd., Merion, Pa. 19066.

. . . its owners are up in the clouds . . .

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"LONG RANGER"

with Shakespeare's fiberglass

WONDERSHAFT

offers:

- protection from weather
- 125 MPH wind rating
- low background noise
- proven performance

The BIG STICK 176 is an excellent CB 18'6" — 27.1 mc fiberglass WONDERSHAFT antenna . . . all direction coverage . . . minimum of dead spots . . . no ground radials . . . independent of mounting location.

Paul Crouch (Crouch TV) Newark, Ohio says . . . *"A Shakespeare 176 BIG STICK, using identical heights, locations and radios outplayed a ________ antenna forty hilly miles away into a tough location. I think Long Rangers are the best antennas."*

User approval of the 176 is so great . . . the manufacturer guarantees the product for its lifetime against any defect in either workmanship or material.

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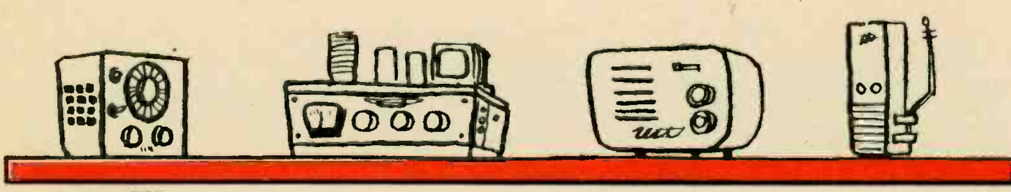
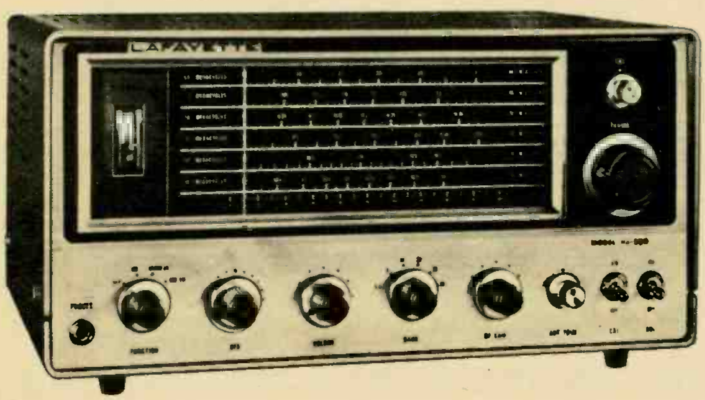


Electronic Marketplace

CB SPECIAL . . . The Imperial is a single-sideband transceiver that also can be used for regular AM and then is compatible with standard CB equipment generally available. Used as a conventional AM transceiver, the unit has full 23-channel capability. Switch the unit to SSB and you double the number of available channels. Such a doubling of channels is made possible by a front-panel switch that allows you to select upper- or lower-sideband operating modes. But the biggest advantage of SSB is that it will turn 5 watts of input power into roughly 20 watts of effective power. This means greater transmission range. Another advantage of SSB is that of greatly reduced interference because there's no carrier. Although SSB has only limited acceptance among CBers so far, the manufacturers of the Imperial see crowded channels as a strong argument in favor of ever-increasing use of sideband. Double-conversion receiver circuit on this one is rated for a sensitivtiy of 0.5 µv. Transmitter is provided with final-tune control. Other controls include R/VFO and variable squelch. The unit matches 30- to 75-ohm antenna loads, operates on 120 VAC or 12 VDC, can be mounted with optional bracket for mobile operation. $299. Regency Electronics, Inc., 7900 Pendleton Pike, Indianapolis, Ind. 46226.

Hamming . . . Designed with the amateur radio operator in mind, the HA-500 receiver tunes AM, SSB and CW in the ham bands from 80 through 6 meters in six tuning ranges. The ten-tube superhet circuit features dual conversion on all bands. Selectivity of tuned RF and first mixer stages is enhanced by two mechanical filters. IF frequencies are 2608 and 455 kc. Audio is supplied by product detector circuit. Always-on oscillator-filament circuit minimizes drift by keeping filament lit as long as the unit is plugged into AC outlet. There is a built-in 100-kc crystal calibrator. The AVC is set to provide standard operation on AM and fast-attack, slow-decay operation on CW and SSB. Sensitivity is listed at better than 1 µv for 10 db signal-to-noise ratio on all bands. IF rejection and image rejection both are listed at -40 db. The audio output, which is listed at 1 watt, matches 8-ohm speaker load or 500-ohm headset. The circuit requires 65 watts of 117 VAC. $149.95. Lafayette Radio Electronics Corp., 111 Jericho Tpk., Syosset, N. Y. 11791.



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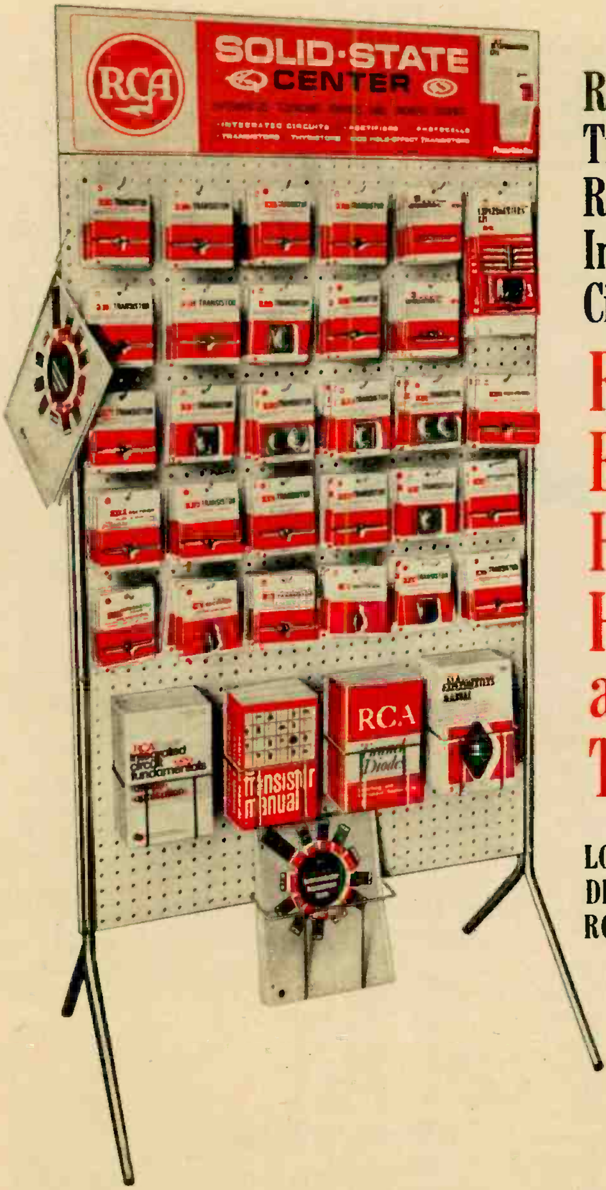

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For EXPERIMENTERS HOBBYISTS HAMS and TECHNICIANS

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Here displayed on the RCA Solid-State Center is the RCA SK-Series Transistors, Rectifiers, and Integrated Circuits; the new RCA 3N128 MOS Field-Effect Transistor; RCA's 40214 Silicon Stud Rectifier; and three RCA Experimenter's Kits. This new Solid-State Center, in addition to its host of devices, also includes technical literature to support the devices right on the rack. It's the "one-stop" answer to the solid-state needs of experimenter, hobbyist, ham, or the replacement requirements of the service technician.

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RCA Solid-State Center Includes:

- RCA Experimenter's Kits. Three kits enable you to build a light dimmer or any one of 14 different circuits for dozens of applications around the house.
- RCA SK-Series "Top-of-the-Line" Devices: 17 Transistors, 2 Rectifiers, and 2 Integrated Circuits, for experimenter or replacement use.
- RCA Technical Manuals. Four manuals include: RCA Experimenter's Manual, RCA Transistor Manual, RCA Linear Integrated Circuits Fundamentals Manual, and RCA Tunnel Diode Manual.
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Keep RCA Experimenter's Kits and the RCA SK-Series in mind when you're shopping for solid-state devices. Look for the RCA Solid-State Center. Now at your RCA Distributor. Do it today!

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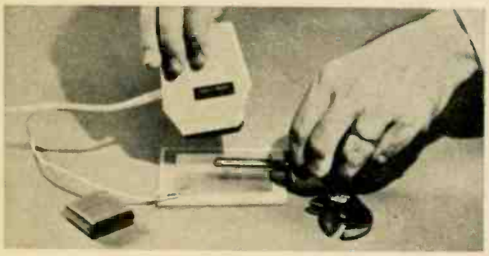
MARKETPLACE

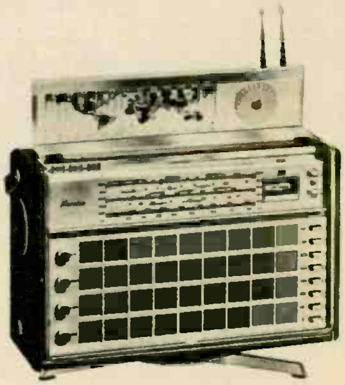
Make Your Mark . . . Manufacturer of the Etch-O-Matic says that anything you can type, write, draw or emboss on its stencil can be etched electrochemically in almost any metal object. Stencils are rated for at least 100 impressions



and have a maximum usable area measuring ⅞ x 1¾ in. The liquid electrolyte will give about 50 impressions per filling. It produces an etch up to 0.002-in. deep with a deep-etch adaptor clip. Objects to be etched need not have flat surfaces; drill identification is a suggested application for the device. $19.95. Martronics Co., 13389 W. 23rd Pl., Golden, Colo. 80401.

Walking Watts . . . The GRS-65A 2-watt CB walkie-talkie is rated for a maximum range of 6 mi. when used with similar units or 10 mi. when operated with a 5-watt base station. Its nickel-cadmium battery provides up to eight hours of service per charge with total life around 5,000 hours. With silicon transistors throughout, the rig will operate in climates ranging from sub-zero to tropical. Transmitter and receiver are crystal-controlled. Equipped with adjustable squelch, 36-in. whip antenna, external antenna connector. Comes in heavy-duty rustproof case with elastic hand band and shoulder strap for easy handling. Optional 117 VAC battery charger features an interconnect cord that will operate from an automobile cigarete lighter. GRS-65A $99.95. Charger $9.95. Heath Co., Benton Harbor, Mich. 49022.

Seaworthy . . . In addition to AM/FM and SW bands, the World Receiver Deluxe's navigational aids are an azimuth ring for plotting position, bands for receiving marine broadcasts and beacon signals and a map with time conversion



dial. Has AGC, AFC, three antennas for maximum reception on any band, built-in earphone. $229.95. North American Philips Co., 100 E. 42nd St., New York, N.Y. 10017.

Hot Tip . . . With the electrodes—made from tungsten and carbon—on the 6-V Touche soldering heat is provided by resistance heating. No waiting for the tip to heat—just touch the soldering tool to the material and the circuit is complete. And because of its extreme heating capability, solder may be applied some distance from tip. $19.80. Graphic Electronics Inc., La Salle, Ill. 61301.

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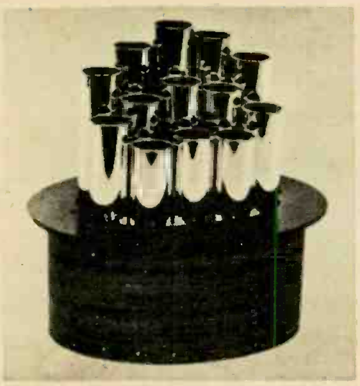
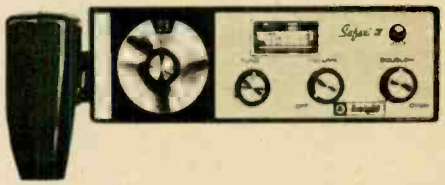
Piping . . . Featuring 13 tuned pipes, the XF-13 Stereo Modulators, according to the manufacturer, can reproduce sounds that are beyond the range of conventional auto speakers. Frequency response is from 40 to 13,000 cps. The modulators are designed to be installed easily on the



deck behind the back seat in autos to provide a remote speaker system for stereo tape cartridge units or other components. Can be used in home, office or boat. With auto installation materials. $49 to $59. Capitol Records, Special Products Div., 1290 Sixth Ave., New York, N.Y. 10019.

Goes Anywhere . . . In addition to its use as a mobile unit the solid-state Safari III CB transceiver kit, which measures 2⅛ x 6⅞ x 8½ in., can be adapted as a base or portable rig. This 5-watt, 23-channel transceiver features push-to-talk mike, S-meter, adjustable squelch, fine-tuning control and illuminated channel-selector



switch. Included are crystals for channel 9. Optional for base station and portable operation are a factory-assembled AC power supply and accessory battery pack. Transceiver $84.50. Power supply $19.95. Battery pack $19.95. Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

The only Theatre Organ available in kit form —for only $1350.

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You've asked for it and here it is — the NEW Schober THEATRE ORGAN that you assemble yourself. For the first time in kit form, a real Theatre Organ with that rich, full, old time theatre pipe organ sound. You create the organ, then you create the music!

The Theatre Organ features special voicing, curved console design, two 61-note keyboards, 2-octave radiating pedal clavier, 8 octaves of tone distributed over 5 pitch registers (including a 1-foot register), 35 speaking organ stops, 8 realistic percussion stops, 4 couplers, and vibrato tablet—48 tablets in all. And all at a truly remarkable low price . . . you save over $1,500 *(well over 50%)* from comparable theatre organs.

Just follow easy step-by-step instructions written in everyday language which anyone can understand. You'll have an unequaled pride when you're finished that only can come from assembling it yourself.

The Theatre Organ starts at $1,350. This price includes a beautiful walnut console or you can save further by building your own from plans. Options available include combination action, genuine reverberation, percussion, and amplifiers and speakers.

Combination Action Ten buttons select preset combinations of stops — actually move the stop tablets as in pipe organs.

Percussion Eight percussion stops provide exciting realism. Celesta, harpsichord, piano, mandolin, xylophone, chrysoglott, orchestral bells, single or reiterating, are played just like the real thing — and sound that way — alone or along with regular organ stops.

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Kodak
TRADEMARK

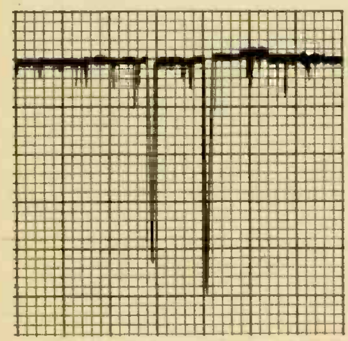
Some plain talk from Kodak about tape:

Uniform magnetic sensitivity

(or the lack thereof)

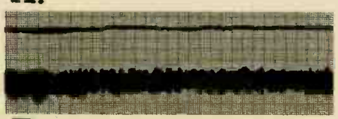
Uniformity for a tape is like kissing babies for a politician. Without it, you're hardly in the running. We take uniformity in all of tape's characteristics very seriously at Kodak. Maybe it's all those years of putting silver emulsions on film that's made us so dedicated to the idea. Uniformity in terms of magnetic sensitivity is one of the most important measures of a tape's performance. Non-uniformity can result in all sorts of bad things like level shifts, instantaneous dropouts, periodic non-uniformity, output variations, distortion, and variations from strip to strip.

Testing for all these possible flaws on a tape is a simple procedure in the lab. Standard industry practice is to record a long wavelength signal (37.5 mil) at a constant input level. The signal from the playback amplifier is then filtered and the output at particular critical wavelengths is permanently charted by a high-speed pen recorder which registers variations on a chart. Instantaneous dropouts caused by foreign matter on the tape surface, for example, would look like this:

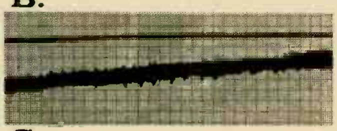


The long and the short of it. The low-frequency procedure gives a good picture of variations in oxide thickness. We take it one step further . . . also test for short wavelength—1.0 mil. This helps evaluate surface smoothness and tape-to-head contact. Taken together, they aid in evaluating the level of lubrication, slitting, and oxide binder characteristics. The smoother the lines, the more uniform the magnetic sensitivity. Guess which graph below is KODAK Sound Recording Tape (the other two graphs represent quite reputable brands of other manufacture):

A.



B.



C.

What looks good sounds good. Congratulations if you picked brand A, Kodak tape. It is notably more uniform . . . doesn't vary more than ¼ db within the reel . . . no more than ½ db from reel to reel.

You benefit as follows:

1. *Within-reel uniformity.*

(a) Less instantaneous and short-term amplitude modulation of the signal, which results in a cleaner signal on playback.

(b) Reduced drift gives less variation in frequency response.

(c) Better uniformity across the strip width (no lengthwise coating lines) results in a more nearly balanced output for stereo recordings.

2. *Reel-to-reel uniformity*

(a) Better coating uniformity gives a more uniform low-frequency sensitivity. This allows splicing of sections of tape from one reel with tape from other reels without obvious signal level changes.

(b) Better coating uniformity also results in a minimum change in optimum bias which allows the professional to establish an operating bias nearer the optimum bias.

KODAK Sound Recording Tapes are available at most camera, department, and electronic stores. New 24-page comprehensive "Plain Talk" booklet covers all the important aspects of tape performance, and is free on request. Write: Department 940, Eastman Kodak Company, Rochester, N.Y. 14650.

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THREE-way bulbs have an annoying habit of burning out a lot faster than ordinary bulbs. Keep track of how frequently you replace them, convert the statistics into dollars and cents and you'll store your three-way lamps in the attic. We don't know why the bulbs are so short-lived but they must be doing something wrong.

There's a way to beat the conspiracy. Replace the switch in the lamp socket with our solid-state dimmer, then use a conventional 150-watt bulb. Did you get that? A complete solid-state *full-wave* dimmer built right in the bottom of an ordinary lamp socket!

Compare prices: a 50-100-150-watt three-way bulb costs about 70¢. An ordinary 150-watt bulb costs about 35¢. In no time at all the savings in bulbs will pay for the dimmer, which will set you back about \$5. And a dimmer will lengthen the life of the bulb because the dimmer applies current gradually. A switch sends a surge of current through the bulb. Besides all that, our In-A-Socket Dimmer is an interesting project in itself.

ELECTRONICS ILLUSTRATED
MAY 1967

IN-A-SOCKET DIMMER

By BERT MANN

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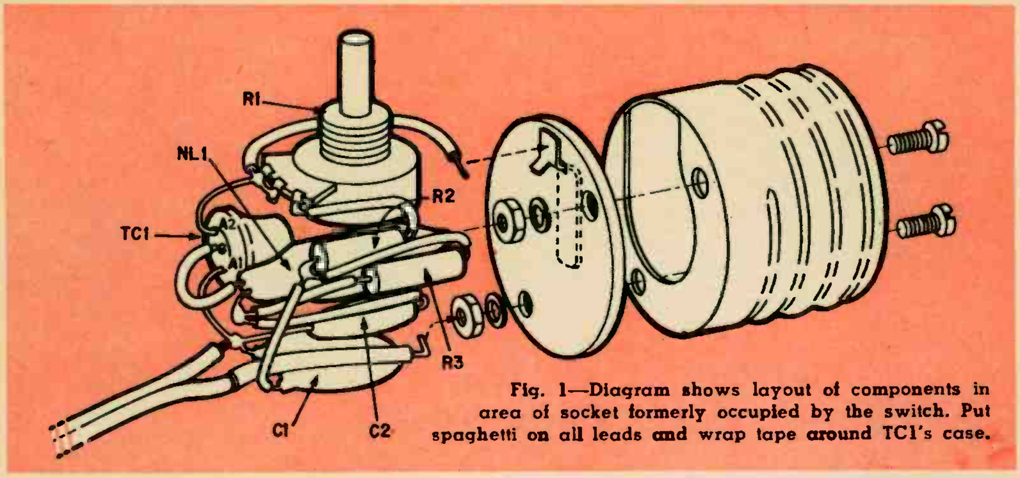

Fig. 1—Diagram shows layout of components in area of socket formerly occupied by the switch. Put spaghetti on all leads and wrap tape around TC1's case.

IN-A-SOCKET DIMMER

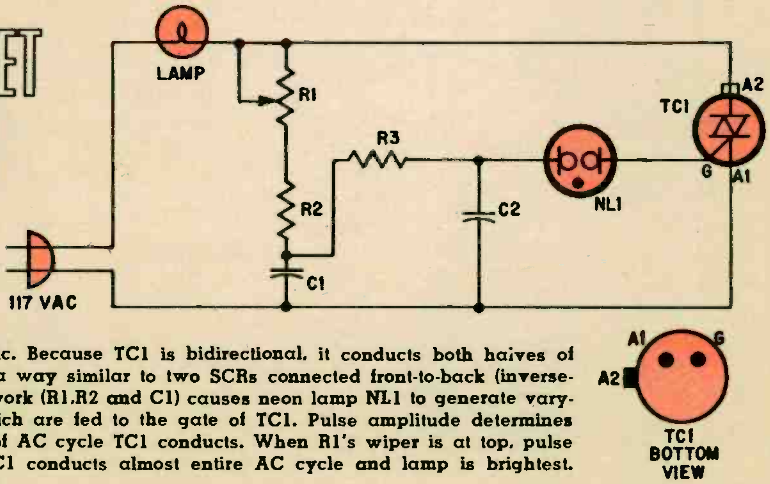

Fig. 2—Dimmer schematic. Because TC1 is bidirectional, it conducts both halves of AC cycle (full wave) in a way similar to two SCRs connected front-to-back (inverse-parallel). Phase-shift network (R1,R2 and C1) causes neon lamp NL1 to generate varying-amplitude pulses which are fed to the gate of TC1. Pulse amplitude determines how much of each half of AC cycle TC1 conducts. When R1's wiper is at top, pulse amplitude is greatest. TC1 conducts almost entire AC cycle and lamp is brightest.

Figure 2 shows the complete dimmer circuit. All components except the plug fit in the socket. Note that there is no on-off switch because R1 turns off TC1 and the bulb. TC1 is a bidirectional thyristor made by RCA. RCA's name for the device is a Triac. It conducts current in two directions, as might two silicon controlled rectifiers connected front-to-back and in parallel. The range of illumination control is from off to full on.

Construction. We built our dimmer in a *push-thru* socket, as is found in most lamps. We suggest you build your dimmer in this type socket because the construction of a *turn-knob* socket is somewhat different and our illustrations would not be suitable.

There's not a bit of extra space available in the lamp socket; therefore, you must use the miniature components specified in the Parts List. To avoid shorts and to eliminate shock hazard, assemble the dimmer exactly as shown in Fig. 1, using spaghetti on every lead longer than 1/8 in.

First, remove the socket from its metal case or shell. Look down into the base and you'll see two screws. Loosen them until the switch falls away from the base. If rivets are used, drill them out. Take care not to lose the tab—the part of the socket that touches the bulb's bottom contact.

Replace the screws (or rivets) with No. 2 or No. 3 by 1/2-in.-long machine screws. Fasten together the fiber insulator disc and the threaded base. Cut one screw at the nut but do not cut the other because you connect one side of the AC line to it.

Solder a 2-in. piece of No. 22 solid insulated wire to the center-contact tab, insert the tab into the fiber insulator disc, then slip the base into the cylindrical cardboard in-

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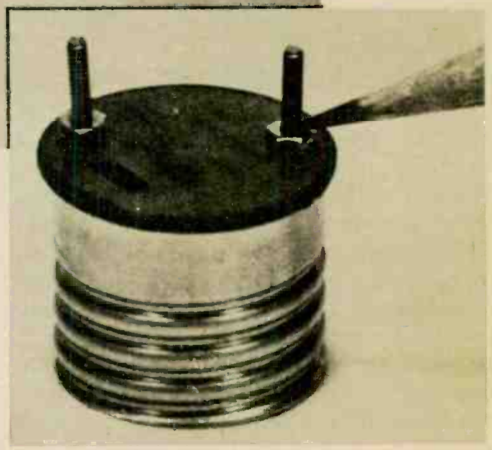

Fig. 3—If rivets were used to hold the socket together, drill them out. Discard switch assembly (in hand) but save all other parts. Cut short the screw (No. 2 or No. 3, ½ in. long) indicated by pencil—the one opposite the center-contact slot.

PARTS LIST
C1—.1 μf, 200 V ceramic disc capacitor (Sprague type TH-P10, Allied 43 D 6606. 78¢ plus postage; not listed in catalog)
C2—.02 μf, 200 V microminiature paper tubular capacitor (Aerovox type P95ZN, Lafayette 34 C 7327)
NL1—NE-83 neon lamp
R1—50,000 ohm miniature potentiometer (Lafayette 32 C 7359)
R2—2,700 ohm, ½ watt, 10% resistor
R3—12,000 ohm, ½ watt, 10% resistor
TC1—Triac, RCA type 40485 (Allied $3.14 plus postage; not listed in catalog)

sulator. Fit the insulator into the socket case. Temporarily install R1 in one of the two switch slots in the socket case. Check that neither of the two base mounting screws is touching R1's case (if they are, the socket case will be connected to the AC line).

If possible, rotate the base so R1 is centered between the screws. (If necessary later on, apply a drop or two of silicon-rubber adhesive between the base and the cardboard insulator to prevent the base from turning when the bulb is inserted.) Route the lead previously connected to the center-contact tab against the insulator and connect it to R1's right and center lugs, as shown. Carefully remove this assembly from the socket.

Cut off the tab on TC1's case and file the edge smooth. Because the A2 lead of TC1 is connected internally to TC1's case, the case must be wrapped with a turn or two of tape.

Place NL1, pointing toward the base, directly against TC1. Making the shortest possible connection, connect one of NL1's leads to the G lead from TC1. Then connect lead A1 to one side of the AC line cord and to one of C1's and C2's leads. Before installing any other components, solder one side of the AC line cord to the long base-mounting screw. Finally, install R2 and R3.

Limitations and Use. The dimmer can handle a maximum of 150 watts. Do not use a larger bulb. Rotate R1 full counterclockwise and plug in the line cord. Slowly advance R1 until the bulb comes on. (The bulb will light at a higher brightness level than its minimum brilliance, obtained when you turn R1 counterclockwise from full on.)

Safety Check. To make certain there's no shock hazard caused by a short to the socket case, connect one lead of an AC voltmeter (set to indicate more than 125 VAC) to the case and connect the other lead to a ground, such as a cold-water pipe. Turn the dimmer full on and note whether the meter indicates about 117 VAC. Then reverse the power plug and look for an indication. If the meter fails to indicate either way, all is well. If the meter indicates voltage, there is a short.

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THE HAM SHACK

BY
WAYNE GREEN
W2NSD/1

WHAT A RUCKUS . . . Couple of issues ago I discussed CW's role in modern hamdom, proposing that a code speed of five words per minute be set for all licenses. Who would have thought such a common-sense idea would stir up such controversy? Mercy me!

You might expect that the heated letters protesting my gall would point out the holes in my reasoning and state clearly why the code speed should be left where it is. But, no, the points made had more to do with my ancestry, the percentage of wit I still retain and the like. Well, all that may be true, but saying so doesn't contribute much that's constructive.

A letter from the ARRL says they did not, either, request the code speed to be increased to 20 wpm. After the fix they've got ham radio into I would think they would hold their (collective) tongue. But since I have no desire to be controversial I shall not give you my opinion of their monstrous incentive-licensing hoax, which is still hanging over our heads ready to rupture.

For would-be hams in the CB set, Hammarlund has put out a CB transceiver that can be tuned to the 10-meter band without tools when the day comes for the switch to hamming. The HQ-205 will receive everything from 540 kc to 30 mc and it has provision for 100-kc crystal calibrator and such ham-type features as variable BFO (for CW or SSB) and bandwidth and calibrated S-meter.

One of the big problems we have in amateur radio is a lack of involvement. Few hams take the trouble to follow what is going on so when something comes up there is no one to speak with authority. I've cringed while visiting ham clubs to hear large quantities of misinformation being put out as fact . . . I even cringe a little when I read some of the ham magazines, fantastic though it may sound.

With 250,000 hams in this country I would think we could manage—every year or so—to rig up some sort of national conference where the main business would be to discuss our rules and suggest changes. Representatives from interested ham clubs could get together and hash things out in committees. The changes then could be voted in or out by the whole conference.

A system like this might provide a sense of involvement that would result in more progress and public service for our hobby. If we could assume more responsibility for our own existence we might be able to take over the examination of prospective new licensees, saving the government millions of dollars and freeing FCC personnel for other services.

Many readers wrote to say they thought my ideas were sterling but asked what they should do to get the ball rolling. The present system for dealing with the FCC is fairly simple. Write them a letter, explaining what you propose and why. Mark *Petition* at the top of the letter and include 15 copies. It is prudent to have the original notarized.

I suggest you talk over your petition with your radio club before throwing it into the hopper. You can ignore the loudest and longest comments and concentrate on the more cogent ideas.

Way out on Six . . . Hey, sport fans! Some night when your Merc is bugged out and your leather jacket is soggy after a rumble with the channel 11 crowd, punch out some of your DNA molecules with the ARRL license manual, hamdom's instant-memorization guide to an amateur ticket.

[*Continued on page* 125]

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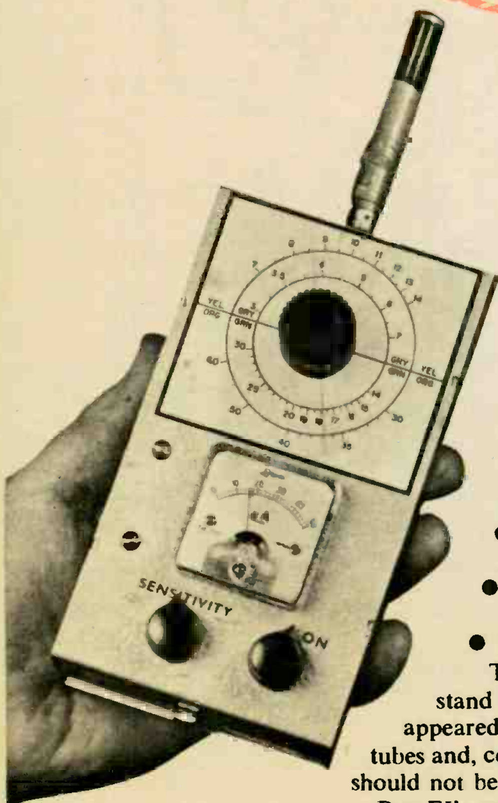
New! Build a Gate-Dip Oscillator



By CLARE GREEN, W6FFS

ASK the ham who owns one and he'll tell you a GDO (grid-dip oscillator) is the most useful test instrument he has in his shack. For the money, it's impossible to beat a GDO when it comes to building, servicing and tuning up transmitters and receivers. Take a look at some of the things it can do:

- Serve as a calibrated signal generator.
- Function as a local oscillator when you are trouble-shooting a receiver.
- Indicate a signal's relative strength.
- Determine the resonant frequency of such tuned circuits as filters, traps, antennas, feedlines and such.
- Operate as an oscillating detector for making frequency measurements.
- Work as a modulation monitor.

The abbreviation GDO, of course, always has been known to stand for *grid-dip oscillator*. But in the last few years GDOs have appeared on the market that are solid state. This means they have no tubes and, consequently, there are no grids. Therefore, these instruments should not be called GDOs.

But EI's solid-state dipper *can* be called a GDO since the letter G stands for gate—the control element in the instrument's field-effect transistor.

Basically a GDO unit is a very accurately calibrated oscillator which includes a meter that indicates change in grid current. When an external tuned circuit is inductively coupled to the oscillator's tuned circuit (both at the same frequency), the GDO's meter indicates a drop, or dip, in grid current. This is because the external tuned circuit absorbs RF energy from the oscillator.

Our GDO, a gate-dip oscillator, uses a field-effect transistor in a circuit that works the same way as a tube GDO. It is completely portable since it is powered by a 9-V battery. It is housed in a 5¼ x 3 x 2⅛-in. metal box. Four plug-in coils cover a range of 3 to 60 mc.

How it Works

Take a look at the schematic in Fig. 3. As you can see, the GDO is a simple oscillator (Colpitts) whose operating frequency is determined by C1A, C1B and the coil plugged into J1. You tune it over the range of each

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Gate-Dip Oscillator

coil with dual variable capacitor C1. Built-in meter M1 indicates the change in Q1's gate current.

When an L-C circuit which is resonant at the same frequency as the GDO is located near the pickup coil (L1-L4), the external tuned circuit will absorb some of the RF energy generated by the oscillator. As a result, this pulls RF energy from the GDO and Q1's gate current drops. Consequently, M1 will indicate a lower current.

The RF produced by the oscillator is detected in Q1's gate-source circuit. The resulting DC through gate-leak resistor R1 is coupled via sensitivity control R2 to M1.

Plug a pair of phones into J2 and you disconnect M1. This converts the GDO into a heterodyne detector which you can use to determine whether or not a receiver's oscillator is working.

Construction

Because of the frequencies at which the GDO operates, parts placement and wiring are critical. Follow as closely as possible the pictorial and photos when installing components. So the dial will lie flat against the cabinet, use flat-head screws and countersunk holes to mount tuning capacitor C1 in the main section of the Minibox. Use spacers or nuts to keep C1's shaft-bearing housing from touching the cabinet. We kept C1 a quarter inch away from the panel in our model.

Mount a 1¼-in. square piece of perforated board on the bottom of C1 spaced approximately ¼-in. from C1. Install flea clips on the board, then connect and wire the components as shown in Fig. 1.

Make sure that J1 is installed so its outside shell and ground lug do not touch the cabinet. You do this by first drilling a ⅝-in.-dia. hole in the top of the cabinet. Then cut a piece of cardboard and put it between J1 and the cabinet.

Make a bracket for B1 to hold it in place. Cut out the dial in Fig. 4 and cement or tape it to the panel around C1's shaft. We used a piece of clear plastic (with a line scribed down the center and filled with ink) fastened to the knob as an indicator. Short pieces of wire cemented to the knob also work.

Refer to the coil detail drawing in Fig. 5. Cut the ⅜-in. dowels to the lengths indicated and make slots for the wires where shown. Solder a large ground lug to each phono plug

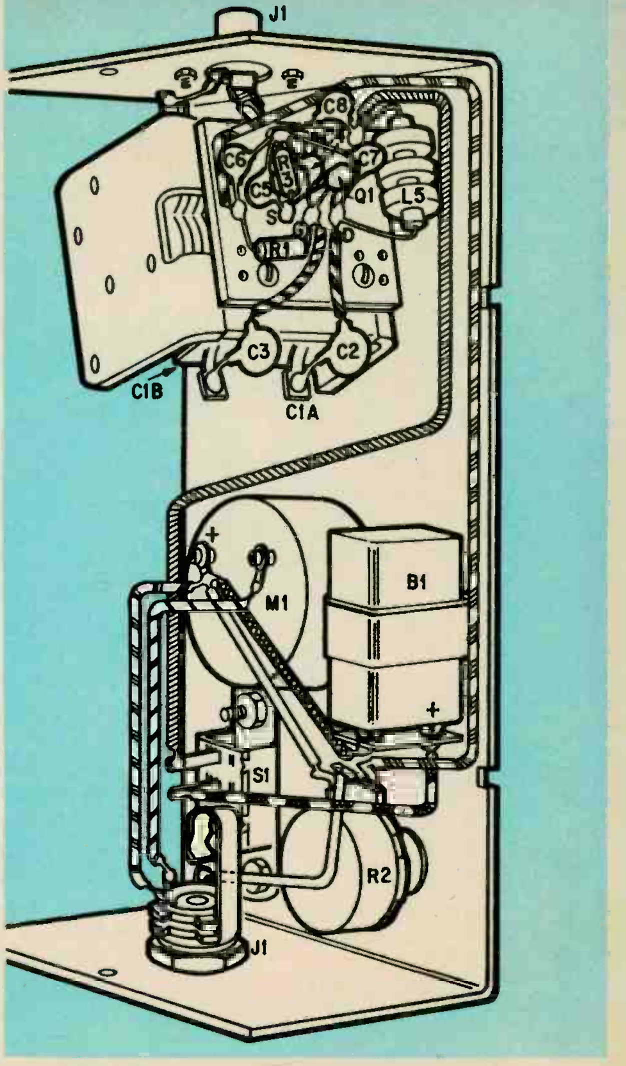
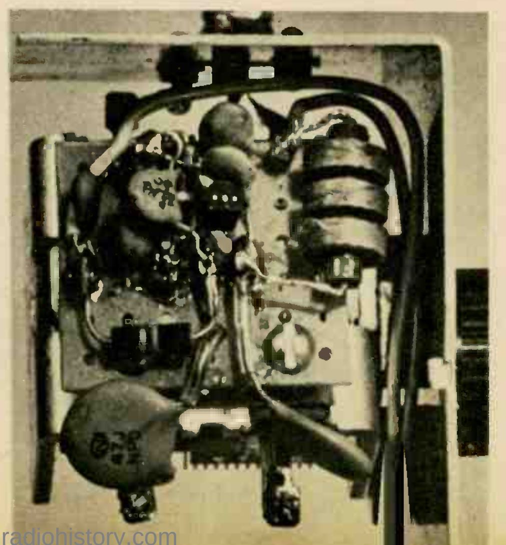


Fig. 1—It's important to install the parts associated with C1 exactly where shown on a 1¼ x 1¼-in. piece of perforated board. Mount the board on C1 as shown, keeping it ¼-in. away from C1's frame with two hex nuts. Cut a ⅝-in.-dia. hole for J1 so its ground lug doesn't touch the cabinet.



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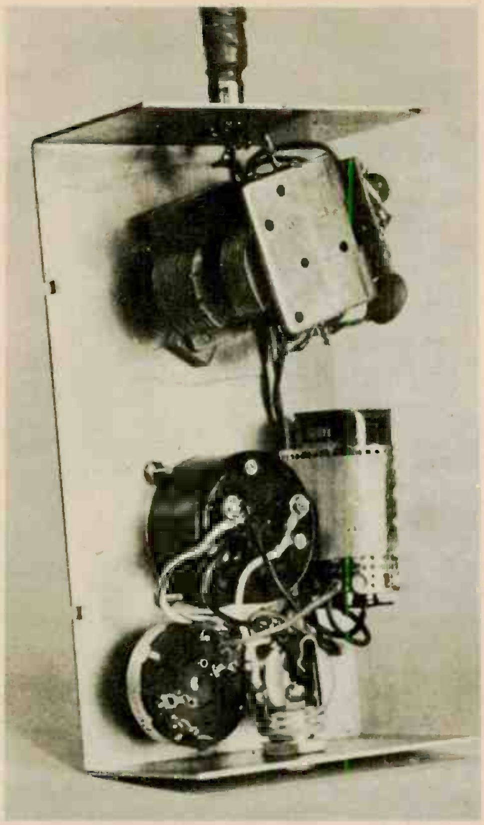

Fig. 2—Parts placement in bottom of cabinet isn't critical; however, mount tuning capacitor at top exactly as shown. We used a rotary switch for S1.

and fasten the other end of the lug to the dowel with a small wood screw. Slip a short length of spaghetti over the coil wire, then slip the wire into the center connector of each phono plug. Wind the coils as shown, keeping the wire tight. Solder the other end of the coil to the ground lug and wrap the entire coil with tape. We used colored plastic tape to identify

PARTS LIST

B1—9 V battery (Burgess 2U6 or equiv.)
C1A,C1B—Two-section variable capacitor; front section: 10.5-365 μμf, rear section: 7.6-132 μμf. (Lafayette 32 R 1101 or equiv.)
C2,C3—47 μμf, 1,000 V ceramic disc capacitor
C4,C7—4.7 μμf, 1,000 V ceramic disc capacitor
C5—470 μμf, 1,000 V ceramic disc capacitor
C6,C8—1,000 μμf, 1,000 V ceramic disc capacitor
J1—Phono Jack
J2—Closed-circuit phone jack
L1,L2,L3,L4—Plug-in coil (see text)
M1—0-50 μa DC microammeter (Lafayette 99 R 5049 or equiv.)
PL1—Phono plug (4 reqd.)
Q1—2N3819 FET (Texas Instruments. Allied, $3.75 plus postage. Not listed in catalog.)
L5—.55 mh RF choke (J.W. Miller 4649. Lafayette 34 R 8829 or equiv.)
R1—10,000 ohm, ½ watt, 10% resistor
R2—10,000 ohm, linear taper potentiometer
R3—120 ohm, ½ watt, 10% resistor
S1-SPST slide switch
Misc.—5¼ x 3 x 2⅛-in. Minibox, perforated board, flea clips, ⅜-in. dowel (10 in.).

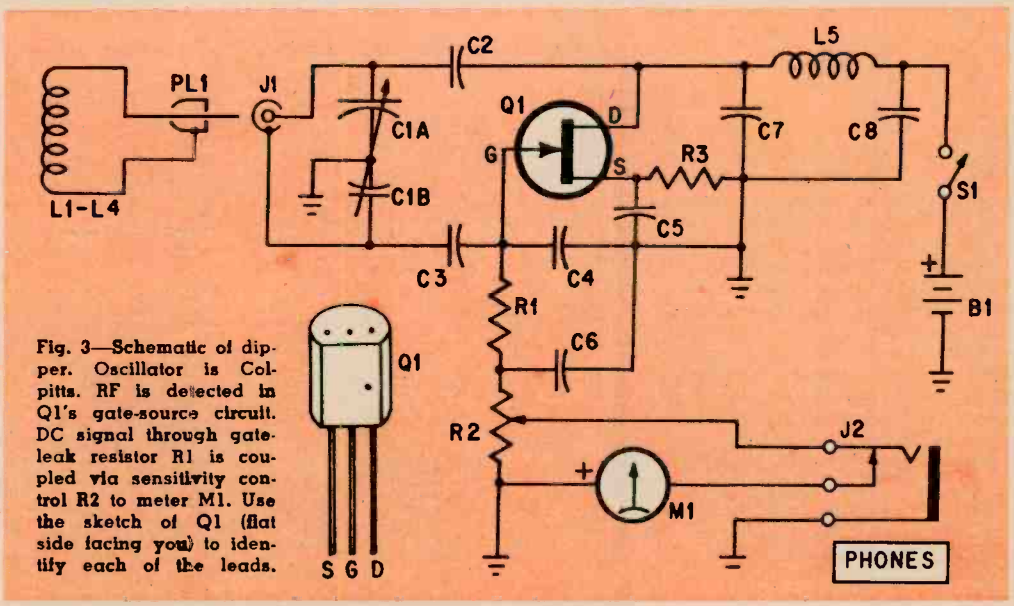

Fig. 3—Schematic of dipper. Oscillator is Colpitts. RF is detected in Q1's gate-source circuit. DC signal through gate-leak resistor R1 is coupled via sensitivity control R2 to meter M1. Use the sketch of Q1 (flat side facing you) to identify each of the leads.

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Gate-Dip Oscillator

each coil and to key it to the appropriate dial scale.

Calibration

There are three ways to calibrate the dipper: the first requires a receiver(s) which tunes to 60 mc, the second requires another GDO, the third requires a signal generator.

If you have an all-band receiver, plug in each coil and tune the receiver until you hear the dipper's output signal (the receiver will go silent). Mark the GDO's dial accordingly.

We used a tube GDO to calibrate our dipper by placing the coils of the two units near each other and tuning for a dip. This calibrates the dipper under a load similar to that used in actual operation.

The third method is to couple a signal generator's output to the GDO with a two-turn coil of wire connected to the generator's output. Plug a pair of phones in J1. When the GDO is tuned to the generator's frequency, you'll hear a beat note in the phones. Start at the bottom of the frequency range so you won't accidentally tune in a harmonic.

The number of turns for each coil is approximate and may have to be changed depending on how you wire your unit. Add or subtract from the specified number of turns to change the range of each coil to correspond to the frequencies marked on the dial.

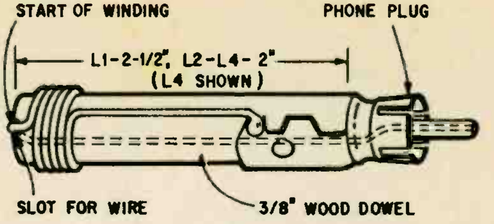

Fig. 5—Coil details. Colors refer to tape, wrapped around wire, we used for fast identification. Plug is held on dowel with a large ground lug.

The way to use the dipper to check a coil is to adjust sensitivity control R2 so M1 indicates near to full scale. Sensitivity control R2 should be turned full clockwise when using the highest-frequency coil (30-60mc), L4. This is necessary because at this frequency Q1 is less efficient and M1 will not indicate full scale. However, the dip will be as apparent as it was at lower frequencies.

With the power off and phones plugged in, the dipper can be used as a tuned detector for checking the output of transmitters. Be careful not to apply too much RF to the dipper or you may burn out the FET. Check the Radio Amateur's Handbook, published by the ARRL, for other ways to use a GDO.

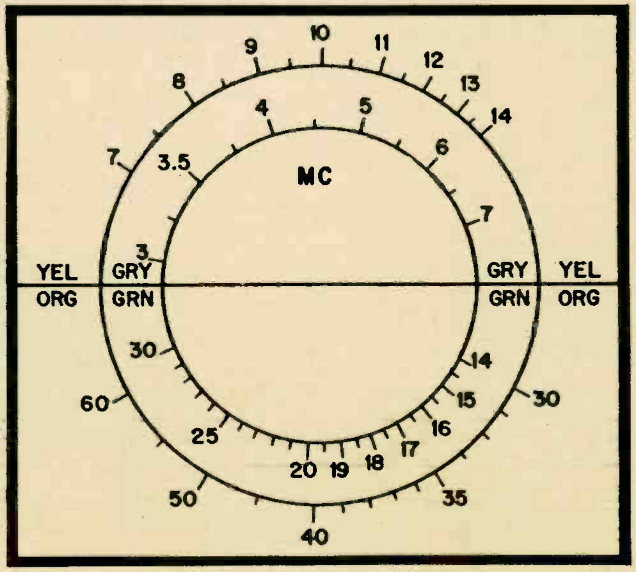

Fig. 4—Cut out this dial and paste it on your GDO. Not only will it be a good starting point for calibrating the instrument, but it will dress it up as well. Colors on each scale correspond to colored tape wound on each coil to simplify finding the correct scale for each coil. You may find the dial's calibration is a bit off when checking the unit against another GDO or receiver. This is because of slight differences in coil construction and layout, and easily can be corrected simply by adding or removing a few turns of wire from each coil.

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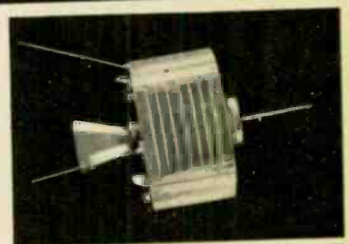

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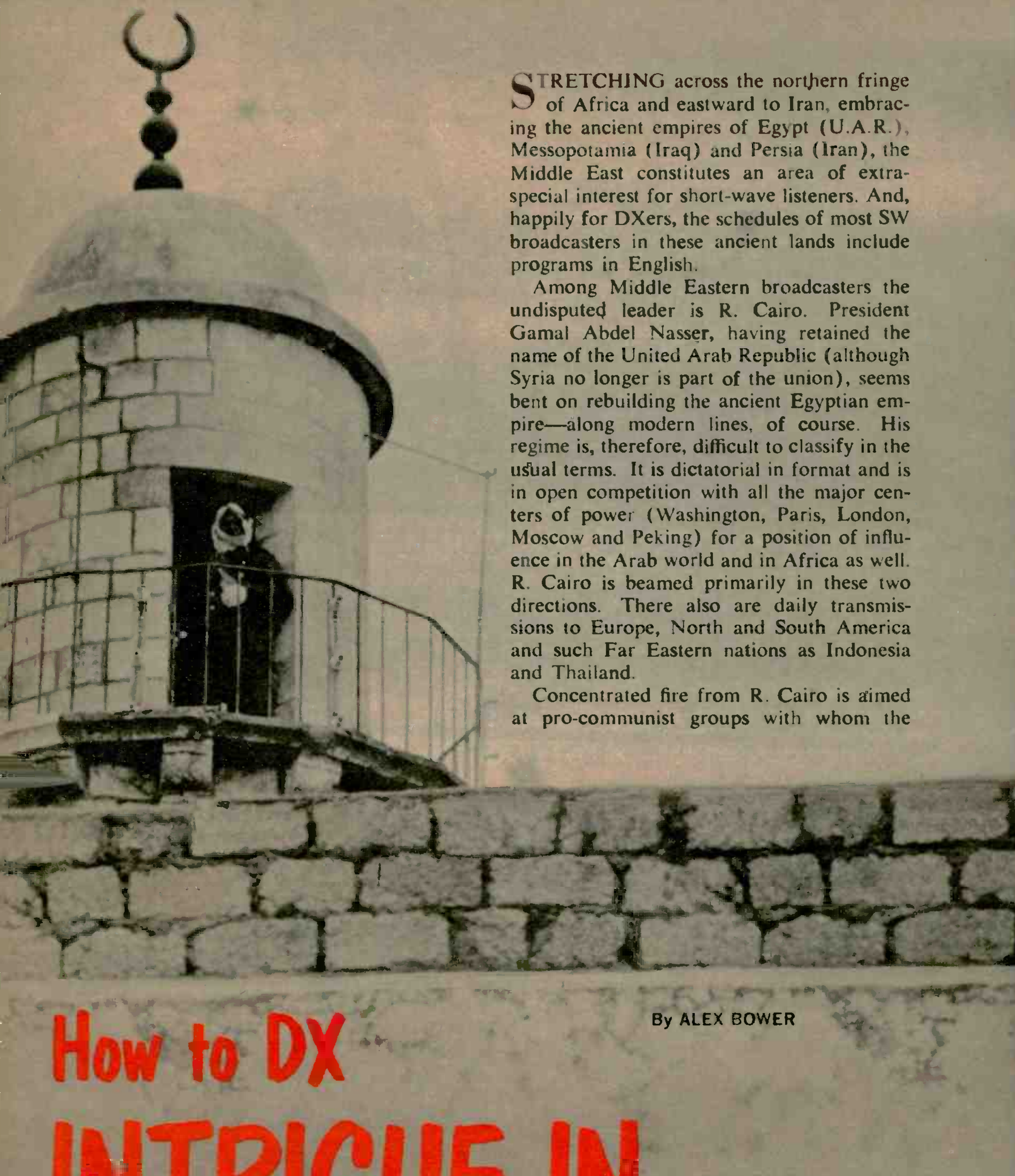

How to DX INTRIGUE IN THE MIDDLE EAST

By ALEX BOWER

STRETCHING across the northern fringe of Africa and eastward to Iran, embracing the ancient empires of Egypt (U.A.R.), Messopotamia (Iraq) and Persia (Iran), the Middle East constitutes an area of extra-special interest for short-wave listeners. And, happily for DXers, the schedules of most SW broadcasters in these ancient lands include programs in English.

Among Middle Eastern broadcasters the undisputed leader is R. Cairo. President Gamal Abdel Nasser, having retained the name of the United Arab Republic (although Syria no longer is part of the union), seems bent on rebuilding the ancient Egyptian empire—along modern lines, of course. His regime is, therefore, difficult to classify in the usual terms. It is dictatorial in format and is in open competition with all the major centers of power (Washington, Paris, London, Moscow and Peking) for a position of influence in the Arab world and in Africa as well. R. Cairo is beamed primarily in these two directions. There also are daily transmissions to Europe, North and South America and such Far Eastern nations as Indonesia and Thailand.

Concentrated fire from R. Cairo is aimed at pro-communist groups with whom the

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U.A.R. struggles for control of two other Arab nations—Syria and Iraq (whose SW voices we'll get to in a moment). But, even so, Cairo's broadcasts are weighted heavily on the anti-American side. They constantly attack our Vietnam policy. (As every active SWL knows, most neutrals are critical of the U.S. in this respect, but R. Cairo's attacks are particularly violent.) Conversely, they play up events that give the impression of friendship with the communist world. You can hear all this for yourself during R. Cairo's transmission to North America at 2030-2200 EST on 9475 kc.

Just how many different transmitter sites are being used by Cairo—and just how far apart they may be—is something of a mystery. Technical evidence, based on reception reports, seems to indicate that the distance is considerable. In particular, there is reason to suppose that an outlying location is used for transmissions to Africa on 17920 kc around 1530 EST.

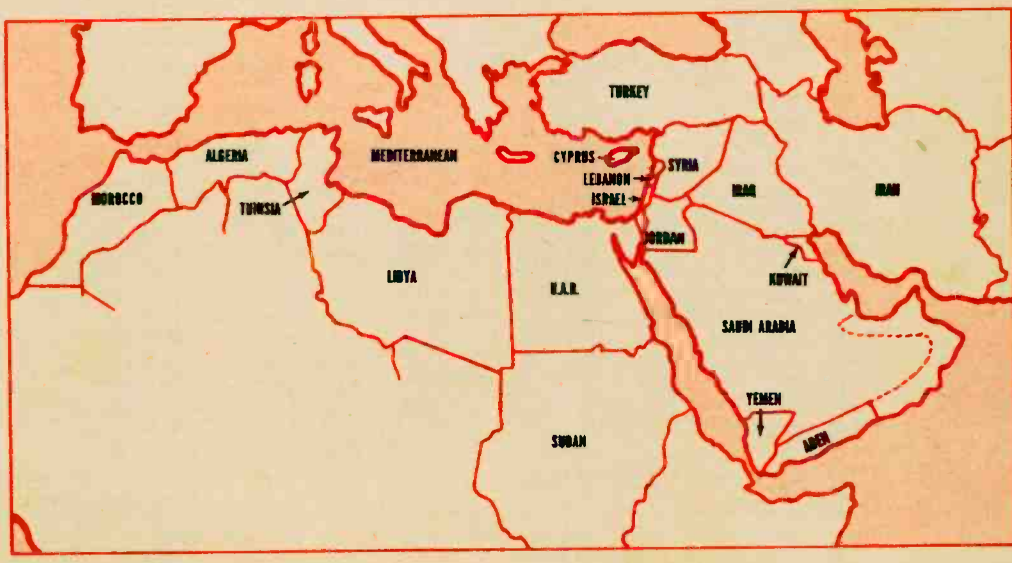
From Syria and Iraq you will hear broadcasts dominated by the flux of power as it shifts back and forth between Nasserite and pro-communist forces. Best way to keep score is to listen to the English-language transmissions. R. Baghdad (Iraq) comes in at 1445 EST on 6095 kc—a pretty rough assignment for North American SWLs. R. Damascus (Syria) transmits at 2300 on 7145 kc, although as this is being written we have yet to see a report of reception on this side of the Atlantic. Both these stations obviously are finer DX catches than is R. Cairo.

No Middle Eastern regime leans further left than that in Algeria. Still, Radio-Television Algerienne certainly is not an out-and-out satellite of Moscow or Peking (as are R. Prague and R. Tirana, for example). R.T.A. is heard regularly on a variety of frequencies and has English at 1700 on 6175 and 9685 kc. Unfortunately, reception of this particular transmission never is better than fair.

R.T.A. also operates a powerful transmitter way down on 529 kc (considered medium wave there, although we would call it long wave). Despite a rising sunspot count, R.T.A.'s 529-kc powerhouse still should be heard occasionally on this side of the Atlantic and for most North American listeners this is the only real chance to log Africa below that 535-kc dividing line.

On R. Cairo's right (politically-speaking) and now the object of scorn in part of the Arab world is the liberal monarchy of Jordan. In Dec., 1966, this tiny land suffered a military invasion by Israel and then was criticized in broadcasts from many Arab countries—but most of all by Cairo—for the mildness of their response. The tamer criticisms simply disagreed with King Hussein's actions, the wilder ones openly urged Jordanians to lop off his head. The monarch at length was forced to accept the stationing in Jordan of troops from other Arab countries.

Also to Cairo's right are the Republic of Lebanon, Morocco's less-than-liberal monarchy, the Sheikdom of Kuwait, the State of



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How to DX

INTRIGUE IN THE MIDDLE EAST

Aden (a British colony) and Saudi Arabia's feudal monarchy. All are more or less allied with the West and the VOA maintains a relay base at Tangier (Morocco) despite reports of its pending demise. (Tangier counted as a separate country for DX purposes when—until the mid-'50s—it was an international city. But no more!) Radiodiffusion-Television Marocaine has its own English-language transmission at 1530 EST on 11735 kc, using one of those VOA transmitters in Tangier.

Depending on constantly-changing QRM conditions, R. Lebanon's 2130 EST broadcast in English for North America (9680 kc) often provides the best reception of any Near East station. On the other hand, Jordan has given up its North American beam due to QRM. It recently began testing a brand-new 250-kw rig on 11870 kc at 2000 EST, however, and by the time you read this Jordan probably will be back on the air for our benefit. The increased friction with Israel and increased pressure from anti-Israel groups in Syria and the U.A.R. mentioned earlier puts pro-Western Jordan in a particularly awkward spot that should color whatever SW fare it offers us.

Aden has not been reported in North America recently, while R. Kuwait opens up on 9520 kc at 2100 EST—but only in Arabic. Although using several international SWBC channels, Saudi Arabia Broadcasting also transmits entirely in Arabic. Best reception currently is on 11725 kc until 1055 EST and on 15150 between 1100 and 1600. S.A.B. recently became an excellent verifier, having caught up on some two years' worth of reception reports. Their anxiety to please may reflect the fact that Saudi Arabia finds itself directly confronted by the U.A.R. in the Yemenite civil war. Don't look for those English broadcasts from Yemen that we keep hearing about—they don't exist. But R. San'a (Yemen's capital) occasionally is received in North America around 1600 EST on 5804 kc.

Arab broadcasters present a united voice on only one subject, it seems—their opposition to Israel. Although a state of war exists, technically, between Israel and its Arab neighbors, they refuse to recognize Levi Eshkol's government (Israel is shown as Occupied Palestine on Arab maps). Kol Israel often can be heard on 9009 kc with English at 1615 EST. The transmission also is carried on 9625 and 9725 kc, intended primarily for Europe and South Africa.

Finally, two other major Near East nations are (like Israel and Jordan) strongly tied to the West—Iran and Turkey. Both are under constant pressure from the neighboring Soviet Union, which objects to their permitting U.S. military bases. In Iran, R. Tehran broadcasts English at 1500 EST—but frequencies are

[*Continued on page* 122]

EI'S DX GUIDE TO MIDDLE EAST INTRIGUE

FREQ. (kc)	STATION (& Country)	TIME (EST)
5060	South Arabian B.C. Serv., Aden	2230 (Arabic)
5804	R. San'a, Yemen	1600 (Arabic)
6095	R. Baghdad, Iraq	1445
6175	R.T.A., Algeria	1700
6195	R.T.T. Tunisia	0000 (Arabic)
6223	R. Tabriz, Iran	2130 (Persian)
6870	R. Meshed, Iran	2130 (Persian)
7140	BBC Relay, Cyprus	2158
7145	R. Damascus, Syria	2300
9009	Kol Israel	1615
9475	R. Cairo, U.A.R.	2030-2200
9508	R. Omdurman, Sudan	2300 (Arabic)
9520	R. Kuwait	2100 (Arabic)
9625	Kol Israel	1615
9680	R. Lebanon	2130
9685	R.T.A., Algeria	1700
9725	Kol Israel	1615
11720	BBC, Cyprus	2158
11725	Saudi Arabian B.C.	1055 sign-off (Arabic)
11730	R. Tehran, Iran	1500
11735	R.T.M., Morocco	1530
11750	R. Tehran, Iran	1500
11870	Jordan B.C. Serv.	2000
15105	R. Tehran, Iran	1500
15150	Saudi Arabian B.C.	1100-1600 (Arabic)
15160	R. Ankara, Turkey	1700
17920	R. Cairo, U.A.R.	1530 (African Languages)

Transmissions are in English unless another language is specified.

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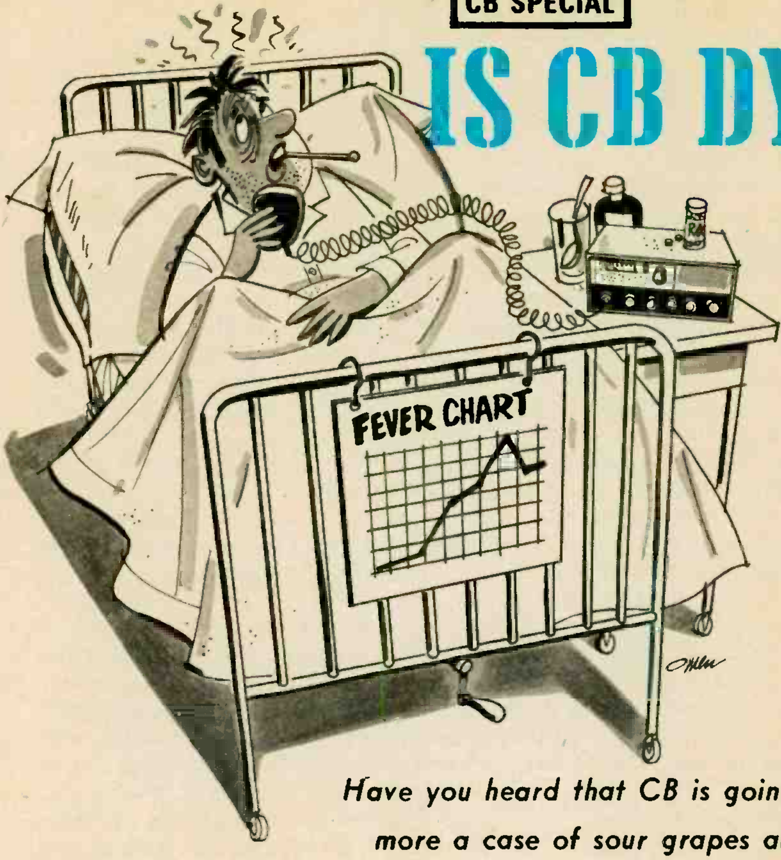
IS CB DYING?



By VERNON SIMMS

Have you heard that CB is going sour? It could be more a case of sour grapes among its ill-wishers.

SPECIAL CB SECTION

True to long-standing tradition, our May issue spotlights the radio service that (as you will see in the article starting on this page) has more licensees than any other. Contents for this year's special section are listed below:

PULSE: 70. Respiration: regular. Vital signs look good. How's the patient's mental condition? Nervous on a mike button, hysterical upon seeing letters F, C and C. Otherwise, patient doing fine.

The patient, of course, is Citizens Band radio. Like Mark Twain, who said, "Reports of my death are premature," CB is beset by undertakers who find that the corpse just won't stop kicking.

Even fitting it for a coffin poses problems. CB is so big it could shove amateur and commercial 2-way radio into its hip pocket. In nine years it's grown until it nudges the million mark and holds the title of FCC's largest division.

Our fever chart, showing CB's growth rate, tells its own story. At the end of fiscal 1958 (in July) the band celebrated its first anniversary with slightly more than 5,000 licensees—probably a small core of the technically-sophisticated. Then the word spread. As you can see, each successive

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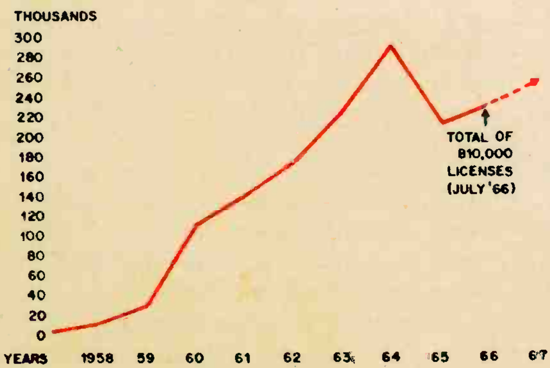
year saw the number of applications rise with incredible vigor. The pinnacle was reached by the end of 1964 when that year alone brought in 293,480 new applications.

In 1965 came an ominous dip, as shown in the graph. That was the year the band got its one-two whammy. First blow was the $8 license fee (March, 1964). Then came the threat of tough new regulations (which went into effect in April, 1965). But look what's happened. CB has proved its resiliency—not only is it heading toward the 1964 high, but one FCC official recently stated that the rate of new applications continues to be "very stable at about 17,000 per month."

That hardly deters members of what could be called the PB for CB club—Pall-Bearers for Citizens Band. It's a group anxious to heft a shoulder under the casket and return to the good-old-days on 27 mc, when the band was only occasionally brought to life by noise from a neighbor's vacuum cleaner or the feeble "Hello, test" of a brand-new ham unaware that 11 meters was as empty as a bottle of burgundy on the Bowery.

Most celebrated of CB's would-be assassins is a sizeable contingent of operators drawn from its own ranks. Funny thing about it is that they're also working toward their own destruction. After buying several hundred dollars' worth of equipment, suffering through a difficult dashboard or roof-top installation, one of the group gets on the air and makes hundreds of successful contacts. Then one day he'll read his own obituary, sent via first-class mail from Washington: *"Order of Revocation . . .* for use of station as hobby or diversion . . . communications with another Class D station for a period exceeding five minutes . . . failure to identify the station. . ." or something along those lines.

CB'S FEVER CHART:
License application rates, by years



Can enough of these death certificates lead to CB's demise? We think not. There's about one FCC monitor for every 10,000 CB licenses. And the engineers are also out catching spies, inspecting broadcasters, riding herd on aircraft, marine and a myriad of other communications services. With a paltry budget dribbled to the FCC by Congress (about $17 million a year), the Commission simply can't paper over every violation, let alone go through cautious legal steps designed to protect the innocent.

Another pall-bearer whisking the lint off his black dickey is the reporter for news media reaching the general public. He unerringly confuses CB (Part 95 rules) with the license-free walkie-talkie (Part 15). When raucous kids splatter the band with profanity he condemns CB as the villain. But should a CBer assist a motorist in distress, the newsman will write of Amateur Radio Operators. Poor publicity, though, will probably have no more impact than it did the time they reported: Mary Poppins Is a Junkie.

Then there's the case of amateur radio which, after all, yielded the 11-meter band in the first place. That loss is still being felt; mention CB to a ham and see what happens. Amateur radio, nevertheless, has its own problems to wrestle

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with. And there is much back-patting between ham and CB on the manufacturing level—what ham-gear producer would belittle his lucrative CB market?

The organizer is another recurring threat to CB's well-being. Like every other major user of radio, CB can imagine benefits it could derive from an organization to protect and expand its interests—keeping members apprised of industry developments. hiring attorneys or lobbyists, and so on. But let's look at the organizers.

CB has often felt the cold finger of the Robber Baron, the one who tells himself "There are one million CB licensees . . . if I charged only five dollars for annual membership in a national organization that would be . . . let's see . . . five million clams a year." Since he would charter the organization in a way that would avoid income taxes his efforts would have to be chalked up as deriving from the non-profit motive. This approach has been tried by everyone from a boilermaker to a show-biz mogul.

It's easy to spot the next type. He's the martinet of the CB set. He has learned to love rapping the gavel at meetings and basking in the respect automatically awarded the office. Why not push the club to regional status—or (some day) go *national?* If his rank and file don't lose interest first, chances are that his type will eventually run afoul of something called arithmetic—the sad discovery that mailing costs alone run to thousands of dollars.

Our last character plays the organization game for political reasons. He sees the FCC as the agent of an overseas power whose purpose is to limit his freedom to ride the airwaves. When you come right down to it, he's not really in favor of any sort of organization.

Since none of these club-men has been successful as a hatchet-man, there may be a score more years in the CB life-expectancy than there seemed to be. In fact, if CBers are ever to be welded into a tightly-knit pressure group it will probably require the white heat of a *real* life-and-death crisis—the sort of thing that would require CBers to go off the air tomorrow and turn in their gear the following day to be melted down as scrap.

Try talking to the businessman who sells CB equipment. For some curious reason many store-owners are like the weatherman who calls skies partly cloudy instead of partly sunny. They are quick to talk of slumps, slow to recount recoveries. They may complain that they can't match the discounts, big ad budgets and bulging stockrooms of major merchandisers. The big outlets, too, tend to be cautious in reporting CB's health. With their heavy inventory in equipment, they are sensitive to the way the wind blows from Washington.

CB'S TRACK RECORD:
Total number of licenses outstanding, compared with other radio services

Service	No. of Licensees
CB	810,000
Amateur Radio	272,400
Industrial 2-Way	142,300
Maritime	125,300
Aeronautical	102,600
Public Safety	52,300
Land Transportation	16,000

Number of CB licensees leads all other communication services.

Still, one of the country's largest distributors states that its CB business is as good as ever, with a sales dip nowhere in sight. A company spokesman confidently estimated that transceivers are moving slightly better than last year. And tube rigs, he said, are far from dead. Although the chain's advertising emphasizes solid-state gear, rigs with bottles remain popular because of price.

If you talk to some manufacturers of CB equipment you might be drowned in optimism. A spokesman for one of CB's top suppliers reports that his annual sales have doubled every year for the past several years. But that kind

[*Continued on page* 48]

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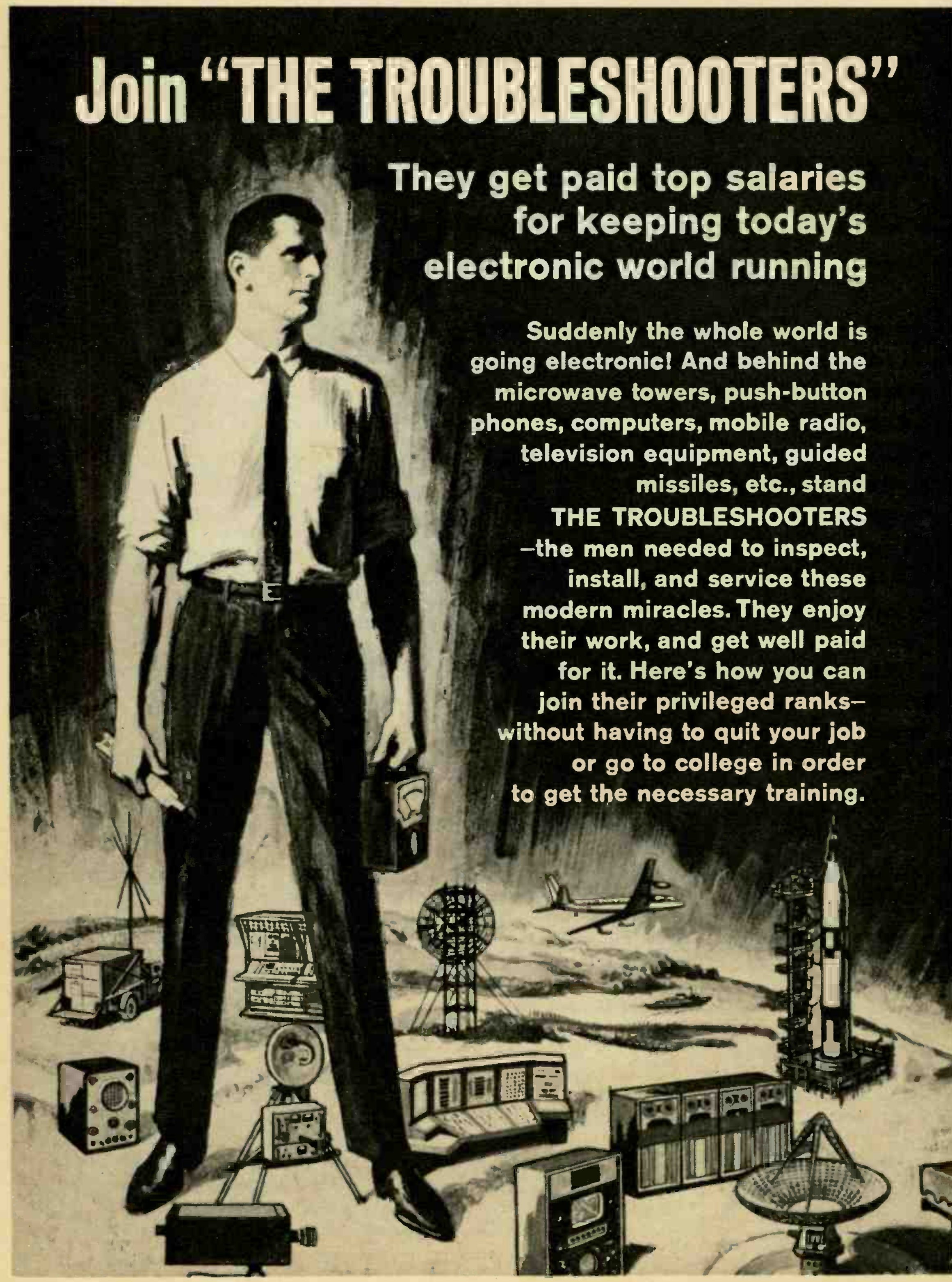

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JUST THINK HOW MUCH in demand you would be if you could prevent a TV station from going off the air by repairing a transmitter...keep a whole assembly line moving by fixing automated production controls...prevent a bank, an airline, or your government from making serious mistakes by repairing a computer.

Today, whole industries depend on electronics. When breakdowns or emergencies occur, someone has got to move in, take over, and keep things running. That calls for one of a new breed of technicians–The Troubleshooters.

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But as one of The Troubleshooters, you may be called upon to service complicated equipment that you've never seen before or *can't* take apart. This means you have to be able to take things apart "in your head." You have to know enough electronics to understand the engineering specs, read the wiring diagrams, and calculate how a circuit should test at any given point.

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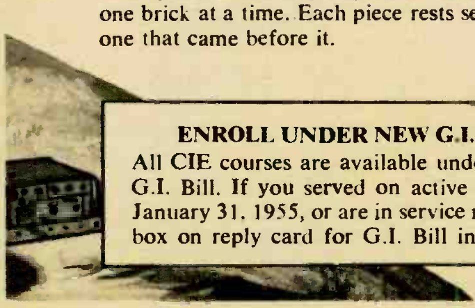

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of runaway, geometric performance, he suspects can't last forever. His sales in 1966 totaled $2 million, and he estimates that 1967 will add up to about $3½ million. Asked if anything has put a crimp in CB sales he pointed to factors that tend to create shortages of materials, rather than customers. One is the war in Vietnam. The other, surprisingly, is color TV. Count the number of controls in color vs black-and-white, he says, and you'll see the reason. The few controls manufacturers there are have been hard-pressed by TV's booming demand. But supply problems, he says, have been licked.

Another well-known manufacturer frankly admits that transceiver sales within the past few months have slipped by some 20 per cent. But he quickly adds that his company's non-CB products have experienced similar hesitancy. He believes it's due to today's tight-money policy. Dealers tend to cut back on inventory when credit is harder to obtain. Another probable brake on CB sales would be the fact that inflation is chipping away at the money consumers have available to spend on their CB purchases. He firmly believes, though, that a small slackening in his sales is not because of any disenchantment with CB itself.

Is everything coming up roses? Far from it. Despite CB's apparent good health, its road remains perilous. FCC statements about the misuses to which the Citizens Radio Service has been subjected have carried slightly-veiled threats of discontinuing the service should objectionable practices continue. But if the Commission performs as it has in the past, there's a good chance it won't play Roman Colosseum—thumbs down, CB dies. Here's why we think so.

We've mentioned the FCC's limited budget—and there is a multitude of other aggravations. Total staff is mere 1,500 and FCC offices are daily strewn with about 3,000 applications for all services. The FCC must move slowly both because of the staggering workload and in order to avoid the serious economic consequences of sweeping, impulsive decisions. Industry has invested millions in CB production facilities and CBers have purchased an estimated two or three transceivers per license—adding up to several hundred million dollars. What's more, law says the commission's rulings must support "public interest, convenience and necessity." This is open to much interpretation, but it can be argued that someone who has been operating since September, 1958 (when Class D was born) will notice little difference in convenience *provided* he operates within the spirit of original CB regulations—this, despite a continuing series of strict and confining rules changes. All this confirms that the FCC, far from giving CB a hard time, is out to improve the service by concentrating on hard-core abuses.

To some observers, moderating forces on the FCC help soften the sting from the latest official attack on CB, launched by a newly appointed Chairman. In a letter to CB manufacturers, it was stated that such items as linear amplifiers, rigs with 5-watt/100-milliwatt switches and unauthorized channels are inviting violation of the rules. It went on to a threat similar to those of the past: "This may necessitate, at least temporarily, the cessation of issuance of any new Citizens Radio licenses pending a reexamination of the justification for and proper operation of the Service." But the Chairman may also have given some consideration to the interest, convenience and necessity of one million CB operators by going on to say; "The Commission would very much regret having to adopt such an inhibitive policy for this Service."

So until CB's death notice is written into the Federal Register, the prognosis still seems to suggest a long and healthy life. In the meantime, the FCC's mounting burden of CB license applications is doing more for the morale of the patient than get-well cards ever could.

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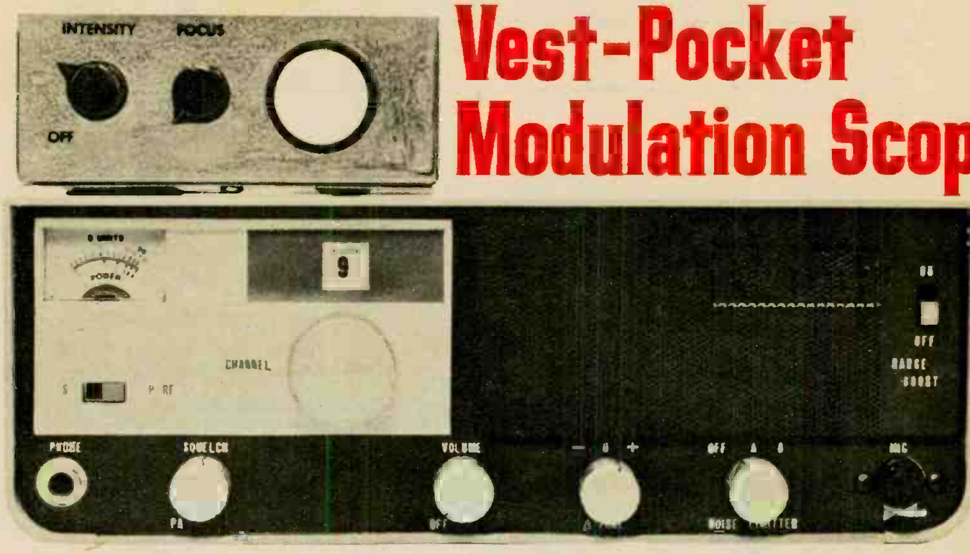
CB SPECIAL

Vest-Pocket Modulation Scope



See what your signal looks like and you can have the best on the air!

By HERB FRIEDMAN, KBI9457

CITIZENS BANDERS are constantly being drowned in a sea of modulation theory. As a result, they overlook the one really important but simple rule: modulation should reach 100 per cent as much of the time as possible. Less than 100 per cent means feeble talk power. Over 100 per cent means distortion and sideband splatter (and perhaps a nice note from old Fox Charlie Charlie).

So they go ahead and try speech clippers, compressors, limiters and other modulation boosters. What happens? They still end up with poor reception reports.

Clippers and compressors boost only the average voice power. It is the peak power you have to watch out for—it causes overmodulation.

The only way to be sure you're putting out a potent signal is to put the signal on display. Unfortunately, peak-indicating modulation meters cost hundreds of dollars and are manufactured mainly for commercial applications.

How, then, can you accurately and at a glance tell just how good your modulation is? By using EI's Vest-Pocket Modulation Scope, of course. It's a peak-indicating modulation instrument which can be built for well under \$50—under \$25 if you pick up a surplus 1EP1 cathode-ray tube (CRT).

With the scope connected to your rig, you can see instantly what your modulation percentage is. Over 100 per cent and you can expect your signal to be distorted. (Actually, 100 per cent *negative* modulation causes trouble. A transmitter which reaches 200 per cent positive modulation but less than 100 per cent negative modulation does not cause distortion or sideband splatter.)

Our scope is designed specifically for CB modulation measurements. A special RF input transformer amplifies the low RF voltage going to the antenna to about 100 V but does not increase the SWR or cause a loss in RF output. A capacitive voltage divider across the transformer permits adjustment for 1 to 3 watts of transceiver output power. A single component change permits operation with transceivers whose output is in excess of 3 watts (to a maximum of 4 watts).

The scope will provide either a trapezoid or a modulation-waveform (MW) display. All tube transceivers have a relatively high modulation voltage—approximately 200 V, which will be adequate to drive the 1EP1's horizontal plates for the trapezoid pattern. In solid-state rigs, however, the voltage isn't sufficient to produce a trapezoid pattern. Therefore, if you have a solid-state rig use the MW connections. An advantage to the MW-

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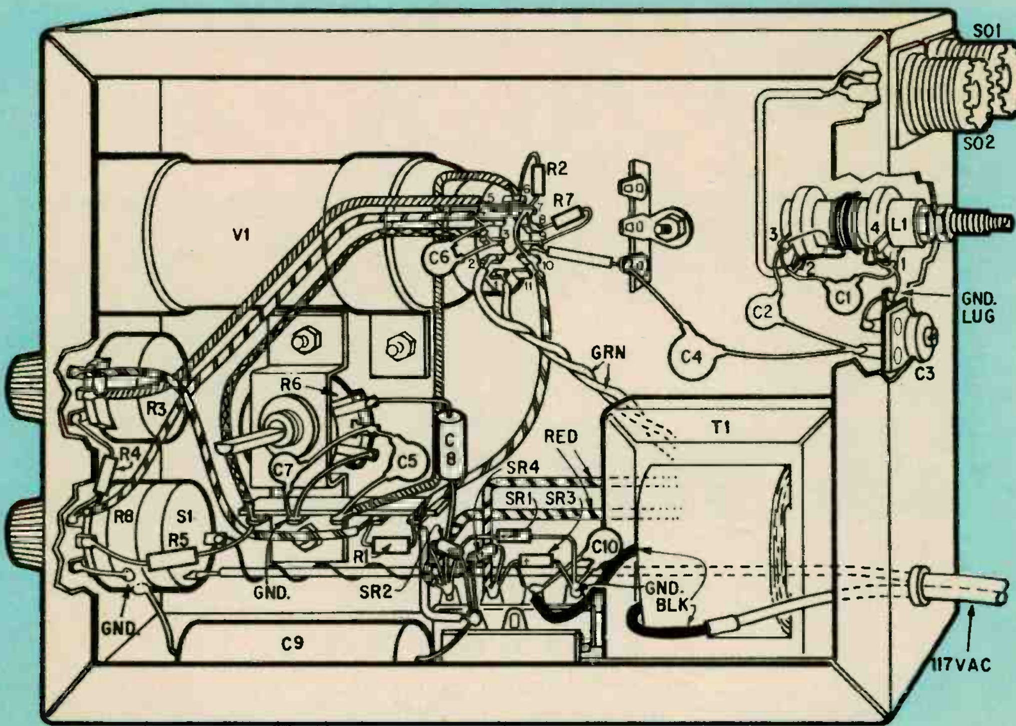

Vest-Pocket Modulation Scope

Fig. 1—Space is at a premium in 5 x 7 x 2-in. chassis so mount parts exactly where shown. We used a special socket on V1; however, you may solder wires and components to tube's pins.

display setup is that an internal modification in the transceiver is not required.

As the scope has no effect on the RF output, it can be left permanently connected to the transceiver so that the modulation can be monitored at all times.

Construction: All part values are critical and no substitutions can be made. Because the layout also is important, the pictorial and photographs should be followed as closely as possible. Our scope was built in a 5x7x2-in. aluminum chassis.

Cut all holes before mounting any components. Note the cabinet's internal corner flanges. Locate the opening for the CRT on the 5 x 2-in. side so the hole just clears the flange—don't cut into the flange.

Cut the opening for the CRT with a 1¼-in. chassis punch or a hole saw. Take up the slight extra clearance between the CRT and the cabinet by wrapping two turns of tape around the front edge of the CRT. Position *focus* control R3 and *intensity* control R8 between the CRT and the edge of the cabinet, but take care that the hole for R3 does not break off the corner flange.

We specify SO-239 connectors for SO1 and SO2. However, you may use a different type to match those you now have. Cut the holes for L1 and C3 at least 1⅛ in. below a line between the centers of SO1 and SO2. Trimmer capacitor C3 requires a hole slightly larger than ½ in. First drill a ½-in. hole and then enlarge it with a round file.

Coil L1 must be wound carefully or there will be a loss in antenna efficiency. If L1 is wound sloppily, take it apart and start all over again. Refer to the sketch of the coil in Fig. 3. Wind the secondary first. Tensilize a 2-ft. length of #26 enameled wire by clamping one end in vise and pulling on the other end until the wire goes dead slack. (If the wire isn't tensilized the coil will unwind.) Scrape approximately ¼ in. of insulation from one end of the wire and solder it to lug 4. Run the wire along the form for ¼ in.

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Fig. 2—We did not install connector SO3 in our model for trapezoid display. If you wish to, move L1 and C3 (see Fig. 1) toward SO1 and SO2, install SO3 below L1. Shaft on potentiometer R6 (directly under V1's mounting bracket) should be cut short so it doesn't protrude beyond side of cabinet.

and then wind 8 closewound turns. Solder the other end of the wire to lug 3.

Solder the end of a 2-ft. piece of tensilized #22 enameled wire to lug 1 and run the wire along the form to the beginning of the first coil. Wind 2 turns as shown and connect the wire to lug 2. The completed coil consists of the 2-turn primary slightly overlapping the 8-turn secondary.

Solder a jumper between the lugs 1 and 4 and extend this jumper about 1 in. past the secondary's start lug (4). Connect 10-$\mu\mu$f disc capacitor C1 across secondary lugs 3 and 4. Cut one lead of C2 to ¾ in. and connect it to lug 3.

Attach a 3-in. insulated lead to lug 2. This lead will be cut to the correct length when L1 is connected to the wire joining SO1 and SO2.

The CRT is held in place by a strap made

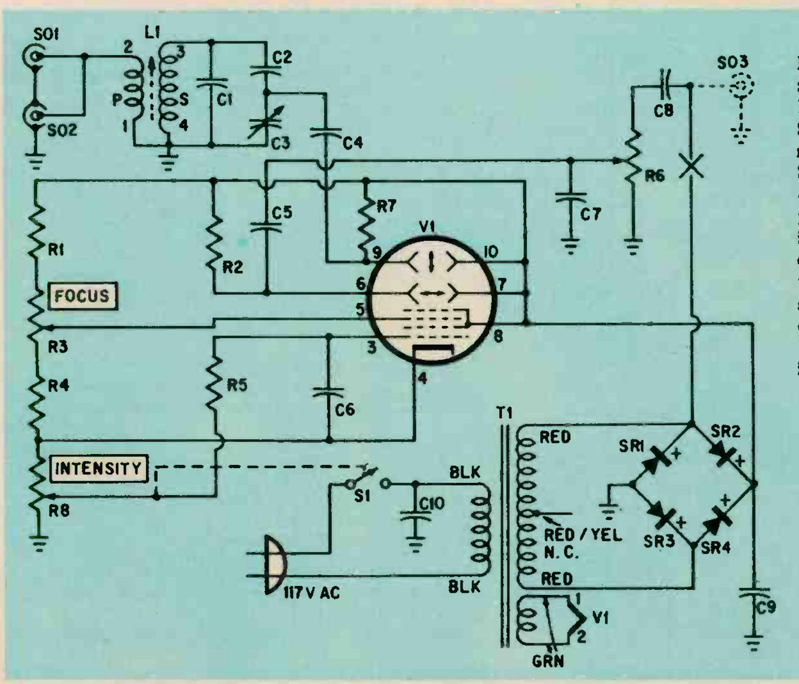

Fig. 3—For trapezoid display, break lead going from SR1, SR2 to C8. Then connect C8 to connector SO3. For clarity in coil diagram below, primary winding (P) is shown centered over secondary winding (S). It should be wound over secondary at beginning of windings near lugs 1, 4.

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Vest-Pocket Modulation Scope

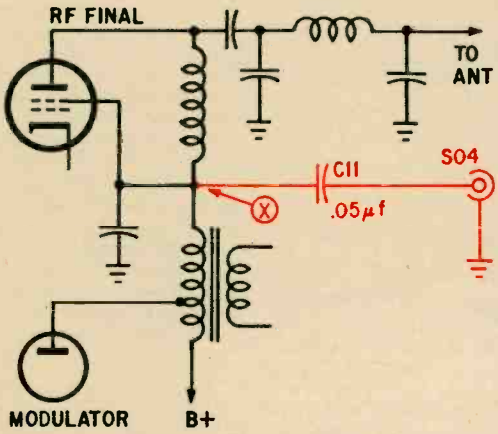

Fig. 4—Add components shown in color to transceiver for trapezoid display. To locate point X in your transceiver, refer to the set's schematic.

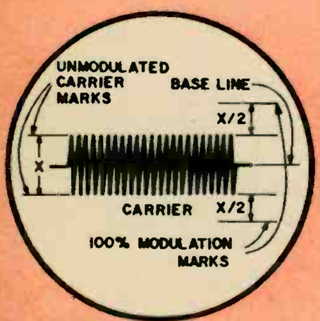

Fig. 5—Pattern shown represents unmodulated carrier. The height of the pattern will double when the 100 per cent modulation level is reached.

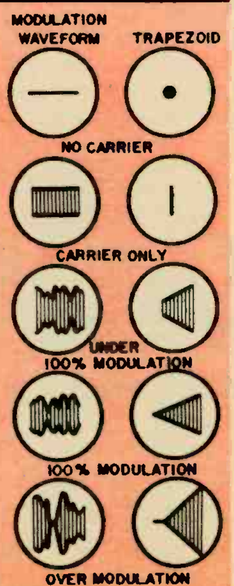

Fig. 6—Nearest patterns are called modulation waveforms. Patterns in far column are referred to as trapezoid displays. To display trapezoid pattern (not possible on solid-state transceivers), you must modify transceiver as shown in Fig. 4 to feed part of audio modulating signal to the scope.

of ½-in.-wide scrap aluminum. Simply wrap the strip around a broom handle to form a clamp shape. But be careful. If the clamp is too tight it may crack V1. A single mounting screw is all that's needed to hold the clamp. A ⅜-in. spacer or stack of washers between the clamp and the chassis will center the CRT. (Do not install the CRT yet.)

Horizontal-gain control R6 is mounted on a U-shape potentiometer mounting bracket inside the chassis. Temporarily install R6 and mark the shaft where it lines up with the edge of the chassis. Cut the shaft at the mark and then hacksaw a slot into it for a screwdriver.

To avoid a parts jam, install the components in the following order: connectors SO1, SO2 (and SO3, positioned halfway down the rear panel, if a trapezoid display is desired). The line cord and T1. Next, R3, R6, R8 and all terminal strips. Install the SO1-SO2 jumper, L1 then C3. Complete all wiring associated with these components. Install all remaining components with SR1-SR4 last.

Install R2, R7 and the jumpers between pins 8, 7 and 10 on V1 directly on V1's pins. Install V1. To be sure of getting a horizontal trace, turn V1 so that pin 1 is aimed toward T1. Complete all wiring to V1's pins and

PARTS LIST

Capacitors: 400 V or higher unless otherwise indicated
C1,C2—10 μμf ceramic disc
C3—7-35 μμf trimmer capacitor (Centralab 827-D, Allied 43 A 1519 or equiv.)
C4,C5,C8,C10—.01 μf tubular or ceramic disc
C6—.1 μf, 75 V ceramic disc
C7—.005 μf ceramic disc
C9—.5 μf, tubular
C11—.05 μf, ceramic disc
L1—Coil wound on J. W. Miller 42A000CB1 coil form (Allied 54 D 3913. $1.56 plus postage. Not listed in catalog)
Resistors: ½ watt, 10% unless otherwise indicated
R1—1 megohm
R2,R7—1.2 megohms
R3—250,000 ohm, linear-taper potentiometer
R4—150,000 ohms
R5—470,000 ohms
R6—1 megohm, linear-taper potentiometer
R8—50,000 ohm, linear-taper potentiometer with SPST switch
S1—SPST switch on R8
SO1,SO2,SO3,SO4—SO-239 coax connector (see text)
SR1-SR4—Silicon rectifier: 750 ma, 400 PIV (Allied 24 A 9693)
T1—Power transformer; secondaries: 250 V @ 25 ma, 6.3 V @ 1 A. (Allied 54 A 2008)
V1—1EP1 cathode ray tube (RCA. Allied 1EP1-Dept. 59D1. $25.75 plus postage. Not listed in catalog)
Misc.—5 x 7 x 2-in. aluminum chassis, 5 x 7-in. aluminum chassis-bottom plate, terminal strips, AC line cord

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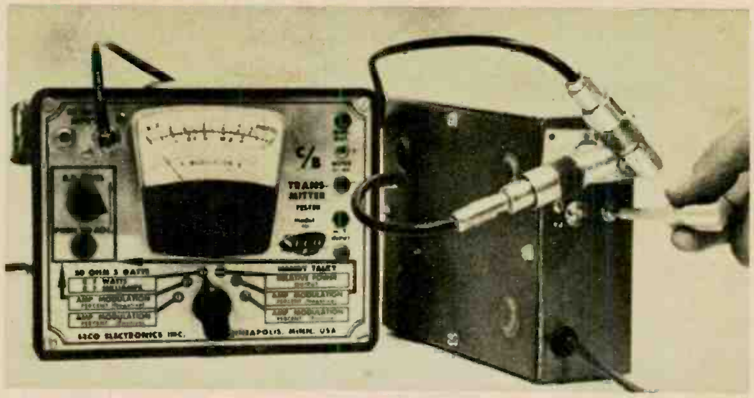

Fig. 7—Adjust L1 by feeding the transmitter output through the scope to a load. Then adjust L1's slug for maximum output power, lowest SWR or maximum display height. Instrument here is Seco Electronics Model 510 CB-transmitter tester.

leave sufficient slack in the wires so V1 can be turned for a horizontal trace.

Checkout. Connect the positive lead of a VOM set to indicate at least 400 V (DC) to the junction of SR1 and SR2. Connect the meter's negative lead to the chassis. Set R3, R6 and R8 full clockwise and turn on power. If the meter doesn't rise to over 350 V immediately pull the plug quickly and check the power supply for a wiring error.

If all is okay, a horizontal trace will appear on the CRT after a short wait. The trace will be centered. Turning R6 counterclockwise will cause the trace to shrink to a small dot in the center of the screen. The correct setting for R6 is that which makes the trace just touch the edges of the CRT. Focus the trace with R3.

Connect the transceiver output to SO1 and the antenna or a dummy load to SO2. We suggest that an SWR meter be connected between SO2 and the load.

When you transmit, the trace should expand. Using an alignment screwdriver, adjust L1's slug for maximum pattern height. This should correspond to lowest SWR and maximum output power. Now adjust C3 so the pattern is about ½ in. high. If high transmitter output prevents the pattern from being reduced to ½ in., change C2 to 5 $\mu\mu$f.

Talking into the microphone will cause the CRT to display the waveforms shown for MW in Fig. 6. Note that at 100 per cent modulation, the negative valleys just reach the baseline (appearing as a bright dot) while the positive peaks (peak-to-peak) are exactly twice the height of the unmodulated carrier. When the modulation exceeds 100 per cent the peak-to-peak height will be more than twice the unmodulated carrier height and there will be a distinct break at the baseline. The break is caused by more than 100 per cent *negative* modulation.

If you prefer the trapezoid pattern, the CRT will display them as shown in Fig. 6 under *trapezoid*. Note that with no carrier and no modulation there is no horizontal line. While modulating, adjust R6 so the horizontal sweep occupies about ¾ the total width of the CRT. Note that at 100 per cent modulation, the pattern forms a point at the baseline (equivalent to the dot in the MW pattern). When 100 per cent negative modulation is exceeded the trapezoid grows a tail—a bright line. The greater the over-modulation the longer the tail.

The Trapezoid Modification. To obtain the

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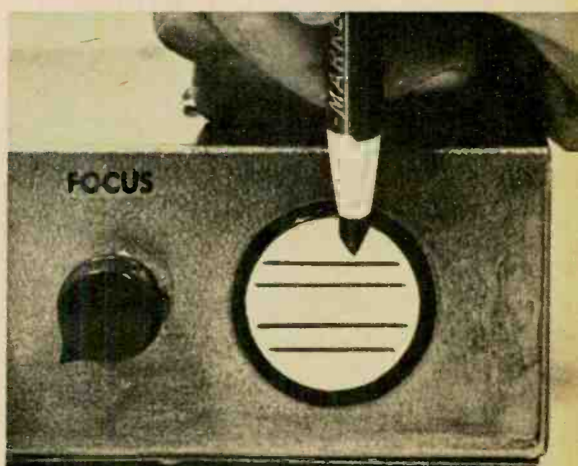

Fig. 8—To determine where to put modulation reference lines, refer to Fig. 5. Then scribe the lines on face of the CRT with a grease pencil.

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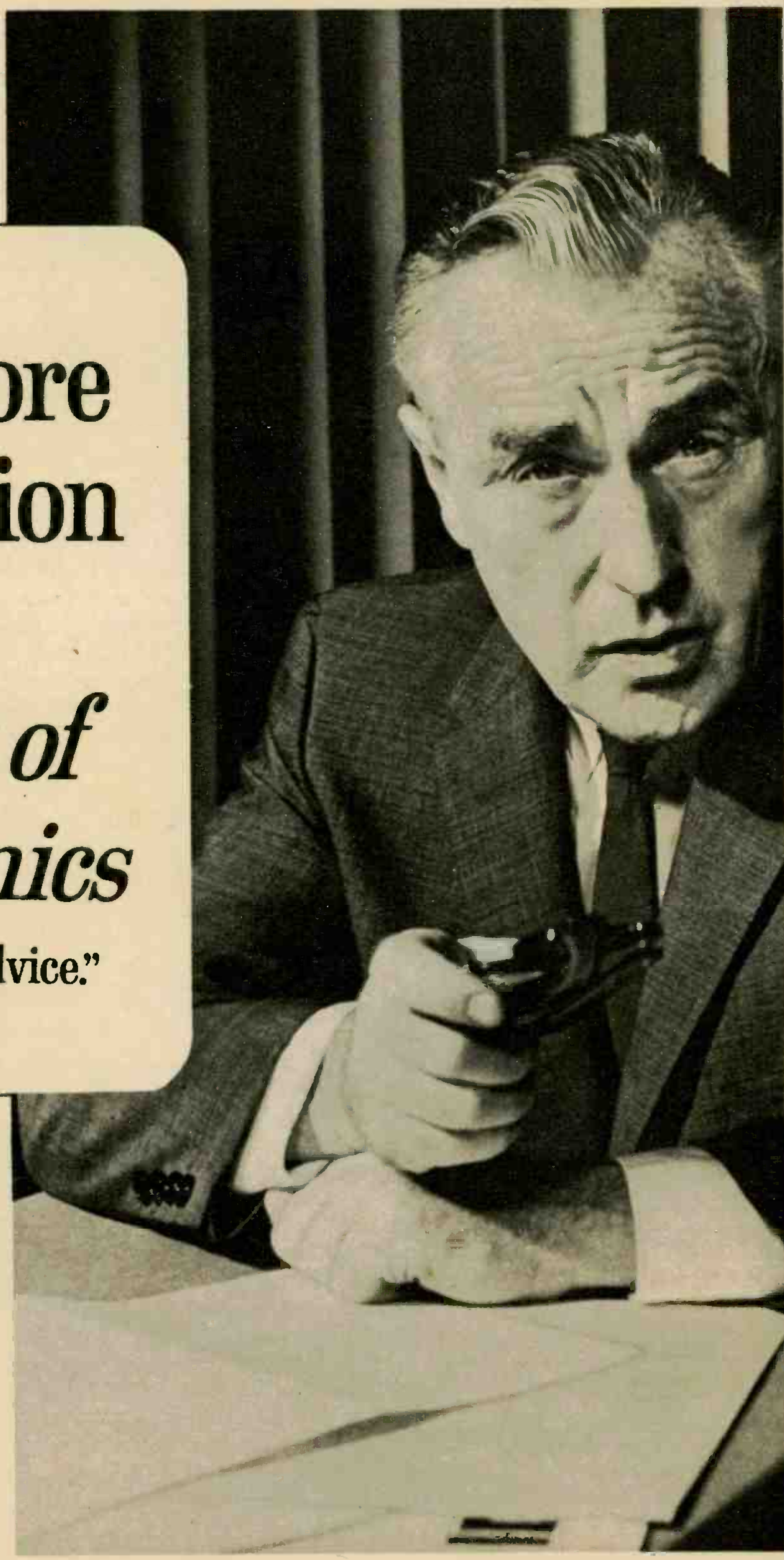

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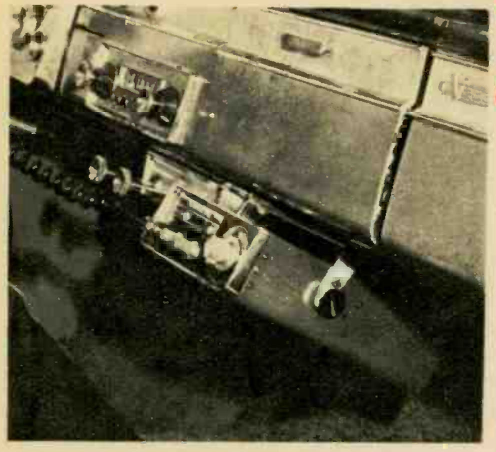


It took 15 minutes to install 2⅜ x 6¼ x 8-in. Lafayette HB-525 transceiver. Rig is so small there's legroom for passenger in middle seat.

The Easy Way

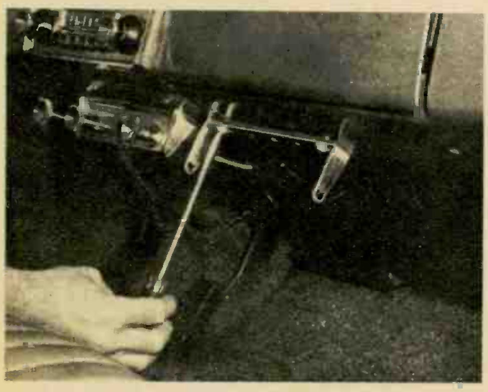
By AL TOLER

REMEMBER the good old days of mobile CB installations? The dashboard bent under 20 lbs. of weight, there were firewall braces, power cables almost as thick as your finger and the rear seat was out in the gutter so the antenna cable could be snaked through the trunk. It was great fun.

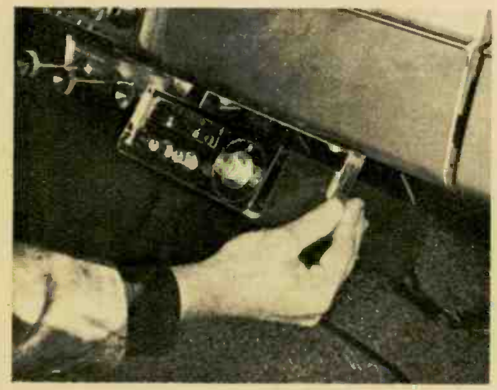
Then there was the antenna-bracket hole in the fender that ended up costing you $100 at trade-in time. Or maybe there was a rear bumper mount that was sheared off when the guy behind you kissed bumpers as he pulled out. And did you ever notice how a CB rig became a yard wide when you tried to find space for it under the dash? Or was it strapped to the driveshaft tunnel where it would cut your ankle whenever you moved your right foot from brake to gas pedal?

All these irritations now are history. The modern mobile CB transceiver—complete with antenna and cables—can sit on the palm of your hand. It requires no new body holes and can be installed without power tools. All you need is a punch, open-end wrench, screwdriver and possibly a soldering iron.

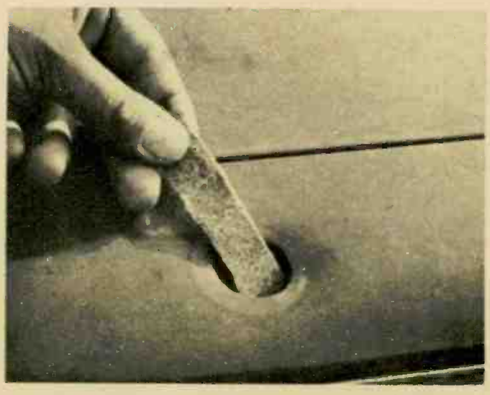
First Things First. We'll start with the transceiver. Solid-state rigs no longer are high-price, second-rate performers. A modern solid-state rig, such as the Lafayette HB-525 we show being installed here, contains



Only two No. 8 self-tapping screws were required to install bracket for typical solid-state transceiver. You start holes with punch, then drill.



Secure transceiver with two gimbal-bracket screws, connect power cord to any hot wire under dash, attach antenna cable and the rig is ready to go.



After removing existing auto-radio antenna, remove with sandpaper all dirt and rust on underside of fender to assure good ground connection.

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to Install CB in Your Car

all the important features of the big tube jobs. It has full 23-channel crystal-controlled coverage in both the transmit and receive modes, delta tuning, squelch, a modulation-boost circuit, and the new PA feature. Best of all, solid-state rigs are priced competitively with tube rigs.

You can squeeze a solid-state transceiver into almost any car—even a sports job. Mounting takes three steps: punch two holes in the underside of the dash (you don't need an electric drill) secure the rig's mounting bracket with two No. 8 self-tapping screws, splice the power cable into *any* hot lead (such as the cigarette lighter) under the dash and the job is done.

CB Antennas Made Easy. A modern CB antenna is even easier to install. There are several dual-purpose, CB/AM antennas available. These antennas, such as the Antenna Specialists M-103 and M-143 or Lafayette's 99 C 3060, work both as an auto-radio antenna and as a CB antenna.

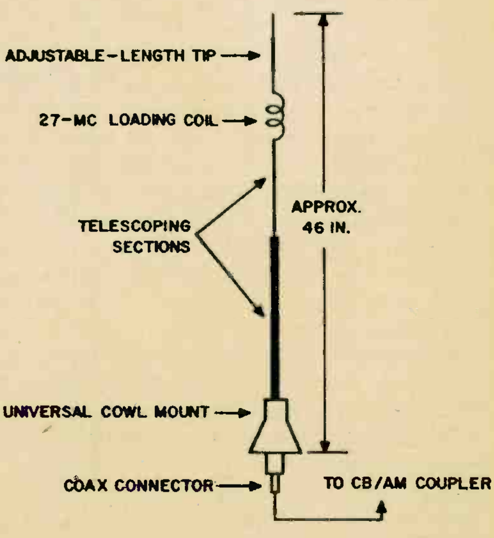
They are made specifically to fit in an existing fender or cowl hole; absolutely no body work is needed. Our diagram below shows how they work. When fully extended the length of the antenna is around 46 in. Approximately 8 in. below the top is a loading coil for CB operation. The coil, consisting of relatively few turns, has virtually no effect at the broadcast frequencies; therefore, the full antenna length—which just about equals a standard AM antenna—picks up the AM broadcast signals.

So as far as CB signals are concerned, the antenna is resonant and most sensitive at CB frequencies. Since the car itself is part of the antenna system, the length of the antenna section *above* the coil is made adjustable to allow fine tuning of antenna system.

The Magic Coupler. Most natural question is how does one keep the auto-radio from shorting out CB signals and vice versa? The answer is a CB/AM antenna coupler (supplied with the antenna or optional) which is connected between the antenna, the auto radio and the CB transceiver.

Our schematic on the next page shows a typical CB/AM coupler—there might be

Attach connector on cable from CB/AM coupler to antenna. A locking bracket snaps into position when the antenna base passes through the hole.



Combination CB/AM antenna has a universal mount and is no longer than average auto-radio antenna. Top loading coil resonates system to 27 mc.

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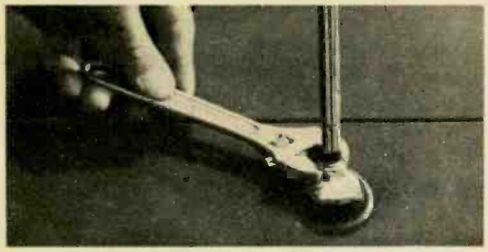
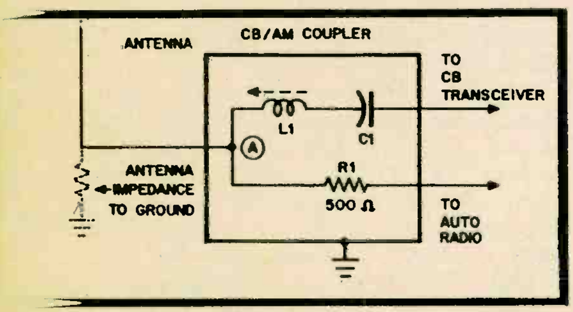
The Easy Way to Install CB in Your Car



Tighten the lock nut on antenna mount with open-end wrench. Do not use pliers. Combination CB/AM antenna is ready to go since it is factory tuned.

A slight adjustment in the length of the antenna section on top of the loading coil might be required to minimize the antenna system's SWR.



Coupler connects single antenna to auto radio and CB transceiver. Incoming signal splits at A. R1 keeps transmitter output out of auto radio.

slight variations but the theory is the same. The signal from the CB antenna is fed to point *A*, where it sees two paths. One is a series-resonant (at 27 mc) path to the transceiver. The other is a high-resistance path to the radio. Since a series-resonant circuit has a low impedance at the frequency to which it's tuned (L1 can be tuned to 27 mc), the CB signal takes the path of least resistance and goes to the transceiver input. At broadcast frequencies, the small value of C1 appears as a high impedance compared to R1 so the broadcast signals are blocked from going to the transceiver and go to the radio.

During transmit the C1-L1 path still is a low impedance; therefore, the transmitter's energy goes without losses to point *A* where it sees the low-impedance of the antenna or the high impedance (500 ohms) of R1. Therefore the signal goes to the antenna. The CB/AM coupler is efficient and there is virtually no loss at 27 mc.

Installing the CB/AM Antenna hardly could be easier. Remove your existing antenna and its cable. Pass the antenna lead from the coupler up through the fender or cowl hole and connect it to the new antenna. If the hole is too small to pass the coax connector attached to the coupler's cable, cut off the connector, pass the cable through the holes and reinstall the connector. This is a lot easier than trying to enlarge the cable hole in the fender. Fit the new CB/AM antenna into the hole, tighten the nut and the antenna is installed.

Connect the remaining coupler cables to the CB transceiver and the radio. Since most solid-state transceivers are factory tuned (usually with sealed tuning adjustments) the transceiver is ready to go as soon as the connector is screwed tight. Generally, the antenna can be tuned up with an SWR meter.

Connect an SWR meter between the transceiver and the coupler and adjust the top section of the antenna for *minimum* SWR. The adjustment has a narrow range so don't expect to see a large variation in SWR. As a general rule an SWR of 2.5:1 or better, is desirable. Finally, tune the car radio to match the antenna. All car radios have a small trimmer capacitor located near the antenna-input jack. Tune in a weak station near the high end of the band and adjust the trimmer for maximum volume.

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CB CORNER

BY LEN BUCKWALTER KBA4480

CB Marries BC

THEY'VE wedded stereo to FM, color to TV and solid to state. Now we're invited to another electronic marriage: a common car radio to an attachment for converting it to CB operation. Unlike earlier systems, this one transmits as well. It could mark the turning point that sees CB emerge from the clubby, special-interest class to become as common in autos as back-up lights.

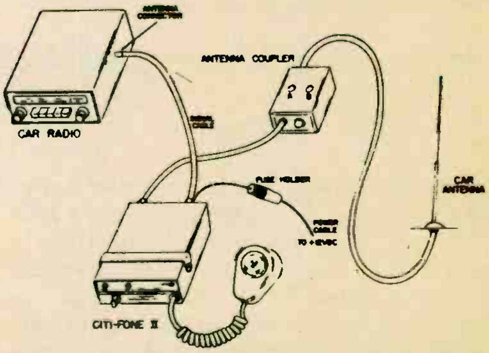
How the new system operates is shown in our illustration. The car radio (which may be any type) plugs into the Citi-Fone II, the special converter recently introduced by Multi-Elmac. Slightly smaller than a miniature CB rig, it converts the 27-mc signal down to the AM band (1365 kc) and audio is heard through the broadcast radio's speaker. Pressing the mike button sends a CB signal from the converter's self-contained transmitter.

The system has certain refinements for compatibility. Switch on a spotting tone to pinpoint the correct setting on the receiver dial and you can monitor CB. Then there's an accessory coupling device to make the car's regular AM whip work on both broadcast and CB. Less desirable side effects include the limited number of channels (two) and lack of squelch. Also, you can't monitor CB while listening to the radio. But the converter is hardly intended for the pros. At $49.95, the circuit-sharing unit seems headed for wider horizons.

Multi-Elmac, you see, is near Detroit where the auto industry is now plumping for the HELP program. Monitoring points have been set up along some busy highways with signs giving notice that Channel 9 is monitored. In one area they're averaging seven CB-triggered assists between 5 and 6 o'clock each afternoon. This performance should further feed the rumor that car-radio manufacturers are toying with the idea of designing CB into BC units. It seems just an integrated circuit or two away.

Is there a place for an add-on device like the one introduced by Multi-Elmac? Probably so—since there are more than 75 million cars, mostly equipped with CB-less radios. And the company reports the converter has already attracted considerable interest among AAA, trailer and other highway-minded groups.

Who's loaded? . . . A recent query to this corner asks, "Where is the best location for the loading coil on a mobile whip?" Trouble is that raising this question among antenna engineers touches off lively controversy.



Standard auto radio (upper left) provides detector and audio amplifier for receiving CB signal, which converter/transmitter unit delivers at 1365 kc.

The top-loaders say a coil high on the whip keeps departing signal high, clearing the car and perhaps stepping over many nearby obstacles. But the base-loaders attack the top-loaders by saying that, since the coil forms a capacitor with the car body, any sway of the antenna as the car moves makes the whole affair behave like a variable tuning capacitor. It causes erratic antenna tuning and increased SWR. And the higher the coil is, the worse the problem is. Base loading, they say, keeps the coil low where it's well-behaved. And the base coil provides a low-impedance path to ground, draining off noise. Top-loaders, of course, pooh-pooh this and speak of efficient coils that outperform conventional types.

Which is better? We can't name the winner yet, but the contest should ultimately help everyone.

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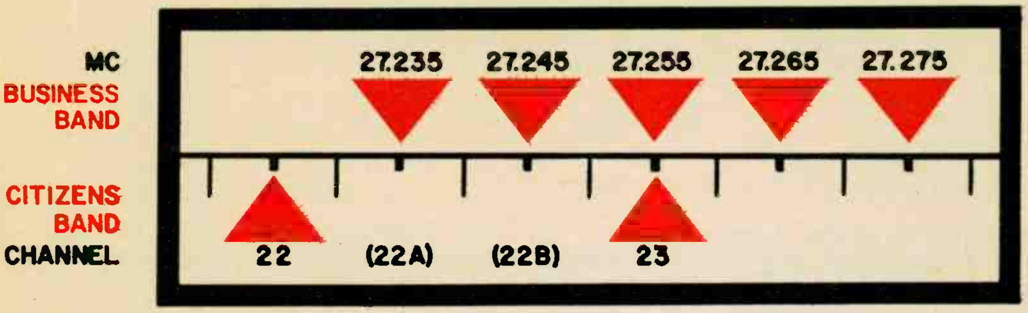

Legal DXing for CBers

How to pick up 30-watters on CB, collect QSLs . . . and stay out of jail, too!

By BILL FOULKES

CITIZENS Banders who pride themselves on having fat 5-watt signals get a little shook up when they find out that right in their own 11-meter band there are what might be termed super-CB stations—that is, rigs running 30 watts, six times the power permitted for run-of-the-mill 11-metering. And CBers can DX them legally, too.

"Okay," you're saying to yourself, "here comes one of those articles on how CBers get caught running 30-watt booster amplifiers." Or maybe some of you are muttering about how you already know that Class C radio-control stations can make their boop-boop-beep-boop noises with 30 watts on channel 23. Neither is the case in point.

There's no trickery in the statement that 30-watt stations do exist within the limits of the band. They are stations that have FCC sanction to run 30 watts input power, have special AM or FM gear from companies known to all CBers—companies like RCA, E. F. Johnson, Pearce Simpson, General Radiotelephone, E.C.I., and others. They even use gear from non-CB companies.

These stations are with us right now and you can listen to them on your regular 5-watt transceiver. Fact is, they aren't real CB stations at all. They are stations operating in several other radio services that use frequencies of 27.235 and 27.245 mc (called channels 22A and 22B by CBers, even though they aren't open for CB use). These channels lie between CB channels 22 and 23.

In addition, these stations—usually operated by small businesses and industries—can obtain licenses on 27.255 mc, 27.265 mc and 27.275 mc. The first of these is CB channel 23 and few 30-watt stations even bother to attempt communications there because of the interference. The last two channels are outside the 11-meter Citizens Band.

When the band opens for skip, the stations on channels 22A and 22B really roll in—taxi companies, railroads, police stations, oil companies, auto emergency stations, trucking companies and the like. Some communications are interesting—more so than regular CB yak-yak, at least. On what CB channel, to take but one example, could you eavesdrop on railroading operations. You *can* do it on channels 22A and 22B. The Pennsylvania Railroad operates five mobile units here under the call KE6203.

Or, for that matter, what about the 70 units operated by the North American Weather Consultants in Santa Barbara, Calif.? They're all on channel 22B with the call KNI70. You might even hear station KCU818 on 22B. That's the Whitfield County Police in Georgia. As a matter of fact, you don't really even have to wait for the band to open for skip to hear these stations. There well may be some locals for you to tune.

The call will distinguish the stations from

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regular CB units. CB stations, of course, use calls consisting of three letters and four numbers (KXX1234).

The 30-watt stations have three different types of distinctive calls. Base stations are three letters and three numbers (KDS484); mobile stations that are unaffiliated with a particular base station use two letters and four numbers (KF7818); special portable stations have calls made up of three letters and two numbers (KJN30).

As a point of interest, all transmitting equipment used on these frequencies must have been type-accepted by the FCC. Type acceptance entails a rather extensive (and expensive), time-consuming process whereby the manufacturer submits detailed technical specifications and sometimes photos of equipment to FCC engineers. The equipment must meet rigid standards for frequency tolerance, modulation percentage, input/output power, receiver reradiation, spurious radiation, performance changes under temperature extremes, etc. Altogether, the process may take months and might entail sending data to the FCC several times.

Sometimes a Business Band user may find that he can get along on 22A and 22B with only 5 watts of power, taking advantage of lower-cost CB equipment on the clearer channels and with a higher antenna. Problem is that regular CB equipment also must be type-accepted by the FCC before it may be licensed for use on 22A and 22B. While many CB rigs may be able to jump the rigid FCC hurdle, at this writing the only 5-watt CB units that are FCC type-approved for Business Band use are the Lafayette HB-600, Hallicrafters CB-3 (and CB-3A) and Sonar Model E.

On the listening end, you can pick up channels 22A and 22B with the right crystal in the receiving portion of your CB set—as long as the transmitting station is sending out an AM signal. (That's another difference between CB and BB—the Business Bander has the option of using FM). Manually tuned full-coverage CB receivers can, of course, be tuned between channels 22 and 23. Some also will tune beyond 23 to pick up the other two business frequencies.

Basically, the stations on 22A and 22B are bound by operating rules that are similar to those under which CB stations operate. Main

LEGAL DX QUARRIES FOR CBers

KAX540	Bedford, Mass.	22A	KDH741	Clermont, Fla.	22A	KDX886	Elmira, N.Y.	22B
KBQ562	Belpre, Ohio	22A	KDH757	Austin, Minn.	22B	KDY726	Omaha, Neb.	22A
KBR763	Dalton, Ga.	22A	KDH832	Flint, Mich.	22A	KDZ247	Batavia, N.M.	22A
KBW588	Drexel Hill, Pa.	22A	KDH889	Great Neck, N.Y.	22A	KDZ704	Holland, Mich.	22B
KCK278	Rapid City, S.D.	22A	KDH898	Chattanooga, Tenn.	22A	KDZ768	Paterson, N.J.	22B
KCK932	Amarillo, Tex.	22A	KDI317	Watertown, N.Y.	22B	KE6203	mobile	22A/B
KCK946	Paulsboro, N.J.	22A	KDI581	Beaumont, Tex.	22B	KEK507	Eureka, Wash.	22A
KCL718	St. Petersburg, Fla.	22B	KDJ781	Canby, Ore.	22B	KEK572	Tampa, Fla.	22A
KCO357	Amarillo, Tex.	22A	KDL601	E. Hartford, Conn.	22B	KEK620	Ames, Kans.	22A
KCQ498	Anniston, Ala.	22B	KDL671	Louisville, Colo.	22A	KEK838	Bladenboro, N.C.	22A
KCQ699	Wayzata, Minn.	22A	KDL989	Fall River, Mass.	22B	KEK863	New Bedford, Mass.	22A
KCT210	Ilion, N.Y.	22B	KDM425	Havana, Ill.	22A	KEK906	Newport News, Va.	22B
KCU818	Whitfield Co., Ga.	22B	KDP799	Bamberg, S.C.	22A	KEK922	Roswell, N.M.	22B
KCW922	McComb, Ohio	22B	KDQ509	Whiteville, N.C.	22B	KEL565	Maben, Miss.	22A
KCX635	Washington, D.C.	22B	KDQ636	Canby, Ore.	22A	KEM271	Falls Church, Va.	22A
KCX732	York, Pa.	22B	KDR505	Manchester, N.H.	22B	KEM274	Durant, Okla.	22B
KCX792	Memphis, Tenn.	22B	KDR913	Grand Rapids, Mich.	22A	KEM326	Thompson, Conn.	22A
KCY292	Topeka, Kans.	22A	KDR971	Las Vegas, Nev.	22A	KEM358	Alexander City, Ala.	22A
KCZ706	Albuquerque, N.M.	22A	KDS210	Julesburg, Colo.	22B	KEW67	Ellicott City, Md.	22A
KDA40	Atlanta, Ga.	22A	KDS484	Marion, Ohio	22B	KF7818	mobile	22B
KDA516	Syracuse, N.Y.	22B	KDS989	Stillwater, Okla.	22A	KG6951	mobile	22B
KDA588	Marengo, Iowa	22B	KDS999	Chicago, Ill.	22A	KG9095	mobile (N.Y.)	22A
KDB879	Blythe, Calif.	22B	KDU414	Dodge City, Kans.	22B	KJN30	portable	22A/B
KDC747	Braymer, Mo.	22B	KDV242	Corbin, Ky.	22B	KJU73	Paragould, Ark.	22A
KDD254	LaCrosse, Wis.	22B	KDW315	Pine Bluff, Ark.	22A	KKX90	Baton Rouge, La.	22A
KDD766	Portland, Ind.	22A	KDW349	Wakefield, R.I.	22A	KSG650	Anderson, Ind.	22B
KDE802	Rome, Ga.	22B	KDW732	Moonville, Mo.	22A	KN170	portable	22B
KDG522	Las Vegas, Nev.	22B						

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CB SPECIAL

Legal DXing for CBers

General Electric has contributed many models to business radio. This is Master Professional FM unit.

Lafayette's HB-600 is one of several 5-watt CB rigs that are FCC-approved for channels 22A and 22B.

E.C.I., well-known to CBers, also makes Fleet Courier 30B, a 30-watt unit for the 11-meter Business Band.

Aircraft Radio Corp.'s Cambridge Series portable will run on internal batteries for periods up to 18 hours.

differences include the fact that the stations are not permitted communications with stations of other licenses and that all transmissions must be entered in a permanent log. The log also must show all maintenance work done on the equipment. The 20-ft. CB antenna height restriction does not apply to these stations and the combination of 30 watts output and a high antenna gives them pretty healthy signals.

If you listen to these stations, of course, you must not try to get them into a QSO with you. An attempt to transmit with your CB rig on 22A or 22B would be in violation of eight zillion FCC rules, regulations, ordinances, policies and wishes. These two particular channels are heavily monitored by the FCC so you wouldn't last long. Anyway, these 30-watt stations are unlikely to violate regulations because loss of their licenses could be the cause of considerable business inconvenience.

Since these are not CB stations but outsiders sharing the band, they do not use the standard FCC Form 505 (the CB application) in getting licenses. If you feel that you might qualify for one of these Business Band licenses, contact the FCC for the name of the class of service you could use and an application.

Getting QSL cards or letters from these stations is quite possible. The biggest problem is getting the name and address of the operator. Fortunately, the location sometimes is mentioned on the air. There aren't any up-to-date callbooks on these Business Band stations, though the Radio Registry volume listing business communications stations, now a couple of years old, does contain a good deal of useful data.

Our chart shows just the BB stations *we've* logged in the last year on channels 22A and 22B. There are hundreds of others on the air.

Your signal report should be as complete as possible but do not divulge the contents of any message you hear. That's illegal.

If you want a QSL card instead of a letter you should make up your own and then send it to the station for verification. None of these stations, so far as we know, has anything resembling a printed QSL card.

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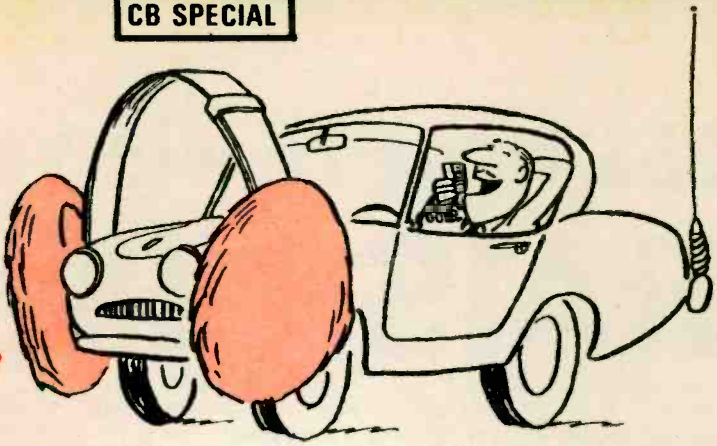
STAMP OUT MOBILE NOISE!



By CHET STEPHENS YOUR transceiver may be a deluxe job with RF and IF noise limiters, but when it comes to suppressing mobile noise, it may simply spin its wheels like those of a car stuck in snow. Although built-in noise limiters remove most annoying clicks and pops, there often remains a continuous noise background which is stronger than the desired signal.

For example, considering today's super-performance transceivers, a 10-microvolt received signal is considered of moderate strength. Yet the average car's mill can easily generate 20 to 50 microvolts of hash, clicks, pops, crackles and other assorted roars! Obviously, any CB signal weaker than the noise is going to be buried. But mobile noise is easily eliminated providing you know where it comes from. Names and addresses of suppliers of the noise-suppression devices we will be talking about are at the end of this article.

There are two types of noise: The most annoying is *radiated* interference caused by the making and breaking of current flow. Points generate RF noise when they break the coil's current. Plugs, producing sparks of several-thousand volts, are great noise generators. They're just like old-time spark transmitters which used a spark to generate radio signals. In a car, a spark produces RF interference which is broadcast by the car's electrical wiring. Best way to get rid of radiated noise is simply to prevent it from being radiated.

The second type of noise is *conducted noise*—noise carried by the wiring, rather than radiated by it, directly into the transceiver. This noise can be eliminated by good solid grounds. The first thing to do is to identify the noise so you know how to attack it. Filtering a lead that contains or radiates no noise simply wastes money.

Where's The Noise? Turn on the transceiver and drive the car at a moderate speed. Let up on the gas and turn off the ignition. While you're coasting to a stop, notice if the noise stops. If it does, the problem is in the alternator (we'll refer to generators as alternators here)/regulator system. If the noise continues, but at a lower volume, the problem is in both the ignition *and* alternator/regulator systems.

Ignition noise is a popping, or sputting, sound which varies with the engine's speed. Race the engine and note if the sputting speed increases. Alternator noise sounds like a whine. If you're not sure which is which try slipping off the alternator drive belt. With the engine running, a reduction in noise points to the alternator/regulator. If the noise per-

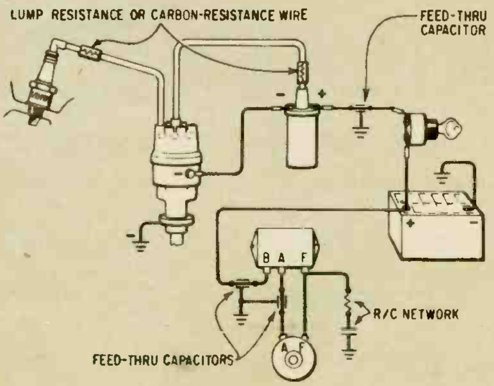


Fig. 1—Completely suppressed ignition system. Resistance plugs may be substituted for resistance suppressor at top of plug; retime engine.

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Fig. 3—Top. If your car does not have resistance plugs or resistance-wire plug cables, a carbon noise suppressor must be added at each plug. Left. All primary ignition leads including the feed to the high-voltage coil should be filtered with coax shielded capacitor. Make certain all of the connections are good and tight.

sists you've got ignition interference. Roars and crackling sounds point to the instruments: a gas gauge or an electric clock.

Generator noise is easily suppressed with a tuned parallel-resonant network which prevents the 27-mc noise components from getting into the ignition wiring from which it is radiated. The filter is connected in series with the generator's armature (A) lead.

Many cars are factory equipped with a generator filter, which is a bypass capacitor from the armature lead to ground. Although these filters are effective at broadcast frequencies, they are next to useless at 27-mc and should be replaced with a shielded capacitor or a tuned trap.

For an alternator a tuned trap might work, but the more costly alternator filter is the better thing to use. This device filters just about everything but DC charging current.

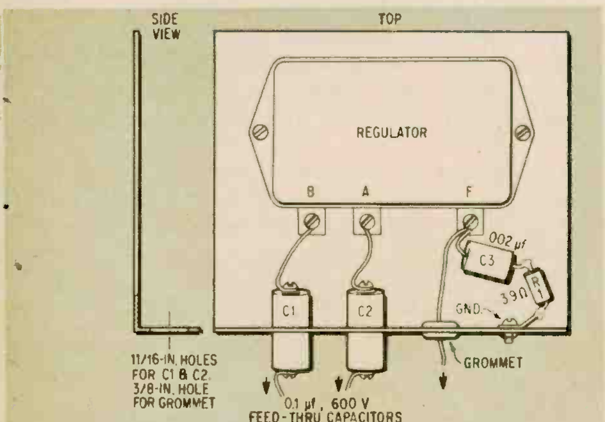

Fig. 2—To filter regulator, mount it on L-bracket and route A and B leads through coax feed-thru capacitors. Filter F lead with R/C network.

Regulator noise, caused by arcing (sparking) at the regulator contacts, sounds like a steady, even-volume crackling that you hear only when the regulator is working. Such noise must be filtered by brute force—with a shielded feed-thru coaxial capacitor in the *B* (battery) and *A* (armature) leads. The *F* (field) lead cannot be filtered by a coaxial capacitor without causing damage to the regulator. Instead, the *F* lead is bypassed to ground through a .002-µf capacitor in series with a 3.9-ohm, 1-watt carbon (*not* wire-wound) resistor. These components can be installed on an L-bracket as shown in Fig. 2. As a general rule, alternator regulators are not as noisy as generator regulators.

Should the regulator continue to radiate noise, as evidenced by failure of the filtering, your only recourse is to shield the regulator and filters in a metal cabinet firmly attached to the car body. If you haven't the inclination to make the enclosure you can purchase a shield assembly complete with filters from the Hallett Mfg. Co.

Crushing the Snaps, Crackles and Pops. Ignition noise means all out war. While most cars have resistance spark-plug wiring to suppress the ignition noise, it is generally inadequate at 27 mc. And even if your car has resistance wiring, resistance suppression very well may be required. Resistance suppressors are simply resistors mounted in a plastic holder and installed in each plug's wire. This point is important: The suppressors must be installed at both ends of the wire to each plug. As a general rule, American cars

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STAMP OUT MOBILE NOISE!

made within the last 5 years use resistance wires. If in doubt, check with the car manufacturer.

The spark at the distributor, caused by arcing at the points is primary source of ignition interference; therefore, each distributor wire must be suppressed. Connect a 10,000-ohm suppressor between the rotor wire (the one in the center) and the wire socket at the distributor. Install a 5,000-ohm suppressor at the distributor between each stator terminal and the wire to the spark plug. Place a 5,000-ohm suppressor at the end of each plug wire. Or, you may replace your plugs with resistor plugs and eliminate the suppressor at both ends of the plug wire. But, you must retime the engine when suppressors are added to the ignition circuit.

The ignition coil, even though it can be in a metal can, will generate noise. Be certain it is firmly connected to the car frame. If necessary, connect a metal strap from the coil case to the frame. We also suggest that the input lead to the coil be filtered with a shielded (coax) capacitor.

Once the ignition coil, distributor and its leads are filtered, there's nothing more you can do to reduce ignition noise except to shield all the wiring. This step is a bit expensive, but if the previous treatment hasn't reduced the noise to almost zero, it must be done to get dead silence. Prefab shielding is available from Hallett and consists of shielded wires for the plugs, plug shields, a shield for the distributor and a shield for the coil.

Once you've crushed ignition and alternator noise you're almost home. All that's left is to suppress noise generated by the instruments. This is easily done by connecting a coaxial capacitor across each gauge and the clock.

A final note, the little ball at the tip of the car radio's antenna is not a decoration. It drains off static charge accumulated in the antenna as the antenna moves through the air. Without the ball you will hear popping similar to ignition noise, but not as consistently. If you lose the ball it *must* be replaced. Any 3/8-in. or 1/2-in. dia. plastic ball will do—it doesn't have to be metal.

Special Noise-Suppression Components are available from several places. The 0.1 μf, 600V feed-thru shielded coaxial capacitors (C1 and C2, Fig. 2) are Sprague Type 80P3. They're available from Allied Radio (Stock No. 43 D 5689. Not listed in catalog.) Price is $1.77 plus postage.

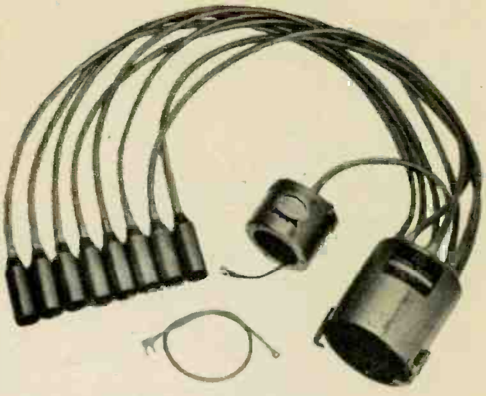

Fig. 4—Complete noise-suppression kit, including shields for distributor and coil, is made by Hallet. Note shielded leads, covers for each plug.

Plug suppressors are Erie's (Erie Technological Products, Inc.) L7VR-10ME (10,000 ohms) and L7VR-5ME (5,000 ohms). These are not generally stocked and will have to be ordered through your regular electronic-parts distributor.

A **generator filter** is available from Allied Radio for $2.35 plus postage. The stock No. is 17 A 8512. Other noise-suppression parts are on page 480 of Allied's catalog. A basic **auto/marine-engine noise-suppression** kit containing a full set of suppressors and filter capacitors and shielded generator cable is available from Lafayette Radio. The stock No. is 42 R 0905. It's on page 145 of Lafayette's catalog and the price is $9.45. And on the same page you see a generator-noise filter, voltage-regulator filter and feed-thru capacitors.

A complete **noise-suppression kit,** including shields for the distributor and coil is available from the Hallett Manufacturing Co. Ash at Regent, Inglewood, Calif. 90301. The firm can also supply a shield box containing filters for a voltage regulator. Write stating the make of your car, the year and the number of cylinders and they will send you the price and further information.

Using the methods just described, you should be able to get rid of that persistent noise once and for all. It will take a little work, but there's no other way out.

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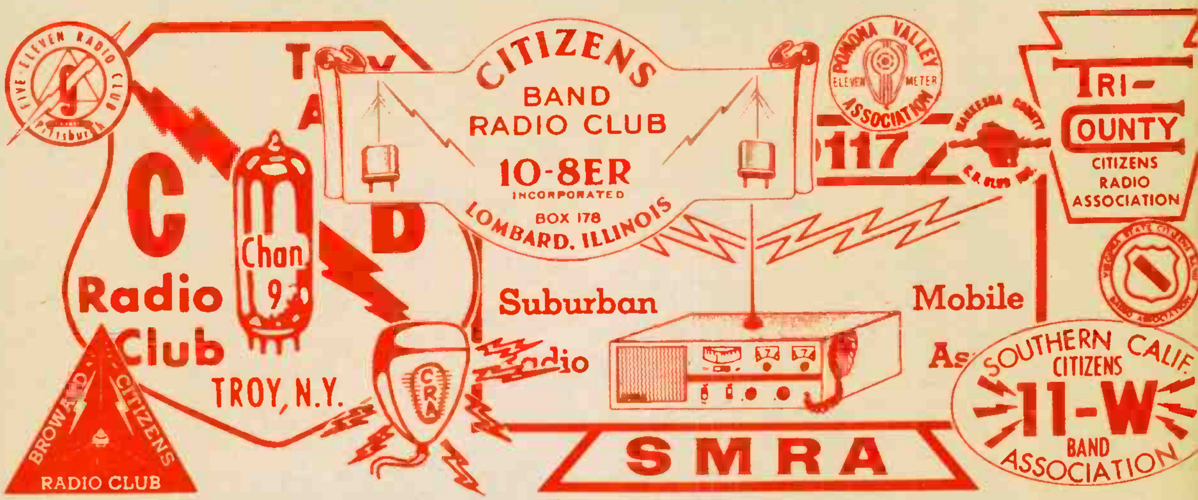
THE TRUTH ABOUT



CB CLUBS

By ALAN LEVESQUE

WHAT a conglomeration of conflicting interests, motives and people CB clubs are! And how they have fought, finagled and fidgeted their way from inception to prosperity (sometimes) and on to disaster (often). Even over the last year a new tack has been taken by a good many of them—a shift toward what may be identified as CB's new community-action or gung-ho group. But more of that later.

The base on which CB clubs originally were built is no different from that of a lonely-hearts club. Members tend to be the sort of folks who, while eager to be part of the scheme of things, take only stumbling steps in that direction. In the security of his own home, the CBer can press a mike button and converse with someone who can't take notice of a bald spot or an oversize nose or a frayed shirt collar. The 5-watt ceiling on transmitter power makes all CBers equal and with a better antenna the meek clerk can be a bigger man than the aggressive loudmouth down the street.

Within a few months after the Citizens Radio Service was opened, growing clusters of clubs were making themselves known—with both the Five-Watt Wizards and the Citizens Band Radio Relay League trying to establish themselves on a national scale. When each learned about the ambitions of the other, the Wizards and the CBRRL people suddenly decided that they didn't like each other, not even a little.

The touchy problem was made worse by the fact that both clubs happened to be headquartered in the same city (New York). Members of each club started staking out claims on some of the channels. Heaven help the poor unfortunate who appeared on one of their private channels. He was cussed, denounced, jammed—buried under an avalanche of epithets.

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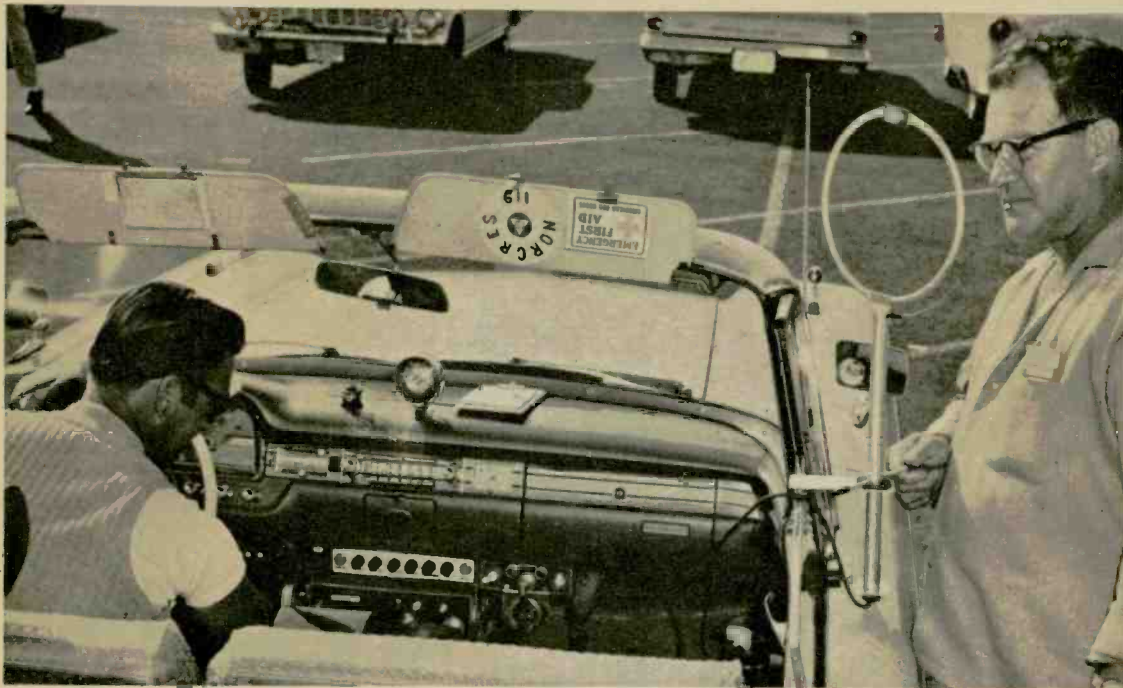

The CB 7-11 Citizens Radio Association of Spokane hunts unlicensed walkie-talkies, hands out FCC rules.

THE TRUTH ABOUT CB CLUBS

In the early summer of 1960 both clubs scheduled highly touted jamborees on the same day and within a few miles of each other. So hard did they try to outdo each other that when it was all over both were exhausted—emotionally, financially and physically. The Wizards never formally disbanded but since most of the members no longer were talking to each other meetings ceased. The CBRRL exists in only a few local chapters.

Then there were dark days when club organizers discovered the idea that CBers represented cash on the hoof. Clubs became machines for collecting dues and merchandising official club paraphernalia. Window dressing included everything from secret handshakes to toothy club officials with $200 custom-tailored suits. But the average CBer was quick to notice that most of them knew barely more about CB than what the initials stood for.

Graduates of these clubs (and others that have made brief bids for popularity) now are combining with CBers who don't need the emotional crutch of the pen-pals-and-coffee routine to swell the emerging ranks of the gung-ho group.

CBers are citizens—that's how the service is identified, in fact. Why not put their talents to work for the rest of the citizenry? This is the basis for the new type of organization (whose members, incidentally, disdain the word *club* as too reminiscent of both the social groups and the money-makers).

The biggest gung-ho bit these days is emergency monitoring, probably because it's the easiest way to break a club into public service. While all it takes is a CB rig and an operator, many clubs have established their own centralized club station, manned on a 24-hour basis. Most monitor channel 9, though channel 11 also is popular. Some stations are equipped to monitor police, marine, CAP, utility, amateur and other services in addition to CB. The REACT program has done much good work in helping to establish proper training practices for this sort of work. There are several hundred REACT teams in the U.S. and Canada.

Although an emergency truck, van or ambulance is a large investment, quite a few take to the road under CB club sponsorship.

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Roadside sign in Gallipolis, Ohio, is typical of those put up by clubs affiliated with REACT program to let motoring CBers know which channel is monitored.

Above—Coordination with police is important to service clubs. Capt. Bergstrom of Elkhart (Ind.) police talks to Art Singleton of CB Operators Committee. Left—Winchester-Frederick Co. (Va.) CB club has this emergency radio van.

The idea is to locate an unused panel truck or small bus, fix it up with anything from a new coat of paint to an emergency power installation and cram it full of CB gear. At the scene of an emergency it becomes the club's radio dispatch office.

One club, the Bennington Rescue Squad in Vermont, felt that their ten-year-old ambulance had reached retirement. They ran a fund drive, raised $11,000 ($3,000 of which came from a hospital) and purchased a brand-new Cadillac ambulance.

Many clubs run simulated emergency communications drills. The Lucas County Civil Defense Communications Unit in Ohio whipped together a dandy emergency drill that extended all the way from Pittsburgh, Pa., to Kendallville, Ind. It was a predicted-log race with simulated disaster conditions. The course covered 50 mi. of miserable road, forcing the units to cross marsh, streams, forest and stone quarries. Some 80 units started but only about 50 were able to finish.

Some clubs even get a chance to operate under *real* emergency conditions. But a mainstay in the area of practical community service is parade control. The Emergency Citizen Band Radio Operators of Norfolk, Neb., took on three parades in one week, with 105-degree heat and 152,000 spectators.

There isn't room in these few pages to list all the cases in which the community action groups have lived up to the name. And if there were it still wouldn't give an accurate picture. When gung-hoers lack competent instruction or adequate organization or serious intentions their efforts can come off looking more like the Keystone Cops.

Members don quasi-police uniforms and drive around in equipment-laden cars with spinning red lights and lots of antennas, searching for disaster. We once watched six of these jokers zero in on a poor guy who had come down with an overheated radiator in the patrol area. Talk about startled!

Another time uninvited CB emergency people became such a nuisance to firemen at a brush fire that the chief had to threaten them with removal by police. This kind of thing is fun and games for the CBers, perhaps, but it's not exactly community service.

But whatever their complexion, CB clubs still flourish, currently to the tune of about 800, with some ten to 15 changes in the roster each month. Undeniably, some of them have proven of value to their communities. But when the choice is between the social chatter groups and the mini-Gestapos, we have heard well-placed FCC officials mutter, "A curse on both your houses."

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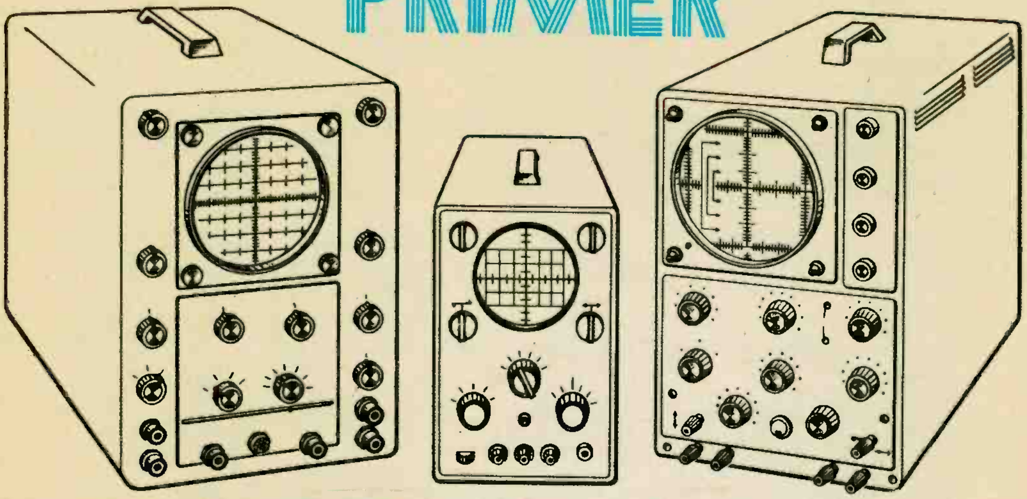
PRIMER ON THE SCOPE



By LEN BUCKWALTER, K1ODH

TELEVISION gave sight to radio. By enabling you to see what previously you could only hear, TV left very little to your imagination.

In the same way, the oscilloscope opens windows on electronic circuits in a way no meter can match. The scope, too, leaves little to your imagination and thus takes the guesswork out of electronic servicing and experimenting.

Like no other measuring instrument, the scope paints a detailed picture of what's happening. Get to know what one can do and you'll agree the letters VOM mean Vague-Old-fashioned Meter.

Look at the photos in Fig. 1. Ordinary line voltage is being measured with both instruments. The VOM indicates 117 V. Fine—if you're only trying to find out why the electric carving knife won't cut the mustard. But how about other characteristics of the signal—polarity, overall waveshape and peak voltages? D'Arsonval's delight ignores them.

The scope shows all as you see in our second comparison photo in Fig. 3. The VOM and the scope were connected to the same point (source of a video signal) in a TV receiver. The VOM needle doesn't even get out of bed. VOM frequency response is too limited and needle inertia is too great.

No one told you to scrap your VOM. It is still a good tool for measuring things like supply voltages, current and resistance. But a scope is the best instrument for examining rapidly-changing, low-level signals. Here's a good rule-of-thumb: When the measuring job is resistance or straight DC, reach for a meter. For just about everything else, use a scope.

How It Works

Most obvious part of a scope is its screen, located at one end of a TV-like cathode-ray tube (crt). As shown in Fig. 2, the crt screen displays a spot of light when struck by a

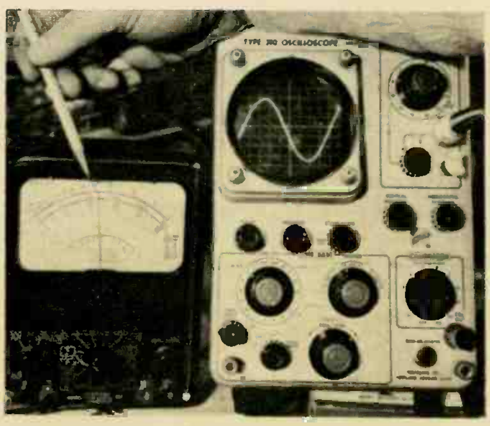


Fig. 1—You can't beat a VOM for measuring magnitude of 60-cps AC. But a scope will show you the signal and can determine its frequency.

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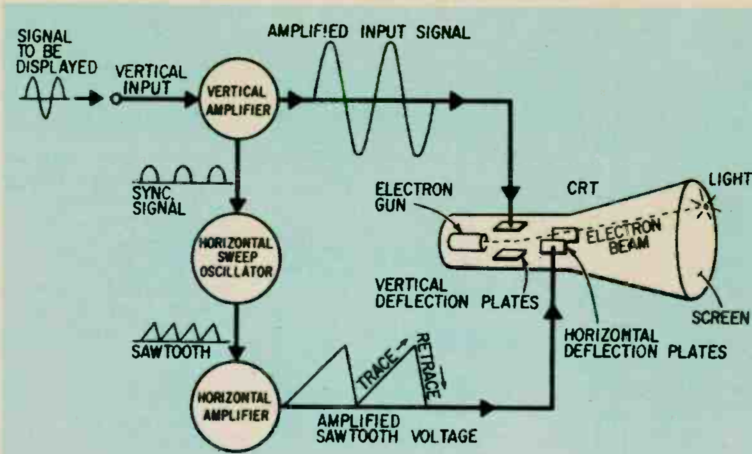

Fig. 2—Diagram of basic scope. Incoming signal is amplified and fed to vertical deflection plates to move electron beam up and down. Portion of input signal is fed to horizontal sweep oscillator to make it produce sawtooth signal in synchronism with input signal. Sawtooth signal is fed to horizontal amplifier which amplifies it to move electron beam from left to right.

beam of electrons emitted by the electron gun at the tube's narrow end. (The gun has a hot cathode, like that of a vacuum tube, plus accelerating and focussing grids.)

Let's examine one cycle of house current, like the trace in Fig. 1. The power company states that the voltage alternates from plus to minus 60 times a second. This signal goes via the vertical amplifier to the crt's vertical deflection plates. The electron beam is then moved up and down and paints a thin vertical line as it is attracted and repelled by the alternating voltage on the vertical plates.

But a vertical line only tells us the amplitude of the signal. To see the shape or form of the incoming signal, we require the scope's horizontal sweep circuit. This is an internal oscillator which feeds a sawtooth (increases linearly) voltage to the crt's horizontal-deflection plates to move the electron beam from left to right.

To drive the beam across the screen evenly, the horizontal plates must receive a linearly-increasing voltage. This is represented by the upward-sloping line marked *trace*. It makes the beam fly from left to right. The beam is returned to the left side of the crt almost instantaneously so it won't distort the display. This is the *retrace* part of the sawtooth.

If the sawtooth signal sweeps the beam from left to right exactly 60 times per second, the 60-cycle input signal on the vertical plates will appear as a single sine-wave cycle on the screen. By selecting a sawtooth frequency of exactly 20 cps, three complete cycles of 60-cps signal will appear. Now to refinements.

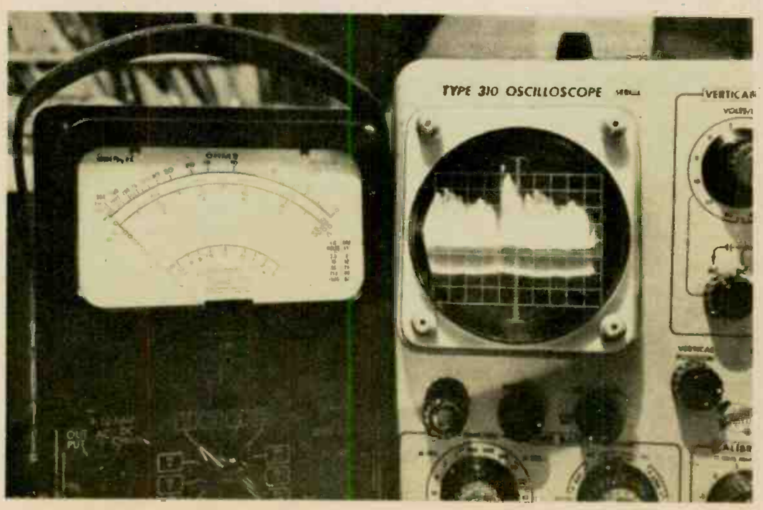

Fig. 3—Use a VOM to measure level of a video signal in a TV set and you get nothing. Reason is, VOM loads circuit under test, has poor frequency response and needle has too much inertia. A lab scope, on the other hand, displays amplitude of signal and lets you observe many of its characteristics. Scope is a Tektronix which sold for about $650, but a less expensive scope can also display a video signal providing its bandwidth goes up to 4 mc.

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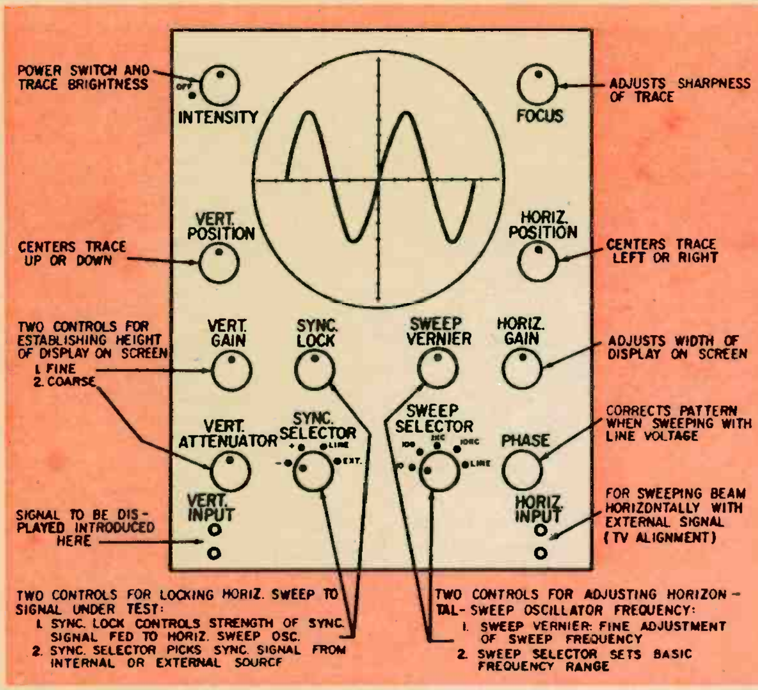

Fig. 4—Function of controls on typical service-type scope. A scope can't get by with any fewer and it doesn't take long to learn how to use them all. Some scopes have concentric controls to simplify operation.

PRIMER ON THE SCOPE

To display low-level input signals, all scopes have horizontal and vertical amplifiers. The sensitivity of the amplifiers, especially the vertical amplifiers determines how large the signal will appear on the scope's screen. One general-purpose scope has vertical sensitivity of 25 (rms) mv/cm. This means that a 25 mv (rms) AC signal will deflect the beam vertically one centimeter. A better scope with higher gain boasts 3.5 (rms) mv/cm. Here, a signal one seventh the amplitude will move the beam the same distance.

Rarely does the horizontal amplifier have to have such sensitivity. Unless you're engaged in specialized work, the horizontal amplifier is usually driven by a hefty signal from the horizontal-sweep oscillator.

If the horizontal-sweep oscillator were a free-runner, it would allow the display to continuously roll across the screen, if vertical signal and horizontal sweep are out of step. The sync signal pins everything down. As you see in Fig. 2, a small bit of input signal is fed from the vertical amplifier to the oscillator. These pulses keep the sweep oscillator in step.

A run-of-the mill scope loses sync when the amplitude of the vertical-input signal is extremely low. A better scope has a sync amplifier (for added stability) and possibly a sync limiter to adjust sync-signal level automatically to suit the input signal. Deluxe scopes have a Schmitt trigger—a slick circuit which makes the tiniest signal look like it's hewn of stone.

Which Scope For You?

You can lash-up a scope for about $20 and have the best modulation monitor on the

Fig. 5—Attenuator probe (bottom) prevents circuits from being loaded. Middle probe is for measuring RF voltage. Top probe is RF demodulator.

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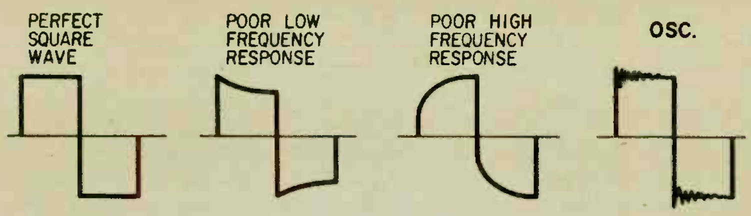

Fig. 6—To check performance of audio amplifier, feed square-wave signal to amplifier's input and observe output on scope. Perform this test at several frequencies. Oscillation is at right.

block. For a ham or CB transmitter, it lays bare per cent modulation, tuning, and distortion. That scope is at the low end of the spectrum. It's little more than crt and power supply.

Then there's a snappy number like the Tektronix 519. Performance boggles the imagination—for about $4,000 it should. Between these extremes are practical scopes for hobbyist, serviceman and lab.

Differences are mainly in vertical-amplifier bandwidth and sensitivity as well as frills. First consider bandwidth, an important characteristic that affects price and the highest frequency you can examine.

In an inexpensive utility scope, bandwidth might extend to 200 or 500 kc. Available in kit form for about $60, such scopes are good for audio service work. They can also be used for routine alignment of AM and FM radios. A utility scope can monitor the RF output of a ham or CB rig, even though such signals are much higher in frequency than the scope's bandwidth. The trick is to feed the RF directly to the crt's plates. (Provision is made in most models for doing this.) You won't see individual RF cycles, but you will see the carrier envelope, which shows important information.

Know the limitations of a utility scope before you buy one. When troubleshooting receivers, signals must be applied to the scope's vertical amplifier. If scope response falls off above 500 kc, you can't examine video information. And deflection sensitivity of a utility scope is generally low.

These faults are significantly overcome in the so-called wideband scopes in the $100-$150 class. Bandwidth rises to about 5 mc, which makes them the best type for servicing home-entertainment electronic equipment. Their vertical amplifiers generally have moxie to boost very low-level signals. Sweep is more linear and less apt to distort the display. Better models have regulated power supplies, built-in voltage calibrators and control settings are more accurate.

Top banana is the *lab scope*. Its big feature is bandwidth—usually higher than 5 mc. The scope's amplifiers almost always are direct coupled (DC). Without coupling capacitors between stages, the scope can display signals of extremely low frequency and even pure DC.

A lab scope generally has *triggered* sweep which is far more sophisticated than the sweep in simpler scopes. Less expensive

[*Continued on page* 123]

Fig. 7—Voltage calibrator, an external accessory, provides an accurate reference trace for measuring the amplitude of the signal being displayed.

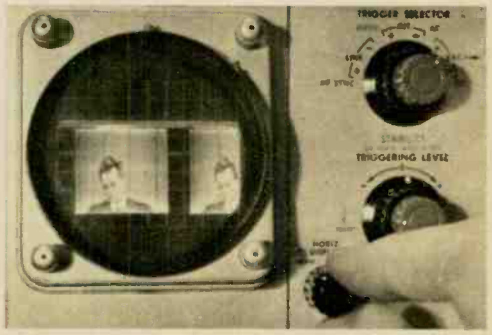

Fig. 8—TV on a scope? From TV set feed 60-cps vert. pulses to vert. input; horiz. pulses to horiz.-trigger input and video to the Z-axis input.

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The LISTENER

C. M. STANBURY II

SHOOK UP . . . Right from the word go, when SW became something more than an experimental device back in the '30's, SWBC has billed itself as a window on the world, a vehicle for international exploration and jazz like that. Only trouble is that many SWLs make sure that they don't explore any further than they have to. What you might call the DX Establishment studiously avoids digging behind the scenes or anything else that might disturb the little world in which it lives. It is asleep and intends to stay that way. The Establishment not only is content with the bland fare turned out by the likes of R. Canada, R. Nederland and R. Denmark, but even demands it and insists that you (the awake SWL) ought to do likewise.

When the Establishment picks up R. Americas (Jan. '67 Listener) it simply hears a station on Swan Island. Of course the Establishment was a little shook when R. Americas' SW transmitter suddenly was taken off the air last Sept. 20 (mid-week, mid-month) at the height of the controversy about its location. The more-easily-jammed BCB transmitter, curiously, still is in business.

Further, when the Establishment listens to WINB (Red Lion, Pa.) it hears—in the words of the station's slogan—America's Friendly Companion to the World. Immediately after WINB appeared on the SW bands in 1963 it achieved a certain mark, as regular addicts of this column know, by airing Carl McIntire's program 20th Century Reformation Hour. After sampling this one we'd hate to hear America's *un*friendly companion to the world.

Paradoxically, Establishment club bulletins are more likely to criticize the VOA than stations like WINB. But not all WINB programs are fire and brimstone. Also featured were a Mr.-&-Mrs. homemaker show and a mailbag program answering (on the air) letters from listeners—the kind of thing Establishment SWLs always lap up. In 1963 these were handled by Mr. and Mrs. Bob Barry. Barry also produced WINB's newscasts.

In 1965 Dr. McIntire seems to have decided that he would like to own a BCB station of his own. Through his Faith Theological Seminary, Inc., he made arrangements to purchase WXUR in Media, Pa. (daytime AM on 690 kc and FM on 100.3 mc). The FCC received complaints from groups representing national or regional arms of UNICEF, the NAACP, the Anti-Defamation League, the United Church of Christ, the Presbyterians, the Baptists, the Lutherans, the Catholic Interracial Council, the National Urban League, the AFL/CIO and a few others. Despite this the FCC finally approved sale of WXUR to McIntire, who promptly promoted Mr. Barry to WXUR station manager.

We have been able to trace Bob Barry's broadcasting career back to 1958 when he was news director for a small station in upstate New York. But at that time he was better known as a flying-saucer researcher. One of his articles for a publication called Saucer News hints that a strange sky object caused the crash of a C-118 transport near Mt. Rainier. The theme is developed with sinister overtones: "The citizens of the Sum-

[*Continued on page* 120]

It may look bleak but it's a bright spot in an Establishment-dominated SWL world. It's Radio Finland, from which emanates every other week (1145 EST Fridays, repeated at 0800 on Saturdays) the programs produced by the Swedish DX Alliance, heard widely in North America on 15185 kc. During the course of one nine-minute transmission both Castro and the CIA got bombed.

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the ABCs of COLOR TV

By JOHN T. FRYE, W9EGV

PART 3: COLOR PICTURE TUBE

REMEMBER how a bumblebee, from an engineering point of view, should not be able to fly? That describes my own awed feelings about the modern tri-color picture tube. To manufacture the tube requires a skillful blend of the most exacting chemical, electronic, mechanical, optical, glass-working and photographic techniques. Fantastically close tolerances must be observed through every step of assembly and maintained in the finished product. Finally, in that finished tube, three sweeping beams of electrons must be deflected individually to achieve a choreography so precise as to make the Radio City Rockettes look like stumblebums. Yet, in spite of all these and other nearly-impossible requirements, the mass-produced shadow-mask picture tube not only works but works surprisingly well.

The theory of the tube actually is quite simple. It puts *parallax* (a headache in photography but a necessity in the shadow-mask tube) to work. Parallax is what causes three boys simultaneously peering through the same knothole in a ballpark fence to see three different areas of the playing field. In Fig. III-1 you see three electron guns arranged in a triangle in the neck of the tube. They shoot converging beams toward the tube face. A short distance behind the face is mounted the *shadow mask*, a sieve-like metal sheet perforated with many small holes.

The three beams are made to converge at a single spot on the rear of the mask. When a hole is included in this impact area, the beams pass through the hole, like three rays of light, and strike the rear of the face plate. Since the beams *converge* on the hole from three different directions, they *diverge* as soon as they are through the hole and strike the face plate at three different points. If the mask is the right distance back of the face plate, the impact areas of the beams on that face plate will be three tiny, mutually-tangent circles.

If we label the beams from the three guns Red, Blue and Green and place dots of phosphor that fluoresce with light of the appropriate colors on the face plate opposite the hole in the shadow-mask, the red beam will pass through the hole and fall on a red dot, the blue beam on a blue dot, the green beam on a green dot. Each beam then can light up only the appropriately-colored dot because the other two dots lie outside a beam coming from that particular direction. This combination of a shadow-mask

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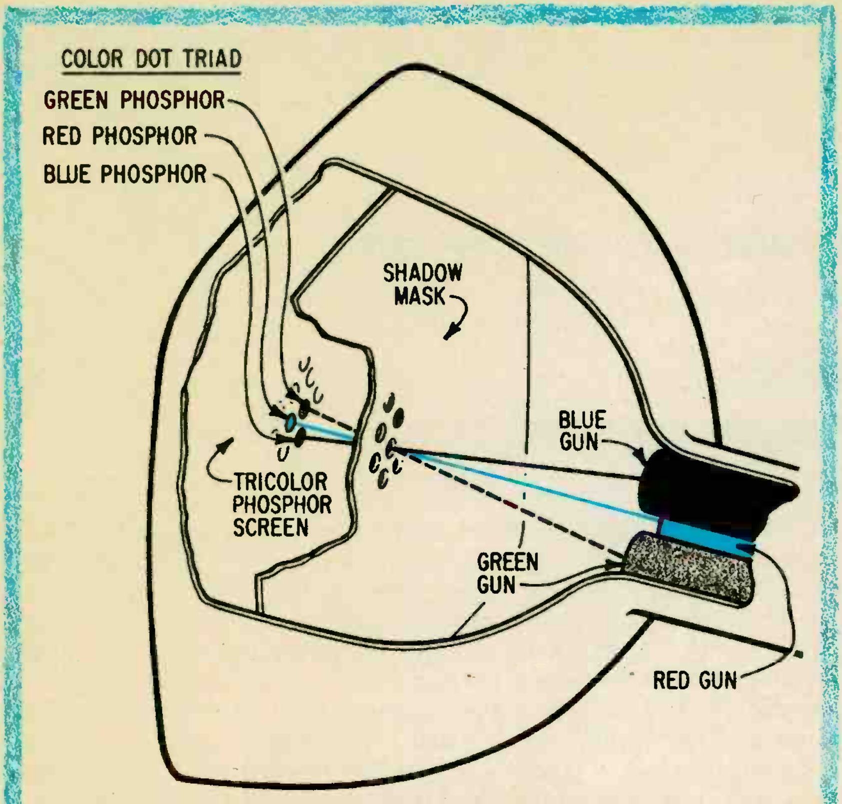

SHADOW MASK PICTURE TUBE

FIG. III-1

hole and an associated triad of red, blue and green dots is repeated hundreds of thousands of times over the face plate so that it is carpeted with a fine mosaic of these tiny circles of different-color phosphors. Yet, no matter where on the face plate it lies, in a properly-operating tube a phosphor dot can be reached only by the correct beam.

The dots making up a triad are so small and closely spaced that the naked eye at a normal viewing distance cannot make them out. That means, as we learned in Part II of this series, that the different colors they produce are mixed or added in the eye. The phosphors are chosen to glow with the three additive primary colors—needed to produce the widest possible color range. By regulating their respective electron beam currents, we can control the proportion of each primary color in the total light thrown off by a triad. Our knowledge of colorimetry will tell us we can use this control to make the triad throw off white light, or any color of the rainbow—or no light at all when all three beams are cut off. Furthermore, by combining these tiny triad units of light and color, we can do the same for any area of the screen, large or small. All we have to do is keep the three beams precisely converged as they fleetingly scan the shadow mask while making separate and continuous lightning-quick changes in the intensity of each beam. That's all!

Before the mind starts to boggle at the complexity of all this, let's see how RCA, the oldest producer, goes about making a color picture tube. The all-essential shadow mask is made from .006-in.-thick cold-rolled steel sheet. Both sides of the mask are coated with photosensitive fish glue. Then it is clamped

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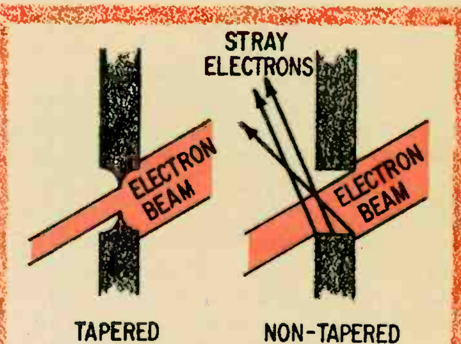
between two glass sheets, each containing photographic patterns for about 400,000 dots. Since dot patterns on opposite sides must coincide perfectly, the steel sheet and glass patterns must be aligned within a fraction of a thousandth of an inch. Exposure to light from high-intensity arc lamps reproduces the dot pattern as unexposed areas in the photosensitive coatings on both sides of the metal.



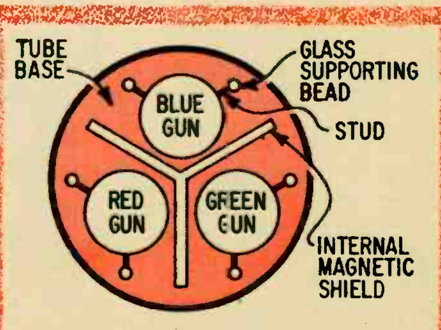
SHADOW MASK HOLE
FIG. III-2

Sprays of water remove the unexposed dot areas while the exposed coating between dots is left intact and is baked to a hard chemical-resistant finish. Finally the sheet with its pattern of naked dots is fed through sprays of acid that eat through the sheet from both sides simultaneously to produce holes having the cross-section shown in Fig. III-2. These double-tapered holes are designed to reduce electron scatter. Toward the edges of the screen—where beam angles are greatest—the taper increases gradually. The diameter of the holes, which have a center-to-center separation of only 0.028 in. even in a 25-in. tube, graduates from a minimum of 0.010 in. at the edges to a maximum of 0.012 in. at the center. Larger holes near the center increase light output in this area and give the eye an impression of greater overall brightness.

At last the mask is formed into the proper curved contour, blackened and welded to a rigid frame that can be inserted in a bimetallic spring-leaf supporting system so precise it keeps the mask in position within 0.00025 in.

With the mask removed, a thin layer of a single-color phosphor slurry is spread evenly over the face plate. The phosphor coating contains a photo-sensitive additive. The mask is inserted and the combination is exposed to a light source positioned so that its rays approach the mask from the same direction as the electron beam that will excite this phosphor in the finished tube. Phosphor areas struck by light rays passing through holes in the mask are rendered insoluble and stay on the face plate when the rest of the phosphor is washed away. The same procedure is used to deposit dots of the other two phosphors, the light source being moved each time. A thin mist of reflective aluminum covering the phosphor dots is baked on in the final step.

Meanwhile, at the neck end of the tube, we find three parallel, closely spaced electron guns built as a unit and providing separate beams for exciting the three different phosphor arrays. The guns are positioned as shown in Fig. III-3. Considered alone, each gun resembles the single gun of the B&W tube. Each has a cathode and four grids (the control grid, the screen grid that adjusts cutoff of beam cur-



COLOR TUBE GUN ASSEMBLY
FIG. III-3

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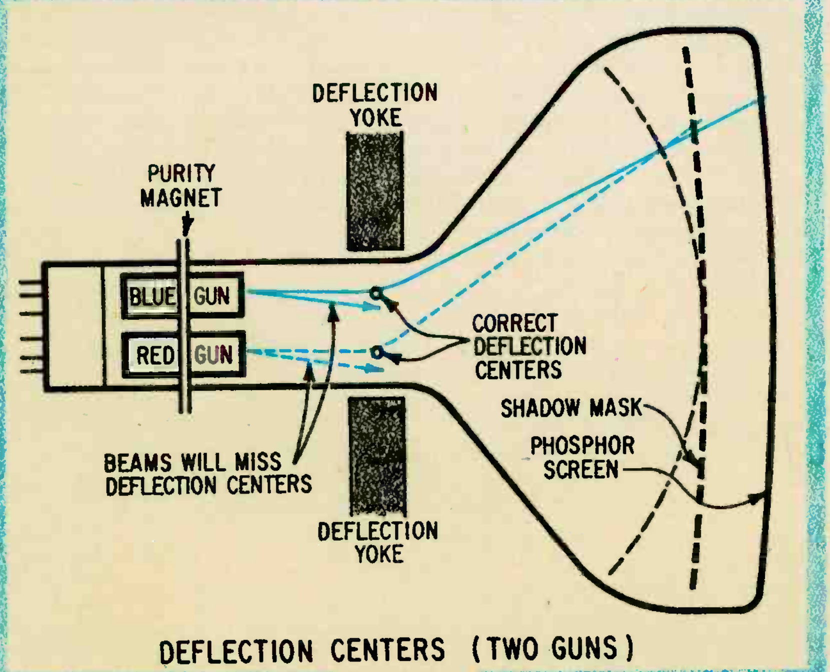
rent, a focusing grid and the *ultor* which carries the highest potential and is the accelerating electrode). Magnetic shielding between the guns prevents interaction of deflection systems.

If two guns are biased off, the raster produced by the remaining gun should be of a single pure color over the entire screen. This *purity* condition will prevail if the beam lands squarely in the center of each phosphor dot it is supposed to excite. That will happen if the *center of deflection* of the beam (see Fig. III-4) falls exactly where the light source was when it fixed the position of those dots. Otherwise the beam will pass through some holes in the mask at the wrong angle and either strike on the edge of the proper dot, resulting in lessened light output, or infringe on dots of other phosphors and produce unwanted color mixtures.

Stray magnetic fields or slight construction discrepancies may shift the centers of deflection away from where they should be. Stray fields that penetrate despite the tube's magnetic shielding may be neutralized with a *degaussing coil,* which is moved about the tube. The centers of deflection may be moved along the axis of the tube by repositioning the deflection yoke. Or the centers may be moved laterally by adjusting the *purity magnet* on the tube neck.

This purity magnet is a circular affair positioned behind the deflection yoke, as shown in Fig. III-4. Rotating the whole magnet assembly on the tube neck rotates its field and causes the three beam paths to describe concerted circular orbits. Changing the relative positions of the two parts of the purity magnet varies the resultant field strength and the diameters of the orbits. These two types of adjustment afford considerable latitude in positioning the beam paths. When purity is corrected for one field (usually the red field is used for adjustment) it is ordinarily correct for the other two. Lack of purity reveals itself as a splotchy appearance of large single-color areas in color reception and as tinted areas in B&W reception.



DEFLECTION CENTERS (TWO GUNS)

FIG. III-4

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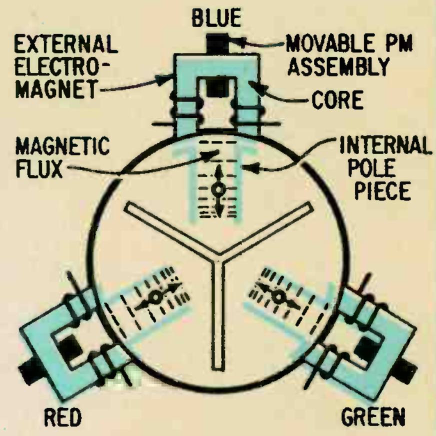
But it is not enough that each beam land squarely on dots of the proper phosphor. To have proper color mixing, these beams must land simultaneously on their respective dots *in the same triads*. (A well-focused beam will cover three mask holes and excite phosphors in three triads simultaneously.) The three guns are tilted slightly toward the center to make the beams converge at a single spot on the shadow mask but they usually need a little extra individual aiming, supplied by what is called *static convergence*.

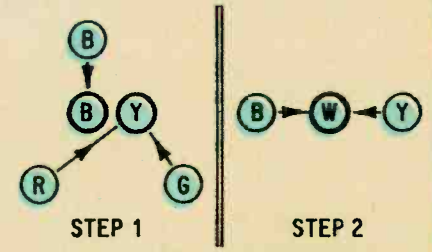


CONVERGENCE ASSEMBLY
FIG. III-5

B&W or color pictures on a color set are composed of three superimposed, different-color pictures. If the *registration* is perfect, the color phosphors work together to produce the desired effect. But if misconvergence causes the edge of one of the pictures to stick out of the color sandwich it is seen as a border of that color on one side of the image with a border of the color resulting from the absence of the misaligned hue on the opposite side. This *color-fringing* indicates improper convergence.

Static convergence in the screen center is produced by adjusting three littel nylon-encased permanent magnets (PMs) mounted in clips at the sides of the U-shaped cores of the electromagnets shown in the assembly of Fig. III-5 and another PM mounted on the tube neck over the third grid of the blue gun and called the *blue lateral magnet*. The convergence assembly is positioned around the neck of the tube at the front of the gun structure so that the feet of the U-shape cores rest directly above the internal pole piece of each gun. These pole pieces collect, concentrate and direct magnetic flux from the external convergence magnets across the paths of the three beams so changes in the flux of one convergence core moves the associated beam toward or away from the tube axis.

This makes static convergence sound simple. But the beams may not move *precisely* toward and away from the tube axis. While the red and green beams always can be brought together at *some* spot, that spot may not fall on the up-and-down line along which the blue beam is moved by its static convergence magnet. That's where the blue lateral magnet comes in. Specially-shaped internal pole pieces direct flux from this magnet so it not only causes the blue beam to move horizontally but simultaneously shifts the red



CONVERGENCE STATIC ADJUSTMENTS
FIG. III-6

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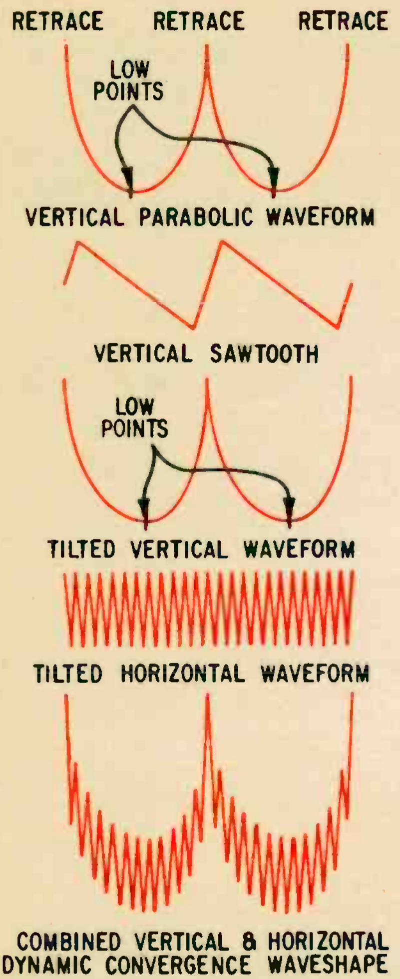

DYNAMIC CONVERGENCE WAVESHAPES
FIG. III-7

and green beams in unison in the opposite direction. We feed into the tube a signal that makes the landing place of each beam on the center of the screen visible as a colored dot (Fig. III-6). Permanent magnets over the red and green guns are adjusted to bring the red and green dots together in a yellow dot. The blue static convergence magnet is adjusted to bring the blue dot level with the yellow dot. Then the blue lateral magnet is adjusted so the blue and yellow dots merge in a single white dot. *Voila!*

Unfortunately this is not the end of the convergence story. Beams converged at the center of the screen will not stay converged automatically when they are deflected to the screen edges. Fig. III-4 shows why. Unless the beams are increasingly spread apart as they move toward screen edges they will converge not at the shadow mask but at the dotted line shown curving away from it. Moreover, beam travel distances at the edges of the picture are not the same for all three guns. The blue beam has the shortest throw to the top of the screen, red to the left, green to the right. Compensating for these factors is *dynamic convergence*. It is accomplished (Fig. III-7) by feeding individual, controllable, properly shaped current waveforms, synchronized with both horizontal and vertical sweep currents, through the windings of each electromagnet of Fig. III-5. The basic parabolic shape of these convergence currents produce maximum spreading of the beams at screen edges and minimum at the center. To compensate for differences in individual beam travel, a controlled amount of distortion, called *tilt*, is introduced deliberately into each parabolic waveform. By adjusting waveforms of separate convergence currents for each gun, the beams can be kept converged as they sweep together across the screen.

Now that we have seen the means used to translate electrical voltages into color pictures, let's see how color scenes are turned into electrical signals. Don't miss a look at the broadcast side of the picture in Part IV!

NEXT ISSUE: TRANSMITTING COLOR

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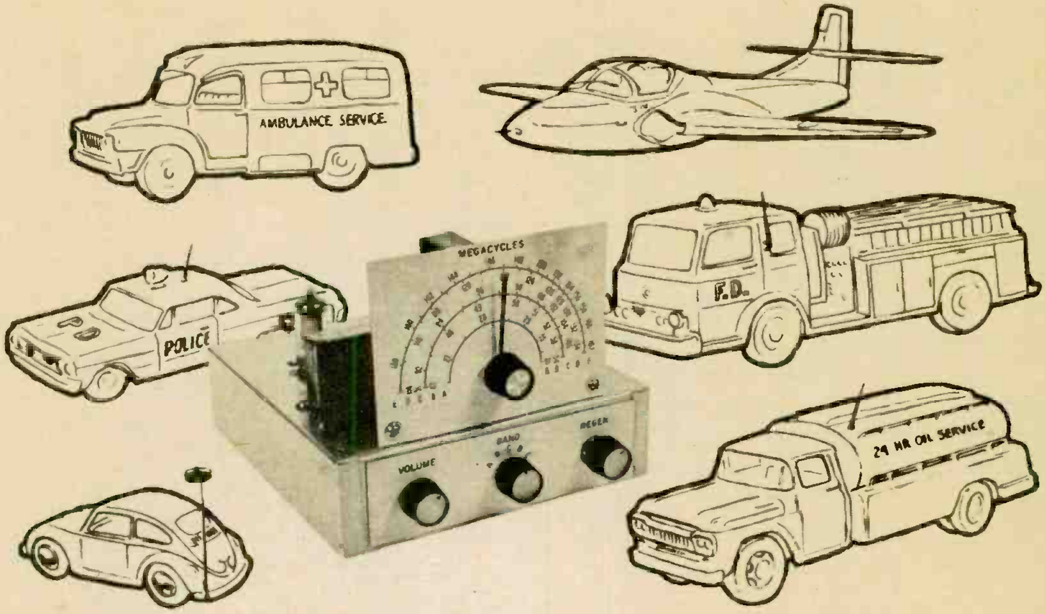

Band-Switched VHFer

Our rig tunes hot listening from 26 to 162 mc without annoying coil changing.

BY CHARLES GREEN, W6FFQ

IT started as a sad story—Hans Christian Andersen's tale of the Ugly Duckling. But it had a happy ending after the swan grew up and found that in his own right he, too, was a real swinger.

So it is with the VHF portion (30-300 mc) of the radio spectrum. Once neglected, the VHF frequencies now are radio's most wanted. They're loaded with good listening. The line-of-sight characteristic of VHF transmissions has changed from a handicap into a blessing in disguise. Reason is, it permits constant day-and-night coverage of local areas. This mode of transmission has proven itself to be ideal for commercial and special-service broadcasting of many types.

With our three-tube VHF receiver, you can listen in on the most active parts of the VHF spectrum. Band *A* (26-31 mc) covers the Citizens Band and the 10-meter ham band. Band *B* (47-54 mc) tunes police and fire departments, as well as the 6-meter ham band. Band C (91-107 mc) covers most of the FM broadcast band. Band *D* (114-134 mc) lets you listen to the aircraft band and Band *E* (137-162 mc) covers the Civil Air Patrol, the 2-meter ham band and public-safety vehicles.

Our receiver's circuit uses a frame-grid triode in a reflexed grounded-grid RF stage. This stage feeds a superregen detector followed by a power amplifier stage that drives an external speaker. The receiver, with its AC power supply, is built on a 7 x 7 x 2-in. aluminum chassis. Construction is straightforward and the coils are easy to wind.

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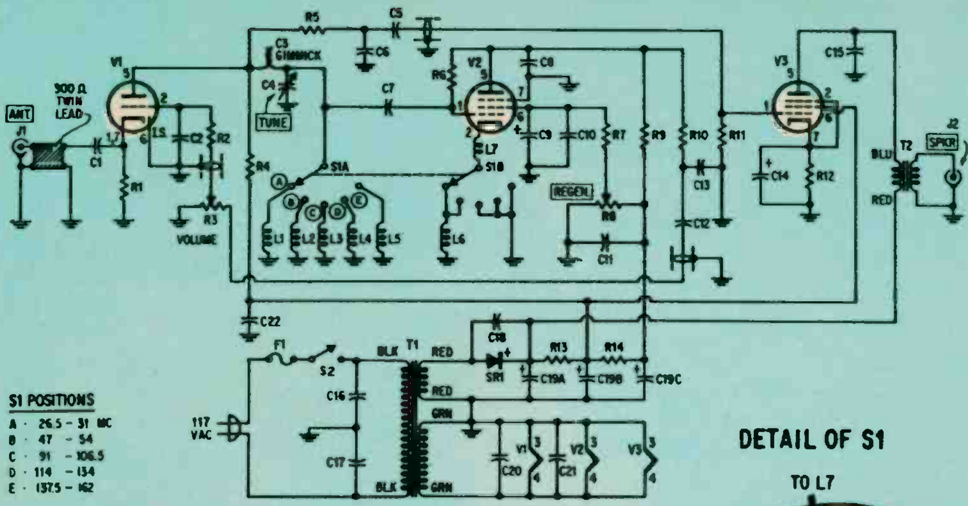
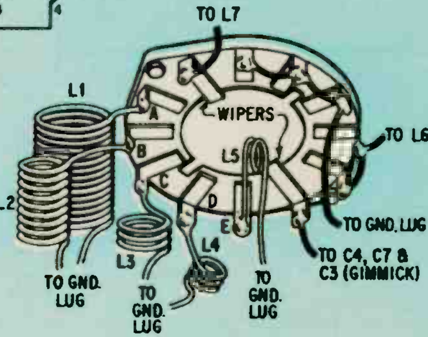


DETAIL OF S1



PARTS LIST

Capacitors: 1,000 V ceramic disc unless otherwise indicated
C1,C7—47 μμf
C2,C10,C11,C20,C21,C22—470 μμf
C3—Gimmick capacitor: three turns of hookup wire (see text)
C4—6.5-13 μμf variable capacitor (Lafayette 32 C 0917)
C5,C12,C15—.01 μf
C6,C13,C16,C17,C18—.001 μf
C8—100 μμf
C9—5 μf, 150 V electrolytic
C14—10 μf, 15 V electrolytic
C19A,B,C—50/30/20 μf, 150 V electrolytic
F1—½ A pigtail-lead fuse
J1,J2—Phono jack
Coils: No. 16 enameled wire (see text)
L1—15 turns, 9/16-in. I.D., ¼ and ½-in. leads
L2—9 turns, ⅜-in. I.D., ⅜-in. leads
L3—3 turns, ⅜-in. I.D. ⅜-in. leads
L4—3 turns, ¼-in. I.D., ⅜-in. leads
L5—1½ turns, ¼-in. I.D., ¾-in. leads
L6—24 μh RF choke (J. W. Miller RFC-28. Lafayette 34 C 8971). Remove 10 turns from each end (see text)
L7—1.72 μh RF choke (J. W. Miller RFC-144. Lafayette 34 C 8973)
Resistors: ½ watt, 10% unless otherwise indicated
R1—270 ohms
R2,R7—10,000 ohms
R3—1 megohm audio-taper potentiometer with SPST switch
R4,R5,R10—120,000 ohms
R6—8.2 megohms
R8—50,000 ohm linear-taper potentiometer
R9—220,000 ohms
R11—1 megohm
R12—470 ohms, 2 watts
R13—1,800 ohms, 2 watts
R14—15,000 ohms
S1A,S1B—2-pole, 5-position ceramic rotary switch (Mallory 173C. Lafayette 30 C 4058)
S2—SPST switch on R3
T1—Power transformer; secondaries: 125 V @ 15 ma, 6.3 V @ 0.6 A (Allied 54 A 1410 or equiv.)
T2—Output transformer; primary: 10,000 ohms; secondary: 4 ohms (Allied 54 A 1448 or equiv.)
V1—6ER5 tube
V2—6CB6A tube
V3—6AK6 tube
Misc.—2 x 7 x 7-in. aluminum chassis, 7 x 7-in chassis bottom plate, 7-pin tube sockets (3), terminal strips

Band-Switched VHFer

Construction

Tape a piece of graph paper over the chassis top and front. Lay out on the paper all chassis holes, scaling your dimensions from our under-chassis photo. Do not spread out the parts. Keep them in the same places shown in the pictorials. As in all high-frequency circuits, parts placement and wiring are critical—especially around bandswitch S1.

The bracket which supports tuning capacitor C4 on top of the chassis is made from a piece of scrap aluminum. The dimensions are not critical so long as the bottom of C4 is about 3/16-in. above the chassis. Our bracket is 1½-in. high by 2¼ in. wide; it has a ⅜-in. mounting foot.

Position the ground lugs for coils L1 through L5 on a line between bandswitch S1 and V2's socket. Wind the coils on either wooden dowels or drills. The number of turns, inside diameter and lead lengths of the coils are detailed in our Parts List. Be sure the coil lead lengths are as specified and the coils are mounted as shown in the dia-

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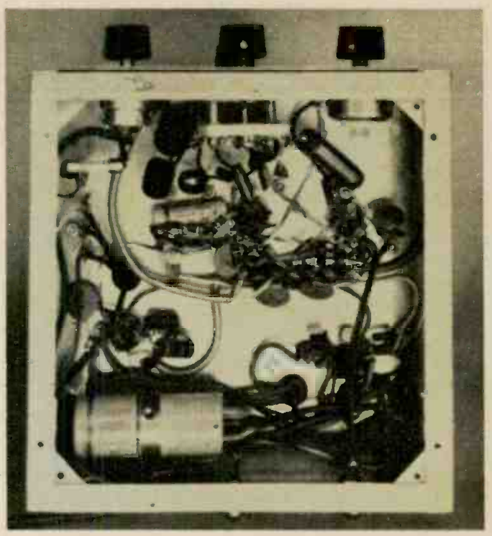
Incoming signal amplified by grounded-grid stage (V1) is fed via C3 and C7 to superregen detector stage (V2). Audio is fed through low-pass filter (R10-C13) back to V1. Amplified audio is fed by low-pass filter (R5-C6) to audio amplifier V3.

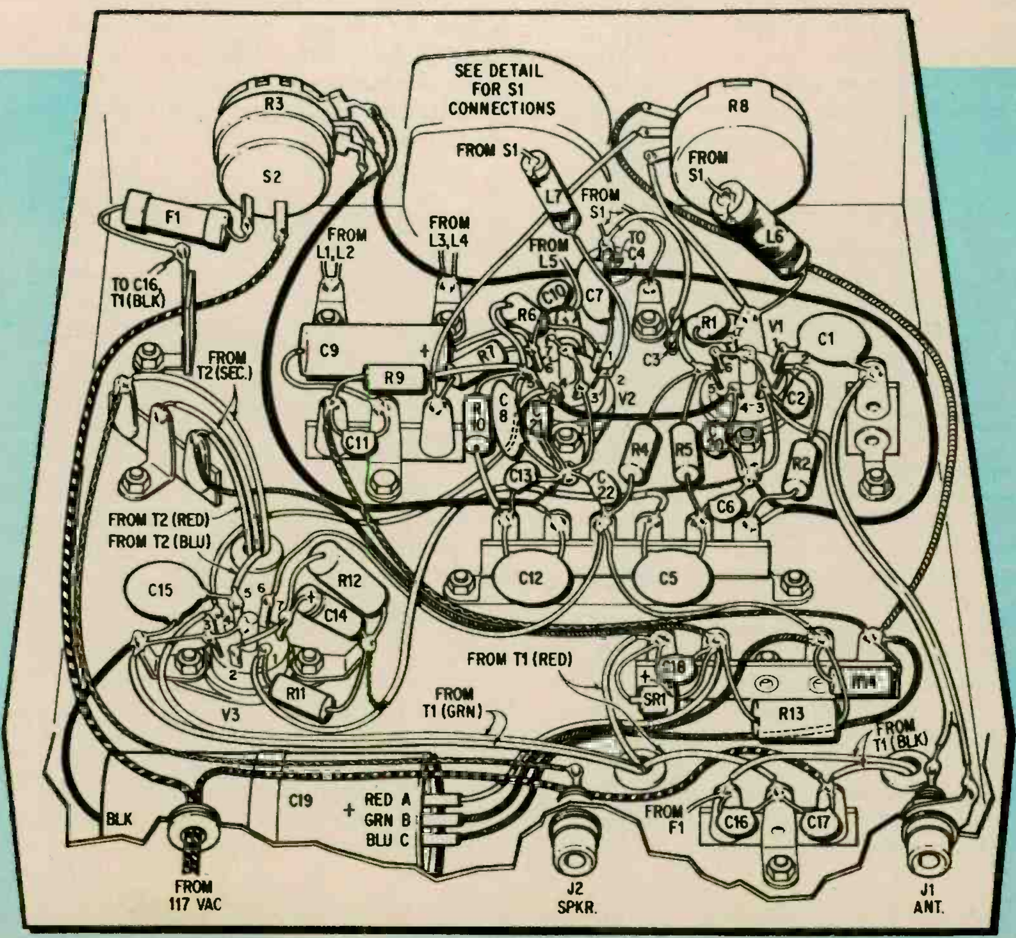
gram under the schematic.

The coil-winding information is approximate. This means the tuning range of each coil will vary, depending on the way you wind it (wind each coil as shown in the detail pictorial of S1 under the schematic) and your wiring layout. Do not crimp the wire leads of the coils on the bandswitch lugs and ground lugs. Just solder them so they can be detached easily. This will pay off later when you are calibrating the dial and wish to adjust the tuning range of each coil.

Carefully unwind ten turns of wire from each end of L6 and solder the remaining wires to the leads coming out of the ends of the form. This modification is necessary to raise the self-resonant frequency of the coil at the



Because of operating frequencies it is important to duplicate our layout. Multiply dimensions in photo by 3.1 to lay out 7 x 7-in. chassis. Wiring details of S1 and coils are under schematic.



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Band-Switched VHFer

top end of the 6-meter band (above 54 mc).

Fabricate gimmick capacitor C3 by soldering a length of hookup wire to pin 5 of V1 and another length of wire to the appropriate lug on S1. Run the wires in a straight line toward each other and twist them together three turns. Cut off the excess and make sure the ends do not touch.

Use spaghetti over the fuse and its leads, as well as on all resistor and capacitor leads that cross, to prevent shorts. Position the wiring as shown in the photo and keep component leads to tube sockets as short as possible. Use a short length of 300-ohm twinlead to connect J1 to the mounting strip to which C1 is connected.

After the chassis wiring is completed, cut a piece of cardboard and fit it on front of the receiver over the tuning-capacitor's shaft. Mount it on the chassis with small brackets at each side. Our dial is 3½ x 5 in. and is made of heavy bristol board. Make a dial pointer by soldering a length of heavy wire to a small piece of sheet metal. Then bend the metal around the tuning capacitor's large-diameter shaft. Cut another piece of cardboard and put it over the controls on the front of the chassis.

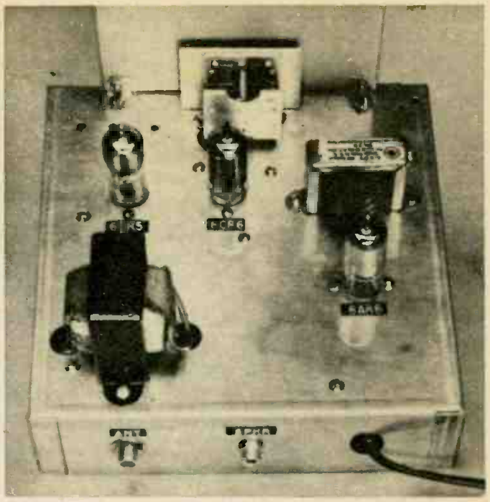
Calibration and Operation

Install the chassis bottom plate and the tubes. Plug in the receiver, turn it on and let it warm up a few minutes. Set *volume* control R3 full clockwise until you hear the typical superregen hiss. This indicates the detector stage is working on at least one band. Check R8's action on other bands selected by S1.

If you have a signal generator that covers the receiver's frequencies, connect it to antenna jack J1 and calibrate the dial lightly in pencil. Then remove the dial and ink in the markings, or use transfer type to make a professional-looking dial.

If necessary, the coils can be squeezed or compressed to change frequency coverage. Or you can remove the coils and either add or remove turns to change the range. A grid-dip meter is helpful in setting up each coil's range.

The antenna is not critical; anything from a 6-ft. length of hookup wire (for strong stations), to an outside TV antenna will work.



Rear view of receiver. V1 is at top, left. V2 is in center. V3 is at right below T2. T1 is at lower left. Note tuning capacitor's mounting bracket.

Some signals (particularly the aircraft and emergency-service bands) are vertically polarized; an outside 2-meter ground plane is good for these bands. Refer to the Radio Amateur's Handbook for construction details on VHF antennas. Or you can buy a commercial antenna.

The receiver drives a 3.2- to 8-ohm external speaker. *Regen* control R8 and the tuning capacitor should be readjusted each time you tune a station until signal is strongest. FM stations must be tuned in on either side of the signal to achieve slope detection.

How it Works

Antenna signals at J1 are amplified by the grounded-grid reflex circuit of V1 and fed by gimmick capacitor C3 to the grid of superregen detector V2. Coils L1 to L5 are tuned by C4 for each band selected by S1A. The RF chokes, L6 and L7, are switched by S1B for the proper feedback for each band.

Regen control R8 varies the gain of the detector stage. The detected audio is fed through low-pass filter R10-C13 back to the grid of V1. V1 also amplifies the audio and feeds it via low-pass filter R5-C6 to the grid to power amplifier V3. The audio output of V3 is coupled through output transformer T2 to external-speaker jack J2.

Power for the circuits is supplied by T1, SR1 and the R/C filter comprising resistors R13, R14 and C19A, B, C.

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KIT

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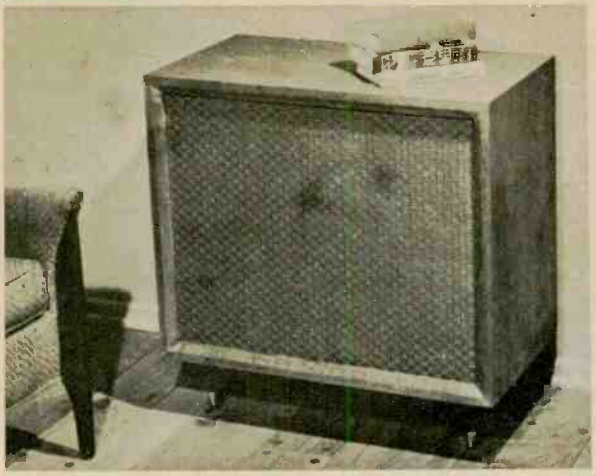
REPORT



A SIZABLE SPEAKER SYSTEM

Lafayette Lowboy

THE audio scene is changing again. After a few years of watching speaker enclosures diminish in size, we're beginning to see them get bigger. And as the trend continues, an old standby—the large bass-reflex enclosure—is coming back into the limelight.

The bass-reflex design is not at all new. As things go in the world of audio, it has grown quite a beard since it was patented in 1932. Properly designed and tuned, a bass-reflex speaker system is capable of delivering excellent sound.

Tucked away on page 103 of Lafayette's 1967 catalog is a bass-reflex enclosure kit. Available in either a high- or low-standing design, it sells for $32.92, unfinished. Its volume is about 5 cu. ft. Though Lafayette says the cabinet is made of plywood, it actually is flakeboard covered with white-birch veneer.

The 20 C 0122WX (the stock number) kit is supplied with a variety of mounting boards to accommodate almost any speaker system. Choices are single- (full-range), two- or three-speaker systems. The three-speaker systems can be made up with a 12- or 15-in. woofer, 6- or 8-in. midrange and a variety of tweeters.

The system we built and tested used a $22.95 12-in. woofer (stock No. 21 C 4720), a $6.50 midrange (stock No. 21 C 4718), a $9.95 dome-lens compression tweeter (stock No. 99 C 6250) and a $14.95 three-way crossover network (stock No. 99 C 0022). All told, our system cost $87.30. A 15-in. woofer costing $23.95 (stock No. 21 C 4719W) is available but we do not recommend it for reasons to be discussed later.

What was it like to put together a cabinet whose parts were said to be precision cut so they would fit together snugly? The first set

Biggest problem in cabinet assembly is at top corners. Note in photo at left that excess stock between dado and mitered edge must be removed before assembly. In center photo, glue is shown being applied to spline groove. In photo at right, the spline is inserted in the groove, after which it is tapped gently into place.

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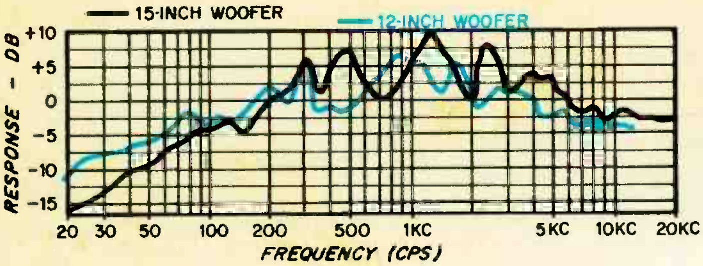


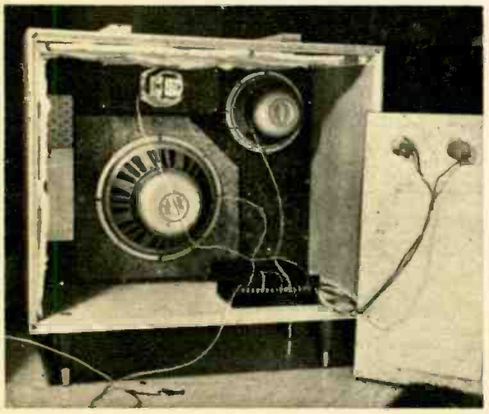
Curve in color shows response of system with 12-in. woofer. Black curve is response with 15-in. woofer. Poorer low-end response with 15-in. woofer is due more to speaker than cabinet. When size of port is reduced to 2½ x 5 in., response down to 40 cps with 12-in. woofer is improved and is better than with the 15-in. woofer.

A SIZABLE SPEAKER SYSTEM

of instructions supplied with the kit was vague and somewhat confusing. We found it was easier to assemble the cabinet by referring to an exploded-view drawing. But the instruction sheets have since been revised and, except for one omission, they are satisfactory.

The omission covers splines (thin wood strips) which are furnished with the kit. They are not mentioned nor are they shown in the drawings. It would not be surprising, therefore, for an inexperienced builder to throw them out since they look like strips of scrap. They are used to align the mitered joints and to prevent the glued surfaces from shifting.

Assembly wasn't difficult. You place the top panel face down on a flat surface and attach the cleats. Spread some glue (supplied) in the joint, then draw the cleat tight with the screws. Put some glue in the spline grooves and insert the splines. The top and sides are assembled with screws. The bottom and sides are screwed together without cleats.



Ready to be closed up. Crossover network is mounted in bottom of cabinet. Midrange- and tweeter-level controls are in cabinet's rear panel.

Tufflex acoustic material is attached with staples to the top, one side and the rear panel.

We checked the enclosure with two different 3-way speaker systems, using the same 8-in. midrange speaker and tweeter with a 12-in. and a 15-in. woofer. The crossover network was wired for 700 cps and 3,000 cps.

Impedance curves for the two woofers revealed that the port size was correct for the 15-in. woofer but too great for the 12-in. woofer. There were no instructions for tuning the cabinet and there is no convenient way of reducing the size of the port. (Lafayette has advised us that tuning instructions will be included with future kits.)

Response measurements of the system were made with a PML type EC-61A calibrated condenser microphone. The curves shown with this article indicate what we consider mediocre low-frequency response with the 15-in. woofer. But this was due primarily to the speaker and not the enclosure. Despite the fact that the enclosure was not at first tuned for the 12-in. woofer, much better performance was obtained with this speaker than the 15-in. woofer. After we reduced the port size to 2½ x 5 in., response with the 12-in. woofer was smooth down to 40 cps.

We found the 8-in. midrange speaker to be too efficient for the woofer and tweeter and it tended to peak a bit below 600 cps. By setting the midrange level control at the 9 o'clock position, we improved balance.

The tweeter displayed smooth, clean response out to 20 kc. The only fault we found with the tweeter (for use in this system) was its 16-ohm impedance. (The woofer and midrange are 8 ohms.) However, we balanced the tweeter by setting its level control at the 3 o'clock position.

Three hours after starting construction we put the test equipment and tools aside and sat down to listen for a while. The sound was great—no doubt about it—from the lowest bass right on out to 20 kc.

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The Shocking Facts About ELECTRONIC QUACKS

Con men in white coats find gadgets bring big takes.

By JACK KAPLAN

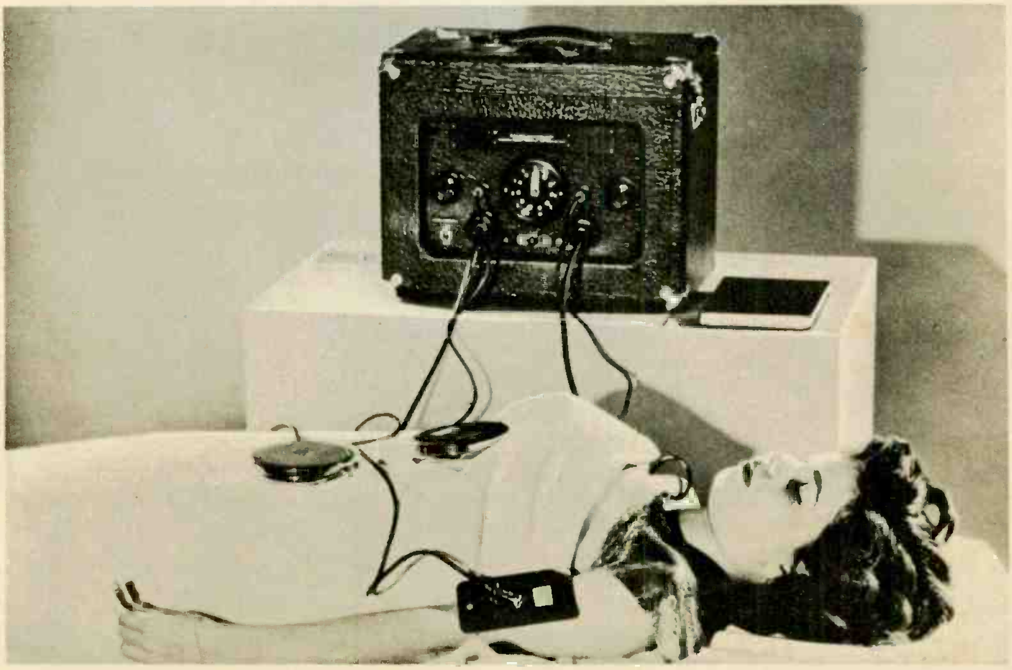
WHEN Doris Hull, 24, was ailing her husband took her to see Otis G. Carroll—a sanipractor in Seattle. At his first examination, Carroll—whom Paul Hull mistakenly assumed to be an M.D.—took a drop of blood from Doris Hull's ear, placed it in what he called his Radionic diagnostic machine and twirled some knobs.

The fee was $50.

His prescription: hot and cold compresses to increase her absorption of water. Although she weighed only 108 lbs. when she visited him and obviously was quite ill, Carroll had her go on ten-day fasts in which she took nothing but water. Meanwhile, he gave her treatments with his Radionic machine. When Mrs. Hull eventually died of starvation and tuberculosis she weighed only 60 lbs. Moreover, her husband and child had contracted TB from her.

An isolated case of gadget quackery? By no means. Rather, it is typical of the misery inflicted upon hundreds of thousands of Americans by quacks who use phony health devices to lure their victims away from legitimate medical treatment and rob them of millions of dollars.

With Rube Goldberg gadgets manufac-



Short-Wave Oscillotron, shown under staged treatment conditions in this FDA photo, was sold by Fred Hart of Electronic Medical Foundation. It is typical of worthless devices that are hawked as cure-alls.

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The Radioclast, an impressive collection of knobs and dials, represents a classic among the instruments derived from Dr. Albert Abrams's theory of cure through application of short-wave vibrations of the appropriate frequency.

The Shocking Facts About ELECTRONIC QUACKS

tured from odds and ends of metal, wire and radio parts—impressive to the gullible because of flashing light bulbs, ticks, and buzzes—the quack carries out a vicious medical con game, capitalizing on people's respect for our scientific age and its electrical wonders. He translates the latest scientific advances into his own special Buck Rogers vocabulary to huckster his worthless product as a cure-all for everything from hay fever to sexual impotence and cancer.

Some devices of the health-machine faker are designed for do-it-yourself home use. Others are sold to drugless healers or fringe practitioners like Carroll for the diagnosis and treatment of patients. For his bogus machines or treatments the quack charges from $5 to $10,000—whatever the traffic will bear.

"Device fakery is big business," says Dr. K. L. Milstead, expert in this field for the Food and Drug Administration (FDA).

Roy De Welles, a self-styled doctor recently convicted of quackery, made more than a million dollars from the pain and tragedy of his fellow citizens with his machine, the Detoxicolon. It's not surprising, then, that authorities agree with Dr. Milstead in assessing the thieves' harvest from health machines at a multi-million-dollar portion of the billions paid to medical charlatans annually.

The FDA has punched hard and often at promoters of fake health devices. It has cracked down on some 1,200 devices, totaling tons of phony cures since 1945 when war's end and readier access to surplus metals and electrical supplies brought renewed vigor to health-machine fraudsters. Last year alone the agency seized 67 devices for false cure-all claims, instituting government action in at least 15 states. And so many of these devices are electrical that authorities have come to talk of the Electromagnetic Era of Quackery.

The phony gadgets we have fallen for in the last few years range from the simple and weird to some more elaborate mechanisms.

In California, a layman named H. F. Bell sold electric blankets as a cure for cancer. He made a practice of buying used electric blankets for $5 to $10 from survivors of patients who had died. After reconditioning he could resell the blankets at $185 each.

Then there was the case of the Sonus Film-O-Sonic, sold for up to $500 and promoted to fringe practitioners as well for home use. This electrical device consisted essentially of the playback mechanism of an ordinary dictating machine. Moistened pads connected to the device were applied to appropriate areas of a patient's body, a continuous musical tape was turned on and the patient was told the vibrations were entering his body to cure him.

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The Micro-Dynameter was promoted to chiropractors as a diagnostic instrument. It sold for up to $875 until it was proved in court to be incapable of diagnosing anything deadlier than perspiration.

The Air-Ozone is one of several similar ozone generators that have been hailed as cure-alls in spite of the fact that ozone (ionized oxygen), far from being therapeutic, can even be lethal.

Program material to fight cancer, incidentally, was Smoke Gets in Your Eyes; for arteriosclerosis it was Holiday for Strings.

Many of the fake machines turn up again and again. For example, the FDA seized 350 Master Violet Ray devices and 520 glass-electrode attachments in Detroit last year, announcing that it was the same device involved in seizures over the last decade. It consists of a spark-plug oscillator in a plastic case about the size of a large flashlight. Fitted with one of the six glass-electrode attachments, it applies a mild electric shock or tingling sensation of the skin of the user. The device was ballyhooed as effective therapy for about 25 conditions from baldness to dental abscesses. "Worthless medically or therapeutically," says the FDA Bureau of Medicine.

When the FDA this last year cracked down on the Vitazone Ozone Generator, it seized another hardy perennial. Touted as "God's gift to humanity," the gadget was recommended for use in some 47 diseases and conditions, ranging from asthma to cancer. The mechanism consisted of a group of eight ultraviolet tubes connected to a control box. The tubes emit light energy of various wavelengths, producing ozone in the surrounding air. Over 3,000 of these devices were sold in the West at $150 each even though experts stress that not only has ozone no curative value, but in certain concentrations it is as poisonous to humans as carbon monoxide.

The majority of the current fake health machines descend from Dr. Albert Abrams, dean of electronic device quackery. He announced that electrons, not cells, form the real basis of life and that disease is a "disharmony of electric oscillations." He maintained that diseased parts of the body emit radio vibrations of characteristic frequencies. So he developed the Dynamizer—a diagnostic machine that could tune in on the frequencies emitted by a sample of a patient's blood. To cure the disease, he neutralized the evil emissions by feeding back into the body radio waves of the same frequency with what he called the Oscilloclast.

Abrams did pretty well with his Radionics —as he dubbed his bogus electrotherapy. But when investigators sent the blood of a rooster and pig to one of his followers he diagnosed general cancer and tuberculosis of the supposed patient's genito-urinary tract. Then the American Medical Association (AMA), joining with the magazine Scientific American, spent $30,000 probing Abrams's Oscilloclast. The conclusion of the panel: "Radionics is a colossal fraud."

So was the Oscilloclast. The experts called it a masterpiece of electrical misconstruction showing that Abrams could not even rig up

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The Shocking Facts About ELECTRONIC QUACKS

a doorbell circuit correctly. But before he died Abrams grossed over two million dollars with his quackery, giving impetus to scores of promoters of Abrams-type machines, flooding the country with worthless health gadgets, supplying drugless or borderline healers like Otis Carroll. The most prominent of these hucksters have been the Electronic Medical Foundation of San Francisco; the Electronic Instrument Co. and the International Electronic Research Foundation, both of Tiffin, Ohio; the Ellis Research Laboratories, Inc. of Chicago; Ruth Drown of Los Angeles.

All in all, experts say, these outfits have offered, cumulatively, 28 varieties of gadgets —many of them duplicates of their competitors' machines—for their quack trade. And each syndicate marketed some 5,000 of its machines to drugless healers and patients. A sampling of the machines in current use are designated by such names as Pathoclast, Diagnometer, Neurolinometer, Magnetron, Hemovitameter, Radioclast, Cosray Electronic, Micro-Tabulometer, Drown Radio Therapeutic Instrument, the Homo-Vibra-Ray-Instrument.

Consider the Electronic Medical Foundation—nominally the inheritor of Abrams's millions—as an example of the smoothness of the Abrams-type operation: The organization maintained a clinic in San Francisco to which practitioners would mail a sample of their patient's blood. After their diagnostic machine, the Radioscope, had determined the disease from the blood sample the Foundation would inform the practitioner by post card of the disease and its treatment. The healer would then treat the patient with one of the machines previously purchased from the Foundation. There were five basic machines—the Oscilloclast, Oscillotron, Depolaray, Depolatron, and Electropad—in 13 different models. These devices are of two kinds: those producing a weak magnetic field and those emitting short-wave frequencies.

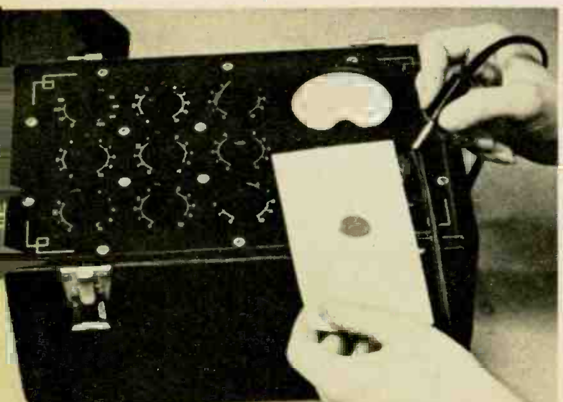
Zeroing in on the Foundation, FDA probers showed that the Radioscope dispensed ridiculous diagnoses. For instance, the FDA submitted the blood of an amputee only to get back a diagnosis of arthritic involvement of the foot and ankle that the man had already lost. Again, the blood of a dead man got back a diagnosis of colitis.

Evidence of this type plus scientific testimony that the Foundation's machines had absolutely no value in the treatment of disease enabled the FDA to obtain a permanent injunction in 1958 against the shipment of the Foundation's gadgets in interstate commerce. And in 1962, Fred Hart, the president of the Foundation, was prosecuted and fined for further distribution of the Foundation's products.

But in spite of these and other court actions brought against perpetrators of health frauds.

[*Continued on page* 120]

Photos courtesy AMA



A diagnostic device that has been popular in California is supposed to evaluate emanations from patient's blood sample and then tell what's wrong.

Depolaray consists primarily of AC electromagnet rigged to cause buzzing on lens. Instructions suggest adjusting the sound to please patients.

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HI-FI TODAY

By John Milder

Minis vs mighties

Have brush, won't skate

LATELY I've been keeping an eye on a couple of trends in speakers that seem, in a way, to conflict with each other.

The first trend is toward really surprising quality in low-price ($50-$75) speakers. There are now perhaps a half-dozen speaker systems in this price category that offer better bass than you used to be able to get from the majority of big and whompingly expensive systems. And their smoothness over the musical range is impressive.

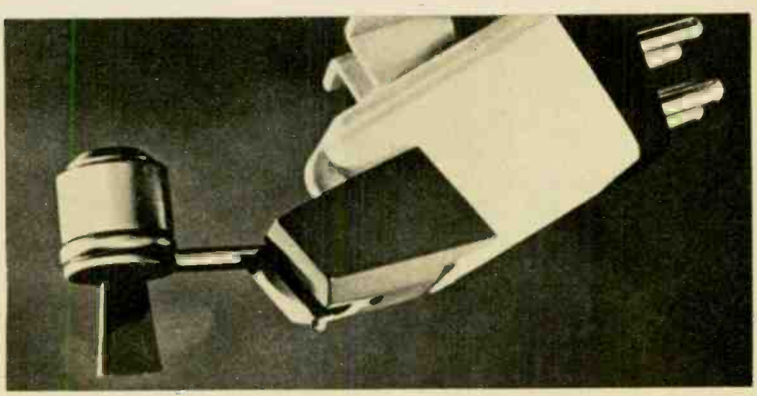
Manufacturers gradually have come to realize that what really costs money in speaker design is the ability to reproduce the lowest octave of bass and the capacity to handle lots of power. To many listeners both factors are minor points—particularly the kind of response (below 50 cps) that seldom is required by musical material.

High-frequency response, on the other hand, doesn't have to cost a lot. And it's vital in the performance of the new low-cost speakers. Highs are responsible for spaciousness and detail (or the lack of) in a speaker's sound. If you doubt it just turn down your treble control and hear the sound fade into the box.

The second trend became apparent to me when I was listening to some speakers in the $200 range. I've sometimes been struck by the absence—and I mean *absence*—of real high-frequency response. Oh, there's enough to keep the sound from seeming trapped in the box. But the designers seem to be aiming for a mellow, slightly fat quality that is inoffensive rather than good. Definition of instruments, particularly strings, is strikingly missing in these systems. So is the important and entirely natural edge in the sound of cymbals, brushes and so on (although it may require direct comparison with speakers that *do* have real highs for full appreciation of the difference).

Considering that *high fidelity* once meant *high frequencies* to many audiophiles, it's doubly ironic that highs have all but disappeared in some highly respected (and high-price) systems. And it even means that some of the low-price speakers may perform more faithfully than some of the big boys.

If you've taken any note of the arguments over anti-skating devices in tone arms. I suggest you consider the new Pickering V-15/3 series of cartridges with built-in record-cleaning brushes. I submit that those simple brushes are about as effective an anti-skating device as you can find. I won't go into the physics here and I won't try to defend or attack the merits of anti-skating compensations in general. But if you're interested, don't overlook those little brushes.



Dubbed the Dustamatic by Pickering, the brush on the firm's V-15/3 cartridge not only clears debris from the path of the stylus but acts as an anti-skating device as well by holding in equilibrium the lateral forces acting on the stylus tip. So-called skating force is claimed by some experts to result in improper groove tracking and excess record wear. Others deny its importance.

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CONFESSIONS OF A RADIO SWAN HOAXER

By TOM KNEITEL, K2AES

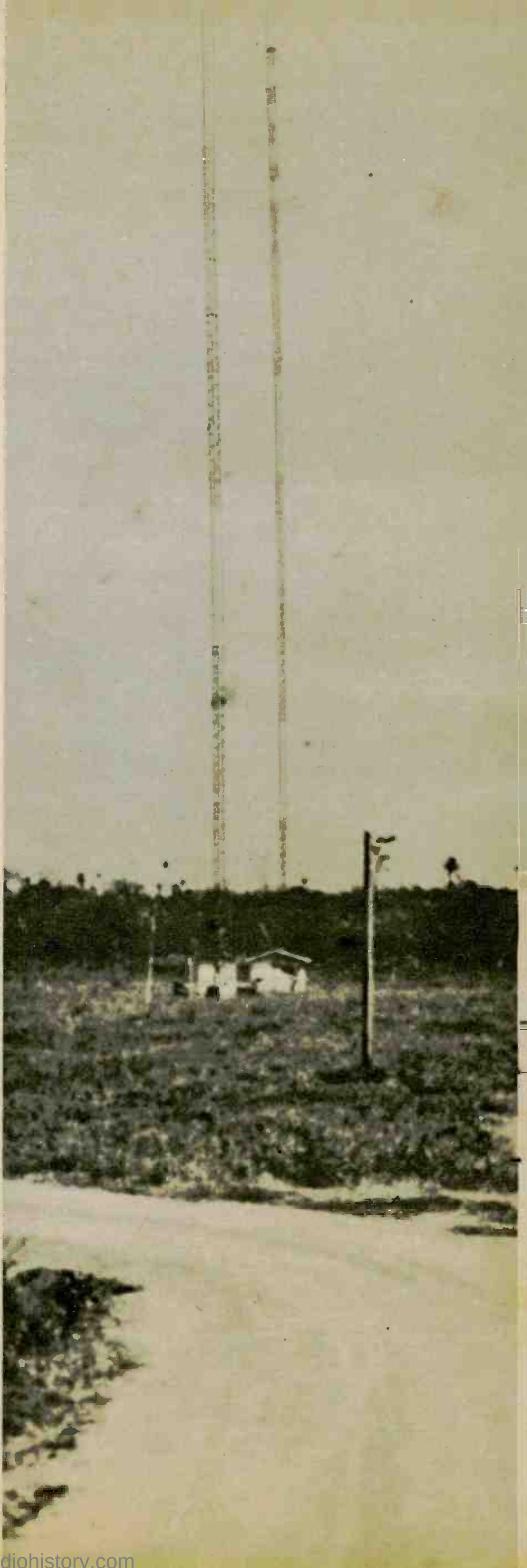
FOR YEARS now I've been sitting here watching a tangled web grow thicker and I've gotten the uneasy feeling that perhaps I'm partly (if not all) to blame for the mess.

I'm talking about Radio Americas (formerly Radio Swan). That mysterious old devil of a quasi-bootleg broadcast station in the Caribbean has been in and out of the headlines, denounced on the floor of the United Nations, and of late has been the topic of much arm-waving and lapel-grabbing in DX radio circles. And in the midst of the furor we've lost the station—that's right, nobody seems to know where this 50,000-watt monster is.

I may have been the only outsider ever to visit and interview R. Americas/Swan officials. And my digging into some of the dark corners is probably what ruined it for everybody else. The story I wrote from my interviews and research produced a number of results, among them the closing of Swan Island to unauthorized Americans, the retirement from general availability of the FCC's rare KS4 (Swan Island) ham radio prefix, and the largest controversy and hoax ever to hit the DX radio hobby.

The station popped up on the air late in 1960 with a powerhouse signal in the BCB and another in the 49-meter short-wave band. They claimed to be transmitting from Swan Island, a guano-encrusted speck of dirt southwest of Cuba. R Swan spokesmen said that they had never applied to the FCC for a broadcast license because they weren't satisfied of U.S. ownership (Honduras also claims the island). They hinted that they might accept an FCC invitation for licensing though.

A U.S. government aeronautical radio sta-



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tion on Swan Island had been using an FCC-assigned call-sign for years. In the case of R. Swan, however, the FCC said they had no information on the existence of the station. Honduran officials claimed the station was operating illegally on *their* island.

But there they were, running a full advertising schedule and making friends and enemies along the way. Among its friends were its sponsors, including Kleenex, R. J. Reynolds Tobacco, Phillip Morris, several religious organizations and groups of outspoken anti-Castro political exiles in Florida. Among its enemies were the U.S. broadcasters who found their prized frequency pirated (KSL in Salt Lake City and WJJD in Chicago) and Fidel Castro.

I had done a short piece on R. Swan for Popular Electronics. Considering what subsequently emerged, that story was rather naive and bland. I had written it without the cooperation of the people at R. Swan; but using it as an entree I approached the Swan offices with the idea of doing a follow-up for a magazine called CB/DXing Horizons. The Swan people gladly accepted as soon as they read the first story. It must have been apparent that I was out to do a standard publicity puff about this new station which had created so much interest and controversy.

In 1961 the station was owned by the Gibraltar Steamship Co. (which owned no steamships). Its offices were in an unused room of an outfit called Radio Press International in New York City. When I interviewed the Manager of the station—a fellow named Horton Heath—I found him to be personable but quite evasive. He furnished me with an advertising rate card and four photographs which he said were taken on Swan Island. The one at the left shows the antenna. Others depicted the inside of the station and the mail plane being unloaded. All were carefully posed so that none of the people could be seen clearly enough for identification.

Frankly, something had the aroma of aged mackerel and it was then that I decided to dig up some facts on my own.

A gentleman named Sumner Smith in Boston who claimed that he personally owned Swan Island said he had issued a lease to R. Swan and the FAA but that he had forgotten the terms of the agreement. He identified a Walter Orr of Baltimore and Thomas Dudley Cabot of Boston as station officials.

Walter Orr could not be located, despite considerable effort.

R. Swan claimed photo (left) to be of Swan Island. R. Americas QSL card (below) confirms location.

RADIO SWAN HOAXER

Thomas Dudley Cabot, of the Boston Cabots, was a former Director of the U.S. office of Internal Security and a former President of the United Fruit Co. (His cousin, Henry Cabot Lodge, was U.S. Ambassador to the U.N. when R. Swan began operation.) When I called I was told he was not available.

I then spoke to Philco's Washington office which was in charge of furnishing the rented engineers for R. Swan. Then I dug up Coastal Air, Inc., of Miami, the air taxi service that had contracted to fly mail and programs to Swan. An outfit known as Hamilton Brothers Steamship Co. in Tampa told me they had three former Navy LCI vessels on the Swan Island route to deliver supplies and equipment. All three supplied at least some corroborative information.

Several times more I contacted the FCC without turning up anything on Radio Swan. Finally, in exasperation, an FCC official let slip the most valuable piece of information to date. He told me to stop calling them and to ask somebody at the State Department.

The State Department? What information could they have on a bootleg radio station? Had we given up our claim on Swan Island and recognized Honduras as the owner? But John Markovich, who also was connected with Horizons Publications, applied to the FCC for a Swan Island ham prefix to see if they were still being issued. He promptly received the call-sign KS4BD.

At this point I was able to piece together a sizable portion of the jigsaw puzzle. Some of the facts didn't jibe with each other but I later learned that my phone calls had been the cause for instant panic with the R. Swan officials. Everyone wanted to know who I was and what I was up to.

When it became known that the KS4BD call had been obtained as a test of FCC authority on Swan Island, no further KS4 call-signs were issued. In addition, the island was placed off limits to most American citizens. The FCC even cancelled one ham expedition at the last minute.

Analyzing all of the facts, I came to several conclusions. First, the amount of money needed to put R. Swan on the air must have been astronomical, considering the technical problems involved. And looking over their ridiculously low ad rates it seemed that the station would have to be operating an awfully long time to make back their expenses. In addition, I couldn't help noticing the peculiar actions and reactions of government officials and offices during my research.

Antenna on Navassa Island belongs to U.S. hams K1IMP and W9WNV whose recent visit proved that this is NOT the site of R. Americas.

While it was possible that somewhere along the line Mr. Cabot's United Fruit Co. might have had a hand in the station (their banana empire felt the pinch when Fidel took over), it seemed more likely that R. Swan was in some way connected with an undercover agency of our government. Castro claimed it was the CIA.

When the article appeared there was instant turmoil. But through it all there was no doubt in anybody's mind that the station was anchored securely to the rock of Swan Island. Remember what I said about creating a controversy? Well, here's where that comes in.

In the next issue of CB/DXing Horizons we dropped a little bomb. We wanted to measure reader reaction and also see if the government would contact us about its source—confirming the connection with R. Swan.

[*Continued on page* 121]

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ELECTRONICS IN THE NEWS

IT'S A BIRD? . . . They call it The Hawk. In fact, the shape *was* contrived to simulate that of a particular variety of hawk known as Gould's Harrier. But it's really a radio-controlled model —not a toy, but one with a serious purpose. The Auckland (New Zealand) International Airport has been plagued by birds, particularly the Wry-Billed Plover, which easily accustoms itself to conventional bird-scaring devices. Ed Saul (foreground), a wildlife biologist assigned to the problem, based his approach on the fact that birds generally exhibit deep-seated fear when confronted by the *shape* of a hawk. Using this model, built by Reg Truman (behind Saul), he has had encouraging success in initial experiments. But there are some bugs in the bird. Since conventional aircraft controls might have interfered with the hawk shape, the model is more difficult to maneuver than an airplane and requires hand launching. Range also is limited, partly because the operator has difficulty determining where the Hawk is in relation to its prey as the distance increases. Controls (by Citizenship Radio of U.S.) and construction (of balsa wood and glass fiber) are otherwise conventional.

Bigger Voice . . . President Jomo Kenyatta of Kenya is shown unveiling what is termed the most powerful medium-wave broadcast station in East Africa. This transmitter station at Ngong, near Nairobi, houses four new 50-kw Marconi transmitters that eventually will be operated in parallel pairs for two 100-kw signals—in addition to a third Voice of Kenya program on older transmitting equipment moved from Langata. Part of Kenya's rapidly-growing domestic communications system, the new facility will offer North American DXers greatly enhanced opportunities to log East Africa.

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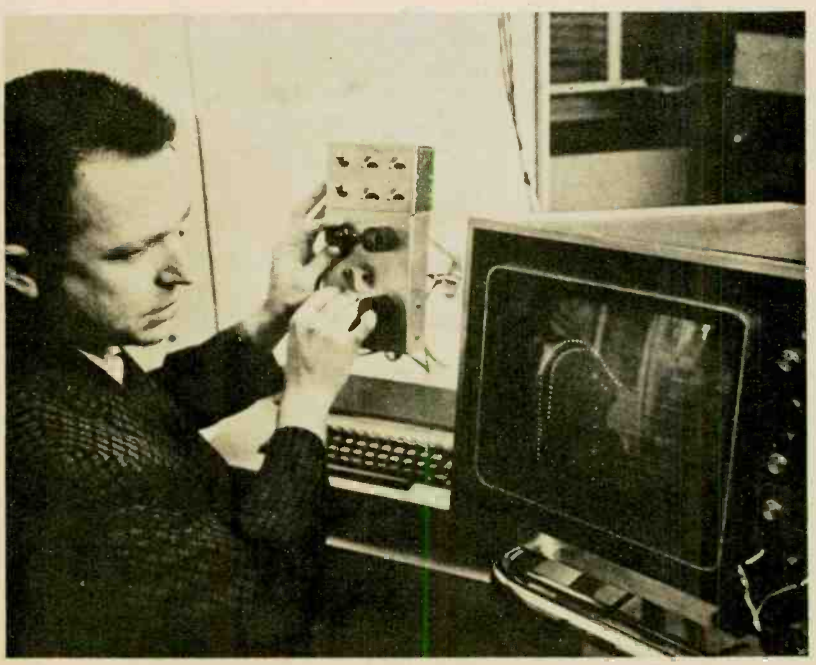
Timely . . . Dick Tracy's wrist radio has been updated by combining it with a 17-jewel watch. Continental Telephone Supply of New York, which sells this one ($375), lists private investigators among the professional, on-call types of users for which its two-way paging facility is designed.



Say Ah! . . . Latest application for computers is synthesis of speech—for both eye and ear. Readout display at the right provides a diagram of the action of lips, jaw, tongue, palate, throat and vocal cords while appropriate sound is produced on the audio monitor. Researcher at the console may alter the sound by changing the position of one or more elements in the display. Sounds then can be combined to imitate speech by applying varying rules for transition from one to another. Bell Telephone Laboratories, who developed the approach, say that it results in simplification of the rules necessary for a computer to generate artificial speech. Object: development of computer facilities that will accept verbal commands and answer back.

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Notes from EI's DX CLUB

OUT in California K.G. Scrimgeour reports BCB reception of the BBC synchronized transmitters on 1214 kc at 2200 PST (0100 EST). So despite that rising sunspot count, medium-wave transatlantic DX still is there—if you hurry.

And it seems to us that if BCBers still can log the BBC, U.S. amateurs should be able to work 160-meter British hams, at least via CW. Some operators currently active over there include G3CAQ, G3OMX, G3PXP (maritime mobile) and GM3VAR who sometime operates from an airborne QTH. If you do work any of these let us know about it.

With the approach of spring, DXers should start looking for stations from the lower part of South America on 49 meters. For example, Californian William Sparks reports CXA12, R. Carve, on 6155 kc from Montevideo, Uruguay, at 1700 PST (2000 EST).

The Swiss Broadcasting Corp. has added two 250-kw transmitters for its external service. One or both of them probably will be used for the North American beam which currently is scheduled at 2015 and 2315 EST on 5965 and 9535 kc.

Meanwhile, according to a report aired by the afore-mentioned SBC, the Basque clandestine R. Euskadi (see the January Listener) is in Venezuela. Double-checking this, we find that general propagation patterns and the process of elimination tend to confirm that R. Euskadi is operating from a non-Communist Latin American nation.

For those who would like to obtain a Cuban QSL other than R. Habana, Bill Migley (Ohio) reports that Circuito CMQ still is verifying. Among other BCB frequencies, this network has a potent signal on 640 kc.

A new frequency for R. Singapore is 7250 kc. They are heard here with Oriental languages and ham QRM starting around 0400 EST (0100 PST). It's stronger on the West Coast, of course.

A new R. Republik Indonesia regional outlet on 5060 kc has been heard by ace DXer William Sparks until after 0730 PST. As yet the exact location is not known.

A brand-new 50-kw station is on the air from rarely-logged Surinam. This is R. Surinam, 725 kc (BCB territory), which should be widely heard until they sign-off around 2230 EST (1930 PST).

Japanese amateurs now have their own 160-meter band. It is all of 5 kc wide, extending from 1907.5 to 1912 kc. Well, make that 4.5 kc. At least everyone will know where to look and judging from Japanese BCB reception, West Coasters actually have a chance to work them during the next month.

Frequencies used by SVA Athens (Greece) Marine Radio are 8811.9 and 13189.5 kc. They're a good DX prospect because they sometimes run a marker (ID) tape in English and Greek on these channels—probably the only English you'll be able to hear from Greece.

Propagation: A combination of lengthening hours of daylight and continued increases in the sunspot number will result in a trend toward higher usable frequencies during the late spring and early summer months. Around-the-clock DX in the 19-meter band will be possible and, during the daylight hours, 16 and 13 meters also will open for DX. During evening and nighttime periods, all bands between 19 and 49 meters should be open at one time or another from some part of the world. During the period from 1000 to 1400 (local time) short skip openings in the Citizens Band and the amateur 10-meter band should occur fairly regularly.

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LESS NOISE - MORE SIGNAL

AN amateur operator near Quito, Ecuador, boasts one of the quietest receiving locations in the world. He should be since he's on top of an 8,000-ft. mountain.

Too bad we aren't all lucky enough to have a mountain in our backyard tall enough to keep us away from the noise produced by appliances, fluorescent lights, oil burners and other things. And on the road, mobile reception can be turned into a mess of hash from barking spark plugs, clattering commutators or a tintinnabulating alternator. The spark produced by a spark plug, for example, produces a spectrum of RF noise scattered throughout the broadcast, FM and even TV bands.

Most people who have tried to eliminate noise say the best place to get rid of it is where it originates. Since this is more easily said than done, many receivers are equipped with a noise-limiter circuit. But some receivers don't have a noise-limiter circuit. In this article we will discuss how several noise-limiter circuits work and how to build one which can be added to your receiver by merely connecting it between the receiver's headphone jack and the phones.

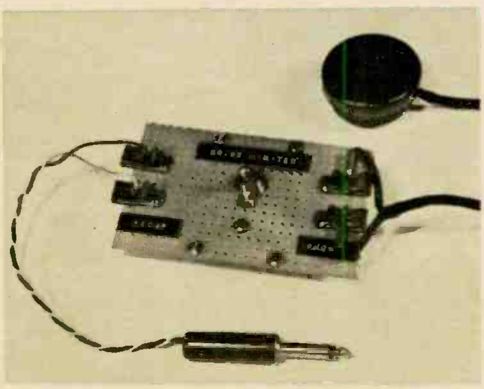

Fig. 1—Our noise limiter was built on a 3 x 5-in. piece of perforated board. However, you could build your limiter circuit in a small Minibox.

Clipping The Spikes

Reducing noise after it enters a receiver can be something like throwing out the baby with the bath water. Reason is, most noise comes in at the same frequency as the desired signal. And filtering noise at the receiver can knock the I.Q. out of the signal's intelligibility.

Fortunately, noise has two special features which set it apart from the desired signal. These differences enable a receiver's noise-limiter circuit to separate the signal from the noise. The special qualities of noise are *strength* and *duration*.

In measuring the strength of noise spikes in a receiver, it has been found that noise impulses may easily be 20 times stronger than the desired audio signal. Merely slicing noise voltage down to the same level as the strongest audio signal works wonders in removing the noise. This is shown in Figs. 2 and 7. Notice that noise and audio are fed into a limiter and a clean audio signal emerges. This is the most common way to remove noise.

The Series Limiter

To see how the circuit works, take a look at Fig. 3. The important component in this circuit is a diode. (Although it's shown as a tube it can also be a semiconductor.) The diode is placed in the path of the audio signal just before it is fed to the audio input stage. For the diode to conduct, its anode must be positive with respect to the cathode. If it is not, electrons from the cathode will not be

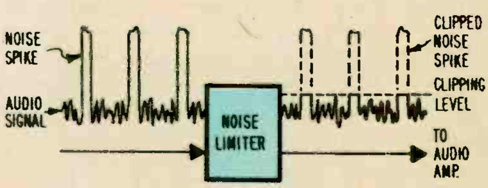

Fig. 2—Basic limiter action. Audio signal containing noise spikes is fed to limiter, which clips off spikes above maximum audio-signal level.

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attracted to the anode and the diode is cut off. An important feature is the 3-V bias applied to the anode by a battery. Given these values let's see what happens when a noise-laden audio signal is applied to the cathode.

Notice that the audio signal which contains the desired intelligence never rises higher than 3 V. This means the cathode will not go more positive than the anode. The audio signal, therefore, can ride through the diode on to the audio stages of the receiver. But the amplitude of a noise pulse may be many times that of the 3 V on the anode. Such a high-voltage pulse cuts off the diode (also termed reverse bias). This prevents the pulse from getting through to the next stage. Only the portion of the signal *below* 3 V can get through the diode. The most lethal portion of the noise is removed.

One fault of this simple circuit is that clipping level is fixed. If a weak, noisy signal arrives, the 3-V bias may be too great to produce clipping. One solution is to add a potentiometer to vary the bias voltage. This would allow you to adjust the limiting level until you heard the signal with least noise.

In more elaborate circuits, the noise limiter is self-adjusting. Instead of fixed bias, the receiver's automatic volume control (AVC) voltage is used to bias the diode. Since the AVC voltage varies with received-signal strength it adjusts circuit voltages to produce clipping at different signal levels.

The Sophisticated Silencer

Although the aforementioned circuit is found in many communications receivers, you may encounter a more complicated system in some rigs. It's called a silencer and it's designed to overcome one big fault of the system just described.

The clipper does a good job, but it creates a problem early in the receiver. In the RF- and IF-amplifier stages, noise pulses exist in full strength and may overload the stages. When this happens the amplifier stages produce distortion, or ring and temporarily break into oscillation. What's more, the time constants of components in the circuit tend to stretch the width of the pulse beyond its approximate millisecond duration to sustain ringing and oscillation.

The silencer circuit eliminates the pulse early in the receiver, before it produces great-

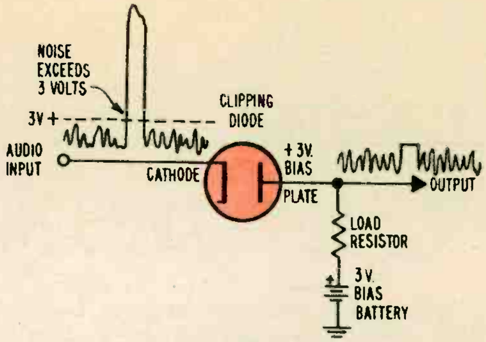

Fig. 3—In series limiter, diode conducts signals whose level is less than 3-V anode bias. Noise exceeding 3-V bias cuts off tube, doesn't pass.

est damage. James Lamb, the circuit's inventor, stated the silencer's job neatly back in 1936: ". . . it makes the noise commit suicide . . ."

And that it does. The basic circuit is shown in Fig. 4. The receiver's IF signal (usually 455 kc) is split up: part of it applied to a controlled IF stage and the remainder is sent to a noise amplifier. (The noise amplifier is required since signals are at a very low level at this point.) The strong noise spike is converted to DC by the noise rectifier, then fed back as a negative-going pulse to the screen grid of the IF amplifier tube. Since the pulse is negative it cuts the IF tube off instantly. During this brief period, the tube does not conduct noise. The silent period is so brief you never notice it.

A Practical Limiter

Our noise limiter circuit can be added to your receiver without modification to the re-

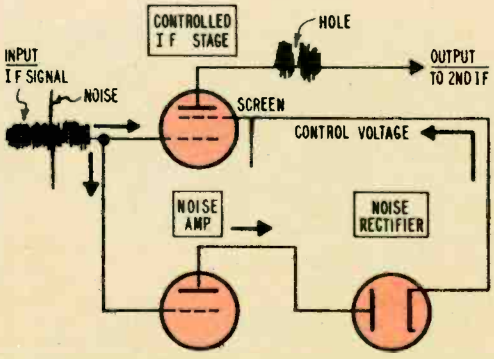

Fig. 4—In silencer circuit, noise in IF signal is amplified, inverted, rectified, fed to screen grid of IF tube. Negative pulse cuts tube off

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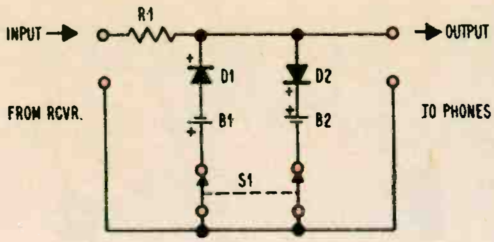

Fig. 5—Limiter you can add to your receiver. Diode D1, battery B1 shunt negative noise pulses to ground. D2,B2 do same to the positive pulses.

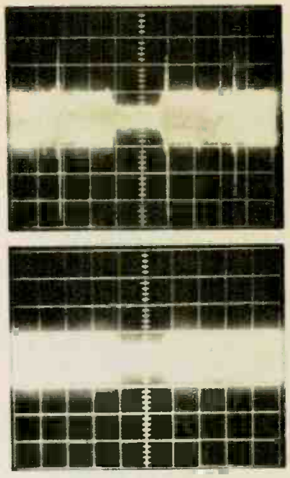

Fig. 7—Top photo shows input signal to limiter. Signal contains noise spikes produced by fluorescent lamp. Photo at bottom shows how noise spikes have been removed leaving clean audio signal.

ceiver itself. It gets connected between the headphone jack and headphone. It clips any noise voltage higher than a normal-level audio signal. The circuit, shown in Fig. 5, also illustrates how a limiter can clip both positive and negative portions of a noise signal; it's known as a full-wave shunt limiter.

Let's begin at the input terminals where the signal arrives from the receiver. After passing through isolating resistor R1, the signal encounters diode D1 (1N60). As in any diode, current can flow through D1 only in one direction. D1 in this circuit is connected so it shunts to ground the negative part of an applied signal. But another element, battery B1 (1.5 V), also is placed in the signal path. Since it applies a steady bias voltage (—1.5 V) to the anode of diode D1, an input signal must be more negative than —1.5 V to be shunted to ground by D1. Since impulse noise is generally much greater in amplitude that the audio signal, it is shunted to ground.

The identical clipping action occurs through diode D2 for the positive part of the noise signal. Only difference here is that battery and diode polarities are reversed.

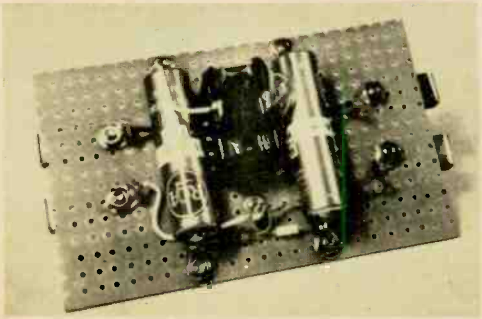

Fig. 6—Underside of limiter. Battery holders and flea clips aren't necessary since parts can be soldered to ground lugs under the mounting nuts.

It is important when building the circuit to be certain all parts are connected exactly as shown. If the diodes aren't marked with the + symbol, the cathode (which is the bar, not the arrowhead part of the symbol) will be marked with either a black band, or several color rings. Use a heat sink when soldering diode leads to prevent overheating.

Our limiter, shown in Fig. 6, was built on a 3 x 5-in. piece of perforated board. We didn't use flea clips or battery holders. Instead, we installed ground lugs under each nut on the back of the board and then soldered the diodes and batteries to the lugs. The batteries are 1.5-V penlite cells.

If you want, you can mount the board right inside your receiver, providing, of course, there's room. Disconnect the leads going to the phone jack and connect them to the limiter input. Then connect the limiter's output to the phone jack. Of course, if your phone jack is wired so the speaker is cut off when the headphones are plugged in, you cannot build the limiter in the receiver. It will have to be used outboard.

To check how our limiter worked, we looked at signals before and after clipping on an oscilloscope. They appear in the photos of Fig. 7. Strong noise impulses were obtained by placing the antenna of an SWL receiver near a fluorescent lamp (a notorious generator of interference). You can see how the narrow spikes protrude far beyond the main portion of the signal, which is an audio tone. After passing through the limiter, however, the audio signal is shorn of its electronic whiskers.—*H. B. Morris*

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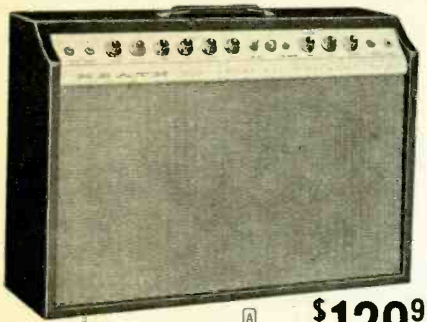

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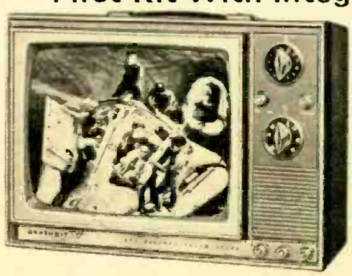

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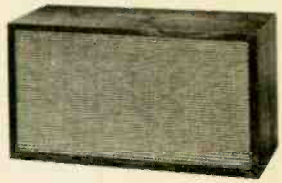

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ADD A MONITOR HEAD TO YOUR RECORDER

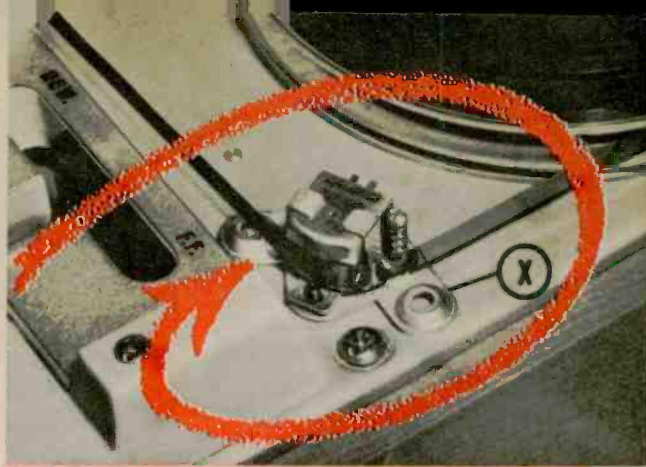

Fig. 1—Head mounted at corner of deck. Tape-guide post goes in bracket marked X to keep the oxide from being rubbed off due to tight wrap.

By LAWRENCE GLENN

WHAT a blow it is to discover you have worse than nothing on that tape you made at the last party! Sure, the level indicator was moving and what you may have heard via something called the *monitor jack* led you to believe you'd have a good recording.

But these clues were misleading because they did not reveal whether anything actually was being *put on the tape.* At best, they indicated simply that the recorder's electronics was working.

To know with certainty whether you have a tape and how good it is, your machine must have a monitor head—a third head which lets you listen to the recording a fraction of a second after it's made.

There's no need to trade in or scrap your present recorder for a more expensive machine that boasts three heads since you can add a monitor head to your present machine. And a four-track monitor head on an old half-track machine will let you play prerecorded stereo tapes, to boot.

The job may take a little ingenuity since all machines are not the same as the one we show here. Matter of fact, the mounting just may be quite simple because you don't have to get involved with the existing head mount. The new head is mounted on the deck itself—the biggest problem may be finding space for it.

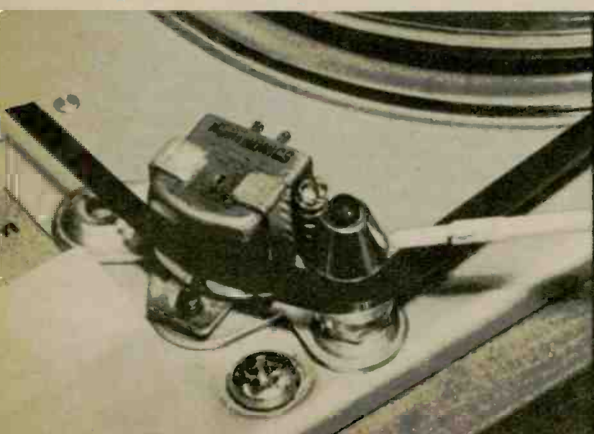

Fig. 2—Nortronics TG-7 tape-guide post, indicated by pointer, insures that the tape will wrap around head gently and oxide won't rub off.

Fig. 3—Completed deck installation. Connecting block attaches cables to head. Adhesive in the grommet keeps the cables firmly in place.

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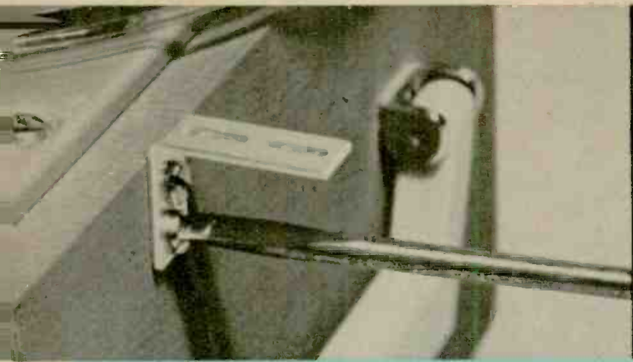

Fig. 4—No room on deck means you'll need a Nortronics L-5 (Allied 15 A 8796) bracket. Install it so that the head assembly is even with deck.

Fig. 6—Completed outboard installation. Again, a Nortronics connector is used to attach cables to head. Don't forget adhesive in the grommet.

If your recorder is an older model—the large let's-not-crowd-things type, you'll have no trouble finding an extra square inch or so on the deck for the monitor head. The four-track head we installed is a Nortronics No. 1001 (Lafayette 28 C 5715). The head and its mount are supplied with installation instructions.

If your machine is one of those new compacts on which there isn't an extra inch of deck space you'll have to add the head outboard.

Whether you go inboard or outboard avoid tight, right-angle wrap-around by using a tape-guide post (Nortronics TG-7, Lafayette 28 C 5761)—a polished metal pole that positions the tape for gentle wrap around the head.

Using a Nortronics Type QK adjustable head-mount assembly (Allied 15 A 8891 S) you'll have no problem positioning a tape guide since the mount is predrilled for best tape-guide position.

For deck mounting, simply install the head mount in any convenient spot. If you have to go outboard, mount a Nortronics L-5 L-bracket (also Lafayette 28 C 5762) on the side of the recorder as shown in Fig. 4 and then screw the head mount on the bracket.

Pass leads from the head through a small grommeted hole drilled in the deck. You'll

[*Continued on page* 125]

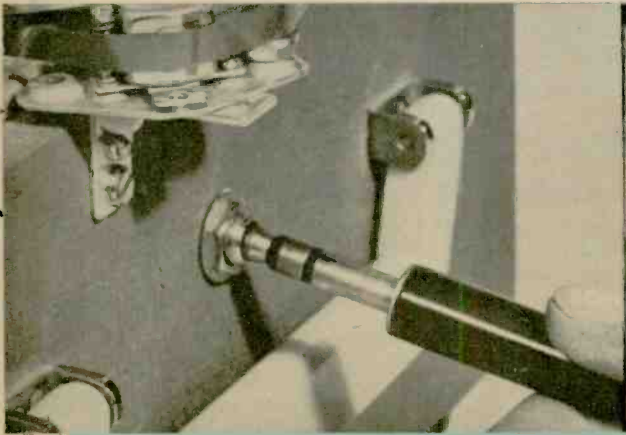

Fig. 5—Leads from extra head can be brought out to jack in side of recorder's cabinet. A four-track head will require a three-circuit phone jack.

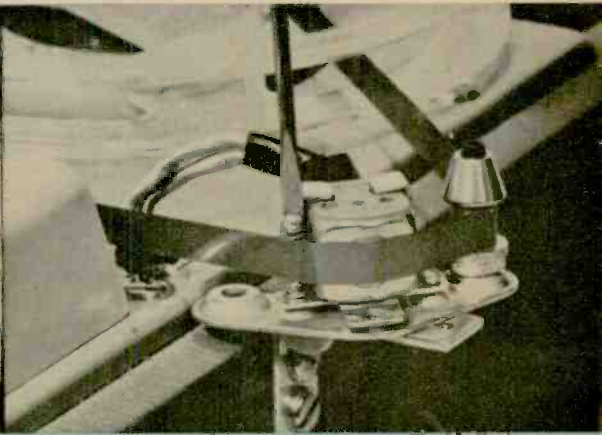

Fig. 7—Mount assembly has several provisions for head alignment. Screws permit adjustment of the height, azimuth and tilt from perpendicular.

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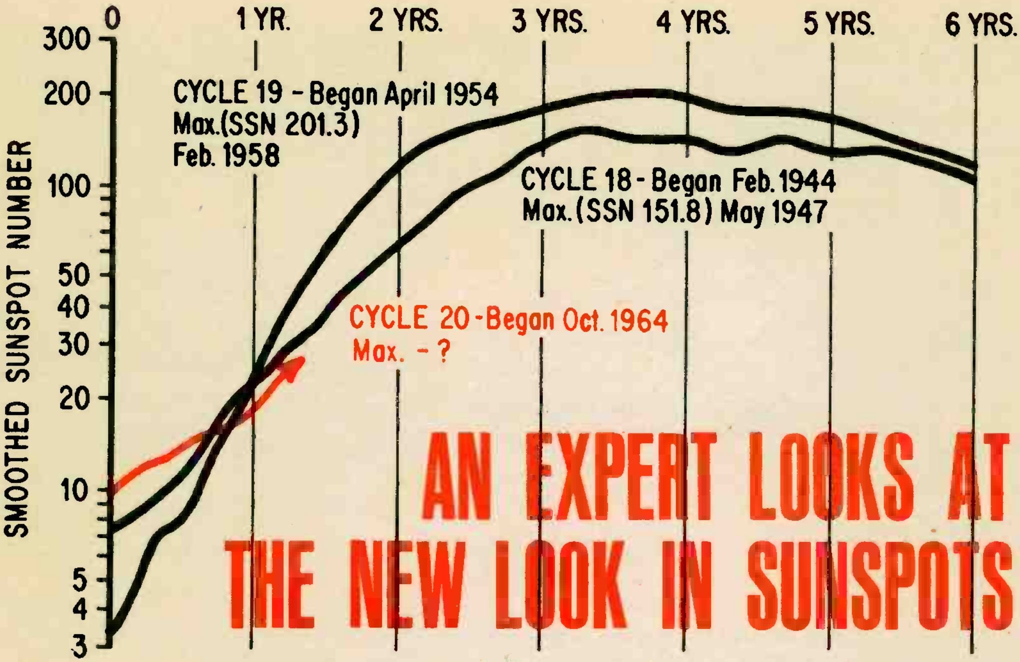

AN EXPERT LOOKS AT THE NEW LOOK IN SUNSPOTS

The coming peaking and it's meaning for radio hobbyists.

By STANLEY LEINWOLL

TO the short-wave listener, the amateur, even the CBer—anyone interested in DX—the big news over the past several months has been the great improvement in receiving conditions, particularly in the frequency range above 20 mc. The amateur 10-meter band has been open longer and with greater consistency than at any time during the past five years, the 11-meter international short-wave broadcast band is being heard regularly, Citizens Band DX no longer is a fond memory.

The dramatic improvement in short-wave radio conditions has been brought about by the return of sunspots. Although the basic physics of sunspots still is little understood, it is known from observations dating back hundreds of years that the number of spots on the sun varies cyclically—from minimum to maximum and back to minimum again—over a period of approximately 11 years. It takes about four years for the number of spots to increase from minimum to maximum, and then another seven to subside.

We also know that radio conditions vary almost in direct proportion to the number of spots on the sun. The more spots there are, the better are conditions in the higher bands. Thus during years like 1963 and 1964, when sunspot activity was at a minimum, the higher bands—such as the amateur 10-meter and the 11-meter band—were virtually dead.

In early 1965 the number of sunspots began to pick up again with the arrival of a new cycle. And DXers began asking: how good will the best conditions be? How long will they last? Some answers can be obtained from a study of the graph above, which compares the last three sunspot cycles. The figures shown are Smoothed Sunspot Numbers (SSN). Since the number of spots appearing on the sun is subject to erratic, month-to-month variations, scientists use figures averaged over a 12-month period so the resulting curve highlights long-term trends.

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A look at the graph shows that the current sunspot cycle (No. 20) began in October 1964 and is following pretty much in the footsteps of one of its predecessors, cycle No. 18. Cycle 20 started rather slowly, leading many scientists to jump to the conclusion that this cycle would be a low one. Since the end of 1965, however, the rate of increase has quickened and it now appears that the coming maximum will be considerably higher than some of the early forecasts indicated.

In comparing cycle 20 with cycle 19 it becomes apparent, even at this early date, that the present sunspot cycle will come nowhere near its predecessor, which peaked in early 1958 at a smoothed number of 201—higher *by 50* than any observed previously and in every respect a record-breaker.

Simple comparison of the early months of sunspot cycles is not the only methods used by scientists to predict what a new cycle will do. The more complex approaches need not be discussed here but they lead most observers to believe that the maximum of the current cycle will come around the middle of 1968 and that it will come nowhere near cycle 19. Furthermore, the consensus seems to be that the next maximum will reach a SSN somewhere between 110 and 135.

What will be the impact of this lower sunspot maximum on high-frequency communications? Study of the charts on the third page of this article provides us with a good clue. The charts show the effect of three different degrees of solar activity (plotted for SSNs of 10, 120 and 180) on Maximum Usable Frequency (MUF) over a path between the U.S. East Coast and Central Europe for a typical 24-hour period during the winter months.

The chart for SSN 10, representing a period of minimum sunspot activity like the 1963-64 winter, shows that during this period the Citizens Band, the 10-meter amateur band and the 11- and 13-meter international short-wave broadcast bands were all well above the MUF, represented by the colored curve. Only the 19-meter band and the 20-meter amateur band were reliable for any length of time.

In dramatic contrast to the black years of 1963 and 1964, we have the curve for MUF over the same path in the winter of 1957-58, with an SSN of 180. During this period, runaway cycle 19 produced radio conditions that had never before been observed in the history of radio communication. The SSN-180 curve shows the amateur 6-meter band close enough to the MUF to make possible at least periodic DX. Moving lower, we can observe that CB, the 10-meter amateur band, and the 11- and 13-meter bands were well within the range of useful frequencies over the circuit. As a result, conditions in all of these bands were excellent every day of the period. TV DX, too, was an almost daily occurence since many of the lower channels (which begin at 54 mc) were well below the MUF over some paths. Transatlantic and transpacific TV DX were fairly commonplace events.

If the forecasts are right and the coming maximum of the sunspot cycle does not exceed 135, what will be the impact on radio conditions next year and the year after that? How will these compare with the years of th previous high, from 1957 to 1959?

Our MUF curve for SSN 120 exhibits striking differences compared to the other two curves. First, from the optimistic point of view, we can see that the coming maximum will again see regular 10-meter amateur DX openings during the daylight hours of the winter months. DX to all parts of the world will be good and highly reliable. This is, of course, in marked contrast to years of sunspot minimum, when everything above 20 mc is generally dead. The same favorable prognosis applies to CB and

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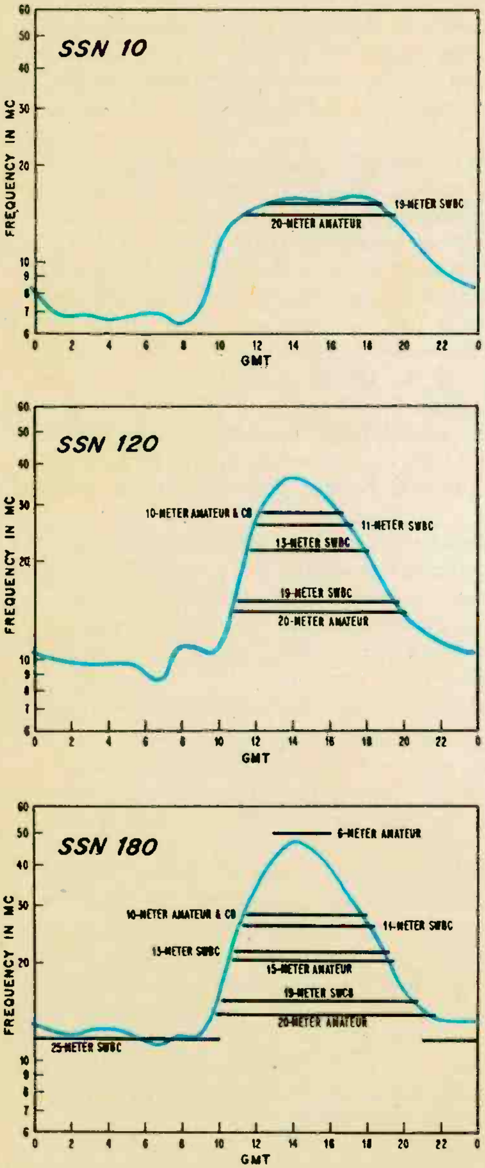
AN EXPERT LOOKS AT THE NEW LOOK IN SUNSPOTS



Charts plot day's fluctuations in MUF on path between U.S. East Coast and Middle Europe in winter for three sunspot conditions. SSN 10 is minimum of cycle; SSN 120 is possible high of current cycle. SSN 180 was high of record-breaking cycle in the late 1950s. See text.

the 11-meter band: both will be generally good to excellent during the daylight hours.

During the nighttime hours, the amateur 40-meter band will be open from local sunset to local sunrise and during quiet nights the 80-meter band also will be open for DX during the same hours. A look at the curve for SSN 10 shows that during minimum sunspot conditions the 40-meter band—although useful sometimes—was not nearly as reliable during the night as it will be during sunspot maximum. During minimum conditions, the 80-meter band often was the only band useful for DX.

Similar conditions will apply to the international short-wave broadcast bands. During the coming maximum, the 31- and 49-meter bands will both be open throughout the hours of darkness. During the minimum years, only the 49-meter band was open and, because of this, congestion in the band was severe.

On the pessimistic side, if we compare the curve for SSN 120 with that for SSN 180, we can see that there will be significantly less use made of the higher bands this time around. For example, there will be approximately 50 per cent less useful time in the amateur 10-meter band and there will be 30 per cent less usable time in the 11-meter band. There will, in fact, be significantly less useful time in all the higher bands.

The picture is particularly disappointing for international short-wave broadcasting. Frequency managers for the world's major broadcasters had been looking forward with great anticipation toward the years of maximum sunspot activity when, it was hoped, there would be some alleviation of the growing congestion in the short-wave bands. Although there will be roughly 50 per cent more short-wave spectrum in which to broadcast during the next several years, the increase in the number of usable channels will not keep pace with the increased demand for more channels.

For example, during the period 2200 to 1000 GMT, which includes peak listening hours in the Western Hemisphere, we can see that the 25-meter band—usable over many circuits during the last sunspot maximum—will not be usable during the coming maximum. As a result, the myriad of broadcasters with transmissions to this hemisphere will be limited to the 31- and 39-meter bands. Some broadcasters have, of course, been

[*Continued on page* 123]

GOOD READING

By Tim Cartwright

***MUSICAL INSTRUMENTS AND AUDIO.** By G. A. Briggs. Herman Publishing Service, Boston, Mass. 238 pages. $5.95*

An entertaining, well-written examination of the way in which musical instruments produce sound and the quantitative factors that make instruments sound like themselves when reproduced over an audio system—that's the new Briggs book. There is nothing startling, just some pointed discussions of simple and important facts, answering questions that don't even get *asked* often enough these days. And the style is Briggs at his best—as witty as ever and with a lot less fluff than in some previous books. The illustrations are pertinent and plentiful, with some good cartoons. Highly recommended.

***YOUR CAREER IN THE AEROSPACE INDUSTRY.** By Waldo T. Boyd. Julian Messner, New York. 222 pages. $3.95*

Providing you're not yet out of high school (or maybe in your freshman year in college), this tome is a good popular treatment of the attractions of a career in aerospace. The book is not a day-by-day description of what it's like to work in the industry but a summary of the achievements and promised achievements of people and projects—fortunately minus the gee-whiz-it's-great style that sometimes mars this kind of treatise. There also is a good final look at specific job areas and the kind of preparation needed for them.

***TRANSISTORS AND INTEGRATED CIRCUITS.** By Donald C. Latham. J. B. Lippincott, Philadelphia & New York. 197 pages. $4.50*

For anyone who is unfamiliar with the transistor, and has just a bit of high-school physics to go on, I can't think of a better introductory book on solid-statery than this. It begins with the story of the transistor's discovery and provides a thorough outline of transistor theory and capabilities, finishing with a lucid detailing of transistor and IC manufacture. And everything is done in readable style. The illustrations are way above the norm for this kind of book—superb, in fact. Well done.

[*Continued on page* 120]

Musical Instruments and Audio uses Punch cartoon to illustrate modern vibrating systems.

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Good Reading

Continued from page 119

MATHEMATICS FOR ELECTRONICS TECHNICIANS. By Paul L. Evans. John Wiley & Sons, New York. 392 pages. $7

I often have the chance to observe the difference between engineers and technicians who have good math backgrounding and those who don't. Nice guys, the latter, but always at a visible disadvantage—particularly in getting *beyond* the problem. At hand we have a book that attacks that disadvantage. It is not easy going by any means but it is packed with vital numbers and equations.

ABCs OF CAPACITORS. By William F. Mullin. Howard W. Sams & Bobbs-Merrill, New York & Indianapolis. 96 pages. $2.25

A good, simple, readable treatise that will tell you practically everything you'll ever need to know about that unglamorous workhorse, the capacitor.

And Make Note Of . . .

COMPUTERS SELF-TAUGHT THROUGH EXPERIMENTS. By Jack Brayton. Sams. 192 pages. $4.25

PRACTICAL RADIO. IRC 103 Series. M. W. Lads Publishing, Philadelphia. 64 pages. $1.25

HANDBOOK OF TRANSISTOR CIRCUITS. IRC 103 Series. M. W. Lads. 64 pages. $1.25

Electronic Quacks

Continued from page 96

the FDA is convinced that the number of worthless devices still in use—many of them previously produced by groups now under permanent injunction—is still very large. Thousands distributed by the Foundation alone may still be used to shake down trusting patients—whose real tragedy often is that, like Doris Hull, they are kept from seeking competent medical help until it is too late.

In 1962 the FDA carried out what it called Operation Abrams Machine in an all-out attack on the problem. Its greatest policing success was scored against the Ellis Micro-Dynameter which they proved in court did no more than measure skin moisture. They then eliminated 1,000 of the devices; but 4,000 more are known to have been distributed. So although the FDA has made inroads against Abrams-style operators, their charlatanry still plagues us.

Authorities readily admit that in trying to go further they are forced to play hide-and-seek among the law's loopholes. The FDA can step in only if offenders cross state lines. State agencies have done little about fake health machines (California's prosecution of Ruth Drown and others is a notable exception). And even when a Federal conviction is obtained, the law provides for only a year in jail and a $1,000 fine for initial offenders—hardly a strong deterrent in a potential million-dollar market.

How can you protect yourself against being victimized? The AMA's tip is that you beware of any self-styled healer if he claims a special or secret element in his cure, if he promises a quick or easy cure, if he advertises with testimonials or case histories, or if he claims persecution by the medical profession or suggests that his methods are better.

The Listener

Continued from page 78

ner-Orting area are silent and scared. They know *something* is wrong, but they can't put their finger on it. What is the Air Force trying to hide?"

Immediately on taking over at WXUR, Barry again became active in the UFO field and has had the editor of Saucer News on his WXUR program. Barry has, in turn, been named an honorary adviser for the 1967 Congress of Scientific Ufologists, billed as New York's First Flying Saucer Convention by Saucer News, which is sponsoring it.

The convention is scheduled for June 22-25, in case you're interested. Speakers will include Kenneth Arnold, who began the whole mass dilusion with his saucer sighting of June 24, 1947—over that same Mt. Rainier. So you see (contrary to what the Establishment seems to believe), there are some pretty wild things going on behind the SWBC scene. And we suspect that a couple of strange sky objects—the very real disappearance of R. Americas' 6-mc transmitter and the unreal appearance of the Mt. Rainier saucer—may even shake up the SWL Establishment permanently.

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Radio Swan Hoaxer

Continued from page 100

The bomb was an innocent-looking news item that read:

> What may be another RADIO SWAN could possibly be brewing in the Caribbean. Just as we go to press we have learned that an American organization has been making inquiries to transmitter and tower manufacturers regarding anticipated delivery dates of this equipment to U.S.-owned Navassa Island. The equipment involved is reported to be a 50,000-watt medium-wave transmitter, a 20,000-watt short-wave transmitter and three 250 foot towers. Navassa Island, located just off Cuba's east coast, near Haiti, would enable broadcasts to hit Fidel from both sides—SWAN on the west, NAVASSA on the east.

We backed this up by sending out actual inquiry letters to manufacturers of towers and transmitters. The choice of Navassa Island was of no particular significance outside the fact that it is American-owned, near Cuba and the same size as Swan. It has no inhabitants.

The only people to get shook up at our news item were the transmitter and antenna manufacturers (who deluged us with letters, phone calls and telegrams offering to send representatives, engineers, etc.) and the DXers of the world. The government never called and we let it go at that.

By this time the Bay of Pigs invasion had taken place and R. Swan turned out to be the communications center of the invaders. After their failure the station changed its name to R. Americas and began playing down the Swan Island angle (although that is where their QSL card locates them).

These events, tied in with the Horizons Navassa item started the ball rolling. Before long we heard that R. Americas had been moved to Navassa Island. Some said that it had been on Navassa Island right from the very start. Within a short time it had become a full-blown controversy. We have heard guesses about the location that have included Navassa, Swan, Cay Sal in the Bahamas, Venezuela, Guatemala, Puerto Juarez in Mexico, Cozumel Island and even a ship at sea.

The situation is now so far out of hand that challenges are being hurled, photos of the station (the ones I obtained) are being studied with magnifying glasses, articles and

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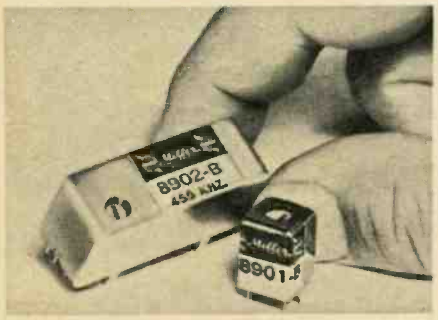

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letters written about the station are being picked apart word by word to ferret out hidden meanings. Explanations to justify one location or another are intricate and full of pseudo-technical rigmarole. And sometimes proponents of one location will suddenly shift to a new one when a new theory appears.

Back on Swan (so far as I can tell) the station is still going full swing on 1160 to 1165 kc (short-wave transmissions were halted without explanation last September 20th). And Castro is still insisting that the American gangsters get the station off of Swan Island. (It isn't easy to hide a 50,000 watt-broadcast station — any plane flying over Swan Island could see it without any trouble and Castro has planes.)

The Navassa theory is preposterous. The desolate pinpoint of rock had been all but forgotten by the world until Horizons brought it back to life. Just this past summer two Americans went to the island to set up a temporary ham station. The operators, Don Miller (W9WNV) and Herb Kline (K1IMP) found the place as barren as ever and displaying a large NO TRESPASSING sign.

The real hoax of Radio Swan/Americas is, perhaps, the one DXers have invented and perpetuated on their own—a fantastic instance of a little rumor mushrooming into a federal case. My guess is that, feeling the CIA was involved, DXers couldn't resist adding a bit of extra intrigue and mystery.

You say that because of my big mouth we'll probably *never* know the full Swan story? Sorry about that.

How To DX Intrigue

Continued from page 40

changing constantly. You might try 15105 and 11730 or 11750 kc. There also are many low-power regional SWBC stations in Iran offering the best of DX. You might watch for R. Tabriz on 6223 kc around 2130 EST. Or even better, R. Meshed near the Soviet border is on 6870 about the same time.

Turkey's R. Ankara can be heard easily in English at 1700 EST on 15160 kc. In terms of sheer intrigue, though, Turkey's interest focuses not in the Middle East proper but on the Mediterranean island of Cyprus, where Turks and Greeks long have been in open conflict. The BBC's East Mediterranean relay from Cyprus signs on 11720 and 7140 kc at 2158 EST.

Primer on the Scope

Continued from page 77

scopes have recurrent sweep which locks easily on the signal. Triggered sweep, however, permits viewing one-shot and extremely irregular wave-shapes. The sweep can be set to start at any point of the signal being viewed. Vertical amplifiers in lab scopes are rated by rise time—a measure of how faithfully the scope displays signals with steep sides.

As its name implies, a lab scope is geared for research and industry. It is an extravagance for troubleshooting electronic equipment normally found at home. But the lab scope is breaking out its institutional and corporate habitat. The reason is its availability in kit form, plus the increasing need for scopes for educational use.

Heath offers a $300 model (IO-14) that boasts features comparable to some commercial units: triggered sweep, 8-mc bandwidth and 40-microsecond rise time. It should have appeal for students studying computer design, or biology, for example, where only a lab scope can investigate signals of extraordinary complexity or low-level and frequency (like the heart beat and other physiological functions).

But let's return to the world of the workaday scope. Here are practical jobs that nearly any such scope performs with ease:

- **Signal Tracing.** Perhaps your stereo amplifier is topping out at 3 kc, possibly due to an open capacitor. Since a meter can't solve this problem, touch a scope probe around the circuit and you'll see the signal —or where it vanishes.

Signal tracing is a fast service technique since it checks whole stages at a glance. Once the scope zeroes in on the defective stages, use a meter if DC measurements are in order.

- **Transistor Circuits.** Here the scope delivers a double bonus. Meter indications in solid-state circuits are often ambiguous and confusing since transistors operate at low voltages. But with a scope you can usually see if a signal is present. Secondly, a scope won't apply destructive wrong-way voltage to a delicate semiconductor. An ohmmeter can.
- **Printed Circuits.** Scopes can sample signals without the messy job of removing components leads from a printed circuit board.
- **Distortion.** Distorted sound can often be seen and identified. A positively-clipped audio signal may mean sagging B+ on a tube plate; a negatively sliced wave can mean too much grid bias.
- **Comparisons.** Examine a signal entering tube or transistor, then compare it with the amplified signal at the output. Differences in wave form can signify trouble.
- **Bandwidth.** The scope provides the only practical method for seeing at a glance the whole bandwidth of a circuit. At radio frequencies a good scope will display the overall response of an FM or TV receiver. On audio frequencies you see response at all frequencies, as in Fig. 6, by using a square wave.

For AM radio and audio-amplifier work, the least-expensive scope will do well. For FM stereo and TV a $100 to $150 scope will fill the bill. For critical servicing of FM stereo, TV as well as advanced experimental work, consider a version of a lab scope.

Vest-Pocket Modulation Scope

Continued from page 53

trapezoid pattern make the following modification after the Scope has been checked out for the MW pattern. Install SO3 on the rear of the cabinet. Disconnect C8 from SR1-SR2 and connect C8 to SO3.

Install a connector (SO4) on the rear of your transceiver and connect the center conductor of SO4 to the modulated B+ feed point in your transceiver's RF final stage. A typical installation is shown in Fig. 4. Point X is the B+ feed point. Regardless of the exact circuit used in your transceiver, the modulated B+ feed is from between the modulation transformer and the RF final's plate input. While capacitor C11 is not needed (as there's a DC blocking capacitor at the input of the Scope) it is recommended as a safety feature to keep the high DC voltage off SO4. Connect SO4 to SO3 with coax.

The New Look in Sunspots

Continued from page 118

making use of the 41-meter band for broadcasts to this hemisphere. But since this band falls within our amateur 40-meter band, such broadcasts are not legal. Unfortunately, lack of reliability in the 25-meter band, plus the expected continued growth of the number of transmitters on the air, will do little to al-

[*Continued on page* 125]

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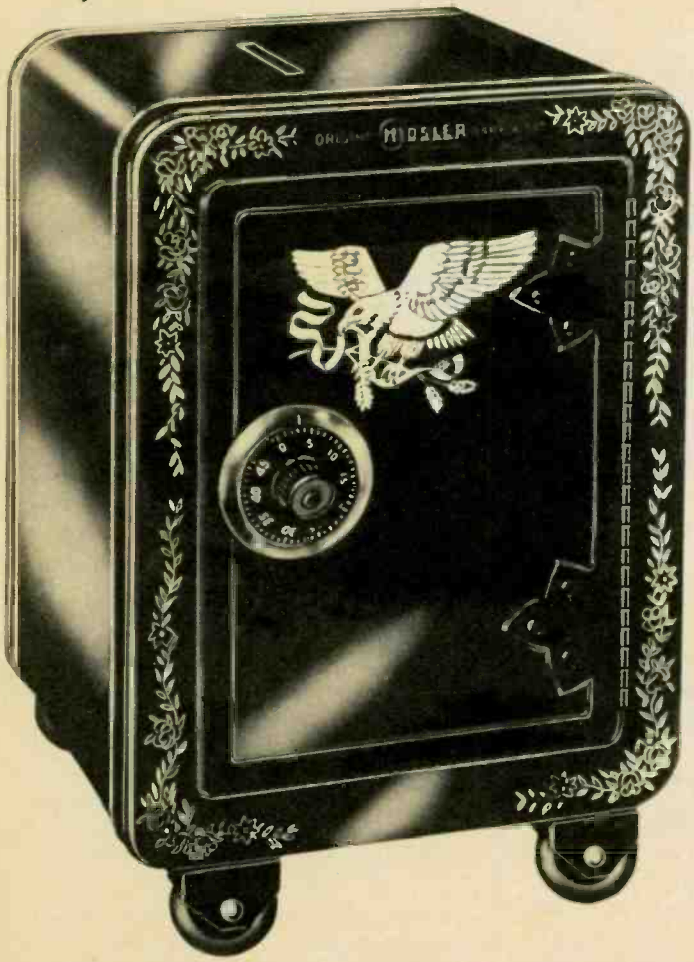

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leviate scheduling of illegal 41-meter transmissions, as broadcasters seek channels to deliver reliable signals to their target areas.

To summarize: Sunspots are on the rise and as a result short-wave radio receiving conditions have been improving rapidly. Maximum sunspot activity is expected to occur in mid-1968, after which a gradual decrease in the sunspot number will begin. The coming maximum of the sunspot cycle will be nowhere near the high of the previous one and as a result there will not be as many openings in the amateur 10-meter band and the 11-meter band as there were during the record-breaking years 1957-59.

Add a Monitor Head

Continued from page 115

probably be tight on space so push all the leads under the deck and then fill the grommet hole with an adhesive. The leads should be connected to a two-circuit jack mounted on the side of the recorder cabinet. The monitor-head output should be fed into the tape-head or magnetic-cartridge input on your stereo amplifier.

For optimum performance, the monitor head must be properly positioned. The height of the head must first be set so the head is centered behind the tape. If a tape guide is used it also must be positioned correctly.

Finally, the mount's alignment screw—the one that pivots the head in an arc—must be adjusted to get the head in perfect azimuth alignment. This is accomplished by adjusting a screw while monitoring a tape for best high-frequency response. Again, detailed alignment instructions are supplied with the head and mount.

The Ham Shack

Continued from page 30

Five words per won't make you too dah-ditty but you can get your Tech diploma from any passing ham, providing you don't freak out.

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OVER AND OUT

BY Rodrigues

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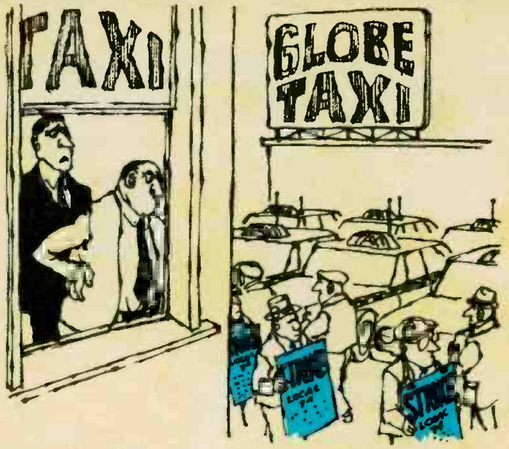
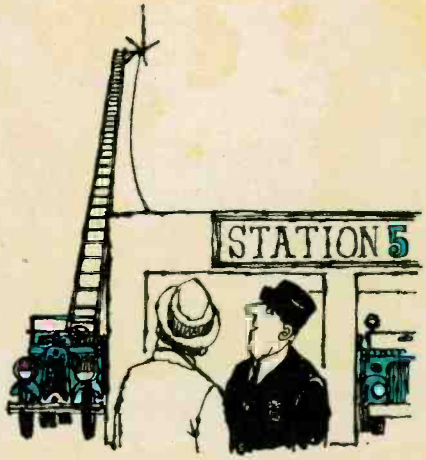
"Flat tire or no flat tire, Mr. Fogarty, you tell that driver MAYDAY is out."



"The union wants adjustable squelch on every 2-way radio. They claim the noise level is driving them nuts."



"We used to get cut off every time the boys got beyond Mulberry Street."

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