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	1DN5	.55		6AX4	.66		6SH7	1.02		12D4	.69
	1G3	.79		6AX5	.74		6SJ7	.88		12DE8	.83
	1J3	.79		6BA6	.50		6SK7GT	.95		12DL8	.88
	1K3	.79		6BC5	.61		6SL7GT	.84		12DQ6	1.04
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	3AL5	.46		6BJ6	.65		6W4	.61		12ED5	.62
	3AU6	.54		6BJ7	.79		6W6	.71		12EG6	.62
	3AV6	.42		6BK7	.85		6X4	.41		12EK6	.62
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5V6	.56	6EA8	.79	12AX4	.67	25CU6	1.11	
5X8	.82	6EB5	.73	12AX7	.63	25DN6	1.42	
5Y3	.46	6EB8	.94	12AY7	1.44	25EH5	.55	
6AB4	.46	6EM5	.77	12AZ7	.86	25L6	.57	
6AC7	.96	6EM7	.82	12B4	.68	25W4	.68	
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6AH4	.81	6EW6	.57	12BF6	.60	35L6	.60	
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6AQ5	.53	6GK5	.61	12BR7	.74	50C5	.53	
6AS5	.60	6GK6	.79	12BV7	.76	50EH5	.55	
6AT6	.49	6GN8	.94	12BY7	.77	50L6	.61	
6AT8	.86	6H6	.58	12BZ7	.86	70L7	.97	
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6AU6	.52	6J6	.71	12CR6	.67	807	.75	

RADIO-TV EXPERIMENTER

JUNE-JULY 1964

Cover Photo by Don Lothrop

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Heating & Air Conditioning with Drawing
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Sales Management
Salesmanship
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Welding Processes

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Spinning
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JUNE-JULY 1964
VOLUME 16 No. 3

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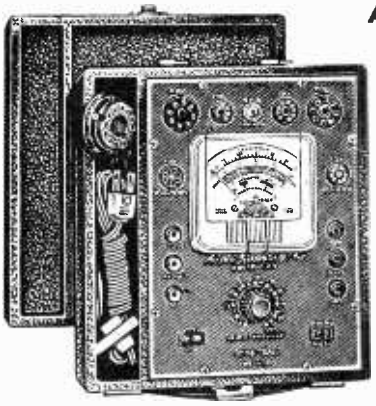
New Model 161 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES



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, (Both 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.

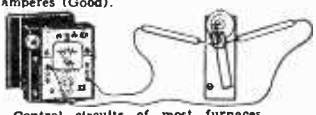
As an Automotive Tester the Model 161 will test:

• 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.

IT'S SO EASY!!

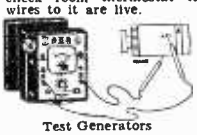
With tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good).

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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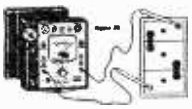

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This 56-page-book—practically a condensed course in electricity. Learn by doing.

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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.

Model 161 comes complete with above book and test leads. Only **$22.50**

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POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor
WA2CQL/2W5115

VIDEO HOME TAPE RECORDERS are coming of age. Considerable research has been done to date and the results are very favorable. Since the announcement of the proposed Telcan video recorder, two new organizations have hopped on the band wagon and are preparing to show off their newly developed home video recording systems in the near future.

The IIT Research Center of the Illinois Institute of Technology has under development a recorder they hope will tape a full hour TV program on a 7-inch reel of standard ¼-inch-wide audio tape. The IIT designers believe their unit overcomes the basic weakness of Telcan—its enormous appetite for tape and the high speed transport. IIT is not divulging any secrets and refuses to tell whether the recording system uses an electron scanning technique or magnetic recording heads like your home audio tape recorder. However, considering IIT competence in the field—they hold most basic tape recording patents—you can believe their claims that the unit under development will meet their stated specs plus the price will be less than presently proposed models.

Fairchild Camera & Instrument Corp. is planning to demonstrate its proposed home video tape recorder to TV set manufacturers any day now. The consumer version of the video recorder will sell for under $300—it was estimated. In addition to the home model, Fairchild plans to market a low-cost industrial-commercial-educational video recorder priced between $4000-$5000. Fairchild is also interested in developing a home TV camera companion to the home video recorder model. Volume production of such units using vidicon camera tubes may drop the price of the camera to about $150. Fairchild, like IIT, is keeping a tight lip on specifications.

(Continued on page 10)

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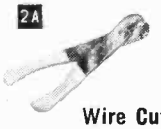

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4

Tube Checker with leads ONLY **$1.69**

Tests radio and TV tubes, and continuity of coils, appliances, etc. With leads. 117 v. 60 cy. A.C. 1 lb. No. 39 A 390.

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5A

Ceramic Disc Capacitors 40 for **98¢**

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6

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SAVE on rectifiers made by Sylvania to military specs. Rated 750 ma at 100 v. PIV. For power supplies, TV sets, kits, etc. Pkg. of 2. 3 oz. No. 30 A 669.

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8

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9

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11

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Positive Feedback

(Continued from page 6)

What can you expect in the near future? In 1965 you *will be able* to purchase a home TV tape recorder plus a TV camera for recording family scenes. Recorder price for the cheapest model will be about $300 and it will be incorporated into a black and white TV receiver. Camera price will be under $200 and the device will play directly into the video recorder or any TV set for direct viewing. This is all an educated guess by your editor. Let's wait for 1965 to prove me right or wrong.

In this issue. Your editor believes that one of the major reasons many CB'ers have not switched over to the ham bands is the amateur license code requirement. Copying 13 words per minute accurately for one minute is an easy task once you have mastered the code. Unfortunately, too many people find it difficult to self-teach code. To make the job easier, several code training courses have been recorded on discs and tapes so that the student can learn and practice in his own home alone.

In this issue there are two articles of interest that can help you learn the International Morse Code, both sending and receiving. On page 45 you will find a round-up code training courses that are currently available, what they cost, what they have to offer, and where you can get them. Then, on page 49, you will find the complete plans for building the Sight-n-Sound code practice oscillator. Your editor is hoping that this *one-two* article combination will help many a CB'er win his ham ticket and enjoy the many privileges of amateur radio.

Hard-to-get Q. In our February-March issue of RADIO-TV EXPERIMENTER the plans for the FM Pocket Mike called for an RF oscillator transistor, type 2N1748A. This Philco unit is very hard to obtain because of the sudden large demand for the part, and to make matters worse, Philco is no longer making this type. So if you are having trouble picking up the 2N1748A, try either the 2N502A or 2N1177 types. These transistor types have been tried in constructed units and work equally as well. The 2N1177 has an extra lead which should be connected to the junction of C4 and R6. This extra lead is the case shield connection.

An error occurs in the part list. R6 is listed as an 50-ohm resistor when it should be listed

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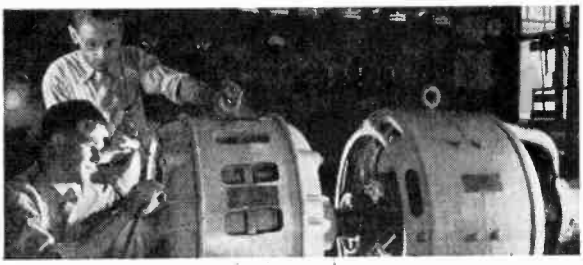

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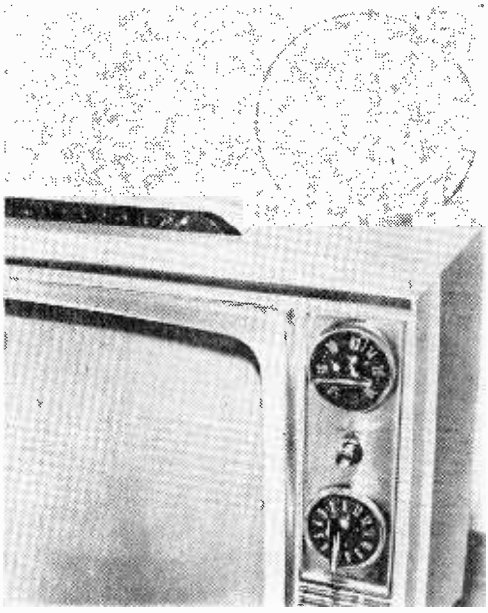
Positive Feedback

as an 510-ohm unit. The schematic diagram is correctly drawn and labeled.

UHF TV. The biggest change in television since the introduction of color has gone into effect April 30 of this year. Federal legislation requires that all TV sets manufactured after April 30 for shipment interstate must be equipped to receive the 70 UHF channels numbered 14 through 83. All this means that an UHF tuner will be added to your TV set at a slight extra cost. If you live in an area where UHF stations exist, the extra cost is no burden. But what if your new set cannot pull in an UHF station? Don't fret! Long before that new set is destined to be scrapped UHF stations will be popping up so fast that you may be pulling in two or more stations.



Here is a close-up view of the channel selector knobs on RCA Victor's portable "Jaunty" model. The regular VHF controls operate the same as present models, the only change being the addition of a position marked "U" on the regular channel selector knob. The other channel selector knob (top) is for UHF. The UHF knob does not click but instead dials similar to a radio. Circular metal loop at rear of the TV cabinet is an all-band UHF antenna.

There are already more than 110 UHF stations in the United States, and more than 525 VHF stations. But the VHF spectrum has room for only about 125 and these can-

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

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

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

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

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

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FROM OUR MAIL BAG

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

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

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

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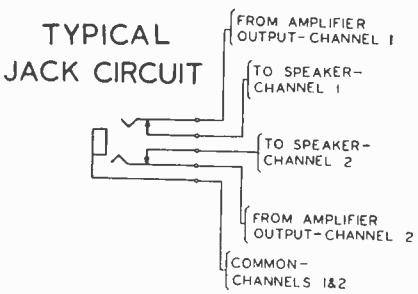
Positive Feedback

not be erected in the regions that need them because of over crowding. The UHF spectrum can accommodate about 3000 new TV stations. Hence, small communities can look forward to their very own home town station, and viewers all over America can expect a much larger choice of TV stations to watch in the future.

Radio and TV Service Poop. The electronics experimenter who may repair an occasional radio or TV set, can now obtain the set's schematic diagram and service data for only *one dollar*. Prompt service by return mail is promised by Supreme Publications, 1760 Balsam Road, Highland Park, Illinois and the cost is a lot less than buying a manual or a pack of unneeded extra material. What's more, here is a source for data on antique radios, and sets of manufacturers long out of business. Supreme Publications supplies the information you request from its own radio and TV volumes, as well as manuals of other publishers kept on hand. So don't give up on those old sets until you have checked with Supreme.

Stereo Headset Connection. A few readers have asked for information on how to connect a stereo headset jack to their old but still serviceable stereo amplifier. The task has been made quite simple by the introduction of Switchcraft's stereo *Littel-Jax* (Part No.



Hook-up details for the stereo Littel-Jax.

14B), a three conductor jack specially designed for switching-out speakers when connecting stereo headphones. Dual, normally-closed switch contacts, open both stereo circuits independently when a three conductor plug is inserted. This new stereo jack is ideally suited for innumerable stereo applications, such as record players, FM/AM multiplex tuners, sound recording equipment, and tape recorders. The *Littel-Jax* 14B mates with

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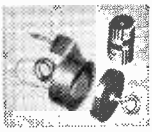

Hobbyists, instructors and industrial lab men will find this well-built Electro-Magnet invaluable. Demonstrate principles of electro-magnetism. Actually lifts 100 lbs. when powered by a single 1½V flashlight battery. Easily deactivated. Includes instructions for 6 experiments—lifting power, magnetic 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.

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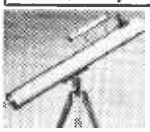

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Great idea! Fascinating fun and sometimes tremendously profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle, all kinds 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.

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standard Switchcraft *Littel-Plugs*, such as Part Nos. 260, 267, 269 and 297. Most electronic part houses stock Switchcraft parts. To be sure your regular parts supplier does so, check the Manufacturers Index at the back of his catalog. The list price for the *Littel-Jax* 14B jack is $.95.

CB kit. In case you would like to know what an editor does in his spare time, it's building kits. The Knight-kit C-555 Citizens Band transceiver was one of the several kits put together during the past two months. The receiver section uses a superhet circuit; oscillator/mixer stage, IF stage, audio driver, and audio output stage. In the transmitter circuit, the audio driver and audio output stages serve to modulate the transistor RF oscillator stage. Completely transistorized, the unit is battery operated.

Knight-Kit C-555 Walkie Talkie

The pocket rig takes about an evening to assemble—the printed circuit board makes assembly almost fool proof. Only a careless wirer sloppy with a soldering iron can possibly prevent this kit from working once completed. Two were put together at the same time and both worked when first turned on. Some alignment was necessary to obtain optimum operation, however the instructions given in step-by-step fashion can guide the inexperienced kit builder to success. Price of *kit* with *crystals* is $21.90. Only one complaint can be registered—the transmit button may need a drop of cement to hold it in place after one week's use. More information can be had by looking at the page facing page 1 in the Allied Radio 1964 catalog #230B.

Home Electrician. If you have to call an electrician every time a fuse blows or a switch fails, then the new ELECTRICAL HANDBOOK is for you. Inside this valuable handbook you'll find information on repairing just about everything that plugs into an AC outlet and the outlet, too. The first electrician's bill you avoid will pay for the handbook, parts, and tickets to a movie for you and the Mrs. See your local newsstand. ■

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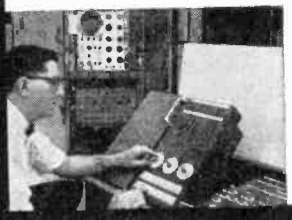

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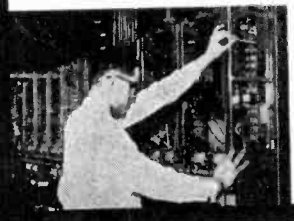

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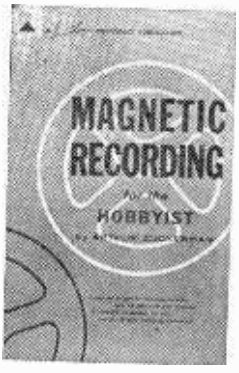
BOOKMARK
by Bookworm

SOME very fine books were published since you last read this column and your ol' Bookworm had to make some difficult eliminations to boil down the stack to the best in each subject group. In order to conserve space and offer more reviews each issue, some changes have been made. All the publishers' addresses are now listed at the end of this column. Also, some of the data pertaining to individual books are given along side the photo of the book cover. That's all that was done. The Bookmark column still remains unchanged in spirit as you will tell by reading on.

Audio. There are two interesting books worth hooting about in the audio field—one is brand new and the other is an old volume that has been revised and brought up-to-date.

Let's take the newcomer first—*Magnetic Recording for the Hobbyist* by *Arthur Zuckerman*—a name familiar to the reader of RADIO-TV EXPERIMENTER. This book is concerned primarily with tape recording as a hobby—a hobby that can be as serious or as casual as you care to make it. The author shares his many tricks and broad knowledge of tape recording techniques with you in an informal and valuable guide to numerous types of recordings and how each is made. Besides building up a library of recordings from records, and radio and TV programs, the author tells you how to record special sound effects, "candid" voices, and "voice" letters. Add to these, tips on tape editing, producing your own program, synchronizing sound on tape, and tape and recorder maintenance and you come up with a volume that should be set beside every home tape recorder. A *Howard W. Sams & Co., Inc.* publication.



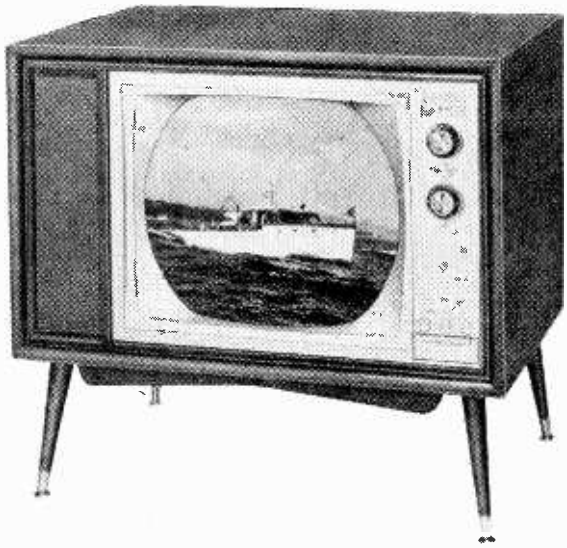
128 pages
Soft cover
$2.50

The other big-buy in audio books this month is *Hi-Fi Stereo for Your Home* by *Arthur Whitman*—a revised edition of an old standby that beginners first enjoying the fruits of high fidelity should read. In straightforward, simple language the author tells you all you need to know about stereo. In this text you quickly learn the meaning of such words as woofer, tweeter, coaxial—words used by audiophiles and hi-fi magazines repeatedly. Among the many points covered, you get the latest word on how stereo affects home listening habits, acoustics and decor, the training of children in the care and use of stereo equipment, and suggestions for building of a fine recording library. A *Cornerstone Library* publication.

160 pages
Soft cover
$1.00

SWL Delight. Year by year the famous *World Radio-TV Handbook* by *Olaf Lund-Johansen* is getting thicker and thicker. The *18th Edition* contains 20 more information-packed pages than the 1963 edition. This handbook is the only comprehensive publication of its kind—containing all broadcast schedules, frequencies, powers, programming, station personnel, mailing addresses, etc., of every known short-wave broadcasting station—including those behind the Iron Curtain. In addition to the scheduling information, the *18th Edition* features numerous articles by well-known personalities in the field of broadcasting. Details on television, number of listeners, frequency bands, sunspot cycle, interference and jamming, clubs, world times, projected plans for the broadcasting of the Tokyo Olympic Games, are

New 1964 Heathkit® All-Channel* Color TV



GR-53A
$399.00
(Includes chassis, all tubes, VHF & UHF tuners, mask, mounting kit, & special speaker)
Optional cabinet $49.00

Everything you need for the best in color TV viewing-Build it in 25 hours-Save hundreds of dollars!

***FCC Requires UHF As Of April 30!** A new Federal law requires that all TV sets built or imported after April 30, 1964 be equipped to receive *all* VHF & UHF channels, 2 thru 83.

As a result, Heathkit now offers you a *new* model consisting of chassis, tubes, mask; a *new* wall mount; a *new* all-transistor UHF tuner; and a special 6" x 9" speaker ... everything for complete high fidelity *all-channel color* and *black & white* TV reception for only $399!

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Quality & Performance Comparable To Sets Costing $600 & More! • 26 tube, 8 diode circuit • Deluxe Standard-Kollsman nuvistor tuner with "push-to-tune" fine tuning • RCA 70° 21" color tube with anti-glare bonded safety glass • 24,000 volt regulated picture power • Automatic color control & gated AGC • 3-stage high gain video I. F. • Line thermistor & thermal circuit breaker protection.

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GRA-53A-1, walnut-finish cabinet, 70 lbs.....$49.00

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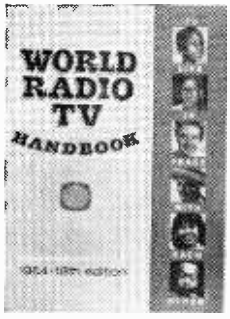
BOOKMARK

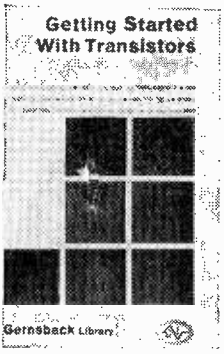
but a small part of the *18th Edition*. No one listening to the short-wave bands will want to be without this extraordinary book distributed by *Gilfer Associates* in the United States.



266 pages
Soft cover
$3.50 postpaid

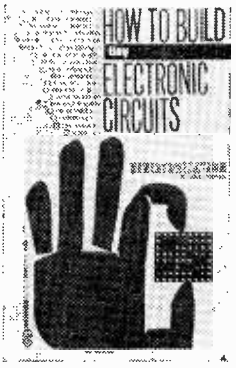
Semiconductors. Two very good new books on semiconductors, one of which should fit into your present experimenting plans.

The first one is *Getting Started With Transistors* by *Louis E. Garner, Jr.*—another RADIO-TV EXPERIMENTER author This basic text rates a *must* by the ol' Bookworm. The author uses straight-from-the-shoulder talk to bring the beginner up-to-date on transistors. He kicks off with a rundown on how transistors came about. Then you learn how to read electronic road maps—schematics—and then you are ready to learn about transistors and how they work. The author even goes into how transistors are made and how to identify them. The most interesting feature about the book is how the author combines words and diagrams to raise the readers knowledge to the experimenter's level. A *Gernsback Library* publication.



160 pages
Soft cover
$3.95

The second text is listed as a semiconductor volume by the ol' Bookworm even though there are a few scattered mentions of vacuum tubes in the text. The book is *How To Build Tiny Electronic Circuits* by *Morris Moses* and you must admit that subminiature circuits are 99⁴¹⁄₁₀₀% semiconductors. In this text the author gives you a practical approach to miniaturization. You get building shortcuts, information on components, techniques to use, plus an interesting assortment of projects. It was the chapter on Practical Miniature Projects that caught this ol' Bookworm's eye. Here is a partial list of projects: "Aspirin-Box" amplifier, meter extender, RF relay, matchbox code practice oscillator, transistor organ, sine-wave clipper, comparison photocell detector, and many others. This volume belongs on every experimenter's workbench. A *Gernsback Library* publication.



192 pages
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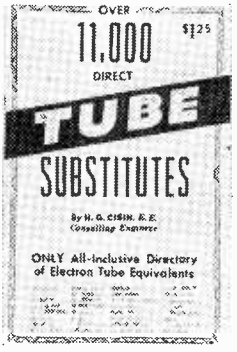

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or EVEN IN YOUR **POCKET** WITH THIS EKERADIO TUNER. DEVELOPED AND SOLD BY EKERADIO SINCE 1947

FEATURES

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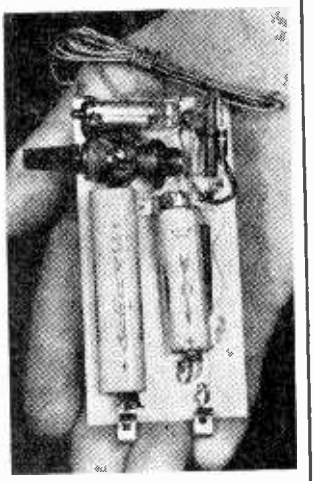

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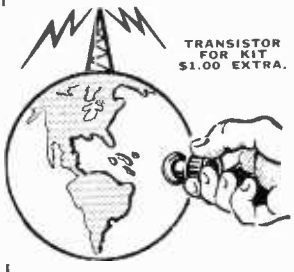
Broadcast tuning coil.	1 drilled plastic chassis.
Oscillator coil.	1 high frequency tube.
Wire for short wave coils.	1 audio transistor.
Hookup wire and ant. lead.	2 special printed circuit plates.
Solder.	1 tuning slug.
4 bolts.	1 tuning knob.
4 nuts.	2 phone clips.
2 battery clips.	1 resistor.
1 coil mounting bracket.	1 sheet of easy to follow instructions.

Double Headset for Beginners or Two Band Kits $2.00 P.P.

WORLD'S SMALLEST TWO BAND RADIO

TUNE IN THE WORLD OF EXCITEMENT WITH THE WORLD'S FIRST THREE STAGE TRANSISTORIZED TWO BAND RADIO KIT FOR ONLY $5.00 FULL PRICE—READ CAREFULLY



This set tunes the broadcast band and a click on the band switch lets you enjoy exciting police calls, ship to shore, aircraft, both commercial and military, amateur phone stations, code and foreign stations from all over the world. (It's the best electronic buy ever offered.) Tunes as many stations as sets costing up to $100.00. Kit includes the following parts: 1 Min-Tube, 1 Min-Tube Socket, 1 Two Band Coil, 1 Band Switch, 1 Battery Switch, 1 Condensers, 2 Resistors, 1 Special Printed Circuit Plate, 2 Phone Clips, 1 Coil Mounting Bracket, 1 Rubber Feet, 1 Antenna Trimmer, 1 Special Ekeradio Electronic Wand, 1 Tuning Knob, Hook-up Wire and a Sheet of Easy to Follow Instructions. (Note: this set can use a 722 or 107 transistor not furnished with the kit.) Batteries available everywhere, for use with Magnetic Headphones from 1,000 to 8,000 ohms. See above for prices on headphones. This can be mounted on your small board or small plastic box. Send only $5.00, a self-addressed gummed label to facilitate shipping of this fantastic kit, and ten cents in stamps to the address below. If the above instructions are not followed, your order may be delayed several months, so read carefully.

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An F-M tuner for your **CAR, HOME,** and even in your **POCKET** with the matched earpiece (making it a three way set)

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No. 1—Channel 5 T-V sound plus 88 to 108 F-M

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1.—Printed circuit plate as (diode-discriminator)
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This set operates on small batteries available everywhere (no batteries furnished).

Only tools needed—soldering iron, pliers & screwdriver.

THE FACTORY PRICE IS $26.95 FOR THE KIT, the EARPIECE IS $3.00 extra. No C.O.D.

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tubes. Code signals after substitutes indicate whether a tube can be used only in parallel circuits, if tube can be used in circuits having controlled warmup time, if tube is of foreign make, if substitute is as good or better than tube it replaces, or if tube is suggested only as a temporary substitute. A *Harry G. Cisin* publication.

128 pages
Soft cover
$1.50

On the other side of the fence is the new fifth edition of the *Transistor Substitution Handbook*. This newly revised and updated edition lists 4,762 transistor types and direct substitutes. Substitutes were selected on a modern, medium-size electronic computer to minimize the problem of selecting suitable transistor replacements. Other information identifies manufacturers, *npn* and *pnp* polarities, germanium and silicon types, and basing diagram styles. Also included is a section listing suitable replacements for foreign transistors, plus a semiconductor diode cross-reference directory. A *Howard W. Sams & Co., Inc.* publication.

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Howard W. Sams & Co., Inc., Box RTE, 4300 West 62nd Street, Indianapolis 6, Indiana

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We can never fail to mention enough times that this ol' Bookworm can review only a limited number of books in each issue of Radio-TV Experimenter. Therefore, if you wish to learn about other valuable electronic books, send a letter to the publishers asking for catalogs. ■

NEW PRODUCTS

CB Rig with Range Boost

Each year new and wonderful improvements are made to CB set design to squeeze out the maximum possible ground-wave range without increasing power above the legal five watts input. The new Lafayette deluxe transceiver HB-333 has "Range Boost" circuitry, unlike other types, the transmitter maintains full carrier at all times. The modulation density of the audio contained in both sidebands is increased, resulting in higher average audio level (100% modulation). This transmitting system is fully compatible with existing CB receivers without the need for external equipment. Priced at

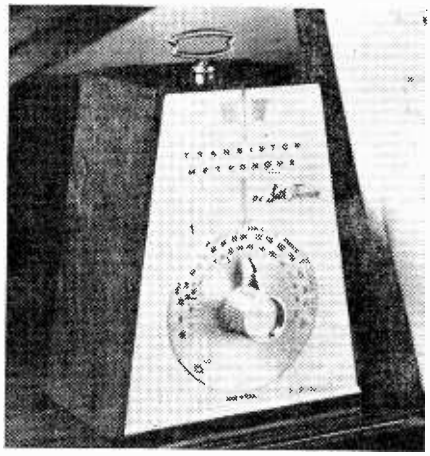
$209.50, the set is a good buy considering you don't have to buy any crystals to operate on any of the 23 channels. Frequency synthesizing is used. The dual conversion receiver also features a sensitivity of better than 0.2 microvolts for 6 db S/N ratio, high selectivity using Nuvistor RF and mixer stages and 12 tuned circuits. In addition, the HB-333 includes AGC, adjustable squelch, variable floating series gate noise limiter, electronic switching and ceramic noise cancelling microphone. *(Lafayette Radio Electronics Corporation, 111 Jericho Turnpike, Syosset, L.I., New York)*

Battery Powered Transistorized Metronome

The first transistor metronome, with all parts American made, has been introduced by

NEW PRODUCTS

Seth Thomas Division of General Time Corporation. This ideal musical gift is complete-



ly portable, since it is cordless and requires no electrical outlet, and operates in any position. Priced at $24.95, the electronic foot stomper has an easy-to-set selector knob with adjustable sound selector and offers a distinctive, precise metronomic click. Classic in design, it is available in select hardwood cases of mahogany or walnut and available at better music shops throughout the country.

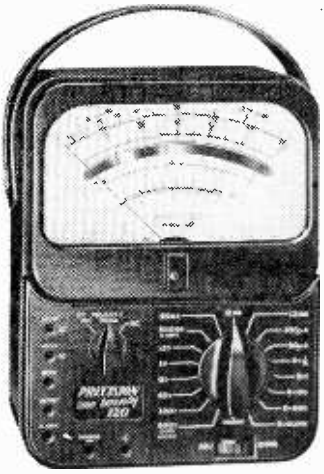
Self-Powered Telephone Amplifier

Burstein-Applebee's self-powered transistorized telephone amplifier allows everyone in a room to hear and speak over a telephone with perfect clarity. A valuable asset and convenience in business offices for local and

distant conference calls, in shops or offices to free hands for other tasks while talking. When in use, the telephone handset is placed on top of the unit like a normal telephone cradle. Automatically the transistor amplifier turns on to provide room volume for everyone to hear. Has extension speaker which must be kept from three to six feet away from handset to avoid acoustical feedback. Priced at $8.88, the telephone amplifier comes complete with battery ready to operate. *(Burstein-Applebee Co., 1012 McGee Street, Kansas City, Mo.)*

Volt-Ohm-Milliammeter with Built-In Meter Protection

Without adding any cost to the consumer's purchasing price, Precision Apparatus—manufacturer of electronic test equipment in kit and wired form—is now including a new built-in meter protection feature at no extra cost in all their Model 120 and 120M VOM's. A specially designed silicon varistor prevents damage to the meters even when subjected to accidental transient overloads of 1,000 times or more. This added protection eliminates burned-out meter movements, bent pointers and other similar damage that can occur when there is a temporary inadvertent overload. The maker believes that their Model 120 VOM is probably the lowest



price professional VOM ($47.95) to have this important feature. *(Precision Apparatus, Inc., Dept. RTE, 80-00 Cooper Avenue, Building #3, Glendale 27, New York)*

Serviceman's Portable VHF-UHF TV Translator

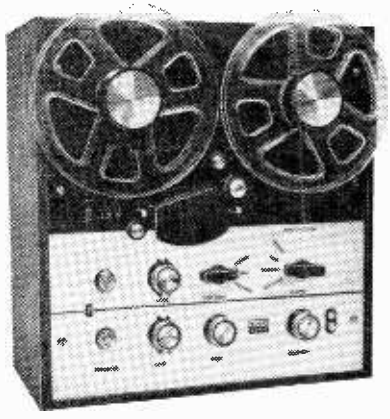
The new Standard Kollsman VHF-UHF TV translator provides UHF television signals when none are available through local telecasting stations. The time-saving instrument is designed for use by the television service

NEW PRODUCTS

technician for servicing all-channel television sets as well as making it possible for the dealer to demonstrate all-channel TV receivers in his show room. The 10-pound portable unit will convert any VHF channel to any UHF channel—black and white as well as color programs. The unit is priced under $100. *(For more details, write to Standard Kollsman Industries, Inc., Dept. 690, 2085 N. Hawthorne Avenue, Melrose Park, Illinois)*

4-Track Tape Deck Kit or Wired

The new EICO compact 4-track stereo and mono recorder-player, Model 2400, incorporating a 3-motor tape transport with elec-



tro-dynamic braking, built to performance and durability standards is now taking its place along side the hi-fi industry's top rated decks. The 22 pound unit is available both

(Continued on page 28)

EXPERIMENTER'S CROSSWORD

ACROSS

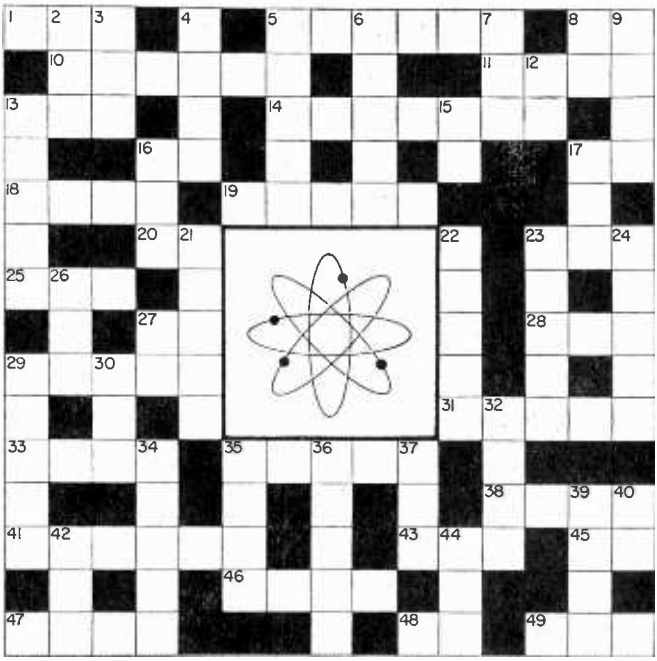
1. Marking on battery.
5. Loudspeaker works on this principle.
8. B.S.___.
10. Circuit disrupter.
11. Vacuum tube element.
13. One who listens to standard broadcasts (abbr.).
14. A(n)_ ____multiplier tube uses secondary emission.
16. Unit of relative power (abbr.).
17. Color TV blue symbol.
18. Gain less than one.
19. Audible phenomenon.
20. Code term.
23. Gain compensating circuit in TV set (abbr.).
25. Interconnected radio stations.
27. One-thousandth of a volt (abbr.).
28. To record from the original source.
29. Found in audio frequency range.
31. Used to observe waveforms.
33. Type of coupling.
35. TV contrast term.
38. Institute of Hi-Fi Manufacturers (abbr.).
41. Might be placed on electrolytic capacitor by peak voltages.
43. A top____is found on most all high-voltage rectifier tubes.
45. Letters symbol for plate resistance.
46. Ionization radiation.
47. Tube connectors.
48. Battery's current (abbr.).
49. Inscription on electrolytic capacitor, near negative terminal (abbr.).

DOWN

2. Generates AC signal (abbr.).
3. One who listens to short wave (abbr.).
4. Matches transmission line to antenna.
5. Platter player.
6. Unit of acoustical absorption.
7. "Again" in ham lingo (backwards)
8. Formula for power.
9. Circulating currents produced by magnetic fields.
12. Letters symbol for load resistor.
13. Antenna matching device.
15. Transmission unit (abbr.).
16. Double silk covered wire (abbr.).
17. Ham operator's key.
21. Propagated periodic disturbances.
22. Product of several volts and a few amperes.
23. Sound.
24. Number of wires within one covering.
26. A very stable oscillator type (abbr.).
29. Units of potential.
30. Either positive or negative electric particle.
32. Temporary connector.
34. Inventor of flat-top array.
35. Method of connecting up controls
36. Electro-mechanical transducer.
37. Spark.
39. Spare, unattached electron.
40. Military unit likely to have communications equipment.
42. Might be caused by maverick signal.
44. Volume stabilizing circuit in radio (abbr.).

The *Experimenter's Crossword* is a simple puzzle provided you allow time to ponder each item. However, set a twelve minute time limit and you'll have to be up on your electronics to finish. Also, do not go back to words you are unsure of until you have gone through all the items first.

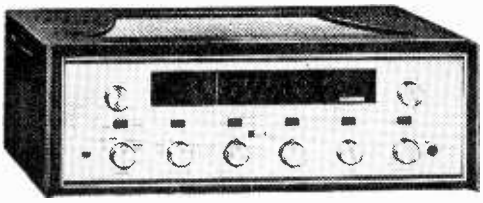
Answers on page 29.



NEW PRODUCTS

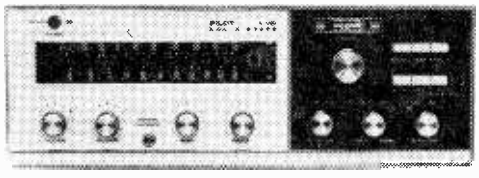
(Continued from page 25)

in kit and wired form, $189.95 and $269.95 respectively. Full record and playback equalization on both 7½ and 3¾ ips tape speeds permits the greatest possible use of the economical lower tape speed. Some operating features worth mentioning are: mixing microphone and line level controls, fast-acting electron-ray level indicators, no pressure pads, precision tape guidance, digital turns counter and automatic end-of-tape stop switch. *(EICO Electronic Instrument Co., Inc., 131-01 39th Avenue, Flushing, New York 11352)*



High Fidelity Stereo Receiver Kit

Among the most popular of high fidelity components these days is the tuner/amplifier combination unit that saves money as well as space without sacrificing sound fidelity. The Knight-kit KN-360 combines in one chassis a stereo FM and FM tuner, a conventional AM tuner, stereo preamplifier with full controls and a 60-watt stereo amplifier for only $249.95. The attractive wood case is extra. All you have to add to the unit is a tape recorder and/or turntable, and speaker system for a complete music system. Specifications are yours for the asking. *(Write to Allied Radio Corporation, 100 N. Western Avenue, Chicago 80, Illinois and mention* RADIO-TV EXPERIMENTER.*)*

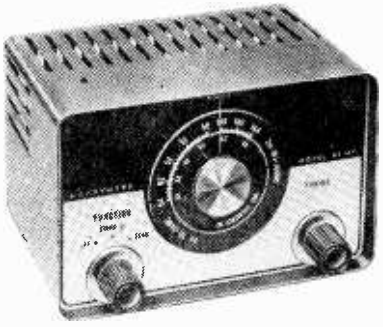


DeLuxe Hi-Fi Stereo Receiver

Pilot Radio has come up with a new deluxe AM/FM/FM-stereo receiver, featuring a 110-watt solid state amplifier that sells for $449.50. The new unit, Pilot R-1000, is equipped with centering tuning meter calibrated for accurate AM and FM tuning, and new speaker selector switches. The FM tuner has a sensitivity of 1.8 microvolts (IHFM) and a capture ratio of one decibel. It also features an automatic FM stereo indicator and four (FM) IF stages. The transistorized amplifier section features a front panel private listening stereo headset output. *(For more details, write to Pilot Radio Corporation, 100 Electra Lane, East Station, Yonkers 4, N. Y.)*

VFO For 6 & 2

Novices and Technicians who have just received their General Class tickets need not junk their 6 and 2 meter rigs for a new rig simply because they want VFO operation. Lafayette Radio's new HE-89 6- and 2-meter VFO is designed to operate with modern transmitters using crystal oscillators in the 8-9 mc. region. High electrical stability is achieved by a series-tuned Clapp oscillator. An OB2 voltage reference tube protects the



unit from line voltage variations. Illuminated plexiglass dial is calibrated from 50-54 mc. (6 meters) and 114-148 mc. (2 meters). Output voltage is 10-20 volts rms. Priced at $29.95, the HE-89 operates on 115-volt 50/60 cps power. *(Lafayette Radio Electronics Corporation, 111 Jericho Turnpike, Syosset, L. I., New York)*

New Speaker System Lets You Sit Anywhere

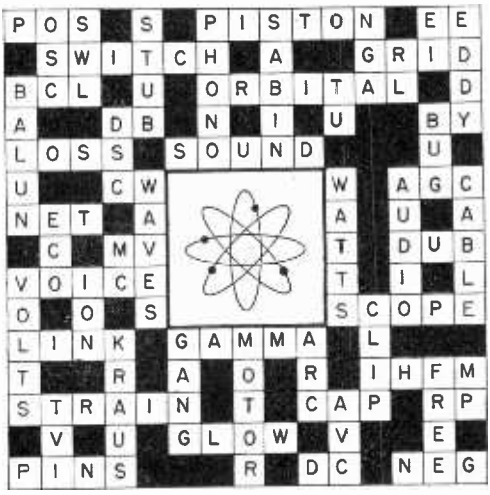
The barrier of stereo conformity has been shattered by Empire Scientific's new Grenadier speaker system. The divergent lens

(Continued on page 30)

Experimenter's Crossword

(Puzzle on page 26)

If you had to stop to think in the midst of the Experimenter's Crossword to find a word, you will discover that you did not finish all of the puzzle in the twelve minutes allocated. The time limit for this puzzle was determined by actual tests. A few experimenters solved the puzzle and were clocked. Although we tried to make the Experimenter's Crossword as comprehensive as possible, our sample group was too small for testing purposes. One sure way to learn whether our twelve minute time limit is accurate or not, is to write and let us know how you did.



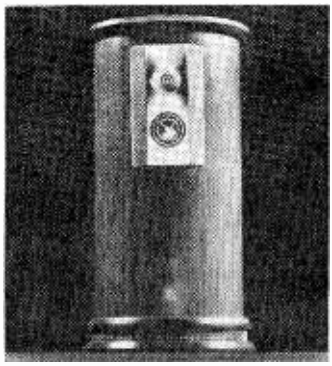
To rate yourself, deduct one point for each unfilled box in the puzzle. If you score 90 or over, you deserve a *Technician* rating, 80 to 89 puts you in the *Experimenter* group, 70 to 79 means you should spend more time keeping your nose in theory books, and 69 and under—buy as many back issues of RADIO-TV EXPERIMENTER as you can find and start boning up for our next crossword puzzle.

Now that you know your rating, you may agree with us, or you may want to take issue with us. Either way, please let us know what you think. Send a postal card to the Editor, RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, New York 10022 and comment on the time interval. If you believe ten minutes is enough, say so. Otherwise, let us know what you believe the limit should be. We'll be waiting for your postal cards. ■

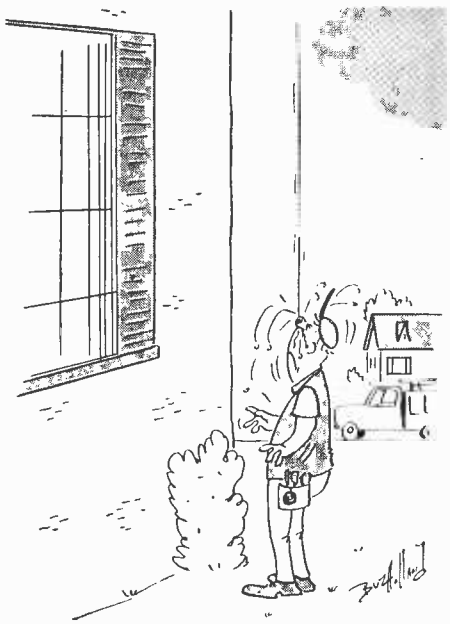
NEW PRODUCTS

(Continued from page 28)

speaker system allows the listener to enjoy the highest fidelity of stereo music from anywhere in the room. A sound radius of 360° dispersion eliminates the need for painstaking location and balancing of speakers. The model 8000 has a frequency response of 30 to 20,000 cps and can handle up to 100 watts



of music power without distorting. The overall dimensions are 15¼-inch diameter, height is 29 inches, and the unit weighs 65 pounds. *(For more information, write to Empire Scientific Corp., 845 Stewart Avenue, Garden City, New York.)* ■



"Look here, Ed, a bird's nest with little . . . ooops, in it.

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LENGTH: 8 ft.

BEAM: 4 ft.

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FEATURES: Convex bottom forward with high-lift after plane. Self-contained air chambers will support 900 lbs. Fiberglass tape on all seams make hull permanently watertight. One man can easily handle this boat on car-top carriers.

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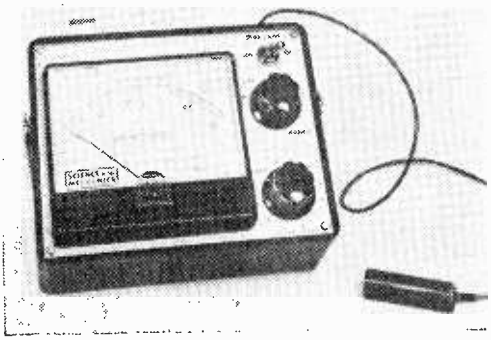

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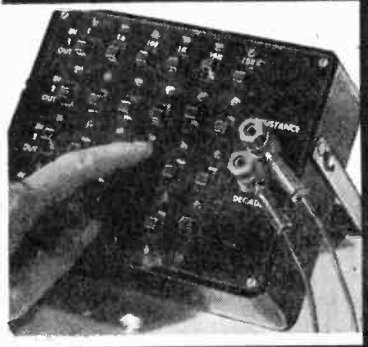
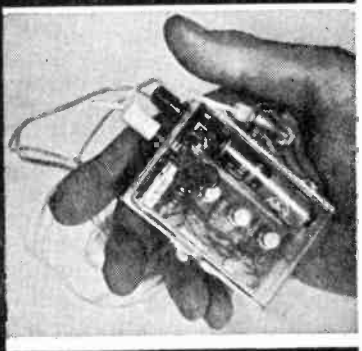


Precision Decade Resistance Box

Designed so the electronic experimenter can get any value of resistance at 1% accuracy. Made of precision components, this decade box offers such advantages as fast fingertip switching from any resistance value from 1 ohm to 1,111,110 ohms within seconds. Add or subtract as little as 1 ohm with 1% accuracy. And ordinary hand tools are all that's needed to assemble it in less than 2 hours.

All Purpose Shop Tachometer

This tachometer is guaranteed to outperform any $50 tach available today or your money will be refunded. This tach belongs in the tool chest of every machinist, electrician, model maker, motor serviceman and inventor. A six position rotary switch enables you to select three speed ranges in either forward or reverse rotation. Three ranges—0—500, 5000 and 15,000—cover the gamut of rpms in the home workshop or laboratory on machine tools, such as lathe cutting speeds, motor rpm, drilling speeds and other motor driven tools where rpm is an important factor.



Pocket-Size Hearing Aid

New hearing aid design provides a minimum of 42 decibels of gain and is adequate for 75% of all cases of partial deafness. The aid weighs only three ounces and is smaller than a king-size cigarette pack. Uses latest electromagnetic earphone and miniature crystal microphone. Powered by a 10¢ pen light flashlight battery and has a switch for turning power off when not in use and a control that lets you adjust the volume to a comfortable sound level.

106

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Ask Me Another?

By Joseph Marshall

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.*

Question: I am having electric interference trouble with my NC-109 receiver. Sometimes the noise is so bad that it is impossible to hear anything below the 20-meter band. I am told the noise might be caused by a defective transformer of the power company. Could this be possible and what can I do about it?

BK, Pinconning, Mich.

Answer: It is quite possible for severe interference to be caused by faults in the power line. Call the manager of your local power company, tell him about your troubles. Power companies have equipment to locate sources of interference and are usually more than willing to track it down and to eliminate it if it is caused by their equipment.

Question: During a recent snow storm radio reception was interrupted by snow on the antenna, which caused the radio to sound like continuous bolts of lightning and it stopped when the snow stopped. Can you tell me why this occurred?

JS, Albion, Mich.

Answer: This phenomenon is a case of *precipitation static.* It also occurs sometimes during a rain storm. Apparently the flakes of snow or drops of rain originate in a cloud heavily charged with static electricity and carry a considerable charge with them. When the snow flakes or rain drops reach an antenna system that is grounded, the charge is discharged through a short arc between flake and antenna. Thus hundreds of miniature *lightning bolts* occur and produce the interference you noted.

Question: What are the highest paid jobs in the field of electronics?

JW, Woodbury, Conn.

Answer: The Chief Engineer of a sizeable electronic company can command between $15,000 and 25,000. Graduate engineers of proven ability can expect to earn $12,000 to 15,000. Technicians without engineering degrees but outstanding ability can earn as much as $10,000 to 12,000.

Question: I have an old Packard-Bell AM/FM/SW receiver. I put new tubes in it. Now I get wonderful reception but everything comes on top of everything else. Can I clear this up with a pre-selector or something?

CTG, Gresham, Ore.

Answer: The chances are 9 out of 10 that you can clear most of it up by taking it to a good service technician and having him align it. All receivers, even the finest communication types, need periodic realignment to maintain their designed sensitivity selectivity, image suppression, etc. This is particularly advisable when tubes are changed, especially if some years have passed since the receiver was last aligned.

Question: I'm getting severe interference in my shortwave radio from fluorescent light —at least, the interference stops when I put the light out. Can I do something about this?

RS, Hamburg, N. Y.

Answer: The simplest and most effective solution is to keep the fluorescent lights off when you're doing serious listening on the radio. While it is possible to "filter" out this type of interference, it can be very stubborn and may require pretty elaborate measures, and may not be fully effective even then.

Question: What is a "trap antenna" and how does it work?

EK, Wichita, Kansas

Answer: Antennas are most efficient when they are resonant at the operating frequency. A dipole, for example, is several times more efficient at the frequency at which its length is equal to a half-wavelength, than at other frequencies. If we want to have equal efficiency at several different frequencies we really need to have several dipoles of different lengths; and, in the past, it was common

Ask Me Another

to combine two dipoles of different lengths to make a "double doublet" or several dipoles to make a "multiple dipole" or "spiderweb" antenna.

A few years ago a clever method was developed by which a single dipole antenna could, in effect, look like two or more dipoles of different length to incoming signals. For example, in Fig. 1 we have in a dipole about 75 feet long tuned to the 6 mc. or 49-meter short-wave band. We would like to cover the 9.5 mc. or 31-meter band. This would take a dipole about 48 feet long. We

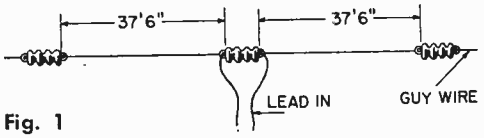


Fig. 1

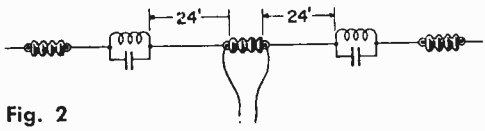


Fig. 2

can make the 75-foot dipole look like 48 feet to a 9.5 signal by cutting it at points 24 feet on each side of center and inserting parallel tuned coil-capacitor tanks tuned to resonance at 9.5 mc. at these points, as is shown in Fig. 2. A parallel-tuned circuit presents an extremely high impedance to any signal whose frequency is the same as the resonant frequency of the tuned circuit. In fact, the tuned circuit or "trap" looks very much like an insulator at 9.5 mc., and hence the antenna seems only 48 ft. long and is therefore resonant at 9.5 mc. The trap is virtually a short circuit at 6 mc. and therefore does not affect the performance in the 49-meter band. We can shorten the antenna to around 31 feet to make it resonant in the 19-meter band by inserting another pair of traps resonant at 19-meters about 15.5 ft. on each side of the dipole center; and additional traps can be inserted at other intervals to cover any desired combination of bands.

Because they reduce the number of antennas needed, trap antennas have become very popular in amateur radio. Even Yagi beam antennas have been adapted for two or three band service by the use of "traps." Trap antennas are available also to cover the various short-wave broadcast bands. While trap antennas are not quite as good as individual antennas would be, they do provide high efficiency economically.

Question: Are the surplus crystals that sell for 50 cents any good?

JE, Perry, Okla.

Answer: I have bought dozens and found them all active. If the frequency is useful to you, or you can grind or etch them, to a useful frequency, they are a good buy.

Question: Most of the radio stations in Cleveland have their transmitters from 3 to 6 miles from my home, and they come in so powerfully and so broadly on my 11-transistor Japanese radio that it is next to impossible to hear out of town stations. My radio dealer tells me that the only sure way of getting other stations is to move to some town farther away from the transmitters. Have you any idea what I can do without moving?

RJG, Parma, Ohio.

Answer: He's right about moving being the only *sure* way, especially if you're determined to keep the transistor radio. Close proximity to high powered transmitters raises problems with any receiver, but transistor types usually are much more troubled than old-fashioned tube types. On the other hand, the 5 tube AC-DC type radio isn't likely to improve matters much. The only hope I can offer is to try a first class general coverage communications receiver by Hammarlung, Hallicrafters or National. Some of the older models, 5, 10 or 15 years old can be bought for between 50 and 100 dollars *reconditioned* from distributors who specialize in selling amateur equipment.

Question: How can I change a broadcast-band radio so it will tune to 500 kc.?

CY, Huntington, W. Va.

Answer: Most BC radios can be moved down to 500 kc. by adding between 50 and 75 pf of capacitance across the RF and oscillator tuning capacitors. The inexpensive 5 to 80 pf mica compression trimmers will do the job. Of course this will mess up the tuning and calibration, and cut out some stations on the high end of the band. A neater way would be to use a simple transistor converter like the one I described in the Winter issue of RADIO-TV EXPERIMENTER on page 31. One of the very inexpensive BC604 crystals in the range between 370 and 450 kc. could

Ask Me Another

be used. Pick a spot between 870 and 950 kc. where there is no broadcast station, choose a crystal whose frequency when added to 500 comes close to this.

Question: Some FM stations we receive come in sharp and clear but some come in with considerable distortion. My serviceman says it is the fault of the station; but when I called up the station they said it was the fault of my tuner. Which is it and what can I do about it?

L.D.M. Chicago, Ill.

Answer: Probably both. In FM broadcasting the higher the modulation (or loudness) the greater the deviation and hence the greater the bandwidth of the transmitted signal. If the receiver has a wide enough bandpass to accept the wide deviation, there will be no distortion; but if the receiver bandpass is narrower than the deviation of the signal, there will be distortion.

A deviation of 75 kc. is allowed for FM broadcasting. Theoretically, the receiver should have a bandpass of 250 kc. to receive a fully modulated monophonic signal and more for a stereo signal. Few tuners have that wide a bandpass because it is difficult to achieve it and at the same time obtain enough sensitivity and selectivity. Ordinarily a bandpass of 175 to 200 kc. is wide enough to provide an acceptably low level of distortion because in the case of most stations, particularly those transmitting "good music" type programs, the maximum deviation occurs only on occasional peaks and at the very highest frequencies only.

However, some stations, especially those broadcasting pop type programs tend to push their modulation very close to the limit a very high percentage of the time by the use of compression and limiting amplifiers. Hence, their *average* modulation level tends to approach the maximum permissible level and when the signal is received on the typical tuner the result is *distortion.* Instead of occurring merely on occasional momentary peaks, distortion now occurs a very considerable percentage of the time and is, of course, very noticeable.

There are tuners capable of handling this extreme type of modulation with a minimum of distortion—notably the *Dynatuner,* the *Knight* and *Sherwood* tuners with "dynamic sideband regulation." Actually, however, it is very probable that even with these tuners the reception will be distorted because many of the pop records played by these stations have inherently high distortion, and compression and limiting are accompanied by a certain amount of distortion. The best solution to the problem, then, is simply to tune right past such stations and listen only to those adhering to some approximation of high fidelity standards.

Question: I am not happy with the reception we are getting of multiplex stereo programs. I notice that when the station plays the same stereo records that I have in my collection, the separation and quality are much inferior than what I get when I play it on my hi-fi system. I have tried several tuners but none of them solves the problem. What can I do?

C.R. Toledo, Ohio

Answer: Wait patiently and when you want the best stereo, use your own records.

Your experience is being duplicated all over the country. The trouble is that many stations have not yet solved all the problems of stereo transmission. The MX system of stereo depends vitally on maintaining the original phase relationships between the two channels of a stereo program. Unfortunately, until MX arrived nobody paid any particular attention to the phase characteristics of audio equipment. Hence, some of the audio equipment used by broadcast stations, which was perfectly satisfactory for monophonic programs, presents problems in stereo programs. Also, until MX arrived recordings were cut and edited without considering phase relationships and hence possess phase differences which seriously degrade separation when they are broadcast even by a perfectly adjusted transmitter and received on a perfect tuner.

These things are being corrected and, as you have no doubt noted, some broadcast stereo programs are very good indeed and the general run of them is improving.

Nevertheless, it will probably remain true that you can get better stereo reproduction on your own hi-fi system than over the radio. First, few stations use record play-back equipment as good as that used in good hi-fi installations, largely because it is too delicate and critical. Secondly, when you play records directly you eliminate the distortion, however slight it may be, which occurs in

Ask Me Another

the extra steps involved in passing the program through the transmitter, over the air, and through your tuner.

Question: I have just bought an expensive new pick-up that is supposed to operate at ¼ of a gram; but it just don't do it. It keeps skipping and jumping, and on most records the distortion is high. Have I bought a dud?
I.N.F. Dallas, Texas

Answer: There are pickups, including the one you bought, which are capable of operating satisfactorily at ¼ gram of pressure *on some records and when installed in certain, properly adjusted arms on turntables immune to external shock.*

The fact that yours is skipping indicates that the tone arm you are using is either not suitable or not properly adjusted; or that the turntable is sensitive to external shock. It doesn't take much of a shock to lift a stylus with ¼ ounce of pressure right out of the groove. In fact, a footstep can do it at 1 gram stylus pressure. Most turntables were designed for pressures of 2 grams or more. There are a few new ones, among them the *AR* and the new *Empire* with floating suspension, that will permit stable operation with very low pressures, because they are quite immune to external shock or vibration. Similarly, only the latest type of elaborately balanced, low-friction arms will permit operation at pressures less than 1 gram. It looks like you're not giving the pickup a square deal in these respects. ■

"I'm not bothering him, Mom. I just want to see what happens when he pokes the hornet's nest in the set."

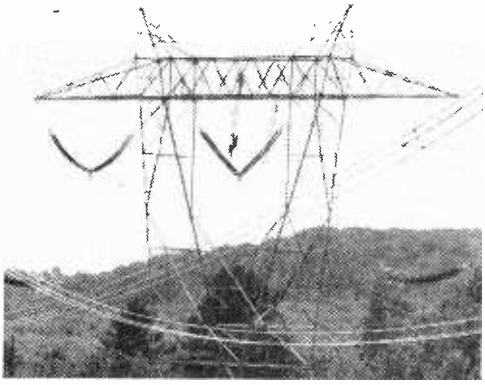
HOTTEST HOT LINE

A TOWER and lines to carry the highest transmission voltages (700 KV) on the North American continent are being tested by General Electric at Pittsfield, Mass. The tests are being sponsored by Hydro-Quebec, a Canadian electric utility, which is building an extra-high-voltage (EHV) system along the St. Lawrence River. The highest voltage transmission lines in the U.S. are 500 KV at the present time.

The tests on the 132-ft.-high tower are being made to check radio interference and the system's ability to withstand switching surges of up to 1700 KV. The structure holds up two sets of four-conductor cables, each 1.382 in. in diameter. Nozzles at the top of the tower spray gallons of water down on the insulators to check their strength under wet conditions, which is somewhat weaker than when dry.

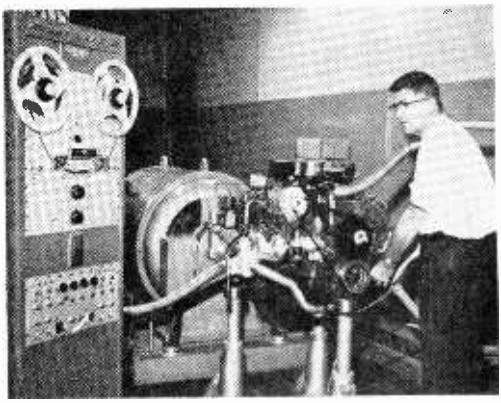
One phase of the test tower, energized at 60 cycles from the project's EHV line, measures radio interference at voltages up to 825 KV, well above maximum operating levels generally encountered.

General Electric plans to test its new epoxy-polymer insulators on the tower. Porcelain types have been used for 60 years. ■



WORKMEN clamber up swinging ladders to make adjustments on 132-ft. "hot line" tower.

HI-FI STEREO for engines



Road test simulating in the labs allows the engineers to compare various engine designs and parts under identical test conditions.

STEREO tape recorders are providing a special type of music at Oldsmobile's engine testing laboratories in Lansing, Mich. While the sounds may not ring a familiar note to the average audiophile's ears, they are sweet sounds to the tuned ears of auto engine engineers.

Oldsmobile engines are now being subjected to even more extensive durability tests which duplicate their overall performance and durability as though they were mounted in automobiles and being driven cross country. This is being done by a unique electronic system developed by Oldsmobile. Called the *Road Test Simulator,* engineers use the system to duplicate road conditions previously recorded in a test car driven on the highways.

The stereo tape, 1200 feet long, records nearly 70 minutes of engine speed and manifold pressure information. Aluminum foil "tabs" are placed at the ends of the tape so that when the tape has completely wound onto the take-up reel, the engine is brought to an idle while the tape automatically rewinds and then starts a new 70-minute run.

The Road Test Simulator permits road testing an engine in the laboratory even in bad weather without endangering drivers. ■

TD-FM radio

COVER STORY

Now you can tune in the FM broadcast band, airplanes and control towers, taxi and police calls, and much more with this easy-to-build budget-priced tunnel diode receiver

■ Add a tunnel diode, a hand wound coil, a few resistors and condensors to a small pre-wired transistor amplifier and—an FM radio is born. Small enough to hold in one hand, you can listen to local FM broadcast stations at home or on the beach. You can also tune the receiver to the higher end of the dial and listen to airplane conversation at nearby airports. Parts of the narrow-band business service can be heard at the high end—you may be able to hear police calls, taxi services and many others.

The TD-FM Radio is simple to build and the costs about $14.00. This is an expensive price to pay for an FM-band *crystal set*, but the costs can be kept down by using spare part items. Add to this the working knowledge gained by assembling your first tunnel diode FM receiver and the cost may be well worth it.

About the circuit. A small folding antenna picks up the FM signal which is selected by coil L1 and capacitor C1. See the schematic

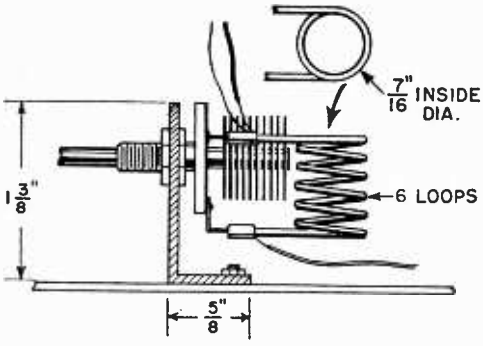
By Homer L. Davidson

diagram. This VHF FM signal is fed to the tunnel diode TD1 superegeneration circuit. Control R3 varies the point of superegeneration on the tunnel diode. The detected audio portion of the signal is coupled to a three-transistor audio amplifier, Z1.

The output of amplifier Z1 is fed to a small 1½-inch PM speaker. The powerful stations will drive the small speaker with plenty of volume. On weaker stations the small receiver can be held close to the ear. With this operational arrangement in mind, a volume control was not incorporated into the design. However, a control can be installed by following the instructions supplied with amplifier Z1.

Preparing Amplifier Z1. There are a few minor changes that are made in the small pre-wired transistor amplifier, Z1. Remove the 30 mf. capacitor from underneath the printed chassis and mount it on top. This is not an electrical change but rather a relocation modification. Drill two small holes to let the capacitor connect to the same terminals as before. Observe the polarity of this electrolytic capacitor when soldering back into the circuit.

Since there is no volume control, the control leads on the small amplifier must be modified. Remove the red and orange wire.



Coil L1 and capacitor C1 comprise the only tuned circuit in the TD-FM radio. Utmost care in assembly is necessary in order to insure a high-Q circuit on the frequency band the receiver is to operate. Bracket is made from an aluminum bracket strip ⅝" wide.

Use a 5100-ohm fixed resistor instead of the volume control. Run one end of the resistor through the same hole from which the red wire was removed and loop the resistor lead to the point where the orange wire was located. Solder this lead to the orange and red wire terminals. Cut off the excess wire. Solder the other end of the resistor at the point of the removed green wire. Save these three flexible wires as they can be used later to wire up the remainder of the unit.

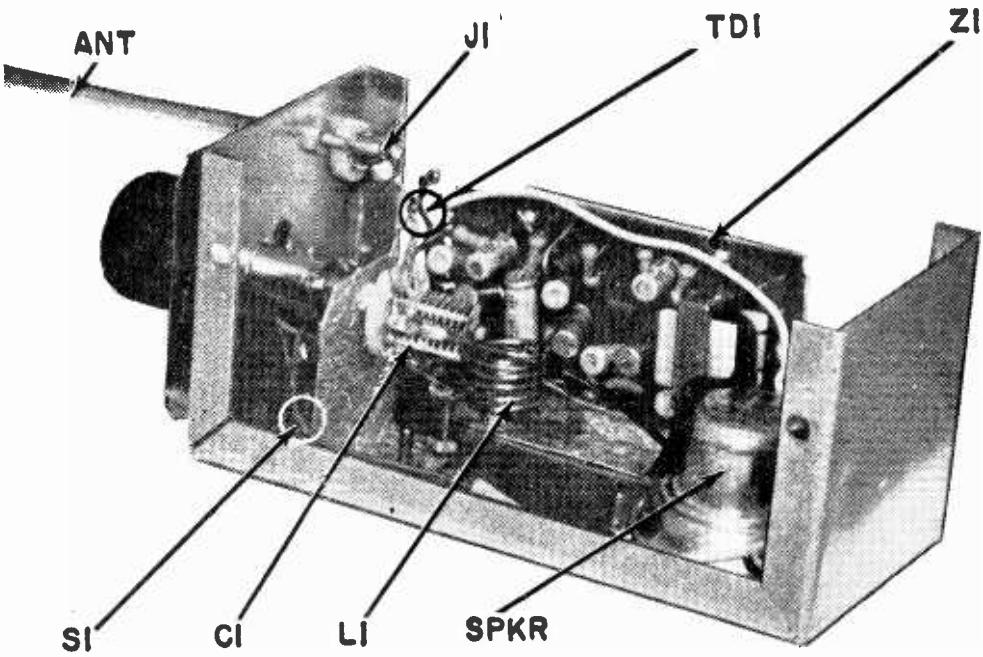
Mount R1, R2, and C2 on the small amplifier printed board. Drill small holes for the leads to pass through, and also use the space where the battery cables come out of the board.

Run the blue wire to one side of the tunnel diode. Be sure to use a heat sink on the tunnel diode lead. Connect the green lead to C1 and L1. Use a d.p.s.t. slide switch to switch on both batteries.

The regeneration control is mounted to the left of the top panel. See photos. Behind

PARTS LIST

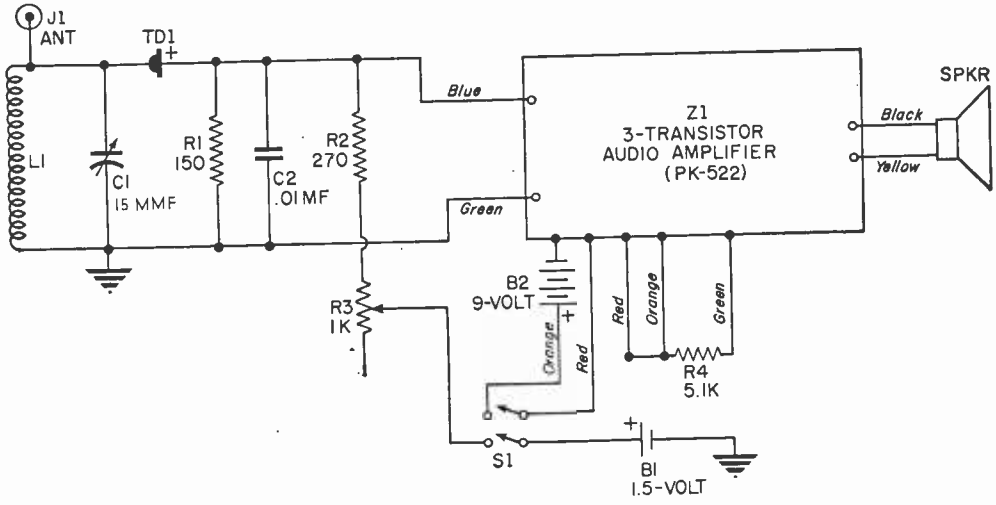
Ant.—Miniature telescoping antenna, 38" to 9" (Lafayette F-343 or equivalent)
B1—1½-volt penlite cell
B2—9-volt battery (Burgess 2U6 or equivalent)
C1—14.2-mmf. variable capacitor (E. F. Johnson 160-107 or equivalent)
C2—.01 mf., 75-volt ceramic capacitor
L1—5½-turns of #16 enameled wire wound to ½-diameter-coils evenly spaced in ¾" length
R1—150-ohm, ½-watt fixed resistor
R2—270-ohm, ½-watt fixed resistor
R3—1000-ohm miniature potentiometer (Lafayette VC-32 or equivalent)
R4—5,100-ohm, ½-watt fixed resistor
S1—D.p.s.t. slide switch
SPKR—1½-inch diameter, 9-ohm PM speaker (Lafayette SK-61 or equivalent)
TD1—TD-1 tunnel diode (General Electric)
Z1—Three transistor miniature amplifier (Lafayette PK-522)
1—2¼" x 2¼" x 5" aluminum chassis box
1—Vernier dial drive mechanism (Lafayette F-753 or equivalent)
Misc.—Hardware, solder, wire, aluminum scrap, paint, decals, cardboard, etc.
Estimated cost: $14.00
Estimated construction time: 3 hours



It's a tight fit inside the aluminum 2¼" x 2¼" x 5" chassis box. It would be best to copy the author's original layout of parts to avoid construction problems.

this control is J1. You can plug the small telescoping antenna into jack J1 or solder it in place. Capacitor C1 is mounted on a small L-bracket away from the top panel. A vernier dial drive mechanism was used in this model for sharp tuning. The variable condenser is mounted directly on the metal bracket. Be sure to insulate the printed side away from the metal bracket. A piece of cardboard cut to size and bolted in place will do fine.

Mount the small speaker at the bottom



The placement of parts in the RF section is critical, but neatness in construction will lick more than half the problem. Keep leads and parts away from coil L1 and capacitor C1.

of the front panel. Use a round punch and knock out 1¼-inch diameter hole. Four small bolts and nuts secure the speaker to the front panel. The yellow and black leads from amplifier Z1 are soldered to the miniature speaker voice coil terminals. Solder the battery leads directly on each battery terminal.

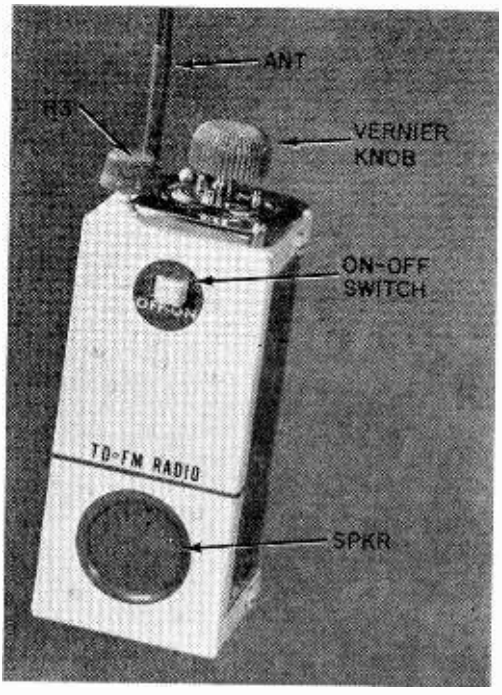
Coil and testing procedure. The small coil is wound from number 16 enameled wire, close wound on a ½ form. Leave one-half inch leads and solder directly to the small variable condenser terminals. Pull the windings apart for stations on the high end of the band and compress the turns on the coil to lower the frequency of the FM band. The coil is self supporting. When wiring in the tunnel diode be sure the top hat rounded end goes to the starter terminal of C1.

To test the unit, flip the sliding switch to ON. You will hear a rushing sound in the small speaker. Advance the small regeneration control and a scratchy, raspy sound is heard. Extend the flexible antenna to full length. Touch the antenna as you rotate the regeneration control. You will notice a clicking or thumping sound as you touch the antenna. Where the sound is loudest, leave the control in that position. You will also notice that a passing auto ignition can be heard. Adjust the control where the ignition noise is loudest. Tune the dial for a station. A hum or carrier sound will come in beside a station and by adjusting the regeneration control the station comes through with good volume.

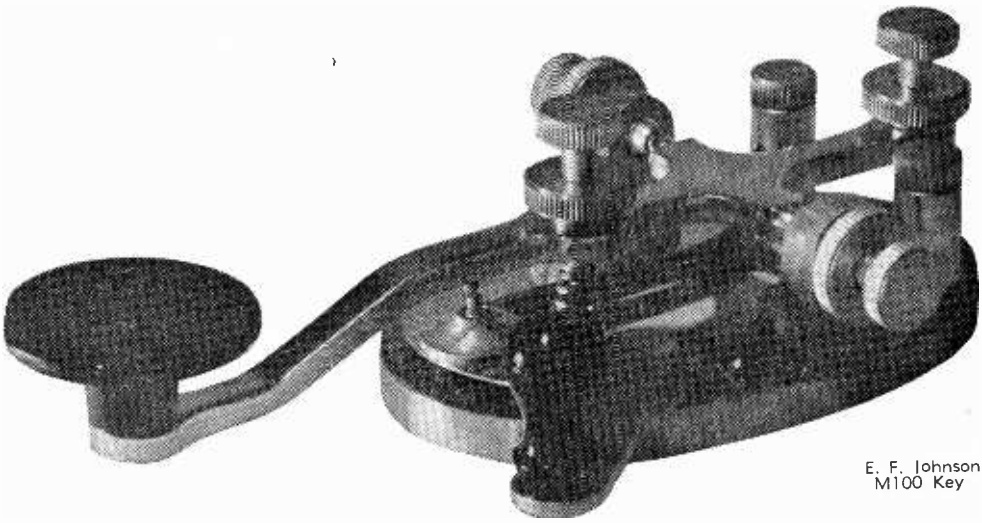
Reception Tips. The TD-FM radio is a local pocket receiver. As you go farther away from the station, the tuning and regeneration control becomes more critical. The metal case reduces the effect of hand capacity and considerably reduces regeneration radiation. Raising and lowering the small antenna will also help to bring in stations. The position of the receiver will also raise or lower the reception of a local FM station. And don't be surprised when you pull in strong TV stations near the FM band.

A Modification. If you want to extend the range of the tunnel diode radio, solder two small tip jacks to the variable condenser and plug in two other coils. Take two small pin sockets from a seven pin molded tube socket. Solder the lugs to the stator and rotator connections. Wind one coil with 4 turns of number 16 enameled wire. Now wind another coil with seven turns of the same wire. Spread the coils turns about the width of each wire. Straighten the coil ends out and trim them with solder. Now each coil can be plugged into these pin sockets.

This will give your TD-FM radio a frequency range of 88 to 148 mc. You can set in your car at the airport, and stick the antenna out the window and listen to aircraft communications. Besides the FM band you can also listen to amateur, civil air patrol and local sounds from TV stations on channels 2-7. One must remember that theTD-FM radio is a local variety and not a long distance receiver. ■



A paint spray finish plus some panel lettering makes the TD-FM radio a knockout.



E. F. Johnson M100 Key

COMPLETE ROUNDUP of Record/Tape Courses

CODE TRAINING COURSES

By Tom Kneitel K3FLL/WB2AAI

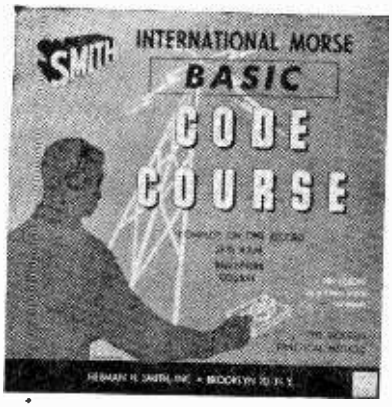
BY FAR the biggest taboo in the hobby-end of electronics is the learning of the International Morse Code (commonly referred to as "CW" by both hams and commercial operators). The prospect of having to learn CW has been known to make strong men weep and weak men take up knitting—but, learn the code you *must* do if you ever hope to obtain any class of ham radio license.

Current FCC regulations call for an ability to transmit and receive a minimum of 5 words per minute for both the Technician and Novice licenses, and 13 words per minute for the General class license.

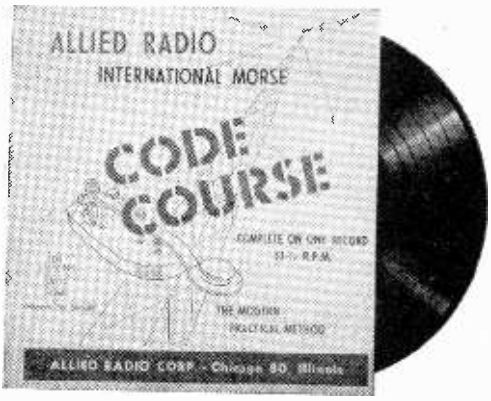
We are not going to try and sell you on the old-time ham's favorite tale about learning the code being "a snap." It certainly isn't a snap, it never was, it never will be. Basically it boils down to the simple fact that you are going to have to memorize certain sound patterns which represent 26 letters, 10 numerals, and several punctuation marks. If you have the natural ability to learn fast, this task should be easier for you than it is for most code students. If you're "Joe Average," like most of us, you'll have to find the method which will be the most palatable and will prepare you for the grade of license you desire.

Various Methods. The old standard method of memorizing the code was to sit down with a code chart (one that shows which combinations of *dots* and *dashes* correspond with the various letters and numerals) and learn it by rote. This is the system which created so many stamp collectors and ship-in-bottle builders.

World War II created the need for thousands of radio operators—we had to come up with new methods of teaching code. The methods had to be fast, thorough, accurate. Even people who had no motivation to learn (such as for a ham license) would have to find these methods acceptable.

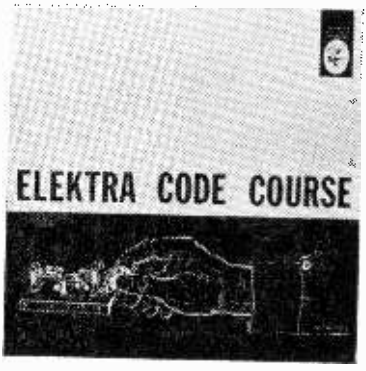


Burnstein-Applebee Co.



Allied Radio

CODE TRAINING COURSES



Elektra Corporation

Of the several methods which were developed, probably the best suited towards home-learning are code practice recordings. A number of these recordings are now commercially manufactured and are probably responsible for the creation of more CW operators (hams call them "brasspounders") than any other currently used system.

To attest to the *relative* simplicity of the recording method of code-learning, you will be interested in the fact that a nine year old child was able to increase his CW speed from 4 to 20 wpm in a 3 week period. The student, Frank Alessi of Brooklyn, N. Y., is now the youngest (to our knowledge) General class license holder in America—perhaps the world. Frank used the *Rider* Sound-n-Sight course.

The recordings are all commercially produced, and of superior quality—most of them being pressed by the major record manufacturers. The recordings produced by *Epsilon,* for instance, are pressed on high quality virgin vynil plastic by the RCA custom pressing division.

What's Available. The following manufacturers produce the recordings indicated. They are available from the manufacturers directly, or from local distributors and dealers.

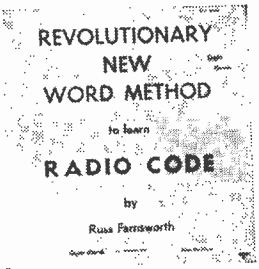
• *ALLIED RADIO,* 100 North Western Ave., Chicago 80, Ill. Course consists of 10 lessons on one 12-inch 33 rpm record. You learn from start to 15 wpm with the aid of a 20-page instruction book included with the record. Cat. #89S573, $4.49.

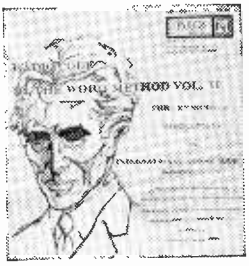
• *AMECO PUBLISHING,* 178 Herricks Rd., Mineola, L. I., N. Y. They produce the following 3 courses:

"Junior Code Course," containing everything to prepare the student for the Novice or Technician exams. Course goes from start to 8 wpm and includes typical FCC-type code exams, instruction book on how to send and receive code, and charts to check receiving accuracy. 10 lessons. Cat. #100-01 (78 rpm), $6.95; Cat. #100-33 (33 rpm), $4.95; Cat. #100-45 (45 rpm), $5.95.

"Senior Code Course" gives you everything in the "Junior" course plus 12 additional lessons to build speed to 18 wpm. Cat. #101-01 (78 rpm), $11.50; Cat. #101-33 (33 rpm), $9.50; Cat. #101-45 (45 rpm), $10.50.

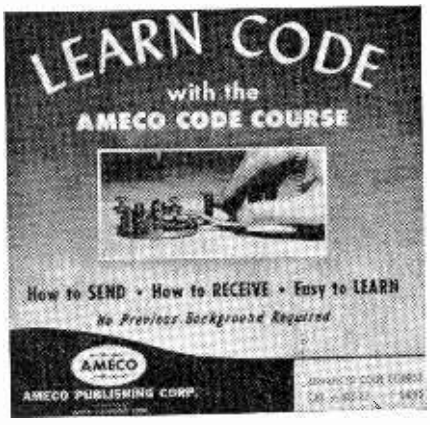
Ameco Publishing



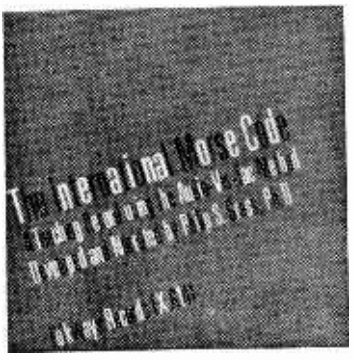


Epsilon Records
(top and right)

Ameco Publishing Corp.



Folkways Records



"Advanced Code Course," prepares Novice class operators for General class license exams. Contain 12 recordings of "Senior" course plus FCC-type exams and instruction book. Speed is from 8½ to 18 wpm. Cat. #103-45 (45 rpm), $4.95; Cat. #103-33 (33 rpm), $4.95; Cat. #103-01 (78 rpm), $5.95.

• *BURSTEIN-APPLEBEE,* 1012 McGee St., Kansas City, Mo. The course is five 10-inch 78 rpm records in an album. Takes you from 1 to 15 wpm in 10 lessons. Cat. #33A181, $4.95. Also available on a single 33 rpm LP, Cat. #33A167, $4.45.

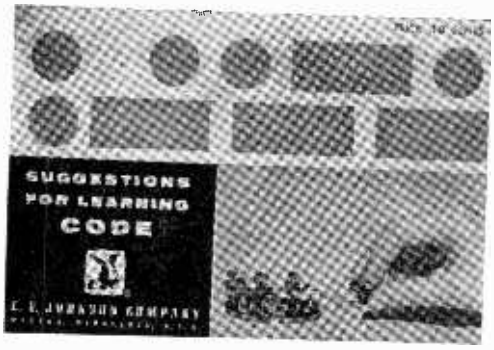
"Beginner's Lesson" is a single 7-inch 45 rpm recording designed to give the beginner a start with CW. Gives the student the general "feel" of listening to CW. Instruction book included. Cat. #23C29, 98¢.

• *ELEKTRA CORPORATION,* 51 West 51 St., New York, N. Y. This is a single 12-inch LP offering a progressive course that should enable you to pass the Novice, Technician, or General class exams. The recording is intended to be played at different speeds to achieve different code speeds. Cat. #CC-1, $3.50.

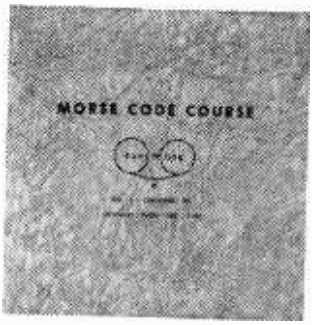
• *EPSILON RECORDS,* 841 Woodside Rd., Redwood City, Calif., produces several code recordings.

"Radio Code by Word Method, Vol. I" consists of three 12-inch recordings. This record is *Epsilon's* exclusive method which was developed over a period of years by experienced operators. It is unique in that it starts the student at a moderate speed and continues at this same speed throughout the course. Instead of increasing the transmitting rate, the complexity of the material is increased. The end result is that the student can develop a high degree of proficiency in less time than he would have been required had he been taught by other methods. Plays at 33 rpm, teaches you 13 wpm. Cat. #ER-1001, $9.95. Also available on Acetate magnetic tape for 3.75 ips twin track playback, Cat. #ER-1002, $9.95.

"Radio Code by Word Method, Vol. II" is a single 12-inch LP recording which tells, in CW, the life story of famed inventor Nikola Tesla. When played at 33 rpm the speed of the CW is 15 wpm, at 45 rpm the CW is 20 wpm, at 78 rpm the CW is 35 wpm. Cat. #ER-1003, $2.49.



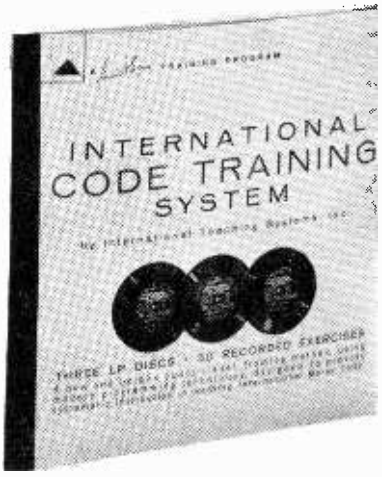
When you purchase an E. F. Johnson key, you will find a handy little booklet packed with the instrument. Code tips and techniques therein are good reading and worth learning.



Lafayette Radio

Rider Publishing Co.

Howard W. Sams & Co.



CODE TRAINING COURSES

• *FOLKWAYS RECORDS,* 121 West 47 St., New York, N. Y. This company produces the "International Morse Code" recording featuring the "Audio-Vis-Tac" method developed by Dr. Phillip S. Gross. This method, which was tested at Ft. Monmouth and also at Metropolitan Vocational High School in Brooklyn, N. Y., proved that the average student could attain a skill of 4 to 7 wpm within 3 to 4 hours. The course consists of 1 12-inch 33 rpm recording which is narrated by Dr. Gross. Cat. #FX-6141, $5.95.

• *LAFAYETTE RADIO,* P. O. Box 10, Syosset, L. I., N. Y., has the following material available:

"Special Code Course," consisting of 10 lessons on a single 12-inch LP record. With the help of the instruction manual, you will learn speeds starting at 2 wpm and progressing to 15 wpm. Cat. #PR-13, $3.50.

"Tapedcode" is a magnetic tape which plays for 2 hours and teaches speeds from 4 to 8 wpm. On a 7-inch 1200 foot reel. Cat. #RT-14, $6.35. Also available in an advanced course for 9 to 18 wpm. Cat. #RT-15, $5.39.

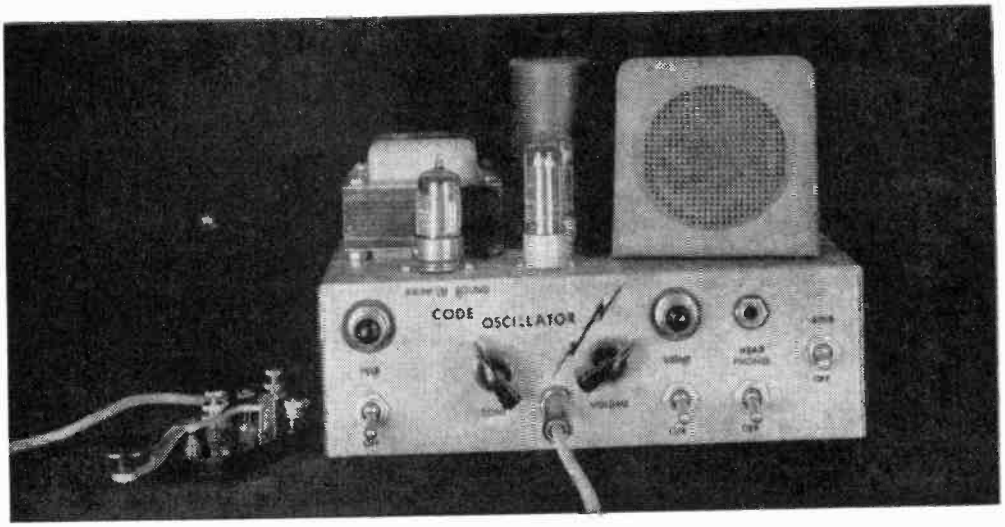
• *RIDER PUBLISHING CO.,* 116 West 14 St., New York, N. Y. offers these courses:

"Sound-n-Sight Novice Course." Three 10-inch LP recordings teaching from start to 8 wpm. The course comes with 47 identification cards and an instruction book. The manufacturer claims that 5 wpm can be achieved in 9½ hours. Cat. #REC-08, $9.50.

"Sound-n-Sight Advanced Course. Three 10-inch LP recordings to prepare the student for the General class exams. Teaches 9 to 20 wpm, and gives the foundation for transmitting and receiving at higher speeds. Includes an instruction book. Cat. #REC-920, $8.95.

"Sound-n-Sight Complete Course." Six

(Continued on page 102)



BUILD THE . . .

SIGHT & SOUND

code practice oscillator

By L. F. Kiner, K6VNT

DO YOU want to learn the Morse code? Do you find a need to improve your present code speed? Or does your club or school need a code practice oscillator that can be used to train large groups or individuals privately? Then the Sight & Sound code practice oscillator is worth building. A specially adapted telegraph key permits the sender to trigger the audio oscillator circuit to generate the *dits* and *dahs* we are used to hearing or to blink a small light for line-of-sight transmissions. A tone and volume control permits sound adjustments to suit listening needs.

Construction. The original unit was built on a 5"x9½"x3" chassis. An aluminum chassis was used since it's easier to work than steel. The chassis size is considerably larger than actually required but provides ease of wiring and avoids crowding of components and controls. The speaker is mounted in a separate case that sits on top of the chassis.

Placement of components is not critical. The builder may follow the general parts layout shown in the photos or change the layout to suit his own particular plans.

If the pilot signal light, PL2, is to be included in the code oscillator it will be necessary to modify the code key to provide an additional contact.

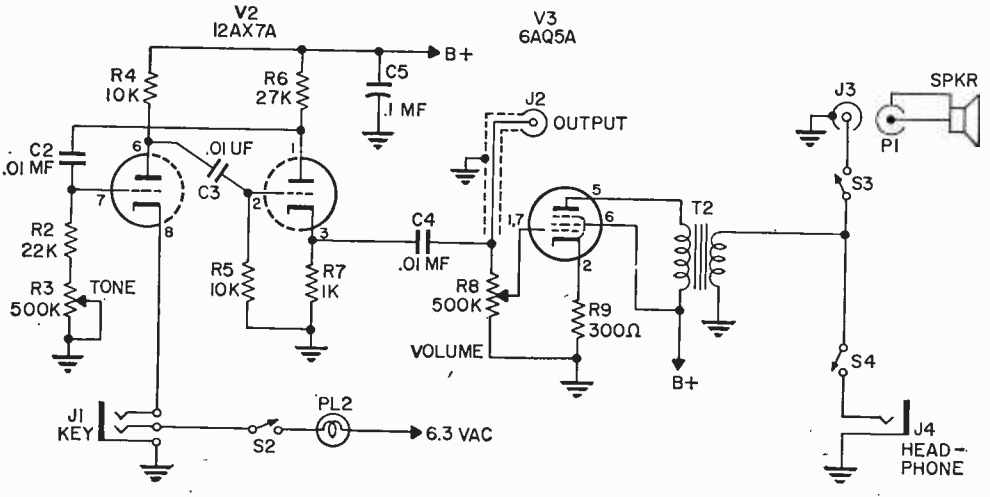
This is accomplished by drilling a #36 hole in the key insulator base next to the front contact that already exists in the key, and taping the hole for a #6-32 screw. A 6-32 screw is then inserted into the hole and adjusted for height so that contact is made when the key is depressed. The additional lead is then attached to this screw.

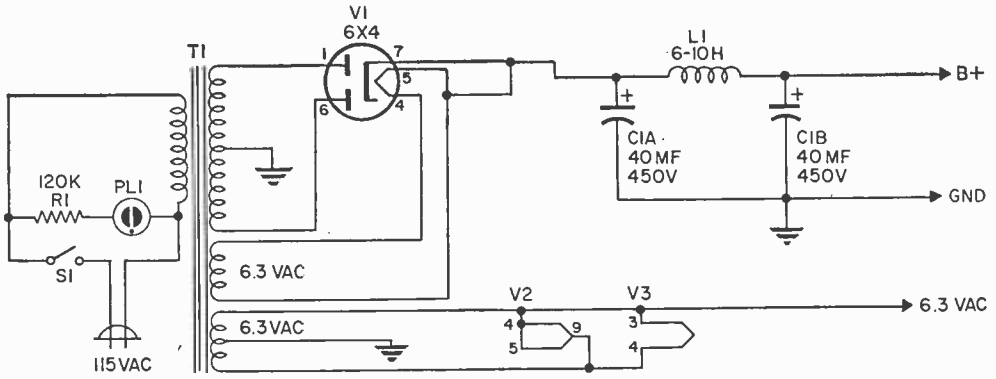
If the builder does not want to include the "signal light" this procedure may be eliminated. However, the light is an unusual feature and is well worth the added effort to include it.

To really dress up the Sight & Sound code practice oscillator, the chassis should be painted after all the holes have been drilled, but prior to mounting of any of the components. Be sure to prime the metal surface first with zinc chromate or equivalent. This will preclude the possibility of the finish coat peeling. Select a good quality metal paint for the finish coat. Decals are applied to the various controls and switches (see illustrations) to facillitate their identification and to further enhance the overall appearance.

PARTS LIST

C1—40-40 dual electrolytic capacitor, 450-WVDC
C2, C3, C4—.01 mf., 600-volt disc capacitor
C5—.1 mf., 600-volt paper capacitor
J1—3-conductor phone jack (Switchcraft C-12B)
J2, J3—Phono jack
J4—2-conductor phone jack (Switchcraft C-11)
L1—Choke, filter, 7 henrys at 50 ma. (Stancor C-1707 or equiv.)
P1—Phono plug
PL1—NE-51 neon bulb
PL2—#47 pilot lamp
R1—120,000-ohm, ½-watt resistor
R2—22,000-ohm, ½-watt resistor
R3, R8—500,000-ohm potentiometer
R4, R5—10,000-ohm, ½-watt resistor
R6—27,000-ohm, ½-watt resistor
R7—1000, ½-watt resistor
R9—390-ohm, ½-watt resistor
S1, S2, S3, S4—S.p.s.t. toggle switch
SPKR—2¼"—4" dia., 3.2-ohm speaker
T1—Power transformer: 300-0-300 VAC at 65 ma. DC; 6.3 VAC at 0.6 amp.; 6.3 VAC at 2.7 amp.; primary 115 VAC (Stancor P-6358 or equiv.)
T2—Output transformer: 5000-ohms pri.; 3.2-ohms sec. at 3 watts (Allied 62 G 064 or equiv.)
V1—6X4
V2—12AX7A
V3—6AQ5A
1—Aluminum chassis, 5" x 9½" x 3" (Bud AC-421 or equiv.)
1—Speaker Cabinet to match speaker
Misc.—Wire, solder, hardware, sockets, paint, decals, etc.
Estimated cost: $24.00
Estimated construction time: 5 hours





The schematic diagram for the oscillator and audio amplifier stages appears at the bottom of page 50. Unit is powered by full-wave rectifier and filament supply diagrammed above.

One final note, the circuit is not critical and the experimenter may vary component values as much as 20 percent with no degradation in performance.

Operation. Upon completion of the oscillator take time out to check its wiring. A few minutes here could avoid trouble and unnecessary parts replacements. Use an ohmmeter and check all the B-plus points. A high resistance reading of 100,000 ohms or more should be obtained.

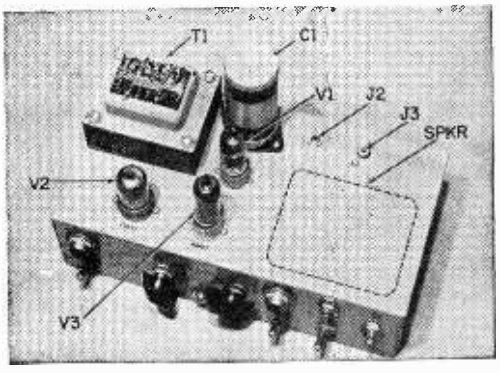
Following a satisfactory preliminary check, plug the line cord into a wall outlet and set all switches to ON. Advance the volume control, R8, to maximum position clockwise. A slight amount of hum should be evident from the speaker (or headphone). If the hum is excessive turn the unit off and (a) recheck the unit for wiring errors; (b) check the filter capacitors, C1A and B, for leakage; and, (c) check the rectifier, V1.

Reduce the setting of R8 to its mid position and insert the key in jack, J1. Close the key. A tone will be heard in the speaker/headphones and if you have included the signal light, PL2, will shine. The tone is adjusted by rotating control, R3.

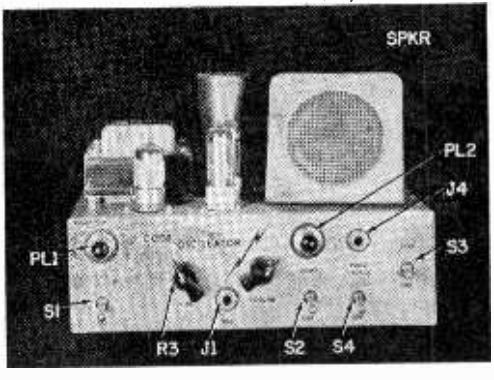
Operation of the signal light, speaker and headphones are controlled by switches S2, S3 and S4 respectively. This permits all modes of operation (sight and sound) simultaneously or individually.

An output jack, J2, is provided in order that the code practice oscillator may be fed directly to the input of your transmitter or tape recorder. Thus, you can transmit without the usual disturbing background noise or you can tape code your own training tapes.

Photos by E. C. Current

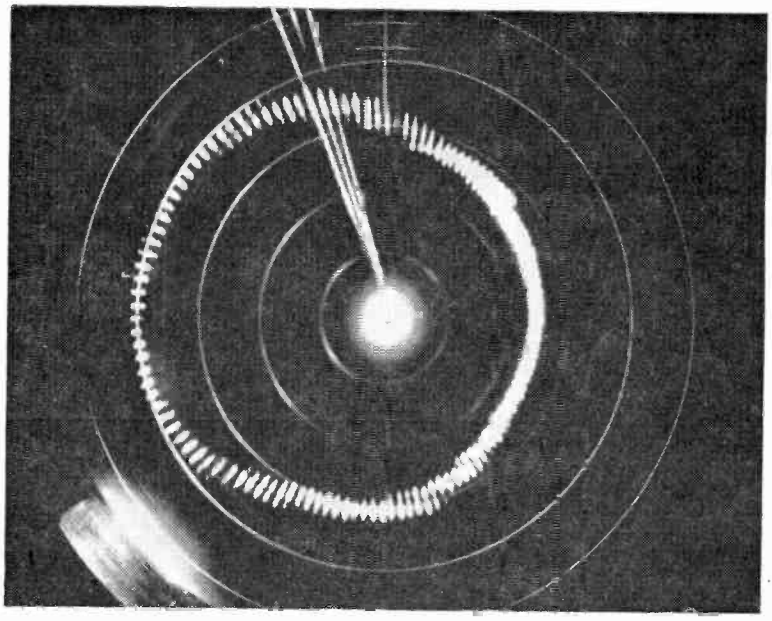


Placement of parts is not critical. A large aluminum chassis provides ample room for the control panel parts and neat layout, too.



Sight & Sound code practice oscillator is all set to go. Just plug in telegraph key. Front panel decals give unit a professional touch.

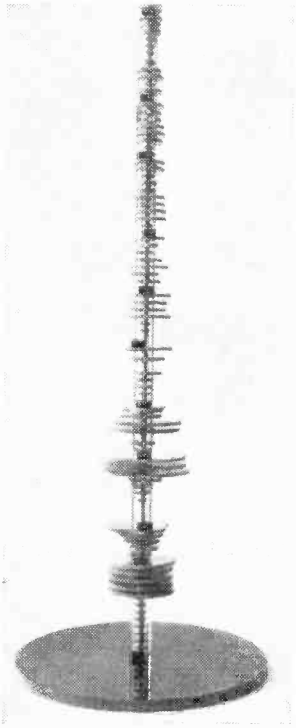
The oscilloscope screen of the sonar caliper shows a complete circle of timed impulses at a selected depth in a deep well. The 'scope indicates that the cavern sides are about 60 feet apart and its center is west of the drill hole. Hair line at top-center of photo indicates magnetic north on all photographs.

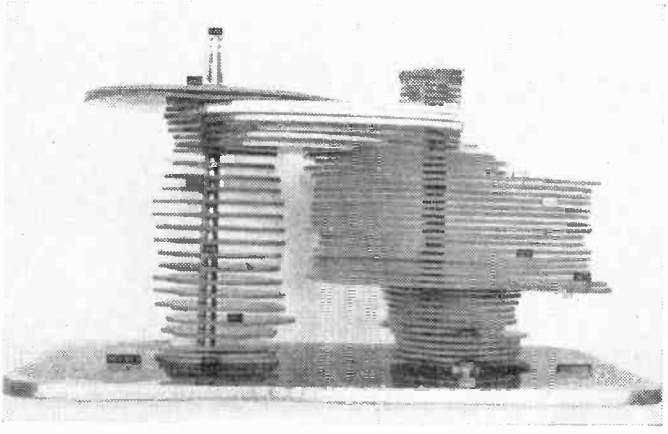


SONAR CALIPER

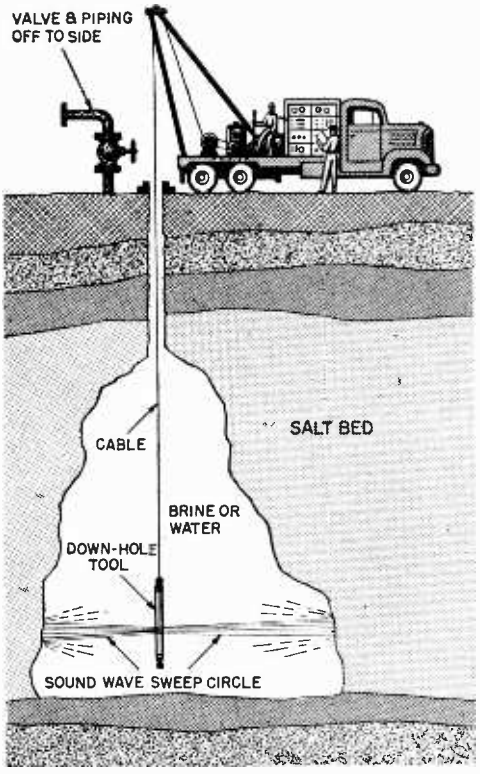
Electronics goes underground to sound out deep caverns

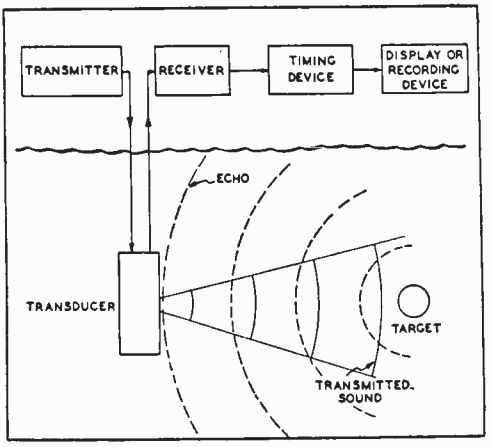
By Merle M. Dowd





Plastic disks cut to scale (1 inch equals 20 feet) are stacked one on top of the other to give well makers an exact model of the underground cavern washed from the salt bed. Irregular shape results from different solubility of varying strata of the salt beds. Model at left shows a very deep well. Model above shows how two caverns were accidentally connected together by a washout that only the sonar caliper can discover.





Block diagram above shows how an underwater sonar device measures the range from the transducer to the target. The transmitter generates an electrical impulse of short duration which is converted to a "beep" sound by the transducer. The sound bounces off of the target and back to the transducer where it is converted to a pulse and sent to the receiver. The timing device and the display unit (oscilloscope) produce 'scope patterns. The diagram at the left shows the down-hole tool which houses the transducer.

SOUND WAVES are being used to *measure* underground caverns made for storing liquid cooking gas and other fluids. These *tanks* offer a low-cost method for storing fluids or gases under pressure compared to steel tanks above ground. Many times these caverns are washed from salt beds by pumping water down a double-walled pipe and bringing up a heavy brine. But the shape and size of the caverns have been difficult to measure and control. Sometimes, one cavern will wash into another, or drill-heads are so widely spaced to prevent interference between caverns that full use of a salt bed is impossible. Knowing the shape and size of a cavern roof is necessary to check on its strength, as cave-ins are expensive to clean out or repair.

How it's done. To measure the size and shape of these underground storage chambers, the Dowell Division of the Dow Chemical Co. has come up with a sonar caliper. It operates like this:

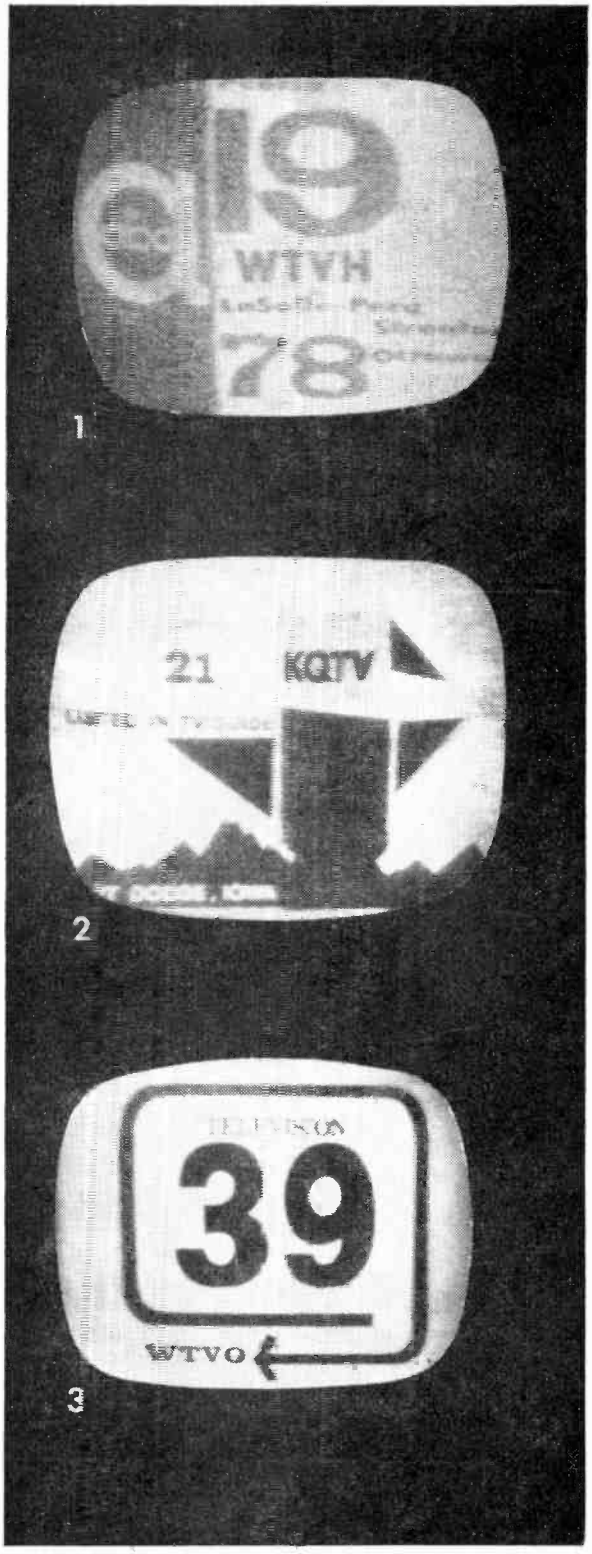
A down-hole sonar sound source and receiver hangs from a cable that hoists it up and down the well casing. Aboard the truck are depth-measuring and electrical recording devices. A precisely timed sound source in the down-hole tool sends out waves that travel to the cavern wall and are reflected back. A transducer changes the reflected sound waves to electrical impulses that travel up to instruments on the truck. By measuring the time it takes for the sound to travel from the down-hole tool to the cavern wall and back, the distance out to the wall can be determined. (*See Echo Collecting, February-March, 1964* RADIO-TV EXPERIMENTER.)

As the down-hole tool produces sound waves, it is constantly turning throughout a full circle. Distances to the wall from the tool are measured in all directions as the sound sweeps around the circle. Pulses from the sonar tool show up on an oscilloscope. Distances are measured from concentric circles on the oscilloscope which are calibrated in five range scales varying from 25 to 500 feet. A special signal identifies magnetic north as the tool turns.

Sound photo. A Polaroid camera records on film the pulse signals shown on the oscilloscope. The magnetic-north signal allows each photo to be oriented directionally. By calipering each slide of the cavern at even depth stages, a 3-dimensional measurement

(Continued on page 104)

TV DX

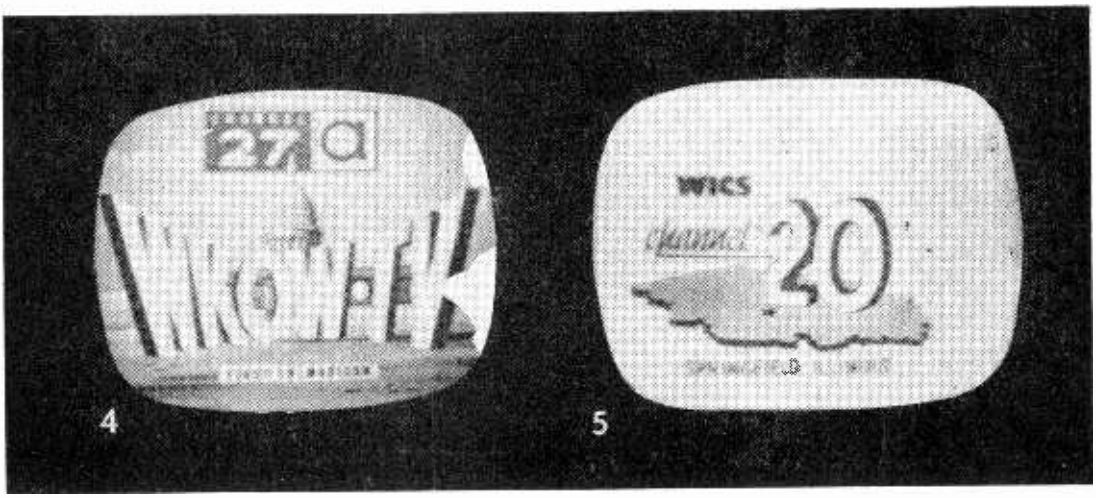


Eyeball DX'ing of UHF and VHF television signals opens new vistas for SWL's with cameras

By C. M. Stanbury II

WITH international viewing via satellites just around the corner, a revolution in DX techniques is also imminent. The DX'ers ear will become the DX'ers eye, program descriptions will become more complex along with a flock of other changes. Smart radio people have gotten in on the ground floor by tackling domestic Television now. Even better, distant reception of these stations constitutes a real challenge in itself.

Skip. The actual mechanics of distant VHF TV reception (channels 2 through 13) are very similar to FM DX as described in the Spring 1963 edition of RADIO-TV EXPERMENTER skip produced in the ionosphere provides reception between 600 and 1500 miles. Inside that range the troposphere must do the job. "Trop" usually occurs during periods of fair weather. On the other hand, VHF TV channels are split into two distinct bands. Channel 2 through 6 are below the FM band and here skip is much more common than with frequency-modulated stations. Channels 7 through 13 are considerably above the FM band, therefore, the only major source of DX is "trop" skip. The latter also applies to UHF although scatter techniques—still in the experimental stage and beyond the scope of this article



Seeing is believing and what better proof can a TV DX'er offer than a photo snap of station panel ID's. Here are a few that prove TV DX'ing is possible. 1—WTVH, Channel 19, 120 miles. 2—KQTV, Channel 21, 340 miles. 3—WTVQ, Channel 39, 45 miles. 4—WKOW-TV, Channel 27, 120 miles. —and last. 5—WICS, Channel 20, 180 miles. ID panels stand still and any amateur with a camera can learn to snap them. However, live scenes shouldn't be attempted when there is any motion or TV camera panning.

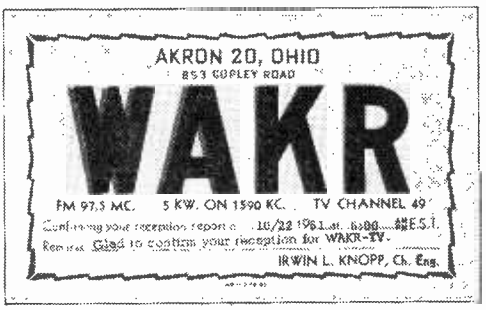
—promise surprises for would-be DX'ers.

Now, channels 2 through 6 would be a real DXer's paradise if not for one factor —*interference*. Channel 2, because it is the lowest in frequency, is best for skip. But suppose you have a local channel 2. It will not only block a distant channel 2 but, via "co-channel QRM" seriously impair reception of channel 3 from distant places. Worse, a station on channel 3 can wreck channels 2, 3 and 4. With so many stations and only 12 VHF channels, interference has become the number one problem for TV DX'ers.

Equipment. Armed with this briefing you are ready to choose your weapons. Of course, most of us must start with whatever gear is available, adding to it on a "priority" basis as the budget permits. Almost any set will do with an outdoor antenna. You can build the antenna array yourself copying any variety of designs. With this in mind, your first *purchase* should be an antenna rotor. Attached to good directional array, this device can eliminate much interference especially on "trop" which often comes from many areas on the same channel. Further, by determining a signal's direction, you can cut down that time wasted on previously logged transmitters. There is nothing more frustrating than battling a weak signal for an hour only to come up with an all too familiar ID.

If you buy the antenna itself, an all (VHF) channel yagi represents a good compromise with price or, in localities where channel 2 is clear, a beam cut to that frequency (54-60 MC) is excellent for working skip which on occasions can even include Latin America.

If you are in a position to purchase a receiver specifically for DX purposes (lucky you) ignore such things as 21 inch screens (which can be a handicap) and fancy cabinets. All that counts is a powerful chassis (ie. R.F. & I.F. stages). Shop around carefully and if possible compare different models side by side when turned to a semi-local —a station approximately 50 miles away.


AKRON 20, OHIO
853 COPLEY ROAD
WAKR
FM 97.5 MC. 5 KW. ON 1590 KC. TV CHANNEL 49
Confirming your reception report of 10/22 1961 at 6:00 P.M. E.S.T.
Reports Glad to confirm your reception for WAKR-TV.
IRWIN L. KNOPP, Ch. Eng.

If you happen to pull in WAKR-TV in Akron, Ohio, the station will verify with a QSL.

Needless to say, also compare co-channel interference from both local and semi-locals. Incidentally a second hand *small screen* receiver in *good* condition is often your best DX buy.

Targets—Now and the Future. While TV programs all suffer from a similar brand of mediocrity whether the station be in Maine or Oregon, there are in addition to distance itself, offbeat targets which the DX'er can shoot for today. We have already mentioned Latin American stations and these include Castro-ite Cubans. Then there are those low powered CBC relays serving isolated communities in Canada's Northland. Canadian Broadcasting Corporation programming is picked up from the microwave relay network which crosses the nation, then in this instance is broadcast to the community on channel 9. There are neither identifications nor any local commercials. These relays produce at least one moment of dead air each hour and these periods are the means by which a DX'er can spot this illusive breed of transmitter. Reports (the contents we'll discuss at the end of this article) should be addressed to one of the major CBC centers such as Toronto, Vancouver, etc. You should be able to determine the general area by the direction of your antenna—again that rotor is important.

Shooting Station Panels. What better proof can you offer that you had *so-and-so* station on your TV screen than to show the station engineer a photograph of his station's ID panel. So, if you are interested in TV DX'ing you must become expert in shooting your TV screen.

Since your photos can be no better than the picture on your TV screen, the set must be adjusted to give the best possible image. Brightness and contrast controls should be set slightly lower than for normal viewing. As no extraneous light must strike the TV screen, it is advisable to close window blinds and turn out room lights.

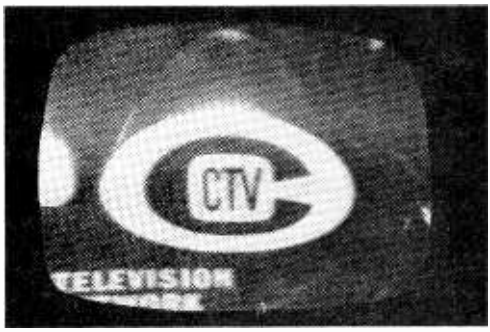
The camera, mounted on a tripod and fitted with a cable release, should be placed with the lens centered on the screen and close enough so that as large an image as possible will be obtained on the film. Focus sharply on the scanning lines across the screen, not on the image.

Since the TV picture is scanned in 1/30th of a second, exposure must be for at least that time. With shutter speeds faster than 1/30, you may get only part of a picture or none at all. Longer exposures may be made, but subject movement will be more of a problem.

Correct exposure must be determined by test, but you might try 1/30 sec. at f/4 as a starting point, using a medium-speed (ASA 125) film such as Kodak Plus-X Pan or Verichrome Pan. For color TV, use Kodak High Speed Ektachrome, Daylight Type, with a Wratten 2B or equivalent filter to absorb ultraviolet radiation. Suggested exposure: 1/30 sec. at f/2.8.

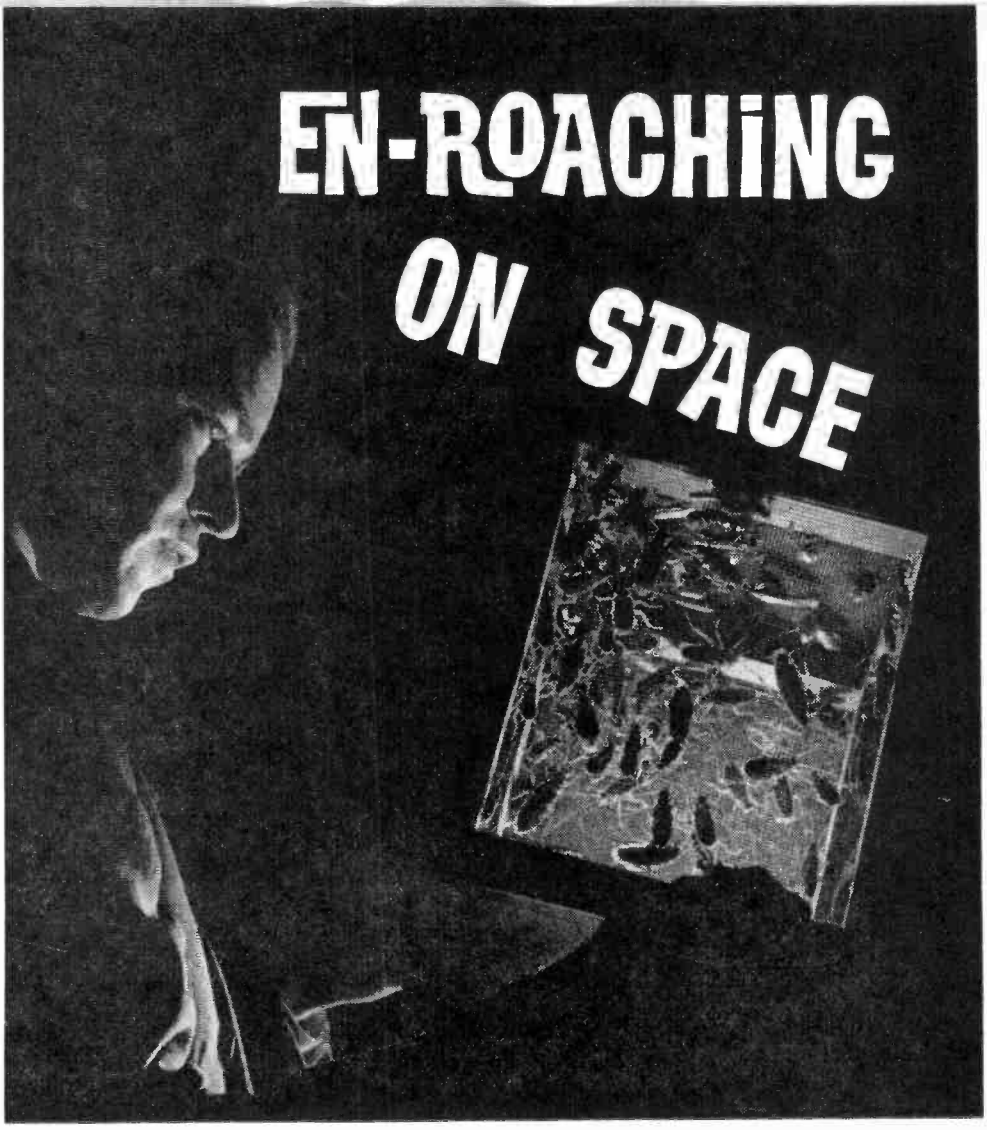
Closeups, as in interview and panel shows, make the best pictures; detail often gets lost in long shots. Don't shoot while the TV camera is moving—dollying or panning, while its lens is zooming, or when action is fast; you can't stop such movement at 1/30 shutter speed. Don't forget to shoot the station's ID panel—this is the icing on the cake.

Reporting. A report for a TV station is not too different from those you would send to a short-wave broadcaster. Date, time (in the station's zone), signal strength (both audio and video), interference (but no ham type abbreviations such as QRM), and program details to prove your reception. In that latter departments the accent is on visual details—description of ID panel (see photos), opening shot of a *local* commercial, etc. Most TV DX men will recognize video reception without audio but not the other way round. Conclude your report with a polite request for confirmation, address it to the Chief Engineer and include return postage. ■



It takes a fired-up television receiver, Yagi antenna and CDR antenna rotator to pull in this 460-mile Canadian signal.

EN-ROACHING ON SPACE



Dr. William N. Sullivan checks a cage of cockroaches reared in laboratory for testing purposes. Dept. of Agriculture photo.

Electronics and an Astrobug join forces to predict the effect infinite night of space will have on man's biological clock

By Katherine Kirkbride

FEW would link man's dreams of walking on the moon, Mars and Venus with the lowly cockroach. Yet today this hardy little fellow goes through basic training in Beltsville, Maryland, to soar millions of miles into space. And as Department of Agriculture entomologist William N. Sullivan, biologist Samson R. Dutky and chemist Milton S. Schechter see it, if the roach succumbs to the hazards of space, then his frailer antagonist, man, is in for trouble upstairs.

For the cockroach is the hardiest creature on earth. He traces his family back 350 million years, has outlived the dinosaur, the ice age, can freeze in an ice cube, unfreeze and walk blithely away. Neither gourmet nor gourmand, he will dine on paint, ink, boot polish, toothpaste, eyelashes, his own discarded shells or fast completely for days, weeks, if need be. He thrives on turning night into day, has even achieved a 90 percent win over man's devious chemical plotting against him.

It's his hardy character and light weight,

EN-ROACHING ON SPACE

his indifference to dieting and his known preference for the evening that qualify him for his presentday role as advance-man for man in outer space. For, reason his Beltsville mentors, if tough-guy cockroach succumbs to Van Allen radiation, cosmic rays or the storms of the sun—even if his biological clock rhythms are disrupted—then frailer man may not make it in outer space.

Selecting the space bug. This extraordinary theory began in the 1950's when entomologist Sullivan was studying agricultural pests flown from an infected country into a non-infected one aboard the wings of propeller planes. When the jet replaced the propeller, Sullivan wondered, would insect life survive the cold of the stratosphere, the speed impact of jet travel?

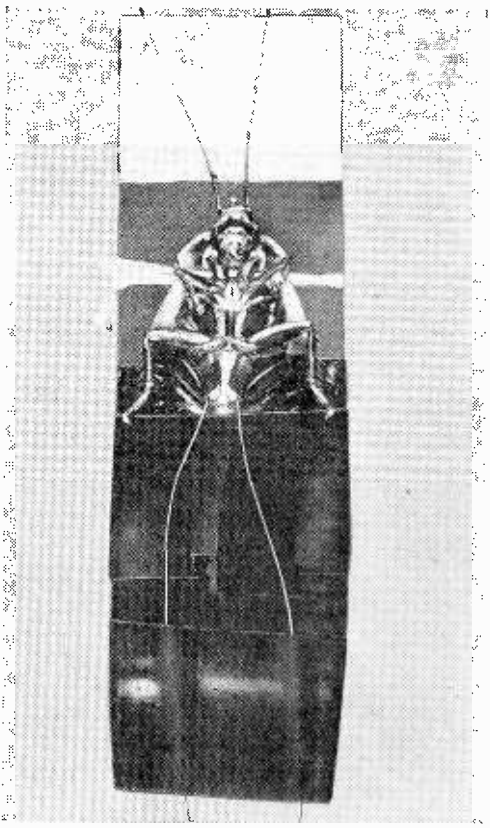
To decide the point, he invited an eastern tent caterpillar to lay eggs on a piece of aluminum foil, folded the foil, taped it to the wing of a jet. After a 50,000 feet trip at over 900 miles an hour, the plane returned with eggs intact. Three days later they hatched.

When Sullivan realized insect life could survive the stress of jet travel, he reasoned, why not try insects in space? "Organisms in nature have behavioral rhythms" he says and their day-night rhythms, their biological clock, could well yardstick reactions in the far reaches of space.

He next chose the hardiest of insects, the cockroach, then picked the hardiest of the roach's 3500 species, the Madeira. Though the Madeira originally hails from the Caribbean, Sullivan had his Madeiranauts reared and selected for rhythm realiability at the University of Princeton, Princeton, New Jersey, and mailed to him in a mailing tube.

Astrobug testing. Then began a series of tests to find out how tough the tough roach is.

First Madeira was placed in a glass cylinder with dog biscuit and water to condition



Astrobug Madeira is secured to an ordinary glass slide with electrician's tape. Silver wire (No. 32) probes connect to base of rear legs.

him for one week to normal daylight and darkness. He was placed in a centrifuge, where he proved he could withstand stresses up to 125 g's, gravitational force that would crush his human astronaut counterpart.

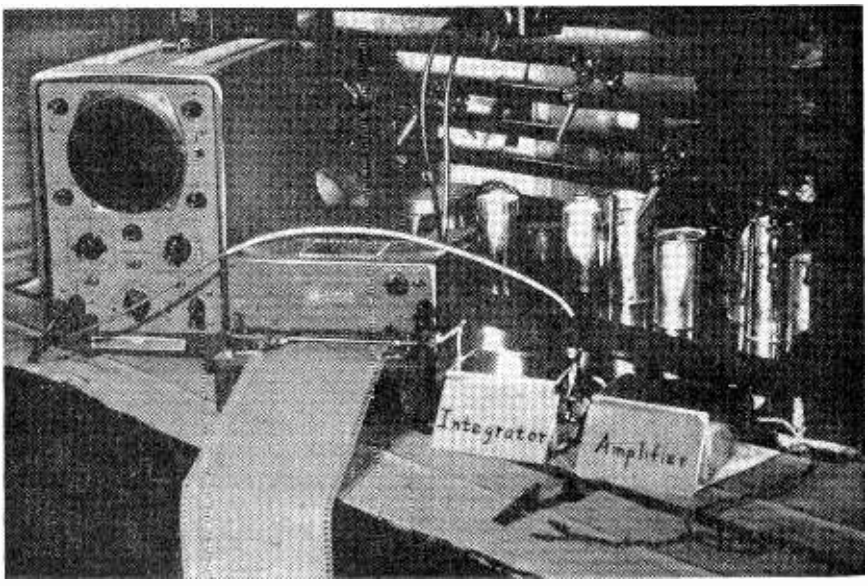
His locomotor activity was monitored from a glass cylinder, then from a five-gallon lard can, equipped with a fan for ventilation, a fluorescent lamp attached to the lid to furnish artificial day and night patterns.

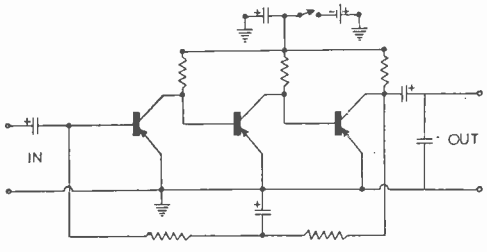
Electronics steps in. Next came Madeira's preparation for space. Sullivan first gave his insectronaut an anesthetic of carbon dioxide, sterilized and mounted him on a ¾" x 3¾" plastic slide, his tiny wings pinned down with plastic electrical tape.

The roach's rear legs were then taped to the strip and lengths of sterilized 32-gauge silver wire inserted into his rear legs at the end of the spine. Tape then secured the electrodes to the plastic slide.

As Madeira reacted to his familiar day-

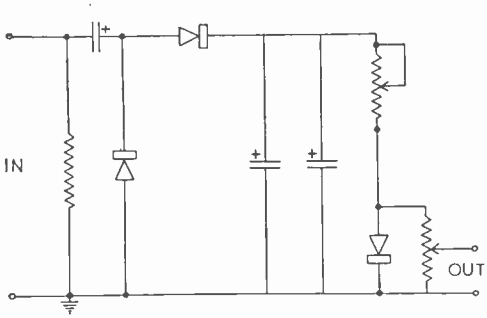
Scientists test cockroaches in the laboratory before space shots



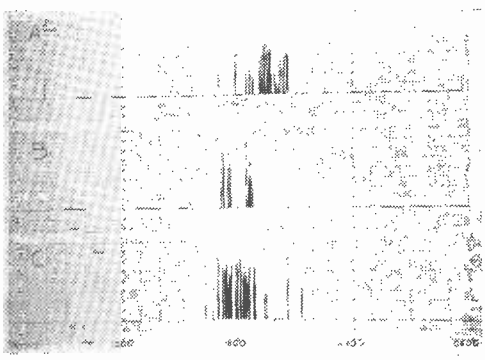


THREE TRANSISTOR AMPLIFIER

The cockroach's biological clock must be studied and understood here on earth before man rockets the astrobug into space and its infinite night. Above, the electronics necessary for continuously recording the integrated electrophysiological output from the electrodes in the rear legs of a cockroach. The transistor amplifier (schematic diagram at left) boosts weak signals over 8000 times. The integrator circuit (see schematic diagram lower left) provides a useful signal to the graph recorder. Chart (see below) shows that cockroach's activity increases after sunset for several hours.



HALF-WAVE VOLTAGE DOUBLING INTEGRATOR
NONLINEAR OUTPUT



EN-ROACHING ON SPACE

night rhythms, signals from the taped electrodes fed into a three-stage transistor amplifier, then into a voltage-doubling integrator to a Varian recorder to graph a permanent record of roach's responses. An oscilloscope pictured wave formations for Sullivan.

The roaches were next taped to a board, exposed to changing light and dark cycles but proved loyal to their biological clock patterns even when kept in the dark for days at a time. Madeira showed especial affection for the hours just after sundown, his fondest activity cycle between 7 and 9 p.m., when he would kick right up to 1 millivolt in contrast to his lowly 10 to 40 microvolt signals in daytime hours.

It is this permanently recorded pattern of day and night activity that Sullivan hopes to compare with Madeira's behavior upstairs.

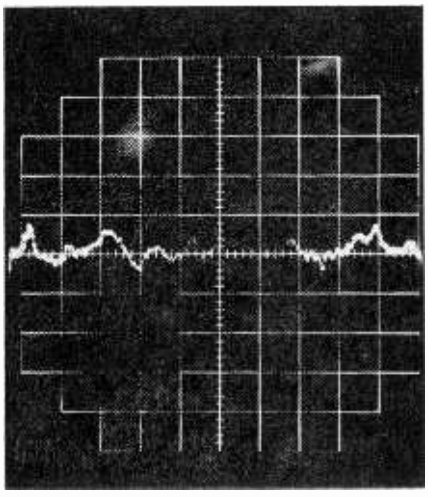
Bug couch. To send his roaches into space, Sullivan has devised a "space couch" he calls a "biopack." Designed to carry chemicals man himself would carry to other worlds, the "couch" is really a container lined with a cloth bag. Inside the bag are chemicals to purify and moisturize the air. The bag is wired inside the can, two *insectronauts* mounted back to back on a slide attached to the lid of the can. Just before sealing, the container is flushed with an oxygen-nitrogen mixture.

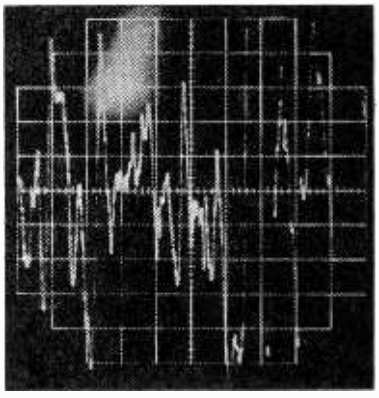
Riding into space, miniature electrodes on tiny cockroach legs will telemeter reactions back to earth. Sullivan hopes to monitor heart and lung reactions, study effects of acceleration, as well as biological clock rhythms, just as long as transmitters keep in touch with receivers on earth and as long as Madeira holds out without food and water.

Sullivan believes this will be about ten days. But if he can find a way to send food and water with his Madeiranauts aboard a NASA satellite for prolonged flight in 1965, he feels he may hear from them for a month, even longer.

As he sums up his theory, man too has a biological clock, active in daytime, not so active at night. And Sullivan hopes to find clues as to how man may respond in space where there is no indication of our 24 hour cycle.

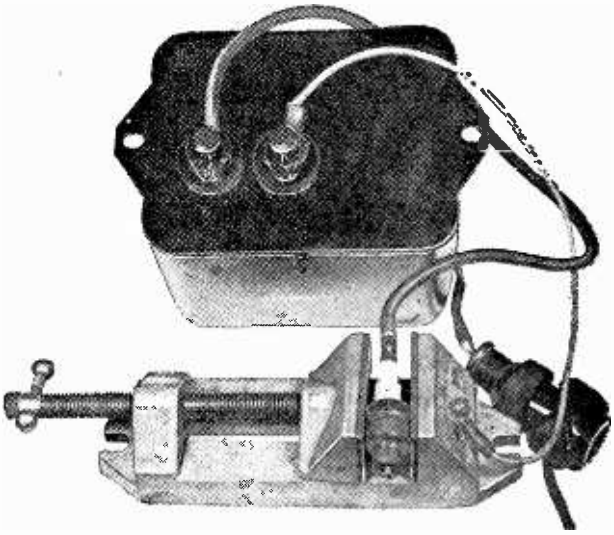
He feels the roach is the hardiest of all creatures, has been around for millions of years without change, and that if the roach's rhythms change radically or cease in outer space, then man is going to have his troubles upstairs. And his dream of reaching the moon may be just that—a dream. ■





Oscilloscope patterns show laboratory researchers cockroach activity. Left, roach during the day; above, action during the night.

Salvage Your Spark Plugs Electronically



By R. Hill

This high current tester restores useable plugs to new condition

SPARK plugs hardly ever wear out. When they're not doing the job, it may be because they're coated with grease, have a crack in the poreclain, are covered with lead deposits, or need to be regapped. Save yourself time and money by testing your plugs with a unit that shows whether you should dress and reinstall them or go out and buy replacements.

All that's needed to make this high current tester is an ignition transformer from an old oil burner that has an output of 10,000 volts with 23 milli-amperes of ac current. Run ignition wires from the transformer to the vise and plug.

When the transformer is operating, an intense spark current flows across the electrodes so that any excessive electrical resistance or leakage will reduce the current flow across the gap.

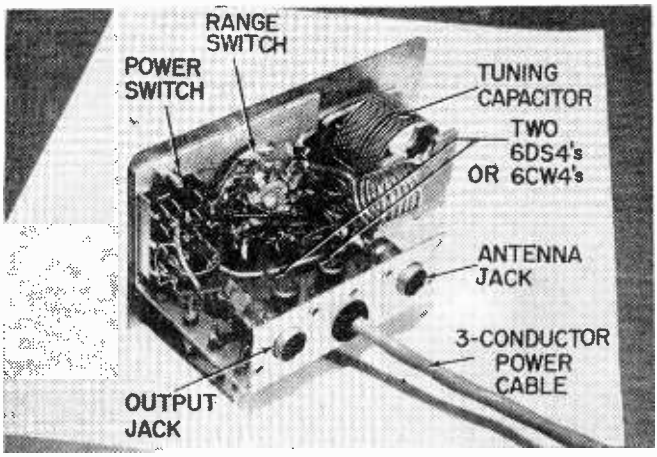
As the spark flows between the electrodes, it separates into many small streamers. As the current flow is reduced, because of resistance or leakage, the streamers tend to separate and the spark becomes first a violet color, then changes to a cold blue, with an increasing crackling sound.

Before you test the plugs clean the electrodes with sandpaper and use a point file to dress the surfaces to a flat, bright finish. Open the gap to 0.040, checking it with a wire gauge. Tighten the brass cap on top of the plug and sand to make it shiny.

Be sure the electrical connection is pulled out or the line switch shut off before you connect the wire to the plug and put it in the vise. With the current on, the spark should completely cover the end of the center electrode. If it doesn't, there can be internal or external spark leakage which may not be visible, or lead deposits remaining on the electrodes that have to be cleaned.

The high flow of current through the plug will soon burn out any carbon along the shorting patch. If after a minute of sparking the pattern is still less than full, the spark is escaping through the insulator or electrical resistance due to corrosion is holding back the current flow and the plug is defective. If the spark in a resistor or suppressor plug is reduced or it refuses to fire the resistor cartridge has likely changed its properties or the contacts between the internal resistor cartridge and center electrode is corroded and interferes with current flow.

Replace the plugs that don't check out. Regap the old plugs according to manufacturer's specifications, bending the side electrode at the side and not the top, and measure the gap with a wire gauge. ■



The Ameco Model PCL pre-amplifier packs a lot of electronics in its 3″ x 5″ x 3″ case. Priced at $24.95, the PCL can be tabbed a bargain booster.

RF BOOSTER for 6-to 160-meters

EVERY serious amateur operator and short-wave listener at one time or another reaches a stage where his receiver does not have the *pull-in ooomph* he would like it to have. The Ameco Equipment Corp. (178 Herricks Road, Mineola, L.I., New York) has come up with an all-band preamplifier, Model PCL, that has the needed oomph your receiver requires.

The PCL is a tuned RF amplifier covering all frequencies from 1.8 to 54 mc. including the 160 through 6 meters amateur bands. The PCL improves the receiver's gain, noise figure, spurious signal rejection and image rejection. It uses two Nuvistors in a cascode circuit and our tests conducted at DX Central's listening post indicated that the gain exceeded 20 db with a noise figure under 2 db throughout most of the usable range.

The PCL requires 6.3 volts at 270 ma. for filament heating and 100 to 300 volts DC at 8 ma. for plate power. Power requirements are low enough to be taken directly from the receiver. The unit's input impedance is nominally 50 to 75 ohms to match most popular antenna types. The antenna jacks accept Motorola auto radio type connectors.

When making up the interconnecting RF cable, keep in mind that shunt capacitance of a cable increases with the length—avoid unnecessary losses at the high end by keeping cable connections as short as possible.

Operation of the PCL is simple. The range switch selects a band of frequencies and the tuning knob adjusted for maximum signal indicated by the S-meter or increasing volume. The power switch has a standby position that keeps the PCL filaments hot. ■

AUTO BELT MINDER

"Buckle up for safety" is the slogan for this simple R-C device

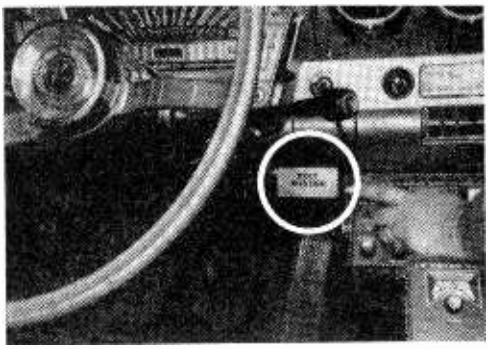
By Fred Blechman, K6UGT

Do you often find yourself blithely driving along in your new Super-Duper Coupe when you suddenly realize that you have completely forgotten to buckle your seat belt? After going to the expense of having the seat belts installed, the least you can do is insure their use. The Auto Belt-Minder is an extremely simple, foolproof device that will remind you to put on your seat belt whenever you start the car.

How It Works. Referring to the Belt-Minder schematic diagram voltage is applied to the discharged electrolytic capacitor C1 when the ignition switch is turned on. The inrush of current, as the capacitor charges, goes through (and is limited by) the relay coil, K1, and the relay contacts close. The contacts connect 12 volts to the series combination of the 6 volt buzzer and the dropping resistor R3. The buzzer, whose loud and raucous tone reminds you to buckle your seat belt, keeps sounding for several seconds and then stops *automatically* as the capacitor charging current drops below the relay drop-out value, opening the relay contacts. The capacitor continues to charge at the source voltage, with the current finally stabilizing at an extremely low leakage value of about 20 microamperes. When the ignition is shut off, C1 discharges through the bleeder resistor R1 and K1 until it is once again discharged and ready for the next sequence; this takes about three minutes, due to the large value of R1.

In testing the unit, it is convenient to cycle the unit at a faster rate, instead of waiting three minutes for the automatic reset. Optional switch S1 and resistor R2 provide a one second reset time when S1 is depressed. Notice that the normal mode of operation

AUTO BELT MINDER



Installed out-of-the-way under the dash board, unit has only one wire connection. Be sure that hardware securing the auto belt minder provides a good ground between the aluminum box and the metal dashboard.

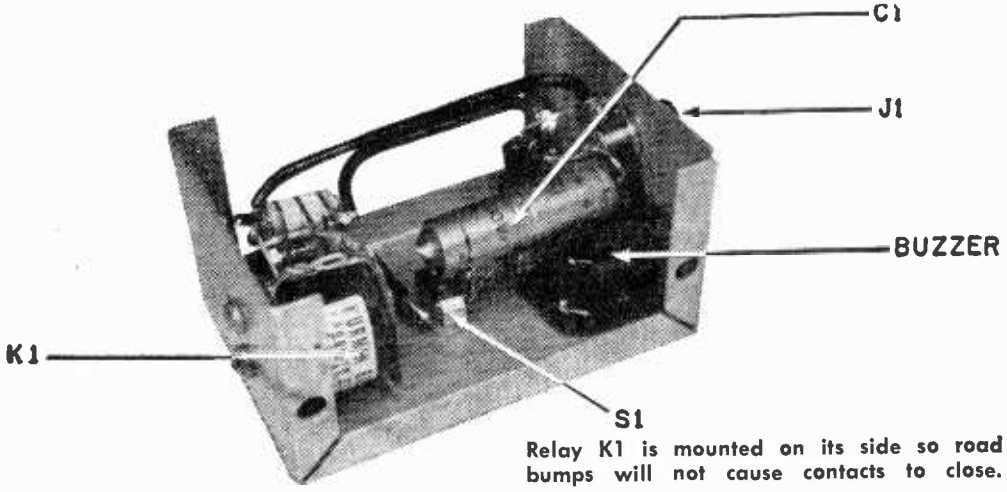
is entirely automatic, requiring no driver attention; it buzzes, stops and resets automatically.

The Belt-Minder was designed for use with a 12 volt system. For a 6 volt system an even more sensitive (and therefore more expensive) relay would be required. Also, notice that this unit can be used with either positive or negative ground cars; if the car has the positive side of the battery connected to the frame, just reverse the polarity of the electrolytic capacitor C1.

Construction. Proper component selection is the secret to the reliable operation of the Belt-Minder. The relay and buzzer specified in the parts list are quality units, both working well within their normal tolerance. Substitution of a less expensive buzzer will result in a larger unit, and the buzzer internal contacts will require adjustment. The specified buzzer is small, requires no adjustment, makes lots of noise and operates very reliably from 12 volts with the series resistor shown (R3).

Probably the most critical item in this unit is the relay. It is available only directly from the manufacturer, as shown in the parts list. This small, sensitive 5000 ohm S.P.D.T. relay closes at 1.4 milliamperes, and stays closed until drop-out of only .14 ma. The high coil resistance and low drop-out current allow preservation of the required charging time constant and buzz duration without using a much larger capacitor for C1.

The parts may be conveniently mounted in the flanged portion of a standard Minibox, as shown in the photos of the author's unit. Make sure the relay is positioned so that, after the Belt-Minder is installed in the car, the relay armature is edgewise to the vertical; otherwise, everytime you go over a bump in the road, you might find the relay snaps closed from the bump and triggers the buzzer for an instant. The buzzer is cemented to the inside of the box. All wiring is point-to-point, so no terminal strips are required. Keep the leads short so the parts are held relatively rigid. Neither wiring or component layout is critical. The back of the



Relay K1 is mounted on its side so road bumps will not cause contacts to close.

Minibox can be screwed to the underside of the dashboard, or to the firewall; this will hold the unit rigidly, as well as providing a connection to the frame of the car for the circuit voltage return. The Minibox, with all the parts installed, is held to the back with the screws supplied with the box.

Electrical Installation. The power to operate the Belt-Minder can be found many places "downstream" of the ignition switch. Usually, cars will have unused wires under the dash for uninstalled accessories that are controlled by the ignition switch. In many cases, radio, instruments and even the cigarette lighter are cut off by the ignition switch.

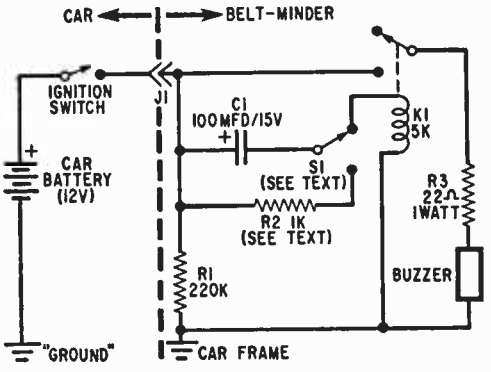
Using a voltmeter, locate a wire that shows 12 volts to the car frame only when the ignition is turned on. Run a new wire from here to the Belt-Minder. Install a pin *jack* at the end of this wire, and insulate the connection well so that there is no chance of this wire shorting to the car frame when the Belt-Minder is not hooked up, or during testing. Notice that a *jack* must be used; a plug, which means a projecting contact, should never be used on a wire connected to the power source, since it is too easy for the plug to make contact with bare metal.

The author used an RCA-type single-hole mounting phono jack in the Belt-Minder, but a small chassis-mounting *plug* would have been better. A small phono-plug to pin-plug adapter was made to mate with the "live" power pin-jack. When the buzzer is operating, the unit draws only about ¼ amp from the battery; when the buzzer stops, the current drawn is in the low microampere range. Therefore, the wiring running to the Belt-Minder can be light gauge. Fusing would be *gilding the lily* but not necessary if the 12-volt line you tap into is now fused.

Testing and Operation. With the Belt-Minder connected as described above, turn on the ignition. The unit should start buzzing instantly, and continue to buzz for about 3 seconds. To make it buzz again, depress S1 for about 1 second; the unit will buzz again for 3 seconds when S1 is released. In normal operation, the unit resets automatically about three minutes after the ignition is turned off. If you want a shorter buzz time, decrease the value of C1; conversely, to increase the buzz time, make C1 larger. To decrease the reset time, make R1 smaller.

You'll find the Belt-Minder much less complex and bothersome than some other safety belt reminder schemes, since it is not connected to the belts themselves in any way. Therefore, you are not forced to connect the buckles just to stop the buzz, as in one such system previously published. If you are just moving the car a short distance and don't want to put on the belt, ignore the 3 second buzz—if you can.

The Belt-Minder uses quality parts, so it costs a little over $10 to build, but it is entirely automatic, and its simplicity makes it very reliable, which is important in any safety device. Some new 1964 cars recognize the importance of a safety belt reminder by offering an optional panel light as a warning device. Build the Belt-Minder and be reminded, even with your eyes closed! ■



Small in size, the Belt-Minder packs a powerful buzzer in its all-aluminum case. Testing is simple—just depress push-button switch on bottom of unit for one second, then release. Buzzer should come on.

PARTS LIST

R1—220,000-ohm, ½-watt resistor
R2—1,000-ohm, ½-watt resistor (optional—see text)
R3—22-ohm, 1-watt resistor
C1—100 mf, 15-volt electrolytic capacitor
*K1—Kurman 51CA42D midget sensitive relay (If not available at your local electronic parts dealer, then order direct from Kurman Elec. Co., 191 Newel Street, Brooklyn, New York 11222—$6.00 postpaid)
J1—RCA-type single hole phono jack (see text)
S1—S.p.d.t. push-button switch (optional—see text) (Lafayette MS-449)
Buzzer—Reeve 361373-1 4-7.5 volts Special (Harold Morgan, 253 West Marquette Road, Chicago 21, Illinois—$3.00 postpaid, alternate buzzer—Lafayette MS-436)
1—Aluminum chassis box—3¼ x 2⅛ x 1⅝
Misc—Wire, pin-plug and pin-jack, RCA-type phono plug, cement.
*Do not substitute. Available only from source listed. Other relays will probably not work as well or at all.
Estimated cost: $11.75 with optional parts
Estimated construction time: 2 hours

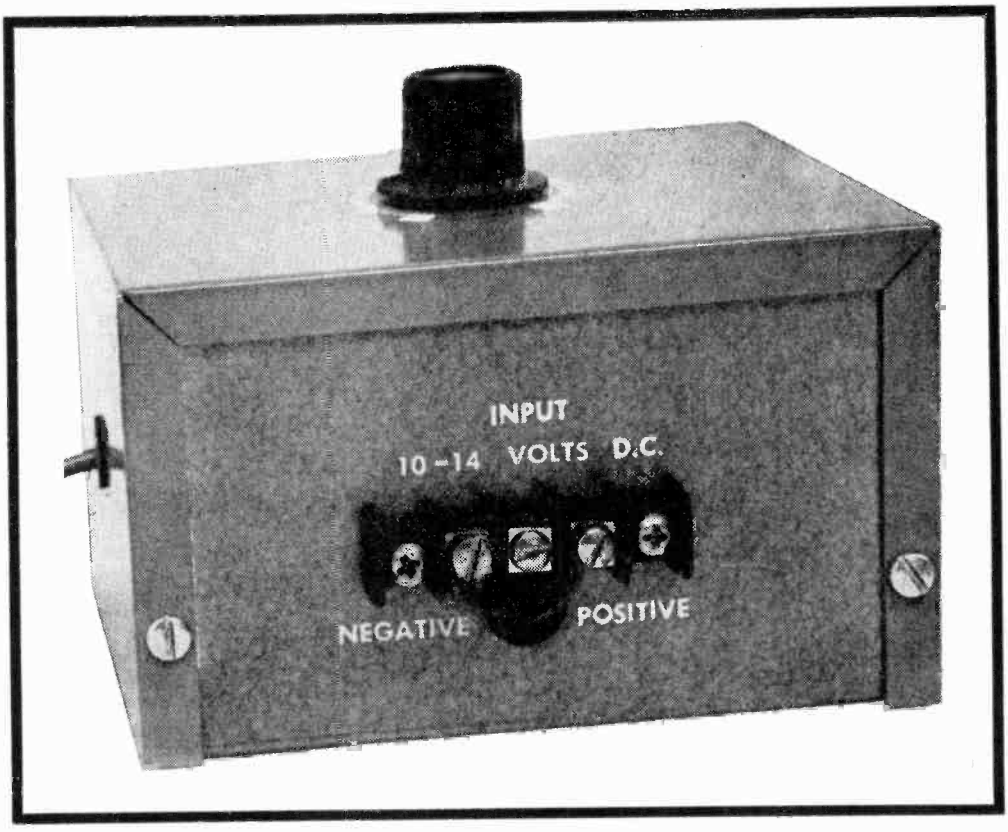
UNDERWATER

ONCE under water a diver was limited to simple hand signals or board and chalk in communicating to other divers. Now, with the aid of *Watercom*, an underwater communication system developed by Bendix, a diver can talk to others beneath the surface of the water up to a range of 100 yards. The diver's voice is amplified, travels through the water, and can be heard by the human ear without the aid of special listening equipment.

The transmitter is housed in a cylinder approximately 14 inches long which is fastened to the diver's air tank by means of a metal strap. A specially designed transducer transmits sound through the water. The battery that provides the power is the size of a quart can of motor oil and fits inside the cylinder. The entire unit weighs only five pounds under water.

The complete gear including special mouth mask and disposable battery retails for $259.90.—*J. Sienkiewicz* ■

The Bendix Watercom lets this Miss chat with her diving instructor during training.



BUILD THE CB -LIM

Add more talk power to your CB transmitter—it maintains constant modulation near 100%

By John Potter Shields

HAVE YOU been looking for a gadget to add more *talk power* to your CB rig? Well then, here's just the thing . . . the CB-Lim. A limiter or compressor, this unit acts as a form of automatic gain control, maintaining a constant level of modulation of your CB rig. A few of the advantages to be gained by using the CB-Lim are:

1. More efficient modulation—nearly 100 per cent modulation is maintained at virtually all speech levels.
2. Less chance of overmodulation—constant modulating level minimizes overmodulation peaks.
3. Less change in received signal strength due to more constant transmitter mod-

BUILD THE CB-LIM

ulation, this resulting in greater signal readability.

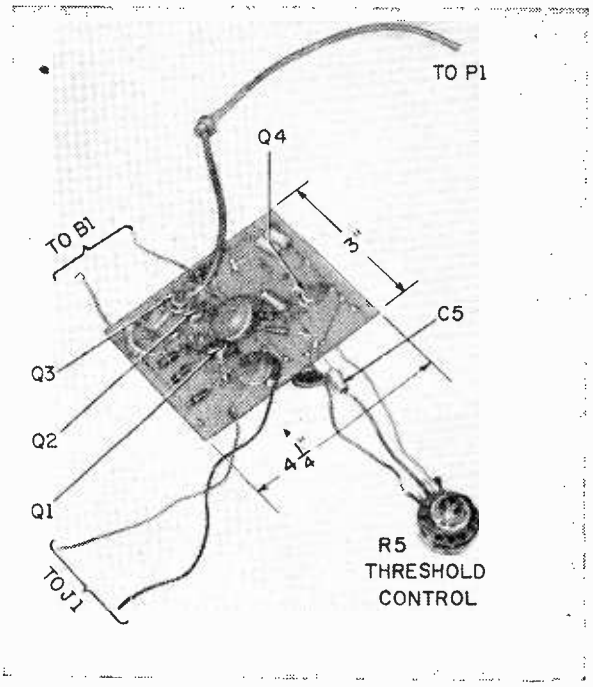
The CB-Lim is an unsophisticated device that is gremlin free, inexpensive to assemble and extremely rugged as it is completely transistorized. Its input power requirements of 10-14-volts DC make it compatible with auto or marine power sources as well as with any CB rig with 12-volt heater tubes by the addition of a simple bridge rectifier system. Aside from its use with CB gear, the CB-Lim is also useful with ham gear, again providing all of the above outlined advantages.

Here's How It Works. Signals from the microphone (crystal or high level dynamic) are fed to the *gate* electrode of the field effect transistor (*FET*) Q1 via the blocking capacitor, C1 (see schematic diagram). An *FET* is used in this first stage in order to present a high input impedance to a crystal microphone. The relatively low input impedance of the conventional transistor loads down a crystal mike, greatly reducing its output and frequency response.

The low impedance output from the *FET*'s *source* electrode is coupled to the base of Q2, the *gating* stage. Q2's emitter is not connected to ground as usual, but rather to the collector of a second *control* transistor, Q3.

The signal appearing at the collector of Q2 is split into two parts, one part being fed to the output signal terminal through the blocking capacitor, C3, and the other part to the *threshold* control, R5. The signal appearing at the slider of R5 is applied to the base of Q4, the control signal amplifier. The amplified signal at Q4's collector is coupled to the voltage doubler rectifier, D1, D2, C6 and C7, which develop a positive voltage proportional to the applied signal.

The positive voltage developed at the doubler's output is fed to the base of Q3. A negative voltage is also applied to Q3's base through R8. With the input signal below the threshold point Q3 receives sufficient negative bias through R8 to conduct fairly heavily, then allowing maximum gain of Q2. An increase in input signal above the threshold point causes a corresponding increase in positive output voltage from the doubler rectifier. This in turn bucks out the negative voltage



Almost all of the parts are mounted on a 3-by-4¼-inch phenolic circuit board. Use stranded wire for leads leaving the board.

PARTS LIST

C1, C2, C3, C4—.05 mf. 50-volt ceramic disc capacitor
C5, C6, C7—5 mf. 15-volt subminiature electrolytic
D1, D2—1N34 diode or equivalent
J1—Phono jack (Switchcraft 3501FP)
P1—Phono plug (Switchcraft 3502)
Q1—TIX-880 field effect transistor (Texas Instruments)
Q2, Q3, Q4—2N1371 transistor (Texas Instruments)
R1—1,000,000-ohm, ½-watt resistor
R2—2,700-ohm, ½-watt resistor
R3, R8—220,000-ohm, ½-watt resistor
R4—3,300-ohm, ½-watt resistor
R5—10,000-ohm, composition potentiometer, linear taper
R6—330,000-ohm, ½-watt resistor
R7—4,700-ohm, ½-watt resistor
R9—68,000-ohm, ½-watt resistor
All fixed resistors rated at 10% tolerance
1—3" x 4" x 5" Aluminum chassis box (Bud CU-3005A)
1—Barrier 3-terminal strip, knob, 3" x 4¼" perforated phenolic board, knob, hardware, wire, solder, etc.
Estimated cost: $14.00
Estimated Construction time: 4 hours

supplied Q3; decreasing its conduction; reducing Q2's gain. The point at which the positive voltage begins to reduce Q2's gain is controlled by the *threshold* control, R5

In case you're wondering how controlling Q3's conduction can vary the gain of Q2, just visualize Q3 as a variable emitter resistor for Q2, whose resistance is a function of its conduction. As you know, increasing the emitter resistance of a common emitter amplified will reduce the gain by virtue of degeneration. This type of control is superior to other forms of control schemes in that it introduces negligible distortion by virtue of the degenerative feedback.

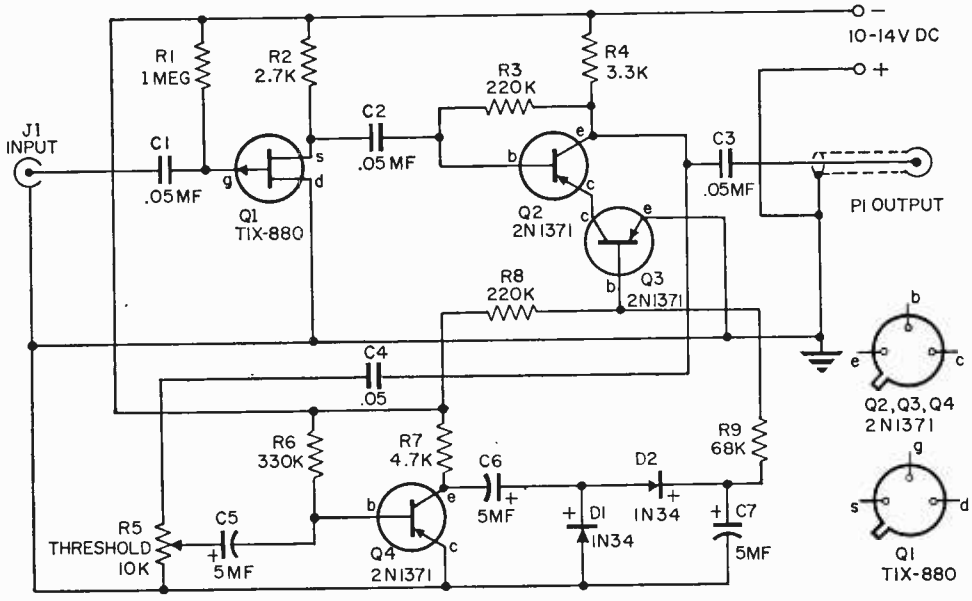
Let's Build One. As shown in the accompanying photos, the author's CB-Lim was assembled on a piece of perforated phenolic circuit board. Small brass eyelets were used as connection points. Construction is not particularly critical nor are parts values.

The completed circuit board can either be mounted in a corner of the existing CB rig or housed in a small minibox as was done by the author. Operating power connections were brought out to a barrier terminal strip mounted on the side of the case.

Testing & Operation. After the unit is completed it should be checked out for proper operation. This checkout is much simplified if a scope or AC VTVM (or conventional multirange VOM of 5,000 ohms/volt AC) is available. Connect the CB-Lim's output lead to either the 'scope or meter, a microphone to its input, and apply power. While whistling into the mike, slowly advance the *threshold* control. Above a certain point, the output level will drop slightly, and increasing the input signal level (by whistling louder) should cause no significant increase in output level. The unit is ready for installation if it passes this test.

While standard "RCA type" phono connectors were used on the author's unit, use the appropriate input and output connectors to match those on your rig.

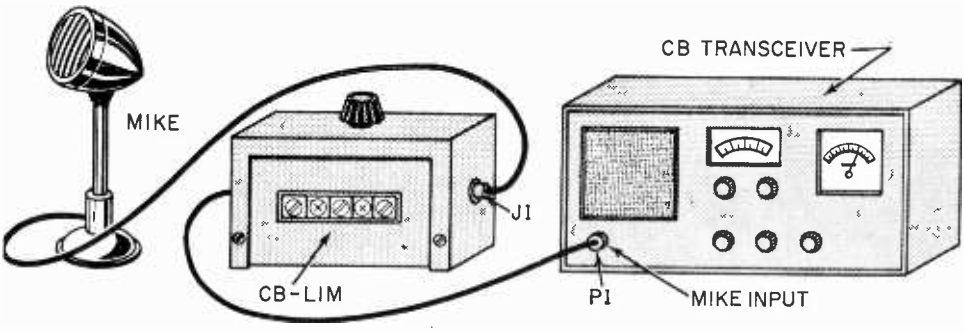
One point should be brought up at this time. Since the CB-Lim does provide a moderate amount of amplification it may overdrive the rig's input stage causing distortion. If this should be the case with your rig, simply insert a 100,000- to 1,000,000-ohm, ½-watt resistor in series with the hot output signal lead of the CB-Lim. The exact

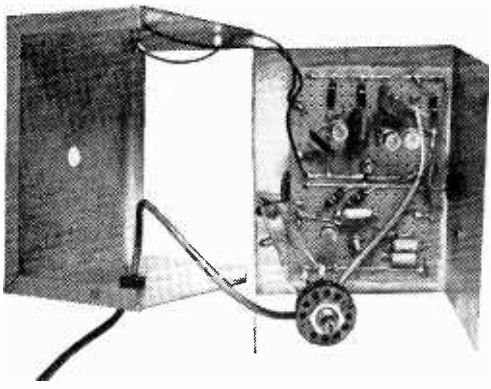


The unusual symbol for Q1 indicates the part is a field effect transistor. Its case resembles Q1's and Q2's. Part placement is not critical, however, try to duplicate the original design.

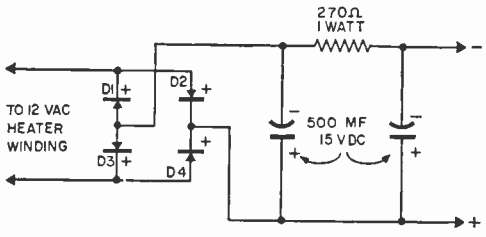
BUILD THE CB-LIM

Connecting the CB-Lim to your transceiver is an easy task. Jack J1 on the unit and plug P1 connected to the cable coming from the unit should be selected to mate with connectors on mike cable and set's mike input.





The CB-Lim prior to final assembly. There is enough room inside to mount dry cells.



D1, D2, D3, D4 = 500 MA SILICON RECTIFIERS

A very simple 12-volt power supply can be made by tapping the available AC power from the CB set's 12-volt AC filament supply.

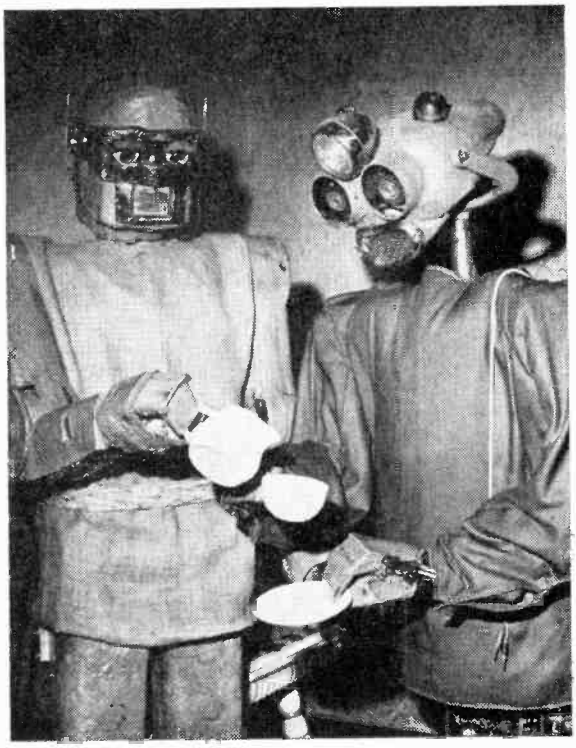
value cannot be specified as it will depend upon the input stage sensitivity of your particular rig. An "on-the-air" test with the transmitter working into a dummy load should be made. A nearby CB receiver will be sensitive enough to pick up the signal. Now would be a good time to bolt the CB-Lim to the side of your CB set. Unit can be mounted almost anywhere in auto installations.

AC to DC. A converter schematic diagram is provided offering a convenient way of powering the 12-volt DC CB-Lim from a 12-volt AC source, such as from the usual 12-volt heater transformer winding of a CB rig. A simple bridge rectifier is connected into the rig's heater winding; the output of which is filtered by a simple R-C pi-section filter. The low current consumption (5 ma.) of the CB-Lim makes filtering an easy task. Of course, a standard 12.6 volt filament transformer can be used . . . a typical unit being the Allied #64-G-136 filament transformer.

Installations in autos demand that the car's battery's positive terminal be connected to ground. If this is not the case in your car, then a 12-volt dry cell power supply will be required.

Well, there you have the CB-Lim. The small $$ and amount of time spent on its construction will be more than justified by the increased operating pleasure you will receive from your ham or CB rig. ■

RAISING ROBOTS



If you are the kind that flunked out of medical school and like to work with your hands, then robot raising may be your calling. Above, Viennese engineer and teacher Klaus Scholz prods past the backbone of a robot to make a servo adjustment. The electro-mechanical men (left) show more dexterity than the average toddler and create less mischief.

The Electro-Mechanical Man—a Science Fiction dream come true

SOME people like to save stamps, others look to clobber a golf ball on weekends, but Viennese engineer Klaus Scholz spends all his spare time building a robot family. The older robot is 2 years and the younger one is still in its prenatal stages.

The weird robot characters that appear to be of science fiction vintage are capable of performing simple human animations. The oldest of the two is not as talented as his budding robot brother who, while still in a state of partial completion, shows more human response.

Herr Scholz intends to fit the second in his family of robots with "organs" of speech and hearing by way of a transistorized "brain." Scholz is trying to create a robot capable of obeying spoken commands and of "thinking" even if only on a low basic level. By demonstrating near-human psychological actions, the inventor believes such a robot would enable experiments in education, obedience and lying.

Robot 2, called Psychotron by the inventor, already has more sensitive hands than his brother. Design measurements were made from human anatomy and arm movements almost duplicate man's. If engineer Scholz can perfect his robots, they may require Social Security numbers.—*J. Sienkiewicz* ■

Quality control by the manufacturer is your guarantee for perfection in tapes.

Photos Courtesy Audio Devices, Inc.

how to buy tape

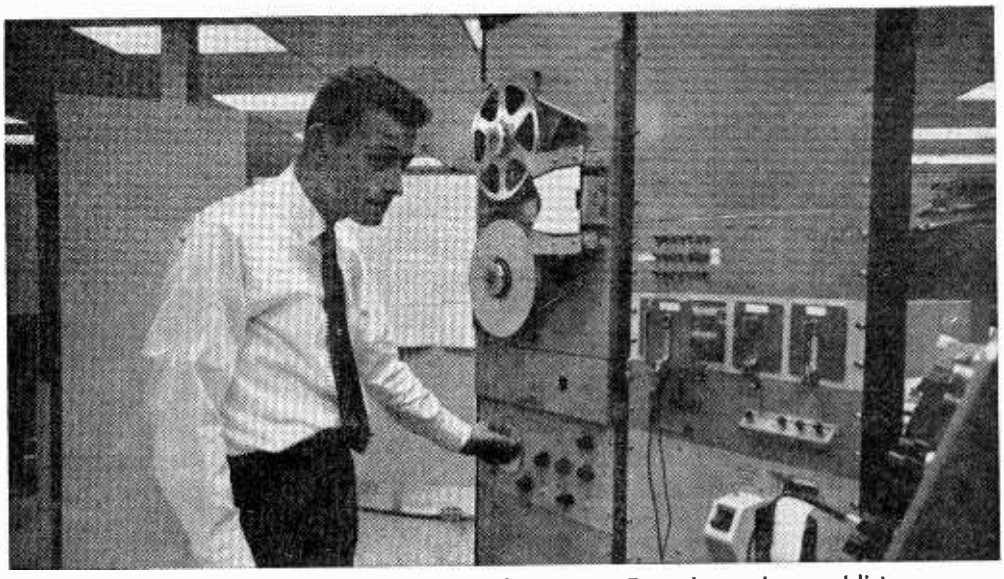
What tape is best for your tape recorder? It's better to trust in brand names than in those unmarked white boxes

By Ralph Freas

WITH 99 per cent wit and 1 per cent accuracy, magnetic tape has been called "rusty cellophane." The reason: much of the recording tape sold uses a backing of cellulose acetate (like cellophane) coated with ferrous oxide particles (like rust). But the phrase hardly conveys so much as a jot of the lab precision and close tolerances needed to produce effective recording tape. It's like saying that a loudspeaker—capable of producing all the tones, timbre, and dynamics of a great symphony orchestra—is a cone of flapping cardboard.

The earliest recording tape used — and don't ask me why—a paper backing. It worked but, from today's vantage point, it seems more of an engineering *tour de force* than a useable, tough, long-lasting product. Tape today is all of these things. The backings of acetate and polyester, or Mylar, are also thin, resistant to temperature and humidity extremes, and extra tough.

Today's tape buyer must undergo an agony of choice. His purchase may range anywhere between a 99-cent bargain in an unlabeled "white box" (for a 1200-foot reel of 1½ mil acetate) to $7.95 for a name-brand reel of ½ mil Mylar—same size reel, but 2400 feet of extra-strong tape. Between the two extremes, the choice is wide and diverse. The buyer will find "extra play", "super strong", "low print", and "high output", in addition to such proprietory names as Tenzar, Ferro-Sheen, Plus-100X, and the like. Let's break



Tape samples are tested from each production run. Tests, beyond normal listening are performed automatically by computers that rate the magnetic tape.

down these tape buys into specific categories.

Is it a bargain? Let's first look inside that "white box" to determine whether it's the bargain it seems. "White box" tape can be many things and you have to buy it with some reservation. Time was when "white box" tape could be used only for horsing-around and never for serious recording. It's deficiencies were many. You might open the box to find curled edges, and rough splices. This is bad enough but, in addition, such less obvious faults as flaking oxide, and uneven coating could also be present. Is that bad? Frankly, yes.

A rough edge can hold the tape away from the tape head as it moves past during recording and playback; if it doesn't make even contact with the head, the sonic results can be pretty bad. Spliced tape is less of a problem. If it's a rough splice, you simply have to go to the bother of doing the job over. Flaking oxide can be real trouble. This means that the binder (a combination of resins and plasticizers) holding the oxide particles was poorly formulated or applied. During recording or playback, minute particles of oxide rub-off and build up on the tape heads. The more it builds-up, the greater the loss of frequency response, particularly on the high-end. The solution to this is a constant cleaning of the heads. There are preparations sold for this purpose.

Uneven coating is the cause of drop-outs. The drop-out of one data bit in thousands may seem to you like a small thing. But, in tape used for instrumentation, it could be disastrous. Instrumentation tape is used, for example, on a Cape Canaveral missile shot and no chances are taken. The missile will only be shot once; you can't bring it back and do it again if some data is lost.

A lot of the tape that finds its way into white boxes nowadays is rejected instrumentation tape. It may not be able to meet military specs but it may meet yours. After all, the loss of one data bit in thousands means nothing to you. In this respect, it's a good buy. It won't have curled edges and it won't flake. It's just not good enough for instrumentation.

But there's another important difference. The formulation of this tape is special; it has a specific use and that use is not wide frequency response. On the high-end especially, the frequency response is not what the professional studio or serious audiophile can expect when they buy a branded and guaranteed tape for audio use. A bargain is only a bargain if you can use it. If you're going to do serious recording of important program material and you have only one chance to record it, "white box" tape is no bargain. On the other hand, if you're going to make a recording of, let's say, a long play disc and you can correct any deficiencies by re-doing the job, you can use "white box" tape with impunity—and some loss of high frequencies.

Have we dwelt overlong on "bargains in white boxes"? There's a reason. Aside from steering you toward or away from it, we've

also covered considerable ground in stating what you should expect in a quality tape. Quality tape won't flake, it will have wide frequency response, the edge will not curl nor have burrs that lift the tape away from the recording head.

Thick and thin of it. As previously mentioned, there remain differences in branded, quality tapes. Consider thickness. Acetate 1½-mils thick can be accommodated in lengths of 1200 feet on the standard 7-inch reel used by most home-type recorders. At 7½ inches-per-second speed (ips), and recording in one direction, this amount of tape allows you to record for a half-hour, or a little more than one side of a 12-inch long play record. Reverse the reels and record another track to double the recording time to a full hour. Reducing the thickness of the tape to a half-mil permits putting as much as 3600-feet of tape on the same 7-inch reel. Thus, the taper can record three times a half hour, or an hour and a half, in one direction at 7½ ips. Using this tape, recording in both directions at 1⅞ ips, makes a 12-hour program possible.

In a very real (reel?) sense, time is money in tape recording. This is especially so today when many recordists are taping stereo off-the-air. Here's a good example. Suppose, you've recorded a Beethoven symphony on a 1200-foot reel, let's say, "The Eroica." This takes up about 48 minutes of tape. Alright, you have 12 minutes left. What'll you do with it? If it reposes on that reel, it's a waste. But if, on the following night, your local stereo-FM station is airing Mozart's Symphony No. 23 in D, you could use that tail-end of tape nicely. The Mozart work takes about 9 minutes. Both works will fit on a 1200-foot reel of 1½-mil acetate.

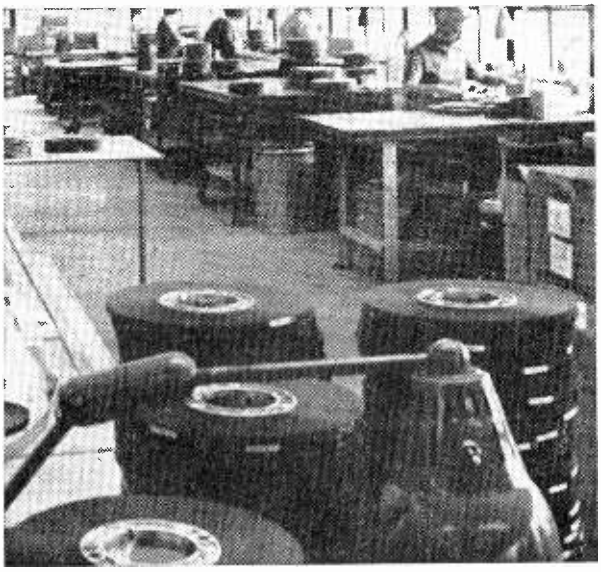
Careful visual checking by trained inspectors at the Audio Devices, Inc. production plant

On the other hand, the Metopera broadcast might be sending Wagner's Die Meistersinger over the air. Which tape should you use? This work, in its entirety, goes on for about 4 hours and 20 minutes. You'll need two 2400 foot reels of ½ mil tape. Get the idea?

These times, incidentally, are not arbitrary or pulled out-of-the-air. They are taken

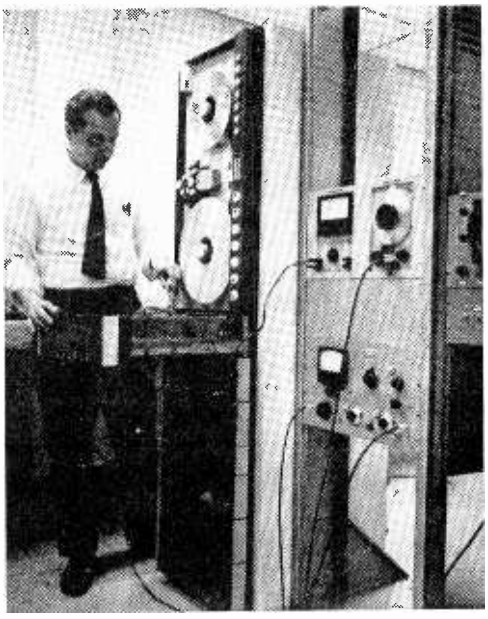
Tape running times are for standard one-track recording or playing in both directions. For running in one direction only, divide the time in half. For dual track recording in both directions, double the time.

Type of Tape	Reel Size (Inches)	Length (Feet)	1⅞ i.p.s.	3¾ i.p.s.	7½ i.p.s.
1.5 Mil Acetate	3	150	30 minutes	15 minutes	7½ minutes
	5	600	2 hours	1 hour	30 minutes
	7	1200	4 hours	2 hours	1 hour
	10½	2400	8 hours	4 hours	2 hours
1.0 Mil Acetate	3	225	48 minutes	24 minutes	12 minutes
	5	900	3 hours	1½ hours	45 minutes
	7	1800	6 hours	3 hours	1½ hours
	10½	3600	12 hours	6 hours	3 hours
1.0 Mil Mylar	3	225	48 minutes	24 minutes	12 minutes
	5	900	3 hours	1½ hours	45 minutes
	7	1800	6 hours	3 hours	1½ hours
	10½	3600	12 hours	6 hours	3 hours
0.5 Mil Mylar tensilized	3	300	1 hour	30 minutes	15 minutes
	3¼	600	2 hours	1 hour	30 minutes
	5	1200	4 hours	2 hours	1 hour
	7	2400	8 hours	4 hours	2 hours
	10½	4800	16 hours	8 hours	4 hours



insures high quality tape products. Here, 10½" professional reels pass by inspectors.

Magnetic tape found in white boxes may be suitable audio tape even though the tapes were rejected for missile applications.



from a very handy little booklet called "Time Table for the Classical Repertoire," produced by a chain of New York high fidelity stores called *Audio Exchange*. Price of the booklet is $2.75.

Tape strength. How strong is tape? Is, for example, 1½-mil acetate much stronger than ½-mil polyester? Yes. The breaking strength of ½-mil Mylar, for example, is 29 pounds (at 75 degrees F., and 90 per cent humidity) whereas the breaking strength of 1½-mil acetate is 41 pounds. Tempered, or tensilized, Mylar has double the strength of ordinary ½-mil Mylar.

The breaking strength of tape is important and so is the yield strength. This is the point at which tape will begin to stretch. Stretching can change the frequency response of the tape and, since, unlike a break, stretching can go unnoticed, it is rather more serious. The weakest tape, in both respects, is ½-mil Mylar. The strongest is 1½-mil Mylar. From all of this it follows, that the most desirable tape from the point of view of long playing time and high strength factor is Tensilized Mylar. It is also the most expensive. A good compromise would seem to be 1-mil Mylar with 1800-feet on a 7-inch reel list-priced at about $4.95.

Print through. Another function of tape thickness is "print through" and its prevention. This simply means the ability of a recorded signal to be induced onto the layers —top and bottom—of tape on the wound reel. If the recording was made at high volume, the strength of the magnetic field on that portion of the tape is relatively high. It can print-through to the next layers of tape and be heard as an "echo" when the recording is played. It can be annoying.

Print through increases with the length of time the tape is stored (wound), the temperature (it increases with a rise in temperature), and tape thickness. The thinner the base material, the greater the print-through.

Tape Care. Tape will wind more evenly if wound at slow speed. This is no problem if a tape is played both ways; it rewinds during use. If played only one way, let it rewind slowly.

If you live in an area that is subject to extremes of humidity and temperature, protect your tapes against them. Let a tape remain at room temperature for a while before playing. Seal the tape in a metal container in very moist areas. Mylar, by the way, has high resistance to even the highest humidity. Keep tape boxed to protect it from dust and grit. If stored for a long time, rewind it occasionally.

If simple care is taken, tape will last for an indefinite time and lose very little of their original fidelity. ■

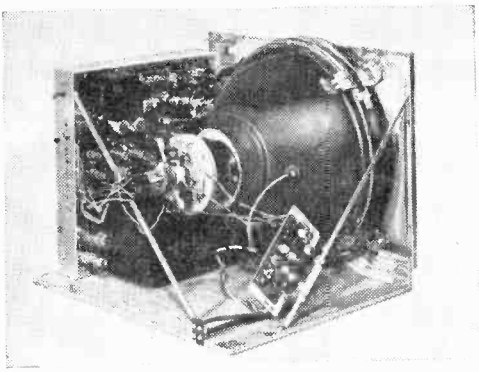
COLOR TV KIT

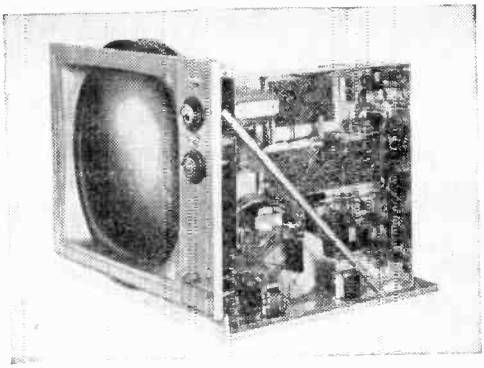
Now you can build a 21-inch Color TV from a Heathkit—Featuring a built-in color dot generator, preassembled and prealigned critical circuits, degaussing coil and foolproof instruction manual

WHO could have imagined five years ago that a color television receiver would be available to the public *in kit form?* And that anyone with some hand tools and soldering iron can assemble a 27-tube project without prior TV or kit-building experience? The Heath Company of Benton Harbor, Michigan did and are now offering a color TV kit at competitive prices, too.

Putting it together. All critical circuits in the color TV are furnished preassembled and pretested, and all the circuit units (subassemblies) are designed to keep the chassis unusually neat and clutter-free. The preassembled units include the *VHF tuner*, the *UHF tuner*, the *horizontal output* and *high voltage circuits*, a circuit board that includes the *IF amplifiers* and *sound detector*, and the *color convergence circuit* board. Almost all the circuits assembled are designed into two circuit boards—the *color* and the *sound-sync*.

Once all the units are installed on the chassis, a pre-laced multiconductor cable made at the factory is fitted around and between the circuit units. Carefully following the instructions, the color-coded wires





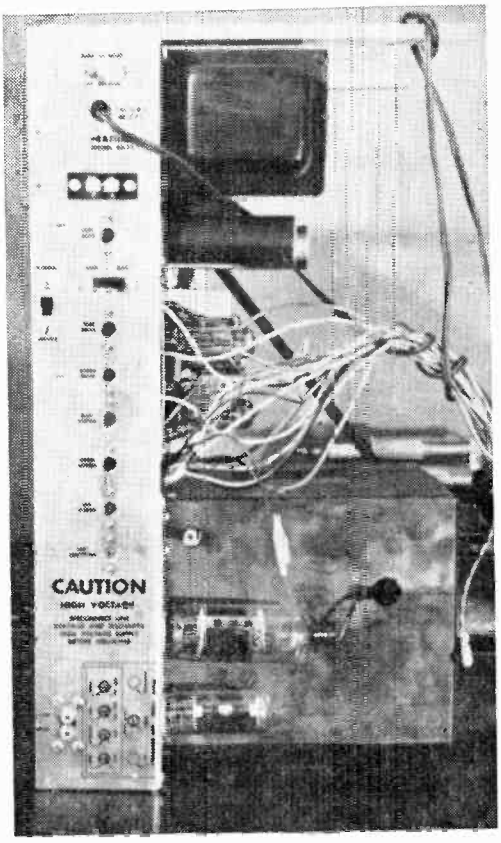
Here are two views of the Heath color TV receiver showing just about every part in kit. It looks like a black & white unit until you examine the deflection coil.

soldered into place interconnect about 95 percent of the receivers tie points. Mistakes are practically *impossible* and the finished wiring job resembles carefully laid-out military equipment. Gone is the rat's nest of wires found in many commercial black and white TV receivers.

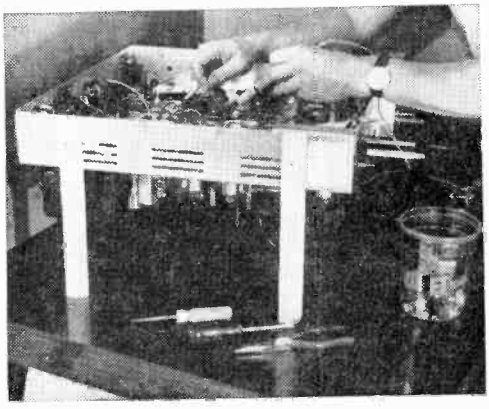
The elapsed construction time claimed by Heath is 25 hours. RADIO-TV EXPERIMENTER found this time to be 22 hours including adjustments.

Power ON. After all preliminary steps are completed as detailed in the spiral-bound manual, power is applied and TV broadcast images were seen on the picture tube. Unlike black and white sets, there will be three images, one for each color—red, blue, and green. Now comes the color convergence adjustments. A degaussing coil supplied with the kit and color dot generator circuit built into the color TV receiver enables the kit builder to adjust the color picture to equal

(Continued on page 106)



Here is the complete chassis just prior to installation. Color adjustment controls are numerous but simple to use properly.

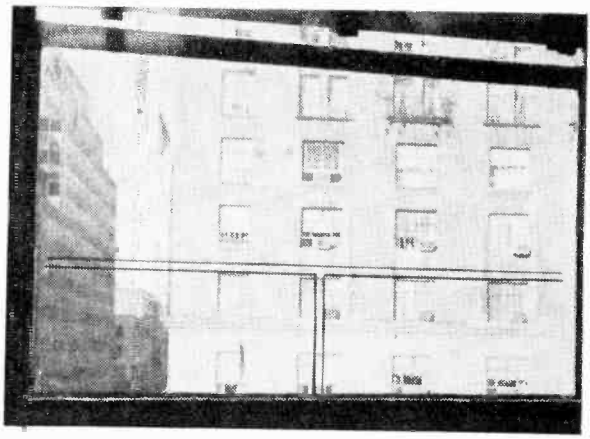


Assembly was speeded up by cutting two legs from 1" wood moulding and bolting to the side of the chassis. Other side of chassis rests on top of high voltage cage.

THIS ANTENNA'S MADE OF PAINT!

You may get best reception with an antenna painted on a window

By B. G. Waterman



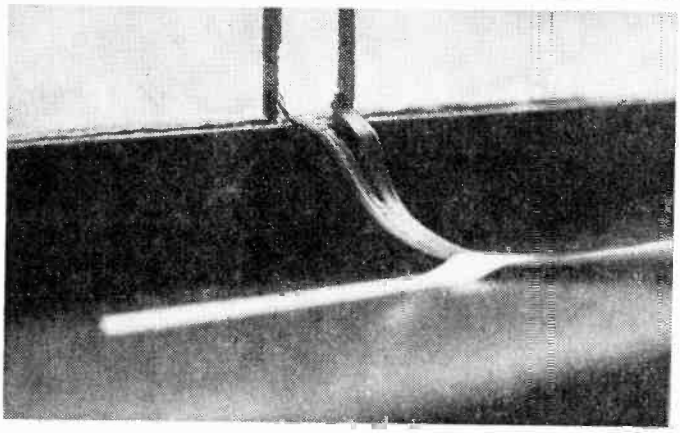
BOTH VHF-TV and FM antennas of conductive silver paint use folded dipole configuration.

How often the poor city dweller is plagued with orders from the landlord that no antenna shall be erected on the roof! The landlord insists that any visitors to *his* roof will have a clear, unobstructed view of all the other roofs in the neighborhood—all decorated with antennas!

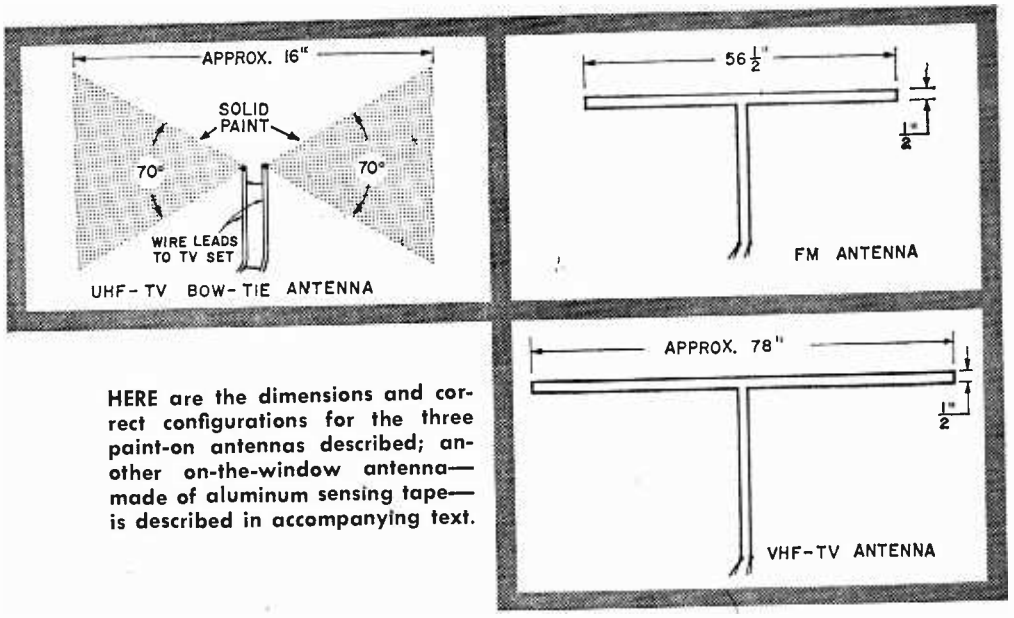
As most metropolitan areas consist of apartments, it is in the city that this problem most often arises. Fortunately, the city dweller also has an advantage in that the transmitter for the local TV or FM station is nearby and offers strong signal characteristics to work with. City folks usually depend on an indoor antenna of some sort—"rabbit ears" for television, and an under-the-carpet antenna for FM. But there's a novel and usually more satisfactory alternative for both these systems: the paint-on antenna.

A painted antenna can be used where you have a window facing the transmitter's antenna. For VHF television (channels 2 to

MASKING TAPE is used to "box in" configuration of paint-on antenna on window. Then clear dope is applied, and a coating of conductive paint. Tape is removed when paint dries.



ENDS of twin lead from TV are stripped of insulation, then fanned out and laid against base of painted conductors where they are bonded with liberal dabs of conductive silver paint.



HERE are the dimensions and correct configurations for the three paint-on antennas described; another on-the-window antenna—made of aluminum sensing tape—is described in accompanying text.

13) and for FM frequencies, a folded dipole configuration is best. UHF-TV takes a different type, described later.

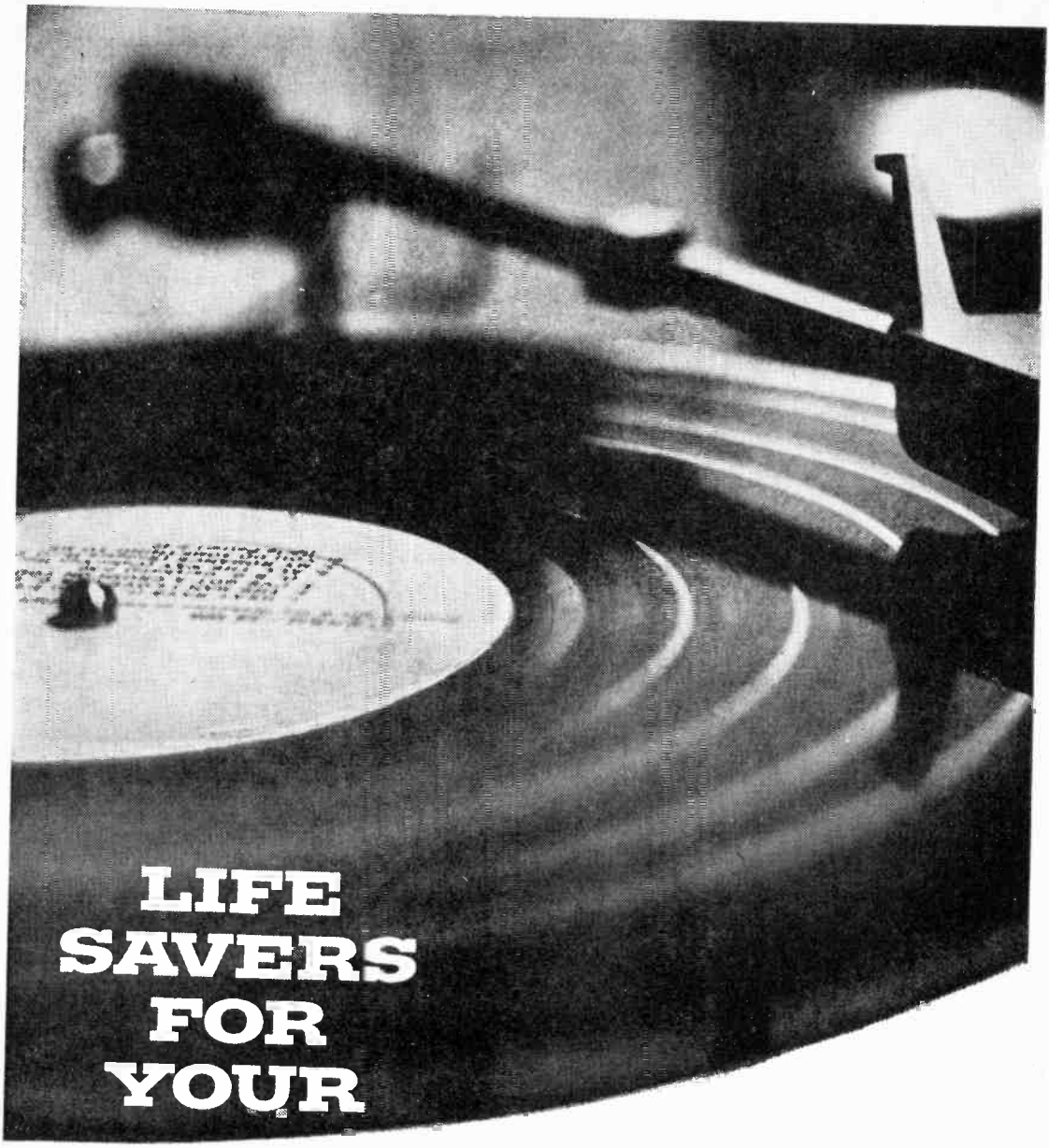
First clean the window thoroughly with a wax-free glass cleaner such as Windex. Now use masking tape to "box in" the shape of the antenna on the window so that the conductive area of the antenna, when painted, will be at least ½ inch wide. Remember to allow for the lead wire connections by taping from the dipole down to the sill. With the masking tape in place, use clear model-airplane dope to paint in the conductor area. This preliminary doping provides an insulated base for the conductor. Allow at least two hours for the dope to dry, then liberally paint on conductive silver paint, applying it in a continuous unbroken path. When dry, use a razor blade with a straightedge along the borders of the antenna to facilitate peeling the tape away. What will remain on the window is the painted antenna and a pair of conductive leads on the window sill. It's best to cover the silver paint with some clear dope to prevent scratch breaks.

To attach the twin lead, first strip about ¼ inch of insulation from the end of each TV conductor. Then, instead of twisting the conductors as is normally done, fan them out. Use tape to anchor firmly the twin lead so that the fanned-out conductors rest against the base of the painted conductors. Now generously swab more conductive paint over these connections to form a positive contact between them. When the assembly has dried, paint over the whole thing with some more clear dope to protect the antenna. Connect the other ends of the twin lead to your set, then turn on the set and check the picture for snow and ghosts.

Another method for installing an on-the-window antenna is to use aluminum sensing tape instead of paint. This tape comes in about a 3/16-inch width. Following the same antenna configurations, simply press the tape in place. The only trouble with this tape is that the adhesive is not conductive, and you must either fold in some pretty fancy corners or else use a dab of silver conductive paint at each joint to keep the path continuous.

The bow-tie configuration is used for the UHF paint-on antenna . . . just follow the diagram. Also, this type can be much improved by the addition of a reflector—which you probably have right at hand: your Venetian blind. Simply lower the blind and close it. Then prop it out until it is about two inches from the antenna. This should provide optimum reception, but experiment by moving it closer to or further from the antenna. Once it's set for best reception, measure the distance and prop it in place. Now try opening and closing the blind. You will notice an additional change in picture quality, and you can effectively "tune" the antenna in this manner for best reception.

When you decide to move, any of these antennas are easily stripped off the windows with a razor blade. ■



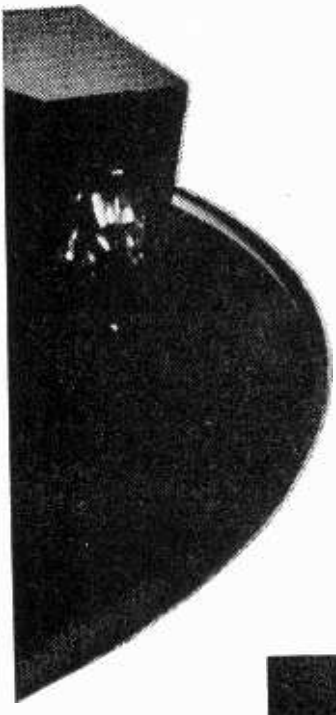
LIFE SAVERS FOR YOUR RECORDS

If you don't pamper your records, plain ordinary household dust and grime will drown your music in snap, crackle and pops.

By Hans Fantel

You plunk down five bucks for a stereo LP record. Presumably you like the music so much that you want to have it for keeps. But how long will it last? And how good will it sound after the first few plays?

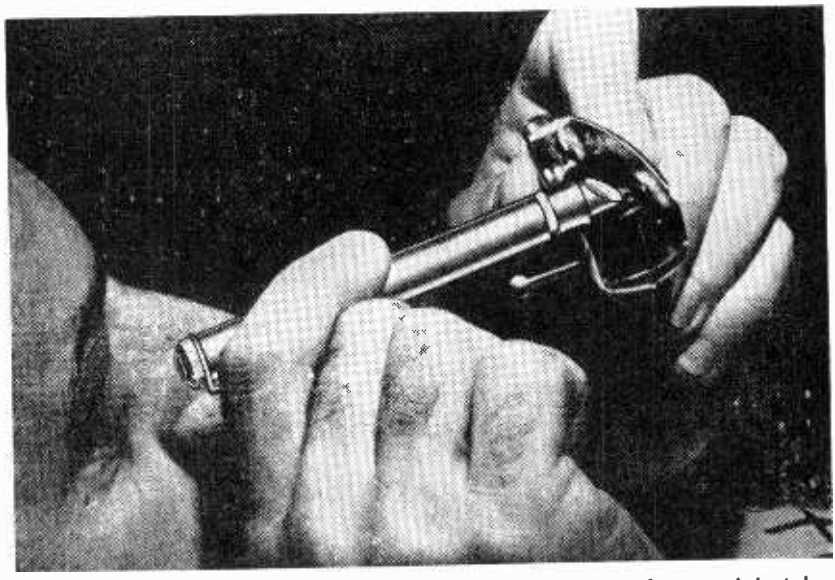
A pampered record will sound almost as lush after the 200th playing as the first. But a neglected record literally bites the dust after only twenty spins or so. In short, by proper handling of your records you can make them last at least ten times longer. So you get ten times your money's worth out of them. And if a record you are really fond of is irreplaceable, lengthening its life means something beyond dollars and cents.



Dust. Plain ordinary household dust is the most vicious record killer. It's downright pathetic to spend money and effort in building fancy sound systems with low distortion and then spoil the whole effect by slapping on a record full of wheezy surface noise and screechy as an owl.

The irony is that the better your equipment, the worse it sounds with dirty discs. Components that coax the subtlest whisp of music from the record groove just as faithfully render every screech and scratch. Stereo, by the way, puts a double hex on dirt; if the stylus is thrown off course by dust particles in the groove, it responds *two* ways to the detour—both vertically and laterally: twice the noise from every dust grain. What's worse, you're feeding in all this noise and distortion right at the signal source. It gets amplified along with the music, and no filtering later on in the system can entirely remove it. (The scratch filters you find on many high-fidelity amplifiers may cut down dust-caused surface noise, but they also clip off quite a bit of the high-frequency range that is the hallmark of lifelike sound.)

In the Groove. All this fuss about a few specks of dust? Well, look at the problem from the bottom of the record groove, a zig-zagging valley whose narrows twists and turns are the shape of the musical sound waves. The tip of your stereo stylus races along this crooked path with tremendous force. The downward pressure



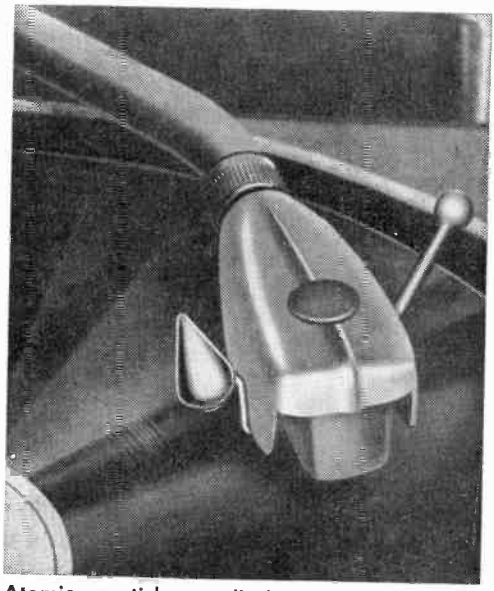
Seeing is believing—regular stylus inspection by means of a special stylus microscope will prevent disc damage due to unsuspected stylus wear.

Life Savers for Your Records

of the stylus may be only a fraction of an ounce. But this weight is concentrated on the tiny area of the stylus tip, which measures only .0005 to .0007 inch in radius—about 1/100 the thickness of the average human hair. Hence the effective force of the stylus in the groove is equivalent to thousands of pounds per square inch. Suddenly a dust particle looms in the path of the stylus, like a boulder of hard rock with razor-sharp edges. The stylus crashes against this "rock." Something evidently has to give. Inevitably, it's the soft vinyl groove in which the rock becomes imbedded like a thorn in flesh.

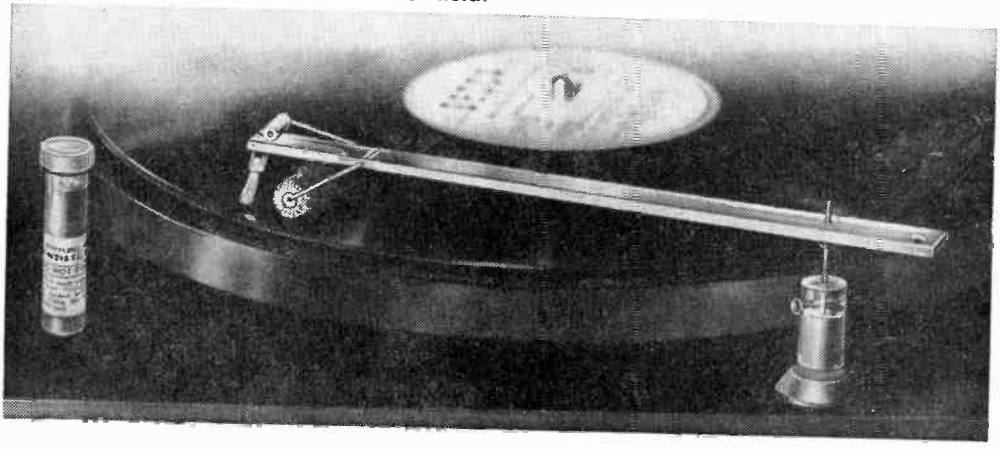
The sound of this dramatic impact: a tiny click in your loudspeaker. But thousandfold repetition, by thousands of dust particles, spreads a tonal fog over your once-brilliant record. The waveforms in the grooves become distorted by the imbedded dust; the sound gets shrill and harsh. Gone is the tonal gloss, the radiance of sound which recording engineers had so carefully molded into the grooves. Later playings pile up more sound-shattering debris—and it acts like a grinding compound. The process accelerates, feeding on itself, and your prize records turn to scrap long before their time.

Static Electricity. No wonder that seasoned hi-fiers firmly hold to the old adage about cleanliness being next to godliness. Trouble is that records are about as tricky to keep dust-free as a blue serge suit. And for the same reason, static electricity.



Atomic particles radiating from a small Audiotex 30-002 emitter clipped to tone arm kills static charges from disc surface.

Elpha's "Dust Bug" (below) cleans records as it plays. Roller resting on LP record is impregnated with an anti-static fluid.



Dust clings to records with the passion of a determined lover. You can't even give it the brush-off; the lint won't take a hint. In fact, brushing merely electrifies the close relationship between disc and dust by making the static charge still bigger, and they cleave even more closely to each other. The record literally has to be tricked out of this fatal misalliance.

One way of doing this is by coating the disc with a thin silicone film which neutralizes the static charge. The film can be wiped on with a velvet pad or a soft cloth moistened with silicone fluid, which simultaneously neutralizes the static and cleans the record. Or the film can be sprayed on from an aerosol pressure can before cleaning. Both kinds of record cleaning kits are available at most audio dealers. Some of the anti-static sprays leave a residue that gums up the grooves and clogs the stylus. For that reason, sprays should be applied sparingly. You are less likely to run into this kind of trouble with liquids applied by means of a pad.

Even the formidable powers of atomic radiation have been invoked to sunder the illicit union between disc and dust. High fidelity claims the honor of having pioneered the first (and still the only) household use of atomic particles. It takes the form of a small piece of radioactive isotope clipped to the tone arm. The radiation from this particle emitter is too weak to cause any health risk, but it ionizes the record and thus dispels the static charge that holds dust to the record surface. After several playings with the atomic gismo, you can simply flick the dust from the record with a soft brush. Since the isotope remains radioactive for several thousand years, you needn't worry about its wearing out—this makes it a "best buy."

No Paws. Aside from cleaning and destaticizing your records, the most effective record life-saver is careful handling. Basically this means a hands-off policy.

It would be crude to refer to your delicate digits as greasy paws, but the fact remains . . . and so does an oil film every time you touch the record. This film gathers dust that turns to grime. Keeping your fingers off the grooved part of the record is the best kind of "grime prevention." Hold a record by supporting it beneath the label with your middle and index fingers while steadying it by keeping your thumb against the record rim.

Tips. Other hints for your anti-dust campaign:

- Move the record cleaning cloth or brush only in the direction of the record grooves, not across them. Otherwise you mar the groove walls. A camel's hair brush about three inches wide, like those used by photographers to dust off their negatives, is handy for flicking dust from the grooves. The bristles are so soft that they won't scratch the record.
- Records should be dusted off before every spin—even brand-new records before the first play. They often

RECORD CARE TIMETABLE

When	What to do
Before each play	Clean record with special brush, pad, or other cleaning device.
Before each playing session	Dust off turntable.
Every 10 playing hours	Inspect metal-tip stylus with microscope.
Every 40 playing hours	Inspect sapphire-tip stylus with microscope.
Every 1000 playing hours	Inspect diamond-tip stylus with microscope.
Every month	Remove accumulated grit and grime from stylus tip. (Caution: do not bend stylus shank!)
Every 2 months	Check tone arm spring or counterweight adjustment for correct stylus pressure. (Use stylus pressure gauge.)
Every 3 months	Check turntable leveling with liquid level. Use shims or screw-type turntable feet to correct any tilt.
Every 6 months	Re-apply a small amount of anti-static fluid to frequently played records (unless atomic radiation destaticizer is used).
	Blow out record jackets and envelopes to prevent dust accumulation in them.
Every 12 months	Launder records with cold water and mild detergent—drip-dry.

LIFE SAVERS FOR YOUR RECORDS

Make and Description	Price
Record Cleaning Devices	
Audiotex "Dust Bug" (cleans records as they play; automatically applies anti-static fluid).	$9.60
Elpa "Dust Bug" (cleans records as they play; automatically applies anti-static fluid).	$6.00
Elpa Parastatik Disc Preener (velvet cleaning roll, wick-fed with anti-static fluid)	$3.00
Robins RB-88 Clean-Sweep camel's hair brush sweeps dust from entire tracking surface with each turn of the record.	$5.95
Grado "Dustat" cleaning brush on adjustable stand (cleans record as it plays, leaks off static charge).	$6.95
Atomic Radiation Static Eliminator	
Audiotex Model 30-002 particle radiation source (clips to tone arm, destaticizes records as they play).	$3.95
Record Cleaning Fluids	
Audiotex 30-010 (liquid in bottle, with applicator pad).	$2.00
Lektrostat record cleaning kit (anti-static fluid and velvet applicator and cleaning pad).	$2.00
Robins ESK-6 (fluid, applicator mitt, and foam pad for cleaning applicator)	$2.00
Anti-static Sprays	
Audiotex 30-007 aerosol can.	$1.69
Fidelitone "Lubri-Stat" in aerosol spray can.	$1.50
Stylus Pressure Gauges	
Acoustic Research stylus pressure gauge (counterweighted arm balance; obtainable only by direct order from manufacturer).	$1.00
Audiotex Model 30-220. Gram-calibrated.	$2.80
Audiotex 30-222. 1-10 gram calibration (less sensitive to light forces than Model 30-220).	$1.65
Garrard SPG-3. Calibrated at ½-gram intervals.	$2.95
Robins SG-2. Range ½-8 grams.	$1.25
Turntable Leveling Sets	
Audiotex 30-226. Four adjustable feet with level.	$3.25
Audiotex 30-224 (level only).	$2.50
Robins ESK-4 Four adjustable feet with liquid level.	$3.50
Robins TL-R2 (level only).	$2.50
Turntable Covers	
Audiotex plastic covers (assorted sizes).	$2.50
Robins rigid collapsible cover.	$4.95
Record Envelopes	
Polyethylene record storage bags for 10″ or 12″ records (pack of 5).	$0.49
Record Cleaning Cloths	
Audiotex 30-022 (impregnated with anti-static silicone fluid).	$1.26
Fidelitone No. 641 cloth (impregnated with anti-static fluid).	$1.00
Robins JC-1 anti-static cleaning cloth.	$1.00
Stylus Inspection Microscopes	
Audiotex Model 30-218; magnification 50x, adjustable focus.	$2.50
Robins MX-1. Magnification 40x, adjustable focus.	$2.50
Same as above with fixed focus.	$1.50

Manufacturers' Addresses

Acoustic Research, Inc.
24 Thorndike Street
Cambridge, Mass.

Audiotex Mfg. Co.
400 South Wyman Street
Rockford, Ill.

Elpa Marketing Industries
Cecil Watts Division
New Hyde Park, N. Y.

The Lektrostat Corporation
845 Edgewater Road
New York 59, N. Y.

Fidelitone Audio Products Division
6415 Ravenswood Ave.
Chicago 26, Ill.

Garrard-British Industries Corp.
80 Shore Road
Port Washington, N. Y.

Grado Laboratories, Inc.
4614 Seventh Avenue
Brooklyn 20, N. Y.

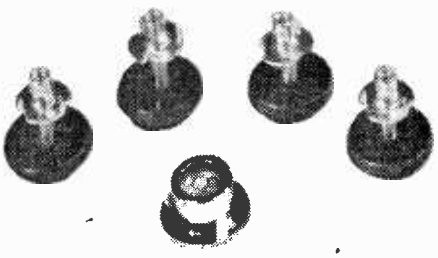
Robins Industries Corp.
15-58 127th Street
Flushing 56, N. Y.

pick up dust from their jackets, and once this dust gets ground in by the stylus, it can never be completely removed or washed away with water.

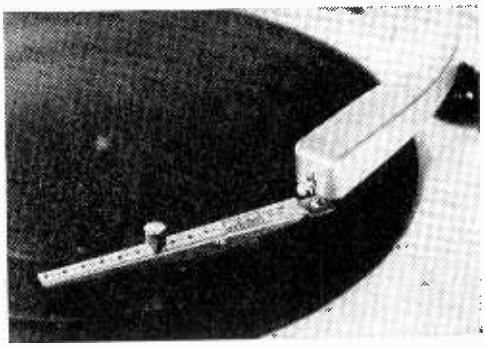
- • • If a record has become really dirty, launder it. Wash it with cold tap water, detergent, and a cellulose sponge. Then let it drip-dry.
- • • Put your records back in their jackets immediately after playing. Don't leave them lying around naked on dusty shelves, sofa pillows or other such convenient parking places.
- • • Squeeze the record jacket when you slide records in or out so that the cardboard sides buckle outward. That way the record can move freely in the envelope without being scratched.
- • • Don't put a clean record on a dusty turntable. Unless your turntable is built into a cabinet, keep it covered when it's not in use.

Pickup Clean-up. Also include your stylus in your cleanup campaign. Dirt—plain or otherwise—comes as natural to a stereo stylus as to a pig: it just digs it up. But while pork is none the worse for the experience, it's fatal to fidelity. During the play of a single 12-inch side, the stylus literally sweeps up about 2½ miles of groove—the curviest, nookiest dust catcher you ever saw. Dirt mounts in miniature heaps on the stylus and tends to derail it from the curvey stereo track. Use a stylus brush occasionally to sweep those tiny dust balls off the stylus. Do it gently. Above all, don't ever drag your finger across the stylus tip to wipe it off, the way the old-timers used to do in pre-stereo days. In the

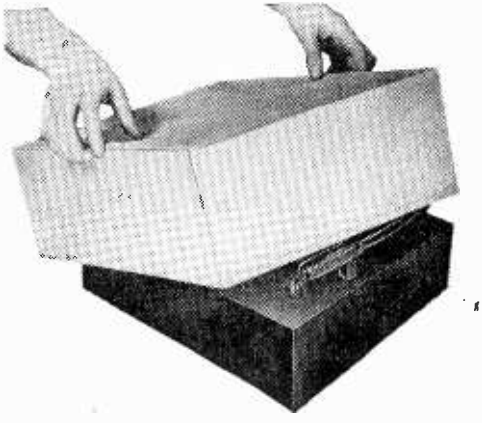
(Continued on page 103)



Four screw-type feet attach to bottom of turntable base. Each leg is adjusted until the base does not wobble and bubble level placed on turntable indicates that it's level.



Stylus pressure gauge helps make correct tone arm tracking pressure adjustment. This adjustment prevents rapid record and stylus wear due to excessive pressure.



Plastic turntable covers keep dust from accumulating on your unit when not in use.

10-2 CB CHECKER

New Knight-Kit test instrument rates your Citizens Band gear

AS ANY seasoned CB'er knows, *Ten-2* means "receiving well." It also describes Knight-Kit's new CB checker; a test instrument capable of ten different tune-up, troubleshooting and test functions. The kit measures all important operating characteristics—modulation, power output, field strength and antenna standing-wave ratio (SWR). It'll help troubleshoot transmitter and receiver, too, with a built-in signal generator and monitor. For the CB'er who wants to convert to ham radio at some future date, there's a code-practice oscillator ready for a key and headset.

Constructing. The Ten-2 kit takes about ten hours. The job is eased by several techniques used by Knight-Kit in their parts-packaging approach. There's no need to fumble for the right resistor in a pile of a dozen or more; just pluck it off a card according to number. And leads are pre-cut to length and stripped at the factory. Solder and a nut-starting tool are also included.

Most care in construction centers around a big selector switch, which is the secret of the kit's versatility. The heart of the circuit—two transistors and several diodes—is actually simple. But as the selector is switched, it reconnects the circuit in complex fashion in order to provide numerous functions. Thus the switch has plenty of solder connections

Knight-Kit Ten-2 CB Checker

and wiring which must be accurate. Slipshod work here will cause short-circuits or damage to switch contacts. Just be sure to follow the instruction manual closely—it clearly explains and shows how the job must be done.

Another area of caution concerns the semiconductors, the two transistors and several crystal diodes. Excessive heat can ruin them. There's no problem with the transistors, they plug into sockets, but diodes must be handled carefully while soldering. The manual recommends grasping the diode lead with a long-nose pliers while applying heat. If pliers aren't handy, use an alligator clip or a piece of metal against the lead to draw off excessive heat.

Alignment. Just before the wired kit is slipped into its carrying case, the first of two alignment steps is performed. All that's required here is a transmit crystal temporarily borrowed from the CB rig. A specially shaped alignment tool is supplied. One RF coil is adjusted while observing the reading on the front-panel meter. The second coil is similarly aligned, only now the CB transmitter is energized to provide the reference signal. Other adjustments include two controls on the rear apron of the chassis which set up an audio oscillator for the most pleasing tone. The checker is now ready for use.

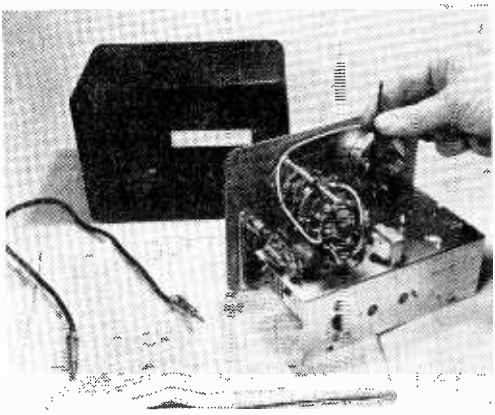
It's in the Book. Any test instrument, of course, is only as good as the person operating it. Knight-Kit has anticipated the possibility that the checker will be handled by CB'ers with little technical or electronic skill. To head off the problem, a separate, 21-page operator's manual is included. It details each function of the Ten-2 and how to apply it to a CB system. Let's see what you can do with the checker in each of its selector-switch positions:

SWR. Any mismatch between the CB rig and its antenna system are quickly located by noting the standing-wave ratio. If the meter reads higher than "2" chances are the antenna is damaged or transmission line shorted or open.

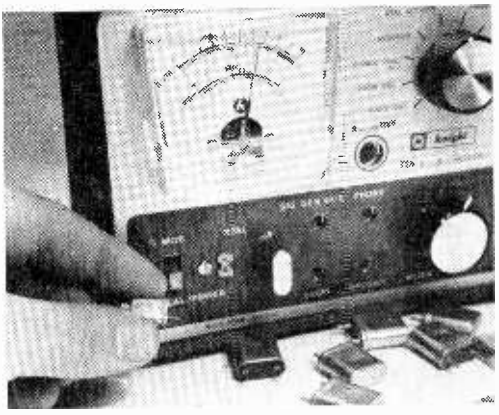
%MOD. +/POWER. This position serves two functions. The first is percentage modulation. Talk into the CB mike and the meter indicates when modulation is striking above or below the desired 100% mark. It can tell how close to talk into the mike, or reveal trouble in the transmitter.

The power function measures transmitter output directly in watts. A reading between 3 and 3.5 watts indicates satisfactory perform-

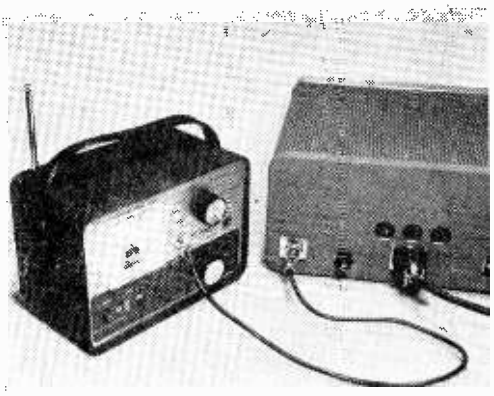
(Continued on page 105)



Tune-up tool, supplied with kit, is used for aligning two coils in the completed kit. CB rig provides signal for tune-up.



One function of the Ten-2 is checking activity of CB crystals. Both standard and handie-talkie types can be tested.



Here, the Ten-2 CB Checker is connected to the antenna terminal of the CB rig under test. One tester can rate your CB gear.

The Crystal Ball

JUNE—JULY 1964

By C. M. Stanbury, II

LOCAL TIME	0000	0300	0600	0900	1200	1500	1800	2100	2400
Europe, North Africa, & Near East	31, 41 (49)		16	19, 25		25, 31 (19, 41)		31, 41	
South Africa	31, 41 60	31, 41	NIL	19, 25	19, 25 (31)	25, 31, 41		31, 41 61	
Asia (except Near East)	41, 49 (60)		25, 31	19, 25		(25)		25, 31 (41)	
South Pacific	31, 49 (41)		25, 31		(25)			19, 25 (31)	
Latin America	49, 60		49, 31		25, 31			49, 60 (90)	

SUMMER is here and DX'ing is at its best. This season the increased static levels of June and July will be effectively diminished by the lowest sunspot activity in eleven years. 19 and 25 meters should be wide open to all corners of the world during the daytime. Nighttime will see the increased good reception on 41-, 49- and 60-meter bands, down to the high end of the BC band.

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 given as good second choices.

White's Radio Log (see page 108) 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 listening possibilities. Happy DX'ing. ■

HOW TO De-Bug a Room

It takes a little know-how to stomp on those electronic bugs

By Byron G. Wels

In our April-May issue of RADIO-TV EXPERIMENTER *we ran an interesting and informative article on "How to Bug a Room." Since the first day that issue hit the newsstands, our office was swamped with urgent pleas from readers asking for information on counter-bugging. We were surprised to learn of the large number of just plain folks who believe they are being bugged and want to do something about it. Therefore, we called on the author to write a sequel for his story and give some helpful advice to the bugged. So, if you need some eavesdropping DDT—read on.*

The Editor

IT COULD happen to you! You enter some seemingly private confines that are familiar to you, you relax what might otherwise be a guarded vigil, and you say and do things that are not meant for others to hear. After all, this is your *sanctum sanctorum*, whether it's your home, your bedroom, your office, or even your telephone. Let's face it, we may be saintly in our approach to our fellow man, but sooner or later, while we might not make enemies as such, a careful study will indicate more than one person who'd like to be "in on" your private conversations for one reason or another.

The rules. No place at all is safe, and you must assume that everything and everybody is bugged before you start—especially when you have a secret to keep.

If you should come upon a concealed microphone in your quarters, the microphone becomes yours. The first instinct is to smash it with a hammer, and gloat over the bugger's loss. While you have every right to do this, think twice. The mike just might have a serial number on it, and armed with this and the manufacturer's name, you just might be able to locate the original purchaser, and perhaps even get to the guy who

De-Bug a Room

planted it! See an attorney in this case.

Don't stop there however. Often, many bugs are planted in a given room, and one is usually placed fairly conspicuously too. This is put there for you to find, destroy, and feel secure once again. Six or eight others, more cleverly hidden are waiting to take your every word.

Play it safe. If you suspect that you are being bugged, (and you always should) you can still communicate your wants without taking any chances. How? Well, there are several safe ways.

In familiar quarters be even more on your guard. When you stop to think how many people have access to your so-called private domain, you will begin to see the reason for this watchfulness. Your home? The maintenance department of an apartment dwelling is equipped with pass keys. The vendors who provide you with such services as dry cleaning, laundry, fresh eggs, milk, all have access to your home at one time or another. In your office, bugging is even simpler. All the bugger has to do is stay around one night after you leave. He's got it made from there on. Your author once planted a bug in an office while the subject was seated at his desk. This subject knew why I was there, and he carefully watched every move I made. He even smiled guardedly at me when I crumpled up an empty cigarette pack and tossed it into his waste basket and then grubbed a smoke from him! The bug? It was in the "empty" cigarette pack, and his waste basket proceeded to relay his messages for the remainder of the day.

You can't win. Or can you? If you are able to, arrange for important meetings at the very last minute, and try to choose a place with a high level of ambient noise. Unfortunately for buggers, a hidden microphone needs all the sound it can get in order to record. If the local noise level is high, and you keep your voice down, the bugger will record nothing but noise. By setting up meeting places at the very last minute, you avoid the possibility of walking into a prebugged set-up. People can be bugged as well. A hidden pocket tape recorder is a deadly weapon of the bugger, who has every legal right to tape all you say. If he tries to use this tape for extortion, he's operating against the law. However, he can play the tape to your enemies, and they can, if they wish, use this information against you, with impunity!

An excellent safety device is a small transistor radio. Keep this playing at a fairly high level, and while it may bug your bugger, it won't let him record very much either.

Locate the bugs. If you want to, you can take steps to locate the hidden microphones and collect them. If nothing else, your bugger is going to be out a few bucks for his efforts. As buggers usually charge exhorbitant fees for their work, microphones are considered expendable anyway. However, if you must find them in order to prove the point, try these few steps first:

1. Examine all that is familiar first. The bugger knows that the unfamiliar in familiar surroundings will tip his hand, so he resorts to disguising his mikes in what objects are in the room.

2. Look for lead-wires. While many experts prefer the more modern wireless microphones, others still rely on wired mikes. Examine surfaces under tables minutely and with bright light for signs of recent work.

3. Check borders and edges. It's an easy matter to run a fine wire through a carpet, but the edge of the carpet will give it all away if you examine this for wires that shouldn't be. See that no additional wires extend from your baseboard junction box of your telephone.

4. Make sure everything works. A radio or TV set is a natural for hiding a bug, as many of the components in such devices can be reworked easily into amplifier circuits, with their own loudspeakers operating as mikes.

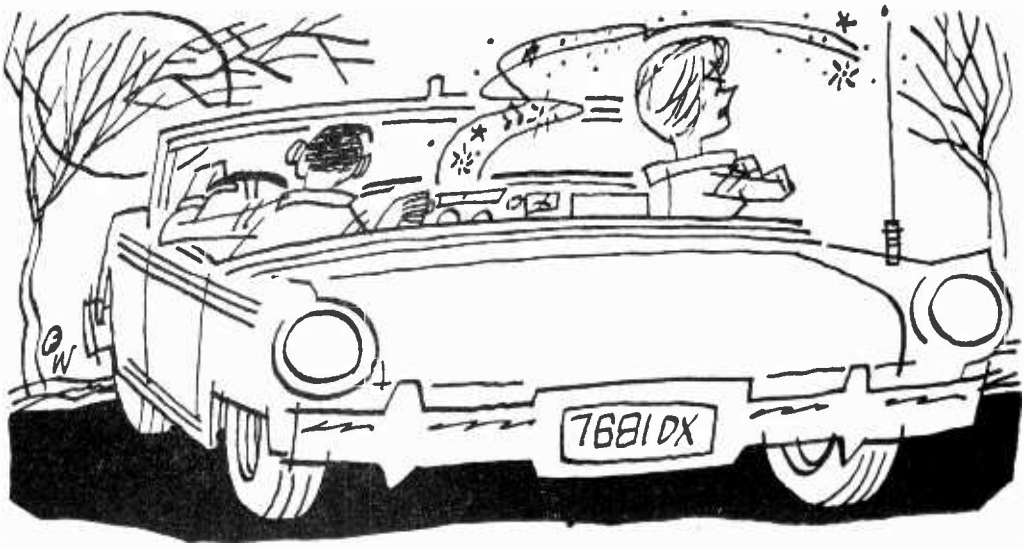
5. Keep some counterbugging apparatus handy, and know how and when to use it.

Counterbugs. Of the many types of microphone units a bugger has available, the most sensitive is the magnetic type. The carbon and the ceramic are almost useless in this sort of work, and all you need is a device called a "stud finder," available in most lumber yards. This has a magnet mounted on an off-center set plastic finger. When you pass it over a wall, and a stud is in the wall, this thing jumps up, as the nail holding the stud attracts it. When it comes in proximity to a hidden magnet, (such as in a magnetic mike) it goes really wild. Instructions come with the gadget.

To locate the radio-type (or wireless) microphones, a handy investment is a piece of test equipment known as a grid-dipper.

(Continued on page 105)

A Little More Than DX



The hottest thing in short-wave listening—folk music and an occasional clandestine station—as demonstrated in this tale

ORA and I got out of the drive-in a few minutes after midnight, 0006 EDST to be exact—I keep the dashboard clock right on. We took the back way home, quiet country road. This a perfect summer night and you'd never know the QRN laden city was only a few miles away, with crickets in the ditches and a soft breeze. It contrasted like the devil with the drive-in's double shock-and-espionage bill.

I switched on the car radio and put my short-wave converter into the circuit. A homebrew job with one tube.

Ora gave me a look. "Are you going to listen to music or DX?" I hesitated. "Both." I let the rig warm up on a Latin American, wild rhythms and all, but had to put it back on frequency every few seconds.

"Uh huh, you got a tip from Marshal Elroy." The rest of it was under her breath and I don't really think she intended me to hear—but I've got DX'ers ears.

For me Marshal means DX. He started in the '20's with a crystal set and so far as I know Marshal was never interested in anything else, not even in girls. Marshal's specialty is pirate stations, secret short-wave clandestine transmitters all over the world. He's logged all the regulars like Radio Libertad, R. Free Russia and R. Teje Iran. Marshal even has QSL's from some most never even heard of, for example The Voice of the White Tower somewhere in the Andes mountains, and Radio Iron aboard a ship near the island of Bimini off Florida's Atlantic coast. These were operated by secret societies who used them to transmit messages and orders to their members. Marshal told me he never actually joined any of these groups but somehow he always got them to verify.

By 12:15 on the clock when the station identified as Radio Cuzco in Peru, my receiver had stopped drifting. This put me around 6250 kc, just above the 49-meter

By C. M. Stanbury II

band. I tuned into this band for 4VB Radio Commerce, Port au Prince at 5983 kc. Found it. 4VB play a Haitian tune at the moment. I looked at Ora. "You don't mind listening to this, do you?"

Wary. "Is that your DX?"

"No. It's supposed to come on the same frequency at 12:25."

Ora moved her shoulders in time with the music. "At least this station is saying something." The only thing Ora likes about Short Wave was the folk music. It's just like Hootenanny on TV, better I guess because you hear a lot more different kinds, things that never get on television. Sometimes, when Ora is in the mood, we sit and listen to it from all over the World. From Radio Conakry in West Africa, Leopoldville, Kol Israel, Radio Thailand, and all you could ever want from Latin America. At home I have some folk music type QSL's including my favorite from TIDCR Costa Rica. A color reproduction in candle light shades. Two spanish cats with guitar, marimba and sombreros. A pair of lovers listening, holding hands, and the she in the pic looked a little like Ora.

Except for country and western, Marshal hated folk music. He always said it reminded him of the city.

With Haitian records, 4VB mixed pieces from Africa and some American blues tunes. That's folk music too you know.

The station I wanted to hear had been on 11690 kc. a week before playing "Washington Square" over and over. Marshal said it was Radio Iron transmitting a coded message and to give him my report. He knew where to send it for a verification. I got the QSL all right, but this morning he told me Radio Iron would have a message for me at 25 minutes past midnight on 5983 kc. This more or less shook me up but I'm too much of a DXer not to listen in.

The road dipped but reception continued perfect. My converter uses a high-Q circuit cutting off QRM 5 kc. either side of the frequency. This doesn't exactly make it hi-fi but then short wave is never hi-fi. And folk music doesn't need hi-fi anyway. We started up a hill and that jamming intended for R. Free Europe faded in. A second later RFE itself on 5985 produced a 2 kc. heterodyne whistle.

"How long is that noise going to last?" She pointed to the radio. I shook my head. "I don't know myself."

Ora looked out the window away from me, sulked.

With my DX ears I could make out the words of a blues through the noise. Just then Radio Commerce came in clear as I nosed to the top of a small hill. I parked here.

Ora still didn't look at me.

"This is the best spot to try for that DX station I want to hear." A moment of silence except for 4VB now working on some calypso with steel drums. "If Radio Iron doesn't show pretty quick we'll forget it."

Back to the blues with Bobby Bland flowing through "Leave it like it is, take it where you find it, that's the way love is." Ora sang along, needling me. I reached out and tried to put one arm around her, she moved away from me. "You'd better take care of your own business, with the radio." Saucy.

Tempted to turn it off but a carrier came on, completely erased the Haitian.

"This is Radio Iron with a message, and a warning for C.L.U."

Those are my initials.

"You are hereby recruited into the service of the Society of Iron." The voice deep and

echoing. "You will now serve us and obey our orders. That woman with you is an undesirable. You will not see her again."

Ora sucked in her breath. "What is it?" Her hands were shaking.

Shook my head. "Don't know."

A scream transmitted. "If you disobey this order, we will. . . ." Radio Iron left the air abruptly.

We waited for it to come back but even 4VB had faded out.

"Marshal told you about it, drive over to his place." Her voice an octave above her normal screech.

I hesitated.

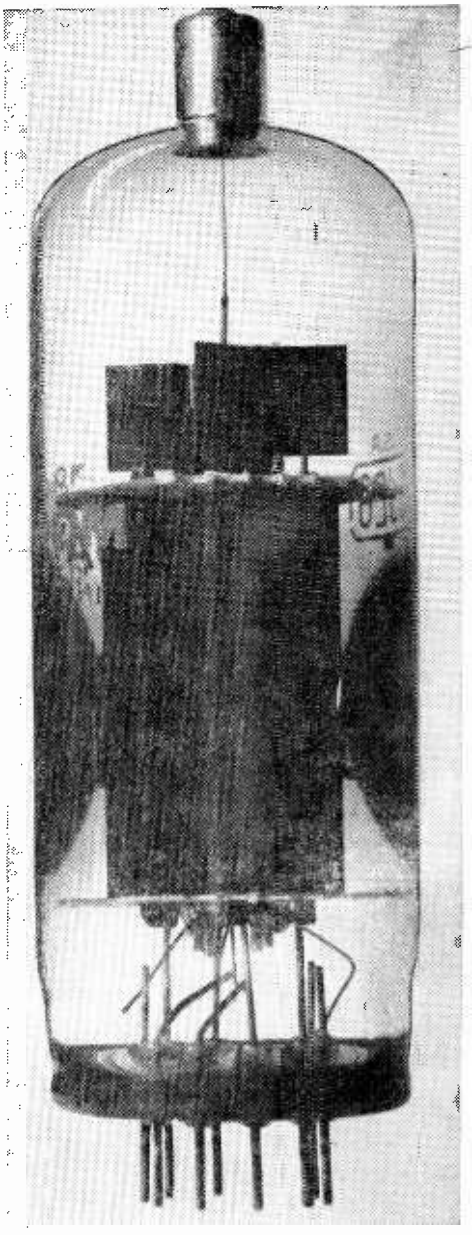
"Come on, man start your motor." Ora twisted a little evening purse in her hands.

I obeyed. We reached the highway where it swung south toward the outskirts of Michigantown and Marshal's old farm house long since deprived of it's orchards and pastures. Marshal hung on there even though the city virtually surrounded him.

(Continued on page 106)

HOW TO READ VACUUM TUBE DIRECTORIES

By Leo G. Sands



With several hundred vacuum tubes in common use today, the electronic experimenter finds the tube directories his most popular reference.

THERE ARE thousands of vacuum tube types of which more than 1000 are listed in one of the major mail order electronics catalogs. Many of these tubes are directly interchangeable, some are electrically the same but have a different base or require differing pin connections. Detailed information about these tubes is important to you if you are an experimenter so you can select the appropriate tube for your specific application. Vacuum tube directories and manuals will help you decide if one of the tubes you have on hand can be used in a circuit or not. Or, if you are repairing a radio, TV, amplifier or other electronic device, you can determine from a tube directory what readily-available tube can be used as a replacement.

Tube Designations. Some tubes are designated only by a number, such as **7591** or **6868.** Most tubes, however, have a combination number-letter designation such as **6AK5, 12AU7** and **35L6GT.** The first number usually represents the filament or heater voltage. The **6AK5**, for example, operates with a nominal filament potential of 6.3 volts, the **12AU7** at 12.6 volts and the **35L6-GT** at 35 volts.

The letter or letters following the first number identify the tube from others, but have no specific meaning otherwise. The second number tells how many active elements there are in the tube. The **6AK5** has six

TYPE	DESCRIPTION	FILAMENT VOLTS	FILAMENT AMPERES	TYPE OF CATHODE	APPLICATION	PLATE VOLTS	SCREEN GRID VOLTS	CONTROL GRID VOLTS (NEG.)	PLATE CURRENT MA.	SCREEN CURRENT MA.	TRANSCONDUCTANCE MICROMHOS	PLATE RESISTANCE MEGOHMS	AMPLIFICATION FACTOR	LOAD RESISTANCE OHMS	POWER OUTPUT WATTS	RECTIFIER CONDENSER INPUT: MAX. A.C. RMS VOLTS PER PLATE	RECTIFIER CONDENSER INPUT: MAX. PEAK INVERSE VOLTS	RECTIFIER CONDENSER INPUT: MAX. D.C. OUTPUT MA.	BULB STYLE	BULB DRAWING NO.	BASE STYLE	BASE EIA NO.	TYPE
117Z3	DIODE	117	0.04	HEATER	HALF-WAVE RECTIFIER	Peak Plate Current per Plate: 540 Ma.										117	330	90	T-5½	5	MIN. 7 PIN	4CB	117Z3
117Z4GT	DIODE	117	0.04	HEATER	HALF-WAVE RECTIFIER											117	350	90	T-9	28	6 PIN OCTAL	5AA	117Z4GT
117Z6GT	DOUBLE DIODE	117	0.075	HEATER	HALF-WAVE RECTIFIER	DC current for each section										235	700	60	T-9	35	7 PIN OCTAL	7Q	117Z6GT
257	PENTODE	5	0.3	FIL.	CLASS A AMPLIFIER	110	110	21.5	20	7	1350	41	55	6000	0.8				ST-16	84	MED. 5 PIN	5B	257
					CLASS					6													
5642	DIODE	1.25	0.20	FIL.	HALF-WAVE RECTIFIER	Max. Peak Plate Current 12 Ma.										3600	10 000	2	T-3	2	SUB MIN. 2 PIN	5642	5642
5654	PENTODE	6.3	0.175	HEATER	CLASS A AMPLIFIER	120	120	8	7.5	2.5	5000	340	Cut-off: 10 μa @ −12 V. Similar to 6AK5						T-5½	3	MIN. 7 PIN	7BD	5654
5687	DOUBLE TRIODE	12.6 / 6.3	0.45 / 0.9	HEATER	CLASS A AMPLIFIER L / L	250 / 120		12.5 / 2	12.5 / 36		5500 / 11 000	3 / 1.7	16.5 / 18.5	Cut-off: 10 μa. at −21 V. / Cut-off: 10 μa. at −10 V.						T-6½	8	MIN. 9 PIN	9H	5687
	DOUBLE			HEATER	HALF-WAVE											117			T-5½	3			
6550	PENTODE	6.3	1.6	HEATER	CLASS A AMPLIFIER	400	225	16.5	87	4	9000	27	7.5	3000	20	Cut-off: 1.0 Ma. @ −35 V.			ST-16	89	WAFER OCTAL 7 PIN	7S	6550
9001	PENTODE	6.3	0.15	HEATER	CLASS A AMPLIFIER	250	100	3	2	0.7	1400	1400							T-5½	3	MIN. 7 PIN	7BD	9001
9002	TRIODE	6.3	0.35	HEATER	CLASS A AMPLIFIER	250		7	6.3		2200	114	25						T-5½	3	MIN. 7 PIN	7BS	9002
9003	PENTODE	6.3	0.15	HEATER	CLASS AB AMPLIFIER	250	100	3	6.7	2.7	1800	700							T-5½	3	MIN. 7 PIN	7BD	9003
9006	DIODE	6.3	0.15	HEATER	DETECTOR RECTIFIER											270	750	5	T-5½	3	MIN. 7 PIN	6BH	9006

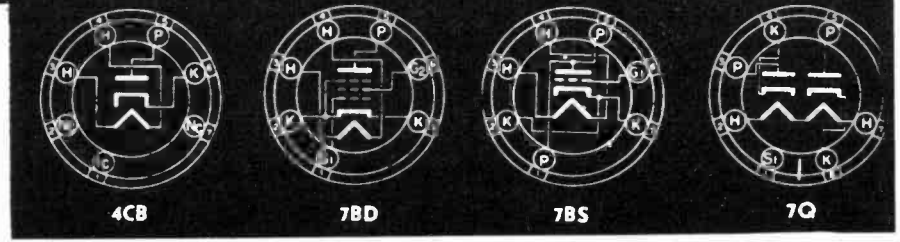
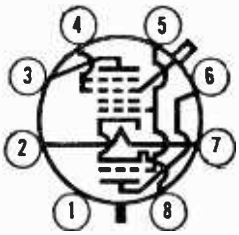


Fig. 1. The illustration on this page is taken from page 41 of the Tong-Sol Characteristics Manual, 23rd Edition. Although manuals vary in form and style from manufacturer to manufacturer, the information therein is identical in all vacuum tube directories. However, always keep the latest edition within grasp if your work or hobby requires information on the latest tube types. Also included in the Tung-Sol manual is information on cathode ray tubes, color codes, ballast tubes, and transistors.



HOW TO READ VACUUM TUBE DIRECTORIES

elements, but only five are brought out separately to the pin connections. They include the heater, cathode, control grid, screen grid and plate. The suppressor grid is connected internally to the cathode and is not counted as a separate active element.

The letters following the second number usually define particular features. The letter **G** generally describes a tube with a glass bulb and an octal base. The letters **GT** generally indicate that the tube has a smaller bulb than one with only the letter **G**. Usually **GT** designates a tube with a **T-9** size bulb and an octal base.

When the last letter is **X**, it generally means that the tube has a low-loss base and **Y** an intermediate loss base. The letter **W** or **M** generally designates a military type tube. The letter **A** at the end of **6V6GTA** means that the tube is an improved version of the **6V6GTA** and can be used as a replacement for either a **6V6** or **6V6GT.** The **17DQ6B** is an improved version of the **17DQ6A**, and so on.

While the above is generally true, some tube designations do not follow exactly the same concept. To be sure, look up the tube in a tube directory.

Early tubes, some of which are kicking around in junk boxes, might not be listed in directories and do not use the same designation formula as a modern type. The **UV199** is a filament type triode which fits a four-prong bayonet socket. The **UX199** has the same characteristics but fits today's standard four-prong socket. The **WD-11** requires a special socket whereas a **WD-12** and a **WX-12** fit a standard four-prong socket. Some early tubes have numbers only, such as **24, 26, 27, 80, 81,** etc., all of which differ widely.

Tubes with the same type designation except for the first numeral or numerals are sometimes identical or closely related except for filament or heater voltage as for example **6SL7GT** and **12SL7GT, 6V6GT** and **126V-6GT, 25L6GT** and **50L6GT.**

Tube Terms. In order to use any of the several available tube directories and manuals, it is necessary to understand the meanings of the technical terms used to identify tube characteristics which are described below. Commonly used abbreviations with their definitions used for these terms are listed in the following table. If you are not familiar with some of the terms and need detailed information, look in the front section of the RCA Receiving Tube Manual. Here is a condensed course on vacuum tubes that everyone should glance through every so often. If more help is needed, a detailed text such as *50 Vacuum Tube Circuits For the Electronics Experimenter* by *Julian M. Sienkiewicz* should be consulted.

Tube Directories. Tube information is published in the form of tables as shown in Fig. 1 and, in some directories, one or more pages are devoted to describing a single tube. A typical tube description is illustrated in Fig. 2.

The table given in Fig. 1 has 24 columns, all of which are not applicable to all tube types. The extreme left and right columns are the same and contain the tube type designations. The first type listed is a **117Z3** tube. Without looking further, it can be determined from the type designation that the tube filament is intended to operate at a nominal 117 volts, since the number **"117"** indicates the filament voltage. The letter **"Z"** following the number **"117"** is often used to designate a *rectifier* tube. Other letters are also used to designate rectifier tubes. The number **"3"** indicates that the tube has three active elements (heater, cathode, plate).

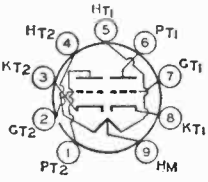
The second column from the left is headed "description" and the **117Z3** tube is listed as a *diode*. The third and fourth columns list the filament requirements, 117 volts at 0.04 amperes. The fifth column indicates that the tube employs an indirectly heated cathode.

The sixth column indicates that the **117Z3** tube is intended for application as a half-wave rectifier. The 7th through 16th columns are blanketed by one statement "Peak Plate Current per Plate: 540 Ma." This means that under typical operating conditions, peak plate current of more than 0.5 ampere (540 ma) can be handled.

The 17th column indicates that the maximum AC voltage that can be applied to the tube plate under typical operating conditions is 117 volts RMS and the 18th column indicates that the peak inverse plate voltage is 330 volts. The peak inverse voltage across a rectifier tube in a half-wave rectifier cir-

12AT7

HIGH-MU TWIN TRIODE



Miniature type used as push-pull cathode-drive amplifier or frequency converter in the FM and television broadcast bands. Outline 12, OUTLINES SECTION. Tube requires miniature nine-contact socket and may be mounted in any position. Each triode unit is independent of the other except for the common heater. For typical operation as a resistance-coupled amplifier, refer to Chart 10, RESISTANCE-COUPLED AMPLIFIER SECTION.

	Series	*Parallel*	
HEATER ARRANGEMENT			
HEATER VOLTAGE (AC/DC)	12.6	6.3	volts
HEATER CURRENT	0.15	0.3	ampere

DIRECT INTERELECTRODE CAPACITANCES:	*Without External Shield*	*With External Shield*▲	
Grid-Drive Operation:			
Grid to Plate (Each unit)	1.5	1.5	μμf
Grid to Cathode and Heater (Each unit)	2.2	2.2	μμf
Plate to Cathode and Heater:			
Unit No.1	0.5	1.2	μμf
Unit No.2	0.4	1.5	μμf
Cathode-Drive Operation:			
Cathode to Plate (Each unit)	0.2	0.2■	μμf
Cathode to Grid and Heater (Each unit)	4.6	4.6■	μμf
Plate to Grid and Heater (Each unit)	1.8	2.6■	μμf
Heater to Cathode (Each unit)	2.4	2.4●	μμf

▲ With external shield connected to cathode of unit under test except as noted.
■ With external shield connected to grid of unit under test.
● With external shield connected to ground.

Maximum Ratings: CLASS A_1 AMPLIFIER (*Each Unit*)

PLATE VOLTAGE	300 *max*	volts
GRID VOLTAGE, Negative bias value	−50 *max*	volts
PLATE DISSIPATION	2.5 *max*	watts
PEAK HEATER-CATHODE VOLTAGE:		
Heater negative with respect to cathode	90 *max*	volts
Heater positive with respect to cathode	90 *max*	volts

Characteristics:

Plate Supply Voltage	100	250	volts
Cathode-Bias Resistor	270	200	ohms
Amplification Factor	60	60	
Plate Resistance (Approx.)	15000	10900	ohms
Transconductance	4000	5500	μmhos
Grid Voltage (Approx.) for plate current of 10 μa	−5	−12	volts
Plate Current	3.7	10	ma

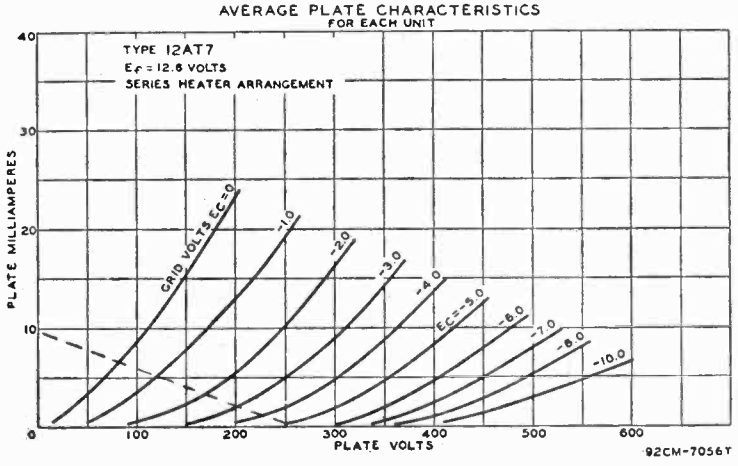
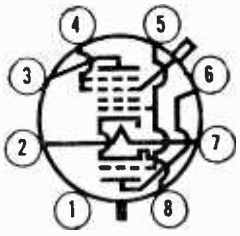


Fig. 2. The illustration on this page is taken from the RCA Receiving Tube Manual. The 12AT7 is a popular high-mu twin triode audio tube.



HOW TO READ VACUUM TUBE DIRECTORIES

cuit is around 1.4 times the rms value of the applied AC plate voltage. When a capacitor input rectifier circuit is used, the peak inverse voltage can be 2.8 times the rms AC plate voltage, as could be the case when a **117Z3** tube is used, since 117 × 2.8 = 337.6 volts.

The 19th column indicates that the maximum output current is 90 ma (0.09 amp) when the tube is used in a rectifier circuit employing a condenser input as shown in Fig. 3.

The tube is a glass miniature type since the 19th column states that the tube style is "T-5½." The shape and dimensions of the tube can be determined by referring to tube outline drawings generally published in tube directories. The 20th column indicates that the tube outline drawing is *Fig. 5* in this particular directory.

The 21st and 22nd columns indicate the style of tube base and base connections, in this case, 7-pin miniature and E1A (Electronic Industries Association) base diagram 4CB which may be found at the center of the top row of tube base diagrams at the right of the table. Looking at the base diagram, it can be seen that the **117Z3** tube has only one plate, a filament and a cathode, and that only four of its seven base pins are utilized.

From the above information, it can be determined that the **117Z3** tube is intended for use as a half-wave rectifier capable of handling a continuous load of 90 ma.

A type **117Z6GT** tube is listed in the third horizontal column. It is indicated in the sixth column that this tube is also intended for use in half-wave rectifier circuits. However, in another tube directory, it is stated that this tube is also intended for use in voltage doubler circuits, as the one shown in Fig. 3. Only one tube is required since the **117Z6GT** has two plates instead of one. It is listed as a "double diode" in column 2, and its basing diagram, referred to as "7Q" in column 23, shows that it has two plates, two cathodes and two series-connected filaments or heaters.

Filament voltage is the same as for the **117Z3** (117 volts) but filament current is 0.075 amperes, almost twice as high, as indicated in columns 3 and 4. The RMS and peak inverse plate voltages listed in columns 17, 18 and 19 are for each of the two diode sections. The tube style is a T-9, a small glass, octal-based tube, whose outline is shown in *Fig. 35* of the same tube directory. The octal base has seven pins instead of the usual eight, but fits standard 8-prong octal sockets.

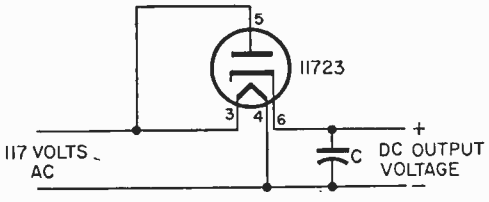
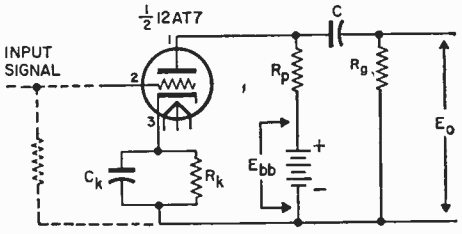


Fig. 3. Half-wave rectifier circuit using a capacitor input filter. The 117Z3 vacuum tube filament pins can be connected directly across the power line eliminating the need for any filament transformer.



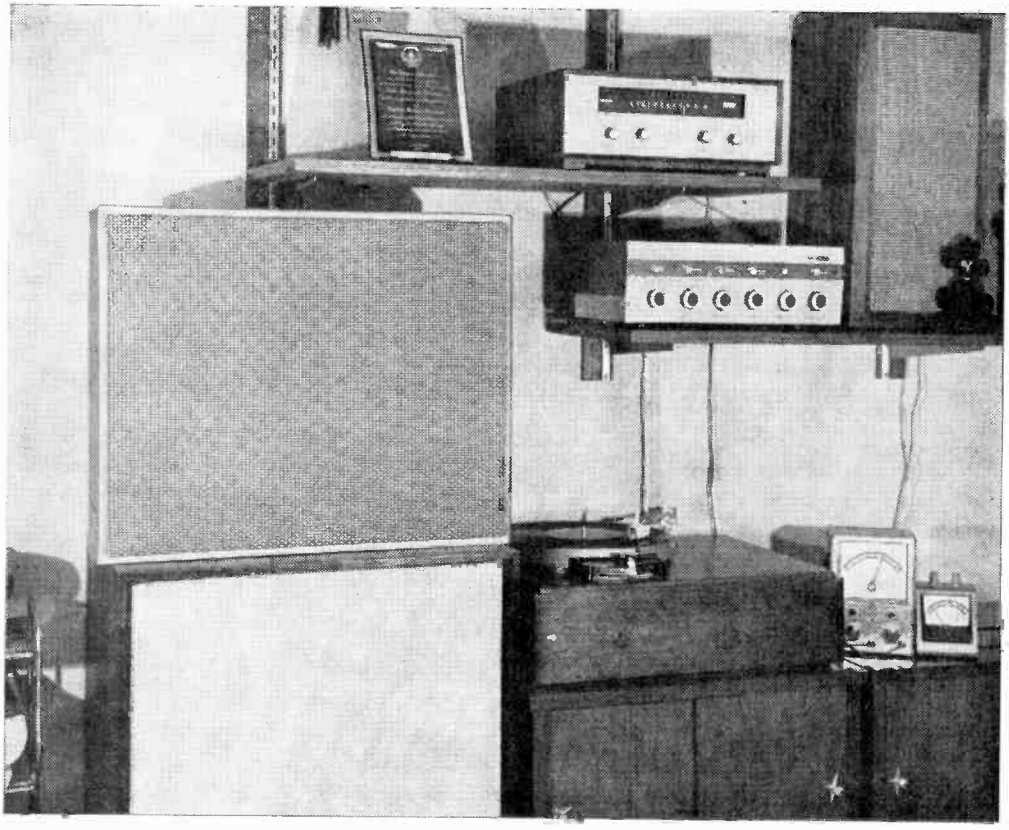
TYPICAL CASE

E_{bb}	R_p	R_g	R_k	C_k	C	E_o
300 VOLTS	220 K ohms	470K ohms	4200 ohms	1.3* MF	0.0074* MF	78 VOLTS PEAK

Fig. 4. The schematic diagram above is for a typical resistance-coupled amplifier circuit using one triode section of a twin-triode 12AT7 vacuum tube. One set of typical values for circuit constants are given below the diagram. Capacitors should be valued at next highest rating available.

Now let's look at a triode. Near the bottom of Fig. 1 is listed the type **9002** tube.

(Continued on page 127)



SLIM-LINE SPEAKER KIT pays fat rewards

IF YOU have had the sad experience of squeezing a 4- x 5- x 4-foot speaker system into a room where three is a crowd, then the Fisher KS-2 Slim-Line speaker kit is for you. Packed into a 20" x 25" x 6½"-deep cabinet, this pancake edition of an infinite baffle packs a frequency response from 35 cycles to beyond audibility that is smooth and transparent throughout its range.

Assembly. Fisher pioneered the *StrataKit* technique—a unique method of packaging and preparing kit parts for the kit builder. The instruction book is designed to lead the uninitiated kit builder to his first success with a minimum of effort and calculated to hold the interest of kit builder to the very end.

The wiring heart of the KS-2 is the crossover network—a full three-way inductive-capacitive circuit with cross-overs at 1200 cps and 2800 cps. This essentially means that the 12-inch woofer handles all frequencies below 1200 cps, the 5-inch mid-range speaker operates on the 1200- to 2800-cps range, and the 3-inch tweeter takes care of everything else above 2800 cps worth hearing. The crossover network is wired on a

6-inch square board. To insure accuracy, an extra copy of the "same size" pictorial is pasted on the mounting board. Included in the cross-over circuit is a tweeter level control that allows the listener to adjust the highs to his hearing taste.

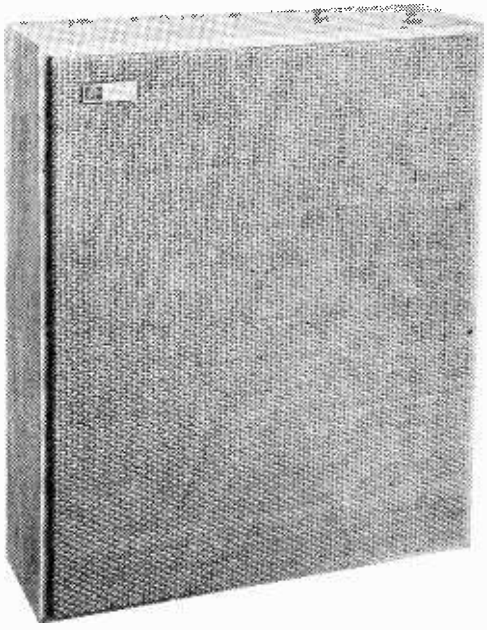
The completed network is mounted on the rear cover. Speakers are then mounted on precut holes and the speaker system rapidly reaches completion.

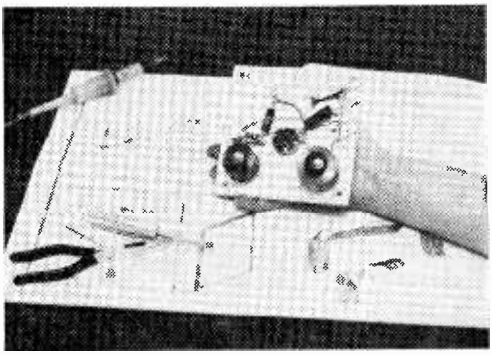
Securing the grille cloth is the trickiest step in the entire kit procedure. Tacks are provided, but your labor will be eased and rewarded if you use a staple gun.

Testing. All sorts of technical performance tests can be performed, but the final and conclusive test is to listen to the speaker system and rate it against a standard. In this instance we stacked the KS-2 up against a $250 infinite baffle system of known good quality. A panel of listeners were asked to rate the KS-2 against the standard while blindfolded. The speakers were A-B'ed with different program materials at several different power levels. Result: the panel could not tell the difference between the speaker systems—in fact they could not tell which system was which—when the program material lacked the extreme low frequencies often found in deep stirring passages of classical music. Admittedly, the panel commented, the slight difference did not justify the over $150 price differential between systems.

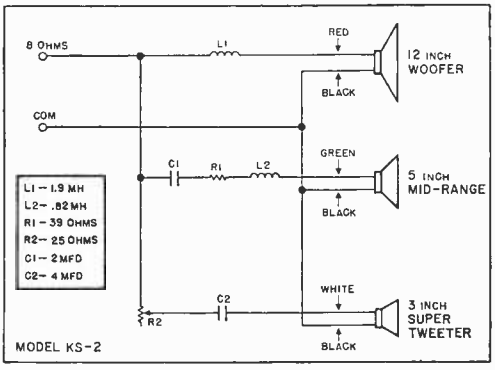
Price data. RADIO-TV EXPERIMENTER tested the KS-2B—an unfinished kit priced at $89.50. The kit in walnut (KS-2W) sells for $94.50. And just in case you are all thumbs, the assembled kits can be had in either finish for $114.50 and 119.50, birch and walnut respectively. At these prices, a stereo speaker system can be had at $50 below a comparable single "big-box" job. If you're in the market for a quality speaker system, and you prefer to use your living room living space for living, then the Fisher KS-2 slim-line speaker systems are for you. ■

The KS-2 test setup (left) was used to rate the slim-line system against a known good speaker system. All by itself, the Fisher KS-2 (below) is a decorative piece.





Crossover network wiring is simplified by pasting same-size pictorial on the board.



Schematic diagram of the crossover network. The speaker system's impedance is 8 ohms.

LITERATURE LIBRARY

A Radio-TV Experimenter Service

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. *Brooks Radio & Television Corp.* offers a $1,000 reward to anyone that can find a competitor who can match their prices. Get facts and list of interesting offers today.

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. Solder is not solder. To learn about the difference, read up on *Ersin* 5-core solder. This Multicore alloy provides faster and better solder joints.

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. For hobbyists designing loudspeaker enclosures, *Electro-Voice Inc.* offers Bulletin #10 which gives general suggestions for construction of all popular enclosures. A new high fidelity catalog is also available.

18. Speakers and enclosures from *Argus 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.

25. Nothing to hide, that *Harmon-Kardon!* They send you a batch of literature describing their products, complete with technical laboratory reports. The equipment is of course, beautiful. It sounds as good as it looks.

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!

37. Here's some info on a wireless remote control for your hi-fi, or if you prefer, they have a wired version for you. There's also a sweet little phase and balance meter. *Stereosonics, Inc.* will send it all if you ask for it.

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. Gor "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.

KITS

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 many years *World Radio Laboratories* has a few flyers for you to look over. These include their new transmitter and an assortment of other products that deserve space in any ham shack.

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

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 1963 Catalog of Values.

Also see items 46 and 47.

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.*

TEST EQUIPMENT

67. Get the most measurement value per dollar." That's what *Electronic Measurements Corp.* says. Looking through the catalogue they send out, they very well might be right!

TELEVISION

69. Interested in tackling a TV kit? *Arkay Kits, 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.

TOOLS

77. Get the right tool for the right job by checking *Moody Machine Products'* new Catalog that lists Moody Kit tool sets. Dealers invited.

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 September 1, 1964

Code Training Courses

(Continued from page 48)

10-inch LP records covering all classes of license exams. Teaches from start to 20 wpm and includes 47 identification cards and an instruction book. Cat. #REC-020, $15.95.

• *SAMS, HOWARD W., & Co.,* 4300 West 62 St., Indianapolis 6, Ind. The company has developed their own "International Code Training System," utilizing modern programmed training techniques. The course includes a diagrammatic system integrated with the recorded exercises, covering 4 to 22 wpm. Three LP recordings plus 96 page text. Cat. #CTG-1, $6.95.

Additional Aids. Besides the must of having a machine to play the foregoing records and tapes, you must also find some way to practice transmitting code to test your knowledge and advance your proficiency.

A common and easy way is by means of a telegraph key, a buzzer and a few batteries. This is perhaps the most inexpensive way of hearing yourself send CW, but it is far from the best since the sound of the buzzer is quite different than any CW you will ever hear on the air. Getting used to the sound of CW as it is transmitted by actual transmitters is a good part of the battle.

Your best bet is to obtain a transistorized code practice oscillator because these produce a sound which sounds very much like what you will hear over a shortwave receiver. Several CPO's are sold commercially (Allied, EICO, Heath, Ameco, Jackson, Dow-Key, and Lafayette units are recommended) for between $3.00 and $15.00. If you want to build your own CPO, plans are provided in this issue of RADIO-TV EXPERIMENTER on page 49.

With your CPO, start sending code from a newspaper or book. Do *not* try to force yourself into "sending fast" because all you will succeed in doing is transmitting unreadable, garbled messages. Send at your "natural" speed and as you acquire practice you will also attain a faster, natural, easy-to-copy speed.

You can check your sending speed by transmitting, without interruption, for 5 minutes. At the end of the 5 minute period you should have sent about 140 characters (numbers and punctuation marks count as 2) in order to succeed at a Novice or Technician exam, or 375 characters for a General.

Receiving Code. If you have a friend who can send code perhaps you can talk him into sending some your way. If you can obtain the services of friend CW operator only once in a while, possibly you can use a tape recorder to keep an always-handy source of practice-receiving material. Record the CW on the tape machine's slowest speed so that you can play it back at higher speeds as your skill increases.

Do *not* rely on your original code course record for much valuable CW receiving practice because by the time you have played the record a few times you will have memorized the transmitted texts on the records. The notable exception to this is the *Epsilon* recording of Tesla's life, which is a fine source of un-memorizable material.

You are indeed fortunate if you have access to a shortwave receiver because the ham bands are an excellent source of varying code speeds. Carefully span the 40 meter (7 mc/s) and 20 meter (14 mc/s) bands and see how many "fists" you can copy. You might wish to take advantage of the code practice transmissions broadcast by ham station W1AW of the *American Radio Relay League* in Connecticut. Their schedule is on 1805, 3555, 7080, 14100, 21075, and 28080 kc/s. On Saturday, Sunday, Tuesday, and Thursday they transmit at 2130 EST in 5, 7½, 10, and 13 wpm (10 minutes of each speed); on Monday, Wednesday, and Friday at 2130 EST they send 15, 20, 25, 30, and 35 wpm; and speeds of 10, 13, and 15 wpm are sent at 1930 EST daily.

Don't Expect Miracles. It's an uphill fight and you will not be the first to discover that there are several "speed barriers" which seem almost impossible to smash through. Take these as challenges, don't let them discourage you. Test your receiving proficiency with the "5-minute test."

The smart operator gives himself a 2 or 3 wpm "cushion" before he attempts to make a try for a ham exam. In other words, if you are required to attain 5 wpm, show up with the ability to do 7 or 8 wpm. Nervousness during the exam can whittle your speed down and this speed margin will be your "insurance."

We have tried to give you the straight facts on CW. From this report you will realize that with only a pinch of natural ability (but a large supply of patience and intestinal fortitude) you too could be bouncing merrily down the CW trail quicker than a hound with a hotfoot! ■

Life Savers for Records

(Continued from page 85)

new high-compliance stereo cartridges, the stylus is so delicate that a casual touch by your finger would bend it out of shape or throw it out of alignment.

Avoid Disc Death. While we're on the subject of the stylus—if you believe in what used to be called "permanent needles" you might as well believe in fairy tales. Misplaced confidence in the permanence of your stylus can take a heavy toll among your discs. "*Groovicide*" is rampant. The torn carcasses of countless records are abundant *habeas corpus* to indict that worn stylus as the hardened killer.

To prevent the murder of your records, keep in mind the following facts:

- • • A metal-tip stylus lasts about ten playing hours before showing the first signs of wear.
- • • A sapphire stylus lasts from 30 to 40 hours.
- • • A diamond stylus last 1000 to 1500 playing hours—even longer in a high-compliance pickup mounted in a low-mass, professional-type arm.

And what happens after that? The worn stylus develops a chisel-like cutting edge which insists on bulldozing its own way instead of wiggling with the music. The net result in the groove is something like a plow ripping through a furrow. The delicate groove contours are cut up into microscopic chunks. With every playing the music gets more screechy, noisy, and garbled. The miniature wreckage in the groove spreads along the entire track and soon the record makes a mockery of your sound system.

Friend Diamond. The diamond stylus, with its ability to withstand abrasion and hold its shape, is your records' best friend. You'd pay about $2.00 for a sapphire stylus. A diamond costs you about $10-$15. Granted, the diamond costs about six times as much as the sapphire, but it plays at least twenty times as long. That makes the diamond the cheapest as well as the safest.

Peace of mind is another bonus you get from a diamond stylus. Assuming you play your sound system about two hours a day, the diamond will last at least two years—and you can forget about it during all this dependable service time.

Once every year or so you might take your diamond down to your audio dealer, who will inspect it for you under a miscroscope free of charge. When you see worn spots (flat facets) on the conical tip of the diamond, it's time for a change.

Excessive stylus pressure also cuts the life expectancy of your records. As explained earlier, the downward force on the stylus—because it's concentrated on the tiny area of the stylus tip—builds up to enormous pressure equivalent to anywhere from 10,000 to 20,000 pounds per square inch. That's a fantastic load for the soft vinyl of the record, and it is important to keep the tracking pressure as light as possible.

Tracking. Thanks to recent progress in cartridge design, it's now possible to track records with stylus pressures as low as one gram (.003 ounce) or even less. With such featherweight tracking, groove erosion from stylus pressure is at the vanishing point. Even in the range from 2-3 grams tracking pressure, record wear is still negligible. Beyond this point, however, it increases rapidly.

To guard against overweight tracking, get yourself a stylus pressure gauge—an inexpensive item obtainable from most audio dealers—and make sure the tracking force on the tone arm is set for the weight specified by the cartridge manufacturer. On most players, the stylus pressure is adjustable either by shifting a counterweight or by adjusting a spring. Incidentally, even the best cartridges will track at extremely light pressure only if mounted in professional-type tone arms. The tone arms found on most ordinary record changers will not operate in the 1-3 gram range. A good component tone arm, plus a high-compliance cartridge, really pay off as life preservers for your records.

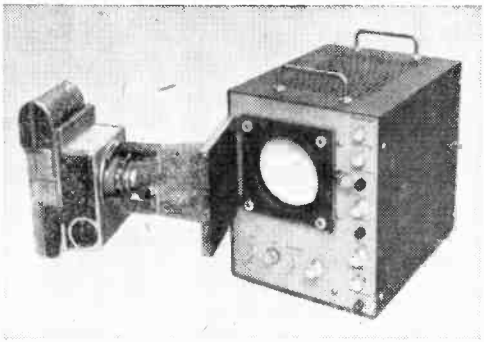
A final pointer. Keep your turntable level. Your equipment cabinet may be out of plumb or your floor might be slanting without your realizing it. So check your turntable with a liquid level. Even a slight tilt puts more pressure on one groove wall than the other and causes rapid wear of the overstressed side. Besides, tilt plays havoc with the delicate balance required for tracing both sides of the stereo groove and thus upsets the natural balance between the two channels. Some tone arms are partly compensated for tilt, but keeping your turntable strictly flat is still your best bet.

We've pinned down the record killers: dust, worn stylus, and overweight tracking. You can keep them harmless with a regular policy of cleanup and inspection. Such a policy will be life insurance for your records. Besides, it pays dividends in better sound. ■

Sonar Caliper

(Continued from page 53)

of the cavern can be obtained. Scale models of the caverns can be constructed from sheet plastic. (See photos.) Each slice represents the distances out from center at each measuring plane.



Quick-print Polaroid camera records oscilloscope pattern at each elevation measured.

The sonar caliper can measure distances through salt or fresh water from 1½ feet out to 500 feet with an accuracy of 5 per cent. Since the speed of sound varies in fluids of different density pressure and temperature, samples of the brine in the cavern are used to calibrate the oscilloscope. Depending on the size of the cavern, a full circle of measurements may be made at 5- to 20-foot vertical intervals. When projected on cross-section sheets and areas scaled by a planimeter, the volume of the cavern can be calculated. Even more important, in some cases, is the shape of adjacent caverns. Often, the shape and direction of a cavern will be checked during washing at several stages to control its shape. ■

De-Bug A Room

(Continued from page 90)

You can buy these in easy to assemble kit form for under $20. The usual wireless mike operates either in the citizens band, or the FM band. All you have to do is plug the unit in, turn it on (in its passive state) and tune slowly through both these ranges of frequency. If you see an indication on your meter, simply leave the unit peaked at this point, and switch it to its active state, so it transmits a steady tone on the frequency where you have it set. If you want to really improve on this device, make a directional antenna for it, using a coil of wire with directional arms, or a loop, and slip this over the sensing coil. With this, you can not only detect the presence of the bug, but can locate the actual unit as well. An all-band broadcast/short-wave receiver can also be used in the detection of wireless bugs.

Actually, the most expensive commodity the bugger has for sale is his own time and ingenuity. If you locate his bugs and tell him you've found them, he silently thanks you for the information, and leaves. If you keep it to yourself, he may have to stay around half the night—wasting valuable time and money.

Finally. The safest way to be sure that nobody is bugging you, is to keep yourself beyond reproach. However, if you are human, as most of us are, you will make some enemies, and they may not all be ethical.

Don't get neurotic about this bugging business, but at the same time, don't let 'em *bug* you, either! ■

"For Pete's sake, Gladys, be still and hand me the pliers!"

10-2 CB Checker

(Continued from page 87)

and 3.5 watts indicates satisfactory performance.

% MOD—. This reads modulation percentage in the *negative* direction as you talk into the mike. (The earlier reading is for positive modulation.) Any overmodulation viewed in this position is more likely to impart a mushy, distorted quality to the operator's voice.

FIELD STRENGTH. This yields one of the best overall indications of output power. Acting like a miniature receiver with an S-meter, the checker shows the results of tuning or changes to transmitter and antenna circuits.

XTAL ACTIVITY: Weak or inactive transmit crystals plugged into the checker socket are detected by the meter reading.

MONITOR. Want to hear yourself as others do? Headsets plugged into the front panel enable you to monitor the transmitted signal. Adjustments can be made as you talk.

SIGNAL GEN. Plug a transmit crystal into the Ten-2 and it radiates a steady RF test signal to the CB rig for alignment, testing or calibration. The signal will bear audio modulation of 1,000 cycles.

CODE OSC. The audio tone used above can also serve for code practice. A key and head-set are the additional items required but not supplied with the kit.

AUDIO OSC. The same audio tone is now made available for applying to a CB rig's audio circuits for trouble-shooting.

Thus the Ten-2 checker should provide just about any function the CB'er is apt to need for keeping his station operating at peak efficiency. What does the FCC have to say about repairing and maintaining your own equipment? The question is answered in regulations (Part 95—the old Part 19) covering CB radio. There is only one stage in the CB set which should not be touched except by the licensed technician: It is the crystal-oscillator in the transmitter, a stage which is frequently sealed and not readily accessible for routine maintenance. Its adjustments rarely must be touched anyway.

The Ten-2, therefore, can be used for all major adjustments and checks for efficient CB operation. And, after several months of use, you can set up the switches and have the instrument check its own battery. Its kit price tag ($25.95) rates the Ten-2 as a top test equipment buy for 1964. ■

Color TV Kit

(Continued from page 77)

or be better than those seen in television dealers' showrooms.

Now, what happens when the color set has been used for a few weeks and the tubes have been *burned-in?* Or, what happens when a vacuum tube has to be replaced? To dramatically illustrate these problems to yourself, ask a friend to move any number of controls and adjustments after you have just finished adjusting the completed kit for a perfect color picture. You will be amazed (as was the *Editor*) how quickly you can readjust the receiver in less time than it originally took.

And once the color receiver is adjusted, you don't need an electronic technician's background to bring in color or black and white pictures. Front panel controls are the same as a conventional set plus a *tint* and *color* controls. A few minutes practice with these controls plus fine tuner and you'll have the best color picture on the block.

One big extra bonus is the set's top quality audio output. Connected to an 8-ohm quality bookshelf speaker, the audio was rated by listener as superior to any other TV audio previously heard.

Advantages of the kit. Like its brother, the black and white set, the color receiver can expect vacuum tube failures in its lifetime. However, the experience gained assembling and adjusting the color set permits the builder to restore the set with a superior color picture by himself without expensive servicemen calls. Also, each time the Mrs. wants to relocate the set to a different part of the room, the color convergence adjustments can be made without a serviceman's expensive help. That's more dollars saved. It can be safely estimated that repair costs on the Heath 21-inch color TV will be of the same magnitude or less compared to 21- and 23-inch black and white sets, and the repair cost savings during the Heath color TV set's life compared to commercial units now on the market may be more than $200. This color TV kit has hidden dollar premiums.

What it costs. The basic color chassis with the 21-inch color picture tube is priced at $399. This service includes a custom mounting kit for wall installations. If you wish, you can purchase a handsome walnut cabinet for only $49. Compare these prices against similar wired color sets and you will discover the price is right.—*J. Sienkiewicz* ■

More Than DX

(Continued from page 92)

We were on a ridge now and could see the lights of the city below. Red and green, blue and white, silhouettes of fairy buildings against a jet black background. Guess at the location of San Juan Street where Ora lived, at Howard Brothers Cleaners where we both worked. Then there was the traffic moving fast and hard, without hesitation, almost a power, like the city itself.

Marshal hated the city.

When we got to his place the neighbors were all standing around the front lawn and sidewalk. Also an FCC monitoring van and a car marked "Federal Bureau of Investigation." I stopped beside one gawking fellow. "What happened?" A feeling began in the pit of my stomach.

Without looking at me he replied, "The crazy old man had a bootleg radio transmitter hidden under his bed. Real fancy setup, sound effects, echo chamber and all."

I put my foot on the accelerater and drove off without burning any rubber.

Ora gave me a funny look. "Didn't you even want to go in and see him, baby?"

"Not now. Maybe tomorrow or when he gets out on bail. Right now I wouldn't know what to say."

She smiled and moved closer to me. "Ask for a QSL." ■

"Why, yes, my TV set does need its *polycap plastic-cased electrolytics* checked, or whatever you said."

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Volume 41, No. 3

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 third and last 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 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 Call Letters, U. S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Cuban, Mexican and Puerto Rico AM Stations by Call Letters, and the newly expanded World-Wide-Short-Wave Section.

In August/September 1964 issue of RADIO-TV EXPERIMETER, Volume 42, No. 1 the *Log* will contain the following listings: U. S. AM Stations by Frequency, Canadian AM Stations by Frequency, U. S. Television Stations by States, Canadian Television Stations by Location and the World-Wide Short-Wave Section. In the event you missed any part of the *Log* published during the first half of 1964, you will have a complete volume of *White's Radio Log* by collecting any three consecutive issues of RADIO-TV EXPERIMENTER during 1964. The three consecutive issues are an entire volume of *White's Rodio Log* that offers complete listings with last minute station change data that are not 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* format an unbeatable reference.

QUICK REFERENCE INDEX

U. S. AM Stations by Call Letters

C.L.	Location	Kc.
KAAA	Kingman, Ariz.	1230
KAAB	Hot Springs, Ark.	1340
KAAY	Little Rock, Ark.	1090
KABC	Los Angeles, Calif.	790
KABH	Midland, Tex.	1510
KABI	Ketchikan, Alaska	580
KABL	Oakland, Calif.	960
KABQ	Albuquerque, N.M.	1350
KABR	Aberdeen, S.Dak.	1420
KACE	Riverside, Calif.	1570
KACI	The Dalles, Oreg.	1300
KACT	Andrews, Tex.	1360
KACY	Port Hueneme, Calif.	1520
KADA	Ada, Okla.	1230
KADL	Pine Bluff, Ark.	1270
KADO	Marshall, Tex.	1410
KADY	St. Charles, Mo.	1460
KAFF	Flagstaff, Ariz.	930
KAFP	Petaluma, Calif.	1490
KAFY	Bakersfield, Calif.	550
KAGE	Winona, Minn.	1380
KAGH	Crossett, Ark.	800
KAGI	Grants Pass, Oreg.	930
KAGO	Klamath Falls, Oreg.	1150
KAGR	Yuba City, Calif.	1450
KAGT	Anacortes, Wash.	1340
KAHI	Auburn, Calif.	950
KAHR	Redding, Calif.	1330
KAHU	Waipahu, Hawaii	940
KAIM	Kaimuki, Hawaii	870
KAIN	Nampa, Ida.	1340
KAIR	Tucson, Ariz.	1490
KAJO	Grants Pass, Oreg.	1270
KAKA	Wickenburg, Ariz.	1250
KAKC	Tulsa, Okla.	970
KAKE	Wichita, Kan.	1240
KALB	Alexandria, La.	580
KALE	Richland, Wash.	960
KALF	Mesa, Ariz.	1510
KALG	Alamogordo, N.Mex.	1230
KALI	Pasadena, Calif.	1430
KALL	Salt Lake City, Utah	910
KALM	Thayer, Mo.	1290
KALN	Iola, Kan.	1370
KALO	Little Rock, Ark.	1250
KALT	Atlanta, Tex.	900
KALV	Alva, Okla.	1430
KAMD	Camden, Ark.	910
KAML	Kenedy, Tex.	990
KAMO	Rogers, Ark.	1590
KAMP	El Centro, Calif.	1430
KAMY	McCamey, Tex.	1450
KANA	Anaconda, Mont.	580
KANB	Shreveport, La.	1300
KAND	Corsicana, Tex.	1340
KANE	New Iberia, La.	1240
KANI	Wharton, Tex.	1500
KANN	Ogden, Utah	1250
KANO	Anoka, Minn.	1470
KAOH	Duluth, Minn.	1390
KAOK	Lake Charles, La.	1400
KAOL	Carrollton, Mo.	1430
KAOR	Oroville, Calif.	1340
KAPA	Raymond, Wash.	1340
KAPB	Marksville, La.	1370
KAPE	San Antonio, Tex.	1480
KAPI	Pueblo, Colo.	690
KAPR	Douglas, Ariz.	930
KAPS	Mt. Vernon, Wash.	1470
KAPT	Salem, Ore.	1220
KAPY	Port Angeles, Wash.	1290
KARA	Albuquerque, N.M.	1310
KARE	Atchison, Kan.	1470
KARI	Blaine, Wash.	550
KARK	Little Rock, Ark.	920
KARM	Fresno, Calif.	1430
KARR	Great Falls, Mont.	1400
KARS	Belen, N.M.	860
KART	Jerome, Idaho	1400
KARY	Prosser, Wash.	1310
KASE	Austin, Tex.	970
KASH	Eugene, Ore.	1590
KASI	Ames, Iowa	1430
KASK	Ontario, Calif.	1510
KASL	Newcastle, Wyo.	1240
KASM	Albany, Minn.	1150
KASO	Minden, La.	1240
KAST	Astoria, Ore.	1370
KASY	Auburn, Wash.	1220
KATA	Arcata, Calif.	1340
KATE	Albert Lea, Minn.	1450
KATI	Casper, Wyo.	1400
KATL	Miles City, Mont.	1340
KATN	Boise, Idaho	1010
KATO	Safford, Ariz.	1230
KATQ	Texarkana, Tex.	940
KATR	Eugene, Ore.	1320
KATY	San Luis Obispo, Cal.	1340
KATZ	St. Louis, Mo.	1600
KAUS	Austin, Minn.	1480
KAVE	Carlsbad, N.Mex.	1240
KAVI	Rocky Ford, Colo.	1320
KAVL	Lancaster, Calif.	610
KAVR	Apple Valley, Calif.	960
KAWA	Waco, Tex.	1010
KAWL	York, Neb.	1370
KAWT	Douglas, Ariz.	1450
KAYC	Beaumont, Tex.	1450
KAYE	Puyallup, Wash.	1450
KAYG	Lakewood, Wash.	1480
KAYL	Storm Lake, Iowa	990
KAYO	Seattle, Wash.	1150
KAYS	Hays, Kans.	1400
KAYT	Rupert, Idaho	970
KBAB	Indianola, Iowa	1490
KBAL	San Saba, Tex.	1410
KBAM	Longview, Wash.	1270
KBAN	Bowie, Tex.	1410
KBAR	Burley, Idaho	1230
KBAT	San Antonio, Tex.	680
KBBA	Benton, Ark.	690
KBBB	Borger, Tex.	1600
KBBC	Centerville, Utah	1600
KBBO	Yakima, Wash.	1390
KBBR	North Bend, Oreg.	1340
KBBS	Buffalo, Wyo.	1450
KBCH	Oceanlake, Oreg.	1380
KBCL	Shreveport, La.	1220
KBEA	Mission, Kans.	1480
KBEC	Waxahachie, Tex.	1390
KBEE	Modesto, Calif.	970
KBEK	Elk City, Okla.	1240
KBEL	Idabel, Okla.	1240
KBEN	Carrizo Sprgs., Tex.	1450
KBER	San Antonio, Tex.	1150
KBET	Reno, Nev.	1340
KBEV	Portland, Oreg.	1010
KBFS	Belle Fourche, S.Dak.	1450
KBGN	Caldwell, Idaho	910
KBGO	Waco, Tex.	1580
KBHB	Sturgis, S. D.	1280
KBHC	Nashville, Ark.	1260
KBHM	Branson, Mo.	1220
KBHS	Hot Springs, Ark.	590
KBIF	Fresno, Calif.	900
KBIM	Roswell, N.Mex.	910
KBIS	Bakersfield, Calif.	970
KBIX	Muskogee, Okla.	1490
KBIZ	Ottumwa, Iowa	1240
KBJT	Fordyce, Ark.	1570
KBKR	Baker, Oreg.	1490
KBKW	Aberdeen, Wash.	1450
KBLA	Burbank, Calif.	1500
KBLF	Red Bluff, Calif.	1490
KBLI	Blackfoot, Idaho	690
KBLR	Bolivar, Mo.	1550
KBLT	Big Lake, Tex.	1290
KBLU	Yuma, Ariz.	1320
KBLY	Gold Beach, Oreg.	1220
KBMI	Henderson, Nev.	1400
KBMN	Bozeman, Mont.	1230
KBMO	Benson, Minn.	1290
KBMR	Bismarck, N. D.	1350
KBMW	Breckinrdg., Minn.	1450
KBMX	Coalinga, Calif.	1470
KBMY	Billings, Mont.	1240
KBND	Bend, Oreg.	1110
KBOA	Kennett, Mo.	830
KBOE	Oskaloosa, Iowa	740
KBOI	Boise, Idaho	950
KBOK	Malvern, Ark.	1310
KBOL	Boulder, Colo.	1490
KBOM	Bismark-Mandan, N. Dak.	1270
KBON	Omaha, Nebr.	1490
KBOP	Pleasanton, Tex.	1380
KBOR	Brownsville, Tex.	1600
KBOW	Butte, Mont.	1490
KBOX	Dallas, Tex.	1480
KBOY	Medford, Oreg.	730
KBPS	Portland, Oreg.	1450
KBRC	Mt. Vernon, Wash.	1430
KBRI	Brinkley, Ark.	1570
KBRK	Brookings, S.Dak.	1430
KBRL	McCook, Nebr.	1300
KBRN	Brighton, Colo.	800
KBRO	Bremerton, Wash.	1490
KBRR	Leadville, Colo.	1230
KBRS	Springdale, Ark.	1340
KBRV	Soda Sprgs., Ida.	540
KBRX	O'Neill, Nebr.	1350
KBRZ	Freeport, Texas	1460
KBSF	Springhill, La.	1460
KBSN	Crane, Tex.	1380
KBST	Big Spring, Tex.	1490
KBTA	Batesville, Ark.	1340
KBTC	Houston, Mo.	1250
KBTM	Jonesboro, Ark.	1230
KBTN	Neosho, Mo.	1420
KBTO	El Dorado, Kans.	1360
KBTR	Denver, Colo.	710
KBUC	Corona, Calif.	1370
KBUD	Athens, Tex.	1410
KBUH	Brigham City, Utah	800
KBUN	Bemidji, Minn.	1450
KBUR	Burlington, Iowa	1490
KBUS	Mexia, Tex.	1590
KBUY	Amarillo, Tex.	1010
KBUZ	Mesa, Ariz.	1310
KBVM	Lancaster, Calif.	1380
KBVU	Bellevue, Wash.	1540
KBWD	Brownwood, Tex.	1380
KBYE	Okla. City, Okla.	890
KBYG	Big Spring, Tex.	1400
KBYP	Shamrock, Tex.	1580
KBYR	Anchorage, Alaska	1270
KBZY	Salem, Oreg.	1490
KBZZ	LaJunta, Colo.	1400
KCAB	Dardanelle, Ark.	980
KCAC	Phoenix, Ariz.	1010
KCAD	Abilene, Tex.	1560
KCAL	Redlands, Calif.	1410
KCAN	Canyon, Tex.	1550
KCAP	Helena, Mont.	1340
KCAR	Clarksville, Tex.	1350
KCAS	Slaton, Tex.	1050
KCAT	Pine Bluff, Ark.	1530
KCBC	Des Moines, Iowa	1390
KCBD	Lubbock, Tex.	1590
KCBQ	San Diego, Calif.	1170
KCBS	San Fran., Calif.	740
KCCL	Paris, Ark.	1460
KCCO	Lawton, Okla.	1050
KCCR	Pierre, S.Dak.	1590
KCCT	Corpus Christi, Tex.	1150
KCCV	Independence, Mo.	1510
KCDI	Kirkland, Wash	
KCEE	Tucson, Ariz.	790
KCEY	Tunlock, Calif.	1390
KCFA	Spokane, Wash.	1330
KCFH	Cuero, Tex.	1600
KCFI	Cedar Falls, Iowa	1250
KCGM	Columbia, Mo.	1580
KCHA	Charles City, Iowa	1580
KCHE	Cherokee, Iowa	1440
KCHI	Chillicothe, Mo.	1010
KCHJ	Delano, Calif.	1010
KCHR	Charleston, Mo.	1350
KCHS	Truth or Consequences, New Mexico	1400
KCHV	Coachella, Calif.	970
KCHY	Cheyenne, Wyo.	1590
KCID	Caldwell, Idaho	1490
KCII	Washington, Iowa	1380
KCIJ	Shreveport, La.	1050
KCIL	Houma, La.	1490
KCIM	Carroll, Iowa	1380
KCIN	Victorville, Calif.	1590
KCJB	Minot, N.Dak.	910
KCJH	San Luis Obispo, Cal.	1280
KCKC	San Bernardino, Cal.	1350
KCKG	Sonora, Tex	1240
KCKN	Kansas City, Kans.	1340
KCKW	Jena, La.	1480
KCKY	Coolidge, Ariz.	1150
KCLA	Pine Bluff, Ark.	1400
KCLE	Cleburne, Tex.	1120
KCLH	Blue Earth, Minn.	1560
KCLN	Clinton, Iowa	1390
KCLO	Leavenworth, Kans.	1410
KCLR	Ralls, Tex.	1530
KCLS	Flagstaff, Ariz.	600
KCLU	Rolla, Mo.	1590
KCLV	Clovis, N.Mex.	1240
KCLW	Hamilton, Tex.	900
KCLX	Colfax, Wash.	1450
KCMC	Texarkana, Tex.	1230
KCMJ	Palm Sprgs., Calif.	1010
KCMO	Kansas City, Mo.	810
KCMS	Manitou Sprgs., Colo.	1490
KCNI	Broken Bow, Nebr.	1280
KCNO	Alturas, Calif.	570
KCNY	San Marcos, Tex.	1470
KCOB	Newton, Iowa	1280
KCOG	Centerville, Iowa	1400
KCOH	Houston, Tex.	1430
KCOK	Tulare, Calif.	1270
KCDL	Ft. Collins, Colo.	1410
KCOM	Comanche, Tex.	1550
KCON	Conway, Ark.	1230
KCOR	San Antonio, Tex.	1350
KCOW	Alliance, Nebr.	1400
KCOY	Santa Maria, Calif.	1400
KCPX	Salt Lake City, Utah	1320
KCRA	Sacramento, Calif.	1320
KCRB	Chanute, Kans.	1460
KCRC	Enid, Okla.	1390
KCRG	Cedar Rapids, Iowa	1600
KCRM	Crane, Tex.	1380
KCRS	Midland, Tex.	550
KCRT	Trinidad, Colo.	1240
KCRV	Caruthersville, Mo.	1370
KCSJ	Pueblo, Colo.	590
KCSR	Chadron, Nebr.	610
KCTA	Corpus Christi, Tex.	1030
KCTI	Gonzales, Tex.	1450
KCTY	Salinas, Calif.	980
KCTX	Childress, Tex.	1510
KCUB	Tucson, Ariz.	1290
KCUE	Red Wing, Minn.	1250
KCUL	Fort Worth, Tex.	1540
KCVL	Colville, Wash.	1270
KCVR	Lodi, Calif.	1570
KCYL	Lampasas, Tex.	1450
KCYR	Milan, N.Mex.	560
KDAB	Arvada, Colo.	1550
KDAC	Ft. Bragg, Calif.	1230
KDAD	Weed, Calif.	800
KDAK	Carrington, N.D.	1600
KDAL	Duluth, Minn.	610
KDAN	Eureka, Calif.	790
KDAV	Lubbock, Tex.	580
KDAY	Santa Monica, Calif.	1580
KDB	Santa Barbara, Calif.	1490
KDBC	Mansfield, La.	1360
KDBM	Dillon, Mont.	800
KDBS	Alexandria, La.	1410
KDCE	Espanola, N.M.	970
KDDD	Dumas, Tex.	800
KDEC	Decorah, Iowa	1240
KDEF	Albuquerque, N.Mex.	1150
KDEN	Denver, Colo.	1340
KDEO	El Cajon, Calif.	910
KDES	Palm Sprgs., Calif.	920
KDET	Center, Tex.	930
KDEX	Dexter, Mo.	1590
KDEY	Boulder, Colo.	1460
KDFN	Doniphan, Mo.	1500
KDGO	Durango, Colo.	1240
KDHI	Twenty-nine Palms, California	1250
KDHL	Faribault, Minn.	920
KDHN	Dimmitt, Tex.	1470
KDIA	Oakland, Calif.	1310
KDIO	Ortonville, Minn.	1350
KDIX	Dickinson, N.Dak.	1230
KDJI	Holbrook, Ariz.	1270
KDKA	Pittsburgh, Pa.	1020
KDKD	Clinton, Mo.	1280
KDLA	DeRidder, La.	1010
KDLE	Aberdeen, S. Dak.	1420
KDLK	Del Rio, Tex.	1230
KDLM	Detroit Lakes, Minn.	1340
KDLR	Devils Lake, N.Dak.	1240
KDLS	Perry, Iowa	1310
KDMA	Montevideo, Minn.	1450
KDMO	Carthage, Mo.	1490
KDMS	El Dorado, Ark.	1290
KDNC	Spokane, Wash.	1440
KDNT	Denton, Tex.	1440
KDOK	Tyler, Tex.	1330
KDOL	Mojave, Calif.	1340
KDOM	Windom, Minn.	1580
KDON	Salinas, Calif.	1460
KDOT	Reno, Nev.	1230
KDOV	Medford, Oreg.	1300
KDQN	DeQueen, Ark.	1390
KDRG	Deer Lodge, Mont.	1400
KDRO	Sedalia, Mo.	1490
KDRS	Paragould, Ark.	1490
KDRY	Alamo Hts., Tex.	1110
KDSJ	Deadwood, S.Dak.	980
KDSN	Denison, Iowa	1580
KDSX	Denison, Tex.	950
KDTA	Delta, Colo.	1400
KDTH	Dubuque, Iowa	1370
KDUZ	Hutchinson, Minn.	1260
KDWA	Hastings, Minn.	1460
KDWB	St. Paul, Minn.	630
KDWT	Stamford, Tex.	1200
KDXE	No. Little Rock, Ark.	1380
KDXU	St. George, Utah	1450
KDYL	Tooele, Utah	990
KDZA	Pueblo, Colo.	1230
KEAN	Brownwood, Tex.	1240
KEAP	Fresno, Calif.	980
KEBE	Jacksonville, Tex.	1400
KECH	Ketchikan, Alaska	620
KECK	Odessa, Tex.	920
KEDD	Dodge City, Kans.	1550
KEDO	Longview, Wash.	1400
KEED	Springfield, Oreg.	1050
KEEE	Nacogdoches, Tex.	1230
KEEL	Shreveport, La.	710
KEEN	San Jose, Calif.	1370
KEEP	Twin Falls, Idaho	1450

WHITE'S RADIO LOG

C.L.	Location	Kc.
KEES	Gladewater, Tex.	1430
KEKO	Kealakekua, Hawaii	790
KELA	Centralia, Wash.	1470
KELD	El Dorado, Ark.	1400
KELI	Tulsa, Okla.	1430
KELK	Elko, Nev.	1240
KELO	Sioux Falls, S.Dak.	1320
KELP	El Paso, Tex.	920
KELR	El Reno, Okla.	1460
KELY	Ely, Nev.	1230
KENA	Mena, Ark.	1450
KENE	Toppenish, Wash.	1490
KENI	Anchorage, Alaska	550
KENM	Portales, N.Mex.	1450
KENN	Farmington, N.M.	1390
KENO	Las Vegas, Nev.	1460
KENY	Bellingham-Ferndale, Wash.	930
KEOK	Payette, Idaho	1450
KEOS	Flagstaff, Ariz.	690
KEPR	Kennewick, Wash.	610
KEPS	Eagle Pass, Tex.	1270
KERB	Kermit, Tex.	600
KERC	Eastland, Tex.	1590
KERG	Eugene, Oreg.	1280
KERN	Bakersfield, Calif.	1410
KERV	Kerrville, Tex.	1230
KESM	Eldorado Springs, Mo.	1580
KEST	Boise, Idaho	790
KETO	Seattle, Wash.	1590
KETX	Livingston, Tex.	1440
KEUN	Eunice, La.	1490
KEVA	Evanston, Wyo.	1240
KEVE	Minneapolis, Minn.	1440
KEVL	White Castle, La.	1590
KEVT	Tucson, Ariz.	690
KEWB	Oakland, Calif.	910
KEWI	Topeka, Kans.	1440
KEX	Portland, Oreg.	1190
KEXO	Grand June., Colo.	1230
KEYD	Oakes, N.Dak.	1220
KEYE	Perryton, Tex.	1400
KEYJ	Jamestown, N.Dak.	1400
KEYL	Long Prairie, Minn.	1400
KEYR	Terrytown, Nebr.	690
KEYS	Corpus Christi, Tex.	1440
KEYY	Provo, Utah	1450
KEYZ	Williston, N.Dak.	1360
KEZE	Huron, S.Dak.	1530
KEZU	Rapid City, S.Dak.	920
KEZY	Anaheim, Calif.	1190
KFAB	Omaha, Nebr.	1110
KFAC	Los Angeles, Calif.	1330
KFAL	Fulton, Mo.	900
KFAM	St. Cloud, Minn.	1450
KFAR	Fairbanks, Alaska	610
KFAX	San Francisco, Calif.	1100
KFAY	Fayetteville, Ark.	1250
KFBB	Great Falls, Mont.	1310
KFBC	Cheyenne, Wyo.	1240
KFBK	Sacramento, Calif.	1530
KFCB	Redfield, S. Dak.	1380
KFDA	Amarillo, Tex.	1440
KFDF	Van Buren, Ark.	1580
KFDI	Wichita, Kansas	1070
KFDM	Beaumont, Tex.	560
KFDR	Grand Coulee, Wash.	1360
KFEL	Pueblo, Colo.	970
KFEQ	St. Joseph. Mo.	680
KFFA	Helena, Ark.	1360
KFGQ	Boone, Iowa	1260
KFGT	Flagstaff, Ariz.	930
KFH	Wichita, Kans.	1330
KFI	Los Angeles, Calif.	640
KFIF	Tucson, Ariz.	1550
KFIV	Modesto, Calif.	1360
KFIZ	Fond du Lac, Wis.	1450
KFJB	Marshalltown, Iowa	1230
KFJM	Grand Forks, N.Dak	1370
KFJZ	Ft. Worth, Tex.	1270
KFKA	Greeley, Colo.	1310
KFKF	Bellevue, Wash.	1330
KFKU	Lawrence, Kans.	1250
KFLA	Scott City, Kans.	1310
KFLD	Floydada, Tex.	900
KFLI	Mountain Home, Ida.	1240
KFLJ	Watsenburg, Colo.	1380
KFLW	Klamath Falls, Oreg.	1450
KFLY	Corvallis, Oreg.	1240
KFMB	San Diego, Calif.	540
KFMJ	Tulsa, Okla.	1050
KFML	Denver, Colo.	1390
KFMO	Flat River, Mo.	1240
KFNF	Council Bluffs, Iowa	920
KFNV	Ferriday, La.	1600
KFNW	Fargo, N.Dak.	900
KFOR	Lincoln, Nebr.	1240
KFOX	Long Beach, Calif.	1280
KFPW	Ft. Smith, Ark.	1230
KFQD	Anchorage, Alaska	730
KFRA	Franklin, La.	1390
KFRB	Fairbanks, Alaska	900
KFRC	San Francisco, Calif.	610
KFRD	Rosenberg, Tex.	980
KFRE	Fresno, Calif.	940
KFRM	Kansas City, Mo.	550
KFRO	Longview, Tex.	1370
KFRU	Columbia, Mo.	1400
KFSA	Ft. Smith, Ark.	950
KFSB	Joplin, Mo.	1310
KFSC	Denver, Colo.	1220
KFSG	Los Angeles, Calif.	1150
KFST	Ft. Stockton, Tex.	860
KFTM	Ft. Morgan, Colo.	1400
KFTV	Paris, Tex.	1250
KFTW	Fredericktown, Mo.	1450
KFUN	Las Vegas, N.Mex.	1230
KFUO	St. Louis, Mo.	850
KFVS	Cape Girardeau, Mo.	960
KFWB	Los Angeles, Calif.	980
KFXD	Nampa, Idaho	580
KFXM	San Bernardino, Calif.	590
KFYN	Bonham, Tex.	1420
KFYO	Lubbock, Tex.	790
KFYR	Bismarck, N.Dak.	550
KGA	Spokane, Wash.	1510
KGAF	Gainesville, Tex.	1580
KGAK	Gallup, N.Mex.	1330
KGAL	Lebanon, Oreg.	920
KGAR	Jacksonville, Ark.	1500
KGAS	Carthage, Tex.	1590
KGAY	Salem, Oreg.	1430
KGB	San Diego, Calif.	1360
KGBC	Galveston, Tex.	1540
KGBS	Los Angeles, Calif.	1020
KGBT	Harlingen, Tex.	1530
KGBX	Springfield, Mo.	1260
KGCA	Rugby, N.D.	1450
KGCX	Sidney, Mont.	1480
KGDN	Edmonds, Wash.	630
KGEE	Bakersfield, Calif.	1230
KGEK	Sterling, Colo.	1230
KGEM	Boise, Idaho	1140
KGEN	Tulare, Calif.	1370
KGER	Long Beach, Calif.	1390
KGEZ	Kalispell, Mont.	600
KGFF	Shawnee, Okla.	1450
KGFJ	Los Angeles, Calif.	1230
KGFL	Roswell, N.Mex.	1400
KGFW	Kearney, Nebr.	1340
KGFX	Pierre, S.Dak.	630
KGGF	Coffeyville, Kans.	690
KGGM	Albuquerque, N.Mex.	610
KGHF	Pueblo, Colo.	1350
KGHL	Billings, Mont.	790
KGHM	Brookfield, Mo.	1470
KGHS	International Falls, Minn.	1230
KGHT	Hollister, Calif.	1520
KGIL	San Fernando, Calif.	1260
KGIW	Alamosa, Colo.	1450
KGKB	Tyler, Tex.	1490
KGKL	San Angelo, Tex.	960
KGKO	Benton, Ark.	1600
KGLC	Miami, Okla.	910
KGLE	Glendive, Mont.	590
KGLN	Glenwood Sprgs., Colo.	980
KGLO	Mason City, Iowa	1300
KGLU	Safford. Ariz.	1480
KGMB	Honolulu, Hawaii	590
KGMC	Englewood, Colo.	1150
KGMI	Bellingham, Wash.	790
KGMO	Cape Girardeau, Mo.	1220
KGMR	Jacksonville, Ark.	1500
KGMS	Sacramento, Calif.	1380
KGNT	Fairbury, Nebr.	1310
KGMY	Missoula, Mont.	1450
KGNB	New Braunfels, Tex.	1420
KGNC	Amarillo, Tex.	710
KGNO	Dodge City, Kans.	1370
KGNS	Laredo, Tex.	1390
KGO	San Francisco, Calif.	810
KGLM	Avalon, Calif.	740
KGON	Oregon City, Oreg.	1520
KGOS	Torrington, Wyo.	1490
KGPC	Grafton, N.Dak.	1340
KGRI	Henderson, Tex.	1000
KGRL	Bend, Oreg.	940
KGRN	Grinnell, Iowa	1410
KGRO	Gresham, Oreg.	1230
KGRS	Pasco, Wash.	1340
KGRT	Las Cruces, N.Mex.	570
KGST	Fresno, Calif.	1600
KGTN	Georgetown, Tex.	1530
KGU	Honolulu, Hawaii	760
KGUC	Gunnison, Colo.	1490
KGUD	Santa Barbara, Calif.	990
KGUL	Port Lavaca, Tex.	1560
KGVL	Greenville, Tex.	1400
KGVO	Missoula, Mont.	1290
KGVW	Belgrade, Mont.	630
KGW	Portland, Oreg.	620
KGWA	Enid, Okla.	960
KGY	Olympia, Wash.	1240
KGYN	Guymon, Okla.	1220
KHAI	Honolulu, Hawaii	1090
KHAK	Cedar Rapids, Iowa	1360
KHAL	Homer, La.	1300
KHAR	Anchorage, Alaska	590
KHAS	Hastings, Nebr.	1230
KHAT	Phoenix, Ariz.	1480
KHBC	Hilo, Hawaii	970
KHBM	Monticello, Ark.	1430
KHBR	Hillsboro, Tex.	1560
KHCS	Portageville, Mo.	1050
KHDN	Hardin, Mont.	1230
KHEM	Big Springs, Tex.	1270
KHEN	Henryetta, Okla.	1590
KHEP	Phoenix, Ariz.	1280
KHER	Santa Maria, Calif.	1600
KHEY	El Paso, Tex.	690
KHFH	Fry, Ariz.	1420
KHHH	Pampa, Tex.	1230
KHIL	Willcox, Ariz.	1250
KHIT	Walla Walla, Wash.	1320
KHJ	Los Angeles, Calif.	930
KHMO	Hannibal, Mo.	1070
KHOB	Hobbs, N.Mex.	1390
KHOE	Truckee, Calif.	1400
KHOG	Fayetteville, Ark.	1440
KHOK	Hoquiam, Wash.	1560
KHOS	Tucson, Ariz.	940
KHOT	Madera, Calif.	1250
KHOW	Denver, Colo.	630
KHOZ	Harrison, Ark.	900
KHQ	Spokane, Wash.	590
KHSJ	Hemet, Calif.	1320
KHSL	Chico, Calif.	1290
KHUB	Fremont, Nebr.	1340
KHUM	Santa Rosa, Calif.	1580
KHUZ	Borger, Tex.	1490
KHVH	Honolulu, Hawaii	1040
KIAL	Astoria, Ore.	1230
KIBE	Palo Alto, Calif.	1220
KIBH	Seward, Alaska	1340
KIBL	Beeville, Tex.	1490
KIBS	Bishop, Calif.	1230
KICA	Clovis, N.M.	980
KICD	Spencer, Iowa	1240
KICK	Springfield, Mo.	1340
KICM	Golden, Colo.	1250
KICO	Calexico, Calif.	1490
KICS	Hastings, Neb.	1550
KICY	Nome, Alaska	850
KID	Idaho Falls, Idaho	590
KIDD	Monterey, Calif.	630
KIDO	Boise, Idaho	630
KIEV	Glendale, Calif.	870
KIFG	Iowa Falls, Ia.	1510
KIFI	Idaho Falls, Idaho	1260
KIFN	Phoenix, Ariz.	860
KIFW	Sitka, Alaska	1230
KIHN	Hugo, Okla.	1340
KIHR	Hood River, Oreg.	1230
KIJV	Huron, S.Dak.	1340
KIKI	Honolulu, Hawaii	1340
KIKK	Pasadena, Tex.	830
KIKO	Miami, Ariz.	650
KIKS	Sulphur, La.	1340
KIKU	Honolulu, Hawaii	1310
KILE	Galveston, Tex.	1420
KILO	Grand Forks, S.Dak.	1400
KILT	Houston, Tex.	1440
KIMA	Yakima, Wash.	610
KIMB	Kimball, Nebr.	1460
KIML	Gillette, Wyo.	1260
KIMM	Rapid City, S.D.	1490
KIMN	Denver, Colo.	1150
KIMO	Hilo, Hawaii	950
KIMP	Mt. Pleasant, Tex.	850
KIND	Independence, Kans.	960
KINE	Kingsville, Tex.	1010
KING	Seattle, Wash.	1330
KINO	Winslow, Ariz.	1090
KINS	Eureka, Calif.	1230
KINT	El Paso, Tex.	980
KINY	Juneau, Alaska	1590
KIOA	Des Moines, Iowa	800
KIOT	Barstow, Calif.	940
KIOX	Bay City, Tex.	1310
KIPA	Hilo, Hawaii	1270
KIQS	Willows, Calif.	1110
KIRO	Seattle, Wash.	1560
KIRT	Mission, Tex.	710
KIRX	Kirksville, Mo.	1580
KISD	Sioux Falls, S.Dak.	1450
KISN	Vancouver, Wash.	1230
KIST	Santa Barbara, Calif.	910
KIT	Yakima, Wash.	1340
KITE	San Antonio, Tex.	1280
KITI	Chehalis, Wash.	930
KITN	Olympia, Wash.	1420
KIUL	Garden City, Kans.	920
KIUN	Pecos, Tex.	1240
KIUP	Durango, Colo.	1400
KIVY	Crockett, Tex.	930
KIWA	Sheldon, Iowa	1290
KIXI	Seattle, Wash.	1550
KIXL	Dallas, Tex.	910
KIXX	Provo, Utah	1040
KIXZ	Amarillo, Tex.	1400
KIZZ	El Paso, Tex.	1150
KJAM	Madison, S.Dak.	1390
KJAN	Atlantic, Iowa	1220
KJAX	Santa Rosa, Calif.	1150
KJAY	Sacramento, Calif.	1430
KJBC	Midland, Tex.	1150
KJCF	Festus, Mo.	1400
KJCK	Junction City, Kans.	1420
KJEF	Jennings, La.	1290
KJEM	Oklahoma City, Okla.	800
KJET	Beaumont, Tex.	1380
KJFJ	Webster City, Iowa	1570
KJIM	Ft. Worth, Tex.	870
KJKJ	Flagstaff, Ariz.	1400
KJLT	North Platte, Nebr.	970
KJNO	Juneau, Alaska	630
KJOE	Shreveport, La.	1480
KJOY	Stockton, Calif.	1280
KJPW	Waynesville, Mo.	1390
KJR	Seattle. Wash.	950
KJRG	Newton, Kans.	950
KJSK	Columbus, Nebr.	900
KKAL	Denver City, Tex.	1580
KKAN	Phillipsburg, Kans.	1490
KKAR	Pomona, Calif.	1220
KKAS	Silsbee, Tex.	1300
KKEY	Vancouver, Wash.	1150
KKHI	San Francisco, Calif.	1550
KKID	Pendleton, Oreg.	1240
KKIN	Aitkin, Minn.	930
KKIS	Pittsburg, Calif.	990
KKIT	Taos, N.Mex.	1340
KKJO	St. Joseph, Mo.	1550
KKOK	Lompoc, Calif.	1410
KLAC	Los Angeles, Calif.	570
KLAD	Klamath Falls, Oreg.	960
KLAK	Lakewood, Colo.	1600
KLAM	Cordova, Alaska	1450
KLAN	Lemoore, Calif.	1320
KLAS	Las Vegas, Nev.	1230
KLBK	Lubbock, Tex.	1340
KLBM	La Grande, Oreg.	1450
KLBS	Los Banos, Calif.	1330
KLCB	Libby, Mont.	1230
KLCN	Blytheville, Ark.	910
KLCO	Poteau, Okla.	1280
KLEA	Lovington, N.Mex.	630
KLEE	Ottumwa, Iowa	1480
KLEI	Kailua, Hawaii	1130
KLEM	LeMars, Iowa	1410
KLEN	Killeen, Tex.	1050
KLEO	Wichita, Kans.	1480
KLER	Orofino, Idaho	950
KLEX	Lexington, Mo.	1570
KLFD	Litchfield, Minn.	1410
KLFF	Mead, Wash.	1590
KLGA	Algona, Iowa	1600
KLGN	Logan, Utah	1390
KLGR	Redwood Falls, Minn.	1490
KLHS	Lordsburg, N.M.	950
KLIB	Liberal, Kans.	1470
KLIC	Monroe, La.	1230
KLID	Poplar Bluff, Mo.	1340
KLIF	Dallas, Tex.	1190
KLIK	Jefferson City, Mo.	950
KLIL	Estherville, Iowa	1340
KLIN	Lincoln, Nebr.	1400
KLIP	Fowler, Calif.	1220
KLIQ	Portland, Oreg.	1290
KLIR	Denver, Colo.	990
KLIX	Twin Falls, Idaho	1310
KLIZ	Brainerd, Minn.	1380
KLKC	Parsons, Kans.	1540
KLLA	Leesville, La.	1570
KLLL	Lubbock, Tex.	1460
KLME	Laramie, Wyo.	1490
KLMO	Longmont, Colo.	1050
KLMR	Lamar, Colo.	920
KLMS	Lincoln, Nebr.	1480
KLMX	Clayton, N.Mex.	1450
KLO	Ogden, Utah	1430
KLOA	Ridgecrest, Calif	1240
KLOC	Ceres, Calif.	920
KLOE	Goodland, Kans.	730
KLOG	Kelso, Wash.	1490
KLOH	Pipestone, Minn.	1050
KLOK	San Jose, Calif.	1170
KLOM	Lompoc, Calif.	1330
KLOO	Corvallis, Oreg.	1350
KLOS	Albuquerque, N.Mex.	1450
KLOU	Lake Charles, La.	1580
KLOW	Loveland, Colo.	1570
KLPL	Lake Providence, La.	1050
KLPM	Minot, N.Dak.	1390
KLPR	Okla. City, Okla.	1140
KLPW	Union, Mo.	1220
KLRA	Little Rock, Ark.	1010
KLRS	Mountain Grove, Mo.	1360
KLTF	Little Falls, Minn.	960
KLTR	Blackwell, Okla.	1580
KLTZ	Glasgow, Mont.	1240
KLUB	Salt Lake City, Utah	570
KLUC	Las Vegas, Nev.	1050
KLUE	Longview, Tex.	1280
KLUV	Haynesville, La.	1580
KLVL	Pasadena, Tex.	1480
KLVT	Levelland, Tex.	1230
KLWN	Lawrence, Kans.	1320
KLWT	Lebanon, Mo.	1230
KLYD	Bakersfield, Calif.	1350
KLYK	Spokane, Wash.	1230
KLYQ	Hamilton, Mont.	980
KLYR	Clarksville, Ark.	1360
KLZ	Denver, Colo.	560
KMA	Shenandoah, Iowa	960
KMAC	San Antonio, Tex.	630
KMAD	Madill, Okla.	1550
KMAE	McKinney, Tex.	1600
KMAK	Fresno, Calif.	1340
KMAM	Butler, Mo.	1530
KMAN	Manhattan, Kans.	1350
KMAQ	Maquoketa, Iowa	1320
KMAR	Winnsboro, La.	1570
KMAS	Shelton, Wash.	1280
KMBC	Kansas City, Mo.	980
KMBL	Junction, Tex.	1450
KMBO	Tucson, Ariz.	940
KMBY	Monterey, Calif.	1240

C.L.	Location	Kc.
KMCD	Fairfield, Iowa	1570
KMCM	McMinnville, Oreg.	1260
KMCO	Conroe, Tex.	900
KMDO	Ft. Scott, Kans.	1600
KMED	Medford, Oreg.	1440
KMEN	San Bernardino, California	1290
KMEO	Omaha, Nebr.	660
KMER	Kemmerer, Wyo.	950
KMHT	Marshall, Tex.	1450
KMIL	Cameron, Tex.	1330
KMIN	Grants, N.M.	980
KMIS	Portageville, Mo.	1050
KMJ	Fresno, Calif.	580
KMLB	Monroe, La.	1440
KMMJ	Grand Island, Nebr.	750
KMNF	Albuquerque, N. M.	1520
KMNS	Sioux City, Iowa	620
KMO	Tacoma, Wash.	1360
KMON	Great Falls, Mont.	560
KMOO	Mineola, Tex.	1510
KMOP	Tucson, Ariz.	1330
KMOR	Littleton, Colo.	1510
KMOX	St. Louis, Mo.	1120
KMPC	Los Angeles, Calif.	710
KMRC	Morgan City, La.	1430
KMRE	Spokane, Wash.	550
KMRS	Morris, Minn.	1230
KMSL	Ukiah, Calif.	1250
KMUL	Muleshoe, Tex.	1380
KMUR	Murray, Utah	1230
KMUS	Muskogee, Okla.	1380
KMVI	Wailuku, Hawaii	550
KMVS	Sierra Vista, Ariz.	1470
KMYC	Marysville, Calif.	1410
KMYT	Clayton, Mo.	1320
KNAF	Fredericksburg, Tex.	910
KNAK	Salt Lake City, Utah	1280
KNAL	Victoria, Tex.	1410
KNBA	Vallejo, Calif.	1190
KNBC	San Francisco, Calif.	680
KNBE	Lincoln, Nebr.	1530
KNBI	Norton, Kan.	1530
KNBX	Kirkland, Wash.	1050
KNBY	Newport, Ark.	1280
KNCK	Concordia, Kans.	1390
KNCM	Moberly, Mo.	1230
KNCO	Garden City, Kans.	1050
KNCY	Nebraska City, Nebr.	1600
KNDC	Hettinger, N.Dak.	1490
KNDE	Aztec, N.Mex.	1340
KNDI	Honolulu, Hawaii	1270
KNDY	Marysville, Kans.	1570
KNEA	Jonesboro, Ark.	970
KNEB	Scottsbluff, Nebr.	960
KNED	McAlester, Okla.	1150
KNEL	Brady, Tex.	1490
KNEM	Nevada, Mo.	1240
KNET	Palestine, Tex.	1450
KNEW	Spokane, Wash.	790
KNEX	McPherson, Kans.	1540
KNEZ	Lompoc, Calif.	960
KNGL	Paradise, Calif.	930
KNGS	Hanford, Calif.	620
KNIA	Knoxville, Iowa	1320
KNIM	Maryville, Mo.	1580
KNIN	Wichita Falls, Tex.	990
KNIT	Abilene, Tex.	1280
KNND	Cottage Grove, Oreg.	1400
KNOC	Natchitoches, La.	1450
KNOE	Monroe, La.	540
KNOG	Nogales, Ariz.	1340
KNOK	Ft. Worth, Tex.	970
KNOP	N. Platte, Nebr.	1410
KNOR	Norman, Okla.	1400
KNOT	Prescott, Ariz.	1450
KNOW	Austin, Tex.	1490
KNOX	Grand Forks, N.Dak.	1310
KNPT	Newport, Ore.	1310
KNUI	Makawao, Hawaii	1310
KNUJ	New Ulm, Minn.	860
KNUZ	Houston, Tex.	1230
KNWC	Sioux Falls, S.D.	1270
KNWS	Waterloo, Iowa	1090
KNX	Los Angeles, Calif.	1070
KOA	Denver, Colo.	850
KOAC	Corvallis, Oreg.	550
KOAD	Lemoore, Calif.	1240
KOAL	Price, Utah	1230
KOAM	Pittsburg, Kans.	860
KOB	Albuquerque, N.Mex.	770
KOBE	Las Cruces, N.Mex.	1450
KOBH	Hot Springs, S.Dak.	580
KOCA	Kilgore, Tex.	1240
KOCY	Oklahoma City, Okla.	1340
KODA	Houston, Tex.	1010
KODE	Joplin, Mo.	1230
KODI	Cody, Wyo.	1400
KODL	The Dalles, Oreg.	1440
KODY	North Platte, Nebr.	1240
KOEL	Oelwein, Iowa	950
KOFE	Pullman, Wash.	1150
KOFI	Kalispell, Mont.	930
KOFO	Ottawa, Kans.	1220
KOFY	San Mateo, Calif.	1050
KOGA	Ogallala, Nebr.	930
KOGO	San Diego, Calif.	600
KOGT	Orange, Tex.	1600
KOH	Reno, Nev.	630
KOHO	Honolulu, Hawaii	1170
KOHU	Hermiston, Oreg.	1570
KOIL	Omaha, Nebr.	1290
KOIN	Portland, Oreg.	970
KOJM	Havre, Mont.	610
KOKA	Shreveport, La.	1550
KOKE	Austin, Tex.	1370
KOKL	Okmulgee, Okla.	1240
KOKO	Warrensburg, Mo.	1450
KOKX	Keokuk, Iowa	1310
KOKY	Little Rock, Ark.	1440
KOL	Seattle, Wash.	1300
KOLD	Tucson, Ariz.	1450
KOLE	Port Arthur, Tex.	1340
KOLJ	Quanah, Tex.	1150
KOLO	Reno, Nev.	920
KOLR	Sterling, Colo.	1490
KOLS	Pryor, Okla.	1570
KOLT	Scottsbluff, Nebr.	1320
KOLY	Mobridge, S.Dak.	1300
KOMA	Okla. City, Okla.	1520
KOME	Tulsa, Okla.	1300
KOMO	Seattle, Wash.	1000
KOMW	Omak, Wash.	680
KOMY	Watsonville, Calif.	1340
KONE	Reno, Nev.	1450
KONG	Visalia, Calif.	1400
KONI	Spanish Fork, Utah	1480
KONO	San Antonio, Tex.	860
KONP	Port Angeles, Wash.	1450
KOOK	Billings, Mont.	970
KOOL	Phoenix, Ariz.	960
KOOO	Omaha, Nebr.	1420
KOOS	Coos Bay, Oreg.	1230
KOPR	Butte, Mont.	550
KOPY	Alice, Tex.	1070
KOQT	Bellingham, Wash.	1550
KORA	Bryan, Tex.	1240
KORC	Mineral Wells, Tex.	1140
KORD	Pasco, Wash.	910
KORE	Eugene, Oreg.	1450
KORK	Las Vegas, Nev.	1340
KORN	Mitchell, S.Dak.	1490
KORT	Grangeville, Idaho	1230
KOSA	Odessa, Tex.	1230
KOSE	Osceola, Ark.	860
KOSG	Panshuska, Okla.	1500
KOSI	Aurora, Colo.	1430
KOSY	Texarkana, Ark.	790
KOTA	Rapid City, S.Dak.	1380
KOTE	Fergus Falls, Minn.	1250
KOTN	Pine Bluff, Ark.	1490
KOTS	Deming, N.M.	1230
KOUR	Independence, Iowa	1220
KOVC	Valley City, N.Dak.	1490
KOVE	Lander, Wyo.	1330
KOVO	Provo, Utah	960
KOWB	Laramie, Wyo.	1290
KOWL	Bijou, Calif.	1490
KOWN	Escondido, Calif.	1450
KOXR	Oxnard, Calif.	910
KOY	Phoenix, Ariz.	550
KOYL	Odessa, Tex.	1310
KOYN	Billings, Mont.	910
KOZE	Lewiston, Idaho	1300
KOZI	Chelan, Wash.	1220
KOZY	Grand Rapids, Minn.	1490
KPAC	Port Arthur, Tex.	1250
KPAK	Minden, La.	1240
KPAL	Palm Springs, Calif.	1450
KPAM	Portland, Oreg.	1410
KPAN	Hereford, Tex.	860
KPAP	Redding, Calif.	1270
KPAS	Banning, Calif.	1490
KPAT	Berkeley, Calif.	1400
KPAY	Chico, Calif.	1060
KPBA	Pine Bluff, Ark.	1590
KPBM	Carlsbad, N.Mex.	740
KPBR	El Paso, Tex.	1530
KPCA	Marked Tree, Ark.	1580
KPCN	Grand Prairie, Tex.	730
KPDN	Pampa, Tex.	1340
KPDQ	Portland, Oreg.	800
KPEG	Spokane, Wash.	1380
KPEL	Lafayette, La.	1420
KPEP	San Angelo, Tex.	1420
KPER	Gilroy, Calif.	1290
KPET	Lamesa, Tex.	690
KPGE	Page, Ariz.	1340
KPHO	Phoenix, Ariz.	910
KPIK	Colorado Sprgs., Colo.	1580
KPIN	Casa Grande, Ariz.	1260
KPIR	Eugene, Wash.	1500
KPLA	Plainview, Tex.	1050
KPLC	Lake Charles, La.	1470
KPLT	Paris, Tex.	1490
KPLW	Union, Mo.	1220
KPLY	Crescent City, Calif.	1240
KPMC	Bakersfield, Calif.	1560
KPNG	Port Neches, Tex.	1150
KPOC	Pocahontas, Ark.	1420
KPOD	Crescent City, Calif.	1310
KPOF	Denver, Colo.	910
KPOI	Honolulu, Hawaii	1380
KPOJ	Portland, Oreg.	1330
KPOK	Scottsdale, Ariz.	1440
KPOL	Los Angeles, Calif.	1540
KPON	Anderson, Calif.	1580
KPOR	Quincy, Wash.	1370
KPOS	Post, Tex.	1370
KPOW	Powell, Wyo.	1260
KPPC	Pasadena, Calif.	1240
KPQ	Wenatchee, Wash.	560
KPRB	Redmond, Oreg.	1240
KPRC	Houston, Tex.	950
KPRK	Livingston, Mont.	1340
KPRL	Paso Robles, Calif.	1230
KPRM	Park Rapids, Minn.	1240
KPRO	Riverside, Calif.	1440
KPRS	Kansas City, Mo.	1590
KPSO	Falfurrias, Tex.	1260
KPST	Preston, Idaho	1340
KPTL	Carson City, Nev.	1300
KPUB	Pueblo, Colo.	1480
KPUG	Bellingham, Wash.	1170
KQAQ	Austin, Minn.	970
KQCY	Quincy, Calif.	1370
KQDF	Spokane, Wash.	1280
KQDY	Minot, N.Dak.	1320
KQEN	Roseburg, Oreg.	1250
KQEO	Albuquerque, N.Mex.	920
KQIK	Lakeview, Oreg.	1230
KQMS	Redding, Calif.	1400
KQUT	Yakima, Wash.	940
KQTE	Missoula, Mont.	1340
KQTY	Salina, Kans.	910
KQV	Pittsburgh, Pa.	1410
KQYX	Joplin, Mo.	1560
KRAC	Alamogordo, N.M.	1270
KRAD	E. Grand Forks, Minn.	1590
KRAE	Cheyenne, Wyo.	1480
KRAI	Craig, Colo.	550
KRAK	Stockton, Calif.	1140
KRAL	Rawlins, Wyo.	1240
KRAM	Las Vegas, Nev.	920
KRAN	Morton, Tex.	1280
KRAY	Amarillo, Tex.	1360
KRBA	Lufkin, Tex.	1340
KRBC	Abilene, Tex.	1470
KRBI	St. Peter, Minn.	1310
KRBN	Red Lodge, Mont.	1450
KRCK	Ridgecrest, Calif.	1360
KRCO	Prineville, Oreg.	690
KRDG	Redding, Calif.	1230
KRDO	Colo. Springs, Colo.	1240
KRDP	Reedsport, Oreg.	1470
KRDS	Tolleson, Ariz.	1190
KRDU	Dinuba, Calif.	1240
KREB	Shreveport, La.	980
KRED	Eureka, Calif.	1480
KREH	Oakdale, La.	900
KREI	Farmington, Mo.	800
KREK	Sapulpa, Okla.	1550
KREM	Spokane, Wash.	970
KREO	Indio, Calif.	1400
KREW	Sunnyside, Wash.	1230
KREX	Grand Junc., Colo.	920
KRFO	Owatonna, Minn.	1390
KRFS	Superior, Nebr.	1600
KRGI	Grand Island, Neb.	1430
KRGV	Weslasco, Tex.	1290
KRHD	Duncan, Okla.	1350
KRIB	Mason City, Iowa	1490
KRIG	Odessa, Tex.	1410
KRIH	Rayville, La.	990
KRIK	Roswell, N. Mex.	960
KRIO	McAllen, Tex.	910
KRIZ	Phoenix, Ariz.	1230
KRKC	King City, Calif.	1490
KRKD	Los Angeles, Calif.	1150
KRKO	Everett, Wash.	1380
KRKT	Albany, Ore.	990
KRLA	Pasadena, Calif.	1110
KRLC	Lewiston, Idaho	1350
KRLD	Dallas, Tex.	1080
KRLN	Canon City, Colo.	1400
KRLW	Walnut Ridge, Ark.	1320
KRMD	Shreveport, La.	1340
KRMG	Tulsa, Okla.	740
KRML	Carmel, Calif.	1410
KRMO	Monett, Mo.	990
KRMS	Osage Beach, Mo.	1150
KRNO	San Bernardino, Calif.	1240
KRNR	Roseburg, Oreg.	1490
KRNS	Burns, Oreg.	1230
KRNT	Des Moines, Iowa	1350
KRNY	Kearney, Nebr.	1460
KROB	Robstown, Tex.	1510
KROC	Rochester, Minn.	1340
KROD	El Paso, Tex.	600
KROE	Sheridan, Wyo.	930
KROF	Abbeville, La.	960
KROP	Brawley, Calif.	1300
KROS	Clinton, Iowa	1340
KROW	Dallas, Ore.	1460
KROX	Crookston, Minn.	1260
KROY	Sacramento, Calif.	1240
KRPL	Moscow, Idaho	1400
KRRR	Ruidoso, N.Mex.	1340
KRRV	Sherman, Tex.	910
KRSA	Alisal, Calif.	1570
KRSC	Othello, Wash.	1400
KRSD	Rapid City, S.Dak.	1340
KRSI	St. Louis Park, Minn.	950
KRSL	Russell, Kans.	990
KRSN	Los Alamos, N.Mex.	1490
KRSY	Roswell, N.Mex.	1230
KRTN	Raton, N.Mex.	1490
KRTR	Thermopolis, Wyo.	1490
KRUN	Ballinger, Tex.	1400
KRUS	Ruston, La.	1490
KRUX	Glendale, Ariz.	1360
KRVC	Ashland, Oreg.	1350
KRVN	Lexington, Nebr.	1010
KRWB	Roseau, Minn.	1410
KRXK	Rexburg, Idaho	1230
KRYS	Corpus Christi, Tex.	1360
KRYT	Colo. Springs, Colo.	1530
KRZE	Farmington, N.M.	1280
KRZY	Albuquerque, N.M.	1580
KSAC	Manhattan, Kans.	580
KSAL	Salina, Kans.	1150
KSAM	Huntsville, Tex.	1490
KSAN	San Francisco, Calif.	1450
KSAY	San Francisco, Calif.	1010
KSBW	Salinas, Calif.	1380
KSCB	Liberal, Kans.	600
KSCJ	Sioux City, Iowa	1360
KSCO	Santa Cruz, Calif.	1080
KSD	St. Louis, Mo.	550
KSDN	Aberdeen, S.Dak.	930
KSDO	San Diego, Calif.	1130
KSDR	Waterton, S.Dak.	1480
KSEE	Santa Maria, Calif.	1480
KSEI	Pocatello, Idaho	930
KSEK	Pittsburg, Kans.	1340
KSEL	Lubbock, Tex.	950
KSEM	Moses Lake, Wash.	1470
KSEN	Shelby, Mont.	1150
KSEO	Durant, Okla.	750
KSET	El Paso, Tex.	1340
KSEW	Sitka, Alaska	1400
KSEY	Seymour, Tex.	1230
KSFA	Nacogdoches, Tex.	860
KSFE	Needles, Calif.	1340
KSFO	San Francisco, Calif.	560
KSGM	Chester, Ill.	980
KSGT	Jackson, Wyo.	1340
KSHA	Medford, Ore.	860
KSIB	Creston, Iowa	1520
KSID	Sidney, Nebr.	1340
KSIG	Crowley, La.	1450
KSIL	Silver City, N.Mex.	1340
KSIM	Sikeston, Mo.	1400
KSIR	Wichita, Kans.	900
KSIS	Sedalia, Mo.	1050
KSIW	Woodward, Okla.	1450
KSIX	Corpus Christi, Tex.	1230
KSJB	Jamestown, N.Dak.	600
KSKI	Sun Valley, Idaho	1340
KSKY	Dallas, Tex.	660
KSL	Salt Lake City, Utah	1160
KSLM	Salem, Oreg.	1390
KSLO	Opelousas, La.	1230
KSLV	Monte Vista, Colo.	1240
KSMA	Santa Maria, Calif.	1240
KSMN	Mason City, Iowa	1010
KSMO	Salem, Mo.	1340
KSNB	Santa Barbara, Calif.	1290
KSNN	Pocatello, Ida.	1290
KSNO	Aspen, Colo.	1260
KSNY	Snyder, Tex.	1450
KSO	Des Moines, Iowa	1460
KSOK	Arkansas City, Kans.	1280
KSON	San Diego, Calif.	1240
KSOO	Sioux Falls, S.Dak.	1140
KSOP	Salt Lake City, Utah	1370
KSOX	Raymondville, Tex.	1240
KSPA	Santa Paula, Calif.	1400
KSPI	Stillwater, Okla.	780
KSPL	Diboll, Tex.	1260
KSPT	Sandpoint, Idaho	1400
KSRA	Salmon, Idaho	960
KSRC	Socorro, N.Mex.	1290
KSRO	Santa Rosa, Calif.	1350
KSRV	Ontario, Oreg.	1380
KSSS	Colorado Springs, Colo.	740
KSST	Sulphur Springs, Tex.	1230
KSTA	Coleman, Tex.	1000
KSTB	Breckenridge, Tex.	1430
KSTH	St. Helen's, Oreg.	1600
KSTL	St. Louis, Mo.	690
KSTN	Stockton, Calif.	1420
KSTP	St. Paul, Minn.	1500
KSTR	Grand Junction, Colo.	620
KSTT	Davenport, Iowa	1170
KSTV	Stephenville, Tex.	1510
KSUB	Cedar City, Utah	590
KSUD	W. Memphis, Ark.	730
KSUE	Susanville, Calif.	1240
KSUM	Fairmont, Minn.	1370
KSUN	Bisbee, Ariz.	1230
KSVC	Richfield, Utah	980
KSVN	Ogden, Utah	730
KSVP	Artesia, N.Mex.	990
KSWA	Graham, Tex.	1330
KSWC	Tucson, Ariz.	1550
KSWI	Council Bluffs, Iowa	1560
KSWM	Aurora, Mo.	940
KSWO	Lawton, Okla.	1380
KSXX	Salt Lake City, Utah	630
KSYC	Yreka, Calif.	1490
KSYL	Alexandria, La.	970
KSYX	Santa Rosa, N.Mex.	1420
KTAC	Tacoma, Wash.	850
KTAE	Taylor, Tex.	1260
KTAN	Tucson, Ariz.	580
KTAR	Phoenix, Ariz.	620
KTAT	Frederick, Okla.	1570
KTBB	Tyler, Tex.	600
KTBC	Austin, Tex.	590
KTCB	Malden, Mo.	1470
KTCR	Minneapolis, Minn.	690
KTCS	Fort Smith, Ark.	1410
KTDL	Farmersville, La.	1470
KTDO	Toledo, Oreg.	1230
KTEE	Idaho Falls, Idaho	900
KTEL	Walla Walla, Wash.	1490
KTEM	Temple, Tex.	1400
KTEO	San Angelo, Tex.	1340
KTER	Terrell, Tex.	1570
KTFI	Twin Falls, Idaho	1270
KTFO	Seminole, Tenn.	1250
KTFS	Texarkana, Tex.	1400
KTFY	Brownfield, Tex.	1300

WHITE'S RADIO LOG

C.L.	Location	Kc.
KTHE	Thermopolis, Wyo.	1240
KTHO	Tahoe Valley, Calif.	590
KTHS	Berryville, Ark.	1480
KTHT	Houston, Tex.	790
KTIB	Thibodaux, La.	630
KTIL	Tillamook, Oreg.	1590
KTIM	San Rafael, Calif.	1510
KTIP	Porterville, Calif.	1450
KTIS	Minneapolis, Minn.	900
KTJS	Hobart, Okla.	1420
KTKN	Ketchikan, Alaska	930
KTKR	Taft, Calif.	1310
KTKT	Tucson, Ariz.	990
KTLD	Tullulah, La.	1360
KTLN	Denver, Colo.	1280
KTLO	Mtn. Home, Ark.	1490
KTLQ	Tahlequah, Okla.	1350
KTLU	Rusk, Tex.	1580
KTLW	Texas City, Tex.	920
KTMC	McAlester, Okla.	1400
KTMN	Trumann, Ark.	1530
KTMS	Santa Barbara, Calif.	1250
KTNC	Falls City, Nebr.	1230
KTNM	Tucumcari, N.Mex.	1400
KTNT	Tacoma, Wash.	1400
KTOC	Jonesboro, La.	920
KTOD	Sinton, Tex.	1590
KTOE	Mankato, Minn.	1420
KTOH	Lihue, Hawaii	1490
KTOK	Oklahoma City, Okla.	1000
KTON	Belton, Tex.	940
KTOO	Henderson, Nev.	1280
KTOP	Topeka, Kans.	1490
KTOW	Sand Spring, Okla.	1340
KTPA	Prescott, Ark.	1370
KTRB	Modesto, Calif.	860
KTRC	Santa Fe, N.Mex.	1400
KTRE	Lufkin, Tex.	1420
KTRF	Thief River Falls, Minn.	1230
KTRG	Honolulu, Hawaii	990
KTRH	Houston, Tex.	740
KTRI	Sioux City, Iowa	1470
KTRM	Beaumont, Tex.	990
KTRN	Wichita Falls, Tex.	1290
KTRY	Bastrop, La.	730
KTSA	San Antonio, Tex.	550
KTSL	Burnett, Tex.	1340
KTSM	El Paso, Tex.	1380
KTTN	Trenton, Mo.	1600
KTTR	Rolla, Mo.	1490
KTTS	Springfield, Mo.	1400
KTTT	Columbus, Nebr.	1510
KTUC	Tucson. Ariz.	1400
KTUE	Tulia. Tex.	1260
KTW	Seattle, Wash.	1250
KTWO	Casper, Wyo.	1470
KTXJ	Jasper, Tex.	1350
KTXO	Sherman, Tex.	1500
KTYM	Inglewood, Calif.	1460
KUAM	Agana, Guam	610
KUBA	Yuba City, Calif.	1600
KUBC	Montrose, Colo.	580
KUBE	Pendleton, Oreg.	1050
KUDE	Oceanside, Calif.	1320
KUDI	Great Falls, Mont.	1450
KUDL	Kansas City, Mo.	1380
KUDU	Ventura, Calif.	1590
KUEN	Wenatchee, Wash.	900
KUEQ	Phoenix, Ariz.	740
KUGN	Eugene, Oreg.	590
KUIK	Hillsboro, Oreg.	1360
KUJ	Walla Walla, Wash.	1420
KUKA	San Antonio, Tex.	1250
KUKI	Ukiah, Calif.	1400
KUKU	Willow Springs, Mo.	1330
KULA	Honolulu, Hawaii	690
KULE	Ephrata, Wash.	730
KULP	El Campo, Tex.	1390
KUMA	Pendleton, Oreg.	1290
KUMU	Honolulu, Hawaii	1500
KUNO	Corpus Christi, Tex.	1400
KUOA	Siloam Springs. Ark.	1290
KUOM	Minneapolis, Minn.	770
KUPD	Tempe. Ariz.	1060
KUPI	Idaho Falls, Idaho	980
KURA	Moab, Utah	1450
KURL	Billings, Mont.	730
KURV	Edinburg, Tex.	710
KURY	Brookings, Oreg.	910
KUSD	Vermillion, S.Dak.	690
KUSH	Cushing, Okla.	1600
KUSN	St. Joseph. Mo.	1270
KUTA	Blanding, Utah	790
KUTI	Yakima. Wash.	980
KUTT	Fargo, N.Dak.	1550
KUTY	Palmdale, Calif.	1470
KUVR	Holdredge, Nebr.	1380
KUXL	Golden Valley, Minn.	1570
KUZN	W. Monroe, La.	1310
KUZZ	Bakersfield, Calif.	800
KVAL	Sauk Rapids, Minn.	800
KVAN	Vancouver, Wash.	1480
KVCK	Wolf Point, Nebr.	1450
KVCL	Winnfield, La.	1270
KVCV	Redding, Calif.	600
KVEC	San Luis Obispo, Calif.	920
KVEE	Conway, Ark.	1330
KVEG	Las Vegas, Nev.	970
KVEL	Vernal, Utah	1250
KVEN	Ventura, Calif.	1450
KVET	Austin, Tex.	1300
KVFC	Cortez, Colo.	740
KVFD	Ft. Dodge, Iowa	1400
KVGB	Great Bend. Kans.	1590
KVI	Seattle, Wash.	570
KVIC	Victoria, Tex.	1340
KVIL	Highland Park, Tex.	1150
KVIM	New Iberia, La.	1360
KVIN	Vinita, Okla.	1470
KVIO	Cottonwood, Ariz.	1600
KVIP	Redding, Calif.	540
KVKM	Monahans, Tex.	1330
KVLB	Cleveland, Tex.	1410
KVLC	Little Rock, Ark.	1050
KVLF	Alpine, Tex.	1240
KVLG	LaGrange, Tex.	1570
KVLH	Pauls Valley, Okla.	1470
KVLL	Livingston, Tex.	1220
KVMA	Magnolia, Ark.	630
KVMC	Colorado City, Tex.	1320
KVML	Sonora, Calif.	1450
KVNC	Winslow, Ariz.	1010
KVNI	Coeur d'Alene, Idaho	1240
KVNU	Logan, Utah	610
KVOB	Bastrop, La.	1340
KVOC	Casper, Wyo.	1230
KVOD	Albuquerque, N. Mex.	730
KVOE	Emporia, Kans.	1400
KVOG	Ogden, Utah	1490
KVOL	Lafayette, La.	1330
KVOM	Morrilton, Ark.	800
KVON	Napa, Calif.	1440
KVOO	Tulsa, Okla.	1170
KVOP	Plainview, Tex.	1400
KVOR	Colo. Springs, Colo.	1300
KVOU	Uvalde, Tex.	1400
KVOW	Riverton, Wyo.	1450
KVOX	Moorhead, Minn.	1280
KVOY	Yuma. Ariz.	1400
KVOZ	Laredo, Tex.	1490
KVPI	Ville Platte. La.	1050
KVRC	Arkadelphia, Ark.	1240
KVRD	Cottonwood, Ariz.	1240
KVRE	Santa Rosa, Calif.	1460
KVRH	Salida. Colo.	1340
KVRS	Rock Springs. Wyo.	1360
KVSA	McGehee. Ark.	1220
KVSF	Santa Fe. N.Mex.	1260
KVSH	Valentine. Nebr.	940
KVSO	Ardmore. Okla.	1240
KVWC	Vernon. Tex.	1490
KVWD	Pearsall. Tex.	1280
KVWM	Show Low, Ariz.	1050
KVWO	Cheyenne, Wyo.	1370
KVYL	Holdenville. Okla.	1370
KWAC	Bakersfield. Calif.	1490
KWAD	Wadena. Minn.	920
KWAK	Stuttgart, Ark.	1240
KWAL	Wallace, Idaho	620
KWAM	Memphis, Tenn.	990
KWAT	Watertown, S.Dak.	950
KWAY	Forest Grove, Oreg.	1570
KWBA	Baytown, Tex.	1360
KWBB	Wichita. Kans.	1410
KWBC	Navasota, Tex.	1550
KWBE	Beatrice, Nebr.	1450
KWBG	Boone, Iowa	1590
KWBW	Hutchinson, Kans.	1450
KWCB	Searcy. Ark.	1300
KWCL	Oak Grove, La.	1280
KWCO	Chickasha, Okla.	1560
KWEB	Rochester, Minn.	1270
KWED	Seguin, Tex.	1580
KWEI	Weiser, Idaho	1260
KWEL	Midland, Tex.	1600
KWEW	Hobbs, N.Mex.	1480
KWFA	Merkle, Tex.	1500
KWFR	San Angelo, Tex.	1260
KWFS	Eugene, Oreg.	1540
KWFT	Wichita Falls, Tex.	620
KWG	Stockton. Calif.	1230
KWHI	Brenham, Tex.	1280
KWHK	Hutchinson, Kans,	1260
KWHN	Fort Smith, Ark.	1320
KWHO	Salt Lake City, Utah	860
KWHW	Altus, Okla.	1450
KWIC	Salt Lake City, Utah	1570
KWIK	Pocatello, Idaho	1240
KWIL	Albany. Oreg.	790
KWIN	Ashland, Oreg.	580
KWIP	Merced, Calif.	1580
KWIQ	Moses Lake, Wash.	1260
KWIV	Douglas, Wyo.	1050
KWIX	Moberly. Mo.	1230
KWIZ	Santa Ana, Calif.	1480
KWJJ	Portland, Oreg.	1080
KWKC	Abilene, Tex.	1340
KWKH	Shreveport, La.	1130
KWKW	Pasadena, Calif.	1300
KWKY	Des Moines, Iowa	1150
KWLA	Many, La.	1530
KWLC	Decorah, Iowa	1240
KWLD	Liberty, Tex.	1050
KWLM	Willmar, Minn.	1340
KWMT	Ft. Dodge, Iowa	540
KWNA	Winnemucca, Nev.	1400
KWNO	Winona, Minn.	1230
KWNS	Pratt, Kans.	1290
KWNT	Davenport, Iowa	1580
KWOA	Worthington, Minn.	730
KWOC	Poplar Bluff, Mo.	930
KWOE	Clinton, Okla.	1320
KWON	Bartlesville, Okla.	1400
KWOR	Worland, Wyo.	1340
KWOS	Jefferson City, Mo.	1240
KWOW	Pomona, Calif.	1600
KWPC	Muscatine, Iowa	860
KWPM	West Plains, Mo.	1450
KWPR	Claremore, Okla.	1270
KWRA	Idaho Falls, Idaho	1400
KWRD	Henderson, Tex.	1470
KWRE	Warrenton, Mo.	730
KWRF	Warren, Ark.	860
KWRO	Coquille, Oreg.	630
KWRT	Boonville, Mo.	1370
KWRV	McCook, Nebr.	1360
KWRW	Guthrie. Okla.	1490
KWSC	Pullman, Wash.	1250
KWSD	Mt. Shasta, Calif.	620
KWSH	Wewoka-Seminole, Oklahoma	1260
KWSK	Pratt, Kans.	1570
KWSL	Grand Junction, Colo.	1340
KWSO	Wasco. Calif.	1050
KWTC	Barstow, Calif.	1230
KWTO	Springfield, Mo.	560
KWTX	Waco, Tex.	1230
KWVN	Concord, Calif.	1480
KWVR	Enterprise, Oreg.	1340
KWVY	Waverly, Iowa	1470
KWWL	Waterloo, Iowa	1330
KWXY	Cathedral City, Calif.	1340
KWYK	Farmington, N.Mex.	960
KWYN	Wynne, Ark.	1400
KWYO	Sheridan, Wyo.	1410
KWYR	Winner, S.Dak.	1260
KWYZ	Everett, Wash.	1230
KXA	Seattle, Wash.	770
KXAR	Hope, Ark.	1490
KXEL	Waterloo, Iowa	1540
KXEN	St. Louis, Mo.	1010
KXEO	Mexico, Mo.	1340
KXEW	Tucson, Ariz.	1600
KXEX	Fresno, Calif.	1550
KXGI	Ft. Madison, Iowa	1360
KXGN	Glendive, Mont.	1400
KXGO	Fargo, N. Dak.	790
KXIC	Iowa City, Iowa	800
KXIT	Dalhart, Tex.	1410
KXIV	Phoenix, Ariz,	1490
KXJK	Forrest City, Ark.	950
KXKW	Lafayette, La.	1520
KXL	Portland, Oreg.	750
KXLE	Ellensburg, Wash.	1240
KXLF	Butte, Mont.	1370
KXLJ	Helena, Mont.	1240
KXLL	Missoula, Mont.	1450
KXLO	Lewiston, Mont.	1230
KXLR	Little Rock, Ark.	1150
KXLW	Clayton, Mo.	1320
KXLY	Spokane, Wash.	920
KXO	El Centro, Calif.	1230
KXOA	Sacramento. Calif.	1470
KXOK	St. Louis, Mo.	630
KXOL	Ft. Worth, Tex.	1360
KXOX	Sweetwater, Tex.	1240
KXRA	Alexandria, Minn.	1230
KXRJ	Russellville, Ark.	1490
KXRO	Aberdeen, Wash.	1320
KXRX	San Jose, Calif.	1500
KXXL	Bozeman, Mont.	1450
KXXX	Colby. Kans.	790
KXYZ	Houston, Tex.	1320
KYA	San Francisco, Calif.	1260
KYCA	Prescott, Ariz.	1490
KYCN	Wheatland, Wyo.	1340
KYES	Roseburg, Oreg.	950
KYJC	Medford. Oreg.	1230
KYLT	Missoula, Mont.	1340
KYME	Boise, Idaho	740
KYND	Tempe, Ariz.	1580
KYNG	Coos Bay. Oreg.	1420
KYNO	Fresno, Calif.	1300
KYNT	Yankton, S.Dak.	1450
KYOK	Houston, Tex.	1590
KYOR	Blythe, Calif.	1450
KYOS	Merced, Calif.	1480
KYOU	Greeley, Colo.	1450
KYRO	Potosi, Mo.	1280
KYSM	Mankato, Minn.	1230
KYSN	Colorado Sprgs., Colo.	1460
KYSS	Missoula, Mont.	910
KYUM	Yuma, Ariz.	560
KYVA	Gallup, N.Mex.	1230
KYW	Cleveland, Ohio	1100
KZEE	Weatherford, Tex.	1220
KZEY	Tyler, Tex.	690
KZIM	Cape Girardeau, Mo.	1220
KZIP	Amarillo. Tex.	1310
KZIX	Fort Collins, Colo.	600
KZNG	Hot Springs, Ark.	1470
KZOK	Prescott, Ariz.	1340
KZOL	Farwell, Tex.	1570
KZOO	Honolulu, Hawaii	1210
KZOT	Marianna, Ark.	1460
KZOW	Globe, Ariz.	1240
KZUN	Opportunity, Wash.	630
KZZN	Littlefield, Tex.	1490
VOUS	Argentia, Nfld.	1480
WAAA	Winston-Salem, N.C.	980
WAAB	Worcester, Mass.	1440
WAAC	Terre Haute, Ind.	1300
WAAF	Chicago, Ill.	950
WAAG	Adel, Ga.	1470
WAAK	Dallas, N.C.	960
WAAP	Peoria, Ill.	1350
WAAT	Trenton, N.J.	1300
WAAX	Gadsden, Ala.	570
WAAY	Huntsville, Ala.	1550
WABA	Aguadilla, P.Rico	850
WABB	Mobile, Ala.	1480
WABC	New York, N.Y.	770
WABF	Fairhope, Ala.	1220
WABG	Greenwood, Miss.	960
WABH	Deerfield, Va.	1150
WABI	Bangor, Maine	910
WABJ	Adrian, Mich.	1490
WABL	Amite, La.	1570
WABO	Waynesboro, Miss.	990
WABQ	Cleveland, Ohio	1540
WABR	Winter Park, Fla.	1440
WABT	Tuskegee, Ala.	580
WABV	Abbeville, S.C.	1590
WABW	Annapolis, Md.	810
WABY	Albany, N.Y.	1400
WABZ	Albemarle, N.C.	1010
WACA	Camden, S.C.	1590
WACB	Kittanning, Pa.	1380
WACE	Chicopee, Mass.	730
WACK	Newark, N.Y.	1420
WACL	Waycross, Ga.	570
WACO	Waco, Tex.	1460
WACR	Columbus, Miss,	1050
WACT	Tuscaloosa, Ala.	1420
WACY	Moss Point, Miss.	1460
WADA	Shelby, N.C.	1390
WADC	Akron, Ohio	1350
WADE	Wadesboro, N.C.	1210
WADK	Newport, R.I.	1540
WADM	Decatur. Ind.	1540
WADO	New York, N.Y.	1280
WADP	Kane, Pa.	960
WADS	Ansonia, Conn.	690
WAEB	Allentown, Pa.	790
WAEL	Mayaguez, P.Rico	600
WAFC	Staunton, Va.	900
WAFS	Amsterdam, N.Y.	1570
WAGC	Centre, Ala.	1550
WAGE	Leesburg, Va.	1290
WAGF	Dothan, Ala.	1320
WAGG	Franklin, Tenn.	950
WAGL	Lancaster, S. C.	1550
WAGM	Presque Isle, Maine	950
WAGN	Menominee, Mich.	1340
WAGR	Lumberton, N.C.	580
WAGS	Bishopville, S.C.	1380
WAGY	Forest City, N.C.	1320
WAIK	Galesburg, Ill.	1590
WAIL	Baton Rouge, La.	1460
WAIM	Anderson, S.C.	1230
WAIN	Columbia, Ky.	1270
WAIR	Winston-Salem, N.C.	1340
WAIT	Chicago, Ill.	820
WAJF	Decatur, Ala.	1490
WAJR	Morgantown, W.Va.	1440
WAKE	Atlanta. Ga.	1340
WAKI	McMinnville, Tenn.	1230
WAKN	Aiken, S.C.	990
WAKO	Lawrenceville, Ill.	910
WAKR	Akron, Ohio	1590
WAKY	Louisville, Ky.	790
WALA	Mobile, Ala.	1410
WALD	Walterboro, S.C.	1220
WALE	Fall River, Mass.	1400
WALG	Albany, Ga.	1590
WALK	Patchogue, N.Y.	1370
WALL	Middletown, N.Y.	1340
WALM	Albion, Mich.	1260
WALO	Humacao, P.R.	1240
WALT	Tampa, Fla.	1110
WALY	Herkimer. N.Y.	1420
WAMD	Aberdeen, Md.	970
WAME	Miami, Fla,	1260
WAMI	Opp, Ala.	860
WAML	Laurel, Miss.	1340
WAMM	Flint, Mich.	1420
WAMO	Homestead, Pa.	860
WAMR	Venice, Fla.	1520
WAMS	Wilmington, Del.	1380
WAMV	East St. Louis, Ill.	1490
WAMW	Washington, Ind.	1580
WAMY	Amory, Miss.	1580
WANA	Anniston, Ala.	1490
WANB	Waynesburg, Pa.	1580
WAND	Canton, Ohio	900
WANE	Ft. Wayne, Ind.	1450
WANN	Annapolis, Md.	1190
WANS	Anderson, S.C.	1280
WANT	Richmond, Va.	990
WANY	Albany, Ky.	1390
WAOK	Atlanta. Ga.	1380
WAOV	Vincennes, Ind.	1450
WAPA	San Juan. P.R.	680
WAPC	Riverhead, N.Y.	1570
WAPE	Jacksonville, Fla.	690
WAPF	McComb, Miss.	980
WAPG	Arcadia, Fla.	1480
WAPI	Birmingham, Ala.	1070
WAPL	Appleton, Wis.	1570

C.L.	Location	Kc.
WAPO	Chattanooga, Tenn.	1150
WAPX	Montgomery, Ala.	1600
WAQE	Towson, Md.	1570
WAQI	Ashtabula, Ohio	1600
WARA	Attleboro, Mass.	1320
WARB	Covington, La.	730
WARD	Johnstown, Pa.	1490
WARE	Ware, Mass.	1250
WARF	Jasper, Ala.	1240
WARI	Abbeville, Ala.	1480
WARK	Hagerstown, Md.	1490
WARM	Scranton, Pa.	590
WARN	Ft. Pierce, Fla.	1330
WARO	Canonsburg, Pa.	540
WARU	Peru, Ind.	1600
WASA	Havre de Grace, Md.	1330
WASK	Lafayette, Ind.	1450
WATA	Boone, N.C.	1450
WATC	Gaylord, Mich.	900
WATE	Knoxville, Tenn.	620
WATH	Athens, Ohio	970
WATK	Antigo, Wis.	900
WATM	Atmore, Ala.	1590
WATN	Watertown, N.Y.	1240
WATO	Oak Ridge, Tenn.	1290
WATP	Marion, S.C.	1430
WATR	Waterbury, Conn.	1320
WATS	Sayre, Pa.	960
WATT	Cadillac, Mich.	1240
WATV	Birmingham, Ala.	900
WATW	Ashland, Wis.	1400
WATZ	Alpena, Mich.	1450
WAUB	Auburn, N.Y.	1590
WAUC	Wauchula, Fla.	1310
WAUD	Auburn, Ala.	1230
WAUG	Augusta, Ga.	1050
WAUX	Waukesha, Wis.	1510
WAVA	Arlington, Va.	780
WAVE	Louisville, Ky.	970
WAVI	Dayton, Ohio	1210
WAVL	Apollo, Pa.	910
WAVN	Stillwater, Minn.	1220
WAVO	Avondale Estates, Ga.	1420
WAVP	Avon Park, Fla.	1390
WAVU	Albertville, Ala.	630
WAVY	Portsmouth, Va.	1350
WAVZ	New Haven, Conn.	1300
WAWA	West Allis, Wis.	1590
WAWK	Kendallville, Ind.	1570
WAWZ	Zarephath, N.J.	1380
WAXE	Vero Beach, Fla.	1370
WAXU	Georgetown, Ky.	1580
WAXX	Chippewa Falls, Wis.	1150
WAYB	Waynesboro, Va.	1490
WAYE	Baltimore, Md.	860
WAYN	Rockingham, N.C.	900
WAYR	Orange Park, Fla.	550
WAYS	Charlotte, N.C.	610
WAYX	Waycross, Ga.	1230
WAYZ	Waynesboro, Pa.	1380
WAZA	Bainbridge, Ga.	1360
WAZE	Clearwater, Fla.	860
WAZF	Yazoo City, Miss.	1230
WAZL	Hazelton, Pa.	1490
WAZS	Summerville, S.C.	780
WAZY	Lafayette, Ind.	1410
WBAA	West Lafayette, Ind.	920
WBAB	Babylon, N.Y.	1440
WBAC	Cleveland, Tenn.	1340
WBAG	Burlington, N.C.	1150
WBAL	Baltimore, Md.	1090
WBAM	Montgomery, Ala.	740
WBAP	Ft. Worth, Tex.	570
WBAR	Bartow, Fla.	1460
WBAT	Marion, Ind.	1400
WBAW	Barnwell, S.C.	740
WBAX	Wilkes-Barre, Pa.	1240
WBAY	Green Bay, Wis.	1360
WBAZ	Kingston, N.Y.	1550
WBBA	Pittsfield, Ill.	1580
WBBB	Burlington, N.C.	920
WBBF	Rochester, N.Y.	950
WBBI	Abingdon, Va.	1230
WBBK	Blakely, Ga.	1260
WBBL	Richmond, Va.	1480
WBBM	Chicago, Ill.	780
WBBO	Forest City, N.C.	780
WBBQ	Augusta, Ga.	1340
WBBT	Lyons, Ga.	1340
WBBW	Youngstown, Ohio	1240
WBBX	Portsmouth, N.H.	1380
WBBY	Wood River, Ill.	590
WBBZ	Ponca City, Okla.	1230
WBCA	Bay Minette, Ala.	1150
WBCB	Levittown, Pa.	1490
WBCH	Hastings, Mich.	1220
WBCI	Williamsburg, Va.	740
WBCK	Battle Creek, Mich.	930
WBCM	Bay City, Mich.	1440
WBCO	Bucyrus, Ohio	1540
WBCR	Christiansburg, Va.	1260
WBCU	Union, S.C.	1460
WBDS	Danville, Pa.	1570
WBEC	Pittsfield, Mass.	1420
WBEE	Harvey, Ill.	1570
WBEJ	Elizabethton, Tenn.	1240
WBEL	Beloit, Wis.	1380
WBEN	Buffalo, N.Y.	930
WBER	Moncks Corner, S. C.	950
WBET	Brockton, Mass.	1460
WBEU	Beaufort, S.C.	960
WBEV	Beaver Dam, Wis.	1430
WBEX	Chillicothe, Ohio	1490
WBFC	Fremont, Mich.	1490
WBFD	Bedford, Pa.	1310
WBGC	Chipley, Fla.	1240
WBGS	Slidell, La.	1560
WBGN	Bowling Green, Ky.	1340
WBGR	Jesup, Ga.	1370
WBHB	Fitzgerald, Ga.	1240
WBHC	Hampton, S.C.	1270
WBHF	Cartersville, Ga.	1450
WBHM	Birmingham, Ala.	1550
WBHP	Huntsville, Ala.	1230
WBIA	Augusta, Ga.	1230
WBIC	Islip, N.Y.	540
WBIE	Marietta, Ga.	1050
WBIG	Greensboro, N.C.	1470
WBIL	Leesburg, Fla.	1410
WBIP	Booneville, Miss.	1400
WBIR	Knoxville, Tenn.	1240
WBIS	Bristol, Conn.	1440
WBIW	Bedford, Ind.	1340
WBIZ	Eau Claire, Wis.	1400
WBKH	Hattiesburg, Miss.	950
WBKN	Newton, Miss.	1410
WBKV	West Bend, Wis.	1470
WBLA	Elizabethtown, N.C.	1440
WBLE	Batesville, Miss.	1290
WBLF	Bellefonte, Pa.	1330
WBLG	Lexington, Ky.	1300
WBLJ	Dalton, Ga.	1230
WBLO	Evergreen, Ala.	1470
WBLR	Batesburg, S.C.	1430
WBLT	Bedford, Va.	1350
WBLU	Salem, Va.	1480
WBLY	Springfield, Ohio	1600
WBMA	Beaufort, N.C.	1400
WBMC	McMinnville, Tenn.	960
WBMD	Baltimore, Md.	750
WBMK	West Point, Ga.	1310
WBML	Macon, Ga.	1240
WBMT	Black Mountain, N.C.	1350
WBNB	Charlotte Amalie, Virgin Islands	1000
WBNC	Conway, N.H.	1050
WBNL	Boonville, Ind.	1540
WBNO	Bryan, Ohio	1520
WBNR	Beacon, N.Y.	1260
WBNS	Columbus, Ohio	1460
WBNT	Oneida, Tenn.	1310
WBNX	New York, N.Y.	1380
WBOB	Galax, Va.	960
WBOC	Salisbury, Md.	1550
WBOF	Virginia Beach, Va.	800
WBOK	New Orleans, La.	1560
WBOL	Bolivar, Tenn.	980
WBOP	Pensacola, Fla.	1600
WBOS	Brookline, Mass.	1230
WBOW	Terre Haute, Ind.	1400
WBOY	Clarksburg, W.Va.	1230
WBPZ	Lock Haven, Pa.	1430
WBRB	Mt. Clemens, Mich.	960
WBRC	Birmingham, Ala.	1420
WBRD	Bradenton, Fla.	1340
WBRE	Wilkes-Barre, Pa.	1050
WBRG	Lynchburg, Va.	1340
WBRK	Pittsfield, Mass.	1400
WBRL	Berlin, N.H.	1250
WBRM	Marion, N.C.	1460
WBRN	Big Rapids, Mich.	1310
WBRO	Waynesboro, Ga.	1320
WBRT	Bardstown, Ky.	900
WBRV	Boonville, N.Y.	1510
WBRW	Brewster, N.Y.	1280
WBRX	Berwick, Pa.	1590
WBRY	Waterbury, Conn.	1300
WBSA	Boaz, Ala.	1550
WBSC	Bennetsville, S.C.	1350
WBSG	Blackshear, Ga.	1420
WBSM	New Bedford, Mass.	1110
WBT	Charlotte, N.C.	1490
WBTA	Batavia, N.Y.	1400
WBTH	Williamson, W.Va.	1330
WBTM	Danville, Va.	1370
WBTN	Bennington, Vt.	1600
WBTO	Linton, Ind.	1480
WBTS	Bridgeport, Ala.	1460
WBUC	Buckhannon, W.Va.	1260
WBUD	Trenton, N.J.	1050
WBUT	Butler, Pa.	1570
WBUX	Doylestown, Pa.	1440
WBUY	Lexington, N.C.	1570
WBUZ	Fredonia, N.Y.	970
WBVA	Waynesboro, Va.	950
WBVL	Barbourville, Ky.	1550
WBVM	Utica, N.Y.	1230
WBVP	Beaver Falls, Pa.	1450
WBYE	Calera, Ala.	1560
WBYG	Savannah, Ga.	1030
WBYS	Canton, Ill.	1470
WBZ	Boston, Mass.	1480
WBZE	Wheeling, W. Va.	1380
WBZI	Brazil, Ind.	990
WBZY	Torrington, Conn.	990
WCAL	Northfield, Minn.	770
WCAM	Camden, N.J.	1310
WCAO	Baltimore, Md.	600
WCAP	Lowell, Mass.	980
WCAR	Detroit, Mich.	1130
WCAT	Orange, Mass.	1390
WCAU	Philadelphia, Pa.	1210
WCAW	Charleston, W.Va.	680
WCAY	Cayce, S.C.	620
WCAZ	Carthage, Ill.	990
WCBA	Corning, N.Y.	1350
WCBG	Chambersburg, Pa.	1590
WCBI	Columbus, Miss.	550
WCBL	Benton, Ky.	1290
WCBM	Baltimore, Md.	680
WCBS	New York, N.Y.	880
WCBT	Roanoke Rapids, N.C.	1230
WCBY	Cheboygan, Mich.	1240
WCCC	Hartford, Conn.	1290
WCCF	Punta Gorda, Fla.	1580
WCCM	Lawrence, Mass.	800
WCCN	Neillsville, Wis.	1370
WCCO	Minneapolis, Minn.	830
WCCW	Traverse City, Mich.	1310
WCDJ	Edenton, N.C.	1260
WCDL	Carbondale, Pa.	1440
WCDS	Glasgow, Ky.	1440
WCDT	Winchester, Tenn.	1340
WCEC	Rocky Mount, N.C.	1240
WCED	DuBois, Pa.	1340
WCEF	Parksburg, W.Va.	1240
WCEH	Hawkinsville, Ga.	950
WCEM	Cambridge, Md.	1410
WCEN	Mt. Pleasant, Mich.	1470
WCER	Charlotte, Mich.	1440
WCFL	Chicago, Ill.	1290
WCFR	Springfield, Vt.	1330
WCFV	Clifton Forge, Va.	1300
WCGA	Calhoun, Ga.	1230
WCGC	Belmont, N.C.	1470
WCGO	Chicago Hghts., Ill.	1430
WCGR	Canandaigua, N.Y.	1350
WCHA	Chambersburg, Pa.	1480
WCHB	Inkster, Mich.	1600
WCHE	Westchester, Pa.	1400
WCHI	Chillicothe, Ohio	960
WCHJ	Brookhaven, Miss.	750
WCHK	Canton, Ga.	1310
WCHL	Chapel Hill, N.C.	1240
WCHN	Norwich, N.Y.	1350
WCHO	Washington Court House, Ohio	1250
WCHS	Charleston, W.Va.	580
WCHV	Charlottesville, Va.	1260
WCIC	Cambridge, Minn.	1300
WCIL	Carbondale, Ill.	1020
WCIN	Cincinnati, Ohio	1480
WCIT	Lima, Ohio	940
WCJU	Columbia, Miss.	1450
WCKB	Dunn, N.C.	780
WCKI	Greer, S.C.	1300
WCKM	Winnsboro, S.C.	1250
WCKY	Cincinnati, Ohio	1530
WCLA	Claxton, Ga.	1470
WCLB	Camilla, Ga.	1220
WCLC	Jamestown, Tenn.	1260
WCLD	Cleveland, Miss.	1490
WCLE	Cleveland, Tenn.	1570
WCLG	Morgantown, W.Va.	1300
WCLI	Corning, N.Y.	1450
WCLO	Janesville, Wis.	1230
WCLS	Columbus, Ga.	1580
WCLT	Newark, Ohio	1430
WCLW	Mansfield, Ohio	1570
WCMA	Corinth, Miss.	1230
WCMB	Harrisburg, Pa.	1460
WCMC	Wildwood, N.J.	900
WCME	Brunswick, Maine	1340
WCMI	Ashland, Ky.	1280
WCMN	Arecibo, P.R.	1350
WCMP	Pine City, Minn.	1270
WCMR	Elkhart, Ind.	1050
WCMS	Norfolk, Va.	1410
WCMT	Martin, Tenn.	1430
WCMY	Ottawa, Ill.	1580
WCNB	Connersville, Ind.	1240
WCNC	Elizabeth City, N.C.	940
WCND	Shelbyville, Ky.	1400
WCNF	Weldon, N.C.	1230
WCNH	Quincy, Fla.	1010
WCNL	Newport, N. H.	930
WCNR	Bloomsburg, Pa.	1210
WCNT	Centralia, Ill.	1010
WCNU	Crestview, Fla.	1150
WCNX	Middletown, Conn.	1370
WCOA	Pensacola, Fla.	910
WCOC	Meridian, Miss.	1320
WCOG	Greensboro, N.C.	1400
WCOH	Newnan, Ga.	1420
WCOJ	Coatesville, Pa.	1230
WCOL	Columbus, Ohio	1450
WCON	Cornelia, Ga.	1150
WCOP	Boston, Mass.	900
WCOR	Lebanon, Tenn.	1400
WCOS	Columbia, S.C.	1240
WCOU	Lewiston, Maine	1170
WCOV	Montgomery, Ala.	1290
WCOW	Sparta, Wis.	1580
WCOY	Columbia, Pa.	900
WCPA	Clearfield, Pa.	940
WCPC	Houston, Miss.	1220
WCPH	Etowah, Tenn.	1280
WCPM	Cumberland, Ky.	1230
WCPO	Cincinnati, Ohio	1490
WCPS	Tarboro, N.C.	1400
WCQS	Alma, Ga.	1090
WCRA	Effingham, Ill.	1330
WCRB	Waltham, Mass.	1420
WCRE	Cheraw, S.C.	1050
WCRI	Scottsboro, Ala.	1150
WCRK	Morristown, Tenn.	1570
WCRL	Oneonta, Ala.	990
WCRM	Clare, Mich.	1230
WCRO	Johnstown, Pa.	1330
WCRR	Corinth, Miss.	1450
WCRS	Greenwood, S.C.	1260
WCRT	Birmingham, Ala.	1580
WCRV	Washington, N.J.	1240
WCRW	Chicago, Ill.	900
WCRY	Macon, Ga.	1260
WCSA	Ripley, Miss.	1390
WCSC	Charleston, S.C.	970
WCSH	Portland, Maine	1010
WCSI	Columbus, Ind.	1550
WCSJ	Morris, Ill.	1590
WCSL	Cherryville, N. C.	1350
WCSM	Celina, Ohio	1340
WCSR	Hillsdale, Mich.	1490
WCSS	Amsterdam, N.Y.	1010
WCST	Berkeley Springs, W.Va.	920
WCTA	Andalusia, Ala.	1450
WCTC	New Brunswick, N.J.	1530
WCTR	Chestertown, Md.	680
WCTT	Corbin, Ky.	1550
WCTW	New Castle, Ind.	980
WCUB	Manitowoc, Wis.	1150
WCUE	Cuyahoga Falls, Ohio	1230
WCUM	Cumberland, Md.	1490
WCVA	Culpeper, Va.	1340
WCVI	Connellsville, Pa.	1550
WCVL	Crawfordsville, Ind.	600
WCVP	Murphy, N.C.	960
WCVQ	Kodiak, Alaska	1450
WCVS	Springfield, Ill.	1600
WCWC	Ripon, Wis.	690
WCYB	Bristol, Va.	1400
WCYN	Cynthiana, Ky.	1450
WDAD	Indiana, Pa.	1250
WDAE	Tampa, Fla.	610
WDAF	Kansas City, Mo.	540
WDAK	Columbus, Ga.	1330
WDAL	Meridian, Miss.	1490
WDAN	Danville, Ill.	1350
WDAR	Darlington, S.C.	1480
WDAS	Philadelphia, Pa.	1410
WDAX	McRae, Ga.	970
WDAY	Fargo, N. Dak.	680
WDBC	Escanaba, Mich.	1420
WDBF	Delray Beach, Fla.	960
WDBJ	Roanoke, Va.	1590
WDBL	Springfield, Tenn.	550
WDBM	Statesville, N.C.	580
WDBO	Orlando, Fla.	1490
WDBQ	Dubuque, Iowa	1350
WDCF	Dade City, Fla.	1220
WDCJ	Arlington, Fla.	1340
WDCR	Hanover, N.H.	900
WDDT	Greenville, Miss.	1420
WDDY	Gloucester, Va.	1370
WDEA	Ellsworth, Me.	1290
WDEC	Americus, Ga.	1220
WDEE	Hamden, Conn.	1370
WDEF	Chattanooga, Tenn.	800
WDEH	Sweetwater, Tenn.	1150
WDEL	Wilmington, Del.	550
WDEV	Waterbury, Vt.	1570
WDEW	Westfield, Mass.	1520
WDGL	Douglasville, Ga.	1130
WDGY	Minneapolis, Minn.	1070
WDIA	Memphis, Tenn.	1450
WDIG	Dothan, Ala.	1150
WDIX	Orangeburg, S.C.	1430
WDJS	Mt. Olive, N.C.	1310
WDKD	Kingstree, S.C.	1260
WDKN	Dickson, Tenn.	1270
WDLA	Walton, N.Y.	1450
WDLB	Marshfield, Wis.	1380
WDLC	Port Jervis, N.Y.	1490
WDLR	Delaware, Ohio	1550
WDLM	E. Moline, Ill.	960
WDLP	Panama City, Fla.	590
WDLT	Indianola, Miss.	1380
WDMC	Otsego, Mich.	980
WDMF	Buford, Ga.	1460
WDMG	Douglas, Ga.	860
WDMJ	Marquette, Mich.	1320
WDMS	Lynchburg, Va.	1320
WDMV	Pocomoke City, Md.	540
WDNC	Durham, N.C.	620
WDNE	Elkins, W.Va.	1240
WDNG	Anniston, Ala.	1450
WDNT	Dayton, Tenn.	1280
WDOB	Canton, Miss.	1370
WDOC	Prestonsburg, Ky.	1310
WDOD	Chattanooga, Tenn.	1310
WDOE	Dunkirk, N.Y.	1410
WDOG	Marine City, Mich.	1590
WDOK	Cleveland, Ohio	1260
WDOL	Athens, Ga.	1470
WDON	Wheaton, Md.	1540
WDOR	Sturgeon Bay, Wis.	910
WDOS	Oneonta, N.Y.	730
WDOT	Burlington, Va.	1400
WDOV	Dover, Del.	1410
WDOW	Dowagiac, Mich.	1440
WDQN	DuQuoin, Ill.	1580
WDRC	Hartford, Conn.	1360
WDSC	Dillon, S.C.	800
WDSG	Oyersburg, Tenn.	1450
WDSK	Cleveland, Miss.	1410
WDSL	Mocksville, N. C.	1520
WDSM	Superior, Wis.	710
WDSP	DeFuniak Springs, Florida	1280
WDSR	Lake City, Fla.	1340
WDSU	New Orleans, La.	1280

WHITE'S RADIO LOG

C.L.	Location	Kc.
WDUN	Gainesville, Ga.	1240
WDUX	Waupaca, Wis.	800
WDUZ	Green Bay, Wis.	1400
WDVA	Danville, Va.	1250
WDVH	Gainesville, Fla.	980
WDVL	Vineland, N.J.	1270
WDWD	Dawson, Ga.	990
WDWS	Champaign, Ill.	1400
WDXB	Chattanooga, Tenn.	1490
WDXE	Lawrenceburg, Tenn.	1370
WDXI	Jackson, Tenn.	1310
WDXL	Lexington, Tenn.	1490
WDXN	Clarksville, Tenn.	540
WDXR	Paducah, Ky.	1560
WDXY	Sumter, S.C.	1240
WDZ	Decatur, Ill.	1050
WEAB	Greer, S.C.	800
WEAC	Gaffney, S. C.	1500
WEAD	College Park, Ga.	1570
WEAG	Alcoa, Tenn.	1470
WEAL	Greensboro, N. C.	1510
WEAM	Arlington, Va.	1390
WEAN	Providence, R.I.	790
WEAQ	Eau Claire, Wis.	790
WEAS	Savannah, Ga.	900
WEAT	W. Palm Beach, Fla.	850
WEAV	Plattsburg, N.Y.	960
WEAW	Evanston, Ill.	1330
WEBB	Baltimore, Md.	1360
WEBC	Duluth, Minn.	560
WEBJ	Brewton, Ala.	1240
WEBO	Owego, N.Y.	1330
WEBQ	Harrisburg, Ill.	1240
WEBR	Buffalo, N.Y.	970
WEBY	Milton, Fla.	1330
WECL	Eau Claire, Wis.	1050
WEDC	Chicago, Ill.	1240
WEDO	McKeesport, Pa.	810
WEEB	Southern Pines, N.C.	990
WEED	Rocky Mount, N.C.	1390
WEEE	Rensselaer, N.Y.	1300
WEEF	Highland Park, Ill.	1430
WEEI	Boston, Mass.	590
WEEL	Fairfax, Va.	1310
WEEN	Lafayette, Tenn.	1460
WEEP	Pittsburgh, Pa.	1080
WEER	Warrenton, Va.	610
WEET	Richmond, Va.	1320
WEEU	Reading, Pa.	850
WEEW	Washington, N.C.	1320
WEEX	Easton, Pa.	1230
WEEZ	Chester, Pa.	1590
WEGO	Concord, N.C.	1410
WEGP	Presque Isle, Maine	1390
WEHH	Elmira Heights-Horseheads, N. Y.	1590
WEIC	Charleston, Ill.	1270
WEIM	Fitchburg, Mass.	1280
WEIR	Weirton, W.Va.	1430
WEIS	Center, Ala.	990
WEJL	Scranton, Pa.	630
WEKR	Fayetteville, Tenn.	1240
WEKY	Richmond, Ky.	1340
WEKZ	Monroe, Wis.	1260
WELB	Elba, Ala.	1350
WELC	Welch, W.Va.	1150
WELD	Fisher, W.Va.	690
WELE	S. Daytona, Fla.	1590
WELI	New Haven, Conn.	960
WELK	Charlottesville, Va.	1010
WELL	Battle Creek, Mich.	1400
WELM	Elmira, N.Y.	1410
WELO	Tupelo, Miss.	580
WELP	Easley, S.C.	1360
WELR	Roanoke, Ala.	1360
WELS	Kinston, N.C.	1010
WELW	Willoughby, O.	1330d
WELY	Ely, Minn.	1450
WELZ	Belzoni, Miss.	1460
WEMB	Erwin, Tenn.	1420
WEMD	Easton, Md.	1460
WEMJ	Laconia, N.H.	1490
WEMP	Milwaukee, Wis.	1250
WENA	Bayamon, P.R.	1560
WENC	Whiteville, N.C.	1220
WEND	Edensburg, Pa.	1580
WENE	Endicott, N.Y.	1430
WENG	Englewood, Fla.	1530
WENK	Union City, Tenn.	1240
WENN	Birmingham, Ala.	1320
WENO	Madison, Tenn.	1430
WENT	Gloversville, N.Y.	1340
WENY	Elmira, N.Y.	1230
WEOK	Poughkeepsie, N.Y.	1390
WEOL	Elyria, Ohio	930
WEPG	S. Pittsburgh, Tenn.	910
WEPM	Martinsburg, W.Va.	1340
WERA	Plainfield, N.J.	1590
WERB	Garden City, Mich.	1090
WERD	Atlanta, Ga.	860
WERE	Cleveland, Ohio	1300
WERH	Hamilton, Ala.	970
WERI	Westerly, R.I.	1230
WERL	Eagle River, Wis.	950
WERT	Van Wert, Ohio	1220
WESA	Charleroi, Pa.	940
WESB	Bradford, Pa.	1490
WESC	Greenville, S.C.	660
WESN	N. Augusta, S.C.	1550
WESO	Southbridge, Mass.	970
WESR	Tasley, Va.	1330
WEST	Easton, Pa.	1400
WESX	Salem, Mass.	1230
WESY	Leland, Miss.	1580
WETB	Johnson City, Tenn.	790
WETC	Wendell-Zebulon, N.C.	540
WETH	St. Augustine, Fla.	1420
WETO	Gadsden, Ala.	930
WETT	Ocean City, Md.	1590
WETU	Wetumpka, Ala.	1250
WETZ	New Martinsville, West Virginia	1330
WEUC	Ponce, P.R.	1420
WEUP	Huntsville, Ala.	1600
WEVA	Emporia, Va.	860
WEVD	New York, N.Y.	1330
WEVE	Eveleth, Minn.	1340
WEW	St. Louis, Mo.	770
WEWD	Laurinburg, N.C.	1080
WEXL	Royal Oak, Mich.	1340
WEXT	W. Hartford, Conn.	1550
WEYE	Sanford, N.C.	1290
WEYY	Talladega, Ala.	1580
WEZB	Birmingham, Ala.	1220
WEZE	Boston, Mass.	1260
WEZJ	Williamsburg, Ky.	1440
WEZN	Elizabethtown, Pa.	1600
WEZQ	Winfield, Ala.	1300
WEZY	Cocoa, Fla.	1350
WFAA	Dallas, Tex.	570
WFAB	Miami, Fla.	990
WFAG	Farmville, N.C.	1250
WFAH	Alliance, Ohio	1310
WFAI	Fayetteville, N.C.	1230
WFAR	Farrell, Pa.	1470
WFAS	White Plains, N.Y.	1230
WFAU	Augusta, Me.	1340
WFAW	Ft. Atkinson, Wis.	940
WFAX	Falls Church, Va.	1220
WFBC	Greenville, S.C.	1330
WFBG	Altoona, Pa.	1290
WFBL	Syracuse, N.Y.	1390
WFBM	Indianapolis, Ind.	1260
WFBR	Baltimore, Md.	1300
WFBS	Spring Lake, N. C.	1450
WFDF	Flint, Mich.	910
WFDR	Manchester, Ga.	1370
WFEA	Manchester, N.Y.	1370
WFEB	Sylacauga, Ala.	1340
WFEC	Miami, Fla.	1220
WFFF	Columbia, Miss.	1360
WFFG	Marathon, Fla.	1300
WFGM	Fitchburg, Mass.	960
WFGN	Gaffney, S.C.	1570
WFGW	Black Mountains, N.C.	1010
WFHG	Bristol, Va.	980
WFHK	Pell City, Ala.	1430
WFHR	Wis. Rapids, Wis.	1320
WFIG	Sumter, S.C.	1290
WFIL	Philadelphia, Pa.	560
WFIN	Findlay, Ohio	1330
WFIS	Fountain Inn, S.C.	1600
WFIV	Kissimmee, Fla.	1080
WFIW	Fairfield, Ill.	1390
WFKN	Franklin, Ky.	1220
WFKY	Frankfort, Ky.	1490
WFLA	Tampa, Fla.	970
WFLB	Fayetteville, N.C.	1490
WFLI	Lookout Mtn., Tenn.	1070
WFLN	Philadelphia, Pa.	900
WFLO	Farmville, Va.	870
WFLR	Dundee, N.Y.	1570
WFLS	Fredericksburg, Va.	1350
WFLW	Monticello, Ky.	1360
WFMC	Goldsboro, N.C.	730
WFMD	Frederick, Md.	930
WFMH	Cullman, Ala.	1460
WFMI	Montgomery, Ala.	1500
WFMJ	Youngstown, Ohio	1390
WFMO	Fairmont, N.C.	860
WFMW	Madisonville, Ky.	730
WFNC	Fayetteville, N.C.	1390
WFNL	No. Augusta, S.C.	1600
WFOB	Fostoria, Ohio	1430
WFOL	Hamilton, Ohio	1560
WFOM	Marietta, Ga.	1230
WFOR	Hattiesburg, Miss.	1400
WFOX	Milwaukee, Wis.	860
WFOY	St. Augustine, Fla.	1240
WFPA	Fort Payne, Ala.	1400
WFPG	Atlantic City, N.J.	1450
WFPM	Fort Valley, Ga.	1150
WFPR	Hammond, La.	1400
WFRA	Franklin, Pa.	1430
WFRB	Frostburg, Md.	560
WFRC	Reidsville, N.C.	1600
WFRL	Freeport, Ill.	1570
WFRM	Coudersport, Pa.	600
WFRO	Fremont, Ohio	900
WFRX	West Frankfort, Ill.	1300
WFSC	Franklin, N.C.	1050
WFSG	Boca Raton, Fla.	740
WFSR	Bath, N.Y.	1380
WFST	Caribou, Maine	600
WFTC	Kinston, N.C.	960
WFTG	London, Ky.	1400
WFTL	Ft. Lauderdale, Fla.	1400
WFTM	Maysville, Ky.	1240
WFTR	Front Royal, Va.	1450
WFTW	Ft. Walton Beach, Florida	1260
WFUL	Fulton, Ky.	1270
WFUN	Huntsville, Ala.	1450
WFUR	Grand Rapids, Mich.	1570
WFVA	Fredericksburg, Va.	1230
WFVG	Fuquay Sprgs., N.C.	1460
WFWL	Camden, Tenn.	1220
WFYC	Alma, Mich.	1280
WFYI	Mineola, N.Y.	1520
WGAA	Cedartown, Ga.	1340
WGAC	Augusta, Ga.	580
WGAD	Gadsden, Ala.	1350
WGAF	Valdosta, Ga.	910
WGAI	Elizabeth City, N.C.	560
WGAL	Lancaster, Pa.	1490
WGAN	Portland, Maine	560
WGAP	Maryville, Tenn.	1400
WGAR	Cleveland, Ohio	1220
WGAS	S. Gastonia, N.C.	1420
WGAT	Gate City, Va.	1050
WGAU	Athens, Ga.	1340
WGAW	Gardner, Mass.	1340
WGBA	Columbus, Ga.	1270
WGBB	Freeport, N.Y.	1240
WGBF	Evansville, Ind.	1280
WGBG	Greensboro, N.C.	1400
WGBI	Scranton, Pa.	910
WGBR	Goldsboro, N. C.	1150
WGBS	Miami, Fla.	710
WGCB	Red Lion, Pa.	1440
WGCD	Chester, S.C.	1490
WGCM	Gulfport, Miss.	1240
WGEA	Geneva, Ala.	1150
WGEE	Indianapolis, Ind.	1590
WGEM	Quincy, Ill.	1440
WGEN	Geneseo, Ill	1500
WGET	Gettysburg, Pa.	1320
WGEZ	Beloit, Wis.	1490
WGFA	Watseka, Ill.	1360
WGFS	Covington, Ga.	1430
WGGA	Gainesville, Ga.	550
WGGG	Gainesville, Fla.	1230
WGGH	Marion, Ill.	1150
WGGD	Salamanca, N.Y.	1590
WGH	Newport News, Va.	1310
WGHB	Maplewood, Minn.	1010
WGHC	Clayton, Ga.	1570
WGHM	Skowegan, Maine	1150
WGHN	Grd. Haven, Mich.	1370
WGHD	Kingston, N.Y.	920
WGIC	Xenia, Ohio	1500
WGIG	Brunswick, Ga.	1440
WGIL	Galesburg, Ill.	1400
WGIR	Manchester, N.H.	610
WGIV	Charlotte, N.C.	1600
WGKA	Atlanta, Ga.	1600
WGKR	Perry, Fla.	1310
WGKV	Charleston, W. Va.	1490
WGL	Fort Wayne, Ind.	1250
WGLB	Port Wash., Wis.	1560
WGLD	Chardon, Ohio	1560
WGLI	Babylon, N.Y.	1290
WGMA	Hollywood, Fla.	1320
WGML	Hinesville, Ga.	990
WGMM	Millington, Tenn.	1380
WGMS	Washington, D.C.	570
WGN	Chicago, Ill.	720
WGNC	Gastonia, N.C.	1450
WGNI	Wilmington, N.C.	1450
WGNO	Granite City, Ill.	920
WGNP	Indian Rocks Beach, Fla.	1520
WGNS	Murfreesboro, Tenn.	1450
WGNY	Newburgh, N.Y.	1220
WGOG	Walhalla, S.C.	1460
WGOH	Grayson, Ky.	1370
WGOK	Mobile, Ala.	900
WGOL	Goldsboro, N.C.	1300
WGOO	Georgetown, S. C.	1470
WGOV	Valdosta, Ga.	950
WGPA	Bethlehem, Pa.	1100
WGPC	Albany, Ga.	1450
WGR	Buffalo, N.Y.	550
WGRA	Cairo, Ga.	790
WGRB	Greensburg, Ind.	1330
WGRD	Grand Rapids, Mich.	1410
WGRF	Aguadella, P.R.	1340
WGRM	Greenwood, Miss.	1240
WGRO	Lake City, Fla.	960
WGRP	Greenville, Pa.	940
WGRV	Greenville, Tenn.	1340
WGRY	Gary, Ind.	1370
WGSA	Ephrata, Pa.	1310
WGSB	Geneva, Ill.	1480
WGSM	Huntington, N.Y.	740
WGSR	Millen, Ga.	1570
WGST	Atlanta, Ga.	920
WGSV	Guntersville, Ala.	1270
WGSW	Greenwood, S.C.	1350
WGTA	Summerville, Ga.	950
WGTC	Greenville, N.C.	1590
WGTL	Kannapolis, N.C.	870
WGTM	Wilson, N.C.	590
WGTN	Georgetown, S.C.	1400
WGTO	Cypress Gardens, Fla.	540
WGUL	New Port Richey, Fla.	1500
WGUN	Decatur, Ga.	1010
WGUS	North Augusta, S.C.	1380
WGUY	Bangor, Maine	1250
WGVA	Geneva, N.Y.	1240
WGVM	Greenville, Miss.	1260
WGWC	Selma, Ala.	1340
WGWR	Asheboro, N.C.	1260
WGY	Schenectady, N.Y.	810
WGYN	Knoxville, Tenn.	1430
WGYV	Greenville, Ala.	1380
WGYW	Fountain City, Tenn.	1430
WHA	Madison, Wis.	970
WHAB	Baxley, Ga.	1260
WHAG	Halfway, Md.	1410
WHAI	Greenfield, Mass.	1240
WHAK	Rogers City, Mich.	960
WHAL	Shelbyville, Tenn.	1400
WHAM	Rochester, N.Y.	1180
WHAN	Raines City, Fla.	930
WHAP	Hopewell, Va.	1340
WHAR	Clarksburg, W.Va.	1340
WHAS	Louisville, Ky.	840
WHAT	Philadelphia, Pa.	1340
WHAV	Haverhill, Mass.	1490
WHAW	Weston, W.Va.	980
WHAY	New Britain, Conn.	910
WHAZ	Troy, N.Y.	1330
WHB	Kansas City, Mo.	710
WHBB	Selma, Ala.	1490
WHBC	Canton, Ohio	1480
WHBF	Rock Island, Ill.	1270
WHBG	Harrisonburg, Va.	1360
WHBL	Sheboygan, Wis.	1330
WHBN	Harrodsburg, Ky.	1420
WHBO	Tampa, Fla.	1050
WHBQ	Memphis, Tenn.	560
WHBT	Harriman, Tenn.	1600
WHBU	Anderson, Ind.	1240
WHBY	Appleton, Wis.	1230
WHCC	Waynesville, N.C.	1400
WHCD	Sparta, Ill.	1230
WHCU	Ithaca, N.Y.	870
WHDF	Houghton, Mich.	1400
WHDH	Boston, Mass.	850
WHDL	Olean, N.Y.	1450
WHDM	McKenzie, Tenn.	1440
WHEB	Portsmouth, N.H.	750
WHEC	Rochester, N.Y.	1460
WHEE	Martinsville, Va.	1370
WHEN	Syracuse, N.Y.	620
WHEO	Stuart, Va.	1270
WHEP	Foley, Ala.	1310
WHER	Memphis, Tenn.	1430
WHEW	Riveria Beach, Fla.	1600
WHEY	Millington, Tenn.	1220
WHFB	Benton Harbor, Mich.	1060
WHGB	Harrisburg, Pa.	1400
WHGR	Houghton L., Mich.	1290
WHHH	Warren, Ohio	1440
WHHL	Holly Hill, S.C.	1440
WHHM	Memphis, Tenn.	1340
WHHT	Lucedale, Miss.	1440
WHHV	Hillsville, Va.	1400
WHHY	Montgomery, Ala.	1440
WHIE	Griffin, Ga.	1320
WHIH	Portsmouth, Va.	1400
WHIL	Medford, Mass.	1430
WHIM	E. Providence, R.I.	1110
WHIN	Gallatin, Tenn.	1010
WHIO	Dayton, Ohio	1290
WHIP	Mooresville, N.C.	1350
WHIR	Danville, Ky.	1230
WHIS	Bluefield, W.Va.	1440
WHIT	New Bern, N.C.	1450
WHIY	Orlando, Fla.	1270
WHIZ	Zanesville, Ohio	1240
WHJB	Greensburg, Pa.	620
WHJC	Matawan, W.Va.	1360
WHK	Cleveland, Ohio	1420
WHKP	Hendersonville, N.C.	1450
WHKY	Hickory, N.C.	1290
WHLB	Virginia, Minn.	1400
WHLD	Niagara Falls, N.Y.	1270
WHLF	South Boston, Va.	1400
WHLI	Hempstead, N.Y.	1100
WHLL	Wheeling, W.Va.	1600
WHLM	Bloomsburg, Pa.	550
WHLN	Harlan, Ky.	1410
WHLO	Akron, Ohio	640
WHLP	Centerville, Tenn.	1570
WHLS	Port Huron, Mich.	1450
WHLT	Huntington, Ind.	1300
WHMA	Anniston, Ala.	1390
WHMC	Gaithersburg, Md.	1150
WHMI	Howell, Mich.	1350
WHMP	Northampton, Mass.	1400
WHN	New York, N.Y.	1050
WHNC	Henderson, N.C.	890
WHNY	McComb, Miss.	1250
WHO	Des Moines, Iowa	1040
WHOA	San Juan, P.R.	870
WHOC	Philadelphia, Miss.	1490
WHOF	Canton, Ohio	1060
WHOK	Lancaster, Ohio	1320
WHOL	Allentown, Pa.	600
WHOM	New York, N.Y.	1480
WHON	Centerville, Ind.	930
WHOO	Orlando, Fla.	990
WHOP	Hopkinsville, Ky.	1230
WHOS	Decatur, Ala.	800
WHOT	Campbell, Ohio	1330
WHOU	Houlton, Maine	1340
WHOW	Clinton, Ill.	1520

C.L.	Location	Kc.
WHP	Harrisburg, Pa.	580
WHPB	Belton, S.C.	1390
WHPE	High Point, N.C.	1070
WHPL	Winchester, Va.	610
WHRT	Hartselle, Ala.	860
WHRV	Ann Arbor, Mich.	1600
WHSC	Hartsville, S.C.	1450
WHSL	Wilmington, N.C.	1490
WHSM	Hayward, Wis.	910
WHSY	Hattiesburg, Miss.	1230
WHTC	Holland, Mich.	1450
WHTG	Eatontown, N.J.	1410
WHUB	Cookeville, Tenn.	1400
WHUC	Hudson, N.Y.	1230
WHUM	Reading, Pa.	1240
WHUN	Huntington, Pa.	1150
WHUT	Anderson, Ind.	1470
WHVF	Wausau, Wis.	1230
WHVR	Hanover, Pa.	1280
WHWB	Rutland, Vt.	1000
WHWH	Princeton, N.J.	1350
WHYE	Roanoke, Va.	910
WHYL	Carlisle, Pa.	960
WHYN	Springfield, Mass.	560
WIAC	San Juan, P.R.	740
WIAM	Williamston, N.C.	900
WIBA	Madison, Wis.	1310
WIBB	Macon, Ga.	1280
WIBC	Indianapolis, Ind.	1070
WIBG	Philadelphia, Pa.	990
WIBM	Jackson, Mich.	1450
WIBR	Baton Rouge, La.	1300
WIBU	Poynette, Wis.	1240
WIBV	Belleville, Ill.	1260
WIBW	Topeka, Kans.	580
WIBX	Utica, N.Y.	950
WICC	Bridgeport, Conn.	600
WICE	Providence, R.I.	1290
WICH	Norwich, Conn.	1310
WICK	Scranton, Pa.	1400
WICO	Salisbury, Md.	1320
WICU	Erie, Pa.	1330
WICY	Malone, N.Y.	1490
WIDE	Biddeford, Maine	1400
WIDU	Fayetteville, N.C.	1600
WIEL	Elizabethtown, Ky.	1400
WIFE	Indianapolis, Ind.	1310
WIFM	Elkin, N.C.	1540
WIGL	Superior, Wis.	970
WIGM	Medford, Wis.	1490
WIGO	Indianapolis, Ind.	810
WIII	Homestead, Fla.	1430
WIIN	Atlanta, Ga.	970
WIKB	Iron River, Mich.	1230
WIKC	Bogalusa, La.	1490
WIKE	Newport, Vt.	1490
WIKI	Chester, Va.	1410
WIKY	Evansville, Ind.	820
WIL	St. Louis, Mo.	1430
WILA	Danville, Va.	1580
WILD	Boston, Mass.	1090
WILE	Cambridge, Ohio	1270
WILI	Willimantic, Conn.	1400
WILK	Wilkes-Barre, Pa.	980
WILL	Urbana, Ill.	580
WILM	Wilmington, Del.	1450
WILO	Frankfort, Ind.	1570
WILS	Lansing, Mich.	1320
WILZ	St. Petersburg Beach, Florida	1590
WIMA	Lima, Ohio	1150
WIMO	Winder, Ga.	1300
WIMS	Michigan City, Ind.	1420
WINA	Charlottesville, Va.	1400
WINC	Winchester, Va.	1400
WIND	Chicago, Ill.	560
WINF	Manchester, Conn.	1230
WING	Dayton, Ohio	1410
WINI	Murphysboro, Ill.	1420
WINK	Fort Myers, Fla.	1240
WINN	Louisville, Ky.	1240
WINQ	Tampa, Fla.	1010
WINR	Binghamton, N.Y.	680
WINS	New York, N.Y.	1010
WINT	Winter Haven, Fla.	1360
WINX	Rockville, Md.	1600
WINY	Putnam, Conn.	1350
WINZ	Miami, Fla.	940
WINU	Highland, Ill.	1510
WIOD	Miami, Fla.	610
WIOI	New Boston, Ohio	1010
WIOK	Normal, Ill.	1440
WION	Ionia, Mich.	1430
WIOS	Tawas City, Mich.	1480
WIOU	Kokomo, Ind.	1350
WIP	Philadelphia, Pa.	610
WIPC	Lake Wales, Fla.	1280
WIPR	San Juan, P.R.	940
WIPS	Ticonderoga, N.Y.	1250
WIRA	Fort Pierce, Fla.	1400
WIRB	Enterprise, Ala.	600
WIRC	Hickory, N.C.	630
WIRD	Lake Placid, N.Y.	920
WIRE	Indianapolis, Ind.	1430
WIRJ	Humboldt, Tenn.	740
WIRK	W. Palm Beach, Fla.	1290
WIRL	Peoria, Ill.	1290
WIRO	Ironton, Ohio	1230
WIRV	Irvine, Ky.	1550
WIRY	Plattsburg, N.Y.	1340
WIS	Columbia, S.C.	560
WISA	Isabella, P.R.	1390
WISE	Asheville, N.C.	1310
WISL	Shamokin, Pa.	1480
WISM	Madison, Wis.	1480
WISN	Milwaukee, Wis.	1130
WISO	Ponce, P.R.	1260
WISP	Kinston, N.C.	1230
WISR	Butler, Pa.	680
WIST	Charlotte, N.C.	1240
WISV	Virouqua, Wis.	1350
WISZ	Glen Burnie, Md.	1590
WITA	San Juan, P.R.	1140
WITH	Baltimore, Md.	1230
WITW	Washington, N.C.	930
WITY	Danville, Ill.	980
WITZ	Jasper, Ind.	990
WIVE	Ashland, Va.	1430
WIVI	Christiansted, V.I.	970
WIVK	Knoxville, Tenn.	860
WIVV	Vieques, P.R.	1370
WIVY	Jacksonville, Fla.	1050
WIXK	New Richmond, Wis.	1590
WIXN	Dixon, Ill.	1460
WIXX	Oakland Park, Fla.	1520
WIYN	Rome, Ga.	1360
WIZE	Springfield, Ohio	1340
WIZR	Johnstown, N.Y.	930
WIZS	Henderson, N.C.	1450
WIZZ	Streator, Ill.	1250
WJAB	Westbrook, Me.	1440
WJAC	Johnstown, Pa.	850
WJAG	Norfolk, Nebr.	780
WJAK	Jackson, Tenn.	1460
WJAM	Marion, Ala.	1310
WJAN	Ishpeming, Mich.	970
WJAQ	Jackson, Miss.	1550
WJAR	Providence, R.I.	920
WJAS	Pittsburgh, Pa.	1320
WJAT	Swainsboro, Ga.	800
WJAX	Jacksonville, Fla.	930
WJAY	Mullins, S.C.	1280
WJAZ	Albany, Ga.	960
WJBB	Haleyville, Ala.	1230
WJBC	Bloomington, Ill.	1230
WJBD	Salem, Ill.	1350
WJBK	Detroit, Mich.	1500
WJBL	Holland, Mich.	1260
WJBM	Jerseyville, Ill.	1480
WJBO	Baton Rouge, La.	1150
WJBS	DeLand, Fla.	1490
WJCD	Seymour, Ind.	1390
WJCM	Sebring, Fla.	960
WJCO	Jackson, Mich	1510
WJCW	Johnson City, Tenn.	910
WJDA	Quincy, Mass.	1300
WJDB	Thomasville, Ala.	630
WJDX	Jackson, Miss.	620
WJDY	Salisbury, Md.	1470
WJEF	Grand Rapids, Mich.	1230
WJEH	Gallipolis, Ohio	990
WJEJ	Hagerstown, Md.	1240
WJEM	Valdosta, Ga.	1150
WJER	Dover, Ohio	1450
WJES	Johnston, S.C.	1570
WJET	Erie, Pa.	1400
WJFC	Jefferson City, Tenn.	1480
WJHO	Opelika, Ala.	1400
WJIG	Tullahoma, Tenn.	740
WJIL	Jacksonville, Ill.	1550
WJIM	Lansing, Mich.	1240
WJIV	Savannah, Ga.	900
WJJC	Commerce, Ga.	1270
WJJD	Chicago, Ill.	1160
WJJL	Niagara Falls, N.Y.	1440
WJJM	Lewisburg, Tenn.	1490
WJJZ	Mount Holly, N.J.	1460
WJLB	Detroit, Mich.	1400
WJLD	Homewood, Ala.	1400
WJLK	Asbury Park, N.J.	1310
WJLS	Beckley, W.Va.	560
WJMA	Orange, Va.	1340
WJMB	Brookhaven, Miss.	1340
WJMC	Rice Lake, Wis.	1240
WJMJ	Philadelphia, Pa.	1540
WJMO	Cleveland Hgts., Ohio	1490
WJMR	New Orleans, La.	990
WJMS	Ironwood, Mich.	630
WJMW	Athens, Ala.	730
WJMX	Florence, S.C.	970
WJNC	Jacksonville, N.C.	1240
WJNO	W. Palm Beach, Fla.	1230
WJOB	Hammond, Ind.	1230
WJOE	Port Joe, Fla.	1080
WJOI	Florence, Ala.	1340
WJOL	Joliet, Ill.	1340
WJON	St. Cloud, Minn.	1240
WJOR	South Haven, Mich.	940
WJOT	Lake City, S.C.	1260
WJOY	Burlington, Vt.	1230
WJPA	Washington, Pa.	1450
WJPD	Ishpeming, Mich.	1240
WJPF	Herrin, Ill.	1340
WJPG	Green Bay, Wis.	1440
WJPR	Greenville, Miss.	1330
WJPS	Evansville, Ind.	1330
WJQS	Jackson, Miss.	1400
WJR	Detroit, Mich.	760
WJRC	Joliet, Ill.	1510
WJRD	Tuscaloosa, Ala.	1150
WJRI	Lenoir, N.C.	1340
WJRL	Rockford, Ill.	1150
WJRM	Troy, N.C.	1390
WJRZ	Newark, N.J.	970
WJSB	Crestview, Fla.	1050
WJSO	Jonesboro, Tenn.	1590
WJTN	Jamestown, N.Y.	1240
WJTO	Bath, Me.	730
WJUD	St. Johns, Mich.	1580
WJUN	Mexico, Pa.	1220
WJVA	South Bend, Ind.	1580
WJW	Cleveland, Ohio	850
WJWL	Georgetown, Del.	900
WJWS	South Hill, Va.	1370
WJWT	Demopolis, Ala.	1350
WJXN	Jackson, Miss.	1450
WJZM	Clarksville, Tenn.	1400
WKAI	Macomb, Ill.	1510
WKAL	Rome, N.Y.	1450
WKAM	Goshen, Ind.	1460
WKAN	Kankakee, Ill.	1320
WKAP	Allentown, Pa.	1320
WKAQ	San Juan, P.R.	580
WKAR	East Lansing, Mich.	870
WKAT	Miami Beach, Fla.	1360
WKAY	Glasgow, Ky.	1490
WKAZ	Charleston, W.Va.	950
WKBC	N. Wilkesboro, N.C.	810
WKBH	La Crosse, Wis.	1410
WKBI	St. Mary's, Pa.	1400
WKBJ	Milan, Tenn.	1600
WKBK	Keene, N.H.	1220
WKBL	Covington, Tenn.	1250
WKBN	Youngstown, Ohio	570
WKBO	Harrisburg, Pa.	1230
WKBR	Manchester, N.H.	1250
WKBV	Richmond, Ind.	1490
WKBW	Buffalo, N. Y.	1520
WKBZ	Muskegon, Mich.	850
WKCT	Bowling Green, Ky.	930
WKCW	Warrenton, Va.	1420
WKDA	Nashville, Tenn.	1240
WKDE	Altavista, Va.	1280
WKDK	Newberry, S.C.	1240
WKDL	Clarksdale, Miss.	1600
WKDN	Camden, N.J.	800
WKDX	Hamlet, N. C.	1250
WKEE	Huntington, W. Va.	800
WKEI	Kewanee, Ill.	1450
WKEN	Dover, Del.	1600
WKER	Pompton Lakes, N.J.	1500
WKEU	Griffin, Ga.	1450
WKEY	Covington, Va.	1340
WKFD	Wickford, R.I.	1370
WKFY	Greenville, Ky.	1600
WKGN	Knoxville, Tenn.	1340
WKHM	Jackson, Mich.	970
WKIC	Hazard, Ky.	1390
WKID	Urbana, Ill.	1580
WKIG	Glenville, Ga.	1580
WKIK	Leonardtown, Md.	1370
WKIN	Kingsport, Tenn.	1320
WKIP	Poughkeepsie, N.Y.	1450
WKIS	Orlando, Fla.	740
WKIX	Raleigh, N.C.	850
WKIZ	Key West, Fla.	1500
WKJB	Mayaguez, P.R.	710
WKJG	Fort Wayne, Ind.	1380
WKJK	Granite Falls, N. C.	1580
WKJR	Muskegon, Mich.	1520
WKKD	Aurora, Ill.	1580
WKKO	Cocoa, Fla.	860
WKKS	Vanceburg, Ky.	1570
WKLA	Ludington, Mich.	1450
WKLC	St. Albans, W.Va.	1300
WKLE	Washington, Ga.	1370
WKLF	Clanton, Ala.	980
WKLJ	Sparta, Wis.	990
WKLK	Cloquet, Minn.	1230
WKLM	Wilmington, N.C.	980
WKLO	Louisville, Ky.	1080
WKLP	Keyser, W. Va.	1390
WKLV	Blackstone, Va.	1440
WKLX	Paris, Ky.	1440
WKLY	Hartwell, Ga.	980
WKLZ	Kalamazoo, Mich.	1470
WKMC	Roaring Sprgs., Pa.	1370
WKMF	Flint, Mich.	1470
WKMH	Dearborn, Mich.	1310
WKMI	Kalamazoo, Mich.	1360
WKMK	Blountstown, Fla.	1370
WKMT	Kings Mtn., N.C.	1220
WKNE	Keene, N.H.	1290
WKNX	Saginaw, Mich.	1210
WKNY	Kingston, N.Y.	1490
WKOA	Hopkinsville, Ky.	1480
WKOK	Sunbury, Pa.	1240
WKOP	Binghamton, N.Y.	1360
WKOS	Ocala, Fla.	1370
WKOV	Wellston, Ohio	1330
WKOW	Madison, Wis.	1070
WKOX	Framingham, Mass.	1190
WKOY	Bluefield, W.Va.	1240
WKOZ	Kosciusko, Miss.	1350
WKPA	New Kensington, Pa.	1150
WKPO	Prentiss, Miss.	1530
WKPR	Kalamazoo, Mich.	1420
WKPT	Kingsport, Tenn.	1400
WKRC	Cincinnati, Ohio	550
WKRG	Mobile, Ala.	710
WKRK	Murphy, N.C.	1320
WKRM	Columbia, Tenn.	1340
WKRO	Cairo, Ill.	1490
WKRS	Waukegan, Ill.	1220
WKRT	Cortland, N.Y.	920
WKRW	Cartersville, Ga.	
WKRZ	Oil City, Pa.	1340
WKSB	Milford, Del.	930
WKSC	Kershaw, S.C.	1300
WKSK	W. Jefferson, N.C.	1600
WKSR	Pulaski, Tenn.	1420
WKST	New Castle, Pa.	1280
WKTC	Charlotte, N.C.	1310
WKTE	King, N.C.	1090
WKTG	Thomasville, Ga.	730
WKTJ	Farmington, Maine	1380
WKTL	Sheboygan, Wis.	950
WKTQ	South Paris, Maine	1450
WKTX	Atlantic Beach, Fla.	1600
WKTY	LaCrosse, Wis.	580
WKUL	Cullman, Ala.	1340
WKVA	Lewistown, Pa.	920
WKVM	San Juan, P.R.	810
WKVQ	Sullivan, Ind.	1550
WKVT	Brattleboro, Vt.	1490
WKWF	Key West, Fla.	1600
WKWK	Wheeling, W.Va.	1400
WKWS	Rocky Mount, Va.	1290
WKXL	Concord, N.H.	1450
WKXV	Knoxville, Tenn.	900
WKXY	Sarasota, Fla.	930
WKY	Oklahoma City, Okla.	930
WKYB	Paducah, Ky.	570
WKYN	Rio Piedras, P.R.	630
WKYO	Caro, Mich.	1360
WKYR	Keyser, W.Va.	1270
WKYW	Louisville, Ky.	900
WKZI	Casey, Ill.	800
WKZO	Kalamazoo, Mich.	590
WLAC	Nashville, Tenn.	1510
WLAD	Danbury, Conn.	800
WLAF	LaFollette, Tenn.	1450
WLAG	La Grange, Ga.	1240
WLAK	Lakeland, Fla.	1430
WLAM	Lewiston, Maine	1470
WLAN	Lancaster, Pa.	1390
WLAP	Lexington, Ky.	630
WLAQ	Rome, Ga.	1410
WLAR	Athens, Tenn.	1450
WLAS	Jacksonville, N.C.	910
WLAT	Conway, S.C.	1330
WLAU	Laurel, Miss.	1600
WLAV	Grand Rapids, Mich.	1340
WLAW	Lawrenceville, Ga.	1360
WLAY	Muscle Shoals, Ala.	1450
WLBA	Gainesville, Ga.	1580
WLBB	Carrollton, Ga.	1100
WLBC	Muncie, Ind.	1340
WLBE	Leesburg, Fla.	790
WLBG	Laurens, S.C.	860
WLBH	Mattoon, Ill.	1170
WLBI	Denham Springs, La.	1220
WLBJ	Bowling Green, Ky.	1410
WLBK	DeKalb, Ill.	1360
WLBL	Stevens Point, Wis.	930
WLBN	Lebanon, Ky.	1590
WLBR	Lebanon, Pa.	1280
WLBS	Centerville, Miss.	1580
WLBZ	Bangor, Maine	620
WLCK	Scottsville, Ky.	1250
WLCM	Lancaster, S.C.	1360
WLCN	Laurensburg, N.C.	1300
WLCO	Eustis, Fla.	1240
WLCS	Baton Rouge, La.	910
WLCX	LaCrosse, Wis.	1490
WLCY	St. Petersburg, Fla.	1380
WLDB	Atlantic City, N.J.	1490
WLDS	Jacksonville, Ill.	1180
WLDY	Ladysmith, Wis.	1340
WLEA	Hornell, N.Y.	1480
WLEC	Sandusky, Ohio	1450
WLEE	Richmond, Va.	1480
WLEM	Emporium, Pa.	1240
WLEO	Ponce, P.R.	1170
WLET	Toccoa, Ga.	1420
WLEU	Erie, Pa.	1450
WLEW	Bad Axe, Mich.	1340
WLFA	Lafayette, Ga.	1590
WLFH	Little Falls, N.Y.	1230
WLGS	Lawrenceville, Va.	580
WLIB	New York, N.Y.	1190
WLIJ	Shelbyville, Tenn.	1580
WLIK	Newport, Tenn.	1270
WLIL	Lenoir City, Tenn.	730
WLIP	Kenosha, Wis.	1050
WLIQ	Mobile, Ala.	1360
WLIS	Old Saybrook, Conn.	1420
WLIV	Livingston, Tenn.	920
WLIZ	Lake Worth, Fla.	1380
WLKB	Decatur, Ga.	1310
WLKM	Three Rivers, Mich.	1510
WLKW	Providence, R.I.	990
WLLE	Raleigh, N.C.	570
WLLH	Lowell, Mass.	1400
WLLL	Lynchburg, Va.	930
WLLY	Wilson, N.C.	1350
WLMJ	Jackson, Ohio	1280
WLNA	Peekskill, N.Y.	1420
WLNG	Sag Harbor, N.Y.	1600
WLNH	Laconia, N.H.	1350
WLOA	Braddock, Pa.	1550
WLOB	Portland, Maine	1310
WLOC	Munfordville, Ky.	1150
WLOD	Pompano Beach, Fla.	980
WLOE	Leaksville, N.C.	1490
WLOF	Orlando, Fla.	950
WLOG	Logan, W.Va.	1230
WLOH	Princeton, W.Va.	1490
WLOI	LaPorte, Ind.	1540
WLOK	Memphis, Tenn.	1480
WLOL	Minneapolis, Minn.	1330
WLON	Lincolnton, N.C.	1050

WHITE'S RADIO LOG

C.L.	Location	Kc.
WLOS	Asheville, N.C.	1380
WLOU	Louisville, Ky.	1350
WLOW	Aiken, S.C.	1300
WLOX	Biloxi, Miss.	1490
WLPM	Suffolk, Va.	1460
WLPO	LaSalle, Ill.	1220
WLPS	Lehighton, Pa.	1150
WLS	Chicago, Ill.	890
WLSB	Copper Hill, Tenn.	1400
WLSC	Loris, S.C.	1570
WLSO	Big Stone Gap, Va.	1220
WLSE	Wallace, N.C.	1400
WLSH	Lansford, Pa.	1410
WLSI	Pikeville, Ky.	900
WLSM	Louisville, Miss.	1270
WLST	Escanaba, Mich.	600
WLSV	Wellsville, N.Y.	790
WLTC	Gastonia, N.C.	1370
WLTN	Littleton, N. H.	1400
WLUV	Loves Park, Ill.	1520
WLVA	Lynchburg, Va.	590
WLUX	Baton Rouge, La.	1550
WLVN	Nashville, Tenn.	1560
WLW	Cincinnati, Ohio	700
WLWO (V.O.A.).	Marathon, Fla.	1040
WLWO (V.O.A.)	Marathon, Fla.	1180
WLYB	Albany, Ga.	1250
WLYC	Williamsport, Pa.	1050
WLYN	Lynn, Mass.	1360
WLYO	New Orleans, La.	940
WMAB	Munising, Mich.	1400
WMAC	Netter, Ga.	1360
WMAD	Madison, Wis.	1550
WMAF	Madison, Fla.	1230
WMAG	Forest, Miss.	860
WMAJ	State College, Pa.	1450
WMAK	Nashville, Tenn.	1300
WMAL	Washington, D.C.	630
WMAM	Marinette, Wis.	570
WMAN	Mansfield, Ohio	1400
WMAP	Monroe, N.C.	1060
WMAQ	Chicago, Ill.	670
WMAS	Springfield, Mass.	1450
WMAT	Lansing, Mich.	1010
WMAX	Grand Rapids, Mich.	1480
WMAY	Springfield, Ill.	970
WMAZ	Macon, Ga.	940
WMBA	Ambridge, Pa.	1460
WMBC	Macon, Miss.	1400
WMBD	Peoria, Ill.	1470
WMBG	Richmond, Va.	1380
WMBH	Joplin, Mo.	1450
WMBI	Chicago, Ill.	1110
WMBL	Morehead City, N.C.	740
WMBM	Miami Beach, Fla.	1490
WMBN	Petoskey, Mich.	1340
WMBO	Auburn, N.Y.	1340
WMBR	Jacksonville, Fla.	1460
WMBS	Uniontown, Pa.	590
WMBT	Shenandoah, Pa.	1530
WMC	Memphis, Tenn.	790
WMCA	New York, N.Y.	570
WMCH	Church Hill, Tenn.	1260
WMCP	Columbia, Tenn.	1280
WMCR	Oneida, N.Y.	1600
WMCW	Harvard, Ill.	1600
WMDC	Hazlehurst, Miss.	1220
WMOD	Fajardo, P.R.	1480
WMDN	Midland, Mich.	1490
WMEG	Eau Gallie, Fla.	920
WMEK	Chase City, Va.	980
WMEL	Pensacola, Fla.	610
WMEN	Tallahassee, Fla.	1330
WMEV	Marion, Va.	1010
WMEX	Boston, Mass.	1510
WMFC	Monroeville, Ala.	1360
WMFD	Wilmington, N.C.	630
WMFG	Hibbing, Minn.	1240
WMFJ	Daytona Beach, Fla.	1450
WMFR	High Point, N.C.	1230
WMGA	Moultrie, Ga.	1400
WMGR	Bainbridge, Ga.	930
WMGS	Bowling Green, Ohio	730
WMGW	Meadville, Pa.	1490
WMGY	Montgomery, Ala.	800
WMID	Atlantic City, N.J.	1340
WMIE	Miami, Fla.	1140
WMIK	Middlesboro, Ky.	560
WMIL	Milwaukee, Wis.	1290
WMIN	Mpls.-St. Paul, Minn.	1400
WMIQ	Iron Mountain, Mich.	1450
WMIR	Lake Geneva, Wis.	1550
WMIS	Natchez, Miss.	1240
WMIX	Mt. Vernon, Ill.	940
WMJM	Cordele, Ga.	1490
WMKR	Millinocket, Me.	1240
WMLF	Pineville, Ky.	1230
WMLO	Beverly, Mass.	1570
WMLS	Sylacauga, Ala.	1290
WMLT	Dublin, Ga.	1330
WMMB	Melbourne, Fla.	1240
WMMH	Marshall, N.C.	1460
WMMM	Westport, Conn.	1260
WMMN	Fairmont, W.Va.	920
WMMW	Meriden, Conn.	1470
WMNA	Gretna, Va.	730
WMNB	No. Adams, Mass.	1230
WMNC	Morganton, N.C.	1430
WMNE	Menomonie, Wis.	1360
WMNI	Columbus, Ohio	920
WMNS	Olean, N.Y.	1360
WMNT	Manati, P.R.	1500
WMNZ	Montezuma, Ga.	1050
WMOA	Marietta, Ohio	1490
WMOC	Chattanooga, Tenn.	1450
WMOD	Moundsville, W.Va.	1370
WMOE	Mobile, Ala.	1550
WMOG	Brunswick, Ga.	1490
WMOH	Hamilton, Ohio	1450
WMOK	Metropolis, Ill.	920
WMON	Montgomery, W.Va.	1340
WMOP	Ocala, Fla.	900
WMOR	Morehead, Ky.	1330
WMOU	Berlin, N.H.	1230
WMOV	Ravenswood, W.Va.	1360
WMOX	Meridian, Miss.	1240
WMOZ	Mobile, Ala.	960
WMPA	Aberdeen, Miss.	1240
WMPC	Lapeer, Mich.	1230
WMPL	Hancock, Mich.	920
WMPM	Smithfield, N.C.	1270
WMPO	Middleport-Pomeroy, Ohio	1390
WMPP	Chicago Heights, Ill.	1470
WMPS	Memphis, Tenn.	680
WMPT	So. Williamsport, Pa.	1450
WMRB	Greenville, S.C.	1490
WMRC	Milford, Mass.	1490
WMRE	Monroe, Ga.	1490
WMRF	Lewistown, Pa.	1490
WMRI	Marion, Ind.	860
WMRN	Marion, Ohio	1490
WMRO	Aurora, Ill.	1280
WMRP	Flint, Mich.	1570
WMSA	Massena, N.Y.	1340
WMSG	Oakland, Md.	1050
WMSJ	Sylva, N.C.	1480
WMSK	Morganfield, Ky.	1550
WMSL	Decatur, Ala.	1400
WMSR	Manchester, Tenn.	1320
WMST	Mt. Sterling, Ky.	1150
WMT	Cedar Rapids, Iowa	600
WMTA	Central City, Ky.	1380
WMTC	Vancleve, Ky.	730
WMTD	Hinton, W. Va.	1380
WMTE	Manistee, Mich.	1340
WMTL	Leitchfield, Ky.	1580
WMTM	Moultrie, Ga.	1300
WMTN	Morristown, Tenn.	1300
WMTR	Morristown, N.J.	1250
WMTS	Murfreesboro, Tenn.	860
WMUS	Muskegon, Mich.	1090
WMUU	Greenville, S.C.	1260
WMVA	Martinsville, Va.	1450
WMVB	Millville, N.J.	1440
WMVG	Milledgeville, Ga.	1450
WMVO	Mt. Vernon, Ohio	1300
WMVR	Sidney, Ohio	1080
WMYB	Myrtle Beach, S.C.	1450
WMYN	Mayodan, N.C.	1420
WMYR	Ft. Myers, Fla.	1410
WNAB	Bridgeport, Conn.	1450
WNAC	Boston, Mass.	680
WNAD	Norman, Okla.	640
WNAE	Warren, Pa.	1310
WNAG	Grenada, Miss.	1400
WNAH	Nashville, Tenn.	1360
WNAK	Nanticoke, Pa.	730
WNAM	Neenah, Wis.	1280
WNAR	Norristown, Pa.	1110
WNAT	Natchez, Miss.	1450
WNAU	New Albany, Miss.	1470
WNAV	Annapolis, Md.	1430
WNAX	Yankton, S.Oak.	570
WNBC	New York, N.Y.	660
WNBF	Binghamton, N.Y.	1290
WNBH	New Bedford, Mass.	1340
WNBP	Newburyport, Mass.	1470
WNBS	Murray, Ky.	1340
WNBT	Wellsboro, Pa.	1490
WNBZ	Saranac Lake, N.Y.	1240
WNCA	Siler City, N.C.	1570
WNCC	Barnesboro, Pa.	950
WNCG	N. Charleston, S.C.	910
WNCO	Ashland, Ohio	1340
WNDB	Daytona Beach, Fla.	1150
WNDR	Syracuse, N.Y.	1260
WNOU	South Bend, Ind.	1490
WNDY	Indianapolis, Ind.	1500
WNEB	Worcester, Mass.	1230
WNEG	Taccoa, Ga.	630
WNER	Live Oak, Fla.	1250
WNES	Central City, Ky.	1050
WNEW	New York, N.Y.	1130
WNEX	Macon, Ga.	1400
WNGA	Nashville, Ga.	1600
WNGO	Mayfield, Ky.	1320
WNHC	New Haven, Conn.	1340
WNIA	Cheektowaga, N.Y.	1230
WNIK	Arecibo, P.R.	1230
WNIL	Niles, Mich.	1290
WNIO	Niles, Ohio	1540
WNJH	Hammonton, N.J.	1580
WNJR	Newark, N.J.	1430
WNKY	Neon, Ky.	1480
WNLC	New London, Conn.	1510
WNLK	Norwalk, Conn.	1350
WNMP	Evanston, Ill.	1590
WNNC	Newton, N.C.	1230
WNNJ	Newton, N.J.	1360
WNNT	Warsaw, Va.	690
WNOE	New Orleans, La.	1060
WNOG	Naples, Fla.	1270
WNOH	Raleigh, N. C.	1550
WNOK	Columbia, S.C.	1230
WNOO	Chattanooga, Tenn.	1260
WNOP	Newport, Ky.	740
WNOR	Norfolk, Va.	1230
WNOS	High Point, N.C.	1590
WNOW	York, Pa.	1250
WNOX	Knoxville, Tenn.	990
WNPS	New Orleans, La.	1450
WNPT	Tuscaloosa, Ala.	1280
WNPV	Lansdale, Pa.	1440
WNRG	Grundy, Va.	940
WNRI	Woonsocket, R.I.	1380
WNRK	Newark, Del.	1260
WNRV	Narrows, Va.	990
WNSL	Laurel, Miss.	1260
WNSM	Valparaiso-Niceville, Florida	1340
WNTT	Tazewell, Tenn.	1250
WNUE	Ft. Walton Bch., Fla.	1400
WNUZ	Talladega, Ala.	1230
WNVA	Norton, Va.	1350
WNVL	Nicholasville, Ky.	1250
WNVY	Pensacola, Fla.	1230
WNXT	Portsmouth, Ohio	1260
WNYC	New York, N.Y.	830
WOAI	San Antonio, Tex.	1200
WOAP	Owosso, Mich.	1080
WOAY	Oak Hill, W.Va.	860
WOBS	Jacksonville, Fla.	1360
WOBT	Rhinelander, Wis.	1240
WOC	Davenport, Iowa	1420
WOCB	W. Yarmouth, Mass.	1240
WOCH	North Vernon, Ind.	1460
WOCK	Okeechobee, Fla.	1570
WODY	Bassett, Va.	900
WOHI	E. Liverpool, Ohio	1490
WOHO	Toledo, Ohio	1470
WOHP	Bellefontaine, Ohio	1390
WOHS	Shelby, N.C.	730
WOI	Ames, Iowa	640
WOIA	Saline, Mich.	1290
WOIC	Columbia, S.C.	1320
WOKA	Douglas, Ga.	1310
WOKB	Winter Garden, Fla	1600
WOKE	Charleston, S.C.	1340
WOKJ	Jackson, Miss.	1550
WOKK	Meridian, Miss.	1450
WOKO	Albany, N.Y.	1460
WOKS	Columbus, Ga.	1340
WOKW	Brockton, Mass.	1410
WOKY	Milwaukee, Wis.	920
WOKZ	Alton, Ill.	1570
WOL	Washington, D.C.	1450
WOLD	Marion, Va.	1330
WOLF	Syracuse, N.Y.	1490
WOLS	Florence, S. C.	1230
WOMI	Owensboro, Ky.	1490
WOMP	Bellaire, Ohio	1290
WOMT	Manitowoc, Wis.	1240
WONA	Winona, Miss.	1570
WOND	Pleasantville, N.J.	1400
WONE	Dayton, Ohio	980
WONN	Lakeland, Fla.	1230
WONW	Defiance, Ohio	1280
WOOD	Grand Rapids, Mich.	1300
WOOF	Dothan, Ala.	560
WOOK	Washington, D.C.	1340
WOOO	Deland, Fla.	1310
WOOW	Greenville, N.C.	1340
WOPA	Oak Park, Ill.	1490
WOPI	Bristol, Tenn.	1490
WOR	New York, N.Y.	710
WORA	Mayaguez, P.R.	760
WORC	Worcester, Mass.	1310
WORD	Spartanburg, S.C.	910
WORG	Orangeburg, S.C.	1580
WORK	York, Pa.	1350
WORL	Boston, Mass.	950
WORM	Savannah, Tenn.	1010
WORT	New Smyrna Beach, Florida	1550
WORX	Madison, Ind.	1270
WOSC	Fulton, N.Y.	1300
WOSH	Oshkosh, Wis.	1490
WOSL	Kissimmee, Fla.	1220
WOSU	Columbus, Ohio	820
WOTR	Corry, Pa.	1370
WOTT	Watertown, N.Y.	1410
WOTW	Nashua, N.H.	900
WOUB	Athens, Ohio	1340
WOVE	Welch, W.Va.	1340
WOW	Omaha, Nebr.	590
WOWE	Allegan, Mich.	1580
WOWI	New Albany, Ind.	1570
WOWL	Florence, Ala.	1240
WOWO	Ft. Wayne, Ind.	1190
WOWW	Naugatuck, Conn.	860
WOWY	Clewiston, Fla.	500d
WOXF	Oxford, N.C.	1340
WOZK	Ozark, Ala.	900
WPAB	Ponce, P.R.	550
WPAC	Patchogue, N.Y.	1580
WPAD	Paducah, Ky.	1450
WPAG	Ann Arbor, Mich.	1050
WPAL	Charleston, S.C.	730
WPAM	Pottsville, Pa.	1450
WPAP	Fernandina Beach, Florida	1570
WPAQ	Mount Airy, N.C.	740
WPAR	Parkersburg, W.Va.	1450
WPAT	Paterson, N.J.	930
WPAX	Thomasville, Ga.	1240
WPAY	Portsmouth, Ohio	1400
WPAZ	Pottstown, Pa.	1370
WPBC	Minneapolis, Minn.	980
WPCC	Clinton, S.C.	1400
WPCF	Panama City, Fla.	1430
WPCO	Mt. Vernon, Ind.	1590
WPOM	Potsdam, N.Y.	1470
WPOQ	Jacksonville, Fla.	600
WPOR	Portage, Wis.	1350
WPDX	Clarksburg, W.Va.	750
WPEG	Winston-Salem, N.C.	1550
WPEH	Louisville, Ga.	1420
WPEL	Montrose, Pa.	1250
WPEN	Philadelphia, Pa.	950
WPEO	Peoria, Ill.	1020
WPEP	Taunton, Mass.	1570
WPET	Greensboro, N.C.	950
WPFA	Pensacola, Fla.	790
WPFB	Middletown, Ohio	910
WPFE	Eastman, Ga.	1580
WPFP	Park Falls, Wis.	1450
WPGA	Perry, Ga.	980
WPGC	Bradbury Hghts., Md.	1580
WPGF	Burgaw, N. C.	1470
WPGW	Portland, Ind.	1440
WPHB	Philipsburg, Pa.	1260
WPHC	Waverly, Tenn.	1540
WPHN	Liberty, Ky.	1560
WPIC	Sharon, Pa.	790
WPID	Piedmont, Ala.	1280
WPIK	Alexandria, Va.	730
WPIN	St. Petersburg, Fla.	680
WPIT	Pittsburgh, Pa.	730
WPKE	Pikeville, Ky.	1240
WPKO	Waverly, Ohio	1380
WPKY	Princeton, Ky.	1580
WPLA	Plant City, Fla.	910
WPLB	Greenville, Mich.	1380
WPLK	Rockmart, Ga.	1220
WPLM	Plymouth, Mass.	1390
WPLO	Atlanta, Ga.	590
WPLY	Plymouth, Wis.	1420
WPMB	Vandalia, Ill.	1500
WPME	Punxsutawney, Pa.	1540
WPMH	Portsmouth, Va.	1010
WPMP	Pascagoula, Miss.	1580
WPNC	Plymouth, N.C.	1470
WPNF	Brevard, N.C.	1240
WPNX	Phenix City, Ala.	1460
WPON	Pontiac, Mich.	1460
WPOP	Hartford, Conn.	1410
WPOR	Portland, Maine	1490
WPOW	New York, N.Y.	1330
WPPA	Pottsville, Pa.	1360
WPQR	McKeesport, Pa.	1360
WPRA	Mayaguez, P.R.	990
WPRC	Lincoln, Ill.	1370
WPRE	Prairie Du Chien, Wis.	980
WPRN	Butler, Ala.	1240
WPRO	Providence, R.I.	630
WPRP	Ponce, P.R.	910
WPRS	Paris, Ill.	1440
WPRT	Prestonsburg, Ky.	960
WPRW	Manassas, Va.	1460
WPRY	Perry, Fla.	1400
WPTF	Raleigh, N.C.	680
WPTL	Canton, N.C.	920
WPTN	Cookeville, Tenn.	1500
WPTR	Albany, N.Y.	1540
WPTS	Pittston, Pa.	1540
WPTW	Piqua, Ohio	1570
WPTX	Lexington Pk., Md.	920
WPUV	Pulaski, Va.	1580
WPVA	Colonial Hghts., Va.	1290
WPVL	Painesville, Ohio	1460
WPXE	Starke, Fla.	1490
WPXY	Greenville, N. C.	1550
WPYB	Benson, N.C.	1580
WQAM	Miami, Fla.	560
WQBC	Vicksburg, Miss.	1420
WQOY	Calais, Maine	1230
WQIC	Meridian, Miss.	1390
WQIK	Jacksonville, Fla.	1280
WQIZ	St. George, S. C.	1300
WQMN	Superior, Wis.	1320
WQMR	Silver Spring, Md.	1050
WQOK	Greenville, S.C.	1440
WQSN	Charleston, S.C.	1450
WQSR	Solvay, N.Y.	1320
WQTE	Monroe, Mich.	560
WQTW	Latrobe, Pa.	1570
WQTY	Arlington, Fla.	1220
WQUA	Moline, Ill.	1230
WQVA	Quantico, Va.	1530
WQXI	Atlanta, Ga.	790
WQXL	Columbia, S.C.	1320
WQXQ	Ormond Bch., Fla.	1380
WQXR	New York, N.Y.	1560
WQXT	Palm Beach, Fla.	1340
WRAA	Luray, Va.	1330
WRAB	Arab, Ala.	1380

C.L.	Location	Kc.
WRAC	Racine, Wis.	1460
WRAD	Radford, Va.	1460
WRAG	Carrollton, Ala.	590
WRAI	Rio Piedras, P. R.	1520
WRAJ	Anna, Ill.	1440
WRAK	Williamsport, Pa.	1400
WRAL	Raleigh, N.C.	1240
WRAM	Monmouth, Ill.	1330
WRAN	Dover, N.J.	1510
WRAP	Norfolk, Va.	850
WRAW	Reading, Pa.	1340
WRAY	Princeton, Ind.	1250
WRBB	Tarpon Springs, Fla.	1470
WRBC	Jackson, Miss.	1300
WRBD	Pampano Beach, Fla.	1470
WRBL	Columbus, Ga.	1420
WRC	Washington, D.C.	980
WRCD	Dalton, Ga.	1430
WRCK	Tuscumbia, Ala.	1410
WRCO	Richland, Wis.	1450
WRCS	Ahoskie, N.C.	970
WRCV	Philadelphia, Pa.	1060
WRDB	Reedsburg, Wis.	1400
WRDO	Augusta, Maine	1400
WRDS	S. Charleston, W.Va.	1410
WRDW	Augusta, Ga.	1480
WREB	Holyoke, Mass.	930
WREC	Memphis, Tenn.	600
WREL	Lexington, Va.	1450
WREM	Remsen, N.Y.	1480
WREN	Topeka, Kans.	1250
WREO	Ashtabula, Ohio	970
WREV	Reidsville, N.C.	1220
WRFB	Tallahassee, Fla.	1410
WRFC	Athens, Ga.	960
WRFD	Worthington, Ohio	880
WRFS	Alexander City, Ala.	1050
WRGA	Rome, Ga.	1470
WRGM	Richmond, Va.	1590
WRGS	Rogersville, Tenn.	1370
WRHC	Jacksonville, Fla.	1400
WRHI	Rock Hill, S.C.	1340
WRIB	Providence, R.I.	1220
WRIC	Richlands, Va.	540
WRIG	Wausau, Wis.	1400
WRIM	Pahokee, Fla.	1250
WRIP	Rossville, Ga.	980
WRIS	Roanoke, Va.	1410
WRIT	Milwaukee, Wis.	1340
WRIV	Riverhead, N.Y.	1390
WRIX	Griffin, Ga.	1410
WRIZ	Coral Gables, Fla.	1550
WRJC	Mauston, Wis.	1270
WRJN	Racine, Wis.	1400
WRJS	San German, P. R.	1060
WRJW	Picayune, Miss.	1320
WRKB	Kannapolis, N.C.	1460
WRKD	Rockland, Maine	1450
WRKH	Rockwood, Tenn.	580
WRKL	New York, N.Y.	910
WRKM	Carthage, Tenn.	1350
WRKT	Cocoa Beach, Fla.	1300
WRLD	Lanitt, Ala.	1490
WRMA	Montgomery, Ala.	950
WRMF	Titusville, Fla.	1050
WRMN	Elgin, Ill.	1410
WRMS	Beardstown, Ill.	790
WRMT	Rocky Mount, N.C.	1490
WRNB	New Bern, N.C.	1490
WRNE	Wis. Rapids, Wis.	1220
WRNL	Richmond, Va.	910
WRNY	Rome, N.Y.	1350
WROA	Gulfport, Miss.	1390
WROB	West Point, Miss.	1450
WROC	Rochester, N.Y.	1280
WROD	Daytona Beach, Fla.	1340
WROK	Rockford, Ill.	1440
WROL	Fountain City, Tenn.	1490
WROM	Rome, Ga.	710
WRON	Ronceverte, W.Va.	1400
WROS	Scottsboro, Ala.	1330
WROV	Roanoke, Va.	1240
WROW	Albany, N.Y.	590
WROX	Clarksdale, Miss.	1450
WROY	Carmi, Ill.	1460
WROZ	Evansville, Ind.	1400
WRPB	Warner Robbins, Ga.	1350
WRPM	Poplarville, Miss.	1530
WRR	Dallas, Tex.	1310
WRRR	Rockford, Ill.	1330
WRRZ	Clinton, N.C.	880
WRSA	Saratoga Sprgs., N.Y.	1280
WRSC	State College, Pa.	1390
WRSL	Stanford, Ky.	1520
WRSW	Warsaw, Ind.	1480
WRTA	Altoona, Pa.	1240
WRTL	Rantoul, Ill.	250d
WRUF	Gainesville, Fla.	850
WRUM	Rumford, Maine	790
WRUN	Utica, N.Y.	1150
WRUS	Russellville, Ky.	610
WRVA	Richmond, Va.	1140
WRVK	Mt. Vernon, Ky.	1460
WRVM	Rochester, N.Y.	680
WRWD	Augusta, Ga.	1480
WRWH	Cleveland, Ga.	1380
WRWJ	Selma, Ala.	1570
WRXO	Roxboro, N.C.	1430
WRYM	New Britain, Conn.	840
WRYT	Pittsburgh, Pa.	1250
WSAC	Fort Knox, Ky.	1470
WSAF	Sarasota, Fla.	1220
WSAI	Cincinnati, Ohio	1360
WSAJ	Grove City, Pa.	1340
WSAL	Logansport, Ind.	1230
WSAM	Saginaw, Mich.	1400
WSAN	Allentown, Pa.	1470
WSAO	Sanitobia, Miss.	1550
WSAR	Fall River, Mass.	1480
WSAT	nr, Salisbury, N.C.	1280
WSAU	Wausau, Wis.	550
WSAV	Savannah, Ga.	630
WSAY	Rochester, N.Y.	1370
WSAZ	Huntington, W.Va.	930
WSB	Atlanta, Ga.	750
WSBA	Savannah, Ga.	1400
WSBB	New Smyrna Beach, Florida	1230
WSBC	Chicago, Ill.	1240
WSBS	Gt. Barrington, Mass.	860
WSBT	South Bend, Ind.	960
WSCM	Panama City Beach, Florida	1290
WSCR	Scranton, Pa.	1320
WSDC	Mocksville, N.C.	1560
WSDR	Sterling, Ill.	1240
WSEB	Sebring, Fla.	1340
WSEL	Pontotoc, Miss.	1440
WSEM	Donaldsonville, Ga.	1500
WSEN	Baldwinsville, N.Y.	1050
WSER	Elkton, Md.	1550
WSET	Glen Falls, N.Y.	1410
WSEV	Sevierville, Tenn.	930
WSFB	Quitman, Ga.	1490
WSFC	Somerset, Ky.	1240
WSFR	Sanford, Fla.	1360
WSFT	Thomaston, Ga.	1220
WSGA	Savannah, Ga.	1400
WSGB	Sutton, W.Va.	1490
WSGC	Elberton, Ga.	1400
WSGN	Birmingham, Ala.	610
WSGO	Oswego, N.Y.	1440
WSGW	Saginaw, Mich.	790
WSHB	Raeford, N.C.	1400
WSHF	Sheffield, Ala.	1290
WSHN	Fremont, Mich.	1550
WSHO	New Orleans, La.	1230
WSHP	Shippenburg, Pa.	1480
WSIB	Beaufort, S.C.	1490
WSIC	Statesville, N.C.	1400
WSID	Baltimore, Md.	1010
WSIG	Mount Jackson, Va.	790
WSIM	Prichard, Ala.	1270
WSIP	Paintsville, Ky.	1490
WSIR	Winter Haven, Fla.	1490
WSIV	Pekin, Ill.	1490
WSIX	Nashville, Tenn.	980
WSJC	Magee, Miss.	1280
WSJM	St. Joseph, Mich.	1400
WSJR	Madawska, Me.	1000
WSJS	Winston-Salem, N.C.	600
WSKI	Montpelier-Barre, Vt.	1240
WSKP	Miami, Fla.	1450
WSKT	S. Knoxville, Tenn.	1580
WSKY	Asheville, N.C.	1230
WSLB	Ogdensburg, N.Y.	1400
WSLG	Clermont, Fla.	1340
WSLI	Jackson, Miss.	930
WSLM	Salem, Ind.	1220
WSLS	Roanoke, Va.	610
WSM	Nashville, Tenn.	650
WSMA	Smyrna, Ga.	1550
WSMB	New Orleans, La.	1350
WSME	Sanford, Maine	1220
WSMG	Greenville, Tenn.	1450
WSMI	Litchfield, Ill.	1540
WSMN	Nashua, N.H.	1590
WSMT	Sparta, Tenn.	1050
WSNE	Cummings, Ga.	1410
WSNJ	nr. Bridgeton, N.J.	1240
WSNO	Barre, Vt.	1450
WSNT	Sandersville, Ga.	1490
WSNW	Seneca Twnshp., S.C.	1150
WSNY	Schenectady, N.Y.	1240
WSOC	Charlotte, N.C.	930
WSOK	Savannah, Ga.	1230
WSOL	Tampa, Fla.	1300
WSON	Henderson, Ky.	860
WSOO	Slt. Ste. Marie, Mich.	1230
WSOQ	No. Syracuse, N.Y.	1220
WSOR	Windsor, Conn.	1480
WSOY	Decatur, Ill.	1340
WSPA	Spartanburg, S.C.	950
WSPB	Sarasota, Fla.	1450
WSPD	Toledo, Ohio	1370
WSPF	Hickory, N.C.	1000
WSPN	Saratoga Sprgs., N.Y.	900
WSPR	Springfield, Mass.	1270
WSPT	Stevens Pt., Wis.	1010
WSPZ	Spencer, W.Va.	1400
WSRA	Milton, Fla.	1490
WSRC	Durham, N.C.	1410
WSRO	Marlborough, Mass.	1470
WSRW	Hillsboro, Ohio	1590
WSSB	Durham, N.C.	1490
WSSC	Sumter, S.C.	1340
WSSO	Starkville, Miss.	1230
WSSV	Petersburg, Va.	1240
WSTC	Stamford, Conn.	1400
WSTH	Taylorsville, N. C.	860
WSTK	Woodstock, Va.	1230
WSTL	Eminence, Ky.	1600
WSTP	Salisbury, N.C.	1490
WSTR	Sturgis, Mich.	1230
WSTS	Massena, N.Y.	1050
WSTU	Suart, Fla.	1450
WSTV	Steubenville, Ohio	1340
WSUB	Groton, Conn.	980
WSUH	Oxford, Miss.	1420
WSUI	Iowa City, Iowa	910
WSUN	St. Petersburg, Fla.	620
WSUX	Seaford, Del.	1280
WSUZ	Palatka, Fla.	800
WSVA	Harrisonburg, Va.	550
WSVL	Shelbyville, Ind.	1520
WSVN	Valdese, N.C.	1490
WSVS	Crewe, Va.	800
WSWN	Belle Glade, Fla.	900
WSWV	Pennington Gap, Va.	1570
WSWW	Platteville, Wis.	1590
WSYB	Rutland, Vt.	1380
WSYD	Mt. Airy, N.C.	1300
WSYL	Sylvania, Ga.	1490
WSYR	Syracuse, N.Y.	570
WTAB	Tabor City, N.C.	1370
WTAC	Flint, Mich.	600
WTAD	Quincy, Ill.	930
WTAG	Worcester, Mass.	580
WTAL	Tallahassee, Fla.	1450
WTAN	Clearwater, Fla.	1340
WTAO	Cambridge, Mass.	1440
WTAP	Parkersburg, W.Va.	1230
WTAQ	LaGrange, Ill.	1300
WTAR	Norfolk, Va.	790
WTAW	Bryan, Tex.	1150
WTAX	Springfield, Ill.	1240
WTAY	Robinson, Ill.	1570
WTBC	Tuscaloosa, Ala.	1230
WTBF	Troy, Ala.	970
WTBO	Cumberland, Md.	1450
WTCB	Flomaton, Ala.	990
WTCH	Shawano, Wis.	960
WTCJ	Tell City, Ind.	1230
WTCM	Traverse City, Mich.	1400
WTCN	Minneapolis, Minn.	1280
WTCO	Campbellsville, Ky.	1450
WTCR	Ashland, Ky.	1420
WTCS	Fairmont, W.Va.	1490
WTCW	Whitesburg, Ky.	920
WTEL	Philadelphia, Pa.	860
WTGA	Thomaston, Ga.	1590
WTHG	Jackson, Ala.	1290
WTHI	Terre Haute, Ind.	1480
WTHM	Lapeer, Mich.	1530
WTHN	Thomaston, Ga.	1500
WTHR	Panama City, Fla.	1480
WTHT	Hazleton, Pa.	1300
WTIC	Hartford, Conn.	1080
WTID	Newport News, Va.	1270
WTIF	Tifton, Ga.	1340
WTIG	Massillon, Ohio	990
WTIK	Durham, N.C.	1280
WTIL	Mayaguez, P.R.	1310
WTIM	Taylorville, Ill.	1300
WTIP	Charleston, W.Va.	1410
WTIX	New Orleans, La.	1240
WTJH	East Point, Ga.	690
WTJS	Jackson, Tenn.	1260
WTKM	Hartford, Wis.	1390
WTKO	Ithaca, N.Y.	1540
WTKY	Tompkinsville, Ky.	1470
WTLB	Utica, N.Y.	1370
WTLK	Taylorsville, N.C.	1310
WTLO	Somerset, Ky.	1570
WTLS	Tallasee, Ala.	1480
WTMA	Charleston, S.C.	1300
WTMB	Tomah, Wis.	1250
WTMC	Ocala, Fla.	1390
WTMJ	Milwaukee, Wis.	1290
WTMP	Tampa, Fla.	620
WTMT	Louisville, Ky.	1150
WTNC	Thomasville, N.C.	620
WTND	Orangeburg, S.C.	790
WTNS	Coshocton, Ohio	920
WTNT	Tallahassee, Fla.	1560
WTOB	Winston-Salem, N.C.	1270
WTOC	Savannah, Ga.	1380
WTOD	Toledo, Ohio	1290
WTOE	Snruce Pine, N.C.	1560
WTOJ	Tomah, Wis.	1470
WTOL	Toledo, Ohio	1460
WTON	Staunton, Va.	1230
WTOP	Washington, D.C.	1240
WTOR	Torrington, Conn.	1500
WTOT	Marianna, Fla.	610
WTPR	Paris, Tenn.	980
WTRA	Latrobe, Pa.	710
WTRB	Rinley, Tenn.	1480
WTRC	Elkhart, Ind.	1570
WTRL	Bradenton, Fla.	1340
WTRN	Tyrone, Pa.	1490
WTRO	Dyersburg, Tenn.	1330
WTRP	LaGrange, Ga.	620
WTRR	Sanford, Fla.	1400
WTRU	Muskegon, Mich.	1600
WTRW	Two Rivers, Wis.	1590
WTRX	Flint, Mich.	1330
WTRY	Troy, N.Y.	980
WTSA	Brattleboro, Vt.	1450
WTSB	Lumberton, N.C.	1340
WTSL	Hanover-Lebanon, New Hampshire	1400
WTSN	Dover, N.H.	1270
WTSV	Claremont, N.H.	1230
WTTR	Vero Beach, Fla.	1490
WTTC	Towanda, Pa.	1550
WTTF	Tiffin, Ohio	1600
WTTH	Port Huron, Mich.	1380
WTTL	Madisonville, Ky.	1310
WTTM	Trenton, N.J.	920
WTTN	Watertown, Wis.	1580
WTTR	Westminster, Md.	1470
WTTS	Bloomington, Ind.	1370
WTTT	Amherst, Mass.	1430
WTUF	Mobile, Ala.	840
WTUG	Tuscaloosa, Ala.	790
WTUP	Tupelo, Miss.	1490
WTUX	Wilmington, Del.	1290
WTVB	Coldwater, Mich.	1590
WTVL	Waterville, Maine	1490
WTVN	Columbus, Ohio	610
WTWA	Thomson, Ga.	1240
WTWB	Auburndale, Fla.	1570
WTWN	St. Johnsbury, Vt.	1340
WTXL	W. Spgfd., Mass.	1490
WTYC	Rock Hill, S.C.	1150
WTYM	East Longmeadow, Mass.	1600
WTYN	Tryon, N.C.	1550
WTYS	Marianna, Fla.	1340
WUFD	Amherst, N.Y.	1080
WULA	Eufaula, Ala.	1240
WUMU	Gainesville, Fla.	1390
WUND	Uhrichsville, Ohio	1540
WUNE	Baton Rouge, La.	1550
WUNO	Rio Piedras, P.R.	1320
WUNS	Lewisburg, Pa.	1010
WUPR	Utado, P.R.	1530
WUSJ	Lockport, N.Y.	1340
WUSM	Havelock, N.C.	1330
WUST	Bethesda, Md.	1120
WVAL	Sauk Rapids, Minn.	800
WVAM	Altoona, Pa.	1430
WVAR	Richwood, W.Va.	1280
WVCF	Apopka, Fla.	1520
WVCG	Coral Gables, Fla.	1070
WVCH	Chester, Pa.	740
WVEC	Hampton, Va.	1490
WVGT	Mt. Dora, Fla.	1580
WVIM	Vicksburg, Miss.	1490
WVIP	Mt. Kisco, N.Y.	1310
WVJP	Caguas, P.R.	1110
WVJS	Owensboro, Ky.	1420
WVKO	Columbus, Ohio	1580
WVLD	Valdosta, Ga.	1450
WVLK	Lexington, Ky.	590
WVLN	Olney, Ill.	740
WVMC	Mt. Carmel, Ill.	1360
WVMI	Biloxi, Miss.	570
WVMT	Burlington, Vt.	620
WVNA	Tuscumbia, Ala.	1590
WVNJ	Newark, N.J.	620
WVOB	Bel-Air, Md.	1520
WVOC	Battle Creek, Mich.	1500
WVOE	Chadburn, N.C.	1590
WVOH	Hazelhurst, Ga.	920
WVOK	Birmingham, Ala.	690
WVOL	Berry Hill, Tenn.	1470
WVOM	Iuka, Miss.	1270
WVON	Cicero, Ill.	1450
WVOP	Vidalia, Ga.	970
WVOS	Liberty, N.Y.	1240
WVOT	Wilson, N.C.	1420
WVOW	Logan, W.Va.	1290
WVOX	New Rochelle, N.Y.	1460
WVPO	Stroudsburg, Pa.	840
WVSC	Somerset, Pa.	990
WVTR	White River Junc., Vt.	910
WVVW	Grafton, W.Va.	1260
WWAB	Lakeland, Fla.	1330
WWBD	Bamberg, S.C.	790
WWBR	Windber, Pa.	1350
WWBZ	Vineland, N.J.	1360
WWCA	Gary, Ind.	1270
WWCC	Bremen, Ga.	1440
WWCH	Clarion, Pa.	1300
WWCO	Waterbury, Conn.	1240
WWDC	Washington, D.C.	1260
WWDS	Everett, Pa.	1050
WWGO	Erie, Pa.	1450
WWGP	Sanford, N.C.	1050
WWGS	Tifton, Ga.	1430
WWHG	Hornell, N.Y.	1320
WWHY	Huntington, W.Va.	1470
WWIL	Ft. Lauderdale, Fla.	1580
WWIN	Baltimore, Md.	1400
WWIS	Black River Falls, Wis.	1260
WWIT	Canton, N.C.	970
WWIZ	Lorain, Ohio	1380
WWJ	Detroit, Mich.	950
WWJB	Brooksville, Fla.	1450
WWJC	Superior, Wis.	1270
WWKY	Winchester, Ky.	1380
WWL	New Orleans, La.	870
WWML	Portage, Wis.	1470
WWNC	Asheville, N.C.	570
WWNH	Rochester, N.H.	930
WWNR	Beckley, W.Va.	620
WWNS	Statesboro, Ga.	1240
WWNY	Watertown, N.Y.	790
WWOD	Lynchburg, Va.	1390
WWOK	Charlotte, N.C.	1480
WWOL	Buffalo, N.Y.	1120
WWOM	New Orleans, La.	600
WWON	Woonsocket, R.I.	1240
WWOW	Conneaut, Ohio	1360
WWPA	Williamsport, Pa.	1340
WWPF	Palatka, Fla.	1260
WWRI	W. Warwick, R.I.	1450
WWRL	Woodside, N.Y.	1600
WWSC	Glens Falls, N.Y.	1450

WHITE'S

RADIO LOG

C.L.	Location	Kc.
WWSR	St. Albans, Vt.	1420
WWST	Wooster, Ohio	960
WWSW	Pittsburgh, Pa.	970
WWVA	Wheeling, W.Va.	1170
WWWB	Jasper, Ala.	1360
WWWF	Fayette, Ala.	990
WWWR	Russellville, Ala.	920
WWWW	Richmond, Va.	1540
WWXL	Manchester, Ky.	1450
WWYN	Erie, Pa.	1260
WWYO	Pineville, W.Va.	970
WXAL	Demopolis, Ala.	1400
WXGI	Richmond, Va.	950
WXIG	Windemere, Fla.	1480
WXKW	Troy, N. Y.	1600
WXLI	Dublin, Ga.	1230
WXLL	Big Delta, Alaska	980
WXLW	Indianapolis, Ind.	950
WXOK	Baton Rouge, La.	1260
WXOX	Bay City, Mich.	1250
WXMT	Merrill, Wis.	730
WXRF	Guayama, P.R.	1590
WXTN	Lexington, Miss.	1150
WXTR	Pawtucket, R.I.	550
WXVA	Charles Town, W.Va.	1550
WXVW	Jeffersonville, Ind.	1450
WXXX	Hattiesburg, Miss.	1310
WXYC	Ft. Myers, Fla.	1350
WXYJ	Jamestown, N.Y.	1340
WXYZ	Detroit, Mich.	1270
WYAL	Scotland Neck, N.C.	1280
WYAM	Bessemer, Ala.	1450
WYCL	York, S.C.	1580
WYDE	Birmingham, Ala.	850
WYGO	Corbin, Ky.	1330
WYHE	Bristol, Tenn.	1550
WYKP	Ocean City, N. J.	1520
WYLD	New Orleans, La.	940
WYMB	Manning, S.C.	1410
WYND	Sarasota, Fla.	1280
WYNG	Warwick-East Greenwich, R.I.	1590
WYNK	Baton Rouge, La.	1380
WYNN	Florence, S.C.	540
WYNR	Chicago, Ill.	1390
WYNZ	Ypsilanti, Mich.	1520
WYOQ	Wyoming, Mich.	1530
WYOU	Tampa, Fla.	1550
WYPR	Danville, Va.	970
WYRE	Annapolis, Md.	810
WYRN	Louisburg, N.C.	1480
WYSH	Clinton, Tenn.	1380
WYSI	Ypsilanti, Mich.	1480
WYSL	Buffalo, N.Y.	1400
WYSR	Franklin, Va.	1250
WYTH	Madison, Ga.	1250
WYTI	Rocky Mount, Va.	1570
WYVE	Wytheville, Va.	1280
WYZE	Atlanta, Ga.	1480
WZEP	DeFuniak Sprgs., Fla.	1460
WZIP	Cincinnati, Ohio	1050
WZKY	Albemarle, N.C.	1580
WZOB	Ft. Payne, Ala.	1250
WZOE	Princeton, Ill.	1490
WZOK	Jacksonville, Fla.	1320
WZOO	Spartanburg, S.C.	1400
WZRH	Zephyr Hills, Fla.	1400
WZRO	Jacksonville Beach, Florida	1010
WZYX	Cowan, Tenn.	1440
WZZZ	Boynton Beach, Fla.	1510

U. S. FM Stations by Call Letters

Abbreviation: (s)—broadcasts stereo

C.L.	Location
KAAR	Oxnard, Calif.
KABC-FM	Los Angeles, Calif.
KACA	Prosser, Wash.
KACE-FM	Riverside, Calif.
KADI	St. Louis, Mo.
KAFE	Oakland, Calif.
KAFI	Auburn, Calif.
KAFM	Salina, Kans.
KAIM-FM	Honolulu, Hawaii(s)
KAJC-FM	Alvin, Tex.
KAJS	Newport Beach, Calif.
KAKC	Tulsa, Okla.
KAKI	San Antonio, Tex.
KALB-FM	Alexandria, La.
KALH	Denver, Colo.
KALW	San Francisco, Calif.
KAMS	Mammoth Spring, Ark.
KANG	St. Louis, Mo.
KANT-FM	Lancaster, Calif.
KANU	Lawrence, Kans.(s)
KANW	Albuquerque, N.Mex.
KAPP	Redondo Beach, Calif.
KARA	Albuquerque, N. Mex.
KARK	Little Rock, Ark.
KARM-FM	Fresno, Calif.
KARO	Houston, Tex.
KASK-FM	Ontario, Calif.
KASU	Jonesboro, Ark.
KATT	Woodland, Calif.
KATY-FM	San Luis Obispo, Calif.
KAYD	Beaumont, Tex.
KAZZ	Austin, Tex.
KBBI	Los Angeles, Calif.
KBBL	Wichita, Kans.
KBBM	Hayward, Calif.
KBBW	San Diego, Calif.
KBCA	Los Angeles, Calif.
KBCL-FM	Shreveport, La.
KBCO	San Francisco, Calif.(s)
KBEE-FM	Modesto, Calif.
KBEY	Kansas City, Mo.
KBFI	Boise, Idaho
KBFM	Lubbock, Tex.
KBGL	Pocatello, Ida.
KBIG	Avalon, Calif.
KBIM-FM	Roswell, N.Mex.
KBLE	Seattle, Wash.
KBMC	Eugene, Wash.
KBMF	Pampa, Tex.
KBMS	Los Angeles, Calif.
KBOA-FM	Kennett, Mo.
KBOI-FM	Boise, Idaho
KBOY-FM	Medford, Oreg.
KBTM-FM	Jonesboro, Ark.
KBUZ-FM	Mesa, Ariz.
KBYR-FM	Anchorage, Alaska(s)
KBYU-FM	Provo, Utah
KCAL-FM	Redlands, Calif.
KCBH	Beverly Hills, Calif.(s)
KCBS-FM	San Francisco, Calif.
KCFM	St. Louis, Mo.(s)
KCHO-FM	Amarillo, Tex.(s)
KCHQ-FM	Conchella, Calif.(s)
KCIB-FM	Fresno, Calif.(s)
KCJC	Merriam, Kans.
KCKN-FM	Kansas City, Kan.
KCLE-FM	Cleburne, Tex.
KCLO-FM	Leavenworth, Kans.
KCMB-FM	Wichita, Kans.
KCMI	Los Angeles, Calif.
KCMK	Kansas City, Mo.
KCMO-FM	Kansas City, Mo.(s)
KCMS-FM	Manitou Springs, Colo.
KCOM	Omaha, Nebr.
KCPS	Tacoma, Wash.
KCPX-FM	Salt Lake City, Utah
KCRA-FM	Sacramento, Calif.
KCRW	Santa Monica, Calif.
KCSM	San Mateo, Calif.
KCUI	Pella, Ia.
KCUR-FM	Kansas City, Mo.
KCVR-FM	Lodi, Calif.
KCWS-FM	Ellensburg, Wash.
KDB-FM	Santa Barbara, Calif.
KODD-FM	Dumas, Tex.
KDEF-FM	Albuquerque, N.Mex.
KDEN-FM	Denver, Colo.
KDES-FM	Palm Spgs., Calif. (s)
KDFC	San Francisco, Calif.
KDKA-FM	Pittsburgh, Pa.
KDMC	Corpus Christi, Tex.
KDMI	Des Moines, Iowa(s)
KDNT-FM	Denton, Tex.
KDPS	Des Moines, Iowa
KDUO	Riverside, Calif.(s)
KDVR	Sioux City, Ia.
KDWC	West Covina, Calif.
KEAR	San Francisco, Calif.
KEAX	National City, Calif.
KEBJ	Phoenix, Ariz.
KEBR	Sacramento, Calif.
KEBS	San Diego, Calif.
KECR	El Cajon, Calif.
KEED-FM	Springfield-Eugene, Oregon(s)
KEEN-FM	San Jose, Calif.
KEEZ	San Antonio, Tex.(s)
KEFC	Waco, Tex.(s)
KEFM	Oklahoma City, Okla.
KEFW	Honolulu, Hawaii
KELE	Phoenix, Ariz.
KELO	Sioux Falls, S.Dak.
KELT	Harlingen, Tex.
KEMO	St. Louis, Mo.
KEPI	Phoenix, Ariz.(s)
KERI	Bellingham, Wash.
KERN-FM	Bakersfield, Calif.
KETO-FM	Seattle, Wash.(s)
KEYM	Santa Maria, Calif.(s)
KEZE	Anaheim, Calif.
KFAB-FM	Omaha, Nebr.
KFAC-FM	Los Angeles, Calif.
KFAM-FM	St. Cloud, Minn.
KFBK-FM	Sacramento, Calif.
KFCA	Phoenix, Ariz.
KFGQ-FM	Boone, Iowa
KFH-FM	Wichita, Kans.
KFIL	Santa Ana, Calif.
KFJC	Mountainview, Calif.
KFJZ	Fort Worth, Tex.
KFMB-FM	San Diego, Calif.
KFMC	Portland, Oreg.
KFMH	Colorado Springs, Colo.
KFMK	Houston, Tex.(s)
KFML-FM	Denver, Colo.
KFMM	Tucson, Ariz.
KFMN	Abilene, Tex.
KFMP	Port Arthur, Tex.(s)
KFMQ	Lincoln, Nebr.
KFMU	Glendale, Calif. (s)
KFMV	Minneapolis, Minn
KFMW	San Bernardino, Calif.
KFMX	San Diego, Calif.(s)
KFMY	Eugene, Oreg.(s)
KFNB	Oklahoma City, Okla.(s)
KFNE	Big Springs, Tex.
KFOG	San Francisco, Calif. (s)
KFOX-FM	Long Beach, Calif.
KFRC-FM	San Francisco, Calif.
KFRE-FM	Fresno, Calif.
KFUO-FM	Clayton, Mo.
KGAF-FM	Gainesville, Tex.
KGB-FM	San Diego, Calif.(s)
KGBN-FM	Caldwell, Idaho
KGFM	Edmonds, Wash.
KGGK	Garden Grove, Calif.(s)
KGLA	Los Angeles, Calif.
KGMG	Portland, Oreg.(s)
KGMI	Bellingham, Wash.
KGNC-FM	Amarillo, Tex.
KGO-FM	San Francisco, Calif.
KGPO	Grants Pass, Oreg.
KGUD-FM	Santa Barbara, Calif.
KHAK-FM	Cedar Rapids, Iowa(s)
KHBL	Plainview, Tex.
KHBR-FM	Hillsboro, Tex.
KHCB	Houston, Tex.
KHFI	Austin, Tex.
KHFM	Albuquerque, N.Mex.(s)
KHFR-FM	Monterey, Calif.(s)
KHGM	Beaumont, Tex.(s)
KHIP	San Francisco, Calif.
KHIQ	Sacramento, Calif.(s)
KHJ-FM	Los Angeles, Calif.
KHMS	El Paso, Tex.
KHOF	Los Angeles, Calif.
KHOM-FM	Turlock, Calif.(s)
KHOZ-FM	Harrison, Ark.
KHPC	Brownwood, Tex.
KHQ-FM	Spokane, Wash.
KHSC	Arcata, Calif.
KHUL	Houston, Tex.
KHVR	Biloxi, Calif.
KHYI	Fremont, Calif.
KICN	Omaha, Nebr.
KIEM	Eureka, Calif.
KIHI	Tulsa, Okla.
KIMP-FM	Mt. Pleasant, Tex.
KING-FM	Seattle, Wash.
KIOO	Oklahoma, Okla.
KIRO-FM	Seattle, Wash.
KISA	Kansas City, Mo.
KISS	San Antonio, Tex.
KISW	Seattle, Wash.(s)
KITH	Phoenix, Ariz.
KITT	San Diego, Calif.
KITY	San Antonio, Tex.
KIXL-FM	Dallas, Tex.(s)
KJAZ	Alameda, Calif.
KJEF-FM	Jennings, La.
KJEM-FM	Okla. City, Okla.
KJIM	Ft. Worth, Tex.
KJLM	San Diego, Calif.
KJML	Sacramento, Calif.
KJOY-FM	Burlington, Vt.
KJPO	Fresno, Calif.
KJRG	Newton, Kans.
KJSB	Houston, Tex.
KJSK-FM	Columbus, Neb.
KLAC-FM	Los Angeles, Calif.
KLAY-FM	Tacoma, Wash.(s)
KLCN-FM	Blytheville, Ark.
KLEN-FM	Killeen, Tex.
KLFM	Beverly Hills, Calif.
KLIR-FM	Denver, Colo.(s)
KLIZ-FM	Brainerd, Minn.
KLJT	Lake Jackson, Tex.
KLOA-FM	Ridgecrest, Calif.
KLON	Long Beach, Calif.
KLRO	San Diego, Calif.(s)
KLSN	Seattle, Wash.(s)
KLST	Colorado Springs, Colo.(s)
KLUB-FM	Salt Lake City, Utah
KLUE-FM	Longview, Tex.
KLUR	Wichita Falls, Tex.
KLVL	Pasadena, Tex.
KLYD-FM	Bakersfield, Calif.
KLYN-FM	Lynden, Wash.
KLZ-FM	Denver, Colo.
KMAK-FM	Fresno, Calif.
KMAP	Dallas, Tex.
KMAX	Sierra Madre, Calif.
KMBC-FM	Kansas City, Mo.(s)
KMCP	Portland, Oreg.
KMCS	Seattle, Wash.
KMER	Fresno, Calif.
KMFM	Tularosa, N. Mex.
KMHT	Marshall, Tex.
KMJ-FM	Fresno, Calif.
KMLA	Los Angeles, Calif.(s)
KMLB-FM	Monroe, La.(s)
KMMK	Little Rock, Ark.
KMOD-FM	Midland, Tex.
KMOX-FM	St. Louis, Mo.
KMPX	San Francisco, Calif.(s)
KMSU	Mankato, Minn.
KMUW	Wichita, Kans.
KMYC-FM	Marysville, Calif.
KMUZ	Santa Barbara, Calif.(s)
KNBR-FM	San Francisco, Calif.
KNCO-FM	Garden City, Kans.
KNDX	Yakima, Wash.
KNEB-FM	Scottsbluff, Nebr.
KNER	Dallas, Tex.
KNEV	Reno, Nev.
KNEW-FM	Scottsbluff, Nebr.
KNFM	Midland, Tex.
KNIK-FM	Anchorage, Alaska
KNIX	Phoenix, Ariz.(s)
KNJO	Thousand Oaks, Calif.
KNDB	Long Beach, Calif. (s)
KNOF	St. Paul, Minn.
KNTO	Wichita Falls, Tex.(s)
KNX-FM	Los Angeles, Calif.
KOA-FM	Denver, Colo.
KOAP-FM	Portland, Ore.
KOCW	Tulsa, Okla.(s)
KODA-FM	Houston, Tex.(s)
KOGM-FM	Tulsa, Okla
KOGO	San Diego, Calif.
KOIN-FM	Portland, Oreg.
KOKH	Oklahoma City, Okla.
KOL-FM	Seattle, Wash.
KONG-FM	Visalia, Calif.(s)
KOOL-FM	Phoenix, Ariz.
KORK	Las Vegas, Nev.(s)
KOSE-FM	Osceola, Ark.
KOST	Dallas, Tex.
KOSU-FM	Stillwater, Okla.(s)
KOTN-FM	Pine Bluff, Ark.
KOZE-FM	Lewiston, Idaho
KPAC-FM	Port Arthur, Tex.
KPAT-FM	Berkeley, Calif.
KPCS	Pasadena, Calif.
KPDQ-FM	Portland, Ore.
KPEN	Atherton, Calif.(s)
KPFA	Berkeley, Calif.
KPFB	Berkeley, Calif.

C.L.	Location
KPFK	Los Angeles, Calif.
KPFM	Portland, Oreg.(s)
KPGM	Los Altos, Calif.
KPLR-FM	St. Louis, Mo.
KPOI-FM	Honolulu, Hawaii (s)
KPDJ-FM	Portland, Oreg.
KPOL-FM	Los Angeles, Calif.(s)
KPPC-FM	Pasadena, Calif.
KPPS-FM	Parsons, Kans.
KPRI	San Diego, Calif.(s)
KPRN	Seattle, Wash.
KPRS-FM	Kansas City, Mo.
KPSD	Dallas, Tex.
KQAL-FM	Omaha, Nebr.(s)
KQBY-FM	San Francisco, Calif.
KQFM	Portland, Oreg.
KQIP	Odessa, Tex.
KQRO	Dallas, Tex.
KQUE	Houston, Tex. (s)
KQV-FM	Pittsburgh, Pa.
KQXR	Bakersfield, Calif.
KRAB	Seattle, Wash.
KRAK-FM	Stockton, Calif.
KRAM-FM	Las Vagas, Nev.
KRAV	Tulsa, Okla.(s)
KRBE	Houston, Tex.(s)
KRCC	Colorado Springs, Colo.
KRCW	Santa Barbara, Calif.
KREM-FM	Spokane, Wash.
KREX-FM	Grand Junction, Colo.
KRHM	Los Angeles, Calif.(s)
KRKD-FM	Los Angeles, Calif.
KRKH-FM	Lubbock, Tex.
KRKY	Denver, Colo.
KRLD-FM	Dallas, Tex.
KRMD-FM	Shreveport, La.
KRNW	Boulder, Colo.
KRNY-FM	Kearney-Holdrege, Nebraska
KRON-FM	San Francisco, Calif.
KROS-FM	Clinton, Iowa
KROW	Santa Barbara, Calif.
KROY-FM	Sacramento, Calif.
KRPM	San Jose, Calif.
KRRC	San Jose, Calif.
KRSI	Minneapolis, Minn.(s)
KRSI-FM	St. Louis Park, Minn.
KRSN-FM	Los Alamos, N.Mex.
KRVM	Eugene, Oreg.
KRVN-FM	Lexington, Nebr.
KSCO	Santa Cruz, Calif.
KSBW-FM	Salinas, Calif.
KSDA	La Sierra, Calif.
KSDB-FM	Manhattan, Kans.
KSDS	San Diego, Calif.
KSEA	San Diego, Calif.
KSEO-FM	Durant, Okla.
KSFM	Dallas, Tex.(s)
KSFR	San Francisco, Calif.(s)
KSFV	San Fernando, Calif.
KSFX	San Francisco, Calif.
KSHE	Crestwood, Mo.(s)
KSHS	Colorado Springs, Colo.
KSJO-FM	San Jose, Calif.(s)
KSJS	San Jose, Calif.
KSL-FM	Salt Lake City, Utah(s)
KSLA	Seattle, Wash.(s)
KSLH	St. Louis, Mo.
KSLT	Tyler, Tex.
KSMA-FM	Santa Maria, Calif.
KSO-FM	Des Moines, Iowa
KSOM	Tucson, Ariz.
KSPC	Claremont, Calif.
KSPI-FM	Stillwater, Okla.
KSPL-FM	Diboll, Tex.
KSRF	Santa Monica, Calif.
KSTE	Emporia, Kans.
KSTL-FM	St. Louis, Mo.
KSTN-FM	Stockton, Calif.
KSUI	Iowa City, Iowa
KSWI-FM	Omaha, Nebr.
KSYN	Joplin, Mo.(s)
KTAL	Texarkana, Tex.
KTAP	Tucson, Ariz.
KTAR-FM	Phoenix, Ariz.
KTBC-FM	Austin, Tex.(s)
KTCF	Cedar Falls, Iowa
KTEC	Oretech, Oreg.
KTGM	Denver, Colo.
KTIM	San Rafael, Calif.
KTIS-FM	Minneapolis, Minn.
KTJO-FM	Ottawa, Kans.
KTNT-FM	Tacoma, Wash.
KTOD	Mt. Pleasant, Tex.(s)
KTOP-FM	Topeka, Kans.
KTOY	Tacoma, Wash.
KTPM	Sun City, Ariz.(s)
KTQM-FM	Clovis, N. M.
KTRB-FM	Modesto, Calif.
KTRH-FM	Houston, Tex.
KTSM-FM	El Paso, Tex.
KTSR	Kansas City, Mo.
KTTS-FM	Springfield, Mo.
KTWR	Tacoma, Wash.
KTXR-FM	Springfield, Mo.(s)
KTXT-FM	Lubbock, Tex.
KTYM-FM	Inglewood, Calif.
KUAC	College, Alaska
KUDE-FM	Oceanside, Calif.
KUDU-FM	Ventura-Oxnard, Calif.(s)
KUER	Salt Lake City, Utah
KUFY	Redwood City, Calif.
KUGN-FM	Eugene, Oreg.
KUHF	Houston, Tex.
KUMD-FM	Duluth, Minn.
KUOA-FM	Siloam Springs, Ark.
KUOH	Honolulu, Hawaii
KUOW	Seattle, Wash.
KUPD-FM	Tempe, Ariz.
KUSC	Los Angeles, Calif.
KUSN-FM	St. Joseph, Mo.
KUT-FM	Austin, Tex.
KUTE	Glendale, Calif.
KVCR	San Bernardino, Calif.
KVEC-FM	San Luis Obispo, Calif.(s)
KVEN-FM	Ventura, Calif.
KVFM	San Fernando, Calif.
KVIL	Highland Pk., Tex.(s)
KVOF-FM	El Paso, Tex.
KVOK	Honolulu, Hawaii
KVOP-FM	Plainview, Tex.
KVOR-FM	Colorado Springs, Colo.
KVSC	Logan, Utah
KVTT	Dallas, Tex.
KWAR	Waverly, Iowa
KWAX	Eugene, Oreg.
KWBE-FM	Beatrice, Neb.
KWFM	Minneapolis, Minn.(s)
KWG-FM	Stockton, Calif.
KWGS	Tulsa, Okla.
KWIX	St. Louis, Mo.
KWIZ-FM	Santa Ana, Calif.
KWJB-FM	Globe, Ariz.
KWKH-FM	Shreveport, La.
KWME	Walnut Creek, Calif.(s)
KWMO	Odessa, Tex.
KWOA-FM	Worthington, Minn.
KWOC-FM	Poplar Bluff, Mo.
KWPC-FM	Muscatine, Iowa
KWPM-FM	West Plains, Mo.
KXEL-FM	Waterloo, Iowa(s)
KXFM	Fort Worth, Tex.
KXJK-FM	Forrest City, Ark.
KXKX	San Francisco, Calif.
KXLU	Los Angeles, Calif.
KXOA	Sacramento, Calif.
KXOL-FM	Ft. Worth, Tex. (s)
KXQR	Fresno, Calif.(s)
KXRQ	Sacramento, Calif.
KXTR	Kansas City, Mo.(s)
KXYZ-FM	Houston, Tex.(s)
KYA-FM	San Francisco, Calif.
KYEW	Phoenix, Ariz.
KYFM	Oklahoma City, Okla.
KYSM-FM	Mankato, Minn.
KYW-FM	Cleveland, Ohio
KZAM	Seattle, Wash.(s)
KZFM	Cortez, Colo.
KZOM	Oklahoma City, Okla.
KZUN-FM	Opportunity, Wash
WAAB-FM	Worcester, Mass.
WAAM-FM	Parkersburg, W.Va.
WABC-FM	New York, N.Y.
WABE	Atlanta, Ga.
WABI-FM	Bangor, Maine
WABQ	Cleveland, Ohio
WABX-FM	Detroit, Mich. (s)
WABZ-FM	Albemarle, N.C.
WACO	Waco, Tex.
WACY-FM	Moss Point, Miss.
WAEB-FM	Cincinnati, Ohio
WAEF	Syracuse, N.Y.
WAER	Syracuse, N.Y.
WAEZ	Miami Beach, Fla.(s)
WAHR-FM	Miami Beach, Fla.
WAIC	San Juan, P.R.
WAIR-FM	Winston-Salem, N.C.
WAIV	Indianapolis, Ind.
WAJC	Indianapolis, Ind.
WAJP	Joliet, Ill.
WAJR-FM	Morgantown, W.Va.
WAKR-FM	Akron, Ohio
WAKW-FM	Cincinnati, Ohio
WALK-FM	Patchogue, N.Y.
WAMC	Albany, N.Y.
WAMF	Amherst, Mass.
WAMO-FM	Pittsburgh, Pa.
WAMU-FM	Washington, D.C.
WANG	Goldwater, Mich.
WAPC-FM	Riverhead, N.Y.(s)
WAPI-FM	Birmingham, Ala.
WAPS	Akron, Ohio
WAQE-FM	Towson, Md.(s)
WARD-FM	Johnstown, Pa.
WARK-FM	Hagerstown, Md.
WARN-FM	Fort Pierce, Fla.
WASA-FM	Havre De Grace, Md.
WASH	Washington, D.C.(s)
WATR-FM	Waterbury, Conn.
WAUG-FM	Augusta, Ga.
WAUP	Akron, Ohio
WAUX-FM	Waukesha, Wis.
WAVA-FM	Arlington, Va.
WAVI-FM	Dayton, Ohio
WAVQ	Atlanta, Ga.
WAVU-FM	Albertville, Ala.
WAVY-FM	Portsmouth, Va.
WAWZ-FM	Zarephath, N.J.
WAYL	Minneapolis, Minn.(s)
WAYZ-FM	Waynesboro, Pa.
WAZL-FM	Hazelton, Pa.
WBAA-FM	W. Lafayette, Ind.
WBAB-FM	Babylon, N.Y.
WBAI	New York, N.Y.
WBAP-FM	Ft. Worth, Tex.(s)
WBAY-FM	Green Bay, Wis.
WBBB-FM	Burlington, N.C.(s)
WBBC	Jackson, Mich.
WBBF-FM	Rochester, N.Y.
WBBM-FM	Chicago, Ill.
WBBO-FM	Forest City, N.C.
WBBQ-FM	Augusta, Ga.
WBBR-FM	E. St. Louis, Ill.
WBBS	Crawfordsville, Ind.
WBBW-FM	Youngstown, Ohio (s)
WBCB-FM	Levittown-Fairless Hills, Pa.
WBCI-FM	Williamsburg, Va.
WBCM-FM	Bay City, Mich.
WBCN	Boston, Mass.(s)
WBCL-FM	South Beloit, Ill.
WBEN-FM	Buffalo, N.Y.
WBET-FM	Brockton, Mass.
WBEU-FM	Beaufort, S.C.(s)
WBEX-FM	Chillicothe, Ohio
WBEZ	Chicago, Ill.
WBFG	Detroit, Mich.
WBFM	New York, N.Y.
WBFO	Buffalo, N.Y.
WBGM	Tallahassee, Fla.
WBGO	Newark, N.J.
WBGU	Bowling Green, Ohio
WBIE-FM	Marietta, Ga.
WBIR-FM	Knoxville, Tenn.
WBIV	Wethersfield, N.Y.
WBJC	Baltimore, Md.
WBKV-FM	West Bend, Wis.(s)
WBKW	Beckley, W.Va.
WBKY	Lexington, Ky.
WBLY-FM	Springfield, Ohio
WBMI	Meridan, Conn.(s)
WBNS-FM	Columbus, Ohio (s)
WBOE	Cleveland, Ohio
WBOR	Brunswick, Maine
WBOS-FM	Brookline, Mass.
WBRB-FM	Mt. Clements, Mich.
WBRC	Birmingham, Ala.
WBRE-FM	Wilkes-Barre, Pa.
WBSM-FM	New Bedford, Mass.
WBST	Muncie, Ind.
WBT-FM	Charlotte, N.C.(s)
WBUD-FM	Trenton, N.J.(s)
WBUF	Buffalo, N.Y.
WBUR	Boston, Mass.
WBUT-FM	Butler, Pa.
WBUY-FM	Lexington, N.C.
WBVA	Woodbridge, Va.
WBVP-FM	Beaver Falls, Pa.
WBWC	Berea, Ohio
WBZ-FM	Boston, Mass.
WCAC	Anderson, S.C.
WCAO-FM	Baltimore, Md.
WCAU-FM	Philadelphia, Pa.
WCBC-FM	Anderson, Ind.
WCBE	Columbus, Ohio
WCBM-FM	Baltimore, Md.
WCBS-FM	New York, N.Y.
WCCC-FM	Hartford, Conn.
WCCV-FM	Charlottesville, Va.
WCED-FM	Dubois, Pa.
WCEN-FM	Mt. Pleasant, Mich.(s)
WCFM	Williamstown, Mass.
WCHA-FM	Chambersburg, Pa.(s)
WCHD	Detroit, Mich.
WCLE-FM	Cleveland, Tenn.
WCLI-FM	Corning, N.Y.
WCLM	Chicago, Ill.
WCLO-FM	Janesville, Wis.
WCLT-FM	Newark, Ohio
WCLW-FM	Mansfield, Ohio
WCMC-FM	Wildwood, N.J.
WCME-FM	Brunswick, Maine
WCMF-FM	Rochester, N.Y.(s)
WCMI-FM	Ashland, Ky.
WCMO	Marietta, Ohio
WCMR-FM	Elkhart, Ind.
WCNB-FM	Connersville, Ind.
WCND	Canton, Ohio(s)
WCOD	Richmond, Va.
WCOH-FM	Newnan, Ga.
WCOL-FM	Columbus, Ohio
WCOP-FM	Boston, Mass.
WCOS-FM	Columbia, S.C.
WCOU-FM	Lewiston, Maine
WCOW-FM	Sparta, Wis.
WCPO-FM	Cincinnati, Ohio
WCPS-FM	Tarbor, N.C.
WCRA-FM	Effingham, Ill.
WCRB-FM	Waltham, Mass.(s)
WCRF-FM	Cleveland, Ohio
WCRT-FM	Birmingham, Ala.(s)
WCSC-FM	Charleston, S.C.
WCSI-FM	Columbus, Ind.(s)
WCSQ	Central Square, N.Y.
WCTA-FM	Andalusia, Ala.
WCTC-FM	New Brunswick, N.J.
WCTM	Eaton, Ohio
WCTW-FM	New Castle, Ind.
WCUF	Akron, Ohio
WCUM-FM	Cumberland, Md.
WCUY-FM	Cleveland Hts., Ohio
WCWM	Williamsburg, Va.
WDAC	Lancaster, Pa.
WDAE-FM	Tampa, Fla.
WDAF-FM	Kansas City, Mo.
WDAS-FM	Philadelphia, Pa.
WDBJ-FM	Roanoke, Va.
WDBN	Akron, Ohio(s)
WDBO-FM	Orlando, Fla.
WDBQ-FM	Dubuque, Iowa
WDCX	Buffalo, N.Y.(s)
WDDE	Hamden, Conn.
WDDS-FM	Syracuse, N.Y.
WDEL-FM	Wilmington, Del.
WDET-FM	Detroit, Mich.
WDFM	State College, Pa.
WDGO	Cleveland, Ohio(s)
WDHA-FM	Dover, N.J.(s)
WDHF	Chicago, Ill.
WDIA-FM	Memphis, Tenn.
WDJK	Atlanta, Ga.
WDJJ	Panama City, Fla.
WDJR	Oil City, Pa.
WDMB-FM	Statesville, N.C.
WDNC-FM	Durham, N.C.
WDOC-FM	Prestonsburg, Ky.
WDOD-FM	Chattanooga, Tenn.
WDOK-FM	Cleveland, Ohio
WDOV-FM	Dover, Del.
WDRC-FM	Hartford, Conn.
WDRK-FM	Greenville, Ohio
WDSC-FM	Dillon, S.C.
WDSU-FM	New Orleans, La.
WDTM	Detroit, Mich.(s)
WDTR	Detroit, Mich.
WDUB	Granville, Ohio
WDUN-FM	Gainesville, Ga.(s)
WDUQ	Pittsburgh, Pa.
WDUZ-FM	Green Bay, Wis.
WDVR	Philadelphia, Pa.
WDWS-FM	Champaign, Ill.
WDXL-FM	Lexington, Tenn.
WEAV-FM	Plattsburgh, N.Y.
WEAW-FM	Evanston, Ill.
WEBH	Chicago, Ill.
WEBQ-FM	Harrisburg, Ill.
WEBR-FM	Buffalo, N.Y.
WECW	Elmira, N.Y.
WEDK	Springfield, Mass.
WEDR-FM	Miami, Fla.
WEEC	Springfield, Ohio
WEED-FM	Rocky Mount, N.C.
WEEI-FM	Boston, Mass.
WEEP-FM	Pittsburgh, Pa.
WEEX-FM	Easton, Pa.
WEFA	Waukegan, Ill.
WEFM	Chicago, Ill.(s)
WEGO-FM	Concord, N.C.
WEIV	Ithaca, N.Y.
WEKZ-FM	Monroe, Wis.
WELF	Glen Ellyn, Ill.
WELG	Elgin, Ill.
WEMC	Harrisonburg, Va.
WEMP-FM	Milwaukee, Wis.
WENR-FM	Chicago, Ill.
WEOK-FM	Poughkeepsie, N.Y.
WEOL-FM	Elyria, Ohio
WEPM-FM	Martinsburg, W.Va.
WEPS	Elgin, Ill.
WEQR	Goldsboro, N.C.
WERE-FM	Cleveland, Ohio
WERI-FM	Westerly, R.I.
WERS	Boston, Mass.
WERT-FM	Van Wert, Ohio
WESC-FM	Greenville, S.C.
WEST-FM	Easton, Pa.
WETL	South Bend, Ind.
WETN	Wheaton, Ill.
WEVC	Evansville, Ind
WEVD-FM	New York, N.Y.
WEWO-FM	Laurinburg, N.C.
WFAA-FM	Dallas, Tex.
WFAH-FM	Alliance, Ohio
WFAN	Washington, D.C.
WFAS-FM	White Plains, N.Y.
WFAU-FM	Augusta, Maine
WFAW	Fort Atkinson, Wis.
WFBC-FM	Greenville, S.C.
WFBE	Flint, Mich.
WFBG-FM	Altoona, Pa.
WFBM-FM	Indianapolis, Ind.
WFBS-FM	Winston-Salem, N.C.
WFCI	Franklin, Ind.
WFCJ	Miamisburg, Ohio
WFCR	Amherst, Mass.
WFDS-FM	Baltimore, Md.
WFFM	Cincinnati, Ohio
WFGM-FM	Fitchburg, Mass.
WFHA-FM	Red Bank, N.J.
WFHR-FM	Wisconsin Rapids, Wis.
WFID	Rio Piedras, P.R.(s)
WFIG	Sumter, S.C.
WFIL-FM	Philadelphia, Pa.
WFIN-FM	Findlay, Ohio(s)
WFIU	Bloomington, Ind.
WFKO	Kokomo, Ind.
WFLA-FM	Tampa, Fla.
WFLM	Ft. Lauderdale, Fla.(s)
WFLN-FM	Philadelphia, Pa.(s)
WFLO	Farmville, Va.
WFLT-FM	Franklin, Tenn.
WFLY	Troy, N.Y.
WFMA	Rocky Mount, N.C.
WFMB	Nashville, Tenn.
WFMD-FM	Frederick, Md.
WFME	Newark, N.J.
WFMF	Chicago, Ill.
WFMG	Gallatin, Tenn.
WFMH-FM	Cullman, Ala.
WFMI	Montgomery, Ala.
WFML	Washington, Ind.
WFMM-FM	Baltimore, Md.
WFMQ	Chicago, Ill.(s)
WFMS	Indianapolis, Ind.

WHITE'S RADIO LOG

C.L.	Location
WFMT	Chicago, Ill.(s)
WFMU	East Orange, N.J.
WFMW-FM	Madisonville, Ky.
WFMX	Statesville, N.C.
WFMZ	Allentown, Pa.
WFNC-FM	Fayetteville, N.C.
WFNS-FM	Burlington, N.C.
WFNY	Racine, Wis.
WFOB-FM	Fostoria, Ohio
WFOL	Hamilton, Ohio(s)
WFOS	South Norfolk, Va.
WFPG	Atlantic City, N.J.
WFPK	Louisville, Ky.
WFPL	Louisville, Ky.
WFQM	San Juan, P.R.
WFRO-FM	Fremont, Ohio
WFST-FM	Caribou, Maine
WFSU-FM	Tallahassee, Fla.
WFTL-FM	Ft. Lauderdale, Fla.
WFUL-FM	Fulton, Ky.
WFUR-FM	Grand Rapids, Mich.
WFUV	New York, N.Y.
WFVA-FM	Fredericksburg, Va.
WGAL-FM	Lancaster, Pa.
WGAR-FM	Cleveland, Ohio
WGAU-FM	Athens, Ga.(s)
WGAY	Silver Spring, Md.
WGBH-FM	Cambridge, Mass.(s)
WGBI-FM	Scranton, Pa.
WGBS-FM	Miami, Fla.
WGCB-FM	Red Lion, Pa.
WGCS	Goshen, Ind.
WGEM-FM	Quincy, Ill.(s)
WGET-FM	Gettysburg, Pa.
WGFM	Schenectady, N.Y. (s)
WGGC	Glasgow, Ky.
WGGM	Taylorville, Ill.
WGH-FM	Newport News, Va.
WGHF	Newton, Conn.(s)
WGHJ	Lawrence, Mass.
WGKA-FM	Atlanta, Ga.
WGLM	Richmond, Ind.
WGLS	Glassboro, N. J.
WGMR	Tyrone, Pa.
WGMS-FM	Washington, D.C.
WGMZ	Flint, Mich.(s)
WGNB	St. Petersburg, Fla.
WGNC-FM	Gastonia, N.C.
WGPA-FM	Bethlehem, Pa. (from Ga.)
WGPC-FM	Albany, Ga.
WGPM	Detroit, Mich.
WGPR-FM	Detroit, Mich.(s)
WGPS	Greensboro, N.C.
WGR-FM	Buffalo, N.Y.
WGRE	Greencastle, Ind.
WGRV-FM	Greeneville, Tenn.
WGSU	Genesco, N.Y.
WGTB-FM	Washington, D.C.
WGTS-FM	Takoma Park, Md.
WGUC	Cincinnati, Ohio
WGVE	Gary, Ind.
WGWR-FM	Asheboro, N.C.
WGYA	Interlochen, Mich.
WHA-FM	Madison, Wis. (s)
WHAD	Delafield, Wis.
WHAI-FM	Greenfield, Mass.
WHAT-FM	Philadelphia, Pa.(s)
WHAV-FM	Haverhill, Mass.
WHBC-FM	Canton, Ohio
WHBF-FM	Rock Island, Ill.(s)
WHBI	Newark, N.J.
WHBM-FM	Xenia, Ohio
WHCI	Hartford City, Ind.
WHCL-FM	Clinton, N.Y.
WHCN	Hartford, Conn.
WHCU-FM	Ithaca, N.Y.
WHDH-FM	Boston, Mass.
WHDL-FM	Allegheny, N.Y.
WHEN-FM	Syracuse, N.Y.
WHFB-FM	Benton Harbor, Mich.
WHFC	Chicago, Ill.
WHFI	West Paterson, N. J.
WHFM	Rochester, N.Y.
WHFS	Bethesda, Md.(s)
WHHI	Highland, Wis.
WHHS	Havertown, Pa.
WHIL-FM	Medford, Mass.
WHIM-FM	Providence, R.I.
WHIO-FM	Dayton, Ohio
WHIZ-FM	Zanesville, Ohio
WHK-FM	Cleveland, Ohio
WHKP-FM	Hendersonville, N.C.
WHKW	Chilton, Wis.
WHKY-FM	Hickory, N. C. (s)
WHLA	Holmen, Wis.
WHLD-FM	Niagara Falls, N. Y.
WHLI-FM	Hempstead. N.Y.
WHLM-FM	Bloomsburg, Pa.
WHMA-FM	Anniston, Ala.
WHNC-FM	Henderson, N.C.
WHO-FM	Des Moines, Iowa
WHOH	Hamilton, Ohio
WHOK-FM	Lancaster, Ohio
WHOM-FM	New York, N.Y.
WHOO-FM	Orlando, Fla.(s)
WHOS-FM	Decatur, Ala.
WHOV	Hampton, Va.
WHP-FM	Harrisburg, Pa.
WHPE-FM	High Point, N.C.
WHPR	Highland Park, Mich.
WHPS	High Point, N.C.
WHRB-FM	Cambridge, Mass.
WHRM	Wausau, Wis.
WHSA	Highland Twp., Wis.
WHSR-FM	Winchester, Mass.
WHTG-FM	Eatontown, N.J.
WHUS	Storrs, Conn.
WHWC	Colfax, Wis.
WHYL-FM	Carlisle, Pa.
WHYN-FM	Springfield, Mass.
WIAL	Eau Claire, Wis.
WIAM-FM	Williamston, N.C.
WIAN	Indianapolis. Ind.
WIBA-FM	Madison, Wis.
WIBC-FM	Indianapolis, Ind.
WIBF	Philadelphia. Pa.
WIBG-FM	Philadelphia, Pa.
WICB	Ithaca, N.Y.
WICR	Indianapolis.Ind.
WIFI	Glenside, Pa.(s)
WIFM-FM	Elkin, N.C.
WIKY-FM	Evansville, Ind.
WIL-FM	St. Louis, Mo.
WILL-FM	Urbana, Ill.
WILO-FM	Frankfort, Ind.
WIMA-FM	Lima, Ohio
WINA-FM	Charlottesville, Va.
WINE-FM	Kenmore, N.Y.
WINF-FM	Manchester, Conn.
WINT-FM	Winter Haven. Fla.
WINZ-FM	Miami, Fla.
WIOD-FM	Miami, Fla.
WIP-FM	Philadelphia, Pa.
WIPR-FM	San Juan, P.R.
WIRA-FM	Ft. Pierce, Fla.
WIRC-FM	Hickory, N. C. (s)
WIRQ	Rochester, N.Y.
WISH-FM	Indianapolis, Ind.(s)
WISK	Medford, Mass.
WISM-FM	Madison, Wis.(s)
WISN-FM	Milwaukee, Wis.
WIST-FM	Charlotte, N.C.
WITA-FM	San Juan, P.R.
WITH-FM	Baltimore, Md.
WITZ-FM	Jasper, Ind.
WIUS	Christiansted, V.I.
WJAC-FM	Johnstown, Pa.(s)
WJAS-FM	Pittsburgh, Pa.
WJAX-FM	Jacksonville, Fla.
WJBC-FM	Bloomington, Ill.
WJBK-FM	Detroit, Mich.
WJBL-FM	Holland, Mich.
WJBO-FM	Baton Rouge, La.
WJBR	Wilmington. Del.(s)
WJCD-FM	Seymour, Ind.
WJDX-FM	Jackson, Miss.
WJEF-FM	Grand Rpds., Mich.(s)
WJEH-FM	Gallipolis, Ohio
WJEJ-FM	Hagerstown, Md.
WJGS	Houghton, Mich.
WJHL-FM	Johnson City, Tenn.
WJIG-FM	Tullahoma, Tenn.(s)
WJIM-FM	Lansing, Mich.
WJIV	Cherry Valley, N.Y.
WJJD-FM	Chicago, Ill.
WJLK-FM	Asbury Park, N.J.
WJLN	Birmingham, Ala.
WJMC-FM	Rice Lake, Wis.
WJMD	Bethesda, Md.(s)
WJOF	Athens, Ala.
WJOL-FM	Joliet, Ill.(s)
WJR-FM	Detroit, Mich.
WJSC-FM	Wilberforce, Ohio
WJTN-FM	Jamestown, N.K.
WJVA-FM	South Bend, Ind.
WJW-FM	Cleveland, Ohio
WJWR	Palmyra, Pa.
WJZZ	Bridgeport, Conn.
WKAK	Kankakee, Ill.
WKAQ-FM	San Juan, P.R.
WKAR-FM	E. Lansing, Mich.
WKAT-FM	Miami, Fla.
WKAY-FM	Glasgow, Ky.
WKAZ-FM	Charleston, W.Va.
WKBC-FM	N. Wilkesboro, N.C.
WKBN-FM	Youngstown, Ohio
WKBR-FM	Manchester, N.H.
WKBV-FM	Richmond, Ind.
WKCQ	Berlin, N.H.
WKCR-FM	New York, N.Y.
WKCS	Knoxville, Tenn.
WKDN-FM	Camden. N.J.
WKEE-FM	Huntington, W.Va.
WKET-FM	Kettering, Ohio(s)
WKFM	Chicago, Ill.(s)
WKHM-FM	Jackson. Mich.
WKIC-FM	Hazard, Ky.
WKIP-FM	Poughkeepsie, N.Y.
WKIS-FM	Orlando. Fla.
WKIX-FM	Raleigh. N.C.
WKJF	Pittsburgh. Pa.(s)
WKLF-FM	Clanton, Ala.
WKLS	Marietta. Ga.(s)
WKLW-FM	Grand Rapids, Mich.
WKMH-FM	Dearborn, Mich.
WKNA	Charleston, W.Va.(s)
WKOF	Hopkinsville, Ky.
WKOK-FM	Sunbury, Pa.
WKOP-FM	Binghamton, N.Y.
WKOX-FM	Framingham, Mass.
WKPT-FM	Kingsport, Tenn.(s)
WKRC-FM	Cincinnati, Ohio (s)
WKRG-FM	Mobile, Ala.
WKRT-FM	Cortland, N.Y.
WKSD	Kewanee, Ill.
WKSU-FM	Kent, Ohio
WKTA	McKenzie, Tenn.
WKTM	N. Charleston, S.C.
WKTM-FM	Mayfield, Ky.(s)
WKWK-FM	Wheeling, W.Va.
WKYB-FM	Paducah, Ky.
WLAD-FM	Danbury, Conn.
WLAG-FM	LaGrange, Ga.
WLAN-FM	Lancaster, Pa.
WLAP-FM	Lexington, Ky.
WLAV-FM	Grand Rapids, Mich.
WLBG-FM	Laurens-Clinton, S.C.
WLBH-FM	Mattoon, Ill.
WLBK-FM	DeKalb, Ill.
WLBR-FM	Lebanon, Pa.
WLCM-FM	Lancaster, S.C.
WLDM	Oak Park, Mich.(s)
WLDS-FM	Jacksonville, Ill.
WLEC-FM	Sandusky, Ohio
WLET-FM	Toccoa. Ga.
WLFM	Appleton, Wis.
WLIB	New York, N. Y.
WLIN	Merrill, Wis.
WLIP-FM	Kenosha, Wis.
WLIR	Hicksville, N.Y.(s)
WLKR-FM	Norwalk, Ohio
WLLH-FM	Lowell, Mass.
WLNA-FM	Peekskill, N.Y.
WLOA-FM	Braddock, Pa.(s)
WLOB-FM	Portland, Maine
WLOE-FM	Leaksville, N.C.
WLOL-FM	Minneapolis. Minn.
WLOM	Chattanooga, Tenn.
WLOS-FM	Asheville, N.C.
WLOV	Cranston, R.I.
WLRJ	Roanoke. Va.
WLRW	Champaign. Ill.
WLVL	Louisville, Ky.
WLYC-FM	Williamsport, Pa.
WMAL-FM	Washington, D.C.
WMAM-FM	Marinette, Wis.
WMAQ-FM	Chicago, Ill.(s)
WMAS-FM	Springfield, Mass.
WMAX-FM	Grand Rapids, Mich.
WMAZ-FM	Macon, Ga.
WMBD-FM	Peoria, Ill.
WMBI-FM	Chicago, Ill.
WMBM	Miami Beach, Fla.
WMBO-FM	Auburn, N.Y.
WMBR-FM	Jacksonville, Fla.
WMCF	Memphis, Tenn.
WMCO	New Concord, Ohio
WMCR	Kalamazoo. Mich.
WMDE	Greensboro, N.C.(s)
WMEB-FM	Orono. Maine
WMER	Celina, Ohio
WMEV-FM	Marion, Va.
WMFM	Madison, Wis.(s)
WMFP	Ft. Lauderdale, Fla.
WMFR-FM	High Point, N.C.
WMGM	Atlantic City, N.J.
WMGW-FM	Meadville, Pa.
WMHC	South Hadley, Mass.
WMHE	Toledo, Ohio
WMIL-FM	Milwaukee, Wis.
WMIT	Marion, N.C.
WMIV	S. Bristol, N.Y.
WMIX-FM	Mt. Vernon, Ill.
WMLS-FM	Sylacauga, Ala.
WMLW	Milwaukee, Wis.
WMMM	Westport, Conn.
WMNA-FM	Gretna, Va.
WMNI-FM	Columbus, Ohio
WMPS-FM	Memphis. Tenn.
WMRI-FM	Marion, Ind.
WMRN-FM	Marion, Ohio
WMRO-FM	Aurora. Ill.
WMRT	Lansing, Mich.
WMSP	Harrisburg, Pa.
WMSR-FM	Manchester, Tenn.
WMT-FM	Cedar Rapids, Iowa (s)
WMTH	Park Ridge, Ill.
WMTI	Norfolk, Va.
WMTW-FM	Mt. Washington, N.H.(s)
WMUA	Amherst, Mass.
WMUB	Oxford, Ohio
WMUL	Huntington, W.Va.
WMUS-FM	Muskegon, Mich.
WMUN	Muncie, Ind.
WMUU-FM	Greenville, S.C.
WMUZ	Detroit, Mich.
WMVA-FM	Martinsville, Va.(s)
WMVB-FM	Millville, N.J.
WMVO-FM	Mount Vernon, Ohio
WMVR-FM	Sidney, Ohio
WMYB-FM	Myrtle Beach, Fla.
WMZK	Detroit, Mich.
WNAD-FM	Norman. Okla.
WNAS	New Albany, Ind.
WNAV-FM	Annapolis, Md
WNBC-FM	New York, N.Y.
WNBD-FM	Daytona Beach, Fla.
WNBF-FM	Binghamton, N.Y.
WNBH-FM	New Bedford, Mass.
WNCN	New York, N.Y.
WNCO-FM	Ashland, Ohio
WNDA	Huntsville, Ala.(s)
WNDU-FM	South Bend, Ind.
WNEM-FM	Bay City, Mich.(s)
WNES-FM	Central City, Ky.
WNEW-FM	New York, N.Y.
WNEX-FM	Macon, Ga.
WNFO-FM	Nashville, Tenn.(s)
WNGO-FM	Mayfield, Ky.
WNHC-FM	New Haven, Conn.
WNIB	Chicago, Ill.
WNIC	DeKalb, Ill.
WNNJ-FM	Newton, N.J.
WNOB	Cleveland, Ohio(s)
WNOK-FM	High Point, N.C.
WNOR-FM	Norfolk, Va.
WNOS-FM	High Point, N.C.
WNOW-FM	York, Pa.
WNSL-FM	Laurel, Miss.
WMTH	Winnetka, Ill.
WNTI	Hackettstown, N.J.
WNUR	Evanston, Ill.
WNWC-FM	Arlington Hts., Ill.
WNYC-FM	New York, N.Y.
WNYE	New York, N.Y.
WOAK	Royal Oak, Mich.
WOAY-FM	Oak Hill, W.Va.
WOBN	Westerville, Ohio
WOC-FM	Davenport, Iowa
WOCB-FM	W. Yarmouth, Mass.
WOCH-FM	North Vernon, Ind.
WOHS-FM	Shelby, N.C.
WOI-FM	Ames, Iowa
WOIO	Cincinnati, Ohio
WOIV	De Ruyter, N.Y.
WOKZ-FM	Alton, Ill.
WOL-FM	Washington, D.C.
WOMC	Royal Oak. Mich.(s)
WOMI-FM	Owensboro, Ky.
WOMP-FM	Bellaire, Ohio
WONO	Syracuse, N.Y.
WOOD-FM	Grand Rapids. Mich.(s)
WOPA-FM	Oak Park, Ill.
WOPI-FM	Bristol, Tenn.
WOR-FM	New York, N.Y.
WORA-FM	Mayaguez. P.R.
WORX-FM	Madison, Ind.
WOSC-FM	Fulton, N.Y.
WOSU-FM	Columbus, Ohio
WOTW-FM	Nashua, N.H.
WOUB-FM	Athens. Ohio
WOW-FM	Omaha. Nebr.
WOXR	Oxford, Ohio
WPAC-FM	Patchogue, N.Y.(s)
WPAD-FM	Paducah, Ky.
WPAT-FM	Paterson. N.J.
WPAY-FM	Portsmouth, Ohio (s)
WPBC-FM	Minneapolis, Minn.
WPBS	Philadelphia, Pa.
WPCA-FM	Philadelphia, Pa.
WPEL-FM	Montrose, Pa.
WPEN-FM	Philadelphia, Pa.
WPEX-FM	Pensacola, Fla.(s)
WPFB-FM	Middletown, Ohio (s)
WPFM	Providence, R.I.(s)
WPFR	Terre Haute, Ind.
WPGC	Bradbury Hts., Md.
WPGI	Pittsburgh. Pa.
WPIC-FM	Sharon, Pa.
WPIN-FM	St. Petersburg, Fla.
WPIT-FM	Pittsburgh, Pa.
WPJB-FM	Providence, R.I.
WPKM	Tampa, Fla.
WPLB	Greenville, Mich.
WPLM-FM	Plymouth, Mass.
WPLN	Nashville. Tenn.
WPLO-FM	Atlanta, Ga.
WPPA-FM	Pottsville, Pa.
WPRB	Princeton, N.J.
WPRK	Winter Park. Fla.
WPRM	San Juan. P.R.
WPRO-FM	Providence, R.I.
WPRS-FM	Paris, Ill.
WPRW-FM	Manassas, Va.
WPSR	Evansville, Ind.
WPTF-FM	Raleigh, N.C.
WPTH	Fort Wayne, Ind.
WPTN-FM	Crookeville. Tenn.
WPTW-FM	Piqua. Ohio
WPWT	Philadelphia, Pa.
WQAL	Philadelphia, Pa.(s)
WQDC-FM	Midland. Mich.(s)
WQFM	Milwaukee, Wis.
WQMF	Babylon, N.Y.(s)
WQMG	Greensboro, N.C.(s)
WQMS	Hamilton, Ohio
WQRS-FM	Detroit, Mich.
WQXI-FM	Atlanta. Ga.
WQXR-FM	New York, N.Y.(s)
WRAJ-FM	Anna, Ill.
WRAK-FM	Williamsport, Pa.
WRAL-FM	Raleigh. N.C.
WRAY-FM	Princeton, Ind.
WRBL-FM	Columbus, Ga.
WRBS	Baltimore. Md.
WRC-FM	Washington, D.C.
WRCM	New Orleans, La.

C.L.	Location
WRED	Youngstown, Ohio
WREO-FM	Ashtabula, Ohio
WREV-FM	Reidsville, N.C.
WRFD-FM	Worthington-Columbus, Ohio
WRFK	Richmond, Va.
WRFL	Winchester, Va.
WRFM	Woodside, N.Y.
WRFS-FM	Alexander City, Ala.
WRFY-FM	Reading, Pa.
WRHS	Park Forest, Ill.
WRIT-FM	Milwaukee, Wis.
WRJN-FM	Racine, Wis.
WRJR	Lewiston, Maine
WRKO-FM	Boston, Mass.
WRKT-FM	Cocoa Beach, Fla.(s)
WRLB	Long Branch, N.J.(s)
WRLX	Hopkinsville, Ky.
WRLD-FM	Lanett, Ala.
WRMI-FM	Morris, Ill.
WRNJ	Atlantic City, N.J.
WRNL-FM	Richmond, Va.
WRNW	Mount Kisco, N.Y.
WROC-FM	Rochester, N.Y.
WROK-FM	Rockford, Ill.
WROW-FM	Albany, N.Y.
WROY-FM	Carmi, Ill.
WRPI	Troy, N.Y.
WRPN-FM	Ripon, Wis.
WRR-FM	Dallas, Tex.
WRRH	Franklin Lakes, N.J.
WRRN	Warren, Pa.
WRSV	Skokie, Ill.
WRSE-FM	Elmhurst, Ill.
WRSW-FM	Warsaw, Ind.
WRTC-FM	Hartford, Conn.
WRTI-FM	Philadelphia, Pa.
WRUF-FM	Gainesville, Fla.
WRUN-FM	Utica, N.Y.
WRVA-FM	Richmond, Va.
WRVB-FM	Madison, Wis.
WRVC	Norfolk, Va.
WRVP	New York, N.Y.
WRWR	Port Clinton, Ohio(s)
WRXO-FM	Roxboro, N.C.
WRYT	Pittsburgh, Pa.
WSAB	Mt. Carmel, Ill.
WSAE	Spring Arbor, Mich.
WSAI-FM	Cincinnati, Ohio
WSAL-FM	Logansport Ind.
WSAM-FM	Saginaw, Mich.
WSB-FM	Atlanta, Ga.(s)

C.L.	Location
WSBA-FM	York, Pa.
WSBC-FM	Chicago, Ill.(s)
WSBF-FM	Clemson, S.C.
WSCB	Springfield, Mass.
WSCH	Hartford, Conn.
WSEI	Olney, Ill.
WSEV-FM	Sevierville, Tenn. (s)
WSFM	Birmingham, Ala.(s)
WSHS	Floral Park, N.Y.
WSID	Baltimore, Md.
WSIM-FM	Salem, Ind.
WSIU	Carbondale, Ill.
WSIX-FM	Nashville, Tenn.(s)
WSJG	Hallandale, Fla.
WSJS-FM	Winston-Salem, N.C.
WSKS	Wabash, Ind.
WSLN	Delaware, Ohio
WSLS-FM	Roanoke, Va.(s)
WSMC-FM	Collegedale, Tenn.
WSMD-FM	Waldorf, Md.
WSMI-FM	Litchfield, Ill.
WSMJ	Greenfield, Ind.
WSNJ-FM	Bridgeton, N.J.
WSNW-FM	Seneca, S.C.
WSOC-FM	Charlotte, N.C.
WSOM	Salem, Ohio
WSON-FM	Henderson, Ky.
WSOU	S. Orange, N.J.
WSOY-FM	Decatur, Ill.
WSPA-FM	Spartanburg, S.C.(s)
WSPD-FM	Toledo, Ohio
WSPE	Springville, N.Y.
WSPT-FM	Stevens Point, Wis.
WSRW-FM	Hillsboro, Ohio
WSTC-FM	Stamford, Conn.
WSTO	Owensboro, Ky. (s)
WSTP-FM	Salisbury, N.C.
WSTR-FM	Sturgis, Mich.
WSTV-FM	Steubenville, Ohio
WSVA-FM	Harrisonburg, Va.
WSVL-FM	Shelbyville, Ind.
WSVS-FM	Crewe, Va.
WSWM	East Lansing, Mich.(s)
WSYR-FM	Syracuse, N.Y.(s)
WTAD-FM	Quincy, Ill.
WTAG-FM	Worcester, Mass.
WTAR	Norfolk, Va.(s)
WTAX-FM	Springfield, Ill.
WTAY-FM	Robinson, Ill.
WTBC-FM	Tuscaloosa, Ala.
WTBO-FM	Cumberland, Md.
WTBS	Cambridge, Mass.

C.L.	Location
WTCX	St. Petersburg, Fla.(s)
WTDS	Toledo, Ohio
WTFM	Babylon, N.Y.(s)
WTHI-FM	Terre Haute, Ind.
WTHS	Miami, Fla.
WTIC-FM	Hartford Conn.(s)
WTJS-FM	Jackson, Tenn.
WTJU	Charlottesville, Va.
WTMA-FM	Charleston, S.C.
WTMJ-FM	Milwaukee, Wis.(s)
WTNC-FM	Thomasville, N.C.
WTOA	Trenton, N.J.
WTOC-FM	Savannah, Ga.
WTOD-FM	Toledo, Ohio
WTOF	Canton, Ohio
WTOL-FM	Toledo, Ohio
WTOP-FM	Washington, D.C.
WTOS	Wauwatosa, Wis.
WTRC-FM	Elkhart, Ind.
WTRI	Greensburg, Ind.
WTSB-FM	Lumberton, N.C.
WTSV-FM	Claremont, N.H.
WTTC-FM	Towanda, Pa.
WTTF-FM	Tiffin, Ohio
WTTR-FM	Westminster, Md.
WTTV-FM	Bloomington, Ind.
WTUN	Tampa, Fla.
WTVN-FM	Columbus, Ohio
WUCB-FM	Chicago, Ill.
WUFM	Utica, N.Y.(s)
WUHY-FM	Philadelphia, Pa.
WULX-FM	Richmond, Ind.
WUNC	Chapel Hill, N.C.
WUNH	Durham, N.H.
WUOA	Tuscaloosa, Ala.
WUOM	Ann Arbor, Mich.
WUOT	Knoxville, Tenn.
WUPY	Lynn, Mass.(s)
WUSC-FM	Columbia, S.C.
WUST-FM	Bethesda, Md.
WUSV	Scranton, Pa.
WVAM-FM	Altoona, Pa.
WVBR-FM	Ithaca, N.Y.
WVCG-FM	Coral Gables, Fla.(s)
WVEC-FM	Hampton, Va.
WVGR-FM	Grand Rapids, Mich.
WVHC	Hempstead, N.Y.
WVJS-FM	Owensboro, Ky.
WVKC-FM	Galesburg, Ill.
WVKO-FM	Columbus, Ohio
WVLK-FM	Lexington, Ky.(s)
WVMC-FM	Mt. Carmel, Ill.

C.L.	Location
WVNA-FM	Tuscumbia, Ala.
WVNJ-FM	Newark, N.J.
WVNO-FM	Mansfield, Ohio(s)
WVOT-FM	Wilson, N.C.
WVOX-FM	New Rochelle, N.Y.
WVSH	Huntington, Ind.
WVST	St. Petersburg, Fla.
WVTS	Terre Haute, Ind.(s)
WWCF	Greenfield, Wis.
WWCO-FM	Waterbury, Conn.
WWDC-FM	Washington, D.C.
WWGP-FM	Sanford, N.C.
WWHG-FM	Hornell, N.Y.
WWHI	Muncie, Ind.
WWIL-FM	Ft. Lauderdale, Fla.
WWJ-FM	Detroit, Mich.
WWKS	Macomb, Ill.
WWMT	New Orleans, La.(s)
WWOD-FM	Lynchburg, Va.
WWOL-FM	Buffalo, N.Y.
WWON-FM	Woonsocket, R.I.
WWOS	Palm Beach, Fla.
WWPB	Miami, Fla.(s)
WWST-FM	Wooster, Ohio
WWSW-FM	Pittsburgh, Pa.
WWTV-FM	Cadillac, Mich.
WWVA-FM	Wheeling, W.Va.
WWWS	Greenville, N.C.
WWYN-FM	Erie, Pa.
WXBR	Cocoa Beach, Fla.
WXCN	Providence, R.I.(s)
WXFM	Elmwood Park, Ill.
WXHR	Cambridge, Mass.
WXPN	Philadelphia, Pa.
WXRI	Norfolk, Va.
WXTC	Annapolis, Md.
WXTO-FM	Grand Rapids, Mich.
WXUR-FM	Media, Pa.
WXYZ-FM	Detroit, Mich.
WYAK	Sarasota, Fla.(s)
WYBC-FM	New Haven, Conn.
KYDD	New Kensington, Pa.
WYCA	Hammond, Ind.
WYCE	Warwick, R.I.
WYCR	York-Hanover, Pa.
WYFI	Norfolk, Va.(s)
WYFM	Charlotte, N.C.
WYFS	Winston-Salem, N.C.
WYRE-FM	Pittsburgh, Pa.
WYSO	Yellow Springs, Ohio
WYZZ	Wilkes-Barre, Pa.
WZIP-FM	Cincinnati, Ohio

Canadian AM Stations By Call Letters

C.L.	Location	Kc.
CBA	Sackville, N.B.	1070
CBAF	Moncton, N.B.	1300
CBE	Windsor, Ont.	1550
CBF	Montreal, Que.	690
CBG	Gander, Nfld.	1450
CBH	Halifax, N.S.	860
CBI	Sydney, N.S.	1140
CBJ	Chicoutimi, Que.	1580
CBK	Regina, Sask.	540
CBL	Toronto, Ont.	740
CBM	Montreal, Que.	940
CBN	St. John's, Nfld.	640
CBO	Ottawa, Ont.	910
CBT	Grand Falls, Nfld.	540
CBU	Vancouver, B.C.	690
CBV	Quebec, Que.	980
CBW	Winnipeg, Man.	990
CBX	Edmonton, Alta.	1010
CBXA	Edmonton, Alta.	740
CBY	Corner Brook, Nfld.	990
CFAB	Windsor, N.S.	1450
CFAC	Calgary, Alta.	960
CFAM	Altona, Man.	1290
CFAR	Flin Flon, Man.	590
CFAX	Victoria, B.C.	810
CFBC	Saint John, N.B.	930
CFBR	Sudbury, Ont.	550
CFBV	Smithers, B.C.	1230
CFCB	Corner Brook, Nfld.	570
CFCF	Montreal, Que.	600
CFCH	Callander, Ont.	600
CFCL	Timmins, Ont.	620
CFCN	Calgary, Alta.	1060
CFCO	Chatham, Ont.	630
CFCP	Courtenay, B.C.	1440
CFCW	Camrose, Alta.	790
CFCY	Charlottetown, P.E.I.	630
CFDA	Victoriaville, Que.	1380
CFDR	Dartmouth, N.S.	790
CFGB	Goose Bay, Nfld.	1340
CFGM	Richmond Hill, Ont.	1310
CFGP	Grande Prairie, Alta.	1050
CFGR	Gravelbourg, Sask.	1230
CFGT	Saint-Joseph-d' Alma, Que.	1270

C.L.	Location	Kc.
CFJC	Kamloops, B.C.	910
CFJR	Brockville, Ont.	1450
CFKL	Scheffervile, Que.	1230
CFLM	La Tuque, Que.	1240
CFLV	Valleyfield, Que.	1370
CFMB	Montreal, Que.	1410
CFML	Cornwall, Ont.	1110
CFMR	Fort Simpson, N.W.T.	1490
CFNB	Fredericton, N.B.	550
CFNS	Saskatoon, Sask.	1170
CFOB	Fort Frances, Ont.	800
CFOR	Orillia, Ont.	1570
CFOS	Owen Sound, Ont.	560
CFOX	Pointe, Claire, Que.	1470
CFPA	Port Arthur, Ont.	1230
CFPL	London, Ont.	980
CFPR	Prince Rupert, B.C.	1240
CFQC	Saskatoon, Sask.	600
CFRA	Ottawa, Ont.	580
CFRB	Toronto, Ont.	1010
CFRC	Kingston, Ont.	1490
CFRG	Gravelbourg, Sask.	710
CFRN	Edmonton, Alta.	1260
CFRS	Simcoe, Ont.	1560
CFRY	Portage la Prairie, Man.	920
CFSL	Weyburn, Sask.	1340
CFTJ	Galt, Ont.	1110
CFTK	Terrace, B.C.	1140
CFUN	Vancouver, B.C.	1410
CFVR	Abbotsford, B.C.	1240
CFWB	Campbell River B.C.	1490
CFYK	Yellowknife, N.W.T.	1340
CFWH	Whitehorse, Y.T.	570
CHAB	Moose Jaw, Sask.	800
CHAD	Amos, Que.	1340
CHAK	Inuvik, N.W.T.	860
CHAT	Medicine Hat, Alta.	1270
CHCM	Marystown, Nfld.	560
CHEC	Lethbridge, Alberta	1090
CHED	Edmonton, Alta.	630
CHEF	Granby, Que.	1450
CHEX	Peterborough, Ont.	980
CHFA	Edmonton, Alta.	680
CHFC	Churchill, Man.	1320

C.L.	Location	Kc.
CHFI	Toronto, Ont.	1540
CHGB	Sainte-Anne-de-la-Pocatière, Que.	1310
CHIC	Brampton, Ont.	1090
CHIQ	Hamilton, Ont.	1280
CHLC	Saguenay Co., Que.	580
CHLN	Trois-Rivières, Que.	550
CHLO	St. Thomas, Ont.	680
CHLT	Sherbrooke, Que.	630
CHML	Hamilton, Ont.	900
CHNC	New Carlisle, Que.	610
CHNO	Sudbury, Ont.	900
CHNS	Halifax, N.S.	960
CHOK	Samia, Ont.	1070
CHOV	Pembroke, Ont.	1350
CHOW	Welland, Ont.	1470
CHQM	Vancouver, B.C.	1320
CHRC	Quebec, Que.	800
CHRD	Drummondville, Que.	1340
CHRL	Roberval, Que.	910
CHRS	St-Jean, Que.	1090
CHSJ	Saint John, N.B.	1150
CHUB	Nanaimo, B.C.	1570
CHUC	Cobourg, Ontario	1500
CHUM	Toronto 7, Ontario	1050
CHVC	Niagara Falls, Ont.	1600
CHWK	Chilliwack, B.C.	1270
CHWO	Oakville, Ont.	1250
CJAD	Montreal, Que.	800
CJAF	Cabano, Que.	1340
CJAT	Trail, B.C.	610
CJAV	Port Alberi, B.C.	1240
CJBC	Toronto, Ont.	860
CJBM	Rimouski, Que.	1450
CJBQ	Belleville, Ont.	800
CJBR	Rimouski, Que.	900
CJCA	Edmonton, Alta.	930
CJCB	Sydney, N.S.	1270
CJCH	Halifax, N.S.	920
CJCJ	Woodstock, N.B.	920
CJCS	Stratford, Ont.	1240
CJDC	Dawson Creek, B.C.	1350
CJDV	Drumheller, Alta.	910
CJEM	Edmundston, N.B.	570
CJET	Smiths Falls, Ont.	630

C.L.	Location	Kc.
CJFP	Riviere-du-Loup, Que.	1400
CJFX	Antigonish, N.S.	580
CJGX	Yorkton, Sask.	940
CJIB	Vernon, B.C.	940
CJIC	Sault Ste. Marie, Ont.	1050
CJJC	Langley, B.C.	850
CJKL	Kirkland Lake, Ont.	560
CJLM	Joliette, Que.	1050
CJLR	Quebec, Que.	1060
CJLS	Yarmouth, N.S.	1340
CJLX	Fort William, Ont.	800
CJME	Regina, Sask.	1300
CJMS	Montreal, Que.	1280
CJMT	Chicoutimi, Que.	1420
CJNB	North Battleford, Sask.	1460
CJNR	Blind River, Ont.	730
CJOB	Winnipeg Man.	680
CJOC	Lethbridge, Alta.	1220
CJON	St. John's, Nfld.	930
CJOR	Vancouver, B.C.	600
CJOY	Guelph, Ont.	1460
CJQC	Quebec, Que.	1340
CJQM	Winnipeg, Manitoba	1470
CJRL	Kenora, Ont.	1220
CJRW	Summerside, P.E.I.	1240
CJSL	Estevan, Sask.	1280
CJSO	Sorel, Que.	1320
CJSP	Leamington, Ont.	710
CJSS	Cornwall, Ont.	1220
CJVI	Victoria, B.C.	900
CKAC	Montreal, Que.	730
CKAD	Wilmot Stn. N.S.	1490
CKAR	Huntsville Ont.	630
CKAR-1	Huntsville, Ont.	1340
CKBB	Barrie, Ont.	950
CKBC	Bathurst, N.B.	1360
CKBI	Prince Albert, Sask.	900
CKBL	Matane, Que.	1250
CKBM	Montmagny, Que.	1490
CKBS	St. Hyacinthe, Que.	1240
CKBW	Bridgewater, N.S.	1000
CKCH	Hull, Que.	970
CKCK	Regina, Sask.	620
CKCL	Truro, N.S.	600
CKCM	Grand Falls Nfld.	620

C.L.	Location	Kc.
CKCN	Sept-Iles, Que.	360
CKCQ	Quesnel, B.C.	570
CKCQ-1	Quesnel, B.C.	1240
CKCR	Kitchener, Ont.	1490
CKCV	Quebec,Que.	1280
CKCW	Moncton, N.B.	1220
CKCY	Sault Ste. Marie, Ont.	920
CKDA	Victoria, B.C.	1220
CKDH	Amherst, N.S.	1400
CKDM	Dauphin, Man.	730
CKDR	Kenora, Ont.	900
CKEC	New Glasgow, N.S.	1320
CKEK	Cranbrook, B.C.	570
CKEN	Kentville, N.S.	1350
CKEY	Toronto, Ont.	580
CKFH	Toronto, Ont.	1430
CKGB	Timmins, Ont.	680
CKGM	Montreal, Que.	980
CKJL	Saint-Jérôme, Que.	900
CKKW	Kitchener, Ontario	1320
CKLB	Oshawa, Ont.	1350
CKLC	Kingston, Ont.	1380
CKLD	Thetford Mines, Que.	1230
CKLG	Vancouver, B.C.	730
CKLM	Montreal, Que.	1570
CKLN	Nelson, B.C.	1390
CKLS	La Sarre, Que.	1240
CKLW	Windsor, Ont.	800
CKLY	Lindsay, Ont.	910
CKML	Mont Laurier, Que.	610
CKMP	Midland, Ont.	1230
CKMR	Newcastle, N.B.	790
CKNB	Campbellton, N.B.	950
CKNL	Fort St. John, B.C.	950
CKNW	New Westminister, B.C.	980
CKNX	Wingham, Ont.	920
CKOC	Hamilton, Ont.	1150
CKOK	Pentieton, B.C.	800
CKOM	Saskatoon, Sask.	1250
CKOT	Tillsonburg, Ont.	1510
CKOV	Kelowna, B.C.	630
CKOX	Woodstock, Ont.	1340
CKOY	Ottawa, Ont.	1310
CKPC	Brantford, Ont.	1380
CKPG	Prince George, B.C.	550
CKPR	Port Arthur, Ont.	580
CKPT	Peterborough, Ont.	1420
CKRB	Cté de Beauce, Que.	1460
CKRC	Winnipeg, Man.	630
CKRD	Red Deer, Alta.	850
CKRM	Regina, Sask.	980
CKRN	Rouyn, Que.	1400
CKRS	Jonquière Que.	590
CKSA	Lloydminster, Alta.	1150
CKSB	Saint-Boniface, Man.	1050
CKSL	London, Ont.	1290
CKSM	Shawinigan, Que.	1220
CKSO	Sudbury, Ont.	790
CKSW	Swift Current, Sask.	1400
CKTB	St. Catharines, Ont.	610
CKTR	Trois-Rivières, Que.	1150
CKTS	Sherbrooke, Que.	900
CKUA	Edmonton, Alta.	580
CKVD	Val-d'Or, Que.	1230
CKVL	Verdun, Que.	850
CKVM	Ville-Marie, Que.	710
CKWS	Kingston, Ont.	960
CKWX	Vancouver, B.C.	1130
CKX	Brandon, Man.	1150
CKXL	Calgary, Alta.	1140
CKY	Winnipeg, Man.	580
CKYL	Peace River, Alta.	610
VOAR	St. John's Nfld.	1230
VOCM	St. John's Nfld.	590
VOWR	St. John's, Nfld.	800

Cuba, Mexico & Puerto Rico AM Stations by Call Letters

The broadcast stations listed below carry regular program material and transmit with 5000 watts or better power output during at least part of their broadcasting day.

Cuba

Location	C.L.	Kc.
Havana	CMCY	550
	CMW	590
	CMQ	640
	CMCU	660
	CMBC	690
	CMCA	730
	CMCD	760
	CMCH	790
	CMCU	820
	CMBZ	830
	CMBL	860
	CMCF	910
	CMBF	950
	CMCK	980
	CMBF	1010
	CMCX	1040
	CMBS	1090
	CMBY	1140
	CMBQ	1160
	CMK	1180
	CMCI	1260
	CMBG	1360
	CMBX	1390
	CMCQ	1420
	CMCM	1460
	CMCX	1490
	CMBD	1520
Holguin	CMKJ	740
Santa Clara	CMHI	570
	CMHQ	630

Mexico

Location	C.L.	Kc.
Acapulco, Gro.	XEBB	600
Chetumal, Q.R.	XEDB	960
Chihuahua, Chih.	XEFI	580
	XEBU	620
	XEM	1390
	XEII	1420
Ciudad Acuna, Coah.	XERF	1570
Ciudad Juarez, Chih.	XELO	800
	XEJ	970
	XEF	1420
Ciudad Obregon, Son.	XEIC	810
	XEOX	1430
Coatzacoalcos, Ver.	ZEZS	1170
Culiacan, Sin.	XENW	710
	XEWS	1010
Guadalajara, Jal.	XEAV	580
	XEZZ	760
	XEHL	1010
	XEWK	1190
	XEDK	1250
Hermosillo, Son.	XEBH	920
	XEDM	1580
Irapuato, Gto.	XEWE	1420
Jalapa, Ver.	XEJJ	1550
La Piedad, Mich.	XELC	980
Leon, Gto.	XELG	680
	XEX	730
	XEXG	6065
Matamoros, Tams.	XEEW	1420
Merida, Yuc.	ZEQW	50
Mexicali, B.C.	XECL	990
	XED	1050
	XEKC	1590
Mexico City	XEPH	590
	XENK	620
	XERPM	660
	XEN	690
	XEX	730
	XERC	790
	XELA	830
	XEUN	860
	XEW	900
	XEQ	940
	XEDF	970
	XEQY	1000
	XEQR	1030
	XEDP	1060
	XERCN	1110
	XEJP	1150
	XEB	1220
	XEL	1260
	XEBS	1410
	XELZ	1440
	XESM	1470
	XERH	1500
	XEMC	1590
	XEWW	6165
	XEWW	9515
	XEQQ	9680
	XEHH	11880
	XERR	15110
	XEWW	15160
	XESC	15205
Monterrey, N.L.	XEWA	540
	XEAR	570
	XEFB	630
	XENL	860
	XET	990
	XEG	1050
	XEMR	1140
	XEAW	1280
	XEFZ	1370
Nogales, Son.	XEHF	1370
Neuvo Laredo, Tams.	XEK	960
Oaxaca, Oax.	XEOA	570
Orizaba, Ver.	XETQ	850
Parras De La Fuente, Coah.	XEJQ	1440
Patzcauro, Mich.	XEXL	1370
Piedras Negras, Coah.	XEWU	580
Poza Rica, Ver.	XEPR	1480
Puebla, Pue.	XEPA	1370
Reynosa, Tams.	XERT	1170
Rio Bravo, Tams.	XEFD	590
Sabinas, Coah.	XEBX	610
San Luis Potosi, S.L.P.	XEWA	540
	XEBM	920
Tampico, Tams.	XEFW	810
Tijuana, B.C.	XETRA	690
	XEMO	860
	XEAU	1470
Torreon, Coah.	XEVK	1010
	XEBP	1310
	XETB	1350
Tuxpan, Nay.	XEUX	810
Tuxpan, Ver.	XETL	1390
Uruapan, Mich.	XEUF	610
Veracruz, Ver.	XEWB	760
	XEU	920
	XELL	1430
Villahermosa, Tab.	XEVA	790
	XEVT	970
Zamora,, Mich.	XEZM	650
Zitacuaro, Mich.	XELX	1460

Puerto Rico

Location	C.L.	Kc.
Arecibo	WCMN	1230
Bayamon	WRSJ	1560
Fajardo	WMDD	1480
Mayaguez	WORA	760
Ponce	WPAB	550
	WPRP	910
San Juan	WKAQ	850
	WAPA	680
	WIAC	740
	WKVM	810
	WHOA	870
	WIPR	940
	WUNO	1320

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 operate 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. Those of you who are interested in monitoring spaceshots and the like should make note of the frequencies which have been used for such purposes in the past. The following have been utilized by NASA for the American shots: 5190, 7580, 10615, 11228, 13215.5, 13826, 15016, 15968, and 20700 kc/s.

In our last issue we ran an article on "undercover" broadcasting stations (*Counterfeit Broadcasters,* by *Tom Kneitel,* K3FLL/WB2AAI) which drew considerable mail. The author reports that RADIO-TV EXPERIMENTER readers added some clandestine loggings of their own to the list we published. Some of those reported were: *"Sawt alh Thawra al Jazariyah"* on 6430, 8023, 8277, 12415; *"Idhaat Harakat an Nahdah al Jazairiyyah"* on 8220 kc/s; *"Sawt Athuqawimin Min Alwilaya Alkamisah"* on 8277 kc/s; *"Radio Christo Botev"* on 7232 kc/s; *"Radio Republik Persatuan"* on 6465 kc/s; *"Radio Rebelde"* on 7005 kc/s; "ZPX14, *La Voz del Movimiento Catorce de Mayo para la Liberdad Paraguaya"* on 14100 kc/s; *"Voce d Istria"* on 6326, 6470, 6550 kc/s.

The clandestine *"R. Liberdad"* is still one of the most active of the many undercover stations on the air. Despite two previously reported mailing addresses for the station which turned out to be false, we have come up with two additional addresses now. The first is P.O. Box 1624, Miami 1, Fla., the other is P.O. Box 2113, Ocean View Branch, Miami, Fla. We can't vouch for either yet. There has been some speculation that the station is located aboard a ship known as the *SS Rex,* but we still put our bet down for the true location as being Venezuela.

"Radio Americas" (formerly *"Radio Swan"*) has been playing musical chairs with an annoying jamming station in Cuba. Because of the jammer they have had to keep changing their broadcast band frequency. They announce that they are on 1160 kc/s but have been heard anywhere between 1156 and 1175 kc/s.

By the way, *"La Voix de la Revolution,"* which was listed in the *Counterfeit Broadcasters* as being an undercover station, turned out to be legit. Their address is P.O. Box 617, Conakry, Guinea Republic.

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*

'TE'S DIO LOG

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 R-TVE monitoring station in New York City, to bring you this month's listings:

Pat Stakem, Cumberland, Md.
Fred Simon, Danbury, Conn.
Peter Grenier, Fall River, Mass.
James Howard, Kansas City, Mo.
Donny Perro, Mobile, Ala.
Jim Bennett, Jr., Conygham, Pa.
Tom Kneitel, New York, N. Y.
Walter P. Pyne, Hagerstown, Md.
Richard Wallace, Flushing, N. Y.
Matthew O'Neill, Freeport, N. Y.
Graham Quaal, Lake Forest, Ill.
Alan S. Lamb, Toronto, Ont.
Francis Gifford, Lathrup Village, Mich.
R. Aman, Milwaukee, Wisc.
Kermit Hickman, Crocker, Mo.
Charles S. Wackerman II, Pollocksville, N. C.

Why not send us your loggings for our next listing? Share your DX with others! Get those reports in NOW! Good DX!

EUROPE

Location	Name	Call	Kc.	EST
ALBANIA				
Tirana	R. Tirana	—	9470	1930
Tirana	R. Tirana	—	9870	0530
ANDORRA				
Andorra	R. Andorra	—	6195	0400
AZORES				
Ponta Delgada	Emissora Nacional	CSA97	4865	1725
BELGIUM				
Brussels	Belg. R. & TV	ORU	6140	1800
BULGARIA				
Sofia	R. Sofia	—	6070	1900
CZECHOSLOVAKIA				
Prague	R. Prague	—	5930	2000
Prague	R. Prague	—	6005	2000
Prague	R. Prague	—	7345	2000
Prague	R. Prague	OLR3A	9550	2000
Prague	R. Prague	—	9795	2000
Prague	R. Prague	OLR5H	15285	1000
Prague	R. Prague	--	17830	1000
DENMARK				
Copenhagen	V. of Denmark	OZF5	9520	2030
Copenhagen	V. of Denmark	OZF7	15165	0700
FINLAND				
Helsinki	Finnish BC	OIX2	9555	2200
Helsinki	Finnish BC	—	11805	2200
Helsinki	Finnish BC	OIX4	15185	0630
FRANCE				
Paris	R. TV Francaise	—	9585	0100
Paris	R. TV Francaise	—	11885	1830
Paris	R. TV Francaise	—	15130	1200
GERMANY (EAST)				
Berlin	R. Berlin Int'l.	—	6050	0600
Berlin	R. Berlin Int'l.	—	6080	0845
GERMANY (WEST)				
Cologne	Deutsche Welle	—	6000	2200
Cologne	Deutsche Welle	DMQ6	6100	1900
Cologne	Deutsche Welle	—	6145	2345
Cologne	Deutsche Welle	—	9545	1900
Cologne	Deutsche Welle	DMQ9	9640	2200
Cologne	Deutsche Welle	DMQ9	9735	1010
Cologne	Deutsche Welle	DMQ11	11795	1010
Munich	Bayerische R.	—	6085	0108
GREAT BRITAIN				
London	BBC	MCM	3953	1900
London	BBC	—	6000	2130
London	BBC	GSL	6110	1615
London	BBC	—	6119	1615
London	BBC	GRK	7185	2250
London	BBC	GSB	9510	1615
London	BBC	GRH	9825	2230
London	BBC	GSD	11750	1700
London	BBC	GWR	15300	1030
London	BBC	—	15420	1200
GREECE				
Larissa	Forces BC	—	5955	0000
Rhodes	V. of America	—	7120	0200
Thesaloniki	R. Thesaloniki	—	6185	2300
HUNGARY				
Budapest	R. Budapest	—	5960	2200
Budapest	R. Budapest	—	6234	1700
Budapest	R. Budapest	—	7220	1900
ICELAND				
Reykjavik	Utvarp Reykjavik	TFJ	9720	1800
ITALY				
Rome	RAI	—	5960	2215
LUXEMBOURG				
Villa Louvigny	R. Luxembourg	—	6090	1600
Villa Louvigny	R. Luxembourg	—	15350	1640
MONACO				
Monte Carlo	Trans World R.	—	7098	0030
Monte Carlo	Trans World R.	—	7260	0230
NETHERLANDS				
Hilversum	R. Netherlands	—	6020	0230
Hilversum	R. Netherlands	—	6035	2030
Hilversum	R. Netherlands	—	6085	1630
Hilversum	R. Netherlands	—	7125	1630
Hilversum	R. Netherlands	—	15445	1030
Hilversum	R. Netherlands	—	17810	1030
PORTUGAL				
Lisbon	V. of The West	—	6025	2100
Lisbon	V. of The West	—	6185	2145
Lisbon	V. of The West	—	21700	0917
RUMANIA				
Bucharest	R. Bucharest	—	6190	.1730
Bucharest	R. Bucharest	—	7195	2115
SPAIN				
Madrid	R. Nac. de Espana	—	6130	1715
Madrid	R. Nac. de Espana	—	9360	0120
Madrid	R. Nac. de Espana	—	9425	0110
SWEDEN				
Stockholm	R. Sweden	—	17845	0900
SWITZERLAND				
Berne	Swiss BC	HER3	6165	2010
Berne	Swiss BC	HED2	7110	1530
Berne	Swiss BC	HER4	9535	2030

Location	Name	Call	Kc.	EST
Berne	Swiss BC	HEU3	9665	2030
Berne	Swiss BC	HEU6	15315	0945
U.S.S.R.				
Alma-Ata	R. Alma-Ata	—	6980	0530
Arkhangelsk	R. Arkhangelsk	—	7165	0615
Gorkiy	R. Gorkiy	—	7185	2300
Kiev	R. Kiev	—	7180	0700
Kiev	R. Kiev	—	7190	0700
Kiev	R. Kiev	—	7210	2100
Kiev	R. Kiev	—	7280	0900
Kiev	R. Kiev	—	7310	0700
Moscow	R. Moscow	—	6140	1700
Moscow	R. Moscow	—	7130	1700
Moscow	R. Moscow	—	7150	1700
Moscow	R. Moscow	—	7163	0500
Moscow	R. Moscow	—	7170	1700
Moscow	R. Moscow	—	7205	1700
Moscow	R. Moscow	—	7250	2200
Moscow	R. Moscow	—	7290	1700
Moscow	R. Moscow	—	7380	1700
Moscow	R. Moscow	—	9620	1700
Moscow	R. Moscow	—	9650	1830
Moscow	R. Moscow	—	15140	2200
Moscow	R. Moscow	—	15460	1800
Tashkent	R. Tashkent	—	11925	0909
Yerevan	R. Yerevan	—	11690	1515
VATICAN				
Vatican City	Vatican R.	—	6145	1950
Vatican City	Vatican R.	—	7250	1950
Vatican City	Vatican R.	—	9645	1950
YUGOSLAVIA				
Belgrade	R. Belgrade	—	6100	1600

AFRICA

ALGERIA				
Algers	R. Algerie	—	9685	1130
ANGOLA				
Luanda	E. Oficial de Angola	—	4955	0600
Luanda	E. Oficial de Angola	CR6SD	6025	0600
Luanda	E. Oficial de Angola	—	7265	0600
Luanda	E. Oficial de Angola	—	9705	0600
Luanda	E. Oficial de Angola	CR6SE	9765	0600
Malanje	R. Clube de Malanje	—	4965	0132
CAMEROON				
Yaounde	Ici Yaounde	—	4972	1600
CENTRAL AFRICAN REPUBLIC				
Bangui	R. Bangui	—	5035	1641
CONGO REPUBLIC				
Leopoldville	R. Congolaise	—	9640	1500
Leopoldville	R. Congolaise	—	11755	2150
Leopoldville	R. Congolaise	—	11795	1500
CONGO (FRENCH AFRICAN)				
Brazzaville	R. Congo	—	9730	2100
Brazzaville	R. Congo	—	11970	2230
Brazzaville	R. Congo	—	15190	1426
Brazzaville	R. Congo	—	15370	0215
DAHOMEY				
Cotonou	R. du Dahomey	—	4875	0145
ETHIOPIA				
Addis Ababa	R. V. of Gospel	ETLF	4905	2130
GABON				
Libreville	R. Nationale	—	4777	1648
GHANA				
Accra	Ghana BC	—	3366	1632
Accra	Ghana BC	—	4915	1646
GUINEA REPUBLIC				
Conakry	Ici Conakry	—	3385	0400
Conakry	Ici Conakry	—	4910	0400
Conakry	Ici Conakry	—	9650	0400
Conakry	Ici Conakry	—	9900	0330
Conakry	Ici Conakry	—	15310	1300
IVORY COAST				
Abidjan	R. Abidjan	—	7215	2300
Abidjan	R. Abidjan	—	11820	2300
LIBERIA				
Monrovia	R. Village	ELWA	15155	1400
Monrovia	V. of America	—	6005	2300
MALGACHE REPUBLIC				
Tananarive	R. Univ. de Tananarive	—	3375	2130
MOROCCO				
Tangier	V. of America	—	7125	2315
Tangier	V. of America	—	7200	2330
MOZAMBIQUE				
Lourenco Marques	R. Club	CR7BG	15295	2100
NIGERIA (FEDERATION)				
Enugu	Nigerian BC	—	4855	161
Lagos	Nigerian BC	—	11900	2030
Lagos	Nigerian BC	—	15355	2330
RHODESIA & NYASALAND				
Lusaka	Federal BC	—	3295	2300
Lusaka	Federal BC	—	3346	2300
Lusaka	Federal BC	—	4911	0855
Lusaka	Federal BC	—	4965	2300
Lusaka	Federal BC	—	6060	1500
SAO TOME E PRINCIPE				
Sao Tome	R. Clube de Sao Tome	CR5SC	4807	1633
SENEGAL REPUBLIC				
Dakar	R. Senegal	—	5960	1100
S. AFRICA (REPUBLIC)				
Paradys	Springbrook R.	—	3370	0930
Paradys	Springbrook R.	—	4875	0930
Paradys	Springbrook R.	—	6095	0930
Paradys	Springbrook R.	—	9650	2040
Paradys	Springbrook R.	—	11900	2330
UPPER VOLTA (REPUBLIC)				
Ouagadougou	R. de la Haute-Volta	—	4813	0130

ASIA AND NEAR EAST

AFGHANISTAN				
Kabul	R. Kabul	—	6000	1900
Kabul	R. Kabul	—	9595	1600
Kabul	R. Kabul	—	9650	1530
Kabul	R. Kabul	—	15135	1600
BURMA				
Rangoon	Burma BC	—	5040	1600
CAMBODIA				
Phnom Penh	R. Nat. Khmere	—	17720	0700
CEYLON				
Colombo	R. Ceylon	—	11800	0137
Colombo	R. Ceylon	—	15450	1830
CHINA (COMMUNIST)				
Peking	R. Peking	—	6210	1548
Peking	R. Peking	—	6345	0100
Peking	R. Peking	—	9485	2006
Peking	R. Peking	—	9785	0710
CHINA (FREE)				
Taipei	V. of Free China	—	6095	2200
Taipei	V. of Free China	—	7130	2200
Taipei	V. of Free China	—	9685	2200
Taipei	V. of Free China	—	11725	0534
Taipei	V. of Free China	—	11825	2206
Taipei	V. of Free China	BED57	15345	2200
Taipei	V. of Free China	—	15395	2200
INDIA				
Delhi	All India R.	VUD	15185	1215
INDONESIA				
Djakarta	V. of Indonesia	YDF	6045	1430
Djakarta	V. of Indonesia	—	9632	1900
Djakarta	V. of Indonesia	YDF6	9710	1604
Djakarta	V. of Indonesia	YDF8	9865	1430
IRAN				
Teheran	R. Iran	—	7135	0730
Teheran	R. Iran	EQC	9659	1730
Teheran	R. Iran	—	11730	1030
Teheran	R. Iran	EPB	15125	0400
IRAQ				
Baghdad	R. Baghdad	—	6095	1950
ISRAEL				
Jerusalem	Kol Yisrael	4XB31	9009	0100
Jerusalem	Kol Yisrael	—	9625	0114
JAPAN				
Tokyo	Far East Network	—	3910	1630
Tokyo	Far East Network	JOZ	3925	1630
Tokyo	Far East Network	JOZ4	3945	1630
Tokyo	R. Japan NHK	JOB6	6080	0300
Tokyo	R. Japan NHK	JOA11	11705	1830
Tokyo	R. Japan	JOB15	15325	1300
KOREA (NORTH)				
Pyongyang	R. Pyongyang	—	15240	2215
KOREA (REPUBLIC)				
Seoul	V. of Free Korea	HLK5	9640	1030
Seoul	V. of Free Korea	HLK6	11950	1230
KUWAIT				
Kuwait	Huna Dar Al-Iza'a Al Kuwaitieh	—	15150	1200
LEBANON				
Beirut	Lebanese BC	—	9620	0745

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EST

Location	Name	Call	Kc.	EST
MALAYSIA				
Singapore	B.B.C.	—	9725	0600
PAKISTAN				
Karachi	R. Pakistan	—	11672	2000
Karachi	R. Pakistan	—	15155	1835
PHILIPPINES				
Manila	Far East BC	—	9710	0630
Manila	Far East BC	DZH8	11850	0440
Manila	Far East BC	DZF2	11920	0630
Manila	Far East BC	DZH9	15300	0600
RYUKYU ISLANDS				
Okinawa	V. of America	—	7165	0831
SYRIA				
Damascus	R. Damascus	—	15165	1230
TIMOR				
Dili	R. Dili	—	3268	1630
TURKEY				
Ankara	R. Ankara	TAS	7285	1625
Ankara	R. Ankara	TAT	9515	1915
VIETNAM (NORTH)				
Hanoi	V. of Vietnam	—	15100	1600
VIETNAM (SOUTH)				
Saigon	VTVN	—	7265	0430

PACIFIC

AUSTRALIA				
Melbourne	Australian BC	VLX9	9610	0530
Melbourne	R. Australia	—	9580	0732
Melbourne	R. Australia	—	15220	0715
Melbourne	R. Australia	—	17840	0715
HAWAII				
Honolulu	V. of America	—	6195	1530
NEW ZEALAND				
Wellington	N.Z. Calling	ZL2	9540	1140
Wellington	N.Z. Calling	ZL3	11780	1140
Wellington	N.Z. Calling	ZL21	15110	0600
Wellington	N.Z. Calling	ZL4	15280	0600

NORTH AMERICA

CANADA				
Halifax, N.S.	Maritime BC	CHNX	6130	1746
Montreal, P.Q.	Canadian BC	CKNA	5970	1800
Montreal, P.Q.	Canadian BC	CHAY	5990	1825
Montreal, P.Q.	Canadian BC	CKLP	9585	0100
Montreal, P.Q.	Canadian BC	CKYU	9625	1818
Montreal, P.Q.	Canadian BC	CKLO	9630	1807
Montreal, P.Q.	Canadian Marconi	CFCX	6005	1030
Sydney, N.S.	Cape Breton BC	CJCX	6010	1500
Toronto, Ont.	Rogers Radio BC	CFRX	6070	2230
UNITED STATES OF AMERICA				
Greenville, N.C.	V. of America	—	5965	2128
Los Angeles, Cal.	A.F.R.T.S.	KCBR	11770	0400
Marathon Key, Fla.	V. of America	—	6115	2108
New York, N.Y.	R. N.Y. Worldwide	WRUL	9520	2330
New York, N.Y.	R. N.Y. Worldwide	WRUL	9695	0300
New York, N.Y.	R. N.Y. Worldwide	WRUL	9710	0030
New York, N.Y.	R. N.Y. Worldwide	WRUL	11950	1700
New York, N.Y.	R. N.Y. Worldwide	WRUL	15385	2030
New York, N.Y.	R. N.Y. Worldwide	WRUL	15440	1700
Red Lion, Pa.	—	WINB	11825	1000
San Francisco, Cal.	V. of Friendship	KGEI	15240	2300

CENTRAL AMERICA AND CARIBBEAN

COSTA RICA				
San Jose	R. Monumental	TIGPH	6215	2239
San Jose	R. Reloj	TIHBG	6203	0155
CUBA				
Havana	R. Havana	—	6135	2310
Havana	R. Havana	—	6150	2100
Havana	R. Havana	—	9765	1900
Havana	R. Havana	—	11840	1445
DOMINICAN REPUBLIC				
San Pedro	V. de Oriente	HIIJ	6025	0600
Santiago	R. Liberdad	HI5B	6080	0515
Santiago	R. Santiago	HI8Z	6060	0500
Santo Domingo	E. Nacionales	HIIZ	6112	1655
Santo Domingo	R. Comercial	HI2JP	4880	2217
Santo Domingo	R. Santo Domingo	HI7SD	3285	2145
Santo Domingo	Santo Domingo TV	HI4U	9505	2257

Location	Name	Call	Kc.	EST
COSTA RICA				
San Jose	Faro del Caribe	TIFC	9645	0900
EL SALVADOR				
San Salvador	R. Nacional	YSS	9555	2130
GUATEMALA				
Guatemala City	R. Cultural	TGNA	5952	0530
Guatemala City	R. Cultural	TGNB	9668	0500
Quetzaltenango	R. Nacional	TGQB	11700	1850
Retalhuleu	R. Modelo	TGRE	11750	0300
HAITI				
Cap Hatien	V. Evangelique	4VE	6120	0606
Port au Prince	R. Haiti	4VHW	6200	0530
HONDOURAS				
Tegucigalpa	R. Centro	HRUC	6155	1845
Tegucigalpa	V. de Hondouras	HRNL	5875	1715
MARTINIQUE				
Fort de France	R. Martinique	—	3315	2241
Fort de France	R. Martinique	—	4975	1030
MEXICO				
Cd. Mante	R. XECM/XECMT	XECMT	6090	1700
Hermosillo	Univ. de Sonora	XEUDS	6115	2240
Mexico City	R. Comerciales	XEHH	11880	1346
Mexico City	R. de XEMC/XESC	XESC	15205	1300
	R. Univ. de Mexico	XEYU	9600	0907
	V. de Amer. Latina	XEWW	6165	0733
	V. de Mexico	XEXG	6065	0645
Tapachula	XETS	XETS	6120	1000
SWAN ISLAND				
Swan	Radio Americas	—	6050	2300
Swan	Radio Americas	—	11780	1243
WINDWARD ISLANDS				
St. Georges	Windward I. BC	—	3280	2000

SOUTH AMERICA

ARGENTINA				
Buenos Aires	R. Belgrano	LRY	6090	2105
Buenos Aires	R. Nacional	LRA33	15345	1400
BOLIVIA				
La Paz	R. Amauta	CP9	6270	0600
BRAZIL				
Natal	R. Poti	ZYI21	4935	2132
Recife	R. Club de Pernambuco	PRA8	11865	0530
Rio de Janero	R. Aparaceida	ZYR83	9635	0145
Rio de Janero	R. Relogio Federal	ZYZ22	4905	1810
Rio de Janero	R. Rural Brasileira	ZYZ32	15105	2100
Rio de Janero	R. Tupi	ZYC9	15370	2000
Salvador	R. Soc. de Bahia	ZYN32	11875	0100
Sao Luis	R. Maranhao	—	4755	1955
Sao Luis	R. Timbira	ZYV9	4975	0600
Sao Luis	R. Timbira	ZYV9	15215	0600
Sao Paulo	R. Excelsior	ZYR56	9585	1808
Sao Paulo	R. Nove de Julho	ZYR96	9620	0200
CHILE				
Santiago	R. Cooperativa	CE970	9700	1910
Santiago	R. Coop. de Sant.	CEI515	15153	1714
Santiago	R. Soc. de Mineria	—	11740	0200
Santiago	R. Yungay	CE965	9655	2033
COLOMBIA				
Bogota	E. Nueva Granada	HJKJ	6160	2341
Bogota	R. Santa Fe	HJAE	4965	0100
Bogota	R. Sutatenza	HJGO	3250	2015
Bogota	R. Sutatenza	HJGC	5075	1838
	Serv. Dif. de RTV	HJCQ	4955	2033
	Voz de Bogota	HJCF	5960	0515
Cali	Voz de Cali	HJEZ	6195	2202
Popayan	Voz de Caucas	HJEQ	6147	2107
ECUADOR				
Guayaquil	E. Atalaya	HCAU2	4600	2100
Portoviejo	Ondas del Volante	HCSP4	6106	1927
Quito	V. de los Andes	HCJ8	11915	2315
Quito	R. Quito	HCQR1	4923	0730
Riobamba	R. Populares	—	3985	0137
PERU				
Iquitos	R. Loreto	—	4685	0300
Iquitos	R. Loreto	—	4735	2100
Iquitos	R. Loreto	OAX8E	9505	0300
Lima	R. America	OAX4W	9450	2136
Lima	R. la Cronica	OAX4J	9525	2300
Lima	R. Nacional	OAX4Z	6082	2317
Pucallpa	R. Pucallpa	OAX8Q	9580	2135
URUGUAY				
Montevideo	R. Ariel	CXA3	6075	0412
Montevideo	V. de Melo	CXA64	15230	1830
VENEZUELA				
Caracas	R. Nacional	YVKO	6170	0400
Caracas	V. de la Patria	YVKX	3305	1947
Valera	R. Valera	YVOI	4840	2210
CLANDESTINE				
—	R. Liberdad	—	7320	2335
—	R. Liberdad	—	15048	0950
—	V. Portugal Libre	—	14350	1425

How to Read

(Continued from page 97)

Reading from left to right, it can be seen that this tube is a triode whose filament operates at 6.3 volts and 0.15 ampere, and has an indirectly heated cathode. Its basic application is as a Class-A amplifier. Typical operating plate voltage is 250 volts (col. 7) and when its grid is biased −7 volts (col. 9), the next column has no information, since this tube does not have a screen grid, plate current is 6.3 ma (col. 10). Its trans-conductance is 2200 micromhos, plate resistance is 114 kilohms (114,000 ohms) and its amplification factor is 25. Columns 15 through 19 contain no information because in this case it is not essential, although the load resistance and power output of some other triodes are listed. This information can, however, be calculated.

The **9002**, like the **117Z3**, has a style T-5½ bulb, pictured in *Fig.* 3 of the same tube directory. It is a 7-pin miniature glass tube whose base diagram is 7BS. While the tube has only one filament, cathode, grid and plate, requiring only five external connections, all seven tube pins are utilized. The cathode is connected to both pins 2 and 7, and the plate to pins 1 and 5 to make the tube more suitable for VHF and UHF circuit applications, but without affecting its performances at lower frequencies.

The type **5654** tube, also listed in Fig. 1, is a pentode (col. 2). The filament operates at 6.3 volts, 0.175 ampere and the tube has an indirectly heated cathode (cols. 3, 4, 5). The tube is intended for use as a Class-A amplifier with both the plate and screen grid operated at 120 volts (cols. 6, 7, 8).

Instead of an actual voltage being specified in col. 9, the letter "K" is a reference which, at the bottom of the table, indicates that the control grid bias is obtained by using a 200-ohm resistor in series with the cathode. Typical operating plate current is 7.5 ma and screen grid current is 2.5 ma (cols. 10, 11). The transconductance of the tube is listed in column 12 as 5000 micromhos and the plate resistance is 340 kilOhms (340,000 ohms) according to data shown in column 13.

The information for columns 14 through 19 is not pertinent. Instead there is a note stating "cut-off: 10 ua @ −12V. similar to **6AK5**." This indicates that the tube is a *sharp-cut-off* type of pentode whose plate current is reduced to only 10 microamperes (0.01 ma) when control grid bias is equal to minus 12 volts, and that the tube is intended for use in applications similar to those in which a **6AK5** tube might be used.

Looking at the information about a **6AK5** on a chart on another page of the same tube directory, you will find that the characteristics are the same when plate and screen are operated at 120 volts, except that the plate resistance of the **6AK5** is 300,000 ohms, compared to 340,000 ohms for the 5654 tube, and that only −8.5 volts at the control grid reduces plate current to 10 microamperes. The bulb style, bulb outline drawing, base style and base connections of the **6AK5** and **5654** are identical.

Tube Manuals. Let's look up a popular type of tube in the "RCA Receiving Tube Manual" and see what information can be found and what it means. The **12AT7** tube is described as a 9-pin miniature, high-mu twin triode on the page reproduced in Fig. 2. The description refers you to the OUTLINES SECTION for information about shape and physical dimensions and suggests applications for the tube. As can be noted in the tube's basing diagram, the **12AT7** contains two independent triodes. The dual filament can be operated in series by feeding 12.6 volts (AC or DC) to socket terminals 4 and 5. For 6.3-volt operation, terminals 4 and 5 are strapped together and 6.3 volts (AC or DC) is fed to terminals 9 and 4 or 5. Filament (heater) current is 0.15 ampere when operated at 12.6 volts or 0.3 ampere when operated at 6.3 volts.

The interelectrode capacitances of the tube are listed in Fig. 2 under various conditions. When operated with a metal shield over the tube these characteristics vary as noted. The interelectrode capacitances of a tube are of importance to the experimenter and the design engineer, but mainly when working at relatively high frequencies where the small amount of internal tube capacitance becomes appreciable as far as the circuit is concerned.

The *maximum ratings* of each section of the tube when operated as a Class-A1 amplifier are given in Fig. 2. These ratings should not be exceeded under normal conditions. In the case of the **12AT7** tube, the potential difference between plate and cathode should not exceed 300 volts, and between the cathode and heater, the potential should not exceed 90 volts.

The maximum plate dissipation is listed as 2.5 watts which means that the difference

he power supplied to the tube and delivered by the tube to the load not exceed 2.5 watts.

When operated at 250 volts on the plate, current flow through the tube is essentially at cut-off when the grid is at −12 volts. Making the grid more negative will have no further effect on plate current, but the grid voltage, according to the tube manual, should not exceed −50 volts.

Below the section on maximum ratings are listed the characteristics of each triode section of the tube. These are average characteristics of this specific type of tube and some variance among tubes is to be expected. The illustration below this section of Fig. 2 is known as a family of curves for this particular tube.

Plate Load Line. In an actual circuit where the plate load is a resistance of relatively high value, the plate current is much lower than the value indicated in the table of characteristics. The plate current and the dynamic operating characteristics of the tube can be determined by drawing a loadline over the family of curves. This is the dotted line which has been added to the published curves.

If the plate load is a 25,000-ohm resistor and the plate supply potential is 250 volts, the left end of the loadline is at the 10 ma point of the vertical side of the graph. See Fig. 2. The current through the load resistor would be 10 ma if the plate-to-cathode path through the tube were a short circuit and the entire plate supply voltage appeared across the resistor. The other end of the load line is at the 250 volt point of the horizontal side of the graph.

The plate current will be 5 ma when the grid is biased negative by one volt by a 200-ohm resistor in series with the cathode or a fixed bias source. A signal that swings the grid positive by one volt, reducing the net grid voltage to zero, causes the plate current to rise to about 7 ma. When the signal swings the grid one volt negative, the net grid potential is −2 volts and plate current is reduced to about 3 ma. This does not take into account the small variation in bias voltage developed across the cathode resistor, which is negligible when the cathode resistor is adequately bypassed.

The voltage drop across the plate load resistor changes as the plate current varies. With no signal at the grid, the drop across the load resistance is 125 volts. Since the plate supply potential is 250 volts, the plate is at a potential of 125 volts above ground. In the presence of a one-volt signal, the voltage drop across the load resistor varies from 75 to 175 volts. Hence, the plate potential with respect to ground varies from 75 to 175 volts. When the output signal is derived from the plate through a capacitor, the output signal swings from zero to +50 volts and from zero to −50 volts. Hence, a one-volt signal is amplified into a 50-volt signal. Or, in other terms, a 2-volt, peak-to-peak signal is raised to a 100-volt, peak-to-peak signal. The voltage gain is therefore 50.

Resistance Coupled Amplifiers. In actual resistance-coupled amplifier circuits, such as the one shown in Fig. 4, larger value plate load resistors are used with the **12AT7** tube. The recommended values in the Resistance Coupled Amplifiers Section of RCA manual range from 100,000 ohms to 470,000 ohms and cathode bias resistance values range from 740 ohms to 15,000 ohms, depending upon plate supply voltage and the values of other circuit components.

When used in circuits where the plate load has low DC resistance and high AC impedance, the no-signal plate current is much higher, in the order of 10 ma or more.

Tube Directories and Circuits. The General Electric tube directory, entitled "Essential Characteristics," has more than 300 pages of information about tube characteristics and includes a section containing circuit diagrams.

The 544-page "RCA Receiving Tube Manual" contains considerable information about tube characteristics, applications and circuits and rather complete descriptions of many tube types.

The "Tung-Sol Electron Tube Characteristics Manual" lists hundreds of tube types and contains a section listing tubes that are not recommended for use in new designs. Issue No. 22 of "Tung-Sol Tips" contains a comprehensive article on interpreting tube ratings and characteristics.

There are also special directories listing interchangeable types of both domestic and foreign manufacture.

Tube directories and manuals contain all the information required by most experimenters and service technicians. Engineers may require the more comprehensive tube handbooks such as the "RCA Electron Tube Handbook," a five-volume set priced at $20. General Electric, Tung-Sol, Sylvania and other tube manufacturers also publish comprehensive tube manuals for engineers. ■

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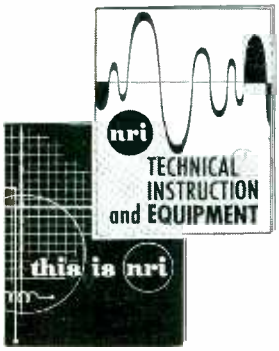

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