How "Electronic Hearts" Now Save Lives!

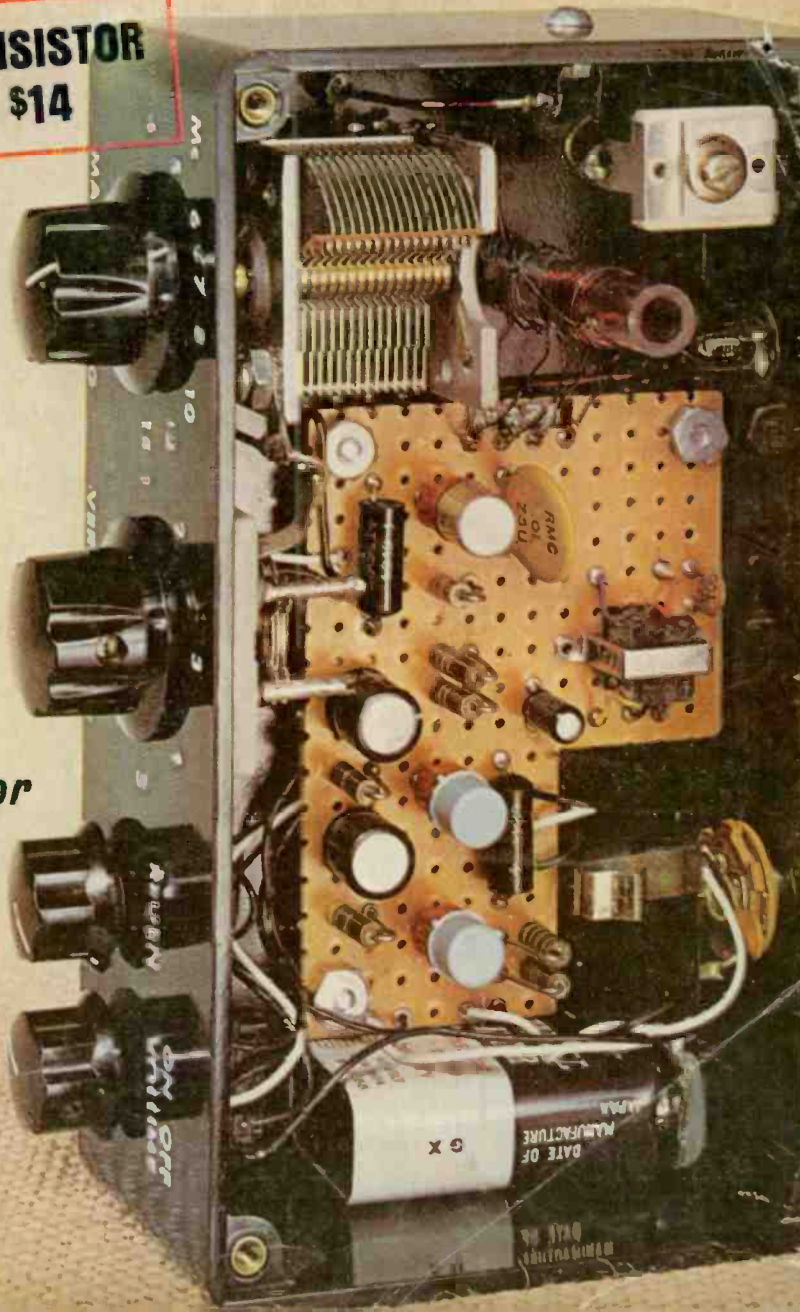
RADIO-TV EXPERIMENTER

WHITE'S RADIO LOG

AM-FM-TV STATIONS
WORLD-WIDE
SHORT-WAVE LISTINGS

AUG.-SEPT. 75¢

BUILD THIS 3-TRANSISTOR SHORT-WAVE SET: $14



Electronics Guide to the Fair!

PLANS FOR:

$2.50 CB Booster
$7 Scope Calibrator
$4 SCR Dimmer

TEST REPORTS:

Shure V-15 15° Stereo Cartridge

Goodmans Maximus I Speaker System

NOW... Courier 23

WITH

RANGE BOOST

23 CHANNELS

24 ~~23~~ FEATURES

DUAL CONVERSION • TRANSISTOR POWER SUPPLY

Still 189^{50} — *including all crystals, mounting brackets, power cords and noise-cancelling microphone*

slightly higher west of Rockies

Send for details . . .

Name ....

Address ....

City .... State ....

eci. electronics communications, inc.

dept. RTV8, 56 hamilton ave., white plains, n. y.

World famous manufacturers of quality CB & BB equipment including Courier 1M, Courier 23, Courier 12, Courier 30B, Courier 50 FM, Port-A-Lab, Transistorized Power Supply, Linear Amplifier.

RADIO-TV EXPERIMENTER

Cover Photo by Don Lothrop

August-September 1965

CONTENTS/INDEX

☆Cover Highlights

AUGUST 1965—
SEPTEMBER 1965

VOLUME 19 No. 1

RADIO-TV EXPERIMENTER

JULIAN M. SIENKIEWICZ WA2CQL/KA1Ø614	*Editor*
WILLIAM HARTFORD KKD7432	*Associate Editor*
ANTHONY MACCARRONE	*Art Director*
JOSEPH DAVIS	*Assistant Art Director*
GREGORY CHISLOVSKY	*Art Editor*
ALBERT DE QUERQUIS	*Art Associate*
VICTOR J. CLOSI	*Art Associate*
LYNDA P. KALMAN	*Art Associate*
ELLIOT S. KRANE	*Advertising Director*
JIM CAPPELLO	*Advertising Manager*
LEONARD F. PINTO	*Production Director*
CARL BARTEE	*Production Manager*
HELEN GOODSTEIN	*Assistant Production Manager*
RICHARD L. HOWE	*Promotion Director*
JOSEPH DAFFRON	*Executive Editor, S&M Handbooks*

President and Publisher
B. G. DAVIS

Executive Vice President and Assistant Publisher
JOEL DAVIS

Vice President and Editorial Director
HERB LEAVY

RADIO-TV EXPERIMENTER, Vol. 19, No. 1 (#748), is published bi-monthly by SCIENCE & MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Editorial, business and subscription offices: 505 Park Ave., New York, N. Y. 10022. One-year subscription (six issues)—$4.00; two-year subscription (12 issues)—$7.00; and three-year subscription (18 issues)—$10.00. Add $1.00 per year for postage outside the U.S.A. and Canada. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 6253 Hollywood Blvd., 213-463-5143; Atlanta: Pirnie & Brown, 3108 Piedmont Rd., N.E., 404-233-6729; Long Island: Len Osten, 9 Garden Street, Great Neck, N.Y., 516-487-3305; Southwestern advertising representative: Jim Wright, 4 N. Eight St., St. Louis, CH 1-1965.

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

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

ELECTRONICS AT THE FAIR

By Art Zuckerman

You'll find a treasure of information about electronics this year at the New York World's Fair. Whether you visited the Fair last year or are planning your first visit, it's a pretty safe bet that you'll find much to learn about the electron in its many guises, past and present.

To help you in your quest through the multitude of exhibits at the Wonderland on Flushing Meadow, we have compiled the following list of attractions of special interest to the electronics buff.

BELL SYSTEM PAVILION

Probably the greatest single communications show at the Fair is the Bell System's massive exhibit. A moving-chair ride sets the stage by giving you a brief tour of the history of man's efforts to send his thoughts across great distances. Then an electric stairway takes you down to the underground main exhibit hall. In the senses area of this great hall, the Visible Speech Translator shows you what sound looks like on a TV screen. Nearby is the Vocoder, a device that breaks down the elements of the human voice, analyzes them, and puts them back together again. There are exhibits that explain crystal and solid-state technology, the workings of the maser and the laser. You will also see a working demonstration of wave theory and the operation of trans-oceanic circuits via undersea cable. Still other exhibits show the devices that permit computers to talk to one another by telephone, and you will be shown how tomorrow's phone switching system will permit a caller to "dial" you and get through even though you're visiting a friend. Probably one of the most interesting exhibits is the Picturephone, a television telephone service that has already been inaugurated among New York, Washington, and Chicago. Outside the exhibit building you will be able to look inside a microwave relay tower and see how it can transmit color television broadcasts. This is definitely a must exhibit for anybody interested in electronics.

COCA COLA PAVILION

Amateur radio operators can pause to refresh and DX at Coca Cola's oasis at the Fair. If you are a qualified "ham," all you need do is present your license, and you will be welcome to operate

HAM RIG at Coca Cola Pavilion is tried by RADIO-TV EXPERIMENTER's editor, Julian M. Sienkiewicz, WA2CQL, as station manager Will Lierheimer looks on. The official amateur radio voice of the New York World's Fair, K2US facilities are available to any pavilion visitor who holds a ham license.

K2US, the Hallicrafter-equipped, 3-position transmitting and receiving station that is the official short-wave voice of the Fair. Always on hand are members of the American Radio Relay League (ARRL). If you haven't got your amateur ticket but would like to learn more about amateur radio, here's your opportunity to see it in action and, also, to pick up helpful literature. A must for anyone with a real interest in amateur radio.

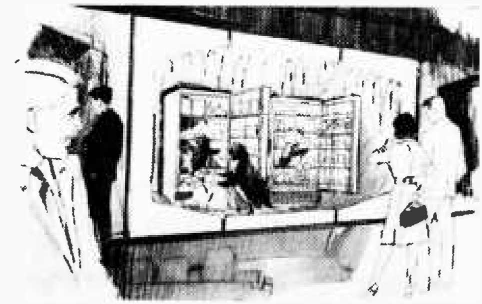
BETTER LIVING CENTER

Acoustic Research, Inc.: A complete display of AR speakers in action, together with the AR taped explanation of what's happening. They

turntable. All are demonstrated in conjunction with Dyna amplifier and tuner equipment, duplicating the AR exhibition booth in New York's Grand Central Station. Worth dropping in on if you happen to be in the Better Living Center.

FORD WONDER ROTUNDA

After debarking from Ford's automobile ride into the past and future, guests at the Wonder Rotunda stroll through a science walk, in which they see samples of the computer and space work

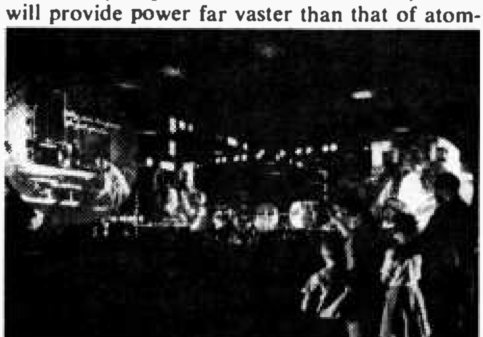


ARTIST'S RENDERING of one of the product "vignettes" that is featured at the Philco Corporation's show at the Ford Motor Company Pavilion. Animated penguins are storing their fish in a 1965 Philco food freezer.

being done by the people who created the Model T. An electric ramp then leads down to a main exhibition hall, where products on display include the electronic produce of Ford's Philco division. Of passing interest, but this isn't an exhibit you'll seek out exclusivly for its electronic content.

GENERAL ELECTRIC PAVILION

General Electric has won itself a first at its World's Fair exhibition by putting on a live demonstration of nuclear fusion, the power behind the hydrogen bomb. Once harnessed, fusion will provide power far vaster than that of atom-



REAR-PROJECTION screens set into wall mirrors at GE Pavilion show electronics research activities.

smashing nuclear energy—and without creating poisonous waste products. Also on view at GE's Progressland Pavilion are the story of electrical progress as enacted by Walt Disney's remarkable audioanimatronic figures; a computer-controlled steel mill; an electronic classroom complete with closed-circuit TV, teaching machines, and a tape recorder language lab; a computerized, electronified hospital; a space station; and electronic appliances and entertainment instruments for the home. A generally-interesting pavilion, though some rather *hokey* treatment takes the keen edge off the very real fusion demonstration.

GENERAL MOTORS FUTURAMA

GM's fabulous look into the future is totally intertwined with electronics. The Futurama ride

AUTO TROUBLESHOOTER that looks like a space capsule is part of Delco display in GM Futurama. It's supposed to figure out what's wrong with a car via electronic probes and computer—an electronic "who-done-it."

APOLLO MODEL is an AC Spark Plug contribution to GM's Futurama. AC is working on Apollo's electronic space guidance system.

AT THE FAIR

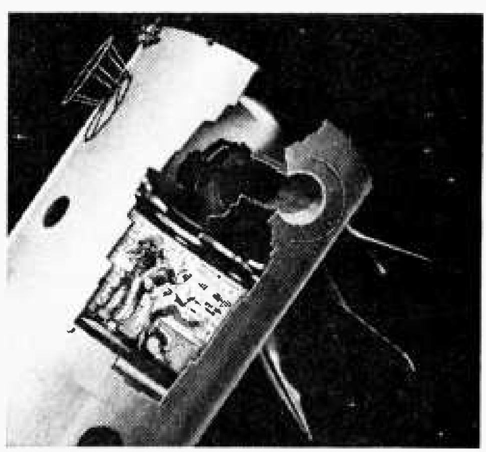
itself takes you into a tomorrow of advanced space, undersea, and Arctic exploration, all with the aid of electronic marvels. Then there are automated farms and GM's major dream, an electronic roadway on which automobiles are controlled remotely by radio. Even GM's dream cars feature electronic controls, replacing today's mechanical steering and power systems. Other displays deal with military electronics and communications, radiation, sonar, and inertial guidance systems for spacecraft. There is even a fanciful presentation in which technicians dressed like spacemen analyze a car's mechanical troubles with the help of a computerized "capsule." This is probably one of the finest exhibits at the Fair, offering more hard information to those desiring it than any other pavilion with the possible exception of the Hall of Science.

HALL OF EDUCATION

Within this pavilion are displays showing the school of tomorrow and current audio-visual equipment used in teaching, including electronic teaching machines, closed-circuit television, phonographs, sound movies, and tape recorders. Some interesting exhibits nestled within a building that contains a shade too much of the *huckster* touch.

HALL OF SCIENCE

Atomic Energy Commission: Highlight of the AEC exhibit is "Atomville, USA," designed to enlighten the younger set while giving them a good time. It is open only to youngsters 8 to 14. Among the attractions is a simulated research reactor they can "operate" while listening to a



MANNED ORBITING LAB is depicted in Martin Marietta show in Hall of Science. Mostly a film, the show's highlight comes when full-sized models of the Orbiting Lab and a space taxi rendezvous above the audience's heads—1970 and you are there.

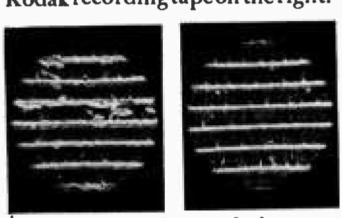
Some plain talk from Kodak about tape:

Slitting accuracy and skew angle

Tape is made in wide rolls which are slit to width—¼″ for most audio tapes. There are three main considerations in this process: cleanliness, dimensional accuracy and trueness of cut. Cleanliness cannot be given too much consideration. When the tape is slit, particles of the oxide and the base can flake off. This condition arises from poor oxide adhesion and poor quality-control standards on slitters. Slitting dirt is virtually nonexistent in Kodak tapes because of our "R-type" binder and our unique slitting techniques.

Tape dirt clogs the recording gap and prevents the tape from making intimate contact with the head, thus causing dropouts and high-frequency losses. Oxide dirt can also cause a phenomenon known as re-deposit. During tape transport operation, gummy oxide dirt can actually re-deposit on the magnetic layer and fuse in position.

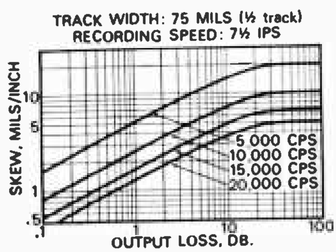
To get some idea about how Kodak tape slitting compares to ordinary slitting, take a look at these two photomicrographs. The dirt you see between the turns on the left is oxide dirt. Compare it to the virtually spotless edges of Kodak recording tape on the right.



It's like splitting hairs, only more critical

From our 42-inch-wide master web, we have to cut 160 ¼-inch ribbons of tape—each almost two miles long. That's a lot of total mileage, especially when you think how straight and true those edges must be to assure optimum tracking on your recorder. In terms of slitting accuracy the standard specs call for a tolerance on width of ± .0020 inches. We decided that that was just about double what it really should be, so we hold ours to ± .0010 inches.

But the really critical part of slitting is a bad guy known as weave. When a tape weaves, it passes the head at a continuously changing skew angle. Look at the graph.



Note how losses pile up as skew angle increases. As you'd guess, the losses are in proportion to frequency. Higher frequencies, higher losses. Same principle, really, as an azimuth loss.

Proper tape tension is important in order to prevent "stepping." Stepping usually takes place about ⅓ of the way from the core of the reel. (That's the point at which there are no clockwise or counterclockwise forces acting upon the tape.) You can visualize it as a lateral shearing of a roadway during an earthquake. Shades of old San Francisco. This sets up stresses which cause fluted edges and prevent proper head contact. From winding billions of feet of motion picture film, Kodak has developed some pretty specialized tension-control techniques. The end result, of course, is that when you get Kodak tape on a roll, you know it's wound properly, not too loose, not too tight. Just right. Our Thread-Easy Reel is part of the story, too. Because it is dynamically balanced, we get a good wind right off the bat and you get a good rewind, too.

Kodak Sound Recording Tape in a complete variety of lengths and types is available at most tape outlets: electronic supply stores, specialty shops, department stores, camera stores . . . everywhere.

FREE! New comprehensive booklet covers the entire field of tape technology. Entitled "Some Plain Talk from Kodak about Sound Recording Tape," it's yours on request when you write Department 8, Eastman Kodak Company, Rochester, N. Y. 14650.

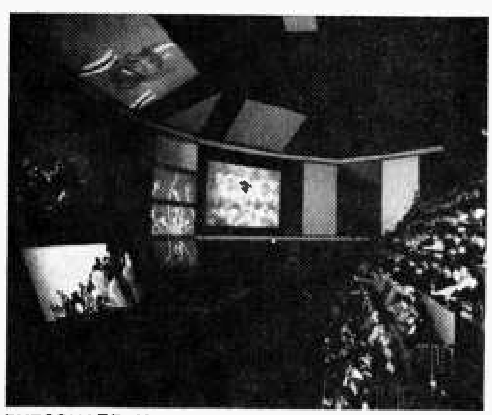
EASTMAN KODAK COMPANY, Rochester, N.Y.

taped explanation of what's happening. They also get a crack at manipulating simulated "hot" radioactive materials by remote control with robot hands. Other devices permit the young ones to build atom structures, see what it would feel like to be "inside" an atom, and read their weight in atoms. All these atomic games can be watched by parents via closed-circuit television. The older folks can also examine an exhibit on "Radiation and Man." It outlines the main facts of atomic science, including the operation of an x-ray machine. Altogether a fascinating glimpse into the world of the atom for kids and dads.

Martin Marietta Corp.: Starring attraction at the Hall of Science is Martin Marietta's movie-and-model demonstration of the planned National Orbiting Space Station, a manned scientific laboratory that will one day hurtle through space so that we can learn more about our newest frontier at first hand. Climaxing the show is the docking of a space taxi to NOSS so that a relief crew can take over and permit the station's personnel to return to earth. During the actual docking maneuver, the film goes off the screen so that attention can be focused on full-sized models of the NOSS and the space taxi. As they move closer together, the sound track permits you to hear the shuttle craft being talked in under radar control from NOSS. A fascinating, informative, and thrilling show.

IBM—INTERNATIONAL BUSINESS MACHINES PAVILION

Beneath the egg-shaped theatre on stilts that IBM calls an "Information Machine," you will



INFORMATION MACHINE theatre inside the IBM "egg" uses a multitude of movie screens to show that computers think pretty much the way people do—only much faster.

find a host of fascinating displays that shed light on how computers operate and what they can do. A group of mechanical puppet-show theatres describe computer systems and how they work

AT THE FAIR

in a delightfully-entertaining manner. In the computer applications area, you are treated to a demonstration of how the monster mechanical brains can translate Russian into English and how they can recognize hand-written characters. The most spectacular feature of the IBM Pavilion, of course, is the Information Machine, with

IBM PAVILION visitors fill out dates on cards for computer to read and print out headline from New York Times story of that day.

its "People Wall." This wall is actually a grandstand that *wafts* you hydraulically up into the egg-shaped theatre. There, through the medium of movies projected onto 9 screens and accompanied by super-stereophonic, 5 channel sound, you are shown how computer processes duplicate the normal human manner of solving problems. If you leave the IBM Pavilion still in the dark about what and how a computer is, you'll have only yourself to blame. A must exhibit for anybody interested in electronic data processing (EDP).

JAPAN PAVILION

Japan's bustling electronic industry is given an excellent showcase at the pavilion of the Far East's technological giant. Electron microscopes are displayed in action, and there are demonstrations of some fascinating videotape recorders, including one that takes and holds still pictures. There is a "space ship" youngsters can "fly" that is connected to a computer that displays its flight path. You will see miniature TV sets in a mass display, a picture on every screen, and a wide assortment of Japanese radios, phonographs, and tape recorders. You will also see electronic controls for industrial machinery. This is a compelling, almost encyclopedic show of Japan's electronic goodies.

KODAK PAVILION

Though Kodak's show is obviously geared to photography, it does have a few things in it that fall into the electronics area. One is an exhibit of radiography, or x-ray technology, featuring the world's largest radiograph. This is a 5-foot,

WORLD'S LARGEST radiograph is this X-ray of an aircraft jet engine, on view at the Kodak Pavilion.

9½-inch x 16-foot, 8-inch x-ray of a jet aircraft engine. There is also a movie presentation which, while based on chemistry, explains atomic and molecular theory entertainingly and clearly. Definitely worth glancing into, even if you're not a photo bug.

MISSOURI PAVILION

The home of McDonnell Aircraft Corp. proudly displays two of that company's major contributions to the space age—a replica of the Mercury spaceship, Friendship 7, and a full-sized mock-up of the two-man Gemini capsule. Interesting, but it duplicates displays to be found elsewhere, especially in the Space Park.

NATIONAL CASH REGISTER PAVILION

An NCR computer goes through its paces for visitors, providing them with a question-answering service. A roomfull of mathematical games

GOURMET RECIPES via computer for Fair goers is for the asking. The NCR 315 computer at the National Cash Register Pavilion will provide visitors with a host of recipes from Hilton International Cookbook ranging from Vichysoisse to Cherries Jubliee.

will give you a painless lesson in binary language as employed by electronic computers. You can also view such miniaturized gadgets as a television screen so small you have to look at it through a microscope. A moderately-interesting exhibit for the electronics minded.

AT THE FAIR

NEW JERSEY PAVILION

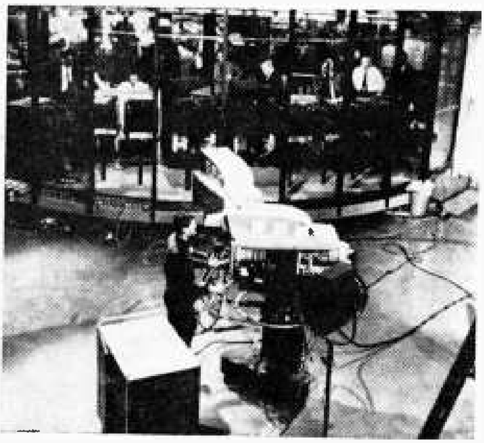
A satellite tracking station in operation is included among the attractions at New Jersey's showcase. Worth taking a look at, if you're nearby, to round out your understanding of space science.

NEW YORK CITY PAVILION

The biggest city's municipal radio station, WNYC, and its UHF television station, Channel 31, have established operating studios in the pavilion which can be watched in action by visitors. Moderately interesting.

RADIO CORPORATION OF AMERICA PAVILION

The RCA exhibit is actually an operating color TV broadcasting station, providing coverage and programming for the entire World's Fair via closed-circuit TV. Visitors to the RCA exhibit, astride the Fair's main entranceway, are given a good look at what it takes to put color on the air—the studios, the control rooms, and the other equipment. They also see themselves on TV and may even take part in one of the Fair telecasts. An excellent primer on modern video broadcasting.



COLOR CONTROL—Nerve center of all the color television activity at the RCA Pavilion is this ultra-modern control room, where producers, directors and technicians work in full view of visitors touring the exhibit.

SERMONS FROM SCIENCE PAVILION

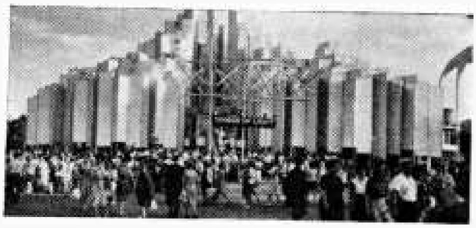
The marvels of ultrasonics, infrared technology, magnetic recording, photoelectronics, and other electronic wonders are used to get across a religious message. A good show with an evangelical twist.

SINGER BOWL EXHIBIT CENTER

Singer Co.'s computer, electronic, and home entertainment products get a showcase in the grandstand structure of the World's Fair's own miniature stadium. The home entertainment instruments, including a full line of stereophonic phonographs and FM radios, are demonstrated. An interesting display.

TOWER OF LIGHT PAVILION

"Holiday of Light," a lively new musical review, is offered at the Tower of Light, the electric utility companies' exhibit for 1965. The show, which uses a variety of techniques including spectacular lighting effects, a lively original musical score and new script, takes place in seven show chambers. Visitors, seated in newly installed revolving seats, will spend about two minutes in each chamber as they are transported through the show on a giant electrically powered turntable. This exhibit is a must because of its unique presentation in telling the story of light.



HOLIDAY WITH LIGHT, the new lively show at the Tower of Light Pavilion, is only one star attraction of several. At night, ever-changing, multi-colored lights bathe the building in a myriad of colors creating a breathtaking visual effect.

TRANSPORTATION & TRAVEL PAVILION

Armed Forces: In separate exhibits at the T&T Pavilion, the Air Force, Army, and Navy-Marines tell their various stories. These stories include the electronic tools used by the Armed Forces and the training of the men who use and maintain them. A valuable stop if you are on the verge of going into the service and want to know what's available in the electronics career fields.

Cinerama: A 360° Cinerama presentation, "To the Moon and Beyond," is a film that will grab you up in spite of yourself. In addition to simulating a voyage through space to the moon, it provides a rundown on the various space vehicles now or soon to be in use, and it explores the elements of science. The 360° process even puts you within the nucleus of an atom! The super-high-fidelity sound system, composed of a number of large speaker systems circling the auditorium, contributes as much to the impact of this unusual film as does the hemispheric projection technique. A worthwhile film feature of the Fair.

UNITED STATES PAVILION

Uncle Sam's personal show at the World's Fair includes a veritable grab-bag of electronic wonders. There are videotape teaching machines that you can try, actual unmanned spacecraft, oscilloscopic reproductions of celestial noise and the sounds of a snail. You will see facsimile picture transmission equipment, the electronic gear used in meteorology. The Pavilion's ride, a mobile movie show through the American saga, ends in the space age, where you get a realistic impression of U. S. satellites falling through the void as they send out their radio messages. As a wrap-up, there is a final stop at the Pavilion library, where a giant Univac computer can be queried on a wide range of American historical questions. Altogether an interesting show, though somewhat bewilderingly pot-pourrified.

UNITED STATES SPACE PARK

The most complete tour of the nation's space effort you can expect to receive, short of a visit to every single installation of the National Aeronautics and Space Administration, is offered to you at the Fair's Space Park. All of the booster rockets and space vehicles of the past and the immediate future are represented either by actual copies of full-scale mockups. This includes one of the Mercury capsules, Aurora 7, in which Scott Carpenter circumnavigated the globe. Junior astronauts can climb into a full-scale model of a Mercury capsule. The various electronic probes, recording, and transmitting systems used by space vehicles are fully explained and illustrated. One of the highlights of the Fair for all age groups.

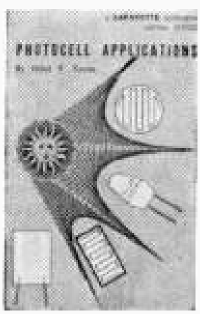
WESTINGHOUSE TIME CAPSULE II

Westinghouse's contribution to future history, the new Time Capsule, loaded with representative items of today's world, will be buried at the close of the Fair right alongside the company's first capsule, which was planted on the last day of New York's 1939-1940 World's Fair. The capsule and its contents, which will be *marked* "Do Not Open for 5,000 Years," are on display. Included in the treasures to be buried are an electronic wristwatch; an electronically-automated Polaroid camera; a Beatles 45 rpm record; a nickel-cadmium-battery-powered rechargeable flashlight; a transistor radio; a pocket radiation monitor; a chunk of graphite from the first atomic reactor; a computer memory unit; a cryogenic superconducting wire; a ruby laser rod; a ceramic permanent magnet; a solid-state, molecular-block electronic circuit; a solar cell from a Vanguard I space satellite; fuel cells; and a collection of tape recordings of famous sounds and voice of the past quarter-century. More a monumental conversation piece than an exhibit, the Time Capsule collection is neverthless a startling reminder of how deeply electronics and its related arts have penetrated our every-day lives and thoughts.

BOOKMARK
by Bookworm

Your ol' Bookworm is squeezed for space because of the number of other articles your Editor is jamming into this issue. But don't fret, I've picked out three new releases that are worth knowing about. In the October/November issue of RADIO TV EXPERIMENTER we will be back to full size and jammed packed with *mucho* reviews.

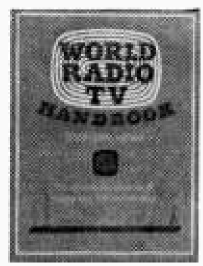
Lights! The trouble with far too many project books for the home experimenter is that part values for circuit components are often omitted, or when they are included the experimenters will have a tough time finding a "Framus Gettus CB-24" super deluxe transistor even if he could afford the $29.71 price. *Lafayette Radio* has put an end to all this by publishing *Photocell Applications* by *Rufus P. Turner.* Over 46 classic



79 pages
Soft cover
$1.50

circuits in seven chapters come complete with circuit description and have complete parts lists (like RADIO-TV EXPERIMENTER). *Lafayette* has gone one step further, they include *Lafayette* part numbers for all parts, so that if you are inclined to purchase some or all of the parts from Lafayette, ordering is simplified. To give you an idea of what is in this book, let the table of contents do the job: *Photo-electric Devices and Characteristics*—photoelectric operation, specifications and care of photocells; *Test Instruments*—various types of light meters, turbidity meter, RF wattmeter, counter, tachometer; *Signal Generators*—AF and RF oscillators, frequency standard, spinning disc tone generator, light controlled neon oscillator; *Photoelectric Relays*—photovoltaic relays, phototransistor relay, powerline operated AC and DC relays, etc; *Control Devices*—light-coupled switches, photoelectric potentiometer, neon photocell choppers, light to AC converter; *Communications Devices*—sun-powered broadcast receiver, sun-powered transistor and tunnel diode transmitters, sun-powered telephone, etc; *Miscellaneous and Experimental*—sun-powered DC motor, light monitor, DC voltage amplifier, memory circuit, etc. To get your copy of *Photocell Applications*, write to *Lafayette Radio,* Dept. RE-48, 111 Jericho Turnpike, Syosset, L. I., New York; order publication number 10-0102.

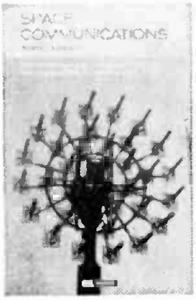
SWL'ers Special. The 19th edition (1965) of the renowned *World Radio-TV Handbook* is hot off the press. It is the only



302 pages
Soft cover
$4.95

book available to short-wave listeners, broadcast station operators, hams, etc. that contains details on every short-wave and TV station throughout the world. All of this information is arranged by class of service to place as much practical information as possible at the fingertips of the reader. Radio stations in each country are identified by call and frequency, station personnel and addresses are given; as well as, radiated power, programs and languages, license fee, identification signals, and network affiliation. In the listing of TV stations, information is given on type of signal, polarization of the antenna, picture and line frequency. The 1965 edition of the *World Radio-TV Handbook* is 20 percent larger than its previous edition—totalling 302 pages. The *World Radio-TV Handbook* is distributed in North America by *Gilfer Associates,* P. O. Box 239, Park Ridge, N. J. 07656. Sold for $4.95 postpaid. The 1965 edition is also available in numerous book stores and radio parts jobbers from coast to coast. This one belongs on every SWLer's bookshelf.

Space Communications. Ever since the launching of the first Echo satellite, communications people have been looking to or listening to the heavens. Radio amateurs as well as military and commercial agencies have cooperated in the development and use of active and passive communications satellites.



166 pages
Soft cover
$3.95

After three years of successful and dramatic accomplishments, the field of space communications has arrived at a consolidating phase. Time and effort will be devoted primarily to improving methods, techniques and equipment now in use or under development. It is a good time for an accurate status report to be found in a new *Rider* paperback called *Space Communications* prepared by a top-notch author in the field.

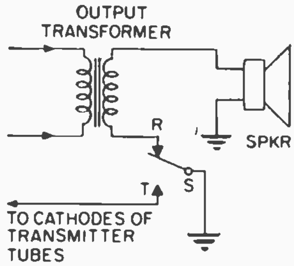
This book, written by *Stanley Leinwoll,* describes what has been accomplished in the field of space communications and what can be expected in the immediate future. It is of practical interest to the radio amateur, the shortwave listener, and the informed layman who wants to understand space communications. The book explains how active and passive communications satellites work, and how one can participate actively in some of the many space projects now being conducted.

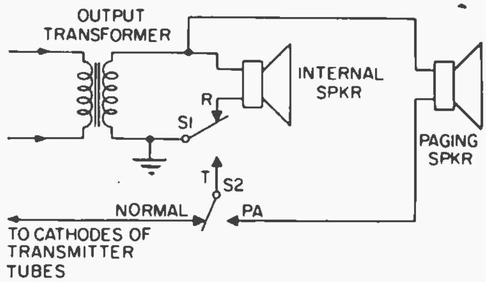
Full chapters are devoted to the flight of Mariner II, OSCAR flights, joint space efforts with international cooperation, direct broadcasting from earth satellites, space listening and the radio amateur in space. An appendix gives pertinent excerpts from the Communications Satellite Act. Throughout, photographs and illustrations enliven the text. (*John F. Rider Publisher, Inc., 116 West 14th Street, New York, New York 10011.*) ■

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 upcoming issues. Sorry, the experts will be unable to answer your questions by mail.*





Calling CB

How can I modify a CB set so I can use it for paging?

—J. C. P., Newark, N. J.

The speaker circuit of a typical CB set is shown in the top drawing of the two schematics. When the transmit-receive relay (or switch) S is in the R (receive) position the speaker is connected. In the T position, the speaker is disconnected and the cathodes of the transmitter tubes are grounded.

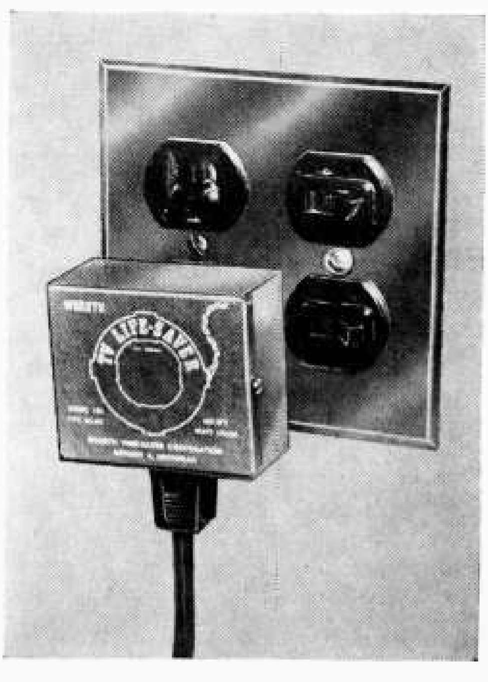
To modify this circuit for paging an s.p.d.t. switch is added and the circuit is rewired as shown in the bottom schematics. Here S1 is the transmit-receive relay (or switch) and S2 is the added switch. When S2 is in the "normal" position, the set operates as before. When set to the PA position, the set's own speaker operates when receiving and the external paging speaker operates when the transmit switch is pressed. But, the transmitter won't go on the air except when S2 is in the "normal" position and the transmit button is pressed.

Tube Stretcher

I have heard of a gadget I can use with a TV set to increase tube life. What is it and where can I get one?

—E. D., Jackson Heights, N. Y.

The Wuerth TV Life Saver shown in the photograph should be available at radio parts stores. It is plugged into the electrical outlet



and the TV set plug is inserted into the gadget. When the set is first turned on, a resistor is connected in series with the AC line to cut the voltage reaching the set. After the resistor gets hot, a pair of contacts close and full voltage is applied to the set. It should greatly increase tube life.

It Ain't Easy

I would like to change my 30-50 mc band FM receiver to cover the 152-174 mc band. Can this be done?

W. C., East McKeesport, Pa.

It probably can be done by changing the RF, mixer and oscillator coils. Try coils with about one-fourth as many turns. You will need a good RF signal generator to permit adjusting the coils (number of turns and spacing of turns) and re-aligning the trimmers. You can set the tuning range limits with the signal generator.

Be a UHF Copycat

What type of antenna is best for reception of weak UHF translator TV stations?

F. B., Las Vegas, Nev.

A parabolic, Yagi or corner reflector antenna will give you considerable gain but must be accurately aimed at the station. Since these antennas have relatively narrow frequency range, they cannot be used to cover the entire UHF TV band. These antennas are fairly inexpensive ($5 to $25).

Blame the Outlet

I often receive a broadcast station with good signal strength but with background static loud enough to be annoying. There are no electrical appliances operating. It there any way to reduce this static?

—M. L., Fresno, Calif.

Try tuning in a strong local station. The noise should be greatly reduced. The noise could be coming over the power line. Try a line filter (Cornell-Dubilier IF-6, etc.) between the power outlet and the set's power plug. If the set has a loop antenna, rotate the set or the loop for minimum noise and maximum signal.

Hm mm mmm

I get a lot of hum on my AM-FM radio. Is there any way of getting rid of this hum? I do a lot of taping from the radio.

—A. S., Cleveland, Ohio

With the tape recorder disconnected, if the set still hums, chances are that it is due to dehydrated electrolytic filter capacitors or insufficient filter capacity. Try connecting a new filter capacitor across each section of the filter capacitor (one at a time) and note if there is any decrease in hum. On the other hand, if the hum is present only with the tape recorder connected, make sure that all of the cable shields are correctly grounded.

S Reading Without AVC

I have an old short wave receiver that doesn't have an AVC circuit. I would like to add an S-meter but all the S-meter circuits I have read about require a connection to the AVC line. Could you tell me how I can add an S-meter to my receiver?

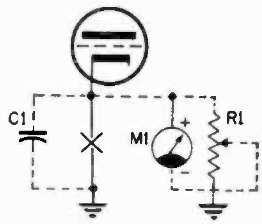
—G. R., Crete, Ill.

If your receiver does not employ a superheterodyne circuit, or is so old that it does not have AVC, it probably employs a grid leak or plate detector using a triode, tetrode or pentode tube. While not a true S-meter, you can add a meter in the detector cathode circuit which will sense the presence of a

ASK ME another

radio carrier and relative indication of its strength.

In the case of a grid leak detector, the cathode is grounded to the chassis. Break the cathode-to-ground lead as shown at *X*



GRID LEAK DETECTOR

in the diagram and connect capacitor C1 (0.1 to 0.25 ufd) from cathode to ground. Connect O-1 DC milliammeter and M1 and 250-ohm potentiometer R1 across capacitor C1 as shown in the diagram. Adjust R1 so that meter M1 is shorted out (minimum resistance) and, with the set turned on but not tuned to a signal, adjust R1 so that meter M1 reads full scale. When you tune in a signal, the meter reading should drop. The stronger the signal, the greater the drop in the meter reading.

If the receiver uses a plate detector, break the cathode resistor lead as shown at *X* in the other diagram and insert meter M2 in

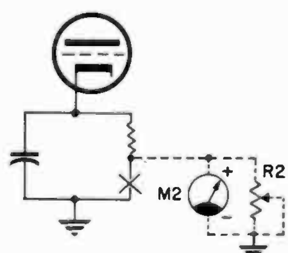


PLATE DETECTOR

series with the resistor and chassis ground and 250-ohm potentiometer S1 across the meter. When tuned to a very strong local signal, adjust R1 for full scale meter reading. When there is no incoming signal, meter M2 reading should be very low, rising with a signal to a level depending upon the strength of the signal. It might be necessary to use a more sensitive meter in some receivers.

Go American (Canadian)

Why do some receiver manufacturers make their receivers so they won't tune to 540 kc (limited to 550 kc)? There are 16 American, 8 Canadian, 1 Cuban, 2 Mexican, 3 Italian and many other foreign stations operating on 540 kc. Also, why do American made receivers cost so much more than foreign made sets?

—*T. M., Red Bank, N. J.*

Congress recently passed a law requiring TV sets to be capable of tuning in all TV channels in both the VHF and UHF bands to prevent discrimination against UHF stations. Let us hope that action by the Congress won't be necessary to get receivers that will cover the entire broadcast band. The stations operating on 540 kc must be quite upset about it.

American made receivers cost more than most foreign made receivers because of higher labor costs. If American manufacturers must pay $2 per hour or more for assembly labor, they must charge more for their products than foreign manufacturers who pay much, much less. Foreign made sets cost more here than in the country of origin because of import duties and shipping costs. The importation of foreign radios has had a serious effect on America's radio industry. Philco, at one time, it is reported, built about 25% of the world's radios. Now their share of the market is very much smaller. In fact, the huge Philco plant at Sandusky, Ohio, where most of the radios were made, has been closed down. Even if they cost more, we should continue to buy American made radios in order to help our own economy. The same holds true for our Canadian friends.

DX Pick-up

Which would be of more value to a short wave listener, a "Q" multiplier or a preselector?

—*R. T., Vineland, N. J.*

A "Q" multiplier improves the selectivity of the receiver between the front end (RF amplifier and mixer) and the detector. It will enable you to separate one weak signal from another weak signal separated in frequency from one another.

A preselector improves the selectivity ahead of the receiver (between the antenna and the receiver). It will improve the rejection of strong unwanted signals, preventing

ASK ME another ?

overloading of the receiver which makes it less sensitive to weak signals. However, it won't help you separate weak signals as well as a "Q" multiplier.

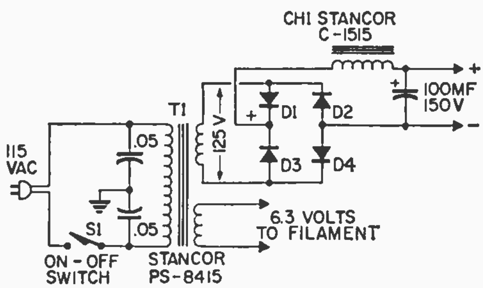
You need both!

Preamp Power Supply

How can I build a power supply for a preamplifier requiring 125-135 volts DC at 7 ma. and 6.3 volts AC for the filament of a 6CB6 tube?

—*G. W., Toledo, Ohio*

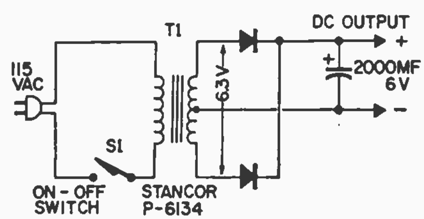
A circuit diagram is given below. Pick diodes with a PIV (peak inverse voltage) rating of around 350-400 volts for maximum reliability. Mount the transformer in a metal chassis so the heat will be conducted away.



Stick To Dry Cells

Can you draw a diagram and give me a parts list for a power supply for a portable tape recorder which uses two 1.5-volt flashlight cells?

J. G., Galveston, Texas



You can use a 6.3-volt filament transformer and a pair of diodes with low forward voltage drop as shown in the diagram. However, you might inject hum into the tape recorder. In view of the low cost and relatively long life of flashlight cells, you might be better off staying with the batteries. ■

RIGS AND RIGAMAROLE

It took a few *sacks* of mail from CB'ers and a little table pounding, and here we are with a regular CB column—a column which offers you something a little different in CB fare. We are going to be giving you a CB'er's eye view of some of the more interesting and exciting pieces of equipment which is being designed for CB use. This includes transceivers, antennas, all sorts of accessories—and some extra special goodies which the manufacturers haven't yet announced. We have our agents (both type 007 and type 36-24-34) well placed inside the design labs around the industry, so things should really be swinging in our little CB corner of RADIO-TV EXPERIMENTER.

Project H.E.L.P. was recently conceived by the Automobile Manufacturers Association. While, from its title, you might think it's part of the war on poverty, it's more a part of the war on powerless vehicles on the nation's roads. The idea is to equip as many cars as possible with 11-meter transceivers—and do it right at the new car dealer. The specially constructed CB rigs will be optional equipment on all new cars coming from Detroit.

First manufacturer to design and build one of the transceivers to be intended for Project H.E.L.P. was *United Scientific Laboratories*, Dept. R78, Division of Vernitron, 59 Central Avenue, Farmingdale, L. I., N.Y. Adding to the other new CB rigs in USL's "Contact" series, the USL "Contact Help"

RIGS and RIGAMAROLE

Amphenol *C-75* 1-watt Hand-Held rig

will be offered to the mobile market for less than $100 (relatively low priced in today's market).

Smaller than a telephone book, and tipping the scales at less than 5 lbs., it dimensions are 10½" wide, 3¼" high, and 8" deep, Accessories include a featherweight hand microphone with a push-to-talk button, a 12 volt cord for cigar lighter plug-in, and a special theft-proof mounting bracket.

In the technical department, the unit is comprised of a 5-watt transmitter combined with a sensitive receiver, both crystal controlled on the special Project HELP channel plus six additional regular CB channels. Also included is a squelch control to keep the set silent while you motor along, safe in the knowledge that road assistance or directions are only a mike-button away.

If your interest in CB lies in the realm of hand held transceivers, we have two new units from *Amphenol-Borg,* Dept. 48R, Distributor Division, 2875 South 25th Avenue, Broadview, Ill.

Both the C-60 and the C-75 transceivers use sensitive superhet kilocycle inhalers to insure good reception even under the hairiest conditions; detecting signals as weak as one microvolt (this is equal to the capabilities of many regular 5 watt base stations). The

C-75 unit has an adjustable squelch and an automatic gain control. The C-75, which is a full 1-watt set, also has the advantage of being constructed of separate modular components. If, say, the transmitter should malfunction, it is merely necessary to unplug the entire transmitter section and bring it to your local Amphenol dealer who can promptly plug another module into your C-75 while the original one gets taken care of at the factory.

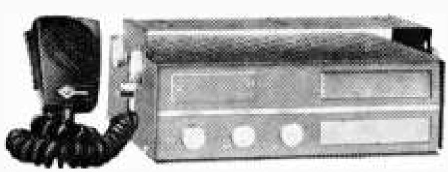
The C-60 unit is a lower power version, using 100 milliwatts input combined with a sensitive receiver.

Both units are encased in high-impact plastic, operate on two channels, and obtain their power from either penlite cells or rechargeable nickel-cadmium batteries.

Price for the C-75 is $114.50, while the C-60 is $89.50.

CB Boating seems to have achieved a peak of popularity this season and here is an advance scoop on a brand new marine CB antenna called the Silver Dolphin. It's produced by Mosley Electronics, Inc., 4610 N. Lindbergh Blvd., Bridgeton, Mo. 63044.

It's a half-wave job with an overall height



United Scientific Laboratories *Contact Help* HELP plus 6-Channel Transceiver

of 8 ft. 5 inches, made from anodized aluminum for complete rust and corrosion proofing. Mounting provisions include the polystyrene base, plus the option of being able to use a swivel mount. For temporary mounting may be used in conjunction with a special "Dolphin" base, this has a clamp mounting.

A distinctive feature is the ability for the antenna to be tilted over for flush-deck mounting when necessary.

The manufacturer guarantees (in writing) that not only will it be free from material defects for two years, but that it will equal or out-perform other CB marine antennas now on the market.

You CB-yachtsmen might throw a binocular in the direction of the Silver Dolphin to see what it has to offer for your particular installation. ■

NEW products

New Transistorized Speech Clipping Microphone

A revolutionary, speech clipping, communications microphone, the D-501K, a hand-held style with press-to-talk switch, especially suitable for mobile applications, is now being offered by American Microphone, Division of Electro-Voice, Inc. The two-transistor D-501K may actually double "talk power" when used with virtually any CB, amateur, or other two-way communications equipment. The microphone can easily be substituted for the original unit on most transmitters. It contains transistor circuitry to provide a variable amount of speech clipping for maximum intelligibility and high

output level. By clipping peaks of vowels which contribute least to intelligibility, it is possible to increase modulation level of consonants, which largely determine clear speech and thus considerably increase average output. The internal transistor amplifier provides gain in excess of the insertion loss in the clipping circuit. In day-to-day use, the cast aluminum case of the model D-501K provides excellent protection without making the unit uncomfortably heavy. The reliable push-to-talk switch and the comfortable hand-held design combine to assure the operator of effortless, efficient use. Grille design protects the internal element from accidental damage and infiltration of dust and foreign particles. Power for the D-501K clipper and amplifier is supplied by an internal long-life cell. Under normal conditions of use, this cell will last several months, depending on the actual amount of use and when exhausted, it can be replaced quickly and inexpensively. The model D-501K output level is adjustable through the use of an internal potentiometer which also sets the degree of clipping. Use of this control allows adjustment for the proper input level for virtually any type of transmitter equipment. The frequency response is 100 to 5,000 cps and is shaped for maximum intelligibility. List price of the D-501K is $49.50. (*For complete specifications write to Electro-Voice, Inc., Dept. LK1, Buchanan, Mich.*)

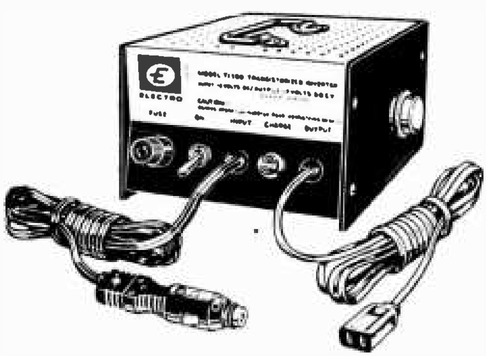
500 Watt Ham Transceiver For Mobile or Fixed Stations

The new SR-500 "Tornado" transceiver made by The Hallicrafters Co. provides the amateur operator with high-performance SSB and CW operation on the three most popular bands; 80M, 40M, and 20M. Lower sideband is used on 80 and 40 meters and upper sideband on 20 meters. The 500 watt *P.E.P.* unit has an amateur net price of $395.00. The transceiver incorporates Hallicrafters' exclusive *Amplified Automatic Level Control* (AALC) which prevents "splatter" often caused by final amplifier

"flat-topping." The receiver section contains the proven Hallicrafters *Receiver Incremental Tuning* Control (RIT) which allows the operator to tune the receiver up to 3 kc. to either side of the transmitter frequency. All jacks and switching for linear amplifier operation are included as well as a combination "S" meter/RF output indicator. Dial calibration is in 5 kc. increments, which are accurate to less than 2 kc. between 100 kc. points after indexing. The VFO has a 500 kc. tunable range, which is stable to within 300 cps after warm up. Sensitivity of the receiver is 1 microvolt for 20 db S/N. Audio response is 600 to 2800 cps at 3 db, and audio output is 2 watts at 3.2 ohms. Operating accessories for the SR-500 include the HA-16 VOX adapter; a P-500 AC power supply for base station operation and a P-500 DC power supply for operation from a 12.6V DC power source. A special MR-160 mobile installation kit is also available which includes all inter-connecting cables. (*For more information on the SR-500 Tornado write to the Hallicrafters Co., Dept. TV51, Fifth and Kostner Avenues, Chicago, Ill. 60624.*)

Transistorized Inverter Puts Household Current in Your Car

Operation of portable television sets, radios, lights and other small household appliances in areas out of reach of AC outlets is now possible with the use of the new Electro electrical inverter that plugs into your car's

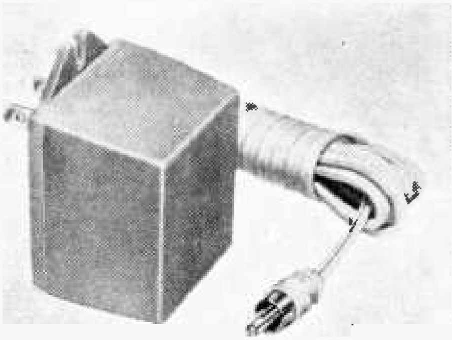


lighter socket. The Model TI-100 Inverter, manufactured by Electro Products Laboratories, Inc., Chicago, has an output of 117 volts, 60 cycles AC with capacity of 125 Watts—ample power to handle many household appliances such as P.A. systems, ham gear, small power tools, recorders, shavers and other appliances from DC voltages in automobiles, boats, trucks, trailers and emergency vehicles. A unique charge-indicator light glows while unit is operating and shows condition of the car battery. The cords total 12 feet in length and include cigarette lighter attachment for simple plug-in operation. The unit operates in any position and is designed for high efficiency at higher output loads, and battery strain, allows 20-volt regulation, no-load and full-load, and frequency regulation of 5 cycles. Overall size of unit, 3½" high, 6¼" wide, 6¼" deep; weight 6¾ lbs. Priced at $39.95. (*Write for Free Bulletin TI-265 available from Electro Products Laboratories, Inc., Dept. 751, 6123 Howard Street, Chicago, Ill. 60648.*)

Plug 'n Play Converter/Charger For Dry Cell Devices

Plug 'n Play makes any cordless device rechargeable, even those using common "flashlight" (carbon-zinc, alkaline or mercury) batteries. It recharges the device automatically when it is not in use and allows the device to be operated directly from ordinary 110-volt household current. Suitable for use on transistor radios, tape recorders, phonographs, electric toothbrushes and shoebrushes, children's toys, movie cameras, electric knives and all types of cordless devices and appliances, it will extend battery life from fifteen to fifty times the normal. It consists of a miniaturized converter/charger contained within a wall plug only slightly larger than the ordinary appliance plug. An electric cord from the charger ends in a jack which plugs into the cordless device for recharging or operating directly from the household current. All AC current is isolated within the wall plug by means of a transformer, meeting UL standards. Rated at 6.5 volts, 20 ma, Plug 'n Play comes complete with a plug adapter for rapid connection to portable tape

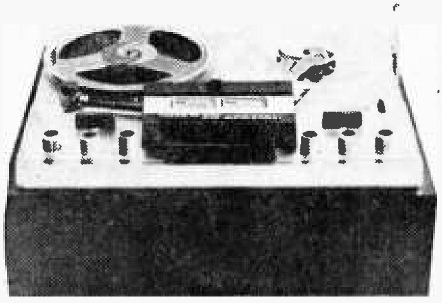
NEW products



recorders and transistor radios. Priced at $5.95. (*For more information write to Dynamic Instrument Corp., Dept. R75, East Bethpage Road, Plainview, L.I., N.Y.*)

Tape Deck Is Module Packed

The newest addition to Mortel Electronics quality line of Uher tape recorders is the new Uher 9000 Tape Deck. The secret behind what may be the most revolutionary tape deck currently on the market today is the exclusive computer designed modules—record, playback, equalizer, power pack and push pull RF bias oscillator circuit. Each module is tested separately and then retested when combined in the package. In addition, each



tape deck comes with its own testing certificate and original frequency response curve sheet. Other exclusive features are: playback equalization curve, that by a single flip of a switch, you can get either CCIR or NARTB standards; a powerful hysteresis synchronous motor; 4 track; separate erase, record and playback heads as well as separate level controls for each channel; monitoring of sound as well as recording by a flip of the AB switch; sound on sound switch; illuminated VU meter; tape tension control (guaranteeing lowest wow and flutter while automatically removing any foreign particles of dust from tape instantly); a vernier adjustment of playback that creates exact azimuthal alignment for every type of tape. Added to these features are tape lifters, end of reel shut-off separate head phone monitor jacks, four-digit counter with automatic reset and 7 inputs. The new Uher 9000 Tape Deck also offers all the marvelous Uher optional accessories such as the famous Akustomat (you speak, machine records; you stop speaking, machine stops—no wasted tape), and the Uher Dia-Pilot (automatic slide projector synchronizer). Other specs worth mentioning are: frequency range, 20-20,000 cps (7½ ips) and 20-15,000 cps (3¾ ips); crosstalk—50-55 db; reel size; up to 7 inches; dimensions, 15.3 x 6.8 x 13-inches; weight, 24 pounds (approx.). Priced at $499.00. (*For more information write to Madisonville Inc., Dept. 48, 310 Madison Avenue, New York, N. Y. 10017.*)

Wireless Intercom Is CB Transceiver

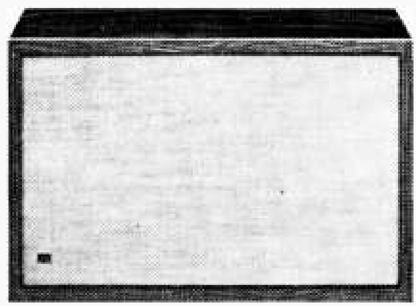
Probably the world's first Citizens Band intercom, the *SELECTaCOM*, has just been offered by Radio Shack Corporation. The desk-top device is both a wireless intercom and a Citizens Band transceiver. Users of the 100-milliwatt *SELECTaCOM* do not have to be on the same AC electrical circuit to communicate, a marked advantage over other wireless intercom systems. The new unit transmits and receives with crystal-controlled stability on CB Channel 5. It can be incorporated into an intercom "net" with any number of similar units, and will receive

NEW products

Channel 5 signals from mobile or walkie-talkie CB sets. No user's license is required. Its further use as a dual-power CB transceiver distinguishes the *SELECTaCOM* from all previous models. Low power 100-mw operation, using the built-in telescopic antenna, provides instant no-license 2-way radio communications. Licensed increased-range operation is available simply by switching to high power 3-watt operation in conjunction with an external ground plane antenna. A built-in speaker/mike eliminates the need for close-up talking through an external microphone. Radio Shack regards the new *SELECTaCOM* as a versatile "telephone" for modern day communications requirements, and anticipates that it will find wide acceptance in schools, laboratories and warehouses, as well as in homes and offices. The *SELECTaCOM* sells for $49.95 a unit, or $99.50 in pairs. *(For more information write to Radio Shack Corporation, Dept. 48R, 730 Commonwealth Ave., Boston 17, Mass.)*

New Big Sound In Bookshelf Units

Three new speaker systems extend the famous *Bozak* sound into the area of "compact" and "bookshelf" units. All use full-size *Bozak* components, with a new and exclusive cabinet design that gives the sound a spaciousness formerly possible only with far larger speakers. The cabinets are matte-finished walnut with natural-linen grille cloth, and can stand horizontally or vertically SONATA II. Model B-211, (see photo) is the smallest, measuring 23⅛" x 14¼" x 11½" deep. It has one B-199A Bass Speaker and a single B-200Y unit, with an LC crossover 6 db per octave at 2500 cycles. Frequency range is 50-16,000 cycles, impedance 8 ohms, and recommended amplifier power 20 watts or more. CONCERTO II and CONCERTO III, Models B-312 and B-313 respectively, use the same cabinet 24½" x 17¼" x 12½" deep. Concerto II is a two-way system based on the B-207A Coaxial speaker having a response from 45 to 16,000 cycles with a 6-db-per-octave crossover at 2500 cycles. Concerto III, in

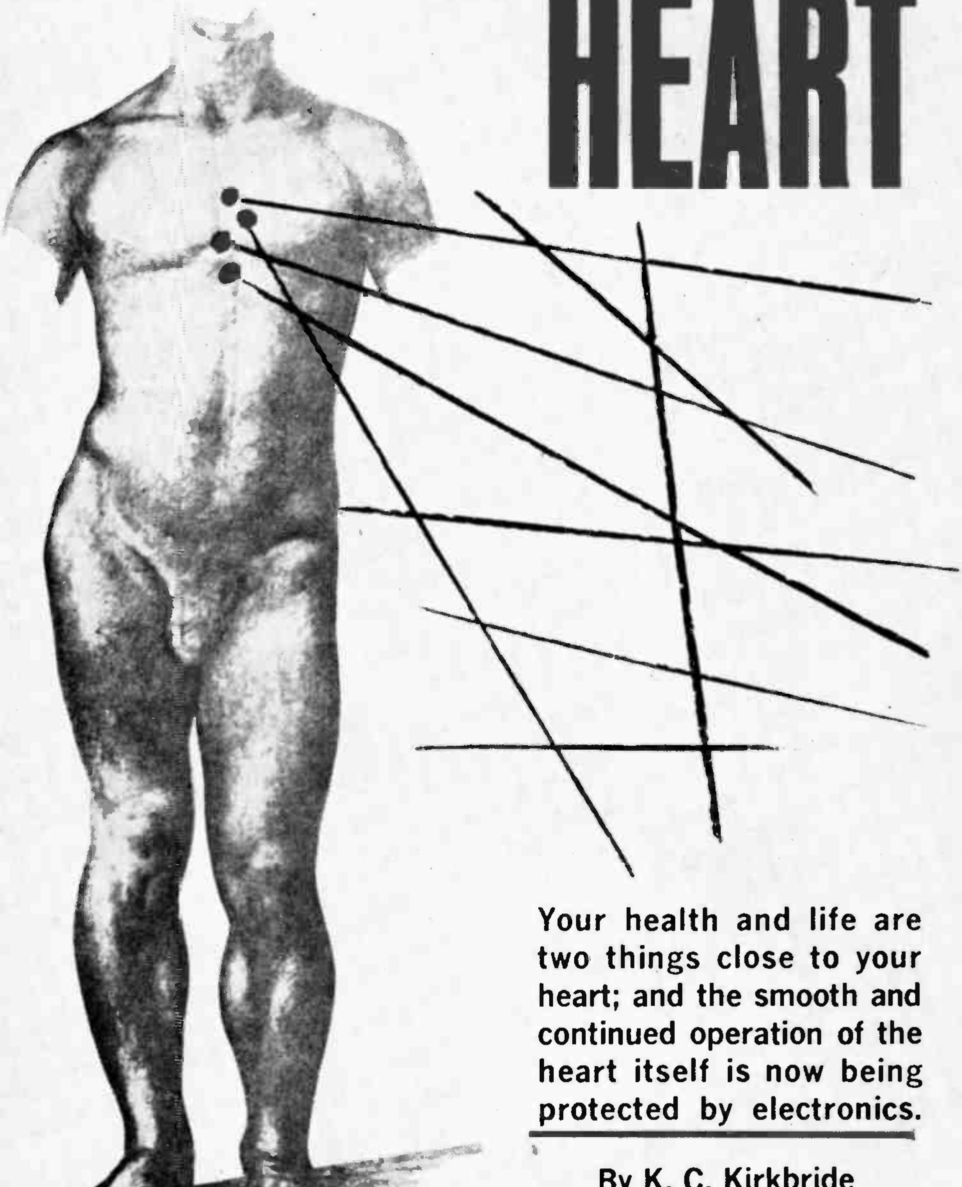


the same cabinet as Concerto II, gains a sharper focus of the middle frequencies through the addition of a B-209B Midrange Speaker and N-10102A Crossover Network. This three-way system has a range of 45 to 16,000 cycles and crossovers 6 db per octave at 800 and 2500 cycles. For both Concerto II and III, the impedance is 8 ohms and recommended amplifier power 20 watts or more. Concerto II can be converted to the three-way system at any time, and the standard components can be transferred to a larger enclosure or wall installation. *(For complete information, address The R. T. Bozak Manufacturing Co., Dept. RTV40, Darien, Connecticut, 06821.)*

Switchcraft Flash—Now you will be able to pick up tangle-free coiled cords designed for replacement of monaural headset cords. Some models are direct replacement for Brush and RCA units. Beautifully designed, the white neoprene coils can extend up to 10 feet. Prices start from $3.70. *(For more information write to Switchcraft, Bul. 149, 5555 N. Elston Avenue, Chicago, Illinois 60630.)* ■

Radio-TV Experimenter
August/September 1965

ELECTRONICS GOES TO YOUR HEART

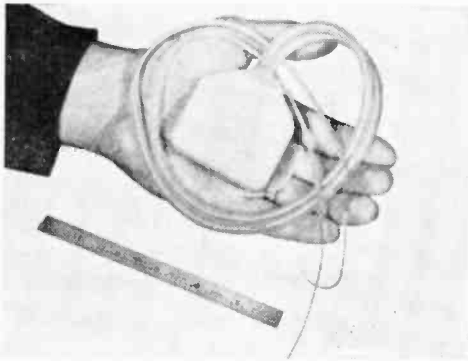


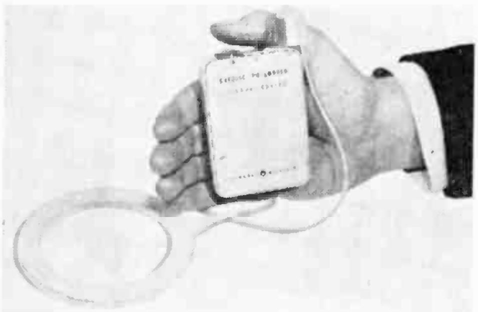
Your health and life are two things close to your heart; and the smooth and continued operation of the heart itself is now being protected by electronics.

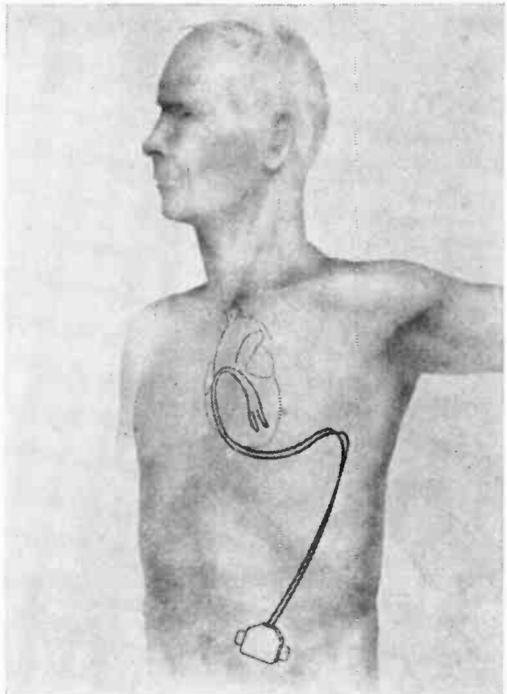
By K. C. Kirkbride

Continued Overleaf

ELECTRONICS GOES TO YOUR HEART





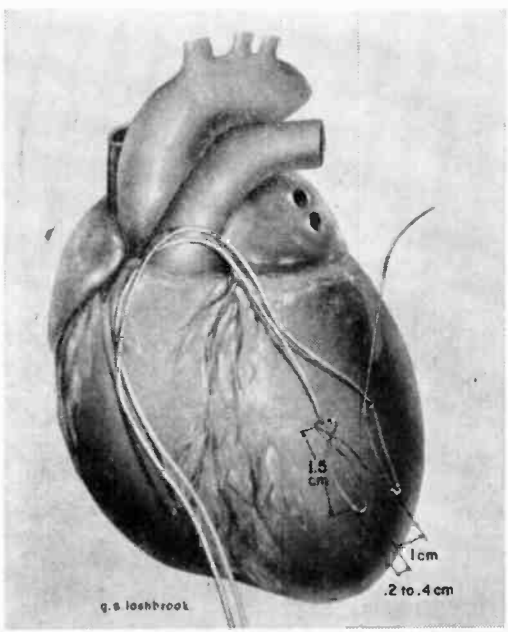


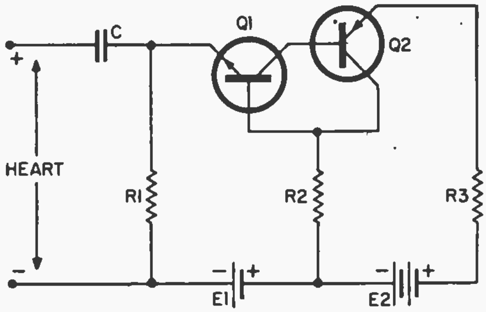
The GE heart pacer is shown implanted in the figure above. The leads run up to the heart supplying pulses that regulate the rate of heart beat. The implanted unit is shown at top left; below it is the external unit with its antenna that allows the pacer pulse rate to be regulated. Photo below shows electrodes sutured to the heart.

In the early morning hours of October 17, 1968, a slim tall young man walked down the stone steps of his local hospital in Sioux City, South Dakota, his face flushed with warm color, a keen eager look in his eyes as his doctor's words echoed in his ears: "Jim, you've just added ten, fifteen years to your life. Good luck!"

Twenty-four hours before, "Jim" had been dying of a heart attack. His doctor speeded him to the hospital, hoarding the "last moments" with oxygen and adrenalin. Now, less than a day later, Jim could walk out of the hospital, a renewed man, only a tiny wire protruding from his chest under his shirt evidencing the fact Jim no longer has a human heart. Now his blood is pumped through his body by an artificial pump, one that can easily add years to his lifespan.

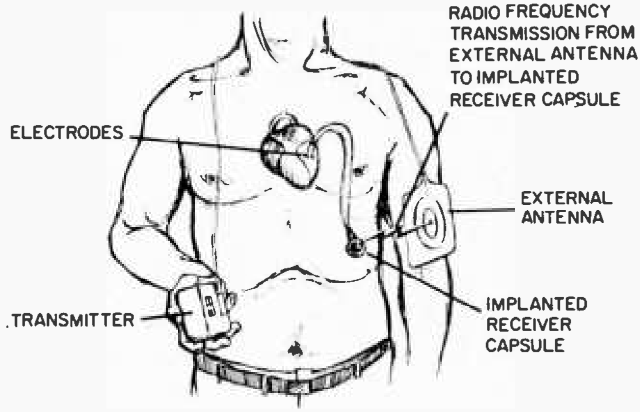
Sound fantastic? Not at all. For within a few years, almost one million people who would have known certain death in 1965 will not only know the chance to live, but will add whole decades of useful activity to their lives.





The circuit of the pacemaker, which is hermetically sealed in a Silastic case, is a basic pulse oscillator. It employs a pnpn complementary transistor configuration exhibiting negative resistance across the terminals of resistor R1. The charging of capacitor C and its discharge through resistor R1 determines the impulse frequency.

Shown in operation here is the radio frequency cardiac pacemaker currently manufactured by Airborne Instrument Laboratories. The operating frequency is 2 megacycles/sec. The external antenna electromagnetically couples the radio frequency field through the patient's skin to the receiver coil which applies it, through the electrodes, to the nerve tissue of the heart.



True, they may not be able to "dance all night" or hobby-it-up by watching dawn come up over River House, but they will be capable of useful activity with an extended life expectancy that will shame folks living in our backward 1965 era.

Number-One Killer. For today, electronic, medical and space engineers team up in the most intense scientific effort of our time, outside the man-in-space program (which too may hinge on the artificial heart), to strike down the number-one killer and crippler of our time—heart disease.

In the works already is a whole series of man-made hearts, "hearts" that have powered dogs for hours, even days, most of the man-made pumps fashioned of plastics and driven by compressed air, motors or liquids. Some of the bolder scientists even predict the ultimate "heart" will be motivated by the electrical vibrations of the body iself.

Artificial Heartbeats. Other laboratories evolutionize tiny electronic pulsers, some smaller than a pack of matches, that "manufacture heartbeats." These tiny stimulators already pace five thousand people through normal activity every day, people who would otherwise suffer the symptoms of heart block, and be curbed in their activity to the life of an invalid.

Heart block exists when the electrical functions of the heart weaken from injury, disease or congenital effect so the heart beats too slowly, or in some instances, too fast. The impulse of a normal heart beat starts at a point on the right side of the heart, travels along a bundle of fibers, fans out into the muscle of the two main pumping chambers, causing them to contract. When this electrical conduction system is injured, the heart cannot supply the body the oxygen it needs. And when block lasts over a few seconds, the victim may faint, suffer convulsions or die.

It wasn't until Dr. Paul N. Zoll and his colleagues at Boston's Beth Israel Hospital applied electric shock to heart-block patients in 1952 that our story begins. Though the theory was old, tracing back to Luigi Galvani who first associated electrical currents with living tissue in the 1700s, to apply it to heart problems was new and startling. The first treatments were successful, and the Doctor reasoned, why couldn't he find some way electrical nourishment could be supplied the heart on a continual basis.

The First Pacemaker. Dr. Zoll and engineers of the Electrodyne Company designed the first pacemaker, a crude affair compared with our modern day miniaturized versions, but it did pulse energy through electrodes from outside the chest wall to the heart. But these first pacers required so much power that they caused chest muscles to contract, often caused burns on the skin, and sometimes frightened the patients they were meant to help.

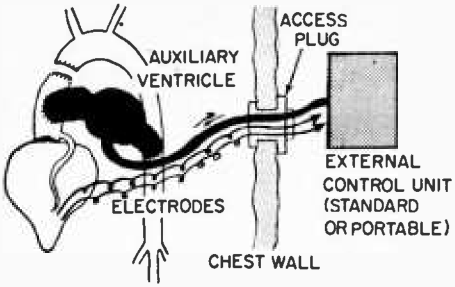
Next a heart surgeon at the University of Minnesota, Dr. C. Walton Lillelei wondered why not hook the electrodes into the heart muscle itself and connect the electrodes to a power supply outside the body. But problems plagued this stage, too. Wires coming from inside the body through the skin too often caused infection; patients found it hard to wear the pacer and bathe, harder yet to exercise.

Rescue. Then a number of major-company laboratories and space-age engineers heard of the doctors' struggles and soon laboratories were rivalling each other creating pacers worn inside and outside the body, pacers that today have saved the lives of thousands.

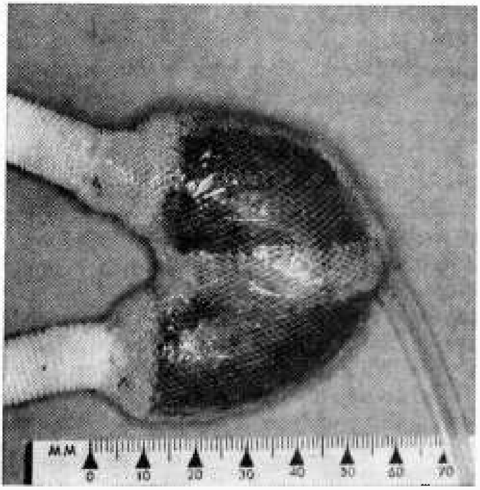
Newest and probably tops among externally-worn pacers is one recently turned out by Airborne Instrument Laboratories at Deer Park, New York. Built to be carried in a patient's shirt pocket with only a tiny receiver and electrode implanted under the skin, it applies radio waves to aid the sick heart.

The six-ounce, battery-powered radio transmitter pulses radio energy to tiny implanted coils and electrodes attached to the heart. The proud sponsors of this wonder plead its virtues over the implanted variety saying it eliminates the need for bulky implants, that its batteries can be replaced without surgery and its pulse rate and voltages regulated easily.

Better Inside. But pacemaker-pioneer Dr. William M. Chardack of Veterans Hospital, Buffalo, New York, cheers for the implanted version. "Out of sight, out of mind," the Doctor reasons. He believes patients "do not feel psychologically handicapped if they can-



Operation of an implantable auxiliary ventricle is shown in a dog, above. Below, the flexible bulb of the auxiliary ventricle is shown fully inflated by compressed air.

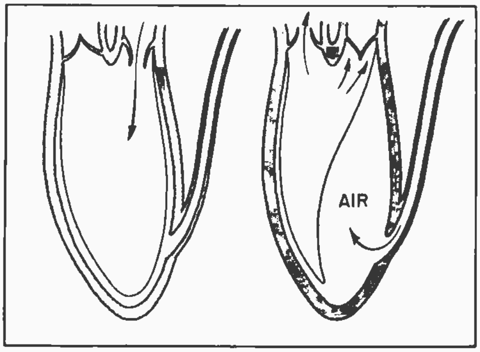


not see the pacemaker." Too, there is less danger of damage in case of a fall.

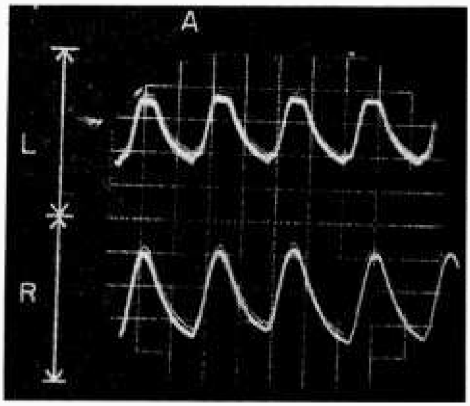
Space Aids. The implanted pacer, developed soon after the early external pulsers, was pioneered by General Electric space and missile engineers working with Dr. Adrian Kantrowitz, now with Maimonides Hospital, Brooklyn, New York.

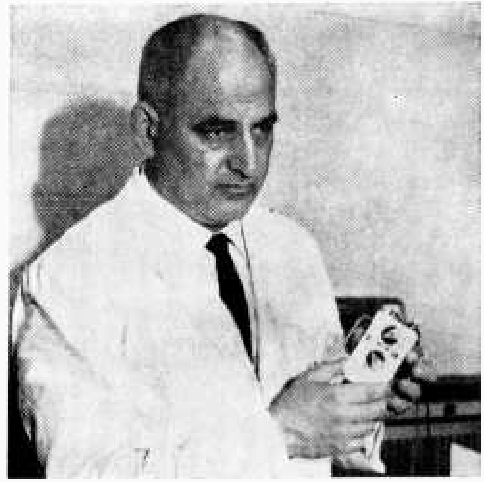
Weighing only five ounces, the GE pacer is 2.5 inches long, 2.25 inches wide, and the tiny wires that thread its main cables, less than two-thousandths of an inch in diameter. But this tiny pacer packs power. Inside are five batteries, two transistors, three resistors, and a capacitor, all sealed in Silastic case.

Implanted by surgery near the patient's waistline, the pacer will tunnel power up through the body to the electrodes attached to the heart to pulse a regulated beat. This placement at the waist is many times preferred by older patients, but younger ones like the pack implanted near the shoulder to



When air is forced into the chamber, above, the ventricle is compressed. Below, the piston movement of an artificial heart inside the chest is displayed on an oscilloscope. The upper curve is the action of the left ventricle and lower curve, right ventricle.





Dr. Adrian Kantrowitz, above, holds cardiac pacemaker designed for heart rate control. Below, the oscilloscope tube of the three-pound Westinghouse Miniscope displays the patient's electrocardiograph. The electrodes are attached to palms with suction cups.

allow freer movement.

When a patient really wants to "jolt" his heart to 75 to 120 pulses a minute, he can switch on a unit GE supplies that can be worn in a shirt pocket, and this outer power supply will transmit energy to the implanted receiver.

But for all the wonders of the modernday pacer, it still has one staggering limitation. Battery power. Even the best batteries wear but five years, then must be replaced by surgery.

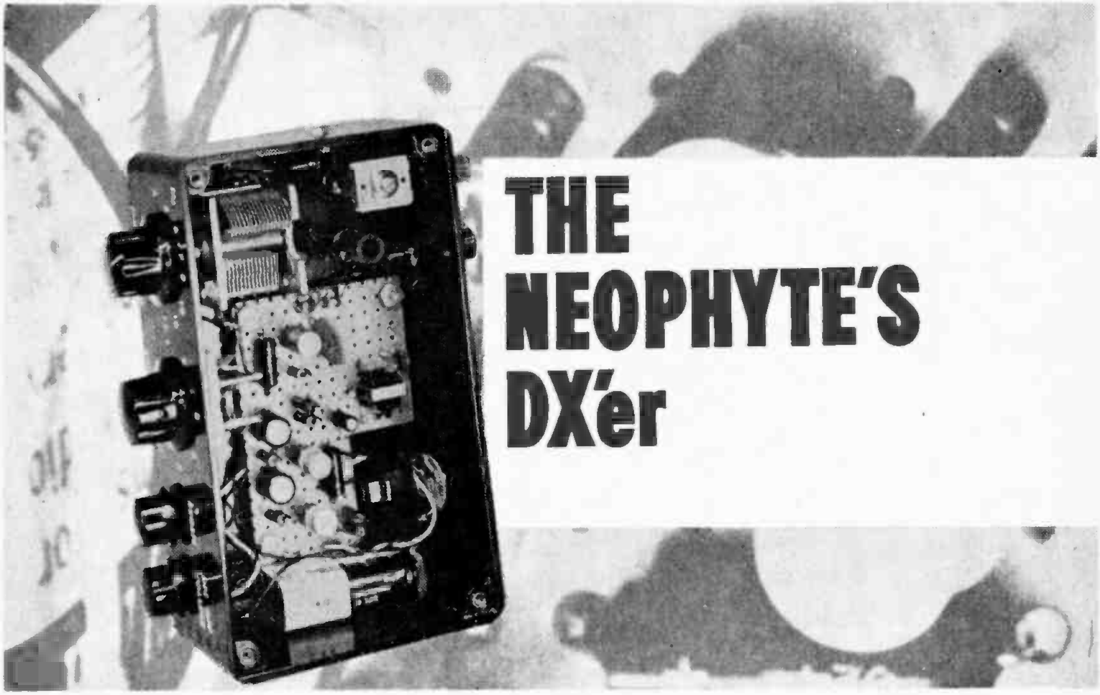
Thirty Years. Now the City of Hope Medical Center in Los Angeles, California, announces it has built a pacer that will last thirty years! The secret is outer-power-source recharging by electromagnetic induction. So far experiments have been made only on dogs, but when the pacer is ready for human use, heart-block patients can buy their pulsers free of worry of battery-breakdown.

As revolutionary as these achievements are—creating a meld of medical and electronic efforts to save thousands of lives—there are still thousands more needing electronic help. But the ultimate help, the solution to the presentday soaring heart-disease fatalities must be the seemingly impossible, the seemingly incredible development—a workable, practical artificial heart!

Dogs Live. While the dedicated doctors who try to fashion this breakthrough admit they still have problems, they have created enough wins to be able to predict such a heart in the near future. Already dogs and calves have lived for hours, even days, with plastic versions, while partial implant has kept dogs alive almost one month; one dog, over a month.

Director of Research at Cleveland Clinic Foundation, Dr. W. J. Kolff, famed for his

(Continued on page 110)



THE NEOPHYTE'S DX'er

Here's an inexpensive receiver, tailor made for the beginner. It'll cost about fourteen dollars to build from all new parts. With a good antenna you'll be able to hear stations from all parts of the globe and send for their acknowledging QSL card to prove it. Interested? No wonder!

The Neophytes' DX'er is a transistorized regenerative short wave receiver with excellent sensitivity and covers the short-wave bands from 4 to 15 megacycles. However, the receiver can be easily modified to cover any band from 500 kilocycles to 30 megacycles. More about this later. Easy to build, it can be built by a novice in eight hours.

The Circuit. Signals picked up by the antenna-ground system are coupled into the tuned circuit C2, C3, L1 by the antenna trimmer C1. Stations are tuned using capacitors C2 and C3, the primary and vernier tuning controls, respectively. Operating bias for the detector, Q1, is supplied by resistor R1.

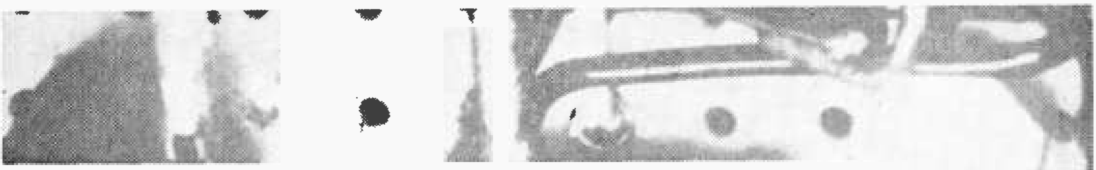
A tickler feedback arrangement is employed in the collector circuit of Q1. Regeneration is controlled by potentiometer R2. Coil L1 is tapped down to match the low input impedance of Q1. Transformer T1 couples the demodulated audio into the two-transistor audio amplifier. The output of the secondary of T1 is fed into the base of Q2 through capacitor C6. Resistors R3 and R4 provide bias for Q2. Resistor R5 adds a measure of stabilization, it's bypassed by capacitor C7. The volume control, resistor R6, is the collector load for Q2. The second audio stage is very similar to the first except that the collector load for Q3 are your headphones.

Mechanical Construction. Before drilling any holes in the case, lightly center punch the spots where holes are called for. Don't use too much pressure when you're drilling or you stand a good chance of cracking the bakelite case. Make the larger holes by first drilling a small hole, then enlarge it with a reamer to the proper size.

Glue a piece of rubber, 2⅛ inches by ¾ inches by ⅜ inches to the inside of the lid for the case. This piece of rubber presses down on the battery when the lid is closed and prevents the battery from shifting. Cement four small rubber pads to the under side of the case; they act as non-skid feet. When you cement the rubber parts to bakelite, use a cement like *Ply-O-Bond*, which is excellent for this purpose.

Before you mount capacitor C2, attach the ground lug to the frame of the capacitor. Make sure that the mounting screw is not long enough to press against the rotor plates of the capacitor. If you can't find a screw short enough, put several washers or a nut under the head of the screw.

Several washers are used on the shaft of



A receiver no bigger than a QSL card! You'll get your first and many more to prove its size . . . and performance!

By Edward A. Morris, WA2VLU

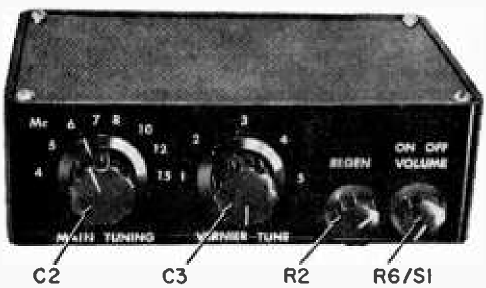
C2 to prevent the plates from being warped when you tighten up on the mounting screws. You can prevent the washers from shifting around by first lightly cementing them over the mounting holes in the frame of C2. Then when you position C2 you won't find that the washers won't stay in the proper position long enough to mount the capacitor.

Mount the rest of the controls on the case along with binding posts BP1 and BP2 and phone jack J1. Cut the shafts on the regeneration and volume controls R2 and R6, down to ¾ inch. The shaft of the vernier tuning control, C3, should be cut to a length of ½ inch.

The Antenna Coil. Wind coil L1 on a 1½-inch long piece of ⅜-inch o.d. plastic tubing. Coil L1 consists of twenty-five turns of number 26 plain enameled wire, close wound. The coil is tapped ten turns from the ground end. The easiest way to place the tap on L1 is to cut off a measured 36-inch piece of wire, and place the tap 14¾ inches from one end. This allows for two-inch pig-tail leads. Now wind the tapped piece of wire around the coil form.

Coil L2 is ten turns of number 26 wire close wound over coil L1. Take special note of the fact that both L1 and L2 should be wound in the same direction, be it clockwise or counter-clockwise. Cover the coil windings with a layer of epoxy or Duco cement. This will keep the coil windings from shifting position. When the windings are dry, cement or mount the coil form in the case. The proper position can be seen in the photographs.

Electrical Construction. Wire the unit according to the schematic diagram. Don't wire in resistor R1 at this time, its exact



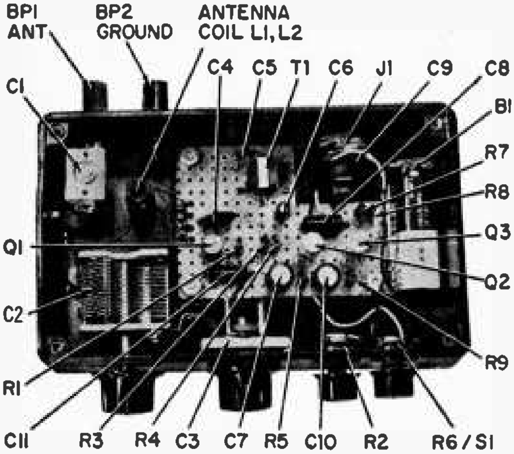
Receiver's front panel consists of tuning, regeneration, volume, and power controls.

value will only be determined later. Be sure to observe polarities where indicated.

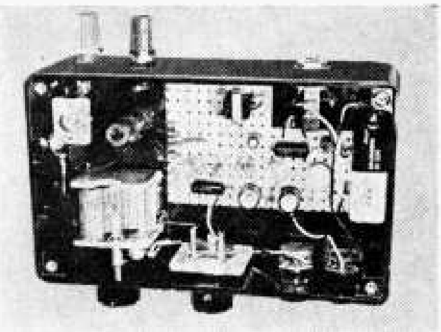
The transformer specified for T1 in the parts list has a center tap on its secondary. This center tap is not used, and may be cut off near the case.

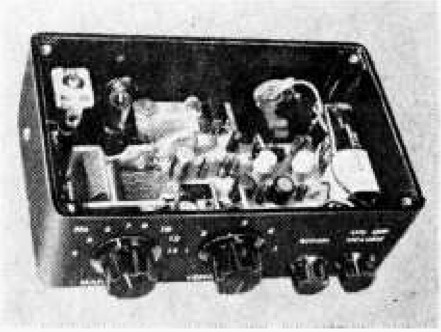
The general parts layout can be seen in the photographs. Parts are close enough together so that most connections can be made by using the pig-tail leads on the com-

NEOPHYTE'S DX'ER



These top views of the receiver with the cover removed show the location of all the components. Note how the phenolic circuit board, which is secured in the chassis with stand-offs, is shaped to fit around jack J1.





ponents themselves. Run the leads under the perforated phenolic circuit board.

Although the author used transistor sockets in his model, the transistors may be soldered directly into the circuit if you choose. If you solder them directly, use a heatsink on the leads, and make the connections as quickly as possible to prevent damage to the transistors.

For regeneration to occur, coils L1 and L2 must be wound in the same direction, be it clockwise or counter-clockwise. They must also be wired into the circuit correctly. If you follow the detail winding drawing and schematic, you should have no trouble.

Final Construction. Wire a 50,000-ohm resistor in series with one arm of a 10 megohm potentiometer. Connect the free end of the fixed resistor, and the center terminal of the 10 megohm pot into the circuit in place of resistor R1. Hook up a 25- to 50-foot antenna to the antenna terminal, and plug in your head set. When you turn on the DX'er you should be able to hear a hissing sound at some setting on the regeneration control, R2. The best value for resistor R1 is now determined experimentally; vary the 10 megohm potentiometer and note the results. If the value of R1 is made too small, the stage will not demodulate the received signal well. On the other hand, if the value is picked too high, you may not be able to get the set to go into regeneration over all parts of the band.

This means you will have to pick some compromise setting of the potentiometer. When you think you have obtained the best results, disconnect the potentiometer from the circuit, being careful not to disturb its setting. Measure the total value of the 50,000-ohm resistor and the potentiometer. Replace it with a fixed resistor which has the closest value. A 4.7 megohm value proved optimum for the unit we built.

If you can't get the receiver to break into regeneration, try reversing the leads to L1 or L2, but not both.

Operation. If you are to get maximum results from the DX'er, you should use a good antenna-ground system. A good antenna would be about 50 feet long, and would be as high as you could get it. A ground need not be more than a cold water pipe, but a ground rod is better still. Sometimes good results can be obtained by just using a good antenna, and a lot will depend on your location.

Let's say you want to tune for an A.M. station. Turn the volume control on-off switch, R6-S1, to about its mid-position. Advance the regeneration control so that it just starts to squeal. As you tune with the main tuning control, you will notice that as you pass over a station the squeal will drop in pitch. Tune to the point of lowest pitch, now reduce the regeneration control, R2, just below the point where the squealing stops. You have now tuned in a station.

If you hear another station on top of the one you want to hear, use the vernier tuning control. If this doesn't help, reduce the capacity of the antenna trimmer C1 by turning it slightly counter-clockwise. The antenna trimmer should normally be set for best sensitivity over the entire tuning range. To receive a continuous wave (CW) station, set the regeneration control just past the point where the squeal starts.

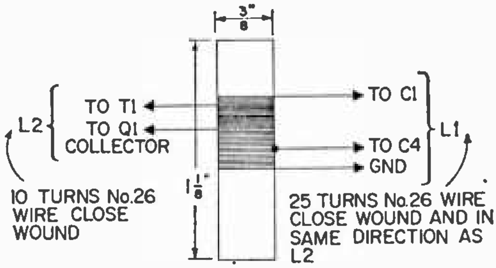
Modifications. Earlier we mentioned the DX'er could be modified to cover any band from 500 kilocycles to 30 megacycles; here's

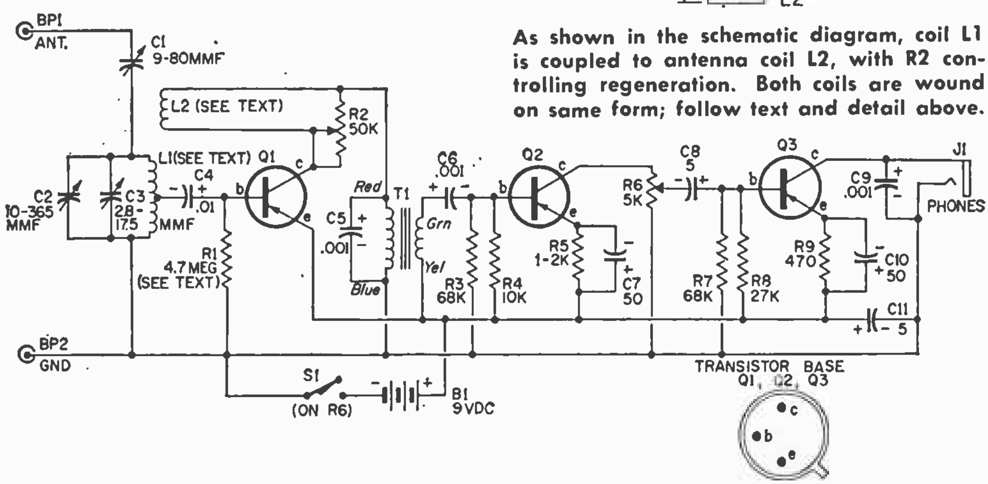
(Continued on page 111)

PARTS LIST FOR NEOPHYTE'S DX'ER

B1—9-volt battery (Burgess 2U6 or equiv.)
BP1, BP2—Red and black binding posts
C1—9-180-pf. mica compression trimmer capacitor (Lafayette 34G6831) or equiv.
C2—10-365-pf. variable capacitor (Lafayette 32G1103) or equiv.
C3—2.8-17.5-pf. variable capacitor (Hammerlund HF-15) or equiv.
C4—.01 mfd. ceramic capacitor
C5, 9—.001 mfd. ceramic capacitor
C6—4 mfd. miniature electrolytic capacitor 6 WVDC
C7, 10—50 mfd. miniature electrolytic capacitor 6 MVDC
C8, 11—5 mfd. miniature electrolytic capacitor 6 MVDC
J1—¼-inch phone jack
L1—25 turns No. 26 wire close wound, on a ⅜-inch diameter, 1⅛-inch plastic coil form (Lafayette Radio 34G8913) Tapped 10 turns from gnd. (See text)
L2—10 turns of No. 26 wire close wound over L1 (See text)
Q1—Pnp rf transistor (Lafayette 19G4211 or equiv.)
Q2, 3—Pnp germanium audio transistor (Lafayette 19G2701 or equiv.)
R1—4,700,000-ohm ½-watt resistor (see text)
R2—50,000-ohm miniature potentiometer (Lafayette 32G7359) or equiv.
R3, 7—68,000-ohm, ½-watt resistors
R4—10,000-ohm ½-watt resistor
R5—1,200-ohm, ½-watt resistor
R6—5,000-ohm miniature potentiometer with on-off switch (Lafayette 32G7363)
R8—27,000-ohm, ½-watt resistor
R9—470-ohm, ½-watt resistor
S1—S.p.s.t. switch (see R6)
T1—Audio transformer, 10,000-ohm primary; 2,000-ohm secondary (Lafayette 19G6126 or equiv.)
1—6¼" x 3¾" x 2" plastic case and cover panel (Lafayette 19G2001 and 19G3701, respectively)
2—Tuning knobs, ¾-inch diam., ⅛-inch shaft Burstein Applebee 12A849)
2—Tuning knobs, 1⅛-inch diam., ¼-inch shaft (Burstein Applebee 12B60)
Misc.—Nuts, bolts, hook-up wire, transistor sockets, battery clip, rubber scoop, perforated circuit board, solder, etc.

Estimated cost: $14.00
Estimated construction time: 8 hours





As shown in the schematic diagram, coil L1 is coupled to antenna coil L2, with R2 controlling regeneration. Both coils are wound on same form; follow text and detail above.

ELECTRONICS AWEIGH

Advance simulators teach our future merchant captains the secrets of radar, RDF, gyroscopic compasses, and nuclear automation that ride the waves in our futuristic vessels

The RDF loop antenna, upper left, is easily recognized by an RTVE'er but you'll have to take a closer look to see that the computerized console at left contains conventional engine room telegraph. Instrument bank, above, simulates that of atomic power plant.

■ The U. S. Merchant Marine Academy, established in 1938, and maintained by the U. S. Department of Commerce under the direction of the Maritime Administration, is a relative newcomer in the ranks of naval training colleges, such as the U. S. Naval Academy (Annapolis) and the marine academies of nations.

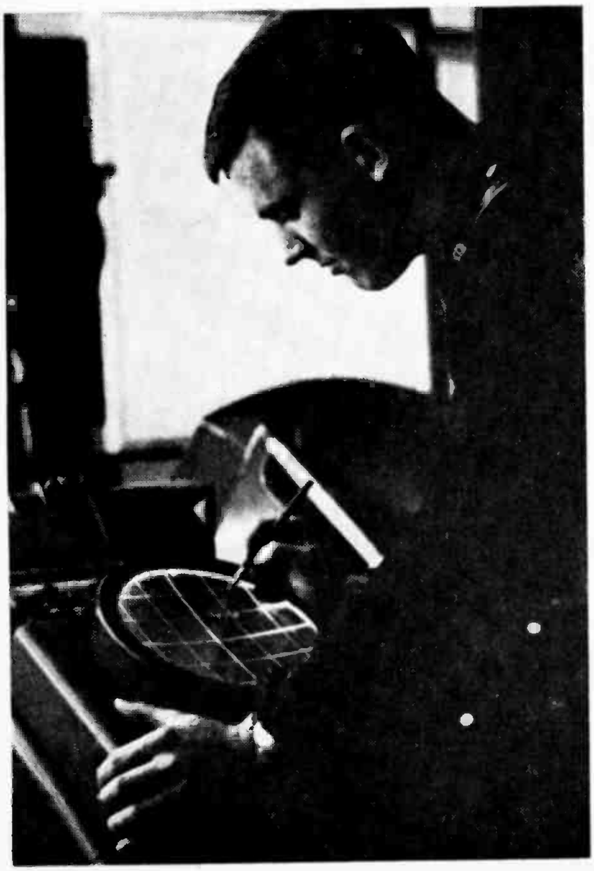
This relative newness has freed the Merchant Marine Academy at King's Point, Long Island, from some of the more restrictive *old traditions* that harken back to the days of sail. The training program at King's Point is dynamically forward looking. On its extensive campus on Long Island's North Shore, the academy has classrooms, workshops, laboratories, and simulated vessels, all of which reflect the most advanced trends in modern technology.

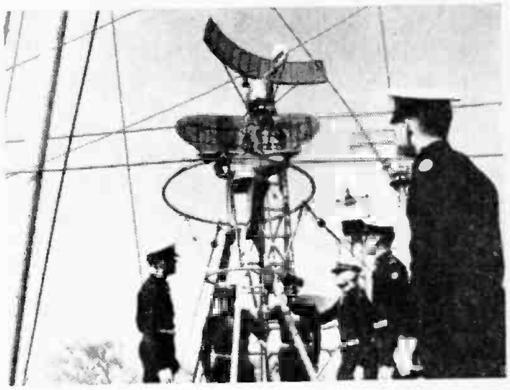
The electronics lab contains the latest aids to navigation; there are no less than four marine refrigeration units; and the nuclear lab has a sub-critical nuclear reactor permitting the performance of all basic experiments ship's officers of the future must know now.

The pride of the Academy is the NS Savannah simulator-computer facility where the controls of the first nuclear powered merchantman of the U.S. fleet are faithfully reproduced in such a manner that every conceivable reaction and operation may be performed by the cadets as if they were on the Savannah herself.

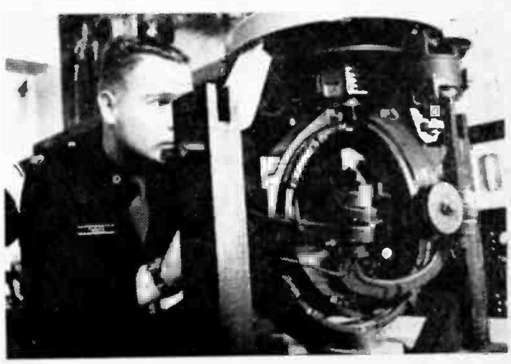
It is in this environment of total training that the future merchant captains of America's merchant marine are being prepared to command our most modern vessels. And they will also be prepared to step onto the deck of the nuclear, highly automated vessels still on the drawing boards. ■

Photos Courtesy Three Lions





Vessel's course is plotted on radar screen at left; operation of radar scan antenna is explained above; and gyroscopic compass, below, points precision finger at true north.



FOREIGN TUBE REPLACEMENT GUIDE

■ How many times have you been faced with the problem of replacing an obviously defective QA2408 vacuum tube in a European "von Schlock Super XB8" receiver not knowing that an ordinary 6SN7GTB will do the job? Don't fret! You will not be the last service technician or "do-it-yourselfer" who held up a simple repair job while waiting for a mail order package to arrive, when the exact or near exact replacement vacuum tube was in your tube caddy or resting in another receiver that was not in use. The interchangeability replacement guide for foreign tubes is given below to take care of such problems. The replacement types listed will give satisfactory performance in almost every case when used in home entertainment equipment. However, due to very unusual circuit design or a critical application, some replacement tubes may not give proper or usable operation.

In some very rare cases, damage to the circuit may occur. To avoid this, observe

(Continued on page 111)

Foreign	Replacement	Foreign	Replacement	Foreign	Replacement	Foreign	Replacement
B36	12SN7GTA	ECC32	6SN7GTB*	HABC80	19T8	QS1208	0B2
B65	6SN7GTB	ECC33	6SN7GTB*	HBC90	12AT6	QV03/12	5763
B152	12AT7	ECC35	6SL7GT*	HBC91	12AV6	QV06/20	6146,6146A
B309	12AT7	ECC81	12AT7	HCC85	17EW8	R19	1X2B
B329	12AU7	ECC82	12AU7	HD51	0A2	RE1	5Y3GT
B339	12AX7,7025	ECC83	12AX7,7025	HD52	0B2	S856	0A2
B719	6AQ8	ECC85	6AQ8	HF93	12BA6	S860	0B2
BPM04	6AQ5A	ECC86	6GM8	HF94	12AU6	T2M05	6J6A
D2M9	6AL5	ECC88	6DJ8	HK90	12BE6	U41	1B3-GT
D63	6H6	ECC91	6J6A	HL92	50C5	U50	5Y3GT
D77	6AL5	ECC180	6BQ7A	HM04	6BE6	U52	5U4GB
D152	6AL5	ECC189	6ES8	HY90	35W4	U70	6X5GT
DAF91	1S5	ECC801S	6201	KD21	0A3	U78	6X4
DAF92	1U5	ECC900	6HA5,6HM5	KD24	0C3	U147	6X5GT
DD6	6AL5	ECF80	6BL8	KD25	0D3	U149	7Y4
DF62	1AD4	ECF82	6U8	KT32	25L6GT	U709	6CA4
DF91	1T4	ECF86	6HG8	KT63	6F6GT	UL84	45B5
DF92	1L4	ECL82	6BM8	KT66	6L6GC	UU12	6CA4
DF904	1U4	ECL84	6DX8	KT71	50L6GT	V2M70	6X4
DH77	6AT6	ECL86	6GW8	KT88	6550	W17	1T4
DH149	7C6	ED2	6AL5	KTZ63	6J7	W63	6K7
DH719	6T8A	EF22	7B7*	L63	6J5	W76	12K7GT
DK32	1A7GT	EF36	6J7*	L77	6C4	W143	7B7*
DK91	1R5	EF37A	1620*	M8079	5726	W147	6K7*
DL33	3Q5GT	EF39	6K7*	M8080	6100	W149	7B7
DL91	1S4	EF72	5840	M8081	6J6	W727	6BA6
DL92	3S4	EF93	6BA6	M8100	5654	WT294	0D3
DL94	3V4	EF94	6AU6A	M8136	6189	X14	1A7GT
DL95	3Q4	EF95	6AK5	M8162	6201	X17	1R5
DP61	6AK5	EF96	6AG5	M8196	5725	X63	6A8
DY30	1B3GT	EF183	6EH7	M8204	5727	X65	6K8
DY80	1X2A/B	EF184	6EJ7	M8212	5726	X66	6K8
DY86	1S2A,1H2	EF731	5899	N15	3Q5GT	X77	6BE6
DY87	1S2A,1H2	EF732	5840	N16	3Q5GT	X727	6BE6
E81CC	6201	EH90	6CS6	N17	3S4	XC97	2FY5
E88CC	6922	EH900S	5915A	N18	3Q4	XCC82	7AU7
E90F	6661	EK90	6BE6	N19	3V4	XCC189	4ES8
E91AA	5726	EL34	6CA7	N709	6BQ5	XCF80	4BL8
E91H	5915A	EL35	6Y6GT*	N727	6AQ5	XF183	3EH7
E91N	5727	EL37	6L6GC	OBC3	12SQ7	XF184	3EJ7
E95F	5654	EL84	6BQ5	OM6	6K7*	XFR1	1AD4
E99F	6662	EL86	6CW5	PCF80	9A8	XL84	8BQ5
E180F	6688*	EL90	6AQ5A	PCF82	9U8A	XY88	16AQ3
E182CC	7044*	EL180	12BY7A,12BV7	PCF86	7HG8	YF183	4EH7
EAA91	6AL5	EM81	6DA5	PCL82	16A8	YF184	4EJ7
EAA901S	5726	EM84	6FG6	PCL84	15DQ8	Z63	6J7
EABC80	6T8A	EN91	2D21,5727	PF9	6K7	Z300T	0A4G
EB34	6H6	EN92	5696A	PH4	6A8	Z900T	5823
EB91	6AL5*	EN93	6D4	PL21	2D21,5727	ZD17	1S5
EBC90	6AT6	EY81	6AF3*	PL84	15CW5	1C1	1R5
EBC91	6AV6	EY88	6AL3	PL500	27GB5	1F3	1T4
EBF32	6B8*	EZ35	6X5GT	PM04	6BA6	1FD9	1S5
EBF89	6DC8	EZ80	6V4	PM05	6AK5	1P10	3S4
EC71	5718	EZ81	6CA4	QA2404	5726	1P11	3V4
EC90	6C4	EZ90	6X4	QA2406	6201	6D2	6AL5
EC92	6AB4	GZ32	5AR4	QA2407	6202	6L12	6AQ8
EC93	6AF4	GZ34	5AR4	QA2408	6SN7GTB	6L13	12AX7A,7025
EC94	6AF4	H52	5U4GB	QE06/50	807	6P15	6BQ5
EC95	6ER5	H63	6F5	QQV03/10	6360	6V4	6CA4
EC97	6FY5	HAA91	12AL5	QS1207	0A2	52KU	5V4GA

THE OSCILLOBRATOR

To calibrate your oscilloscope to indicate voltage just take a dash of a few dollars to home-brew this circuit

By William J. Millard

The Oscillobrator is of interest mainly to people who have oscilloscopes, or to people who hope to buy one but whose budget will allow only the economy model . . . or to experimenters who don't even own a scope but simply can't resist a construction project.

Those in all three categories are probably aware that without a voltage calibrator an oscilloscope functions strictly as an observational device. With one, the oscilloscope becomes a highly sophisticated voltage measuring instrument.

The shortcomings of the ordinary voltmeter are readily apparent. It performs very successfully on D.C. voltages, or on 60-cycle sine waves. But it is useless at audio or radio frequencies, or on square waves, or on pulsating DC, in fact, on any non-sinusoidal waveform. It is in these applications that calibrated oscilloscope really earns its keep.

A Bargain Project. The careful shopper can buy all new parts for the Oscillobrator for less than ten dollars. Voltage calibrator kits now on the market cost anywhere from half again to twice as much. Not only has this circuit sacrificed nothing to achieve economy, but it can actually boast of features not found in its commercial counterparts.

For instance, it requires no warmup time. Flip on the switch when you are ready to take the measurement and flip it off when you are through. There is no standby current consumption, nor any overheating and ventilation problem. If you are so inclined, you can substitute a spring-loaded momentary contact switch for S1 so that it will turn itself off when released.

Another highly desirable characteristic is that constant *zeroing* or recalibration is not required. After you make the initial adjustment you need give it no further attention unless you change the voltage regulator tube or some other component.

Perhaps the outstanding feature is the convenience and availability that can be built into the instrument. It is designed to plug directly into the vertical input terminals of the oscilloscope. The test leads can be plugged into the Oscillobrator and left there

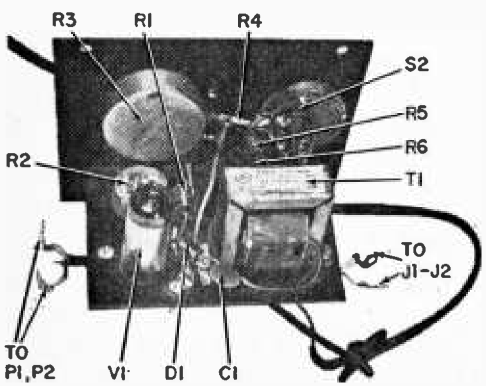
THE OSCILLOBRATOR

permanently because, in the off position, switch S1 provides a direct path between the input and the output terminals. For all of these reasons, the Oscillobrator easily earns the descriptive term of *Instant Bystander*.

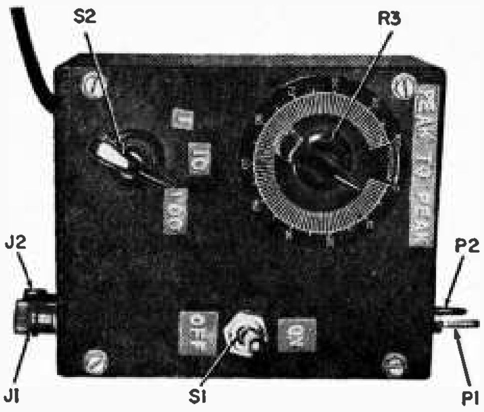
How It Works. Voltage regulator tube V1 is the heart of the calibrator. It fires when the pulse from the rectifier reaches 115 volts and immediately draws enough current through resistor R1 to reduce the voltage and hold it at a steady 105 volts. When the amplitude of the positive pulse drops below that point, the regulator tube cuts off. The resultant waveform, as it appears on the oscilloscope, is shown in the drawing. The peak at the left side represents the initial surge to 115 volts that fires the regulator tube. The horizontal bars at the top and bottom represent a voltage differential of 105 volts.

When the oscilloscope sweep frequency is higher than 60 cycles, which is normally the case, the calibrator output appears as a set of parallel bars. The vertical components of the waveform occur so rapidly that they practically disappear, leaving the two horizontal bars representing the calibrating voltage. Normal line-voltage variations have a negligible effect on the VR tube output, thus providing an excellent comparison standard.

Voltage Divider Network. The calibration voltage is controlled by potentiometer R3 and the divider network consisting of



All components except the input and output jacks and plugs are mounted on subchassis.



Plugs P1 and P2 are placed at a level to meet vertical input terminals of the scope.

resistors R4, R5, and R6. The use of a wirewound potentiometer for R3 is an absolute must. The linearity of a carbon potentiometer, even with the so-called *linear taper*, is too poor for reasonably accurate calibration. Resistors R4, R5, and R6 should be low-tolerance resistors, 5% or less. If you have a good supply of resistors in your junk box and an accurate ohmmeter of adequate range, you can build up a divider to

PARTS LIST

C1—.01-mf., 600-volt ceramic capacitor
D1—Silicon rectifier, 400PIV, 750ma (GE 1N539, Lafayette Radio 19G5001 or equiv.)
J1, J2—Red and black banana jacks
M1—AC voltmeter (for calibration only)
P1, P2—Red and black plugs to match oscilloscope input jacks
R1—4700-ohm, 2-watt, 10% resistor
R2—5,000- to 50,000-ohm, ½-watt, linear taper potentiometer
R3—20,000-ohm, ½-watt, linear taper wirewound potentiometer
R4—470,000-ohm, ½-watt, 5% resistor
R5—47,000-ohm, ½-watt, 5% resistor
R6—5100-ohm, ½-watt, 5% resistor
R7—Low resistance potentiometer (for calibration only)
S1—D.p.d.t. toggle switch
S2—Single gang, 3-position rotary switch
T1—Power transformer, 125vdc @ 15ma (Allied Electronics 61G410 or Lafayette 33G3405)
V1—OB2 voltage regulator tube
1—4" x 5" x 3" utility cabinet (Bud C-1794 or equiv.)
Misc.—7-pin miniature socket, solder lugs, terminal strip, line cord and plug, dial and switch plates, indicator knobs, panel markings, hardware, wire, solder, etc.

Estimated cost $7.00
Estimated construction time: 6 hours

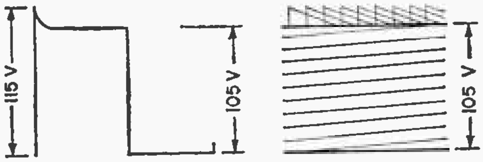
even closer tolerance—it's all up to you.

Construction Hints. The configuration of the control panel of your oscilloscope determines to a large extent the physical layout and the type of cabinet you choose for your version of the Oscillobrator. If you wish to plug directly into your scope, you'll want to use as small a cabinet as possible. Be sure to locate plugs P1 and P2 so that the calibrator doesn't cover the oscilloscope controls. Switch S1 and the input and output terminals J1-J2 and P1-P2, respectively, should be in a direct line and isolated as much as possible to avoid losses and interaction with the calibrator circuits.

Note that calibrating potentiometer R2 is mounted on the subpanel with screwdriver access through a hole drilled in the side of the cabinet. R2 can be a surplus potentiometer from your junkbox and can range from 5K to 50K ohms resistance. If it has no slot, cut one in the shaft with a hacksaw. Once it has been adjusted it requires no further attention and the inside mounting prevents accidental misalignment.

Potentiometer dial plates with 0-100 divisions are available from most parts supply houses. The ideal method for the most precise among us would be to make your own dial so as to conform to the potentiometer being used, because even the wirewound variety is not perfectly linear. However, some non-linearity ordinarily poses no problem for most applications. Besides, the dial plate is dressier and costs about a quarter.

Once the front panel with the subchassis is attached to the cabinet, quarters are a



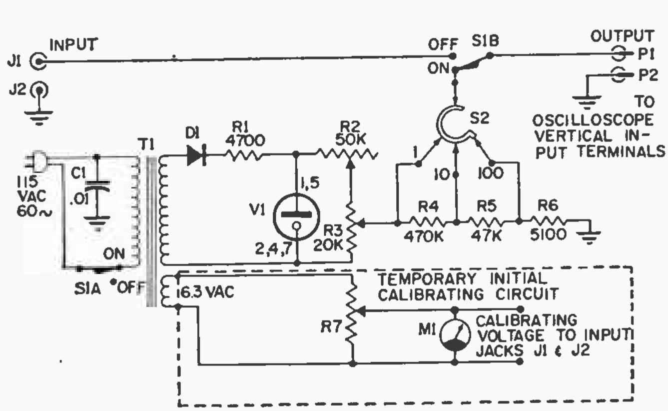
Single V1 pulse at left; but resulting two bars at right represent calibrating voltage.

little too close for easy access. Therefore, after the chassis wiring is complete, prepare two lengths of shielded wire slightly longer than necessary to reach from S1 to the input jacks and output plugs. Solder them to the appropriate lugs on S1. Then with the front panel partially in place but still with enough space to work in, solder the loose ends of the shielded wire to the input and output connectors on the cabinet. Both the input and the output positive terminals, J1 and P1, respectively, must be insulated from the cabinet. The negative terminals, J2 and P2, may be mounted directly.

Calibration. Calibration is simple. You will need an AC voltmeter, a source of alternating current, and another potentiometer. You can use another transformer to hook up the calibration circuit shown in the schematic diagram, or, which is more convenient, run a couple of leads from the unused 6.3-volt winding of transformer T1 to potentiometer R7. Leave the voltmeter M1 connected during the calibration process so as to prevent any fluctuation caused by the loading imposed on the circuit by the

(Continued on page 80)

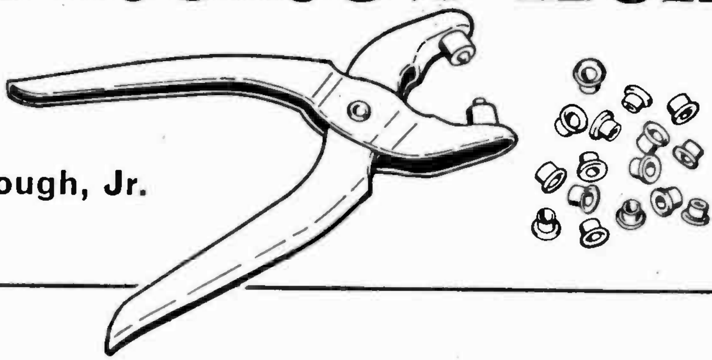
Schematic diagram of the Oscillobrator shows the OFF position feature of passing the signal directly to the oscilloscope. Note the advantageous use of 6.3vac T1 leads, otherwise unused, for a calibration source (see table).



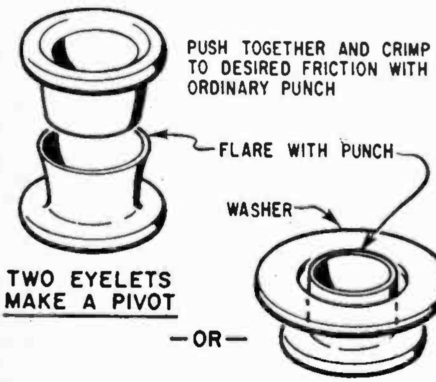
VOLTAGE COMPARISON

RMS	Peak-to-Peak
.354	1
.707	2
1.07	3
1.41	4
1.77	5
2.12	6
2.47	7
2.83	8
3.18	9
3.54	10
7.07	20
11.61	30
14.14	40
17.67	50
21.21	60
24.75	70
28.28	80
31.82	90
35.35	100

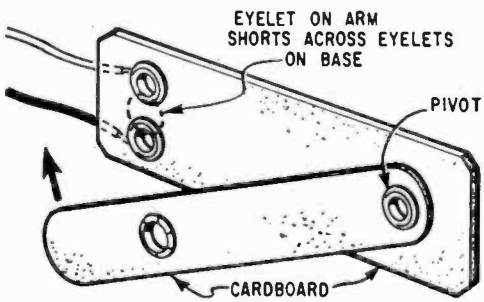
Switches from



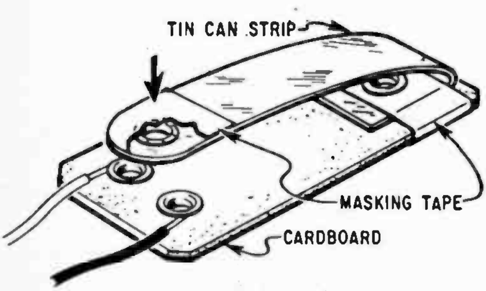
By Roy L. Clough, Jr.



TWO EYELETS MAKE A PIVOT



SINGLE POLE SWITCH



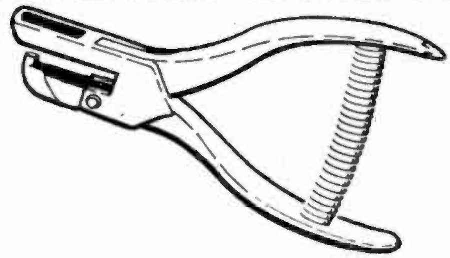
MOMENTARY CONTACT SWITCH

■ When you're working on experimental setups, particularly simple computers and logic circuits, you'll frequently need special switching arrangements that aren't easy to come by.

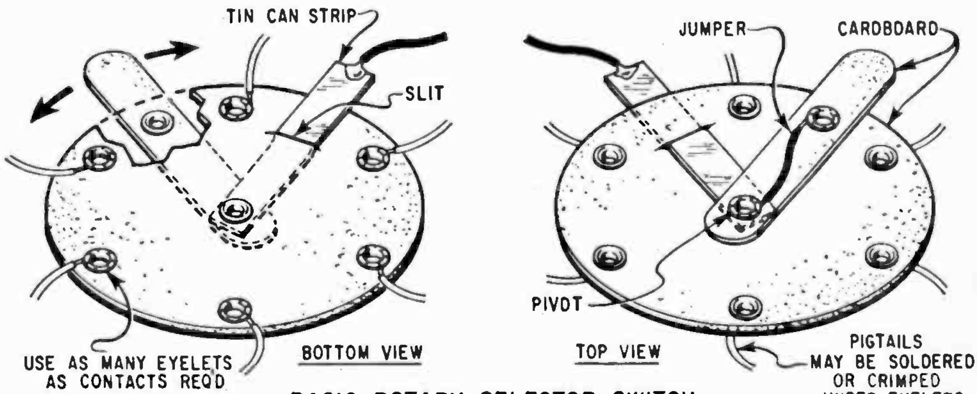
Next time you run into a switch snag, try rolling your own; it's often quicker and easier than modifying a switch you have. And by designing your own, you can always add contacts or revise the layout. All you need are some eyelets and some scrap cardboard.

Switches perform one or more of three functions: they open or close one or several circuits and remain in position until operated again; they open or close one or several circuits and

Eyelets & Cardboard



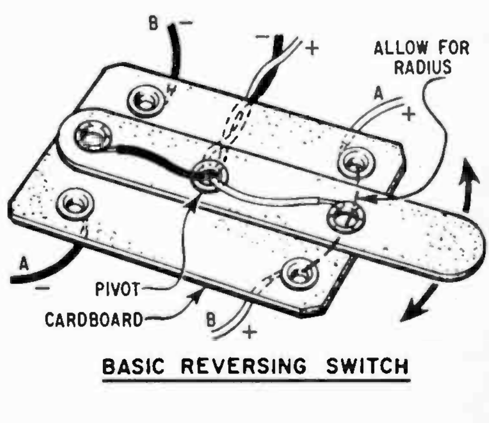
If you'd rather switch than fight through pages of a parts catalog, read on!



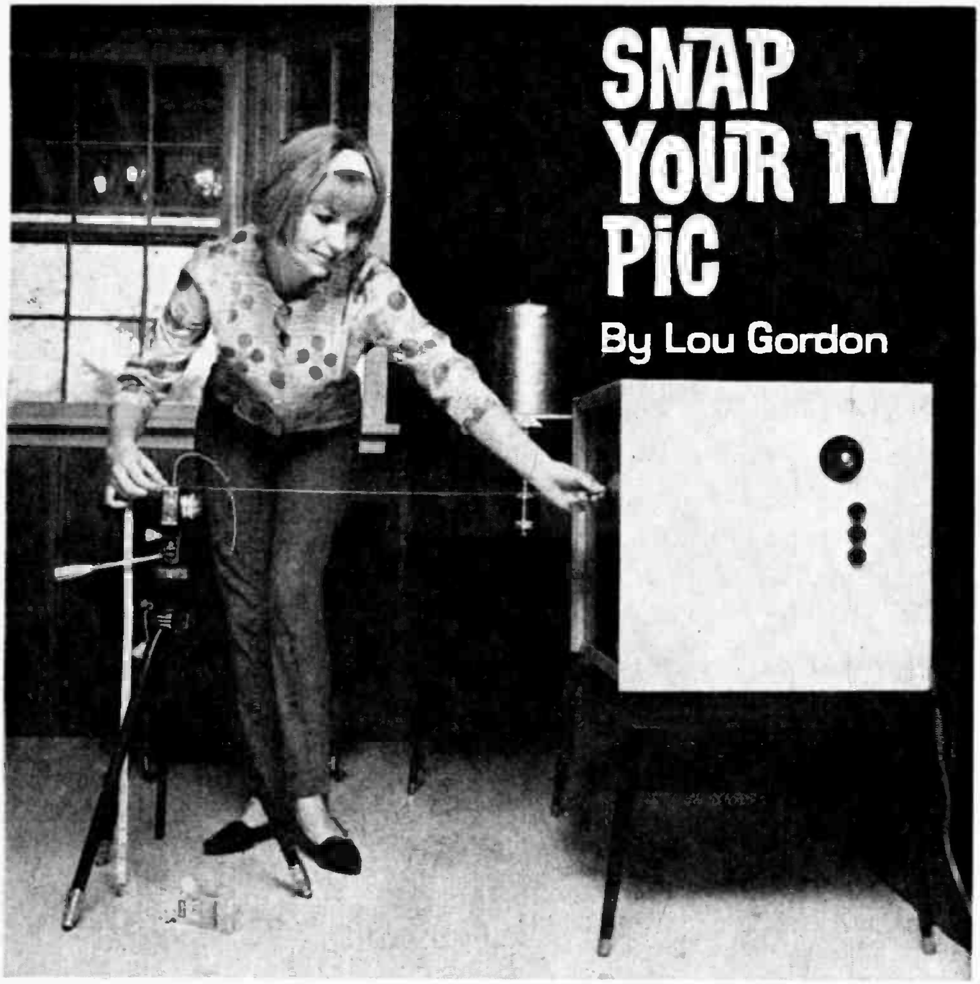
BASIC ROTARY SELECTOR SWITCH

immediately return to their normal state when released; and they reverse or redistribute the flow of current. Your home-brew switches can do all these things.

Plan your switch before you start. Four simple types are shown here, and from these basic patterns you can develop just about any type you need. You can add or delete contacts as required; pivots can be made from two eyelets, or with one eyelet and a thin washer; and pigtail leads can be crimped in or soldered to the backs of the contacts. Use a tough, springy grade of cardboard and make a switch for the best. ■



BASIC REVERSING SWITCH



SNAP YOUR TV PIC

By Lou Gordon

■ How would you like to dramatize your photo album with snapshots of your favorite Met baseball player at bat—pictures you made yourself from a box seat behind first base, home plate or the outfield. You can do it without leaving your home by recording on film the images on your television screen. And you can get good pictures because "live" television photographs best.

Television images are recorded most easily and most satisfactorily with an adjustable still camera mounted on a tripod—the tripod is a must for good pictures, and it's a good idea to use a shutter release cable. Place the camera and tripod as close as possible to the television screen, preferably at a distance where the TV screen just fills the viewfinder. You should use a tape measure to accurately measure the distance from the front of the TV screen to the film plane (back) of your camera. Make sure that the camera's taking lens is lined up with the center of the television screen—both horizontally and vertically. Set the camera's focusing scale for the exact distance you have measured.

The television image will photograph best if it is adjusted so that it has a slightly softer, or lower-than-normal, contrast. *Never* use flash and turn out all room light—the light from the screen itself will be adequate if you follow these directions. During the day close curtains and drapes to reduce flares and reflections.

You may find the distance is too short for the focusing range of your camera. If it is, use a lens portrait attachment to avoid having to move the camera further back, resulting in a smaller image on your film.

(Continued on page 111)

BUILD HER FOR DINNER

By C. M. Stanbury

Robots are fun, especially when friends build one for you!

It all began innocently enough at a coffee break in the employees cafeteria at Experimental Electronics Inc. George Fenner, the wild eyed mail boy was describing to a couple of the firm's experimental engineers the kick he got out of watching Rhoda, the gorgeous robot on the TV show, *My Living Doll.*

"I'd sure like to take out a girl like that," he had remarked. The older men looked at George rather paternally and a voice spoke up.

"We could build you one." It was Frank Tucker the firm's experimental genius who had first offered and his assistant Will James had chimed right in with, "Would you like a blonde or a redhead?"

After that it became a daily joke and the two engineers would make quite a big deal out of it each day, reporting their progress to George. George took it all in his stride and just went along with the two men good naturedly, but there were times when he would listen to their progress reports and wonder if it were possible that the two men were actually thinking seriously about the project. Almost anything could happen around Experimental Electronics Inc.—and it usually did. The firm had done some government work on robots, but as far as George knew there was nothing current being done in that department—or was there?

It was when the two engineers started asking George for the measurements he preferred that he began to feel that the men were possibly getting serious, and so he picked the statistics 38-24-36. Just a week later they approached him with books on facial structure and asked him to pick out a chin and a nose and a set of eyes. Now he knew that the two men were building up to something big. When they brought in a kit and had him choose skin textures he was baffled. Finally his curiosity was getting beyond control and he pleaded with the men that he be allowed to see the project—but they refused.

"We won't let you see her till we're done," Frank Tucker explained, "then you'll be all the more impressed with the finished product."

This waiting went on for a full six months and by then George had filled in every single detail of the girl's requirements from her toe nails to the tip of her nose. It became evident from the questions that Frank and Will were nearing the end of their project. Finally, one morning as George sipped his coffee the two men rose and taking George solemnly by the shoulders they announced, "She's nearly ready, George. We'll have her ready for you Friday night."

George was quite a happy fellow that week waiting for whatever surprise the two men had worked up for him. He had decided months before that the two men had

been carrying on a good natured hoax and since then he had tried his best to convince them that he believed. Then when Friday evening arrived, true to their word, the men took George into their lab and lifting the lid of a long storage case they revealed the perfect specimen that George had ordered. She was a true Goddess with beauty that cannot be described with mere words. She smiled a most loving smile at George and he stood mute dazed by her stunning beauty. Her beauty so overwhelmed him that he found it difficult to listen to the operating instructions that Frank and Will were giving him.

"The button on the back shuts her off." Will explained and George placed his hand on her lovely back and sure enough there was a button.

"When her bell rings you push her battery reset button," Frank said and just then a bell sounded and Frank took the girl's wrist and pushed a button.

"Listen to her hum," Will said and they took turns listening at her neck to the quiet hum of her perfectly performing components.

George scanned the product and smiled, "Yes sir, 38-24-36, just like I ordered. Now what should I do with her?" he asked, "I've got no money, no car."

Frank grinned and took out his wallet, "Here's twenty bucks kid, take her out, feed her, and dance her around."

"And take my car," Will said, handing George the keys.

"But how do I make her move?" George asked eagerly.

"Order her," Frank explained.

"Well all right," George said and looking at both men bug eyed, he took in a deep breath, looked straight at the girl and in a firm voice ordered, "Come with me, robot."

Together they went out of the office, arm in arm, and walked out to the parking lot. Together they climbed into Will's sleek roadster and spinning the wheels they roared down the highway.

George turned to the lovely creature beside him and taking another deep breath he ordered, "Now take that silly button off your back, that battery operated humming motor off your neck, that silly switch and bell off your wrist, and relax baby. We've got twenty bucks to spend tonight and we are going to have a ball . . . that's *B A L L*."

She smiled her most loving smile and after removing the props she snuggled closer to George saying, "Whatever you say, Master."

Now You Can Beat It With a Hose

■ A one-inch length of automobile windshield wiper hose can be used as a quick, inexpensive ¼"-to-¼" shaft coupler for radio and other electronic gadgets. While not intended to replace conventional couplers which employ set screws, the hose does grip the shafts with surprising tenacity, making it handy in an emergency or in experimental breadboards. A 3- to 4-inch length of hose makes a good flexible coupler for connecting the shaft of a variable component to a knob shaft when the two shafts are out of line up to 45 degrees from each other—backlash is practically nil.

Other uses for the hose include couplers for small electric motors, Veeder-Root counters—in fact, anywhere ¼-inch shafts are used, and the load requirements are moderate.—*Frank H. Tooker*

RADIO-TV EXPERIMENTER LAB CHECK

UTC/GOODMANS MAXIMUS 1
Miniature High Fidelity
Bookshelf Speaker System

The 7¼ x 10½ x 5½-inch UTC/Goodmans Maximus 1 hi-fi speaker system comprises a 1900 cycle cross-over network, a tweeter, and a 4-inch *woofer*. And the question immediately comes to mind: "How in heck can you get any bass from a 4-inch speaker?" This reaction is more than justified since history of miniature "bookshelf" speakers is strewn with honest disasters and outright attempts to make a fast buck. And no one ever had the audacity to claim high fidelity from a 4-inch woofer.

But it's that 4-inch woofer which is the big difference between the Maximus 1 and other crude attempts at high-fidelity midget speakers.

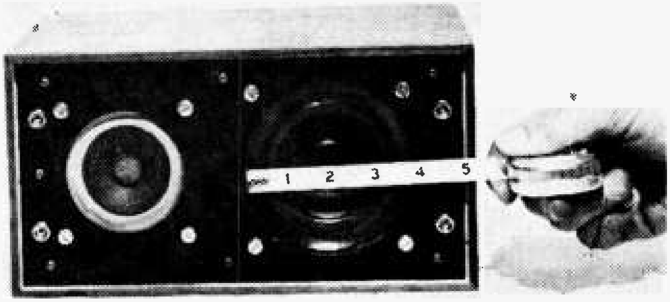
Big Push. Good low frequency response requires the movement of large amounts of air; and the usual way to move air is to have a large cone with a small motion, or "push." A small cone with a really big push could also accomplish the same effect, but trying for a large push usually means driving the speaker's voice coil into a non linear magnetic field—the result is distortion. (And this assumes the speaker cone compliance would allow a large motion which a small cone usually doesn't permit.)

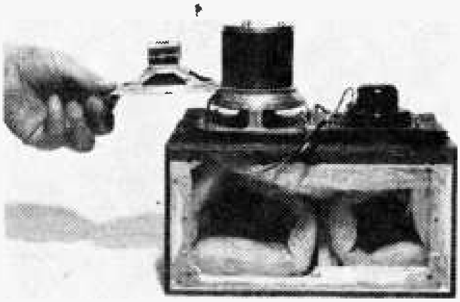
But a big push is exactly what the Maximus delivers. The cone, as we are familiar with them, hardly exists at all. There is only a small stiff-cone area; the rest is a very flexible rubber surround. Place your fingertips very lightly against the cone and it moves a good half inch. In addition, the magnet, in comparison to the rest of the speaker—cone plus frame—is tremendous. This allows the voice coil to move in a linear field even under high power levels, without distortion.

In other words, the 4-inch woofer has the *capacity* to handle large amounts of low

Look closely, that's a speaker between the books on the lower shelf! But you won't find the quality of the sound of the Maximus 1 as unobtrusive as its enclosure. For it will swell through the room, just as complete in its bass response, as speaker systems twice its size. The Maximus 1 will put an end to your idea of good sound depending on the greatest number of cubic feet in an enclosure.

Research into diaphragm behavior and electromagnetic control characteristics resulted in the patented Cushioned Air Pneumatic Suspension (CAPS) principle that made a 4-inch diameter high fidelity woofer a reality. With the easily replaceable grille cloth removed, the woofer cone's rubber surround is visible.





That hunk of iron on the woofer is all magnet. Its size is compared to a standard 4-inch replacement speaker held at the left. Note heavy padding and divided cabinet; and that's putty on front for an air tight seal.

frequency energy and it's the *capacity* that's the key to the Maximus 1.

Listening Test. Since the Maximus 1 is designed and touted as a "bookshelf" speaker system we felt is should be tested against another "bookshelf" speaker. Unfortunately, there just isn't another hi-fi "bookshelf" speaker that will really fit on a bookshelf. So for our reference speaker we chose a good quality *8-inch* speaker in a rather *large* cabinet (this one is also called a "bookshelf" model though we doubt there is a shelf it could fit on).

With the amplifier's tone controls set to "flat" the reference speaker delivered unmistakable high fidelity sound while the Maximus 1 was definitely lacking in low frequency response from the upper bass range down. However, when we adjusted the tone control for some 10 db of bass boost the Maximus 1's low frequency response was a twin brother to the reference speaker. (With the Maximus 1 placed in a corner at the junction of the two walls it required only 5 db boost to equal the wall mounted reference speaker.)

Of course, if one tried to pump 10 db bass boost into a 4-inch replacement type speaker it would literally destroy the speaker. But the Maximus has the capacity to handle the extra power, and it does so with low distortion. As we said, it was a twin to the much larger speaker system.

Now don't assume there is anything wrong with using bass boost to compensate for the speaker. Fact is, the latest thinking is to specifically tailor the amplifier response to match speaker deficiencies—thereby attaining optimum "speaker response." So using bass boost with miniature speakers is no longer anything special—as long as the speaker has the capacity to handle the power needed for good low frequency performance.

Going back to our A-B test, the overall sound quality of the Maximus 1 was very close to the reference speaker—very clean well balanced sound with a slight touch of brightness.

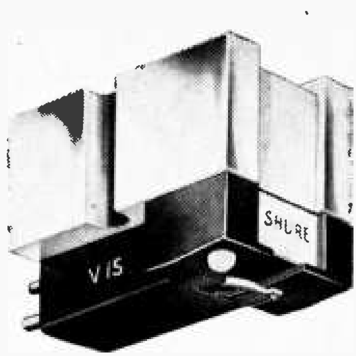
All in all, where space or decor requirements call for miniature speakers, we feel Maximus 1 is the only model (so far) which can deliver hi-fi performance. While it cannot compete with a 12-inch system, the Maximus 1 delivers a surprisingly *big* sound from a *very* small cabinet. For further information, write to UTC Sound Division, Dept. 7R1, 809 Stewart Avenue, Garden City, New York. ■

Specifications—Maximus 1

Price—$59.50
Freq. range—45-20,000 cps
Capacity—15 watts
2 speakers—woofer and tweeter
Crossover—1900 cps.

RADIO-TV EXPERIMENTER LAB CHECK

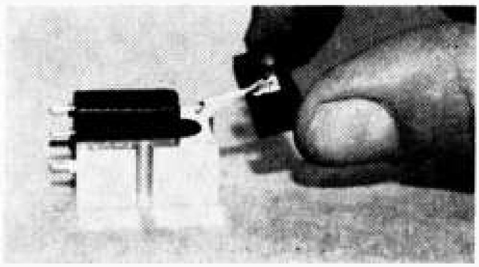
SHURE V-15
15-Degree
Stereo Cartridge



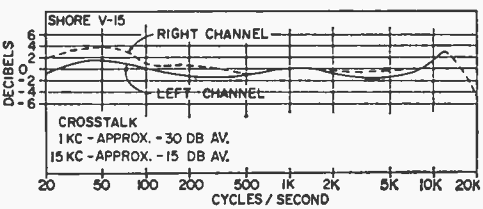
The Shure V-15 stereo cartridge is described as having a *bi-radial elliptical stylus with a 15 degree tracking angle.* Unfortunately, unless one follows the advanced engineering articles this description sounds like gobbly-gook. So let's briefly review what the technical terminology means.

Back in the early days of recording—like last year—records were cut by a stylus positioned at right angles to the disc—true vertical. Today, to obtain better fidelity, most major record manufacturers position the cutting stylus approximately 15 degrees off true vertical. Therefore, to obtain maximum fidelity the playback stylus should be positioned as close as possible to 15 degree cutting angle, so the V-15 utilizes a 15-degree tracking angle.

Tips on Tips. As for the bi-radial elliptical stylus, it's just a fancy name for a stylus configuration that conforms to the record's grooves. As you know, the record master is cut with a flat faced stylus which vibrates back-and-forth through an imaginary line running through the center of the disc. Without going into the "why?" of it, a conical pickup stylus cannot faithfully maintain groove-wall contact in exactly the same manner as the groove was cut—actually the problem gets most severe in the disc's inner grooves. (This is known as tracking or inner groove distortion.)



The V-15 stylus is mounted in a relatively large plastic block. To change the stylus you pull out the old and insert the new.



The V-15's frequency response and separation specifications match manufacturer's claims.

Specifications—Shure V-15

Price—$62.50 net
Tracking angle—15 degrees
Frequency output—20—20,000 cps
Output voltage—6 millivolts/channel at 1000 cps at 5 cm/sec.
Channel separation—Nominally 25 db at 1,000 cps, 20 db at 10,000 cps
Balance—within 2 db of each channel
Impedance—47,000 ohms per channel
Tracking force—3/4 to 1 1/2 grams

Another tracking difficulty is "pinch effect." Depending on the modulation the grooves widen and narrow, and a sharply pointed conical stylus rides up and down in the grooves—on stereo records undesired up and down motion causes second harmonic distortion.

Shure attempts to get around the two tracking problems by using a stylus which is more-or-less oval shaped rather than conical. The broad face of the pickup stylus is supposed to follow more closely the actual path of the flat faced cutting stylus. The stylus is also shaped to reduce up and down groove motion. This is the practical meaning of *bi-radial elliptical.*

Testing. A nice theory but how does it work out in practice. Do the advantages show up in measurements?—not really. The frequency response shown is about standard for high quality pickups. The big difference

LAB CHECK

is in the V-15's tracking force, and the resultant sound quality.

The V-15 is designed to track at forces between ¾ and 1½ grams. At ¾ gram the V-15 requires the highest quality most precisely balanced arm, but any decent arm will do at 1½ grams (no record changers). The extra light pressure means extended record life and we were able to obtain 28 plays at 1½ grams before there was a discernable change in the record's sound quality.

Listening. What comes out of the loudspeaker is remarkable. Up through the upper midrange the V-15 delivered the sound expected of a quality pickup. The difference was in the highs—smooth as silk with not even a touch of stridency even at high modulation. From the brittle natural "edge" of the trumpets to the rivets vibrating in a cymbal, the overall V-15 quality was akin to the highest quality tape recordings. We seriously question whether one could tell the difference between tape playback and the V-15 sound in an A-B test.

The quality from mono discs cannot be described with words; it's as if the V-15 brings new life to old records.

An attractive feature is the user changeable stylus. Instead of having to handle a delicate fine wire, the user handles only a relatively large plastic block containing the stylus. One simply slides the stylus into place by pushing on the block. The stylus is retractable—that is, if the arm is dropped the stylus folds up, and does not dig into the record. A small soft plastic button mounted in the stylus support block protects the record from drop damage in that it prevents the pickup from digging into the record.

Our comments cannot faithfully describe the V-15; you must see it and hear it to believe it. ■

VIDEO IN THE GROOVE

■ The *Videodisc* spinning above has more than sound in its grooves. It also stores video signals that are picked up by the stylus of a conventional record player and read out to a conventional television receiver. The unique part of the system, termed *Phonovid,* and developed by the Westinghouse Electric Corporation, is the link that joins record player to television receiver. The link is comprised of electronic circuits that make up what is known as a scan converter.

The scan converter uses a television scanning technique that resembles that used to obtain television pictures from the signals broadcast by weather satellites and space probes. Information from the *Videodisc* is stored in the scan converter's special electronic storage tubes, which build up and display a complete TV picture every 6 seconds. One picture is read out repeatedly and displayed during the time that the next one is being formed from the video information in the grooves of the recording.

Phonovid system has great potential in the area of educational audio-visual aids. It could find application in classroom instruction, industrial and commercial training, vocational and military training, sales presentations, and remedial instruction, where repetition and opportunity for drill are essential. Any part of the recording can be held, skipped or repeated by manually lifting the tone arm. During interruption of the sound, the picture remains on the screen allowing discussion or emphasis of the topic. And it's no more complicated to operate than the high-fidelity phonograph rig you have at home. ■

Brunei and Bhutan are just two exotic places you can QSL

■ Contrary to what you may have read elsewhere, short-wave listening does require something more than a receiver—it takes know-how. Most would-be SWL's find this out the hard way—by trial and plenty of errors. But if you keep on reading, we plan to unlock the seven gates to SWL prowess right here and now.

Broadcast & Utility Stations. Putting it as simply as possible, transmissions from a broadcast station are intended for reception by the general public. Utility transmissions are for a specific individual(s). Utility stations include ships, coastal transmitters, aircraft, telephone, military and many others. SW broadcast stations, on the other hand, fall into just two categories—international broadcasts (Voice of America, Radio New York Worldwide, BBC, Radio Moscow, etc.) and those intended for regional coverage only. The latter are similar in purpose to those 50-kilowatt clear channel jobs on the ordinary AM band.

Broadcasting. It is of course broadcast stations which the general public hears most about but BC stations are assigned only about one tenth the SW frequencies. Most operate within those bands shown in the table. Meanwhile, except for some narrow Amateur bands (a completely separate hobby incidentally), all other SW frequencies are assigned to the Utilities. And yes, you may listen to utility stations. The only legal restriction is that you may not repeat the content of any such transmission but generally speaking nobody cares if you mention things like aeronautical weather reports, positions of aircraft or ships, and other items which are obviously of a non confidential nature. Probably the strictest enforcement applies to telephone conversations, many of which are sent via scrambled speech anyway.

Two regional SWBC bands, 90 and 60-meters, are used for broadcasting only in the tropics. Elsewhere including the U. S., utility stations operate in this territory. Thus SWL's may tune for both types simultaneously, complete with mutual interference.

SECRETS OF SHORT-WAVE SUCCESS

By C. M. Stanbury II

When To Listen Where. Whether utility or broadcast, the same *general* reception conditions prevail. Upper frequencies are best during daylight hours with a peak around 2.00 PM (1400), but that's 2.00 PM at the midpoint between transmitter and receiver. Just how high the most useful frequency is depends upon the sunspot count and day to day variations.

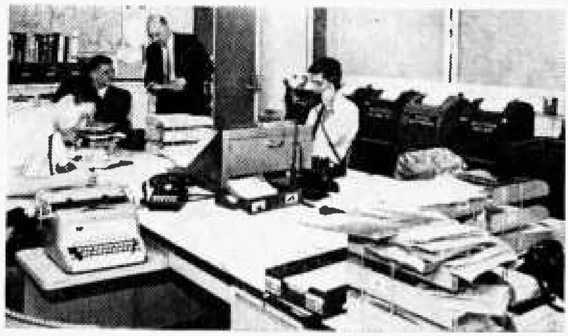
Just the opposite is true at night when lower frequencies come into their own, especially in winter. Further, as most regional stations operate below 7 mc. (7000 kc.) and these usually represent rarer reception, the hours of darkness become very important.

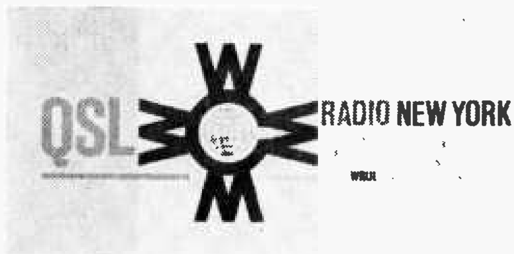
A more detailed account of reception conditions becomes very complicated and therefore beyond the scope of this article. However we suggest you consult our *Propagation Forecast* in every issue of the RADIO-TV EXPERIMENTER.

The SW Broadcast Bands. Although SWBC stations are vastly outnumbered by utilities, they will be the primary targets for most SWL's. BC stations require the least special knowledge to monitor and of course they do the most to encourage listeners—announce frequencies (sometimes), publish schedules and issue those all important DX'ers QSLs (which we'll discuss a little later). Therefore every rookie SWL must be prepared to cope with those narrow, crowded SWBC bands.

QRM means man-made interference and that is the story of the SWBC band. First, short-wave broadcast channels are only 5 kc. apart (as compared with 10 kc. on your standard AM band) and on an inexpensive receiver several channels may come in at once. It takes a strong signal to override this type of *QRM*. Next, some SW broadcast stations operate between channels thus creating a whistle or "heterodyne". For example, Radio Corporation at Santiago, Chile is on 9498 kc. (slightly outside the band) while Magadan, U.S.S.R. uses 9500 kc.—a difference in frequency of only 2 kc. As 1 kilocycle equals 1000 cycles per second, these two stations together produce an audio notes of 2000 c.p.s., which can be most annoying to the ear drums.

General Listening and DX. At this point you must decide what you want out of short wave. Whether you are primarily interested in the SWBC programs themselves, i.e., their content, or whether you want to perform technical feats, in other words, DX. For the general, non DX'ing short-wave listener,





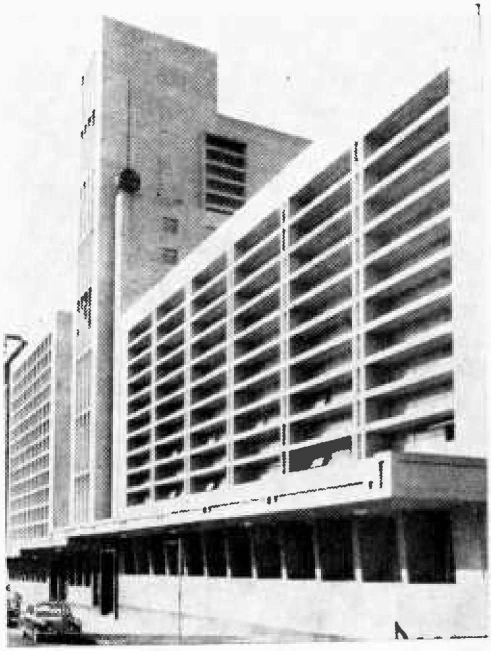
SWBC stations have numerous attractions—the most important of which are news, views of the world's governments and folk music of every hue.

DX'ers concentrate upon hearing as many countries as possible plus weak and otherwise difficult to receive transmitters. As DX'ers have to do little more than identify each station (but see the next section), many SW transmissions (because of weak signals and QRM are absolutely useless to general listeners) provide fine DX "loggings". On the other hand, every general listener should do a little DX'ing. In fact this is very important. Through DX'ing, an SWL's ear develops. Once you have that all important ear, stations which were previously nothing but so much noise, provide really worthwhile listening. All it takes is practice.

Reporting & QSL's. Nearly every DXers collects QSLs. These are cards or letters sent out by the stations confirming your reception. A typical QSL is displayed at top of page. These represent tangible rewards for your DX prowess. To obtain each station's QSL you must send it a complete and correct reception report. Your report must contain time and date of reception (specify time zone used—GMT (EST plus 5 hours) is best for all large SWBC stations), frequency, a description of the program(s) heard to prove your reception (about 3 specific items are best), reception conditions and a run down

Short Wave Broadcast Bands

Kc.	Band (Meters)	Notes
3,200-3,400	60	Tropics only
3,900-4,000	49	NOT in the Americas
4,750-5,060	41	Tropics only
5,950-6,200	31	
7,100-7,300	25	NOT in the Americas
9,500-9,775	19	
11,700-11,975	16	
15,100-15,450	90	
17,700-17,900	75	
21,450-21,750	13	
25,600-26,100	11	



Short-wave listening can begin right at home by DX'ing New York's International SW station WRUL (scene from WRUL's news room left, top). WRUL is an easy mark and responds with a colorful QSL card (left, bottom) that has spurred many an SWL'er to bigger and better DX's. At right is "Radio Clube de Mocambique" headquarters, a commercial SW broadcaster in Portuguese East Africa. Above is list of SW bands (given in meters) and their frequencies.

on your own equipment can be helpful also.

Most SW stations can be addressed simply by station name, city and country. Most non government stations require return postage. The SWL can either purchase International Reply coupons (15c each) at his local post office or purchased uncancelled foreign stamps (of the appropriate nationality) from a dealer.

Buying A Receiver. Now that you have a good idea what short wave is all about, you're ready to buy that first receiver. It's a good idea to start with a relatively inexpensive job, say less than $100, then as your interest and know-how increase, move up a more expensive receiver in the "communications" class. If technically inclined, you can purchase your first rig in kit form and save a few dollars.

Assuming the SWL does plan to spend less than $100, he will have to choose that rereceiver with the features he needs most. As those SWBC bands are so crowded, the prime requisite will be fine tuning which is accomplished by what's known as "bandspread", a second dial. With bandspread, the tuning procedure is as follows. Locate the desired band on the main dial then turn slowly across it on the bandspread.

After fine tuning, look for sensitivity (ability to pick up weak signals) and selectivity (ability to separate stations on adjoining frequencies). If you purchase from those companies which are well known either in the communications or kit fields, you'll get exactly what you pay for in these departments. Of course no receiver works well without an antenna, preferably the outdoor variety.

The one thing you should definitely not do is look for hi-fi features. Because of interference and constant flutuations in signal strength, short wave reception is simply not a hi-fi medium. So called hi-fi SW circuits merely *decrease* the receiver's selectivity.

Keep In Touch. The final thing you'll have to know is where to obtain information on SW stations, i.e. frequencies and schedules. Much of this data can be found in "White's Radio Log" a regular part of the RADIO-TV EXPERIMENTER. But some stations change frequency every month and new stations are constantly appearing on the bands. Thus to really keep up with this fascinating world, you should join a short-wave listeners club. At present the three major organizations in North America covering SWBC stations are as follows:

- American SWL Club, 223 Potters Road, Buffalo, N. Y. 14220
- Newark News Radio Club, 215 Market Street, Newark, N. J.
- North American SW Association, 1503 Fifth Avenue A2, Altoona, Pa. 16002

Each issues a monthly news publication and each will send you a sample copy for only 25c. Mention RADIO-TV EXPERIMENTER and tell them we gave 'em a plug.

Good listening. ■

WRITING MUSIC WITH ELECTRONS

■ "Music of the spheres" may be one way to refer to the music produced when atoms, which resemble the universe-in-miniature, are stripped of their electrons. But it is also referred to as cold, disturbing, and downright inhuman. However, Dr. Myron Schaeffer, professor of music and head of the electronic music laboratory which he established at the University of Toronto, lets the unsympathetic critics have their say and continues creating in, if nothing else, a very exciting new art form.

Dr. Schaeffer, who has studied music in Europe, taught at Columbia University, and lectured and researched in Latin America, has also studied mechanical engineering and invented some of the equipment, or rather, instruments, used in the music laboratory. The lab, Canada's first and only the second one built in North America, contains, as shown here, quite a variety of electronic equipment which Dr. Schaeffer uses in composing.

Photos courtesy Three Lions

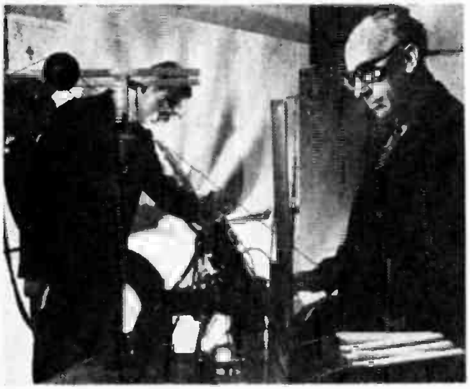
First, he creates basic sounds on sine-wave generators and records them on a multiple *creative* tape recorder. Then, he cuts up the tape and splices it to get the desired result. Some of the sounds are first altered with filters, added tremolo, and modified volume. The end product, which is unique, unconventional sound, is defined as *music* because it is arranged. But musical traditionalists term it sheer noise.

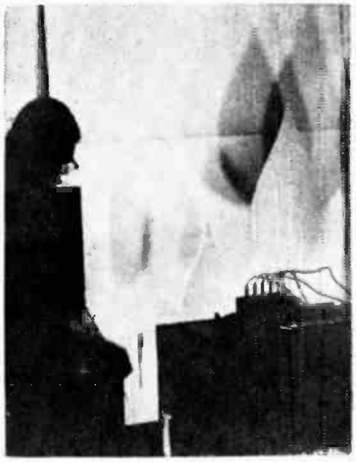
Regardless of who calls it what, the acceptance of electronically produced music is increasing, especially in the form of scores for ballet, contemporary dance, and films. And it is more often than not beautifully effective and artistically handled in these contexts.

But, on the other hand, a concert of electronic music wears thin quickly: there is no orchestra for the audience to watch, merely a whirling reel of tape, and perhaps not even that. A lonely stereophonic speaker set-up may be all that *performs* under the spotlight on center stage. To solve this visual boredom of the concert stage, Dr. Schaeffer has created patterns of color as a visual accompaniment to an electronic music score. The stage may be *choreographed* with cardboard mobiles, for example, and illuminated with spotlights whose colors are changed as the musical tones evolve.

The visual effects projected abstractly suggest the texture of the electronic score, and involve the audience visually.

Dr. Schaeffer reminds us that the reaction to Wagner's and Beethoven's music was unsympathetic at first. So, if you're tempted to mix some music with your hobby, the worst result will be that you'll make a big noise in your experimenters' circle. ■





At the far left, Dr. Schaeffer rehearses concert of new works. Shadows are color patterns which mix and change in response to the musical score, color au go-go.

At the right, the composer, Dr. Schaeffer, finalizes his score. After the musician's touch selects a part from one original tape, a duet from another, a solo excerpt from a third, and so on, the reassembled completed passage of music is recorded on a single tape. At the left, Dr. Schaeffer lends an ear to the completed tape which unifies single notes and sound sequences.

Jim Gabura, Dr. Schaeffer's assistant and an electronics engineering student, lends a hand taping sounds that, to the layman resemble a whistle and steam escaping. But to an RTVE'er they are obviously an electronically generated sine tone (the whistle) and plain white noise (escaping steam) often heard.

PROPAGATION FORECAST

June-July, 1965

By C. M. Stanbury II

■ It has been almost two years since 16 meters was the best band for any area at any hour of the day. But as you can see from our chart, with the sunspot count rising 16 meters is again making its presence felt in the short-wave world. As that count continues to rise, more and more international broadcasting organizations will be moving up here, and there will even be some significant activity during evening hours. Possibly the most intriguing current 16-meter DX is Cairo's clandestine "Voice of Free Africa" on 17810 kc from 1700 to 1745 EST. This is a regular Egyptian transmitter which they switch from 17785 especially for these rebel broadcasts to Africa.

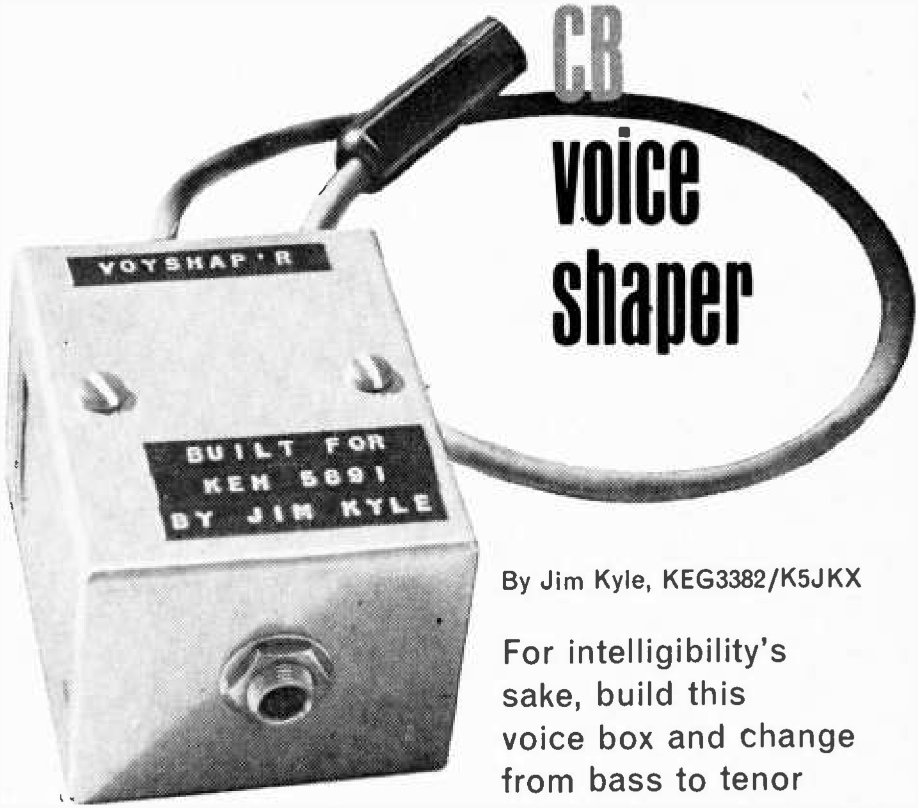
With high frequency conditions gradually returning to "normal," logging regional SWBC stations (into which category most real DX falls) will become more difficult. For Africa and the Near East, 41 meters will take over a key position as transoceanic reception decreases on 60 and 90 meters. At the same time, powerful international transmitters will move up from 49 meters leaving a quality of Latin American DX in the clear.

With sunspots back, we can also expect ionospheric disturbances which can knock out all reception from upper and mid-latitudes while leaving tropical signals in the clear. These disturbances fall into two categories—solar flares (of short duration) and ionospheric (or "magnetic") storms that can last several days. ■

<table>
<tr><th>LISTENER'S TIME</th><th>0000–0300</th><th>0300–0600</th><th>0600–0900</th><th>0900–1200</th><th>1200–1500</th><th>1500–1800</th><th>1800–2100</th><th>2100–2400</th></tr>
<tr><td>Asia (except Near East)</td><td colspan="2">31</td><td colspan="2">19 (25)</td><td>25 POOR</td><td colspan="2">19, 16</td><td>25</td></tr>
<tr><td>Europe, Africa (N. of the Sahara) & Near East</td><td>41 (31)</td><td>41 POOR</td><td>19</td><td colspan="2">19, 16</td><td>25 (41)</td><td>31</td><td>31 (41)</td></tr>
<tr><td>Africa (S. of the Sahara)</td><td>41</td><td>41 POOR</td><td>NONE</td><td colspan="2">19, 16</td><td>31, 25</td><td>31</td><td>41</td></tr>
<tr><td>South Pacific</td><td>31</td><td>41, 49</td><td>25, 31</td><td colspan="2">25</td><td>19 POOR</td><td>19</td><td>25</td></tr>
<tr><td>Latin America</td><td colspan="2">60</td><td>49</td><td colspan="2">25 (49)</td><td>31</td><td colspan="2">49</td></tr>
</table>

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 Broadcast Stations list.

ham-CB voice shaper



By Jim Kyle, KEG3382/K5JKX

For intelligibility's sake, build this voice box and change from bass to tenor

■ **"KEH 5891,** this is KEG 3382 calling"

"Roger, KEJ 3382, this is KEH 5891, go ahead."

"No, no, old man, this is KE*G* 3382. That's G as in George."

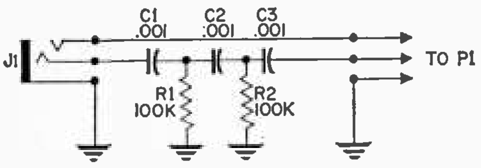
Do you have this problem consistently, with most of your on-the-air voice contacts? After a couple of years of having other hams come back to him as "K5KKX," "K5JKS," "K5JJS," and all the other possible ways in which his call could be misunderstood, and similar problems with his present CB call, the author did a bit of study. It couldn't *all* be in the other fellow's ear, he felt.

The Intelligibility Problem. It wasn't, either. He found that his voice was particularly lacking in the high-frequency components which make the difference between many letter sounds. What's more, he found that he wasn't alone in the problem. The average adult male voice is fairly low in high-frequency energy—and it seems that half the operators on the air have voices lower-pitched than average.

The author, having made this discovery, promptly modified the audio sections of all his rigs to add boost to the weak highs, with a correspondingly spectacular increase of intelligibility as the result. When the rest of the gang heard the results of the modifications, they asked for some type of device which would do the same for them.

The result was the *Voyshap'r*. This device, housed in the smallest available size chassis box, plugs between the mike and the rig and provides the treble boost. No modification

ham-CB voice shaper



Schematic diagram of the Voice Shaper has a very familiar appearance since its circuit is a basic high-pass filter. Series capacitors have low impedance at high frequencies.

of the rig is necessary.

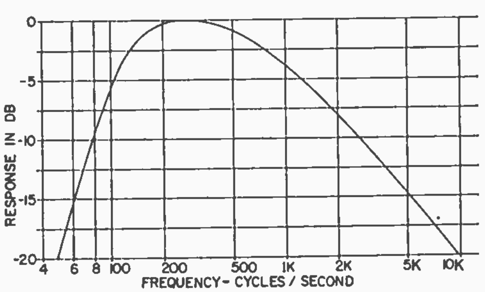
It must be emphasized at the outset that when the *Voyshap'r* (or any other similar device) is used, the transmitted voice will no longer sound "natural." In the process of boosting the highs, the circuit cuts down the low-frequency energy, and it's this low-frequency component that gives the voice its individual sound.

When the *Voyshap'r* is doing its job, the transmitted voice will sound very much like that you hear over long-distance telephone circuits. It will be crisper and more understandable than before, but you may not be recognized so readily without your call letters!

The Circuit. The *Voyshap'r* consists of a three-section high-pass resistance capacitance filter, at relatively high impedance. It's designed for use with either crystal, ceramic, or dynamic microphones. It's best used in conjunction with an *outboard* clipper or preamplifier accessory, since if used alone it has a very slight (almost undetectable) loss which the clipper or preamp will make up.

The series capacitors, C1, C2, and C3, in

Fig. 1. This logarithmic plot of frequency vs. db shows the power distribution of an average male voice; note peak at 300 cps.



the Voyshap'r (see schematic diagram) vary in impedance depending upon the frequency of the signal applied to it. At low frequencies, their impedance is high in comparison with the fixed shunt resistors. At high frequencies, their impedance is low.

Thus at very high frequencies, near the top of the audio range, the capacitors are effectively short-circuits, and the circuit is effectively only two resistors connected in parallel across the mike line. The only effect of this is to cause a slight reduction in audio because of the power shunted around the output through the resistors; this effect is negligible.

At very low frequencies the capacitors

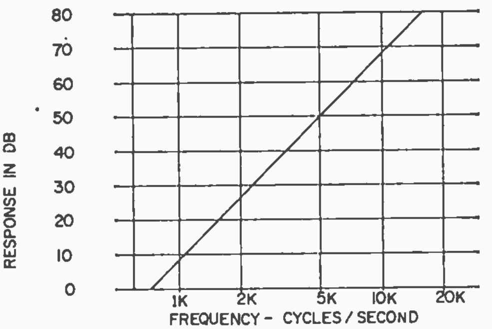


Fig. 2. When frequency vs. response in db is plotted for Voice Shaper, we get a linear response of 18 db/octave. Changing component values gives even greater response.

look like almost open circuits. Specifically, at 16 cycles per second, the impedance of each capacitor is 10 megohms. This impedance acts as a voltage divider, together with the resistor in each section, to reduce the output voltage by a factor of 100 *per section*. Thus, at 16 cycles, the *Voyshap'r* will reduce the output signal to 1/1,000,000 of its original value (100 x 100 x 100). This amounts to 120 db loss.

From Bass to Tenor. In the important middle audio range, from 300 to 3000 cps, it isn't quite so simple. At 1600 cps, the capacitors and the resistors have identical impedance (100,000 ohms). At first you might think the voltage-divider action would reduce output signal to ⅛ that of the input (½ per section, times three sections)—but this neglects the effect each section has on the preceding one. In practice, the reduction is modified by the shunting effect of the later sections. Throughout the useful audio range, the *Voyshap'r's* output signal increases with frequency at 18 db per octave.

Fig. 1 shows the average power distribution of the human male voice; Fig. 2 shows the 18-db-per-octave response of the Voyshap'r. Combining these two gives us Fig. 3, which is the output power distribution of the *Voyshap'r* with an average voice. The excess highs go to make up the difference for those of us who have less treble than "average" in our voices.

Construction. The most difficult part of the construction job is drilling the holes in the chassis box—that's how simple the device is! Lay out 3/8-inch holes centered on each end of the box as shown in the photos, and

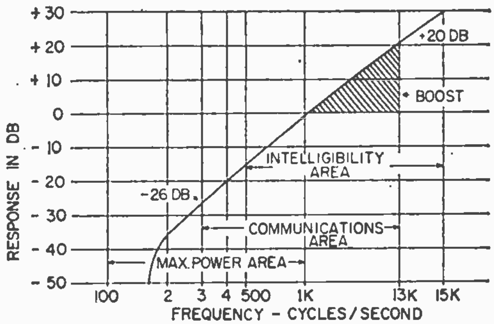


Fig. 3. When we plot the combined effect of Fig. 1 and Fig. 2, we get the output power distribution of the Voice Shaper working with the voice of our average ham or CB'er.

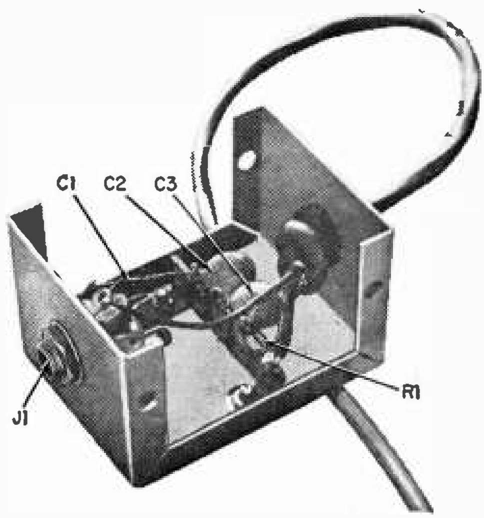
use the terminal strip as a template to mark 5/32-inch holes on the top.

Then mount the terminal strip in place with 6-32 by 1/4" screws. Resistors R1 and R2 mount on the lower parts of the terminal strip. Capacitor C1 runs from input jack J1 to the terminal strip, while C2 and C3 both mount on the strip itself. The push-to-talk

PARTS LIST

C1, C2, C3—.001-mf. ceramic disc capacitors
J1—3-conductor, 1/4-inch, open circuit phone jack (Mallory 702B or equiv.)
P1—3-conductor, 1/4-inch phone plug (Littel-Plug 260 or equiv.)
R1, R2—100,000-ohm, 1/2-watt resistors
1—2 3/4" x 2 1/8" x 1 5/8" aluminum chassis box (Bud CU3000A or equiv.)
Misc.—3-terminal terminal strip, 2-conductor shielded output cable, hardware, solder, etc.

Estimated cost: $2.50
Estimated construction time: 1 hour



Aluminum chassis box for the Voice Shaper can be the smallest you can find. Terminal strip supports the filter components all of which are visible except for resistor R2.

wire of the output cable connects directly to J1, while the audio wire of the cable connects to C3 at the terminal strip. The shielding is grounded at the strip.

The photos show a switching-type jack at J1; this was used simply because it was the only type on hand when the unit was built. The switch is an unnecessary expense.

If your mike uses a different type of connector, J1 should of course be changed to correspond with it. Alternatively, the 3-contact phone plug can be used by removing your mike connector from the mike cord and putting it on the output cable of the *Voyshap'r*, then putting the phone plug on the mike cable so it will plug into J1. However, this will prevent you from taking the *Voyshap'r* out of the line when desired.

Added Boost. Should the treble boost effect not be great enough to suit you, you can replace R1 and R2 with resistors of just 1/10 the specified value. This will almost completely eliminate all traces of bass response. However, a preamp will probably be necessary if this is done, since the Voyshap'r loss will be some 10 times greater and will probably cause a noticeable reduction of audio on the transmitted signal.

The preamp or clipper, if used, should be between the *Voyshap'r* and the rig. No other accessory should be connected *ahead* of the Voyshap'r, for maximum effect. ■

BUILD THE SAFE -LITE

This ingenious circuit will put eyes in the back of your head so you'll know at a glance whether your stoplights and brake light switch are working

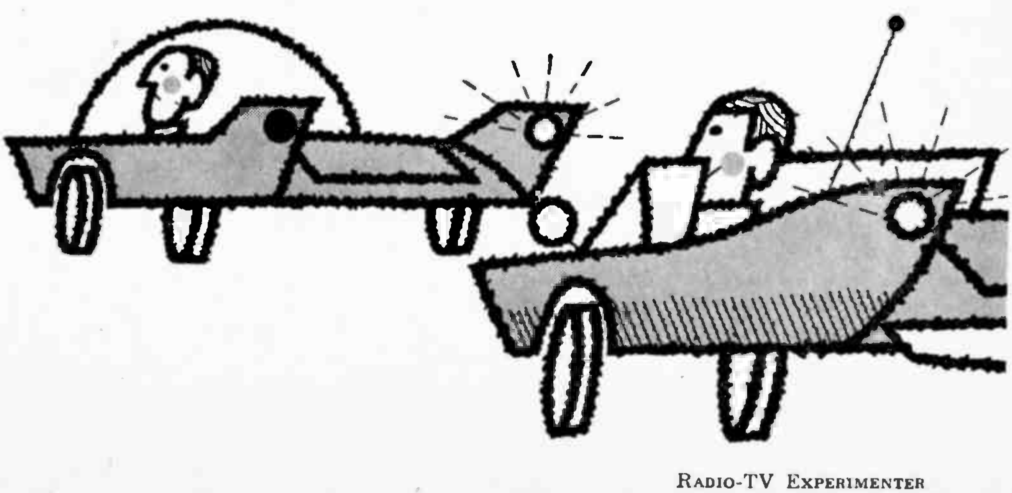
By Herbert Friedman, W2ZLF/KB19457

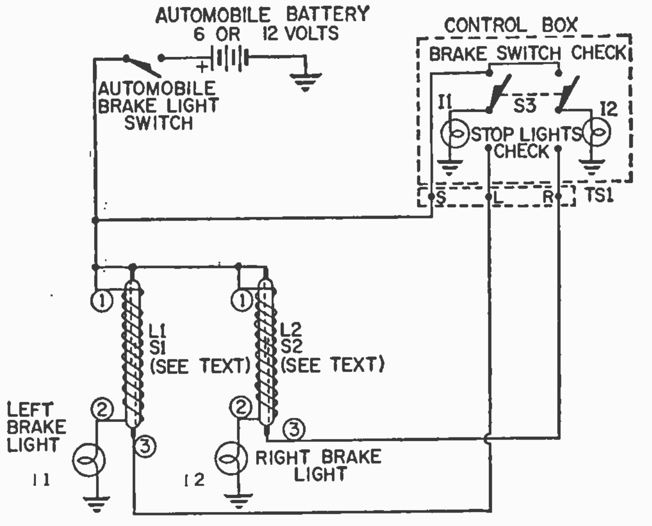
■ Driving your car with defective brake lights is a sure way to make it a candidate for the junk heap, not to mention the possibility of your incurring a few hospital bills. And even if you don't suffer a fender-bender there's always John Law ready to hand out citations for defective lights. So why risk a summons, or worse yet *your life*, when you can build the *Safe-Lite* and be years ahead of Detroit's built-in safety options.

What It Does. The Safe-Lite gives you an instantaneous check of your *brake light switch* and the *individual stoplights* merely by flicking a switch; and you don't have to get out of the car to do it, you test the stop light system in seconds from the driver's seat. And at no time does the Safe-Lite interfere or affect the normal operation of the brake switch and stop lights.

The Safe-Lite consists of a dash mounted control box and two electromagnet trigger switches, one for each stop light. The control box contains two pilot lamps—one for each stoplight—*which light if the stop lights are working.* When a stoplight fails, the representative pilot lamp also fails. The pilot lamps also double as a brake switch tester.

How It Does It. The two hearts of the Safe-Lite are the trigger switches, which are actually nothing more than a magnetic coil surrounding a reed switch. When the current to the stop lights flows through the coils (L1 and L2), a magnetic field is established around the reed switches (S1 and S2)

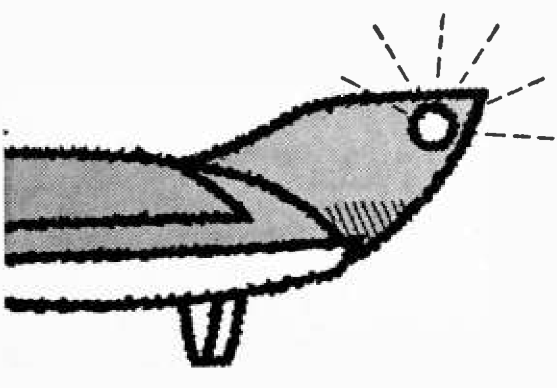




The schematic diagram shows wiring of the Safe-Lite circuit itself as well as its incorporation into your automobile's brake light circuit. The brake light switch is usually found on your hydraulic master cylinder; the trigger switches are best secured in the trunk near the stoplights; and the control box can be mounted under the dashboard, or for more custom installation, right in the dash.

and the contacts close, thereby activating the supply voltage to the pilot lamps (I1 and I2) in the control box. (See schematic diagram.) If the left stoplight should fail the left pilot lamp won't light when the brake pedal is depressed. Similarly with the right stoplight. S3, the test switch, also sets up the two pilot lights, I1 and I2, to indicate proper operation of your auto's brake switch. If both I1 and I2 fail to light when S1 is set to the SWITCH position (and the brake is depressed) it is the brake switch that is defective.

How It's Built. The control box is built on the main section of a 5¼"x3"x2⅛" miniature chassis box. On one end mount the pilot lamp assemblies I1 and I2, and the center-off test switch, S3. On the opposite end mount a 3-lug screw terminal strip. Use at least No. 18 stranded wire for connections, No. 16 is preferable, however. Under no circumstances use No. 20 or No. 22 hook-up wire.



What good is knowing your stoplights are defective and you're twenty miles from the nearest auto supply store? So, store spare bulbs in the cabinet cover as shown. Two common spring type tool holders—available from your local hardware dealer—are used to hold the spare bulbs. They can be either screwed or epoxy cemented to the cover. Just make certain they are positioned such that they will not force the bulbs against the switch or pilot lamp assemblies when the cover is in place.

For proper operation the electromagnetic triggers, the combination of L1 and S1, and L2 and S2, must be carefully assembled. The triggers are made from G.E. type X-7 reed switch assemblies and a wind it yourself coil. Enclosed in each X-7 reed switch package is a reed switch, coil form, magnet and instructions. Discard the magnet and ignore the instructions.

The electromagnet coils L1 and L2 are made using No. 18 solid enameled wire. Before winding the coils the wire must be tensilized or the coils will unwind, Clamp one end of a 10-foot section of wire in a vise and pull the other end with a pair of pliers until the wire goes *dead slack*. Don't pull too hard, just enough to remove the wire's resilience.

Press the wire into a slot on the left end of the coil form—allow about 6 inches for a lead—and wind a tight, closewound coil until you reach the right end. When you reach the right end, keep winding the coil in the same direction but wind a second layer from right to left, making a double wound coil. Snip off the excess wire leaving a 6-inch lead, push the lead into a retaining slot and the coil is completed.

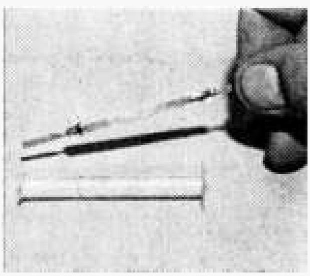
Insert the reed switch through the coil centering it so the reed terminals are at each end of the coil. Scrape away the insulation from either coil lead (it becomes the No. 1 lead), wrap the exposed lead around the adjacent reed terminal and solder. To the remaining reed terminal solder a 6 inch length of No. 16 stranded wire (this is lead No. 3). The remaining coil lead is lead No. 2.

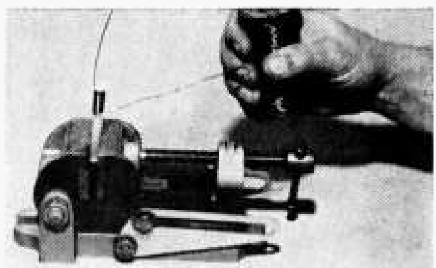
Select a section of ½-inch aluminum or copper tubing just a little longer than the overall length of the reed (including the end terminals) and scrape all burrs from inside the tubing. Apply a liberal amount of G.E. RTV silicone rubber sealant on the coil (and force some into the coil around the reed switch) and insert the reed assembly into the tubing, then pack both ends of the tubing with RTV Sealant. Allow 24 hours for the sealant to dry. It will form into a resilient rubber which will absorb any shocks and vibration, thus protecting the reed switches which are glass enclosed. Repeat the above steps for the second trigger switch.

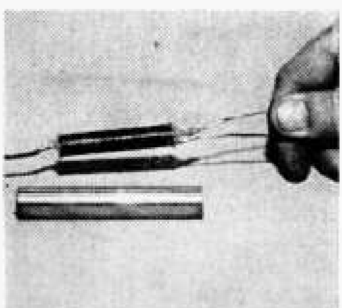
How It's Installed. Mount the control box under the dash or any other convenient location, making certain the box makes a good electrical connection to the car body. Locate the triggers in the trunk compartment near the stoplights. Sometimes some body screws protrude into the trunk, and a cable clamp mounted to these screws will retain the triggers. Now locate the brake light switch. If you have difficulty finding it, consult your shop manual or a mechanic to show you where it is. The brake switch has two terminals; one connects to the battery and one connects to the stop lights. Connect a section of No. 16 wire to the stoplight terminal and connect the other end to the *S* terminal on the control box.

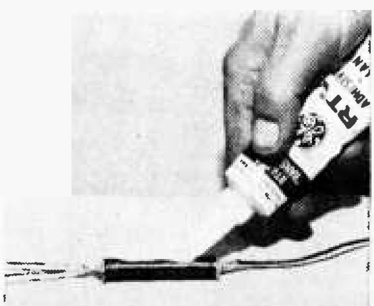
Attach two wires to the *L* and *R* terminals (use different color wires or coding to indicate the left and right wires) and run these

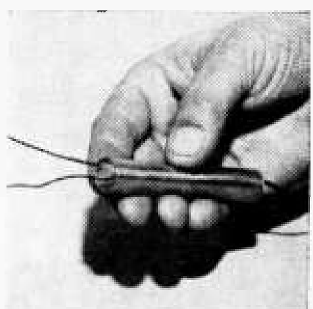
The fabrication of the trigger switches is shown in these photographs. The long reed switch is inserted in the coil form which is then wound with No. 18 enameled wire. Assembled trigger combination is then enclosed in ½-inch tubing cut to length as shown below. Rubber sealant completes job.











wires to the trunk compartment. This can be done by passing the wires under the rear seat or they can be placed in the existing channel which carries the manufacturers wiring to the trunk. The channel can be found by tracing the stoplight wires from the trunk forward.

Next, locate the brake light wires by tracing out the stoplight bulb socket(s). (Most bulbs are the two terminal type, one for the parking/signal light and one for the stoplight.) Cut the stoplight wires at a point near the triggers and connect the free wire coming from the brake switch to trigger lead No. 1. The wire from the brake lamp connect to lead No. 2. The wires coming from the control box connect to lead No. 3. These connections can be soldered and taped or connecting plugs can be used.

PARTS LIST

- I1, I2—Control box indicator lamp assemblies (Dialco Series 810B-432 [green] or equiv.) with GE No. 1133 or 1488 lamps for 6- or 12-volt systems, respectively
- L1, L2—Approximately 53 turns No. 18 solid enameled wire wound on reed switch coil forms. (See text)
- S1, S2—Electromagnetically actuated reed switches (GE-X7 or equiv.)
- S3—D.p.d.t. toggle switch
- TS1—3-lug screw terminal strip
- 1—5¼" x 3" x 2⅛" aluminum chassis box (Bud 3006A or equiv.)
- 1—½-pound spool No. 18 plain enameled magnet wire (Allied 48T104)
- Misc.—½-inch metal tubing, silicone rubber sealant (GE RTV-type or equiv.), No. 18 or No. 16 stranded wire, panel marking, hardware, solder, etc.

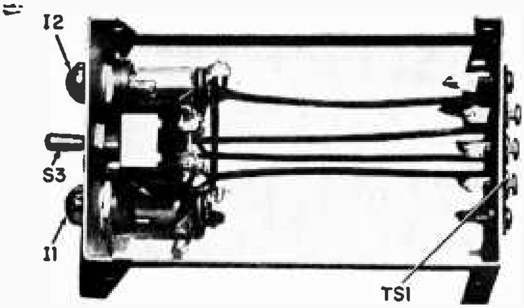
Estimated cost: $6.00

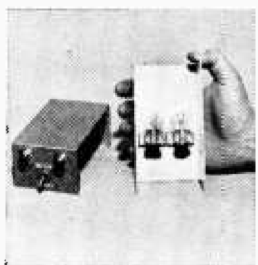
Estimated construction time: 3 hours (plus sealant curing and installation time)

How It's Used. Turn the ignition switch on. Set S3 to the *SWITCH* position; depressing the brake pedal will cause *both* indicators to light if the brake switch is working. If the brake switch is defective *both* indicators will fail to light. To test the stoplights set S3 to the LIGHTS position and depress the brake pedal. If both stoplights are operative both indicators will light. Test the circuit to make certain there are no wiring errors by removing the left stoplight—the left pilot should extinguish. Similarly test the right stoplight.

If in the course of your travels a stoplight should fail simply replace it with a spare bulb from the control box.

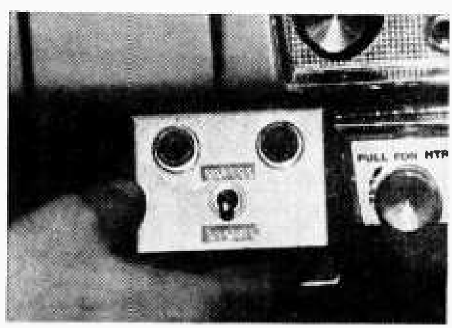
The Safe-Lite in addition to being a unique safety device, gives you that extra bit of *rear-end protection*, so important for motoring pleasure. ■





If you use an under-the-dash control box to mount the switch, indicator lights and terminal strip, construct it as shown at the left. There is room left in the enclosure after the wiring of components to mount a couple of spare emergency brake light lamps.

The trigger switch at the left is clamped into the trunk on the inside of the rear fender. Mounting is quick and simple. At the right, the optimum installation position for the control box is determined. Study the passenger compartment of your car before enclosing the Safe-Lite to find the best place to install it.



The Oscillobrator

Continued from page 49

voltmeter, as well as to warn you of any serious fluctuations in line voltage.

The step-by-step calibration procedure is as follows:

1. Turn the range switch S2 to 10, Switch S1 to OFF, and set R3 to 100 on the dial.

2. Adjust the AC voltage to as close to 3.54 volts as possible using potentiometer. This corresponds to 10 volts peak-to-peak.

3. With 3.54 volts rms applied to the Oscillobrator input jacks J1 and J2, adjust the vertical gain of your scope so that the sinewave is at some conveniently measured height on the faceplate markings.

4. Turn switch S1 to the ON position, and adjust the screwdriver control on R2 so that the two horizontal bars are the same height as the sinewave in step 3.

5. Using R7 and M1, adjust the input voltage as near to 1.75 volts as you can. This corresponds to a peak-to-peak voltage of 5 volts.

6. Turn switch S1 to the ON position and adjust the vertical gain of the scope so that the sinewave once more is at some conveniently measured height.

7. Turn switch S1 to the ON position and adjust R3 until the squarewave is the same height as the sinewave in step 6.

8. If the indicator knob on R3 is not pointing to 50 on the dial, carefully loosen the setscrew and move the knob until it does. Before tightening the setscrew, check that the image on the scope is still the same height.

The Oscillobrator is now adjusted for 10 volts peak-to-peak at the maximum dial reading, for 5 volts at midpoint, and for O volts at the minimum dial setting. As is the case with most measuring instruments, accuracy is greatest at midrange.

In the event you wish to check the calibration further against some additional voltages, or if you want to calibrate at a different range than 0 to 10, use the accompanying table of various peak-to-peak voltages and their rms equivalents. You will find some variations not only due to the difficulty in reading fractional voltages on the voltmeter, but also to imperfect linearity of the wirewound potentiometer.

If these variations are objectionable, then you have no alternative but to prepare and calibrate your own dial. However, some discrepancy can usually be tolerated as long as the peak-to-peak amplitude of any given waveform will measure the same in a month or a year as it does now. Thanks to the VR tube, the Oscillobrator does this unfailingly.

Using the Oscillobrator. By the time you have completed the calibration process, you will have become a skilled operator. Since it is strictly a comparison process, you will find it useful to choose one particular set of markings on the scope grid and always adjust the vertical gain so that the signal to be measured is of that amplitude.

At first you may wish to adjust the vertical position control so that the calibrating lines occur at the same points as the peaks of the waveform being measured. The slight offset is the result of the firing pulse mentioned earlier. As you gain familiarity, however, even this adjustment will become unnecessary.

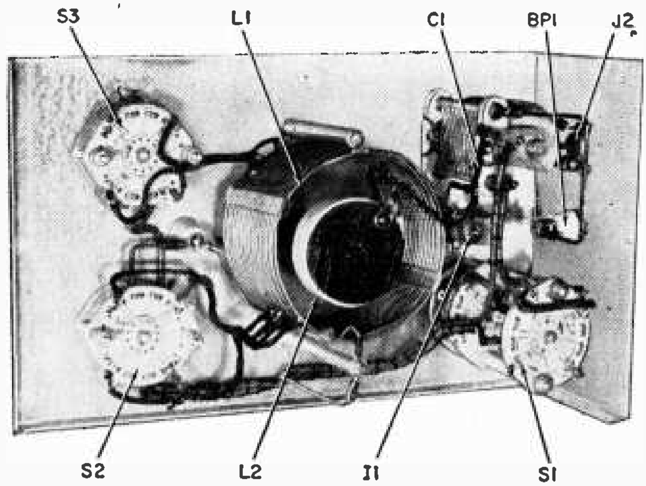
Your reaction after the Oscillobrator has been used a few times will inevitably be, *How did I get along without it!* ■

Aluminum Combination Window Serves as Antenna

■ An aluminum storm-screen combination window makes a good antenna for boosting the range of broadcast receivers, table-top radios, and short-wave receivers, since they cover a fairly large area.

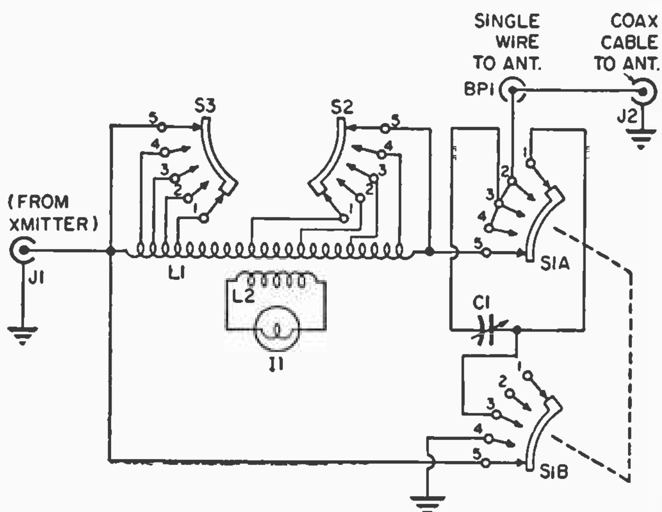
Just clip a length of wire to the aluminum frame and connect the other end to the antenna terminal of the radio, using alligator clips for both connections. If you prefer a permanent installation, fasten the end of the wire lead under one of the screwheads on the window frame. If your radio is an AC-DC table model, or any other type that operates off the power lines but uses no isolation or power transformer, connect a .01 mfd, 600-volt fixed capacitor between the antenna terminal and the aluminum window frame to isolate the frame from the radio and prevent shocks.

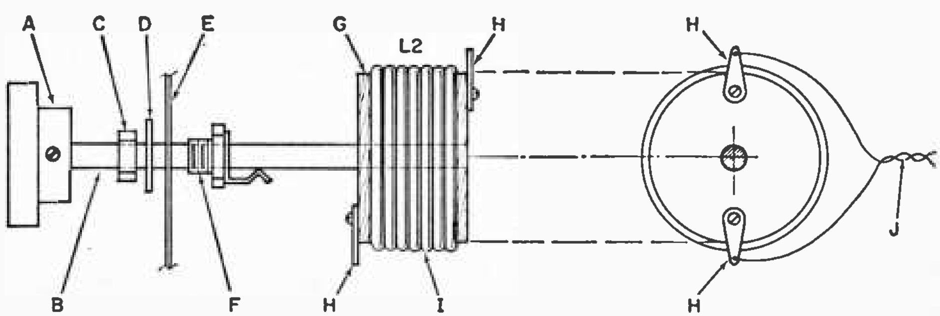
A point to check before connecting your new antenna: if frame touches a steel building frame, the signal may be grounded so look before you leap! ■



All of the components of the Tenna Tuner are mounted on the front panel and the top of the enclosure. The construction details of coil L2, whose turns are concentric within those of coil L1, are clearly visible. The solder lugs screwed to the wooden dowel coil form are the terminal points for running a twisted pair of wires to indicator lamp I1. Mounted on top of the unit are coax jacks J1 (not visible), jack J2, and binding post BP1.

Schematic diagram of the unit shows how loading coil L1, the heart of the circuit, is tapped in single turn units by switch S3 and in units of four by switch S2. Voltage is induced in coil L2 to drive indicator lamp I1. (See text for a thorough discussion of L1-L2 theory and construction details.) Ganged switch S1 places variable capacitor C1 in series or parallel with coil L1, or removes it from the circuit entirely, or grounds the antenna input through coil L1.





Side and end views of fabrication of indicator coupling coil L2 show how dowel shaft runs through phone jack which acts as bearing. See parts identification, page 88.

LITERATURE LIBRARY

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

ELECTRONIC PARTS

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

2. The new 516-page 1965 edition of *Lafayette Radio's* multi-colored catalog is a perfect buyer's guide for hi-fi'ers, experimenters, kit builders, CB'ers and hams. Get your free copy, today!

3. *Progressive "Edu-Kits" Inc.* now has available their new 1965 catalog featuring hi-fi, CB, Amateur, test equipment in kit and wired form. Also lists books, parts, tools, etc.

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

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

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

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

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

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

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

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

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

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

25. Unusual surplus and new equipment/parts are priced "way down" in a 32-page flyer from *Edlie Electronics.* Get one.

75. *Transistors Unlimited* has a brand new catalog listing hundreds of parts at exceptionally low prices. Don't miss these bargains!

HI-FI/AUDIO

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

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

16. *Garrard* has prepared a 32-page booklet on its full line of automatic turntables including the Lab 80, the first automatic transcription turntable. Accessories are detailed too.

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

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

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

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

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

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

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

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

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

TAPE RECORDERS AND TAPE

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

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

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

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

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

HI-FI ACCESSORIES

76. A new voice-activated tape recorder switch is now available from *Kinematix.* Send for information on this and other exciting products.

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

KITS

41. Here's a firm that makes everything from TV kits to a complete line of test equipment. *Conar* would like to send you their latest catalog—just ask for it.

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

43. Want to learn about computers the easy way? Brochure from *Digication Electronics* describes its line of transistorized kits.

44. A new short-form catalog (pocket size) is yours for the asking from *EICO*. Includes hi-fi, test gear, CB rigs and amateur equipment—many kits are solid-state projects.

AMATEUR RADIO

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

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

CITIZENS BAND SHORT-WAVE RADIO

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

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

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

52. If you're a bug on CB communications or like to listen in on VHF police, fire, emergency bands, then *Regency Electronics* would like to send you their latest specs on their receivers.

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

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

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

Also see Item 46.

SCHOOLS AND EDUCATIONAL

56. *Bailey Institute of Technology* offers courses in electronics, basic electricity and drafting as well as refrigeration. More informatioo in their informative pamphlet.

57. *National Radio Institute*, a pioneer in home-study technical training, has a new book describing your opportunities in all branches of electronics. Unique training methods make learning as close to being fuo as any school can make it.

68. Would you like to learn all about television servicing quickly at home? *Coyne Electronics Institute* would like to show you how easy it is, and at a low cost, too.

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

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

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

ELECTRONIC PRODUCTS

62. Information on a new lab transistor kit is yours for the asking from *Arkay International*. Educational kit makes 20 projects.

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

64. If you can use 117-volts, 60-cycle power where no power is available, the *Terado Corp.* Trav-Electric 50-160 is for you. Specifications are for the asking.

77. Government surplus nickel cadmium cells can be yours at a fraction of original cost! Send for *Esse Radio's* 3-page flyer.

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

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.

73. Attention, TV servicemen! *Barry Electronics* "Green Sheet" lists many TV tube, parts, and equipment buys worth while examining. Good values, sensible prices.

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

74. Get your copy of *CIE's (Cleveland Institute of Electronics)* 2-color data sheet on their electronics slide rule and information on their free "Auto-Programmed" 4-lesson instruction course.

TOOLS

78. Now you can get color coded nutdrivers in handy, plastic cases as well as conventional wall racks and bench stands. *Xcelite's* newly revised 16-page Catalog 162 gives full information.

Radio-TV Experimenter, Dept. LL-748
505 Park Avenue, New York, N. Y. 10022

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

☐ I am a subscriber

☐ Indicate total number of booklets requested

Be Sure To Enclose 25¢

1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	26
27	28	29	30	31	32	33	34	35	36	37	38	39
40	41	42	43	44	45	46	47	48	49	50	51	52
53	54	55	56	57	58	59	60	61	62	63	64	65
66	67	68	69	70	71	72	73	74	75	76	77	78

NAME (Print clearly)____________________

ADDRESS____________________

CITY__________ STATE__________ ZIP CODE__________

Tenna Tuner

Continued from page 85

The Tenna Tuner construction details which follow and reference to the drawings and photographs, should offer no fabrication difficulties to the builder.

The Cabinet. This item should receive first consideration inasmuch as one half of the cabinet housing the components serves the purpose of panel mounting all of the items. To achieve this, a chassis box, 10"x 6"x3½" was selected. The two halves of this cabinet separate into two 'L' shaped portions and as all components are mounted on but one half, the entire unit may be removed from its cabinet without trailing wires (other than the antenna lead) betweeen the two halves. This permits mounting the blank section of the cabinet which carries no equipment other than the coax connectors and open wire feeder binding post, directly to a wall or table top or it may be fitted with rubber feet and merely rest on the operating table. Obviously, any suitable metal cabinet may be used. The LMB aluminum box (see parts list) was chosen from the standpoint of accessibility to its interior and convenience in mounting components and accomplishing wiring. It provides a neat and substantial enclosure as well.

The Loading Coil. Coil L1 is an air-spaced inductor 2½ inches in diameter with 20 turns of #12 tinned, bare copper wire. Spacers on the coil shown are of polystyrene insulation cemented to the winding at the factory. Taps are taken off at every turn for four turns from one end and then every fourth turn to the opposite end of the coil. These should be left about six inches long initially and cut to proper length as they are soldered to the coil switches S2 and S3.

The Variable Capacitor. A ceramic insulated, 50 mmf, double-spaced transmitting type of capacitor is used for C1. As indicated in the schematic diagram, this capacitor is wired into the circuit through switch S1 so that when the switch arm is in the No. 1 position, the capacitor is in series with the antenna, coil and transmitter output. In the No. 2 position the capacitor is disconnected from the circuit and the loading coil is in series with the antenna and transmitter with no added capacity. The No. 3 position places the capacitor in parallel with the loading coil and in position 4, the antenna is grounded through the coil.

The Output Indicator. Essentially the foregoing paragraphs describe the Tenna Tuner proper. And added refinement is in the output indicator which is a simple device electro-magnetically and from that standpoint requires no further description other than its physical installation. The mechanical arrangement of the coupling coil, while somewhat unique, is also extremely simple and is best explained by the component location photograph and a few words of clarification. Note that we previously mentioned that the method of varying the coupling of the output indicator coil L2 to the loading coil L1, required occasional adjustment. Just as you move a loop of wire soldered to the terminals of a dial light bulb, along the convolutions of the tank coil or final amplifier inductance in your transmitter in order to obtain a satisfactory point at which to judge the brilliance of your bulb, you must also

(Concluded on page 90)

Construction Details for Coupling Coil L2 (See page 85)

A—Front panel adjusting knob
B—¼" wooden dowel shaft
C—Hexagonal nut
D—Washer
E—Front panel
F—Single open circuit phone jack
G—1⅝" wooden coil form
H—Lugs for connection to winding
I—Pick-up winding
J—Twisted pair to indicator lamp

PARTS LIST

BP1—Binding post for single lead antenna
C1—11.5 to 53 mmf. double-spaced variable capacitor (Hammarlund MC-50-SX or equiv.)
I1—Indicator lamp assembly Bayonet base (Lafayette Radio 33G6109)
J1, J2—Coaxial receptacles (Amphenol 83-1R or equiv.)
L1—20 turns, No. 12 tinned bare copper wire, 2½ inches diameter (Air-Dux 2004T or equiv.)
L2—7 turns No. 20 hookup wire on 1⅝-inch diameter dowel (see text)
S1—2-gang, single-pole, 4-position rotary switch (Centralab 2542 or equiv.)
S2, S3—1-gang, single-pole, 4-position rotary switches (Centralab 2542 or equiv.)
1—10" x 6" x 3½" flangelock chassis box LMB 1063EL or equiv.)
Misc.—Dial plates, tuning knobs, binding posts, phone jack shaft bearing, 1⅝" wooden coil form, ¼" dowel, solder lugs, hardware, wire, solder, panel decals, rubber feet, etc.

Estimated cost: $10.00
Estimated construction time: 8 hours

"Pulling Power Is Amazing"

Classified MARKET PLACE

Classified Ads only 55¢ per word, each insertion, minimum 10 words, payable in advance. For information on Classified ads—to be included in our next RADIO-TV EXPERIMENTER—write C. D. Wilson, Mgr., Classified Advertising, 505 Park Ave., New York, N. Y. 10022.

ADDITIONAL INCOME

MAKE Mail Order pay. Get "How To Write a Classified Ad That Pulls." Includes certificate worth $2.00 toward classified ad in S & M. Send $1.00 to C. D. Wilson. Science & Mechanics. 505 Park Ave.. New York. N. Y. 10022.

AUTO TRAILERS & SUPPLIES

BUILD Expanding Eight Foot Trailer. Accommodates Five. Literature 10¢. Fra-Mar Company. Wilmington. Mass.

BATTERIES—GENERATORS

BATTERY Secret. Guaranteed Last 5-Years Longer. Write Joe's, Box 1115-SC. Modesto. Calif.

BIG MAIL

YOUR Name Listed with 1000 Mailers. Publishers. Imprinters. etc. Our mailing each month $1.00. Dixie Mailers. King. North Carolina.

BOATS, MOTORS & MARINE SUPPLIES

BOAT Kits! Factory molded fiberglass or pre-assembled plywood. 50 models. 12' to 30'. Free catalog. Luger. Dept. UC-65. 8200 Access Road. Minneapolis 31. Minn.

FULL size. cut-to-shape boat patterns. blueprints. Send 50¢ for big New illustrated "Build a Boat" catalog includes Fishing Boats. Garvies. Cruisers. Catamarans. Houseboats—Outboards. Inboards. Sailboats—7½ to 38'. "How to Build a Boat" booklet $2.50. Cleveland Boat Blueprint Co.. Box 18250. Cleveland. Ohio.

CONVERT your present boat trailer winch to power. For complete instructions send $1.00 to Winch. P.O. Box 642. Sheboygan. Wis.

EIGHT Foot Pram Kit $39.95. Sailing Rigs available. Butler. X123. Marblehead. Massachusetts.

ELIMINATE Underwater corrosion any size boat. Box 823. So. Miami. Fla. 33143.

"FISHHOOK" Sunfish or similar type Boat. metal wall storage Boat Bracket. "Theft proof" requires no extra space. Mention if vertical or horizontal hanging. Can be installed on masonry. wood or tree. Send check or money order for $14.95 each. To "Fishhook"—Franklin Lakes. New Jersey.

BOOKS & PERIODICALS

BOOKS for everyone. Catalogs mailed 15¢. Myers Books. Marquand. Mo. 63655.

BUSINESS OPPORTUNITIES

I MADE $40.000.00 a Year by Mailorder. Helped others to make money! Start with $10.00—Free Proof. Torrey. Box 3565-T. Oklahoma City 6. Okla.

FREE Book "990 Successful Little-Known Businesses.' Fascinating! Work home! Plymouth-811-G. Brooklyn 18. N. Y.

CAMERAS & PHOTO SUPPLIES

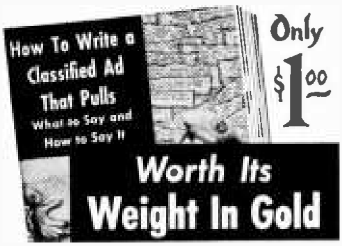
FREE illustrated photographic bargain book. Central Camera Co.. Dept. 36-H. 230 So. Wabash. Chicago. Ill.

AT last! Build your own supersensitive light meter from complete kit with easy to follow instructions. Send $19.95 to Kit Division. Science and Mechanics. 505 Park Ave.. New York 22. Money completely refunded if Kit returned within ten days for any reason

CAMPERS, CAMPING EQUIPMENT & TENTS

CAMPER Units—Compact buses. vans—Build yourself—Plans, instructions, photographs. Set SM2 for Volkswagens SM4. for Econoliners. Dodges. $2.00 set. Dot Campers. Box 67J. Saugus. Calif.

OUTDOORSMEN! You'll want to receive every issue of Camping Journal. written by pros for man-sized reading. Read what they say about equipment. food. rigs. first aid—all aspects from wilderness camping to firearms to gourmet camp cooking. Send $4.50 for your 1-year subscription to Camping Journal. 505 Park Ave.. New York. N. Y. 10022.



Make your classified ad pay! This handbook tells how—with examples; included is a Credit Certificate worth $2.00 toward the cost of a classified ad in S & M. For a copy of "How to Write a Classified Ad That Pulls," send $1.00 to C. D. Wilson, Science & Mechanics, 505 Park Ave., New York, N. Y. 10022.

COINS, CURRENCY & TOKENS

UNCIRCULATED Mexican Silver 1 Peso 1962. Plus ten different foreign coins. $1.45. McMahon. 2626 Westheimer. Houston. Texas 77006.

COINS Wanted—Top Dollar. Free list. Capo, 1030 Morris St., Philadelphia. Pennsylvania 19148.

LINCOLN Cent sets 1941-1964 complete. 63 Coins Fine to Uncirculated in holder $3.85. John Wright. Box 5585. Washington, D. C. 20016.

EARTHWORMS

BIG Money Raising Fishworms and Crickets. Free literature. Carter Farm-O. Plains. Georgia.

EDUCATION & INSTRUCTION

"THE Real Atom" and "Elementary Particle Structure and Keys to the Universe." The beginning of Man's Final Picture of Material Reality. Price $1.00 Postpaid. The Real Atom. P.O. Box 245. Claysville. Penna.

CATALOG of all Science & Mechanics Craftprints. Send 25¢ to cover postage and handling to Craftprint Div., Science & Mechanics. 505 Park Ave.. New York. N. Y. 10022.

ELECTRONIC KITS & SERVICES

ELECTRONIC Kits Wired and Tested. Electronic Fabrications, 1717 N. Ft. Harrison. Clearwater, Fla.

BUILD a high precision all purpose tachometer. 3 ranges. Measures speeds on tape recorders. lathes. cutting tools. auto engines. many more uses. Only $169.95. Kit Division. Science & Mechanics. 505 Park Ave.. New York. N. Y. 10022.

FISHING TACKLE, BAIT & LURES

MORE Fun. Action. Fish With Three Way Fish Call Only $14.95. Free Trial Offer—Lures with Order Now! E. G. Van Orman, P.O. Box 756. Atascadero. California 93422.

ANGLERS! "Fisherman's" Summer Edition is now available. Enjoy your favorite sport more by reading what the experts say about walleye fishing, artificial lures. trolling. surfcasting. plus much more. Send $1.00 to: Fisherman. #738. 505 Park Ave., New York. N. Y. 10022. Or start your one-year subscription. $3.00.

FLORIDA LAND

FLORIDA Water Wonderland—Home. cottage. Mobilesites. Established area. $590.00 full price. $9.00 a month. Swimming, fishing. boating. Write: Lake Weir. Box MK38. Silver Springs, Florida AD 6-1070 (F-1).

FOR INVENTORS

PATENT Searches — 48 hour airmail service. $6.00. including nearest patent copies. More than 200 registered patent attorneys have used my service. Free Invention Protection Forms. Write Miss Ann Hastings. Patent Searcher. P. O. Box 176. Washington 4. D. C.

GIFTS THAT PLEASE

1000 NAME and Address Labels $1.00. LaParl. 1513 Springwells. Detroit. Mich. 48209.

GIVE the best reading in the Mechanical Field—give Science & Mechanics! The pros tell all about Automobiles. Science, Electronics. Another plus: the large new "FiXiT" Section. $4.00 for year's subscription. Science & Mechanics. 505 Park Ave., New York. N. Y. 10022.

HYPNOTISM

NEW concept teaches you self-hypnosis quickly! Free literature. Smith-McKinley. Box 3038. San Bernardino. Calif.

SLEEP-Learning—Hypnotism! Strange catalog free! Autosuggestion. Box 24-TV. Olympia. Washington.

INVENTIONS WANTED

INVENTORS! We will develop. sell your idea or invention patented or unpatented. Our national manufacturer-clients are urgently seeking new items for highest outright cash sale or royalties. Financial assistance available. 10 years proven performance. For free information. write Dept. 7. Wall Street Invention Brokerage. 79 Wall Street. New York 5. N. Y.

MAILING LISTS

YOUR Name listed with 1000 Mailers. Publishers. Importers. etc. Our mailing each month $1.00. Dixie Mailers. King. North Carolina.

MONEYMAKING OPPORTUNITIES

FOR Money Making Opportunities. Business Building Offers. Write Tojocar. 2907-A West 39th Place. Chicago. Ill. 60632.

DOZENS of successful ways to be your own boss or conduct a small business profitably. Get your copy of Income Opportunities—only $1.00 or order a subscription for $4.50. Write Income Opportunities. 505 Park Ave.. New York. New York 10022.

Tenna Tuner

Continued from page 88

do so in this tuning unit to achieve the same result. But where you must have access to the interior of a transmitter in order to couple an indicator lamp loop to the tank coil, we accomplish it in this little tuner by the simple manipulation of a knob on the front panel. Not by *turning* the knob clockwise or counter-clockwise, but by pulling it out or pushing it in. Note the use of a conventional single circuit phone jack to serve as a bearing for the shaft of L2. The spring on the jack provides sufficient friction on the dowel shaft to maintain any chosen setting.

How Many Turns? The only experimentation necessary with L2 if you follow the mechanical arrangement shown in the construction details is determining the number of turns you will need on the coil form. Initial tests were made with a #47 pilot light bulb and 5 turns on L2, wound on a 1⅝" diameter wooden core (closet rod stock at any lumber yard). This proved entirely satisfactory on the 20, 40 and 80 meter bands although the indicator coil coupling knob required some slight re-adjustment for each band. On 10 and 15 meters, no illumination could be obtained with this bulb. Several transmitters were tried: EICO models 723 and 720, Viking Adventurer, Knight T-50 and T-60 and the Viking Navigator and Viking RANGER II. No indication was obtained on the lamp from any of these although all were good on the lower frequencies. Changing bulb types still did not correct this. Next, the number of turns on the coupling coil was reduced to three. Fine then on 10, 15 and 20 but nothing on 40 or 80! So, we went the other way although theoretically it didn't quite add up. We tried *seven* turns on the coupling coil; we then got satisfactory illumination on *all* bands, 10 through 80 inclusive, with but slight re-adjustment of the coupling control knob on each band.

So, that part is up to you; you'll have to match up the number of turns on the coupling coil, and the type of lamp you are using, to your power output. There is a combination which will give you a satisfactory indication not only in the restricted novice bands but in those open to the general class ham as well. ■

WHITE'S RADIO LOG

Volume 44, No. 1

/ up-to-date Broadcasting Directory of North .merican AM, FM and TV Stations. Including a ʖpecial Section on World-Wide Short-Wave Stations

ʼth ʼsue of *White's Radio Log* we have ..d the following listings: U.S. AM by Frequency, Canadian AM Sta- t \ y Frequency, U.S. Commercial Tele- vi. Stations by States, U.S. Educational T ion Stations by States, Canadian Tele- Stations by Cities, and the World- ort-Wave Stations.

.n r **Next Issue.** October-November, 55, *Log* will contain the following list- ʒs: AM Stations by Location, U.S. M Si 's by States, Canadian AM Sta- ons b ·ation, Canadian FM Stations by .ocatic ·xican and Cuban AM Stations by Loc. and the expanded Short-Wave Section. hort-wave listings will always be comp ..evised in each issue of *Log* to insure 10 up-to-date information.

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

Therefore, in any three consecutive 1965 issues of Radio-TV Experimenter magazines, 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, Fla.	50000d
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.	250d
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
KSO	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
WFSO	Pinellas Park, Fla.	
WACL	Waycross, Ga.	5000
WKYX	Paducah, Ky.	
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
WSOM	Salem, O.	
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.	250
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	Kennewick-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

KBOI	Boise, Ida.	50000
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.	500d
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

KUAI	Eleele, Kanai, Hawaii	
WGN	Chicago, Ill.	50000

730—410.7

WJMW	Athens, Ala.	1000
KFQD	Anchorage, Alaska	10000
KSUD	W. Memphis, Ark.	250d
WLOR	Thomasville, Ga.	5000d
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
WVIC	E. Lansing, Mich.	
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N.Mex.	1000d
WDOS	Oneonta, N.Y.	1000d
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

Kc. Wave Length W.P.

740—405.2
WBAM Montgomery, Ala. 50000d
KUEQ Phoenix, Ariz. 1000d
KBIG Avalon, Cal.
KCBS San Francisco, Calif. 50000
KSSS Colo. Springs, Colo. 1000
KVFC Cortez, Colo. 1000d
WSBR Boca Raton, Fla. 1000
WKMK Blountstown, Fla. 1000d
WKIS Orlando, Fla. 5000
KYME Boise, Idaho 500d
WVLN Olney, Ill. 1000d
KBOE Oskaloosa, Iowa 250d
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
WBMO 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
KFMB San Diego, Cal. 5000
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
WYNR 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
WWBO 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
KOAD Weed, Calif. 1000d
KBRN Brighton, Colo. 500d
WLAD Danbury, Conn. 1000d
WSUZ Palatka, Fla. 1000d
WJAT Swainsboro, Ga. 1000d
WKZI Casey, Ill. 250d
KXIC Iowa City, Iowa 1000d
WBOK New Orleans, La. 1000d
WCCM Lawrence, Mass. 1000d
WVAL Sauk Rapids, Minn.
KREI Farmington, Mo. 1000d
KDBM Dillon, Mont. 1000d
WKON Camden, N. J. 5000d
KJEM Okla City, Okla. 250d
KPDQ Portland, Ore. 5000d
WCHA Chambersburg, Pa. 5000d
WDSC Dillon, S.C. 1000d
WEAB Greer, S.C. 250d
WOEH 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
WATI Indianapolis, Ind. 2500d
WYRE Annapolis, Md. 250d
WJPW Rockford, Mich.
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-St. Paul, 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 Aguadilla, P.R. 500
WRAP Norfolk, Va. 5000
KTAC Tacoma, Wash. 1000

860—348.6
WHRT Hartselle, Ala. 250d
WAMI Opp, Ala. 1000d
KIFN Phoenix, Ariz. 1000d
KOSE Osceola, Ark. 1000d
KWRF Warren, Ark. 250d
KTRB Modesto, Calif. 10000
WOWW Naugatuck, Conn. 250d
WAZE Clearwater, Fla. 500d
WKKO Cocoa, Fla. 1000d
WERD Atlanta, Ga. 1000
WDMG Douglas, Ga. 5000d
WMRI Marion, Ind. 250d
KWPC Muscatine, Iowa 250d
KOAM Pittsburg, Kans. 10000
WSON Henderson, Ky. 500d
WAYE Dundalk, Md. 1000d
WSBS Gt. Barrington, Mass. 250d
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
KBIR Wichita, Kan. 250d
WKYW Louisville, Ky. 1000d
WLSI Pikeville, Ky. 5000d
KREH Oakdale, La. 250d
WCME Brunswick, Maine 1000d
WLMD Laurel, Md.
WATC Gaylord, Mich. 1000d
KTIS Minneapolis, Minn. 1000d
WOOT Greenville, Miss. 1000d
KFAL Fulton, Mo. 1000d
KJSK Columbus, Nebr. 1000d
WOTW Nashua, N.H. 1000d
WBRV Boonville, N.Y. 1000d
WSPN Saratoga, N. Y.
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
WOOY Bassett, Va. 500d
WAFC Staunton, Va. 1000d
KUEN Wenatchee, Wash. 1000d
WATK Antigo, Wis. 250d

910—329.5
WOVC Dadeville, Ala. 500d
KPHO Phoenix, Ariz. 5000
KLCN Blytheville, Ark. 5000d
KAMD Camden, Ark. 5000
KOEO El Cajon, Calif. 1000
KEWB Oakland, Calif. 5000
KOXR Oxnard, Cal. 5000
KPOF nr. Denver, Colo. 5000
WRCH 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
KISI 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. M. 5000
WRKL New York, N. Y. 1000d
WLAS Jacksonville, N.C. 5000d
KCJB Minot, N.Dak. 1000
WBRJ Marietta, O. 5000
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 Andalusia, 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. 5000
WMEG Eau Gallie, Fla. 1000
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
WIRO 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
KENY Bellingham-Ferndale, Wash. 1000d
WSAZ Huntington, W.Va. 5000
KROE Sheridan, Wyo. 1000d
WLBL Auburndale, Wis. 5000d

WHITE'S RADIO LOG

Kc. Wave Length W.P.

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.	1000d
WYLD	New Orleans, La.	10000
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
KWRC	Woodburn, Ore.	
WESA	Charlerol, 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	1000d
KXJK	Forrest City, Ark.	5000d
KFSA	Ft. Smith, Ark.	1000
KAHI	Auburn, Calif.	5000d
KIMN	Denver, Colo.	5000
WLOF	Orlando, Fla.	5000
WGTA	Summerville, Ga.	5000d
WGOV	Valdosta, Ga.	5000
KBOI	Boise, Idaho	5000
KLER	Orofino, Idaho	1000d
WAAF	Chicago, Ill.	1000d
WXLW	Indianapolis, Ind.	5000d
KOEL	Oelwein, Ia.	5000
KJRG	Newton, Kans.	500d
WBVL	Barbourville, Ky.	1000d
WAGM	Presque Isle, Maine	5000
WXLN	Potomac-Cabin John, Md.	
WORL	Boston, Mass.	5000d
WWJ	Detroit, Mich.	5000
KRSI	St. Louis Park, Minn.	1000d
WBKH	Hattiesburg, Miss.	5000d
KLIK	Jefferson City, Mo.	5000d
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
KOSX	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
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
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
KHFI	Austin, Tex.	
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.	1000d
WSUB	Groton, Conn.	1000d
WRC	Washington, D.C.	5000
WDVH	Gainesville, Fla.	5000d
WTOT	Marianna, Fla.	1000d
WBOP	Pensacola, Fla.	1000d
WLOD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	500d
WRIP	Rossville, Ga.	500d
KUPI	Idaho Falls, Idaho	1000d
WITY	Danville, Ill.	1000
KREB	Shreveport, La.	5000d
WCAP	Lowell, Mass.	1000d
WDMC	Otsego, Mich.	500
WPBC	Minneapolis, Minn.	5000
WAPF	McComb, Miss.	5000d
KMBC	Kansas City, Mo.	5000
KLYQ	Hamilton, Mont.	1000d
KVLV	Fallon, Nev.	5000d
KICA	Clovis, N. Mex.	1000
KMIN	Grants, N. Mex.	1000d
WTRY	Troy, N.Y.	5000
WKLM	Wilmington, N.C.	5000d
WAAA	Win.-Salem, N.C.	1000d
WONE	Dayton, Ohio	5000
WILK	Wilkes-Barre, Pa.	5000
WAZS	Summerville, S.C.	500d
WRBI	Winnsboro, S.C.	500d
KDSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
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
KEND	Cheyenne, Wyo.	

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
KOYL	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
WGOG	Wahalla, S. C.	1000d
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
KIND	Independence, Kans.	250d
KDLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WITL	Lansing, Mich.	500d
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.	50000d
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
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.	250
KNCO	Garden City, Kan.	5000d
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
KEED	Springfield-Eugene, Ore.	1000d
WBUT	Butler, Pa.	1000d
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

KUPO	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
KLMO	Longmont, Colo.	10000d
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
WKOK	Sunbury, Penn.	10000
WMIA	Arecibo, P. R.	5000
WFLI	Lookout Mtn., Tenn.	10000
WDIA	Memphis, Tenn.	50000
KOPY	Alice, Tex.	1000
KENR	Houston, Tex.	
WKOW	Madison, Wis.	10000

1080—277.6

WKAC	Athens, Ala.	1000d
KSCO	Santa Cruz, Calif.	10000
WTIC	Hartford, Conn.	50000
WVCG	Coral Gables, Fla.	10000d
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
WWDR Murfreesboro, N. C.
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
WGLC Mendota, Ill.
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. 50000d
KIPA Hilo, Hawaii 1000
WMBI Chicago, Ill. 5000d
KFAB Omaha, Nebr. 50000
WBT Charlotte, N.C. 50000
KBND Bend, Oreg. 5000
WWDS Everett, Penn. 250d
WNAR Norristown, Penn. 50000d
WVJP Caguas, P.R. 250
WHIM Providence, R.I. 1000d
WPHC Waverly, Tenn. 1000d
KORY Alamo Heights, Tex. 1000d

1120—267.7

WUST Bethesda, Md. 250d
KMOX St. Louis, Mo. 50000
WWOL Buffalo, N.Y. 1000d
KEED Springfield-Eugene, Ore. 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
KDRC 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
KRKD 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
KBIA Burlington, Ia.
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. 1000d
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

WAQY Birmingham, Ala.
WABF Fairhope, Ala. 1000
KVSA McGehee, Ark. 1000d
KLIP Fowler, Calif. 250d
KIBE Palo Alto, Cal. 5000d
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, Md. 1000d
KBHM Branson, 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 Talladega, 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
KCON Conway, 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
WBME Belfast, Me.
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. 1000
KODE Joplin, Mo. 1000
KLWT Lebanon, Mo. 250
KNCM Moberly, Mo. 1000
KBMN Bozeman, Mont. 1000d
KHDN Hardin, Mont. 1000
KXLO Lewiston, Mont. 1000
KLCB Libby, Mont. 250
KTNC Falls City, Nebr. 100
KHAS Hastings, 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. 1000
KHHH Pampa, Tex. 250
KSEY Seymour, Tex. 1000d
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
WLLI Brookneal, Va.
WCFV Clifton Forge, Va. 1000
WFVA Fredericksburg, Va. 1000
WNOR Norfolk, Va. 1000
KWYZ Everett, Wash. 1000
KSPO Spokane, Wash.
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
KRDY 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
WLCO 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
KASD	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
WATT	Cadillac, Mich.	1000
WCBY	Cheboygan, Mich.	1000
WJPD	Ishpeming, Mich.	1000
WJIM	Lansing, Mich.	1000d
WMFG	Hibbing, Minn.	1000
KPRM	Park Rapids, Minn.	1000
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
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
WBAX	Wilkes-Barre, Pa.	1000
WALO	Humacao, P.R.	1000
WWON	Woonsocket, R.I.	1000
WKDK	Newberry, S.C.	250
WDXY	Sumter, S. C.	1000
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

WZOB	Ft. Payne, Ala.	1000d
WETU	Wetumpka, Ala.	5000d
KAKA	Wickenburg, Ariz.	500d
KFAY	Fayetteville, Ark.	1000d
KALO	Little Rock, Ark.	1000
KHOT	Madera, Calif.	500d
KTMS	Santa Barbara, Calif.	1000
KDHI	Twenty-Nine Palms, California	1000d
KMSL	Ukiah, Calif.	500d
KICM	Golden, Colo.	500d
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

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.	1000d
WJBL	Holland, Mich.	5000
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
WCSA	Ripley, Miss.	
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
WISD	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
WJJJ	Christiansburg, Va.	
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

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.	5000
WVOM	Iuka, 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

WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KCJH	Arroyo Grande, Cal.	1000
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	1000
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d
KWCL	Oak Grove, La.	500d
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WWTC	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
WONT	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.	5000
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

WHOD	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
KBMD	Benson, Minn.	500d
WBLE	Batesville, Miss.	1000d
KALM	Thayer, Mo.	1000d
KGVD	Missoula, Mont.	5000
KDIL	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
KMMD	Marshall, Mo.	1000d
KBRL	McCook, Nebr.	5000d
KPTL	Carson City, Nev.	5000
WPNH	Plymouth, N. H.	
WAAT	Trenton, N.J.	5000d
WOSC	Fulton, N.Y.	1000d
WMMJ	Lancaster, N.Y.	
WEEE	Rensselaer, N.Y.	5000d
WRRC	Spring Valley, N. Y.	
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.	1000
KOIA	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.	1000
WDOC	Prestonsburg, Ky.	5000d
KIKS	Sulphur, La.	500d
KUZN	W. Monroe, La.	1000d
WLDB	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
WCLU	Covington, Ky.	
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
KHRT	Minot, N. D.	
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
WOMS	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
WYGD	Corbin, Ky.	5000d
WMDR	Morehead, Ky.	1000d
KVDL	Lafayette, La.	1000
WASA	Havre de Grace, Md.	5000d
WCRB	Waltham, Mass.	5000
WTRX	Flint, Mich.	5000
WLOL	Minneapolis, Minn.	5000
WJPR	Greenville, Miss.	1000d
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
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
KWXY	Cathedral City, Cal.	
KMAK	Fresno, Calif	1000
KDOL	Mojave, Calif.	100
KSFE	Needles, Calif.	250
KAOR	Oroville, Cal.	1000
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
WODK	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.	1000
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
KVBR	Brainerd, Minn.	
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
KDRO	Sedalia, 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
WMBD	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
WUNA	Aquadilla, P. R.	
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.	1000
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
WMDN	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
KITH	Clinton, Mo.	
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
WSLR	Akron, O.	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

Kc.	Wave Length	W.P.
WWWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WELR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	5000
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
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
KRCB	Council Bluffs, Iowa	
KXGI	Ft. Madison, Iowa	1000d
KSCJ	Sioux City, Iowa	5000
KBTO	El Dorado, Kans.	500d
WFLW	Monticello, Ky.	1000d
KDXI	Mansfield, La.	1000d
KVIM	New Iberia, La.	1000d
KTLD	Tallulah, La.	500d
WEBB	Baltimore, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYO	Caro, Mich.	1000d
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

Kc.	Wave Length	W.P.
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
WDEA	Ellsworth, Me.	5000
WMHI	Braddocks Hts., Md.	500d
WKIK	Leonardtown, Md.	1000d
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
KFRD	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
WEIF	Moundsville, W. Va.	1000d
WCCN	Neillsville, Wis.	5000d
KVWO	Cheyenno, Wyo.	1000

1380—217.3

Kc.	Wave Length	W.P.
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
WWCM	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.	1000
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

Kc.	Wave Length	W.P.
WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	500d
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo	5000d
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.	5000d
KAOH	Duluth, Minn.	500
KRFO	Owatonna, Minn.	500d
WROA	Gulfport, Miss.	1000d
WQIC	Meridian, Miss.	5000d
KJPW	Waynesville, Mo.	1000d
KENN	Farmington, N.Mex.	5000
KHOB	Hobbs, N.Mex.	5000d
WEOK	Poughkeepsie, N.Y.	5000
WRIV	Riverhead, N.Y.	1000d
WFBL	Syracuse, N.Y.	5000
WEED	Rocky Mount, N.C.	5000
WADA	Shelby, N.C.	1000
WJRM	Troy, N.C.	500d
KLPM	Minot, N.Dak.	5000
WOHP	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
KBBO	Yakima, Wash.	1000

1400—214.2

Kc.	Wave Length	W.P.
WMSL	Decatur, Ala.	1000
WXAL	Demopolis, Ala.	1000d
WFPA	Ft. Payne, Ala.	1000
WJLD	Homewood, Ala.	1000
WJHO	Opelika, Ala.	1000
KSEW	Sitka, Alaska	250
KCLF	Clifton, Ariz.	250
KJKJ	Flagstaff, Ariz.	250
KXIV	Phoenix, Ariz.	1000
KTUC	Tucson, Ariz.	250
KVOY	Yuma, Ariz.	250
KELD	El Dorado, Ark.	1000
KCLA	Pine Bluff, Ark.	1000
KWYN	Wynne, Ark.	1000
KPAT	Berkeley, Calif.	1000
KREO	Indio, Calif.	250
KQMS	Redding, Calif.	250
KSLY	San Luis Obispo, Cal.	250
KSPA	Santa Paula, Calif.	250
KHOE	Truckee, Calif.	1000
KUKI	Ukiah, Calif.	1000
KONG	Visalia, Calif.	1000
KRLN	Canon City, Colo.	250
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.	1000
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
WKFR	Battle Creek, Mich.	
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.	1000
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.	1000
KFRU	Columbia, Mo.	1000
KJCF	Festus, Mo.	250
KSIM	Sikeston, Mo.	1000
KTTS	Springfield, Mo.	1000
KORG	Deer Lodge, Mont.	250
KXGN	Glendive, Mont.	250
KARR	Great Falls, Mont.	1000
KCOW	Alliance, Nebr.	1000
KLIN	Lincoln, Neb.	1000
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.	250d
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.	1000
KEBE	Jacksonville, Tex.	1000
KIUN	Pecos, Tex.	1000
KEYE	Perryton, Tex.	250
KVOP	Plainview, Tex.	1000
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
WRDN	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

WUNI	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
WDDV	Dover, Del.	5000
WMYR	Fort Myers, Fla.	5000
WBIL	Leesburg, Fla.	1000d
WONS	Tallahassee, Fla.	5000d
WGRI	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
WVCB	Shallotte, N. C.	
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.	1000
KPOC	Pocahontas, Ark.	1000d
KRDO	Colo. Sprgs., Colo.	1000
KSTN	Stockton, Calif.	5000
WLIS	Old Saybrook, Conn.	500d
WBRD	Bradenton, Fla.	1000
WDBF	Delray Beach, Fla.	5000d
WETH	St. Augustine, Fla.	1000d
WAVO	Avondale Estates, Ga.	1000d
WRBL	Columbus, Ga.	5000
WPEH	Louisville, Ga.	1000d
WLET	Toccoa, Ga.	5000d
KOLL	Honolulu, Hawaii	5000
WINI	Murphysboro, Ill.	500d
WIMS	Michigan City, Ind.	5000d
WOC	Davenport, Iowa	5000
KJCK	Junction City, Kans.	1000d
KULY	Ulysses, Kan.	
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.	5000
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

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
KQRS	Golden Valley, Minn.	5000d
WHHT	Lucedale, Miss.	1000d
WSEL	Pontotoc, Miss.	1000d
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
WHRN	Herndon, Va.	
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, Cal.	1000
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
KEEP	Twin Falls, Idaho	1000
WVON	Cicero, Ill.	1000
WKEI	Kewanee, Ill.	500
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
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
WLKN	Lincoln, Me.	
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.	1000
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. D.	1000
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	1000
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
WOLB	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
WOYX	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
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
WDOL	Athens, Ga.	1000d
WCLA	Claxton, Ga.	1000
WRGA	Rome, Ga.	5000
WMPP	Chicago Heights, Ill.	1000d
WMBD	Peoria, Ill.	5000
WHUT	Anderson, Ind.	1000d
KTRI	Sioux City, Iowa	5000
KWVY	Waverly, Iowa	1000d
KARE	Atchison, Kans.	1000
KLIB	Liberal, Kans.	500d
WSAC	Fort Knox, Ky.	1000d
KTOL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJOY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KAND	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
WVDL	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
KCMS	Manitou Springs, Colo.	500
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, Mich.	5000d
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.	1000
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	1000
KTLD	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
KOB	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.	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	1000
KCIO	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WOAN	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, Kan.	1000
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.	1000
WTXL	W. Springfield, Mass.	1000
WABJ	Adrian, Mich.	1000
WMDN	Midland, Mich.	1000
WTIQ	Manistique, Mich.	
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.	1000
WTUP	Tupelo, Miss.	250
WVIM	Vicksburg, Miss.	250
KDMO	Carthage, Mo.	250
KTTR	Rolla, Mo.	1000
KDRO	Sedalia, Mo.	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
WLDE	Leaksville, N.C.	250
WRNB	New Bern, N.C.	1000
WRMT	Rocky Mount, N. C.	1000
WSTP	Salisbury, N. C.	1000
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
WOXB	Chattanooga, Tenn.	1000
WROL	Fountain City, Tenn.	1000
WJJM	Lewisburg, Tenn.	1000
WOXL	Lexington, Tenn.	1000
KNOW	Austin, Tex.	250
KIBL	Beeville, Tex.	250
KBST	Big Spring, Tex.	1000
KHUZ	Borger, Tex.	250
KNEL	Brady, Tex.	250d
KSAM	Huntsville, Tex.	250
KVOZ	Laredo, Tex.	250
KZZN	Littlefield, Tex.	1000
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
KBRD	Bremerton, Wash.	1000
KLDG	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
WFIF	Milford, Conn.	
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.	250
WZBN	Zion, 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
WKBX	Winston-Salem, N. C.	
WKER	Pompton Lakes, N. J.	500d
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
KDKO	Littleton, Colo.	1000
WNLC	New London, Conn.	10000
WZZZ	Boynton Beach, Fla.	1000d
WWBC	Cocoa, Fla.	
WINU	Highland, Ill.	250d
WJRC	Joliet, Ill.	500d
WKAI	Macomb, Ill.	1000d
KIFG	Iowa Falls, Iowa	500d
KANS	Larned, Kan.	1000d
WMEX	Boston, Mass.	5000
WJCO	Jackson, Mich.	5000d
WLKM	Three Rivers, Mich.	500
KCCV	Independence, Mo.	1000d
KTTT	Columbus, Nebr.	500d
WRAN	Dover, N.J.	1000
WJIC	Salem, N.J.	
WBRW	Brewster, N.Y.	1000d
WEAL	Greensboro, N.C.	1000d
WBZB	Selma, N. C.	500d
WPSL	Monroeville, Penn.	250d
WLAC	Nashville, Tenn.	50000
KCTX	Childress, Tex.	250d
KABH	Midland, Tex.	500d
KMOO	Mineola, Tex.	250d

Kc. Wave Length W.P.

KROB Robstown, Tex. 500d
KSTV Stephenville, Tex. 250d
KGA Spokane, Wash. 50000
WAUX Waukesha, Wis. 10000d

1520—197.4

KGHT Hollister, Calif. 500
KACY Port Hueneme, Calif. 10000
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
WKJR Muskegon Hts., Mich. 1000d
WYNZ Ypsilanti, Mich. 250d
KOLM Rochester, Minn. 1000d
WOSL Mocksville, N.C. 5000
WSLT Ocean City-Somers Pt., N. J. 1000d
KHIP Albuquerque, N.Mex. 500d
WKBW Buffalo, N.Y. 50000
WFYI Mineola, N. Y. 10000d
WBNO Bryan, Ohio 500d
WINW Canton, O.
WKNT Kent, O.
WTTO Toledo, O.
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
WIOD Elizabethton, Tenn.

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
WTTI Dalton, Ga.
KNBI Norton, Kan. 1000d
KWLA Many, La. 1000d
WTCR Chestertown, Md. 250d
WRPM Poplarville, Miss. 1000d
WTHM Lapeer, Mich. 5000d
WERX Wyoming, Mich. 500d
KSMM Shakopee, Minn.
KMAM Butler, Mo. 250
KNBE Lincoln, Neb. 5000d
WCKY Cincinnati, Ohio 50000
WMBT Shenandoah, Pa. 250d
WUPR Utuado, P. R.
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
WOGA Sylvester, Ga.
WSMI Litchfield, Ill. 1000d
WBNL Boonville, Ind. 250d
WAOM Decatur, Ind.
WLOI LaPorte, Ind. 250d
KXEL Waterloo, Iowa 50000
KNEX McPherson, Kans. 250d
KLKC Parsons, Kans. 250d
WDON Wheaton, Md. 1000
WMRR Marshall, Mich. 250d
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 Uhrichsville, O. 250
KWFS Eugene, Ore. 1000d
WJMJ Philadelphia, Pa. 50000d
WPTS Pittston, Pa. 1000d
WPME Punxsutawney, Pa. 1000d
WAOK 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
WMOO Mobile, Ala.
KFIF Tucson, Ariz. 50000d
KXEX Fresno, Calif. 500d
KKHI San Fran., Calif. 10000
KOAB Arvada, Colo. 50000
WEXT W. Hartford, Conn. 1000d
WRIZ Coral Gables, Fla. 10000d

Kc. Wave Length W.P.

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
KEDO 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. 1000d
WSHN Fremont, Mich. 1000d
WOKJ 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 Canandaigua, 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
KMAO 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
WMIR Lake Geneva, Wis.
WMAD Madison, Wis.

1560—192.3

WAGC Centre, Ala. 1000d
KBIB Monette, Ark. 250d
KPMC Bakersfield, Calif. 10000
KIQS Willows, Calif. 250d
WBYS Canton, Ill. 250d
WVAK Paoli, Ind.
WRIN Rensselaer, Ind. 250d
KSWI Council Bluffs, Iowa 1000d
KABI Abilene, Kan. 250d
WPHN Liberty, Ky. 250d
WOXR Paducah, Ky. 1000
WBGS Sidell, La. 1000d
KBEW Blue Earth, Minn. 250
KQYX Joplin, Mo. 250
WQXR New York, N.Y. 50000
WTNS Coshocton, Ohio 1000d
WCNW Hamilton, O. 1000d
WTOO Toledo, Ohio 5000d
KWCO Chickasha, Okla. 1000
WRSJ Bayamon, P.R. 5000
WAGL Lancaster, S. C. 1000d
WWGM Nashville, Tenn. 10000d
WBOL Bolivar, Tenn. 250d
KCAD Abilene, Tex. 500d
KHBR Hillsboro, Tex. 250d
KGUL Port Lavaca, Tex. 500d
KHOK Hoquiam, Wash. 1000d
WGLB Port Washington, Wis.

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
WEAO 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
KMCO Fairfield, Iowa 250d
KJFJ Webster City, Iowa 250d
KNOY Marysville, Kans. 250d

Kc. Wave Length W.P.

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, Penn. 1000d
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
WKKO Aurora, Ill. 250d
WOQN DuQuoin, Ill. 250d
WBBA Pittsfield, Ill. 250d
WKIO 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
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
WENO Ebensburg, Pa. 1000d
WANB Waynesburg, Pa. 250d
WORG Orangeburg, S.C. 1000d
WBBR Travelers Rest, S.C.
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

Kc. Wave Length W.P.

WILA Danville, Va. 1000d
WPUV Pulaski, Va. 5000d
WTTN Watertown, Wis. 1000d

1590—188.7

WATM Atmore, Ala. 5000d
WBIB Centerville, Ala.
WVNA Tuscumbia, Ala. 5000
KPBA Pine Bluff, Ark. 1000d
KLIV San Jose, Cal. 5000d
KUDU Ventura, Cal. 10000
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
WOOG Marine City, Mich. 1000d
WMIC St. Helen, Mich. 500d
KRAD E. Grand Forks, Minn. 1000d
WWUN Jackson, Miss.
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
WNCT 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. 250
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, Cal. 5000
KHER Santa Maria, Calif. 500d
KUBA Yuba City, Calif. 5000
KLAK Lakewood, Colo. 5000
WKEN Dover, Del. 5000d
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
KMOO Ft. Scott, Kans. 500d
WSTL Eminence, Ky. 500d
WKYF Greenville, Ky.
KFNV Ferriday, La. 1000d
KLEB Golden Meadow, La. 1000d
KLVI Vivian, La. 500d
WINX Rockville, Md. 1000
WBOS Brookline, Mass. 5000

WHITE'S

RADIO LOG

Kc. Wave Length	W.P.
WTYM East Longmeadow, Mass.	5000d
WAAM Ann Arbor, Mich.	1000
WTRU Muskegon, Mich.	5000
WKOL 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.	5000
WGIV Charlotte, N.C.	1000
WIDU Fayetteville, N.C.	1000d
WHVL Hendersonville, N. C.	
WFRC Reidsville, N.C.	1000
WKSK W. Jefferson, N.C.	1000d
KOAK Carrington, N.Dak.	500d
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
WBPR Bayamon, P. R.	
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
CFTK Terrace, B. C.	1000
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 5000n
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
CJCN Grand Falls, Nfld.	10000
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 Leamington, Ont	1.000
CFRG Gravelbourg, Sask.	5.000d
CKVM Ville-Marie, Que.	10.000d 1.000n
CJOX Grand Bank, Nfld.	1000
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
CBX Edmonton, Alta.	50000
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	
CHQR Calgary, Alta.	10000
850—352.7	
CJJC Langley, B.C.	1.000
CKRD Red Deer, Alta.	10.000d 1.000n
CKVL Verdun, Que.	50000d 10.000n
860—348.6	
CBH Halifax, N.S.	10.000
CFPR Prince Rupert, B. C.	10000
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
CKOH Amherst, N. S.	1000
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
CFSX Stephenville, Nfld.	500
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	
CBR Calgary, Alta.	50000
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
CFAX Victoria, B. C.	1000
CHOK Sarnia, Ont.	5.000d 1.000n
1090—275.1	
CHEC Lethbridge, Alta.	5.000
CHRS St. Jean, Que.	10.000d
1110—272.6	
CBD Saint John, N. B.	10000
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
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
CFVR Abbotsford, B.C.	250
CJAF Cabano, Que.	250
CJAV Port Alberni, B.C.	250
CJCS Stratford	500d 250n
CJRW Summerside, P.E.I.	250
CJWA Wawa, Ont.	1.000d 250n

Kc. Wave Length	W.P.
CKBS St. Hyacinthe, Que.	250
CKLS La Sarre, Que.	250
CKWL Williams Lake, B. C.	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
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
1300—230.6	
CBAF Moncton, N.B.	5,000
CJME Regina, Sask.	1000
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
CJLS Yarmouth, N.S.	250
CKAR-1 Parry Sound, Ont.	250
CKOX Woodstock, Ont.	250
1350—222.1	
CHOV Pembroke, Ont.	1,000
CJDC Dawson Creek, B.C.	1,000
CJLM Joliette, Que.	1,000
CKEN Kentville, N.S.	1,000
CKLB Oshawa, Ont.	10,000d 5,000n
1360—220.4	
CKBC Bathurst, N.B.	10,000
1370—218.8	
CFLV Valleyfield, Que.	1,000
1380—217.3	
CFDA Victoriaville, Que.	1,000
CKLC Kingston, Ont.	5,000
CKPC Brantford, Ont.	10,000
1390—215.7	
CKLN Nelson, B.C.	1,000
1400—214.2	
CJFP Riviere du Loup, Que.	10,000d 250n
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
CKSL London, Ont.	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
CHUC Cobourg, Ont.	1000
CJBM Causapscal, Que.	1,000d 250n
1460—205.4	
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	
CKAY Duncan, B. C.	1000
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	
CJRN 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
Corona	KMTW	52
Eureka	KIEM-TV	3
	KVIQ-TV	6
Fresno	KAIL	53
	KFRE-TV	30
	KJEO	47
	KMJ-TV	24
Guasti	KBSA	46
Los Angeles	KABC-TV	7
	KCOP	13
	KHJ-TV	9
	KMEX-TV	34
	KNBC	4
	KNXT	2
	KPOL-TV	22
	KTLA	5
	KTTV	11
Modesto	KLOC-TV	17
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
Tijuana-San Diego	XETV	6
	XEWT-TV	12
San Francisco	KGO-TV	7
	KHJK	44
	KPIX	5
	KRON-TV	4
Oakland-San Francisco	KTVU	2
San Jose	KNTV	11
	KGSC-TV	48
San Luis Obispo	KSBY-TV	6
Santa Barbara	KEYT	3
Santa Maria	KCOY-TV	12
Santa Rosa	KHCD	50
Visalia-(Fresno)	KICU-TV	43
COLORADO		
Colorado Springs-Pueblo	KKTV	11
	KRDO-TV	13
Denver	KBTV	9
	KCTO	2
	KLZ-TV	7
	KOA-TV	4
Durango	KREZ-TV	6
Grand Junction	KREX-TV	5
Montrose	KREY-TV	10
Pueblo	KOAA-TV	5
Sterling	KTVS	3
CONNECTICUT		
Hartford	WHCT	18
	WTIC-TV	3
New Britain-Hartford	WHNB-TV	30
New Haven-Hartford	WNHC-TV	8
Waterbury	WATR-TV	20
DELAWARE		
No Stations		
DISTRICT OF COLUMBIA		
Washington	WOOK-TV	14
	WCTL	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
	WRSK	36
	WJXT	4
Largo	WLCY-TV	10
Miami	WCKT	7
	WLBW-TV	10
	WMGF-TV	33
	WTVJ	4
Orlando	WOBD-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
S. Miami	WCIX-TV	6
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
	KHVO	13
Honolulu	KGMB-TV	9
	KHVH-TV	4
	KONA	2
	KTRG-TV	13
Wailuku	KALA	7
	KMAU-TV	3
	KMVI-TV	12
IDAHO		
Boise	KBOI-TV	2
	KTVB	7
Idaho Falls	KID-TV	3
	KIFI-TV	8
Lewiston	KLEW-TV	3
Pocatello	KTLE	6
Twin Falls	KMVT	11
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
Freeport	WCEE-TV	23
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
	KUPK	13
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
	WIHS-TV	38
	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
	WKBD	50
	WXYZ-TV	7
Flint	WJRT-TV	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, Ia.	KTVO	3
Poplar Bluff	KPOB-TV	15
St. Joseph	KFEQ-TV	2
St. Louis	KMOX-TV	4
	KGSL-TV	30
	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	KGVO-TV	13

NEBRASKA

Location	C.L.	Chan.
Albion	KHQL-TV	8
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
Superior	KHTL-TV	4

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

Location	C.L.	Chan.
Burlington	WKBS	41
Wildwood	WCMC-TV	40

NEW MEXICO

Location	C.L.	Chan.
Albuquerque	KGGM-TV	13
	KDAT-TV	7
	KOB-TV	4
Carlsbad	KAVE-TV	6
Clovis	KFDW-TV	12
Roswell	KSWS-TV	8
	KBIM-TV	10

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-TV	9
New Bern	WNBE-TV	12
Raleigh-Durham	WRAL-TV	5
Washington	WITN-TV	7
Wilmington	WECT	6
	WWAY	3
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
	WVIZ-TV	25
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
La Grange	KTVB	13
Medford	KTVM	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
	WPHL-TV	12
	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
	KVER	13
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
Victoria	KXIX	19
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-Charles	WHTN-TV	13
	WSAZ-TV	3
Oak Hill	WOAY-TV	4
Parkersburg-Marietta, O.	WTAP-TV	15
Weston	WDTV	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
	WAOW-TV	9

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	WMGZ	16
	WORA-TV	5
Ponce	WSUR-TV	9
	WPSJ	14
	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
Huntsville	WHIQ	25
Mobile	WEIQ	42
Montgomery	WAIQ	26
	WKAB-TV	32
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
San Jose	KTEH	54
Santa Maria	KCOY-TV	12
San Mateo	KCSM-TV	14

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
Orlando	WMFE-TV	24
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
Wrens	WCES-TV	20

ILLINOIS

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

IDAHO

Location	C.L.	Chan.
Moscow	KUID-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
	WGBX	44

MICHIGAN

Location	C.L.	Chan.
Detroit	WTVS	56
Onondaga-East Lansing	WMSB	10
University Center (Bay City)	WUCM-TV	19

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
Portales	KENW	3

NEW YORK

Location	C.L.	Chan.
Buffalo	WNED-TV	17
New York	WNDT	13
	WNCY	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
Cleveland	WVIZ-TV	25
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
Hershey	WITF-TV	33
Philadelphia	WUHY-TV	35
Pittsburgh	WQED	13
	WQEX	16

SOUTH CAROLINA

Location	C.L.	Chan.
Charleston	WITV	7
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
Spokane	KSHD	7
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

WHITE'S

RADIO LOG

Canadian Television Stations by Cities

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
Atikokan, Ont.	CBWAT-4	7
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
Bonavista, Nfld.	CJON-TV-1	10
Boston Bar, B.C.	CFCR-TV-9	5
Brandon, Man.	CKX-TV	5
Brooks, Alta.	CFCN-TV-3	9
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
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
Chilliwack, B. C.	CHAN-TV-1	11
Cheticamp, N. S.	CBFCT	10
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, Sask.	CKCK-TV-1	12
Cranbrook, B.C.	CBUBT	10
Crescent Valley, B.C.	CHMS-TV-1	5
Dawson Creek, B.C.	CJDC-TV	5
Drunheiler, Alta.	CFCN-TV-1	8
Drumheller, Alta.	CHCT-TV-1	12
Dryden, Dntario	CBWAT-1	9
Eastend, Sask.	CJFB-TV-1	2
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
Enderby, B. C.	CHBC-TV-5	72
Estcourt, Que.	CJES-TV-1	70
Falkland, B.C.	CFWS-TV-1	5
Flin Flon, Man.	CBWBT	10
Fort Francis, Ont.	CBWAT-3	5
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, Dnt.	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.	CBFOT-1	12
Kapuskasing, Ont.	CFCL-TV-1	3
Keams, Ont.	CFCL-TV-2	2
Kelowna, B.C.	CHBC-TV	2
Kemano, B. C.	CFTK-TV-5	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
Magdalen Islands, P. Q.	CBFCT-1	12
Malakwa, B.C.	CFFI-TV-1	5
Manicouagan 5, P.Q.	CKHQ-TV-1	10
Marquis, Sask.	CKMJ-TV	7
Matagami, P. Q.	CKRN-TV-4	7
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
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
Mont Climont, P. Q.	CKBL-TV-1	11
Moyie, B. C.	CKVS-TV-1	5
Murdochville, P. Q.	CKBL-TV-2	6
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
Quebec, Que.	CBVT	11
Quesnel, B.C.	CFCR-TV-11	7
Red Deer, Alta.	CHCA-TV	6
Red Lake, Ont.	CBWAT-5	10
Regina, Sask.	CHRE-TV	9
Regina, Sask.	CKCK-TV	2
Rimouski, Que.	CJBR-TV	3
Rivière-au-Renard	CHAU-TV-7	7
Rivière du Loup, Que.	CKRT-TV	7
Riviere du Loup, Que.	CKRT-TV-3	2
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.	CJDN-TV	6
St. John's, Nfld.	CBNT	8
Ste. Marguerite-Marie, P.Q.	CHAU-TV-1	2
St. Quentin, N.B.	CHAU-TV-2	10
Ste. Rose du Degele, P. Q.	CKRT-TV-2	
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 D'Or, Que.	CKRN-TV-2	8
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
Ville Marie, Que.	CKRN-TV-3	6
Waterton Park, Alta.	CJWP-TV-1	12
Westwold, B.C.	CFWS-TV-2	12
Whitecourt, Alta	CFRN-TV-3	7
Wililams 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	3
Winnipeg, Man.	CBWT	6
Winnipeg, Man.	CJAY-TV	7
Wynyard, Sask.	CKOS-TV-3	6
Yorkton, Sask.	CKOS-TV	3
Yarmouth, N.S.	CBHT-3	11
Yuill Mountain, Balfour, B.C.	CKBF-TV-1	5

World-Wide Short-Wave Stations

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

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.

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:

George Matyaszek, Chicago, Ill.
Leonard Smith, Shadyside, Ohio
J. M. Harris, Vancouver, B. C.
Julian Sienkiewicz, Brooklyn, N. Y.
Tom Kneitel, New York, N. Y.
John Sigel, Worcester, Ohio
A. L. Kempton, St. Petersburg, Fla.
Susan Henriksen, Pt. Washington, N. Y.
Claire Campbell, Central Valley, Calif.
Ronald Flachac, Marshfield, Wisc.
Graham Chloupek, Oakland, Calif.
W. Wandrei, Burnaby, B. C.
David Carlson, Kirkwood, Mo.
R. J. Monson, Lancaster, Va.
Steve Shimko, Baltimore, Md.
David Weegar, Cooksville, Ont.
Bruce Zuckerman, Clark, N. J.
William Lee, Bethlehem, Pa.
Alvin R. Wilkinson, Ft. Braff, N. C.
R. J. Allen, Williams Lake, B. C.
Robert Bouvier, Providence, R. I.
John P. LeFave, Reading, Mass.
Tom Carpenter, Harrison, Mich.
Jimmy Davis, Lawton, Okla.
M. Herbach, Brooklyn, N. Y.
Allen Mattis, Stone Lake, Wisc.
Frank B. Kennedy, Saratoga, Calif.
Joao Negrao, Santos, Brasil
John A. Czupowski, Cicero, Ill.
Nicholas Manusos, Lisle, Ill.
Mike Doherty, Willowdale, Ont.
Carl Stephan, Rochester, N. Y.
Bruce Kirkpatrick, Topeka, Kans.
Ronald Shopinski, Mt. Carmel, Pa.
Verne Horsley, APO N. Y. 09079
Lawrence Whitehead, Wewoka, Okla.
Alfred V. Sander, Concord, Calif. (great report)
N. S. Jortner, New York, N. Y.

Freq.	*Call*	*Name*	*Location*	*EST*
1630	VAK	Victoria*	Victoria, B.C.	0400
2182	—	(marine emerg.)*	various ship & shore	—
2410	VL9CG	—	Goroka, Papua	0430
2450	4VEH	V. Evangelique	Cap Hatien, Haiti	0630
2482	KOW	Seattle*	Seattle, Wash.	0510
2514	WLC	Rogers City*	Rogers City, Mich.	0023
2590	VAF	Alert Bay*	Alert Bay B.C.	0755
2598	KFX	Astoria*	Astoria, Ore.	0507
	KQX	Portland*	Portland, Ore.	0345
3215	VTW3	R. Tarawa	Tarawa, Gilbert Is.	0230
3218	—	R. Sto. Domingo	Santo Domingo, Dom. Rep.	2330
3240	—	R. Brazzaville	Brazzaville, Congo	2330
3260	—	R. Naimey	Naimey, Niger	0030
3300	—	R. Belize	Belize, Brit. Honduras	1730
3304	VL8BD	—	Daru, Papua	0430
3306	—	Rhodesia B.C.	Gwelo, Rhodesia	1000
3315	—	R. Martinique	Fort de France, Martinique	2000
3326	—	R. Tingo Maria	Peru	2200
3356	—	R. Bechuanaland	Gaberones, Bechuanaland	1030
3366	—	V. of Ghana	Accra, Ghana	1700
3910	CR7RA	R. Pax	Beira, Mozambique	0130
3952	MCM	BBC	London, England	1900
3960	—	R. Pax	Beira, Mozambique	0130
3975	GRC	BBC	London, England	2030
3980	—	R. Commercial	Angola	1400
4372	WCM	Pittsburgh*	Pittsburgh, Pa.	0830
4421	WLC	Rogers City*	Rogers City, Mich.	0023
4706	—	R. Progresso	Ecuador	2100
4719	CR4AB	R. C. de Mindelo	Sao Vicente, Cape Verdi Is.	1645
4756	—	Fiji Is. BC	Nandi, Fiji Is.	1830
4775	—	R. Commercial	Angola	1350

60 Meter Band—4750 to 5060 Kc/s

Freq.	*Call*	*Name*	*Location*	*EST*
4790	HRST	R. Primero de Mayo	Tequcigalpa, Hond.	2300
4798	XJA43	—	Brit. Columbia	2302
	XJD44	Prince Rupert	Prince Rupert, B.C.	2337
	XJD51	Terrace	Terrace, B.C.	2315
4811	HCFA4	V. de Manabi	Portoviejo, Ecuador	2305
4813	ZYH27	R. Iracema	Fortaleza, Brazil	1957
4820	XEJG	E. Casa de la Cult.	Guadalajara, Mex.	2134
4825	ZYE7	R. Educadora	Parnaiba, Brazil	2145
4828	—	Rhodesia NC	Gwelo, Rhodesia	0930
4830	CP70	R. Grigota	Santa Cruz, Bolivia	2100
4835	ZYA	R. Roraima	Boa Vista, Brazil	2030
4846	—	V. San Isdro	La Ceida, Hond.	2015
4864	CSA93	E. dos Azores	Ponta Delgada, Azores	1500
4880	HIJP	R. Comercial	Santo Domingo, D.R.	2100
4890	—	R. Dakar	Dakar, Senegal	0100
4926	—	R. Equat.	Santa Isabel, Sp. Guinea	1600
4954	ZYE23	R. Educadora	Braganca, Brazil	2045
4965	—	R. Santa Fe	Bogota, Colombia	2150
4967	—	Kuwait BC	Kuwait	1200
4970	—	R. Mogadiscio	Mogadiscio, Somalia	1245
4972	—	R. Yaounde	Yaounde, Cameroon	0030
5014	—	R. Universario	La Paz, Bolivia	2000
5020	—	R. Naimey	Naimey, Niger	0030
5024	—	R. Centinela del Sur	Loja, Ecuador	2030
5025	—	R. Pax	Beira, Mozambique	0130
5036	—	R. Ilo	Peru	2200
5042	CR6RF	R. Club de Bengela	Benguela, Angola	0045
5047	—	R. du Togo	Lome, Togo	1600
5060	—	R. Catclica	Quito, Ecuador	2000
5070	—	R. Liberdad	clandestine	0800
5521	KWA6	Anchorage*	Anchorage, Alaska	0530
5566	KIL8	Miami*	Miami, Fla.	0600
	KKF8	New Orleans*	New Orleans, La.	0615
5574	KSF	San Francisco*	San Francisco, Cal.	2005
5619	KKF8	New Orleans*	New Orleans, La.	1919
	XACF	Mexico City*	Mexico City, Mex.	1919

WHITE'S

RADIO LOG

Freq.	Call	Name	Location	EST
5626	VFZ	Goose Bay*	Goose Bay, Lab.	2010
5880	—	R. Peking	Peking, China	1500
5930	—	R. Prague	Prague, Czech.	2000

49 Meter Band—5950 to 6200 Kc/s

Freq.	Call	Name	Location	EST
5960	—	Greenlands Radio	Godthab, Greenland	1530
	—	RAI	Rome, Italy	1310
	DMQ	Deutsche Welle	Cologne, W. Ger.	2355
5970	—	R. Brazzaville	Brazzaville, Congo	2300
	CKNA	Canadian BC	Montreal, P.Q.	1700
5975	—	R. Santiago de Chile	Santiago, Chile	0500
5980	DMQ	Deutsche Welle	Cologne, W. Ger.	1610
	—	Greenlands Radio	Godthab, Greenland	1530
5985	—	Vatican R.	Vatican City	1930
6000	—	R. Americas	Swan Island	0045
6005	—	R. Nederland	Hilversum, Neth.	1100
6010	—	RAI	Rome, Italy	0525
	YSS	R. Nacional	San Salvador, El. Sal.	2115
6015	PRA8	R. Pernambuco	Pernambuco, Brazil	1930
6025	VUD	All India Radio	Delhi, India	1515
6055	—	R. Prague	Prague, Czech.	0530
6060	—	R. Naimey	Naimey, Niger	0030
6070	GRR	BBC	London, England	1700
	—	R. Sofia	Sofia, Bulgaria	1950
6075	DMQ	Deutsche Welle	Cologne, W. Ger.	1900
6080	ZL7	N.Z. Calling	Wellington, N.Z.	0530
	—	Swiss BC	Berne, Switz.	2130
	ZYK2	R. Jornal do Com.	Recife, Brazil	1930
6095	BED29	V. Free China	Taipei, Formosa	0500
6100	DMQ	Deutsche Welle	Cologne, W. Ger.	1900
	—	R. Belgrade	Belgrade, Yugo.	1700
6101	YNHC	R. Hernandez de Corda	Ocotal, Nicar.	1820
6105	—	R. Abidjan	Abidjan, Ivory Coast	0130
6120	—	Swiss BC	Berne, Switz.	2130
	4VEH	La V. Evangelique	Cap Hatien, Haiti	0630
6123	OAX5U	R. Huamanga	Peru	2330
6128	OCX4M	R. Pasco	Cerro de Pasco, Peru	2330
6135	—	R. Havana	Havana, Cuba	0705
6140	—	R. Papeete	Papeete, Tahiti	2230
	—	R. Nacional de Espana	Madrid, Spain	1630
6145	DMQ	Deutsche Welle	Cologne, W. Ger.	2305
6150	—	S. African BC	Capetown, S. Afr.	2200
6165	ZYC7	R. Tupi	Rio de Janeiro, Brazil	0100
	XEWW	La V. de Americana	Mexico City, Mex.	2320
6170	TGZ8	R. Novela	Guatemala City, Guat.	2300
6175	DMQ	Deutsche Welle	Cologne, W. Ger.	2035
6180	HJCT	R. Nacional	Bogota, Colombia	1830
6195	GRN	BBC	London, England	1800
	—	R. Nacional	Asuncion, Paraguay	0310
6210	OAZ4E	R. Minero	La Oroya, Peru	1900
6240	—	R. Liberdad	clandestine	0800
	OAX7A	R. Cuzco	Cuzco, Peru	2100
6270	—	R. Nacional	Asuncion, Paraguay	0310
6290	—	R. Peking	Peking, China	1300
6567	W8R	Miami*	Miami, Fla.	2102
	WRW	San Juan*	San Juan, P.R.	2105
	WEK	New Orleans*	New Orleans, La.	2107
6890	—	R. Peking	Peking, China	1300
7082	—	Injah Sedaye Melatte Iran	clandestine	1000

41 Meter Band—7100 to 7300 Kc/s

Freq.	Call	Name	Location	EST
7105	—	R. Naimey	Naimey, Niger	0030
	—	R. Nacional Espana	Madrid, Spain	1630
	—	R. Brazzaville	Brazzaville, Congo	2300
7115	—	R. Prague	Prague, Czech.	2000
7130	—	R. Naimey	Naimey, Niger	0030
	BED7	V. of Free China	Taipei, Formosa	2150
7135	—	R. Pakistan	Karachi, Pakistan	1445
7165	—	R. Tanzania	Dar es Salaam, Tanzania	0230
7175	DMQ	Deutsche Welle	Cologne, W. Ger.	1610
	—	Rhodesia BC	Gwelo, Rhodesia	0930
7205	—	R. Pax	Beira, Mozambique	0130
7215	—	R. Tehran	Tehran, Iran	1500
7225	DMQ	Deutsche Welle	Cologne, W. Ger.	2330
7235	VUD	All India R.	Delhi, India	1515
	—	RAI	Rome, Italy	1310
7250	—	Vatican R.	Vatican City	1930
7260	DMQ	Deutsche Welle	Cologne, W.Ger.	1520
	—	VTVN	Saigon, S. Vietnam	0830
7270	—	S. African BC	Capetown, S. Afr.	2200
7275	—	RAI	Rome, Italy	0525
7295	—	R. Budapest	Budapest, Hungary	1700
7308	—	R. Liberdad	clandestine	0800
7310	—	R. Tirana	Tirana, Albania	1930
7345	—	R. Prague	Prague, Czech.	2000
7440	—	R. Peking	Peking, China	1500
7450	—	R. Peking	Peking, China	1300
7840	—	V. de la Palma	Las Palmas, Canary Is.	1600
8837	KIL8	Miami*	Miami, Fla.	0840
8872	WWA3	San Juan*	San Juan, P.R.	0715
8905	KSF	San Francisco*	San Francisco, Cal.	2308
8948	WWA3	San Juan*	San Juan, P.R.	1900
	KEA5	New York*	New York, N.Y.	1902
9009	4XB31	Kol Zion	Jerusalem, Israel	1330
9325	—	R. Liberdad	clandestine	0800
9360	—	R. Nacional Espana	Madrid, Spain	1430
9457	—	R. Peking	Peking, China	0430
9460	—	Trans World R.	Bonaire, Neth. Ant.	0700

31 Meter Band—9500 to 9775 Kc/s

Freq.	Call	Name	Location	EST
9505	—	R. Prague	Prague, Czech.	0530
9510	GSB	BBC	London, England	0800
9520	—	R. Santo Domingo	Sto. Domingo, D.R.	1715
	OZF5	V. of Denmark	Copenhagen, Denmark	2100
9525	—	R. Japan	Tokyo, Japan	1000
	—	S. African BC	Capetown, S. Afr.	1415
	WRUL	R. N.Y. Worldwide	New York, N.Y.	1645
9530	—	R. Tanzania	Dar es Salaam, Tanz.	0230
	—	R. Amman	Amman, Jordan	1600
9535	HER4	Swiss BC	Berne, Switz.	2130
9540	ZL2	New Zealand Calling	Wellington, N.Z.	0140
9545	DMQ	Deutsche Welle	Cologne, W. Ger.	1050
9555	—	R. Amman	Amman, Jordan	2000
9570	—	R. Australia	Melbourne, Austral.	0145
9577	OAX8Q	R. Pulcallpa	Pulcallpa, Peru	2240
9580	—	R. Australia	Melbourne, Austral.	0715
9590	—	R. Nederland	Hilversum, Neth.	1555
9615	—	R. Nacional de Espana	Madrid, Spain	1125
9625	—	Canadian BC	Montreal, P.Q.	1700
9635	ZYR83	R. Aparaceida	Aparaceida, Brazil	1630
9640	HLK5	V. of Free Korea	Seoul, Korea	0930
9645	—	Vatican R.	Vatican City	1930
	TIFC	E. Cultural	San Jose, C.R.	0800
9655	VUD	All India R.	Delhi, India	0500
9660	—	R. Lebanon	Beirut, Lebanon	2030
	—	R. Nacional de Espana	Las Palmas, Canary Is.	0900
9670	—	Disini Saudi Arabia	Jeddah, Saudi Arabia	0300
9675	CR6SG	R. Club do Huila	Sa da Banderia, Angola	0400
9685	BED73	V. of Free China	Taipei, Formosa	2150
9690	LRA	R. Nacional	Buenos Aires, Arg.	0120
9695	—	R. Phnom Penh	Phnom Penh, Cambodia	2100
9700	CE970	V. de Chile	Santiago, Chile	0545
9705	—	R. Japan	Tokyo, Japan	1000
9710	OAX9D	R. Tropical	Tarapoto, Peru	0615
9715	—	R. Nederland	Hilversum, Nederland	1400
9730	—	R. Brazzaville	Brazzaville, Congo	2300
	—	R. Berlin Int'l.	Berlin, E. Ger.	1300
9735	DMQ	Deutsche Welle	Cologne, W. Ger.	1010
9740	—	R. Pakistan	Karachi, Pakistan	1445
	—	R. Splendid	Buenos Aires, Arg.	1825
9745	ORU	R. TV Belge	Brussels, Belg.	1650
9755	—	V. of Free China	Taipei, Formosa	1145
	—	Ici Paris	Paris, France	2040

Freq.	Call	Name	Location	EST
9770	4VEH	La V. Evangelique	Cap Hatien, Haiti	0630
9795	—	R. Prague	Prague, Czech.	.2000
9833	—	R. Budapest	Budapest, Hungary	1930
9860	—	R. Peking	Peking, China	1300
9865	YDF6	V. of Indonesia	Jakarta, Indonesia	1200
9915	VUD	All India R.	Delhi, India	1515
9955	—	R. Peking	Peking, China	1500
11650	—	R. Peking	Peking, China	0430
11660	—	R. Damascus	Damascus, Syria	0830

25 Meter Band—11700 to 11975 Kc/s

11710	—	R. Australia	Melbourne, Austr.	0145
	VUD	All India R.	Delhi, India	0500
	—	R. Brazzaville	Brazzaville, Congo	2300
11715	YDF2	V. of Indonesia	Jakarta, Indonesia	1200
	—	R. Nacional de Espana	Madrid, Spain	1800
11720	—	R. Athens	Athens, Greece	1245
11730	—	R. Nederland	Hilversum, Neth.	1555
	—	R. Tehran	Tehran, Iran	1500
11735	—	Moroccan BC	Tangier, Morocco	1530
11740	—	V. of America	Monrovia, Liberia	1230
11760	—	R. Australia	Melbourne, Austr.	1745
11770	—	V. of America	Monrovia, Liberia	1500
11770	VUD	All India R.	Delhi, India	0500
11775	DMQ	Deutsche Welle	Cologne, W. Ger.	1050
11780	—	R. Japan	Tokyo, Japan	2100
	ZL3	New Zealand Calling	Wellington, N.Z.	0140
11785	DMQ	Deutsche Welle	Cologne, W. Ger.	0230
11795	DMQ	Deutsche Welle	Cologne, W. Ger.	1010
11800	—	R. Peking	Peking, China	0430
	—	R. Ceylon	Colombo, Ceylon	0930
11805	ZYZ36	R. Globo	Rio de Janeiro, Brazil	1915
11810	VUD	All India R.	Delhi, India	0830
	—	R. Lebanon	Beirut, Lebanon	1330
11825	BED69	V. of Free China	Taipei, Formosa	2150
	—	R. Papeete	Papeete, Tahiti	2230
11835	4VEH	La V. Evangelique	Cap Hatien, Haiti	0630
	—	R. TV Algerienne	Algiers, Algeria	1700
11850	LLK	R. Norway	Oslo, Norway	1104
11855	—	Disini Saudi Arabia	Jeddah, Saudi Arabia	1200
	WRUL	R. N.Y. Worldwide	New York, N.Y.	1700
11860	BED45	V. of Free China	Taipei, Formosa	2150
11874	—	Disini Saudi Arabia	Jeddah, Saudi Arabia	1200
11875	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	1200
	WRUL	R. N.Y. Worldwide	New York, N.Y.	1515
11885	DMQ	Deutsche Welle	Cologne, W. Ger.	1010
	CXA68	R. Sarandi	Montevideo, Uruguay	2235
11890	DMQ	Deutsche Welle	Cologne, W. Ger.	1210
11900	—	S. African BC	Capetown, S. Afr.	0500
11925	DMQ	Deutsche Welle	Cologne, W. Ger.	0345
	HLK6	V. of Free Korea	Seoul, Korea	1830
	—	Windward I. BC	St. Georges, Grenada	1730
11940	—	R. Japan	Tokyo, Japan	0730
11950	—	Disini Saudi Arabia	Jeddah, Saudi Arabia	0300
	PRL3	R. Min. da Educ. e Cult.	Rio de Janeiro, Brazil	0500
11955	—	R. Nederland	Hilversum, Neth.	1230
11990	—	R. Prague	Prague, Czech.	2000
12095	GRF	BBC	London, England	1300
13264	VFG	Gander*	Gander, Nfld.	1226
15050	—	R. Liberdad	clandestine	0800
15100	—	Windward Is. BC	St. Georges, Grenada	1730
15105	VUD	All India R.	Delhi, India	0500
15060	—	R. Peking	Peking, China	0700

19 Meter Band—15100 to 15450 Kc/s

15110	ZL21	New Zealand Calling	Wellington, N.Z.	2145
15115	—	R. Peking	Peking, China	0430
	HCJB	V. of the Andes	Quito, Ecuador	1330
15125	HLK41	V. of Free Korea	Seoul, Korea	1900
15135	—	R. Japan	Tokyo, Japan	2100
	—	R. Havana	Havana, Cuba	1610
15165	VUD	All India R.	Delhi, India	0520
	OZF7	V. Denmark	Copenhagen, Den.	0730
	—	R. Damascus	Damascus, Syria	1230
15195	TAQ	R. Ankara	Ankara, Turkey	2230

Freq.	Call	Name	Location	EST
15220	—	S. African BC	Capetown, S. Afr.	0500
	WRUL	R. N.Y. Worldwide	New York, N.Y.	0745
	—	R. Australia	Melbourne, Austr.	2000
15225	VUD	All India R.	Delhi, India	0830
15235	—	R. Japan	Tokyo, Japan	0030
15275	DMQ	Deutsche Welle	Cologne, W. Ger.	0345
15280	ZL4	New Zealand Calling	Wellington, N.Z.	1845
15340	—	R. Havana	Havana, Cuba	1700
15345	—	R. Athens	Athens, Greece	1245
15370	—	R. Brazzaville	Brazzaville, Congo	1400
15380	CSA42	E. Nacional	Lisbon, Port.	1350
15425	—	R. Nederland	Hilversum, Neth.	1230
15440	WRUL	R. N.Y. Worldwide	New York, N.Y.	0700
15445	—	R. Brazzaville	Brazzaville, Congo	2300

16 Meter Band—17700 to 17900 Kc/s

17695	GVP	BBC	London, England	0700
17720	—	R. Brazzaville	Brazzaville, Congo	0730
17725	—	R. Japan	Tokyo, Japan	0030
17730	WRUL	R. N.Y. Worldwide	New York, N.Y.	1000
17790	GSG	BBC	London, England	0700
17805	—	S. Afr. BC	Capetown, S. Afr.	0600
17835	—	R. Peking	Peking, China	0430
17840	WRUL	R. N.Y. Worldwide	New York, N.Y.	1115
17840	—	R. Australia	Melbourne, Austr.	2000
17845	DMQ	Deutsche Welle	Cologne, W. Ger.	0230
17855	—	R. Havana	Havana, Cuba	0930
	VUD	All India R.	Delhi, India	0500
17875	WRUL	R. N.Y. Worldwide	New York, N.Y.	1000
17885	—	BBC	London, England	0930
17890	HCJB	V. of the Andes	Quito, Ecuador	1330
	—	V. of Free China	Taipei, Formosa	1030
17895	CSA66	E. Nacional	Lisbon, Port.	0900
17910	—	V. of Ghana	Accra, Ghana	0945
21500	—	R. Brazzaville	Brazzaville, Congo	1330
21530	—	V. of Ghana	Accra, Ghana	0900
21545	—	V. of Ghana	Accra, Ghana	0945
21700	—	E. Nacional	Lisbon, Port.	0940
21710	GVS	BBC	London, England	0930

"Red Fox to Blue Eagle, come in, Blue Eagle!"

Electronics Goes to your Heart

Continued from page 39

artificial kidney, says: "When we detach ourselves from emotional, symbolic and conventional notions, we realize the heart is a double pump with a fairly well-known output," and adds, "Should the only other alternative be death, one might prefer to have an artificial heart in the chest, even if some wires or thin tubes would have to come out of the chest wall to provide the power."

Assistant Versus Full-Time Hearts. Dr. Kolff has already kept dogs alive for hours with a total "heart" while Dr. Adrian Kantrowitz at Maimonides, applying an auxiliary or assistant heart—has kept his dogs alive for days, even a month.

The Kantrowitz assistant heart looks much like a flattened rubber ball with a double wall, the inner portion flexible so it can pulse like its human counterpart as air flows into the outer section. Both sections are made of *dacron-reinforced Silastic 372*, and pumped by a unit driven by air. Two teflon-coated stainless-steel electrodes are sutured to the heart and air-pumped from a portable battery-driven pack worn on the dog's back. Dr. Kantrowitz' colleagues claim this "assistant" heart has kept dogs alive for weeks; one animal, 32 days!

Heart to Heart. The total-replacement "heart" Dr. Kolff has developed in Cleveland has kept his dogs alive and kicking 29 hours. This fantastic medical-electronic achievement is the end result of a long dismaying struggle. The first "heart" of the series, fashioned of *plyvinyl chloride* and powered by a reciprocating pump and an oscillating column of air was a dismal failure.

The next, made of *polyurethane VC*, a plastic thought to be kinder to blood cells, was powered by five solenoid magnets and its valve design improved. This "heart"—tested in January of 1959—only one month after the failure of the first—kept a dog alive two hours.

But this pump ran into troubles too. The magnets were clumsy, large and heavy. Then a Dutch engineer suggested trying pulsed current rather than AC or DC and with this current, it was possible to use solenoids one-fifth the weight of the earlier ones.

Try Motors. Dr. Wolff's men then built tiny electromotors to fit into a chest cavity, and NASA engineers came up with the 64-dollar answer—try a pump driven by air or gas. Two compressed-air-driven "hearts" were then built, one that pushed blood with a rolling diaphragm, the other pumping blood from a plastic sack compressed within a rigid plastic shell.

"It is the sack-type heart that has kept an animal alive as long as twenty-six hours," Dr. Kolff says. He feels the air-driven version may become humanly practical long before other "hearts." When air is pressed into the rigid housing surrounding the plastic sack of an air-driven heart, the heart pumps much like the human original.

One Coil to Another Coil. Another "heart"—one powered by two stationary coupling coils, the first coil within the chest wall, the second outside—has been developed at the University of Missouri. During the day, the patient would wear a battery pack. The pack's energy, transformed to high frequency by a transistorized oscillator, would set up a magnetic field that would charge the inner coil.

At night the patient would be free of the pack, and could draw power from coils set up around his bed. This unique system is already being tested by implanting coils in dogs. The dogs then live in cages where coils have been installed in the walls.

But the ultimate in artificial hearts, as some of our advanced doctors forecast, may well be powered by the body's own electrical currents. Already one doctor in New Jersey believes we can convert the body's mechanical energy into electrical energy.

Taking New Heart. With such amazing prospects for the future it is only natural to ask, how soon will we be able to order new hearts? Soon, say the experts.

Dr. Walton Lillelei believes, "Hearts will be artificially replaced in man within ten years—and that's a conservative estimate." While Dr. Kolff retorts, "I'll be disappointed if a synthetic heart does not replace the human heart within three years." And when the Doctor says that, a staff member smiles as he recalls the day they kept a calf alive 29 hours on an artificial heart: "In case you think we had only clinical life there, four people had their hands full keeping that 150 pounds of cow from getting off the table during those hours."

If the coming artificial heart adds that much spunk to man's disposition this writer would like to add her prediction to that of the famed Doctors': We are in for an exciting era ahead. ■

Snap Your TV Pic

Continued from page 52

Your photo dealer can help you select the correct lens for your camera.

Also, in using your viewfinder be careful of *parallax*. When you are in this close, your viewfinder *may* not be showing exactly what the film will record, and you will have to correct for this parallax in the mounting of your camera. Best bet is to adjust the tripod so that the camera lens is exactly centered on the screen determined by simple plumb line measurement.

For recording black-and-white television images, use a medium speed film like Kodak Verichrome Pan or Kodak Plus-X Pan Film with your lens opening set at f/3.5 and a shutter speed of 1/25- or 1/30-second for a camera with between-the-lens shutter (the type most of us own). Use a lens opening of f/6.3 and shutter speed 1/10-second for a camera with a focal plane shutter.

You'll get best results in black-and-white if the film is given about 50 per cent more development time than normal—either in your own darkroom or by a custom photofinisher. The extra processing cost will *not* raise the price more than 50 per cent—as a rule of thumb.

For recording from color television, you'll need a fast color film like Kodak Improved High Speed Ektachrome Film, Daylight Type, in a camera with between-the-lens shutter and a maximum lens opening of at least f/2.8. With this film you will need a filter to absorb ultraviolet radiation from the color television tube—a Kodak Wratten 2B or Kodak Skylight Filter will work well. Use a shutter speed of 1/30-second.

One more word of advice: Recording images from television can be fascinating, particularly of an historical event like a Met home run. Screen images change often and you'll have the urge to record every one.

Now, a note of caution: If your fascination carries over into photographing regularly-scheduled TV programs or commercials, the material you record may be copyrighted and, you may be violating the copyright by making pictures. You have to make that decision. But unless you are certain no copyright is involved, do not—under any circumstances—make any commercial use of pictures you may take from television for your own entertainment. ■

Replacement Guide

Continued from page 46

the unit's operation after replacement has been made. If the unit works properly without circuit parts overheating (cathode, plate and screen resistors in particular) all is well. However, if the unit does not function as it should, shows signs of overheating, or pops fuses, forget the substitution and obtain the exact replacement.

Note that some replacement parts are starred(*). These tubes have different heater currents than those they replace. Do not use these tube types in sets that have series connected filament circuits. ■

The Neophyte's Dx'er

Continued from page 43

how: For minor changes in frequency, from those originally covered by the DX'er, remove or add a few turns to L1. If you add turns the tuning range will be lowered in frequency. If you remove turns, the tuning range will increase in frequency. For major variations, the number of turns on both L1 and L2 will have to be changed, along with the tap on L1. The tap on coil L1 will be about ⅕ to ¼ of the way to the ground end of the coil. Coil L2 will be about 15 to 25% of the turns on L1.

The DX'er can be made to cover the standard broadcast band by substituting a tapped ferrite antenna coil (such as the Lafayette 32G4108) for L1. Coil L2 will be about 15 turns of No. 30 wire wound on top of the ferrite antenna coil.

In the modifications outlined above, some experimentation will be necessary to find the best position for the tap on L1, and the number of turns on coil L2.

Although the DX'er was meant to be used with high impedance (1 to 4 kilohm) headsets, enough output is obtained on strong signals to drive a small speaker. To use a speaker with the DX'er, connect the primary of a matching transformer such as the Lafayette 99G6201 (2-kilohm primary, 10-ohm secondary) to jack J1. The secondary winding is connected to the speaker.

Crystal earphones can be used with the DX'er by connecting a 2.2-kilohm, ½-watt resistor in shunt with the terminals on J1. Now listen in to some good DX. ■

GET READY FOR THE SPACE and SCIENCE ERA! SEE SATELLITES, MOON ROCKETS CLOSE-UP

AMAZING SCIENCE BUYS for FUN, STUDY or PROFIT

See the Stars, Moon, Planets Close Up! 3" ASTRONOMICAL REFLECTING TELESCOPE

Photographers! Adapt your camera to this Scope for excellent Telephoto shots and fascinating photos of moon!

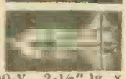
60 TO 180 POWER! Famous Mt. Palomar Type! An Unusual Buy! See the Rings of Saturn, the fascinating planet Mars, huge craters on the Moon, phases of Venus. Equatorial Mount with lock on both axes. Aluminized and overcoated 3" diameter high-speed f/10 mirror. Telescope equipped with a 60X eyepiece and a mounted Barlow Lens. Optical Finder Telescope included. Hardwood, portable tripod. FREE with Scope: Valuable STAR CHART plus 272-page "HANDBOOK OF HEAVENS" plus "HOW TO USE YOUR TELESCOPE" BOOK.

Stock No. 85,050-HP ....$29.95 Postpaid

4¼" Reflecting Telescope—up to 225 Power
Stock No. 85,105-HP ....$79.50 F.O.B.

Superb 6" Reflector Telescope
Up to 576 Power. Equatorial mount and Pedestal Base.
Stock No. 85,086-HP ....$199.50 F.O.B.

BRILLIANT ELECTRONIC FLASH TUBES FOR PHOTOGRAPHERS & MECHANICS



Time your car ignition, use for photo flash, signal light, control device or as strobe light. These flash tubes, filled with Xenon gas, have glass envelopes with sealed electrode at each end. Mfd. by G. E. Instructions incl.

Low voltage tube for low energy repetitive flash applications. Operates on an anode between 120- and 500-V., 2-⅛" lg. x ¼" diam. For ignition timing, uses 130-V. with 30 mfd. discharge capacitor, 4-sec. av. flash rate, 20-hr. approx. life.

STOCK NO. 40,725-HP ....$5.20 Ppd.

Portable photo equipment applications in covered reflectors or housings protecting user from contact with high voltage. Low operating voltage (400- to 550-V.) well suited for use with electrolytic type capacitors. 2½" high x ¾" diam., mounted on a 1-⅜" diam. x 1/16" thick wafer base designed to be crimped into a reflector. Three pins serve as soldering terminals. Typical photo flash application uses 450-V. on the anode with 1050 mfd. capacitance, 4200 lumen-sec output, peak lumen output 4 x 106, 2/min. flash rate.

STOCK NO. 40,726-HP ....$9.00 Ppd.

MAKE YOUR OWN POWERFUL ASTRONOMICAL TELESCOPE

Grind Your Own Astronomical Mirror
Kits contain mirror blank, tool, abrasives, diagonal mirror and eyepiece lenses. You build instruments ranging in value from $75.00 to hundreds of dollars.

Stock No.	Diam.	Mirror Thickness	Price
70,003-HP	4¼"	¾"	$ 7.50 ppd.
70,004-HP	6"	1"	11.95 ppd.
70,005-HP	8"	1⅜"	19.50 ppd.
70,006-HP	10"	1¾"	30.75 f.o.b.
70,007-HP	12½"	2⅛"	59.95 Barrington

BARGAIN! LONG & SHORT WAVE ULTRA-VIOLET LIGHT SOURCE

Small! Lightweight! Portable! Most Powerful at the Price!

Newly developed for prospecting, mineral collecting, fluorescent demonstrations, etc. Most powerful source of long and short wave ultra-violet light in one compact home-or-field unit! One source produces short wave UV radiation with peak intensity of 2537 angstroms. Other source produces long wave UV with peak intensity of 3660 angstroms. Unit has rugged all-metal housing, special circuitry for battery conservation, easy access for replacing tubes, extra large filters. Operates on house current or batteries. Lightweight, only 1 lb. 5 oz. Compact 5½" x 2" x 8½". Fully guaranteed 6 identified mineral specimens included.

Stock No. 70,259-HP ....$24.95 Postpaid

BATTERY ADAPTER CASE with shoulder strap.
Stock No. 70,260-HP ....$5.75 Postpaid

MAIL COUPON for FREE CATALOG "HP"

EDMUND SCIENTIFIC CO., Barrington, N. J.
Completely New 1965 Edition. 148 pages.
Nearly 4000 Unusual Bargains.
Please rush Free Giant Catalog-HP.

Name ....

Address ....

City .... Zone .... State ....

SOLVE PROBLEMS! TELL FORTUNES! PLAY GAMES!

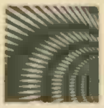
NEW WORKING MODEL DIGITAL COMPUTER

ACTUAL MINIATURE VERSION OF GIANT ELECTRONIC BRAINS

Fascinating new see-through model computer actually solves problems, teaches computer fundamentals. Adds, subtracts, multiplies, shifts, complements, carries, memorizes, counts, compares, sequences. Attractively colored, rigid plastic parts easily assembled. 12" x 3½" x 4¾". Incl. step-by-step assembly diagrams, 32-page instruction book covering operation, computer language (binary system), programming, problems and 15 experiments.

Stock No. 70,683-HP ....$5.00 Postpaid

EXPLORE THE WORLD OF "OP ART"



Fascinating New

MOIRE' PATTERNS KIT

Fantastic Visual Effects! Limitless Applications.

Now! Experiment with the amazing new tool of tomorrow. Basis of "OP ART"—latest rage sweeping the country in art, fashion, packaging industries. 1,000's of uses for hobbyists, photographers, designers, lab and home experimenters. Fun! Profitable! Unlimited potential. Here's your complete introduction to this new technology in one simplified, inexpensive kit developed by Dr. Gerald Oster, Brooklyn Poly. Inst. Contains 8 basic patterns on both clear acetate lantern slide size 3¼" x 4" (.050" thick) and .010" thick white Kromekote paper 3¾" x 4½" (coated one side): (1) Coarse grating, (2) 65-line grating, (3) Logarithmic scale grating, (4) Radial lines, 5-degrees, (5) Equispaced circles, (6) Fresnel zone plate, (7) Sphere projection, (8) Cylinder projection; one piece 3¼" x 4" 150-dot screen on film; copy Dr. Oster's book, "The Science of Moire' Patterns," an authoritative introduction to the fascinating world of moire'.

Stock No. 70,718-HP ....$6.00 Ppd.
Stock No. 60462-HP—Same as above without book $4.00 Ppd.

MOIRE' PATTERN ACCESSORY KIT. For additional experiments. Incl. metallic balloon, calcite, two kinds of diffracting gratings, one-way mirror foil, polarizing materials, Ronchi rulings, assortments of lenses.

Stock No. 60,487-HP ....$8.00 Ppd.

Astonishing 3-Dimensional Color Effects

NEW MULTI-LENS THERMOPLASTIC SHEETING

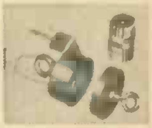
10,000 Parabolic Lenses Per Sq. Inch

Art or type appears to float or sink . . . illusion of depth up to ¾". Accepts art work, silk screen painting, quality lithography. Used at World's Fair by Disney and Dali. Resists soiling—easily cleaned. 22"x54" sheets. MULTI-LENSED LAMINATED SHEETS—MOIRE PATTERN.

Stock No. 70,728-HP, Translucent, colorless ..$ 9.50 Postpaid
Stock No. 70,729-HP, Vacuum-metalized back, chrome colored ....$12.50 Postpaid

(Other sheets and sizes available)

RUGGED, LOW-PRICED EXPERIMENTAL ELECTRO-MAGNET



Hobbyists, instructors and industrial lab men will find this well-built Electro-Magnet invaluable. Demonstrate principles of electro-magnetism. Actually lifts 100 lbs. when powered by a single 1½V flashlight battery. Easily deactivated. Includes instructions for 8 experiments—lifting power, magnetic flux and magnetomotive force, air gap, area of contact, retentivity and field configuration. Unit includes magnet and yoke assembly, battery holder, leads, clips and eyebolts. Steel core and yoke precision ground for max. flatness. About 2½" dia. x 4½" lg. Wt. 2 lbs.

Stock No. 60,435-HP ....$10.00 Postpaid

Instantly Copy and Measure Contours

NEW MAGNETIC CONTOUR GAGE

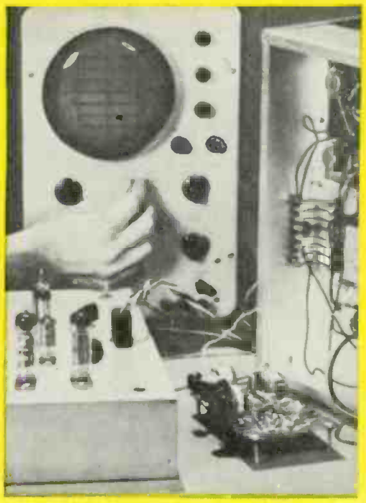
Contour gage with magnetic rods-to-holder, linkage, instantly conforms to irregular shapes, instantly locks copied information and measures it directly. 160 rods, arranged side by side to slide independently within a permanent magnet holder. Rods linked to holder by magnetic attraction, provides optimum sliding and gripping action. Can be locked positively, without distortion, by flipping lever. Patented precision tool unequalled for restoring, repairing and duplicating wood and metal; making models, samples, patterns and molds; quality control; prototype transfer; floor and wall covering installation. Use for checking tire tread wear; plastic fabrication; making die-cut inserts for paper boxes, etc. Forms both inside (match) and outside (fit) profiles with single motion. Direct reading scales for taking both horizontal and vertical measurements of portions of contour. Can be read from either end to accuracy of 1/32". Rods can be instantly realigned. Measures contours up to 5" lg. and 2¾" high. Stainless and chrome-plated steel, tempered rods have tapered ends. Overall meas. 5¾" lg. x 4" high x ¾" deep. In saddle-stitched, suede-lined case. Instructions inc. Wgt. approx. 14-oz.

Stock No. 60,507-HP ....$13.95 Ppd.

ORDER BY STOCK NUMBER . SEND CHECK OR MONEY ORDER . SATISFACTION GUARANTEED

EDMUND SCIENTIFIC CO., BARRINGTON, N. J.

BUILD, EXPERIMENT, EXPLORE, DISCOVER WITH NRI CUSTOM-DESIGNED TRAINING KITS



BUILD YOUR OWN PHONE/CODE TRANSMITTER

This is just one of seven training kits programmed into NRI's Complete Communications course. You get actual practice in building your own crystal-controlled, phone/code transmitter and putting it on the air. You experiment with modulation, "clamping" circuits, key filters, other aspects of commercial transmitter operation. Can be put on the air simply by attaching an antenna and complies with FCC regulations. As with all NRI training kits, you get the most modern features and parts.

BUILD ACTUAL ANALOG COMPUTER CIRCUITS

Industry, business offices, the government and military all need trained Electronics Technicians. NRI's Industrial Electronics course prepares you. You progress through 10 carefully designed training kits, topping off your practical experience phase of training by experimenting with feedback control systems, analog computers and digital computer elements. You actually solve problems on this analog computer you build yourself. This is the *practical,* fast way to a good paying, career position.

BUILD A CUSTOM-ENGINEERED TELEVISION RECEIVER

Want to earn \$3 to \$5 an hour in spare time? Want your own part-time or full-time business? In Radio-TV Servicing you learn to install, maintain, service radios, TV sets, hi-fi and stereo, other home Electronics equipment. In your training are eight training kits, including this complete, modern, slim-line TV receiver. You build it yourself, become familiar with components and circuits, learn servicing procedures . . . and earn extra money as you train. National Radio Institute, Washington, D.C.

SEE OTHER SIDE ▶

Join the Thousands Who Gained Success with NRI

"I am Frequency Coordinator for the 11th Naval District. The course was priceless." J. J. JENKINS, San Diego, Calif.

"Many thanks to NRI. I hold FCC License, am master control engineer with KXIB-TV." R.L. WOOD, Fargo, N.D.

"I am a Senior Engineering Aide. Without NRI I would still be working in a factory at a lower standard of living." D. F. CONRAD, Reseda, Calif.

FIRST CLASS
PERMIT
NO. 20-R
Washington, D.C.

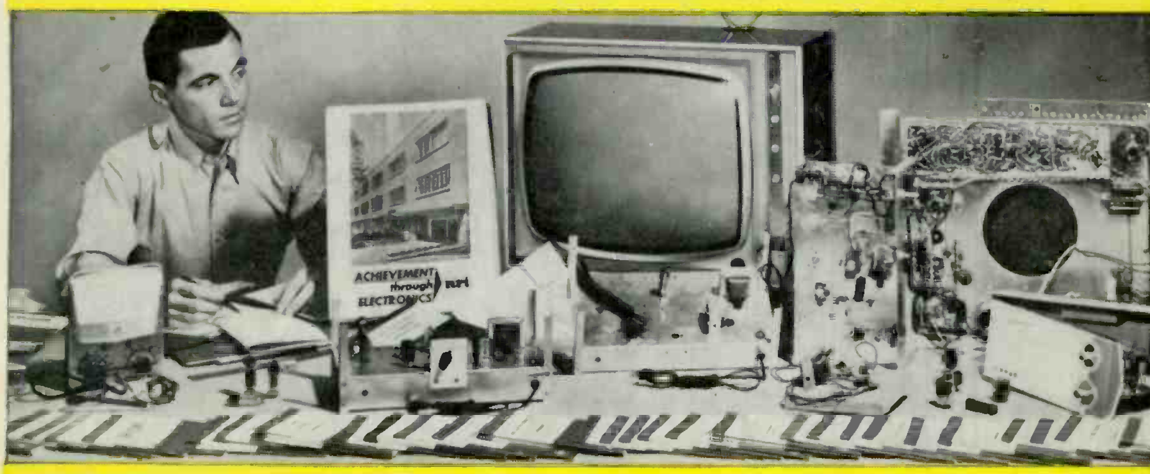
BUSINESS REPLY MAIL
NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY

NATIONAL RADIO INSTITUTE
3939 Wisconsin Avenue
Washington, D.C. 20016

YOU GET MORE FOR YOUR MONEY FROM NRI

Below is an example of material included in just one NRI course. Other NRI home study plans are equally complete.

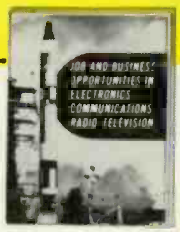


AMERICA'S OLDEST AND LARGEST RADIO-TV, ELECTRONICS HOME-STUDY SCHOOL

Compare if you like. You'll find—as have so many thousands of others—that NRI training can't be beat. From the delivery of your first lessons in the remarkable, new Achievement Kit sent the day we receive your enrollment, to "bite-size," easily read texts and carefully designed training equipment . . . NRI gives you more value. The picture above dramatically illustrates the material included in just one NRI course. Everything you see is included in low-cost NRI training. But NRI is more than kits and texts. It's also friendly, personal services which have made NRI a 50 year leader in the home study field.

Whatever your interest or need . . . whatever your education . . . there is an NRI instruction plan in Radio-TV Servicing, Electronics or Communications to fit your needs; tuition rates to fit your budget. Prove to yourself—your best home-study buy is NRI. Mail postage-free card today. No salesman will call. NATIONAL RADIO INSTITUTE, Electronics Division, Washington, D.C. 20016.

◀ SEE OTHER SIDE



National Radio Institute, Electronics Division
Washington, D.C. 20016 5-085

Please send me your catalog. I have checked the field(s) of most interest to me. (No salesman will call) PLEASE PRINT.

- ☐ Television-Radio Servicing
- ☐ Complete Communications
- ☐ Industrial-Military Electronics
- ☐ FCC License
- ☐ Basic Electronics
- ☐ Math for Electronics
- ☐ Electronics for Automation
- ☐ Aviation Communications
- ☐ Marine Communications
- ☐ Mobile Communications

Name____________________ Age______

Address____________________ Zip Code______

City____________________ State______

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

NOW 10 WAYS to train at home

MAIL CARD

NO POSTAGE REQUIRED

OVER 50 YEARS OF LEADERSHIP IN ELECTRONICS TRAINING