Radio-TV EXPERIMENTER

WHITE'S RADIO LOG
AM-FM STATIONS/WORLD-WIDE SHORTWAVE LISTINGS

APRIL-MAY 75¢

— IN THIS ISSUE —
2 SPECIAL PROJECTS

NEW! FIRST TIME EVER!

for Beginners—
LONG-WAVE VLF RECEIVER
tunes radio's basement
(would you believe 20,000 meters?)

for Pro's—
WIRELESS HEAT DETECTOR
measures temperatures
fully 25 ft. from source!

NOVICES: Get the chirps out of your rig!

Introducing EICO's New "Cortina Series"!

Today's electro-technology makes possible near-perfect stereo at moderate manufacturing cost: that's the design concept behind the new EICO "Cortina" all solid-state stereo components. All are 100% professional, conveniently compact (3⅛"H, 12"W, 8"D), in an esthetically striking "low silhouette." Yes, you can pay more for high quality stereo. But now there's no need to. The refinements will be marginal and probably inaudible. Each is $89.95 kit, $119.95 wired.

Model 3070 All-Silicon Solid-State 70-Watt Stereo Amplifier: Distortionless, natural sound with unrestricted bass and perfect transient response (no interstage or output transformers); complete input, filter and control facilities; failure-proof rugged all-silicon transistor circuitry.

Model 3200 Solid-State FM/MPX Automatic Stereo Tuner: Driftless, noiseless performance; 2.4μV for 30db quieting; RF, IF, MX are pre-wired and pre-tuned on printed circuit boards — you wire only non-critical power supply.

7 New Ways to make Electronics more Fun!

Save up to 50% with EICO Kits and Wired Equipment.

You hear all the action-packed capitals of the world with the NEW EICO 711 "Space Ranger" 4-Band Short Wave Communications Receiver — plus ham operators, ship-to-shore, aircraft, Coast Guard, and the full AM band. 550KC to 30MC in four bands. Selective, sensitive superhet, modern printed circuit board construction. Easy, fast pinpoint tuning: illuminated slide-rule dials, logging scale; "S" meter, electrical bandspread tuning, variable BFO for CW and SSB reception, automatic noise limiter. 4" speaker. Headphone jack. Kit $49.95. Wired $69.95.

More "ham" for your dollar than ever — with the one and only SSB/AM/CW 3-Band Transceiver Kit, new Model 753 — "the best ham transceiver buy for 1966" — Radio TV Experimenter Magazine. 200 watts PEP on 80, 40 and 20 meters. Receiver offset tuning, built-in VOX, high level dynamic ALC, silicon solid-state VFO. Unequaled performance, features and appearance. Sensationally priced at $189.95 kit, $299.95 wired.

NEW EICO 888 Solid-State Engine Analyzer

Now you can tune-up, trouble-shoot and test your own car or boat.

Keep your car or boat engine in tip-top shape with this completely portable, self-contained, self-powered universal engine analyzer. Completely tests your total ignition/electrical system. The first time you use it — just to tune for peak performance — it'll have paid for itself. (No tune-up charges, better gas consumption, longer wear) 7 instruments in one, the EICO 888 does all these for 6V and 12V systems; 4, 6 & 8 cylinder engines.

The EICO 888 comes complete with a comprehensive Tune-up and Trouble-shooting Manual including RPM and Dwell angle for over 40 models of American and Foreign cars. The Model 888 is an outstanding value at $44.95 kit, $59.95 wired.

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.

There's more PUNCH in the new EICO "Sentinel-Pro" 23-channel Dual Conversion 5-watt CB Transceiver. New advanced Big-Reach "Range Plus" circuitry lengthens "talk-power" reach. Automatic noise limiter super-sensitizes for weak signals. "Finger Tip" antenna loading and transmitter tuning controls. 23 crystal-controlled transmit and receive channels — all crystals supplied. Rear-illuminated S/RF meter. Transistorized 12VDC and 117VAC dual power supply. Wired only, $169.95. Positive-Negative Ground/Mobile Marine Modification kit (optional $5.95).

Model 460 Wideband Direct-Coupled 5" Oscilloscope. DC-4.5mc for color and B&W TV service and lab use. Push-pull DC vertical amp., bal. or unbal. input. Automatic sync limiter and amp. $99.95 kit, $139.95 wired.

FREE 1967 CATALOG

RTVE-4

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

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

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

Name ____________________

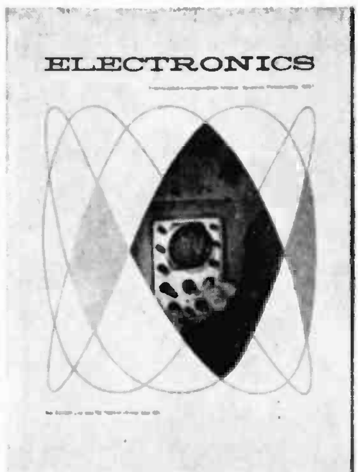
Address ____________________

City ____________________

State __________ Zip __________

Model 232 Peak-to-Peak VTVM. A must for color or B&W TV and industrial use. 7 non-skip ranges on all 4 functions. With exclusive Uni-Probe.® $29.95 kit, $49.95 wired.

AN ENTIRELY NEW LOOK AT THE ELECTRONICS FIELD



SEND FOR YOUR COPY

FREE

If you're interested in Radio, TV or Electronics—as a hobby or a possible future career—clip the coupon below and mail it for your FREE copy of this new 64-page booklet. It was written *to answer the questions people usually ask about these fields.* Questions you may well have.

For example: What electronics course should you study? It depends on your reason for wanting to learn about electronics—and "Electronics" helps you match your personal ambitions with the types of courses that are available. You'll learn what each kind of course will teach you . . . and what jobs it will prepare you to fill. (The booklet uses 22 International Correspondence Schools courses for reference; they represent the broadest range you'll find anywhere.)

"Electronics" also contains a detailed description of the home study "extras" you can expect when you study with I.C.S.

What's it like to study an electronics course by mail? "Electronics" tells you. • What guarantee do you have of success in electronics? An eminent educator answers this and other basic questions. • How long will your study take? What do former students say about the benefits they are receiving from home study? How valuable do employers consider home study? The booklet answers these questions, as well as many, many more.

Your FREE copy of "Electronics" is waiting for you. All you have to do is fill out the coupon now, and mail it *right away.*

CLIP COUPON HERE I.C.S., Scranton, Pa. 18515
Accredited Member, National Home Study Council

ICS®
INTERNATIONAL CORRESPONDENCE SCHOOLS
Dept. 49974B, Scranton, Penna. 18515
Yes! Send me your FREE three-booklet Career Kit, including the new "Electronics" Career Guide.

Name__________ Age____

Address__________

City______ State______ Zip Code______

Occupation______ Employed by______

Working Hours____A.M. to____P.M.

Special rates to members of U. S. Armed Forces • Convenient payment plan • Special Training programs for industry

RADIO-TV EXPERIMENTER is published bimonthly at $4.00 per year, by Science & Mechanics Publishing Co., 505 Park Avenue, New York, N.Y. 10022. Second class postage paid at New York, N.Y., and at additional mailing office.

RADIO-TV EXPERIMENTER

Cover photo by Leonord Heicklen

April-May 1967
CONTENTS/INDEX

☆Cover Highlights

APRIL/MAY, 1967

RADIO-TV EXPERIMENTER

Dedicated to America's Electronics Experimenters

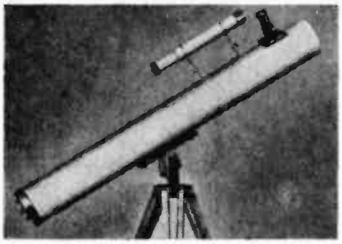
RADIO-TV EXPERIMENTER, Vol. 22, No. 2 is published bi-monthly by SCIENCE & MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Editorial, business and subscription offices: 505 Park Ave., New York, N.Y. 10022. One-year subscription (six issues)—$4.00; two-year subscription (12 issues)—$7.00; and three-year subscription (18 issues)—$10.00. Add $1.00 per year for postage outside the U.S.A. and Canada. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 1709 W. 8th St. 213-483-5317; Atlanta: Pirnie & Brown, 3108 Piedmont Rd., N.E., 404-233-6729; Long Island: Len Osten, 9 Garden Street, Great Neck, N.Y. 516-487-3305; Southwestern advertising representative: Jim Wr..., 4 N. Eight St., St. Louis, CH 1-1965.

EDITORIAL CONTRIBUTIONS must be accompanied by return postage and will be handled with reasonable care; however, publisher assumes no responsibility for return or safety of manuscripts, art work, or photographs. All contributions should be addressed to the Editor, Radio-TV Experimenter, 505 Park Avenue, New York, New York 10022

Second class postage paid at New York, New York and at additional mailing office.

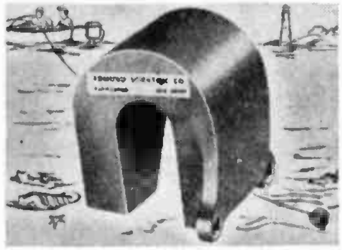
MAIL ORDER # SHOPPING MART **UNUSUAL VALUES**

A selection of products available by mail for readers of Radio-TV Experimenter
All merchandise sold on a money-back guarantee. Order Direct by Stock No. Send check or M.O.



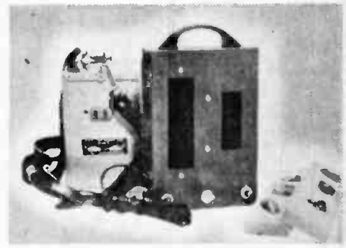
3" ASTRONOMICAL TELESCOPE

See stars, moon, phases of Venus, planets close up. 60 to 180 power—famous Mt. Palomar reflecting type. Aluminized & overcoated 3" diameter f/10 primary mirror, ventilated cell. Equipped with 60X eyepiece and mounted 3X finder scope, hardwood tripod. FREE: "STAR CHART"; 272-page "HANDBOOK OF HEAVENS"; "HOW TO USE YOUR TELESCOPE" book. $29.95 Ppd. Order Stock No. 85,050HP. Edmund Scientific Co., Barrington, N.J. 08007.



"FISH" WITH A MAGNET

Go treasure hunting on the bottom! Fascinating fun & sometimes profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along bottom—your "treasure" haul can be outboard motors, anchors, other metal valuables. 5-lb. Magnet is war surplus—Alnico V Type—Gov't cost $50. Lifts over 150 lbs. on land—much greater weights under water. $12.50 Ppd. Order Stock #70,571HP. Edmund Scientific, Barrington, N.J. 08007.



LONG & SHORT-WAVE ULTRA VIOLET LAMP

Photograph gem-like colors of 85 fluorescent minerals, artwork, chalks, paints. Use for prospecting, mineral collecting, etc. Sturdy, compact, portable. Short-wave UV radiation up to 2537 angstroms—long up to 3660 angstroms. Operates on AC or "D" Batteries. Wt. 1 lb. 5 oz. Incl. 9 ft. cord, booklet, set of fluorescent minerals. $29.75 Ppd. Order Stock No. 70,259HP. Edmund Scientific Co., Barrington, N.J. 08007.

ASTRONOMICAL TELESCOPE KITS

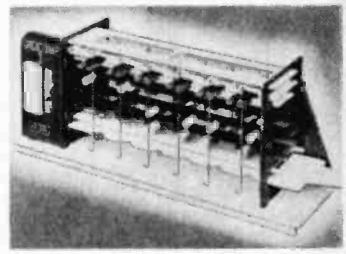
Grind your own mirror for powerful telescope. Kit contains fine annealed pyrex mirror blank, tool, abrasives, diagonal mirror, and eyepiece lenses. You build instruments valued from $75.00 up.

Stock#	Diam.	Thickness	Price
70,003HP	4¼"	¾"	$8.00 Ppd.
70,004HP	6"	1"	12.95 Ppd.
70,005HP	8"	1⅜"	21.00 Ppd.
70,006HP	10"	1¾"	34.25 f.o.b.
70,007HP	12½"	2⅛"	65.85 f.o.b.

Edmund Scientific Co., Barrington, N.J. 08007.

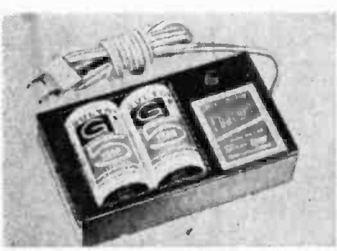
COLLIMATOR—PARALLEL LIGHT SOURCE

Terrific bargain! Surplus gun sight orig. cost Gov't. about $100. Was essentially a source of infinite light. Many uses for experimentors, research labs. Metal ring and dot reticle f/2.5, 2" achromatic lens, bulb 3⅜"x2⅝" reflector glass plate. Bulb operates on 14V, can be converted to 110V—or inexpensive transformer available. 6¾"x5"x2¾". $9.95 Ppd. Order #70,774HP. 110V transformer, $3.75 Ppd. #60,521HP. Edmund Scientific Company, Barrington, New Jersey 08007.



NEW MODEL DIGITAL COMPUTER

Solve problems, tell fortunes, play games with miniature version of giant electronic brains! Adds, subtracts, multiplies, shifts, complements, carries, memorizes. Colored plastic parts easily assembled. 12"x3½"x4¾". Incl. step-by-step assembly diagrams, 32-p. instruction book covering operation, computer language (binary system) programming, problems & 15 experiments. $5.98 Ppd. Order stock #70,683HP. Edmind Scientific Co., Barrington. N.J. 08007.



SPACE-AGE NICKEL CADMIUM BATTERIES

Guaranteed rechargeable for 5 years. Use in flashlights, portable radios, toy or flash guns. Obsolete all others! Low-cost kit includes compact, highly efficient charger and 2 "D" size Ni-Cd batteries. Power output remains constant. 1 or 2 "D" or "C" size batteries charge in 16 hrs. $9.95 Ppd. Order Stock No. 60,591HP. Charger only. $5.98. Stock No. 60,592HP. Two "D" cells only. $5.98 No. 60,593HP. Edmund Scientific Co., Barrington, New Jersey 08007.

GIANT SURPLUS BALLOONS

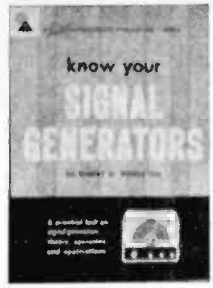
"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed, and temp. Made of heavy black rubber. Inflate with vacuum cleaner or auto air hose, or locally available helium for high rise. 8' diam. $2.00 Ppd. Order Stock No. 60,568HP. Edmund Scientific Co., Barrington, N.J. 08007.

GIANT FREE CATALOG

Completely new 1967 Catalog. 148 page. packed with nearly 4,000 unusual bargains. Exciting new categories. Many new items. 100's of charts, illustrations. Many hard-to-get war surplus bargains. Enormous selection of telescopes, microscopes, binoculars, magnets, magnifiers, prisms, photo components, etc. For hobbyists, experimenters, workshops, factories. Shop by mail. No. salesman will call. Write for Catalog "HP" to Edmund Scientific Co., Barrington, N.J.

BOOKMARK

BY BOOKWORM



144 pages
Soft cover
$2.50

Signal Generators. The newest book in the popular Sam's "Know Your" series, *Know Your Signal Generator* gives practical coverage of signal generators from A to Z, enabling the technician to get maximum performance from these instruments. Robert G. Middleton, the author, has considered the needs of the practicing technician who will find the book useful in making performance checks and maintenance adjustments as well as troubleshooting equipment.

The text discusses basic principles of all types of signal generators, then proceeds to explain generator accuracy, calibration, modulation, measurement of output voltages and harmonic amplitudes, and many more considerations. In addition to covering basic instruments, it includes dip meters, analyzers, radio test sets, and uhf and supersonic generators. The treatment is non-mathematical and does not require an "engineering" background to be understood. Specs and schematics of typical service type instruments in current use are included.

Know Your Signal Generator is available from electronics parts distributors and book stores throughout the country, or from Howard W. Sams & Co., Inc., Dept. JWM, 4300 W. 62nd St., Indianapolis, Ind. 46206.

Build It. It's with great pride that we report that an old friend of this reviewer, and an author seen frequently in Radio-TV Experimenter, has published his fourth book dedicated to the radio amateur. Howard S. Pyle, known to hams around the world as W7OE, started his ham career way back in 1908. Professionally, he has worked for the federal government as a radio inspector and electronics engineer. He is a senior member of the IEEE and past vice-director of the NW Division of the ARRL.

Now retired, author Pyle calls upon his vast storehouse of knowledge and experience to generate magazine articles and books. His latest effort, *Building Your Amateur Radio Novice Station*, is the first construction manual on this timely subject.

The text covers everything down to the last detail, a treatment which many beginners need. Nothing, in fact, is overlooked in the course of building the station, from the very first steps to actually putting the rig on the air. Included, for

128 pages
Soft cover
$3.50

example, are same-size drilling and cutout templates for the chassis and panels of a professional-appearing transmitter and receiver. And though they cost but little, they carry a relatively high resale value should the builder ever decide to part with the rig.

While the equipment has been specifically designed to meet all the requirements imposed on a novice amateur radio station, it will serve the General-Class amateur as well. As a finishing touch to the projects, a complete rollaway ham shack is fully described for those with limited space.

Copies are available from electronics parts distributors and bookstores throughout the country, or from the publisher, Howard W. Sams & Co., Inc., Dept. RRF, 4300 West 62nd St., Indianapolis, Ind. 46206.

Voltmeters. Over the years, the capabilities and uses of the voltmeter have considerably advanced and expanded. Today, the technician and experimenter need a greater technical proficiency—one that combines up-to-date testing *know-how* with a *know-why* understanding of operating principles. A good start toward such proficiency can be had by reading *Modern Electronic Voltmeters*, by Sol D. Presnky. This book gives the technician and experimenter a thorough understanding of modern electronic voltmeters: first, by reviewing fundamental principles of the basic instrument; second, by covering well-established VTVM and transistor voltmeter test procedures.

An expanded view of the vacuum tube voltmeter encompasses the highly sensitive DC microvoltmeters (employing chopper-stabilized amplifiers), the high sensitivity AC (or audio) voltmeters, and the extremely high impedance electrometer type of voltmeter. It also includes sensitive current measurements in the micro-microampere (picoampere) ranges and covers

Bookmark

232 pages
Soft cover
$4.95

industrial versions of the voltmeter in the form of millivolt recorders and digital voltmeters.

Many examples of testing are included for radio and television applications and industrial electronic systems; simplified or functional schematic diagrams are used liberally throughout. The book is published by John F. Rider, Publisher, Inc., Dept. WJW, 116 W. 14th St., New York, N. Y. 10011.

Mathematics. Paul L. Evans, electronics instructor at Foothill College, has come up with a text written especially for the future electronics technician. The book, *Mathematics for Electronics Technician*, presents all of the mathematics needed for anlysis of AC and DC circuits. The author reviews high-school algebra and

392 pages
Hard cover
$7.00

basic trigonometry, and stresses how their principles are applied in the solution of series, parallel, series-parallel, and network circuits.

Quadratic and simultaneous equations are covered, as are uses of the slide rule, scientific notation, determinants, imaginary and complex numbers, and the use of Thevenin's and Norton's Theorems. The language of the text is decidedly for students—lengthy explanations are avoided wherever their inclusion is not necessary. In short, if mathematics has relegated you to bringing up the rear, *Mathematics for Electronics Technicians* should put you back in the driver's seat. The text is available at all bookstores. Can't get a copy? Write to John Wiley & Sons, Inc., 605 Third Ave., New York, N. Y. 10016.

Pepping Pooped Color. In using test equipment, technicians often develop a certain routine for using each piece of gear for only a limited number of tasks. *101 Ways To Use Your Color-TV Test Equipment*, by test-equipment authority Robert G. Middleton, is written to encourage service technicians to explore the total possibilities of their equipment for faster and better troubleshooting. This newly-revised and updated edition describes the many uses for various types of equipment used to pin point color-TV problems more quickly. It takes up each type of test gear and shows the ways it can be used—some conventional, some unusual.

160 pages
Soft cover
$2.95

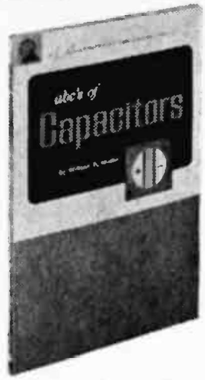
Methods range from the very basic to complex, but explanations are concise and easy to follow. The book includes actual photographs of the waveforms that occur at various points and discusses likely defects. Test setups, procedures, and results are described and illustrated in detail in this book which tells how to test all types of circuits found in color-TV receivers. Every serviceman can benefit from this book—it helps in getting more from your test equipment for faster troubleshooting.

Copies are available from electronics parts distributors and bookstores throughout the country, or direct from the publisher, Howard W. Sams & Co., Inc., 4300 West 62nd St., Indianapolis, Ind. 46206.

Blame It on Farad. One of the most difficult concepts for the hobbyist to visualize is the electrical function of capacitors. To him they appear as "breaks" in the circuit and nothing more. Actually, capacitors have special electrical characteristics which are necessary in an electrical circuit. The usual textbook explanation of capacitors is not sufficiently clear to completely remove the mystery and complexity that surrounds them.

ABC's of Capacitors, by William F. Mullin, is written in everyday language that anyone can understand. It explains how various types of capacitors are constructed, spells out typical characteristics and applications, discusses points to consider when selecting replacements, and offers several practical methods of testing and measuring capacitors. The book was written for experimenters who work with electronic circuits,

Bookmark

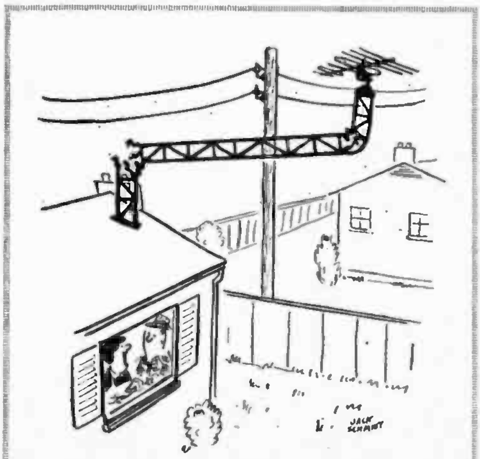


96 pages
Soft cover
$2.25

or anyone who needs a clear-cut understanding of capacitors as an aid in troubleshooting.

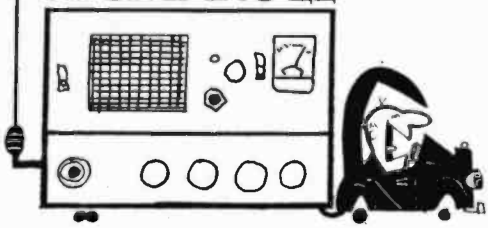
Author Mullin has provided a text which effectively bridges the gap between engineering technology and circuit theory—making it a truly practical reference for beginning technicians, servicemen, and students. Copies are available from electronics parts distributors and bookstores throughout the country, or direct from the publisher, Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, Ind. 46206.

Get The Catalog. Each month several letters cross our desk from readers seeking information that can be theirs for the asking. Do as the ol' Bookworm does—write to the publisher, asking for their latest book catalog. You will be surprised to discover the various titles that are available, not only in electronics, but in other scientific fields allied to electronics. At the end of each book review we give the publisher and his address. Just drop him a card and let the mailman do the rest. ■



"The men from the power company came. They said something about 'right-of-way'."

CB RIGS & RIGMAROLE



Build a Better CB. "It's little, it's lovely, it's light," might be a good description of the latest offering from EICO Electronic Instrument Co., Inc.. 131-01 39th Ave., Flushing, N.Y. 11352. Their new CB rig, the NOVA-23, seems to be worth all of the effort which they have obviously poured into its development—it's a real Hertz grabber.

Transistors, it's got; 23 channels, it's got; an S-meter, it's got; a built-in PA system, it's got; a 12-volt negative-ground/positive-ground power supply, it's got; and it weighs only 7 lbs. Is it a big deal? Well, today about all *that's* basic minimum for any self-respecting CB rig. But don't give up the ghost. The NOVA-23's got an extra kick or two hidden up its mike cable.

First, the rig uses an exclusive dual-crystal lattice filter. While that may sound like a fugitive from a salad plate, it's really a sophisticated gizmo for giving the set razor-sharp selectivity (ability to reject unwanted signals on nearby channels).

Another NOVA-23 exclusive is an efficient "up-converter" frequency synthesizer which provides extra stability and trouble-free performance (all crystals are supplied for full 23 channel CB'ing). The only extra you have to buy is your car.

The use of precision series-mode fundamental crystals is unusual in CB gear, but the NOVA-23's got 'em. This results in exceptional stability on transmit and receive.

While some CB rigs are plagued by ills resulting from vibration and shock during mobile use, according to EICO (which seems to be a nice way of saying that we CB'ers are rotten drivers), the NOVA-23 is put together in ruggedized mili-

CB Rigs & Rigmarole

tary-style modular PC construction. A sealed computer-type, removable relay offers burnout-proof switching.

Excellent range with minimum distortion is offered by means of 100% modulation coupled with the full legal *output* of 3.2 watts (that's 5-watts input, Bud). On receiving, the rig pulls 'em in even if the signals are weaker than half of a microvolt and filters out the noise through a highly efficient, lossless limiter.

Price for putting the NOVA-23 under your dashboard is $189.95 (wired and tested).

Tiger-Tail for your Transistors. We've seen tigers put to all sorts of uses these past few months — everything from using them in your tank to putting one on your team. Now you can use a tiger (or at least its tail) on your CB rig. Yup, it's a new antenna for your rig and it's a different approach than most others.

The Tiger Tail antenna permits you to tune your output for maximum on any given channel, easily and with full efficiency. The difference in the Tiger Tail is that it has a self-contained output meter installed where you can repeak the antenna with a minimum of bother.

Weighing only 2 lbs., the antenna is quickly removed from your window for portability.

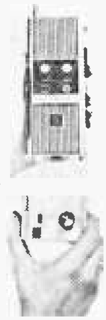
The tunable Tiger Tail avoids one of CB's foremost monsters, that of mismatch between the rig and the antenna. By means of the tuning capacitor in the base of the antenna, the antenna can be made to resonate exactly on the specific transmitting frequency. In addition to matching the antenna to the rig, the antenna can be adjusted to reduce harmful effects of nearby metallic objects which might otherwise botch the Hertz stick.

Weather will not affect the operation of the Tiger Tail.

Manufacturer is Elnex, Inc., of Naples, N.Y. Could be big things ahead for this one.

30¢ per Milliwatt. American-made communications gear has a rough time competing for low price with some of the imported stuff, and this goes double for hand-held transceivers. The result has been a shyness on the part of many CB manufacturers to come through with these popular units.

E. F. Johnson Co., of Waseca, Minn., seems to have stumbled upon some sort of secret previously known only to foreign manufacturers.



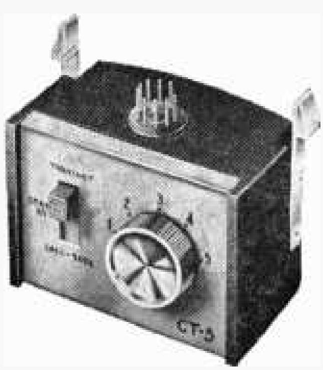
The result is a 100-milliwatt, quality walkie-talkie which can be sold for $29.95.

Our immediate response upon hearing about this was that, despite Johnson's excellent track record in making quality CB gear, that this was some sort of new venture of theirs into the toy market. A short romp through the specs of the unit and a five-minute field test, however, seem to pop that little balloon.

The unit features a crystal-controlled superhet megahertz inhaler with excellent sensitivity. A built-in battery meter lets you discover how far you are from instant silence.

The set is in a nifty-looking, rugged case with a leather carrying strap. License isn't required; all it takes is $29.95 and an inquiry to E.F. Johnson or any of their many dealers.

CB Snobbery. Here's a way to eliminate all of the idle chatter you have to put up with while monitoring a CB channel. Plug this unit into any Fanon CB unit and you can selectively signal any other single station in a network of up to 5 stations. And you can do so without disturbing the others.



Best of all, each of the stations in the network will hear only stony silence until it is called by any of the other stations equipped with the device. If you've got a Fanon rig, you'll want to look into this.

Fanon's address is 439 Frelinghuysen Ave., Newark, N.J. ■

150-Watt Stereo Receiver Kit

An outstanding stereo receiver tuning AM, FM, and stereo FM as well as accepting the output from any phonograph or tape player. the new AR-15 from Heath is designed to give kit-builders sound on a par with the finest. Pumping out 75 watts of IHF power per channel, the AR-15 has all solid-state, all-silicon circuitry. Two integrated circuits in the IF amplifier make for ultra-high gain and ultra-hard limiting. Two crystal filters replace the IF transformers, which means there are no coils to align. And field-effect transistors (FET's) in the FM front end promise extra high overload capability and extra low cross-modulation.

Heathkit AR-15 Receiver

Four Zener diodes and two thermal circuit breakers protect the driver and output transistors from overloads and short-circuits of any duration; a special front-panel indicator even shows when the circuit breakers have opened. The "black magic" panel remains dark until the unit is turned on.

The AR-15 sells for $329.95 in kit form; an optional 7-lb. walnut cabinet is $19.95 extra. It's available now from the Heath Company, Benton Harbor, Mich. 49023.

Electronic Throttle

Offered in kit form, Knight-kit's new Motor-Speed/Light Control is a useful accessory for the home workbench. When assembled, it permits speed control of electric drills, saws, sanders, and other electrically-operated power tools. Used with power tools there is said to be virtually no loss of torque, even at low speeds. It

Knight-kit KG-201 Motor-Speed/Light Control

also controls the brightness of incandescent lamps and photographic photofloods. The control can be used with a soldering iron (except transformer-type guns) to limit heat for protection of delicate components.

The control's solid-state circuit uses a silicon-controlled rectifier, two diodes and a calibrated output control. In full "on" position, the appliance runs at normal speed. It can be used with any universal-wound AC-DC motor-driven device with a rating of 7.5 amps or less, or for loads up to 500 watts.

The unit is protected by a thermal circuit. Output receptacle and 6-ft. power cord are 3-wire grounded types for safety. Motor-Speed/Light Control, Model KG-201 is priced at $9.95. Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

Experimenter's Slide Rule

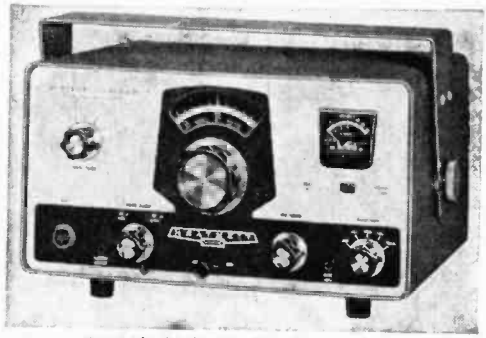
The Shure reactance slide rule was first made available in 1943 and continues to be a sought-

Shure Reactance Slide Rule

after item, so Shure Brothers decided to reissue it. It's helpful for solving resonant frequency, capacitive reactance, inductive reactance, coil "Q" and dissipation factor problems that cover a frequency range from 5 Hz to 10,000 MHz. The rules are available for $1.00 each. Write Shure Brothers, Inc., Sales Dept. 5, 222 Hartrey Ave., Evanston, Ill. 60204.

All You SSBers Form a Double Line

Up-proving the Heathkit SB-Series of SSB transceivers for 80, 40, or 20 meter communicating, comes a new line with not only improvements but lower price as well. The new Single-Banders have front-panel selection of upper or lower sideband operation, improved audio and AVC response, microphone and gain control, bias adjustment on the front panel for changing from fixed to mobile operation, a mode switch



Heathkit SB-Series Ham Transceivers

position for control of optional HRA-10-1 plug-in crystal calibrator, ALC input for operation with linear amplifiers, and power connectors compatible with Heath SB-Series power supplies. Full 200 watts P.E.P SSB fixed or mobile, model numbers and prices are as ensues: HW-12A, 75 meters, $99.95; HW-22A, 40 meters, $104.95; HW-32A, 20 meters, $104.95; HP-13, mobile power supply, $59.95; HP-23, fixed-station power supply, $39.95. Heath Co., Benton Harbor, Mich. 49022.

Two-Meter Transceiver

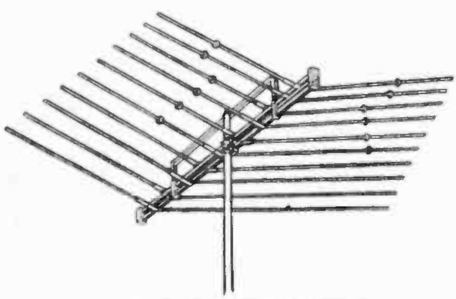
This dandy VHF transceiver has a 25-watt DC input transmitter and sensitive triple conversion receiver with crystal-controlled mixer. The 16-tube, 4-transistor, 7-diode circuitry uses separate receiver and VFO frequency controls. Effective series gate noise limiter combines with variable squelch control for quiet standby reception. The HA-1200's output frequency may be crystal-controlled with standard 8 MHz crystals. Its illuminated edgewise meter indicates S units on receive and relative RF output on transmit. Comes with rugged push-to-talk ceramic microphone with coiled cord AC and DC power cables, and mobile mounting bracket. Has solid-state

Lafayette HA-1200 Ham Transceiver

power supplies for 117 VAC and 12 VDC negative ground operation. Size, 11⅞ x 12¾ x 5⅞; price, $189.95. From Lafayette dealers or for further dope write Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, N. Y. 11791.

JFD LPV-TV/FM OK

Further improvements have been made by JFD Electronics Co. on their LPV-TV/FM color log periodic series of antennas. The new antennas have *stronger signal response* than previous VHF log periodic antennas. Another feature of the series is a system of capacitor-coupled "cap-electronics" dipoles, which respond on the third harmonic mode, as well as the fundamental



JFD LPV-TV100 VHF-FM Antenna

mode, this being especially effective in color. Plus the series has a lower-impedance twin-boom feeder, and integrated transformer design. There are eight different models ranging in price from $14.95 for the LPV-TV40 (VHF range up to 50 miles), to $79.95 for LPV-TV190 (VHF range up to 200 miles). Get all the facts at your distributors, or write to JFD Electronics Co., Dept. JS, 15th Ave. at 62nd St., Brooklyn, N. Y. 11219.

NTSC Color Bar Generator

Reasonably priced for the service technician, the EICO 380 solid-state color bar generator offers saturated National Television Systems Committee (NTSC) color signals. The unit's

New Products

☆☆

RF output: 0-50,000 uv into 300 ohms. Video output: both positive and negative polarities 0-10 V p-p into 4700 ohms. NTSC colors: yellow, I; red, R-Y; magenta, Q, B-Y; blue, cyan, green, white. Horizontal lines 13 variable thickness; vertical lines 10 variable thickness; crosshatch 13 horizontal and 10 vertical lines; 130 dots variable size. 117 VAC, 60 Hz; 8½ x 5¾ x 6⅜ inches. Available in factory wired form only at $169.00 from EICO, 131-01 39th Ave., Flushing, N.Y. 11352.

Peacock Peeper

This eyeball gimmick, called Dynascope, has a 2¼-in.-diameter mirror and a clip-on 1½-in.-diameter magnifying glass mounted on a 6-in.-long stainless steel rod. The serviceman attaches the unit to the color TV screen with the suction cup. This eliminates waste time and walking

B&K Dynascope

back and forth between front screen and rear controls during focus, purity and convergence adjustments. Available at test equipment distributors, Dynascope is priced at $7.95. Or write to: B&K Div., Dynascan Corp., 1801 W. Belle Plaine Ave., Chicago, Ill. 60613.

Put a Fix on Color

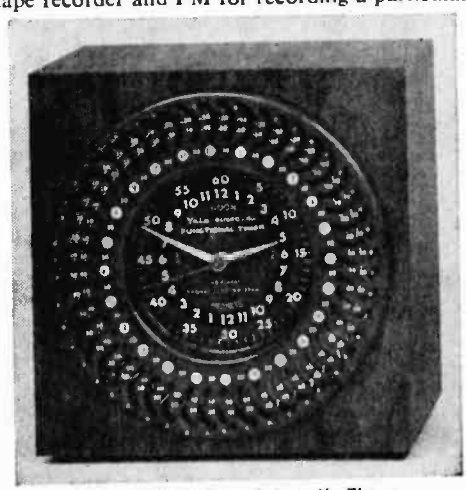
Looking for a color/bar generator in kit form? The Knight-kit KG-685 unit has some advanced details engineered into it—such as a gray scale pattern providing 6 discreet levels of brightness for gun tracking adjustments. There is a shaded light source and a steel polished service mirror. A single control selects one of seven crystal-controlled test patterns including purity, tracking, dots, cross-hatch, vertical lines, horizontal lines and color bars. Using 22 transistors and 8 diodes and measuring 4⅝ x 9⅝ x

Knight-kit KG-685 Color/Bar Generator

12 in., the KG-685 with all parts, cables and instructions in kit form is $89.95. Fully assembled it's $129.95. For complete specifications see the Allied catalog No. 260, free from Allied Radio Corp., Dept. 20, 100 N. Western Ave., Chicago, Ill. 60680.

Round-the-Clock Switch

This automatic timer handles up to 1000 watts, comes in either 12- or 24-hour operation, and allows you to preset as many as 48 combinations of time intervals. You can be away from home and let the Functional Timer turn on the tape recorder and FM for recording a particular

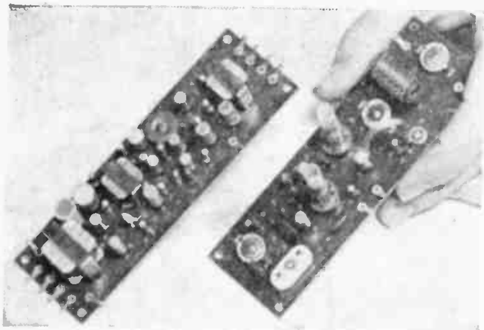


Yale Audio 24-Hour Automatic Timer

program. Other suggested uses: time-lapse photography, sleep learning, background music intervals, water and lighting systems, phone answering service, machinery operation, and so on. The 24-hour model in a walnut case sells for $65.85. The 12-hour model without the buzzer and case is priced at $44.50. Order from Yale Audio of Florida, Dept. XII, 2732 Florida Ave., Tampa, Fla. 33602.

Amplifier-Modulator

This compact, solid-state amplifier-modulator has a 5-transistor, 1-thermistor circuit. Comes completely assembled with schematic diagram.



Round Hill AA-100 Amplifier-Modulator with mating Transmitter at right

The model AA-100 has a shielded input transformer with two primary windings: 50 ohms and high impedance. The output transformer has two secondary windings: 8 ohms (for speakers) and 500 ohms (for modulation and high impedance loads). Unit has a volume control mounted on the circuit board. Performance: low distortion, 200 milliwatt push-pull output; extremely high gain, 80 db. Circuit board is 5½ x 1¾ in., and can be powered by any 9-volt DC source. Priced at $6.95 the AA-100 comes from Round Hill Associates, 434 6th Ave., New York, N. Y. 10011.

Daughter of Serenata

Here's a lower-priced version of Telex's famous high fidelity Serenata headset, the Serenata II, which has central comfort control dial, all-dynamic sound reproducers, fixed straight

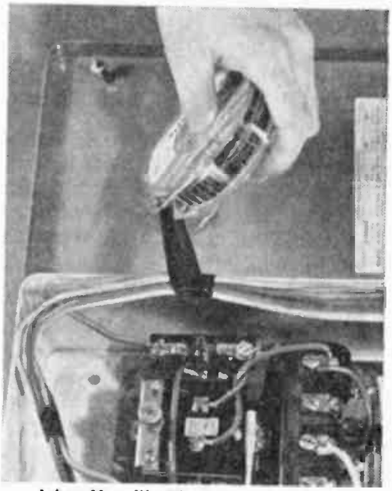
Telex Serenata II Hi-Fi Headset

cord, deluxe ear-cushions. Response is 20-20,000 Hz; sensitivity, 92 db/mw. The price is $44.95 from Telex-Acoustic Products, Dept. 2, 3054 Excelsior Blvd., Minneapolis, Minn. 55416.

Check with your local Hi-Fi Dealer and ask for a listening demonstration.

Stick with Stick-em

A new vinyl plastic tape has been developed with a formula that provides an adhesion value of 45 oz. per inch width, and will help you make



Johns-Manville Vinyl Electrical Tape

safer, more enduring splices. J-M Plastic Electrical Tape averages 9000-volts dielectric strength per layer, can be used indoors and out, and is priced according to sizes and roll lengths. Also available in a pop-up dispenser. Get your roll at any electrical supply house or write to Johns-Manville, Dutch Brand Div., Dept. X2, 7800 S. Woodlawn Ave., Chicago, Ill. 60619.

FM/Stereo Sounds in a Kit

A new FM stereo table radio kit features the same tuner and IF circuit used in deluxe Heathkit stereo components for *cool* transistor sound. Model GR-36 also has automatic switching to stereo, adjustable phase control, fixed automatic frequency control, built-in automatic gain con-

Heathkit GR-36 FM-Stereo Table Radio

trol, clutch-release volume control, adjustable tone control, slide-rule dial, external antenna connectors, two 5¼-in. PM speakers. You couple the circuit board construction with the factory-assembled and aligned front panel—total assembly takes around 10-hours. The wal-

☆☆

nut cabinet measures 19 x 9¼ x 6½-in., kit cost is only $69.95. For details write Heath Company, Benton Harbor, Mich. 49022.

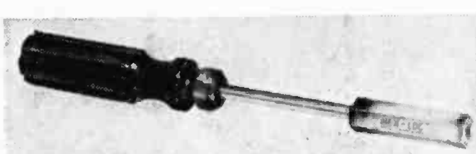
AC Hits the Road

Need a handy device for operating portable TV sets, phonographs, lights, PA systems, or standard electrical appliances from a 12-volt DC battery? Electro Products Solid-State Inverter, model TI-100A may be just the unit for you. Just plug it into the lighter socket of your car or connect it directly to the battery with a color-coded battery-clip adaptor accessory. The inverter features automatic thermal overload protection and a "start" switch for rapid starting of hard-to-start items; converts battery power in cars, trucks, trailers, boats, etc. with 12-volt DC sources to 117-volt AC, 60 Hz. Size: 3½ x 6¼ x 6¼ in., 6¾ lb. List price $46.50 from Electro Products Laboratories, Inc., Dept. 67, 6123 W. Howard St., Chicago, Ill. 60648.

Electro Products TI-100A Inverter

Multiple Socket Wrench

Repairmen and servicemen will enjoy the unique locking feature of this multiple socket wrench, designed to fit nine different sized nuts from No. 2 to ¼-in. or hex-head screws from 3/16- to 7/16-in. The Hex-Loc wrench has a succession of nesting sockets, spring-loaded. The nut or hex-head screw finds its own size socket and locks there. All you have to do is twist the handle. Price, $4.95; manufacturer, General Implements Corp., Dept. HEX, 946 Saratoga St., East Boston, Mass. 02128.



General Implements Hex-Loc Wrench

IT'S TWINS

for independence hall!

By Dick Flanagan

■ As every red-blooded American knows, Independence Hall—witness to the Declaration of Independence (not to mention the Continental Congress and the Constitutional Convention)—is located in Philadelphia, the nation's second capital (New York was first; Washington, D.C., third). And just as the capital moved south, the nation and its people spread westward.

Today, the union's most populous state is located not in the east but the west, which is another way of saying that California's 20-odd millions would have to take a mighty long trip to visit the birthplace of American liberty. Fortunately, that long journey is no longer necessary.

Located at Knott's Berry Farm in Buena Park, California, the second Independence Hall is a meticulously constructed duplicate of the original. Some 140,000 hand-finished clay bricks went into its making, and the twin even boasts specially mixed paints and intricate hand carvings faithful to the original. But *re*-creation didn't stop there.

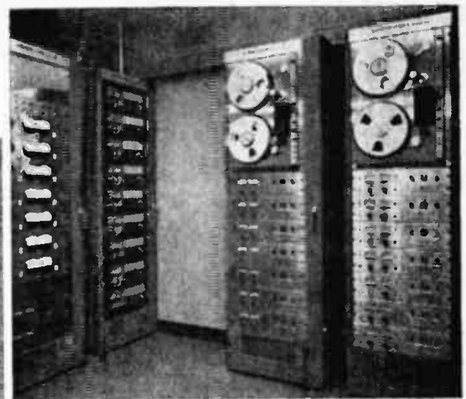
So that visitors to the new Hall might relive the momentous minutes when American independence was born, Walter Knott of Knott's Berry Farm commissioned Hollywood documentary producer Phil Stuart to revive that historic occasion in sound. Phil's answer: two special 14-track Ampex recorders feeding 56 James B. Lansing speakers hidden throughout the room.

As room lights fade and candles begin to flicker, today's audience hears the delegates enter and make their way to the 13 tables. Then, as the sounds of carriage wheels and children echo in the street outside, the great debates begin again—this time in a twin some 3000 miles from the original! ■

Guides in Colonial garb impart '76 flavor to "new" Hall. Replica took two years to build.

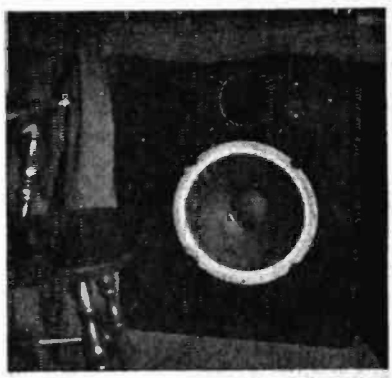
Debates associated with Declaration of Independence are recreated in room below.

Tucked away on second floor of Independence Hall replica are two special Ampex AG-300 professional tape recorders (at right). Below, Philip Stuart, creator of the sound show, adjusts one of the recorders.

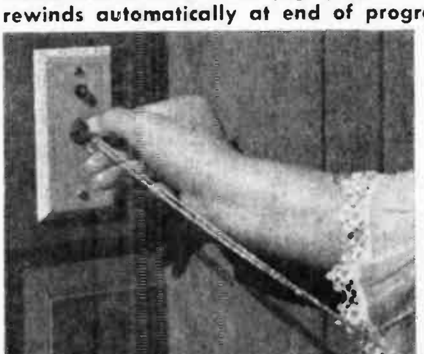


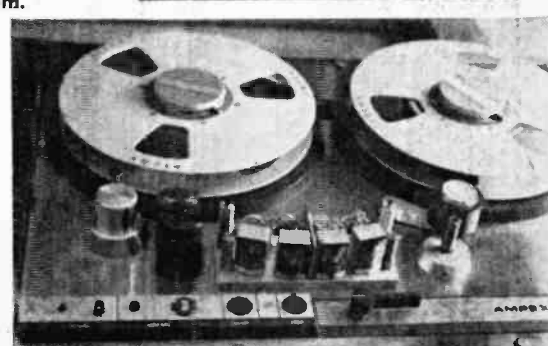
Photos courtesy Ampex Corporation

James B. Lansing S-7 (above) and S-8 (below) speaker systems are hidden throughout Hall.



Key controls tamper-proof switch (below) which activates recorder (right). Unit rewinds automatically at end of program.





Meter Protection

I would like to install a Lafayette Meter Guard or an International Rectifier MP-100 meter protection rectifier to my VOM. Are they really effective? How should I install one?

—*G. D., Montreal, Quebec, Canada*

Yes, they protect the meter from excessive voltage drop across the meter movement and from reversed polarity voltage. The meter protectors usually are furnished with installation instructions. Protectors are not all the same and installation procedures may differ.

What is It?

What transistor can I substitute for a TIX-882?

—*F. T., Ronan, Montana*

We couldn't find it listed in Datadex or in industrial catalogs. You can probably get the exact type or substitute from Allied Electronics, the industrial division of Allied Radio, at 100 North Western Avenue in Chicago by mail order. Often special-batch or experimental transistors are given company numbers—the manufacturer will often provide exact data or indicate a suitable replacement.

Quick as a Wink

I have an early transistorized hi-fi amplifier whose power supply has burned out a couple of times. I would like to modify it to use an electronic filter in place of electrolytic capacitors. Diagrams of the original power supply circuit and the proposed new circuit are enclosed. Do you think the new circuit will be better?

—*A. L. W., Ithaca, N. Y.*

No. If the power supply burns out because of a shorted power transistor in the amplifier (usual cause) or because of electrolytic capacitor failure, the new circuit will be subject to the same hazards. Cure: put a fuse in the collector or emitter circuit of each power transistor—one in the power supply would have to have a much higher rating and the transistor could go before the fuse. Semiconductor diodes should have a series resistor to limit current surges into the input filter capacitor. Current surges can burn out diodes faster than a wink.

Seek and Ye Shall Find

I can't find a GE C6B silicon controlled rectifier in any of my catalogs. I am convinced you bought the last one. If you know where I can get one, please let me know.

—*H. K., Eau Claire, Wisconsin*

You will find it listed on page 270 of the 1967 Allied Catalog, priced at $2.07. You can order one by mail from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

Not Worth It

Can you give me a diagram of an amplifier for increasing the power of my 15-watt transmitter to 20 watts?

—*F. M. B., Spring City, Tennessee*

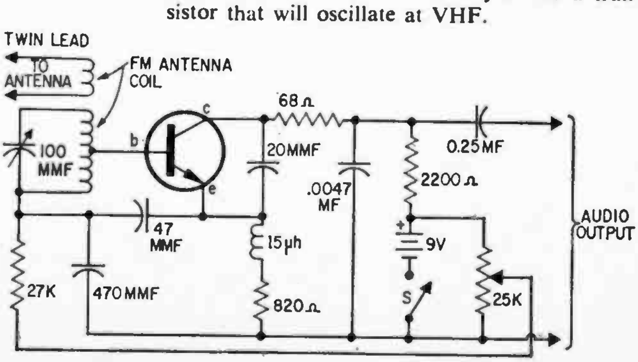
It is not worth building an amplifier to increase power only one-third. You'll get *out* almost as well with 15 watts as with 20. That small a change can often be accomplished by increasing the B-plus voltage 25 to 30% above what the manufacturer designed into the unit.

One-Transistor FM Set

Can you give me a circuit for a one or two transistor FM tuner?

—*B. B., Rocky Ford, Colorado.*

Here's a diagram of a superregenerative receiver which will receive AM or FM. For coils, pick them from the J. W. Miller catalog which any, on-his-toes parts distributor should have or should be able to order for you. Unless you are very close to an FM station, don't expect great results. And, make sure you use a transistor that will oscillate at VHF.

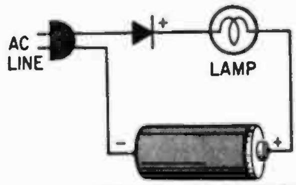


6-Volt Recharger

Can I recharge a 6-volt ignition battery using a charger as shown in the schematic?

—*D. T., Mayo, Florida.*

Yes. To get the full scoop, write for a copy of *Using the Secondary Capacity of Primary Cells* from Dynamic Instrument Corp., 115 E. Bethpage Road, Plainview, New York.

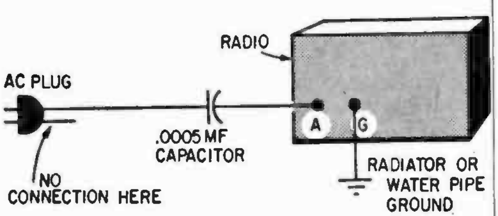


BCB Skywire

I would like to know how to improve the BCB reception of a Knight-kit Star Roamer receiver. I am in a dorm and a long wire is impossible.

—*W. H. P., Troy, New York.*

Try using the power line as an antenna as shown in the diagram. Reverse AC plug to see which side gives best reception. Don't overlook the signal pickup abilities of bed springs, and combination storm-screen windows (or other metal frame windows) or the rain downspout and gutter. For safety, use the capacitor when making the connections—someone else might get the same idea.



Have Whip?—Better Travel

I have a four-band Radionette which was made in Norway. Using a 10-foot whip antenna outside of the window of my third floor apartment, I can get Holland, Japan, Australia and the Voice of America and that's about it. My building is 12 stories high and made of steel and concrete. How can I upgrade my receiver?

—*E. A. B., San Francisco, California*

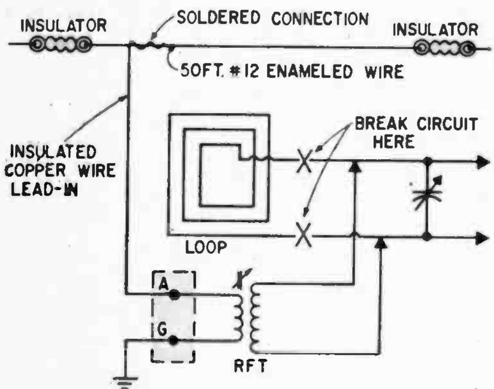
Your antenna is in a shielded, electrically noisy area. You're doing well, considering the circumstances. For better shortwave reception, get a professional communications receiver and install a doublet antenna on the roof of the building, feeding it through coaxial cable. In an apartment building in a big city, you can't expect outstanding reception.

Adding Antenna Input

I am a begining AM-BCB listener and would like to know how to set up an outside antenna for my receiver.

—*J. W., Cortland, New York*

If your radio has a loop antenna or loopstick, replace it with an antenna coil (RF transformer) such as Miller A-320-A as shown in the diagram and connect an antenna and ground to the primary of the transformer. Add the connections shown in heavy lines. Adjust the core of the new coil for best reception.



It's the End

I have an old Emerson DM 831 AC/DC radio which covers the BC, medium wave and shortwave bands to 49 meters. One tube is missing from the socket labelled "ballast." When on shortwave I pick up BCB stations and hams. What can be done?

—*W. B. F., Houston, Texas*

Give it a decent burial. It shouldn't work at all with the ballast tube removed. For good shortwave reception you need a more modern receiver able to cope with all the stuff that's in the air.

Narrow-Band FM Problem

I have to turn up the volume wide open on my dual-band VHF-FM monitor receiver to get clear reception. If I change the detector to a gated-beam type as you suggested in an earlier issue, will I lose something else?

—*W. S., Wilmington, Delaware*

The gated-beam detector should work well on both narrow band (±5 kHz) and wide band (±15 kHz) FM signals.

Some Definitions

Several questions: (1) Why does the dial of my shortwave receiver indicate 11.82 when I am tuned to a station listed at 11820 in White's Radio Log? (2) What do DX and BCB-DX mean? (3) What does kHz mean? (4) Does GMT listed in the shortwave section of White's Radio Log mean the time we should get the station here, less the five hours difference?

—*B. C. H., Cherryfield, Massachusetts*

Several answers: (1) 11.82 is in megacycles or megaHertz (MHz); 11820 is in kilocycles or kiloHertz (kHz); they both mean the same. (2) DX means long-distance reception; BCB-DX means BroadCast Band long-distance reception. (3) KiloHertz (kHz) is the new international term for kilocycles per second. (4) Yes, GMT minus 5 hours equals EST.

24-Volt Power

I have a surplus BC-603 receiver, but I do not have a 24-volt power source to operate it. Could you show me a diagram of a power supply I could use?

—*A. J., Hazelhurst, Wis.*

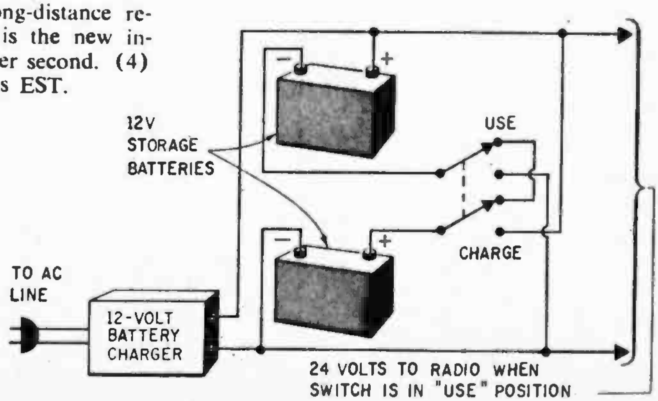
Simply hook up two 12-volt storage batteries and a battery charger as shown in the diagram. While you could build a 24-volt rectifier, it might be cheaper to rewire the set for AC operation. If you'll send us the schematic, we might be able to tell you how.

It's Called a Sleep Switch

Can you tell me how to build an automatic timer which will shut off a radio after one hour?

—*J. L. B., Danville, Iowa*

This would be a mechanical project, not an electronic one. For one hour electronic timing. you would require an enormous capacitor. It would be much easier to buy a ready-made, one-hour timer such as a Rhodes Mark-Time switch, costing about $6.50 at electronic parts or electrical distributors.



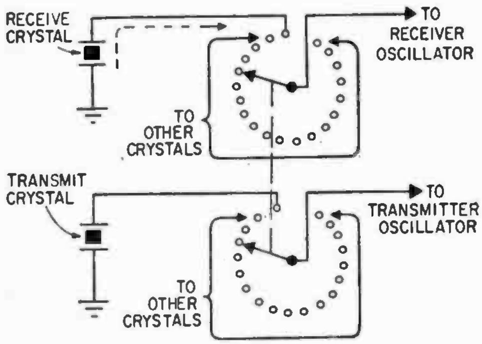
It'll Cost Ya!

My CB radio has crystal holders for only six channels. Can you give me a circuit for modifying it so I can transmit and receive on all 23 channels by turning a dial instead of having to change crystals?

—R. R., Medford, Massachusetts.

You can use the channel selector switch used in the Knight-kit Safari III connected as shown in the diagram. Order spare part No. 437-157 from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680. You will have to add crystals and crystal sockets.

Before you put the rig on the air, have all the channel frequencies measured by a licensed operator at a two-way mobile radio shop. Otherwise, you might operate off frequency and be inviting a citation from the FCC.



All for the Want of a Horseshoe Nail!

On page 109 of the Fall 1965 issue of Elementary Electronics, you show a schematic of an electronic fence charger using a 12-volt ignition coil. What kind of a coil has a separate primary and secondary? No luck in finding an 1140A-2 SCR.

—L. C. R., Baltimore, Maryland

The SCR was labelled incorrectly as "1140A-2". It should have been labelled T140A2 and sells for $2.70. A Mallory 12-T ignition coil has four terminals as shown in the original diagram.

Luck!

How can I pick up TV stations hundreds of miles away? I see letters published in your magazine about receiving TV stations more than 500 miles away. How do they do this?

—D. W., Washington, Connecticut

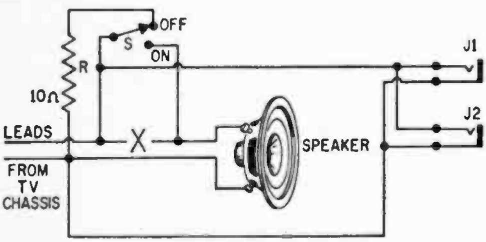
Long distance TV reception is possible only when skip conditions exist. It might never happen in your area at a time when you are tuned in. If you had a portable TV set on top of Mt. Shasta, you might be able to pick up TV stations in San Francisco more than 300 miles away. The only way to do it for sure is to go to a distant city and tape-record programs and then take the tapes home and play them back through your TV set. Seriously, long distance TV reception, except via a space satellite, is not intended. The same channels are in use in several cities and long distance transmission would cause interference.

Silent TV

How can I add two headphone jacks to my TV set? I would like to use both headphones at the same time or either one individually.

—*W. G. S., West Chester, Pennsylvania*

Add a SPDT toggle switch (S), a 10-ohm, 2-watt resistor (R), and two open-circuit phone jacks (J1 and J2), break one side of the speaker circuit as indicated at X, and wire the parts as shown in the diagram. When S is set to OFF, the speaker is disconnected and the resistor is connected in its place. Plug in a low-impedance (6-8-ohm) headset into either jack or two into both jacks. If one lead to the speaker voice coil is grounded to the speaker frame, break the ungrounded lead (X). Mount the switch and jacks on the insulated rear cover, not the TV set chassis.



SOS in QRM

Doesn't the Coast Guard and the FCC have a monitoring device to listen in on 2182 kHz, the distress frequency? They should do so on weekends when boat owners are calling for help. So many boat owners talk back and forth on that channel and, when told to get off, they don't. There should be a $500 fine and their licenses should be taken away for using that frequency for other than safety and calling. Why don't you publish a list of all Coast Guard, ship, fire and police, aircraft, taxi, pleasure boat, CB and amateur stations?

—*T. M., Red Bank, New Jersey*

The Coast Guard does monitor 2182 kHz (kc), at all times. You are right about taking action against boaters who use 2182 kHz for gabbing. Many boat owners act as if they were CB hobbyists, monopolizing the channel that is used even by ocean liners for safety purposes. Smart boat owners are installing VHF-FM marine radios because the VHF marine channels are not congested.

It is impractical to publish a list of all non-broadcast stations since there are hundreds of thousands of them and it would require several volumes. You can get amateur call books at radio parts distributors. CB call books are available from Communications Publishing Corp., Box 63992, Oklahoma City, Okla. 73106.

Be Specific

Can you give me a schematic for a transistorized antenna amplifier?

—*J. B. H., Petaluma, California*

For what frequency band?

Schematic Found

One of your readers asked for a circuit of an Atwater Kent Model 20 receiver. Years ago I purchased two "Official Radio Service Manuals" (published by Gernsback) from a service man who was in the business during the late '20's and the early '30's. I find there are two Model 20's, the compact 7960 for headphones only and the 4640 for use with a loudspeaker. I would be glad to let you have copies of the diagrams.

—*H. W., Manitowoc, Wisconsin*

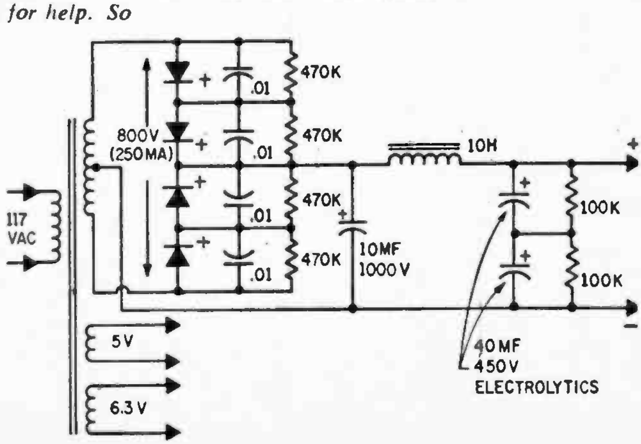
If you will loan us the diagram for publication, we will be grateful and will return it to you.

Xmitter B-plus

Please give a schematic of an economical power supply delivering 400-500 volts at 200 milliamps for a 75-watt transmitter.

—*L. M., Yonkers, N. Y.*

Try the circuit shown in the diagram. Pick rectifier diodes with high PIV.



BFO for SSB

I have a Lafayette HA63 receiver. It is possible to convert it so I can receive SSB signals? I like the radio but would like it more if I could get SSB.

—*E. S. G., Detroit, Michigan*

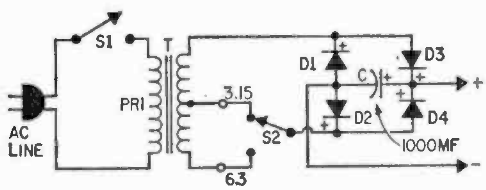
Get a Lafayette Beat Bander, a BFO that can be used externally with almost any shortwave receiver. The device furnishes the missing carrier to make it possible to receive SSB signals.

Small Power Supply

Can you give me a circuit of an AC-to-DC power supply capable of delivering 3 to 5 volts at 20 to 25 ma?

A. B. P., Philadelphia, Pennsylvania.

You can use a 6.3-volt filament transformer (T1) and four garden-variety silicon rectifiers connected in a full-wave bridge circuit as shown in the diagram. Switch S2 lets you select either full voltage (excess of 6) or half voltage. The actual voltage depends upon load current. Capacitor C filters out the ripple.



Beginner's Special Query

Can a ferrite-rod or a telescoping antenna be used for the "Beginner's Special" solid-state regen instead of the 10-15 foot long-wire antenna specified? Transistor radios use ferrite rod antennas, so can't the regen? Can I make mine truly portable?

—*D. Y. N., San Diego, Calif.*

The ferrite-rod antenna coil would have to be used in a plastic case instead of the aluminum chassis box specified. It will probably be suitable for some of the strong local stations. The telescoping antenna used with the ferrite coil might give you just about the same reception as with the longer (15-foot) antenna if you use a coil with the highest "Q" (figure of merit) you can find—just make sure it will match the capacitor used or you might not be able to cover the broadcast band.

Easy on the Ears

Can I use stereo headphones with my shortwave receiver so they will be rubber-foam padded for comfort?

—*T. M., Red Bank, New Jersey*

You can get similar phones in mono, such as Superex.

Ask Me Another

Who Knows

What are the relative advantages of pancake versus cylindrical wound metal locator coils?

—H. P. W., Wichita Falls, Texas

Perhaps some reader who has had experience with both will write and tell us.

SCA Construction

In regard to your article on SCA background music, will you publish a schematic so I can build a SCA detector?

—C. L. Lownsbury, Somewhere, U.S.A.

Watch a future issue for a construction article.

That's Not Right

I have a Knight Star Roamer on which I get radio and TV instead of shortwave. What can I do about it?

—J. S., Denver, Colorado

You must be very close to BCB and TV stations. Try a shorter antenna. Nevertheless, you should be able to receive shortwave stations between the spurious responses from nearby stations.

Transistor Ignition Info.

Where can I get a lot of information on transistor ignition systems?

—D. I. J., Sainte-Genevieve, Missouri

Get a copy of "Transistor Ignition Systems Handbook" at your radio parts store. Publisher is Sams and price is $2.95.

What's SHF?

When wading through old magazines I ran across the term SHF. Is it or isn't it real and, if it is, what are its frequency and applications?

—R. D. L., Parchment, Michigan

SHF means Super-High Frequency. It is the portion of the radio spectrum above UHF and extends from 3000 to 30,000 MHz (mc). Most microwave systems and radars operate in the SHF bands.

Hurray for Leo!

My CB transceiver has channel numbers one through eight and tuning numbers one through 23. Please translate the numbers for me in terms of megacycles.

—A. K. G., Wisner, Nebraska

The channel numbers refer to the channels for which the transceiver has crystals installed. Channel 1 could be any channel. So could Channel 2, and so on. The tuning dial refers to the CB channels, originally numbered as below by Leo G. Sands in his book "Class D Citizens Radio." Since then, the industry has adopted the same channel numbering system which is listed below.

Channel Number	*Frequency (mc)*
1	26.965
2	26.975
3	26.985
4	27.005
5	27.015
6	27.025
7	27.035
8	27.055
9	27.065
10	27.075
11	27.085
12	27.105
13	27.115
14	27.125
15	27.135
16	27.155
17	27.165
18	27.175
19	27.185
20	27.205
21	27.215
22	27.225
23	27.255

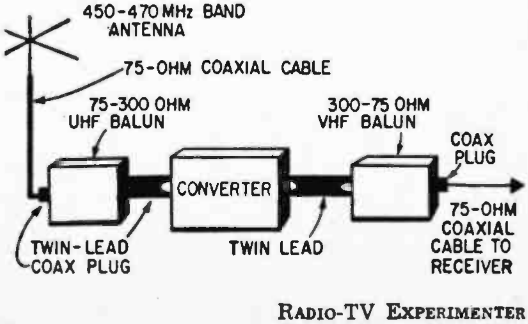
Converting Converter

How can I convert a UHF TV tuner so I can use it with a 150-174 MHz (mc) band receiver for tuning in 450-470 MHz band mobile stations?

K. W., Chicago, Illinois.

Add a slight amount of capacitance (a few mmf) across the oscillator tank until it tunes down below 470 MHz. To connect its output to your receiver, use a 300-to-75-ohm matching transformer (balun) as shown in the diagram. The impedance match into your receiver won't be perfect, but it is suitable for such an inadequate set-up.

You will also need an outdoor (rooftop) 450-470 MHz band antenna. You can get one from Mark Products in Skokie near you. The UHF balun is also required, as shown. Here again, you may have some mismatch since most communications antennas are 50 ohms.



Not Impossible—Not Easy

Is there any way I can convert my Lafayette HE-15 to operate in the 6-meter ham band?

—P. D., Woodhull, New York

You can take turns off the receiver antenna, mixer and oscillator coils and the transmitter RF amplifier output coils, or select new coils from the J. W. Miller Co. catalog (5917 South Main Street, Los Angeles, California 90035). Operate the RF amplifier as a doubler, using crystals operating at half the output frequency. Use a dip meter to determine when the coil turns are correct. This would make a good construction project article. How about a reader writing one?

It Is! It Is!

How can I change the circuit of the Test Bench Power Supply (Aug.-Sept. 1966 issue) to also have variable amperage?

—No name, Mesa, Arizona

The amperage is variable since the current depends upon voltage and load resistance ($I = E/R$).

Solid-State UHF Converter

Is there such a thing as a transistorized UHF converter for TV?

—J. J. McC., Cambridge, Mass.

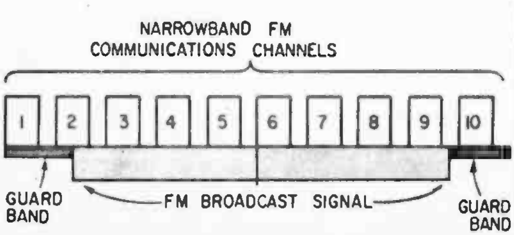
The Blonder Tongue BTD-44 is solid state and sells for less than $15.00. Your Boston parts distributors should have them available.

Never The Twain Shall Meet

Is it feasible to modify a standard portable FM radio for receiving the 30-50 mc or 150-174 mc band?

—P. H., Ukiah, California.

While you could modify the front end (mixer, oscillator, RF), the IF amplifier would be too broad and you would have trouble separating land mobile stations, several of which would fit into the 200 kHz (kc) or wider band pass of the receiver. FM broadcast stations employ wide band FM with ±75 kHz deviation whereas communications stations mostly use only ± 5 kHz deviation. While both are FM, they are quite different.

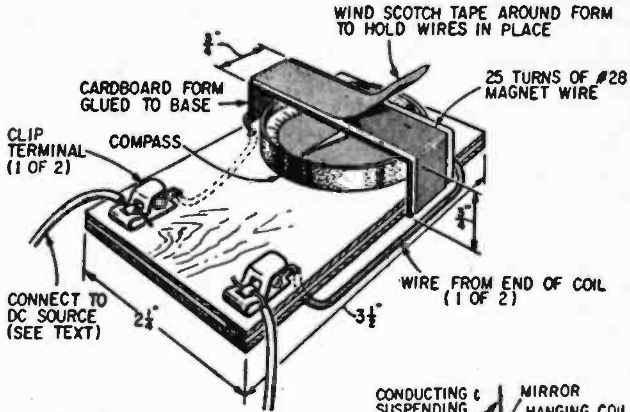


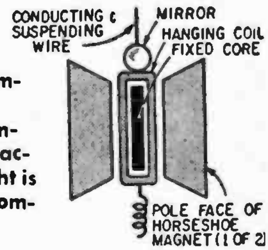
COMPASS GALVANOMETER

by T. A. BLANCHARD

Many electrical measuring instruments today are based on the design of the d'Arsonval *String Galvanometer,* but substitute a needle-suspended coil riding on jeweled bearings for the hanging coil employed in the original precise lab instrument.

The galvanometer is not often used to measure quantity of current flowing in a circuit, but rather to indicate the polarity and presence of small currents by comparison to null methods. The compass galvanometer (made from the illustration at right) can be used with a Wheatstone bridge to indicate null points.





Easy to build, the compass galvanometer (above) can be assembled in an hour at practically no cost. At right is hanging coil galvanometer used in labs.

The d'Arsonval instrument suspends a small coil between the pole faces of a permanent *horseshoe* magnet. When a current flows through the coil it becomes an electromagnet and its *like* poles repel the *like* poles of the horseshoe magnet, thus causing the coil to turn on the connecting wire. The strength of the current through the coil determines the extent of the coil's rotation.

A small pointer attached to the moving coil registers on a curved dial, or a tiny mirror is attached to the galvanometer string. A beam of light is aimed at the mirror, bouncing the beam off to a wall screen or chart to give great magnification of tiny current changes in a darkened room.

Making A Simple Galvanometer. A small amount of insulated magnet wire, any Boy Scout pocket compass and a 2¼ x 3½-in. scrap of plywood is what you need to make the compass galvanometer. Cut a strip of cardboard ¾-in. wide and 3¾-in. long. Score the cardboard ¾ in. from each end, with a dull knife blade and crease so the cardboard form resembles a C or bridge shape. Now glue the cardboard to the edges of the wood base. Do not use tacks!

Bind the cardboard with a rubber band until glue or cement dries. Wind 25 turns of #28 magnet wire around the cardboard. Heavier wire and fewer turns will work, too, with a slight drop-off in sensitivity.

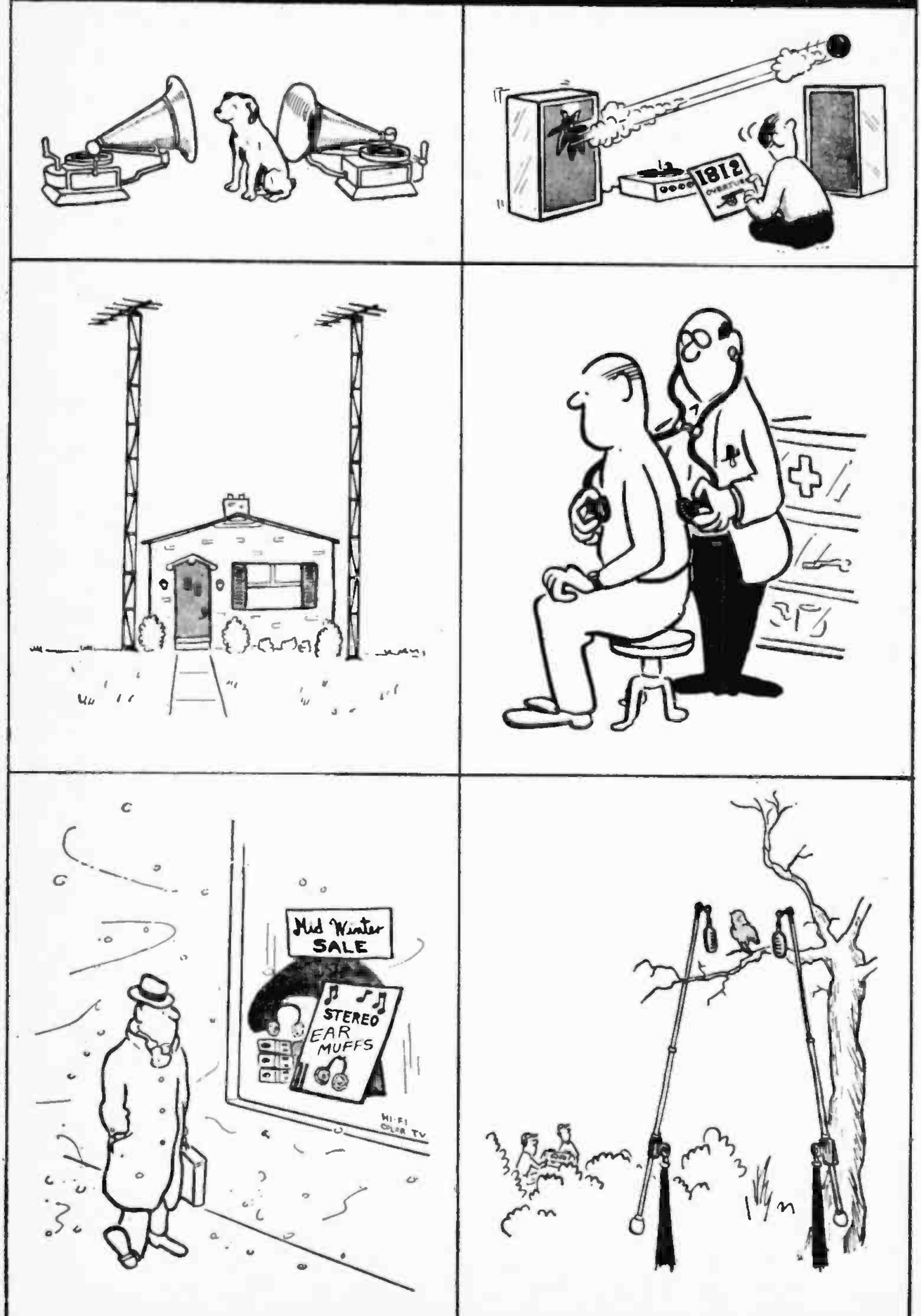
Scotch tape is wound around the finished coil to keep the wire turns in place. Connect the ends of the coil to screw terminals or clips. Slip the compass under the coil in a position where its needle comes under the coil and parallel to the coil turns.

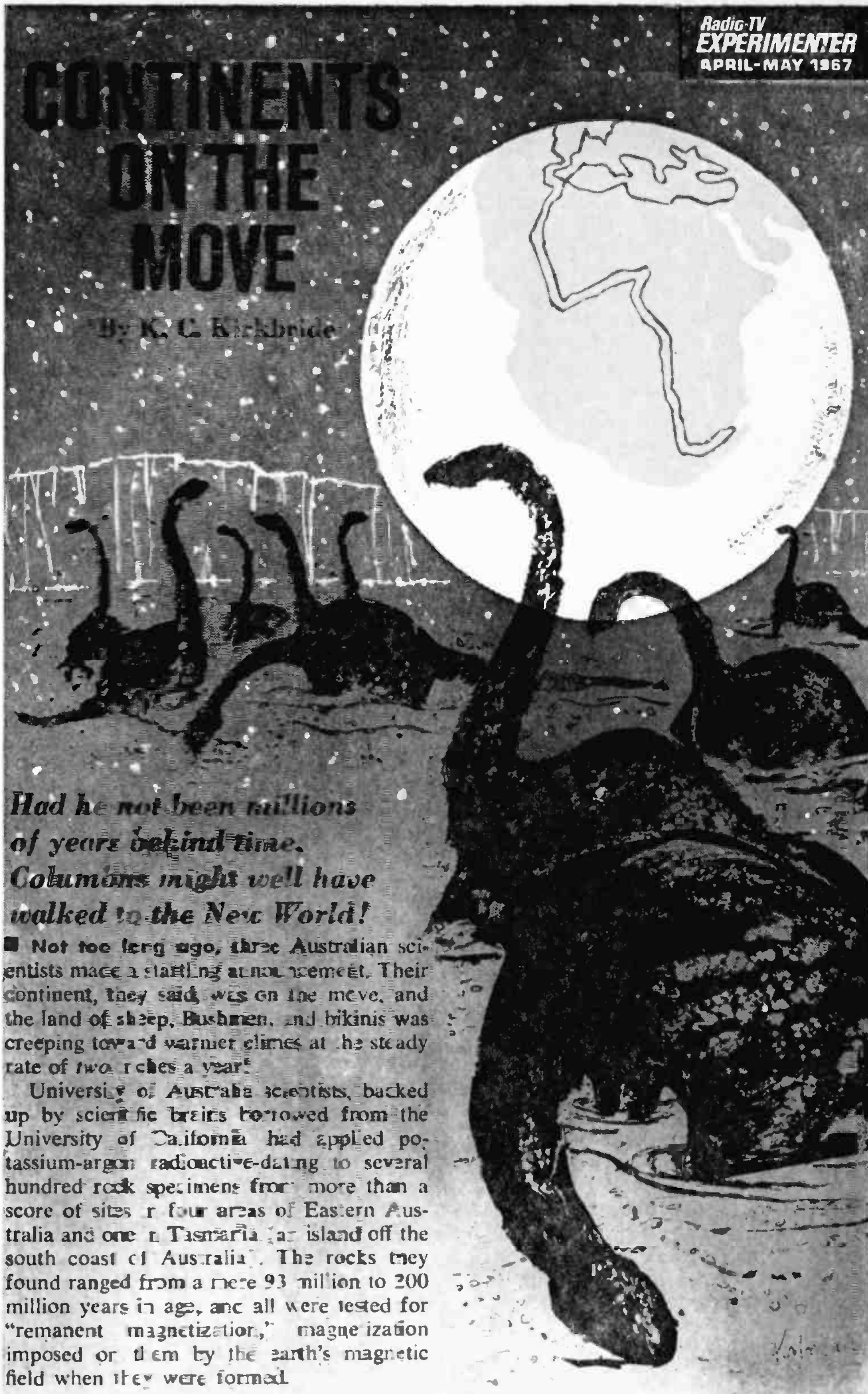
Connect the galvanometer in series with a flashlight battery and bulb, a buzzer or a toy motor, etc. When the circuit is closed, the compass needle will be drawn so that it is at right angles to the coil. A slow swing of the needle indicates the circuit is drawing little current. A rapid swing denotes an increase in current flow.

To show how sensitive this simple galvanometer is, connect what appears to be a dead flashlight cell across the terminals, immediately breaking the circuit. The compass needle will spin at a merry clip, indicating there is still some life in the "dead" cell. ■

STEREOƎЯƎTƧ

By
Jack Schmidt





CONTINENTS ON THE MOVE

By K. C. Kirkbride

Had he not been millions of years behind time, Columbus might well have walked to the New World!

■ **Not too long ago, three Australian sci-**entists made a startling announcement. Their continent, they said, was on the move, and the land of sheep, Bushmen, and bikinis was creeping toward warmer climes at the steady rate of *two* inches a year!

University of Australia scientists, backed up by scientific brains borrowed from the University of California had applied potassium-argon radioactive-dating to several hundred rock specimens from more than a score of sites in four areas of Eastern Australia and one in Tasmania (an island off the south coast of Australia). The rocks they found ranged from a mere 93 million to 200 million years in age, and all were tested for "remanent magnetization," magnetization imposed on them by the earth's magnetic field when they were formed.

CONTINENTS

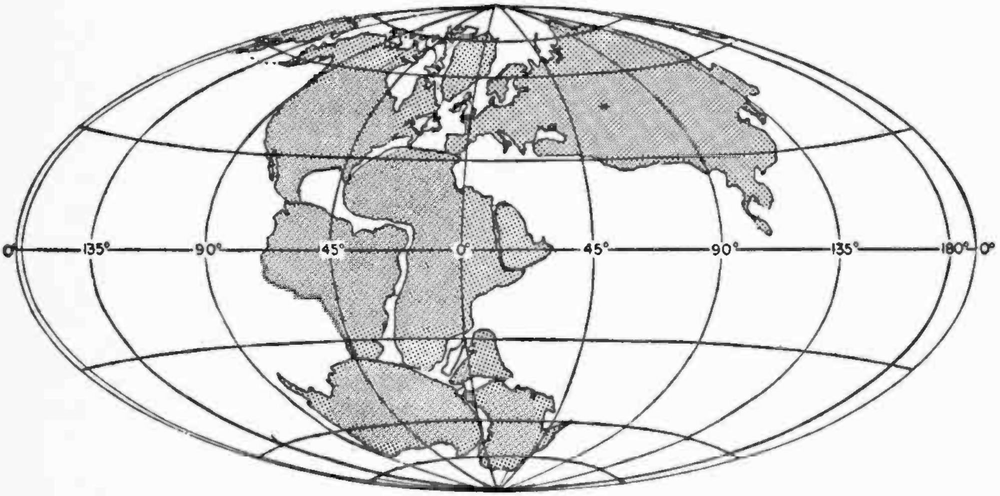
The result of their extensive testing convinced the Australian scientists that their country was not only on the move, but had been for a long time. In fact, it had traveled *3400 miles* in the past 100 million years.

According to the rock testimony, Australia at one time must have been a shivery continent close to the South Pole. Packing two feet of ice aboard, it had slowly inched its way to its new address in the balmy waters of the Pacific and Indian Oceans. And it apparently doesn't intend to stop there.

For almost from the time man could turn a globe around he has puzzled over the fact that South American shores could be pushed up against West African shores with virtually perfect jigsaw fit. The obvious question many have asked: had these continents once been linked?

As long ago as 1620 Francis Bacon suggested the answer was yes. An Austrian geologist named Edouard Suess who lived in the 19th Century thought there could have been a great super-continent about the time of the Paleozoic Age, and named it *Gondwanaland*.

But not until 1912 did German meteorologist Alfred Wegener gather geological evidence enough to present a serious case



Reconstruction shows continents as they probably were during the age of dinosaurs, flying reptiles, and early mammals about 200 million years ago. It was during this time, the mid-Mesozoic period, that continental drift occurred due to spreading from mid-ocean ridges.

When they wrote up their findings in the Journal of Geological Studies of Australia, the scientists explained they had arrived at their conclusions because their extensive research could lead to only one of two answers. Either the earth had boasted some pretty mixed-up magnetic fields (with more than two poles) at some time or other, or Australia had traveled a long way.

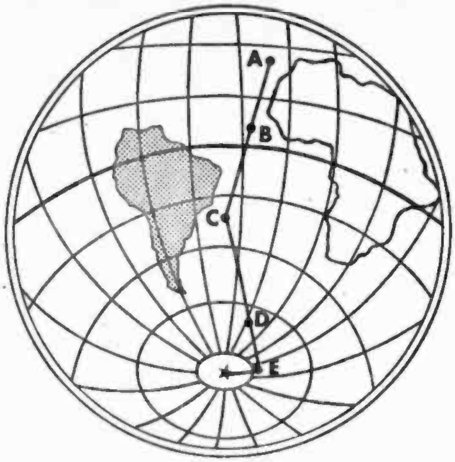
The Great Jigsaw. All of which stirred an old controversy. Had there really been, as many scientists claim, a great super-continent that stretched across the South Pole millions of years ago, a one-world continent surrounded by a single ocean? And had it been broken up by some action of nature, its sections to drift apart to form the continents we know now?

for the fact that once there had been such a continent, that it had broken into pieces and shifted to various parts of the earth. In a best-seller of his time, Wegener argued that if the earth could "flow" vertically as we know it does in the formation of mountains, why could it not flow laterally?

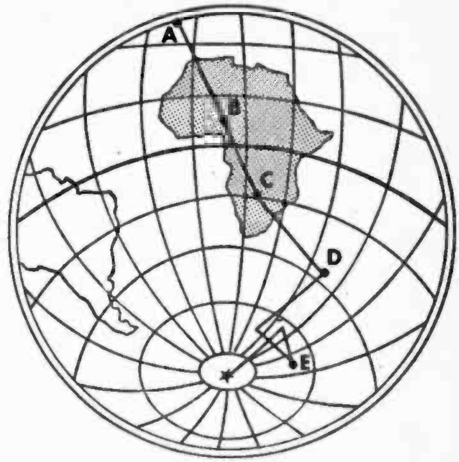
Wegener pointed to the Aspy Fault in Nova Scotia, which he said could be an extension of the Great Glen Fault in Scotland. Similarities existed in mountain ranges in Newfoundland and Scotland. And if you wanted to "move" North America over toward Europe, you could see a good fit between formations of the Appalachians on the east coast of the U.S., and the highlands of Scotland and even Scandinavia.

What's more, fossil remains found in the

POLAR WANDERING CURVES FOR SOUTH AMERICA AND AFRICA THROUGH THE AGES

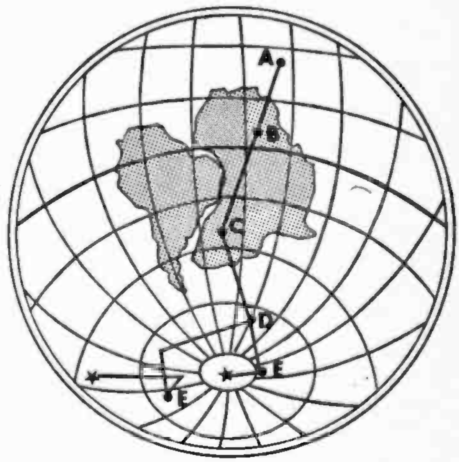


1. Polar Wandering Curve for South America



2. Polar Wandering Curve for Africa

As rocks formed from sediment, small particles of iron were locked into place. Each particle was aligned by the north-south magnetic pole field forces, much like the particles found in magnetic tape. From these "locked" particles scientists can pinpoint the south pole location millions of years ago. Called paleo-magnetic reconstruction, the study of rockbound particles reveals polar wanderings through the ages for South America (1) and Africa (2). The letters in the diagrams refer to the ages of the rocks from which the polar wandering curves were deduced: A, 400 million; B, 330 million; C, 250 million; D, 200 million; and E, 170 million years ago. By superimposing the curves in (1) and (2) on each other, scientists found the position of Africa relative to South America (3) for the interval between 400 and 200 million years ago. Note that the older parts of the curves in (1) and (2) coincide in (3) at points A through D. When the pole wandered during these ancient times, Africa and South America were one large land mass. From 200 million years ago to today, the mated continents have drifted apart, which explains why the polar drifting curves in (3) do not match from point D to the present day (★).



3. Location of Africa and South America 200-400 million years ago

South American Andes and in Western Africa of both plants and animals were so similar they could have grown side by side in the same age. And one 18-ft.-long swimming reptile, the Mesosaurus, had twin brothers in South America and West Africa and no other relatives in the world.

Disbelievers. But for all this imposing evidence, the status-quo thinkers were still not convinced. The earth had once been a huge flaming ball, they said. And then it had cooled. And its contractions had fathered the mountain ranges, but the continents were fixed now. And the oceans stayed in place. Besides, there wasn't any power on earth that could push a continent around.

But advances in radioactive probing soon proved the earth a bit more complicated than the traditionalists held. For one thing, it was old, some 4.5 billion years. For an-

CONTINENTS

other, the cooling hasn't stopped at all. Quite the contrary, heat is still being generated from within the earth!

And much as water slowly simmers in a pan, convection currents could account for some of the motions of our crust. For the transfer of heat flowing from the earth's inner layers through the conductive material of the upper layers could cause the stress and strain known on the surface.

The Big Shift. One theory has it that the top consists of 40-50 miles of granitic solids. Resting on other layers that are hot plastic, this top layer can shift, sheer, and slide as forces command. And it can be this slow, continual churning that causes volcanic action and earthquakes. Millions of years ago, it could also have caused the earth's top layer to break, setting the continents adrift.

With this explanation, it was easier to picture the earth's crust at one time, angered by two giant heat engines—the sun above, the earth below—breaking first into mammoth cracks and pieces and then setting a massive continent adrift.

But still the scientists argued. Some geologists insisted that research into earthquake phenomena had shown the earth must be steady-state. And almost every geological convention from 1915 on went on record as having taken its own crack at the drift/anti-drift debate.

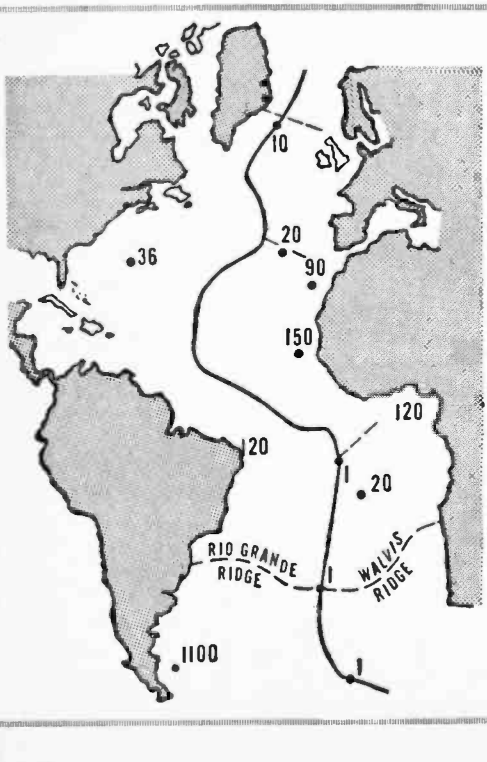
Then Dr. J. Tuzo Wilson of the Institute of Earth Science at the University of Toronto flatly came out for the "drifters." He said evidence clearly showed "great horizontal displacements" had broken the earth's crust. There were three ways he could tell:

1. Measurement of the magnetism of rocks found on various continents showed the continents must have moved in relation to the earth's magnetic poles.

2. Huge faults, cleavages in the earth's crust, seemed to have drifted tens, even hundreds of miles in their time. The great cliff in the floor of the Eastern Pacific must have shifted as much as 750 miles, if his magnetic studies were right.

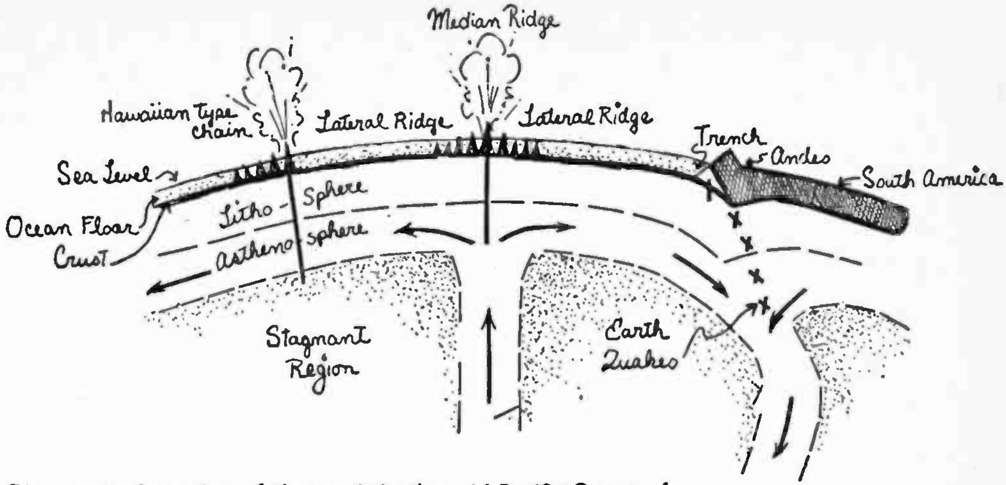
3. The islands in the oceans seemed to get older the farther they were from mid-ocean ridges.

Crack! Besides, it stood to reason that if the continents separated at one time, there should be ridges in the ocean's floor to mark where they had cracked, and these ridges



THE BIRTH OF AN OCEAN

The Atlantic Ocean did not exist 200 million years ago. It was born when the continents which now comprise the old and new worlds separated along a median ridge (solid line). Since new material belched forth from the earth to fill the void on the floor of the ocean, the volcanic islands in the Atlantic are younger than the ocean (numerals on the map indicate island ages in millions of years). Note that islands are older the further they are from the median ridge. The dashed lines indicate lateral ridges whose ends would match points on opposite continents that were previously joined. Since the island mass off the tip of South America is older than the Atlantic Ocean, it must be part of the continent that broke free during the past 200 million years. The solid dots on the map indicate islands which have active volcanoes.



Diagrammatic section of the earth in the mid-Pacific Ocean offers clues to the origin of pairs of lateral ridges, median ridge, Hawaiian-type chain and mountains. Heat from the center of the earth brings material up to a weak point in the earth's surface, pushing hot lava outward. The weak point is the median ridge (see drawing and caption at bottom of previous page). As the ocean floor moves away from the median ridge, a chain of volcanic peaks is formed, creating the lateral ridges on either side of the median ridge. A long time ago, a volcano at the median ridge remained active as it drifted westward, thus forming the Hawaiian chain. Note, no peaks are to the east of this chain. As the ocean floor bumps against the South American continent, it flows downward. When it does, the continent is suppressed on its west shore and the Andes are pushed upward to form a tall mountain chain. The earthquake region along the coast is thought to be a result of the continent snapping back into place as the ocean floor tries to push it down.

should follow the continents' shorelines.

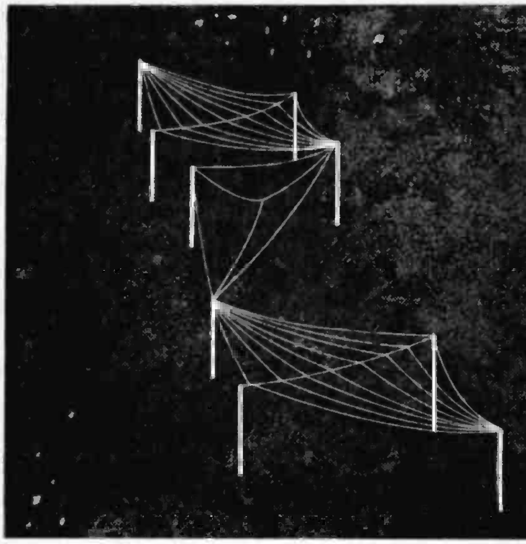
Tracing a ridge between Europe and North America that follows much the same jigsaw pattern of the shorelines between North America and Europe was comparatively simple. So was tracing the ridge between West Africa and South America. But it took a survey of the Indian Ocean to trace the breaking lines between the four continents of Africa, Asia, Australia, and Antarctica.

Leading proponent of the continental drift theory is Dr. J. Tuzo Wilson (center) of the Institute of Earth Science, University of Toronto. Here, Prof. Wilson discusses the once-controversial concept with two other members of his staff: Gordon West (left) and Fraser Grant.

Three such ridges have been traced and a fourth is believed to exist. Clear ridges show between Antarctica and Australia, India and Africa. Some scientists even believe that as India moved northward, it collided with the Asian land mass, *throwing up* the Himalayan mountains!

Wilson believes the rifting began millions of years ago with a crack that slowly broke North America from Europe, separating in a triangular shape forming Greenland. To the South, the rifting continued, next separating Africa from Antarctica, then spreading diagonally across what is now the Indian Ocean.

As Africa and India moved northward, they separated from Australia as well as Antarctica. And then in another sixty million years, the convection churning opened a northwesterly diagonal that separated Africa from India, and Australia from Antarctica. *(Continued on page 120)*



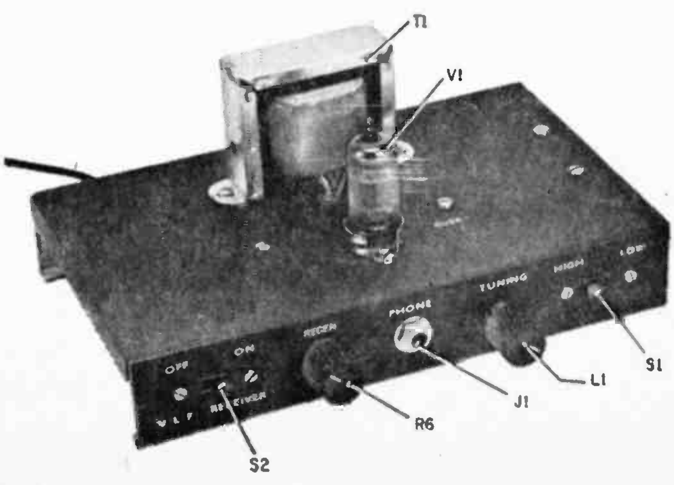
build our 1-TUBE BOTTOM SCRAPER

Here's a one-tube receiver project that has been designed especially for eavesdropping on the Navy's super-powered CW stations that operate in the vicinity of 20 kHz(kc). Whether you're interested in high-speed code practice with 5-letter cipher groups, want to copy the latest news flashes in plain English, or merely want to set your watch by good ol' Naval Observatory time signals, it will pay you to have a receiver that tunes to the fantastically-long wavelengths in the neighborhood of 15,000 meters.

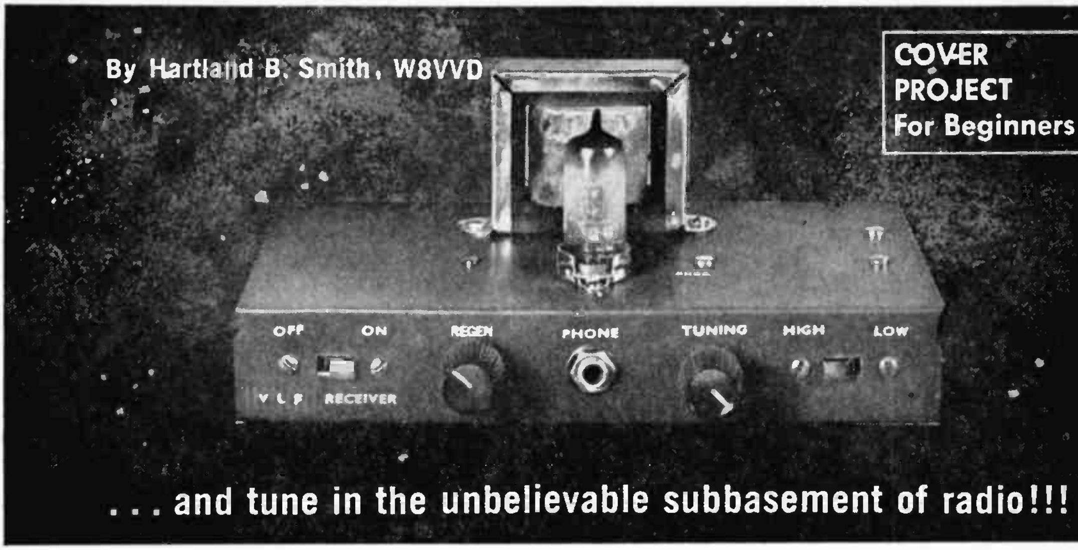
Just think of it, a half wave antenna for this range is almost 5-miles long! Of course you won't need one that long to pick up signals satisfactorily. In Michigan, where the author lives, a hundred feet of wire and a good ground provide excellent reception, day or night, of NAA in Maine; NSS, Maryland; and NPG on the west coast. As a matter of fact, that's why Uncle Sam uses such long waves. They offer consistently good reception all over the world so that even submerged nuclear subs on the other side of the globe can get their latest orders without difficulty.

About The Circuit. The receiver consists of a regenerative detector that tunes from 13 to 28 kHz plus a single stage of audio amplification. A self-contained power supply furnishes DC for the tube.

You tune to different VLF stations by varying the position of the slug in L1, a TV horizontal-oscillator coil which is paralleled



Bottom Scraper was built on chassis without panel or cabinet. If you want a more impressive receiver, unit can be housed in a small sloping-front enclosure.



by C1. An extra capacitor, C2, may be switched across coil L1 to provide sufficient tuning range—to cover the entire band from 13 to 28 kHz. Schematic diagram is located on page 49.

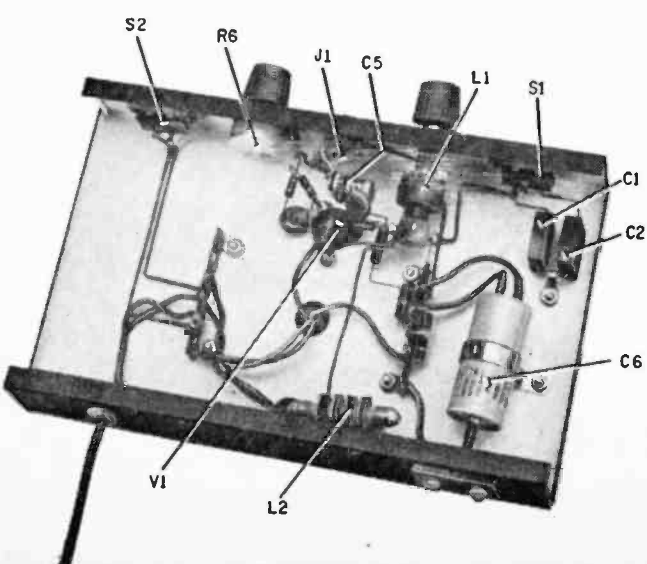
In the antenna circuit, choke L2 passes very-low frequencies, but offers a high impedance to strong local broadcast signals. It prevents them from reaching the grid of V1A where they would be detected and cause unwanted interference.

Potentiometer R6 is the regeneration control which varies the screen voltage of V1A. When this voltage is set at the proper level, V1A oscillates to provide the beat note required for reception of CW signals.

The detector's output is coupled, via C4, to the grid of V1B where the audio signal is amplified. The plate circuit of this stage is capacitance-coupled to high-impedance headphones plugged into J1.

The half-wave rectifier power supply furnishes approximately 150-volts DC to the plates of tube V1. The filament winding of transformer T1 supplies 6.3 volts AC for the heater.

Construction. Most articles tell you to carefully follow the layout of the original and to avoid parts substitutions. This receiver is different. You can employ just about any layout that suits your fancy, without degrading the performance of the set. As a matter of fact, the short, direct leads usually required in RF circuits are of little



Bottom view of chassis of Bottom Scraper shows there is plenty of room, so smaller chassis could be used without affecting operation. Other frequencies below 540 kHz can be tuned if additional capacitors are switched by a multi-position S1.

Bottom Scraper

consequence in a unit that operates at or near the audio frequency range.

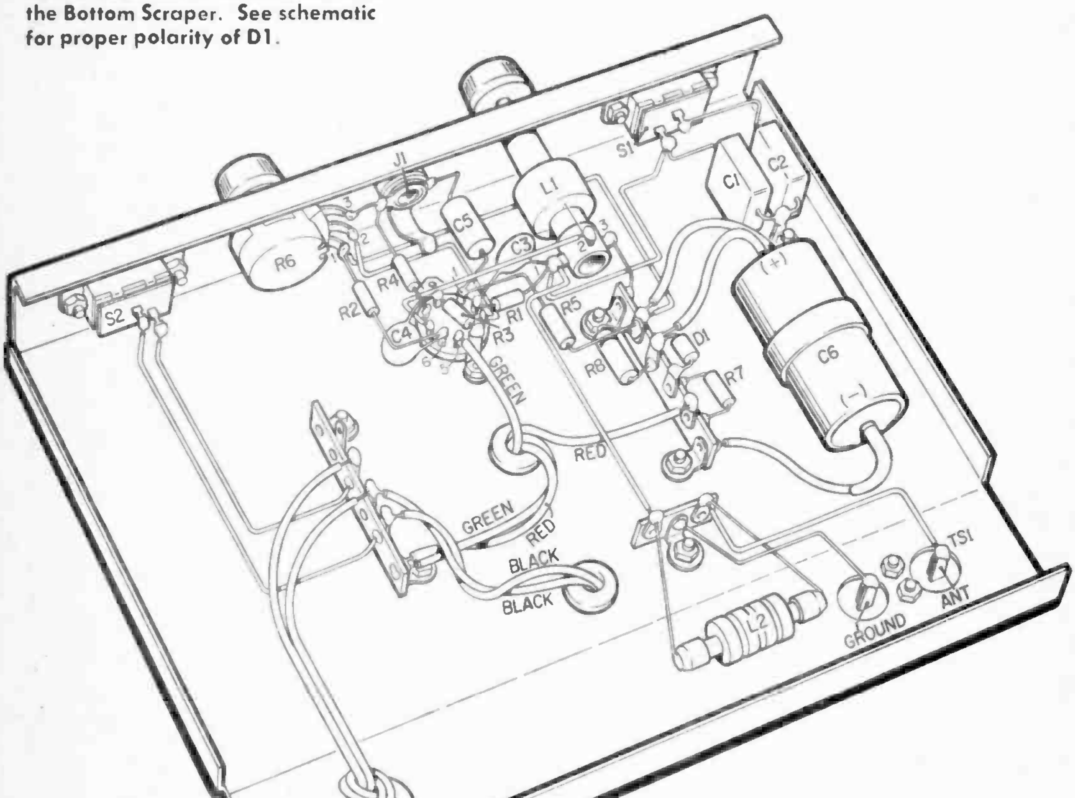
With the exception of L1, C1, and C2, component values may vary by as much as 50% from the figures specified, with little or no effect on the receiver's operation. As a result, this gadget is a natural for construction from junk box parts.

The threaded brass adjustment shaft of L1 is too small to accept knobs designed for ¼-in. shafts. A short length of plastic rod or wooden dowel is cemented over the end of the shaft so that an ordinary knob can be fastened to it. Since L1 was not designed by the manufacturer for constant tuning, it will pay you to apply a small amount of Lubriplate or Vaseline to the threads in order to minimize friction and wear.

Operation. Attach an antenna at least a hundred feet long to the ANT terminal of TS1 and a good cold-water pipe ground to the other terminal. Screw the slug of L1 fully counterclockwise (all the way out of the coil) and open S1 (*HIGH* setting). Plug a pair of headphones into J1 and turn S2 *on*.

After V1 has warmed up for a minute or two, advance R6 until you hear a hissing noise in the phones, which denotes that V1A is oscillating. Slowly turn the knob of L1

Pictorial diagram can be used by the beginner to successfully wire the Bottom Scraper. See schematic for proper polarity of D1.



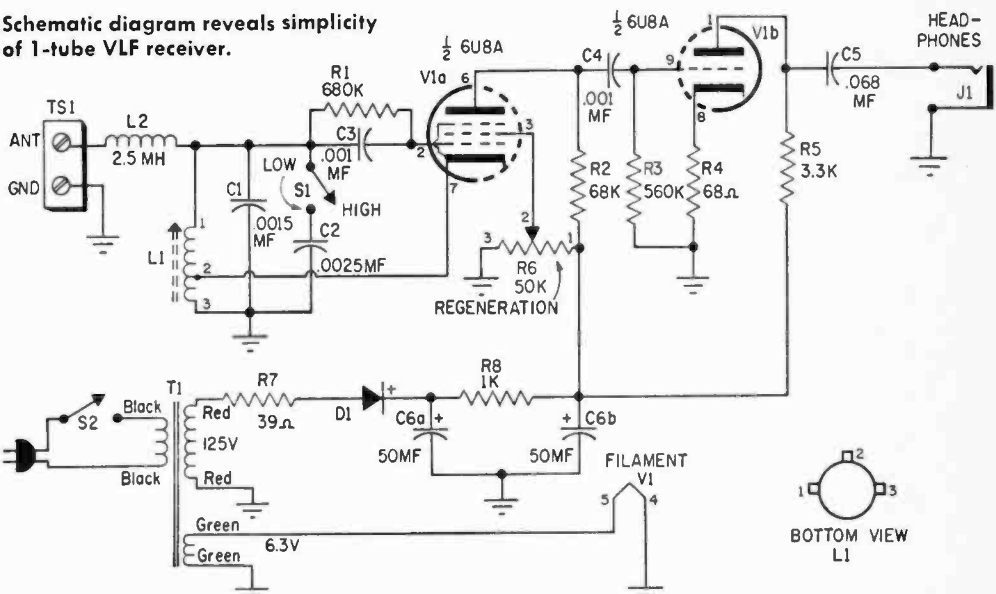
clockwise. As you do this, you should hear two or three different CW stations. Peak L1 and R6 for optimum reception of the desired signal. A regenerative receiver isn't very selective, so don't be surprised if you can hear the other stations faintly in the background when you are tuned to a signal.

With S1 open, the tuning range is approximately 20 to 28 kHz. With it closed, the range is 13 to 20 kHz. You'll hear a whistle when the slug is all the way into L1 and S2 is closed. This is because the detector is actually oscillating at 13 kHz, a frequency which all but the oldest fogeys are easily capable of hearing.

Back the slug out a bit and the whistle will disappear. NAA, the lowest-frequency signal you'll pick up, operates just beyond the audible range. Therefore, the oscillation produced by the detector at this frequency won't bother you—at least not unless you have the supersensitive ears of an Airedale or Dachshund. (For a listing of other VLF stations you can hear on the Bottom Scraper, see "A Guide to VLF Listening" beginning on the next page.)

For best results, always operate the receiver with R6 set close to the point where oscillation just commences. Advancing the regeneration control too far will not only reduce sensitivity, but may even cause the oscillator to take off at an audio rate, producing an uncomfortably loud howl in the headphones. ■

Schematic diagram reveals simplicity of 1-tube VLF receiver.



LONG-WAVE RECEIVER PARTS LIST

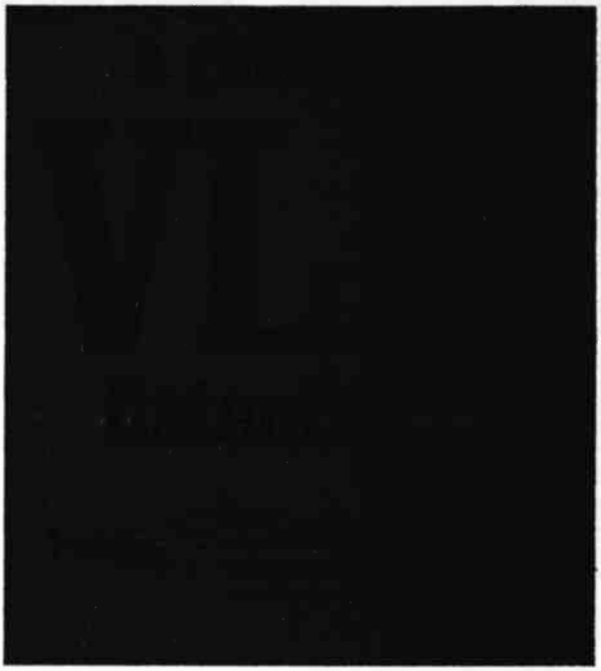
- C1—.0015-mf. silver mica capacitor
- C2—.0025-mf. silver mica capacitor
- C3, C4—.001-mf. ceramic disc capacitor
- C5—.068-mf., 200-volt tubular capacitor
- C6—50-, 50-mf., 150-volt dual electrolytic capacitor
- D1—500-ma., 400-piv., silicon diode rectifier (IN2070 or equiv.)
- J1—Open circuit phone jack
- L1—16-42 millihenry TV horizontal-oscillator coil (J. W. Miller 6211 or equiv.)
- L2—2.5 mh. RF choke
- R1—680,000-ohm, ½-watt resistor
- R2—68,000-ohm, ½-watt resistor
- R3—560,000-ohm, ½-watt resistor
- R4—68-ohm, ½-watt resistor
- R5—3300-ohm, 1-watt resistor
- R6—50,000-ohm linear taper potentiometer
- R7—39-ohm, ½-watt resistor
- R8—1000-ohm, 1-watt resistor
- S1, S2—S.p.s.t. slide switch
- T1—Power Transformer. Pri.: 117 volt, 60 Hz; Sec.: 125 volt, 50 ma.; 6.3-volt, 2-amp (Knight 54A1411 or equiv.)
- TS1—2-screw terminal strip
- V1—6U8A tube
- 2—4-terminal insulated tie strips
- 2—Knobs
- 1—9x5½x1½-inch aluminum chassis
- 1—9-prong miniature tube socket
- Misc.—Solder lugs, wire, solder, 6-32 machine screws and nuts, power cord and plug, rubber grommets, etc.

Estimated cost:	$14.00
Construction time:	3 hours

■ Each year finds thousands of bespectacled radio engineers tinkering and fussing in an effort to roll back the upper frontiers of the usable radio spectrum. Before World War II, microwaves were little more than a dream. But by the postwar years the art of radio had extended way up into the megaHertz. Today, we have stretched the radio spectrum so high in frequency that transmitted waves have taken on weird science-fiction aspects—so much so, in fact, that such words as "lasers," "death rays," "klystrons" and "magnetrons" are now commonplace as cornball comedians. For the truth is that SHF and EHF (super and extra high frequencies) have largely been conquered with the help of computers, sophisticated equipment, high-powered talent, and large doses of cash.

Lost in the shuffle to expand radio's glamorous high-frequency frontier is the possibly more fascinating work being done to locate the bottom end of the radio spectrum. If progress is a true measure of the stiffness of a challenge, then the VLF (very low frequency) researchers are having a much tougher time of it than the fellows working with microwaves. Each step of progress in the microwave spectrum is measured in thousands of megaHertz (a megaHertz being a million Hertz or cycles), and new barriers are broken every few years. At the low frequency end, things stand only a few kiloHertz below where they were fully 40 years ago.

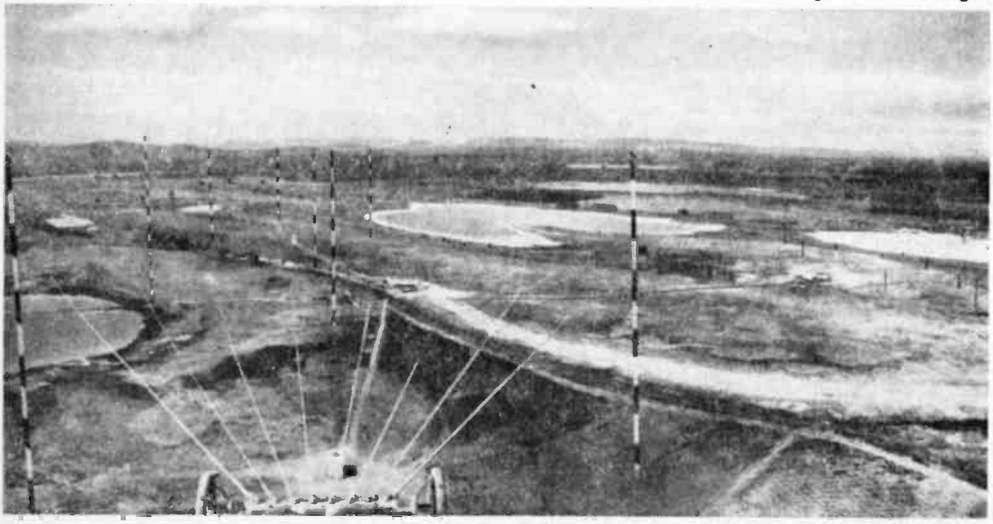
Yet that low-frequency limit is keeping many people busy on a round-the-clock schedule—and they're studying more than

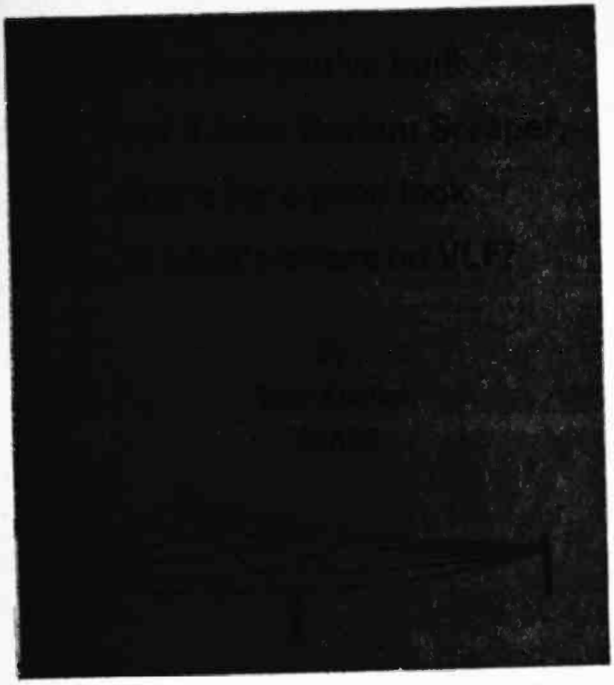


just the frontier itself. In fact, they're researching all manner of strange (and often unexplained) radio sounds and signals which mysteriously appear in their receivers.

And just as "laser" and "klystron" can be considered bywords of EHF, VLF, too, has its own special parlance, each word being a description of some of the strange sounds to be heard: "whistlers," "the hiss," "risers," "clicks," "chinks," "tweak," "and the "dawn chorus." (Whistlers are generated on earth by lightning; some of the other signals are

NBS antenna farm at the Fort Collins, Colo. site. Tallest mast is a towering 470 feet high.





heard only during a nuclear explosion or rocket launching; still others have left researchers scratching their heads in wonderment. One theory even has it that some sounds might be caused by minute particles flowing from the sun toward earth!)

Why VLF? But why the interest in developing a portion of the radio spectrum which may have been played out four decades ago? Laser beams and radar have already given us adequate reward for microwave research, but what—if anything—can be gained from these very low frequencies?

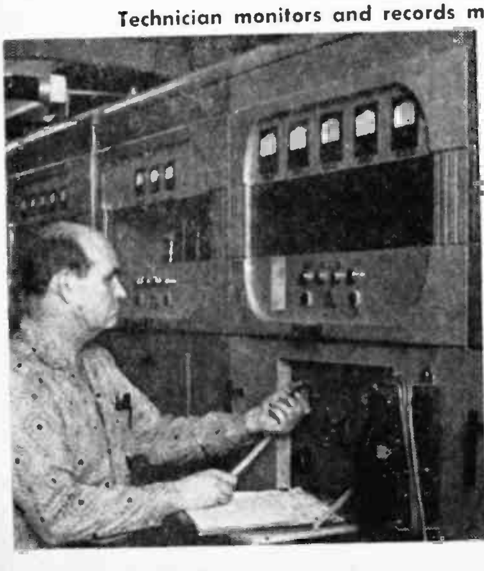
Not too long ago several interesting things were learned about VLF which did a lot to give the band increased importance. For many years it had been thought that the ionosphere would hold these signals along the surface of the earth. However, the LOFTI I satellite (launched in 1961) not only squashed this theory but set scientists to seriously considering the use of VLF for intra-space communications.

One reason stems from the fact that VLF signals aren't subject to the whims of sunspots and various ionospheric conditions which can black out all other forms of long-distance radio communications for hours or even days. In addition, only VLF signals can be heard by submerged submarines (even as much as 100 feet down) regardless of their location.

It was also discovered that the super-accurate time and frequency standards being broadcast by the U.S. National Bureau of Standards over station WWV on shortwave were actually not nearly as accurate as the signals which were (and are) being sent over WWVL, their VLF experimental station on 20 kHz. When the space program called for precise time and frequency standards never before required, VLF saved the day.

With high-powered VLF stations established, a multitude of purposes could be served. It could be used for round-the-clock communications with nuclear subs which might stay submerged for several months; it could provide communications with other VLF land stations without fear of temporary

Technician monitors and records meter readings at transmitter in WWVL "shack" (at right).



VLF listening

interruptions which might pop up during an international crisis; it would fill the bill for the space program's needed accuracy and would be available in the event long-range communications into outer space were ever required.

The Big Ones. The U.S. Navy took up the challenge and built a gigantic VLF transmitting station, NLK in Jim Creek, Wash. Delivering a million-watt signal, the station actually pumped its power from an antenna system strung across a mountain range. The results were so encouraging that the Navy then built NAA in Cutler, Me., as a *big brother* for NLK.

To imagine the magnitude of NAA is a bit much for the mind of modern man (used to the trend towards micro-miniaturization of electronics gear). The rig runs a cool 2 million watts; its antenna is comprised of 64 miles of 1-in. bronze wire which hangs from 26 towers, some nearly as high as the Empire State Building. The antenna is separated from the masts by 70-ft. insulators. Ground system? Yes, they use 11-million ft. of copper wire. As for coupling the transmitter into the antenna, the coaxial matching section is so large a man can stand inside it.

These two stations proved so successful that the Navy eventually established a network of VLF communications stations. Meanwhile, many other nations have climbed aboard the VLF bandwagon. The net result is that tuning a receiver across the band today brings in a multitude of stations from points throughout the world, all chattering away like mad. Because of the nature of the band and its signals, a simple regenerative receiver can bring in stations which, on shortwave, would be rare DX with even

Very-Low Frequency Station Listings—13.6 to 18.6 kHz

KHz	Call	Location	Kw
13.6	NPM	Honolulu, Hawaii	50
	NBA2	Summit, Canal Zone	50
		Forestport, N.Y.	25
14.1	NAA	Cutler, Me.	2000
14.29	SOA21	Warsaw, Poland	200
14.3	UVH4	Ostachkov, USSR	15
	UBE2	Petropavlovsk, USSR	500
	EOY3	Piltun, USSR	1
	EOB2	Preobrajenskoe, USSR	1
14.5	CNM	Casablanca, Morocco	
	HWU	LeBlanc, France	250
14.6	UVA	Batumi, USSR	100
14.7	NHB	Kodiak, Alaska	1000
	NPN	Guam, Marianas Is.	1000
	NPM	Pearl Harbor, Hawaii	1000
	NAA	Cutler, Me.	2000
	NLK	Jim Creek, Wash.	1000
14.8	NAA	Cutler, Me.	2000
14.9	NBA	Balboa, Canal Zone	1000
15	UIK	Vladivostok, USSR	100
	UMS	Kronstadt, USSR	
15.1	FUO	Croix d'Hins, France	500
	VTI	Bombay, India	100
15.3	NHB	Kodiak, Alaska	1000
	NPN	Guam, Marianas Is.	1000
	NPM	Pearl Harbor, Hawaii	1000
	EVT2	Dickson, Antarctica	200
	NLK	Jim Creek, Wash.	1000
15.5	NPM	Pearl Harbor, Hawaii	1000
	NAA	Cutler, Me.	2000
	NSS	Washington, D.C.	1000
15.6	EWB	Odessa, USSR	5000
15.7	NPM	Pearl Harbor, Hawaii	1000
	NPL	San Diego, Calif.	500
	NPG	San Francisco, Calif.	500
15.975	GBR	Rugby, England	750
16.1	RK19	Algazy, USSR	11

KHz	Call	Location	Kw
16.2		Yosami, Japan	500
	UGK	Kaliningrad, USSR	500
16.3		Hermosillo, Mex.	1
		Merida, Mex.	1
		Mexico City, Mex.	1
		Monterrey, Mex.	1
		Tapachula, Mex.	1
16.4	DMA	Mainflingen, W. Germany	10
16.5	SOA31	Warsaw, Poland	200
16.6	NPM	Pearl Harbor, Hawaii	1000
16.8	FTA2	St. Assise, France	250
17	VTO	Vizagapatam, India	50
	FUB	Paris, France	
	NDT	Yokosuka, Japan	
17.1	UMS	Moscow, USSR	1000
17.2	SAQ	Varberg, Sweden	200
	UMS	Kronstadt, USSR	
17.44		Yosami, Japan	500
17.6	JXZ	Helgeland, Norway	350
	SOA41	Warsaw, Poland	200
17.8	NPM	Pearl Harbor, Hawaii	1000
	NAA	Cutler, Me.	2000
	NSS	Washington, D.C.	1000
17.9	UBE2	Petropavlovsk, USSR	500
	RSZD	Salair, USSR	1
18	NBA	Balboa, Canal Zone	50
	NPL	San Diego, Calif.	1000
	NLK/NPG	Jim Creek, Wash.	1000
18.1	UFOE	Matotchkinchar, USSR	100
18.2	NAH	New York, N.Y.	200
18.4	NAK	Annapolis, Md.	200
	NAD	Boston, Mass.	200
	NAH	New York, N.Y.	200
18.5	NAA	Cutler, Me.	2000
18.6	NHB	Kodiak, Alaska	1000
	NPM	Pearl Harbor, Hawaii	1000
	NBA	Balboa, Canal Zone	1000

a high-priced multi-tube superheterodyne set.

Listening on the comparatively little-known and little-explored VLF band is twice as exciting as battling it out on shortwave. And this explains why VLF has attracted a growing number of DX hounds who are pulling new stations out of the noise by the dozens. A receiver or tuner for VLF isn't difficult to construct (plans for a very efficient receiver appear in the preceding article), and firing up a rig on VLF is well worth the small effort and investment.

If you aren't a homebrew fan, there are several military surplus receivers available which will tune down to 15 kHz. Among them are U.S. Navy models RE, RAK, RBA, RBL and DZ, the U.S. Army's BC-969A and R389 (made by Collins), and some relics of World War I vintage which can still cut the mustard—the SE-143 and SE-1420. Further, RCA has shipboard receiver called the AR-8510 which is quite good, and (if money is no object) such commercial receivers as the National HRO-500 (with VLF converter), Racal RA-17 (with converter), and Wireless Specialty IP-500 are perfect playmates.

What's To Hear? Two differences from SWLing immediately become apparent to anyone trying his hand at DXing the VLF band, the most obvious being that CW (code) is the prime mode of transmission. Though some stations (chiefly in the U.S.S.R.) are authorized for voice communications, it's rather tricky trying to run 3kHz of voice modulation in this band, mainly because of the other thing which makes VLF different from shortwave—the way the stations are set up on the frequencies.

On shortwave even CW stations must be separated by at least 1 or 2 kHz so that they can be copied without the use of highly elaborate crystal, mechanical, or audio filters to reject adjacent signals. On the VLF band, where stations are sometimes separated by only 100 Hz or (*Continued on page 96*)

Very-Low Frequency Station Listings—18.6 (cont.) to 27 kHz

KHz	Call	Location	Kw
	NAA	Cutler, Me.	2000
	NLK/NPG	Jim Creek, Wash.	1000
	NEJ	Seattle, Wash.	1000
18.8	NAK	Annapolis, Md.	200
	NAD	Boston, Mass.	200
	NAH	New York, N.Y.	200
18.9	UMB	Rostov, USSR	1000
19	GQD	Anthorn, USSR	500
	MHW	Rugby, England	350
	NPM	Pearl Harbor, Hawaii	1000
	NSS	Washington, D.C.	1000
19.2	SOA51	Warsaw, Poland	200
19.3	UFAA	Pereiezdnaia, USSR	15
	ULK	Djarkent, USSR	1
	RTBS	Povorotnyi, USSR	15
19.4	NHB	Kodiak, Alaska	1000
	NPN	Guam, Marianas Is.	1000
	NPM	Pearl Harbor, Hawaii	1000
	NLK	Jim Creek, Wash.	1000
	NSS	Annapolis, Md.	1000
	NEJ	Seattle, Wash.	1000
19.6	GBZ	Greenwich, England	350
19.7	UGE	Arkhanghelsk, USSR	150
19.8	NPM	Pearl Harbor, Hawaii	1000
	NPL	San Diego, Calif.	1000
	NPG	San Francisco, Calif.	1000
20	PWZ	I. Governador, Brazil	50
	WWVL	Ft. Collins, Colo.	40
	JG2AR	Tokyo, Japan	3
20.27	IDR	Rome, Italy	500
20.6		Hermosillo, Mex.	1
		Merida, Mex.	1
		Mexico City, Mex.	1
		Monterrey, Mex.	1
		Tapachula, Mex.	1
	RTSP	Darasun, USSR	1
20.76	IDR	Rome, Italy	2500

KHz	Call	Location	Kw
21.05	HWU	LeBlanc, France	100
21.37	GYA	London, England	120
21.4	NSS	Annapolis, Md.	1000
	NAA	Cutler, Me.	2000
21.75	HWU	LeBlanc, France	100
22.1	NAK	Annapolis, Md.	200
	NAD	Boston, Mass.	200
	NAH	New York, N.Y.	200
22.3	NSS	Washington, D.C.	1000
22.35	NAK	Annapolis, Md.	200
	NAD	Boston, Mass.	200
	NAA	Cutler, Me.	2000
	NAH	New York, N.Y.	250
22.7	ARM	Chittagong, Pakistan	50
	ARL	Karachi, Pakistan	50
23	UIT	Lazo Khabarovstock, USSR	1
	UFQE	Matotchkinchar, USSR	100
	RFG	Millerovo, USSR	15
23.2	UFKA	Millerovo, USSR	50
23.4	DMB	Mainflingen, W. Germany	10
24	NPM	Pearl Harbor, Hawaii	1000
	NBA	Balboa, Canal Zone	1000
	NLK	Jim Creek, Wash.	1000
24.3	RTF6	Sarpa, USSR	15
24.6	ROR/RCV	Moscow, USSR	
25	ROR	Moscow, USSR	
	PWB	Belem, Brazil	20
25.3	NAA	Cutler, Me.	2000
25.7	RFR6	Pioner Sovkhoz, USSR	25
25.82	NAA	Cutler, Me.	2000
	NAH	New York, N.Y.	200
	NSS	Washington, D.C.	1000
26.1	NPM	Pearl Harbor, Hawaii	1000
	NPG	San Francisco, Calif.	1000
	NEJ	Seattle, Wash.	1000
26.6	CAA2A	Santiago, Chile	50
27	FTA27	Paris, France	25

WIRELESS HEAT DETECTOR

By
ELMER C. CARLSON
Technical Editor

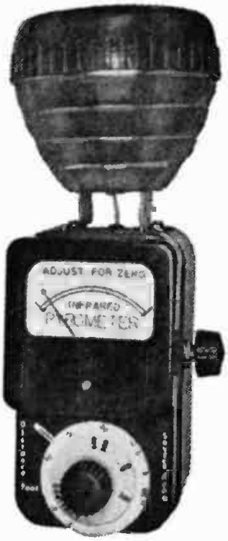
Infrared radiation pyrometer measures temperatures up to 25 feet from source, costs only $15 to build!

■ This completely portable, self-contained instrument will let you measure the temperatures of motors, flue and steam pipes, engine exhaust manifolds, freshly-painted objects within a bake oven, and other heated surfaces without even touching them. And no longer will you find it necessary to use a ladder to check the temperature of an air-conditioner compressor, wall-mounted electric fan, or lighting fixture shell.

To be sure, industrial infrared-radiation pyrometers have been around for more than a decade. But it's only recently that the heat sensing component has been available over the parts counter and at a price low enough for the experimenter and hobbyist.

Some of the industrial units have complex lens systems, periscope-type telescopic lenses, and many other design features that boost the purchase price. The end result is that a completely wired industrial pyrometer sells for some $2,000. Of course, this isn't too expensive—for a steel mill, an aircraft manufacturer, or a utility company. But at that price you won't find many pyrometers in home workshops, which explains the beauty of the instrument about to be described.

What's Infrared? Every object radiates infrared rays unless it's so very cold that the electrons stop moving and simply huddle together. With higher temperatures, infrared radiation becomes more apparent—it's *heat.*



Easy-to-build infrared radiation pyrometer will demonstrate a heat-measurement technique long used by industry.

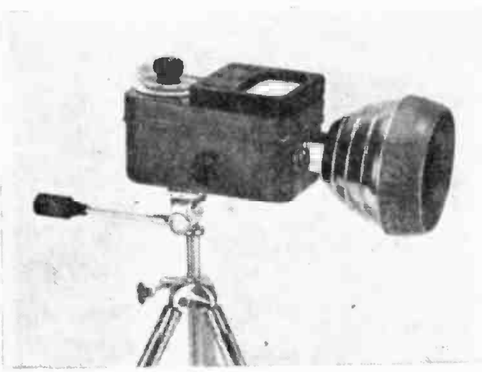
In fact, when you get up to about 1000 degrees Fahrenheit you can start to see the heat radiation as a very dull red glow. As the temperature increases, the radiation frequency increases. Eventually, it becomes white light, which means the object is actually white hot. Once the frequency has become high enough to be visible, the temperatures can be "read" by their color and you don't need instruments like thermometers and infrared radiation pyrometers.

Infrared radiation is electromagnetic radiation. Close in frequency to visible light, these waves have to be handled like light.

Being so short in wavelength we can't make antennas for them as we do for UHF and microwaves.

Significantly, infrared rays radiate from an object almost like radio waves from a broadcast station. The rays get weaker and more spread out as they get further and further away from the starting point. Thus, while we can't make antennas for infrared radiations, we can make *sensors* that react to the heat waves. These *thermistors* reduce their resistance value as they warm up. Very small thermistors—called *thermistor bolometers,* and measuring only a fraction of an inch square—are mounted so they can be exposed to infrared rays and are so designed that they can warm up and cool off very fast.

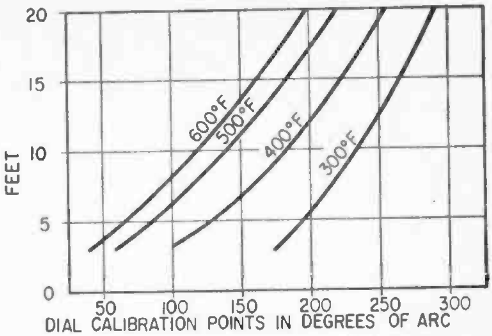
The amount of heat (infrared) radiation reaching the thermistor bolometer is very small, but what does reach it determines the amount of resistance change. For maximum sensitivity (maximum resistance change), there must be maximum infrared radiation pick up and concentration on the thermistor bolometer.



Completed unit is mounted on a camera tripod. Once zeroed in on heat source the unit is locked in position to make temperature readings. Cost of tripod is not included as part of cost estimate.

Infrared frequencies are between microwaves and visible light frequencies. Many of the methods of handling light and microwaves can also be used on infrared rays. The most common item used to collect and concentrate light and microwaves is the reflector. And the larger the reflector the greater the number of rays that can be collected and concentrated. The greater the infrared radiation reaching the bolometer, the greater will be the change in resistance value of the bolometer.

Calibration Chart. This change in bolometer resistance can be recorded in a table or plotted as curves on a graph. And if you're going to use the pyrometer as a portable instrument you will need a calibration chart.



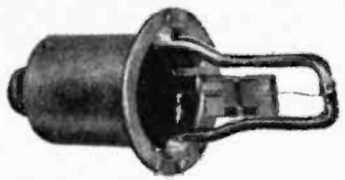
Calibration chart can be used for greater accuracy. Use finely graduated 270-degree dial. For greatest accuracy substitute a 10-turn potentiometer and dial for R6.

Radiation picked up 20 feet from the heat source will be much less than that picked up only 5 feet from the heat source. (You can actually *see* this weakening with white light, but infrared is invisible. In fact, most people can't even feel heat rays unless they are very close to the source or the heat source is very large and the heat very intense.)

You'll have to make your own calibration chart. The sample shown here won't be very accurate for any other pyrometer. You can see one reason for this if you use the reflector as a flashlight. The flashlight beam changes in size and shape as you move closer or further from the surface you're shining it on. This beam shape will greatly affect the temperature indications received from distant heat sources. Even the size of the heat source will change the temperature indication (a large warm area can give off the same amount of infrared radiation as a much smaller, very hot heat source). In short, infrared radiation pyrometry has some built-in pitfalls, though if it didn't pyrometers wouldn't cost several-thousand dollars and there would be a lot more of them around.

The Circuit. As already suggested, the heart of this build-it-yourself pyrometer is a little heat-sensitive element called a *thermistor bolometer*. When this bolometer is protected from infrared radiation it has a high value of resistance. Any heat makes the resistance value of the bolometer get lower. (If you measure the resistance of the bolometer with the ohmmeter range of a VTVM you'll get a reading of about 250,000 ohms.

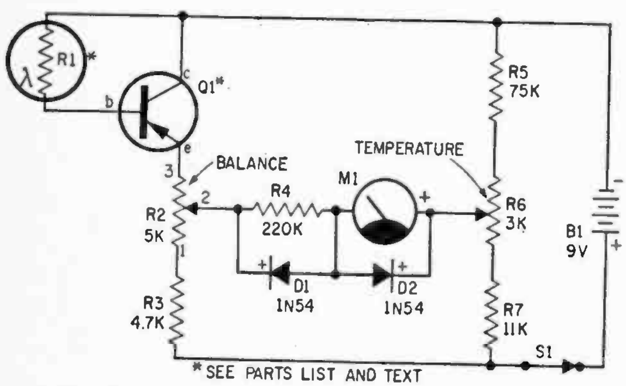
HEAT DETECTOR



Enlarged view of heat detector shows the tiny bolometer suspended from U-shaped support. Flanged base is identical to that used on PR-series flashlight bulbs.

However, the resistance of the bolometer is actually higher, since current from the ohmmeter battery heats the bolometer and immediately reduces its resistance value.)

In the schematic diagram, R1 is the heat-sensitive bolometer. As its resistance decreases, more current flows through Q1 because of the change in current in the base circuit. The additional current flow in the base-to-emitter circuit increases the voltage drop across R2 and R3.



Circuit is basically that used in all bridge circuits for exacting measurements. The diodes make it possible to use off-the-shelf meter instead of special unit. R1 and Q1 are part of Infrared Detector kit—bolometer element is shown above, at top left of page.

This voltage drop could be measured directly and calibrated in terms of temperature. But the voltage-drop *change* is small and accurate readings would be very difficult to make.

By using an old circuit (the bridge), zero to full-scale indications can be made by the same voltage-drop change that would be but a few minor scale divisions on a voltmeter across R2 and R3 (or a milliameter in series with the emitter or collector to indicate the change in current.)

The bridge circuit balances out the residual (always present) voltage drop from the emitter of Q1 to the battery end of R3. With the reflector covered and with R2 set to the emitter end of its rotation, *Balance* control R6 is adjusted for a zero indication on meter M1. Now any change in emitter current is indicated as an up-scale reading on M1. The diodes protect meter M1 from excessive current.

The Meter. For maximum sensitivity and reading accuracy a special circuit was designed. Most zero-center meters available at low cost are FM-tuning meters and their sensitivities are only ±50 or ±100 microamperes. While ratings of this order are passable for our purposes the scale length on such units leaves much to be desired for making accurate readings.

Since most readings of temperature are up-scale indications, scale length to the left of zero can be kept to a minimum. Accordingly, the pointer-adjust screw was rotated for maximum up-scale reading, and this spot on the meter became the new zero point.

Diode D2 prevents up-scale meter overload—just as in many VOMs that have protected movements. To prevent left-of-zero

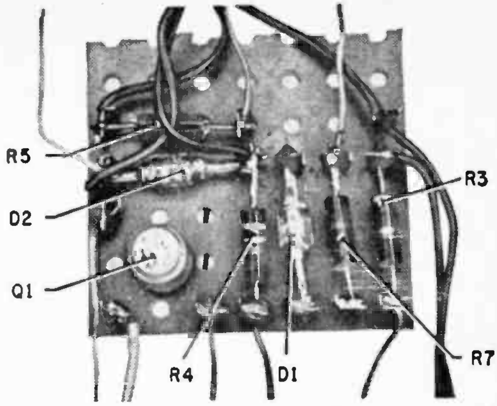
PARTS LIST

B1—9-volt transistor radio battery (NEDA 1604 or equiv.)
D1, D2—1N54 germanium diode or equivalent
M1—0-50 uA panel meter (Lafayette 99C5042 or equiv.)
Q1—Transistor, general-purpose pnp (part of Radio Shack 276-543 Infrared Detector Kit)
R1—Infrared detector bolometer (part of Radio Shack 276-035, 276-543 or equiv.)
R2—5,000-ohm potentiometer (linear taper)
R3—4,700-ohm, ½-watt resistor
R4—220,000-ohm, ½-watt resistor
R5—75,000-ohm, ½-watt, 5% resistor
R6—3,000-ohm potentiometer (linear taper)
R7—11,000-ohm, ½-watt, 5% resistor
Misc.—Knobs, plastic discs, plastic foam, wire, solder, etc.
Estimated cost: $15
Construction time: 2 hours (calibration time not included)

indications from pinning the meter pointer (and possibly ruining the meter movement), diode D1 was connected in series with the meter. This effectively stopped *all* down-scale pointer movement.

With no down-scale pointer movement, it is impossible to set the pointer to electrical zero with any degree of accuracy. Resistor R4, in parallel with D1, allows down-scale indications but limits pointer travel to the extent that even when the pointer goes off scale to the left it doesn't jam and stick in the off-scale position.

Resistors R3, R5, and R7 reduce the total resistance needed for potentiometers R2 and R6—giving maximum rotation, minimum difficulty in making control adjustments, and maximum scale on the calibrated dial of potentiometer R6.



Most of circuit is contained on scrap of perforated board, shown almost exact size. All interconnections are on under side.

Construction. The thermistor bolometer

Infrared detector is mounted in searchlight head of flashlight—red blinker is discarded. Shop carefully as cost of the flashlight can push cost above estimate.

in the Infrared Detector kit comes with a reflector. However, it is small compared to the 3¼-in. infrared filter (red plastic) that is also supplied along with a general-purpose *pnp* transistor and a low-current pilot-light bulb. For maximum infrared pick up a larger reflector is needed.

In an effort to get the largest possible reflector that will take a flange-type, prefocussed flashlight bulb (like the PR-12 or PR-13 used in the flashlights with 4 or 5 dry cells or a 6-volt lantern battery), an imported flashlight equipped with a large reflector and large square battery box that normally housed a 6-volt lantern battery was selected. The sides are high enough to accommodate controls and the top wide enough for the 0-50 microammeter (after the handle with the blinker lamp was removed).

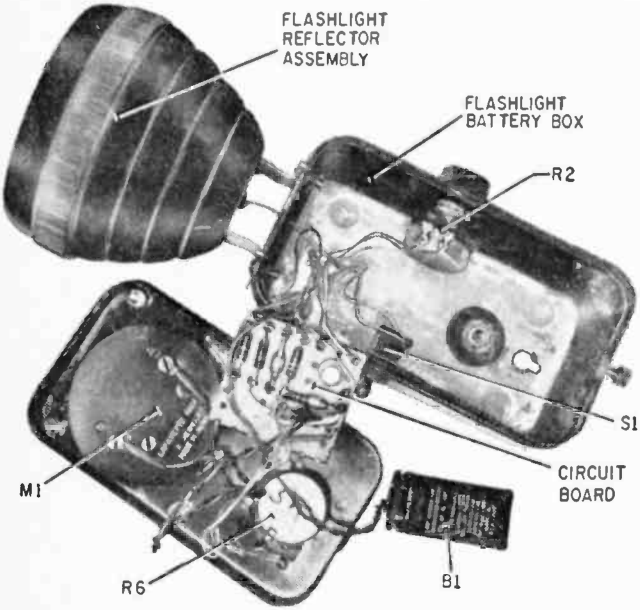
The hinge joint on the rear of the reflector housing is bent and attached directly to the battery box. Three holes are drilled into that end of the battery box—two for mounting the reflector housing and one for the lead to the center of the prefocus socket.

Remember to pick the flashlight only for reflector size and meter mounting space—the flashlight can be either plastic or metal—as can the reflector. There is nothing critical with parts placement, and all parts can be mounted on less than a 2-in. square of perforated phenolic board. (Though a transistor socket is used on this perforated board, it isn't needed—it was used only to make it easier to try several different types of transistors. Both *npn* and *pnp* general-purpose types worked equally well. High-gain and switching types can be a little critical since in some there is too rapid a current change with just a little change in bolometer resistance.)

Solder Quickly. Even with the short leads, no heat sink was used when the components were soldered to the push-in terminals. A clean, hot soldering-iron tip was the secret—a 47-watt, pencil-tip soldering iron will heat a joint properly before the heat can creep up the low-heat-conductance alloy leads of diodes and transistors. A low-wattage iron takes longer to heat the joint and heat can travel further. The biggest danger of ruining a semiconductor with heat is when the current is applied. The heat changes the characteristics of the semiconductor (diode or transistor), allowing more-than-usual current to flow. This, in turn, creates more heat, more current, and still more heat.

While both components and construction are not critical, the calibration is overly critical. The care taken in calibration, and subsequent temperature readings, determines the accuracy of the temperature indications.

Preliminary Testing. Once the wiring is complete you'll be able to make some quick tests to see if the instrument is working.



Red plastic infrared filter fits in reflector without cutting. Clear plastic lens holds it in its position. Miniature switches and controls can be used to save space. Heavy washers on both sides strengthen area around tapped stud—shown in bottom of battery box. Circuit board is not mounted inside battery box—it is wrapped with plastic foam.

First rotate the *balance* knob. The meter pointer should move back and forth through the zero point as you rotate the knob from one end of its rotation to the other. Make sure the opening to the reflector is tightly covered.

Rotating the *temperature* knob should have the same effect on the meter pointer. Set the *temperature* knob, which controls the wiper arm of the potentiometer (R6) so the arm is at the extreme counterclockwise end of its rotation.

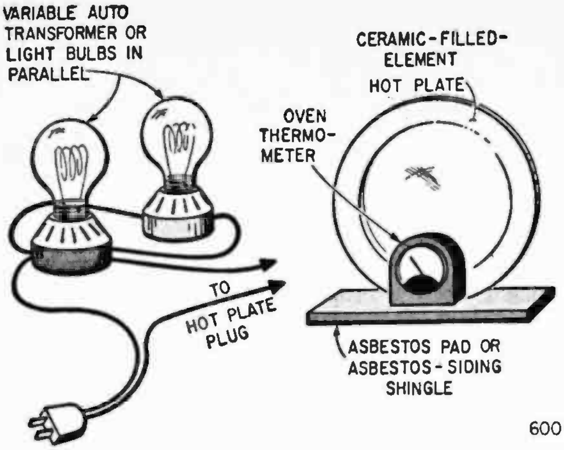
Adjust the *Balance* knob for a zero indication on the meter with the bolometer element covered so it can't pick up any radiation.

Now aim the bolometer element (in its reflector) at your heated soldering iron. From two or three feet there should be a very definite increase (up-scale indication) of the meter reading.

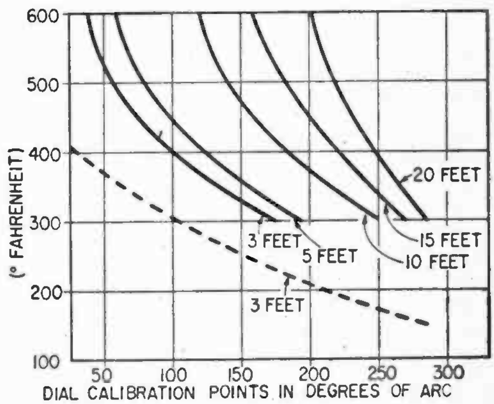
Heat Source. Quite accurate calibrations can be made using an electric hot plate as a heat source and an oven thermometer as an indicator. This will cover a range from about 150 F to around 600 F, depending on the thermometer. Of course, the accuracy of the thermometer used will determine the accuracy of the calibration chart.

There must be some method of controlling the voltage applied to the hot plate. A variable autotransformer is a big help—if you have one that will pass the current required to heat the hot plate. (If you don't have a 5- or 10-ampere variable autotransformer, you can connect regular household light bulbs in series with the hot plate. The higher the wattage of the lamps, the more heat will issue from the hot plate.)

The next thing you'll have to have is patience—once you set the voltage applied to the hot plate, you'll have to wait for the thermometer to catch up to the temperature of the hot plate. If you try to make your calibrations as the hot plate warms up you'll come up with an entirely different curve than if you wait for the thermometer pointer to stop moving. The difference is shown by the dotted line in the calibration chart. By comparing the two curves for 3-feet distance you'll see that there is about 100 F difference —indicating that there is about 100 degrees lag between the surface of the hot plate and



Hot plate used as calibrating heat source is the type supplied in hobby copper-enameling kits. Light bulbs or autotransformer reduce temperature to between 200°F and 600°F. Bimetallic coil of oven thermometer is kept about ¼ in. away from ceramic element. Maintain constant temperature for five minutes or more before making a calibration run. Without sufficient warm up thermometer may indicate as much as 100 degrees lower than surface of element as shown, by dotted line, below.



the heat at the bi-metallic element of the thermometer.

Place your heat source where it will be protected from drafts which will upset the heat transfer between the hot plate and the oven thermometer. Place the oven thermometer so that its bi-metallic coil is about ¼ in. from the surface of the hot plate—you'll probably have to bend the bracket or even turn the thermometer upside down in its socket to get the thermometer close enough to the hot plate. Now plug in the hot plate and let it heat up with about half voltage (60 volts) applied.

Set-Up Area. While the hot plate is heating you can mark your distances from the heat source. Strips of masking tape at the 3-, 5-, 10-, 15-, 20-, and 25-foot distances will be about all you'll need. (After about 25 feet the pattern of the infrared pick up will become too broad to be reliable unless you have a very-well-focused reflector or a very-large heat source.) Just make sure you have enough room for the tripod legs to set on the floor easily.

Calibration. While the heat source is still stabilizing you can make a few preliminary tests and get used to the technique of aiming the radiation pyrometer at the heat source.

If you have a movie-camera tripod with gear-driven vertical and horizontal panning, you'll find aiming the radiation pyrometer much easier—particularly as you get further and further away from the oven heat source. First cover the reflector, and (with the temperature-calibrated potentiometer set to the extreme counterclockwise end of its rotation) adjust the *balance* control for a zero indication on the meter. This compensates for minor ambient temperature changes and sets the calibration dial to its lowest-temperature point.

Aiming the Pyrometer. Uncover the reflector and aim it toward the heat source. As you pick up radiation the meter pointer moves up scale. If the pointer goes off scale, rotate the *temperature-calibrated* knob for about a half-scale indication on the meter. Keep aiming the reflector up and down, left and right until there is no longer any increase in the meter-pointer indication, then lock the pyrometer in that position. Next, rotate the *temperature* knob for a zero indication on the meter pointer.

Now move the pyrometer back to the next distance marker and repeat the procedure. If you notice continued change in the *balance* setting, try another transistor (once you are sure that the battery voltage is not slowly dropping—shifting the transistor to a different point on its operating curve). As you get further and further away from the heat source, you will get less and less indication on the meter.

Once you have mastered the technique of aiming the pyrometer and the heat source

(Continued on page 118)

Propagation Forecast

By C. M. Stanbury II

April/May, 1967

■ Shortwave conditions are constantly changing. They are seldom exactly the same from day to day. Thus, any prediction can only select the band or bands which will more often than not be best during a certain time period. Because conditions do vary, the best SWBC band may be the one above or below the one listed in the table.

On the other hand, the operating patterns of the SWBC stations themselves modifies our table a wee bit. For example, at 0900-1500 listener's time, 16- and 19-meter bands are listed as best for Europe. Technically speaking, on a few days, 13 meters will actually provide stronger signals from Europe than 19 meters. But, as yet, not quite enough Europeans have moved up to the 13-meter band to warrant its listing as an important second choice.

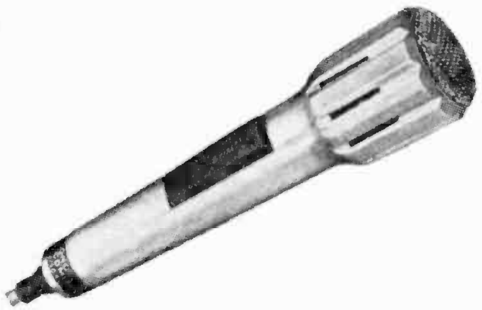
Meanwhile, static has again become an important factor on frequencies below 7 MHz (41 meters), but, these frequencies will still be best for Latin America at night. Why? Well, simply because that's where most of their SWBC stations operate. Most other SW prediction columns around these days don't bother to take this little matter into account. Now is also the time to watch these lower frequencies for stations from the southern part of Africa—Rhodesia, Zambia, S. Africa, etc. See WHITE'S RADIO LOG (pages 114 to 116) for frequencies. ■

RADIO-TV EXPERIMENTER PROPAGATION FORECAST

Apr.-May 1967 LISTENER'S STANDARD TIME	ASIA (except Near East)	EUROPE, NEAR EAST & AFRICA (N. of the Sahara)	AFRICA (S. of the Sahara)	SOUTH PACIFIC	LATIN AMERICA
0000-0300	31, 25	31 (41, 25)	41, 49, 60	41, 31	49, 60 (90)
0300-0600	31, 25	31	41, 31 (poor)	60, 49 (90, 41)	49, 60 (90)
0600-0900	25, 19, 16	19	19 (poor)	31, 25	31 (40)
0900-1200	19	19, 16	19, 16	25 (31)	25
1200-1500	19	19, 16	19, 16	25 (poor)	19
1500-1800	19, 16	25, 19 (31)	31 (41)	19 (poor)	31
1800-2100	19, 16	31, 25 (41, 19)	31	25, 19, 16	31, 60 (49)
2100-2400	19, 16 (25)	31, 25 (41, 19)	41, 49, 60	25, 19, 16	49, 60 (90)

To use the table put your finger on the region you want to hear and log, move your finger down until it is along side the local standard time at which you will be listening and lift your finger. Underneath your pointing digit will be the shortwave band or bands that will give the best DX results. The time in the above propagation prediction table is given in *standard time* at the listener's location which effectively compensates for differences in propagation characteristics between the east and west coasts of North America. However, Asia and the South Pacific stations will generally be received stronger in the West while Europe and Africa will be easier to tune on the east coast. The shortwave bands in brackets are given as second choices. Refer to White's Radio Log for World-Wide Shortwave Broadcast Stations list.

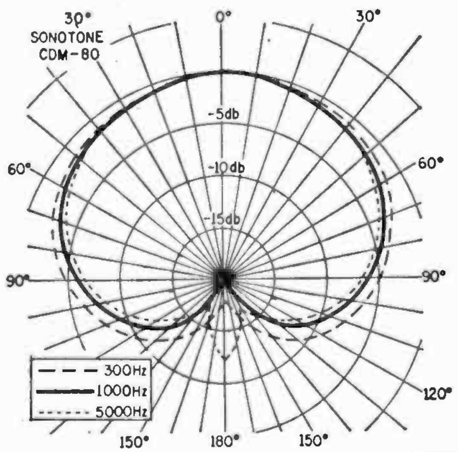
Radio-TV EXPERIMENTER LAB CHECK



SONOTONE CDM-80
Cardioid
Dynamic Microphone

■ Whether your tape recorder is an inexpensive budget model or one of the "professional" types, it's more than likely the microphone that came with it is *junk*. Oh, yes, the mike might be "professionally" styled with a slim metal casing, and it might be of the dynamic type. But the active element (often called the cartridge) is still junk—with a poor frequency curve, high distortion, and the total inability (due to omnidirectional sensitivity) to discriminate against unwanted sounds.

Clearly, good tape recordings require a good microphone. And one of the best we've seen, considering its price, is Sonotone's model CDM-80.

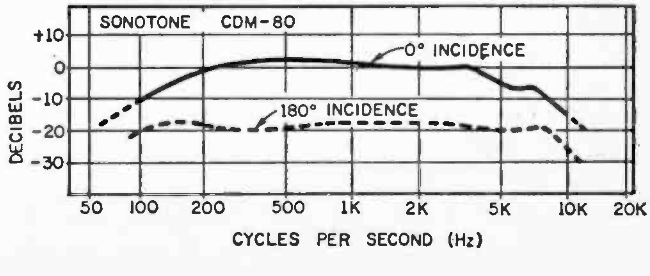


Cardioid Pattern. First, and most important, the CDM-80 has a *cardioid* response, which means it's insensitive to sounds arriving from the rear and exhibits somewhat reduced sensitivity to sounds arriving from the sides. The CDM-80's actual response is shown in the polar-pattern diagram. The 0° mark represents sound arriving into the microphone from the front, and 180° represents sound arriving from the rear.

The importance of the cardioid pattern is that it sharply reduces the echo effect so common in homes. In other words, sounds bouncing off the walls and ceilings which do not arrive directly into the diaphragm are attenuated. And unlike many inexpensive "cardioid" mikes, which are actually omnidirectional at the higher frequencies, the CDM-80 has almost an overlapping (uniform) cardioid pattern clear up to 5000 Hz (cps).

In one of the roughest tests, a single mike pick up of a piano in a 12 x 15 full-panel room, the CDM-80 proved an admirable performer. While there was considerable echo, there was a decided presence caused by an almost direct pick up of the incident piano sound. On the other hand, the same recording made with a typical "factory supplied"

(Continued on page 116)



Diagrams show polar response (above) and frequency response (right) for the Sonotone CDM-80 microphone. Note that the unit maintains its cardioid pattern extremely well at frequencies as high as 5000 Hz.

You get more for your money from NRI—

America's oldest and largest Electronic, Radio-Television home-study school

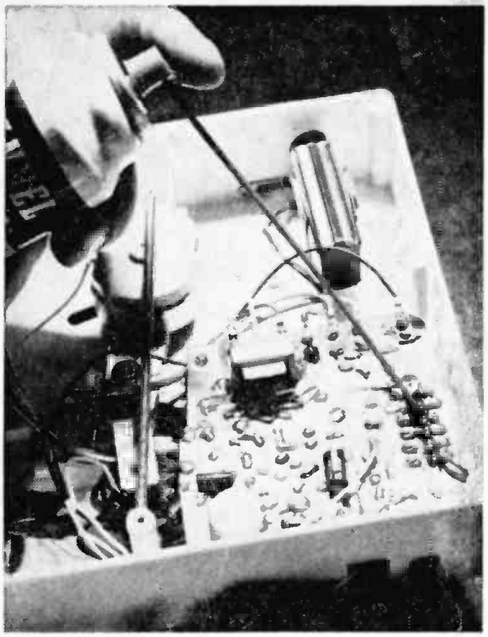
Compare. You'll find — as have so many thousands of others — NRI training can't be beat. From the delivery of your first lessons in the remarkable, new Achievement Kit, to "bite size," easily-read texts and carefully designed training equipment . . . NRI gives you more value.

Shown below is a dramatic, pictorial example of training materials in *just one* NRI Course. Everything you see below is included in low-cost NRI training. Other major NRI courses are equally complete. Text for text, kit for kit, dollar for dollar—your best home-study buy is NRI.

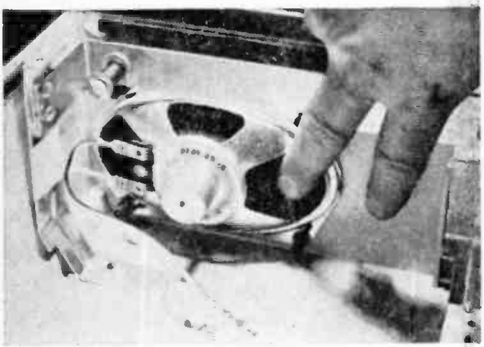
THOSE MINOR TAPE TROUBLES

. . . and what you can do about them

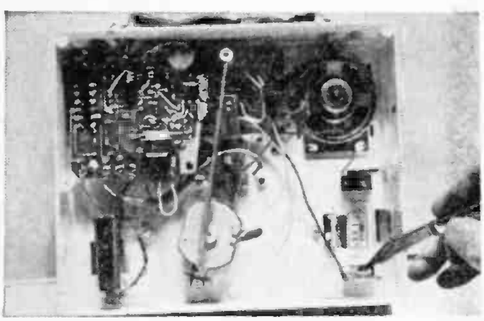
By HOMER L. DAVIDSON



Oil has caused more tape troubles than it has cured, though it can be a godsend if used sparingly. But oil mechanical parts only.

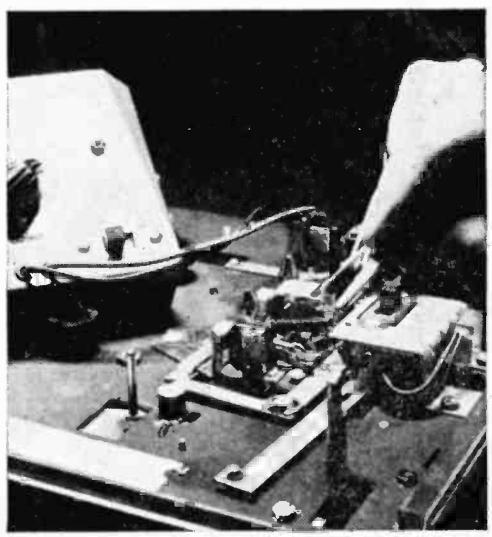


Speaker is often responsible for distorted sound, particularly if finger pressed against cone corrects trouble. Remedy is new speaker.

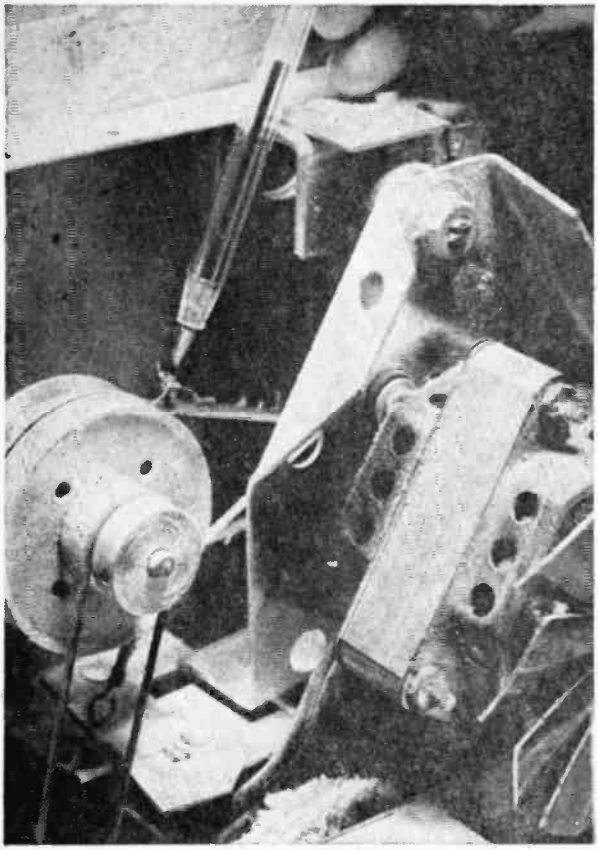


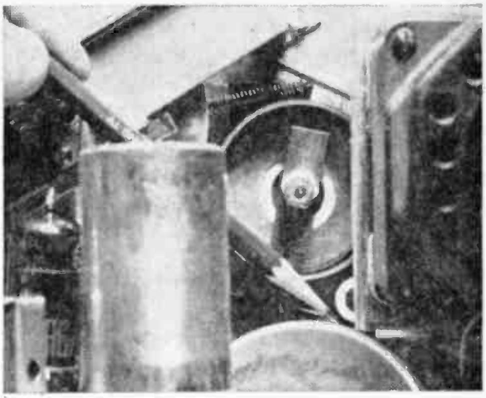
Batteries (if used) should be replaced often and removed whenever recorder is stored. Knife here points to corroded terminals.

■ Ben Franklin wasn't thinking of tape-recorder repair when he observed that "a penny saved is a penny earned," but the fact is that you *can* cut service calls by making minor recorder repairs yourself. Our photos present a rogue's gallery of common tape-recorder ills, with the suggested remedy indicated in each case. A quick perusal will no doubt reveal what you have long suspected—that the answer to your tape troubles lies right in your own two hands. ■

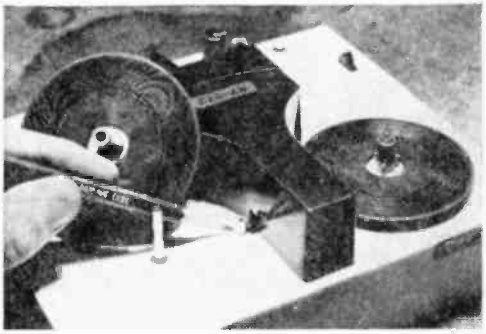


Tubes or transistors are chief reason for loss of record/play functions. Audio generator should quickly pinpoint defective one.



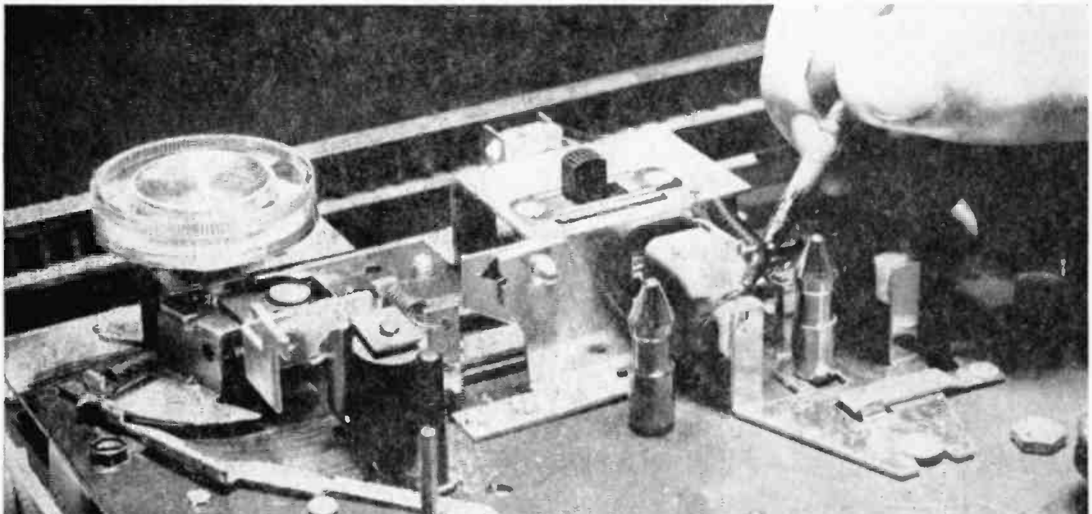


Capstan flywheel, if oily, can result in slippage, as can hardened rubber drive assembly. Remedies: clean flywheel, replace drive.



Drive belt may be culprit in recorder with too-slow tape speed. Clean belt with fluid; be certain idler pulley(s) are well oiled.

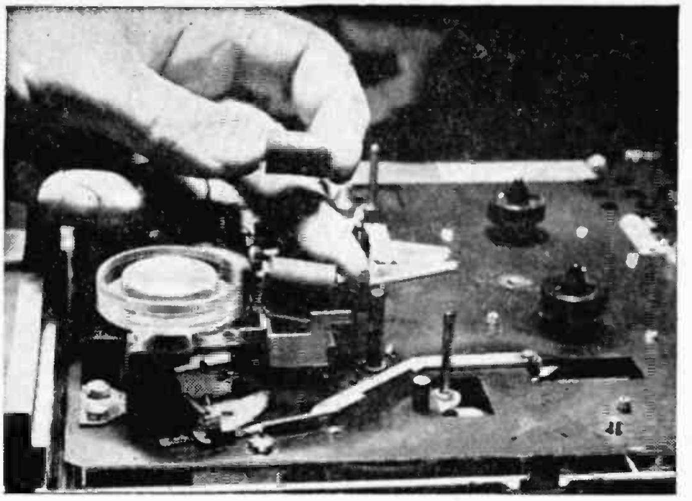
Tape guides and levers can slow tape, even stop recorder if bent or otherwise damaged. To fix, check and correct tape path.



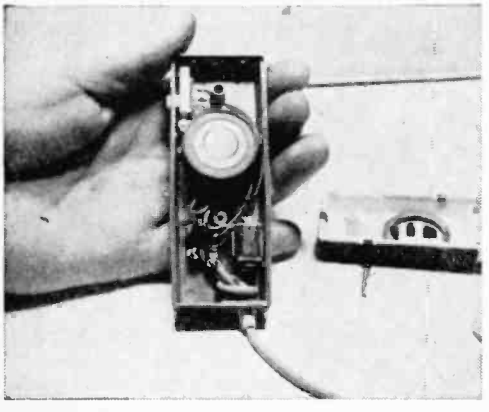
Record/play head holds key to proper operation of any recorder and can be source of weak, noisy, or distorted recordings. Use Q-tip moistened in head cleaner to remove dirt and residue; use demagnetizer to remove residual magnetism and place head in neutral state.

TAPE TROUBLES

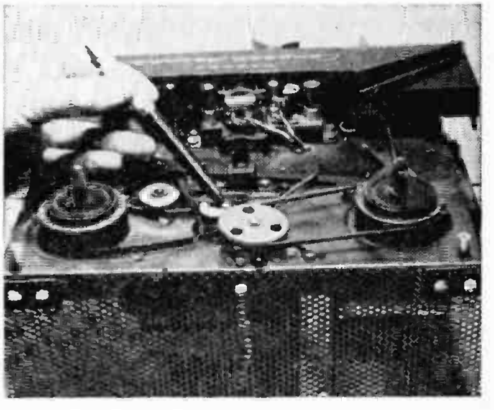
Continued



Rubber pressure roller can result in uneven tape motion, particularly if badly worn (as is roller being held by hand in photo). Since a worn roller cannot be repaired, an exact replacement must be secured from either the manufacturer or his agent.



Mike cord can be explanation for intermittent recording, and mike can go completely dead if one or more wires in cable are broken. New cord or mike will solve problem.



Rewind drive wheel can prevent proper operation during rewind function if it is bent or otherwise defective. In portable units, batteries can also be to blame.

Tape itself holds clue to many a minor trouble. Dull side of tape must face heads if recorder is to function properly; tape must be fully erased if recording is to be clean and unblemished (virgin or bulk-erased tape being the best bet for good recordings).

By Marshall Lincoln
W7DQS

CHIRP CHUCKING made easy

A chirpy CW signal is for the birds. So now is the time to get off your perch and shake your tailfeathers if you want to clean up your nest before the FCC swoops down on you.

■ There it goes again! *Chowpy chowpit chow chowpy chow!*

What a horrible CW note that Ham has! Sounds like a motorcycle bouncing down a rocky road with a flat tire. What on earth could cause such a horrible signal? Is that guy keying his rig with a hammer instead of a telegraph key?

Probably not, but he does have troubles. The simple truth is that fellow has a bad case of *chirp*.

Chirp is a fairly common disease on the Ham bands. Recently licensed Hams, especially, have trouble with chirping transmitters, although they are not the only operators putting chirpy notes on the air. You can occasionally hear old timers, some with two-letter calls, putting out chirp, too.

Older fellows may be too lazy or too indifferent to fix their rigs. The newcomer, though, who has the pep and energy to do the necessary troubleshooting, is the fellow this article is aimed at.

To this bright-eyed fellow, the thrill of putting out any kind of signal at all is so great that he may not be critically checking the *quality* of his signal. Or, he may sense there is something wrong with his signal, but he may not know just what it is or what to do about it.

But then comes that dark day when he gets a notice from the FCC stating his chirpy signal has been picked up by a monitoring station. Oh, woe! What to do now?

The thing to do is plain and simple—fix the trouble, and preferably before anyone else learns of it.

Chirp isn't a heinous crime, since it can happen in the best of families. But it should not go unattended for any length of time. Careful attention to the causes and cures given here should help the beginning Ham solve this little problem before it gets him into trouble with the FCC.

What Is Chirp? Perhaps the best way to define chirp is to say that it's the carrier shifting in frequency each time the transmitter is keyed. Every time the key is closed, the output frequency changes slightly—instead of remaining absolutely steady as the FCC rules and regs require. This produces the *chowpy chowpit* beat note with the BFO in a receiver. And the FCC isn't interested in the chirping transmitter because it sounds terrible. For the fact is that the chirpy signal is taking up a lot more room than it should and thus actually depriving other operators of precious space in the band.

Shifting Carrier. That chirpy signal is caused by the transmitter oscillator shifting

CHIRP CHUCKING

frequency. Frequently, it's because of poor power-supply regulation, though there are several other possible culprits.

Most everyone who has ever used one knows a VFO is sensitive to all sorts of outside influences that may shift its frequency. But some fellows (such as Novices), who use crystal-controlled rigs, feel they are immune to chirp trouble. A crystal oscillator can't possibly chirp, they say, because its frequency is rigidly controlled by the crystal itself—*Rock steady,* to use a pun.

Unfortunately, this isn't so. Crystal oscillators definitely can, and do, chirp.

Low-cost transmitters, whether home-brew or store-bought, are usually more susceptible to chirp because some of the niceties of design have been omitted to save money. Even the fancy chrome-plated jobs with the big price tags will chirp if something breaks down.

Since chirp is no respecter of age or income bracket, let's tackle its causes and cures. Power-supply regulation has already been mentioned as the No. 1 enemy, so we'll start by delving into that little wicket in greater detail.

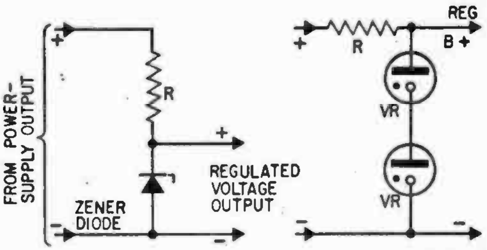
Applied Voltage. Whenever the plate or screen voltage applied to an oscillator stage changes, the frequency of that stage will probably change, too. This means that to have a stable oscillator, the plate and screen voltages supplied to that oscillator must be stable, also.

However, the actual voltage put out by a simple power supply will vary as the load (current drawn) on that supply is varied. In a Ham transmitter, for example, when the key is closed, a signal is sent through all stages to the final amplifier, where most of the power is used. This sudden demand for power—this current drain—saps the power-supply filter capacitors of some of their stored energy, and loads the power transformer. As a result, the voltage at the output of the power supply drops.

When this change in voltage is passed along to the oscillator, the oscillator frequency shifts. The result is chirp.

Good transmitter design avoids this situation. First, the B-plus to the oscillator stage is regulated. Second, the oscillator may have its own private power supply—separate from the heavy-duty power supply connected to the driver and final stages. Neither of these steps is guaranteed to prevent chirp, but they definitely will help.

Constant Voltage. Voltage regulation is accomplished primarily with either a gas-discharge voltage-regulator tube (VR tube) or a Zener diode. Two or more VR tubes or Zener diodes can be connected in series to regulate higher voltages, as shown in the schematic diagram.



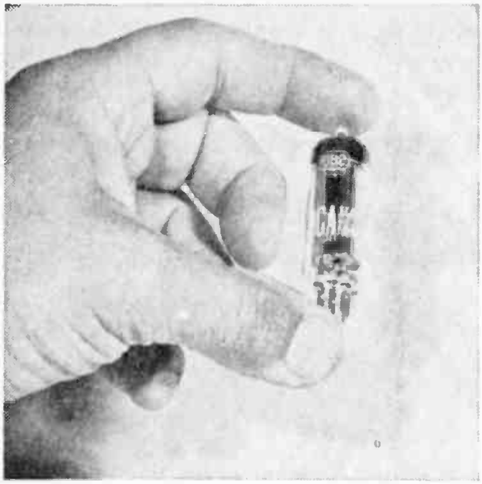
Voltage drop across R maintains regulated voltage. Zener diode or VR tubes draw more or less current, maintaining voltage.

For the oscillator B-plus to be regulated, of course, the regulator components must be of proper value and in good condition. A quick check with a voltmeter will tell you if your oscillator is getting the voltage called for in the manual. Another quick check is to watch the voltage-regulator tube, if your rig has one, to be sure it glows all the time—both during key down (maximum current) and key up (minimum current) conditions. The glow in the VR tube is the ionized gas in the tube—ionized by the voltage applied to it.

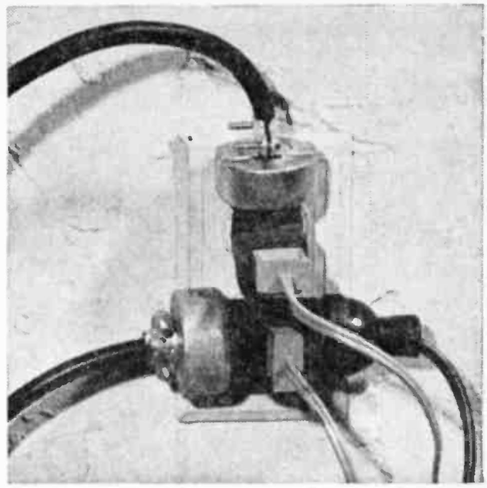
Glow in the VR tube may change intensity slightly when the transmitter is keyed, but it should not flicker or go out. If it does, the voltage getting to the oscillator stage is no longer being regulated. The trouble may be a faulty VR tube. Or the series resistor connected to the VR-tube anode may have increased in value. When replacing a VR tube, be sure you use the type designated on the chassis or in the manual. Each type of VR tube has its own voltage rating. Using the wrong one will result in incorrect or unregulated voltage being applied to the oscillator stage.

Power-supply voltage regulation by itself may not solve all the problems in an amateur transmitter. Sometimes the 117-volt line voltage itself may vary, creating problems which the VR tube just can't quite iron out.

Line-to-Load. Even when the line voltage supplied by the power company is pretty



Miniature VR tubes have replaced the much larger octal-based types. Standard voltages are 59, 75, 105 and 150. Resistance value must be varied for voltage changes.



Outlet octopus has many chances for poor electrical contacts. It only takes one ohm of contact resistance to drop line voltage 1-volt, at 100 watts of AC power.

stable, the line voltage at the rig's line plug can be a horse of another color. There can be a voltage drop in the house wiring or the socket itself. This voltage drop will vary with the load placed on the wiring by the equipment. When the transmitter is keyed, more current is drawn from the power line and the voltage drop is greater. This means the voltage reaching the rig will vary with the keying—a possible cause of chirp.

Improper tuning of the rig or loading of the antenna can cause chirp, too, by imposing varying or excessive loads on the transmitter power supply. Modifying a transmitter to put out more power (for example—by using higher-power final-amplifier tubes) may lead to chirp trouble, too, unless the power supply is uprated so it will not be overloaded.

Filter and Bleeder. Some operators overlook the fact that the bleeder resistor and filter capacitors in the power supply itself have a function in regulating the supply's voltage. They do this by imposing a fixed load on the power supply. This tends to stabilize the power-supply voltage. Although the capacitors and the bleeder resistor do not hold the voltage to an absolutely steady value as a VR tube does, they do smooth out some of the power-supply variations that would otherwise occur as the load on the supply varies. Consequently, if the filter capacitors dry out (and change value or become open) or if the bleeder resistor opens, the stabilizing influence of these components is taken away. The result is the power supply voltage is no longer as stable as it should be, and, once again, there is chirp.

Sometimes an oscillator tube, either in a VFO or a crystal-controlled oscillator, can go sour, causing chirp. This may be due to an actual mechanical defect that develops in the tube—for example, an electrode that comes loose from its support. Alternatively,

Heat often oxidizes tube pins and other connections. Pulling tube and reinserting in socket often cleans the contacts.

it may be caused by a change in the tube's characteristics. A shift in interelectrode capacitance, for example, will affect the frequency of the oscillator. This trouble is about the easiest of all to fix—just plug in a new tube.

So far, we have covered only *electrical*

CHIRP CHUCKING

causes of chirp. These are the most common, but there can be *mechanical* causes of chirp as well.

Mechanical Shock. Oscillators used to control the frequency of transmitters are almost always enclosed in separate metal cabinets for shielding and rigidity. This rigidity is very important. If any part of the oscillator's tuned circuit (such as a coil, capacitor, or a connecting lead to one of these components) is moved very slightly, the frequency of the oscillator may change. This can also occur with a slight bending of the oscillator enclosure or by a sharp impact (or vibration) that reaches the components within the oscillator enclosure.

Beginners are often amazed to find how sensitive some oscillators are to mechanical shock. Sometimes just one loose mounting screw in the oscillator enclosure can shift the oscillator frequency with each vibration that reaches it. An operator, sending with a straight key (and pounding it fairly hard), can transmit vibration through the table top to the rig. The result is another chirpy signal.

A loose mounting screw on a tuning capacitor or coil, or a loose tuning slug in one of the VFO coils, can have the same effect. Whenever working on an oscillator, always double-check all mounting screws, nuts, and machine screws to be sure they are tightened securely. A few extra minutes spent in such a simple housekeeping chore may make the difference between a clean signal and an awful-sounding chirpy one.

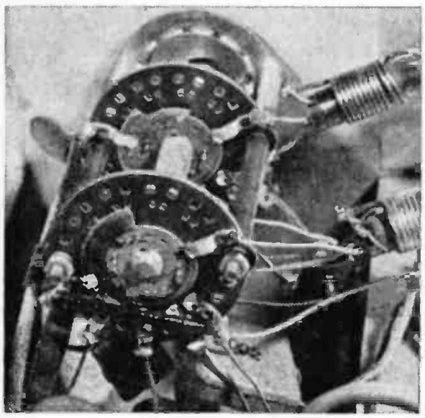
Another mechanical cause of chirp may be a *microphonic* oscillator tube—that is, a tube sensitive to vibrations similar to those which can affect a poorly secured oscillator enclosure.

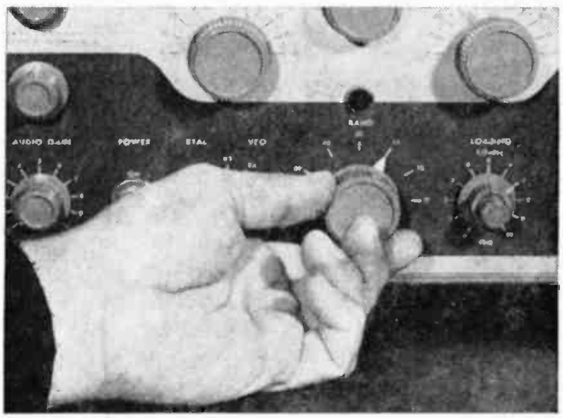
Dirty or loose switch contacts can cause a chirpy signal, too. By not making good electrical contact, they cause erratic operation. The contacts which usually cause this kind of trouble are those on the VFO portion of the bandswitch.

Spring tension of the contacts will often become weakened when the bandswitch is left in the same position for a long time. Parking the bandswitch on a band which you do not use often may help avoid this trouble. Rotating the bandswitch through all positions a few times whenever you sit down at the rig can also be of help in cleaning the contacts.

If this does not do the job, try cleaning them with some aerosol-spray contact cleaner—available at most electronics parts stores. Look very carefully at each switch contact as you slowly rotate the switch through all positions and make sure that each stationary contact moves slightly as the moving contact slides under it. If it does not move, then this stationary contact is not pressing firmly against the sliding contact, and so probably isn't making a good electrical connection.

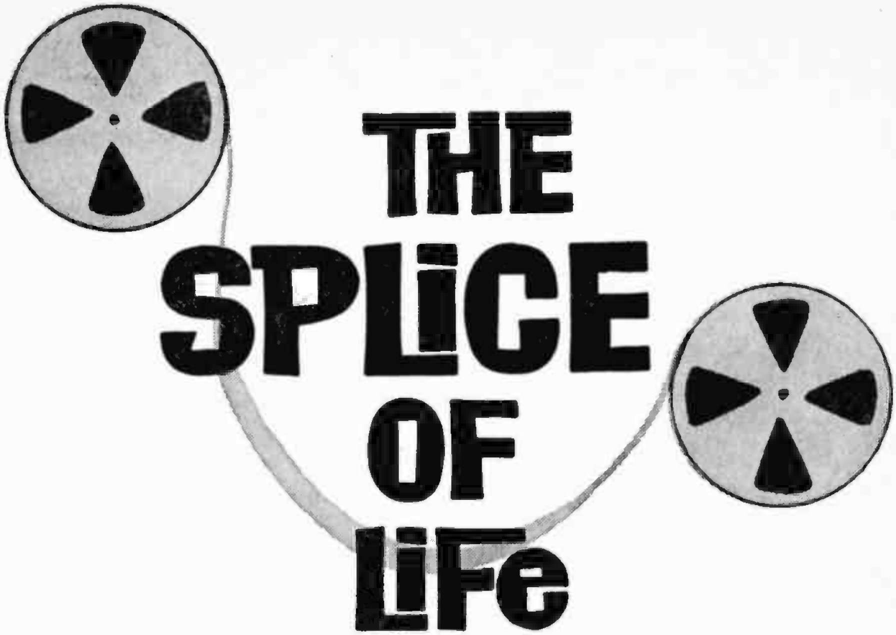
You ordinarily can fix it by bending the stationary contact *very carefully* with a very small screwdriver, needle-nosed pliers, or tweezers. Be very cautious when making this adjustment—the switch contacts are delicate and you may do irreparable damage if you get rough with them.





Contact cleaner will loosen oxidization and tarnish from bandswitch contacts. Just spray it on; rotate switch several times. For more stubborn cases rub with a cotton-tipped swab.

(Continued on page 117)



THE SPLICE OF LIFE

Master a few tricks and techniques of the tape splicing trade, and your recordings can take on the sheen and polish you ordinarily associate with those made by pros

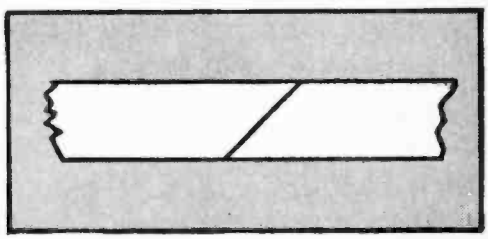
—By LEN BUCKWALTER

■ Become a sharp tape splicer and you may well succeed in getting Richard Burton to mouth "Yeah! Yeah! Yeah!" or Bugs Bunny to garble "please" and "thank you." For in the splice lies the key to much tape fiddling and juggling, not to mention mending. Fortunately, tape splicing is a simple enough accomplishment. The only catch is that joints must be popless, snag-free, and move through the recorder like a lubricated leopard.

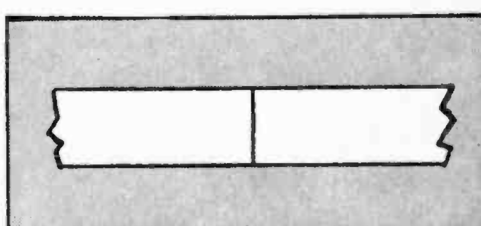
It's important, for example, never to use ordinary cellophane tape for splicing. It'll ooze and glue together turns of tape on the reel, gum up heads, and likely cause flutter during playback. Any tape made expressly for splicing avoids this problem. Just be sure the cut ends of the tape butt tightly together at the splice, since an exposed portion of splicing tape here can also introduce stickiness.

Be certain, too, that scissors, razor blade, or other cutting tool isn't magnetized or you may end up doing things to the tape you weren't counting on. Best way to avert this danger is with a bulk eraser, although the tip of a gun-type soldering iron (which emits a demagnetizing AC field) will also suffice.

(*Continued on next page.*)

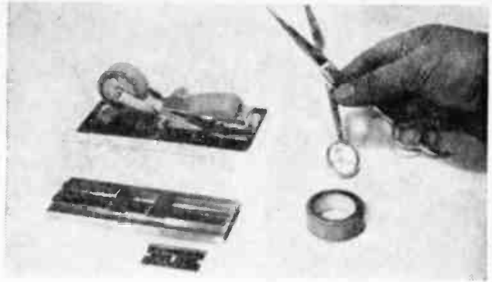


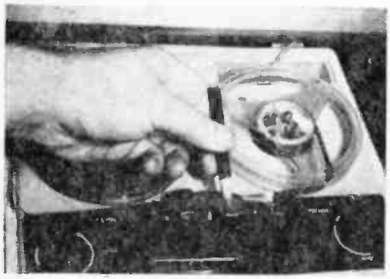
Two most common types of splices are the diagonal cut (above) and the right-angle cut (below). Most splices are of the diagonal variety, since cut travels across head at an angle and ordinarily produces no abrupt change in sound. Right-angle splice is preferred for very tight editing, such as removing the "s" from "tomatoes" or the plop of an annoying switch click.

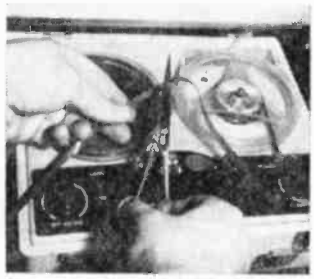


THE SPLICE OF LIFE
(Continued)

Simplest tape splicer is at right—ordinary scissors and a roll of splicing tape. Second system is splicing block at lower left. Its disadvantage: it won't help you make the important "waist" cut. Splicer at top left is most convenient: it holds, cuts, and trims in semi-automatic fashion.

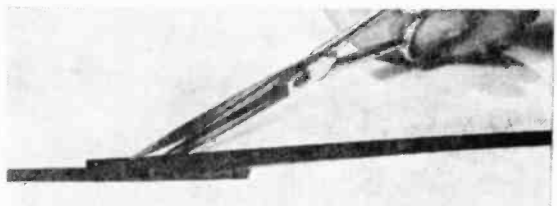




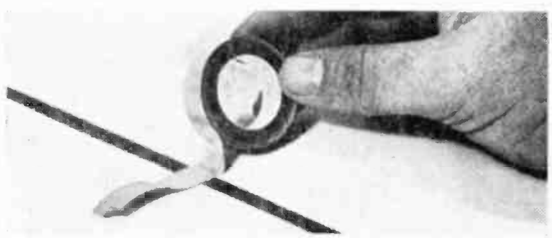


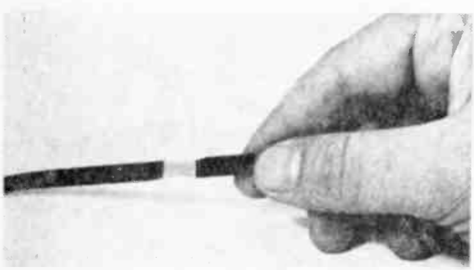
To locate point of splice, stop machine at desired moment in program. Lift tape and mark shiny side with grease pencil. Snip tape at marked point, run undesired tape through machine, then stop, mark, and cut, as before.

With scissor method, two tape ends to be spliced are brought together, shiny sides up. For diagonal splice, overlap ends and snip through both tapes simultaneously at 45-degree angle. Make sure both tapes are perfectly aligned with edges running in a straight line before you cut.



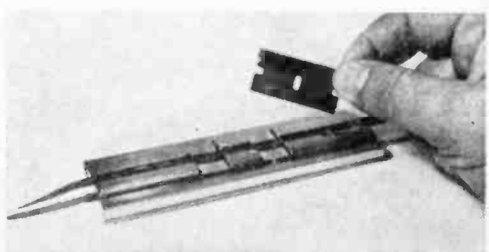
Cut ends of tape are then brought together so they join with no overlap and covered with a piece of splicing tape. Running a fingernail over splice will help adhesive form a good bond; note that splicing tape is applied only to one surface of each section of tape—the shiny side.

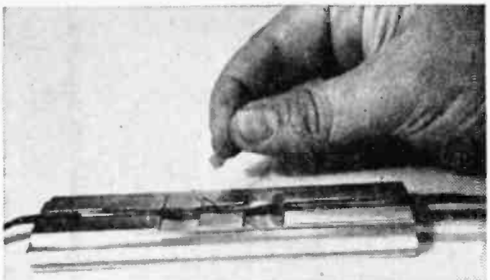




Last step (above) in simple scissors technique is to trim edges of splice with slight indentation (called a "waist"). Properly made, waist will prevent possible snagging when tape is played on machine.

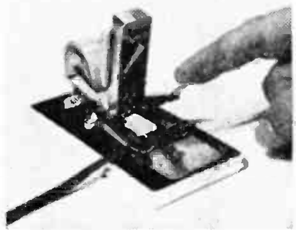
Splicing block is superior to scissors since tape ends are pressed into recesses which hold lengths in perfect alignment. Razor blade drawn along V-notch in block slices neat diagonal across two tape sections.

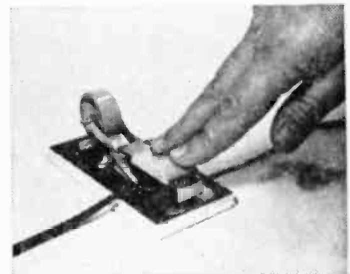


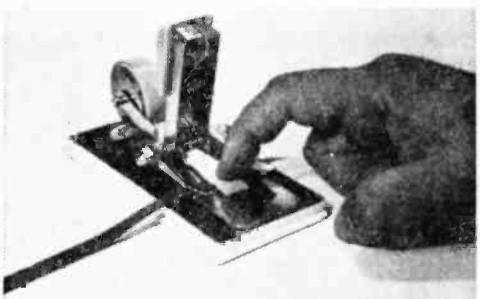


You can again join edges with regular splicing tape, but another useful tool is called a "patch." A short, pre-cut section of adhesive material, it is pressed over the joint, then rubbed with a finger. Tape should be given a waist cut after removal from block to trim away excess adhesive.

Last tape-splicing method is most elaborate, but also most convenient. Splicer at right is made by Robins and called the "Gibson Girl" for reasons which will become apparent. Pressing down metal fingers holds tape in place; bringing down cutter slices diagonal cut through tape ends.

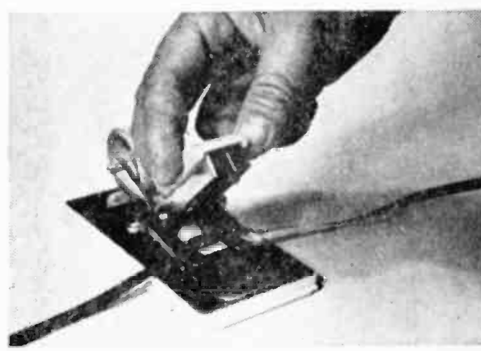




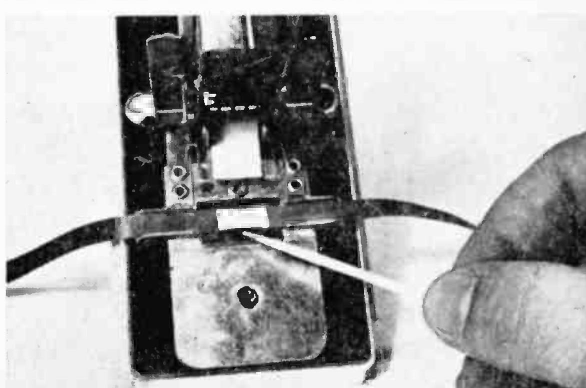


Since splicer carries an entire roll of splicing tape in special holder at rear of device, there's never any need to search for splicing tape. End is simply brought forward and pressed over the tape joint.

Cutting head is brought down again, having first been slid forward slightly to position another cutter over the tape. This time, cutter effects waist cut on tape.



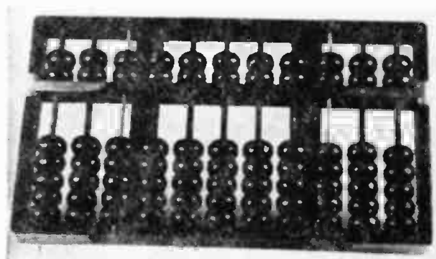
Toothpick points to finished splice with curved-in middle reminiscent of pinched-waist Gibson Girl of a generation ago. Tape is now ready for test-run on recorder to determine whether splice is correctly positioned and is serving its intended purpose. If it isn't, tape can be returned to splicer for second try.



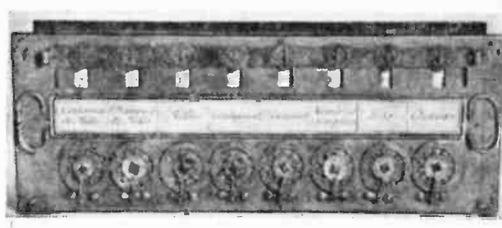
No Numbers...

■ Though computers have come a long way since the invention of the lowly abacus (which likely took place shortly after the dawn of civilization), few people realize exactly *how* far.

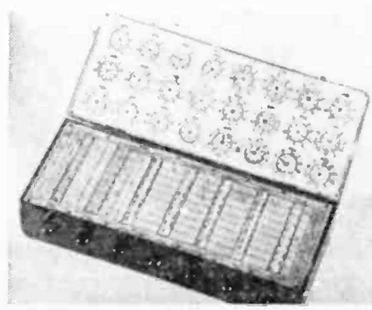
Even the ancient Roman, hampered beyond belief when confronted with the need to add such unwieldly figures as DCCXC and CCCLXX, was actually better off than *his* ancestors. For while both the Egyptians and Babylonians had developed primitive number systems, it wasn't until around 100



1



2



3

1 Abacus (date unknown)
2 Pascal's Calculator (1642)
3 Grillet Calculator
4 Babbage's "Difference Engine" (1812)
5 Babbage's "Analytical Engine" (1834)
6 Bollee Calculating Machine
7 Olivetti Underwood Divisumma 24 (1967)

Photos and facts courtesy Olivetti Underwood Corp.

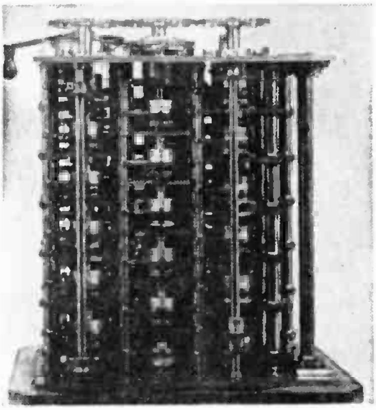
No Nothing...

B.C. that the Romans came up with the idea of allowing simple marks to stand for small numbers (the *one, two, three, four* of the matter) and letters for all others.

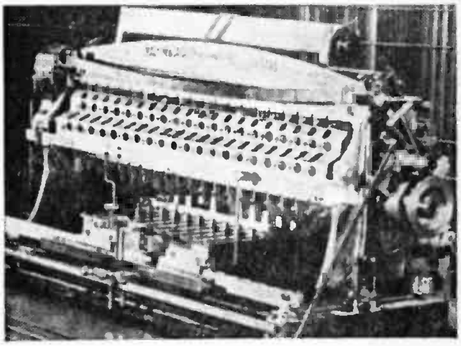
Yet another snag in the Roman style of computing was lack of a symbol to stand for "nothing." For the unfortunate truth is that mathematics was hampered for countless years by the missing "nothing" concept. Finally, sometime in the Middle Ages, the *0* reached Europe along with other Arabic numbers via Arabic trade routes.

Still used by school children and Oriental businessmen, the abacus also comes into play for scoring in billiards. But the centuries have witnessed emergence of a wealth of other devices to aid man in his mathematical musings (see our photos). Today, even the old-fashioned mechanical adding machine has succumbed to the electronic computer, probably the most revolutionary development on the numbers scene since the days when there were no numbers, no nothing.

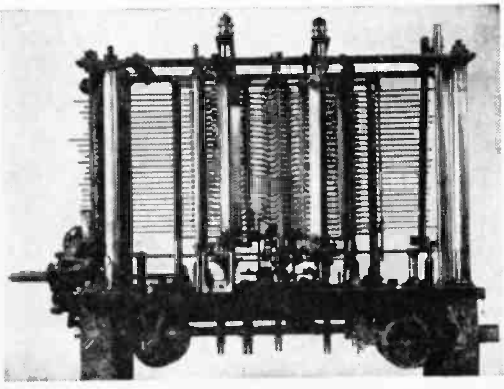
—*Robert Levine.*



4

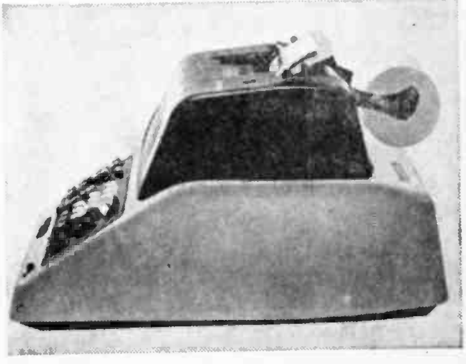


6

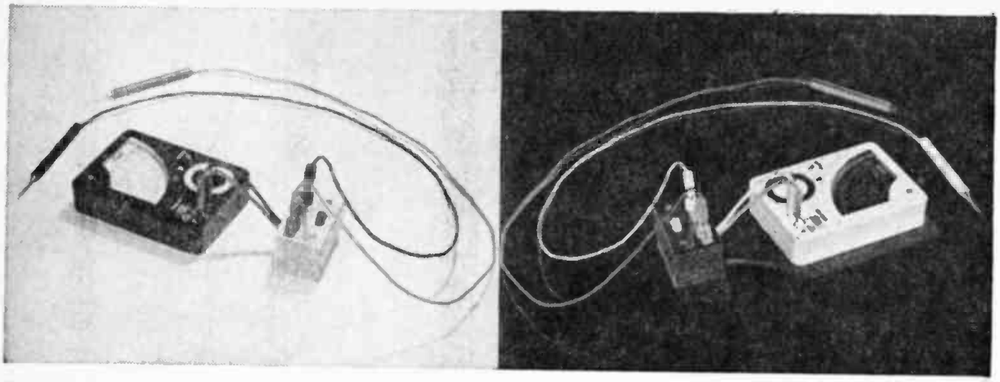


5

7



Add a Flip-Flop to Your Meter



Make your troubleshooting less trouble—build a low-cost test-lead reversing switch for your VOM and VTVM.

by Marshal Lincoln, W7DQS

■ VOM's, multitesters, pocket voltmeters, and all their brothers and cousins come in a thousand shapes and sizes these days. But though priced to fit any purse and purpose, many of them lack a very handy feature which you yourself can add in an hour or less. This is the Meter Flip-Flop, or, by a more descriptive name, a *polarity-reversing switch*. Some testers have this feature built in, but a surprising number of VOM's, many of them rather expensive models, do not.

To be sure, for AC voltage or resistance measurements, the lack of such a switch poses no problem. But when measuring DC, it's amazingly easy to accidentally connect the meter backwards into the circuit under test. This immediately throws the meter off scale—*downscale,* which means you then have to reverse either the test prods on the circuit under test, or reverse the pins plugged into the meter.

With the handy Meter Flip-Flop, you just leave the clips on the test leads where they are, flip the switch, and go right ahead with your work. The switch reverses the polarity of the test prods with respect to the meter.

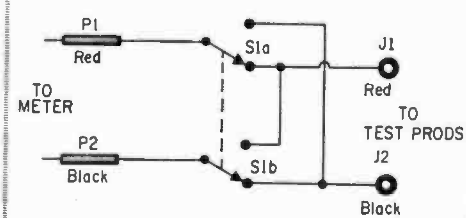
Construction, shown in the photos and wiring diagram, is very simple, with nothing critical involved. A d.p.d.t. switch, two jacks and two plugs of the type used by your own meter and test prods, some hookup wire,

(Continued on page 120)

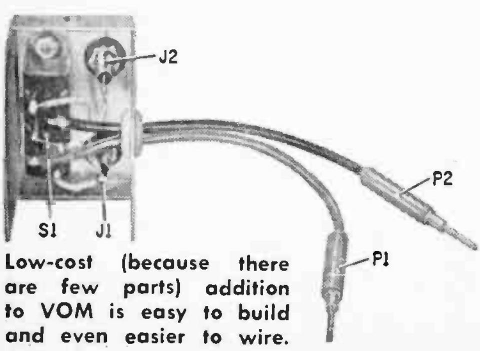
PARTS LIST

J1, J2—Tip or banana jack (to match meter leads)
P1, P2—Pin tip or banana plug (to match meter jacks J1, J2)
S1—D.p.d.t. switch (slide, see-saw, or toggle type)
1—Chassis box, 2¼ x 1½ x 1⅜-in. (LMB type M00, Burstein-Applebee 20A458, or equiv.)
Misc.—Test-lead wire, hookup wire, solder, grommet, machine screws and nuts, etc.

Estimated cost: $1.50
Construction time: 1 hour



Simple circuit, shown in schematic form, can be used for other purposes like reversing battery connections powering a permanent-magnet motor.



Low-cost (because there are few parts) addition to VOM is easy to build and even easier to wire.

Radio-TV EXPERIMENTER LAB CHECK

EICO MODEL 378
Switch-Selectable Audio Signal Generator

■ With audio equipment reaching an almost theoretically perfect performance level in respect to frequency response and distortion, the "service grade" audio frequency generators found on experimenter workbenches are just about worthless. For how can you test a modern, "ruler-flat" amplifier having a distortion rating of 0.5% with an AF generator having an uneven output level and a residual distortion of approximately 1.0%?

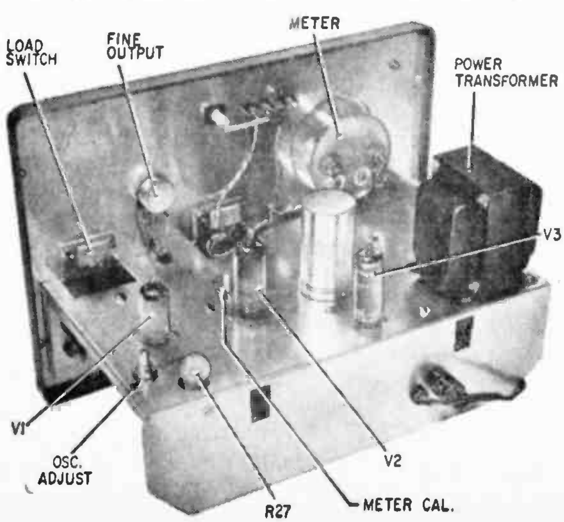
Modern audio equipment cannot be checked with what we used to call service-grade instruments. Today's audio gear requires lab-quality test equipment. Fortunately, in the audio field, lab-quality test gear isn't necessarily synonymous with a multi-hundred-dollar price tag. In fact, there are a few lab-quality, sine-waveform AF signal generators in the $50 price range.

A typical example of low-cost lab quality is EICO's Model 378 Audio Signal Generator, which is available in kit form at $49.95, or factory-wired at $69.95. Unlike the conventional AF generator in which a manual-controlled sweep dial picks any frequency between the lower and upper limits with some degree of accuracy, the EICO 378 lets you select discreet frequencies right on the button.

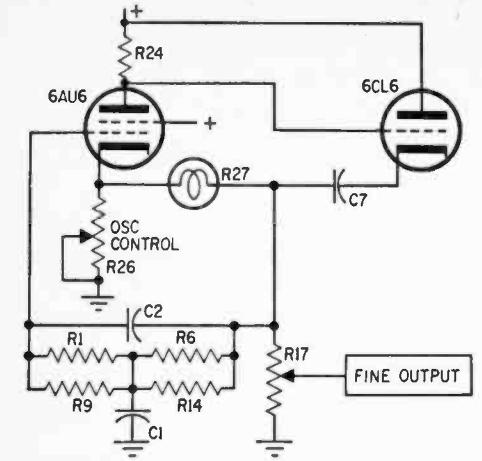
The EICO 378's output frequency is selected by twisting three selector switches. The first switch selects the cycles in units of 10; the second switch selects cycles in units of 1; and the third selector determines the multiplier from X1 to X1000. For example, if you needed, say, 25 Hz (cps), you would set the first switch to 20, the second to 5, and the multiplier to X1. If you needed a 3600 Hz output, the first switch would be set to 30, the second to 6, and the multiplier to X100.

The generator's output voltage is fully metered in terms of both voltage and decibels. The output *range* switch provides six full-scale ranges from .003 volt (−60 db) to 1 volt (0 db) into a 600-ohm output impedance. Two additional switch positions provide a 3-volt (+10 db) and 10-volt (+22 db) output at high impedance. A *load* switch provides for internal or external 600-ohm load for all ranges below 1 volt.

When the internal load is used, the



Rear view of EICO 378 chassis reveals well-spaced components without even so much as a hint of crowding. Meter calibration and oscillator adjust are the only two user-set controls at rear.



Simplified diagram of oscillator circuit in EICO 378 shows 6AU6 oscillator and 6CL6 cathode follower with bridged-T filter consisting of C1, C2, R1, R6, R9, and R14. See text below for details of circuit operation and performance.

output meter will indicate the output voltage with the generator working into an external load of 10,000 ohms or higher (such as a typical AF amplifier or recorder). Naturally, the output meter gives correct readings when an external load or the high-impedance output ranges are used. A *fine* output control adjusts the output level of each range from zero to full scale.

How It Works. The basic AC circuit (AC path only, no DC) is best used to describe circuit operation (see schematic diagram). The oscillator is the 6AU6 stage, which works into the 6CL6 cathode follower. Regenerative (positive) feedback from the 6CL6 cathode through C7 and R27 (a lamp) would normally tend to cause the circuit to break into oscillation. However, a bridged-T "notch filter," consisting of C1, C2, R1, R6, R9, and R14, provides a degenerative (negative) feedback path greater than the regeneration, thereby "cancelling" the regeneration and stabilizing the 6AU6 stage.

At one frequency, determined by resistor and capacitor values, the "notch filter" provides a minimum of degeneration and zero phase shift. The positive feedback is not cancelled at this particular "notch" frequency, and the 6AU6 stage breaks into oscillation.

In the EICO 378, the values of C1 and C2 are determined by the *multiplier* switch (X1, X10, etc.). The first *cycles* switch (0-100) determines the value of R1/R6, and the second *cycles* switch (0-10) determines the value of R9/R14. (These resistor and capacitor designations correspond with those appearing on the actual EICO schematic.)

Is $50 Really Lab-Grade? Since the EICO 378 is touted as a lab-grade generator, we checked it against instruments commonly found in a quality lab: a Hewlett-Packard AC VTVM and a General Radio distortion meter.

Over the audio range of 20 to 20,000 Hz (the limits of the distortion meter), the 378's distortion was so low there is no need to show a curve. While EICO claims a maximum distortion of 0.1%, the measured distortion of the kit version (user-calibrated) was a consistent 0.05% to 0.06% over the entire range, save near 100 Hz where the distortion measured 0.08%.

The unit's output meter accuracy was excellent. Our tests showed it to be within ½ db of the AC VTVM standard between the limits of 10 and 1,000,000 Hz. Also of note is the meter's outstanding decading accuracy, which was superior to most AC VTVM units. When the 378's AC VTVM meter indicated the lowest readable value of 0.1, we decaded two ranges down. Result: the meter reading was exactly on the "1" mark, which fact speaks for good performance.

Of course, you may ask the question: "If the EICO 378 is so good, why is it at least $100 cheaper than a laboratory signal generator?" We feel the explanation lies primarily in the component quality and long-term frequency stability. The EICO 378 utilizes standard-grade components, while a laboratory signal generator (in today's market) meets Mil-Spec. Similarly, a laboratory signal generator would require no re-calibration over a period of several years, while the EICO might have to be re-calibrated yearly (a ten-minute process). Also, the EICO 378 doesn't come in an expensive steel cabinet with a deep-etched panel.

The kit version is to be recommended. It's a two-evening project that saves the factory wiring cost. The chassis is way oversize, and the components get lost in the wide open spaces. In addition, there are absolutely no tight corners.

Since there are relatively few components, construction would present no problems, even to a beginner, if it weren't for the assembly manual. The manual we received had several errors (since corrected), and

(Continued on page 119)

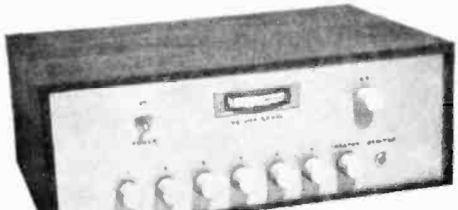
The MIX-MASTER

By Herb Friedman, KBI 9457

Studio-type audio consolette lets you mix inputs just like a pro.

■ If you're a typical tape-recording hobbyist, your big interest in life is to produce recordings with as much "studio quality" as possible. But in all too many cases, what finally pours from the tape bears little resemblance to what comes out of even the worst studio.

Actually, the problem is not you; it's your equipment. For even the best of recorders—the so-called "pro" models—are likely to have the same old one-mike, one-line input arrangement. Yet "studio quality" recordings often require a *blend* of several sound sources. In other words, they rely on more than one microphone and they perhaps throw in sound effects from another recorder, or background music from a phonograph. To turn such tricks, a recording studio utilizes a *consolette*—a unit that mixes inputs from various mikes and high-level sources. Such a device boasts VU metering and a monitor that allows the engineer to "ride" gain to control the various sound levels at all times.



Neat appearance of finished Mix-Master consolette matches component hi-fi units housed in similar oiled walnut cabinets.

While a studio consolette costs several thousand dollars, most of the circuits are unnecessary as far as the recording hobbyist is concerned. In fact, "studio quality" can easily be obtained in the home by simply providing several high- and low-level mixers, full metering of the output line, and monitoring.

Just such a consolette appears in our photo at left. (Hold on—don't yell "It's got tubes!" and skip ahead. Tubes are used for a good reason, as we'll see shortly.) The consolette provides four inputs for microphones, and two inputs for high-level devices such as tape recorders or phonographs. Any combination of the six inputs can be simultaneously mixed together. A master gain control, R29, controls the overall output level of all sound sources. As a result, the consolette's output level can be adjusted while the level of all inputs is determined by the individual mixer controls, R11 through R16.

The mixer circuits, which consist of V1 and V2, plus ½ of V3, provide a 0.1 v output from an input level of 3 mv at the microphone jacks, J1 through J4. Only 50 mv is needed at the high level inputs, J5 and J6, for a 0.1 v output.

The second half of V3 and transistor Q1 provide the necessary amplification and impedance matching for VU meter M1. The VU amplifier gain is adjustable, allowing M1 to be calibrated to "read zero" at any

SPECIFICATIONS

Input impedance—1 megohm
Source impedance—Inputs 1 through 6, any equipment rated "high impedance"
Output terminating impedance—100,000 ohms or higher
Frequency response—± 1.5 db, 40 to 20,000 Hz
Output level—0.1-volt rms
THD at 1 kHz for rated output—0.3%
Noise level below rated output—−60 db

MIX-MASTER

output level up to 0.1 v. Phone jack J7, which is connected across the VU meter, provides the headphone monitor output.

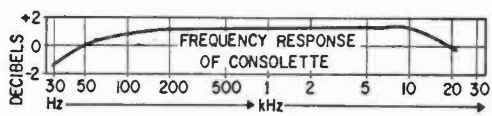
Frequency response is ± 1.5 db between 40 and 20,000 Hz (cps), and the VU meter's response matches the consolette's response for all practical purposes. The response was tailored to roll off below 40 Hz to avoid excess rumble pickup—rumble being a common recording problem. To extend frequency response down to 20 Hz (which we don't recommend), simply replace capacitors C1, C2, C3, C4, and C7 with 0.1 mf units.

Why Tubes? While solid-state is superior to tube design from the viewpoint of power requirements and heating effects, solid-state also tends to be synonymous with a high hiss level. (The measured noise level of solid-state recorders might appear to be lower than equivalent tube equipment, but the predominant noise of solid-state gear occurs at the frequencies where the ear is most sensitive. The noise from tube equipment, in contrast, is largely hum, which falls at a frequency where the ear is less sensitive.)

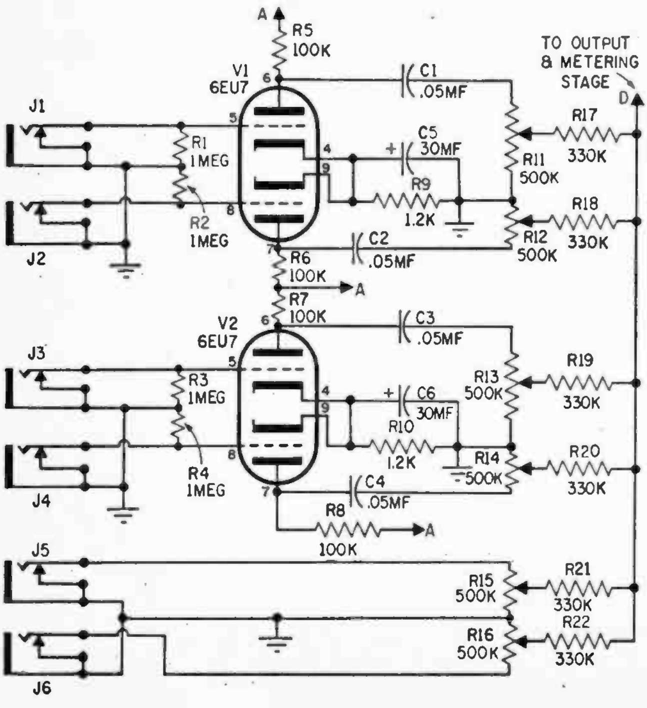
To reduce hum, the consolette design maintains the heater circuit at a positive DC potential above the cathode bias voltage by using a tap on a fixed voltage divider across the B-plus supply. The junction of resistors R39 and R40 provides a +10-volt bias for the heater circuit (which is "center-tapped" by R37 and R38). Since the heater is now positive at all times with respect to the cathode, there can be no electron flow from heater to cathode, and hum is eliminated.

The second method used to reduce noise is to provide a line-level output of 0.1 v. Since the line-level output connects to the line-level input of the recorder, low-level, noise-producing amplifiers in the recorder are bypassed. This again tends to reduce the overall hiss level. In addition, the use of extra-heavy filtering in the power supply further cuts hum and noise so that the resulting noise level is 60 db below 0.1 v.

Construction. Since the consolette can be built on virtually any chassis and in any cabinet, it's an easy matter to match your existing equipment. All that's needed is a suitable cabinet and a sheet of aluminum for the front panel. The consolette shown utilizes a walnut cabinet actually intended for



Graph illustrates the frequency response of the Mix-Master audio consolette. Response at 20 Hz can be improved by changing the coupling capacitors to those of increased value as explained in text.



Circuit for input stages of Mix-Master audio consolette shows four low-level inputs and two high-level inputs (J5 and J6). Two low-level inputs can be eliminated (if you have no need for them) by leaving out one duo-triode and the associated resistors and capacitors.

a Harman-Kardon amplifier. The panel is gold-anodized aluminum with the titling photo-printed into the aluminum.

Since the negative for our panel already exists, the manufacturer will supply a gold anodized panel for ten dollars (see Parts List). They are untrimmed and can be cut to fit a maximum size of 15⅛-in. wide x 5¼-in. high. The centers and cut-outs are printed on the aluminum along with the control titles.

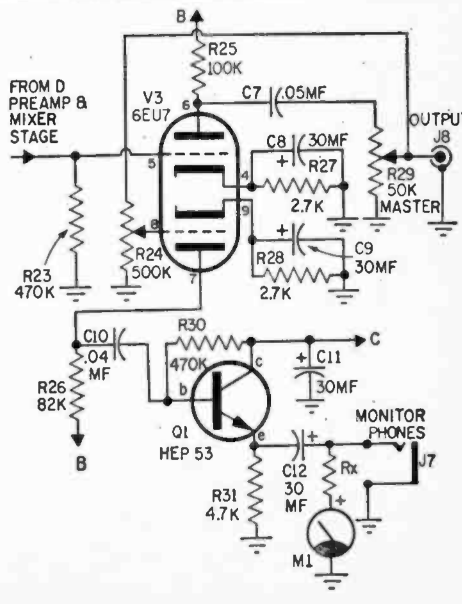
Use any size chassis which fits conveniently into the selected cabinet, though the larger the better (the chassis shown is 1½-in. high x 11-in. wide x 9-in. deep). Position power transformer T1 in the rear corner of the chassis and as far as possible from the audio circuits. The input jacks, J1 through J6, are mounted on the rear apron and as far as possible from T1. The tubes (V1, V2, and V3) are positioned about 1½ in. from the front panel.

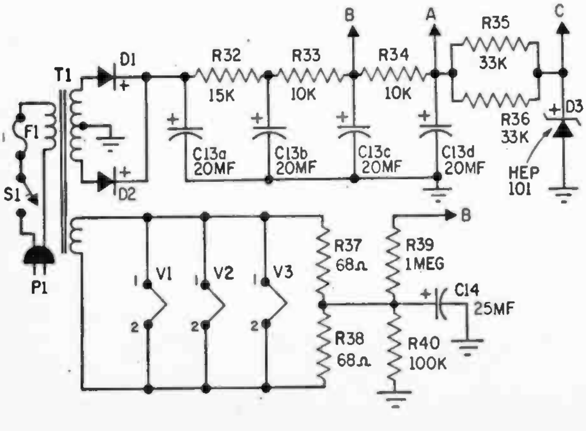
PARTS LIST FOR AUDIO CONSOLETTE

C1, C2, C3, C4, C7—.05 mf, 200 volt capacitor
C5, C6, C8, C9, C12—30-mf, 6-volt electrolytic capacitor
C10—.04-mf, 200-volt capacitor
C11—30 mf, 12-volt electrolytic capacitor
C13—20/20/20/20 mf, 450-volt 4-section electrolytic capacitor
C14—25-mf, 25-volt electrolytic capacitor
D1, D2—Silicon diode, 400-volt piv, 750 ma or higher
D3—10-volt Zener diode, Motorola HEP-101 (Allied HEP101 or equiv.)
F1—1-ampere slo-blo pigtail fuse
J1, J2, J3, J4, J5, J6—Shorting-type phone jack
J7—Phone jack
J8—Phone jack
M1—VU meter (Lafayette 90 C 5033 or equiv.)
P1—AC power plug
Q1—Transistor, Motorola type HEP-53 (Allied HEP53 or equiv.)
R1, R2, R3, R4, R39—1 megohm, ½-watt resistor
R5, R6, R7, R8, R25, R40—100,000 ohm, ½-watt resistor
R9, R10—1200-ohm, ½-watt resistor
R11, R12, R13, R14, R15, R16, R24—500,000-ohm, audio-taper potentiometer (IRC PQ13128 or equiv.)
R17, R18, R19, R20, R21, R22—330,000-ohm, ½-watt resistor
R23, R30—470,000-ohm, ½-watt resistor
R26—82,000-ohm, ½-watt resistor
R27, R28—2700-ohm, ½-watt resistor
R29—50,000-ohm, audio-taper potentiometer (IRC PQ13123, or equiv.)
R31—4700-ohm, ½-watt resistor
R32—15,000-ohm, ½-watt resistor
R33, R34—10,000-ohm, ½-watt resistor
R35, R36—33,000-ohm, 1-watt resistor
R37, R38—68-ohm, ½-watt resistor
Rx—3600-ohm resistor (supplied with meter)
S1—S.p.s.t. switch
T1—Power transformer: 117 VAC primary; 2050 VAC secondary @ 25-ma and 6.3-volt secondary @ 1a (Allied 54A2008 or equiv.)
V1, V2, V3—6EU7 vacuum tube
Misc.—Chassis, cabinet, terminal strips, shielded cable, etc. (see text)
(Front panel is available from Mahler Research, GPO Box 1159, New York, N.Y. 10001)

Estimated cost: $45.00
Construction time: 8 hours

Full-wave power supply (below) provides DC for tubes as well as the transistor. Phones used for monitoring affect the calibration of the VU meter—the higher the phone's impedance the less effect on meter calibration. Always use same phones.

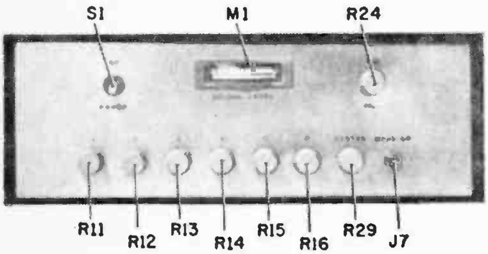




The MIX-MASTER

Incidentally, when making the cutouts for the tube sockets, make certain the tubes are spaced on either side of the meter. Since the meter is positioned below the top of the tubes, any tube mounted in this area will prevent installation of the meter.

Great care must be taken in construction to insure minimum hum and noise. The sockets for V1 and V2 should be the shielded type where the base provides ⅓ shielding



Front panel shows location of all Mix-Master level controls. Edgewise meter removes much of the "scientific look" often associated with modern hi-fi units.

of the tube (top shields will not be needed). Further, shielded leads in most instances are grounded at one end only. Specifically, the shielded lead from J1 to V1 is grounded at both ends; the leads for J2 through J6 are grounded only at the jacks.

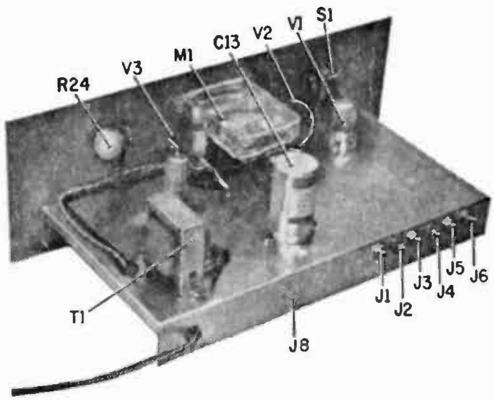
The shielded lead from R29 to R24 is grounded at R29; the shielded lead from R24 to V3 is grounded at both ends.

If you want to go to a little extra trouble to eliminate hum from possible ground loops, insulate J1-J6 from the chassis with shoulder washers, connect the J1-J6 ground terminals together, and run a lead to the case of R11. Jacks J1 through J6 are of the shorting-type, which automatically ground the "hot" conductor when the plug is removed.

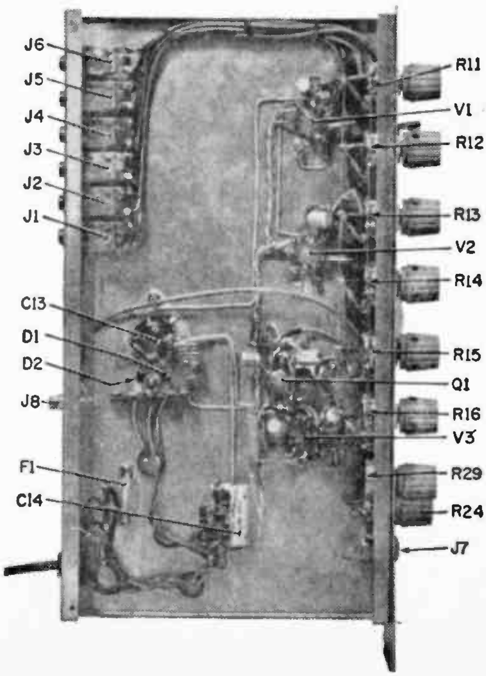
Ground connections for controls R11-R16 are made to a ground buss of solid wire. Position the controls so that the ground lugs point nearly straight up when the chassis is upside-down. Then pass a wire through the ground lugs of R11-R16. If necessary, twist the mixer lugs so the wire passes through the terminal hole.

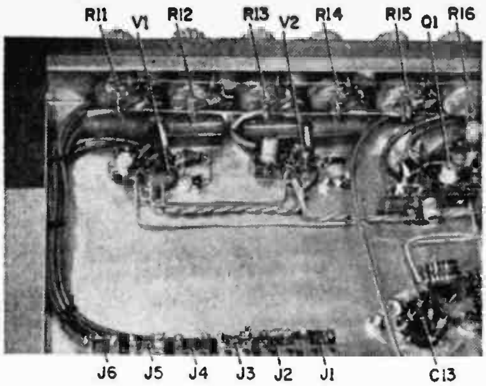
Make certain the wire (buss) doesn't touch any of the mixer cases, then solder each of the ground terminals, ultimately soldering the buss to the case of R11. The ground terminal for the master level control, R29, is connected via the shielded output lead to J8's ground lug.

The "mixer buss" is installed in a similar manner. Solder a single terminal strip to the cover of each mixer, taking care to position the terminal so a wire can be passed through to the next terminal. Connect the appropriate isolation resistor (R17, R18, etc.) between the wiper of each mixer and its terminal strip, and pass a wire through all six terminals and solder. The end of the wire at

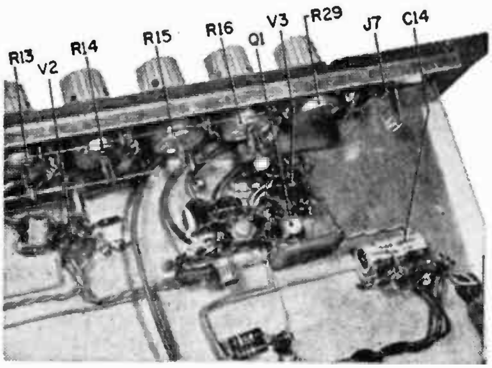


Rear-panel view shows location of jacks and tubes (above); under-chassis view (below) shows concentration of resistors, capacitors, and controls with wiring.





Single bare wire makes the common ground connection to all gain controls. Single ground point to chassis eliminates the hum-causing ground loops. Heater leads are twisted to balance out hum-inducing magnetic field surrounding AC power leads.



mixer #6 is connected to one grid (pin 5) of V3.

Lighting The Meter. Though the VU meter indicated in the Parts List doesn't contain a pilot light, it can be illuminated by positioning a #47 pilot lamp against the side of the meter case (since this is an optional circuit it isn't shown in the schematic). Use one of the meter mounting screws to fasten a pilot lamp assembly to the meter mounting bracket, and bend the bracket so the lamp is alongside of and nearly touching the meter case. Use a lamp socket which has *both* leads isolated from the chassis mount, and connect the lamp leads to the filament winding of T1.

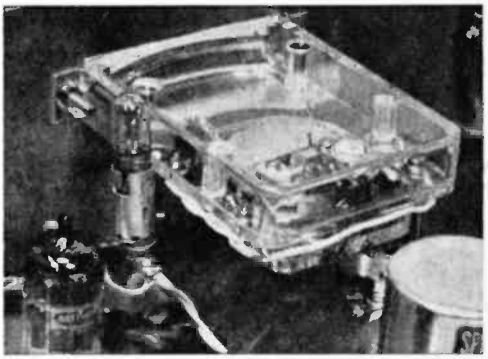
The Cathode Follower. The transistor cathode-follower amplifier is assembled on two adjacent terminal strips as illustrated in the photographs. The 10-volt source for the amplifier is provided by the Zener diode D3. Do not substitute another unit for the specified D3. Also, make certain D3's cathode, the end marked with a thin white band, is connected to R35 and R36.

Resistor Rx (3600 ohms) is supplied with the meter specified in the Parts List. Do not attempt to increase meter sensitivity by eliminating Rx, since this resistor is essential for meter calibration.

Fuse F1, a 1-ampere slo-blo pigtail type, is wired directly into the circuit. If you prefer, a standard fuseholder can be used.

Avoiding Problems. The construction of the consolette should present no problems as long as standard construction techniques are used, and the usual care given to diode and capacitor polarities. While it makes no difference how the tubular capacitors (C1, C2, etc.) are installed, make certain the electrolytics (C5, C8, etc.) are installed exactly as shown (note the "+" polarity symbols in the schematic). Similarly, install diodes D1, D2 and D3 as shown; the symbol (+) indicates the diode's cathode—the end often marked with a thin white band.

Calibration. Typical connections for VU meter calibration are made as follows: Connect J8 to the recorder's input. Connect a signal source—preferably a signal generator, but you can use a microphone—to any of the mike inputs (J1-J4). (A tape- or phono-signal source should be connected to J5 or J6). Set the master gain control (R29) to the ¾-open position and line-level gain control full open. Then, speaking into the mike, or using a mike-level signal (—50 db) from the generator, advance the appropriate control (R11-R16) until the recorder's volume indicator shows normal maximum recording level. Holding the input signal constant, ad-



Pilot lamp is attached to side of plastic meter case, producing a subdued glow at front panel. You might want to use jewel type pilot assembly on front panel for a more outstanding indication that AC is on.

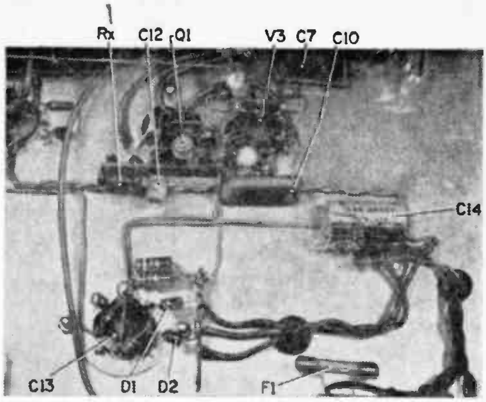
MIX-MASTER

just the VU calibrate control R24 until M1 indicates 0 VU; indications on M1 will now correspond to those on the recorder.

On some recorders, the built-in volume indicator is only lightly damped, though it may be styled as a VU meter. When a complex waveform is fed to the consolette, the meter on such a recorder will indicate peaks far above the zero mark at the same time the consolette's meter is indicating below zero. Since the ballistics of the meter in the recorder are sometimes selected to allow "pushing" the recording level to tape saturation, the meter in the consolette should be adjusted to correspond to the recorder's meter—not vice versa. If necessary, always advance R24 so the peaks indicated on M1 correspond to the peaks indicated on the recorder's meter.

Using The Consolette. The consolette is intended to be connected to the high-level input of a recorder or PA amplifier. If the consolette output is connected to a microphone (low-level) input, the recorder or amplifier will likely be overloaded or there will be severe hum.

Low-level input (at J1, J2, J3 and J4) to the consolette can be from any high-impedance microphone—a 50,000-ohm dynamic or a high-impedance crystal or ceramic type. For J5 and J6, use a high-level high-impedance source such as a crystal or ceramic phono cartridge, the output of a tape deck, or an AM or FM tuner. In normal use, it is suggested that the recorder's line-level gain be set to near maximum.



Grommet protects leads from power transformer. Diodes are mounted right at base of filter capacitor. Filament leads run to right—to bleeder for positive bias.

The consolette's output can be monitored with headphones at J7, which is intended for phones of 2000-ohms impedance or higher. Phones of 2000- to 4000-ohms impedance will cause the meter to indicate from 1 to 3 db below the actual output level. (Crystal headphones will have less effect on the meter indications.) If you have this problem, simply connect a 2700-ohm resistor in series with J7. The volume level at J7 is comfortable; not too loud and not too low. While R24 can be used to vary the monitor level, keep in mind that R24 also determines M1's calibration.

Now you're all set to make professional-like recordings. The main thing is to keep those monitor phones on and watch that jiggling meter pointer—boost those low levels and ease down on those peaks. All it takes is practice. ■

STRAIGHT FROM THE SHOULDER

■ "Look ma, no hands!" (a phrase traditionally associated with cyclists) can now be attributed to many a fireman, policeman, or industrial worker. For a unique two-way radio distributed by American Teletronics Corp. (AMTEL) in San Francisco weighs a mere 5 oz. and is purposely designed for hands-free operation. Pictured is one model of the unit (trade-named "Shoulder Talk"), which can be installed in almost any safety helmet in a matter of minutes. Also available is a model for use with a gas mask. ■

Regardless Of What You Pay For A Color TV...

It Can't Perform As Well As This New Heathkit® "180" For Only $379.95*

Here's Why!

Exclusive Features That Can't Be Bought In Ready-Made Sets At Any Price! *All* color TV sets require periodic convergence and color purity adjustments. This new Heathkit GR-180 has *exclusive* built-in servicing aids so *you* can perform these adjustments anytime . . . *without* any special skills or knowledge. Simple-to-follow instructions and detailed color photos in the GR-180 manual show you exactly what to look for, what to do and how to do it. Results? Beautifully clean and sharp color pictures day in and day out . . . and up to $200 savings in service calls during the life of your set!

Exclusive Heath Magna-Shield . . . surrounds the entire tube to keep out stray magnetic fields and improve color purity. In addition, *Automatic Degaussing* demagnetizes and "cleans" the picture everytime you turn the set on from a "cold" start.

Choice Of Installation . . . Another Exclusive! The GR-180 is designed for mounting in a wall or your own custom cabinet. Or you can install it in either optional Heath factory-built Contemporary or Early American styled cabinets.

From Parts To Programs In Just 25 Hours. All critical circuits are preassembled, aligned and tested at the factory. The GR-180 manual guides you the rest of the way with simple, non-technical instructions and giant pictorials. You can't miss!

Plus A Host Of Advanced Features . . . like the hi-fi 180 sq. inch rectangular tube with "rare earth phosphors", smaller dot size and 24,000 volt picture power for brighter, livelier colors and sharper definition . . . *Automatic Color Control* and gated *Automatic Gain Control* to reduce color fading and insure jitter-free pictures at all times . . . deluxe *VHF Turret Tuner* with "memory" fine tuning . . . *2-Speed Transistor UHF Tuner* . . . *Two Hi-Fi Sound Outputs* for play through your hi-fi system or connection to the GR-180's 4" x 6" speaker . . . *Two VHF Antenna Inputs* — a 300 ohm balanced and a 75 ohm coax . . . *1-Year Warranty* on the picture tube, 90 days on other parts. For full details mail coupon on the following page.

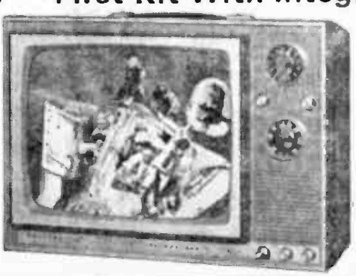
***Kit GR-180,** everything except cabinet, 102 lbs. **$379.95**

GRA-180-1, walnut cabinet (shown above), 30 lbs. . . 18¼" D x 28¼" W x 29" H **$49.95**

GRA-180-2, Early American cabinet, 37 lbs. . . 18¼" D x 28¼" W x 31¾" H . . . Available February **$75.00**

NEW 12" Transistor Portable TV — First Kit With Integrated Circuit

Unusually sensitive performance. Plays anywhere . . . runs on household 117 v. AC, any 12 v. battery, or optional rechargeable battery pack ($39.95); receives all channels; new integrated sound circuit replaces 39 components; preassembled, prealigned tuners; high gain IF strip; Gated AGC for steady, jitter-free pictures; front-panel mounted speaker; assembles in only 10 hours. Rugged high impact plastic cabinet measures a compact 11½" H x 15¾" W x 9⅜" D. 27 lbs.

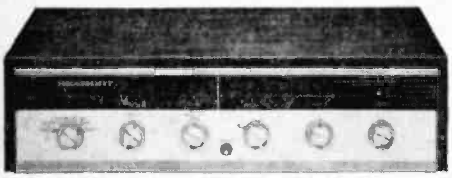


Kit GR-104
$119.95

Turn Page For More New Kits From HEATH

How To Have Fun While You Save . . .

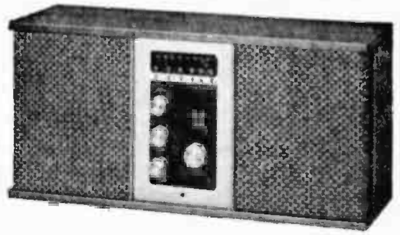
30-Watt Solid-State FM/FM Stereo Receiver . . . Your Best Buy In Stereo



Kit AR-14
$99.95
(less cabinet)

High Performance At Lowest Cost Features 31 transistors, 10 diodes for cool, natural transistor sound; 20 watts RMS, 30 watts IHF music power @ ±1 db, 15 to 50,000 Hz; wideband FM/FM stereo tuner, plus two preamplifiers; front panel stereo headphone jack; compact 3⅞" H x 15¼" W x 12" D size; simple 20-hour kit assembly. Custom mount it in a wall, or either Heath preassembled cabinets (walnut $9.95, beige metal $3.95). 16 lbs.

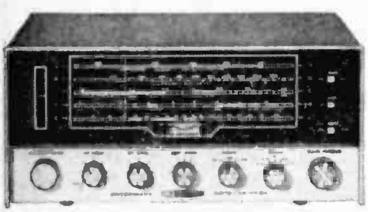
NEW! Deluxe Solid-State FM/FM Stereo Table Radio



Kit GR-36
$69.95

Tuner and IF section same as used in deluxe Heathkit transistor stereo components. Other features include automatic switching to stereo; fixed AFC; adjustable phase for best stereo; two 5¼" PM speakers; clutched volume control for individual channel adjustment; compact 19" W x 6½" D x 9¼" H size; preassembled, prealigned "front-end"; walnut cabinet; simple 10-hour assembly. 17 lbs.

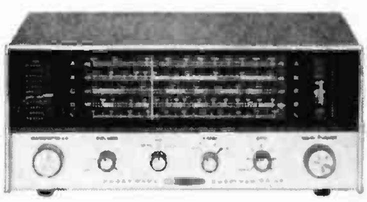
5-Band AM/Shortwave Radio



Kit GR-54
$84.95

Compare It To Sets Costing $150 & More! 5 bands cover 200-400 kHz, AM and 2-30 MHz shortwave. Features tuned RF stage; crystal filter for razor sharp selectivity; separate product detector for SSB & CW, plus AM diode detector; switchable BFO control; ANL; AVC; "S" meter; 4" x 6" speaker; headphone jack; antenna trimmer; charcoal gray metal cabinet; includes SWL antenna. 25 lbs.

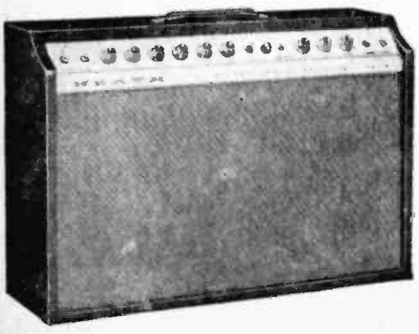
4-Band AM/Shortwave Receiver



Kit GR-64
$37.95

Hear Live Broadcast From Hundreds Of Foreign Countries, Voice of America, Radio Moscow, hams, ship-to-shore, plus popular AM. Covers 550 kHz to 30 MHz in 4 bands. Boasts 4-tube superhet circuit plus 2 silicon rectifiers; 5" speaker; BFO control; "S" meter; bandspread tuning; headphone jack; AM rod antenna; charcoal gray metal cabinet. 15 lbs.

New! Heathkit 60-Watt Solid-State Guitar Amplifier



Kit TA-16
$129.95

All The Features Guitarists Want Most . . . 60 watts peak power; two channels, one for accompaniment, accordion, organ or mike, the other has variable reverb and tremolo for lead guitars; 2 inputs per channel; two foot switches for reverb & tremolo; two 12" heavy-duty speakers; hum reduction switch; one easy-to-build circuit board with 13 transistors, 6 diodes — total kit assembly time 12 hours; 28" W x 9" D x 19" H leather-textured black vinyl cabinet of ¾" stock; 120 v. or 240 v. AC operation; extruded aluminum front panel; chrome-plated knobs. 52 lbs.

Build Your Own Heathkit® Electronics

NEW Heathkit® /Magnecord® 1020 4-Track Stereo Recorder Kit

Kit AD-16
$399.50
(less cabinet)

Save $170 by doing the easy assembly yourself. Features solid-state circuitry; 4-track stereo or mono playback and record at 7½ & 3¾ ips; sound-on-sound, sound-with-sound and echo capabilities; 3 separate motors; solenoid operation; die-cast top-plate, flywheel and capstan shaft housing; all push-button controls; automatic shut-off; plus a host of other professional features. 45 lbs. Optional walnut base $19.95, adapter ring $4.75

New! SB-101 80-10 Meter SSB Transceiver — Now With Improved CW Transceive Capability

Kit SB-101
$360.00
(less speaker)

Now features capability for front panel switch selection of either the USB/LSB standard 2.1 kHz SSB filter or the optional SBA-301-2 400 Hz CW filter . . . plus simplified assembly at no increase in price over the already famous Heathkit SB-100. Also boasts 180-watt P.E.P. input, 170 watts input CW, PTT & VOX, CW sidetone, Heath LMO for truly linear tuning and 1 kHz dial calibrations. 23 lbs. SBA-301-2, 400 Hz CW filter . . . $20.95. Kit HP-13, mobile power supply . . . $59.95. Kit HP-23, fixed station supply........................$39.95

2-Watt Walkie-Talkie

Assembled
GRS-65A
$99.95

New . . . Factory Assembled. Up to 6 mile range; rechargeable battery; 9 silicon transistors, 2 diodes; superhet receiver; squelch; ANL; aluminum case. 3 lbs. 117 v. AC battery charger & cigarette lighter charging cord $9.95. Crystals $1.99 ea.

NEW Portable Phonograph Kit

Kit GD-16
$39.95

All Transistor. Assembles in 1 to 2 hours. Preassembled 4-speed automatic mono changer; 4" x 6" speaker; dual Sapphire styli; 45 rpm adaptor; olive & beige preassembled cabinet; 117 v. AC. 23 lbs.

FREE

World's Largest Electronic Kit Catalog!

108 pages ... many in full color ... describe these and over 250 easy-to-build Heathkits for color TV, stereo/hi-fi, CB, ham, marine, shortwave, test, educational, home and hobby items. Mail coupon for your free copy.

HEATHKIT

HEATH COMPANY, Dept. 19-4
Benton Harbor, Michigan 49022

☐ Enclosed is $______________, plus shipping.

Please send model (s)______________________

☐ Please send FREE 1967 Heathkit Catalog.

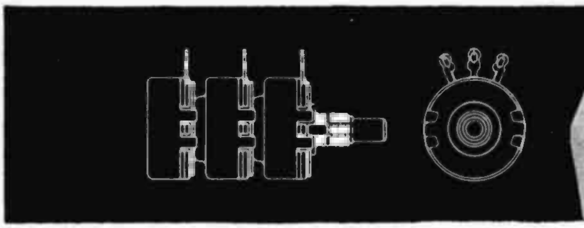
Name______________________________

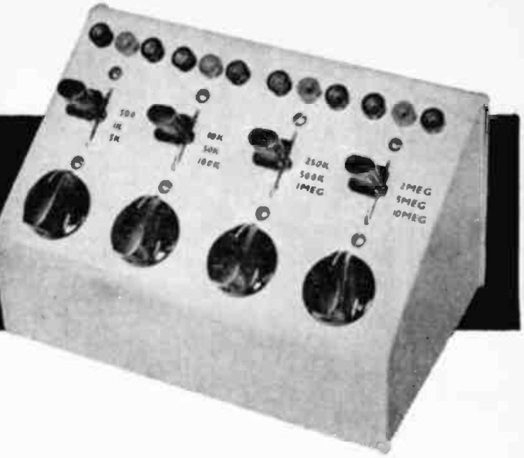
Address____________________________

City__________________ State__________ Zip______

Prices & specifications subject to change without notice. CL-274

POT BOX





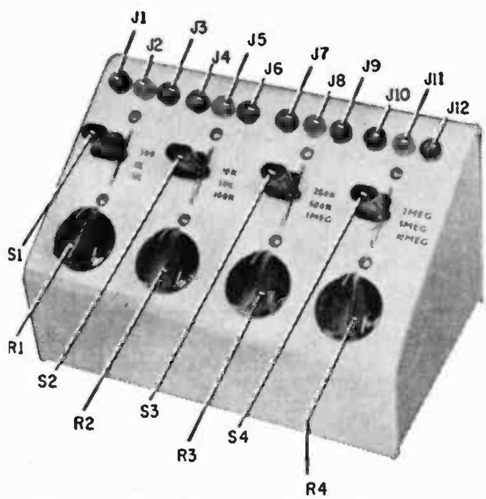
by Jack Brayton

Flip a switch, twist a wrist—the resistance you want, when you want it.

■ If there's one thing the experimenter almost never has it's the correct pot (potentiometer in Webster's) for the circuit he's building or fixing. Those pots in the junk box always seem to be either noisy, dirty, broken, or their values are simply wrong for the project at hand.

Sure, you can manage (after wasting time searching) to find a pot that works in the circuit you're breadboarding. But can you find another one with a slightly-higher or lower-resistance value to locate the circuit's outside limits? Are you sure your final choice is well within those limits? You can do all these things, simply, easily, with the *Pot Box*. You can also temporarily replace a few of those fixed resistors with pots—to see how the circuit would act if these fixed units were higher, or lower in resistance value. Since the *Pot Box* has twelve *overlapping* ranges you can have *continuous* coverage from a few ohms to 10 Meg.! Still another advantage is that individual range switches allow up to four pots to be used *simultaneously*.

Cost is not prohibitive—the complete, 4-section, 12-range unit costs only about $22.00 to build. Even this price can be cut by $5.00 or more simply by eliminating one of the lesser used sections at the high or low end. Using 3-position, double-pole slide switches will also reduce costs by about



Each group of three jacks is for one potentiometer. Lever switches select one of the wafers of each triple-section unit.

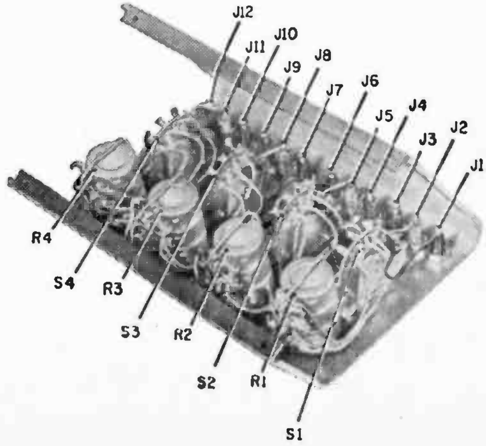


TABLE OF POTENTIOMETER RANGES

R1a—500	R2a—10K*	R3a—250K*	R4a—2Meg.*
R1b—1K	R2b—50K	R3b—500K*	R4b—5 Meg.
R1c—5K	R2c—100K*	R3c—1 Meg.*	R4c—10 Meg.

*Indicates values available in log (audio) tapers.

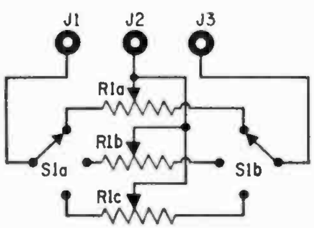
75¢ for each of the sections. (Use Continental-Wirt G338; Allied 35Z032.)

Its Secret. Its secret is simple and neat. *Triple-section* controls are used which means only four knobs are on the panel even though twelve potentiometer values are available at the jacks. As we've already mentioned, low-cost, double-pole, lever-type range switches are utilized to connect the four triple-section potentiometers to the various output jacks.

PARTS LIST FOR POT BOX

J1-J12—Tip jacks (or banana jacks) (H. H. Smith 1515 or equiv.)
R1a, b, c—500-ohm, 1,000-ohm, 5,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45-D501-MD102-MD502-16)
R2a, b, c—10,000-ohm, 50,000-ohm, 100,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45-D103-MD503-MD104-16)
R3a, b, c—250,000-ohm, 500,000-ohm, 1,000,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45-D254-MD504-MD105-16)
R4a, b, c—2,000,000-ohm, 5,000,000-ohm, 10,000,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45-D205-MD505-MD106-16)
S1-S4—3-p.d.t., positive-action, non-shorting lever switch (Centralab 1454 or equiv.)
1—Sloping-panel utility cabinet, 7-in. wide (Bud C1609—steel; AC1613—aluminum, or equiv.)
4—Knobs for ¼-in. round shaft
Misc.—Wire, solder, machine screws and nuts, panel marking decals, paint, etc.

Estimated cost: $22.00
Construction time: 4 hours

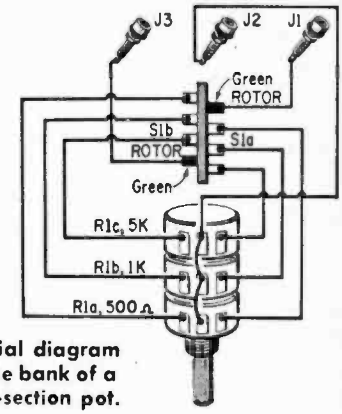


ALTERNATE PARTS LIST

(For Log-Tapered Audio Controls)

R2a, b, c—10,000-ohm, 50,000-ohm, 100,000-ohm, triple-section potentiometer (Allied 46D1892C—type A103-MD503-MA104-16)
R3a, b, c—250,000-ohm, 500,000-ohm, 1,000,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45A254-MA504-MA105-16)
R4a, b, c—2,000,000-ohm, 5,000,000-ohm, 10,000,000-ohm, triple-section potentiometer (Allied 46D1892C—type 45-A205-MD505-MD106-16)

Parts. All of the parts, except the controls, are standard and widely available. The four controls are from Allied's *industrial catalog* and may be ordered ($3.00 each) using the stock and type numbers shown in the Parts List. It's important to note that the *stock* number merely indicates a triple-section control while the *type* number indicates the placement and resistance values used to make up the control. Thus, *both* the stock and



Pictorial diagram for one bank of a triple-section pot.

type numbers must be clearly written on the order.

Linear instead of logarithmic (log) tapered pots are specified in the Parts List because tapered pots do not come in all of the values needed. However, if you do a lot of audio or related work and want log-tapered pots in as many values as possible, simply substitute the stock and type numbers shown in Alternate Parts List when ordering the controls. The values marked with an asterisk (*) in the table would then be log tapered pots.

Construction. Of course, construction is started by laying out the sloping panel of the utility box on ¼-inch graph paper as shown. Then cut it out; tape it to the front panel; center punch the holes; and, finally, drill them. The switch slots are started in the ¼-inch center holes and are sawed with a keyhole hack saw. A thin, flat file is used to smooth the edges and widen the slots slightly.

The parts are mounted as shown in the illustrations. You can't mount the switches wrong (upside down) since their terminals are symmetrical, the same in either position. Furthermore, the rotor terminals are identified by a green dye.

Wiring. Wiring is simple and easy because each of the four sections are wired exactly the same. The schematic diagram shows the

(Continued on page 120)

LITERATURE LIBRARY

★ Starred items indicate advertisers in this issue. Consult their ads for additional information and specifications.

CB—BUSINESS RADIO SHORTWAVE RADIO

116. Pep-up your CB rig's performance with *Turner's* M+2 mobile microphone. Get complete spec sheets and data on other *Turner* mikes.

★93. *Heath Co.* has a new 23-channel all-transistor 5-watt CB rig at the lowest cost on the market, plus a full line of CB gear. See their new 10-band AM/FM/Shortwave portable and line of shortwave radios.

101. If it's a CB product, chances are *International Crystal* has it listed in their colorful catalog. Whether kit or wired, accessory or test gear, this CB-oriented company can be relied on to fill the bill.

48. *Hy-Gain's* new CB antenna catalog is packed full of useful information and product data that every CB'er should know. Get a copy.

107. Get with the mobile set with *Tram's* XL'100. The new Titan CB base station, another *Tram* great, is worth knowing about.

111. Get the scoop on *Versa-Tronics'* Versa-Tenna with instant magnetic mounting. Antenna models available for CB'ers, hams and mobile units from 27 MHz to 1000 MHz.

45. Catering to 2-way radio buffs for 30 years, *World Radio Laboratories* has a new free catalog which includes the latest CB transceivers, etc. Quarterly fliers chock-full of bargains are also available.

115. Get the fully story on *Polytronics Laboratories'* latest CB entry —Carry-Comm. Full 5-watts, great for mobile, base or portable use. Works on 12 VDC or 115 AC.

50. Make your connection with *Amphenol*—tune in to the latest on CB product news with specs and pics on new gear. Keep informed on Amphenol's new products.

100. You can get increased CB range and clarity using the "Cobra" transceiver with speech compressor—receiver sensitivity is excellent. Catalog sheet will be mailed by *B&K Division* of *Dynascan Corporation.*

54. A catalog for CB'ers, hams and experimenters, with outstanding values. Terrific buys on *Grove Electronics'* antennas, mikes and accessories.

96. If a rugged low cost business/industrial two-way radio is what you've been looking for, be sure to send for the brochure on *E. F. Johnson Co.'s* brand new Messenger "202."

103. *Squires-Sanders* would like you to know about their CB transceivers, the "23'er" and the new "S5S." Also, CB accessories that add versatility to their 5-watters.

KITS

★42. Here's a colorful 108-page catalog containing a wide assortment of electronic kits. You'll find something for any interest, any budget. And *Heath Co.* will happily send you a copy.

★44. *EICO's* new 48-page 2-color pocket-size short form catalog is just off the press. Over 250 products: Ham radio, CB, hi-fi—in kit and wired form—are illustrated. Also, discover *EICO's* new experimenter kit line.

ELECTRONIC PRODUCTS

66. Try instant lettering to mark control panels and component parts. *Datak's* booklets and sample show this easy dry transfer method.

108. Get the facts on *Mercury's* line of test equipment kits—designed to make troubleshooting easier, faster and more profitable.

67. "Get the most measurement value per dollar," says *Electronics Measurements Corp.* Send for their catalog and find out how!

92. How about installing a transistorized electronic ignition system in your current car? *AEC Laboratories* will mail their brochure giving you specifications, schematics.

109. *Seco* offers a line of specialized and standard test equipment that's ideal for the home experimenter and pro. Get specs and prices today.

HI-FI/AUDIO

★26. Always a leader, *H. H. Scott* introduces a new concept in stereo console catalogs. "At Home With Stereo," offers decorating ideas, a complete explanation of the more technical aspects of stereo consoles.

85. Need a tuner? Preamp? Amp? Tape deck? Then inspect *Dyna* for kits or wired units. It's worthwhile looking at test reports *Dyna* sends your way.

110. Get the latest facts on sound columns. *American Geloso Electronics Inc.* offers a ten-page booklet giving the hows and whys plus method of installation and arrangement of sound columns.

15. A name well-known in audio circles is *Acoustic Research.* Here's its booklet on the famous AR speakers and the AR turntable.

16. Discover how Cueing Control, anti-scating and other *Garrard* features in the Lab 80 offer tops in audio listening. 32-page *Garrard* Comparator Guide will make you a wiser buyer—get it.

17. Build your own bass reflex enclosures from fool-proof plans offered by *Electro-Voice.* At the same time get the specs on *EV's* solid-state hi-fi line—a new pace setter for the audio industry.

19. *Empire Scientific's* new 8-page, full color catalog is now available to our readers. Don't miss the sparkling decorating-with-sound ideas.

24. Need a hi-fi or PA mike? *University Sound* has an interesting microphone booklet audio fans should read before making a purchase.

27. An assortment of high fidelity components and cabinets are described in the *Sherwood* brochure. The cabinets can almost be designed to your requirements, as they use modules.

95. Confused about stereo? Want to beat the high cost of hi-fi without compromising on the results? Then you need the new 24-page catalog by *Jensen Manufacturing.*

99. Get the inside info on why *Acoustech's* solid-state amplifiers are the rage of the experts. Colorful brochure answers all your questions.

TAPE RECORDERS AND TAPE

113. *Scotch* is the product and it's made by *Minnesota Mining and Mfg. Co. (3M).* Get a packet full of facts and tape data from *3M* and learn all about your tape recorder and the tape it needs.

31. All the facts about *Concord Electronics Corp.* tape recorders are yours for the asking in a free booklet. Portable, battery operated to four-track, fully transistorized stereos cover every recording need.

32. "Everybody's Tape Recording Handbook" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 24-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

33. Become the first to learn about *Norelco's* complete Carry-Corder 150 portable tape recorder outfit. Four-color booklet describes this new cartridge-tape unit.

34. You can't pick the tape recorder you need without a program—and *Sony Superscope* has one. Full color 16-page booklet is as good as your dealer's showcase. Includes accessories.

35. If you are a serious tape audiophile, you will be interested in the new *Viking of Minneapolis* line—they carry both reel and cartridge recorders you should know about.

91. Sound begins and ends with a *Uher* tape recorder. Write for this new 20 page catalog showing the entire line of *Uher* recorders and accessories. How to synchronize your slide projector, execute sound on sound, and many other exclusive features.

HI-FI ACCESSORIES

112. *Telex* would like you to know about their improved Serenata Headset—and their entire line of quality stereo headsets.

39. A 12-page catalog describing the audio accessories that make hi-fi living a bit easier is yours from *Switchcraft, Inc.* The cables, mike mixers, and junctions are essentials!

98. Swinging to hi-fi stereo headsets? Then get your copy of *Superex Electronics'* 16-page catalog featuring a large selection of quality headsets.

104. You can't hear FM stereo unless your FM antenna can pull 'em in. Learn more and discover what's available from *Finco's* 6-pager "Third Dimensional Sound."

AMATEUR RADIO

46. A long-time builder of ham equipment, *Hallicrafters* will send you lots of info on the ham, CB and commercial radio-equipment.

SCHOOLS AND EDUCATIONAL

114. Prepare for tomorrow by studying at home with *Technical Training International*. Get the facts today on how you can step up in your present job.

★59. For a complete rundown on curriculum, lesson outlines, and full details from a leading electronic school, ask for this brochure from the *Indiana Home Study Institute*.

★61. *ICS (International Correspondence Schools)* offers 236 courses including many in the fields of radio, TV, and electronics. Send for free booklet "It's Your Future."

★74. How to get an F.C.C. license, plus a description of the complete electronic courses offered by *Cleveland Institute of Electronics* are in their free catalog.

105. Get the low-down on the latest in educational electronic kits from *Trans-Tek*. Build light dimmers, amplifiers, metronomes, and many more. *Trans-Tek* helps you to learn while building.

TOOLS

118. Secure coax cables, speaker wires, phone wires, etc., with *Arrow* staple gun tackers. 3 models for wires and cables from 3/16" to ½" dia. Get fact-full Arrow literature.

★78. Need a compact screwdriver kit? *Xcelite's* 99PV-4 and 99PV-6 consists of handle, 3 and 5 blades, respectively, in "see-thru" zipper case. Get *Xcelite's* catalog 166.

TELEVISION

★70. *The Heath Co.* now has a 19" color TV to complement their 21" and 25" models. A new B&W portable model will be a hot seller for the mobile set. Get the facts today!

72. Get your 1967 catalog of *Cistin's* TV, radio, and hi-fi service books. Bonus—TV tube substitution guide and trouble-chaser chart is yours for the asking.

97. Interesting, helpful brochures describing the TV antenna discovery of the decade—the log periodic antenna for UHF and UHF-TV, and FM stereo. From *JFD Electronics Corporation*.

ELECTRONIC PARTS

117. Don't build that next project until you get your mits on *Bigelow's* 13th anniversary catalog. You've got to read this one to believe the buys.

★1. Allied's catalog is so widely used as a reference book, that it's regarded as a standard by people in the electronics industry. Don't *you* have the latest *Allied Radio* catalog? The surprising thing is that it's free!

★2. The new 1967 Edition of *Lafayette's* catalog features sections on stereo hi-fi, CB, ham gear, test equipment, cameras, optics, tools and much more. Get your copy today.

★3. Bargains galore! Parts, tools, test equipment, radios and many more specials at ultra-low prices. *Progressive Edu-Kits* will send latest catalog.

★4. *Olson's* catalog is a multicolored newspaper that's packed with more bargains than a phone book has names. Don't believe us? Get a copy.

★23. No electronics bargain hunter should be caught without the 1967 copy of *Radio Shack's* catalog. Some equipment and kit offers are so low, they look like misprints. Buying is believing.

★5. *Edmund Scientific's* new catalog contains over 4000 products that embrace many interests and fields. It's an 148-page buyers' guide for Science Fair fans.

★106. With 70 million TV's and 240 million radios somebody somewhere will need a vacuum tube replacement at the rate of one a second! Get *Universal Tube Co.'s* Troubleshooting Chart and facts on their $1 flat rate per tube.

★7. Whether you buy surplus or new, you will be interested in *Fair Radio Sales Co.'s* latest catalog—chuck full of surplus buys for every experimenter.

8. Want a colorful catalog of goodies? *John Meshna, Jr.* has one that covers everything from assemblies to zener diodes. Listed are government surplus radio, radar, parts, etc. All at unbelievable prices.

★6. Bargains galore, that's what's in store! *Poly-Paks Co.* will send you their latest eight-page flyer listing the latest in merchandise available, including a giant $1 special sale.

10. *Burstein-Applebee* offers a new giant catalog containing 100's of big pages crammed with savings including hundreds of bargains on hi-fi kits, power tools, tubes, and parts.

★11. Now available from *EDI (Electronic Distributors, Inc.)* a catalog containing hundreds of electronic items. *EDI* will be happy to place you on their mailing list.

12. VHF listeners will want the latest catalog from *Kuhn Electronics*. All types and forms of complete receivers and converters.

RADIO-TV EXPERIMENTER, Dept. 467
505 Park Avenue, New York, N. Y. 10022

Please have literature whose numbers I have encircled sent to me as soon as possible. I am enclosing 25¢ (no stamps) to cover handling charges.

☐ I am a subscriber

☐ Indicate total number of booklets requested

Be Sure To Enclose 25¢

1 2 3 4 5 6 7 8 10 11 12 15 16 17
19 23 24 26 27 31 32 33 34 35 39 42 44 45
46 48 50 54 57 59 61 66 67 70 72 74 78 85
91 92 93 95 96 97 98 99 100 101 103 104 105 106
107 108 109 110 111 112 113 114 115 116 117 118

NAME (Print clearly) ____________________

ADDRESS ____________________

CITY ____________ STATE ____________ ZIP ________

VLF Listening

Continued from page 53

less, there is seldom an interference problem even with a broadly tuned receiver.

A typical example was station GBR in England, a long-time VLF resident on 16 kHz. For reasons known only to the GBR staff, it was decided to change the station's frequency for better coverage. The end result was a new transmitting frequency of 15.975 kHz (a mere 25 Hz away from the original frequency). Such a shift would hardly have been detected on shortwave, but it was sufficient on this band to make the needed difference.

It's interesting to note that high-speed CW cannot be transmitted on VLF and the normally rapid U.S. Navy communications must be idled down to 25 wpm or less. It also seems that because of some unique antenna resonance problems found in VLF transmission, signals cannot be sent which require a greater bandwidth than the antenna can handle—at least not without seriously damaging the transmitting equipment in the process. As a result, many VLF stations transmit code so slowly that even someone who is not able to read CW can write down the dots and dashes and decipher them later from a chart.

As a true DX fiend, you're probably wondering about the possibilities of getting QSL's from these stations (and who wouldn't like to lay claim to a card from a 2-million watt station?). Rest easy, for these stations have always been very cooperative, even to the point of being encouraging, to those hardy DX enthusiasts who have ventured into radio's most mysterious frontier.

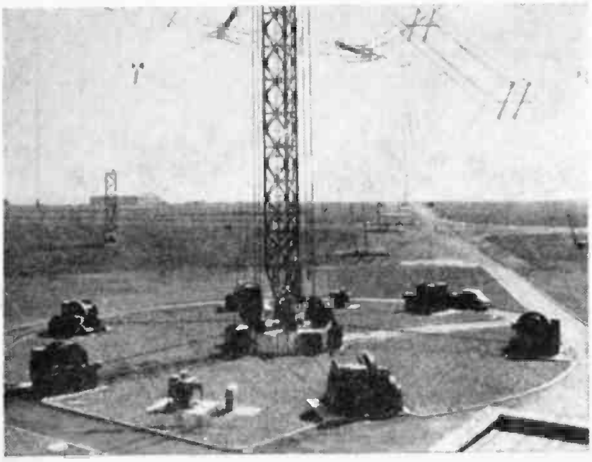
Future Of VLF. Experiments are still continuing to establish new records in low-frequency transmission. For a while the lowest frequency achieved was 800 Hz (0.8 kHz), which was the low-frequency edge of the Naval Research Laboratory's experimental "whistler" receiver. More recently, the U.S. Air Force was successful in sending a signal about 750 miles (from a 300,000 watt transmitter) on a frequency of 400 Hz!

Researchers have now discovered that a resonant cavity exists between the surface of the earth and the ionosphere. This frequency is estimated as being just below 8 Hz, which point could turn out to be rock-bottom.

Meanwhile, from a practical standpoint, the U.S. Navy is in the process of establishing a new VLF long-range navigational system dubbed "Omega," with stations already established in Norway, the Canal Zone, Trinidad, Hawaii, Forestport (N.Y.), and three other locations, including one at an undisclosed point in the U.S. midwest ("Omega" incidentally, is apparently intended to be the navigational system for our nuclear submarine fleet.)

Each station transmits two sequential radio pulses on 10.2 and 13.6 kHz, at a specific time during a 10-second period. Receivers aboard Navy vessels will compare minute time differences between any three or more of the signals and a series of lines can be then plotted on a chart which will show the exact location of the vessel. Some of the "Omega" stations have already been heard on 13.6 kHz.

Though VLF was almost dead and buried after World War I, the renewed interest in this band has been truly exciting for anybody interested in electronics. And as a unique brand of radio communications, VLF can well be considered the last outpost in an otherwise tamed frontier. Why not tune in on the excitement this last frontier has to offer—all it takes is a receiver less complicated than a table radio to make you a full-fledged member of the "in" crowd! ■



NATO VLF station at Anthorn, England, has six halyard winches around the base of main mast. At the present time it is the largest single antenna system to be found in Western Europe.

Volume 47, Part 2

WHITE'S RADIO LOG

An up-to-date Broadcasting Directory of North American AM, FM and TV Stations. Including a Special Section on World-Wide Short-Wave Stations

This is the second part of *White's Radio Log*, published in three parts twice each year. This format permits the Editors of RADIO-TV EXPERIMENTER to offer its readers two complete volumes of *White's Radio Log* each year, while increasing the scope of the *Log* and inserting station changes as they occur.

In this issue of *White's Radio Log* we have included the following listings: U. S. AM Stations by Location, U. S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, and the expanded, up-to-date World-Wide Short-Wave Section.

In the June/July issue of RADIO-TV EXPERIMENTER, the *Log* will contain the following listings: U. S. AM Stations by Call Letters, U. S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and the expanded World-Wide Short-Wave Section.

In the event you missed any part of the *Log* published earlier this year, you will have a complete copy of *White's Radio Log* by collecting any three consecutive issues of RADIO-TV EXPERIMENTER during 1966. The three consecutive issues comprise a complete volume of *White's Radio Log* that offers complete listings with last minute station change data that can not be offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find *White's Radio Log* an unbeatable reference.

QUICK REFERENCE INDEX

WHITE'S RADIO LOG

U. S. AM Stations by Location

Location	C.L.	kHz
Abbeville, Ala.	WARI	1480
Abbeville, La.	KROF	960
Abbeville, S.C.	WABV	1590
Aberdeen, Md.	WAMD	970
Aberdeen, Miss.	WMPA	1240
Aberdeen, S.Dak.	KSDN	930
	KXRO	1320
Aberdeen, Wash.	KBKW	1450
Abilene, Tex.	KRBC	1470
	KCAD	1560
	KNIT	1280
	KWKC	1340
Abilene, Kansas	KABI	250
Abingdon, Va.	WBBI	1230
Ada, Okla.	KADA	1230
Adel, Ga.	WAAG	1470
Adrian, Mich.	WABJ	1490
Agana, Guam	KUAM	610
Aguadilla, P.R.	WABA	850
	WGRF	1340
Ahoskie, N.C.	WRCS	970
Aiken, S.C.	WAKN	990
	WLOW	1300
Aitkin, Minn.	KKIN	1000
Akron, Ohio	WAKR	1590
	WSLR	1350
	WCUE	1150
	WHLO	640
Alamogordo, N.M.	KALG	1230
	KINN	1270
Alamo Heights, Tex.	KDRY	1110
Alamosa, Colo.	KGIW	1450
Albany, Ga.	WALG	1590
	WFAZ	960
	WLYB	1250
	WGPC	1450
	WJAZ	960
Albany, Ky.	WANY	1390
Albany, Minn.	KASM	1150
Albany, N.Y.	WABY	1400
	WOKO	1460
	WPTR	1540
	WROW	590
Albany, Oreg.	KWIL	790
	KRKT	990
Albemarle, N.C.	WABZ	1010
	WZKY	1580
Albert Lea, Minn.	KATE	1450
Albertville, Ala.	WAVU	630
Albion, Mich.	WALM	1260
Albuquerque, N.M.	KABQ	1350
	KDEF	1150
	KGGM	610
	KHIP	1520
	KOB	770
	KQEO	920
	KARA	1310
	KVOD	730
	KLOS	1580
	KRZY	1450
Alcoa, Tenn.	WEAG	1470
Alexander City, Ala.	WRFS	1050
Alexandria, La.	KALB	580
	KDBS	1410
	KSYL	970
Alexandria, Minn.	KXRA	1490
Alexandria, Va.	WPIK	730
Algona, Iowa	KLGA	1600
Alice, Tex.	KOPY	1070
Alisal, Cal.	KRSA	1570
Allendale, S.C.	WOOG	1460
Allentown, Pa.	WHOL	1600
	WAEB	790
	WKAP	1320
	WSAN	1470
Alliance, Nebr.	KCOW	1400
Alliance, Ohio	WFAH	1310
Alisal, Calif.	KRSA	1570
Alma, Ga.	WCQS	1400
Alma, Mich.	WFYC	1280
Alpena Township, Mich.	WATZ	1450
Alpine, Tex.	KVLF	1240
Altavista, Va.	WKDE	1000
Alton, Ill.	WOKZ	1570
Altona, Man.	CFAM	1290
Altoona, Pa.	WFBG	1290
	WRTA	1240
	WVAM	1430
Alturas, Calif.	KCNO	570
Altus, Okla.	KWHW	1450
Alva, Okla.	KALV	1430
Amarillo, Tex.	KBUY	1010
	KPUR	1440
	KGNC	710
	KIXZ	940
	KRAY	1360
	KZIP	1310
Ambridge, Pa.	WMBA	1460
Americus, Ga.	WDEC	1290
	WISK	1390
Ames, Iowa	KASI	1430
	WOI	640
Amherst, Mass.	WTTT	1430
Amherst, N.S.	CKDH	1400
Amherst, N.Y.	WUFO	1080
Amite, La.	WABL	1570
Amory, Miss.	WAMY	1580
Amsterdam, N.Y.	WAFS	1570
	WCSS	1490
Anaconda, Mont.	KANA	580
Anacortes, Wash.	KAGT	1340
Anaheim, Calif.	KEZY	1190
Anchorage, Alaska	KBYR	1270
	KFQD	750
	KENI	550
Andalusia, Ala.	WCTA	920
	WAAO	1530
Anderson, Cal.	KMRE	1580
Anderson, Ind.	WHUT	1470
	WHBU	1240
Anderson, S.C.	WAIM	1230
	WANS	1280
Andrews, Tex.	KACT	1360
Annapolis, Md.	WANN	1190
	WYRE	810
	WNAV	1430
Ann Arbor, Mich.	WAAM	1600
	WPAG	1050
Anna, Ill.	WRAJ	1440
Anniston, Ala.	WANA	1490
	WDNG	1450
	WHMA	1390
Anoka, Minn.	KANO	1470
Ansonia, Conn.	WADS	690
Antigo, Wis.	WATK	900
Apollo, Pa.	WAVL	910
Apopka, Fla.	WVCF	1520
Apple Valley, Cal.	KAVR	960
Appleton, Wis.	WAPL	1570
	WHBY	1230
Aquadilla, P. R.	WUNA	1340
Arab, Ala.	WRAB	1380
Arcadia, Fla.	WAPG	1480
Arcata, Calif.	KENL	1340
	KATA	1340
Ardmore, Okla.	KVSO	1240
Arecibo, P.R.	WCMN	1280
	WMIA	1070
	WNIK	1230
Argentia, Nfld.	VOUS	1480
Arkadelphia, Ark.	KVRC	1240
Arkan. City, Kans.	KSOK	1280
Arlington, Fla.	WDCJ	1220
Arlington, Va.	WAVA	780
	WEAM	1390
Arroyo Grande, Calif.	KOAG	1280
Artesia, N.M.	KSVP	990
Arvada, Colo.	KQXI	1550
Ashburn, Ga.	WMES	1570
Asbury Park, N.J.	WJLK	1440
Asbury Park-Eatontown, N. J.	WHTG	1410
Asheboro, N.C.	WGWR	1260
Asheville, N.C.	WISE	1310
	WLOS	1380
	WSKY	1230
	WWNC	570
Ashland, Ky.	WCMI	1340
	WTCR	1420
Ashland, Ohio	WNCO	1340
Ashland, Oreg.	KWIN	1400
	KRVC	1350
Ashland, Va.	WIVE	1430
Ashland, Wis.	WATW	1400
Ashtabula, Ohio	WAQI	1600
	WREO	970
Aspen, Colo.	KSNO	1260
Astoria, Oreg.	KAST	1370
	KVAS	1230
Atchison, Kans.	KARE	1470
Athens, Ga.	WGAU	1340
	WDOL	1470
	WKAC	1080
	WRFC	960
	KQXI	790
Athens, Ohio	WATH	970
	WOUB	1340
Athens, Tenn.	WLAR	1450
	WYXI	1390
Athens, Tex.	KBUD	1410
Atlanta, Ga.	WPLO	590
	WIGO	1340
	WAOK	1380
	WERD	860
	WGKA	1600
	WGST	920
	WIIN	970
	WQXI	790
	WSB	750
	WYZE	1480
Atlanta-Decatur, Ga.	WGUN	1010
Atlanta, Tex.	KALT	900
Atlantic, Iowa	KJAN	1220
Atlantic Beach, Fla.	WKTX	1600
Atlantic City, N.J.	WFPG	1450
	WLDB	1490
	WMID	1340
Atmore, Ala.	WATM	1590
Atoka, Okla.	KEOR	1110
Attleboro, Mass.	WARA	1320
Auburn, Ala.	WAUD	1230
Auburn, Calif.	KAHI	950
Auburn, N.Y.	WMBO	1340
	WAUB	1590
Auburn, Wash.	KASY	1220
Auburndale, Fla.	WTWB	1570
Auburndale, Wis.	WLBL	930
Augusta, Ga.	WAUG	1050
	WBBQ	1340
	WBIA	1230
	WGAC	580
	WRDW	1480
	WTHB	1550
Augusta, Maine	WRDO	1400
	WFAU	1340
Aurora, Colo.	KOSI	1430
Aurora, Ill.	WMRO	1280
	WKKD	1580
Aurora, Mo.	KSWM	940
Austin, Minn.	KAUS	1480
	KQAQ	970
Austin, Tex.	KNOW	1490
	KHFI	970
	KTBC	590
	KOKE	1370
	KVET	1300
Avalon, Cal.	KBIG	740
Avon Park, Fla.	WAVP	1390
Avondale Estates, Ga.	WAVO	1420
Aztec, N. Mex.	KHAP	1340
Babylon, N.Y.	WBAB	1440
	WGLI	1290
Bad Axe, Mich.	WLEW	1340
Bainbridge, Ga.	WMGR	930
	WAZA	1360
Baker, Mont.	KFLN	960
Baker, Oreg.	KBKR	1490
Bakersfield, Calif.	KAFY	550
	KBIS	970
	KERN	1410
	KGEE	1230
	KUZZ	800
	KLYD	1350
	KWAC	1490
	KPMC	1560
Bellingham, Wash.	KPUG	1170
Baldwinsville, N.Y.	WSEN	1050
Ballinger, Tex.	KRUN	1400
Baltimore, Md.	WBAL	1090
	WAYE	860
	WBMD	750
	WCAO	600
	WCBM	680
	WEBB	1360
	WFBR	1300
	WITH	1230
	WSID	1010
	WWIN	1400
Bamberg-Denmark, S.C.	WWBD	790
Bangor, Maine	WABI	910
	WGUY	1250
	WLBZ	620
Banning, Calif.	KPAS	1490
Bardstown, Ky.	WBRT	1320
Barnesboro, Pa.	WNCC	950
Barnesville, Ga.	WBAF	1090
Barnwell, S.C.	WBAW	740
Barre, Vt.	WSNO	1450
Barstow, Calif.	KWTC	1230
	KIOT	1310
Bartlesville, Okla.	KWON	1400
Bartow, Fla.	WBAR	1460
Bassett, Va.	WODY	900
Bastrop, La.	KTRY	730
	KVOB	1340
Batavia, N.Y.	WBTA	1490
Batesburg, S.C.	WBLR	1430
Batesville, Ark.	KBTA	1340
Batesville, Miss.	WBLE	1290
Bath, Maine	WJTO	730
Bath, N.Y.	WFSR	1580
Baton Rouge, La.	WAIL	1260
	WLUX	1550
	WYNK	1380
	WIBR	1300
	WJBO	1150
	WLCS	910
	WXOK	1460
Battle Creek, Mich.	WBCK	930
	WKFR	1400
	WVOC	1500
Baxley, Ga.	WHAB	1260
Bay City, Mich.	WBCM	1440
	WXOX	1250
Bay City, Tex.	KIOX	1270
Bay Minette, Ala.	WBCA	1110
Bayamon, P.R.	WLUZ	1600
	WRSJ	1560
Baytown, Tex.	KWBA	1360
Beacon, N.Y.	WBNR	1260
Beardstown, Ill.	WRMS	790
Beatrice, Nebr.	KWBE	1450
Beaufort, N.C.	WBMA	1400
Beaufort, S.C.	WBEU	960
	WSIB	1490
Beaumont, Tex.	KLVI	560
	KPYC	1450
	KTRM	990
Beaver Dam, Wis.	WBEV	1430
Beaver Falls, Pa.	WBVP	1230
Beckley, W. Va.	WJLS	560
	WCIR	1060
	WWNR	620
Bedford, Ind.	WBIW	1340
Bedford, Pa.	WBFD	1310
Bedford, Va.	WBLT	1350
Beeville, Tex.	KIBL	1490
Bel Air, Md.	WVOB	1520
Belen, N.Mex.	KARS	860
Belfast, Me.	WBME	1230
Belgrade, Mont.	KGVW	630
Bellaire, Ohio	WOMP	1290
Bellefontaine, Ohio	WOHP	1390
Bellefonte, Pa.	WBLF	1330
Bell Fourche, S.Dak.	KBFS	1450
Belle Glade, Fla.	WSWN	900
Belleville, Ont.	CJBQ	800
Belleville, Ill.	WIBV	1260
Bellevue, Wash.	KFKF	1330
	KBVU	1540
Bellingham, Wash.	KPUG	1170
	KGMI	790
	KOQT	1550
Bellingham-Ferndale, Wash.	KENY	930
Belmont, N.C.	WCGC	1270
Beloit, Wis.	WGEZ	1490
	WBEL	1380
Belton, S.C.	WHPB	1390
Belton, Tex.	KTON	940
Belzoni, Miss.	WELZ	1460
Bemidji, Minn.	KBUN	1450
Bend, Oreg.	KBND	1110
	KGRL	940
Bennetsville, S.C.	WBSC	1550
Bennington, Vt.	WBTN	1370
Benson, Minn.	KBMO	1290
Benson, N.C.	WPYB	1580
Benton, Ark.	KBBA	690
	KGKO	850
Benton, Ky.	WCBL	1290
Benton Harbor-St. Joseph, Mich.	WHFB	1060
Berkeley, Calif.	KPAT	1400
Berkeley Springs, W.Va.	WCST	1010
Berlin, N.H.	WMOU	1230
	WBRL	1400
Berry Hill, Tenn.	WVOL	1470
Berryville, Ark.	KTHS	1480
Berwick, Pa.	WBRX	1280
Bessemer, Ala.	WYAM	1450
Bethesda, Md.	WUST	1120
Bethlehem, Pa.	WGPA	1100
Beverly, Mass.	WMLO	1570
Biddeford, Maine	WIDE	1400
Big Bear Lake, Cal.	KTOT	1050
Big Delta, Alaska	WXLL	980
Big Lake, Tex.	KBLT	1290
Big Rapids, Mich.	WBRN	1460
Big Spg., Tex.	KBST	1490
	KHEM	1270
	KBYG	1400
Big Stone Gap, Va.	WLSD	1220
Bijou, Cal.	KOWL	1490
Biloxi, Miss.	WLOX	1490
	WVMI	570
Billings, Mont.	KBMY	1240
	KGHL	790
	KOOK	970
	KOYN	910

Location	C.L.	kHz
	KURL	730
Binghamton, N.Y.	WINR	680
	WKOP	1360
	WNBF	1290
Birmingham, Ala.	WAPI	1070
	WBRC	960
	WCRT	1260
	WAQY	1220
	WENN	1320
	WATV	900
	WSGN	610
	WYDE	850
	WVOK	690
Bisbee, Ariz.	KSUN	1230
Bishop, Calif.	KIBS	1230
Bishopville, S.C.	WAGS	1380
Bismarck, N.Dak.	KFYR	550
	KBMR	1350
Bismarck-Mandan, N.Dak.	KBOM	1270
Black Mountain, N.C.	WBMS	1350
	WFGW	1010
Black River Falls, Wis.	WWIS	1260
Blackfoot, Idaho	KBLI	690
Blackshear, Ga.	WBSG	1350
Blackstone, Va.	WKLV	1440
Blackwell, Okla.	KLTR	1580
Blaine, Wash.	KARI	550
Blakely, Ga.	WBBK	1260
Blanding, Utah	KUTA	790
Bloomington, Ill.	WJBC	1230
Bloomington, Ind.	WTTS	1370
Bloomsburg, Pa.	WCNR	930
	WHLM	550
Blountstown, Fla.	WKMK	1370
Blue Earth, Minn.	KBEW	1560
Bluefield, W.Va.	WHIS	1440
	WKOY	1240
Blythe, Calif.	KYOR	1450
Blytheville, Ark.	KLCN	910
Boaz, Ala.	WBSA	1300
Boca Raton, Fla.	WSBR	740
Bogalusa, La.	WIKC	1490
	WBOX	920
Boise, Idaho	KATN	1010
	KBOI	670
	KEST	790
	KGEM	1140
	KIDO	630
	KYME	740
Bolivar, Mo.	KBLR	1550
Bolivar, Tenn.	WBOL	1560
Bonham, Tex.	KFYN	1420
Boone, Iowa	KFGQ	1260
	KWBG	1590
Boone, N.C.	WATA	1450
Boonville, Ind.	WBNL	1540
Boonville, Mo.	KWRT	1370
Booneville, Miss.	WBIP	1400
Boonville, N.Y.	WBRV	900
Borger, Tex.	KHUZ	1490
	KBBB	1600
Boston, Mass.	WBZ	1030
	WCOP	1150
	WILD	1090
	WNAC	680
	WEZE	1260
	WEEI	590
	WHDH	850
	WMEX	1510
	WRYT	950
Boulder, Colo.	KBOL	1490
	KDEY	1360
Bowie, Tex.	KBAN	1410
Bowling Green, Ky.	WKCT	930
	WBGN	1340
	WLBJ	1410
	KPCR	1530
Bowl. Green, Ohio	WMGS	730
Boynton Beach, Fla.	WZZZ	1510
Bozeman, Mont.	KXXL	1450
	KBMN	1230
Bradbury Hgts., Md.	WPGC	1580
Braddock, Pa.	WLOA	1550
Braddocks Heights, Md.	WMHI	1370
Bradenton, Fla.	WTRL	1490
	WBRD	1420
Bradford, Pa.	WESB	1490
Brady, Tex.	KNEL	1490
Brainerd, Minn.	KLIZ	1380
	KVBR	1340
Branson, Mo.	KBHM	1220
Brantford, Ont.	CKPC	1380
Brattleboro, Vt.	WTSA	1450
	WKVT	1490
Brawley, Calif.	KROP	1300
Brazil, Ind.	WWCM	1380
Breckenridge, Minn.	KBMW	1450
Breckenridge, Tex.	KSTB	1430
Bremen, Ga.	WWCC	1440
Bremerton, Wash.	KBRO	1490
Brenham, Tex.	KWHI	1280
Brevard, N.C.	WPNF	1240
Brewster, N.Y.	WBRW	1510
Brewton, Ala.	WEBJ	1240
Bridgeport, Ala.	WBTS	1480
Bridgeport, Conn.	WICC	600
	WNAB	1450

Location	C.L.	kHz
Bridgeton, N.J.	WSNJ	1240
Brigham City, Utah	KBUH	800
Brighton, Colo.	KBRN	800
Brinkley, Ark.	KBRI	1570
Bristol, Conn.	WBIS	1440
Bristol, Tenn.	WOPI	1490
	WKYE	1550
Bristol, Va.	WCYB	690
	WFHG	980
Brockton, Mass.	WBET	1460
	WOKW	1410
Brockville, Ont.	CFJR	1450
Broken Bow, Nebr.	KCNI	1280
Bronson, Mo.	KBHM	1220
Brookfield, Conn.	WINE	940
Brookfield, Mo.	KGHM	1470
Brookhaven, Miss.	WCHJ	1470
	WJMB	1340
Brookings, Oreg.	KURY	910
Brookings, S.Dak.	KBRK	1430
Brookline, Mass.	WBOS	1600
Brookneal, Va.	WODI	1230
Brooksville, Fla.	WWJB	1450
Brownfield, Tex.	KKUB	1300
Brownsville, Tenn.	WBHT	1520
Brownsville, Tex.	KBOR	1600
Brownwood, Tex.	KBWD	1380
	KEAN	1240
Brunswick, Ga.	WGIG	1440
	WMOG	1490
	WYNR	790
Brunswick, Maine	WCME	900
Bryan, Ohio	WBNO	1520
Bryan, Tex.	KORA	1240
	WTAW	1150
Buckhannon, W.Va.	WBUC	1460
Bucyrus, Ohio	WBCO	1540
Buffalo, N.Y.	WBEN	930
	WYSL	1400
	WEBR	970
	WGR	550
	WKBW	1520
	WWOL	1120
Buffalo, Wyo.	KBBS	1450
Buford, Ga.	WDYX	1460
Burbank, Calif.	KBLA	1500
Burley, Idaho	KBAR	1230
Burlington, Iowa	KBUR	1490
	KYEO	1150
Burlington, N.C.	WBBB	920
	WBAG	1150
Burlington, Vt.	WDOT	1400
	WJOY	1230
	WVMT	620
Burnett, Tex.	KTSL	1340
Burns, Oreg.	KRNS	1230
Burnsville, N.C.	WKYK	1540
Butler, Ala.	WPRN	1220
Butler, Mo.	KMAM	1530
Butler, Pa.	WBUT	1050
	WISR	680
Butte, Mont.	KBOW	550
	KXLF	1370
Cabin, John, Potomac, Md.	WXLN	950
Cadillac, Mich.	WATT	1240
Cadiz, Ky.	WKDZ	1110
Caguas, P.R.	WNEL	1430
	WVJP	1110
Cairo, Ga.	WGRA	790
Cairo, Ill.	WKRO	1490
Calais, Maine	WQOY	1230
Caldwell, Idaho	KCID	1490
	KBGN	910
Calera, Ala.	WBYE	1370
Calexico, Calif.	KICO	1490
Calhoun, Ga.	WCGA	900
Camas, Wash.	KVAN	1480
Cambridge, Md.	WCEM	1240
Cambridge, Mass.	WYHR	740
Cambridge, Ohio	WILE	1270
Camden, Ark.	KAMD	910
	KJWH	1450
Camden, N.J.	WCAM	1310
	WKDN	800
Camden, S. C.	WACA	1590
Camden, Tenn.	WFWL	1220
Cameron, Tex.	KMIL	1330
Camilla, Ga.	WCLB	1220
Campbell, Ohio	WHOT	1330
Campbellsville, Ky.	WTCO	1450
Canandaigua, N.Y.	WCGR	1550
Cannon City, Colo.	KRLN	1400
Canonsburg, Pa.	WARO	540
Canton, Ga.	WCHK	1290
Canton, Ill.	WBYS	1560
Canton, Miss.	WMGO	1370
Canton, N.C.	WWIT	970
Canton, Ohio	WCNS	900
	WOIO	1060
	WHBC	1480
	WINW	1520
Canyon, Tex.	KCAN	1550
Cape Girardeau, Mo.	KFVS	960
	KZYM	1220
	KGMO	1550
Carbondale, Ill.	WCIL	1020
Carbondalé, Pa.	WCOL	1440
Caribou, Maine	WFST	600
Carlisle, Pa.	WHYL	960
	WIOO	1000
Carlsbad, N.Mex.	KAVE	1240
	KCCC	930

Location	C.L.	kHz
	KPBM	740
Carmel, Calif.	KRML	1410
Carmi, Ill.	WROY	1460
Carnegie, Pa.	WZUM	1590
Caro, Mich.	WKYO	1360
Carolina, P. R.	WVOZ	1400
Carrington, N.Dak.	KOAK	1600
Carrizo Springs, Tex.	KBEN	1450
Carroll, Iowa	KCIM	1380
Carrollton, Ala.	WRAG	590
Carrollton, Ga.	WLBB	1100
Carrollton, Mo.	KAOL	1430
Carson City, Nev.	KPTL	1300
Cartersville, Ga.	WBHF	1450
	WKRW	1270
Carthage, Ill.	WCAZ	990
Carthage, Mo.	KDMO	1490
Carthage, Miss.	WECP	1480
Carthage, Tenn.	WRKM	1350
Carthage, Tex.	KGAS	1590
Caruthersville, Mo.	KCRV	1370
Casa Grande, Ariz.	KPIN	1260
Casey, Ill.	WKZI	800
Casper, Wyo.	KTWO	1470
	KATI	1400
Cathedral City, Calif.	KVOC	1230
	KWXY	1340
Cayce, S.C.	WCAY	620
Cayey, P.R.	WLEY	1080
Cedar City, Utah	KSUB	590
Cedar Falls, Iowa	KCFI	1250
Cedar Rapids, Iowa	KCRG	1600
	KLWW	1450
	WMT	600
	KHAK	1360
Cedartown, Ga.	WGAA	1340
Celina, Ohio	WCSM	1350
Center, Ala.	WEIS	990
	WAGC	1550
Center, Tex.	KDET	930
Centerville, Ala.	WBIB	1590
Centerville, Iowa	KCOG	1400
Centerville, Ind.	WHON	930
Centreville, Miss.	WLBS	1580
Centerville, Tenn.	WHLP	1570
Centerville, Utah	KBBC	1600
Central City, Ky.	WNES	1050
	WMTA	1380
Centralia, Ill.	WCNT	1210
Centralia & Chehalis, Wash.	KELA	1470
Centreville, Ala.	WBIB	1110
Ceres, Calif.	KLOC	920
Chadburn, N.C.	WVOE	1590
Chadron, Nebr.	KCSR	610
Chambersburg, Pa.	WCHA	800
	WCBG	1590
Champaign, Ill.	WDWS	1400
Chanute, Kans.	KCRB	1460
Chapel Hill, N.C.	WCHL	1360
Charleroi, Pa.	WESA	940
Charles City, Iowa	KCHA	1580
Charleston, Ill.	WEIC	1270
Charleston, Mo.	KCHR	1350
Charleston, S.C.	WCSC	1390
	WOKE	1340
	WPAL	730
	WQSN	1450
	WTMA	1250
Charleston, W.Va.	WCAW	680
	WCHS	580
	WGKV	1490
	WKAZ	950
	WTIP	1240
	WXVA	1550
Charlotte, Mich.	WCER	1390
Charlotte, N.C.	WBT	1100
	WAYS	610
	WGIV	1600
	WKTC	1310
	WSOC	930
	WIST	1240
	WWOK	1480
	WRPL	1540
Charlotte Amalie, V.I.	WBNB	1000
	WSTA	1340
	WBNB	1000
Charlottesville, Va.	WCHV	1260
	WELK	1010
	WINA	1070
Chase City, Va.	WMEK	980
Chatham, Va.	WKBY	1080
Chattahoochee, Fla.	WSBP	1580
Chattanooga, Tenn.	WMOC	1450
	WAPO	1150
	WOEF	1370
	WOOD	1310
	WOXB	1490
	WNOO	1260
Cheboygan, Mich.	WCBY	1240
Cheektowaga, N.Y.	WNIA	1230
Chehalis-Centralia, Wash.	KITI	1420
Chelan, Wash.	KOZI	1220
Cheraw, S.C.	WCRE	1420
Cherryville, N. C.	WCSL	1590
Cherokee, Iowa	KCHE	1440
Chesapeake, Va.	WSJT	1600
Chester, Ill.	KSGM	980

Location	C.L.	kHz
Chester, Pa.	WEEZ	1590
	WVCH	740
Chester, S.C.	WGCO	1490
Chester, Va.	WIKI	1410
Chestertown, Md.	WCTR	1530
Cheyenne, Wyo.	KFBC	1240
	KCHY	1530
	KRAE	1480
	KVWO	1370
	KEND	980
Chicago, Ill.	WAAF	950
	WAIT	820
	WBBM	780
	WCFL	1000
	WCRW	1240
	WEDC	1240
	WGN	720
	WIND	560
	WJJD	1160
	WLS	890
	WMAQ	670
	WMBI	1110
	WNUS	1390
	WSBC	1240
Chicago Hgts., Ill.	WMPP	1470
	WCGO	1600
Chickasha, Okla.	KWCO	1560
Chico, Calif.	KHSL	1290
	KPAY	1060
Chicopee, Mass.	WACE	730
Childress, Tex.	KCTX	1510
Chillicothe, Mo.	KCHI	1010
Chillicothe, Ohio	WBEX	1490
	WCHI	1350
Chipley, Fla.	WBGC	1240
Chippewa Falls, Wis.	WAXX	1150
Christiansburg, Va.	WJJJ	1260
Christiansted, V.I.	WIVI	970
Church Hill, Tenn.	WMCH	1260
Cicero, Ill.	WVON	1450
Cincinnati, Ohio	WCKY	1530
	WCIN	1480
	WCPO	1230
	WKRC	550
	WLW	700
	WSAI	1360
	WZIP	1050
Clanton, Ala.	WKLF	980
Clare, Mich.	WCRM	990
Claremont, N.H.	WTSV	1230
Claremore, Okla.	KWPR	1270
Clarion, Pa.	WWCH	1300
Clarksburg, W.Va.	WBOY	1400
	WHAR	1340
	WPDX	750
Clarksdale, Miss.	WROX	1450
	WKDL	1600
Clarksville, Ark.	KLYR	1360
Clarksville, Tenn.	WJZM	1400
	WDXN	540
Clarksville, Tex.	KCAR	1350
Claxton, Ga.	WCLA	1470
Clayton, Ga.	WGHC	1570
Clayton, Mo.	KXLW	1320
	KFUO	850
Clayton, N.Mex.	KLMX	1450
Clearfield, Pa.	WCPA	900
Clearwater, Fla.	WTAN	1340
	WAZE	860
Cleburne, Tex.	KCLE	1120
Clermont, Fla.	WSLC	1340
Cleveland, Ga.	WRWH	1350
Cleveland, Miss.	WCLD	1490
	WDSK	1410
Cleveland, Ohio	WKYC	1100
	WIXY	1260
	WERE	1300
	WGAR	1220
	WHK	1420
	WABQ	1540
	WJW	850
Cleveland, Tenn.	WBAC	1340
	WCLE	1570
Cleveland, Tex.	KVLB	1410
Cleve. Hgts., Ohio	WJMO	1490
Clewiston, Fla.	WOWY	1590
Clifton, Ariz.	KCLF	1400
Clifton Forge, Va.	WCFV	1230
Clincho, Va.	WDIC	1430
Clinton, Ill.	WHOW	1520
Clinton, Iowa	KCLN	1390
	KROS	1340
Clinton, Mo.	KDKD	1280
Clinton, N.C.	WRRZ	880
Clinton, Okla.	KWOE	1320
Clinton, S.C.	WPCC	1410
Clinton, Tenn.	WYSH	1380
Cloquet, Minn.	WKLK	1230
Clovis, N.Mex.	KCLV	1240
	KICA	980
Coachella, Calif.	KCHV	970
Coalinga, Cal.	KOLI	1470
Coatesville, Pa.	WCOJ	1420
Cochran, Ga.	WVMG	1440
Cocoa, Fla.	WKKO	860
	WEZY	1350
	WWBC	1510
Cocoa Beach, Fla.	WRKT	1300
Cody, Wyo.	KODI	1400
Coeur d'Alene, Ida.	KVNI	1240
Coffeyville, Kans.	KGGF	690
Colby, Kans.	KXXX	790
Coldwater, Mich.	WTVB	1590

WHITE'S

RADIO LOG

Location	C.L.	kHz
Coleman, Tex.	KSTA	1000
Colfax, Wash.	KCLX	1450
College Park, Ga.	WAIA	1570
Collierville, Tenn.	WPIP	1590
Colonial Heights, Va.	WPVA	1290
Colorado City, Tex.	KVMC	1320
Colo. Sprgs., Colo.	KRDO	1240
	KPIK	1580
	KVOR	1300
	KSSS	740
	KYSN	1460
	KRYT	1530
Columbia, Ky.	WAIN	1270
Columbia, Miss.	WCJU	1450
Columbia, Mo.	KFRU	1400
	KCGM	1580
Columbia, Pa.	WCOY	1580
Columbia, S.C.	WCOS	1400
	WIS	560
	WOIC	1320
	WNOK	1230
	WQXL	1470
Columbia, Tenn.	WMCP	1280
	WKRM	1340
Columbus, Ga.	WDAK	540
	WRBL	1420
	WHYD	1270
	WCLS	1580
	WOKS	1340
Columbus, Ind.	WCSI	1010
Columbus, Miss.	WACR	1050
	WCBI	550
Columbus, Nebr.	KJSK	900
	KTTT	1510
Columbus, Ohio	WBNS	1460
	WCOL	1230
	WMNI	920
	WOSU	820
	WTVN	610
	WVKO	1580
Colville, Wash.	KCVL	1270
Comanche, Tex.	KCOM	1550
Commerce, Ga.	WJJC	1270
Concord, Calif.	KWUN	1480
Concord, N.H.	WKXL	1450
Concord, N.C.	WEGO	1410
Concordia, Kans.	KNCK	1390
Conneaut, Ohio	WWOW	1360
Connellsville, Pa.	WCVI	1340
Connersville, Ind.	WCNB	1580
Conroe, Tex.	KMCO	900
Conway, Ark.	KCON	1230
	KVEE	1330
Conway, N.H.	WBNC	1050
Conway, S.C.	WLAT	1330
Cookeville, Tenn.	WHUB	1400
	WPTN	1550
Coolidge, Ariz.	KCKY	1150
Coos Bay, Dreg.	KOOS	1230
	KYNG	1420
Copper Hill, Tenn.	WLSB	1400
Coquille, Oreg.	KWRO	630
Coral Gables, Fla.	WRIZ	1550
	WVCG	1080
Corbin, Ky.	WCTT	680
	WYGO	1330
Cordele, Ga.	WMJM	1490
Cordova, Alaska	KLAM	1450
Corinth, Miss.	WCMA	1230
	WKCU	1350
Cornelia, Ga.	WCON	1450
Corning, Ark.	KCCB	1260
Corning, N.Y.	WCBA	1350
	WCLI	1450
Corona, Cal.	KREL	1370
Corpus Christi, Tex.	KCTA	1030
	KCCT	1150
	KEYS	1440
	KRYS	1360
	KSIX	1230
	KUNO	1400
Corry, Pa.	WOTR	1370
Corsicana, Tex.	KAND	1340
Cortez, Colo.	KVFC	740
Cortland, N.Y.	WKRT	920
	KFLY	1240
Corvallis, Dre.	KLOO	1340
Corydon, Ind.	WPDF	1550
Coshocton, Ohio	WTNS	1560
Cottage Grove, Dre.	KNND	1400
Cottonwood, Ariz.	KVRD	1240
	KVIO	1600
Coudersport, Pa.	WFRM	600
Council Bluffs, Iowa	KFNF	920
	KRCB	1360

Location	C.L.	kHz
Courtenay, B.C.	CFCP	1440
Covington, Ga.	WGFS	1430
Covington, Ky.	WCLU	1320
Covington, La.	WARB	730
Covington, Tenn.	WKBL	1250
Covington, Va.	WKEY	1340
Cowan, Tenn.	WZYX	1440
Cozad, Neb.	KAMI	1580
Craig, Colo.	KRAI	550
Crane, Tex.	KCRR	1380
	KBSN	970
Crawfordsville, Ind.	WCVL	1550
Crescent City, Calif.	KPLY	1240
	KPOD	1310
Creston, Iowa	KSIB	1520
Crestview, Fla.	WCNU	1010
	WJSB	1050
Crewe, Va.	WSVS	800
Crockett, Tex.	KIVY	1290
Crookston, Minn.	KROX	1260
Crossett, Ark.	KAGH	800
Crossville, Tenn.	WAEW	1330
Crowley, La.	KSIG	1450
Crystal Lake, Ill.	WCLR	850
Cuero, Tex.	KCFH	1600
Cullman, Ala.	WFMH	1460
	WKUL	1340
Culpeper, Va.	WCVA	1490
Cumberland, Ky.	WCPM	1280
Cumberland, Md.	WCUM	1230
	WKYR	1270
	WTBO	1450
Cummings, Ga.	WSNE	1410
Cushing, Okla.	KUSH	1600
Cuyahoga Falls, Ohio	WCUE	1150
Cypress Gardens, Fla.	WGTO	540
Cynthiana, Ky.	WCYN	1400
Dade City, Fla.	WDCF	1350
Dadeville, Ala.	WDVC	910
Daingerfield, Tex.	KEGG	1560
Dalhart, Tex.	KXIT	1410
Dallas, N.C.	WAAK	960
Dallas, Oreg.	KROW	1460
Dallas, Tex.	KRLD	1080
	KIXL	1040
	KSKY	660
	KLIF	1190
	WFAA	570
	WFAA	820
	KBOX	1480
	WRR	1310
Dalton, Ga.	WBLJ	1230
	WRCD	1430
	WTTI	1530
Danbury, Conn.	WLAD	800
Danville, Ill.	WDAN	1490
	WITY	980
Danville, Ky.	WHIR	1230
Danville, Pa.	WPGM	1570
Danville, Va.	WBTM	1330
	WYPR	970
	WDVA	1250
	WILA	1580
Dardanelle, Ark.	KCAB	980
Darlington, S.C.	WDAR	1350
Davenport, Iowa	WOC	1420
	KWNT	1580
	KSTT	1170
Dawson, Ga.	WDWD	990
Dayton, Ohio	WHIO	1290
	WING	1410
	WDNE	980
	WAVI	1210
Dayton, Tenn.	WDNT	1280
Daytona Beach, Fla.	WNDB	1150
	WMFJ	1450
	WROD	1340
Deadwood, S.Dak.	KDSJ	980
Dearborn, Mich	WKNR	1310
Decatur, Ala.	WHOS	800
	WAJF	1490
	WMSL	1400
Decatur-Atlanta, Ga.	KGUN	1010
	WOMN	1310
Decatur, Ill.	WDZ	1050
	WSOY	1340
Decatur, Ind.	WADM	1540
Decorah, Iowa	KDEC	1240
	KWLC	1240
Deer Lodge, Mont.	KDRG	1400
Deerfield, Va.	WABH	1150
Defiance, Ohio	WONW	1280
De Funiak Springs, Fla.	WDSP	1280
	WZEP	1460
De Kalb, Ill.	WLBK	1360
De Land, Fla.	WJBS	1490
	WOOO	1310
Delano, Calif.	KCHJ	1010
Delaware, Ohio	WDLE	1550
Delray, Bch., Fla.	WDBF	1420
Del Rio, Tex.	KDLK	1230
Delta, Colo.	KDTA	1400
Deming, N.Mex.	KOTS	1230
Demopolis, Ala.	WXAL	1400
Denham Sprgs., La.	WLBI	1220
Denison, Iowa	KDSN	1580
Denison-Sherman, Tex.		

Location	C.L.	kHz
	KDSX	950
Denmark-Bamberg, S.C.	WWBD	790
Denton, Tex.	KDNT	1440
Denver, Colo.	KDEN	1340
	KFML	1390
	KHOW	630
	KIMN	950
	KLIR	990
	KLZ	560
	KBTR	710
	KOA	850
	KPOF	910
	KFSC	1220
	KTLN	1280
Denver City, Tex.	KKAL	1580
De Queen, Ark.	KDQN	1390
DeRidder, La.	KDLA	1010
Des Moines, Iowa	KCBC	1390
	KIOA	940
	KRNT	1350
	KSO	1460
	KWKY	1150
	WHO	1040
Detroit, Mich.	WCAR	1130
	WJBK	1500
	WJLB	1400
	WJR	760
	WWJ	950
	WXYZ	1270
Detroit Lakes, Minn.	KDLM	1340
Devils Lake, N.Dak.	KDLR	1240
Dexter, Mo.	KDEX	1590
Diboll, Tex.	KSPL	1260
Dickinson, N.Dak.	KDIX	1230
Dickson, Tenn.	WDKN	1260
Dillon, Mont.	KDBM	800
Dillon, S.C.	WDSC	800
Dimmitt, Tex.	KDHN	1470
Dinuba, Calif.	KRDU	1130
Dixon, Ill.	WIXN	1460
Dodge City, Kans.	KGNO	1370
	KEDD	1550
Donaldsonville, Ga.	WSEM	1500
Doniphan, Mo.	KDFN	1500
Dothan, Ala.	WAGF	1320
	WDIG	1450
	WOOF	560
Douglas, Ariz.	KAWT	1450
	KAPR	930
Douglas, Ga.	WDMG	860
	WOKA	1310
Douglas, Wyo.	KWIV	1050
Douglasville, Ga.	WDGL	1520
Dover, Del.	WDOV	1410
	WKEN	1600
Dover, N.J.	WRAN	1510
Dover, N.H.	WTSN	1270
Dover, Ohio	WJER	1450
Dowagiac, Mich.	WDOW	1440
Doylestown, Pa.	WBUX	1570
Dublin, Ga.	WMLT	1330
	WXLI	1230
Du Bois, Pa.	WCED	1420
Dubuque, Iowa	KDTH	1370
	WDBQ	1490
Duluth, Minn.	KDAL	610
	WEBC	560
	KAOH	1390
Dumas, Ark.	KDDA	1560
Dumas, Tex.	KDDD	800
Duncan, Okla.	KRHD	1350
Dundee, N.Y.	WFLR	1570
Dunkirk, N.Y.	WDOE	1410
Dunn, N.C.	WCKB	780
Du Quoin, Ill.	WDQN	1580
Durango, Colo.	KIUP	930
	KDGO	1240
Durant, Okla.	KSFO	750
Durham, N.C.	WDNC	620
	WSRC	1410
	WSSB	1490
	WTIK	1310
Dyersburg, Tenn.	WDSG	1450
	WTRO	1330
Eagle Pass, Tex.	KEPS	1270
Eagle River, Wis.	WERL	950
Easley, S.C.	WELP	1360
E. Grand Forks, Minn.	KRAD	1590
Eastland, Tex.	KERC	1590
E. Lansing, Mich.	WKAR	870
	WVIC	730
E. Liverpool, Ohio	WOHI	1490
East Longmeadow, Mass.	WTYM	1600
Eastman, Ga.	WUFF	710
E. Moline, Ill.	WDLM	960
E. Point, Ga.	WTJH	1260
East Prairie, Mo.	KGCL	1080
E. Syracuse, N.Y.	WPAW	1540
Easton, Md.	WEMD	1460
Easton, Pa.	WEEX	1230
	WEST	1400
Eatonton, Ga.	WXPQ	1520
Eatontown, N.J.	WHTG	1410
Eau Claire, Wis.	WEAQ	790
	WBIZ	1400
	WECL	1050
Eau Gallie, Fla.	WMEG	920
	WTAI	1560

Location	C.L.	kHz
Ebensburg, Pa.	WEND	1580
Edenton, N.C.	WCDJ	1260
Edinburg, Tex.	KURV	710
Edmonds, Wash.	KGDN	630
Effingham, Ill.	WCRA	1090
Elba, Ala.	WELB	1350
Elberton, Ga.	WSGC	1400
El Cajon, Calif.	KDEO	910
El Campo, Tex.	KULP	1390
El Centro, Calif.	KXO	1230
	KAMP	1430
El Dorado, Ark.	KDMS	1290
	KELD	1400
Eldorado, Kans.	KBTO	1360
Eldorado Springs, Mo.	KESM	1580
Eleele, Kauai, Hawaii	KUAI	720
Elgin, Ill.	WRMN	1410
Elizabeth City, N.C.	WCNC	1240
	WGAI	560
Elizabethton, Tenn.	WBEJ	1240
	WIDD	1520
Elizabethtown, Ky.	WIEL	1400
Elizabethtown, N.C.	WBLA	1440
Elizabethtown, Pa.	WHRY	1600
Elk City, Okla.	KBEK	1240
Elkhart, Ind.	WTRC	1340
	WCMR	1270
Elkins, N.C.	WIFM	1540
Elkins, W.Va.	WDNE	1240
Elko, Nev.	KELK	1240
Elkton, Md.	WSER	1550
Ellensburg, Wash.	KXLE	1240
Ellenville, N.Y.	WELV	1370
Ellsworth, Me.	WDEA	1370
Elmira, N.Y.	WELM	1410
	WENY	1230
Elmira Heights-Horseheads, N.Y.	WEHH	1590
El Paso, Tex.	KROD	600
	KELP	920
	KHEY	690
	KINT	1590
	KIZZ	1150
	KSET	1340
	KTSM	1380
El Reno, Okla.	KELR	1460
Ely, Minn.	WELY	1450
Ely, Nev.	KELY	1230
Elyria, Ohio	WEOL	930
Eminence, Ky.	WSTL	1600
Emporia, Kans.	KVOE	1400
Emporia, Va.	WEVA	860
Emporium, Pa.	WLEM	1250
Endicott, N.Y.	WENE	1430
Englewood, Colo.	KGMC	1150
Englewood, Fla.	WENG	1530
Englewood, Tenn.	WENR	1090
Enid, Okla.	KCRC	1390
	KGWA	960
Enterprise, Ala.	WIRB	600
Enterprise, Oreg.	KWVR	1340
Ephrata, Pa.	WGSA	1310
Ephrata, Wash.	KULF	730
Erie, Pa.	WWYN	1260
	WICU	1330
	WJET	1400
	WWGO	1450
Erwin, Tenn.	WEMB	1420
Escanaba, Mich.	WDBC	680
	WLST	600
Escondido, Calif.	KOWN	1450
Espanola, N. M.	KDCE	970
Etowah, Tenn.	WCPH	1220
Eufaula, Ala.	WULA	1240
Eugene, Oreg.	KORE	1450
	KPIR	1500
	KASH	1600
	KATR	1320
	KERG	1280
	KUGN	590
	KWFS	1540
Eunice, La.	KEUN	1490
Eureka, Calif.	KINS	980
	KDAN	790
Eustis, Fla.	WLCO	1240
Evanston, Ill.	WEAW	1330
	WNMP	1590
Evanston, Wyo.	KEVA	1240
Evansville, Ind.	WROZ	1400
	WGBF	1280
	WIKY	820
	WJPS	1330
Eveleth, Minn.	WEVE	1340
Everett, Pa.	WWDS	1050
Everett, Wash.	KRKO	1380
	KWYZ	1230
Evergreen, Ala.	WBLO	1470
Exeter, N.H.	WKXR	1540
Fairbanks, Alaska	KFAR	660
	KFRB	900
Fairbault, Minn.	KDHL	920
Fairbury, Nebr.	KGMT	1310
Fairfax, Va.	WEEL	1310
Fairfield, Ill.	WFIW	1390
Fairfield, Iowa	KMCD	1570
Fairfield, O.	WCNW	1560
Fairhope, Ala.	WABF	1220
Fairmont, Minn.	KSUM	1370

Location	C.L.	kHz
Fairmont, N.C.	WFMO	860
Fairmont, W.Va.	WMMN	920
	WTCS	1490
Fairway, Kan.	KUDL	1380
Fajardo, P.R.	WMDD	1480
Falfurrias, Tex.	KPSO	1260
Fall River, Mass.	WALE	1400
	WSAR	1480
	KVLV	980
Falls Church, Va.	WFAX	1220
Falls City, Nebr.	KTNC	1230
Fargo, N.Dak.	WDAY	970
	KFGO	790
	KFNW	900
	KQWB	1550
Faribault, Minn.	KDHL	920
Farmersville, La.	KTDL	1470
Farmington, Me.	WKTJ	1380
Farmington, Mo.	KREI	800
Farmington, N.M.	KENN	1390
	KWYK	960
	KRZE	1280
Farmville, N.C.	WFAG	1250
Farmville, Va.	WFLO	870
Farrell, Pa.	WFAR	1470
Farwell, Tex.	KZOL	1570
Fayette, Ala.	WWWF	990
Fayetteville, Ark.	KHOG	1440
	KFAY	1250
Fayetteville, N.C.	WFAI	1230
	WFNC	940
	WFLB	1490
	WIDU	1600
Fayetteville, Tenn.	WEKR	1240
Fergus Falls, Minn.	KOTE	1250
Fernandino Beach, Fla.	WFBF	1570
Ferriday, La.	KFNV	1600
Festus, Mo.	KJCF	1400
Festus-St. Louis, Mo.	KXEN	1010
Findlay, Ohio	WFIN	1330
Fisher, W.Va.	WELD	690
Fitchburg, Mass.	WEIM	1280
	WFGM	960
Fitzgerald, Ga.	WBHB	1240
Flagstaff, Ariz.	KCLS	600
	KAFF	930
	KJKJ	1400
	KEOS	690
Flat River, Mo.	KFMO	1250
Flint, Mich.	WFDF	910
	WTRX	1330
	WAMM	1420
	WMRP	1570
	WKMF	1470
	WTAC	600
Flomaton, Ala.	WTCB	990
Florence, Ala.	WJOI	1340
	WOWL	1240
Florence, S.C.	WJMX	970
	WOLS	1230
	WYNN	540
Floydada, Tex.	KFLD	900
Foley, Ala.	WHEP	1310
Fond du Lac, Wis.	KFIZ	1450
Fordyce, Ark.	KBJT	1570
Forest, Miss.	WMAG	860
Forest City, N.C.	WBBO	780
	WAGY	1320
Forest Grove, Ore.	KWAY	1570
Forrest City, Ark.	KXJK	950
Ft. Atkinson, Wis.	WFAW	940
Ft. Bragg, Calif.	KDAC	1230
Ft. Campbell, Ky.	WABD	1370
Ft. Collins, Colo.	KCOL	1410
	KZIX	600
Ft. Dodge, Iowa	KVFD	1400
	KWMT	540
Ft. Knox, Ky.	WSAC	1470
Ft. Lauderdale, Fla.	WFTL	1400
	WWIL	1580
Ft. Madison, Iowa	KXGI	1360
Ft. Morgan, Colo.	KFTM	1400
Ft. Myers, Fla.	WINK	1240
	WMYR	1410
	WCAI	1350
Ft. Payne, Ala.	WFPA	1400
	WZOB	1250
Ft. Pierce, Fla.	WARN	1330
	WIRA	1400
Ft. Scott, Kans.	KMDO	1600
Ft. Smith, Ark.	KFPW	1230
	KFSA	950
	KTCS	1410
	KWHN	1320
Ft. Stockton, Tex.	KFST	860
Ft. Valley, Ga.	WFPM	1150
Ft. Walton Beach, Fla.	WNUE	1400
	WFTW	1260
Ft. Wayne, Ind.	WGL	1250
	WOWO	1190
	WLYV	1450
	WKJG	1380
Ft. Worth, Tex.	KJIM	870
	KCUL	1540
	KFJZ	1270
	KNOK	970
	WBAP	570
	WBAP	820
	KXOL	1360
Fortuna, Cal.	KIXF	1280
Fosston, Minn.	KEHG	1480
Fostoria, Ohio	WFOB	1430
Fountain City, Tenn.	WGYW	1430
	WROL	1490
Fountain Inn, S.C.	WFIS	1600
Fowler, Calif.	KLIP	1220
Framingham, Mass.	WKOX	1190
Frankfort, Ind.	WILO	1570
Frankfort, Ky.	WFKY	1490
Franklin, Ky.	WFKN	1220
Franklin, La.	KFRA	1390
Franklin, N.C.	WFSC	1050
Franklin, N.H.	WFTN	1240
Franklin, Pa.	WFRA	1450
Franklin, Tenn.	WAGG	950
Franklin, Va.	WYSR	1250
Franklinton, La.	WFCG	1110
Frederick, Md.	WFMD	930
Frederick, Okla.	KTAT	1570
Fredericksburg, Tex.	KNAF	910
Fredericksburg, Va.	WFVA	1230
	WFLS	1350
Fredericktown, Mo.	KFTW	1450
Fredonia, N.Y.	WBUZ	1570
Freeport, Ill.	WFRL	1570
Freeport, N.Y.	WGBB	1240
Freeport, Tex.	KBRZ	1460
Fremont, Mich.	WBFC	1490
	WSHN	1550
Fremont, Nebr.	KHUB	1340
Fremont, Ohio	WFRO	900
Fresno, Calif.	KARM	1430
	KBIF	900
	KIRV	1510
	KEAP	980
	KXEX	1550
	KFRE	940
	KGST	1600
	KMAK	1340
	KMJ	580
	KYNO	1300
Friona, Tex.	KNNN	1070
Front Royal, Va.	WFTR	1450
Frostburg, Md.	WFRB	560
Fulton, Ky.	WFUL	1270
Fulton, Mo.	KFAL	900
Fulton, N.Y.	WOSC	1300
Fuquay Sprgs., N.C.	WFVG	1460
Gadsden, Ala.	WGAD	1350
	WETO	930
	WAAX	570
	WEAC	1500
Gaffney, S.C.	WFGN	1570
Gainesville, Fla.	WDVH	980
	WGGG	1230
	WRUF	850
	WUWU	1390
Gainesville, Ga.	WGGA	550
	WDUN	1240
	WLBA	1580
Gainesville, Tex.	KGAF	1580
Gaithersburg, Md.	WHMC	1150
Galax, Va.	WBOB	1360
Galesburg, Ill.	WGIL	1400
	WAIK	1590
Gallatin, Tenn.	WHIN	1010
	WAMG	1130
Gallipolis, Ohio	WJEH	990
Gallup, N. Mex.	KGAK	1330
	KYVA	1230
Galveston, Tex.	KILE	1400
	KGBC	1540
Gander, Nfld.	CBG	1450
Garden City, Kan.	KUIL	1240
	KUPK	1050
Garden City, Mich.	WTAK	1090
Gardner, Mass.	WGAW	1340
Gary, Ind.	WWCA	1270
	WLTH	1370
Gastonia, N.C.	WGNC	1450
	WLTC	1370
Gate City, Va.	WGAT	1050
Gaylord, Mich.	WATC	900
Geneseo, Ill.	WGEN	1500
Geneva, Ala.	WGEA	1150
Geneva, Ill.	WGSB	1480
Geneva, N.Y.	WGVA	1240
Georgetown, Del.	WJWL	900
Georgetown, Ky.	WAXU	1580
Georgetown, S.C.	WGTN	1400
	WGOO	1470
Georgetown, Tex.	KGTN	1530
Gettysburg, Pa.	WGET	1320
Gillette, Wyo.	KIML	1270
Gilroy, Calif.	KPER	1290
Gladewater, Tex.	KEES	1430
Glasgow, Ky.	WKAY	1490
	WCDS	1440
Glasgow, Mont.	KLTZ	1240
Glen Burnie, Md.	WISZ	1590
Glendale, Ariz.	KRUX	1360
Glendale, Calif.	KIEV	870
Glendive, Mont.	KXGN	1400
	KGLE	590
Glennallen, Alaska	KCAM	790
Glens Falls, N.Y.	WBZA	1410
	WWSC	1450
Glenville, Ga.	WKIG	1580
Glenwood Sprgs., Colo.	KGLN	980
Globe, Ariz.	KZOW	1240
Gloucester, Va.	WODY	1420
Gloversville-Johnston, N.Y.	WENT	1340
Gold Beach, Oreg.	KBLY	1220
Golden, Colo.	KICM	1250
Golden Meadow, La.	KLEB	1600
Golden Valley, Minn.	KQRS	1440
	KUXL	1570
Goldsboro, N.C.	WFMC	730
	WGBR	1150
	WGOL	1300
Gonzales, Tex.	KCTI	1450
Goodland, Kans.	KLOE	730
Goshen, Ind.	WKAM	1460
Gouverneur, N.Y.	WIGS	1230
Grafton, N.D.	KGPC	1340
Grafton, W.Va.	WVVW	1260
Graham, Tex.	KSWA	1330
Grand Coulee, Wash.	KFDR	1360
Grand Forks, N.D.	KFJM	1370
	KILD	1440
	KNOX	1310
Grand Haven, Mich.	WGHN	1370
Grand Island, Nebr.	KMMJ	750
	KRGI	1430
Grand Junction, Colo.	KREX	920
	KEXO	1230
	KSTR	620
	KWSL	1340
Grand Prairie, Tex.	KPCW	730
Grand Rapids, Mich.	WJEF	1230
	WFUR	1570
	WGRD	1410
	WLAV	1340
	WMAX	1480
	WOOD	1300
Grand Rapids, Minn.	KOZY	1490
Grangeville, Idaho	KORT	1230
Granite City, Ill.	WGNU	920
Granite Falls, N. C.	WKJK	1580
Grants, N.Mex.	KMIN	980
Grants Pass, Oreg.	KAGI	930
	KAJO	1270
Grayson, Ky.	WGOH	1370
Gt. Barrington, Mass.	WSBS	860
Gt. Bend, Kans.	KVGB	1590
Gt. Falls, Mont.	KFBB	1310
	KUDI	1450
	KMON	560
	KARR	1400
Greeley, Colo.	KFKA	1310
	KYOU	1450
Green Bay, Wis.	WBAY	1360
	WJPG	1440
	WDUZ	1400
Greeneville, Tenn.	WGRV	1340
	WSMG	1450
Greenfield, Mass.	WHAI	1240
Greensboro, N.C.	WBIG	1470
	WCOG	1320
	WEAL	1510
	WKTB	1550
	WGBG	1400
	WPET	950
Greensburg, Ind.	WTRE	1330
Greensburg, Pa.	WHJB	620
Greenville, Ala.	WGYV	1380
Greenville, Ky.	WKYF	1600
Greenville, Mich.	WPLB	1380
Greenville, Miss.	WJPR	1330
	WDDT	900
	WGVM	1260
Greenville, Pa.	WGRP	940
Greenville, N. C.	WNCT	1590
	WOOW	1340
	WPXY	1550
Greenville, S.C.	WESC	660
	WFBC	1330
	WMRB	1490
	WMUU	1260
	WQOK	1440
Greenville, Tex.	KGVL	1400
Greenwich, Conn.	WGCH	1490
Greenwood, Miss.	WABG	960
	WGRM	1240
	WLEF	1540
Greenwood, S.C.	WCRS	1450
	WGSW	1350
Greer, S.C.	WEAB	800
	WCKI	1300
Grenada, Miss.	WNAG	1400
Gresham, Oreg.	KRDR	1230
Gretna, Va.	WMNA	730
Griffin, Ga.	WKEU	1450
	WHIE	1320
	WGRI	1410
Grinnell, Iowa	KGRN	1410
Groton, Conn.	WSUB	980
Grove City, Pa.	WSAJ	1340
Grundy, Va.	WNRG	940
Guayama, P.R.	WXRF	1590
Gulfport, Miss.	WROA	1390
	WGCM	1240
Gunnison, Colo.	KGUC	1490
Guntersville, Ala.	WGSV	1270
Guthrie, Okla.	KWRW	1490
Guymon, Okla.	KGYN	1220
Hagerstown, Md.	WARK	1490
	WJEJ	1240
Haines City, Fla.	WHAN	930
Haleyville, Ala.	WJBB	1230
Halfway, Md.	WHAG	1410
Hamden, Conn.	WDEE	1220
Hamilton, Ala.	WERH	970
Hamilton, Mont.	KYLQ	980
Hamilton, Ohio	WMOH	1450
Hamilton, Tex.	KCLW	900
Hamlet, N. C.	WKDX	1250
Hammond, Ind.	WJOB	1230
Hammond, La.	WFPR	1400
Hammonton, N.J.	WNJH	1580
Hampton, S.C.	WBHC	1270
Hampton, Va.	WVEC	1490
Hancock, Mich.	WMPL	920
Hanford, Calif.	KNGS	620
Hannibal, Mo.	KHMO	1070
Hanover, N.H.	WTSL	1400
	WDCR	1340
Hanover, Pa.	WHVR	1280
Hardin, Mont.	KHDN	1230
Harlan, Ky.	WHLN	1410
Harlingen, Tex.	KGBT	1530
Harriman, Tenn.	WHBT	1600
Harrisburg, Ill.	WEBQ	1240
Harrisburg, Pa.	WFEC	1400
	WCMB	1460
	WHP	580
	WKBD	1230
Harrison, Ark.	KHDZ	900
Harrisonburg, Va.	WHBG	1360
	WSVA	550
Harrodsburg, Ky.	WHBN	1420
Hartford, Conn.	WDRC	1360
	WCCC	1290
	WPOP	1410
	WTIC	1080
Hartford, Wis.	WTKM	1540
Hartselle, Ala.	WHRT	860
Hartsville, S.C.	WHSC	1450
Hartsville, Tenn.	WJKM	1090
Hartwell, Ga.	WKLY	980
Harvard, Ill.	WMCW	1600
Harvey, Ill.	WBEE	1570
Hastings, Mich.	WBCH	1220
Hastings, Minn.	KDWA	1460
Hastings, Nebr.	KHAS	1230
	KICS	1550
Hattiesburg, Miss.	WBKH	950
	WFOR	1400
	WHSY	1230
	WXXX	1310
Havelock, N.C.	WUSM	1330
Haverhill, Mass.	WHAV	1490
Havre, Mont.	KOJM	610
Havre de Grace, Md.	WASA	1330
Hawkinsville, Ga.	WCEH	610
Haynesville, La.	KLUV	1580
Hays, Kans.	KAYS	1400
Hayward, Wis.	WHSM	910
Hazard, Ky.	WKIC	1390
Hazelhurst, Ga.	WVOH	920
Hazlehurst, Miss.	WMDC	1220
Hazleton, Pa.	WAZL	1490
Heber Springs, Ark.	KAWW	1370
Helena, Ark.	KFFA	1360
Helena, Mont.	KCAP	1340
	KBLL	1240
Hemet, Calif.	KHSJ	1320
Hempstead, N.Y.	WHLI	1100
Henderson, Ky.	WSON	860
Henderson, Nev.	KBMI	1400
	KTOO	1280
Henderson, N.C.	WHNC	890
	WIZS	1450
Henderson, Tex.	KGRI	1000
	KWRD	1470
Hendersonville, N.C.	WHKP	1450
	WHVL	1600
Henryetta, Okla.	KHEN	1590
Hereford, Tex.	KPAN	860
Herkimer, N.Y.	WALY	1420
Hermiston, Oreg.	KOHU	1570
Herendon, Va.	WHRN	1440
Herrin, Ill.	WJPF	1340
Hettinger, N.Dak.	KNDC	1490
Hibbing, Minn.	WMFG	1240
Hickory, N.C.	WHKY	1290
	WIRC	630
	WSPF	1000
Highland, Ill.	WINU	1510
Highland Park, Ill.	WEEF	1430
Highland Park, Tex.	KVIL	1150
Highland Springs, Va.	WENZ	1450
High Point, N.C.	WMFR	1230
	WNOS	1590
	WHPE	1070
Hillsboro, Ohio	WSRW	1590

WHITE'S RADIO LOG

Location	C.L.	kHz
Hillsboro, Oreg.	KUIK	1360
Hillsboro, Tex.	KHBR	1560
Hillsdale, Mich.	WCSR	1340
Hillsville, Va.	WHHV	1400
Hilo, Hawaii	KPUA	970
	KIPA	1110
	KIMO	850
Hinesville, Ga.	KGML	990
Hinton, W. Va.	WMTD	1380
Hobbs, N.Mex.	KWEW	1480
	KHOB	1390
Holbrook, Ariz.	KDJI	1270
Holdenville, Okla.	KVYL	1370
Holdredge, Nebr.	KUVR	1380
Holland, Mich.	WHTC	1450
	WJBL	1260
Hollister, Cal.	KMPG	1520
Hollywood, Fla.	WGMA	1320
Holly Hill, S.C.	WHHL	1440
Holly Springs, Miss.		
	WKRA	1110
Holyoke, Mass.	WREB	930
Homer, La.	KHAL	1320
Homestead, Fla.	WIII	1430
Homewood, Ala.	WJLD	1400
Honolulu, Hawaii	KAIM	870
Honolulu, Hawaii	KCCN	1420
	KGMB	590
	KZOO	1210
	KHAI	1090
	KPOI	1380
	KIKI	830
	KGU	760
	KHVH	1040
	KNDI	1270
	KOHO	1170
	KORL	650
	KTRG	990
	KULA	690
Hood River, Oreg.	KIHR	1340
Hope, Ark.	KXAR	1490
Hopewell, Va.	WHAP	1340
Hopkinsville, Ky.	WHOP	1230
	WKOA	1480
Hoquiam, Wash.	KGHO	1560
Hornell, N.Y.	WWHG	1320
	WLEA	1480
Hot Springs, Ark.	KBHS	590
	KXOW	1420
	KZNG	1470
Hot Springs, S.Dak.		
	KOBH	580
Houghton, Mich.	WHDF	1400
Houghton Lake, Mich.		
	WHGR	1290
Houlton, Maine	WHOU	1340
Houma, La.	KCIL	1490
Houston, Miss.	WCPC	940
Houston, Mo.	KBTC	1250
Houston, Tex.	KCOH	1430
	KENR	1070
	KILT	610
	KNUZ	1230
	KODA	1010
	KPRC	950
	KTHT	790
	KTRH	740
	KXYZ	1320
	KYOK	1590
Howell, Mich.	WHMI	1350
Hudson, N.Y.	WHUC	1230
Hugo, Okla.	KIHN	1340
Humacao, P.R.	WALO	1240
Humboldt, Tenn.	WIRJ	740
Huntingdon, Pa.	WHUN	1150
Huntington, Ind.	WHLT	1300
Huntington, N.Y.	WGSM	740
Huntington, W.Va.		
	WKEE	800
	WSAZ	930
	WWHY	1470
Huntsville, Ala.	WBHP	1230
	WEUP	1600
	WFIX	1450
	WAAY	1550
Huntsville, Tex.	KSAM	1490
Huron, S.Dak.	KIJV	1340
Hutchinson, Kans.	KWBW	1450
	KWHK	1260
Hutchinson, Minn.	KDUZ	1260
Hyde Park, N.Y.	WHVW	950
Idabel, Okla.	KBEL	1240
Idaho Falls, Idaho	KID	590
	KTEE	1260
Immokalee, Fla.	WCOF	1490
Independence, Ia.	KUPI	980
	KOUR	1220
Independence, Kans.		
	KIND	1010
Independence, Mo.	KCCX	1510
Indiana, Pa.	WDAD	1450
Indianapolis, Ind.	WATI	810
	WBRI	1500
	WFBM	1260
	WGEE	1590
	WIBC	1070
	WIFE	1310
	WIRE	1430
	WXLW	950
Indianola, Iowa	KBAB	1490
Indianola, Miss.	WNLA	1380
Indian Rocks Beach, Fla.		
	WGNP	1520
Indio, Calif.	KREO	1400
Inglewood, Calif.	KTYM	1460
Inkster, Mich.	WCHB	1440
International Falls, Minn.		
	KGHS	1230
Inverness, Fla.	WYSE	1560
Iola, Kansas	KALN	1370
Ionia, Mich.	WION	1430
Iowa City, Iowa	KXIC	800
	WSUI	910
Iowa Falls, Iowa	KFIG	1510
Iron Mtn., Mich.	WMIQ	1450
Irondale, Ala.	WLPH	1480
Ironton, Ohio	WIRO	1230
Ironwood, Mich.	WJMS	630
Irvine, Ky.	WIRV	1550
Isabella, P.R.	WISA	1390
Ishpeming, Mich.	WJPD	1240
	WCKD	970
Islip, N.Y.	WBIC	540
Ithaca, N.Y.	WHCU	870
	WTKO	1470
Iuka, Miss.	WVOM	1270
Jackson, Ala.	WHOD	1290
Jackson, Mich.	WIBM	1450
	WKHM	970
	WJCO	1510
Jackson, Miss.	WJDX	620
	WJQS	1400
	WJXN	1450
	WOKJ	1550
	WWUN	1590
	WRBC	1300
	WSLI	930
Jackson, Ohio	WLMJ	1280
Jackson, Tenn.	WDXI	1310
	WJAK	1460
	WTJS	1390
Jackson, Wis.	WYLO	540
Jackson, Wyo.	KSGT	1340
Jacksonville, Ark.	KGMR	1500
Jacksonville, Fla.	WJAX	930
	WAPE	690
	WBOM	970
	WZOK	1320
	WIVY	1050
	WMBR	1460
	WOBS	1360
	WPDQ	600
	WQIK	1090
	WRHC	1400
Jacksonville, Ill.	WJIL	1550
	WLDS	1180
Jacksonville, Miss.	WJQS	1400
Jacksonville, N.C.	WJNC	1240
	WLAS	910
Jacksonville, Tex.	KEBE	1400
Jacksonville Bch., Fla.		
	WBIX	1010
Jamestown, N.Dak.	KEYJ	1400
	KSJB	600
Jamestown, N.Y.	WJTN	1240
	WKSN	1340
Jamestown, Tenn.	WCLC	1260
Janesville, Wis.	WCLO	1230
Jasper, Ala.	WWWB	1360
	WARF	1240
Jasper, Ind.	WITZ	990
Jasper, Tex.	KTXJ	1350
Jefferson City, Mo.	KLIK	950
	KWOS	1240
Jefferson City, Tenn.		
	WJFC	1480
Jeffersonville, Ind.	WXVW	1450
Jena, La.	KCKW	1480
Jennings, La.	KJEF	1290
Jerome, Idaho	KART	1400
Jerseyville, Ill.	WJBM	1480
Jesup, Ga.	WLOP	1370
John Day, Ore.	KJDY	1400
Johnson City, Tenn.		
	WJCW	910
	WETB	790
Johnston, S.C.	WJES	1570
Johnstown, N.Y.	WIZR	930
Johnstown, Pa.	WJAC	850
	WARD	1490
	WCRO	1230
Joliet, Ill.	WJOL	1340
	WJRC	1510
Joliette, Que.	CJLM	1350
Jonesboro, Ark.	KBTM	1230
	KNEA	970
Jonesboro, La.	KTOC	920
Jonesboro, Tenn.	WJSO	1590
Jonesville, La.	KANV	1480
Joplin, Mo.	WMBH	1450
	KQYX	1560
	KFSB	1310
	KODE	1230
Junction, Tex.	KMBL	1450
Junc. City, Kans.	KJCK	1420
Juneau, Alaska	KINY	800
	KJNO	630
Kailua, Hawaii	KLEI	1130
Kalamazoo, Mich.	WKPR	1420
	WKZO	590
	WKLZ	1470
	WKMI	1360
Kalispell, Mont.	KGEZ	600
	KOFI	930
Kane, Pa.	WKZA	960
Kankakee, Ill.	WKAN	1320
Kannapolis, N.C.	WGTL	870
	WRKB	1460
Kans. City, Kans.	KCKN	1340
Kansas City, Mo.	KCMO	810
	KMBC	980
	KPRS	1590
	WDAF	610
	WHB	710
Kaukauna, Wis.	WKAU	1050
Kenedy-Karnes City, Texas		
	KAML	990
Kealakekua, Hawaii		
	KONA	790
Kearney, Nebr.	KGFW	1340
	KRNY	1460
Keene, N.H.	WKNE	1290
	WKBK	1220
Kelso, Wash.	KLOG	1490
Kemmerer, Wyo.	KMER	950
Kendallville, Ind.	WAWK	1140
Kenedy, Tex.	KAML	990
Kennett, Mo.	KBOA	830
	KBXN	1540
Kennewick, Wash.	KSMK	1340
Kennewick-Pasco-Richland, Wash.	KEPR	610
Kenosha, Wis.	WLIP	1050
Kent, O.	WKNT	1520
Keokuk, Iowa	KOKX	1310
Kermit, Tex.	KERB	600
Kerrville, Tex.	KERV	1230
Kershaw, S.C.	WKSC	1300
Ketchikan, Alaska	KTKN	930
Kewanee, Ill.	WKEI	1450
Keyser, W.Va.	WKLP	1390
Key West, Fla.	WKWF	1600
	WKIZ	1500
Kilgore, Tex.	KOCA	1240
Killeen, Tex.	KLEN	1050
Kimball, Nebr.	KIMB	1260
King, N. C.	WKTE	1090
King City, Calif.	KRKC	1490
Kingman, Ariz.	KAAA	1230
Kings Mountain, N.C.		
	WKMT	1220
Kingsport, Tenn.	WKIN	1320
	WKPT	1550
Kingston, N.Y.	WBAZ	1550
	WGHQ	920
	WKNY	1490
Kingstree, S.C.	WDKD	1310
Kingsville, Tex.	KINE	1330
Kinston, N.C.	WELS	1010
	WFTC	960
	WISP	1230
Kirkland, Wash.	KYAC	1460
	KBLE	1050
Kirksville, Mo.	KIRX	1450
Kissimmee, Fla.	WFIV	1080
	WJPB	1220
Kittanning, Pa.	WACB	1380
Klamath Falls, Oreg.		
	KAGO	1150
	KFLW	1450
	KLAD	960
Knoxville, Iowa	KNIA	1320
Knoxville, Tenn.	WBIR	1240
	WIVK	850
	WATE	620
	WKXV	900
	WNOX	990
	WROL	1490
Kokomo, Ind.	WIOU	1350
Kosciusko, Miss.	WKOZ	1350
Laconia, N.H.	WLNH	1350
	WEMJ	1490
LaCrosse, Wis.	WKBH	1410
	WLCX	1490
	WKTY	580
Ladysmith, Wis.	WLDY	1340
Lafayette, Ga.	WLFA	1590
Lafayette, Ind.	WASK	1450
	WAZY	1410
	WBAA	920
Lafayette, La.	KPEL	1420
	KVOL	1330
	KXKW	1520
Lafayette, Tenn.	WEEN	1460
LaFollette, Tenn.	WLAF	1450
LaGrande, Oreg.	KLBM	1450
LaGrange, Ga.	WLAG	1240
	WTRP	620
LaGrange, Ill.	WTAQ	1300
LaGrange, Tex.	KVLG	1570
LaJunta, Colo.	KBZZ	1400
Lake Charles, La.	KLOU	1580
	KPLC	1470
	KAOK	1400
Lake City, Fla.	WDSR	1340
	WGRO	960
Lake City, S.C.	WJOT	1260
Lake Geneva, Wis.	WMIR	1550
Lakeland, Fla.	WLAK	1430
	WONN	1230
	WWAB	1330
Lake Placid, N.Y.	WIRD	920
Lakeport, Cal.	KBLC	1270
Lake Providence, La.	KLPL	1050
Lake Tahoe, Calif.	KOWL	1490
Lakeview, Oreg.	KQIK	1230
Lake Wales, Fla.	WIPC	1280
Lakewood, Colo.	KLAK	1600
Lakewood Center, Wash.		
	KFHA	1480
Lake Worth, Fla.	WLIZ	1380
Lamar, Colo.	KLMR	920
Lamesa, Tex.	KPET	690
Lampasas, Tex.	KCYL	1450
Lancaster, Calif.	KAVL	610
	KBVM	1380
Lancaster, Ky.	WIXI	1280
Lancaster, N.Y.	WMMJ	1300
Lancaster, Ohio	WHOK	1320
Lancaster, Pa.	WGAL	1490
	WLAN	1390
Lancaster, S.C.	WLCM	1360
	WAGL	1560
Lander, Wyo.	KOVE	1330
Lanett, Ala.-W. Point, Ga.		
	WRLD	1490
Lansdale, Pa.	WNPV	1440
Lansford, Pa.	WLSH	1410
Lansing, Mich.	WILS	1320
	WJIM	1240
	WITL	1010
Lapeer, Mich.	WMPC	1230
	WTHM	1530
LaPlata, Md.	WSMD	1560
LaPorte, Ind.	WLOI	1540
Laramie, Wyo.	KLME	1490
	KOWB	1290
Laredo, Tex.	KGNS	1300
	KVOZ	1490
Larned, Kans.	KANS	1510
LaSalle, Ill.	WLPO	1220
LasCruces, N.Mex.	KOBE	1450
	KGRT	570
Las Vegas, Nev.	KENO	1460
	KLAV	1230
	KORK	1340
	KRAM	920
	KLUC	1050
	KVEG	970
Las Vegas, N.Mex.	KFUN	1230
Latrobe, Pa.	WPKV	1570
	WQTW	1570
	WTRA	1480
Laurel, Md.	WLMD	900
Laurel, Miss.	WAML	1340
	WLAU	1600
	WNSL	1260
Laurens, S.C.	WLBG	860
Laurinburg, N.C.	WEWO	1080
	WLNC	1300
Lawrence, Kans.	KFKU	1250
	KLWN	1320
Lawrence, Mass.	WCCM	800
Lawrenceburg, Tenn.		
	WDXE	1370
Lawrenceville, Ga.	WLAW	1360
Lawrenceville, Ill.	WAKO	910
Lawrenceville, Va.	WLES	580
Lawton, Okla.	KSWO	1380
	KCCO	1050
Leadville, Colo.	KBRR	1230
Leaksville, N.C.	WLOE	1490
Leavenworth, Kans.	KCLO	1410
Lebanon, Ky.	WLBN	1590
Lebanon, Mo.	KLWT	1230
Lebanon, Oreg.	KGAL	920
Lebanon, Pa.	WLBR	1270
Lebanon, Tenn.	WCOR	900
Leesburg, Fla.	WLBE	790
	WZST	1410
Leesburg, Va.	WAGE	1290
Leesville, La.	KLLA	1570
Lehighton, Pa.	WYNS	1150
Leitchfield, Ky.	WMTL	1580
Leland, Miss.	WESY	1580
LeMars, Iowa	KLEM	1410
Lemmon, S.D.	KBJM	1400
Lemoore, Calif.	KLAN	1320
	KOAD	1240
Lenoir, N.C.	WJRI	1340
Lenoir, Tenn.	WLIL	730
Lenoir City, Tenn.	WBLC	1360
Leonardtown, Md.	WKIK	1370
Levelland, Tex.	KLVT	1230
Levittown, Pa.	WBCB	1490
Lewisburg, Pa.	WUNS	1010
Lewisburg, Tenn.	WJJM	1490
Lewiston, Idaho	KRLC	1350
	KOZE	1300
Lewiston, Maine	WCOU	1240
	WLAM	1470
Lewistown, Mont.	KXLO	1230
Lewistown, Pa.	WKVA	920
	WMRF	1490
Lexington, Ky.	WLAP	630
	WBLG	1300
	WVLK	590

Location	C.L.	kHz
Lexington, Miss.	WXTN	1000
Lexington, Mo.	KLEX	1570
Lexington, Nebr.	KRVN	1010
Lexington, N.C.	WBUY	1440
Lexington, Tenn.	WDXL	1490
Lexington, Va.	WREL	1450
Lexington Pk., Md.	WPTX	920
Libby, Mont.	KLCB	1230
Liberal, Kans.	KSCB	1270
	KLIB	1470
Liberty, Ky.	WPHN	1560
Liberty, N.Y.	WVOS	1240
Lihue, Hawaii	KTOH	1490
Lima, Ohio	WIMA	1150
	WCIT	940
Lincoln, Ill.	WPRC	1370
Lincoln, Me.	WLKN	1450
Lincoln, Nebr.	KFOR	1240
	KLIN	1400
	KLMS	1480
	KLOL	1530
Lincolnton, N.C.	WLON	1050
Linton, Ind.	WBTO	1600
Litchfield, Ill.	WSMI	1540
Litchfield, Minn.	KLFD	1410
Little Falls, Minn.	KLTF	960
Little Falls, N.Y.	WLFH	1230
Littlefield, Tex.	KZZN	1490
Little Rock, Ark.	KARK	920
	KALO	1250
	KLRA	1010
	KOKY	1440
	KAAY	1090
	KVLC	1050
Littleton, Colo.	KOKO	1510
Littleton, N. H.	WLTN	1400
Live Oak, Fla.	WNER	1250
Livingston, Mont.	KPRK	1340
Livingston, Tenn.	WLIV	920
Livingston, Tex.	KETX	1440
	KVLL	1220
Lock Haven, Pa.	WBPZ	1230
Lockport, N.Y.	WUSJ	1340
Lodi, Calif.	KCVR	1570
Logan, Utah	KVNU	610
	KSTU	1300
	KLGN	1390
Logan, W.Va.	WLOG	1230
	WVOW	1290
Logansport, Ind.	WSAL	1230
Lompoc, Calif.	KKOK	1410
	KLOM	1330
	KNEZ	960
London, Ky.	WFTG	1400
Long Beach, Calif.	KFOX	1280
	KGER	1390
Longmont, Colo.	KLMO	1060
Long Prairie, Minn.	KEYL	1400
Longview, Tex.	KFRO	1370
	KLUE	1280
Longview, Wash.	KEDO	1400
	KBAM	1270
Lookout Mtn., Tenn.	WFLI	1070
Lorain, Ohio	WWIZ	1380
Loretto, Pa.	WWSF	1400
Loris, S.C.	WLSC	1570
Los Alamos, N.Mex.	KRSN	1490
Los Angeles, Calif.	KABC	790
	KFI	640
	KHJ	930
	KFWB	980
	KGFJ	1230
	KFAC	1330
	KLAC	570
	KMPC	710
	KNX	1070
	KPOL	1540
	KGBS	1020
	KRKD	1150
Los Banos, Calif.	KLBS	1330
Louisburg, N.C.	WYRN	1480
Louisville, Ga.	WPEH	1420
Louisville, Ky.	WAVE	970
	WAKY	790
	WHAS	840
	WKLO	1080
	WINN	1240
	WFIA	900
	WLOU	1350
	WTMT	620
Louisville, Miss.	WLSM	1270
Loveland, Colo.	KLOV	1570
Loves Park, Ill.	WLUV	1520
Lovington, N.Mex.	KLEA	630
Lowell, Mass.	WCAP	980
	WLLH	1400
Lubbock, Tex.	KCBD	1590
	KDAV	580
	KLBK	1340
	KFYO	790
	KLLL	1460
	KSEL	950
Lucedale, Miss.	WHHT	1440
Ludington, Mich.	WKLA	1450
Lufkin, Tex.	KRBA	1340
	KTRE	1420
Lumberton, N.C.	WAGR	580
	WTSB	1340
Luray, Va.	WRAA	1330
Lynchburg, Va.	WLVA	590
	WLLL	930

Location	C.L.	kHz
	WDMS	1320
	WWOD	1390
	WBRG	1050
Lynn, Mass.	WLYN	1360
Lyons, Ga.	WBBT	1340
Macomb, Ill.	WKAI	1510
Macon, Ga.	WBML	1240
	WCRY	900
	WIBB	1280
	WMAZ	940
	WNEX	1400
Macon, Miss.	WMBC	1400
Macon, Mo.	KLTI	1560
Madawaska, Me.	WSJR	1230
Madera, Calif.	KHOT	1250
Madill, Okla.	KMAD	1550
Madison, Fla.	WMAF	1230
Madison, Ga.	WYTH	1250
Madison, Ind.	WORX	1270
Madison, S.D.	KJAM	1390
Madison, Tenn.	WENO	1430
Madison, Wis.	WHA	750
	WIBA	1310
	WISM	1480
	WKOW	1070
	WMAD	1550
Madisonville, Ky.	WFMW	730
	WTTL	1310
Magee, Miss.	WSJC	810
Magnolia, Ark.	KVMA	630
Makawao, Hawaii	KNUI	1310
Malden, Mo.	KTCB	1470
Malone, N.Y.	WICY	1490
Malvern, Ark.	KBOK	1310
Manassas, Va.	WPRW	1460
Manati, P.R.	WMNT	1500
Manchester, Conn.	WINF	1230
Manchester, Ga.	WFDR	1370
Manchester, Ky.	WWXL	1450
Manchester, N.H.	WFEA	1370
	WGIR	610
	WKBR	1250
Manchester, Tenn.	WMSR	1320
Manhattan, Kans.	KSAC	580
	KMAN	1350
Manistee, Mich.	WMTE	1340
Manistique, Mich.	WTIQ	1490
Manitou Springs, Colo.	KCMS	1490
Manitowoc, Wis.	WCUB	980
	WOMT	1240
Mankato, Minn.	KYSM	1230
	KTOE	1420
Manning, S.C.	WYMB	1410
Mansfield, La.	KDXI	1360
Mansfield, Ohio	WMAN	1400
	WCLW	1140
Maplewood, Minn.	WRCR	1010
Maquoketa, Iowa	KMAQ	1320
Marathon, Fla.	WFFG	1300
Marianna, Ark.	KZOT	1460
Marianna, Fla.	WTYS	1340
	WTOT	980
Marietta, Ga.	WFOM	1230
	WBIE	1080
Marietta, Ohio	WMOA	1490
	WBRJ	910
Marine City, Mich.	WSMA	1590
	WMAM	570
Marion, Ala.	WJAM	1310
Marion, Ill.	WGGH	1150
Marion, Ind.	WBAT	1400
	WMRI	860
Marion, N.C.	WBRM	1250
Marion, Ohio	WMRN	1490
Marion, S.C.	WATP	1430
Marion, Va.	WMEV	1010
	WOLD	133
Marked Tree, Ark.	KPCA	1580
Marksville, La.	KAPB	1370
Marlborough, Mass.	WSRO	1470
Marquette, Mich.	WDMJ	1320
Marshall, Mich.	WMRR	1540
Marshall, Minn.	KMHL	1400
Marshall, Mo.	KMMO	1300
Marshall, N.C.	WMMH	1460
Marshall, Tex.	KMHT	1450
	KOOX	1410
Marshalltown, Iowa	KFJB	1230
Marshfield, Wis.	WDLB	1450
Martin, Tenn.	WCMT	1410
Martinsville, Ind.	WCBK	1540
Martinsburg, W.Va.	WEPM	1340
Martinsville, Va.	WHEE	1370
	WMVA	1450
Maryville, Mo.	KNIM	1580
Marysville, Calif.	KMYC	1410
Marysville, Kans.	KNDY	1570
Maryville, Tenn.	WGAP	1400
Mason, Mich.	WUNN	1110
Mason City, Iowa	KGLO	1300
	KRIB	1490
	KSMN	1010
Massena, N.Y.	WMSA	1340
	WYBG	1050
Massillon, Ohio	WTIG	990
Matawan, W.Va.	WHJC	1360
Mattoon, Ill.	WLBH	1170
Mauston, Wis.	WRJC	1270
Mayaguez, P.R.	WAEL	600
	WKJB	710
	WORA	760

Location	C.L.	kHz
	WPRA	990
	WTIL	1300
Mayfield, Ky.	WNGO	1320
Mayodan, N.C.	WMYN	1420
Mayville, N.D.	KMAV	1520
Maysville, Ky.	WFTM	1240
McAlester, Okla.	KTMC	1400
	KNED	1150
McAllen, Tex.	KRIO	910
McCall, Ida.	KMCL	1240
McCamey, Tex.	KAMY	1450
McComb, Miss.	WHNY	1250
	WAPF	980
McCook, Nebr.	KBRL	1300
	KICX	1360
McGehee, Ark.	KVSA	1220
McKeesport, Pa.	WEDO	810
	WMCK	1360
McKenzie, Tenn.	WHDM	1440
McKinney, Tex.	KYAL	1600
McMinnville, Oreg.	KMCM	1260
McMinnville, Tenn.	WBMC	960
	WAKI	1230
McPherson, Kans.	KNEX	1540
McRae, Ga.	WDAX	1410
Meadville, Pa.	WMGW	1490
Medford, Mass.	WHIL	1430
Medford, Oreg.	KMED	1440
	KSHA	860
	KOOV	1300
	KBOY	730
	KYJC	1230
Medford, Wis.	WIGM	1490
Media, Pa.	WXUR	690
Melbourne, Fla.	WMMB	1240
Memphis, Tenn.	WHBQ	560
	KBGH	1130
	WHER	1430
	WMC	790
	WOIA	1070
	WMPS	680
	WLOK	1340
	WMQM	1480
	WREC	600
	KWAM	990
Mena, Ark.	KENA	1450
Mendota, Ill.	WGLC	1090
Menominee, Mich.	WAGN	1340
Menomonie, Wis.	WMNE	1360
Merced, Calif.	KYOS	1480
	KWIP	1580
Meriden, Conn.	WMMW	1470
Meridian, Miss.	WCOC	910
	WDAL	1330
	WMOX	1010
	WOKK	1450
	WQIC	1390
Merkle, Tex.	KWFA	1500
Merrill, Wis.	WXMT	730
Mesa, Ariz.	KBUZ	1310
	KALF	1510
Metropolis, Ill.	WMOK	920
Metter, Ga.	WMAC	1360
Mexia, Tex.	KBUS	1590
Mexico, Mo.	KXEO	1340
Mexico, Pa.	WJUN	1220
Miami, Ariz.	KIKO	1340
Miami, Fla.	WGBS	710
	WIOD	610
	WFAB	990
	WAME	1260
	WMIE	1140
	WOAH	1220
	WQAM	560
	WOCN	1450
	WINZ	940
Miami, Okla.	KGLC	910
Miami Beach, Fla.	WMBM	1490
	WKAT	1360
	WFUN	790
Michigan City, Ind.	WIMS	1420
Middlebury, Vt.	WFAD	1490
Middleport-Pomeroy, Ohio	WMPO	1390
Middlesboro, Ky.	WMIK	560
Middletown, Conn.	WCNX	1150
Middletown, N.Y.	WALL	1340
Middletown, Ohio	WPFB	910
Midland, Mich.	WMDN	1490
Midland, Tex.	KCRS	550
	KJBC	1150
	KWEL	1440
	KABH	1510
Milan, Tenn.	WKBJ	1600
Miles City, Mont.	KATL	1340
Milford, Conn.	WFIF	1500
Milford, Del.	WKSB	930
Milford, Mass.	WMRC	1490
Milledgeville, Ga.	WMVG	1450
Millen, Ga.	WGSR	1570
Millington, Tenn.	WGMM	1380
Millinocket, Me.	WMKR	1240
Millville, N.J.	WMVB	1440
Milton, Fla.	WEBY	1330
	WSRA	1490
Milton, Pa.	WMLP	1380
	WARC	1380
Milwaukee, Wis.	WEMP	1250
	WFOX	860
	WRIT	1340
	WISN	1130
	WMIL	1290

Location	C.L.	kHz
	WOKY	920
	WTMJ	620
Minden, La.	KASO	1240
Mineola, N.Y.	WTHE	1520
Mineola, Tex.	KMOO	1510
Mineral Wells, Tex.	KORC	1140
Minneapolis, Minn.	WCCO	830
	WLOL	1330
	WMIN	1400
	WDGY	1130
	WWTC	1280
	KTCR	690
	KTIS	900
	KUOM	770
	KSTP	1500
Minot, N. Dak.	KLPM	1390
	KHRT	1320
	KCJB	910
Mission, Kans.	KBEA	1480
Mission, Tex.	KIRT	1580
Missoula, Mont.	KGVO	1290
	KXLL	1450
	KQTE	1340
	KYSS	910
Mitchell, S.Dak.	KORN	1490
Moab, Utah	KURA	1450
Moberly, Mo.	KNCM	1230
Mobile, Ala.	WUNI	1410
	WABB	1480
	WGOK	900
	WMOO	1550
	WTUF	840
	WKRG	710
	WLIQ	1360
	WMOZ	960
Mobridge, S.Dak.	KOLY	1300
Mocksville, N.C.	WDSL	1520
Modesto, Calif.	KTRB	860
	KBEE	970
	KFIV	1360
Mojave, Calif.	KDOL	1340
Moline, Ill.	WQUA	1230
Monahans, Tex.	KVKM	1330
Moncks Corner, S. C.	WBER	950
Monett, Mo.	KRMO	990
Monette, Ark.	KBIB	1560
Monmouth, Ill.	WRAM	1330
Monroe, Ga.	WMRE	1490
Monroe, La.	KMLB	1440
	KLIC	1230
	KNOE	540
Monroe, Mich.	WQTE	560
Monroe, N.C.	WMAP	1060
Monroe, Wis.	WEKZ	1260
Monroeville, Ala.	WMFC	1360
Monterey, Calif.	KIDD	630
	KMBY	1240
Montevideo, Minn.	KDMA	1460
Monte Vista, Colo.	KSLV	1240
Montezuma, Ga.	WMNZ	1050
Montgomery, Ala.	WBAM	740
	WAPX	1600
	WCOV	1170
	WFMI	1500
	WHHY	1440
	WMGY	800
	WRMA	950
Montgomery, W.Va.	WMON	1340
Monticello, Ark.	KHBM	1430
Monticello, Fla.	WWSD	1090
Monticello, Ky.	WFLW	1360
Montpelier, Ida.	KVSI	1450
Montpelier-Barre, Vt.	WSKI	1240
Montrose, Colo.	KUBC	580
Montrose, Pa.	WPEL	1250
Mooresville, N.C.	WHIP	1350
Moorhead, Minn.	KVOX	1280
Morehead, Ky.	WMOR	1330
Morehead City, N.C.	WMBL	740
Morgan City, La.	KMRC	1430
Morganfield, Ky.	WMSK	1550
Morgantown, N.C.	WMNC	1430
Morgantown, W.Va.	WAJR	1440
	WCLG	1300
Morrilton, Ark.	KVOM	800
Morris, Ill.	WCSJ	1550
Morris, Minn.	KMRS	1230
Morristown, N.J.	WMTR	1250
Morristown, Tenn.	WCRK	1150
	WMTN	1300
Morton, Tex.	KRAN	1280
Moscow, Idaho	KRPL	1400
Moses Lake, Wash.	KSEM	1470
	KWIQ	1260
Moss Point, Miss.	WACY	1460
Moulton, Ala.	WLCB	1530
Moultrie, Ga.	WMGA	1400
	WMTM	1300
Moundsville, W.Va.	WEIF	1370
Mountain Grove, Mo.	KLRS	1360
Mountain Home, Ark.	KTLO	1240
Mountain Home, Ida.	KFLI	1240
Mt. Airy, N.C.	WPAQ	740
	WSYD	1300
Mt. Carmel, Ill.	WVMC	1360
Mt. Clemens, Mich.	WBRB	1430

WHITE'S RADIO LOG

Location	C.L.	kHz
Mt. Dora, Fla.	WVGT	1580
Mt. Jackson, Va.	WSIG	790
Mt. Kisco, N.Y.	WVIP	1310
Mt. Olive, N.C.	WDJS	1430
Mt. Pleasant, Mich.	WCEN	1150
Mt. Pleasant, Tex.	KIMP	960
Mt. Shasta, Calif.	KWSD	620
Mt. Sterling, Ky.	WMST	1150
Mt. Vernon, Ill.	WMIX	940
Mt. Vernon, Ind.	WPCO	1590
Mt. Vernon, Ky.	WRVK	1460
Mt. Vernon, Ohio	WMVO	1300
Mt. Vernon, Wash.	KAPS	1470
	KBRC	1430
Muleshoe, Tex.	KMUL	1380
Mullins, S.C.	WJAY	1280
Muncie, Ind.	WLBC	1340
	WERK	990
Munfordville, Ky.	WLOC	1150
Munising, Mich.	WGON	1400
Murfreesboro, N. C.	WWDR	1080
Murfreesboro, Tenn.	WGNS	1450
	WMTS	810
Murphy, N.C.	WCVP	600
	WKRK	1320
Murphysboro, Ill.	WINI	1420
Murray, Ky.	WNBS	1340
Murray, Utah	KMOR	1230
Muscatine, Iowa	KWPC	860
Muscle Shoals City, Ala.	WLAY	1450
Muskegon, Mich.	WKBZ	850
	WKJR	1520
	WTRU	1600
	WMUS	1090
Muskogee, Okla.	KBIX	1490
	KMUS	1380
Myrtle Beach, S.C.	WMYB	1450
	WTGR	1520
Nacogdoches, Tex.	KEEE	1230
	KSFA	860
Nampa, Idaho	KFXO	580
	KAIN	1340
Nanticoke, Pa.	WNAK	730
Napa, Calif.	KVON	1440
Naples, Fla.	WNOG	1270
Narrows, Va.	WNRV	990
Nashua, N.H.	WOTW	900
	WSMN	1590
Nashville, Ark.	KBHC	1260
Nashville, Ga.	WNGA	1600
Nashville, Tenn.	WKOA	1240
	WLAC	1510
	WMAK	1300
	WNAH	1360
	WSIX	980
	WSM	650
	WWGM	1560
Nassau, Bahamas	ZNS-2	1240
Natchez, Miss.	WMIS	1240
	WNAT	1450
Natchitoches, La.	KNOC	1450
Naugatuck, Conn.	WOWW	860
Navasota, Tex.	KWBC	1550
Nebraska City, Nebr.	KNCY	1600
Needles, Calif.	KSFE	1340
Neenah, Wis.	WNAM	1280
Neillsville, Wis.	WCCN	1370
Neon, Ky.	WNKY	1480
Neosho, Mo.	KBTN	1420
Nevada, Mo.	KNEM	1240
New Albany, Ind.	WHEL	1570
	WREY	1290
New Albany, Miss.	WNAU	1470
Newark, Del.	WNRK	1260
Newark, N.J.	WJRZ	970
	WNJR	1430
	WVNJ	620
Newark, N.Y.	WACK	1420
Newark, Ohio	WCLT	1430
New Bedford, Mass.	WBSM	1420
	WNBH	1340
New Bern, N.C.	WHIT	1450
	WRNB	1490
Newberry, Mich.	WNBY	1450
Newberry, S.C.	WKDK	1240
New Boston, Ohio	WIOI	1010
New Braunfels, Tex.	KGNB	1420
New Britain, Conn.	WRCH	910
	WRYM	840
New Brunswick, N.J.	WCTC	1450
Newburgh, N.Y.	WGNY	1220
Newburyport, Mass.	WNBP	1470
New Castle, Ind.	WCTW	1550
New Castle, Pa.	WKST	1280
Newcastle, Wyo.	KASL	1240

Location	C.L.	kHz
New City, N. Y.	WRKL	910
New Haven, Conn.	WAVZ	1300
	WELI	960
	WNHC	1340
New Iberia, La.	KANE	1240
	KNIR	1360
New Kensington, Pa.	WKPA	1150
New London, Conn.	WNLC	1510
New Martinsville, W.Va.	WETZ	1330
Newnan, Ga.	WCOH	1400
	WNEA	1300
New Orleans, La.	WDSU	1280
	WNNR	990
	WBOK	800
	WNOE	1060
	WSMB	1350
	WNPS	1450
	WSHO	1230
	WTIX	690
	WWL	870
	WWOM	600
	WYLD	940
Newport, Ark.	KNBY	1280
Newport, N.H.	WCNL	1010
Newport, Oreg.	KNPT	1310
Newport, R.I.	WADK	1540
Newport, Tenn.	WLIK	1270
Newport, Vt.	WIKE	1490
Newport News, Va.	WGH	1310
	WTID	1270
Newport Richey, Fla.	WGUL	1500
New Richmond, Wis.	WIXK	1590
New Roads, La.	KWRG	1500
New Rochelle, N.Y.	WVOX	1460
New Smyrna Beach, Fla.	WSBB	1230
	WOGO	1550
Newton, Iowa	KCOB	1280
Newton, Kans.	KJRG	950
Newton, Mass.	WNTN	1550
Newton, Miss.	WBKN	1410
Newton, N.J.	WNNJ	1360
Newton, N.C.	WNNC	1230
New Ulm, Minn.	KNUJ	860
New York, N.Y.	WABC	770
	WADO	1280
	WBNX	1380
	WCBS	880
	WEVD	1330
	WHN	1050
	WHOM	1480
	WINS	1010
	WLIB	1190
	WMCA	570
	WNBC	660
	WNEW	1130
	WNYC	830
	WOR	710
	WPOW	1330
	WWRL	1600
Niagara Falls, N.Y.	WHLD	1270
	WJJL	1440
Niceville-Valparaiso, Fla.	WNSM	1340
Nicholasville, Ky.	WNVL	1250
Niles, Mich.	WNIL	1290
Niles, Ohio	WNIO	1540
Nogales, Ariz.	KNOG	1340
Nome, Alaska	KICY	850
Norfolk, Nebr.	WJAG	780
Norfolk, Va.	WTAR	790
	WCMS	1050
	WNOR	1230
	WRAP	850
Normal, Ill.	WIOK	1440
Norman, Okla.	WNAD	640
	KNOR	1400
Norristown, Pa.	WNAR	1110
N. Adams, Mass.	WMNB	1230
N. Atlanta, Ga.	WATY	680
N. Augusta, S.C.	WGUS	1380
	WFNL	1600
North Bend, Oreg.	KFIR	1340
North Charleston, S.C.	WNCG	910
Northampton, Mass.	WHMP	1400
North East, Pa.	WHYP	1530
Northfield, Minn.	WCAL	770
N. Little Rock, Ark.	KOXE	1380
	KXLR	1150
North Platte, Nebr.	KJLT	970
	KNOP	1410
	KOOY	1240
No. Syracuse, N.Y.	WSOQ	1220
N. Vernon, Ind.	WOCH	1460
No. Wilkesboro, N.C.	WKBC	810
Norton, Kans.	KNBI	1530
Norton, Va.	WNVA	1350
Norwalk, Conn.	WNLK	1350
Norwich, Conn.	WICH	1310
Norwich, N.Y.	WCHN	970
Oakdale, La.	KREH	900
Oakes, N.Dak.	KEYD	1220
Oak Grove, La.	KWCL	1280
Oak Hill, W.Va.	WOAY	860
Oakland, Cal.	KNEW	910

Location	C.L.	kHz
	KABL	960
	KDIA	1310
Oakland, Md.	WMSG	1050
Oakland Park, Fla.	WIXX	1520
Oak Park, Ill.	WOPA	1490
Oak Ridge, Tenn.	WATO	1290
Ocala, Fla.	WMOP	900
	WTMC	1290
	WWKE	1370
Ocean City, Md.	WETT	1590
Ocean City, Somers Pt., N.J.	WSLT	1520
Oceanlake, Oreg.	KBCH	1380
Oceanside, Calif.	KUDE	1320
Ocilla, Ga.	WSIZ	1380
Oconto, Wis.	WOCO	1260
Odessa, Tex.	KECK	920
	KOSA	1230
	KOYL	1310
	KRIG	1410
Oelwein, Iowa	KOEL	950
Ogallala, Nebr.	KOGA	930
Ogden, Utah	KLO	1430
	KANN	1250
	KSVN	730
	KVOG	1490
Ogdensburg, N.Y.	WSLB	1400
Oil City, Pa.	WKRZ	1340
Okeechobee, Fla.	WOKC	1570
Okla. City, Okla.	KBYE	890
	KLPR	1140
	KOCY	1340
	KOMA	1520
	KTOK	1000
	KJEM	800
	WKY	930
Okmulgee, Okla.	KOKL	1240
Old Saybrook, Conn.	WLIS	1420
Olean, N.Y.	WMNS	1360
	WHDL	1450
Olney, Ill.	WVLN	740
Olympia, Wash.	KGY	1240
	KITN	920
Omaha, Nebr.	KBON	1490
	KFAB	1110
	KOIL	1290
	KOOO	1420
	KOWH	660
	WOW	590
Omak, Wash.	KOMW	680
Oneida, N.Y.	WMCR	1600
Oneida, Tenn.	WBNT	1310
O'Neill, Nebr.	KBRX	1350
Oneonta, Ala.	WCRL	1570
Oneonta, N.Y.	WDOS	730
Ontario, Calif.	KASK	1510
Ontario, Oreg.	KSRV	1380
Opelika, Ala.	WPHO	1400
Opelousas, La.	KSLO	1230
Opp, Ala.	WAMI	860
Opportunity, Wash.	KZUN	630
Orange, Mass.	WCAT	1390
Orange, Tex.	KOGT	1600
Orange, Va.	WJMA	1340
Orangeburg, S.C.	WDIX	1150
	WORG	1580
	WTNO	920
Orange Park, Fla.	WAYR	550
Ord, Neb.	KNLV	1060
Oregon City, Ore.	KYMN	1520
Orlando, Fla.	WDBO	580
	WHOO	990
	WHIY	1270
	WLOF	950
	WKIS	740
Ormond Bch., Fla.	WQXQ	1380
Orofino, Idaho	KLER	950
Oroville, Calif.	KAOR	1340
Ortonville, Minn.	KDIO	1350
Osage Bch., Mo.	KRMS	1150
Osceola, Ark.	KOSE	860
Oshkosh, Wis.	WOSH	1490
Oskaloosa, Iowa	KBOE	740
Oswego, N.Y.	WSGO	1440
Othello, Wash.	KRSC	1400
Otsego, Mich.	WAOP	980
Ottawa, Ill.	WCMY	1430
Ottawa, Kans.	KOFO	1220
Ottumwa, Iowa	KBIZ	1240
	KLEE	1480
Owatonna, Minn.	KRFO	1390
Owego, N.Y.	WEBO	1330
Owensboro, Ky.	WOMI	1490
	WVJS	1420
Owosso, Mich.	WOAP	1080
Oxford, Miss.	WSUH	1420
Oxford, N.C.	WOXF	1340
Oxnard, Calif.	KOXR	910
Ozark, Ala.	WOZK	900
Paducah, Ky.	WDXR	1560
	WKYX	570
	WPAD	1450
Page, Ariz.	KPGE	1340
Painesville, Ohio	WPVL	1460
Paintsville, Ky.	WSIP	1490
Palatka, Fla.	WWPF	1260
	WSUZ	800
Palestine, Tex.	KNET	1450
Palm Bch., Fla.	WQXT	1340
Palm Sprgs., Calif.	KCMJ	1010
	KDES	920
	KPAL	1450
Palmdale, Calif.	KUTY	1470

Location	C.L.	kHz
Palm Desert, Cal.	KGOL	1270
Palo Alto, Calif.	KIBE	1220
Pampa, Tex.	KPDN	1340
	KHHH	1230
Panama Beach, Fla.	WGNE	1480
	WSCM	1290
Panama City, Fla.	WDLP	590
	WPCF	1430
Paoli, Ind.	WVAK	1560
Paradise, Calif.	KNGL	930
Paragould, Ark.	KDRS	1490
Paris, Ark.	KCCL	1460
Paris, Ill.	WPRS	1440
Paris, Ky.	WPDE	1440
Paris, Tenn.	WTPR	710
Paris, Tex.	KPLT	1490
	KFTV	1250
Parkersburg, W.Va.	WCEF	1050
	WPAR	1450
	WTAP	1230
Park Falls, Wis.	WPFP	1450
Park Rapids, Minn.	KPRM	1240
Parsons, Kans.	KLKC	1540
Pasadena, Cal.	KPPC	1240
	KRLA	1110
	KWKW	1300
Pasadena, Tex.	KLVL	1480
	KIKK	650
Pascagoula-Moss Point, Miss.	WPMP	1580
Pasco, Wash.	KORD	910
Paso Robles, Calif.	KPRL	1230
Patchogue, L.I., N.Y.	WALK	1370
	WPAC	1580
Paterson, N.J.	WPAT	930
Pauls Valley, Okla.	KVLH	1470
Pawhuska, Okla.	KOSG	1500
Pawtucket, R.I.	WXTR	550
Payette, Ida.	KYET	1450
Pearsall, Tex.	KVWG	1280
Pecos, Tex.	KIUN	1400
Peekskill, N.Y.	WLNA	1420
Pekin, Ill.	WSIV	1140
Pell City, Ala.	WFHK	1430
Pendleton, Oreg.	KTIX	1240
	KUMA	1290
Pennington Gap, Va.	WSWV	1570
Pensacola, Fla.	WBOP	980
	WBSR	1540
	WMEL	610
	WNVY	1230
	WCOA	1370
Peoria, Ill.	WXCL	1350
	WMBD	1470
	WIRL	1290
	WPEO	1020
Perry, Fla.	WPRY	1400
	WGKR	1310
Perry, Ga.	WPGA	980
Perry, Iowa	KOLS	1310
Perryton, Tex.	KEYE	1400
Peru, Ind.	WARU	1600
Petaluma, Calif.	KTOB	1490
Petersburg, Va.	WSSV	1240
Petoskey, Mich.	WMBN	1340
Phenix City, Ala.	WPNX	1460
Philadelphia, Miss.	WHOC	1490
Philadelphia, Pa.	KYW	1060
	WCAU	1210
	WDAS	1480
	WFIL	560
	WFLN	900
	WHAT	1340
	WHOC	1490
	WIBG	990
	WIP	610
	WPEN	950
	WRCP	1540
	WTEL	860
Philipsburg, Pa.	WPHB	1260
Phillipsburg, Kans.	KKAN	1490
Phoenix, Ariz.	KIFN	860
	KXIV	1400
	KHAT	1480
	KHEP	1280
	KCAC	1010
	KOY	550
	KOOL	960
	KPHO	910
	KUEQ	740
	KRIZ	1230
	KTAR	620
Phoenix City, Ala.	WPNX	1460
Piedmont, Ala.	WPID	1280
Piedmont, Mo.	KPWB	1140
Pierre, S.D.	KGFX	1080
	KCCR	1240
Pikeville, Ky.	WLSI	900
	WPKE	1240
Pine Bluff, Ark.	KCLA	1400
	KAOL	1270
	KOTN	1490
	KCAT	1530
	KPBA	1590
Pine City, Minn.	WCMP	1350
Pineville, Ky.	WANO	1230
Pineville, Ky.	WMLF	1230
Pineville, W.Va.	WWYO	970

Location	C.L.	kHz
Pipestone, Minn.	KLOH	1050
Piqua, Ohio	WPTW	1570
Pittsburg, Calif.	KKIS	990
Pittsburg, Kans.	KOAM	860
	KSEK	1340
Pittsburgh, Pa.	KDKA	1020
	KQV	1410
	WAMO	860
	WJAS	1320
	WPIT	730
	WTAE	1250
	WEEP	1080
	WWSW	970
Pittsfield, Ill.	WBBA	1580
Pittsfield, Mass.	WBEC	1420
	WBRK	1340
Pittston, Pa.	WPTS	1540
Plainfield, N.J.	WERA	1590
Plainview, Tex.	KVOP	1400
Plant City, Fla.	WPLA	910
Platteville, Wis.	WSWW	1590
Plattsburg, N.Y.	WEAV	960
	WIRY	1340
Pleasanton, Tex.	KBOP	1380
Pleasantville, N.J.	WOND	1400
Plymouth, Ind.	WTCA	1050
Plymouth, Mass.	WPLM	1390
Plymouth, N.C.	WPNC	1470
Plymouth, N.H.	WPNH	1300
Plymouth, Wis.	WPLY	1420
Pocahontas, Ark.	KPOC	1420
Pocatello, Idaho	KSEI	930
	KWIK	1240
	KSNN	1290
Pocomoke City, Md.	WDMV	540
Pomona, Calif.	KWOW	1600
	KKAR	1220
Pompton Lakes, N. J.	WKER	1500
Pompano Beach, Fla.	WLOD	980
	WRBD	1470
Ponca City, Okla.	WBBZ	1230
Ponce, P.R.	WPRP	910
	WEUC	1420
	WPAB	550
	WLEO	1170
	WISO	1260
Pontiac, Ill.	WPOK	1080
Pontiac, Mich.	WPON	1460
Pontotoc, Miss.	WSEL	1440
Pooli, Ind.	WVAK	1560
Poplar Bluff, Mo.	KWOC	930
	KLID	1340
Poplarville, Miss.	WRPM	1530
Portage, Mich.	WTPS	1560
Portage, Pa.	WWML	1470
Portage, Wis.	WPDR	1350
Portageville, Mo.	KMIS	1050
Portales, N.Mex.	KENM	1450
Port Angeles, Wash.	KAPY	1000
	KONP	1450
Port Arthur, Tex.	KOLE	1340
	KPAC	1250
Porterville, Calif.	KTIP	1450
Port Hueneme, Calif.	KACY	1520
Port Huron, Mich.	WHLS	1450
	WTTH	1380
Port Jervis, N.Y.	WDLC	1490
Port Lavaca, Tex.	KGUL	1560
Portland, Ind.	WPGW	1440
Portland, Maine	WCSH	970
	WGAN	560
	WLOB	1310
	WPOR	1490
Portland, Oreg.	KBPS	1450
	KBEV	1010
	KLIQ	1290
	KEX	1190
	KGW	620
	KOIN	970
	KPAM	1410
	KPDQ	800
	KPOJ	1330
	KWJJ	1080
	KXL	750
Port Neches, Tex.	KPNG	1150
Portsmouth, N.H.	WBBX	1380
	WHEB	750
Portsmouth, Ohio	WPAY	1400
	WNXT	1260
Portsmouth, Va.	WHIH	1400
	WPMH	1010
	WAVY	1350
Port Sulphur, La.	KPBC	1510
Port Washington, Wis.	WGLB	1560
Post, Tex.	KPOS	1370
Poteau, Okla.	KLCO	1280
Potomac-Cabin John, Md.	WXLN	950
Potosi, Mo.	KYRO	1280
Potsdam, N.Y.	WPOM	1470
Pottstown, Pa.	WPAZ	1370
Pottsville, Pa.	WPAM	1450
	WPPA	1360
Poughkeepsie, N.Y.	WEOK	1390
	WKIP	1450
Powell, Wyo.	KPOW	1260
Poynette, Wis.	WIBU	1240
Prairie du Chien, Wis.	WPRE	980
Pratt, Kan.	KWNS	1290
Prentiss, Miss.	WKPO	1510
Prescott, Ariz.	KYCA	1490
	KENT	1340
	KNOT	1450
Prescott, Ark.	KTPA	1370
Presque Isle, Me.	WAGM	950
	WEGP	1390
Preston, Idaho	KPST	1340
Preston, Minn.	KFIL	1060
Prestonsburg, Ky.	WPRT	960
	WDOC	1310
Price, Utah	KOAL	1230
Prichard, Ala.	WZAM	1270
Prince Albert, Sask.	CKBI	900
Princeton, Ill.	WZOE	1490
Princeton, Ind.	WRAY	1250
Princeton, Ky.	WPKY	1580
Princeton, N.J.	WHWH	1350
Princeton, W.Va.	WLOH	1490
Prineville, Oreg.	KRCO	690
Prosser, Wash.	KARY	1310
Providence, R.I.	WEAN	790
	WHIM	1110
	WICE	1290
	WJAR	920
	WLKW	990
	WPRO	630
	WRIB	1220
Provo, Utah	KIXX	1400
	KEYY	1450
	KOVO	960
Pryor, Okla.	KOLS	1570
Pueblo, Colo.	KDZA	1230
	KAPI	690
	KCSJ	590
	KFEL	970
Pueblo, Colo.	KKAM	1350
	KPUB	1480
Pulaski, Tenn.	WKSR	1420
Pulaski, Va.	WPUV	1580
Pullman, Wash.	KWSC	1250
	KOFE	1150
Punta Gorda, Fla.	WCCF	1580
Punxsutawney, Pa.	WPME	1540
Putnam, Conn.	WINY	1350
Puyallup, Wash.	KAYE	1450
Quanah, Tex.	KOLJ	1150
Quantico, Va.	WQVA	1530
Quincy, Calif.	KQCY	500
Quincy, Fla.	WCNH	1230
Quincy, Ill.	WGEM	1440
	WTAD	930
Quincy, Mass.	WJDA	1300
Quincy, Wash.	KPOR	1370
Quitman, Ga.	WSFB	1490
Racine, Wis.	WRAC	1460
	WRJN	1400
Radford, Va.	WRAD	1460
Raeford, N.C.	WSHB	1400
Raleigh, N.C.	WKIX	850
	WYNA	1550
	WPTF	680
	WLLE	570
	WRNC	1240
Ralls, Tex.	KCLR	1530
Rantoul, Ill.	WRTL	1460
Rapid City, S.Dak.	KOTA	1380
	KIMM	1150
	KRSD	1340
	KEZU	920
Raton, N.Mex.	KRTN	1490
Ravenswood, W.Va.	WMOV	1360
Rawlins, Wyo.	KRAL	1240
Raymond, Wash.	KAPA	1340
Raymondville, Tex.	KSOX	1240
Rayville, La.	KRIH	990
Reading, Pa.	WEEU	850
	WHUM	1240
	WRAW	1340
Redding, Calif.	KRDG	1230
	KAHR	1330
	KQMS	1400
	KVCV	600
	KVIP	540
Red Bluff, Calif.	KBLF	1490
Redfield, S.Dak.	KFCB	1380
Redlands, Calif.	KCAL	1410
Red Lion, Pa.	WGCB	1440
Red Lodge, Mont.	KRBN	1450
Redmond, Oreg.	KPRB	1240
Red Wing, Minn.	KCUE	1250
Redwood Falls, Minn.	KLGR	1490
Reedsburg, Wis.	WRDB	1400
Reedsport, Oreg.	KRAF	1470
Reidsville, N.C.	WFRC	1600
	WREV	1220
Remsen, N.Y.	WREM	1480
Reno, Nev.	KOH	630
	KBET	1340
	KOLO	920
	KONE	1450
	KCBN	1230
Rensselaer, Ind.	WRIN	1560
Rensselaer, N.Y.	WEEE	1300
Renton, Wash.	KREN	1420
Rexburg, Idaho	KRXK	1230
Rhinelander, Wis.	WOBT	1240
Rice Lake, Wis.	WJMC	1240
Richfield, Minn.	WPBC	980
Richfield, Utah	KSVC	980
Richland, Wash.	KALE	960
Richland, Wis.	WRCO	1450
Richlands, Va.	WRIC	540
Richmond, Ind.	WKBV	1490
Richmond, Ky.	WEKY	1340
Richmond, Va.	WANT	990
	WBBL	1480
	WRGM	1540
	WLEE	1480
	WEET	1320
	WGOE	1590
	WTVR	1380
	WRNL	910
	WRVA	1140
	WXGI	950
	WRGM	1540
Richwood, W.Va.	WVAR	1280
Ridgecrest, Calif.	KRCK	1360
	KLOA	1240
Ridgeland, S.C.	WBUG	1430
Rio Piedras, P.R.	WUNO	1320
	WRAI	1190
Ripley, Miss.	WSCA	1260
Ripley, Tenn.	WTRB	1570
Ripon, Wis.	WCWC	1600
Riverhead, N.Y.	WRIV	1390
	WAPC	1570
Riverside, Calif.	KPRO	1440
	KACE	1570
Riverton, Wyo.	KVOW	1450
Riviera Beach, Fla.	WHEW	1600
Roanoke, Ala.	WELR	1360
Roanoke, Va.	WDBJ	960
	WRIS	1410
	WPXI	910
	WROV	1240
	WSLS	610
Roanoke Rapids, N.C.	WCBT	1230
Roaring Sprgs., Pa.	WKMC	1370
Roberval, Que.	CHRL	910
Robinson, Ill.	WTAY	1570
Robstown, Tex.	KROB	500
Rochelle, Ill.	WRHL	1060
Rochester, Minn.	KROC	1340
	KWEB	1270
	KOLM	1520
Rochester, N.H.	WWNH	930
Rochester, N.Y.	WBBF	950
	WHAM	1180
	WHEC	1460
	WNYR	680
	WSAY	1370
	WROC	1280
Rockford, Ill.	WROK	1440
	WYFE	1150
	WRRR	1330
Rockford, Mich.	WJPW	810
Rock Hill, S.C.	WRHI	1340
	WTYC	1150
Rockingham, N.C.	WAYN	900
Rock Island, Ill.	WHBF	1270
Rockland, Maine	WRKD	1450
Rockmart, Ga.	WPLK	1220
Rock Springs, Wyo.	KVRS	1360
Rockville, Conn.	WRKV	800
Rockville, Md.	WINX	1600
Rockwood, Tenn.	WRKH	580
Rocky Ford, Colo.	KAVI	1320
Rocky Mount, N.C.	WCEC	810
	WEED	1390
	WRMT	1490
	WKWS	1290
Rocky Mount, Va.	WYTI	1570
Rogers, Ark.	KAMO	1390
Rogers City, Mich.	WHAK	960
Rogersville, Tenn.	WRGS	1370
Rolla, Mo.	KCLU	1590
	KTTR	1490
Rome, Ga.	WLAQ	1410
	WIYN	1360
	WRGA	1470
	WROM	710
Rome, N.Y.	WKAL	1450
	WRNY	1350
Ronceverte, W.Va.	WRON	1400
Roseau, Minn.	KRWB	1410
Roseburg, Oreg.	KRNR	1490
	KQEN	1240
	KRXL	1250
	KYES	950
Rosenberg, Tex.	KFRD	980
Roservelt, N.M.	KRDD	1320
Rossville, Ga.	WRIP	980
Roswell, N.Mex.	KRSY	1230
	KGFL	1430
	KBIM	910
	KROO	1320
	KRIK	960
	KSWS	1020
Roxboro, N.C.	WRXO	1430
Royal Oak, Mich.	WEXL	1340
Rugby, N. Dak.	KGCA	1450
Ruidoso, N.Mex.	KRRR	1340
Rumford, Me.	WRUM	790
Rupert, Idaho	KAYT	970
Rushton, La.	KRUS	1490
Rusk, Texas	KTLU	1580
Russell, Kans.	KRSL	990
Russellville, Ala.	WWWR	920
Russellville, Ark.	KXRJ	1490
Russellville, Ky.	WRUS	610
Rutland, Vt.	WHWB	1000
	WSYB	1380
Sacramento, Calif.	KCRA	1320
	KFBK	1530
	KGMS	1380
	KJAY	1430
	KRAK	1140
	KROY	1240
	KXOA	1470
Safford, Ariz.	KGLU	1480
	KATO	1230
Sag Harbor, N.Y.	WLNG	1600
Saginaw, Mich.	WKNX	1210
	WSAM	1400
	WSGW	790
St. Albans, Vt.	WWSR	1420
St. Albans, W.Va.	WKLC	1300
St. Anthony, Ida.	KIGO	1400
St. Augustine, Fla.	WFOY	1240
	WETH	1420
St. Charles, Mo.	KADY	1460
St. Cloud, Minn.	KFAM	1450
	WJON	1240
Ste. Genevieve, Mo.	KSGM	1340
St. George, S.C.	WQIZ	1300
St. George, Utah	KDXU	1450
St. Helen, Mich.	WMIC	1590
St. Helens, Oreg.	KOHI	1600
St. Ignace, Mich.	WIDG	940
St. Johns, Mich.	WJUD	1580
St. Johnsbury, Vt.	WTWN	1340
St. Joseph, Mich.	WSJM	1400
St. Joseph-Benton Harbor, Mich.	WHFB	1060
St. Joseph, Mo.	KFEQ	680
	KKJO	1550
	KUSN	1270
St. Louis, Mo.	KATZ	1600
	KMOX	1120
	KSD	550
	KSTL	690
	KWK	1380
	KXOK	630
	WEW	770
	WIL	1430
	KXEN	1010
St. Louis Park, Minn.	KRSI	950
St. Mary's, Pa.	WKBI	1400
St. Paul, Minn.	KSTP	1500
	KDWB	630
	WMIN	1400
	WMKT	1370
	WCCO	830
St. Pauls, N.C.	WBYB	1060
St. Peter, Minn.	KRBI	1310
St. Petersburg, Fla.	WPIN	680
	WSUN	620
	WLCY	1380
St. Petersburg Beach, Fla.	WILZ	1590
Salamanca, N.Y.	WGGO	1590
Salem, Ill.	WJBD	1350
Salem, Ind.	WSLM	1220
Salem, Mass.	WESX	1230
Salem, Mo.	KSMO	1340
Salem, N. J.	WJIC	1510
Salem, O.	WSOM	600
Salem, Oreg.	KSLM	1390
	KAPT	1220
	KBZY	1490
	KGAY	1430
Salem, Va.	WBLU	1480
Salida, Colo.	KVRH	1340
Salina, Kans.	KSAL	1150
	KFRM	550
	KISI	910
Salinas, Calif.	KDON	1460
	KSBW	1380
Salinas, Calif.	KCTY	980-1000
Saline, Mich.	WOIB	1290
Salisbury, Md.	WBOC	960
	WICO	1320
	WJDY	1470
Salisbury, N.C.	WSTP	1490
	WSAT	1280
Salmon, Idaho	KSRA	960
Salt Lake City, Utah	KALL	910
	KCPX	1320
	KLUB	570
	KNAK	1280
	KSL	1160
	KSOP	1370
	KSXX	630
	KWHO	860
	KWIC	1550
San Angelo, Tex.	KTEO	1340
	KGKL	960
	KPEP	1420
	KWFR	1260
San Antonio, Tex.	KAPE	1480
	KBAT	680
	KBER	1150
	KCOR	1350
	KEDA	1540
	KITE	930
	KUKA	1250
	KUBO	1310
	KMAC	630
	KONO	860
	KTSA	550
	WOAI	1200
San Bernardino, Calif.		

WHITE'S RADIO LOG

Location	C.L.	kHz
	KCKC	1350
	KFXM	590
	KRNO	1240
	KMEN	1290
Sandersville, Ga.	WSNT	1490
San Diego, Calif.	KCBQ	1170
	KFMB	760
	KOGO	600
	KGB	1360
	KSON	1240
	KSDO	1130
Sandpoint, Idaho	KSPT	1400
Sand Spring, Okla.	KTOW	1340
Sandusky, Mich.	WMIC	1560
Sandusky, Ohio	WLEC	1450
San Fernando, Calif.	KGIL	1260
Sanford, Fla.	WTRR	1400
Sanford, Me.	WSME	1220
Sanford, N.C.	WEYE	1290
	WWGP	1050
San Francisco, Calif.	KFRC	610
	KCBS	740
	KFAX	1100
	KGO	810
	KNBR	680
	KKHI	1550
	KSAY	1010
	KSFO	560
	KSOL	1450
	KYA	1260
San Gabriel, Cal.	KAIL	1430
San German, P. R.	WRJS	1060
Sanitobia, Miss.	WSAO	1550
San Jose, Calif.	KLOK	1170
	KLIV	1590
	KEEN	1370
	KXRX	1500
San Juan, P.R.	WAPA	680
	WHOA	870
	WIAC	740
	WIPR	940
	WKAQ	580
	WKVM	810
	WKYN	630
	WITA	1140
San Luis Obispo, Calif.	KATY	1340
	KSLY	1400
	KVEC	920
San Marcos, Tex.	KCNY	1470
San Mateo, Calif.	KOFY	1050
San Rafael, Calif.	KTIM	1510
San Saba, Tex.	KBAL	1410
San Sebastion, P.R.	WFBA	1460
Santa Ana, Calif.	KWIZ	1480
Santa Barbara, Cal.	KDB	1490
	KGUD	990
	KIST	1340
	KTMS	1250
	KACL	1290
Santa Clara, Calif.	KGNU	1430
Santa Cruz, Calif.	KSCO	1080
Santa Fe, N.Mex.	KTRC	1400
	KAFE	810
	KVSF	1260
Santa Maria, Cal.	KCDY	1400
	KHER	1600
	KSMA	1240
	KSEE	1480
Santa Monica, Cal.	KDAY	1580
Santa Paula, Calif.	KSPA	1400
Santa Rosa, Calif.	KSRO	1350
	KHUM	1580
	KVRE	1460
	KJAX	1150
Santa Rosa, N.Mex.	KSYX	1420
Sapulpa, Okla.	KREK	1550
Saranac Lake, N.Y.	WNBZ	1240
Sarasota, Fla.	WKXY	930
	WSAF	1220
	WSPB	1450
	WYND	1280
Saratoga, N.Y.	WSPN	900
Saratoga Springs, N.Y.	WKAJ	900
Sauk Rapids, Minn.	WVAL	800
Sault Ste. Marie, Mich.	WSOO	1230
Savannah, Ga.	WBYG	1450
	WEAS	900
	WSAV	630
	WSGA	1400
	WTOC	1290
	WSOK	1230
Savannah, Tenn.	WORM	1010
Sayre, Pa.	WATS	960

Location	C.L.	kHz
Sheffield, Ala.	WSHF	1290
Schenectady, N.Y.	WGY	810
	WSNY	1240
Scotland Neck, N.C.	WYAL	1280
Scott City, Kans.	KFLA	1310
Scottsbluff, Nebr.	KNEB	960
	KOLT	1320
Scottsboro, Ala.	WCRI	1050
	WROS	1330
Scottsdale, Ariz.	KDOT	1440
Scottsville, Ky.	WLCK	1250
Scranton, Pa.	WARM	590
	WEJL	630
	WGBI	910
	WICK	1400
	WSCR	1320
Seaford, Del.	WSUX	1280
Searcy, Ark.	KWCB	1300
Seattle, Wash.	KAYO	1150
	KIXI	910
	KING	1090
	KIRO	710
	KJR	950
	KOL	1300
	KOMO	1000
	KETO	1590
	KTW	1250
	KVI	570
	KXA	770
	KBLE	1050
Sebring, Fla.	WJCM	960
	WSEB	1340
Sedalia, Mo.	KDRO	1340
	KSIS	1050
Seguin, Tex.	KWED	1580
Selma, Ala.	WGWC	1340
	WHBB	1490
Selma, N.C.	WBZB	1090
Seminole, Tex.	KTFO	1250
Senatobia, Miss.	WSAO	1550
Seneca Township, S.C.	WSNW	1150
Sevierville, Tenn.	WSEV	930
Seward, Alaska	KIBH	950
Seymour, Ind.	WJCD	1390
Seymour, Tex.	KSEY	1230
Shakopee, Minn.	KSMM	1530
Shallotte, N.C.	WVCB	1410
Shamokin, Pa.	WISL	1480
Shamrock, Tex.	KBYP	1580
Sharon, Pa.	WPIC	790
Shawano, Wis.	WTCH	960
Shawnee, Okla.	KGFF	1450
Sheboygan, Wis.	WHBL	1330
	WKTS	950
Sheffield, Ala.	WSHF	1290
Shelby, Mont.	KSEN	1150
Shelby, N.C.	WOHS	730
	WADA	1390
Shelbyville, Ind.	WSVL	1520
Shelbyville, Ky.	WCND	940
Shelbyville, Tenn.	WHAL	1400
	WLIJ	1580
Sheldon, Iowa	KIWA	1550
Shelton, Wash.	KMAS	1280
Shenandoah, Iowa	KMA	960
	KFNF	920
Shenandoah, Pa.	WMBT	1530
Sheridan, Wyo.	KWYO	1410
	KROE	930
Sherman, Tex.	KRRV	910
	KTXO	1500
Shippensburg, Pa.	WSHP	1480
Show Low, Ariz.	KVWM	970
Shreveport, La.	KANB	1300
	KBCL	1220
	KEEL	710
	KOKA	1550
	KJOE	1480
	KCIJ	980
	KRMD	1340
	KWKH	1130
Sidney, Mont.	KGCX	1480
Sidney, Nebr.	KSID	1340
Sidney, O.	WMVR	1080
Sierra Vista, Ariz.	KHFH	1420
Sikeston, Mo.	KSIM	1400
	KMPL	1520
Siler City, N.C.	WNCA	1570
Siloam Sprgs., Ark.	KUOA	1290
Silsbee, Tex.	KKAS	1300
Silver City, N.Mex.	KSIL	1340
Silver Sprgs., Md.	WQMR	1050
Simcoe, Ont.	CFRS	1560
Sinton, Tex.	KTOO	1590
Sioux City, Iowa	KSCJ	1360
	KMNS	620
	KTRI	1470
Sioux Falls, S.Dak.	KISD	1230
	KELO	1320
	KNWC	1270
	KSOO	1140
Sitka, Alaska	KIFW	1230
	KSEW	1400
Skowhegan, Maine	WGHM	1150
Slaton, Tex.	KCAS	1050
Slidell, La.	WBGS	1560
Smithfield, N.C.	WMPM	1270
Smithville, Tenn.	WJLE	1480
Smyrna, Ga.	WYNX	1550
Snyder, Tex.	KSNY	1450
Socorro, N.Mex.	KSRC	1290
Soda Sprgs., Idaho	KBRV	540

Location	C.L.	kHz
Somerset, Ky.	WSFC	1240
	WTLO	1480
Somerset, Pa.	WVSC	990
Sonora, Calif.	KVML	1450
Sonora, Tex.	KCKG	1240
So. Bend, Ind.	WNDU	1490
	WJVA	1580
	WSBT	960
Southbridge, Mass.	WESO	970
So. Boston, Va.	WHLF	1400
Southern Pines, N.C.	WEEB	990
South Charleston, W. Va.	WRDS	1410
South Daytona Beach, Fla.	WELE	1590
So. Gastonia, N.C.	WGAS	1420
So. Haven, Mich.	WJOR	940
So. Knoxville, Tenn.	WSKT	1580
So. Paris, Me.	WKTQ	1450
So. Pittsburg, Tenn.	WEPG	910
So. St. Paul, Minn.	KDWB	630
	WMKT	1370
So. Williamsport, Pa.	WMPT	1450
Spanish Fork, Utah	KONI	1480
Sparks, Nev.	KBUB	1270
Sparta, Ill.	WHCO	1230
Sparta, N.C.	WCOK	1060
Sparta, Tenn.	WSMT	1050
Sparta, Wis.	WKLJ	990
	WCOW	1290
Spartanburg, S.C.	WHCQ	1400
	WORD	910
	WSPA	950
	WASC	1530
Spencer, Iowa	KICO	1240
Spencer, W.Va.	WVRC	1400
Spokane, Wash.	KGA	1510
	KDNC	1440
	KSPO	1230
	KPEG	1380
	KHQ	590
	KJRB	790
	KREM	970
	KXLY	920
	KCFA	1330
	KUOY	1280
Springdale, Ark.	KBRS	1340
	KSPR	1590
Springfield, Ill.	WCVS	1450
	WMAY	970
	WTAX	1240
Springfield, Mass.	WHYN	560
	WMAS	1450
	WSPR	1270
Springfield, Mo.	KGBX	1260
	KICK	1340
	KTTS	1400
	KWTO	560
Springfield, Ohio	WIZE	1340
	WBLY	1600
Springfield-Eugene, Ore.	KEED	1120
Springfield, Tenn.	WDBL	1590
Springfield, Vt.	WCFR	1480
Springhill, La.	KBSF	1460
Spring Lake, N. C.	WFBS	1450
Spring Valley, N.Y.	WRRC	1300
Spruce Pine, N.C.	WTOE	1470
Stamford, Conn.	WSTC	1400
Stamford, Tex.	KDWT	1400
Stanford, Ky.	WRSL	1520
Starke, Fla.	WPXE	1490
Starkville, Miss.	WSSO	1230
State College, Pa.	WMAJ	1450
	WRSC	1390
Statesboro, Ga.	WWNS	1240
Statesville, N.C.	WSIC	1400
	WDBM	550
Staunton, Va.	WTON	1240
	WAFC	900
Stephenville, Tex.	KSTV	1510
Sterling, Colo.	KGEK	1230
	KOLR	1490
Sterling, Ill.	WSDR	1240
Steubenville, Ohio	WSTV	1340
Stevens Point, Wis.	WSPT	1010
Stillwater, Minn.	WAVN	1220
Stillwater, Okla.	KSPI	780
Stockton, Calif.	KJOY	1280
	KSTN	1420
	KWG	1230
Storm Lake, Iowa	KAYL	990
Streator, Ill.	WIZZ	1250
Stroudsburg, Pa.	WVPO	840
Stuart, Fla.	WSTU	1450
Stuart, Va.	WHEO	1270
Sturgeon Bay, Wis.	WDOR	910
Sturgis, Mich.	WSTR	1230
Sturgis, S. D.	KBNB	1280
Stuttgart, Ark.	KWAK	1240
Suffolk, Va.	WLPM	1460
Sullivan, Ind.	WKQV	1550
Sullivan, Mo.	KTUI	1560
Sulphur, La.	KIKS	1310
Sulphur Sprgs., Tex.	KSST	1230
Summerville, Ga.	WGTA	950
Summerville, S.C.	WALS	980
Sumner, Wash.	KDFL	1560
Sumter, S.C.	WFIG	1290

Location	C.L.	kHz
	WDXY	1240
	WSSC	1340
Sunbury, Pa.	WKOK	1070
Sunnyside, Wash.	KREW	1230
Sun Valley, Ida.	KSKI	1340
Superior, Nebr.	KRFS	1600
Superior, Wis.	WDSM	710
	WIGL	970
	WWJC	1270
	WAXK	1320
Susanville, Calif.	KSUE	1240
Sutton, W. Va.	WSGB	1490
Swainsboro, Ga.	WJAT	800
Sweetwater, Tenn.	WDEH	800
Sweetwater, Tex.	KXOX	1240
Sylacauga, Ala.	WFEB	1340
	WMLS	1290
Sylva, N.C.	WMSJ	1480
Sylvania, Ga.	WSYL	1490
Sylvester, Ga.	WOGA	1540
Syracuse, N.Y.	WHEN	620
	WFBL	1390
	WNDR	1260
	WOLF	1490
	WSYR	570
Tabor City, N.C.	WTAB	1370
Tacoma, Wash.	KMO	1360
	KTAC	850
	KTNT	1400
	KVI	570
Taft, Calif.	KTKR	1310
Tahlequah, Okla.	KTLQ	1350
Tahoe Valley, Calif.	KTHO	590
Talladega, Ala.	WEYY	1580
	WNUZ	1230
Tallahassee, Fla.	WMEN	1330
	WONS	1410
	WTAL	1450
	WTNT	1270
Tallassee, Ala.	WTLS	1300
Tallulah, La.	KTLD	1360
Tampa, Fla.	WALT	1110
	WDAE	1250
	WYOU	1550
	WFLA	970
	WHBO	1050
	WINQ	1010
	WTMP	1150
	WSOL	1300
Taos, N. Mex.	KKIT	1340
Tarboro, N.C.	WCPS	760
Tarpon Springs, Fla.	WCWR	1470
Tasley, Va.	WESR	1330
Taunton, Mass.	WPEP	1570
Tawas City, Mich.	WIOS	1480
Taylor, Tex.	KTAE	1260
Taylorsville, N. C.	WSTH	860
	WTLK	1570
Taylorville, Ill.	WTIM	1410
Tazewell, Tenn.	WNTT	1250
Tazewell, Va.	WTZE	1470
Tell City, Ind.	WTCJ	1230
Tempe, Ariz.	KUPD	1060
	KYND	1580
Temple, Tex.	KTEM	1400
Terre Haute, Ind.	WBOW	1230
	WAAC	1300
	WTHI	1480
Terrell, Tex.	KTER	1570
Terrytown, Nebr.	KEYR	690
Texarkana, Ark.	KOSY	790
Texarkana, Tex.	KCMC	740
	KATQ	940
	KTFS	1400
Texas City, Tex.	KTLW	920
Thayer, Mo.	KALM	1290
The Dalles, Oreg.	KODL	1440
	KACI	1300
Thermopolis, Wyo.	KRTR	1490
	KTHE	1240
Thief River Falls, Minn.	KTRF	1230
Thibodaux, La.	KTIB	630
Thomaston, Ga.	WSFT	1220
	WTGA	1590
	WTHN	1500
Thomasville, Ala.	WJDB	630
Thomasville, Ga.	WPAX	1240
	WLOR	730
Thomasville, N.C.	WTNC	790
Thomson, Ga.	WTWA	1240
Three Rivers, Mich.	WLKM	1510
Ticonderoga, N.Y.	WIPS	1250
Tiffin, Ohio	WTTF	1600
Tifton, Ga.	WTIF	1340
	WWGS	1430
Tillamook, Oreg.	KTIL	1590
Titusville, Fla.	WRMF	1050
Titusville, Pa.	WTIV	1230
Toccoa, Ga.	WLET	1420
	WNES	630
Toledo, Ohio	WOHO	1470
	WSPD	1370
	WTOD	1560
	WCWA	1230
	WTTO	1520
Toledo, Oreg.	KTDO	1230
Tolleson, Ariz.	KRDS	1190
Tomah, Wis.	WTMB	1460
Tompkinsville, Ky.	WTKY	1370

Location	C.L.	kHz
Tooele, Utah	KDYL	990
Topeka, Kans.	WIBW	580
	KEWI	1440
	WREN	1250
	KTOP	1490
Toppenish, Wash.	KENE	1490
Torrington, Conn.	WTOR	610
Torrington, Wyo.	KGOS	1490
Towanda, Pa.	WTTC	1550
Towson, Md.	WAQE	1570
Trail, B.C.	CJAT	610
Travelers Rest, S.C.	WBBR	1580
Traverse City, Mich.	WTCM	1400
	WCCW	1310
Trenton, Mo.	KTTN	1600
Trenton, N.J.	WAAT	1300
	WBUD	1260
	WTTM	920
Trenton, Tenn.	WTNE	1500
Trinidad, Colo.	KCRT	1240
Troy, Ala.	WTBF	970
Troy, N.Y.	WHAZ	1330
	WTRY	980
	WXKW	1600
Troy, N. C.	WJRM	1390
Truckee, Calif.	KHOE	1400
Trumann, Ark.	KTMN	1530
Truth or Consequences, New Mexico	KCHS	1400
Tryon, N.C.	WTYN	1550
Tucson, Ariz.	KTUC	1400
	KXEW	1600
	KAIR	1490
	KCEE	790
	KTAN	580
	KCUB	1290
	KEVT	690
	KHOS	940
	KMOP	1330
	KFIF	1550
	KTKT	990
	KOLD	1450
Tucumcari, N.Mex.	KTNM	1400
Tulare, Calif.	KCOK	1270
	KGEN	1370
Tulia, Tex.	KTUE	1260
Tullahoma, Tenn.	WJIG	740
Tulsa, Okla.	KAKC	970
	KOME	1300
	KRMG	740
	KELI	1430
	KVOO	1170
	KFMJ	1050
Tupelo, Miss.	WELO	580
	WTUP	1490
Turlock, Calif.	KCEY	1390
Tuscaloosa, Ala.	WJRD	1150
	WACT	1420
	WNPT	1280
	WTUG	790
	WTBC	1230
Tuscumbia, Ala.	WVNA	1590
	WRCK	1410
Tuskegee, Ala.	WABT	580
Twenty-Nine Palms, Calif.	KDHI	1250
Twin Falls, Idaho	KTFI	1270
	KLIX	1310
	KEEP	1450
Two Rivers, Wis.	WTRW	1590
Tyler, Tex.	KZAK	1330
	KDOK	1490
	KTBB	600
	KZEY	690
Tyrone, Pa.	WTRN	1340
Uhrichsville, Ohio	WUND	1540
	WBTC	1540
Ukiah, Calif.	KUKI	1400
	KMSL	1250
Ulysses, Kan.	KULY	1420
Union, S.C.	WBCU	1460
Union City, Tenn.	WENK	1240
Uniontown, Pa.	WMBS	590
Urbana, Ill.	WILL	580
	WKID	1580
Utica, N.Y.	WIBX	950
	WBVM	1550
	WRUN	1150
	WTLB	1310
Utuado, P.R.	WUPR	1530
Uvalde, Tex.	KVOU	1400
Valdese, N.C.	WSVM	1490
Valdosta, Ga.	WGOV	950
	WGAF	910
	WJEM	1150
	WVLD	1450
Valentine, Nebr.	KVSH	940
Vallejo, Calif.	KNBA	1190
Valley City, N.Dak.	KOVC	1490
Valparaiso-Niceville, Fla.	WNSM	1340
Valparaiso, Ind.	WAKE	1500
	WNWI	1080
Van Buren, Ark.	KFDF	1580
Van Cleve, Ky.	WMTC	730
Vanceburg, Ky.	WKKS	1570
Vancouver, Wash.	KISN	910
	KKEY	1150
	KGAR	1550
Vandalia, Ill.	WPMB	1500
Van Wert, Ohio	WERT	1220
Venice, Fla.	WAMR	1320
Ventura, Calif.	KVEN	1450
	KUDU	1590
Vermillion, S.Dak.	KUSD	690
Vernal, Utah	KVEL	1250
Vernon, Ala.	WVSA	1380
Vernon, Tex.	KVWC	1490
Vero Beach, Fla.	WAXE	1370
	WTTB	1490
Vicksburg, Miss.	WQBC	1420
	WVIM	1490
Victoria, Tex.	KNAL	1410
	KVIC	1340
Victorville, Calif.	KCIN	1590
Vidalia, Ga.	WVOP	970
Vieques, P.R.	WIVV	1370
Ville Platte, La.	KVPI	1050
Vincennes, Ind.	WAOV	1450
Vineland, N.J.	WWBZ	1360
	WDVL	1270
Vinita, Okla.	KVIN	1470
Vinton, Va.	WKBA	1550
Virginia, Minn.	WHLB	1400
Virginia Beach, Va.	WVAB	1550
Viroqua, Wis.	WISV	1360
Visalia, Calif.	KONG	1400
Vivian, La.	KNCB	1600
Waco, Tex.	WACO	1580
	KAWA	1010
	KBGO	1580
	KWTX	1230
Wadena, Minn.	KWAD	920
Wadesboro, N.C.	WADE	1210
Wagoner, Okla.	KWLG	1530
Wahpeton, N.D.-Breckenridge, Minn.	KBMW	1450
Wailuku, Hawaii	KMVI	550
Waipahu, Hawaii	KAHU	940
Walhalla, S.C.	WGOG	1000
Wallace, Idaho	KWAL	620
Wallace, N.C.	WLSE	1400
Walla Walla, Wash.	KHIT	1320
	KUJ	1420
	KTEL	1490
Walnut Ridge, Ark.	KRLW	1320
Walsenburg, Colo.	KFLJ	1380
Walterboro, S.C.	WALD	1220
Waltham, Mass.	WCRB	1330
Walton, N.Y.	WDLA	1270
Ward Ridge, Fla.	WJOE	1570
Ware, Mass.	WARE	1250
Warner Robbins, Ga.	WRBN	1600
	WAVC	1350
Warren, Ark.	KWRF	860
Warren, Ohio	WHHH	1440
Warren, Pa.	WNAE	1310
Warrensburg, Mo.	KOKO	1450
Warrenton, Mo.	KWRE	730
Warrenton, Va.	WEER	1570
	WKCW	1420
Warsaw, Ind.	WRSW	1480
Warsaw, Va.	WNNT	690
Warwick-E.Greenwich, R.I.	WYNG	1590
Wasco, Calif.	KWSO	1050
Washington, D.C.	WGMS	570
	WMAL	630
	WOL	1450
	WOOK	1340
	WWDC	1260
	WRC	980
	WTOP	1500
Washington, Ga.	WLOV	1370
Washington, Ind.	WAMW	1580
Washington, Iowa	KCII	1380
Washington, N.J.	WCRV	1580
Washington, N.C.	WEEW	1320
	WITN	930
Washington, Pa.	WJPA	1450
Washington Court House, Ohio	WCHO	1250
Walterboro, S.C.	WALD	1060
Waterbury, Conn.	WATR	1320
	WBRY	1590
	WWCO	1240
Waterbury, Vt.	WDEV	550
Waterloo, Iowa	KXEL	1540
	KNWS	1090
	KWWL	1330
Watertown, N.Y.	WATN	1240
	WOTT	1410
	WWNY	790
Watertown, S.Dak.	KSDR	1480
	KWAT	950
Watertown, Wis.	WTTN	1580
Waterville, Me.	WTVL	1490
Watseka, Ill.	WGFA	1360
Watsonville, Calif.	KOMY	1340
Wauchula, Fla.	WAUC	1310
	WPRV	1600
Waukegan, Ill.	WKRS	1220
Waukesha, Wis.	WAUK	1510
Waupaca, Wis.	WDUX	800
Waupun, Wis.	WLKE	1170
Wausau, Wis.	WRIG	1400
	WSAU	550
	WXCO	1230
Waverly, Iowa	KWVY	1470
Waverly, Ohio	WPKO	1380
Waverly, Tenn.	WPHC	1060
Waxahachie, Tex.	KBEC	1390
Waycross, Ga.	WACL	570
	WAYX	1230
Waynesboro, Ga.	WBRO	1310
Waynesboro, Miss.	WABO	990
Waynesboro, Pa.	WAYZ	1380
Waynesboro, Va.	WAYB	1490
	WANV	970
Waynesburg, Pa.	WANB	1580
Waynesville, Mo.	KJPW	1390
Waynesville, N.C.	WHCC	1400
Weatherford, Tex.	KZEE	1220
Webster City, Iowa	KJFJ	1570
Weed, Calif.	KDAD	800
Weirton, W.Va.	WEIR	1430
Weiser, Idaho	KWEI	1260
Welch, W.Va.	WELC	1150
	WOVE	1340
Weldon, N.C.	WCNF	1400
Wellington, Kan.	KLEY	1130
Wellsboro, Pa.	WNBT	1490
Wellston, Ohio	WKOV	1330
Wellsville, N.Y.	WLSV	790
Wenatchee, Wash.	KPQ	560
	KUEN	900
	KMEL	1340
Wendell-Zebulon, N.C.	WETC	540
Weslaco, Tex.	KRGV	1290
West Allis, Wis.	WAWA	1590
W. Bend, Wis.	WBKV	1470
Westbrook, Me.	WJAB	1440
West Chester, Pa.	WCHE	1520
West Covina, Cal.	KGRB	900
W. Frankfort, Ill.	WFRX	1300
W. Hartford, Conn.	WEXT	1550
West Jefferson, N.C.	WKSK	1600
W. Liberty, Ky.	WLKS	1450
West Looma, Cal.	KGRB	900
W. Memphis, Ark.	KSUD	730
W. Monroe, La.	KUZN	1310
W. Palm Beach, Fla.	WEAT	850
	WJNO	1230
	WIRK	1290
West Plains, Mo.	KWPM	1450
West Point, Ga.	WBMK	1310
W. Point, Ga.-Lanett, Ala.	WRLO	1490
West Point, Miss.	WROB	1450
Westport, Conn.	WMMM	1260
W. Springfield, Mass.	WTXL	1490
W. Yarmouth, Mass.	WOCB	1240
Westerly, R.I.	WERI	1230
Westfield, Mass.	WDEW	1570
Westminster, Md.	WTTR	1470
Weston, W.Va.	WHAW	980
W. Warwick, R.I.	WWRI	1450
Wetumpka, Ala.	WETU	1250
Wewoka-Seminole, Okla.	KWSH	1260
Wharton, Tex.	KANI	1500
Wheatland, Wyo.	KYCN	1340
Wheaton, Md.	WDON	1540
Wheeling, W.Va.	WHLL	1600
	WBZE	1470
	WKWK	1400
	WWVA	1170
White Castle, La.	KEVL	1590
Whitehall, Mich.	WLRC	1490
White Plains, N.Y.	WFAS	1230
White River Junc., Vt.	WNHV	910
Whitesburg, Ky.	WTCW	920
Whiteville, N.C.	WENC	1220
Wichita, Kans.	KAKE	1240
	KLEO	1480
	KFDI	1070
	KFH	1330
	KSIR	900
	KWBB	1410
Wichita Falls, Tex.	KNIN	990
	KTRN	1290
	KWFT	620
Wickenburg, Ariz.	KAKA	1250
Wickford, R.I.	WKFD	1370
Wildwood, N.J.	WCMC	1230
Wilkes-Barre, Pa.	WBAX	1240
	WBRE	1340
	WILK	980
Williamsburg, Ky.	WEZJ	1440
Williamsburg, Va.	WBCI	740
Williamson, W.Va.	WBTH	1400
Williamsport, Pa.	WLYC	1050
	WRAK	1400
	WWPA	1340
Williamston, N.C.	WIAM	900
Willimantic, Conn.	WILI	1400
Williston, N.D.	KEYZ	1360
Willmar, Minn.	KWLM	1340
Willoughby, Ohio	WELW	1330
Willow Springs, Mo.	KUKU	1330
Willows, Calif.	KIQS	1560
Wilmington, Del.	WAMS	1380
	WDEL	1150
	WILM	1450
	WTUX	1290
Wilmington, N.C.	WMFD	630
	WHSL	1490
	WKLM	980
	WGNI	1340
Wilmington, O.	WMWM	1090
Wilson, N.C.	WGTM	590
	WLLY	1350
	WVOT	1420
Winchester, Ky.	WWKY	1380
Winchester, Tenn.	WCDT	1340
Winchester, Va.	WINC	1400
	WHPL	610
Windber, Pa.	WWBR	1350
Winder, Ga.	WIMO	1300
Windom, Minn.	KDOM	1580
Window Rock, Ariz.	KHAC	1300
Windsor, Conn.	WSOR	1480
Winfield, Ala.	WEZQ	1300
Winfield, Kan.	KNIC	1550
Winnemucca, Nev.	KWNA	1400
Winnfield, La.	KVCL	1270
Winner, S.Dak.	KWYR	1260
Winnsboro, La.	KMAR	1570
Winnsboro, S.C.	WCKM	1250
Winona, Minn.	KWNO	1230
	KAGE	1380
Winona, Miss.	WONA	1570
Winslow, Ariz.	KVNC	1010
	KINO	1230
Winston-Salem, N.C.	WAAA	980
	WAIR	1340
	WFCM	1550
	WSJS	600
	WTOB	1380
	WKBX	1500
Winter Garden, Fla.	WOKB	1600
Winter Haven, Fla.	WSIR	1490
	WINT	1360
Winter Park, Fla.	WABR	1440
Wisconsin Rapids, Wis.	WFHR	1320
	WRNE	1220
Wolf Pt., Mont.	KVCK	1450
Woodburn, Ore.	KWRC	940
Woodbury, Tenn.	WBFJ	1540
Wood River, Ill.	WRTH	590
Woodside, N.Y.	WWRL	1600
Woodward, Okla.	KSIW	1450
Woonsocket, R.I.	WNRI	1380
	WWON	1240
Wooster, Ohio	WWST	960
Worcester, Mass.	WAAB	1440
	WNEB	1230
	WORC	1310
	WTAG	580
Worland, Wyo.	KWOR	1340
Worthington, Minn.	KWOA	730
Worthington, Ohio	WRFD	880
Wynne, Ark.	KWYN	1400
Wyoming, Mich.	WERX	1530
Wytheville, Va.	WYVE	1280
Yakima, Wash.	KIT	1280
	KIMA	1460
	KBBO	1390
	KQOT	930
	KUTI	980
	KYAK	1390
Yankton, S.D.	KYNT	1450
	WNAX	570
Yauco, P.R.	WKFE	1550
Yazoo City, Miss.	WAZF	1230
York, Nebr.	KAWL	1370
York, Pa.	WNOW	1250
	WORK	1350
	WSBA	910
York, S.C.	WYCL	980
Youngstown, Ohio	WBBW	1240
	WFMJ	1390
	WKBN	570
Ypsilanti, Mich.	WYSI	1480
	WYNZ	1520
Yreka, Calif.	KSYC	1490
Yuba City, Calif.	KUBA	1600
	KZIN	1450
Yuma, Ariz.	KBLU	1320
	KVOY	1400
	KYUM	560
Zanesville, Ohio	WHIZ	1240
Zarephath, N.J.	WAWZ	1380
Zebulon-Wendell, N. C.	WETC	540
Zephyr Hills, Fla.	WZRH	1400
Zion, Ill.	WZBN	1500

U. S. FM Stations by States

(Continued next page)

WHITE'S RADIO LOG

ALABAMA

Location	C.L.	MHz
Albertville	WQSB	105.1
Alexander City	WRFS-FM	106.1
Andalusia	WNBX	98.1
Anniston	WHMA-FM	100.5
Athens	WJOF	104.3
	WATM-FM	104.1
Bay Minette	WBCA-FM	105.5
Birmingham	WAPI-FM	99.5
	WBRC-FM	106.9
	WCRT	96.5
	WSFM	93.7
Carrollton	WRAG-FM	94.1
Clanton	WKLF-FM	97.7
Cullman	WFMH-FM	101.1
Decatur	WDRM	102.1
	WRSA	96.9
Dothan	WOOF-FM	99.7
Fairhope	WABF-FM	92.1
Florence	WJOI-FM	107.3
Gadsden	WLJM	103.7
Hamilton	WERH-FM	92.1
Homewood	WJLN	104.7
Huntsville	WAHR	99.1
	WNDA	92.9
Jackson	WHOD-FM	104.9
Mobile	WKRG-FM	99.9
	WMFC-FM	98.5
	WLPR	96.1
Montgomery	WFMI	98.9
	WAJM	103.3
	WHHY-FM	101.9
Muscle Shoals	WLAY-FM	105.5
Scottsboro	WCNA-FM	98.3
Selma	WHBB-FM	100.1
	WHPD	100.1
Sylacauga	WMLS-FM	98.3
Tuscumbia	WVNA	100.3
Tuscaloosa	WTBO-FM	95.7
	WUOA	91.7
	WACT-FM	105.5

ALASKA

Location	C.L.	MHz
Anchorage	KNIK	105.5
	KBYR-FM	102.1
	KHAR-FM	103.9
College	KUAC	104.9

ARIZONA

Location	C.L.	MHz
Flagstaff	KAFF-FM	92.9
Globe	KWJB-FM	100.3
Mesa	KBUZ-FM	104.7
	KMND-FM	93.3
Phoenix	KRFM	95.5
	KFCA	91.5
	KITH	101.3
	KOOL-FM	94.5
	KNIX-FM	102.5
	KOY-FM	92.5
	KMEO	96.9
	KTAR-FM	98.7
	KYEW	93.3
	KHEP-FM	101.5
Show Low	KVWM	93.5
Tempe	KUPD-FM	97.9
Tucson	KFMM	99.5
	KCEE-FM	96.1
	KSOM	92.9
	KVOA-FM	93.7

ARKANSAS

Location	C.L.	MHz
Blytheville	KLCN-FM	96.1
Conway	KASC	91.5
	KVEE-FM	105.1
Dardanelle	KCAB-FM	102.3
El Dorado	KRIL	99.3
	KELD-FM	103.1
Fayetteville	KFAV	92.1
	KNWA	103.9
Ft. Smith	KFPW-FM	94.9
	KMAG	99.1
	KTCS-FM	99.9
Harrison	KHOZ-FM	102.9
Hot Springs	KBHS-FM	96.7
	KGUS	97.5
Jacksonville	KGMR-FM	100.3
Jonesboro	KBTM-FM	101.9
	KASU	91.9
	KNEA-FM	107.9
Little Rock	KARK	103.7
	KMYO-FM	95.7
Mammoth Springs	KAMS	103.9
Newport	KNBY-FM	105.5
Osceola	KOSE-FM	98.1
Pine Bluff	KOTN-FM	92.3
Siloam Springs	KUOA-FM	105.7

CALIFORNIA

Location	C.L.	MHz
Aklah	KLFL	94.3
Alameda	KJAZ	92.7
Anaheim	KEZR-FM	95.9
Angwin	KANG	89.9
Apple Valley	KAVR-FM	102.3
Arcata	KTOD	90.5
Atherton	KPEN	101.3
Auburn	KAFI	101.1
Avalon	KBIG	104.3
Bakersfield	KERN-FM	94.1
	KGEE-FM	97.5
	KIFM	96.5
Berkeley	KPFA	94.1
	KPFB	89.3
	KPAT-FM	102.9
Bijou	KHUR	99.9
Bishop	KIBS-FM	100.7
Carlsbad	KARL-FM	95.9
Carmel	KRML-FM	101.7
Claremont	KSPC	88.7
Coachella	KCHV-FM	93.7
El Cajon	KECR	93.3
Escondido	KOWN-FM	92.1
Fremont	KFMR	104.9
Fresno	KARM-FM	101.9
	KCIB-FM	94.5
	KFRE-FM	93.7
	KMJ-FM	97.9
	KXQR	102.7
Garden Grove	KTBT	94.3
Glendale	KFMU	97.1
	KUTE	101.9
Hayward	KTUX	101.7
Hemet	KHSJ-FM	105.5
Inglewood	KTYM-FM	103.9
La Canada	KUNF	88.9
LaSierra	KSDA	89.7
Lodi	KCVR-FM	97.7
Lompoc	KLOM-FM	92.7
Long Beach	KJLH	102.3
	KLON	88.1
	KNOB	97.9
Los Altos	KPGM	97.7
	KFJC	88.7
Los Angeles	KABC-FM	95.5
	KBBI	107.5
	KBCA	105.1
	KBMS	105.9
	KCBH	98.7
	KFAC-FM	92.3
	KFOX-FM	100.3
	KADS	103.5
	KGBS-FM	97.1
	KHJ	101.1
	KMET	94.7
	KMLA	100.3
	KNX-FM	93.1
	KPFK	90.7
	KPOL-FM	93.9
	KRHM	102.7
	KRKD-FM	96.3
	KUSC	91.5
	KXLU	89.1
	KHOF	99.5
Los Angeles-Avalon	KBIG-FM	104.3
Los Banos	KLBS-FM	95.9
Los Gatos	KLGS	95.3
Marysville	KRFD	99.9
Merced	KAMB	101.5
Modesto	KBEE-FM	103.3
	KTRB-FM	104.1
Monterey	KMBY-FM	96.9
Newport Beach	KOCM	103.1
Northridge	KEDC-FM	88.5
Oakland	KAFE	98.1
Oceanside	KUDE	102.1
Ontario	KOYA	93.5
Oxnard	KPMJ	104.7
Pasadena	KPCS	89.3
	KPPC-FM	106.7
Palm Springs	KDES-FM	104.7
Redding	KCER	92.9
Redondo Beach	KKOP	93.5
Redlands	KCAL-FM	96.7
	KUOR-FM	89.1
Ridgecrest	KLOA-FM	105.5
Riverside	KBBL	99.1
	KACE-FM	92.7
	KDUO	97.5
Riverside	KUCR	88.1
Sacramento	KCRA-FM	96.1
	KERS	88.9
	KFBK-FM	96.9
	KJML	106.5
	KEBR	100.5
	KHIQ	105.1
	KJML	95.3
	KRAK-FM	92.9
	KSFM	96.9
	KXRQ	98.5
	KXOA-FM	107.9
Salinas	KSBW-FM	102.5
	KRSA-FM	100.7
	KERR	103.9
San Bernardino	KVCR	91.9
	KFMW	99.9
	KEBS	89.5
	KRCS	95.1
San Diego	KOGO-FM	94.1
	KFMB-FM	100.7
	KFMX	96.5
	KGB-FM	101.5
	KITT	105.3
	KDIG	98.1
	KLRO	94.9
	KPRI	106.5
	KSDS	88.3
	KBBW	102.9
	KSDO-FM	103.7
	KSEA	97.3
San Fernando	KVFM	94.3
San Francisco	KALW	91.7
	KBRG	105.3
	KCBS-FM	98.9
	KDFC	102.1
	KEAR	97.3
	KFOG	104.5
	KFRC-FM	106.1
	KGO-FM	103.7
	KNBR-FM	99.7
	KMPX	106.9
	KOIT	93.3
	KPEN	101.3
	KRON-FM	96.5
	KSFR	94.9
	KXKX	88.5
	KCMA	90.3
	KBRG	105.3
	KABL-FM	98.1
	KKHI-FM	95.7
San Jose	KSJO-FM	92.3
	KRPM	98.5
	KSJS	90.7
	KPLX	106.5
	KEEN-FM	100.3
San Luis Obispo	KATY-FM	96.1
	KSBY-FM	93.3
San Mateo	KCSM	90.9
	KUFY	107.7
San Rafael	KTIM	100.9
Santa Ana	KWIZ-FM	96.7
	KYMS	106.3
Santa Barbara	KCSB-FM	91.1
	KDB-FM	93.7
	KMUZ	103.3
	KTMS	97.5
Santa Clara	KSCU	90.1
	KREP	105.7
Santa Cruz	KSCO-FM	99.1
Santa Maria	KXFM	99.1
	KSMA-FM	102.5
Santa Monica	KCRW	89.9
	KSRF	103.1
Sierra Madre	KMAX	107.1
Stanford	KZSU	90.1
Stockton	KUOP	91.3
	KSTN-FM	107.3
	KWG-FM	105.7
Tahoe Valley	KTHO-FM	103.1
Thousand Oaks	KNJO	92.7
Torrance	KNHS	89.7
Tracy	KSRT	100.9
Tulare	KDFR	106.7
	KGEN-FM	94.9
Turlock	KOSO	93.1
Twenty-Nine Palms	KDHI-FM	95.7
Ukiah	KUKI-FM	93.5
Ventura-Oxnard	KVEN-FM	100.7
Visalia	KONG-FM	92.9
Walnut Creek	KDFM	92.1
West Covina	KSGV	98.3
Woodland	KATT	95.3

COLORADO

Location	C.L.	MHz
Boulder	KRNW	97.3
Colorado Springs	KRCC	91.5
	KKFM	96.5
	KSHS	90.5
	KVOR-FM	92.9
	KPIK-FM	94.3
	KRDO-FM	95.1
	KRYT-FM	101.9
Cortez	KZFM	94.1
Denver	KFML-FM	98.5
	KLIR-FM	100.3
	KLZ-FM	106.7
	KDEN-FM	99.5
	KOA-FM	103.5
	KOSI-FM	101.1
	KTGM	105.1
	KMYR	95.5
	KBPI	105.9
Ft. Collins	KCSU-FM	90.9
	KFMF	93.9
Ft. Morgan	KFTM-FM	94.3
Grand Junction	KREX-FM	92.3
Lakewood	KLAK-FM	107.5
Longmount	KLMO-FM	104.3
Loveland	KLOV-FM	102.3
Manitou Springs	KCMS-FM	102.7
Pueblo	KVMN	98.9
Rocky Ford	KAVI-FM	95.9

CONNECTICUT

Location	C.L.	MHz
Bridgeport	WJZZ	99.9
	WPKN	88.1
Brookfield	WGHF	95.1
Danbury	WLAD-FM	98.3
Fairfield	WSHU	91.1
Hamden	WDEE	101.3
Hartford	WHCN	105.9
	WDRC-FM	102.9
	WCCC-FM	104.9
	WLAE	93.7
	WRTC-FM	89.3
	WTIC-FM	96.5
Meriden	WBMI	95.7
Middletown	WESU	88.1
New Haven	WNHC-FM	99.1
	WYBC-FM	94.3
Norwalk	WDRN	95.9
Norwich	WICH-FM	97.7
Stamford	WSTC-FM	96.7
Storrs	WHUS	90.5
Waterbury	WATR-FM	92.5
	WWCO-FM	104.1
Westport	WMMM	107.9

DELAWARE

Location	C.L.	MHz
Dover	WDOV-FM	94.7
Wilmington	WDEL-FM	93.7
	WJBR	99.5

D. C.

Location	C.L.	MHz
Washington	WASH	97.1
	WAMU-FM	88.5
	WFAN	100.3
	WGAY	99.5
	WGMS-FM	103.5
	WGTB	90.1
	WMAL-FM	107.3
	WOL-FM	98.7
	WRC-FM	93.9
	WTOP-FM	96.3
	WWDC-FM	101.1

FLORIDA

Location	C.L.	MHz
Atlantic Beach	WKTZ-FM	96.1
	WAQB-FM	104.9
Belle Glade	WSWN-FM	93.5
Boca Raton	WWOG	99.9
Bradenton	WBRD-FM	103.3
Clear Water	WTAN-FM	95.7
Cocoa	WEZY-FM	99.3
Cocoa Beach	WXBR	101.1
	WRKT-FM	104.3
Coral Gables	WVCG-FM	105.1
Crestview	WAAZ-FM	104.9
Daytona Beach	WNDB-FM	94.5
	WMFJ-FM	101.9
De Funiak Springs	WZEP-FM	103.1
Fort Lauderdale	WWIL-FM	103.5
	WFLM	105.9
	WFTL-FM	106.7
	WMJR	100.7
Ft. Meyers	WINK-FM	96.9
	WMYR-FM	101.9
Ft. Pierce	WARN-FM	98.7
Ft. Walton Beach	WFTW-FM	99.3
Gainesville	WRUF-FM	103.7
Immokalee	WCOF-FM	95.9
Jacksonville	WJAX-FM	95.1
	WQIK-FM	99.1
	WRLJ	96.9
	WIVY-FM	92.5
	WKTZ-FM	96.1
Jacksonville-Atlantic Bch	WKAT-FM	93.1
Key West	WFYN-FM	92.5
Lakeland	WVFM	94.1
Maitland	WTLN-FM	95.3
Marianna	WTOT-FM	100.9
Melbourne	WMMB-FM	102.3
Miami	WKAT-FM	93.3
	WGBS	96.3
	WIOD-FM	97.3
	WTHS	91.7
	WEDR	99.1
	WWPB	101.5
Miami Beach	WAEZ-FM	94.9
	WGOS	93.9
Milton	WXBM-FM	102.3
Mt. Dora	WHIY-FM	107.7
Naples	WNFM	94.5
Ocala	WMOP-FM	93.7
Okeechobee	WLMC	103.1
Orlando	WDBO-FM	92.3
	WHOO-FM	96.5
	WKIS-FM	100.3
	WWQS	105.1
Palm Beach	WWOS-FM	97.9
	WPBA-FM	107.1
Panama City	WMAI-FM	107.9
	WDLP-FM	92.5
Pensacola	WPEX-FM	94.1
	WCOA-FM	102.7
St. Augustine	WFOY-FM	97.7
St. Petersburg	WGNB	101.5
	WTCX	99.5
	WPIN-FM	107.3
Sarasota	WYAK	102.5
	WSPB-FM	106.3
Sebring	WSEB	105.5
Stuart	WMCF	92.7
Tallahassee	WFSU-FM	91.5
	WBGM-FM	98.9
	WMEN-FM	104.1
Tampa	WATL-FM	100.7

Location	C.L.	MHz
	WEMI	94.9
	WFLA-FM	93.3
	WPKM	104.7
	WUSF	89.7
Titusville	WRMF-FM	98.3
West Palm Beach	WPBF	107.9
Winter Haven	WXKL	97.5
Winter Park	WPRK	91.5
	WLOQ	103.1

GEORGIA

Location	C.L.	MHz
Albany	WGPC-FM	104.5
	WJIZ	96.3
Americus	WDEC-FM	94.3
Athens	WGAU-FM	102.5
	WDOL-FM	104.7
Atlanta	WABE	90.1
	WPLO-FM	103.3
	WGKA-FM	92.9
	WSB-FM	98.5
	WLTA-FM	99.7
Augusta	WAUG-FM	105.7
	WBBQ-FM	104.3
Brunswick	WGIG-FM	100.7
	WYNR-FM	101.5
Canton	WCHK-FM	105.5
Carrollton	WLBB-FM	102.3
Columbus	WRBL-FM	102.9
	WGBA-FM	107.3
Cornelia	WCON-FM	99.3
Decatur	WAVO-FM	94.9
Oublin	WXLI-FM	92.7
Gainesville	WDUN-FM	103.9
	WWQT	97.1
Griffin	WKEU-FM	97.7
Lagrange	WLAG-FM	104.1
Macon	WMAZ-FM	99.1
Manchester	WFDR-FM	99.3
Marietta	WBIE-FM	101.5
	WKLS	98.1
Milledgeville	WMVG-FM	102.3
Moultrie	WMTM-FM	93.9
Newnan	WCOH-FM	96.7
Perry	WPGA-FM	100.9
Rome	WRGA-FM	102.3
	WROM-FM	97.7
Rossville	WRIP-FM	105.5
Savannah	WTOC-FM	94.1
	WEAS-FM	93.1
Smyrna	WKXI	94.1
Statesboro	WMCD	100.1
Swainsboro	WJAT-FM	101.7
Toccoa	WLET-FM	106.1
Valdosta	WGOV-FM	92.9
W. Point	WCJM	100.9

HAWAII

Location	C.L.	MHz
Honolulu	KAIM-FM	95.5
	KHVH-FM	93.9
	KPOI-FM	97.5
	KVOK	88.1
	KUOH	90.5

IDAHO

Location	C.L.	MHz
Boise	KBOI-FM	97.9
Idaho Falls	KID-FM	96.1
	KGVM-FM	99.1
Lewiston	KOZE-FM	96.7
Moscow	KUID	91.7
Pocatello	KBGL	88.7

ILLINOIS

Location	C.L.	MHz
Alton	WOKZ-FM	100.3
Anna	WRAJ-FM	92.7
Arlington Heights	WNWC	92.7
Aurora	WKKD-FM	95.9
	WMRO-FM	107.9
Bloomington	WJBC-FM	101.5
Carbondale	WSIU	91.9
Carmi	WROY-FM	97.3
Centralia	WCNT-FM	95.3
Champaign	WDWS-FM	97.5
	WLRW-FM	94.5
Charleston	WEIC-FM	92.1
Chicago	WBBM-FM	96.3
	WBEZ	91.5
	WCLM	101.9
	WLS-FM	94.7
	WDHF	95.5
	WEBH	93.9
	WEFM	99.5
	WSDM	97.9
	WFMF	100.3
	WNUS-FM	107.5
	WFMT	98.7
	WKFM	103.5
	WMAQ-FM	101.1
	WMBI-FM	90.1
	WNIB	97.1
	WXRT	93.1
	WJJD-FM	104.3
Columbia	WCBW	104.9
Crete	WTAS	102.3
Oancille	WDAN-FM	102.1
Decatur	WSOY-FM	102.9
DeKalb	WNIC	89.7
	WLBK-FM	92.5
Dixon	WIXN-FM	101.7
Dundee	WVFV	103.9
E. St. Louis	WMRY	101.1
Effingham	WCRA-FM	95.7
	WELG	103.9
	WRMN-FM	94.3
Elgin	WEPS	88.1
	WELG	103.9
	WRMN-FM	94.3
Elmhurst	WRSE-FM	88.7
Elmwood Park	WXFM	105.9
Evanston	WEAW	105.1
	WNUR	88.7
Fairfield	WFIW-FM	104.9
Flossmoor	WHFH	88.5
Freeport	WELL-FM	98.5
Galesburg	WYKC-FM	88.1
Glen Ellyn	WELF	107.1
Greenville	WGRN	89.3
Harrisburg	WEBQ-FM	99.9
Highland Park	WEEF-FM	103.1
Jacksonville	WLOS-FM	100.5
	WAJP	93.5
Joliet	WJOL-FM	96.7
Kankakee	WKAK-FM	99.9
Kewanee	WKEI-FM	92.1
Lansing	WLNR-FM	106.3
LaSalle	WLPO-FM	99.3
Lawrenceville	WAKO-FM	103.1
Litchfield	WSMI-FM	106.1
Loves Park	WLUV-FM	96.7
Macomb	WWKS	91.3
	WKAI-FM	100.1
Madison	WGNU-FM	106.5
Mattoon	WLBH-FM	96.9
Mendota	WGLC-FM	100.9
Morris	WRMI-FM	104.7
Morrison	WMHS	91.5
Mt. Carmel	WSAB	94.9
	WVMC-FM	101.1
Mt. Vernon	WMIX-FM	94.1
Normal	WGLT	91.7
Oak Park	WOPA-FM	102.7
Olney	WSEI-FM	92.9
Ottawa	WOLI	98.3
Paris	WPRS-FM	98.3
Park Forest	WRHS	88.1
Park Ridge	WMTH	88.5
Pekin	WSIV-FM	95.3
Peoria	WMBD-FM	93.3
	WJSI	106.9
Pittsfield	WBBA-FM	97.7
Quincy	WGEM-FM	105.1
	WTAO-FM	99.5
Robinson	WTAY-FM	100.7
Rockford	WROK-FM	97.5
Rock Island	WHBF-FM	98.9
	WVIK	90.9
Skokie	WRSV	98.3
South Beloit	WBEL-FM	103.1
Springfield	WTAX-FM	103.7
	WFMB	104.5
	WVEM	101.9
Sterling	WJVM	94.3
Streator	WIZZ-FM	97.7
Taylorville	WGGM	95.0
Urbana	WILL-FM	90.9
	WPGU	103.9
Waukegan	WEFA	102.3
Wheaton	WETN-FM	88.1
Winnetka	WNTH	88.1
Woodstock	WREK	105.5

INDIANA

Location	C.L.	MHz
Anderson	WAFM	97.9
Bloomington	WFIU	103.7
	WTTV-FM	92.3
Bluffton	WCRD	100.1
Columbus	WCSI-FM	98.3
Connersville	WCNB-FM	100.3
Crawfordsville	WNDY	106.3
Elkhart	WCMR-FM	104.7
	WTRC-FM	100.7
	WXAX	104.7
Elwood	WBMP	101.7
Evansville	WIKY-FM	104.1
	WEVC	91.5
	WPSR	90.7
	WVHI	105.3
Fort Wayne	WPTH	95.1
	WKJG-FM	97.3
Franklin	WFCI	89.3
	WIFN	95.9
Frankfort	WILO-FM	99.7
Gary	WGVE	88.1
Goshen	WGCS	91.1
Greencastle	WGRE	91.7
	WXTA	94.3
Greenfield	WSMJ	99.5
Greensburg	WTRE-FM	107.3
Hammond	WYCA	92.3
Hartford City	WHCI	91.9
	WWHC	104.9
Huntington	WVSH	91.9
	WHLT-FM	103.1
Indianapolis	WAJC	104.5
	WBDG	90.9
	WICR	88.7
	WISH-FM	107.9
	WAIV	105.7
	WFBM-FM	94.7
	WFMS	95.5
	WGEE-FM	103.3
	WIAN	90.1
	WIBC-FM	93.1
Jasper	WITZ-FM	104.7
Kendallville, Ind.	WAWK-FM	93.3
Kokomo	WFKO	100.5
	WKMO	93.5
Lafayette	WASK-FM	105.3
	WAZY-FM	96.7
La Porte	WLOI-FM	96.7
Logansport	WSAL-FM	102.3
Madison	WORX-FM	96.7
Marion	WMRI-FM	106.9
	WBST	90.7
Michigan City	WMCB-FM	95.9
Monticello	WVTL	95.3
Muncie	WMUN	104.1
	WWHI	91.5
New Albany	WNAS	88.1
New Castle	WCTW-FM	102.5
	WYSN	91.1
North Vernon	WOCH-FM	106.1
Peru	WARU-FM	98.3
Plainfield	WJMK	98.3
Plymouth	WTCA-FM	94.3
Princeton	WRAY-FM	98.1
Richmond	WGLM	96.1
	WECI	91.5
	WKBV-FM	101.3
Scottsburg	WMPI	100.9
Seymour	WJOD	93.7
Shelbyville	WSVL-FM	97.1
South Bend	WETL	91.9
	WHME	103.1
	WNDU-FM	92.9
	WPFR	102.7
	WJVA-FM	103.9
	WSBT-FM	101.5
Terre Haute	WTHI-FM	99.9
	WBOW-FM	107.5
	WPFR	102.7
	WVTS	100.7
	WISU	89.7
Wabash	WSKS	91.3
	WKUZ	95.9
Warsaw	WRSW-FM	107.3
Washington	WFML	106.5
West Lafayette	WBAA-FM	99.1
W. Terre Haute	WWVR	105.5
Valparaiso	WVUR-FM	90.3
Vincennes	WAOV-FM	96.7

IOWA

Location	C.L.	MHz
Ames	WOI-FM	90.1
Atlantic	KJAN-FM	103.7
Boone	KFGQ	99.3
Carroll	KCIM-FM	93.7
Cedar Falls	KTCF	88.1
Cedar Rapids	KHAK-FM	98.1
	WMT-FM	104.5
Clarion	KRIT	96.9
Clinton	KROS-FM	96.1
Creston	KSIB-FM	101.7
Oavenport	WOC-FM	103.7
	KWNT-FM	106.5
Des Moines	KDPS	88.1
	KDMI-FM	97.3
	WHO-FM	100.3
	KFMG	94.9
	KWDM	93.3
Dubuque	WDBQ-FM	105.3
	KDTH-FM	92.9
Ft. Dodge	KWMT-FM	94.5
Iowa City	KSUI	91.7
	KXIC-FM	100.7
Iowa Falls	KIFG-FM	95.3
Maquoketa	KMAQ-FM	95.3
Mt. Vernon	KRNL-FM	89.7
Muscatine	KWPC-FM	99.7
Newton	KUWS-FM	95.9
Oskaloosa	KBOE-FM	104.9
Sioux City	KOVR	97.9
	KTFC	103.3
Spencer	KICD-FM	107.7
Storm Lake	KAYL-FM	101.5
Waterloo	KNWS-FM	101.9
	KXEL-FM	105.7
Waverly	KWAR	89.1

KANSAS

Location	C.L.	MHz
Baldwin	KNBU	88.9
Dodge City	KGNO-FM	95.5
Emporia	KSTE	88.7
	KVOE-FM	104.9
Garden City	KUPK-FM	97.3
Junction City	KJCK-FM	94.5
Kansas City	KCFC	98.1
	KCKN-FM	94.1
Larned	KANS-FM	96.7
Lawrence	KANU	91.5
	KLWN-FM	105.9
Leavenworth	KCLO-FM	98.9
Manhattan	KSDB-FM	88.1
Newton	KIRG-FM	92.3
Ottawa	KTJO-FM	88.1
	KOFO-FM	95.7
Parsons	KPPS-FM	91.1
Pratt	KWNS-FM	93.1
Russell	KRSL-FM	95.9
Salina	KAFM	99.9
Scott City	KFLA-FM	94.5
Topeka	KTOP	100.3
	WIBW-FM	97.3
Wichita	KFH-FM	100.3
	KQTY	101.3
	KMUW	89.1
	KCBM-FM	107.3

KENTUCKY

Location	C.L.	MHz
Albany	WANY-FM	106.3
Ashland	WCMI-FM	93.7
Beattyville	WLJC	102.3
Benton	WCBL-FM	102.3
Bowling Green	WLBJ-FM	96.7
Campbellsville	WTCO-FM	103.9
Central City	WNES-FM	101.9
Erlanger	WKKY-FM	100.9
Ft. Knox	WSAC-FM	105.5
Frankfort	WKYW	104.9
Fulton	WFUL-FM	104.9
Georgetown	WRVG	90.1
Glasgow	WGGC	95.1
Grayson	WGOH-FM	102.3
Greenville	WKYF-FM	101.1
Hazard	WKIC-FM	101.1
Henderson	WSON-FM	99.5
Hopkinsville	WHOP-FM	98.7
	WKOF	100.3
Jamestown	WJRS-FM	103.1
Lexington	WBKY	91.3
	WLAP-FM	94.5
	WLEX-FM	98.1
	WVLK-FM	92.9
Louisville	WFPK	91.9
	WFPL	89.3
	WHAS-FM	97.5
	WKLO-FM	99.7
	WLRS	102.3
	WXEL	103.9
Madisonville	WFMW-FM	93.9
	WNGO-FM	94.7
Manfordville	WLOC-FM	102.3
Maysville	WFTM-FM	95.9
Monticello	WFLW-FM	101.7
Morehead	WMOR-FM	92.1
	WMKY-FM	91.1
Morganfield	WMSK-FM	95.3
Murray	WAAW	103.7
Owensboro	WOMI-FM	92.5
	WVJS-FM	96.1
Paducah	WPAO-FM	96.9
	WKYX-FM	93.3
Paintsville	WSIP-FM	100.1
Pikeville	WPKE-FM	92.1
Prestonburg	WDOC-FM	95.5
Russellville	WRUS-FM	92.1
St. Mathews	WSTM	103.1
Somerset	WSEK	96.7
Whitesburg	WTCW-FM	104.9

LOUISIANA

Location	C.L.	MHz
Alexandria	KALB-FM	96.9
Baton Rouge	WJBO-FM	102.5
	WQXY-FM	100.7
DeRidder	KDLA-FM	101.7
Golden Meadow	KLEB-FM	94.3
Hammond	WTGI	103.3
Houma	KCIL-FM	107.1
Jennings	KJEF-FM	92.7
Lafayette	KRVS-FM	88.3
	KPEL-FM	99.9
	KSMB	94.5
Lake Charles	KPLC-FM	99.5
	KIKS-FM	96.1
La Place	WCKW	92.3
Monroe	KMLB-FM	104.1
	KNOE-FM	101.9
	KREB	106.1
Mt. Vernon	KRNL-FM	105.3
Natchitoches	KNOC-FM	97.7
New Orleans	WBEH	89.3
	WDSU-FM	105.3
	WNNR-FM	97.1
	WWOM-FM	98.5
	WWMT	95.7
Opelousas	KSLO-FM	107.1
Ruston	KRUS-FM	107.1
Shreveport	KRMD-FM	101.1
	KBCL-FM	96.5
	KWKH-FM	94.5
Thibodaux	KTIB-FM	106.3
Ville Platte	KVPI-FM	93.5
W. Monroe	KUZN-FM	98.3
Winnfield	KVCL-FM	92.1

MAINE

Location	C.L.	MHz
Augusta	WFAU-FM	101.3
Bangor	WABI-FM	97.1
Brunswick	WBOR	91.1
	WCME-FM	98.9
Caribou	WFST-FM	97.7
Ellsworth	WDEA-FM	95.7
Lewiston	WCOU-FM	93.9
	WRJR	91.5
Orono	WMEB-FM	91.9
Poland Springs	WMTW-FM	94.9
Portland	WLOB-FM	97.9
	WPOR-FM	101.9
	WGAN-FM	102.9

MARYLAND

Location	C.L.	MHz
Annapolis	WNAV-FM	99.1
	WANN-FM	107.9
	WXTC	107.9
	WAQE-FM	101.9

WHITE'S

RADIO LOG

Location	C.L.	MHz
Baltimore	WBJC	91.5
	WCAO-FM	102.7
	WCBM-FM	106.5
	WFMM-FM	93.1
	WRBS	95.1
	WSID	92.3
	WBAL-FM	97.9
	WITH-FM	104.3
	WSID-FM	92.3
Bethesda	WJMD	94.7
	WHFS	102.3
Bradbury Heights	WPGC	95.5
Catonsville, Md.	WCBC	105.7
Cumberland	WCUM-FM	102.9
Frederick	WFMD-FM	99.9
Frostburg	WFRB-FM	105.3
Glen Burnie	WISZ-FM	95.9
Hagerstown	WJEJ-FM	104.7
	WARK-FM	106.9
Halfway	WHAG-FM	96.7
Havre de Grace	WASA-FM	103.7
Oakland	WBUZ	95.5
Salisbury	WBOC-FM	94.3
Tacoma Park	WGTS-FM	91.9
Waldorf	WSMD-FM	104.1
Westminster	WTTR-FM	100.7

MASSACHUSETTS

Location	C.L.	MHz
Amherst	WAMF	88.1
	WFCR	88.5
	WMUA	91.1
Andover	WPAA	91.7
Boston	WBUR	90.9
	WBCN	104.1
	WBZ-FM	106.7
	WCOP-FM	100.7
	WEEI-FM	103.3
	WERS	88.9
	WHDH-FM	94.5
	WRKO-FM	98.5
	WXHR-FM	96.9
Brockton	WBET-FM	97.7
Brookline	WBOS-FM	92.9
Cambridge	WGBH-FM	89.7
	WHRB-FM	95.3
	WTBS	88.1
Fitchburg	WBNE-FM	104.5
Framingham	WKOX-FM	105.7
Gloucester	WVCA-FM	104.9
Greenfield	WHAI-FM	98.3
Haverhill	WHAV-FM	92.5
Hyannis	WKOD-FM	106.1
	WBRK-FM	101.7
Lawrence	WCCM-FM	93.7
Lowell	WLLH-FM	99.5
Lynn	WLYM-FM	101.7
Medford	WHIL-FM	107.9
New Bedford	WBSM-FM	97.3
	WNBH-FM	98.1
N. Adams	WMNB-FM	100.1
Northampton	WHMP-FM	99.3
Pittsfield	WQRB-FM	105.5
	WBRK-FM	101.7
Plymouth	WPLM-FM	99.1
S. Hadley	WMHC	88.5
Springfield	WHYN-FM	93.1
	WSCB	88.9
	WMAS-FM	94.7
Tounton	WRLM	97.3
Waltham	WCRB-FM	102.5
W. Yarmouth	WOCB-FM	94.9
Williamstown	WCFM	91.3
Winchester	WHSR-FM	91.9
Worcester	WAAB	107.3
	WSRS	96.1

MICHIGAN

Location	C.L.	MHz
Adrian	WLEN	103.9
Alma	WFYC-FM	104.9
Alpena	WHSB	107.7
	WATZ-FM	93.5
Battle Creek	WKFR-FM	103.3
Big Rapids	WBRN-FM	100.9
Ann Arbor	WUOM	91.7
Bay City	WBCM-FM	96.1
	WNEM-FM	102.5
Benton Hrbr.	WHFB-FM	99.9
Birmingham	WHFI	94.7
Charlotte	WCER-FM	92.7
Cheboygan	WCBY-FM	105.1
Coldwater	WTVB-FM	98.3
Dearborn	WKNR-FM	100.3
Detroit	WDET-FM	101.9
	WBFG	98.7
	WCHD	105.9
	WDTM	106.7
	WABX	99.5
	WDTR	90.9
	WGPM	107.5
	WJBK-FM	93.1
	WMUZ	103.5
	WGPR	97.9
	WJR-FM	96.3
	WOMC-FM	104.3
	WQRS-FM	105.1
	WRMK-FM	98.7
	WWJ-FM	97.1
	WXYZ-FM	101.1
	WCAR-FM	92.8
E. Lansing	WKAR-FM	90.5
	WITL-FM	100.7
	WSWM	99.1
	WVIC-FM	95.7
Flint	WFBE	95.1
	WGMZ-FM	107.9
	WMRP-FM	105.5
Grand Rapids	WFUR-FM	102.9
	WJEF	93.7
	WLAV-FM	96.9
	WYON	101.3
	WOOD-FM	105.7 (s)
	WVGA-FM	104.1
	WXTO-FM	97.9
	WKLW-FM	95.7
Greenville, Mich.	WPLB-FM	107.3
Hancock	WMPL-FM	93.5
Highland Pk.	WHPR	88.1
Holland	WJBL-FM	94.5
	WHTC-FM	96.1
Houghton Lake	WJGS	98.5
Interlochen	WGYA	103.1
	WIAA	88.3
Jackson	WIBM-FM	94.1
	WKHM-FM	106.1
Kalamazoo	WMUK	102.1
	WSEO-FM	106.5
Lansing	WJIM-FM	97.5
	WILS-FM	89.7
Mackinaw City	WRIW	94.3
Marquette	WNMR	90.1
	WDMJ-FM	95.7
Midland	WQDC-FM	99.7
Mount Clemens	WBRB-FM	102.7
Mount Pleasant	WCMU	90.1
Muskegon	WFFM	106.9
Oak Park	WLDM	95.5
Owasso	WOAP-FM	103.9
Petoskey	WJML	98.9
	WMBN-FM	96.7
Port Huron	WHLS-FM	107.1
Royal Oak	WOAK	89.3
	WOMC	104.3
Saginaw	WSAM-FM	98.1
St. Joseph	WSJM-FM	107.1
Spring Arbor	WSAE	89.3
Sturgis	WSTR-FM	103.1
Traverse City	WLDR-FM	101.9
	WTCM-FM	103.5
Warren	WPHS	91.5
Ypsilanti	WEMU	88.1

MINNESOTA

Location	C.L.	MHz
Anoka	KTWN	107.9
Blue Earth	KBEW-FM	100.9
Brainerd	KLIZ-FM	95.9
Collegeville	KSJR-FM	90.1
Golden Valley	KQRS-FM	92.5
Mankato	KMSO	90.5
	KYSM-FM	103.5
Minneapolis-St. Paul	KTIS-FM	98.5
	KWFM	97.1
	KNOF	95.3
	WPBC-FM	101.3
	WAYL	93.7
	WCTS-FM	100.3
Moorhead	KVOX-FM	99.9
New Ulm	WNUJ-FM	93.1
Park Rapids	WPRM-FM	103.7
Red Wing	KCUE-FM	105.5
Richfield	WPBC-FM	101.3
Rochester	KROC-FM	106.9
	KNXR	97.5
St. Cloud	KFAM-FM	104.7
St. Louis Park	KRSI-FM	104.1
St. Paul	WMIN-FM	102.1
	KSTP-FM	94.5
St. Peter	KRBI-FM	105.5
Willmar	KWLM-FM	105.5
	KWOA-FM	95.1

MISSISSIPPI

Location	C.L.	MHz
Biloxi	WVMI-FM	106.3
Corinth	WKCU-FM	94.3
Forest	WQST	92.5
Greenwood	WSWG	99.1
Gulfport	WROA-FM	107.1
Hattiesburg	WHSY-FM	104.5
	WFOR-FM	103.7
Houston	WCPC-FM	93.3
Jackson	WJDX-FM	102.9
	WJMI	99.7
	WSLI-FM	96.3
	WWHO	94.7
Kosciusko	WKOZ-FM	105.1
Laurel	WNSL-FM	100.3
Louisville	WLSM-FM	107.1
Meridian	WMMI	88.1
Moss Point	WACY-FM	104.9
Natchez	WNAT-FM	95.1
New Albany	WNAU-FM	103.5
Pascagoula	WPMP-FM	99.1
Poplarville	WRPM-FM	107.9
Pontotoc	WSEL-FM	96.7
Tupelo	WELO-FM	98.5
Vicksburg	WQMV	98.7

MISSOURI

Location	C.L.	MHz
Buffalo	KBFL	91.3
Cape Girardeau	KZYM-FM	102.9
Carrollton	KAOL-FM	101.1
Clayton	KFUO-FM	99.1
Columbia	KWWC-FM	90.5
Crestwood	KSHE	94.7
Dexter	KDEX-FM	107.3
El Dorado Springs	KESM-FM	101.7
Houston	KBTC-FM	99.3
Joplin	WMBH-FM	96.1
	KSYN	92.5
Kansas City	KCMO-FM	94.9
	KBEY	104.3
	KTSR	90.1
	WDAF-FM	102.1
	KCMK	93.3
	KCUR-FM	89.3
	KMBR	99.7
	KPRS-FM	103.3
	KXTR	96.5
Kennett	KBOA-FM	98.9
Kirksville	KRXL	94.5
Mexico	KWWR-FM	95.7
Moberly	KRES	104.7
Osage Beach	KRMS-FM	93.5
Point Lookout	KSOZ	88.1
Poplar Bluff	KWOC-FM	94.5
Rolla	KCLU-FM	94.3
	KMSM	88.5
St. Joseph	KUSN-FM	105.1
St. Louis	KCFM	93.7
St. Louis	KACO	107.7
	KADI	96.5
	WAMV-FM	101.1
	WIL-FM	92.3
	KSLH	91.5
	KSTL-FM	98.1
	KRFD	106.9
Sedalia	KSIS-FM	92.1
Springfield	KTTS-FM	94.7
	KTXR	101.5
Union	KLPW-FM	101.7
Waynesville	KFBD	97.7
West Plains	KWPM-FM	93.9

MONTANA

Location	C.L.	MHz
Belgrade	KGVW-FM	96.7
Billings	KURL-FM	97.1
Bozeman	KBHF	93.7
Great Falls	KOPR-FM	106.3
Missoula	KUFM	88.1

NEBRASKA

Location	C.L.	MHz
Beatrice	KWBE-FM	92.9
Columbus	KJSK-FM	101.1
Hastings	KICS-FM	93.5
Kearney-Holdrege	KRNY-FM	98.9
Lexington	KRUN-FM	93.1
Lincoln	KFMQ	95.3
	KWHG	102.7
Omaha	KQAL-FM	94.3
	KFAB-FM	99.9
	KFBI-FM	100.7
	KOWH-FM	94.1
	WOW-FM	92.3
	KICN	96.1
Scottsbluff	KNEW-FM	94.1

NEVADA

Location	C.L.	MHz
Las Vegas	KORK-FM	97.1
	KRGN	101.9
	KLUC-FM	98.5
	KVEG-FM	92.3
Reno	KNEV	95.5
	KUNR	88.1
Reno	KSRN	104.5

NEW HAMPSHIRE

Location	C.L.	MHz
Berlin	WMOU-FM	103.7
Claremont	WTSV-FM	106.1
Conway	WBNC-FM	93.5
Durham	WUNH	90.3
Laconia	WLNH-FM	98.3
Keene	WKNE-FM	103.7
Manchester	WKBR-FM	95.7
	WGIR-FM	101.1
Mt. Washington	WMTW-FM	94.9
Nashua	WOTW-FM	106.3
Portsmouth	WHEB-FM	100.3

NEW JERSEY

Location	C.L.	MHz
Asbury Park	WJLK-FM	94.3
	WHTG-FM	105.5
Atlantic City	WFPG-FM	96.9
	WMGM	103.7
	WRNJ	95.1
Bridgeton	WSNJ-FM	107.7
Camden	WKDN-FM	106.9
Dover	WDHA-FM	105.5
E. Orange	WFMU	91.1
Eatontown	WHTG-FM	106.3
Franklin	WLVP	102.3
Franklin Lakes	WRRH	88.7
Glassboro	WGLS-FM	89.7
Hackettstown	WNTI	91.9
Hanover	WHPH	90.3
Long Branch	WRLB	107.1
Millville	WMVB-FM	97.3
Newark	WHBI	105.9
	WFME	94.7
	WVNJ-FM	100.3
	WBGO	88.3
New Brunswk.	WCTC-FM	98.3
Paterson	WPAT-FM	93.1
Princeton	WPRB	103.3
Red Bank	WFHA-FM	106.3
South Orange	WSOU	89.5
Trenton	WBUD-FM	101.5
	WTOA	97.5
	WTSR	89.7
	WTTM-FM	94.5
Wildwood	WCMC-FM	100.7
Zarephath	WAWZ-FM	99.1

NEW MEXICO

Location	C.L.	MHz
Alamogordo	KXXI	94.3
	KOTO	105.5
Albuquerque	KANW	89.1
	KBNM	99.5
	KDEF-FM	94.1
	KRST	92.3
	KHFM	96.3
	KOAT-FM	100.3
	KOB-FM	93.3
	KUNM	90.1
Carlsbad	KCNM	92.1
Clovis	KTQM-FM	99.9
Hobbs	KHOB-FM	95.7
Los Alamos	KRSN-FM	98.5
Las Cruces	KGRD-FM	103.9
Las Vegas	KEDP	91.1
Lovington	KLEA-FM	101.7
Mountain Park	KMFM	97.9
Roswell	KBIM-FM	94.9
Santa Fe	KSNM	95.5
Taos	KKIT-FM	99.3
Tucumcari	KTNM-FM	92.7
University Park	KRWG	91.7

NEW YORK

Location	C.L.	MHz
Albany	WAMC	90.3
	WHRL	103.1
Auburn	WMBO-FM	106.9
Babylon	WTFM	103.5
	WGSM-FM	94.3
	WBAB-FM	102.3
Binghamton	WNBF-FM	98.1
	WHRW	90.5
	WKOP-FM	99.1
Brooklyn	WNYE	91.5
Brookville	WCWP	88.1
Buffalo	WBEN-FM	102.5
	WDCX	99.5
	WBFO	88.7
	WBUF	93.3
	WEBR	94.5
	WGR-FM	96.9
	WTSL-FM	103.3
	WWOL-FM	104.1
	WYSL-FM	103.3
	WBNY-FM	96.1
Canton	WSLU	89.7
Central Square	WCSQ	89.3
Cherry Valley	WJIV	101.9
Clinton	WHCL-FM	88.7
Corning	WCLI-FM	106.1
Cortland	WKRT-FM	99.9
Depew	WBLK-FM	93.7
DeRuyter	WOIV	105.1
Elmira	WECW	88.1
	WEHH-FM	94.3
	WENY-FM	92.7
Floral Park	WSHS	90.3
Garden City	WLIR	92.7
Geneso	WGSU	88.3
Hempstead	WHLI-FM	98.3
	WVHC	88.7
Hornell	WWHG-FM	105.3
Ithaca	WHCU-FM	97.3
	WICB	91.7
	WEIV	103.7
	WVBR-FM	93.5
Jamestown	WJTN-FM	93.3
	WKSN-FM	101.7
Johnstown	WIZR-FM	104.9
Kenmore	WYSL-FM	103.3
Kingston	WGHQ-FM	94.3
Lake Success	WTFM	103.5
Liberty	WVOS-FM	95.9
Loudonville	WVCR-FM	89.1
Middletown	WALL-FM	92.7
Mt. Kisco	WRNW	107.1
	WVIP-FM	106.3
Newburgh	WFMN	103.1
New Rochelle	WVOX-FM	93.5
New York	WABC-FM	95.5
	WBAI	99.5
	WCBS-FM	101.1
	WEVD-FM	97.9
	WFUV	90.7
	WHOM-FM	92.3

Location	C.L.	MHz
	WKCR-FM	89.9
	WLIB-FM	107.5
	WNCN	104.3
	WNEW-FM	102.7
	WNBC-FM	97.1
	WNYC-FM	93.9
	WNYE	91.5
	WOR-FM	98.7
	WPIX-FM	101.9
	WQXR-FM	96.3
	WRFM	105.1
	WRVR	106.7
Niagara Falls	WHLD-FM	98.5
Norwich	WCHN-FM	93.9
Olean	WHDL-FM	95.7
Oswego	WOSE	104.9
Plattsburg	WEAV-FM	99.9
Patchogue	WALK-FM	97.5(s)
	WPAC-FM	106.1
Peekskill	WLNA-FM	100.7
Potsdam	WTSC-FM	91.1
Poughkeepsie	WKIP-FM	104.7
	WEOK-FM	101.5
Riverhead	WAPC-FM	103.9(s)
Rochester	WHFM	98.9
	WBBF-FM	92.5
	WCMF	96.5
	WIRQ	90.9
	WNYR-FM	101.3
	WROC-FM	97.9
	WRUR-FM	90.1
	WVOR	100.5
Schenectady	WGFM	99.5
South Bristol	WMIV	95.1
Springville	WSPE	88.1
Syracuse	WAER	88.1
	WDDS-FM	93.1
	WONO	107.9
	WSRV	100.9
	WSYR-FM	94.5
Troy	WFLY	92.3
	WRPI	91.5
Utica	WRUN-FM	105.7
	WOUR	96.9
Wethersfield	WBIV	105.7
White Plains	WFAS-FM	103.9

NORTH CAROLINA

Location	C.L.	MHz
Albemarle	WABZ-FM	100.9
Asheboro	WGWR-FM	92.3
Asheville	WLOS-FM	104.3
Bridgeton	WVWB-FM	97.7
Burlington	WBBB-FM	101.1
	WFNS-FM	93.9
Black Mountain	WMIT	106.9
Burgaw	WPGF-FM	99.9
Burlington-Graham	WBAG-FM	92.9
Chapel Hill	WUNC	91.5
Charlotte	WBT-FM	107.9
	WIST-FM	95.1
	WSOC-FM	103.7
	WYFM	104.7
Clingman's Pk.	WMIT	106.9
Clinton	WRRZ-FM	107.1
Concord	WEGO-FM	97.9
Durham	WDNC-FM	105.1
	WSRC-FM	107.1
Elkin	WIFM-FM	100.9
Fayetteville	WFNC-FM	98.1
Forest City	WBBO-FM	93.3
	WAGY-FM	105.3
Franklin	WFSC-FM	96.7
Gastonia	WGNC-FM	101.9
Goldsboro	WEQR	96.9
Greensboro	WMDE	98.7
	WQMG-FM	97.1
	WUAG	89.9
Greenville	WWWS	91.3
	WNCT-FM	107.7
Grifton	WITN-FM	93.3
Henderson	WHNC-FM	92.5
	WHKP-FM	102.5
Hendersonville	WHKP-FM	102.5
Hickory	WHKY-FM	102.9
	WXRC	95.7
High Point	WHPE-FM	95.5
	WHPS	89.3
	WMFR-FM	99.5
	WNOS-FM	100.3
Jacksonville	WJNC-FM	92.1
	WXQR-FM	105.5
Kannapolis	WRKB-FM	99.7
Laurinburg	WEWO-FM	96.5
Leaksville	WLOE-FM	94.5
Lexington	WBUY-FM	94.3
Lumberton	WTSB-FM	95.7
	WAGR-FM	102.3
North Wilkesboro	WKBC-FM	97.3
Raleigh	WKIX-FM	96.1
	WPTF-FM	94.7
	WRAL-FM	101.5
Reidsville	WWMO-FM	102.1
Rocky Mount	WEED-FM	92.1
	WFMA	100.7
Rochester	WVOR	92.5
Roxboro	WRXO-FM	96.7
Salisbury	WSTP-FM	106.5
Sanford	WWGP-FM	105.5
Shelby	WOHS-FM	96.1
Statesville	WFMX	105.7
Tabor City	WTAB-FM	104.9
Tarboro	WCPS-FM	104.3
Thomasville	WTNC-FM	98.3
Washington	WITN-FM	93.3
Williamston	WIAM	103.7
Wilmington	WPRV	93.9
	WHSL-FM	97.3
Wilson	WVOT-FM	106.1
Winston-Salem	WAIR-FM	93.1
	WAAA-FM	107.5
	WFDD-FM	88.1
	WSJS-FM	104.1

NORTH DAKOTA

Location	C.L.	MHz
Bismarck	KFYR-FM	92.9
Devils Lake	KDLR-FM	96.7
Fargo	KFNW-FM	97.9
	WDAY-FM	93.7
	KDSU	91.9
Grand Forks	KVBC	94.7
Minot	KCJB-FM	97.1

OHIO

Location	C.L.	MHz
Akron	WAKR-FM	97.5
	WAPS	89.1
	WCUE-FM	96.5
Alliance	WFAH-FM	101.7
Ashland	WNCO-FM	101.3
Ashtabula	WREO-FM	97.1
Athens	WOUB-FM	91.5
	WATH-FM	105.5
Barberton	WDBN	94.9
Bellaire	WOMP-FM	100.5
Berea	WBWC	88.3
Bowling Green	WAWR-FM	93.5
	WBGU	88.1
Bryan	WBNO-FM	100.9
Bucyrus	WBCO-FM	92.7
Cambridge	WILE-FM	96.7
Canton	WHBC-FM	94.1
	WCNO	106.9
	WTOF	98.1
Celina	WMER-FM	94.3
	WCSM-FM	96.7
Chillicothe	WBEX-FM	93.3
Cincinnati	WAEF-FM	98.5
	WCPO-FM	105.1
	WAKW-FM	93.3
	WGUC	90.9
	WKRC-FM	101.9
	WJBI	102.7
	WZIP-FM	92.5
Circleville	WNRE	104.9
Cleveland	KYW-FM	105.7
	WBOE	90.3
	WCRF-FM	103.3
	WCLV	95.5
	WDOK-FM	102.1
	WERE-FM	98.5
	WGAR-FM	99.5
	WHK-FM	100.7
	WJW-FM	104.1
	WNOB	107.9
	WXEN	106.5
	WZAK	93.1
Cleveland Hts.	WCUY-FM	92.3
Columbus	WCBE	90.5
	WBNS-FM	97.1
	WCOL-FM	92.3
	WMNI-FM	99.7
	WOSU-FM	89.7
	WTVN-FM	96.3
	WVKO	94.7
Conneault	WFIZ	104.9
Dayton	WHIO-FM	99.1
	WONE-FM	104.7
	WDAO	107.7
Delaware	WSLN	88.7
East Liverpool	WOHI-FM	104.3
Eaton	WCTM	92.9
Elyria	WEOL-FM	107.3
Fairfield	WCNW-FM	94.9
Findlay	WFIN-FM	100.5
Fostoria	WFOB	96.7
Fremont	WFRO-FM	99.3
Gallipolis	WJEH-FM	101.5
Granville	WDUB-FM	91.3
Greenville	WDRK-FM	106.5
Hamilton	WQMS	96.7
	WHOH	103.5
Hillsboro	WSRW-FM	106.7
Holland	WPOS-FM	102.3
Kent	WKSU-FM	88.1
	WKNT-FM	100.1
Kenton	WKTN-FM	98.3
Kettering	WVUD-FM	99.9
Lancaster	WHOK-FM	95.5
Lima	WIMA-FM	102.1
	WTGN	97.7
Logan	WLGN-FM	98.3
London	WLNO	106.3
Mansfield	WVNO	106.1
Marietta	WCMO	89.3
	WMOA-FM	94.3
Marion	WMRN-FM	106.9
Miamisburg	WFCJ	93.9
Middletown	WPFB-FM	105.9
Mt. Vernon	WMVO-FM	93.7
New Concord	WMCO	91.1
Newark	WCLT-FM	100.3
Norwalk	WLKR-FM	95.3
Oxford	WMUB	88.5
	WOXR	97.7
Piqua	WPTW-FM	95.7
Port Clinton	WRWR-FM	94.5
Portsmouth	WPAY-FM	104.1
	WNXT-FM	99.3
Salem	WSOM-FM	105.1
Sandusky	WLEC-FM	102.7
Sidney	WMVR-FM	105.5
Springfield	WBLY-FM	103.9
	WEEC-FM	100.7
	WUSO	89.1
Steubenville	WSTV-FM	103.5
Struthers	WKTL	90.7
Tiffin	WTTF-FM	103.7
Toledo	WSPD-FM	101.5
	WMHE	92.5
	WTDS	91.3
	WTOL-FM	104.7
	WTRT	99.9
Urbana	WCOM-FM	101.7
Van Wert	WERT-FM	98.9
Wapakoneta	WERM	92.1
Washington Court House	WCHO-FM	105.5
Westerville	WOBN	91.5
Wilberforce	WCSU-FM	88.9
Wooster	WWST-FM	104.5
Worthington-Columbus	WRFD-FM	97.9
Xenia	WHBM-FM	103.9
	WBZI	95.3
Yellow Springs	WYSO	91.5
Youngstown	WKBN-FM	98.9
	WBBW-FM	93.3
	WRED	101.1
Zanesville	WHIZ-FM	102.5

OKLAHOMA

Location	C.L.	MHz
Bethany	KNBQ	104.9
Chickasha	KNOR	105.5
Durant	KSEO-FM	107.3
Edmond	KWHB	97.7
	KCSC	88.1
Enid	KCRC-FM	96.9
Eufaula	KCES	102.3
Lawton	KLAW	101.5
McAlester	KNED-FM	101.3
Midwest City	KTEA-FM	92.5
Norman	WNAD-FM	90.9
Nowata	KNFB	94.3
Oklahoma City	KOKH	88.9
	KEFM	94.7
	KIOO	100.5
	KJEM-FM	102.7
	KOCY-FM	96.1
	KOFM	104.1
	KYFM	98.9
	KFNB	101.9
Ponca City	KLOR-FM	99.3
Shawnee	KBGC	89.9
Stillwater	KOSU-FM	91.7
	KSPI-FM	93.9
Tahlequah	KTLQ-FM	101.7
Tulsa	KWGS	90.5
	KRMG-FM	95.5
	KOCW	97.5
	KOGM-FM	92.9
	KORU	103.3
	KRAV	96.5

OREGON

Location	C.L.	MHz
Corvallis	KFLY-FM	101.5
	KBVR	90.1
Eugene	KRVM	91.9
	KEED-FM	93.1
	KFMY	97.9
	KUGN-FM	99.1
	KWAX	91.1
	KBMC	94.5
Grants Pass	KGPO	96.9
Medford	KBOY-FM	95.3
Oretech	KTEC	88.3
Portland	KOAP-FM	92.3
	KGMG	95.5
	KOIN-FM	101.1
	KPDQ-FM	105.3
	KPFM	97.1
	KPOJ-FM	98.5
	KQFM	100.3
	KRRC	89.3

PENNSYLVANIA

Location	C.L.	MHz
Allentown	WFMZ	100.7
	WAEB-FM	104.1
	WMUH	89.7
Altoona	WVAM-FM	100.1
	WFBG-FM	98.1
Beaver Falls	WBVP-FM	106.7
	WGEV	88.3
Bedford	WAKM	100.9
Bellwood	WHGM	103.9
Bethlehem	WGPA-FM	95.1
Bloomsburg	WHLM-FM	106.5
Boyertown	WBYC-FM	107.5
Braddock	WLOA-FM	96.9
Butler	WBUT-FM	97.7
Carbondale	WODL-FM	94.3
Carlisle	WHYL-FM	102.3
Chambersburg	WCHA-FM	95.1(s)
DuBois	WCED-FM	102.1
Easton	WEST-FM	107.9
	WJRH	90.5
	WEEX-FM	99.9
Ebensburg	WEND-FM	99.1
Elizabethtown	WMSH-FM	106.7
Erie	WWYN-FM	99.9
Gettysburg	WGET-FM	107.7
Greencastle	WKSL	94.3
Greensburg	WOKU-FM	107.1
Greenville	WGRP-FM	107.1
Grove City	WEDA-FM	
Harrisburg	WHP-FM	97.3
	WMSP	94.9
	WTPA-FM	104.1
	WCMB-FM	99.3
Havertown	WHHS	89.3
Hazleton	WAZL-FM	97.9
Jenkintown	WIBF-FM	103.9
Johnstown	WARD-FM	92.1
	WJAC-FM	95.5
Lancaster	WGAL-FM	101.3
	WDAC	94.5
	WLAN-FM	96.9
Lebanon	WLBR-FM	100.1
Lewisburg	WVBU-FM	90.5
Lewiston	WMRF-FM	95.9
Lock Haven	WBPZ-FM	92.1
Martinsburg	WJSM	92.7
Meadville	WARC	90.3
	WMGW-FM	100.3
Media	WXUR-FM	100.3
Montrose	WPEL-FM	96.5
New Kensington-Tarentum	WYDD	100.7
Oil City	WDJR	98.5
Palmyre	WRLC	92.1
Philadelphia	WCAU-FM	98.1
	WPBS-FM	105.3
	WDAS-FM	105.3
	WRCP-FM	104.5
	WFIL-FM	102.1
	WDVR	101.1
	WFLN	95.7
	WHAT-FM	96.5
	WUHY-FM	90.9
	WIFI	92.5
	WIBG-FM	94.1
	WMMR	93.3
	WPEN-FM	102.9
	WPWT	91.7
	WQAL	106.1
	WRTI-FM	90.1
	WXPN	88.9
Pittsburgh	KDKA-FM	92.9
	WAMO	105.9
	WEEP-FM	107.9
	WTAE-FM	96.1
	KQV-FM	102.5
	WDUQ	91.5
	WJAS-FM	99.7
	WKJF	93.7
	WPIT-FM	101.5
	WWSW-FM	94.5
Pottsville	WPPA-FM	101.9
Reading	WRFY-FM	102.5
	WXAC	91.3
Red Lion	WGCB-FM	96.1
Scranton	WGBI-FM	101.3
	WUSV	88.9
	WWDL-FM	104.9
Sharon	WPIC-FM	102.9
Somerset	WVSC-FM	97.7
State College	WMAJ-FM	103.1
	WDFM	91.1
	WRSC-FM	96.7
Stroudsburg	WVPO-FM	93.5
Sunbury	WKOK-FM	94.1
Tamaqua	WSVB	105.5
Telford	WBMR	89.7
Towanda	WTTC-FM	95.3
Tyrone	WGMR-FM	102.3
Union City	WBVB	102.3
University Park	WOFM	91.1
Warren	WRRN	92.3
Washington	WJPA-FM	95.3
Waynesboro	WAYZ-FM	101.5
Wilkes-Barre	WBRE-FM	98.5
	WYZZ	92.9
Williamsport	WLYC-FM	105.1
	WRAK-FM	100.3
York	WNOW-FM	105.7
	WSBA-FM	103.3

RHODE ISLAND

Location	C.L.	MHz
Cranston	WLOV	99.9
Kingston	WRIU	91.1
Providence	WPJB-FM	105.1
	WBRU	95.5
	WDOM	91.3
	WICE-FM	107.7
	WHIM-FM	94.1
	WPRO-FM	92.3
	WCRQ	101.5
Warwick	WBHS	90.5
Woonsocket	WWON-FM	106.3

SOUTH CAROLINA

Location	C.L.	MHz
Aiken	WLOW-FM	95.9
	WAKN-FM	99.3
Anderson	WCAC	101.1
Bamberg	WWBD-FM	92.7

WHITE'S RADIO LOG

Location	C.L.	MHz
Barnwell	WBAW-FM	101.7
Batesburg	WBLR-FM	92.1
Beaufort	WBEU-FM	98.7
Charleston	WCSC-FM	96.9
	WTMA-FM	95.1
Clemson	WSBF-FM	88.1
Columbia	WCOS-FM	97.9
	WNOK-FM	104.7
	WUSC-FM	89.9
Conway	WLAT-FM	104.1
Darlington	WDAR-FM	105.5
Dillon	WDSC-FM	92.9
Easley	WELP-FM	103.9
Florence	WJMX-FM	103.1
Greenville	WESC-FM	92.5
	WFBC-FM	93.7
	WMUU-FM	94.5
Greenwood	WCRS-FM	96.7
Kingstree	WDKD-FM	100.1
Lancaster	WLCM-FM	107.1
Laurens-Clinton	WLBG-FM	100.5
Myrtle Beach	WMYB-FM	92.1
N. Charleston	WKTM	102.5
Orangeburg	WDIX-FM	106.7
Rock Hill	WRHI-FM	98.3
Seneca	WBFM	98.1
Spartanburg	WSPA-FM	98.9
Sumter	WFIG-FM	101.3

SOUTH DAKOTA

Location	C.L.	MHz
Hot Springs	KOBH-FM	96.7
Sioux Falls	KELO-FM	92.5

TENNESSEE

Location	C.L.	MHz
Bristol	WOPI-FM	96.9
Brownsville	WBHT-FM	95.3
Chattanooga	WDOD-FM	96.5
	WLOM	106.5
	WDEF-FM	92.3
Cleveland	WCLE-FM	100.7
Clinton	WYSH-FM	104.9
Collegedale	WSMC	90.7
Columbia	WYFY-FM	101.7
Cookeville	WHUB-FM	98.3
	WPTN-FM	94.3
Covington	WKBL-FM	93.5
Crossville	WAEW-FM	99.3
Dickson	WDKN-FM	102.3
Franklin	WFLT-FM	100.1
Gallatin	WFMG	104.5
Greeneville	WOFM	94.9
Humboldt	WIRJ-FM	102.3
Jackson	WTJS-FM	104.1
Jamestown	WDEB	100.1
Johnson City	WJCW-FM	101.5
Kingsport	WKPT-FM	98.5
Knoxville	WBIR-FM	93.5
	WIVK-FM	107.7
	WKCS	91.1
	WUOT	91.9
	WCAS	97.5
Lawrenceburg	WDXE-FM	95.9
Lebanon	WFMQ	91.3
Lexington	WDXL-FM	99.3
Livingston	WLIV-FM	95.9
Manchester	WMSR-FM	99.7
McKenzie	WKTA	106.9
McMinnville	WHNR	101.7
Memphis	WMC-FM	99.7
	KLYX	101.1
	WMPS-FM	97.1
	WNTL	104.5
	WREC-FM	102.7
Milan	WKBJ-FM	92.3
Morristown	WMTN-FM	95.9
Murfreesboro	WMTS-FM	96.3
Nashville	WLAC-FM	105.9
	WPLN	90.3
	WLWM	95.5
	WNFO	103.3
	WSIX-FM	97.9
	WATO-FM	94.3
Oneida	WBNT-FM	105.5
Savannah	WORM-FM	101.9
Sevierville	WSEV-FM	102.1
Sparta	WSMT-FM	105.5
Springfield	WDBL-FM	94.3
Tullahoma	WJIG-FM	93.3

TEXAS

Location	C.L.	MHz
Abernathy	KWGO-FM	99.5
Abilene	KACC-FM	91.1
	KFMN	99.3
	KWKC-FM	105.1
Amarillo	KGNC-FM	93.1
	KVII-FM	94.1
Austin	KHFI-FM	98.3
	KAZZ	95.5
	KMFA	89.5
	KTBC-FM	93.7
	KUT-FM	90.7
	KVET-FM	100.7
Beaumont	KHCB-FM	105.7
	KAYD-FM	97.5
	KTRM-FM	95.1
	KJET-FM	107.7
	KLVI-FM	94.1
Big Spring	KFNE	95.3
Brenham	KWHI-FM	106.3
Brownwood	KHPC	88.1
	KFRN-FM	99.3
Bryan	KORA-FM	98.3
Clear Lake City	KMSC	102.1
Cleburne	KCLE-FM	94.9
College Station	WTAW-FM	92.1
Conroe	KNRO	106.9
	KNRO-FM	106.5
Corpus Christi	KZFM	95.5
Dalhart	KXIT-FM	94.3
Dallas	KIXL-FM	104.5
	KEIR	102.9
	KMAP	105.3
	KNER	88.1
	KNUS	98.7
	KRLD-FM	92.5
	WFAA-FM	97.9
	WRR-FM	101.1
	KVTT	91.7
	KBOX-FM	100.3
Del Rio	KDLK-FM	94.3
Denton	KDNT-FM	106.1
DiBoll	KSPL-FM	95.5
Dumas	KDDD-FM	95.3
El Paso	KVOF-FM	88.5
	KTSM-FM	99.9
	KHMS	94.7
Ft. Worth	WBAP-FM	96.3
	KFJZ-FM	97.1
	KFWT-FM	102.1
	KCUL-FM	93.9
	KNOK-FM	107.5
	KTCU-FM	89.1
Gainesville	KGAF-FM	94.5
Harlingen	KELT	94.5
Henderson	KGRI-FM	100.1
Hereford	KPAN-FM	106.3
Highland Park-Dallas		
	KVIL-FM	103.7
Hillsboro	KHBR-FM	102.3
Houston	KHGM	102.9
	KHCB-FM	105.7
	KIKK-FM	95.7
	KFMK	97.9
	KODA-FM	99.1
	KLEF	94.5
	KOST	100.3
	KQUE	102.9
	KRBE	104.1
	KXYZ-FM	96.5
	KTRH-FM	101.1
	KUHF	91.3
	KBNO	93.7
Killeen	KLEN-FM	93.3
Humboldt	WIRJ-FM	102.3
Huntsville	KSAM-FM	101.7
Jasper	KTXJ-FM	102.3
Lake Jackson	KLJT	107.3
Lamesa	KPET-FM	100.3
Longview	KLUE-FM	105.7
Lubbock	KSEL-FM	93.7
	KBFM	96.3
	KLBK-FM	94.5
	KTXT-FM	91.9
Marshall	KMHT-FM	97.3
McAllen	KQXX	98.5
Midland	KNFM	92.3
	KMOD-FM	93.3
Mt. Pleasant	KIMP-FM	100.7
Muleshoe	KMUL-FM	103.1
Odessa	KQIP	96.7
	KWMO	99.1
	KOCV	91.3
	KOYL-FM	97.9
Paris	KPLT-FM	99.3
Pasadena	KLVL-FM	92.5
Plainview	KHBL	88.1
Port Arthur	KFMP	93.3
	KPAC-FM	98.5
Robstown	KROB-FM	99.9
San Angelo	KWLW	93.9
	KSJT	97.5
San Antonio	KISS	99.5
	KBER-FM	100.3
	KEEZ	97.3
	KAKI-FM	98.1
	KITY	92.9
	KMFM	96.1
	KWFR-FM	94.5
	KCOR-FM	101.9
	KITE-FM	104.5
	WKBI-FM	90.3
Sinton	KTOD-FM	101.3
Spearman	KBMF-FM	98.3
Temple	KYLE-FM	104.9
Texarkana	KTAL-FM	98.1
	KDSY-FM	102.5
Tyler	KZAK-FM	93.1
	KDOK-FM	101.5
Victoria	KTXN-FM	92.1
Waco	KEFC	95.5
	KWBU	89.9
Wichita Falls	KLUR	99.9
	KNTO	95.1

UTAH

Location	C.L.	MHz
Ephraim	KEPH	88.9
Logan	KUSU-FM	91.5
Ogden	KBOC	101.9
	KWCR-FM	88.1
Provo	KBYU-FM	88.9
	KFMC	96.1
Salt Lake City	KCPX-FM	98.7
	KLUB-FM	97.1
	KSL-FM	100.3
	KSOP-FM	104.3
	KWHO-FM	93.3

VERMONT

Location	C.L.	MHz
Burlington	WJOY-FM	98.5
	WRUV	90.1

VIRGINIA

Location	C.L.	MHz
Arlington	WAVA-FM	105.1
	WCCV-FM	97.5
Blacksburg	WVVV	104.9
Charlottesville	WINA-FM	95.3
	WTJU	91.3
Chesapeake	WFOS	90.5
Covington	WKEY-FM	100.9
Crewe	WSVS-FM	104.7
Farmville	WFLO-FM	95.7
Fredericksburg	WFVA-FM	101.5
Gretna	WMNA-FM	103.3
Grundy	WNRG-FM	97.7
Hampton	WVEC-FM	101.3
	WHOV	88.3
Harrisonburg	WEMC	91.7
	WSVA-FM	100.7
Lynchburg	WWOD-FM	100.1
	WDMS-FM	101.7
Manassas	WPRW-FM	106.7
Marion	WMEV-FM	93.9
Martinsville	WMVA-FM	96.3
Newport News	WGH-FM	97.3
Norfolk	WMTI	91.5
	WCMS-FM	100.5
	WNOR-FM	98.7
	WPHD	104.5
	WRVC	102.5
	WTAR-FM	95.7
	WXRI	105.3
	WYFI-FM	99.7
Petersburg	WSSV-FM	99.3
Portsmouth	WAVY-FM	96.9
Radford	WRAD-FM	101.7
Richmond	WCOD	98.1
	WRFK	91.1
	WRVA-FM	94.5
	WRNL-FM	102.1
Roanoke	WDBJ-FM	94.9
	WLRJ	92.3
	WROV-FM	103.7
	WSLS-FM	99.1
South Boston	WHLF-FM	97.5
South Norfolk	WFOS	90.5
Staunton	WSGM-FM	93.5
Suffolk	WXYW	92.9
Warrenton	WEER-FM	107.7
Williamsburg	WCWM	89.1
	WRCI	96.5
Winchester	WRFL	92.5
	WEFG	102.5
Woodbridge	WXRA	105.9
Yorktown	WYCS	91.5

WASHINGTON

Location	C.L.	MHz
Aberdeen	WDUX-FM	104.7
Bellevue	KFKF-FM	92.5
Bellingham	KGMI-FM	92.9
	KERI	104.3
Bremerton	KBRO-FM	106.9
Centralia	KGME-FM	102.9
Cheney	KEWC-FM	89.1
College Place	KGTS	91.3
Edmunds	KGFM	105.3
Ellensburg	KCWS-FM	91.5
Eugene	KBMC	104.5
Hoquiam	KGHO-FM	103.9
Lynden	KLYN-FM	106.5
Opportunity	KZUN-FM	96.1
Prosser	KACA	101.7
Richland	KCYS	95.1
Seattle	KING-FM	98.1
	KBBX	98.9
	KBLE-FM	93.3
	KETO-FM	101.5
	KIRO-FM	100.7
	KISW	99.9
	KLSN	96.5
	KOL-FM	94.1
	KRAB	107.7
	KTW-FM	102.5
	KUOW	94.9
	KIXI-FM	95.7
Spokane	KREM-FM	92.9
	KDNC-FM	93.7
	KTWD	105.7
	KXLY-FM	99.9
	KHQ-FM	98.1
Tacoma	KCPS	90.9
	KLAY-FM	106.1
	KPLU	88.5
	KTNT-FM	97.3
	KTOY	91.7
	KTAC-FM	103.9
Yakima	KNDX-FM	106.3

WEST VIRGINIA

Location	C.L.	MHz
Beckley	WBKW	99.5
Berkeley Springs	WSCF-FM	93.5
Bethany	WVBC	88.1
Bluefield	WHIS-FM	104.5
Charleston	WKAZ-FM	97.5
	WCHS-FM	96.1
	WKNA	98.5
	WTIO	102.7
	WVAF	99.9
Charlestown	WZFM	98.3
Huntington	WKEE-FM	100.5
	WMUL	88.1
	WVQM	103.3
Martinsburg	WEPM-FM	97.5
Morgantown	WAJR-FM	101.9
Norfolk	WCMS-FM	100.5
Oak Hill	WOAY-FM	94.1
Parkersburg	WTAP-FM	103.1
	WCEF-FM	99.3
St. Albans	WKLC-FM	105.1
Wheeling	WKWK-FM	97.3
	WWVA-FM	98.7
	WTRF-FM	107.5

WISCONSIN

Location	C.L.	MHz
Appleton	WLFM	91.1
	WAPL-FM	105.7
Beloit	WBCR-FM	88.1
Chilton	WHKW	89.3
Colfax	WHWC	88.3
Delafield	WHAD	90.7
Eau Claire	WIAL	94.1
	WEAU-FM	104.5
Fort Atkinson	WFAW	107.3
Green Bay	WBAY-FM	101.1
	WDUZ-FM	94.5
Greenfield Twp.	WWCF	94.9
Highland	WHHI	91.3
Highland Twp.	WHSA	89.9
Janesville	WCLO-FM	99.9
Kenosha	WLIP	95.1
La Crosse	WHLA	90.3
	WWLA	93.3
Madison	WHA-FM	88.7
	WIBA-FM	101.5
	WISM-FM	98.1
	WMFM	104.1(s)
	WRVB-FM	102.5
Manitowoc	WKUB	92.1
Marinette	WHMD	91.5
Marshfield	WDLB-FM	106.5
Menomonee	WZMF	98.3
Merrill	WLIN	100.7
Milwaukee	WFMR	96.5
	WMIL-FM	95.7
	WISN-FM	97.3
	WRIT-FM	102.9
	WAWA-FM	102.1
	WQFM	93.3
	WTMJ	94.5
	WBON	107.7
	WEMP-FM	99.1
	WUWM	89.7
Monroe	WEKZ-FM	93.7
Mt. Horeb	WFMK	92.3
Neenah-Menasha		
	WNAM-FM	99.3
Neillsville	WCCN-FM	107.5
Oshkosh	WMKC	96.7
	WRST-FM	88.1
	WOSH-FM	103.9
Platteville	WSUP	90.5
	WSWW-FM	99.3
Port Washington		
	WGLB-FM	100.1
Racine	WRJN-FM	100.7
	WFNY	92.1
Rhinelander	WOBT-FM	107.9
Rice Lake	WJMC-FM	96.3
Richland Center	WRCO-FM	100.9
Ripon	WCWC-FM	95.9
Sauk City	WVLR	96.7
Shawano	WTCH-FM	100.1
Sparta	WCOW-FM	97.1
Stevens Point	WSPT-FM	97.9
Sturgeon Bay	WDOR-FM	95.9
Superior	WWJC-FM	105.1
	WSSU	91.3
Tomah	WTMB-FM	98.9
Two Rivers	WTRW-FM	102.3
Watertown	WTTN-FM	104.7
Waukesha	WAUK-FM	106.1
Wausau	WHRM	91.9
	WRIG-FM	101.9
Wauwatosa	WTOS	103.7
West Bend	WBKV-FM	92.5
Whitewater	WSUW	91.7
Wisc. Rapids	WFHR-FM	103.3

WYOMING

Location	C.L.	MHz
Casper	KATI-FM	94.5
Cheyenne	KVWO-FM	106.3
Laramie	KUWR	91.5

Location	C.L.	MHz
GUAM		
Agana	KUAM-FM	93.9
PUERTO RICO		
Arecibo	WCMN-FM	104.3
	WNIK-FM	107.3
Aguadilla	WABA-FM	100.3
Bayamon	WRSJ-FM	100.7
Carolina	WVOZ-FM	107.7
Corozal	WORO	92.5
Fajardo	WMDD-FM	96.5
Guayama	WXRF-FM	96.5
Mayaguez	WKJB-FM	99.1
	WORA-FM	97.5
	WOYE-FM	94.1
Ponce	WLEO-FM	101.9
	WPAB-FM	93.3
San Juan	WIPR-FM	91.3
	WIAC-FM	102.3
	WITA-FM	107.7
	WOLA	105.7
VIRGIN ISLANDS		
St. Croix, Christiansted	WIVI-FM	99.5
Christiansted, St. Croix	WIVI-FM	99.5

Canadian AM Stations by Location

Location	C.L.	kHz
Abbotsford, B.C.	CFVR	1240
Alma, Que.	CFGT	1270
Altona, Man.	CFAM	1290
Amherst, N.S.	CKDH	900
Amos, Que.	CHAD	1340
Antigonish, N.S.	CJFX	580
Barrie, Ont.	CKBB	950
Bathurst, N.B.	CKBC	1360
Belleville, Ont.	CJBQ	800
Blind River, Ont.	CJNR	730
Brampton, Ont.	CHIC	790
Brandon, Man.	CKX	1150
Brantford, Ont.	CKPC	1380
Bridgewater, N.S.	CKBW	1000
Brockville, Ont.	CFJR	1450
Burns Lake, B.C.	CFLD	1400
Cabano, Que.	CJAF	1240
Calgary, Alta.	CBR	1010
	CFAC	960
	CFCN	1060
	CHQR	810
	CKXL	1140
Callander, Ont.	CFCH	600
Cambell River, B.C.	CFWB	1490
Campbellton, N.B.	CKNB	950
Camrose, Atla.	CFCW	790
Causapscal, Que.	CJBM	1450
Charlottetown, P.E.I.	CFCY	630
Chatham, Ont.	CFCO	630
Chicoutimi, Que.	CBJ	1580
	CJMT	1420
Chilliwack, B.C.	CHWK	1270
Churchill, Man.	CHFC	1230
Cobourg, Ont.	CHUC	1450
Collingwood, Ont.	CKCB	1400
Corner Brook, Nfld.	CBY	990
	CFCB	570
Cornwall, Ont.	CFML	1110
	CJSS	1220
Courtenay, B.C.	CFCP	1440
Cranbrook, B.C.	CKEK	570
Dartmouth, N.S.	CFDR	790
Dauphin, Man.	CKDM	730
Dawson Creek, B.C.	CJDC	1350
Drumheller, Alta.	CJDV	910
Drummondville, Que.	CHRD	1340
Dryden, Ont.	CKDR	900
Duncan, B.C.	CKAY	1500
Edmonton, Alta.	CBX	740
	CFRN	1260
	CHED	630
	CHFA	680
	CHQT	1110
	CJCA	930
	CKUA	580
Edmundston, N.B.	CJEM	570
Estevan, Sask.	CJSL	1280
Flin Flon, Man.	CFAR	590
Fort Frances, Ont.	CFOB	800
Fort Simpson, N.W.T.	CFMR	1490
Fort St. John, B.C.	CKNL	560
Fort William, Ont.	CJLX	800
Fredericton, N.B.	CBZ	970
	CFNB	550
Galt, Ont.	CFTJ	1110
Gander, Nfld.	CBG	1450
Goose Bay, Nfld.	CFGB	1340
Granby, Que.	CHEF	1450
Grande Prairie, Alta.	CFGP	1050
Grand Bank, Nfld.	CJOX	710
Grand Falls, Nfld.	CBT	540
	CKCM	620
	CJCN	680
Gravelbourg, Sask.	CFRG	710
	CFGR	1230
Guelph, Ont.	CJOY	1460
Halifax, N.S.	CBH	860
	CHNS	960
	CJCH	920
Hamilton, Ont.	CHML	900
	CKOC	1150
	CHIQ	1280
Hauterive, Que.	CHLC	580
Huntsville, Ont.	CKAR	630
Hull, Que.	CKCH	970
Inuvik, N.W.T.	CHAK	860
Joliette, Que.	CJLM	1350
Jonquiere, Que.	CKRS	590
Kamloops, B.C.	CFJC	910
Kapuskasing, Ont.	CKAP	580
Kelowna, B.C.	CKOV	630
Kenora, Ont	CJRL	1220
Kentville, N.S.	CKEN	1350
Kingston, Ont.	CFRC	1490
	CKLC	1380
	CKWS	960
Kirkland Lake, Ont.	CJKL	560
Kitchener, Ont.	CHYM	1490
	CKKW	1320
Kitimat, B.C.	CKTK	1230
Langley, B.C.	CJJC	850
La Pocatiere, Que.	CHGB	1310
La Sarre, Que.	CKLS	1240
La Tuque, Que.	CFLM	1240
Leamington, Ont.	CJSP	710
Lethbridge, Atla.	CHEC	1090
	CJOC	1220
Lindsay, Ont.	CKLY	910
Lloydminster, Atla.	CKSA	1080
London, Ont.	CFPL	980
	CKSL	1410
Marystown, Nfld.	CHCM	560
Matane, Que.	CKBL	1250
Medicine Hat, Alta.	CHAT	1270
Middleton, N.S.	CKAD	1490
Midland, Ont.	CKMP	1230
Moncton, N.B.	CBAF	1300
	CKCW	1220
Mont Laurier, Que.	CKML	610
Montmagny, Que.	CKBM	1490
Montreal, Que.	CBF	690
	CBM	940
	CFCF	600
	CFMB	1410
	CJAD	800
	CJMS	1280
	CKAC	730
	CKLM	1570
	CKGM	980
Moose Jaw, Sask.	CHAB	800
Nanaimo, B.C.	CHUB	1570
Nelson, B.C.	CKLN	1390
New Carlisle, Que.	CHNC	610
Newcastle, N.B.	CKMR	790
New Glasgow, N.S.	CKEC	1320
New Westminster, B.C.	CKNW	980
Niagara Falls, Ont.	CJRN	1600
North Battleford, Sask.	CJNB	1050
North Vancouver, B.C.	CKLG	730
Oakville, Ont.	CHWO	1250
Orillia, Ont.	CFOR	1570
Oshawa, Ont.	CKLB	1350
Ottawa, Ont.	CBO	910
	CBOF	1250
	CFRA	580
	CKOY	1310
	CKPM	1440
Owen Sound, Ont.	CFOS	560
Parry Sound, Ont.	CKAR-1	1340
Peace River, Alta.	CKYL	610
Pembroke, Ont.	CHOV	1350
Penticton, B.C.	CKOK	800
Peterborough, Ont.	CHEX	980
	CKPT	1420
Pointe Claire, Que.	CFOX	1470
Portage La Prairie, Man.	CFRY	920
Port Alberni, B.C.	CJAV	1240
Port Arthur, Ont.	CFPA	1230
	CKPR	580
Prince Albert, Sask.	CKBI	900
Prince George, B.C.	CKPG	550
Prince Rupert, B.C.	CFPR	860
	CHTK	560
Quebec, Que.	CBV	980
	CFOM	1340
	CHRC	800
	CJLR	1060
	CKCV	1280
Quesnel, B.C.	CKCQ	570
Red Deer, Alta.	CKRD	850
Regina, Sask.	CBK	540
	CJME	1300
	CKCK	620
	CKRM	980
Revelstoke, B.C.	CKCR	1340
Richmond Hill, Ont.	CFGM	1310
Rimouski, Que.	CJBR	900
Rivière du Loup, Que.	CJFP	1400
Roberval, Que.	CHRL	910
Rosetown, Sask.	CKKR	1330
Rouyn, Que.	CKRN	1400
Ste. Anne de la Pocatiere, Que.	CHGB	1310
St. Boniface, Man.	CKSB	1050
St. Catharines, Ont.	CKTB	610
St. Hyacinthe, Que.	CKBS	1240
St. Jean, Que.	CHRS	1090
St. Jerome, Que.	CKJL	900
Saint John, N.B.	CBD	1110
St. John's Nfld.	CBN	640
	CJON	930
	VOAR	1230
	VOCM	590
	VOWR	800
St. Joseph d'Alma, Que.	CFGT	1270
St. Thomas, Ont.	CHLO	680
Saekville, N.B.	CBA	1070
Saint John, N.B.	CBD	1110
	CFBC	930
	CHSJ	1150
Salmon Arm, B.C.	CKXR	580
Sarnia, Ont.	CHOK	1070
Saskatoon, Sask.	CFNS	1170
	CFQC	600
	CKOM	1250
Sault Ste. Marie, Ont.	CJIC	1050
	CKCY	920
Schefferville, Que.	CBDR	1230
Sept-Iles, Que.	CKCN	560
Shawinigan, Que.	CKSM	1220
Sherbrooke, Que.	CHLT	630
	CKTS	900
Simcoe, Ont.	CFRS	1560
Smiths Falls, Ont.	CJET	630
Smithers, B.C.	CFBV	1230
Sorel, Que.	CJSO	1320
Stratford, Ont.	CJCS	1240
Steinbach, Man.	CHSM	1250
Stephenville, Nfld.	CFSX	910
Sudbury, Ont.	CFBR	550
	CHNO	900
	CKSO	790
Summerside, P.E.I.	CJRW	1240
Swift Current, Sask.	CKSW	1400
Sydney, N.S.	CBI	1140
	CHER	950
	CJCB	1270
Terrace, B.C.	CFTK	590
Thetford Mines, Que.	CKLD	1230
Thompson, Man.	CHTM	610
Trois-Rivières, Que.	CHLN	550
	CKTR	1150
Tillsonburg, Ont.	CKOT	1510
Timmins, Ont.	CFCL	620
	CKGB	680
Toronto, Ont.	CBL	740
	CFRB	1010
	CHFI	680
	CHIN	1540
	CHUM	1050
	CJBC	860
	CKEY	590
	CKFH	1430
Trail, B.C.	CJAT	610
Truro, N.S.	CKCL	600
Val d'Or, Que.	CKVD	900
Valleyfield, Que.	CFLV	1370
Vancouver, B.C.	CBU	690
	CFUN	1410
	CHQM	1320
	CJOR	600
	CKLG	730
	CKWX	1130
Verdun, Que.	CKVL	850
Vernon, B.C.	CJIB	940
Victoria, B.C.	CFAX	1070
	CJVI	900
	CKDA	1220
Victoriaville, Que.	CFDA	1380
Ville Marie, Que.	CKVM	710
Ville St. Georges, Que.	CKRB	1460
Wawa, Ont.	CJWA	1240
Welland, Ont.	CHOW	1470
Weyburn, Sask.	CFSL	1340
Whitehorse, Y.T.	CFWH	570
Williams Lake, B.C.	CKWL	1240
Windsor, N.S.	CFAB	1450
Windsor, Ont.	CBE	1550
	CKLW	800
	CKWW	580
Wingham, Ont.	CKNX	920
Winnipeg, Man.	CBW	990
	CJOB	680
	CJQM	1470
	CKRC	630
	CKY	580
Woodstock, N.B.	CJCJ	920
Woodstock, Ont.	CKOX	1340
Yarmouth, N.S.	CJLS	1340
Yellowknife, N.W.T.	CFYK	1340
Yorkton, Sask.	CJGX	940

Canadian FM Stations by Location

Location	C.L.	MHz
Belleville, Ont.	CJBQ-FM	97.1
Brampton, Ont.	CHIC-FM	102.1
Brandon, Man.	CKX-FM	96.1
Brantford, Ont.	CKPC-FM	92.1
Calgary, Alta.	CHFM-FM	95.9
Clearwater, B.C.	CFFM-FM-2	92.7
Cornwall, Ont.	CJSS-FM	104.5
Edmonton, Alta.	CFRN-FM	100.3
	CJCA-FM	99.5
	CKUA-FM	98.1
Halifax, N.S.	CHNS-FM	96.1
Hamilton, Ont.	CHML-FM	95.3
Kamloops, B.C.	CFFM-FM	98.3
Kelowna, B.C.	CJOV-FM	104.7
Kentville, N.S.	CKWM-FM	97.7
Kingston, Ont.	CFRC-FM	91.9
	CKLC-FM	98.3
	CKWS-FM	96.3
Kitchener, Ont.	CHYM-FM	96.7
La Pocatiere, Que.	CHGB-FM	102.9
Lethbridge, Alta.	CHEC-FM	100.9
London, Ont.	CFPL-FM	95.9
Merritt, B.C.	CFFM-FM-3	103.9
Montreal, Que.	CBF-FM	95.1
	CBM-FM	100.7
	CFCF-FM	92.5
	CJFM-FM	95.9
	CJMS-FM	94.3
	CKGM-FM	97.7
Oshawa, Ont.	CKQS-FM	93.5
Ottawa, Ont.	CBO-FM	103.3
	CFMO-FM	93.9
Penticton, B.C.	CKOK-FM	97.1
Port Arthur, Ont.	CKPR-FM	94.3
Quebec, Que.	CHRC-FM	98.1
Red Deer, Alta.	CKRO-FM	98.9
Regina, Sask.	CFMQ-FM	92.1
Rimouski, Que.	CJBR-FM	101.5
Saint John, N.B.	CFBC-FM	98.9
Saskatoon, Sask.	CFMC-FM	103.9
	CJUS-FM	89.7
Sault Ste. Marie, Ont.	CJIC-FM	100.5
	CKCY-FM	104.3
Savona, B.C.	CFFM-FM-1	101.9
Sherbrooke, Que.	CHLT-FM	102.7
St. Catharines, Ont.	CKTB-FM	97.7
Sudbury, Ont.	CKSO-FM	92.7
Sydney, N.S.	CJCB-FM	94.9
Tillsonburg, Ont.	CKOT-FM	100.5
Timmins, Ont.	CKGB-FM	94.5
Toronto, Ont.	CBC-FM	99.1
	CHFI-FM	98.1
	CHUM-FM	104.5
	CJRT-FM	91.1
	CKFM-FM	99.9
Truro, N.S.	CKCL-FM	100.9
Vancouver, B.C.	CBU-FM	105.7
	CHQM-FM	103.5
	CKGL-FM	99.3
Verdun, Que.	CKVL-FM	96.9
Victoria, B.C.	CFMS-FM	98.5
Windsor, Ont.	CKLW-FM	93.9
Winnipeg, Man.	CJOB-FM	97.5
	CBW-FM	98.3
	CKQM-FM	94.3
	CKY-FM	92.1

White's World-Wide Shortwave Stations

Noticing that a number of the reader reports we receive at DX Central are lacking in a few of the basics, we thought that this might be a good opportunity to briefly hash over a couple of the musts.

Would you believe that each issue finds a number of reports filed in the *circular file* because the listeners who sent them in forgot to include the time that the station was heard? Alas, too true. How many reports do you think we receive which show a time heard, but don't indicate the time system? Yup, plenty of reports show a time heard as, say, "1425." Great, but 1425 doesn't mean very much unless it says somewhere that it's GMT, EST, PST, or whatever (by the way, we prefer GMT here).

Nobody expects that all DX monitors have frequency measuring gear (although some do), but it's sort of tough making use of a report which indicates something as generalized as "41-meter band" as the frequency of a station heard. Even saying "6-MHz band" is a bit fuzzy. Okay, your receiver isn't too accurate, but try to at least get as close—like "6.2 MHz."

Station identification? Well if you say "Sweden" we'll know that you mean "Radio Sweden" because that's about the only station to be heard on the SWBC bands from that country. "Brazil" or "Mexico" mean little or nothing because there are scores of different stations to be heard from these countries. We need to know some specific data on the exact station heard (especially Central and South American broadcasters).

In other words, send us as much detailed and specific information as you can. Let us sort through it and eliminate any facts we don't need—we would rather have too much than too little.

It's a sobering fact to learn that more than half of the reports we receive are utterly useless. We want your reports, but sending us vague facts is a waste of your time and ours.

In your report to us please indicate the name and/or call of the station, the location, the approximate frequency, and the time in (GMT) monitored. Send as many as you like. We will use as many as space will allow.

kHz	Call	Name	Location	GMT
2149	—	V. of West	Lisbon, Portugal	0815
2410	4VU	R. Lumiere	Pt. au Prince, Haiti	1000

90-Meter Band—3200 to 3400 kHz

kHz	Call	Name	Location	GMT
3204	—	Nigerian BC	Ibadan, Nigeria	0520
3210	—	R. Sol	Higuey, Dom. Rep.	2300
3245	—	R. Monte-Ceneri	Dom. Rep.	2230
3268	—	R. Timor	Timor	1500
3280	—	Windward I. BC	St. Georges, Grenada	2200
3304	VL8BD	R. Daru	New Guinea	0700
3305	YVKX	V. de la Patria	Caracas, Venez.	0015
3315	—	R. Gazeta	Alagoas, Brazil	0200
3325	YVRA	R. Monagas	Maturin, Venez.	0040
3335	VL9CD	R. Wewak	Papua	1100
3346	—	R. Zambia	Lusaka, Zambia	0415
3380	—	West. Nigerian BC	Ibadan, Nigeria	2200
3385	—	R. Rabaul	New Guinea	0615
3396	—	Nigerian BC	Kaduna, Nigeria	2150
3824	—	R. Maseru	Maseru, Lesotho	0700
3980	—	Nigerian BC	Enugu, Nigeria	0500
3985	9UB92	R. Cordac	Bujumbura, Burundi	0400
	VQO4	Solomon I. BC	Honiara, Sol. Is.	0845
4710	ZYF24	R. Maranhao	Sao Luiz, Brazil	0215

60-Meter Band—4750 to 5060 kHz

kHz	Call	Name	Location	GMT
4770	ELWA	R. Village	Monrovia, Liberia	2215
4775	—	R. Kabul	Kabul, Afghanistan	1515
4780	HIAS	Onda Musical	Sto. Domingo, Dom. Rep.	0300
4783	—	R. Mali	Bamako, Mali	2240
4795	—	R. Comercial	Sa da Banderia, Angola	2305
4810	—	R. S. Africa	Paradys, S. Africa	0430
4815	—	R. Ouagadougou	Ouagadougou, Up. Volta	2140
4820	CR6RZ	R. Angola	Luanda, Angola	2235
4835	—	R. Mali	Bamako, Mali	0600
4850	—	R. Malaysia	Sarawak	1330
4855	—	East. Nigerian BC	Enugu, Nigeria	2135
4870	—	R. Dahomey	Cotonou, Dahomey	2130
4880	—	R. Congo	Leopoldville, Congo	2135
4890	YVKB	R. Venezuela	Caracas, Venezuela	0100
4900	YVNK	R. Juventud	Caracas, Venezuela	0300
4910	HIN	R. HIN	Sto. Domingo, Dom. Rep.	0230
4920	VLM4	Australian BC	Brisbane, Australia	1110
4930	YVOT	R. Junin	San Cristobal, Venez.	0330
4940	—	R. Abidjan	Abidjan, Ivory Coast	0600
4945	HJCW	E. Suramerica	Bogota, Colombia	0350
4950	—	R. Malaysia	Sarawak	1230
4955	—	R. Caiari	Portoviejo, Brazil	0200
4965	—	R. Zambia	Lusaka, Zambia	1830
4967	—	R. Kuwait	Kuwait	1600
4970	YVLK	R. Rumbos	Caracas, Venezuela	0255
4980	YVOC	Ecos del Torbes	San Cristobal, Venez.	2300
4985	—	R. Malaysia	Sarawak	1100
	—	Nigerian BC	Lagos, Nigeria	0530
4990	YVMO	R. Barquisimeto	Barquisimeto, Venez.	1012
4995	ZYY2	R. Brazil Central	Goiana, Brazil	0550
5005	OAX2S	R. Jaen	Jaen, Peru	0300
5010	—	R. Garoua	Garoua, Cameroon	2140
	YVRW	R. Bocono	Caracas, Venezuela	0415
5015	—	R. Vladivostok	Vladivostok, USSR	1010
5020	4VGS	R. Independence	Gonaives, Haiti	2330
5025	—	R. Malaysia	Kuala Lumpur, Malaysia	1100
5035	HROE	V. de las Fronteras	Tegucigalpa, Hond.	1200
5037	—	R. Malaysia	Sarawak	1135
5040	—	R. Tbilisi	Tbilisi, USSR	0155
5045	ZK5	R. Rarotonga	Rarotonga, Cook Is.	0510
5047	—	R. Lome	Lome, Togo	2100
5050	—	R. Tanzania	Dar es Salaam, Tanzan.	1600
5180	—	R. Atlantida	Iquitos, Peru	0200
5917	—	Bizim R.	(clandestine)	2030

49-Meter Band—5950 to 6200 kHz

kHz	Call	Name	Location	GMT
5954	TIQ	R. Casino	Puerto Limon, C.R.	1105
5960	—	Trans World R.	Bonaire, N.W.I.	0430
	DMQ5	Deutsche Welle	Cologne, W. Germ.	0345
5970	HJVN	R. Horizonte	Bogota, Colombia	0400
5980	—	Lebanese BC	Beirut, Lebanon	1425
5990	—	RAI	Rome, Italy	2020
	—	R. Sweden	Stockholm, Sweden	0000
6000	—	R. Kabul	Kabul, Afghanistan	0730
6010	—	RAI	Rome, Italy	0100
	CJCX	CJCX	Sydney, N.C.	0955
6015	—	R. Habana	Havana, Cuba	0730
6022	OAX4Q	R. Victoria	Lima, Peru	1055
6025	CSA52	V. of West	Lisbon, Portugal	0000
6030	CFVP	V. of Praries	Calgary, Alta.	1205
6050	—	Vatican R.	Vatican City	0030
6055	—	R. Prague	Prague, Czech.	0930
6060	HIAZ	R. Santiago	Santiago, Dom. Rep.	1100
6065	—	R. Sweden	Stockholm, Sweden	2015
6070	—	R. Ghana	Accra, Ghana	0300
	CFRX	CFRX	Toronto, Ont.	1010
6080	ZL7	R. New Zealand	Wellington, N.Z.	0645
6082	OAX4Z	R. Nacional	Lima, Peru	0300
6090	—	R. Kaduna	Kaduna, Nigeria	0530
	VLI6	Australian BC	Sydney, Australia	1025
6095	—	R. Mogadiscio	Mogadiscio, Somalia	1800
6100	DMQ6	Deutsche Welle	Cologne, W. Germ.	0000
6105	XEQM	R. Yucatan	Merida, Mex.	0000
6110	—	R. Baku	Baku, USSR	1630
	—	R. Ghana	Accra, Ghana	0330
6120	DMQ6	Deutsche Welle	Cologne, W. Germ.	1940
	4VE	V. Evangelique	Cap Haitien, Haiti	1030
6130	—	R. Ghana	Accra, Ghana	0300
6135	DMQ6	Deutsche Welle	Cologne, W. Germ.	0555
6140	VLW6	Australian BC	Perth, Australia	1030
6150	VLR6	Australian BC	Melbourne, Australia	1115
6155	OEI21	Austrian R.	Vienna, Austria	0500
6157	—	R. Tirana	Tirana, Albania	2200
6165	—	Swiss BC	Berne, Switz.	0700
6185	CSA29	V. of West	Lisbon, Portugal	0000
6190	—	Vatican R.	Vatican City	1915
6195	—	BBC	London, England	0400
6234	—	R. Budapest	Budapest, Hungary	1330
6250	EAJ206	R. S. Isabel	Fernando Po	1855
7035	—	R. Peking	Peking, China	1100
7090	—	R. Tirana	Tirana, Albania	2220

41-Meter Band—7100 to 7300 kHz

kHz	Call	Name	Location	GMT
7105	—	R. Budapest	Budapest, Hungary	1940
7120	VUB	All India R.	Bombay, India	1105
7130	CSA55	V. of West	Lisbon, Portugal	2015
	BED7	V. Free China	Taipei, Free China	0250
7165	—	R. Free Europe	Munich, W. Germ.	2235
7175	—	V. America Relay	Poro, Philippines	1100
7195	VUD	All India R.	New Delhi, India	1045
7200	—	R. Kabul	Kabul, Afghanistan	1515
7205	—	V. America Relay	Thessaloniki, Greece	2200
7210	—	R. Hanoi	Hanoi, N. Vietnam	1000
7215	—	All India R.	New Delhi, India	2220
	—	R. Hanoi	Hanoi, N. Vietnam	1000
7225	—	R-TV Marocaine	Sebaa Aioun, Morocco	2230
7230	—	R. Ouagadougou	Ouagadougou, Up. Volta	0600
7240	—	RAI	Rome, Italy	2115
7245	OEI33	Austrian R.	Vienna, Austria	0600
7250	—	Vatican R.	Vatican City	1815
7265	—	R. Tirana	Tirana, Albania	0530
	—	Trans World R.	Monte Carlo, Monaco	1400
7270	—	R. Sweden	Stockholm, Sweden	2245
7275	—	RAI	Rome, Italy	2020
7290	—	Trans World R.	Monte Carlo, Monaco	1400
7345	—	R. Prague	Prague, Czech.	0105
9009	—	Kol Zion	Tel Aviv, Israel	2045
9295	PRN9	R. Seguranca	Rio de Janeiro, Braz.	0120
9360	—	R. Tirana	Tirana, Albania	0530

31-Meter Band—9500 to 9775 kHz

kHz	Call	Name	Location	GMT
9500	—	Bizim R.	(clandestine)	2030
9505	—	R. Prague	Prague, Czech.	0930
9508	—	R. Omdurman	Omdurman, Sudan	0400
9510	—	BBC Relay	Ascension I.	0658
9525	OEI49	Austrian R.	Vienna, Austria	0000
9540	ZL2	R. New Zealand	Wellington, N.Z.	0645
9545	DMQ9	Deutsche Welle	Cologne, W. Germ.	2240
9560	—	Vatican R.	Vatican City	2200
9570	—	R. Australia	Melbourne, Australia	0730
9580	—	R. Erevan	Erevan, USSR	0800
9600	—	V. America Relay	Monrovia, Liberia	0605
	—	R. Tashkent	Tashkent, USSR	1400
9605	DMQ9	Deutsche Welle	Cologne, W. Germ.	1940
9615	ORU4	R-TV Belge	Brussels, Belgium	2115
9620	—	VTVN	Saigon, S. Vietnam	1230
	—	Trans World R.	Bonaire, N.W.I.	0230
9630	—	RAI	Rome, Italy	0100
9640	—	R. Pakistan	Karachi, Pakistan	1945
9645	—	Vatican R.	Vatican City	1400
9655	—	R. Habana	Havana, Cuba	0730
9675	—	R. South Africa	Capetown, S. Afr.	2326
9680	—	V. West	Lisbon, Portugal	0000
	—	R. Habana	Havana, Cuba	0930
9700	—	R. Kabul	Kabul, Afghanistan	1830
9715	—	R. Tirana	Tirana, Albania	0115
9720	—	R. Prague	Prague, Czech.	0110
9725	4XB51	Kol Zion	Tel Aviv, Israel	2045
9730	—	Bizim R.	(clandestine)	2030
	—	V. West	Lisbon, Portugal	2015
9735	DMQ9	Deutsche Welle	Cologne, W. Germ.	0345
9740	ORU	R-TV Belge	Brussels, Belgium	1600
	HCJB	V. of Andes	Quito, Ecuador	0530
9755	—	VTVN	Saigon, S. Vietnam	1230
9760	—	R. Ghana	Accra, Ghana	0430
	—	R. S. Africa	Capetown, S. Africa	2345
9770	—	Austrian R.	Vienna, Austria	2300
	4VEH	V. Evangelique	Cap Haitien, Haiti	1030
9833	—	R. Budapest	Budapest, Hungary	1940
9840	—	R. Baku	Baku, USSR	1600
9915	—	BBC	London, England	1945
9950	—	R. Peking	Peking, China	1510
9972	—	R. Peking	Peking, China	2000
11300	—	V. Japan	Tokyo, Japan (?)	1600

25-Meter Band—11700 to 11975 kHz

kHz	Call	Name	Location	GMT
11705	—	R. Sweden	Stockholm, Sweden	1600
11715	ORU	R-TV Belge	Brussels, Belg.	1600
	—	R-TV Morocaine	Tangier, Morocco	2230
11740	—	Vatican R.	Vatican City	1400
	—	V. America Relay	Monrovia, Liberia	0510
11760	—	Lebanese BC	Beirut, Lebanon	0130
	—	R. Vienna	Vienna, Austria	0300
11770	HCJB	V. of the Andes	Quito, Ecuador	2030
	—	Trans World R.	Bonaire, N.W.I.	2215
11780	—	Hashemite BC	Amman, Jordan	0100
	ZL3	R. New Zealand	Wellington, N.Z.	2345
11795	DMQ11	Deutsche Welle	Cologne, W. Germ.	2240
11800	—	R. Ghana	Accra, Ghana	2000
11810	—	R. Sweden	Stockholm, Sweden	1400
11820	—	R. Tahiti	Papeete, Tahiti	0200
11823	—	R. Jor. Comercio	Recife, Brazil	2330
11825	BED69	V. Free China	Taipei, Free China	0250
11830	4VEH	V. Evangelique	Cap Haitien, Haiti	1030
11835	—	Vatican R.	Vatican City	1800
11840	CSA31	V. West	Lisbon, Port.	0815
11845	—	V. Japan	Japan (?)	1000
11855	—	R. Habana	Havana, Cuba	1855
	—	Swiss BC	Berne, Switz.	1220
11890	—	BBC Relay	Singapore	0000
11895	ORU	R-TV Belge	Brussels, Belg.	2115
11900	—	Swiss BC	Berne, Switz.	1515
11910	HCJB	V. Andes	Quito, Ecuador	0900
11925	—	Tashkent R.	Tashkent, USSR	1400
11930	—	R. Habana	Havana, Cuba	2110
	VUD	All India R.	New Delhi, India	1945
11975	—	West Indies BC	St. Georges, Grenada	0005
12065	—	R. Peking	Peking, China	2000
14520	—	Korean Cent. BC	Pyongyang, N. Korea	0100
15080	—	R. Euzkadi	(clandestine)	2230

19-Meter Band—15100 to 15450 kHz

kHz	Call	Name	Location	GMT
15105	—	BBC Relay	Ascension I.	1800
15110	ZL21	R. New Zealand	Wellington, N.Z.	2345
15115	HCJB	V. Andes	Quito, Ecuador	2030
15120	—	Vatican R.	Vatican City	1400
15125	BED60	V. Free China	Taipei, Free China	0250
15145	ZYK33	R. Jor. Comercio	Recife, Brazil	2330
	HCJB	V. Andes	Quito, Ecuador	2000
15155	—	R. Habana	Havana, Cuba	0730
15160	TAU	R. Ankara	Ankara, Turkey	1830
	OZF7	R. Denmark	Copenhagen, Den.	1600
15235	—	Swiss BC	Berne, Switz.	1330
15250	—	R. Euzkadi	(clandestine	2230
15255	—	Swiss BC	Berne, Switz.	1515
15270	—	R. Kabul	Kabul, Afghanistan	1830
15285	—	R. Ghana	Accra, Ghana	1645
15305	—	Swiss BC	Berne, Switz.	1515
15310	—	BBC Relay	Ascension I.	0700
15320	HCJB	V. Andes	Quito, Ecuador	1800
15325	—	Lebanese BC	Beirut, Lebanon	2300
15330	—	R. Ceylon	Colombo, Ceylon	0700
15340	—	R. Tanzania	Dar es Salaam, Tanz.	1600
15345	BED49	V. Free China	Taipei, Free China	0250
15350	—	Lebanese BC	Beirut, Lebanon	1830
15365	—	R. Canada	Montreal, Que.	1215
15410	OE166	Austrian R.	Vienna, Austria	2240
15430	—	Austrian R.	Vienna, Austria	0000
15440	WNYW	R. N.Y. Worldwide	New York, N.Y.	0000

16-Meter Band—17700 to 17900 kHz

kHz	Call	Name	Location	GMT
17755	WNYW	R. N.Y. Worldwide	New York, N.Y.	1630
17820	TAV	R. Ankara	Ankara, Turkey	1415
17830	—	Swiss BC	Berne, Switz.	1330
17840	WNYW	R. N.Y. Worldwide	New York, N.Y.	2000
	—	R. Sweden	Stockholm, Sweden	1400
	—	V. West	Lisbon, Port.	0730
17850	—	R. Ceylon	Colombo, Ceylon	0915
17870	—	R. Habana	Havana, Cuba	2140
17880	HCJB	V. Andes	Quito, Ecuador	1800
17890	—	R. Budapest	Budapest, Hungary	1940
	CSA46	V. West	Lisbon, Port.	0815
	BED40	V. Free China	Taipei, Free China	0250
17910	—	R. Ghana	Accra, Ghana	1330
17950	—	R. Pakistan	Karachi, Pakistan	1335

13-Meter Band—21450 to 21750 kHz

kHz	Call	Name	Location	GMT
21485	WNYW	R. N.Y. Worldwide	New York, N.Y.	1200
21495	CSA67	V. West	Lisbon, Port.	0730
21520	—	Swiss BC	Berne, Switz.	1330
21545	—	R. Ghana	Accra, Ghana	1815
21590	—	BBC	London, England	1415

Sonotone CDM-80 Mike

Continued from page 61

mike and a budget "cardioid" type resulted in severe echo, making the resultant recording most unpleasant.

Naturally, the CDM-80's cardioid response will improve straight speech pickup for Hams and CBers by reducing the mike's sensitivity to extraneous noises.

Frequency Response. The CDM-80's frequency response is rated, by modern standards, for speech—80 to 10,000 Hz. While it does not have the so-called "music range" of 50 to 15,000 Hz, what there is, is exceptionally clean. In fact, the distortion checked out considerably below that of low-cost hi-fi mikes, which have a wide response but very high relative distortion.

The CDM-80 is one of the most pop-proof mikes we've run across. With the mike against the lips, and the level at a shout, there was just a trace of popping on the *p*'s, *d*'s, *t*'s, etc. This is a definite advantage in home recording where the mike often gets "swallowed."

Name Your Impedance. The CDM-80's output impedance is designed for both the amateur and professional recordist. The output cable, of which 15 feet is supplied, has three leads plus a shield. By using the appropriate leads, the mike's output impedance is either 200 ohms balanced, 200 ohms unbalanced, or 50,000 ohms.

Of course, even the amateur recordist will find the low-impedance output of value, particularly for long cable runs. To avoid hum and noise pick-up in the cable, the 200-ohm balanced output can be used, with a low-to-high-impedance transformer at the end of the cable.

The Output Level. The CDM-80's rated output level of −59 db is considerably less than the output level of the inexpensive mikes supplied with many recorders. Nonetheless, it is approximately that of any other good-quality microphone.

A desk stand, the model CMS-10, priced at $5.25, is optional. The supplied microphone holder, actually a *lavalier*, is a total disaster. Worn around the neck, the holder makes the mike stick out at right angles, almost as if someone stabbed the user with the mike.

Summing Up. While the CDM-80 does not have a "music" frequency response, it is most suitable as a general-purpose home microphone, performing exceptionally well on speech and most pleasantly on musical instruments (not hi-fi, but very clean and smooth quality). The cardioid pattern more than makes up for the deficiency in frequency response: music recordings made with the CDM-80 in the home often surpassed those made with a hi-fi omnidirectional microphone.

With a user net (list) price of $43.50, the CDM-80 is recommended as a "replacement microphone." Additional information can be obtained by writing Sonotone Corp., Dept. RG, Elmsford, N.Y. 10523. ■

Chirp Chucking

Continued from page 72

Bad Rock. A defective crystal also can be a cause of chirp—a crack in the crystal, or a crystal that is dirty or loose in its holder. A cracked crystal cannot be repaired; you'll have to throw it away. A dirty crystal, on the other hand, can be cleaned with alcohol.

Sometimes an operator will open the case and remove a crystal from its holder—rubbing the crystal blank lightly with a soft pencil to lower its frequency. This works, but sometimes it causes poor electrical contact between the crystal and the holder. The result is an intermittent or unstable oscillator. A modified crystal may take spells of oscillating at *both* its "old" and "new" frequencies, or it may jump unpredictably from one to the other. This can really produce a queer-sounding signal!

Listen! How can you know if you have chirp? The only way to know for sure is to monitor your own transmitted signal. If each dot and dash is a steady whistle, your signal is clean. But if it makes a sound that you might call a *yelp* or a *burp*, you have chirp.

The best way to monitor your CW signal is in your own receiver. Instead of muting your receiver when you transmit, leave the receiver *alive* so you can hear your own signal just like the other guys are hearing it. Make sure, though, that the wire from the antenna terminals on the back of the receiver to the antenna relay is very short. This wire acts as an antenna and picks up some of the transmitted signal. If this signal coming into the receiver when you transmit is too strong, it may burn out the antenna coil on your receiver.

It's a good idea, too, to reduce the input signal to the receiver with the receiver's RF gain control. This will help protect the input stage of the receiver as well as protect your own ears from the strong blast of your own signal!

This method of monitoring will also tell you if you are operating on the same frequency as the operator to whom you are talking. If your note has the same pitch as his, you are on the same frequency. If not, you are near his frequency, but not right on it.

RF Monitor. In working DX, you sometimes deliberately get on a frequency different from the station you are calling, so you will need a different system for monitoring your own signal. Such a system, used by many CW operators, is an RF monitor. This is a tiny, broad-tuned receiver, housed in a small box placed near the transmitter.

The RF monitor picks up the strong RF signal from the transmitter near it, regardless of frequency, and converts this signal to an audio tone. Some RF monitors have their own small speaker, while others have only enough audio power to operate headsets.

An RF monitor will allow you to hear your own signal, just as it is going on the air, regardless of whether you have your receiver tuned to your transmitter frequency or not.

Either method of monitoring will tell you immediately if your rig chirps. An important side benefit, of course, is that a monitor will help you send better code because you will be listening to your own sending.

This sums up the main causes of chirp; how to detect chirp; what to do about it if you find it. Armed with this information, you should be able to maintain your signal as one of the cleanest on the air. Remember: chirp belongs in a bird cage, not in a Ham transmitter! ■

CHIRP-CHUCKERS CHECK LIST

Trouble	Look For
Unstable DC-supply voltage	Defective VR tube or Zener diode.
	Defective series resistor in regulator circuit.
	Weak or open power-supply filter capacitors.
	Open power-supply bleeder resistor.
	Lack of any voltage regulation for oscillator power supply.
	Improperly tuned transmitter or improperly loaded antenna.
Unstable AC power-line voltage	Overloaded wall plug or house wiring.
	Poor plug-in contacts or dirty fuse contacts.
	Poor wiring connections or corroded splices.
Erratic oscillator operation	Defective oscillator tube.
	Dirty or loose oscillator switch contacts.
	Insecure oscillator housing.
	Loose oscillator capacitor, coil, or coil tuning slug.
	Defective or dirty crystal.

Heat Detector

Continued from page 59

has stabilized (the thermometer hasn't changed its indication for five minutes or more), you're ready to start on your calibration chart or direct-reading dial. You can make a simple table or a series (or family) of curves on a graph. Once you have the table you can make either of the two graphs —or both of them.

To make an accurate calibration chart you'll need a finely graduated dial. If you don't want to go to the expense of a 10-turn precision potentiometer and a 10-turn counting dial, the next best choice is a vernier dial like the National AM-6 which is calibrated around 270 degrees of its circumference. The direct-reading dial eliminates that additional cost, but the temperature calibration won't be as accurate.

With the temperature of the heat source stabilized at some temperature, start at the most distant marker and make your temperature readings and record the *Temperature* knob readings as on the chart. Differences in the bolometer, transistor, reflector, and even potentiometers make it necessary to calibrate each pyrometer individually.

With your complete set of calibration charts you'll be able to take temperature readings of objects that would be all but impossible to attach a thermometer to—because of their shape or their inaccessibility.

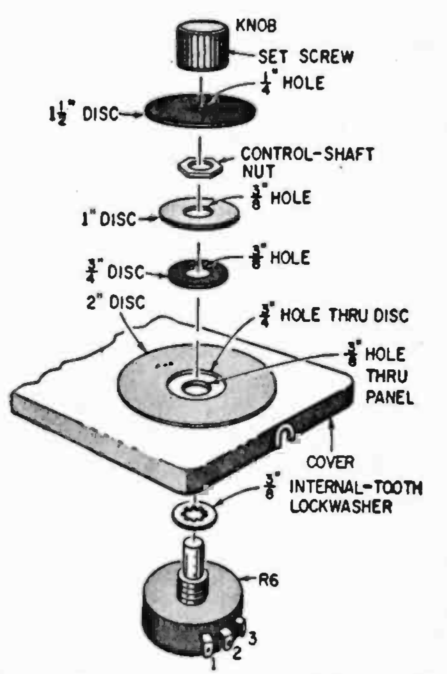
Direct Reading Dial. To make temperature measurement easier a computing dial can be made. Temperature readings are then as simple as making exposure readings with a photographic lightmeter. The construction and calibration of the dial itself is probably the most difficult part of the whole project, since it computes (like a circular slide rule) three variables:

1) the radiation temperature of the heat source (in degrees F);
2) The distance from the heat source (in feet);
3) the heat-radiating area of the source (in square inches).

For calibration purposes you have control over all three, but during actual measurements you only know two—the distance, and the area of the target.

Where To Start. First you'll have to make discs—one about 2-in., the other about 1½-in. in diameter. The smaller one is cemented to the knob of R6. The temperature calibrations can be placed on the smaller disc using readings plotted on the calibration chart—first transferring them to polar-coordinate graph paper. Or you can mark them directly on the knob without first making a calibration chart (though this is more difficult and less accurate).

Direct-reading dial shows major calibration points. Additional points can be indicated to increase accuracy of readings.



Construction and assembly of the direct-reading dial is not difficult. Cut discs from thin plastic or heavy paper stock.

The 2-inch Disc. At one point on the 2-in. disc indicate the 10-foot-distance calibration point; directly across from it, on the opposite edge of the disc, indicate the 20-square-inch point.

Now mark a line on the metal panel to be used as a pointer to indicate the distance from the heat source. Next you have to mount the 2-in. disc, temporarily, as shown in the drawing. (You'll have to take the disc off if you apply press-on numbers for the calibration markings.)

Set up the pyrometer ten feet from the calibrating heat source and adjust the instrument for a zero reading. Now place the knob-mounted disc on the shaft of R6 so the temperature indicated by the thermometer (measuring the heat source) coincides with the 20-square-inch calibration mark. (The 20-square-inch calibration mark is the index—pointer—for all temperature indications of areas of 20 square inches.)

Of course, if you haven't made a calibration chart and precalibrated the temperature knob (R6), you can place the knob in any position and mark the temperature on the 1½ in. disc. (Follow the directions given under calibration.)

Once you have all the temperature points marked on the 1½-in. disc, you move the pyrometer to a position 15 feet from the calibrating heat source and again adjust for a zero reading on the panel meter—with the heat source at 400 F.

Rotate the 2-in. disc—setting the 20-square-inch calibration mark adjacent to the 400 F temperature marking. The spot on the edge of the 2-in. disc indicated by the line on the panel is the 15-foot calibration. Repeat the procedure for the 5-foot and 20-foot calibrations (and any other distances that you might want in between). Just make sure that the temperature of the calibration heat source remains constant throughout this

Completed unit shows circuit board wrapped in foam and secured with transparent tape.

portion of the calibration procedure.

Area Calibration. This is the simple part. All you have to do is take a large piece (of at least ⅛-in. thick) cardboard, fiberboard, plywood, or pressed board and cut a hole 1-in. square in it. Place the shield between the calibrating heat source and the pyrometer and as close to the heat source as possible.

With the pyrometer set up at 10 feet, readjust R6 for a zero indication on the meter. Set the 2-in. disc to indicate 10 feet. Next to the 400 F calibration, place (on the 2-in. disc) the calibration mark for 1 square-inch.

Repeat the procedure for 4 square-inches and any other size areas you want for future measurement. It is best to keep the area shields as separate items—one for each size—for those calibration checks that are sure to be made at some later date.

Now you're all set to measure temperature like you've never been able to measure temperature before—from a distance. ■

EICO 378 Generator

Continued from page 80

several instructions left too much up to the builder's judgment. In mounting, some parts weren't precisely identified.

On the other hand, the operating-maintenance manual is very good, particularly with regard to user adjustment and calibration of the output level meter. Incidentally, the manual claims that minimum distortion is obtained when the 378 is adjusted with a distortion meter, but we found no significant difference between distortion meter and the user-adjustment techniques presented in the manual.

In terms of performance, the 378 is indeed of laboratory quality. And it isn't often that kit test gear can claim to be of lab quality and live up to that claim.

For additional information on the Model 378 Audio Generator, write to EICO, Dept. ME, 131-01 39th Ave., Flushing, N. Y. 11352. ■

Drifting Continents

Continued from page 45

Wilson points out, too, that the ends of the Rio Grande and the Walvis lateral ridges are exactly opposite points on the coasts of South America and Western Africa and could have fitted together at one time. Northern ridges extending from Iceland to Greenland to the continental shelf of Europe could also link in a continental fit.

But even Wilson sought the added assurance that proof by study of rock magnetization could bring. For rocks can give "fixes" like fossilized compasses on the North and South Poles, spotting the continents' locations as they must have existed in line with the poles in different ages. Rocks laid down during the past 50 to 100 million years have magnetizations that generally point due north. Older rocks do not.

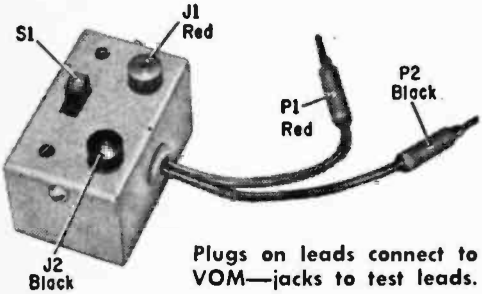
Formed of sediment, mud, sand, and pieces of iron or titanium, rocks lay in the earth's magnetic field. As they cool, they ultimately take on the character of history books. For centuries later, they still reveal the latitude and orientation of the land where they lay at the time of their formation.

Looking Ahead. Today, scientists measuring the magnetization of rocks known to have been formed in the period the continents were breaking can come to only two conclusions. Either the earth's magnetic field at that time had some mighty peculiar configurations (such as more than two poles), or the continents have definitely drifted apart from each other.

Recently, another group of scientists from the University of Sao Paulo in Brazil and the University of California found some ancient rocks in South America and West Africa they think can decide the issue once and for all. If dating these rocks with radioactive potassium-argon and rubidium-strontium reveals they are the same age, this should clinch the "drift" theory, thereby settling a centuries-old scientific question. Do we live on continents that are conservative, old stay-at-homes? Or are our continents more like the rolling stones that just won't say put? ■

Meter Flip-Flop

Continued from page 78



Plugs on leads connect to VOM—jacks to test leads.

A slide switch is used in the unit shown in the photos, but a toggle, see-saw, or rotary switch can be used if you wish. If you build your unit in a metal box, as shown here, be sure to use insulating shoulder washers when mounting the two jacks.

For frequent use, or for ease in carrying your test equipment, you can attach the switch box to the side or bottom of your VOM with screws and nuts. Or, it may be kept as a separate unit, connected to the meter only when making DC measurements. In either case, you will find it a very handy addition to your multimeter. ■

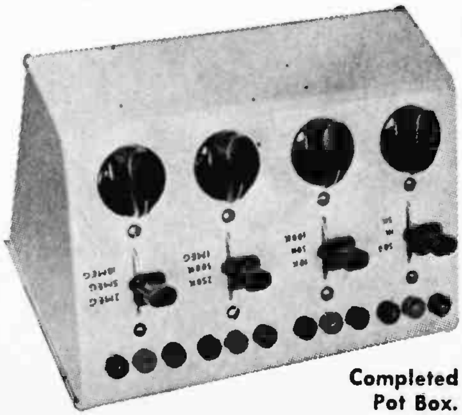
Pot Box

Continued from page 93

wiring of a single section and all remaining sections are wired exactly the same.

The last step is checking the wiring and solder joints. Also, if an ohmmeter is available, it's a good idea to check the resistance values for each switch position to make sure the controls are connected to the output jacks in the order listed in the table.

Having built the Pot Box it's certain that you'll never have a potentiometer shortage around your shop. ■



Completed Pot Box.

CLASSIFIED Market Place

FOR BIGGER PROFITS! NEW CAREER OPPORTUNITIES!
READ AND REPLY TO THESE CLASSIFIED ADS

Classified Ads 55¢ per word, each insertion, minimum 10 words, payable in advance. To be included in the next available issue of RADIO-TV EXPERIMENTER, copy must be in our New York Office by April 10th. Address orders to C. D. Wilson, Manager, Classified Advertising, RADIO-TV EXPERIMENTER, 505 Park Ave., New York, N. Y. 10022.

ADDITIONAL INCOME

MAKE Your Classified Ad Pay. Get "How To Write a Classified Ad That Pulls." Includes certificate worth $2.00 towards classified ad in S & M. Send $1.00 to C. D. Wilson, Science & Mechanics, 505 Park Ave., New York, N. Y. 10022.

AUTHOR'S SERVICE

PUBLISH your book! Join our successful authors publicity advertising promotion, beautiful books. All subjects invited. Send for free manuscript report and detailed booklet. Carlton Press, Dept. SMH, 84 Fifth Avenue, New York 10011.

BOOKS & PERIODICALS

SENSATIONAL book shows How To Get What You Want. Details Free. Baker, 1000 McClusky, Jerseyville, Ill. 62052.

1000 ELECTRONIC Books Available By Mail. Free Catalog. Books, Box 796, Dept. 3, Montreal 3, Canada.

BUSINESS OPPORTUNITIES

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

FREE Book "990 Successful Little-Known Businesses." Fascinating! Work home! Plymouth 911-W, Brooklyn, N. Y. 11216.

CHEMICALS & APPARATUS

SEARCHING For Economically Priced Chemicals and Apparatus? Gift with Catalogue 25¢. Starr Scientific, Manitowoc, Wisconsin 54220.

EARTHWORMS

BIG Money Raising Fishworms and Crickets. Free Literature. Carter Farm-O, Plains, Georgia 31780.

EDUCATION & INSTRUCTIONS

BUILD Your Own Test Equipment and a stereo AM-FM Radio. Practical Home Study Courses in Electronics in Theory, Practice and Servicing with complete kits and tools included in price. Write for free booklet with no obligation to: Inesco, Intercontinental Electronics School, Dept. 16B, 9100 St. Lawrence Blvd., Montreal 11, Quebec, Canada.

CRITICAL Shortages For Aviation Radiomen. Learn Avionics. Employment Assured. Academy Avionics, Reno/Stead Airport, Reno, Nevada 89501.

ELECTRONIC PARTS

UNIQUE relay to build variety of remote controls, model railroads, liquid level control, weather detector, burglar alarm, games, trick circuits. 20 design ideas included free. $3.95 prepaid. Dept. H. Alco, Lawrence, Mass.

FOR INVENTORS

PATENT Searches—48 hour airmail service, $6.00, including nearest patent copies. More than 200 registered patent attorneys have used my service. Free invention protection Forms. Write Miss Ann Hastings, Patent Searcher, P. O. Box 176, Washington, D. C. 20004.

FOR SALE MISCELLANEOUS

1,000 GUMMED Address Labels 50¢. Mart's, Box 454-C, Mackinaw, Ill. 61755.

GIFTS THAT PLEASE

FREE Gift Catalogs. D. Shults, Box 320, Dept. SMC-3, Santa Cruz, Calif. 95060.

HYPNOTISM

SELF Hypnosis. Latest method and instructions. 3¾ I.P.S. Recorded Tape. 45 minutes. $4.00. Victor, 315½ East Maple, El Segundo, Calif. 90245.

PHENOMENAL Memory, Hypnotism, and flash Mathematics! Guaranteed. $3.00. Hypnotex, Box 797-DM, Minneapolis, Minnesota 55440.

INVENTIONS WANTED

WE either sell your invention or pay cash bonus. Write for details. Universal Inventions, 298-5, Marion, Ohio.

MONEYMAKING OPPORTUNITIES

HOW To Make A Home Operated Mail Business Pay!! Details—Carpenter, 2907—J West 39th Place, Chicago, Ill. 60632.

START Profitable Business in spare time. Investigate many money-making agency and franchise opportunities. Send 10¢ for sample copy of Income Opportunities Magazine, 505 Park Avenue, New York, 10022. Dept. S.

PATENT SERVICE

PATENT Searches—48 hour airmail service, $6.00, including nearest patent copies. More than 200 registered patent attorneys have used my service. Free invention protection Forms. Write Miss Ann Hastings, Patent Searcher, P. O. Box 176, Washington, D. C. 20004.

PERSONAL

BILL Problems? Poor credit no trouble. Not a loan company. Send for free application. Automatic Acceptance, 318DC Broadway Blvd., Reno, Nev. 89502, or 307-DC Pocasset Ave., Providence, R. I. 02909.

CONFIDENTIAL Boston Remails. Reliable 20¢. Cresco, 323 Ridge, Arlington, Massachusetts 02174.

PETS—DOGS, BIRDS, RABBITS, HAMSTERS, ETC.

MAKE big money raising rabbits for us. Information 25¢. Keeney Brothers, New Freedom, Penna. 17349.

RADIO & TELEVISION

McGEE Radio Company. Big 1966-1967 Catalog Sent Free. America's Best Values. Hi-Fi, Amplifiers, Speakers, Electronic Parts. Send Name, Address and Zip Code Number to McGee Radio Company, 1901 McGee Street, Dept. RTV, Kansas City, Missouri 64108.

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

CB & Ham Goodies—New Catalog free. Tepabco, Boyers Ave., Gallatin, Tenn. 37066.

CANADIANS—Giant Electronics Catalogs. Hi-Fi, Shortwave, Ham, CB. Rush $1.00. ETCO, Dept. EX, Box 741, Montreal, Canada.

DIAGRAMS, servicing information, Radio $1.00. Television $1.50. Beitman, 1760 Balsam, Highland Park, Ill. 60035.

FREE Catalog on New Manufactured and Surplus Parts. Bigelow Electronics, Box 71, Bluffton, Ohio 45817.

TELEVISION troubles spotted in minutes! Repair all makes and models this easy expert way. No Book theory. A real "work bench" simplified method. Used by "pros" throughout the industry. Write, specifying black/white, or color. National Technical Research Labs, 6430 So. Western Ave., Whittier, Calif. 90606.

SCIENCE EXPERIMENTERS

EVERYTHING For Amateur Experimenters! Catalog 25¢. Hagenow Laboratories, Manitowoc, Wis. 54220.

SCIENCE Experimenter—the magazine dedicated to the youth who is interested in experimentation. Send $1.00, includes Postage, to Science Experimenter, 505 Park Ave., New York, N. Y. 10022.

SONGWRITERS

POEMS Wanted for musical setting and recording. Send poems. Free examination. Crown Music, 49-SC West 32, New York, New York 10001.

SPECIAL SERVICES

LOOK Men—especially Golf Players. Cut your shoe cost. Send 25¢ for details. Delph's Leather Products, Tamaqua, Pennsylvania 18252.

TREASURE FINDERS—PROSPECTING EQUIPMENT

"NEW" Scientific Instrument detects buried gold, silver, coins, treasures. $19.95 up. Free catalog. Relco-A30, Box 10563, Houston, Texas 77018.

DIAMONDS. Gold. Find Them. Pamphlet Free. 18788 Cajon, San Bernardino, California 92407.

You can earn more money if you get an FCC License

...and here's our famous CIE warranty that you will get your license if you study with us at home

NOT SATISFIED with your present income? The most practical thing you can do about it is "bone up" on your electronics, pass the FCC exam, and get your Government license.

The demand for licensed men is enormous. Ten years ago there were about 100,000 licensed communications stations, including those for police and fire departments, airlines, the merchant marine, pipelines, telephone companies, taxicabs, railroads, trucking firms, delivery services, and so on.

Today there are over a million such stations on the air, and the number is growing constantly. And according to Federal law, no one is permitted to operate or service such equipment without a Commercial FCC License or without being under the direct supervision of a licensed operator.

This has resulted in a gold mine of new business for licensed service technicians. A typical mobile radio service contract pays an average of about $100 a month. It's possible for one trained technician to maintain eight to ten such mobile systems. Some men cover as many as fifteen systems, each with perhaps a dozen units.

Coming Impact of UHF

This demand for licensed operators and service technicians will be boosted again in the next 5 years by the mushrooming of UHF television. To the 500 or so VHF television stations now in operation, several times that many UHF stations may be added by the licensing of UHF channels and the sale of 10 million all-channel sets per year.

Opportunities in Plants

And there are other exciting opportunities in aerospace industries, electronics manufacturers, telephone companies, and plants operated by electronic automation. Inside industrial plants like these, it's the licensed technician who is always considered first for promotion and in-plant training programs. The reason is simple. Passing the Federal government's FCC exam and getting your license is widely accepted proof that you know the fundamentals of electronics.

So why doesn't everybody who "tinkers" with electronic components get an FCC License and start cleaning up?

The answer: it's not that simple. The government's licensing exam is tough. In fact, an average of two out of every three men who take the FCC exam fail.

There is one way, however, of being pretty certain that you will pass the FCC exam. And that is to take one of the FCC home study courses offered by the Cleveland Institute of Electronics.

CIE courses are so effective that better than 9 out of every 10 CIE-trained men who take the exam pass it...on their very first try! That's why we can afford to back our courses with the iron-clad Warranty shown on the facing page: you get your FCC License or your money back.

There's a reason for this remarkable record. From the beginning, CIE has specialized in electronics courses designed for home study. We have developed techniques that make learning at home easy, even if you've had trouble studying before.

In a Class by Yourself

Your CIE instructor gives his undivided personal attention to the lessons and questions you send in. It's like being the only student in his "class." He not only grades your work, he analyzes it. And he mails back his corrections and comments the same day he receives your assignment, so you can read his notations while everything is still fresh in your mind.

Mail Card for Two Free Books

Want to know more? The postpaid reply card bound-in here will bring you free copies of our school catalog describing opportunities in electronics, our teaching methods, and our courses, together with our special booklet, "How to Get a Commercial FCC License." If card has been removed, just send your name and address to us.

Matt Stuczynski, Senior Transmitter Operator, Radio Station WBOE

"I give Cleveland Institute credit for my First Class Commercial FCC License. Even though I had only six weeks of high school algebra, CIE's AUTO-PROGRAMMED™ lessons make electronics theory and fundamentals easy. I now have a good job in studio operation, transmitting, proof of performance, equipment servicing. Believe me, CIE lives up to its promises."

Chuck Hawkins, Chief Radio Technican, Division 12, Ohio Dept. of Highways

"My CIE Course enabled me to pass both the 2nd and 1st Class License Exams on my first attempt...I had no prior electronics training either. I'm now in charge of Division Communications. We service 119 mobile units and six base stations. It's an interesting, challenging and rewarding job. And incidentally, I got it through CIE's Job Placement Service."

Glenn Horning, Local Equipment Supervisor, Western Reserve Telephone Company

"There's no doubt about it. I owe my 2nd Class FCC License to Cleveland Institute. Their FCC License Course really teaches you theory and fundamentals and is particularly strong on transistors, mobile radio, troubleshooting and math. Do I use this knowledge? You bet. We're installing more sophisticated electronic gear all the time and what I learned from CIE sure helps."

ENROLL UNDER G.I. BILL

All CIE courses are available under the new G.I. Bill. If you served on active duty since January 31, 1955, or are in service now, check box on reply card for G.I. Bill information.

CIE Cleveland Institute of Electronics

1776 E. 17th St., Dept. EX-19 Cleveland, Ohio 44114

Accredited by the Accrediting Commission of the National Home Study Council, and the only home study school to provide complete coverage of electronics fundamentals plus such up-to-date applications as: Microminiaturization • Laser Theory and Application • Suppressed Carrier Modulation • Single Sideband Techniques • Logical Troubleshooting • Boolean Algebra • Pulse Theory • Timebase Generators...and many more.