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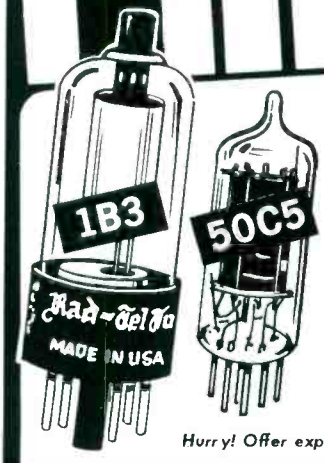

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	5CL8	.76		6DG6	.62		12AL8	.95		19BG6	1.39
	5CQ8	.84		6DJ8	1.21		12AQ5	.60		19EA8	.79
	5EA8	.80		6DK6	.59		12AT6	.50		19T8	.85
	5EU8	.80		6DN6	1.55		12AT7	.76		21EX6	1.49
	5J6	.72		6DQ6	1.10		12AU6	.51		25AX4	.70
	5T8	.86		6DT5	.81		12AU7	.61		25C5	.53
	5U4	.60		6DT6	.53		12AV6	.41		25C45	.59
	5U8	.84		6DT8	.94		12AV7	.82		25CD6	1.52
	5V6	.56		6EA8	.79		12AX4	.67		25CU6	1.11
	5X8	.82		6EB5	.73		12AX7	.63		25DN6	1.42
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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
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RADIO-TV EXPERIMENTER

AUGUST-SEPTEMBER, 1964

Cover Photo by Don Lothrop

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AUGUST-SEPTEMBER 1964

VOLUME 17 No. 1

RADIO-TV EXPERIMENTER

RADIO-TV EXPERIMENTER, Vol. 17, No. 1, is published bi-monthly by SCIENCE & MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Editorial, business and subscription offices: 505 Park Ave., New York, N. Y. 10022. One-year subscription (six issues)—$4.50—two-year subscription (12 issues)—$9.00; and three-year subscription (18 issues)—$13.00. Add $1.00 per year for postage outside the U.S.A. and Canada. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 6363 Wilshire Blvd., 653-5037; Southwestern advertising representative: Jim Wright, 4 N. Eight St., St. Louis, CH 1-1965. Application for second-class postage rates is pending at New York, N. Y., and at additional mailing offices.

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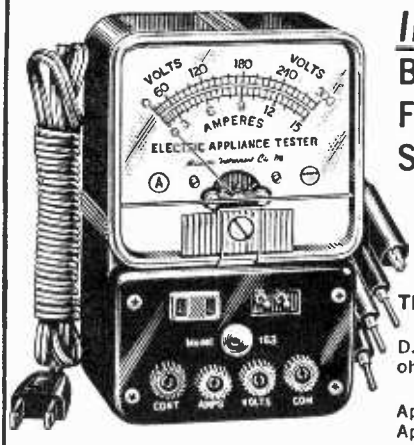

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The Model 163

Measures A.C. and D.C. voltages, 0 to 300 volts; A.C. and D.C. current, 0 to 15 amperes; indicates continuity to 100,000 ohms.

The ranges specified above are sufficient to test all Home Appliances without exception and the vast majority of Industrial Appliances and Utilities.

The Model 163

Will measure the current consumption of any home electrical appliance without the necessity of breaking any of the wires and while the unit is in operation. You simply insert the plug of the appliance into a special socket on the front panel of Model 163, plug the line cord of the Model 163 into the electric line outlet, and read the current consumption in amperes direct on the meter. This is a feature not included in many ampere testers selling from $25.00 to $100.00.

Testing TV tubes with Model 163

Please note Model 163 will not test the quality of the tube (an emission tester is required for that purpose) but Model 163 will test all tubes used in your TV set, including picture tubes, for open filaments, burned out tubes, etc.

Testing electric lines and outlets

The Model 163 will measure the voltage of any electrical line, outlet or socket. Most lines vary between 110 volts and 125 volts depending upon power line load. Some lines are 220 volts (actually vary between 208 volts and 240 volts). Model 163 will accurately measure all such lines, A.C. or D.C.

Motors

The model 163 will test all motors—single phase, multi-phase, universal, squirrel cage, induction; in fact every type from fractional H.P. to 2 H.P.

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The Model 163 employs a rugged, accurate, highly damped meter movement with sealed air-damping chamber. Because the meter is of the A.C. type, rectification of current is not required, greatly reducing the possibility of ever damaging the meter or its associated components.

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Model 163 includes both a prod type lead and an alligator clip lead allowing maximum flexibility.

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POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor
WA2CQL/2W5115

IF THIS year's photo show at the New York Coliseum was any indication of things to come, it won't be too long before photography becomes just another branch of electronics. One had to look mighty hard to find some photo gear that wasn't *dependent* on electronics. And we don't mean those super sensitive cadmium-sulphide light meters that manages to take readings in the Black Hole of Calcutta—only a photographer could call this electronics.

No, by electronics we mean circuits, using tubes, transistors, resistors, etc.; without which the camera gear couldn't function.

A perfect example of electronic control was the DeJur PT-70 Command projector. Here was electronic control at its finest—*stolen* straight from TV. A small, hand-sized ultrasonic generator—actually metal rods struck by hammers when the appropriate button is depressed—controlled eight projector functions; and at distances up to forty feet. Think, without the transistorized receiver the projector couldn't work—unless you used a forty foot control cable and had the audacity to call it *remote control.*

Another "stolen" idea we saw was variable lighting control. Remember that SCR Motor Speed Control Project we ran a while back? It's now in a fancy case, costs nearly double the price, and it's called a lighting control. Again, without electronics, no heatless lighting control.

And photography has also benefited from advances in the audio field. Remember the last time you saw 8mm. sound movies? That's right—*bad sound* would be putting it mildly. Well, all the work that went into stabilizing tape transport, and recording heads, which permits a decent tape recorder to be turned out for a hundred bucks has finally caught up with movie projectors. We saw (heard?) some 8mm. magnetic movies of which it can truly be said: "You haven't

Positive Feedback

seen 8mm. home movies till you've *heard* them."

But science is a two way street, and the electronics hobbyist is going to benefit from some photo developments. While we were looking over some of those superb alkaline batteries that the Mallory Co. seems to forget are just as advantageous to the electronics hobbyist as they are to the photographer, we chanced to hear some interesting comments which we were quick to follow up. Seems as if Mallory is about to release a rechargeable *mercury* battery. Ahhhh, the wonders of life, no more basketful of batteries for walkie-talkies or transistor projects. And no more drain on the pocketbook for the latest curse on mankind—battery operated toys. Just one or two sets of budget priced rechargeable mercuries which can be used again and again.

Yep, somehow we figure that in '65 or '66 the annual photo show will be just a couple of booths at the *I-triple-E* (that's right, the IEEE electronics show).

The cost of CB. In our April issue (page 8) we made a point of mentioning that too many frills added to the CB sets of today have raised the purchase price well above 1959 prices. To illustrate the point, we took a photo of a typical set of 1959 vintage, retouched it with the hope that no one would recognize it, and gave it a price tag of $139.95. We were not trying to fool anyone, but rather, preferred to keep the discussion on a general level and not mention any manufacturer's name. Well, we didn't fool the maker of the set, and as luck would have it, he agreed with us 100 per cent. We have reprinted the main body of the letter sent to us by Multi-Elmac Company for your information.

> Your editorial, Positive Feedback, April-May, 1964 issue regarding low cost Citizens-band equipment was read with avid interest, as the picture of the C.B. rig shown on page 8 is quite obviously our older Model CD-5 "Citi-Fone."
>
> The Model CD-5 was one of the original Citizens-band transceivers on the market and was continuously available at the $134.50 price, until it was replaced with the new Model CD-5A in the summer of 1963.
>
> The Model CD-5A literature is en-

Positive Feedback

closed and is available at $139.50, an increase of five dollars ($5.00) over the original unit of 1959.

The CD-5A has improved audio gain, provision for our new "Tone Guard" tone signaling system, as well as, other changes to improve the performance. It is, I might add, a very popular model and our leading seller. Very few units, regardless of price, exceed the performance of this CD-5A either in the transmit or receive mode.

It is still quite possible to buy "quality," "reliability" and "performance" at a reasonable price. Just like the good old days of 1959.

Thank you for a very interesting article.

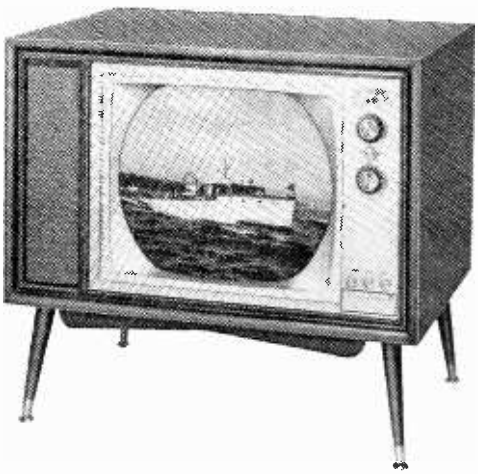
Sincerely,
MULTI-ELMAC COMPANY
Charles E. Lighthall
Sales Manager

If you are interested in more information on the Citi-Fone, Model CD-5A, write to Multi-Elmac Company, 21470 Coolidge Highway, Oak Park 37, Michigan and say that the Editor of RADIO-TV EXPERIMENTER *sent you.*

SWL's Getting Together. The long discussed *Association of North American Radio Clubs* is finally a reality. The final approval of the Association's constitution was announced by the (acting) Executive Secretary, Don Jensen, following a tabulation of ballots from representatives of eleven clubs in the United States and Canada. The ANARC constitution lists the Association's objectives as: promoting closer ties between radio clubs, promoting interchange of ideas and information between radio clubs, working for the common good of the DX'ing hobby, providing a forum to work out differences and problems involving radio clubs, and providing a medium to speak for all radio clubs and listeners in North America. Don Jensen, serving as the Association's spokesman, stressed that the Association is not a "super club," but rather a federation of independent radio organizations.

The following United States and Canadian radio clubs are affiliated with the association of North American Radio Clubs: Newark News Radio Club, Canadian DX Club, American SWL Club, North Ameri-

New 1964 Heathkit® All-Channel Color TV



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Everyone Agrees It Outperforms Any Other, Is Easy To Build, & Saves Up To $400!

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

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

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

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

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

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

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Compare These Additional Features: • 26-tube, 8-diode circuit • Deluxe Standard-Kollsman VHF tuner with push-to-tune fine tuning for individual channels, 2 thru 13 • New transistor UHF tuner for channels 14 thru 83 • High definition 70° 21" color tube with anti-glare bonded safety glass • 24,000 volt regulated picture power • Automatic color control & gated AGC for peak performance • 3-stage high gain video I.F. • Line thermistor for longer tube life • Thermal circuit breaker for component protection.

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Positive Feedback

can Shortwave Association, Worldwide Monitors Radio Club, Inc., Canadian International DX Club, Short Wave Listener's—Certificate Hunters Club, Kentucky DX'ers Association, Folcroft Radio Club, and Great Lakes Shortwave DX Club. Looks like a strong and healthy group.

If your radio club is interested in learning more about ANARC, RADIO-TV EXPERIMENTER urges you, to contact Executive Secretary, Don Jensen, 1832 Ridge Drive, Racine, Wisconsin 53406.

Color TV has been a big question mark in the eyes of American consumers for some time. Your editor sees three major reasons why color TV has not become a significant factor in video broadcasting.

Price seems to be the major cause of disappointing sales. At the present time less than 4% of the total TV homes in the United States have color sets. This means that 50 million families have elected to do without color. Also, replacement sets in these homes and "second sets" continue to be black and white units. Bargain hunters will discover that color TV sets are currently from $200 to $250 more than b&w units of same picture tube size. The consumer has to decide whether he wants to buy one b&w set or pay the price of almost three b&w sets to enjoy color.

The next two reasons go hand in hand. Color TV programming covers only a small portion of total viewing time available to the consumer in all areas throughout the country. Why purchase a color TV set to watch b&w programs? And many of the color telecasts are old movies, golf tournaments (ugh!), and Johnny Carson. Most of the color TV programming occurs when families are outside the home or should be asleep. This poor color programming also make the sales job a difficult one. I have never seen a color TV set show a color program (or even a b&w picture) in a show room or store window. Don't blame the poor salesmen; they would like to have a color set operating in their showroom every minute the store doors are open. Without a color TV program to display, what wise shopper would invest over $350 for a status symbol?

Color TV is good! Once you have seen and enjoyed color programs, present day prices will appear to be reasonable. And tomorrow's prices will be lower. Picture tube

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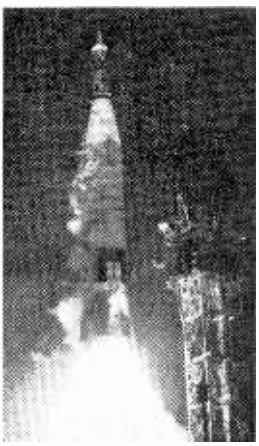

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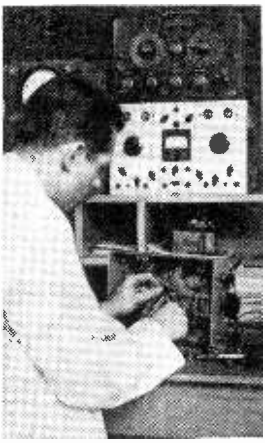

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manufacturers are expecting a price drop with increased sales. Foreign imports may hit the color TV market in early 1965, and the increased competition may drive prices down. Summing up: color TV sales will zoom as color programming increases and color TV set prices become competitive with b&w sets.

Hams at the fair. Among the many internationally known VIP's visiting the 1964-1965 New York World's Fair will be members of a worldwide fraternity of enthusiasts which links King Hassan of Morocco with Senator Barry Goldwater and Mr. Ernest Henderson, President of Sheraton Hotels with jazz musician Peewee Hunt.

When they visit the Fair, it's bound to be with a purposeful gleam in their eyes and conversation peppered with mysterious terms like "CUL," "OM," "88," "DX" and "73."

For this select international elite consists of celebrities who are ardent amateur radio operators. And for them, as for 250,000 other "hams," the big attraction will be The Coca-Cola Company Pavilion where the finest 3-position sending and receiving station ever built for amateur radio communication will be housed.

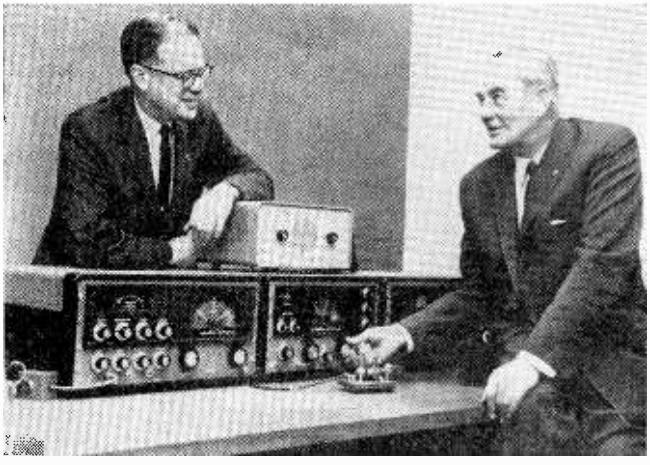
This unique communications center will link hams all over the world with the special excitement of the Fair and will also offer them the extra thrill of contacting or being contacted by a VIP ham who's visiting the Fair.

Of course, a ham never knows who might be at the key of the next station he contacts. Back in early 1928, a ham in San Francisco contacted a fellow ham in Pomona, California. The San Francisco operator, it seemed, had politics on his mind because his chat with his opposite number in Pomona was devoted mainly to extolling the virtues of one Alfred E. Smith for the presidential election in November of that year rather than that of his opponent Herbert Hoover. The operator in Pomona seemed to enjoy the speech but didn't sound too impressed. In fact, he had little to say and soon "signed off." The San Francisco operator wondered a moment, then picked up his directory of amateur stations to check the name and address of the ham he'd just contacted. He found the owner of the Pomona station happened to be Herbert Hoover, Jr.!

Today, Mr. Hoover is still an active ham and, as President of the American Radio Relay League, Inc., the national organization for hams in this country, he is expected to put in several appearances at the New York World's Fair amateur-radio communications center in The Coca-Cola Company Pavilion.

There are many royal "hams." King Hassan of Morocco and Maharajah Thondup Namgyal of Sikkim (who recently married New York socialite Hope Cooke) both operate their own stations—not to mention six Arabian princes and an Indian maharajah.

Any amateur radio operator who visits the special station in The Coca-Cola Company Pavilion at the World's Fair will be allowed to operate from the studio when he presents his credentials: a "ticket" or license from the FCC or the government of his own country. ■



Herbert Hoover, Jr. (right), President of the American Radio Relay League, tests the sending-and-receiving equipment housed in the "ham shack" of the Coca-Cola Company Pavilion at the New York World's Fair 1964-1965 while John Huntoon, ARRL General Manager, looks on.

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This man didn't "set the world on fire" when he was a schoolboy. In fact, he was a BELOW AVERAGE student. But look at him now! He is multiplying numbers that should ordinarily produce the answer in about 4 minutes. Yet here he is writing the correct answer on the blackboard in less than 15 seconds flat! He knows little about math — he even failed arithmetic in school. Read on to discover the fantastic new method that even a child can learn easily in just a few short hours — at home . . .

Yes, in just hours you can turn into a "math wizard" even though you know little about arithmetic! Surprise your friends with your "E-Z MATH" ability . . . enjoy job security and advancement . . . a better job . . . Increase your self-confidence and prestige—all through amazing new "E-Z MATH".

The world is moving *fast* these days. In good times and bad the ability to handle mathematical problems in our age of electronics, automation and nuclear science is becoming more and more necessary for promotion on the job and for higher pay. If you don't think you have what it takes—and if you believe that "math" is beyond your power—then you're in for the biggest surprise of your life!

For now you CAN learn to DIVIDE, MULTIPLY, ADD and SUBTRACT figures not only *quickly* and *easily*—but also in a FRACTION of the time the average person requires! You can actually solve such tough problems as multiplying a 5-figure number by a 7-figure number in your head without ever touching pencil to paper . . . or dividing 836791 by 284, for example, in exactly 15 seconds—even if you "flunked" math in school!

The secret of success in "math" is NOT laborious study and wearisome practice—but, on the contrary, knowledge of SPECIAL SHORT CUTS, LITTLE-KNOWN METHODS of calculation and arithmetical "tricks" that take the work and gamble out of figuring. These methods—so new and radical that they have not yet been incorporated in our school systems—take but a few hours to learn. Yet they permit you to OUT-THINK and OUT-FIGURE the average high school and college graduate who hasn't had the benefit of these amazing methods! You can even BEAT AN ELECTRIC CALCULATOR in answering many problems!

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"E-Z MATH" shows you in plain, easy-to-understand language how to cut figuring time in HALF and even in QUARTERS—and at the same time arrive at the *correct* answer in every case! The methods and short cuts you learn in "E-Z MATH" are *foolproof* . . . require almost NO memorization . . . and are so *practical* that you'll find yourself using these systems virtually every day. You'll become an expert in no time at all. Before you know it—you're ready to move into that important job you've always wanted . . . to drive ahead and in greater responsibility at higher pay . . . and to amaze, surprise and delight your friends with your new magic powers of mental arithmetic! Yes, "math" will open up new opportunities for you, since the person with "math" know-how can just about "write his own ticket."

Sharpen Your Brain Power— with Short-Cut "E-Z MATH"!

Imagine being asked to divide 38634 by 89½—and rattling off the answer absolutely correctly in 7 seconds! Or—multiplying 369.34 by 982.7 and coming up with the correct result in 11 seconds! Or adding 29 numbers each with 6 digits—and supplying the right total every time! People will GASP at your fabulous lightning-quick mind. You'll be able to JUGGLE numbers . . . do STUNNING TRICKS . . . amaze your friends and boss—and be a "master mind!"

With a knowledge of "E-Z MATH" you no longer need be puzzled by such every-day figuring as computing interest charges on installment purchases . . . division, multiplication and addition of fractions . . . adding long rows of numbers with 100% accuracy . . . adding and subtracting fractions from whole numbers—plus many, many other practical and valuable pointers you will use daily to your advantage. The few hours you spend with this course will really pay off. Numbers are the basic instrument of all scientific and technical work. The man or woman who can use "math" is rewarded, recognized quickly, moves *ahead* in his job faster and more surely!

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Send for "E-Z MATH" today on our no-risk money-back guarantee: use the book for 30 days . . . prove to your own satisfaction how far a knowledge of "E-Z MATH" can advance you in business and social life. If you don't agree that this is the *best investment* you've ever made . . . if your family and friends aren't AMAZED by your new ability—return the book for full and prompt refund.

CAN YOU SOLVE THESE EVERY-DAY BUSINESS AND SOCIAL ARITHMETIC PROBLEMS IN THE TIME ALLOWED? YOU CAN DO THEM EASILY EVEN WHEN BLINDFOLDED—AFTER YOU'VE READ "E-Z MATH"!

Blindfold yourself and have someone call the following numbers to you as you add them:

739
463
906
785
642

(Solve in 6 seconds) ?

$\frac{9864372}{8146}$ = ? (Solve in 9 seconds)

$\frac{4}{7} \times \frac{9}{4}$ = ? (Solve in 4 seconds)

1¾% interest per month amounts to what percentage yearly? (Solve in 4 seconds)

367 X 75 = ? (Solve in 3 seconds)

WHAT IS "E-Z MATH"?

"E-Z MATH" is based on an amazing new method of working with numbers—easier to learn and remarkably faster and more accurate than you ever dreamed possible when you took math in school. You'll be shown the newest way of *reading* numbers—just as though they were *words*—and of adding and subtracting them almost at a glance—INSTANTLY! You'll be shown a unique new technique for adding hundreds and even thousands of numbers without ever making a mistake . . . yet you'll never add higher than eleven! Yes, from now on you'll whiz through all figuring problems without wasting your valuable time—through income tax, checking grocery lists, homework—as fast as a calculator. You'll never again dislike or avoid numbers—you'll actually ENJOY using them to get ahead in business!

WHAT THEY SAY:

"My 10-year old had nearly always failed arithmetic with old-method arithmetic. Then he found my copy of 'E-Z MATH'. Now in less time than you can put the numbers on a blackboard, he can multiply 8391726547 by 12. It's amazing and incredibly easy. I use it myself on my job and my wife uses it to check grocery lists."
—A Father

"You have a unique new teaching approach for which I compliment you. It's the best I have ever seen. Pupils' marks seem to be climbing as a result. Should help in any job. Excellent for home tutoring use."
—SCHOOL PRINCIPAL

"Thank you! Thank you! Thank you! All our children are using your system too, and it is terrific. My husband and I are using it—and it works! My husband has already received a job advancement with tremendous boost in pay. Best investment we have ever made!"
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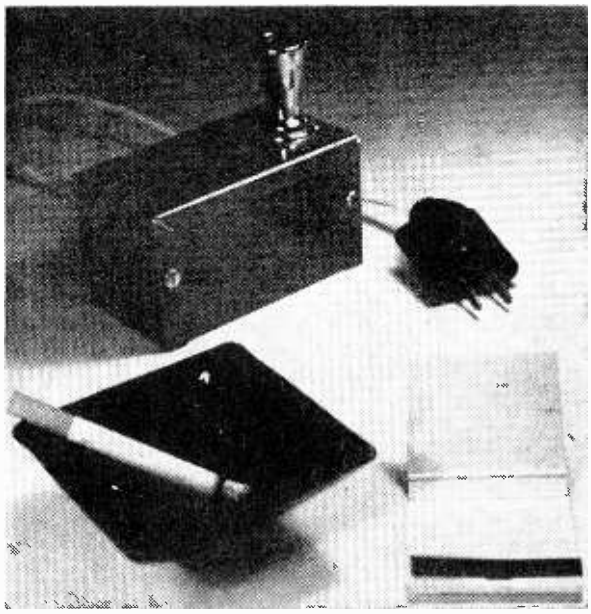
"Electrical Matches"

By Robert K. Re



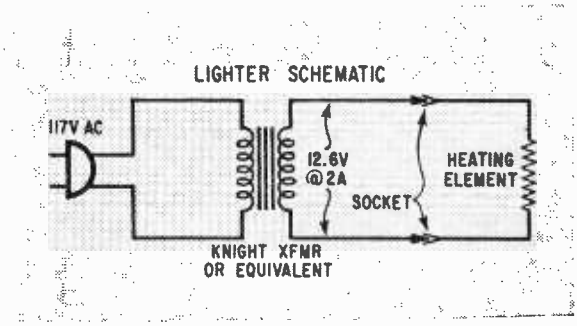
Housed properly, unit is an attractive table piece.

SMOKERS who occasionally run out of matches while working in the shop should try this project. A car lighter and a filament transformer make an excellent "electrical match." Easily constructed in one evening, the "match" requires only three parts plus a small box. Housed in an attractive holder, it even makes a unique addition to a living-room end table, as evident in the photo above.

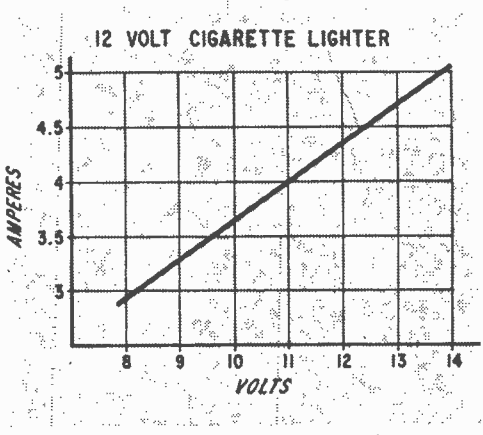
Available in most auto parts stores, the lighter requires about 4.5 amps at 12 volts; however, a transformer with a 12.6 volt winding at 2 amps will work quite well for intermittent duty. I used a Knight (Allied Radio) unit—it gets warm only after 5 or 6 uses in quick succession.

The parts can be mounted in any small box; a 4 x 2¼ x 2¼ Bud Minibox handles the job nicely. If you have a high-current supply (ac/dc) in the lab, just hook up the lighter directly whenever you need it. Though it isn't vital, a switch, indicator, and fuses can be added. I used a fused-plug for protection.

Although the "electrical match" is initially a bit more expensive than the paper variety, it is far more convenient than trying to light up your stogey using a large soldering iron. And if you have an ac outlet on your patio, the "electrical match" will prove to be windproof, too. ■



Switch, fuse, and indicator can be added.

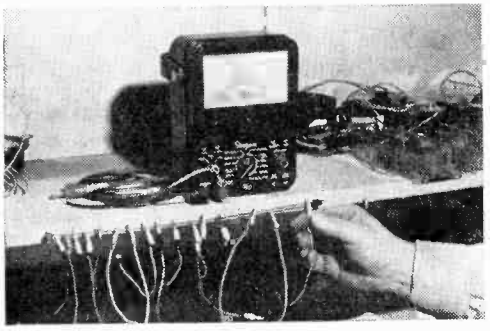


Lighter's current versus voltage relationship.

QUICK CONNECTIONS

IF you've ever had to make a quick electrical connection you'll know how irksome it can be to heat up the soldering iron, or maybe you can't use a solder connection at all.

With clip leads this problem is eliminated. Hooking a test instrument *probe* into a circuit to leave hands free becomes simple, as does temporarily connecting resistors, capacitors and potentiometers, and it saves socket pins, terminal strips, and pigtails from unnecessary damage.



CLIP LEADS to a piece of wire strung between screws or nails to keep them handy.

These and a multitude of other uses can be found for insulated 8- to 12-in. clip leads and they can be made up from alligator clips such as Lafayette MS-569 or MS-570 and thermoplastic hookup wire (Lafayette WR-227) or bought ready made (MS-479). For special purposes battery boxes and snaps can be wired up with clip leads making battery connections simple and reliable. Assemble a few other leads with standard phone and phono plugs at one end. These are very useful in audio work.

For transistor work Mueller Micro-Gator clips #34 and insulators to fit, at 6 and 7¢ respectively, are excellent, affording a firm grip on small diameter pigtails and easy access to tight places on printed circuit boards. The clips also make excellent heat sinks for transistor soldering.

To keep your clip leads handy and ready for use, string a piece of #16 bus wire or any other heavy wire tightly between two screws or nails and clip the leads to it. ■

BOOKMARK
by Bookworm

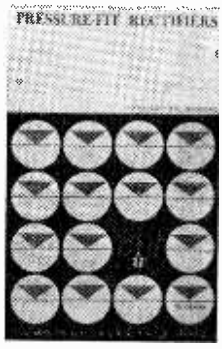
Book publishers discovered among their ranks some of the world's largest electronic companies. These companies find it expedient to publish certain types of handbooks and texts in order to speed up the dissemination of specialized information in selected esoteric areas. So, this month your ol' Bookworm will devote the beginning paragraphs of his column to several notable soft cover efforts by some electronic industry giants. If you are interested in more information either drop into your local book store or send a note to the publisher whose address can be found listed at the end of this column.

Lafayette Radio. For the past two years miniature, audio amplifiers and AM radio tuners in compact transistorized units have been popular selling items in the Layafette

96 pages
Soft cover
$1.50

catalog. Experimenters and gadget makers alike have found these units useful in countless applications. So much so that *Rufus P. Turner* has devoted an entire text on them called *Transistorized Miniature Amplifier and Tuner Applications*. The book describes the amplifiers and tuners, and shows how to use them in more than sixty useful applications. The circuits in this text have been tested and all of them have been simplified. The six chapters, thoroughly, yet simply discuss useful ham and CB accessories, control applications, test instruments, hearing aids, electronic stethoscope, intercom and many other applications. Illustrations and complete parts lists make the text material easy to understand and follow. A *Lafayette Radio* publication.

Tung-Sol Electric Inc. An application manual for pressure-fit rectifiers has been published by a leading vacuum tube and semiconductor manufacturer. *Pressure-Fit Rectifiers,* a *Tung-Sol* publication, covers applications of two families of high performance silicon diodes: an 18 amp family in



90 pages
Soft cover
75 cents

five voltage categories from 50 to 400 volts, and a 25 amp family in seven voltage categories from 50 to 600 volts. The device treated in this book is called the Pressure-Fit Rectifier because it is mounted by pressing the rectifier case directly into a heatsink surface. These diodes are used in alternator systems of automobiles. The application section of this manual will be of particular interest to the experimenter because of the many circuit applications and schematics offered. There is a temperature measuring circuit, a dual model train control, six position light dimming switch circuit and many others.

General Electric. Now in its third edition, the *SCR Manual* highlights the first major coverage of light-activated SCR's and gate turn-off switches, with characteristics,

412 pages
Soft cover
$2.00

ratings and a number of suggested circuits for a variety of applications. The volume was written as a reference source for design engineers but it serves equally well as a very informative text for the experimenter. And in case you have an old edition, replace it. The latest version has 17 per cent more pages and more than 50 per cent of the material in the new edition has not been published previously. A *General Electric Company* publication.

128 pages
Soft cover
$2.50

For Hams Only. One of the best known electronic magazine authors is *Charles Caringella*, W6NJV, author of a new text *Practical Ham Radio Projects*. Each chapter of his book contains complete data for constructing a unique, useful piece of amateur equipment; chassis layout diagrams, schematics, photos, and parts lists provide necessary guidelines for building each unit. Where appropriate, tuning and alignment procedures, operating instructions, and other pertinent details are included. Some of the projects are: all-band 500-watt linear amplifier; 2-meter SSB mixer and linear amplifier; all-band 500-watt antenna tuner, VFO for 6, 2 and 1.25 meters and many other worthwhile projects. This text is the second Caringella text to be published by *Howard W. Sams & Co., Inc.*

Sarnoff Biography. The *Encyclopaedia Britannica Press* has published a moving, readable account of a modern Horatio Alger —*David Sarnoff: Putting Electrons to Work* by *John Tebbel*. A newsboy at ten, operator of a newstsand in New York's Hell's Kitchen slum at 11, Sarnoff became—like Edison—a telegraph operator at 15. As a young man in 1912, he spent 72 continuous hours report-

(Continued on page 21)

EXPERIMENTER'S CROSSWORD

ACROSS

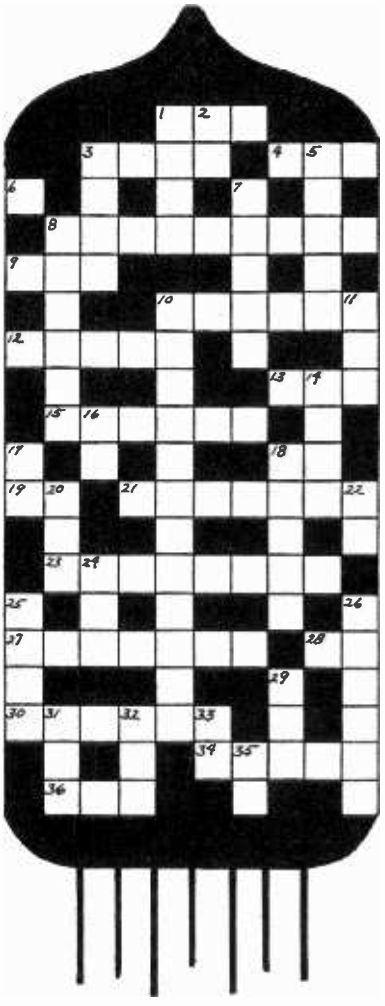
1. Neon indicator light is a_____ -filled tube.
3. Negative control grid DC voltage.
4. Electrical connection made anywhere between ends of a coil.
6. Impedance.
8. Special UHF tube used in radar.
9. A noise caused by unfilter DC supply.
10. Sine-wave is divided into 360 parts, each called a_____.
12. Tube performance is determined by its characteristic_____.
13. Very low frequencies (abbr.).
15. Curve that is not straight is known as non-_____.
18. Public address system (abbr.).
19. Milliampere (abbr.)
21. Four element vacuum tube.
23. To obtain more output power, two similar tubes may be connected in___.
27. Purpose of a diode in a power supply is to___.
28. Tube that regulates voltage (abbr.).
30. Circuit providing input to a power amplifier.
34. Unit of capacitance.
36. Unit of conductance.

DOWN

1. Voltage amplification is called_____.
2. Preposition.
3. ___tetrode concentrates electrons into a stream on their way to the plate.
5. The positive plate of an electronic device.
7. All the world is one and so are triodes, tetrodes, pentodes, etc.
8. Grid-plate transductance is also called its_____ conductance.
10. Negative feedback is_____.
11. Volt is a measurement of_____(abbr.).
14. Power consuming device between the plate and the B-plus line.
16. RF signal, in a superhet is heterodyned to a lower frequency called the___ (abbr.).
17. Amplitude modulation (abbr.).
18. Watt is a unit of_____.
20. Unit of electrical current (abbr.).
22. Ohm's law states that $I = ?/?$.
24. Circuit used to reduce loud speaker blasts due to signal increases.
25. The "valve" used in most vacuum tubes to control stream of electrons.
26. Three element electron tube.
29. Unit of reactive power.
31. Phonograph turntable speed is measured in _____(abbr.).
32. Hams use this to control frequency (abbr.).
33. Radio frequency (abbr.).
35. Rectifier changes it to direct current (abbr.).

The *Experimenter's Crossword* is a simple puzzle provided you allow time to ponder each item. However, set a ten minute time limit and you'll have to be up on your electronics to finish.

Answers on page 23



By Stephen Nelson

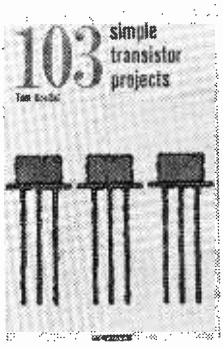
BOOKMARK

(Continued from page 19)

ing the list of 712 survivors of the sinking of the "unsinkable" Titanic to a stunned world. Nobody was more impressed by the wonder of Marconi's radio than Sarnoff. He hitched his star to the fabulous electron and went on to prophesy what he called the *radio music box*. A decade later *radio* was a household item, and radio broadcasting stations were on the air from coast to coast. Black-and-white television and color TV have followed the radio into the American home, just as Sarnoff had dreamed and planned. But the Sarnoff story goes on. The future which has always fascinated him more than the present, is as much the subject of the book as Sarnoff. The concluding chapter spells out some of the possibilities for computers, medicine, communications, satellites and space technology. Today's young people will have opportunities undreamed of when he began his remarkable career.

192 pages
Hard cover
$2.95

Simple Projects. If you're a ham, CB'er, audiophile, or experimenter you'll find plenty



120 pages
Soft cover
$2.75

(Continued on page 127)

The Crystal Ball

August—September, 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 →		← 19 →		← 19, 25 →		← 25, 31 →	← 31, 41 (49) →	
South Africa	← 31, 41, 60 →		← 31, 41 →		← 41 →		← 19, 25 →	← 25, 31, 41 →	← 31, 41, 60 (90) →
Asia (except Near East)	← 31, 41 →				← 19, 25 →				
South Pacific	← 31, 49 →		← 31, 49, 60 →		← 25, 31 →		← 25 →	← 25, 19 →	
Latin America	← 49, 60 →		← 49, 31 →		← 25, 31 →		← 49, 60 (90) →	← 31, 49 60 →	

WITH the coming of the fall, we can expect the general winter propagation characteristics to appear with the dropping of the higher maximum frequencies during the night. This is the time of the year you can expect the noise level to decrease rapidly. Broadcast band DX'ers with *extra long* long-wire antennas can expect to log DX at the band's high-frequency end.

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 diffcrences 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.

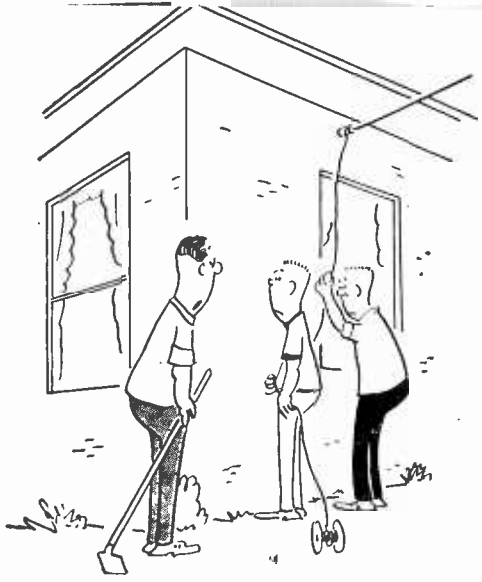
White's Radio Log *(see page 106)* now lists many new short-wave stations in its improved Short-Wave Section. You can use the Crystal Ball propagation table to determine your chances of hearing a given station. If the station broadcasts on more than one frequency, you will know which one will offer the best listening possibilities. Happy DX'ing. ■

Experimenter's Crossword

(Puzzle on page 20)

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 ten 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 ten minute time limit is accurate or not, is to write and let us know how you did.

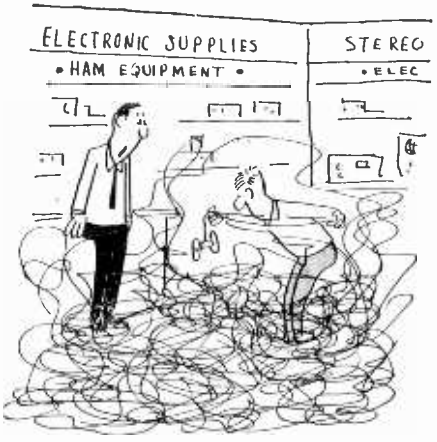
To rate yourself, deduct one point for each unfilled box in the puzzle. If you score 90 or over, you deserve a *Technician* rating, 80 to 89 puts you in the *Experimenter* group, 70 to 79 means you should spend more time keeping your nose in theory books, and 69 and under—buy as many back issues of RADIO-TV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



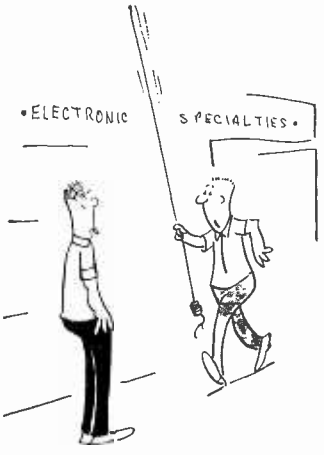
"What's that about running a dipole megacycle? Son, you can just walk to school like I did!"

ANTENNA DILEMMA

By Harold E. Holland



"Are you convinced now the spool has 100 feet of antenna wire on it?"



"We don't have a seven-foot long whip antenna, but we do have this one 'bout seven feet tall."

"Don't bother Daddy now, Paul. Can't you see he's tired from putting up his antenna."

"At first I thought that noise was really something but I see it was only your tower falling."

NEW PRODUCTS

Transistorized Antenna Control

First antenna control making use of transistors is the Model C-225 "Tenna-Rotor" developed by The Alliance Manufacturing Co., Inc. Transistorized circuit provides constant synchronization between control unit and outside motor which turns roof antenna, resulting in finer degree of antenna orien-

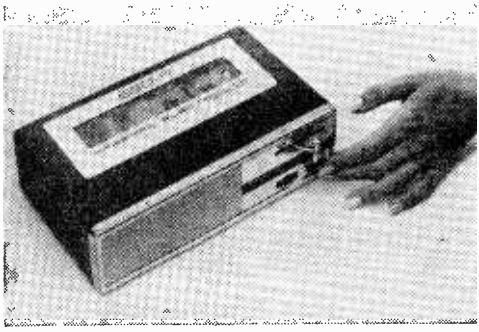
tation required by both color TV and stereo FM. Other advantages include silent operation and longer life. Resembling a small desk clock, the new unit is decorator-styled in brown and white, high-impact plastic. List price: $59.95. *(Complete details from Dept. MJ-697, The Alliance Manufacturing Co., Inc., Alliance, Ohio.)*

Pocket Tape Recorder

When you want to "tape it with you" with professional accuracy, you'll want to look into the Freeman 550 Senior portable tape recorder. This hand-held unit brings studio standards of record and playback to the portable tape recorder field. Compact, as a portable should be, the 550 weighs just 5½ pounds and comes complete with such necessary recording equipment as leather carrying case, remote control microphone, earphone, battery cartridge, telephone pick-

NEW PRODUCTS

up, tape and take-up reel. The unit is powered by self-contained batteries or an AC power supply. Priced at $159.50, the 550 features a super fast forward and rewind;



professional capstan drive, built-in extended range monitor speaker, input jacks for microphone and radio-phono, professional VU meter and battery condition indicator, one lever function control, and advanced mechanical engineering in tape transport design. Professional quality of the 550 Senior and its accessories is attested to by the fact that more than 600 radio stations have chosen it as their official tape recorder. *(Freeman Electronics Corporation, Dept. 97, 729 North Highland Avenue, Los Angeles 38, California.)*

New SSB/CW Transceiver From a New Ham Firm

The first new product to be developed under the Galaxy name is the Galaxy III 300-watt SSB/CW transceiver for 80-40 and 20 meters, which has been especially designed to meet the demands of both fixed station and mobile hams. The Galaxy III is a compact 6" x 10¼" x 11¼" and weighs only 14 pounds. The unique compactness is due to the newly developed hybrid transistorized

circuitry. The transmitter section delivers a full 300 watts P.E.P., using modern shift carrier, with a choice of both upper and lower sidebands. Full 500-kc. coverage on 80, 40, and 20 meters. The Galaxy and matching accessories are now available at all leading ham distributors for $349.95. *(Complete specifications are yours for the asking. Galaxy Industries, 10 South 34th Street, Council Bluffs, Iowa.)*

SWL'ers Watch

Finding the time anywhere on the earth is an easy trick with the Endura Navigator wrist watch. The time piece's moving rim and the 24 hour track are perfectly synchronized. Suppose you want to know the time in Tokyo when it is 9:00 AM in Chicago. Set the Chicago index opposite 9 on the 24 hour track. We see it is 24 o'clock (midnight) in Tokyo. It is also 6:00 AM in Juneau, 15 o'clock (3:00 PM) in London, etc. The Navigator is a handsome Swiss jeweled watch in gold anodized case with sweep second hand and luminous dial for $12.95 postpaid. *(C. Cabell Carter & Son, 1112 Argyle Avenue, Dept. SEH, Baltimore 1, Maryland.)*

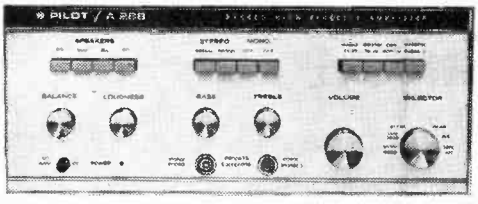
VHF Coaxial Antenna Operates on 108-136 MC Band

In the last few years many short-wave listeners have been listening in on the aero bands for new DX thrills. Regency Electronics, makers of commercial flight monitoring aircraft receivers knows how important the antenna system is at these high frequencies, and has introduced a whip-type antenna designed for use in the 108 and 136 MC VHF band which has a nominal impedance

of 72 ohms. The Regency AA-1 type coaxial antenna comes in two easily assembled sections, each 23½-inches long (47-inches fully extended). Made of lightweight, sturdy, metal construction, the entire antenna weighs only 4 ounces. The two section AA-1 is primarily designed to work with the Regency new flight monitoring aircraft receiver. Selling for $5.95, the Regency AA-1 can be mounted rapidly in a vertical fashion on the roof or window sill aimed in the direction of stations or transmitting source. It is designed to use RG-59U cable for interconnection with receiver. *(You'll get all the facts when you write to Regency Electronics, Inc., Dept. RTE, 7900 Pendleton Pike, Indianapolis 26, Ind.)*

DeLuxe Integrated Stereo Amplifier

A new de luxe 80-watt integrated stereo amplifier, the Pilot A288, now offers two *his* and *hers* private listening headphone outputs. The A288 harmonic distortion is .1 per



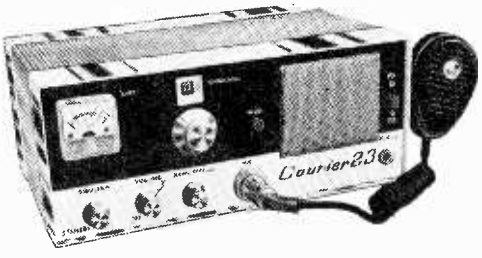
cent or less, frequency response is 5 to 50,000 cps, and speaker outputs are impedanced matched to 4, 8 and 16 ohms. Equipped with 12 push buttons for complete listening flexibility, the Pilot A288 includes

NEW PRODUCTS

these control features: speaker selection, scratch filter, rumble filter, phono input selector and tape monitor. The amplifier is 6¼-inches high, 15¼ inches wide and 12¾ inches deep and sells for $289.50. *(For more details and specifications, write to Pilot Radio Corporation, Dept. 697, 100 Electra Lane, East Station, Yonkers 4, New York.)*

Keep In Touch With Courier CB

The E.C.I. Electronics Communications, Inc., has come up with a new Courier—tabbed the Courier 23—a 23-channel CB transceiver with all channels crystal controlled, and all crystals supplied. Priced at $189.50 including noise-cancelling microphone, mounting brackets, power cords and transistor power supply, the Courier 23 features crystal synthesis. Also, the unit has built-in PA system, double-conversion, .25 mv sensitivity, headset/auxiliary S-RF meter, 3 kc. bandspread control, standby switch and many other features. Those who know the Courier 1 and 1M performance record will



need no further pitch—it is one of the top-notch bas or "under-dash" CB units available at its price. *(Write to E.C.I. Electronics Communications, Inc., Dept. RTE, 325 No. Macqesten Parkway, Mt. Vernon, New York.)*

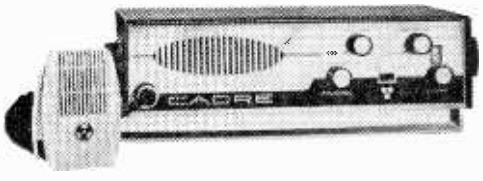
First 3-Way 3-Speed Tape Recorder

Announced as the most versatile all-transistor portable tape recorder ever made, the Saxon 555, is the only professional—quality tape recorder that can actually choose its own energy. The Saxon 555 operates on portable 9-volt batteries, 12-volt auto battery by plugging into cigarette lighter, or on ordinary power via its own built-in AC system. This power selection feature is of definite advantage to fit the habits of the mobile doctor, businessman, student, news reporter and music lover. Featuring three-speed record and playback, 1⅞, 3¾ and 7½ ips., the eight transistor Saxon 555 includes cap-

stan constant speed drive and finger-tip push-button control. Additional features include recording level meter, tape counter, tone control, AC pilot light and external speaker. The unit retails under $170.00 and comes complete with standard accessories. *(Kouyoh International Corporation, 1200 Santee Street, Los Angeles, California.)*

Portable CB

After delivering over 20,000 completely transistorized CB sets you can be sure that the Cadre claims for their new Model 510-A five-watt, two-way transceiver are made by the voice of experience. The 510-A features

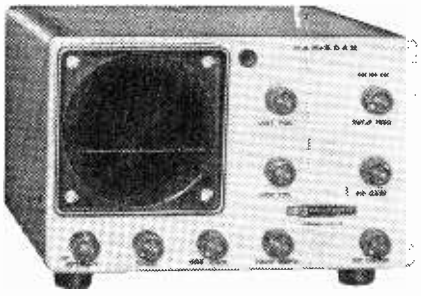


redesigned audio, power supply, and variable tuner circuitry for improved performance and reliability. All-chanel tuning is locked directly to the five channel crystal receiver; noise limiting and noise suppression are more effective; and current drain has been reduced to a minimum. This is important when operating off batteries. Nationally advertised at $219.95, the 510-A includes a

built-in AC and DC power supply, push-to-talk microphone, accessory terminal board, mobile mounting kit, and channel 11 crystals. An optional rechargeable battery pack, including standbys, retails for $78.75. Transceiver and battery pack weigh only 9 pounds. *(Write for more information. Cadre Industries Corporation, Dept. 697, 20 Valley Street, Endicott, New York 13761.)*

Ham Scan Spectrum Monitor

The new Heathkit "Ham Scan" is the first low-cost spectrum monitor available in easy-to-build kit form. This *off-beat oscilloscope* is an extremely useful accessory that will greatly increase the versatility and enjoyment of all amateur radio and CB operations. "Ham Scan" is designed to operate with virtually all receivers in service today and permits visual operation of band activity up to 50 kc above and below the frequency to which a receiver is tuned. The "Ham Scan" identifies signals as to SSB, AM or CW types, spots band openings or clear



portions of the band, facilitates checking of carrier and sideband suppression of SSB transmitters, identifies "splattering" signals and many more. The idea behind "Ham Scan" is not new but, until now, was not popular because the price was too high and the resulting demand, too low. *(Complete details and specifications of the "Ham Scan" can be obtained by writing to the Heath Company, Dept. TRVE, Benton Harbor, Michigan.)*

Information on new products was supplied by the manufacturers and edited considerably in order to list many items. More information can be had for the asking by writing directly to the manufacturer. Address of the manufacturer is at the end of each product review. ■

Ask Me Another

By Leo G. Sands

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

Question: Does any company make a short wave receiver that has bandspread on the world-wide broadcast frequencies instead of the ham frequencies? If not, does any company plan to produce one of this type?

DSM, Columbus, Ga.

Answer: The bandspread dial of general coverage short wave receivers can be used for expansion of the short wave broadcast bands. In addition to the ham band scales, the bandspread dial usually has a 0-100 logging scale. To use the bandspread dial, set it to the 100 position and the main tuning dial to the high end of the broadcast band you want to cover. Then tune through the band with the bandspread dial.

Since the bandspread dial is not calibrated for the broadcast bands, you can prepare a log sheet for each of the bands, noting the dial position on the 0-100 logging scale with reference to the frequency (if known) of the stations you receive. If the receiver has a built-in calibrator, or if you have an external 100-kc calibrator, you can note on the log sheet the dial readings for every 100-kc point.

Question: How do I get Radio Lisbon Portugal to QSL my reception reports. I have written them several times and nothing seems to work. What do you suggest I do?

OPF, Newark, N. J.

Answer: Radio stations are not required to acknowledge reception reports from listeners. Many do because it is in the interest of good public relations. Other readers have asked similar questions, including acknowledgements from domestic FM and TV stations.

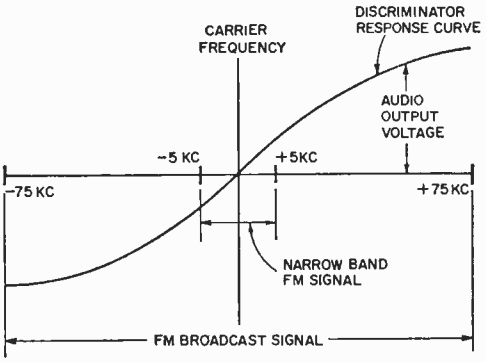
The best way to get an overseas station to answer your reception report and receive an QSL card in return is to send a neatly typed letter on one sheet of paper. State exactly the times, frequency(s), call letters and/or slogans used, and give complete program reports for long periods—½ to 1 hour.

FM and TV stations have limited range and reports of reception of their signals from tuners-in within their operating range are of no technical interest. They are in the business of selling commercial time and their engineers have calculated their range. However, many of them might be interested in reports of freak reception at great distances caused by "skip" transmission which rarely occurs in the VHF and UHF bands. In any case, I would consider it good policy on the part of broadcasters to respond to reports from tuners-in who care enough to tune in their stations. They can only sell their commercial time if they have an audience.

Question: Would it be possible to convert a low-cost FM broadcast receiver, such as the Lafayette FS-221, to change the frequency coverage from 88-108 Mc. to 152-174 Mc.?

DB, Toronto, Canada

Answer: While the coils could be altered to change the receiver's frequency coverage, it would also be necessary to replace the IF and discriminator transformers since the receiver is designed to work with FM signals



Comparison of the FM broadcast and narrow-band communications FM transmitted signals.

deviated ±75 Kc. and to pass signals 150-200 Kc. wide. Mobile radio systems operating in the 152-174 Mc. band employ narrow band FM with deviation limited to ±5 Kc. (1/15th as much).

Unless the IF and discriminator circuits were modified for narrow band FM, audio recovery (sound level) would be very poor. The ability to separate stations would also be very poor since the 150-200 Kc/s bandwidth of the receiver IF amplifier would cover from five to seven mobile channels and you would probably find the receiver desensitized by unwanted signals. For as little as $60 (in the U. S.), you can get a 152-174 Mc. band FM receiver designed for receiving narrow band FM signals.

Question: Can I use my Part 15 walkie-talkie for communicating with citizens radio stations?

AN, Dover, New Hampshire

Answer: Yes, if you have a Class D Citizens Radio Station license and the walkie-talkie meets the technical requirements spelled out in Part 95 (formerly Part 19) of the F.C.C. Rules and Regulations. The manufacturer can tell you if this is the case.

While these walkie-talkies can be used for intercommunicating with other walkie-talkies operated without a station license under Part 15 of the rules, they may be used lawfully for communicating with CB stations only when covered by a station license. When licensed, they may "not" be used for communicating with unlicensed stations since a Citizens Radio Station may only comunicate with other Citizens Radio Stations, which must be licensed.

Question: What is compatible-AM? I have heard that marine radiotelephones designed for single sideband communication must also be capable of compatible-AM operation.

RKH, Port Washington, New York

Answer: Use of single sideband (SSB) is permitted on many marine radio channels. On some channels, AM or compatible-AM must be used in order to communicate with stations that are not yet equiped for SSB.

In SSB transmisison, the radio carrier is not transmitted and only one of the two sidebands produced by amplitude modulation is transmitted. In AM transmission, the carrier and both sidebands are transmitted. In compatible-AM, the carrier is transmitted and one sideband is suppressed. Hence, as in SSB, only one sideband is transmitted.

In order to receive an SSB signal, the carrier must be generated at the reeciver and mixed with the incoming carrier-less signal. When using an ordinary AM receiver, SSB signals can only be utilized if the receiver is equipped with a BFO (beat frequency oscillator), which is ordinarily used for code reception. The BFO is turned on to furnish the missing carrier. Compatible-AM signals can be utilized by an ordinary AM receiver, without having or using a BFO, since the carrier is received from the distant transmitter. However, a compatible-AM signal takes up only half as much radio band space as an AM signal.

Question: Can I build an FM wireless microphone and operate it without a station license in the 88-108 Mc/s band?

DR, Palo Alto, California

Answer: Unlicensed wireless microphones may be operated in the 88-108 Mc/s FM broadcast band but only if the transmitter has been "type arroved" by the F.C.C., ruling out the use of homemade equipment. The Kinematix Imp II is a ready-made FM wireless microphone. It is priced at $39.95 and requires an external dynamic microphone. A model with a built-in microphone is priced at $49.95, and one furnished with a contact microphone for a guitar is priced at $59.95. Their output can be picked up with an ordinary FM broadcast receiver. More information is available from The Heath Company, Benton Harbor, Michigan, which distributes them.

Question: My two business partners and I, who are college bound, are interested in opening up a radio broadcasting station. Where can I get information about F.C.C. requirements for a license? And, what would it cost to set up a 100-watt FM station?

D. L. Wheaton, Illinois

Answer: Get a copy of Volume III, F.C.C. Rules and Regulations, which contains Part 3 governing Radio Broadcast Services. You can order a copy by mail from the Government Printing Office, Washington, D. C., or you might be able to buy a copy in Chicago at the field office of the U. S. Department of Commerce. You might visit the Chicago office of the Federal Communications Commission (listed in the telephone directory under United States Government) to look at their copy of the rules and discuss your

Ask Me Another

interest with the engineer in charge.

The basic requirement is to have lots of money. You may also require the service of an attorney who specializes in broadcast licensing problems.

Cost information can be obtained locally from the RCA office in the Furniture Mart in Chicago and by mail from Gates Radio Company in Quincy, Illinois or Paul Greenmeyer, RCA, Building 15-1, Camden 2, New Jersey. The editor of Broadcast Engineering, 4300 West 62nd Street, Indianapolis 6, Indiana, might be able to give you a complete list of equipment manufacturers.

Question: Would it be possible for me to convert my rim-drive tape recorder into a capstan-drive type in order to reduce wow and flutter? Also, how can I improve the frequency response of the four-transistor amplifier?

TLR, Johnson City, Tennessee

Answer: A tape recorder mechanism that is relatively free of wow and flutter is a carefully designed and precisely made machine. I do not consider it practical or economically feasible to upgrade your tape recorder mechanism which, apparently, was designed to be adequate for recording and playback of speech. By modifying your amplifier's frequency response, you will reduce its effectiveness for clear speech reproduction and may possibly make the wow more objectionable when playing back music.

Question: I'm planning to build an amplifier system for a string bass or guitar. What kind of amplifier and speaker do I need?

Rd'A, Rochester, New York

Answer: You can use almost any type of amplifier that has a high impedance microphone input and has sufficient frequency range to cover the music spectrum. It should have tone controls which will enable you to modify the frequency response to suit your instrument and personal tastes. Its power output capability depends upon whether you plan to play your instrument in a small room or a large hall. The speaker

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Ask Me Another

should be of a hi-fi type, capable of handling the output of your amplifier and reproducing sounds as low as 50 cycles.

Question: I would like to build a transmitter-receiver for a light aircraft with self-contained batteries or for operation from an external 12-volt wet battery. Can you help me?

HH, Osseo, Minnesota

Answer: Only F.C.C. "type accepted" transmitters can be licensed for use on aircraft in the Aviation Radio Services. While it is possible to build your own, it would have to be tested and certified by a qualified laboratory to determine if it meets F.C.C. technical standards. This would cost many times more than a factory-made, type accepted transmitter.

Question: How can I convert a tape recorder with no radio input so that it will record directly from a radio or record player?

AB, Old Hickory, Tennessee

Answer: If your tape recorder microphone is equipped with a standard phone plug, you can use a Lafayette MS-769 ($0.89) Volume Control Adaptor, or equal. It plugs into your microphone jack and your record player or radio receiver output is connected to the adaptor through a standard phono plug. It has a volume control which enables you to reduce the level of the record player or radio receiver, which is much higher than the output level of a microphone.

The record player pick-up may be connected directly to the phono plug through a piece of single conductor shielded cable.

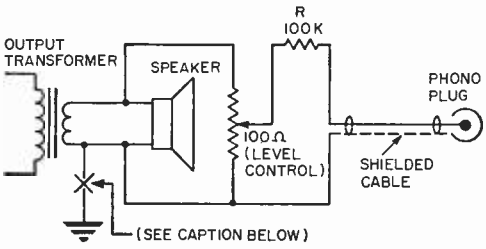

Diagram for adding a tape recorder pick-up jack to a radio or amplifier. Ground connection should be broken if hum occurs.

The same kind of cable and plug can be used for picking off the audio output of the radio receiver. While the audio take off point could be at the detector or first audio amplifier, it is easier to pick up the audio at the radio speaker terminals as shown in Fig. 1. The value of the resistor is not critical and is in the circuit to prevent loading down the input circuit of the tape recorder and seriously affecting its frequency response.

Question: I read somewhere that experiments have shown that the average person can't hear distortion of less than 1%. If that is so why do we have to have distortion as low as .1% in hi-fi amplifiers?

A.D.C., Passaic, N.J.

Answer: Research also shows that the average American male wears a size 40 suit and the average American female a size 14 dress. But a size 40 suits fits me like a circus tent fits a Philadelphia lot and a size 14 dress fits my wife—well, let's not get into that. How would this average size fit you and your wife?

The "average persons" in statistics are always a minority. Anytime you have an average figure, it must be true by statistical mathematics that there are as many people above the average as there are below the average. So the experiment you cite also proves that a lot of people hear distortion a good deal less than 1%; in fact, it probably proves that there are just as many people who can hear distortion smaller than 1% as there are people who can discern distortion only if it is more than 1%.

High fidelity is not designed for the average person or the average ear. The finest amplifiers are designed to have distortion so low that it will be below the hearing ability of even the most acute ear. The high fidelity industry leaves the satisfaction of that very tolerant average person to the package industry which apparently has never heard of the research you mention because it still permits an amplifier with 5 per cent distortion to be called "undistorted."

Question: What's the difference between IHFM Music Power and sine-wave power and how are they related?

L.P., Brooklyn, N.Y.

Answer: It is often the difference between good and superb amplifiers but the relationship is usually purely coincidental.

The IFHM Music Power rating is one of

the most remarkable measurements of anything that human ingenuity has involved and one of the most meaningless. Its principal purpose is to make the lowest category of amplifiers look more respectable to the uninformed purchaser.

It is supposed to be the power output an amplifier will deliver on musical waveforms; and if there were some really valid way of measuring this it would be a good idea. But the means of measuring it are just about as indirect as making love by mail and just about as good a substitute for the genuine article. To measure an amplifier's music power they replace the power supply you get when you buy the amplifier, with an "ideal" power supply and then measure the power output with sine waves. This curious measurement is justified by the assumption first, that hi-fi amplifiers are called upon to deliver maximum power only during peaks of very short duration; and secondly, that a practical, imperfect power supply can deliver the same power for a short peak as the same amplifier will deliver continuously with a perfect power supply.

The assumptions are by no means completely valid; but even if they were the resulting rating doesn't offer much guidance and can be quite deceiving because it makes a poor amplifier look much better than it is and a good amplifier little if any better than it is. It is as if we measured the power of automobiles by replacing the motor that we are going to buy, with another more ideal motor. With this procedure the *Falcon* would enjoy a much greater improvement in rating than a *Jaguar* or *Ferrari* which already have nearly ideal motors. The music power output of a poor amplifier may be twice as high as its continuous sine-wave power output; on the other hand in the case of the superb amplifier there may be little if any difference. Hence, two amplifiers with the same music power output may have a difference as great as 50 per cent in their continuous sine-wave power output.

The music power measurement actually measures the quality of the power supply in an amplifier, rather than the performance of the amplifier itself. It is really significant only if the music power output is compared with the continuous sine-wave power output —the smaller the difference the better the power supply and the better the power supply, in most cases, the better the amplifier.

Actually the best measure of amplifier performance is the sine wave power output

Ask Me Another

over the entire audio range from 20 to 20,000 cycles. Since the manufacturer of fine amplifiers gains little or nothing from the use of "music power output" ratings he usually rates his amplifier in terms of power output over the entire audio range; or at least gives both the music power and sine wave power output.

The only thing safe to assume in this curious business is that the amplifier that is rated *only* in terms of music power output has nothing to brag about in terms of sine-wave power output.

Question: When I increase the volume of my hi-fi system after a certain point the sound is all cut-up and the loudspeakers kind of burble. What's wrong?

T.C.K., Clearwater, Fla.

Answer: Almost certainly your system is suffering from acoustic feedback. The bass output of the speakers—probably the rumble of your changer—is vibrating the changer which in turn is feeding the vibration into the amplifiers through the pick-up and as a result the system is oscillating at a very low frequency.

The probability is that you're trying to get too much bass boost. If you have the loudness control or switch in the ON position, turn it to the OFF position. If you have the bass control in the boost position, turn it to the neutral position.

You can minimize the occurrence of acoustic feedback by putting a foam rubber pad under the turntable or changer. The type you buy to put under a typewriter is usually just the right size. You can also put foam rubber pads under the speakers. The self-adhering foam rubber weatherstripping you can buy at auto supply stores is ideal. Cut strips of it and attach to the speakers so the foam rubber is between speaker and floor or shelf.

Another solution would be to get rid of your present changer or turntable and replace it with an AR which is virtually immune to acoustic feedback.

Of course, if you have a one-package deal in which the speakers and changer are mounted in the same cabinet there is nothing

much you can do except keep the volume low and the bass down.

Question: Some of my older records have got a lot of static on them and wiping them with a "jocky cloth" doesn't seem to do much good. What can I do to get rid of the pops and crackles.

D.B., Rye, N.Y.

Answer: Take your discs into the kitchen. Dissolve a couple of pinches of detergent in a clean basin full of tap water. Immerse the record in this and if it is dirty and has fingerprints on it, wipe gently in a rotary motion along the grooves with a soft cloth. Rinse the record with a gentle stream of clean water from the faucet; dry it with a very soft cloth or a chamois; touch the record to the faucet to remove any static charge buildup; and then try it. This will often do the trick when nothing else will.

Question: Something is wrong with my transistorized amplifier; but my serviceman won't touch it. And he says he wouldn't let any other serviceman touch it and I should send it back to the factory. I'm doing that but I don't understand why I have to. It might be something simple.

P.U.M., Des Moines, Iowa

Answer: Yes, and it might be very simple for a serviceman to compound your troubles by blowing out several transistors in the course of trying to find out what the trouble is.

Transistors cannot be serviced or tested safely with the ordinary type of equipment used for tube amplifiers, TV's and radios. Putting the probe of an ohmmeter on a VTVM at the wrong spot could destroy a transistor or two. There are special instruments for safely trouble shooting transistor gadgets such as computers; but these run into hundreds of dollars and it is doubtful that one serviceman in a million owns one.

This is one disadvantage of transistorized hi-fi units at present. As they come into greater use manufacturers undoubtedly will develop methods and instruments for trouble shooting and adjustment that are relatively fool-proof. But as things stand only the manufacturer of the specific device is certain to have the knowledge and the facilities for servicing the thing with minimum risk.

Our condolences on your troubles; but congratulations on having a *wise* and *honest* serviceman. ■

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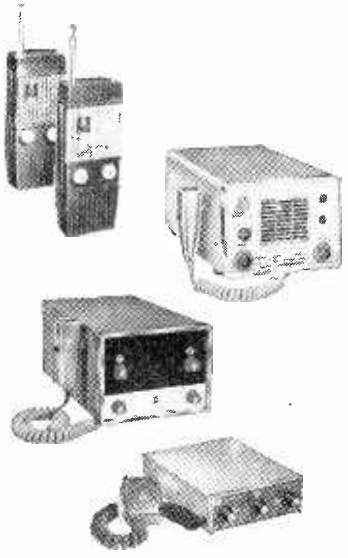

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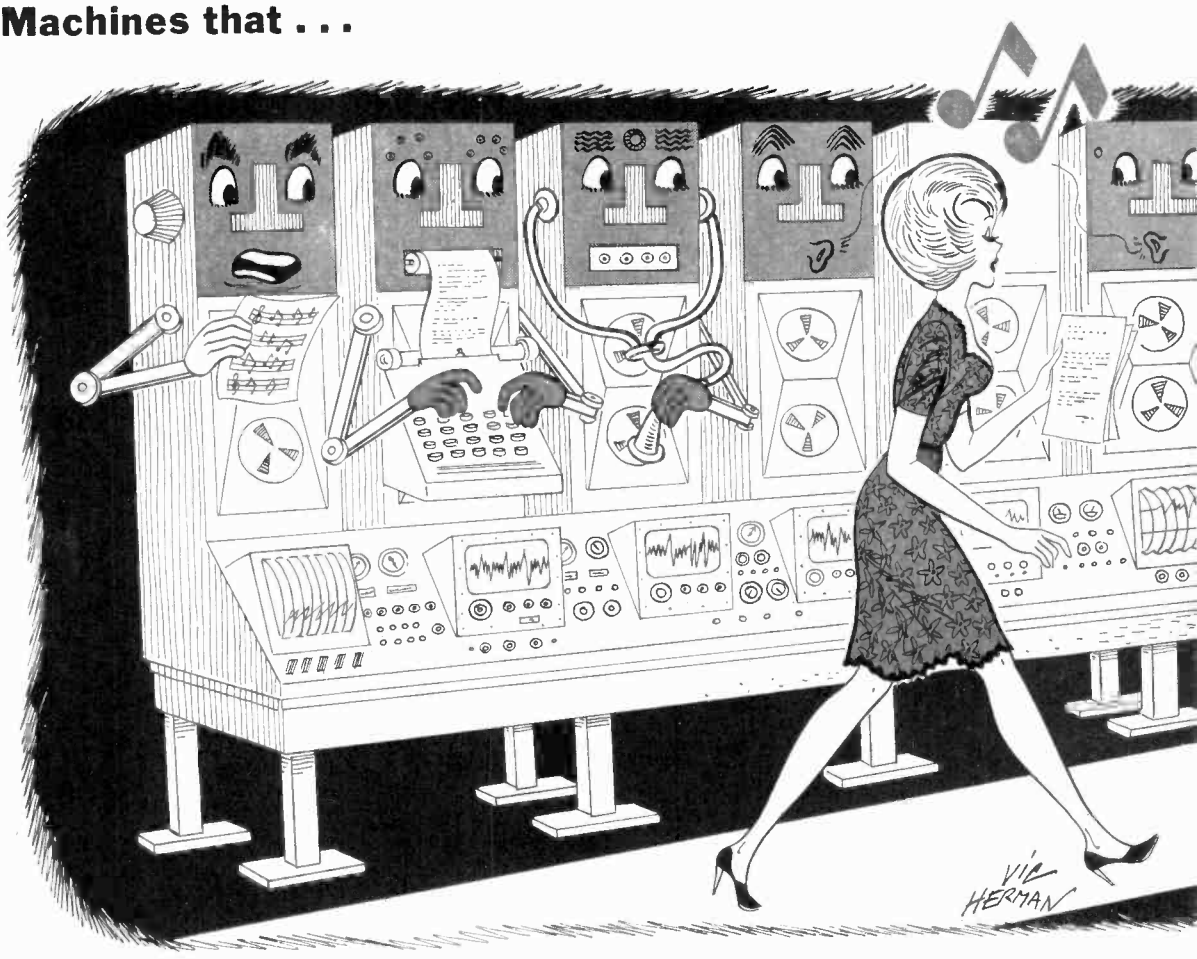


SEE, Read, Hear, Sniff, Talk, & SING

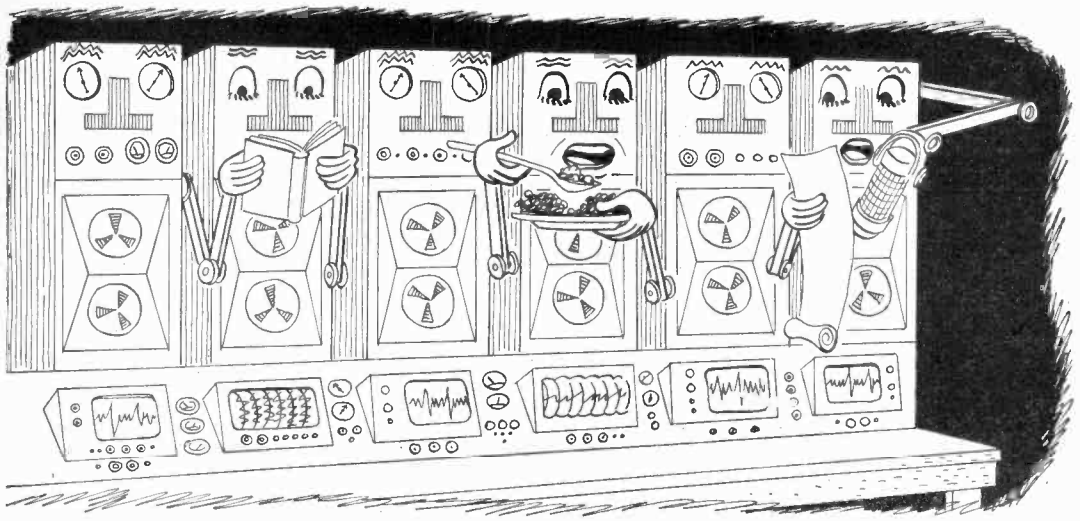
By K. C. Kirkbride

ANYTHING man can do machines are going to do too, even surpass their human creators, if man has his say about machines he's teaching to simulate man's own senses.

Already he's taught machines to see, read, hear, scent odors, talk and *sing!*

In a Frog's Eye. To teach a machine to see MIT engineers first studied the simplest of visual systems, that of the frog. To discover just how the frog sees, they attached tiny metal electrodes to nerve fibers leading from retina to brain. Pulses that passed through the electrodes proved the frog outlines objects, detects motion, sees edges of light and dark, and dimming.

If a fly buzzes toward a frog, the frog sees the fly. If it moves away from the frog, the

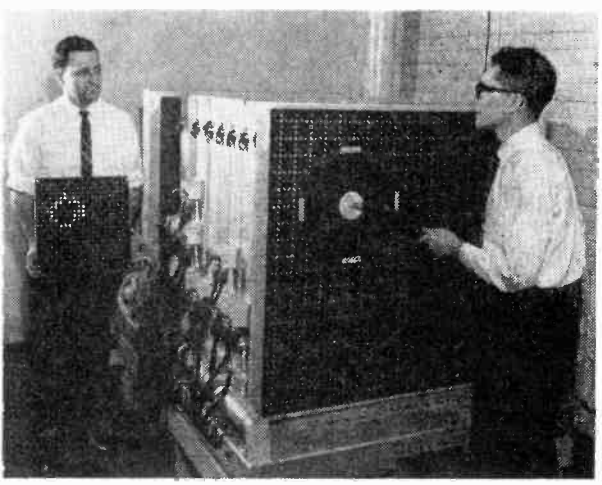


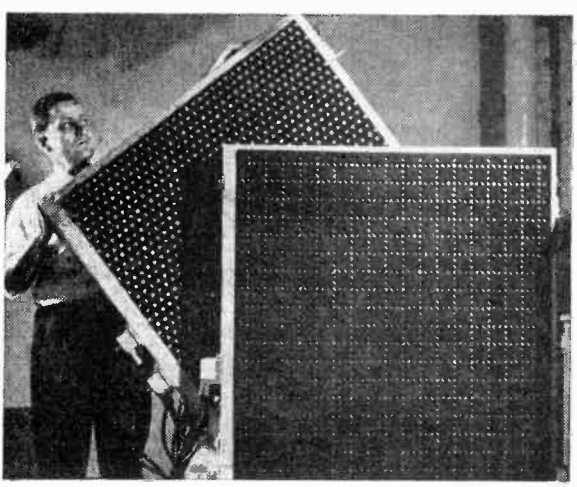
frog doesn't see it. At least, he does not transmit the information to his tiny brain. Keeping his eyes wide open always, the frog sees shadow if it means threat of danger, dismisses a shadow that crosses the sun. He sees the edge of an object, not the object itself. Like the female of the human species, the frog sees just what it wants to see, dismissing all detail.

When MIT engineers described their findings, RCA engineers picked up the lead, duplicated the biological structure of the frog's eye electronically. The resultant electronic "eye" now weighs hundreds of pounds but could be miniaturized to the size of the frog.

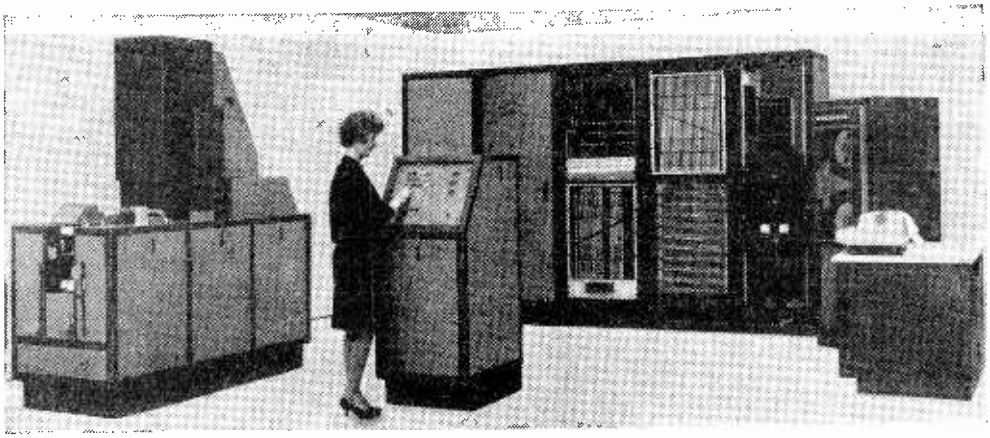
It consists of 33,000 parts, copies the frog's information-processing system by means of printed circuits, 3793 photoconductive cells, 2652 neon lamps, relays information from layer to layer of electronic circuits much as the frog relays information through his retina.

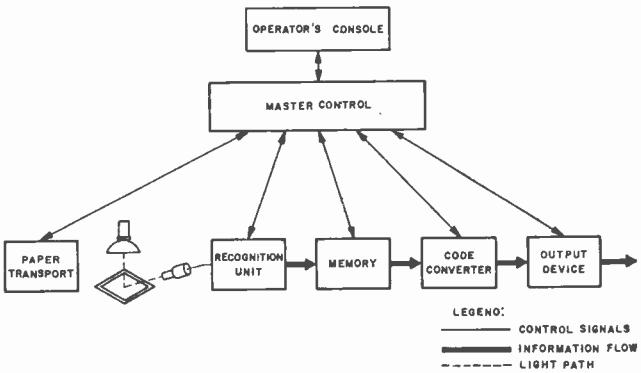
"The frog's eye is a natural computer" says one RCA engineer, "It makes life-and-





Two RCA engineers (left) check out a device that functions like a frog's eye. At right, an engineer removes one of the six layers of the simulated frog's retina. This "seeing" bionic system is seen as a forerunner of a whole new generation of automatic data processing electronic devices.





An overall view (above) of Philco's new General Purpose Print Reader system. Block diagram (left) shows signal flows in the system that reads a printed page.

death decisions for the frog without bothering his limited brain. It screens out anything not important to the frog."

It's this frog canniness RCA engineers hope to see applied to weapons systems to detect targets, make quick decisions to destroy enemy planes, missiles, even do reconnaissance "seeing."

But Seeing Isn't Reading. To teach a machine to see doesn't mean it will read. It took Philco engineers to achieve that. They have taught a machine they fondly call GPPR (General Purpose Print Reader) to read letters, cards, and documents. GPPR reads different fonts of type and print, upper and lower case letters, periods, commas, numerals, all without batting a machine eyelash.

GPPR will read one part of a page, refuse to glance at the other. Will read part of a line, if told to, ignore the rest. Completely dismiss smudges and smears, edit as it goes along, reread fast if it thinks it didn't get the right meaning the first time. Or it may decide to read only certain types of information on a page.

All at the rate of 2000 characters per second, faster than man could possibly read.

It first reads its "auto-load" instructions into its memory. Then when pages are fed onto a a vacuum belt holding the paper for the cathode ray scanner to transfer word to machine bits for GPPR's memory—the machine knows just what part of the page to read. Come output time, GPPR reads the letter back onto the device of man's choosing —magnetic tape, paper tape or punched cards.

GPPR can even read its own future, the day when it will scan addresses and zip codes for U. S. postoffices, letters for business men, instructions for the military.

IBM's Machine Reads Handwriting! It won't be long before your favorite sales girl will write quantity, price and merchandise number of your purchase on a punched card sales slip. When the store closes, an IBM reader will scan the slips of the day, read

SEE, Read. Hear, Sniff, Talk, & SING

handwritten instructions into a computer, and be ready with the day's sales record in seconds.

IBM's new revolutionary machine scans contours of handwritten figures, is now being tried out at *Higbee's* in Cleveland, Ohio, on an experimental basis, is definitely the machine of the future for retailers.

Machines that Hear. But the future of machines that will respond to man's voice-command is far from definite. Man himself gives the "listening" machine a hard time because he speaks in slurs, in streams of sound too whimsical for the steadier-minded machine to comprehend.

One machine named "Audrey," Automatic Digit Recognizer, did listen to her master. Ninety times out of one-hundred when Bell Labs Engineer K. H. Davis spoke to "Audrey" she flashed a white light of recognition on her gadget-lined steel brow. But when Davis' fellow engineers spoke to her, she admitted hearing only 70-80 percent of the time. Women and children she ignored.

"Audrey" heard her master's voice in the form of small bits of sound called phonemes, translated these into machine bits, compared them with her master's voice patterns stored in her memory.

But Audrey's stubborn loyalty to Engineer Davis spurred Bell Labs engineers to seek Audreys that would hear many voices, many inflections.

Some of the newer theories now being investigated are based on the work of Sir Richard Paget in the 1920's. It was through his phonetic-acoustic theories the voice-triggered toy "Radio Rex" became feasible. The energy in the spoken word "Rex" triggered the toy so that a celluloid dog on an iron base held inside a house by an electromagnet, was released.

Bell Labs men now add speech studies to their phonetic-acoustic studies, have found the word "I" is man's favorite word. Sixth on the used list is "you."

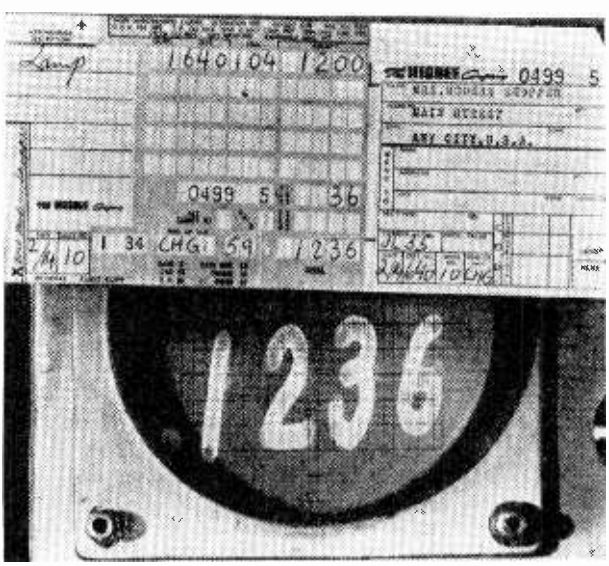
Honeywell's Electronic Sniffer. You would think creating a device to sniff odors would be number one on the impossible list yet Honeywell has done just that. Don't tell your wife if you nip a bit but Honeywell has developed an electronic nose that sniffs alcohol. It can sniff gasoline, paint, lacquer.

How Can a Machine Sniff Odors? Honeywell found certain odors absorb ultraviolet radiation more than others. They built a machine that aims an ultraviolet lamp's rays on a sensitive detector tube. The to-be-sniffed gas is drawn into the machine by a small fan funnel. As the gas passes between lamp and tube, part of the ultraviolet rays from the lamp are absorbed by the gas.

This lessens the amount picked up by the tube and triggers a gadget that turns on a ventilating fan if needed; sounds an alarm if the sniffed gas is a dangerous one.

Honeywell's new "nose" will bloodhound hospital operating rooms, warehouses, gasoline storage areas, factories, "bark" when it scents dangerous gases in coin-operated dry-cleaning plants.

Hello, This Is Computer Speaking. Engineers taught the computer to talk some time ago, but it took IBM engineers to supersleuth a talking computer that could answer the telephone. Their 7770 not only tends the phone, but knows all the answers, whether you're looking for information about the weather, insurance or banking.



An oscilloscope displays four numbers scanned by an experimental IBM optical reader from a store sales slip. IBM is seeking new ways to apply advanced handling techniques in the retail industry by eliminating punched cards.

You might be an insurance agent on the West Coast, need information from your New York office. Simply dial a few numbers. IBM 7770 will answer, listen and translate your question into machine talk, find the answer in its magnetic drum files, come back on the phone and tell you the information you want to know, all in deep business-like computer tones.

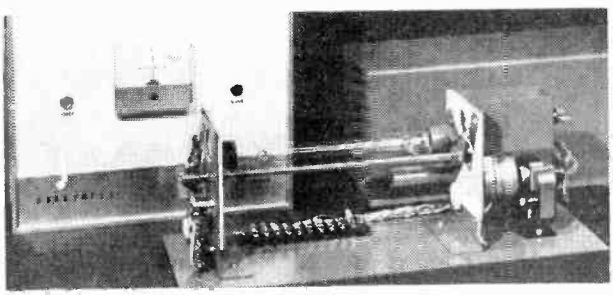
But Bell Labs Engineers Top This! Bell Labs engineers not only taught their computers to talk, but to sing! A second computer to accompany a singing computer!

Bell Labs men first program a computer with punched cards sequenced with phonetic speech sounds. To add buzz, hiss, intensity plus vowel resonance, nine control signals are then programmed. The computer that way turns speech into song.

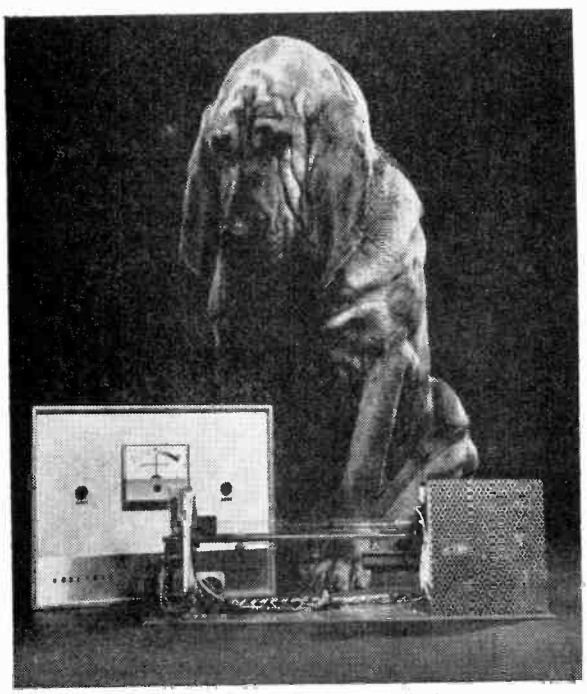
The machine first speaks the words in measured monotone. Add a control signal and the words take on inflection and phrasing. A third control adds pitch and timing. While another computer accompanies on the piano. You hear "Bicycle Built For Two" all right on pitch and the computer never, never shows stage-fright. Though the human singer is apt to when he hears his machine competitor's rich baritone; fear the singing computer may snag some of his bookings.

But Not for a Few Years Yet! It takes twenty-five minutes of computer time to produce one minute singing time. And at presentday computer rates, we have never heard of a network, stage show or night club eager to pay computer prices—not in our memory!

Though man has taught his machines to see, read, hear, scent odors, talk and sing, he still has a way to go before he can make a machine *look* like Gina Lollobrigida. ■

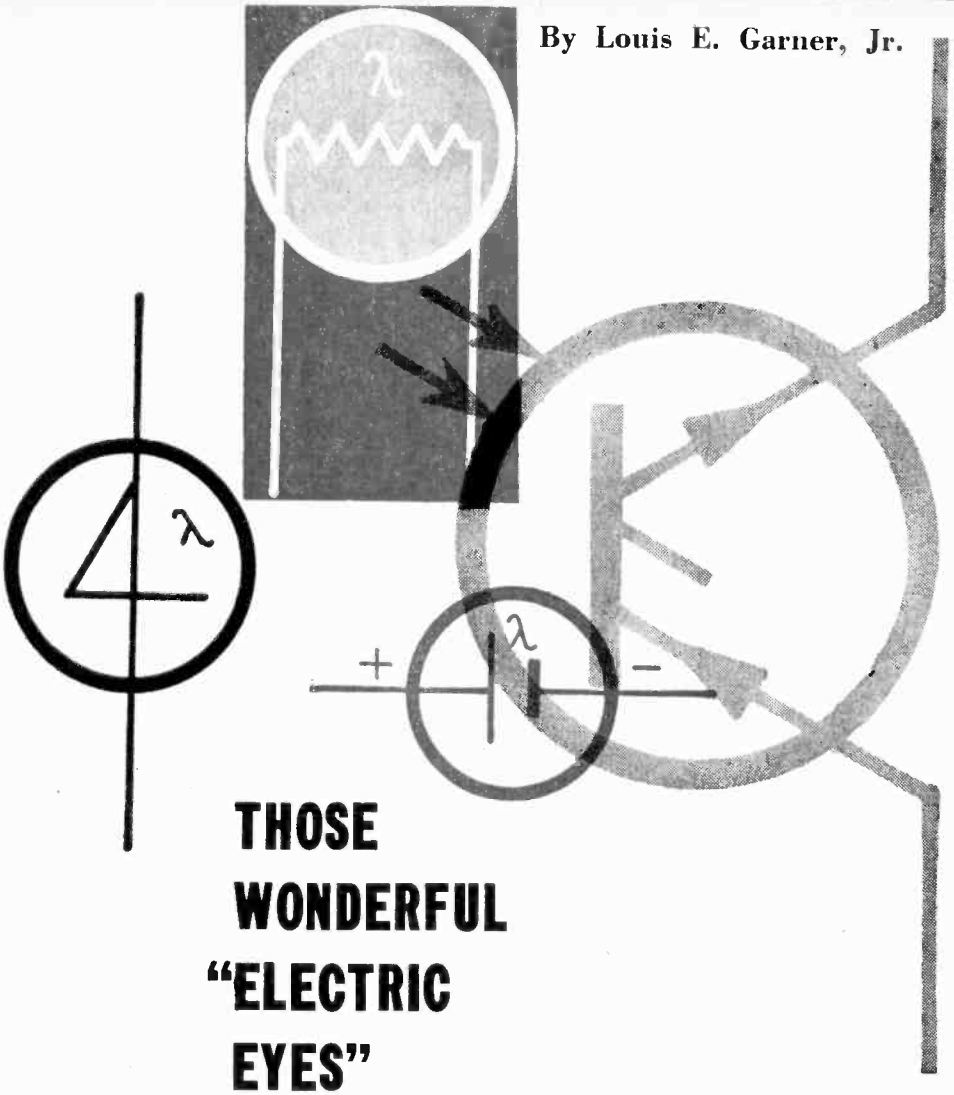


Sad eyed bloodhound (below) keeps an eye on his electronic replacement. Odor detection unit (right) can sense perchlorethylene concentrations down to 40 parts per million in an air sample. Unit "barks" an alarm when concentrations exceed minimum safety levels.



Bell Telephone Lab scientists listen to a tape recording of synthesized speech which was produced by a programmed digital computer.

By Louis E. Garner, Jr.



THOSE WONDERFUL "ELECTRIC EYES"

ONCE upon a time, to borrow a phrase from *fairy tales*, light-sensitive devices were known popularly as *electric eyes*. However, just as fairy tales have been replaced by science-fiction, so has the expression "electric eye" given way to more technical, if less romantic, terms.

Today, there are a large variety of electric eyes—oops, photosensitive cells—available. In a broad sense, there are, literally, more types produced than a dog has fleas. Not all of the available types are suitable for hobbyist or experimenter use, however. Some are precision units intended only for costly instruments. Others are special purpose types with a limited range of application. Still others are produced only on specific orders by equipment manufacturers and are not stock types. Finally, some types are so expensive as to preclude their use except in military and high-priced industrial equipment.

Photosensitive devices, nonetheless, are particularly attractive to the hobbyist, for they may be used in so many useful projects. Fortunately, several manufacturers have been quick to recognize the interests and needs of the home experimenter. These firms have introduced a number of low-cost light-sensitive components, making them available both individually and in attractive pre-packaged kits. Several of these are illustrated in Figs. 1, 2 and 3. The kits and components shown are available through both local and

mail order franchised distributors.

What's Available. Currently available experimenter-type photosensitive cells are generally semiconductor devices. That is, they depend, for their operation, on the characteristics of materials with electrical properties intermediate between those of metallic conductors, such as gold, silver and copper, and "pure" insulators such as porcelain and glass. The principal semiconductor materials used are selenium, germanium, silicon and such compounds as cadmium sulphide and cadmium selenide.

The *International Rectifier Corporation* (233 Kansas Street, El Segundo, California) produces the kit illustrated in Fig. 1. Packaged in an attractive and re-usable plastic case, the kit contains seven photocells and an experimental booklet in which numerous circuits are shown. Silicon, selenium and cadmium sulphide types are featured in a variety of sizes and styles.

Sylvania Electric Products, Inc. (Emporium, Pa.) manufactures the kit shown in Fig. 2. In addition to three cadmium sulphide photocells, the *Sylvania* kit, Model PCK-10, includes a small mounting bracket, a voltage dropping resistor, a sensitive relay, and a 52-page circuits booklet.

Although not offering a "kit" at present, another major manufacturer, *General Electric* (Owensboro, Kentucky), has included two light-sensitive devices in its recently introduced "Experimenter" line of electronic components. The two devices, a cadmium sulphide photocell and a silicon light-activated switch, may be combined with other items in the line and standard components to assemble a variety of interesting circuits. "Blister-packaged," each device is supplied with an instruction sheet describing one or more circuit applications.

What's Inside. Regardless of individual characteristics, currently available semiconductor photocells may be grouped into three broad classes . . . *photoconductors, photovoltaic cells,* and *light-activated switches* (or LAS). Of these, photoconductors may be thought of as variable resistances whose values depend on the amount of light striking their sensitive surfaces. Photovoltaic devices, on the other hand, actually convert light into electrical energy and generate an output voltage; as a result of this ability, they

Fig. 1. International Rectifier's K-421 Experimenter's Kit includes selenium and silicon photovoltaic cells and cadmium sulphide photoconductors. Comes in plastic box — $5.95.

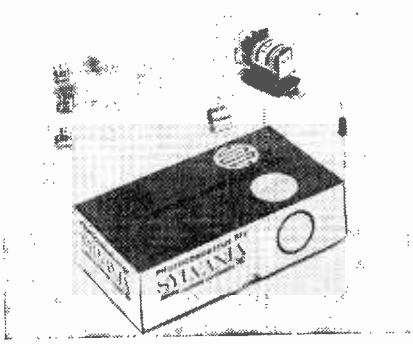


Fig. 2. Sylvania's PCK-10 Photoconductor Kit consists of three cadmium sulphide photoconductors, bracket, relay and resistor—$9.95.

Fig. 3. A cadmium sulphide photoconductor and light activated switch are among GE's Experimenter Line.

are often called *solar* or *sun batteries*. Finally, light-activated switches, as the name implies, have an all-or-nothing conduction characteristic. Behaving as a "switch," LAS units "close" (offer low resistance to current flow) when stimulated by light.

The construction of a typical cadmium sulphide photoconductor cell is illustrated in Fig. 4(A). The light-sensitive compound is deposited in a grid-like pattern on an insulating wafer, leads are attached, and the entire assembly is sealed in a glass envelope. Photoconductors are identified by the schematic symbol shown in Fig. 4(B) which is essentially a standard resistor symbol enclosed by a circle with the Greek letter *lambda* (λ) added to indicate that the device is sensitive to light.

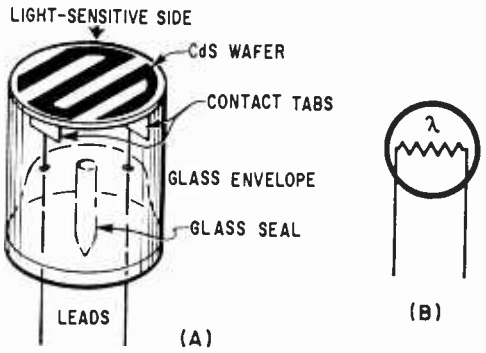


Fig. 4. Construction of a typical cadmium sulphide photoconductor (A) and symbol (B).

Photovoltaic cells may be made up using either silicon or selenium as their basic elements. The construction of a typical selenium type is shown in cross-section view in Fig. 5(A). A layer of pure selenium is deposited on a metal (steel, brass or aluminum) baseplate which serves as one electrode. This is followed by a thin layer of cadmium oxide to form a photoelectric junction. Next, a transparently thin layer of gold is used to improve conductivity and, finally, a front electrode collector strip of cadmium alloy is applied by a spray process. As might be expected, photovoltaic cells are identified by a modified battery schematic symbol, as illustrated in Fig. 5B.

Commercially available light-activated switches, in general, are quite small physically . . . about the size of general purpose detector diodes. The construction of a typical unit is illustrated in Fig. 6A. The active "heart" of the device is a tiny pellet of silicon and actually consists of four alternate layers of P and N-type semiconductor materials. Light-activated switches may be identified by either of the schematic symbols shown in Fig. 6B, depending on individual manufacturer preferences.

Construction Projects. A variety of low-cost experimental projects are illustrated schematically in Figs. 7, 8 and 9. These have been abstracted from the circuits suggested by different semiconductor manufacturers. The project illustrated in Fig. 7 was adapted from circuits given in the booklet furnished with *Sylvania's* Model PCK-10 kit. The circuit shown in Fig. 8 is among those given in the booklet furnished with *International Rectifier's* Model K-421 kit. Finally, the project illustrated in Fig. 9 is among those featured in *GE*'s "Experimenter Line."

All of the projects shown are intended for hobbyist construction and hence neither layout nor lead-dress are overly critical. Good wiring practice should be observed, however, with a *clean* layout chosen and all wiring done in a professional manner. Care must be taken to avoid overheating semi-conductor leads when soldering these components in place. DC polarities, where indicated, must be observed. As with all electronic projects, only *rosin-core* solder should be used for wiring.

The exact construction method used for any of the projects, too, is pretty much a matter of individual preference. A conventional chassis may be used, breadboard assembly, or, if desired, an etched circuit board. Regardless of the construction technique employed, however, all wiring should be double-checked for errors and accidental shorts *before* power is applied.

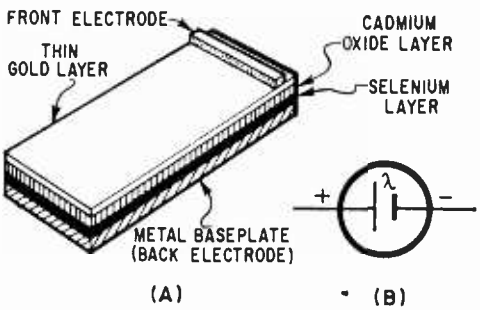


Fig. 5. Cross-section view of a selenium photovoltaic cell (A) and its symbol (B).

Annunciator. Serving to sound a bell or buzzer whenever anyone enters a doorway, the unit shown schematically in Fig. 7 should be useful to doctors, realtors, merchants, or others who operate small offices or stores. In operation, the photoconductor, PC, is stimulated by light from the small lamp and hence has a low resistance, permitting sufficient current to flow through the relay to energize it. The relay's armature is held against its *NO* contact. When the light beam is interrupted, the PC's resistance increases, reducing the current through relay's coil, causing the armature to "drop out" and close the *NC* contact. This, in turn, applies power to the external alarm device. Both the PC and relay are furnished in the PCK-10 kit. Switch S1 is a toggle or slide type. Any 115-volt AC buzzer or bell (or even a small lamp) may be used as a signalling device. The exciter lamp is nominally a 7-watt, 115 volt unit, but its exact wattage is determined by the distance between it and the photocell.

The control circuit may be assembled in a small *Minibox* or similar case. A small opaque tube should be mounted in front of the photocell to shield out ambient light. An enamelled tin-can (such as a frozen juice can) may be used for housing the exciter lamp and its socket. For best performance, the control unit and lamp should be mounted from two to four feet above the floor.

Sun Powered Receiver: Designed to cover the AM Broadcast Band, the receiver cir-

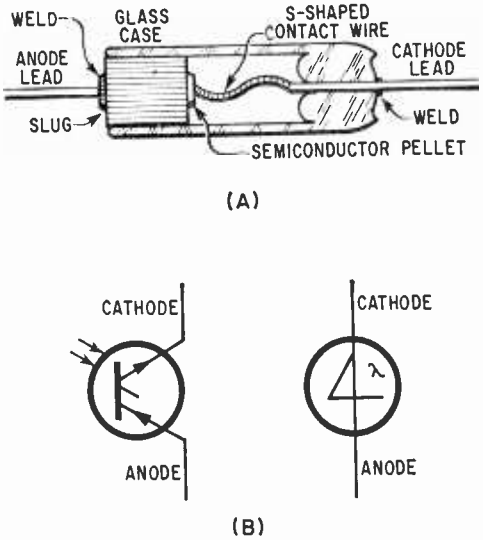
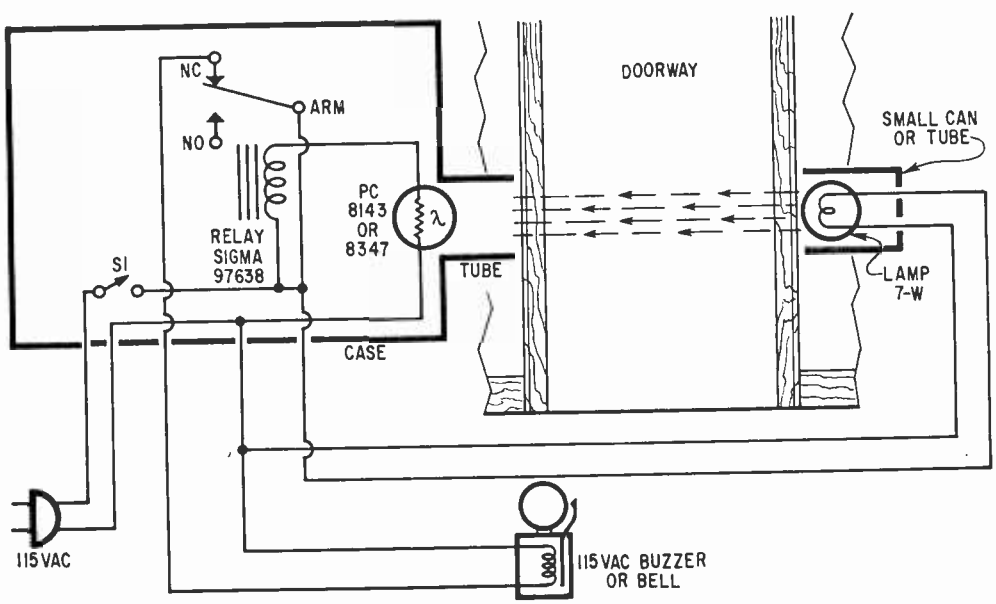


Fig. 6. Cross-section view of a GE silicon light activated switch (A) made by General Electric, and two schematic symbols (B) currently used by electronic engineers.

Fig. 7. A low-cost annunciator featuring a cadmium sulphide photoconductor sensing unit. The photoconductor serves as a light sensitive s.p.s.t. switch that opens whenever the doorway's light beam is blocked.



cuit shown in Fig. 8 derives its entire operating power from sunlight or strong artificial light. It is, in a sense, related to the light-powered circuits used in space probes and man-made satellites. In operation, RF signals picked up by the antenna-ground system are selected by tuned circuit L1-C1 and detected by diode D1. The resulting audio signal is amplified by a common-emitter transistor stage, Q1, and used to drive a pair of headphones. The photovoltaic cell PC converts light into electrical energy and serves as the circuit's power source. Two or three photovoltaic cells in series will step up the voltage and pep-up the audio output.

Referring to the schematic, L1 is a *J. W. Miller* type #2001 loopstick antenna coil and C1 is a standard 365 mmf. tuning capacitor. D1 is a general purpose diode, such as types 1N34 or 1N48, while Q1 is a *PNP* transistor such as types CK722 or 2N107. The sun battery, PC, is an *International Rectifier* type B2M, B3M or S1M cell. Moderate impedance (2,000 to 4,000 ohm) headphones are used. If desired, a small crystal earphone may be employed if shunted by a 3.9K, ½ watt resistor. A short to moderately long antenna may be used for local reception, but best results are obtained if a fairly long external antenna is connected to L1's tap. The ground connection is not essential in some installations, and many builders may wish to experiment with different types of odd antenna systems and ground connections.

Magic Lamp. Quite mystifying, the project illustrated in Fig. 9 is apparently an electric lamp which can be turned *on* only when "lit" with a match . . . and *off* only by blowing it out. Actually, of course, the lamp is entirely electric and its mysterious behavior is obtained by electronic magic. In operation, light-activated switches LS1 and LS2 prevent the application of power to the low-voltage lamp bulb until activated by external light (from a match). Afterwards, LS1 and LS2 are held on by the bulb's light until darkened (by holding a finger over the hole through which light reaches them). Transformer T1 supplies the 6.3-volt AC power for circuit operation.

An old brass-based kerosene lamp is used for assembling the project. Transformer T1 is a 6.3-volt filament transformer (such as a *Stancor* type P6465). SO1 is a miniature bayonet socket and the lamp a type #47 bulb. LS1 and LS2 are *GE* type GE-X2 light-activated switches; these two devices should be arranged behind a hole in the lamp's base in such a way that they receive light from the bulb but are not readily illuminated by room light.

In use, a lighted match is held over LS1 and LS2 to "light" the lamp. The lamp is turned off by surreptitiously holding a finger over the light hole while pretending to blow on the bulb. ■

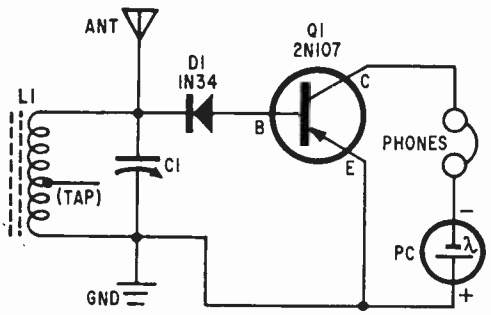


Fig. 8. Sun bathers will enjoy making and using the solar-powered AM receiver diagrammed above. PC replaces 1.5-volt dry cell.

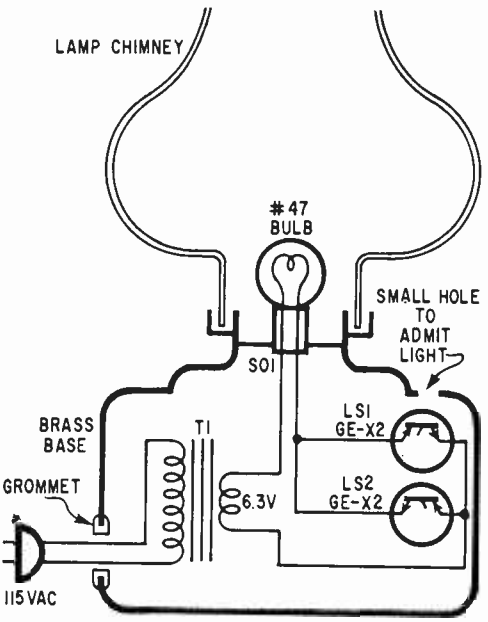


Fig. 9. The "Magic Lamp" project uses two light sensitive switches and a light bulb to act like a holding relay. It takes an external light source to activate LS1 and LS2, which in turn closes the lamp circuit.

add a HANDSET to your CB rig

Go professional! And learn how cool CB communications can be

By Lester Escargot

ADD a handset to your CB transceiver, and you've made a modification that'll put you right up with the pros. What's so great about a handset? Well, for one thing, a 5-buck handset can do more to dress up your CB gear and give it an "official" look than a ton-and-a-half of extra chrome trim. Better yet, a handset, properly installed, can give one whale of a boost to your CB operations.

First of all, a handset offers you privacy. Hook up a handset and the whole world isn't going to know what you're talking about. If you use your rig in an office, there's no blasting speaker to bother everyone. And if your rig's in your car, the guy next to you at the red light is going to be as much in the dark about your business as the character next in line at a telephone booth. Still another extra from a handset is added. A handset brings the sound right to your ear with no road noise or engine rumble to mask the message.

Though there are more ways to connect a handset than there are hands to hold them, ours gives you a *de luxe* handset hookup. As shown in the photographs and schematic diagrams, the modification involves the use of a control box which gives full "professional" operation. When the handset is in the

Add a Handset to your CB Rig

hanger, it presses against a small push-button switch (S1). Your rig works normally with the handset in this position and the transceiver connected to the speaker just as it was before the modification. But lift the handset and the speaker will be disconnected. Handset in hand, you talk and listen via the handset and forget your rig even has a speaker. And, should you want normal operation (handset for talking and speaker for listening) all you have to do is activate switch S2.

About the Circuit. The modifications to the transceiver are minor; actually, only the speaker connections are changed. The speaker circuit is opened so the output can be fed either to the speaker or to the handset. In practice, the handset is always connected. However, this has no effect on performance —it just simplifies the switching.

Resistor R1, which serves as a load for the rig's output transformer, is sometimes supplied as part of the transceiver. If it already is built into your equipment, simply leave it connected and ignore the other resistor (R2) when you're wiring up the control unit. On the other hand, if your transceiver doesn't have this resistor, you'll have to insert R2, a 10-ohm 1-watt resistor.

You can either add a separate jack to your transceiver for the speaker connections, or you can change the mike input jack to a multi-contact type. By and large though, a multi-contact plug makes for a neater, more professional installation.

Assembling the control unit. The control box consists of a 3¼ x 2⅛ x 1⅝-inch Minibox with a handset hanger fashioned from a piece of scrap aluminum. Any shape which can hold the handset when the car passes over a bump will be satisfactory. However, since the hanger must force the handset against push-button switch S1, reasonably heavy aluminum must be used. If the hanger is too light it will deform and S1 will be activated when least expected. (With S1 acti-

CB HANDSET PARTS LIST

Mike—Ceramic microphone element to fit inside of telephone handset transmitter section, replacement type

R1—See text for details

R2—10-ohm, 1-watt fixed resistor (see text for details)

S1—Pushbutton switch, use normally open contacts only (Lafayette MS-449 or equiv.)

S2—S.p.s.t. switch (Lafayette SW-21 or equiv.)

S3—Butterfly switch part of handset

1—Handset with butterfly switch S3 (Surplus item available at Herbach & Rademan, Inc., 1204 Arch Street, Philadelphia 7, Pa.; order #TM-11K856; $6.70 postpaid)

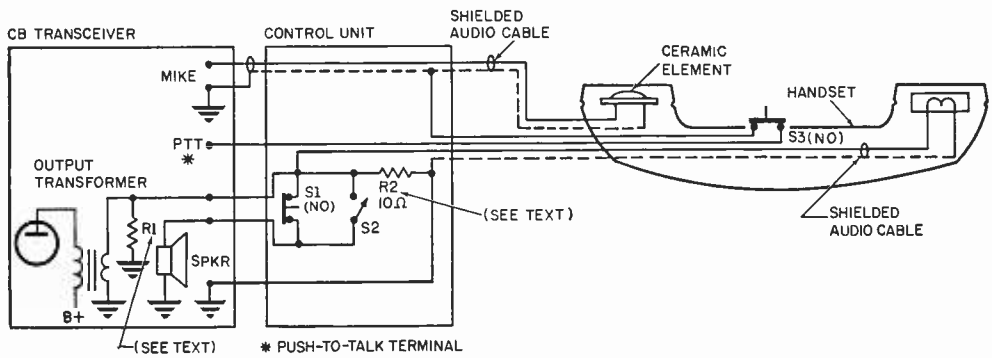
1—Coiled cord, two leads with separate shields, two unshielded leads (Alpha Wire #696/2)

1—Aluminum box, 3½" x 2⅛" x 1⅝" (Bud CU3000A)

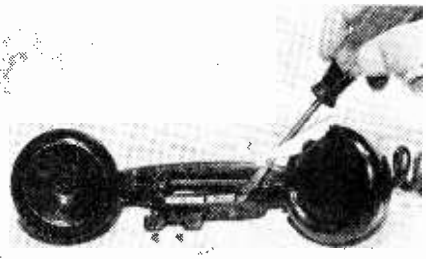
Misc.—Foam plastic, terminal strip, grommet, scrap aluminum, hardware, wire, solder, etc.

Estimated construction time: 2 hours

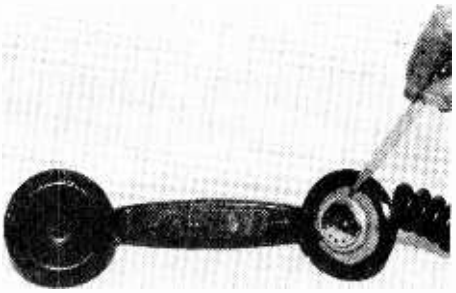
Estimated cost: $9.50



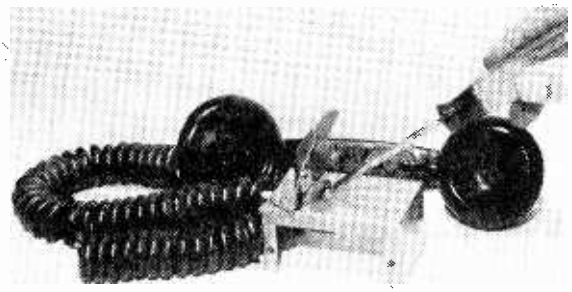
The schematic diagram reveals that no changes were made to the original microphone circuit; ear piece is nothing more than an extension speaker.



Handset with push-to-talk switch removed. Notice the channel behind the switch where wires to the earphone pass through to mike.



The surplus handset comes with a carbon mike that cannot be used. New mike is installed in mouth-piece surrounded by foam padding to prevent vibration pickup.



The complete project ready for installation. Screwdriver points out pushbutton switch S1 that disconnects speaker when handset is removed from the unit's aluminum hanger.

vated the speaker is cut off, and you can't hear if you're being called.)

After the hanger is installed, position switch S1 just above the hanger so it contacts the *lower* edge of the handset's earphone, or the normal swing of the handset as you drive will cause S1 to operate intermittently. Switch S2—the "speaker-permanently-on switch"—can be installed in any convenient spot.

Modifying the handset. The handset *must* be the type with a built-in push-to-talk switch; whether the switch is the butterfly or button type doesn't make any difference as long as it's there. And picking up a handset should be no great shake. Handsets are available from "surplus dealers," both mail-order and local, for about five dollars a piece. Shop around!

Since the handset comes equipped with a carbon mike, a ceramic element (a dynamic will also work) must be substituted. You can scrounge the element from an existing mike or purchase one from any of the large electronics parts houses.

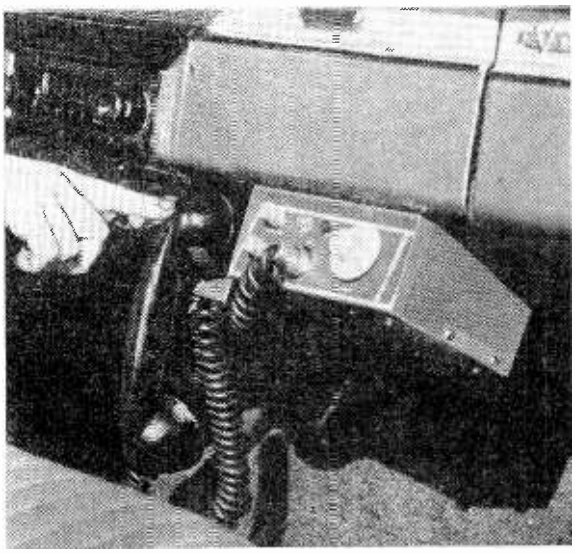
To modify the handset, first expose all components by removing the mike and earphone caps and the switchplate. Remove the carbon element and all springs (contactors) which connect to the element. Carefully unsolder the switch leads. This done, remove the wires from the earphone contactors but *leave the springs in place.* Replace the unshielded connecting cord with a coil-cord having shielded wires; the Alpha #696/2 Communications Cord with two shielded and two unshielded leads will just about fit.

Push one shielded lead through the handset and connect both the shield and the center conductor to the earphone springs. Next, push the red and black leads just past the switch slot and connect them to the switch. Finally, connect the second shielded lead to the microphone element.

To prevent annoying noises from the mike when you handle the handset, cement the element to a piece of foam plastic or rubber and then cement the assembly into the handset. Take care the foam isn't so thick that the element will come in contact with the protective cap. Before final assembly, make certain the cord won't pull out of the handset. A good trick here is to wrap several turns of kite string around the edge of the cord where it passes through the handset. Wedge the string-girdled cord in place, and you should have a good tight fit.

The cord supplied with most handsets is

Installed alongside a CB rig, the CB handset is within driver's reach.



extra long. Collapsed it's two feet long; extended it's twelve. Calculate how much you'll need and cut off the excess; the portion left over should be long enough to connect the control unit to the transceiver.

The handset connections are soldered directly to the control unit. Notice that one of the two push-to-talk wires is soldered to the mike shield (ground) in the control box. This is done because an "extra" wire will be needed for the control transceiver speaker connections. Don't attempt to solder the push-to-talk wire to the shield in the handset; space is at a premium in the handset and you're likely to end up with a short circuit.

Using the handset. Mount the control unit on the dashboard (or wall) so it can be reached easily. With switch S2 *off*, all calls will be heard in the speaker. When you lift the handset to answer, switch S1 will automatically mute the speaker, and you will talk and listen via the handset. If full-time speaker operation is desired, just activate switch S2.

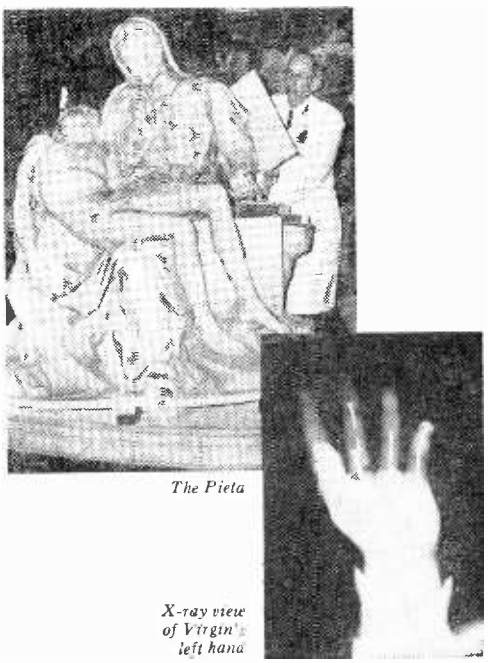
About the only trouble you're likely to face is having bounces and jolts jiggle the handset turning S1 on and off and cutting the speaker in and out. Should this happen, simply adjust the hanger tension so the handset is pressed firmly against the control box. ■

INSIDE VIEW OF MICHELANGELO'S PIETA

FEW of the millions seeing Michelangelo's *Pieta* at the New York World's Fair will have the penetrating view of an Eastman Kodak scientist named George Cortney. Radiographs—pictures made with x-ray and gamma ray sources—were made of the *Pieta* at the request of the Vatican Pavilion Committee and the firms that insured the *Pieta's* safe arrival at the Fair. These radiographs and conventional photographs provided vital information valuable to the movers who shipped the *Pieta* from The Pieta Chapel in Rome to the Vatican Pavilion at the Fair.

About 40 separate x-ray pictures, the result of 15 exposures, were made with an x-ray machine operating on voltages up to 200,000 volts. Thicker parts of the statue were examined with cobalt-60 gamma rays—substantially more penetrating than x-rays.

At some time in the past, the fingers on the outstretched left hand of the Virgin were broken. Cortney's radiography revealed, for the first time, that interior pins were used to reassemble the fingers. ■



The Pieta

X-ray view of Virgin's left hand

Simple induction device blinks when your phone rings

BUILD THE Telephone ALARM

By Herbert Friedman,
W2ZLF, KBI9457

IT SEEMS that a friend of ours had a typical problem of our age. He works in a large office with lots of telephones—all with the same type ringer. If he went more than three feet from his desk he couldn't tell whose phone was ringing—and much was the shoe-leather he wore out flying to answer what he thought was a call for him. And to make things even worse, the "water cooler" was on the other side of the office; if he stood around to lift-one with the boys, heaven knows what important call he'd miss.

But now, "space age electronics" has made possible the *telephone alarm*. This device frees you from those telephone shackles—you too can get to the

TELEPHONE ALARM

water cooler—and you don't have to worry whether or not you'll miss a call.

What is it? The *telephone alarm* is a device which gives a visual indication when the telephone rings. A standard telephone pickup coil placed near the phone senses when the phone rings; the pickup's signal is then amplified so it actuates a relay circuit which flashes a lightbulb in step with the ringing. No, it's not one of those dinky neon lamps the telephone company uses—the *telephone alarm* can flash a 150-watt lightbulb.

Phone Flash. See how easy it becomes. When a phone rings you look toward your desk. If the desk appears to be bombarded by a Buck Roger's ray gun, it's your phone that's ringing. If there's no blinking light bulb, let someone else worry about whose phone is ringing.

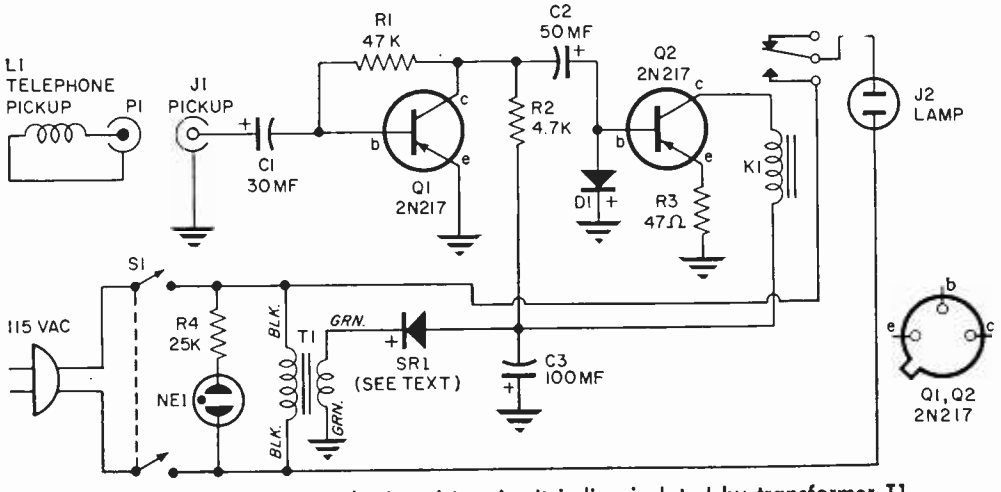
You can have more than a flash if you like. An extra bell or gong can be installed in the barn yard if farming is your business. In fact, you can attach a solenoid and tape recorder to the *telephone alarm* and let the combination answer your telephone. At the first ring, the solenoid lifts the handset while a transistorized tape recorder tells the caller to wait while you race into the house from the patio.

Construction. The *telephone alarm* is actually a control unit. That is, it doesn't actually provide the light source. A standard AC outlet on the side of the cabinet allows you to plug in any visual indicator you prefer; for example, a desk lamp, a small light, or maybe a powerful bulb mounted high on the wall.

The alarm is assembled in the main section of a 5¼" x 3" x 2⅛" aluminum chassis box. Space is a little on the tight side so take care that you leave enough room for the cover to be slipped back into place.

Relay K1 is a special type and no substitution should be made. The specified model is standard stock at most electronic parts distributors; it is also low cost. The relay switches the line voltage, and since the wiper contact is actually K1's frame, the relay must be insulated from the cabinet. Cut a section of perforated Bakelite board to approximately 1 x 1½ inches. Next, enlarge two diagonal corner perforations (holes) so a 9/32 screw can be passed through the board. Then, mount K1 in such a manner that when the relay assembly is installed with one of the enlarged holes towards the center of the cabinet and the K1 wiper contact is adjacent to J2. The relay assembly must be mounted above the cabinet to insure that the relay's mounting screw does not short to ground. A quarter inch spacer or stack of washers at each mounting screw will insure insulation.

As soon as the relay assembly is mounted connect the relay's wiper contact to J2. If you wait to make the connection until all



A close look reveals that the transistor circuit is line isolated by transformer T1.

PARTS LIST

C1—30-mf, 6-VDC electrolytic capacitor
C2—50-mf, 15-VDC electrolytic capacitor
C3—100-mf, 15-VDC electrolytic capacitor
D1—1N34A diode
J1—Phono jack
J2—AC socket (Amphenol 61-MIP-61F)
K1—S.p.d.t., 6-volt, 335-ohm relay (Potter & Brumfield R55D-6VDC)
L1—Telephone pickup coil (Lafayette MS-16)
NE1—NE-51H—neon bulb
P1—Phono Plug
Q1, Q2—2N217 or GE-2, or equiv.
R1—47,000-ohms, ½-watt resistor
R2—4,700-ohms, ½-watt resistor
R3—47-ohms, ½-watt resistor
R4—25,000-ohms, ½-watt resistor
S1—D.p.d.t. toggle or slide switch
SR1—Silicon diode, 10 PIV or more (see text)
T1—6.3-volt filament transformer (Lafayette Radio TR-11 or equiv.)
1—Aluminum chassis box, 5¼" x 3" x 2⅛" (Bud CU-2106-A)
MISC.—Perforated board, terminal strip, grommet, wire, solder, etc.

Estimated construction time: 4 hours
Estimated cost: $11.00

components are in place you may damage some components when you try to cram the soldering iron into position. The wiper contact is extremely delicate and can be easily damaged. To avoid breaking the wiper lug pass the connecting lead through both the wiper and J2 lug *before* soldering either end.

To prevent a parts jam, thereby reducing the possibility of the soldering iron damaging a few components, use printed circuit type capacitors for C1 and C2. These capacitors have both leads coming out one end. Take extra care to install the capacitors with the correct polarity; the capacitors are the electrolytic type and if the polarity is reversed the unit will not only be inoperative but some extensive damage may result.

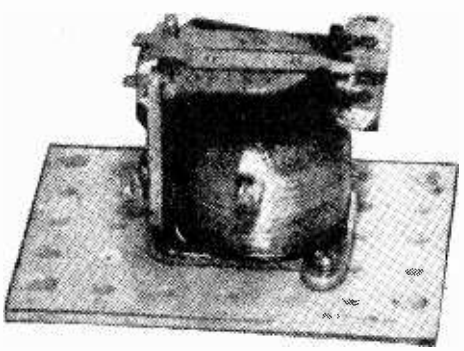
Speaking of polarity, also check that D1's polarity is correct. In this instance the cathode, the end designated with a band, a bar or a "+", is connected to the chassis (ground).

Note that the power supply positive output is grounded—be sure SR1's polarity is correct. SR1 requires a rating of only 10 PIV or higher. The lowest cost silicon diode you can obtain will work just fine.

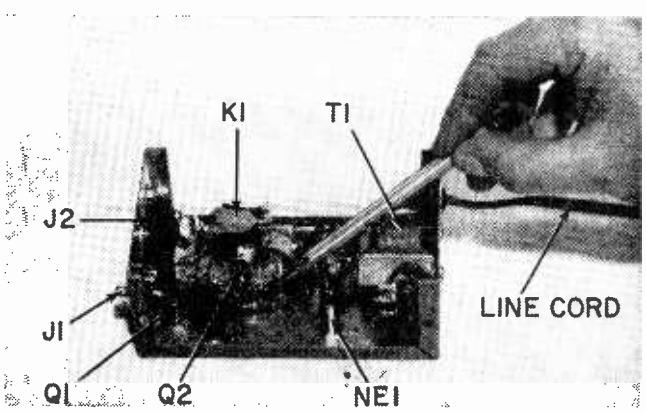
Jack J2 can be any AC chassis mounting socket. We suggest the use of the specified unit since it requires only a standard 1⅛-inch hole that can be knocked out with a chassis punch.

Transistors Q1 and Q2 can be 2N217 or GE-2 type. Avoid "bargain specials;" the alarm requires guaranteed high-gain transistors.

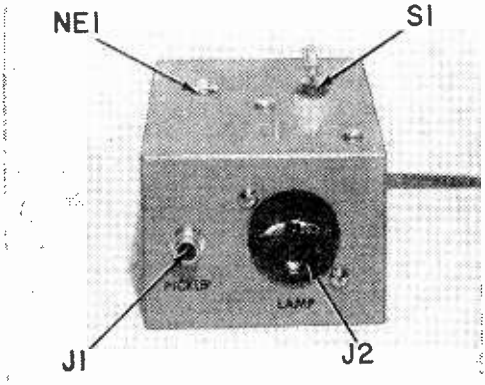
The pickup coil *must* be the flat model, the type designed to be placed under the telephone. The alarm will not work with a pickup coil attached to the earphone part of the handset.



To keep costs down, a Potter & Brumfield R55D-6VDC relay is used in the telephone alarm. The relay must be mounted on an insulator base to isolate the relay's wiper contact from the chassis box. Follow text mounting instructions carefully.



The chassis box is just large enough to house all of the component parts. Follow parts layout shown in photo (right) and cover will fit over unit. Pencil points to perforated Bakelite board which insulates relay K1 from aluminum box.



The completed telephone alarm. Use of a standard AC socket for J1 permits desk or wall lamp to be used as flasher alarm.

Using the Alarm. Connect the pickup to J1, a 115-volt lamp to J2, and apply power to the *telephone alarm*. To avoid pitting K1's contacts the lamp should use a bulb not larger than 150 watts. Next, position the pickup for best ringing signal and tape it in position with masking tape. For example, with a desk phone place the pickup directly under the phone and move it around until the light flashes when the phone rings. Usually the pickup will work satisfactorily with the pickup under the phone; however, if you cannot get signal from the ringer try placing the pickup on the sides of the phone—it has to work on one side if it doesn't work underneath.

On wall phones the pickup will work on one side or the other, though it may be

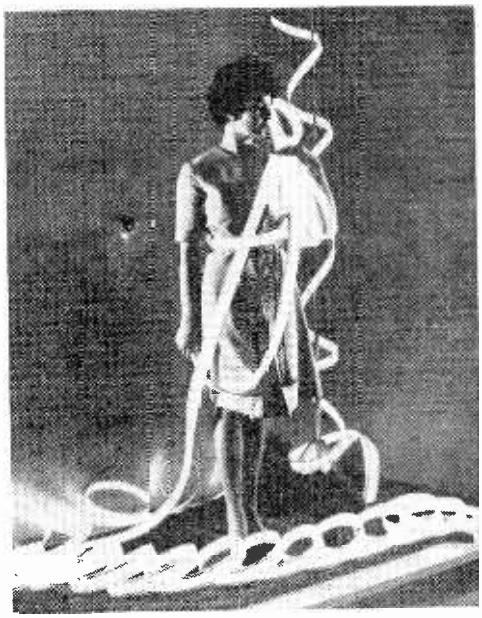
Where you place the telephone pickup, L1, is determined by test while the 'phone is ringing.

necessary to slide the unit along the side for optimum sensitivity.

Whether you use a wall or a desk phone you have to avoid tripping the relay with dial pulses. Under certain conditions the dial pulse, or the pulse generated when the handset is lifted off, or replaced in the cradle, will momentarily flash the light. If this condition occurs simply move the pickup a half inch at a time until you get tripping on the ring but not on momentary pulses. ■

LIGHT BY THE FOOT

FLEXIBLE light that will be available by the foot, by the yard, or by the mile has been developed by Sylvania. Called Panelescent Tape-Lite, the new light source is completely flexible and can be twisted, coiled, bent, or shaped in wrap-around form, even while lit. Cool to the touch, Tape-Lite produces medium-level illumination without bulbs, tubes, filaments, gases, or special fixtures. It operates on the principle of electroluminescence which creates light by the excitation of phospors by electricity, lighting is cool to the touch and a 100-foot length requires less electricity than a 100-watt bulb. The new light works on ordinary household current and it can be dimmed to any point from full brightness to off. New trends in architecture and construction, advertising, automotive, aviation and traffic control lighting can be expected. ■



Lunch Box Portable

No radio was ever easier to build, and you can put it in anything from a cosmetic carrying case to a plastic parts container or that thing cigars come packed in

By Herbert Friedman, W2ZLF/KBI1957

KNOW anyone who needs a radio built into a lunch-box? Sure you don't, and we don't either. But make that lunch-box a beach, picnic or cosmetic case (same item—new name) and we'll bet you can rattle off a dozen kids and a dozen-and-a-half girl-friends who would be more than pleased to have one.

Come to think of it, some of the crowd we've mentioned might even prefer the thing in a lunch-box so they could *chew along with Mitch*.

Where can you get a lunch-box portable? As far as we know, you can't. But you *can* build one. In fact, we've purposely made the experimenter's Lunch-Box Portable so simple anyone can build it. You qualify, even if your experience in the electronics construction game is limited to soldering a couple of wires together. The Lunch-Box Portable needs no alignment, no calibration yet you end up with an AM superhet that's plenty sensitive—packs oodles of oomph and carries its own self-contained battery and ferrite antennae. Better yet, the set can be your design down to the last extra handle or decorative decals you put on its case.

The radio itself consists of five modules: An all transistor tuner which is prealigned and comes complete with a calibrated dial; a transistor amplifier with enough "sock" to bring complaints from everyone else on the beach; a volume control; a battery; and a speaker. As for the "lunch-box" just about anything goes as long as it's *not metal*. You can use a small cosmetics case, a regular or oversize lunch box, a beach case, and even a double Barbie Doll case which will hold the radio and still leave room for picnic goodies and a thermos for two.

Construction. While our connections and wiring procedure differ considerably from those supplied with the tuner and amplifier, you'll have less trouble and more volume with less distortion if you stick with us.

First, remove the dial from the AM tuner

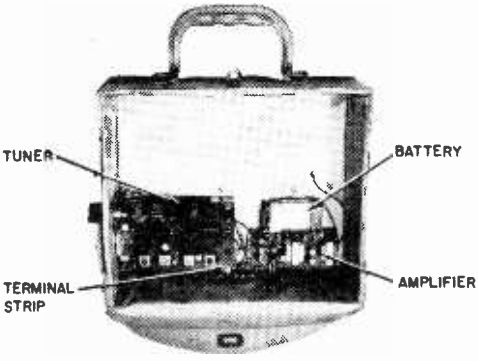
by unscrewing the retaining screw and pulling the dial *straight off*. Don't rotate the dial as you remove it since this will either break the dial or the tuning condenser.

Mount the tuner as shown, preferably in the upper corner of the case to keep wasted space at a minimum. You can also mount the amplifier at the same time, again taking care to conserve as much space as possible.

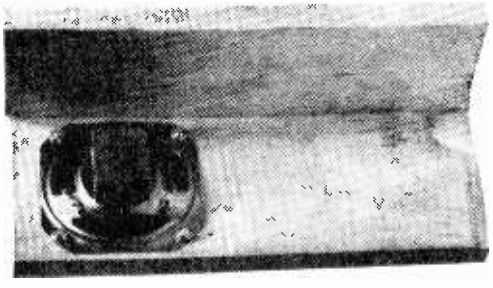
The battery is held in place with a clamp which is made from scrap aluminum or a tin can. The smallest battery you should use is the Burgess 2U6 or its equivalent. If space permits, by all means use a larger battery, since the bigger the battery the longer its life. (In normal use an Eveready 266 or its equivalent will last several months.) The battery clamp should be sufficiently snug to hold the battery, but not so snug that you have to remove the clamp when you want to change batteries.

With tuner, amplifier, and battery, the next step is to identify the amplifier's switch leads; since both are orange colored, it'll take a little checking to figure out which is which. With the battery disconnected, connect one lead from your ohmmeter to the amplifier's black lead (the main ground). There are two black leads on the amplifier, one going to the speaker and the other going into the amplifier itself. The ground lead is the one going to the amplifier (you can't miss, since the black lead going to the speaker is paired with the grey speaker wire). Connect the other ohmmeter lead to both orange switch leads. The wire that indicates a short to the black lead is the ground and it should be marked with tape.

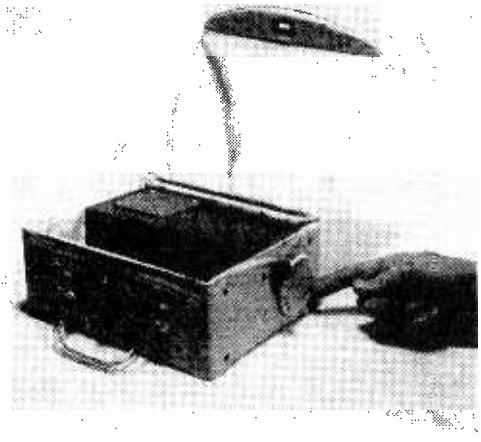
Prepare for wiring by mounting a terminal strip under one of the screws which hold the



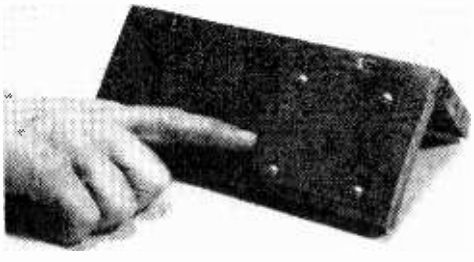
Inside view of lunch box portable prior to installation of loudspeaker and wood panel.



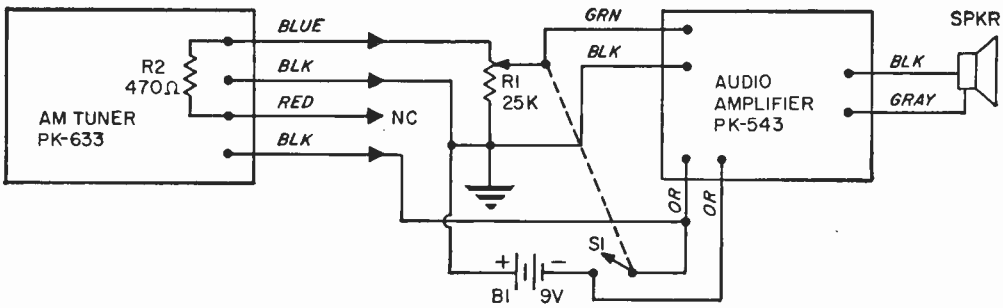
The speaker is mounted on a wood L-shaped frame which divides the lunch box into a closed compartment and a food storage area.



The completed lunch box portable is ready for its first field trip or school lunch. Paint wood L-shape form to match plastic.



Loudspeaker should be protected from possible damage. Square pieces of perforated phenolic board offers maximum protection.



Interconnection diagram for the lunch box portable. AM tuner and audio amplifier are purchased, prewired units with color-coded leads. Interconnect these units after all parts except speaker have been mounted.

tuner to its mounting bracket; for rigidity place an internal starwasher between the strip's mounting foot and the tuner.

Before connecting the tuner to the amplifier, wire volume control R1. At the same time, connect resistor R2 as shown, directly across the appropriate tuner terminals. Though R2 isn't called for in the amplifier and tuner instructions, its use will result in very clean sound, even at high volume levels.

The leads from the tuner are soldered to small brads on the tuner itself. To avoid haywire splices remove the existing tuner wires as you solder and connect directly to the brads themselves. Take care not to "cook" the tuner as your solder—a light iron of about 40—75 watts will be just right. Carefully unsolder the tuner's blue lead and connect a lead from R1's "high" side to the brad which was connected to the blue lead. Unsolder the tuner's *inside* black lead and connect the amplifier's black lead to this brad. (Note: Only the *inside* black lead is the tuner ground.) Next, unsolder the *outside* black lead (the negative battery connection) and connect the amplifier's ground lead (the orange wire we identified earlier and marked with tape) to the brad. Now connect the negative battery lead to the same brad. The battery's *positive* lead can be connected to any ground point on the audio amplifier.

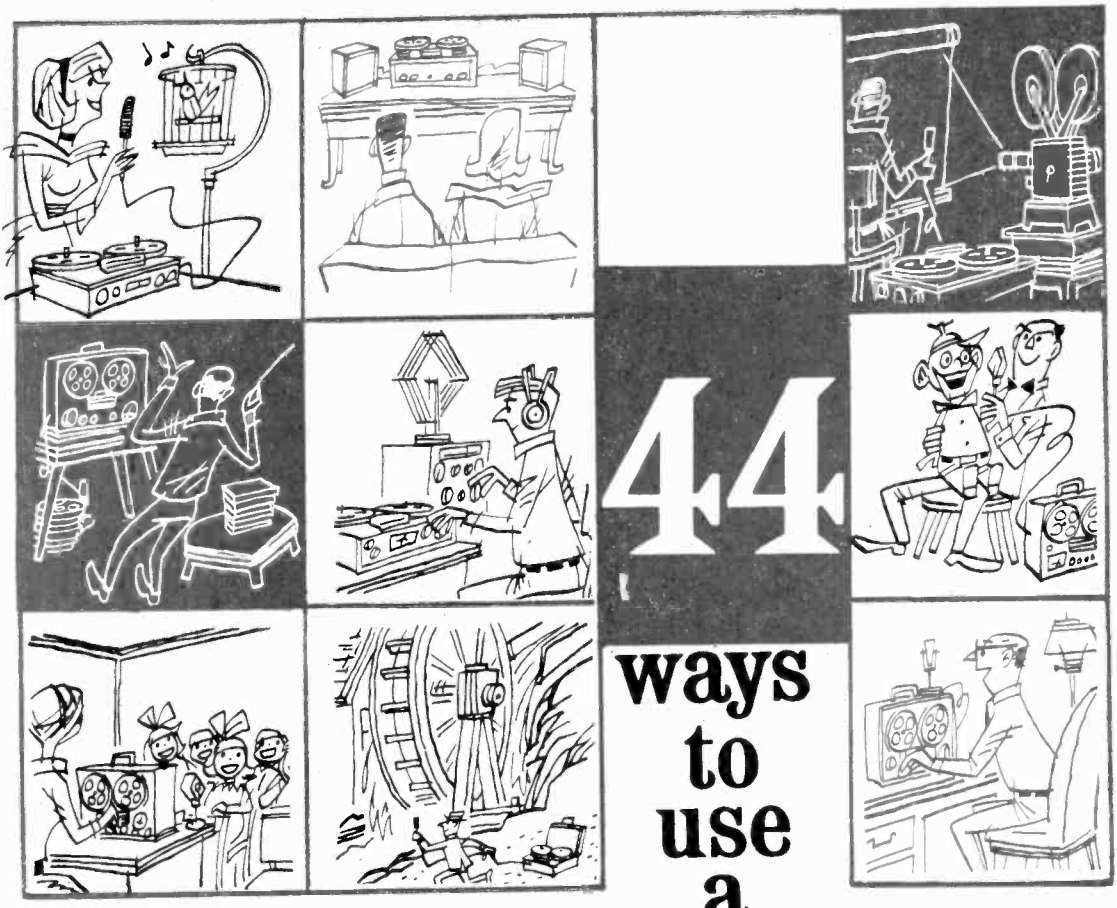
The speaker (SPKR1) is mounted on a wood L-shaped frame which protects the radio and also divides the case into compartments. Since the larger the speaker the better the sound, use the largest speaker possible. If you're after an extremely compact arrangement, use a 2½ inch speaker; —anything smaller will result in sound so "tinny" it will be annoying. To protect the speaker from damage, a section of perforated wiring board can be mounted on the frame. Or you can make your own by drilling closely spaced holes in a piece of plastic.

The frame is held to the case with four sheet metal screws, two on each side. Don't put in a series of screws, since the frame must be removed when you want to replace the battery. Standard #6, ½ inch sheet metal screws will do nicely.

Firing up the Lunch-Box Portable. Replace the knob on the tuner and turn the set on. This done, tune in a station and let 'er rip! For a dial-marker, simply put a dab of nail-polish on the box opposite the appropriate dial numbers when the set is tuned to a station whose frequency you know. ■

LUNCH BOX PORTABLE PARTS LIST

B1—9-volt battery (see text)
R1—50,000-ohm miniature potentiometer with switch (Lafayette VC-31 or equiv.)
R2—470-ohms, ½-watt resistor
SPKR—8- to 10-ohm speaker (see text)
1—AM tuner (Lafayette PK-633 or equiv.)
1—Audio amplifier (Lafayette PK-543 or equiv.)
1—Lunch box, plastic or wood construction (see text)
Misc.—Terminal strip, scrap aluminum for battery holder, wood, knob for R1, hardware, solder, wire, etc.
Estimated construction time: 2 hours
Estimated cost: $18.50



DEVELOPED originally as a means to conveniently record all types of music and the human voice for radio broadcasting purposes, the tape recorder has become a Jack-of-all trades whose only rivals are the jinns who came out of bottles and jars in the Arabian Nights entertainments. And unlike the jinni that was corked up again in its bottle, the tape recorder escaped into the world and crept into almost every facet of our lives. To count and illustrate the many uses of hi-fi tape recorders is an impossible task, with many new ideas constantly turning up each day. However, here are 44 ways to use your tape recorder that may introduce you to some new applications and stir your imagination in the creation of many, many more.

RECORDER

1 As a Program Source. Tapes offer the highest fidelity of recording and reproduction, particularly on stereo. Not all the music or program material available on discs is available on tape, but a good proportion of the most spectacular programs of the mainline recording labels can be obtained on tape. Tape programs cost more than discs but are superior to discs in noise level, dynamic range, transient response and stereo separation. Any tape recorder can be connected to any *components* type hi-fi system, and to most package types, for playing back commercial tapes through the hi-fi. If you want to use tapes as the principal program source for a hi-fi, a tape deck —which has no preamplifiers or recording facilities—is an economical buy. All current components type preamplifiers and control-amplifiers have facilities for connecting a tape deck directly to them, and provide the amplification and equalization needed for proper playback of commercial tapes.

2 Dub Those Rare Old 78's. Those old 78 rpm records do not play back well on current hi-fi systems; and if they are rare you don't want to play them very often. The most convenient and safest way to enjoy them as often as you like is to record them on tape. A little experimentation in adjusting the tone controls on the hi-fi system, or the tape recorder, or both, can make them sound very much better than they do played directly.

3 Duplicate Tapes. You can make duplicates of your own or commercial tapes. There are two ways of doing this. The simplest way is to use two recorders—or a tape-playback-deck and a recorder. Some recorders, notably the new Bell, have an attachment so you can duplicate tapes directly on the one machine.

4 Radio and TV Recording. Any tape recorder can be attached to any components type hi-fi system to record anything that you can feed into the hi-fi—radio and TV programs or disc recordings. Most of them have a Tape-Monitor switch which permits you to record the program and at the same time listen to it. In this way you can add to your collection recordings of those special programs on radio and TV that are not available on commercial records. Or, you can build up a collection of music on tape. This is an especially economical way for the teen-agers in the family to get recordings of those latest hit songs.

5 Automatic Radio or TV Monitor. It is relatively simple by the use of a clock-switch to record radio or TV programs automatically, so you can record a favorite radio or TV program while you're away, and play it back when you come home. With a "Program Timing Switch" it is possible to turn the radio or TV/recorder combination on and off automatically throughout the day to record as many programs as a reel of tape will accommodate; up to 2 hours at 1⅞ ips with the double play tape.

6 Preserve a Record of Historic Moments. Today the radio and TV often puts you on the spot to witness or hear some of the most historic events in current history. Attached to the hi-fi system a tape recorder can be switched in almost instantly to record for yourself and your posterity the big moments of local, national and international history. Our recorded treasury, for example includes recordings on discs of King Edward's abdication, the Hindenburgh disaster, President Roosevelt's funeral, and many more recent historic moments on tape.

44 ways to use a TAPE RECORDER

7 Tape a Demonstration of Your Hi-Fi. A well planned demonstration of stereo high fidelity is good entertainment for your guests. Ordinarily you have to use a half dozen records, playing one section from this one and another from that one and the result is awkward and lacking in maximum impact. Choose a program of records that shows-off the system to best advantage, record it with your own comments, if you like, on tape. Now you're ready at a moments notice to provide an organized, coordinated half-hour or an hour demonstration of what your hi-fi music system can do.

8 The Sounds of Wildlife. Hunting the sounds of wildlife with a tape recorder can be exciting and challenging. You can use many of the tricks of nature photographers—the hidden and baited microphone for example. For "telephoto" effects you can rig a parabolic microphone or use a highly directional mike like the *Electro-Voice* "Sound Spot."

9 Strange and Exotic Sounds. Make a collection of the odd, strange and exotic sounds you run into during your travels or around you. For that matter, a collection of all the different sounds you hear can be exciting and highly useful in making future sound pictures or for sound effects for slides or movies or theatricals.

10 Test the Fi of Your Hi-Fi. Arrange your tape recorder with the mike or mikes a few feet in front of the speaker or speakers; and 2) the tape output of your hi-fi going to the external input of the recorder. Play a test record and record it first directly off the disk. Now record the same passage as it comes out of the loudspeakers. Playing back the tape will give you an A/B comparison and a pretty good idea of how much your hi-fi, or the acoustics of the room modifies the original sound.

11 Record Your Own Artists. Add to your collection of recorded music the music created by your own local artists—the members of your family, the band or orchestra they play in, your local symphony or high school band, or jazz band, the local musical prodigies, your church or club choir, etc. With modern stereo tape recorders you can do it stereo. You may be surprised to hear how well they sound over your hi-fi.

12 Message Center. One of the handiest uses of a tape recorder, especially in a big, busy family, is as a message center. We're always having to pass instructions, reminders, leave notes, etc. for other members of the family; and some of the biggest family squabbles and snafus arise from the failure of these messages and reminders to reach the desired party at the desired time. Set up a tape recorder at a convenient place in the home, preferably near the telephone. In the morning, or the previous evening, Mamma and/or Papa can record instructions, reminders, shopping lists, etc. for all the other members. During the day, mother or whoever is holding down the fort, can record reports of telephone calls, further instructions, reminders, etc. When the kids come home from school or papa from work, they monitor the tape to see what messages are on tap; roger re-

ceipt of message or report compliance with a brief message. At the end of the day it is easy to check the score—and there's a record to settle arguments.

13 Recording Radio and TV Recipes. Those recipes that come by radio and TV are interesting and can be helpful but they don't always cook exactly what you want to feed the family on a particular day. You can accumulate a fine file of these on tape, put them on when you want that particular type of food.

14 Record Telephone Conversations. By the use of inexpensive induction pickups it is easy to record telephone conversations. In this way complicated instructions, or messages for people who are not at home to take them personally, can be recorded. The law requires that the party at the other end must be informed that his conversation is being recorded; and for this purpose a "beeper" is available as an accessory to insert a periodic beep into the phone as a notice that the conversation is being recorded. Inversely, a recorded message can be passed on by phone simply by holding the telephone handset close to the recorder loudspeaker.

15 The Music Student's Monitor. A tape recorder is an invaluable assistant for the music student. You can record your playing and hear exactly how well you have done on your lesson for the day or week—even year to year.

16 Tape Grandma's Recipes. Grandma's special dish is always wonderful when she cooks it but a poor imitation when you cook it. Trouble is she belongs to a "pinch of this and a dab of that" school and your pinches and dabs don't quite correspond to hers. Next time, put the tape recorder on and record the whole process as grandma cooks, noting down dabs in terms of spoonfuls and inserting the pinches at the proper points etc. At your leisure you can transcribe the recorded notes into a modern recipe or simply play back the tape and let grandma cook by delayed and remote control.

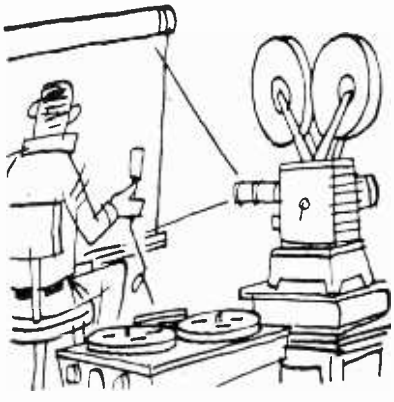
17 Tape Your Own Recipes. You yourself have undoubtedly some special dishes in which the ingredients are not exactly in prescription quantities. To preserve these or to pass them on, leave the tape recorder on as you mix, season, baste, etc., then transcribe this to regular written form or simply use the tape to guide you, or whoever you want to impart your culinary secrets to.

18 Record Complicated Instructions. Any time you have to follow complicated instructions—putting a knock-down or kit type gadget together for instance—why not record the instructions on tape. If you have an accessory footswitch on your recorder, the whole operation becomes a cinch. You can listen to each step, lift up your foot while following them, press down on the switch to get the next step, etc. Or you can record the instructions with pauses long enough to permit you to follow the steps—or even, if you want to make a production out of it, fill the intervals with music to soothe your nerves.

44 ways to use a TAPE RECORDER

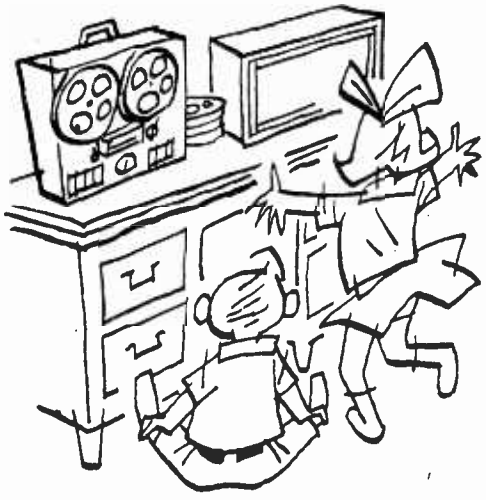
19 Sound for Home Movies or Slides. The movie or slide program you filmed will have a much greater impact if synchronized with an accompanying music, sound effects and voice commentary background. It is easy to provide this even with the simplest tape recorder and some current tape recorders have facilities for fully automatic synchronization. The simplest way is merely to record your commentary on tape while monitoring the slides or movie program. You can do this leisurely and carefully, and in this way get a greater impact than you do talking off the cuff.

You can be as elaborate as you want to by using appropriate excerpts of music and adding sound effects. Both music and sound effects can come from disc recordings. There are many sound effects records providing every variety of sound. That's what radio and TV stations use nowadays. The only problem is synchronization of tape and projector. You can keep the slide program in sync simply by controlling the change of slides with the projector switch or remote control to keep slides in step with the



commentary. With some new tape machines you can record signals on the tape that will key the slide projector and thus have a fully automatic slide show.

20 The Instruction Bank. Remember how often your wife has called you at work to find out how you change a fuse, or what do you do to get the whatchamacallit working? Every house hold has one or two temperamental gadgets which tend to go out of order and are easy to restore to proper function if you know how, but mamma simply can't remember how. Why not record instructions for these on a reel so the wife can get the dope without bothering you on the job?



21 Keep the Kids Occupied. Preschool children can be the straw that breaks mamma's back especially in the mid-afternoon when instead of kiddy type cartoons, the TV is offering soap operas. For that occasion when other, more urgent duties demand mother's time, record a couple of reels of stories, sound-tracks from TV cartoons, children's songs, etc., to keep the brat out of your hair. If you record yourself reading his favorite picture books or comics, the kid can listen to your voice while looking at the book and just about duplicate the experience of the original reading. This is especially helpful if you yourself have gotten pretty tired of the book, and can scarcely stand the thought of reading it for the 999th time. And if you can't stand hearing it either, feed the program through a pair of headphones to the heir or heiress.

22 Record Committee Meetings. Those informal meetings with rapid-fire discussions, exchanges and possibly, arguments are difficult for a secretary to record. A tape at slow speed will preserve it and a replaying of it may well turn up good ideas or suggestions which didn't sink in at the time.

23 Sound Effects for Your Model Train Layout. You can tape a program of sound effects in synchronization with the action on your model train layout. A number of records are available giving just about any railroad sound effect you might want—even the near miss of an accident at a grade crossing. It is more difficult to synchronize the tape program to the train layout but it can be done by stopping the action while changing records, and being clever in editing the tape. The added impact of the sound background is terrific.

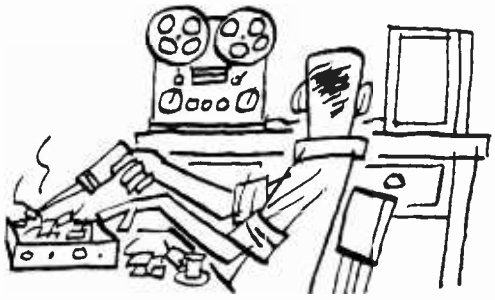
24 Learn a Foreign Language. A tape recorder is a particularly useful medium for learning foreign languages. You can get courses on tape of practically any language including a smattering of Hindustani. Furthermore, you can use the tape recorder to record yourself as you try to speak the language, and thus see how well or poorly you're doing.

25 Give a Taped Program. A taped program for your club can be a real change of pace. One idea is *The Sounds of Our Town*, with a special emphasis on those that ought to be eliminated or minimized. Another is a *Man on the Street Interview* with a number of citizens giving their opinions on what's good or bad about the town or what should be done about some problem facing the town. If your club sponsors a fund drive for some charitable activity, prepare a tape giving the reactions of the people benefitting from the activity. Or, for your veteran's club, take the recorder to the local Veterans' Hospital and record messages from the fellows in the hospital. When you go to Washington, take the recorder along and record a brief message or an interview with your congressman or senator.

26 Recording Lab and Workshop Notes. We have a foot-switch controlled recorder at our lab bench. Instead of making pencil notes of measurements, adjustments, etc., we simply depress the footswitch, announce the measurement or adjustment. Later we transcribe these to paper at our leisure. This cuts lab time by 50 per cent or more. The same method could be used in workshops.

27 Comparing Notes with Fellow Hobbyists. Correspondence with other fellows in the same hobby can be difficult and time consuming because it usually involves passing on detailed technicalities and that means long letters which you never get around to writing. By using tape you can pass on a lot of information in a relatively short time and with relatively little trouble; and most of us find it easier to talk for 10 minutes than to write for a half hour. Furthermore, there's no problem reading the other guys handwriting—or yours, for that matter.

28 Recording Incoming Net Traffic. This saves both net time and your time. If copy is solid, one transmission is enough, no matter how fast the other guy is. If copy is poor, it is often possible to get the text off tape, by playing it back several times, when it is not possible to do it directly. Trouble with most operators is that they can't write the message down as fast as the other guy transmits it. With tape you can take all the time you want to transcribe after the net.

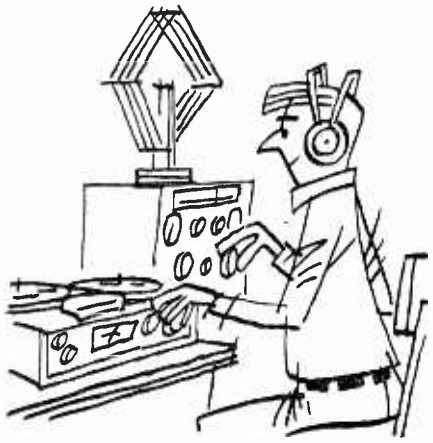


29 Tape Guest Speeches. When you have a prominent speaker for your club, tape his talk or speech. Your radio or TV station may wish to use short excerpts, or even the entire speech, in its news report, thus giving your club good publicity. A library of taped talks can be very useful to fill-in a program when no speaker is available.

44 ways to use a TAPE RECORDER

30 Contest Log. In a contest the trick is to make the most contacts in a given time. By using a tape recorder to record QSO's one *op* can work as many stations as an *op* and *log keeper*. Also you have an incontrovertible record of the contact in case any question comes up. You can transcribe the log to an official form at your leisure after the contest.

31 Record that Rare DX. You can preserve the thrill of working a rare DX, and have evidence of having done so, by recording the QSO on your tape recorder.



32 What Is It? Record sounds or sound effects and offer a prize for the party guest who identifies the greatest number.

33 What Goes On Here? Record sound track of TV dramas during dramatic moments when there is no conversation and take notes of what went on during this interval. Ask guests to guess from music or sounds what was going on on screen. Or record sound occurring during various household jobs, or around the office, shop or store, and let guests identify activity from sounds.

34 Recording Outgoing Traffic. When you have a lot of traffic or a bulletin or announcement to send, you may be able to do a better job by recording it all on tape and using the tape to modulate the transmitter.

35 Tape Technical Discussion or Instructions. When you ask another ham for help or advice in circuitry, modification, trouble shooting, etc., you can get full benefit of the advice by taping it instead of depending on rapidly scribbled notes. This may well eliminate errors also. You can preserve that fine MARS technical broadcast for future reference by recording it entire.

36 Give Tape Reports of Modulation Quality. A tape of the sound of the other station as it is heard when you receive it is the best report of sound quality you can give. It is best to send the tape directly to him. Playing it back over your transmitter will modify the sound by the characteristics of your own transmitter and his receiver. A series of tests with different mikes, adjustments, etc. recorded on tape will give him the best basis for comparison and decision.

37 The Phantom Band or Orchestra. You can join an orchestra or band, or quartette any time you like and with a tape recorder, you can see how well you fit in. The simplest way is this: play a recording on your hi-fi of a band or orchestra playing a selection you have learned. Set up a tape recorder where the mike can pick up both the hi-fi and you. Playing back the tape will show you how well or poorly you have contributed to the overall effect.

38 Tape Interference or Illegal Transmissions. If the problem is caused by another ham, this may help clear the QRM diplomatically. If it is caused by a neighbor's appliance, it may help persuade him to filter it or to pick a time for using it that will bother you least. If it is power line type, it may help the power company to identify and locate it. And if it should become necessary to make a federal case out of it, you'll have the evidence.

39 Code Practice Broadcasts. When giving code practice over the air it is necessary to use code groups in plain English. Many, if not most of the commercial code practice records and instruction tapes, have random groups of characters. You can have one of your

good *ops* record practice tapes in plain English groups at various speeds, edit these with opening and closing announcements, and thus make the problem of code practice broadcasts simple and legal as well.

40 Who Said That? Record snatches of voices of prominent people off the radio or TV, or of friends and neighbors. Intersperse with some clues. Offer a prize for whoever identifies the greatest number.

41 For Club Publicity. Most radio stations will welcome one- or two-minute taped announcements of your club activities, excerpts of speeches, or highpoints of your meetings or programs. Doing it this way saves them time and makes it possible for them to schedule the tape at their convenience. In the case of a local concert or a talk by an important personage, the station may want to broadcast the entire proceedings off tape at a later hour or date. (It is well to obtain the speaker's permission for a broadcast, especially if he received a fee.)

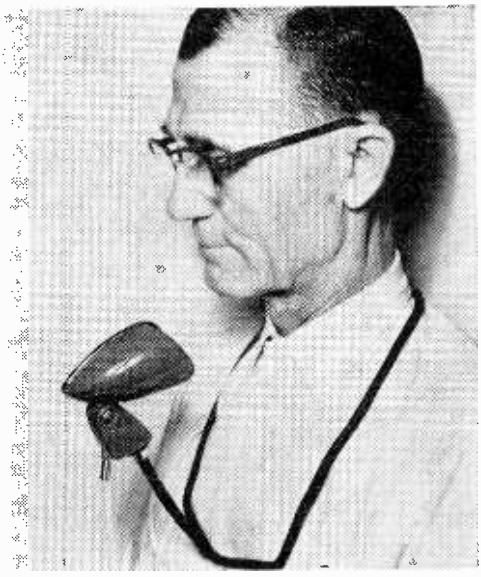
42 Hunting Vanishing Sound. Every generation has a different sound and every year some sounds disappear—like the awesome sound of the steam locomotive. There are sounds in your community that will not be heard ten or 20 years from now, or which are not heard anywhere else today—the sound of a *mule powered sorghum mill*, for example. Hunting vanishing sound can be very exciting. A battery powered recorder, or a standard recorder with an inverter so it can be operated from a car battery, and a long microphone cable are the only tools you need.

43 The Sound Picture. It is possible to "paint" a picture with sound and it can be representational or abstract just as a canvas painting, or a sculpture. It is quite possible that *sound pictures* may become a new art form. Here is a new unexplored medium of self-expression with almost limitless possibilities. Anyone can produce a *sound picture* of his home or neighborhood by collecting snatches of the typical and representative sounds, and then editing them like a film to produce the greatest impact or to tell a story.

44 Working Out a Club Speech. When you are invited to give a talk or program before your club, on the local radio or TV, rehearse yourself on the tape recorder first. In this way you can correct errors, time yourself, edit for maximum effect—and, if your talk puts *you* to sleep, either arrange for someone else to give it, or pick up a pencil and write another. ■

Chest Support for Mike

THIS simple "third hand" microphone chest support frees your hands for other duties while it holds the microphone close to your mouth. These features make the mike support useful to ministers, amateur radio operators, auctioneers, bingo announcers, "ballyhoo truck" drivers, sideshow barkers, or just about everyone who wants to be heard over PA systems. You can make this chest support for about 35¢ worth of materials, or you may have the materials in your spare parts box—bringing the cost down to zero.



Wire Bending. Obtain a 24-inch length of #8 gage rubber-covered or plastic-covered solid alminum wire. This wire is sold by radio and electric parts stores for grounding TV antennas. Bend the wire to shape suggested in the photo at right, so it fits nicely behind the neck and over the shoulders and chest.

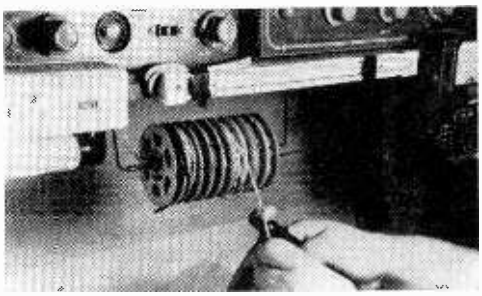
Strip the insulation off the two ends of the wire; remove the cord-protecting-spring in an Amphenol 75-MC1M mike cable connector and slip the connector over the two ends of the aluminum wire and tighten its set screw to lock it on. Wrap a few turns of plastic electrical tape around the two wires, at the bend near the chest, to hold the wires together. You may want to use some epoxy cement or the latest General Electric silicon rubber cements to permanently "cement solder" the connector to the aluminum wire. The chest support is now ready for use.

The ⅝-27 threads on the cable connector will fit the socket in your microphone. Secure the mike in place. The author used black insulated wire so it will show up in the photo. White plastic insulation may be preferred.

—Art Trauffer

REEL DEAL

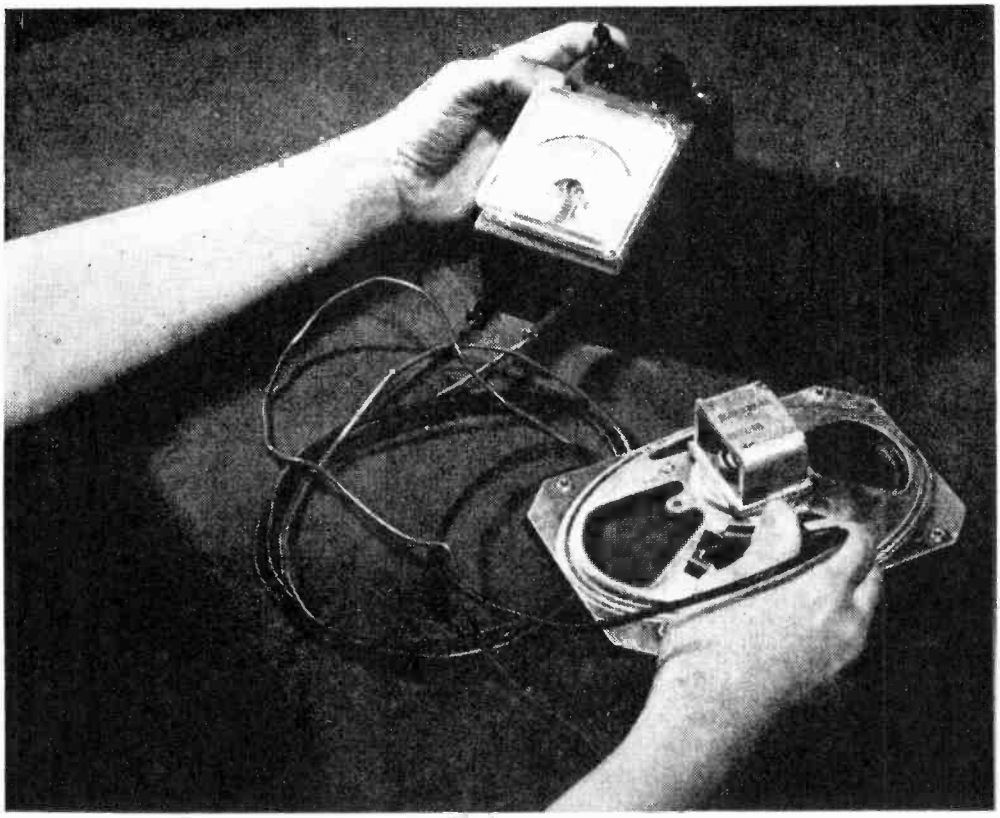
TIRED of groping around for solid, stranded, or colored hookup wire while right in the midst of a new project? Well, using empty 8 millimeter movie reels, an old coat hanger, two grommets, and a piece of tubing, it takes about fifteen minutes to make a *reel deal.*



The "shaft" for mounting the reels may be aluminum, brass, copper, or plastic tubing having a ¼-inch outside diameter. Wind a different type of wire on each of a number of reels and slip them onto the shaft. When the desired number of reels are on the shaft, force snug-fitting grommets on each end to hold the reels on the shaft.

Bend two pieces of coat hanger to form brackets that insert into the center of the reel shaft; the other end of each wire is mounted under a workbench shelf with wood screws. Shape the wire brackets so they can pivot on their mounting screws, allowing easy "swing-away" removal for adding, changing or refilling the reels. Different colored reels will help you pick out the wire you need at a glance.

—Fred Blechman, K6UGT



LO-OHMMETER

Building an universal low-range ohmmeter that can measure resistance down to 1/20th of an ohm

By Jim Kyle, K5JKX

EVER need to measure a resistance lower than one ohm, accurately? Here's a simple one-evening project, an inexpensive meter which starts where most ohmmeters leave off—and will give you an accurate reading of only 0.05 ohms. We call it the Lo-Ohmmeter.

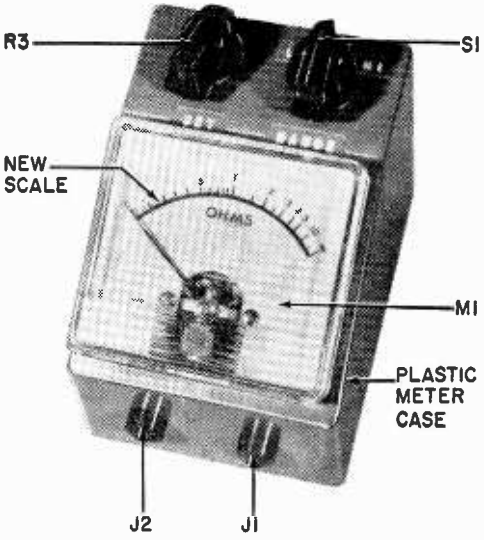
And though such a device might seem rather specialized at first glance, it has a multitude of uses on an experimenter's workbench. It was originally developed for use in checking out ham and CB mobile installations, where fractions of an ohm of resistance in battery leads can result in extreme loss of output power. However, the word got around, and now the unit pictured in the photographs is in daily use by an aircraft maintenance firm. They use the Lo-Ohmmeter to check out the thermocouples in all engine-temperature instruments, which (if good) will have 0.56 ohms resistance. None of their high-priced test equipment could measure this low value—but this gadget takes it in stride.

LO-OHMMETER

Other Uses. You can employ the Lo-Ohmmeter to check out speaker voice coils, to test for "cold-soldered" joints and to measure low-valued meter shunts for other construction projects. However, under *no* circumstances should the Lo-Ohmmeter be used to test any type of semiconductor device, since *high current* flows in the test leads in use and either a diode or a transistor would be destroyed!

Adding to the attractiveness of the Lo-Ohmmeter for most experimenters is the fact that any type of meter movement rated at 1 milliampere or less, full-scale, can be used with no circuit changes. The accompanying meter face is accurate for all meters (regardless of rating) provided it is enlarged or reduced so that the total scale length is the same as that of the meter you plan to use.

Let's Build It. The starting point is, of course, to gather all the materials. You'll need a 1-ohm 5-watt resistor, as accurate as you can obtain; a 10-ohm 1-watt unit, also as accurate as possible (however the original used regular 5-percent resistors and had no accuracy problems); a 3-position switch; a potentiometer whose value we'll discuss in the next paragraph; a 1½-volt manganese-alkaline Size D cell; a holder for it; a pair of test jacks to fit your test leads; a case to hold it all; and of course the meter.



Any standard plastic or aluminum meter case can serve as an attractive chassis and box.

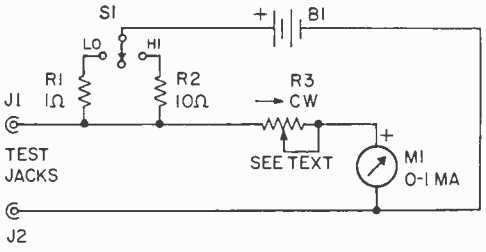
I used a 0-100 microamp meter salvaged from a burned-out SWR bridge, but as mentioned before any 0-1 MA or more sensitive meter can be used. The unit has been tested with the inexpensive Shurite 0-1 MA meter and works nicely with it; using the Shurite meter, total parts cost should be in the neighborhood of $10. However, the longer scale length provided on more expensive meters makes reading of resistance values more easy, and a good quality 2½-inch size 0-1 meter is recommended. The meter you choose will determine the value of the potentiometer required; the pot should be of a value which will just permit the meter to read full scale with the pot set for maximum resistance and a fresh battery in the meter. This would be 1500 ohms for a 0-1 MA movement, or 15,000 ohms for a 0-100 microamp movement. To get the right value for other meters, divide full-scale meter rating in milliamperes (1000 microamps equals 1 MA) into 1.5, and the result is the pot rating in thousands of ohms.

The case shown in the photos is a Cesco meter case, distributed by the LMB chassis people, and was chosen for both looks, strength, and ease of working. It's already cut out for any 2½-inch meter and can be "drilled" with a hot icepick although a regular twist drill is faster. A metal case can serve equally as well.

With all parts in one place, the next step is to lay out and drill the holes for the switch, the potentiometer, *and* the test lead jacks. Position of these holes and sizes are shown in the drilling layout detail drawing. If you use a conventional aluminum or steel meter case, use the same approximate locations. Part location, aside from physically fitting inside the case, is not critical.

The battery holder mounts on the metal bottom plate with two 4-36 screws, which are cut off flush with their nuts after being tightened. A pair of good side-cutters will handle the No. 4 screws.

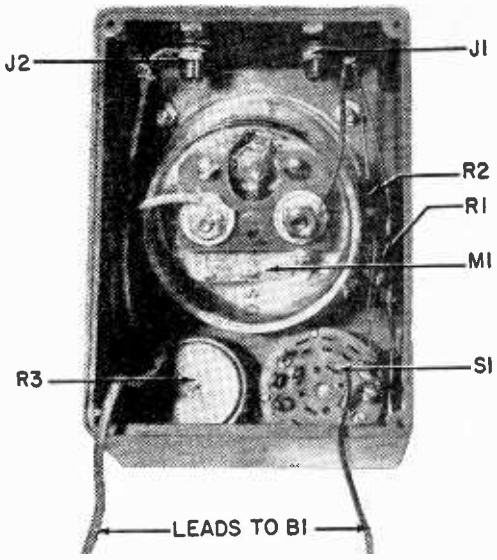
Be Careful. At this point, construction is two-thirds complete. The final step before wiring is to disassemble your meter and put in the new scale. Since every meter is different, this is something you'll have to figure out for yourself, but here are a few general hints. Most meters are held to their case fronts by three tiny flat-head screws located 120 degrees apart around the side of the round portion of the meter. Removing these screws



Close examination of circuit reveals that external resistor serves as the meter shunt.

PARTS LIST

B1—1½-volt manganese-alkaline dry cell, D-size (Burgess AL-2)
J1, J2—Insulated tip jacks—one red, one black
M1—0.1 ma. DC meter (See text)
R1—1-ohm, 5-watt resistor, 5%
R2—10-ohm. 1-watt resistor, 5%
R3—1500-ohm potentiometer (use with 0-1 ma. meter) or 15,000-ohm potentiometer (use with 0-100 microamp meter)
S1—3-position, single-throw, rotary switch (Mallory 3123J)
1—2½" plastic meter case (See text)
1—D-cell holder (Keystone 175)
Misc.—Wire, solder, hardware, etc.
Estimated cost: $10.00
Estimated construction time: 3 hours



Bottum-up view of Lo-Ohmmeter shows parts placement—battery mounts on bottom cover.

allows the meter movement to be slid backward out of the case front. If the meter has a "zero-adjust" screw on the front, be sure not to move it while the movement is out of the case; it will cause offscale reading if not properly aligned when the meter is put back together. Remember, avoid all unnecessary handling of the meter and *do not touch* any moving parts.

With the movement out of the case, you'll usually find two small screws holding the scale in place. Removing these screws allows the scale to *slide out* from under the *meter needle*. If you *don't touch* the needle or allow the scale to touch it, you're home free. With the scale out in the clear, you can measure the distance straight across from one end of the scale to the other. This is distance "A" on the sample scale furnished here, and you can then have this scale photocopied so that distance "A" comes out the right size for your meter.

Then, align the photocopy over the old meter scale and cement them together with rubber cement. A strong light usually lets you see throgh the photocopy to align the scales. When the rubber cement is dry, use a razor blade or Xacto knife to trim away excess paper around the edges and to remove the photocopy paper over the two mounting-screw holes, then put the scale back under the needle and the movement back in the case by reversing the procedure you used to get them out.

Mount the modified meter in place on the box, and also install the potentiometer, switch, and test jacks. Now we're ready for the wiring.

Wiring the unit is something of an anti-climax. Follow the schematic and the photos; the whole thing shouldn't take over 15 minutes to wire up.

When wiring is complete, install the battery in its holder. Set the potentiometer for maximum resistance (full counter-clockwise) and turn the switch to either "hi" or "low" range. The needle should rise to something between half- and full-scale position.

Set the needle to the "infinity" mark at full scale with the "SET" potentiometer, and you're ready to measure. For a start, try a known resistance. On the "low" range, the meter reads directly as calibrated, from 0 to 50 ohms in steps of 0.1 ohm below 1 ohm and stepping by ohms from there up to 10. On the "hi" range, all scale readings are multiplied by 10. This gives maximum accuracy in the 1-to-10-ohm region; at higher resistance values, a conventional VTVM or VOM can be used.

Always turn the range switch to "off" when the meter isn't being used, as battery life will be reduced otherwise. Be sure to use only the manganese-alkaline type of battery, as other types have too much internal resistance to give accurate readings if the battery is aged to any appreciable extent.

How It Works. If you're interested in how this gadget works, here's a brief rundown:

The basic theory is that of a voltage divider, in which the resistance being measured forms the lower leg. With a known voltage applied across the battery, and the other leg of the divider being a resistance of known value, the voltage appearing at the tap gives a direct indication of the resistance of the unknown leg.

In this meter, the meter movement itself and the "SET" potentiometer form a voltmeter which measures this voltage. The 1-ohm and 10-ohm resistors are the upper-leg standards, while the battery furnishes the voltage.

With no resistor connected to the test leads, current flow through the voltage-divider will be so small that it can be called non-existent (only the current which drives the meter flows under these conditions, and it is hundreds of times smaller than current flow when a resistor is connected). With no current flow through the upper leg of the divider, the full battery voltage will appear at the hot test jack, where the voltmeter part of the circuit begins.

Here, the voltmeter measures the battery voltage. We're not really interested in the voltage, so we use the "SET" potentiometer to bring the meter needle to full scale.

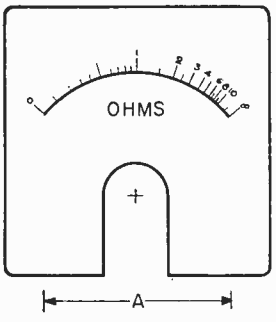
Now if a resistor is connected to the test leads, it will complete the voltage divider and current will flow. Let's assume we're using the 10-ohm resistor ("hi" range) and connect the leads to a 2.2-ohm resistor for test. The current flow through the divider, from Ohm's Law, will be 1.5 ÷ 12.2 amperes, or 0.123 amperes. This amount of current flowing through the 2.2-ohm "unkown" lower leg will develop about 0.27 volts across it. Since we set the meter to read 1.5 volts full-scale and it is now connected to a 0.27-volt source, the needle will swing about 18 percent of the way across the scale (0.27 ÷ 1.5). This point is marked as 2.2 ohms.

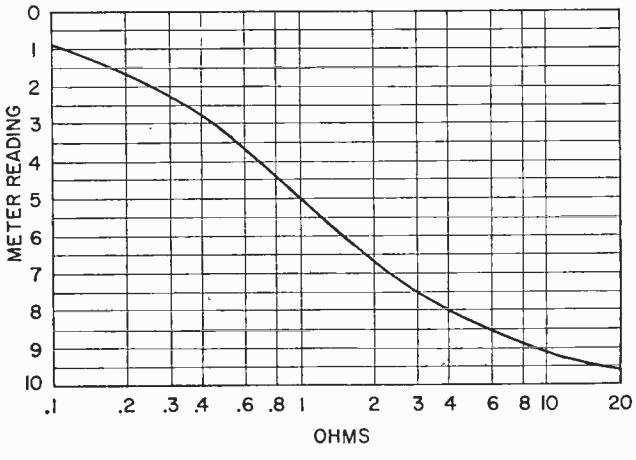
It would work just the same if battery voltage had dropped to 1.2 volts. When we get back to figuring the percentage of full-scale distance the needle will swing, we'll find it's still 18 percent and the voltage change at the battery has cancelled itself out.

A graph of meter swing verses ohms resistance (see below) can be used if your meter can't be opened to put in a new scale. Simply find the meter reading on its scale of the graph, read across to the curve, and then move up to the "ohms" scale to find out the value of the unknown resistance.

The same principle is used in almost all VTVM ohmmeter sections; a totally different idea is used in VOM's. In a portable instrument, 10 ohms center scale is about as high a resistance as can be read because at higher resistance values, the "voltmeter" part of the device is no longer several hundred times the resistance of the resistor under test, and accuracy breaks down.

You'll find the Lo-Ohmmeter a handy little test instrument in your kit of gear. And you might even find, as I did, that all your friends want one too when the word gets around! ■





Meter scale drawing (above) and meter-swing vs. resistance graph (right) are used to calibrate any meter (see text).

the Contact

CB radio can be way out of this world—if you know what I mean

By C. M. Stanbury II

DECEMBER 9,—I first heard her on December 2—a week ago. "CQ, calling CQ, this is 6WØØØØØ." I should have ignored it, her call was phony and the CQ illegal. But I'm the adventurous type, not scared of much, and besides her voice was the kind you day dream about. Deep and sultry, but sort of musical too,

"6WØØØØ, this is KBZ1133. How do you read me?" Citizens Band radio is a great game if you play it right. Break rules and you have the FCC on your back. Otherwise, it's pretty dull. Now take the CQ—you know, calling anybody who cares to answer—if I hadn't answered her CQ there would have been absolutely nothing shaking this week.

"S/9, KBZ1133. Over."

"Where did you get those 6WØØØØ call letters?"

"From the Martian branch of the Stellar Communications Commission." She should have giggled but didn't.

Every contact was like that, wild. That first contact was made from my base station. Every evening thereafter, contacts were made via my mobile rig, a 1951 Ford with $70 C-22 transceiver. Starting on the third encounter I tried to track her down. I had to keep 6WØØØØ talking and drive in whichever direction her signal was strongest. With a vertical whip antenna mounted on the center of my rear fender, all I had to do was aim the car in the direction of maximum signal.

"What's an earth woman doing with a Martian call?"

"Who says I'm an earth woman."

"Aren't you?"

"No! Born on Venus and raised on Mars,"

Each night her stories got wilder and all the time I figured either I'd find her or she'd run out of material. In order to track her better I built myself an S-meter and added it to the C-22.

So here I am, December 9, a cold winter's

night, after breaking my date with a girl who certainly didn't come from Mars, chasing a phantom. One eye on US 20 and the other on that S-meter. "6WØØØØ, what did you come down to earth for?"

"To make contact with the Great White Lodge of the Himalayas."

"What's that?" Pushed my speedometer up to 70.

"You know, the abominable snowmen."

"Cousins of yours?" Gained on her, meter went from S/8 to 10 db over S/9.

"Oh, no, I don't look the least like them."

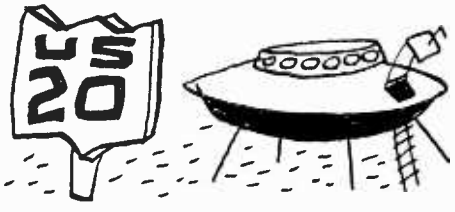
Her signal fell off. I made a U-turn right there on the highway. A tractor-trailer coming up behind me really banged his horn as we passed. I told you, there isn't much I'm scared of. Turned south onto a county road. Luck, the needle began climbing again.

"Are you still there, KBZ1133?"

"Still here, 6WØØØØ. Hey, what do you look like?"

Considered it. "Red hair, about five foot seven, 130 pounds but a nice figure by either earth or Martian standards."

Her description contrasted like the devil



with Maria's, the girl I stood up. Less than five foot, jet black hair piled atop the head for extra height. But Maria was pretty, too. "6WØØØØ, what do you want with an abominable snowman?"

"I'm the new ambassador from Mars." She pushed my needle to 20 db over S/9.

"I don't get it."

"Can you keep a secret. . . . Oh it doesn't matter, nobody would believe it if you told them anyway."

The rise in her signal strength began to flatten out, then fell off sharply as I passed a gravel road to the right. I stopped, backed up and turned off onto this dubious trail.

"The Great White Lodge of the Himalayas are a secret troup of superior beings who through their agents rule the earth." She should have been an actress I guess.

It began to snow, not a flurry but for real.

"The Lodge also has commerce with other planets therefore we each send an ambassador."

"Just to the Himalayas?" Wind came up strong and I could hardly see the road ahead of me.

"Oh, yes, your species are much too primitive."

"Then what are you doing way over in North America?" Snow got so bad I could make out the road only a few feet ahead of me.

"Ran out of fuel on my entry. I had to hide the saucer in some woods, borrow an earthling's car and hunt one of the Lodge's emergency caches."

Right then it occurred to me she might really be driving a stolen car. I began to sweat despite the cold. "On your way back to the saucer now?"

"Just reached it." Pushed my S-meter needle all the way over against the pin. "So I guess we'll have to cut this short. It's been nice." She left the air.

"6WØØØØ, are you there?" Silence. "6WØØØØ, this is KBZ1133, do you still read me?" Stupid question. She was gone.

At that moment doing 35 on the frozen gravel, I skidded. Like a fool I used the brakes and wound up really embedded in a snow drift. Got out, walked about 50 yards where the road came to a dead end against steel mesh gate. The sign on it read "Federal Communications Commission Monitoring Station." I turned around and half sprinted, half skated back to my car but parked behind it was an FCC van and an agent stood by my car waiting for me.

"KBZ1133?"

I half nodded.

"We've been chasing you for a half hour, boy. And there's some traffic cops that want to see you, too."

"Did you find her?"

"No." He laughed slightly. A fuzzy laugh. "She must have really taken off."

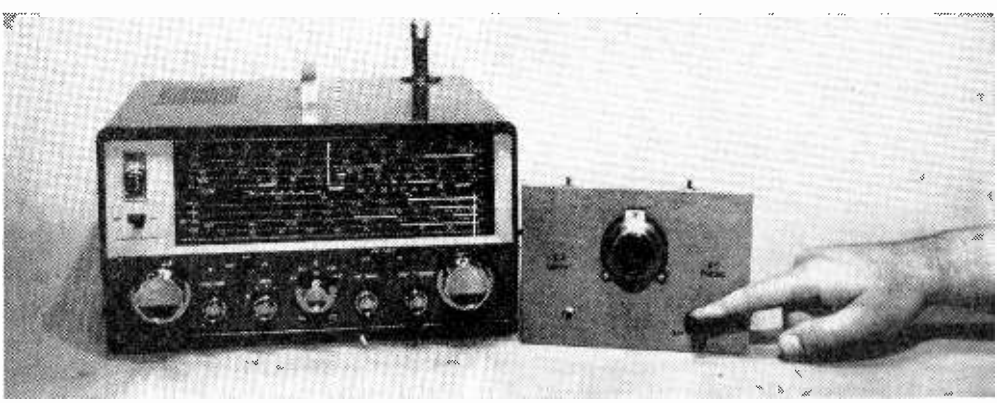
So it will probably cost me about two or three hundred dollars in fines. To pay them, I'll have to sell the Ford and CB rigs. And without a car I don't stand much chance of getting Maria back.

But what really bugs me is why 6WØØØØ dumped me off right on the FCC's doorstep. And I keep thinking wouldn't it be a kill if she really were the Martian ambassador. And the Great White Lodge really did rule the Earth through secret agents and this FCC monitor is one of those agents.

Well, she said no one would believe me. ■

BCB BOOSTER

By Herbert Friedman W2ZLF



Separating "wheat from the chaf" is the job of this tunable broadcast-band preamp that connects to any receiver

ONE of the most frustrating experiences for the BCB DX'ers is to see all those rare ones listed in *White's Radio Log* and wonder who in heck heard them. Well, many people hear them and you should, too! It might be that your receiver just won't receive them. Quite frankly, a budget receiver, always popular with BCB DX'ers, can always use a little extra gain. In fact, even a high priced receiver can often use an extra kick-in-the-pants on the broadcast band.

Well, if you want to join the list of SWLs who report those offbeat stations, you can do it without rushing down to "Cheap Tommy's Antique Shoppe and Radio Swap Shop" for a new receiver. All it takes is DX Central's BCB Booster—an outboard unit specifically designed for the BCB DX'er with a budget receiver. And if you wish, you can use it with a Gold Plated Mark CCLXVI. The BCB Booster is a tuneable RF amplifier capable of giving up to 5 S-units gain ('though the average is slightly over 3 S-units —we're honest). While it is AC operated it can be used *safely* with an AC-DC receiver since the booster's output is isolated from ground.

Since only standard components are used, and the layout is *clean*, it's a simple project even for the beginner. Even the coils are pre-wound, and they require *no modifications*—you use 'em as you get 'em.

Construction. The booster has very high gain, and quite likely it will break into oscillation if the layout and wiring gets sloppy. We suggest you follow the layout shown, and wire in such a manner that, within reason, plate leads don't cross or run parallel to grid leads—try to keep maximum spacing between grid and plate connections.

We suggest the use of the exact specified components. Of course, some of you, because of local conditions will probably make minor substitutions; therefore, to insure

stabile operation the layout should follow the detail drawing.

The mounting centers for the major chassis components are given on page 78. T1 and T2's holes should be large enough to insure that the rough edges of the hole do not cut through the connecting leads insulation. We suggest at least a half inch opening.

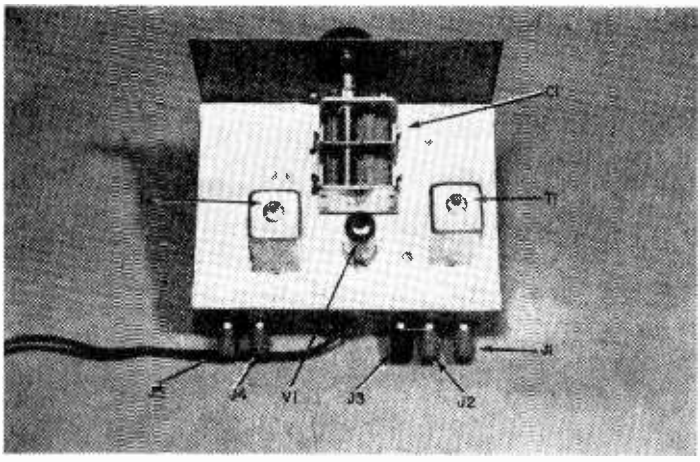
V1's socket doesn't have to be shielded, but if you have a shielded socket handy it can be used. Whether or not a shield is used the socket's center pin *must* be connected to ground. Failure to ground the socket's center pin will most likely result in tuning instability and oscillations.

Tuning capacitor C1 is usually mounted by three screws passing through the bottom of the frame. If the screws are too long they will short circuit C1's stator plates; since one set of plates is connected to the B+ line considerable damage can result. If possible, C1 should be mounted with 6-32 x ⅛ or 3/16-inch screws.

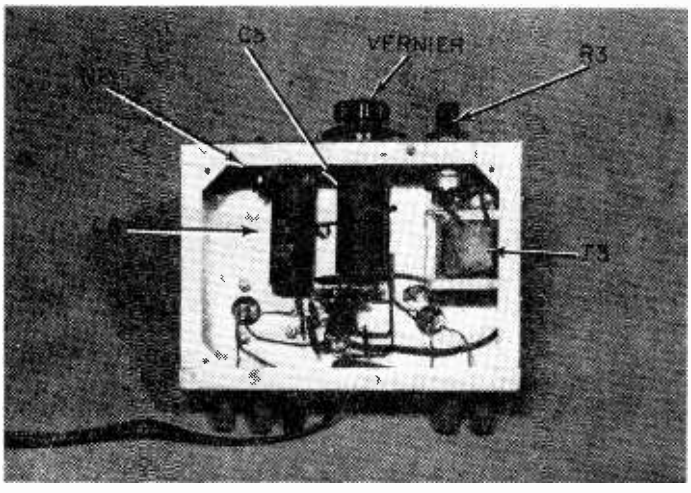
Make certain the holes in the chassis through which the tuning capacitor's connecting leads pass do not cut through the insulation. If you don't make large holes make sure the edges are burnished so no *knife edges* remain.

Disregard all instructions which are supplied with T1 and T2 and make the connections exactly as shown in the schematic diagram. *Do not reverse* any of the color coded wires.

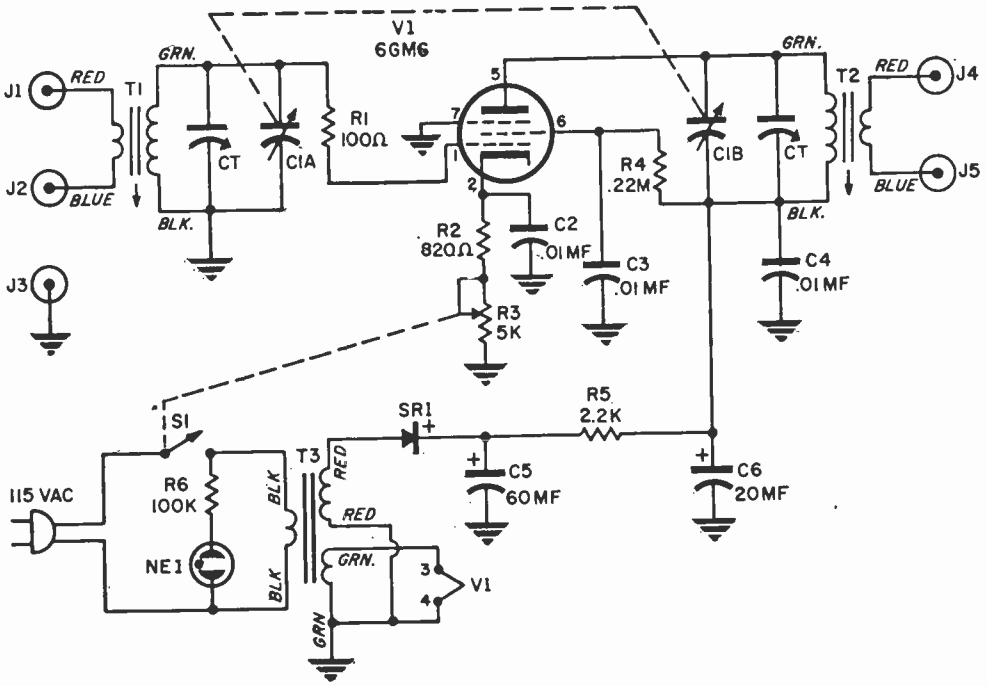
The front panel can be cut from scrap aluminum or a chassis bottom plate. Hole centers must match mounted parts. To avoid binding the tuning vernier's shaft, cut the hole considerably larger than the shaft



Compare the photo (left) against the detail top-view drawing on page 78. Part placement is critical to insure satisfactory operation with no oscillations. If you wish, the BCB Booster can be installed in a cabinet.



Under chassis view of the booster showing part placement. Note that power transformer T3 is mounted on a side flange. Filter capacitors C5 and C6 are mounted to terminal strips.



Schematic diagram for the BCB Booster. Although the circuit may seem uncomplicated, considerable design and model-making effort was expended to insure maximum gain over the tuning range without oscillations.

PARTS LIST

C1—Tuning capacitor, two gang TRF, dual 365 mf. (Lafayette MS-142)
C2, C3, C4—.01-mf., 1-kv ceramic disc capacitor
C5—60-mf., 150-VDC electrolytic capacitor
C6—20-mf., 150-VDC electrolytic capacitor
J1-J5—Five-way binding post (Lafayette MS-566)
NE1—Neon pilot light assembly (Lafayette MS-478 or equiv.)
R1—100-ohm, ½-watt resistor
R2—820-ohm, ½-watt resistor
R3—5000-ohm linear potentiometer with switch (IRC Q11-114/76-1 or equiv.)
R4—200,000-ohm, ½-watt resistor
R5—2,200-ohm, ½-watt resistor
R6—100,000-ohm, ½-watt resistor
SR1—Silicon diode (Allied Radio 39A669-D)
T1, T2—Midget RF coil (Miller type A-320-A or Allied Radio 61G087)
T3—Power transformer; 125-v at 15 ma., 6.3-v at .6 amp. (Allied Radio 61G410 or equiv.)
V1—6GM6 vacuum tube
1—Vernier dial (Lafayette F-347)
1—Chassis, aluminum 5" x 7" x 2" (Bud AC-402)
Misc.—7-pin socket, terminal strips, hardware, 5" x 7" aluminum plate, wire, solder, etc.

Estimated cost: $16.50
Estimated construction time: 5 hours

diameter—at least one-half inch is recommended.

Pilot lamp NE1 can be any neon lamp assembly. If the one you use has a built-in limiting resistor R6 is eliminated.

For maximum connection convenience J1-J5 are five way binding posts. Don't substitute phono jacks since both the input and output circuits are isolated from ground.

Alignment. For best results the booster should be aligned with an RF generator.

Set C1's plates to full mesh and screw C1's trimmers hand tight (the trimmers are the small brass screws mounted on one side of the frame). Using coaxial cable (any type), connect the booster to your receiver.

Connect a signal generator set to 550 kc. to J1 and J2, and apply power to the generator, booster, and receiver. Set gain control R3 to the mid-position and allow a fifteen minute warmup.

Set the generator to *unmodulated signal* and tune in the signal on the receiver. If the receiver is equipped with an S-meter adjust the generator's output for the lowest possible S-meter reading. If the receiver lacks an S-meter use a *modulated* test signal, run the

receiver's audio and RF gain wide open, and adjust the generator's output for the absolute *minimum* signal you can hear. If the receiver has an AVC on-off-switch, set it to off.

Using an insulated alignment screwdriver adjust T1 and T2's slugs for maximum preamp gain. Then, set the generator to the highest BC frequency the receiver can tune. Set C1 to full open and tune in the signal. Using an alignment screwdriver adjust both C1 trimmers for maximum gain.

To insure optimum tracking adjustment keep reducing the generator's output so minimum useable level is maintained, and repeat the procedure several times since a slug adjustment affects the trimmer adjustment and vice-versa.

It is important to remember to always set C1 to the low or high end before tuning the signal. The booster's selectivity is relatively sharp, and if C1 is set to full mesh you won't receive the high end signal and you may waste time looking for a problem which doesn't exist.

Do it by ear. If you don't have a signal generator a reasonably good alignment can be made *by ear*. Set C1 to full mesh and tune in a *very weak* signal on the low end of the band. (If the signal is strong disconnect the antenna.) Note how much the receiver's tuning capacitor is opened from full mesh and adjust C1 to a similar position. For example, if the receiver's capacitor is opened ten degrees open C1 ten degrees. Then, adjust T1 and T2 for maximum gain.

Next, set C1 full open and tune in a signal on the high end. Again note the position of the receiver's tuning capacitor and set C1 similarly. Adjust C1's trimmers for maximum gain. As with the generator alignment, the procedure must be performed several times to obtain optimum performance.

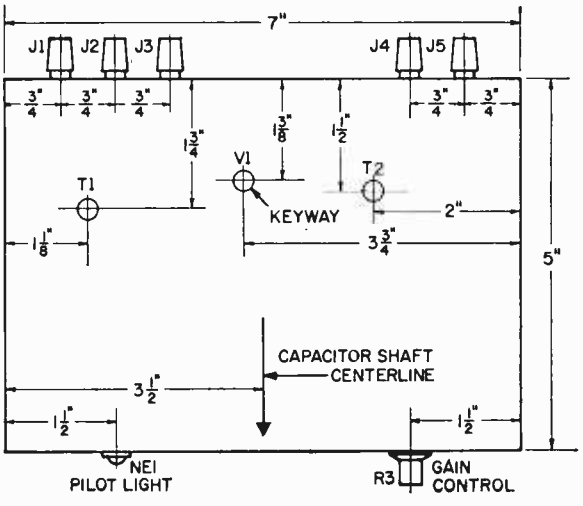
Using the Booster. For maximum convenience make a chart of what frequencies correspond to the vernier's 0-100 calibration. The easiest way to do this is to tune in a signal (station or generator) of known frequency, peak tune the booster, and note the vernier calibration.

Connect the booster to the receiver and the antenna to J1 and J2. If the antenna is just a section of wire connect the antenna to J1 and a jumper from J2 to ground terminal J3. If you use an antenna coupler or tuner connect to input terminals J1 and J2, but try grounding both J1 and J2—sometimes a ground will improve performance.

Set C1 to the part of the band you want to monitor (low middle or high end) and apply power by rotating R3 just past the point where you hear the power switch click. Tune in a signal and peak the signal with the booster. At minimum setting of R3 there will be considerable gain; if more gain is required advance R3.

The booster's gain is very high, and depending on the wiring and other conditions, the circuit may break into oscillation at full gain—the oscillation is evidenced by receiver "blocking," or the ability to *tune* signals with

(Continued on page 105)



Top view drawing showing parts placement on the BCB Booster's chassis. Rubber cement white paper to the top, front and back sides of the chassis and mark all hole centers as shown in the drawing. Mounting holes for the tuning capacitor are marked with the unit held in place and its shaft located along the centerline. Parts mounted on the front and back sides are located midway from top to bottom of chassis.

EARLY in 1964 the huge 135-foot diameter satellite, Echo II, became the largest spacecraft ever to be orbited by man. Made by the G. T. Schjeldahl Company of Northfield, Minn., Echo II represents a vast improvement over Echo I. Whereas Echo I "remembered" the creases and wrinkles it had acquired in its rocket-borne canister, Echo II "forgot" them when its skin was stressed during the inflation process in space. Echo II will retain its spherical shape indefinitely whereas Echo I is thought to have acquired huge dimples and skin-fold reducing its radio reflector effectiveness.

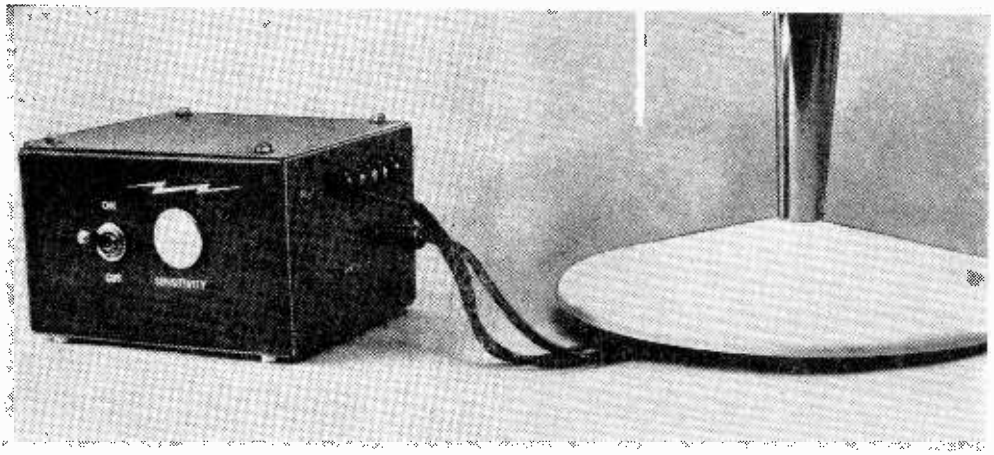
Echo II's skin is a specially designed lamination consisting of two layers of Alcoa aluminum foil .00018-inch thick bonded to each side of .00035-inch thick DuPont Mylar. Total thickness is .0007 inch—only a fraction of the thickness of a human hair.

Echo II is 135-feet high, weighs about 540 pounds and is designed to withstand skin stresses of 22,900 pounds per square inch. Now all the Schjeldahl people had to do was pack it in a canister that is 39.6 inches in diameter and 29.3 inches deep. Fiberglass-covered plastic foam and a plastic sheet protect Echo II from damage from vibration or shifting. The complex packaging job was one of many successful steps in the launching of the world's largest radio-signal-reflecting laboratory. —*J. Sienkiewicz*

Echo II, comprised of some 54,000 square feet of specially laminated material, was folded and stacked, prior to being inserted by engineers into an 11-cubic-foot canister.

After essentially all of the residual air in folded Echo II was evacuated, the satellite was placed in a Grumman-built canister 39.3 inches in diameter and 29.3 inches deep.

BUILD The



The ProxSwitch, shown above, converts the base of a lamp to a touch switch.

Here's a transistor project that doubles as a proximity detector or, if you like, gives you touch control of lights and appliances

By John Potter Shields

HERE'S a little gadget that can find a myriad of uses around the house and workshop—it can be used as a burglar alarm, model train control, safety device, touch lamp switch, etc. What we're talking about is a proximity operated switch—approaching or touching it actuates a set of switch contacts which can control table lamps, appliances, fans and many other household electric and electronic gadgets.

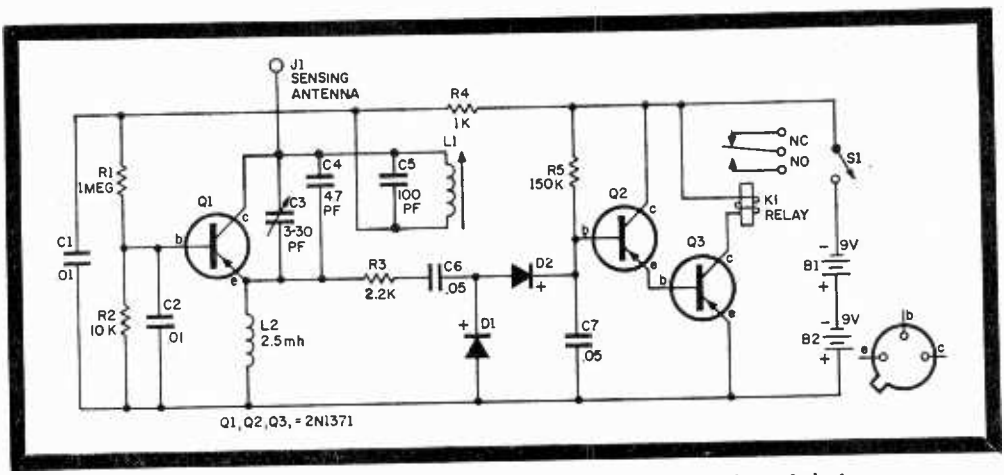
The ProxSwitch, while not new, has generally taken the form of vacuum tube circuits which are bulky and cannot be freed from the 115-volt power line. On the other hand, the ProxSwitch, being completely transistorized can be battery operated, is extremely small physically and has very low power consumption for economical operation. Being portable, the ProxSwitch can be used in any location thus greatly increasing the number of its possible applications.

How It Works. Transistor, Q1, operates as an RF oscillator with a loopstick ferrite antenna coil serving as the oscillator coil. The trimmer capacitor, C3, forms part of the oscillator circuit, feeding RF energy from Q1's collector to its emitter. In operation, C3 is adjusted to the point where Q1 is just oscillating. Now, when capacitance between Q1's collector and ground is increased by a person coming close to, or touching, the sensing antenna, RF feedback from Q1's collector to emitter is reduced and the oscillator will cease oscillating.

Due to the presence of the RF choke, L2, Q1's emitter is at RF potential when the circuit is oscillating. The RF voltage appearing at Q1's emitter is fed through the isolating resistor, R3, and blocking capacitor, C6, to the voltage doubler rectifier consisting of diodes D1 and D2. Capacitor C7 filters RF from the rectified DC appearing at the output of the doubler.

The positive voltage from the doubler is applied to the base of Q2 which is connected as an emitter following its emitter being conected to Q3's base. This circuit

ProxSwitch



Lab tested, the ProxSwitch circuit was found to be of foolproof design.

configuration, often called a "Darlingsten pair," offers good DC current gain coupled with a relatively high input impedance. The relay is connected into the collector circuit of Q3 so that will be actuated when Q3's collector current exceeds approximately 3 milliamperes.

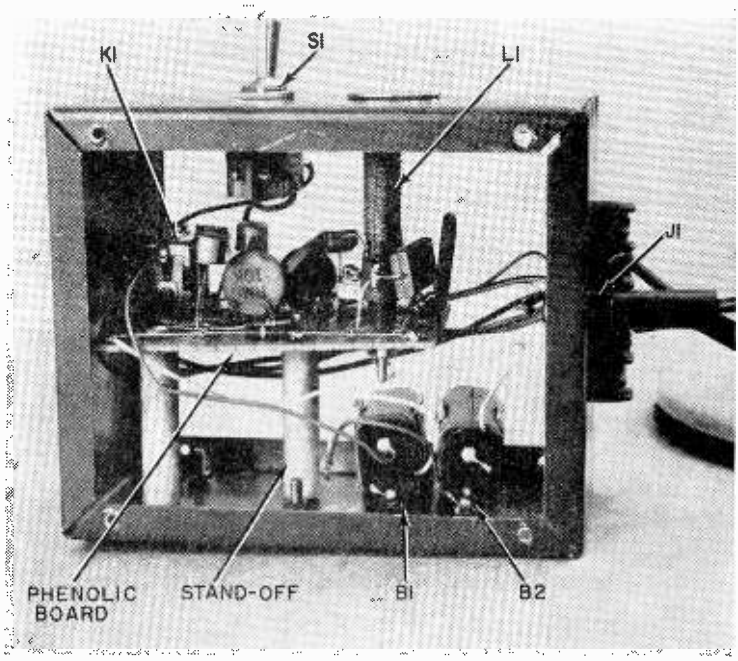
Resistor, R5, is chosen so that in the absence of a positive voltage at the doubler's output; as caused when Q1 is not oscillating due to added capacitance at the "sensing antenna," Q2 receives sufficient forward bias to cause Q3 to conduct heavily, closing the relay. When Q1 is oscillating (with no added capacitance), the resulting positive voltage developed at the output of the voltage doubler is sufficient to "override" the negative base bias. This reduces the collector current of Q3, and the relay remains open. There, the relay remains open except when a person or object approaches the "sensing antenna," at which time it will be energized.

Let's Build One. The ProxSwitch was assembled on a small piece of perforated phenolic board. Inter-connections between the various components are made to small brass eyelets . . . the author preferring these to the somewhat more conventional flea clips. This completed assembly is mounted in a

PROXSWITCH PARTS LIST

B1, B2—9-volt battery (Eveready 216 or equiv.)
C1, C2—.01-uf, disc capacitor
*C3—4-30-pf. ceramic dielectric trimmer (Centralab 822-EN or equiv.)
*C4—47-pf. mica capacitor
*C5—100-pf. mica capacitor
C6, C7—.05 disc capacitor
*1-pf. = 1-mmf.
D1, D2—1N34 or Semitron DN34A
J1—Insulated banana jack (GC Electronics 33-188)
L1—Antenna "loopstick," Q of 500 for 365 mmf. tuning capacitor
Q1, Q2, Q3—2N1371
R1—1,000,000-ohm, ½-watt resistor
R2—10,000-ohm, ½-watt resistor
R3—2,200 ohm, ½-watt resistor
R4—1,000-ohm, ½-watt resistor
R5—150,000-ohm, ½-watt resistor
S1—S.p.s.t. toggle switch
1—S.p.d.t. sensitive relay (Sigma 11F-2300-SIL)
1—3"x4"x5" aluminum utility cabinet (Bud AU-1028)
Misc.—3-terminal barrier strip, 3"x2¾" perforated phenolic board, 1¾" standoffs (2 required), battery connectors, battery clips, wire, solder, etc.

Estimated cost: $16.50
Estimated construction time: 4 hours



Inside view of the ProxSwitch with top and bottom covers off. Almost all of the parts are mounted on a *prefab* phenolic board.

standard Bud 3″ x 4″ x 5″ aluminum utility cabinet by means of two ceramic spacers salvaged from the high voltage section of a discarded TV. No special wiring precautions need be taken—just keep the leads reasonably short and direct. A ¾-inch hole is cut in the utility box above the trimmer (C3) to facilitate its adjustment when the "chassis" is placed in the cabinet. A scrap plug is placed in the hole to prevent tampering.

Adjustment. After assembly is completed, carefully check the wiring for possible errors. If all appears to be in order, screw L1's plug all the way out, connect the two nine-volt batteries and switch the unit on. With no "antenna" connected to the sensing antenna jack, screw the trimmer (C3) in as far as it will go. With this setting, the relay should be de-energized. Touching the sensing antenna terminal with a finger should cause the relay to close, the relay opening again when the finger is removed. If the unit passes these tests all may be assumed to be in order.

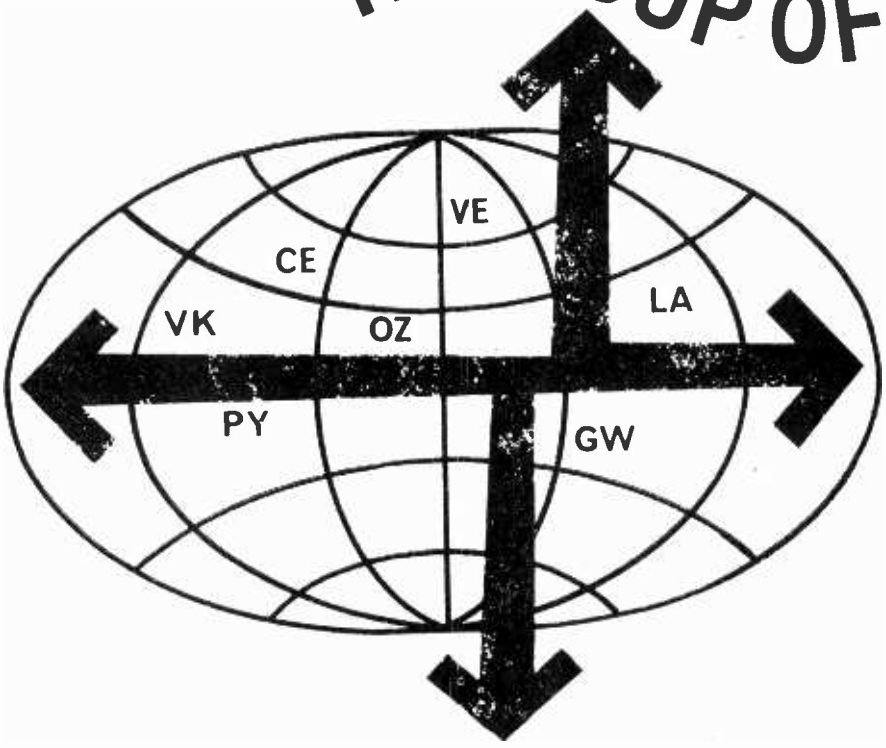
A few words are in order regarding the sensing antenna. The values of the feedback capacitors (C3 and C4) have been chosen for a sensing antenna plate with a maximum rise of approximately 6-inch square or a 2-foot length of wire. If a larger or longer antenna is desired, it may be necessary to increase the value of C3 in order to balance the increased external capacitance of the larger sensing antenna. If the relay stays closed even with C3 screwed all the way out, excessive external capacitance is indicated and either the sensing antenna should be reduced in size or the value of C3 increased.

The sensitivity of the ProxSwitch can be considerably increased by adding an external ground. This can be easily done by simply clipping a lead from one of the screws on the unit's cabinet to the finger stop of a telephone dial, electrical outlet or switch box mounting screw, water pipe, etc. This grounding will extend the sensitivity up to several inches from a 6-inch square plate; greater distance from a larger antenna.

Applications. The relay in the ProxSwitch has a maximum contact rating of 1 ampere at 115 volts; *non inductive* loads. This means that while the relay will safely switch loads such as table lamps (up to 100 watts), a larger relay should be used for heavier, or inductive loads.

If desired, a "ratchet" relay can be added to the ProxSwitch to allow "touch once-on, touch again-off" operation as is required in a touch operated lamp, for example. A suitable ratchet relay is the Potter-Brumfield type APIIA which is available with a 115-volt coil. ■

ROUNDUP OF



HAM-BAND RECEIVERS

What's available in ham-band receivers under $500

LIFE in the 60's seems to be a matter of making one decision after another so it seems only natural that electronics manufacturers should join into the fun and games with their own endless number of choices of receiving equipment. For instance, as if it wasn't a difficult task to select for yourself one of the numerous general coverage shortwave receivers available, you can also pick from an entirely separate family of receivers which have coverage restricted to only the ham bands. So you see, you might go out and purchase a general coverage set when you might need one of the restricted coverage sets—each has distinctive advantages.

Looking over the reams of literature which pour forth from manufacturers, it becomes quite obvious that the selection of a ham-band-only receiver is just as exacting a job as picking a general coverage set (RADIO-TV EXPERIMENTER April-May issue, page 91).

Ham Bands Only? Basically, a ham-band-only receiver consists of a standard communications receiver which has been specifically designed to receive only ham radio frequencies—generally 80 through 10 meters, although some have the added bonuses of the recently rejuvenated 160-meter band and the rapidly crowding-up 6-meter band made popular by Technicians.

By Tom Kneitel, K3FLL/WB2AAI

Manufacturer	Model	Net Price	No. of Tubes	No. of Bands	Sensitivity (10db S/N)	RF Stage	Selectivity (6db down)	Adjustable AVC	Dial Resets
HEATH (KIT)	HR-10	$ 79.95	7	5	1 μv		3 kc		√
HEATH (KIT)	HR-20	134.54	8	5	1 μv		3 kc	√	
HALLICRAFTERS	SX-140	139.95	5	6	NA	√	4 kc		√
MOSLEY	CM-1	182.70	5	5	.5 μv		2.5 kc		
MULTI-PRODUCTS	PMR-8	189.50	8	7	.5 μv	√	3 kc		
NATIONAL	NC-155	199.95	10	6	1 μv	√	ADJ		√
HAMMARLUND	HQ-110A	249.00	12	7	1 μv	√	ADJ		√
HEATH (KIT)	SB-300	265.00	10	8	1 μv	√	2.1 kc	√	√
DRAKE	2B	279.95	10	12	.5 μv	√	ADJ	√	√
NATIONAL	NC-270	279.95	10	6	1.5 μv	√	ADJ		√
HAMMARLUND	HQ-170A	369.00	17	7	1 μv	√	ADJ	√	√
RME	6900	369.00	15	5	1 μv	√	ADJ		√
HALLICRAFTERS	SX-117	379.95	12	5	.75 μv	√	ADJ		√
HALLICRAFTERS	SX-101A	445.00	15	6	1 μv	√	ADJ	√	√
NATIONAL	NC-303	449.00	15	5	1 μv	√	ADJ		√

*Optional accessory. NA—Figures not supplied by manufacturer. ADJ—Adjustable.

Pick the ham-band receiver that suits

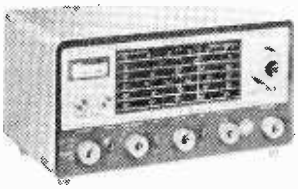
A *ham-band-only* receiver means you cannot receive standard broadcasting stations, you cannot receive international shortwave broadcasting stations, you cannot hear ships, aircraft, police, military, and CB stations—just ham stations.

While you will miss out on these features of a general coverage receiver, their loss enables the manufacturer to use less and/or smaller components in the receiver and less complicated construction features (single knob tuning and spread out dial scales, for instance.)

Wide Open Spaces. In a general coverage receiver there are, for example, usually 4 bands which cover the entire span of 530 kc. to 34 mc. In a *ham-band-only* receiver there are 5 to 8 bands; each one covering a different amateur band. A little computing shows you that in a general coverage receiver you can comb almost 34 mc. in 4 bands, while in our restricted coverage set you magnify only one tenth of this section of the radio spectrum, and spread out into additional space too. So, one obvious advantage is that you have, in a ham-band-only receiver, a product of the age of specialization—designed to provide the *maximum* reception of amateur stations, and offering extraordinary *band-spread coverage.*

Heath-Kit HR-10

Heath-Kit HR-20



Hallicrafters SX-140

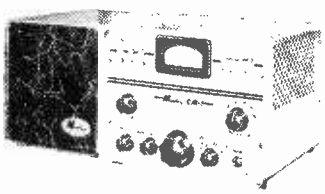
IF Stages	Antenna Trim	Q Multi-plier	X-tal Calib.	Antenna Impedance (Ohms)	Pre-Selector
2	√		*	50	
2	√			50	
1	√		√	50	
3				25-100	
2	√			50	
2	√		√	50-70	
2	√	√	√	100	
2	√		√	50	√
1	√	*	*	50	√
2	√		√	50-70	
4	√		√	100	
3	√		√	50-400	
3	√	√	√	50	√
3	√	√	√	50	
2	√	√	*	50-70	

Hammarlund HQ-110A

Heath-Kit SB-300

Drake 2B

your shack's needs



Mosley CM-1

National NC-270

Multi-Products PMR-8

Hammarlund HQ-170A

National NC-155

RME 6900

Besides the bandspread advantage, you also get better readability of the dial scales (the 20-meter band on a general coverage receiver might be a half inch on the main scale and 3 or 4 inches on the bandspread, while on a ham-band-only receiver the band is spread out over as much as 8 inches). It is not uncommon to get direct frequency reading of less than one kilocycle on a properly aligned and calibrated unit.

In a restricted coverage receiver, the manufacturer need provide you with but one tuning capacitor (the general coverage set's bandspread dial isn't needed), and it is, in effect *all bandspread*. This, in turn, means increased receiver stability because the capacitor plates are double spaced and of extra rugged construction.

Other Considerations. The local oscillator in a restricted coverage receiver can be made to track the incoming signal over a narrower range of frequencies being tuned. With the oscillator exactly on frequency to provide the precise value of intermediate frequency at the output of the mixer, the highest gain will be achieved in the intermediate frequency circuits.

In addition, the restricted oscillator range allows a higher C to L ratio. The increased capacitive value of the circuit allows swamping out the usually annoying tube and stray capacity changes, providing improved oscillator stability.

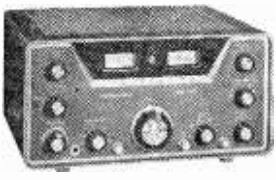
The Sets. While in outward appearance, restricted coverage receivers look essentially like any other communications receiver, the one-knob-tuning feature is the most obvious giveaway as to the set's true function. All have the ham's old standby, the *S-meter*. Unlike many general coverage receivers (especially the lower cost sets), the general rule for restricted coverage sets is to be sold *without* the loudspeaker included. Another item which is just about *standard* on these sets is a coaxial antenna connector.

Survey. We have selected some of the most popular restricted coverage receivers in the moderate price range and have listed them here with some of their most important features. You will probably notice that for their respective costs, they offer more features than general coverage sets of comparable prices. The addresses of the manufacturers listed in this article are listed at the end of this article.

Summary. In summarizing, where "hamming" is the main station activity, the restricted coverage set provides (by far) the most desirable features for the least monetary expenditure. For those who are interested in "hamming," plus general shortwave monitoring, the general coverage receiver is probably the best bet. Of course, if you're the wealthy type of electronics hobbyist, you can always get yourself one of each type—general coverage and restricted. ■

R. L. Drake Co., Miamisburg, Ohio 45342
The Hallicrafters Co., 5th and Kostner, Chicago, Ill.
Hammarlund Mfg. Co., Inc., 53 West 23rd Street, New York, N. Y. 10010
The Heath Company, Benton Harbor, Mich.
Mosley Electronics Inc., 46-10 North Lindberg Blvd., Bridgeton, Mo.
Multi-Products Co., 21470 Coolidge Highway, Oak Park 37, Mich.
National Radio Co., Inc., 37 Washington Street, Melrose 76, Mass.
RME—G. C. Electronics Co., 400 South Wyman Street, Rockford, Ill.

Hallicrafters SX-101A



Hallicrafters SX-117

National NC-303

RADIO-TV EXPERIMENTER LAB CHECK

DYNAKIT SCA-35

Hi-Fi Stereo Control Amplifier

WITH stereo amplifiers fast approaching the flight control panel of a modern jetliner in terms of complexity, it's a pleasure to find a good quality amplifier the little woman can operate without two weeks of instruction. Actually, unless you look real close, you might easily assume the Dynakit SCA-35 is a mono amplifier. It's only when you spot the *balance* control and *stereo/mono* switch that you're sure someone didn't ship you a mono amplifier.

All the SCA-35's controls are the "unitized" type, with a single knob controlling the input selector, volume, and tone adjustments for both channels. Of course, a single knob and switch also controls the volume balance between the channels while unitized switches select the *loudness* control, *filter,* and mono or stereo mode. In short, what you do to one channel you do to the other and only one-half the usual complement of switches and controls are required—it couldn't be any more convenient to use.

What it Does: Each amplifier section delivers a maximum of 17.5 watts per channel, with a choice of five inputs: a tape head with 7½ ips NAB equalization, a radio (high level), a tape recorder preamplifier, a spare high level, and a phono input which utilizes one of three pre-equalized circuits—low level magnetic (RIAA), high level magnetic or ceramic.

The outputs are: constant level tape (the tone and volume controls have no effect), an 8 or 16 ohm speaker with a derived center channel, and provision for a headset output—if a pre-drilled ⅜ inch hole on the rear apron is worthy of the word "provision."

About the Kit. Except for a few power supply and front panel components most of the work is done for you at the factory; the actual "heart" of the unit—the electronics—is supplied pre-wired on four printed circuit modules. Unless you try hard, it's difficult to make a wiring mistake.

Rather than having the pictorials split up on individual pages, large, separate drawings which can be taped to the wall are supplied. The pictorials are notably good, with an assortment of shadings used to denote the connections.

Two exceptional conveniences are the printed circuit "couplates" used for the equalizers and the moulded harness. All the phono equalizers and tone controls (six in all) are supplied as couplates, and it is only necessary to connect a few wires rather than a bagful of components. Couplates look like square "disc" capacitors with many leads. The harness consists of four different colored wires moulded side by side into a flat ribbon; to make connections you simply pull aside as much wire as you need. It's a far easier and error-free method than a "rats nest" of individual wires.

There are no shielded cables with their attendant possibility of shorts (a common problem with beginners). Extensive chassis shielding and complete separation of the power supply/output and input circuits re-

sults in excellent stability and virtual hum-free operation even though the input leads are unshielded. (Of course, the preamplifier's DC filaments and hum balance controls for each channel have a lot to do with the low noise level.)

It would be a waste of time to fill several pages with curves and charts concerning performance since the amplifier delivered within .2 db exactly what DYNA specifies—no more, no less. For example, the specs call for 17.5 watts at less than 1% distortion and that's what it is; try for more than 17.5 watts and the distortion immediately heads for the ceiling. The only serious discrepancy with the specs was the tone control's 15 kc. boost; both channels delivered 10.3 db boost instead of the specified 12 db—but 1.7 db isn't a big deal.

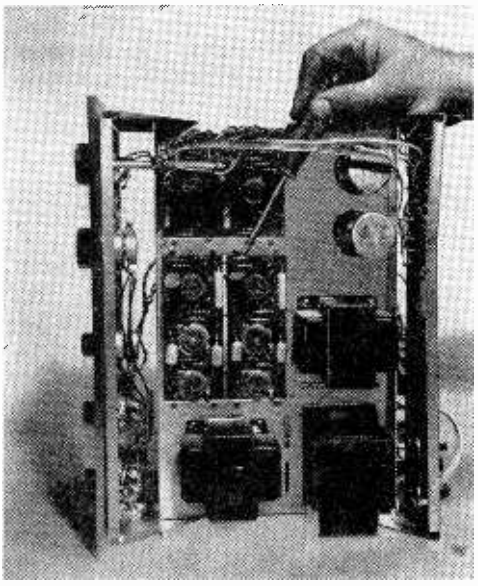
Some Observations. The filter circuit is interesting. Usually, in order to eliminate distortion and noise from old discs a "high cut" filter is provided which sharply attenuates the frequencies above two to five thousand cycles; this generally results in a somewhat bass-heavy or "boomy" sound. The SCA-35 take a different approach: both the highs *and lows* are attenuated so the result is a "narrow spectrum" but balanced sound —definitely pleasing to the ear.

The front panel is a decided advantage for the "everything in a cabinet" audiophile. While the amplifier is supplied with a metal cover, it can be installed in an equipment cabinet by someone other than a professional carpenter. The supplied cover is formed so it is flush with the front panel and everything looks normal when it stands alone on the shelf.

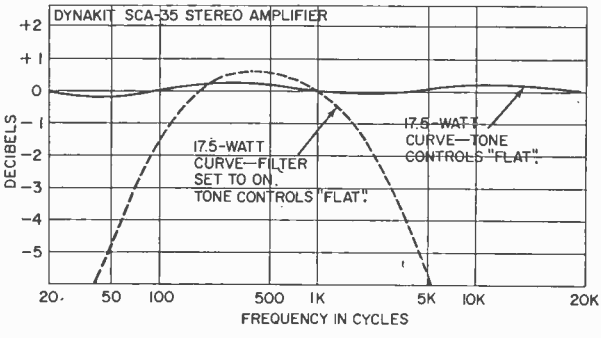
But when the metal cover is removed you find that the front panel is oversize, and when you cut the amplifier opening in that nice expensive furniture cabinet you don't have to worry about any rough edges showing—the opening which will allow the chassis to slide into place is substantially smaller than the front panel area. The amplifier looks like it's part of the cabinet rather than something which just happens to fit into a hole.

Summing Up. Soundwise you won't be disappointed; the SCA-35 is well worth the $99.95 purchase price. With all but the lowest efficiency speakers there is enough clean sound to rattle the windows. And while the amplifier's minimum number of controls might not reflect the status symbol of a solid wall of switches and knobs, you at least won't have to spend sixty minutes explaining to a dollar-an-hour baby sitter how to get "background music."

For more information on the DYNAKIT Stereo Control Amplifier SCA-35, write to Dynaco Inc., Dept. 698, 3912 Powelton Ave., Philadelphia 4, Pa. ■



Screwdriver points to one of four pre-wired printed circuits. Note maximum separation between input cables above screwdriver and the two output and power transformers.



Response curves for the Dynakit SCA-35. Tone controls are centered. Note that "humped" curve is not too severe; 75 cps. is less than 3 db down.

By Len Buckwalter, KBA448Ø

SIDEBAND

Limited to five-watt operation, CB'ers have opened up range limits and diminished channel cluttering by going sideband

CB RADIO has finally hit the power jackpot. After being strait-jacketed by a 5-watt limit for six years, the service is experiencing a minor revolution in equipment. The reason is *sideband*; a sophisticated type of transmission offering more range, solid communications and additional channel space. What's more, sideband has already been given the nod by the FCC. Although it eclipses power ratings for conventional CB equipment, it fits neatly inside the old 5-watt regulation. How so?

Sideband's secret, in a word, is *efficiency*. It strikes at big chunk of energy wasted in any conventional AM signal. You can prove it to yourself. Watch the S-meter on any CB receiver. A strong incoming signal moves the pin way up and holds it there. Notice that the pin doesn't vary with the voice—it stays rock solid. This is true because S-meters read the radio *carrier*, which contains no voice information. RF carriers, as shown by the new systems, are about as welcome as a sieve in a sinking boat. It's

All About CB SIDEBAND

the *sidebands* that carry all the talk power.

AM Signal. A close look at the signal from a conventional CB transmitter may shatter some illusions. It is not, as generally believed, a carrier on 27 mc that varies in strength with the voice, shown in Fig. 1. This is only part of the story. The more complete picture is in Fig. 2. The transmitted signal consists of *three* parts—upper sideband, carrier and lower sideband. You can also prove this on the S-meter of any good receiver. As the tuning dial is slowly moved across an incoming signal, the meter starts to kick in step with the voice. If you keep moving the dial the meter produces a high steady reading. Continue past this point and again the pin kicks on voice (until the receiver loses the signal). What happened was the result of the receiver scanning across the three components of the normal AM signal; one sideband, then steady carrier and other sideband. Talk power is evident only in the two sidebands.

There's nothing mysterious about sidebands if you consider how the transmitter creates them in the first place. The basic job of a conventional transmitter is to take audio currents from the microphone and modulate them onto a radio carrier. It's illustrated in Fig. 3; audio and radio frequency combine in the final transmitter stage. You can pick one of several names for what happens here—modulation, heterodyning or beating—but the result is a *mixture* of audio and radio energy. Consider an audio tone of 1,000 cycles, a rather high-pitched sound. Entering the transmitter final, it beats against a radio carrier on 27,000 kc (27 mc). The tone *adds* to the carrier frequency and produces the upper sideband. As shown in Fig. 3, the new frequency is 27,001 kc. A nearly identical process occurs for the lower sideband—the 1-kc. audio tone *subtracts* from the carrier and 26,999 kc appears. When voice modulates the transmitter, numerous audio frequencies similarly distribute themselves above and below the carrier.

Consider the carrier on 27 mc. It contains no modulation, is rock-steady, and serves no further useful purpose. Its sole reason for existing is to *create the sidebands inside the transmitter.* But the biggest indictment against the carrier is yet to come. If you look at Fig. 4, you'll see that transmitter divides power unequally between sidebands and carrier. That 27-mc signal in the middle snatches away twice as much wattage as do the two useful sidebands. In a conventional 5-watt CB rig, the figures are telling. A CB signal in the antenna is about 3 watts after it emerges from the transmitter. Fig. 4 reveals that *two* of those three watts appear in the carrier. The remaining watt is split equally into upper and lower sideband, a half-watt each. So, when you get down to basics, the conventional CB transceiver puts about 1 money-paying watt on the air.

This splurge of carrier power was realized years ago by other services; overseas radiotelephone and SAC bomber communications, for example (not to mention FM stereo, TV broadcasting and ham radio). Each, to varying degrees, found that cutting down on carrier made more energy available for sidebands where it really counts. This, too, is the basis of CB sideband. By swapping carrier for sidebands, those three output watts are vastly increased in talk-power content. CB sideband equipment now on the market does it in one of three ways.

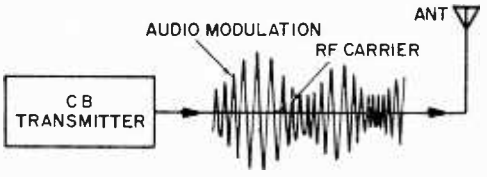


Fig. 1. Typical AM signal from CB set.

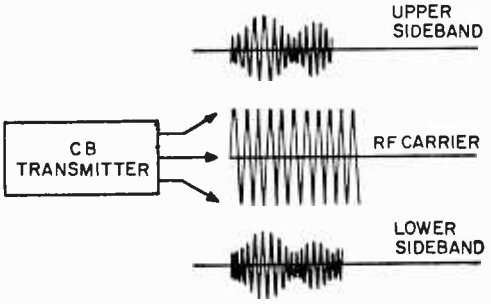
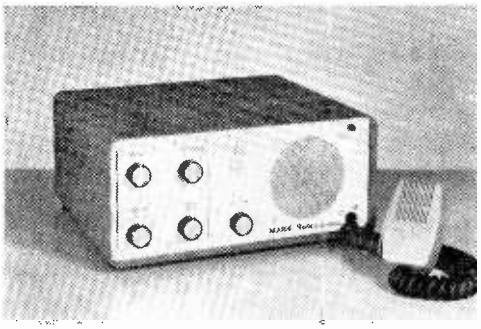


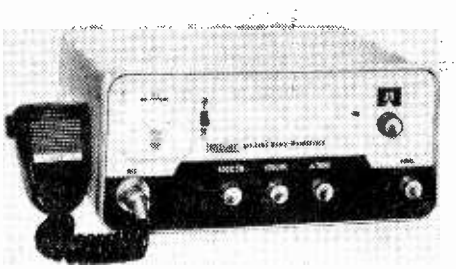
Fig. 2. Actual CB signal. Audio appears only in two sidebands, carrier is steady.

DSSC. The first system to appear on CB

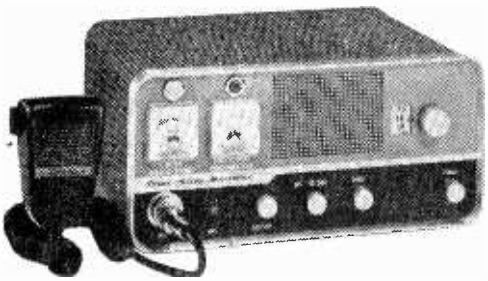


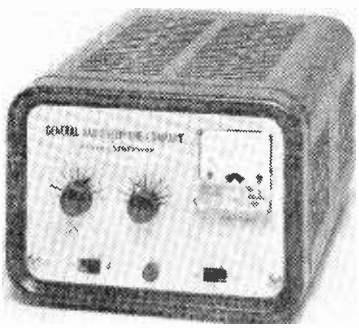
Mark Products Sidewinder SSB-27 was the first single-sideband rig to appear on the CB market. Its RF carrier is reduced to less than one-thousandths that of a normal CB carrier. Likewise, one sideband is suppressed to one ten-thousandths that of usual sideband power. Remaining sideband receives nearly all output wattage. Selector switch on front panel enables operator to transmit on upper or lower sideband on any of five channels. Priced at $299.50.

Allied Radio's new Knight KN-2560 CB transceiver is a compatible double-sideband unit. It is rated at 10 watts PEP (peak envelope power). This figure does not exceed the legal 5-watt limit since sideband rigs are permitted to peak (but not average) well above the 5-watt level. Priced at $214.95.



Olsen Electronics "Side Bander" CB transceiver is of the double-sideband, reduced carrier type, fully compatible with all CB equipment. Price of transceiver, fitted with 23-channel capability, is $214.95.





General Radiotelephone's SBT-3 is an outboard adapter for converting GR's conventional transceivers to double-sideband, suppressed-carrier operation. General also plans to market a similar adapter for modifying any CB transceiver for reduced-carrier operation, a system that's compatible with all CB receivers. New adapter will be known as the SBT-4. Both units sell for $99.50.

was the double-sideband *suppressed* carrier or just DSSC. As the name implies, both upper and lower sidebands are transmitted, but the carrier is eliminated. It's done by bucking out carrier in the final stage, but leaving sidebands untouched. (A more detailed description of the action is in Fig. 5.) With carrier eliminated the transmitter can expend its energy in amplifying sidebands alone.

Although the system multiplies talk power by several times, it's incompatible. Signals cannot be heard on conventional CB receivers. The reason is that a small amount of 27-mc, or carrier, frequency is required by the receiver for its detection process. The receiver must beat sidebands with carrier to recover the original audio tones. (Similar to receiving code with the BFO.) The problem is solved with an additional oscillator in

All About CB SIDEBAND

the receiver to provide the missing frequency. The one manufacturer marketing transmitter units of the DSSC type also makes available the necessary receiving adapter.

DSRC. Most sideband equipment made today fits into this category. It is DSRC, or double-sideband *reduced* carrier. The key word is *reduced*. Unlike the *suppressed* carrier unit described above, these transceivers are perfectly compatible with all other stations on the air. No special adapter is required to reproduce the signal in the receiver. Thus, one strong reason for its popularity; it's compatible. But there's a small price to pay in terms of watts. The reduced-carrier rig transmits just enough steady carrier to provide a receiver with energy for the detection process. Not quite as efficient as suppressing the carrier completely, but there still is more sock to the audio signal as compared with the conventional AM rig.

The operating principle of the DSRC rig is the same as shown for the suppressed-carrier unit with one exception. The two tubes in the final stage are unbalanced slightly so the 27-mc carrier cannot completely buck itself out. (One method is to apply more B+ voltage to one of the tubes.)

Anyone hearing the signal from a DSRC rig is in for a mild surprise. The receiver S-meter kicks with the voice, revealing that most power is in the sidebands. This makes the customary signal report in S-units somewhat inaccurate. With relatively little carrier present, the S-reading is lower than for a conventional AM signal. For this reason, it's fairer to give a signal report on the basis of voice quality and strength, rather than steady carrier S-units.

SSB. Topping the list of sideband systems for CB is SSB, or single sideband. It is the most costly, has a raft of complex circuits, but gives the power-hungry CBer the biggest wallop of all. Here, the CB manufacturer goes for broke. Not only does he suppress the carrier, but one entire sideband as well. Nearly all the punch of the transmitter final is directed into amplifying that single sideband. This makes it possible for *two* different sideband stations to transmit on the *same* channel at the *same* time . . . without interfering with each other. A look at the SSB system shows why.

In the conventional CB rig, or any of the double-sideband models, both upper and lower sidebands are transmitted. (Each, as we've noted, contains the same audio information.) To accept both sidebands, the receiver must have considerable bandwidth, that is be wide enough to admit frequencies lying above and below the 27-mc carrier. The single-sideband receiver, on the other hand, is only *half* as wide since it only needs to admit one sideband. (In actual practice, the SSB receiver is about 3 kc wide.) This narrowing down of receiver response to an upper *or* lower sideband area of a channel gives the effect of doubling the CB band from 23 to 46 channels! If, for example, an SSB station is transmitting on the lower sideband of channel 14, another SSB rig may work channel 14's upper sideband.

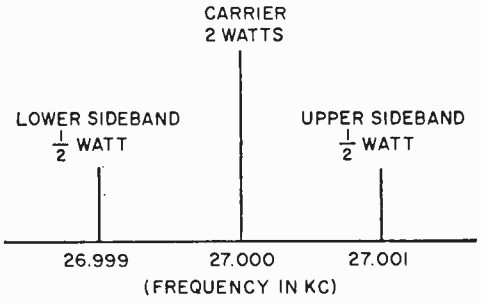


Fig. 4. Graph of how output power is divided among three parts of CB signal. Carrier receives twice as much as its two sidebands.

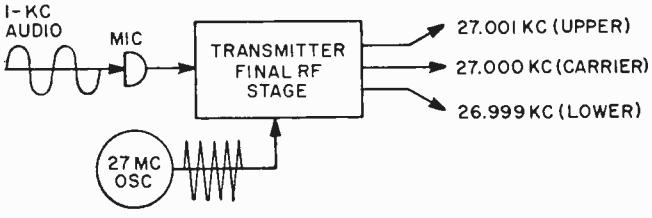


Fig. 3. Transmitter produces carrier sidebands by adding and subtracting 1-kc. audio signal from the 27-mc. RF carrier signal.

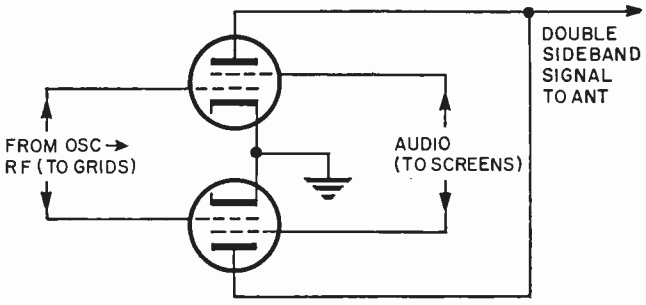


Fig. 5. Typical circuit for suppressing RF carrier. RF from oscillator is applied to grids in push-pull, plates are connected in parallel. This causes steady RF to buck itself out. Audio is supplied to screen grids in push-pull.

A simplified block diagram of how an SSB signal is produced appears in Fig. 6. It's mainly a process of bucking out the carrier in an early stage, then using a crystal filter to slice off one sideband. The receiver section uses the identical filter to narrow its response to one sideband. There's also an oscillator for completing the detection process, as in a double-sideband suppressed-carrier unit. The SSB system is not compatible with normal rigs. Picking up the signal on a conventional receiver creates an audio signal variously termed "monkey chatter" or "Donald Duck."

Sideband Performance. What can you expect from the new rigs? In the double-sideband units, you're pleasantly rewarded with a hefty boost in audio power. The single sideband rigs do even better. But anyone expecting to burn out receiver coils of CB friends down the block should consider these other factors. CB sideband provides a definite improvement in talk power—but does not make CB a long-distance medium. Even if the transmitter were to double power output (and sideband does much better than this), a person on the receiving end would just barely notice the increase in his ear or on an S-meter. The sideband systems are more properly a method of greatly improving an existing coverage pattern. Many of the "shadow" or difficult areas are filled in by the sideband signal; mobiles are heard under tough conditions. To be sure, there is a range increase, but a modest one. In one test we made, an SSB-equipped mobile travelled out some forty miles from base while maintaining communications. Although a conventional rig did almost as well on distance, the sideband unit eliminated aggravating flutter, noise and dead spots along the way. It was remarkably quiet, too, in terms of atmospheric background noise.

That sideband in CB won't increase range by four or five times might be even crucial to its existence. The FCC has repeatedly warned that CB is a short-range service. So far, there have been no rumblings from the Commission about sideband spilling into neighboring communities to cause excessive interference. Sideband's twin attractions—solid coverage and doubling the number of channels (in SSB)—should easily win over many CB'ers tired of old-fashioned AM. ■

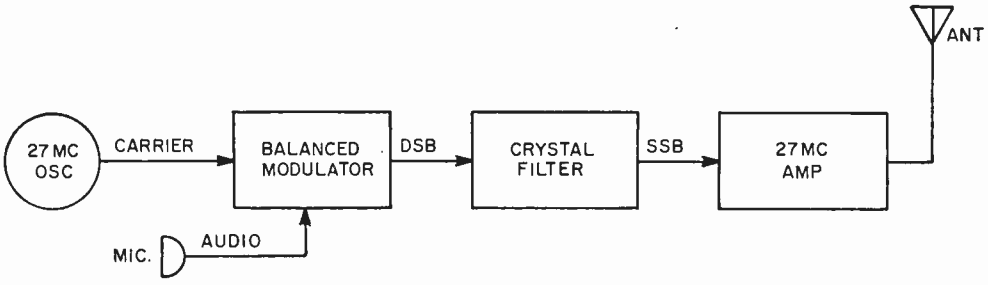
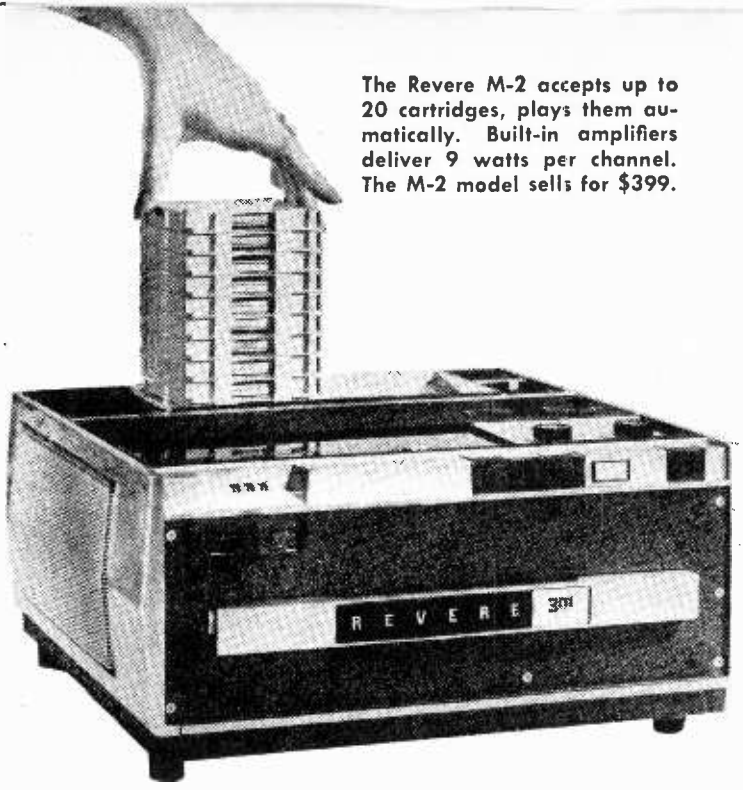


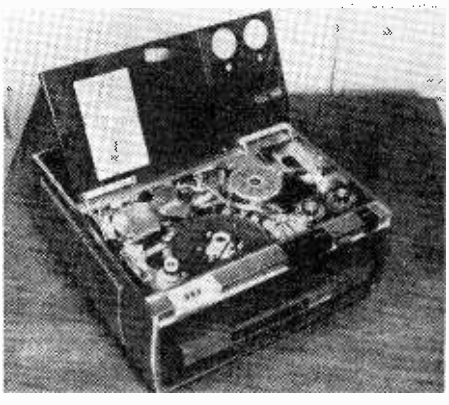
Fig. 6. Block diagram of a simplified SSB CB transmitter. Early stages provide same functions described in Fig. 5. The DSB signal, however, is applied to crystal filter for removing of one sideband. Then SSB signal is amplified.



The Revere M-2 accepts up to 20 cartridges, plays them automatically. Built-in amplifiers deliver 9 watts per channel. The M-2 model sells for $399.

Every inch counts inside the Revere M-2, but the machine is largely jamproof. Jacks on rear panel may be used to feed external amps or speakers, and to connect two microphones.

AUTOMATIC TAPE CARTRIDGE PLAYER



No fuss, no bother—just 15 automatic hours of sound on tape!

HOW would you like to have a tape recorder that automatically plays tape-after-tape just like a record changer runs through record-after-record? Think such a gismo hasn't been invented yet? Well you're wrong. There's an automatic tape player on the market right now that makes playing tapes every bit as easy as playing records. All you have to do is pile on a stack of tapes, push a button, and let 'er rip. Matter of fact, this new tape recorder is even one up on the record changer. It lets you hear entire tape after entire tape, not just one side of a record after another.

A product of 3M, the new machine is made by the Revere-Wollensak Division. And, take it from us, it's quite a machine. It not only threads and plays tape after tape, but it even rewinds them when they're through. And, since it's entirely automatic, you yourself need hardly lift a finger, let alone touch the tape.

Finger Control. The Revere is designed so that push buttons control the entire opera-

tion. Once you've put the tapes in place and pressed the "play" button, everything is automatic from there on out. Depending on how many tapes you've stacked up, the Revere will give you up to 15 hours of stupendous stereo. All you have to do is adjust volume and tone to your liking, sink into your favorite easy chair, and let the Revere take it from there. Reject or repeat a tape now and then by pushing the "change" or "repeat" buttons if you feel like it. Otherwise, sit back and listen. For this is a machine that even shuts itself off when the last tape is over!

The Inside Story. All right, you ask, what gives? What's the secret that enables this tape recorder to do what other machines only wish they could do? For an answer to these questions, let's go back a few years to the days when the Revere automatic tape cartridge player was just an idea in an engineer's mind.

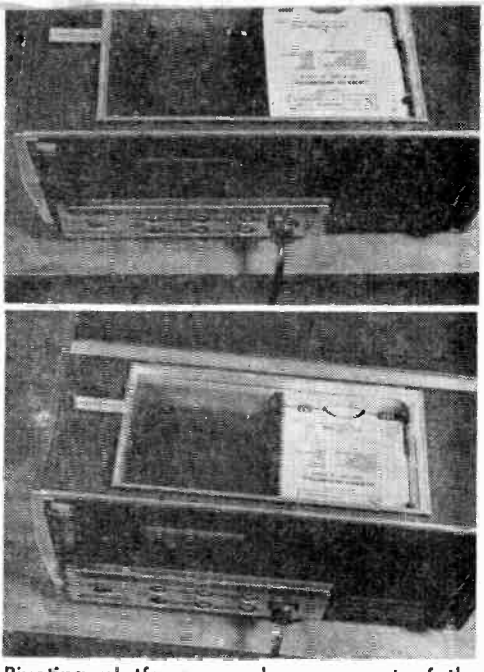
For years and years, it seems, a good many individuals and concerns have been interested in taking some of the nuisance out of playing tapes. But how? No one proved able to come up with a very workable solution, and the people at 3M were as baffled as everyone else. So they did exactly what any person does who's smart enough to realize he doesn't have the answer. They tossed the problem to someone else and asked what he could do about it.

The gentleman 3M picked was Dr. Peter Goldmark of CBS Laboratories, the very person who had revolutionized the record industry a decade or so before with his 33⅓ rpm LP record. Could Dr. Goldmark design a machine that would play tapes like a record changer plays records? And could he keep the machine on the simple side so someone other than a seven-handed robot with an MIT degree could operate the thing? Even more important, could he keep the price down so the King of Siam wouldn't be the only person who could afford one?

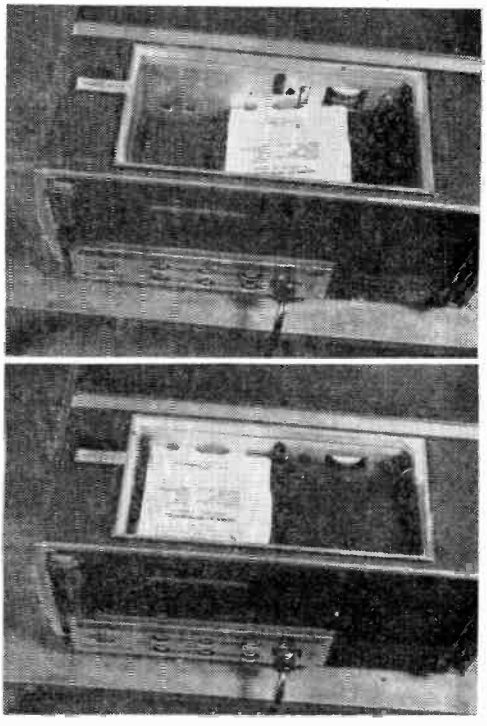
Fortunately, Dr. Goldmark and 3M engineers came through on every count. Since a standard reel of tape didn't seem very suitable for use on a tape changer, they devised what's known as a "tape cartridge." Though the tape's still coiled up in its usual fashion, all you see is a flat little plastic sandwich.

It was 3M's next step to find a way to cut the standard 7½ ips tape speed down enough so he wouldn't have to cram upwards of a half a mile of tape in the 3¾" x 3¼" cartridge. Their solution? Design a special

(Continued on page 105)



Pivoting platform reveals one secret of the ingenious Revere. Once user has placed tape cartridge in "load" side of platform (top photo), all subsequent operations are fully automatic. Machine "senses" and threads tape, plays entire selection, then rewinds tape at high speed (photo above). With rewinding completed, platform tilts (photo below), causing cartridge to slide into other half of platform (bottom photo).



Universal battery tester

By James Robert Squires

BATTERIES are as much a part of our everyday life as countless other conveniences which have now become necessities. It's difficult to mention something that hasn't been converted to battery use. We are a nation on the go and we take our radios, flash cameras, walkie-talkies, shavers, and even our battery powered tooth brushes right along with us. As a normal result the average American household is knee deep in batteries in various stages of charge. No member of the family can be sure which batteries are good and which are not. Often, unfortunately, the good are thrown away with the bad. This waste can be eliminated by building your very own universal dry-battery tester.

What it can do. The tester's range is designed to test batteries up to 50 volts, and provide battery loads up to 500 milliamperes with the meter in the circuit and up to one ampere with the meter out of the circuit. Two very common loads for batteries are the screw and bayonet-based pilot lamps. So, two special sockets are provided for testing batteries by using both lamp types.

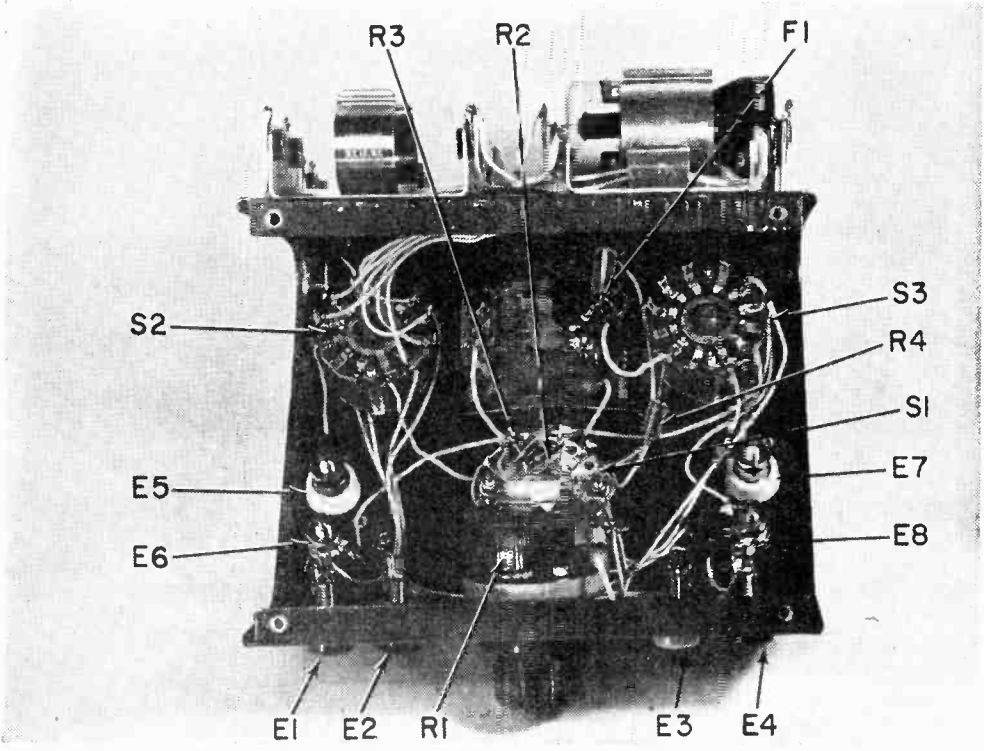
A further useful feature of the tester is its ability to give some information as to the expected life of the battery or batteries now used in your equipment. The test only requires that you have a good idea of the normal load current drawn by the equipment. The testing covers a broad spectrum of batteries which typically includes the AA, AAA, C and D cells. These four battery types can be tested by types either as singles or as a pair. The BATTERY SELECTOR switch, S2, selects the appropriate battery holder mounted on the rear of the tester.

Full-load testing. The most meaningful static test a battery can pass is a terminal voltage measurement under full load conditions. For this reason three load arrangements are possible with the universal dry-battery tester. The first of these is a lamp test. By using either the bayonet (BAY) pilot lamp socket, SO2, or the screw, (SCW) pilot lamp socket, SO1, a wide variety of lamps can be used as a load.

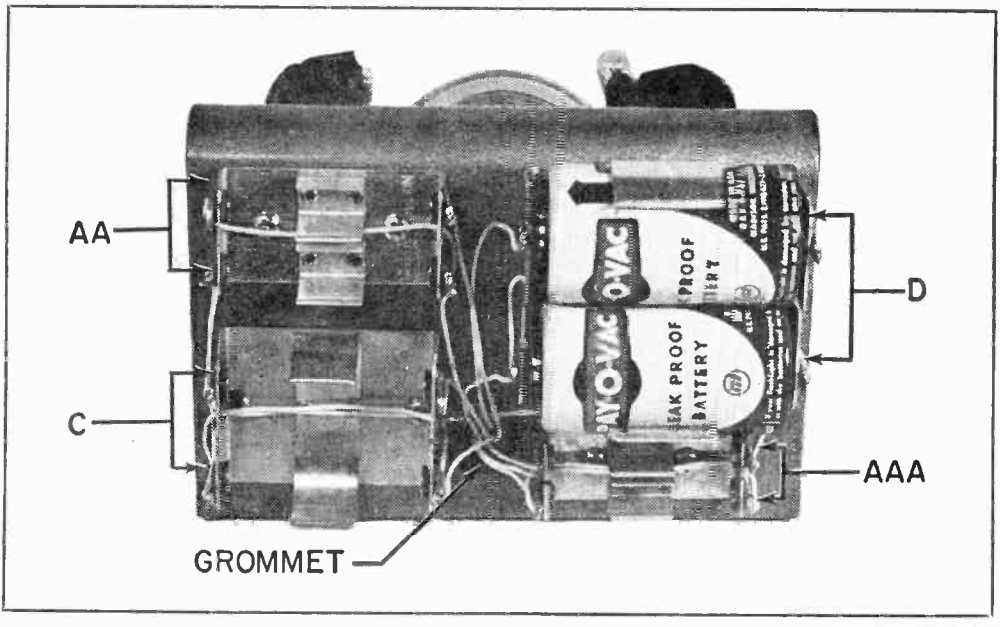
The second of these is a 25 ohm, 25 watt rheostat, R1. The VARIABLE LOAD position of the LOAD SELECTOR switch, S3, connects the 25 ohm rheostat, R1 across any battery selected by the BATTERY SELECTOR switch, S2. Load currents up to 500 milliamperes are possible through the meter. The meter is protected by a type 8AG instrument fuse rated at 0.5 ampere.

The third load position connects the se-

Now you can test dry cells and know when to replace them



Bottom view of the tester showing location of parts. Follow construction hints on pages 29-34.



Back of the tester's cover is just large enough to hold the four dual battery holders.

lected battery across the EXTERNAL LOAD white and black terminals, E7 and E8.

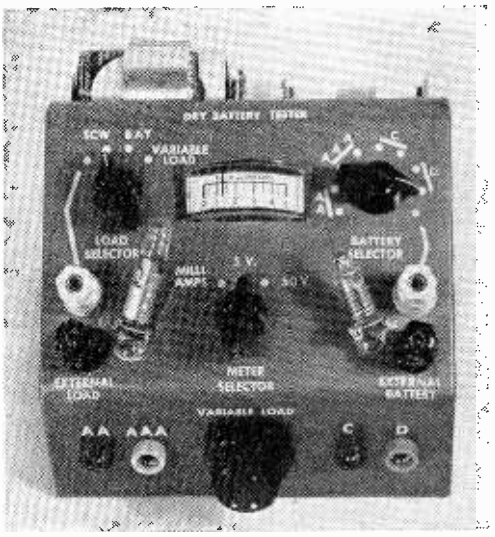
Picking the meter. In many of the applications of batteries their load current exceeds 100 milliamperes. For this reason a meter having a 0- to 500 milliampere range was selected. To bring up the ohms-per-volt sensitivity to approximately 200, a 0-5 milliampere meter movement, M1, was used. The meter has an approximate internal resistance of 127 ohms. A shunt resistor, R4, for the M1 was constructed by winding 93.3 inches of No. 32 solid enameled copper wire on a 100,000-ohm resistor body. The current error for the tester purposes with this shunt resistor is negligible. However the shunt is used only for current measurements.

For voltage measurements the same 0-5 ma. meter movement is used. This enables construction of a 200-ohms-per-volt meter which in turn reduces the tester loading on the battery or batteries under test.

Testing. Before starting battery test it's a good idea to measure the full-load drain on those batteries commonly used in the various gadgets in your house. The VARIABLE LOAD rheostat, R1, can be set to draw an identical load current. Then in future tests typical load currents can be quickly set into the tester. A normal load for many flashlights is between 200 and 350 milliamperes. For each application it will be necessary to establish your own lower limit of useful battery voltage. Usually a 30 per cent voltage drop under load is sufficient cause to discard a dry cell.

A rough estimate of future battery life can be found by selecting an average full-load current for this battery. Measure the full-load voltage at this time. With the battery or batteries connected in the tester and the METER SELECTOR switch, S1, set to MILLI-AMPS, set the VARIABLE LOAD rheostat, R1, for a load current 50 per cent greater than average full-load current. If this additional load applied for a short time causes more than say a 30 per cent drop in the battery voltage, it's usefulness in that application should be questioned.

In some battery applications there is only a small load current drain. The 9 volt-transistor battery is an example. Average load current for this battery is 20 milliamperes. Caution should be taken never to switch the LOAD SELECTOR switch, S3, to VARIABLE LOAD when low-current drain batteries are being tested. The LOAD SELECTOR switch, S3, should always be

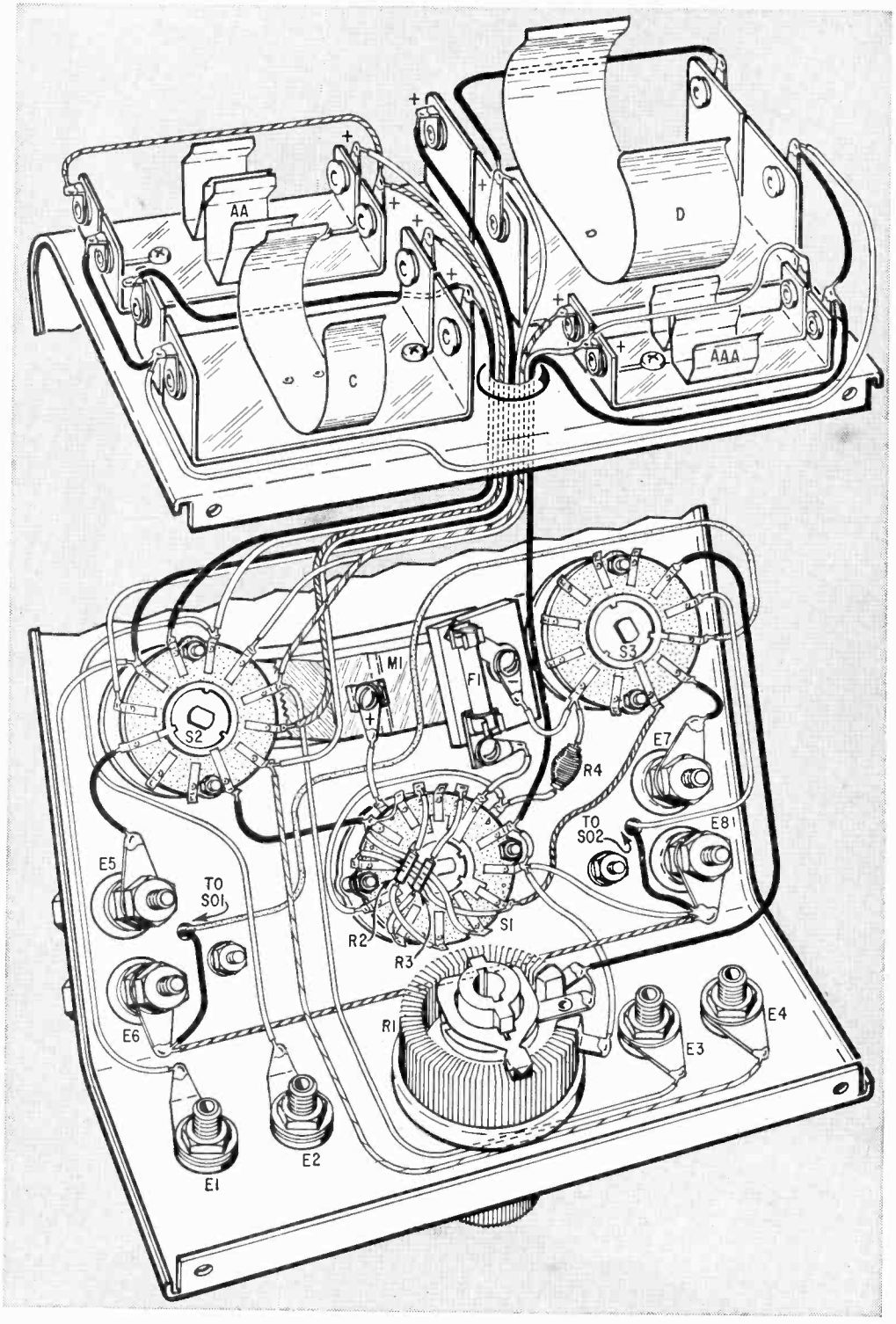


Panel lettering gives the tester a pro look.

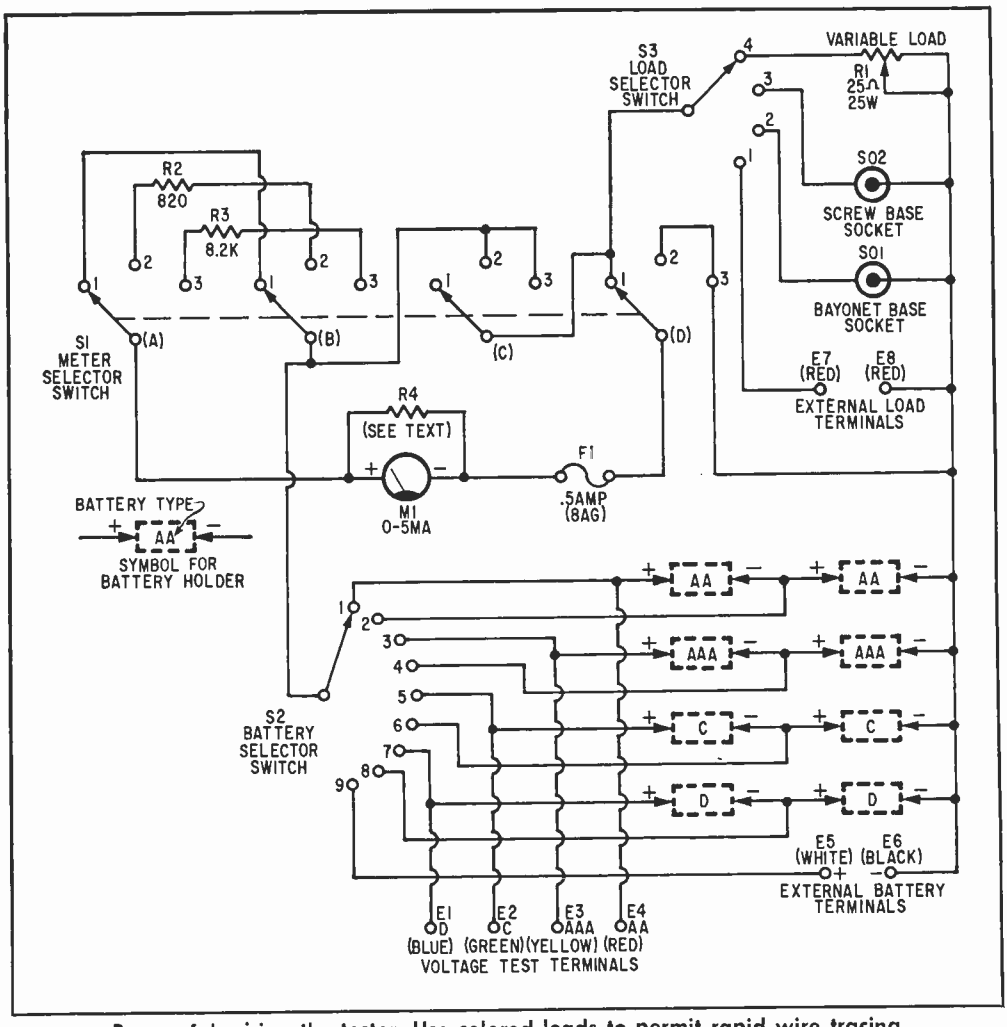
PARTS LIST

E1—Jack, blue insulated midget banana (G. C. Electro-craft type 33-220)
E2—Jack, green (like E1)
E3—Jack, yellow (like E1)
E4—Jack, red (like E1)
E5—Binding post, white (Superior DF30WTC)
E6—Binding post, black (Superior DF30BLC)
E7, E8—Binding post, red (Superior DF30RC)
F1—Fuse, 0.5 ampere, instrument type 8AG
M1—DC milliammeter, 0-5 ma. (Emico Model 13 Edgewise)
R1—Rheostat, 25-ohms overwound (Ohmite type 0147)
R2—820 ohm, ½-watt, 10% resistor
R3—8.2k, ½-watt, 10% resistor
R4—Meter shunt made from 93.3 inches of #32 solid enabled copper wire (see text)
S1—4 pole—3 position rotary switch (Use 4 pole—4 position Centralab type 2515)
S2—1 pole—9 position rotary switch (Use 1 pole—1-10 position Centralab type PA-1001)
S3—1 pole—4 position rotary switch (Use 1 pole—11 position Centralab type PA-2001)
SO1—Pilot lamp socket, screw base (Dialco type 505)
SO2—Pilot lamp socket, bayonet base (Dialco type 705)
1—Battery holder for 2AA-size cells (Keystone type 140)
1—Battery holder for 2 AAA-size cells (Keystone type 138)
1—Battery holder for 2 C-size cells (Keystone type 174)
1—Battery holder for 2 D-size cells (Keystone type 176)
1—Cabinet aluminum universal sloping-panel 6" W x 4" H x 4¼" D (Bud type AC-1612)
1—Fuse holder, for meter back mounting (Littlefuse type 383002)
Misc.—wire, solder, hardware, grommet, etc.

Estimated construction time: 5 hours
Estimated parts cost: $21.00



Considering the crowding of parts in the Universal Battery Tester, it is wise to follow the parts layout and wire placement as illustrated in the pictorial diagram above.



Be careful wiring the tester. Use colored leads to permit rapid wire tracing.

left at the EXTERNAL LOAD position. The external load for a typical 9-volt battery used in transistor radios is a 470-ohm, ½-watt resistor connected at the EXTERNAL LOAD jacks, E7 and E8. You simply see that the full-rated voltage is indicated on meter M1. Use Ohm's law to find loads.

There are four sections to the METER SELECTOR switch, S1, wafer. The first double section (A and B) selects the shunt or multiplier resistor depending on the switch setting. The next section (C) connects the load switch to the battery switch during voltage measurements. The last section (D) connects the meter either as an ammeter or as a voltmeter during load test.

Construction. Start by taping a sheet of white paper over the lower and sloping surfaces of the universal sloping panel chassis. A drill center diagram can then be laid out on this white surface. Refer to the photos for details. Drill and deburr all holes. Refer to the rear view photo for details on mounting the holders. The Adel nibbling tool is handy for cutting the square meter hole. All parts can then be mounted except the meter and 25-watt rheostat.

When mounting the five-way terminals on the thin aluminum chassis, file off the shoulder of the under-chassis insulator of the terminal. This will assure a tight fit.

Now install the meter being careful not to mar the plastic face. The schematic diagram indicates the wiring connections. After the *meter selector* switch, S1, has been wired install the 25-watt rheostat, R1, and wire its connections. Liberal use of the external jacks on the tester allows workbench duties. ■

New Pirate Broadcaster

There's more than oil in off-shore operations for avid DX'ers

By Tom Kneitel, K3FLL/WB2AAI

BRITISH DX'er D. C. Brightman, of Wolverton, Bucks, England, was the first to report on signals from the newest shipboard "pirate" broadcaster to RADIO-TV EXPERIMENTER.

Mr. Brightman was monitoring the broadcast band with his Geloso G-209R receiver when he first heard the station, "Radio Caroline" a few months ago. The frequency was 1500 kc/s, and the programming consisted of 12 hours of music. According to "Radio Caroline's" announcer, the station was aboard a ship which was anchored 9 miles off the coast of Essex, England.

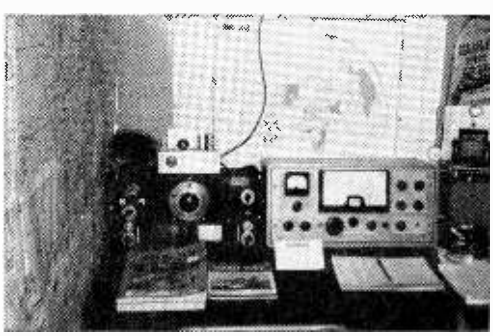
"Pirate" broadcasters are, as you may know, unlicensed radio stations which beam their signals into countries which do not permit commercial broadcasting. The "pirates" sell commercial advertising time to companies who wish to sell their products in these countries—and since the stations are located in international waters, it is frequently difficult for the "trespassed" nation to rid themselves of their unwanted, and unlicensed, seaboard voice.

On 1500 kc/s. But the situation goes deeper than broadcasting commercial jingles into a country which doesn't permit such things. In the particular case of "Radio Caroline," the British Coast Guard became upset because they claim that "Radio Caroline" is broadcasting on a frequency which is used for communications with lightships. This charge was promptly denied by a "Radio Caroline" spokesman, who stated that their frequency is "not used by anyone else." A check of the DX Central records, however, indicated that 1500 kc/s is shared with at least 30 other legitimate broadcasters from Australia to The Volcano Island, and this is to say nothing of the countless North American stations on the channel. In addition, "Radio Caroline" operates on a frequency which is capable of jamming adjacent frequency broadcasters in Portugal, Germany, and Spain.

International Action. Eventually the British government had all it could take from "Radio Caroline" and requested the International Telecommunications Union (an agency of the United Nations) to see what they could do to silence the station. The British told the ITU that the station is using two ten-thousand watt transmitters and is located aboard the S.S. Caroline, a converted passenger vessel flying the Panamanian flag.

The ITU will now communicate with the Panamanian government to remind them that there is an international agreement which does not permit broadcasting from ships or aircraft in international waters. In previous situations of a similar nature, the ITU was successful in having the Panamanian government withdraw their flags from ships broadcasting off the Dutch and Danish coasts.

Will it work this time? Eventually it will, but chances are that "Radio Caroline" will be silenced only to be replaced by another in the long line of "pirates" which have been providing juicy tidbits for DX'ers for many years. ■



Monitoring station operated by D. C. Brightman, Wolverton, Bucks, England. Receiver on left is a National HRO-5T, on the right is a Geloso G-209R. This is the equipment used to monitor clandestine Radio Caroline.

A Radio-TV Experimenter Service

LITERATURE LIBRARY

Numbers in heavy type indicate advertisers in this issue. Consult their ads for additional information.

ELECTRONIC PARTS

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

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

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

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

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

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

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

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

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

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

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

HI-FI/AUDIO

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

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

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

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

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

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

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

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

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

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

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

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

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

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

TAPE RECORDERS AND TAPE

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

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

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

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

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

HI-FI ACCESSORIES

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

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

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

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

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

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

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

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

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

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

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

SCHOOLS AND EDUCATIONAL

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

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

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

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

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

ORGANS

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

AUTOMOTIVE

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

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

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.

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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.

Radio-TV Experimenter, Dept. LL-698
505 Park Avenue, New York, N. Y. 10022

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FLORIDA LAND

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INVENTIONS needed immediately for manufacturers. For additional information write Kessler Corporation, C-70FI, Fremont, Ohio.

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FREE Electronics Catalog. Tremendous Bargains. Electrolabs, Dept. C-520 NN, Hewlett, New York 11557.

CONVERT any television to supersensitive, big-screen oscilloscope. No electronic experience necessary. Only minor changes required. Illustrated plans $2.00. Relco-A30, Box 10563, Houston 18, Texas.

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Automatic Tape Cartridge Player

(Continued from page 95)

ultra-narrow-gap recording head, and also perfect a sensitive, ultra-low-noise tape that would give hi-fi sound at the phenomenally low tape speed of 1⅞ ips.

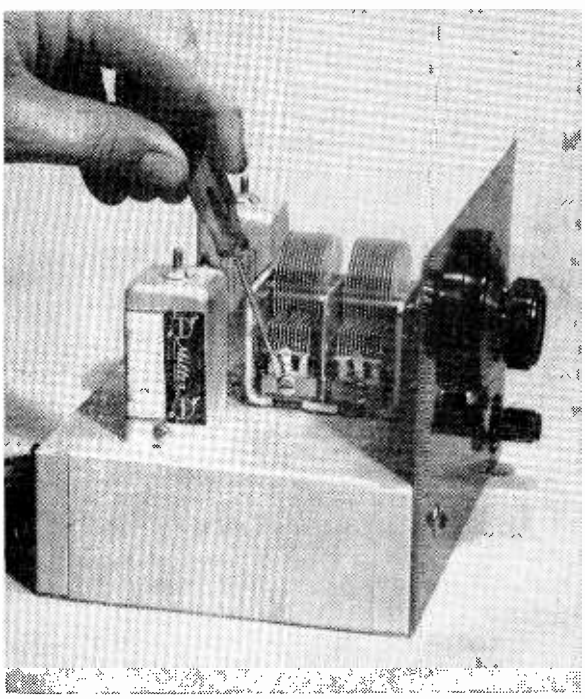
Success. With 3M's helping hand, Goldmark again came through with flying colors. And today, the Revere automatic tape cartridge player is just as real as his now-ubiquitous LP record. Toss a stack of blank cartridges on the Revere, and you can record enough 4-track stereo for a whole weekend's listening enjoyment. Pile a bunch of prerecorded cartridges on the machine about dinner time, and you'll have music enough to last well into the Late Late Show.

Using the Revere to record mono or stereo from a microphone or radio amounts to little more than inserting a plug or two, pushing a button, and adjusting the level controls. And, while the sound from its built-in speakers should satisfy all but the most exacting hi-fi buffs, a couple of output jacks make it a simple matter to hook the Revere up to your present stereo system.

One thing you can't do with the Revere is edit tapes, of course, since it's a little hard to crack open those plastic cartidges. But then, this is hardly a drawback worth worrying about. After all, how much more can you expect from a machine that comes across with as much as the Revere does? ■

BCB Booster

(Continued from page 78)



It is important that the BCB Booster be aligned carefully so that it tracks accurately. Trimmer capacitor screws (one of two pointed out by screwdriver) are used to align the RF preamplifier to signals on the high end of the BC band.

the booster. If you get oscillations at full gain try changing the input ground, or connect the booster to an electrical ground such as a water pipe—this will usually eliminate oscillations.

If the oscillation persists, reduce the booster's gain by backing off on R3. There's plenty of reserve gain and the little bit lost in eliminating instability won't be noticed.

Built as described, you'll find the BCB Booster a *hot* performer. Changes or modifications to the BCB Booster's circuit are not recommended.

If you have a mind to, you can eliminate output jacks J4 and J5 and install a coaxial cable connector to serve instead. Nothing tricky here, except be sure to connect the red lead from RF output transformer, T2, to the center terminal on the jack and the blue lead to the shell. ■

IT HAPPENED BEFORE

"You mean you've been putting all this down on tape?!"

Volume 42, No. 1

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

WHITE'S RADIO LOG was founded by Charles DeWitt White in Providence, R.I. as an extension of his earlier publishing activities which, in turn, were a continuation of the business established by his father: the publication of city directories, street guides and municipal tax guides.

In the early days of broadcasting, the compilation of a list of operating stations and their frequencies was no simple task. Prior to the Dill-White Radio Act of 1927, if a feed merchant, auto dealer, barber or undertaker wanted to advertise his wares or services, he had only to select a frequency and go on the air.

Nevertheless, Mr. White's directory publishing experience had convinced him that he could successfully assemble a radio log, and in 1924 he justified his conviction with *The Rhode Island Radio Call Book,* following this shortly after with *White's Triple List of Radio Broadcasting Stations.*

In 1927 the two publications were merged, nationwide distribution was established and in ensuing years related publications, such as *Sponsored Radio Programs, Radio Announcer's Guide, Short-Wave Schedule Guide* and a special Canadian edition of *White's Radio Log* (which has had its title shortened to the one it bears today), were also issued. The *Log* reached a combined circulation of well over 1,000,000 copies at one time.

The 1927 Fall-Winter issue of the *Log* listed 701 U.S. Stations. Most powerful were WEAF (now WNBC), N. Y., with 50,000 watts, KDKA, Pittsburgh, WGY, Schenectady, and WJZ (now WABC), N. Y., each with 30,000 watts; WGN-WLIB, Chicago, with 15,000 watts; and Boston's WBZ, also with 15,000. Five stations listed (one a Junior High School in Norfolk, Va.) operated on a mighty 5 watts.

In 1957, Mr. White, who was then 76 years old, died in his sleep. His heirs sold all rights in and to the *Log* to the publisher of SCIENCE & MECHANICS and in January of 1958 the first edition of *White's Radio Log,* Vol. 35, No. 1, was published as a special supplement to the RADIO-TV EXPERIMENTER.

From 1958 to the end of 1961, the *Log* was published in each semiannual issue of RADIO-TV EXPERIMENTER until the beginning of 1962 when the magazine was published quarterly. Beginning with the February/March 1964 issue, RADIO-TV EXPERIMENTER has been published bi-monthly.

With six issues a year hitting the newsstands throughout the United States, Canada and many other countries, it was necessary that *White's Radio Log* undergo its first major format change in over two decades. In-

creased listings due to the growth of VHF and UHF television and FM broadcasting have made it an almost impossible task to present the complete *Log* every two months with the listing accuracy demanded by the users. Add to these listings, stations located in Canada, Mexico and West Indies, and you can begin to imagine the enormous task it is to assemble *White's Radio Log*. To further increase the scope of the *Log*, the Short-Wave Section has been revised, and the station listings increased in scope and number. Complete details on the Short-Wave Section appear immediately before that section.

In this issue of *White's Radio Log* we have included the following listings: U.S. AM Stations by Frequency, Canadian AM Stations by Frequency, U.S., Puerto Rico, and Canadian FM Stereo Stations (a new listing), U.S. Commercial Television Stations by States, U.S. Educational Television Stations by States, Canadian Television Stations by Cities, and the World-wide Short-Wave Stations. You will note that the U.S. and Canadian AM station listings have been separated. The number of AM broadcast stations for both nations has grown considerably through the years and separate listings will simplify the updating process. The FM stereo station listing was added to the *Log* because of the countless requests we received from readers. Splitting of the U.S. Television stations into commercial and educational listings will prove its value in the next few years as the number of educational UHF TV stations swell the ranks of TV broadcasters.

In our next issue, October/November, 1964, the *Log* will contain the following listings: U.S. and Canadian AM Stations by Location, U.S. FM Stations by States, Canadian Stations by Location, Mexican and Cuban AM Stations by Location, and the expanded Short-Wave Section. The short-wave listings will always be completely revised in each issue of *White's Radio Log* to insure 100 per cent up-to-date information leaving nothing to chance.

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

Therefore, in any three consecutive 1964 issues of RADIO-TV EXPERIMENTER, you will have a complete cross-reference listings of *White's Radio Log* that is *always up-to-date*. The three consecutive issues are a complete volume of *White's Radio Log* that offers complete listings with last minute station change data that can not be offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find the new *White's Radio Log* format an unbeatable reference. ■

QUICK REFERENCE INDEX

WHITE'S

RADIO LOG

U.S. AM Stations by Frequency

U. S. stations listed alphabetically by states within groups. Abbreviations: Kc., frequency in kilocycles; W.P., watt power; d—operates daytime only. Wave length is given in meters.

Kc.	Wave Length	W.P.
540—555.5		
KVIP	Redding, Calif.	5000d
KFMB	San Diego, Calif.	5000
WGTO	Cypress Gardens, Florida	50000
WDAK	Columbus, Ga.	5000
KBRV	Soda Springs, Idaho	500d
KWMT	Ft. Dodge, Iowa	5000d
KNOE	Monroe, La.	5000
WDMV	Pocomoke City, Md.	500d
WBIC	Islip, N.Y.	250d
WETC	Wendell-Zebulon, N.C.	5000d
WARO	Canonsburg, Pa.	250d
WYNN	Florence, S.C.	250d
WDXN	Clarksville, Tenn.	1000d
WRIC	Richlands, Va.	1000d
550—545.1		
KENI	Anchorage, Alaska	5000
KOY	Phoenix, Ariz.'	5000
KAFY	Bakersfield, Calif.	1000
KRAI	Craig, Colo.	1000
WAYR	Orange Park, Fla.	1000d
WGGA	Gainesville, Ga.	5000
KMVI	Wailuku, Hawaii	1000
KFRM	Concordia, Kansas	5000d
WCBI	Columbus, Miss.	1000
KSD	St. Louis, Mo.	5000
KOPR	Butte, Mont.	1000
WGR	Buffalo, N.Y.	5000
WDBM	Statesville, N.C.	500d
KFYR	Bismarck, N.Dak.	5000
WKRC	Cincinnati, Ohio	5000
KOAC	Corvallis, Oreg.	5000
WHLM	Bloomsburg, Pa.	1000
WPAB	Ponce, P.R.	5000
WXTR	Pawtucket, R.I.	1000
KCRS	Midland, Tex.	5000
KTSA	San Antonio, Tex.	5000
WDEV	Waterbury, Vt.	5000
WSVA	Harrisonburg, Va.	5000
KARI	Blaine, Wash.	5000
KMRE	Spokane, Wash.	500d
WSAU	Wausau, Wis.	5000
560—535.4		
WOOF	Dothan, Ala.	5000d
KYUM	Yuma, Ariz.	1000
KSFO	San Fran., Calif.	5000
KLZ	Denver, Colo.	5000
WQAM	Miami, Fla.	5000
WIND	Chicago, Ill.	5000
WMIK	Middlesboro, Ky.	500d
WGAN	Portland, Maine	5000
WFRB	Frostburg, Md.	1000
WHYN	Springfield, Mass.	1000d
WQTE	Monroe, Mich.	500d
WEBC	Duluth, Minn.	5000
KWTO	Springfield, Mo.	5000
KMON	Great Falls, Mont.	5000
WGAI	Elizabeth City, N.C.	1000
KCYR	Milan, N. H.	560
WFIL	Philadelphia, Pa.	5000
WIS	Columbia, S.C.	5000
WHBQ	Memphis, Tenn.	5000
KLVI	Beaumont, Tex.	5000
KPQ	Wenatchee, Wash.	5000
WJLS	Beckley, W.Va.	5000
570—526.0		
WAAX	Gadsden, Ala.	5000
KCNO	Alturas, Calif.	5000
KLAC	Los Angeles, Calif.	5000
WGMS	Washington, D.C.	5000
WACL	Waycross, Ga.	5000
WKYB	Paducah, Ky.	1000
WVMI	Biloxi, Miss.	1000d
KGRT	Las Cruces, N.Mex.	5000d
WMCA	New York, N.Y.	5000
WSYR	Syracuse, N.Y.	5000
WWNC	Asheville, N.C.	5000
WLLE	Raleigh, N.C.	500d
WKBN	Youngstown, Ohio	5000
WNAX	Yankton, S.Dak.	5000
WFAA	Dallas, Tex.	5000
WBAP	Ft. Worth, Tex.	5000
KLUB	Salt Lake City, Utah	5000
KVI	Seattle, Wash.	5000
WMAM	Marinette, Wis.	5000
580—516.9		
WABT	Tuskegee, Ala.	500d
KABI	Ketchikan, Alaska	1000
KTAN	Tucson, Ariz.	5000
KMJ	Fresno, Calif.	5000
KUBC	Montrose, Colo.	5000
WDBO	Orlando, Fla.	5000
WGAC	Augusta, Ga.	5000
KFXD	Nampa, Idaho	5000
WILL	Urbana, Ill.	5000d
KSAC	Manhattan, Kans.	5000
WIBW	Topeka, Kans.	5000
KALB	Alexandria, La.	5000
WTAG	Worcester, Mass.	5000
WELO	Tupelo, Miss.	1000
KANA	Anaconda, Mont.	1000
WAGR	Lumberton, N.C.	500
KWIN	Ashland, Oreg.	1000
WHP	Harrisburg, Pa.	5000
WKAQ	San Juan, P.R.	5000
KOBH	Hot Springs, S.Dak.	500d
WRKH	Rockwood, Tenn.	1000d
KDAV	Lubbock, Tex.	500d
WLES	Lawrenceville, Va.	500d
WCHS	Charleston, W.Va.	5000
WKTY	LaCrosse, Wis.	5000
590—508.2		
KHAR	Anchorage, Alaska	5000
WRAG	Carrollton, Ala.	1000d
KBHS	Hot Springs, Ark.	5000d
KFXM	San Bernardino, Cal.	1000
KTHO	Tahoe Valley, Calif.	1000d
KCSJ	Pueblo, Colo.	1000
WDLP	Panama City, Fla.	1000
WPLO	Atlanta, Ga.	5000
KGMB	Honolulu, Hawaii	5000
KID	Idaho Falls, Idaho	5000
WBBY	Wood River, Ill.	500d
WVLK	Lexington, Ky.	5000
WEEI	Boston, Mass.	5000
WKZO	Kalamazoo, Mich.	5000
KGLE	Glendive, Mont.	500d
WOW	Omaha, Nebr.	5000
WROW	Albany, N.Y.	5000
WGTM	Wilson, N.C.	5000
KUGN	Eugene, Oreg.	5000
WARM	Scranton, Pa.	5000
WMBS	Uniontown, Pa.	1000
KTBC	Austin, Tex.	5000
KSUB	Cedar City, Utah	1000
WLVA	Lynchburg, Va.	1000
KHQ	Spokane, Wash.	5000
600—499.7		
WIRB	Enterprise, Ala.	1000
KCLS	Flagstaff, Ariz.	5000
KVCV	Redding, Calif.	1000
KOGO	San Diego, Calif.	5000
KZIX	Ft. Collins, Colo.	1000d
WICC	Bridgeport, Conn.	5000
WPDQ	Jacksonville, Fla.	5000
WMT	Cedar Rapids, Iowa	5000
WWOM	New Orleans, La.	1000d
WFST	Caribou, Maine	5000d
WCAO	Baltimore, Md.	5000
WLST	Escanaba, Mich.	1000d
WTAC	Flint, Mich.	1000
KGEZ	Kalispell, Mont.	2000
WCVP	Murphy, N.C.	1000d
WSJS	Winston-Salem, N.C.	5000
KSJB	Jamestown, N.D.	5000
WFRM	Coudersport, Pa.	1000d
WAEL	Mayaguez, P.R.	1000
WREC	Memphis, Tenn.	5000
KROD	El Paso, Tex.	5000
KERB	Kermit, Tex.	1000d
KTBB	Tyler, Tex.	1000
610—491.5		
WSGN	Birmingham, Ala.	5000
KFAR	Fairbanks, Alaska	5000
KAVL	Lancaster, Calif.	1000
KFRC	San Francisco, Calif.	5000
WTOR	Torrington, Conn.	1000d
WIOD	Miami, Fla.	5000
WMEL	Pensacola, Fla.	500d
WCEH	Hawkinsville, Ga.	500d
WRUS	Russellville, Ky.	500d
KDAL	Duluth, Minn.	5000
WDAF	Kansas City, Mo.	5000
KOJM	Havre, Mont.	1000
KCSR	Chadron, Nebr.	1000d
WGIR	Manchester, N.H.	5000
KGGM	Albuquerque, N.Mex.	5000
WAYS	Charlotte, N.C.	5000
WTVN	Columbus, Ohio	5000
WIP	Philadelphia, Pa.	5000
KILT	Houston, Tex.	5000
KVNU	Logan, Utah	5000
WSLS	Roanoke, Va.	5000
WHPL	Winchester, Va.	500d
KEPR	Kennewick, Wash.	5000
620—483.6		
KTAR	Phoenix, Ariz.	5000
KNGS	Hanford, Calif.	1000
KWSD	Mt. Shasta, Calif.	1000d
KSTR	Grand Junction, Colo.	5000d
WSUN	St. Petersburg, Fla.	5000
WTRP	LaGrange, Ga.	1000d
KWAL	Wallace, Idaho	1000
KMNS	Sioux City, Iowa	1000
WTMT	Louisville, Ky.	5000
WLBZ	Bangor, Maine	5000
WJDX	Jackson, Miss.	5000
WVNJ	Newark, N.J.	5000
WHEN	Syracuse, N.Y.	5000
WDNC	Durham, N.C.	5000
KGW	Portland, Oreg.	5000
WHJB	Greensburg, Pa.	1000
WCAY	Cayce, S.C.	500d
WATE	Knoxville, Tenn.	5000
KWFT	Wichita Falls, Tex.	5000
WVMT	Burlington, Vt.	5000
WWNR	Beckley, W.Va.	1000
WTMJ	Milwaukee, Wis.	5000
630—475.9		
WAVU	Albertville, Ala.	1000d
WJDB	Thomasville, Ala.	1000d
KJNO	Juneau, Alaska	1000
KVMA	Magnolia, Ark.	1000d
KIDD	Monterey, Calif.	1000
KHOW	Denver, Colo.	5000
WMAL	Washington, D.C.	5000
WSAV	Savannah, Ga.	5000
WNEG	Toccoa, Ga.	500d
KIDO	Boise, Idaho	5000
WLAP	Lexington, Ky.	5000
KTIB	Thibodaux, La.	500d
WJMS	Ironwood, Mich.	1000
KDWB	So. St. Paul, Minn.	5000
KXOK	St. Louis, Mo.	5000
KGVW	Belgrade, Mont.	1000d
KOH	Reno, Nev.	5000
KLEA	Lovington, N.Mex.	500d
WIRC	Hickory, N.C.	1000d
WMFD	Wilmington, N.C.	1000
KWRO	Coquille, Oreg.	5000d
WEJL	Scranton, Pa.	500d
WKYN	San Juan, P.R.	5000
WPRO	Providence, R.I.	5000
KGFX	Pierre, S. Dak.	200d
KMAC	San Antonio, Tex.	5000
KSXX	Salt Lake City, Utah	1000d
KGDN	Edmunds, Wash.	5000d
KZUN	Opportunity, Wash.	500d
640—468.5		
KFI	Los Angeles, Calif.	50000
WOI	Ames, Iowa	5000d
WHLO	Akron, Ohio	1000
WNAD	Norman, Okla.	1000d
650—461.3		
KORL	Honolulu, Hawaii	10000
WSM	Nashville, Tenn.	50000
KIKK	Pasadena, Texas	250d
660—454.3		
KMEO	Omaha, Nebr.	500d
WNBC	New York, N.Y.	50000
WESC	Greenville, S.C.	10000d
KSKY	Dallas, Tex.	1000
670—447.5		
WMAQ	Chicago, Ill.	50000
680—440.9		
KNBR	San Fran., Calif.	50000
WPIN	St. Petersburg, Fla.	1000d
WCTT	Corbin, Ky.	1000
WCBM	Baltimore, Md.	10000
WNAC	Boston, Mass.	50000
WDBC	Escanaba, Mich.	10000
KFEQ	St. Joseph, Mo.	5000
WINR	Binghamton, N.Y.	1000
WRVM	Rochester, N.Y.	250d
WPTF	Raleigh, N.C.	50000
WISR	Butler, Pa.	250d
WAPA	San Juan, P.Rico.	10000
WMPS	Memphis, Tenn.	10000
KBAT	San Antonio, Tex.	50000
KOMW	Omak, Wash.	1000d
WCAW	Charleston, W.Va.	10000
690—434.5		
WVOK	Birmingham, Ala.	50000d
KEOS	Flagstaff, Ariz.	1000
KEVT	Tucson, Ariz.	250d
KBBA	Benton, Ark.	250d
KAPI	Pueblo, Colo.	250d
WADS	Ansonia, Conn.	500d
WAPE	Jacksonville, Fla.	50000
KULA	Honolulu, Hawaii	10000
KBLI	Blackfoot, Idaho	1000d
KGGF	Coffeyville, Kans.	10000
WTIX	New Orleans, La.	5000
KTCR	Minneapolis, Minn.	500d
KSTL	St. Louis, Mo.	1000d
KEYR	Terrytown, Nebr.	1000d
KRCO	Prineville, Oreg.	1000d
WXUR	Media, Pa.	500
KUSD	Vermillion, S.Dak.	1000d
KHEY	El Paso, Tex.	10000
KPET	Lamesa, Tex.	250
KZEY	Tyler, Tex.	250d
WCYB	Bristol, Va.	10000d
WNNT	Warsaw, Va.	250d
WELD	Fisher, W.Va.	500d
700—428.3		
WLW	Cincinnati, Ohio	50000
710—422.3		
WKRG	Mobile, Ala.	1000
KMPC	Los Angeles, Calif.	50000
KBTR	Denver, Colo.	5000
WGBS	Miami, Fla.	50000
WROM	Rome, Ga.	1000d
KEEL	Shreveport, La.	50000
WHB	Kansas City, Mo.	10000
WOR	New York, N.Y.	50000
DZRH	Manila, P.I.	10000
WKJB	Mayaguez, P.Rico	1000
WTPR	Paris, Tenn.	250d
KGNC	Amarillo, Tex.	10000
KURV	Edinburg, Tex.	250
KIRO	Seattle, Wash.	50000
WDSM	Superior, Wis.	5000
720—416.4		
WGN	Chicago, Ill.	50000
730—410.7		
WJMW	Athens, Ala.	1000
KFQD	Anchorage, Alaska	10000
KSUD	W. Memphis, Ark.	250d
WKTG	Thomasville, Ga.	1000d
KLOE	Goodland, Kans.	1000d
WFMW	Madisonville, Ky	500
WMTC	Van Cleve, Ky.	1000d
KTRY	Bastrop, La.	250d
WARB	Covington, La.	250d
WITO	Bath, Maine	1000d
WACE	Chicopee, Mass.	5000d
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N.Mex.	1000d
WDOS	Oneonta, N.Y.	1000d

Kc.	Wave Length	W.P.
WFMC	Goldsboro, N.C.	1000d
WOHS	Shelby, N.C.	1000d
WMGS	Bowling Green, Ohio	1000d
KBOY	Medford, Oreg.	1000d
WNAK	Nanticoke, Pa.	1000d
WPIT	Pittsburgh, Pa.	5000d
WPAL	Charleston, S.C.	1000d
WLIL	Lenoir, Tenn.	1000d
KPCN	Grand Prairie, Tex.	500d
KSVN	Ogden, Utah	1000d
WPIK	Alexandria, Va.	5000d
WMNA	Gretna, Va.	1000d
KULE	Ephrata, Wash.	1000d
WXMT	Merrill, Wis.	1000d

740—405.2

WBAM	Montgomery, Ala.	50000d
KUEQ	Phoenix, Ariz.	1000d
KGLM	Avalon, Calif.	10000d
KCBS	San Francisco, Calif.	50000
KSSS	Colo. Springs, Colo.	1000
KVFC	Cortez, Colo.	1000d
WFSG	Boca Raton, Fla.	1000d
WKMK	Blountston, Fla.	1000d
WKIS	Orlando, Fla.	5000
KYME	Boise, Idaho	500d
WVLN	Olney, Ill.	1000d
KBOE	Oskaloosa, Iowa	250d
WNOP	Newport, Ky.	1000d
WTAO	Cambridge, Mass.	250d
KPBM	Carlsbad, N.Mex.	1000d
WGSM	Huntington, N.Y.	5000d
WMBL	Morehead City, N.C.	1000d
WPAQ	Mount Airy, N.C.	10000d
KRMG	Tulsa, Okla.	50000
WVCH	Chester, Pa.	1000d
WIAC	San Juan, P.Rico	10000
WBAW	Barnwell, S.C.	1000d
WIRJ	Humbolt, Tenn.	250d
WJIG	Tullahoma, Tenn.	250d
KTRH	Houston, Tex.	50000
KCMC	Texarkana, Tex.	1000
WBCI	Williamsburg, Va.	500d

750—399.8

WSB	Atlanta, Ga.	50000
WBMD	Baltimore, Md.	1000d
KMMJ	Grand Island, Neb.	10000d
WHEB	Portsmouth, N.H.	1000d
KSEO	Durant, Okla.	250d
KXL	Portland, Oreg.	50000
WPDX	Clarksburg, W.Va.	1000d

760—394.5

KGU	Honolulu, Hawaii	10000
WJR	Detroit, Mich.	50000
WCPS	Tarboro, N.C.	1000d
WORA	Mayaguez, P.R.	5000

770—389.4

KUOM	Minneapolis, Minn.	5000d
WCAL	Northfield, Minn.	5000d
WEW	St. Louis, Mo.	1000d
KOB	Albuquerque, N.Mex.	50000
WABC	New York, N.Y.	50000
KXA	Seattle, Wash,	1000d

780—384.4

WBBM	Chicago, Ill.	50000
WJAG	Norfolk, Neb.	1000d
WCKB	Dunn, N.C.	1000d
WBBO	Forest City, N.C.	1000d
KSPI	Stillwater, Okla.	250d
WAVA	Arlington, Va.	1000d

790—379.5

WTUG	Tuscaloosa, Ala.	500d
KCEE	Tucson, Ariz.	5000d
KOSY	Texarkana, Ark.	1000
KDAN	Eureka, Calif.	5000d
KABC	Los Angeles, Calif.	5000
WLBE	Leesburg, Fla.	5000
WFUN	Miami Beach, Fla.	5000
WQXI	Atlanta, Ga.	5000
WKLU	Brunswick, Ga.	
WGRA	Cairo, Ga.	1000d
KEKO	Kealakekua, Hawaii	1000
KEST	Boise, Idaho	1000d
WRMS	Beardstown, Ill.	500d
KXXX	Colby, Kans.	5000d
WAKY	Louisville, Ky.	5000
WRUM	Rumford, Me.	1000d
WSGW	Saginaw, Mich.	5000
WSJC	Magee, Miss.	1000d
KGHL	Billings, Mont.	5000
WWNY	Watertown, N.Y.	1000
WLSV	Wellsville, N.Y.	1000d
WTNC	Thomasville, N.C.	1000d
KXGO	Fargo, N. Dak.	5000
KWIL	Albany, Oreg.	1000
WAEB	Allentown, Pa.	5000
WPIC	Sharon, Pa.	1000d
WEAN	Providence, R.I.	5000
WWBD	Bamberg, S.C.	1000d
WETB	Johnson City, Tenn.	1000d
WMC	Memphis, Tenn.	5000
KTHT	Houston, Tex.	5000
KFYO	Lubbock, Tex.	5000
KUTA	Blanding, Utah	1000d
WSIG	Mount Jackson, Va.	1000d
WTAR	Norfolk, Va.	5000
KGMI	Bellingham, Wash.	5000
KNEW	Spokane, Wash.	5000
WEAQ	Eau Claire, Wis.	5000

800—374.8

WHOS	Decatur, Ala.	1000d
WMGY	Montgomery, Ala.	1000d
KINY	Juneau, Alaska	5000
KAGH	Crossett, Ark.	250d
KVOM	Morrilton, Ark.	250d
KUZZ	Bakersfield, Calif.	250d
KDAD	Weed, Calif.	1000d
KBRN	Brighton, Colo.	500d
WLAD	Danbury, Conn.	250d
WSUZ	Palatka, Fla.	1000d
WJAT	Swainsboro, Ga.	1000d
WKZI	Casey, Ill.	250d
KXIC	Iowa City, Iowa	1000d
WBOK	New Orleans, La.	1000d
WCCM	Lawrence, Mass.	1000d
WVAL	Sauk Rapids, Minn.	5000
KREI	Farmington, Mo.	1000d
KDBM	Dillon, Mont.	1000d
WKDN	Camden, N.J.	1000d
KJEM	Okla City, Okla.	250d
KPDQ	Portland, Oreg.	1000d
WCHA	Chambersburg, Pa.	1000d
WDSC	Dillon, S.C.	1000d
WEAB	Greer, S.C.	250d
WDEH	Sweetwater, Tenn.	1000d
KDDD	Dumas, Tex.	250d
KBUH	Brigham City, Utah	250d
WSVS	Crewe, Va.	5000d
WKEE	Huntington, W.Va.	1000d
WDUX	Waupaca, Wis.	5000d

810—370.2

KGO	San Francisco, Calif.	50000
WIGO	Indianapolis, Ind.	250d
WYRE	Annapolis, Md.	250d
KCMO	Kansas City, Mo.	50000
WGY	Scheneetady, N.Y.	50000
WKBC	N.Wilkesboro, N.C.	1000d
WCEC	Rocky Mount, N.C.	1000d
WEDO	McKeesport, Pa.	1000d
WKVM	San Juan, P.R.	25000
WMTS	Murfreesboro, Tenn.	5000d

820—365.6

WAIT	Chicago, Ill.	5000d
WIKY	Evansville, Ind.	250d
WOSU	Columbus, Ohio	5000d
WFAA	Dallas, Tex.	50000
WBAP	Ft. Worth, Tex.	50000

830—361.2

KIKI	Honolulu, Hawaii	250
WCCO	Minneapolis, Minn.	50000
KOFI	Kalispell, Mont.	1000
KBOA	Kennett, Mo.	1000d
WNYC	New York, N.Y.	1000

840—356.9

WTUF	Mobile, Ala.	1000d
WRYM	New Britain, Conn.	1000d
WHAS	Louisville, Ky.	50000
WVPO	Stroudsburg, Pa.	250d

850—352.7

WYDE	Birmingham, Ala.	10000
KICY	Nome, Alaska	5000
KOA	Denver, Colo.	50000
WRUF	Gainesville, Fla.	5000
WEAT	W. Palm Beach, Fla.	1000
KIMO	Hilo, Hawaii	1000
WHDH	Boston, Mass.	50000
WKBZ	Muskegon, Mich.	1000
KFUO	St. Louis, Mo.	5000d
WKIX	Raleigh, N.C.	10000
WJW	Cleveland, Ohio	10000
WJAC	Johnstown, Pa.	10000
WEEU	Reading, Pa.	1000
WABA	Aguadilla, P.R.	500
WRAP	Norfolk, Va.	5000
KTAC	Tacoma, Wash.	1000

860—348.6

WHRT	Hartselle, Ala.	250d
WAMI	Opp, Ala.	1000d
KIFN	Phoenix, Ariz.	1000d
KOSE	Osceola, Ark.	1000d
KWRF	Warren, Ark.	250d
KTRB	Modesto, Calif.	10000
WOWW	Naugatuck, Conn.	250d
WAZE	Clearwater, Fla.	500d
WKKO	Cocoa, Fla.	1000d
WERD	Atlanta, Ga.	1000
WDMG	Douglas, Ga.	5000d
WMRI	Marion, Ind.	250d
KWPC	Muscatine, Iowa	250d
KOAM	Pittsburg, Kans.	10000
WSON	Henderson, Ky.	500d
WAYE	Dundalk, Md.	1000d
WSBS	Gt. Barrington, Mass.	250d
KNUI	New Ulm, Minn.	1000d
WMAG	Forest, Miss.	500d
KARS	Belen, N. Mex.	250d
WFMO	Fairmont, N.C.	1000d
WSTH	Taylorsville, N. C.	250d
KSHA	Medford, Oreg.	1000d
WAMO	Pittsburgh, Pa.	1000d
WTEL	Philadelphia, Pa.	10000d
WLBG	Laurens, S.C.	1000d
WIVK	Knoxville, Tenn.	1000d
KFST	Ft. Stockton, Tex.	250d
KPAN	Hereford, Tex.	250d
KSFA	Nacogdoches, Tex.	1000d
KONO	San Antonio, Tex,	5000
KWHO	Salt Lake City, Utah	1000d
WEVA	Emporia, Va.	1000d
WOAY	Oak Hill, W.Va.	10000d
WFOX	Milwaukee, Wis.	250d

870—344.6

KIEV	Glendale, Calif.	250d
KAIM	Kaimuki, Hawaii	5000
WWL	New Orleans, La.	50000
WKAR	E. Lansing, Mich.	5000d
WHCU	Ithaca, N.Y.	1000d
WGTL	Kannapolis, N.C.	1000d
WHOA	San Juan, P.R.	5000
KJIM	Ft. Worth, Tex.	250
WFLO	Farmville, Va.	1000d

880—340.7

WCBS	New York, N.Y.	50000
WRRZ	Clinton, N.C.	1000d
WRFD	Worthington, Ohio	5000d

890—336.9

WLS	Chicago, Ill.	50000
WHNC	Henderson, N.C.	1000d
KBYE	Okla. City, Okla.	1000d

900—333.1

WATV	Birmingham, Ala,	1000d
WGOK	Mobile, Ala.	1000d
WOZK	Ozark, Ala.	1000d
KPRB	Fairbanks, Alaska	10000
KHOZ	Harrison, Ark.	1000d
KBIF	Fresno, Calif.	1000d
KGRB	West Covina, Cal.	250d
WJWL	Georgetown, Del.	5000d
WSWN	Belle Glade, Fla.	1000d
WMOP	Ocala, Fla.	1000d
WCGA	Calhoun, Ga.	1000d
WCRY	Macon, Ga.	250d
WEAS	Savannah, Ga.	5000d
KSIR	Wichita, Kan.	250d
WKYW	Louisville, Ky.	1000d
WLSI	Pikeville, Ky.	5000d
KREH	Oakdale, La.	250d
WCME	Brunswick, Maine	1000d
WATC	Gaylord, Mich.	1000d
KTIS	Minneapolis, Minn.	1000d
WDDT	Greenville, Miss.	1000d
KFAL	Fulton, Mo.	1000d
KJSK	Columbus, Nebr.	1000d
WOTW	Nashau, N.H.	1000d
WBRV	Boonville, N.Y.	1000d
WKAJ	Saratoga Springs, N.Y.	250d
WAYN	Rockingham, N.C.	1000d
WIAM	Williamston, N.C.	1000d
KFNW	Fargo, N.Dak.	1000d
WCNS	Canton, Ohio	500d
WFRO	Fremont, Ohio	500d
WCPA	Clearfield, Pa.	1000d
WFLN	Philadelphia, Pa.	1000d
WKXV	Knoxville, Tenn.	1000d
WCOR	Lebanon, Tenn.	500d
KALT	Atlanta, Tex.	1000d
KMCO	Conroe, Tex.	500d
KFLD	Floydada. Tex.	250d
KCLW	Hamilton, Tex.	250d
WODY	Bassett, Va.	500d
WAFC	Staunton, Va.	1000d
KUEN	Wenatchee, Wash.	1000d
WATK	Antigo, Wis,	250d

910—329.5

WDVC	Dadeville, Ala.	500d
KPHO	Phoenix, Ariz.	5000
KLCN	Blytheville, Ark.	5000d
KAMD	Camden, Ark.	1000
KDEO	El Cajon, Calif.	1000
KEWB	Oakland, Calif.	5000
KOXR	Oxnard, Calif.	1000d
KPOF	nr. Denver, Colo.	5000
WHAY	New Britain, Conn.	5000
WPLA	Plant City, Fla.	1000d
WGAF	Valdosta, Ga.	5000
KBGN	Caldwell, Ida.	1000d
WAKO	Lawrenceville, Ill.	500d
WSUI	Iowa City, Iowa	5000
KGTY	Salina, Kans.	00000
WLCS	Baton Rouge, La.	1000
WABI	Bangor, Maine	5000
WFDF	Flint, Mich.	5000
WCOC	Meridian, Miss.	5000
KOYN	Billings, Mont.	1000d
KYSS	Missoula, Mont.	1000d
KBIM	Roswell, N.Mex.	5000d
WLAS	Jacksonville, N.C.	5000d
KCJB	Minot, N.Dak.	1000
WBRJ	Marietta, O.	
WPFB	Middletown, Ohio	1000
KGLC	Miami, Okla.	1000
KURY	Brookings, Oreg.	1000d
WAVL	Apollo, Pa.	1000d
WGBI	Scranton, Pa.	1000
WSBA	York, Pa.	5000
WPRP	Ponce, P.R.	5000
WNCG	North Charleston, S.C.	500d
WORD	Spartanburg, S.C.	5000d
WJCW	Johnson City, Tenn.	5000
WEPG	S. Pittsburgh, Tenn.	500d
KNAF	Fredericksburg, Tex.	1000d
KRIO	McAllen, Tex.	5000
KRRV	Sherman, Tex.	1000
KALL	Salt Lake City, Utah	5000
WVTR	White River Junction, Vermont	1000d
WRNL	Richmond, Va.	5000
WHYE	Roanoke, Va.	1000d
KORD	Pasco, Wash.	1000d
KIXI	Seattle, Wash.	1000
KISN	Vancouver, Wash.	1000
WHSM	Hayward, Wis.	5000d
WDOR	Sturgeon Bay, Wis,	1000d

920—325.9

WCTA	Adalusia, Ala.	5000
WWWR	Russellville. Ala.	1000d
KARK	Little Rock, Ark.	5000
KLOC	Ceres, Calif.	500d
KDES	Palm Springs, Calif.	1000d
KVEC	San Luis Obispo, Cal.	1000
KREX	Grd. Junction, Colo.	5000
KLMR	Lamar, Colo.	1000
WMEG	Eau Gallie, Fla.	1000d
WGST	Atlanta, Ga.	5000
WVOH	Hazelhurst, Ga.	500wd
WGNU	Granite City, Ill,	500d
WMOK	Metropolis, Ill.	1000d
WBAA	W. Lafayette, Ind.	5000
KFNF	Council Bluffs, Ia.	5000
WTCW	Whitesburg, Ky.	5000d
WBOX	Bogalusa. La.	1000d
KTOC	Jonesboro, La.	1000d
WPTX	Lexington Pk., Md.	500d
WMPL	Hancock, Mich.	1000d
KDHL	Faribault, Minn.	1000
KWAD	Wadena, Minn.	1000
KRAM	Las Vegas, Nev.	1000
KOLO	Reno, Nev.	1000
KQEO	Albuquerque, N.Mex.	1000
WTTM	Trenton, N.J.	1000
WKRT	Cortland, N.Y.	1000
WGHQ	Kingston, N.Y.	5000d
WIRD	Lake Placid, N.Y.	1000
WBBB	Burlington, N.C.	5000d
WMNI	Columbus, Ohio	1000
KGAL	Lebanon, Oreg.	1000
WKVA	Lewistown, Pa.	1000
WJAR	Providence, R.I.	5000
WTND	Orangeburg, S.C.	1000d
KEZU	Rapid City, S.Dak.	1000d
WLIV	Livingston, Tenn.	1000d
KELP	El Paso, Tex.	1000
KECK	Odessa, Tex.	1000
KTLW	Texas City, Tex.	1000d
KITN	Olympia, Wash.	1000d
KXLY	Spokane, Wash.	5000
WMMN	Fairmont, W.Va.	5000
WOKY	Milwaukee, Wis.	5000

930—322.4

WETO	Gadsden, Ala.	1000d
KTKN	Ketchikan, Alaska	1000
KAPR	Douglas, Ariz.	1000d
KFGT	Flagstaff, Ariz.	1000d
KHJ	Los Angeles, Calif.	5000
KNGL	Paradise, Calif.	500d
KIUP	Durango, Colo.	5000
WKSB	Milford, Del.	500d
WHAN	Haines City, Fla.	1000
WJAX	Jacksonville, Fla.	5000
WKXY	Sarasota, Fla.	1000
WMGR	Bainbridge, Ga.	5000
KSEI	Pocatello, Idaho	5000
WTAD	Quincy, Ill.	5000
WHON	Centerville, Ind.	
WKCT	Bowling Green, Ky.	1000
WFMD	Frederick, Md.	5000
WREB	Holyoke, Mass.,	500d
WBCK	Battle Creek, Mich.	5000
KKIN	Aitkin, Minn.	1000d
WSLI	Jackson, Miss.	5000
KWOC	Poplar Bluff, Mo.	5000
KOFI	Kalispell, Mont.	5000d
KOGA	Ogallala, Nebr.	500d
WWNH	Rochester, N.H.	5000d
WPAT	Paterson, N.J.	5000
WBEN	Buffalo, N.Y.	5000
WSOC	Charlotte, N.C.	5000
WITN	Washington, N.C.	5000
WEOL	Elyria, Ohio	1000
WKY	Oklahoma City, Okla.	5000
KAGI	Grants Pass, Oreg.	5000
WCNR	Bloomsburg, Pa.	1000d
KSDN	Aberdeen, S.D.	1000
WSEV	Sevierville, Tenn.	5000d
KDET	Center, Tex.	1000d
KITE	San Antonio, Tex.	5000
WLLL	Lynchburg, Va.	1000d

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
KENY	Bellingham-Ferndale, Wash.	1000d
WSAZ	Huntington, W.Va.	5000
KROE	Sheridan, Wyo.	1000d
WLBL	Auburndale, Wis.	5000d

940—319.0

KHOS	Tucson, Ariz.	250
KFRE	Fresno, Calif.	50000
WINE	Brookfield, Conn.	1000d
WINZ	Miami, Fla.	50000
WMAZ	Macon, Ga.	50000
KAHU	Waipahu, Hawaii	10000
WMIX	Mt. Vernon, Ill.	5000d
KIOA	Des Moines, Iowa	10000
WCND	Shelbyville, Ky.	
WYLD	New Orleans, La.	1000
WJOR	South Haven, Mich.	1000d
WCPC	Houston, Miss.	50000d
KSWM	Aurora, Mo.	500d
KVSH	Valentine, Nebr.	5000d
WFNC	Fayetteville, N.C.	10000
WCIT	Lima, Ohio	250d
KGRL	Bend, Oreg.	1000d
WESA	Charleroi, Pa.	250d
WGRP	Greenville, Pa.	1000d
WIPR	San Juan, P.R.	10000
KIXZ	Amarillo, Tex.	5000
KTON	Belton, Tex.	1000d
KATQ	Texarkana, Tex.	1000d
WNRG	Grundy, Va.	5000d
KQOT	Yakima, Wash.	250d
WFAW	Ft. Atkinson, Wis.	250

950—315.6

WRMA	Montgomery, Ala.	1000d
KXJK	Forrest City, Ark.	5000d
KFSA	Ft. Smith, Ark.	1000
KAHI	Auburn, Calif.	5000d
KIMN	Denver, Colo.	5000
WLOF	Orlando, Fla.	5000
WGTA	Summerville, Ga.	5000d
WGOV	Valdosta, Ga.	5000
KBOI	Boise, Idaho	5000
KLER	Orofino, Idaho	1000d
WAAF	Chicago, Ill.	1000d
WXLW	Indianapolis, Ind.	5000d
KOEL	Oelwein, Iowa	1000
KJRG	Newton, Kans.	500d
WBVL	Barbourville, Ky.	1000d
WAGM	Presque Isle, Maine	5000
WORL	Boston, Mass.	5000d
WWJ	Detroit, Mich.	5000
KRSI	St. Louis Park, Minn.	1000d
WBKH	Hattiesburg, Miss.	5000d
KLIK	Jefferson City, Mo.	5000d
KLHS	Lordsburg, N. Mex.	1000d
WHVW	Hyde Park, N.Y.	500d
WBBF	Rochester, N.Y.	1000
WIBX	Utica, N.Y.	5000
WPET	Greensboro, N.C.	5000d
KYES	Roseburg, Oreg.	1000d
WNCC	Barnesboro, Pa.	500d
WPEN	Philadelphia, Pa.	5000
WBER	Moncks Corner, S. C.	500d
WSPA	Spartanburg, S.C.	5000
KWAT	Watertown, S.Dak.	1000
WAGG	Franklin, Tenn.	1000d
KDSX	Denison, Tex.	500
KPRC	Houston, Tex.	5000
KSEL	Lubbock, Tex.	5000
WXGI	Richmond, Va.	5000d
KMER	Kemmerer, Wash.	1000
KJR	Seattle, Wash.	5000
WERL	Eagle River, Wis.	1000d
WKAZ	Charleston, W.Va.	5000
WKTS	Sheboygan, Wis.	500d
KMER.	Kemmerer, Wyo.	1000

960—312.3

WBRC	Birmingham, Ala.	5000
WMOZ	Mobile, Ala.	1000
WCVQ	Kodiak, Alaska	250
KOOL	Phoenix, Ariz.	5000
KAVR	Apple Valley, Calif.	5000d
KNEZ	Lompoc, Calif.	500
KABL	Oakland, Calif.	5000
WELI	New Haven, Conn.	5000
WGRO	Lake City, Fla.	500d
WJCM	Sebring, Fla.	1000d
WFAZ	Albany, Ga.	5000d
WRFC	Athens, Ga.	5000
KSRA	Salmon, Idaho	1000d
WDLM	E. Moline, Ill.	1000d
WSBT	South Bend, Ind.	5000
KMA	Shenandoah, Iowa	5000
WPRT	Prestonsburg, Ky.	5000d
KROF	Abbeville, La.	1000d
WBOC	Salisbury, Md.	5000
WFGM	Fitchburg, Mass.	1000
WHAK	Rogers City, Mich.	5000d
KLTF	Little Falls, Minn.	500d
WABG	Greenwood, Miss.	1000
KFVS	Cape Girardeau, Mo.	5000
KNEB	Scottsbluff, Nebr.	1000
KWYK	Farmington, N.Mex.	1000d
KRIK	Roswell, N. Mex.	1000d
WEAV	Plattsburg, N.Y.	5000
WAAK	Dallas, N.C.	1000d
WFTC	Kinston, N.C.	5000
WWST	Wooster, Ohio	1000d
KGWA	Enid, Okla.	1000
KLAD	Klamath Falls, Oreg.	5000d
WHYL	Carlisle, Pa.	5000d
WADP	Kane, Pa.	1000d
WATS	Sayre, Pa.	1000d
WBEU	Beaufort, S.C.	1000d
WBMC	McMinnville, Tenn.	500d
KIMP	Mt. Pleasant, Tex.	1000d
KGKL	San Angelo, Tex.	5000
KOVO	Provo, Utah	5000
WDBJ	Roanoke, Va.	5000
KALE	Richland, Wash.	1000
WTCH	Shawano, Wis.	1000

970—309.1

WERH	Hamilton, Ala.	5000d
WTBF	Troy, Ala.	5000
KVWM	Show Low, Ariz.	1000d
KNEA	Jonesboro, Ark.	1000d
KBIS	Bakersfield, Calif.	1000
KCHV	Coachella, Calif.	5000
KBEE	Modesto, Calif.	1000
KFEL	Pueblo, Colo.	1000d
WFLA	Tampa, Fla.	5000
WIIN	Atlanta, Ga.	5000d
WVOP	Vidalia, Ga.	5000d
KHBC	Hilo, Hawaii	1000
KAYT	Rupert, Idaho	1000d
WMAY	Springfield, Ill.	1000
WAVE	Louisville, Ky.	5000
KSYL	Alexandria, La.	1000
WCSH	Portland, Maine	5000
WAMD	Aberdeen, Md.	500
WESO	Southbridge, Mass.	1000d
WJAN	Ishpeming, Mich.	5000d
WKHM	Jackson, Mich.	1000
KQAQ	Austin, Minn.	5000d
KOOK	Billings, Mont.	5000
KJLT	No. Platte, Nebr.	5000d
KVEG	Las Vegas, Nev.	500d
WJRZ	Newark, N.J.	5000
KDCE	Espanola, N. M.	1000d
WEBR	Buffalo, N.Y.	5000
WCHN	Norwich, N.Y.	500d
WRCS	Ahoskie, N.C.	1000d
WWIT	Canton, N.C.	1000d
WDAY	Fargo, N.Dak.	5000
WREO	Ashtabula, Ohio	5000
WATH	Athens, Ohio	1000d
KAKC	Tulsa, Okla.	1000
KOIN	Portland, Oreg.	5000
WWSW	Pittsburgh, Pa.	5000
WJMX	Florence, S.C.	5000
KASE	Austin, Tex.	1000d
KBSN	Crane, Tex.	1000d
KNOK	Ft. Worth, Tex.	1000d
WIVI	Christiansted, V. I.	5000
WYPR	Danville, Va.	1000d
WBVA	Waynesboro, Va.	500d
KREM	Spokane, Wash.	5000
WWYO	Pineville, W.Va.	1000d
WHA	Madison, Wis.	5000d
WIGL	Superior, Wis.	500d

980—305.9

WKLF	Clanton, Ala.	1000d
WXLL	Big Delta, Alaska	100
KINS	Eureka, Calif.	5000
KEAP	Fresno, Calif.	500d
KFWB	Los Angeles, Calif.	5000
KCTY	Salinas, Calif.	1000d
KGLN	GlenwoodSprgs., Colo.	1000d
WSUB	Groton, Conn.	1000d
WRC	Washington, D.C.	5000
WDVH	Gainesville, Fla.	5000d
WTOT	Marianna, Fla.	1000d
WBOP	Pensacola, Fla.	1000d
WLOD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	500d
WRIP	Rossville, Ga.	500d
KUPI	Idaho Falls, Idaho	1000d
KSGM	Chester, Ill.	500
WITY	Danville, Ill.	1000
KREB	Shreveport, La.	5000d
WCAP	Lowell, Mass.	1000d
WDMC	Otsego, Mich.	500
WPBC	Minneapolis, Minn.	5000
WAPF	McComb, Miss.	1000d
KMBC	Kansas City, Mo.	5000
KLYQ	Hamilton, Mont.	1000d
KVLV	Fallon, Nev.	5000d
KICA	Clovis, N. Mex.	1000
KMIN	Grants, N. Mex.	1000d
WTRY	Troy, N.Y.	5000
WKLM	Wilmington, N.C.	5000d
WAAA	Win.-Salem, N.C.	1000d
WONE	Dayton, Ohio	5000
WILK	Wilkes-Barre, Pa.	5000
WAZS	Summerville, S.C.	500d
WRBI	Winnsboro, S.C.	500d
KDSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
KFRO	Rosenberg, Tex.	1000d
KSVC	Richfield, Utah	5000
WFHG	Bristol, Va.	5000
WMEK	Chase City, Va.	500d
KUTI	Yakima, Wash.	5000d
WHAW	Weston, W.Va.	1000d
WCUB	Manitowoc, Wis.	1000d
WPRE	Prairie du Chien, Wis.	1000

990—302.8

WEIS	Center, Ala.	250
WWWF	Fayette, Ala.	1000d
WTCB	Flomaton, Ala.	500d
KTKT	Tucson, Ariz.	10000
KKIS	Pittsburg, Calif.	5000
KGUD	Santa Barbara, Calif.	1000d
KLIR	Denver, Colo.	1000d
WBZY	Torrington, Conn.	1000d
WFAB	Miami, Fla.	5000
WHOO	Orlando, Fla.	50000
WDWD	Dawson, Ga.	1000d
WGML	Hinesville, Ga.	250d
KTRG	Honolulu, Hawaii	5000
WCAZ	Carthage, Ill.	1000d
WITZ	Jasper, Ind.	1000d
KAYL	Storm Lake, Iowa	250d
KRSL	Russell, Kans.	250d
WJMR	New Orleans, La.	250d
KRIH	Rayville, La.	250d
WCRM	Clare, Mich.	250d
WABO	Waynesboro, Miss.	250d
KRMO	Monett, Mo.	250d
KSVP	Artesia, N.Mex.	1000
WEEB	Southern Pines, N.C.	5000d
WJEH	Gallipolis, Ohio	1000d
WTIG	Massillon, Ohio	250d
KRKT	Albany, Oreg.	250d
WIBG	Philadelphia, Pa.	50000
WVSC	Somerset, Pa.	250d
WPRA	Mayaguez, P.R.	10000
WLKW	Providence, R.I.	50000
WAKN	Aiken, S.C.	1000d
WNOX	Knoxville, Tenn.	10000
KWAM	Memphis, Tenn.	1000d
KTRM	Beaumont, Tex.	1000
KAML	Kenedy, Tex.	250d
KNIN	Wichita Falls, Tex.	10000
KDYL	Tooele, Utah	1000d
WNRV	Narrows, Va.	1000d
WANT	Richmond, Va.	1000d
WKLJ	Sparta, Wis.	250

1000—299.8

WCFL	Chicago, Ill.	50000
WSPF	Hickory, N.C.	1000d
KTOK	Okla. City, Okla.	5000
KSTA	Coleman, Tex.	250d
KGRI	Henderson, Tex.	250d
WHWB	Rutland, Vt.	1000d
WBNB	Charlotte Amalie, Virgin Islands	1000
KOMO	Seattle, Wash.	50000

1010—296.9

KCAC	Phoenix, Ariz.	500d
KVNC	Winslow, Ariz.	1000
KLRA	Little Rock, Ark.	10000
KCHJ	Delano, Calif.	5000
KCMJ	Palm Sprgs., Calif.	1000
KSAY	San Fran., Calif.	10000d
WCNU	Crestview, Fla.	1000d
WZRD	Jacksonville Beach, Florida	2500d
WINQ	Tampa, Fla.	50000d
WGUN	Decatur, Ga.	50000d
KATN	Boise, Idaho	1000d
WCSI	Columbus, Ind.	500d
KSMN	Mason City, Iowa	1000d
KIND	Independence, Kans.	250d
KDLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WMRT	Lansing, Mich.	5000d
WRCR	Maplewood, Minn.	
WMOX	Meridian, Miss.	10000
KCHI	Chillicothe, Mo.	250d
KXEN	Festus, Mo.	50000d
KRVN	Lexington, Nebr.	25000d
WCNL	Newport, N.H.	250d
WINS	New York, N.Y.	50000
WABZ	Albermarle, N.C.	1000d
WFGW	Black Mountain, N.C.	10000d
WELS	Kinston, N.C.	1000d
WIOI	New Boston, Ohio	1000d
KBEV	Portland, Oreg.	1000d
WUNS	Lewisburg, Pa.	250d
WHIN	Gallatin, Tenn.	1000d
WORM	Savannah, Tenn.	250d
KBUY	Amarillo, Tex.	5000
KODA	Houston, Tex.	1000d
KAWA	Waco, Tex.	10000d
WELK	Charlottesville, Va.	1000d
WMEV	Marion, Va.	1000d
WPMH	Portsmouth, Va.	5000d
WCST	Berkeley Sprgs., W.Va.	250d
WSPT	Stevens Pt., Wis.	1000d

1020—293.9

KGBS	Los Angeles, Calif.	50000
WCIL	Carbondale, Ill.	1000d
WPEO	Peoria, Ill.	1000d
KDKA	Pittsburgh, Pa.	50000

1030—291.1

WBZ	Boston, Mass.	50000
KCTA	Corpus Christi, Tex.	50000d

1040—288.3

KHVH	Honolulu, Hawaii	5000
WHO	Des Moines, Iowa	50000
KIXL	Dallas, Tex.	1000d

1050—285.5

WRFS	Alexander City, Ala.	1000d
WCRI	Scottsboro, Ala.	250d
KVLC	Little Rock, Ark.	1000d
KOFY	San Mateo, Calif.	1000d
KWSO	Wasco, Calif.	1000d
KLMO	Longmont, Colo.	250d
WJSB	Crestview, Fla.	1000d
WIVY	Jacksonville, Fla.	1000d
WHBO	Tampa, Fla.	250d
WRMF	Titusville, Fla.	500d
WAUG	Augusta, Ga.	5000d
WBIE	Marietta, Ga.	500d
WMNZ	Montezuma, Ga.	250d
WDZ	Decatur, Ill.	1000d
WKWB	Plymouth, Ind.	
KNCO	Garden City, Kans.	1000d
WNES	Central City, Ky.	500d
KLPL	Lake Providence, La.	250d
KCIJ	Shreveport, La.	250d
KVPI	Villa Platte, La.	250d
WMSG	Oakland, Md.	500d
WQMR	Silver Sprg., Md.	1000d
WPAG	Ann Arbor, Mich.	5000d
KLOH	Pipestone, Minn.	1000d
WACR	Columbus, Miss.	1000d
KMIS	Portageville, Mo.	250d
KSIS	Sedalia, Mo.	1000d
KLVC	Las Vegas, Nev.	500d
WBNC	Conway, N.H.	1000d
WSEN	Baldwinsville, N.Y.	250d
WSTS	Massena, N.Y.	1000d
WHN	New York, N.Y.	50000
WFSC	Franklin, N.C.	1000d
WLON	Lincolnton, N.C.	1000d
WWGP	Sanford, N.C.	1000d
WZIP	Cincinnati, Ohio	1000d
KCCO	Lawton, Okla.	250d
KFMJ	Tulsa, Okla.	1000d
KUBE	Pendleton, Oreg.	1000d
KEED	Springfield, Oreg.	1000d
WBUT	Butler, Pa.	1000d
WWDS	Everett, Pa.	250d
WLYC	Williamsport, Pa.	1000d
WSMT	Sparta, Tenn.	1000d
KLEN	Killeen, Tex.	250d
KFAZ	Liberty, Tex.	250d
KPLA	Plainview, Tex.	1000d
KCAS	Slaton, Tex.	250d
WGAT	Gate City, Va.	250d
WBRG	Lynchburg, Va.	1000d
WCMS	Norfolk, Va.	1000d
KBLE	Seattle, Wash.	1000d
WCEF	Parkersburg, W. Va.	5000d
WECL	Eau Claire, Wis.	1000d
WLIP	Kenosha, Wis.	250d
KWIV	Douglas, Wyo.	250d

1060—282.8

KUPD	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
WNOE	New Orleans, La.	50000
WHFB	Benton Harbor, Mich.	1000d
WMAP	Monroe, N.C.	250d
WHOF	Canton, Ohio	5000
WRCV	Philadelphia, Pa.	50000
WRJS	San German, P. R.	250

1070—280.2

WAPI	Birmingham, Ala.	50000
KNX	Los Angeles, Calif.	50000
WVCG	Coral Gables, Fla.	1000d
WIBC	Indianapolis, Ind.	50000
KFDI	Wichita, Kans.	10000
KHMO	Hannibal, Mo.	5000
WHPE	High Point, N.C.	1000d
WMIA	Arecibo, P.R.	500
WFLI	Lookout Mtn., Tenn.	10000
WDIA	Memphis, Tenn.	50000
KOPY	Alice, Tex.	1000
WKOW	Madison, Wis.	10000

1080—277.6

KSCO	Santa Cruz, Calif.	10000
WTIC	Hartford, Conn.	50000
WKLO	Louisville, Ky.	5000
WOAP	Owosso, Mich.	1000d
WUFO	Amherst, N.Y.	1000

Kc.	Wave Length	W.P.
WEWO	Laurinburg, N.C.	1000d
WMVR	Sidney, O.	250d
KWJJ	Portland, Oreg.	50000
WEEP	Pittsburgh, Pa.	1000d
KRLD	Dallas, Tex.	50000
1090—275.1		
KAAY	Little Rock, Ark.	50000
WCRA	Effingham, Ill.	250d
KHAI	Honolulu, Hawaii	5000
KNWS	Waterloo, Iowa	1000d
WBAL	Baltimore, Md.	50000
WILD	Boston, Mass.	1000d
WMUS	Muskegon, Mich.	1000d
WERB	Garden City, Mich.	
WKTE	King, N.C.	500d
KING	Seattle, Wash.	50000
1100—272.6		
KFAX	San Francisco, Calif.	50000
WLBB	Carrollton, Ga.	250d
WHLI	Hempstead, N.Y.	10000d
KYW	Cleveland, Ohio	50000
WGPA	Bethlehem, Pa.	250d
1110—270.1		
WALT	Tampa, Fla.	50000d
KIPA	Hilo, Hawaii	1000
WMBI	Chicago, Ill.	5000d
KFAB	Omaha, Nebr.	50000
WBT	Charlotte, N.C.	50000
KBND	Bend, Oreg.	5000
WNAR	Norristown, Pa.	500d
WVJP	Caguas, P.R.	250
WHIM	Providence, R.I.	1000d
WPHC	Waverly, Tenn.	1000d
KDRY	Alamo Heights, Tex.	1000d
1120—267.7		
WUST	Bethesda, Md.	250d
KMOX	St. Louis, Mo.	50000
WWOL	Buffalo, N.Y.	1000d
KCLE	Cleburne, Tex.	250d
1130—265.3		
KRDU	Dinuba, Calif.	1000
KSDO	San Diego, Calif.	5000
KLEI	Kailua, Hawaii	1000
KWKH	Shreveport, La.	50000
WCAR	Detroit, Mich.	50000
WDGY	Minneapolis, Minn.	50000
WNEW	New York, N.Y.	50000
1140—263.0		
KRAK	Sacramento, Calif.	50000
WMIE	Miami, Fla.	10000
KGEM	Boise, Idaho	10000
WSIV	Pekin, Ill.	5000d
KLPR	Oklahoma City, Okla.	1000d
WITA	San Juan, P.R.	500
KSOO	Sioux Falls, S.Dak.	10000
KORC	Mineral Wells, Tex.	250d
WRVA	Richmond, Va.	50000
1150—260.7		
WBCA	Bay Minette, Ala.	1000d
WGEA	Geneva, Ala.	1000d
WJRD	Tuscaloosa, Ala.	5000
KCKY	Coolidge, Ariz.	1000
KXLR	No. Little Rock, Ark.	5000
KFSG	Los Angeles, Calif.	2500
KRKD	Los Angeles, Calif.	5000
KJAX	Santa Rosa, Calif.	5000
KGMC	Englewood, Colo.	1000d
WCNX	Middletown, Conn.	500d
WDEL	Wilmington, Del.	5000
WNDB	Daytona Bch., Fla.	1000
WTMP	Tampa, Fla.	5000d
WFPM	Fort Valley, Ga.	1000d
WJEM	Valdosta, Ga.	1000d
WGGH	Marion, Ill.	5000d
WJRL	Rockford, Ill.	500d
KWKY	Des Moines, Iowa	1000
KSAL	Salina, Kans.	5000
WMST	Mt. Sterling, Ky.	500d
WLOC	Mumfordville, Ky.	1000d
WJBO	Baton Rouge, La.	5000
WGHM	Skowhegan, Maine	5000d
WHMC	Gaithersburg, Mo.	1000
WCOP	Boston, Mass.	5000
WCEN	Mt. Pleasant, Mich.	5000
KASM	Albany, Minn.	1000d
WXTN	Lexington, Miss.	500d
KRMS	Osage Beach, Mo.	1000d
KSEN	Shelby, Mont.	1000
KDEF	Albuquerque, N.Mex.	1000
WRUN	Utica, N.Y.	5000
WBAG	Burlington, N.C.	1000d
WGBR	Goldsboro, N.C.	5000
WCUE	Cuyahoga Falls, Ohio	1000d
WIMA	Lima, Ohio	1000
KNED	McAlester, Okla.	1000
KAGO	Klamath Falls, Oreg.	5000
WHUN	Huntingdon, Pa.	5000d
WYNS	Lehighton, Pa.	1000d
WKPA	New Kensington, Pa.	1000d
WDIX	Orangeburg, S.C.	5000
WTYC	Rock Hill, S.C.	1000d
WSNW	Seneca Township, South Carolina	1000d
KIMM	Rapid City, S.Dak.	5000d
WAPO	Chattanooga, Tenn.	5000
WCRK	Morristown, Tenn.	1000
WTAW	Bryan, Tex.	1000d
KCCT	Corpus Christi, Tex.	1000d
KIZZ	El Paso, Tex.	1000d
KVIL	Highland Park, Tex.	1000d
KJBC	Midland, Tex.	1000d
KPNG	Port Neches, Tex.	500d
KOLJ	Quanah, Tex.	500d
KBER	San Antonio, Tex.	1000d
KOFE	Pullman, Wash.	1000d
KAYO	Seattle, Wash.	5000
KKEY	Vancouver, Wash.	1000d
WABH	Deerfield, Va.	1000d
WELC	Welch, W.Va.	1000d
WAXX	Chippewa Falls, Wis.	5000d
WISN	Milwaukee, Wis.	5000
1160—258.5		
WJJD	Chicago, Ill.	50000
KSL	Salt Lake City, Utah	50000
1170—256.3		
WCOV	Montgomery, Ala.	10000
KCBQ	San Diego, Calif.	50000
KLOK	San Jose, Calif.	10000
KOHO	Honolulu, Hawaii	1000
WLBH	Mattoon, Ill.	250d
KSTT	Davenport, Iowa	1000
KVOO	Tulsa, Okla.	50000
WLEO	Ponce, P.R.	250
KPUG	Bellingham, Wash.	1000
WWVA	Wheeling, W.Va.	50000
1180—254.1		
WLDS	Jacksonville, Ill.	1000d
WHAM	Rochester, N.Y.	50000
1190—252.0		
KRDS	Tolleson, Ariz.	250
KEZY	Anaheim, Calif.	1000
KNBA	Vallejo, Calif.	250d
WOWO	Ft. Wayne, Ind.	50000
WANN	Annapolis, Md.	10000d
WKOX	Fram'gham, Mass.	1000d
WLIB	New York, N.Y.	10000
KEX	Portland, Oreg.	50000
KLIF	Dallas, Tex.	50000
1200—249.9		
WOAI	San Antonio, Tex.	50000
1210—247.8		
KZOO	Honolulu, Hawaii	1000
WCNT	Centralia, Ill.	1000d
WKNX	Saginaw, Mich.	10000d
WADE	Wadesboro, N.C.	1000d
WAVI	Dayton, Ohio	250d
WCAU	Philadelphia, Pa.	50000
1220—245.8		
WEZB	Birmingham, Ala.	1000d
WABF	Fairhope, Ala.	1000
KVSA	McGehee, Ark.	1000d
KLIP	Fowler, Calif.	250d
KIBE	Palo Alto, Calif.	1000d
KKAR	Pomona, Calif.	250d
KFSC	Denver, Colo.	1000d
WDEE	Hamden, Conn.	1000d
WQTY	Arlington, Fla.	1000d
WOSL	Kissimmee, Fla.	1000d
WMET	Miami, Fla.	250d
WSAF	Sarasota, Fla.	1000d
WCLB	Camilla, Ga.	1000d
WPLK	Rockmart, Ga.	500d
WSFT	Thomaston, Ga.	250d
WLPO	LaSalle, Ill.	1000d
WKRS	Waukegan, Ill.	1000d
WSLM	Salem, Ind.	5000d
KJAN	Atlantic, Iowa	250d
KOUR	Independence, Iowa	250d
KOFO	Ottawa, Kans.	250d
WFKN	Franklin, Ky.	250d
KBCL	Shreveport, La.	250d
WLBI	Denham Springs, La.	250d
WSME	Sanford, Maine	1000d
WBCH	Hastings, Mich.	250d
WAVN	Stillwater, Minn.	5000d
WMDC	Hazlehurst, Miss.	250d
KBHM	Branson, Mo.	1000d
KLPW	Union, Mo.	1000d
WKBK	Keene, N.H.	1000d
WGNY	Newburgh, N.Y.	5000d
WSOQ	N. Syracuse, N.Y.	1000d
WKMT	Kings Mtn., N.C.	1000d
WREV	Reidsville, N.C.	1000d
WENC	Whiteville, N.C.	1000d
KEYD	Oakes, N.Dak.	1000d
WGAR	Cleveland, Ohio	50000
WERT	Van Wert, Ohio	250d
KGYN	Guymon, Okla.	1000d
KBLY	Goldbeach, Oreg.	1000d
KAPT	Salem, Ore.	1000
WJUN	Mexico, Pa.	1000d
WRIB	Providence, R.I.	1000d
WALD	Walterboro, S.C.	1000d
WFWL	Camden, Tenn.	250d
WCPH	Etowah, Tenn.	1000d
WHEY	Millington, Tenn.	250d
KVLL	Livingston, Tex.	250d
KZEE	Weatherford, Tex.	250d
WLSD	Big Stone Gap, Va.	1000d
WFAX	Falls Church, Va.	5000d
KASY	Auburn, Wash.	250d
KOZI	Chelan, Wash.	1000d
WRNE	Wis. Rapids, Wis.	500d
1230—243.8		
WAUD	Auburn, Ala.	1000
WJBB	Haleyville, Ala.	1000
WBHP	Huntsville, Ala.	1000
WNUZ	Talladega, Ala.	250
WTBC	Tuscaloosa, Ala.	250
KIFW	Sitka, Alaska	250
KSUN	Bisbee, Ariz.	250
KAAA	Kingman, Ariz.	1000
KRIZ	Phoenix, Ariz.	250
KATO	Safford, Ariz.	250
KINO	Winslow, Ariz.	1000
KCON	Conway, Ark.	250
KFPW	Ft. Smith, Ark.	1000
KBTM	Jonesboro, Ark.	1000
KGEE	Bakersfield, Calif.	1000
KWTC	Barstow, Calif.	1000
KIBS	Bishop, Calif.	1000
KXO	El Centro, Calif.	250
KOAC	Ft. Bragg, Calif.	250
KGFJ	Los Angeles, Calif.	1000
KPRL	Paso Robles, Calif.	1000
KRDG	Redding, Calif.	250
KWG	Stockton, Calif	1000
KEXO	Grand Junc., Colo.	250
KBRR	Leadville, Colo.	250
KDZA	Pueblo, Colo.	1000
KGEK	Sterling, Colo.	1000d
WINF	Manchester, Conn.	1000
WGGG	Gainesville, Fla.	1000
WONN	Lakeland, Fla.	1000
WMAF	Madison, Fla.	1000
WSBB	New Smyrna Bch., Florida	1000
WNVY	Pensacola, Fla.	1000
WCNH	Quincy, Fla.	1000d
WJNO	W. Palm Beach, Fla.	250
WBIA	Augusta, Ga.	1000d
WBLJ	Dalton, Ga.	1000
WXLI	Dublin, Ga.	1000
WFOM	Marietta, Ga.	1000
WSOK	Savannah, Ga.	1000
WAYX	Waycross, Ga.	1000
KBAR	Burley, Idaho	1000
KORT	Grangeville, Idaho	250
KRXK	Rexburg, Idaho	1000
WJBC	Bloomington, Ill.	1000
WQUA	Moline, Ill.	1000
WHCO	Sparta, Ill.	250
WJOB	Hammond, Ind.	1000
WSAL	Logansport, Ind.	1000
WTCJ	Tell City, Ind.	1000
WBOW	Terre Haute, Ind.	1000d
KFJB	Marshalltown, Iowa	1000
WHIR	Danville, Ky.	1000d
WHOP	Hopkinsville, Ky.	1000
WMLF	Pineville, Ky.	1000d
KLIC	Monroe, La.	1000d
WSHO	New Orleans, La.	1000
KSLO	Opelousas, La.	1000
WSJR	Madawaska, Me.	1000
WQDY	Calais, Maine	1000d
WITH	Baltimore, Md.	1000d
WCUM	Cumberland, Md.	1000
WMNB	No. Adams, Mass.	1000d
WESX	Salem, Mass.	1000
WNEB	Worcester, Mass.	1000
WJEF	Grand Rapids, Mich.	1000
WIKB	Iron River, Mich.	1000
WMPC	Lapeer, Mich.	250
WSOO	Sit. Ste. Marie, Mich.	1000
WSTR	Sturgis, Mich.	1000d
KXRA	Alexandria, Minn.	250
WKLK	Cloquet, Minn.	1000
KGHS	Internat'l Falls, Minn.	250
KYSM	Mankato, Minn.	1000
KMRS	Morris, Minn.	250
KTRF	Thief Riv. Flls., Minn.	1000
KWNO	Winona, Minn.	1000d
WCMA	Corinth, Miss.	1000
WHSY	Hattiesburg, Miss.	1000
WSSO	Starkville, Miss.	250
WAZF	Yazoo City, Miss.	250
KODE	Joplin, Mo.	1000
KLWT	Lebanon, Mo.	250
KNCM	Moberly, Mo.	1000
KBMN	Bozeman, Mont.	1000d
KHDN	Hardin Mont.	1000
KXLO	Lewiston, Mont.	1000
KLCB	Libby, Mont.	250
KTNC	Falls City, Nebr.	100
KHAS	Hastings, Nebr.	250
KELY	Ely, Nev.	250
KLAS	Las Vegas, Nev.	250
KCBN	Reno, Nev.	250
WMOU	Berlin, N.H.	1000d
WTSV	Claremont, N.H.	1000
WCMC	Wildwood, N.J.	100
KALG	Alamogordo, N.Mex.	250
KOTS	Deming, N.Mex.	250
KYVA	Gallup, N. Mex.	1000
KFUN	Las Vegas, N.Mex.	250
KRSY	Roswell, N. Mex.	1000
WNIA	Cheektowaga, N.Y.	500
WENY	Elmira, N.Y.	1000
WIGS	Gouverneur, N.Y.	
WHUC	Hudson, N. Y.	1000
WLFH	Little Falls, N. Y.	1000
WFAS	White Plains, N. Y.	1000
WSKY	Asheville, N.C.	1000
WFAI	Fayetteville, N.C.	1000d
WMFR	High Point, N.C.	1000
WISP	Kinston, N.C.	1000d
WNNC	Newton, N. C.	1000
WCBT	Roanoke Rap., N. C.	1000
KDIX	Dickinson, N.Dak.	250
WCPO	Cincinnati, Ohio	1000
WCOL	Columbus, Ohio	1000
WIRO	Ironton, Ohio	250
WTOL	Toledo, Ohio	1000d
KADA	N. of Ada, Okla.	250
WBBZ	Ponca City, Okla.	250
KIAL	Astoria, Oreg.	1000
KRNS	Burns, Oreg.	250
KOOS	Coos Bay, Oreg.	250
KRDR	Gresham, Oreg.	1000
KYJC	Medford, Oreg.	1000
KQIK	Lakeview, Oreg.	250
KTOO	Toledo, Oreg.	250
WBVP	Beaver Falls, Pa.	1000
WEEX	Easton, Pa.	1000
WKBO	Harrisburg, Pa.	1000
WCRO	Johnstown, Pa.	1000
WBPZ	Lock Haven, Pa.	250
WTIV	Titusville, Pa.	500d
WNIK	Arecibo, P.R.	1000
WERI	Westerly, R.I.	1000
WAIM	Anderson, S.C.	1000
WNOK	Columbia, S.C.	1000d
WOLS	Florence, S.C.	1000
KISD	Sioux Falls, S.Dak.	1000d
WAKI	McMinnville, Tenn.	1000
KSIX	Corpus Christi, Tex.	1000
KDLK	Del Rio, Tex.	250
KNUZ	Houston, Tex.	1000
KERV	Kerrville, Tex.	1000
KLVT	Levelland, Tex.	250
KEEE	Nacogdoches, Tex.	1000
KOSA	Odessa, Tex.	250
KHHH	Pampa, Tex.	250
KSEY	Seymour, Tex.	1000
KSST	Sulphur Sprgs., Tex.	1000
KWTX	Waco, Tex.	1000d
KMUR	Murray, Utah	250
KOAL	Price, Utah	250
WJOY	Burlington, Vt.	1000
WBBI	Abingdon, Va.	1000d
WCFV	Clifton Forge, Va.	1000
WFVA	Fredericksburg, Va.	1000
WNOR	Norfolk, Va.	1000
KWYZ	Everett, Wash.	1000
KLYK	Spokane, Wash.	250
KREW	Sunnyside, Wash.	1000
WLOG	Logan, W.Va.	1000
WTAP	Parkersburg, W.Va.	1000
WHBY	Appleton, Wis.	1000
WCLO	Janesville, Wis.	1000
WHVF	Wausau, Wis.	1000d
KVOC	Casper, Wyo.	1000
1240—241.8		
WEBJ	Brewton, Ala.	250
WPRN	Butler, Ala.	1000d
WULA	Eufaula, Ala.	250
WOWL	Florence, Ala.	1000
WARF	Jasper, Ala.	1000
KVRD	Cottonwood, Ariz.	250
KZQW	So. of Globe, Ariz.	1000
KVRC	Arkadelphia, Ark.	250
KWAK	Stuttgart, Ark.	250
KPLY	Crescent City, Calif.	250
KMBY	Monterey, Calif.	1000
KPPC	Pasadena, Calif.	100
KLOA	Ridgecrest, Calif.	250
KROY	Sacramento, Calif.	1000
KRNO	San Bernardino, California	1000d
KSON	San Diego, Calif.	250
KSMA	Santa Maria, Calif.	250
KSUE	Susanville, Calif.	1000
KRDO	Colo. Sprgs., Colo.	1000
KDGO	Durango, Colo.	1000
KSLV	Monte Vista, Colo.	1000
KCRT	Trinidad, Colo.	250
WWCO	Waterbury, Conn.	1000
WBGC	Chipley, Fla.	250
WLCO	Eustis, Fla.	250
WINK	Fort Myers, Fla.	250
WMMB	Melbourne, Fla.	1000
WFOY	St. Augustine, Fla.	1000
WBHB	Fitzgerald, Ga.	1000
WOUN	Gainesville, Ga.	1000
WLAG	LaGrange, Ga.	1000
WBML	Macon, Ga.	1000
WWNS	Statesboro, Ga.	1000
WPAX	Thomasville, Ga.	250
WTWA	Thomson, Ga.	250
KVNI	Coeur d'Alene, Idaho	1000

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
KFLI	Mountain Home, Idaho	250
KWIK	Pocatello, Idaho	250
WCRW	Chicago, Ill.	1000
WEOC	Chicago, Ill	1000d
WSBC	Chicago, Ill.	1000
WEBQ	Harrisburg, Ill.	250
WTAX	Springfield, Ill.	1000
WSOR	Sterling, Ill.	500d
WHBU	Anderson, Ind.	1000d
KDEC	Decorah, Iowa	1000
KWLC	Decorah, Iowa	1000
KBIZ	Ottumwa, Iowa	1000
KICD	Spencer, Iowa	1000
KIUL	Garden City, Kans.	1000
KAKE	Wichita, Kans.	250
WINN	Louisville, Ky.	1000
WFTM	Maysville, Ky.	1000
WPKE	Pikeville, Ky.	1000d
WSFC	Somerset, Ky.	1000
KASO	Minden, La.	1000
KANE	New Iberia, La.	1000
WCOU	Lewiston, Maine	1000
WCEM	Cambridge, Md.	1000
WJEJ	Hagerstown, Md.	1000
WHAI	Greenfield, Mass.	250
WOCB	W. Yarmouth, Mass.	1000
WATT	Cadillac, Mich.	1000
WCBY	Cheboygan, Mich.	1000
WJPD	Ishpeming, Mich.	1000
WJIM	Lansing, Mich.	1000d
WMFG	Hibbing, Minn.	1000
KPRM	Park Rapids, Minn.	250
WJON	St. Cloud, Minn.	1000
WMPA	Aberdeen, Miss.	250
WGRM	Greenwood, Miss.	250
WGCM	Gulfport, Miss.	1000
WMIS	Natchez, Miss.	250
KFMO	Flat River, Mo.	250
KWOS	Jefferson City, Mo.	1000d
KODE	Joplin, Mo.	1000d
KNEM	Nevada, Mo.	250
KBMY	Billings, Mont.	1000
KLTZ	Glasgow, Mont.	250
KBLL	Helena, Mont.	1000
KFOR	Lincoln, Nebr.	1000
KODY	North Platte, Nebr.	1000
KELK	Elko, Nev.	1000
WSNJ	Bridgeton, N. J.	1000
KAVE	Carlsbad, N.Mex.	1000
KCLV	Clovis, N.Mex.	1000
WGBB	Freeport, N. Y.	1000
WGVA	Geneva, N.Y.	1000d
WJTM	Jamestown, N.Y.	500d
WVOS	Liberty, N. Y.	1000
WNBZ	Saranac Lake, N.Y.	1000
WSNY	Schenectady, N.Y.	1000d
WATN	Watertown, N. Y.	1000
WPNF	Brevard, N.C.	250
WIST	Charlotte, N.C.	1000
WCNC	Elizabeth City, N.C.	1000d
WJNC	Jacksonville, N.C.	1000
WRAL	Raleigh, N.C.	1000
KDLR	Devils Lake, N.Dak.	250
WBBW	Youngstown, Ohio	1000
WHIZ	Zanesville, Ohio	1000
KVSO	Ardmore, Okla.	250
KBEK	Elk City, Okla.	250
KBEL	Idabel, Okla.	250
KOKL	Okmulgee, Okla.	1000
KFLY	Corvallis, Oreg.	1000d
KTIX	Pendleton, Oreg.	1000
KPRB	Redmond, Oreg.	250
WRTA	Altoona, Pa.	1000
WHUM	Reading, Pa.	1000
WKOK	Sunbury, Pa.	1000
WBAX	Wilkes-Barre, Pa.	1000
WALO	Humacao, P.R.	1000
WWON	Woonsocket, R.I.	1000
WKDK	Newberry, S.C.	250
WDXY	Sumter, S.C.	250
WBEJ	Elizabethton, Tenn.	1000
WEKR	Fayetteville, Tenn.	1000
WBIR	Knoxville, Tenn.	1000
WKDA	Nashville, Tenn.	1000
WENK	Union City, Tenn.	1000
KVLF	Alpine, Tex.	1000
KEAN	Brownwood, Tex.	1000
KORA	Bryan, Tex.	250
KOCA	Kilgore, Tex.	250
KSOX	Raymondville, Tex.	250
KCKG	Sonora, Tex.	1000
KXOX	Sweetwater, Tex.	1000
WSKI	Montpelier, Vt.	1000
WSSV	Petersburg, Va.	1000
WROV	Roanoke, Va.	1000
WTON	Staunton, Va.	1000
KXLE	Ellensburgh, Wash.	1000
KGY	Olympia, Wash.	1000
WKOY	Bluefield, W.Va.	1000
WTIP	Charleston, W.Va.	1000
WDNE	Elkins, W.Va.	1000
WOMT	Manitowoc, Wis.	1000d
WIBU	Poynette, Wis.	1000d
WOBT	Rhinelander, Wis.	1000
WJMC	Rice Lake, Wis.	1000
KFBC	Cheyenne, Wyo.	1000
KEVA	Evanston, Wyo.	1000
KASL	Newcastle, Wyo.	250
KRAL	Rawlins, Wyo.	1000
KTHE	Thermopolis, Wyo.	1000

1250—239.9

WZOB	Ft. Payne, Ala.	1000d
WETU	Wetumpka, Ala.	5000d
KAKA	Wickenburg, Ariz.	500d
KHIL	Willcox, Ariz.	1000d
KFAY	Fayetteville, Ark.	1000d
KALO	Little Rock, Ark.	1000
KHOT	Madera, Calif.	500d
KTMS	Santa Barbara, Calif.	1000
KDHI	Twenty-Nine Palms, California	1000d
KMSL	Ukiah, Calif.	500d
KICM	Golden, Colo.	1000d
WNER	Live Oak, Fla.	1000d
WRIM	Pahokee, Fla.	500d
WDAE	Tampa, Fla.	5000
WLYB	Albany, Ga.	1000d
WYTH	Madison, Ga.	1000d
WIZZ	Streator, Ill.	500d
WGL	Ft. Wayne, Ind.	1000
WRAY	Princeton, Ind.	1000d
KCFI	Cedar Falls, Iowa	500d
KFKU	Lawrence, Kans.	5000
WREN	Topeka, Kans.	5000
WNVL	Nicholasville, Ky.	500
WLCK	Scottsville, Ky.	500d
WGUY	Bangor, Maine	5000d
WARE	Ware, Mass.	1000
WWBC	Bay City, Mich.	1000d
KOTE	Fergus Falls, Minn.	1000
KCUE	Red Wing, Minn.	1000d
WHNY	McComb, Miss.	5000
KBTC	Houston, Mo.	500d
WKBR	Manchester, N.H.	5000
WMTR	Morristown, N.J.	5000d
WIPS	Ticonderoga, N.Y.	1000d
WFAG	Farmville, N.C.	500d
WKDX	Hamlet, N. C.	1000d
WBRM	Marion, N.C.	1000d
WCHO	Washington Court House, Ohio	500d
KQEN	Roseburg, Oreg.	5000d
WLEM	Emporium, Pa.	1000d
WPEL	Montrose, Pa.	1000d
WRYT	Pittsburgh, Pa.	5000
WNOW	York, Pa.	5000d
WTMA	Charleston, S.C.	5000
WOKM	Winnsboro, S.C.	500d
WKBL	Covington, Tenn.	1000d
WNTT	Tazewell, Tenn.	5000
KFTV	Paris, Tex.	500d
KPAC	Port Arthur, Tex.	5000
KUKA	San Antonio, Tex.	1000d
KTFO	Seminole, Tex.	1000d
KANN	Ogden, Utah	1000d
KVEL	Vernal, Utah	5000d
WDVA	Danville, Va.	5000
WYSR	Franklin, Va.	1000d
WEER	Warrenton, Va.	1000d
KWSC	Pullman, Wash.	5000
KTW	Seattle, Wash.	1000
WEMP	Milwaukee, Wis.	5000

1260—238.0

WCRT	Birmingham, Ala.	5000d
KPIN	Casa Grande, Ariz.	1000d
KCCB	Corning, Ark.	500d
KBHC	Nashville, Ark.	500d
KGIL	San Fernando, Calif.	5000
KYA	San Francisco, Calif.	5000
KSNO	Aspen, Colo.	5000d
WMMM	Westport, Conn.	1000d
WNRK	Newark, Del.	500d
WWDC	Washington, D.C.	5000
WFTW	Fort Walton Beach, Florida	1000d
WAME	Miami, Fla.	5000d
WWPF	Palatka, Fla.	1000
WHAB	Baxley, Ga.	5000d
WBBK	Blakely, Ga.	1000d
WTJH	East Point, Ga.	5000d
KTEE	Idaho Falls, Idaho	5000
KWEI	Weiser, Ida.	1000d
WIBV	Belleville, Ill.	5000d
WFBM	Indianapolis, Ind.	5000
KFGQ	Boone, Iowa	1000d
KWHK	Hutchinson, Kans.	1000
WXOK	Baton Rouge, La.	1000d
WEZE	Boston, Mass.	5000
WALM	Albion, Mich.	1000
WJBL	Holland, Mich.	5000d
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
KGBX	Springfield, Mo.	5000
KIMB	Kimball, Nebr.	1000d
WBUD	Trenton, N.J.	5000
KVSF	Santa Fe, N.Mex.	1000
WBNR	Beacon, N.Y.	1000d
WNDR	Syracuse, N.Y.	5000
WGWR	Asheboro, N.C.	5000d
WCDJ	Edenton, N.C.	1000d
WDOK	Cleveland, Ohio	5000
WNXT	Portsmouth, Ohio	5000
KWSH	Wewoka-Seminole, Oklahoma	1000
KMCM	McMinnville, Oreg.	1000
WWYN	Erie, Pa.	5000
WPHB	Philipsburg, Pa.	5000d
WISO	Ponce, P.R.	1000
WMUU	Greenville, S.C.	5000d
WJOT	Lake City, S.C.	1000d
KWYR	Winner, S.Dak.	5000d
WNOO	Chattanooga, Tenn.	1000d
WMCH	Church Hill, Tenn.	1000d
WDKN	Dickson, Tenn.	1000d
WCLC	Jamestown, Tenn.	1000d
KSPL	Diboll, Tex.	1000d
KPSO	Falfurrias, Tex.	500d
KWFR	San Angelo, Tex.	1000d
KTUE	Tulia, Tex.	1000d
KTAE	Taylor, Tex.	1000d
WCHV	Charlottesville, Va.	5000
WBCR	Christiansburg, Va.	1000d
KWIQ	Moses Lake, Wash.	1000d
WVVW	Grafton, W.Va.	500d
WWIS	Black River Falls, Wis.	1000d
WEKZ	Monroe, Wis.	1000d
KPOW	Powell, Wyo.	5000

1270—236.1

WGSV	Guntersville, Ala.	1000d
WSIM	Prichard, Ala.	1000d
KBYR	Anchorage, Alaska	1000
KDJI	Holbrook, Ariz.	1000d
KADL	Pine Bluff, Ark.	5000d
KGOL	Palm Desert, Calif.	
KCOK	Tulare, Calif.	5000d
WNOG	Naples, Fla.	500d
WHIY	Orlando, Fla.	5000d
WTNT	Tallahassee, Fla.	5000
WKRW	Cartersville, Ga.	500d
WGBA	Columbus, Ga.	5000d
WJJC	Commerce, Ga.	1000d
KNDI	Honolulu, Hawaii	5000
KTFI	Twin Falls, Idaho	5000
WEIC	Charleston, Ill.	1000d
WHBF	Rock Island, Ill.	5000
WCMR	Elkhart, Ind.	5000
WWCA	Gary, Ind.	1000
WORX	Madison, Ind.	1000d
KSCB	Liberal, Kans.	1000
WAIN	Columbia, Ky.	1000d
WFUL	Fulton, Ky.	1000d
KVCL	Winnfield, La.	1000d
WSPR	Springfield, Mass.	5000
WXYZ	Detroit, Mich.	5000
KWEB	Rochester, Minn.	5000
WVOM	Ioka, Miss.	1000d
WLSM	Louisville, Miss.	5000d
KUSN	St. Joseph, Mo.	1000d
KBUB	Sparks, Nev.	1000d
WTSN	Dover, N.H.	5000
WDVL	Vineland, N.J.	500d
KRAC	Alamogordo, N.Mex.	1000d
WHLD	Niagara Falls, N.Y.	5000d
WDLA	Walton, N.Y.	1000d
WCGC	Belmont, N.C.	1000
WMPM	Smithfield, N.C.	5000d
KBOM	Mandan, N.Dak.	1000
WILE	Cambridge, Ohio	1000d
KWPR	Claremore, Okla.	500d
KAJO	Grants Pass, Oreg.	5000d
WLBR	Lebanon, Pa.	5000
WBHC	Hampton, S.C.	1000d
KNWC	Sioux Falls, S.Dak.	1000
WLIK	Newport, Tenn.	5000d
KIOX	Bay City, Tex.	1000
KHEM	Big Spring, Tex.	1000d
KEPS	Eagle Pass, Tex.	1000d
KFJZ	Fort Worth, Tex.	5000
WTID	Newport News, Va.	1000d
WHEO	Stuart, Va.	1000d
KCVL	Colville, Wash.	1000d
KBAM	Longview, Wash.	5000d
WKYR	Keyser, W.Va.	5000d
WRJC	Mauston, Wis.	500d
WWJC	Superior, Wis.	5000d

1280—234.2

WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KCJH	Arroyo Grande, Calif.	500d
KFOX	Long Beach, Calif.	1000
KCJH	San Luis Obispo, Cal.	500d
KJOY	Stockton, Calif.	1000
KTLN	Denver, Colo.	5000
WSUX	Seaford, Del.	1000d
WDSP	DeFuniak Springs, Florida	5000d
WQIK	Jacksonville, Fla.	5000d
WIPC	Lake Wales, Fla.	1000d
WYND	Sarasota, Fla.	500d
WIBB	Macon, Ga.	5000d
WMRO	Aurora, Ill.	1000d
WGBF	Evansville, Ind.	5000
KCOB	Newton, Iowa	1000d
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d
WDSU	New Orleans, La.	5000
KWCL	Oak Grove, La.	500d
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WTCN	Minneapolis, Minn.	5000
KVOX	Moorhead, Minn.	1000
KDKD	Clinton, Mo.	1000d
KYRO	Potosi, Mo.	500d
KCNI	Broken Bow, Nebr.	1000d
KTOO	Henderson, Nev.	5000d
KRZE	Farmington, N.Mex.	5000d
WAQO	New York, N.Y.	5000
WROC	Rochester, N.Y.	5000d
WSAT	Salisbury, N.C.	1000
WYAL	Scotland Neck, N.C.	5000d
WONW	Defiance, Ohio	1000
WLMJ	Jackson, Ohio	1000d
KLCO	Poteau, Okla.	1000d
KERG	Eugene, Oreg.	5000
WBRX	Berwick, P.	1000d
WHVR	Hanover, Pa.	5000
WKST	New Castle, Pa.	1000
WCMN	Arecibo, P.R.	5000
WANS	Anderson, S.C.	5000
WJAY	Mullins, S.C.	5000d
KBHB	Sturgis, S. D.	1000d
WMCP	Columbia, Tenn.	1000d
WDNT	Dayton, Tenn.	1000d
KNIT	Abilene, Tex.	500d
KWHI	Brenham, Tex.	1000d
KLUE	Longview, Tex.	1000d
KRAN	Morton, Tex.	500
KVWG	Pearsall, Tex.	500d
KNAK	Salt Lake City, Utah	5000
WKDE	Altavista, Va.	500d
WYVE	Wytheville, Va.	1000d
KMAS	Shelton, Wash.	1000d
KJDY	Spokane, Wash.	5000d
KIT	Yakima, Wash.	5000
WVAR	Richwood, W.Va.	1000d
WNAM	Neenah, Wis.	5000

1290—232.4

WTHG	Jackson, Ala.	1000d
WSHF	Sheffield, Ala.	1000d
WMLS	Sylacauga, Ala.	1000d
KEOS	Flagstaff, Ariz.	1000
KCUB	Tucson, Ariz.	1000
KDMS	El Dorado, Ark.	5000d
KUOA	Siloam Sprgs., Ark.	5000d
KHSL	Chico, Calif.	5000
KPER	Gilroy, Calif.	5000d
KMEN	San Bernardino, California	5000
KACL	Santa Barbara, Calif.	5000d
WCCC	Hartford, Conn.	500d
WTUX	Wilmington, Del.	1000d
WTMC	Ocala, Fla.	5000
WSCM	Panama City Beach, Florida	500d
WIRK	W. Palm Bch., Fla.	5000
WDEC	Americus, Ga.	1000d
WCHK	Canton, Ga.	1000d
WTOC	Savannah, Ga.	5000
KSNN	Pocatello, Idaho	1000d
WIRL	Peoria, Ill.	5000
KWNS	Pratt, Kansas	5000
WCBL	Benton, Ky.	5000d
KJEF	Jennings, La.	1000d
WHGR	Houghton Lake, Mich.	5000
WNIL	Niles, Mich.	500d
WOIB	Saline, Mich.	500d
KBMO	Benson, Minn.	500d
WBLE	Batesville, Miss.	1000d
KALM	Thayer, Mo.	1000d
KGVO	Missoula, Mont.	5000
KOIL	Omaha, Nebr.	5000
WKNE	Keene, N.H.	5000
KSRC	Socorro, N.M.	1000d
WGLI	Babylon, N. Y.	5000
WNBF	Binghamton, N.Y.	5000
WHKY	Hickory, N.C.	5000
WEYE	Sanford, N.C.	1000d
WOMP	Bellaire, Ohio	1000d
WHIO	Dayton, Ohio	5000
KUMA	Pendleton, Oreg.	5000
KLIQ	Portland, Oreg.	5000d
WFBG	Altoona, Pa.	5000
WICE	Providence, R.I.	5000
WFIG	Sumter, S.C.	1000
WATO	Oak Ridge, Tenn.	5kw
KBLT	Big Lake, Tex.	1000d
KIVY	Crockett, Tex.	500d
KRGV	Weslaco, Tex.	5000
KTRN	Wichita Falls, Tex.	5000
WPVA	Colonial Hgts., Va.	5000d
WAGE	Leesburg, Va.	1000d
WKWS	Rocky Mount, Va.	1000d
WVOW	Logan, W.Va.	5000
KAPY	Port Angeles, Wash.	1000d
WMIL	Milwaukee, Wis.	1000d
WCOW	Sparta, Wis.	5000d
KOWB	Laramie, Wyo.	5000

Kc.	Wave Length	W.P.
1300—230.6		
WBSA	Boaz, Ala.	1000d
WTLS	Tallassee, Ala.	1000d
WEZQ	Winfield, Ala.	500d
KWCB	Searcy, Ark.	1000d
KROP	Brawley, Calif.	1000
KYNO	Fresno, Calif.	5000
KWKW	Pasadena, Calif.	5000
KVOR	Colo. Sprgs., Colo.	1000
WAVZ	New Haven, Conn.	1000
WRKT	Cocoa Beach, Fla.	500d
WFFG	Marathon, Fla.	500
WSOL	Tampa, Fla.	5000d
WMTM	Moultrie, Ga.	5000d
WNEA	Newman, Ga.	500
WIMO	Winder, Ga.	1000d
KOZE	Lewiston, Idaho	5000
WTAQ	LaGrange, Ill.	1000
WFRX	W. Frankfort, Ill.	1000d
WHLT	Huntington, Ind.	500d
WAAC	Terre Haute, Ind.	500d
KGLO	Mason City, Iowa	5000
WBLG	Lexington, Ky.	1000
WIBR	Baton Rouge, La.	1000d
KANB	Shreveport, La.	5000
WFBR	Baltimore, Md.	1000d
WJDA	Quincy, Mass.	1000d
WOOD	Grand Rapids, Mich.	5000
WRBC	Jackson, Miss.	5000
KMMO	Marshall, Mo.	1000d
KBRL	McCook, Nebr.	5000d
KPTL	Carson City, Nev.	5000
WAAT	Trenton, N.J.	250
WOSC	Fulton, N.Y.	1000d
WEEE	Rensselaer, N.Y.	5000d
WGOL	Goldsboro, N.C.	1000d
WLNC	Laurinburg, N.C.	500
WSYD	Mt. Airy, N.C.	500d
WERE	Cleveland, Ohio	5000
WMVO	Mt. Vernon, Ohio	500
KOME	Tulsa, Okla.	5000
KDOV	Medford, Oreg.	5000d
KACI	The Dalles, Oreg.	1000d
WWCH	Clarion, Pa.	500d
WTHT	Hazleton, Pa.	1000d
WTIL	Mayaguez, P.R.	1000
WLOW	Aiken, S.C.	500wd
WCKI	Greer, S.C.	1000d
WKSC	Kershaw, S.C.	500d
WQIZ	St. George, S.C.	500d
KOLY	Mobridge, S.Dak.	1000d
WMTN	Morristown, Tenn.	5000d
WMAK	Nashville, Tenn.	5000
KVET	Austin, Tex.	1000
KTFY	Brownfield, Tex.	1000d
KGNS	Laredo, Tex.	500d
KKAS	Silsbee, Tex.	500d
KSTU	Logan, Utah	1000
KOL	Seattle, Wash.	5000
WCLG	Morgantown, W.Va.	1000d
WKLC	St. Albans, W.Va.	1000d
1310—228.9		
WHEP	Foley, Ala.	1000d
WJAM	Marion, Ala.	5000d
KBUZ	Mesa, Ariz.	5000
KBOK	Malvern, Ark.	1000d
KIOT	Barstow, Calif.	500d
KPOD	Crescent City, Calif.	1000d
KDIA	Oakland, Calif.	1000
KTKR	Taft, Calif.	1000d
KFKA	Greeley, Colo.	1000
WICH	Norwich, Conn.	5000
WOOD	Deland, Fla.	5000d
WGKR	Perry, Fla.	1000d
WAUC	Wauchula, Fla.	500d
WLKB	Decatur, Ga.	500
WOKA	Douglas, Ga.	1000d
WBRO	Waynesboro, Ga.	1000d
WBMK	West Point, Ga.	1000d
KNUI	Makawao, Hawaii	1000
KLIX	Twin Falls, Idaho	5000
WISH	Indianapolis, Ind.	5000
KDLS	Perry, Iowa	500d
KOKX	Keokuk, Iowa	1000d
KFLA	Scott City, Kans.	500d
WTTL	Madisonville, Ky.	500d
WDOC	Prestonsburg, Ky.	5000d
KIKS	Sulphur, La.	500d
KUZN	W. Monroe, La.	1000d
WLOB	Portland, Maine	5000d
WORC	Worcester, Mass.	5000
WKMH	Dearborn, Mich.	5000
WCCW	Traverse City, Mich.	5000d
KRBI	St. Peter, Minn.	1000d
WXXX	Hattiesburg, Miss.	1000d
KFSB	Joplin, Mo.	5000
KFBB	Great Falls, Mont.	5000
KGMT	Fairbury, Nebr.	500d
WJLK	Asbury Park, N. J.	1000
WCAM	Camden, N. J.	1000
KARA	Albuquerque, N.M.	1000d
WVIP	Mt. Kisco, N.Y.	5000d
WTLB	Utica, N.Y.	1000
WISE	Asheville, N.C.	5000
WKTC	Charlotte, N.C.	1000
WTIK	Durham, N.C.	1000
KNOX	Grand Forks, N.Dak.	5000
WFAH	Alliance, Ohio	1000d
KNPT	Newport, Oreg.	5000
WBFD	Bedford, Pa.	5000d
WGSA	Ephrata, Pa.	5000d
WNAE	Warren, Pa.	5000d
WDKD	Kingstree, S.C.	5000d
WDOD	Chattanooga, Tenn.	5000
WDXI	Jackson, Tenn.	1000d
WBNT	Oneida, Tenn.	1000d
KZIP	Amarillo, Tex.	5000
WRR	Dallas, Tex.	1000d
KOYL	Odessa, Tex.	5000d
KUBO	San Antonio, Tex.	5000
WEEL	Fairfax, Va.	5000
WGH	Newport News, Va.	1000d
KARY	Prosser, Wash.	5000
WIBA	Madison, Wis.	
1320—227.1		
WAGF	Dothan, Ala.	1000
WENN	Birmingham, Ala.	5000d
KBLU	Yuma, Ariz.	500d
KWHN	Fort Smith, Ark.	5000
KRLW	Walnut Ridge, Ark.	1000d
KHSJ	Hemet, Calif.	500d
KLAN	Lemoore, Calif.	1000d
KUDE	Oceanside, Calif.	500
KCRA	Sacramento, Calif.	5000
KAVI	Rocky Ford, Colo.	1000d
WATR	Waterbury, Conn.	5000
WGMA	Hollywood, Fla.	1000d
WZOK	Jacksonville, Fla.	5000
WAMR	Venice, Fla.	500d
WHIE	Griffin, Ga.	5000d
WKAN	Kankakee, Ill.	1000
KNIA	Knoxville, Iowa	500d
KMAQ	Maquoketa, Iowa	500d
KLWN	Lawrence, Kans.	500d
WBRT	Bardstown, Ky.	1000d
WNGO	Mayfield, Ky.	1000d
KHAL	Homer, La.	1000d
WICO	Salisbury, Md.	1000d
WARA	Attleboro, Mass.	1000
WILS	Lansing, Mich.	5000
WDMJ	Marquette, Mich.	1000
WRJW	Picayune, Miss.	5000d
KXLW	Clayton, Mo.	1000d
KOLT	Scottsbluff, Nebr.	5000
KRDD	Roswell, N.M.	1000d
WWHG	Hornell, N.Y.	5000d
WQSR	Solvay, N.Y.	500d
WAGY	Forest City, N.C.	1000
WCOG	Greensboro, N.C.	5000
WKRK	Murphy, N.C.	5000d
WEEW	Washington, N.C.	500d
KQDY	Minot, N.Dak.	1000d
WHOK	Lancaster, Ohio	1000d
KWOE	Clinton, Okla.	1000d
KATR	Eugene, Ore.	5000
WKAP	Allentown, Pa.	1000
WGET	Gettysburg, Pa.	5000
WJAS	Pittsburgh, Pa.	1000
WSCR	Scranton, Pa.	5000
WUNO	Rio Piedras, P.R.	5000
WOIC	Columbia, S. C.	5000
KELO	Sioux Falls, S.Dak.	5000d
WKIN	Kingsport, Tenn.	5000d
WMSR	Manchester, Tenn.	1000d
KVMC	Colo. City, Tex.	5000
KXYZ	Houston, Tex.	5000
KCPX	Salt Lake City, Utah	1000
WDMS	Lynchburg, Va.	1000d
WEET	Richmond, Va.	5000
KXRO	Aberdeen, Wash.	1000d
KHIT	Walla Walla, Wash.	1000d
WQMN	Superior, Wis.	
WFHR	Wisconsin Rapids, Wis.	5000
1330—225.4		
WROS	Scottsboro, Ala.	1000d
KMOP	Tucson, Ariz.	500d
KVEE	Conway, Ark.	500d
KLOM	Lompoc, Calif.	1kd
KFAC	Los Angeles, Calif.	5000
KLBS	Los Banos, Calif.	500d
KAHR	Redding, Calif.	5000d
WARN	Ft. Pierce, Fla.	1000
WWAB	Lakeland, Fla.	1000d
WEBY	Milton, Fla.	5000d
WMEN	Tallahassee, Fla.	5000d
WMLT	Dublin, Ga.	5000d
WEAW	Evanston, Ill.	5000d
WRAM	Monmouth, Ill.	1000d
WRRR	Rockford, Ill.	1000d
WJPS	Evansville, Ind.	5000
WGRB	Greenburg, Ind.	
KWWL	Waterloo, Iowa	5000
KFH	Wichita, Kans.	5000
WYGO	Corbin, Ky.	5000d
WMOR	Morehead, Ky.	1000d
KVOL	Lafayette, La.	1000
WASA	Havre de Grace, Md.	1000d
WCRB	Waltham, Mass.	5000
WTRX	Flint, Mich.	5000
WLOL	Minneapolis, Minn.	5000
WJPR	Greenville, Miss.	1000
WDAL	Meridian, Miss.	1000d
KUKU	Willow Springs, Mo.	1000d
KGAK	Gallup, N.Mex.	5000
WEVD	New York, N.Y.	5000
WPOW	New York, N.Y.	5000
WEBD	Owego, N.Y.	1000d
WHAZ	Troy, N.Y.	1000
WUSM	Havelock, N.C.	1000d
WHOT	Campbell, Ohio	1000
WFIN	Findlay, Ohio	1000d
WKOV	Wellston, Ohio	500d
WELW	Willoughby, O.	500wd
KPOJ	Portland, Oreg.	5000
WBLF	Bellefonte, Pa.	500
WICU	Erie, Pa.	5000
WLAT	Conway, S. C.	5000
WFBC	Greenville, S.C.	5000
WAEW	Crossville, Tenn.	1000d
WTRO	Dyersburg, Tenn.	500d
KMIL	Cameron, Tex.	500d
KSWA	Graham, Tex.	500d
KINE	Kingsville, Tex.	1000d
KVKM	Monahans, Tex.	5000
KDOK	Tyler, Tex.	1000d
WBTM	Danville, Va.	5000
WRAA	Luray, Va.	1000d
WOLD	Marion, Va.	1000d
WESR	Tasley, Va.	1000d
KFKF	Bellevue, Wash.	5000d
KCFA	Spokane, Wash.	5000d
WETZ	New Martinsville, W.Va.	1000d
WHBL	Sheboygan, Wis.	1000
KOVE	Lander, Wyo.	5000
1340—223.7		
WKUL	Cullman, Ala.	1000
WJOI	Florence, Ala.	1000
WGWC	Selma, Ala.	250
WFEB	Sylacauga, Ala.	1000
KIBH	Seward, Alaska	250
KIKO	Miami, Ariz.	250
KKIT	Taos, N.M.	250
KNOG	Nogales, Ariz.	250
KPGE	Page, Ariz.	250
KENT	Prescott, Ariz.	250
KBTA	Batesville, Ark.	1000
KAAB	Hot Springs, Ark.	500
KBRS	Springdale, Ark.	1000
KATA	Arcata, Calif.	250
KMAK	Fresno, Calif	1000
KDOL	Mojave, Calif.	100
KSFE	Needles, Calif.	250
KAOR	Oroville, Calif.	250
KATY	San Luis Obispo, California	1000
KIST	Santa Barbara, Calif.	1000
KOMY	Watsonville, Calif.	1000
KDEN	Denver, Colo.	1000
KWSL	Grand Junction, Colo.	250
KVRH	Salida, Colo.	1000
WNHC	New Haven, Conn.	1000
WOOK	Washington, D. C.	1000
WSLC	Clermont, Fla.	250
WTAN	Clearwater, Fla.	250
WROD	Daytona Bch., Fla.	1000
WDSR	Lake City, Fla.	1000
WTYS	Marianna, Fla.	1000
WQXT	Palm Beach, Fla.	250
WSEB	Sebring, Fla.	250
WNSM	Valparaiso-Niceville, Fla.	250
WAKE	Atlanta, Ga.	1000
WGAU	Athens, Ga.	1000
WBBQ	Augusta, Ga.	1000
WGAA	Cedartown, Ga.	1000
WOKS	Columbus, Ga.	1000
WBBT	Lyons, Ga.	1000
WTIF	Tifton, Ga.	1000
KAIN	Nampa, Idaho	1000
KPST	Preston, Idaho	250
KSKI	Sun Valley, Idaho	1000
WSOY	Decatur, Ill.	1000
WJPF	Herrin, Ill.	1000
WJOL	Joliet, Ill.	1000
WBIW	Bedford, Ind.	1000
WTRC	Elkhart, Ind.	1000
WLBC	Muncie, Ind.	1000
KROS	Clinton, Iowa	1000
KLIL	Estherville, Iowa	100
KCKN	Kansas City, Kans.	1000d
KSEK	Pittsburg, Kans.	1000
WCMI	Ashland, Ky.	1000
WBGN	Bowling Green, Ky.	250
WNBS	Murray, Ky.	1000d
WEKY	Richmond, Ky.	1000
KVOB	Bastrop, La.	250
KRMD	Shreveport, La.	1000d
WFAU	Augusta, Maine	1000
WHOU	Houlton, Maine	1000
WGAW	Gardner, Mass.	1000
WNBH	New Bedford, Mass.	1000
WBRK	Pittsfield, Mass.	1000
WLEW	Bad Axe, Mich.	1000
WLAV	Grand Rap., Mich.	1000
WCSR	Hillsdale, Mich.	1000
WMTE	Manistee, Mich.	1000
WAGN	Menominee, Mich.	1000
WMBN	Petoskey, Mich.	1000
WEXL	Royal Oak, Mich.	1000
KDLM	Detroit Lakes, Minn.	1000
WEVE	Eveleth, Minn.	1000
KROC	Rochester, Minn.	1000
KWLM	Willmar, Minn.	1000
WJMB	Brookhaven, Miss.	250
WAML	Laurel, Miss.	250
KXEO	Mexico, Mo.	1000d
KLID	Poplar Bluff, Mo.	1000d
KSMO	Salem, Mo.	1000
KICK	Springfield, Mo.	1000
KCAP	Helena, Mont.	1000
KPRK	Livingston, Mont.	1000
KATL	Miles City, Mont.	1000
KQTE	Missoula, Mont.	250
KHUB	Fremont, Nebr.	500
KGFW	Kearney, Nebr.	1000
KSID	Sidney, Nebr.	1000
KORK	Las Vegas, Nev.	250
KBET	Reno, Nev.	1000
WDCR	Hanover, N.H.	1000
WMID	Atlantic City, N.J.	1000
KHAP	Aztec, N.Mex.	1000
KRRR	Ruidoso, N. Mex.	1000
KKIT	Taos, N.Mex.	250
KSIL	Silver City, N.Mex.	1000
WMBO	Auburn, N.Y.	1000
WENT	Gloversville, N.Y.	1000
WKSN	Jamestown, N.Y.	250
WUSJ	Lockport, N.Y.	250
WMSA	Massena, N.Y.	1000
WALL	Middletown, N.Y.	1000
WIRY	Plattsburgh, N.Y.	1000
WJRI	Lenoir, N.C.	1000
WTSB	Lumberton, N.C.	1000
WOXF	Oxford, N.C.	1000
WOOW	Greenville, N.C.	1000
WGNI	Wilmington, N.C.	250
WAIR	Winston-Salem, N.C.	1000
KGPC	Grafton, N.Dak.	250
WNCO	Ashland, Ohio	250
WOUB	Athens, Ohio	1000
WIZE	Springfield, Ohio	1000
WSTV	Steubenville, Ohio	250
KIHN	Hugo, Okla.	1000
KOCY	Okla. City, Okla.	250
KTOW	Sand Springs, Okla.	250
KLOO	Corvallis, Oreg.	250
KWVR	Enterprise, Oreg.	250
KIHR	Hood River, Oreg.	1000d
KFIR	North Bend, Oreg.	100
WCVI	Connellsville, Pa.	1000
WSAJ	Grove City, Pa.	1000
WKRZ	Oil City, Pa.	1000
WHAT	Philadelphia, Pa.	1000
WRAW	Reading, Pa.	1000
WTRN	Tyrone, Pa.	1000
WBRE	Wilkes-Barre, Pa.	1000
WWPA	Williamsport, Pa.	250
WGRF	Aguadilla, P.R.	1000
WOKE	Charleston, S.C.	1000
WRHI	Rock Hill, S.C.	1000
WSSC	Sumter, S.C.	1000
KIJV	Huron, S. D.	1000
KRSD	Rapid City, S.Dak.	1000
WBAC	Cleveland, Tenn.	1000
WKRM	Columbia, Tenn.	1000
WGRV	Greeneville, Tenn.	1000
WKGN	Knoxville, Tenn.	1000d
WLOK	Memphis, Tenn.	1000
WCDT	Winchester, Tenn.	250
KWKC	Abilene, Tex.	250
KTSL	Burnett, Tex.	250
KAND	Corsicana, Tex.	250
KSET	El Paso, Tex.	250
KLBK	Lubbock, Tex.	250
KRBA	Lufkin, Tex.	250
KPDN	Pampa, Tex.	250
KOLE	Port Arthur, Tex.	250
KTEO	San Angelo, Tex.	250
KVIC	Victoria, Tex.	1000
WTWN	St. Johnsbury, Vt.	250
WSTA	Charlotte Amalie, V.I.	1000
WKEY	Covington, Va.	1000
WHAP	Hopewell, Va.	1000
WJMA	Orange, Va.	250
KAGT	Anacortes, Wash.	250
KGRS	Pasco, Wash.	1000
KAPA	Raymond, Wash.	250
KMEL	Wenatchee, Wash.	250
WHAR	Clarksburg, W.Va.	1000
WEPM	Martinsburg, W. Va.	250
WMON	Montgomery, W.Va.	1000
WOVE	Welch, W.Va.	1000
WLDY	Ladysmith, Wis.	1000d
WRIT	Milwaukee, Wis.	250
KSGT	Jackson, Wyo.	250
KYCN	Wheatland, Wyo.	1000
KWOR	Worland, Wyo.	
1350—222.1		
WJWT	Demopolis, Ala.	5000d
WELB	Elba, Ala.	1000d
WGAD	Gadsden, Ala.	5000
KLYD	Bakersfield, Calif.	1000d
KCKC	San Bernardino, Calif.	500
KSRO	Santa Rosa, Calif.	5000
KGHF	Pueblo, Colo.	5000
WNLK	Norwalk, Conn.	1000
WINY	Putnam, Conn.	1000d
WEZY	Cocoa, Fla.	1000
WDCF	Dade City, Fla.	1000d
WXYC	Ft. Myers, Fla.	1000d
WBSG	Blackshear, Ga.	500d
WRWH	Cleveland, Ga.	1000d

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
WRPB	Warner Robins, Ga.	5000d
KRLC	Lewiston, Idaho	5000
WAAP	Peoria, Ill.	1000
WJBD	Salem, Ill.	1000d
WIOU	Kokomo, Ind.	5000
KRNT	Des Moines, Iowa	5000
KMAN	Manhattan, Kans.	500d
WLOU	Louisville, Ky.	5000d
WSMB	New Orleans, La.	5000
WHMI	Howell, Mich.	500
KOID	Ortonville, Minn.	1000d
WCMP	Pine City, Minn.	1000d
WKOZ	Kosciusko, Miss.	5000d
KCHR	Charleston, Mo.	1000d
KBRX	O'Neill, Nebr.	1000d
WLNH	Laconia, N.H.	5000d
WHWH	Princeton, N.J.	5000
KABQ	Albuquerque, N.M.	5000
WCBA	Corning, N.Y.	1000d
WRNY	Rome, N.Y.	500d
WBMT	Black Mountain, N.C.	500d
WHIP	Mooresville, N.C.	1000d
WLLY	Wilson, N.C.	1000d
KBMR	Bismarck, N. D.	5000
WADC	Akron, Ohio	5000
WCSM	Celina, Ohio	500d
WCHI	Chillicothe, Ohio	1000d
KRHD	Duncan, Okla.	250
KTLQ	Tahlequah, Okla.	1000d
KRVC	Ashland, Oreg.	1000d
WORK	York, Pa.	5000
WWBR	Windber, Pa.	
WOAR	Darlington, S.C.	1000d
WGSW	Greenwood, S.C.	1000d
WRKM	Carthage, Tenn.	1000d
KCAR	Clarksville, Tex.	500d
KTXJ	Jasper, Tex.	1000d
KCOR	San Antonio, Tex.	5000
WBLT	Bedford, Va.	1000d
WFLS	Fredericksburg, Va.	1000d
WNVA	Norton, Va.	5000d
WAVY	Portsmouth, Va.	5000
WPDR	Portage, Wis.	5000d

1360—220.4

WWWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WERR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	500d
KFFA	Helena, Ark.	1000
KFIV	Modesto, Calif.	1000
KRCK	Ridgecrest, Calif.	1000d
KGB	San Diego, Calif.	5000
WDRC	Hartford, Conn.	5000
WDBS	Jacksonville, Fla.	5000d
WKAT	Miami Beach, Fla.	5000
WSFR	Sanford, Fla.	500d
WINT	Winter Haven, Fla.	1000d
WAZA	Bainbridge, Ga.	1000d
WLAW	Lawrenceville, Ga.	1000d
WMAC	Metter, Ga.	500d
WiYN	Rome, Ga.	500d
WLBK	DeKalb, Ill.	1000d
WVMC	Mt. Carmel, Ill.	500d
WGFA	Watseka, Ill.	1000d
KHAK	Cedar Rapids, Iowa	1000d
KXGI	Ft. Madison, Iowa	1000d
KSCJ	Sioux City, Iowa	5000
KBTO	El Dorado, Kans.	500d
WFLW	Monticello, Ky.	1000d
KDBC	Mansfield, La.	1000d
KVIM	New Iberia, La.	1000d
KTLD	Tallulah, La.	500d
WEBB	Dundalk, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYD	Caro, Mich.	500d
WKMI	Kalamazoo, Mich.	5000
KLRS	Mountain Grove, Mo.	1000d
KWRV	McCook, Nebr.	1000d
WNNJ	Newton, N.J.	1000d
WWBZ	Vineland, N.J.	1000
WKOP	Binghamton, N.Y.	5000
WMNS	Olean, N.Y.	1000d
WCHL	Chapel Hill, N.C.	1000d
KEYZ	Williston, N.D.	5000
WSAI	Cincinnati, Ohio	5000
WWOW	Conneaut, Ohio	500d
KUIK	Hillsboro, Oreg.	1000d
WPQR	McKeesport, Pa.	5000
WPPA	Pottsville, Pa.	5000
WELP	Easley, S.C.	1000d
WLCM	Lancaster, S.C.	1000d
WNAH	Nashville, Tenn.	1000d
KRAY	Amarillo, Tex.	500d
KACT	Andrews, Tex.	1000d
KWBA	Baytown, Tex.	1000
KRYS	Corpus Christi, Tex.	1000
KXOL	Ft. Worth, Tex.	5000
WBOB	Galax, Va.	1000d
WHBG	Harrisonburg, Va.	5000d
KFDR	Grand Coulee, Wash.	1000d
KMD	Tacoma, Wash.	5000
WHJC	Matawan, W.Va.	1000d
WMOV	Ravenswood, W.Va.	1000d
WBAY	Green Bay, Wis.	5000
WISV	Virouqua, Wis.	1000
WMNE	Menomonie, Wis.	1000d
KVRS	Rock Springs, Wyo.	1000

1370—218.8

WBYE	Calera, Ala.	1000d
KTPA	Prescott, Ark.	500d
KBUC	Corona, Calif.	1000
KQCY	Quincy, Calif.	500d
KEEN	San Jose, Calif.	5000
KGEN	Tulare, Calif.	1000d
WKMK	Blountstown, Fla.	500d
WKDS	Ocala, Fla.	5000d
WCOA	Pensacola, Fla.	5000
WAXE	Vero Beach, Fla.	1000d
WBGR	Jesup, Ga.	5000
WFDR	Manchester, Ga.	1000d
WKLE	Washington, Ga.	1000d
WPRC	Lincoln, Ill.	1000d
WTTS	Bloomington, Ind.	5000
WGRY	Gary, Ind.	1000d
KDTH	Dubuque, Iowa	5000
KGNO	Dodge City, Kans.	5000
KALN	Iola, Kans.	500d
WGOH	Grayson, Ky.	5000d
WTKY	Tompkinsville, Ky.	1000d
KAPB	Marksville, La.	1000d
WMHI	Braddocks Hts., Md.	500d
WKIK	Leonardtown, Md.	1000d
WDEA	Ellsworth, Me.	5000d
WGHN	Grand Haven, Mich.	500d
KSUM	Fairmont, Minn.	1000
WMGO	Canton, Miss.	1000d
KWRT	Boonville, Mo.	1000d
KCRV	Caruthersville, Mo.	1000d
KXLF	Butte, Mont.	5000
KAWL	York, Nebr.	500d
WFEA	Manchester, N.H.	5000
WALK	Patchogue, N.Y.	500d
WSAY	Rochester, N.Y.	5000
WLTC	Gastonia, N.C.	5000d
WTAB	Tabor City, N.C.	5000d
KFJM	Grand Forks, N.D.	1000d
WSPD	Toledo, Ohio	5000
KVYL	Holdenville, Okla.	500d
KAST	Astoria, Oreg.	1000
WDTR	Corry, Pa.	1000
WPAZ	Pottstown, Pa.	1000d
WKMC	Roaring Sprgs., Pa.	1000d
WIVV	Vieques, P.R.	1000
WKFD	Wickford, R.I.	500d
WOEF	Chattanooga, Tenn.	5000
WDXE	Lawrenceburg, Tenn.	1000d
WRGS	Rogersville, Tenn.	1000d
KOKE	Austin, Tex.	1000d
KFRO	Longview, Tex.	1000
KPOS	Post, Tex.	500d
KSOP	Salt Lake City, Utah	1000d
WBTN	Bennington, Vt.	1000d
WHEE	Martinsville, Va.	5000d
WJWS	South Hill, Va.	5000d
KPOR	Quincy, Wash.	1000d
WMOD	Moundsville, W.Va.	1000d
WCCN	Neillsville, Wis.	5000d
KVWO	Cheyenne, Wyo.	1000

1380—217.3

WRAB	Arab, Ala.	1000d
WGYV	Greenville, Ala.	1000d
KDXE	N. Little Rock, Ark.	1000d
KBVM	Lancaster, Calif.	1000d
KGMS	Sacramento, Calif.	1000
KSBW	Salinas, Calif.	5000
KFLJ	Walsenburg, Colo.	1000d
WAMS	Wilmington, Del.	5000
WLIZ	Lake Worth, Fla.	500d
WQXQ	Ormond Bch., Fla.	1000d
WLCY	St. Petersburg, Fla.	5000
WAOK	Atlanta, Ga.	5000
WSIZ	Doilla, Ga.	5000d
KPOI	Honolulu, Hawaii	5000
WBZI	Brazil, Ind.	500d
WKJG	Ft. Wayne, Ind.	5000
KCIM	Carroll, Iowa	1000
KCII	Washington, Iowa	500d
WMTA	Central City, Ky.	500d
WWKY	Winchester, Ky.	1000d
WYNK	Baton Rouge, La.	500d
WKTJ	Farmington, Me.	1000d
WTTH	Port Huron, Mich.	1000
WPLB	Greenville, Mich.	500d
KLIZ	Brainerd, Minn.	1000d
KAGE	Winona, Minn.	1000
WDLT	Indianola, Miss.	500d
KUOL	Kansas City, Mo.	5000
KUVR	Holdredge, Nebr.	500
WBBX	Portsmouth, N.H.	1000
WAWZ	Zarephath, N.J.	5000
WFSR	Bath, N.Y.	500d
WBNX	New York, N.Y.	5000
WLOS	Asheville, N.C.	5000
WTDB	Winston-Salem, N.C.	5000
WWIZ	Lorain, Ohio	500d
WPKO	Waverly, Ohio	1000d
KSWO	Lawton, Okla.	1000
KMUS	Muskogee, Okla.	1000
KBCH	Ocean Lake, Oreg.	1000d
KSRV	Ontario, Oreg.	5000
WACB	Kittanning, Pa.	1000d
WMLP	Milton, Pa.	1000d
WAYZ	Waynesboro, Pa.	1000d
WNRI	Woonsocket, R.I.	1000d
WAGS	Bishopville, S.C.	1000d
WGUS	N. Augusta, S.C.	1000d
KOTA	Rapid City, S.Dak.	5000
KFCB	Redfield, S.Dak.	500d
WYSH	Clinton, Tenn.	1000d
WGMM	Millington, Tenn.	500d
KJET	Beaumont, Tex.	1000
KBWD	Brownwood, Tex.	1000
KCRM	Crane, Tex.	1000d
KTSM	El Paso, Tex.	5000
KMUL	Muleshoe, Tex.	1000d
KBOP	Pleasanton, Tex.	1000d
WSYB	Rutland, Vt.	5000
WMBG	Richmond, Va.	5000
KRKO	Everett, Wash.	5000
KPEG	Spokane, Wash.	5000d
WMTD	Hinton, W.Va.	1000d
WBEL	Beloit, Wis.	5000

1390—215.7

WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	500d
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo.	1000d
WAVP	Avon Park, Fla.	1000d
WPUP	Gainesville, Fla.	5000d
WYNR	Chicago, Ill.	5000
WFIW	Fairfield, Ill.	1000
WJCD	Seymour, Ind.	1000d
KCLN	Clinton, Iowa	1000d
KCBC	Des Moines, Iowa	1000
KNCK	Concordia, Kans.	500d
WANY	Albany, Ky.	1000d
WKIC	Hazard, Ky.	5000d
KFRA	Franklin, La.	500d
WEGP	Presque Isle, Me.	5000d
KJPW	Waynesville, Mo.	1000d
WCAT	Orange, Mass.	1000d
WPLM	Plymouth, Mass.	5000
WCER	Charlotte, Mich.	1000d
KAOH	Duluth, Minn.	500
KRFO	Owatonna, Minn.	500d
WROA	Gulfport, Miss.	1000d
WQIC	Meridian, Miss.	5000d
KJPW	Waynesville, Mo.	1000d
KENN	Farmington, N.Mex.	5000
KHOB	Hobbs, N.Mex.	5000d
WEOK	Poughkeepsie, N.Y.	5000
WRIV	Riverhead, N.Y.	1000d
WFBL	Syracuse, N.Y.	5000
WEED	Rocky Mount, N.C.	5000
WADA	Shelby, N.C.	1000
WJRM	Troy, N.C.	500d
KLPM	Minot, N.Dak.	5000
WDHP	Bellefontaine, Ohio	500d
WMPO	Middleport-Pomroy, Ohio	1000d
WFMJ	Youngstown, Ohio	5000
KCRC	Enid, Okla.	1000
KSLM	Salem, Oreg.	5000
WLAN	Lancaster, Pa.	5000
WRSC	State College, Pa.	1000d
WISA	Isabella, P.R.	1000
WHPB	Belton, S.C.	1000d
WCSC	Charleston, S.C.	5000
KJAM	Madison, S.D.	5000d
WTJS	Jackson, Tenn.	5000
KULP	El Campo, Tex.	500d
KBEC	Waxahachie, Tex.	500d
KLGN	Logan, Utah	1000
WEAM	Arlington, Va.	5000
WWOD	Lynchburg, Va.	5000
WKLP	Keyser, W. Va.	1390
KBBO	Yakima, Wash.	1000

1400—214.2

WMSL	Decatur, Ala.	1000
WXAL	Demopolis, Ala.	1000d
WFPA	Ft. Payne, Ala.	250
WJLD	Homewood, Ala.	1000
WJHO	Opelika, Ala.	1000
KSEW	Sitka, Alaska	250
KCLF	Clifton, Ariz.	250
KJKJ	Flagstaff, Ariz.	250
KXIV	Phoenix, Ariz.	1000
KTUC	Tucson, Ariz.	250
KVOY	Yuma, Ariz.	250
KELD	El Dorado, Ark.	1000
KCLA	Pine Bluff, Ark.	1000
KWYN	Wynne, Ark.	1000
KPAT	Berkeley, Calif.	1000
KREO	Indio, Calif.	250
KQMS	Redding, Calif.	250
KSLY	San Luis Obispo, Cal.	250
KSPA	Santa Paula, Calif.	250
KHOE	Truckee, Calif.	1000
KUKI	Ukiah, Calif.	1000
KONG	Visalia, Calif.	1000
KRLN	Canon City, Colo.	250
KOTA	Delta, Colo.	250
KFTM	Ft. Morgan, Colo.	250
KBZZ	La Junta, Colo.	250
WSTC	Stamford, Conn.	1000
WILI	Willimantic, Conn.	1000
WFTL	Ft. Lauderdale, Fla.	250
WIRA	Ft. Pierce, Fla.	1000
WNVE	Ft. Walton Bch., Fla.	1000d
WRHC	Jacksonville, Fla.	250
WPRY	Perry, Fla.	250
WTRR	Sanford, Fla.	1000
WZRH	Zephyr Hills, Fla.	250
WCQS	Alma, Ga.	1000
WSGC	Elberton, Ga.	1000
WNEX	Macon, Ga.	1000
WMGA	Moultrie, Ga.	1000
WCOH	Newnan, Ga.	1000
WGSA	Savannah, Ga.	1000
KART	Jerome, Idaho	250
KRPL	Moscow, Idaho	250
KSPT	Sandpoint, Idaho	1000
WDWS	Champaign, Ill.	1000
WGIL	Galesburg, Ill.	1000
WROZ	Evansville, Ind.	1000
WBAT	Marion, Ind.	1000
KCOG	Centerville, Iowa	100
KVFD	Fort Dodge, Iowa	1000
KVDE	Emporia, Kans.	1000
KAYS	Hays, Kans.	1000
WCYN	Cynthiana, Ky.	250
WIEL	Elizabethtown, Ky.	1000
WFTG	London, Ky.	250
WFPR	Hammond, La.	250
KAOK	Lake Charles, La.	1000
WRDO	Augusta, Maine	1000d
WIDE	Biddeford, Maine	1000
WWIN	Baltimore, Md.	1000
WALE	Fall River, Mass.	1000
WLLH	Lowell, Mass.	1000
WHMP	Northampton, Mass.	1000
WELL	Battle Creek, Mich.	1000
WJLB	Detroit, Mich.	1000d
WHDF	Houghton, Mich.	250
WMAB	Munising, Mich.	250
WSAM	Saginaw, Mich.	1000
WSJM	St. Joseph, Mich.	1000
WTCM	Traverse City, Mich.	1000
KEYL	Long Prairie, Minn.	250
KMHL	Marshall, Minn.	1000
WMIN	Mpls.-St. Paul, Minn.	1000
WHLB	Virginia, Minn.	1000
WBIP	Booneville, Miss.	250
WNAG	Grenada, Miss.	250
WFOR	Hattiesburg, Miss.	250
WJQS	Jackson, Miss.	250
WMBC	Macon, Miss.	250
KFRU	Columbia, Mo.	1000
KJCF	Festus, Mo.	250
KSIM	Sikeston, Mo.	1000
KTTS	Springfield, Mo.	1000
KDRG	Deer Lodge, Mont.	250
KXGN	Glendive, Mont.	250
KARR	Great Falls, Mont.	1000
KCDW	Alliance, Nebr.	1000
KLIN	Lincoln, Nebr.	250
KBMI	Henderson, Nev.	250
KWNA	Winnemucca, Nev.	1000
WBRL	Berlin, N.H.	250
WTSL	Hanover, N.H.	1000
WLTN	Littleton, N. H.	250
KTRC	Santa Fe, N.Mex.	250
KCHS	Truth or Consequences, New Mexico	250
KTNM	Tucumcari, N.Mex.	250
WONO	Pleasantville, N.J.	1000
WABY	Albany, N.Y.	1000
WYSL	Buffalo, N.Y.	1000d
WSLB	Ogdensburg, N.Y.	1000
WBMA	Beaufort, N.C.	250
WGBG	Greensboro, N.C.	1000
WSIC	Statesville, N.C.	1000
WLSE	Wallace, N. C.	1000
WHCC	Waynesville, N.C.	1000
WCNF	Weldon, N.C.	1000d
KEYJ	Jamestown, N.Dak.	1000
WMAN	Mansfield, Ohio	1000d
WPAY	Portsmouth, Ohio	1000
KWDN	Bartlesville, Okla.	250
KTMC	McAlester, Okla.	250
KNDR	Norman, Okla.	250
KNND	Cottage Grove, Oreg.	1000d
WEST	Easton, Pa.	1000
WJET	Erie, Pa.	1000
WFEC	Harrisburg, Pa.	1000d
WKBI	St. Marys, Pa.	1000
WICK	Scranton, Pa.	1000
WRAK	Williamsport, Pa.	1000
WCDS	Columbia, S.C.	1000
WGTN	Georgetown, S.C.	1000
WHCQ	Spartanburg, S.C.	1000d
WJZM	Clarksville, Tenn.	1000
WHUB	Cookeville, Tenn.	1000
WLSB	Copper Hill, Tenn.	250
WGAP	Maryville, Tenn.	1000d
WHAL	Shelbyville, Tenn.	1000
KRUN	Ballinger, Tex.	250

Kc.	Wave Length	W.P.
KBYG	Big Spring, Tex.	250
KUNO	Corpus Christi, Tex.	250
KILE	nr. Galveston, Tex.	250
KGVL	Greenville, Tex.	250
KEBE	Jacksonville, Tex.	250
KIUN	Pecos, Tex.	1000
KEYE	Perryton. Tex.	250
KVOP	Plainview. Tex.	250
KDWT	Stamford, Tex.	250
KTEM	Tempie, Tex.	1000
KTFS	Texarkana, Tex.	250
KVOU	Uvalde. Tex.	250
KIXX	Provo, Utah	250
WDOT	Burlington, Vt.	1000
WINA	Charlottesville, Va.	1000
WHHV	Hillsville, Va.	250
WHIH	Portsmouth, Va.	1000
WHLF	So. Boston, Va.	1000
WINC	Winchester, Va.	1000
KEDO	Longview, Wash.	250
KRSC	Othello, Wash.	250
KTNT	Tacoma, Wash.	1000
WBOY	Clarkesburg, W.Va.	1000
WRON	Ronceverte, W.Va.	1000
WSPZ	Spencer, W.Va.	1000
WKWK	Wheeling, W.Va.	1000
WBTH	Williamson, W.Va.	1000
WATW	Ashland, Wis.	1000
WBIZ	Eau Claire, Wis.	1000
WDUZ	Green Bay, Wis.	1000
WRJN	Racine, Wis.	1000
WRDB	Reedsburg, Wis.	1000
WRIG	Wausau, Wis.	1000
KATI	Caspar, Wyo.	1000
KODI	Cody, Wyo.	

1410—212.6

WALA	Mobile, Ala.	5000
WRCK	Tuscumbia, Ala.	500d
KTCS	Fort Smith, Ark.	1000
KERN	Bakersfield, Calif.	1000
KRML	Carmel, Calif.	500d
KKOK	Lompoc, Calif.	500d
KMYC	Marysville, Calif.	5000
KCAL	Redlands, Calif.	5000d
KCOL	Ft. Collins, Colo.	1000
WPOP	Hartford, Conn.	5000
WDOV	Dover, Del.	5000d
WMYR	Fort Myers, Fla.	5000
WBIL	Leesburg, Fla.	1000d
WONS	Tallahassee, Fla.	5000d
WRIX	Griffin, Ga.	1000d
WSNE	Cummings, Ga.	1000d
WDAX	McRae, Ga.	1000d
WLAQ	Rome, Ga.	1000
WRMN	Elgin, Ill.	1000d
WTIM	Taylorville, Ill.	1000d
WAZY	Lafayette, Ind.	1000d
KGRN	Grinnell, Iowa	500d
KLEM	LeMars, Iowa	1000d
KCLO	Leavenworth, Kans.	5000d
KWBB	Wichita, Kans.	5000
WLBJ	Bowling Green, Ky.	5000
WHLN	Harlan, Ky.	5000d
KDBS	Alexandria, La.	1000d
WDDW	Halfway, Md.	1000d
WHAG	Halfway, Md.	1000d
WOKW	Brockton, Mass.	1000d
WGRD	Grand Rap., Mich.	1000d
KLFD	Litchfield, Minn.	500d
KRWB	Roseau, Minn.	1000d
WDSK	Cleveland, Miss.	1000d
WBKN	Newton, Miss.	500d
KNOP	N. Platte, Nebr.	1000d
WHTG	Asbury Park, N.J.	
WHTG	Eatontown, N.J.	500d
WDOE	Dunkirk, N.Y.	1000
WELM	Elmira, N.Y.	1000
WSET	Glen Falls, N.Y.	1000d
WOTT	Watertown, N.Y.	5000
WEGO	Concord, N.C.	1000d
WSRC	Durham, N.C.	1000d
WING	Dayton, Ohio	5000
KPAM	Portland, Oreg.	5000d
WLSH	Lansford, Pa.	5000d
KQV	Pittsburgh, Pa.	5000
WPCC	Clinton, S.C.	1000d
WYMB	Manning, S.C.	1000d
WCMT	Martin, Tenn.	1000d
KBUD	Athens, Tex.	1000d
KBAN	Bowie, Tex.	500d
KVLB	Cleveland, Tex.	500
KXIT	Dalhart, Tex.	500d
KADO	Marshall. Tex.	500
KRIG	Odessa. Tex.	1000
KBAL	San Saba, Tex.	500d
KNAL	Victoria. Tex.	500
WIKI	Chester, Va.	
WRIS	Roanoke. Va.	5000d
WRDS	S. Charleston, W. Va.	
WKBH	LaCrosse. Wis.	5000
KWYO	Sheridan, Wyo.	1000

1420—211.1

WACT	Tuscaloosa. Ala.	5000d
KHFH	Sierra Vista, Ariz.	1000d
KPOC	Pocahontas, Ark.	1000d
KRDO	Colo. Sprgs., Colo.	1000
KSTN	Stockton, Calif.	5000
WLIS	Old Saybrook, Conn.	500d
WBRD	Bradenton, Fla.	1000
WDBF	Delray Beach, Fla.	5000d
WETH	St. Augustine, Fla.	1000d
WAVO	Avondale Estates, Ga.	1000d
WRBL	Columbus, Ga.	5000
WPEH	Louisville, Ga.	1000d
WLET	Toccoa, Ga.	5000d
KOLL	Honolulu, Hawaii	
WINI	Murphysboro, Ill.	500d
WIMS	Michigan City, Ind.	5000d
WOC	Davenport, Iowa	5000
KJCK	Junction City, Kans.	1000d
WTCR	Ashland, Ky.	5000d
WHBN	Harrodsburg, Ky.	1000d
WVJS	Owensboro, Ky.	5000
KPEL	Lafayette, La.	1000
WBSM	New Bedford, Mass.	5000
WBEC	Pittsfield, Mass.	1000
WAMM	Flint, Mich.	1000d
WKPR	Kalamazoo, Mich.	1000d
KTOE	Mankato, Minn.	5000
WSUH	Oxford, Miss.	1000d
WQBC	Vicksburg, Miss.	1000
KBTN	Neosho, Mo.	500d
KOOO	Omaha, Nebr.	1000d
KSYX	Santa Rosa, N.Mex.	1000d
WALY	Herkimer, N.Y.	1000d
WACK	Newark, N.Y.	500
WLNA	Peekskill, N.Y.	1000d
WMYN	Mayodan, N.C.	500
WGAS	S. Gastonia, N.C.	500d
WVOT	Wilson, N.C.	1000
WHK	Cleveland, Ohio	5000
KTJS	Hobart, Okla.	1000d
KYNG	Coos Bay, Oreg.	1000d
WCOJ	Coatesville, Pa.	5000
WCED	DuBois, Pa.	5000
WEUC	Ponce, P.R.	1000
WCRE	Cheraw, S.C.	1000d
KDLE	Aberdeen, S. D.	1000d
WEMB	Erwin, Tenn.	5000d
WKSR	Pulaski, Tenn.	1000
KFYN	Bonham, Tex.	250d
KTRE	Lufkin. Tex.	1000
KGNB	New Braunfels, Tex.	1000d
KPEP	San Angelo, Tex.	1000d
WWSR	St. Albans, Vt.	1000d
WDDY	Gloucester, Va.	1000d
WKCW	Warrenton, Va.	5000d
KITI	Chehalis, Wash.	1000d
KUJ	Walla Walla, Wash.	5000
WPLY	Plymouth, Wis.	500d

1430—209.7

WFHK	Pell City, Ala.	1000d
KHBM	Monticello, Ark.	1000d
KAMP	El Centro, Calif.	1000d
KARM	Fresno, Calif.	5000
KALI	Pasadena, Calif.	5000
KJAY	Sacramento, Calif.	500d
KGBA	Santa Clara, Cal.	1000
KOSI	Aurora, Colo.	5000
WIII	Homestead, Fla.	500d
WLAK	Lakeland, Fla.	5000
WPCF	Panama City, Fla.	5000
WGFS	Covington, Ga.	1000d
WRCD	Dalton, Ga.	1000d
WWGS	Tifton, Ga.	5000
WEEF	Highland Park, Ill.	1000d
WCMY	Ottawa, Ill.	500d
WIRE	Indianapolis, Ind.	5000
KASI	Ames, Iowa	1000d
KMRC	Morgan City, La.	500d
WNAV	Annapolis, Md.	5000
WTTT	Amherst, Mass.	5000d
WHIL	Medford, Mass.	5000d
WION	Ionia, Mich.	5000d
WBRB	Mt. Clemens, Mich.	500d
WLAU	Laurel, Miss.	5000d
KAOL	Carrollton, Mo.	500d
WIL	St. Louis, Mo.	5000
KRGI	Grand Island, Nebr.	5000
WNJR	Newark, N.J.	5000d
KGFL	Roswell, N.M.	5000d
WENE	Endicott. N.Y.	5000
WMNC	Morganton, N.C.	5000d
WDJS	Mt. Olive, N.C.	1000d
WRXO	Roxboro, N.C.	1000d
WFOB	Fostoria, Ohio	1000
WCLT	Newark, Ohio	500d
KALV	Alva, Okla.	500
KELI	Tulsa, Okla.	5000
KGAY	Salem. Oreg.	5000d
WVAM	Altoona, Pa.	1000
WFRA	Franklin, Pa.	500d
WNEL	Caguas, P.R.	1000
WBLR	Batesburg, S.C.	5000d
WATP	Marion, S.C.	1000d
KBRK	Brookings. S. Dak.	1000d
WGYW	Fountain City, Tenn.	1000d
WENO	Madison, Tenn.	5000d
WHER	Memphis, Tenn.	1000
KSTB	Breckenridge, Tex.	1000d
KEES	Gladewater, Tex.	1000d
KCOH	Houston, Tex.	1000d
KLO	Ogden, Utah	5000
WIVE	Ashland, Va.	1000d
WDIC	Clinchо, Va.	1000d
KBRC	Mt. Vernon, Wash.	5000
WEIR	Weirton, W.Va.	1000
WBEV	Beaver Dam, Wis.	1000d

1440—208.2

WHHY	Montgomery, Ala.	5000
KWBY	Scottsdale, Ariz.	5000d
KHOG	Fayetteville, Ark.	1000d
KOKY	Little Rock, Ark.	5000d
KVON	Napa, Calif.	500
KPRO	Riverside, Calif.	1000
KCOY	Santa Maria, Calif.	1000
WBIS	Bristol. Conn.	500d
WABR	Winter Park, Fla.	5000d
WWCC	Bremen, Ga.	1000d
WGIG	Brunswick. Ga.	5000
WRAJ	Anna, Ill.	500d
WIOK	Normal, Ill.	1000
WPRS	Paris, Ill.	1000d
WGEM	Quincy. Ill.	5000
WROK	Rockford, Ill.	5000
WPGW	Portland, Ind.	500d
KCHE	Cherokee. Iowa	500d
KEWI	Topeka, Kans.	5000
WCDS	Glasgow, Ky.	1000d
WKLX	Paris, Ky.	1000d
WEZJ	Williamsburg, Ky.	1000d
KMLB	Monroe, La.	5000
WJAB	Westbrook, Me.	5000d
WAAB	Worcester, Mass.	5000
WBCM	Bay City, Mich.	1000
WDOW	Dowagiac, Mich.	1000d
WCHB	Inkster, Mich.	1000d
KEVE	Golden Valley, Minn.	5000
WHHT	Lucedale, Miss.	1000d
WSEL	Pontotoc, Miss.	1000d
WJLK	Asbury Park, N.J.	5000d
WMVB	Millville, N.J.	1000d
WBAB	Babylon, N.Y.	1000d
WJJL	Niagara Falls, N.Y.	1000d
WSGO	Oswego, N.Y.	1000d
WBLA	Elizabethtown, N.C.	1000d
WBUY	Lexington, N.C.	5000
KILO	Grand Forks, N.D.	1000
WHHH	Warren, Ohio	5000
KMED	Medford, Oreg.	5000
KODL	The Dalles, Oreg.	1000
WCDL	Carbondale, Pa.	5000d
WNPV	Lansdale, Pa.	500d
WGCB	Red Lion, Pa.	1000d
WQOK	Greenville, S.C.	5000
WHHL	Holly Hill, S.C.	1kwd
WZYX	Cowan, Tenn.	1000d
WHDM	McKenzie, Tenn.	500d
KFDA	Amarillo, Tex.	5000
KEYS	Corpus Christi, Tex.	1000
KDNT	Denton, Tex.	5000
KETX	Livingston, Tex.	5000d
WKLV	Blackstone, Va.	5000d
KDNC	Spokane, Wash.	5000d
WHIS	Bluefield. W.Va.	5000
WAJR	Morgantown, W.Va.	5000
WJPG	Green Bay, Wis.	5000

1450—206.8

WDNG	Anniston. Ala.	1000
WYAM	Bessemer, Ala.	1000
WDIG	Dothan, Ala.	1000
WFIX	Huntsville, Ala.	1000
WLAY	Muscle Shoals City, Alabama	1000
KLAM	Cordova, Alaska	250
KAWT	Douglas. Ariz.	250
KNOT	Prescott, Ariz.	250
KOLD	Tucson, Ariz.	250
KENA	Mena, Ark.	250
KYOR	Blythe, Calif.	250
KOWN	Escondido, Calif.	250
KPAL	Palm Springs, Calif.	250
KTIP	Porterville, Calif.	1000
KSAN	San Francisco, Calif.	1000
KVML	Sonora, Calif.	250
KVEN	Ventura, Calif.	1000
KAGR	Yuba City, Calif.	100
KGIW	Alamosa, Colo.	250
KYOU	Greeley, Colo.	1000
WNAB	Bridgeport, Conn.	1000
WILM	Wilmington, Del.	1000
WOL	Washington, D. C.	1000
WWJB	Brooksville, Fla.	250
WMFJ	Daytona Beach, Fla.	1000
WSKP	Miami, Fla.	250
WBSR	Pensacola. Fla.	1000
WSPB	Sarasota. Fla.	1000
WSTU	Stuart, Fla.	250
WTAL	Tallahassee. Fla.	1000
WGPC	Albany, Ga.	1000
WBHF	Cartersville, Ga.	1000
WCON	Cornelia, Ga.	1000
WKEU	Griffin, Ga.	250
WMVG	Milledgeville, Ga.	1000
WBYG	Savannah, Ga.	1000
WVLD	Valdosta, Ga.	1000
KEOK	Payette, Idaho	250
KEEP	Twin Falls, Idaho	1000
WVON	Cicero. Ill.	1000
WKEI	Kewanee, Ill.	100
WCVS	Springfield, Ill.	1000
WANE	Ft. Wayne, Ind.	1000
WXVW	Jeffersonville, Ind.	250
WASK	Lafayette, Ind.	1000
WAOV	Vincennes, Ind.	1000
KLWN	Cedar Rapids, Iowa	250
KWBW	Hutchinson, Kans.	1000
WTCO	Campbellsville, Ky.	1000
WWXL	Manchester, Ky.	1000
WPAD	Paducah, Ky.	1000
KSIG	Crowley, La.	1000
KNOC	Natchitoches, La.	1000
WNPS	New Orleans, La.	250
WRKD	Rockland, Maine	250
WKTQ	South Paris, Maine	1000
WTBO	Cumberland, Md.	1000
WMAS	Springfield, Mass.	1000
WATZ	Alpena Township, Michigan	1000
WHTC	Holland, Mich.	1000
WMIQ	Iron Mtn., Mich.	250
WIBM	Jackson, Mich.	1000
WKLA	Ludington, Mich.	250
WHLS	Port Huron, Mich.	1000
KATE	Albert Lea, Minn.	250
KBUN	Bemidji, Minn.	1000
KBMW	Breckenridge, Minn.	1000
WELY	Ely, Minn.	1000
KFAM	St. Cloud, Minn.	1000
WROX	Clarksdale, Miss.	250
WCJU	Columbia, Miss.	250
WJXN	Jackson, Miss.	1000
WOKK	Meridian, Miss.	250
WNAT	Natchez, Miss.	250
WROB	West Point, Miss.	250
KFTW	Fredericktown, Mo.	1000
WMBH	Joplin, Mo.	1000
KIRX	Kirksville, Mo.	1000
KOKO	Warrensburg, Mo.	1000
KWPM	West Plains, Mo.	1000
KXXL	Bozeman, Mont.	1000
KUDI	Great Falls, Mont.	1000
KXLL	Missoula, Mont.	250
KRBN	Red Lodge, Mont.	1000
KVCK	Wolf Point, Mont.	1000
KWBE	Beatrice, Nebr.	250
KONE	Reno, Nev.	250
WKXL	Concord, N.H.	1000
WFPG	Atlantic City, N.J.	1000
WCTC	New Brunswick, N. J.	1000
KLOS	Albuquerque, N.Mex.	250
KLMX	Clayton, N.Mex.	1000d
KOBE	Las Cruces, N.Mex.	250
KENM	Portales, N.Mex.	1000
WCLI	Corning, N.Y.	1000
WWSC	Glen Falls, N.Y.	1000d
WHDL	Olean, N.Y.	1000
WKIP	Poughkeepsie, N. Y.	1000
WKAL	Rome, N.Y.	250
WATA	Boone, N. C.	1000
WGNC	Gastonia, N.C.	1000
WIZS	Henderson, N.C.	1000
WHKP	Hendersonville, N.C.	1000
WHIT	New Bern, N.C.	250
WFBS	Spring Lake, N.C.	500
KGCA	Rugby, N.Dak.	250
WJER	Dover, Ohio	1000
WMOH	Hamilton, Ohio	1000d
WLEC	Sandusky, Ohio	1000
KWHW	Altus, Okla.	1000
KGFF	Shawnee, Okla.	1000
KSIW	Woodward, Okla.	1000
KORE	Eugene, Oreg.	1000
KFLW	Klamath Falls, Oreg.	250
KLBM	La Grande, Oreg.	1000
KBPS	Portland, Ore.	250
WWGO	Erie, Pa.	1000d
WDAD	Indiana, Pa.	1000
WPAM	Pottsville, Pa.	1000
WMPT	So. Williamsport, Pa.	250
WMAJ	State College, Pa.	1000d
WJPA	Washington, Pa.	250
WWRI	W. Warwick, R.I.	1000
WQSN	Charleston, S.C.	1000
WCRS	Greenwood, S.C.	1000
WMYB	Myrtle Beach, S.C.	1000
WHSC	Hartsville, S.C.	1000
KBFS	Belle Fourche, S. Dak.	1000
KYNT	Yankton, S.Dak.	250
WLAR	Athens, Tenn.	1000
WMOC	Chattanooga, Tenn.	1000
WDSG	Dyersburg, Tenn.	250
WSMG	Greeneville, Tenn.	250
WLAF	LaFollette. Tenn.	1000
WGNS	Murfreesboro, Tenn.	1000
KAYC	Beaumont, Tex.	1000
KBEN	Carrizo Sprgs., Tex.	250
KCTI	Gonzales. Tex.	250
KMBL	Junction, Tex.	250
KCYL	Lampasas, Tex.	250
KMHT	Marshall, Tex.	1000
KAMY	McCamey, Tex.	250
KNET	Palestine, Tex.	250
KSNY	Snyder, Tex.	1000
KURA	Moab, Utah	1000
KEYY	Provo, Utah	250
KDXU	St. George, Utah	250
WSNO	Barre, Vt.	1000
WTSA	Brattleboro, Vt.	1000
WFTR	Front Royal. Va.	1000
WENZ	Highland Springs, Va.	250
WREL	Lexington, Va.	1000
WMVA	Martinsville, Va.	1000
KBKW	Aberdeen, Wash.	1000
KCLX	Colfax, Wash.	1000
KONP	Port Angeles. Wash.	250
KAYE	Puyallup, Wash.	1000
WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	250

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
WDLB	Marshfield, Wis.	1000
WPFP	Park Falls, Wis.	1000
WRCO	Richland Center, Wis.	1000
KBBS	Buffalo, Wyo.	250
KVOW	Riverton, Wyo.	1000

1460—205.4

WFMH	Cullman, Ala.	5000d
WPNX	Phenix City, Ala.	5000
KZOT	Marianna, Ark.	500
KCCL	Paris, Ark.	500d
KTYM	Inglewood, Calif.	5000
KDON	Salinas, Calif.	5000
KVRE	Santa Rosa, Calif.	1000d
KDEY	Boulder, Colo.	500d
KYSN	Colo. Sprgs., Colo.	1000
WBAR	Bartow, Fla.	1000d
WZEP	DeFuniak Springs, Florida	1000d
WMBR	Jacksonville, Fla.	5000
WDMF	Buford, Ga.	1000d
WPNX	Columbus, Ga.	1000
WROY	Carmi, Ill.	1000d
WIXN	Dixon, Ill.	1000d
WRTL	Rantoul, Ill.	250d
WKAM	Goshen, Ind.	1000
WOCH	North Vernon, Ind.	1000d
KSO	Des Moines, Iowa	5000
KCRB	Chanute, Kans.	1000d
WRVK	Mt. Vernon, Ky.	500d
WAIL	Baton Rouge, La.	5000
KBSF	Springhill, La.	1000d
WEMD	Easton, Md.	500d
WBET	Brockton, Mass.	5000
WBRN	Big Rapids, Mich.	1000d
WPON	Pontiac, Mich.	1000
KOWA	Hastings, Minn.	
KDMA	Montevideo, Minn.	1000
WELZ	Belzoni, Miss.	1000d
KADY	St. Charles, Mo.	5000d
KRNY	Kearney, Nebr.	5000d
KENO	Las Vegas, Nev.	1000
WOKO	Albany, N.Y.	5000
WVOX	New Rochelle, N.Y.	500d
WHEC	Rochester, N.Y.	5000
WFVG	Fuquay Sprgs., N.C.	1000d
WRKB	Kannapolis, N.C.	500d
WMMH	Marshall, N.C.	500d
WBNS	Columbus, Ohio	5000
WPVL	Painesville, Ohio	500d
KROW	Dallas, Oreg.	5000d
KELR	El Reno, Okla.	500
WMBA	Ambridge, Pa.	500d
WCMB	Harrisburg, Pa.	5000
WBCU	Union, S.C.	1000
WGOG	Walhalla, S.C.	500d
WJAK	Jackson, Tenn.	5000d
WEEN	Lafayette, Tenn.	1000d
KBRZ	Freeport, Tex.	500d
KLLL	Lubbock, Tex.	1000d
WACO	Waco, Tex.	1000
WPRW	Manassas, Va.	500d
WRAD	Radford, Va.	5000
WLPM	Suffolk, Va.	5000d
KCDI	Kirkland, Wash.	5000d
KIMA	Yakima, Wash.	5000
WBUC	Buckhannon, W.Va.	5000d
WRAC	Racine, Wis.	500d
WTMB	Tomah, Wis.	1000d

1470—204.0

WBLO	Evergreen, Ala.	1000d
KMVS	Sierra Vista, Ariz.	1000d
KZNG	Hot Springs, Ark.	1000d
KBMX	Coalinga, Calif.	500d
KUTY	Palmdale, Calif.	5000
KXOA	Sacramento, Calif.	5000
WMMW	Meriden, Conn.	1000d
WRBD	Pompano Beach, Fla.	5000
WRBB	Tarpon Sprgs., Fla.	5000d
WAAG	Adel, Ga.	1000d
WDOL	Athens, Ga.	1000d
WCLA	Claxton, Ga.	1000
WRGA	Rome, Ga.	5000
WMPP	Chicago Heights, Ill.	1000d
WMBD	Peoria, Ill.	5000
WHUT	Anderson, Ind.	1000d
KTRI	Sioux City, Iowa	5000
KWVY	Waverly, Iowa	1000d
KARE	Atchison, Kans.	1000
KLIB	Liberal, Kans.	500d
WSAC	Fort Knox, Ky.	1000d
KTDL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJDY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KANO	Anoka, Minn.	1000d
WCHJ	Brookhaven, Miss.	1000d
WNAU	New Albany, Miss.	500d
KGHM	Brookfield, Mo.	500d
KTCB	Malden, Mo.	1000d
WTKO	Ithaca, N.Y.	1000d
WPDM	Potsdam, N.Y.	1000d
WBIG	Greensboro, N.C.	5000
WPNC	Plymouth, N.C.	1000d
WTOE	Spruce Pine, N.C.	1000d
WOHO	Toledo, Ohio	1000
KVLH	Pauls Valley, Okla.	250d
KVIN	Vinita, Okla.	500d
KRAF	Reedsport, Oreg.	5000d
WSAN	Allentown, Pa.	5000
WFAR	Farrell, Pa.	1000d
WWML	Portage, Pa.	500d
WQXL	Columbia, S.C.	5000d
WGOO	Georgetown, S. C.	500d
WEAG	Alcoa, Tenn.	1000d
WVOL	Berry Hill, Tenn.	5000
KRBC	Abilene, Tex.	5000
KDHN	Dimmitt, Tex.	
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
KELA	Centralia, Wash.	5000
KSEM	Moses Lake, Wash.	5000
KAPS	Mount Vernon, Wash.	5000d
WWHY	Huntington, W.Va.	5000d
WBZE	Wheeling, W.Va.	500d
WBKV	West Bend, Wis.	1000d
KTWO	Casper, Wyo.	5000

1480—202.6

WARI	Abbeville, Ala.	1000
WBTS	Bridgeport, Ala.	1000d
WIXI	Irondale, Ala.	5000d
WABB	Mobile, Ala.	5000
KHAT	Phoenix, Ariz.	500
KGLU	Safford, Ariz.	1000
KTHS	Berryville, Ark	1000
KWUN	Concord, Calif.	500d
KRED	Eureka, Calif.	5000
KYOS	Merced, Calif.	5000
KWIZ	Santa Ana, Calif.	5000
KSEE	Santa Maria, Calif.	1000
KPUB	Pueblo, Colo.	1000d
WSOR	Windsor, Conn.	500d
WAPG	Arcadia, Fla.	1000d
WTHR	Panama Beach, Fla.	500d
WXIV	Windemere, Fla.	1000d
WYZE	Atlanta, Ga.	5000d
WRDW	Augusta, Ga.	5000
WGSB	Geneva, Ill.	1000
WJBM	Jerseyville, Ill.	500d
WTHI	Terre Haute, Ind.	1000
WRSW	Warsaw, Ind.	1000
KLEE	Ottumwa, Iowa	500d
KBEA	Mission, Kans.	1000d
KLEO	Wichita, Kans.	5000
WKOA	Hopkinsville, Ky.	1000d
WNKY	Neon, Ky.	1000d
WTLO	Somerset, Ky.	1000d
KCKW	Jena, La.	500d
KANV	Jonesville, La.	500d
KJOE	Shreveport, La.	1000d
WSAR	Fall River, Mass.	5000
WMAX	Grand Rapids, Michigan	1000d
WIOS	Tawas City, Mich.	1000d
WYSI	Ypsilanti, Mich.	500wd
KAUS	Austin, Minn.	1000
KGCX	Sidney, Mont.	5000
KLMS	Lincoln, Nebr.	1000
KWEW	Hobbs, N. Mex.	5000
WLEA	Hornell, N.Y.	1000d
WHOM	New York, N.Y.	5000
WREM	Remsen, N.Y.	5000d
WWOK	Charlotte, N.C.	5000
WYRV	Louisburg, N.C.	500d
WMSJ	Sylva, N.C.	5000d
WHBC	Canton, Ohio	5000
WCIN	Cincinnati, Ohio	5000
WTRA	Latrobe, Pa.	500d
WDAS	Philadelphia, Pa.	5000
WISL	Shamokin, Pa.	1000
WSHP	Shippensburg, Pa.	500d
WMDD	Fajardo, P.R.	5000
KSDR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500
WLOK	Memphis, Tenn.	5000d
KBOX	Dallas, Tex.	5000
KLVL	Pasadena, Tex.	1000
KAPE	San Antonio, Tex.	500d
KONI	Spanish Fork, Utah	1000d
WCFR	Springfield, Vt.	1000d
WBBL	Richmond, Va.	5000
WLEE	Richmond, Va.	5000
WBLU	Salem, Va.	5000d
KFHA	Lakewood, Wash.	1000d
KVAN	Vancouver, Wash.	1000d
WISM	Madison, Wis.	5000
KRAE	Cheyenne, Wyo.	1000d

1490—201.2

WANA	Anniston, Ala.	250
WAJF	Decatur, Ala.	1000
WRLD	Lanett, Ala.	250
WHBB	Selma, Ala.	250
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	250
KTLO	Mtn. Home, Ark.	250
KDRS	Paragould, Ark.	1000
KOTN	Pine Bluff, Ark.	250
KXRJ	Russellville, Ark.	1000
KWAC	Bakersfield, Calif.	1000
KPAS	Banning, Calif.	250
KICO	Calexico, Calif.	250
KRKC	King City, Calif.	1000
KOWL	Lake Tahoe, Calif.	250
KTOB	Petaluma, Calif.	1000
KBLF	Red Bluff, Calif.	1000
KDB	Santa Barbara, Calif.	1000
KSYC	Yreka, Calif.	1000
KBOL	Boulder, Colo.	1000
KGUC	Gunnison, Colo.	250
KCMS	Manitou Sprgs., Colo.	100
KOLR	Sterling, Colo.	250
WTOR	Torrington, Conn.	250
WTRL	Bradenton, Fla.	250
WJBS	DeLand, Fla.	250
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	1000
WPXE	Starke, Fla.	250
WTTB	Vero Beach, Fla.	1000
WSIR	Winter Haven, Fla.	250
WMOG	Brunswick, Ga.	250
WMJM	Cordele, Ga.	1000
WMRE	Monroe, Ga.	1000d
WSFB	Quitman, Ga.	250
WSNT	Sandersville, Ga.	500
WSYL	Sylvania, Ga.	250
KTOH	Lihue, Hawaii	250
KCID	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WDAN	Danville, Ill.	1000
WAMV	East St. Louis, Ill.	1000
WOPA	Oak Park, Ill.	1000
WZOE	Princeton, Ind.	1000
WKBV	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Iowa	1000
KRIB	Mason City, Iowa	250
KKAN	Phillipsburg, Kans.	250
KTOP	Topeka, Kans.	250
WFKY	Frankfort, Ky.	1000d
WKAY	Glasgow, Ky.	1000
WOMI	Owensboro, Ky.	1000
WSIP	Paintsville, Ky.	1000
WIKC	Bogalusa, La.	1000
KEUN	Eunice, La.	250
KCIL	Houma, La.	1000
KRUS	Ruston, La.	1000
WPOR	Portland, Maine	1000
WTVL	Waterville, Maine	1000
WARK	Hagerstown, Md.	1000
WHAV	Haverhill, Mass.	250
WMRC	Milford, Mass.	250
WTXL	W. Springfield, Mass.	1000
WABJ	Adrian, Mich.	1000
WBFC	Fremont, Mich.	250
WMDN	Midland, Mich.	1000
WCBQ	Whitehall, Mich.	1000
KOZY	Grand Rapids, Minn.	250
KLGR	Redwd. Falls, Minn.	1000
WLOX	Biloxi, Miss.	1000
WCLD	Cleveland, Miss.	250
WHOC	Philadelphia, Miss.	250
WTUP	Tupelo, Miss.	250
WVIM	Vicksburg, Miss.	250
KDMO	Carthage, Mo.	250
KTTR	Rolla, Mo.	1000
KDRO	Sedalia, Mo.	250
KBOW	Butte, Mont.	1000
KBON	Omaha, Nebr.	1000
WEMJ	Laconia, N.H.	1000
WLDB	Atlantic City, N. J.	1000
KRSN	Los Alamos, N.Mex.	1000
KRTN	Raton, N. Mex.	1000
WCSS	Amsterdam, N.Y.	1000
WBTA	Batavia, N.Y.	250
WKNY	Kingston, N.Y.	1000
WICY	Malone, N.Y.	1000
WDLC	Port Jervis, N. Y.	1000
WOLF	Syracuse, N. Y.	1000
WSSB	Durham, N. C.	1000
WFLB	Fayetteville, N.C.	250
WLOE	Leaksville, N.C.	250
WRNB	New Bern, N.C.	1000
WRMT	Rocky Mount, N. C.	1000
WSTP	Salisbury, N.C.	250
WSVM	Valdese, N.C.	1000
KNDC	Hettinger, N.Dak.	250
WHSL	Wilmington, N.C.	250
KOVC	Valley City, N. Dak.	1000
WBEX	Chillicothe, Ohio	1000
WJMO	Cleveland Hghts., O.	1000
WOHI	E. Liverpool, Ohio	250
WMOA	Marietta, Ohio	1000
WMRN	Marion, Ohio	1000
KWRW	Guthrie, Okla.	100
KBIX	Muskogee, Okla.	250
KBKR	Baker, Oreg.	1000
KRNR	Roseburg, Oreg.	1000
KBZY	Salem, Oreg.	1000
WESB	Bradford, Pa.	1000
WAZL	Hazleton, Pa.	1000
WARD	Johnstown, Pa.	1000
WGAL	Lancaster, Pa.	1000
WBCB	Levittown, Pa.	1000
WMRF	Lewiston, Pa.	1000
WMGW	Meadville, Pa.	1000d
WNBT	Wellsboro, Pa.	1000
WSIB	Beaufort, S.C.	100
WGCD	Chester, S.C.	250
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S.Dak.	1000
WOPI	Bristol, Tenn.	1000
WDXB	Chattanooga, Tenn.	1000
WROL	Fountain City, Tenn.	250
WJJM	Lewisburg, Tenn.	1000
WDXL	Lexington, Tenn.	1000
KNOW	Austin, Tex.	250
KIBL	Beeville, Tex.	250
KBST	Big Spring, Tex.	1000
KHUZ	Borger, Tex.	250
KNEL	Brady, Tex.	250
KSAM	Huntsville, Tex.	250
KVOZ	Laredo, Tex.	250
KZZN	Littlefield, Tex.	250
KPLT	Paris, Tex.	1000
KGKB	Tyler, Tex.	250
KVWC	Vernon, Tex.	250
KVOG	Ogden, Utah	1000
WKVT	Brattleboro, Vt.	1000
WIKE	Newport, Vt.	1000
WCVA	Culpeper, Va.	1000
WVEC	Hampton, Va.	1000
WAYB	Waynesboro, Va.	1000
KBRO	Bremerton, Wash.	1000
KLOG	Kelso, Wash.	1000
KENE	Toppenish, Wash.	1000
KTEL	Walla Walla, Wash.	250
WGKV	Charleston, W.Va.	1000
WTCS	Fairmont, W.Va.	1000d
WLOH	Princeton, W.Va.	250
WGEZ	Beloit, Wis.	1000d
WLCX	LaCrosse, Wis.	1000
WIGM	Medford, Wis.	1000
WOSH	Oshkosh, Wis.	1000
KIML	Gillette, Wyo.	250
KLME	Laramie, Wyo.	500
KRTR	Thermopolis, Wyo.	250
KGOS	Torrington, Wyo.	1000

1500—199.9

WFMI	Montgomery, Ala.	500d
KGMR	Jacksonville, Ark.	1000d
KBLA	Burbank, Calif.	10000
KXRX	San Jose, Calif.	5000
WTOP	Washington, D.C.	50000
WKIZ	Key West, Fla.	250
WGUL	New Port Richey, Fla.	250d
WSEM	Donaldsonville, Ga.	1000d
WTHN	Thomaston, Ga.	1000d
KUMU	Honolulu, Hawaii	1000
WGEN	Genesco, Ill.	250d
WPMB	Vandalia, Ill.	
WVOC	Battle Creek, Mich.	1000d
WJBK	Detroit, Mich.	10000
KSTP	St. Paul, Minn.	50000
KDFN	Doniphan, Mo.	1000d
WGIC	Xenia, O.	
KOSG	Pawhuska, Okla.	500d
KPIR	Eugene, Ore.	10000d
WMNT	Manati, P.R.	250
WEAC	Gaffney, S. C.	1000d
KWFA	Merkle, Tex.	250d
KTXO	Sherman, Tex.	250
KANI	Wharton, Tex.	500

1510—199.1

KALF	Mesa, Ariz.	10000d
KASK	Ontario, Calif.	1000
KIRV	Fresno, Calif.	500
KTIM	San Rafael, Calif.	1000d
KMOR	Littleton, Colo.	1000
WNLC	New London, Conn.	10000
WZZZ	Boynton Beach, Fla.	1000d
WWBC	Cocoa, Fla.	
WINU	Highland, Ill.	250d
WJRC	Joliet, Ill.	500d
WKAI	Macomb, Ill.	1000d
KIFG	Iowa Falls, Iowa	500d
KANS	Larned, Kan.	1000d
WMEX	Boston, Mass.	5000
WJCO	Jackson, Mich.	5000d
WLKM	Three Rivers, Mich.	500
KCCV	Independence, Mo.	1000d
KTTT	Columbus, Nebr.	500d
WEAL	Greensboro, N.C.	1000d
WBRW	Brewster, N.Y.	1000d
WLAC	Nashville, Tenn.	50000
KCTX	Childress, Tex.	250d
KABH	Midland, Tex.	500d
KMOO	Mineola, Tex.	
KROB	Robstown, Tex.	500d
KSTV	Stephenville, Tex.	250d
KGA	Spokane, Wash.	50000
WAUX	Waukesha, Wis.	10000d

1520—197.4

KGHT	Hollister, Calif.	500
KACY	Port Hueneme, Calif.	10000

Kc.	Wave Length	W.P.
WTLN	Apopka, Fla.	5000d
WGNP	Indian Rocks Beach, Fla.	1000d
WIXX	Oakland Park, Fla.	1000d
WHOW	Clinton, Ill.	5000d
WLUV	Loves Park, Ill.	500d
WSVL	Shelbyville, Ind.	1000
KSIB	Creston, Iowa	1000d
WRSL	Stanford, Ky.	500d
KXKW	Lafayette, La.	1000
WVCB	Bel Air, Md.	250d
WKJR	Muskegon Hts., Mich.	1000d
WYNZ	Ypsilanti, Mich.	250d
KOLM	Rochester, Minn.	1000d
WDSL	Mocksville, N. C.	
WYRP	Ocean City, N. J.	1000d
KHIP	Albuquerque, N.Mex.	500d
WKBW	Buffalo, N.Y.	50000
WFYI	Mineola, N. Y.	10000d
WBNO	Bryan, Ohio	500d
KOMA	Okla. City, Okla.	50000
KGON	Oregon City, Oreg.	10000
WCHE	West Chester, Pa.	250
WRAI	Rio Piedras, P. R.	250

1530—196.1

WLCB	Moulton, Ala.	1000d
WCTR	Chestertown, Mo.	1530
KCAT	Pine Bluff, Ark	250d
KFBK	Sacramento, Calif.	50000
KRYT	Colorado Springs, Col.	
WENG	Englewood, Fla.	1000
KNBI	Norton, Kan.	1000d
KWLA	Many, La.	1000d
WTCR	Chestertown, Md.	250d
WRPM	Poplarville, Miss.	1000d
WTHM	Lapeer, Mich.	5000d
WERX	Wyoming, Mich.	500d
KMAM	Butler, Mo.	250
KLOL	Lincoln, Neb.	
WCKY	Cincinnati, Ohio	50000
WMBT	Shenandoah, Pa.	250d
KGTN	Georgetown, Tex.	1000d
KGBT	Harlingen, Tex.	50000
KCLR	Ralls, Tex.	1000d
WQVA	Quantico, Va.	250
KCHY	Cheyenne, Wy.	10000

1540—195.0

KPOL	Los Angeles, Calif.	50000
WSMI	Litchfield, Ill.	1000d
WBNL	Boonville, Ind.	250d
WLOI	LaPorte, Ind.	250d
KXEL	Waterloo, Iowa	50000
KNEX	McPherson, Kans.	250d
KLKC	Parsons, Kans.	250d
WDON	Wheaton, Md.	1000
WMRR	Marshall, Mich.	
WPTR	Albany, N.Y.	50000
WIFM	Elkin, N.C.	1000d
WBCO	Bucyrus, Ohio	500d
WABQ	Cleveland, Ohio	1000d
WNIO	Niles, Ohio	500d
WBTC	Uhrichsville, Ohio	
KWFS	Eugene, Ore.	1000d
WJMJ	Philadelphia, Pa.	50000d
WPTS	Pittston, Pa.	1000d
WPME	Punxsutawney, Pa.	1000d
WADK	Newport, R.I.	1000d
WBFJ	Woodbury, Tenn.	
KCUL	Ft. Worth, Tex.	50000d
KGBC	Galveston, Tex.	1000
WWWW	Richmond, Va.	
KBVU	Bellevue, Wash.	1000
WTKM	Hartford, Wis.	500d

1550—193.5

WBHM	Birmingham, Ala.	50000d
WAAY	Huntsville, Ala.	5000
WMOE	Mobile, Ala.	50000d
KFIF	Tucson, Ariz.	50000d
KXEX	Fresno, Calif.	500d
KKHI	San Fran., Calif.	10000
KDAB	Arvada, Colo.	10000d
WEXT	West Hartford, Conn.	1000d
WRIZ	Coral Gables, Fla.	10000d
WORT	New Smyrna Bch., Fla.	250
WYOU	Tampa, Fla.	10000d
WSMA	Smyrna, Ga.	10000d
WJIL	Jacksonville, Ill.	1000d
WCTW	New Castle, Ind.	250
KIWA	Sheldon, Iowa	500d
KEDD	Dodge City, Kans.	1000d
WIRV	Irvine, Ky.	1000d
WMSK	Morganfield, Ky.	250d
WLUX	Baton Rouge, La.	5000d
KOKA	Shreveport, La.	10000
WSER	Elkton, Md.	250d
WSHN	Fremont, Mich.	1000d
WJAQ	Jackson, Miss.	50000
WSAO	Sanitobia, Miss.	5kwd
KBLR	Bolivar, Mo.	250
KGMO	Cape Girardeau, Mo.	5000d
KKJO	St. Joseph, Mo.	5000
WCGR	Canadaigua, N.Y.	250
WBAZ	Kingston, N.Y.	500d
WBVM	Utica, N.Y.	1000
WPXY	Greenville, N. C.	500d
WNOH	Raleigh, N.C.	1000d
WTYN	Tryon, N.C.	1000d
WPEG	Winston-Salem, N.C.	1000d
KUTT	Fargo, N.D.	5000d
WDLR	Delaware, Ohio	500d
KMAD	Madill, Okla.	250
KREK	Sapulpa, Okla.	500d
WLOA	Braddock, Pa.	1000d
WTTC	Towanda, Pa.	500d
WKFE	Yauco, P.R.	250
WBSC	Bennetsville, S.C.	10000
WTHB	N. Augusta, S.C.	1000d
KCAN	Canyon, Tex.	1000
KWBC	Navasota, Tex.	250d
WKYE	Bristol, Tenn.	1000d
WYRL	Bristol, Tenn.	1000d
WPTN	Cookeville, Tenn.	250d
WTPI	Cookville, Tenn.	250d
WKPT	Kingsport, Tenn.	10000d
KCOM	Comanche, Tex.	250d
WKBA	Vinton, Va.	1000d
WBOF	Virginia Beach, Va.	5000d
WXVA	Charlestown, W.Va.	500d
KOQT	Bellingham, Wash.	1000d
KGAR	Vancouver, Wash.	1000d

1560—192.3

WAGC	Centre, Ala.	1000d
KPMC	Bakersfield, Calif.	10000
KIQS	Willows, Calif.	250d
WBYS	Canton, Ill.	250d
WRIN	Rensselaer, Ind.	250d
KSWI	Council Bluffs, Iowa	1000d
KABI	Abilene, Kan.	250d
WDXR	Paducah, Ky.	1000
WBGS	Slidell, La.	
KBEW	Blue Earth, Minn.	250d
KQYX	Joplin, Mo.	250
WQXR	New York, N.Y.	50000
WSDC	Mocksville, N.C.	250d
WGLO	Chardon, Ohio	250d
WTNS	Coshocton, Ohio	1000d
WFOL	Hamilton, Ohio	
WTOD	Toledo, Ohio	5000d
KWCO	Chickasha, Okla.	1000
WRSJ	Bayamon, P.R.	5000
WAGL	Lancaster, S. C.	1000d
WLVN	Nashville, Tenn.	10000d
WBOL	Bolivar, Tenn.	250d
KCAD	Abilene, Tex.	500d
KHBR	Hillsboro, Tex.	250d
KGUL	Port Lavaca, Tex.	500d
KHOK	Hoquiam, Wash.	1000d

1570—191.1

WCRL	Oneonta, Ala.	1000d
WRWJ	Selma, Ala.	5000d
KBRI	Brinkley, Ark.	250d
KBJT	Fordyce, Ark.	250d
KRSA	Alisal, Calif.	250d
KCVR	Lodi, Calif.	1000d
KACE	Riverside, Calif.	1000d
KLOV	Loveland, Colo.	250d
WTWB	Auburndale, Fla.	5000d
WPAP	Fernandina Beach, Florida	1000d
WOKC	Okeechobee, Fla.	1000
WJOE	Ward Ridge, Fla.	250
WMES	Ashburn, Ga.	1000d
WGHC	Clayton, Ga.	1000d
WEAD	College Park, Ga.	1000d
WGSR	Millen, Ga.	250d
WOKZ	Alton, Ill.	1000d
WFRL	Freeport, Ill.	5000d
WBEE	Harvey, Ill.	1000d
WTAY	Robinson, Ill.	250d
WILO	Frankfort, Ind.	250d
WAWR	Kendallville, Ind.	250d
WOWI	New Albany, Ind.	1000d
KMCD	Fairfield, Iowa	250d
KJFJ	Webster City, Iowa	250d
KNDY	Marysville, Kans.	250d
KWSK	Pratt, Kans.	250d
WKKS	Vanceburg, Ky.	250d
WABL	Amite, La.	500d
KLLA	Leesville, La.	1000
KMAR	Winnsboro, La.	1000
WAQE	Towson, Md.	5000d
WPEP	Taunton, Mass.	1000d
WMLO	Beverly, Mass.	500d
WDEW	Westfield, Mass.	1000d
WMRP	Flint, Mich.	1000d
WFUR	Grand Rapids, Michigan	1000d
KUXL	Golden Valley, Minn.	500d
WONA	Winona, Miss.	1000d
KLEX	Lexington, Mo.	250d
WAFS	Amsterdam, N.Y.	1000
WFLR	Dundee, N.Y.	1000d
WBUZ	Fredonia, N.Y.	250d
WAPC	Riverhead, N.Y.	1000d
WTLK	Taylorsville, N.C.	500
WNCA	Siler City, N.C.	1000d
WCLW	Mansfield, Ohio	1000
WPTW	Piqua, Ohio	250d
KTAT	Frederick, Okla.	250d
KOLS	Pryor, Okla.	1000d
KWAY	Forest Grove, Oreg.	1000d
KOHU	Hermiston, Oreg.	1000d
WPGM	Danville, Pa.	
WBUX	Doylestown, Pa.	5000d
WQTW	Latrobe, Pa.	1000d
WFGN	Gaffney, S.C.	250d
WJES	Johnston, S.C.	250
WLSC	Loris, S.C.	1000d
WHLP	Centerville, Tenn.	1000d
WCLE	Cleveland, Tenn.	1000d
WTRB	Ripley, Tenn.	1000d
KZOL	Farwell, Tex.	250d
KVLG	La Grange, Tex.	250d
KTER	Terrell, Tex.	250d
KWIC	Salt Lake City, Utah	5000
WSWV	Pennington Gap, Va.	1000d
WYTI	Rocky Mount, Va.	1000d
WAPL	Appleton, Wis.	1000d

1580—189.2

WEYY	Talladega, Ala.	1000d
KYND	Tempe, Ariz.	10000d
KPCA	Marked Tree, Ark.	250d
KFDF	Van Buren, Ark.	1000d
KPON	Anderson, Calif.	1000d
KWIP	Merced, Calif.	500d
KDAY	Santa Monica, Cal.	50000d
KHUM	Santa Rosa, Calif.	500d
KPIK	Colorado Sprgs., Colo.	5000d
WSBP	Chattachoochee, Fla.	1000d
WWIL	Ft. Lauderdale, Fla.	10000
WVGT	Mount Dora, Fla.	1000d
WCCF	Punta Gorda, Fla.	1000d
WCLS	Columbus, Ga.	1000d
WPFE	Eastman, Ga.	500d
WLBA	Gainesville, Ga.	5000d
WKIG	Glenville, Ga.	1000d
WKKD	Aurora, Ill.	250d
WDQN	DuQuoin, Ill.	250d
WBBA	Pittsfield, Ill.	250d
WKID	Urbana, Ill.	250d
WCNB	Connersville, Ind.	250d
WJVA	South Bend, Ind.	1000d
WAMW	Washington, Ind.	250d
KCHA	Charles City, Iowa	500d
KWNT	Davenport, Iowa	500d
KDSN	Denison, Iowa	500d
WAXU	Georgetown, Ky.	10000d
WMTL	Leitchfield, Ky.	250d
WPKY	Princeton, Ky.	250d
KLUV	Haynesville, La.	250d
KLOU	Lake Charles, La.	1000
WPGC	Bradbury Hgts., Md.	10000
WJUD	St. Johns, Mich.	1000d
KDOM	Windom, Minn.	250d
WAMY	Amory, Miss.	5000d
WLBS	Centreville, Miss.	250d
WESY	Leland, Miss.	1000
WPMP	Pascagoula-Moss Point, Mississippi	1000d
KCGM	Columbia, Mo.	250d
KESM	Eldorado Springs, Mo.	250d
KNIM	Maryville, Mo.	250d
WNJH	Hammonton, N.J.	250d
WCRV	Washington, N.J.	500d
KRZY	Albuquerque, N.Mex.	1000d
WPAC	Patchogue, N.Y.	10000d
WZKY	Albemarle, N.C.	250d
WKJK	Granite Falls, N. C.	500d
WPYB	Benson, N.C.	500d
WVKO	Columbus, Ohio	1000d
KTTR	Blackwell, Okla.	1000d
WCOY	Columbia, Pa.	500d
WEND	Ebensburg, Pa.	1000d
WANB	Waynesburg, Pa.	250d
WORG	Orangeburg, S.C.	1000d
WYCL	York, S.C.	250d
WSKT	Colonial Village, Tenn.	250d
WLJ	Shelbyville, Tenn.	1000d
WSKT	South Knoxville, Tenn.	250
KKAL	Denver City, Tex.	250d
KGAF	Gainesville, Tex.	250d
KIRT	Mission, Tex.	1000d
KTLU	Rusk, Tex.	500d
KWED	Seguin, Tex.	1000d
KBYP	Shamrock, Tex.	250d
KBGO	Waco, Tex.	1000
WILA	Danville, Va.	1000d
WPUV	Pulaski, Va.	5000d
WTTN	Watertown, Wis.	1000d

1590—188.7

WATM	Atmore, Ala.	5000d
WVNA	Tuscumbia, Ala.	5000d
KPBA	Pine Bluff, Ark.	1000d
KLIV	San Jose, Calif.	5000
KUOU	Ventura, Calif.	1000
KCIN	Victorville, Calif.	500d
WBRY	Waterbury, Conn.	5000
WOWY	Clewiston, Fla.	500d
WILZ	St. Petersburg Beach, Florida	1000d
WELE	S. Daytona Bch., Fla.	1000d
WALG	Albany, Ga.	1000
WLFA	Lafayette, Ga.	5000d
WTGA	Thomaston, Ga.	500d
WNMP	Evanston, Ill.	1000d
WAIK	Galesburg, Ill.	5000d
WGEE	Indianapolis, Ind.	5000d
WPCO	Mt. Vernon, Ind.	500d
KWBG	Boone, Iowa	1000
KVGB	Great Bend, Kans.	5000
WLBN	Lebanon, Ky.	1000d
KEVL	White Castle, La.	1000d
WETT	Ocean City, Md.	1000
WTVB	Coldwater, Mich.	5000
WDOG	Marine City, Mich.	1000d
WMIC	St. Helen, Mich.	500d
KRAD	E. Grand Forks, Minn.	1000d
WOKJ	Jackson, Miss.	5000d
KDEX	Dexter, Mo.	1000d
KPRS	Kansas City, Mo.	1000d
KCLU	Rolla, Mo.	1000d
WSMN	Nashua, N.H.	5000
WERA	Plainfield, N.J.	500d
WAUB	Auburn, N.Y.	500d
WEHH	Elmira Heights-Horseheads, N.Y.	500d
WGGO	Salamanca, N.Y.	5000d
WCSL	Cherryville, N.C.	
WVOE	Chadburn, N.C.	1000
WGTC	Greenville, N.C.	500
WNOS	High Point, N.C.	10000d
WAKR	Akron, Ohio	5000
WSRW	Hillsboro, Ohio	500d
KHEN	Henryetta, Okla.	500d
KTIL	Tillamook, Oreg.	1000
WZUM	Carnegie, Pa.	10000d
WCBG	Chambersburg, Pa.	5000d
WEEZ	Chester, Pa.	1000
WXRF	Guayama, P.R.	1000
WYNG	Warwick, R.I.	1000d
WABV	Abbeville, S.C.	1000d
WACA	Camden, S.C.	1000d
KCCR	Pierre, S.Dak.	1000d
WJSO	Jonesboro, Tenn.	5000d
WDBL	Springfield, Tenn.	1000d
KGAS	Carthage, Tex.	1000d
KERC	Eastland, Tex.	500d
KINT	El Paso, Tex.	1000d
KYOK	Houston, Tex.	5000
KCBD	Lubbock, Tex.	1000
KBUS	Mexia, Tex.	500d
KTOD	Sinton, Tex.	1000
WISZ	Glen Burnie, Md.	500
WRGM	Richmond, Va.	5000d
KLFF	Mead, Wash.	1000d
KETO	Seattle, Wash.	5000d
WIXK	New Richmond, Wis.	5000d
WSWW	Platteville, Wis.	5000
WTRW	Two Rivers, Wis.	1000d
WAWA	West Allis, Wis.	1000d

1600—187.5

WEUP	Huntsville, Ala.	5000d
WAPX	Montgomery, Ala.	1000
KVID	Cottonwood, Ariz.	1000d
KXEW	Tucson, Ariz.	1000
KGKO	Benton, Ark.	1000d
KGST	Fresno, Calif.	1000d
KWOW	Pomona, Calif.	1000
KHER	Santa Maria, Calif.	500d
KUBA	Yuba City, Calif.	5000
KLAK	Lakewood, Colo.	5000
WKEN	Dover, Del.	500d
WKTX	Atlantic Beach, Fla.	1000d
WKWF	Key West, Fla.	500
WHEW	Riviera Beach, Fla.	1000
WPRV	Wauchula, Fla.	
WOKB	Winter Garden, Fla.	1000d
WGKA	Atlanta, Ga.	1000d
WNGA	Nashville, Ga.	1000d
WCGO	Chicago Hgts., Ill.	1000d
WMCW	Harvard, Ill.	500d
WBTO	Linton, Ind.	500d
WARU	Peru, Ind.	1000d
KLGA	Algona, Iowa	5000d
KCRG	Cedar Rapids, Iowa	5000
KMDO	Ft. Scott, Kans.	500d
WSTL	Eminence, Ky.	500d
KFNV	Ferriday, La.	1000d
KLEB	Golden Meadow, La.	1000d
KLVI	Vivian, La.	500d
WINX	Rockville, Md.	1000
WBOS	Brookline, Mass.	5000
WTYM	East Longmeadow, Mass.	5000d
WAAM	Ann Arbor, Mich.	1000
WTRU	Muskegon, Mich.	5000
WKDL	Clarksdale, Miss.	1000d
WFFF	Columbia, Miss.	500d
KATZ	St. Louis, Mo.	5000
KTTN	Trenton, Mo.	500d
KNCY	Nebraska City, Nebr.	500d
KRFS	Superior, Nebr.	500d
WMCR	Oneida, N.Y.	1000d
WLNG	Sag Harbor, N.Y.	500
WXKW	Troy, N.Y.	500d
WWRL	Woodside, N.Y.	50000
WGIV	Charlotte, N.C.	1000
WIDU	Fayetteville, N.C.	1000d
WFRC	Reidsville, N.C.	1000
WKSK	W. Jefferson, N.C.	1000d
KDAK	Carrington, N.Dak.	500d
WAQI	Ashtabula, Ohio	1000d
WBLY	Springfield, Ohio	1000d
WTTF	Tiffin, Ohio	500d
KUSH	Cushing, Okla.	1000d
KASH	Eugene, Oreg.	5000
KSTH	St. Helens, Oreg.	1000d

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
WHOL	Allentown, Pa.	500d
WHRY	Elizabethtown, Pa.	500d
WFIS	Fountain Inn, S.C.	1000d
WFNL	No. Augusta, S.C.	500d
WHBT	Harriman, Tenn.	5000d
WKBJ	Milan, Tenn.	1000d
KBBB	Borger, Tex.	500d
KBOR	Brownsville, Tex.	1000
KWEL	Midland, Tex.	1000d
KCFH	Cuero, Tex.	500d
KMAE	McKinney, Tex.	1000d
KOGT	Orange, Tex.	1000
KBBC	Centerville, Utah	1000d
WHLL	Wheeling, W.Va.	5000d
WCWC	Ripon, Wis.	5000

Canadian AM Stations by Frequency

Abbreviations: Kc., frequency in kilocycles; W.P., watt power; d, operates daytime only; n, operates nighttime only. Wavelength is given in meters.

Kc.	Wave Length	W.P.
540—555.5		
CBK	Regina, Sask.	50,000
CBT	Grand Falls, Nfld.	10,000
550—545.1		
CFBR	Sudbury, Ont.	1,000d
CFNB	Fredericton, N.B.	50,000
CHLN	Trois-Rivieres, Que.	10,000d
CKPG	Prince George, B.C.	250
560—535.4		
CFOS	Owen Sound, Ont.	1,000
CHCM	Marystown, Nfld.	1,000d
		500n
CJKL	Kirkland Lake, Ont.	5,000
CKCN	Sept-Iles, Que.	5,000
570—526.0		
CFCB	Corner Brook, Nfld.	1,000
CJEM	Edmundston, N.B.	5,000d
		1,000n
CKCQ	Quesnel, B.C.	1,000
CKEK	Cranbrook, B.C.	1,000
CFWH	Whitehorse, Y.T.	1,000
580—516.9		
CFRA	Ottawa, Ont.	50,000d
		10,000n
CHLC	Hauterive, Que.	5,000d
		2,500n
CJFX	Antigonish, N.S.	5,000
CKPR	Port Arthur, Ont.	5,000d
		1,000n
CKUA	Edmonton, Alta.	10,000
CKY	Winnipeg, Man.	50,000
590—508.2		
CFAR	Flin Flon, Man.	1,000
CKEY	Toronto, Ont.	5,000
CKRS	Jonquiere, Que.	1,000
VOCM	St. John's, Nfld.	10,000
600—499.7		
CFCF	Montreal, Que.	5,000
CFCH	Callander, Ont.	10,000d
		5,000n
CFQC	Saskatoon, Sask.	5,000
CJOR	Vancouver, B.C.	10,000
CKCL	Truro, N.S.	1,000
610—491.5		
CHNC	New Carlisle, Que.	5,000
CJAT	Trail, B.C.	1,000
CKML	Mont Laurier, P.Q.	1,000
CKTB	St. Catharines, Ont.	10,000d
		5,000n
CKYL	Peace River, Alta.	1,000
620—483.6		
CFCL	Timmins, Ont.	10,000d
		2,500n
CKCK	Regina, Sask.	5,000
CKCM	Grand Falls, Nfld.	10,000
630—475.9		
CFCO	Chatham, Ont.	1,000
CFCY	Charlottetown, P.E.I.	5,000
CHED	Edmonton, Alta.	10,000
CHLT	Sherbrooke, Que.	10,000d
		5,000n
CJET	Smith Falls, Ont.	1,000
CKAR	Huntsville, Ont.	1,000
CKOV	Kelowna, B.C.	1,000
CKRC	Winnipeg, Man.	10,000
640—468.5		
CBN	St. John's, Nfld.	10,000
680—440.9		
CHFA	Edmonton, Alta.	5,000
CHLO	St. Thomas, Ont.	1,000
CJOB	Winnipeg, Man.	10,000d
		2,500n
CKGB	Timmins, Ont.	10,000
690—434.5		
CBF	Montreal, Que.	50,000
CBU	Vancouver, B.C.	10,000
710—422.3		
CJSP	Leaminton, Ont	1,000
CFRG	Gravelbourg, Sask.	5,000d
CKVM	Velle-Marie, Que.	10,000d
		1,000n
730—410.7		
CJNR	Blind River, Ont.	1,000
CKAC	Montreal, Que.	50,000
CKDM	Dauphin, Man.	10,000d
		5,000n
CKLG	North Vancouver, B.C.	10,000
740—405.2		
CBL	Toronto, Ont.	50,000
CBXA	Edmonton, Alta.	250
790—379.5		
CFDR	Dartmouth, N.S.	5,000
CFCW	Camrose, Alta.	10,000
CKMR	Newcastle, N.B.	1,000
CKSO	Sudbury, Ont.	10,000d
		5,000n
CHIC	Brampton, Ont.	1,000d
		500n
800—374.8		
CFOB	Fort Frances, Ont.	1,000d
CHAB	Moose Jaw, Sask.	10,000d
		5,000n
CHRC	Quebec, Que.	10,000
CJAD	Montreal, Que.	10,000
BJBQ	Belleville, Ont.	1,000
CJLX	Fort William, Ont.	10,000d
		5,000n
CKOK	Penticton, B.C.	10,000d
		500n
CKLW	Windsor, Ont.	50,000
VOWR	St. John's, Nfld.	1,000
810—370.2		
CFAX	Victoria, B.C.	1,000d
850—352.7		
CJJC	Langley, B.C.	1,000
CKRD	Red Deer, Alta.	10,000d
		1,000n
CKLV	Verdun, Que.	50,000d
		10,000n
860—348.6		
CBH	Halifax, N.S.	10,000
CHAK	Inuvik, N.W.T.	1,000
CJBC	Toronto, Ont.	50,000
900—333.1		
CHML	Hamilton, Ont.	5,000
CHNO	Sudbury, Ont.	10,000d
		1,000n
CJBR	Rimouski, Que.	10,000
CJVI	Victoria, B.C.	10,000
CKBI	Prince Albert, Sask.	10,000
CKDR	Dryden, Ont.	1,000d
CKJL	St. Jerome, Que.	1,000
CKTS	Sherbrooke, Que.	1,000
910—329.5		
CBO	Ottawa, Ont.	5,000
CFJC	Kamloops, B.C.	10,000d
		1,000n
CHRL	Roberval, Que.	1,000
CJDV	Drumheller, Alta.	5,000
CKLY	Lindsay, Ont.	1,000
920—329.9		
CFRY	Portage La Prairie, Man.	1,000
CJCH	Halifax, N.S.	10,000d
		5,000n
CJCJ	Woodstock, N.B.	1,000
CKCY	Sault Ste. Marie, Ont.	10,000d
		5,000n
CKNX	Wingham, Ont.	2,500d
		1,000n
930—322.4		
CFBC	Saint John, N.B.	10,000d
		5,000n
CJCA	Edmonton, Alberta	10,000d
		5,000n
CJON	St. John's Nfld.	10,000
940—319.0		
CBM	Montreal, Que.	50,000
CJGX	Yorkton, Sask.	10,000d
		1,000n
CJIB	Vernon, B.C.	1,000
950—315.6		
CKBB	Barrie, Ont.	10,000d
		2,500n
CKNB	Campbellton, N.B.	10,000d
		1,000n
960—312.3		
CFAC	Calgary, Alta.	10,000
CHNS	Halifax, N.S.	10,000
CKWS	Kingston, Ont.	5,000
970—309.1		
CKCH	Hull, Que.	5,000
CKNL	Fort St. John, B.C.	1,000d
		500n
980—305.9		
CBV	Quebec, Que.	5,000
CFPL	London, Ont.	10,000d
		5,000n
CHEX	Peterborough, Ont.	5,000
CKGM	Montreal, Que.	10,000
CKNW	New Westminster, B.C.	10,000d
		5,000n
CKRM	Regina, Sask.	10,000d
		5,000n
990—302.8		
CBW	Winnipeg, Man.	50,000
CBY	Corner Brook, Nfld.	10,000
1000—299.8		
CKBW	Bridgewater, N.S.	10,000
1010—296.9		
CBX	Edmonton, Alta.	50,000
CFRB	Toronto, Ont.	50,000
1050—285.5		
CFGP	Grande Prairie, Alta.	10,000
CHUM	Toronto, Ont.	5,000d
		2,500n
CJIC	Sault Ste. Marie, Ont.	10,000d
		2,500n
CJNB	North Battleford, Sask.	10,000
CKSB	St. Boniface, Man.	10,000
1060—282.8		
CFCN	Calgary, Alta.	10,000
CJLR	Quebec, P.Q.	10,000
1070—280.2		
CBA	Sackville, N.B.	50,000
CHOK	Sarnia, Ont.	5,000d
		1,000n
1090—275.1		
CHEC	Lethbridge, Alta.	5,000
CHRS	St. Jean, Que.	1,000d
1110—272.6		
CFML	Cornwall, Ont.	1,000
CFTJ	Galt, Ont.	250d
1130—265.3		
CKWX	Vancouver, B.C.	50,000
1140—263.0		
CBI	Sydney, N.S.	10,000
CFTK	Terrace, B.C.	1,000
CKXL	Calgary, Alta.	10,000
1150—260.7		
CHSJ	Saint John, N.B.	10,000d
		5,000n
CKOC	Hamilton, Ont.	5,000
CKSA	Lloydminster, Alta.	10,000
CKTR	Trois-Rivieres, Que.	10,000d
		1,000n
CKX	Brandon, Man.	10,000d
		1,000n
1170—256.3		
CFNS	Saskatoon, Sask.	1,000
1220—245.8		
CJOC	Lethbridge, Alta.	10,000d
		5,000n
CJSS	Cornwall, Ont.	1,000
CJRL	Kenora, Ont.	1,000
CKDA	Victoria, B.C.	10,000
CKCW	Moncton, N.B.	10,000
CKSM	Shawinigan, Que.	1,000
1230—243.8		
CFBV	Smithers, B.C.	1,000d
		250n
CFGR	Gravelbourg, Sask.	250n
CFKL	Schefferville, Que.	250
CFPA	Port Arthur, Ont.	1,000d
		250n
CHFC	Churchill, Man.	250
CKLD	Thetford Mines, Que.	1,000d
		250n
CKMP	Midland, Ont.	250
CKVD	Val d'Or, Que.	1,000d
		250n
VOAR	St. John's, Nfld.	100
1240—241.8		
CFLM	La Tuque, Que.	1,000d
		250n
CFPR	Prince Rupert, B.C.	250
CFVR	Abbotsford, B.C.	250
CJAV	Port Alberni, B.C.	250
CJCS	Stratford	500d
		250n
CJRW	Summerside, P.E.I.	250
CKCQ-1	Williams Lake, B.C.	250
CKBS	St. Hyacinthe, Que.	250
CKLS	La Sarre, Que.	250
1250—239.9		
CHWO	Oakville, Ont.	1,000d
		500n
CKBL	Matane, Que.	5,000
CKOM	Saskatoon, Sask.	10,000
1260—238.0		
CFRN	Edmonton, Alta.	50,000
1270—236.1		
CFGT	St. Joseph d'Alma, Que	1,000
CHAT	Medicine Hat, Alta.	10,000
CHWK	Chilliwack, B.C.	10,000
CJCB	Sydney, N.S.	10,000
1280—234.2		
CHIQ	Hamilton, Ont.	5,000
CJMS	Montreal, Que.	10,000d

Kc.	Wave Length	W.P.
		5,000n
CJSL	Estevan, Sask.	1,000
CKCV	Quebec, Que.	10,000d
		5,000n
1290—232.4		
CFAM	Altona, Man.	10,000d
		5,000n
CKSL	London, Ont.	5,000
1300—230.6		
CBAF	Moncton, N.B.	5,000
CIME	Regina, Sask.	1,000
1310—228.9		
CFGM	Richmond Hill, Ont.	10,000d
		2,500n
CHGB	Ste-Anne-de-Pocatiere, Que.	5,000
CKOY	Ottawa, Ont.	50,000
1320—227.1		
CHQM	Vancouver, B.C.	10,000
CJSO	Sorel, Que.	10,000d
		1,000n
CKEC	New Glasgow, N.S.	5,000
CKKW	Kitchener, Ont.	1,000
1340—223.7		
CFGB	Goose Bay, Nfld.	1,000
CFSL	Weyburn, Sask.	1,000d
		250n
CFYK	Yellowknife, N.W.T.	250
CHAD	Amos, Que.	250
CHRD	Drummondville, Que.	250
CJAF	Cabano, Que.	250
CJLS	Yarmouth, N.S.	250
CJQC	Quebec, Que.	250
CKAR-1	Parry Sound, Ont.	250

Kc.	Wave Length	W.P.
CKOX	Woodstock, Ont.	250
1350—222.1		
CHOV	Pembroke, Ont.	1,000
CJDC	Dawson Creek, B.C.	1,000
CJLM	Joliette, Que.	1,000
CKEN	Kentville, N.S.	1,000
CKLB	Oshawa, Ont.	10,000d
		5,000n
1360—220.4		
CKBC	Bathurst, N.B.	10,000
1370—218.8		
CFLV	Valleyfield, Que.	1,000
1380—217.3		
CFDA	Victoriaville, Que.	1,000
CKLC	Kingston, Ont.	5,000
CKPC	Brantford, Ont.	10,000
1390—215.7		
CKLN	Nelson, B.C.	1,000
1400—214.2		
CJFP	Riviere du Loup, Que.	5,000d
		250n
CKDH	Amherst, N.S.	250
CKRN	Rouyn, Que.	250
CKSW	Swift Current, Sask.	1,000d
		250n
1410—212.6		
CFMB	Montreal, P.Q.	10,000
CFUN	Vancouver, B.C.	10,000
1420—211.1		
CJMT	Chicoutimi, Que.	1,000

Kc.	Wave Length	W.P.
CKPT	Peterborough, Ont.	1,000d
		500n
1430—209.7		
CKFH	Toronto, Ont.	10,000d
		5,000n
1440—208.2		
CFCP	Courtney, B.C.	1,000
1450—206.8		
CBG	Gander, Nfld.	250
CFAB	Windsor, N.S.	250
CFJR	Brookville, Ont.	1,000d
		250n
CHEF	Granby, Que.	1,000d
		250n
CJBM	Causapscal, Que.	1,000d
		250n
1460—205.4		
CJNB	North Battleford, Sask.	10,000
CJOY	Guelph, Ont.	10,000d
		5,000n
CKRB	Ville St. Georges, Que.	10,000d
		5,000n
1470—204.0		
CFOX	Pointe Claire, Que.	10,000d
		5,000n
CHOW	Welland, Ont.	1,000d
		500n
CJQM	Winnipeg, Man.	5,000
1490—201.2		
CFMR	Fort Simpson, N.W.T.	25
CFRC	Kingston, Ont.	100

Kc.	Wave Length	W.P.
CKAD	Wilmot, N.S.	1,000n
		250n
CKBM	Montmagny, Que.	1,000d
		250n
CKCR	Kitchener, Ont.	10,000d
		5,000n
CFWB	Campbell River, B.C.	250
1500—199.9		
CHUC	Cobourg, Ont.	1,000
1510—199.1		
CKOT	Tillsonburg, Ont.	1,000
1540—195.0		
CHFI	Toronto, Ont.	50,000
1550—193.5		
CBE	Windsor, Ont.	10,000
1560—192.3		
CFRS	Simcoe, Ont.	250d
1570—191.1		
CFOR	Orillia, Ont.	10,000d
		1,000n
CHUB	Nanaimo, B.C.	10,000
CKLM	Montreal, Que.	10,000
1580—189.2		
CBJ	Chicoutini, Que.	10,000
1600—187.5		
CHVC	Niagara Falls, Ont.	10,000

U. S., Puerto Rico, and Canadian FM Stereo Stations

Location	C.L.
ALABAMA	
Birmingham	WCTR-FM
	WSFM
Huntsville	WAHR
	WNDA
Montgomery	WAJM-FM
	WFMI-FM
ALASKA	
Anchorage	KBYR-FM
	KNIK-FM
ARIZONA	
Phoenix	KEPI
	KNIX
Sun City	KTPM
Tucson	KSOM
ARKANSAS	
El Dorado	KELD-WM
	KRIL-FM
CALIFORNIA	
Bakersfield	KIFM
Beverly Hills	KCBH
Coachella	KCHQ-FM
Fremont	KHYD
Fresno	KCIB
	KXQR
Garden Grove	KGGK
Long Beach	KNOB
Los Angeles	KFAC-FM
	KFMU
	KMLA
	KPOL-FM
	KRHM
Monterey	KHFR
Palm Springs	KDES-FM
Riverside	KDUO
Sacramento	KHIQ
	KSFM
San Diego	KBBW
	KFMX
	KGB-FM
	KLRO
	KPRI
San Francisco	KAFE
	KBRG
	KFOG
	KMPX
	KSFR
	KXKX
San Jose	KEEN-FM

Location	C.L.
	KSJO-FM
San Luis Obispo	KVEC-FM
Santa Barbara	KGUD-FM
	KMUZ
Santa Maria	KEYM
Turlock	KHOM
Ventura	KUDU-FM
Visalia	KONG-FM
Walnut Creek	KWME
Woodland	KATT
COLORADO	
Colorado Springs	KLST
Denver	KFML-FM
	KLIR-FM
Manitou Springs	KCMS-FM
CONNECTICUT	
Brookfield	WGHF
Hartford	WTIC-FM
Meriden	WBMI
DELAWARE	
Wilmington	WDEL-FM
	WJBR
DISTRICT OF COLUMBIA	
Washington	WASH
	WGMS-FM
FLORIDA	
Clearwater	WTAN-FM
Cocoa Beach	WRKT-FM
Coral Gables	WVCG-FM
Ft. Lauderdale	WFLM
	WMJR
Miami	WWPB
Miami Beach	WAEZ
Orlando	WHOO-FM
Palm Beach	WWOS
Pensacola	WPEX-FM
St. Petersburg	WTCX
Sarasota	WYAK
GEORGIA	
Athens	WGAU-FM
Atlanta	WKLS
	WLTA-FM
	WSB-FM
Columbus	WRBL-FM

Location	C.L.
Gainesville	WDUN-FM
HAWAII	
Honolulu	KAIM-FM
	KPOI-FM
IDAHO	
Boise	KBOI-FM
ILLINOIS	
Bloomington	WJBC-FM
Champaign	WLRW
Chicago	WEFM
	WFMQ
	WFMT
	WKFM
	WMAQ-FM
	WXRT
Decatur	WSOY-FM
Elmwood Park	WXFM
Joliet	WJOL-FM
Matoon	WLBH-FM
Quincy	WGEM-FM
Rock Island	WHBF-FM
INDIANA	
Columbia	WCSI-FM
Evansville	WIKY-FM
Greenfield	WSMJ
Indianapolis	WFMS
	WIFE-FM
Richmond	WKBV-FM
South Bend	WNDU-FM
Terre Haute	WVTS
IOWA	
Ames	WOI-FM
Cedar Rapids	KHAK-FM
	WMT-FM
Des Moines	KDMJ
Sioux City	KDVR
Waterloo	KXEL-FM
KANSAS	
Kansas City	KCJC
Lawrence	KANU
Wichita	KCMB-FM
	KWBB-FM
KENTUCKY	
Lexington	WVLK-FM
Owensboro	WSTO

Location	C.L.
LOUISIANA	
Monroe	KMLB-FM
New Orleans	WWMT
MAINE	
Caribou	WFST-FM
MARYLAND	
Bethesda (Washington, D.C.)	WHFS
	WJMD
Towson (Baltimore)	WAQE-FM
MASSACHUSETTS	
Boston	WBCN
	WGBH
Framingham	WKOX-FM
Waltham	WCRB-FM
Worcester	WSRS
MICHIGAN	
Ann Arbor	WOIA-FM
Bay City	WNEM-FM
Detroit	WABX
	WBFG
	WDTM
	WGPR
	WLDM
	WOMC
East Lansing	WSWM
	WVIC
Flint	WGMZ
Grand Rapids	WJFM
	WOOD-FM
Interlochen	WIAA
Midland	WQDC
Mt. Pleasant	WCEN-FM
MINNESOTA	
Minneapolis	KRSI-FM
	KWFM
	WAYL
MISSOURI	
Joplin	KSYN
Kansas City	KCMO-FM
	KMBC-FM
St. Louis	KCFM
	KSHE
Springfield	KTXR

WHITE'S RADIO LOG

Location	C.L.
NEBRASKA	
Omaha	KQAL-FM
NEVADA	
Las Vegas	KORK-FM
	KRGN
Reno	KNEV
NEW HAMPSHIRE	
Mt. Washington	WMTW
NEW JERSEY	
Atlantic City	WFPG-FM
Dover	WDHA-FM
Long Beach	WRLB
Princeton	WPRB
Trenton	WBUD-FM
NEW MEXICO	
Albuquerque	KHFM
Los Alamos	KRSN-FM
NEW YORK	
Babylon, L.I.	WGLI-FM
Buffalo	WADV
	WDCX
Fresh Meadows (N.Y.C.)	WTFM
Garden City, L.I.	WLIR
New York	WABC-FM
	WKCR-FM
	WQXR-FM
	WRFM
Patchogue, L.I.	WPAC-FM
Riverhead, L.I.	WAPC-FM
Rochester	WCMF
Schenectady	WGFM
Syracuse	WSYR-FM
Utica	WUFM
NORTH CAROLINA	
Burlington	WBBB-FM
Charlotte	WBT-FM
Greensboro	WMDE
	WQMG
Greenville	WNCT-FM
Hickory	WHKY-FM
	WIRC-FM
Leaksville	WLOE-FM
OHIO	
(Akron)	WDBN
Canton	WCNO
Cincinnati	WKRC-FM
Cleveland	WCLV
	WDOK-FM
	WNOB
Columbus	WBNS-FM
Fairfield	WFOL-FM
Findlay	WFIN-FM
Kettering	WKET-FM
Mansfield	WVNO-FM
Middletown	WPFB-FM
Port Clinton	WRWR-FM
Portsmouth	WPAY-FM
Springfield	WBLY-FM
Toledo	WTOL-FM
Youngstown	WBBW-FM
OKLAHOMA	
Oklahoma City	KFNB
	KYFM
Stillwater	KOSU-FM
Tulsa	KOCW
	KRAV
OREGON	
Eugene	KFMY
	KWFS-FM
Portland	KPFM
	KGMG
Springfield	KEED-FM
PENNSYLVANIA	
Boyertown	WBYO
Braddock (Pittsburgh)	WLOA-FM
Chambersburg	WCHA-FM
Harrisburgh	WTPA-FM
Johnstown	WJAC-FM
	WFLN-FM
Philadelphia	WDVR
	WHAT-FM
	WIFI
	WQAL
Pittsburgh	WKJF
Reading	WRFY-FM
Tyrone	WGMR-FM
Wilkes-Barre	WYZZ
York-Hanover	WYCR
RHODE ISLAND	
Providence	WPFM
	WXCN
SOUTH CAROLINA	
Beaufort	WBEU-FM
Columbia	WCOS-FM
North Charleston	WKTM
Spartanburg	WSPA-FM
TENNESSEE	
Chattanooga	WDOD-FM
Greeneville	WGRV-FM
Kingsport	WKPT-FM
McKenzie	WKTA
Nashville	WNFO-FM
	WSIX-FM
Sevierville	WSEV-FM
Tullahoma	WJIG-FM
TEXAS	
Amarillo	KCHO
Austin	KTBC-FM
Beaumont	KHGM
Corpus Christi	KTOD-FM
Dallas	KIXL-FM
	KVIL-FM
Ft. Worth	KXOL-FM
	WBAP-FM
Gainesville	KGAF-FM
Houston	KFMK
	KODA-FM
	KQUE
	KRBE
	KXYZ-FM
Port Arthur	KFMP
San Antonio	KEEZ
Wichita Falls	KNTO
UTAH	
Salt Lake City	KSL-FM
VIRGINIA	
Martinsville	WMVA-FM
Norfolk	WTAR-FM
	WYFI
Richmond	WFMV
Roanoke	WSLS-FM
WASHINGTON	
Seattle	KETO-FM
	KISW
	KIXI-FM
	KLSN
	KZAM
Tacoma	KLAY-FM
WEST VIRGINIA	
Bluefield	WHIS-FM
Charleston	WKNA
Martinsburg	WEPM-FM
WISCONSIN	
Delafield	WHAD
Eau Claire	WIAL
Kenosha	WAXO
	WLIP-FM
Madison	WHA-FM
	WISM-FM
	WMFM
	WRVB-FM
Milwaukee	WFMR
	WMKE
	WTMJ-FM
Wausau	WSAU-FM
West Bend	WBKV-FM
PUERTO RICO	
Rio Piedras	WFID
CANADA	
Calgary, Alberta	CHFM-FM
Kamloops, B.C.	CFFM-FM
Vancouver, B.C.	CHQM-FM
Winnipeg, Man.	CJOB-FM
	CJQM-FM
	CKY-FM
London, Ont.	CFPL-FM
Ottawa, Ont.	CFMO-FM
Toronto, Ont.	CHFI-FM
	CKFM-FM
Windsor, Ont.	CKLW-FM
Montreal, Que.	CFCF-FM
	CJFM-FM
	CKGM-FM
Quebec, Que.	CHRC-FM
Sherbrooke, Que.	CHLT-FM
Verdun, Que.	CKVL-FM

U. S. Commercial Television Stations by States

Territories and possessions follow states. Chan., channel; C.L., call letters.

Location	C.L.	Chan.
ALABAMA		
Birmingham	WAPI-TV	13
	WBRC-TV	6
Decatur	WMSL-TV	23
Dothan	WTVY	4
Florence	WOWL-TV	15
Huntsville	WAAY-TV	31
	WHNT-TV	19
Mobile	WALA-TV	10
	WKRG-TV	5
Montgomery	WCCB-TV	32
	WCOV-TV	20
	WSFA-TV	12
Selma	WSLA	8
ALASKA		
Anchorage	KENI-TV	2
	KTVA	11
Fairbanks	KFAR-TV	2
	KTVF	11
Juneau	KINY-TV	8
ARIZONA		
Phoenix	KOOL-TV	10
	KPHO-TV	5
	KTVK	3
Phoenix-Mesa	KTAR-TV	12
Tucson	KGUN-TV	9
	KOLD-TV	13
	KVOA-TV	4
Yuma	KBLU-TV	13
	KIVA	11
ARKANSAS		
El Dorado-Monroe, La.	KTVE	10
Ft. Smith	KFSA-TV	5
Jonesboro	KAIT-TV	11
Little Rock	KARK-TV	4
	KATV	7
	KTHV	11
CALIFORNIA		
Bakersfield	KBAK-TV	29
	KERO-TV	23
	KLYD-TV	17
Chico	KHSL-TV	12
Eureka	KIEM-TV	3
	KVIQ-TV	6
Fresno	KAIL	53
	KFRE-TV	30
	KJEO	47
	KMJ-TV	24
Hanford	KDAS	21
Los Angeles	KABC-TV	7
	KCOP	13
	KHJ-TV	9
	KIIX	22
	KMEX-TV	34
	KNBC	4
	KNXT	2
	KTLA	5
	KTTV	11
Redding	KRCR-TV	7
Sacramento	KCRA-TV	3
Stockton-Sacramento	KOVR	13
Sacramento	KXTV	10
Salinas-Monterey	KSBW-TV	8
San Bernardino	KCHU	18
San Diego	KFMB-TV	8
	KOGO-TV	10
Tijuana-San Diego	XETV	6
	XEWT-TV	12
San Francisco	KGO-TV	7
	KPIX	5
	KRON-TV	4
Oakland-San Francisco	KTVU	2
San Jose	KNTV	11
San Luis Obispo	KSBY-TV	6
Santa Barbara	KEYT	3
Santa Maria	KCOY-TV	12
Visalia-(Fresno)	KICU-TV	43
COLORADO		
Colorado Springs-Pueblo	KKTV	11
	KRDO-TV	13
Denver	KBTV	9
	KCTO	2
	KLZ-TV	7
	KOA-TV	4
Durango	KJFL-TV	6
Grand Junction	KREX-TV	5
Montrose	KREY-TV	10
Pueblo	KOAA-TV	5
Sterling	KTVS	3
CONNECTICUT		
Hartford	WHCT	18
	WTIC-TV	3
New Britain-Hartford	WHNB-TV	30
New Haven-Hartford	WNHC-TV	8
Waterbury	WATR-TV	20
DELAWARE		
No Stations		
DISTRICT OF COLUMBIA		
Washington	WOOK-TV	14
	WMAL-TV	7
	WRC-TV	4
	WTOP-TV	9
	WTTG	5
FLORIDA		
Daytona Beach-Orlando	WESH-TV	2
Ft. Myers	WINK-TV	11
Jacksonville	WFGA-TV	12
	WJXT	4
Miami	WCKT	7
	WLBW-TV	10
	WTVJ	4
Orlando	WDBO-TV	6
	WFTV	9
Palm Beach	WPTV	5
West Palm Beach	WEAT-TV	12
Panama City	WJHG-TV	7
Pensacola-Mobile, Ala.	WEAR-TV	3
St. Petersburg-Tampa	WSUN-TV	38
Tallahassee-Thomasville, Ga.	WCTV	6
Tampa-St. Petersburg	WFLA-TV	8
	WTVT	13
GEORGIA		
Albany	WALB-TV	10
Atlanta	WAII-TV	11
	WAGA-TV	5
	WSB-TV	2
Augusta	WJBF	6
	WRDW-TV	12
Columbus	WRBL-TV	3
	WTVM	9
Macon	WMAZ-TV	13
Savannah	WSAV-TV	3
	WTOC-TV	11
HAWAII		
Hilo	KALU	11
	KHBC-TV	9
	KHJK	13
Honolulu	KGMB-TV	9
	KHVH-TV	4
	KONA	2
	KTRG-TV	13
Wailuku	KALA	7
	KMAU-TV	3
	KMVI-TV	12
IDAHO		
Boise	KBOI-TV	2
	KTVB	7
Idaho Falls	KID-TV	3
	KIFI-TV	8
Lewiston	KLEW-TV	3
Pocatello	KTLE	6
Twin Falls	KMVT	11

Location	C.L.	Chan.
ILLINOIS		
Champaign	WCHU	33
	WCIA	3
Chicago	WBBM-TV	2
	WBKB	7
	WCIU	26
	WGN-TV	9
	WNBQ	5
Danville	WICD	24
Decatur	WTVP	17
Harrisburg	WSIL-TV	3
LaSalle	WEEQ-TV	35
Moline	WQAD-TV	8
Peoria	WEEK-TV	43
	WMBD-TV	31
	WTVH	19
Quincy-Hannibal, Mo.	WGEM-TV	10
Rockford	WTVO	39
	WREX-TV	13
Rock Island	WHBF-TV	4
Springfield	WICS	20
INDIANA		
Evansville	WEHT	50
	WFIE-TV	14
	WTVW	7
Fort Wayne	WANE-TV	15
	WKJG-TV	33
	WPTA	21
Indianapolis	WFBM-TV	6
	WISH-TV	8
	WLW-I	13
Bloomington-Indianapolis	WTTV	4
Lafayette	WFAM-TV	18
Marion	WTAF-TV	31
Muncie	WLBC-TV	49
South Bend	WNDU-TV	16
	WSBT-TV	22
Elkhart-South Bend	WSJV	28
Terre Hause	WTHI-TV	10
IOWA		
Cedar Rapids	KCRG-TV	9
Cedar Rapids-Waterloo	WMT-TV	2
Davenport	WOC-TV	6
Des Moines	KRNT-TV	8
	WHO-TV	13
Ames-Des Moines	WOI-TV	5
Fort Dodge	KQTV	21
Mason City	KGLO-TV	3
Sioux City	KTIV	4
	KVTV	9
Waterloo-Cedar Rapids	KWWL-TV	7
KANSAS		
Ensign	KTVC	6
Garden City	KGLD	11
Goodland	KLOE-TV	10
Great Bend	KCKT	2
Hays	KAYS-TV	7
Pittsburg-Joplin, Mo.	KOAM-TV	7
Salina	KSLN-TV	34
Topeka	WIBW-TV	13
Wichita	KAKE-TV	10
	KARD-TV	3
Hutchinson-Wichita	KTVH	12
KENTUCKY		
Bowling Green	WLTV	13
Lexington	WKYT-TV	27
	WLEX-TV	18
Louisville	WHAS-TV	11
	WAVE-TV	3
	WLKY	32
Paducah	WPSD-TV	6
LOUISIANA		
Alexandria	KALB-TV	5
Baton Rouge	WAFB-TV	9
	WBRZ	2
Lafayette	KATC	3
	KLFY-TV	10
Lake Charles	KPLC-TV	7
Monroe-West Monroe	KNOE-TV	8
New Orleans	WDSU-TV	6
	WVUE	12
	WWL-TV	4
Shreveport	KSLA-TV	12
Shreveport-Texarkana, Texas	KTAL-TV	6
Shreveport	KTBS-TV	3
MAINE		
Bangor	WABI-TV	5
	WLBZ-TV	2
Poland Spring	WMTW-TV	8
Portland	WCSH-TV	6
	WGAN-TV	13
Presque Isle	WAGM-TV	8
MARYLAND		
Baltimore	WBAL-TV	11
	WJZ-TV	13
	WMAR-TV	2
Salisbury	WBOC-TV	16
MASSACHUSETTS		
Adams	WCDC	19
Boston	WBZ-TV	4
	WHDH-TV	5
	WNAC-TV	7
Greenfield	WRLP	32
Springfield-Holyoke	WHYN-TV	40
Springfield	WWLP	22
Worcester	WWOR	14
MICHIGAN		
Allen Park (Detroit)	WJMY	20
Bay City-Saginaw	WNEM-TV	5
Cadillac-Traverse City	WWTV	9
Cheboygan	WTOM-TV	4
Detroit	WJBK-TV	2
Windsor, Ont.	CKLW-TV	9
Detroit	WWJ-TV	4
	WXYZ-TV	7
Flint	WJRT	12
Grand Rapids	WOOD-TV	8
	WZZM-TV	13
Kalamazoo	WKZO-TV	3
Lansing	WJIM-TV	6
Marquette	WLUC-TV	6
Onondaga	WILX-TV	10
Saginaw	WKNX-TV	57
Sault Ste. Marie	WWUP-TV	10
Traverse City	WPBN-TV	7
MINNESOTA		
Alexandria	KCMT	7
Austin	KMMT	6
Duluth-Superior, Wis.	KDAL-TV	3
	WDSM-TV	6
Mankato	KEYC-TV	12
Minneapolis-St. Paul	KMSP-TV	9
	WCCO-TV	4
	WTCN-TV	11
Rochester	KROC-TV	10
St. Paul-Minneapolis	KSTP-TV	5
Walker	KNMT	12
MISSISSIPPI		
Biloxi	WLOX-TV	13
Columbus	WCBI-TV	4
Greenwood	WABG-TV	6
Jackson	WJTV	12
	WLBT	3
Laurel-Hattiesburg	WDAM-TV	7
Meridian	WTOK-TV	11
Tupelo	WTWV	9
MISSOURI		
Cape Girardeau	KFVS-TV	12
Columbia	KOMU-TV	8
Hannibal-Quincy, Ill.	KHQA-TV	7
Jefferson City	KRCG	13
Joplin	KODE-TV	12
Kansas City	KCMO-TV	5
	KMBC-TV	9
	WDAF-TV	4
Kirksville-Ottumwa, La.	KTVO	3
Poplar Bluff	KPOB-TV	15
St. Joseph	KFEQ-TV	2
St. Louis	KMOX-TV	4
	KSD-TV	5
	KPLR-TV	11
	KTVI	2
Sedalia	KMOS-TV	6
Springfield	KTTS-TV	10
	KYTV	3
MONTANA		
Billings	KULR-TV	8
	KOOK-TV	2
Butte	KXLF-TV	4
Glendive	KXGN-TV	5
Great Falls	KFBB-TV	5
	KRTV	3
Helena	KBLL-TV	12
Missoula	KMSO-TV	13
NEBRASKA		
Grand Island	KGIN-TV	11
Hastings	KHAS-TV	5
Hay Springs	KDUH-TV	4
Hayes Center	KHPL-TV	6
Kearney-Holdrege	KHOL-TV	13
Lincoln	KOLN-TV	10
McCook	KOMC	8
North Platte	KNOP-TV	2
Omaha	KETV	7
	KMTV	3
	WOW-TV	6
Scottsbluff-Gering	KSTF	10
NEVADA		
Las Vegas	KLAS-TV	8
	KORK-TV	2
	KSHO-TV	13
Reno	KCRL	4
	KOLO-TV	8
NEW HAMPSHIRE		
Manchester	WMUR-TV	9
NEW JERSEY		
No Stations		
NEW MEXICO		
Albuquerque	KGGM-TV	13
	KOAT-TV	7
	KOB-TV	4
Carlsbad	KAVE-TV	6
Clovis	KICA-TV	12
Roswell	KSWS-TV	8
NEW YORK		
Albany-Troy-Schenectady	WAST	13
Albany	W-TEN	10
Schenectady-Albany-Troy	WRGB	6
Binghamton	WBJA-TV	34
	WINR-TV	40
	WNBF-TV	12
Buffalo	WBEN-TV	4
	WGR-TV	2
	WKBW-TV	7
Elmira-Corning	WSYE-TV	18
New York	WABC-TV	7
	WCBS-TV	2
	WNBC-TV	4
	WNEW-TV	5
	WOR-TV	9
	WPIX	11
Plattsburgh	WPTZ	5
Rochester	WHEC-TV	10
	WOKR	13
	WROC-TV	8
Syracuse	WHEN-TV	5
	WNYS-TV	9
	WSYR-TV	3
Utica	WKTV	2
Carthage-Watertown	WCNY-TV	7
NORTH CAROLINA		
Asheville	WISE-TV	62
	WLOS-TV	13
Charlotte	WBTV	3
	WSOC-TV	9
Durham-Raleigh	WTVD	11
Greensboro	WFMY-TV	2
Greenville	WNCT	9
New Bern	WNBE-TV	12
Raleigh-Durham	WRAL-TV	5
Washington	WITN-TV	7
Wilmington	WECT	6
Winston-Salem & Greensboro	WSJS-TV	12
Greensboro-High Point & Winston-Salem	WGHP-TV	8
NORTH DAKOTA		
Bismarck	KFYR-TV	5
	KXMB-TV	12
Dickinson	KQIX-TV	2
Fargo	KTHI-TV	11
	WDAY-TV	6
Grand Forks	KNOX-TV	10
Minot	KMOT	10
	KXMC-TV	13
Pembina	KCND-TV	12
Valley City	KXJB-TV	4
Williston	KUMV-TV	8
OHIO		
Akron	WAKR-TV	49
Cincinnati	WCPO-TV	9
	WKRC-TV	12
	WLW-T	5
Cleveland	WEWS	5
	KYW-TV	3
	WJW-TV	8
Columbus	WBNS-TV	10
	WLW-C	4
	WTVN-TV	6
Dayton	WHIO-TV	7
	WLW-D	2
Lima	WIMA-TV	35
Steubenville-Wheeling, West Va.	WSTV-TV	9
Toledo	WSPD-TV	13
	WTOL-TV	11
Youngstown	WFMJ-TV	21
	WKBN-TV	27
	WYTV	33
Zanesville	WHIZ-TV	18
OKLAHOMA		
Ada	KTEN	10
Ardmore & Sherman-Denison, Texas	KXII	12
Elk City	KSWB	8
Lawton	KSWO-TV	7
Oklahoma City	KWTV	9
	WKY-TV	4
	KOCO-TV	5
Tulsa	KOTV	6
	KVOO-TV	2
	KTUL-TV	8
OREGON		
Coos Bay	KCBY-TV	11
Eugene	KEZI-TV	9
	KVAL-TV	13
Klamath Falls	KOTI	2
Medford	KBES-TV	5
	KMED-TV	10
Portland	KATU	2
	KGW-TV	8
	KOIN-TV	6
	KPTV	12
Roseburg	KPIC	4
PENNSYLVANIA		
Altoona	WFBG-TV	10
Erie	WICU-TV	12
	WSEE	35
Harrisburg	WHP-TV	21
Harrisburg-York-Lebanon	WTPA	27
Johnstown	WJAC-TV	6
	WARD-TV	56
Lancaster	WGAL-TV	8
Lancaster-Lebanon	WLYH-TV	15
Philadelphia	WCAU-TV	10
	WFIL-TV	6
	WRCV-TV	3
Pittsburgh	KDKA-TV	2
	WIIC	11
	WTAE	4
Wilkes-Barre & Scranton	WBRE-TV	28
Scranton & Wilkes-Barre	WDAU-TV	22
	WNEP-TV	16
York	WSBA-TV	43
RHODE ISLAND		
Providence	WJAR-TV	10
	WPRO-TV	12
Providence (New Bedford, Mass.)	WTEV	6
SOUTH CAROLINA		
Anderson	WAIM-TV	40
Charleston	WCIV	4
	WCSC-TV	5
	WUSN-TV	2
Columbia	WCCA-TV	25
	WIS-TV	10
	WNOK-TV	19
Florence	WBTW	13
Greenville	WFBC-TV	4
Spartanburg	WSPA-TV	7
SOUTH DAKOTA		
Aberdeen	KXAB-TV	9
Deadwood-Lead	KDSJ-TV	5
Florence-Watertown	KDLO-TV	3
Mitchell	KORN-TV	5
Rapid City	KOTA-TV	3
	KRSD-TV	7
Reliance	KPLO-TV	6
Sioux Falls	KELO-TV	11
	KSOO-TV	13
TENNESSEE		
Chattanooga	WDEF-TV	12
	WRCB-TV	3
	WTVC	9
Jackson	WDXI-TV	7
Johnson City-Bristol-Kingsport	WJHL-TV	11
Knoxville	WATE-TV	6
	WBIR-TV	10
	WTVK	26
Memphis	WMCT	5
	WHBQ-TV	13
	WREC-TV	3
Nashville	WLAC-TV	5
	WSIX-TV	8
	WSM-TV	4
TEXAS		
Abilene	KRBC-TV	9
Alpine	KVLF-TV	12
Amarillo	KFDA-TV	10
	KGNC-TV	4
	KVII	7
Austin	KTBC-TV	7
Beaumont	KBMT	12
	KFDM-TV	6
Big Spring	KWAB-TV	4
Bryan	KBTX-TV	3
Corpus Christi	KRIS-TV	6
	KZTV	10
Dallas-Ft. Worth	WFAA-TV	8
	KRLD-TV	4
El Paso	KELP-TV	13
	KROD-TV	4
	KTSM-TV	9
Ft. Worth-Dallas	KTVT	11
	WBAP-TV	5
Harlingen	KGBT-TV	4
Houston	KHOU-TV	11
	KTRK-TV	13
	KPRC-TV	2
Laredo	KGNS-TV	8
Lubbock	KCBD-TV	11

WHITE'S

RADIO LOG

Location	C.L.	Chan.
	KLBK-TV	13
Lufkin	KTRE-TV	9
Midland & Odessa	KMID-TV	2
Monahans & Midland	KVKM-TV	9
Odessa	KOSA-TV	7
Port Arthur-Beaumont	KPAC-TV	4
San Angelo	KACB-TV	3
	KCTV	8
San Antonio	KENS-TV	5
	KONO-TV	12
	KWEX-TV	41
	WOAI-TV	4
Sweetwater-Abilene	KPAR-TV	12
Temple-Waco	KCEN-TV	6
Tyler-Longview	KLTV	7
Waco	KWTX-TV	10
Weslaco	KRGV-TV	5
Wichita Falls	KFDX-TV	3
	KAUZ-TV	6

UTAH

Salt Lake City	KCPX-TV	4
	KSL-TV	5
	KUTV	2

VERMONT

Burlington	WCAX-TV	3

VIRGINIA

Bristol-Kingsport & Johnson City, Tenn.	WCYB-TV	5
Harrisonburg	WSVA-TV	3
Norfolk	WTAR-TV	3
Hampton-Norfolk	WVEC-TV	13
Portsmouth-Norfolk-Newport News	WAVY-TV	10
Richmond	WRVA-TV	12
	WTVR	6
Richmond-Petersburg	WXEX-TV	8
Roanoke	WDBJ-TV	7
	WSLS-TV	10
Lynchburg-Roanoke	WLVA-TV	13

WASHINGTON

Bellingham	KVOS-TV	12
Pasco-Kennewick-Richland	KEPR-TV	19
Richland	KNDU	25
Seattle	KING-TV	5
	KIRO-TV	7
	KOMO-TV	4
Spokane	KHQ-TV	6
	KXLY-TV	4
	KREM-TV	2
Tacoma-Seattle	KTNT-TV	11
Tacoma	KTVW	13
Yakima	KIMA-TV	29

WEST VIRGINIA

Bluefield	WHIS-TV	6
Charleston	WCHS-TV	8
Clarksburg	WBOY-TV	12
Huntington-Charles	WHTN-TV	13
	WSAZ-TV	3
Oak Hill	WOAY-TV	4
Parkersburg-Marietta, O.	WTAP-TV	15
Weston-Fairmont	WJPB-TV	5
Wheeling	WTRF-TV	7

WISCONSIN

Eau Claire	WEAU-TV	13
Green Bay	WBAY-TV	2
	WLUK-TV	11
La Crosse	WFRV	5
Madison	WKBT	8
	WISC-TV	3
	WKOW-TV	27
	WMTV	15
Milwaukee	WISN-TV	12
	WITI-TV	6
	WTMJ-TV	4
	WUHF	18
Wausau	WSAU-TV	7

WYOMING

Casper	KTWO-TV	2
Cheyenne	KFBC-TV	5
Riverton	KWRB-TV	10

GUAM

Agana	KUAM-TV	8

PUERTO RICO

Aguadilla-Mayaguez	WOLE-TV	12
Mayaguez	WORA-TV	5
Ponce	WSUR-TV	9
	WRIK-TV	7
San Juan	WAPA-TV	4
	WKAQ-TV	2
Caguas-San Juan	WKBM-TV	11

VIRGIN ISLANDS

Charlotte Amalie	WBNB-TV	10

U. S. Educational Television Stations by States

Territories and possessions follow states. Chan., channel; C.L., call letters.

ALABAMA

Birmingham	WBIQ	10
Dozier	WDIQ	2
Mobile	WEIQ	42
Montgomery	WAIQ	26
Mount Cheaha State Park	WCIQ	7

ARIZONA

Phoenix	KAET	8
Tucson	KUAT	6

CALIFORNIA

Sacramento	KVIE	6
San Bernardino	KVCR-TV	24
San Francisco	KQED	9
San Mateo	KCSM-TV	14

COLORADO

Denver	KRMA-TV	6

CONNECTICUT

Hartford	WEDH	24

DELAWARE

Wilmington	WHYY-TV	12

DISTRICT OF COLUMBIA

Washington	WETA-TV	26

FLORIDA

Gainesville	WUFT	5
Jacksonville	WJCT	7
Miami	WSEC-TV	17
	WTHS-TV	2
Tallahassee	WFSU-TV	11
Tampa-St. Petersburg	WEDU	3

GEORGIA

Athens	WGTV	8
Atlanta	WETV	30
Columbus	WJSP-TV	28
Savannah	WVAN-TV	9
Waycross	WXGA-TV	8

ILLINOIS

Carbondale	WSIU	8
Chicago	WTTW	11
Urbana-Champaign	WILL-TV	12

INDIANA

South Bend	WNDU-TV	16

IOWA

Des Moines	KDPS-TV	11

KENTUCKY

Louisville	WFPK-TV	15

LOUISIANA

Monroe	KLSE	13
New Orleans	WYES-TV	8
	WWL-TV	4

MAINE

Augusta	WCBB	10
Orono	WMEB-TV	12
Presque Isle	WMEM-TV	10

MASSACHUSETTS

Boston	WGBH-TV	2

MICHIGAN

Detroit	WTVS	56
Onondaga-East Lansing	WMSB	10

MINNESOTA

St. Paul-Minneapolis	KTCA-TV	2

MISSOURI

Columbia	KOMU-TV	8
Kansas City	KCSD-TV	19
St. Louis	KETC	9

NEBRASKA

Lincoln	KUON-TV	12

NEW HAMPSHIRE

Durham	WENH	11

NEW MEXICO

Albuquerque	KNME-TV	5

NEW YORK

Buffalo	WNED-TV	17
New York	WNDT	13
Schenectady	WMHT	17

NORTH CAROLINA

Chapel Hill	WUNC-TV	4

NORTH DAKOTA

Fargo	KFME	13

OHIO

Athens	WOUB-TV	20
Bowling Green	WBGU-TV	70
Cincinnati	WCET	48
Columbus	WOSU-TV	34
Newark	WGSF	28
Oxford	WMUB-TV	14
Toledo	WGTE-TV	30

OKLAHOMA

Oklahoma City	KETA	13
	KOKH-TV	11
Tulsa	KOED-TV	11

OREGON

Corvallis	KOAC-TV	7
Portland	KOAP-TV	10

PENNSYLVANIA

Philadelphia	WUHY-TV	35
Pittsburgh	WQED	13
	WQEX	16

SOUTH CAROLINA

Charleston	WITV	7
Greenville	WNTV	29

SOUTH DAKOTA

Vermillion	KUSD-TV	2

TENNESSEE

Memphis	WKNO-TV	10
Nashville	WDCN-TV	2

TEXAS

Dallas	KERA-TV	13
Houston	KUHT	8
Lubbock	KTXT-TV	5
Port Arthur-Beaumont	KPAC-TV	4
Richardson	KRET-TV	23
San Antonio-Austin	KLRN-TV	9

UTAH

Logan	KUSU-TV	12
Ogden	KWCS-TV	18
	KOET	9
Provo	KBYU-TV	11
Salt Lake City	KUED	7

VIRGINIA

Hampton-Norfolk	WHRO-TV	15

WASHINGTON

Pullman	KWSC-TV	10
Seattle	KCTS-TV	9
Tacoma	KPEC-TV	56
	KTPS	62
Yakima	KYVE-TV	47

WISCONSIN

Green Bay	WBAY-TV	2
Madison	WHA-TV	21
Milwaukee	WMVS	10
	WMVT	36

PUERTO RICO

Mayaguez	WIPM-TV	3
San Juan	WIPR-TV	6

Canadian Television Stations by Cities

Chan., channel number; Bullet (*) indicates recent change.

Location	C.L.	Chan.
Adams Hill, B.C.	CFCR-TV-8	11
Alticane, Sask.	CKBI-TV-1	10
Amherst, N.S.	CJCH-TV-3	8
Antigonish, N.S.	CFXU-TV	9
Argentia, Nfld.	CJOX-TV	10
Ashcroft, B.C.	CFCR-TV-2	10
Baldy Mountain, Man.	*CKSS-TV	8
Bale St. Paul, P.Q.	CKRT-TV-1	13
Banff, Alta.	CHCA-TV-2	10
	CFCN-TV-2	8
Barrie, Ont.	CKVR-TV	3
Bayview, N.S.	CJCH-TV-2	6
Bon Accord, N.B.	CHSJ-TV-1	6
Boston Bar, B.C.	CFCR-TV-9	5
Brandon, Man.	CKX-TV	5
Burmis, Alta.	CJLH-TV-3	3
Burnaby, B.C.	CHAN-TV	8
Calgary, Alta.	CFCN-TV	4
Calgary, Alta.	CHCT-TV	2
Callander, Ont.	CFCH-TV	10
Campbellton, N.B.	CKCD-TV	7
Canning, N.S.	CJCH-TV-1	10

Location	C.L.	Chan.
Carleton, Que.	CHAU-TV	5
Carlyle Lake, Sask.	CKOS-TV-2	7
Carrot Creek, Alta.	CFRN-TV-1	9
Castlegar, B.C.	• CBUAT-2	3
Chandler, P.Q.	CHAU-TV-4	7
Charlottetown, P.E.I.	CFCY-TV	13
Chase, B.C.	CFCR-TV-8	11
Chicoutimi, P.Q.	CJPM-TV	6
Chicoutimi, P.Q.	CKRS-TV-2	2
Clearwater, B.C.	CFCR-TV-10	2
Clermont, Que.	CFCV-TV-1	75
Clinton, B.C.	CFCR-TV-4	9
Corner Brook, Nfld.	CBYT	5
Cornwall, Ont.	CJSS-TV	8
Coronation, Alta.	CHCA-TV-1	10
Courtenay, B.C.	CBUT-1	9
Colgate, Saskatchewan	CKCK-TV-1	12
Cranbrook, B.C.	CBUBT	10
Dryden, Ontario	CBWAT-1	9
Eastend, Sask.	CJFB-TV-1	2
Crescent Valley, B.C.	CHMS-TV-1	5
Dawson Creek, B.C.	CJDC-TV	5
Drumheller, Alta.	CFCN-TV-1	8
Drumheller, Alta.	CHCT-TV-1	12
Edmonton, Alta.	CBXT	5
Edmonton, Alta.	CFRN-TV	3
Edmundston, N.B.	CJBR-TV-1	13
Edson, Alta.	CFRN-TV-2	12
Elliot Lake, Ont.	CKSO-TV-1	3
Enderby, B.C.	CFEN-TV-1	5
Estcourt, Que.	CJES-TV-1	70
Falkland, B.C.	CFWS-TV-1	5
Flin Flon, Man.	CBWBT	10*
Foxwarren, Man.	CKX-TV-1	11
Gaspe, P.Q.	CHAU-TV-6	10
Gaspe West, P.Q. (Bechervaise Mountain)	CFGW-TV-1	6
Goose Bay, Nfld.	CFLA-TV	8
Grand Falls, Nfld.	CJCN-TV	4
Grande Prairie, Alta.	CBXAT	10
Greenwater Lake, Sask.	CKBI-TV-3	4
Halifax, N.S.	CBHT	3

Location	C.L.	Chan.
Halifax, N.S.	CJCH-TV	5
Hamilton, Ont.	CHCH-TV	11
Invermere, B.C.	CFWL-TV-1	6
Inverness, N.S.	CJCB-TV-1	6
Jonquiere, Que.	CKRS-TV	12
Kamloops, B.C.	CFCR-TV	4
Kapuskasing, Ont.	CFCL-TV-1	3
Keams, Ont.	CFCL-TV-2	2
Kelowna, B.C.	CHBC-TV	2
Kenora, Ont.	CBWAT	8
Keremeos, B.C.	CHKC-TV-1	5
Kingston, Ont.	CKWS-TV	11
Kitchener, Ont.	CKCO-TV	13
Kokish, B.C.	CFKB-TV-2	9
Lethbridge, Alta.	CJLH-TV	7
Lillooet, B.C.	CFCR-TV-1	11
Liverpool, N.S.	CBHT-1	12
Lloydminster, Alta.	CKSA-TV	2
London, Ont.	CFPL-TV	10
Lumby, B.C.	CHID-TV-1	5
Malakwa, B.C.	• CFFI-TV-1	5
Manicouagan 5, P.Q.	CKHQ-TV-1	10
Matane, Que.	CKBL-TV	9
Medicine Hat, Alta.	CHAT-TV	6
Melita, Man.	CKX-TV-2	9
Merritt, B.C.	CFCR-TV-3	10
Moncton, N.B.	CBAFT	11
Moncton, N.B.	CKCW-TV	2
Mont Blanc, Perce, Que.	CJAO-TV-1	80
Mont Climont, P.Q.	CKBL-TV-1	11
Mont-Laurier, Que.	CBFT-2	3
Mount Timothy, B.C.	CFCR-TV-6	5
Mont Tremblant, Que.	CBFT-1	11
Montreal, Que.	CBFT	2
Montreal, Que.	CBMT	6
Montreal, Que.	CFCF-TV	12
Montreal, Que.	CFTM-TV	10
Moose Jaw, Sask.	CHAB-TV	4
Nakusp, B.C.	• CJNP-TV-1	2
Nakusp, B.C.	• CJNP-TV-2	4
Nelson, B.C.	CBUAT-1	9
Newcastle, N.B.	CKAM-TV-1	7
Newcastle Ridge, B.C.	CFKB-TV-1	7

Location	C.L.	Chan.
New Glasgow, N.S.	CFCY-TV-1	7
Nipawin, Sask.	CKBI-TV-4	2
North Battleford, Sask.	CKBI-TV-2	7
Oliver, B.C.	CHBC-TV-3	8
Ottawa, Ont.	CBOFT	9
Ottawa, Ont.	CBOT	4
Ottawa, Ont.	CJOH-TV	13
Parry Sound, Ont.	CKVR-TV-1	11
Passmore, B.C.	• CHMS-TV-2	2
Peace River, Alta.	CBXAT-1	7
Peachland, B.C.	CHPT-TV-1	5
Pembroke, Ont.	CHOV-TV	5
Penticton, B.C.	CHBC-TV-1	13
Perce, Que.	CHAU-TV-5	2
Perrys, B.C.	• CHMS-TV-3	5
Peterborough, Ont.	CHEX-TV	12
Pivot, Alta.	CHAT-TV-1	4
Port Alfred, P.Q.	CKRS-TV-1	9
Port Arthur, Ont.	CKPR-TV	2
Port Daniel, P.Q.	CHAU-TV-3	10
Port Hardy, B.C.	CFKB-TV-3	3
Prince Albert, Sask.	CKBI-TV	5
Prince George, B.C.	CKPG-TV	3
Princeton, B.C.	CHGP-TV-1	5
Prince Rupert	CFTK-TV-1	6
Quebec, Que.	CFCM-TV	4
Quebec, Que.	CKMI-TV	5
Quesnel, B.C.	CFCR-TV-11	7
Regina, Sask.	CHRE-TV	9
Regina, Sask.	CKCK-TV	2
Red Deer, Alta.	CHCA-TV	6
Rimouski, Que.	CJBR-TV	3
Rivière-au-Renard	CHAU-TV-7	7
Rivière du Loup, Que.	CKRT-TV	7
Roberval, Que.	CKRS-TV-3	8
Rouyn, Que.	CKRN-TV	4
Saint John, N.B.	CHSJ-TV	4
Salmon Arm, B.C.	CHBC-TV-4	5
Saskatoon, Sask.	CFQC-TV	8
Sault Ste. Marie, Ont.	CJIC-TV	2
Savona, B.C.	CFCR-TV-7	8
Senneterre, P.Q.	CKRN-TV-1	7
Sheet Harbour, N.S.	• CBHT-4	11
Shelburne, N.S.	CBHT-2	8
Sherbrooke, Que.	CHLT-TV	7
Sioux Lookout, Ont.	CBWAT-2	12

Location	C.L.	Chan.
Smithers, B.C.	CFTK-TV-2	5
Sointula, B.C.	CFKB-TV-4	5
Squamish, B.C.	CHAR-TV-1	7
St. John's, Nfld.	CJON-TV	6
Ste. Marguerite-Marie, P.Q.	CHAU-TV-1	2
St. Quentin, N.B.	CHAU-TV-2	10
Stephenville, Nfld.	CFSN-TV	8
Stranraer, Sask.	CFQC-TV-1	3*
Sturgeon Falls, Ont.	CBFST	7
Sudbury, Ont.	CBFST-1	13
Sudbury, Ont.	CKSO-TV	5
Swift Current, Sask.	CJFB-TV	5
Sydney, N.S.	CJCB-TV	4
Temiscaming, P.Q.	CBFST-2	12
Temiscaming, P.Q.	CJTK-TV-1	3
Terrace, B.C.	CFTK-TV	3
The Pas, Man.	CBWBT-1	7
Timmins, Ont.	CFCL-TV	6
Toronto, Ont.	CBLT	6
Toronto, Ont.	CFTO-TV	9
Trail, B.C.	CBUAT	11
Trois-Rivières, Que.	• CKTM-TV	13
Upsalquitch Lake, N.B.	CKAM-TV	12
Val Marie, Sask.	CJFB-TV-2	2
Vancouver, B.C.	CBUT	2
Vernon, B.C.	CHBC-TV-2	7
Victoria, B.C.	CHEK-TV	6
Waterton Park, Alta.	CJWP-TV-1	12
Westwold, B.C.	CFWS-TV-2	12
Williams Lake, B.C.	CFCR-TV-5	8
Willow Bunch, Sask.	CKCK-TV-2	6
Windsor, Ont.	CKLW-TV	9
Wingham, Ont.	CKNX-TV	8
Winnipeg, Man.	CBWFT	6
Winnipeg, Man.	CBWT	3
Winnipeg, Man.	CJAY-TV	7
Wynyard, Sask.	CKOS-TV-3	6
Yorkton, Sask.	CKOS-TV	3
Yarmouth, N.S.	CBHT-3	11
Yuill Mountain, Balfour, B.C.	CKBF-TV-1	5

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

WHITE'S RADIO LOG

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. Our ballot for the most unusual station of the month goes to the station which keeps repeating "Kiss Me Honey" over and over without benefit of any other identification. A recent schedule is shown in the "Clandestine" section of our listings this month. It has also been noted on 6095 and 11695 kc/s. Location unknown.

The mysterious women reading lists of numbers in various languages are still with us. One of our R-TVE reporters noted a woman reading numbers in Czech on about 9855 kc/s at 2020 EST. Another reporter picked up a similar transmission in Spanish at 1305 EST on 1220 kc/s. Our own monitoring station has heard transmissions in Spanish on 3452 and 4680 kc/s recently.

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

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

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

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

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

George Oppegard, New Castle, Del.
Paul A Knieriem, Middle Village, N. Y.
Walter P. Pyne, Hagerstown, Md.
Tom Kneitel, New York, N. Y.
John R. Hriczo, Munhall, Pa.
(unsigned), Scarborough, Ont.
Kenneth Ford, Clinton, Ill.
Jim Henry, Newton Sq., Pa.
John McLeod, Vancouver, B. C.
Danny Moore, Cincinnati, Ohio
Michael Scavuzzo, Crescent City, Calif.
Joseph Batross, Jr., Zanesville, Ohio
Herbert Reid, Eureka, Calif.
Joseph Falcone, Philadelphia, Pa.
Lewis T. Rogers, Amsterdam, N. Y.
Richard Wallace, Flushing, N. Y.
Ormand Santucci, Cliffside Park, N. J.
Henry L. Bonner, Jr., Montgomery, Ala.
Curtis S. Laughlin, Portland, Me.
Bruce F. Merkle, Arlington, Va.
Neil Sullivan, Camden, N. J.
Gordon E. Fish, Salem, Va.
John Charlton, Windsor, Ont.
Ronnie S. Horowitz, Bronx, N. Y.

EUROPE

Location	Name	Call	Kc.	EST
ALBANIA				
Tirana	R. Tirana	—	7090	1500
Tirana	R. Tirana	—	9390	1500
AUSTRIA				
Vienna	R. Austria	OEI21	6155	0000
Vienna	R. Austria	OEI22	7245	0615
Vienna	R. Austria	OEI49	9525	1900
Vienna	R. Austria	OEI47	9770	0400
Vienna	R. Austria	OEI52	11785	0400
Vienna	R. Austria	—	11870	1200
Vienna	R. Austria	—	15115	0700
Vienna	R. Austria	—	15240	1400
Vienna	R. Austria	—	15325	1200
Vienna	R. Austria	OEI66	15410	0104
Vienna	R. Austria	—	15435	0006
Vienna	R. Austria	—	17750	1000
Vienna	R. Austria	OEI78	17840	0600

Location	Name	Call	Kc.	EST
BULGARIA				
Sofia	R. Sofia	—	6070	2300
CZECHOSLOVAKIA				
Prague	R. Prague	—	5930	1400
Prague	R. Prague	—	6025	1415
Prague	R. Prague	—	9020	0716
DENMARK				
Copenhagen	V. of Denmark	OZF7	15165	0700
FINLAND				
Helsinki	Finnish BC	OIX7	6120	1600
Helsinki	Finnish BC	OIX2	9555	1100
Helsinki	Finnish BC	—	11805	1100
Helsinki	Finnish BC	OIX4	15185	0715
GERMANY (WEST)				
Cologne	Deutsche Welle	DMQ6	6100	0006
Cologne	Deutsche Welle	—	7180	2020
Cologne	Deutsche Welle	DMQ9	9735	1010
Cologne	Deutsche Welle	DMQ11	11795	1014
GREAT BRITAIN				
London	BBC	GSL	6110	1545
London	BBC	—	6185	2100
London	BBC	GRN	6195	1545
London	BBC	—	7160	1900
London	BBC	GWC	15070	0830
London	BBC	GSO	15180	0700
London	BBC	GSI	15260	1500
London	BBC	GWR	15300	1040
London	BBC	—	15380	1030
London	BBC	—	15410	1500
London	BBC	—	15420	1030
London	BBC	—	17820	1033
GREECE				
Thesaloniki	V. of America	—	7170	1130
HUNGARY				
Budapest	R. Budapest	—	6130	2200
Budapest	R. Budapest	—	9833	2045
ICELAND				
Reykjavik	Utvarp Reykjavik	TFJ	9720	1000
ITALY				
Rome	RAI	—	5960	1640
Rome	RAI	—	21560	0915
MONACO				
Monte Carlo	Trans World R.	—	7200	0230
Monte Carlo	Trans World R.	—	7260	0235
NETHERLANDS				
Hilversum	R. Netherlands	—	5985	2205
Hilversum	R. Netherlands	—	6020	1630
Hilversum	R. Netherlands	—	6085	1636
Hilversum	R. Netherlands	—	6090	2215
Hilversum	R. Netherlands	—	9590	2030
Hilversum	R. Netherlands	—	9700	1515
Hilversum	R. Netherlands	—	9715	1630
Hilversum	R. Netherlands	—	11800	1430
NORWAY				
Oslo	R. Norway	LLS	7210	0040
Oslo	R. Norway	LKQ	11735	1000
POLAND				
Warsaw	Rozglosnia Harcerska	—	6850	0600
PORTUGAL				
Lisbon	V. of West	—	6025	2210
Lisbon	V. of West	—	6080	2245
Lisbon	V. of West	—	6185	2122
RUMANIA				
Bucharest	R. Bucharest	—	5990	1422
Bucharest	R. Bucharest	—	6190	1700
Bucharest	R. Bucharest	—	7195	1400
Bucharest	R. Bucharest	—	7810	1555
Bucharest	R. Bucharest	—	9517	1542
Bucharest	R. Bucharest	—	9540	1620
Bucharest	R. Bucharest	—	9580	1600
Bucharest	R. Bucharest	—	11800	1559
SPAIN				
Madrid	R. Nac. de Espana	—	6140	1900
Madrid	R. Nac. de Espana	—	9619	1515
Madrid	R. Nac. de Espana	—	9695	0900
SWEDEN				
Stockholm	R. Sweden	—	15420	0945
SWITZERLAND				
Berne	Swiss BC	HEU3	9665	1145
Berne	Swiss BC	—	11825	1145
Berne	Swiss BC	HER5	11865	0945
Berne	Swiss BC	—	15140	0400
Berne	Swiss BC	—	15190	0945
Berne	Swiss BC	HEU6	15315	0950
Berne	Swiss BC	HEU7	17720	0400
Berne	Swiss BC	HER8	21520	0400
Geneva	U.N. R.	—	6010	1420
Geneva	U.N. R.	—	6100	2033
Geneva	U.N. R.	—	7110	0750
Geneva	U.N. R.	—	7290	1420
Geneva	U.N. R.	—	7443	1200
Geneva	U.N. R.	—	9535	2030
Geneva	U.N. R.	—	9575	1425
Geneva	U.N. R.	—	9665	0750
U.S.S.R.				
Alma-Ata	R. Alma-Ata	—	9380	0900
Moscow	R. Moscow	—	6203	2040
Moscow	R. Moscow	—	6365	2020
Moscow	R. Moscow	—	6425	2018
Moscow	R. Moscow	—	7130	2018
Moscow	R. Moscow	—	7150	1758
Moscow	R. Moscow	—	7180	2020
Moscow	R. Moscow	—	7256	0100
Tashkent	R. Tashkent	—	9600	0700
Tashkent	R. Tashkent	—	11925	0900
Yerevan	R. Yerevan	—	9685	0400
Yerevan	R. Yerevan	—	11830	0400
VATICAN				
Vatican City	R. Vatican	—	6145	1950
Vatican City	R. Vatican	—	7050	1955
Vatican City	R. Vatican	—	7250	1953
Vatican City	R. Vatican	—	9645	1950
YUGOSLAVIA				
Belgrade	R. Belgrade	—	11735	2000

AFRICA

ALGERIA				
Algers	R. Algeria	—	9580	1100
ANGOLA				
Luanda	E. Official	—	4955	0100
Luanda	E. Official	CR6SD	6025	0100
Luanda	E. Official	—	6190	0100
Luanda	E. Official	—	7235	0105
Luanda	E. Official	—	9560	0600
Luanda	E. Official	—	9705	0600
Luanda	E. Official	CR6SE	9765	0600
Sa da Bandeira	R. Club de Huila	CR6SG	3970	1545
CONGO (FRENCH AFRICAN)				
Brazzaville	R. Congo	—	4843	0018
Brazzaville	R. Congo	—	9730	1400
Brazzaville	R. Congo	—	11710	1200
Brazzaville	R. Congo	—	11725	1200
Brazzaville	R. Congo	—	11970	1200
Brazzaville	R. Congo	—	15190	1230
Brazzaville	R. Congo	—	15370	1400
EGYPT (U.A.R.)				
Cairo	U.A.R. BC	—	7075	0130
Cairo	U.A.R. BC	—	9475	1630
Cairo	U.A.R. BC	—	11915	0130
ETHIOPIA				
Addis Ababa	R. Addis Ababa	—	6185	1100
Addis Ababa	R. Addis Ababa	—	7290	2330
Addis Ababa	R. Addis Ababa	—	9610	1100
Addis Ababa	R. Addis Ababa	—	11875	1510
Addis Ababa	R. Addis Ababa	—	11925	1000
Addis Ababa	R. Addis Ababa	—	15300	1310
Addis Ababa	R. V. of Gospel	ETLF	9685	1155
Addis Ababa	R. V. of Gospel	ETLF	9705	1400
GHANA				
Accra	Ghana BC	—	11800	1535
Accra	Ghana BC	—	21545	0950
GUINEA REPUBLIC				
Conakry	Ici Conakry	—	15310	0100
IVORY COAST				
Abidjan	R. Abidjan	—	7215	1330
Abidjan	R. Abidjan	—	11820	1335
LIBERIA				
Monrovia	R. Village	ELWA	3225	0213
Monrovia	R. Village	ELWA	15155	1625
Monrovia	V. of America	—	6075	2320
Monrovia	V. of America	—	7195	2230
Monrovia	V. of America	—	15370	1500
LIBYA				
Tripoli	R. Tripolis	—	5965	0000
MALAGACHE REPUBLIC				
Tananarive	U. Univ. de Tanan.	—	3370	1130
MALI				
Bamako	R. Nacional	—	9745	1655
MOROCCO				
Tanger	V. of America	—	7270	0230
Tanger	V. of America	—	11735	1530
Tanger	V. of America	—	15535	1530
MOZAMBIQUE				
Beira	E. do Aero Club	—	3235	1100

WHITE'S RADIO LOG

Location	Name	Call	Kc.	EST
Beira	E. do Aero Club	—	7240	1100
Beira	R. Pax	—	3960	2300
Beira	R. Pax	—	7205	2332
NIGERIA				
Enugu	Nigerian BC	—	4855	1730
Lagos	Nigerian BC	—	4990	0130
Lagos	Nigerian BC	—	7275	0900
Lagos	Nigerian BC	—	9690	0900
Lagos	Nigerian BC	—	11900	1230
Lagos	Nigerian BC	—	15255	1100
RHODESIA & NYASALAND				
Lusaka	Federal BC	—	4911	2330
Salisbury	S. Rhod. BC	—	3396	2255
Salisbury	S. Rhod. BC	—	6025	0235
RWANDA				
Kigali	Deutsche Welle	—	7225	0500
Kigali	Deutsche Welle	—	7260	1100
SAO TOME E PRINCIPE				
Sao Tome	R. Club de S. T.	CR5SC	4807	1700
SIERRA LEONE				
Freetown	Sierra Leone BC	—	3316	0200
TANGANYIKA				
Dar es Salaam	R. Tanganyika	—	7280	0200
TOGO				
Lome	R. Togo	—	5047	1600

ASIA AND NEAR EAST

AFGHANISTAN				
Kabul	R. Kabul	—	15225	1332
BURMA				
Rangoon	Burma BC	—	4795	0600
Rangoon	Burma BC	—	5040	0615
Rangoon	Burma BC	—	6035	1945
Rangoon	Burma BC	—	7120	2330
CAMBODIA				
Phnom Penh	R. Nat. Khmere	—	5940	0030
Phnom Penh	R. Nat. Khmere	—	11915	2200
Phnom Penh	R. Nat. Khmere	—	17720	2030
CEYLON				
Colombo	R. Ceylon	—	15333	0415
CHINA (COMMUNIST)				
Peking	R. Peking	—	9457	2000
Peking	R. Peking	—	9945	0745
Peking	R. Peking	—	11885	0540
CHINA (FREE)				
Taipei	V. of Free China	BED29	6095	2152
Taipei	V. of Free China	BED7	7130	2150
Taipei	V. of Free China	BED69	11825	2155
Taipei	V. of Free China	BED49	15345	2205
Taipei	V. of Free China	BED71	15395	2150
Taipei	V. of Free China	BED40	17890	2157
INDIA				
Delhi	All India Radio	VUD	5955	1448
Delhi	All India Radio	VUD	7125	1452
Delhi	All India Radio	VUD	9915	1512
INDONESIA				
Djakarta	V. of Indonesia	—	9770	0500
Djakarta	V. of Indonesia	YDF8	9865	1400
Djakarta	V. of Indonesia	YDF2	11715	1400
JAPAN				
Tokyo	N.H.K.	—	11820	1840
KOREA (NORTH)				
Pongyang	R. Pongyang	—	5044	0600
Pongyang	R. Pongyang	—	7225	1500
Pongyang	R. Pongyang	—	9752	0600
KOREA (REPUBLIC)				
Seoul	V. of Free Korea	HLK65	11595	0030
Seoul	V. of U.N.	—	2405	0300
Seoul	V. of U.N.	—	3985	0300
LEBANON				
Beirut	Lebanese BC	—	11800	1615
Beirut	Lebanese BC	—	11890	1645
MONGOLIA				
Ulan Bator	Ankhararai Ulanbatras	—	4070	1750
PHILIPPINES				
Manila	Far East BC	—	9555	1230
SAUDI ARABIA				
Jeddah	Saudi Arab. BC	—	9650	0000
Jeddah	Saudi Arab. BC	—	11950	0000
SINGAPORE				
Singapore	Brit. Far East BC	—	15265	0945
SYRIA				
Damascus	R. Damascus	—	7390	0230
THAILAND				
Bangkok	R. Bangkok	—	11910	1226
TURKEY				
Ankara	R. Ankara	TAS	7285	1700
Ankara	R. Ankara	TAU	15160	1400
VIETNAM (NORTH)				
Hanoi	R. Hanoi	—	9760	0630
Hanoi	R. Hanoi	—	15045	0400
Hanoi	R. Hanoi	—	15115	0400

PACIFIC

AUSTRALIA				
Brisbane	R. Australia	VLM	4910	0700
Melbourne	R. Australia	—	9570	1700
Melbourne	R. Australia	—	9580	0800
Melbourne	R. Australia	—	11710	1700
Melbourne	R. Australia	—	15220	2145
Melbourne	R. Australia	—	17840	2145
Perth	R. Australia	VLX9	9610	1730
FIJI				
Suva	Fiji BC	VRH8	3286	0330
HAWAII (U.S.A.)				
Honolulu	V. of America	—	6195	0514
Honolulu	V. of America	—	9650	0448
Honolulu	V. of America	—	9680	0700
NEW CALEDONIA				
Noumea	R. Noumea	—	7170	0300
NEW ZEALAND				
Wellington	N.Z. Calling	—	9410	1315
Wellington	N.Z. Calling	ZL2	9540	0312
Wellington	N.Z. Calling	ZL1	11780	0300
PAPUA & NEW GUINEA				
Port Moresby	Austr. BC	VLK3	3925	1500
Port Moresby	Austr. BC	VLT4	4890	1500
Port Moresby	Austr. BC	VLT9	9520	0200
SOLOMON ISLANDS				
Honiara	Solomon I. BC	VQO3	3995	0430
TAHITI				
Papeete	R. Tahiti	—	11825	2230

NORTH AMERICA

CANADA				
Halifax, N.S.	Maritime BC	CHNX	6130	1346
Montreal, Que.	R. Canada	CKLO	9410	1206
Montreal, Que.	R. Canada	CKLP	9585	1700
Montreal, Que.	R. Canada	CKYU	9625	0305
Montreal, Que.	R. Canada	CKLO	9630	1500
Montreal, Que.	R. Canada	CHOL	11720	0745
Montreal, Que.	R. Canada	CKCS	15320	0630
Montreal, Que.	R. Canada	CKNC	17820	0630
Montreal, Que.	Canadian Marconi	CFCX	6005	1400
Ottawa, Ont.	Dominion Observ.	CHU	7335	1715
St. Johns, Nfld.	R. Canada	CBNX	6160	1205
Sydney, N.S.	Cape Breton BC	CJCX	6010	1623
Toronto, Ont.	Rogers Radio BC	CFRX	6070	2200
UNITED STATES OF AMERICA				
Bethany, Ohio	V. of America	—	11900	2245
Greenville, S.C.	V. of America	—	15390	1500
Los Angeles, Cal.	Armed Forces	—	5965	0800
New York, N.Y.	Armed Forces	—	9705	1730
New York, N.Y.	R. N.Y. Worldwide	WRUL	11950	0700
New York, N.Y.	R. N.Y. Worldwide	WRUL	15440	0700
Red Lion, Pa.	—	WINB	11795	1500
Red Lion, Pa.	—	WINB	17720	1200
San Francisco, Cal.	V. of Friendship	KGEI	15240	1830

CENTRAL AMERICA AND CARIBBEAN

BRITISH HONDURAS				
Belize	Brit. Hond. BC	—	3300	2100
COSTA RICA				
San Jose	R. Periodico Reloj	—	6205	1842
San Jose	V. de la Victor	TIRICA	9615	0000
CUBA				
Havana	R. Havana	—	6135	2230
Havana	R. Havana	—	11800	1500
Havana	R. Havana	—	11960	1400

Location	Name	Call	Kc.	EST
DOMINICAN REPUBLIC				
Santiago	R. Santiago	HIAZ	3395	0121
Santo Domingo	Onda Musical	HIAS	3350	2130
Santo Domingo	R. HIG	HIG	9485	2130
GUATEMALA				
Flores	R. Tikal	TGRT	6200	2212
Guatemala City	V. de Guat.	TGWB	6180	1900
Puerto Barrios	R. Norte	—	11699	1802
HAITI				
Cap Hatien	V. Evangelique	4VSO	2450	0530
Cap Hatien	V. Evangelique	4VE	6120	0545
Cap Hatien	V. Evangelique	4VEH	9770	0541
Cap Hatien	V. Evangelique	4VEJ	11834	0535
HONDURAS				
La Ceila	R. Luz	—	4890	1752
Tegucigalpa	V. de Suyapa	HRUS	4930	2208
MARTINIQUE				
Fort de France	R. Martinique	—	3315	2030
MEXICO				
Chipas	R. Tapachula	XETS	6120	2338
Ci. Mante	R. XECM/XECMT	XECMT	6090	1700
Hermosillo	R. Univ. de Herm.	XEUDS	6115	2200
Mexico City	La Hora Exacta	XETT	9555	0940
Mexico City	R. Comerciales	XEHH	11880	1630
Mexico City	R. Comerciales	XERR	15110	1722
Mexico City	R. XEMC/XESC	XESC	15205	1715
SWAN ISLAND				
Swan	R. Americas	—	6050	1957
WINDWARD ISLANDS				
St. Georges, Gren.	Windw. I. BC	—	11895	1452

SOUTH AMERICA

ARGENTINA				
Buenos Aires	R. Belgrano	LRY2	11820	1420
Buenos Aires	R. Belgrano	—	11710	1400
Buenos Aires	R. Belgrano	LRI2	11780	2000
Buenos Aires	Argentina Calling	LRA32	9690	1715
Buenos Aires	Argentina Calling	LRA33	15345	1700
BOLIVIA				
La Paz	R. Antiplano	—	5046	1800
BRAZIL				
Fortaleza	R. Iracema	ZYH27	4815	1945
Natal	E. Educadora Rural	—	3285	0311
Sao Luiz	R. Timbira	ZYV9	4975	1800
Sao Paulo	R. Bandeirantes	ZYR78	11925	1800
CHILE				
Santiago	R. Nuevo Mundo	CEI174	11740	2032
Santiago	R. Yungay	CE965	9650	0600
ECUADOR				
Quito	R. Nacional	HCXZI	4940	1745
Quito	V. de los Andes	HCJB	9745	2102
Quito	V. de los Andes	HCJB	9780	0130
Quito	V. de los Andes	HCJB	11900	2250
Quito	V. de los Andes	HCJB	11915	2000
Quito	V. de los Andes	HCJ8	15115	1905
Quito	V. de los Andes	HCJB	17890	1515
PERU				
Cuzco	R. Tahuantisuyo	OAX7C	6265	2315
Huamanga	R. Huancavelica	OAX5U	4815	0000
Iquitos	R. Loreto	—	4730	1830
Juliaca	E. El Sol	OBX7D	3230	0158
La Oroya	R. Minerva	OAZ4E	6205	1845
Lima	R. La Cronica	OAX4J	9390	1921
Lima	R. Nacional	OAX4Z	6082	1900
Lima	R. Nacional	OAX4R	9562	0726
Lima	R. Nacional	OAX4T	15150	1400
SURINAM				
Paramaribo	R. Surinam	PZC	15462	2000
VENEZUELA				
Caracas	R. Rumbos	YVLK	11975	0100
Tovar	R. Tovar	YVPM	3365	2000

CLANDESTINE

—	Azad Kashmir R.	—	3250	1130
—	R. Liberdad	—	7308	2021
—	R. Liberdad	—	7315	0102
—	"Kiss Me Honey"	—	9555	0800
—	"Kiss Me Honey"	—	11700	0800
—	"Kiss Me Honey"	—	11950	0800
(W. Germany)	R. Free Russia NTS	—	6280	0810

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Bookmark

(Continued from page 21)

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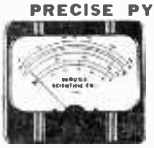

Precision built pyrometer calibrated for use with chromel-alumel thermocouples (listed below), conversion charts for all other base metal thermocouples. Also serves as an ultra-precise millivoltmeter. Has zeroing adjustment. Case is 4.5⅞" x 4", and features three separate scales for reading ranges from 32 (degrees) to 25,000 (degrees) Fahrenheit, 0 (degrees) to 1370 (degrees) Centigrade and from 0 to 55 in Millivolts. High resistance, not easily affected by thermocouple length, but small enough to register smallest temperature deflections.

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THERMOCOUPLE KIT—Includes 8 thermocouples (10" long), welded hot junction. 3" porcelain double bore insulator, color coded fiberglass insulation on leads with polarity indicated, and complete instructions. Can be used with millivoltmeter or milliammeter.

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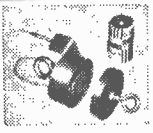

Hobbyists, instructors and industrial lab men will find this well-built Electro-Magnet invaluable. Demonstrate principles of electro-magnetism. Actually lifts 100 lbs. when powered by a single 1½V flashlight battery. Easily deactivated. Includes instructions for 6 experiments—lifting power, magnetic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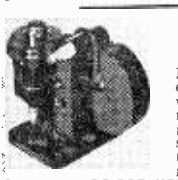

Electron magnetron tunable metal envelope comprising tube, magnet, variable tuner. 5-volt heater. 3,000 volt peak anode; frequency range 9300-9320 megacycles. Used with wave guide apparatus. Extremely valuable for lab-school experimenting. Contains excellent gap magnet (3 lbs. 14 ozs.), adjustable stop-type gear reduction control.

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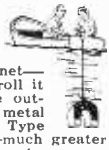
Go Treasure Hunting On The Bottom



Great idea! Fascinating fun and sometimes tremendously profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle, all kinds of metal valuables. 5-lb. Magnet is war surplus—Alnico V Type—Gov't Cost $50. Lifts over 150 lbs. on land—much greater weights under water. Order now and try this new sport.

Stock No. 70,571-HP 5-lb. Magnet . . . . . **$12.50 Postpaid**
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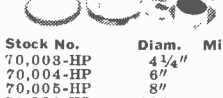
Stock No. 70,572-HP 7½ lb. Lifts 175 lbs. . . **$18.75 Postpaid**
Stock No. 85,152-HP 15 lb. size lifts over 350 lbs. $33.60 FOB



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Grind Your Own Astronomical Mirror

Kits contain mirror blank, tool, abrasives, diagonal mirror and eyepiece lenses. You build instruments ranging in value from $75.00 to hundreds of dollars.

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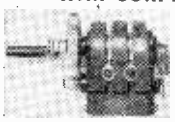
70,004-HP	6"	1"	11.95 ppd.
70,005-HP	8"	1⅜"	19.50 ppd.
70,006-HP	10"	1¾"	30.75 } f.o.b.
70,007-HP	12½"	2⅛"	59.95 } Barrington

WAR SURPLUS ELECTRIC GENERATOR



Brand-new Signal Corps Generator for endless experiments, electrical users, demonstrations. Generates up to 90 volts by turning crank. Use in high impedance relays. Ring bells. Or charge ground and bring up night crawlers for fishing bait. Has 2 Alnico Magnets. Wt. 2 lbs. Cost to Govt. $15.00.

Stock No. 50,225-HP . . . . **$6.95 Postpaid**

Same type generator, mounted, with light, as electricity demonstrator.

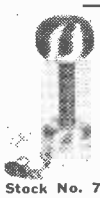
Stock No. 50,365-HP . . . **$11.95 Postpaid**

Miniature Submersible Water Pump For Hobbies, Experiments

Sturdily built, self priming, electric water pump. Extremely long life, trouble free operation. Ideal for science classes, advertising exhibits, miniature waterfalls, fountains, etc. Operates under water on 8 to 20V AC. At 20V, pumps 1 pint per minute at 12" head. Does not operate in salt water. Spare valve, spring and instructions incl. Plastic. 2½" lg., 1" dia., wt. 1¼-oz.

Stock No. 60,307-HP . . . . . **$2.98 Postpaid**

HIGH-VOLTAGE, LOW-AMPERAGE VAN DE GRAF TYPE ELECTROSTATIC GENERATOR



Volt potential—200,000, yet completely safe for classroom experiments. Demonstrate lightning and how lightning rods work; St. Elmo's fire; repulsion of like charges; electrostatic dust collections; the classic "hair-raising effect"; many other electric phenomena. Motor, 110V, 60-cycle, AC. Humidity range, 0-90%. Current, 1.5 to 2.5 microamps. Aluminum base, frame and charge collector. Insulating column—unbreakable vinyl chloride plastic. Ht. 17", Dia. 6¾". Full instructions on experiments and care.

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