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RADIO-TV EXPERIMENTER

FEBRUARY-MARCH 75¢

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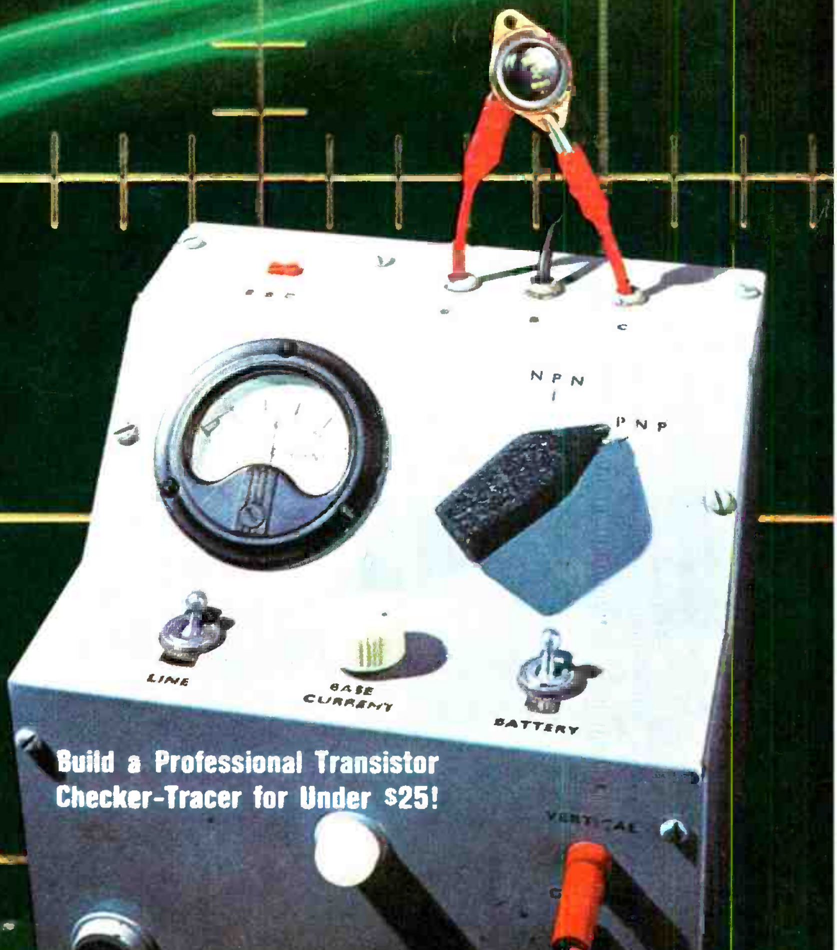

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RADIO-TV EXPERIMENTER

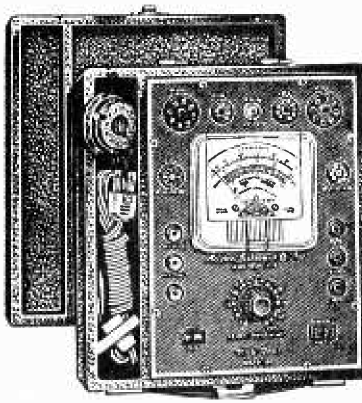
February-March, 1965

Cover Photo by Don Lothrop

CONTENTS/INDEX

New Model 161 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES



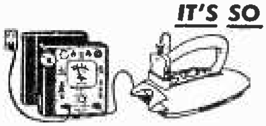
As an electrical trouble shooter the Model 161:

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

As an Automotive Tester the Model 161 will test:

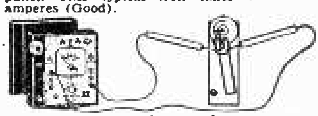
• Both 6 Volt and 12 Volt Storage Batteries • Generators • Starters • Distributors • Ignition Coils • Regulators • Relays • Circuit Breakers • Cigarette Lighters • Stop Lights • Condensers • Directional Signal Systems • All Lamps and Bulbs • Fuses • Heating Systems • Horns • Also will locate poor grounds,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

IT'S SO EASY!!

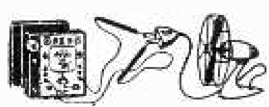


With tester's cord in outlet, current consumption of appliance is read direct on meter when line cord is connected to receptacle on panel. This typical iron takes 7 amperes (Good).

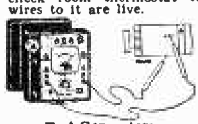
Simply insert tube in appropriate socket then follow procedure as outlined in our manual.



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

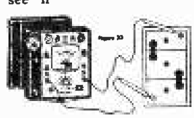


Small electric fan motor indicates 50 ohms (normal resistance).



Test Generators

READ THIS!



Test Storage Batteries

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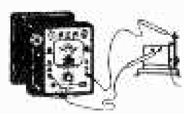

Test Circuit Breakers

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- How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.
- How to trace trouble in the electrical circuits and parts in automobiles and trucks.

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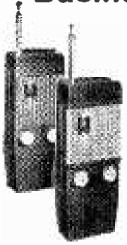

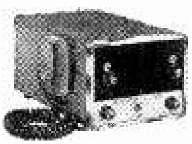

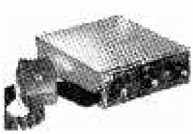

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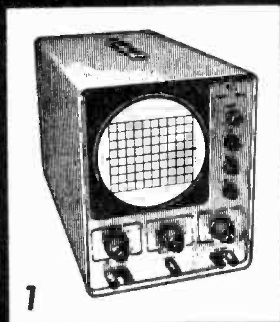
5 in. Oscilloscope 1

Transistorized Meter 2

Modern Lessons 3



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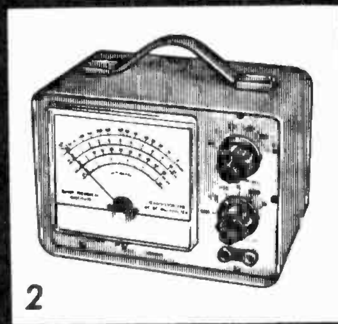

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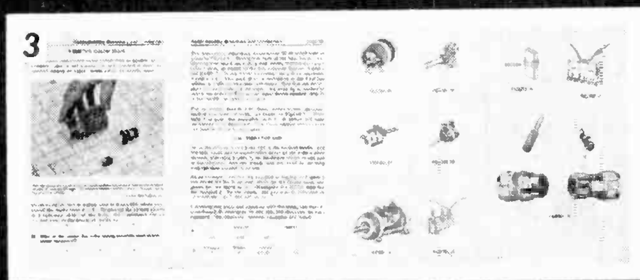
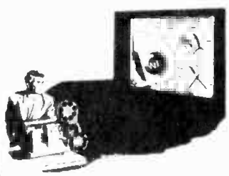


3

AT SEA

ON LAND

In the Air!



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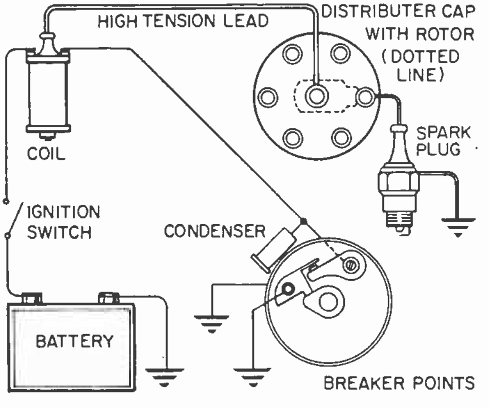
POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor
WA2CQL/2W5115

Can you afford to spend $30 to as much as $200 for an automobile ignition system that may save you the cost of a few $10 tuneups during the life time of your car? Can you afford this sum to save only a fraction of a mile per gallon of gas over the long haul? Can you afford the price of a transistorized ignition system to save even less in money and gain far less in performance if you keep your car tuned up and do your own work? I doubt it.

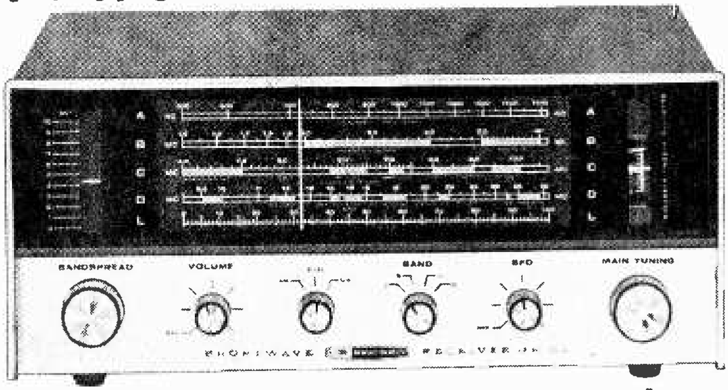


Standard ignition system—6-cylinder car

Transistorized ignition systems can be one of three types in which transistors serve as switches to aid or replace the contact breaker points of the conventional ignition system. Type *one* retains the contact breaker points to control the system, type *two* is controlled magnetically, and type *three* is a capacitor-discharge system. Type *one* is the most common and is the type available for use on existing cars, so it is the type that concerns us here.

To understand transistor ignition, you

How To Get Improved SWL Performance At The Same Low Price...



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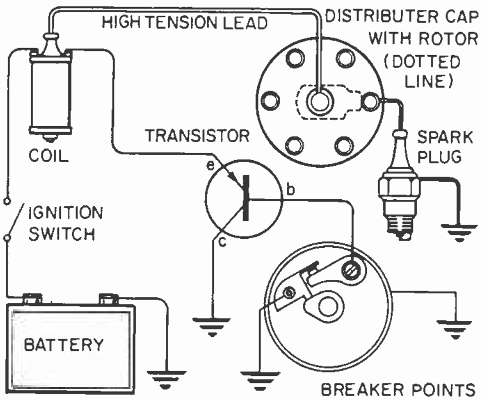
must first understand the conventional system. As shown in the diagram, current from the battery is controlled by the contact breaker points on its way to the coil where it is built up to high voltage. From the coil it returns to the distributor which directs it to the correct spark plug. The transistorized system uses the points only to time the transistor which switches the current on and off for the coil. Otherwise it is basically similar to the conventional system.

The claimed advantages for the transistor system are that the points carry a far lower current than they do with the conventional system. Thus point burning, common at about 10,000 miles with the conventional system, rarely, if ever, occurs with a transistorized system. So the points in the new system will last about 30,000 miles. Great, but let's look at the situation a little more closely.

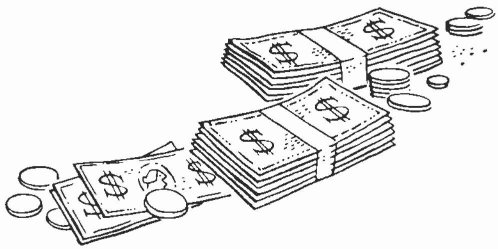


Transistorized ignition system

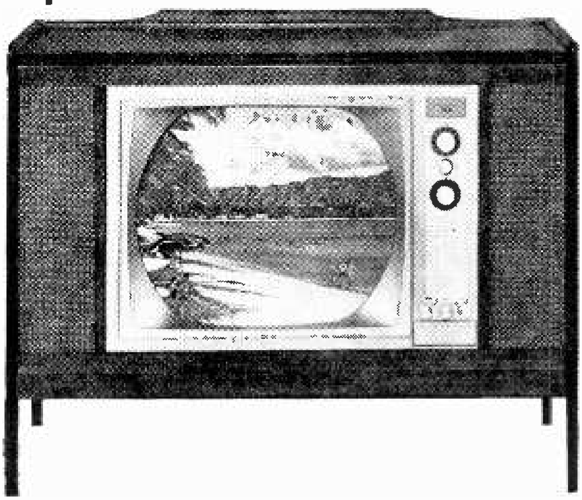
While the points themselves will not burn and develop high resistance, other things can and often do happen to impair efficiency. Rubbing block and cam lobes eventually wear down enough to seriously affect timing. And if, as often happens, one cam lobe wears more quickly than another, one cylinder will fire sooner and the other later than designed. Of course this kind of trouble can also occur with the conventional system, but it is more apt to be discovered and corrected when the points and condenser are changed.

Transistorized ignition systems also fall prey to an interesting failure almost unknown

Regardless of what you pay for other Color TV



it can't perform as well as this one...



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But don't take our word for it. See the special articles on the Heathkit GR-53A in the May issue of **Popular Electronics,** June issue of **Radio-TV Experimenter,** February issue of **Popular Mechanics,** April issue of **Science & Mechanics,** and the August issue of **Radio-Electronics.**

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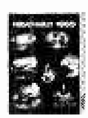

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to conventional systems. If the engine stops with the points open on a cold day, water condensation on the points may form an ice insulation. In the conventional system the current is high enough to melt the ice, but in the transistor system it often is not. The result: mysterious failure to start on cold days.

Some test evidence suggests that the conventional ignition system is superior to transistorized systems in firing fouled spark plugs because it generally offers a greater voltage output at engine speeds up to 3000 rpm. (Note: most passenger car engines are operating at from about 2000 to at most about 3500 or 4000 rpm in normal highway driving.) This would seem to negate some claims of extended spark plug life with transistorized ignition systems.

Of particular interest to ham radio operators and CB'ers, the capacitive discharge transistorized ignition systems don't work as well when equipped with radio-noise suppression equipment.

Still another problem is shop tuneup test equipment. Expensive ignition analyzers and other test equipment will have to be modified or replaced to be used on cars equipped with transistorized ignition systems. This means that there will be very few shops with the proper equipment to check out or tune up your transistor system, and that those few will have to charge an arm and a leg in order to pay off their expensive test instruments.

Yet, despite these drawbacks, transistorized ignition is here now as a working system in several forms. It does offer certain very real advantages, but at a price to be sure; is it worth this extra cost? In the present stage of development, many automotive design engineers do not believe that the advantages justify the added cost. Especially when the gains over a properly maintained conventional system are so slight.

Perhaps the transistorized ignition system is not yet the answer for general automotive service. Still, there must be something to it or you wouldn't hear so much about it on racing cars, in trucks, and for other specialized uses.

Yes, there are many things that transistorized systems do better than any conventional system. The main advantage is that the coil builds up peak voltage much faster than it can in a conventional system which

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means that full voltage is available to fire the spark plugs at a much higher engine speed range. Here the advantage can be somewhat offset by using conventional system with dual contact breaker points, but nevertheless the transistorized system has it all over the conventional on this point. Racing cars, dragsters, and other vehicles which require top performance at high engine speeds are turning to the transistorized systems to get it. But in every case high speed performance is more important to them than the price. In a race, even a few hundred extra rpm at the critical moment can make the difference between winning and being an also-ran. On the highway it just does not matter that much.

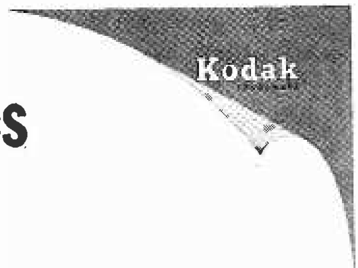
Some truck fleets are turning to transistor systems for a totally different reason. While performance is important to them, the trucker is looking at longer periods of efficient ignition service between tuneups. His reason, money. It works this way. Even though the tuneup may not cost him any more than the $10 to $15 it would cost you (and union scale truck mechanics don't come cheap), there is another important factor—downtime. If having his truck tied up for just one day costs only $50, and often it is much more than that, then the transistorized system becomes a profitable proposition if it saves the downtime of one or two tuneups. But most passenger cars can get tuned up while you are working at your job without costing more than minor inconvenience. Is this worth the extra cost to you?

Transistorized ignition systems could well be a coming thing and, perhaps, stock equipment. However, for the average motorist they may indeed be more trouble and expense than they are worth. On the other hand, if you are a drag racer, an Indianapolis car captain, or Grand Prix pilot you could need the new system right now. Only *you* can take a look at the kind of driving *you* do and decide whether or not a transistorized system will give you enough advantages to make it worth the cost.

Electronics in the Garage. While the hood of your old internal combustion run-around is still up, take a look at page 75 of this issue.

You'll see that electronics need not only be under your hood and on your automotive test bench, but can be working for you in still

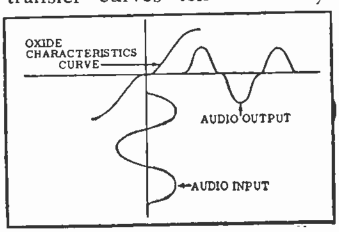
Some plain talk from Kodak about tape:



Bias transfer characteristics and dependent parameters

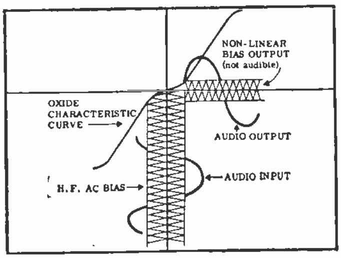
Ever heard the story about the pilot on his first solo flight? Unfortunately the engine failed. But fortunately he had a parachute. But unfortunately the chute failed to open. But fortunately he landed on a haystack. But unfortunately there was a pitchfork in the haystack. Except for the unhappy ending, this might be the story of how gamma ferric oxides respond to magnetic fields. Everything about it is fortunate with one exception. *Linearity*. The oxide needles used in the coatings have atrocious linearity characteristics. Feed in a clean, pure sine wave and out comes a non-sinusoidal complex waveform that looks something like a demented snake trying to bite its own head off. How does it sound? About as pleasant as Junior's first violin lesson.

How then is magnetic recording possible? Fret not—there's a way out. The entire problem is solved by one wonderful, mysterious phenomenon called bias. The transfer curves tell the story.

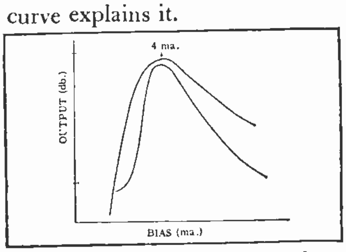


The slightly twisting curve at the upper left represents the oxide response. The lower curve is a pure, sine wave input. At the upper right we have the result of the response curve on the input . . . a mess.

The reason it looks the way it does is because the sine wave input is affected by the non-linear characteristics of the gamma ferric oxides. But look closely. Note that while the oxide performance is non-linear when taken over its entire length, we can find linearity over selected sections. In other words, we can get rid of our distortion if we can put the signal on the linear section of the oxide's characteristic curve. And that is exactly what bias does. It "lifts" the signal away from the convoluted central area on the graph and moves it out to linear areas.



The amount of bias (that is the current in milliamperes) applied to the head is highly critical if top performance is to be achieved. Bias affects output, high and low frequency sensitivity, signal-to-noise ratio and distortion. This curve explains it.



The steep curve represents low frequency sensitivity (measured in db.) at varying bias levels for many tapes. Note that you get good performance providing you have a bias setting of about 4 milliamperes. (Curves for the other magnetic parameters are similar in shape and all peak at about the same bias level.) Vary one milliampere and you "fall off the curve" and suffer severe losses in sensitivity. Now look at the broader curve. You can vary a milliampere with hardly any change in performance at all. Here's the point. *Kodak tape has that broad curve.* It gives you top performance even though your bias settings aren't perfect. And if your tape recorder is more than a year old, then chances are enough shift has taken place to push you off the cliff. That's why we designed a broad bias curve. And that's why you need it. It's just one more way that Kodak tape gives you an extra bit of assurance of top performance.

KODAK Sound Recording Tapes are available at all normal tape outlets: electronic supply stores, specialty shops, department stores, camera stores . . . everywhere.

EASTMAN KODAK COMPANY, Rochester, N.Y.

Positive Feedback

another way. The Auto Sentinel will start your car in the morning and have it running and warm when you leave the house—quite a luxury on these cold winter days!

The Sentinel circuit, utilizing five relays, is completely self-contained. It has safety provisions against low oil pressure, failure to start, and starting with the car in gear. It is also a compact unit that can be installed permanently in your car in an out of the way place convenient for making the connections to your auto electrical system.

But, as with transistorized ignition, you'll have to decide if the advantages and convenience justify its construction—read no further if you reside in the moderate climate of Southern California. ■

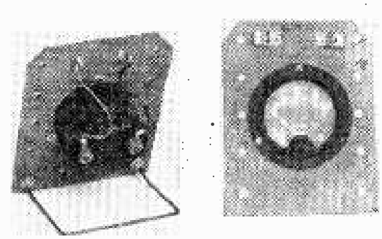
Meter Mount

Why not put those surplus panel meters to use as test meters in experimental projects by constructing the inexpensive mounting stand shown here?

Just scribe a circle on ordinary pegboard to fit your panel meter body and cut it out with a saw. A length of coat hanger (some of which are found in every well equipped workshop) can be bent as shown in the photo and secured to the pegboard.

Two Fahnestock clips or another type of binding post can be mounted on the face of the pegboard to hold your test leads or wiring setup. Run two short wires from the posts or clips to the meter terminals and you're ready to put the meter to use.

—C. Green, W31KH



For convenience, meter terminals of mounting stand are wired to front of pegboard.

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You will learn how to build radios, using regular schematics; how to wire and solder in a professional manner; how to service radios. You will work with the standard type of punched metal chassis as well as the latest development of Printed Circuit chassis.

You will learn the basic principles of radio. You will construct, study and work with RF and AF amplifiers and oscillators, detectors, rectifiers, test equipment. You will learn and practice code, using the Progressive Code Oscillator. You will learn and practice trouble-shooting, using the Progressive Signal Tracer, Progressive Signal Injector, Progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional material.

You will receive training for the Novice, Technician and General Classes of F.C.C. Radio Amateur Licenses. You will build Receiver, Transmitter, Square Wave Generator, Code Oscillator, Signal Tracer and Signal Injector circuits, and learn how to operate them. You will receive an excellent background for television, Hi-Fi and Electronics.

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

THE KIT FOR EVERYONE

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

Many thousands of individuals of all ages and backgrounds have successfully used the "Edu-Kit" in more than 79 countries of the world. The "Edu-Kit" has been carefully designed, step by step, so that you cannot make a mistake. The "Edu-Kit" allows you to teach yourself at your own rate. No instructor is necessary.

PROGRESSIVE TEACHING METHOD

The Progressive Radio "Edu-Kit" is the foremost educational radio kit in the world, and is universally accepted as the standard in the field of electronics training. The "Edu-Kit" uses the modern educational principle of "Learn by Doing." Therefore you construct, learn schematics, study theory, practice trouble shooting—all in a closely integrated program designed to provide an easily-learned, thorough and interesting background in radio.

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

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

THE "EDU-KIT" IS COMPLETE

You will receive all parts and instructions necessary to build twenty different radio and electronics circuits, each guaranteed to operate. Our Kits contain tubes, tube sockets, variable, electrolytic, mica, ceramic and paper dielectric condensers, resistors, tie strips, hardware, tubing, punched metal chassis, Instruction Manuals, hook-up wire, solder, selenium rectifiers, coils, volume controls and switches, etc.

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

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• SET OF TOOLS

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- TESTER INSTRUCTION MANUAL
- HIGH FIDELITY GUIDE • QUIZZES
- TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • FCC AMATEUR LICENSE TRAINING
- PRINTED CIRCUITRY

SERVICING LESSONS

You will learn trouble-shooting and servicing in a progressive manner. You will practice repairs on the sets that you construct. You will learn symptoms and causes of trouble in home, portable and car radios. You will learn how to use the professional Signal Tracer, the unique Signal Injector and the dynamic Radio & Electronics Tester. While you are learning in this practical way, you will be able to do many a repair job for your friends and neighbors, and charge fees which will far exceed the price of the "Edu-Kit." Our Consultation Service will help you with any technical problems you may have.

FROM OUR MAIL BAG

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

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

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

PRINTED CIRCUITRY

At no increase in price, the "Edu-Kit" now includes Printed Circuitry. You build a Printed Circuit Signal Injector, a unique servicing instrument that can detect many Radio and TV troubles. This revolutionary new technique of radio construction is now becoming popular in commercial radio and TV sets.

A Printed Circuit is a special insulated chassis on which has been deposited a conducting material which takes the place of wiring. The various parts are merely plugged in and soldered to terminals.

Printed Circuitry is the basis of modern Automation Electronics. A knowledge of this subject is a necessity today for anyone interested in Electronics.

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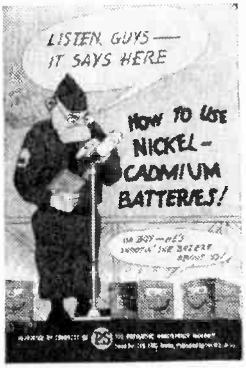
BOOKMARK
by Bookworm

To start the new year off right, scan through your workshop bench and bookshelf, and toss away those old electronic parts catalogs that should be replaced with the later 1965 issues that came in the mail during the last few months. If you do not have a 1965 catalog to replace the old one, now is the time to write out post cards and bring your catalog file up to date. Listed below are a few catalog sources that the ol' Bookworm was lucky enough to receive review copies. If you don't have a 1965 catalog from one or more of these electronic parts suppliers, start writing out post cards today! And be sure to say the ol' Bookworm in RADIO TV EXPERIMENTER sent you.

- ☐ *Allied Radio, 100 N. Western Avenue, Chicago, Illinois 60680*
- ☐ *Burstein-Applebee Co., 1012-14 McGee Street, Kansas City 6, Missouri*
- ☐ *Lafayette Radio Electronics Corp., Dept. PR22, P.O. Box 10, Syosset, L.I., New York 11791*
- ☐ *Newark Electronics Corporation, 223 West Madison Street, Chicago 6, Illinois*
- ☐ *Olson Electronics, Inc., 260 South Forge Street, Akron 8, Ohio*
- ☐ *Radio Shack, 730 Commonwealth Avenue, Boston 17, Mass.*
- ☐ *World Radio Laboratories, 3415 W. Broadway, Council Bluffs, Iowa 51504*

Free Comic Book—Ni-Cd Batteries. The "care and feeding" of a rechargeable nickel-cadmium battery should be done with complete knowledge of this new-type portable power unit, according to engineers of the Battery Division, Sonotone Corporation, also point out that the nickel-cadmium battery is a sophisticated portable power system and should be treated as such. Experience has shown that the better informed maintenance group handling Ni-Cd batteries, the better the performance of the battery and the product in which it is used. As a result of this experience, a unique booklet has been developed, entitled *How to Use Nickel-Cadmium Batteries.* It is illustrated in cartoon fashion, explaining technical matters in a



light vein and converting the subject into a pleasant half-hour of informative reading. Any experimenter who plans to use or service nickel-cadmium batteries will find the know-how gained in this booklet invaluable. To get your free copy of *How to Use Nickel-Cadmium Batteries (BA-109)*, write the Battery Division, Sonotone Corporation, Dept. 227, Elmsford, New York.

5-Volume Basic Course. The continual trend toward automation and the ever-increasing use of electronics equipment has created a tremendous need for electronics technicians and others with some electronics background. To meet this need, a new *Basic Electricity/Electronics* Series has just been introduced by *Howard W. Sams & Co.* It is a complete beginner's course, requiring no prior knowledge of electricity or electronics. More than 2 years in development by some of the nation's most prominent electronics writers and educators, this is the first complete basic electricity/electronics textbook series to be published with the modern "programmed" format. Developed especially to meet the need for a training course geared for today's technology, the series is up-to-date not only in content but also in its method of presentation. The content of each of the 5 volumes is presented in two-page segments, utilizing a modern, 5-step "programmed" teaching process that is unequalled for use in schools, training programs, or for self-instruction. Five volumes cover: *Basic Principles and Applications; How AC and DC Circuits Work; Understanding Tube and Transistor Circuits; Understanding and Using Test Equipment;* and *Motors and Generators—How They Work.* The *Course* provides fundamentals required for progress in

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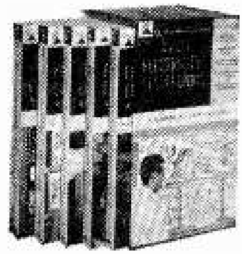
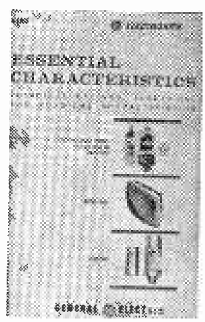


many fields, including radio and television maintenance, radio communications, broadcast engineering, industrial electronics and electricity. This series presents an opportunity for up-to-date training at the lowest possible cost. Upon completion of the series, a student will have an understanding of modern principles and techniques normally attained only through supervised training programs at a far greater cost. The 5-volume hard-bound edition in slipcase (ECS-50) sells for $24.95, while the soft-cover edition (ECY-50) is $19.95. Individual volumes are $4.50 each. For more information, write to *Howard W. Sams & Co., Inc.*, 4300 West 62nd Street, Indianapolis 6, Indiana.

Quicky Reviews. Being a bit tight on space this issue and long on reviews, your ol' Bookworm will list and comment on several recent issues that should not pass by unnoticed.

Essential Characteristics, a *General Electric* publication that is a mighty buy for its

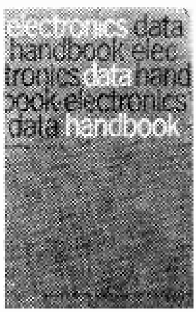


low cover price of $1.50. This vacuum tube directory tells you all there is to know about tube types currently in use in either new equipment or relics over 35 years old. You can pick up a copy at your local parts distributor or mail a check for $1.50 to *General Electric Company*, Electronics Components Division, Owensboro, Kentucky.

Transistor Manual, another *General Electric* publication is more than just a directory of transistor types. It is a text packed with theory, application notes and circuits the experimenter can use in new construction

projects. Priced at $2.00, this 652-page soft-cover manual is the publishing buy in the directory market. Copies can be had by writing to *General Electric Company*, Semiconductor Products Department, Electronics Park, Syracuse, New York. Be sure to enclose a check for $2.00.

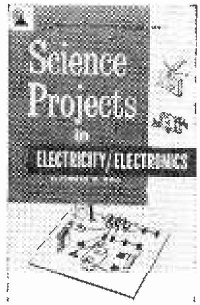
Electronics Data Handbook, by *Martin Clifford* is a book for the experimenter who frequently must call on technical data in the



province of the electronic technician and engineer. Price: $2.95 for paperback edition. Order from *Gernsback Library, Inc.*, 154 West 14th Street, New York, New York 10011.

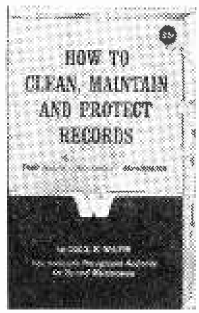
Science Projects in Electricity/Electronics by *Edward M. Noll* is just what the title says it is—a compilation of practical experience projects with step-by-step instruction, demonstration, and sufficient theory to understand

BOOKMARK

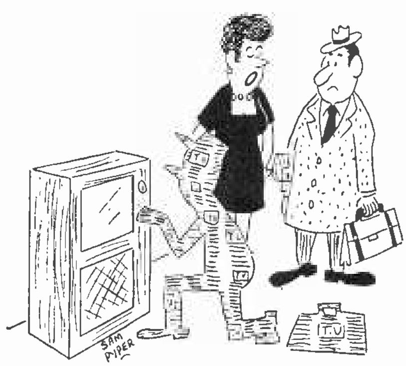


the principles involved. Covered in 128 pages are amplifiers, oscillators, FM tuners and antennas, and even electronic control circuits. Only $2.95 from *Howard W. Sams & Co.*, Inc., 4300 W. 62nd Street, Indianapolis 6, Ind.

How to Clean, Maintain and Protect Records, a 16-page pocket guide on how to keep



your LP's in top shape while playing. Authored by *Cecil E. Watts*, this booklet can be had for 25¢ in coin from *Elpa Marketing Industries, Inc.*, New Hyde Park, New York. ■



"I found him in the 'yellow pages'."

ASK ME another ?

By Leo G. Sands

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

Q. Enclosed you will find some information on people that hear radio broadcasts through their heads, probably coming from fillings in their teeth. Can you furnish information on this subject?

—*S. C., Coconut Grove, Fla.*

A. Several weeks ago I recall hearing a radio interview program on my auto radio on which the guest admitted he started this myth and had a lot of scientists interested. However he said it was just a hoax.

Q. I have a Paragon RA-10 tuner with DA-2 detector-amplifier. Can you give me the approximate age? Where may I dispose of it to someone who would be interested in keeping it as an antique?

—*O. L. S., Idalou, Texas*

A. Your equipment was probably manufactured between 1920 and 1924. Unfortunately, too many precious examples of the most exciting radio era's receivers have already wound up in the garbage dump. In 1938, your equipment would have had a trade-in value of about one dollar. Today,

ASK ME another ?

its value is dubious. But, *don't throw it away!* Not long from now it may be valuable. Readers may know of individuals, museums or corporations that are collecting electronic artifacts and are invited to send their suggestions to the editor who will refer them to you.

Q. I live in an apartment over a store which has fluorescent lights as well as a neon sign, and I am getting very severe interference on my NC-105 short-wave radio on all four bands even with the noise limiter turned on. Can you suggest a remedy?

—R. S., Trenton, N.J.

A. Yes! Move! But short of moving you might get the proprietor of the store to install interference filters, such as Cornell-Dubilier Type IF-24, on each lamp. They cost only 90 cents each. You might also try a type IF-8 (same make) at your receiver's power plug. But, chances are, the noise has to be stopped at the source.

Q. I have a Johnson Messenger II CB set I plan to use as a mobile unit and would like your "honest" answer on what is the "best" base antenna that money can buy, and your advice on what set to buy for use as a base station.

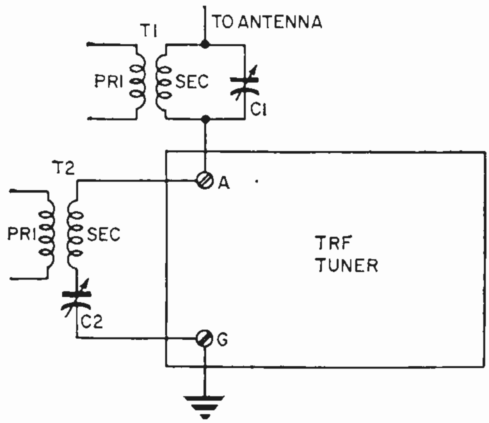
—V. S., Savannah, Ga.

A. The set you have has an excellent reputation and you might get another one to use as a base station. In picking a CB set, the important "number" to look for is the "watts output." They're all rated at 5 watts input. There are many excellent CB sets on the market ranging in price up to $350 for a Poly Comm Sr 23. Which you buy depends on the features you want to pay for. New, important features to look for include a "selectivity filter" which minimizes adjacent channel interference.

There is no "best" base station antenna because there are so many good ones. Because of the size requirements at 27 Mc/s, no omnidirectional CB antenna has appreciable gain, such as can be obtained in the higher frequency bands. Antennas in the "best" class cost upward of $25. To get the most power into the antenna, tune the set to it with a VSR meter, and use RG-8/U or even better coaxial cable such as one of the "foam" types. You may have to go to a professional two-way mobile radio shop to get foam type cable locally.

Q. I have constructed the TRF tuner described in RADIO-TV EXPERIMENTER No. 595, and it works OK except I get a lot of interference from stations on 1420 kc/s and 1480 kc/s when I tune in a weak (good music) station on 1450 kc/s, which I want to listen to. What can I do?

—A. C. Brooklyn, N.Y.



Use Meissner part No. 14-1072 or equivalent for RF coils T1 and T2. Mica trimmer capacitors C1 and C2 are 25-280 mmf. units like Lafayette part No. 34G6832.

A. A TRF tuner is good for music reproduction because of its ability to pass the whole radio signal. In your case, its selectivity, which is not as good as that of a superheterodyne receiver, is not adequate. You might try a shorter antenna or both a series and shunt wavetrap, connected as shown in the schematic diagram. One wavetrap is tuned to 1420, and the other to 1480 kc/s. Adjustment may be critical and some weakening of the 1450-kc/s signal might result because of the closeness of the frequencies.

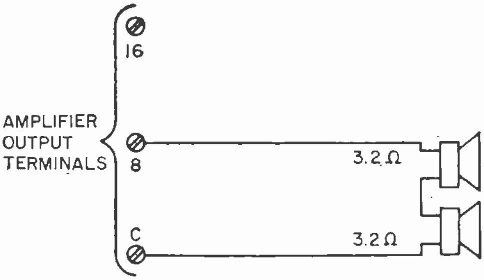
Q. How long do I have to wait to get a license for a marine radiotelephone for my boat?

—L. R. V., Deerfield Park, Fla.

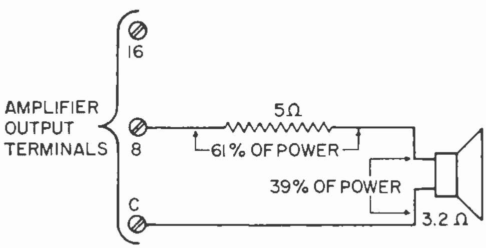
A. Get a copy of FCC Form 501 from the nearest FCC office, fill it in and sign it, and. if you are a U.S. citizen and have both a boat and a "type accepted" radiotelephone, you will be issued an "interim" ship license immediately to use while you wait the usual 60 days for your regular license. If you can read and write, and converse in English, you can get your Restricted Radiotelephone Operator Permit immediately without having to take an examination. But read Part 83, FCC Rules and Regulations, first.

Q. I have a 30-watt audio amplifier which has speaker connections for 8- and 16-ohm speakers. How can I connect a 3.2-ohm speaker to it?

—T. E. Skillman, N.J.



Two 3.2-ohm loudspeakers in series can be connected across 8-ohm terminations.



Simple method for connecting one 3.2-ohm loudspeaker to 8-ohm terminals.

A. You can connect two 3.2-ohm speakers in series across the 8-ohm output. To use only one 3.2-ohm speaker, you can connect a 5-ohm 20-watt resistor in series with one of the speaker leads. But, when the amplifier is delivering full-rated power, 18 watts will be lost in the resistor and there will be only 12 watts at the speaker. This is a loss of about 4 db in sound level. If the speaker is quite efficient, 12 watts may be adequate. But, you may be happier with the results if you get an 8-ohm speaker.

ASK ME another ?

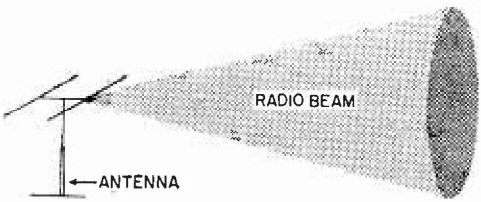
Q. I am unable to locate a source of supply for the General Electric NE-77 neon lamp required in the Neon Switch Photocell Relay described in your February-March 1964 issue. Any information you can give will be greatly appreciated.

—*J. A. O., Camp Lejeune, N.C.*

A. The G.E. NE-77 lamp is listed as Stock Number 7E952 and priced at $0.55 each in the latest catalog of Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

Q. If you send a radio signal and it goes through space, will it still exist as long as it does not come in contact with something that would dissipate its energy, or will the signal dissipate itself eventually?

—*G. F., Montreal, Canada*

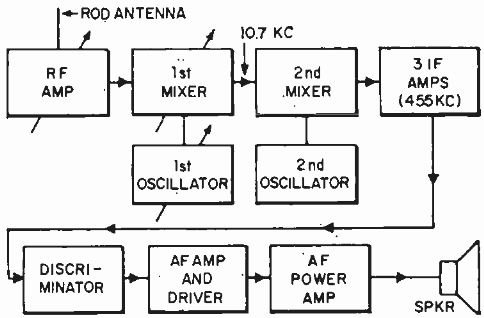


A. The width of a radio signal gets wider and wider with distance, even if it starts out as a narrow beam. The energy is therefore spread out, and as it spreads out its power is smaller within a given area. It would probably continue on forever, but the likelihood of its being intercepted by a radio receiver diminishes with distance and eventually the signal becomes so weak that it is lost in the noise generated in the receiver.

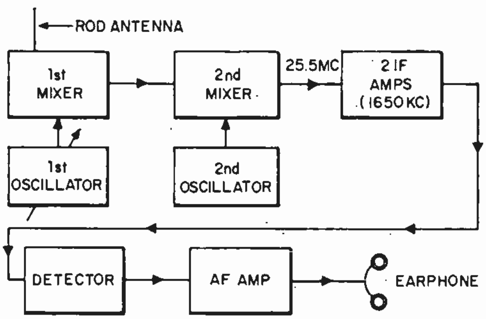
Q. Since there are so many pocket size AM and FM transistor radios, is it not possible to construct an FM pocket receiver that would be tunable from 30-60 mc as well as from 60-90 mc, 150-170 mc and 450-470 mc or an AM receiver tunable from 108-144.5 mc?

—*D. M., Chicago, Ill.*

A. Yes, it would be possible, but it would require considerable design and construction work to build a VHF or UHF pocket receiver that would be fairly sensitive, selective and stable. The FM broadcast channels in the 88-108 mc band are spaced 200 kc apart and transmit signals that deviate ±75 kc when modulated. The VHF/FM communications channels in the 30-50 mc band are spaced only 20 kc apart and the signals deviate only ±5 kc. Thus, 10 of them could occupy the space taken up by one FM broadcast channel. Obviously, tuning would be much more difficult and selectivity would be a problem.



Block diagram of FM receiver for VHF reception. IF's are 10.7 mc. and 455 kc. from 1st and 2nd mixers.



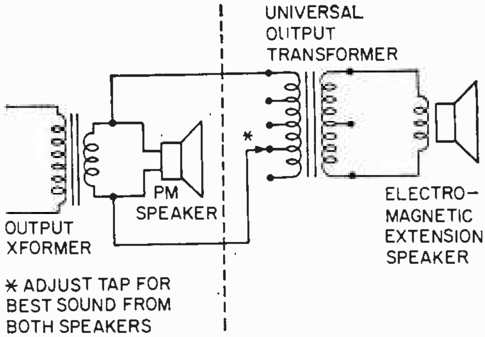
Block diagram of AM receiver for reception in 118-134 mc. aviation band. IF's are 21.5 mc. and 1650 kc.

There are several receivers on the market which are fixed-turned to one or two selectable VHF communications channels and which employ crystal control. They are quite expensive ($200 or more). Portable UHF receivers are also available, but they cost even more because the high frequency transistors are quite expensive.

There is no doubt that receivers could be built, such as you describe. The cost of

ASK ME another ?

the design, when done professionally, would run to thousands of dollars. Nevertheless, it would make a fine project for an experienced experimenter and we would love to be the first to publish an article about it. (See block diagrams)

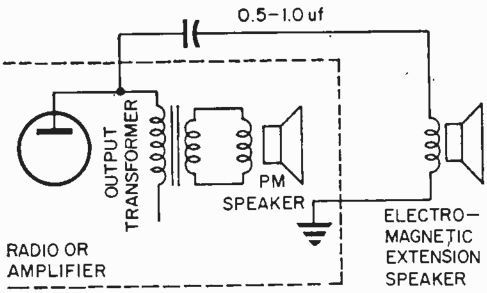


An universal output transformer is the best method for matching an add-on loudspeaker. Adjust taps for best sound.

Q. How can I connect an electro-magnetic speaker as an extension to a PM speaker?

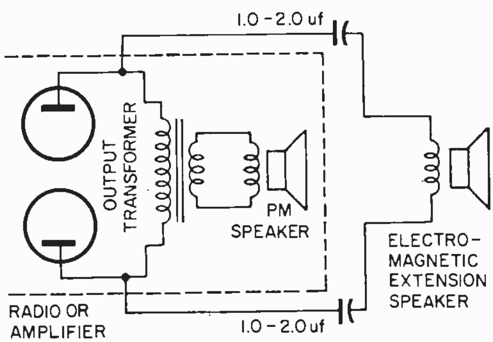
—*L. B., Oliver, B. C., Canada*

A. A typical electro-magnetic speaker has an impedance of 2000 ohms or higher whereas a PM speaker usually has an impedance of 8 ohms or less. If the electro-magnetic speaker is to be connected directly to the radio or amplifier, one lead is connected to the plate of the AF power amplifier stage through an 0.5 mfd or 1.0 mfd paper capacitor, and the other lead to chassis ground, or common ground buss, when the AF power amplifier is single-ended. In push-pull amplifiers, the speaker leads are connected from plate-to-plate across the primary of the output transformer with a 1.0 or 2.0 mfd paper capacitor in series with each lead.



Here, the added speaker is connected in parallel to amp's plate load.

To connect an electro-magnetic speaker to a PM speaker, instead of to the output of the amplifier, or to the voice coil output of and amplifier, an impedance step-up transformer is required. A universal output transformer is recommended since the impedance ratio can be varied. The speaker is connected to the primary (high impedance) winding of the transformer. The diagrams show how the various connections are made.



Push-pull circuits present no problem—be sure to use high-voltage capacitors.

Q. I am using an inverted L antenna which is 60 feet long, not including the lead-in, and 40 feet above the ground. If I had a longer antenna would I get better reception? My receiver is a triple-conversion HQ-180A. Can I add a pre-selector or antenna turner?

—*S. F. C., Oakland, Calif.*

A. You have an excellent receiver which has excellent sensitivity and selectivity. Using a longer antenna in the metropolitan area in which you live will result in more medium frequency band signal pick-up, but it will bring you other problems. There are so many radio signals on the air in your area, and many of them powerful, that the front-end of you unusually sensitive receiver may be overloaded. There is no need for a pre-selector for your receiver. It will pick up radio signals from great distances as long as they aren't drowned out by noise which will be stronger if you extend your antenna.

NEW products

The fall New York High Fidelity Show heralded the coming of many new and varied products in the audio and high-fidelity market place. It is almost impossible to include all the products in this issue of RADIO-TV EXPERIMENTER and, also, to give equal coverage to so many and varied areas of interest our diversified readership enjoys. So, for this issue only, the New Products column will be devoted entirely to high-fidelity products introduced during the second half of 1964. Because our space is limited, one product mention per manufacturer will be given, space permitting. In our next issue, the New Products column will return to its normal format covering the many fields for hobby electronics.

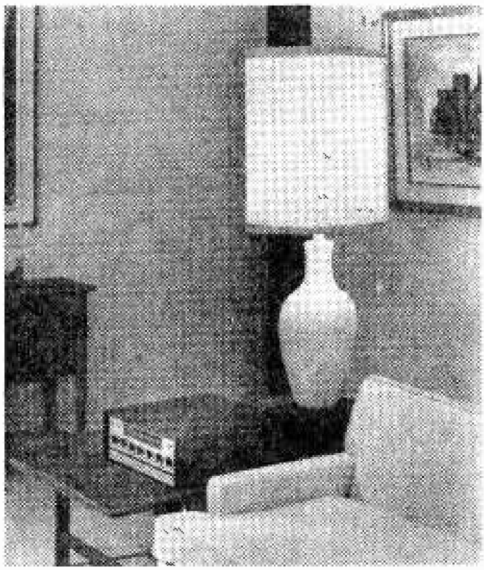
As an added service to our readers, all the listings in the *New Products* column are keyed **(A1, A2, A3,** etc.) to the coupon at the bottom of the *Literature Library* service feature on page *105*. If you wish to learn more about the products of several high fidelity manufacturers, it would be advantageous to use this coupon to contact them. Just circle the items on which you wish to receive information and data. We will do the rest.

Acoustica Lampshade Speaker System

Listen to high fidelity music from your lampshade! That's the latest idea for audio enthusiasts who want the combination of magnificent high fidelity sound and attractive living room decor. A Los Angeles electro-acoustics company deeply involved in space programs, *Acoustica Associates, Inc.*, has developed a dual purpose lamp-and-speaker which features sound actually radiating in a 360° pattern from the surface of what looks like a normal, elegant lampshade. Heart of the lampshade speaker is an almost weightless diaphragm which is free to move and thus create sound between two fixed electrodes in the form of closely spaced, concentric, wire-mesh cylinders. When covered with fabric, these cylinders become a trans-

NEW products

lucent lampshade of the finest quality. The lamp bulb and the speaker system operate independently of each other and can be used either simultaneously or separately. The

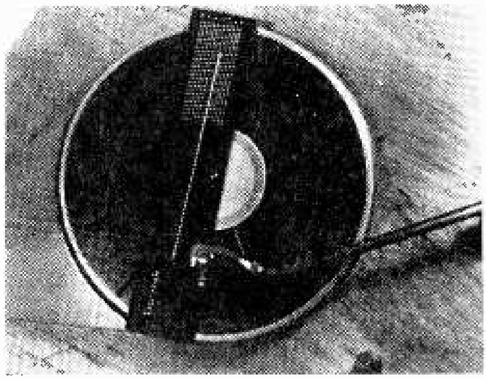


novel design of the lampshade speaker, which disperses sound from its entire surface area, eliminates the necessity of sitting in one specific place for perfect enjoyment of monaural or stereo programs. No longer is special positioning of speakers or chairs needed—360° sound surrounds the listener with concert hall realism everywhere in a room. The lamp-speakers retail for $199.50 up to $239.50 each, depending on the model. (*Acoustica Associates, Inc., Dept. 722, 5331 West 104th Street, Los Angeles, California 90045.*)

Circle **A1** on page 105

Alard Tracking Error Indicator Tru-Trak

Tru-Trak, a device that shows visually the amount of "tracking error" in record players and positions the tone arm for optimum performance, has been developed by Alard Products. Tru-Trak is a visual tool that eliminates the necessity of working with complicated calculations and difficult hairline measurements in determining the proper mounting position for the tone arm. The use of Tru-Trak to read tracking error, according to the developer, makes it possible to achieve less distortion and greater fidelity with maximum stereo separation. The device consists of a pointer assembly that attaches to the cartridge and a calibrated scale that fits over the turntable spindle. As the tone arm is moved across the turntable, the pointer indicates visually, the tracking variations of the tone arm. By changing the mounting position of the tone arm, the increase or decrease in

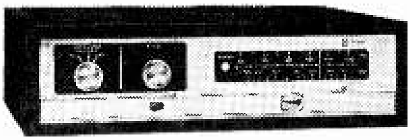


tracking is readily apparent. The mounting position that produces the minimum amount of movement on the scale is the proper positioning for greatest fidelity with the particular tone arm and cartridge being tested. Tru-Trak is precision made from Lucite, fits standard cartridge mounting and can be installed in minutes—price is $6.95 postpaid. (*For more information write to Alard Products, Dept. TE72, Somerset, California. 95684.*

Circle **A2** on page 105

Allied Radio Solid-State FM-AM Tuner Kit KG-765

Allied Radio, makers of the *Knight-kit* line, have come up with a sure winner in their new all-transistor stereo FM-AM tuner kit, Model KG-765. Through its solid-state circuitry, the KG-870's 26 premium semiconductors offer realistic high-fidelity performance; virtually eliminate hum and extraneous noise; and account for the compactness of this unit (measures only 2¾" high). They also provide absolute freedom from microphonics and mechanical noises and instant operation. The KG-870 develops a powerful 70-watt IHFM music power output—140

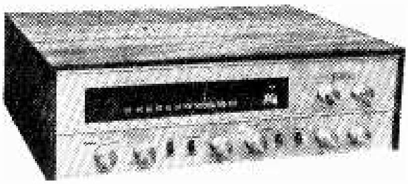


watts of peak power—there are no output transformers or DC blocking capacitors in the output stage—reproduction is clean and pure. In addition, such Knight-Kit features as modular printed circuits and plugin transistor sockets assure fast, easy assembly. The KG-765's specifications are—Power Output: IHFM Music Power, 70 watts; 35 watts per channel; 140 watts peak. Continuous Sine Wave Power, 28 watts per channel. For use with 8, 16-ohm speakers. Frequency Response: ± 1 db, 20 to 25,000 cps at rated power output. Distortion: Harmonic, 0.5%; IM, less than 1%; measured at rated power output. Hum Level: Tuner, −80 db; Magnetic Phono, −68 db; Tape Head, −60 db. Channel Separation: 40 db. Inputs: Tape Head (NAB); Magnetic Phono (RIAA); Tuner: Aux 1; Aux 2. Lists at $99.95 for kit; $149.95 wired. Brown metal case, $4.95; economy wood case, $6.95; de luxe wood case, $12.95. (*Write to Allied Radio Corporation, Dept. 2RT2, 100 N. Western Avenue, Chicago 80, Illinois for complete details.*)

Circle **A3** on page 105

Eico FM/MX-Stereo Tuner/Amplifier Model 3566

A new all-transistor FM-stereo/multiplex tuner/amplifier kit, which can be assembled by "beginners" as well as experts, had its first public showing at the New York high fidelity show late in September by *EICO Electronic Instrument Co., Inc.* Known as the *EICO* Model 3566, the new high fidelity instrument will be available in kit form for



$229.95 and in factory-wired form for $349.95 at the more than 2500 *EICO* distributors throughout the world. *EICO* officials declare that the Model 3566 is equal in performance and quality to tuner/amplifiers selling in the $500 to $600 range. The model 3566 consists of an FM-stereo/multiplex tuner and amplifier on a single heavy-gauge aluminum chassis that can be mounted in a console or in an oiled walnut cabinet which is available for $9.95 extra. Since no tubes are employed in either the tuner or amplifier sections, heating is minimized and no high voltage power supply is required. The tuner-amplifier may be used independently with a pair of loudspeakers for FM stereo and mono radio reception. Input jacks are provided to enable use with a magnetic record player or changer and a tape deck. Output jacks are provided for connection to a tape recorder to enable the user to record FM radio programs. An output jack for stereo headphones is provided on the front panel. The all-transistor FM "front-end" and the four-stage IF amplifier/limiter assemblies are furnished pre-wired and aligned with the kit, minimizing the time required to assemble the instrument. The factory-wired model, of course, is furnished ready to use. The instrument is designed for operation from 115 volts AC. It can be used on boats by providing a DC-to-AC inverter. (*Complete specifications can be had by writing directly to EICO Electronic Instrument Co., Inc., Dept. 722, 131-01 39th Avenue, Flushing, New York 11352.*)

Circle **A4** on page 105

Electro-Voice FM-Stereo Receiver Model E-V 88

The first of several new product lines for *Electro-Voice* is their ultra-new E-V 88 FM-stereo receiver. In addition to exceptional sensitivity and selectivity, the E-V 88 features fully automatic switching from monophonic to stereo reproduction without noisy mechanical relays or audible variation in tonal quality. Four IF/limiter stages are provided, each of which makes use of dual special-purpose transistors which provide balanced, symetrical limiting at each stage. An automatic stereo indicator light insures positive identification of stereo signals. A special inhibitor circuit prevents stereo indicator from being triggered by random noise between stations. An accurate zero-center tuning meter guarantees precise "on station"

tuning. Multiplex circuit is time switching type to provide inherent SCA rejection and insure minimum sensitivity to noise on weak stereo signals. The E-V 88 incorporates a total of forty-three transistors, seventeen in the tuner section and twenty-six in the amplifier section. Additionally, four silicon diodes are employed in the power supply. Extremely cool operation is accomplished by direct conduction of the small amount of heat from the output transistors to the unit's heavy base plate. All components are operated well within their rated temperature range, insuring long life and exceptional stability. The E-V 88 sells for $397.00. (*For more detailed information write to Electro-Voice, Inc., Dept. 72RT, Buchannan, Michigan.*)

Circle **A5** on page 105

Empire Elliptical Stylus Cartridge 880PE

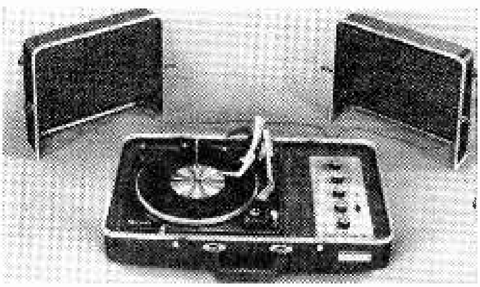
Mr. Herb Horowitz, President of *Empire Scientific Corp.* has recently annouced the distribution of its new 88OPE elliptical stylus cartridge and elliptical stylus replacement. The new *Empire* 88OPE carries forth all the standard features of the "proven perform-

ance" 88OP, plus some new ones. Some of the important specifications for the 88OPE are: frequency response, 8-30,000 cps; output voltage, 8.0 millivolts per channel; chanel separation, more than 30 db; load impedance, 47,000 ohms per channel; weight, 10 grams; compliance, 20 x 10 cm/dyne; tracking force, ½ to 4 grams; stylus, .2 x .9 mil bi-radial elliptical hand polished diamond; terminals, four-terminal output; tracking error, 15 degrees. The 88OPE sells for $29.95 retail. When *Empire* introduced the 880 and 880P, they boasted it did away with obsolescence. In effect it has. Now every 880 or 880P owner can have an elliptical stylus by simply replacing its present stylus with the new replaceable 880PE elliptical stylus. The replacement stylus retails for $14.95 (*Empire Scientific Corp., Dept. E72, 845 Stewart Ave., Garden City, New York*)

Circle **A6** on page 105

Fisher Portable and Module Stereo Systems

Two new high-powered, transistorized *Fisher* stereo systems, designed to meet the rising consumer demand for better-quality compact systems, have been introduced by the *Fisher Radio Corporation*. The new systems, called the *Fisher* 50 Portable (see photo) and the *Fisher* 75 Custom Module, both have 30 watts of Music Power (IHF), and a highly



flexible set of audio controls including a 5-position selector, dual bass and treble, balance, volume, and a front-panel headphone jack. Both systems have connections for tuner and tape recorder, and will play anywhere that AC power is available. The lightweight Portable consists of a *Fisher* 30-watt master control amplifier and *Garrard* 4-speed automatic turntable, plus two *Fisher* inductance speaker systems. The Portable has two 10-foot cables for wide stereo separation. Only 23¾" wide, 8" high, and 14¼" deep.

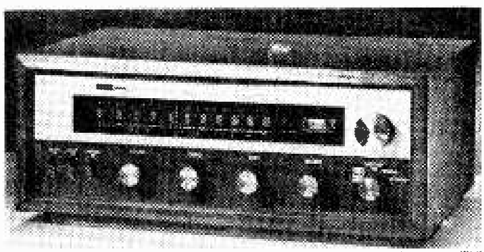
NEW products

the *Fisher* 50 Portable is about the size of a man's one-suiter, and is considered the perfect companion for music lovers who travel. The *Fisher* 75 Custom Module, identical in the electronics to the 50, has two speaker systems that utilize larger 8-inch woofers (compared to the *Fisher* 50 Portable's 6-inch woofer). The *Fisher* 50 Portable retails at $229.50. The *Fisher* 75 Custom Module is $269.50. (*Fisher Radio Corporation, Dept. 22E, 21-21 44th Drive, Long Island City 1, New York.*)

Circle **A7** on page 105

Harman-Kardon All Transistor FM-Stereo Receiver Model SR 300

The industry's first all-transistor FM stereo receiver line, extending frequency response both above and below the audio spectrum, has been developed by *Harman-Kardon, Inc.* The least expensive unit in the line is the Model SR 300 receiver. The SR300 is all-solid state, using no vacuum tubes, not even nuvistors, yet sold at a price comparable to vacuum tube units. A wide range of frequencies, including sub-sonics and ultrasonics are handled by the receiver at natural relative amplitudes and with a freedom from distortion not previously available. The en-



tire response is flat from minimum listening levels to full 75-watt music power, and there is no phase shift or crossover distortion. *Harman-Kardon* engineers, with the help of the transistor, have designed the SR300 to reproduce inaudible frequencies as low as 8 cycles per second and as high as 25,000 cps, and have demonstrated that the full impact of stereo is experienced only when these outer frequencies are brought into play. The 36-watt SR300 receiver has front-panel controls for high and low cut, contour, off-on and volume, treble and bass, speaker balance and program selection. Stereomatic circuit switches automatically between monaural and stereo. Bandwidth at full power is 10 to 23,000 cps; frequency response at normal listening level (1 watt) is 8 to 25,000 cps ($\pm$ 1 db); and harmonic distortion is less than 1.0 per cent. Dimensions are 14⅛ inches wide, 4½ inches high and 9¾ inches deep. List Price: $279.00. (*Complete specifications on the SR300 receivers as well as other receivers in the line are yours for the asking by writing directly to Harmon Kardon, Inc., Dept. 7RTE, 15th & Lehigh Avenue, Philadelphia, Pennsylvania.*)

Circle **A8** on page 105

Lafayette 70-Watt AM/FM—Stereo Receiver LR-800

Those of you who read the Lab Check of the *Lafayette* LA-226C stereo receiver in the last issue of RADIO-TV EXPERIMENTER will be glad to know that a pepped-up model, the LR-800 has replaced it. The LR-800 is a self-contained unit incorporating many deluxe features such as a tuneable nuvistor

front end giving 1.5 microvolt sensitivity for 20 db quieting. A "Stereo Search" circuit identifies a multiplex station with a tone signal through your speakers. The tuner section achieves a multiplex separation of 37 db at 400 cycles and a frequency response from 50-15,000 cps $\pm$1 db. The amplifier produces 35 watts per channel with harmonic distortion at 1%. Hum and noise is –55 db at low level and –80 db at high level inputs. Correct equalization is provided for RIAA phono and NAB tape head inputs. Output impedances are switch selected at 8 and 16 ohms and include a front panel stereo headphone jack. Input selector controls access to AM, FM, FM MPX, Phono, Tape Head, and Auxiliary music sources. The LR-800 utilizes 24 tubes, 9 diodes and 1 selenium rectifier and is enclosed in a handsome case with

(Continued on page 35)

NEW products

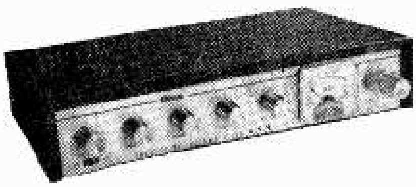
(Continued from page 32)

contrasting gold extruded aluminum panel. Its dimensions are 17W x 5⅞ H x 14"D, and its *Lafayette* stock number is 99-0005WX. The LR-800 is priced at $199.50—only $10 more than its predecessor, the LA-226C. (*For more information write to Lafayette Radio, Dept. E22, 111 Jericho Turnpike, Syosset, New York 11791.*)

Circle **A9** on page 105

Olson Electronics 4-Channel Preamplifier-Mixer Model RA-637

A new all-transistor preamplifier-mixer, *Olson's* Model RA637, may be used as a straight preamplifier for mike or magnetic phono cartridge or, to mix up to four input signals from high or low level sources. All inputs require standard RCA phono type connectors. All inputs require standard RCA phono type connectors. Each of the four inputs is equipped with a selector switch for high or low level signals along with individ-

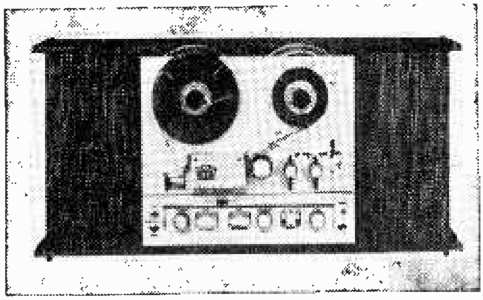


ual volume controls permitting you to blend and mix the signals as you wish. Model RA-637 comes equipped with VU meter and master gain control plus bass and treble tone controls. The preamplifier's gain is 65 db, −30 db on the low level position. The unit is powered by six standard penlight batteries included with the purchase. Size: 10" W x 2¼" H. x 6⅜" D. The preamplier-mixer sells for $39.98. (*For more information write to Olson Electronics, Inc., Dept. WW22, 260 South Forge Street, Akron 8, Ohio.*)

Circle **B1** on page 105

Roberts 1600 Series Designer Tape Recorders

The tape recorder with its radio-room knobs and switches has been given a face lifting by *Roberts Electronics*. Their new Designer Line, the 1600 Series has fewer controls and what there are are dressy and slim of line. These are placed in a Burmese gold face and in turn nested in elegant walnut and vertical panels of grill cloth. They are table models that sit well alone, wall mounted or recessed flush. Recorder functions were simplified. The complicated nature of recording has been minimized. The *Roberts* 1600 Series has a unitized construction. Components are mounted on a single metal chassis. Shipping stability and resistance to jarring are increased. Easier internal access is provided and maintenance problems reduced. *Roberts*

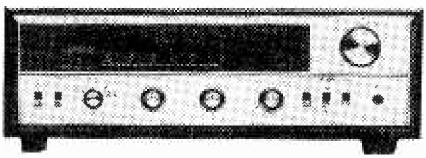


1600 Series features are: 3-digit tape counter, automatic shutoff, individual channel stereo VU recording meters, simplified channel volume controls and tone control, two coaxial stereo speakers, tape speeds of 3¾ and 7½ IPS with optional 15 IPS kit available, 4-channel stereo or monaural record and playback including stereo phono/radio inputs. Frequency response is 30 to 18,000 CPS at 7¾ IPS. Signal-to-noise ratio is better than 45 db. Bias oscillator frequency is 95 KC. (*Complete specifications and pricing information is available by writing Roberts Electronics, Dept. 722, 5922 Bowcroft St., Los Angeles, Calif. 90016.*)

Circle **B2** on page 105

H. H. Scott Solid State Tuner/Amplifier

The new Model 344 solid state FM-stereo tuner amplifier has been added to the *H. H. Scott* line of quality hi-fi components. The 344 combines the features and performance of the finest *Scott* stereo tuners and amplifiers in a unit comparable in size to an ordinary tuner. The tuner section of the 344 includes a silver-plated four-nuvistor front end for 2.2 uv sensitivity (IHF) with 80 db cross modulation rejection. Flat line limiting makes the 344 impervious to ignition pulse noises and overloading caused by strong local stations. The stereo multiplex section utilizes *Scott's* solid state Time-Switching multiplex circuitry to capitalize on the superior switching capabilities of transistors. Separation is in excess of 35 db. Automatic stereo switching is accomplished by means of exclusive Scott Auto-Sensor circuitry, a computer-like device which compares the incoming signal with a fixed noise signal. If the incoming signal includes only noise, Comparatron stays in the monophonic mode. If a 19 kc multiplex pilot is present, the Auto-Sensor instantly and silently switches to stereo. The solid state amplifier stage of the 344 delivers a conservative 25 watts music power per channel into an eight ohm load, but the tremendous reserve peak power of transistors

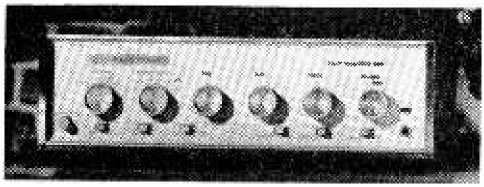


assures even better performance in actual use. Massive heat sinks assure conservative cool operation. Additional features of the 344 include: compensation network which automatically boosts extreme highs and lows when volume is reduced, to give full range of sound at any selected volume; noise filter to reduce objectionable noises from scratchy records or poor broadcasts; front panel low-level output for connection of stereo earphones; flywheel-balanced, ball-bearing mounted tuning knob for smoothness of operation; and separate Power On-Off switch so that all front panel controls may be left in normal operating position. Price, east of the Rockies, is less than $430.00. *(For further information or specifications, write: H. H. Scott, Inc., Dept. P72, 111 Powdermill Road, Maynard, Mass.)*

Circle **B3** on page 105

Sherwood Solid-State Integrated Amplifier

Power, fidelity, and operating reliability never before available in a compact, integrated amplifier-preamplifier are now offered in Sherwood Electronics' new S-9000 all-silicon solid-state stereo amplifier. This trim 14" x 4" x 12½" deep component delivers 150 watts of music power. Peak power for the S-9000 is 300 watts, while the continuous sine-watt power rating is 100 watts or 50 watts per channel with *both channels operating at the same time.* Because of its cool operation, it is ideal for the most confined custom installations, even at full power. There are no limitations as to mounting position, including mounting with the knobs up. Power band width at 1% distortion is superb, from 12 cps. to 23,000 cps, Harmonic distortion at the *continuous power*

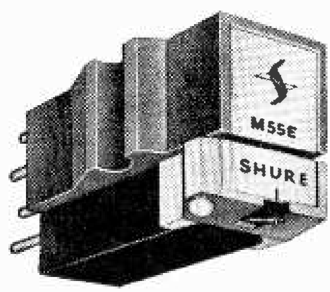


rating is less than ½%. At normal audio levels the distortion never exceeds 0.15%. Sensitivity for rated output is: phone 1.8 millivolts, tapehead 1.0 millivolts, and tuner 0.25 volts. Maximum noise and hum below rated output: phono −70 db., and tuner −80 db. Output circuits are transformerless, direct coupled through low-loss 3000 microfarad capacitors. The output handles speaker systems with impedance ranging from 4 to 16 ohms. The S-9000 provides complete front panel controls for every input and output function. The controls include: a selector for tape head, phono tuner, and auxiliary inputs; a stereo-mono mode selector; bass, treble, loudness, and channel balance, phono level; switches for tape monitoring, hi and lo filters, loudness compensation, phasing and speaker on-off. A separate stereo headphone jack is provided for private listening. Price of the S-9000 is $299.50 for the chassis. A separate wood-grained walnut leatherette-on-metal case is available at $8.50 to enclose the chassis for table top use. West Coast prices are $302.50 and $8.50 respectively. *(Sherwood Electronic Laboratory, Inc., Dept. R22, 4300 North California Avenue, Chicago, Illinois 60618.)*

Circle **B4** on page 105

Shure Stereo Dynetic Cartridge M55E

A new 15-degree elliptical stylus cartridge developed especially to complement the wave of new, light tracking automatic turntables now breaking on the high fidelity scene has been announced by *Shure Brothers, Inc.* Called the M55E, the new unit is designed to operate at tracking forces of from ¾ to 1½ grams, well within the tracking capability range of most of the new, higher-priced automatic turntable models currently being introduced. Heretofore, the use of elliptical stylus cartridges was reserved for light-tracking manual turntables because an elliptical stylus tracking in excess of 1½ grams can cause serious record wear. Used within the proper ¾ to 1½ grams range, however, an elliptical stylus offers definite performance advantages over a conical stylus, with no increase in record wear. The performance advantages are obtained by reducing IM, harmonic and tracing distortion. The M55E incorporates an elliptical stylus assembly as does the finest *Shure* cartridge, the Model V-15. The primary differences between the M55E and the V-15 are physical construction details and the fact that the M55E is constructed under standard quality control procedures rather than the extremely rigid



test procedures developed expressly for the Model V-15 and its Master Quality Control Program. Development of the stylus assembly for the new M55E cartridge also provides owners of *Shure* Model M44 conical stylus cartridges an opportunity to upgrade their systems. If they have turntables capable of tracking in the ¾ to 1½ grams range, they can get performance comparable to the M55E by simply purchasing and using an N55E replacement stylus in their M44 cartridge. Some of the important specifications for the M55E are: frequency response, 20-20,000 cps; output voltage, 6 millivolts per channel at 1,000 cps at 5 cm/sec.; channel separation, over 25 db at 1,000 cps; channel balance, within 2 db of each other; load impedance, 47,000 ohms per channel; tracking force, ¾ to 1½ grams; stylus data, .0009-inch frontal radius and .0002-inch side contact radius. Price of the Model M55E cartridge with elliptical stylus is $35.50. Cost of the N55E replacement stylus alone is $20.00. *(Shure Brothers, Inc., Dept. RT-22, 222 Hartley Ave., Evanston, Illinois.)*

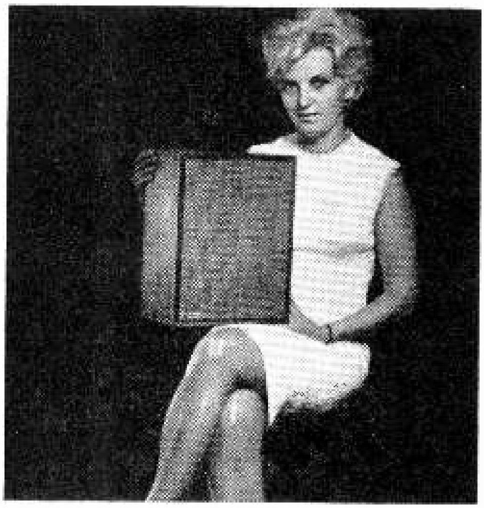
Circle **B5** on page 105

Sonotone Bookshelf Speaker System Model RM-1

Here is a compact speaker system introduced by *Sonotone* that permits the audiophile to utilize a limited amount of space by installing an entire stereo speaker system on a bookshelf without sacrificing speaker quality because of size. The Sonomaster RM-1 is designed with two speakers, a 6-inch flexible-suspension, linear-type, high-compliance woofer and a high-frequency tweeter. The tweeter offers excellent high-frequency dispersion evenly over a wide angle. The small tweeter is equipped with a calibrated level control which permits each listener to adjust the highs best suited to his personal taste. The speakers are acoustically matched by means of an integrated crossover network. The RM-1 offers wide high-frequency dis-

NEW products

persion, smooth frequency response, wide frequency range and low distortion. Impedance is 8 ohms, response is 45 to 20,000 cycles per second, crossover frequency is at 5,000 cycles per second. The Sonomaster

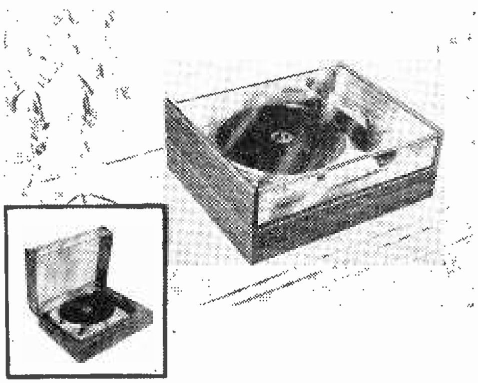


will handle all music and voice passages from their true beginning. Feed a fine quality signal into the RM-1 and it will reproduce every detail, whether it be loud or soft—the system adds no coloration. The RM-1 can also handle power—it takes 40 watts of average program material (80 watts peak). It has been tested with over 100 watts of program material for short periods of time. To take advantage of the loud passages in an average size living room, a power amplifier rated at 10 watts is the recommended minimum to be used with the system. The RM-1 measures 14½" x 10½" x 7¼" deep. It's finished in attractive hand-rubbed oiled walnut. It carries a consumer net of $42.50. (*Information is yours for the asking by writing to Sonotone Corporation, Dept. 22RT, Elmsford, New York.*)

Circle **B6** on page 105

Thorens Plexiglass Dust Cover and Base

A rich, hand-rubbed walnut base is combined with a wood-paneled plexiglass dust cover in a new "showpiece" hi-fi cabinet announced by *Thorens*. The new cabinet, Model CAB, was created after consultation with leading furniture and musical instrument manufacturers, and fits both traditional and contemporary decor. The plexiglass and walnut cover is designed to balance in an open position without hinges or other hardware, and may be lifted from the base without disconnecting fittings. Incorporated into the dust cover base is a new triple isolation method of minimizing effects from extraneous shocks and vibrations. Each base includes a set of pliant rubber damping grommets said to offer five times the resiliency of older grommets. They provide a "floating cushion" on which the turntable "floats." Another set of grommets is provided to afford complete isolation of all moving parts. Each base carries a genuine hardwood tag, signifying its certification by the Fine Hardwoods Association. Overall dimensions are 20" wide x 16¼" deep x 7½" high. The base and dust

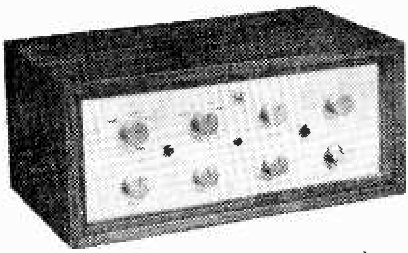


cover are available in several model styles, $40.00 for the CAB-124/121 designed for use with the TD-124 and TD-121 turntables. The distributors of the *Thorens* base and dust covers informs us that almost any manual turntable can fit into the base. All that is required is to discard the original pre-cut base board, replace it with a board of equal outside dimensions to mount the turntable you now own, paint the base board black and you're all set to install your unit. Record changers with tall center posts cannot be accommodated by the dust cover. (*More information can be had by writing to Thorens, distributed by Elpa Marketing Industries, Thorens Div., Dept. RT22, New Hyde Park, New York.*)

Circle **B7** on page 105

Whitecrest Stereo Preamp/Amp Model APS-100

By eliminating obsolete features and employing orthodox, proven circuitry, premium parts, and meticulous manufacturing, *Whitecrest Industries, Inc.* has designed a new stereo integrated control amplifier that offers the consumer a combination of both first-rate quality and economy. Attractively packaged in a grained oil walnut cabinet, the *Whitecrest* Model APS-100 reflects design features usually found in professional equipment. The use of massive output transformers, employing grain oriented laminations, insure full rated power, down to 10 cps. The six silicon rectifiers and the oversize power transformer, all operating at a fraction of their individual ratings, provide the superb voltage regulation essential for full-range, distortion-free reproduction. Stereo music power output (IHFM, both channels) is 60 watts. Each channel has individual bass and treble controls, permitting accurate compensation for room acoustics and different program material. A separate loudness con-

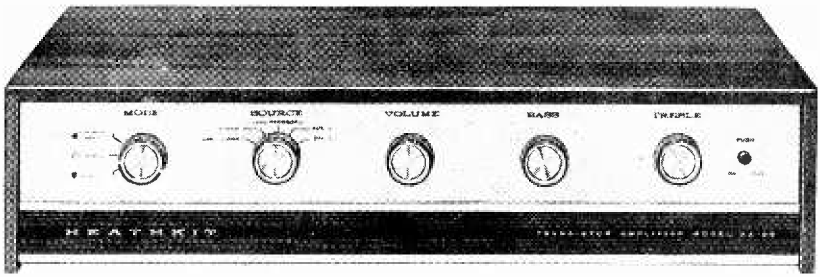


tour control provides the proper compensation for low level listening. Additional specifications for the Model APS-100 are: peak power output (both channels), 100 watts; music power output (IHFM, both channels), 60 watts; power output (RMS, per channel), 27.5 watts; harmonic distortion (at rated output), .25%; intermodulation distortion (at rated output), .75%; hum and noise level, 80 db below rated output; frequency response, 10-20,000 cps ±1 db; sensitivity (for rated output), 300 mv (high level inputs), 3.5 mv (phono input), 2 mv (tape input); output impedances, 4-8-16 ohms; tube complement: 4-7591, 4-12AX7, 2-12AU7, 6-silicon diode rectifiers; bass and treble control range, −15 to +15 db; power requirements, 117 volts 60 cycles. Price, $159.95. (*Whitecrest Industries Inc., Dept. R22V, 1085 Manhattan Ave., Brooklyn, New York.*)

Circle **B8** on page 105 ■

"Until just recently, I have been somewhat skeptical about low-priced transistor amplifiers. However, after testing and listening to the Heath AA-22, I feel it is time to revise my opinion."

JULIAN D. HIRSCH, Hi Fi /Stereo Review, Nov. '64

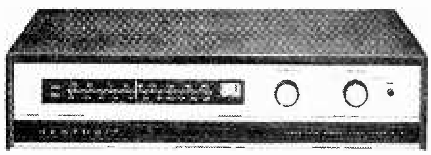


Heathkit® 40-Watt Transistor Stereo Amplifier . . . $99.95

Mr. Hirsch Went On To Say: "*This remarkable amplifier can easily hold its own against any amplifier — tube or transistor — anywhere near its price range. It is the embodiment of the so-called 'transistor sound' — clean, sharply defined and transparent. It has the unrestrained effortless quality that is sometimes found in very powerful tube amplifiers, or in certain transistor amplifiers. The AA-22 is almost unique among amplifiers at or near its price, since it delivers more than its rated power over the entire range from 20 to 20,000 cps . . . The power response curve of this amplifier is one of the flattest I have ever measured . . . Its RIAA phono equalization was one of the most precise I have ever measured . . . Intermodulation distortion was about 0.5% up to 10 watts, and only 1% at 38 watts per channel, with both channels driven . . . The hum and noise of the amplifier were inaudible . . . Hi Fi/Stereo Review's kit builder reports that the AA-22 was above average in 'buildability' . . . In testing the AA-22, I most appreciated not having to handle it with kid gloves. I operated it at full power for long periods, and frequently overdrove it mercilessly, without damage to the transistors, and with no change in its performance measurements. One of the best things about the Heath AA-22 is its price, $99.95 in kit form, complete with cabinet.*"

About All We Can Add is that the AA-22 has complete controls; 5 stereo inputs to handle mag. phono, stereo-mono tuners, tape recorders, & 2 auxiliary sources; 4, 8 & 16 ohm speaker outputs; plus tape recorder outputs. It weighs in at 23 lbs. for shipping, and it's delivered direct to your door.

Oh, Yes, One More Thing! There's a matching AM/FM/FM Stereo tuner that performs just as well for the same price.



Kit AJ-33A, matching tuner, 17 lbs. $99.95

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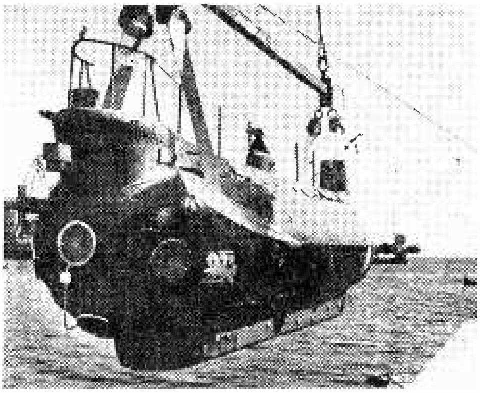
EXPLORING THE NEW WORLD UNDER THE sea

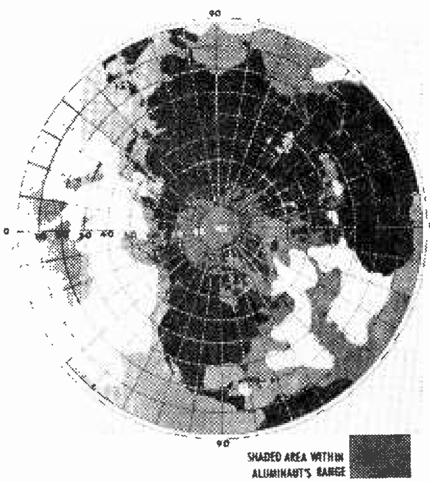
By K. C. Kirkbride

On the historic day of September 3, 1964, a long, sleek aluminum ship slid down the ways at Groton, Connecticut, later to submerge 15,000 feet into total darkness, its oceanographer crew to descend to areas in the seas never probed by man before, and to surface

Under The Sea

Electronics in oceanography probes a world of mystery and opportunity hidden on the ocean's bottom under 350 million cubic miles of water





again with the safety of land travel.

Designed to travel an 80-mile range of the ocean's floor at 3.8 knots, *Aluminaut* is built to stay submerged as long as 72 hours, carry a crew of three downstairs, with a passenger list of fifteen. Packed with electronic gear—ranging from underwater television, to sonar-sounding systems, two-way radio and mechanical arms primed to reach out and grasp handfuls of the bottom of the sea—the silver ship may well pioneer the day when man may fully explore the seas.

J. Louis Reynolds, Chairman of the Reynolds Metals Company launched the historic submersible with the words, "Beneath the 350 million cubic miles of water sprawled across three-quarters of the earth's surface is a great untapped storehouse of natural wealth." Rich stores of manganese, cobalt, gold, diamonds, vanadium, sulphur, iron, oil, nickel lay under the sea. Vast supplies of food that could nourish starving peoples of nations plagued by exploding populations, wait only to be farmed.

Fifty-foot Aluminaut, above left, is about to be slapped on hull in a welcome by the sea for which she was born. Aluminaut, built by General Dynamics' Electric Boat Division, will be run by Woods Hole Oceanographic Institution in a research program exploring ocean floor, 60 percent of which is in reach (left). Now, less than 10 percent has been reached. Above, Westinghouse sonar photo of a square mile of sea's floor 8400 feet down, shot 300 feet from bottom. Center line is ship's path.

Massive Underwater Platforms. Defense experts warn too, that free nations can at any time be Pearl-Harbor'd from massive underwater missile "platforms." Yet until the recent electronic "giant awakening" man has almost totally lacked the implements to deal with the powerful watery environment around him. For centuries, the oceanographer frustrated along with the crudest of tools.

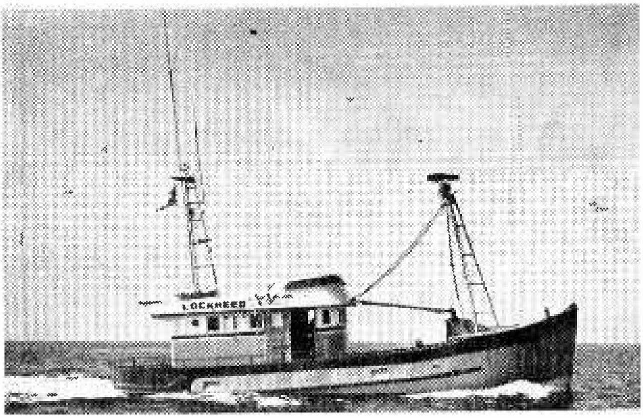
Aristotle peered over the side of the boat in the shallow waters of the Mediterranean, studying marine life, and decided some fish were animals.

Bottles and Buckets. Centuries later, Benjamin Franklin with only a bucket, a bottle and a thermometer, discovered the Gulf Stream. Naval Officer Matthew Fontain Maury in the early 1800's charted winds and tides from logbooks, studied the seas and concluded animal populations lived in underseas "cities" separated by mountain ranges and ridges.

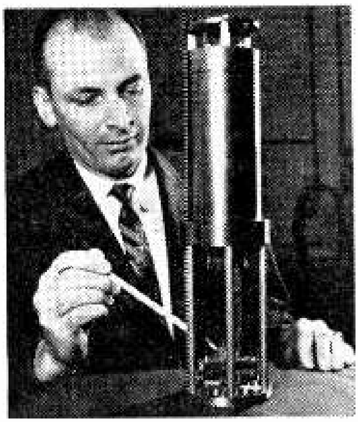
England's H. M. S. Challenger steamed down the Thames in 1872 to spend three-and-one-half years travelling the world, established oceanography as a science with only a bottle, cable, wire and dredges to work with.

As Director James M. Snodgrass of the Scripps Institute, LaJolla, California, pictures the plight of the harassed oceanographer: Imagine shrinking the Pacific Ocean down to a lake ten miles across. On this scale, the ocean's maximum depth would correspond to 60 feet. Then place a toothpick on the lake. The toothpick by scale would represent the oceanographic vessel which we use. Take a filament finer than the finest spider thread to represent the cable the oceanographer would lower to sample the ocean bottom, and then try to plumb this fine thread to the 60-foot depth.

Picturing it this way it is easy to comprehend why for centuries the mysteries of the seas have always Garbo'd man. Until recent



Lockheed, despite their research into the exiting underwater realm of the future, must still ply the surface of the ocean with the conventional craft of today.



ACF Electronics' hydrophone, above, detects sound in deepest parts of the sea. ACF velocimeter, left, will indicate undersea weather conditions.

Under The Sea

threats of war, food and mineral shortages spurred American engineers to fashion new electronic "bottles and buckets."

We See the Sea With Sound. Westinghouse engineers "photograph" the landscape of the bottom of the sea, with its hills and valleys, with an electronic "photographer" 12 feet long, weighing 1500 pounds, they tow along under a mother ship, 200 to 400 feet above ocean bottom at depths down 20,000 feet.

Two sets of sonar transducers reach out 1200 feet on each side to scan the ocean floor with high-frequency sonar. Each sonar line "sees" a strip of the floor 2400 feet long, four feet wide, transmits its rebounding "lines" to the vehicle, where the high frequency waves are reconverted to electrical signals, amplified, and fed by cable to the surface ship in parallel lines, much as the television picture is reproduced. The "lines" are then permanently registered on a moving roll of sensitive paper.

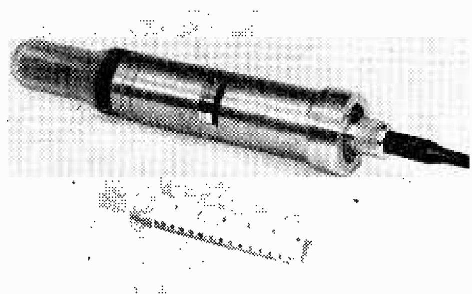
To Spot Internal Waves. Lockheed engineers track giant hidden undersea waves—some more than one-hundred feet tall—by building a wall of thermistors. Stationed 400, 500, 1900 and 2000 feet below the surface, these electronic "buckets" connect by cable to a recording van on the nearby shore. Temperature and time readings are transmitted to shore every five minutes, signals converted to numbers, printed by a recorder, the data then fed to a computer to predict the wave's intentions. Reason for keeping a sharp eye on these truants is they can throw off a well-behaved wave of sonar.

Another underwater bad-boy, the tidal wave, speeds at 500 to 600 miles an hour under the ocean's surface, can pass right undership, escape detection until it bursts full fury ashore to havoc an unsuspecting town or island.

To detective these destructive characters, Bendix men place a transponder on the ocean floor that can detect a true tidal by pressure change, transmit an alarm to a surface buoy to relay its message by radio to a station ashore. When not chasing tidals, this Bendix "bottle" records water temperatures, salient content, current velocity and direction.

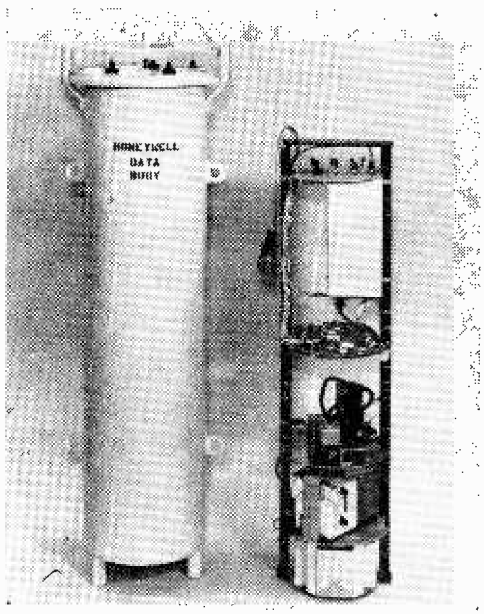
Sounds Under the Sea. To keep tabs on submarines underseas, Lockheed engineers designed an underwater "tracking" system, placing three hydrophones two miles apart to pick up sound signals under 3600 feet of water, which are then amplified and transmitted to computers ashore. The smart computer then reconstructs the signals, knows where the sub is heading.

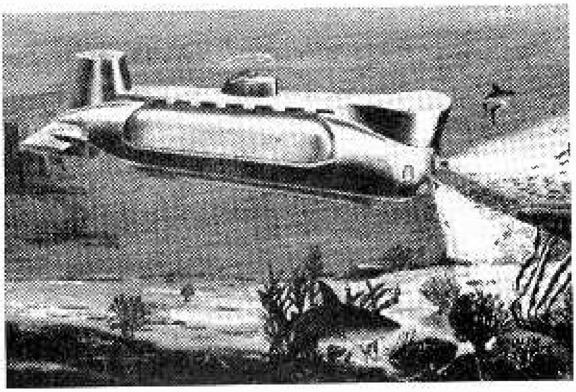
ACF Industries engineers shape another oceanic snooper like a cigar, prime it to listen 37,000 feet underseas, through the lower half of its 27-pound hydrophone "boot" which ACF men fill with castor oil. Reason



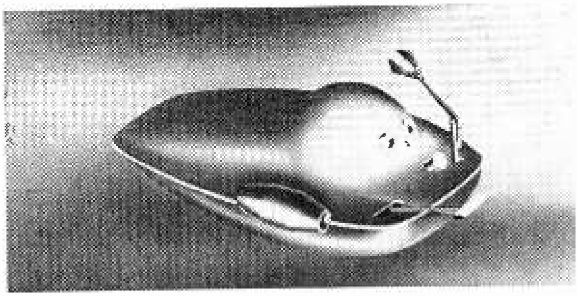
Honeywell deep-water hydrophone is capable of operation at pressures up to 2500 pounds/sq. in. Frequency response is 5-50,000.

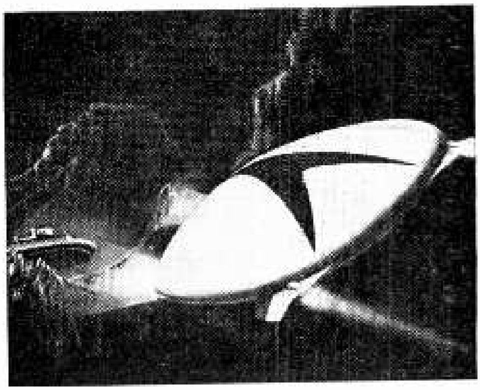
Honeywell S-1000-A1 buoy is powered by nickel-cadmium batteries for 6-month operation at ocean depths up to 5,000 feet. The unit is fully compatible with present day low-cost, data-collecting telemetering gear.





Artist's conception at left shows Aluminaut in its undersea environment. Searchlights illuminate ocean bottom for its television cameras. Below left, an artist's conception shows the Deepstar, a 3-man deep sea vehicle that will dive 12,000 feet to explore earth's last frontier equipped with sample collecting mechanical arms. Below, Lockheed's flying saucer-like Turtle searches out sunken cargo in craggy peaks of undersea mountains.



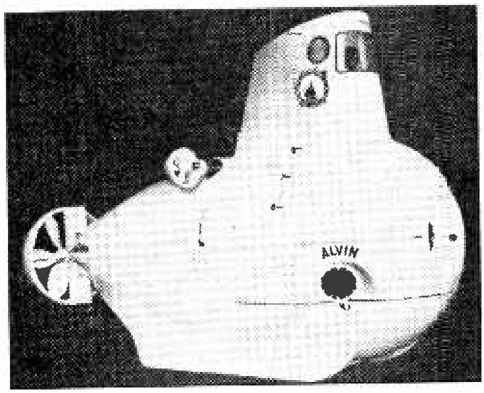


for the oil, they say, is that it has the same acoustical or sound transmission properties as water.

This One Tells It To The Skies. Honeywell's buoy S-1000-A-1 scouts tides, temperatures and sea sounds, transmits what it hears to ship or plane overhead. Weighing 200 pounds, the Honeywell listener converts frequency analog inputs of attached sensors to digital form, records data on magnetic tape with a readout rate of 100 bits per second. Honeywell engineers say they can space their buoys over oceans much like a mammoth game of checkers to report deep-sea findings to aircraft flying overhead tuning in with data receiver-processors.

Another Honeywell buoy, TM-1-A, reads ocean temperatures at eight fixed, pre-established depths on a single vertical station at set times, records temperature readings on 35-mm photographic film. Frequency of readings can be set at 1, 2, 3, or 4 an hour, each buoy living a "lifetime" of 1600 readings.

The Ocean's Moods. But to master the oceans in our lifetime, some top scientists believe we must "occupy" the oceans, not simply study them. To comprehend the ocean's moods and whims, we must send



Alvin, a deep submergence research vehicle, is a tool of Woods Hole Oceanographic Institution. Chubby sub can cruise 20-25 miles.

ships down through the seas that can "see" lower levels, probe these depths with a whole series of observers to follow *Aluminaut*.

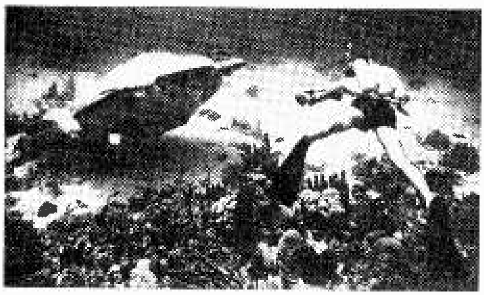
Chubby *Alvin*, product of Litton Industries, is built to Lewis-Clark the oceans at the 6,000 foot level, cruise a range of 20 to 25 miles at a top speed of 6-8 knots, look around with sonar-scanning eyes, closed-circuit TV and first-hand port-hole observation by its pilot and crew.

Under The Sea

Sink To The Depths With Deepstar. While *Alvin* and *Aluminaut* openly admit their ancestors were submarines, the Westinghouse dreamboat looks more like a whale. Built to pull some fast maneuvers at depths of 12,000 feet, *Deepstar* will prop one of its crew in tilted seat, the other two lying prone on the floor to peer through four-inch thick plexiglass windows to observe the seas around them.

Turtle Is Round. Lockheed's contribution to pioneering underseas exploration looks like a turtle. The brainchild of Dr. Willy Fiedler, one of the Polaris fathers, *Turtle* is designed one day in the future to ferry pas-

(Continued on page 129)



Vehicle above, designed and built by Jacques-Yves Cousteau, explores shallow reef. Below, "arm" for undersea recovery holds millstone.

A message from . . .
SENATOR WARREN G. MAGNUSON

The ocean is an ever-changing and demanding environment. To understand it, to exploit its vast living and mineral resources, and eventually to master the sea, the scientist and engineer must have tools. These range from miniaturized sensing elements to complex buoy and sonar arrays; from fantastically accurate intertial navigation systems to orbiting oceanographic satellites. The federal government must look to the capabilities and experience of American industry to design, develop and build the new ocean-electronics systems so vital to the National Oceanographic Program. But to meet this exciting challenge we need a new breed of specialists: Men capable of understanding the sea's complex, dynamic features and processes; men willing and able to apply our already advanced terrestrial and space technology to fathoming the ocean's deep frontiers. As Chairman of the Senate Commerce Committee and as a consistent champion of the oceanography effort, it is obvious to me that the future of our entire program depends in large measure on ocean-electronics. The opportunities are there in the 350 million cubic miles of salt water covering this planet. A vigorous, industry-wide effort will capture these opportunities.

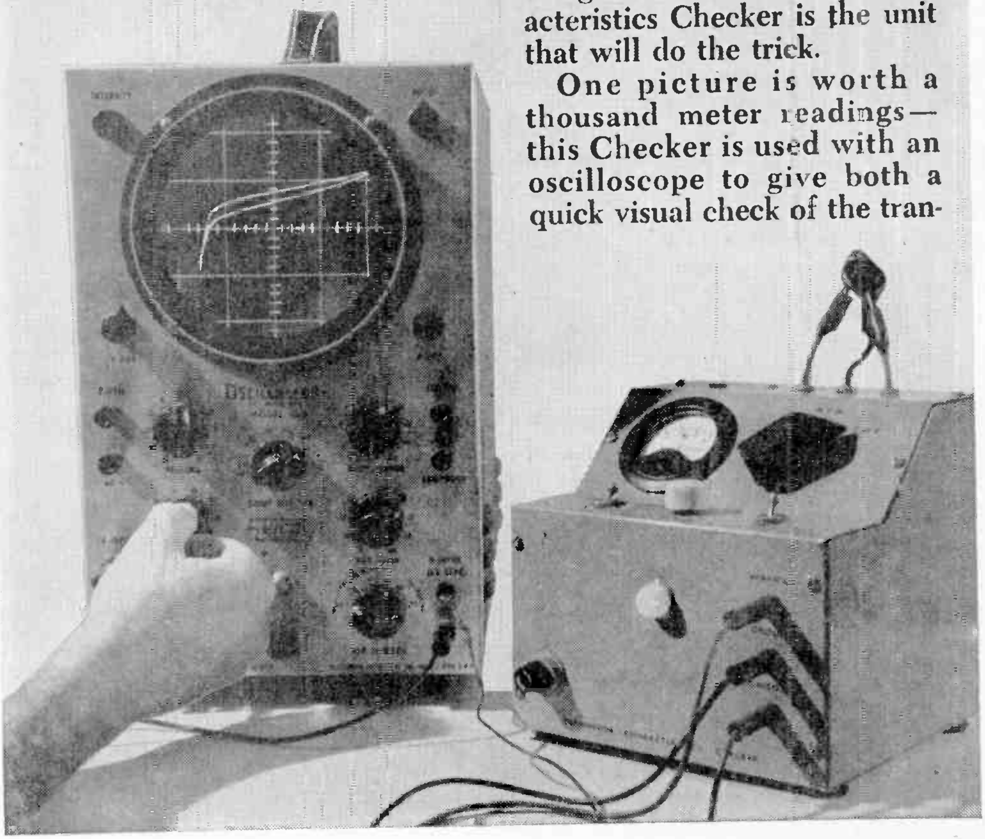
COVER STORY

TRANSISTOR CHARACTERISTICS CHECKER

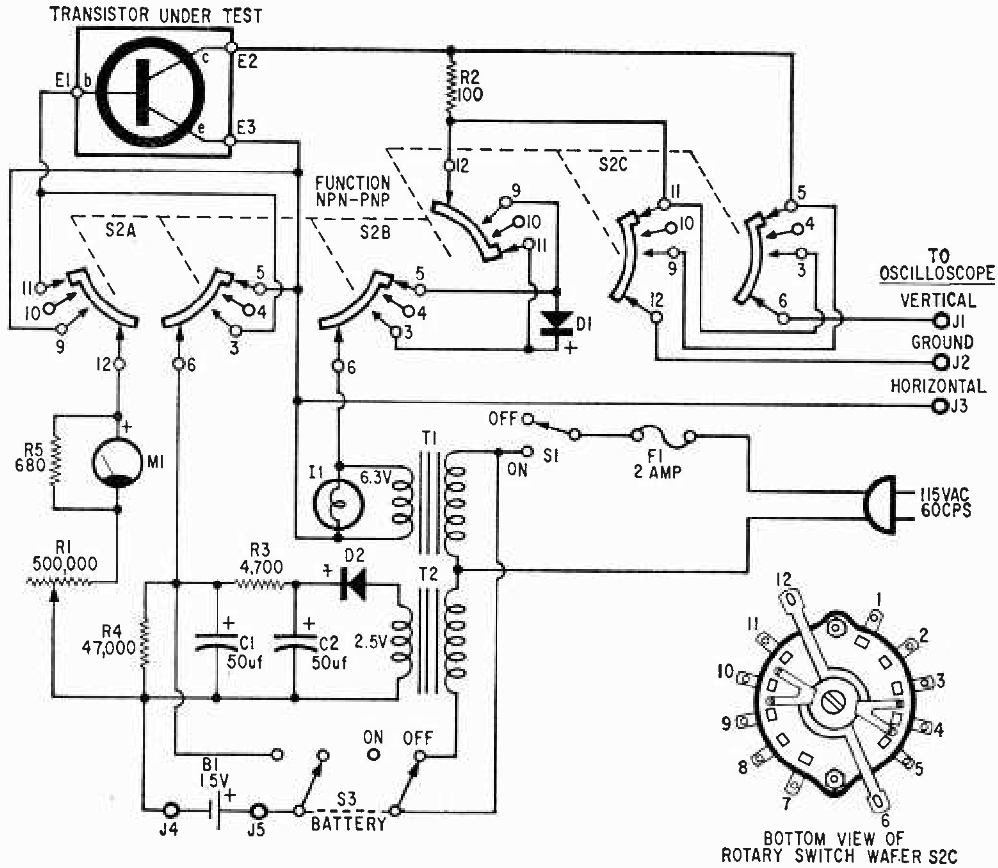
ONE SCOPE TRACE TAKES ALL GUESSWORK OUT OF TRANSISTOR CHECKING

By D. Ross Duffel and Henry A. Schneider

■ Whether you're a serviceman, experimenter, technician, or engineer, you've often needed a quick and reliable way to determine a transistor's condition, or its characteristic curves for an amplifier design. The Transistor Characteristics Checker is the unit that will do the trick.



One picture is worth a thousand meter readings—this Checker is used with an oscilloscope to give both a quick visual check of the tran-



Schematic diagram of Transistor Checker shows switching for checking PNP or NPN transistor.

sistor and a display of its characteristic curves. In addition to checking and displaying design curves, the unit, costing less than $25 to build, can be used to match pairs of inexpensive transistors. This will save purchasing a costly matched pair.

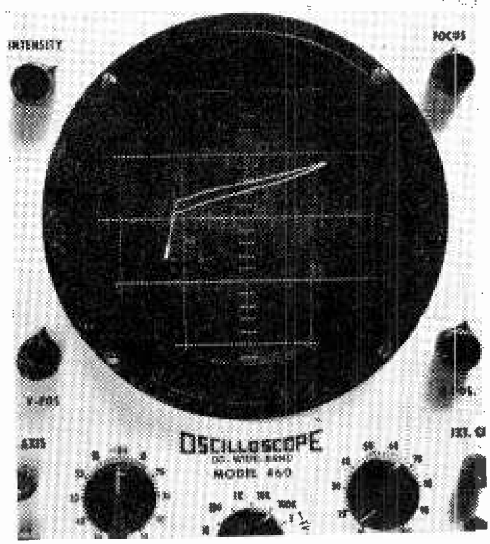
The schematic diagram shows how the voltages for obtaining the collector characteristic curves are tapped off at external jacks to be connected directly to the oscilloscope. The collector characteristics obtained correspond to the common plate current-plate voltage curves for vacuum tubes. Indications of leakage, current gain, output impedance, best base current for linear operation, and an indication of maximum allowable collector voltage are revealed by the curves.

Theory of Operation. The transistor under test receives a pulsing DC voltage representing a wide variation of operating conditions. As we know from basic transistor theory, a given base current will make a larger given amount of current carriers available to the reverse biased collector-to-emitter circuit. Only a small amount of collector voltage is needed to attract the available carriers, after which an increase of collector voltage results in very little collector current increase. The result is a characteristic curve similar to a vacuum tube pentode plate characteristic.

To obtain the characteristic curve, the Checker provides a variable base voltage as well as the pulsing DC collector voltage. The voltage applied between the collector and emitter circuit is seen along the oscilloscope's horizontal axis. The collector current is on the vertical axis. Therefore the collector voltage and current information are given directly in the characteristic curve. By varying the base current, a family of average collector characteristics can be obtained.

The Circuit. A half-wave filtered source of DC or a battery in series with a microammeter is used for the variable base supply; and a diode in series with a filament type transformer is used for the collector supply. A ganged, three-section DPDT switch reverses the vertical oscilloscope connections and collector and base polarity for testing either PNP or NPN transistors. The oscilloscope trace is deflected vertically by the amount of the drop of the collector current due to 100-ohm resistor R2, and horizontally by the applied voltage between the collector and emitter.

Putting It Together. The chassis layout is not critical and components you have on hand can be used if others are changed to maintain circuit parameters. For example, if you have a 6-volt transformer, it can be substituted for 2.5-volt transformer (T2) provided you change potentiometer R1 to 2 megohms and R4 to 10,000 ohms at ½ watt. In this case use a 6-volt battery in place of 1.5-volt battery (B1). Diode D1 should preferably be a silicon diode of 500 ma. and 200 PIV, minimum, since a silicon diode will have the least forward drop. Either a silicon or selenium diode is acceptable for diode D2 since the forward drop and PIV are not critical.



Oscilloscope trace, running from left to right, indicates the transistor under test is a PNP.

Transformer or Battery. The transistor characteristics checker shown in the photographs was wired by the authors using a s.p.s.t. switch for S3, the *Battery* switch, connected only to cut the line voltage from transformer T2. The battery was then temporarily clipped into the circuit to provide base voltage. In the schematic diagram, however, a wiring is shown that may be preferred. *Battery* switch S3 is a d.p.d.t that places the battery, rather than the transformer, in the circuit when it is in the On position. There is plenty of room in the chassis for a battery holder, or, as an alternative, jacks J4 and J5 can be placed on the back panel of the unit for an external connection. A more readily available sloping panel cabinet can be used in place of the uniquely shaped cabinet shown.

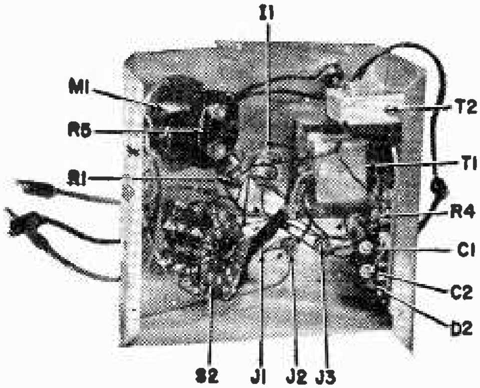
When the wiring is complete, check all connections to ensure that base and collector polarities are correct.

Using the Checker. To test a transistor, connect the vertical, horizontal, and ground leads to your oscilloscope and adjust the vertical gain of the scope for .1 volt per centimeter, or .1 volt per ½ inch for low current transistors and 1 volt per division for high

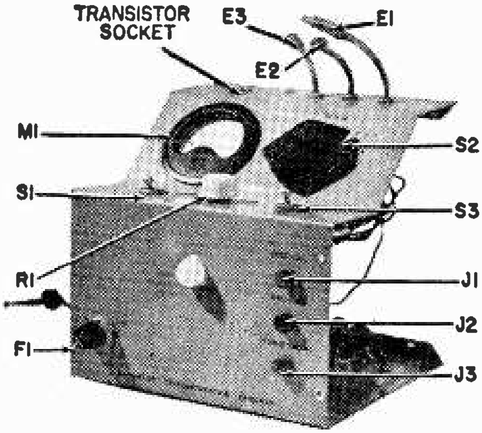
PARTS LIST

B1—1.5-volt, D-size battery
C1, C2—50-50mfd, 150WV, dual-section electrolytic capacitor (Lafayette Radio 32G0121 or equiv.)
D1, D2—Silicon rectifiers, 750 ma, 200PIV at 25°C; 500 ma, 200PIV at 90°C (Lafayette 19G4210 or equiv.)
E1, E2, E3—Mueller Mini-gator clips and flexible insulators, 2 red and 1 black (Lafayette 32G3500 and 35G3527C, respectively)
F1—Type 3AG standard Littelfuse, 2 amp., and Buss HKP fuse mounting (Lafayette 13G1015 and 13G6202, respectively)
I1—Indicator lamp and assembly (Allied 7E992 and 7E510, respectively)
J1, J2, J3, J4, J5—Insulated tip jacks, 3 red, 2 black (Lafayette 32G6432C)
M1—Base current microammeter, 0-500ua (Olson ME 101 or equiv.)
R1—500,000-ohm, linear taper potentiometer
R2—100-ohm, ½-watt resistor
R3—4,700-ohm, ½-watt resistor
R4—47,000-ohm, ½-watt resistor
R5—680-ohm, ½-watt resistor
S1—S.p.s.t. toggle switch
S2—3-gang, 6-pole, 5 position per pole, non-shorting rotary switch (Mallory 1335L or equiv.)
S3—D.p.d.t. toggle switch
T1—Filament transformer, 6.3v at 1 amp. (Lafayette 33G3702 or equiv.)
T2—Filament transformer, 2.5v at 3 amp. (Allied 64G132 or equiv.)
1—Sloping panel cabinet, 8" x 8" x 8" (Premier SFC-500 or equiv.)
Misc.—Battery holder, dial knobs, line cord, transistor socket, terminal strips, hookup wire, grommet, solder, nuts, bolts, etc.

Estimated cost: $23.00
Estimated construction time: 4 hours



Inside view shows arrangement of components; sloping cabinet is treated similarly.



All components and wiring is on front panel so back of the cabinet can be removed freely.

current transistors. These settings will eliminate annoying double trace and prevent off screen readings. Set the horizontal control to the external position and adjust the gain to allow 9 volts to cover an appreciable portion of the screen. Turn off both base and collector power and insert the transistor leads in the test socket, or use the three external test clips to connect the transistor. Turn on the base voltage and determine which position of the NPN-PNP function switch allows the greatest current flow. This determines whether the transistor is PNP or NPN, and if base-emitter section of transistor is good.

Low power transistors should have current flow only one way through the base-emitter diode section. Power transistors should have a somewhat lower resistance in one direction at a higher base current. If the base section is shorted or is very leaky, current flow will be equal in both directions indicating that the transistor is defective. After determining the forward current direction, set the base current low, about 50 to 100 microamperes, and then turn on the collector power. The curve will appear on the oscilloscope as the base current is increased.

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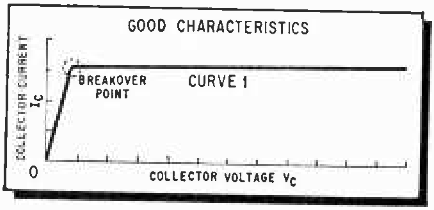
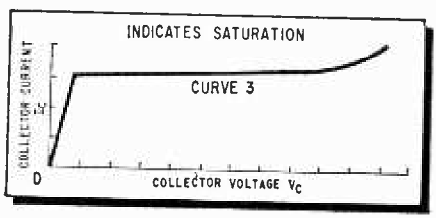
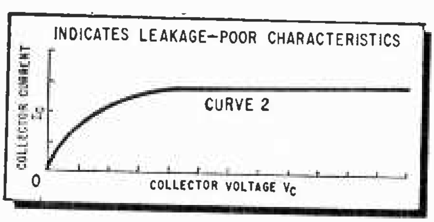
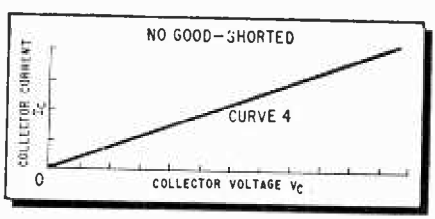


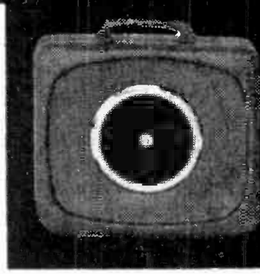


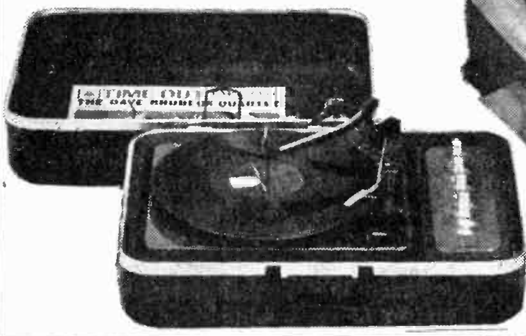




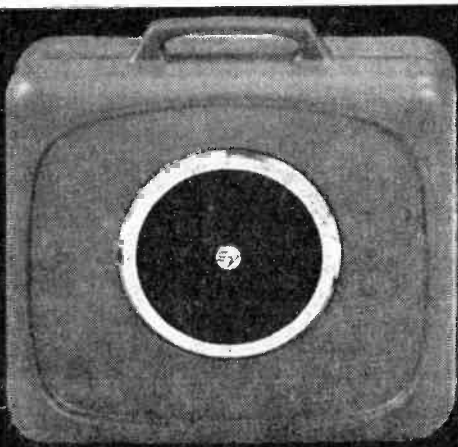
Transistor characteristics curves such as these become immediately recognizable and don't require detailed analysis to determine the information they contain. They are discussed in detail in text for various types of transistors and effect of oscilloscope gain on their shape.

The Younger Set swings to Stereo COMPACTS





By Hans Fantel



Electro-Voice Entertainer 1 $235.00

A new breed of audio equipment is sounding off this season—the stereo compacts. These new units are hardly bigger than ordinary table phonographs, yet their performance comes within hailing distance of the kind of fidelity found only in full-size equipment. Some of these new compacts are so cleverly designed that the complete stereo system—record changer, stereo amplifier, and two detachable speakers

—fit into a single portable case no bigger or heavier than a man's two-suiter. Other models, intended for nonportable home use, come finished in walnut.

The compacts are a brave try to fill the wide gap between standard-size sound components and the garden-variety type of portable or table-model phonograph. Most of them are priced below the regular range for component systems. They are evidently intended for customers wanting better sound than ordinary phonographs provide, but who haven't got the cash or the space for a full-size stereo system.

The sudden swing to compacts was the big surprise of the recent High Fidelity Show in New York. Manufacturers like Fisher, Scott, Shure, KLH, and Electro-Voice, who in the past had been turning out sound equipment strictly in the *Cadillac* class, were suddenly trotting out a bunch of bantams that might be called the *Volkswagens* of audio.

This trend opens up several questions:

. . . Why are top rank firms now making compacts when they didn't do it before?

. . . How good are the new bantam systems?

. . . Should you buy one or stick with traditional big components?

To answer these questions we must look at

STEREO COMPACT COMPARISONS

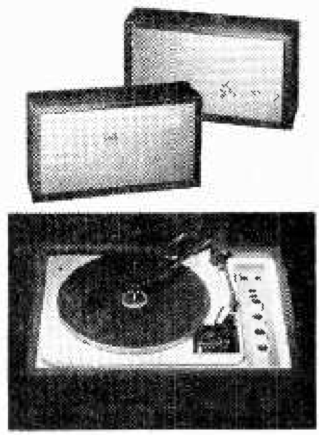
Make and Model	Type	Dimensions (Inches)	Weight (Pounds)	Power (Watts/ Channel)	Changer-Type
KLH 11	1-piece luggage-style	24 x 14 x 7	28	15	Garrard (Special design w. low-mass tone arm)
KLH 11-W	Home-style Walnut	Changer & Amp 18 x 14 x 8 Speakers 14 x 8¼ x 8	–	15	Garrard (Special design w. low-mass tone arm)
Fisher 50	1-piece luggage-style	24¾ x 14¼ x 8	35	15	Garrard AT6
Electro-Voice Entertainer 1	2-piece luggage-style	Changer & Amp 16 x 20½ x 9 Speakers 16¾ x 17 x 5⅞	34½	15	Garrard AT6
Fisher 75	Home-style Walnut	Changer & Amp 24½ x 14⅝ x 5½ Speakers 16¼ x 10⅜ x 9⅛	53	15	Garrard AT6
Scott Stereo Compact	Home-style Walnut	Changer & Amp 24½ x 15 x 8¼ Speakers 14 x 8¾ x 5⅝	–	no data furnished	Garrad AT6
Benjamin Stereo 200 with Benjamin 208 speakers	Home-style Walnut	Changer & Amp 18½ x 16 x 9½ Speakers 21¾ x 11½ x 8¾	–	18	Miracord 10
Shure M-100L	2-piece luggage style	Changer & Amp 20⅞ x 15⁵⁄₁₆ x 8¾ Speakers 20⅞ x 19¼ x 14	56	20	Dual 1009
KLH 20	Home-style Walnut or Mahogany	Changer, tuner & Amp 18¼ x 14 x 4	–	40	Garrard (Special design w. low-mass tone-arm)
Shure M-100W	Home-style Walnut	Changer & Amp 11 x 21½ x 16 Speakers 10¼ x 21 x 8⅜	–	20	Dual 1009

KLH 11

Cartridge	Remarks	Price
Pickering Magnetic	Tuner & tape recorder inputs and headphone jack provided	199.95
Pickering Magnetic	Tuner & tape recorder inputs and headphone jack provided	209.95
Pickering Magnetic	Tape recorder, tuner inputs and headphone jack provided	229.50
E-V Ceramic	No tuner or tape inputs	235.00
Pickering Magnetic	Tape recorder, tuner inputs and headphone jack provided	269.50
Pickering Magnetic	Tuner & tape inputs provided; room for optional FM stereo tuner in enclosure. Tuner: $129.00 additional.	299.95
Elac Magnetic	Tuner & tape inputs and tape output jacks provided. Other speakers may be substituted.	328.50
Shure V-15 Magnetic w. elliptical stylus	Tuner inputs and microphone jack provided. Other speakers may be substituted.	389.00
Pickering Magnetic	FM stereo tuner included, zero-center tuning indicator, stereo indicator light, tape inputs and outputs, headphone jack, built-in antenna, external antenna optional.	399.95
Shure V-15 Magnetic w. elliptical stylus	Tuner inputs and microphone jack provided. Other speakers may be substituted.	450.00

the roots of this new development. Of course, portable or table-model stereo sets have glutted the market for years. They crowded the shelves in department stores, discount houses and appliance stores. But you'd rarely see one in a bona-fide high-fidelity shop; for nearly all of them were bass-shy, their treble shrieked, and when you turned up the volume they piled up enough distortion to make the silkiest string orchestra sound like a bunch of sandpaper kazoos. No wonder any true hi-fier sneered at this kind of portable or table-model record player. Even audio engineers partly accepted the notion that small photographs necessarily had to sound tinny and screechy. As a whole, the high fidelity industry stayed away from portable or table-model designs.

Cigar Box Speakers. But then one firm upset the applecart. About two years ago, KLH Research and Development Corporation of Cambridge, Massachusetts, came up



KLH 11-W

with its Model 11—a completely self-contained stereo system in a single piece of luggage, weighing all of 28 pounds. The two detachable speakers hardly seemed bigger than a generous cigar box. Yet to everyone's amazement, they gave forth with clear, full-bodied sound that would do credit to a loudspeaker many times their size. And to top it off, the whole rig sold for less than $200.

At first, KLH was suspected of witchcraft.

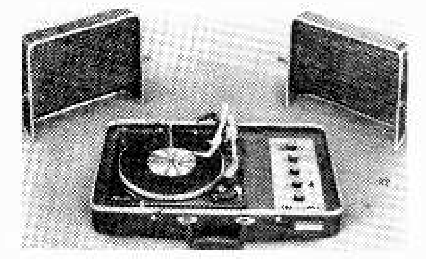
Stereo Compacts

But audio engineering, like any other science, can't hold a secret for long. When the competition ripped apart the Model 11 and pried into its inards, they discovered the trick for getting big sound from small speakers. KLH had done it by matching the frequency response of the amplifier to the exact requirements of the speaker. Instead of designing the amplifier with flat frequency response, they put some extra wallop in the low end to make up for the weak bass of the tiny speakers. The amplifier response curve *zigs* where the speaker response curve *zags*. In the end you wind up with an *accoustically* flat output that gives every note its due despite unavoidable speaker deficiencies.

This isn't the same as just turning up the bass boost. For one thing, amplifier and speaker response have to be exactly intermatched. The kinks of the amplifier response curve must *dovetail* accurately with the kinks of the speaker response curve, or else the sound gets boomy. Besides, the small speakers have to be fitted with hefty magnets and high-compliance cone suspensions so that the voice coil can travel freely back and forth over a fairly long stretch of piston travel. This enables the small speaker to accept the powerful thrusts of beefed-up bass without tearing to shreds or breaking into distortion. And because of the longer piston travel of the cone, the speaker pumps more air with each stroke, allowing even a small speaker to stir up enough air for effective bass projection.

The problem was to keep speaker motion exactly proportional to the amplifier signal over the whole length of the extended cone travel. A new technique of speaker design had to be developed to accomplish this. Finally KLH came up with a three-inch speaker that covered the entire musical range with a nice, round bottom and a whistle-clean top—at least at moderate power levels. But for proper performance speaker and amplifier had to be literally made for each other.

What Price Compactness? Once KLH had pioneered this method of getting bass without bulk, others were quick to follow. Today there is an ample choice of compact stereo systems ranging from less than $200 to more than $400. Yet the difference in sound between them does not seem as great as the difference in price. (Some non-hi-fi compacts sell for lesst than $190, but their performance cannot be compared to the units discussed here.)



Fisher 50

Fisher 75

Even the lowest-priced units in the current crop of compacts deliver the kind of sound that would have seemed impossible in equipment of this size only a short time ago. In terms of sheer dollar value, the units selling around $200 rate as exceptional bargains. Only a kit builder assembling his own amplifier and speaker can hope to get more performance per dollar invested than some of these ready-wired units offer. As yet no compacts come in kit form, probably because of extremely tight construction tolerances.

What accounts for this breakthrough in quality? Partly it is the intermatching of speakers and amplifiers pioneered by KLH. Partly it is the general knowledge gained within the past two years in the design of small speakers. But the overriding factor in the development of today's compacts is the growing sophistication of transistor circuitry. It is at last possible to design extremely small amplifiers with high reliability, low distortion, and sufficient power output. The elimination of output transformers save both weight and bulk. To make the most of the miniaturization possibilities inherent in transistor circuits, some compacts—notably KLH and Benjamin—spread the amplifier circuitry all around the base plate of the record changer, tucking it under next to the turntable motor. The result is a complete stereo amplifier measuring only about two inches in height.

Finally, transistor amplifiers, if properly matched to the speakers, keep very tight control over the excursions of the speaker cones. This provides more accurate speaker damping than was formerly attainable with small amplifiers. Thanks to these excellent damping characteristics of the amplifier and the extra-heavy speaker magnets in some of the better models, the tiny speakers can be driven at fairly high power levels without distorting. By carefully combining all these design factors, engineers were finally able to come up with clean, balanced sound in extremely small equipment.

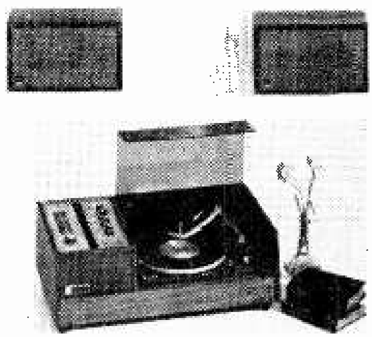
Despite variations in individual design, the new compacts bear a certain family resemblance. They all are built around high-quality record changers which can also be used conveniently for manual playing of single records. They all use modern high-compliance cartridges (mostly magnetic) tracking at stylus pressures of about two grams—an important factor in lengthening the life span of records. They all come equipped with a diamond stylus. Most of them provide inputs for other program sources, such as stereo FM tuners and tape recorders. For details about individual models, see the feature comparison chart.

How do they sound? That, after all, is the ultimate touchstone of any radio system. As a group, the compacts do a lot better than anyone would normally expect from equipment that size. Granted, the lowest reach of the bass fiddle and the pedal notes of the organ won't come through with powerful conviction. But there is adequate mid-bass and the over-all balance of highs and lows is quite pleasant. Best of all, at moderate volume levels, the character of the individual instruments is remarkably true and lifelike. In comparison to ordinary phonographs the improvement in tonal quality is downright dramatic.

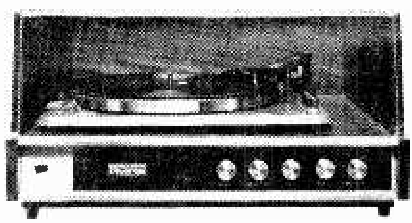
Yet the maufacturers of the new compacts are the first to admit that their new bantams aren't meant to rival or replace full-size sound systems. Chief drawback of many compacts is their low power-handling capacity. The limiting factor here is not the amplifier. At anywhere from fifteen watts to twenty watts per channel the amplifiers actually put out more power than the little speakers can comfortably handle. As you turn the volume control beyond the two o'clock position on some of these models, the speakers get over-driven in heavily orchestrated passages. When a symphonic fortissimo comes along, they tend to blur. But lighter orchestrations, such as jazz or pop arrangements still come through clean and undistorted even at fairly high volume levels.

So if you want to shake the walls with symphonic thunder, the compacts are not for you. But less demanding kinds of music are admirably reproduced, especially in moderate-size rooms where you don't need to crank up the volume.

The various compact models now on the market differ somewhat in their ability to handle power bursts such as orchestral climaxes or crashing piano chords. It's a good idea, therefore, to try out several competing makes before making a final choice. Bring along your own stereo record for comparison testing. A well-recorded symphony

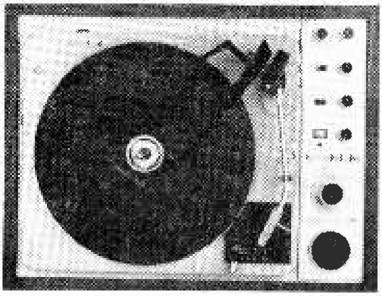


H. H. Scott Compact



Benjamin Stereo 200

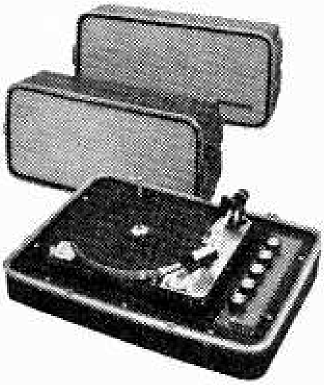
Stereo Compacts



KLH 20

or piano concerto will give the various systems a tough workout. Differences will show up very clearly at fortissimo passages.

Bigger Bantams. The compact trend in audio parallels the compact trend in cars. No sooner had the first compact cars come off the line than Detroit immediately started making bigger, beefed-up compacts with more powerful engines and snappier performance. The same thing is happening right now in the audio industry. The latest entries are two "super-compacts" designed to provide the convenience of a fully self-contained compact system without the twin drawback of small speakers and their power limitation,

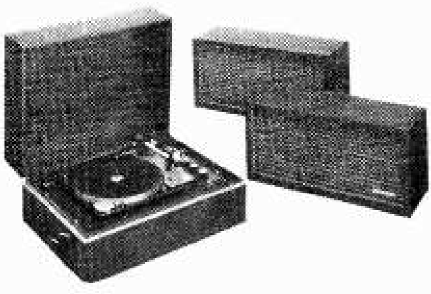


Shure M-100L

such as the Shure M-100L and M-100W, the Benjamin 200, and the KLH Model 20. The last three are intended for permanent home installation rather than portable use and therefore come in walnut cases. Their speakers are larger and the amplifiers heftier than those of the more compact compacts. The KLH-20, for instance, packs forty watts per channel—almost three times the power of most smaller compacts. This kind of power reserve would be ample even in a full-sized system. What's more, the speakers reach down comfortably to the lowest notes of the musical scale and can take a full orchestral blast without shattering. Besides, the KLH-20 contains a highly sensitive built-in stereo tuner at almost no increase in size.

The Benjamin 200 and the two Shure models differs from most other compacts in that they don't tie you down to just one type of speaker. Their amplifier output is "flat"—not tailored to the requirements of one particular speaker. Almost any fairly efficient speaker can therefore be conected if you don't happen to like the speakers normally furnished with these systems.

The new compacts, coming completely preasembled, are a boon for the wire-shy folk who like the idea—of a sound system they can just plug in and play. Apartment-dwellers who can't give house-room to a full-size system will value the compacts' ability to cram the most sound in the least space. And of course, luggage-style compacts are a natural for footloose hi-fi fans—college students, weekenders, baby sitters and party-goers—who want to lug good sound in a suitcase. ■



Shure M-100W

10-80 RECEIVER

This 2-tube regenerative detector rig will tally a score of stations

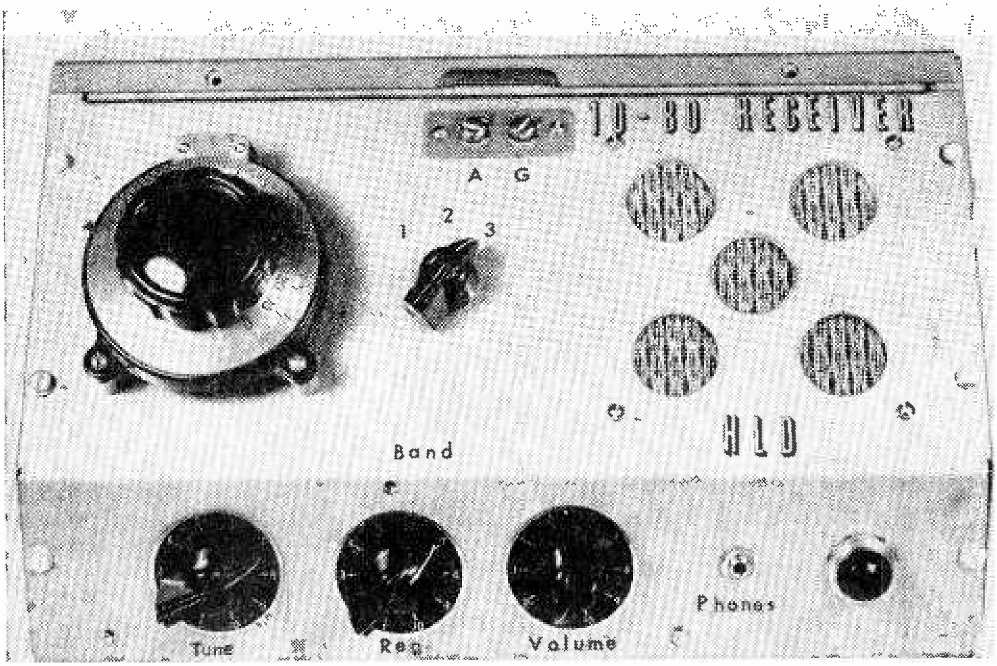
By Homer L. Davidson

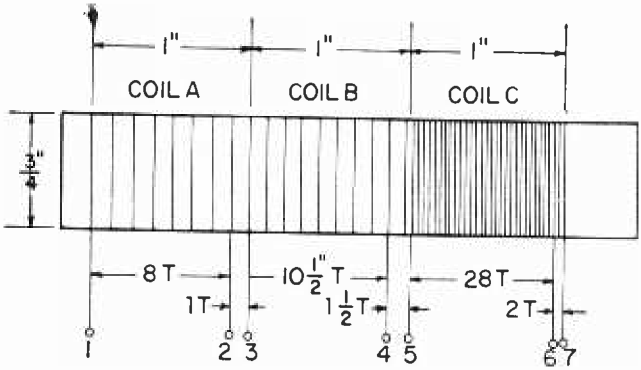
Here is a nifty little receiver that tunes the ten- to eighty-meter short-wave bands by switching a single-wound tapped coil into a regeneration detector circuit. Actually, the receiver uses only two tubes, but one is the 6D10 *compactron* that contains three separate triode sections. The 6D10 combines several functions in a single glass envelope. Space is saved by using only one tube instead of a possible three. This economy in parts not only saves space but money as well. The compactron, relatively new on the market, does a real job in this short-wave circuit. The first triode section is used as an RF amplifier, the second as a regeneration detector, and the third as the first audio stage.

The cost of the 10-80 short-wave receiver is around $30.00. However, surplus parts from previous projects can be used to greatly reduce this cost.

Circuit Description. The antenna lead in is capacity coupled to the cathode of an untuned RF triode stage control grid tied directly to ground. This stage isolates the loading circuit between the regeneration detector and the outside antenna.

The Detector. This stage amplifies the RF/audio signal. Current flows through the cathode into coil L2 and to ground. Coil L2





Tuning coil L2 can be wound using this pictorial view as a guide. No. 28 enameled wire is used for all three sections. The turns for each section are spread to cover one inch of the tube. With coil C, the turns will be touching when 30 are wound to the inch.

is tuned to one frequency which depends on the setting of C4 and C7, and the setting of S1. S1 selects portions of L2 that are needed to tune in a particular band, whereas the capacitors resonate those selected sections at a desired frequency. L2 behaves like an auto-transformer and steps up the cathode signal and supplies it back to the control grid of the detector stage. Here is where the regenerative feature takes place. The stage would oscillate unless its gain were reduced. That is the function of the regeneration control R3. By lowering the potential applied to the plate of the detector, the gain for the stage can be controlled. Resistor R2 and Capacitor C6 team up to form a grid leak detector network for providing bias for the triode section and converting the RF signal into pulsed audio.

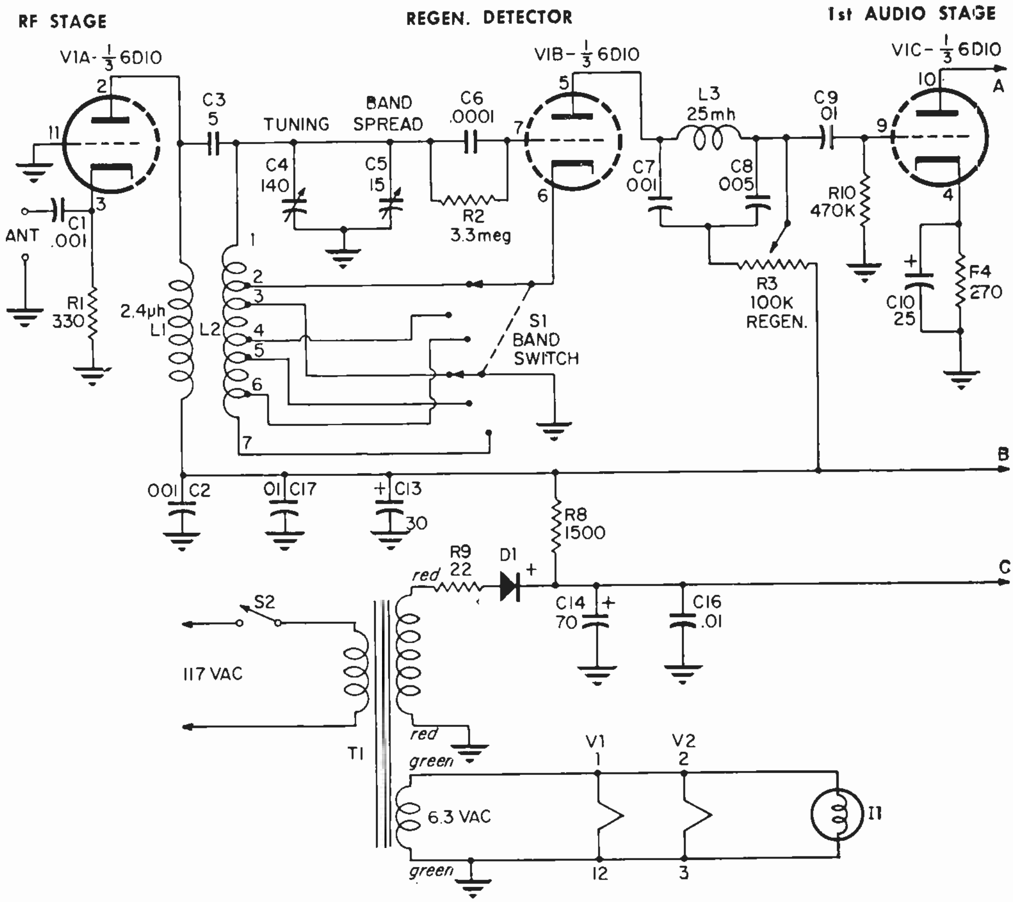
6D10 Audio Amplifier. Capacitors C7 and C8 with RFC choke L3 combine to serve as a pi-network to filter the audio signal supplied to the third triode section of the 6D10. This first audio section incorporates a variable resistor, R5, in the plate circuit which serves as a plate load and also the receiver's volume control.

Following the first amplifier in the circuit is headphone jack J1. Sufficient signal is present here to drive a pair of phones. When the phones aren't plugged in, the audio signal is capacity coupled to the final audio stage and to a four-inch speaker. The output transformer is tied in the high end of the power supply for greater voltage resulting in more amplification.

Power Supply. The power supply is a conventional half wave rectifier using a silicon diode. A low priced power transformer with 125- and 6.3-volt secondaries isolates the AC from the chassis ground. The s.p.s.t. on-off power switch is connected to the volume control, R5. In addition to the two tube filaments, jeweled pilot light I1 is connected to the 6.3-volt secondary.

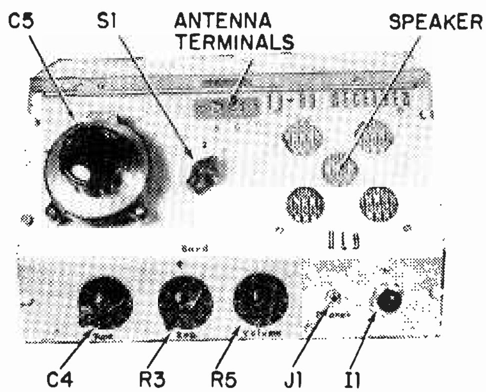
Coil Toil. The tuning coil is actually one

The aluminum chassis is visible when looking into the top of the sloping panel cabinet that houses the receiver. Most of the components, aside from the front panel variable controls and switches, are mounted on the 7"x5" chassis.

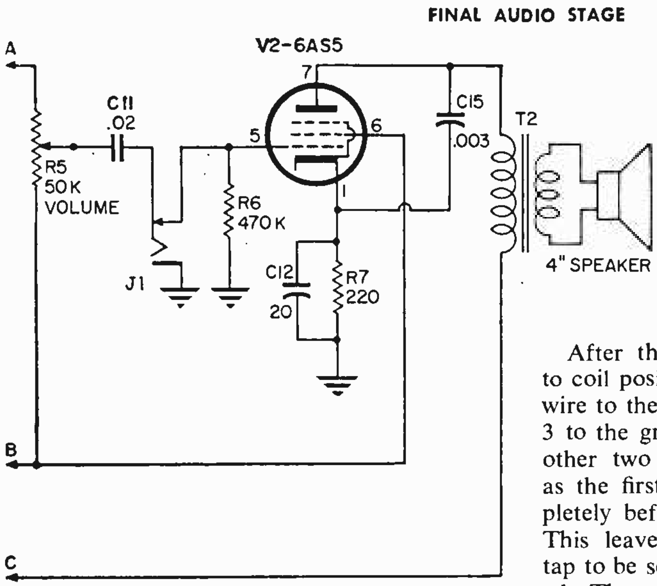


coil wound in a single layer on a plastic tube ¾ inch in diameter. Coil A has a total of 9 turns of No. 28 enameled wire tapped at the 8th turn for terminal 2 that goes to the cathode circuit. Coil B has a total of 12 turns tapped at the 10½ turn. Coil C of the 40 to 80 meter band is 30 turns tapped at the 28th turn. The total number of turns of the coil is 51. All three coils are spread to a length of one inch on the coil form. This results in the last coil with the turns almost touching or close wound.

When winding the coil, one end should be held in a vise for easier winding. Start at terminal No. 1 and wind 8 turns and then scrape back the enameled wire insulation. Wrap a short piece of wire around the scraped spot and solder the connection. Continue one more turn and do the same thing. This completes coil A. Do not cut the coil wire but wind 12 more turns to cover a full inch on the plastic tube. The last coil is also done in the same fashion. Place coil dope over the windings or scotch tape will hold the windings in place.



Sloping face of the cabinet holds the speaker, band switch S1, and band spread capacitor C5, which is vernier controlled for fine tuning.



Schematic diagram of receiver shows wealth of circuitry encompassed by 12-pin Compactron.

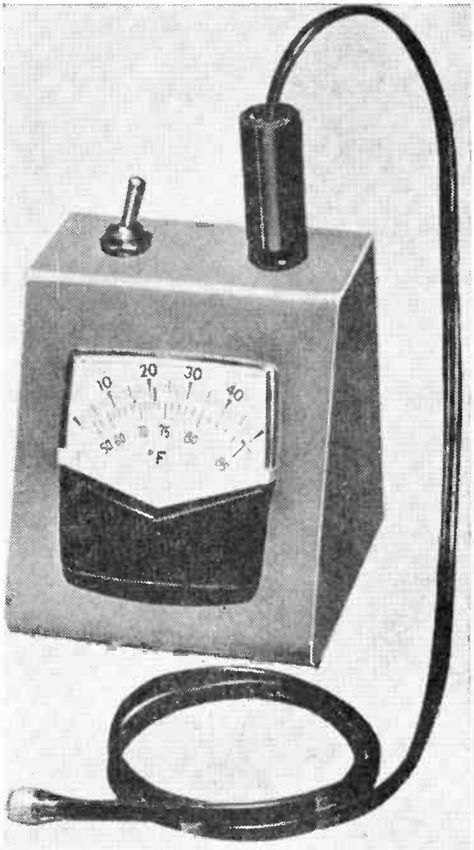
After the coil is wound, turn switch S1 to coil position No. 1. Take terminal 2 and wire to the cathode section. Solder terminal 3 to the ground section of the switch. The other two coils are hooked to the switch as the first one. Wire up the switch completely before mounting to the front panel. This leaves only the cathode and ground tap to be soldered after the switch is mounted. The same No. 28 enameled wire can be used for the tap hookup wire or flexible hookup wire could be used.

(Continued on page 128)

10-80 RECEIVER PARTS LIST

C1—.001-mf., 300-volt ceramic capacitor
C2—.001-mf., 300-volt ceramic capacitor
C3—5-mf., 300-volt ceramic capacitor
C4—140-mf. miniature variable condenser (Hammarlund APC-140B)
C5—15-mf. miniature variable condenser (Hammarlund MAPC-15B)
C6—.0001-mf. silver mica capacitor
C7—.001-mf., 300-volt ceramic capacitor
C8—.005-mf., 300-volt ceramic capacitor
C9—.01-mf. ceramic capacitor
C10—25-mf. subminiature electrolytic capacitor, 25-volts (Lafayette CF-143 or equiv.)
C11—02.-mf., 400-volt paper capacitor
C12, C13, C14—Three-section twist-prong capacitor, 20-mf. @ 25v, 30-mf. @ 150v, 70-mf. @ 150v (Allied 19L301 or equiv.)
C15—.003-mf., 300-volt ceramic capacitor
D1—Silicon power rectifier 750 ma, 200 PIV @ 25° C, 500 ma, 200 PIV @ 90° C (Lafayette SP-197 or equiv.)
I1—Indicator lamp assembly with red jewel and 6.3-volt lamp (Lafayette PB-106 and PL-39 or equiv.)
J1—"Little-Jax" phone jack (Lafayette PJ-59 or equiv.)
L1—Rf-choke, 2 microhenries
L2—51 turns No. 28 enameled wire wound on ¾-inch form
L3—75 turns No. 28 enameled wire wound on ¼-inch resistor form
R1—330-ohm, ½-watt resistor
R2—3,300,000-ohm, ½-watt resistor
R3—100,000-ohm linear-taper control
R4—27-ohm, ½-watt resistor
R5—50,000-ohm logarithmic-taper control with s.p.s.t. switch
R6—470,000-ohm, ½-watt resistor
R7—220-ohm, ½-watt resistor
R8—1500-ohm, 1-watt resistor
R9—22-ohm, 1-watt resistor
S1—2-gang, 6-pole, 3-position rotary switch (Lafayette SW-281)
T1—Power transformer, Pri: 117 vac, 60 cycle —Sec: 125 vac, 50 ma; 6.3 vac, 2 amperes (Lafayette TA-305 or equiv.)
T2—Fixed output transformer, Pri: 3000 ohms —Sec: 3.2 ohms. Pwr: 3 watts (Lafayette TA-19 or equiv.)
V1—Compactron tube 6D10
V2—6AS5 beam power tube
1—Sloping panel cabinet, gray hammertone, 6½" h. x 11-1/16" w. x 7-7/32" d. (Bud C-1586HG)
1—Open-end aluminum chassis 1½" x 7" x 5" (Bud CB-30)
1—4" square PM speaker
Misc.—Line cord, antenna wire and insulators, terminal strips, coil dope, tube sockets, insulated hookup wire, spaghetti rubber grommets, grill cloth, solder, pointer knobs, dial plates, vernier dial, panel marking decals, nuts, bolts, etc.

Estimated cost: $30.00
Estimated construction time: 12 hours



Home-made direct reading thermometer uses a low-cost PNP transistor as a sensing element to indicate temperature of solutions

By A. A. Mangieri

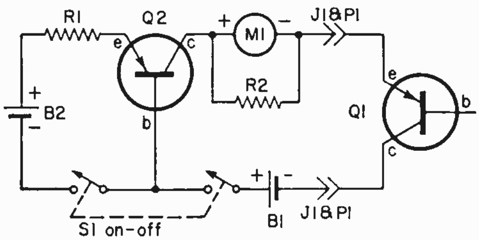
DARKROOM THERMOMETER

A **low cost** transistor operated as a *reverse biased diode* is the sensing element in the home-made, direct-reading, electronic thermometer described in this article. Designed for use in a photographic darkroom, the thermometer's non-linear expanded temperature range of 50°F to 85°F gives instant meter temperature indication of solutions used to develop and process black and white and color photographic films and papers. One important design feature of the device is that battery aging has almost *no effect* on the accuracy of the direct-reading darkroom thermometer.

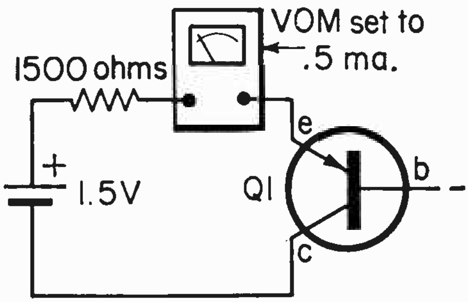
Circuit Operation. Sensing element transistor Q1, (refer to schematic diagram) is series connected with meter M1 and dry cell battery B1. As required for a *pnp* transistor, the collector lead (c) connects to the negative terminal of the battery. The base lead (b) is not used. Resistor R2 is a selected meter shunt. Transistor Q2, resistor R1, and battery B2 comprise a current limiter. The current limiter protects the meter from damage due to excess current by limiting the current when the temperature of Q1 is well above 85°F.

In this circuit, meter M1 indicates the reverse bias collector-emitter leakage current *Iceo* of Q1. Leakage current *Iceo* is very sensitive to temperature but relatively insensitive to the voltage of battery B1. This is shown in *Iceo vs. Vc* graph which shows leakage curves at 60°F and 85°F. When battery B1 is fresh and has a voltage of 1.5 volts, loadline X, which establishes the transistor operating points, is located at 1.5 volts as shown. The meter currents are established by intersection points A and B. As the battery ages and drops to one volt, the loadline shifts laterally to Y at 1 volt. But the meter currents at points C and D are only slightly

Darkroom Thermometer



Schematic diagram of the darkroom thermometer shows action of switch S1. It is a D.p.s.t. that removes both batteries from the circuit.



In selecting the best transistor for use as a temperature sensor, a VOM is used to find the transistor with optimum leakage current.

less than those at points A and B respectively although the battery voltage has dropped by thirty-three percent.

Construction. Connections shown in the diagram are for *pnp* transistors. If *npn* transistors are used, reverse the battery polarities. General purpose rf-if transistors were used as they were on hand and obtained as surplus. Transistor Q1, selected as later detailed, has a current gain of about two hundred. Transistor Q2 has a current gain of thirty and is not critical as to gain.

Mount all parts excepting Q1 in a small meter case. A bakelite board mounted on the meter supports Q2, R1, R2, and the batteries. Insulate phone jack J1 from the metal meter case. The current is not grounded to the case.

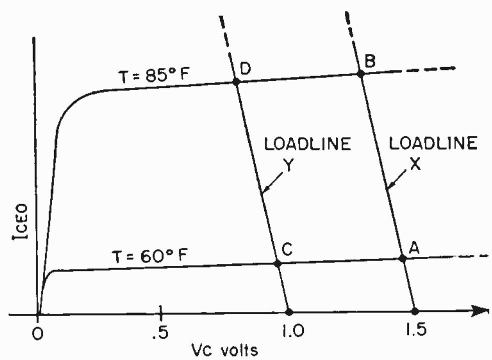
Transistor Q1 is selected to find one which has sufficient collector to emitter leakage current *Iceo* at 85°F to deflect M1 to full scale. To select Q1, set up a warm water bath at 85°F as shown in detail test diagram. The test tube prevents wetting of the transistor. Make temporary twisted wire connections with the transistor leads and tape. Connect the collector and emitter lead wires to the test circuit (see diagram) and measure the leakage current at 85°F. When making this test, stir the water and allow five or ten minutes to stabilize temperatures and meter indications. If the meter indication seems erratic and wavers back and forth, the transistor is unsuitable for use as Q1.

Select a transistor having a leakage current falling between 50 and 200 microamperes. If the selected unit has a leakage current between 50 and 100 microamperes, meter M1 should be a 50 microampere movement. Otherwise, use a 100 microampere meter. Record the measured value of *Iceo* for later use in calculating resistor R1.

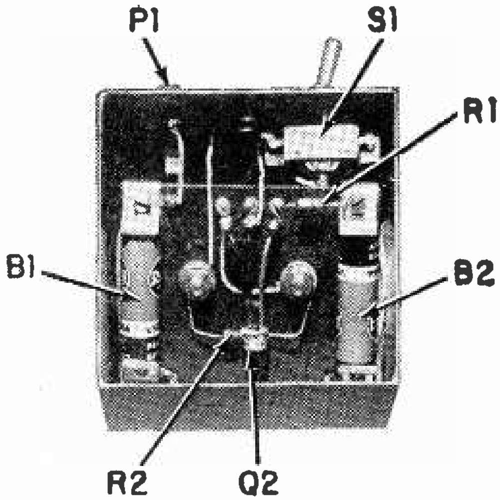
With Q1 in the 85°F water bath, remove the VOM and replace it with the meter to be used. Most likely, the meter will be deflected off-scale. The meter is brought to or near full-scale deflection by means of shunt resistor R2. To determine the value of R2, temporarily connect a potentiometer across the meter terminals and adjust it until the meter reads at or near full-scale. Remove the adjusted pot and measure its adjusted value to determine the value of R2. In some cases, R2 may not be required. R2 may be in the form of an adjustable pot incorporated in the circuit if desired.

Depending on the meter to be used and the leakage of Q1, resistor R1 is calculated from Ohm's law using R = E/I. To find R1 (in ohms), simply divide 1 volt (the end

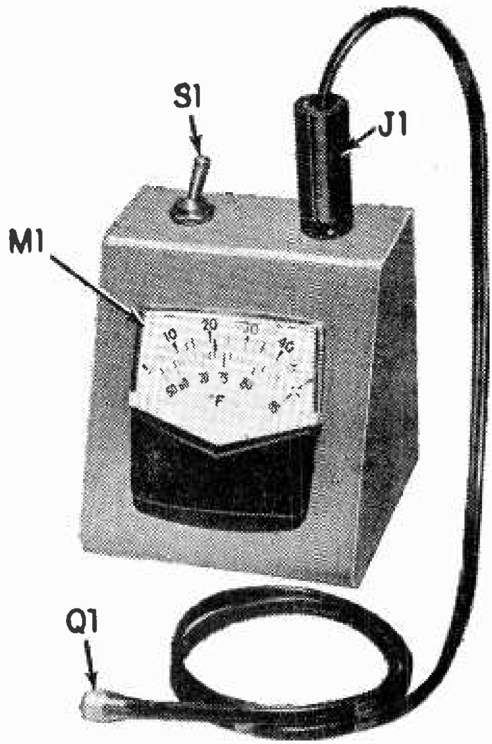
(Continued on page 129)



The variation in collector-emitter leakage current of transistor with changing battery voltage and temperature is shown in curves above. Decrease in current between the 1.5- and 1-volt points is negligible whereas the current difference with temperature is great.



Darkroom thermometer components fit comfortably in a meter case. Note the bakelite mounting board is held by meter terminals.

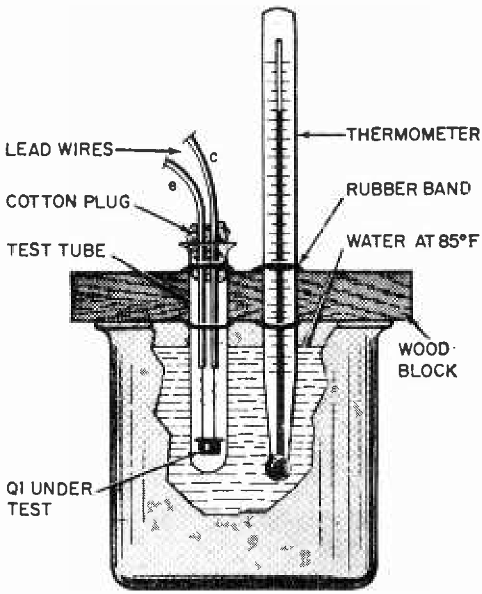


Meter deflection is recalibrated in °F. Lead for Q1 can be cut to any convenient length.

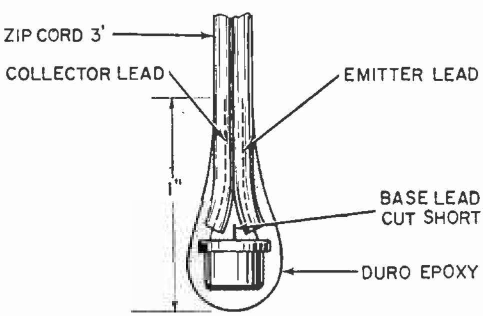
PARTS LIST

B1, B2—1.5-volt penlite cell (Burgess Z cell or equiv.)
J1—Phone jack (H. H. Smith 75 or equiv.)
M1—Dc meter, 0-50 microamperes (Triplett M series or equiv.)
P1—Phone plug (H. H. Smith 222 or equiv.)
Q1, Q2—Rr-if transistor, general purpose, see text (Allied Radio 39A642 or equiv.)
R1—See text
R2—See text
S1—S.p.s.t. toggle switch
1—Meter cabinet (Bud CMA-1936 or equiv.)
1—Dual penlite cell battery holder, or two single units (Keystone 140 or equiv.)
Misc.—3" x 4" 1/16" Bakelite perforated strip, flea clips, 3-feet lamp zip cord, hardware, epoxy, etc.

Estimated cost: $8.25
Estimated construction time: 3 hours not counting epoxy curing time



Experimental setup for selecting the best transistor and calibrating the meter in °F.

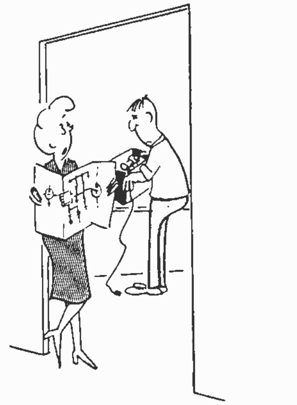


Transistor Q1 is completely encapsulated by applying duro epoxy to it in successive layers.

THE XYL

By H. E. Holland

"You can't miss it, Sarah. Our QTH has a red roof and Ed will be out front shoveling snow."



"Of course you're right, dear. I'm looking to see if this schematic is."

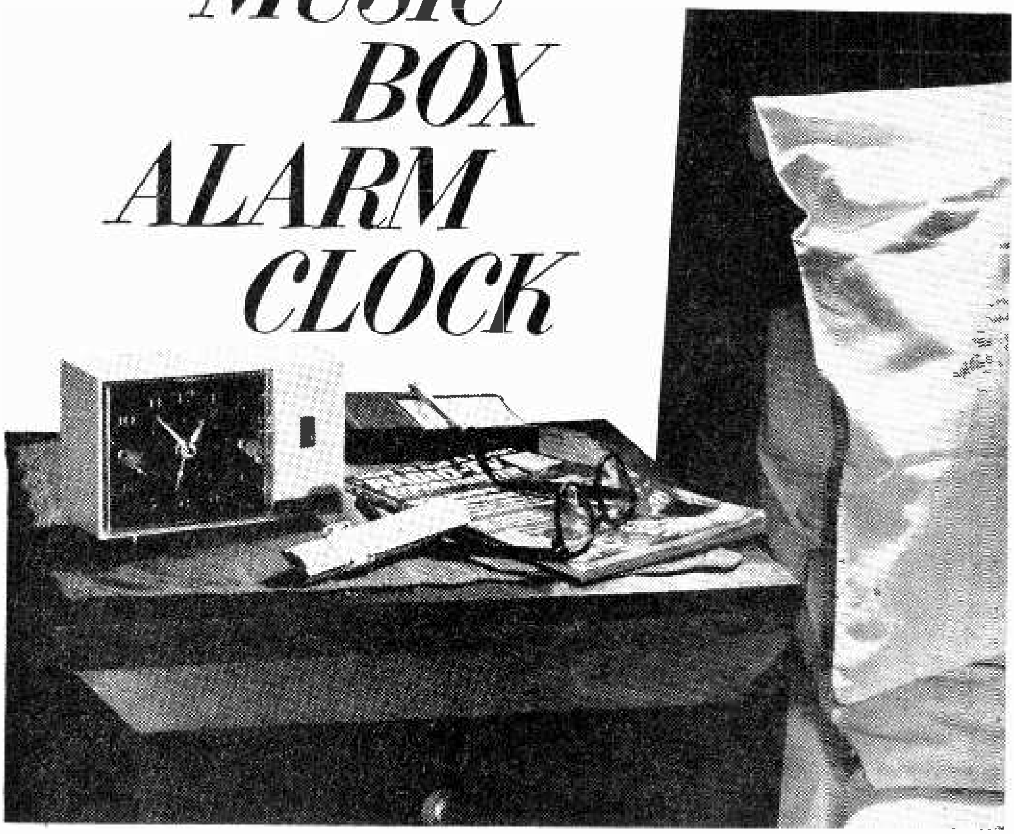
"Oh, Ed, my signal reports are 5' by 5' since you put up that inverted 'V'."

"Whatcha mean, 'you hadn't time to fix dinner yet?' "

"No wonder all the tubes are loose— the way your tongue rattles."

"Call back in about two hours, Sarah. She's busy on another line right now."

MUSIC BOX ALARM CLOCK



Beating the path back from Slumbersville can be made in waltz time with a miniature electric carillon

By Leon A. Wortman

If **you** dislike being awakened by a raucous, buzzing alarm, or don't want to risk the shattering sounds of a brass band on the clock radio, but prefer to be awakened gently each morning, this project is for you. It can be built by adding only three components to a commercially available electric alarm clock. Neither the wiring nor the mechanism of the clock need be modified, nor is it necessary to have any components external to the clock.

Neat Package. Most clock and timer mechanisms come in a plastic case that has sufficient free space inside for the necessary music box movement, resistor, and silicon rectifier diode.

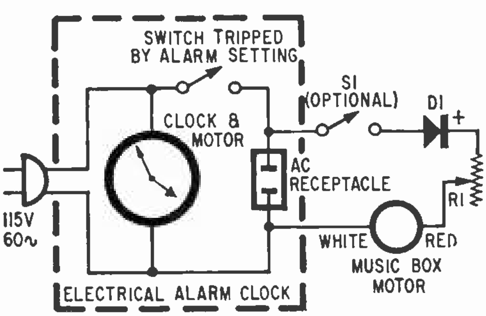
The first step is to remove the round knurled time-setting knob from its shaft on the back of the clock. Grip the shaft with a pair of pliers between the knob and the clock's back plate. Rotate the knob counterclockwise and it will come off the threaded shaft. Now remove the back plate. The interior of the clock is now exposed and ready to receive the music box components.

Wiring. It is easiest to wire the components before mounting them in the clock case. Following the schematic diagram and the photographs, connect and solder the components, keeping the leads just long enough to work comfortably. When connecting the silicon rectifier diode, observe the polarity shown in the schematic diagram. Connect one lead to a terminal of the clock's AC receptacle and the other to the upper fixed terminal of the resistor. Solder the red wire from the music box movement to the slider terminal of the resistor, and the white wire to the remaining terminal of the AC receptacle.

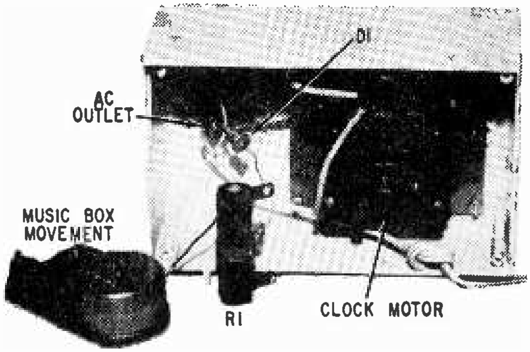
Mounting. Epoxy resin and hardener, available in 2-tube sets in all hardware stores, is used to hold the musical movement and resistor in place inside the clock case. Looking at the back of the clock, place it on its left side on a flat surface. After mixing the resin and hardener, apply the epoxy to the bottom of the music box movement and set it on the left side of the clock case. Be careful not to let any epoxy touch the moving parts of the movement. Position the movement so it doesn't touch metallic parts of the clock. Also allow room for replacing the back plate. Allow the clock to rest on its side at least overnight, long enough for the epoxy to harden.

After the movement is secure, put the clock upright to glue the resistor in place. Glue the unconnected end of the resistor to the case of the clock. The position is not critical; it's important only that no other part of the clock's mechanism or wiring touch the resistor. Leave space for replacing the clock's back plate and, as before, allow time for the epoxy to harden before moving the clock.

Gears, Switches, and Trips. The clock mechanism includes an electric switch that is tripped at the time for which the alarm is set. This switch applies power to the AC receptacle on the front of the clock case. The diode rectifies the AC to DC for operating the motor of the music box movement. And the resistor limits the current through the motor which also controls its speed. The slider on the resistor provides the means for setting the current, or speed, limits. To find the best setting for the slider, move it to the unconnected side of the resistor. Now plug the clock into the house current and turn the clock's control knob to the On position.



The music box motor circuit connects across AC receptacle—music while your coffee percs.



Part location is determined by available space and your knack for mounting parts in tight corners. Be sure to check for shorts.

PARTS LIST

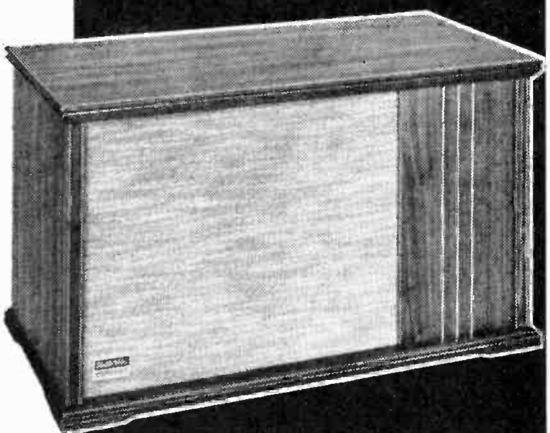
D1—Silicon rectifier diode, 200 PIV, 750 ma. (International Rectifier SD92 or equiv.)
R1—2500-ohm, 25-watt resistor with slider
S1—S.p.s.t. toggle switch (optional)
1—Music box movement (Order from Olson Electronics, 260 S. Forge St., Akron, Ohio)
1—Timer-alarm clock (Olson Electronics, Stock No. X-901)
Misc: Wire, epoxy and hardener, solder, etc.

Estimated cost: $12.00
Estimated construction time: 1 hour

Slowly move the slider toward the connected end of the resistor. Stop when the music box movement motor starts to operate. Turn the control knob off and on several times; if the movement doesn't start each time the knob is On, reset the slider a fraction of an inch closer to the connected terminal. Repeat the on-off sequence until you are satisfied that the movement starts reliably.

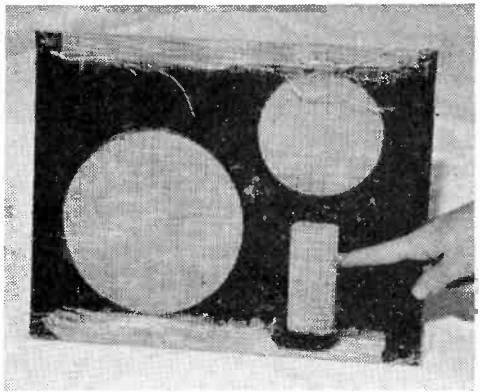
Set and Sleep. The clock's alarm setting is used in the conventional way. Usually an explanation of the clock controls is included with the timer movement. When the alarm is tripped, power is applied to the music box movement which continues to run until stopped by turning off the alarm clock's appliance circuit. If, after you leisurely awake to the music box, your morning becomes a hectic timed-to-the-last-minute affair, an extra switch can be added to the clock for further convenience. By placing a single-pole single-throw toggle switch in line with the music box movement, you can leave power on the AC front panel receptacle while turning off the music box. So, if your electric coffee pot is plugged in ready to "perc" at the crack of dawn, it will not be turned off when you turn off the music box alarm. ■

BOLT TOGETHER SPEAKER SYSTEM

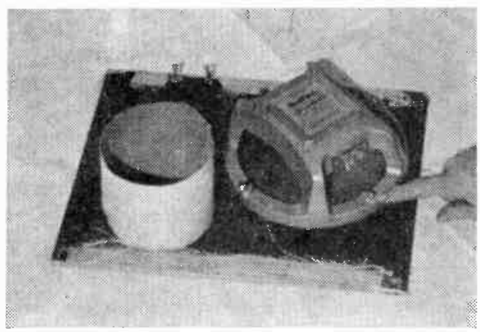


ELECTRO-VOICE KIT TAKES 20 MINUTES TO ASSEMBLE— NEEDS NO TOOLS, NO SOLDERING, NO MESSY FINISHING

RADIO-TV EXPERIMENTER LAB CHECK



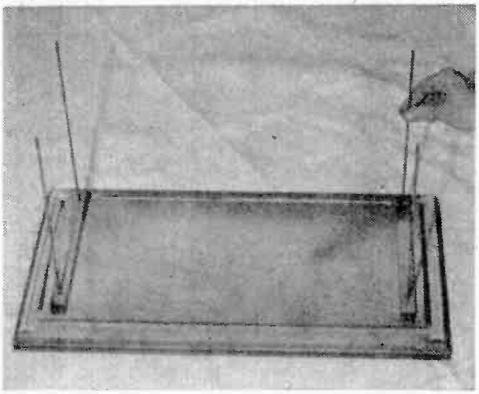
Finger indicates pre-cut tweeter opening in the front panel (above). The smaller of the two round cutouts is for the ducted-port tube. Typical of the wingnut-bolt assembly used by Electro-Voice, the bolt passes through the speaker mounting holes into a captive nut in the front panel as shown in the photo below.



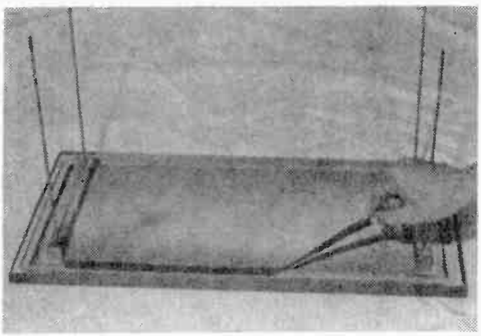
EVEN if your hi-fi gear is in the *save-a-buck* category, there's no reason why you can't have a true-sounding, decent-looking speaker system sacrificing virtually nothing in performance when compared to larger, more expensive units.

The secret to low budget good looking sound is the Electro-Voice Coronet speaker kits. Hold on! Don't run away! Sure we know about those speaker kits where you get a few cans of paint which are supposed to give "the look of real hardwoods" (providing you're an expert finisher). And we know about those kits where you need a carpenter's shop for assembly. No, the E-V Coronets require no tools other than a pair of scissors, they can be assembled by a seven year old child and they are pre-finished. Yes, pre-finished—you paint, brush and spray *nothing*. And wonder of wonders—no glue either.

The Coronet kits come with your choice



Four threaded rods (above) squeeze the top and bottom of the cabinet together against the sides. To prevent resonances at the joints, an adhesive gasket (below) is used to "insulate" the cabinet sections. The completed assembly will be as rigid as a glued-and-woodscrewed cabinet store-bought.



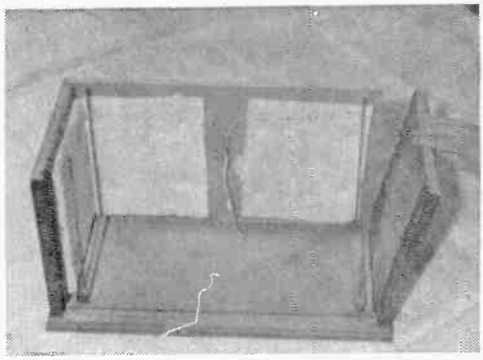
of one of four speakers. Regardless of the speaker choice a basic cabinet is used; a "bookshelf" type with an oiled walnut finish. Actually, a walnut veneer applied to a ¾ inch wood panel. The panels are tongue and grooved, precut to size with excellent accuracy; the finished product looks strictly *pro*. Unless you brag no one can tell it's a kit.

The cabinet assembles *only* with wingnut-bolt combinations. Whether you're mounting a speaker or locking the cabinet together all you do is tighten a wingnut—no glue, no screwdriver, and no pliers.

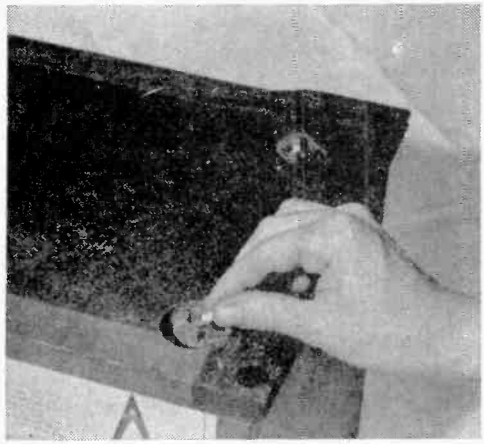
To insure that the cabinet is resonance free at the joints an adhesive gasket—cut with scissors—is applied to all joints.

Photo Proof. The pictures tell the whole assembly story. If you think it looks easy you're right—it is. Total construction time is fifteen to twenty minutes. When you're

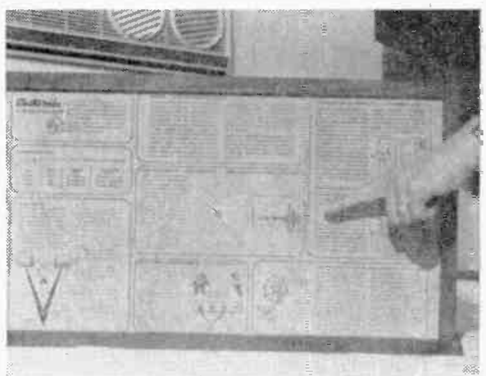
(Continued on page 134)



The sides are placed in position and then the bottom piece will be fitted on top. Note use of heavy sound absorbing padding. Hanging wire pair connects speaker (and tweeter).

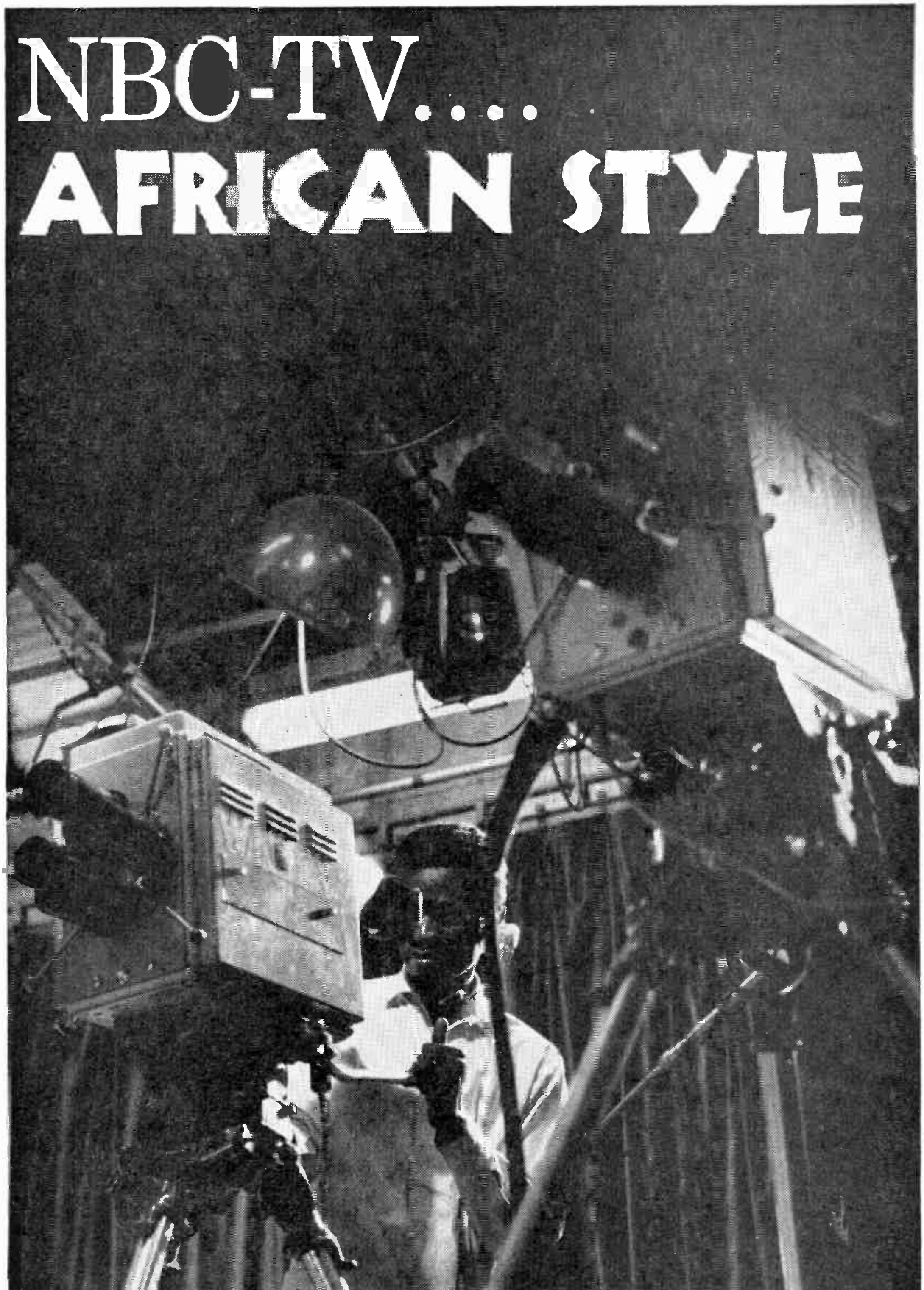


Four wingnuts on the bottom piece lock the cabinet together completing the "no-tools-needed" assembly. The nuts fit in recessed cutouts so they cannot scratch your shelves.



To permit trouble-free expansion in the future, pictorial wiring diagrams and instructions for tweeter and tweeter control connections are printed on cabinet's back.

NBC-TV.... AFRICAN STYLE



TV lights the once dark continent

To African television viewers, NBC-TV means *Nigerian Broadcasting Corporation*, the first network in the newly emerged states of the continent. "First in Africa" proclaims a sign on the 26-story skyscraper in Ibadan, Nigeria's largest city, where the network's central offices are located. From these studios are televised a variety of shows daily to viewers within a radius of 90 miles, as far away as Lagos, Nigeria's capital and port city on the Gulf of Guinea. NBC also has a studio here, which means that most Nigerian TV fans have a view of all the important people and occurrences and entertainments in Nigeria's two leading cities. A studio at Enugu, to the east, completes the network. There are about 100,000 television sets in Nigerian homes, each costing an average $160.00, though owners can purchase them with a down-payment of $60.00.

Programming. Daily, five hours of programming are televised. Local producers are, of course, influenced by American and European show styles, but program content is equally determined by local tastes and other conditions, and also budgetary limitations. There is a demand for live television theatre, for example, but such plays are only rarely televised because an hour's time costs up to $2,000 and there are few professional actors available. Most TV performers are amateurs from community or university stages.

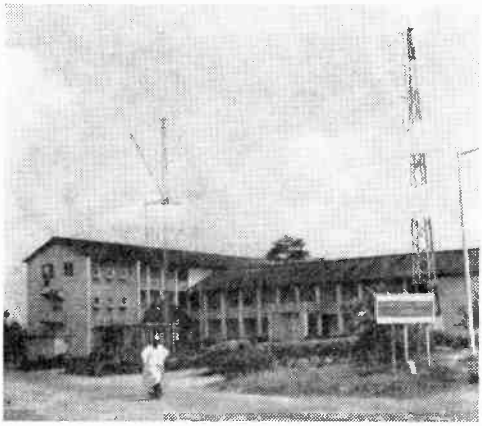
Mornings, there is a single program, mostly educational, which runs 90 minutes; the home screen doesn't resume until six p.m., when a newscast is televised. An amusing show, dealing with Nigerian daily life, follows. It is in the Yoruba language, the indigenous tongue of one of the largest (about 5,000,000) ethnic groups in southern Nigeria. All other programming is in English, the official language. Always scheduled after this show is a film which will appeal to both adults and children—inevitably, an American "western." A star-studded feature movie follows, usually a Hollywood product. Afterwards, a locally produced "Women's Magazine" is televised, and the end of the viewing day comes at about nine p.m., when an international news film jetted in from London is shown.

Although the government partly owns the Nigerian Broadcasting Corporation, there are many commercials for products, and for the usual costly reasons. Local politicians haven't made much use of the medium in their campaigns, however. All claim, privately, that they are dissatisfied with their image as projected by TV.

Program director signals cameraman during production of popular program "Aunt Ebun and Musa." He monitors position, angle, and sequencing of three cameras from screens on the console layout in front of him.

The 90-minute morning program is mostly educational and cultural. Dances and games deriving from Nigerian folklore often appear.

Segment of morning program for youngsters shows Julie Cocker and partner, who wears head of mammal well known to audience.



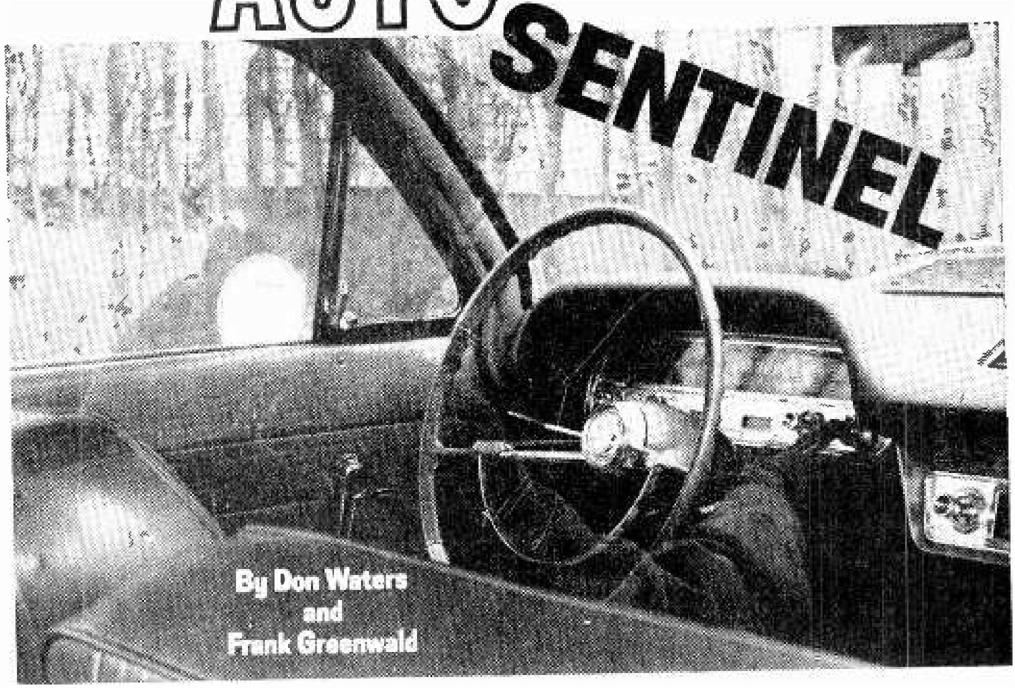
The Broadcasting House at Lagos is one of the three radio-television studios in the country.

Educational TV. The network is making a significant contribution to the Nigerian people and to all of the new Africa, as well. In the works is a project to erect collective reception centers with very large television screens where as many as 200 people might view a program simultaneously. Such shows would be educational, now the most popular type televised. Ratings indicate a preference for documentaries on foreign countries, discussions in Yoruba on daily problems, and lectures which teach something—how to purify drinking water at home, for example.

Of significance to the rest of emerging Africa is the fact that the network's entire staff—actors, directors, writers, technicians—learned their business in the local studios. As other stations open elsewhere in Africa, their staff's come first to Nigeria to learn television production. For it is indispensable to the success of television in the new Africa that all personnel be African, and at present NBC-TV is the only network on the continent with the facilities to support this optimistic point of view. ■

Lovely Julie Cocker is one of Nigeria's favorite TV personalities. Lagos is her home studio.

AUTO SENTINEL



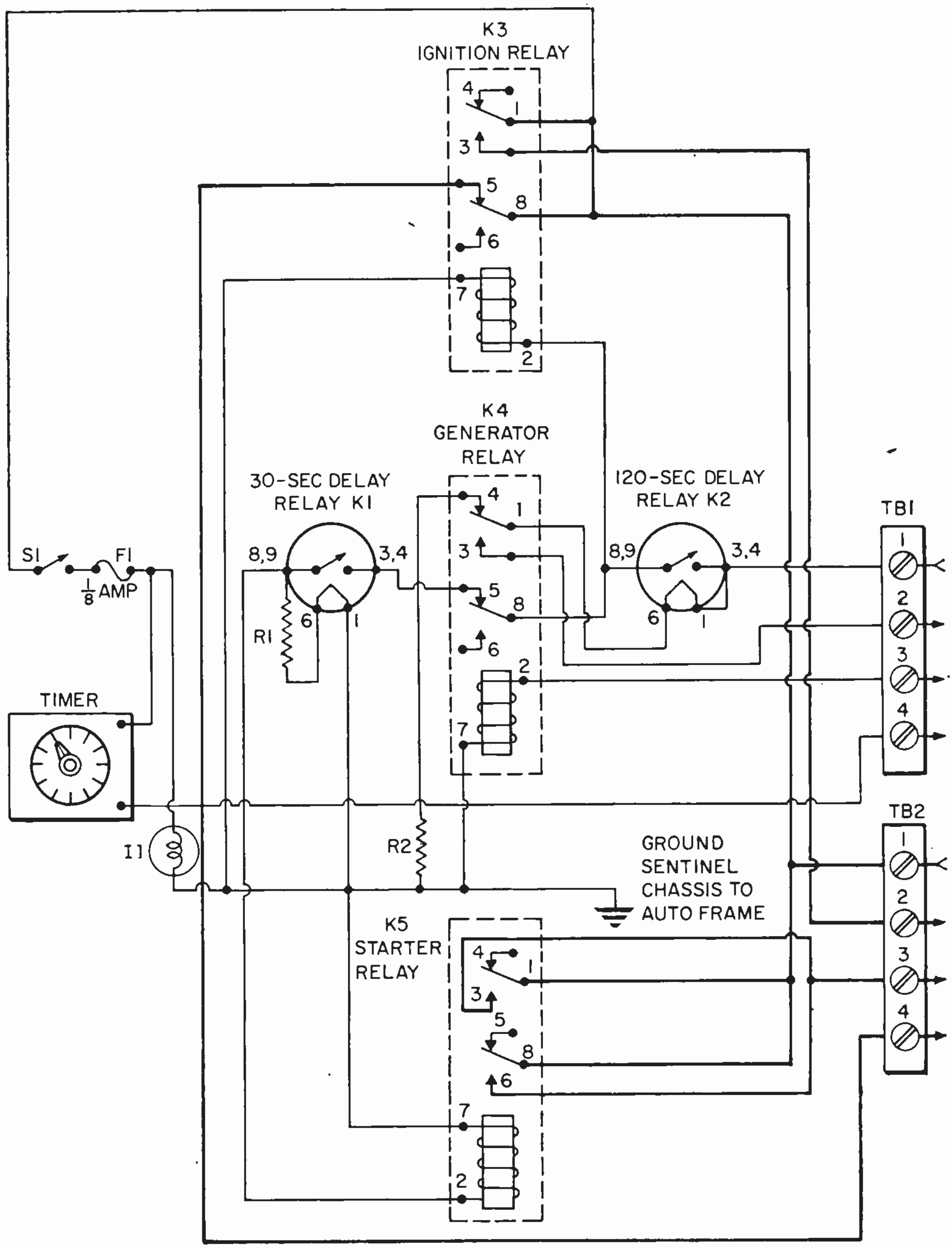
Electronics thaws out Jack Frost by keeping the heat in your car

Got the cold winter blues?—and especially when it comes to winter motoring? This clever electro-mechanical device will take some of the bite out of old man winter. One of winter's biggest bites occurs the first thing in the morning; you step out of a toasty warm house into a blustery gray winter morning and step into your car which feels even colder and proceed to crank it over. Several seconds later you thankfully uncross your fingers, listen to the cold, sputtering, wheezing engine, and settle down to waiting for it to warm up enough to drive. That's first on the agenda; you can't think of putting on the heater until you're several miles down the road.

How much nicer to find your car running and warm when you go out in the morning; and *you can!*—with this chauffeur-duplicating unit.

What Starts It? You can either instruct your "chauffeur" to start your car when the temperature drops below a certain mark, or you can have it started, say 10 or 15 minutes, before you leave the house. Two "hearts" of the auto sentinel allow this selection. One is a 12-hour timer and the other is a small temperature switch. The timer can be left at its zero position and the temperature switch will thermostatically start and stop the car to maintain engine temperature between 120 and 170 degrees. This arrangement is ideal for a "get away" car when your car has to roll at a moment's notice.

But the second option is ideally suited for most of us who have a fairly established routine. If you normally leave your home or work on a fairly routine basis, preset the timer for the span of hours until you'll be away less the warmup time you desire and you're all set. Leave the heater and defroster in the On position when you leave the auto and you'll have a frost-free windshield to boot. At the predetermined time the timer interlocks close, initiating the engine start and run condition. As a safety measure, the temperature switch then takes over and turns the engine off when it reaches the normal op-



Connections made to terminal boards TB1 and TB2 in chassis box from car's wiring.

TB1-1—From series connection of drive selector switch and engine temperature switch S2.

TB1-2—To low oil switch on engine block.

TB1-3—To voltage regulator armature terminal.

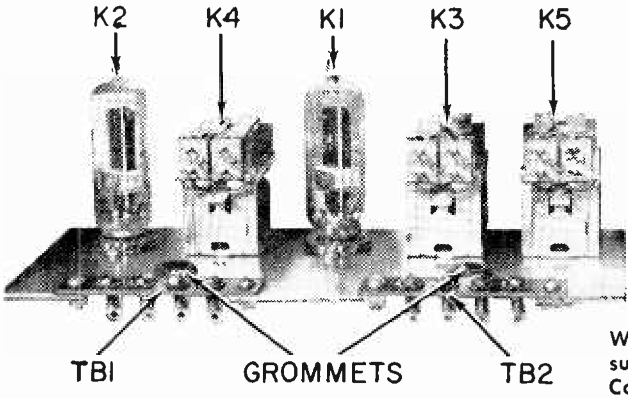
TB1-4—To series combination of drive selector safety switch S3 and engine (radiator) temperature switch S2.

TB2-1—Hot line from auto battery.

TB2-2—Tap to ignition switch auto accessory circuit.

TB2-3—To parallel combination of starter solenoid and accelerator solenoid K6.

TB2-4—To hot side of ignition switch ignition circuit.



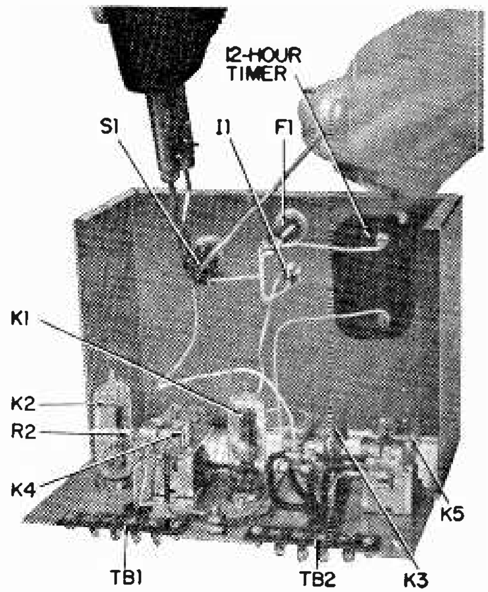
The five relays along with terminal boards TB1 and TB2 are mounted on a 3⅜"x7⅞" scrap aluminum. Follow parts arrangement to avoid trouble.

erating temperature. So if you oversleep or are otherwise delayed, the car does not run continuously but only maintains the engine about 120 degrees or more. The author's automobile, for example, will start and run four times an hour on a −10 degree day.

Safety Features. The circuit is designed to prevent a prolonged engine cranking condition if the engine will not start. The delay relays provide three separate starting attempts. Failure to start after the third attempt turns the unit off. No further action occurs until the sentinel is turned off and a two or three minute period is allowed for the timing delay relays to return to normal.

Low oil pressure protection is provided through the 1 and 3 interlocks of the generator relay, K4 (see schematic diagram). Once the engine is started, the generator relay is energized from the output of the generator armature. This relay, K4, has a triple purpose in that upon energization it immediately disconnects the starter circuit through the 8 to 5 interlocks; it also interrupts the timing

Wire up unit before installing relay subassembly inside of chassis box. Complete assembly of unit—be sure all parts are securely mounted to take the road and motor vibrations.



AUTO SENTINEL PARTS LIST

F1—⅛-ampere fuse and holder (Allied Radio 52B230 and 41B720, respectively.)

I1—Indicator lamp and assembly (Allied Radio 7E513 and 7E781, respectively.)

K1, K2—S.p.s.t., normally closed delay relays, 30 and 120 seconds, respectively, (Amperite 6C30T and 6C120T or equiv.)

K3, K4, K5—Switching relays, 6-volt DC coil (Potter and Brumfield Type GPD or equiv.)

K6—intermittent-duty solenoid, 6-volt, 2-ohm, ⅛" to ⅞" stroke, 39-ounce lift (sufficient for most cars), (Guardian Electric Mfg. Co. No. 11 or equiv.)

R1, R2—22-ohm, 2-watt fixed resistors

S1—S.p.s.t. toggle switch

S2—Temperature switch with mylar sleeve "Fascostat". Order directly from: Fasco Industries, Inc., Agusta at North Union, Rochester, N. Y., 14602

S3—Mechanically actuated, snap-action, S.p.s.t. switch (Operating force and pre-travel determined by the make of automobile.)

TB1, TB2—4-prong terminal strips

1—Aluminum chassis, 8" x 6" x 3½" (Bud 3009A or equiv.)

1—12-hour timer with normal closed contacts that open when time is set (M. H. Rhodes type 90,015—accept no substitutes.)

Misc.—Scrap aluminum, cotter pins, epoxy cement, No. 12 and 20 wire, 9-pin tube sockets (2), nuts, bolts, solder, etc.

Estimated cost: $30.00

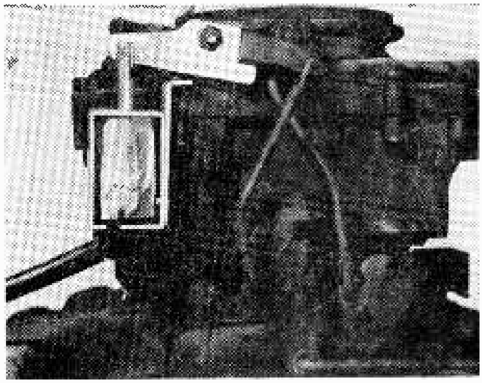
Estimated construction and installation time: 12 hours cycle of the ignition timing relay, K3, through the 1 and 4 interlocks. The 1 to 3 interlocks continue to provide heater current to the 120-sec. delay relay, K2, until the low oil pressure light goes out.

A drive selector safety switch, S3, is located at any convenient position on the lower portion of the steering column. It should be connected so the switch will be held closed electrically with the drive selector in Neutral or Park only. This switch has a two-fold purpose: primarily, it won't allow the engine to be started while the auto is in gear, and secondly, it will automatically stop the engine without the ignition key.

Contruction And Wiring. The unit is contained in an 8" x 6" x 3½" aluminum cabinet. As shown in the photographs. the timer, fuse holder, indicator light, and power switch are mounted on the front panel. The remaining five relays are mounted in a row on a 3⅜" x 7⅞" scrap piece of aluminum that forms a chassis base when mounted in the cabinet an inch above the bottom. The arrangement of the relays and the terminal strips provides the optimum wiring arrangement. The leads from the ignition and starter relays to the four prongs of terminal board TB2 are all No. 12 wire (shown heavy on the schematic diagram). The remaining wiring is No. 20. The starter relay interlocks of starter relay, K5, are wired in parallel to handle currents up to 20 amperes. The accelerator solenoid, K6, is connected in parallel with the starter solenoid to trip the automatic choke and pick up the fast idle cam on the carburetor.

Installation. In addition to the ground lead from the sentinel chassis to your auto's ground, there are eight leads that must be connected from terminal strips TB1 and TB2 to various points in the automobile. Most are direct electrical connections, to your low oil switch, for example, and will vary according to the year and make of your car. Two connections bear mentioning: 1. Accelerator Solenoid. The mounting and linkages can be made from scrap aluminum and will have to be engineered for your particular automobile. The author's installation in an Oldsmobile is shown in the photograph. Care should be exercised to provide ample clearance between the linkage of the accelerator solenoid, K6, and the accelerator linkage so normal acceleration and deceleration is not impaired. The leads to the solenoid should then be snaked to avoid entanglement with mechanical linkages.

2. Engine temperature switch, S2, should



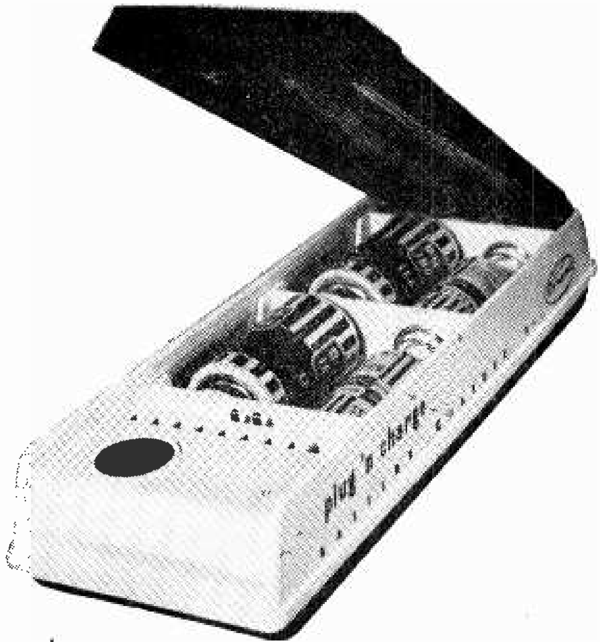
The accelerator solenoid, K6, takes a bit of doing to mount correctly. In no way should it interfere with your car's accelerator linkage.

be mounted on top of the radiator header. The switch is electrically hot and must be enclosed in its mylar sleeve after the two leads are soldered to its terminals. To secure the switch to the header, place a generous amount of epoxy type cement on the radiator and place the switch into it. Do not move the assembly until the epoxy has set up. A warm engine, incidentally, will usually speed up the epoxy curing time.

The sentinel itself can be located anywhere in the auto that you find convenient. Remember, if your car is running in a garage, take precaution to ensure adequate ventilation. If you Florida and other sub-tropical readers feel slighted at all this concern to increase the comfort of those who must endure the great northern winters, don't be. What about your summers? Are they uncomfortable enough that you've got an air conditioner in your car? Then set the auto sentinel to cool it!

Admittedly, this project should not be attempted by the novice experimenter who has never "fooled" with his car's wiring. Before going ahead with this project, obtain a service manual for your automobile from the manufacturer. They can be had for about five dollars, but price will vary from dealer to dealer. Study the electrical circuit until you fully understand it. You may find that there are changes and adaptations you wish to make which are beyond the scope of this article. One important fact to remember, the Auto Sentinel is not a substitute for a recommended service station maintenance program such as tune up, *winterizing*, new points and spark plugs. If your car is a hot performer in the late fall, then the auto sentinel will keep it hot when ol' man Winter blows. ■

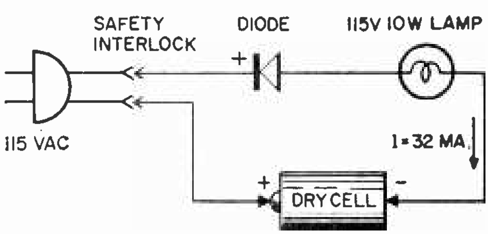
PEP UP THOSE DYING DRY CELLS



Inexpensive battery charger keeps children's toys and flashlights in fully-charged dry cells

What do you do when a dry cell grows weak? If you toss it into the trash can, you stand to lose about $3.00 every time. Why? Dry cells can be *recharged* to give up to 15 new lives, and at 20¢ per life you stand to lose a lot. The "Plug'n Charge" home battery charger sells for $5.95 and it can recharge D, C, and AA dry cells as well as the popular 9-volt batteries found in transistor radio. It doesn't matter whether they are carbon-zinc, alkaline, nickel-cadmium or mercury varieties, the charger's half-wave rectifier circuit pumps 32 ma. of pulsating current through the cells. A handy chart on the bottom of the unit tells you how long to charge each type. Powered from the AC line, the charger has a power interlock making it safe for the fumble-hasty housewife. To order or obtain information, write to *Dynamic Instrument Corp., E. Bethpage Rd., Plainview, N. Y.* ■

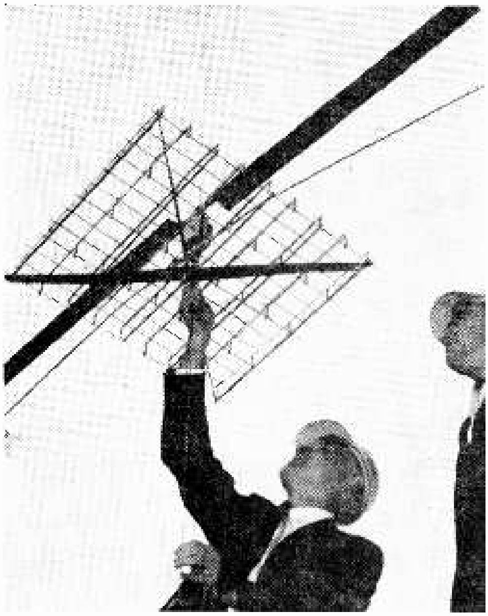
Top photo shows charger ready to charge D and C dry cells once lid has been closed. Below, 9-volt battery is about to be charged.



Simple enough to build yourself, the circuit requires a power diode rated at 100 ma. at 200 PIV or better. A 10-watt tungsten lamp serves as the current-regulating ballast tube.

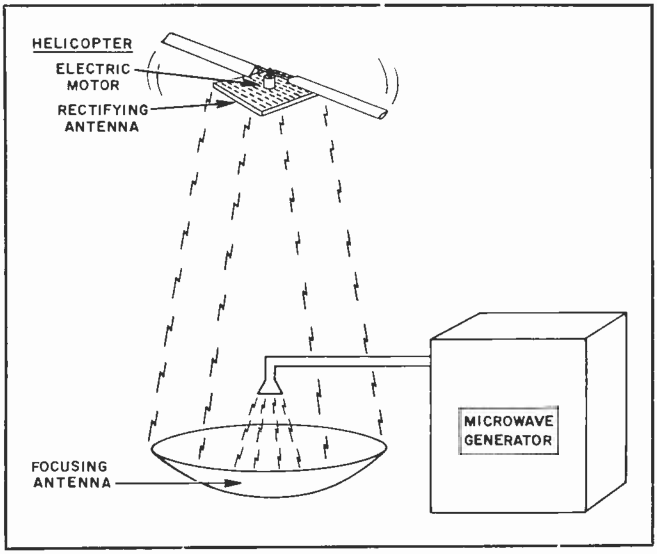
The Helicopter that Flies on Radio Waves

It took 65 years to make a Science Fiction dream come true

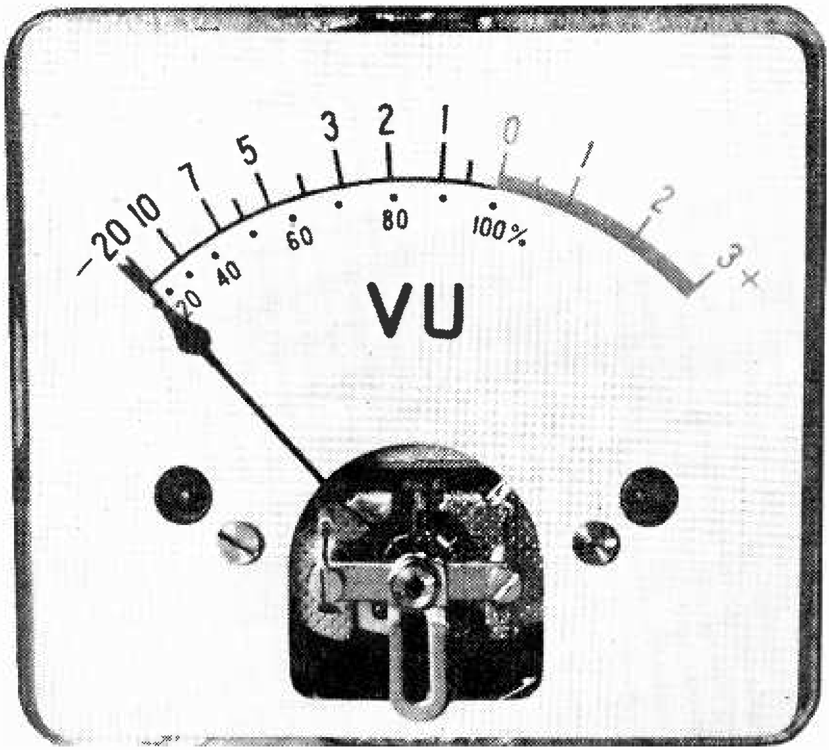


In 1899, Nikola Tesla constructed a 200-foot Tesla coil rated at 300 kilowatts and 150 kilocycles. Tesla hoped to set up standing-waves of electrical energy around the whole surface of the earth, so that receiving antennas set at optimum points could tap this power when needed. Tesla's plan failed, but 65 years later Raytheon's Super Power Laboratory employing all the modern resources of radar and solid state electronics demonstrated that radio waves could fly a small model helicopter. The demonstration consisted of generating 400 watts of RF power at 2450 mc., focusing this power into a narrow microwave beam. The helicopter's antenna received the power, and rectified the microwave energy into 102 watts of DC power driving the 'copters electric motor. Although this was a modest demonstration, Raytheon successfully demonstrated microwaves someday would be used for power transfer purposes. —*J. Sienkiewicz*

Raytheon engineers (above) ready specially constructed helicopter for its 50-foot flight. Wire grille antenna contains thousands of tiny glass-bead diodes that rectify the RF signal as it is received. Since the copter was unmanned, wire tethers limited flight to a true vertical only. Focusing antenna (right) is of the parabolic type designed to beam microwaves straight up to 'copter.



How to make better tape recordings...



BUILD A VU METER

By Herbert Friedman

Professional recording engineers tell us . . . You've got to use a *volume level indicator* to get best results from a tape recorder." Why? Because the signal-to-noise ratio and distortion are determined by the recorded sound level. Actually, the record and playback amplifiers are virtually distortion free; whatever distortion exists is primarily determined by the *recorded level on the tape*.

"But of course," you say, "all recorders have some kind of level indicators, so what's the big deal?" The answer is that word *indicator;* exactly *what* does *your recorder's indicator* indicate?

Up until recent years most moderate priced tape recorders and some expensive ones used "eye tubes" or flashing neon lamps to indicate the *maximum recording level.* When the recorder's input signal is sufficient to drive the tape just to the overload point the eye tubes close and the neons flash. But if the signal is just short of maximum the eye doesn't close and the neon doesn't flash—so what's on the tape? Is the signal near the optimum level or is it down in the noise level? And if the eye tubes do close and the neon does flash is the sound level at maximum or has maximum been exceeded—you don't really know. All these peak indicators tell you is that at some point the recorded signal has been at or near maximum.

Perhaps you'll get a picture of the need for a *good* recording level indicator by examining the effect of recorded level on tape playback.

Tape and Distortion. Tape recorder specifications are referenced to a specific distortion level. Since the electronic circuits are usually distortion free the total harmonic distortion (THD) on playback is considered the tape distortion. The usual practice is to establish the maximum recording level at the point which produces 2% THD on playback. (Some recorders use 3% THD as the reference level.) The noise figure is then referenced to the recorder input level which produces 2% THD. For example, record and playback controls are set "wide open" and the input signal (sign wave) is adjusted to produce 2% THD on playback. The generator is then disconnected from the recorder, the input is terminated with a resistor equal to the signal generator's output impedance, and the noise level is measured. If the noise level is, say, −50 db, it is the *optimum* figure; in actual use the noise figure is less.

Since the input level which produces 2% THD is virtually tape saturation, increasing the input signal level only causes the distortion to rise sharply, without a corresponding increase in output level (amplitude distortion).

Fig. 1 illustrates the distortion and noise effects at tape saturation (2% THD). If the signal level is increased above saturation the distortion rises sharply. When the input signal is reduced below saturation the noise level is increased.

How does this all affect you? Let's take a typical case, a recorder equipped with a neon recording indicator lamp. To insure minimum distortion the recorder input is kept below the level which flashes the indicator—it lights only on occasional signal peaks. Well what exactly is the recorder input level—the lamp isn't telling you, it only says the level is below tape saturation. But how low, perhaps the level is 10 db below optimum, so the effective noise level appears to go up 10 db. If the optimum noise level is −50 db it is now −40 db, and −40 db is easily heard.

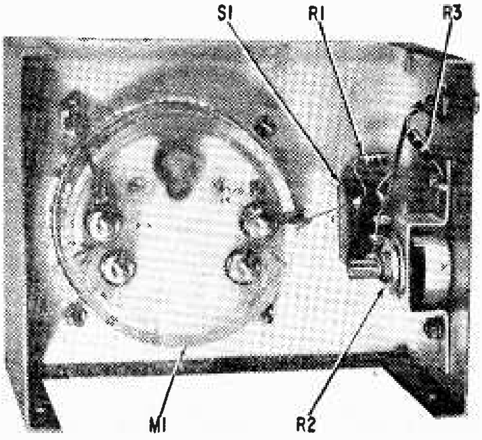
Then again, suppose you find the tape noise (hiss) extremely annoying and you try to overcome it by recording as close as possible to the saturation level. The flashing lamp doesn't get any brighter when maximum level is exceeded. (True, an eye tube will overlap slightly but there is a limit to overlap.) How do you know when saturation has been exceeded—you don't know until you play the tape back and hear the distortion.

So you see, lamps and eye tubes aren't the best means of indicating recording level.

PARTS LIST

J1—Phono jack
M1—VU meter (Lafayette 99G5043 or equiv.)
R1—See text
R2—100,000-ohm potentiometer, linear taper
R3—See text
S1—S.p.d.t. toggle switch
1—Aluminum cabinet, style and size optional—author used 3"x4"x5" box
Misc.—Potentiometer mounting bracket, wire, solder, hardware, etc.

Estimated cost: $10.00
Estimated construction time: 1½ hours



Note the meter has two sets of terminals. Extra set is the power connections for the panel lamps. If the meter is inoperative, connection has probably been made to the lamp terminals. Special bracket holding potentiometer R2 is standard stock; it can be made from aluminum scrap.

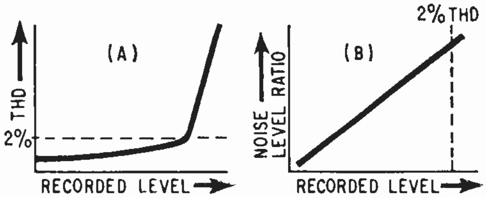


Fig. 1. The left graph (A) shows the effect of an increase in signal level past tape saturation, 2% THD. Attempting to get more output by increasing the recording level causes a sharp rise in distortion. As the signal increases, the signal-to-noise ratio (B) is improved. Optimum results are obtained when the signal is at the reference level—2% THD.

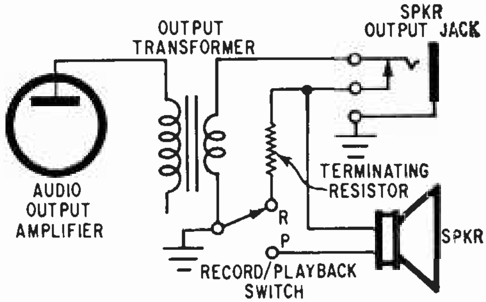


Fig. 3. Typical recorder output circuit. Note terminating resisitor is lifted when the speaker output jack is used. On some models the bottom of the resistor is connected to the top terminal of the jack and is never disconnected.

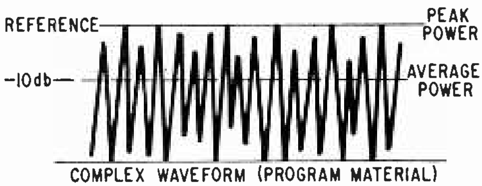


Fig. 2. Typical power waveform obtained with program material—speech and music. While peak power determines maximum recording level, a VU meter responds to average power which is 10 db below peak. When testing VU meter with sine-wave power, drop signal level 10 db to simulate peak power conditions.

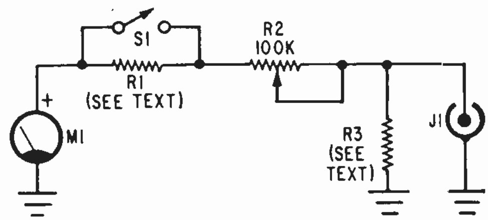


Fig. 4. This simple circuit allows the VU meter to be calibrated for any recorder. R2 calibrates meter for sine-wave tone. S1-R1 corrects reading 10 db to allow for "loss" when meter indicates voice/music program level.

VU Meter. To obtain tapes with "recording studio quality" use the indicator the recording engineers use—the VU Meter. Since the VU meter gives an accurate indication of levels above and below maximum the recordist sees a "visual picture" of exactly what is going on the tape.

The VU meter has built-in characteristics (called meter ballistics) specifically tailored for recording (and broadcasting). First, it does not indicate peak recording level; rather, it more closely follows the average sound power of program material—speech and music. If the VU meter were to follow peaks the pointer would swing so rapidly the eye could not keep track of what was going on. Instead, the pointer rises and falls slowly, giving the engineer a clear picture of sound energy. Actually, as shown in Fig. 2 the meter indicates about 10 db less than peak level on program material. When steady sign wave tone is applied then the meter has time to rise to the peak value. This is an important point to keep in mind when recording—we'll go into it later. (While the 10 db damping difference is of no concern *during* recording it must be taken into account when using tone to check the recorder.)

Where to Tie In. Connecting a VU meter to the average budget recorder is a relatively easy job, certainly within the capabilities of all readers—you just connect it to the recorder's speaker output jack.

A common recorder circuit is shown in Fig. 3—the AF power output tube is also the recording head driver. During playback the speaker is connected to the output transformer. During recording the speaker is disconnected and a resistor load is substituted for the speaker. (On some recorders there is a permanent resistor connected to the output transformer—even when the speaker is connected.) Since the output transformer connections are brought to the "speaker jack" a VU meter is easily connected; just plug into the speaker jack.

Of course, some means must be provided for calibrating the VU meter and terminating the output transformer, and Fig. 4 and the photos show the circuit that does the job.

Construction. The VU meter assembly is mounted in a 3 x 4 x 5 inch aluminum cabinet. To avoid upsetting the calibration, calibration control R2 is mounted inside the cabinet on a special "control bracket" which is available from most electronic parts distributors.

Resistor R3 is used only if your recorder uses a terminating resistor which is disconnected when the speaker jack is used; and R3 is exactly the value of the resistor in the recorder. For example, if the recorder uses a 4-ohm, ½ watt terminating resistor R3 is 4-ohms, ½ watt. If the recorder's terminating resistor is not disconnected when the speaker jack is used eliminate R3.

Resistor R1 is specified in the instruction manual supplied with the VU meter as 18,000 ohms; ignore it. Sometimes it is 18K and sometimes it isn't; the value must be determined for *your* particular recorder.

Calibrating the Meter. Set S1 to the calibrate and VU position (closed) and connect J1 to the recorder's speaker output—a standard audio patch cord can be used. Temporarily connect a 25,000-ohm potentiometer in place of R1 and connect a signal generator to the recorder input. Adjust the signal generator and the recorder gain controls so the neon lamp just lights or the eye tube just closes (with the tape running through the heads). Then adjust R2 so the meter indicates *"O" VU* (or 100%). Leave all level controls alone for the next step. Open S1 (the "peak" position) and adjust the R1 potentiometer until the meter indicates −10 VU. Since R1 and R2 interact to some degree, perform the two adjustments several times until the opening and closing of S1 always results in a 10 db difference *with the reference at "O" VU*. There will be several settings of R1 and R2 which will result in a 10 db difference but the reference won't be "O" VU. Don't be in a hurry—the meter *must* indicate "O" with S1 closed.

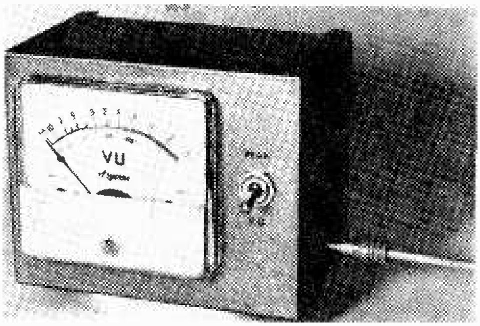
Carefully, without disturbing R1's adjustment, remove R1 from the circuit, measure its value with an ohmmeter, and connect a fixed resistor of the closest value across S1.

Using the VU Meter. For program material S1 is kept closed. Optimum recording level will occur when the average program peak causes the meter pointer to rise to "O". It is perfectly satisfactory for an occasional loud peak to rise the pointer into the "red region" (above "O"). Just make certain the level isn't so high the pointer continually slams into the right hand "pin". The meter's calibration provides a 10 db "buffer" below maximum recording level and an occasional rise into the "red region" will not cause tape overload distortion.

Remember that the meter is calibrated to provide optimum recording level. Adjusting the recorder's gain control so the meter never reaches "O" is only sacrificing signal-to-noise ratio—it won't improve sound quality.

When using tone for recorder tests the meter is calibrated for "peak reading" by opening S1—"O" VU indicating maximum recording level. However, keep in mind that you cannot run frequency curves at maximum level. The built-in recording equalization requires that frequency curves be run 12 to 16 db below maximum.

First, set S1 *open*. Then, feed in a 400 cps signal to the recorder and adjust the signal level for a −12 db reading. Holding the input signal steady, sweep the band within your recorder's frequency range, say

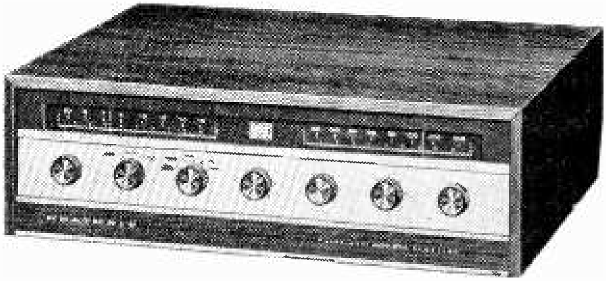


The completed unit gives a professional look to your recording setup. Keep an eye on the meter's pointer when manipulating the tape recorder's volume controls to different levels.

50 to 12000 cps. The meter reading will increase as the frequency is raised. At no time should the meter reading exceed "O". If any frequency causes the pointer to rise above "O" reduce the input level accordingly. Once you have established the correct cps, *close S1*, and note the meter reading—this is the input reference level for the recorder. Anytime you want to check the recorder just feed in a 400 cps signal and adjust the generator (or recorder gain control) for the reference meter reading—then sweep all frequencies. The recorder's playback output will then be an accurate reflection of the overall frequency response. ■

RADIO-TV EXPERIMENTER LAB CHECK

HEATH-KIT AR-13A All-Transistor Stereo Receiver



What are the features you'd be likely to find in a *deluxe* stereo receiver? All solid state, perhaps, to keep down heat dissipation? A positive stereo indicator which indicates stereo broadcasts even when the FM is set to mono? Or how about a rock-steady AFC that keeps the stations tuned in on-the-button even from a cold start? You could certainly work up a long list of desired features, but would you be able to find them in a moderately priced receiver? If you're thinking about the Heathkit AR-13A AM-FM Stereo Transistor Receiver the answer is yes; for packed into a single chassis is just about every convenience you can think of.

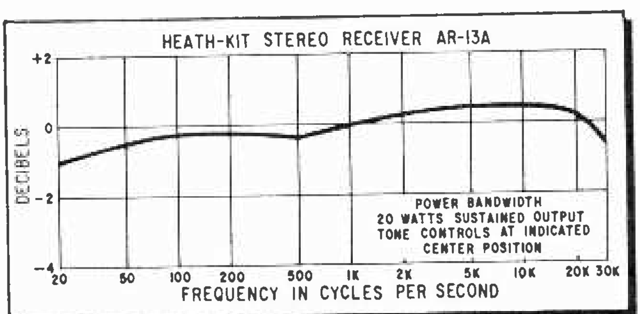
Designed-In Features. It would take too much space to list all the features—you can look them up in Heath's ads anyway—but a few of the major features are: Adjustable phasing of the 19 kc pilot signal (can compensate for component aging); MPX balance in addition to standard amplifier balance; FM squelch to keep the receiver quiet between stations; exceptionally good AFC: selectable SCA and stereo noise filters; and fused outputs to protect the transistors from destruction should the speaker leads be shorted.

And just a few examples of minor features which though not earth shaking are a decided convenience: Dual tandem tone and volume controls; individual pre-setting level controls on the magnetic and auxiliary inputs so you aren't jarred out of your seat when switching program sources of different levels; and a 4 ohm speaker output in addition to 8 and 16 ohms.

It takes 46 transistors and 17 diodes to get all these features into one package. Actually, the receiver is a combination—with a common power supply—of Heath's AM-FM Stereo tuner and 40 watt amplifier also offered as individual units. While there are a formidable number of components the potential builder should fear not; the circuits are broken down into four major printed circuits: the AM-FM IF strip, the MPX adapter and the two preamps. Each utilize their own PC board so the constructor handles small units. But as you might expect, it takes 16 hours to build the kit.

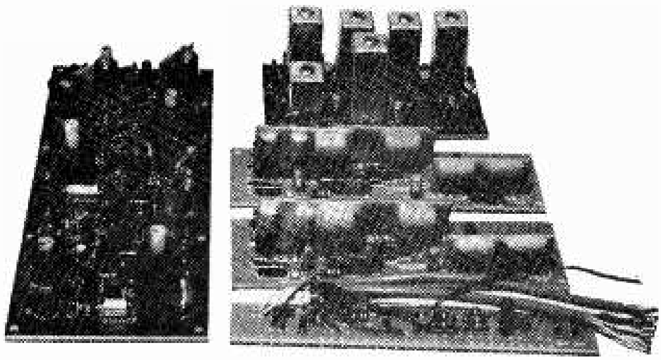
The really critical circuits—the FM tuner and IF and MPX coils—are supplied pre-aligned; the FM tuner is also prewired.

Though many controls are used Heath has avoided the "engineer's panel" appearance which is often confusing even to the most



The power bandwidth curve for Heath-kit AR-13A shows less than 1% variation in the listening spectrum with each channel driven simultaneously at full 20-watts by sinusoidal input.

Over half of the wiring is on five printed circuit boards and Heath wires one of them for you. The MX board (left), input circuit (bottom right), and two audio preamplifiers (middle right) can be wired in under ten hours. IF amplifier is pre-wired.



experienced of audiophiles. The controls and switches which are only occasionally used—or set just once—are hidden behind a *decor-cover* door running the full length of the front panel along the bottom. The only exposed front panel controls are the usual tuning, volume, tone, input and mode.

Alignment. Since the AM tuner, IF amplifiers and MPX are user wired one might expect a difficult alignment procedure. In fact, one might expect that a beginner might not be able to obtain optimum alignment. Such is not the case. Two alignment procedures are provided: instrument and non-instrument. The instrument alignment requires only quality service grade equipment and can be done—or should only be done—by someone *experienced* in instrument alignment of FM receivers. Actually, the instrument alignment offers very little over the non-instrument procedure. Most of the coils are pre-aligned and Heath supplies a notably easy procedure for the few user adjusted coils. The only requirement is that the user read carefully so as not to confuse a clockwise adjustment with a counterclockwise adjustment.

How It Checks Out. Of course, the final performance determines whether any equipment—kit or otherwise—is worth the money and time expended. So let's run down the audio section first.

This editor first heard the amplifier section when it was first offered as a separate unit, and thought at the time that a new high in sound quality had been obtained. It had a "certain something" which became known as *"transistor sound."* I have no reason to change that opinion now. The amplifier delivers a shimmering sound quality which is immediately apparent. The bass has a solid *thud* and the highs are delivered without stridency. The measured frequency response has no relationship to the actual sound because any modern amplifier shows good curves. The difference is in what the *ear hears,* and it hears some good sound from the AR-13A.

In addition to the built-in AM-FM a magnetic input with 6 mv. sensitivity for 20 watts output is provided plus two auxiliary inputs with a .25 volt sensitivity. Tape recorder jacks for each channel are connected before the tone and volume controls so that no changes to the amplifier control setting affect the recording.

Typical of transistor amplifiers the speaker impedance determines the power output; for example, at 1 kc., an 8 ohm speaker will pull 20 watts (sine wave) at .3% total harmonic distortion (THD) while a 16 ohm speaker pulls 13.5 watts at .390 THD PER CHANNEL. A four ohm speaker will pull 9 watts. While 4 ohm connections are not common to transistor amplifiers, Heath obtains this output impedance through an internal 4 ohm resistor which is automatically connected in series with a 4 ohm speaker—the amplifier "sees" 8 ohms.

Power Output/Channel (Watts) at .3% THD at 1 kc

4 ohms	8 ohms	16 ohms
9	22	14

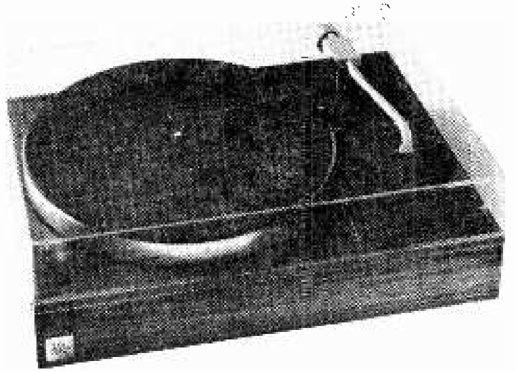
The overall performance was so close to Heath's specs that it's not worth taking up space. Whether the delivered performance was slightly more or less than claimed was insignificant and couldn't be heard.

The Tuner Section. The AM tuner is notably good for AM tuners with low noise even in the presence of large fluorescents.

The FM reception is excellent. The AFC is very *hard* and will grab a station even if the tuning is set to the very fringe of a signal's

(Continued on page 132)

RADIO-TV EXPERIMENTER LAB CHECK



ACOUSTIC RESEARCH XA
Two-Speed/Manual Stereo Turntable

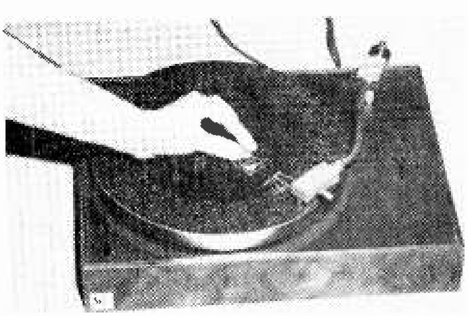
Take a few minutes and add up the cost of your amplifier, speakers and record collection. Even if you've only got a hundred or so records the investment is somewhere between $500 and $1000. So what's it worth to you to hear the music *exactly* as it was recorded? How much is a turntable worth which adds no coloration of its own—no wow, no rumble, no hum, no pitch changes. Better yet, what's it worth for a turntable which exceeds the stability of the best broadcast turntables; one that will keep the needle in the groove even when a bunch of teenagers use the music room for a dance hall. Is it worth $200 or $300? Maybe it is, but all it will cost you is $78, the price of AR's Model XA turntable.

The XA turntable is actually a "player", equipped with a 2 speed motor (45-33⅓), pre-mounted arm and oiled walnut base.

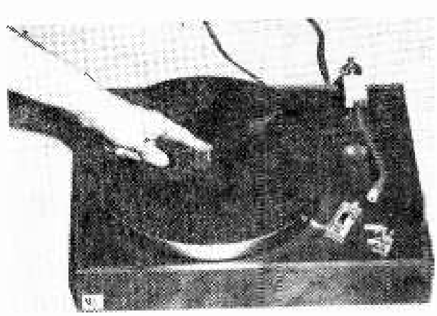
Two Motors. An unusual feature of this turntable is the motor, actually two motors. Think, what is virtually the most constant speed motor available at a reasonable price? That's right, clock motors; and the XA uses two clock motors which deliver a phenominal speed regulation. A strobe disc stands rock-still on the XA—no drift, no warble or shift; even when it is tested with a deliberately warped record which causes the needle to "dig in" on the "hills." And speaking on warped records, the arm pivot point is just about equal to the height of the record: this is the optimum point required for proper tracking of warped records. There is none of the familiar tone slide commonly caused by excess record warp, the AR plays "clean" even when the warp is just short of hanging the arm on the heel of the cartridge.

Wow and flutter is at rock bottom, it cannot be heard and it can't be measured because it falls into the residual reading on our wow and flutter meter. Pitch change, caused

(Continued on page 131)



A simple but extremely accurate stylus pressure is standard equipment with each kit.



Exact location for optimum stylus tracking is possible with AR's stylus overhang gauge.

PROPAGATION FORECAST

for February-March, 1965

By C. M. Stanbury II

Conditions for the next couple months will be approximately the same as they have been throughout this winter. The upper bands, especially 19 meters, will be somewhat more erratic due to a further deterioration in the F2 layer (for some mysterious reason this layer is at its reflecting best on the longest day of the year) and to emphasize this hazard, we have added that term *erratic* at appropriate points in the chart.

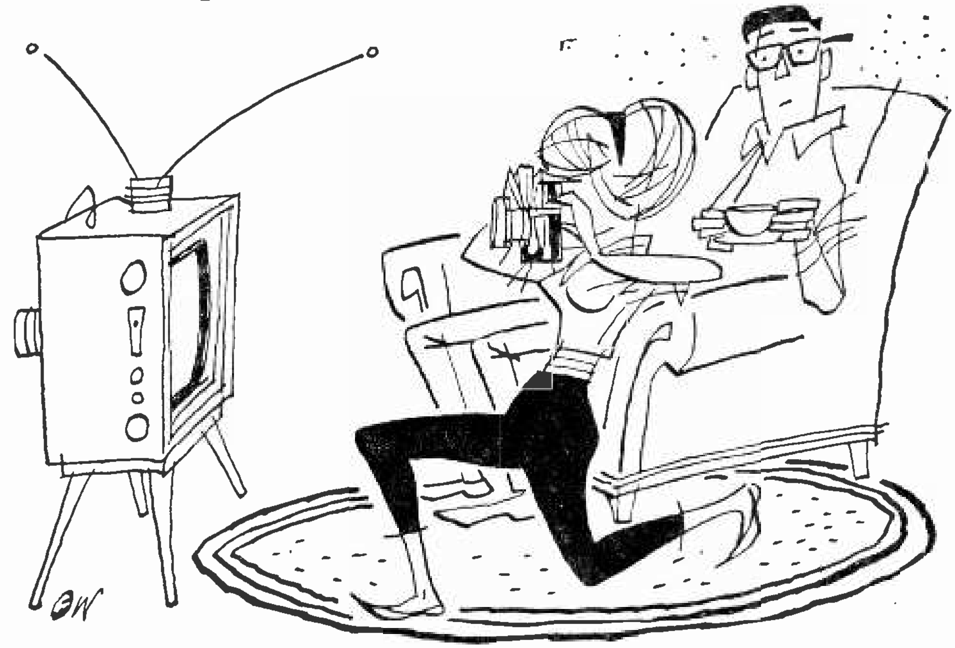
The lower bands, particularly 90 and 60 meters, will continue to be excellent for DX'ers. Although SWBC targets are fewer, 75 meters will also be good when U. S. & Canadian ham QRM falls off due to skipping. On the other hand, 49 meters *could* be good but *won't* be because of tremendous overcrowding. This condition will ease up after Midnight and SWL's should also keep an ear open for late morning opening to Latin America. On this same 49 meter band at midday (or a little earlier), watch for low powered Canadian stations like CKFX at Vancouver, B. C., on 6080 kc with a mere 10 watts. It's going to be that kind of a year—so get your gear in tip-top shape.

This will be a rough season for daytime and/or *don't-work-too-hard* type listeners, but not for the real DX'er. The latter is in a position to log things which will be almost impossible in years to come. Same applies to the medium-wave broadcast band and to Utility DX'ing between 1605 and 3000 kc. For more on utility listening, read Marine Broadcast DX (page 95, December/January, 1964 issue). ■

LOCAL TIME	0000–0300	0300–0600	0600–0900	0900–1200	1200–1500	1500–1800	1800–2100	2100–2400
Europe, North Africa, & Near East	75, 49 (41)	49, 41	19 (ERRATIC)	25, 19	31, 25	49	49, 41	75, 49 41
South Africa	90, 60	49, 41 (POOR)	(ERRATIC)	25, 19		41, 60 (90)	49, 41	90, 60
Asia (except Near East)	49, 31	90, 75 (49, 31)	41, 31	25, 19 (ERRATIC)		31		
South Pacific	41	60, 49	41	25 (ERRATIC)		25		31
Latin America	90	60	49	(49)	31		90, 60	

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 local standard time you will be listening and lift your finger. Underneath your pointing digit will be the short-wave band or bands that will give the best DX results. The time in the above propagation prediction table is given in *standard time* at the listener's location which effectively compensates for differences in propagation characteristics between the east and west coasts of North America. However, Asia and the South Pacific stations will generally be received stronger in the West while Europe and Africa will be easy to tune on the east coast. The short-wave bands in brackets are given as poor second choices. Refer to White's Radio Log for World-Wide Short-Wave Stations listing.

Operation QRM



By C. M. Stanbury II

Radio Porlamar was one of those long shots DXers dream about. You get one crack at it, if you blow your chance, go chase the BBC. Porlamar is the capitol of Isla Margarita. On March 1 the island not only declared its independence from Venezuela but a new social system too—matriarchy. Then before you could catch your breath, some publicity minded rebel official, a ham, scheduled this DX program for the 15th. They picked 1575 kc which after 1:00 AM is a clear channel, usually. The program started then and ran until 3:00.

This frequency in the evening is a real mess here in North America. I've never heard either the Costa Rican or Dominican which normally hold it down because of my neighbor's antique TV set whose sync circuit puts an S/9 plus signal on 1575. But their evil eye (in the flat across the hall) is always turned off sharp at 1:00 (after the late show). I counted on this, kept my fingers crossed, wore a rabbit's foot, the whole bit, because tomorrow Venezuela held elections and who ever won would re-occupy Isla Margarita, *immediately*.

At 12:50 I tuned in 1575, right on the nose with that TVI to guide me in. Then I put my Q multiplier (a QX535) into the circuit. . . .

And waited.

Nothing happened. At 1:05 that mighty buzz across the hall was still going strong. At 1:10 the suspense became unbearable and by 1:20 I knew I was going to have to do something. But how the devil do you talk someone into turning off their Television. It's like your stomping on the household deity.

Even by 1:30 I didn't really have a plan, just a theory—"The whole truth and nothing but the truth." It sounded good, anyway. I took a long deep breath, left my own 'cave,' crossed the hall and knocked.

"Yes?" Soft feminine voice.

"Mrs. Taylor?" Probably thought I was a masher or something.

She opened her door a crack but left the chain on. "Do I look like Mrs. Taylor?"

She certainly didn't. Shook my head.

"What do you want? I'm the baby sitter." The lousy 40 watt bulb in the hall didn't do anything for her confidence.

Pointed to myself. "Halder Scott, Hal

Scott from across the hall."

"And what do you want?" I still looked like a masher.

Hesitated. "Do you supose you could turn your TV set off for about ten minutes?"

Rested one hand on the hip and gave me a look.

"You see, I'm a DXer. That's someone who tunes for. . . ."

"Yes, I know what DX is."

Figured I had it made. "Well, I'm trying for a very special program on 1575."

Nodded, slight smile. "And my set is blocking the frequency."

"Yes." Could almost see that QSL from Radio Porlamar. "So will you turn it off?"

She unhooked the chain. "Come in here and look at my set." A command as she swung the door open wide.

I tried to catch the angle—like the on/off knob was missing and she couldn't find

the wall plug? Got inside, she closed the door behind us, I took one look at the picture and flipped. Perfect ID panel from HIT-TV in Santo Domingo.

"Most beautiful F skip you ever saw." She cut the brightness back a little. "It's been like this all evening on channel 2."

HIT began to fade and just like that Circuito CMQ from somewhere in Cuba took its place.

"A TV DXer's dream." Made sure her contrast was on full. "And until it quits, this set stays on." Patted her monster lovingly.

A BCB man's nightmare. I began to sag back into an easy chair, think up some new strategy.

"Hold it." She retrieved her camera from the seat behind me, snapped a picture of CMQ's ID panel.

Sat down. "Couldn't you even turn it off for 5 minutes?"

"Uh uh." Took another picture just to be sure. "But I will make you a cup of coffee while we watch the DX roll in." Saucy smile.

Sighed. "Might as well."

She moved into the kitchen. "Hope instant's okay?"

"Yes." Gave her set a dirty look, tempted to cut the cord and run.

"What's CMQ doing?"

"Starting to fade." Maybe the opening would fold.

She hurried back with our coffee, just as YSY in El Salvador appeared. Handed me my cup. "I'll get the cream and sugar in just a second." Rolled her film to the next picture.

"I take it black . . . what is your name anyway?"

"Opal." Another station came in with YSY and neither were visible for a few minutes, just those black and white bars produced by a 20 kc offset. "If I were home, could separate them with my beam and rotor."

"Why don't you go, I'll take over for you."

Laughed. "Never quit trying, do you?" YSY took command again, just as it identified. Opal aimed her camera and pulled the trigger, she worked like a pro, better.

Glanced at my watch—2:00. I kept the thing right on the nose, which left me an hour to go. Could still make it.

YSY signed off.

A final glimmer of hope. "Wouldn't they all be off by now?"

"No. CMQ and HIT are gone but a couple others should still be around." Television Central in Panama made it through.

"How many shots you got left on that film?"

"Five." She captured the Panamanian. "Enough." A second shot. Opal never passed up that safety factor.

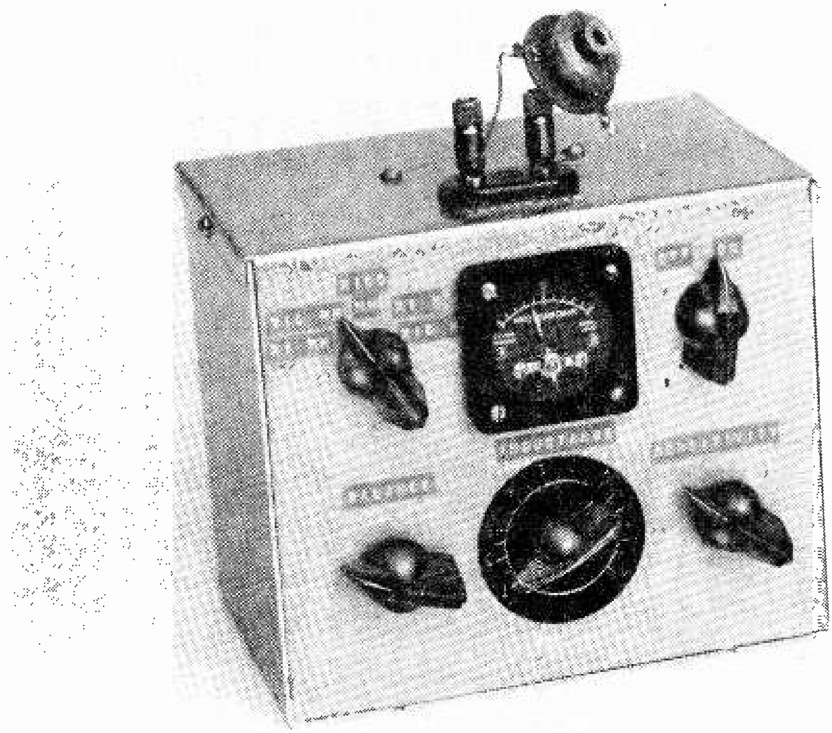
Sipped my coffee until 2:30 when YVKS in Caracas, Venezuela showed. Opal bagged it, held up one finger.

Didn't get a chance to answer. With fantastic signal, a hand made ID panel skipped in. "Television Porlamar, la Voz del Matriarcado. Viva la Femenino."

Right then I swore off DX for at least the next 24 hours.

Opal moved in for the kill. "At the last minute they decided to try TV too." Used her camera. Again.

But what else could I expect from a Matriarchy? ■



Inductance Bridge

3 simple circuits working together let you measure inductance

You can find the value of those unmarked surplus and commercial type inductances with this handy transistorized inductance bridge. This simplified, easy to build unit uses three inexpensive transistors in a battery powered circuit that will adequately determine inductance values of RF, audio and filter chokes from 1 millihenry to 100 henries.

The bridge is housed in a compact 4" x 5" x 6" aluminum utility box, with all components self-contained. A built-in meter and direct reading dials, indicate the inductance values.

How It Works. Approximately 1 kc is generated by the R-C phase shift oscillator circuit of Q3 and is connected via the Q2 emitter-follower circuit to the basic inductance bridge circuit.

The unknown inductance is connected across J1. Then the inductance control R2,

By Charles Green, W3IKH

and balance control R7 are adjusted to balance the bridge circuit for a minimum indication on meter M1. The inductance control, R2, is calibrated to read the inductance value, multiplied by range switch S1 setting.

The range resistors R3, R4, R5, and R6 are connected into the basic bridge circuit by range switch S1A, with the reference capacitors, C1-C2, switched by S1B for the ranges of 1 millihenry to 100 henries.

The 1 kc output of the bridge circuit is coupled via the Sensitivity control, R8, to Q1. This amplifier signal is then rectified by the detector circuit of D1, D2, D3, and D4. The dc output actuates M1, which indicates the balancing of the bridge circuit by a minimum reading (null).

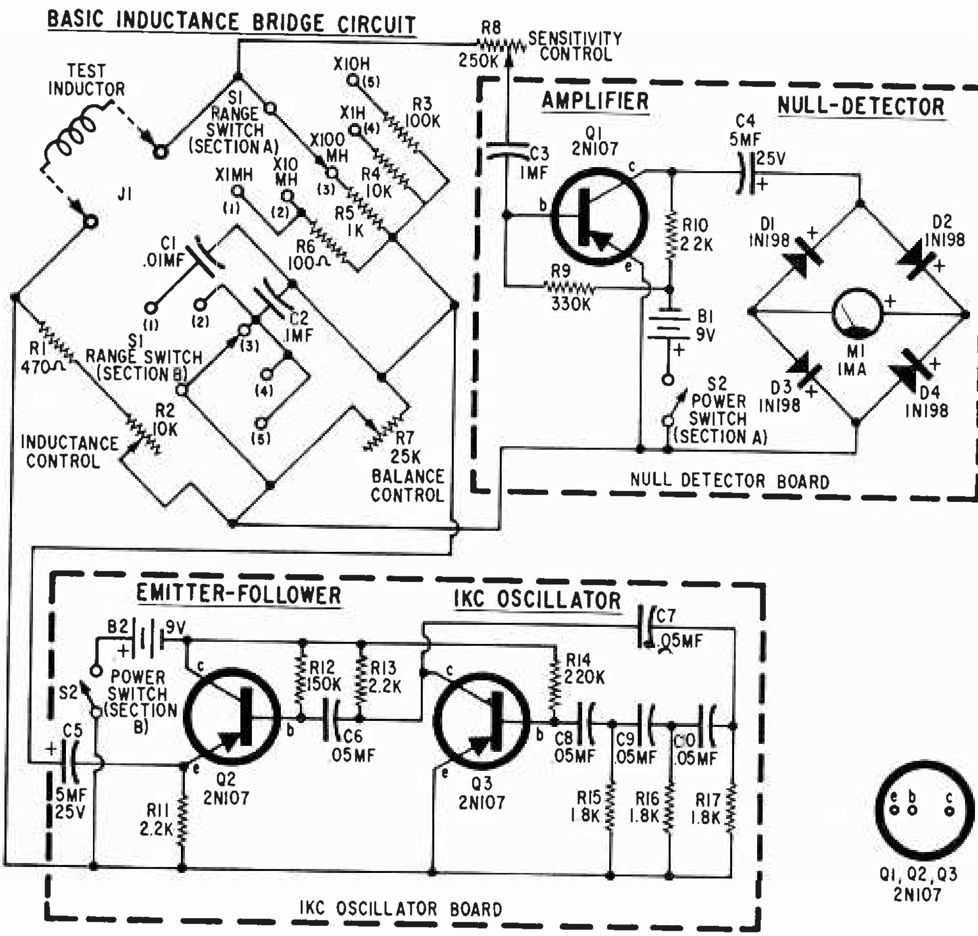
S2 controls the battery power to the unit. Two 9 volt batteries are used to provide isolation between the oscillator and detector.

Construction. The wiring and layout are not critical, any parts placement and box size can be used. The author utilized a 4" x 5" x 6" aluminum chassis box with component layout as shown in the photos.

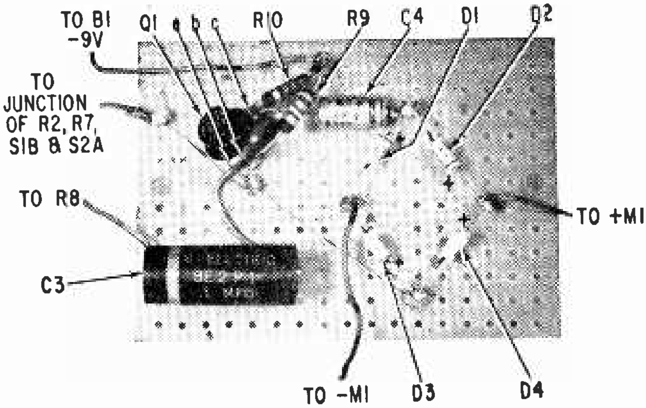
Meter M1 can be any type from 50 ua to 1 ma., the greater the sensitivity of the meter, the more accurate the adjustment of the Inductance control, R2, will be for balancing the bridge circuit. As the meter does not have to be calibrated, any type of meter scale can be used, such as the surplus one shown in the photo.

The scale for the Inductance control, R2, was made by painting an aluminum disc with black enamel and scratching the calibration markings. But a paper scale with ink notations can also be used.

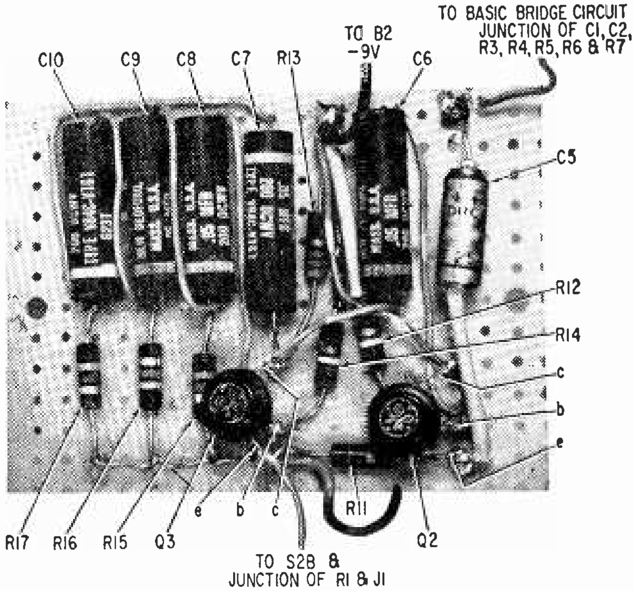
The basic bridge components are mounted on the front panel of the box, using shake-



An inductance bridge circuit, 1 kc. oscillator and null detector comprise the test unit.



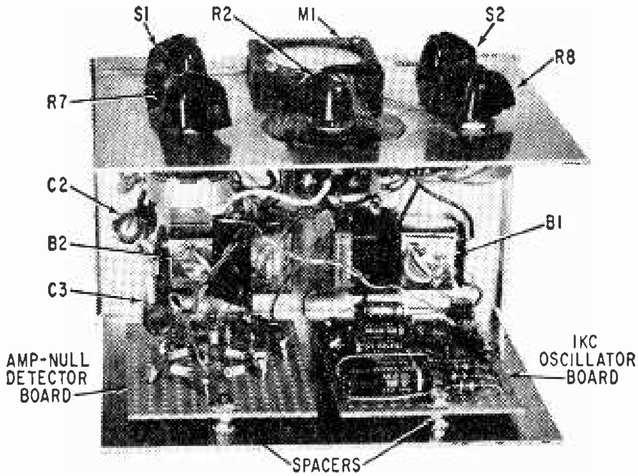
The author's phenolic board assemblies are shown for layout reference. Amplifier-null detector board is at top and 1 kc. oscillator board is shown below. It is suggested that novices follow the author's original layout very carefully.



PARTS LIST

B1, B2—9 volt battery (Burgess 2U6 or equiv.)
C1—.01 mf., 100-volt paper capacitor
C2—.1 mf., 100-volt paper capacitor
C3—.1 mf., 100-volt paper capacitor
C4, C5—5mf., 25-volt miniature electrolytic capacitor
C6—.05mf., 100-volt paper capacitor
C7, C8, C9, C10—.05mf., 100-volt paper capacitor
D1, D2, D3, D4—1N198 diode (1N34A or 1N60 can be used)
J1—Dual binding post assembly (H. H. Smith type 209)
M1—1-ma. DC meter (Emico RF-2C, Shurite 8300Z, or equiv.)
Q1, Q2, Q3—2N107 transistor
R1—470-ohm, ½-watt resistor
R2—10,000-ohm, 5-watt, wire-wound potentiometer, linear taper
R3—100,000-ohm, ½-watt resistor
R4—10,000-ohm, ½-watt resistor
R5—1,000-ohm, ½-watt resistor
R6—100-ohm, ½-watt resistor
R7—25,000-ohm carbon potentiometer, linear taper
R8—250,000-ohm carbon potentiometer
R9—330,000-ohm, ½-watt resistor
R10, R11, R13—2,200-ohm, ½-watt resistor
R12—150,000-ohm, ½-watt resistor
R14—220,000-ohm, ½-watt resistor
R15, R16, R17—1.8K, ½-Watt, 10% carbon resistor
S1—2-pole, 5-position rotary switch, non-shorting
S2—2-pole, 2-position rotary switch, non-shorting
1—4" x 5" x 6" aluminum box (LMB 142 or equiv.)
Misc.—perforated boards, wire, hardware, etc.

Estimated cost: $25.00
Estimated construction time: 8 hours



Inside view of the completed inductance bridge showing location of board assemblies and internal part locations. Note absence of rat's nest wiring.

proof washers to prevent movement. The amplifier-detector and the oscillator-emitter follower circuits are installed on two perforated boards. The wiring of the perforated boards can be made using "flea clips" or feeding the leads through the holes, bending the ends, and soldering. All of the wiring should be made on the side of the boards that the components are mounted on. This will simplify any possible troubleshooting after the boards are mounted in the box. Mount the perforated boards with a spacing nut on their mounting screws to make sure that the flea clips or soldered wiring does not short to the box side. Note: do not connect the wires to the arm of the Inductance control, R2, until after calibration.

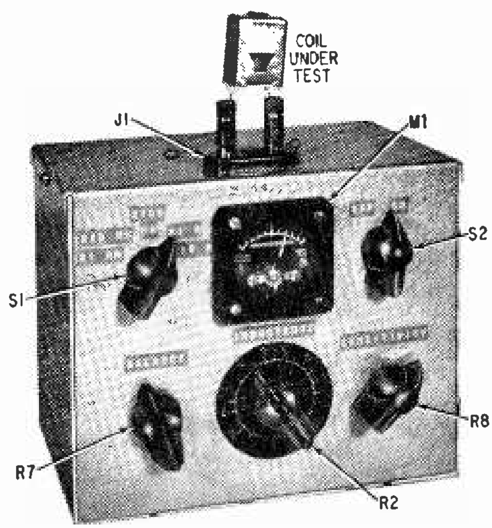
Make battery mounting brackets out of sheet aluminum strips and cover them with a plastic tape, wrapping to insulate the batteries from the case.

The metal box is not electrically connected to the circuits. The author did not notice any hand capacity effects while operating the unit, but an external ground to the case can be used if required. The battery connectors can be fabricated by disassembling old batteries and using their terminal strips.

Calibration and Operation. Calibrate the inductance dial by hooking up an ohmmeter between the arm of the Inductance control, R2, and the terminal of J1 that connects to R1. Mark off on the dial every 500 ohm points on R2 to 10,000 ohms. Disconnect the ohmmeter and solder the wires to the arm of the Inductance control, R2.

Connect the batteries and turn S2 to on. No warm up time is necessary. Rotate the sensitivity switch until the meter indicates half scale. Connect an inductance (RF or filter choke) to J1. Set the Range switch, S1, to an appropriate range. Adjust the Inductance control, R2, to mid-range and rotate the Balance control, R7, for a dip in the indication of M1. Then alternately adjust R2 and R7 until the meter is at a maximum dip (minimum current reading). Increase sensitivity as required with the Sensitivity control, R8, to achieve maximum meter dip. Multiply the reading of the Inductance control, R2, by the setting of Range switch, S1, to find the inductance value.

The author used 10% components because they are readily available through normal retail sources. If better components are available, they can be used in the same circuit for higher accuracy than 10%. ■



Complete unit showing location of front panel controls, the meter, M1, and jack, J1, at top.

Primer on...the OSCILLOSCOPE

An electron stream wiggling across a phosphorescent screen will shed some green light on your waveform measurements

By Leo G. Sands

The oscilloscope is unquestionably the most versatile and useful electronic testing instrument you can have on your workbench—whether it be for hobby purposes or servicing. It is a voltmeter which measures voltage with respect to time and presents its measurements in graph form. But first, let's look into how it works.

The oscilloscope heart is a cathode ray tube (CRT) which is similar to a television picture tube except that its beam is moved by applying *voltage* to its deflection plates. In a TV picture tube the beam is moved by

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applying *current* to its deflection coils. Almost all CRT's employ electro-static deflection whereas almost all modern TV picture tubes employ electro-magnetic deflection.

Inside the CRT. Electrons are emitted from a cathode and are hurled through various grids toward a phosphorescent screen as shown in Fig. 1. When the electrons strike the screen, the screen glows at the point of impact with the electrons. The electron stream passes through a space which has four plates that are used for deflecting the electron stream. Fig. 2 shows a dot which is the electron beam, the two plates marked "V" are the vertical deflection plates and those marked "H" are the horizontal deflection plates.

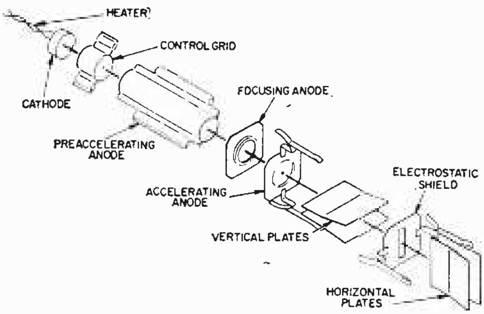

Fig. 1. Electron gun detail drawing.

If we apply a DC voltage to the horizontal deflection plates, as shown in Fig. 3, the dot (electron stream) moves toward the plate at the right which is positively polarized. If we reverse the polarity of the voltage, the dot will move to the left.

By applying a DC voltage to the vertical deflection plates, as in Fig. 4, the dot is moved upward—reversing the polarity of the voltage—moves the dot downward. And, if we apply DC voltages to both sets of plates as in Fig. 5, the dot can move in an oblique direction.

Now, if we use two potentiometers to make it possible to adjust the voltages and their relationship as well as their polarity, as shown in Fig. 6, the dot can be moved to any point on the screen. By turning R1, we can make the top vertical deflection plate positive or negative—R2 lets us do the same to the horizontal deflection plates.

Voltmeter. We can measure DC voltage, using the circuit shown in either Fig. 3 or 4, if we know the sensitivity of the CRT, by noting how far the dot moves from its normal position on the screen.

It is possible to measure AC voltage by applying it to the vertical deflection plates, as shown in Fig. 7. As the AC voltage rises, falls and reverses in polarity, the dot is moved up and down with each AC cycle. A vertical line is painted on the screen and remains there there until the AC voltage is removed. The position of the vertical line can be moved to the left or right by adjusting potentiometer R. The length of the vertical line is determined by the level of the AC voltage.

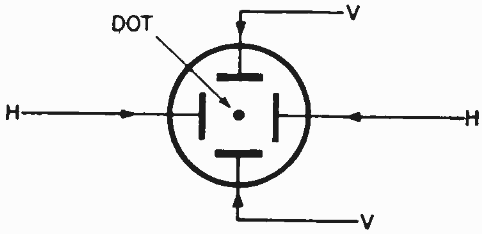

Fig. 2. Undeflected dot (electron stream).

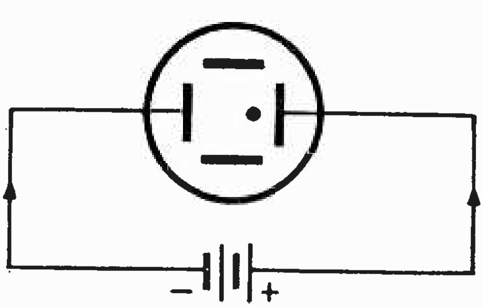

Fig. 3. Dot moves right to positive plate.

Measuring Time. By applying a sawtooth voltage to the horizontal deflection plates, as shown in Fig. 8(A), the dot moves at even speed from the left side of the screen to the right. The sawtooth voltage rises evenly from zero to its maximum value and then drops abruptly to zero, and keeps repeating itself, as shown in Fig. 8(B).

If it requires one second for the sawtooth voltage to rise from zero to its maximum value, the dot moves from the left to the right

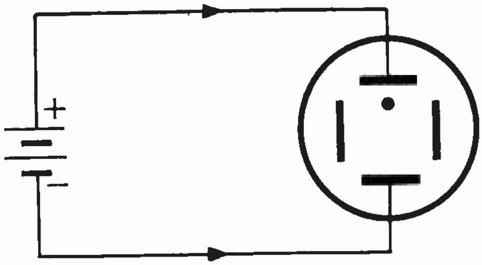

Fig. 4. Dot moves up to positive plate.

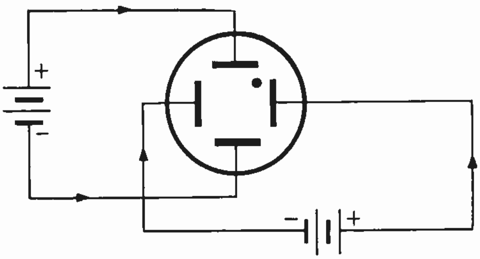

Fig. 5. Dot moves right and up to corner of the two positive plates.

in one second. When the voltage drops abruptly to zero, the dot moves back to the left at such high speed that it can't be seen. But during its left to right excursions, the dot can be seen traversing in a straight horizontal direction. Thus, we can measure *time*. If we apply a DC voltage across the vertical plates, the horizontal trace will be moved either up or down, depending upon the polarity of the DC voltage. But, it will remain horizontal as long as the DC voltage is steady.

Now, if we set the sawtooth oscillator to generate one sawtooth wave once every 1/60th of a second, the horizontal trace will appear as a solid line because it retraces itself so fast that the eye thinks it sees it all the time.

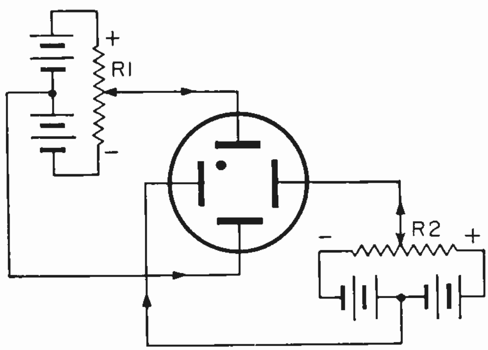

Fig. 6. Position of dot can be varied by adjusting potentiometers R1 and R2.

When we apply a 60-cycle AC voltage to the vertical deflection plates, and a 60-cycle sawtooth voltage to the horizontal deflection plates, as shown in Fig. 9, the AC voltage waveform will appear on the screen. Fig. 10 shows the waveform for one and two sawtooth cycles. If the sensitivity of the CRT is known, we can determine the peak-to-peak voltage of the AC signal by measuring the distance between its positive and negative waveform peaks.

At the Beginning. The forerunner of the oscilloscope was the *oscillograph*. In a very simple oscillograph, a paper tape moves at a steady speed and a pen writes on it as its arm is moved by a meter movement, as shown in Fig. 11. The swing of the pen, as indicated by the trace it writes, is determined by the level of the voltage being measured; time is measured by the speed of the paper tape travel. Obviously, such an instrument cannot be used to examine high frequency signals because of the slow tape speed and the inertia of the pen mechanism.

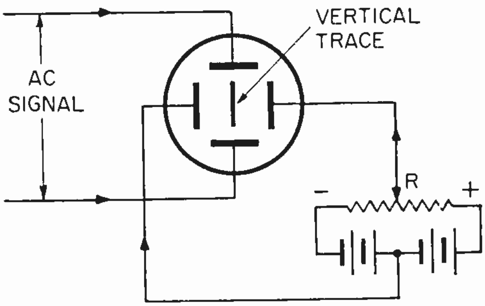

Fig. 7. A rapidly moving AC signal will cause a vertical line trace.

An *oscilloscope*, on the other hand, is an electronic device capable of high speed operation. A typical oscilloscope is shown in Fig. 12. While we have shown direct connections to the deflection plates in Figs. 2 through 9, an oscilloscope employs amplifiers as shown in Fig. 13, and fairly complex sweep circuits.

What's up front. The scope (abbreviation for oscilloscope) shown in Fig. 12 has several front panel adjustments. The focus (sharpness of dot) is adjusted with the upper left hand knob, and the brightness of the dot with the upper right hand knob. The vertical position of the dot may be adjusted with the knob at the left near the bottom of the screen, and its horizontal position with the knob on the opposite side.

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The center knobs (one over the other) are used for selecting the sweep rate (sawtooth frequency). The gain of the vertical amplifier is adjusted by the dual knob at the lower left (vertical sensitivity) and the horizontal gain by the dual knob at lower right.

Connections to the vertical and horizontal inputs are made at the binding posts at the bottom of the front panel. The slide switch at the lower left hand corner is usually set to AC except when a DC voltage or an AC

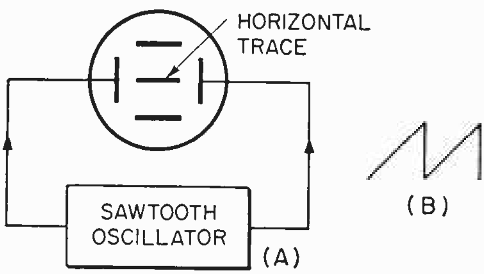

Fig. 8. A horizontal line trace occurs when AC signal is on horizontal plates.

signal with DC imposed is to be observed. The sawtooth signal generated within the scope is available for external use at the pin jack in the lower right hand corner.

With the vertical gain set to maximum, and the horizontal gain set to zero, a vertical line will appear on the screen which will be one centimeter in length for each 18 millivolts (0.018 volts) of input signal applied to the vertical input. By turning up the horizontal gain and adjusting the sweep frequency, the waveform of the signal applied to the vertical input will be seen on the screen. The higher the voltage applied to the vertical input terminals, the lower the vertical gain control setting.

Using a Scope. There are countless uses for a scope. In Fig. 14, a set-up is shown for observing a 60-cycle AC signal. Transformer T is a 6.3-volt filament transformer and R is a potentiometer of any convenient value and functions as a variable voltage divider. The adjustable AC voltage is applied to the vertical input terminal and the "G" terminal

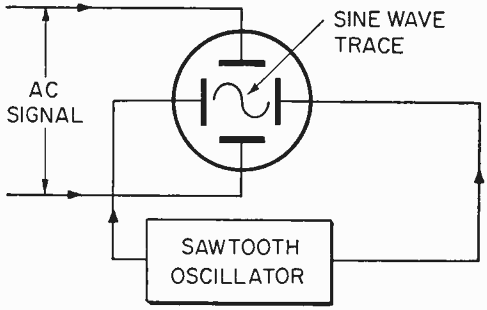

Fig. 9. An AC sinusoidal wave can be seen when a sawtooth signal is applied to the horizontal plates.

which is grounded and is common to both the vertical and horizontal inputs. By adjusting the vertical and horizontal gain controls, and the sweep frequency, we can observe a single cycle or several cycles (by increasing sweep frequency to a multiple of 60 cycles) of the 60-cycle signal. By adjusting R, changes in the amplitude of the applied AC signal can be seen.

Higher frequency signal waveforms are observed by connecting the output of a signal generator to the scope's vertical input as shown in Fig. 15. If the signal generator is a sine wave audio frequency (AF) oscillator, we can look at its output waveform and note what readjustment of the scope is necessary as we change the frequency.

If the signal generator is a combination sine wave/square wave type, it can be set to generate square waves and observe their waveform on the scope screen. By connecting a capacitor, C, in series with the generator output lead and a potentiometer (connected as rheostat) across the vertical input, as shown in Fig. 16, we can observe the effect of this R-C network on sine wave and square wave signals at various frequencies. When R is a one-megohm potentiometer and C has a value of 0.005 mfd, low frequency square

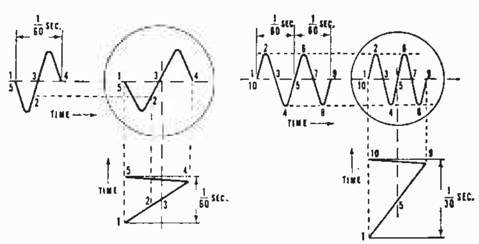

Fig. 10. The numbered points on the two waveforms occur at the same time. This way you can see how trace is developed.

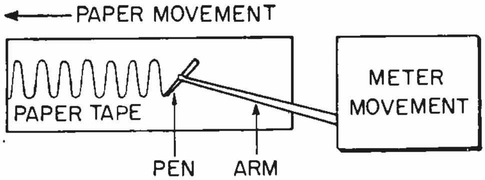

Fig. 11. The oscillograph is an electromechanical device that places an inked trace on a moving strip of paper.

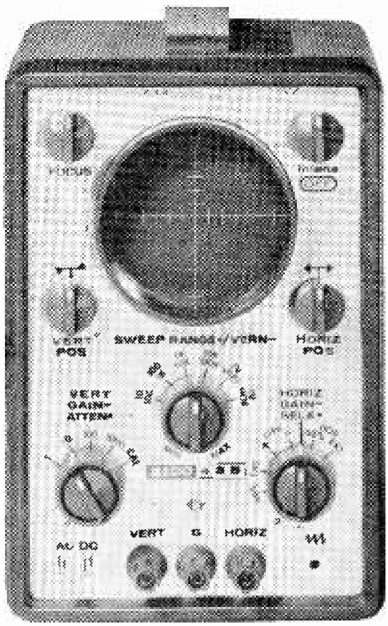

Fig. 12. The EICO 435 oscilloscope, made from a kit, is typical of many models available at moderate prices.

waves can be converted into pulses whose width can be varied by adjusting R. Also, when using a sine wave signal, we can observe how C and R affect frequency response, particularly at low audio frequencies. This demonstrates how the frequency of an audio amplifier is affected by the values of interstage coupling capacitors and associated grid resistors.

By putting R in series with the signal generator output lead and C across the scope's vertical input, we see other effects on wave shape and amplitude with respect to frequency.

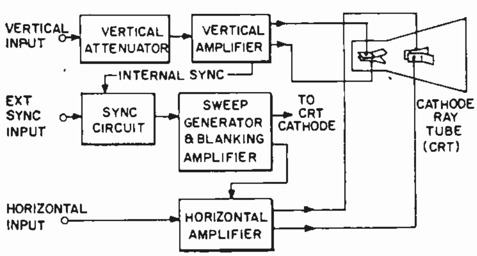

Fig. 13. Block diagram of a typical oscilloscope designed for workbench use.

Looking at RF. If the signal generator is an RF oscillator and is connected to the scope as shown in Fig. 15, we can observe RF waveforms when the signal generator is set to produce an unmodulated signal. The highest frequency to which the signal generator can be set and still be able to discern the waveform depends upon the frequency response characteristics of the scope. Using the scope shown in Fig. 12, it was possible to observe and lock in signals up to 12 mc. Although this scope has a rated frequency response of

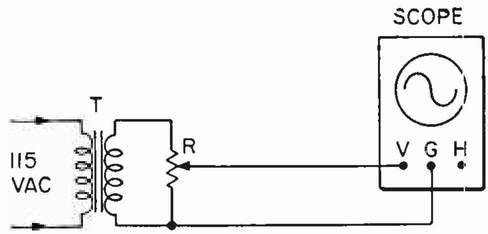

Fig. 14. Set-up for observing 60-cycle AC.

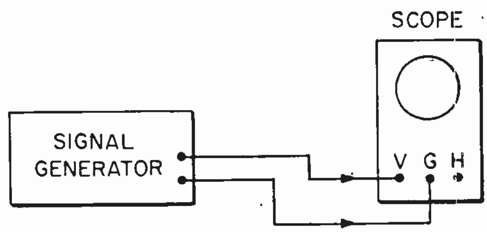

Fig. 15. Signal generator connect to oscilloscope's horizontal input terminals.

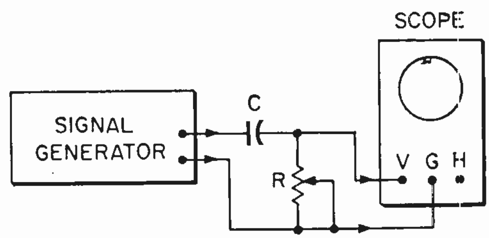

Fig. 16. By connecting a signal diode across resistor R you can discover how radio AM signals are detected.

OSCILLOSCOPE

DC to 4.5 mc, it is useful at higher frequencies, but the vertical size of the waveform becomes smaller at frequencies above 5 mc or so.

Turning up the RF signal generator's modulator *on* (amplitude modulation—AM), we can see what an AM radio signal looks like (see Fig. 17). Now, by using the hook-up shown in Fig. 16 and adding a crystal diode across R, we can see how a detector works.

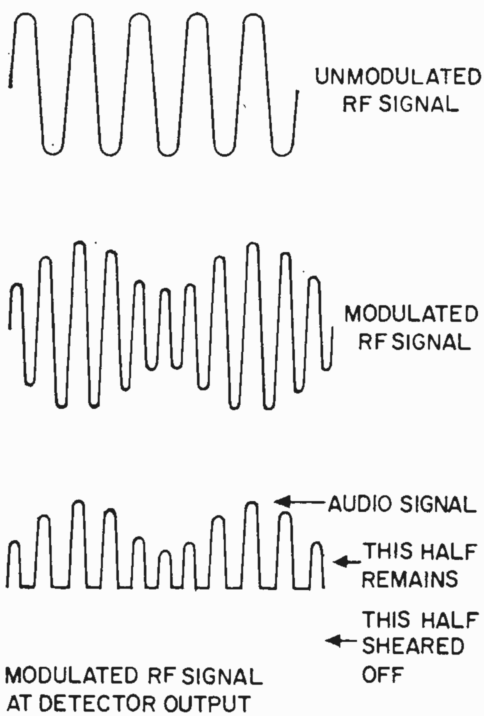

Fig. 17. Most signal generators have modulated and unmodulated outputs. These and detected signal (bottom) can be viewed.

It cuts off part of the waveform and allows us to take a look at the audio modulating signal.

Trouble-shooting. Now that we have learned the basics of using a scope, we can use it as a signal tracer. We need a low-capacity probe which can usually be purchased at most radio parts stores. The schematic of a low frequency probe is shown in

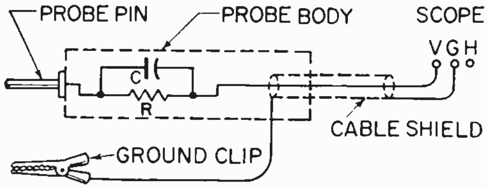

Fig. 18. Probes reduce circuit loading.

Fig. 18. The lead to the vertical input terminal of the scope is the inner conductor of a shielded cable. The ground terminal is connected to the shield of the cable.

The pin of the probe is touched to the circuit being checked and the ground clip is fastened to the chassis of the device being checked. The signal passes through R and C which are connected in parallel. Resistor R usually has a high value around 33 megohms and C usually has a value of a few picofarads (micro-microfarads). This R-C network reduces the level of the signal reaching the scope and C makes the probe favor higher frequencies, and at the same time re-

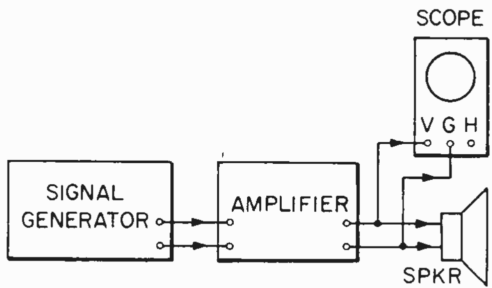

Fig. 19. Audio output from an amplifier can be best rated by observing on 'scope.

duces the loading effect on the circuit being checked.

By touching the probe pin to the grid and then the plate of every stage of a radio receiver or audio amplifier, when a signal is present, it is possible to view the waveform of the signal at these points. When checking RF and IF circuits, the waveform will look something like that shown in Fig. 15. When checking audio circuits, the waveforms of the music or speech will be seen.

Audio. The characteristics of an audio amplifier, or the audio section of a radio receiver, may be observed by feeding the output of an audio signal generator into the audio amplifier input as shown in Fig. 19.

(Continued on page 130)

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AUTOMOTIVE

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.

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

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

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

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

SLIDE RULE

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

TOOLS

78. Learn about *Xcelite's* line of pliers and snips, specialized for radio, TV and electronic work. Xcelite's hand tools offer many advantages worth looking into—get bulletins N464 and N664.

Radio-TV Experimenter, Dept. LL-722
505 Park Avenue, New York, N. Y. 10022

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B5	B6	B7	B8	B9	(See New Products column—pages 27-39)							

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WHITE'S RADIO LOG

Volume 43, No. 1

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 news-

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stands 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. Increased 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, over 4,500 United States and Canadian AM broadcast stations, and 800 television stations are listed, not to mention the completely revised shortwave station list. Errors will appear in spite of our constant checking. In fact, some listings are incomplete as we go to press because information from the FCC was lacking. If you spot an error or know of information we are lacking, please write giving complete data: station call sign, location, frequency, power, daytime or 24-hour operation. Write to *Editor, White's Radio Log,* Radio-TV Experimenter, 505 Park Avenue, New York, New York 10022.

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. Commercial Television Stations by States, U.S. Educational Television Stations by States, Canadian Television Stations by Cities, FM Stereo Stations, and the World-Wide Short-Wave Stations.

In our next issue, April/May, 1965, the *Log* will contain the following listings: U.S. AM Stations by Location, U.S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, 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 June/July 1965 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 or 1965 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 up to the minute listings 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
WYLO	Jackson, Wis.	250

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
KBOW	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
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
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.	50000
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
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.	1000
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.	1000
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
KUAM	Agana, Guam	1000
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.	500
KEPR	Kennevick-Richland-Pasco, 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.	500d
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

KOWH	Omaha, Neb.	
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.	1000d
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
WLOR	Thomasville, Ga.	1000d
KLOE	Goodland, Kans.	1000d
WFMW	Madisonville, Ky	500
WMTC	Van Cleve, Ky.	1000d
KTRY	Bastrop, La.	250d
WARB	Covington, La.	250d
WJTO	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
WESG	Boca Raton, Fla.	1000
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	Humboldt, 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
WHA	Madison, Wis.	5000d

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.	1000

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
KCAM	Glennallen, Alaska	5000
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
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.	5000d
WDUX	Waupaca, Wis.	5000d

810—370.2

KGO	San Francisco, Calif.	50000
WIGO	Indianapolis, Ind.	2500d
WYRE	Annapolis, Md.	250d
KCMO	Kansas City, Mo.	50000
WGY	Schenectady, 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.	5000
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	Clayton, Mo.	5000
WKIX	Raleigh, N.C.	10000
WJW	Cleveland, Ohio	10000
WJAC	Johnstown, Pa.	10000
WEEU	Reading, Pa.	1000
WABA	Aquadilla, 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
KNUJ	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	Honolulu, 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
KTEE	Idaho Falls, Ida.	1000d
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.	5000
KDEO	El Cajon, Calif.	1000
KEWB	Oakland, Calif.	5000
KOXR	Oxnard, Cal.	5000
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
KLSI	Salina, Kan.	500d
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	Shenandoah, Ia.	1000d
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.	500d
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.	1000
KOGA	Ogallala, Nebr.	500d
WSOC	Charlotte, N.C.	5000
WITN	Washington, N.C.	5000
WWNH	Rochester, N.H.	5000d
WPAT	Paterson, N.J.	5000
WBEN	Buffalo, N.Y.	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

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
WCND Shelbyville, N.Y. 250d
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
KIBH Seward, Alaska 1000
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, Ia. 5000
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-Sherman, 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
WJAZ Albany, Ga. 5000
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

Kc. Wave Length W.P.

WFGM Fitchburg, Mass. 1000
WHAK Rogers City, Mich. 5000d
KLTF Little Falls, Minn. 500d
WABG Greenwood, Miss. 1000
KFVS Cape Girardeau, Mo. 5000
KFLN Baker, Mont.
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. 5000
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
WANV 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
KCAB Dardanelle, Ark. 1000d
KINS Eureka, Calif. 5000
KEAP Fresno, Calif. 500d
KFWB Los Angeles, Calif. 5000
KCTY Salinas, Calif. 1000d
KGLN Glennwood Springs, Colo. 1000
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
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
KSGM St. Genevieve, Mo. 500
KLYQ Hamilton, Mont. 1000d
KLVV 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

Kc. Wave Length W.P.

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
KFRD Rosenberg-Richmond, 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
WNNR 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-Karnes City, Tex. 250d
KNIN Wichita Falls, Tex. 10000
KDYL Tooele, Utah 1000d
WNRV Narrows, Va. 1000d
WANT Richmond, Va. 1000d

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
WBIX Jacksonville Beach, Fla. 10000d
WINQ Tampa, Fla. 50000d
WGUN Decatur, Ga. 50000d
KATN Boise, Idaho 1000d
WCSI Columbus, Ind. 500d
KSMN Mason City, Iowa 1000d
KINO Independence, Kans. 250d
KDLA DeRidder, La. 1000d
WSID Baltimore, Md. 1000d
WITL Lansing, Mich. 5000d
WRCR Maplewood, Minn. 250d
WMOX Meridian, Miss. 10000
KCHI Chillicothe, Mo. 250d
KXEN Festus-St. Louis, 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-Marlin, Tex. 10000d
WELK Charlottesville, Va. 1000d
WMEV Marion, Va. 1000d

Kc. Wave Length W.P.

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
WMNZ Montezuma, Ga. 250d
WDZ Decatur, Ill. 1000d
WTCA 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. 1000d
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-Eugene, Ore. 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
KCAS Slaton, Tex. 250d
WGAT Gate City, Va. 250d
WBRG Lynchburg, Va. 1000d
WCMS Norfolk, Va. 1000d
KBLE Seattle, Wash. 5000d
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-St. Joseph, Mich. 5000
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

WKAC Athens, Ala. 1000d
KSCO Santa Cruz, Calif. 10000
WTIC Hartford, Conn. 50000
WBIE Marietta, Ga. 10000d
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.	250d
WMWM	Wilmington, O.	
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

KRLA	Pasadena, Cal.	50000
WALT	Tampa, Fla.	5000d
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
KRKO	Los Angeles, Calif.	5000
KJAX	Santa Rosa, Calif.	5000
KGMC	Englewood, Colo.	1000d
WCNX	Middletown, Conn.	1000d
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, Md.	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
WRAI	Rio Piedras, P.R.	500
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.	5000d
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
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	Talledega, Ala.	250
WTBC	Tuscaloosa, Ala.	1000
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
KDAC	Ft. Bragg, Calif.	250
KGFJ	Los Angeles, Calif.	1000
KPRL	Paso Robles, Calif.	1000
KRDG	Redding, Calif.	250
KWG	Stockton, Calif	1000
KEXO	Grand Junction, Colo.	1000
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
WQDY	Calais, Maine	1000d
WSJR	Madawaska, Me.	1000
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
WMPC	Lapeer, Mich.	250
WSOO	Slt. Ste. Marie, Mich.	1000
WSTR	Sturgis, Mich.	1000d
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.	1000
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
KXLD	Lewiston, Mont.	1000
KLCB	Libby, Mont.	250
KTNC	Falls City, Nebr.	100
KHAS	Hastings, Neb.	1000
KELY	Ely, Nev.	250
KLAV	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, O.	1000
WTOL	Toledo, Ohio	1000d
KADA	N. of Ada, Okla.	250
WBBZ	Ponca City, Okla.	250
KVAS	Astoria, Ore.	1000
KRNS	Burns, Ore.	1000
KOOS	Coos Bay, Oreg.	250
KRDR	Gresham, Oreg.	1000
KYJC	Medford, Oreg.	1000
KQIK	Lakeview, Oreg.	250
KTDO	Toledo, Ore.	1000
WBVP	Beaver Falls, Pa.	1000
WEEX	Easton, Pa.	1000
WKBO	Harrisburg, Pa.	1000
WCRO	Johnstown, Pa.	1000
WBPZ	Lock Haven, Pa.	1000
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
WXCO	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
KZOW	So. of Globe, Ariz.	1000
KVRC	Arkadelphia, Ark.	250
KWAK	Stuttgart, Ark.	250
KPLY	Crescent City, Calif.	250
KOAD	Lemoore, Cal.	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.	1000
WLCD	Eustis, Fla.	250
WINK	Ft. Myers, Fla.	1000
WMMB	Melbourne, Fla.	1000
WFOY	St. Augustine, Fla.	1000
WBHB	Fitzgerald, Ga.	1000
WDUN	Gainesville, Ga.	1000
WLAG	LaGrange, Ga.	1000
WBML	Macon, Ga.	1000
WWNS	Statesboro, Ga.	1000
WPAX	Thomasville, Ga.	1000
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
WEDC Chicago, Ill	1000d
WSBC Chicago, Ill.	1000
WEBQ Harrisburg, Ill.	1000
WTAX Springfield, Ill.	1000
WSDR Sterling, Ill.	500
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
WMKR Millinocket, Me.	1000
WCEM Cambridge, Md.	1000
WJEJ Hagerstown, Md.	1000
WHAI Greenfield, Mass.	250
WOCB W. Yarmouth, Mass.	1000
WAIT 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.	1000
KBLL Helena, Mont.	1000
KFOR Lincoln, Nebr.	1000
KODY North Platte, Nebr.	1000
KELK Elko, Nev.	1000
WFTN Franklin, N.H.	
WSNJ Bridgeton, N. J.	1000
WSLT Ocean City-Somers Point, 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
KQEN Roseburg, Ore.	1000
WRTA Altoona, Pa.	1000
WHUM Reading, Pa.	1000
WKOK Sunbury, Pa.	250
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.	1000
KOCA Kilgore, Tex.	1000
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

Kc. Wave Length	W.P.
WZOB Ft. Payne, Ala.	1000d
WETU Wetumpka, Ala.	5000d
KAKA Wickenburg, Ariz.	500d
KFAY Fayetteville, Ark.	1000d
KALU 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
WLEM Emporium, Pa.	1000d
WPEL Montrose, Pa.	1000d
WRYT Pittsburgh, Pa.	5000
WNOW York, Pa.	5000d
WTMA Charleston, S.C.	5000
WCKM Winnsboro, S.C.	500d
WKBL Covington, Tenn.	1000d
WNTT Tazewell, Tenn.	500d
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.	5000
WEMP Milwaukee, Wis.	5000

1260—238.0

Kc. Wave Length	W.P.
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, Ida.	5000d
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.	500
WWIS Black River Falls, Wis.	1000d
WEKZ Monroe, Wis.	1000d
KPOW Powell, Wyo.	5000

1270—236.1

Kc. Wave Length	W.P.
WGSV Guntersville, Ala.	1000d
WSIM Prichard, Ala.	1000d
KBYR Anchorage, Alaska	1000
KDJI Holbrook, Ariz.	1000d
KADL Pine Bluff, Ark.	5000d
KGOL Palm Desert, Cal.	500d
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.	500d
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.	5000
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.	5000
WRJC Mauston, Wis.	500d
WWJC Superior, Wis.	5000d

1280—234.2

Kc. Wave Length	W.P.
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
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
WADO 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
KUDY Spokane, Wash.	5000d
KIT Yakima, Wash.	5000
WVAR Richwood, W.Va.	1000d
WNAM Neenah, Wis.	5000

1290—232.4

Kc. Wave Length	W.P.
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, Cal.	500d
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.	5000
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.	5000
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	La Grange, Ill.	5000
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.	1000
KANB	Shreveport, La.	1000d
WFBR	Baltimore, Md.	5000
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.	5000d
WOSC	Fulton, N.Y.	1000d
WMMJ	Lancaster, N.Y.	
WEEE	Rensselaer, N.Y.	5000d
WGOL	Goldsboro, N.C.	1000d
WLNC	Laurinburg, N.C.	500
WSYD	Mt. Airy, N.C.	5000
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.	500d
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
KKUB	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
WOOO	Deland, Fla.	5000d
WGKR	Perry, Fla.	1000d
WAUC	Wauchula, Fla.	500d
WOMN	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
WIFE	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
WKNR	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.	5000
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.	5000
WBNT	Oneida, Tenn.	1000d
KZIP	Amarillo, Tex.	1000d
WRR	Dallas, Tex.	5000
KOYL	Odessa, Tex.	1000d
KUBO	San Antonio, Tex.	5000
WEEL	Fairfax, Va.	5000
WGH	Newport News, Va.	5000
KARY	Prosser, Wash.	1000d
WIBA	Madison, Wis.	5000

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.	1000d
WKAP	Allentown, Pa.	5000
WGET	Gettysburg, Pa.	1000
WJAS	Pittsburgh, Pa.	5000
WSCR	Scranton, Pa.	1000
WUNO	Rio Piedras, P.R.	5000
WOIC	Columbia, S. C.	5000
KELO	Sioux Falls, S.Dak.	5000
WKIN	Kingsport, Tenn.	5000d
WMSR	Manchester, Tenn.	5000d
KVMC	Colo. City, Tex.	1000d
KXYZ	Houston, Tex.	5000
KCPX	Salt Lake City, Utah	5000
WDMS	Lynchburg, Va.	1000
WEET	Richmond, Va.	1000d
KXRO	Aberdeen, Wash.	5000
KHIT	Walla Walla, Wash.	1000d
WQMN	Superior, Wis.	1000d
WFHR	Wisconsin Rapids, Wis.	5000

1330—225.4

WROS	Scottsboro, Ala.	1000d
KMOP	Tucson, Ariz.	500d
KVEE	Conway, Ark.	500d
KLOM	Lompoc, Cal.	1000d
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.	5000
WRAM	Monmouth, Ill.	1000d
WRRR	Rockford, Ill.	1000d
WJPS	Evansville, Ind.	5000
WGRB	Greenburg, Ind.	500d
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.	5000d
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
WEBO	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.	5000d
KFKF	Bellevue, Wash.	5000d
KCFA	Spokane, Wash.	5000d
WETZ	New Martinsville, W.Va.	1000d
WHBL	Sheboygan, Wis.	5000
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.	1000
KKIT	Taos, N.M.	250
KNOG	Nogales, Ariz.	250
KPGE	Page, Ariz.	1000
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
KCKN	Kansas City, Kans.	1000d
KSEK	Pittsburg, Kans.	1000
WCMI	Ashland, Ky.	1000
KENT	Prescott, Ariz.	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
KSGM	St. Genevieve, Mo.	1000
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.	1000
KBET	Reno, Nev.	1000
WDCR	Hanover, N.H.	1000
WMID	Atlantic City, N.J.	1000
KHAP	Aztec, N.M.	1000d
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.	1000
WAIR	Winston-Salem, N.C.	250
KGPC	Grafton, N.Dak.	1000
WNCO	Ashland, O.	1000
WOUB	Athens, Ohio	250
WIZE	Springfield, Ohio	1000
WSTV	Steubenville, Ohio	1000
KIHN	Hugo, Okla.	250
KOCY	Okla. City, Okla.	1000
KTOW	Sand Springs, Okla.	250
KLOO	Corvallis, Oreg.	250
KWVR	Enterprise, Oreg.	250
KIHR	Hood River, Oreg.	250
KFIR	North Bend, Oreg.	1000
WCVI	Connellsville, Pa.	1000d
WSAJ	Grove City, Pa.	100
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.	1000
WGRF	Aguadilla, P.R.	250
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.	1000
WLOK	Memphis, Tenn.	1000d
WCDT	Winchester, Tenn.	1000
KWKC	Abilene, Tex.	1000
KTSL	Burnett, Tex.	250
KAND	Corsicana, Tex.	250
KSET	El Paso, Tex.	250
KLBK	Lubbock, Tex.	250
KRBA	Lufkin, Tex.	1000
KPDN	Pampa, Tex.	250
KOLE	Port Arthur, Tex.	250
KTEO	San Angelo, Tex.	250
KVIC	Victoria, Tex.	250
WTWN	St. Johnsbury, Vt.	1000
WSTA	Charlotte Amalie, V.I.	250
WKEY	Covington, Va.	1000
WHAP	Hopewell, Va.	1000
WJMA	Orange, Va.	1000
KAGT	Anacortes, Wash.	250
KGRS	Pasco, Wash.	250
KAPA	Raymond, Wash.	1000
KMEL	Wenatchee, Wash.	250
WHAR	Clarksburg, W.Va.	1000
WEPM	Martinsburg, W. Va.	1000
WMON	Montgomery, W.Va.	250
WOVE	Welch, W.Va.	1000
WLDY	Ladysmith, Wis.	1000
WRIT	Milwaukee, Wis.	1000d
KSGT	Jackson, Wyo.	250
KYCN	Wheatland, Wyo.	250
KWOR	Worland, Wyo.	1000

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
KKAM	Pueblo, Colo.	5000
WNLK	Norwalk, Conn.	1000
WINY	Putnam, Conn.	1000d
WEZY	Cocoa, Fla.	1000
WDCF	Dade City, Fla.	1000d
WCAI	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, Ida.-Clarkston, Wash. 5000d
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
KDIO 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. 1000d
WDAR 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
WELR 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
KDEY Boulder, Colo. 500d
WDRC Hartford, Conn. 5000
WOBS 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 Baltimore, Md. 5000d
WLYN Lynn, Mass. 1000d
WKYO 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
WMCK 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
KMO Tacoma, Wash. 5000
WHJC Matawan, W.Va. 1000d
WMOV Ravenswood, W.Va. 1000d
WBAY Green Bay, Wis. 5000
WISV Viroqua, Wis. 1000
WMNE Menomonie, Wis. 1000d
KVRS Rock Springs, Wyo. 1000

1370—218.8

WBYE Calera, Ala. 1000d
KTPA Prescott, Ark. 500d
KREL Corona, Cal. 1000
KQCY Quincy, Calif. 500d
KEEN San Jose, Calif. 5000
KGEN Tulare, Calif. 1000d
WKMK Blountstown, Fla. 500d
WKOS 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
WLTH Gary, Ind. 1000d
KDTH Dubuque, Iowa 5000
KGNO Dodge City, Kans. 5000
KALN Iola, Kans. 500d
WABD Ft. Campbell, Ky. 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. 5000d
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
WOTR Corry, Pa. 1000
WPAZ Pottstown, Pa. 1000d
WKMC Roaring Sprgs., Pa. 1000d
WIVV Vieques, P.R. 1000
WKFD Wickford, R.I. 500d
WDEF 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 Ocilla, Ga. 5000d
KPOI Honolulu, Hawaii 5000
WBZI Brazil, Ind. 500d
WKJG Ft. Wayne, Ind. 5000
KCIM Carroll, Iowa 1000
KCII Washington, Iowa 500d
KUDL Fairway, Kan. 5000
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
KWK St. Louis, 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
WTOB 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
WISK Americus, Ga. 5000d
WNUS 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
KADH 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-Pomeroy, O. 5000d
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. 1000d
KBBD Yakima, Wash. 1000

1400—214.2

WMSL Decatur, Ala. 1000
WXAL Demopolis, Ala. 1000d
WFPA Ft. Payne, Ala. 1000
WJLD Homewood, Ala. 1000
WJHD 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
KDTA Delta, Colo. 250
KFTM Ft. Morgan, Colo. 250
KBZZ La Junta, Colo. 1000
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. 1000
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, Ia. 500
KVFD Fort Dodge, Iowa 1000
KVOE 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
KCOW 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.M. 1000
KCHS Truth or Consequences, New Mexico 250
KTNM Tucumcari, N.M. 1000
WOND 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
WSHB Raeford, 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
KWON Bartlesville, Okla. 1000
KTMC McAlester, Okla. 250
KNOR Norman, Okla. 250
KNND Cottage Grove, Oreg. 1000d
KJDY John Day, Ore. 250
WEST Easton, Pa. 1000
WJET Erie, Pa. 1000
WFEC Harrisburg, Pa. 1000d
WICK Scranton, Pa. 250
WRAK Williamsport, Pa. 1000
WVOZ Carolina, P.R. 250
WCOS Columbia, S.C. 1000
WGTN Georgetown, S.C. 1000
WHCQ Spartanburg, S.C. 1000d
WJZM Clarksville, Tenn. 1000
WHUB Cookeville, Tenn. 1000
WLSB Copperhill, Tenn. 1000
WGAP Maryville, Tenn. 1000d
WHAL Shelbyville, Tenn. 1000
KRUN Ballinger, Tex. 250

Kc. Wave Length W.P.

KBYG Big Springs, Tex. 1000
KUNO Corpus Christi, Tex. 250
KILE nr. Galveston, Tex. 250
KGVL Greenville, Tex. 250
KEBE Jacksonville, Tex. 1000
KIUN Pecos, Tex. 1000
KEYE Perryton, Tex. 250
KVOP Plainview, Tex. 250
KDWT Stamford, Tex. 1000
KTEM Temple, 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. 1000
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. 250
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. 1000

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. 5000
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
WNOP North Platte, Neb. 1000
WHTG Asbury Park-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. 5000d
WRIS Roanoke, Va. 5000d
WRDS S. Charleston, W.Va. 1000d
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

Kc. Wave Length W.P.

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 5000
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
KYNG Coos Bay, Oreg. 1000d
WCOJ Coatesville, Pa. 5000
WCED DuBois, Pa. 5000
WEUC Ponce, P.R. 1000
WCRE Cheraw, S.C. 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-Centralia, Wash. 1000d
KREN Renton, Wash. 500d
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 San Gabriel, Cal. 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. 5000
KGFL Roswell, N.M. 5000d
WENE Endicott, N.Y. 5000
WMNC Morganton, N.C. 5000
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. 1000
WNEL Caguas, P.R. 1000
WBLR Batesburg, S.C. 5000d
WATP Marion, S.C. 1000d
WBUG Ridgeland, S.C. 1000d
KBRK Brookings, S. Dak. 1000d
WGYW Fountain City, Tenn. 1000d
WENO Madison, Tenn. 5000
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 Clincho, Va. 1000d
KBRC Mt. Vernon, Wash. 5000
WEIR Weirton, W.Va. 1000
WBEV Beaver Dam, Wis. 1000d

Kc. Wave Length W.P.

1440—208.2

WHHY Montgomery, Ala. 5000
KDOT 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. 1000
KEVE Golden Valley, Minn. 5000d
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. 1000d
WZYX Cowan, Tenn. 1000d
WHDM McKenzie, Tenn. 500d
KFDA Amarillo, Tex. 5000
KEYS Corpus Christi, Tex. 1000
KDNT Denton, Tex. 5000
KWEL Midland, Tex. 5000d
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. 1000
KOLD Tucson, Ariz. 250
KENA Mena, Ark. 250
KJWH Camden, Ark. 1000d
KYOR Blythe, Calif. 250
KOWN Escondido, Calif. 250
KPAL Palm Springs, Calif. 250
KTIP Porterville, Calif. 1000
KSOL San Francisco, Cal. 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. 250
WKEU Griffin, Ga. 1000
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
KLWW Cedar Rapids, Ia. 250

Kc. Wave Length W.P.

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. 1000
WHLS Port Huron, Mich. 1000
KATE Albert Lea, Minn. 250
KBUN Bemidji, Minn. 1000
KBMW Wahpeton, N.D.-Breckinridge, Minn. 1000d
WELY Ely, Minn. 1000
KFAM St. Cloud, Minn. 1000
WROX Clarksdale, Miss. 1000
WCJU Columbia, Miss. 250
WJXN Jackson, Miss. 250
WOKK Meridian, Miss. 1000
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. 1000
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, Ore. 1000
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. 1000
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

WHITE'S RADIO LOG

Kc. Wave Length W.P.

WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	250
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
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.	1000
WBET	Brockton, Mass.	5000
WBRN	Big Rapids, Mich.	1000d
WPON	Pontiac, Mich.	1000
KOWA	Hastings, Minn.	1000d
KDMA	Montevideo, Minn.	1000
WELZ	Belzoni, Miss.	1000d
WACY	Moss Point, Miss.	1000d
KADY	St. Charles, Mo.	5000d
KRNY	Kearney, Nebr.	5000d
KENO	Las Vegas, Nev.	1000
WJJZ	Mt. Holly, N.J.	5000d
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
WFBA	San Sebastian, P.R.	
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
KYAC	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
KZNG	Hot Springs, Ark.	1000d
KBMX	Coalinga, Calif.	500d
KUTY	Palmdale, Cal.	5000d
KXOA	Sacramento, Calif.	5000
WMMW	Meriden, Conn.	1000d
WRBD	Pompano Beach, Fla.	5000
WCWR	Tarpon Springs, Fla.	5000d
WAAG	Adel, Ga.	1000d
WOOL	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.	500d
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
KELA	Centralia-Chehalis, Wash.	5000d
KSEM	Moses Lake, Wash.	5000
KAPS	Mount Vernon, Wash.	500d
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, Kan.	1000
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.	500d
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
WYRN	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
KSOR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500
WMQM	Memphis, Tenn.	
WJLE	Smithville, Tenn.	1000d
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 Center, Wash.	1000d
KVAN	Camas, 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.	1000
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
KOWL	Bijou, Cal.	1000
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 Springs, Colo.	500
KOLR	Sterling, Colo.	250
WGCH	Greenwich, Conn.	
WTOR	Torrington, Conn.	250
WTRL	Bradenton, Fla.	250
WJBS	Deland, Fla.	1000
WIRA	Ft. Pierce, Fla.	250
WCOF	Immokalee, Fla.	
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	1000
WPXE	Starke, Fla.	250
WTTB	Vero Beach, Fla.	1000
WSIR	Winter Haven, Fla.	500
WMOG	Brunswick, Ga.	1000
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, Ill.	1000
WKBV	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Ia.	500
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.	1000
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
WMDN	Midland, Mich.	1000
WLRC	Whitehall, Mich.	1000
KXRA	Alexandria, Minn.	250
KOZY	Grand Rapids, Minn.	250
KLGR	Redwd. Falls, Minn.	1000
WLOX	Biloxi, Miss.	1000
WCLD	Cleveland, Miss.	1000
WHOC	Philadelphia, Miss.	250
WTUP	Tupelo, Miss.	250
WVIM	Vicksburg, Miss.	250
KOMO	Carthage, Mo.	250
KTTR	Rolla, Mo.	1000
KDRO	Sedalia, Mo.	1000
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
WOLC	Port Jervis, N. Y.	1000
WOLF	Syracuse, N. Y.	1000
WSSB	Durham, N. C.	1000
WFLB	Fayetteville, N.C.	1000
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
WHSL	Wilmington, N.C.	250
KNDC	Hettinger, N.D.	1000
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.	1000
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.	1000d
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S.Dak.	1000
WOPI	Bristol, Tenn.	1000
WDXB	Chattanooga, Tenn.	1000
WROL	Knoxville, Tenn.	1000
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
WSGB	Sutton, 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

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
WPMB	Vandalia, Ill.	
WBRI	Indianapolis, Ind.	5000d
WAYK	Valparaiso, Ind.	
KWRG	New Roads, La.	
WVOC	Battle Creek, Mich.	1000d
WJBK	Detroit, Mich.	10000
KSTP	Minneapolis-St. Paul, Minn.	50000
KDFN	Doniphan, Mo.	1000d
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, Cal.	500d
KTIM	San Rafael, Calif.	1000d
KMOR	Littleton, Colo.	1000
WNLC	New London, Conn.	10000
WZZZ	Boynton Beach, Fla.	1000d
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
WRAN	Dover, N.J.	1000
WBRW	Brewster, N.Y.	1000d
WEAL	Greensboro, N.C.	1000d
WLAC	Nashville, Tenn.	50000
KCTX	Childress, Tex.	250d
KABH	Midland, Tex.	500d
KMOO	Mineola, Tex.	250d
KROB	Robstown, Tex.	500d
KSTV	Stephenville, Tex.	250d
KGA	Spokane, Wash.	50000
WAUX	Waukesha, Wis.	10000d

Kc. Wave Length W.P.

1520—197.4

KGHT Hollister, Calif. 500
KACY Port Hueneme, Calif. 10000
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. 5000
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
KYMN Oregon City, Ore. 10000
WCHE West Chester, Pa. 250
WRAI Rio Piedras, P. R. 250
WBHT Brownsville, Tenn. 250d

1530—196.1

WLCB Moulton, Ala. 1000d
WCTR Chestertown, Mo. 1530
KCAT Pine Bluff, Ark 250d
KTMN Trumann, Ark. 250d
KFBK Sacramento, Calif. 50000
KRYT Colorado Springs, Colo. 1000d
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
KNBE Lincoln, Neb. 5000d
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
WBSR Pensacola, Fla. 1000
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.
WLEF Greenwood, Miss. 500d
KBXM Kennett, Mo. 250d
WPTR Albany, N.Y. 50000
WRPL Charlotte, N.C. 1000d
WIFM Elkin, N.C. 1000d
WBCO Bucyrus, Ohio 500d
WABQ Cleveland, Ohio 1000d
WNIO Niles, Ohio 500d
WBTC Ulrichville, O. 250
KWFS Eugene, Ore. 1000d
WJMJ Philadelphia, Pa. 50000d
WPTS Pittston, Pa. 1000d
WPME Punxsutawney, Pa. 1000d
WADK Newport, R.I. 1000d
WBFJ Woodbury, Tenn. 500d
KCUL Ft. Worth, Tex. 50000d
KGBC Galveston, Tex. 1000
WRGM Richmond, Va. 10000
KBVU Bellevue, Wash. 1000
WTKM Hartford, Wis. 500d

1550—193.5

WBHM Birmingham, Ala. 50000d
WAAY Huntsville, Ala. 5000
KFIF Tucson, Ariz. 50000d
KXEX Fresno, Calif. 500d
KKHI San Fran., Calif. 10000
KDAB Arvada, Colo. 50000
WRIZ Coral Gables, Fla. 10000d
WORT New Smyrna Bch., Fla. 250
WYOU Tampa, Fla. 10000d
WSMA Smyrna, Ga. 10000d
WJIL Jacksonville, Ill. 1000d
WCSJ Morris, Ill. 250d
WPDF Corydon, Ind. 250d
WCTW New Castle, Ind. 250
WKQV Sullivan, Ind. 250d
KIWA Sheldon, Iowa 500d
KEDD Dodge City, Kans. 1000d
KNIC Winfield, Kan. 250d
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 Senatobia, Miss. 5000d
KBLR Bolivar, Mo. 250
KGMO Cape Girardeau, Mo. 5000d
KKJO St. Joseph, Mo. 5000
KICS Hastings, Neb. 500d
WCGR Canadaiqua, 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 Bennettsville, S.C. 10000
WTHB N. Augusta, S.C. 1000d
KCAN Canyon, Tex. 1000
KWBC Navasota, Tex. 250d
WKYE Bristol, Tenn. 1000d
WPTN Cookeville, Tenn. 250d
WTPI Cookville, Tenn. 250d
WKPT Kingsport, Tenn. 10000d
KCOM Comanche, Tex. 250d
WKBA Vinton, Va. 1000d
WKVK Virginia Beach, Va. 5000d
WXVA Charlestown, W.Va. 500d
KOQT Bellingham, Wash. 1000d
KGAR Vancouver, Wash. 1000d

1560—192.3

WAGC Centre, Ala. 1000d
KBIB Monette, Ark. 250d
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
WPHN Liberty, Ky. 250d
WDXR Paducah, Ky. 1000
WBGS Sidell, La. 1000d
KBEW Blue Earth, Minn. 250
KQYX Joplin, Mo. 250
WQXR New York, N.Y. 50000
WSDC Mocksville, N.C. 250d
WGLD Chardon, Ohio 250d
WTNS Coshocton, Ohio 1000d
WFOL Hamilton, O. 1000d
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, Cal. 5000d
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. 5000d
WTAY Robinson, Ill. 250d
WILO Frankfort, Ind. 250d
WAWK Kendallville, Ind. 250d
WNUW New Albany, Ind. 10000d
KMCD Fairfield, Iowa 250d
KJFJ Webster City, Iowa 250d
KNDY Marysville, 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. 1000d
WONA Winona, Miss. 1000d
KLEX Lexington, Mo. 250d
WAFS Amsterdam, N.Y. 1000d
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, O. 1000d
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 500d
WSWV Pennington Gap, Va. 1000d
WYTI Rocky Mount, Va. 1000d
WAPL Appleton, Wis. 1000d

1580—189.2

WEYY Talladega, Ala. 1000d
KYND Tempe, Ariz. 50000
KPCA Marked Tree, Ark. 250d
KFDF Van Buren, Ark. 1000d
KMRE Anderson, Cal. 1000d
KWIP Merced, Calif. 500d
KDAY Santa Monica, Cal. 50000
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
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
KLTR 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
WLIJ 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, Cal. 5000d
KUDU 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. 5000
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. 500d
WVOE Chadburn, N.C. 1000
WGTC Greenville, N.C. 500
WNOS High Point, N.C. 1000d
WAKR Akron, Ohio 5000
WSRW Hillsboro, Ohio 500d
KHEN Henryetta, Okla. 500d
KTIL Tillamook, Oreg. 1000
WZUM Carnegie, Pa. 1000d
WCBG Chambersburg, Pa. 5000
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.D. 250d
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
KVIO 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. 500d
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

WHITE'S RADIO LOG

Kc. Wave Length	W.P.
WAQI Ashtabula, Ohio	1000d
WBLY Springfield, Ohio	1000d
WTTF Tiffin, Ohio	500d
KUSH Cushing, Okla.	1000d
KASH Eugene, Oreg.	5000
KOHI St. Helens, Ore.	1000d
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
CKWW Windsor, Ont.	500
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
CHTM Tompson, Man.	1,000
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.	50,000d 10,000n
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 Saulte 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.	10,000d
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
CKTK Kitimat, B.C.	1,000d 250n
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
CJWA Wawa, Ont.	1,000d 250n
CKCQ-1 Williams Lake, B.C.	250
CKBS St. Hyacinthe, Que.	250
CKLS La Sarre, Que.	250
1250—239.9	
CBOF Ottawa, Ont.	10,000
CHSM Steinbach, Man.	10,000
CHWO Oakville, Ont.	1,000d 500n
CKBL Matane, Que.	10,000d 5,000n
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

Kc.	Wave Length	W.P.
1280—234.2		
CHIQ	Hamilton, Ont.	5,000
CJMS	Montreal, Que.	50,000d 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 5,000n
CKEC	New Glasgow, N.S.	5,000
CKKW	Kitchener, Ont.	1,000
1340—223.7		
CFGB	Goose Bay, Nfld.	1,000
CFOM	Quebec, Que.	250
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
CKOX	Woodstock, Ont.	250
1350—222.1		
CHOV	Pembroke, Ont.	1,000
CJOC	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.	10,000d 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
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
CKPM	Ottawa, Ont.	10,000
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
1480—202.6		
CBZ	Fredericton, N.B.	10,000
1490—201.2		
CFMR	Fort Simpson, N.W.T.	25
CFRC	Kingston, Ont.	100
CKAD	Middleton, 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. 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
	WEAR-TV	3
	WKRG-TV	5
Montgomery	WCOV-TV	20
	WKAB-TV	32
	WSFA-TV	12
Selma	WSLA	8
ALASKA		
Anchorage	KENI-TV	2
	KTVA	11
Fairbanks	KFAR-TV	2
	KTVF	11
Juneau	KINY-TV	8
ARIZONA		
El Dorado, Ariz.-Monroe, La.	KTVE	10
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	8
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
	KMEX-TV	34
	KNBC	4
	KNXT	2
	KTLA	5
	KTTV	11
Redding	KRCR-TV	7
	KIXE-TV	9
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
	XETV	6
Tijuana-San Diego	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
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
	WDCA-TV	20
	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
	WJKS-TV	36
	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
Honolulu	KHJK	13
	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
Twin Falls	KMVT	11
ILLINOIS		
Champaign	WCHU	33
	WCIA	3
Chicago	WBBM-TV	2
	WBKB	7
	WCIU	26
	WGN-TV	9
	WMAQ-TV	5
	WOGO-TV	32

WHITE'S RADIO LOG

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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 Haute	WTHI-TV	10

IOWA

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Bowling Green	WLTV	13
Lexington	WKYT-TV	27
	WLEX-TV	18
Louisville	WHAS-TV	11
	WAVE-TV	3
	WLKY-TV	32
Paducah	WPSD-TV	6

LOUISIANA

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Baltimore	WBAL-TV	11
	WJZ-TV	13
	WMAR-TV	2
Salisbury	WBOC-TV	16

MASSACHUSETTS

Location	C.L.	Chan.
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	WJZB-TV	14

MICHIGAN

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Las Vegas	KLAS-TV	8
	KORK-TV	2
	KSHO-TV	13
Reno	KCRL	4
	KOLO-TV	8

NEW HAMPSHIRE

Location	C.L.	Chan.
Manchester	WMUR-TV	9

NEW JERSEY

No Stations

NEW MEXICO

Location	C.L.	Chan.
Albuquerque	KGGM-TV	13
	KOAT-TV	7
	KOB-TV	4
Carlsbad	KAVE-TV	6
Clovis	KFDW-TV	12
Roswell	KSWS-TV	8

NEW YORK

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Asheville	WISE-TV	62
	WLOS-TV	13
Charlotte	WBTV	3
	WCCB-TV	36
	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

Location	C.L.	Chan.
Bismarck	KFYR-TV	5
	KXMB-TV	12
Dickinson	KDIX-TV	2
Fargo	KTHI-TV	11
	WDAY-TV	6
Minot	KMOT	10
	KXMC-TV	13
Pembina	KCND-TV	12
Valley City	KXJB-TV	4
Williston	KUMV-TV	8

OHIO

Location	C.L.	Chan.
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
	WKEF	22
	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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Providence	WJAR-TV	10
	WPRO-TV	12
Providence (New Bedford, Mass.)	WTEV	6

SOUTH CAROLINA

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Abilene	KRBC-TV	9
Amarillo	KFDA-TV	10
	KGNC-TV	4
	KVII	7
Austin	KHFI-TV	42
	KTBC-TV	7
Beaumont	KBMT	12
	KFDM-TV	6
Big Spring	KWAB-TV	4
Bryan	KBTX-TV	3
Corpus Christi	KIII	3
	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

Location	C.L.	Chan.
El Paso-Juarez, Mex.	XEJ-TV	5
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
	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

Location	C.L.	Chan.
Salt Lake City	KCPX-TV	4
	KSL-TV	5
	KUTV	2

VERMONT

Location	C.L.	Chan.
Burlington	WCAX-TV	3

VIRGINIA

Location	C.L.	Chan.
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

Location	C.L.	Chan.
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
	KNDO	23

WEST VIRGINIA

Location	C.L.	Chan.
Bluefield	WHIS-TV	6
Charleston	WCHS-TV	8
Clarksburg	WBOY-TV	12
Huntington-Charleston	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

Location	C.L.	Chan.
Eau Claire	WEAU-TV	13
Green Bay	WBAY-TV	2
	WLUK-TV	11
	WFRV	5
La Crosse	WKBT	8
Madison	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

Location	C.L.	Chan.
Casper	KTWO-TV	2
Cheyenne	KFBC-TV	5
Riverton	KWRB-TV	10

GUAM

Location	C.L.	Chan.
Agana	KUAM-TV	8

PUERTO RICO

Location	C.L.	Chan.
Aguadilla-Mayaguez	WOLE-TV	12
Mayaguez	WORA-TV	5
Ponce	WSUR-TV	9
	WRIK-TV	7
San Juan	WAPA-TV	4
	WKAQ-TV	2
	WTSJ	18
Caguas-San Juan	WKBM-TV	11

VIRGIN ISLANDS

Location	C.L.	Chan.
Charlotte Amalie	WBNB-TV	10

U. S. Educational Television Stations by States

Territories and possessions follow states. Chan., channel; C.L., call letters.

ALABAMA

Location	C.L.	Chan.
Birmingham	WBIQ	10
Dozier	WDIQ	2
Mobile	WEIQ	42
Montgomery	WAIQ	26
Mount Cheaha State Park	WCIQ	7

ARIZONA

Location	C.L.	Chan.
Phoenix	KAET	8
Tucson	KUAT	6

CALIFORNIA

Location	C.L.	Chan.
Sacramento	KVIE	6
San Bernardino	KVCR-TV	24
San Francisco	KQED	9

COLORADO

Location	C.L.	Chan.
Denver	KRMA-TV	6

CONNECTICUT

Location	C.L.	Chan.
Hartford	WEDH	24

DELAWARE

Location	C.L.	Chan.
Wilmington	WHYY-TV	12

DISTRICT OF COLUMBIA

Location	C.L.	Chan.
Washington	WETA-TV	26

FLORIDA

Location	C.L.	Chan.
Gainesville	WUFT	5
Jacksonville	WJCT	7
Miami	WSEC-TV	17
	WTHS-TV	2
Tallahassee	WFSU-TV	11
Tampa-St. Petersburg	WEDU	3

GEORGIA

Location	C.L.	Chan.
Athens	WGTV	8
Atlanta	WETV	30
Columbus	WJSP-TV	28
Savannah	WVAN-TV	9
Waycross	WXGA-TV	8

ILLINOIS

Location	C.L.	Chan.
Carbondale	WSIU	8
Chicago	WTTW	11
Urbana-Champaign	WILL-TV	12

IOWA

Location	C.L.	Chan.
Des Moines	KDPS-TV	11

KENTUCKY

Location	C.L.	Chan.
Louisville	WFPK-TV	15

LOUISIANA

Location	C.L.	Chan.
Monroe	KLSE	13
New Orleans	WYES-TV	8

MAINE

Location	C.L.	Chan.
Augusta	WCBB	10
Calais	WMED-TV	13
Orono	WMEB-TV	12
Presque Isle	WMEM-TV	10

MASSACHUSETTS

Location	C.L.	Chan.
Boston	WGBH-TV	2

MICHIGAN

Location	C.L.	Chan.
Detroit	WTVS	56
Onondaga-East Lansing	WMSB	10

MINNESOTA

Location	C.L.	Chan.
Duluth	WDSE-TV	8
St. Paul-Minneapolis	KTCA-TV	2

MISSOURI

Location	C.L.	Chan.
Kansas City	KCSD-TV	19
St. Louis	KETC	9

NEBRASKA

Location	C.L.	Chan.
Lincoln	KUON-TV	12

NEW HAMPSHIRE

Location	C.L.	Chan.
Durham	WENH	11

NEW MEXICO

Location	C.L.	Chan.
Albuquerque	KNME-TV	5

NEW YORK

Location	C.L.	Chan.
Buffalo	WNED-TV	17
New York	WNDT	13
	WNYC	31
Schenectady	WMHT	17

NORTH CAROLINA

Location	C.L.	Chan.
Chapel Hill	WUNC-TV	4
Charlotte	WUTV	36

NORTH DAKOTA

Location	C.L.	Chan.
Fargo	KFME	13

OHIO

Location	C.L.	Chan.
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

Location	C.L.	Chan.
Oklahoma City	KETA	13
	KOKH-TV	25
Tulsa	KOED-TV	11

OREGON

Location	C.L.	Chan.
Corvallis	KOAC-TV	7
Portland	KOAP-TV	10

PENNSYLVANIA

Location	C.L.	Chan.
Clearfield	WPSX-TV	3
Philadelphia	WUHY-TV	35
Pittsburgh	WQED	13
	WQEX	16

SOUTH CAROLINA

Location	C.L.	Chan.
Charleston	WITV	6
Greenville	WNTV	29

SOUTH DAKOTA

Location	C.L.	Chan.
Vermillion	KUSD-TV	2

TENNESSEE

Location	C.L.	Chan.
Memphis	WKNO-TV	10
Nashville	WDCN-TV	2

TEXAS

Location	C.L.	Chan.
Dallas	KERA-TV	13
Houston	KUHT	8
Lubbock	KTXT-TV	5
Richardson	KRET-TV	23
San Antonio-Austin	KLRN-TV	9

UTAH

Location	C.L.	Chan.
Logan	KUSU-TV	12
Ogden	KWCS-TV	18
	KOET	9
Provo	KBYU-TV	11
Salt Lake City	KUED	7

VIRGINIA

Location	C.L.	Chan.
Hampton-Norfolk	WHRO-TV	15
Portsmouth	WYAH-TV	27
Richmond	WCVE-TV	23

WASHINGTON

Location	C.L.	Chan.
Pullman	KWSC-TV	10
Seattle	KCTS-TV	9
Tacoma	KPEC-TV	56
	KTPS	62
Yakima	KYVE-TV	47

WISCONSIN

Location	C.L.	Chan.
Madison	WHA-TV	21
Milwaukee	WMVS-TV	10
	WMVT	36

PUERTO RICO

Location	C.L.	Chan.
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	3
Ashcroft, B.C.	CFCR-TV-2	10
Baldy Mountain, Man.	• CKSS-TV	8
Baie 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
Burns Lake, B.C.	CFTK-TV-3	2
Calgary, Alta.	CFCN-TV	4
Calgary, Alta.	CHCT-TV	2
Callander, Ont.	CFCH-TV	10
Campbellton, N.B.	CKCD-TV	7

WHITE'S RADIO LOG

Location	C.L.	Chan.
Canning, N.S.	CJCH-TV-1	10
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
Crescent Valley, B.C.	CHMS-TV-1	5
Dryden, Ontario	CBWAT-1	9
Eastend, Sask.	CJFB-TV-1	2
Dawson Creek, B.C.	CJDC-TV	5
Drunheller, 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
Halifax, N.S.	CJCH-TV	5
Hamilton, Ont.	CHCH-TV	11
Huntsville, Ont.	CKVR-TV-2	8
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
Kildala, B.C.	CFTK-TV-4	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
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
Red Lake, Ont.	CBWAT-5	10
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
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
	CBFOT	9
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

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
	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
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
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

Location	C.L.
	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
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	WTDL-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

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 elsewhere.

WHITE'S RADIO LOG

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.

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.

In our listings, a station or frequency marked with an asterisk (*) indicates a non-broadcast station or frequency. This might include aeronautical, maritime, military, or other type of transmission, either in regular AM or single sideband (SSB). In instances where many non-broadcast stations use the same frequency, we have given you a clue as to the type of stations to be found there, rather than pin down only one station.

The biggest thing in international broadcasting these days are the so-called "pirate" (unlicensed) broadcasting ships which are popping up all over western Europe. Last issue we gave you a run down on the current status of them, but now, only two months later, there are many more on the air—and these bootleg stations have added a further audacity to their operations, they are sending out QSL cards! Since some U.S. and Canadian listeners have reported hearing these stations, and since information on their operation does not appear in any "official" listings of radio stations, we have contacted our pirate broadcasting authority, Tom Kneitel, K3FLL/WB2AAI, for further details. Here's what he has for us this month:

Radio Caroline, reported in our December-January issue, now QSL's with a black and white card showing a picture of a bell. Their *new* address is P.O. Box 3, Ramsey, Isle of Man, England.

Radio City, is the new name for *Radio Sutch* (see December-January R-TVE). Operating on 1529 kc/s from 5 AM to 1 PM (EST), they will soon increase power to 2,000 watts from their present 560 watts. They announce, "Britain's First Teenage Radio Station."

Radio Invicta, "The Voice of Kent," operates 1 AM to 1 PM (EST) on 980 kc/s. The address for QSL's is: 16 East Cliff Gardens, Folkestone, Kent, England. They play non-teenage music. This station was originally known as *"GBLN, Radio GB, London,"* and was heard as early as April, 1962.

Radio North Sea, or **Radio Nordzee,** is broadcasting to Holland from a fixed platform in the North Sea. They tested on 1070, 1475 and 1485 kc/s as "Your Station From The Sea;" they have now settled down on 1400 kc/s with 1,000 watts on the following schedule: 4 AM to 6 AM (EST) and 11 AM to 3 PM (EST). They are expected to open a TV station soon.

Radio Albatross, a converted minesweeper, soon to start 18 hours of broadcasting daily to East Anglia, England.

Radio Lambay, another new one, will be anchored 5 miles off the coast of Dublin, Ireland.

Star Club Radio, A West German station, will have programs in both German and Dutch from their moorings near Heligoland.

An English RADIO-TV EXPERIMENTER monitor, Rex H. Lawson of London, reports hearing "The Voice of The Sea," apparently another name for *Radio North Sea.* Their broadcast signed off with these cryptic words: "This broadcast is for our most constant listener, Peter. Our mutual friend Long John still has 3 legs and 2 arms, and tomorrow he will be making progress on shore. Now this is the Voice of The Sea closing down forever, to arise tomorrow, like Venus, out of the sea in a different language. Goodnight. Bon Soir. Guten Abend."

Still the most mysterious station around is the so-called "Kiss Me Honey" station, which does nothing more than play the same popular song over-and-over again. It consists of a woman, accompanied by a flute, singing "Kiss Me Honey." Sometimes the recording is played at double speed, and there are never any announcements. Reported by many U.S. and Canadian monitors on 11695 kc/s, the station suffers from heavy jamming at times and has been heard most recently around 1:30 to 2 PM (EST), also 8:30 to 9:45 AM (EST). There is a possibility that "Kiss Me Honey" may itself be a jamming station attempting to silence "Radio Peyk-e Iran" (Radio Free Iran) a bootleg political agitator probably located in Bulgaria. "Radio Peyk-e Iran" and "Kiss Me Honey" operate on the same frequency. "KMH" has also been heard on "Peyk-e" 9555 kc/s channel which seems to be more than just a coincidence. Tom Kneitel, who supplied this data, reports good signals from "KMH" and says that most listeners should be able to copy this interesting station without much difficulty.

Monitor E. Panum, Vancouver, B.C., reports hearing standard broadcast station 2CY in Canberra, N.S.W., Australia, on 850 kc/s. The 10,000 watter was heard from 6 AM to 6:16 AM (EST) last August 17th. It was running an S-3. Nice going! That's a long haul on the broadcast band.

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

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

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

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

Donald Burns, Rego Park, N. Y.
Larry Bruegl, Park Falls, Wisc.
Phil Zucchi, Manomet, Mass.
Glenn R. Wyant, St. Catherines, Ont.
John Paulsen, Selma, Ala.
Tom Kneitel, New York, N. Y.
John Janecek, Lincoln, Nebr.
J. J. Graulich, New Castle, Del.
Charles Purdy, Jr., Millis, Mass.
Bill Grammage, Waco, Tex.
David White, Cadiz, Ky.
C. M. Carlson, San Marcos, Calif.
Rich Roth, Buzzards Bay, Mass.
W. Wandrei, Burnaby, B. C.
John M. McLeod Vancouver, B. C.
Ken Dubar, Wallingford, Conn.
unsigned, Narberth, Pa.
Larry Cotarici, Chicago, Ill.
Dan Bennett, Serafina, N. Mex.
Barry Firth, Lakeland, Fla.
Bruce Pomeroy, Phoenix, Ariz.
John Swain, Caneseraga, N. Y.
Stuart Sood, Greensboro, N. C.
Ronald Bedford, Canton, Ohio
George Derringer, Newburgh, N. Y.
Jerry Van Vactor, Spearfish, S. D.
Lee Rand, Old Town, Me.
Dennis Letendre, N. Miami, Fla.
Gerardo Brown, Jr., Oneonta, N. Y.
Julian M. Siemkiewicz, Brooklyn, N. Y.
Paul Stefany, Rockaway, N. J.
Bruce Kirkpatrick, Topeka, Kans.
Joseph Falcone, Philadelphia, Pa.
William Campbell, Canandaigua, N. Y.
John Sowers, Hightstown, N. J.
Robert Leipow, Brooklyn, N. Y.
Jack Kaplan, Teaneck, N. J.
Richard Tygrest, Hopewell, Va.
Dan Parker, Pocatello, Idaho
Barry Cobb, Cincinnati, Ohio
Philip Jones, Whittier, Calif.
Carleton May, Westminster, Mass.
David Pyatt, Indianapolis, Ind.
John Hanzlik, Omaha, Nebr.
Allen Mattis, Stone Lake, Wisc.
Douglas Strande, Northwood, N. D.
Bruce Molter, Maplewood, Mo.
Tom Mace, Vernon, B. C.
Frank Brandon, Schuylerville, N. Y.
Herb Fredmon, Jamaica, N. Y.
Gene Whitehurst, Hallettsville, Tex.
Chuck McClure, Bethany, Okla.
Marion C. Bue, Seattle, Wash.
John Hasse, Vermillion, S. D.
Terry McGlone, Waukesha, Wisc.
Steve Shimko, Baltimore, Md.
Albert Rosenberg, New Castle, Del.

Freq.	Call	Name	Location	EST
2182	—	(Marine Emerg.)*	various ship & land	—
2390	ZYV71	R. Mundo Melhor	Governador, Braz.	1942
2425	—	S. Rhodesia BC	Gwelo, S. Rhodesia	2300
2460	—	Windw. Is. BC	St. Georges, Grenada	1500
2670	NMW	NMW (U.S.C.G.)*	Seattle, Wash.	0030
	NMY	NMY (U.S.C.G.)*	New York, N.Y.	0721
	—	U.S. Coast Guard*	various ship & land	—
2716	—	U.S. Navy*	various ship & land	—
3215	VUD	All India R.	New Delhi, India	1215
3236	ZK6	R. Raratonga	Raratonga, Cook Is.	0145
3245	VL8BK	VL8BK	Kerema, Papua	1500
3250	—	R. Highveld	Capetown, S. Africa	0108
3264	—	R. Congo	Brazzaville, Congo	2330
3280	—	Windw. Is. BC	St. Geprges, Grenada	1500

WHITE'S RADIO LOG

Freq.	Call	Name	Location	EST
3284	VRH8	Fiji BC	Suva, Fiji Is.	0135
3300	—	Brit. Hond. BC	Belize, Brit. Honduras	2300
3320	—	Korean Central BC	Pyongyang, N. Korea	1455
3330	CHU	Dominion Observat.*	Ottawa, Ont., Canada	2235
3331	—	R. TV Francais	Dzaoudzi, Comores	2230
3345	—	R. Alvadora	Londrina, Brazil	2140
3396	—	S. Rhodesia BC	Gwelo, S. Rhodesia	2300
3835	HCWNI	V. del Triunfo	Sto. Domingo, Ecu.	2100
3883	CR4AA	R. Club de Cabo Verde	Praia, Cape Verde Is.	1600
3925	JOZ	Nihon Tampa Hoso	Tokyo, Japan	0855
3950	CR6RZ	R. Angola	Luanda, Angola	0600
3952	CR7RA	R. Pax	Beira, Mozambique	2300
3953	MCM	BBC	London, Engl.	1900
3995	VQO3	Solomon Is. BC	Honiara, Sol. Is.	0230
4684	—	R. Hanoi	Hanoi, N. Vietnam	1100

60 Meter Band—4750 to 5060 Kc/s

Freq.	Call	Name	Location	EST
4720	CR4AB	R. Club Mindelo	Praia, Cape Verdi Is.	1600
4741	—	R. Sarenda	Carniri, Bolivia	2000
4767	—	Ondas Lojanas	........, Ecuador	2200
4773	HCMX4	R. Cenit.	Portoviejo, Ecuador	2300
4775	HCEH3	R. El Progresso	Loja, Ecuador	2245
4814	HCFA4	V. de Manabi	Portoviejo, Ecuador	'2330
4815	—	R. de Haute Volta	Ougadougou, Upper Volta	1400
4820	CR6RZ	R. Angola	Luanda, Angola	0600
	—	R. Reunion	St. Denis, Reunion	1230
4840	VL9BR	VL9BR	Rabaul, New Guinea	0100
4843	—	R. Congo	Brazzaville, Congo	2330
4850	ACA	U.S. Army*	Quarry Hts., Canal Zone	2325
	—	R. Mauritaine	Nouakchott, Mauritania	2230
4865	—	Brunei BC	Brunei Town, Brunei	1300
4870	—	R. Dahomey	Cotonou, Dahomey	1310
4877	—	V.T.V.N.	Saigon, S. Vietnam	1730
4880	—	R. Nationale	Leopoldville, Congo	2300
4925	—	R. Club de Mozamb.	Lourenco Marques, Mozamb.	2330
4926	—	R. Equat.	Baja, Span. Guinea	1600
4955	CR6RZ	R. Angola	Luando, Angola	0600
4945	—	R. Highveld	Capetown, S. Africa	0108
4955	HJCQ	R. TV Nacional	Bogota, Colombia	1930
4972	—	R. Yaounde	Yaounde, Cameroon	2330
5000	WWV	Nat'l Bur. of Stds.*	Beltsville, Md.	2122
	HBN	—*	Neuchatel, Switz.	2344
5005	—	R. Jaen	Jaen, Peru	2145
	—	Idaah al Jumhuriyah	Omdurman, Sudan	1130
5010	—	Windw. Is. BC	St. Georges, Grenada	1045
5012	—	S. Rhodesia BC	Gwelo, S. Rhodesia	0115
5015	—	Govorit Vladivostok	Vladivostok, USSR	0445
	PRC8	R. Guanabara	Rio de Janeiro, Brazil	2000
5016	—	E. Prov. de Guine	Bissau, Port. Guinea	1700
5025	—	R. Pax	Beira, Mozambique	2300
5030	HI3C	V. del Papagayo	La Romana, D.R.	1630
5035	—	R. Centr. Afric.	Bangui, Centr. Afr. Rep.	1500
5047	—	R. Rep. Togo	Lome, Togo	0300
5700	—	R. Liberdad	clandestine	1800
5910	—	Bizim R.	clandestine	1500
5930	—	R. Prague	Prague, Czech.	2000

49 Meter Band—5950 to 6200 Kc/s

Freq.	Call	Name	Location	EST
5950	TIQ	R. Casino	Puerto Limon, Costa Rica	1910
5955	—	Trans World R.	Bonaire, Neth. Ant.	1830
5965	—	V. of America	Greenville, N.C.	2110
5970	CKNA	R. Canada	Montreal, P.Q., Can.	0715
5978	CE597	R. Pres. Balmaceda	Santiago, Chile	2330
5980	—	R. Sanaa	Sanaa, Yemen	0600
5990	—	R. Malaysia	Kuching, Malaysia	1800
5994	—	R. Francaise	Fort de France, Martinique	1815
6001	—	R. Americas	Swan I.	0500
6005	CFCX	CFCX	Montreal, P.Q., Can.	1400
6010	—	Gorovit Yerevan	Yerevan, USSR	0430
6020	—	S. Rhodesia BC	Gwelo, S. Rhodesia	1000
6025	CR6RZ	R. Angola	Luanda, Angola	0600
6030	—	R. Baghdad	Baghdad, Iraq	1430
6035	—	V. of America	Monrovia, Liberia	0200
6040	—	R. Yaounde	Yaounde, Cameroon	0600
6045	XEXQ	R. Univ. Potosina	S. L. Potosi, Mexico	2346
6050	HCJB	V. of the Andes	Quito, Ecuador	0130
6055	JOZ2	Nihon Tampa Hoso	Tokyo, Japan	0855
	VTW2	V. of Tarawa	Tarawa, Gilbert & Ellice	1430
6060	—	R. Havana	Havana, Cuba	2100
6070	—	R. Sofia	Sofia, Bulgaria	2000
	CFRX	CFRX	Toronto, Ont., Canada	0245
6075	DMQ6	Deutsche Welle	Cologne, W. Germany	2035
	CXA3	R. Ariel	Montevideo, Uruguay	0430
6080	ZL7	R. New Zealand	Wellington, N.Z.	1300
	—	R. Berlin Int'l.	Berlin, E. Germany	1230
6085	—	R. Nederland	Hilversum, Neth.	2340
6095	—	R. Baghdad	Baghdad, Iraq	1430
6100	DMQ6	Deutsche Welle	Cologne, W. Germany	1900
6115	—	R. Club de Mozamb.	Lourenco Marques, Mozamb.	2330
	XEUDS	R. Univ. de Sonora	Hermosillo, Mex.	2350
6130	VUD	All India R.	New Delhi, India	1445
	—	V. of Spain	Madrid, Spain	2307
	—	V. of America	Honolulu, Hawaii	0630
6133	—	R. Malaysia	Kuching, Malaysia	1800
6135	—	R. Havana	Havana, Cuba	2200
	—	R. Prague	Prague, Czech.	0800
6145	DMQ6	Deutsche Welle	Cologne, W. Germany	2355
6160	—	R. TV Algerienne	Algiers, Algeria	0100
6165	XEWW	V. de Amer. Latina	Mexico D.F., Mexico	0705
6170	DUH2	Phil. Is. BC	Manila, Philippines	0425
6175	DMQ6	Deutsche Welle	Cologne, W. Germany	1900
	—	R. Malaysia	Kuching, Malaysia	1800
6185	—	V. of the West	Lisbon, Portugal	2325
6195	HRD2	V. de Atlantida	La Ceiba, Honduras	1915
6200	4VHW	R. Haiti	Port au Prince, Haiti	1905
6205	TIHBG	R. Reloj	S. Jose, Costa Rica	2100
6210	—	R. Peking	Peking, China	1605
6215	TIGPH	R. Monumental	S. Jose, Costa Rica	0000
6234	—	R. Budapest	Budapest, Hungary	1445
6290	—	R. Liberdad	clandestine	1800
	—	R. Peking	Peking, China	1430
6500	—	R. Puerto la Cruz	Puerto la Cruz, Venez.	2215
6567	—	Caribbean aero*	various aircraft & land	—
7035	—	R. Peking	Peking, China	0700
7085	—	R. Peking	Peking, China	1605

41 Meter Band—7100 to 7300 Kc/s

Freq.	Call	Name	Location	EST
7100	—	BBC	London, England	1900
7120	—	R. Prague	Prague, Czech.	2000
7125	VUD	All India R.	New Delhi, India	1445
7150	—	R. Moscow	Moscow, USSR	2100
7170	—	R. Nationale	Leopoldville, Congo	2300
7175	—	S. Rhodesia BC	Gwelo, S. Rhodesia	0500
	—	R. Congo	Brazzaville, Congo	0600
7195	—	V. of America	Monrovia, Liberia	0300
7205	CR7RB	R. Pax	Beira, Mozambique	2300
7210	—	R. Kiev	Kiev, USSR	1100
7215	—	R. Budapest	Budapest, Hungary	1445
7220	—	R. Australia	Melbourne, Australia	0100

Freq.	Call	Name	Location	EST
7225	—	R. Bucharest	Bucharest, Rumania	2030
7235	—	All India R.	New Delhi, India	1445
	CR6RZ	R. Angola	Luanda, Angola	0600
7250	—	Vatican R.	Vatican City	1950
7260	—	R. TV Francaise	Dzaoudzi, Comores	0445
7300	—	R. Berlin Int'l.	Berlin, E. Germany	1230
7305	—	R. Budapest	Budapest, Hungary	1630
7320	—	R. Liberdad	clandestine	0615
	—	Govorit Yerevan	Yerevan, USSR	0430
7335	CHU	Dominion Observ.*	Ottawa, Ont., Canada	2230
7340	—	R. Peking	Peking, China	1430
7345	—	R. Prague	Prague, Czech.	2000
7390	—	R. Damascus	Damascus, Syria	0000
7450	—	R. Peking	Peking, China	1430
7825	TAS	R. Ankara	Ankara, Turkey	1430
7950	NAU3	U. S. Navy*	Ft. Allen, P.R.	2050
8071	—	R. Stathmos	clandestine	1255
8871	—	Caribbean aero*	various planes & land	—
8879	—	Pacific aero*	various planes & land	—
8905	KIS	Anchorage*	Anchorage, Alaska	1222
	KVM	Honolulu*	Honolulu, Hawaii	2257
	KSF	San Francisco*	San Francisco, Calif.	2005
9009	4XB31	Kol Yisrael	Jerusalem, Israel	1515
9046	TJF90	Douala*	Douala, Cameroon	2306
9180	ZUD21	*	Oilfantsfontien, S. Afr.	2045
9192	SOJ31	Warsaw*	Warsaw, Poland	0046
9317	—	BBC	London, England	2200
9325	—	R. Liberdad	clandestine	1800
	AEZ	U. S. Army*	Asmara, Ethiopia	2303
9350	—	BBC	London, England	1630
9440	CP39	La Cruz del Sur	La Paz, Bolivia	1850
9457	—	R. Peking	Peking, China	1605
9480	—	R. Corp. P.R.*	San Juan, P. R.	2239
9485	—	R. Sto. Domingo	Sto. Domingo, Dom. Rep.	0130

31 Meter Band—9500 to 9775 Kc/s

Freq.	Call	Name	Location	EST
9500	OAX8F	R. Loreto	Iquito, Peru	2015
	—	Govorit Magadan	Magadan, USSR	0745
9505	—	N.H.K.	Tokyo, Japan	0100
9510	GSB	BBC	London, England	2310
	—	R. TV Algerienne	Algiers, Algeria	0130
9515	XEWW	V. de Amer. Latina	Mexico D. F., Mexico	0705
9518	—	Huna Kuwait	Kuwait	2300
9520	OZF5	V. of Denmark	Copenhagen, Den.	2030
	—	Idaah al Jumhuriyah	Omdurman, Sudan	2330
	VUD	All India R.	New Delhi, India	0500
9540	—	R. Moscow	Moscow, USSR	0045
9545	DMQ9	Deutsche Welle	Cologne, W. Germany	2355
	—	R. Beirut	Beirut, Lebanon	0430
9550	—	Windw. Is. BC	St. Georges, Grenada	1045
	OAX1Z	R. Nacional	Tumbes, Peru	0630
9555	—	R. Damascus	Damascus, Syria	0900
9560	—	R. Berlin Int'l.	Berlin, E. Germany	2000
	—	R. Amman	Amman, Jordan	1845
9565	—	V. of Indonesia	Djakarta, Indonesia	0430
9570	—	R. Moscow	Moscow, USSR	2100
9575	DMQ9	Deutsche Welle	Cologne, W. Germany	2200
	—	R.A.I.A.	Rome, Italy	1940
9580	GSC	BBC	London, England	0045
9595	JOZ3	Nihon Tampa Hoso	Tokyo, Japan	0855
9600	KCBR	Armed Forces R.	San Francisco Calif.	1000
9610	LLG	R. Norway	Oslo, Norway	2100
9625	—	Kol Yisrael	Jerusalem, Israel	1515
	—	R. Canada	Montreal, P. Q., Canada	1800
9640	DMQ9	Deutsche Welle	Cologne, W. Germany	2115
	YVPG	Ecos del Torbes	San Cristobal, Venez.	1800
9645	—	R. Berlin Int'l.	Berlin, E. Germany	2345
	—	Vatican R.	Vatican City	1950
9650	—	R. Moscow	Moscow, USSR	2100
	—	R. Peking	Peking, China	0700
9660	—	R. Nationale	Leopoldville, Congo	2300
	—	Gorovit Kiev	Kiev, USSR	2140
9665	HEU3	Swiss BC	Berne, Switz.	1415
9680	—	R. Moscow	Moscow, USSR	2100
9690	VUD	All India R.	New Delhi, India	1445
	LRA32	R. Argentina	Buenos Aires, Arg.	2148
	ZYB22	R. Rio Mar	Manaus, Brazil	1230
9700	—	R. Sofia	Sofia, Bulgaria	1850
9705	—	U.N. R.	New York, N. Y.	2300
	ETLF	V. of Gospel	Addis Ababa, Ethiopia	0930
9715	—	R. Congo	Brazzaville, Congo	1215
9720	ETLF	V. of Gospel	Addis Ababa, Ethiopia	1100
	—	V. of America	Bethany, Ohio	2145
9735	DMQ9	Deutsche Welle	Cologne, W. Germany	1000
9740	—	R. Moscow	Moscow, USSR	1700
9745	HCJB	V. of the Andes	Quito, Ecuador	0130
9760	—	R. Moscow	Moscow, USSR	1700
9795	—	R. Prague	Prague, Czech.	2000
9745	ORU	R. Brussels	Brussels, Belg.	1100
9760	—	R. Hanoi	Hanoi, N. Vietnam	0500
9765	CR6BZ	R. Angola	Luanda, Angola	1300
9770	OE147	Oesterreichischer R.	Vienna, Austria	1900
9833	—	R. Budapest	Budapest, Hungary	2035
9840	—	R. Hanoi	Hanoi, N. Vietnam	2330
9860	—	R. Peking	Peking, China	1430
9990	—	R. Peking	Peking, China	0900
9915	VUD	All India R.	New Delhi, India	1445
9925	WWK49	R. Corp. P. R.*	San Juan, P. R.	0250
9970	ZNX43	Georgetown*	Georgetown, Barbados	1807
10135	ZB146	Cable & Wireless*	Ascension I.	1931

25 Meter Band—11700 to 11975 Kc/s

Freq.	Call	Name	Location	EST
10410	KUK30	Guam*	Agana, Guam	0115
11915	HCJB	V. of the Andes	Quito, Ecuador	0130
11672	—	R. Pakistan	Karachi, Pakistan	0830
11690	—	R. Moscow	Moscow, USSR	1700
11700	—	V. of Indonesia	Djakarta, Indonesia	0430
11705	—	R. Moscow	Moscow, USSR	0145
11755	—	R. Moscow	Moscow, USSR	0145
11760	CKRA	R. Canada	Montreal, P. Q., Canada	1800
11770	VUD	All India R.	New Delhi, India	0500
	—	V. of America	Bethany, Ohio	1800
11795	DMQ11	Deutsche Welle	Cologne, W. Germany	1300
11800	—	R. Peking	Peking, China	0700
	—	R. Berlin Int'l.	Berlin, E. Germ.	2000
11805	—	R. Sweden	Stockholm, Sweden	2332
11810	—	R. TV Algerienne	Algiers, Algeria	0600
11815	ZYW24	R. Brasil Cent.	Goiania, Brazil	1900
11820	—	R. Peking	Peking, China	2305
	—	R. TV Francaise	Abidjan, Ivory Coast	0130
11830	ZL20	R. N.Z.	Wellington, N.Z.	2300
11835	—	R. TV Algerienne	Algiers, Algeria	0130
	4VEJ	V. Evangelique	Cap Hatien, Haiti	0845
	—	Trans World R.	Monte Carlo, Monaco	1010
11840	—	R. Hanoi	Hanoi, N. Vietnam	2330
11850	—	R. Moscow	Moscow, USSR	0145
11865	—	Trans World R.	Monte Carlo, Monaco	1310
11875	WRUL	R. N. Y. Worldwide	New York, N.Y.	1330
11885	—	R. Peking	Peking, China	0900
11900	—	V. of Nigeria	Lagos, Nigeria	0900
11920	—	R. Berlin Int'l.	Berlin, E. Germany	2345
11925	DMQ11	Deutsche Welle	Cologne, W. Germany	1000
	ZYR78	R. Bandeirantes	Sao Paulo, Brazil	1930
	HLK6	V. of Free Korea	Seoul, Korea	0200
11940	WRUL	R.N.Y. Worldwide	New York, N. Y.	0700
11965	PRB24	R. Record	Sao Paulo, Brazil	1930
11970	—	Gorovit Yerevan	Yerevan, USSR	0430
11980	—	R. Moscow	Moscow, USSR	0145
11990	—	R. Prague	Prague, Czech.	2000
12182	—	BBC	London, England	1300
13265	VFG	Gander*	Gander, Nfld.	1829
14350	—	R. Portugal Libre	clandestine	1415
15044	—	R. Hanoi	Hanoi, N. Vietnam	1100
15050	—	R. Liberdad	clandestine	1800
15060	—	R. Peking	Peking, China	0700
15085	—	Windw. I. BC	St. Georges, Grenada	1500
15095	—	R. Pakistan	Karachi, Pakistan	0830
	—	R. Peking	Peking, China	1855
	—	R. Teheran	Teheran, Iran	0200

19 Meter Band—15100 to 15450 Kc/s

Freq.	Call	Name	Location	EST
15105	VUD	All India R.	New Delhi, India	0500
15110	XERR	R. Comerciales	Mexico D. F., Mexico	1715
15115	—	R. Peking	Peking, China	2301
	HCJB	V. of the Andes	Quito, Ecuador	0130
15116	—	R. Hanoi	Hanoi, N. Vietnam	0500
15135	—	R. Havana	Havana, Cuba	1550
15155	—	R. Ghana	Accra, Ghana	0900
	ELWA	ELWA	Monrovia, Liberia	1415
15165	VUD	All India R.	New Delhi, India	0500

WHITE'S RADIO LOG

Freq.	Call	Name	Location	EST
	—	R. Damascus	Damascus, Syria	1100
15165	OZF7	V. of Denmark	Copenhagen, Denmark	0700
15185	OIX4	Finnish BC	Helsinki, Finland	1530
15190	CKCX	R. Canada	Montreal, P. Q., Canada	1800
15195	TAQ	R. Ankara	Ankara, Turkey	1200
15210	—	U.A.R. BC	Cairo, Egypt	1545
15220	—	Austr. BC Comm.	Melbourne, Australia	1500
15240	KGEI	V. of Friendship	San Francisco, Calif.	1830
15245	—	Ici Paris	Paris, France	0800
15255	—	V. of Nigeria	Lagos, Nigeria	0900
15270	—	R. Havana	Havana, Cuba	1530
15280	ZL4	R. N.Z.	Wellington, N.Z.	1600
15290	WRUL	R. N. Y. Worldwide	New York, N. Y.	1440
15315	—	V. of America	Monrovia, Liberia	1500
15335	ORU	R. Brussels	Brussels, Belg.	0600
15340	—	R. Havana	Havana, Cuba	1800
15345	—	V. of Greece	Athens, Greece	1230
15380	—	BBC	London, England	1115
15385	—	Gorovit Yerevan	Yerevan, USSR	0430
15440	WRUL	R. N. Y. Worldwide	New York, N. Y.	0700
15620	KUQ20	Samoa*	Pago Pago, Amer. Samoa	1900
15465	PZH25	Surinam*	Paramaribo, Surinam	0927
15674	KEA20	Wake I.*	Wake Island	1550
15913	—	BBC	London, England	0415

16 Meter Band—17700 to 17900 Kc/s

Freq.	Call	Name	Location	EST
17715	—	V. of America	Greenville, N. C.	1815
17720	—	Ici Paris	Paris, France	0800
17720	—	Windw. Is. BC	St. Georges, Grenada	1400
17745	—	V. of Greece	Athens, Greece	1230
17760	WRUL	R. N. Y. Worldwide	New York, N. Y.	0700
17765	—	Ici Paris	Paris, France	0800
17775	—	R. Club de Mozamb.	Lourenco Marques, Mozamb.	2330
17815	—	R. Tupi	Sao Paulo, Brazil	1230
17820	TAV	R. Ankara	Ankara, Turkey	0915
17840	—	R. Australia	Melbourne, Australia	2000
17845	ORU	R. Brussels	Brussels, Belg.	0600
17855	VUD	All India R.	New Delhi, India	0500
	—	V. of America	Dixon, Calif.	1815
17860	ORU	R. Brussels	Brussels, Belg.	0600
	HCJB	V. of the Andes	Quito, Ecuador	1300
17875	PRL2	R. Min. da Educacao	Rio de Janeiro, Brazil	1105

13 Meter Band—21450 to 21750 Kc/s

Freq.	Call	Name	Location	EST
21500	—	Ici Paris	Monrovia, Liberia	1415
21535	ELWA	ELWA	Paris, France	0800
21620	—	Ici Paris	Paris, France	0800

10-80 Receiver

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Coil L3 is wound from the same type of wire on a ¼-inch diameter resistor form. There are a total of 75 turns scramble wound on this winding.

Component Mounting and Wiring. Mount all of the variable controls and tuning condensers on the front panel of the cabinet. The aluminum open-end chassis holds most of the larger parts, such as the tubes and sockets, and transformers. The mounting and layout of parts are shown in the chassis photograph.

Follow the schematic diagram and chassis photograph in wiring the chassis. Conventional wiring procedures should be used: mainly, keep leads short as possible, and twist the 6.3-volt filament leads. It would prove easiest to use insulated hookup wire throughout the chassis. Component leads need only be spaghetti-insulated when there is a possibility of their shorting to the chassis.

After the short-wave receiver has been completely wired, check the wiring carefully before plugging into an AC outlet and turning the switch on.

Initial Adjustments. The two vacuum tubes and pilot lamp light when power is on. Now turn the volume control to maximum at which point audio hum will be heard. Adjust the regeneration control until the receiver goes into oscillation. Switch to band three and turn the large tuning condenser; whistles will be heard over the band. Tune in a whistle or beep and reduce the regeneration control until the signal is audible. It is noted that cw code signals are best identified when the control is past the spot of regeneration. This little shortwave receiver has quite a lot of volume for room listening but if you desire quiet listening, just plug in a pair of earphones.

Antenna. A long antenna of seventy five feet of the inverted L variety works quite well with the 10-80 receiver. The higher the antenna the better. A inverted I antenna is simply a length of wire laying horizontally with the ground with an insulator at each end. A shorter antenna of 25 feet will work well enough for local use.

Trouble? If the receiver does not work properly, check voltages on the plate of each tube and follow the usual troubleshooting procedures. A quick way to check the audio circuit is to place a screwdriver on the grid, pin 9, of the 6D10; a low audio hum should be noticed.

Finally, check each band for operation and smooth regeneration control. Use tuning condenser C5 to spread the signals across the dial. Short-wave or ham fan, you'll enjoy listening to this homemade receiver. You'll find the dial loaded with stations. ■

Darkroom Thermometer

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point voltage of battery B2) by the leakage current Iceo (in amperes) previously measured at 85°F. R1 will be somewhere between 5000 and 20,000 ohms.

Mount Q1 on the end of a three foot length of rubber lamp cord. Clip off the base lead and push the C and E leads, cut to ¾ inch length, into the stranded wire at the end of the cord. Label the wires at the other end accordingly. Using carbon tetrachloride, clean the transistor and the cord end to remove traces of grease. Apply a flexible epoxy cement, such as DURO E-POX-E, in several layers to form a waterproof encapsulation around the transistor. Allow 24 hours curing time. To check the encapsulation for water leakage, place the element in a cup of water and measure the resistance between the water and each lead of the transistor. The resistance should be greater than 25 megohms.

Calibration. To calibrate the thermometer, use an accurate mercury or alcohol thermometer and the water bath as setup previously. Omit the test tube and immerse the transistor and thermometer at least two inches into the water. Start with a water bath temperature of 90°F and allow it to cool gradually. When the temperature drops to 85°F, record the meter indication or mark a card attached to the meter face. Calibrate the scale at each degree from 70 to 85°F.

Next, cool the water to 45°F using crushed ice cubes. Stir the water thoroughly and remove excess ice, if present. Calibrate in five degree intervals from 50°F to 60°F and two degree intervals from 60°F to 70°F as the water warms up slowly to room temperature.

The simplest method of providing a meter scale is to attach a card to the outer face of the meter. Masking tape was used to attach the card. Use of cements may damage plastic faced meters. If done with care, the original meter dial plate may be removed, painted white on the reverse side, and marked with a temperature scale.

Application. Immerse at least two inches of the cord end into the liquid solution when checking the temperature. Do not insert the element into liquids above 176°F as permanent damage or decalibration may result to the germanium transistor. When battery voltages, with S1 closed, drop to one volt, replace the battery. ■

New World Under The Sea

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sengers through the oceans, help salvage lost cargoes, rescue crews from sunken submarines, as well as study and mine the oceans.

Turtle's Dr. Fiedler is convinced man has long appreciated the ocean's vast wealth but has simply lacked the tools to operate at watery depths, and he feels, "Settlements underneath the sea are not improbable." But we must first map these regions.

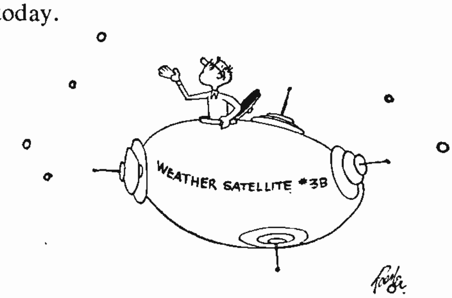
In that he is joined by a number of top scientists. Dr. Athelstan Spilhaus, Dean of the Institute of Technology at the University of Minnesota thinks we may ultimately see floating factories, and future ocean cities.

Westinghouse engineers design a nuclear reactor to power just such a city. Their drawing-board reactor is planned with no moving parts to function at least 18 months without maintenance and power an underseas city of 6,000 people. Westinghouse Director Richard C. Cunningham says, "If man could establish an undersea community as a base for geological studies or mining operations, it would be comparable to discovering a new world."

New Sea World: Whether we will eventually live, mine, work under the seas can only be scanned in the future. But the modern day explosion of electronic development that prompts these visionary speculations is very real today and forecasts a "new world" of knowledge tomorrow.

Senator Warren G. Magnuson, Chairman of the Senate Commerce Committee and Senate champion of an inner-space NASA calls the ocean an "ever-changing, demanding environment." To understand it, he says, "to exploit its vast living and mineral resources, to eventually master the seas, scientists and engineers must have tools."

These are the tools emerging from our nation's electronic and scientific laboratories today. ■



Transistor Checker

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The Picture. The typical oscilloscope wave-forms in the illustration are the patterns most usually obtained when checking transistors. With a vertical gain of .1 volt per division, each division on the scope face will be 1 milliampere; at 1 volt per division, each division will equal 10 milliamps. Note that the oscilloscope will show the PNP curve from left to right, NPN curve right to left.

The first curve indicates the characteristics of a good transistor. The slopes of the current rise and constant current portions of the curve, as well as the nature of the break-over point, give indications of the condition of the transistor. The amount of slope of the nearly horizontal section is an indication of leakage. But power transistors have some leakage and oscilloscope gain affects the final curve so a better indication of the transistor's condition can be obtained by observing how sharp a break occurs in the curve. The second curve illustrates a gradual or poor break which base-collector leakage and a transistor of questionable quality.

The third curve illustrates break down where the voltage capability has been exceeded. This pattern sometimes occurs normally and without damage to very low voltage transistors in the 9-volt peak circuit. The 100-ohm resistor prevents excessive collector current and heating. If the breakdown results in a steeply rising line for a transistor rated at more than the breakdown voltage point, it is obvious the transistor is defective. The fourth curve showing no breakover characteristic is typical of a defective transistor. If the curve approaches the vertical, it is apparent that large collector currents are flowing with little applied voltage and the transistor is shorted. If the curve approaches a horizontal line, there is no variation of collector current and the transistor is open.

Further Uses. By recording corresponding base current and collector current for various transistors, you can match transistors for balanced pairs. Just compare the values you've recorded, pair off the closest, and you've saved a purchase.

The transistor characteristic checker can also be used to check diodes. The base supply and the microammeter form the basis of an ohmmeter which checks diodes by comparing forward to back currents. ■

Oscilloscope

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The scope is connected across the amplifier output to observe the output signal. The waveform at the various stages can be observed by using a probe as suggested earlier.

The frequency response of the amplifier can be determined by varying the frequency of the signal generator and noting the change in amplitude of the waveform on the scope screen. The dynamic characteristics of the amplifier can be noted by varying the signal generator output level. When the signal reaches a certain level, the amplifier output may not increase and distortion of the waveform, resulting from overloading, can be noted on the scope screen.

By feeding a square wave signal into the amplifier, you can note whether the output signal is square or distorted because of phase shift and poor high frequency response in the amplifier.

Only a few of the uses of a scope can be covered here. There are excellent books on the subject. A scope can be used for measuring frequency, modulation level and symmetry and many, many other tests. Here, we haven't even touched on the use of the horizontal input of a scope. This will be discussed in future articles.

Other scope adjustments, not explained here, such as sync, and the use of 60-cycle and external sync signals are covered in instruction books furnished with scopes.

Picking a Scope. There are dozens of scopes on the market ranging in price from around $70 for a kit to more than $1000 for a lab-type instrument. The lowest cost scopes will usually satisfy the needs of beginner experimenters. Engineers and color TV servicemen usually insist on a more sophisticated scope with a frequency response extending from DC to 4 mc or higher. Most scopes are not designed to work with DC, but for some purposes the ability to pass DC is essential.

Scopes are available in several brands at radio parts stores and mail order houses. Used and obsolete military scopes are also available from surplus dealers but in many cases you are much better off sticking to equipment designed for *you*. Regardless of whether you buy a new or used scope, or get a kit and build it yourself, you will find it the most useful device in your shop for learning about electronics. ■

Lab Check—AR's XA Turntable

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by various stylus pressures also could not be heard.

Hum pickup from the motors is non-existent, which we contribute to some brilliant thinking (simple as it may appear). AR has placed the motors on the longest diagonal from the pickup. When tested with an Shure M44-5 cartridge there was absolutely no hum pickup from the motors, it couldn't be heard or measured. Just to double check we swung the arm to the opposite side of the turntable—over the motors—and sure enough there was the usual motor hum. (The next time you hear a debate on how to reduce motor hum pickup just remember how AR avoids the whole problem. Of course, the XA's non-ferrous platter and Mumetal motor shields are great helps.)

Tone Arm. The supplied arm is a good example of thoughtful "consumer thinking"; by this we mean that it's a pleasure to find a manufacturer that doesn't assume every hi-fi enthusiast is a natural born mechanic. Though mounted in place with all leads connected, the arm is supplied unattached to the pivot post (to avoid shipping damage). All the user has to do is thread the arm onto the pivot post (or spindle as AR calls it). Now did you ever try turning a section of polished rod; a first rate pain in the neck. But not on the XA; the pivot post is milled for easy gripping. (Sure, milling isn't a big deal but it's in keeping with the spirit of "consumer thinking.")

The cartridge mounting is also well thought out. If you ever unpacked a cartridge you know about the envelope filled with mounting parts, each one smaller than the next; with the choice of parts left up to the consumer. Not so with AR. AR supplies all the required parts, each one so different from the other you can't make a mistake. They also supply a reference chart for virtually all hi-fii cartridges which details the exact screws and spacers to be used. And AR even supplies an "easy grip" screwdriver which fits the cartridge and arm adjustment screws (this item alone is worth a buck).

Adjustments. When you're all set to make the final arm adjustments AR again comes to the rescue with "consumer thinking." You all know about overhang—the distance the needle must project past the turntable spindle for proper tracking. Well, on the XA you don't guess, or break a diamond needle trying to jam a ruler under the cartridge. AR supplies a gauge which fits over the spindle; and you simply lengthen the arm until the needle fits into a dimple on the end of the gauge.

Stylus pressure? The turntable comes supplied with one of the best stylus pressure gauges we've seen (AR also sells this item for a dollar). Place the needle in the dimple on one end of the gauge, place the correct gram weights on the other end of the scale, and simply slide the arm's counterweight back and forth until the scale is balanced. Again, you don't have to be a mechanic to get the pressure adjusted right the first time. You don't have to lift a gauge "to the exact height of the record," you don't have to "orient the gauge so the stylus is centered." You can't make a mistake with the AR gauge.

Finally, there is the user adjustment for "rate of fall." By simply rotating the arm pivot the arm is adjusted so it lowers to the record slowly. Should you pick the arm up and suddenly have it slip from your grasp the arm will not slam into the record; rather, it lowers slowly by itself. AND, the arm is designed so the damping is released just before the arm reaches the record, the stylus does not have to drag a damping load in addition to the arm.

If all the foregoing adjustments appear to be formidable, forget about them. Total time from opening the packing case, through reading the instructions, to final adjustment is less than *20 minutes.*

Keeping in the Groove. Finally, we *must* call your attention to the XA's stability. Both the turntable and arm are attached to a separate frame which is floated to the cabinet and deck; the arm is not attached to the deck. If the motor is jarred the arm moves with the motor and vice-versa. Virtually no normal movement of the turntable's base or the cabinet on which it is mounted will cause the needle to jump out of the groove, even at ¾ gram stylus pressure. It is even possible to strike the top of the base with a hammer sharply and hear no effect on playback.

The Acid Test. Just to give the suspension system the severest test, the turntable was placed directly on the speaker cabinet with the volume at normal listening level. Not only was there no acoustic feedback, there was no discernible detrimental effect on the sound. ■

Heath-kit AR-13A
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sidebands. There is an AFC On-off switch. The mono sound is excellent and easily compliments the audio amplifier: low noise level, good sensitivity, and *clean* reception even on high level modulation. The stereo reception is superb, with "studio" separation that can be user adjusted at any time. An interesting convenience is a separate stereo reverse switch which does not affect the amplifier's L-R connection. Also, the FM stereo balance is independent of the amplifier balance. Both can be set for optimum balance eliminating the possible need to change balance when switching from phono to FM stereo.

The stereo indicator is a full-time lamp. Whether the FM selector is set for Mono or Stereo the lamp lights when the station transmits stereo. This is a decided convenience if the stations in your locality broadcast stereo part-time. Should you be listening to a mono program and not hear the announcement that the station is switching to stereo, a glance at the front panel will tell the story—if the lamp is lit stereo is on.

We found only two complaints with the AR-13A, both concerning FM reception. The first is the tuning meter. Contrary to the familiar meter, a weak signal—one that would be noisy—indicates about half-scale instead of the usual bottom scale indication. Virtually any usable signal indicates full scale. It's a minor inconvenience that some audiophiles will object to. Next, the *local-distance* reception switch, instead of changing receiver sensitivity, disconnects the outdoor antenna and connects a *line-cord* antenna. Heath suggest that the local connection—the line cord antenna—be used for strong stations. This causes multipath pickup making stereo listening almost impossible in many homes. If local stations are so strong they overload the tuner the best thing to do is to place an adjustable attenuator between the outdoor antenna's transmission line and the receiver. In all honesty, these two exceptions will be overlooked by most audiophiles since they will tune by ear and always use external dipole antennas.

Comparing the AR-13A on a feature versus dollar basis, one cannot help but admit that the receiver is a rock-bottom dollar buy, about the best you can hope for in the solid-state market place. ■

Ham Receiver Goes CB

Though the Heath SB-300 is known as an 80 through 10 meter amateur receiver, many hams and CB'ers overlook the fact that is can also be used as a darn good CB receiver. Not only do you get the option of receiving conventional AM CB signals, but you get top quality sideband reception to boot.

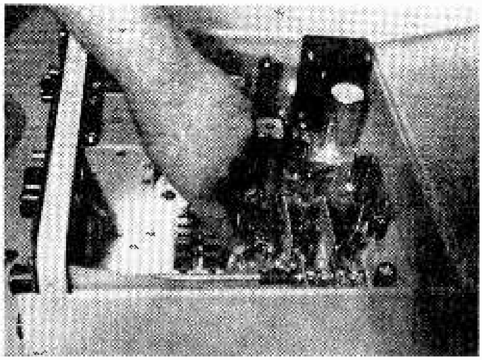
Unlike most receiver conversions—which are best left undone—modifying the SB-300 takes but a few minutes and in no way affects its normal amateur performance. In fact it's a good bet for the CB'er studying for a ham ticket; only one investment buys hot performance for both CB and ham radio.

Easy Conversion. The modification is as easy as can be—all that is involved is changing two components. Since the portion of the 10-meter band above 29.5 mc. is rarely used by hams, this band switch position is converted to CB by simply pulling out the original 29.5 mc. crystal and inserting a CB crystal.

The final step is to retune the 29.5 mc. heterodyne oscillator coil (L19). Since the slug of L1 won't pull down to the Citizens' Band, its tuning capacitor, C215, must be increased from 36 mmf. to 56 mmf.—use an Arco Elemenco type DM-15 silver mica capacitor available from Allied Radio. Capacitor C215 is easy to get at and there should be no difficulty in affecting the change. Follow the alignment instructions given in the SB-300 instruction manual and peak for maximum output at the test jack.

The CB crystal is available from Texas Crystals, Crystal Drive, Fort Myers, Florida. Specify a .005% third overtone type in an HC6/U holder. Crystal frequency is 35.795 mc. Price is $4.20 postpaid. This crystal will provide a CB band of 26.9 to 27.4 mc.

—*Herbert Friedman*



Replacing capacitor C215 proves easy enough.

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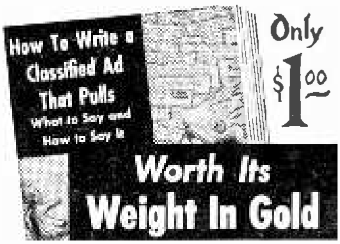

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Lab Check—E-V Coronet

Continued from page 71

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Price Is Right. The cost of a Coronet system depends on your choice of speaker. The lowest cost unit, the Coronet I, sells for $37.60 (the so-called user net) and utilizes E-V's MC8 "Michigan" speaker. While the MC8 doesn't give outstanding booming bass and shimmering highs it has a well balanced (50 - 13,000 cycles), clean sound—notably clean for the price. It is the opinion of many who have used the Coronet I (including us) that the sound quality is comparable to systems costing two or three times as much.

For a few bucks more, $41.60, you can get the Coronet II which uses the LS8 "Wolverine" speaker. The Wolverine's sound is similar to the MC8 with a little more sock in the bass.

At the top of the line are the Coronet III and IV selling for $49.60 each—you pick 'em. The Coronet III sports E-V's SP8B loudspeaker. This little 8-inch job is noted for its well balanced, notably clean and bright sound—frequency response 40 to 15,000 cps. The Coronet IV sports the Wolverine LT8 3-way loudspeaker—frequency response 45 to 18,000 cps. Both the III and IV are two of the few "bookshelf" speaker systems with the *BIG SPEAKER* sound.

Summing up. Regardless which Coronet you choose you're going to get more than your money's worth in sound and looks. We rate all models of the Coronet line *a good audio buy* for budget and medium-priced high fidelity systems. However, we must admit that the best buy in the line is the Coronet IV—the speaker system kit that offers the best dollar buy for top notch performance with minimum assembly time. No matter whether you are workshop master mechanic or "ten-thumb putterer," you should investigate the Coronet line. For more information, write to Electro-Voice Incorporated, Dept. LC-722, Buchanan, Michigan. ■

ADVERTISING INDEX

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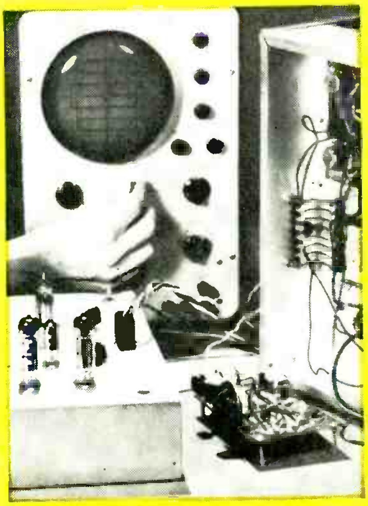

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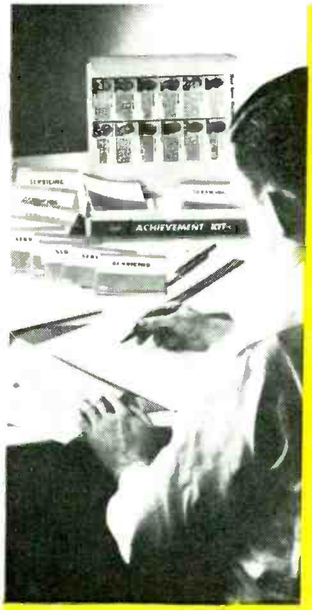

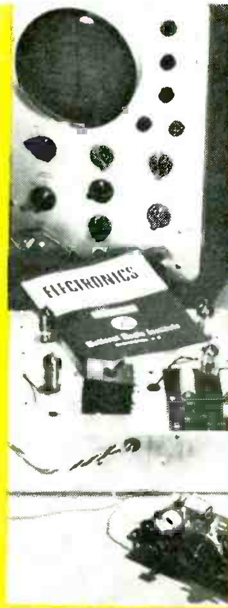

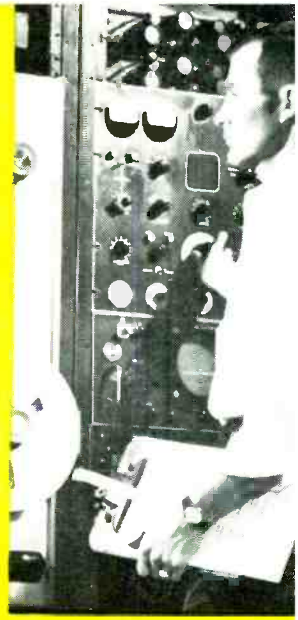

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