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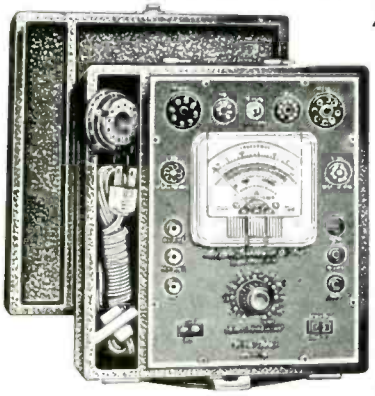

As an electrical trouble shooter the Model 161:

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps, Fluorescents, Switches, Thermostats, etc.
- *Will test all TV tubes (including picture tubes)* for open filaments and burned out tubes.
- Measures A.C. and D.C. Voltages, (Bath 110 Volt and 220 Volt lines).
- Will measure current consumption (amperes) *while the appliance under test is in operation.*
- Incorporates a sensitive direct-reading resistance range which will measure all resistances commonly used in electrical appliances, motors, etc.

As an Automotive Tester the Model 161 will test:

● Both 6 Volt and 12 Volt Storage Batteries ● Generators ● Starters ● Distributors ● Ignition Coils ● Regulators ● Relays ● Circuit Breakers ● Cigarette Lighters ● Stop Lights ● Condensers ● Directional Signal Systems ● All Lamps and Bulbs ● Fuses ● Heating Systems ● Horns ● Also will locate poor grounds, breaks in wiring, poor connections, etc.

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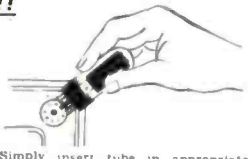
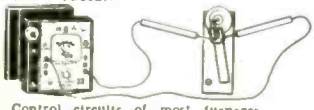
With tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good)

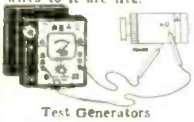


Simply insert tube in appropriate socket then follow procedure as outlined in our manual.



Control circuits of most furnaces use 24 volts obtained from step-down transformer. Here's how to check room thermostat to see if wires to it are live.

Small electric fan motor indicates 50 ohms (normal resistance).



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• How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.

• How to trace trouble in the electrical circuits and parts in automobiles and trucks.

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RADIO-TV EXPERIMENTER

OCTOBER-NOVEMBER, 1964

Cover Photo by Dan Rubin
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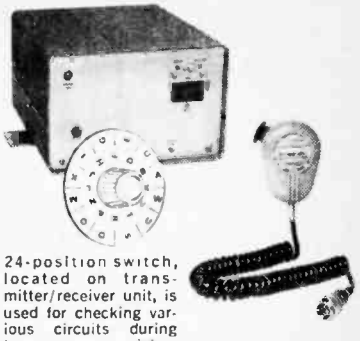
Remote Console



24-position switch, located on transmitter/receiver unit, is used for checking various circuits during tune-up or servicing.

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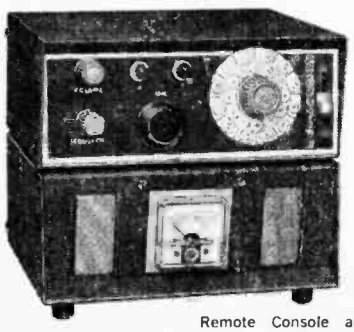
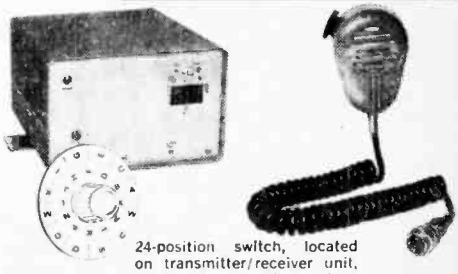


Remote Console and Speaker Console. Two units may be "stacked" or installed separately.



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OCTOBER-NOVEMBER 1964
VOLUME 17 No. 2

RADIO-TV EXPERIMENTER

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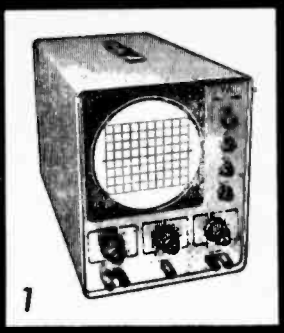
Transistorized Meter 2
Modern Lessons 3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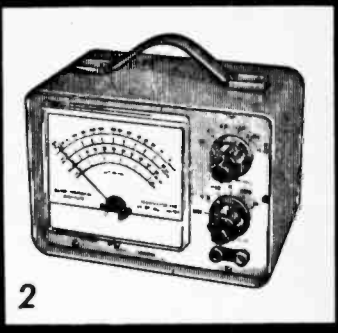
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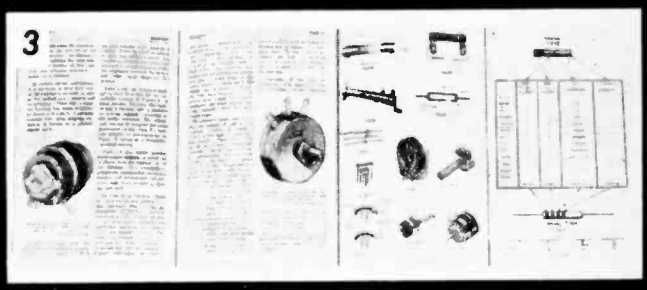
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POSITIVE FEEDBACK

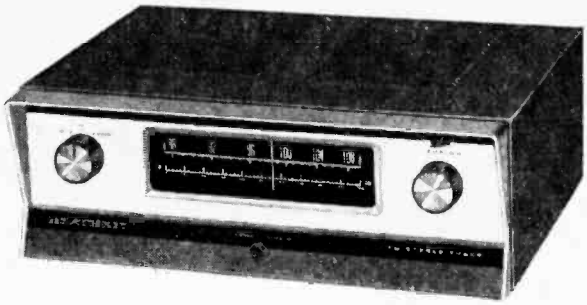
Julian M. Sienkiewicz, Editor
WA2CQL/2W5115

IF THE electronic hobbyist ever wondered where the local radio distributor browses for *his* parts, chances are it's in Chicago. It's at the "Parts Show," an annual event which recently brought together nearly 300 electronic manufacturers and thousands of distributors which stock their products. This is no glamorous event—like the star-gazing electronic engineer's show in New York, or the plush hi-fi shows held in several big cities. It's a sober session with few gimmicks. Those manufacturers are bent on capturing your local distributor and a slice of today's whopping billion-dollar market in everything from tiny resistors to big steel towers. Build a crystal set or buy a color TV and you'll probably have components first featured at a Parts Show.

The affair this year had the trappings of a market place. Lining the exhibition halls of the Conrad Hilton hotel were display booths bulging with the latest in capacitors and—that's right—stereo for your car. These are the products you can expect to find on the store shelves and see pictured in the mail-order catalogs. Several items should be of special interest to the consumer and hobbyist.

That stereo-in-your car was shown mounted in a mock-up of a car dashboard, with speakers dutifully positioned at the left and right. Essentially a tape system, it uses a small cartridge-type player, the same kind that failed to spark much interest for home use. But it looks practical for the automobile. The driver can easily shove a cartridge into a slot without looking. Slung under the dash, the player mechanism operates for an hour with a single cartridge (3¾ ips speed). Another entry into the field of highway hi-fi, this one for monophonic sound, is also a cartridge player. It has an interesting feature. Rather than house its own speaker and amplifier, the system utilizes the regular

This New Heathkit® FM Stereo Tuner At $49.95...



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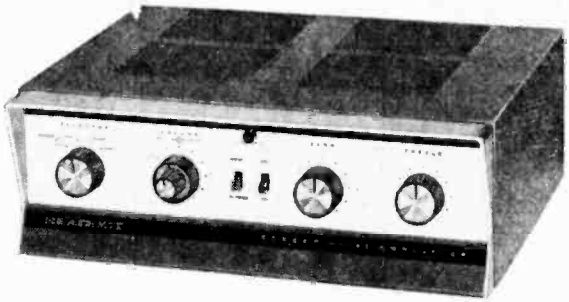

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Positive Feedback

car radio. It cleverly contains a small oscillator (like a wireless mike) which broadcasts the signal into the car radio. There's no need to wire into the radio's audio circuits.

The hobbyist can expect new things in those little plastic bags that usually contain bargain-price semiconductors. Show exhibitors in this category, with their blister-packs and see-through bags, are coming up with new ideas. One firm has latched onto the "potting" approach: encapsulating a whole semiconductor circuit into a module that's ice-cube size. One unit, for example, is a small audio amplifier hidden inside an epoxy jacket. It takes a mike on one end, a speaker off the other, with a battery for power. Even the big companies, like GE and IRC, have not overlooked the table-top tinkerer. They've expanded their lines of hobby components, complete with schematics, attractively card-mounted.

The heart of the show, however, still centers on standard products. No spectacular gains here, but many familiar components show definite signs of refinement. TV antenna makers, for example, stress the ability of their latest designs to deliver signals equally well for black-and-white, color, FM and FM stereo. At least one company exhibited a new breed of TV antenna which is described as a "combo." It's a single antenna which operates on both VHF and UHF, as opposed to the conventional 2-antenna and 2-feedline approach.

The CB'er will see no radical changes in antenna design, but can anticipate more specialized units for his boat, improved mounting versatility and a bigger swing toward the use of fiber glass in whips. In transceivers, this year's star is sideband equipment.

Hi-fi developments continue in the direction of solid-state, transistorized tuners and amplifiers and the trend toward smaller speaker systems. One manufacturer even got good bass performance from a 4-inch cone coupled with a huge magnet and special suspension system. The speaker cabinet took up little more room than a table radio.

But products alone do not make up a show. Where people gather there is bound to be plenty of back-room speculation and second guessing about the future. Two hot issues kicked around were CATV (community antenna television systems) and the so-called

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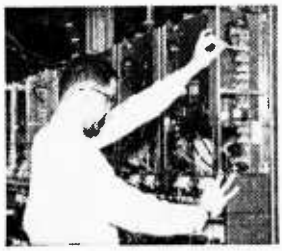

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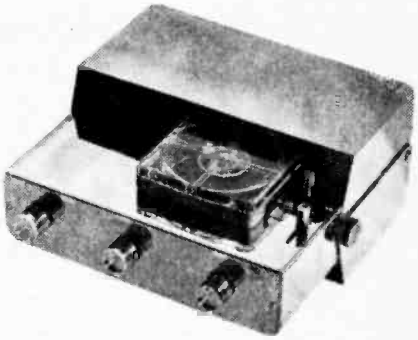
Positive Feedback

"fair trade" pricing of hi-fi equipment. CATV, which transmits signals through cable to the home, is actively opposed by several groups, especially antenna manufacturers. The buzzing about fair trade came on the heels of recent announcements from two major hi-fi manufacturers which would affect the resale price of their equipment. These moves are intended to counter what is said



Pictured above is one of the new products, an in-car stereo, tape cartridge player, introduced at the "Parts Show." If you would like to receive some literature and prices, write to Wally's Auto Radio Service, 550 West 54th Street, New York, New York 10019.

to be irresponsible discounting in the hi-fi field.

When will the consumer learn about the happenings at the "Parts Show"? Today! Just start thumbing through the advertisements in this issue and issues to come.

GE Owns FM Stereo. The United States Patent Office has granted General Electric Patent No. 3,122,610 covering the stereophonic FM broadcasting system adapted in 1961 as the U. S. standard and now in nationwide use. The patent covers FM stereo receivers, receiver kits, broadcast transmitters, and certain service and test equipment.

General Electric will license individual stations to use an FM stereo transmitter at a nominal royalty of $50 which covers the full 17-year-life of the patent. At present, there are over 350 stereo stations on the air and this number is expected to grow to over 400 by year end. Also, makers of stereo FM equipment such as radios, tuners or adapters, or parts kits for building such equipment

(Continued on page 25)

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	1B3	.79		5BK7	.86		6BC5	.61		6DG6	.62
	1DN5	.55		5BQ7	1.01		6BC8	1.04		6DJ8	1.21
	1G3	.79		5BR8	.83		6BE6	.55		6DK6	.59
	1J3	.79		5CG8	.81		6BF5	.90		6DN6	1.55
	1K3	.79		5CL8	.76		6BF6	.44		6DQ6	1.10
	1R5	.77		5CQ8	.84		6BG6	1.70		6DT5	.81
	1S5	.75		5EA8	.80		6BH8	.98		6DT6	.53
	1T4	.72		5EU8	.80		6BJ6	.65		6DT8	.94
	1U5	.65		5J6	.72		6BJ7	.79		6EA8	.79
	1X2B	.82		5T8	.86		6BK7	.85		6EB5	.73
	2AF4	.96		5U4	.60		6BL7	1.09		6EB8	.94
	3AL5	.46		5U8	.84		6BN6	.74		6EM5	.77
	3AU6	.54		5V6	.56		6BQ6	1.12		6EM7	.82
	3AV6	.42		5X8	.82		6BQ7	1.00		6EU8	.79
	3BC5	.63		5Y3	.46		6BU8	.70		6EV5	.75
	3BN6	.75		6AB4	.46		6BX7	1.11		6EW6	.57
	3BU8	.78		6AC7	.96		6BZ6	.55		6EY6	.75
	3BY6	.58		6AF4	1.01		6BZ7	1.03		6FG7	.69
	3BZ6	.56		6AG5	.70		6C4	.45		6FV8	.79
	3CB6	.56		6AH4	.81		6CB6	.55		6GH8	.80
	3CS6	.58		6AH6	1.10		6CD6	1.51		6GK5	.61
	3DG4	.85		6AK5	.95		6CG7	.61		6GK6	.79
	3DK6	.60		6AL5	.47		6CG8	.80		6GN8	.94
	3DT6	.54		6AM8	.78		6CL8	.79		6H6	.58
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	12A4	.60		12CN5	.56		12SQ7GT	.91		50L6	.61
	12AB5	.60		12CR6	.67		12U7	.62		70L7	.97
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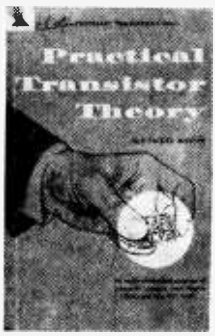

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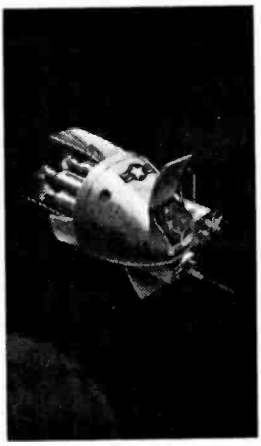

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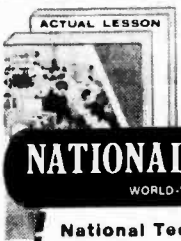

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Battery Picking. Most experimenters design a transistor circuit and slap in a standard 9-volt transistor radio battery to power the unit without much regard for such things as current drain, service capacity, the intermittency of discharge, cut-off or minimum permissible voltage for both circuit and battery, and temperature at which battery is to

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operate—just to name a few important items. Pricing is very important, too. One other very important characteristic of batteries is their physical size. You can't begin to imagine the vast number of standard shapes available. To get all the facts on dry cells, it's best you pick up a copy of *"Eveready" Battery Applications and Engineering Data* published by *Union Carbide Consumer Products Company*. Just thumbing through the pages of this reference text you will discover that you can design circuits for voltages up to 510 volts and use a carbon-zinc battery to power it. You'll learn how dry cells generate power, the important differences between carbon-zinc, alkaline, nickel-cadmium, mercury, and silver batteries will become apparent, plus many other facts too numerous to mention. This book is a *must* for all experimenters' book shelves.

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

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

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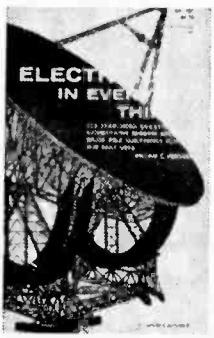
Radio circuits are treated one stage at a time, each followed by test procedures and quick reference trouble-shooting charts that easily locate the stage with a defective part. The text includes special trouble-shooting techniques for auto radios, transistor portables, FM receivers, and other special types of sets. This well prepared volume is a *must* for your service bench. Your ol' Bookworm suggests that you write to the *McGraw-Hill* people and ask for literature on their "*TV, Radio and Audio Servicing Course.*" It's worth while looking into.



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What's the Answer. In an interesting book published by *Barns & Noble, Inc.* 113 searching questions and answers are given about the major role electronics plays in our daily lives. The author, *William C. Vergara,* interprets the wonders of electronics for the

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non-technical reader in his book, *Electronics in Everyday Things*. To kick off, the author starts with the question, "What is an electron?" From there he goes to several others which can be answered by most electronic texts. However, the author then answers such questions as: Can the human heart be speeded up electronically?, Can noise banish pain?, Do fish use electronic radar?, What is an ion rocket?, and many others. Your ol' Bookworm found countless questions and their answers of immense interest. Forty-nine diagrammatic drawings by author and nine pages of photos add clarity to some of the more complicated questions.

An unusually good text on pulse technology has been published by *John Wiley & Sons, Inc.* and is the original work of *William A. Stanton* of Orange Coast College, California. The text, *Pulse Technology*, is a practical treatment of laboratory-tested pulse circuits, including computer topics closely

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related to pulse technology. This is an intermediate textbook for the electronic technician. The author explains circuit phenomena through the application of basic laws: Ohm's law, Kirchhoff's and Joule's laws, Lenz's law and Child's law. The author does not rely on mathematics as a crutch, but prefers to use simple, direct language. If your current work or hobby brings you close to the field of pulse technology, your Bookworm suggests you look into this text.

Tube Substitution. If you are like many other electronics experimenters across the nation, you have a spare parts box filled to the brim with odd-ball tubes you may never

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use. Or you may be a part-time radio or TV serviceman who can't afford to stock up on "ump-te-ump" tubes. In either case and many others too numerous to mention, the *Howard W. Sams* text, *Tube Substitution Handbook*, is for you. The first section of this cross reference covers American receiving tubes, listing nearly 7000 substitutes for over 2,000 types. Other sections cover subminiature types, industrial tubes, communications and special purpose tubes, foreign types, and picture tubes. Instructions accompanying the various sections provide guidance in making proper substitutions, in addition to suggestions for cross-referencing between sections for additional substitutes. This is the seventh edition of this reference, and, as usual, it has been meticulously compiled by the *Howard W. Sams Engineering Staff*.

Publishers. The publishers of the texts in this issue's Bookshelf are listed below with their addresses. When writing to a publisher mention that you read all about it in RADIO-TV EXPERIMENTER.

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Positive Feedback

(Continued from page 14)

will have to pay a royalty charge of 50¢. Transmitter manufacturers will pay a fee of $50 per transmitter and makers of test signal generators used in servicing FM stereo equipment will pay a royalty of $1 per unit. ■

Color TV, once priced well above the average man's pocketbook, may be a standard fixture in 50 million living rooms in the next five years. Many American manufacturers have dropped the price of their cheapest 1964 color sets down to $399, but price will be knocked down about another $100 this summer. As we go to press, Sears, Roebuck and Co. is marketing a compact Japanese-made color TV set featuring an exclusive 16-inch picture tube and a frame-grid tuner to cover all 82 UHF and VHF television channels.

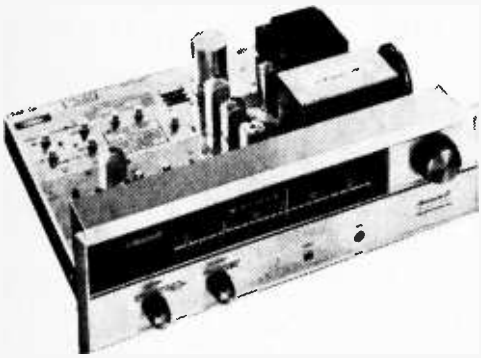
The Sears' set (and many other small-screen, color sets soon to come on the market) is a Japanese product. While the U. S. was in its moon race with Russia, the American leadership in consumer electronics was all but handed to Japan, who used considerable capital and engineering "egg heads" to wrestle the *radio leadership*, and possibly the *TV leadership* as well, away from us. However, due to considerable layoffs in the military electronics field, an acceleration of engineering-effort trend has been noted in consumer electronics. We may be now at the turning point and may very soon completely eliminate the Japanese challenge to our world leadership in consumer electronics. ■

"Gonna sign off, OM, and go for a swim."

NEW PRODUCTS

High-Fidelity Solid-State Tuner

The vacuum tube may go the way of the cat-whisker crystal if the semiconductor trend in hi-fi systems continues. *H. H. Scott* has beat a path to the maker of a better transistor and has come up with a new transistor FM-stereo tuner, retailing at only $259.95. The new Model 312 includes six



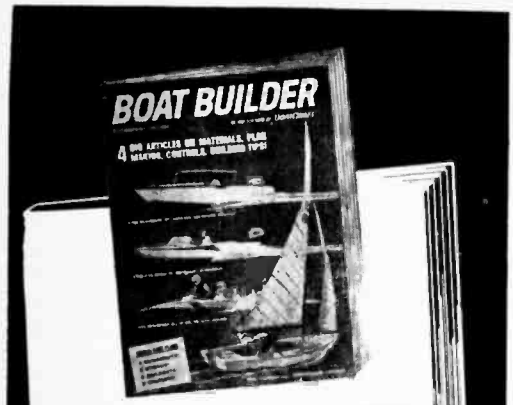
major engineering innovations: exclusive "Comparatron" provides foolproof silent automatic stereo switching, which is not affected by momentary changes in signal strength; "Flat Line Limiting" circuits assure quiet, noise-free FM reception, impervious to automobile ignitions and other electrical disturbances; new *Scott* silver-plated fournuvistor front end achieves maximum sensitivity, greater reliability, longer life, and guaranteed stability over years of use; *Scott's* exclusive AGC controlled IF stages assure perfect stereo reception without overload, eliminate the need for "local-distant" switch (there are four all-silicon IF's); new solid-state Series Gate multiplex circuitry makes possible separation in excess of 35 db; bi-symmetric audio output stage guarantees exactly equal output on each channel assuring truly professional off-the-air tape recordings. Usable sensitivity (IHFM) of the *Scott* 312 is 2.2 uv (minimum); signal-to-noise ratio: 65 db; distortion: under 0.8%; drift: less than 0.02%; frequency response (in stereo): ± 1 db, 30-15,000 cycles; capture ratio: 4 db; selectivity: 35 db; cross modulation rejection: 80 db; AM suppression: 55 db; accuracy of calibration: 0.5%; separation: 35 db; dimensions 15½"w x 5½"h x 13¼"d in optional accessory case. (*For complete specification sheet on the Model 312, write to H. H. Scott, Inc., Dept. P-706, 111 Powdermill Road, Maynard, Mass.*)

Repair Kit For Tape Recorders

For those who find it hard to tape it because their recorders need minor repairs, there's now a Professional Tape Recorder Maintenance Kit available at just $14.95. A product of *Freeman Electronics Corporation*, the MK-100 kit contains a tape splicer, head demagnetizer, head cleaner, head lubricant, mechanism lubricant, splicing tape and special Q-tips for reaching less accessible parts. All items are conveniently packaged in a charcoal gray, leatherette finish, compartmentalized box, that serves as a permanent container for all tape recorder maintenance supplies. (*The MK-100 is available from Freeman Electronics, Dept. 706, 729 N. Highland Avenue, Los Angeles 38, California.*)

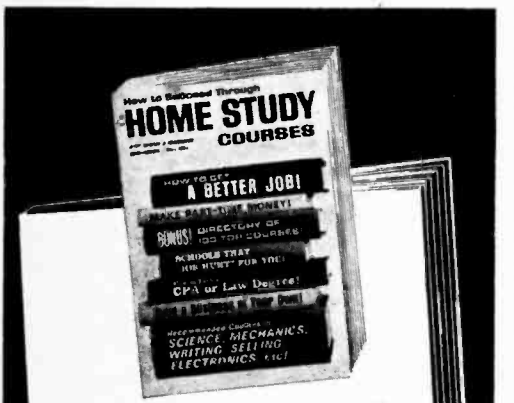
Noise-Cancelling Low-Cost Microphone

Here is a hand-size mike recommended for amateur radio, citizens band, and PA work where a rugged microphone is required. Made by *Shure Brothers, Inc.*, the new Model 202 is a ceramic type that features a noise-cancelling port in the top of the case that provides a sharp roll-off of the frequencies where background noise most seriously affects intelligibility. This unique design feature provides clear, crisp, natural voice reproduction. The unit is sturdy, high impact



Detailed plans and complete step-by-step instructions on how to build every type boat found on inland lakes and coastal waters. Includes outdoor run-abouts (10) to 15 feet), hydroplanes (7 to 11 feet), car-top hunting and fishing boats, cruisers (15 to 27½ feet). Plus informative articles and tips on boat building, installing steers and controls, which woods to use—and more.

BOAT BUILDER
BoatCraft's Fall Edition
No. 702



Dozens of practical and constructive suggestions to improve your present position or to stabilize your career plans for your future. Contains a complete directory of courses, giving time, scope and job prospects, plus informative stories such as What's New in Home Study?, Home Study is the Key to: A Better Job; The Professions; A Business of Your Own; A Better Job.

HOME STUDY COURSES
Fall Edition
No. 703

NEW PRODUCTS

plastic case and fits comfortably in the palm of the hand. It is equipped with a heavy duty push-to-talk, non-locking switch, designed to withstand severe operating conditions and constant usage. Price: $20.00. (*For more information on the Model 202 and other models, write to Shure Brothers, Inc., 222 Hartrey Avenue, Evanston, Illinois and tell them you read it in* RADIO-TV EXPERIMENTER)

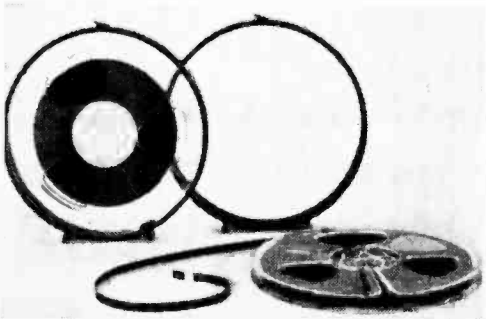
New Electronic Brain Checks Out Car Engines

An "electronic brain" hardly bigger than a bread box, that completely checks out any engine's ignition system in less than five minutes, has been introduced by *GorDon Industries, Inc.* This "ignition trouble analyzer" tests the starter, coil, condenser, rotor, cap, points, plugs, battery and all ignition wiring, checks out the low- and high-voltage systems and even AC ignition pulses. It can be used with conventional or transistorized ignition systems running on 6, 8 (marine) or 12 volts. The "minuscule" power required comes from the ignition system itself. Special snap-on leads fasten to the distributor primary lead and any convenient ground. A third lead connected to an ultrasensitive probe ferrets out the trouble spots. The *GorDon*

700 Ignition Trouble Analyzer differs from conventional engine test instruments and oscilloscopes in that it checks ignition systems operating under full load. The analyzer has built-in protection: it can't be hurt by being hooked up backwards, nor can it injure any electrical component in the engine. Magnetized rubber feet hold the anlyzer on the hood or fender without scratching the finish. List price for the analyzer fitted with a carrying case and including the two test leads and the probe is $129.50. (*Additional information is available by writing directly to GorDon Industries, Inc., Dept. RTVE, 7601 Wayzata Boulevard, Minneapolis, Minn.*

Tape Accessory For Tape Storage

A simple "snap-around" ring to enclose a standard seven inch diameter recording tape reel which prevents tape reel warping, tape spillage, and dust contamination has been developed by *Hudson Photographic Industries, Inc.* Although not a storage can, the reel container, called "Lock-A-Matic Ring Stand," provides all the functions in one easy to handle plastic ring which snaps



NEW PRODUCTS

around the outer rim of any style seven inch diameter recording tape reel. The ring has a simple snap lock to secure the ring to the reel. Each Lock-A-Matic Ring Stand has a foot section to allow the reels to be stored vertically. Lock-A-Matic Ring Stands are available through most hi-fi equipment stores and many photographic stores. They cost 39¢ each or 3 for $1.00. (*If not available locally yet, write to Hudson Photographic Industries, Inc., Irvington-on-Hudson, New York. Be sure to mention* RADIO-TV EXPERIMENTER.)

23 Channel CB Transceiver

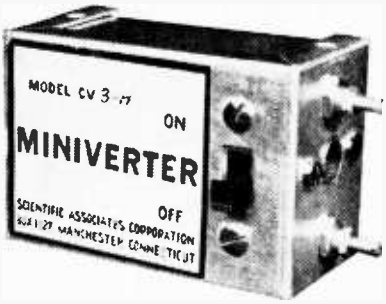
The new Citi-Fone, Model SS, from the *Multi-Elmac Company*, features full 23-channel, crystal-controlled operation, Delta tuning, triple tuned RF, "noise immune"

squelch, ASG noise limiter, illuminated channel selector and dual function panel meter, AC/DC power supply and "Tone Guard" connector. The Citi-Fone, Model SS is shipped complete with all crystals, AC and DC power cords, mounting bracket and microphone. Price is $169.50. (*More information can be had by writing directly to Sales Manager, Multi-Elmac Company, 21470 Coolidge, Oak Park 37, Mich. Be sure to mention* RADIO-TV EXPERIMENTER.)

Solid State Device For Short-Wave Listening

Now with the aid of a precision electronic device manufactured by *Scientific Associates Corporation of Manchester*, hobbyists, boaters, sports car fans and flying enthusiasts can convert any radio to a shortwave receiver The device, called the "Miniverter," is de-

signed to be inserted in the antenna lead of a radio and by doing so, converts it to a sensitive shortwave receiver covering any one megacycle hand from 1 megacycle to 160 megacycles. Sports car fans can use the Miniverter to obtain time checks from either the Canadian Bureau of Standards, Station

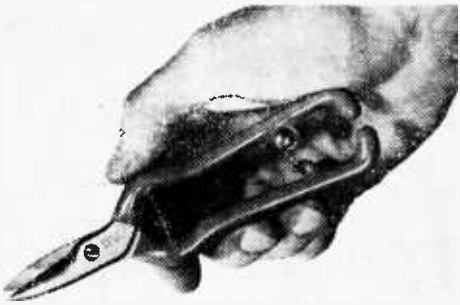


CHU or from the National Bureau of Standards, Station WWV. Boaters listening to the marine hands can determine weather and fishing conditions long before reaching their boat. Other models cover aviation, amateur radio and citizen bands. Designed primarily for use in mobile applications, the compact unit measures only 3" x 2½" x 1⅝". Its input accepts a standard Motorola plug and its output terminates with a Motorola plug on a 12" length of coaxial cable. Merely insert the car's antenna lead-in into the input jack and the output lead into the car antenna jack and you are ready to listen. A simple on-off switch selects between regular broadcast reception and shortwave reception. Added sensitivity and selectivity is provided by a tuned RF stage while a crystal oscillator stage eliminates drift problems. The Miniverter is available in nineteen standard models carried as stock items. Price starts at $14.95. Frequencies not covered by standard models are available upon special order. (*For more information, write Scientific Associates Corporation, Dept. 56, P. O. Box 1027, Manchester, Connecticut.*)

Snips For Experimenters

New fine wire and filament cutters for electronic assembly and service work have been added to the *Xcelite* line of professional hand tools. Made of high carbon, hot drop-forged tool steel, the No. 86 Electronic Snips may also be used for removing insulating coverings and for cutting sheet metals and other light materials up to .025" thick. Hobbyists, electricians and jewelers will find additional applications for the snips. Shearing

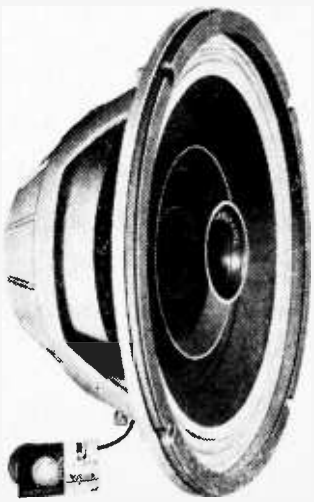
NEW PRODUCTS



action of the short, pointed blades prevents peaks on cut wires and damaging shocks to components in electronic assemblies. A conveniently located, thumb-operated latch keeps snips closed and a coil spring returns the blades to open position for smooth, continuous cutting. Blades are polished and chrome plated. List price is $3.90. *(Further information may be obtained by writing Xcelite Incorporated, Dept. 706, Orchard Park, N. Y. for Bulletin N464.)*

New High-Fidelity Loudspeaker Line

Jensen Manufacturing Company, maker of high-fidelity speaker systems and sound accessories, has added a new line of advance designed, low-cost, high fidelity speakers called the DELTA Series. This new series consists of the Model DL-220, a 3-element, 12-inch coaxial unit priced at $34.75; Model DL-120, a dual-cone, 12-inch speaker priced



at $21.50; and Model DL-80, a dual-cone, 8-inch loudspeaker priced at $15.25. Each of the speakers in the new DELTA Series offers these outstanding features: precision Syntox-6 magnetic systems; exclusive low-distortion Flexair suspensions; binding post terminals for quick, easy connections; attractive die-cast housings for permanent alignment; and stable spider suspensions for positive voice-coil centering. Complete specification information on the DELTA Series is given in *Jensen's* new 2-color brochure MY which will be sent free upon request. *(Write to Jensen Manufacturing Company, Dept. RTE, 6601 S. Laramie Avenue, Chicago, Ill. 60638.)*

Citizen Band Transceiver With 23-Channel F-S Control

The newest unit to the *Sonar Radio Corp.* line of CB equipment is the FS-23 transceiver that incorporates every feature that is necessary without having the need to buy additional crystals to bring in any one of 23 CB channels. The *Sonar* uses 13 tubes, 2 silicon diodes, 1 germanium diode and 12 hermetically sealed crystals to perform in 19 stages aside from the power supply which uses 2 power transistors and 4 silicon rectifiers. The oscillators are of the fundamental type and provide a higher degree of transceiver stability under all operating conditions. Continuous one control channel switching with 23 frequency-synthesized (F-S) crystal-controlled channels plus many other features make the FS-23 a good buy at $299.95. A *Sonar* Selective Call unit (59.50) and Vox Anti-Vox Unit ($32.50) are two valuable accessories you can add on to your *Sonar* FS-23. *(A fully descriptive catalog sheet with more specific technical information can be had by writing to Sonar Radio Corp., Dept. 706, 73 Wortman Avenue, Brooklyn, New York.)*

(Continued on page 36)

RECONVERTED from a "mothballed" troopship by Sperry Rand Corp., the Gen. *Arnold* is now rated the world's largest (14,000 tons), completely instrumented missile-tracking ship.

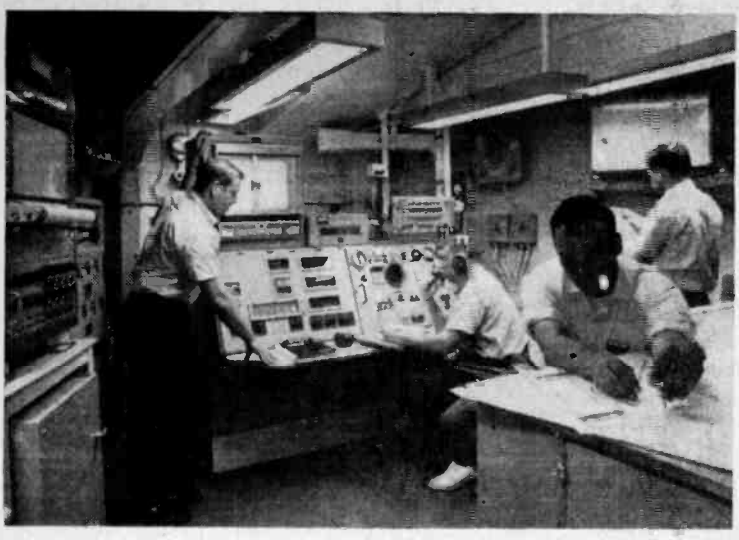
By J. C. Phillips

DESCRIBED as a "floating range station," the converted troop transport *General Henry H. Arnold* carries enough space age electronic gear to make it the equal of most of our highly developed land missile-tracking sites. It is officially listed as an Advanced Range Instrumentation Ship (ARIS).

The 14,000-ton vessel is propelled by steam turbines generating 9,000 hp, enabling it to speed at over 17 knots. Crew facilities include a hospital, lounges, laundries, staterooms, and a galley sufficient to support the crew for long periods at sea. When the U. S. Air Force vessel goes to sea it usually carries 100 crew members and 65 scientists and electronics technicians.

The vast amount of electronic gear and telemetry instrumentation that fills the ship's decks and interior compartments has extended the instrumented length of the Atlantic Missile Range (AMR) to more than 10,000 miles. Three 30- to 40-ft.-diameter radar reflectors are atop massive mounts placed between the stack and bridge. These parabolic "dishes" enable the ship to track an object the size of a baseball at 300 miles, while telemetric devices aboard can receive 800,000 bits of information each second of computered operation.

Officials estimate that knowledge gleaned from pre-impact data can lead to a 50% increase in intercontinental ballistic missile (ICBM) effectiveness. Other ship-gathered data may help to develop an anti-ICBM device. Man-in-space operations, lunar, and deep-space probes are all expected to benefit from the *General Henry H. Arnold's* operations as a floating tracking station. The Air Force operates a second ARIS, named *General Hoyt S. Vandenberg.* ■



Navigation control console is built around an inertial guidance system that locates the tracking ship's position within a matter of yards in relation to Cape Canaveral, Florida, the missile launching site.

Master control in operations center (below) has a "hot line" into every corner of the ship. It controls a complex linked by some 80 miles of cables and can gather over 100 million bits of information on flights.

ES

Univac 1206 computer (left, rear) processes post-launch and flight data to help ship's radar and telemetry units function quickly and accurately when a launched missile comes into range.

NEW PRODUCTS

(Continued from page 32)

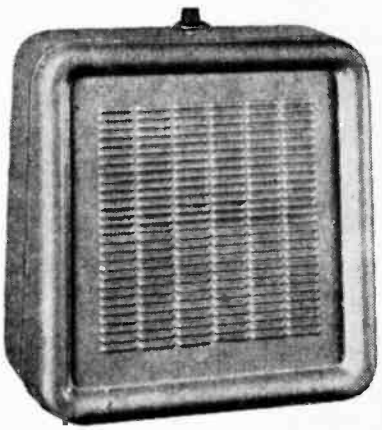
Darkroom Enlarging Aid

If you've ever done any darkroom photo developing, then you know that the most important step—the determination of the proper printing paper contrast and exposure time—is guessed by the worker's "trained eye." The result is usually a large and wasteful expenditure of time and paper in order to get one correct print. Now a computer system that takes the guesswork out of this vital step has been introduced by the Heath Company. Called the Mitchell Fotoval Computer System, this unique darkroom aid permits a scientific and accurate calculation of correct exposure times and photographic paper grades or contrast filters. The Fotoval Computer was invented by photography enthusiast Robert Mitchell, and engineered by

Heath in conjunction with its sister company, Weston Instrument & Electronics. It is scientifically designed to measure the projected photographic negative, and indicate the exact contrast and exposure. As a result the operator can quickly make uniformly correct prints each and every time, thus realizing very substantial savings in time, paper and money. Basically the Fotoval Computer System provides any darkroom worker with the final standard to control all variables in his darkroom, and blend them into a precise enlarging system. Such factors as variation in paper sensitivity from package to package, enlarging lenses, and problem negatives can now be controlled. The Fotoval Computer is truly a "control center" for your darkroom. The Fotoval Computer System is available in a money-saving kit form through the Heath Company for $89.00. *(A postcard addressed to Heath Company, Dept. 76, Benton Harbor, Michigan, will bring full details. Or you may purchase the Fotoval in factory assembled form at any Weston Photo Dealer throughout the country.)*

Patio Hi-Fi Loudspeaker

To enhance your favorite outdoor relaxation, Utah Electronics has come up with an all-weather speaker which can be fastened to the outside wall of your house. Your choice of music or radio program can be your companion while you prepare dinner over the charcoal, sun-bathe, or putter around with the landscaping. Guests, too, will enjoy music while sipping a cold beverage or dancing on the patio. The Utah MOD-8 is supplied complete with an L-pad volume control (to save trips into the house) and 25 feet of speaker



wire. Installation is simplified by use of two key-hole type slots in the rear cover. All fiber parts are moisture-proofed and the rose-beige finish is baked on. Dealer Net Price is about $10.00. *(For more data, write to Utah Electronics Corporation, Dept. TVE, 1124 East Franklin Street, Huntington, Indiana.)*

When writing to manufacturers, tell them about your hobby interests. They may have many other products, both old and new, that you may not know about. ■

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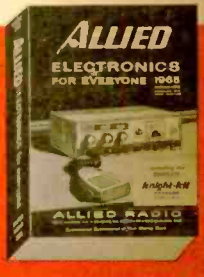

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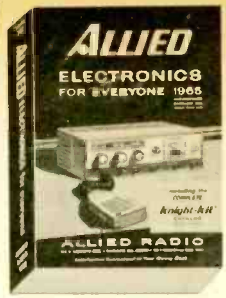

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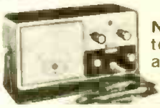

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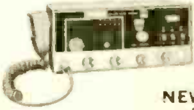

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Ask Me Another

By Leo G. Sands

RADIO-TV EXPERIMENTER *brings the know-how of electronics experts to its readers. If you have any questions to ask of this reader-service column, just type it on the back of a 4¢ postal card and send it to "Ask Me Another," RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, New York 10022. The experts will try to answer your questions in the available space in up coming issues. Sorry, the experts will be unable to answer your questions by mail.*

Q. The radiator of the two-meter ground plane antenna I am using with my 152-174 mc FM receiver is 17½ inches long. To what length should it be cut for best performance?

—W. B. T., Atlantic City, N. J.

A. The length is approximately correct for the 152-174 mc band. I wouldn't cut it. If you want longer receiving range, I suggest the use of very low loss coaxial cable, such as one of the new foam types. To get even better results, replace the antenna with one of the omni-directional gain types. They are bigger and cost more, but some increase signal strength by as much as 6 db. But, the most important thing is to get the antenna up high as possible.

Q. What is the difference between a loop antenna and an inverted "L" antenna?

—D. P., Baltimore, Md.

A. A loop antenna is a coil of wire which serves as both the antenna and the receiver's tuned input circuit, as illustrated in Figure 1. The loop antenna may have an air core, or it may be wound on a ferrite core to form what is known as a loopstick. It is directional and therefore must be positioned with respect to the direction to the station for maximum pick-up when listening to a weak signal.

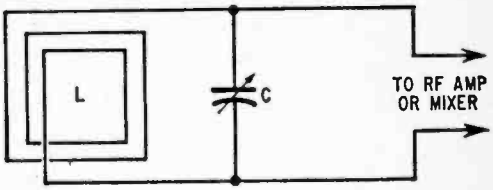


Fig. 1. Loop antenna.

An inverted "L" is generally an untuned antenna made of wire and installed out of doors, as illustrated in Figure 2. The lead-in is connected to one end of the antenna. When the lead-in is connected to the center of the antenna, as shown in Figure 3, the antenna is known as a "T."

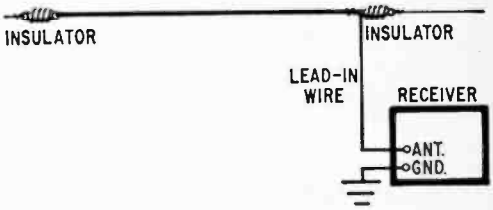


Fig. 2. Inverted "L" antenna.

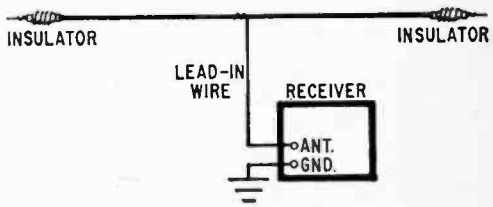


Fig. 3. "T" antenna.

Q. I have a 6-transistor table radio that makes screeching and grating noises every time it is turned on. What can I do to fix it?

—M. C., Port Huron, Mich.

A. Sounds like a noisy volume control, a common trouble. You might get a bottle of volume control cleaner and squirt some of it inside the volume control through an opening and twirl the knob several times. If this does not cure the trouble, you could

Ask Me Another

write to the manufacturer and buy a replacement volume control. Your local radio parts store might have an equivalent part in stock.

Servicing transistor radios requires skill and extreme care. If the volume control is not accessible or if it is not the cause of the trouble, you should take it to a shop that has experience with transistor sets.

Q. When I am tuned into a station while listening to my short wave receiver and turn the set off and then turn the set back on again after a few minutes, why do I receive a different station?

—L. W., Cranford, N. J.

A. The frequency of the local oscillator can vary with temperature and its plate voltage. Its frequency determines the frequency your receiver picks up. When you first turn your receiver on, its frequency drifts until the local oscillator becomes stabilized. It may take 20 minutes or longer to reach stability. When you turn the set off, it starts to cool. When you turn it back on again, the temperature starts to rise again. Oscillator plate voltage is affected by the change in plate current which may vary until stability is reached. To avoid this effect, let the receiver warm up for at least 20 minutes before starting to depend upon its ability to stay tuned. Don't turn it off until you are through using it for several hours.

The same effect can take place in a regenerative receiver whose detector frequency varies with plate voltage and temperature.

Q. I would like to receive police calls with my auto radio. What equipment do I have to install?

—J. A., Paterson, N. J.

A. You can get a VHF converter, such as the one manufactured by Hartman Marine Electronics Corp. for around $50. By using what is called "slope detection," FM signals can be heard with an AM auto radio. However, it is illegal in some cities and counties to have a radio in your car cap-

able of tuning in police calls without special authorization. There is no ban on listening in on other kinds of mobile radio stations, but you may not divulge what you heard to any one. This is covered by the secrecy clause of the Communications Act of 1934.

If you do plan to install a "police-call" receiver in your automobile, we suggest you contact your local and state police agencies at once. Be sure you have their written permission before installing any equipment in your car.

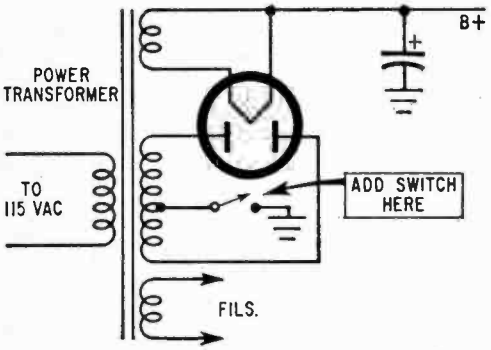


Fig. 4. Plate voltage cut-off switch for a tube-type, full-wave rectifier circuit.

Q. So I can leave the filaments of the tubes in my AM/FM radio operating continuously to prolong tube life, but without having the tuner consume its full 75 watts when not in actual use, can I add a filament transformer and a switch so I can cut out the main power transformer?

—P. S., Hartford, Wis.

A. You don't need an extra transformer. All you have to add is a switch (preferably a toggle switch) to open and close the high voltage circuit without affecting the filament circuit. Where to connect the switch depends upon the power supply circuit used in your receiver. If a full-wave vacuum tube rectifier is used, the switch can be connected in series with the center tap of the high voltage secondary winding of the power transformer, as shown in Figure 4. The same circuit can be used if the receiver employs a full-wave selenium or silicon rectifier.

If the receiver employs a full-wave bridge rectifier, the switch is connected in series with one of the high voltage leads, as shown in Figure 5. Or, if a voltage doubler rectifier is used, the circuit shown in Figure 6 can be employed.

Ask Me Another

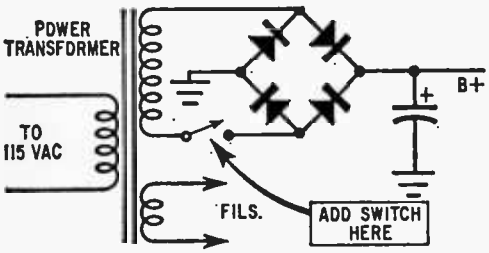


Fig. 5. Plate voltage cut-off switch for full-wave, diode bridge rectifier circuit.

When the switch is open, the plate voltage is cut off and the life of filter capacitors and the tubes is extended. It is the turning off and on of the filaments that reduces tube life.

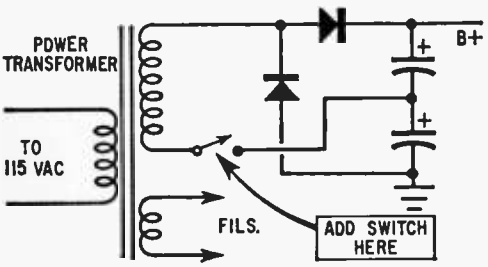


Fig. 6. Plate voltage cut-off switch for voltage-doubler, half-wave power supply.

Q. Can I operate a transmitter in the 10-kc space between the channels in the citizens band as long as I stay within the band?

—R. K., Southampton, Mass.

A. Yes, if you operate the transmitter at less than 100 milliwatts input, without a station license, and otherwise in accordance with the requirements of Part 15 of the F.C.C. Rules and Regulations. However, you will not be allowed to communicate with citizens radio stations which are licensed.

A licensed citizens radio station may be operated only on the specifically allocated channels within the band and the transmitter must operate at a frequency within 0.005% of one of the channel frequencies, a tolerance of about 1.3 kc. It is unlawful for anyone but a licensed radio operator (first or second class) to adjust the transmitter oscillator circuit.

It is not practical to use the space between the channels, even if it were permitted, when using commercially available AM citizens radio equipment since there is actually no space left between the channels when you allow for sidebands, frequency tolerance and receiver selectivity.

Q. I want to build a directional antenna for broadcast band DX'ing. What do I have to do?

—M. C., Rockford, Ill.

A. It's not easy. Acres of ground are required for a truly effective directional antenna for the AM broadcast band, and it may not be worth the cost and effort. It is relatively easy to build a directional antenna for the short-wave bands since the antenna elements are relatively short. For the broadcast band, they would have to be several hundred feet long.

Broadcast band DX is complicated by the

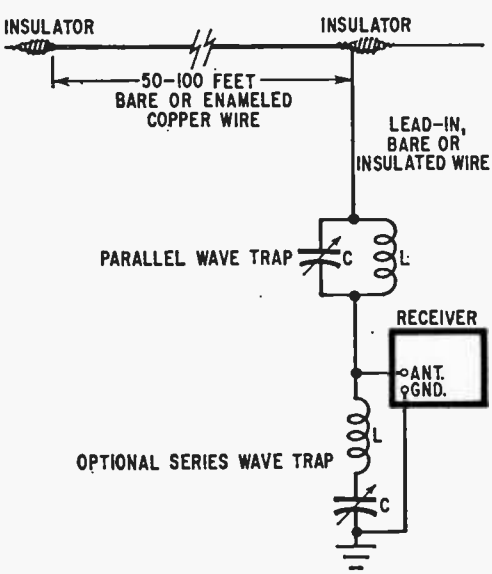


Fig. 7. Long wire antenna system for the broadcast band. Wave trap (L and C) can be either series or parallel type. Values are: C—365-mmf. variable capacitor (Lafayette Radio MS-214); L—antenna coil, primary winding not used (Meissner 14-1004).

fact that there are only a few stations which do not share their frequency with another station. To receive stations which operate on a shared frequency, you may have to wait until only one of the stations is on the air at the time.

You can expect to enjoy DX reception at night if you have a sensitive and selective receiver and an outdoor antenna. Your biggest problem may arise from your local 5000-watt station on 1440 kc. Your other two local stations on 1150 kc and 1330 kc are daytime stations. With a long antenna, the strong local station may overload the front end of your receiver, causing interference to be generated within the receiver and desensitization of the receiver. This can be reduced or relieved by connecting a wave trap in series with the antenna or across the antenna-ground terminals as shown in Figure 7. Tune the wavetrap until the local station signal is weakest.

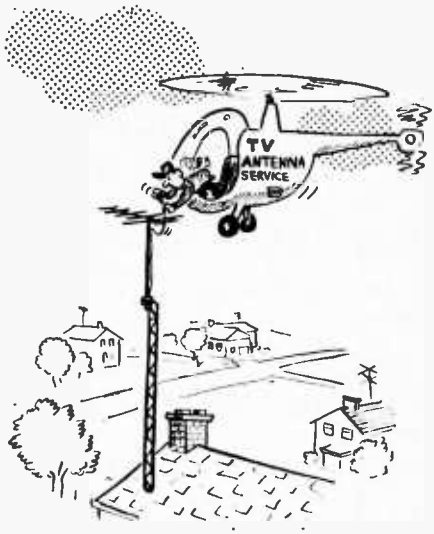
Q. If I do not understand the language spoken by a foreign station, what data should I take down to prove reception when sending for a QSL card?

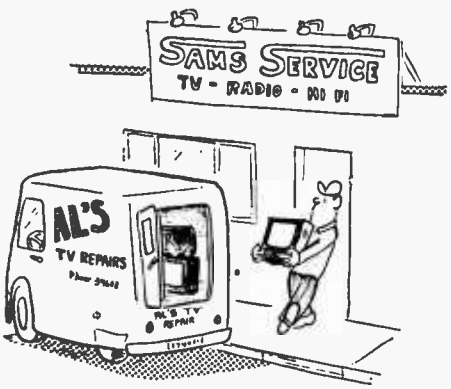
—E. J. R., Philadelphia, Pa.

A. Note the exact listening period in Greenwich Mean Time. State whether program material was voice or music, and if voice, whether male or female; if music, give general description or name the piece—state if brass band, symphony, guitar, etc. Give station frequency as near as you can and the quality of reception. Add any other information that you may understand or deduce. And use a typewriter. ■

"Horrace, brush up on your CW for a couple of weeks and come back; I'll test you again for your Novice license."

"Ease off a little, Ed!"

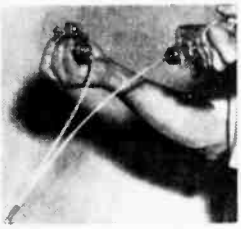




THE BUSINESS END OF TV REPAIR

". . . Unit 7—proceed immediately to coffee shop—pick up two black, one with cream, six donuts. . . ."

"I'm telling you, Boss, it just doesn't sound right!"



ABOVE, dowsing effect was measured by attaching torqmeters to nylon and whalebone dowsing rods. Meters recorded dip. Water was found in the area.

Proof of Dowsing?

DOWSING—the art of divining or witching for water by means of a forked stick or rod—has been denounced as an outright fraud by those who have never seen it demonstrated. But farmers, woodsmen, and many scientists believe that in the hands of an experienced dowser, the forked stick is an almost infallible method of discovering underground streams and pools.

In an effort to provide scientific measurement of the dowsing effect, Power Instruments, Inc., of Skokie, Ill., recently loaned two of their dynamic torqmeters to one of America's leading dowsers, Norman Evans of Georgetown, N. Y. The meters were attached to both nylon and whalebone dowsing rods, and photographs were taken of the results. Torque measurements (the amount the rods dipped) were 24 oz/in and 36 oz/in in different locations. The area measured was later found to be over an underground spring of 1000 gallons per minute capacity!

What causes the dowsing effect? No one knows. Got any ideas? ■

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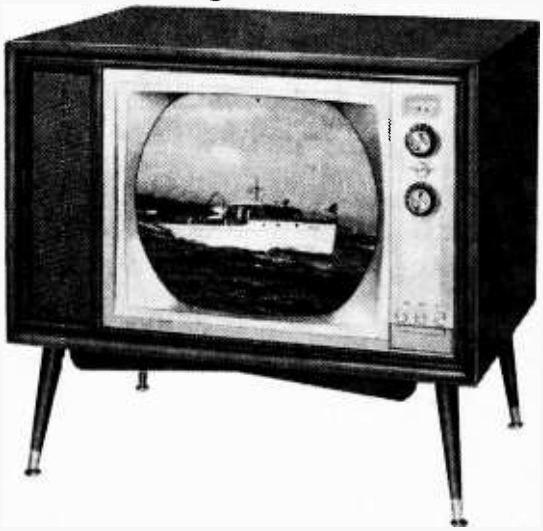

GR-53A
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(Includes chassis, all tubes, VHF & UHF tuners, mask, mounting kit, & special speaker) cabinet optional $49.00

Here's What The Experts Say! Popular Electronics, May issue: "The GR-53A is not a skimpy receiver in which corners have been cut to keep costs down and still provide color TV. Instead, the GR-53A (on a comparison shopping basis) has the same color and sound fidelity, flexibility, and ease of handling as those manufactured receivers which sell for over $600."

Radio-TV Experimenter, June issue: "The repair cost savings during the Heath Color TV set's life compared to commercial units may be more than $200."

Popular Mechanics, February issue: "Mounted, pre-aligned critical circuits enable beginners to assemble. Picture quality is topnotch."

Science & Mechanics, April issue: "Built-in servicing circuits such as a dot generator are valuable aids in getting the set operating for the first time & eliminating expensive service calls & bills when realignment or part replacement is needed later on."

Anyone Can Build It! No special skills or knowledge required . . . all critical assemblies are factory-built & tested . . . simple check-by-step instructions take you from parts to picture in just 25 hours!

Exclusive Built-In Service Center Eliminates Maintenance Costs! You adjust and maintain the GR-53A yourself with the degaussing coil, service switch, and built-in dot generator! No more costly TV service calls! No other set has these self-servicing features!

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Enjoy Complete TV Reception Now! . . . by ordering the new 1964 Heathkit 21" High Fidelity Color TV!

Kit GR-53A, chassis, tubes, mask, VHF and UHF tuners, mounting kit, speaker, 121 lbs. ____$399.00
GRA-53-6, walnut-finished cabinet, 53 lbs. __$49.00

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"DAFT" about the MOON

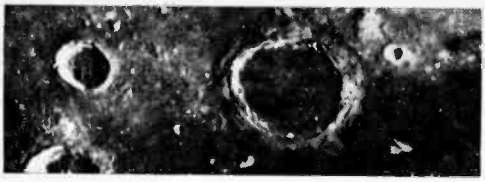
Long before the first astronaut sets foot on the moon, man must land electronic devices to probe the lunar surface and its depths

By K. C. Kirkbride

AT one time or another we were told the moon is made of green cheese—for man's answer to his endless quest to know the nature of the moon has ranged from the ridiculous to the scientific.

As long back as 1609 Galileo found a telescope in Vienna, studied the moon, and twenty years later wrote:

"The prominences there are mainly very similar to our most rugged and steepest mountains, and some of them are seen to be drawn out in long tracks of hundreds of miles."



DAFT about the MOON

For his earnest efforts to contribute to the knowledge of all mankind, Galileo was awarded a long rest in prison. Three hundred years later the Encyclopedia Britannica seconded his theories, added: "These craters in appearance closely resemble the volcanic craters on earth, and it is possible they may have similar origin."

Moon Daft. In 1893 Geologist G. K. Gilbert visited Washington, D. C., seeking funds for his Observatory, exclaimed to a friend: "I am a little daft on the subject of the moon, being troubled by a new idea as to its craters."

Meteors Beat Craters Out of the Moon. Gilbert was inclined to veto the volcano theory, believed the moon looked so beat due to its brushes with none-too-friendly meteors. One Congressman at the time thanked *him* with the comment that he, Gilbert, "has no better way to employ his time than to sit up all night gaping at the moon."

The Dust Settled It. Man hasn't changed his mind much about the moon since Gilbert-Galileo days, except to add some dust. Yet today when many would dismiss the subject others "stay up all night" fashioning ingenious vehicles to solve for all time the secrets of the elusive moon.

In Princeton, New Jersey, a small 4½ pound pistol-shaped camera sits on an RCA laboratory table, waiting its turn at Kennedy to visit the moon. Not quite as large as a carton of cigarettes, it is fashioned with new integrated circuits and a special 70-degree wide-angle lens for on-board Apollo viewing, and a 9 to 35 degree lens to snap distant scenes the astronaut will view from his spacecraft window.

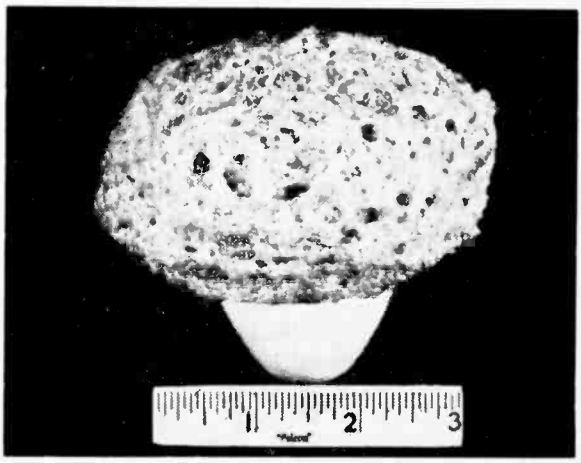
The World's First. RCA engineers believe their Apollo camera will be the world's first space-qualified camera with integrated circuitry capable of sending live television 240,000 miles through space to your living room screen.

On its Apollo trip it will first telecast pictures to earth of crew members during launch and flight, monitor spacecraft panels during flight, view the earth and moon during maneuvers. Once our space men step onto the lunar surface they would focus the RCA camera on moon terrain, telecast pictures back to earth. Receiving stations would then videotape, scan-convert and relay pictures across the country, around the world, showing action on the moon as it *happens* on the moon!

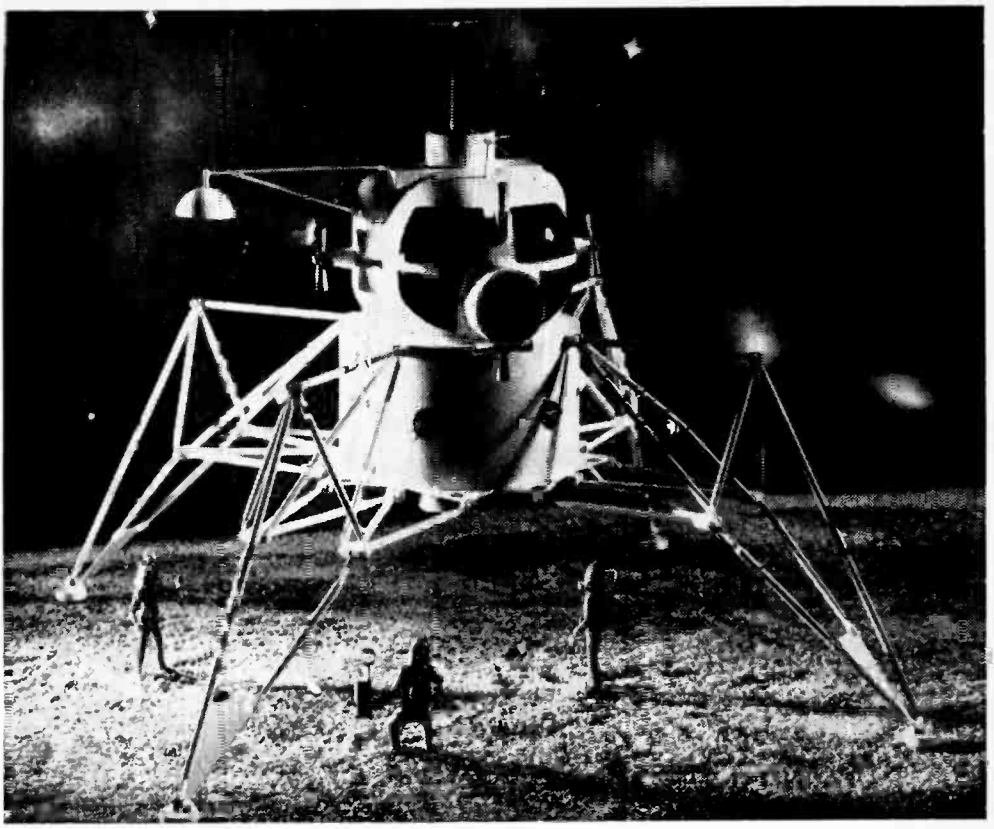
An Aluminum Astronaut! But before that happens, an aluminum "astronaut" is booked for a month's stay on the moon. Striding the laboratory floor at Hughes Aircraft in Culver City, California, an eight-feet-tall, 13-feet-wide aluminum-and-steel astronaut awaits launch in 1965.

Hughes engineers claim Surveyor will weigh one ton at launch, discard its retro rockets just before landing, thin down to 600 pounds to soft-land on the moon, landing more gently than a human parachutist might drop to earth.

Twenty hours after launch-time Astronaut Surveyor will heed radio instructions from NASA engineers, adjust flight path, then target in on the moon. Toward the end of its long 66-hour journey, it will leave its par-

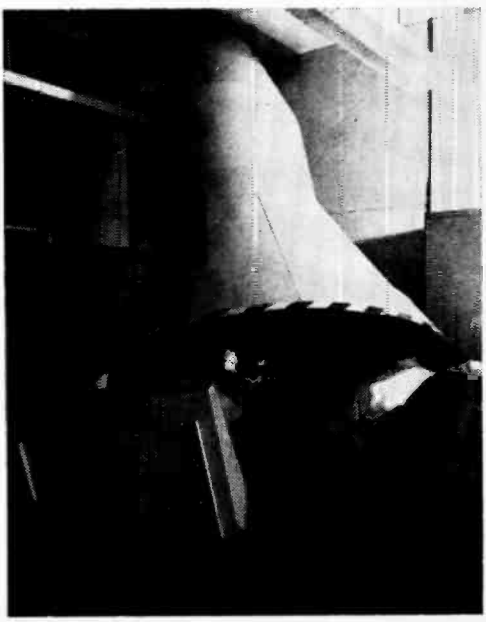


"Green cheese" cured on Earth by Bendix scientists is actually Simolivac (silicon-molten-vacuum), prepared in the attempt to support their theory that the surface of the moon is a porous crust. Unlike many early scientific theories that took years to confirm, theirs may be proven or disproven in a very short time.

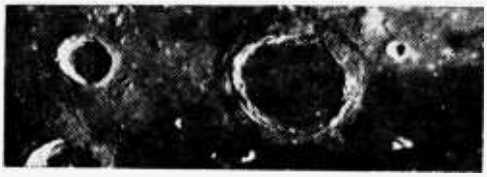


A LEM is not a moon insect but a Lunar Excursion Module to be used in Project Apollo. This 1/20 scale model of the LEM is being used by Bendix engineers to develop vehicle legs for feather-light landings on the moon.

For realism, this advanced simulator provides the training astronaut with a visual, rather than just an instrumented frame of reference.



The "trial balloon" of yesterday has been replaced by the precise spacecraft simulator that exposes the astronaut to the routines, and unexpected emergencies, of future spaceflight.



DAFT about the MOON

ent craft, fire its vernier rockets, slow down to six miles an hour, achieve the first soft lunar landing.

As it surfaces, four television cameras will beam pictures to earth. And once Surveyor settles its sprawling aluminum feet on moon soil, it will turn its television camera eye on the moon's surface to transmit pictures every few seconds to the earth's modernday "daft."

Dig the Moon. But Astronaut Surveyor will dig the moon as well as picture its surface. Surveyor's drill will dig some 18 to 60 inches into the moon's crust, pick up and "feel" its soil. Its instruments will record moon quakes, measure radiation and particle fields in the atmosphere-less "atmosphere" while scientists on earth watch from their television screens.

No Dust. Bendix engineers at Boulder, Colorado, challenge one of our fondest theories about the moon. They doubt the dust.

Bendix men simulated in their laboratories conditions they believe happened on the moon. They simulated molten lava as it would pour from a volcano, in a vacuum, bombarded it with gamma radiation, and produced a porous rock that gives off a shining light like the moon's.

They named their rock Simolivac for "silicon," "molten," and "vacuum"—say a square foot of the hardy material will support four tons of weight. They insist, too, their discovery rules out the dust theory.

But to prove, disprove or improve Gilbert-Galileo theories, they have fashioned a "rover" vehicle to prowl a one-mile radius around Surveyor. As Surveyor judges the texture of the moon's surface, this vehicle will map it, spot hazards to man as he lands.

Back-Seat Driver. To help spot the site for man to land, Engineer Ralph Kinney of Bendix has designed an ingenious "back-seat driving" system whereby an operator on earth will "drive" a vehicle 240,000 miles away—on the moon.

Bendix engineers today simulate the new steering through a closed-loop system with human operator instructing a high-speed Bendix G-20 digital computer to "drive" by remote control radio command.

Applied to Surveyor or Apollo missions to the moon, the Kinney system would mount a TV camera on the moon vehicle, telecast low-frame pictures of the "road" ahead, back to earth.

Driver "Sees" 240,000 Miles Ahead! The driver on earth would feed description of the scene he sees to the computer, radio back the next steering command.

To perfect his ingenious system, Engineer Kinney hurdles problems of TV frame rate, steering methods, transmission time delay.

Of all, time delay may prove the hardest to drive through for the earth-bound "driver" must determine his steering commands from pictures photographed 1.3 seconds *before* he sees them. He will know too, his command won't reach the moon until 1.3 seconds *after* the computer makes the steering decision. And any "crash" could cost millions of dollars, even affect national prestige.

He'll have to be the smartest of back-seat drivers for a signal travels 2.6 seconds round-trip to the moon, leaving an earth-bound driver always 1.3 seconds behind the moon-times.

Computer On the Moon! IBM engineers have devised a hybrid analog-digital computer simulator so far ahead of the times it has already "been" to the moon.

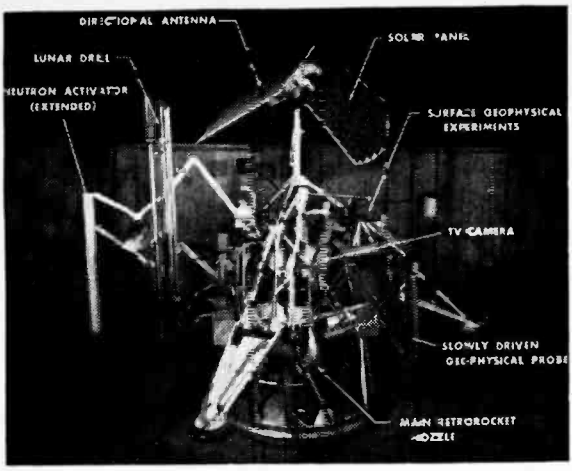
At IBM Space Guidance Center, Oswego, New York, an IBM simulator reproduces the sights, sounds and "feel" (except weightlessness) of a trip to the moon.

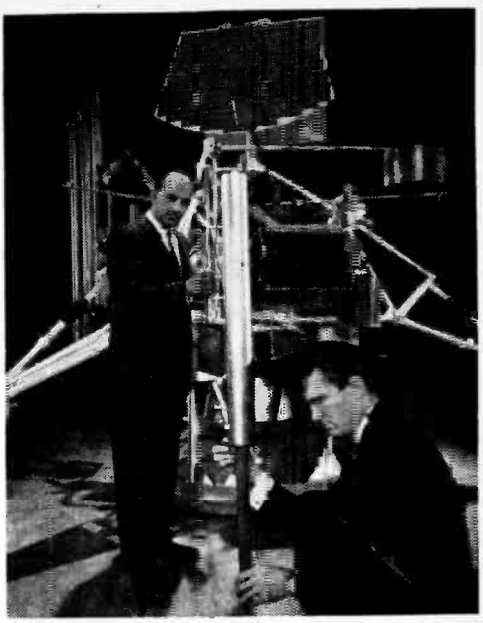
Four live NASA astronauts recently "flew" a Gemini mockup a series of eight-minute runs manually guiding the spacecraft from point of re-entry down to 50,000 feet.

Within two-three minutes after "landing", the computer faithfully reported astronaut flight record, information to judge pilot performance including spacecraft control, target accuracy and the craft's fuel consumption.

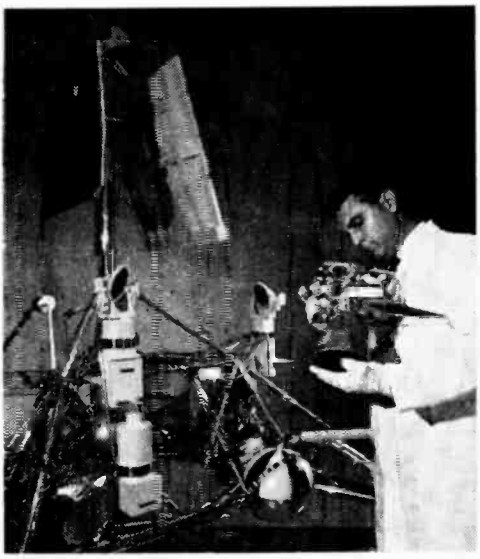
But To Land On The Moon the Space Center has developed an Advanced Simulator, one that simulates all the sights, sounds of launch, earth orbit, rendezvous, mid-course maneuver and lunar landing.

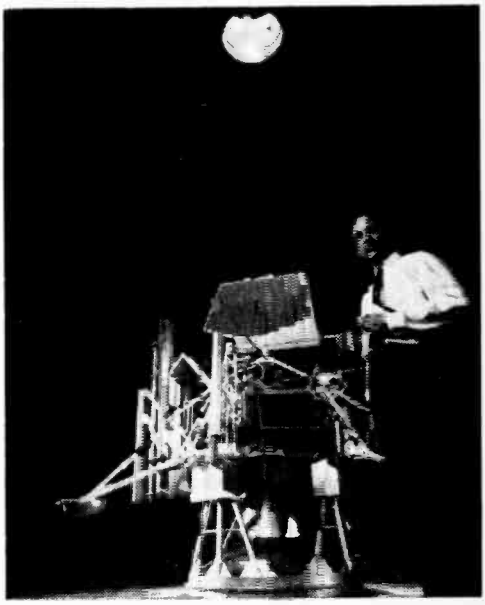
Full on-stage environment is projected through a wrap-up of closed-circuit television, a relief model of the moon's landscape, a sensor display system, all encased in a theater mockup built round the craft.





Surveyor samples the surface of the moon with the probe being examined by the scientists at right. The technician below examines one of the stabilizing vernier rockets. The light, below right, represents the sun whose energy pierces the dark sky to operate instruments.





So when the simulator-naut descends on the moon, he looks out his spacecraft "window", views the "mountains" Gilbert stayed up all night to watch.

A Way-Out Radio Station! All of which sounds like a *David Sarnoff prophecy* coming true. Which it is. For some time ago, the RCA Board Chairman prophesied we would put a roving vehicle on the moon, control it from earth, and conduct surveys in preparation for future manned landings.

Then added: "Exploration of the surfaces of the moon would establish the practicability of installing there the first interplanetary radio relay station controlled from the earth, and capable of providing vital communications and navigational links for space vehicles."

By the time *that* comes true, we may be glad to go back to green cheese! ■

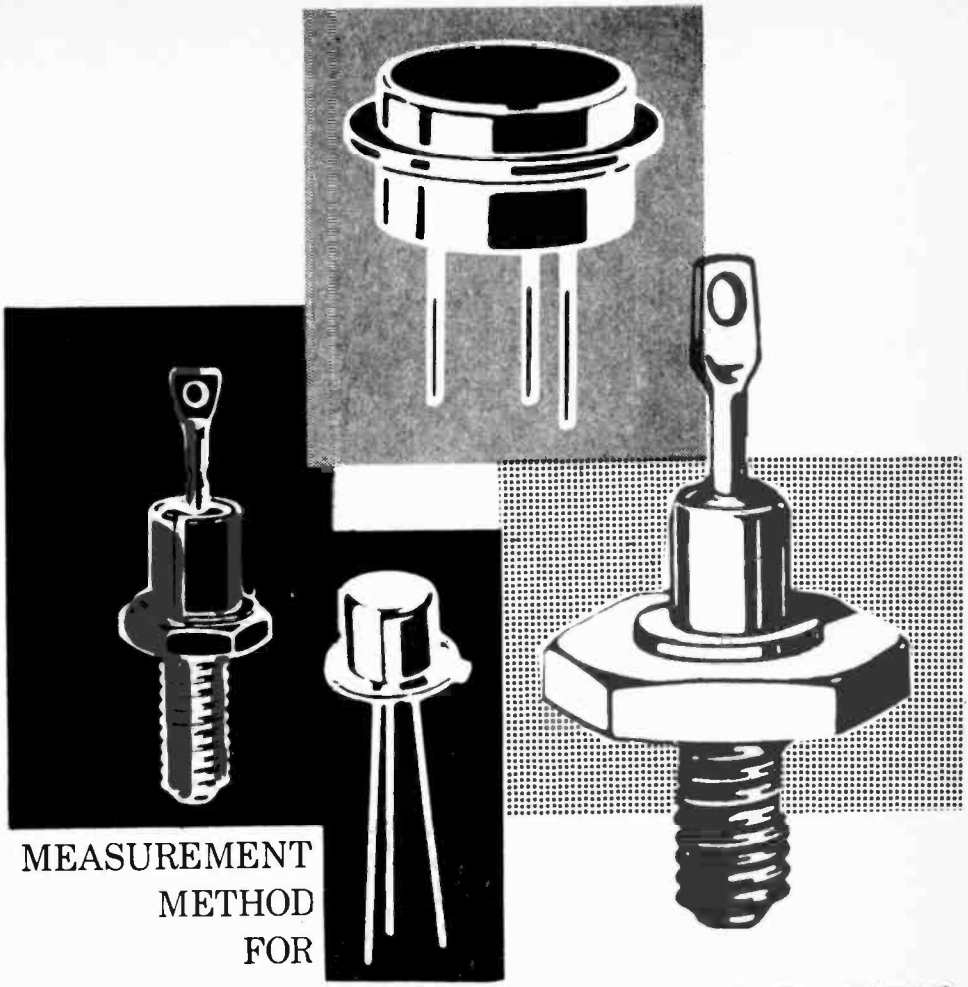
Electronics

Hits the Road

A central communications console (above) and cabinet for storing ice is placed behind the driver's contoured seat. Note curved sofa seat. Television receiver (see extreme right) can be viewed by rear seat passengers and swivel-seated front rider with car in motion.

In the Ford Pavilion at the New York World's Fair is a *luxury lounge* station wagon that is tabbed as a practical dream car. Named the Aurora, this rolling laboratory was made for testing new ideas in styling and engineering. A major objective of the Aurora is to develop new comfort features for greater enjoyment of long trips. Ford stylists designed the interior to accommodate a TV set, three separate AM/FM radios, thermoelectric combination oven-refrigerator units, a tape recorder and a built-in beverage cooler and cabinet. The wagon uses electroluminescent safety lighting, a bank of 12 one-inch sealed beam headlamps, a power-adjustable polarized sun roof, and both indirect and direct interior lighting. Although highly experimental, who knows when you will be hitting the road—electronically.

—*J. Sienkiewicz*



MEASUREMENT METHOD FOR SEMICONDUCTOR CIRCUITS

By Carl Henry

WHEN you finished that last transistor project, did you have trouble? Much of your trouble may have been in the type of measurement equipment you were using to check the completed circuit. Did you know that the size battery your VTVM or VOM uses in its "ohms" section has a great effect on whether you can accurately check resistance in a semi-conductor circuit? Did you know that using some types of VOM's to read current in a transistor circuit can completely change the circuit operation? Transistor circuits are complicated, and if you work with test equipment that may give deceptive readings, you have two strikes on you from the start.

VOM Facts. Circuit loading is one of the prime considerations in making any measurement. Referring to Figure 1, you can see that by measuring the collector voltage on transistor Q1, with a VOM of 1000-ohms/volt sensitivity, will change the normal col-

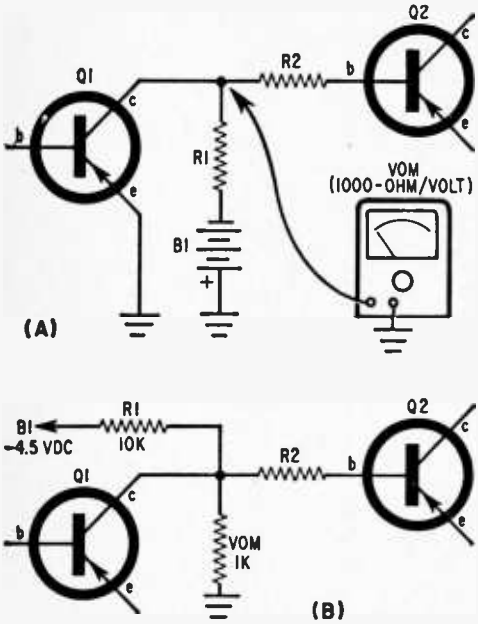


Fig. 1. The 1000-ohm/volt meter (A) connected to the circuit is equal to 1K-ohms (b).

lector voltage of −1.0 volt to less than −0.4 volt. This is due to the loading effect the VOM has on the circuit.

This distortion of the actual voltage is the reason a VTVM is recommended for voltage measurements. It is relative of course to the impedance of the circuit. You can better see this by imagining R1 being replaced with a transformer whose primary winding has 10 ohms resistance. In this case a VOM with 1000 ohm/volt sensitivity will not change the actual collector voltage enough to matter.

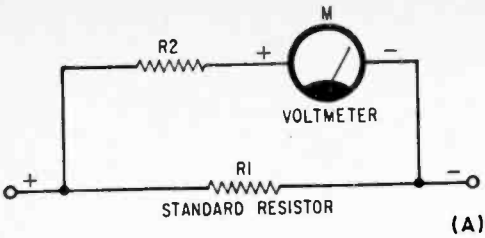
Don't be led into believing that a VTVM is essential for transistor measurements from this example. Actually, a VOM is the ideal type of test equipment to use for all transistor and other semi-conductor circuitry. A VTVM may couple stray 60-cycle signals into the transistor circuit, or the fact that the case is connected to the ground probe in some VTVMs may be awkward. However, the VOM you use should be of the 20,000-ohm/volt type. And you should always keep the circuit loading problem in mind. If you use your VOM to measure a voltage, say on the 1-volt range, and it reads 0.6 volt; then switch to the 5 volt range and the reading changes to 1.0 volt, your obvious conclusion should be that your VOM is loading the circuit too much on the lower range.

High vs. Low. Always use the highest range possible, since the input resistance of the VOM increases with the higher ranges. For example, on a typical 20,000-ohm/volt VOM, the input resistance on the 1-volt range is 20,000 ohms. This increases to 200 kilohms on the 10-volt range, and to 2 megohms on the 100-volt range. As a general rule when making voltage measurements: first know your circuit, know its relative resistance and impedance. Then, know the input resistance of your VOM. In knowing the relative factors involved, you will not be misled in making your measurement.

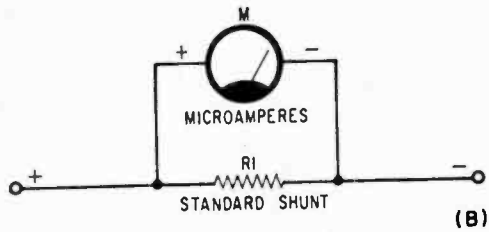
Current. Sometimes inserting a VOM in series with a circuit to measure current can change the circuit action completely. There are two basic types of current measuring circuits used in volt-ohmmeters or VOMs. Figure 2 illustrates both of them. The difference is that in the first type (Figure 2A) a standard resistor is used to develop a voltage drop, which is then measured by the 1-volt voltmeter. In the second type (Figure 2B) the meter is connected directly across a resistor which acts as a shunt. Many VOM's use the former type of circuit. In order to use such a current meter without error, make up a chart as in Figure 2, and keep it with the meter. Then, when measuring current in a circuit, check to see if the additional resistance the VOM is adding to the circuit will be likely to affect circuit operation. Usually when the voltage source supplying the current is low, trouble will be encountered. In higher voltage supply circuits, the additional drop across the internal VOM resistance will not matter.

The circuit in Figure 2A has one decided advantage that the circuit in Figure 2B cannot have. Since you are reading the voltage drop across a resistor, there is nothing to prevent you from reading AC as well as DC voltage. You merely use an AC voltmeter, and read the measurement in terms of AC current. This is very useful in servicing many devices, by using their input current as a measure of their proper operation. It can also be very useful in servicing electrical appliances for the home, those that the wife is always after you to fix. When you buy or build a VOM, you must decide whether this advantage outweighs the disadvantage of this circuit.

The Volts In It. In many semi-conductor



FOR 1 VOLT DEVELOPED	
RANGE	RI (OHMS)
100 MICROAMPS	20000
1 MA	1000
10 MA	100
100 MA	10
1 AMP	1
10 AMP	0.1



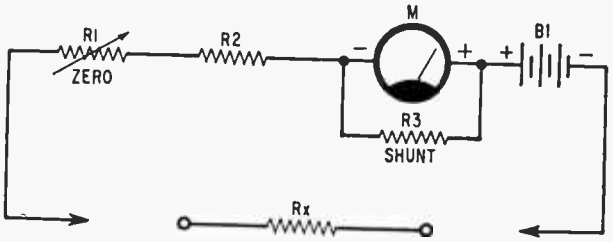
FOR FULL SCALE READING (20000 OHM/VOLT)	
RANGE	RI (OHMS)
100 MICROAMPS	2000
1 MA	100
10 MA	10
100 MA	1
1 AMP	0.1
10 AMP	0.01

Fig. 2. Loading reminder chart kept with your meter decreases the chance of reading errors.

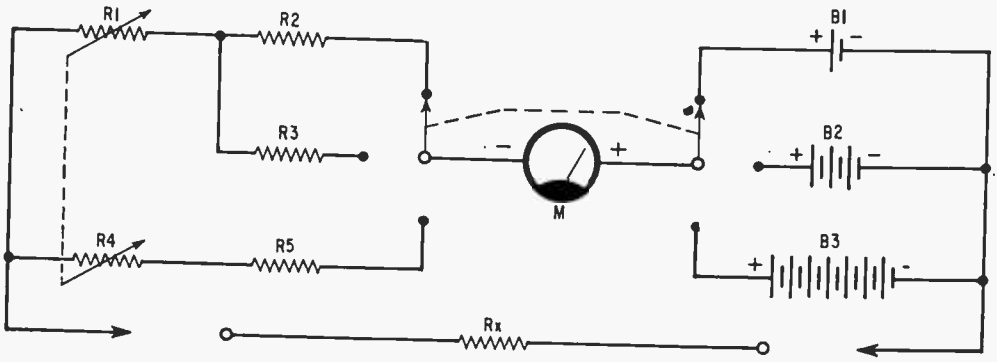
circuits, using an ohmmeter to measure forward and reverse resistance can be very misleading. Most VTVM ohmmeter circuits use a 1.5 volt battery on all ranges, while battery voltage in a VOM will vary with the "ohms" range used. VOM battery voltage will also vary between different manufacturers. As an example of the misleading use of an ohmmeter, consider the following story. A normal silicon diode requires a voltage drop of 0.6 volts across its junction to begin conduction. Since a VTVM has an internal 1.5 volt battery, no trouble is normally had with measuring silicon diodes, and standard practice in the service industry is to check silicon diodes by resistance measurement, their indication being very high resistance in one direction, and very low resistance in the other direction. A local distributor told me that he was having trouble with a certain high voltage silicon diode, designed as a replacement for high voltage rectifiers in TV sets. They were being returned as fast as they were sold, the servicemen claiming they read open in both directions. Checking one of the rectifiers with an ohmmeter proved the claims to be true; the rectifier indicated open. The high voltage rectifiers were perfectly okay, however. A check with the manufacturer turned up the fact that the rectifiers were constructed of 50 silicon junctions in series, to extend the voltage rating. Since each junction required 0.6 volt to conduct, an ohmmeter would not indicate unless it had an internal battery source of 30 volts or more.

High Voltage Ohmmeter. It is possible of course to modify your ohmmeter to use a higher voltage battery. Figure 3A illustrates a typical ohmmeter circuit and a possible modification is shown in Figure 3B. Use of a battery in the range of 6 to 15 volts is a good bet for general testing. However a battery voltage in the range of 75 to 90 volts is also useful, especially for testing capacitors for breakdown, testing diodes, and testing many types of transistors. If you use such a high voltage, don't use any sort of shunt on the meter. Assuming a 50 microamp meter, the maximum current through the circuit under test will be 50 microamps, and thus not high enough to harm any component except very delicate transistors and diodes. Be careful and be sure you know what you are testing when you use a high voltage ohmmeter. A good compromise is to use a 1.5-volt battery on the low "ohms" range, a 15-volt battery on the medium "ohms" range, and a 90-volt battery on the high ohms range. The novice is advised not to modify his ohmmeter to a high voltage unit because of the possibility of meter damage. It is suggested that a separate unit be constructed in an aluminum chassis box and used to supplement his present ohmmeter.

Zeners. High voltage ohmmeters can be used to good advantage in testing zener diodes. The only requirement is that the

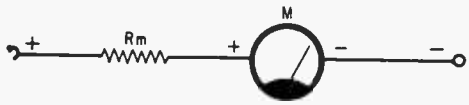


(A)

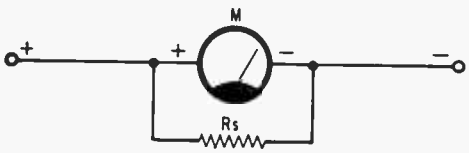


(B)

internal battery must be higher than the zener voltage rating of the diode. To test a zener, read the forward resistance as usual. Then, using the high voltage ohms scale, read the reverse resistance, but read it in terms of current. You can figure what the diode should read in this manner: first take the difference between the specified zener voltage and the internal battery. Divide this voltage difference by the mid-scale value on the ohms range. This will give the microamps that the meter should read on that particular zener diode, if the diode is working properly. For instance, assume my meter uses a 75-volt battery, and I want to know if a 14-volt zener diode is working properly. Taking the difference between the voltages as being 61 volts, I divide this voltage by the mid-scale value of ohms on this ohms range, which happens to be 1.5 megohms. This



(A) $Rm = \frac{\text{VOLTAGE TO BE MEASURED}}{\text{CURRENT RATING OF M}}$



$Rs = \frac{\text{METER FS VOLTAGE RATING}}{\text{CURRENT TO BE MEASURED}}$

TYPICAL VALUES OF METER RESISTANCE	
CURRENT	INTERNAL RESISTANCE
50 MICROAMPS	2000 OHMS
200 MICROAMPS	660 OHMS
500 MICROAMPS	156 OHMS
1.0 MA	27 OHMS

(B)

(C)

Fig. 4. In the ohmmeter circuit of (C), R1 + R2 must be adjusted so M reads full scale (0) with B1. The half scale ohms value will then equal R1 + R2. The meter can be shunted or B1 voltage changed to change range.

Fig. 3. For semiconductor circuits where a high VOM voltage is required to initiate conduction, the usual 1.5 volt battery in a meter will not suffice. This modification allows use of higher voltage batteries.

gives me a value of approximately 40 microamps. I read this value on any convenient 0-to-50 ma. scale on the meter. If I read some other value, I can figure backwards and find the zener point of the diode under test. If the diode is rated at one value, and measures another, I can be sure the diode is defective.

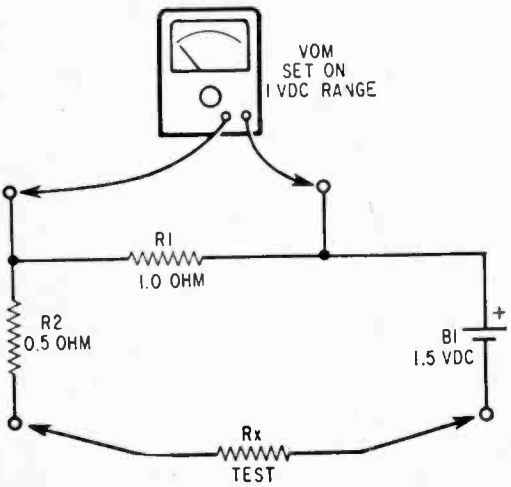
Redesigning Your VOM. As long as you understand how the VOM is operating, and within what limitations, you cannot be deceived by it into false assumptions about the circuit under test. If you want to redesign some of your VOM ranges, Figure 4 shows you how.

Low Ohmmeter. A good VOM is the most versatile piece of test equipment you can have. Not only is it useful generally, it can also be used with adapters to many other jobs. In fact, one well known manufacturer, Simpson Electric Company, has designed a whole line of adapters to extend the usefulness of their VOM. Figure 5 illustrates a simple adapter you can use with your VOM to extend your "ohms" ranges to "RX 1/10." Although the VOM is set on voltage ranges, readings are taken from the ohms scale. The value of R1 plus R2 is shown to be 1.5 ohms. This value must be the same as the mid-scale value on your RX1 range, times whatever multipling factor you are using; in this case it is RX 1/10. The center scale value on my RX1 scale is 15 ohms, so the resistor must be 1.5 ohms. Do not leave the test leads shorted together for long at a time, since the circuit is drawing 1 amp from the battery when the meter reads full scale.

Ohms to Z. Figure 6 is a simple impedance or AC resistance measuring device. It measures the AC resistance of any component connected to its terminals. To do this, a 60 cycle/second AC signal is supplied by transformer T1. Resistor R1 adjusts the transformer output to be exactly 5 volts, and the VOM is set on its 5 VAC range. Other combinations can be used, too. For instance, if your VOM has a 2.5 VAC range, use this range and set the output of T1 to be 2.5 volts. Accuracy will be generally better with higher AC voltages.

Resistors R2, R3, and R4 are determined in this manner. Make the value of R2 the center scale value of your VOM's RX1 range. Resistors R3 and R4 are then made 10, 100, or 1000 times multiples of this value. Read the unknown AC resistance on the ohms scale, applying the proper multiplying factor. An accuracy of 10% of full scale can be expected. When you build such adapters, do not use them in circuits that may tend to overload or be harmed by excess current or voltage. Know and understand your VOM circuits. The versatility of your VOM is limited only by your own knowledge and imagination. ■

Fig. 5. VOM ranges can be adapted to give scales of RX 1/10 using proper resistors.



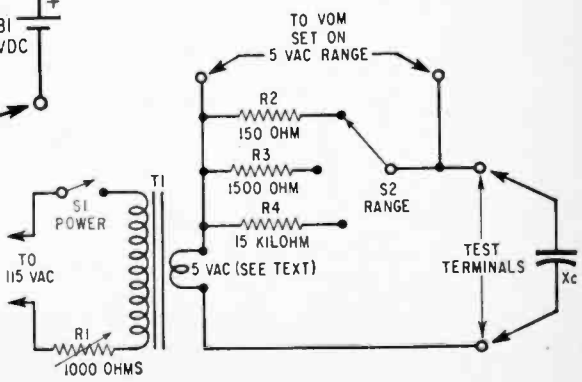
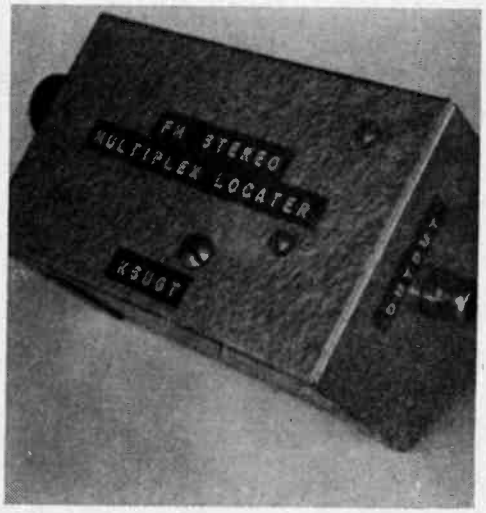
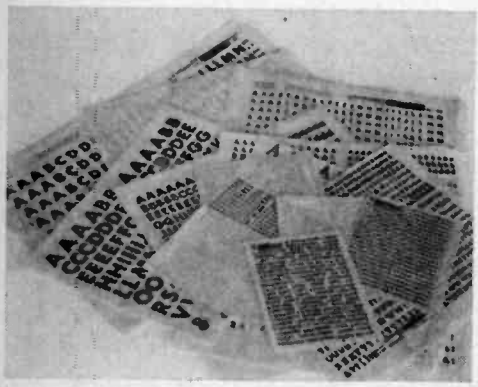


Fig. 6. The VOM is easily adapted for measuring AC resistance by adjusting transformer secondary voltage to match the VOM range you desire, and selecting resistors for center scale deflection and multiples.

5 WAYS TO LABEL YOUR EQUIPMENT



The M-4 Home Labelmaker (above, left) uses ¼-inch tapes in ten bright colors. A 44 character die wheel with symbols and punctuation in addition to numbers and letters lets you make up just about any label for your electronic project. Project shown upper-right uses labels to identify external connection jacks as well as nameplate nomenclature. Note call letters K6UGT.



"Instant Lettering" type come in a large variety of colors, sizes and styles of type, offering the home experimenter the greatest flexibility in labelling. You can combine several types of lettering with as many as nine different colors. Easy to use, the letter is placed over the area you want it and pressed in place with thumb nail pressure. Good results can be had on first try.

Here are five ways you can human engineer your electronic projects and store-bought gear. Although one may be better than another, each method has its advantages

By Fred Blechman, K6UGT

If you build or modify electronic equipment, you already know about a first-class stickler—labels. No construction project is really finished until you've put on the necessary labels, but labels are often left off just the same. The reason is that only a handful of hobbyists seem to have licked the labelling problem.

Unless you're among this precious few, now's the time to learn some labelling tricks. After all, isn't it inconsistent to perform a faultless engineering and construction job, apply a perfect coat of paint or enamel, and then ruin the entire appearance with some labels you made with masking tape and a ball-point pen? What say we take a look-see at five sure-fire ways to dress those projects up?

Embossed Labels. About three years ago, the Dymo M-22 Tapewriter appeared on the market. Although it was hand-operated, the $39.95 tag on this label-making tool was a little steep for most hobbyists and experimenters. And while the tape's adhesive backing holds well to most surfaces, the lettering is too large for most "home-brew" electronic equipment.

When the M-5 Tapewriter came on the scene at $24.95, using tape only ⅜-inch wide, some carefree experimenters (the author included) broke down and made the investment, with very gratifying results. However, the real breakthrough wasn't long in coming, and the M-4 Home Labelmaker is now available from Lafayette Radio for only $6.64. This now puts the experimenter within reach of an inexpensive, neat, simple, fast means of making custom labels in six different colors on ¼-inch vinyl plastic tape. The lettering is white in all cases, but the tape costs only about a penny an inch. There are eight letters, each ⅛ inch high, in an inch of tape.

The operation is simplicity itself: a 44-

Magic-Tape labels are made with a typewriter. First type the desired wording on a strip of Magic-Tape placed on a typewriter roll, then transfer, by rubbing, to a second strip, which becomes the label. While this label is not as fancy as other types, it is a distinct improvement over the old approach of typing labels on white paper and cementing or Scotch taping them to the equipment. One advantage of this technique is that you can say a lot in a very small allotted space.

character die (letters, numbers, symbols and punctuation) is rotated into position; squeezing the trigger first embosses the tape, then advances it for the next character. A second trigger provides cutoff and tabs the cut end for removal of the protective backing.

"Instant Lettering." If you want the most professional type of labelling, try the new dry-transfer "Instant Lettering" sets. While not as fast as the Labelmaker just described, the dry-transfer letters are the closest thing to commercial lettering available to the experimenter at a reasonable price. Produced in nine colors and a multitude of sizes and lettering styles, they let you go "hog-wild" in dressing up your "home-brew" projects. These made-in-England transfers are distributed in this country by the Datak Corp., 63—71st St., Guttenberg, N. J.

Lafayette Radio sells the "Titles For Electronic Equipment" set, consisting of 24 small sheets with words, letters and numbers, for $4.95. To use these dry transfers, simply place the transfer letter or word in position on the surface to be labelled, rub with a pencil, and lift the transfer sheet. Lo and behold, the letter or word has been transferred to the surface so clearly and opaquely that it must be seen to be believed.

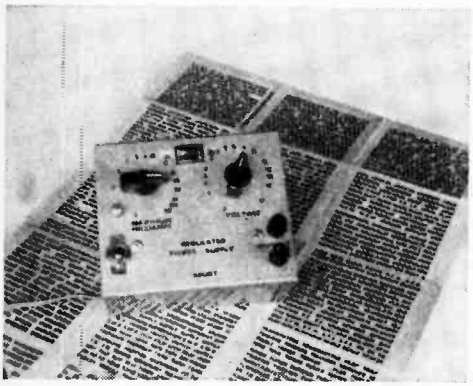
"Magic-Tape" Labels. By now, everyone has heard of "Magic-Tape," the 3M product that *"looks frosty on the roll, but is invisible on the job."* But did you know that you can use Magic-Tape for labelling your equipment? Here's the procedure:

1. Put a strip of Magic-Tape on the empty roller of your typewriter. Don't worry—it'll come off easily later.
2. Using the regular black or red ribbon, type the desired nomenclature directly on the Magic-Tape.
3. Place *another* piece of Magic-Tape directly on top of the first piece and *rub briskly*.
4. Peel off the upper piece of Magic-Tape. The printing will have transferred completely to the sticky side of this piece, and it is now only a matter of snipping with the scissors and pressing onto the equipment. The tape on the roller may be used over and over, since it is only a "carrier" in the process.

Notice that the printing is completely protected from smearing or abrasion, since it is on the underside of the installed label. The tape becomes practically invisible with only the letters showing—a vast improvement over typewriter labels of bygone days. If you want white lettering, use the new Ko-Rec-Type white carbon paper (available in stationery stores) instead of the regular typewriter ribbon.

The Old Standby—Decals. Black or white water-transfer decals have been used for many years for "professional" home equipment labelling. However, aside from the inconvenience and time-consuming process of cutting out each word or letter and soaking it in water to remove the backing, decals still remain available to the experimenter in only a limited variety. One-eighth inch high block lettering is standard, and you have to look far (and spend a premium price) to find variety of size, color or lettering style.

(Continued on page 135)



Still the most popular method of labelling equipment is the time-honored decal. Each word must be wetted, and applied in place.

White ink, such as the type used in photo albums, is suitable for labelling dark colored equipment—cheapest and quickest method.

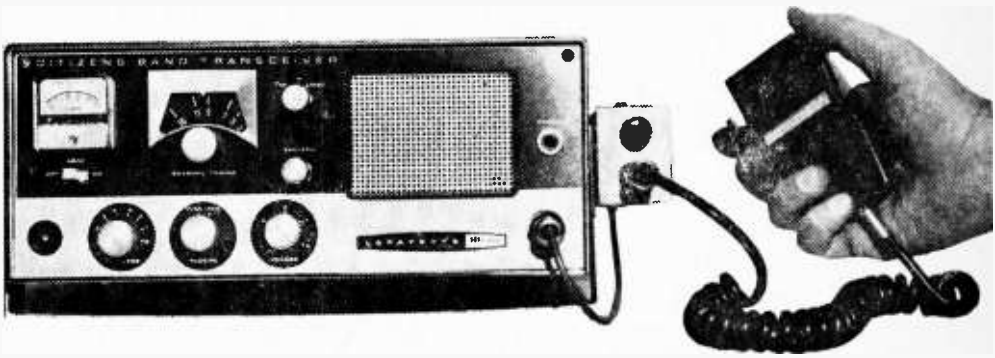
By Herbert Friedman, W2ZLF/KBI9457

better CB modulation

What's that? You still can't get the boys to admit the modulation from your *All Channel Blaster Model Mark II* is the best on the air? Well you're not alone with the problem; lots of other CB'ers with the best of equipment have the same problem—a lack of *talk power*.

The difficulty is not with the equipment *per se* since most modern transceivers and many of the older ones are quite frankly, examples of what good engineering should be—transceivers have plenty of modulation *potential*—the difficulty is in using the potential. To keep things from getting complex, and also to stay within FCC regulations, CB modulators are designed for an *average* voice. The microphone gain and the frequency response of the entire modulator including the microphone is tailored to give the *average* voice real sock—the signal stands out like a bikini at a WCTU meeting. But now you come along and your *All Channel Blaster* sounds like a leaky faucet. Wha' Hoppen? Nothing! You just don't have an "average" voice.

Just as people differ so do their voices.



Build this microphone preamp for your CB rig and all of your soup will go into talk power

Your voice might rattle the windows while the CB'er down the block couldn't get a rebuke in the library if he shouted. And George on the other side of town has a voice that rumbles like a dump truck, while Jane, who is built like the Graf Zeppelin, sounds like a young Patty Duke.

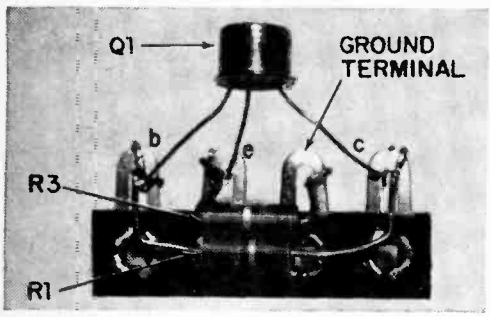
All of you can't sound good on *average* equipment, for real *talk power* you need equipment tailored for your own voice: perhaps the smooth silky quality of a dynamic mike to take the edge off a squeek, or low frequency attenuation to cut a bassy voice, or a mike preamp to turn into a roar, or maybe just some means of cutting a roar to a mild yell.

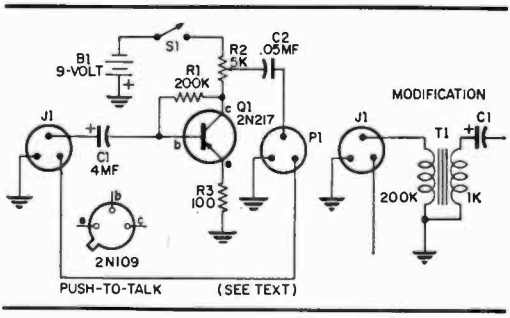
The Gadget. In fact, when you come right down to it the CB Mike Preamp is your gateway to more "talk power". First off, a transistorized preamp contains its own built-in power supply; it goes between the mike and the transceiver and requires no modifications to the existing circuitry. Second, the input impedance will match those dynamic mikes which are finding increasing favor with CB'ers. Third and fourth, etc., if your modulation needs only some beefing up of the high frequencies use the CB Mike Preamp with your present ceramic mike; the low impedance loading of the preamp will attenuate the mike's lows and your signal will come out sharp and crisp. And if all you need is lots of amplification with no change in frequency response just add the modification shown in the schematic diagram to the preamp and you have enough gain to make a modulation meter jump off the table.

If the preamp appears to have more parts than usually shown in other CB preamps, you're right! There are more parts and with good reason. The CB Mike Preamp is temperature stabilized. Also modulation won't jump over 100% if the car gets hot or drop to nothing when the windshield is covered with snow.

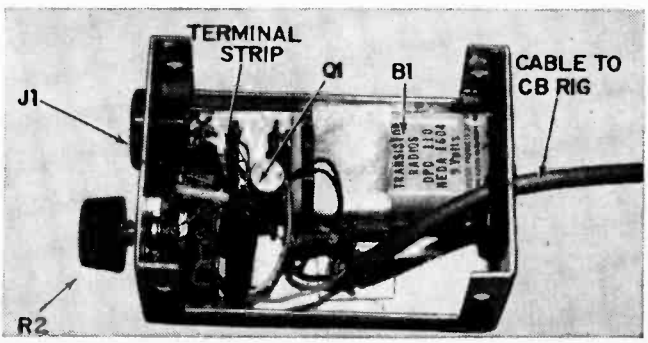
Construction. The unit shown is a compact handful built in a 3¼" x 2⅛" x 1⅝" aluminum chassis box. If you're not used to wiring in tight corners, or if you use the high-impedance modification, we suggest the use of a larger box. Select a mike input jack, J1, which matches your present mike connector; likewise, output plug, P1, should match the transceiver input jack. While we show a single push-to-talk control wire you must install as many as required. Some rigs use two or three wire control.

If you build the compact model volume





Amplifier is pre-wired on a terminal strip prior to mounting. The lug with no connection to transistor Q1 is the ground-mounted terminal. Schematic diagram for the preamp is shown at right.



Most of the cabinet space is devoted to battery B1 which should be firmly mounted. Use insulated terminals so they don't short to cabinet.

control R2 must be the miniature type specified in the parts list. A standard potentiometer will not fit in the box. If you use a larger cabinet, R2 can be standard size. Power switch S1 is part of R2—the specified control is supplied with the switch attached. If you use a standard size potentiometer, make certain you order the switch—it is a separate unit and *you* must attach it to the control.

Transistor Q1 can be any low cost transistor of the 2N109 or 2N217 type. As the 2N109 requires a socket, we suggest the use of a 2N217 whose long leads allows the transistor to be soldered directly into the circuit. Since the transistor is easily damaged by excessive heat, a heat sink such as an alligator clip should be attached to each lead when soldering.

As shown, most of the preamp is pre-wired on a terminal strip subassembly. Using a strip with three tie points plus a ground lug assemble transistor Q1 and the base (R1) and emitter (R3) resistors. Then place the assembly in the cabinet and complete the wiring.

Take extra care that C1's *negative* lead is connected to Q1's base; the unit might not work if C1's polarity is reversed.

B1, a standard 9-volt transistor radio battery, will last several months in normal service. Since there is no commercial holder available, you must roll your own. A small scrap of aluminum or a section from a tin can is shaped into a "Z" bracket *slightly* smaller than the battery. When the battery is *forced* into the holder even the most violent mobile service won't shake it loose. If uninsulated battery connectors are used or if you solder directly to the battery terminals place a piece of electrical tape between the battery and the terminal strip. Since everything is pretty compact there isn't much space between the battery and the terminal strip and should the battery slide forward the tape will prevent the battery terminals from shorting to the terminal strip.

The Modification. If the preamp is to be used with a ceramic mike and you don't want the transistor's low input impedance to reduce the mike's low frequency response add the modification shown in the schematic diagram. Transformer T1 matches the high impedance of the mike to the low input impedance of the transistor. Since the transformer specified is about thumb size, only a slightly larger cabinet is required.

Mounting being small the preamp can be mounted directly on the transceiver—this will give you the convenience of having the power switch/gain control at your fingertips. To avoid drilling holes in the transceiver's cabinet, the preamp should be mounted on the mobile bracket or carrying handle as shown.

Using the preamp. Connect your mike to J1 and the transceiver to P1. Ease R2 clockwise until you feel the power switch just click-in. Then, speaking in a normal voice advance R2 until your rig is modulated to 100% on speech *peaks*. Best results are obtained if you use a modulation meter when making adjustments (borrow one from your club). The preamps gain must be adjusted critically since there is more amplification than you'll ever need, and you can easily overmodulate. For this reason avoid having a friend try to judge your adjustments by listening on a receiver—the ear, particularly on strong signals, is a poor substitute for a modulation meter. ■

PARTS LIST

B1—9-volt transistor battery (Burgess 2U6 or equiv.)
C1—4-mf., 6-volt miniature electrolytic capacitor
C2—.05-mf., 75-volt miniature ceramic disc capacitor
J1—See text
P1—See text
Q1—2N109 or 2N217 transistor (see text)
R1—200,000-ohm, ½-watt resistor
R2—5000-ohm miniature potentiometer with on-off switch (Lafayette VC-27, see text)
R3—100-ohms, ½-watt resistor
S1—Part of R2
T1—Audio transformer; 200,000-ohm primary, 1000-ohm secondary (Lafayette TR-120, see text)
1—3¼" x 2⅛" x 1⅝" aluminum chassis box (Bud 2117A)
Misc. Battery clip, terminal strip, grommet, wire, solder, hardware, etc.

Estimated cost: $8.00
Estimated construction time: 1 hour

If you want to conserve the transceiver's resale value by not drilling any additional holes, the gimbal bracket's screw can be used to secure the preamp's cover in place.

Beating the Guitar's soft-sound barrier

By Walter G. Salm

Be heard above the crowd for $1.95—just add a magnetic or contact microphone to your guitar

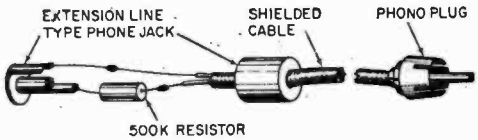
The pickup of the magnetic guitar microphone, shown in place on a Western guitar, is positioned along mounting rod and is visible under the strings tight against the pick board.

The guitar is a delightful musical instrument offering rewarding and pleasurable results when teamed up with a full moon, lakeside view, and a pretty Miss. But try to strum out a tune at a crowded party and you'll discover that you can't hear yourself play, let alone think. Clearly what is needed is an electric guitar. When you already have a mono or stereo hi-fi rig, all you need to "electrify" that guitar is an inexpensive sound pickup—a magnetic or contact microphone.

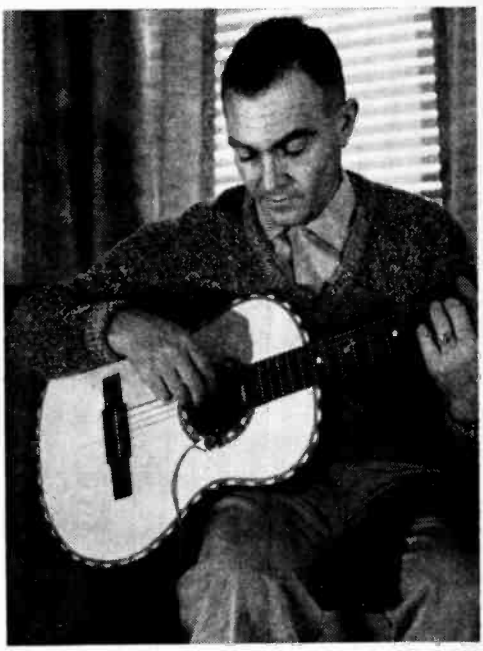
The Pickup. The truest method of guitar sound reproduction is obtained with a magnetic guitar microphone. The magnetic pickup, requiring a guitar with steel strings, reacts to the changing magnetic fields caused by these strings as they vibrate. The fidelity of magnetic pickup will give the amplified sound the tonal quality characteristic of fine electric guitars. These magnetic pickups (Lafayette PA-41 or equiv.) are available at radio supply outlets for about $1.95.

The microphone installation on a Western guitar is straightforward but on the classic instrument some modification is required. The classic guitar has strings that terminate at the bridge, leaving no place to attach the microphone hardware. Therefore, the microphone assembly must be removed from its metal post and modified by cutting a small slot in each end. A piece of elastic with a hook at each end can be snaked around the guitar body to fasten the pickup in place.

Another method—a far preferable one if you don't mind having a permanent assembly on the guitar—is glue. Glue is actually the best and easiest solution to the problem.



Adapter cord with 500K resistor in series with center conductor is impedance matcher.



The contact microphone, this one a clip-on version, is simple to install but lacks the tonal quality of the magnetic version. And it doesn't come with the magnetic version's volume and tone controls that enable you, in combination with your amplifier controls, to control the quality of your music.

The "custom" magnetic microphone mounting on the classic guitar, using an epoxy glue, makes a neat, clean, and permanent job.

Guitar's soft-sound barrier

But if you're going to glue, experiment first to obtain an optimum position for the microphone—glue is awfully permanent, especially the epoxy varieties. The volume and tone controls that are part of the magnetic pickup assembly can be removed altogether or be mounted in a similar manner.

An alternative type of pickup uses the contact microphone. The microphone is attached to the wood of the guitar and picks up vibrations within the instrument transmitted through the wood. The contact microphone, also about $1.95, is best for more amateur use since it fails to reproduce the fine tonal quality of the guitar as well as the ideally suited magnetic microphone.

The Amplifier. Your high fidelity or stereo system will provide more than enough power for electronic amplification as well as reverberation if you have a reverb unit.

Earphone monitoring provides several distinct advantages, especially during the quiet hours!

Of course, if you are a professional guitarist, your hi-fi amplifier will lack features you may desire—a tremolo circuit, multiple input facilities, and portability. For these, you need a guitar amplifier such as Lafayette's Model LA-75.

Connecting the microphone—either magnetic or contact—to a conventional amplifier requires a special adapter cord. The microphone cable usually terminates in a standard (PL-55 type) phono plug. And hi-fi amplifiers require an RCA phono plug—the type that is standard equipment on record players and tuners. Some kind of impedance matching is also necessary between the microphone and the magnetic phono input on the amplifier. The simplest solution to the impedance problem is wiring a 500,000-ohm resistor in series with the center conductor. The resistor can be hidden in an extension line jack—the type used to add extra length to cords that have phono plugs. The line from this jack terminates in an RCA type phono plug, completing the necessary conversion. This approach accomplishes all that is required—matching impedance, adapting the phono plug to the phono input on the amplifier, and providing an extension cord for a necessary amount of mobility.

If you want to team up and use two instruments, they can be "mixed" on a stereo amplifier by plugging one into each channel, setting the function selector on "monophonic" and using the balance control for mixing. With the "function" switch on "stereo" the two instruments will play out of separate loudspeakers. Again, relative volume levels can be adjusted with the balance control.

Feedback Problems. In operation, you will run into acoustic feedback problems, especially with the contact microphone. Although these pickups are specially designed units, they are still sensitive to sound waves and with the right conditions you can get that familiar public address system "squeal" in your living room. When making tape recordings, it may be preferable to plug the microphone directly into the recorder. An alternative method is to tap the preamplifier output on the music amplifier, cutting off the speaker and monitoring with headphones. You can do substantially the same thing with a conventional stereo amplifier by plugging the tape recorder into the tape output jacks provided.

Earphone monitoring is always preferable when recording since turning up speaker volume loud enough to hear what is being recorded risks bringing neighbors to your door and, most important, risks a recording ruined by feedback. In fact just about any time you play the electrified guitar for practice or pleasure, the stereo headphone arrangement proves best—it keeps the wife and neighbors happy, you have no feedback problems, and, if you are only a would-be master guitarist, you don't let everyone know you're learning by goofing—occasionally, of course. ■

Discover some surprising things about the subtleties of spoken language, the reliability of taped "evidence," and your own powers of concentration and recall while using your high fidelity tape recorder in four new ways

TAPE STUNTS

If you would like to perform some unusual experiments with your tape recorder—get ready to throw a party! The reason: you just can't do these alone, amid the clutter of oscilloscopes and tube testers in your lab; you definitely need the aid of a group of congenial, cooperative friends. But that's precisely why these experiments are not only instructive, but also a lot of fun. One warning: if you want your guests to leave at a "reasonable" hour, you had better find some other way to amuse them.

Aside from the tape recorder and some human guinea pigs, your equipment requirements are quite simple—a microphone, some earphones on extension cords, a reel of blank tape, a bit of imagination.

Phonetics. Deceptively simple in concept, this game of word phonetics seems to fascinate all who try it; although easily played by anyone, the game can stump a college English professor. And don't worry about the peculiar phonetic language we have to use to explain the stunt; it all becomes quite clear the first time you play.

Ask each of your guests to write down a short sentence of about six words, then dictate his chosen sentence onto tape, pronouncing everything *backwards*. The object: to see how good his speech sounds when the tape is played in reverse.

By Jorma Hyypia

Sounds simple? Guess again! Consider the familiar nursery rhyme, "Mary had a little lamb." It isn't enough, obviously, to simply dictate "Lamb little had a Mary" because the word *order* will be correct on playback, but the words themselves will be unintelligible. The more perceptive players will foresee the need to reverse the words as well, and will visualize the rhyme like this: "Bmal elttil a dah yram." But even this refinement generally produces only a barely understandable result—certainly not good, fluent English.

For best results, each *syllable* sound in each word must also be reversed! This will call for some advance figuring with paper and pencil. Thus phoneticized, our nursery rhyme would look something like this:

Hmăl letil'yĕ hud'dăh hēē rĕm'

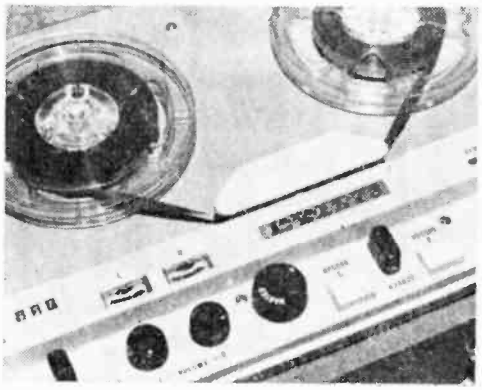
Try pronouncing that, while observing proper placement of accents, and you will see how challenging the game can be. Now you should be able to obtain a playback version that is fairly good English; but you will discover that complete accuracy is virtually unattainable because it is impossible to vocalize certain sounds in reverse. Fortunately, some of the more important words in our language are easy to handle: for "love" you simply say "vul" and for "sex" you say "skess." You will discover the tough sounds soon enough, so we won't tip you off in advance.

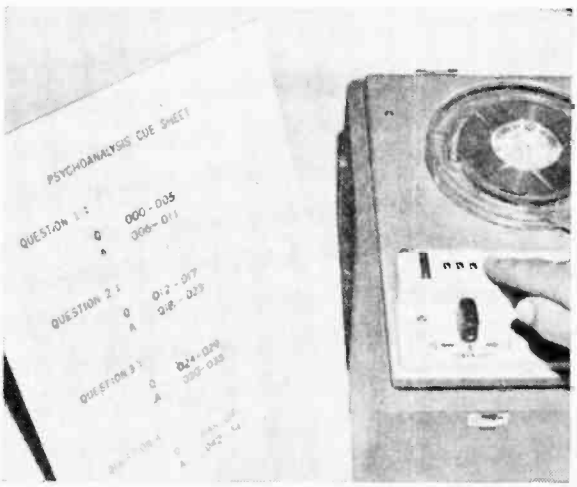
So what's the point of all this? First, it will reveal a lot of fascinating things about the nature of spoken language that you may never have suspected; secondly, it is a lot of fun! The grunts and wheezes of the participants are, to say the least, hilarious! And if this isn't funny enough—or sufficiently challenging—ask your guests to recite comic limericks or try reverse *singing!*

Going Backwards. Your only technical problem: how to play the tape in reverse. A full track recorder is easiest to use; because it has only one sound track on the tape, all you need do is switch the reels and run the tape through the machine backwards. But most of us have two-track recorders, and a simple reversal of the tape would

To get your guests acquainted with the phonetics game, prepare a simple display card and let everyone practice an easy phrase.

To play tape backwards, switch reel positions, give tape half twists before and after it enters and leaves playback heads.

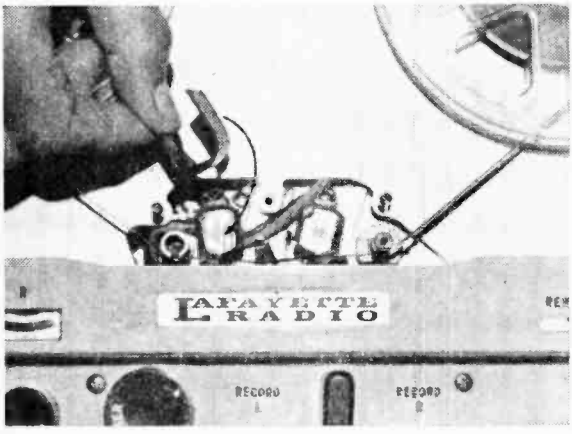




Prepare a detailed script in order to make the psychoanalysis experiment successful.

position the playback head on the wrong track. However, there's a simple solution. Reverse the reels, but give the tape a *half* twist before threading it through the tape head section of the recorder; this inversion of the tape puts the desired track into position against the playback head. The "wrong" side of the tape will be against the head, but sound reproduction is entirely adequate if thin gauge tape is used. Remember to give the tape a second half-twist after it emerges from the tape head section so that it will wind properly on the take-up reel.

Psychoanalysis. Ask one person in your group to be the subject of an experiment in psychoanalysis, and instruct him to answer a series of questions put to him by the interviewer. Explain that the interview will be taped for subsequent analysis. Assure the



In psychoanalysis experiment shield is made from soft sheet iron and placed around first head to prevent audio signal erasure.

volunteer that if any of the questions are too personal, he is free to plead the *fifth amendment.*

You ask a number of questions that seem to be rather pointless, but when the interview is played back from the tape, the subject hears himself making some startling admissions about his personal beliefs, habits and aspirations! The reason: his answers are exactly as he stated them, but they now apply to a wholly *new* set of questions he has never heard.

It doesn't take much imagination to foresee the entertainment possibilities in this stunt. For example, you might ask, "How often do you have your car greased?" But on playback the question comes out "How often do you take a bath?" The victim hears his own voice answer "Every three months." Just make up your own questions, but in such a way that they tend to "force" answers that will be funny when heard in context with the secret questions. Just stick to one rule: keep within the bounds of good taste, if you want to keep your friends.

Like the preceding stunt, this game is instructive as well as highly entertaining. It will dramatically demonstrate how easily electronic equipment can be used to manufacture incriminating evidence, and why taped evidence is of extremely dubious value in legal proceedings.

How It's Done. Obviously, you must prepare two sets of questions in advance of the party. Record one set on a piece of blank tape, leaving "blank" sections, for the answers, between each question. Write the other questions down on paper for use during the interview.

Your main technical problem: how to record the subject's answers into the blank sections following each pre-recorded question without erasing or garbling the questions on the tape. To prevent erasure of the tape, slip a U-shaped sheet iron shield over the erase (first) head of the recorder; cover the shield with plastic electrical tape to insulate it, taking care to avoid tape over-laps on the outside of the shield where the recording tape passes over it (to avoid picking up adhesive on the magnetic tape).

You must also prevent interview questions from being recorded on the pre-recorded questions already on the tape. The easiest way is to use a microphone with an on-off switch, activating the mike only during the periods when the subject is answering.

Mike Modification. If your mike doesn't have a cut-off switch, radio equipment suppliers such as Lafayette Radio (New York) can provide in-line switches for a few dollars. Or you can make your own from a simple switch, phone jack, and a 2½" x ¾" typewriter ribbon can.

Notch the side of the can with tin snips and fasten the jack to the hole, insulating it from the can with fiber washers and tape. Install a "push-for-on" switch (makes contact only while depressed) on the cover of the can; place it off-center just enough to clear the jack inside the can.

Attach a phone plug to the end of a shielded lead mike cord (about 6 feet long if you want to operate the switch surreptitiously by

foot), taking care to attach the center lead to the lug contacting the tip of the plug, and the shield to the shank lug.

Pass the other end of the cord through a hole in the side of the can, holding it in place with windings of electrical tape. Connect the center lead to one terminal of the switch. About 1½ inches from the end of the wire, scrape off the insulation to permit soldering of a wire tap to the braided shield. Solder the other end of the tap wire to the jack lug connected to the center contact of the jack; another short wire connects the other jack contact (the one making contact with the tip of the phone plug) to the remaining terminal on the switch. If the switch causes a bad hum in the tape recorder, check these leads; properly wired, it provides quiet cut-off of the microphone.

Before placing the lid on the can, cut two slots on the rim to clear the protruding jack and wire.

You can, of course, use a "push-for-off" switch but this keeps the mike live most of the time and increases chances of accidental garbling of the pre-recorded material on the tape. The "push-for-on" switch recommended minimizes this risk.

Cute Queing. The only remaining problem is proper timing or cueing of the tape during the interview session. One method is to allot a specific time interval—say 5 or 10 seconds—for each question and each answer; but this method requires that you keep very accurate track of the time during the interview. A better method is to use your recorder's index counter. On your sheet of interview questions note counter ranges corresponding to each set of questions and answers. This will enable you to keep easy, accurate check of the recording as it progresses. If your subject hesitates before answering a question, use the pause control of the recorder to hold the tape movement for a moment; otherwise the delayed answer may not fit into the allotted blank space on the tape. Also encourage your subject to give quick, brief responses rather than lengthy

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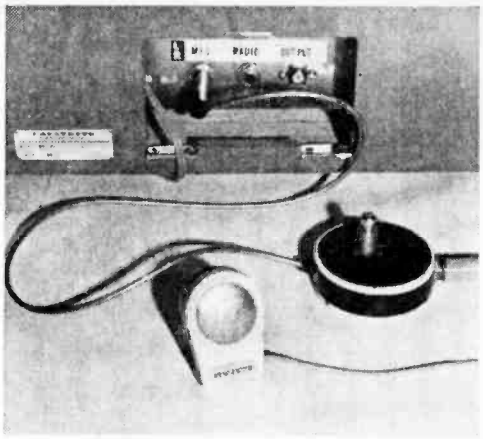
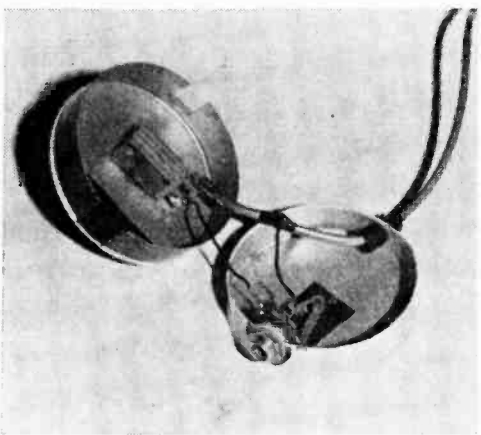
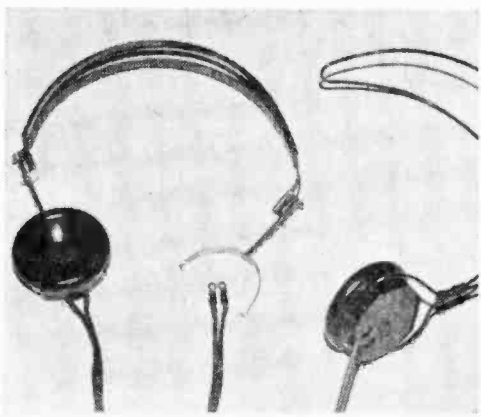




Typewriter ribbon can (above) contains switch and jack for microphone on-off switch. Inside view (below) shows construction details. Note black tape strips used to insulate jack from can, and two notches cut in lid permit it to pass over jack and shielded cable.



One headset can be made into two with some zip cord, wire hanger, and some rewiring.

DX 1975

Was that his girl or a fish on 396 kc.? Fish can't talk but . . .

By C. M. Stanbury II

Brandi arrived here sharp at eight. "Where's your soldering iron?" I stared at the collection of coils and wires under her arm. "Is that what I think it is?"

"A power supply for your RAX-1." She put it down on my work table.

"Where under the Earth did you learn so much about electronics?"

"From your magazines." She pointed to a stack of EXPERIMENTERS in the corner. "Been practicing for a couple months. When I do something, I know what I'm doing." She located the soldering iron. "And in a few minutes you'll be on long wave."

"And out of the All American DX League."

Softly. "That's right."

The whole thing bugged me. Here was a girl who never cared anything about electronics or DX, and apparently didn't know one end of a radio from the other. Now all of the sudden she makes like a first class technician. Just so she can stomp on Jack Meyers, top banana of the AADXL.

"How long have you had this RAX-1?" She worked rapidly.

"Since 1970, the year Jack made me BCB director for the League. Then he took one look at this long-wave set and said that if I ever used it, I'd not only be out of office, but lose my League membership."

"And you did what he told you, like a good little boy." Small with long jet black hair usually drawn back into a pony tail, but

sometimes she would let it hang down just for me. Other times she would sit absolutely still and stare at you with a look suggesting *Mt. Pelee*, that volcano which destroyed the city of St. Pierre on Martinique.

I took a long deep breath. "The League says what counts as a verification. Jack could have all my QSL's disqualified." I didn't tell her but I was also next in line for *the throne*, if I played it cool.

"You male DX'ers think you're so smart, how did you ever let a Frankenstein like the AADXL start?"

I fiddled with my log book. "About 10 years ago all of the DX clubs decided to form a league. But some of the clubs were just one man operations, no constitution, no elections or anything like that. So eventually it turned into the dictatorship the thing is now."

She made a final defiant connection, then Brandi found the wall socket and we were in business. The receiver warmed up, down into radio's cavernous depths, high pitched wales, crashing spring static, dots and dashed interspersed—then ZBB Bimini.

"We are transmitting from a sealed undersea cavern. Soon Atlantis will arise . . ."

"That's what Jack's afraid of?" Brandi pushed the volume up.

I nodded. With every new ID the AADXL throne room slipped further out of sight.

She carefully tuned right on to 396 kc.

"Beacon ZBB is the island's only radio station."

"And that's why the League banned all long-wave DX?"

"I guess?"

She stared at the receiver and listened to ZBB.

"Bimini is a part of Atlantis, the lost continent, they've found ruins of an Atlantis temple on the island. According to some clairvoyant down in West Virginia it was an evil civilization which will rise again."

Brandi laughed, mixture of fire and detachment. "From their caves at the bottom of the sea, I suppose."

"Jack says 8 different planes have disappeared without a trace while flying over the area, 6 from the USAF and 2 British airliners. He thinks Atlantis kidnapped them so they could turn the passengers and crew into agents."

"But Jack won't put any of these theories down on paper."

"Everybody would think he was some kind of nut."

"They might be right." ZBB faded. Our antenna was merely three feet of copper wire hanging to the floor. Brandi grasped it, used her own body as an aerial, Bimini came in loud and clear again. "What time is it?" That way ZBB came in now you'd think Brandi is Atlantis herself.

At my watch. "8:26."

"We'd better hurry." Brandi let go the wire, the signal remained audible. "Where's your walkie talkie?"

"The 99-mill job?" Hadn't used this gadget in over a year—didn't even know if it still worked. Jack frowned upon non-listening radio activities.

"Yes." Brandi glanced around the room impatiently.

I motioned to a corner cupboard. She got it, pulled out my BCB crystal and inserted one of her own which barely fit.

"What are you doing?" A peculiar sensation in the back of my neck.

She pushed the On button, a deafening feedback. Turned it off. "Set your receiver for 396 kc. When Jack arrives, we'll really push him over the edge."

"Jack's coming here?" Nightmare come true.

"Called him just before I left home."

"Did you have to carry it that far?"

"Yes." Her volcano look can destroy most men.

A knock at the door, again, louder. With my walkie talkie Brandi moved swiftly into the next room.

I began to sweat, Jack was pounding. He could probably hear ZBB right out there in the hall. I let him in.

A big man resembling the wrestler Hans Schmidt. Without one word he moved cat like to the radio table, picked up my

(Concluded on page 130)

If you separate the wheat from the chaff in your home-made tapes you'll come up with "professional" reels everybody will enjoy

By B. G. Waterman

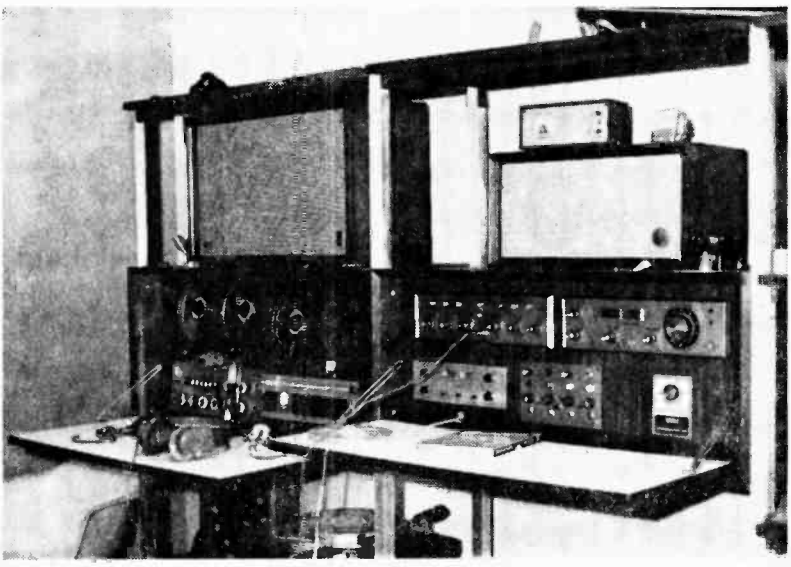
EDIT 'n' SPLICE

You may have known that there were such things as tape splicers, and you may have used one a few times, either for repairing a snapped tape or splicing a hank of leader to a new tape reel. The splicer however, can provide you with almost as much real hobby-time as the recorder itself will. It takes knowing how, and here's some inside info for you from an old pro in the business.

What To Splice. It depends on what you want to accomplish! The splicer is a tool of the editor, and therefore, you must know how to use it. Let's examine the basic splicing method first. If you butt-join two pieces of tape, the joint will produce a sharp "click" as it goes passed the head. To avoid this click, we cut both tapes at a forty-five degree angle and make the splice this way. We then join the two pieces of tape and hold the joint with a special adhesive-backed tape called *splicing tape*. This splicing tape is made with a non-creeping adhesive. If ordinary pressure sensitive tape is used, the adhesive will creep, or move, and when your tape winds over itself on the take-up reel, the layers above and below the splice will cling, causing pulling, drag, and some odd effects on the tape recorder.

To further avoid any creeping, we try to cut a slight "waist" in the tape, trimming in slightly at the top and bottom of the splice. This trimmed waist can be done with a razor blade, as can the cutting of the forty-five degree angle on the tape. However, as your tape is sensitive to magnetic effects, a blade must be used which is completely free of magnetism.

The Tools. While a careful eye and a sharp blade are often sufficient, there are



Here is a home hi-fi stereo system designed to perform "professional" tape editing with top-notch audio gear.

EDIT 'n' SPLICE

commercial tape splicers that will mate the tape ends, guide the blade, and hold the tape to facilitate the operation. One firm produces a tape splicer in a variety of price ranges that not only holds the tapes, but contains a set of blades that trims the forty-five degree cut, you press the tape over the joint, and then it makes the trim for the waist. This splicer is called the "Gibson-Girl" and one look at the waist trim can explain the name.

Other tools you will need are a wax pencil, or grease pencil to mark the tape where you want to cut. A bright color that will show well on the brown or black tape is best, and most commercial recording studios seem to prefer yellow, although white works just as well.

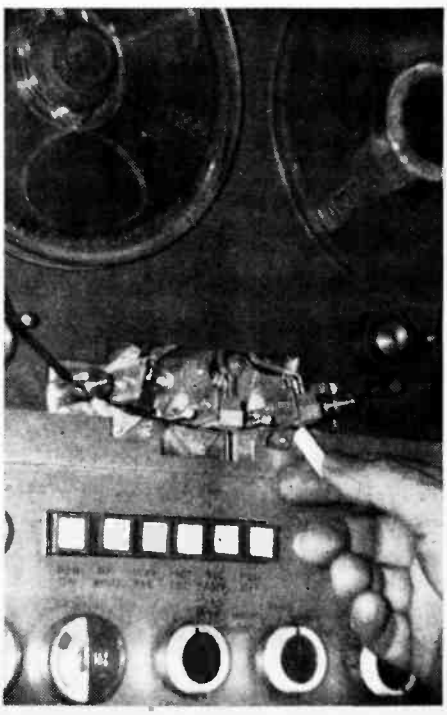
Sometimes you misjudge the splice, and get more sound than you planned. To remove spurious sounds from a tape, a handy device is a piece of ⅛-in. Alnico magnet. You can easily cement this to the back of your wax pencil, and use it as a sound eraser.

You will also require a spool of leader tape. This is acetate tape the same size and width as the magnetic tape, but with no oxide coating. It provides silent periods where you need them, and is also used at the beginning and end of each reel to prevent damage to the recording tape ends should whipping occur during rewind operations.

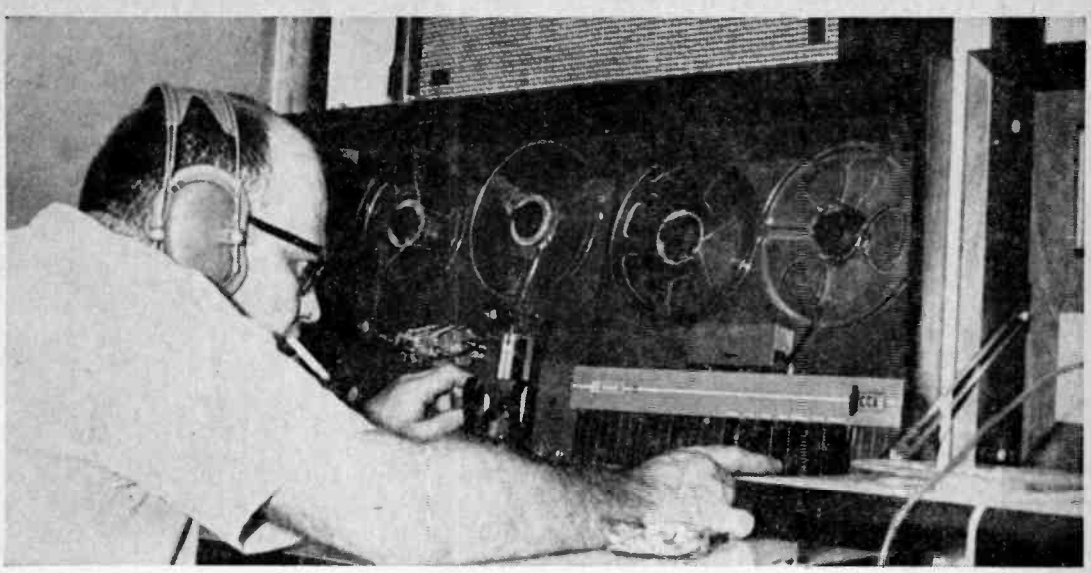
Finally, you will need a bulk tape eraser. This is a handy device, for while you can erase a tape by passing it through the machine, the bulk eraser does it better and far faster.

So Let's Edit. First we must understand the principles behind editing tape. The simplest form of editing is by sound burst. Most machines can be turned on but without the tape turning. Record, in the normal fashion, a sentence read from a book. Now rewind and stop the tape somewhere in mid-sentence. If you manually (and slowly) turn the reel, you will hear the burst of sound as a new word starts. Before this burst of sound, there is the silent space that occurs between words. It is in this silent space that we do the cutting! The *faster* the tape is moving, obviously, the *more* silent space there will be between words. Professionals use a speed of fifteen-inches-per-second (15 ips), about twice the speed of your home recorder. Don't let this deter you however,

With the amplifier still on, but with the reels not turning, you can manually "rock" the reels in either direction. This way you can locate the "sound bursts" on the tape which indicate the start of a word or a passage you want to cut.



Using a white or yellow wax crayon, make a mark on the plastic (uncoated) side of the tape, using the playback head-gap as a reference point. Cut here to make your splice.



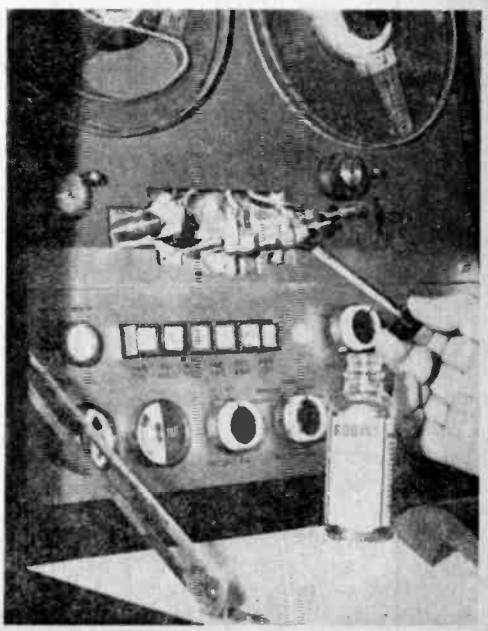
for good sound burst splicing can be done even at 3-¾ ips.

To do your editing, remove the tape head cover, and play the tape until you get to the part you want to remove. Stop the tape at the first word of the section to be cut out, and then rocking the reels back and forth by hand, locate the burst of sound that indicates the first word. Rewind the tape just a little bit, and using the grease pencil, mark the tape directly over the head at this point. If your machine is a three-head type, remember that the first head at the left is the erase head, the second from the left is the record head, and the one at the extreme right is the playback head. Make all markings over the playback head. Now continue to play the tape at normal speed until you come to the end of the part you want to cut out. Again, locate the beginning sound burst of the first word *after* the part to be removed, and then rewind slightly and mark the tape again.

Now We Splice. Pull some slack from the reels, and disengage the tape from the spindle and idlers. Locate the yellow mark on the tape, and set the tape in the splicer so the yellow mark is centered under the cutting blade. Make the first cut at an angle of forty-five degrees. Now continue to pull the tape from the rewind reel until you locate the first yellow mark you made. Again, place the tape in the splicer and make the second cut. Press the splicing tape over the joint, and trim the splice, remembering to cut a slight waist if the splicer doesn't do it for you. Now rewind the tape on the ma-

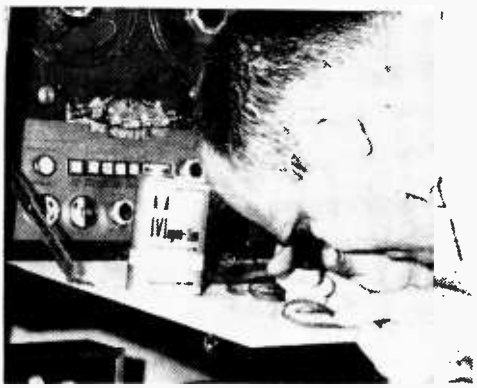
After a lengthy session of editing and splicing, the reel of tape sometimes consists of more splicing than recording tape. To insure break-free playback in the future, play your spliced-up reel on one machine into another to re-record a master that is free of splices.

Don't forget to clean and degauss the tape heads when you finish a session so the machine will be ready for you when you next use it. Use a good commercial solvent to clean heads, remove oxide and stray wax marks.



chine, and play through the splice to make certain you have accomplished what you set out to do. You can continue to cut bad parts out of your recording in the same fashion.

Watch Out! There are certain limitations that are incumbent upon you in splicing and editing. For one thing, you can edit in one direction only. If your machine is a half-track, or quarter track type, after splicing in one direction, you would ruin this work by splicing in the other direction. It doesn't make much difference if only one track is used, but record each reel of tape in one direction only.



You can check your recordings visually with Reeve's Magna-See, which makes the recorded tracks visible for checking head alignment.

The other problem you will have is in background music. Obviously, if you have a continuous sound of music in the background, any editing such as we have described, will be made obvious by the discontinuity of the musical theme. Professionals will ordinarily record the voice first on one tape, and then, while the voice is played back on one machine, they add the music score to another tape. By playing both these tapes onto a third machine, they have a perfect voice and music tape. Sound effects are then made on another tape while this combination tape is being played, and the whole is combined on a final master tape. If you have a stereo machine with *sound-on-sound facilities*, you can record your voice on one track, then using sound on sound, add the music score to the second track. These can be played onto one track of a second machine, and you can add the effects now.

Duping. This word is a contraction used in the trade, and means duplicating. If you have spliced a tape extensively, you may wind up with more splicing tape than recording tape! To avoid any playback problems with such a tape, make a dupe by playing the original directly into another machine, via patch cable without using speakers or microphones. What you will finally have is a copy of the spliced tape, but without the splices.

Dubbing. In the movie industry, they say that good background music is music that the viewer is not conscious of. Similarly, in using music on your tapes as a mood-setter, consider the tenor of the material, and select your music accordingly. You will undoubtedly be using disc records for such musical effects, so choose wisely. You will soon learn that a change of music may often mean a change of key with no modulation. The result is a challenge to the ear of the listener, and is markedly noticeable. If you must make such a change, slowly drop the level of the music *out* and then increase the level of the music *in*. Don't overdo the sound effects either. Use subtle sounds, to enhance, rather than dominate your tape.

Some Final Hints. If you have a two-speed machine, and do your splicing at the slow speed, you can shift to the fast speed to get through a section you aren't interested in. While the sound is somewhat garbled and sounds like the famous TV chipmunks, you soon develop an ear for this and can hear the words as they fly past. Because splicing and editing is usually a great deal of repetition, it isn't always great fun for others who are listening, and therefore, a pair of earphones will help preserve peace in the family.

When you have finished your evenings work, take the time to clean the excess marking pencil grease from the tape heads, using a good solvent cleaner designed for this purpose, and demagnetize the heads so they'll be ready for the next use. Replace the head cover to protect the head area from dust.

If it seems an awful lot of work for the result, try it once, and check the results on your friends. Good tapes are as different from amateurish tapes as good professional movies are different from the home movies you have seen so often at friends' homes. ■

HINTS ON GOING

Mobile

By Julian M. Sienkiewicz
WA2CQL, 2W5115

Installing 2-way radio transceivers in private cars is as American as hot dogs and soda pop. CB'ers, hams and business banders all share common installation problems

If you are purchasing a mobile transceiver you will find, included with your shining new pride and joy, a complete and detailed book of instructions on the various steps to go through to install the unit in a vehicle. This includes step-by-step details on how to drill holes and other "nuts and bolts" data. While these instructions will certainly be invaluable in helping you to achieve the status of "going mobile," they generally lack some of the finer points of a custom installation. Having installed a few rigs in my time, perhaps you will find some of my observations to be of value—as have numerous ham and CB operators to whom I have given aid in their moments of need.

Deciding on the Rig. Before we dig into the family chariot, we might delve for a minute on the rig itself—after all you will want to avoid (at all costs) the horror of plunking out the hard earned sheckles for a unit which is not suitable for your car! By not suitable I mean that they simply cannot be installed "nohow" in your vehicle.

Consider this, you hear of a great buy on a rig and you promptly purchase it. Did you stop to consider if the unit can be furnished with power from your vehicle's electrical

HINTS ON GOING *Mobile*

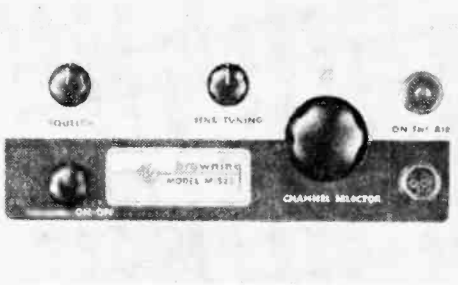
system? It seems almost too obvious to tell you that a 6 volt rig will not work in a 12 volt car (somebody once asked if you will get twice as much output by running a 6 volt rig from a 12 volt system) and a 12 volt unit cannot possibly function on a 6 volt system. Too obvious, true, but it has been attempted.

Let us say that your chosen unit requires the same voltage that your vehicle intends to deliver, but what about the current drain? Perhaps your rig requires 15 amps, but your battery can only spare 5 amps for the unit. Small foreign and domestic cars should be immediately suspect of containing puny electrical systems which might be finicky about feeding a radio transceiver. One possible solution: a transistorized transceiver, as these require less power consumption than tube models. Another possibility would be to try installing an *alternator* to replace the *generator*.

Another thing to think about is the physical size of the transceiver—that is, will the thing fit into your car? Some cars (even the so-called "big" cars) do not have a convenient place to mount a rig. Better do a little work with a tape measure before buying that rig. If your car doesn't offer much in the way of under-the-dashboard mounting space, you might think about placing the rig under the front seat, in the glove compartment, or in a vertical position along the wall in front of the left front door (this is rough on your legs, however). Possible alternate solutions: a transistorized rig (they are usually smaller than tube sets), a "small" tube set (the *Browning* "Drake" is a good example), or one of the new rigs which mount in the trunk and are controlled from the driver's position by a small remote control "head" (such as the *International Crystal* models 750H and 1000).

Connecting the Transceiver. The actual mounting of the transceiver (that is, the bolting of the set to the dashboard, or wherever) will be sufficiently covered in the instructional manual which you will get with the set, and since each individual set has its own particular problems, we won't offer any suggestions here. The connections to the set, however, deserve some comment.

CB started it and the other mobile services are soon to follow—a transistorized rig. Unit shown is the Hallicrafters CB-5.



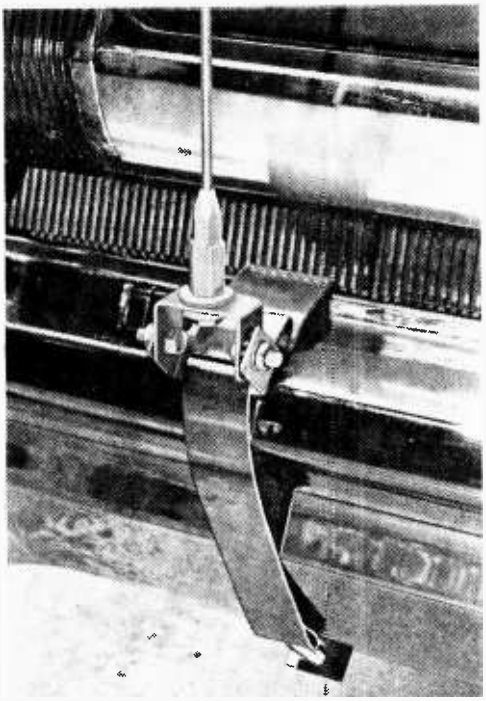
The Browning "Drake" transceiver, designed for those mobile CB operators who prefer vacuum tube gear while enjoying the compact size associated with transistorized units.

Regardless of what the instruction book says, we have found that best power connections are made directly between the rig and the battery, and using RG-8/U coaxial cable to carry the power to the set. The shield at the battery end of the cable is attached to a ground spot on the car. At the transceiver end of the cable, the shield and center conductor of the cable are connected to the transceiver's power socket on the same pins used with the original power wires.

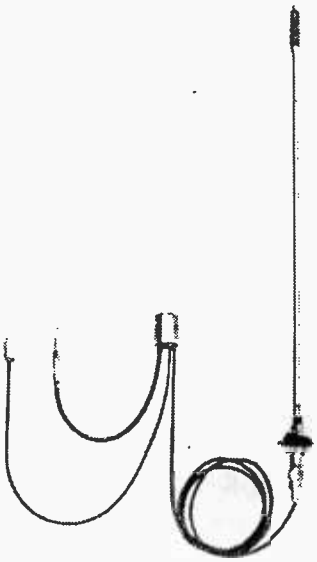
If your transceiver is supplied with a gadget to allow you to operate the set from your cigarette lighter, do *not* use such a device if your installation is going to be of a permanent nature.

The cable between the CB rig and the antenna can be type RG-58/U coaxial cable, however its installation will depend on where you decide to locate the antenna.

Locating the Antenna. Much has been written on the best place to mount a mobile antenna, and it all boils down to the fact that the optimum spot is smack in the center of the roof. For a 2 meter ham rig, where the antenna is 12 inches high, this creates no



Hu-Gains Model BPR bumper mount is ideal for the mobile operator who hates to drill holes in his new car. Stainless steel strap fits any bumper without marring chrome.



For those adverse to turning the family car into an antenna farm, Antenna Specialists type M-103 antenna permits simultaneous operation on CB and the car's BCB receiver.

problems. On the Citizens Band, where a quarter-wave ("standard") whip antenna is over 100 inches long, this prospect doesn't seem quite as rosy.

The solutions are: use a shortened, or "loaded," whip antenna in the center of the roof; or use a full length whip in a *poorer* spot, such as on the rear fender. If you don't want to drill mounting holes for the antenna, you can use a bumper mount.

While the rooftop mounting will give generally better results than anywhere-else mounting, the difference is minor unless you are planning an extremely critical communications system which must function in fringe coverage areas.

If you decide on the roof mounting it will be necessary to drill the hole for the antenna mount right above the ceiling light fixture (remove the fixture first). The cable to the antenna must then be painstakingly "snaked" through the ceiling padding, down through the windshield corner post, and out under the dashboard. A "snake wire" can be used to aid this operation.

For rear mounting, the cable should be passed through the front of the trunk and thence beneath the carpeting to the point where the rig is to be located. You can use your whip antenna to pull the cable through. Also, most new cars have lots of room under the door sills. Look into it. Do not solder on the coaxial connector until the cable is ready to be hooked to the transmitter, and leave an extra foot of slack wire.

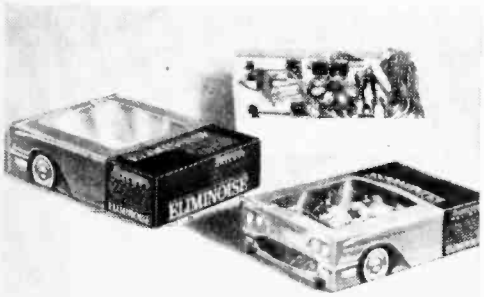
Here's a suggestion which will be of use to those of you who will be operating in large cities, where mobile antennas vanish in the night when the car is not parked in a garage. We have found that the addition of a Hy-Gain Antenna Products type *QD* "quick disconnect" device will save you the expense and bother of having to replace a stolen antenna. The *QD* sells for less than $3 and will work with any mobile antenna. It is attached with only a pair of pliers. The *QD* permits you to remove your antenna from its mount in a matter of seconds (without tools) so that it may be locked inside the vehicle, away from sticky fingers. It's also handy if you would just as soon not have an antenna on the vehicle during periods

HINTS ON GOING *Mobile*

when the rig is not in use.

In Conclusion. Your mobile installation is what *you* make it. If you do nothing more than follow the instruction manual, you will have a rather efficient, but undistinguished, installation. With the aid of the foregoing hints, you will have a customized mobile station—more efficient, snappier looking, and easier to live with, than any other in your area. Be sure *not* to let anyone else in your area read this article, lest you lose your unique status. ■

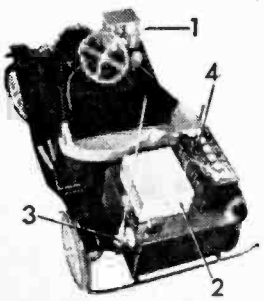
Small CB transceivers fit neatly inside of a glove compartment requiring no brackets.



Many mobile operators complain of high ignition noise interference. E. F. Johnson markets a noise killing kit that easily connects to any vehicle's ignition wires.

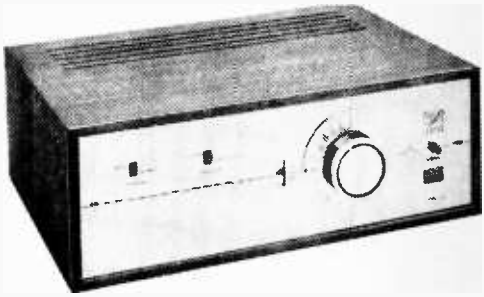
The wise mobile operator keeps tab on his car's electrical system. Here, an Allied Radio ammeter-voltmeter kit gives better information than your car's idiot lights.

THIS MONTH'S COVER



If you would like to duplicate the CB installation shown on this month's cover, here is a rundown of the equipment used. 1 and 2 are the components for the *International Crystal* 750-H Citizen Band transceiver. The remote control unit and speaker are mounted up front near the driver and the "guts" are stored in a neat cabinet in the rear or trunk compartment. The antenna system (3) consists of *Hy-Gains* Model BDY ball body mount and *Hy-Gains* "Jiffy Topper" antenna. The car battery (4) is made by *Autolite* and usually found in Ford cars. And just in case you're interested in the Model T Ford, it is a ½-scale model of the 1910 "Tin Lizzie" that's available from Hammacher Schlemmer of New York for only $395.00.

EICO 2200 FM-Multiplex Stereo Tuner



IT WASN'T too long ago that building a radio receiver or tuner meant only the saving of a factory construction fee. Getting the device to work properly was another story. If you were an experimenter you had the necessary knowledge to locate the mistakes and the test equipment necessary for the required alignment. But if you were a beginner—or didn't have a bench full of test gear—you often spent the wiring fee in having a local service shop dig out the wiring errors and/or aligning the device.

But how times have changed. FM Stereo comes along and complex MPX tuner kits designed to be trouble-free even for the newcomer to electronics are commonplace. And a perfect example is EICO's Classic Series 2200 FM Stereo Tuner; for here is an MPX tuner of which it can truly be said: "It will work *well* the first time you turn it on."

The Manuals. The 2200 stars out as a beginner's project with a new approach to instruction manuals. In fact, there are *three* instruction manuals.

The first is a pictorial book the size of an artist's sketch pad, 11x14 inches. Each pictorial represents only a very small part of the total assembly. No pictorial shows complex crossed leads or a jumble of components. And each component for the individual pictorial is keyed to marks at the top of each page—you pull out the required components before you start each step.

The second book is the construction steps: and even here is a new convenience. Instead of a batch of multi-step pages that gets buried under the project, the book folds out into an easel that stands upright on the workbench. Each page contains a minimum number of steps, practically eliminating the possibility of skip-stepping.

The third book is the maintenance manual. Notice the word *maintenance*—not alignment. This book is only needed for breakdowns after the tuner has been used. The tuner does not require alignment (unless you louse-up some of the coils).

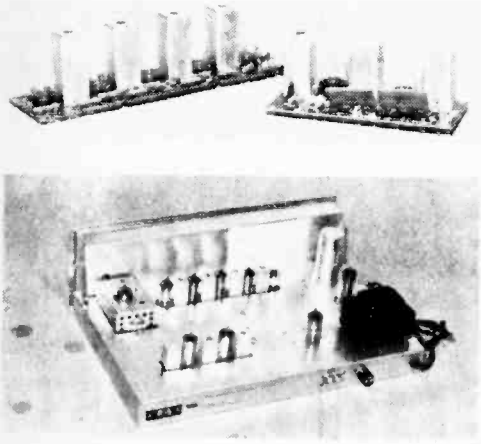
At least two hours of worry-free construction time was saved because of the excellent manuals. Total construction time (taking it slow) was a little over five hours.

It's Half Done. In keeping with the "beginner approach" the tuner is a semi-kit. The chassis and panel components are supplied pre-mounted. The IF strip is supplied completely pre-wired and pre-aligned on a printed circuit board. Actually, the user wires only the rectifier, audio amplifier and the MPX printed circuit board which uses pre-aligned coils. The "front-end," the heart of any tuner, is also provided pre-wired and pre-aligned; aligned, as you shall see, with extreme calibration accuracy.

To further insure trouble-free assembly, in addition to colorcoded wires of which no two similar colors are in the same group, the shielded (coax) cables are also multicolor and at no time does the wirer work with more than one wire of a given color. (There is no such thing as: "use the shorter black wire from hole B.")

A great convenience is the component packaging, which is keyed to the pictorials. For example, when working on Figure 1 an envelope marked "Fig. 1" contains only those components used to complete Figure 1. Even the hardware is packaged by size.

Tuning Up. When completed, all circuits except one is factory aligned. The single user adjustment consists of tuning one coil slug until a whistle (in the stereo mode) vanishes. Unfortunately, this step requires a special alignment tool which isn't included with the kit and we suggest you purchase one before you start assembly. Then you can have the thrill of firing-up when the last step is completed. (It would be nice if EICO included this ten cent item in the kit.)



IF strip (top, left) and MPX board (top, right) are pre-wired and pre-aligned. They fit neatly in pre-punched chassis (below).

One of the first things you note when the tuner is first turned on is that there is no AFC—automatic frequency control. Since the tuner is virtually drift-free there is no need for AFC (a paid for convenience really not needed). You are therefore assured that if the station is tuned in properly you will obtain optimum stereo reception.

To insure proper tuning a twin-bar tuning eye is provided. A station is tuned dead center when there is minimum spacing between the bars.

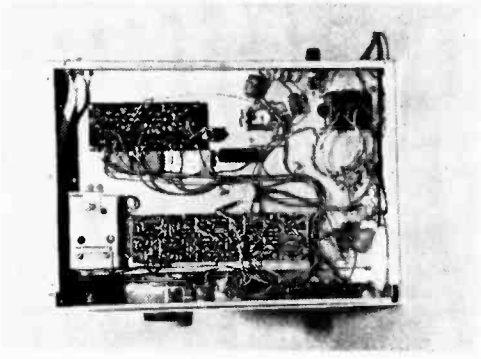
Stereo ID. Stereo program identification is made via the tuning eye. A front panel switch causes the twin bars to overlap when a station is transmitting stereo. However, the stereo indicator is used *after* the station is tuned in. In a locality with few stations this creates no problem. But, in a metropolitan area with many stations it can be a first class pain-in-the-neck to check every individual station that transmits stereo on occasion (as opposed to full time stereo stations).

An unusual stereo tuning aid is the "audio cut-out." To avoid false stereo indications (such as from noise) when using the tuning eye as a stereo indicator, the stereo tuning switch sets up an audio defeat. A true stereo program indication occurs when the electric eye bars overlap; then the switch is released and audio restored. The mono or stereo mode is selected by a switch.

Fine Points. Both the dial drive mechanism and the calibration are excellent. Though a tuning flywheel is not employed, a mechanical vernier drive and a multi-wrap pulley insure backlash-free tuning. The slightest rotation of the tuning knob is translated into a tuning correction.

The dial is calibrated both in frequency and logging scale (0-10), and the calibration is excellent. Calibration marks are at one megacycle intervals and stations were tuned in exactly on-frequency across the entire dial. In the event component aging changes the calibration it can be restored by rotating the dial past the end stops: this technique "slips" the dial back into calibration (try it: it isn't mentioned in the instruction manuals).

Of course, the final criterion is the sound quality, and it is notably good. Channel separation is comparable to quality contemporary tuners. The sound quality is "smooth," with no stridency even at high modulation levels. At $92.50 in kit form you best look over your shoulder as you leave the store with your EICO 2200 tuner—you're holding the audio "steal-of-the-year" in your hands.



Under chassis view of the 2200 shows spacious layout without a "rats nest" look.

For more information on the EICO 2200 FM-multiplex stereo tuner write directly to EICO Electronics Co., Dept. 706, 131-01 39th Avenue, Flushing, New York.

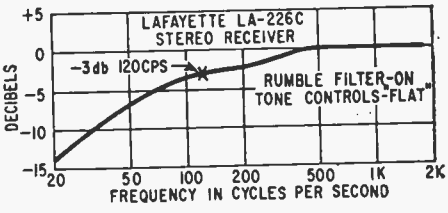
LAFAYETTE LA-226C High-Fidelity FM-Stereo Receiver

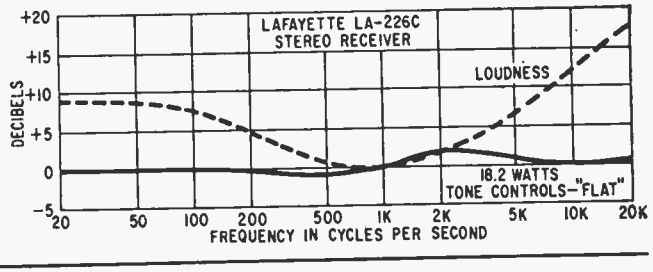
IF YOU'RE among the ever growing group of stereo enthusiasts who can see no *good* reason to stack three or four electronic units in order to enjoy Hi-Fi, since one integrated unit could do the job: Lafayette Radio's *full feature* model LA-226C Stereo Receiver may be just the item to grace your equipment cabinet. We say *full feature* because the LA-226C offers more than just a stereo amplifier with an AM and MPX tuner packed into one cabinet: in terms of flexibility the receiver offers as many conveniences as most component combinations.

Checking the LA-226C. Leading off with a 40 watt rating—20 watts per channel—each amplifier delivered a tested 18.2 watts at .2% harmonic distortion: the distortion rising rapidly above 18.2 watts. Individual bass and treble tone controls are provided for both channels. A friction lock insures that once the optimum adjustment is made for channels A and B a single adjustment varies the tone settings of both channels equally.

Both a loudness and rumble filter are provided, the loudness filter being somewhat unusual in that extra high frequency boost is applied in addition to the low frequency boost. Depending on your own taste the extra boost may be pleasing or annoying. While most find it pleasing, the extra high frequency boost can be restored to normal with the tone controls.

While the rumble filter does its job of reducing turntable rumble, it is not a sharp cutoff and some of the bass—though not an objectionable amount—is also attenuated.





Rated at 20 watts, the LA-226C delivered 18.2 watts at .2% THD. Top graph shows effect of rumble filter—cutoff is not sharp and there is some attenuation below 120 cycles. Bottom graph shows LA-226C's frequency response with tone controls set flat as indicated by front panel markings. Dashed curve is frequency response with loudness "on."

There is only one set of speaker terminals per channel; the 8 or 16 ohm connection being selected by a switch on the rear apron. A second apron-mounted switch provides phase reversal for one speaker (that's all that's needed).

For tests, or other purposes, a front panel switch selects outputs from channel A, B, AB or AB reverse. Actually, the switch doesn't disconnect or change speaker connections; rather, selection is done before the volume controls.

An extra feature is the front panel mounted speaker/headset selector switch and a headset (phone) jack. No special connections are required for headset listening. You just plug in the phones and set the speaker switch to *off*. If, for some reason, you need both phones *and* speakers simultaneously the phones are left connected and the selector switch is set to speakers *on*.

Both blend and balance controls are provided. The blend control is adjustable from full stereo to full mono, and all points in between. For example, should you object to having a ping-pong effect the blend control can be used to mix a little of the two signals together for a center-fill. The balance control simply adjusts the volume balance between the two channels.

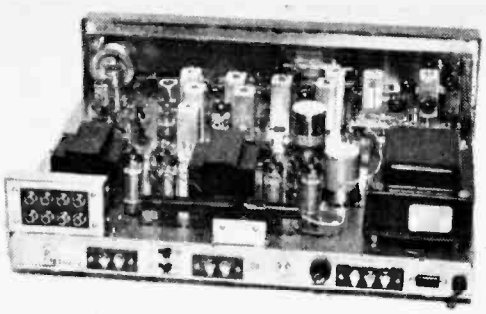
Inputs and Outputs. Three external inputs are provided: an RIAA magnetic *Phono* with a 470,000-ohm load; an equalized *Ceramic* (crystal) phono, and an *Auxiliary* such as for a tape recorder preamp. Test found the external input sensitivity in RMS to be: magnetic phono, 2.4 mv.; ceramic phono, 28 mv.; and auxiliary, .148 volt.

An output for feeding a tape recorder's recording amplifier is also provided. This output is located before the receiver's volume, tone and blend controls so that adjustments to the amplifier don't affect the tape recordings.

EFFECTS OF TONE CONTROLS

Control Setting	20 cps	1 kc.	20 kc.
Full Bass and Treble Boost	+14 db	0 db	+11 db
Full Bass and Treble Cut	—10 db	0 db	—18.5 db

Tone controls have enough range to suit the modest listener. Extreme boosts at the high and low end can be obtained by switching in the loudness control. Extra bass attenuation can be had by switching on the rumble filter. These are extreme cases and will not occur when reasonably flat, good-quality loudspeakers are used.



The LA-226C with its metal cover removed.

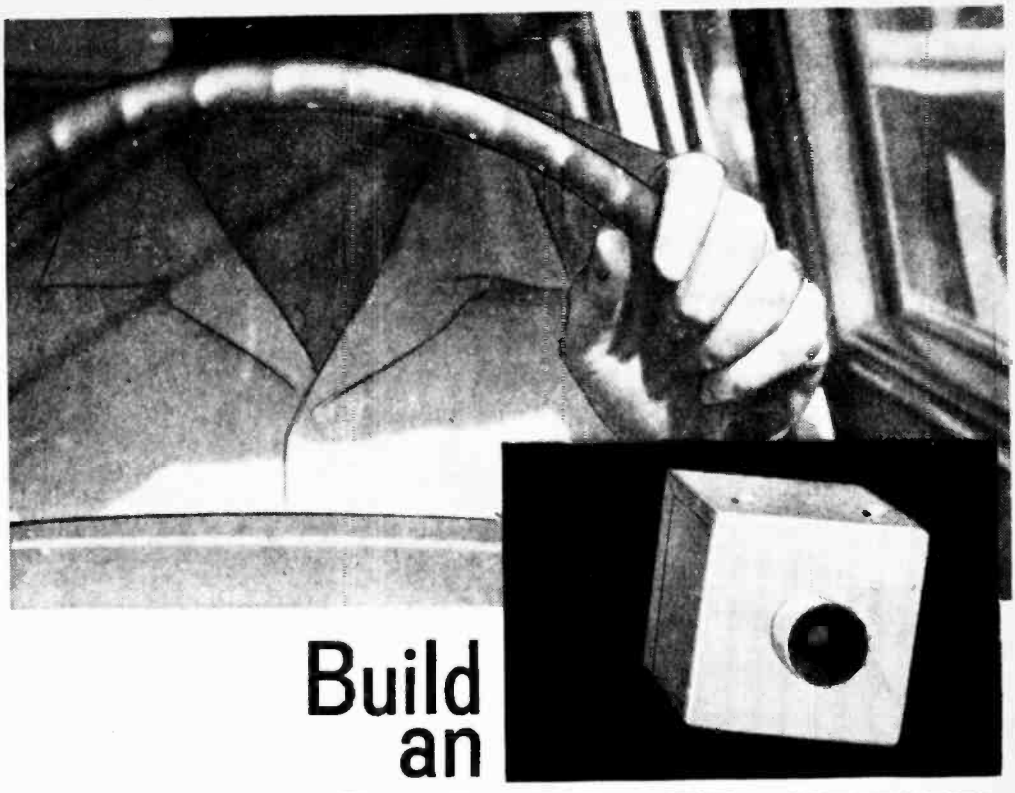
Tuning and Reception. Both the AM and FM section utilize a two-bar tuning "eye." When tuning is adjusted so the two bars are as close as possible the station is tuned on-the-button. The tuning eye also doubles as a stereo broadcast indicator. When searching for a stereo program the "eye" will overlap on stereo broadcasts if the function switch is set to *stereo search*.

A particularly effective AFC is provided which locks-up even on very weak stations if the tuning is anywhere near the station frequency. Of course, while this might create a problem when trying to receive a weak station adjacent to a strong one, the AFC can always be disabled; even with the AFC *off* drift is negligible.

FM stereo reception is good—but considering the price of this receiver it is excellent. You *are* going to hear stereo, but don't expect extreme hair raising ping-pong effects. The AM reception using the built-in ferrite antenna is average—one is like any other on the broadcast band.

Style and Cost. The LA-226C is very highly styled. Though it can be considered a budget receiver there is nothing "cheesy" about its appearance. The cabinet is solid, with a finish that doesn't look as if the spray gun was just waved in the air—it's more like baked enamel (it might even be baked enamel).

At $189.95, good overall performance and an abundance of useful features make the LA-226C an attractive buy. Compared to other stereo receivers that have similar features and performance, the LA-226C offers savings up to $200—the price of a pair of bookshelf speaker systems and automatic changer. ■



Build an AUTO-DIMMER for your car

By Carl Henry

Anyone who does much night driving ends up telling himself the same thing again and again. "I need an automatic headlamp dimmer," he chides. And no bones about it, this is truly one of the handiest gadgets a driver can have on his auto. But it's also expensive—or is it?

Thanks to a new semiconductor, it's now possible to build a good automatic headlamp dimmer for only ten dollars. The headlamp control relay will cost about seven dollars more. So, for seventeen dollars and a little work, you can equip your car with an automatic dimmer, as good as any on the market, that will work well and be maintenance free.

Construction is simple and straightforward. There are no tricky circuits to cause

Your automobile's footswitch will be as useless as a handcrank

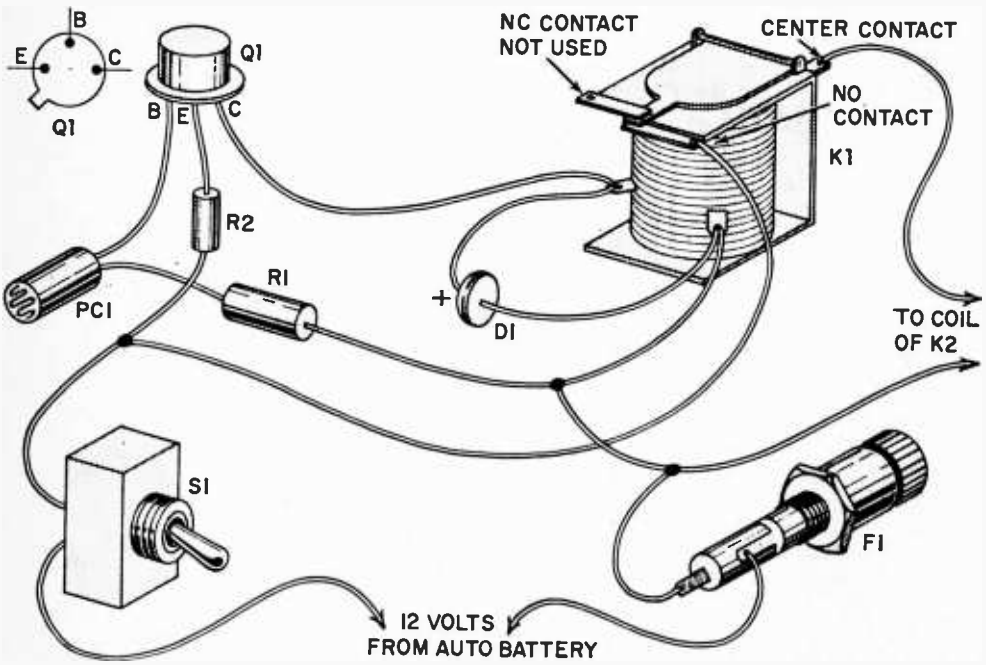
trouble, and installation in your auto is a matter of only an hour's work. Optional controls can be added to vary both sensitivity and time delay.

The Circuit. Before starting construction, let's take a minute to study the schematic diagram for the Auto-Dimmer. The key to the operation of the circuit is the photocell, PC1. This is a variable-resistance cell which automatically varies its resistance depending on the amount of light striking it. In total darkness, the resistance of the cell is about 2 megohms. But as the light on the cell increases, the resistance of the cell decreases; at 100 footcandles, the cell has a resistance on the order of 1000 ohms.

The photocell is used to supply bias to the transistor, Q1. When the light "seen" by the transistor is sufficient to lower the resistance, the forward bias on the transistor increases and the relay, K1, closes. The transistor thus acts to amplify the action of the photocell. The transistor relay in turn operates the control relay which dims the auto headlamps. See schematic diagram of control chassis. This second relay is necessary to allow the manual footswitch dimmer to override the automatic dimmer under any conditions.

The balance of the circuit consists of two resistors, R1 and R2, which serve as current-limiting resistances for the transistor. Diode D1 is necessary to protect the transistor from surges caused by the operation of relay K1.

Construction. The author built his automatic dimmer on an old piece of printed-circuit board that happened to be handy. You can do the same if you have such an item in your junk box. Otherwise, you can wire the circuit on perforated phenolic board and use solder lugs for the connection points. Drill the board as shown in the detail drawing, then mount the relay on the board with 4-40 machine screws. Follow



Pictorial diagram of the Auto-Dimmer showing how wires interconnect the various parts. Exact parts placement and lead lengths are not critical. However, it is suggested that the builder follow construction details in this article carefully.

once you have installed this light-sensitive semiconductor device

the mounting and wiring as shown in the pictorial diagram and photos. Punch the box for the automatic dimmer. Mount the fuse holder, switch and the grommet to hold the photocell.

A piece of plastic tubing is attached to the front of the box with epoxy resin to act as a light shield for the photocell. This prevents extraneous light from affecting the dimmer circuit. Mount the plastic tubing, then mount the circuit board using two 6-32 machine screws. Stand the board from the top of the box as shown.

Now finish the wiring, and connect a 5-ft. piece of four-conductor cable to the proper connections on the box.

Check-Out. You can now make a preliminary test on the dimmer by hooking it to a 12-volt source. When you are sure that the wiring is correct, connect a 12-VDC source to the dimmer, and turn switch S1 to *Automatic*. Relay K1 should operate if there is enough light to see by. Putting your hand tightly over the photocell should cause the relay to drop out. If you have trouble, double-check your wiring again.

After the dimmer passes this check, you are ready to proceed with construction of the control chassis. Refer to the detail drawing on punching the control chassis and the schematic diagram for the control relay circuit. The author used a piece of scrap aluminum for the chassis, which he painted white after punching it.

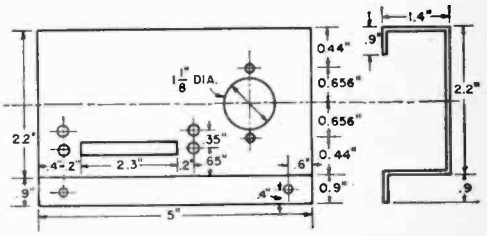
You may wonder about the need for a second relay in this circuit. The answer is simple. The larger relay on the control chassis can switch the heavy current of the headlamp circuit better, and it also allows the driver to have complete control of the lights.

As you can see from the schematic diagrams, if the automatic dimmer holds the headlamps on bright, you can dim them sim-

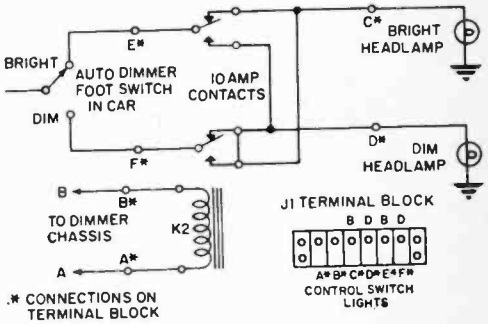
PARTS LIST

D1—Silicon rectifier (International Rectifier 2E4 or equiv.)
F1—½-amp fuse, 3AG
1—Fuse holder for 3AG fuse
J1—6-terminal barrier strip (Cinch-Jones 6-140 or equiv.)
K1—S.p.d.t. relay (Potter & Brumfield RS5D with 6-VDC coil)
K2—Multi-contact relay (Potter & Brumfield KRP11D-G with 12-VDC coil)
PC1—Photocell (Clairex CL-604L)
Q1—Pnp transistor; use either 2N654 (Motorola) or 2N241A (GE)
R1—470-ohm, 1-watt resistor
R2—47-ohm, ½-watt resistor
S1—S.p.d.t. toggle switch
1—Octal Socket
1—Aluminum chassis box, 4" x 2¼" x 2¼" (Bud CU2103A)
1—Scrap aluminum for control chassis, 5" x 7"
Misc.—Shield for photo cell, phenolic board, rubber grommet, wire, cable, solder, etc.

Estimated Cost: $17.00
Estimated construction time: 6 hours with installation



The dimensions for the overall size of the control chassis is not critical except for mounting holes for relay K2 and 6-terminal barrier strip J1 where cables connect.



Schematic diagram for the control chassis mounted under the automobile's hood. The hot leads to the bright and dim headlamps are cut. Then, ends that trace back to the dimmer switch connect to terminals E* and F*. The ends that trace back to the headlamps connect to terminals C* and D*.

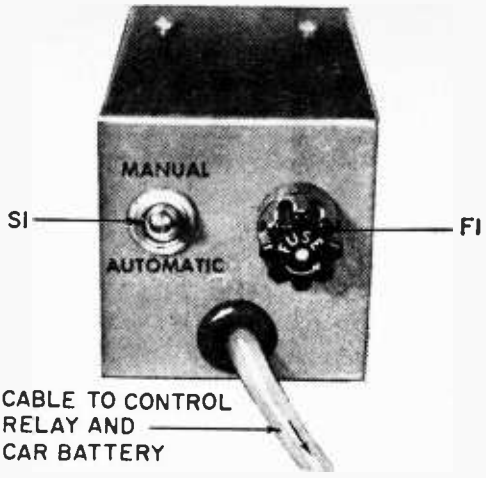
ply by pushing the footswitch. The reverse is also true—if the lights dim when they should remain bright, the footswitch will override the automatic dimmer and restore the lamps to high beam.

After completing construction and wiring of the control chassis, install it in your car, and break the wires from your footswitch to the headlamps through the terminal strip on the control chassis. After doing this, check your lights to see that they operate normally. There should be no change in the operation of the headlamps. Most important, if the lights were on bright when you started the wiring, they should still be on bright.

Install the automatic dimmer in your car, either to your left or on the center of the top of the dashboard. Be sure that windshield wipers, windshield stickers, or other items do not prevent the photocell from "seeing" the road. Point the dimmer straight ahead and level it.

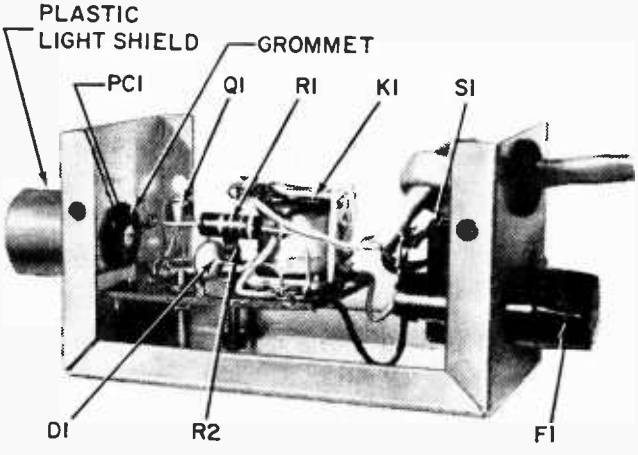
Pick up 12 volts from the headlamp fuse for power to the automatic dimmer. Connect the other two output wires from the automatic dimmer to the terminals on the control chassis.

Final Test. Before giving the Auto-Dimmer a test road run, set switch S1 to *Manual*. The lights should then work normally, and so should the footswitch. Now switch to low beam, and turn S1 from *Manual* to *Automatic*. Assuming you are parked with no street lights close by, the headlamps should switch from low to high beam at once. Note that you can always override the automatic dimmer with the footswitch, and that

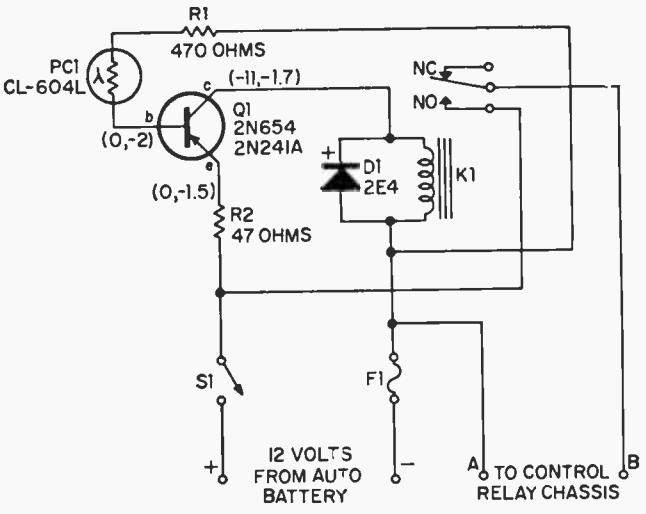


Driver's view of the Auto-Dimmer mounted to the left of the driver next to the windshield. Final adjustment has to be made during road test to aim "eye" correctly.

View of the control chassis installed under the hood of the author's car. Mount where the unit will be accessible for inspection.



Inside view of the Auto-Dimmer showing location of parts. Relay K1 is isolated from metal case by phenolic board.

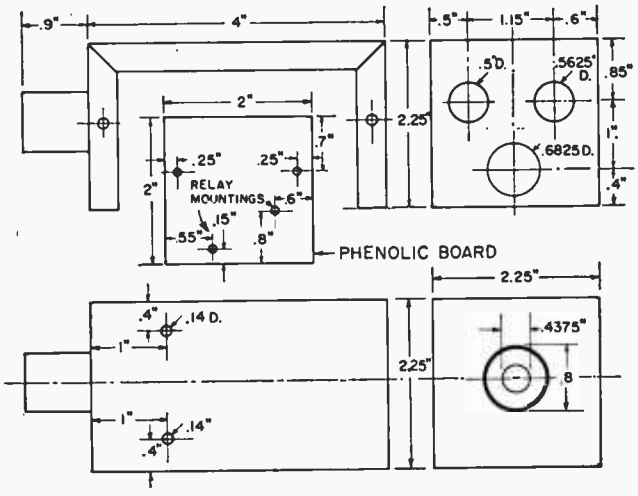


The heart of the Auto-Dimmer circuit is photocell PC1 which serves as a light-sensitive, variable resistor that controls the conduction of transistor Q1. Light from a distant headlamp drops the internal resistance of PC1 down from 2 megohms to about 1000 ohms. Thus, a strong negative bias is applied to Q1 and the transistor conducts heavily drawing a large current through K1's coil. Result—relay is energized providing a closed circuit for the control chassis. Numbers in parenthesis are voltages with and without Q1 conducting respectively.

the incident light in town is enough to hold the lights on low beam.

No provision is made for variable sensitivity. You can add this feature if you wish, although in general it is not necessary. To add this control, replace resistor R1 with a 100,000-ohm, 1-watt potentiometer connected as a 2-terminal resistor. This will give you a wide control over the light switching point of the circuit. At minimum resistance on the potentiometer, sensitivity will be at maximum.

The switching delay of the circuit can also be adjusted to a different value. If you wish to change the switching time, add a capacitor between the base of transistor Q1 and the positive side of the 12-volt source. You can use from 0.05 to 1.0 uf. in this position—the bigger the capacitor, the longer the delay in switching. ■



Detail drawing of the Auto-Dimmer dashboard box. Follow plans exactly in order to fit parts in the box. Be sure that no wires press against relay K1's clapper closing it continuously. Mount relay on phenolic board and then mount board in box. Use an ohmmeter to check that no part of the relay is electrically connected to the chassis box. Phenolic board is raised about 1/4-inch above the box bottom by means of spacers to prevent accidental shorts. Plastic light shield is painted black to reduce reflection.

Heathkit SB-300 Deluxe SSB Amateur Receiver

SSB Receiver Kit

Complete linear coverage of 80 through 10 meter amateur bands

IT'S TRULY amazing what quality the kit manufacturers can offer at low prices. A good case in point is the Heath SB-300 SSB receiver. At $265.00, it is superb from any viewpoint, having practically all the features and performance the average ham operator could desire.

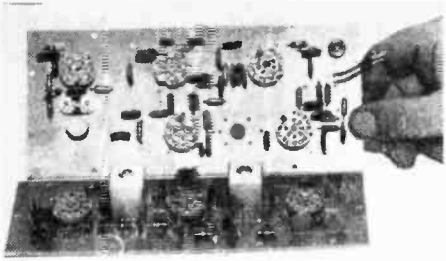
The SB-300 is what is known as a "frequency meter receiver"—that is, its dial calibration is so accurate it can be depended upon for precision readings. For example, if you've a sked on 3.825 mc. you just set the dial to that frequency and there's your buddy (providing *he's* on frequency). Or, if you like to crowd the edges you can do it within several hundred cycles and still be certain you're inside the band.

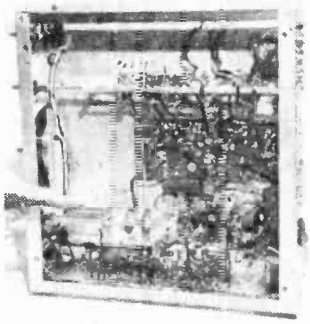
Band Spread Plus. Unlike the usual receiver dials you're perhaps familiar with, the SB-300 tunes only the 80- through 10-meter hambands in 500 kc. segments; for example, on 80 meters the receiver tunes 3.5 to 4 mc.; on 40 meters, 7 to 7.5 mc.; and on 10 meters there are four bands starting at 28, 28.5, 29, and 29.5 mc.

As you would expect, the bandspread is phenomenal. At a moderate tuning rate it could take up to two minutes to tune across the 80/75 meter band—10 seconds if you are in a hurry. Of course, the extra long bandspread makes tuning SSB and CW a pleasure. Since a frequency change of just a few hundred cycles represents a substantial movement of the tuning control, it is very easy to separate SSB or CW signals separated by just a hundred or so cycles.

The Circuit. The entire line-up is: an RF amplifier with its own preselector (not coupled to the tuning dial—you peak each signal for optimum reception), a crystal controlled heterodyne oscillator and mixer, a linear master oscillator (LMO) and mixer, a mechanical filter, IF amplifier, diode detector for AM and a crystal-controlled BFO and product detector for SSB and CW reception. Naturally, an audio amplifier, and an adjustable 100 kc. crystal standard.

Sound like a routine line-up? It is. The extra is what Heath gets out of the circuits. First, both a slow and fast AGC (automatic

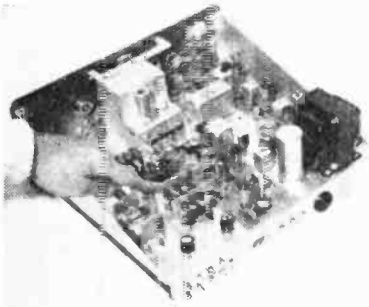


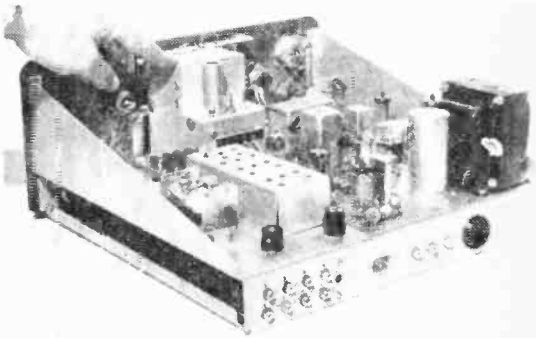


Extensive shielding of critical circuits contributes to excellent stability. Factory made wire harness eliminates rat's nest wiring underneath the chassis.

Designed to be assembled by the kit builder, the RF and IF amplifiers are constructed on two printed circuit boards (top). Completed receiver with hand pointing out coil shields (below). Make a check for short circuits between coils and shields.

Finger points to the Linear Master Oscillator (LMO) which is supplied completely preassembled and aligned.





gain control) is provided which is effective in all three modes. it is particularly good on SSB where the slow AGC position results in reception without "pumping." The AGC is also the delayed type—below a preset level it has no effect and you don't get

vision is made for automatic control of the antenna/converter connections. There are three "hot" antenna jacks (plus a spare); one is the regular antenna input: the remaining two are for converter outputs. A chassis

SSB receiver kit

the instructions and layout are particularly good, and we feel safe in saying that even a beginner with little experience should be able to have this kit working right off the bat. (But, if you've never built anything with more than one tube wait a while for the SB-300—get a little more construction experience.)

The only major problem or difficulty the beginner might have is in soldering the printed circuit (PC) boards. If you use a pencil tipped iron of less than 50 watts and the wire type solder supplied, there'll be no strain. But, if you use a solder gun or a high wattage iron, or substitute a "heavier" solder to "get a better connection," you'll have nothing but heartaches from the PC boards.

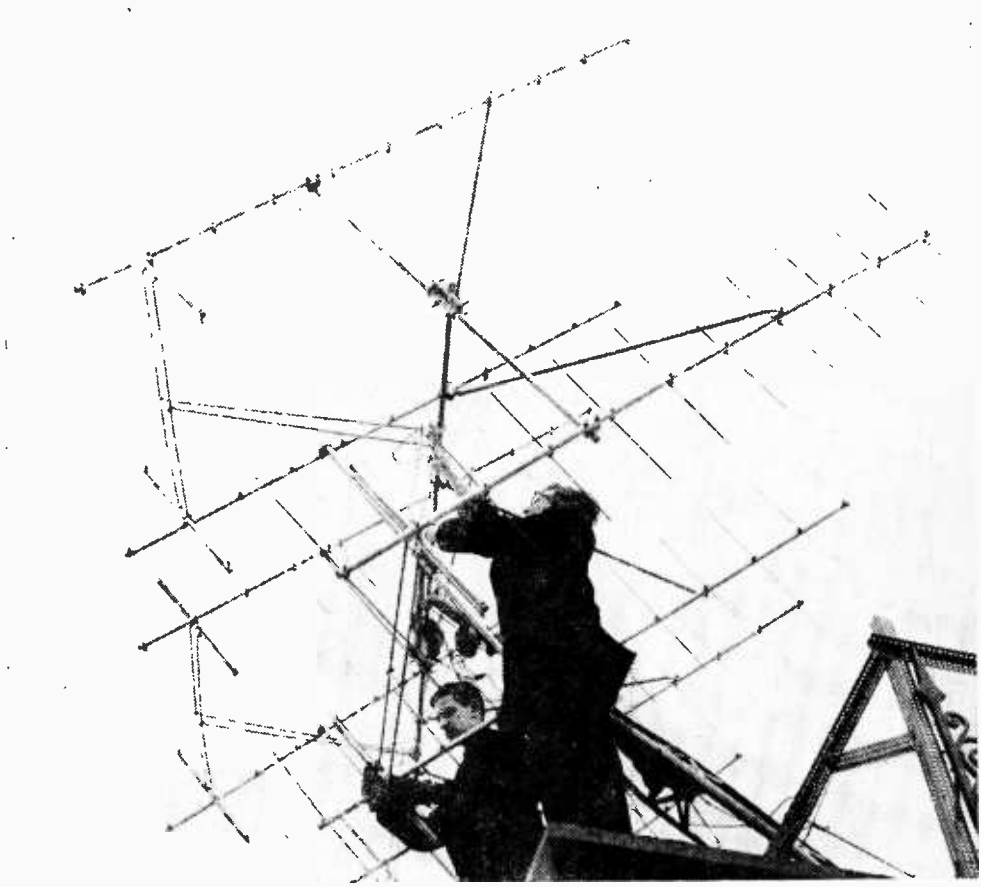
Most of the components (all the critical components) are mounted on two PC boards; only the product detector and RF coils and power supply mount on the chassis. The LMO is supplied completely pre-wired and pre-aligned so no matter what you do your assembly can't affect calibration.

While there are many interconnecting cables, they are all supplied in a single color-coded harness and while the connections look formidable they are perhaps the easiest and quickest part of assembly. Just take extra time to make certain you select the correct color wire at each breakout.

About the only critical assembly—as strange as it may seem *now*—is the dial mechanism. All the extra time spent on this item will be more than made up for in final performance (Heath doesn't make this point too clear). The accuracy of dial reading and tuning ease is directly proportional to the effort put into the dial assembly. Since this is next to the last step don't be in a hurry to finish the kit. Check the dial operation *several times* before you assemble the front panel. Once the panel is in place it's nearly impossible to correct the dial if you don't like the "action."

While this is a complex receiver by any standards, the alignment is extremely easy—in a way it's easier to align than an AC-DC radio. If you don't have an accurate signal generator a darn good alignment can be had by using the built-in 100 kc. calibrator and a VTVM (you *must* use a VTVM). Heath gives both the signal generator and calibrator alignment procedures.

Our Viewpoint! How does the final product perform? Just GREAT! To print the performance figures would be simply to reprint Heath's specs. (You can look these up yourself). An indication of the quality is in the receiver's stability. After a short twenty minute warm-up drift is virtually non-existant. If the received signal isn't drifting you can work through an entire contact without touching the tuning knob. (Even on a quick five minute warmup you can stick with an SSB signal.) In short, if you're looking for a good single-side-band receiver, and the SB-300's specs appeals to you, you won't be disappointed. ■



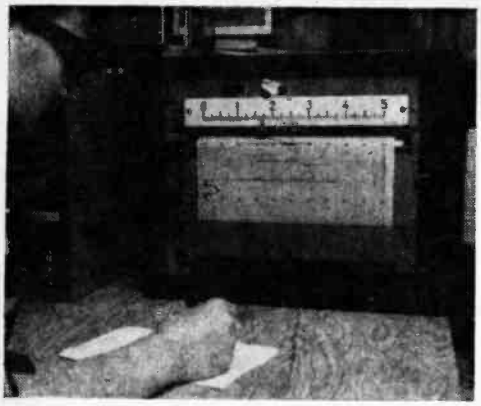
Barry Appleman (left) and Andrew Palkovitz (right) are at home amid a complex of eight Yagi antennas and rotators because they put them together on top of a Brooklyn museum.

Teen-age Astronomers Tune In the Stars

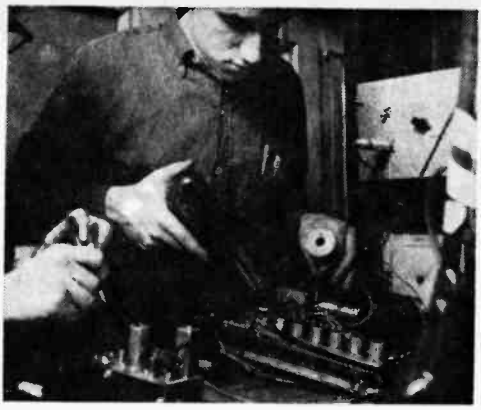
Photos courtesy Three Lions

This is a quiet year for the sun, but this *brightest* of our stars is likely to lose some of its hottest secrets as a result. Brooklyn teen-agers are listening to it as well as other stars, and studying what they hear. They're able to tune-in on the stars because two boys recently completed building a radio telescope at the Brookyln Children's Museum. Installed in a roof observatory there, it is being used for teaching and student research throughout the year.

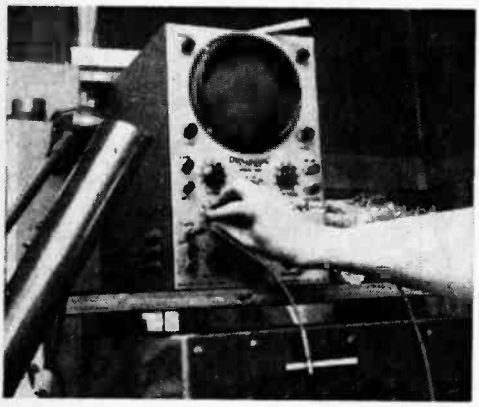
The stars, the sun, planets, and other extra-terrestrial sources in the heavens above emit radio signals which can be detected and recorded by a radio telescope. The one in Brooklyn which Andrew Palkovitz, 16, and Barry Appleman, 17, designed and built over a three-month period, is an equitorial mounted Yagi-type radio telescope operating at a frequency of 220 megacycles. Both teen-agers are students at Brooklyn Technical



This 0-5 millivolt Weston recorder graph donated by Bell Laboratories plots emissions from planetary and stellar radio emissions.



Among the many complex electronic components of the telescope is an intermediate frequency amplifier being worked on by Barry.



Once assembled, the many components of the telescope need frequent checking and alignment. Here, an EICO 460 oscilloscope is used.

Studying data recorded on previous day, Andy and Barry mark graph for time and anticipated sources during the "year of the quiet sun."

High School, and they built the complex electronic listening device as a project. In the process, they mounted eight Yagi antennas on the Museum's roof. These highly directional antennas detect the signals from the heavens and transmit them to various components and electronics systems inside in the observatory.

The entire complex scheme was put together by the boys, assisted by Joel Stewart Levine, head of the Museum's astronomy department. An 0-5 millivolt pen recorder, donated by Bell Laboratories, detects and graphs the signals. Other electronic devices include a radio frequency amplifier and converter coupled to an intermediate frequency amplifier. A 1962 grant from the National Science Foundation financed Mr. Levine's initial research work with a radio telescope at Yale. Currently, a similar grant at the Museum is supportng the projects of the teenage astronomers.

Because they would like to know more about the temperature of the planets, these students are studying planetary radio emissions for clues. Effects of the ionosphere on radio signals from outer space is another project. Locating and mapping radio sources in the sky is a daily labor of love for these young scientists. But much young curiosity centers on the sun itself. Because it is having less solar eruptions and fewer storms of sunspots than usual, its radio signals are coming through clearly. Hence, observation of it by ear is likely to be no more shattering than listening to the Beatles. ■

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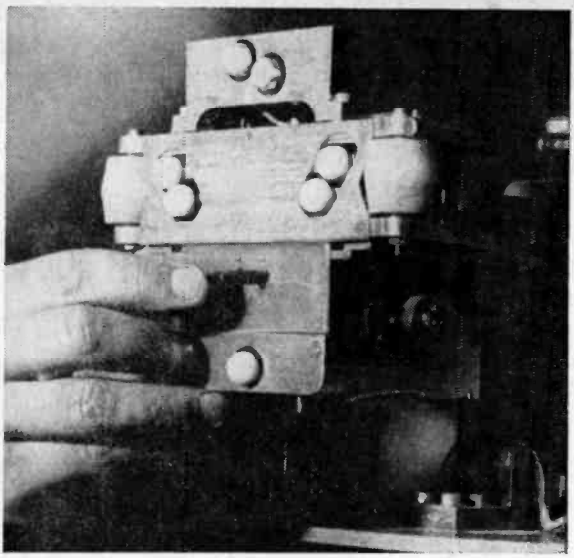
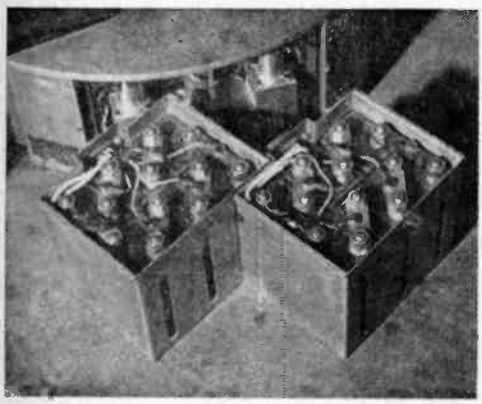
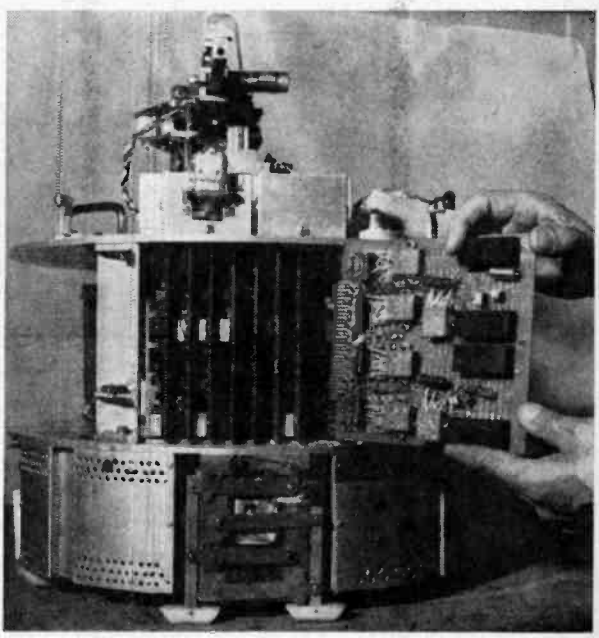


Photos courtesy of Three Lions, Inc.

The head assembly on the robot's only arm has eight white teflon balls that activate microswitches when depressed. The balls are spaced so that when placed over a wall plate of an ordinary wall receptacle, the four inner balls (see photo left) are depressed and AC prongs (pointed out by top finger) makes contact. Two battery packs (lower left) each contain six batteries and serve as the robot's power supply. Logic circuit boards (see below) packed with electronic parts do most of the "thinking." Here, the robot determines when it is hungry—a calorie countdown.

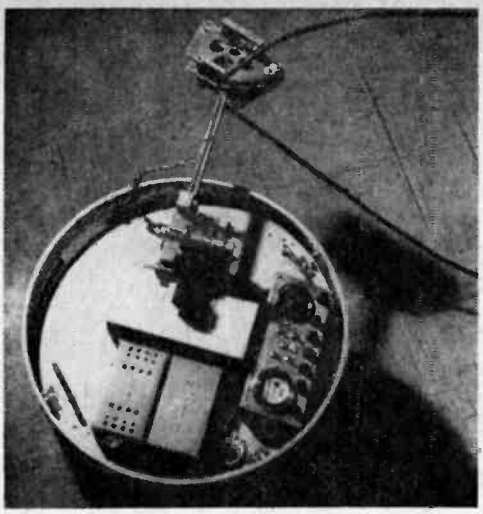




THE ROBOT THAT FEEDS ITSELF

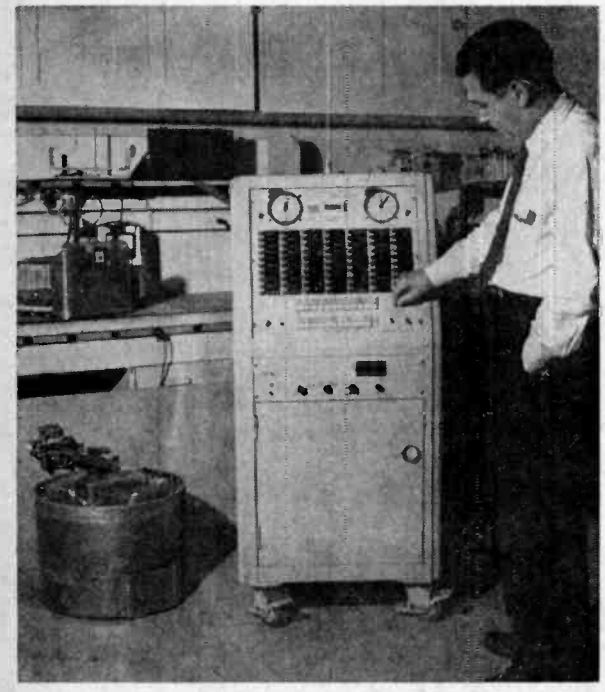
Roaming through the halls and offices of the Applied Physics Laboratory in Johns Hopkins University is a 100-pound robot that looks like a hatbox and can accomplish most amazing feats—like feeding itself. When its 12 silver-cadmium batteries get weak, the robot has the "brain" capability to guide the robot in a search for a 115-volt wall receptacle, plug itself into the power line, and take on a charge. Furthermore, there is a special senser system that stops the robot at the top of stairs or platform edges. And, if its only arm catches in a wire or railing, it has the brains to think its way out.

—J. Sienkiewicz



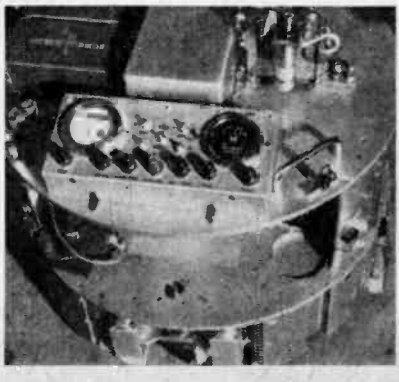
When a wire snarls on the robot's arm, it will not run off and drag the physics laboratory with it. Robot has "brain" capability to free itself in such instances.

As much as it would like to, the robot comes to a halt at the top of a stairway and lets the pretty Miss escape. Mechanical sensors prevent the robot from falling.



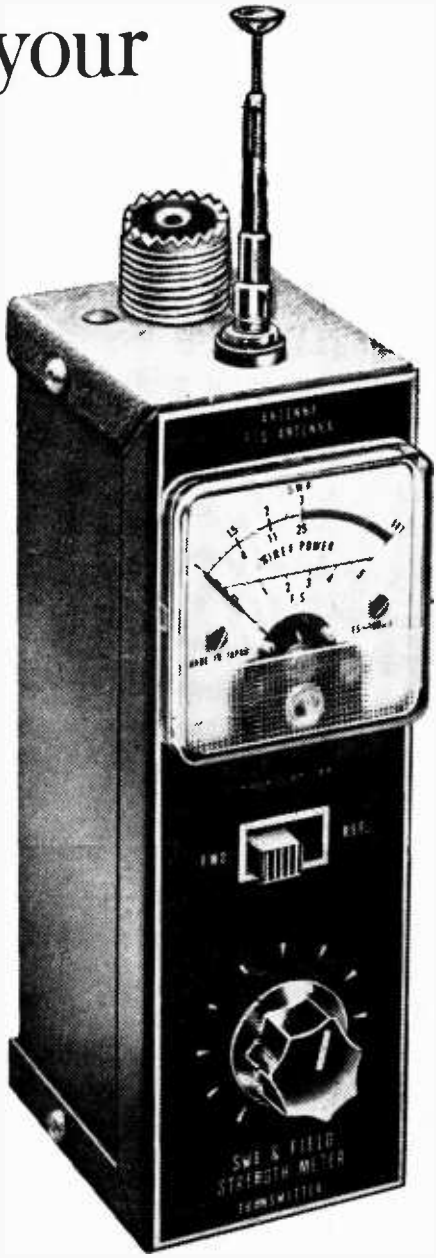
A special telemetering console monitors the robot's actions at a distance. Left, robot is feeding on a simulated wall outlet.

No corner is sacred to the snooping habit of the robot in its search for wall outlets. Scientists at work are very often surprised as the robot pokes into nooks and corners.



Close up view of robot showing the control panel. Meters and lights indicate robot's health—on/off switch is for human control.

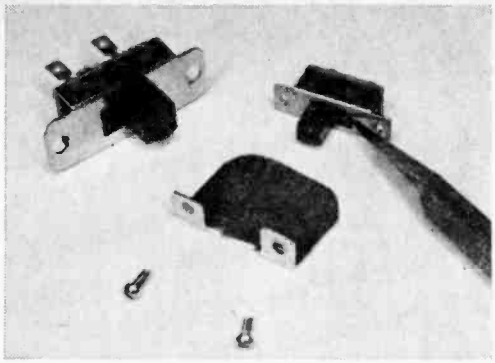
"Switch-ify" your SWR bridge



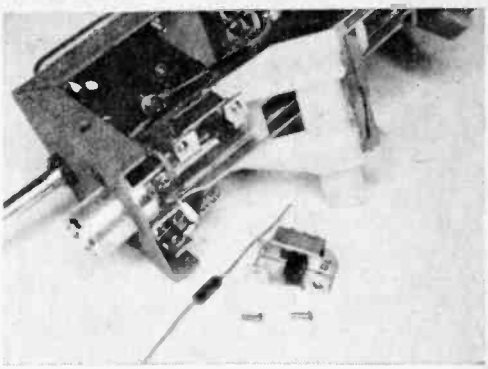
Designed to be built for use with only one—either a 52-ohm or a 75-ohm—coaxial transmission line, many of the available SWR bridges can be simply modified to switch-select either impedance desired

The standing wave ratio (SWR) of an antenna transmission line is a measure of the efficiency of the antenna system. A low SWR, ideally 1:1, is highly desirable and a good indication that your antenna is radiating almost all the radio frequency energy fed into the transmission line from the transmitter. For this reason, SWR bridges have become a very popular accessory in ham, CB and commercial radio stations. Many wired and kit-form SWR bridges usable up to 1 kilowatt of RF power are readily available from $10 to $30—but most of them are designed with a fixed impedance limiting their use to an antenna system with a corresponding impedance. To get proper readings on the SWR bridge, it must not disturb the impedance of the transmission line in which

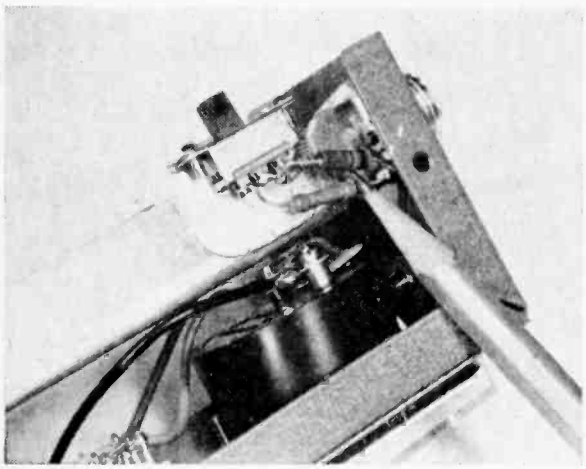
By Fred Blechman, K6UGT



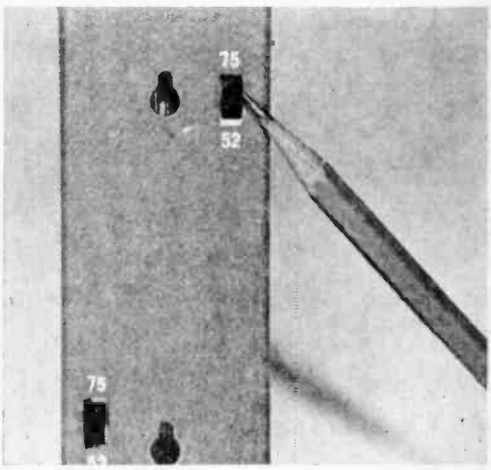
The standard-size slide switch (left) is too large for this modification but a miniature switch with a small bracket is ideal.



The miniature switch and bracket are held by a small nylon clamp while they are cemented in place next to the 150-ohm resistor.



Both the 100- and the 150-ohm resistors fit compactly into the available chassis space.



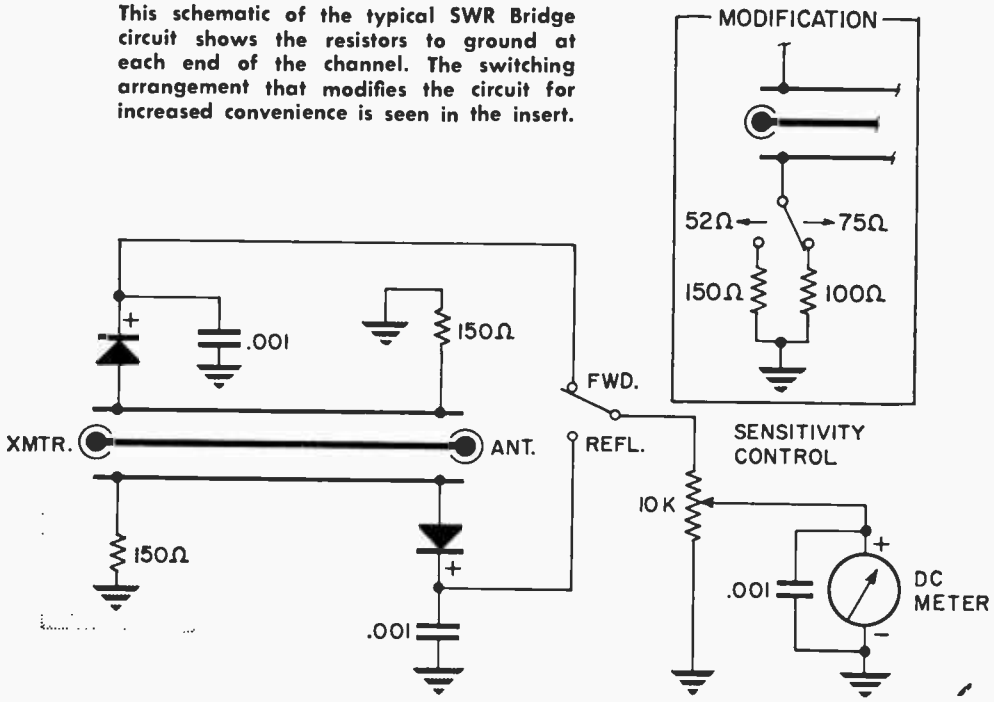
The switch toggles project through holes in the back cover which is marked 52 and 75.

it is placed. But you can make a simple modification, for less than a dollar, that will give your SWR bridge dual-capability application with both 52-ohm and 75-ohm impedance transmission lines.

Most ready-made bridges are designed for use with 52-ohm coaxial transmission line, such as RG-58/U or RG-9/U. If these bridges are used with common 75-ohm coaxial transmission line such as RG-59/U or RG-11/U (typically used with simple dipole antennas, or in combination with a balun coil for folded dipoles), the bridge meter reading will be sadly in error. Also, the improper bridge impedance will probably create a higher SWR on the transmission line because it is mismatched to the line. Most SWR bridge kits do furnish the builder with a choice of resistor values so the bridge can be built for use with either 52-ohm or 75-ohm coaxial transmission lines—but not both! But with the simple addition of two switches and two resistors your bridge can have the dual capability of operating with a 52- or 75-ohm line switch selected.

Switch it. This modification is based on the switching arrangement on the Lafayette TM-58 SWR Bridge and RF Power Meter. It is one of the few units available that has switch-selection of the impedance. A selector switch is placed at each end of the bridge measuring section; these switches select the proper resistor values to make the bridge impedance match the transmission line impedance. But the Lafayette HE-72 SWR and Field Strength Meter, although a more inex-

This schematic of the typical SWR Bridge circuit shows the resistors to ground at each end of the channel. The switching arrangement that modifies the circuit for increased convenience is seen in the insert.



pensive instrument, can also incorporate the switch-selectable impedances. The unit's field strength meter section is not at all affected by the changes to provide switchable impedance. Although the HE-72 is illustrated here, the Allied Knight-kit P-2 SWR/Power Meter, Heath AM-2, Heath HM-11, and the Monarch FSI-3 SWR and Field Strength Meter also can be converted to dual-capability by the same technique.

Construction. All you need to modify the HE-72 are two slide switches, two 100-ohm ½-watt composition (*not* wirewound), resistors, a small scrap of aluminum sheet, some good cement (epoxy) and a short length of insulated hookup wire.

After removing the back of the unit, you will find a 150-ohm resistor at each end of the channel, connected from a chassis-grounded lug to the end of a small pickup rod. Install one slide switch at each end of the channel near this resistor. On this unit, miniature slide switches * must be used, or the back will not fit on. By mounting each switch to a small right-angle bracket made from scrap aluminum, and then cementing this bracket to the side of the channel, the switches can be positioned so the switch toggles will project through the back cover.

After the cement has dried, unsolder each of the 150-ohm resistors from the small rods, and solder them instead to the bottom lug of each slide switch. Solder a short insulated wire from the center lug of each switch to the small rods from which the resistors were removed. Now solder the new 100-ohm resistors from the top lug of each slide switch to the same ground connections used for the 150-ohm resistors to complete the rewiring.

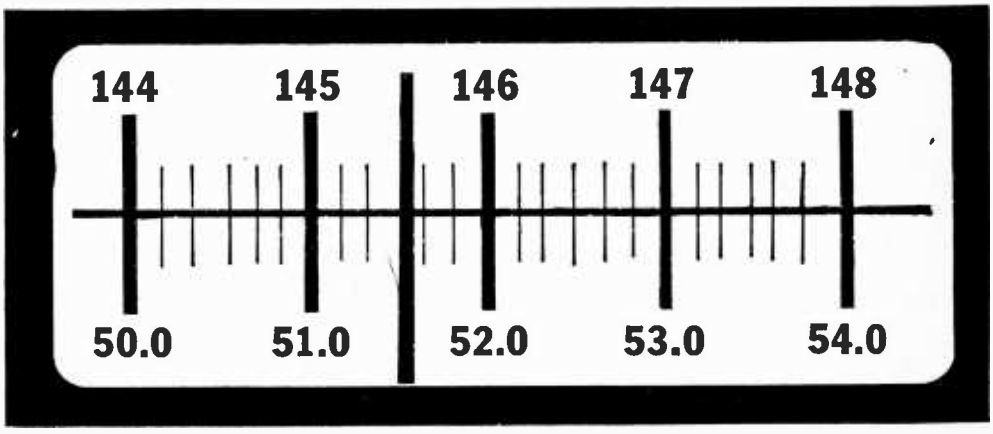
Small holes can now be cut in the back cover for the new switch toggles to project through. Replace the back cover and mark the switch positions "75 ohms" on the 100-ohm resistor side and "52 ohms" on the 150-ohm resistor side.

Some Tips. In modifying other units, you might be able to use less expensive standard-size slide switches. The same procedure can be followed with all SWR Bridges that use the typical channel-insulator-rod construction.

With the modification complete, the bridge can be used with any common antenna system that uses coaxial transmission line. Just set the switches to the line impedance and record an accurate SWR—conveniently. ■

* Author used the Lafayette SW-104 miniature slide switch. Any slide switch that fits the unit you are modifying will be suitable at low power levels.

6 and 2 meter TRANSCEIVER ROUNDUP



By Tom Kneitel
K3FLL/WB2AAI

Despite what many people will tell you about the Citizens Band being a blight on humanity, it must be nevertheless admitted by all concerned that CB was the inspiration for the latest popular piece of electronics gear—the *transceiver*, such being the name for a single unit containing both a transmitter and a receiver, generally utilizing components which are common to both circuits.

Not that transceivers hadn't been around long before CB came along in the late 1950's, they had been with us for years in police, taxi, and other two-way commercial radio installations. CB brought to life the compact, stylish, versatile, and *low-cost* version of the equipment.

Realizing the amazing flexibility and market appeal of the newly reborn transceiver, a number of electronics manufacturers took the hint from the CB folks and brought out transceivers designed for the amateur radio market, concentrating most of their efforts on the 6- and 2-meter bands. It should be noted that the 2-meter transceivers have been widely accepted by Civil Defense authorities and by the constantly growing numbers of Novice class operators who populate the band. Six meters, strangely enough, attracts a majority of the more than 30,000 ham operators who "graduated" to the ham service by way of CB. Transceivers are popular because of their ease of installation and operation.

Transceiver Features. Basic features of many transceivers are combination home/mobile units with 12VDC/115VAC or 6VDC/115VAC power supplies, a keenly peaked noise limiting circuit, push-to-talk microphone circuit, high efficiency modula-

Manufacturer	Model	No. of Tubes	Band	Input Power (watts)	Squelch	VFO	Xtal Spotting	Power Supply[1] Included
CLEGG	99'er	10	6	8	NO	NO	YES	115
CLEGG	22'er	13	2	18	NO	NO	YES	12/115
CLEGG	THOR 6	18	6	50-60	NO	YES	NO	115
CLEGG	VENUS	21	6	85[2]	NO	YES	—	115
GONSET	SIDEWINDER	3	2	20[2]	NO	YES	—	NONE
GONSET	G-50	12	6	48	YES	YES	YES	115
GONSET	Communicator 4	18	2	24	YES	NO	YES	12/115
GONSET	G-76	18	6	100	NO	NO	YES	NONE
HEATH	HW-29A	5	6	5	NO	NO	NO	115
HEATH	HW-30	5	2	5	NO	NO	NO	115
HEATH	HW-10	15	6	10[3]	YES	YES	YES	6/12/115
HEATH	HW-20	15	2	10[3]	YES	YES	YES	6/12/115
LAFAYETTE	HE-45B	8	6	14	YES	NO	YES	12/115
OLSON	RA-570	11	6	15	YES	NO	YES	12/115
POLYTRONICS	POLY-COMM 6	15	6	18	YES	YES	YES	12/115
POLYTRONICS	POLY-COMM 2	19	2	17	YES	YES	YES	12/115
UTICA	650	13	6	22	YES	YES	YES	12/115
UTICA	652	11	2	15	YES	NO	YES	12/115
WORLD RADIO	TC6A	6	6	5	NO	NO	NO	NONE

1. 6—6VDC; 12—12VDC; 115—115VAC. 2. Peak-Envelope-Power. 3. Output power.

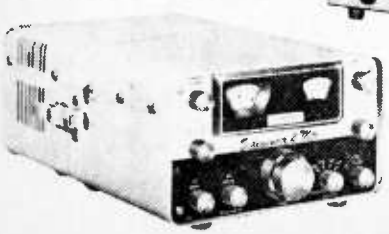
Clegg 99'er

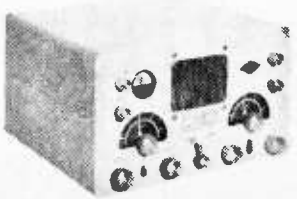
Clegg 22'er

Clegg Thor 6

Clegg Venus

Gonset Sidewinder





Gonset G-50

Push to Talk	Price ($)	Notes
NO	$159.95	
YES	239.50	
NO	349.95	
NO	450.00	Xtal spotting not necessary; SSB.
YES	399.95	Xtal spotting not required; SSB. 21 transistors.
NO	367.30	
NO	409.95	
YES	451.32	Also includes 80, 40, 20, 15, and 10 meters; VFO on Lower bands
NO	44.95	Kit; regen-receiver.
NO	44.95	Kit; regen-receiver.
YES	199.95	Kit.
YES	199.95	Kit.
YES	119.95	
YES	139.98	
YES	329.50	
YES	349.50	
YES	189.95	
YES	150.00	
NO	39.95	

tion (often with adjustable gain), "channel spotting" (which allows you to rapidly adjust your transmitter frequency to any frequency being received, built-in loudspeaker, "S" meter, panel lights, and pi-network transmitter output to permit loading into various antenna impedances. A recent innovation has been the introduction of single sideband ("SSB") transceivers to meet the demands for this popular transmission mode.

Buying a Transceiver. Certain transceivers were designed for interchangeable home station *and* mobile use, while others are suitable for operation in only one type of installation.

If you're looking for a mobile transceiver, you will find that a unit which has some provisions for mounting under the dashboard will be a plus—these provisions might be an actual mobile mounting bracket which is included with the set, or it could be holes drilled in the cabinet for the installation of an optional mobile mounting bracket. Be certain that your mobile transceiver has push-to-talk, or that a "PTT" circuit can be added without too much trouble, because it is virtually impossible to *safely* navigate a car

Gonset G-76

Gonset Communicator 4

Heath HW-29A
Heath HW-30

Heath HW-10

Heath HW-20

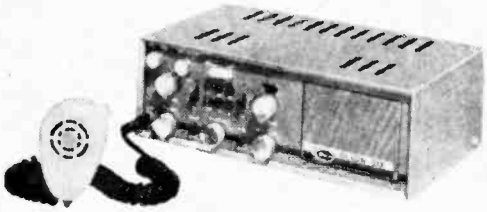
while trying to manage a steering wheel, microphone, transmit/receive switch on the front panel of a transceiver, and possibly a gear shift (remember those?).

Mobile units should be chosen which are compact enough to allow passengers sitting in the front seat to have leg room, and you must also select a unit which will give a pleasant appearance when installed in your car (especially if there is *wifey* to contend with).

A squelch circuit is handy if you intend monitoring a club or net frequency for long periods of time while no stations are transmitting. Under these circumstances, the crackle and hiss of background and ignition noise can be very annoying. A squelch circuit permits you to leave the receiver on, *silently*—only to be heard from when a signal comes onto the frequency you are monitoring.

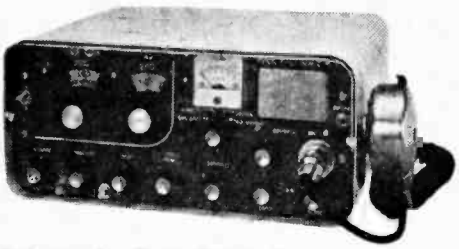
For a base station, the requirements are far less demanding. You are not necessarily concerned with the compactness of the unit (unless your wife has your ham operations exiled to the top of the closet or a remote corner of the kitchen). One thing to keep in mind when selecting a home station—you

Lafayette HE-45B



Olson RA-570

Polytronics Poly-Comm 6



Polytronics Poly-Comm 2

Utica 650

Utica 652

World Radio TC6-A

(Continued on page 132)

PROPAGATION FORECAST

for October/November 1964

By C. M. Stanbury II

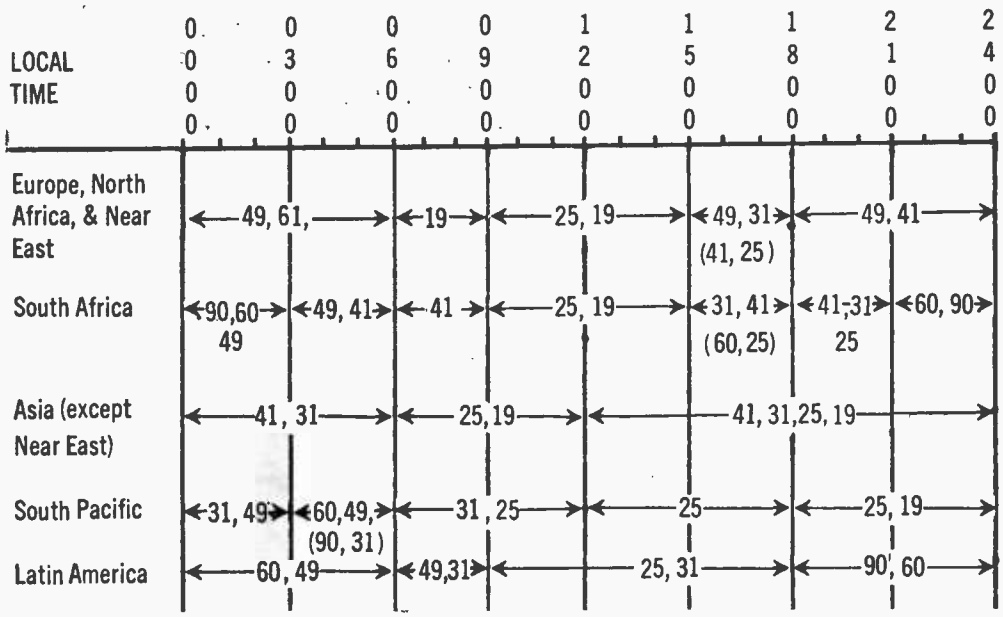
AROUND October 1st world-wide radio reception will reach a peak. Summer static will have disappeared in most parts of the U. S. and Canada, while ionospheric absorption will be almost nil at night due to that minimal sunspot count. At the same time the 25- and 31-meter bands will still be useful during hours of darkness. Therefore, crowding on lower frequencies will not be a major problem until mid winter. Add to this continued good reception from below the equator and we have a few weeks of *golden* short wave conditions.

We said the peak will occur around October 1. But exactly when it happens depends upon those sunspots (if any) on that face of the sun which faces earth. As the sun revolves once on it's axis every 27 days, a kind of cycle is set up. If conditions are good on September 10, they will also be pretty good on October 7. This pattern has absolutely nothing to do with atmospheric static.

Here is a list of six especially hot targets to shoot for during September and October:

Country	Station	Freq. Kc.	EST
India	A.I.R., Delhi	15,225	0930
Pakistan	R. Pakistan, Karachi	11,674	0835
Netherland Antilles	Trans World Radio, Bonaire	800*	Evenings
Monaco	Trans World Radio, Monte Carlo	7,260	0230
Luxembourg	Radio Luxembourg	6,090	1500
Luxembourg	Radio Luxembourg	233†	1900, 2400

* Broadcast Band. † Long Wave.



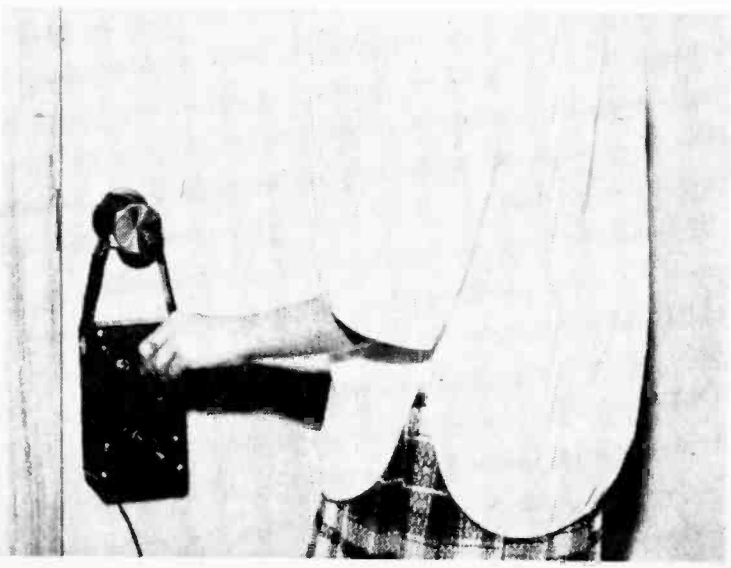
To use the table, put your finger on the region you want to hear and log, move your finger to the right until it is under the time you will be listening and lift your finger. Underneath your pointing digit will be the short-wave band or bands that will give the best DX results.

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 easy to tune on the east coast. The short-wave bands in brackets are giver as good second choices.

White's Radio Log now lists many new short-wave stations in its improved Short-Wave Section. You can use the Crystal Ball propagation table to determine your chances of hearing a given station. If the station broadcasts on more than one frequency, you will know which one will offer the best possibilities.

BLACK BOX ALARM

By Homer L. Davidson



Most traps and alarms are detected by the expert burglar, but he will be thwarted by the lack of wires or electric eyes in this capacity actuated alarm. A babysitter can hang it on a door knob and easily adjust it.

Ever been bothered with a peeping Tom, a shy burglar, or an unwanted intruder? Then build the Black Box Alarm and be protected! Hang the Black Box on any metal door knob—in a hotel, motel, or your own home—and the alarm will sound the minute someone grabs the knob from the other side.

Place the Black Box in an open window, and anyone approaching the window screen triggers the unit. Lay the capacity metal plate near your valuable possessions, and the alarm sounds off whenever an intruder draws near. The unit will cost you less than $15 to put together—a small price indeed for the positive protection it offers.

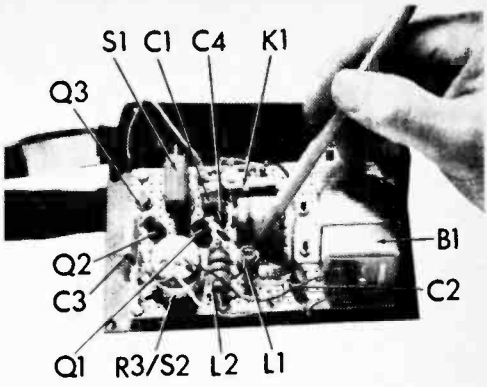
The Circuit. Basically, the alarm consists of three transistors: Q1 is an oscillator, while Q2 and Q3 act as amplifiers to drive the relay. Capacitor C1 is connected to jack J1 and couples the capacity plate to the base circuit of Q1. Jack J2 couples a common ground to the Black Box ground system. A trimmer capacitor (C3) and a choke (L2) in the emitter leg of Q1 control the point of oscillation.

Q2 and Q3 are conventional amplifiers with a sensitivity control (R3) in the collector circuit of Q2. The collector of Q2 and the base of Q3 are tied directly together, while an 8000-ohm relay appears in the output leg of Q3. Capacitor C5 is an electrolytic capacitor which eliminates relay chatter and provides smoother relay operation.

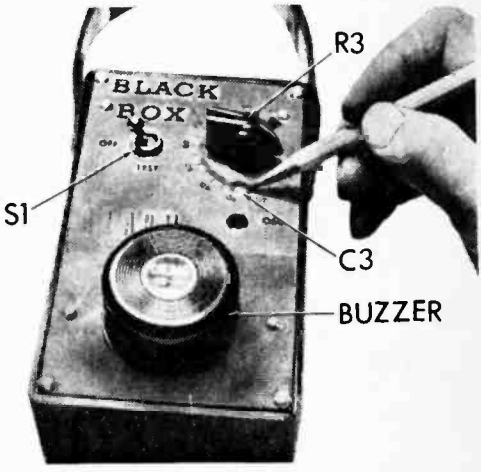
The whole unit is powered by one small 9-volt battery (B1). Whenever a person or a large animal comes near the capacity plate, Q1 is triggered into oscillation. Q1's output, meanwhile, is amplified by Q2 and Q3. The output of Q3 is fed into the relay, which will close and cause the buzzer to sound whenever the signal from Q3 is strong enough.

Construction. Start by mounting all of the larger parts as shown in the photos; parts placement isn't at all critical. Wire the smaller parts into the circuit as the unit is being put together. To avoid errors, it's always best to mark off on the diagram as the various components are wired in.

If you begin with the oscillator coil (L1), you can solder the small components to each terminal. Be sure that the bottom end of the coil (terminal 4) goes to a common ground point, and that the tap on L1 (terminal 3) is connected to L2 and C3. Take an ohmmeter, if handy, and measure the resistance between terminals 3 and 4 on the oscillator coil. This resistance will be extremely low in value, while the top half of



Transistor oscillator coil L1 is the fixed coil in the oscillator circuit. L2 is adjustable to provide increased sensitivity. The trimmer screw of oscillator circuit capacitor C3 is conveniently located on the front panel to provide easy adjustment to bring on oscillation.



the coil (between terminals 1 and 3) will measure around 4 ohms. Note that there are two terminals on the coil that aren't used; these are the ones from the primary winding.

Once you have the coil and the other oscillator components properly wired, you can install transistors Q2 and Q3 and their associated parts. These include the test switch (S1) and resistor R1 in the base circuit of Q2, as well as resistor R2 and potentiometer R3 in the base circuit of Q3.

It's always best to adjust the contact points on the relay coil before it's wired up. Unscrew the mounting bolts and remove the relay from the perforated board. Take a piece of typing paper, rip it in half, and

BLACK BOX ALARM

insert one piece between the armature leaf and the coil magnet assembly. This done, insert the other piece of paper between the bottom adjustment control screw and the leaf contact point.

Now adjust both contact screws so the paper will just slide in and out easily. Next, remount the relay coil on the perforated board. Finish construction by soldering in the small electrolytic capacitor and the buzzer itself.

Testing the Black Box. After the alarm has been completely wired, go over your work again just to make sure there are no errors. Solder the battery plug to switch S2 and ground; note that the negative lead goes to S2. If a milliameter is handy, insert it in series with the negative battery lead and S2. The unit shouldn't pull over 1.5 ma. when it's operating unless there's a short or a wiring error.

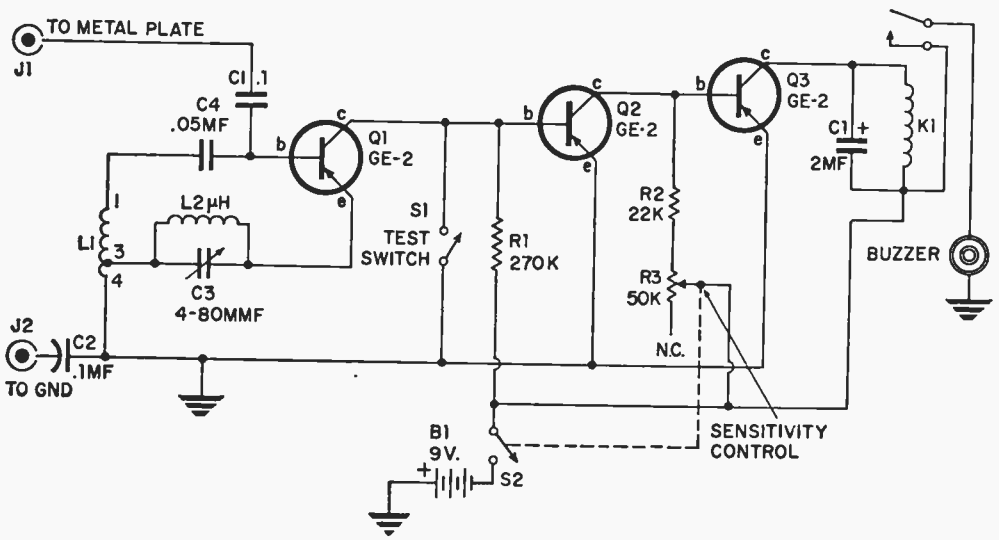
Turn S2 on and rotate R3 until the relay closes and the buzzer sounds. Now turn R3 back until the buzzer quits, then throw S1 on. The buzzer will also buzz at the point. Now tighten C3 until its plates are as close together as possible. Run a lead from the free end of C2 to a water pipe or other suitable ground. In addition, attach a lead from a 1-ft. square metal plate (an old chassis bottom plate is ideal) to the free end of C1.

The buzzer should now sound whenever you put your hand near the metal plate. If necessary, back off C3 or adjust the slug on L2 to control the point at which Q1 goes into oscillation. You can also vary the setting of R3 to control the triggering of the relay coil.

Setting Up. After the unit has been tested to satisfaction, mount the perforated board on the front panel of the meter case. The top half of the front panel was sprayed red with a small can of spray paint to finish off the unit and cause the decals and the lettering to stand out.

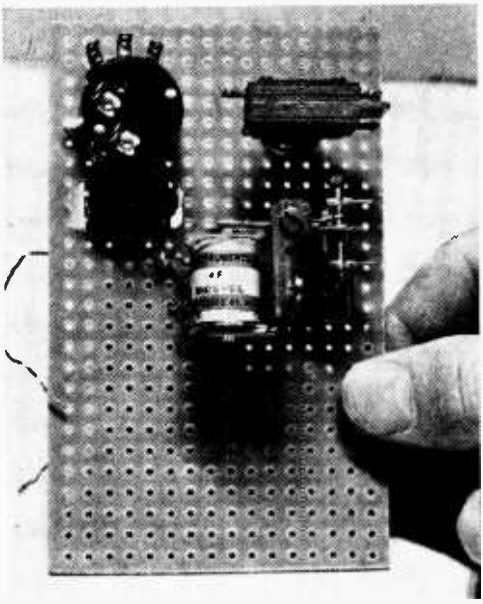
Two small phone jacks are mounted in the back of the case. The top jack goes to one end of capacitor C1, while the bottom jack connects to the free end of capacitor C2. It's best to use long flexible wire leads when making these connections.

Next, cut a plastic or cloth belt to 12 inches in length and tape thin brass or copper stock to the inside of the belt material. Solder



Capacitance between an intruder and the metal plate or strap is coupled to oscillator transistor Q1 through jack J1 to trigger the circuit.

Although its circuit is deceptively simple, this capacity operated relay is a real watch dog; hang it on a door knob or sit it in a window—it'll tell you the minute someone approaches nearby



Construction is started by mounting the larger components on the perforated board.

Parts List

B1—9-volt battery (Burgess 2N6 or equiv.)
C1, C2—.1-mf, 75 volt ceramic capacitor
C3—4-80 mmf trimmer capacitor
C4—.05-mf, 75 volt ceramic capacitor
C5—2-mf, 15 wvdc electrolytic capacitor
J1, J2—Miniature tip jacks
L1—455-kc transistor oscillator coil (Miller 2020 or Stancor RTC-9079)
L2—1.5-millihenry iron-core r.f. choke (Miller 70F153AI or Stancor RTC-8524)
Q1, Q2, Q3—GE 2 or equivalent (see text)
R1—270,000-ohm, ½-watt resistor
R2—22,000-ohm, ½-watt resistor
R3—50,000-ohm potentiometer with s.p.s.t. switch S2
K1—S.p.d.t. relay, 8000-ohm coil (Sigma 4F-8000-S/SIL)
S1—S.p.s.t. toggle switch
S2—S.p.s.t. switch (on R3)
1—Buzzer (Calrad CB-1.5 or Burstein-Applebee 22B51)
1—6¼" x 3¾" x 2" bakelite case (Lafayette MS-216 with MS-217 cover, or equiv.)
Misc.—Pointer knob, battery plug, phenolic board, cloth belt, spare chassis bottom plate, wire, cable, connectors, hardware, solder, etc.

Estimated cost: $21.00
Estimated construction time: 4 hours

a length of flexible wire to one end of the slim stock metal and connect it to jack J1. Now when you wish to hang the alarm on a metal door knob, you can use this metal belt instead of the metal plate to set off the alarm.

Other Notes. The three transistors used in the alarm circuit are the type GE2. If you have a transistor tester, use the best of the three transistors in the oscillator circuit. Assuming you can't obtain the GE2's or don't have them in your junk box, you can use 2N215 for Q1 and Q2 and a 2N217 in the relay circuit (Q3).

L2 was a standard 1.5 millihenry choke in the author's model, although a homemade unit can be used. One can be made by taking 15 feet of No. 36 enameled wire, or smaller, and scramble-winding it over a 10-megohm, ½-watt resistor.

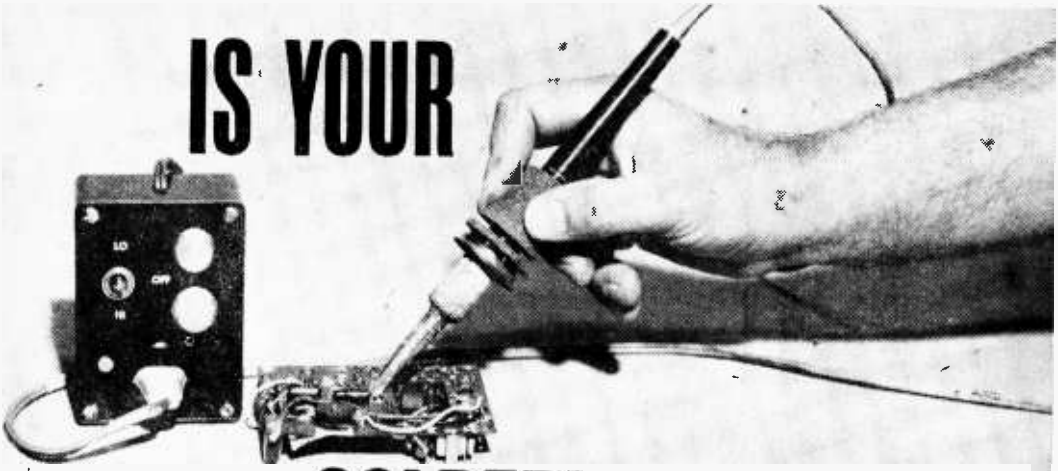
Sensitivity control R3 should always be turned up until the relay energizes and then backed off a little until the relay armature drops out. The buzzer will come on when the relay is energized and will quit at the point of drop out.

J2 is a ground jack which couples the alarm to a common ground. A metal radiator, a furnace duct, or a water pipe can all serve for this purpose. Naturally, the alarm works best with this lead connected to a good ground.

When the capacity plate is used, L2 may have to be adjusted for more sensitivity. It is easier to adjust the oscillator coil than C3. C3 will give a greater change, while the oscillator coil adjustment is finer and slower.

To find out whether the oscillator is working, turn on a small table radio near the unit. With capacitor C3 turned all the way in, an oscillator hum should be heard around 700 kc/s on the dial.

If you still have trouble, throwing test switch S1 on grounds the output of the oscillator and thus enables you to check out the remainder of the circuit. If trouble does exist, you might check the resistances of the relay and oscillator coils for possible open windings. You might also try resetting the contact adjustment on the relay points to get a clean buzzer sound. ■



IS YOUR SOLDERING IRON TOO HOT?

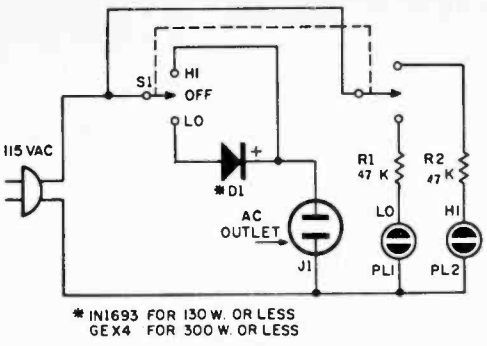
To keep your soldering iron "lukewarm" when not in use, call on a diode in a half-wave circuit to beat the heat

By James A. Fred

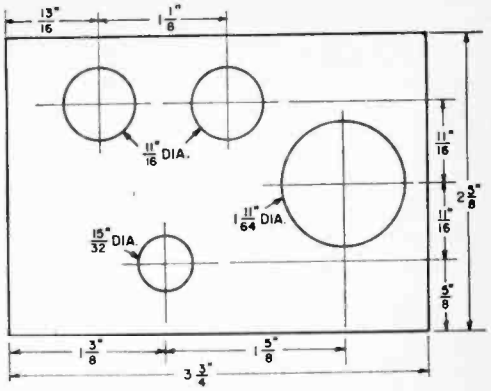
DO YOU have trouble keeping your soldering iron warm? Yes! I said warm.

Most people prefer their soldering irons hot, but my pencil soldering iron gets so hot that the tip turns red. Consequently when I get ready to use it the tip is oxidized and must be cleaned before it can be used. You may wonder why I don't use a soldering gun, but in all my thirty-two years of radio and electronic work I have never owned one. I have used them many times, but still don't have one for my own work bench. When I sit down to work I turn the soldering iron on and when I leave several hours later I turn it off. This is the reason that I want to keep my iron warm when not soldering.

The Black Box. In the photographs you can see the little black box that keeps my iron warm when I am not soldering and hot when I am soldering. This box contains a silicon rectifier, two pilot lights, a d.p.d.t., center-off toggle switch, an AC receptacle, and a line cord coming out one end of the box. With the switch in the *LO* position the soldering iron is in series with the silicon rectifier. The rectifier is connected as a half wave rectifier and as such will supply pulsating DC at about 66% of the line voltage. This means that we will be supplying about 80 volts of pulsating half wave DC to the soldering iron. The iron being a heat operated device will tolerate this DC voltage. When high heat is needed the switch is pushed down to *HI* and the full line voltage



Switch S1 connects the AC line directly to the AC outlet or via the diode rectifier.



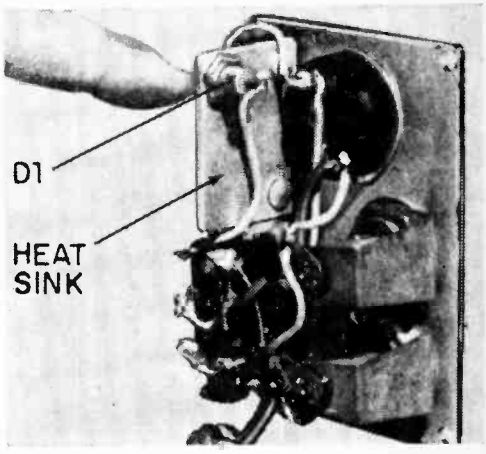
Cover for plastic box is made from phenolic material. Follow diagram above carefully.

is restored to the iron. *CAUTION!* The half wave pulsating DC cannot be applied to a transformer device because it will burn it out.

Hot Lights. The two pilot lights serve a useful purpose as follows: with the switch on *LO* the upper bulb is lit, with the switch on *HI* the lower bulb is lit. Just a glance will show you whether the iron is warm or hot. This also will help to prevent you from leaving the iron on for long periods of time.

Putting It Together. The assembly and wiring is straight forward with only a word of warning necessary. If you intend using an iron of less than fifty watts a 2 ampere, 200 PIV silicon rectifier will be adequate. To insure that the rectifier runs cool the rectifier can be mounted on a heat sink. The rectifier must be mounted with the heat sink insulated from the front cover.

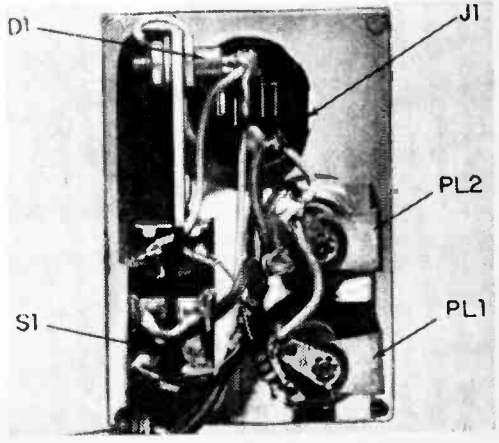
With this black box to keep your soldering iron both warm and hot you should have many hours of happy soldering. ■



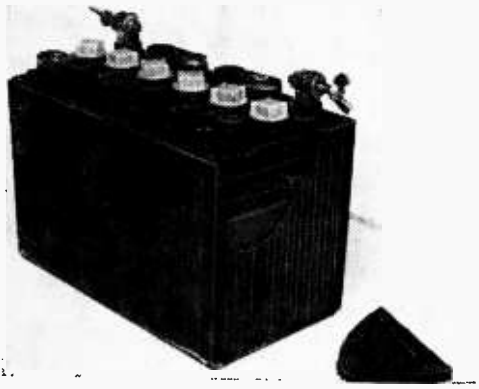
Rear views of the box's cover (top and bottom) showing location of parts and wiring. Diode D1 must be mounted on a heat sink, which in turn is mounted on front panel. Be sure sink is insulated from mounting screws.

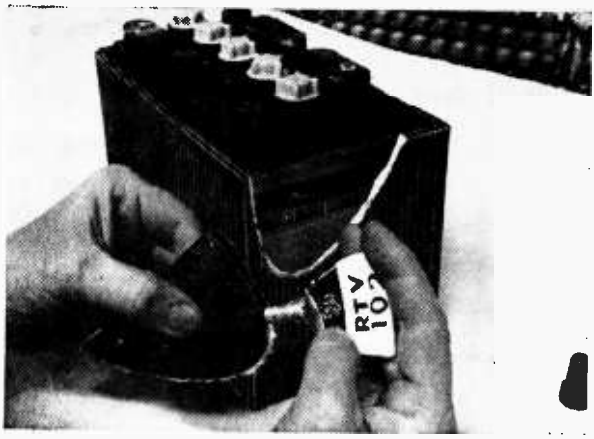
PARTS LIST

D1—Silicon rectifier; GE-X4 for 300-watt operation, 1N1693 for 130-watt (see text)
J1—AC power receptacle (Amphenol 39F100)
PL1, PL2—NE-51H neon bulb
2—Miniature bayonet socket with red jewel for pilot lamps PL1 and PL2 (Dialco Series 810, red jewel)
R1, R2—47,000-ohm, ½-watt resistor
S1—D.p.d.t. center-off toggle switch (Newark Electric Corp. 23F356)
1—Instrument case, plastic, $2^{21}/_{32}$" x $3^{25}/_{32}$" x $1^{15}/_{32}$" (Newark Electric 26F145 or equiv.)
1—Cover for instrument case (make from plastic —see top of this page)
Misc.—AC line cord, decals, screws, nuts, wire, solder, etc.
Estimated cost: $5.00 or less
Estimated construction time: 1½ hours



If your battery is cracked or broken like the author's shown below, it can be repaired. If just cracked, continue to crack until smallest possible piece is broken off. After removing the plate assembly, (right) edges of crack are chemically cleaned, dried, and then GE silicone sealant is applied.





REPAIRING CRACKED AUTO BATTERIES

By Waldo T. Boyd

IF YOUR storage battery is cracked by a freeze-up or accident, it is possible to save it with just a few tools and a bit of skill. The sooner you get to work after the crack occurs, the better, since a dead battery soon "sulfates." Before you start, be sure to empty the cell or cells you are working on of all electrolyte. Store the acid in glass containers. Take no chances in injuring yourself or damaging your clothes.

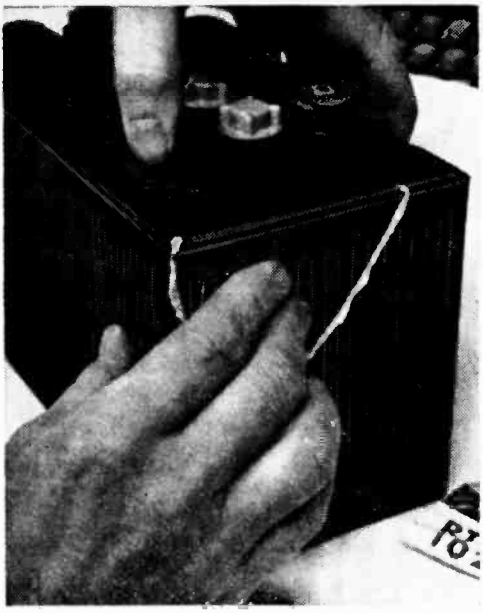
Working Room Needed. First, the plate should be removed from the affected cell. Drill into each end of the connecting strap (or straps of a center cell) with a large-diameter bit, just deep enough to release the strap from the cell post. Save the lead drillings. With a pair of pliers, rock the strap gently back and forth and it will break away from the post quite easily. Apply a fine, pointed flame around the tar seal until it becomes soft. Do not hold the flame in one place long enough to cause the case or tar to burn.

When the tar is soft and tacky, grasp the terminal and the stub where the strap was removed with large pliers held in each hand. Hold the battery on the floor between your feet, and exert a steady, moderate pull upward. The tar will slowly give way, and the plate assembly will slide out.

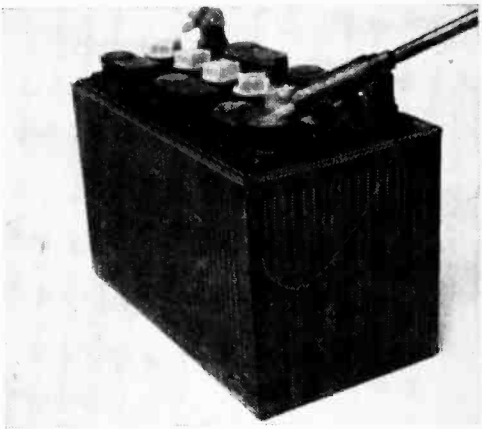
Set the plate assembly into a can of water to prevent it from drying out. Dried separators will crack, and dried plates sometimes will never again take a charge.

Cleaning. Carefully break a section out of the case by continuing the crack so the edges can be cleaned and dried. The smaller the piece broken out, the simpler will be the

A cracked lead-acid battery will soon become worthless unless



Press the chip into battery case (left) and hold in place for at least eight hours. A rubber band cut from an old inner tube makes an excellent "jig." After the sealent has dried, replace the plate assembly and restore battery to original condition. Blow torch (below) is used to "solder" strap in place.



repair job. Clean the edges of both the piece and the case with a soft cloth dipped in a solution of bicarbonate of soda (baking soda). When the bubbling ceases, daub the edges with a clean cloth soaked in clear water, then dry with a clean, absorbent cloth. Set both the piece and the case aside for at least 24 hours to dry thoroughly.

"Stick-um." The "miracle" silicone sealant that will do the job is "RTV-102" manufactured by General Electric*. Squeeze a thin layer on the edges of both the chip and the case and press the chip into place. Hold it in place with a clamp or large rubber band for at least 8 hours, in accordance with directions on the sealant tube.

After it has set for the minimum length of time, carefully cut the excess sealant flush with the inside of the case. Remove the cell from its water bath, and insert it into the case in the same position as it was originally. Run the torch flame around the tar, lightly to prevent burning, and the cell will drop snugly down until the plates rest on the bottom of the case.

*RTV-102 is available from Allied Radio, Catalog No. 7E227

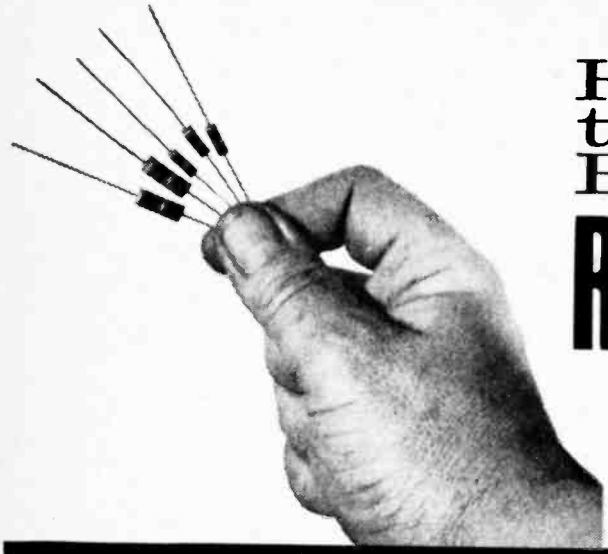
Assembly. Lay the post strap in place, and *carefully*, with a tight circular motion, heat the strap and post stub until they are almost ready to melt, and then melt the lead drilling or solder into the drilled hole. The trick is to keep the temperature just hot enough to melt at the joint and yet not so hot that it will melt the entire lead strap. As the lead and solder builds up and fills the hole, it will flow into the strap and post to form the necessary electrical bond.

Run the torch lightly over the rough places in the tar, adding a pinch of tar as necessary to fill the seal. Ordinary hard roofing tar is excellent in case you need more than you have on hand.

The repaired cell should now be refilled with electrolyte at 1.280 sp. gravity. Do not simply add water since the cell lost its electrolyte by spillage. Electrolyte can be obtained at a local battery shop, and chances are, the shop repairman will be glad to fill the cell for you himself.

Finally, charge the battery with a home charger, and test all cells. If the repaired cell tests higher than 1.280 at full charge, remove some of the electrolyte and add water. ■

you repair the leaking case and restore the lost electrolyte



How to Buy FIXED RESISTORS

By Jay Copeland

How many times have you solved an Ohm's law problem and come up with 156.86 ohms at .266 watts as a value for a cathode bias resistor. Now, the next trick is to find a stock resistor at that value. Impossible, as you probably know. There *ain't* no such animal. Quickly you study the characteristic curves for the vacuum tube used in the circuit and find that any resistor from about 130 ohms to 180 ohms will do the job.

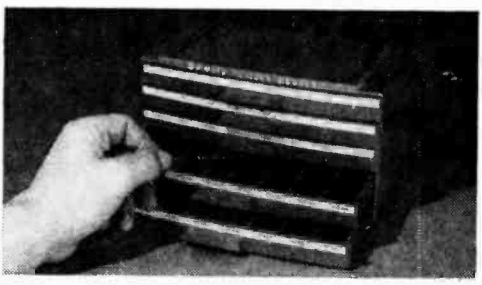
The Parts Catalog. Next thing to do is look into an electronic parts catalog and see what's available. First, resistors of the common fixed composition variety are available in 1/10, ½, 1 and 2 watt ratings. Since the resistor's computed value was .266 watts, the next largest size should be used—½ watt (.500). On over rated wattage capacity increases the safety margin of the resistor in the circuit function it was selected.

Checking the catalog again you will see that the closest resistance value available is 160 ohms but only as a 5% tolerance type. This means that the true value of the 160 resistor is somewhere between 152 ohms to 168 ohms. This resistor can be used in place of the computed 156.86 ohms if you are willing to pay 24 cents. However, if you use a 150 ohm resistor with 10% tolerance—it ranges from 135 ohms to 165 ohms—its true value is still within the desired resistance range and it's priced at 12 cents.

Money talks. Price is very important in projects that use many resistors. For example, let's assume you are putting together an amplifier that uses 27 resistors rated at ½ watt. Using the *Allied Radio* catalog as a price guide, you can buy these resistors for $5.13 if they are 5%'ers and for $2.43 if they are 10%'ers. Fortunately, except for the rare critical circuit, 10% tolerance resistors are good enough for almost all the projects you will ever build.

Identification. Almost everyone knows the RMA color code used to mark resistance values on resistors. But just in case you don't know what a *gray*, *red*, *green* and *gold* banded resistor is rated at, refer to figure 1. The illustration shows us that gray is 8, red

(Continued on page 132)



Buy 150 ½-watt assorted resistors and Ohmite will toss in a storage cabinet; $18.00.

Standard Mil & EIA Resistor Values for Fixed Composition Resistors

20%	10%	5%	20%	10%	5%	20%	10%	5%	20%	10%	5%
10	10	10		390	390	15000	15000	15000		560000	560000
		11			430			16000			620000
	12	12	470	470	470		18000	18000	680000	680000	680000
		13			510			20000			750000
15	15	15		560	560	22000	22000	22000		820000	820000
		16			620			24000			910000
	18	18	680	680	680		27000	27000	1.0 Meg.	1.0 Meg.	1.0 Meg.
		20			750			30000			1.1 Meg.
22	22	22		820	820	33000	33000	33000		1.2 Meg.	1.2 Meg.
		24			910			36000			1.3 Meg.
	27	27	1000	1000	1000		39000	39000	1.5 Meg.	1.5 Meg.	1.5 Meg.
		30			1100			43000			1.6 Meg.
33	33	33		1200	1200	47000	47000	47000		1.8 Meg.	1.8 Meg.
		36			1300			51000			2.0 Meg.
	39	39	1500	1500	1500		56000	56000	2.2 Meg.	2.2 Meg.	2.2 Meg.
		43			1600			62000			2.4 Meg.
47	47	47		1800	1800	68000	68000	68000		2.7 Meg.	2.7 Meg.
		51			2000			75000			3.0 Meg.
	56	56	2200	2200	2200		82000	82000	3.3 Meg.	3.3 Meg.	3.3 Meg.
		62			2400			91000			3.6 Meg.
68	68	68		2700	2700	100000	100000	100000		3.9 Meg.	3.9 Meg.
		75			3000			110000			4.3 Meg.
	82	82	3300	3300	3300		120000	120000	4.7 Meg.	4.7 Meg.	4.7 Meg.
		91						130000			5.1 Meg.
100	100	100		3900	3900	150000	150000	150000		5.5 Meg.	5.5 Meg.
		110			4300			160000			6.2 Meg.
	120	120	4700	4700	4700		180000	180000	6.8 Meg.	6.8 Meg.	6.8 Meg.
		130			5100			200000			7.5 Meg.
150	150	150		5600	5600	220000	220000	220000		8.2 Meg.	8.2 Meg.
		160			6200			240000			9.1 Meg.
	180	180	6800	6800	6800		270000	270000	10.0 Meg.	10.0 Meg.	10.0 Meg.
		200			7500			300000			11.0 Meg.
220	220	220		820	820	330000	330000	330000		12.0 Meg.	12.0 Meg.
		240			9100			360000			13.0 Meg.
	270	270	10000	10000	10000		390000	390000	15.0 Meg.	15.0 Meg.	15.0 Meg.
		300			11000			430000			16.0 Meg.
330	330	330		12000	12000	470000	470000	470000		18.0 Meg.	18.0 Meg.
		360			13000			510000			20.0 Meg.
									22.0 Meg.	22.0 Meg.	22.0 Meg.

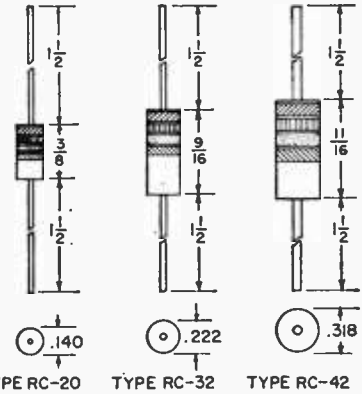


Fig. 2. Dimensions of three common fixed composition resistors used in most projects.

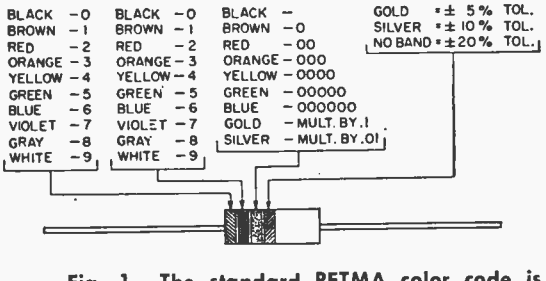


Fig. 1. The standard RETMA color code is used to identify nominal resistance values.

Return of the SMALL SCREEN

For lightness, portability and a sharp image, these miniature television sets are hard to beat

By A. I. Schutzer

IN the beginning a television set was a big, mysterious mahogany box with a tiny 10, 12, or 14-inch screen in the center. If you were lucky, you owned one and were the most popular man on the block. All the neighbors drank your beer, raided your icebox, and hunched around that small screen in a darkened living room, watching Milton Berle do his impersonation of the late banana-hatted Carmen Miranda. You dreamed of the day when TV screens would fill an entire wall.

Then came the big-screen explosion—17, 19, 21, 23-inch. The only limit seemed to be how far apart you would be willing to prop your eyelids so you could take in the whole picture. Dr. Kildare may have needed a high-power microscope to see the disease bugs, but you didn't. You could pick them out on your giant TV, blown up bigger than life, with the naked eye.

And now—within the last 12 months or so—the reaction has set in. The buying public has turned with enthusiasm to tiny-screen, lightweight TV receivers and manufacturers have been in a mad scramble to fill the demand. The small sets have become about as popular as transistor radios. It is only a matter of time until they are as numerous.

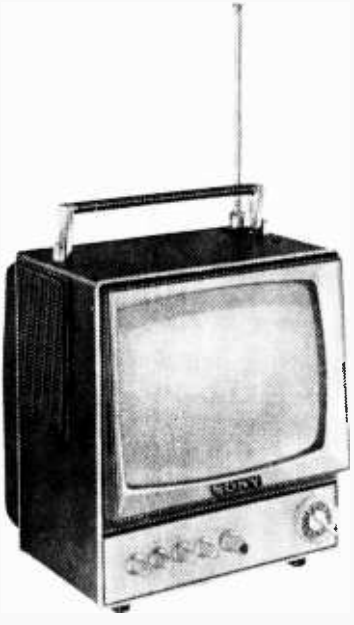
Panasonic Mitey 9 has a 9-in. screen, weighs 10½ lbs., plays anywhere you go. $229.95.

Admittedly, the small sets have a few disadvantages. Care has to be taken that rain doesn't ruin the sets when they are used outdoors. Transistors are sensitive to heat, and too much direct sun and inadequate ventilation can turn them into useless hunks of metal. Even when the sets are running on a low 12 or 15 volts from a battery, there may be as much as 8000 volts floating around inside the set—enough to curl your hair if you take the set with you into a tub of water or poke your fingers where they shouldn't be. And batteries must be treated with respect, not allowed to run down or get an over-charge.

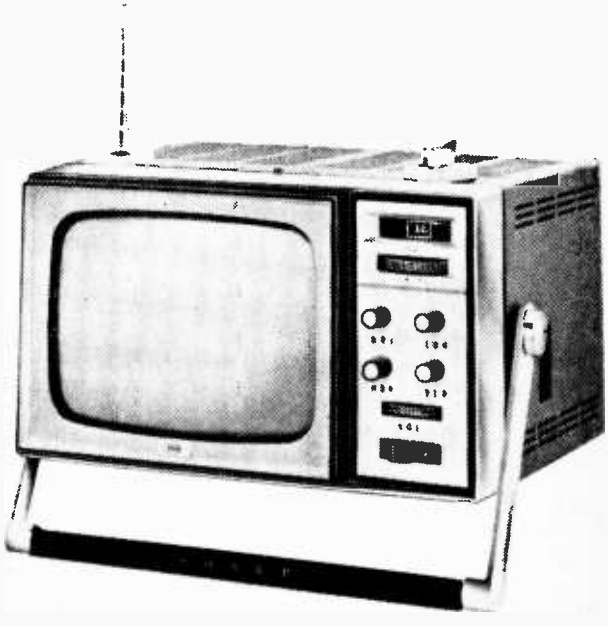
But the advantages of the small-screen, lightweight sets, which can be easily carried from one room to another in the home, or used almost anywhere outdoors where there is an adequate signal, far outweigh the disadvantages. The battery-operated jobs no longer tie you to a power line and wall socket. You can use them on a picnic, at a beach, on a boat, in a car, on a ski slope, at a ball game, upstairs, downstairs, in my lady's chamber. Light enough for a child to carry, the receivers can be used by various members of the family in shifts, in different rooms at different times: For everybody at the breakfast table in the morning, on a kitchen counter while the lady of the house is cooking dinner, by the kids in the den in the afternoon, and by the adults at the side of the bed at night.

The smallness of the screens of the miniature sets has somehow become a virtue. The images have all the fine detail of a photograph—the horizontal scanning lines are packed so close to each other, they don't break up into dots the way they do on a big-screen set. Best viewer-to-set distance is about three feet for the small screens. At that spread, the size relationship to the viewer is approximately the same as with a 23-inch giant viewed from 14 to 15 feet. And a comfortable number of people can view the small set at the three-foot distance with no sweat.

The first transistorized miniature portables made, strangely enough, were American-designed and manufactured, in spite of the common and mistaken belief that the small set is a Japanese achievement. In 1959, Philco hit the market with its 15-lb. Safari, a transistorized receiver that used a two-inch picture tube and an optical system that magnified the small image to about 14-inch screen size. The problem with this set was that its optical system, in combination with a sunshade, made it impossible for more



Sony's 9-incher weighs 12 lbs., has 24 transistors. Price of VHF model is $229.95. It is estimated the UHF model, for channels 2-83, will sell for about $249.95.



Model TRP-601 from Sharp Electronics Corp. has a 6-in. screen and weighs 8 lbs. Built-in battery recharging circuits permit the set to operate on house power while batteries are being recharged. The set lists for $199.95, and the UHF model will probably be available at the same price.

Most of these sets can operate on house current, batteries or plugged into batteries in your automobile or even in your boat

than one person at a time to view the screen. In 1960, Motorola offered its 19-inch transistorized Astronaut. Its drawbacks were its weight (40 lbs.) and a 19-inch image that became practically invisible outdoors. In 1961, Sony turned out a 17-pound, 8½-inch receiver. Its problems were its wet cell battery and mediocre reception.

Just recently the manufacturers got the bugs out of their small sets. But before we describe the new models on the market, what they can do, and what they cost, we'd better clarify the VHF-UHF tuner situation.

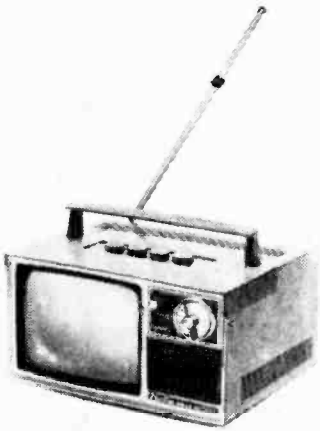
For the next three to five months, you will be seeing two versions of almost every model on the market at your dealer's—a VHF (Very High Frequency) model, receiving channels 2 through 13 (54 to 215 megacycles), and an all-channel receiver, incorporating UHF (Ultra-High Frequency), receiving channels 2 through 83 (54 to 215, plus 470 to 890 megacycles). This Donnybrook arises out of a law passed by Congress in June of 1962. The law requires that all TV receivers, including imported sets, produced after April 30, 1964, for shipment in interstate commerce in the U.S.A., must be equipped to receive *all* TV channels from 2 to 83.

The purpose of the law was to create a new market for stations not yet in existence —and thus encourage their construction. The result of the law, as of right now, is that both kinds of sets will be available on the market simultaneously for a number of months while the old inventory is being sold off and the new sets are coming in. You will be able to make a choice. The all-channel set will usually cost you about $15-$30 more; but in at least one case, nothing more. If you buy a channel 2-13 set and convert to UHF later—after the new stations exist—it will cost you about $15-$30.

The data on most of the new all-channel

(Continued on page 124)

General Electric's Personal Portable weighs 12½ lbs. It has an 11-inch screen, is available in four colors, has retail price of $99.95.



Delmonico's 5½-inch miniature weighs 6½ lbs. It works from house current, from batteries, or from car batteries. Price: $169.95.

Basic price of Delmonico 4½-in. model is $149.95. Batteries produce eight hours of operation before they will require a recharge.

Small Screen TV Sets

(Continued from page 120)

models is already in, and we'll describe them in addition to the VHF models and furnish price details. The all-channel models presently differ from the VHF models in the tuner only, and the manufacturers generally have been identifying them by putting a U in front of the model number used to identify the corresponding VHF set.

We'll illustrate how this works out with our first manufacturer and his VHF and all-channel models, and show the price differential. We'll start with the biggest of the small sets and then work our way down to the tiniest of the miniature portables.

Admiral's Playmate is a 16-lb. portable with an 11-inch screen (all screens are measured on the diagonal, lower corner to opposite upper corner), with a 60-sq. in. viewing area. Set dimensions are 12⅝Hx 13⅜Wx9⅞D. Power supply is 110-120 volts, 60 cycle AC, with a polarized power plug that assures positive ground to the TV chassis. The set features good automatic gain control, minimizing picture fade and aircraft "flutter". Built-in antenna. Model P1104 lists at $99.95. Model P1110, offering an earphone speaker that can be plugged into the front of the set for private listening, is $109.95. The all-channel (2-83) version of the P1104 is the UP1104; price, $119.95. All-channel model of the P1110 is the UP-1110, $129.95.

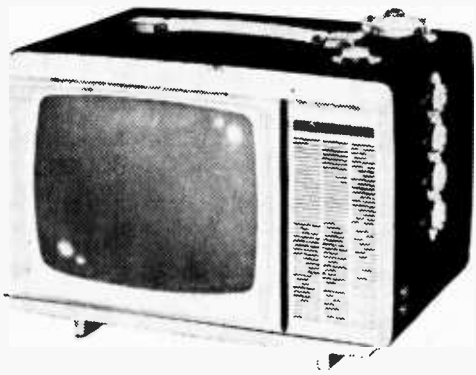
General Electric's 11-inch screen receiver, Model M110YBG, weighs in at 12½ lbs., measures 14Wx10⅜Hx9⅞D, operates from home power line, has built-in monopole antenna, 6"x2" speaker, and life-time guaranteed printed circuit boards. Lists for $99.95 in channel 2-13 version. All channel version, Model M111YBG, incorporating GE's new transistorized cigarette-pack-size UHF tuner, lists for $119.95. Model M112YBN lists for $109.95, includes earphone jack and earphone for private listening. All-channel version of this set, Model M113YBN, lists for $129.95.

The next step down in screen size is to the 9-incher, and models are offered by three manufacturers, Sony, Delmonico, and Panasonic. Let's take a look at Sony's package first.

Sony's 9-inch Model 9-304W weighs 12 lbs., measures 9⅝Hx8⅝Wx7⅝D, has 24 transistors, 14 diodes, 2 thermistors, front panel controls, plug-in printed circuit boards, telescoping antenna, works off your house power line, its own battery, or the 12-volt battery in your car. Price of the 2-13 channel model is $229.95. Set accepts and powers a transistorized UHF converter and UHF antenna attachment, Model VUC-4W, listing at $49.95. Sony anticipates its all-channel model will price out at about $249.95. Battery pack, including battery charger, is $24.95. Replacement battery is $15.95. Distributor is Sony Corp. of America, 580 Fifth Avenue, New York, N. Y. 10036.

Delmonico's 9-inch Model 9PV weighs 18 lbs., measures 12$\frac{3}{16}$Wx7$\frac{11}{16}$Hx12$\frac{3}{16}$D, has 14 tubes, 5 diodes, high gain tuner, works off house power, has built-in earphone jacks for private listening. Set is "UHF ready" for easy installation of UHF converter. The 2-13 channel model lists for $89.95. The all-channel version, Model UHF-9PV, lists at $109.95. Distributor is Delmonico International, 50-35 56th Road, Maspeth 78, N. Y.

Panasonic's 9-inch Mitey 9 weighs 10½ lbs., measures 7$\frac{7}{10}$Hx9$\frac{1}{10}$Wx8$\frac{7}{10}$D, has 27 transistors, 20 diodes, built-in antenna, side-panel tuning, works off house power or its own battery. Set lists for $229.95. Battery pack, including charger and battery, lists at $49.95, replacement battery at $15.95. Distributor, Matsushita Electric Corp. of America, 200 Park Avenue, New York, N. Y. 10017, had no information on an all-channel version of this set at the time we went to press.

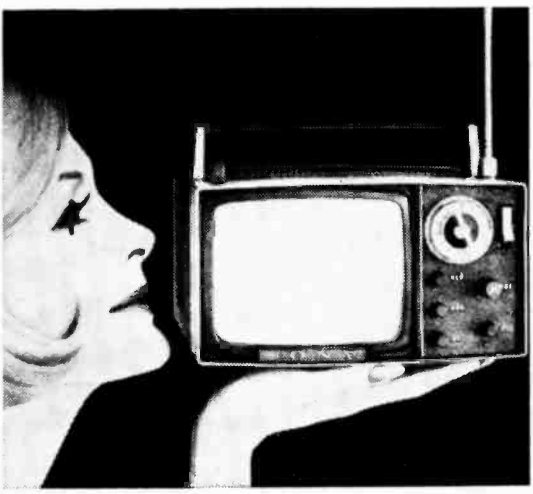


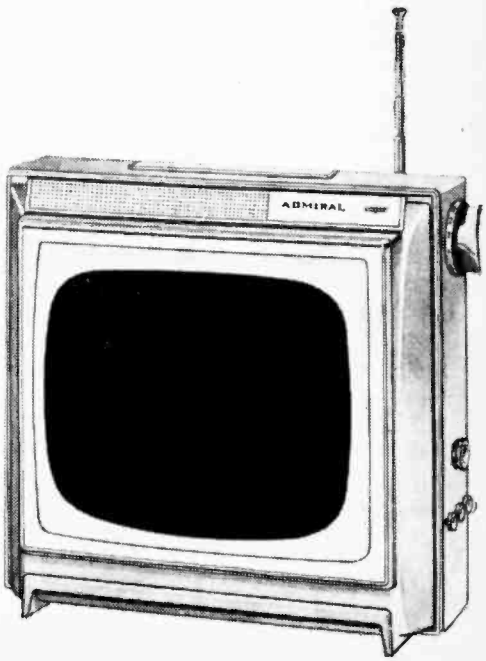
Delmonico's 9-incher weighs 18 lbs., has 14 tubes, 5 diodes, works on house current, can take a UHF converter. Basic price is $89.95.

From the 9-inchers we take a big jump downwards to the truly miniature sets, beginning with Sharp Electronic's 6-inch Model

SPECIFICATIONS OF MINIATURE TV SETS

Manufacturer	Model	Screen size	Weight	Power source	Basic price
Admiral	Playmate P1104	11″	16 lbs.	110-120 volts	$99.95
	P1110 (with earphone for private listening)				109.95
	UP1104 (all-channel, 2-83, version of P1104)				119.95
	UP1110 (all-channel, 2-83, version of P1110)				129.95
General Electric	M110YBG	11″	12½ lbs.	110-120 volts	99.95
	M112YBN (with earphone for private listening)				109.95
	M111YBG (all-channel version of M110YBG)				119.95
	M113YBN (all-channel version of M112YBN)				129.95
Sony	9-304W	9″	12 lbs.	110-120 volts or battery	229.95
	All-channel version (est. price)				249.95
Delmonico	9PV	9″	18 lbs.	110-120 volts	89.95
	UHF-9PV				109.95
Panasonic	Mitey 9	9″	10½ lbs.	110-120 volts or battery	229.95
Sharp Electronics	TRP-601	6″	8 lbs.	110-120 volts or battery	199.95
	TRP-602UHF				199.95
Delmonico	5T30U	5½″	6½ lbs.	110-120 volts or battery	169.95
	UHF version (est. price)				189.95
Sony	5-303W	5″	8 lbs.	110-120 volts or battery	189.95
Delmonico	4T20U	4½″	7½ lbs.	110-120 volts or battery	149.95
	4T-40	4½″	8½ lbs.	110-120 volts or battery	169.95
	4T-40U (all-channel version)				189.95





Above, Sony 5-inch model weighs 8 lbs. Set lists for $189.95 and can work from house current, its own portable battery, or 12-volt car or boat battery. Right, Admiral 11-incher has basic price of $99.95. Other models are available with earphone. UHF models sell for an additional $20.

TRP-601. This lightweight portable weighs 8 lbs., measures 5Hx8½Wx7¾D, has 23 transistors, 12 diodes, 3 thermistors, plug-in printed circuit boards for easy servicing, built-in antenna, separate volume control for one-time setting, front panel controls, earphone jacks for private listening by two persons, and built-in battery recharging circuits permitting operation of set on house current while the battery is being re-charged. Set lists at $199.95, replacement battery at $22.95. All-channel version of this set, Model TRP-602UHF, will hold the price line at $199.95 list, will add 1 more transistor and 4 more diodes over the UHF model. Distributor is Sharp Electronics Corp., 1270 Sixth Avenue, New York, N. Y. 10020.

Delmonico's 5½-inch portable miniature, weighing 6½ lbs., Model 5T30U, measures 8¼Wx7¼Hx7D. The set has 24 transistors, 16 diodes, built-in antenna, front and top panel controls, earphone jack and earphone for private listening, operates from cigarette lighter receptable in car, 115 volts AC, or from an Eveready battery #561. Set operates for 3½ hours on a single battery charge. Set lists for $169.95, plus $29.95 for charger and battery pack. Replacement battery lists at $22.95. All-channel version of this model, if manufactured, according to the distributor, will list at $189.95.

Sony checks in with its 5-inch Micro-TV, Model 5-303W, weighing 8 lbs. and measuring 7⅝Wx4¼Hx7¼D. Set provides 12½ sq. in. of viewing area, equivalent to about 1/15 that of a 23-in. screen. Set has 25 transistors, 20 diodes, built-in antenna, 2 earphone inputs, operates from its own portable battery, 12-volt auto or boat battery, or household AC current. Set lists at $189.95, including earphone. Automobile accessory kit, including bracket to hold set for rear-seat viewing, car antenna, battery cord that plugs into cigarette lighter, and sunshade, lists at $44.95. Battery pack, including case, recharger, and battery, lists for $24.95. A case for the set lists at $12.95. Model VUC-4W UHF converter, including special UHF antenna attachment, bringing in channels 14 to 83, is optional accessory at $49.95. Distributor had no information on an all-channel model at time we went to press.

Delmonico comes in strong with two 4½-inch miniature TV packages, both transistorized pygmy beauties. The first, Model 4T20U, weighs 7½ lbs., including batteries, measures 4Wx5Hx9D, has 25 transistors and 25 diodes, provides instant-on picture and sound. Set operates from house power line or from three 4½-volt rechargeable alkaline batteries that fit in a drawer-like tray at the bottom of the set. Batteries produce 8 hours of operation before needing recharge. There is an optional adapter that fits your cigarette lighter socket for operation from your 12-volt car battery. Built-in antenna. Earphone and jack for private listening. Set lists for $149.95, including batteries. Battery charger and case list for $24.95. Advanced design of charger prevents over-charging of batteries. The distributor states there will be no all-channel version of this model.

Delmonico's other 4½-inch miniature portable, Model 4T-40, measuring 4⅞Hx 8¼Wx7½D, weighing 8½ lbs., including batteries and charger, has 25 transistors and 25 diodes, dual telescopic antennas, provision for operating from house power or 12-volt car or boat battery or three 4½-volt rechargeable batteries supplied with the set. Special charger cut-off prevents battery overcharge; earphone and jack for private listening. The 4T-40 lists at $169.95, including batteries. Carrying case and charger list at $24.95. This set will be available with a single-dial all-channel tuner for channels 2 through 83. List price of this all-channel model, 4T-40U will be $189.95.

For lightness, portability, and a sharp, photographic-like image, the miniature TV receivers cannot be beat. As a first set, they are tops for personal viewing. As a second set, they free the viewer from power lines and wall sockets, and make viewing anywhere that an adequate signal exists a reality.

And what about the future? Well, RCA has already displayed mock-ups of "personal TV sets" expected to be in use in the 1970s. These are hardly larger than a small transistor radio with a four-in. viewing screen occupying about half the case. And don't overlook the possibility of a wrist TV—no larger than your present wrist watch or Dick Tracy's wrist radio. With the amazing recent advances in micro-miniaturization, such sets are well within the realm of possibility. The circuitry is no problem, but we'll need a technological breakthrough before we can develop a screen for such a small set.

That breakthrough may be closer than you think. At the National Cash Register exhibit at the New York World's Fair, you'll see a live TV image measuring only 1/16th of an inch across. It is used to demonstrate high-resolution phosphors which may be used on your TV screen of the future. ■

(Continued from page 70)

comments; the way you phrase your questions will do much to elicit the short answers you want.

If your recorder doesn't have an index counter, you can place marker tabs on the tape itself to indicate the beginning of each question and each answer section of the tape. Small strips of white tape-splicing material serve well; use a vertical strip to mark the beginning of a question, a horizontal strip to mark the beginning of the answer section.

Amnesia. This is the simplest of these four games, requires no advance preparation, yet it will startle and amuse your guests. It is a very effective test of an individual's powers of concentration.

The only equipment required is a microphone, a set of earphones, and a tape recorder with *off-the-tape* playback monitoring facilities. If your recorder has only two heads—an erase, and combined record-playback head—it won't work because you will be monitoring the incoming signal rather than taped signal. Any three-head tape recorder will work.

Accuse one of your guests of being amnesic, and challenge him to recite a familiar limerick. But before he begins, ask him to put on the earphones while he dictates the limerick into the microphone. Just say that you will tape his voice so that there will be no argument later about whether he had recited correctly and with ease.

Chances are he will go to pieces and forget the limerick before he has finished the first sentence! His distress, and failure, will be extremely puzzling to other guests. But don't tell them the reason; let each person find out for himself. Many people are wholly unable, even on second or third tries, to state their own names and addresses accurately.

Yet you have done nothing more than record the subject's voice on tape—as you said you would. Your subject expects to hear his voice through the earphones, but he won't anticipate that the recorded version, *played back through the tape-monitor system,* will be out of step with what he is saying at any given moment. His instinctive reaction is to slow down his recitation in order to let the recorded version "catch up." Of course it doesn't—it also slows down. This further confuses the subject, and he promptly forgets what he planned to say.

With repeated practice, some persons can learn to ignore the taped voice. Many can't. There is only one type of person who can't be tricked this way—a deaf person.

Skits-O-Phrenia. This stunt—one of the most amusing—calls for the use of a stereo tape recorder. Choose two guests, preferably a man and a woman, to act out a simple skit while the spectators attempt to detect the meaning of the pantomime. Explain that the participants won't have to memorize the script because it is all on tape, and both players will hear the instructions through earphones so that the audience will receive no clues, except the pantomime action itself.

Only *you* know that the players will receive wholly different, contradictory instructions from the tape; the woman assumes that the male partner hears exactly the same instructions she hears. But he doesn't.

This creates some strange problems for the players. At a certain point, for example, the woman may be led to expect amorous advances which she is instructed to violently rebuff; but the man, instructed to make the advances, is led to believe that she will welcome them! When she seemingly refuses to play her part according to script, the male becomes completely bewildered and the action becomes largely spontaneous. This of course produces action that is as bewildering to the audience as to the participants. Don't hesitate to turn off the tape recorder temporarily while the players attempt to play the scene; then turn it on again when the action begins to slow down.

What you have done, of course, is to record slightly different directions on the two stereo channels. You then tap one channel, only, to each of the earphones.

When the fun is over, you can reap a dividend of hilarity. Before the participants have a chance to compare notes and figure out the trick, rewind the tape and switch the earphone connections surreptitiously. Then suggest they try it over again, in the hope that a re-run will be smoother. Each player will expect to get the same directions as before; instead, the roles will be reversed. The result? Well, let's just say that depends on your personal talents as an amateur playwright. ■

A Radio-TV Experimenter Service

LITERATURE LIBRARY

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ELECTRONIC PARTS

1. This 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. This catalog is far too detailed to describe here. *Lafayette Radio Electronics Corp.* will send one you can examine for yourself!

3. *Progressive "Edu-Kits" Inc.* now has available their new 1964 catalog featuring hi-fi, CB, Amateur, test equipment in kit and wired form. Also lists books, parts, tools, etc.

4. We'll exert our influence to get you on the *Olson* mailing list. This catalog comes out regularly with lots of new and surplus items. If you find your name hidden in the pages, you win $5 in free merchandise!

5. Unusual scientific, optical and mathematical values. That's what *Edmund Scientific* has. War surplus equipment as well as many other hard-to-get items are included in this new 148-page catalog.

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.

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

8. Want a colorful catalog of surplus goodies? *John Meshna Jr.* has one that covers everything from assemblies to Zener diodes. You can buy complex units that set the government back thousands, at a fraction of the cost!

9. Are you still paying drugstore prices for tubes? *Nationwide Tube Co.* will send you their special bargain list of tubes. This will make you light up!

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 electronic 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.

HI-FI/AUDIO

12. Tone-arms, cartridges, hi-fi, and stereo preamps and replacement tape heads and conversions are listed in a complete *Shure Bros.* catalog.

13. Here's a beautifully presented brochure from *Altec Lansing Corp.* Studio-type mikes, two-way speaker components and other hi-fi products.

14. For the love of mikes! *Astatic Corp.* has lots. Studio types, ham types, recording types, etc. See its catalog sheets for the details.

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

16. *Garrard* has prepared a four-color booklet on its full line of automatic turntables. Accessories are detailed too.

17. Two brand new full-color booklets are being offered by *Electro-Voice, Inc.* that every audiophile should read. They are: "Guide to Outdoor High Fidelity" and "Guide to Compact Loudspeaker Systems."

18. Speakers and enclosures from *Argos Products Co.* feature a new and novel well-mounting system. To find out more, *Argus* will be happy to send literature.

19. A valuable 8-page brochure from *Empire Scientific Corp.* describes technical features of their record playback equipment. Also included are sections on basic facts and stereo record library.

20. Tape recorder heads wear out. After all, the head of a tape deck is like the stylus of a phonograph, and *Robins Industries* has a booklet showing exact replacements. Lots of good info on how the things are built, too.

21. *Wharfedale*, a leading name in loudspeakers and speaker systems, has a colorful booklet to send to you on its product line. Complete with prices, it is a top-notch buyers guide.

22. A wide variety of loudspeakers and enclosures from *Utah Electronics* lists sizes shapes and prices. All types are covered in this 16-page heavily illustrated brochure.

24. Here's a complete catalog of high-styled speaker enclosures and loudspeaker components. *University* is one of the pioneers in the field that keeps things up to date.

26. When a manufacturer of high-quality high fidelity equipment produces a line of kits, you can just bet that they're going to be of the same high quality! *H. H. Scott, Inc.*, has a catalog showing you the full-color, behind-the-panel story.

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.

28. Very pretty, very efficient, that's the word for the new *Betacom* intercom. It's ideal for stores, offices, or just for use in the home, where it doubles as a baby-sitter.

TAPE RECORDERS AND TAPE

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

31. "The Care and Feeding of Tape Recorders" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 16-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

32. You can learn lots about tape recorders. Big tape recorders for studios, little tape recorders for business men, all kinds of tape recorders from *American Concertone.*

33. "40 and More Ways to Use Your Roberts Tape Recorder" shows how to get the most enjoyment from your tape recorder for "your family growing up," language lessons, speeches, even synchronized sound with slides and home movies. Yours for the asking from *Roberts Electronics.*

34. The 1964 line of *Sony* tape recorders, microphones and accessories is illustrated in a new 16-page full color booklet just released by *Superscope, Inc.*, exclusive U.S. distributor.

HI-FI ACCESSORIES

36. 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!

38. An entirely new concept in customizing electron tubes has generated a new replacement line. *Gold Lion* tubes give higher output and lower distortion than ordinary production high-fidelity tubes.

39. Got "furniture-sag"? Hmmm? *Adjustable Caster Co.* thinks you'd better level the shelf your turntable sits on before you try to level the turntable itself! Lots of data here.

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41. Here's a firm that makes everything from television kits to pocket stoves. The *Conar* catalog is yours for the asking.

42. Here's a 100-page catalog of a wide assortment of kits. They're high-styled, highly-versatile, and *Heath Co.* will happily add your name to the mailing list.

43. A complete line of test equipment as well as a wide assortment of hi-fi and stereo gear from *PACO Kits* will come your way if you circle 43.

AMATEUR RADIO

45. Catering to hams for 29 years, *World Radio Laboratories* has a new FREE 1965 catalog which includes all products deserving space in any ham shack. Quarterly fliers, chock-full of electronic bargains are also available.

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

47. Here's a goodly assortment of literature covering the products of the *Dow-Key Co.* They make coaxial relays, switches, and preamps for hams and CB'ers.

CITIZENS BAND SHORT-WAVE RADIO

48. *Hy-Gain's* new 16-page CB antenna catalog is packed full of useful information and product data that every CB'er should know about. Get a copy.

49. Want to see the latest in communication receivers? *National Radio Co.* puts out a line of mighty fine ones and their catalog will tell you all about them.

50. Are you getting all you can from your Citizens Band radio equipment? *Cadre Industries* has a booklet that answers lots of the questions you may have.

51. Antennas for CB and ham use as well as for commercial installations is the specialty of *Antenna Specialists Co.* They also have a generator for power in the field.

53. When private citizens group together for the mutual good, something big happens. *Hallicrafters, Inc.* is backing the CB React teams and if you're interested in CB, circle #53.

54. A catalog for CB'ers, hams and experimenters, with outstanding values. Terrific buys on antennas, mikes and accessories. Just circle #54 to get *Grove Electronics* free 1964 Catalog of Values.
Also see items 46 and 47.

55. Interested in CB or business-band radio? Then you will be interested in the catalogs and literature *Mosley Electronics* has to offer.

SCHOOLS AND EDUCATIONAL

56. Three new courses in marine communication, aircraft communication, and guidance and mobile communications are available from *National Radio Institute.* The pamphlets are well-illustrated and educational.

57. Here are three pamphlets dealing with television trouble-shooting, radio trouble-shooting and high fidelity. These, from *Progressive Edu-Kits* are very complete and easy to understand.

58. Interested in ETV? *Adler Electronics* has a booklet describing educational television and this goes into a depth study of ETV in all its ramifications. There's a good science fair project here for someone!

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.*

60. Facts on accredited curriculum in E. E. Technology is available from *Central Technical Institute* plus a 64-page catalog on modern practical electronics.

ORGANS

61. A complete booklet and price list giving you the inside data on *Schober Organs* are yours for the asking.

AUTOMOTIVE

63. Got some questions regarding transistor ignition? *W. F. Palmer Labs* will send you a booklet which explains what transistor ignition is all about. If you decide, after reading, that this is for you, their kits will let you build your own!

65. Want power plus for your auto? New Transistorized Ignition adds 20% more MPG, 3 to 5 times more spark plug life. Lower maintenance cost. Free catalog and instruction booklet available from *Anderson Engineering.*

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69. Interested in tackling a TV kit? *Arkay International, Inc.* will send you full literature (including a schematic) of this truly educational kit. It's used in many of the electronic schools.

70. The first entry into the color-TV market in kit form comes from the *Heath Company.* A do-it-yourself money saver that all TV watchers should know about.

71. The smallest television set to date is featured in this beautiful prepared brochure from *SONY Corp.* You'll be amazed at the variety this firm offers.

72. Get your 1964 catalog of *Cisin's* TV, radio, and hi-fi service books. Bonus—TV tube substitution guide and trouble-chaser chart is yours for the asking.

SLIDE RULE

75. Want to find rapid solutions to complicated math problems? Solve interest and ratio, log and trig problems with 10-scale slide rule. *Alsynco* will send complete information.

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78. Xcelite's Allen hex-type screwdriver kits in plastic cases are must items for the home experimenter's tool box. Learn about what's available to keep your tool box filled with the right tool for the right job.

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Service on this coupon expires March 1, 1965

DX 1975

(Continued from page 72)

AADXL log book and prepared to tear it in half.

A carrier came on erasing ZBB. "This is The Voice of Atlantis." A muffled voice. "I am a convert from your world with a message for you."

Jack dropped the book.

"We are transmitting from a sealed undersea cavern. Soon Atlantis will arise with flying submarines and reclaim Bimini, then eventually free the whole world."

Jack, the lord of all DX-dom had turned slightly green. "You heard the message too, didn't you?" Picked up my log and carefully put it back on the table. "If we both tell them, they'll believe us."

I played it cool. "I hear a beacon, what about it?"

"That signals S/9, you must have heard the message from Atlantis!"

"What kind of a message is ZBB?" Brandi had pushed him over the edge like she planned, but if I handled the thing right, I could have both Atlantis and boss the AADXL, too.

The voice of Atlantis shifted frequency ever so slightly. "We have harnessed those great fires of the inner Earth. It is this power that drivers our Aerosubs and the pumps which hold back the sea. With this power we will reconquer the earth's surface. Join us now, tomorrow it will be too late." Left the air.

I shook my head. "Still sounds like ZBB."

Jack turned around and walked out.

He would go to the council. Those men who ran all the individual radio clubs. Jack kept them in power and they did the same for him. But this time when he told the council his story, they would instead remove him. Then, they would make me the *big boy*.

Brandi reappeared with my walkie talkie.

I put one arm around her shoulders. "You deserve an award, honey."

"The devil I do, your old transmitter wouldn't modulate." Poker faced, "You think I'm lying?" She held the rig out in my direction.

Now I know she's putting it on. To prove it all I have to do is take the walkie talkie away from her and try the thing for myself. But what happens with Atlantis if Brandi is telling the truth? Like maybe I'm scared to push that button and find out. ■

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UNDERSTAND Your Dreams, $2.00. Walter Kazaks, 234 East 58th Street, New York 10022.

CATALOG of all Science and Mechanics Craftprints. Send 25¢ to cover postage and handling to Craftprint Div., Science & Mechanics, 505 Park Ave., New York 22.

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TRANSISTOR Treasure Detectors locate buried gold, silver, coins. Kits, assembled models $19.95 up. Free catalog. Relco-A30, Box 10563, Houston 18, Texas.

How to Buy Resistors

(Continued from page 116)

is 2 and green the number of zeros following is 00000. Hence, the resistor is a 8,200,000-ohm unit (8.2 Meg) and the last band—gold—tells us it is a 5% unit.

The physical size of the resistor indicates its wattage rating—refer to the drawings in figure 2. As the wattage rating increases, so does the physical size of the resistor. Obtain a ½-, 1-, and 2-watt resistors—look at them and roll them in your fingers—you will never forget what your senses of sight and touch teach you. Thereafter, you will be able to *sort on sight* resistors, by their wattage.

What's available? The table of standard resistance values given in this article has been accepted by government and industry. Values that do not appear on this table will be difficult to obtain, and then only by special order. There are some standard values for resistances below 10 ohms. However, as an experimenter you will seldom have call for these values except in some odd transistor circuits and even odder vacuum tube circuits. You may have trouble purchasing 20% tolerance resistors. Most dealers and distributors do not stock these resistors since the call for them has diminished considerably.

How to buy. If your stocks of resistors are very low, make a large purchase of 150 ½-watt assorted resistors for $18 and you will get an attractive resistor filing cabinet that is useful in keeping your stock orderly and easily accessible. You can have either a metal cabinet made by *IRC* or a plastic unit made by *Ohmite*. *Lafayette Radio* offers 100 ½-watt assorted plus a plastic hinged box for only $4.50. Although the box is not as good as the *IRC* and *Ohmite* models, the resistor assortment buy is hard to beat and is excellent for restocking purposes.

Let's see how you can save money on small purchases. Assume you have to buy four ½-watt resistors because your stock has been depleted in these resistance values. Using the *Allied* catalog as a price standard, these resistors will cost 48¢. Now let's double the order. Not only do you get extra resistors to beef up your depleted stock, you also enjoy a price lowering for quantity reasons. The price for the eight resistors is 72¢—the second four resistors cost only 24¢ to stock. In another instance, let's assume you need 31 ½-watt resistors for a home-built amplifier. The cost is $2.79. Now, if you were to order 19 more resistors to add to your shop's stock (a total of 50 resistors), the price would be only $2.75—you save 4¢ and get 19 resistors *free*. Now that's quantity buying that's hard to beat!

Round up of facts. If you are learning something new about resistors for the first time, point an accusing finger at yourself for not reading the fine print in your radio parts catalog. All the information in this article was obtained from one electronics parts supply house and checked against several others which were equally informative. The next time you buy component parts in quantity, read the catalog pages carefully and don't forget the small print. That's where you can multiply your penny savings into dollars. ■

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6 & 2 Meter Roundup

(Continued from page 106)

will probably find that a transceiver which is available with a microphone on a desk stand will be more convenient than the hand type with a coiled cord.

With the exception of 2-meter band Novice operators, most hams want a variable transmit frequency feature to enable them to move up and down the band in order to more easily work other stations. While some transceivers have a built-in "VFO" to permit this, some units do not include this. In order to add the VFO function it will be necessary for you to purchase a separate unit which might run anywhere from about $20 up to $70 or more.

Some transceivers do not come with the mobile power supply included and this would also have to be purchased separately, or the transceiver would have to be operated from an inverter. In any case, this would also add to the cost of the equipment.

Survey. We have taken a look around at the most popular 6- and 2-meter transceivers and list here some significant features of each. Obviously we cannot list each and every feature of each piece of equipment, and we suggest that if any particular unit looks like it might be down your alley you write to the manufacturer for complete details.

As we go to press, we understand that the Hallicrafters Company, Chicago, Ill. 60624,

(Concluded on page 153)

Volume 42, No. 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*, now published in three parts twice each year. This format change, the first in over two decades, enables the Editors of RADIO-TV EXPERIMENTER to offer to its readers two complete volumes of *White's Radio Log* each year, while increasing the scope of the *Log* and its accuracy.

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 December/January 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 1964. 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 the new *White's Log* format an unbeatable reference.

QUICK REFERENCE INDEX

WHITE'S

RADIO LOG

U. S. AM Stations by Location

Location	C.L.	Kc.
Abbeville, Ala.	WARI	1480
Abbeville, La.	KROF	960
Abbeville, S.C.	WABV	1590
Aberdeen, Md.	WAMD	970
Aberdeen, Miss.	WMPA	1240
Aberdeen, S. Dak.	KDLE	1420
	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
Aguadilla, P.R.	WABA	850
	WGRF	1340
Ahoskie, N.C.	WRCS	970
Aiken, S.C.	WAKN	990
	WLOW	1330
Aitkin, Minn.	KKIN	1000
Akron, Ohio	WAKR	1590
	WADC	1350
	WCUE	1150
	WHLO	640
Alamogordo, N.M.	KALG	1230
	KRAC	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	1450
	KRZY	1580
Alcoa, Tenn.	WEAG	1470
Alexander City, Ala.	WRFS	1050
	KALB	580
	KDBS	1410
	KSYL	970
Alexandria, Minn.	KXRA	1230
Alexandria, Va.	WPIK	730
Algona, Iowa	KLGA	1600
Alice, Tex.	KOPY	1070
Alisal, Cal	KRSA	1570
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	1280
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
	KFDA	1440
	KGNC	710
	KIXZ	940
	KRAY	1360
	KZIP	1310
Ambridge, Pa.	WMBA	1460
Americus, Ga.	WDEC	1290
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	730
	KENI	550
Andalusia, Ala.	WCTA	920
Anderson, Calif.	KPON	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.	WTLN	1520
Apple Valley, Cal.	KAVR	960
Appleton, Wis.	WAPL	1570
	WHBY	1230
Arab, Ala.	WRAB	1380
Arcadia, Fla.	WAPG	1480
Arcata, Calif.	KENL	1340
Arcata, Calif.	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.	WQTY	1220
Arlington, Va.	WAVA	780
	WEAM	1390
Artesia, N.M.	KSVP	990
Arvada, Colo.	KDAB	1550
Arroyo Grande, Calif.	KCJH	1280
Ashburn, Ga.	WMES	1570
Asbury Park, N.J.	WJLK	1440
	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	5000
Astoria, Oreg.	KAST	1370
	KIAL	1230
Atchison, Kans.	KARE	1470
Athens, Ga.	WGAU	1340
	WDOL	1470
	WRFC	960
Athens, Ohio	WATH	970
	WOUB	1340
Athens, Tenn.	WLAR	1450
Athens, Tex.	KBUD	1410
Atlanta, Ga.	WPLD	590
	WAKE	1340
	WAOK	1380
	WERD	860
	WGKA	1600
	WGST	920
	WIIN	970
	WQXI	790
	WSB	750
	WYZE	1480
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
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
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
	KASE	970
	KTBC	590
	KOKE	1370
	KVET	1300
	KGLM	740
Avalon, Calif.	WAVP	1390
Avon Park, Fla.		
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
	WBMD	750
	WCAO	600
	WCBM	680
	WFBR	1300
	WITH	1230
	WSID	1010
	WWIN	1400
Bamberg, S.C.	WWBD	790
Bangor, Maine	WABI	910
	WGUY	1250
	WLBZ	620
Banning, Calif.	KPAS	1490
Barboursville, Ky.	WBVL	950
Bardstown, Ky.	WBRT	1320
Barnesboro, Pa.	WNCC	950
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	1460
	WLUX	1550
	WYNK	1380
	WIBR	1300
	WJBO	1150
	WLCS	910
	WXOK	1260
Battle Creek, Mich.	WBCK	930
	WELL	1400
	WVOC	1500
Baxley, Ga.	WHAB	1260
Bay City, Mich.	WBCM	1440
	WWBC	1250
Bay City, Tex.	KIOX	1270
Bay Minette, Ala.	WBCA	1150
Bayamon, P.R.	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
	WWNR	620
Bedford, Ind.	WBIW	1340
Bedford, Pa.	WBFD	1310
Bedford, Va.	WBLT	1350
Beeville, Tex.	KIBL	1490
Bel Air, Md.	WVCB	1520
Belen, N.Mex.	KARS	860
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	1600
Benton, Ky.	WCBL	1290
Benton Harbor, 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 Delta, Alaska	WXLL	980
Big Lake, Tex.	KBLT	1290
Big Rapids, Mich.	WBRN	1460
Big Sprg., Tex.	KBST	1490
	KHEM	1270
	KBYG	1400
Big Stone Gap, Va.	WLSD	1220
Biloxi, Miss.	WLOX	1490
	WVMI	570
Billings, Mont.	KBMY	1240
	KGHL	790
	KOOK	970
	KOYN	910
	KURL	730
Binghamton, N.Y.	WINR	680
	WKOP	1360
	WNBF	1290
Birmingham, Ala.	WAPI	1070
	WBHM	1550
	WBRC	960
	WCRT	1260
	WEZB	1220
	WENN	1320

Location	C.L.	Kc.
	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.	WBMT	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.	KBEN	1560
Bluefield, W.Va.	WHIS	1440
	WKOY	1240
Blythe, Calif.	KYOR	1450
Blytheville, Ark.	KLCN	910
Boaz, Ala.	WBSA	1300
Boca Raton, Fla.	WFSG	730
Bogalusa, La.	WIKC	1490
	WBOX	920
Boise, Idaho	KATN	1010
	KBOI	950
	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
	WORL	950
Boulder, Colo.	KBOL	1490
	KDEY	1460
Bowie, Tex.	KBAN	1410
Bowling Green, Ky.	WKCT	930
	WBGN	1340
	WLBJ	1410
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
	WTRL	1490
Bradenton, Fla.	WBRD	1420
	WESB	1490
Bradford, Pa.	KNEL	1490
Brady, Tex.	KLIZ	1380
Brainerd, Minn.	KBHM	1220
Branson, Mo.	CKPC	1380
Brantford, Ont.	WTSA	1450
Brattleboro, Vt.	WKVT	1490
Brawley, Calif.	KROP	1300
Brazil, Ind.	WBZI	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
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
	WYKE	1550
Bristol, Va.	WCYB	690
	WFHG	980
Brockton, Mass.	WBET	1460
	WOKW	1410
Brockville, Ont.	CFJR	1450
Broken Bow, Nebr.	KCNI	1280
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
Brooksville, Fla.	WWJB	1450
Brownfield, Tex.	KTFY	1300
Brownsville, Tenn.	WBHT	1520
Brownsville, Tex.	KBOR	1600
Brownwood, Tex.	KBWD	1380
	KEAN	1240
Brunswick, Ga.	WGIG	1440
	WMOG	1490
	WKLU	790
Brunswick, Maine	WCME	900
Bryan, Ohio	WBNO	1520
Bryan, Tex.	KORA	1240
	KTAW	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.	WDMF	1460
Burbank, Calif.	KBLA	1500
Burley, Idaho	KBAR	1230
Burlington, Iowa	KBUR	1490
Burlington, N.C.	WBBB	920
	WBAG	1150
Burlington, Vt.	WDOT	1400
	WJOY	1230
	WVMT	620
Burnett, Tex.	KTSL	1340
Burns, Oreg.	KRNS	1230
Butler, Ala.	WPRN	1240
Butler, Mo.	KMAM	1530
Butler, Pa.	WBUT	1050
	WISR	680
Butte, Mont.	KBOW	1490
	KOPR	550
	KXLF	1370
Cadillac, Mich.	WATT	1240
Caguas, P.R.	WNEL	1430
	WVJP	1110
Cairo, Ga.	WGRA	790
Cairo, Ill.	WKRO	1490
Calais, Maine	WQDY	1230
Caldwell, Idaho	KCID	1490
	KBGN	910
Calera, Ala.	WBYE	1370
Calexico, Calif.	KICO	1490
Calhoun, Ga.	WCGA	900
Cambridge, Md.	WCEM	1240
Cambridge, Mass.	WTAO	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.	WTCD	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
	WHOF	1060
	WHBC	1480
Canyon, Tex.	KCAN	1550
Cape Girardeau, Mo.	KFVS	960
	KZIM	1220
	KGMO	1550
Carbondale, Ill.	WCIL	1020
Carbondale, Pa.	WCDL	1440
Caribou, Maine	WFST	600
Carlisle, Pa.	WHYL	960
Carlsbad, N.Mex.	KAVE	1240
	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.	KDAK	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.	KWXY	1340
	KVOC	1230
	WCAY	620
Cayce, S.C.	KSUB	590
Cedar City, Utah	KCFI	1250
Cedar Falls, Iowa	KCRG	1600
Cedar Rapids, Iowa	KLWN	1450
	WMT	600
	KHAK	1360
Cedartown, Ga.	WGAA	1340
Celina, Ohio	WCSM	1350
Center, Ala.	WEIS	990
	WAGC	1550
Center, Tex.	KDET	930
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, Miss.	WLBS	1580
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
Chardon, Ohio	WGLD	1560
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
Charlotte,	WRPL	1540
Charlotte Amalie, V.I.	WBNB	1000
	WSTA	1340
	WBNB	1000
Charlottesville, Va.	WCHV	1260
	WELK	1010
	WINA	1400
Chase City, Va.	WMEK	980
Chattahouchee, Fla.	WSBP	1580
Chattanooga, Tenn.	WMOC	1450
	WAPO	1150
	WDEF	1370
	WDOD	1310
	WDXB	1490
	WNOO	1260
Cheboygan, Mich.	WCBY	1240
Cheektowaga, N.Y.	WNIA	1230
Chehalis, Wash.	KITI	1420
Chelan, Wash.	KOZI	1220
Cheraw, S.C.	WCRE	1420
Cherryville, N. C.	WCSL	1590
Cherokee, Iowa	KCHE	1440
Chester, Ill.	KSGM	980
Chester, Pa.	WEEZ	1590
	WVCH	740
Chester, S.C.	WGCD	1490
Chester, Va.	WIKI	1410
Chestertown, Md.	WCTR	1530
Cheyenne, Wyo.	KFBC	1240
	KCHY	1530
	KRAE	1480
	KVWO	1370
Chicago, Ill.	WAAF	950
	WAIT	820
	WBBM	780
	WCFL	1000
	WCRW	1240
	WEDC	1240
	WYNR	1390
	WGN	720
	WIND	560
	WJJD	1160
	WLS	890
	WMAQ	670
	WMBI	1110
	WSBC	1240
Chicago Hgts., Ill.	WMPP	1470
	WCGO	1600
Chickasha, Okla.	KWCO	1580
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.	WGBC	1240
Chippewa Falls, Wis.	WAXX	1150
Christiansburg, Va.	WBCR	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
	WPOX	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	KYW	1100
	WDOK	1260
	WERE	1300
	WGAR	1220
	WHK	1420
	WABQ	1540
	WJW	850
Cleveland, Tenn.	WBAC	1340
	WCLE	1570
	KVLB	1410
Cleveland, Tex.	WJMD	1490
Cleve. Hgts., Ohio	WOWY	1590
Clewiston, Fla.	KCLF	1400
Clifton, Ariz.	WCFV	1290
Clifton Forge, Va.	WDIC	1430
Clincho, Va.	WHOW	1520
Clinton, Ill.	KCLN	1390
Clinton, Iowa	KROS	1340
	KDKD	1280
Clinton, Mo.	WRRZ	880
Clinton, N.C.	KWOE	1320
Clinton, Okla.	WPCC	1410
Clinton, S.C.	WYSH	1380
Clinton, Tenn.	WKLK	1230
Cloquet, Minn.	KCLV	1240
Clovis, N.Mex.	KICA	980
Coachella, Calif.	KCHV	970
Coalinga, Calif.	KBMX	1470
Coatesville, Pa.	WCOJ	1420
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
Coleman, Tex.	KSTA	1000
Colfax, Wash.	KCLX	1450
College Park, Ga.	WEAD	1570
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

WHITE'S RADIO LOG

Location	C.L.	Kc.
Columbia, Tenn.	WMCP	1280
	WKRM	1340
Columbus, Ga.	WDAK	540
	WRBL	1420
	WGBA	1270
	WCLS	1580
	WOKS	1340
	WPNX	1460
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
	KFRM	550
Conneaut, Ohio	WWOW	1360
Connellsville, Pa.	WCVI	1940
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, Oreg.	KOOS	1230
	KYNG	1420
Copper Hill, Tenn.	WLSB	1400
Coquille, Oreg.	KWRO	630
Coral Gables, Fla.	WRIZ	1550
	WVCG	1070
Corbin, Ky.	WCTT	680
	WYGO	1330
Cordele, Ga.	WMJM	1490
Cordova, Alaska	KLAM	1450
Corinth, Miss.	WCMA	1230
Cornelia, Ga.	WCON	1450
Corning, Ark.	KCCB	1260
Corning, N.Y.	WCBA	1350
	WCLI	1450
Corona, Calif.	KBUC	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
	KLOO	1340
	KFLY	1240
	KLOO	1350
Coshocton, Ohio	WTNS	1560
Cottage Grove, Ore.	KNND	1400
Cottonwood, Ariz.	KVRD	1240
	KVIO	1600
Coudersport, Pa.	WFRM	600
Council Bluffs, Iowa	KFNF	920
	KSWI	1560
Courtenay, B.C.	CFCP	1440
Covington, Ga.	WGFS	1430
Covington, La.	WARB	730
Covington, Tenn.	WKBL	1250
Covington, Va.	WKEY	1340
Cowan, Tenn.	WZYX	1440
Craig, Colo.	KRAI	550
Crane, Tex.	KCRR	1380
Crane, Texas	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
Cuero, Tex.	KCFH	1600
Cullman, Ala.	WFMH	1460
	WKUL	1340
Culpeper, Va.	WCVA	1490
Cumberland, Ky.	WCPM	1280
Cumberland, Md.	WCUM	1230
	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
Dalhart, Tex.	KXIT	1410
Dallas, N.C.	WAAK	980
Dallas, Oreg.	KROW	1460
Dallas, Tex.	KRLD	1080
	KIXL	1040
	KSKY	660
	KLIF	1190
	WFAA	570
	WFAA	820
	KBOX	1480
The Dalles, Oreg.	WRR	1310
	KACI	1300
Dalton, Ga.	KDDL	1440
	WBLJ	1230
Danbury, Conn.	WRCD	1430
Danville, Ill.	WLAD	800
	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
	WONE	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, Ga.	WGUN	1010
	WLKB	1310
Decatur, Ill.	WDZ	1050
	WSOY	1340
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
	WJWT	1350
Denham Sprgs., La.	WLBI	1220
Denison, Iowa	KDSN	1580
Denison, Tex.	KDSX	950
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.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, Tex.	KDDD	800
Duncan, Okla.	KRHD	1350
Dundalk, Md.	WAYE	860
	WEBB	1360
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
Eagle Pass, Tex.	WTRO	1330
Eagle River, Wis.	KEPS	1270
Easley, S.C.	WERL	950
E. Grand Forks, Minn.	WELP	1360
Eastland, Tex.	KRAD	1590
E. Lansing, Mich.	KERC	1590
E. Liverpool, Ohio	WKAR	870
East Longmeadow, Mass.	WOHI	1490
Eastman, Ga.	WTYM	1600
E. Moline, Ill.	WPFE	1580
E. Point, Ga.	WDLM	960
E. St. Louis, Ill.	WTJH	1260
Easton, Md.	WAMV	1490
Easton, Pa.	WEMD	1460
	WEEX	1230
	WEST	1400
Eatontown, N.J.	WHTG	1410
Eau Claire, Wis.	WEAQ	790
	WBIZ	1400
	WECL	1050
Eau Gallie, Fla.	WMEG	920
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	1300
El Centro, Calif.	KXO	1230
	KAMP	1430
El Dorado, Ark.	KDMS	1290
	KELD	1400
Eldorado, Kans.	KBTO	1360
Eldorado Springs, Mo.	KESM	1580
Elgin, Ill.	WRMN	1410
Elizabeth City, N. C.	WCNC	1240
	WGAI	560
Elizabethton, Tenn.	WBEJ	1240
Elizabethtown, Ky.	WIEL	1400
Elizabethtown, N.C.	WBLA	1440
Elizabethtown, Pa.	WHRY	1600
Elk City, Okla.	KBEK	1240
Elkhart, Ind.	WTRC	1340
	WCMR	1270
Elkin, N.C.	WIFM	1540
Elkins, W.Va.	WDNE	1240
Elko, Nev.	KELK	1240
Elkton, Md.	WSER	1550
Ellensburg, Wash.	KXLE	1240
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.	KVDE	1400
Emporia, Va.	WEVA	860
Emporium, Pa.	WLEM	1250
Endicott, N.Y.	WENE	1430
Englewood, Colo.	KGMC	1150
Englewood, Fla.	WENG	1580
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
Estherville, Iowa	KLIL	1340
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
	KRED	1480
Eustis, Fla.	WLCO	1240
Evanston, Ill.	WEAW	1330
	WNMP	1590
Evanston, Wyo.	KEVA	1240
Evansville, Ind.	WRDZ	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
Fairbanks, Alaska	KFAR	610
	KFRB	900
Fairbury, Nebr.	KGMT	1310
Fairfax, Va.	WEEL	1310
Fairfield, Ill.	WFIW	1390
Fairfield, Iowa	KMCD	1570
Fairhope, Ala.	WABF	1220
Fairmont, Minn.	KSUM	1370
Fairmont, N.C.	WFMO	860
Fairmont, W.Va.	WMMN	920
	WTCS	1490
Fajardo, P.R.	WMDD	1480
Fairfurrias, Tex.	KPSO	1260
Fall River, Mass.	WALE	1400
	WSAR	1480
Falls Church, Va.	WFAX	1220
Falls City, Nebr.	KTNC	1230
Fargo, N.Dak.	WDAY	970
	KFNW	900
	KUTT	1550
	KXGO	790
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.	KDTE	1250

Location	C.L.	Kc.
Fernandina Beach. Fla.	WPAP	1570
Ferriday, La.	KFNV	1600
Festus, Mo.	KJCF	1400
	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	1000
	KJKJ	1400
	KEOS	690
	KEOS	1290
Flat River, Mo.	KFMO	1240
Flint, Mich.	WFDF	910
	WTRX	1330
	WAMM	1420
	WMRP	1570
	WKMF	1470
	WTAC	600
Flomaton, Ala.	WTCB	990
Florence, Ala.	WJDI	1340
	WOWL	1240
Florence, S.C.	WJMX	970
	WDLS	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. 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
	WXYC	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
	WANE	1450
	WKJG	1380
Ft. Worth, Tex.	KJIM	870
	KCUL	1540
	KFJZ	1270
	KNOK	970
	WBAP	570
	WBAP	820
	KXOL	1360
Fostoria, Ohio	WFOB	1430
Fountain City, Tenn.	WGYW	1430
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, Pa.	WFRA	1430
Franklin, Tenn.	WAGG	950
Franklin, Va.	WYSR	1250
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
	KYND	1300
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
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
Gallipolis, Ohio	WJEH	990
Gallup, N. Mex.	KGAK	1330
	KYVA	1230
Galveston, Tex.	KILE	1400
	KGBC	1540
Gander, Nfld.	CBG	1450
Garden City, Kans.	KNCO	1050
	KIUL	1240
Garden City, Mich.	WERB	1090
Gardner, Mass.	WGAW	1340
Gary, Ind.	WWCA	1270
	WRAY	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	1490
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
Glens Falls, N.Y.	WSET	1410
	WWSC	1450
Glenville, Ga.	WKIG	1580
Glenwood Sprgs., Colo.	KGLN	980
Globe, Ariz.	KZOW	1240
Gloucester, Va.	WDDY	1420
Gloversville-Johnston, N.Y.	WENT	1340
Gold Beach, Oreg.	KBLY	1220
Golden, Colo.	KICM	1250
Golden Meadow, La.	KLEB	1000
Golden Valley, Minn.	KEVE	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
	KILO	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.	KDZY	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
	KYDU	1450
Green Bay, Wis.	WBAY	1360
	WJPG	1440
	WOUZ	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
Greenburg, Ind.	WGRB	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.	WGTC	1590
	WOOW	1340
	WPXY	1550
Greenville, S.C.	WESC	660
	WFBC	1330
	WMRB	1490
	WMUU	1260
	WQOK	1440
Greenville, Tex.	KGVL	1400
Greenwood, Miss.	WABG	960
	WGRM	1240
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
	WRIX	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
	WCNW	1560
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
	WKBO	1230
Harrison, Ark.	KHOZ	900
Harrisonburg, Va.	WHBG	1360
	WSVA	550
Harrodsburg, Ky.	WHBN	1420
Hartford, Conn.	WORC	1360
	WCCC	1290
	WPOP	1410
	WTIC	1080
Hartford, Wis.	WTKM	1540
Hartselle, Ala.	WHRT	860
Hartsville, S.C.	WHSC	1450
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
	WTHT	1300
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
	KTOD	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
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
Hillsboro, Oreg.	KUIK	1360
Hillsboro, Tex.	KHBR	1560
Hillsdale, Mich.	WCSR	1340
Hillsville, Va.	WHHV	1400
Hilo, Hawaii	KHBC	970
	KIPA	1110
	KIMO	850
Hinesville, Ga.	KGML	990
Hinton, W. Va.	WMTO	1380
Hobart, Okla.	KTJS	1420
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, Calif.	KQHT	1520
Hollywood, Fla.	WGMA	1320
Holly Hill, S.C.	WHHL	1440
Holyoke, Mass.	WREB	930
Homer, La.	KHAL	1320
Homestead, Fla.	WIII	1430
Homewood, Ala.	WJLD	1400
	KAIM	870
Honolulu, Hawaii	KGMB	590
	KZOO	1210
	KHAI	1090
	KPOI	1380
	KIKI	830
	KGU	760
	KHVH	1040
	KORL	650
	KNDI	1270
	KOHO	1170
	KTRG	990
	KULA	690
	KUMU	1500
	KOLL	1420
Hood River, Oreg.	KIHR	1340
Hope, Ark.	KXAR	1490
Hopewell, Va.	WHAP	1340
Hopkinsville, Ky.	WHOP	1230
	WKOA	1480
Hoquiam, Wash.	KHOK	1560
Hornell, N.Y.	WWHG	1320
	WLEA	1480
Hot Springs, Ark.	KAAB	1340

WHITE'S RADIO LOG

Location	C.L.	Kc.
	KBHS	590
	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.	KTBC	1250
Houston, Tex.	KCOH	1430
	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
Independence, Ia.	KUPI	980
	KOUR	1220
Independence, Kans.	KIND	1010
Independence, Mo.	KCCX	1510
Indiana, Pa.	WDAD	1450
Indianapolis, Ind.	WFBM	1260
	WGEE	1590
	WIBC	1070
	WIGO	810
	WIRE	1430
	WISH	1310
	WXLW	950
	WNDY	1500
Indianola, Iowa	KBAB	1490
Indianola, La.	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
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
Iron River, Mich.	WIKB	1230
Irondale, Ala.	WIXI	1480
Ironton, Ohio	WIRO	1230
Ironwood, Mich.	WJMS	630
Irvine, Ky.	WIRV	1550
Isabella, P.R.	WISA	1390
Ishpeming, Mich.	WJPD	1240
	WJAN	970
Islip, N.Y.	WBIC	540
Ithaca, N.Y.	WHCU	870
	WTKO	1470
Iuka, Miss.	WVOM	1270
Jackson, Ala.	WTHG	1290
Jackson, Mich.	WIBM	1450
	WKHM	970
	WJCO	1510
Jackson, Miss.	WJDX	620
	WJQS	1400
	WJXN	1450
	WJAQ	1550
	WOKJ	1590
	WRBC	1300
Jackson, Ohio	WSLI	930
Jackson, Tenn.	WLMJ	1280
	WDXI	1310
	WJAK	1460
	WTJS	1390
Jackson, Wis.	WYLO	540
Jackson, Wyo.	KSGT	1340
Jacksonville, Ark.	KGMR	1500
Jacksonville, Fla.	WJAX	930
	WAPE	690
	WZOK	1320
	WIVY	1050
	WMBR	1460
	WOBS	1360
	WPDQ	600
	WQIK	1280
	WRHC	1400
Jacksonville, Ill.	WJIL	1550
	WLDS	1180
Jacksonville, N.C.	WJNC	1240
	WLAS	910
Jacksonville, Tex.	KEBE	1400
Jacksonville Beh., Fla.	WZRO	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
Jefferson City, Tenn.	KWOS	1240
	WJFC	1480
Jeffersonville, Ind.	WXVW	1450
Jena, La.	KCKW	1480
Jennings, La.	KJEF	1290
Jerome, Idaho	KART	1400
Jerseyville, Ill.	WJBM	1480
Jesup, Ga.	WBGR	1370
John Day, Ore.	KJDY	1400
Johnson City, Tenn.	WJCW	910
	WETB	790
Johnston, S.C.	WJES	250
Johnstown, Pa.	WJAC	850
	WARD	1490
	WCRO	1230
Joliet, Ill.	WJDL	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
June. City, Kans.	KJCK	1420
Juneau, Alaska	KINY	800
	KJNO	630
Kailua, Hawaii	KLEI	1150
Kaimuki, Hawaii	KAIM	870
Kalamazoo, Mich.	WKPR	1420
	WKZO	590
	WKLZ	1470
	WKMI	1360
Kalispell, Mont.	KGEZ	600
	KOFI	930
Kane, Pa.	WADP	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
	KUDL	1380
	WDAF	610
	WHB	710
Kealakekua, Hawaii	KEKO	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	1570
Kenedy, Tex.	KAML	990
Kennett, Mo.	KBOA	830
	KBXN	1540
Kennewick-Pasco-Richland, Wash.	KEPR	610
Kenosha, Wis.	WLIP	1050
Keokuk, Iowa	KOKX	1310
Kermit, Tex.	KERB	600
Kerrville, Tex.	KERV	1230
Kershaw, S.C.	WKSC	1300
Ketchikan, Alaska	KTKN	930
	KABI	580
Kewanee, Ill.	WKEI	1450
Keyser, W.Va.	WKYR	1270
	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.	KCDI	1460
	KNBX	1050
Kirksville, Mo.	KIRX	1450
Kissimmee, Fla.	WDSL	1220
Kittanning, Pa.	WACB	1380
Klamath Falls, Oreg.	KAGO	1150
	KFLW	1450
	KLAD	960
Knoxville, Iowa	KNIA	1320
Knoxville, Tenn.	WBIR	1240
	WIVK	860
	WATE	620
	WKGN	1340
	WKXV	900
	WNOX	990
	WROL	1490
Kodiak, Alaska	WCVQ	960
Kokomo, Ind.	WIOU	1350
Kosciusko, Miss.	WKOZ	1350
Laconia, N.H.	WLNH	1350
	WEMJ	1490
LaCrosse, Wis.	WKBH	1410
	WLCX	1490
Ladysmith, Wis.	WKTY	580
Lafayette, Ga.	WLDY	1340
Lafayette, Ind.	WLFA	1590
	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
Lakeland, Fla.	WLAK	1430
	WDNN	1230
	WWAB	1330
Lake Placid, N.Y.	WIRD	920
Lake Providence, La.	KLPL	1050
Lake Tahoe, Calif.	KOWL	1490
Lakeview, Oreg.	KQIK	1230
Lake Wales, Fla.	WIPC	1280
Lakewood, Colo.	KLAK	1600
Lakewood, 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, Ohio	WHOK	1320
Lancaster, Pa.	WGAL	1490
	WLAN	1390
Lancaster, S.C.	WLCM	1360
	WAGL	1560
Lander, Wyo.	KOVE	1330
Lanett, Ala.	WRLD	1490
Lansdale, Pa.	WNPV	1440
Lansford, Pa.	WLSH	1410
Lansing, Mich.	WILS	1320
	WJIM	1240
	WITL	1010
Lapeer, Mich.	WMPC	1230
	WTHM	1530
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
	KLAS	1230
	KORK	1340
	KRAM	920
	KLUC	1050
	KVEG	970
Las Vegas, N.Mex.	KFUN	1230
Latrobe, Pa.	WPKV	1570
	WQTW	1570
	WTRA	1480
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
	WBIL	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
Lemoore, Calif.	KLAN	1320
Lenoir, N.C.	WJRI	1340
Lenoir, Tenn.	WLIL	730
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
Lexington, Miss.	WXTN	1150
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
	KLIB	1470
Liberal, Kans.	KSCB	1270
Liberty, Ky.	WPNN	1560
Liberty, N.Y.	WVOS	1240
Liberty, Tex.	KFAZ	1050
Lihue, Hawaii	KTOH	1490
Lima, Ohio	WIMA	1150
	WCIT	940
	WPRC	1370
Lincoln, Ill.	KFOR	1240
Lincoln, Nebr.	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	1280
Littlefield, Tex.	KZZN	1490
Little Rock, Ark.	KARK	920
	KALO	1250
	KLRA	1010
	KOKY	1440
	KAAY	1090
	KVLC	1050
Littleton, Colo.	KMOR	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.	WUSI	1340
Lodi, Calif.	KCVR	1570
Logan, Utah	KVNU	610
	KSTU	1300
	KLGN	1390
Logan, W.Va.	WLOG	1230
	WVOW	1290
Logansport, Ind.	WSAL	1280
Lompoc, Calif.	KKOK	1410
	KLOM	1330
	KNEZ	960
London, Ky.	WFTG	1400
Long Beach, Calif.	KFOX	1280
	KGER	1390
Longmont, Colo.	KLMO	1050
Long Prairie, Minn.	KEYL	1400

Location	C.L.	Kc.
Longview, Tex.	KFRO	1370
	KLUE	1280
Longview, Wash.	KEDO	1400
	KBAM	1270
Lookout Mtn., Tenn.	WFLI	1070
Lorain, Ohio	WWIZ	1380
Lordsburg, N.Mex.	KLHS	950
Loris, S.C.	WLSC	1570
Los Alamos, N.Mex.	KRSN	1490
Los Angeles, Calif.	KABC	790
	KFI	640
	KHJ	930
	KFSG	1150
	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
	WKYW	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
	WDMS	1320
	WWOD	1390
	WBRG	1050
	WLLL	930
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
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	970
	WIBA	1310
	WISM	1480
	WKOW	1070
Madisonville, Ky.	WFMW	730
	WTTL	1310
Magee, Miss.	WSJC	790
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	1560
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
Manitou Springs, Colo.	KCMS	1490
Manitowoc, Wis.	WCUB	980
	WOMT	1240
Mankato, Minn.	KYSM	1230
	KTOE	1420
Manning, S.C.	WYMB	1410
Mansfield, La.	KDBC	1360
Mansfield, Ohio	WMAN	1400
	WCLW	1570
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	1050
Marietta, Ohio	WMOA	1490
	WBRJ	910
Marine City Mich.	WDOG	1590
Marinette, Wis.	WMAN	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
	KADO	1410
Marshalltown, Iowa	KFJB	1230
Marshfield, Wis.	WDLB	1450
Martin, Tenn.	WCMT	1410
Martinsburg, W.Va.	WEPM	1340
Martinsville, Va	WHEE	1370
	WMVA	1450
Marystown, Nfld. Can.	CHCM	560
Marysville, Calif	KMYC	1410
Marysville, Kans	KNDY	1570
Maryville, Mo.	KNIM	1580
Maryville, Tenn.	WGAP	1400
Mason City, Iowa	KGLO	1300
	KRIB	1490
	KSMN	1010
Massena, N.Y.	WMSA	1340
	WSTS	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
	WPRA	990
	WTIL	1300
Mayfield, Ky.	WNGO	1320
Mayodan, N.C.	WMYN	1420
Maysville, Ky.	WFTM	1240
McAlester, Okla.	KTMC	1400
	KNED	1150
McAllen, Tex.	KRIO	910
McCamey, Tex.	KAMY	1450
McComb, Miss.	WHNY	1250
	WAPF	980
McCook, Nebr.	KBRL	1300
	KWRV	1360
McGehee, Ark.	KVSA	1220
McKeesport, Pa.	WEDO	810
	WPQR	1360
McKenzie, Tenn.	WHDM	1440
McKinney, Tex.	KMAE	1600
McMinnville, Oreg.	KMCM	1260
McMinnville, Tenn.	WBMC	960
	WAKI	1230
McPherson, Kans.	KNEX	1540
McRae, Ga.	WDAX	1410
Mead, Wash.	KLFF	1590
Meadville, Pa.	WMGW	1490
Medford, Mass.	WHIL	1430
Medford, Oreg.	KMED	1440
	KSHA	860
	KDOV	1300
	KBOY	730
	KYJC	1230
Medford, Wis.	WIGM	1490
Media, Pa.	WXUR	690
Melbourne, Fla.	WMMB	1240
Memphis, Tenn.	WHBQ	560
	WHER	1430
	WMC	790
	WDIA	1070
	WMPS	680
	WLOK	1340
	WMQM	1480
	WREC	600
	KWAM	990
Mena, Ark.	KENA	1450
Menominee, Mich.	WAGN	1340
Menomonie, Wis.	WMNE	1360
Merced, Calif.	KYOS	1480
	KWIP	1580
Meriden, Conn.	WMMW	1470
Meridian, Miss.	WCOC	910
	WDAL	1350
	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
	WMBM	1220
	WAME	1260
	WMIE	1140
	WQAM	560
	WSKP	1450
	WINZ	940
Miami, Okla.	KGLC	910
Miami Beach, Fla.	WMBM	1490
	WKAT	1360
	WFUN	790
Michigan City, Ind.	WIMS	1420
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	1600
	KABH	1510
Milan, N. H.	KCYR	560
Milan, Tenn.	WKBJ	1600
Miles City, Mont.	KATL	1340
Milford, Del.	WKSB	930
Milford, Mass.	WMRC	1490
Milledgeville, Ga.	WMVG	1450
Millen, Ga.	WGSR	1570
Millington, Tenn.	WHEY	1220
	WGMM	1380
Millinocket, Me.	WMKR	1240
Millville, N.J.	WMVB	1440
Milton, Fla.	WEBY	1330
	WSRA	1490
Milton, Pa.	WMLP	1570
	WARC	1380
Milwaukee, Wis.	WEMP	1250
	WFOX	860
	WRIT	1340
	WISN	1150
	WMIL	1290
	WOKY	920
	WTMJ	620
Minden, La.	KASO	1240
Mineola, N.Y.	WFYI	1520
Mineola, Tex.	KMOO	1510
Mineral Wells, Tex.	KORC	1140
Minneapolis, Minn.	WCCO	830
	WLOL	1330
	WMIN	1400
	WDGY	1130
	WPBC	980
	WTCN	1280
	KTCR	690
	KTIS	900
	KUOM	770
Minot, N. Dak.	KLPM	1390
	KQDY	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.	WALA	1410
	WABB	1480
	WGOK	900
	WTUF	840
	WKRG	710
	WLIQ	1360
	WMOZ	960
Mobridge, S.Dak.	KOLY	1300
Mocksville, N.C.	WSDC	1560
	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
	WCOV	1170
	WAPX	1600
	WHHY	1440
	WMGY	800
	WRMA	950
	WFMI	1500
Montgomery, W.Va.	WMON	1340
Monticello, Ark.	KHBM	1430
Monticello, Ky.	WFLW	1360
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
Morganton, N.C.	WMNC	1430
Morgantown, W.Va.	WAJR	1440
	WCLG	1300
Morrilton, Ark.	KVOM	800
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
Moulton, Ala.	WLCB	1530
Moultrie, Ga.	WMGA	1400
	WMTM	1300
Moundsville, W.Va.	WMOD	1370
Mountain Grove, Mo.	KLRS	1360
Mountain Home, Ark.	KTLO	1490
Mountain Home, Ida.	KFLI	1240
Mt. Airy, N.C.	WPAQ	740
	WSYD	1300
Mt. Carmel, Ill.	WVMC	1360
Mt. Clemens, Mich.	WBRB	1430
Mt. Dora, Fla.	WVGT	1580
Mt. Holly, N.J.	WJJZ	1460
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.	WWVK	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
Munfordville, Ky.	WLOC	1150
Munising, Mich.	WMAB	1400
Murfreesboro, Tenn.	WGNS	1450
	WMTS	810
Murphy, N.C.	WCVP	600
	WKRK	1320
Murphysboro, Ill.	WINI	1420
Murray, Ky.	WNBS	1340
Murray, Utah	KMUR	1230
Muscatine, Iowa	KWPC	860
Muscle Shoals City, Alabama	WLAY	1450
Muskegon, Mich.	WKBZ	850
	WKJR	1520
	WTRU	1600
	WMUS	1090
Muskogee, Okla.	KBIX	1490
	KMUS	1380
Myrtle Beach, S.C.	WMYB	1450
Nacogdoches, Tex.	KEEE	1230
	KSFA	860
Nampa, Idaho	KFXD	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.	WKDA	1240
	WLAC	1510
	WMAK	1300
	WLVN	1560
	WNAH	1360
	WSIX	980
	WSM	650
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

WHITE'S RADIO LOG

Location	C.L.	Kc.
Nellisville, Wis.	WCCN	1370
Neon, Ky.	WNKY	1480
Neosho, Mo.	KBTN	1420
Nevada, Mo.	KNEM	1240
New Albany, Ind.	WOWI	1570
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, S.C.	WKDK	1240
New Boston, Ohio	WIOI	1010
New Braunfels, Tex.	KGNB	1420
New Britain, Conn.	WHAY	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
New Haven, Conn.	WAVZ	1300
	WELI	960
	WNHC	1340
New Iberia, La.	KANE	1240
	KVIM	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
	WJMR	990
	WBOK	800
	WNOE	1060
	WSMB	1350
	WNPS	1450
	WTIX	690
	WWL	870
	WWOM	600
	WYLD	940
Newport, Ark.	KNBY	1280
Newport, Ky.	WNOP	740
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
	WORT	1550
Newton, Iowa	KCOB	1280
Newton, Kans.	KJRG	950
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
	WBNX	1380
	WCBS	880
	WEVD	1330
	WHOM	1480
	WINS	1010
	WLIB	1190
	WMCA	570
	WHN	1050
	WNEW	1130
	WNYC	830
	WOR	710
	WADO	1280
	WPOW	1330
	WQXR	1560
	WNBC	660
Niagara Falls, N.Y.	WHLD	1270
	WJJL	1440
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. Augusta, S.C.	WGUS	1380
	WFNL	1600
	WTHB	1550
North Bend, Oreg.	KFIR	1340
North Charleston, S.C.	WNCG	910
Northampton, Mass.	WHMP	1400
Northfield, Minn.	WCAL	770
N. Little Rock, Ark.	KDXE	1380
	KXLR	1150
North Platte, Nebr.	KJLT	970
	KNOP	1410
	KODY	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, Calif.	KEWB	910
	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
	WKOS	1370
Ocean City, Md.	WETT	1590
Ocean City, N. J.	WYKP	1520
Ocean City-Somers Pt., N.J.	WSLT	1240
Oceanlake, Oreg.	KBCH	1380
Oceanside, Calif.	KUDE	1320
Ocilla, Ga.	WSIZ	1380
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
	WDW	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
Oregon City, Oreg.	KGON	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.	KOIO	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.	WDMC	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.	WKYB	570
	WDXR	1560
	WPAD	1450
Page, Ariz.	KPGE	1340
Pahokee, Fla.	WRIM	1250
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
Palo Alto, Calif.	KIBE	1220
Pampa, Tex.	KPDN	1340
	KHHH	1290
Panama City, Fla.	WOLP	590
	WPCF	1490
Panama City Beach, Fla.	WTHR	1480
	WSCM	1290
Paradise, Calif.	KNGL	930
Paragould, Ark.	KDRS	1490
Paris, Ark.	KCCL	1460
Paris, Ill.	WPRS	1440
Paris, Ky.	WKLX	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, Calif.	KALI	1430
	KPPC	1240
	KWKW	1300
Pasadena, Tex.	KLVL	1420
	KIKK	650
Pascagoula-Moss Point, Miss.	WPMP	1580
Pasco, Wash.	KORD	910
	KGRS	1340
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, Idaho	KEOK	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
	KUBE	1050
	KUMA	1290
Pennington Gap, Va.	WSWV	1570
Pensacola, Fla.	WBOP	980
	WBSR	1450
	WMEL	610
	WNVY	1230
	WCOA	1370
Peoria, Ill.	WAAP	1350
	WMBD	1470
Perry, Fla.	WPEO	1020
	WPRY	1400
	WGKR	1310
Perry, Ga.	WPGA	980
Perry, Iowa	KDLS	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.	WCAU	1210
	WDAS	1480
	WFIL	560
	WFLN	900
	WHAT	1340
	WIBG	990
	WIP	610
	WJMJ	1540
	WPEN	950
	WRCV	1060
	WTEL	860
Phillipsburg, Pa.	WPHB	1260
Phillipsburg, Kans.	KKAN	1490
Phoenix, Ariz.	KIFN	860
	KXIV	1400
	KHAT	1480
	KHEP	1280
	KCAC	1010
	KOY	550
	KOL	960
	KPHO	910
	KUEQ	740
	KRIZ	1230
	KTAR	620
Picayune, Miss.	WRJW	1320
Piedmont, Ala.	WPID	1280
Pierre, S.Dak.	KGFX	630
	KCCR	1590
Pikeville, Ky.	WLSI	900
	WPKE	1240
Pine Bluff, Ark.	KCLA	1400
	KADL	1270
	KOTN	1490
	KCAT	1530
	KPBA	1590
Pine City, Minn.	WCMP	1350
Pineville, Ky.	WMLF	1230
Pineville, W.Va.	WWYO	970
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
	WRYT	1250
	WEEP	1080
	WWSW	970
Pittsfield, Ill.	WBBA	1580
Pittsfield, Mass.	WBRC	1420
	WBRK	1340
Pittston, Pa.	WPTS	1540
Plainfield, N.J.	WERA	1590
Plainview, Tex.	KVOP	1400
	KPLA	1050
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.	WKWB	1050
Plymouth, Mass.	WPLM	1390
Plymouth, N.C.	WPNC	1470
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
Pompano Beach, Fla.	WLOO	980
	WRBD	1470
Ponca City, Okla.	WBBZ	1230
Ponce, P.R.	WPRP	910
	WEUC	1420
	WPAB	550
	WLEO	1170
	WISO	1260
Pontiac, Mich.	WPON	1460
Pontotoc, Miss.	WSEL	1440
Pooli, Ind.	WVAK	1560
Poplar Bluff, Mo.	KWOC	930
	KLID	1340
Poplarville, Miss.	WRPM	1530
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

Location	C.L.	Kc.
	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 Washington, Wis.	WGLB	1560
Post, Tex.	KPOS	1370
Poteau, Okla.	KLCO	1280
Potosi, Mo.	KYRO	1280
Potsdam, N.Y.	WPDM	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, Kans.	KWSK	1570
	KWNS	1290
Prescott, Ariz.	KYCA	1490
	KENT	1340
	KNOT	1450
Prescott, Ark.	KTPA	1370
Presque Isle, Me.	WAGM	950
	WEGP	1390
Preston, Idaho	KPST	1340
Prestonsburg, Ky.	WPRT	960
	WDOC	1310
Price, Utah	KOAL	1230
Prichard, Ala.	WSIM	1270
Prince Albert, Sask.	CKBI	900
Princeton, Ind.	WRAY	1250
Princeton, Ky.	WPKY	1580
Princeton, N.J.	WHWH	1350
Princeton, W.Va.	WLOH	1490
Prineville, Ores.	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
	KFEL	970
	KGHF	1350
	KCSJ	590
	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.	KPDR	1370
Quitman, Ga.	WSFB	1490
Racine, Wis.	WRAC	1460
	WRJN	1400
Radford, Va.	WRAD	1460
Raleigh, N.C.	WKIX	850
	WNOH	1550
	WPTF	680
	WLLE	570
	WRAL	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	1280
Rensselaer, Ind.	WRIN	1560
Rensselaer, N.Y.	WEEE	1300
Rexburg, Idaho	KRXK	1230
Rhinelander, Wis.	WOBT	1240
Rice Lake, Wis.	WJMC	1240
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	1590
	WLEE	1480
	WEET	1320
	WMBG	1380
	WRNL	910
	WRVA	1140
	WXGI	950
	WWWW	1540
Richwood, W.Va.	WVAR	1280
Ridgecrest, Calif.	KRCK	1360
	KLOA	1240
Ridgeland, S.C.	WBNG	1430
Rio Piedras, P.R.	WUNO	1320
	WRAI	1520
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
	WHYE	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
Rochester, Minn.	KROC	1340
	KFAV	1520
	KWEB	1270
Rochester, Minn.	KOLM	1520
	KWEB	1270
Rochester, N.H.	WWNH	930
Rochester, N.Y.	WBBF	950
	WHAM	1180
	WHEC	1460
	WRVM	680
	WSAY	1370
	WROC	1280
Rockford, Ill.	WROK	1440
	WJRL	1150
	WRRR	1330
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, 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, Ores.	KRNR	1490
	KRXL	1250
Rosenberg, Tex.	KYES	950
Roservelt, N.M.	KRDD	1320
Rossville, Ga.	WRIP	980
Roswell, N.Mex.	KRSY	1230
	KGFL	1430
	KBIM	910
	KRIK	960
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. Augustine, Fla.	WFOY	1240
	WETH	1420
St. Charles, Mo.	KADY	1460
St. Cloud, Minn.	KFAM	1450
	WJON	1240
St. George, S.C.	WQIZ	1300
St. George, Utah	KDXU	1450
St. Helen, Mich.	WMIC	1590
St. Helens, Oreg.	KOHI	1600
St. Johns, Mich.	WJUD	1580
St. Johnsbury, Vt.	WTWN	1340
St. Joseph, Mich.	WSJM	1400
St. Joseph, Mo.	KFEQ	680
	KKJO	1550
	KUSN	1270
St. Louis, Mo.	KATZ	1600
	KFUO	850
	KMOX	1120
	KSD	550
	KSTL	690
	KXOK	630
	WEW	770
	WIL	1430
St. Louis Park, Minn.	KRSI	950
St. Mary's, Pa.	WKBI	1400
St. Paul, Minn.	KSTP	1500
	KDWB	630
	WMIN	1400
	WCCO	830
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, Oreg.	KSLM	1390
	KAPT	1220
	KBZY	1490
	KGAY	1430
Salem, Va.	WBLU	1480
Salida, Colo.	KVRH	1340
Salina, Kans.	KSAL	1150
	KCTY	980
	KQTY	910
Salinas, Calif.	KDON	1460
	KSBW	1380
Salinas, Calif.	KCTY	980-1000
Saline, Mich.	WOIB	1290
Salisbury, Md.	WBIC	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	1570
San Angelo, Tex.	KTEO	1340
	KGKL	960
	KPEP	1420
	KWFR	1260
San Antonio, Tex.	KAPE	1480
	KCOR	1350
	KBAT	680
	KBER	1150
	KITE	930
	KUKA	1250
	KUBO	1310
	KMAC	630
	KONO	860
	KTSA	550
	WOAI	1200
San Bernardino, Calif.	KCKC	1350
	KFXM	590
	KRNO	1240
	KMEN	1290
Sandersville, Ga.	WSNT	1490
San Diego, Calif.	KCBQ	1170
	KFMB	540
	KOGO	600
	KGB	1360
	KSON	1240
	KSDO	1130
Sandpoint, Idaho	KSPT	1400
Sand Spring, Okla.	KTOW	1340
Sandusky, Ohio	WLEC	1450
San Fernando, Calif.	KGIL	1260
Sanford, Fla.	WTRR	1400
	WSFR	1360
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
	KSAN	1450
	KSFO	560
	KYA	1260
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
	KCJH	1280
	KSLY	1400
	KVEC	920
San Marcos, Tex.	KCNY	1470
San Mateo, Calif.	KOFY	1050
San Rafael, Calif.	KTIM	1510
San Saba, Tex.	KBAL	1410
Santa Ana, Calif.	KWIZ	1480
Santa Barbara, Cal.	KDB	1490
	KGUD	990
	KIST	1340
	KTMS	1250
	KACL	1290
Santa Clara, Calif.	KGBA	1430
Santa Cruz, Calif.	KSCO	1080
Santa Fe, N.Mex.	KTRC	1400
	KVSF	1260
Santa Maria, Cal.	KCOY	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 Springs, N.Y.	WKAJ	900
Sauk Rapids, Minn.	KVAL	800
Sault Ste. Marie, Michigan	WSOO	1230
Savannah, Ga.	WBYG	1450
	WEAS	900
	WSAV	630
	WSGA	1400
	WTOC	1290
	WSOK	1230
Savannah, Tenn.	WORM	1010
Sayre, Pa.	WATS	960
Scheffield, 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

WHITE'S RADIO LOG

Location	C.L.	Kc.
	KOLT	1320
Scottsboro, Ala.	WCRI	1050
	WROS	1330
Scottsdale, Ariz.	KWBY	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
Seaside, Oreg.	KSRG	730
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	1490
	KSIS	1050
Seguin, Tex.	KWED	1580
Selma, Ala.	WGWC	1340
	WHBB	1490
	WRWJ	1570
Seminole, Tex.	KTFO	1250
Seneca Township, S.C.	WSNW	1150
Sevierville, Tenn.	WSEV	930
Seward, Alaska	KIBH	1340
Seymour, Ind.	WJCD	1390
Seymour, Tex.	KSEY	1230
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
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
	KMVS	1470
Sikeston, Mo.	KSIM	1400
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.	KTOD	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.	WSMA	1550
Snyder, Tex.	KSNY	1450
Socorro, N.Mex.	KSRC	1290
Soda Sprgs., Idaho	KBRV	540
Solvay, N.Y.	WQSR	1320
Somerset, Ky.	WSFC	1240
	WTLO	1480
Somerset, Pa.	WVSC	998
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, Florida	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.	KOWB	630
So. Williamsport, Pa.	WMPT	1450
Spanish Fork, Utah	KONI	1480
Sparks, Nev.	KBUB	1270
Sparta, Ill.	WHCO	1230
Sparta, Tenn.	WSMT	1050
Sparta, Wis.	WKLJ	990
	WCOW	1290
Spartanburg, S.C.	WHCQ	1400
	WORD	910
	WSPA	950
Spencer, Iowa	KICO	1240
Spencer, W.Va.	WSPZ	1400
Spokane, Wash.	KGA	1510
	KDNC	1440
	KLYK	1230
	KPEG	1380
	KHQ	590
	KMRE	550
	KNEW	790
	KREM	970
	KXLY	920
	KCFA	1330
Springdale, Ark.	KBRS	1340
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, Oreg.	KEED	1050
Springfield, Tenn.	WOBL	1590
Springfield, Vt.	WCFR	1480
Springhill, La.	KBSF	1460
Spring Lake, N. C.	WFBS	1450
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
Sulphur, La.	KIKS	1310
Sulphur Sprgs., Tex.	KSST	1230
Summerville, Ga.	WGTA	950
Summerville, S.C.	WALS	980
Sumter, S.C.	WFIG	1290
	WDXY	1240
Sunbury, Pa.	WSSC	1340
	WKOK	1240
Sunnyside, Wash.	KREW	1230
Sun Valley, Ida.	KSKI	1340
Superior, Nebr.	KRFS	1600
Superior, Wis.	WDSM	710
	WIGL	970
	WWJC	1270
	WQMN	1320
Susanville, Calif.	KSUE	1240
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
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 Sprgs., Fla.	WRBB	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
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
	KRMW	1300
Thermopolis, Wyo.	KRTR	1490
	KTHE	1240
Thief River Falls, Minn.	KTRF	1230
Thibodaux, La.	KTIB	680
Thomaston, Ga.	WSFT	1220
	WTGA	1590
	WTHN	1500
Thomasville, Ala.	WJDB	630
Thomasville, Ga.	WPAX	1240
	WKTG	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
	WTOL	1230
Toledo, Oreg.	KTDO	1230
Tolleson, Ariz.	KRDS	1190
Tomah, Wis.	WTMB	1460
Tompkinsville, Ky.	WTKY	1370
Tooele, Utah	KDYL	990
Topeka, Kans.	WIBW	580
	KEWI	1440
	WREN	1250
	KTOP	1490
Toppenish, Wash.	KENE	1490
Torrington, Conn.	WBZY	990
	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
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
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.	KDOK	1330
	KGJB	1490
	KTBB	600
	KZEY	690
Tyrone, Pa.	WTRN	1340
Uhrichsville, Ohio	WUND	1540
Uhrichsville, Ohio	WBTC	1540
Ukiah, Calif.	KUKI	1400
	KMSL	1250
Union, Mo.	KLPW	1220
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
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
Van Buren, Ark.	KFDF	1580
Van Cleve, Ky.	WMTC	730
Van Wert, Ohio	WERT	1220
Vanceburg, Ky.	WKKS	1570
Vancouver, Wash.	KISN	910
	KKEY	1150
	KVAN	1480
	KGAR	1550
Vandalia, Ill.	WPMB	1500
Venice, Fla.	WAMR	1320
Ventura, Calif.	KVEN	1450
	KUDU	1590
Vermillion, S.Dak.	KUSD	690
Vernal, Utah	KVEL	1250
Vernon, Tex.	KVWC	1490
Vero Beach, Fla.	WAXE	1370

Location	C.L.	Kc.
	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 Bch., Va.	WBOF	1550
Viroqua, Wis.	WISV	1360
Visalia, Calif.	KONG	1400
Vivian, La.	KLVI	1600
Waco, Tex.	WACO	1580
	KAWA	1010
	KBGO	1580
	KWTX	1230
Wadena, Minn.	KWAD	920
Wadesboro, N.C.	WADE	1210
Wailuku, Hawaii	KMVI	550
Waipahu, Hawaii	KAHU	940
Walhalla, S.C.	WGOG	1460
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.	WRPB	1350
Warren, Ark.	KWRF	860
Warren, Ohio	WHHH	1440
Warren, Pa.	WNAE	1310
Warrensburg, Mo.	KOKO	1450
Warrenton, Mo.	KWRE	730
Warrenton, Va.	WEER	1250
	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.	WKLE	1370
Washington, Ind.	WAMW	1580
Washington, Iowa	KCII	1380
Washington, N.J.	WCRV	1580
	WITN	930
Washington, N.C.	WEEW	1320
Washington, Pa.	WJPA	1450
Washington Court House, Ohio	WCHO	1250
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.	WAUX	1510
Waupaca, Wis.	WDUX	800
Wausau, Wis.	WRIG	1400
	WSAU	550
	WHVF	1230
Waverly, Iowa	KWVY	1470
Waverly, Ohio	WPKO	1380
Waverly, Tenn.	WPHC	1540
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
	WBVA	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
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
West Hartford, Conn.	WEXT	1550
West Jefferson, N.C.	WKSK	1600
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
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
Westwego, La.	KABE	1540
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
White Plains, N.Y.	WFAS	1230
White River Junc., Vt.	WVTR	910
Whitehall, Mich.	WCBP	1490
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
Willcox, Ariz.	KHIL	1250
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
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
Windemere, Fla.	WXIV	1480
Winder, Ga.	WIMO	1300
Windom, Minn.	KDOM	1580
Windsor, Conn.	WSOR	1480
Winfield, Ala.	WEZQ	1300
Winfield, Kan.	KNIC	1550-250
Winnemucca, Nev.	KWNA	1400
Winnfield, La.	KVCL	1270
Winner, S.Dak.	KWYR	1260
Winnsboro, La.	KMAR	1570
Winnsboro, S.C.	WCKM	1250
	WRBI	980
Winona, Minn.	KWNO	1230
	KAGE	1380
Winona, Miss.	WONA	1570
Winslow, Ariz.	KVNC	1010
	KINO	1230
Winston-Salem, N.C.	WAAA	980
	WAIR	1340
	WPEG	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
Woodbury, Tenn.	WBFJ	1540
Wood River, Ill.	WBBY	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
Xenia, O.	WGIC	1500
Yakima, Wash.	KIT	1280
	KIMA	1460
	KBBO	1390
	KQOT	940
	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	1580
Youngstown, Ohio.	WBBW	1240
	WFMJ	1390
	WKBN	570
Ypsilanti, Mich.	WYSI	1480
	WYNZ	1520
Yreka, Calif.	KSYC	1490
Yuba City, Calif.	KUBA	1600
	KAGR	1450
Yuma, Ariz.	KBLU	1320
	KVOY	1400
	KYUM	560
Zanesville, Ohio	WHIZ	1240
Zarephath, N.J.	WAWZ	1380
Zephyr Hills, Fla.	WZRH	1400

U. S. FM Stations by States

Location	C.L.	Mc.
ALABAMA		
Albertville	WAVU-FM	105.1
Alexander City	WRFS-FM	106.1
Andalusia	WCTA-FM	98.1
Anniston	WHMA-FM	100.5
Athens	WJOF	104.3
Bay Minette	WBCA-FM	105.5
Birmingham	WAPI-FM	99.5
	WBRC-FM	106.9
	WSFM	93.7
Clanton	WKLF-FM	100.9
Cullman	WFMH-FM	101.1
Decatur	WHOS-FM	102.1
Homewood	WJLN	104.7
Huntsville	WAHR	99.1
	WNDA	92.9
Jackson	WTHG-FM	104.9
Mobile	WKRG-FM	99.9
	WLPR	96.1
Montgomery	WFMI	98.9
	WAJM	103.3
Sylacauga	WMLS-FM	98.3
Tuscumbia	WVNA	100.3
Tuscaloosa	WTBO-FM	95.7
	WUOA	*91.7
ALASKA		
Anchorage	KNIK	105.5
	KBYR-FM	102.1
College	KUAC	104.9
ARIZONA		
Globe	KWJB-FM	100.3
Mesa	KBUZ-FM	104.7
Phoenix	KRFM-FM	95.5
	KFCA	*88.5
	KOOL-FM	94.5
	KITH	101.3
	KNIZ	102.5
	KOY-FM	92.5
	KPHO-FM	96.9
	KTAR-FM	98.7
	KYEW	93.3
Show Low	KHEP-FM	101.5
Sun City	KVWM-FM	93.5
Tempe	KTPM	106.3
Tucson	KUPD-FM	97.9
	KFMM	99.5
	KSOM	92.1
	KVOA-FM	94.9
ARKANSAS		
Blytheville	KLCN-FM	96.1
El Dorado	KRIL-FM	99.3
	KELD-FM	103.1
Fayetteville	KFAY-FM	92.1
Ft. Smith	KFPW-FM	94.9
	KMAG	99.9
Harrison	KHOZ-FM	102.9
Hot Springs	KBHS-FM	96.7
Jonesboro	KBTM-FM	101.9
	KASU	91.9
Little Rock	KARK	103.7
Mammoth Springs	KAMS	103.9
Osceola	KOSE-FM	98.1
Pine Bluff	KOTN-FM	92.3
Siloam Springs	KUOA-FM	105.7
CALIFORNIA		
Alameda	KJAZ	92.7
Anaheim	KEZR-FM	95.9
Angwin	KANG	88.1
Arcata	KTOO	*90.5
Atherton	KPEN	101.3
Auburn	KAFI	101.1
Avalon	KBIG	104.3
Bakersfield	KERN-FM	94.1
	KQXR	101.5
	KIFM	96.5
Berkeley	KPFA	94.1
	KPFB	*89.3
	KPAT-FM	102.9
Bijou	KHUR	99.9
Carmel	KRML-FM	101.7
Claremont	KSPC	*88.9
Coachella	KCHQ-FM	93.7
El Cajon	KECR	93.3

WHITE'S RADIO LOG

Location	C.L.	Mc.
Fremont	KHYD	104.9
Fresno	KARM-FM	101.9
	KCIB-FM	94.5
	KFRE-FM	93.7
	KMJ-FM	97.9
	KXQR	102.7
Garden Grove	KGGK	94.3
Glendale	KFMU	97.1
	KUTE	101.9
Hayward	KBBM	101.7
Hemet	KHSJ-FM	105.5
Inglewood	KTYM-FM	103.9
LaSierra	KSDA	*89.7
Lodi	KCVR-FM	97.7
Long Beach	KFOX-FM	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
	KBIQ	104.3
	KBMS	105.9
	KCBH	98.7
	KFAC-FM	92.3
	KGLA	*103.5
	KHJ	101.1
	KMLA	100.3
	KNX-FM	93.1
	KPFK	*90.7
	KPDL-FM	93.9
	KRHM	94.7
	KRKD-FM	96.3
	KLAC-FM	102.7
	KUSC	*91.5
	KXLU	*88.7
	KHOF	99.5
Los Banos	KLBS-FM	95.9
Los Gatos	KLGS	95.3
Marysville	KRFD	99.9
Modesto	KBEE-FM	103.3
	KTRB-FM	104.1
Monterey	KHFR	96.9
Newport Beach	KNBB	103.1
Northridge	KEDC-FM	88.5
Oakland	KAFE	98.1
Oceanside	KUDE	102.1
Ontario	KASK-FM	93.5
Oxnard	KPMJ	104.7
Pasadena	KPCS	89.3
Palm Springs	KPPC-FM	106.7
Redondo Beach	KDES-FM	104.7
Redlands	KAPP	93.5
Ridgecrest	KCHL FM	96.7
Riverside	KLDA-FM	105.5
	KPLI	99.1
	KACE-FM	92.7
	KDUO	97.5
Sacramento	KCRA-FM	96.1
	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
San Bernardino	KVCR	*91.9
	KFMW	99.9
	KEBS	*89.5
San Diego	KDGO-FM	94.1
	KFMB-FM	100.7
	KFMX-FM	96.5
	KGB-FM	101.5
	KITT	105.3
	KJLM	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
	KRON-FM	96.5
	KSFR	94.9
	KQBY-FM	95.7
	KXKX	88.5
	KYA-FM	93.3
	KCMA	*90.3
	KBRG	105.3
	KAFE	98.1
	KKHI-FM	95.9
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
San Mateo	KCSM	*90.9
	KUFY	107.7
San Rafael	KTIM	100.9
Santa Ana	KWIZ-FM	96.7
	KFIL	106.3
Santa Barbara	KRCW	97.5
	KDB-FM	93.7
	KMUZ	103.3
	KCSB-FM	91.1
Santa Clara	KSCU	*90.1
	KREP	105.7
Santa Cruz	KSCD-FM	99.1
Santa Maria	KEYM	99.1
	KSMA-FM	102.5
Santa Monica	KCRW	*89.9
	KSRF	103.1
Santa Rosa	KEFM	100.1
Sierra Madre	KMAX	107.1
Stanford	KZSU	*90.1
Stockton	KUOP	*91.3
	KSTN-FM	107.3
	KWG-FM	105.7
Thousand Oaks	KNJO	92.7
Turlock	KHDM	92.9
Twenty-Nine Palms		
	KDHI-FM	95.3
Ventura-Oxnard	KVEN-FM	100.7
Visalia	KONG-FM	92.9
Walnut Creek	KWME-FM	92.1
West Covina	KSGV	98.3
Woodland	KATT	95.3

COLORADO

Boulder	KRNW	97.3
Colorado Springs	KRCC	*91.3
	KFMH	96.5
	KSHS	*90.5
	KVOR-FM	92.9
	KLST	94.3
Cortez	KZFM	94.1
Denver	KFML-FM	96.5
	KDEN-FM	99.5
	KLIR-FM	100.3
	KLZ-FM	106.7
	KOA-FM	103.5
	KTGM	105.1
	KIMN-FM	95.5
	KBPI	105.9
Ft. Collins	KCSU-FM	*90.9
Grand Junction	KREX-FM	92.3
Manitou Springs	KCMS-FM	102.7

CONNECTICUT

Bridgeport	WJZZ	99.9
	WPKN	88.1
Brookfield	WGHF	95.1
Danbury	WLAD-FM	98.3
Darien	WORM	95.9
Fairfield	WSHU	*91.1
Hamden	WDEE	101.3
Hartford	WHCN	105.9
	WDRC-FM	102.9
	WCCC-FM	106.9
	WSCH	93.7
	WRTC-FM	*89.3
	WTIC-FM	96.5
Manchester	WINF-FM	107.9
Meriden	WBMI	95.7
Middletown	WESU	88.1
New Haven	WNHC-FM	99.1
	WYBC-FM	94.3
Stamford	WSTC-FM	96.7
Storrs	WHUS	*90.5
Waterbury	WATR-FM	92.5
Westport	WMMM	107.9

DELAWARE

Dover	WDOV-FM	94.7
Wilmington	WDEL-FM	93.7
	WJBR	99.5

D. C.

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

Atlantic Beach	WKTZ-FM	96.1
Boca Raton	WWOG	103.3
Bradeton	WBRD-FM	103.3
Clear Water	WTAN-FM	95.7
Cocoa Beach	WXBR	101.1
Coral Gables	WVCG-FM	105.1
Daytona Beach	WNDB-FM	94.5
Deltuniak Springs		
	WZEP-FM	103.1
Fort Lauderdale	WWIL-FM	103.5
	WFLM	105.9
	WFTL-FM	107.7
	WMJR	100.7
Ft. Meyers	WINK-FM	96.9
Fort Pierce	WARN	98.7
Ft. Walton Beach		
	WFTW-FM	99.3
Gainesville	WRUF-FM	*104.1
Jacksonville	WJAX-FM	95.1
	WMBR-FM	96.1
	WQIK	99.1
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	WKAT-FM	93.1
	WAEZ-FM	94.9
	WMBM-FM	93.9
Milton	WXBM-FM	102.3
Ocala	WMDP-FM	93.7
Orlando	WDBO-FM	92.3
	WHOO-FM	96.5
	WKIS-FM	100.3
Palm Beach	WWOS-FM	97.9
Panama City	WMAI-FM	107.9
Pensacola	WPEX-FM	94.1
	WCOA-FM	100.7
St. Petersburg	WGNB	101.5
	WTCX	99.5
	WPIN-FM	107.3
Sarasota	WYAK	102.5
Stuart	WSTU-FM	92.7
Tallahassee	WFSU-FM	*91.5
	WBGM-FM	98.9
Tampa	WDAE-FM	100.7
	WFLA-FM	93.3
	WPKM	104.7
	WTUN	*88.9
	WUSF	*89.7
Winter Haven	WINT-FM	97.5
Winter Park	WPRK	*91.5

GEORGIA

Albany	WGPC-FM	104.5
	WJAZ	96.3
Americus	WDEC-FM	94.3
Athens	WGAU-FM	102.5
	WDOL-FM	104.7
Atlanta	WABE	*90.1
	WAVQ	94.9
	WPLO-FM	103.3
	WGKA-FM	92.9
	WSB-FM	98.5
	WLTA-FM	99.7
Augusta	WAUG-FM	105.7
	WBBQ-FM	103.7
Canton	WCHK-FM	105.5
Carrollton	WLBB-FM	102.3
Columbus	WRBL-FM	102.9
	WGBA-FM	107.3
Gainesville	WOUN-FM	103.9
Lagrange	WLAG-FM	104.1
Macon	WMAZ-FM	99.1
Marietta	WBIE-FM	101.5
	WKLS	96.1
Moultrie	WNTM-FM	93.9
Newnan	WCOH-FM	96.7
Savannah	WTOC-FM	97.3
Smyra	WDJK	94.1
Swainsboro	WJAT-FM	101.7
Toccoa	WLET-FM	106.1
West Point	WBMK-FM	100.9

HAWAII

Honolulu	KAIM-FM	95.5
	KPOI-FM	97.5
	KVOK	*88.1
	KUOH	*90.5

IDAHO

Boise	KBOI-FM	97.9
Lewiston	KOZE-FM	96.7
Moscow	KUID	*91.7
Pocatello	KBGL	*88.7

ILLINOIS

Alton	WOKZ-FM	100.3
Anna	WRAJ-FM	92.7
Arlington Heights	WNWC	92.7
Aurora	WKKD	95.9
Bloomington	WJBC-FM	101.5
Carbondale	WSIU	*91.9
Carmi	WROY-FM	97.3
Champaign	WDWS-FM	97.5
	WLRW-FM	94.5
Chicago	WBBM-FM	96.3
	WBEZ	*91.5
	WCLM	101.9
	WDHF	95.5
	WEBH	93.9
	WEFM	99.5
	WHFC	97.9
	WENR-FM	94.7
	WFMF	100.3
	WFMQ	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
Decatur	WSOY-FM	102.9
DeKalb	WNIC	*91.1
	WLBK-FM	92.5
Dixon	WIXN-FM	101.7
E. St. Louis	WBBR	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	*89.3
Freeport	WFRL-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	WLDS-FM	100.5
	WAJP	93.5
Joliet	WJOL-FM	96.7
Kankakee	WKAK-FM	99.9
Kewanee	WKSD	*91.9
LaSalle	WLPO-FM	99.3
Litchfield	WSMI-FM	106.1
Loves Park	WLUV-FM	96.7
Macomb	WWKS	*91.3
Mattoon	WLBH-FM	96.9
Morris	WRMI-FM	104.7
Mt. Carmel	WSAB	94.9
	WVMC-FM	101.1
Mt. Vernon	WMIX-FM	94.1
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
Peoria	WMBD-FM	92.5
Quincy	WGEM-FM	105.1
	WTAD-FM	99.5
	WTAY-FM	100.7
Rockford	WROK-FM	97.5
Rock Island	WHBF-FM	98.9
Rock Island	WVIK	90.9
Skokie	WRSV	98.3
South Beloit	WBEL-FM	103.1
Springfield	WTAX-FM	103.7
Streator	WIZZ-FM	97.7
Taylorville	WGGM	95.0
Urbana	WILL-FM	*90.9
Waukegan	WEFA	102.3
Wheaton	WETN-FM	*88.1
Winnetka	WNTH	*88.1

INDIANA

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	WBBS-FM	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
Franklin	WFCI	*89.3
Frankfort	WILO-FM	99.7
Fort Wayne	WPTH	95.1
Gary	WGVE	*88.1
Goshen	WGCS	91.1
Greencastle	WGRE	*91.7
Greenfield	WSMJ	99.5
Greensburg	WTRE	107.3
Hammond	WYCA	92.3
Hartford City	WHCI	*91.9
Huntington	WVSH	*91.9
Indianapolis	WAJC	*104.5
	WICR	*88.7
	WISH-FM	107.9

Location	C.L.	Mc.
	WAIV	105.7
	WFBM-FM	94.7
	WFMS	95.5
	WIAN	*90.1
	WIBC-FM	93.1
Jasper	WITZ-FM	104.7
Kokomo	WFKO	100.5
	WKMO	93.5
Lafayette	WASK-FM	105.3
	WAZY-FM	96.7
La Porte	WLOI-FM	96.7
Madison	WORX-FM	96.7
Marion	WMRI-FM	106.9
	WBST	*90.7
Muncie	WMUN	104.1
	WWHI	*91.5
New Albany	WNAS	*88.1
New Castle	WCTW-FM	102.5
	WYSN	*91.1
North Vernon	WDCH-FM	106.1
Plainfield	WJMK	98.3
Princeton	WRAY-FM	98.1
Richmond	WGLM	96.1
Salem	WSIM-FM	98.9
Seymour	WJOD	93.7
South Bend	WETL	*91.9
	WNDU-FM	92.9
	WPFR	102.7
	WJVA-FM	103.9
Terre Haute	WTHI-FM	99.9
	WVTS	100.7(s)
	WVIS	*89.7
Wabash	WSKS	*91.3
Warsaw	WRSW-FM	107.3
Washington	WFML	106.5
West Lafayette	WBAA-FM	99.1

IOWA

Ames	WOI-FM	*90.1
Boone	KFGQ	*99.3
Cedar Falls	KTCF	*88.1
Cedar Rapids	KHAK-FM	98.1
	WMT-FM	104.5
Clarion	KRIT	96.9
Clinton	KROS-FM	96.1
Davenport	WOC-FM	103.7
Des Moines	KDPS	*88.1
	KDMI	97.3
	KSO	98.5
	WHO-FM	100.3
	KFMG	94.9
	KWDM	93.3
Iowa City	WMT-FM	*91.7
Mt. Vernon	KRNL-FM	*89.7
Muscatine	KWPC-FM	99.7
Oskaloosa	KBOE-FM	106.3
Sioux City	KDVR	97.9
Storm Lake	KAYL-FM	101.5
Waverly	KWAR	89.1

KANSAS

Emporia	KSTE	*88.7
Garden City	KNCO-FM	97.3
Kansas City	KCFC	98.1
	KCKN-FM	94.1
Lawrence	KANU	*91.5
	KLWN-FM	105.9
Leavenworth	KCLO-FM	98.9
Manhattan	KSDB-FM	*88.1
Newton	KJRG-FM	92.3
Ottawa	KTJO-FM	*88.1
Parsons	KPPS-FM	*91.1
Salina	KAFM	99.9
Topeka	KTOP	100.3
	WIBW-FM	97.3
Wichita	KFH-FM	100.3
	KQTY	101.3
	KMUW	*89.1
	KCBM-FM	107.3

KENTUCKY

Ashland	WCMI-FM	93.7
Bowling Green	WLBJ-FM	96.7
Central City	WNES-FM	101.9
Fulton	WFUL-FM	104.9
Georgetown	WRVG	*90.1
Glasgow	WGGC	95.1
Greenville	WKYF-FM	101.1
Hazard	WKIC-FM	101.1
Henderson	WSON-FM	99.5
Hopkinsville	WRLX	98.7
	WKOF	100.3
Lexington	WBKY	*91.3
	WLAP-FM	94.5
Louisville	WFPK	*91.9
	WFPL	*89.3
	WKLO-FM	99.7
	WLRS	102.3
Madisonville	WFMW-FM	93.9
	WNGO-FM	94.7
Manfordville	WLOC-FM	102.3
Owensboro	WOMI-FM	92.5
	WVJS-FM	96.1
Paducah	WPAD-FM	96.9
	WKYB-FM	93.3
Prestonburg	WOOC-FM	95.5
Somerset	WSFC-FM	96.7
Whitesburg	WTCW-FM	103.9

Location	C.L.	Mc.

LOUISIANA

Alexandria	KALB-FM	96.9
Baton Rouge	WJBO-FM	101.5
Houma	KCIL-FM	107.1
Jennings	KJEF-FM	92.7
Lafayette	KRVS-FM	*88.3
Monroe	KMLB-FM	104.1
Mt. Vernon	KRNL-FM	105.3
New Orleans	WBEH	89.3
	WDSU-FM	105.3
	WRCM	97.1
	WMMT	95.7
Shreveport	KRMD-FM	101.1
	KBCL-FM	96.5
	KWKH-FM	94.5

MAINE

Augusta	WFAU-FM	101.3
Bangor	WABI-FM	97.1
Brunswick	WBOR	*91.1
	WCME-FM	98.9
Caribou	WFST-FM	97.7
Lewiston	WCOU-FM	93.9
	WRJR	91.5
Orono	WMEB-FM	91.9
Poland Springs	WMTW-FM	94.9
Portland	WLOB-FM	97.9

MARYLAND

Annapolis	WNAV-FM	99.1
	WANN-FM	107.9
	WXTC	107.9
	WAQE-FM	101.9
Baltimore	WBJC	*88.1
	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 (s)
	WHFS-FM	102.5
Bradbury Heights	WPGC	95.5
Cumberland	WCUM-FM	102.9
Frederick	WFMD-FM	99.9
Hagerstown	WJEJ-FM	104.7
	WARK-FM	106.9
Havre de Grace	WASA-FM	103.7
Oakland	WBUZ	95.5
Tacoma Park	WGTS-FM	*91.9
Waldorf	WSMD	104.1
Westminster	WTTR-FM	100.7

MASSACHUSETTS

Amherst	WAMF	*88.1
	WFCR	*88.5
	WMUA	*91.1
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	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	WFGM-FM	104.5
Framingham	WKOX-FM	105.7
Greenfield	WHAI-FM	98.3
Haverhill	WHAV-FM	92.5
Lawrence	WGHJ	93.7
Lowell	WLLH-FM	99.5
Lynn	WHIL-FM	107.9
Medford	WISK	107.9
New Bedford	WBSM-FM	97.3
	WNBH-FM	98.1
Plymouth	WPLM-FM	99.1
S. Hadley	WMHC	*88.5
Springfield	WHYN-FM	93.1
	WEDK	*91.7
	WSCB	*88.9
	WMAS-FM	94.7
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

Alma	WFYC-FM	104.9
Alpena	WHSB	107.7
Battle Creek	WELL-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
Coldwater	WTVB-FM	98.3
Dearborn	WKNR-FM	100.3
Detroit	WDET-FM	*101.9
	WBFG-FM	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
	WLIN	92.3
E. Lansing	WKAR-FM	*90.5
	WSWM	99.1
	WVIC	91.9
Flint	WFBE	*95.1
	WGMZ-FM	107.9
	WMRP-FM	105.5
Grand Rapids	WFUR-FM	102.9
	WJEF-FM	93.7
	WLAV-FM	96.9
	WMAX-FM	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
Highland Pk.	WHPR	*88.1
Holland	WJBL-FM	94.5
	WHTC-FM	96.1
Houghton Lake	WJGS	98.5
Interlochen	WGYA	*103.1
	WIAA	89.7
Jackson	WBBC	94.1
	WKHM-FM	106.1
Kalamazoo	WMCR	*102.1
	WKMI-FM	106.5
Lansing	WJIM-FM	97.5
	WYFE	100.7
Marquette	WNMR	90.1
Midland	WQDC-FM	99.7
Mount Clemens	WBRB-FM	102.7
Mount Pleasant	WCMU	*90.1
Muskegon	WMUS-FM	106.9
Oak Park	WLDM	95.5
Port Huron	WHLS-FM	107.1
Royal Oak	WOAK	*89.3
	WOMC	104.3
Saginaw	WSAM-FM	98.1
Spring Arbor	WSAE	*89.3
Sturgis	WSTR-FM	103.1
Warren	WPHS	91.5

MINNESOTA

Brainerd	KLIZ-FM	95.9
Golden Valley	KEVE-FM	92.5
Mankato	KMSO	*90.5
	KYSM-FM	103.5
Minneapolis	KTIS-FM	*98.5
	KWFM	97.1
	WLOL-FM	99.5
	WPBC-FM	101.3
	WAYL	96.1
	WCTS-FM	100.3
Rochester	KROC-FM	106.9
St. Cloud	KFAM-FM	104.7
St. Louis Park	KRSI-FM	104.1
St. Paul	KNOF	95.3
Worthington	KWOA-FM	94.9

MISSISSIPPI

Gulfport	WORA	107.1
Jackson	WJDX-FM	102.9
Laurel	WNSL-FM	100.3
Meridian	WMMI	*88.1

MISSOURI

Carrollton	KAOL-FM	101.1
Clayton	KFUO-FM	99.1
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
	KMBC-FM	99.7
	KPRS-FM	103.3
	KXTR	96.5
Kennett	KBOA-FM	98.9
Osage Beach	KRMS-FM	93.5
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
	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
West Plains	KWPM-FM	93.9

MONTANA

Belgrade	KGVW-FM	96.7
Billings	KURL-FM	97.1
Bozeman	KBHF	93.7
Great Falls	KARR-FM	106.3

NEBRASKA

Beatrice	KWBE-FM	92.9
Columbus	KJSK-FM	96.9
Hastings	KICS-FM	93.5
Kearney-Holdrege	KRNY-FM	98.9
Lexington	KRUN-FM	93.1
Lincoln	KFMQ	95.3
	KWHG	106.3
Omaha	KQAL-FM	94.3
	KFAB-FM	99.9
	WOW-FM	92.3
	KICN	96.1
Scottsbluff	KNEW-FM	94.1

NEVADA

Las Vegas	KORK-FM	97.1
	KRGN	101.9
	KLUC-FM	98.5
	KXLV	93.1
Reno	KNEV	95.5
	KUNR	88.1

NEW HAMPSHIRE

Berlin	WMOU-FM	103.7
Claremont	WTSV-FM	106.1
Durham	WUNH	*90.3
Exeter	WPEA	*88.1
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

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	105.3
Franklin Lakes	WRRH	88.7
Glassboro	WGLS-FM	*89.7
Hackettstown	WNTI	*91.9
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	105.3
South Orange	WSOU	*89.5
Trenton	WBUD-FM	101.5
	WTOA	97.5
Wildwood	WCMC-FM	100.7
Zarephath	WAWZ-FM	99.1

NEW MEXICO

Alamogora	KQDI	94.3
Albuquerque	KANW	*89.1
	KHFM	96.3
	KARA-FM	99.5
	KOAT-FM	100.3
Clovis	KTQM-FM	99.9
Los Alamos	KRSN-FM	98.5
Mountain Park	KMFM	97.9
Roswell	KBIM-FM	97.1

NEW YORK

Albany	WAMC	*90.3
Auburn	WMBO-FM	96.1
Babylon	WTFM	103.5
	WGU-FM	102.3
Binghamton	WNBF-FM	98.1
	WKOP-FM	95.3
Brooklyn	WNYE	*91.5
Brookville	WCWP	88.1
Buffalo	WBEN-FM	102.5
	WDCX	99.5

WHITE'S RADIO LOG

Location	C.L.	Mc.
	WBFO	*88.7
	WEBR	94.5
	WGR-FM	96.9
	WBUF	93.3
	WWOL-FM	104.1
	WYSL-FM	103.3
	WDIF	96.1
Canton	WSLU	89.3
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
DeRuyter	WOIV	105.1
Elmira	WECW	*88.1
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	101.7
Jamestown	WJTN-FM	93.3
Kenmore	WYSL-FM	103.3
Lake Success	WTFM	103.5
Liberty	WVOS-FM	95.9
Loudonville	WVCR-FM	89.1
Mt. Kisco	WRNW	107.1
	WVIP-FM	106.3
New Rochelle	WVOX-FM	93.5
New York	WABC-FM	95.5
	WBAI	99.5
	WBFM	101.9
	WCBS-FM	101.1
	WEVD-FM	97.9
	WFUV	*90.7
	WHOM-FM	92.3
	WKCR-FM	*89.9
	WLIB	107.5
	WNCN	104.3
	WNEW-FM	102.7
	WNYC-FM	93.9
	WNYE	91.5
	WQR-FM	98.7
	WQXR-FM	96.3
	WNBC-FM	97.1
	WRFM	105.1
	WRVR	106.7
Niagara Falls	WHLD-FM	98.5
Norwich	WCHN-FM	103.9
Olean	WHDL-FM	95.7
Plattsburg	WEAV-FM	99.9
Patchogue	WALK-FM	97.3(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	100.1
	WCMF	96.5
	WIRQ	*90.9
	WROC-FM	97.9
	WVOR	100.5
	WRVM-FM	92.5
Schenectady	WGFM	99.5
South Bristol	WMIV	95.1
Springville	WSPE	*88.1
Syracuse	WAER	*88.1
	WDDS-FM	93.1
	WONO	100.9
	WSYR-FM	94.5
Troy	WFLY	92.3
	WRPI	*91.5
Utica	WRUN-FM	105.7
Wethersfield	WBIV	105.7
White Plains	WFAS-FM	103.9

NORTH CAROLINA

Location	C.L.	Mc.
Albemarle	WABZ-FM	100.9
Asheboro	WGWR-FM	92.3
Asheville	WLOS-FM	104.3
Burlington	WBBB-FM	101.1
	WFNS-FM	93.9
Burlington-Graham	WBAG-FM	92.9
Chapel Hill	WUNC	*91.5
Charlotte	WBT-FM	107.9
	WIST-FM	95.1
	WSOC-FM	103.5
	WYFM	104.7
Clingman's Pk.	WMIT	106.9
Concord	WEGO-FM	97.9
Durham	WDNC-FM	105.1
Elkin	WIFM-FM	100.9
Fayetteville	WFNC-FM	98.1
Forest City	WBBO-FM	93.3
	WAGY-FM	105.3
Gastonia	WGNC-FM	101.9
Goldsboro	WEQR	96.9
Greensboro	WMDE	98.7
	WQMG-FM	97.1
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
	WIRC-FM	95.7
High Point	WHPE-FM	95.5
	WHPS	*89.3
	WMFR-FM	99.5
	WNOS-FM	100.3
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	WREV-FM	102.1
Rocky Mount	WEED-FM	92.1
	WFMA	100.7
Rochester	WVOR	92.5
Roxboro	WRXO-FM	96.7
Salisbury	WSTP-FM	100.5
Sanford	WWGP-FM	105.5
Shelby	WOHS-FM	96.1
Statesville	WFMX	107
Tarboro	WCPS-FM	104.3
Thomasville	WTNC-FM	98.3
Williamston	WIAM	103.7
Wilmington	WPRV	93.9
Wilson	WVOT-FM	106.1
Winston-Salem	WAIR-FM	93.1
	WYFS	107.5
	WFDD-FM	*88.1
	WSJS-FM	104.1

NORTH DAKOTA

Location	C.L.	Mc.
Fargo	KFNW-FM	97.9

OHIO

Location	C.L.	Mc.
Akron	WAKR-FM	97.5
	WAPS	*89.1
	WCUF	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	WBGU	*88.1
Bucyrus	WBCD-FM	92.7
Cambridge	WILE-FM	96.7
Canton	WHBC-FM	94.1
	WCNO	106.9
	WTOF-FM	98.1
Celina	WMER-FM	94.3
Chillicothe	WBEX-FM	93.3
Cincinnati	WCPO-FM	105.1
	WAEF-FM	104.3
	WGUC	*90.9
	WAKW-FM	93.3
	WKRC-FM	101.9
	WSAI-FM	98.5
	WOIO	94.1
Cleveland	KYW-FM	105.7
	WXEN	106.5
	WBOE	*90.3
	WCRF	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
	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	*91.1
East Liverpool	WOHI-FM	104.3
Eaton	WCTM	92.9
Elyria	WEOL-FM	107.3
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	98.7
	WHOH	103.5
	WFOL-FM	94.9(s)
Hillsboro	WSRW-FM	106.7
Kent	WKSU-FM	*88.1
Kenton	WKTN	
Lancaster	WHOK-FM	95.5
Lima	WIMA-FM	102.1
Mansfield	WVNO	106.1
Marietta	WCMO	*89.3
Marion	WMRN-FM	106.9
Miamisburg	WFCJ	93.9
Middletown	WPFB-FM	105.9
Mt. Vernon	WMVO-FM	93.7
New Concord	WMCO-FM	*91.9
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
Salem	WSOM-FM	105.1
Sandusky	WLEC-FM	102.7
Springfield	WBLY-FM	103.9
	WEEC-FM	100.7
Steubenville	WSTV-FM	103.5
Tiffin	WTTF-FM	103.7
Toledo	WSPD-FM	101.5
	WMHE	92.5
	WTDS	*91.3
	WTDL-FM	104.7
	WTRT	99.9
Van Wert	WERT-FM	98.9
Westerville	WOBN	*91.5
Wilberforce	WJSC-FM	*88.9
Wooster	WWST-FM	104.5
Worthington-Columbus	WRFD-FM	97.9
Xenia	WHBM-FM	103.9
Yellow Springs	WYSO	*91.5
Youngstown	WKBN-FM	98.9
	WBBW-FM	99.3
	WRED	101.1
Zanesville	WHIZ-FM	102.5

OKLAHOMA

Location	C.L.	Mc.
Durant	KSEO-FM	107.3
Edmond	KWHB	97.7
Midwest City	KMWC	94.7
	KTEA-FM	92.5
Norman	WNAD-FM	*90.9
Oklahoma City	KOKH	*88.9
	KIOO	100.5
	KEFM	94.7
	KYFM	98.9
	KJEM-FM	102.7
	KOCY-FM	96.1
	KFNB	101.9
Shawnee	KBGC	*89.9
Stillwater	KOSU-FM	*91.7
	KSPI-FM	93.9
Tulsa	KWGS	*90.5
	KIHI	95.5
	KOCW	97.5
	KOGM-FM	92.9
	KRAV	96.5

OREGON

Location	C.L.	Mc.
Corvallis	KFLY-FM	101.5
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	KBDY-FM	95.3
Oretech	KTEC	*88.3
Portland	KOAP-FM	92.3
	KGMG	95.5
	KOIN-FM	101.1
	KPOJ-FM	105.3
	KPFM	97.1
	KPOI-FM	98.5
	KQFM	100.3
	KRRC	*89.3

PENNSYLVANIA

Location	C.L.	Mc.
Allentown	WFMZ	100.7
	WAEB-FM	104.1
Altoona	WVAM-FM	100.1
	WFBG-FM	98.1
Beaver Falls	WBVP-FM	106.7
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	WCDL-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
Edensburg	WEND	103.9
Elizabethtown	WMSH-FM	106.7
Erie	WWYN-FM	99.9
Gettysburg	WGET-FM	107.7
Glenside	WIFI	92.5
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	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
Meadville	WMGW-FM	100.3
	WARC-FM	*88.1
Montrose	WPEL-FM	96.5
New Kensington-Tarentum	WYDD	100.7
Oil City	WDJR	98.5
Palmyra	WJWR	92.1
Philadelphia	WCAU-FM	98.1
	WPBS-FM	105.3
	WDAS-FM	105.3
	WPCA-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
	WIP-FM	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
	WRYT-FM	98.1
	KQV-FM	102.5
	WDUQ	*91.5
	WYRE-FM	107.9
	WILY	105.9
	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
Red Lion	WGCB-FM	96.1
Scranton	WGBI-FM	101.3
	WUSV	*88.9
	WWDL-FM	104.9
Sharon	WPIC-FM	102.9
State College	WDFM	*91.1
	WMAJ-FM	103.1
Stroudsburg	WVPO-FM	93.5
Sunbury	WKOK-FM	94.1
Towanda	WTTC-FM	92.7
Tyrone	WGMR-FM	101.1
Warren	WRRN	92.3
Washington	WJPA-FM	104.3
Waynesboro	WAYZ-FM	101.5
Wilkes-Barre	WBRE-FM	98.5
	WYZZ	103.3
Williamsport	WLYC-FM	105.1
	WRAK-FM	100.3
York	WNOW-FM	105.7
	WSBA-FM	103.3

RHODE ISLAND

Location	C.L.	Mc.
Cranston	WLOV	99.9
Providence	WPJB-FM	105.1
	WICE-FM	107.7
	WPFM	95.5
	WPRO-FM	92.3
	WXCN	101.5
Woonsocket	WWON-FM	106.3

SOUTH CAROLINA

Location	C.L.	Mc.
Anderson	WCAC	101.1
Beaufort	WBEU-FM	98.7
Charleston	WCSC-FM	96.9
	WTMA-FM	93.1
Clemson	WSBF-FM	*88.1
Columbia	WCOS-FM	97.9
	WNOK-FM	104.7
	WUSC-FM	*89.9
Conway	WLAT-FM	104.1
Dillon	WDSC-FM	92.9
Florence	WJMX-FM	103.1
Greenville	WESC-FM	92.5
	WFBC-FM	93.7
	WMVU-FM	94.5
Laurens-Clinton	WLBG-FM	100.5
N. Charleston	WKTM	102.5
Rock Hill	WRHI-FM	98.3
Seneca	WSNW-FM	98.1
Spartanburg	WSPA-FM	98.9
Sumter	WFIG-FM	101.3

Location	C.L.	Mc.
SOUTH DAKOTA		
Hot Springs	KOBH-FM	96.7
TENNESSEE		
Bristol	WOPI-FM	96.9
Chattanooga	WDOD-FM	96.5
	WLON	106.5
	WDEF-FM	92.3
Cleveland	WCLE-FM	100.7
Collegedale	WSMC-FM	*88.1
Cookeville	WHUB-FM	98.3
	WPTN-FM	94.3
Dickson	WDKN-FM	102.3
Franklin	WFLT-FM	100.1
Gallatin	WFMG	104.5
Greeneville	WGRV-FM	94.9
Humboldt	WIRJ-FM	102.3
Jackson	WTJS-FM	104.1
Johnson City	WJCW-FM	100.7
Kingsport	WKPT-FM	98.5
Knoxville	WBIR-FM	93.5
	WKCS	*91.1
	WUOT	*91.9
	WCAS	97.5
Lexington	WDXL-FM	99.3
Livingston	WRHM-FM	95.9
Manchester	WMSR-FM	99.7
McKenzie	WKTA	106.9
McMinnville	WHNR	101.7
Memphis	WMC-FM	99.7
	WMPS-FM	97.1
	WDIA-FM	102.7
Morristown	WMTN-FM	95.9
Nashville	WFMB	105.9
	WPLN	90.3
	WSIX-FM	97.9
Sevierville	WSEV-FM	102.1
Sparta	WSMT-FM	105.5
Springfield	WDBL-FM	94 3
Tullahoma	WJIG-FM	93.3
TEXAS		
Abernathy	KWGN-FM	99.5
Abilene	KACC-FM	*91.1
	KFMN	99.3
Alvin	KMSC	102.1
Amarillo	KGNC-FM	93.1
Austin	KHFI	98.3
	KAZZ	95.5
	KTBC-FM	93.7
	KUT-FM	*90.7
Beaumont	KHCB-FM	105.7
	KAYD-FM	97.5
Big Spring	KFNE-FM	95.3
Brenham	KWHI-FM	106.3
Brownwood	KHPC	88.1
Cleburne	KCLE-FM	94.9
College Station	WTAW-FM	92.1
Corpus Christi	KZFM	95.5
Dallas	KIXL-FM	104.5
	KMAP	105.3
	KNER	*88.1
	KRLD-FM	92.5
	KLIF-FM	98.7
	WFAA-FM	97.9
	WRR-FM	101.1
	KVTT	*91.7
	KQRO	102.9
	KBOX-FM	100.3
Denton	KDNT-FM	106.3
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
	KXFM	99.5
	KFJZ-FM	97.1
	KJIM-FM	102.1
	KCUL-FM	93.9
	KNOK-FM	107.5
Gainesville	KGAF-FM	94.5
Harlingen	KELT	94.5
Henderson	KGRI-FM	100.1
Highland Pk.	KUIL-FM	103.7
Hillsboro	KHBR-FM	102.3
Houston	KHGM	102.9
	KHCB-FM	105.7
	KHUL	95.7
	KFMK	97.9
	KODA-FM	99.1
	KLEF	94.5
	KOST	100.3
	KQUE	102.9
	KRBE	104.1
	KXYZ	96.5
	KTRH-FM	101.1
	KUHF	*91.3
	KBNO	93.7
Hilleen	KLEN-FM	93.3
Jasper	KTXJ-FM	102 3
Lamesa	KPET-FM	100 3
Longview	KLUE-FM	105.7
Lubbock	KSEL-FM	93 7
	KBFM	96.3
	KTXT-FM	*91.9
Marshall	KMHT-FM	97.3
Midland	KNFM	92.3
	KMOD-FM	93.3
Mt. Pleasant	KIMP-FM	96.1
Odessa	KQIP	96.7
	KWMO	99.1
Odessa	KOCV	91.3
Pasadena	KLVL-FM	92.5
Plainview	KHBL	*88.1
Port Arthur	KFMP	93.3
	KPAC-FM	98.5
San Antonio	KISS	99.5
	KEEZ	97.3
	KAKI-FM	98.1
	KITY	92.9
	KMFM	96.1
Sinton	KTOD-FM	101.3
Spearman	KBMF-FM	98.3
Texarkana	KTAL-FM	98.1
Tyler	KSLT	93.1
	KDOK-FM	101.5
Waco	KEFC	97.5
Wichita Falls	KLUR	99.9
	KNTO	95.1
UTAH		
Ephraim	KEPH	*88.9
Logan	KUSU-FM	*88.1
Provo	KBYU-FM	*88.9
Salt Lake City	KCPX-FM	98.7
	KLUB-FM	97.1
	KSL-FM	100.3
VERMONT		
Burlington	WJOY-FM	98.5
VIRGINIA		
Arlington	WAVA-FM	105.1
	WCCV-FM	97.5
Charlottesville	WINA-FM	95.3
	WTJU	91.3
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
	WNOR-FM	98.7
	WRVC	102.5
	WTAR-FM	95.7
	WXRI	104.5
	WYFI-FM	99.7
Portsmouth	WAVY-FM	96.9
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
Williamsburg	WCWM	89.1
	WRCI	96.5
Winchester	WRFL	92.5
Woodbridge	WXRA	105.9
WASHINGTON		
Aberdeen	WDUX-FM	104.7
Bellingham	KGMI-FM	92.9
	KERI	104.3
Bremerton	KBRO-FM	106.9
Cheney	KEWC-FM	*89.1
College Place	KGTS	91.3
Edmunds	KGFM	105.3
Ellensburg	KCWS-FM	*91.5
Eugene	KBMC	104.5
Lynden	KLYN-FM	106.5
Opportunity	KZUN-FM	96.1
Prosser	KACA	102.3
Seattle	KING-FM	98.1
	KBLE-FM	93.3
	KETO-FM	101.5
	KGMJ	95.7
	KIRO-FM	100.7
	KISW	99.9
	KLXN	96 5
	KMCS	98.9
	KOL-FM	94.1
	KRAB	107.7
	KUOW	94.9
	KIXI	95.7
Spokane	KREM-FM	92.9
	KXLY-FM	99.9
	KHQ-FM	98.1
Tacoma	KCPS	90.9
	KLAY-FM	106.3
	KTNT-FM	97.3
	KTOY	*91.7
	KTAC-FM	103.9
Yakima	KNDX-FM	106.5
WEST VIRGINIA		
Beckley	WBKW	99.3
Bluefield	WHIS-FM	104.5
Charleston	WKAZ-FM	97.5
	WKNA	98.5
	WCAW-FM	99.9
Huntington	WKEE-FM	100.5
	WMUL	*88.1
Martinsburg	WEPM-FM	97.5
Morgantown	WAJR	101.9
Oak Hill	WOAY-FM	94.1
Wheeling	WKWK-FM	97.3
	WWVA-FM	98.7
	WTRF-FM	107.5
WISCONSIN		
Appleton	WLFM	*91.1
Chilton	WHKW	*89.8
Colfax	WHWC	*88.3
Delafield	WHAD	*90.7
Eau Claire	WIAL	94.1
Fort Atkinson	WFAW	107.3
Green Bay	WBAY-FM	101.1
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
Merrill	WLIN	100.7
Milwaukee	WFMR	96.5
	WMIL-FM	95.7
	WISN-FM	97.3
	WRIT-FM	102.9
	WMKE	102.1
	WQFM	93.3
	WTMJ	94.5
	WBON	107.7
	WEMP	99.1
Monroe	WEKZ-FM	98.7
Mt. Horeb	WFMK	92.3
Neillsville	WCCN-FM	105.5
Platteville	WSCI-FM	*89.5
Racine	WRJN-FM	100.7
	WFNY	92.1
Rice Lake	WJMC-FM	96.3
Ripon	WCWC-FM	106.1
Sparta	WCOW-FM	97.1
Stevens Point	WSPT-FM	97.9
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
Wisc. Rapids	WFHR-FM	103.3
WYOMING		
Cheyenne	KVWO-FM	106.3

Canadian FM Stations by Location

Location	C.L.	Mc.
Belleville, Ont.	CJBQ-FM	97.1
Brantford, Ont.	CKPC-FM	92.1
Calgary, Alta	CHFM-FM	95.9
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
Kamloops, B.C.	CFFM-FM	98 3
Kingston, Ont.	CFRC-FM	91.9
	CKLC-FM	99.5
	CKWS-FM	96.3
Kitchener, Ont.	CKCR-FM	96.7
Lethbridge, Alta.	CHEC-FM	100.9
London, Ont.	CFPL-FM	95.9
Montreal, Que.	CBF-FM	95.1
	CBM-FM	100.7
	CFCF-FM	92.5
	CJFM-FM	95.9
	CKGM-FM	97.7
Oshawa, Ont.	CKLB-FM	93.5
Ottawa, Ont.	CBO-FM	103.3
	CFMO-FM	93.9
Port Arthur, Ont.	CKPR-FM	94.3
Quebec, Que.	CHRC-FM	98.1
Rimouski, Que.	CJBR-FM	101.5
Sherbrooke, Que.	CHLT-FM	102.7
St. Catharines, Ont.	CKTB-FM	97.7
St. Norbet, (Winnipeg) Man.	CFMW-FM	98.3
Sydney, N.S.	CJCB-FM	94.9
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
Vancouver, B.C.	CBU-FM	105.7
	CFQM-FM	103.5
	CKVL-FM	96.9
Victoria, B.C.	CKDA-FM	98.5
Windsor, Ont.	CKLW-FM	93.9
Winnipeg, Man.	CJDB-FM	97.5
	CKQM-FM	94.3
	CKY-FM	92.1

(Continued on next page)

WHITE'S

RADIO LOG

Canadian AM Stations by Location

Location	C.L.	Kc.
Abbotsford, B.C.	CFVR	1240
Altona, Man.	CFAM	1290
Amherst, N.S.	CKDH	1400
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
Cabano, Que.	CJAF	1340
Calgary, Alta.	CFAC	960
	CFCN	1060
	CKXL	1140
Callander, Ont.	CFCH	600
Campbell River, B.C.	CFWB	1490
Campbellton, N.B.	CKNB	950
Camrose, Alta.	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
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
Edmonton, Alta.	CBX	1010
	CBXA	740
	CFRN	1260
	CHED	630
	CHFA	680
	CJCA	930
	CKUA	580
Edmundston, N.B.	CJEM	570
Estevan, Sask.	SJSL	1280
Flin Flon, Man.	CFAR	590
Fort Frances, Ont.	CFOB	800
Fort Simpson, N.W.T.	CFMR	1490
Fort St. John, B.C.	CKNL	970
Fort William, Ont.	CJLX	800
Fredericton, N.B.	CFNB	550
	CBZ	1480
Galt, Ont.	CFTJ	1110
Gander, Nfld.	CBG	1450
Goose Bay, Nfld.	CFGB	1340
Granby, Que.	CHEF	1450
Grande Prairie, Alta.	CFGP	1050
Grand Falls, Nfld.	CBT	540
	CKCM	620
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
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.	CKCR	1490
Kitimat, B.C.	CKTK	1230
	CKKW	1320
Langley, B.C.	CJJC	850
La Sarre, Que.	CKLS	1240
La Tuque, Que.	CFLM	1240
Leamington, Ont.	CJSP	710
Lethbridge, Alta.	CHEC	1090
	CJOC	1220
Lindsay, Ont.	CKLY	910
Lloydminster, Alta.	CKSA	1150
London, Ont.	CFPL	980
	CKSL	1290
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, P.Q.	CKML	610
Montmagny, Que.	CKBM	1490
Montreal, Que.	CBF	690
	CBM	940
	CFCF	600
	CFMB	1410
	CJAD	800
	CJMS	1280
	CKAC	730
	CKGM	980
	CKLM	1570
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.	CFDR	1570
Oshawa, Ont.	CKLB	1350
Ottawa, Ont.	CBD	910
	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	1240
Quebec, Que.	CBV	980
	CHRC	800
	CJLR	1060
	CJQC	1340
	CKCV	1280
Quesnel, C.C.	CKCQ	570
Red Deer, Alta.	CKRD	850
Regina, Sask.	CBK	540
	CJME	1300
	CKCK	620
	CKRM	980
Richmond Hill, Ont.	CFGM	1310
Rimouski, Que.	CJBR	900
Riviere du Loup, Que.	CJFP	1400
Roberval, Que.	CHRL	910
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
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
Sackville, N.B.	CBA	1070
Saint John, N.B.	CFBC	930
	CHSJ	1150
Sarnia, Ont.	CHOK	1070
Saskatoon, Sask.	CFNS	1170
	CFQC	600
	CKOM	1250
Sault Ste. Marie, Ont.	CJIC	1050
	CKCY	920
Sept-Iles, Que.	CKCN	560
Shawinigan, Que.	CKSM	1220
Shefferville, Que.	CFKL	1230
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
Sudbury, Ont.	CFBR	550
	CHND	900
	CKSO	790
Summerside, P.E.I.	CJRW	1240
Swift Current, Sask.	CKSW	1400
Sydney, N.S.	CBI	1140
	CJCB	1270
Terrace, B.C.	CFTK	1140
Thetford Mines, Que.	CKLD	1230
Thompson, Man.	CHTM	610
Trois-Rivieres, Que.	CHLN	550
	CKTR	1150
Tillsonburg, Ont.	CKOT	1510
Timmins, Ont.	CFCL	620
	CKGB	680
Toronto, Ont.	CBL	740
	CFRB	1010
	CHFI	1540
	CHUM	1050
	CJBC	860
	CKEY	590
	CKFH	1430
Trail, B.C.	CJAT	610
Truro, N.S.	CKCL	600
Val d'Or, Que.	CKVD	1230
Valleyfield, Que.	CFLY	1370
Vancouver, B.C.	CBU	690
	CFUN	1410
	CHQM	1320
	CJOR	600
	CKWX	1130
Verdun, Que.	CKVL	850
Vernon, B.C.	CJIB	940
Victoria, B.C.	CFAX	810
	CJVI	900
	CKDA	1220
Victoriaville, Que.	CFDA	1380
Ville Marie, Que.	CKVM	710
Ville St. Georges, Que.	CKRB	1460
Welland, Ont.	CHOW	1470
Weyburn, Sask.	CFSL	1340
Whitehorse, Y. T.	CFWH	570
Williams Lake, B.C.	CKCQ-1	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

World-Wide Short-Wave Stations

The World-Wide Short Wave Stations section of *White's Radio Log* is, as its name implies, a *log*, that lists stations actually monitored by listeners in the United States, Canada and overseas. It is *not* intended to be a listing of *all* shortwave transmitters licensed as such listings contain numerous inactive transmitters, and low powered stations which are rarely heard by DX'ers. The stations listed here, therefore, are those most often reported and consistently heard during the past few months. Many have been monitored by DX CENTRAL, the official RADIO-TV EXPERIMENTER monitoring post in New York City.

Because of the fact that this log represents actual monitoring reports rather than data taken from published program schedules received from the stations, you may find that frequencies (and operating times) given here differ from *official* listings. This is because foreign short-wave stations frequently oper-

ate several kilocycles away from their assigned (and announced) frequencies. In addition, the schedules of these stations are often changed and the changes are not published in the schedules until many months later. We feel that the type of log which *White's Radio Log* is presenting represents a very realistic picture of the current status of short-wave broadcasting, and is something which cannot be obtained from any other sources.

For the DX'er. If you care to roam the bands for DX, we present here some information which will be of invaluable use to you in tracking down DX stations.

It should be noted that most short-wave broadcasting stations operate within 9 specific frequency bands, established by international agreement. Each of these bands has a number, corresponding to the average wavelength of the frequencies within the band. The 9 bands are as follows:

60-meter band= 4750 kc to 5060 kc
49-meter band= 5950 kc to 6200 kc
41-meter band= 7100 kc to 7300 kc
31-meter band= 9500 kc to 9775 kc
25-meter band=11700 kc to 11975 kc
19-meter band=15100 kc to 15450 kc
16-meter band=17700 kc to 17900 kc
13-meter band=21450 kc to 21750 kc
11-meter band=25600 kc to 26100 kc

Although the current radio propagation conditions have made the high frequency bands (11 and 13 meter bands) relatively poor for DX'ers, the other bands are generally good during certain periods of the year. As a general rule, the following bands are "hot for DX" during the times indicated:

60-meter band=Winter nights.
49-meter band=Winter nights.
41-meter band=Winter nights.
31-meter band=Nights, all year.
25-meter band=Nights, all year.
19-meter band=Days all year, and Summer nights.
16-meter band=Days, all year, and Summer nights.
13-meter band=Days, all year.
11-meter band=Days, all year.

Here and There on the Bands. Many of you have written to report the reception of non-broadcast radiotelephone transmissions using single sideband (SSB) modulation—however most of those who report hearing these stations ask our advice on how to make the modulation "readable" on a standard communication receiver. Of course, if you have a receiver with a "SSB" position on the function switch you have no problems, but if you have any of the older receivers or a current low cost set you will have to improvise a bit. Here's how to adjust your receiver to monitor these SSB transmissions: 1) place the "BFO" (or "AM/CW" switch) in *on* (or "CW") position; 2) back down *slightly* on the RF gain by means of the "Sensitivity" control, 3) tune *slightly* to the side of the loudest portion of the desired signal, 4) using the *code pitch control*, find the spot which offers clearest modulation. If your set does not have a *code pitch* control, tune very carefully and slowly back and forth across the signal to find the best spot.

As an example of some of the interesting and rarely heard countries to be monitored by means of these SSB stations (which dot the radio spectrum) we constantly hear SSB radiotelephone transmissions from Bermuda, Jamaica, Curacao and Guam. Just about every country you can think of can be monitored by this method. Let us know how you make out!

Let Us Know. Listeners are invited to submit their loggings to us for publication in the Shortwave section of *White's Radio Log*. Be sure to include the following information for each station you report: approximate frequency, callsign and/or station name, city and country, and time heard in Eastern Standard Time, 24 hour clock. Address your reports to: DX CENTRAL, *White's Radio Log*, c/o RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, N. Y. 10022, U.S.A.

Time To Listen. All times shown in *White's Radio* Log are in the 24 hour EST clock system. For example, 0800 is 8:00 AM EST, 1200 is noon EST, 1800 is 6 PM EST, and so on. For conversion to other time zones, subtract 1 hour for CST (0800 EST is 7 AM CST), 2 hours for MST, 3 hours for PST.

The following abbreviations are used in our listings: BC—Broadcasting Company, Corporation, or System; E—Emissora; R—Radio or Radiodiffusion; V—Voice or Voz.

TNX. We are indebted to the following DX'ers who added their loggings to those of DX CENTRAL, the official RADIO-TV EXPERIMENTER monitoring station in New York City, to bring you this month's listings:

Why not send us your loggings for our next listing? Share your DX with others!

Get those reports in *now!* Good *DX!*

R. A. Crowder, Babson Park, Fla.
Charles Aher, E. St. Louis, Ill.

WHITE'S RADIO LOG

David Cuevas, S. San Gabriel, Calif.
Benn Schreiber, Rockford, Ill.
Julian M. Sienkiewicz, Brooklyn, N. Y.
Ira Stoler, Brooklyn, N. Y.
"The Destroyer," Bakersfield, Calif.
Tom Kneitel, New York, N. Y.
Tracy Ketchman, Plymouth, Mich.
Thomas O. Miller, Bucklin, Mo.
Philip Zucchi, Manomet, Mass.
John Moore, Portsmouth, Ohio
Donald Anderson, Villa Park, Ill.

Pat Stakem, Cumberland, Md.
Adelard Beaupre, Putnam, Conn.
Edward Weigand, Rochester, N. Y.
Edward S. Menahan, Brooklyn, N. Y.
Mike Bennett, Ottawa, Ont.
Paul Johnson, Monmouth, Ill.
Carleton May, Westminster, Mass.
Mac Haplan, St. Augustine, Fla.
Tim Evans, Cleveland, Ohio
Dewaine Anderson, Roseburg, Ore.
John LeGates, E. Orange, N. J.
Alan Greene, Philadelphia, Pa.
Kenneth Wright, Wilder, Idaho
William Brooks, Little Valley, N. Y.
James Burton III, Appalachia, Va.
John McLeod, Vancouver, B. C.
Mike Vannier, Louisville, Ky.
Dave Siddall, Hyannis, Mass.
F. Petrucci, Venice, Calif.

EUROPE

Location	Name	Call	Kc.	EST
ALBANIA				
Tirana	R. Tirana	—	7090	1500
Tirana	R. Tirana	—	9390	1500
ANDORRA				
La Vieja	R. des Vallees	—	6305	1700
AUSTRIA				
Vienna	R. Austria	OE147	9770	2000
BELGIUM				
Brussels	R. Brussels	ORU	17830	0500
Brussels	R. Brussels	ORU	17850	0715
BULGARIA				
Sofia	R. Sofia	—	9700	1900
CZECHOSLOVAKIA				
Prague	R. Prague	—	5200	2300
Prague	R. Prague	—	5290	2300
Prague	R. Prague	—	7345	2025
Prague	R. Prague	—	9795	2030
FINLAND				
Helsinki	Finnish BC	OIX7	6120	1600
Helsinki	Finnish BC	—	11805	1118
DENMARK				
Copenhagen	V. of Denmark	OZF5	9520	2000
Copenhagen	V. of Denmark	OZF7	15165	0900
FRANCE				
Allouis	RTF International	—	15160	1400
GERMANY (WEST)				
Cologne	Deutsche Welle	DMQ6	6100	1900
Cologne	Deutsche Welle	DMQ9	9545	1930
Cologne	Deutsche Welle	DMQ9	9579	2355
Cologne	Deutsche Welle	DMQ9	9735	2355
Cologne	Deutsche Welle	DMQ11	11795	2355
Cologne	Deutsche Welle	DMQ15	15295	1710
GREAT BRITAIN				
London	BBC	—	6185	2122
London	BBC	GRN	6195	1530
London	BBC	GSO	15180	0700
London	BBC	GWR	15300	1630
GREECE				
Athens	Forces BC	—	6045	1621
HUNGARY				
Budapest	R. Budapest	—	9833	1930
ITALY				
Rome	RAI	—	9579	1930
Rome	RAI	—	11905	1730
MONACO				
Monte Carlo	Trans World R.	—	7260	0230
NETHERLANDS				
Hilversum	R. Netherlands	—	6085	1730
Hilversum	R. Netherlands	—	9590	2230
Hilversum	R. Netherlands	—	9715	1730
Hilversum	R. Netherlands	—	11730	1600
Hilversum	R. Netherlands	—	15245	0100
Hilversum	R. Netherlands	—	15425	1600
Hilversum	R. Netherlands	—	17810	0100
Hilversum	R. Netherlands	—	21575	1070
NORWAY				
Oslo	R. Norway	—	9595	0230
Oslo	R. Norway	—	9610	0820
POLAND				
Warsaw	R. Warsaw	—	6135	1530
Warsaw	R. Warsaw	—	7125	2330
Warsaw	R. Warsaw	—	7270	1530
Warsaw	R. Warsaw	—	7285	2330
PORTUGAL				
Lisbon	V. of West	—	6025	1345
Lisbon	V. of West	—	6252	1940
SPAIN				
Madrid	R. Nac. de Espana	—	6130	2200
Madrid	R. Nac. de Espana	—	7030	1620
Madrid	R. Nac. de Espana	—	9695	0330
SWITZERLAND				
Berne	Swiss BC	—	7110	1345
Berne	Swiss BC	HER4	9535	2015
Berne	Swiss BC	HED6	9655	2015
Berne	Swiss BC	HEU3	9665	1345
Berne	Swiss BC	HER5	11865	2015
U.S.S.R.				
Minsk	R. Minsk	—	5940	1630
Minsk	R. Minsk	—	5970	1630
Moscow	R. Moscow	—	6425	2015
Moscow	R. Moscow	—	7130	2015
Moscow	R. Moscow	—	7256	0110
Moscow	R. Moscow	—	9600	0700
Moscow	R. Moscow	—	9695	2125
Moscow	R. Moscow	—	9700	2200
Moscow	R. Moscow	—	9740	2200
Novosibirsk	R. Novosibirsk	—	4430	1800
VATICAN				
Vatican City	R. Vatican	—	6145	1950
Vatican City	R. Vatican	—	7250	1950
Vatican City	R. Vatican	—	9600	1100
Vatican City	R. Vatican	—	9645	1950
Vatican City	R. Vatican	—	11740	1100
YUGOSLAVIA				
Belgrade	R. Belgrade	—	6100	1145
Belgrade	R. Belgrade	—	7200	1145
Belgrade	R. Belgrade	—	9505	1145

AFRICA

Location	Name	Call	Kc.	EST
ALGERIA				
Algers	R. Algeria	—	6160	0130
Algers	R. Algeria	—	9510	0130
Algers	R. Algeria	—	11810	0600
Algers	R. Algeria	—	11835	0130
ANGOLA				
Benguela	R. Club de Benguela	—	5044	0045
Carmona	R. Club de Congo Port.	CR6RU	6135	0100
Luanda	Ondas Populares	—	4860	1045
Luanda	Ondas Populares	—	7140	1045
Luanda	Ondas Populares	—	9630	1045
Mocamedes	R. Club de Mocamedes	CR6RM	5015	1200
Mocamedes	R. Club de Mocamedes	CR6RM	9515	0100
Nova Lisboa	R.-Club de Huambo	CR6RD	3704	2300

Location	Name	Call	Kc.	EST
Nova Lisboa	R. Club de Huambo	—	5060	0100
Nova Lisboa	R. Club de Huambo	CR6RD	7160	0100
BECHUANALAND				
Lobatsi	Z.N.B.	ZNB	3356	1030
CONGO (Rep. of)				
Elisabethville	R. Ufac	—	4890	1100
Leopoldville	R. Congolaise	—	9620	0500
Leopoldville	R. Congolaise	—	11795	0500
CONGO (French African)				
Brazzaville	R. Brazzaville	—	9730	1100
Brazzaville	R. Brazzaville	—	11725	1100
Brazzaville	R. Brazzaville	—	15190	1430
DAHOMEY				
Cotonou	R. du Dahomey	—	4870	2350
EGYPT (UAR)				
Cairo	R. Cairo	—	9475	1630
Cairo	R. Cairo	—	9495	1630
ETHIOPIA				
Addis Ababa	R. Addis Ababa	—	15300	1510
Addis Ababa	R. V. of Gospel	ETLF	4905	0845
Addis Ababa	R. V. of Gospel	ETLF	7120	1200
Addis Ababa	R. V. of Gospel	ETLF	9685	1200
Addis Ababa	R. V. of Gospel	ETLF	9705	0930
Addis Ababa	R. V. of Gospel	ETLF	9755	1000
Addis Ababa	R. V. of Gospel	ETLF	9765	0830
Addis Ababa	R. V. of Gospel	ETLF	15185	0900
GABON				
Libreville	R. Gabon	—	4777	0000
GHANA				
Accra	Ghana BC	—	4915	1500
Accra	Ghana BC	—	11800	1550
GUINEA (Rep.)				
Conakry	V. de la Revolution	—	6165	1100
GUINEA (Spanish)				
Bata, Rio Muni	R. Ecuatorial	—	7850	1200
IVORY COAST				
Abidjan	R. Abidjan	—	7215	1330
Abidjan	R. Abidjan	-	11820	1340
LIBERIA				
Monrovia	R. Village	ELWA	3225	0215
Monrovia	V. of America	ELWA	15370	1445
MALI				
Bamako	R. Bamako	—	9735	1650
MAURETANIA				
Nouakchott	R. Mauretania	—	3222	0130
Nouakchott	R. Mauretania	—	6035	0700
Nouakchott	R. Mauretania	—	9610	0700
MOROCCO				
Tanger	R. Tanger	—	11735	0130
Tanger	R. Tanger	—	15345	0130
Tanger	R. Tanger	—	15395	0130
Tanger	V. of America	—	9699	2115
RHODESIA				
Salisbury	S. Rhod. BC	—	5010	0240
Salisbury	S. Rhod. BC	—	6025	0220
SENEGAL				
Dakar	R. Senegal	—	5960	0100
SOUTH AFRICA (Rep.)				
Paradys	Springbok R.	—	9650	2345
SUDAN				
Omdurman	Sudan BC	—	9480	2300
TANGANYIKA				
Dar es Salaam	R. Tanganyika	—	9530	0300
ZAMBIA				
Lusaka	N. Niger BC	—	3270	2300
Lusaka	N. Niger BC	—	3346	2300
Lusaka	N. Niger BC	—	4828	2300
Lusaka	N. Niger BC	—	4911	1000
Lusaka	N. Niger BC	—	7220	0500

ASIA AND NEAR EAST

Location	Name	Call	Kc.	EST
AFGHANISTAN				
Kabul	R. Kabul	—	4785	0900
Kabul	R. Kabul	—	9595	0600
Kabul	R. Kabul	—	9635	1400
Kabul	R. Kabul	—	9650	0530
Kabul	R. Kabul	—	11955	1300
BRUNEI				
Brunei	R. Brunei	—	4865	0300
CEYLON				
Colombo	R. Ceylon	—	15335	0145
CHINA (Communist)				
Peking	R. Peking	—	6210	1300
Peking	R. Peking	—	7080	1300
Peking	R. Peking	—	7230	1300
Peking	R. Peking	—	9457	1300
CHINA (Free)				
Taipei	V. of Free China	BED29	6095	2150
Taipei	V. of Free China	BED73	9685	2150
Taipei	V. of Free China	BED69	11825	2150
Taipei	V. of Free China	BED49	15345	2150
Taipei	V. of Free China	BED71	15395	2150
Taipei	V. of Free China	BED40	17890	2150
INDIA				
Calcutta	All India R.	VUD	9787	2215
Delhi	All India R.	VUD	5955	1440
Delhi	All India R.	VUD	7125	1445
Delhi	All India R.	VUD	9915	1510
INDONESIA				
Djakarta	V. of Indonesia	—	6020	0500
Djakarta	V. of Indonesia	YDF	6045	0500
Djakarta	V. of Indonesia	—	9770	0500
Djakarta	V. of Indonesia	YDF2	11710	1600
Djakarta	V. of Indonesia	YDF3	11795	0030
Makassar	R. Makassar	—	4750	1100
IRAN				
Teheran	R. Iran	—	7125	2300
Teheran	R. Iran	—	9660	2300
Teheran	R. Iran	—	11730	0930
Teheran	R. Iran	—	15130	2300
ISRAEL				
Jerusalem	Kol Yisrael	—	9609	1500
Jerusalem	Kol Yisrael	—	9625	1515
JAPAN				
Tokyo	N.H.K.	JKH	7230	1500
Tokyo	N.H.K.	JKI	7285	1530
Tokyo	N.H.K.	JKH2	9655	1725
Tokyo	N.H.K.	—	15135	0115
Tokyo	N.H.K.	—	15425	0115
Tokyo	N.H.K.	—	17755	0115
JORDAN				
Amman	Amman BC	—	9560	2015
KOREA (North)				
Pyongyang	R. Pyongyang	—	6195	0730
Pyongyang	R. Pyongyang	—	7225	1510
Pyongyang	R. Pyongyang	—	9752	0627
LEBANON				
Beirut	Lebanese BC	—	5985	2330
Beirut	Lebanese BC	—	11890	1630
Beirut	Lebanese BC	—	15285	2330
PAKISTAN				
Karachi	R. Pakistan	—	17740	0835
PHILIPPINES				
Manila	Far East BC	—	9555	1215
SAUDI ARABIA				
Jeddah	Saudi Arab. BC	—	9650	0000
Jeddah	Saudi Arab. BC	—	11950	0000
SINGAPORE				
Singapore	Brit. Far East. BC	—	15265	0945
SYRIA				
Damascus	R. Damascus	—	7390	0244
THAILAND				
Bangkok	R. Bangkok	—	11910	1226
TURKEY				
Ankara	R. Ankara	TAS	7285	1700
VIETNAM (North)				
Hanoi	R. Hanoi	—	9840	2330
Hanoi	R. Hanoi	—	11840	2330
VIETNAM (South)				
Saigon	R. Saigon	—	7265	1915

PACIFIC

Location	Name	Call	Kc.	EST
AUSTRALIA				
Melbourne	R. Australia	—	9570	0100
Melbourne	R. Australia	—	11710	0100
Melbourne	R. Australia	—	15220	2000
Melbourne	R. Australia	—	15664	1035
Melbourne	R. Australia	—	17840	2000
Perth	Austr. BC	VLX9	9610	0800
Perth	Austr. BC	—	9780	0730
Perth	Austr. BC	VLX1S	15425	2300
FIJI				
Suva	Fiji BC	VRH8	3284	0300
GILBERT & ELLIS IS.				
Tarawa	V. of Tarawa	VTW2	6055	2330
NEW CALEDONIA				
Noumea	R. Noumea	—	7170	1400
NEW ZEALAND				
Wellington	R. New Zealand	—	9410	1310
Wellington	R. New Zealand	ZL2	9540	0310

WHITE'S RADIO LOG

Location	Name	Call	Kc.	EST
Wellington	R. New Zealand	ZL1	11780	0300
SOLOMON ISLANDS				
Honiara	Solomin I. BC	VQO3	3995	0422
TAHITI				
Papeete	R. Tahiti	—	11825	2230

NORTH AMERICA

CANADA				
Montreal, Que.	R. Canada	CKNA	5970	0215
Montreal, Que.	R. Canada	CKLP	9585	1800
Montreal, Que.	R. Canada	CKYU	9625	0215
Montreal, Que.	R. Canada	CKLO	9630	0100
Montreal, Que.	R. Canada	CKRA	11760	1800
Montreal, Que.	R. Canada	CKCX	15190	1800
Montreal, Que.	R. Canada	CKCS	15320	0600
Montreal, Que.	R. Canada	CKNC	17820	0600
Toronto, Ont.	Rogers Radio BC	CFRX	6070	2045
UNITED STATES OF AMERICA				
Dixon, Calif.	V. of America	—	9697	1100
New York, N. Y.	R. N.Y. Worldwide	WRUL	11940	1315
New York, N. Y.	R. N.Y. Worldwide	WRUL	15440	1300
Red Lion, Pa.	WINB	WINB	11795	1630
San Francisco, Calif.	V. of Friendship	KGEI	15240	2045
San Francisco, Calif.	V. of Friendship	KGEI	11710	2130

CENTRAL AMERICA AND CARIBBEAN

BRITISH HONDURAS				
Belize	Brit. Hond. BC	—	3300	2100
COSTA RICA				
San Jose	Faro del Caribe	TIFC	9881	2345
San Jose	R. Periodico Reloj	—	6025	1842
San Jose	V. de la Victor	TIRICA	9615	2000
San Jose	R. Monumental	TIGPH	6215	0100
CUBA				
Havana	R. Havana	—	6060	2100
Havana	R. Havana	—	9675	1700
Havana	R. Havana	—	11760	0630
Havana	R. Havana	—	11865	1700
Havana	R. Havana	—	15135	1630
Havana	R. Havana	—	15155	1400
DOMINICAN REPUBLIC				
Santiago	R. Hit Musical	HIDA	3368	2000
Santiago	R. Santiago	HIAZ	3395	0121
Santo Domingo	Onda Musical	HIAS	3350	2130
Santo Domingo	R. Commercial	HIJP	4883	2300
Santo Domingo	R. HIG	HIG	9485	2130
Romana (La)	Voz de Papagayo	HIBB	5045	2100
EL SALVADOR				
San Salvador	R. Nacional	YSS	6010	2000
San Salvador	R. Nacional	YSS	9550	2000
GUATEMALA				
Flores	R. Tikal	TGRT	6200	2210
Guatemala City	V. de Guat.	TGWB	6180	1900
Puerto Barrios	R. Norte	—	11699	1800
HAITI				
Cap Hatien	V. Evangelique	4VSO	2450	0530
Cap Hatien	V. Evangelique	4VE	6120	1400
Cap Hatien	V. Evangelique	4VEH	9770	0530
Cap Hatien	V. Evangelique	4VEJ	11835	1400
Port-au-Prince	R. Comerce	4VB	5985	1815
Port-au-Prince	R. Comerce	4VC	9540	1815
HONDURAS				
La Ceila	R. Luz	—	4890	1745
Tegucigalpa	V. de Suyapa	HRUS	4930	2208
MARTINIQUE				
Fort de France	R. Martinique	—	3315	2030
MEXICO				
Chipas	R. Tapachula	XETS	6120	2330
Ci. Mante	R. XECM/XECMT	XECMT	6090	1700
Hermosillo	R. Univ. de Herm.	XEUDS	6115	2200
Mexico City	La Hora Exacta	XETT	9555	0940
Mexico City	R. Comerciales	XEHH	11880	1630
Mexico City	R. Comerciales	XERR	15110	1715
Mexico City	R. XEMC/XESC	XESC	15205	1730
Sonora	R. Univ. de Sonora	XEUDS	6140	1200

Location	Name	Call	Kc.	EST
NICARAGUA				
Somoto	Servicio del Radio	YNJM	6200	1830

SOUTH AMERICA

ARGENTINA				
Buenos Aires	RAE	LRI1	6090	1400
Buenos Aires	RAE	LRA32	9690	1900
Buenos Aires	RAE	—	11710	1800
Buenos Aires	RAE	LRI2	11780	1400
BOLIVIA				
La Paz	R. Antiplano	—	5046	1800
BRAZIL				
Fortaleza	R. Iracema	ZYH27	4815	1945
Mato Grasso	R. Soc. Triangulo	—	11952	2300
Maunas	R. do Amazonas	—	17795	0600
Rio de Janero	R. Nacional	PRL7	9720	2000
Rio de Janero	R. Nacional	—	11795	2000
Sao Jose	R. Univ. Santos Dumont	ZYR232	17725	1800
Sao Luiz	R. Timbira	ZYV9	4975	0200
Sao Paulo	R. Bandeirantes	ZYR78	11925	1800
Sao Paulo	R. Cultura	—	17815	0900
CHILE				
Santiago	R. Liberdad	CE604	6040	2015
Santiago	R. Nuevo Mundo	CE1174	11740	2130
Santiago	R. Pres. Balmaceda	CE960	9598	1800
Santiago	R. Yungay	CE965	9650	0600
COLOMBIA				
Popayan	V. del Rio Cauca	HJED	6146	2100
Villavicencio	R. Villavicencio	—	4870	2340
ECUADOR				
Esmereldas	R. Iris	HCDY4	3945	2340
Guayaquil	R. el Mundo	HCBJ2	4750	2130
Machala	R. Via	—	4725	2300
Quito	E. Gran Colombia	HCMJ1	4910	2300
Quito	R. Nacional	HCXZ1	4940	1745
Quito	R. Nac. Espejo	HCWE1	4880	2300
Quito	V. de los Andes	HCJB	6050	0430
San Jose	V. del Rio Chimbo	HCMZ6	4875	0645
FRENCH GUIANA				
Cayenne	R.-TV Francaise	—	6170	1915
PARAGUAY				
Asuncion	R. Encarnacion	ZPA5	11940	1600
Villarrica	R. Guaira	ZPA6	5975	0800
PERU				
Chiclayo	R. Dekar	OAX1A	6700	1800
Cuzco	R. Tahuantisuvo	OAX7C	6265	2315
Huamanga	R. Huancavelica	OAX5U	4815	0000
Iquitos	R. Loreto	OAX8F	9500	2200
Juliaca	R. El Sol	O8X7D	3230	0158
La Oroya	R. Minerva	OAZ4E	6205	1845
Lima	R. La Cronica	OAX4J	9390	1921
Lima	R. Nacional	OAX4R	9562	0720
Lima	R. Nacional	OAX4T	15150	1400
SURINAM				
Paramaribo	R. Surinam	PZC	15462	2000
VENEZUELA				
Caracas	R. Rumbos	YVLK	11975	0100
Caracas	R. Tropical	YVKP	4870	2320
Tovar	R. Tovar	YVPM	3365	0525

"Got his first QSL card . . . from nine blocks down the street."

5 Ways to Label Your Equipment

(Continued from page 58)

you have to look far (and spend a premium price) to find variety of size, color or lettering style.

Decals are notoriously delicate, both during application and during use. In addition they reflect light, which can make them hard to read and can easily ruin an otherwise perfect photograph. However, there is no denying that decals, sold by every radio supply store, are presently the most popular experimenters' labelling method, and are entirely satisfactory for many uses.

White-Ink Labelling. Lastly, and leastly, we have the white-ink method. Since a large variety of amateur and surplus equipment comes in black, gray, or olive-drab cases, white is the appropriate color for labelling. A quick, inexpensive, easy way to label this equipment is with the use of plain white ink, available at any dime store. This is the white ink used to label black pages in photo albums. Often supplied with a small special-nib pen, the ink can be used for labelling all kinds of equipment.

The biggest advantage of this method is that you are completely free to use any style or size letters or designs that suit your fancy. With the proper attention to keeping the pen-nib clean, you'll be surprised to find how many fancy "labels" you can make for 25 cents.

You may find use for more than one of these labelling techniques on a single piece of equipment. If so, give them a try and you'll be able to judge which ones to use on your next project. ■

"What was it that you were soldering?"

6 & 2 Meter Roundup

(Continued from page 132)

will shortly bring 6- and 2-meter ham transceivers.

Write to these manufacturers for further details and be sure to mention RADIO-TV EXPERIMENTER:

Clegg Laboratories
475 Watchung Avenue
Watchung, N. J.

Gonset, Inc.
1515 South Manchester Ave.
Anaheim, Calif. 92803

Heath Company
Benton Harbor, Mich.

Lafayette Radio
P.O. Box 10
Syosset, L. I., N. Y. 11791

Olson Electronics, Inc.
384 South Forge St.
Akron, Ohio 44308

Polytronics Laboratories
88 Clinton Rd.
W. Caldwell, N. J. 07007

Utica Communications Corp.
2917 West Irving Park Rd.
Chicago, Ill. 60618

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60 TO 180 POWER! Famous Mt. Palomar Type! An Unusual Buy! See the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, phases of Venus. Equatorial Mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f/10 mirror. Telescope equipped with a 60X eyepiece and a mounted Barlow Lens. Optical Finder Telescope included. Hardwood, portable tripod. FREE with Scope: Valuable STAR CHART plus 272-page "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.

Stock No. 85,050-HP ..... **$29.95 Postpaid**

4¼" Reflecting Telescope—up to 225 Power

Stock No. 85,105-HP ..... **$79.50 F.O.B.**

Intriguing Low-Cost Moon Model

Exciting outer space display and conversation piece. Exact replica. 30,000 formations—peaks, craters, Ocean of Storms, etc.—all in relief. Scaled to size. Accurate distance relationships. Proper lighting shows moon phase; "black light" produces startling effects. Tough, washable plastic. Three colors. Far side blank—can be used for space data. Excellent gift item. 12" dia., wt. ¾ lb.

Stock No. 70,515-HP ..... **$12.50 Postpaid**

'FISH' WITH A MAGNET

Go Treasure Hunting On The Bottom

Great idea! Fascinating fun and sometimes tremendously profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle, all kinds of 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. Order now and try this new sport.

Stock No. 70,571-HP 5-lb. Magnet ..... **$12.50 Postpaid**
Stock No. 70,570-HP 3½ lb. Lifts 40 lbs. ..... **$8.75 Postpaid**
Stock No. 70,572-HP 7½ lb. Lifts 175 lbs. .. **$18.75 Postpaid**
Stock No. 85,152-HP 15 lb. size lifts over 350 lbs. $33.60 FOB

MAKE YOUR OWN POWERFUL ASTRONOMICAL TELESCOPE

Grind Your Own Astronomical Mirror

Kits contain mirror blank, tool, abrasives, diagonal mirror and eyepiece lenses. You build instruments ranging in value from $75.00 to hundreds of dollars.

Stock No.	Diam.	Mirror Thickness	Price	
70,003-HP	4¼"	¾"	$ 7.50	ppd.
70,004-HP	6"	1"	11.95	ppd.
70,005-HP	8"	1⅜"	19.50	ppd.
70,006-HP	10"	1¾"	30.75	f.o.b.
70,007-HP	12½"	2⅛"	59.95	Barrington

WAR SURPLUS ELECTRIC GENERATOR

Brand-new Signal Corps Generator for endless experiments, electrical users, demonstrations. Generates up to 90 volts by turning crank. Use in high impedance relays. Ring bells. Or charge ground and bring up night crawlers for fishing bait. Has 2 Alnico Magnets. Wt. 2 lbs. Cost to Govt. $15.00.

Stock No. 50,225-HP .... **$6.95 Postpaid**

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Stock No. 50,365-HP ... **$11.95 Postpaid**

HIGH-VOLTAGE, LOW-AMPERAGE VAN DE GRAF TYPE ELECTROSTATIC GENERATOR

Volt potential—200,000, yet completely safe for classroom experiments. Demonstrate lightning and how lightning rods work; St. Elmo's fire; repulsion of like charges; electrostatic dust collections; the classic "hair-raising effect"; many other electric phenomena. Motor, 110V, 60-cycle, AC. Humidity range, 0-90%. Current, 1.5 to 2.5 microamps. Aluminum base, frame and charge collector. Insulating column—unbreakable vinyl chloride plastic. Ht. 17". Dia. 6¾". Full instructions on experiments and care.

Stock No. 70,264-HP ..... **$39.50 Postpaid**

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Dozens of practical applications for this low-priced photoelectric kit. Make a photoelectric counter for entrance ways or conveyor belts, light-actuated door opener, lightmeter, transmitter power output indicator, countless circuit designs possible. Includes: 3/T-4 CdS photoconductors (¼" diam x ½" lg.), mounting bracket, Sigma AC-DC relay (2 amps resistive load), 22K-Ohm, 1-watt resistor and a 52-page booklet defining 10 different projects.

Stock No. 60,441-HP ..... **$10.45 Ppd.**

BRILLIANT ELECTRONIC FLASH TUBES FOR PHOTOGRAPHERS & MECHANICS

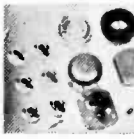
Time your car ignition, use for photo flash, signal light, control device or as strobe light. These flash tubes, filled with Xenon gas, have glass envelopes with sealed electrode at each end. Mfd. by G. E. Instructions incl.

Low voltage tube for low energy repetitive flash applications. Operates on an anode between 120- and 500-V., 2-4/8" lg. x ¼" diam. For ignition timing, uses 130-V. with 30 mfd. discharge capacitor, 4-sec. av. flash rate, 20-hr. approx. life.

STOCK NO. 40,725-HP ..... **$5.20 Ppd.**

Portable photo equipment applications in covered reflectors or housings protecting user from contact with high voltage. Low operating voltage (400- to 550-V.) well suited for use with electrolytic type capacitors. 2⅛" high x ¾" diam., mounted on a 1-3/8" diam. x 1/16" thick wafer base designed to be crimped into a reflector. Three pins serve as soldering terminals. Typical photo flash application uses 450-V. on the anode with 1050 mfd. capacitance, 4200 lumen-sec output, peak lumen output 4 x 106, 2 min. flash rate.

STOCK NO. 40,726-HP ..... **$9.00 Ppd.**



ELECTRIC DISCOVERY KIT

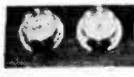
Electric circuits, easily set up for practical operation demonstrations. Kit includes: 6 miniature receptacles, 10 miniature lamps, 1 double coil bell with high grade magnet wire coil, 38' red insulated #18 B&S wire, 38' white insulated B&S wire, single pole switch, double pole switch, double battery holder.

Stock No. 90,052-HP ..... **$6.25 Postpaid**

RUGGED, LOW-PRICED EXPERIMENTAL ELECTRO-MAGNET

Hobbyists, instructors and industrial lab men will find this well-built Electro-Magnet invaluable. Demonstrate principles of electro-magnetism. Actually lifts 100 lbs. when powered by a single 1½V flashlight battery. Easily deactivated. Includes instructions for 6 experiments—lifting power, magnetic flux and magnetomotive force, air gap, area of contact, retentivity and field configuration. Unit includes magnet and yoke assembly, battery holder, leads, clips and eyebolts. Steel core and yoke precision ground for max. flatness. About 2½" dia. x 4½" lg. Wt. 2 lbs.

Stock No. 60,435-HP ..... **$10.00 Postpaid**



HOME WEATHER STATION

New "Weather Station" is highly sensitive to weather changes. Consistently accurate thermometer to ±2%; barometer accurate to ±.25" and hygrometer to ±5%. Foretells weather changes from 12 to 24 hours in advance. Hygrometer calibrated in percent relative humidity. Excellent for teaching weather phenomena and meterological hobby work. Instrument mounted on handsome wood-grained wall panel 15½" x 5¾". Meter cases heavily metallized—combines beauty and protection. Dials, in etched aluminum, of high precision. Full instructions.

Stock No. 70,607-HP ..... **$9.95 Postpaid**

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APR.-MAY RADIO-TV EXPERIMENTER

Amaze your friends with Black Light wizardry. 110-V Black Light Fixture Kit includes 6-watt filter-type black light bulb, bulb starter, starter switch, pair of 2-pronged clips, line cord, 2 wire nuts for splicing wires, complete instructions for assembly.

Stock No. 70,587-HP .... **$5.25 Postpaid**

Complete Magic Glow Kit includes Fixture Kit above, plus stand, invisible water paints and ink, fluorescent crayon, tracer powder, pen, 3 brushes, specimens of fluorescent rocks: wernerite from Canada, fluorite from England, willemite from U.S.

Stock No. 70,256-HP ..... **$11.95 Postpaid**

Terrific Buy! American Made! OPAQUE PROJECTOR

Projects illustrations up to 3" x 3½" and enlarges them to 35" x 30" if screen is 6½ ft. from projector; larger pictures if screen is further away. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt, A.C. current, 6-ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4½" wide. Weight 1 lb., 2 oz. Plastic case with built-in handle.

Stock No. 70,199-HP ..... **$7.95 Postpaid**

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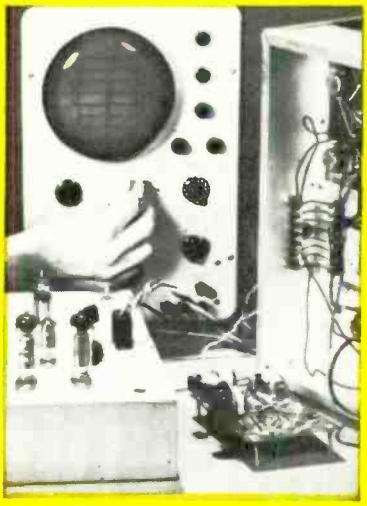

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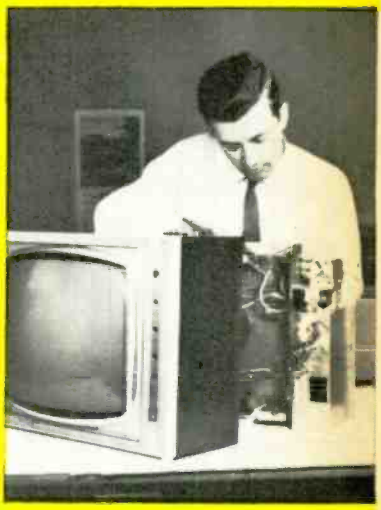

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Want to earn $3 to $5 an hour in spare time? Want your own part-time or full-time business? In Radio-TV Servicing you learn to install, maintain, service radios, TV sets, hi-fi and stereo, other home Electronics equipment. In your training are eight training kits, including this complete, modern, slim-line TV receiver. You build it yourself, become familiar with components and circuits, learn servicing procedures . . . and earn extra money as you train. National Radio Institute, Washington, D.C.

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