RADIO-TV EXPERIMENTER

FEBRUARY-MARCH 75c

WHITE'S RADIO LOG

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

3 ONE-EVENING PROJECTS

- Antique 'Phone Radio
- Universal AC Ammeter
- Perf-Board Phono Preamp

SIGHT & SOUND PROJECT

Sync Slides with Tape

(See page 37)

HOW BAD IS HIGHWAY HI-FI?

TEST REPORTS

International C-12B Frequency Meter

Heathkit/Magnecord 1020 4-Track Stereo Recorder

Knight-kit Safari III Portable CB Transceiver

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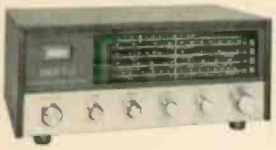

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Mathematics and Physics for Engineering
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Petroleum Production Engineering
Petroleum Refinery Oper.
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FEB.-MARCH 1967

RADIO-TV EXPERIMENTER

Dedicated to America's Electronics Experimenters

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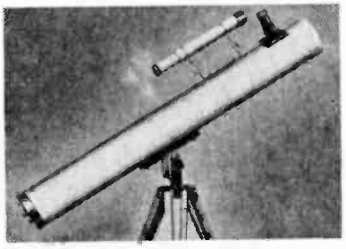

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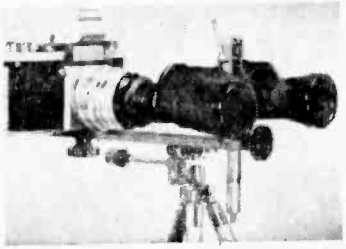

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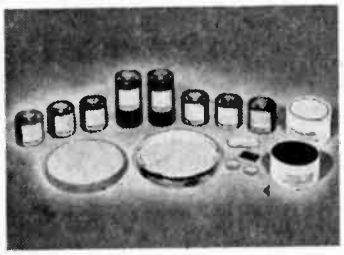

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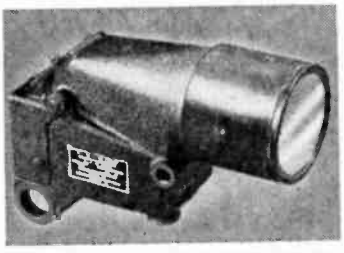

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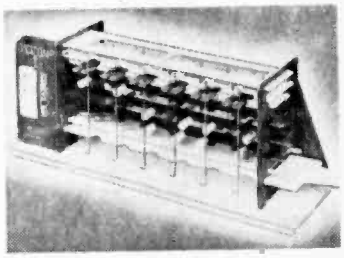

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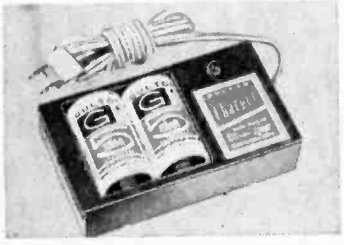

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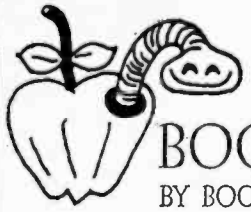

☐☐ **Color TV.** The vast growth of color television activity has developed a pressing need for simplified, more useful color-TV troubleshooting guidance. *Color-TV Servicing Guide*, by Robert G. Middleton, is a quick, effective servicing tool, arranged by color-TV trouble symptoms. It shows how to apply proper troubleshooting procedures, based on an analysis of trouble symptoms. It includes many full-color illustrations of actual picture tube displays for the various troubles, plus clear, concise text explaining possible causes and diagnosing procedures.

Soft cover
112 pages
$3.95

The book goes through each section of the color-TV receiver, describing the symptoms of related troubles. The last chapter in the book explains in detail how to test and troubleshoot with color-bar generators. Without this helpful book at hand, many servicemen may be wasting time needlessly. It is written in a clear, concise manner by author Bob Middleton who is well-known for his down-to-earth books for practicing techniques. *Color-TV Servicing Guide* is available from electronic parts distributors and bookstores throughout the country, or from Howard W. Sams & Co., Inc., Dept. RTV, Indianapolis, Indiana 46206.

☐☐ **Data Book.** The fifth edition of the highly popular reference book *Allied Electronics Data Handbook* has been revised and enlarged to include new and up-dated material for use in electronics. Fundamental mathematical data covers math constants, math symbols and algebraic formulas. Complete mathematical tables are given for squares, cubes, square roots, cube roots, reciprocals, common logarithms, natural sines, cosines and tangents. Radio and electronic formulas are provided for 70-volt speaker matching systems, resistance, capacitance, in-

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Your best bet today, especially if you don't have a college education, is probably in the field of two-way radio.

Two-way radio is booming. Today there are more than *five million* two-way transmitters for police cars, fire trucks, taxis, planes, etc. and Citizen's Band uses—and the number is growing at the rate of 80,000 new transmitters per month.

This wildfire boom presents a solid gold opportunity for trained two-way radio service experts. Most of them are earning $5,000 to $10,000 a year *more* than the average radio-TV repair man.

Why You'll Earn Top Pay

One reason is that the U.S. doesn't permit anyone to service two-way radio systems unless he is *licensed* by the Federal Communications Commission. And there simply aren't enough licensed electronics experts to go around.

Another reason two-way radio men earn so much more than radio-TV service men is that they are needed more often and more desperately. A home radio or TV set needs repair only occasionally, and there's no real emergency when it does. But a two-way radio user *must* keep those transmitters operating at all times, and *must* have them checked at regular intervals by licensed personnel to meet FCC requirements.

This means that the available licensed experts can "write their own ticket" when it comes to earnings. Some work by the hour and usually charge at least $5.00 per hour, $7.50 on evenings and Sundays, plus travel expenses. Others charge each customer a monthly retainer fee, such as $20 a month for a base station and $7.50 for each mobile station. A survey showed that one man can easily maintain at least 15 base stations and 85 mobiles. This would add up to at least $12,000 a year.

Be Your Own Boss

There are other advantages too. You can become your own boss—work by yourself or gradually build your own fully staffed service company. Instead of being chained to a workbench, machine or desk, you'll move around, see lots of action, rub shoulders with important police and fire officials and business executives who depend on two-way radio for their daily operations. You may even be tapped for a big job working for one of the two-way radio manufacturers in field service, factory quality control, or laboratory research and development.

How To Get Started

How do you break into the ranks of the big-money earners in two-way radio? This is probably the best way:

1. Without quitting your present job, learn enough about electronics fundamentals to pass the Government FCC Exam and get your Commercial FCC License.

2. Then get a job in a two-way radio service shop and "learn the ropes" of the business.

3. As soon as you've earned a reputation as an expert, there are several ways you can go. You can move *out* and start signing up and servicing your own customers. You might become a franchised service representative of a big manufacturer and then start getting into two-way radio sales, where one sales contract might net you $5,000. Or you may be invited to move *up* into a high-prestige salaried job with one of the major manufacturers.

The first step—mastering the fundamentals of electronics in your spare time and getting your FCC License—can be easier than you think.

Cleveland Institute of Electronics has been successfully teaching electronics by mail for over thirty years. Right at home, in your spare time, you learn electronics step by step. Our AUTO-PROGRAMMED™ lessons and coaching by expert instructors make everything clear and easy, even for men who thought they were "poor learners." You'll learn not only the fundamentals that apply to all electronics design and servicing, but also the specific procedures for installing, troubleshooting, and maintaining two-way mobile equipment.

Get Your FCC License... or Your Money Back!

By the time you've finished your CIE course, you'll be able to pass the FCC License Exam with ease. Better than nine out of ten CIE-trained men pass the FCC Exam the first time they try, even though two out of three non-CIE men fail. This startling record of achievement makes possible the CIE Warranty: you'll pass the FCC Exam upon completion of your course or your tuition will be refunded in full.

Before Ed Dulaney studied with CIE, he was a crop duster. Today he owns the Dulaney Communications Service, with seven people working for him repairing and manufacturing two-way equipment. Says Dulaney: "I found the CIE training thorough and the lessons easy to understand. No question about it—the CIE course was the best investment I ever made."

Find out more about how to get ahead in all fields of electronics, including two-way radio. Mail coupon for two FREE books, "How To Succeed In Electronics" and "How To Get A Commercial FCC License."

CIE Cleveland Institute of Electronics
1776 E. 17th St., Dept. EX-18 Cleveland, Ohio 44114

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Please send me without cost or obligation:

1. Your 40-page book "How To Succeed In Electronics" describing the job opportunities in Electronics today, and how your courses can prepare me for them.
2. Your book on "How To Get A Commercial FCC License."

Name_____ (please print)

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Occupation_____ Age_____

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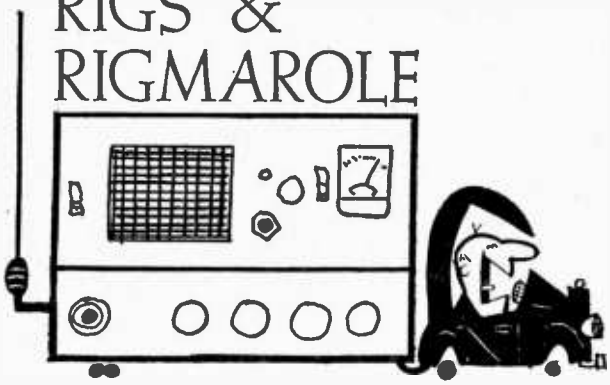
CB RIGS & RIGMAROLE



a what's new product column that's fun to read

■ **A Real Charmer.** No, the Cobra V isn't some kind of late model snake, it's a glitzy new CB rig which just blew on the scene from the windy city. The Cobra is right in step with the latest trends in CB gear—little in size, all transistorized, low cost, efficient; and it claims to be the first rig on the market with a "special protective circuit for transmitter components."

In the performance department, the Cobra V has transistorized transmit/receive switching (that means no moving parts and therefore less chance for mechanical failure when a tired old relay drops dead of fatigue). There's also a clever new *voltage filter* to improve the clarity of the signals inhaled by the Cobra V.

B&K Cobra V CB Transceiver

Running a whopping 100% modulated 5-watt input on any five channels, the set puts up quite a showy front with a walnut grain finish ('neath that frilly walnut finish is an all steel housing).

For those wise guys out there in the reading audience who come on strong with the fancy tech talk, we note that the Cobra V comes on strong with better than half a microvolt sensitivity (for 10 db S/N) and a selectivity of 6 db at ± 3 kc—O.K.?

You can get enough literature on the Cobra V to stuff a megacycle if you drop a card or letter to the manufacturer, B&K Division, Dynascan Corp., 1801 West Belle Plaine Ave., Chicago, Ill. 60613.

A Matchless Antenna? We've seen some wild looking things connected to the output of CB rigs but the Antenna Specialists MACH III makes the rest of them look like as tame as a tranquilized bunny rabbit.

Not knowing exactly how to describe it, the best we can do is simply parrot the description of the thing as stated by the manufacturer: "A spiral shaped, printed-circuit coil, waterproofed and shock-suspended inside a wing-shaped ornamental base." This all boils down to the fact that this circuitry is a "involute transducer" (wha?).

Now that the engineering is clear to you (because it certainly isn't to us) we can get into the performance of the little devil. It's a 32 inch steel whip, basically, set into a futuristic cyco-lac plastic base containing all of the sophisticated jazz we just told you about (don't ask us to repeat it please).

Available in a variety of mounting types (with or without shock spring), the MACH III is DC grounded for optimum SWR across the band. The antenna may be peaked up to your particular rig by means of an adjustment in the base.

Prices (depending on mounting hardware) range from $12 to $25. The folks who figured this one out are at Antenna Specialists, 12435 Euclid Avenue, Cleveland, Ohio 44106.

Palm Sized Yakker. Palm sized can mean the size of a palm tree, but in this case it's a miniature radio station offering 2 channel operation, superheterodyne receiving, push-pull audio, 9 transistor function circuitry, and it's all wrapped up under a $14.95 price tag.

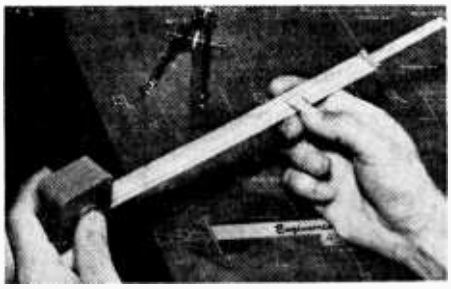
This rig is called the Lafayette HA-62, transmitting in all its tiny glory from a die-cast chrome highlighted front panel via a telescoping whip antenna. Put in a 9 volt battery and you can plug in an earphone and make like Jack Daniel's (or James Bond, or whatever that fellow's name is). Signals from the HA-62 will carry for a mile or two under normal conditions, and no license is required (and no age limit either).

One Of Our Aircraft Is Missing. Not long ago we suggested that walkie-talkie users might make good use of the Class C radio control channels which lie between the Class D CB channels—thereby avoiding harmful interference from their more powerful 5-watt brothers. Unfortunately we forgot to consider the possible effects on the radio controlled aircraft using these channels. A number of model fliers quickly brought this to our attention—mentioning several instances when a walkie-talkie became the instrument of destruction to a prized model aircraft; knocked it right out of the sky.

The aircraft folks will be moving to their new 70 MHz mc channels and perhaps we might hold off on invading their 27 MHz channels until they're all moved out. ■

Retractable Slide Rule

Very-small-pocket-sized (1¾ x 1¾ x 1 in.), this pocket slide rule extends to ten inches. The slide rule features *A*, *B*, C, and *D* scales with *B* and C scales folded in *D'pi* and *D pi* relationship to permit determination of circular areas and circumference by moving cursor only. Double-length sliding



B and C scales provide an endless feature formerly found on circular slide rules. Reverse side measures to 20 in. or its metric equivalent and lists basic equivalents, fan laws, power, trig and geometric formulas. Cost, $8.50; manufacturer, Cal-Tape, 1095 Kingston Park, Roann, Ind. 46974.

5-Band CB Receiver/Direction Finder

This transistor portable tunes all 23 CB channels on two separate bands, as well as police/marine/shortwave band, 1.5-4.5 MHz; low frequency beacon/weather band, 200-400 kHz; standard AM broadcast band. The "Nova CB" has an accurately calibrated rotating antenna and null meter, and is also a precision radio direction finder for boats and light planes. Priced at $149.95, Nova CB comes with leather carrying case, chrome mounting brackets, 3 telescoping whip antennas, batteries,

headphone jacks, miniature earpiece, pushbutton dial light, external power cord, house current adapter. Available at most stores or from Nova-Tech, Inc., 630 Meyer Lane, Redondo Beach, Calif.

Bass Guitar Speaker Systems

These speakers, PMC-1 and PMC-2, have been engineered to obtain maximum performance from bass guitar amplifiers. The 12-inch speakers have 2-inch diameter voice coils and 2-pound magnets. Both systems are about the size of a 2-suiter suitcase. The PMC-1 ($166.50) has a 12-inch woofer and handles 60 watts; the PMC-2 ($216.50) has two 12-inch woofers and handles 120 watts. Speakers made by Utah Electronics, 1124 E. Franklin St., Huntington, Ind.

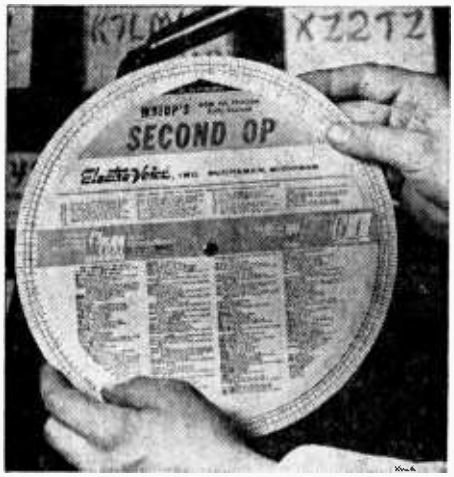
For Hams What Am

The DR-30 Communications Receiver is a solid-state, dual conversion superhet unit using field-effect transistors. The use of FET's in the RF stages make for greater sensitivity, better image rejection and exceptional freedom from cross-modulation or overloading on strong signals. All the circuitry is on 9 plug-in, glass epoxy modules; chassis is 3/16-inch thick aluminum. Complete ham-band coverage, 80 through 10 meters plus a portion of six meters; 9.5-10.5 MHz for WWV and 31-meter SWL

band plus provision for two optional crystals for additional frequency coverage. Selectivity positions 5.0, 2.1 and 0.5 kHz. Collins mechanical filter for SSB, operates on 12 VDC. Priced at $389.50 amateur net from Davco Electronics, Inc., PO Box 2677, Tallahassee, Fla. 32304.

Updated Second Op

Coincident with a rapid increase in good band conditions on most shortwave frequencies comes the revised, fourth edition of W91OP's Second Op. This is a simple DX computer on laminated card stock, giving beam headings to every country in the world from major geographic locations in the United States, immediate identification of prefixes including specific location of the prefix, time zone, continent, postage rates. Included on the periphery of the Second Op are provisions for logging contacts and receipt of confirmation. Send your name and address and $1.00 to Electro-Voice, Inc., Dept. PR-4, Buchanan, Mich. 49107 (or visit your local Electro-Voice distributor).



2—New Receivers—2

Both these new Hallicrafters receivers are AM/FM. The FM-66, shown on the right, has a hand-rubbed walnut cabinet, two built-in antennas, printed circuit chassis, and a 5-inch permanent

magnet speaker. It measures 14½ x 7½ x 5¾ inches, list price is $64.95.

And on the left, Model S-210 has 4 short wave bands as well as AM and FM. This one has "spread" tuning, accomplished by electronically spreading apart distant stations to relieve congestion, permitting highly selective tuning on 49, 31, 25 and 19 meters. Power supply is the same as the FM-66—105-120 volt, 60 Hz AC. Has 3 dual-purpose and 3 single-purpose tubes. The vinyl-covered metal cabinet is 14½ x 7½ x 5¾ inches, and the unit lists for $89.95. If you don't have a Hallicrafters distributor near you, their address is Hallicrafters Co., 4401 W. 5th Ave., Chicago, Ill. 60624.

Lit-Up Base Antenna

The "Speakin' Beacon" Citizens Band base station antenna is a 27 MHz omnidirectional coaxial antenna with a permanent-circuit neon light built into its tip. Whenever the transmitter is keyed, the neon tube glows, visually verifying the RF power output and acting as a beacon to help guide mobiles. A Stati-Light ball surrounding the neon tube dissipates static electricity and helps eliminate noise. The ball, part of the neon light circuitry, provides proper capacity to ground to generate necessary voltage to light neon when RF energy is present. The Speakin' Beacon is 19 feet, 3 inches, aluminum, built to withstand winds up to 80 mph, has its own built-in lightning protection, and can be installed anywhere a vertical pipe would fit. Gamma matched, it has exceptionally low VSWR. Model is M-148, CB net price is $29.95, source is The Antenna Specialists Co., 12345 Euclid Ave., Cleveland, Ohio 44106.

Switch Hi-Fi All Over the Place

If you want simultaneous distribution of sound to more than one stereo speaker system—say family room, den, etc.—up to eight different areas in any combination at the same time, Model 642 Sound Control Center is for you. Offices, schools, would be other applications. Model 641, on the other hand, has a positive interlocking feature between switch stations which insures that only one system at a time can be selected. Frequency response through the internal switching network is

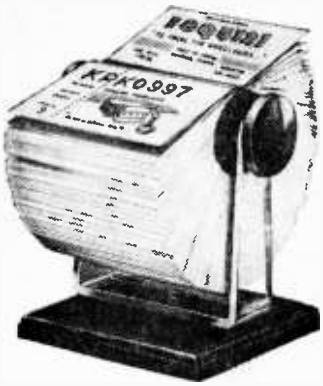
from DC to 30 kHz with negligible switching loss. No external power (other than audio power being distributed) is required for operation. Power handling capability is 100 watts maximum into a 4-ohm load. User net price for Model 642 or 641 is $49.50 from Switchcraft, Inc., 5555 Elston Ave., Chicago, Ill. 60630. Write for details and address of nearest distributor.

Hobbyists' Solid-State Kits

At popular prices, the do-it-yourselfer can now get hold of a wide variety of blister-packaged electronic kits as follows: EC-100 Siren Kit, $4.95; EC-101 Burglar Alarm Kit, $6.95; EC-102 Fire Alarm Kit, $6.95; EC-200 Intercom Kit, $3.95; EC-300 Audio Amplifier Kit, $4.95; EC-400 Metronome Kit, $3.95; EC-500 Tremolo Kit, $8.95; EC-600 Light Flasher Kit, $3.95; EC-700 "Mystifier" Kit, $4.95; EC-800 Photocell Nite Lite Kit, $4.95; EC-900 Power Supply Kit, $7.95; EC-1000 Code Oscillator Kit, $2.50. Shown is EC-1000. From EICO Electronic Instrument Co., Inc., 131-01 39th Ave., Flushing, N.Y. 11352. Each kit or group of kits may be the heart of your next home-brew project.

Flip Over Your QSL's

Luxury Model (SD) Rotary Card Holder comes with 200 see-through Mylar binders to hold 400 QSL cards. You have more? Relax, you can add more binders to hold up to 600 cards max. The luxury model has knobs and base of solid gunstock walnut and a 2-inch tapered Plexiglas frame and comes assembled in a gift box. Price—$24.95 postpaid. The Standard (S) model has plastic knobs and base, chrome frame, has Mylar binders for 160 cards, comes knocked-down for $9.95. Nordlund Radio Products, 7635 W. Irving Park Rd., Chicago, Ill. 60634.



Be Your Own TV Producer

A new closed-circuit TV camera, model SS-310, using less space than a telephone, is priced in the hobbyist range. Resolution at center of picture is 350 horizontal lines or better with monitors, and 300 lines or better with conventional receivers. The

camera circuit contains 19 silicon transistors, 2 germanium transistors, and 14 diodes. A clear picture can be obtained with a minimum amount of illumination, using f1.4 lens supplied with the camera. The SS-310 has an automatic electronic circuit that instantly compensates for wide and sudden lighting changes, assuring a clear picture under virtually all light conditions. Plug-in modular circuit boards facilitate replacements with a minimum of downtime. User price of the SS-310 with f1.4 lens, 25 feet of coaxial cable with connectors, is $289.95. Maker is Squires-Sanders, Inc., Martinsville Rd., Millington, N. J. 07946.

Transistorized Doorman

This pocket-sized garage-door controller, the Electro-Lift, opens, closes, locks the garage door

and controls the garage light from 100 feet away. Meeting FCC rules, the Electro-Lift uses a new radio coding system called pulse-tone modulation. The 2¾ x 3¾ x 1-inch, 10 oz. transmitter can be carried in purse or pocket, clipped to the sun visor or under the dashboard. The receiver fastens to the wall of the garage; not overhead as in other versions. The Electro Lift gives double protection

against mishaps with both pushbutton and automatic stop features; handles single or double one-piece doors up to 20 feet wide and 8 feet high, sectional doors up to 10 feet wide. The complete Perma-Power Electro-Lift system sells for $179.95, and is friction-driven (the Perma-Power model G-670 is a chain-drive unit). Available nationally, or write to Perma-Power Co., 5740 N. Tripp Ave., Chicago, Ill. 60647.

Self-Service Technician

Mercury Electronics has dolled up their new self-service tube tester 204 Series in modern blue and grey cabinet designs. The new units have a panel designed to accommodate over 1,700 tube types including the latest nuvistors, novars, compactrons, magnovals and 10 pin types. They also test fuses, pilot lights, 6- and 12-volt auto radio vibrators. Only two settings are required to test any tube, and a flip tube chart lists over 1,700 tube types. For positive contacts there are 68 phosphor-bronze and beryllium tube sockets. The Lo-Boy Floor Model 204LB is dealer net $209.95. Counter Model 204C is $159.95. Mercury Electronics Corp., 315 Roslyn Rd., Mineola, N. Y. 11501.

Low-Cost 4-Track Recorder

At a nice price ($89.95) the Model RK-810, Stock No. 99-1527WX, has 3 speeds with 4-track monaural/record and 4-track playback stereo with 5-position selector control for rewind, stop, run, fast forward and pause for instant editing. It has a self-contained 5-inch speaker, 3-digit tape counter with

New Products

reset button, stereo tape head output jacks, 2 inputs for mike and auxiliary. Response is 40-15,000 Hz at 7½ ips; 40-10,000 Hz at 3¾ ips. Signal-to-noise ratio is 40 db or better; crosstalk 55 db or better. Size is 11⅝ x 1¼ x 6⅔ inches. Takes 3- to 7-inch reels. Comes with dynamic microphone, 3 connecting cables, 2 rubber reel caps and 7-inch empty take-up reel. Textured vinyl case. Model RK-810 from Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, N.Y. 11791.

For Part 15'ers

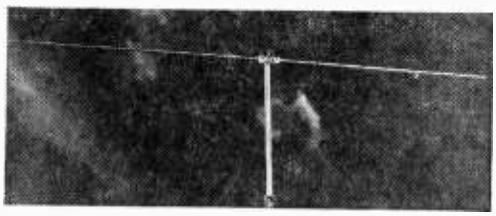
With the Rangemaster 100 mW transceiver comes a guarantee stating that it will outperform in range and clarity any CB transceiver not requiring an operator's license. Reason for claim? An additional RF amplifier stage for long range reception. Pluses: extra sensitive superheterodyne receiver; crystal-controlled transmitter and receiver with separate microphone and speaker for telephone-like operation; switch controlled squelch, telescoping 60-inch antenna. The Rangemaster can be used with AC base station or AC adapter. Over 200 mW audio output; better than 30 db signal-to-noise ratio; 18 db selectivity. Uses 6 Penlite batteries. Size 8 x 2½ x 3 in., weight 1½ lbs., price $39.95. For information: Claricon, 663 Dowd Ave., Elizabeth, N. J.

Magnetizer Demagnitizer

This beautifully simple little tool eliminates the need for special magnetized tools. To magnetize a screwdriver just insert into one of the holes in the Sure-Nuf. The screwdriver retains its new magnetic properties until it is drawn across one of Sure-Nuf's outside metal plates. This breaks the magnetic field, and voila! it's back in its non-magnetic state. Smaller than a cigarette pack and weighing less than four ounces, the Sure-Nuf's permanent magnets never need recharging. Retail price is $2.89 from New Enterprises Inc., PO Box 338, Reno, Nevada 89504.

Go-Anywhere Antenna

The Trik Stik (Model TS-1) antenna can be mounted vertically or horizontally anywhere, under any conditions, for the following applications: Citizens Band, business radio (low and high band), SWL, monitor, aircraft, Civil Defense, amateur, experimenter, television, FM. Assembly is accomplished in minutes for permanent installations, temporary stations or test purposes and complete instructions are supplied with measurements for setting Trik Stik to the correct dimensions for any of the services listed. Price is $6.45 and it comes from Cush-Craft, 621 Hayward St., Manchester, N. H. 03103.



Cardioid Dynamic Mike

The cardioid pickup pattern of Olson's new mike sharply reduces feedback in PA and recording applications. Model M-216 has a moisture- and heat-resisting hermetically sealed cartridge, durable cast metal case. Will fit any stand with ⅝-27

thread. Impedance, 50K ohms; response 100-12,000 Hz. Comes with 20-ft. shielded cable, diameter 1⅞-in., 4½-in. long. $14.98 from Olson Electronics, Inc., 260 S. Forge St., Akron, Ohio 44308.

Bargain Regulated Power Supply

Here's a bargain for the experimenter or service technician who needs a low-cost variable source of ripple-free regulated DC power. Model PZ-121, available in factory assembled or kit form, delivers stable, continuously variable output from 0-15 volts DC and usable currents to 250 ma. from an AC line. This compact (6¼ x 3¾ x 2 in.), solid-state

unit provides regulation better than ± 0.2 volts and AC ripple of less than 5 mv for outputs to 100 ma. Zener-reference model PZ-121 features burn-out proof circuitry and transformer isolated output. Price—a mere $13.95 in kit form, $19.95 assembled, from Viking Engineering of Mpls., PO Box 9507, Minneapolis, Minn. 55440.

20,000 Ohms-per-Volt VOM

Knight-Kit has a new VOM, model KG-640, listed in complete detail in Allied's 1967 catalog No. 260. The KG-640 has a total of 57 ranges starting as low as 0.8 VDC, covered by a positive-action range/function switch and range-doubler switch that virtually doubles the effective number of ranges. Repeatability of readings is promised by its rugged taut-band meter movement. No damage is possible to the protected movement, even with 1,000 times overload. The new Knight-Kit 20,000 ohms-per volt VOM, with test leads, batteries and detailed instructions, is priced at $39.95 in kit form, $59.95 assembled. Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

Ham Station in a Needle

By DICK FLANAGAN

■ **Many's the Ham** longing for a super skyhook, but Bob Ryan, W7GWA, isn't one of them. For Bob numbers among the operators of what may very well be the highest Ham station in the world, which, because of its unusual location, also boasts a skyhook to top all skyhooks.

Installed on the observation deck of the Seattle Space Needle some 550 feet above the city's rooftops, station WA7GBD is operated by the Space Needle Amateur Radio Club. And Bob, who is one of the club's 75 members, takes turns working Hams around the world from this strange Ham-station-in-a-needle.

Bob generally works 20-meter SSB, using a Drake TR-4 transceiver and a companion RV-4 remote VFO. Currently, the station is heard as far away as Japan, Brazil, and Russian Siberia. Even greater range and reliability are expected when the present 300-watt transmitter is joined by a kilowatt linear, which is now on order from Drake. When it arrives, Seattle's Ham-station-in-a-needle will be as powerful as any amateur station going.

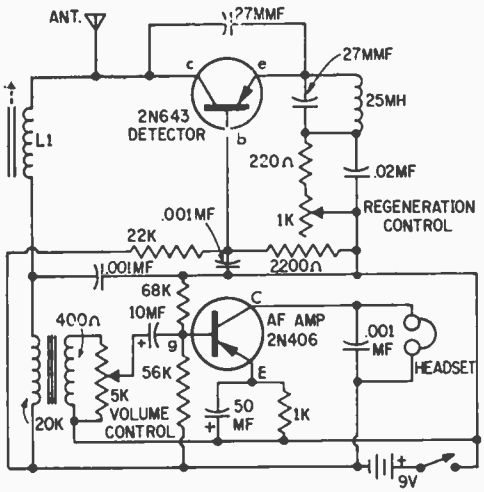
In spite of the Club's extraordinary offerings, there are no membership dues or other fees. The Space Needle organization simply issues free elevator passes to all members so they can have ready access to the station at any time. And since nearly a million people visit the observation deck annually, the public relations value of the station is thought to be excellent. Most of the visitors see the station in operation, frequently handling traffic from U.S. servicemen on ships and at bases overseas. ■

CW Monitor

How can I add a code monitor to my CW transmitter?

—C. C. S., Moody AFB, Ga.

While you could build an audio tone generator and key it simultaneously with your transmitter, you will not be actually monitoring your transmitted signal. To do so, all you need



is a simple regenerative receiver, operated in an oscillating condition, a grid-dip meter or a heterodyne-type frequency meter, such as the BC-221 which is available at military surplus outlets.

You can build a monitor using a circuit such as shown in the diagram. (The coil can be a plug in type so you can change coils when switching your transmitter from one band to another.) Just place it near the transmitter and tune in its signal, with the key down, until you hear a beat note. You will then be able to

monitor your transmissions. The oscillator is tuned by adjusting its ferrite core. An antenna may be connected to the antenna binding post, but is usually not necessary when near a transmitter.

Q-multiplier vs: Crystal Filter

My shortwave set employs a 1650-kHz IF. Would a Q-multiplier do any good, and where can I get one?

—R. N. K., Morton Grove, Ill.

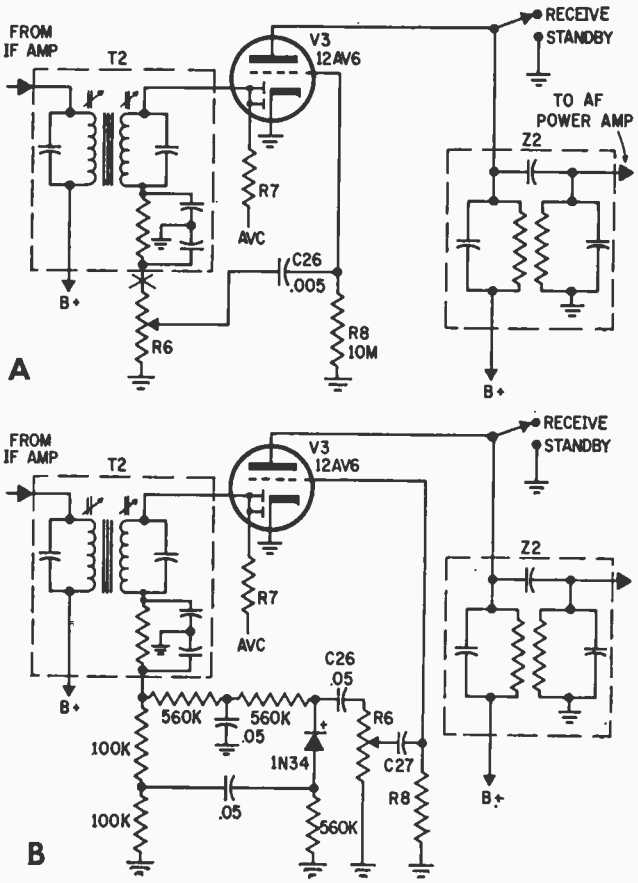
A Q-multiplier is most effective at relatively low frequencies, 455 kHz and below. For 1650 kHz, a crystal filter can be used to improve selectivity. It is inserted at the input of the IF amplifier. They are made by several companies, primarily for equipment manufacturers. One company near you, Niederman-Sherold, Inc., 4302 Warren Avenue, Hillside, Illinois, makes a 1650-kc crystal bandpass filter.

Add Noise Limiter

Can you give me a circuit for adding a noise limiter to my National SW-54 receiver?

—J. L., Seattle, Wash.

The original circuit of the detector and first-audio stage are shown in the upper diagram. Break the circuit at "X" and add five resistors, three capacitors and a diode as shown in the lower diagram.



QSL a Satellite

Is it possible to receive satellite signals from outer space on a shortwave set? If so, on what frequencies?

—C. B., Seattle, Wash.

Russian satellites transmit on around 20 MHz within the tuning range of most shortwave sets which usually tune up to 30 MHz. American satellites transmit on frequencies around 100 MHz. A special VHF receiver or a converter ahead of a shortwave receiver is required.

Mum's the Word

I have sent QSL cards to ship and marine coast stations I have heard, but have received no verification from them. Why don't they acknowledge my reports?

—A. R. T., Marysville, Wash.

You aren't supposed to send QSL cards to any but broadcast and amateur stations, un-

less you are requested to do so personally or by published invitation. An international treaty and the Communications Act make it unlawful for anyone to divulge the contents of any transmission, or even its very existence, from any class of station except broadcast or amateur.

Manufacturers' Radio Service

I recently read that 30 new low-power radio channels have been allocated in the 72- to 76-MHz band. Where can I get equipment for this band?

—R. K., Passaic, N. J.

It has been reported that Femco, Inc., Irwin, Penna, and Union Switch & Signal, Swissvale, Penna., will have equipment available for the 72- to 76-MHz band. However, these channels are restricted to those eligible in the Manufacturers Radio Service and may not be used for hobby or personal purposes.

Can or Will Earn?

How much can I earn as a radio-TV service technician? I have completed a correspondence course and have had experience building kits.

—E. L., Edmonds, Wash.

In your part of the country, union scale for a technician is $3.60 per hour and is supposed to rise to $3.75 in 1967. Some non-unions shops pay less, some more for an experienced man. New York subway crews earn as much. But, electronics can be more fun.

"How did a sweet kid like you get into a racket like this?"

Ask Me Another

Detector for FM, AM, CW and SSB

How can I modify a communications receiver to work on FM as well as AM, CW and SSB?

—R. H., Seattle, Wash.

You can replace the AM detector and first AF stage with a gated-beam tube (such as 6BN6) using the circuit shown in the schematic diagram. The existing IF transformer feeds the control grid of the tube. When S1 is set to AM and S2 is set to F (for fast AVC response) or S (slow AVC response), the grid and cathode function as a grid leak or diode detector and the rest of the tube functions as an AF amplifier. AVC voltage is developed across R2-R3 and is tapped off at their junction. Diode D1 prevents AVC action until the signal reaches a satisfactory level. With S3 open, the positive bias on the quadrature grid can be varied with R1 for minimum audio distortion.

When S1 is set to SSB/CW, the signal from the receiver's BFO (beat frequency oscillator) is fed to the quadrature grid to form a product detector. AVC attack time can be selected by setting S2 to F or S.

For FM narrow band reception, S1 is set to FM and C1-L1 are connected to the quadrature grid to form a gated-beam discriminator. By setting S2 to the *None* position, AVC is cut out and the tube also functions as a limiter. Closing S3 makes it possible to vary the cathode bias on both the control and quadrature grids with R1 for maximum sound recovery and best limiter action. The quadrature coil (L1) is tuned to the same frequency as the receiver IF and trimmed for maximum FM audio recovery.

High-Frequency Problem

I have a (Brand X) 4-tube superhet shortwave receiver which has good selectivity and sensitivity up to about 14 mc. But, from there up to 30 mc, it lacks the ability to pull in all but the very strongest signals. Would the addition of a preselector solve this problem?

—C. L., Brantford, Ontario

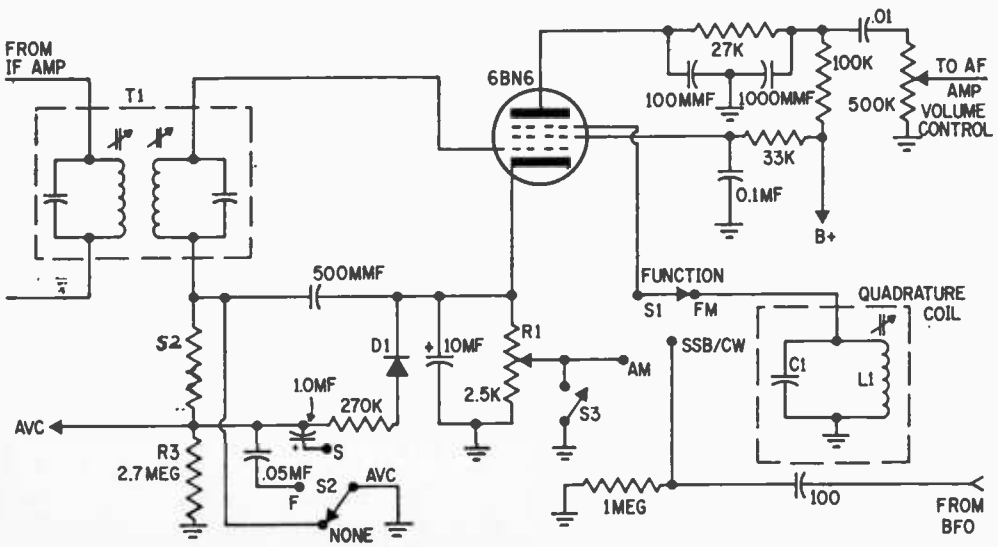
Have you had the tubes checked on a critical tube tester? Try new converter and IF-amplifier tubes. Also adjust the highest frequency band RF trimmer when tuned in to a CB or 10-meter ham station and again when receiving the weakest signal you can tune in. If you have or can borrow a signal generator, realign the IF transformers. *Be sure to use a proper outdoor antenna.* A preamplifier (preselector) would help, but it doesn't sound as if you were getting all of the performance that was designed into your receiver.

Sure Mike!

Can you give me the address of a company that produces a transceiver-type mike for ham transmitter use?

—L. Dec., Austin, Texas

Roanwell Corp., 180 Varick Street, New York, N. Y. 10014 makes mikes of this type. So do many others including Electro-Voice, Turner and Sonotone. Try your local electronics-parts distributors who should have them in stock.



A Hot Note

I recently read in Variety that a musician was killed as a result of electrocution while playing an electric guitar. How can this happen?

—H. H., Van Nuys, Calif.

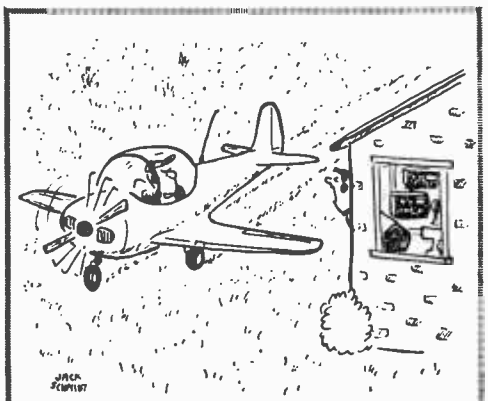
He must have been in a bathtub or standing on a wet floor when it happened. Alvino Rey and others have been playing electric guitars for years with no ill effects. The danger of electric shock can be great under some conditions. For example, a skindiver, who was testing an underwater TV camera in Al Ogilvie's swimming pool in California would have been electrocuted when he took the camera into the pool if it hadn't been noted that the camera was "hot" to the touch when the camera was handled at poolside. Grounding the shield of the camera cable saved the skin diver's life. The camera was "hot" because of the line-filter capacitors in its power supply which put the case about 60 volts above ground potential. The same hazard exists with TV sets and hi-fi devices. Moral: Don't touch any appliance connected to the AC line when bathing.

Crystal vs. Mechanical

Would you please tell me how to connect a mechanical filter to my communications receiver (diagram enclosed)?

—J. B., Topeka, Kansas

Your set already has an adjustable crystal filter whose bandpass or selectivity can be varied. You don't need a mechanical filter. Receiver design engineers are still arguing which is better, a crystal filter or a mechanical filter. They're both good. If I were you, I'd keep what you have.



"I wasn't calling you! I was telling my kids to 'come on in, quick'!"

Ask Me Another

Does it Pay?

How can I boost the input power of my 5-watt, 2-meter transceiver to 75 watts?

—L. B., Morton Grove, Ill.

Get a linear amplifier. Connect its input to the output of your transceiver and the antenna to the output of the linear amplifier which should have internal antenna switching facilities. However, you can quadruple your effective radiated power by installing a 6 db gain antenna which costs less than a linear amplifier and won't increase your electric bill. Call AM 2-2903 in Chicago and ask for Griff. He's near you and can tell you what kind to use, where to get one and for how much.

Just a Minute

In one of your articles about building a novice antenna loader, a B & W Miniductor coil form was specified. Where can I get one?

—D. P., Cuyahoga Falls, Ohio.

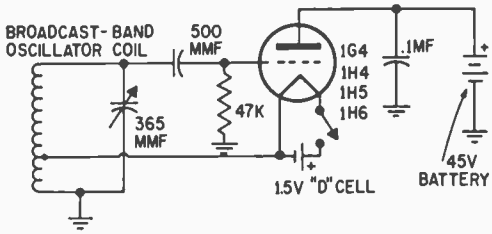
It is made by Barker & Williamson in Bristol, Penna. If you can't find it at your local radio parts store, write to Mr. A. Consalvi at B & W.

Carrier for Frequency Standard

How can I recover the unmodulated carrier from an AM broadcast station so I can use it as a frequency standard?

—J. T. H., Pittsburgh, Pa.

Rig up an oscillator using a circuit such as the one shown in the diagram. Place it near an AM broadcast receiver and tune in a station at the desired frequency. Then tune the oscillator close to the broadcast-station frequency so you will hear an audio beat (whistle). Carefully tune the oscillator for zero beat, the point where no whistle is heard. You'll have it set right if you get a whistle when you turn the tuning capacitor either way. When set to zero beat with a signal of known frequency, your oscillator will be within a few cycles of that frequency.

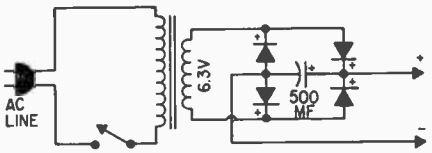


9-Volt Battery Eliminator

Can you give me a circuit for an AC power supply for replacing a 9-volt transistor battery?

—P. C., Helena, Montana

Four 1N1693 or similar diodes, a 6.3-volt filament transformer and an electrolytic capacitor, connected as shown in the diagram, should do the trick. The no-load voltage should be around 9.8 volts which will drop somewhat under load.



Engineering Takes Years

I want to assemble a transistor radio capable of receiving radio signals in Canada from radio stations of Indo-Pak Subcontinent, especially the following: All India, Radio Delhi, Radio Pakistan Karachi, Radio Lahore (Pakistan), Radio Sirinagar (occupied Kashmir), Radio Jammu (occupied Kashmir), Radio Jallunder (Panjab, India), Radio Ceylon (commercial station operated from Bombay, India), Radio Dacca (Pakistan) plus local longwave stations. If it is possible, could you please draw a diagram and advise equipment to be used to produce a "perfect model."

—A. A., Vancouver, British Columbia

If it were possible to give you a diagram of an all-transistor, all-wave receiver meeting your requirements, we would do so gladly. There is such a receiver on the market (National) but it costs more than $1,000. It probably cost the manufacturer more than $100,000 and several man-years to design it. While we could dream up a diagram, there are countless other problems you would have to solve yourself. It would cost you a great deal in money and time with no assurance of satisfaction. As a compromise, you might consider Lafayette's 11-band portable at around $160 or Zenith's Transoceanic, ready to use.

Filter vs Crystal

Please don't make fun of the use of a mechanical filter with a "Q" multiplier. I have a Hammarlund HQ-100 with a Lafayette mechanical filter and the results are excellent. Adjacent channel QRM is much reduced and stability is considerably improved. For CW reception it cannot be beat for the price.

—R. C., Manchester, N. H.

Of course a mechanical filter is a good device. But, in a receiver which already has a crystal filter, why add another one? Since your receiver does not have a crystal filter, the addition of a mechanical filter makes sense.

☆☆

SWL Skywire

I am a beginner SWL. What is the best antenna setup for 10-160 meters?

—M. B., Toronto, Ontario

Start out with a 50-foot wire antenna. Allied Radio in Chicago offers a complete antenna kit for 98 cents. You should be able to get one in Toronto for not much more. Later, as you get more experience, and if you have adequate space, you can use something more exotic.

Dig for Tunnel Diode

I can't find a TD-1 tunnel diode for use in the TD-FM radio described in a recent issue. What other type can I use?

—L. A. R., Detroit, Mich.

Get a GE 1N3712. It sells for $3.75.

Don't, If You Don't Know

I have 3-phase, 3-wire, 220-volt power. I have a machine which operates from a 220-volt, 2-wire circuit and ground. Can I connect it to two wires of the three-phase circuit and run a ground to the water main?

—W. O. S., Niles, Mich.

If the ground lead is used only for grounding the frame of the machine and is not actually connected to the 220-volt line, OK. Otherwise, you may need a star-to-wye transformer. Before you do anything, consult the power company.

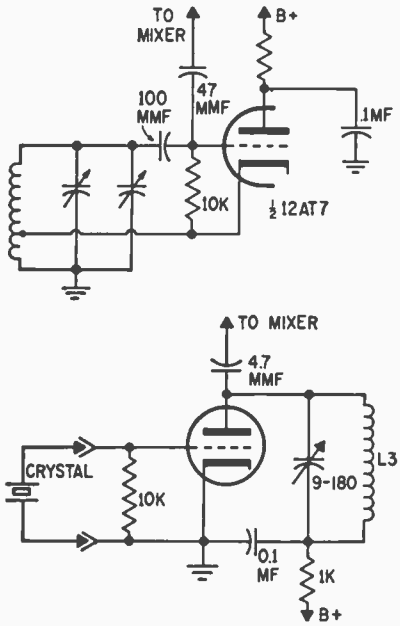
Ask Me Another

VFO or Crystal?

How can I install a crystal in my 30 to 50-MHz band FM receiver for receiving on 39.46 MHz?

—A reader, Someplace, USA

The first diagram is the circuit of the oscillator stage of your set, according to the schematic you sent. The second diagram is the modified circuit. Use the same oscillator coil tuned by a trimmer capacitor. Disconnect the oscillator section of the main tuning capacitor. You still use the tuning dial to tune the RF amplifier and mixer to 39.46 MHz. For that frequency, use a 28.76 MHz crystal.



It's a Boo-Boo!

When watching TV commercials I have noticed that a commercial will come on for a second or two and then there is some kind of a switch. The commercial comes back on but at the beginning instead of at the point where it was interrupted. Do TV stations or networks run two films of the same program at the same time, with one as back-up?

—W. A. W., Huntington, West Va.

Checking with a major TV station in New York City, it was learned that no back-up film is used. In case of failure, the operator probably winds the film back up on the reel and reruns it. Thus, you will see it from the beginning. Even though film problems do sometimes arise, station and network executives often let operators know that "it will not happen here." . . . but it does—sometimes.

OCR for ZIP

What is OCR and what is it used for?

—N. K., Philadelphia, Penna.

One meaning of OCR is *optical character recognition*, a technique for reading printing and written matter electronically. In one system, each character is looked at quickly by a flying-spot scanner, a kind of TV camera. What the scanner "sees" is sent in the form of electrical signals to logic circuits which identify the character and send a digital signal to a computer. For example, the logic circuitry can determine the difference between a handwritten lower-case E and a lower-case L. Both look alike but one is taller. OCR systems are used to read accounting forms and other documents as well as the ZIP code on letters.

Ceylon to a "T"

What make and model shortwave set might be capable of receiving Radio Ceylon on 11,800 kHz here in California?

—G. G., Davis, Calif.

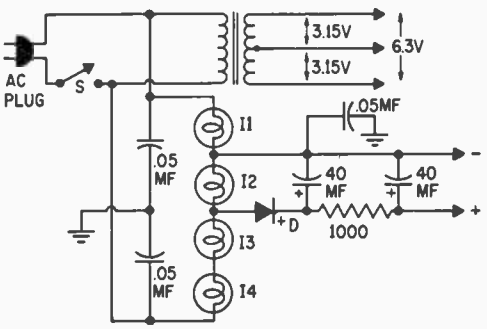
Almost any sensitive superhet shortwave receiver that can be tuned to that frequency should be able to pickup the signal when it is bounced your way. However, the set should be equipped with a good outdoor antenna.

B-plus and Filament Power

Is it possible to build a AC-power supply furnishing 22.5 to 30 volts DC and 6.3 volts for a radio using a 3AU6 tube?

—T. L., Springfield, Ohio

You can use the circuit shown. The transformer furnishes 3.15 and 6.3 volts AC. Plate voltage is obtained from the AC line through a voltage divider composed of four No. 327 pilot lamps. According to the RCA Receiving Tube Manual, a 3AU6 tube requires 3.15 volts, not 6.3 volts, for its filament, as does a 6AU6.

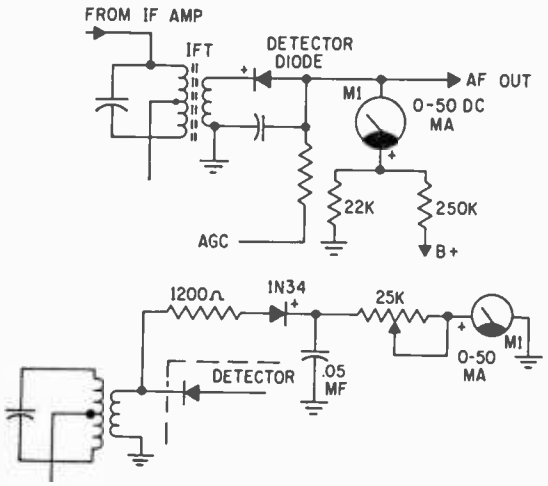


Solid-State S-Meter

Can you tell me how I can add an S-meter to a transistor shortwave receiver?

—A. D., Utuado, Puerto Rico

If your receiver has AGC, you can use the circuit shown in the first diagram. You will have to reverse the meter leads, depending upon whether the set uses *pnp* or *npn* transistors. On the other hand, if your set does not have AGC, try the second circuit. Resistance values are approximate since it would be necessary to have a schematic of your set to determine exact values.



Now You Know!

In your White's Radio Log, you don't list police, fire and other non-broadcast stations. Why not?

—J. B., Avon Lake, Ohio

There are more than 1,500,000 police, fire and other radio communications stations plus countless mobile units. It would require several books to list them all. They are listed in the several volumes of The Radio Registry published by Radio Magazines, Inc., Box 629, Mineola, N. Y.

Skirling Got Ya' Whirling?

On my shortwave radio I hear tones which sound like bag pipes. What are they and what is their purpose?

—M. E., Brooklyn, N. Y.

They are undoubtedly tones used for remote control or telemetering. In what is known as tone multiplexing, two or more tones may be transmitted simultaneously, producing unusual sounds.

How About That?

One of our local stations is on FM but still operates on AM even though it was told not to operate on the AM band by the FCC. Why doesn't its owner obey the FCC?

—J. W., Cleveland, Ohio

Believe me, the station would not be operating in the AM band if it didn't have a license to do so. Many broadcasting companies use the same program material, simultaneously, on both AM and FM transmitters. The FCC now requires FM outlets to broadcast (a portion of their broadcast day) separate (different) programs.

Van de Graaf Measurements

How can I measure the amperage and wattage of my Van de Graaf electrostatic generator? The instructions list only the voltage.

—T. T., Iselin, N. J.

The current is infinitesimal. Otherwise, the device would be dangerous. While it might be possible to measure the current, it wouldn't be worth the required investment in instruments. Why not ask the manufacturer who may have made the measurements in a laboratory?

Aero Bander Not for FM

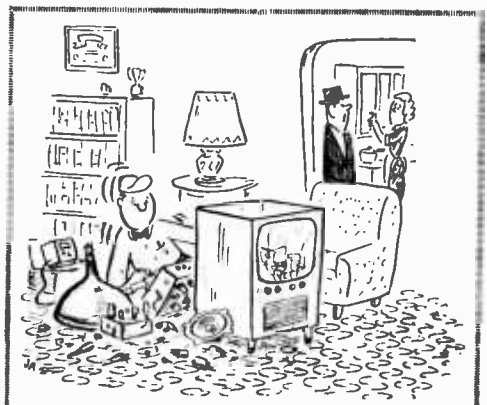
How could I modify the Aero Bander to receive the FM broadcast band?

—M. A. F., San Antonio, Texas

Your AM radio would not demodulate the FM signals.

That's an Iffy Question

If a spacecraft could be built that could go faster than radio waves, it could overtake and intercept radio waves from the past. Right? What would happen if the radio signal and the



"Did the man show up to fix the old set in the basement?"

receiver were both traveling at the same speed?
—E. S., Garden City Park, N. Y.

I guess it would continue to receive the same thing like "Johnny One Note" or a pickup stylus stuck in a record groove.

Needle Sticks?

I have an Armaco AR4 VOM with a 95-microamp meter movement. Whenever the test leads are shorted (for the resistance test), the needle moves to only a point somewhere between one-quarter and one-half scale position. Battery voltage and all resistors seem to be OK. What could be the problem?
—W. J. L., Toronto, Canada

Still sounds like resistor or battery trouble. Even if the resistors pass current and look OK, they could have changed in resistance value.

TV or Not TV

How can I convert an old TV set into an oscilloscope?
—M. S., Amherst, N. Y.

It wouldn't be worth the trouble. You can buy a scope kit for about $80 and you will get much more benefit from it.

Swing It

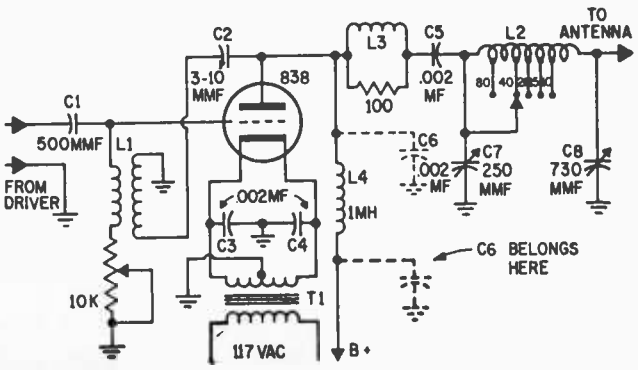
I have an old 0-1 milliammeter. The needle swings quite some time before it comes to rest. What can I do about it?
—H. W. B., Bonarlaw, Ontario

Sounds like it needs mechanical repair and adjustment, which could be expensive at today's skilled labor rates. Since a new meter costs so little, why don't you get a new one?

RF Amplifier Doesn't

I recently built a class-C RF amplifier which does not amplify. Diagram is enclosed. When I feed 10 watts into it, I get about 5 watts out. Also, I get RF output at the input but not at the output of the pi network. Yet, the pi network still has a tuning effect. What is wrong?
—J. P., Ogden, Utah

Looking at your diagram, it appears that C6 is connected to the wrong side of RF choke L4. If actually connected as shown, the plate of the tube is bypassed to ground for RF. Connect C6 to the B+ side of L4.



Try, Try Again

How can I identify kind and rating of an assortment of semiconductors and transistors of assorted shapes and no marking?
—G. W. B., Lancaster, Calif.

Is it going to be a boy, girl or an it? That's the way it is with transistors. When they reach the end of the production line, they're tested and marked to indicate what they turned out to be. You could spend hours running tests on your diodes and transistors and trying to match them up with the specs on umpteen thousand types. Just try them in circuits. If one doesn't do what you expect, try another one.

Brand X Does It Again

I have a noise problem with my two identical (Brand X, Model Y) CB transceivers. It is so bad that it is almost impossible to receive anything except over very short distances. I have tried using them both as a mobile unit and a base station, but both are just as noisy in either application. Can you give me a circuit for a noise limiter I can add?
—P. L. McG., Knoxville, Tenn.

Looking up the circuit of your sets we find that a noise limiter is included and the sets should be very sensitive, the latter accounting for the noise. You probably live near a busy street and pick up ignition noise from passing cars. Try moving your base antenna away from the street and, in your car, suppress the noise at the source with adequate suppression devices.

Canadian Ham

Can you tell me where I can get a radio amateur license in Canada?
—R. M., Lacombe, Alberta

Write to the Department of Transport in Ottawa. They can furnish you the address of their nearest field office.

(Continued on page 35)

Ask Me Another

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Continued from page 32

Using SCR's

Can you tell me where I can get a schematic and parts list for a 1500-watt light dimmer using two SCR's back-to-back and for operation from a 115-volt 60-cycle AC source?

—J. A. W., Ridgeway, Ont.

Write to either General Electric, Rectifier Components Dept., Auburn, N. Y. or Westinghouse Electric Corp., Semiconductor Division, Youngwood, Penna. Their application engineering departments should be able to suggest a circuit. Also you might get a copy of the GE SCR Manual or the Westinghouse SCR Designers Handbook. Both are available from the respective firms at $2.00 each.

Knee-High to a Brass-Pounder

What is the age limit for an amateur radio operator license?

—C. S. C., Queens Village, N. Y.

There is no age limit. There are quite a few young hams. I got my general class ticket when I was 14, which was a long time ago.

Brass-Pounders Delight

Can you tell me who, if anyone, is interested in old Morse telegraph equipment?

—C. A. N., New York City

The Toledo Morse Chapter is collecting antique telegraph equipment. Leon C. W. Kettring, 1118 Clymena Drive, Toledo, Ohio, is head of the organization's procurement committee.

Biggest KW?

What is a California kilowatt?

—D. W., Palo Alto, Calif.

A *California kilowatt* is a ham expression for transmitters allegedly employed by some hams in California that operate at much higher power than the legal one-kilowatt limit. Such operation is illegal, but it is said that it is practiced by some. Since everything is supposed to be bigger in California than elsewhere, so are some ham rigs, they say. ■

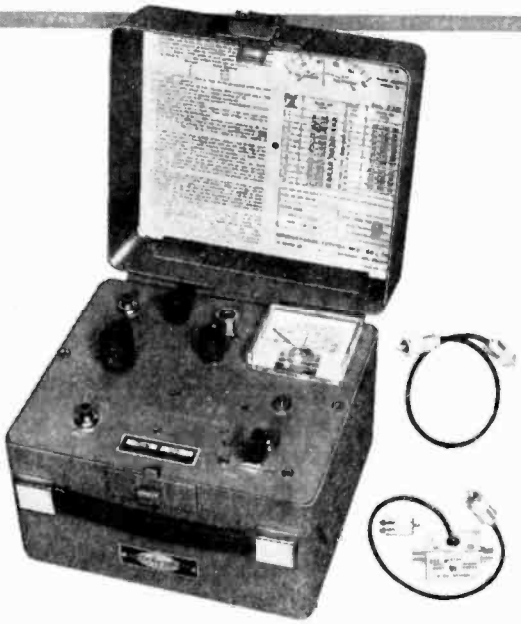
If You Service Citizens Radio Transceivers . . .

you should have

AN INTERNATIONAL

C-12B

FREQUENCY METER



Four Instruments In One

The C-12B is more than a frequency standard — it measures power output, measures AM modulation, and is a signal generator . . . all self contained in one convenient unit.

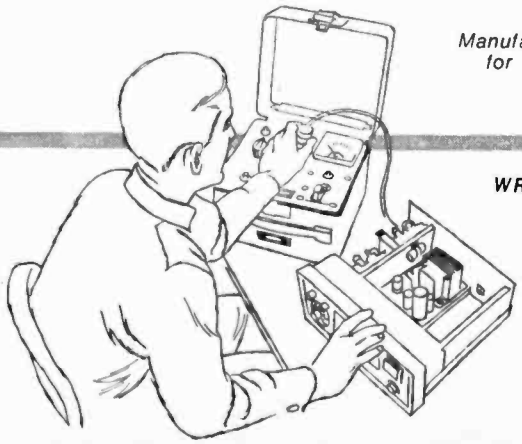
check these features!

- *Frequency Measurement* — Range 26.965 mc to 27.255 mc. Frequency stability ± .0025% 32°F to 125°F; ± .0015% 50°F to 100°F.
- *Power Measurement* — 0 to 5 watts, accuracy ± ¼ watt.
- *Counter Circuit* — Frequency range 0 to 3 kc. Residual error 100 CPS @ zero beat.
- *AM Modulation Measurement* — Range 0 to 100%. Accuracy 3% @ 400 CPS @ 80% modulation.
- *Signal Generator* — Frequency range 26.965 mc to 27.255 mc. Low output 1 microvolt through special pick-off box furnished with meter. High output 100 microvolts through output jack.
- *Panel Controls* — Channel selector, 24 positions • "Hi-Lo" frequency adjust • RF level control • Modulation set • Power • Meter calibration adjust • Function selector, 7 positions • Modulation • RF • Deviation • Calibration • Battery Test "A" • Battery Test "B" • Battery Test "C".
- *Battery Power Required* — 1½ vdc @ 60 ma, 67½ vdc @ 5 ma, 9 vdc.

The C-12B is capable of holding 24 crystals and comes with 23 crystals installed. Everything you need including connecting cable, PK box, dummy load, and batteries.

Cat. No. 620-101 ..... $300.00

Manufacturers of precision electronic products for home, industry and aerospace needs.



WRITE FOR COMPLETE CATALOG

INTERNATIONAL

CRYSTAL MFG. CO., INC.

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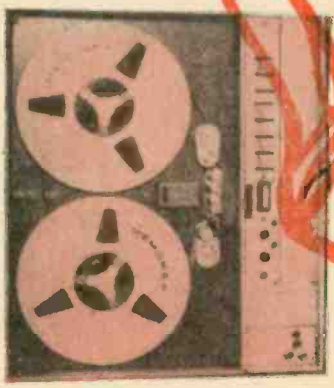
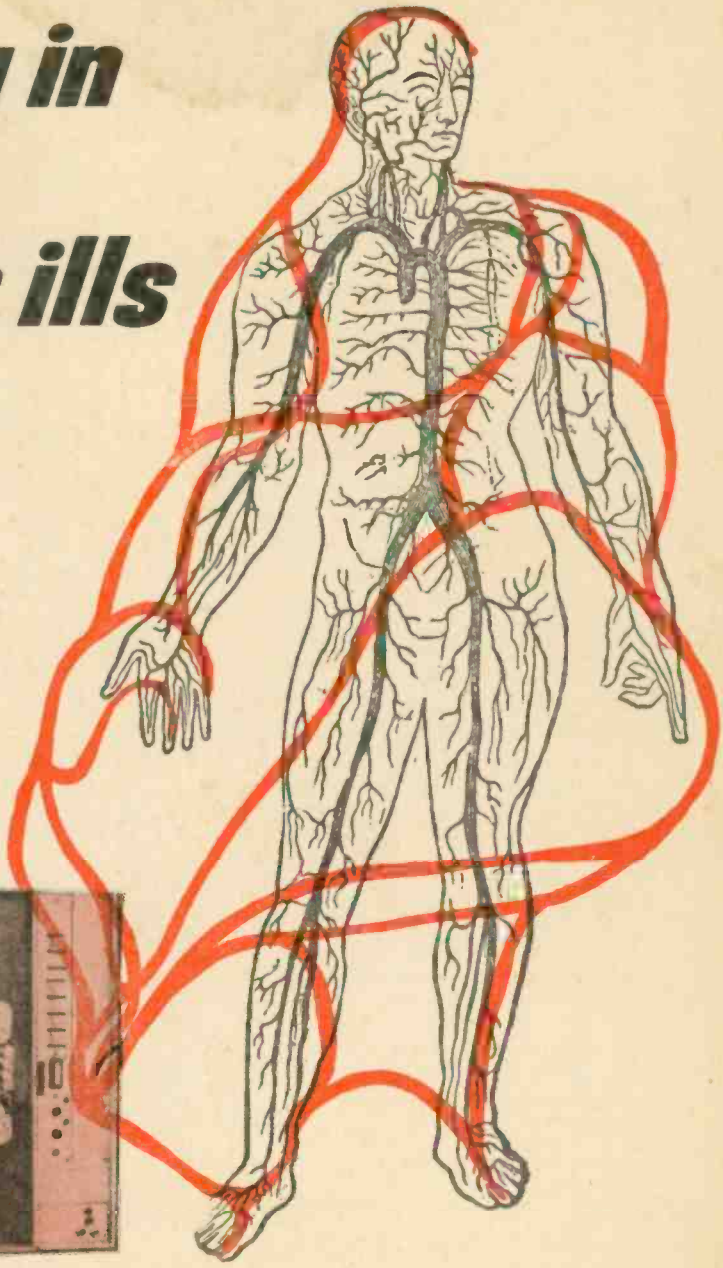
Tuning in on the body's ills

By K.C. Kirkbride





■ It all started with a pill, a pill that was a radio station, a radio station that could transmit "news" direct from a human stomach. The pill was followed by a camera, a camera so small it could be swallowed and photograph a man's stomach in living color.

At first, no one took these tiny pioneers very seriously. For at the time medicine appeared to be in one corner, electronics in another, and the two weren't going to pull off any full-fledged marriage for a long time—if ever. But that was before man began to seriously consider the fact that his brain, nervous, and muscular systems are all electrical. And if man himself is electrical, why not his repair and diagnostic systems? *(Continued overleaf)*

Tuning in on the body's ills

This realization led to a new science called biomedical engineering, a discipline that combines electronic with medical techniques, sometimes borrowing from space and military research to create new diagnostic wonders. One day soon such marvels may rule out the hit-or-miss human error that has characterized medicine up to our time. Come that happy hour and current medical techniques may seem as medieval as when man applied leeches to cure his aches and pains.

All One. Now being introduced in major hospitals is a master six-unit electronic medical internist built by Honeywell. Its big claim to fame is the fact that it can instantaneously record eight types of information about a patient and show them on a 17-in. screen.

ECG, EEG, EMG, PCG, and other electrodes sensing surface and below-skin changes show heart, brain action, and skin temperatures on a television screen to a doctor as he operates. This new system's sharp-focus screen is so bright it can be seen 20 feet away. And the device promises to eliminate much of the hazard in surgery as well as store vital information for later consultation and record.

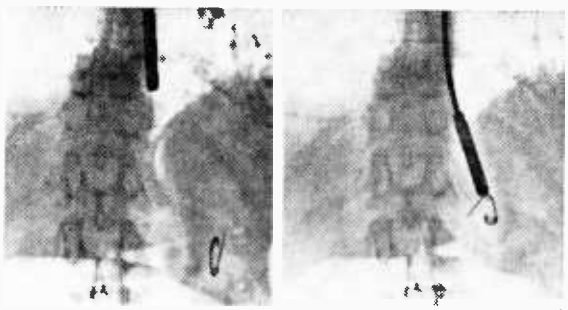
Life Savers. Not as comprehensive but already a veteran of 250 neurological operations is an IBM-Mayo Clinic system on duty at St. Mary's Hospital in Rochester, Minnesota.

To monitor patients, electrical detector signals are converted to digital coding, processed and printed out on a special typewriter to be scanned by a closed-circuit TV camera. The machine will show a patient's heart and breathing rates, arterial pressures, and body temperatures on a 14-in. screen while an operation is in progress. Meanwhile, a 5-in. satellite oscillograph set up near the patient will give automatic electrocardiograph readings.

Warnings. Another team of Advanced Systems engineers borrow techniques used to analyze missile status before test firing. Their purpose: to have "early warning" of changes in a patient's condition before clinical signs appear.

Sensors relay information to an IBM 1800 computer, report on an operating room screen warning of changes that could bring on an emergency in the seriously ill.

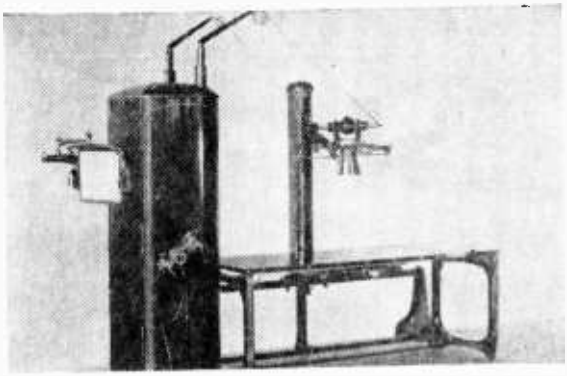
Nuclear. Still another biomedical life-

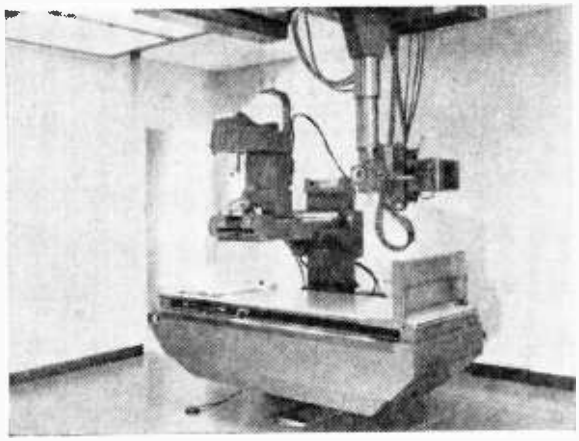


New medical tool developed at General Electric Research Laboratory is switchable magnet that can be turned on and off at will. Inserted gently down patient's throat (left), device is steered under fluoroscopic guidance to spring of open safety pin, then switched on. Pin can now be turned around and cautiously removed blunt end first.

Both permanent and electromagnets are represented in GE's new devices for retrieving swallowed ferrous objects. When permanent-magnet instrument being held by Miss Betty J. Drumond won't suffice, "steerable" magnet held by Dr. Fred E. Luborsky is called on to recover objects from previously inaccessible regions of the stomach.

Some advances in medical electronics fall in the evolutionary (rather than revolutionary) category, with recent improvements in X-ray equipment a prime example. X-ray installation at right dates from the late '20s and consists of a vertical fluoroscope in conjunction with a radiographic table, with the same power source being used for each. Note that over-table tube is still of the non-shockproof type, with exposed high-tension leads.





Modern X-ray installation (at left) conceals X-ray tube in rayproof body of enclosed table, while image is now made thousands of times brighter by means of image intensifier on deck extending across table. Further, over-table X-ray tube is supported on telescoping column, in turn suspended from overhead carriage traveling on ceiling racks. Resulting arrangement permits rapid positioning and angulation of X-ray tube.

saver supplying emergency information is nuclear. A surgeon may need to know before an operation if a patient needs a transfusion, what kind of anesthetic may be best, and whether or not the heart is getting enough blood.

To answer these questions, Picker X-Ray built a machine it calls a "Hemolitre." This unit shows just how much blood is circulating in a patient, information that can mean the difference between life and death in heart cases, serious surgery, or an automobile accident emergency.

Picker does it by tagging a small amount of serum with a radioactive substance such as Iodine 131 which is then injected into a patient's bloodstream. A few minutes later, a small sample of blood is withdrawn. The Hemolitre then calculates the radioactive potency of the blood before and after the injection, as well as the radioactivity of the serum itself.

This information is then fed into a computer which spins its electronic gears and ultimately reveals what the doctors want to know on its front panel.

Chair Is Examiner. Philco isn't that formal. Their engineers at Western Development Laboratories division at Palo Alto, California, have developed a diagnostic chair. Once a patient is comfortably seated, the chair picks up respiration rate, pulse rate, heart sounds, and electrocardiograph readings, then records the data on graph paper—all without the patient's knowledge!

While the Philco sensor chair borrows its tricks from space research, a new development at RCA was once in the Army. The image amplifier, adding amplification and TV skills to the already powerful electron microscope, is a direct descendant of the World War II "Snooperscope." Combined with an image orthicon, it gives 50,000 times the light gain of the conventional studio camera.

The very intense intensifier can now see and record images too faint to be seen by an electron microscope alone, and it will even record them for TV tape or film playback. Honorary RCA Vice President Dr. Alfred N. Goldsmith calls the new amplifier "among the most powerful and useful electronic de-

Tuning in on the body's ills

Electronic medical system devised by Honeywell (right) can simultaneously measure, record, and display a wide range of functional changes that can occur in any patient. Main elements of system are KP-731 multichannel oscilloscope (top right), 1508 Visicorder (middle right), and 8100-II FM portable tape recorder/reproducer (top left). Also recording data for later playback is the Mayo Clinic-IBM radiation scanner (below, right). Unlike ordinary scanners which produce a paper chart or film image, the Mayo-IBM system records all data on magnetic tape for computer processing, thus giving doctors a clearer view of images painted by radioactivity.

vices for biomedical applications known." Dr. Goldsmith is so enthusiastic about the amplifier he hopes we will one day improve electron-optical powers to the point where sequences of nucleic acids will be seen, classified, and their significance visually decoded.

Living Color. Probing even more deeply into human body secrets is the Picker Magna-Scanner, a new machine that will scan inner organs and glands in both black-and-white and color. Mounted on the end of a beam on a scanner that can be rolled across the room and wheeled right up to a patient's bedside, the machine scans radioactive material inside the body.

A photorecorder picks up a black-and-white picture of the organ or gland involved at the same time a multicolor dot recorder pictures the same areas in eight colors. The two systems, black-and-white and color, are designed to supplement each other, showing different versions of the same organ to the diagnosing doctor.

Already in use at Cedars of Lebanon Hospital in Los Angeles, the scanner pictures a patient's liver, spleen, pancreas, parathyroid, brain, heart, lungs, thyroid, kidneys or spine.

Sound Tells. Sound waves can diagnose, too. Doctors at the Albert Einstein Medical Center in Philadelphia say a good many elderly patients cannot take prolonged X-ray examination, so a medical-engineering team

built a machine that scans people with sound waves. High-frequency sound cites vascular disease, particularly hardening of the arteries, by photographing an artery blocked by deposits or harmed by an aneurysm.

Ultrasonic waves at a frequency of about 2 MHz reflect from body tissues, register an image on an oscilloscope, and are then photographed for future records.

Skin Changes. Even a more revolutionary diagnostic tool is one that spots disease by skin-temperature changes.

Called thermography, the technique hinges

Device above records knee motion, passes findings on to computer for analysis. Knee in photo is model.

on the theory that the average internal temperature of the body remains pretty much unchanged if a person is healthy. Skin temperature, in contrast, fluctuates, depending on both internal and external factors.

At the Einstein Medical Center, physicians scan skin surfaces with infrared radiometers to cite internal disturbances. The method calls for rapid, high-resolution infrared scanners and very basic scientific know-how to be able to accurately analyze. But in spite of the revolutionary aspects of the new technique, it has already won its colors by early detection of some types of cancer and vascular troubles.

Model Organs. For the new electronic internists to completely rule out diagnostic error, the modern doctor applying the techniques must know more about the workings of the human body, still enigmatic in many respects. This information IBM and University of Mississippi School of Medicine engineers and physicians try to supply. Borrowing from space science they successfully simulate body organs with a computer.

Feeding all known information along with mathematical descriptions of body organs and systems into analog and digital computers, they simulate such organs as the human lung, kidney, and heart.

One model of a kidney has already afforded doctors a clearer comprehension of the relationship between kidney function and high blood pressure. And they hope to learn more about arterial blood pressure, blood flow, and blood composition through a mathematical model of the circulatory system.

For years, doctors have tried to discover how kidneys control rates at which substances are eliminated or reabsorbed into the body. To date, they have only theories, but they now hope to solve their problem by building a mathematical model. The computer can then show which theory best simulates actual function.

The Body A System. Dr. Arthur C. Buyton of the Mississippi School explains the work by saying he believes the body the best engineered and most complicated system known. Since it is controlled by several hundred patterns, only a computer, he thinks, can aid in understanding its workings.

To discover why elderly women fall and break a hip more often than men, Moss Rehabilitation Hospital in Philadelphia has carried out another study. Two hundred women clad in shorts and wired to an electronic machine, walk across a "copper" carpet. Six muscular movements are recorded: the angle of each hip, knee, and ankle joint, plus muscular potentials during five walking positions.

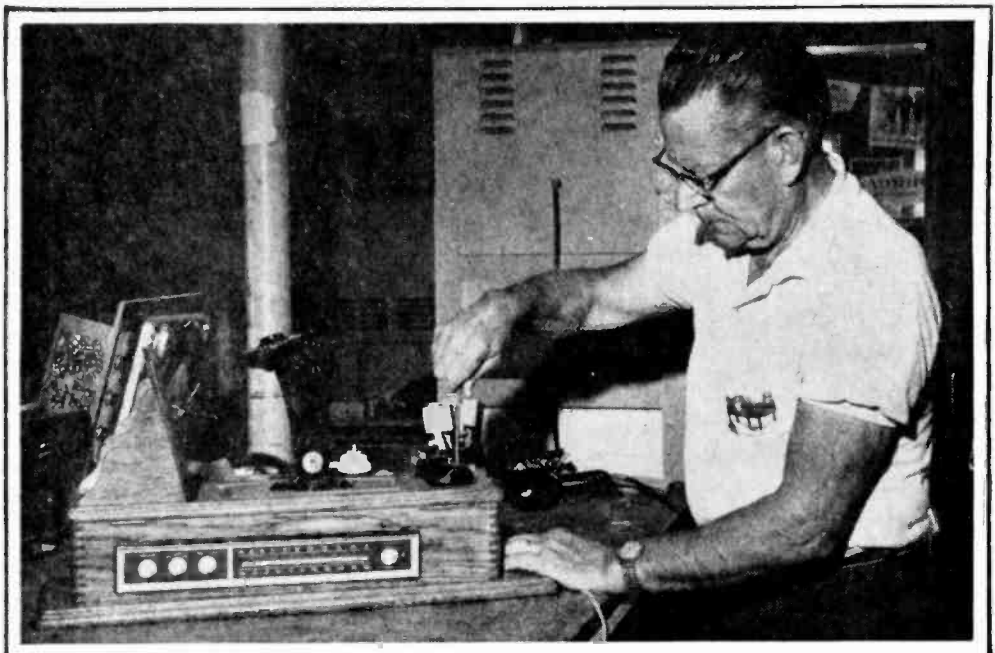
Each of the motions is then measured electronically with the thought that if the doctors can find why the women fall they may discover a preventive.

Pain Cure. For the study, analysis, and diagnosis of the human body and its complaints, the new biomedical engineering has already proved revolutionary in its promise to rule out human error. But so far it has come up with few cures.

One, however, seems so extraordinary it may well eclipse any medical process yet known! While not exactly a cure, it promises to relieve severe pain, the kind associated with diseases such as cancer and serious injury to the nervous system.

A Dime Helps. Smaller than a dime, the miniature device can be implanted near the spinal cord. Here, a mild, non-painful stim-

(Continued on page 116)



PARTY LINE LISTENING

It takes only a few hours to install a modern radio in the case of an antique telephone, but you'll end

☐ Time was when telephones came in wooden boxes with cranks and earpieces. Mounted on the wall at some level or other, the then new-fangled creations could be utilized only with a preposterous amount of stretching or stooping—and only if the party line wasn't engaged.

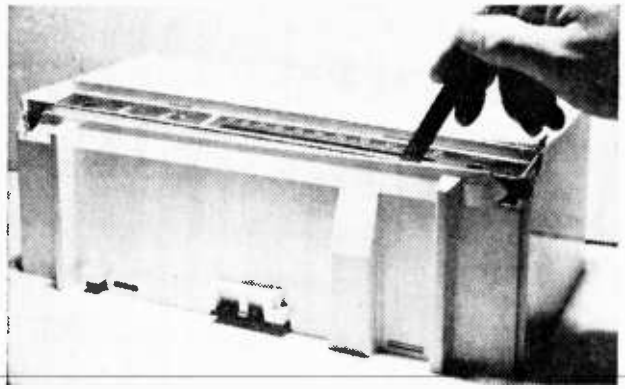
Today, most of these phones have gone the way of the Stanley Steamer, though a few still lurk in attics and antique shops (the one in the photos was picked up at a country sale for a five-dollar bill). And though their days as telephones are over, such oldies can be returned to service in a way grandpop would never have dreamed of —as a conversation-inspiring cabinet for a table radio.

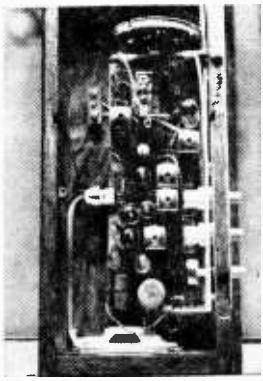
Strip Treatment. The old oak wall telephone in the photos took its first steps toward its new role when it was dusted, then given the strip treatment. All of the old wiring and small parts were removed from the inside of the main case, leaving only the box and the exterior paraphernalia.

The front-hinged lid of the telephone came off when we removed the screws from one side of the three brass hinges. We then cleaned up the main cabinet and the wooden back, removing a variety of grease, pencil marks, and stains. What we didn't touch, of course, were the dents and scratches (remember, we wanted this to be an antique!).

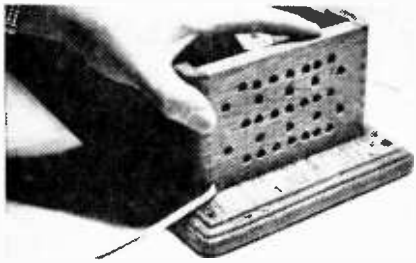
Almost any long and narrow radio chassis could have gone into the telephone cabinet. The type or age of the radio really made precious little difference as long as the radio worked and would fit in the main compartment. Though we were tempted at one point to use a small, battery-powered transistor job, we eventually settled on a new G-E T1220A AM/FM table model (which, incidentally, uses an AC/DC circuit).

Trial Run. Once the etched circuit board had been removed from the radio's plastic case, we temporarily lined up the chassis and marked the mounting holes for its controls. Since we wanted to mount the dial plate separately, we cut it free from the cabinet with a hacksaw blade. Having smoothed off the rough edges, we laid the dial on the side of the telephone case, carefully traced around it, then slid the radio chassis into





Slide-rule dial in radio author used was permanently affixed to plastic cabinet, so author carefully sawed it out with hacksaw blade. Dial could then be fitted into cutout in telephone box.



Photos above show how radio was positioned in telephone box; view at left shows 3/8-in. holes in one end of box for speaker grille and line cord. Varnish was later applied to telephone box to spruce up its appearance.

up with plenty to talk about and a lot to listen to.

By HOMER L. DAVIDSON

position. Fortunately, we found there would be plenty of room to mount the chassis in the telephone compartment and also to fasten it to the dial.

Masking tape was placed on the marked edge of the antique cabinet to serve as a guide line for the dial cutout and to protect the case against possible mars and scratches. We then drilled two ½-in. holes on opposite ends of the masked area to start a small saber saw. Since the oak case was very hard, we were careful not to feed the power saw too fast.

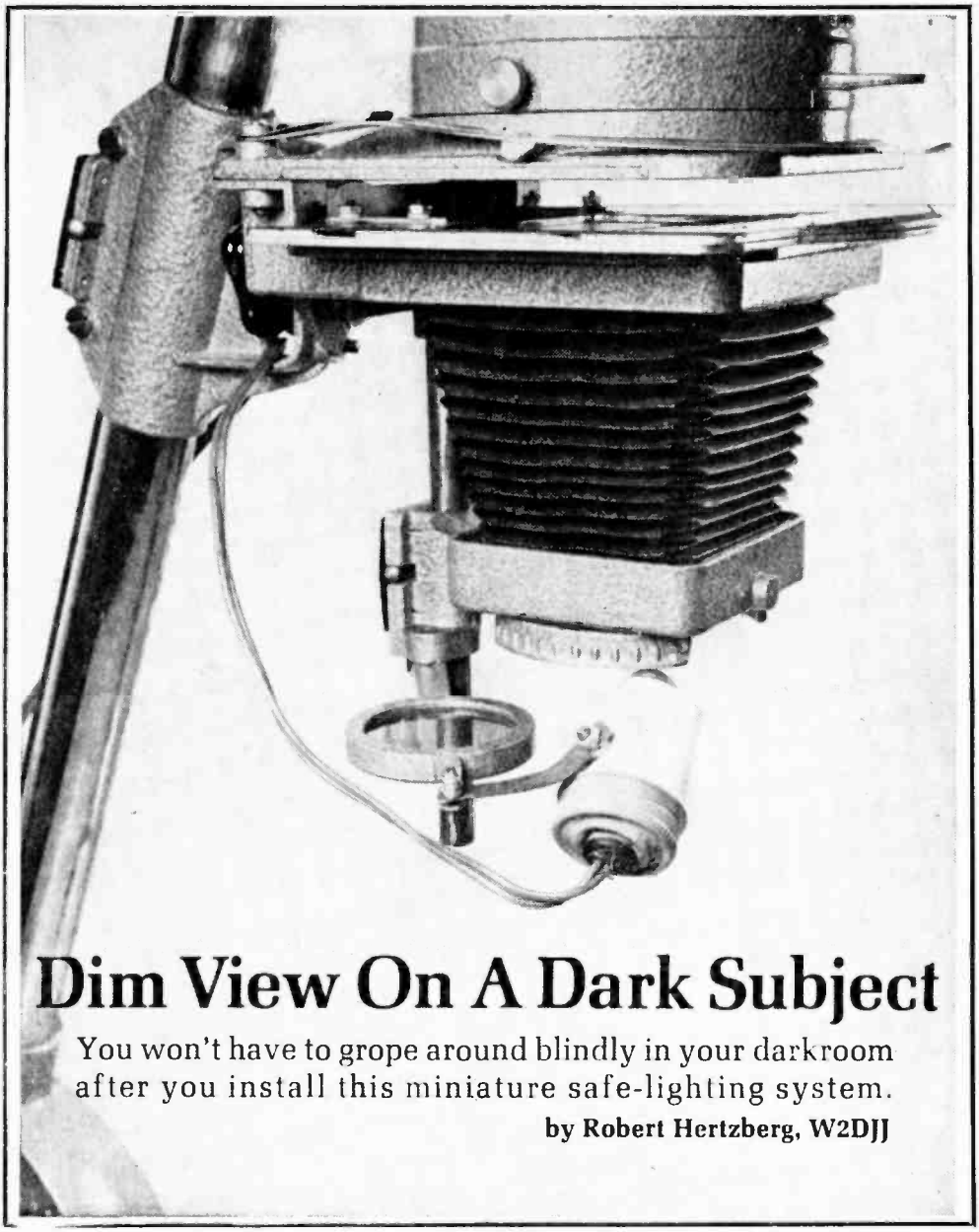
Plastic Grille. We mounted a 4-in. speaker at the bottom of the telephone case, having first drilled several ⅜-in. holes and then covered them with a small piece of plastic screening. The line cord was passed through another ⅜-in. hole at the speaker end of the cabinet, and a knot was tied in the cord at a point just inside the cabinet to secure it against accidental stress.

Next, we replaced the circuit board in the cabinet and marked the chassis mounting holes on the wooden base. This done, we removed the chassis and drilled two ⅛-in. mounting holes. Wood screws and spacers were used to fasten the chassis to the telephone base.

With the plastic dial in the new opening, we drilled two mounting holes at either end so the dial could be fastened to the telephone cabinet. The dial was mounted in place and the radio chassis was then bolted to the dial itself.

Finishing Touches. With the project almost completed, we then soldered the wires from the output transformer to the speaker voice-coil terminals and taped the FM antenna wire to the inside of the telephone cabinet. After the radio had been mounted and tested, we sealed the dial in place by squirting rubber seal around the dial.

Later, we removed the telephone bells, front mouthpiece, and hand phone hanger from the cabinet and spray-painted them with black enamel. When they were dry, we remounted them in position, then touched up the telephone cabinet proper with two coats of varnish. And last of all, we sat back for some real modern-time Party Line Listening! □



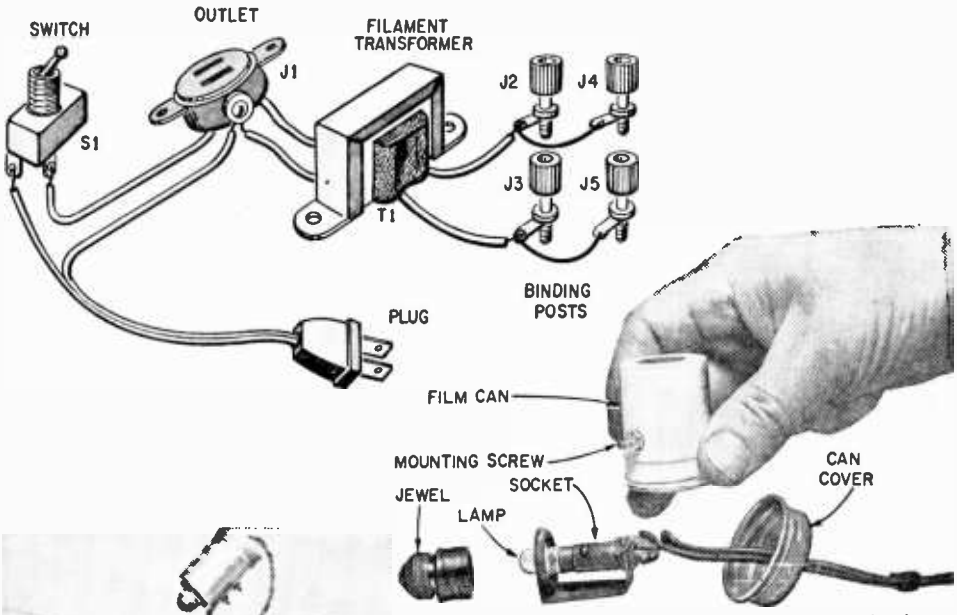
Dim View On A Dark Subject

You won't have to grope around blindly in your darkroom after you install this miniature safe-lighting system.

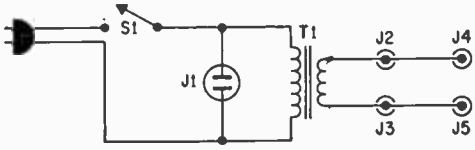
by Robert Hertzberg, W2DJJ

Why fumble around in your photo darkroom trying to read the markings on an enlarger lens or a print timer? The time you spend in your darkroom will be much pleasanter if you install a very simple lighting system using a few inexpensive parts, most of which can be salvaged from an experimenter's "junk box." Even if bought new they cost little.

The actual sources of illumination are a couple of pilot-light assemblies with red jewels and No. 47 miniature bayonet-base lamps. These fit neatly inside 35-mm film cans. The holes for them are made in the can with an ordinary penknife, the metal being very soft aluminum. One can is mounted on the pivoted safe-light arm of the enlarger by a short piece of brass or aluminum, which is bent to throw the light upward to the rim of the lens. The usefulness of the filter is not impaired at all: the whole assembly swings back and forth smoothly. The other can is mounted over the face of the print timer, pointing downward.



Compare the pictorial diagram (top) with the schematic diagram below, side of the parts list. Connections to the outlet will vary depending on the type and style you chose. A duplex type may be handy in the future—if you add an AC-powered print-exposure meter. While other cans may be used to house the miniature safe lights the 35mm film cans (above) are usually plentiful around the darkroom. You can easily tailor the completed system (left) to suit your own needs.



PARTS LIST

J1—Outlet (Female power receptacle)
J2-J5—Binding posts, insulated
S1—Toggle switch, s.p.d.t.
T1—6.3-volt, 1-amp. sec; 117-volt pri filament transformer (Lafayette 33R3702 or equiv.)
2—Pilot lamp assemblies—red jewel (Lafayette 33R6109 or equiv.)
2—#47 pilot lamps
Misc.—Film cans, wire, solder, wood stock, glue and nails, machine screws, etc.

Estimated cost: $2.50
Construction time: 1 hour

The lamps are powered by a 6.3-volt filament transformer which is enclosed in a small wooden box at one end of a board used for a base—the front portion of the base supports the timer itself. The various dimensions of the box are adjusted to suit the size of the timer. The top of the box holds a line switch and four binding posts; the right side, a single AC outlet—for the timer's AC plug.

The light for the timer dial connects to one pair of binding posts, the enlarger-lens light to the other. Lamp cord is fine for the purpose. A single pair of posts would serve just as well, since the lamps are in parallel, but the extra pair is handy if still another light is wanted, perhaps to illuminate a clock face or a paper safe. There is absolutely no shock danger from the low-voltage wiring powered by the filament transformer.

Placed next to the enlarger, the timer-transformer unit is very convenient to operate. The bright red jewels end all squinting, yet do not fog the fastest black-and-white enlarging papers. ■

It's War!

The shocking truth about the bitter battles that may determine the future of every Ham and CB operator in the United States

■ **"It's war!"** The words of a militant professional protest leader? Hardly. Fact is, they were grumbled only recently by a fellow radio operator—a normally quiet and bookwormish chap who probably thinks twice before he swats a fly. But this time he had good reason to be infuriated. And his sentiments are typical of those being muttered in radio circles throughout the country.

Several factors precipitated his declaration: first, the seemingly hostile attitude towards Hams and CBers by the Federal Communications Commission; second, the strained relations between the American Radio Relay League and Hams; third, the growing realization among operators that they might well have to fight to defend their operating rights and privileges!

The battle lines are most definitely drawn; wits are being sharpened right this minute! But what are the issues? What is at stake, and what brought on this unusual battle royal? Many of the facts have never been revealed—until now, that is.

Down The River. It is believed by some that the Ham radio situation began at a private meeting in New York between the FCC and the executives of the ARRL and *QST* (the ARRL's official publication). With a major international radio frequency allocation conference looming on the horizon, the FCC regretfully reported that some of the new African nations were complaining about the lack of radio frequencies for their use; possibly they would try to steal the Ham frequencies. If such a thing actually came to pass, Hams throughout the world would blame the FCC because it permits U.S. citizens to get Ham licenses with a minimum of red tape, exams, and waiting time. As a result the U.S. has amassed a tremendous number of Hams per capita—many of them rotten operators who have earned (for American Hams in general) an international reputation as obnoxious loudmouths running far more power than is necessary.

The FCC was on a spot and felt that something would have to be done to show the rest of the world that U.S. Hams weren't so bad as to cause the loss of Ham radio frequencies. The ARRL was quick to accept the challenge of coming up with some sort of

By Alex Karlin

solution to save face for the Commission.

The ARRL brass itself had long been unhappy with many of the new breed of Hams and said it had "increasing concern . . . as to whether the basic purposes and objectives of the amateur radio service, particularly those relating to technical qualifications and proficiency," were being achieved. The League claimed that many Hams "just go out and buy their equipment, plug it into the light socket, connect an antenna and operate."

All of this was far below the dignity of the pompous and tradition-steeped League executives, many of whom still live in the days when operators wound their coils on oatmeal boxes and put India ink on crystals to change frequency. It seemed to them that this would be the right time to weed out these new rascals by either kicking them off the air altogether or at least openly branding them as *second-class* operators.

The Plan. Back the ARRL folks went to Connecticut and into the conference room for secret talks. The result of the brain-picking session was a mish-mash of ideas which had been previously rejected by the ARRL and the FCC, only now the plan was rearranged and dubbed with the new title of "Incentive Licensing." Worded in fancy legal terms, it was rushed down to the FCC on a silver platter for prompt approval. *QST*, having the uneasy feeling that the plan might not sit too well with some ARRL members, gingerly tried to explain Incentive Licensing to its 105,000 reader/members. The result was an upbeat explanation intended to sell an idea which had few selling points (no mention was made of the FCC's inspirational role in its creation).

Stripped of the fancy frills, the plan suggests creation of a new "elite" class of Ham license to be called the "Amateur First Class License." This license would be available only to those Hams who had held an Advanced, General, or Conditional Class License for at least one year.

To get the new license, the Ham would have to take a new written exam which would be harder than his previously taken test: he would also have to pass a 16-wpm code test (existing General Class tests call for 13 wpm). Only operators of this new license class (or those who held the coveted "Extra Class" license, which is harder to obtain) would be allowed to operate a phone station on the prime DX frequencies below 50 MHz (160 through 10 meters). Those Hams who couldn't pass the exam would be forced to jam into a small band of phone frequencies or use CW (which, for all practical purposes, is now obsolete).

In addition, all phone privileges, for Novice operators (the 2-meter band) would be withdrawn. To round the plan off, the FCC was asked by the ARRL to devise "distinctive" call-signs for each particular class of license so that Hams would immediately be able to ascertain the prowess of fellow amateur operators.

The Prospects. The FCC's acceptance of these ideas would see thousands of long-time DX phone operators unceremoniously evicted from their operating haunts until (and un-

It's War!

less) they could pass a rougher exam than they had ever before taken. (Fact of the matter is that many Hams couldn't pass the very exam they took to get their original license if a year or so had elapsed.) Their only hope would be to cram for the new exam and, failing that, squeeze onto the few remaining frequencies or pack their DX gear in mothballs and migrate to the local-coverage VHF bands—where the FCC was to reserve them some "exclusive" frequencies.

The regular VHF operator, already plagued with split-up bands and class distinction between General, Technician and Novice class operators, would then be faced with the prospect of slicing up the pie for yet another group. For new immigrants from the lower bands would be now joining the VHF fraternity by taking away the regular VHF operators' best frequencies. The idea, of course, was to force the Technician class VHF operator to get the incentive to step up his code speed and pass a General Class license which would permit him to again operate on his old frequencies.

Not On Your Life. The grass roots reaction was instantaneous and rather violent. Enraged Hams flooded both the ARRL and FCC offices with highly impassioned messages, all carrying the same theme, namely, that they weren't buying even one little bit of this proposal. *CQ* magazine, an independent Ham publication, offered its own plan for upgrading the American Ham, but the damage had already been done. The ARRL plan had been formally submitted to the FCC. And Wayne Green, Ham radio's angry young man (and publisher of another Ham publication, *73*, promptly sailed into the ARRL with one of his famous tirades over *that* one.

With cannon bombarding it from all sides, the ARRL found itself in a rather embarrassing situation, especially since the FCC unexpectedly decided to play it cool and not rubber-stamp Incentive Licensing into the law of the land. The League was simply left to hang by its thumbs while the folks in Washington pigeon-holed the idea and announced that they were "thinking over" the plan's alleged merits.

The League landed out in the cold with many Hams, too. In fact, when mid-1965 membership stood at 105,000, the League had confidently predicted that mid-1966 rolls would fatten up to about 108,000 to 110,000 members. In actuality, membership had shriveled to less than 80,000 by mid-1966!

Panic Button. Not only had Hams stopped renewing their memberships in the League, but the proposal had triggered one of the most horrendous business slumps Ham radio had ever known. The proposal was also the best explanation for one of the most severe drops in license applications for years.

The ARRL hastily engaged a public relations firm to find out what had gone wrong and what had happened to its membership. The poll-takers in turn announced that the "crux of the situation" was that "if the people are indeed representative, then too many Hams just do not feel the sense of personal relationship with the League they want to feel." In other words, most Hams just couldn't understand why their good Ham buddies at the League would have officially proposed Incentive Licensing without having taken the minor courtesy of asking members for their opinion beforehand.

Meanwhile, the League itself explained causes of non-renewal thisaway: that the League was "out-of-touch" with the operators' interests; the operator simply "had not gotten around to renewing;" and the operator was "just not active" any longer.

By the fall of 1966, things had gotten so desperate at the League that *QST* announced what appeared to many to be an almost pathetic last-gap measure to recapture the badly fumbled ball; a panacea for regaining its composure, lost prestige, and members. The new idea, "Ham Quest 67," had the League pleading (in *QST*), "Strength through unity—that's what is needed."

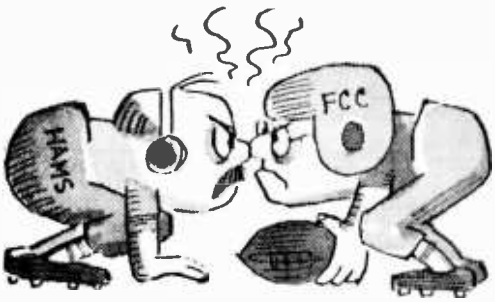
Carefully skirting any mention of the dreaded Incentive Licensing plan, the ARRL rehashed all of the reasons why it's really pretty wonderful to have the kindly ARRL folks lending their prestige to Ham radio and watching out for the interests of the operators. Part of "Ham Quest 67" included sending out "ammunition to be used in convincing non-members that they ought to join the League . . . ," offering prizes for the member or affiliated local club bringing in the largest number of new members.

The FCC? Yes, it's *still* thinking over the proposal. But it also offers no inkling as to when (if ever) a decision will issue forth.

The way things stand now, Ham radio has been shaken to its foundations. Operators are angry and confused. The industry is pulling in its belt a few notches. And the FCC (still meditating the Incentive Licensing plan and seemingly unaware that Ham radio has been hurt badly) has managed to find the time to turn its helping hand towards yet another radio service.

The CB Scene. In September of 1966, the FCC sent a letter to all CB manufacturers expressing the FCC's unhappiness with the CB service. The letter innocently hoped that the manufacturers (who have a $50-million per year thing going in CB) "will assuredly agree . . . that . . . a healthy state of affairs" hardly exists. Manufacturers were told that unless things got better the FCC might consider putting a temporary freeze on new CB licenses.

Established with the best of intentions and the worst of planning, the CB service was



created by the FCC on a frequency band long regarded as useless for communications because of the fantastic noises generated there by industrial, scientific, and medical electronic gadgets. Even Hams, some of whom can turn almost anything into a useful communications tool, had precious little use for it. The band was "given" to CBers much as a useless scrap of meat is tossed to a dog, except that the FCC made it clear that the meat could be eaten only in certain ways, and only *without* enjoyment. The Commission announced that CB communications could not consist of "hobby type communications" or "idle chit chat."

Biting The Hand. As had been feared, the CB operator picked up on the CB service as a great way to be a "sort of" ham operator, using CB sets as telephones in a gigantic party-line gossip and bull-throwing festival. This sent the FCC into apoplectic convulsions and brought forth upon the users a number of purges which saw new rules added, old ones strengthened, fines invoked, licenses revoked, and even the old ogre of the Federal Trade Commission trotted out to frighten manufacturers. Despite these efforts some 20,000 new license applications still arrive at the FCC each month, and the present license records show about 800,000 citizens licensed and using about 2½-million transceivers (most of them incorrectly, one can presume).

But what gives? Wasn't the FCC created to control radio communications in the United States—a task that includes issuing licenses and making and enforcing laws in the public "interest, convenience and necessity"? True. But to enforce those laws it receives a grubby little pittance with which it must also run a huge monitoring network to tune in on hams, CBers, commercial broadcasters, business-band operators, police, ships, aircraft, and dozens of other radio stations.

Although the FCC doesn't admit it openly, some officials have privately confessed that the money available for enforcement purposes simply isn't enough to adequately foot its monitoring network. Nor is it sufficient for the Commission to even attempt to enforce most of the rules which it grinds out in an almost endless procession. And therein lies the rub.

CB is not only a newcomer to the family of radio services, it's a difficult one to handle at best. Worse yet, it's considered to be non-essential (for the protection of life or property or for informing the public, that is). The FCC perhaps feels that if it can't get more money, maybe it would be better off with less radio services—and guess which is at the uppermost tip of the totem?

It's a pity that the FCC can't keep some of the money it takes in on fines and licenses. CBers alone toss Uncle Sam about $160,000 per month in license fees. The money comes into the FCC alright, but it goes right out for placement in the government's kitty where it is doled out in support of European junkets for VIP's, insect research, and programs to lull farmers into *not* growing wheat. Maybe a little of this money pumped into anemic FCC veins would give it stomach enough to carry on in the traditions of the Great Society.

The most ludicrous thing about the whole CB "dilemma" has yet to be mentioned. For in spite of all the FCC's bellyaching, nobody would be any the worse if CBers were simply left alone to talk themselves blue

It's War!

wouldn't this be in the public "interest, convenience and necessity"?

Holding The Bag. Yet the FCC, staffed by political appointees and public servants, insists that it is acting in the best interests of the American public. And despite the abject poverty under which the FCC must exist, when the COMSAT communications satellite arrived on the scene an Act of Congress was rushed through to establish a new FCC division just to handle the single satellite. (They probably haven't been too busy in the new division since the rates are so high that even the TV networks don't use it very often.)

In the meantime, the American public has watched the FCC give token interest to the rigged quiz shows which duped 190-million citizens (threats to put a freeze on broadcast station licenses were not heard). Users of essential communications services are crowding each other off the air due to lack of sufficient channels, yet the FCC insists on reserving 470 MHz worth of UHF-TV space for a mere 250 broadcasters. And on the marine bands, casual listening discloses opulent yachtsmen broadcasting language so salty it would bring a blush to the face of even the crustiest old navy Chief.

Are these problems of a lesser nature than those facing CB or Ham radio? Are the broadcasters truly the "darlings" of the FCC (as has been suggested for years)? Or is it that the FCC is so understaffed that they just haven't seen these problems or so underfinanced that they can't afford to do anything about them?

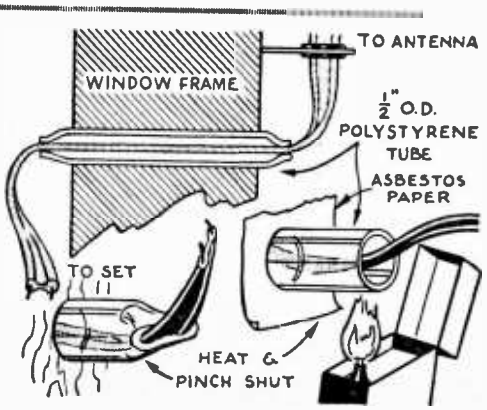
Regardless of the answer, one gets the impression that the FCC might perhaps have had a master plan right along which would explain some of its activities. A hint of this was perhaps dropped when FCC Commissioner Kenneth A. Cox recently stated that if all other alternatives fail to sufficiently relieve the present congestion, additional frequencies would have to be given to needy services. This, he said, would be accomplished by a complete reorganization of the radio spectrum (Cox likened it to "unscrambling an egg"). Obviously, new frequencies can't be created by a wave of the FCC's magic wand. They would necessarily have to be taken away from "non-essential" radio service.

It's War! Yes, it really is a war, still a cold one at this point but warming up by the minute! Hams are thoroughly disgusted at being made fools of by the ARRL, and even more annoyed with the FCC which (for reasons unknown to the operators) is still fumbling with the Incentive Licensing scheme. The ARRL is wobbling around on a shaky pair of legs. Ham and CB manufacturers are wondering where they go from here, and CB operators are still trying to figure out the justice in their paying $8 for a CB license only to be divested of their rights to freedom of speech and the pursuit of happiness.

One guess is as good as another as to where the next battle will be fought. If the FCC would ever attempt to shut down these services, it would undoubtedly be faced with the specter of three million bootleg operators jamming the reallocated frequencies. And could the rumor be true that three million CBers and Hams intend marching on Washington, right up to the FCC's Ham/CB office (above a supermarket, by the way) to sing "We Shall Over-modulate!"? ■

Bushing for TV Line

To bring TV twin-leads into the house with low-loss and without letting cold air in, make sealed feed-through bushings from polystyrene tubing. For 300-ohm line, bore a ½ in. dia. hole through window frame and push a length of ½-in. O.D. polystyrene tubing through the hole, allowing about 1½ in. of tubing to project on each side of frame. Push line through tubing. Seal tube ends by heating with matches or a cigarette lighter, and, wearing a glove to protect the fingers, pinch the tube ends firmly together. Hold until plastic sets. Works fine for long-wire antenna lead-ins. ■



SPY-IN-THE-TIE

by Lars Jorgensen

■ Privacy is almost a thing of the past. Nearly every day the papers detail some new horizons in eavesdropping, from the phone company listening in to subscriber's conversations to executives bugging the rank-and-file employee's washroom. And of course, in this modern era of recording tape and the scissors, even the most innocuous of conversations can be *rearranged* into the most damning of evidence. What to do? Nothing. You can scream and the most you'll get is a few sympathetic words from your Congressman, but not much else; for the *poletzi* you complain to are up to their ears in wiretaps and bugs, the Feds have a sorry record of eavesdropping prosecutions, the phone company has been getting away with it for at least 30 years, and your Congressman's indignation dies with yesterday's headlines.

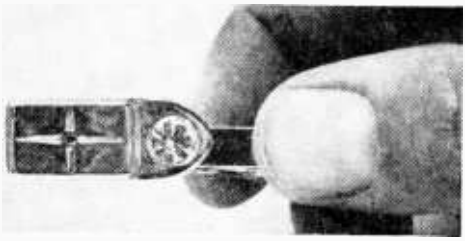
About the only thing *you* can do is *fight to protect the truth;* make certain that what's used against you isn't the result of some brilliant tape editing. Make certain that when you tell your neighbor "I need some money for termite poison" it doesn't come out "I poison for money."

And you can easily protect yourself with the Tie-Spy—known in the trade as an 007 FM mike. Just clip on the Tie-Spy and your words are broadcast to a nearby FM receiver,

where it can be transferred to tape in an *unedited* version of what was said.

As shown in the photographs, the Tie-Spy consists of an miniature, very-short-range FM transmitter and a microphone that appears to be a high-class diamond-studded tie-pin. You simply clip the mike to your tie (naturally you're out of luck if you wear bow ties), place a battery in the transmitter, and you're on the air. A nearby confederate can monitor your conversation on an FM portable and handle the recording.

Construction. The unit shown is housed in a plastic case approximately 2⅛ x 1¼ x 1¾ inches. Actually it can be made smaller by using subminiature components. But to keep the price down to rock bottom, we have used standard components available from Allied and Lafayette Radio (among others). If you want to squeeze it into an olive by all means do so, just use the equiv-



While the tie-bar may not be *the most* in men's jewelry it does the job—it's the microphone that counts the most right here.

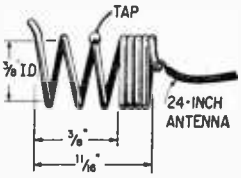
alent miniature values—nothing is really critical except the coil.

In a similar vein, the sound quality is exceptionally "tinny"—*readable* but "tinny." This is due to the low-impedance loading of the high-impedance crystal tie-clip mike we used to keep costs down. If you want to go for a few extra bucks get a better mike, a low impedance job—say a dynamic type from 500 to 500 ohms. You can even try a small transistor radio speaker, or might even add a matching transformer. As we said, nothing is really critical.

The electronics is assembled on a 1⅝ x 2 11/16 inch section of perf-board. If you slightly round-off the corners the perf-board will just fit into the plastic case.

Start assembly by mounting tuning capacitor C5 and oscillator/antenna loading coil L1. L1 is made as follows: Cut off a three foot section of AWG-18 solid enameled wire and *tensilize* it by clamping one end in a vise and pulling on the free end until the wire goes "dead slack"—unless this is done the coil will unwind when you release tension.

Using a ⅜-inch drill bit as the form, wind seven closewound, tight turns. Remove the coil from the form and stretch the first three turns so the distance from the "start" to the third turn is exactly ⅜ inch. Scrape a small bit of insulation from the start of the third turn (actually what we call the second turn), and solder about an inch of wire to this



Coil is quite critical since it determines the transmitting frequency. It must be right on the button.

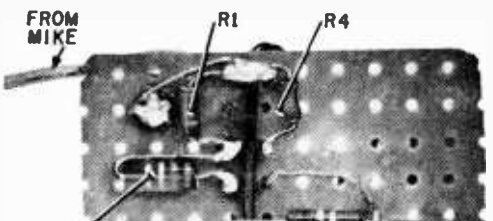
tap. As shown in the schematic, the tap connects to the "top" of C5 while the "start" of the coil connects to Q2's collector. The free end of the coil will be connected later to the antenna.

Flea clips or Vector T28 push-in terminals are used for tie points and supports. To mount the C5-L1 assembly, push in a set of terminals directly under C5's solder tabs and install a very short support lead from C5's tabs to the terminals.

To insure frequency stability C6 should be the silver mica type or its equivalent. Space gets a little tight on top of the board so miniature resistors (1/10 or ⅛ watt) and capacitors are suggested. The components on the bottom of the board can be "standard" size (¼-watt resistors, etc.).

We can only be certain the project will work with the transistors specified in the parts list, do not substitute another type for the specified Q1 and Q2.

Battery Power. The power supply has no

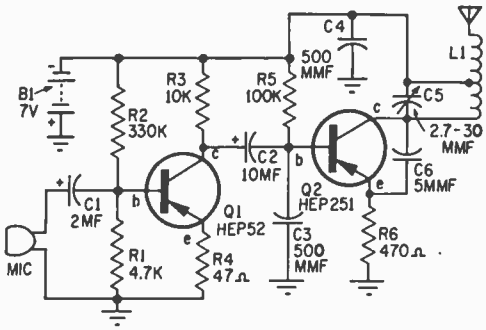


Either 1/10 or 1/2-watt resistors can be used here on under side of perf-board.

PARTS LIST

B1—7-volt mercury battery, Mallory (Allied 55J886 or equiv.)
C1—2-mf, @ 6-volt DC
C2—10-mf, @ 12-volt DC
C3, C4—500-mmf ceramic disc
C5—2.7-30 mmf, trimmer capacitor (Arco 461 or equiv.)
C6—5-mmf silver mica
L1—see text
M1—Tie-Clasp Microphone, (Lafayette 99C-4567 or equiv.)
Q1—Transistor, Motorola HEP 251 (from Allied)
Q2—Transistor, Motorola HEP 52 (from Allied)
R1—4700-ohm, 1/10-watt resistor
R2—330,000-ohm, 1/10-watt resistor
R3—10,000-ohm, 1/10-watt resistor
R4—47-ohm, 1/10-watt resistor
R5—100,000-ohm, 1/10-watt resistor
R6—470-ohm, 1/10-watt resistor
Misc.—Plastic cabinet, (Lafayette 13C3801); perf-board; terminals, wire, solder, L-brackets, machine screws, nuts, etc.

Estimated cost: $7.00
Construction time: 2 hours



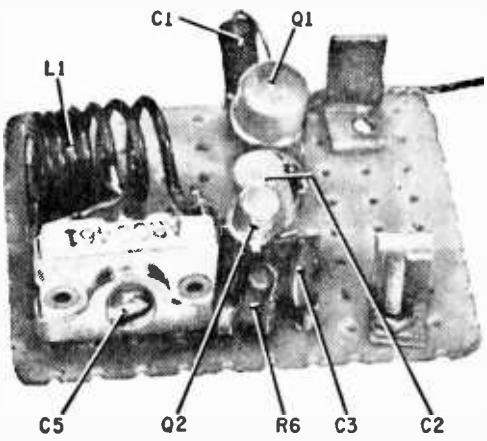
Circuit is simple but you must remember that wiring at 100 MHz is critical—all leads to Q2 and L1-C5 must be kept short to get proper operation on the FM band.

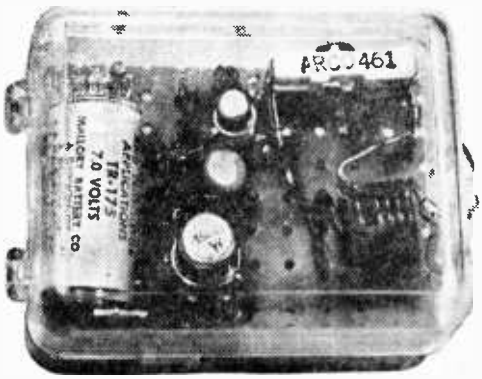
on-off switch. To start the transmitter you simply clip in the battery. To turn the unit off you remove the battery. The specified battery will give an average of 35 hours service, depending on the "freshness" and frequency of use. Since there is no standard battery holder you have to make your own. The battery holder is simply two L-brackets fashioned from scrap aluminum (an old Minibox) or copper. The L-brackets are mounted to the board with 2–56 machine screws. Connection is made to the clips by soldering directly to the *head* and *nut*. Note that the negative clip has a hook at the end. The battery's negative terminal is slightly recessed into its case, so to insure connection you must form an ⅛-inch "hook" which will *bite* into the negative battery terminal.

The Mike and Antenna. The mike is supplied with a mini-plug. Cut off the plug, unbraid the shield—forming a *tinned* twisted lead with no free strands—and solder the mike cable directly to a ground terminal and the input to C1. The antenna consists of 12 inches of very-thin stranded wire—AWG-22 or thinner—soldered to L1's free end.

Drop the unit into the plastic case, leaving the hinged cover open. Mark the points where the mike and antenna leads will pass through the case. Remove the transmitter and quickly press a hot soldering tip into the edge of the case at marks for the mike and antenna leads. The case will melt under the iron, forming the openings for the two leads. Don't press down hard or you'll go

(Continued on page 114)





Tight-wound portion of L1 is a loading coil for the short antenna—the spread portion tunes with C5. Leads that connect to the base, emitter and collector of Q2 should be kept as short as possible (a normal VHF wiring technique). Those to Q1 aren't as critical. Transparent plastic box protects delicate parts—specially L1 and C5—from damage.

Personal Hi-Fi

A complete tonearm, preamp, earphone-amp combo, this setup is ideal for stereo on the private side.

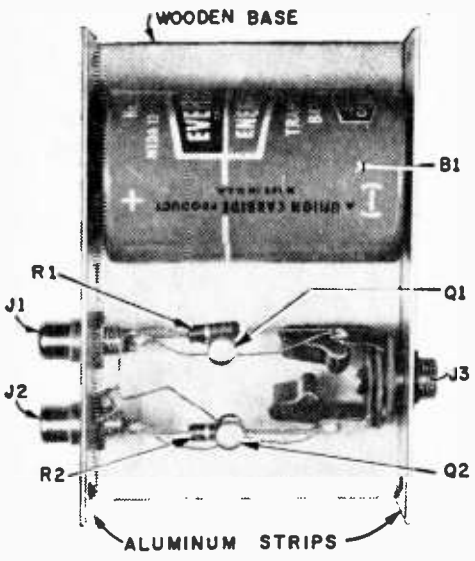
By Art Trauffer

■ Build this novel amplifier-in-miniature and you'll no longer have to fire up a high-powered stereo amplifier just to drive a pair of headphones. This little stereo-headphone driver will cost under $3.00, entail less than an hour's work, and yet give you beautiful, clean, wide-range headphone reproduction. Utilizing the Euphonics Miniconic semiconductor stereo phono cartridge, the TA-15 tonearm and the PS-15 power source, this simple setup is perfect for personal hi-fi.

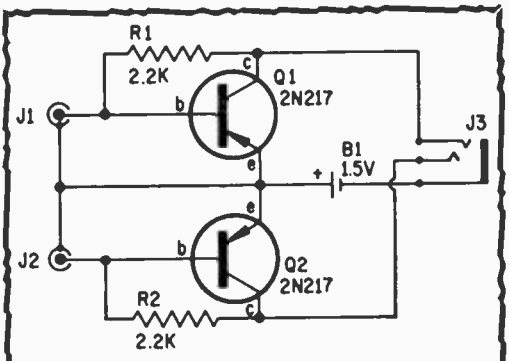
The photo below gives some idea of how easy this little amplifier is to put together, and the schematic diagram reveals how few parts are involved. No volume controls are used because headphone volume is just right for persons with normal hearing, and the stereo balance is good.

Construction. Note that the two aluminum panels, screw-fastened to the wooden base, act as a battery holder for the size-D flashlight cell and automatically connect the cell to the circuit. Phono-input jacks J1 and

(*Continued on page 116*)



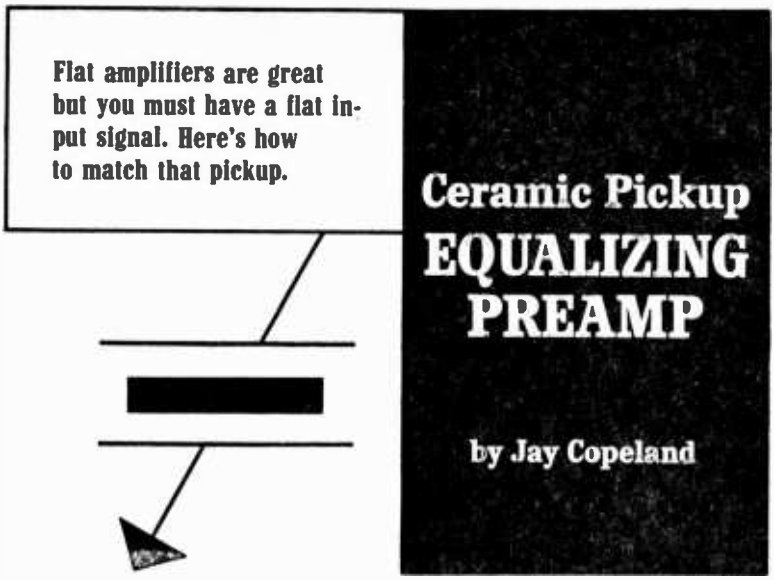
Aluminum panels attached to wooden base form sides of unit and also serve as battery holder. Jacks need not be insulated.



PARTS LIST

B1—1.5 volts, D-size dry cell
J1, J2—Phono jacks (single-hole mount)
J3—Stereo headphone jack (two-circuit type)
Q1, Q2—2N217, GE-2, or SK3003 transistor or equivalent
R1, R2—2200 ohms, ½-watt resistor
Misc.—Wood stock, aluminum stock (.037-in. 20-gauge), wood screws, lockwashers, solder, stereo headphones (low impedance)

Estimated cost: $3.00
Construction time: 1 hour

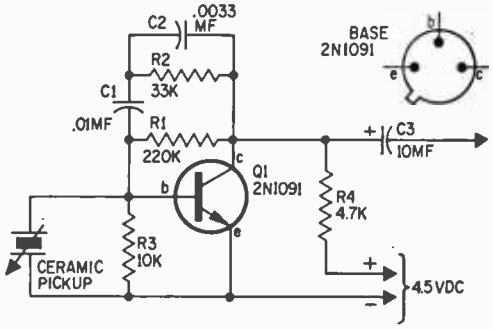


■ One of the problems with home-made phono amplifiers is that they are invariably *flat*—good circuit design can make even the cheapest transistor audio amplifier flat to within ±3 db throughout the usable portion of its frequency curve. You would think this feature would be desirable, but it's not necessarily so when you take a *hard* look at the signal supplied by the phono pickup. The unequalized output voltage curve for a typical ceramic cartridge extends from 50 to 10,000 cps. peaks at about 300 cps, and falls about 6 db per octave at 50 cps and 15 db per octave at 10,000 cps. Also, the impedance of a ceramic pickup decreases as the frequency is increased. On top of this non-linear characteristic the signal is further complicated by the record manufacturers. Recordings are deliberately made with reduced amplitudes at low frequencies, a relatively flat middle frequency range, and increased amplitudes at high frequencies due to manufacturing difficulties in the preparation of plastic platters. Therefore, a carefully designed preamplifier circuit is needed to boost the low-frequency signals, reduce the highs and match the ceramic pickup's impedance before passing an equalized audio signal to the frequency-*flat* amplifier.

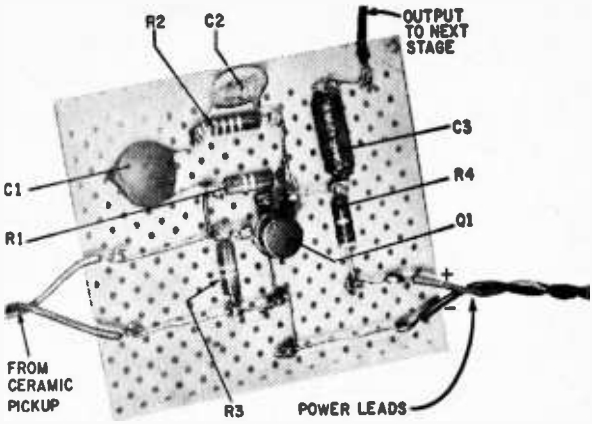
Fortunately, the recording industry had decided on a recording equalization standard (R.I.A.A.) and the characteristics of ceramic pickups are almost universally identical with respect to frequency response and im-

PARTS LIST FOR EQUALIZING PREAMP

C1—.01-mf. disc capacitor (voltage not critical)
C2—.0033-mf. disc capacitor (voltage not critical)
C3—10-mf., 6-WVDC electrolytic capacitor
Q1—2N1091 npn transistor, RCA (Alternates are 2N440, 440A, 635, 636, 636A, 1005, 1006)
R1—220,000-ohm, ½-watt resistor 5%
R2—33,000-ohm, ½-watt resistor 5%
R3—10,000-ohm, ½-watt resistor 5%
R4—4,700-ohm, ½-watt resistor 10%
1—Perf-board cut to 2¾" x 2½" approx.
Misc.—Flea clips, bare and insulated wire, solder, etc.
Estimated cost: $3.50
Construction time: 1½ hours.



Equalized output is taken across C3 and the negative lead of the DC power input.



Layout of the components on the perforated circuit board is not at all critical—but watch ground connections if you take power from amplifier.

pedance output. Now, a preamplifier can be designed to *straighten* the frequency-output curve from a ceramic pickup's signal prior to being fed to a *flat* amplifier.

How it works. The schematic diagram for the ceramic-pickup preamplifier appears to be a basic common-emitter type using an *npn* small-signal transistor—except for the collector-base network (resistor R2 and capacitors C1 and C2). Resistors R1 and R3 provide fixed base bias. The amplifier's input impedance is made smaller than the pickup's impedance and Q1's current gain is made to vary inversely to the velocity response of the R.I.A.A. recording characteristics.

The negative feedback characteristics of the collector-base network does the equalizing—C1 is the effective circuit element for frequencies between 30 and 500 Hz (cps); R2 between 500 and 2000 Hz; and C2 above 2000 Hz.

The large amount of negative feedback reduces distortion and permits the use of low operating current in the collector circuit. This is essential for a low-noise output signal. The fact that no equalizing network is connected in series with the base also helps reduce noise.

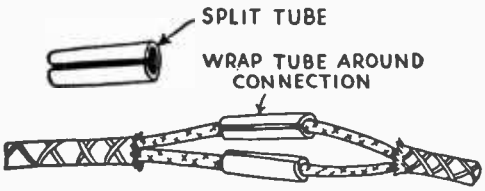
The low input impedance of the preamplifier permits hookup to all available ceramic pickups on the market today. Remember, unlike a vacuum-tube amplifier circuit, this transistor preamplifier depends on the apparent input impedance mismatch for proper audio equalization.

Putting It Together. Parts layout, shown in photo, closely matches the schematic diagram. All resistor, capacitor and transistor leads terminate at flea clips. If you prefer not to use flea clips, make all connections by passing leads through perf-board holes and soldering underneath perf-board. Twisted wire leads can be used to connect to ceramic pickup and amplifier input terminals. Shielded cables should be substituted if hum level is high. Also, it may be necessary to connect a 10-mf. 6-volt electrolytic capacitor across the power supply leads (watch polarity) if preamp taps power from phono's power supply.

Installation is not critical. Keep leads short and locate perf-board away from heat. A classical recording (with violins) can serve as a test record. Play the recording before and after modification—use your amp's *AUX* input. ■

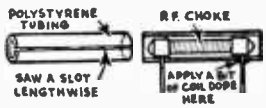
A Safe Connection

• When making a wire connection for your projects, cut two one-inch pieces from a half-inch rubber tube. Split these and put one around



each wire at the connection point. Then wrap some plastic electrical tape over all, and it makes a neat, safe job. This idea is not suitable for power or lamp cords.

Polystyrene Tubing Insulates Chokes

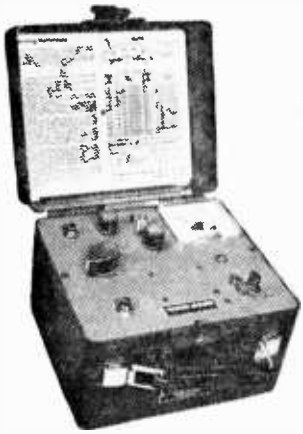


• To protect the metal ends of an RF choke from accidental contacts in a crowded radio chassis saw a lengthwise slot on one side of a length of polystyrene tubing, and slip it over the RF choke. For straight-wound chokes, ½ in. O.D. tubing is about right, but for pie-wound chokes use larger tubing. Coil-dope or speaker-cement applied to wire leads where they enter tubing keeps tubing from slipping off choke. Or, heat the ends of the tubing and pinch them shut. Use color code to indicate value.

RADIO-TV EXPERIMENTER LAB CHECK

INTERNATIONAL CRYSTAL MODEL C-12B

CB Frequency Meter



■ It should be evident to every CBer that the FCC is bent on a real crackdown, for the monthly list of fines and forfeitures now runs several pages rather than several lines. And a quick perusal of the list shows that next to transmitted obscenities, off-frequency operation ranks near the top of the pink-ticket list.

But there is really no reason why any CBer should risk losing his license because of off-frequency operation. For the truth of the matter is that any communications service shop or CB club shop should be equipped with a frequency meter.

A frequency check is difficult? Nonsense. With a frequency meter specifically designed for CB, such as International Crystal's model C-12B, it takes but ten seconds to check each channel. Equally important, operation is so simple the check could be performed by a child.

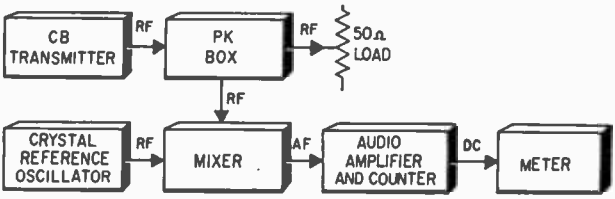
Twenty-three Plus. The C-12B is a hybrid (tube and transistor), battery-powered frequency meter specifically designed for the Citizen's Band. It has 23 switch-selected frequencies plus a spare (the 24th position). In addition to checking frequency with a claimed accuracy of .0015%, the meter will also measure percent modulation and the transceiver's RF power output.

The meter is supplied with a separate pick-up box (called the PK) that provides a dummy load for the transmitter and acts as an attenuator when the frequency meter is used as a precision signal generator. The meter's direct output provides an unmodulated signal (for alignment, say) of 100 microvolts; with the PK box in the circuit, the output at the end of the PK's test cable is one microvolt.

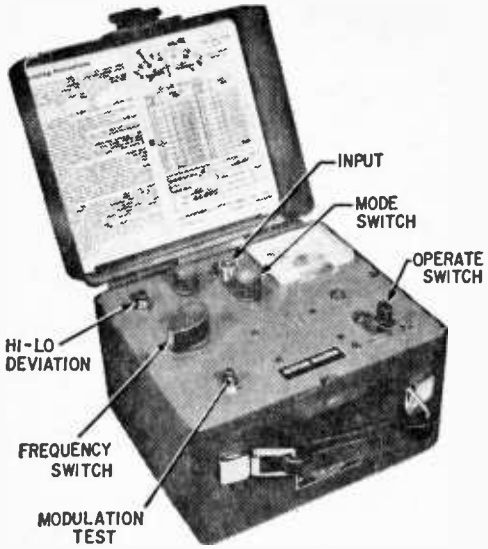
On The Beat. Block diagram shows how the frequency tests are performed. The output of a precise crystal-controlled oscillator is mixed (beat) with the transceiver's output signal. The difference signal below is first amplified, then rectified, and the resultant DC passed to a calibrated meter. The greater the difference frequency, the higher the meter reading. This, in turn, is interpolated into deviation from center-frequency.

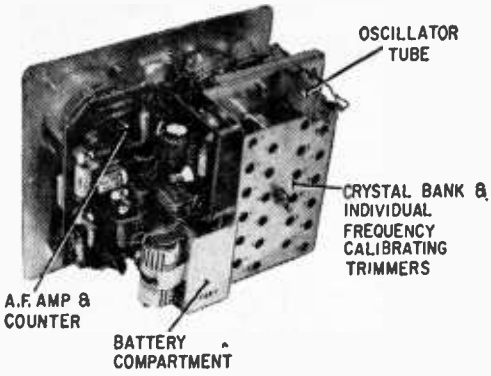
Let's look at a practical example. Suppose you wanted to check out a channel-9 crystal. Setting the frequency meter to channel 9 produces an internal 27.065 MHz signal. If the signal from the transceiver were off-frequency by 100 Hz, its output would be 27,065,100 Hz. And when 27,065,000 Hz is beat against 27,065,100 Hz, the output from the mixer will be the difference between the two frequencies—a 100-Hz beat note.

This is then amplified, rectified and the resultant DC displayed on the meter as 100-Hz deviation. A special switch is provided that tells you whether the deviation is above or below center channel. If the signal from the transmitter were exactly 27.065 MHz, there would be no (zero) beat note and the meter would therefore indicate "0"—no deviation from center channel. The meter is calibrated from 0 to 3000 Hz deviation, with



Block diagram shows frequency measurement system. PK box samples RF signal fed into the dummy load—feeds it to mixer.





Operating panel of the International Crystal C-12B (left) and internal layout (above) shows the major portions of this accurate (±100 Hz) frequency meter for CB.

a special mark at the maximum permitted deviation of 1350 Hz.

The Acid Test. Is the C-12B reliable? Is it really a secondary frequency standard the CBer and the service shop can depend on? To find out, we checked the C-12B against a Hewlett-Packard counter with a known accuracy of 1 Hz. The results are shown in the table. Column 1 shows the channel, column 2 the assigned frequency, column 3 the actual reference frequency of the C-12B, and column 4 the C-12B's error in Hz. Note that the error is less than the specified 100 Hz and in many instances less than 10 Hz.

Channel	Frequency in Hz	C-12B Output	Error in Hz
1	26965000	26964971	29
2	26975000	26974990	10
3	26985000	26985002	2
4	27005000	27004992	8
5	27015000	27014992	8
6	27025000	27024995	5
7	27035000	27035002	2
8	27055000	27054986	14
9	27065000	27065014	14
10	27075000	27075004	4
11	27085000	27085018	18
12	27105000	27104979	21
13	27115000	27114984	16
14	27125000	27125000	1
15	27135000	27134951	49
16	27155000	27155002	2
17	27165000	27165009	9
18	27175000	27175002	2
19	27185000	27185004	4
20	27205000	27205016	16
21	27215000	27215003	3
22	27225000	27225019	19
23	27255000	27255037	37
24	No crystal provided (spare)		

Allowing for interpolation of the meter scale (which is calibrated in units of 60 Hz), the maximum error of the model we obtained would be considerably less than 100 Hz. Frequency drift from the moment of throwing the power switch to the moment of measurement (a few seconds) was less than 10 Hz, again keeping total error well within the claimed 100 Hz.

As far as the mechanical operation is concerned, things couldn't be easier. You feed in the transmitter's signal, set the *mode* switch to *RF*, adjust the *level* control until the meter pointer lines up with a scale mark, then switch to *deviation*. The meter then indicates frequency deviation instantly; total measurement time is less than 10 seconds.

Other Functions. To use the C-12B as a power meter, you simply set the *mode* switch to *RF* and turn the *level* control full clockwise. The C-12B then indicates the transmitter's output power, and in the unit we tested it does so with an accuracy better than the claimed ¼ watt. For example, when the actual power fed into the unit was 3.0 watts, the C-12B indicated an input of 3.2 watts.

Since the C-12B's meter is damped, a sustained word rather than a string of words must be used for modulation tests in order to permit the meter to rise to peak value. For example, when the speech input was a long

(Continued on page 118)

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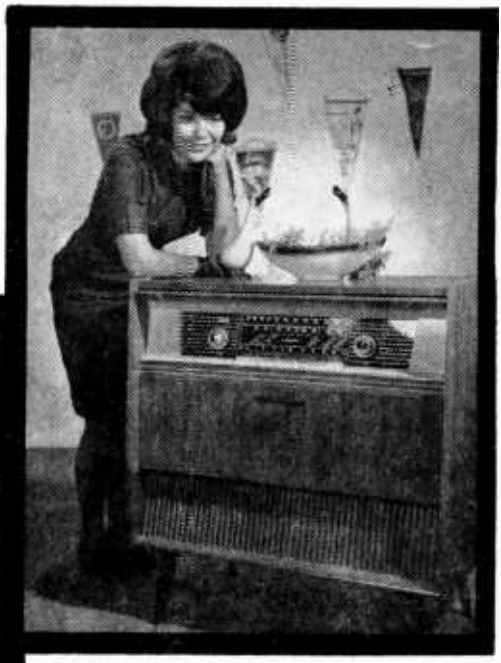


INSTANT BFO

by C. M. Stanbury II

■ Many receivers for the general public have a short wave band but no BFO (beat-frequency oscillator). Most hams today use either Morse code (CW) or single-sideband (SSB) voice (both of which require a BFO), and cannot be tuned in on receivers without a BFO circuit. But there is a solution. Go to a war-surplus dealer, purchase the lowest priced longwave receiver he has at hand, and you're in business.

Here's How. Just about all modern receivers, especially those which are intended for the general public, are put together using a superheterodyne circuit (not that there is anything necessarily "super" about the home-entertainment version of it). The signal from the antenna is picked up by the RF stage of the receiver—at the station's actual frequency. In the type of set we're dealing with here, little amplification takes place in the RF (*radio frequency*) stage. Instead it is immediately converted to a fixed *intermediate frequency* (IF), and usually centers on 455 kHz (kc). Because this narrow band of frequencies is fixed, tuned-amplifier circuits can be built much more economically.

Now if you had a receiver intended for amateur or communications listening, it would have a beat-frequency oscillator operating very near the *intermediate frequency*. The BFO is actually a miniature transmitter (oscillator) built into the receiver and putting out a microvolt signal. For example, in Lafayette's brand new HA-700 the BFO operates at either 452.5 or 457.5 kHz (and if necessary can be adjusted for any value in between). When a CW carrier is tuned dead on, it appears in the IF stage at exactly 455 kHz, beats with that BFO just 2.5 kHz away and in turn produces an audio note of 2500 Hz (cps). (1 kHz equals 1000 Hz, of course.) The dots and dashes are then easily readable (heard as dots and dashes).

What To Do? But we're forgetting—you've inherited a SW receiver without a beat-frequency oscillator. So obviously what you must do is *add* a BFO to your present receiver. And because you are just a beginner, this must be accomplished in the simplest way possible. Which brings us back to that war-surplus longwave receiver. Most of these are blessed with a BFO which operates at the LW sets' own IF (somewhere below 200 kHz) and all will tune the SW rigs' IF. (Be careful—some were regenerative circuits not superhets.) By now I'm sure the idea is beginning to dawn on you. If not then consider this little experiment.

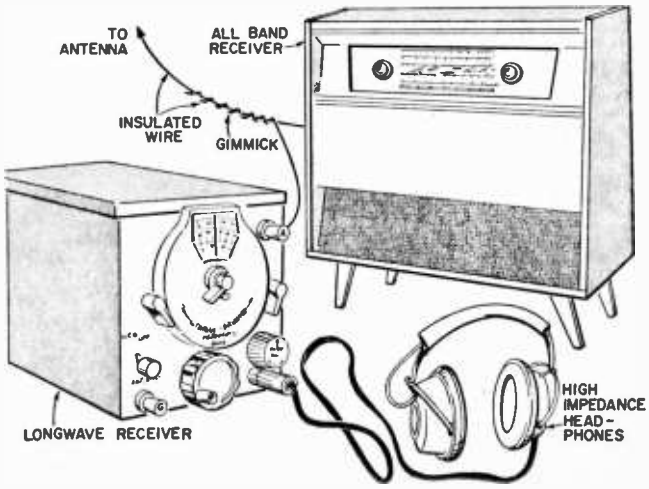
Put the two receivers side by side on a table. Pick out a station on the SW dial, then turn the set's volume down to nil but not far enough to turn the power *off*. Now tune the LW receiver to 455. Lo and behold—there is your SW station.

Why? Well, because every inexpensive shortwave rig radiates slightly at its intermediate frequency. Whatever it picks up is rebroadcast at 455 kHz and your longwave receiver will pick this up. Of course you'll want maximum IF pickup. To obtain this, the two receivers should be connected to a common antenna. And if this still doesn't provide enough pickup, have a *qualified* technician hitch the SW IF's output directly into the LW's RF circuit. But we emphasize the person who does this must be fully qualified. If you try it yourself, the results could be "shocking." Anyway, in most cases the common antenna will do the trick.

Pitfalls. Now in setting up this system there are a few pitfalls to avoid. First be sure the LW receiver does tune to the IF—that is, it must have a band covering the 400 through 500 kHz range. Next, be sure the LW rig you buy is war surplus and not a new one, otherwise you could wind up paying more than a regular Ham receiver would have cost. Sometimes the band switches on these old rigs act up, however, for amateur purposes, once the receiver is on that 455 kHz band, you shouldn't care less. On the other hand, this should knock down that price still further. For more exact details on price, pick out the appropriate dealers from their ads in this issue (and Literature Library), then write them.

There is one more thing to look out for. We said that the two receivers should be connected to a common antenna. But sometimes connecting the SW receiver on the hookup will badly detune the LW antenna circuit. If this does happen, simply place a very small capacitor (not bigger than 50 $\mu\mu$f but the value is not critical) between the longwave lead and main antenna which in turn is attached directly to the SW rig. This effectively isolates the two tuning circuits. This is a must if you decide to connect into the IF amplifier directly.

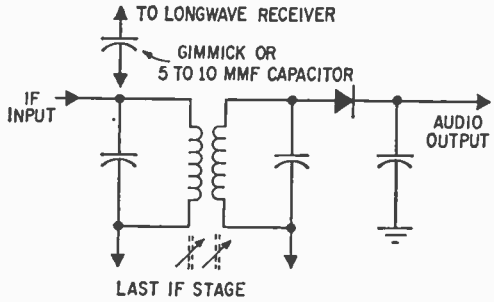
All Set. So now you're all set for CW reception. You're also ready to receive single-sideband transmissions but these will require much more careful tuning. A SSB signal is just like one using standard AM (amplitude modulation) except that *one sideband* (which you won't miss) and the *carrier* have been removed. In order to hear single-sideband voice transmissions in an intelligible manner you must produce your own carrier within the IF. The BFO, of course, makes this possible. *(Turn page)*



Military-surplus longwave receiver (above) picks up the IF radiation and gives added selectivity for those crowded bands devoted to brass pounding. BFO in longwave receiver puts the dits and dahs back into the Morse code messages. Short wire from antenna post (right) is wrapped around outdoor antenna lead for capacitive coupling. Direct connection to last IF stage, through very-small-value capacitor, is better.

INSTANT BFO

Using The BFO. However, in order for your BFO to act successfully as a substitute carrier two conditions must be met. First, it must appear in the IF, frequency-wise, exactly where the station's own carrier, if it had one, would be. Second, strength of modulation and artificial carrier must be the same in that IF stage. Both problems are considerably simplified in this instance because the living-room type of all-band (SW) receiver you are now being forced to use is not very selective, which means a range of signals at least 10 kHz wide (5 kHz on each side of the tuned frequency) will be passed on to the LW receiver with their comparative strengths unaltered. Then because just about all superheterodyne sets are blessed with AVC (automatic volume control), you merely have to tune the LW receiver up and down those IF signals until the desired modulation becomes readable. However, because of the military rig's own high degree of selectivity, the amateur station's modulation level will probably be weaker than normal. To compensate for this, push the LW's audio gain (volume) well up.



The 5- to 10-mmf capacitor reduces detuning of IF amplifier to a minimum but after the connection is made last stage should be repeaked. IF signal goes to longwave receiver through a short length of coaxial lead.

How Good? Now before anybody gets delusions of grandeur, we'll level with you. This system will not work as well as a regular Ham receiver. It is intended strictly for those who have inherited (gratis) one of those highly polished, so-called hi-fi sets, or even one of the many transistorized portables whose shortwave band has been added just "for luck." On the other hand, when you consider that such rare amateur loggings as FK8AB New Caledonia, CR5SP Sao Tome, a number of Antarctic stations, etc. (who use almost nothing but single sideband), we think you'll agree that the effort involved in using this inexpensive converter combination is well spent. ■

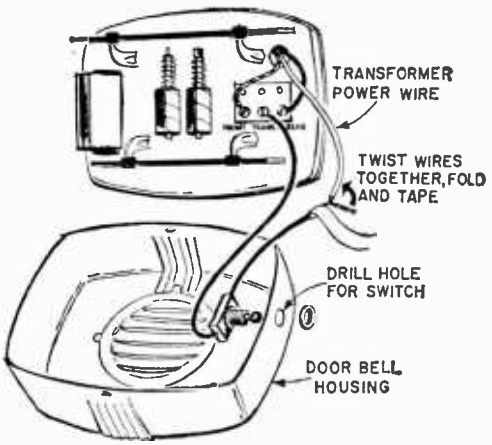
Doorbell Silencer

Here's a simple way of silencing that doorbell or buzzer so that it won't wake Junior taking his afternoon nap.

Pick up a small twist switch with threaded shaft and nut for panel mounting from your hardware store or "five-and-dime." Remove the cover or housing from your doorbell and drill a hole through it large enough to pass the threaded shaft on the switch. Make sure the switch body inside the housing won't interfere with the bell mechanism.

Remove the wire coming from the bell transformer from its terminal and connect one of the pigtail wires on the switch to the transformer terminal. Then connect the transformer wire to the other pigtail wire on the switch by twisting them together and taping.

You don't have to turn off the house current for this job—house bell circuits carry only 6 volts. However, it is wise to do so if you must stand on a chair or stepladder.



Replace bell housing, and have someone press doorbell button so you will know if the switch is in the "on" or "off" position. ■

THE "NEW MOD" SOLDIER GOES ELECTRONIC

Yesterday's science fiction has become today's fact

By K.C. KIRKBRIDE

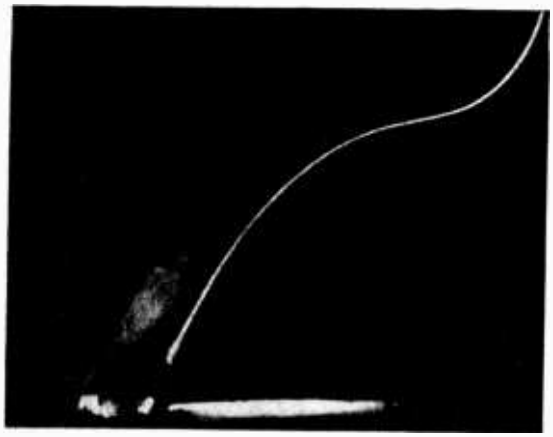
■ **Come a day soon** the lowly foot-slogger will become a one-man division, complete with his own missile and missile launcher, landing apparatus, communications equipment. And he'll carry his gear wherever he goes.

A soldier turned packhorse? Hardly. For much of the new weaponry emerging from major research today rivals tiny Alice for wonder. Fantastic though it seems, the foot soldier of tomorrow will carry whole systems on his back, weapons that draw from astronomy and space and molecular electronics, and shame the crude armaments of the past.

Was a time man warred with sticks and stones, bows and arrows, and lances and swords. He rode off to battle resplendent on a white horse, with metal vest and gleaming sword and flowing cape. But for all his splendid beauty he was a pretty vulnerable target for the guy who didn't like him. So as time went on and he sharpened up a bit he fashioned more skillful weapons: the rifle, the machine-gun, the grenade. But never in his history, with all his advancing technology, has man designed instruments of war as sophisticated as the ones he tests today.

World's First. Using advanced radar techniques, RCA engineers have built a canny system that will mount on the barrel of a rifle, an M-79 grenade launcher, or an M-60 automatic. Its function: to spot moving enemy targets, whether walking or running, man or animal, large or small, jeep or ten-ton truck. *(Continued Overleaf)*

THE "NEW MOD" SOLDIER



Redeye, the shoulder-fired guided missile being held by the soldier on the previous page, is perfect for defense against low-flying enemy aircraft. At left, streak in sky reveals missile scoring direct hit on target drone; above, missile blasts plane from sky by scoring another direct hit.

When tomorrow's soldier wants to spot a target in an area, he will simply switch a control on the back of his weapon. The world's smallest radar will then look over the situation, let its soldier boss know when it spots a target by emitting a series of eerie sounds. Ranging all the way from a low groan to a high-pitching squeal, such noises will reveal whether the radar has spotted a walking man, a crawling man, a man who is running, or a speeding vehicle.

Doppler Squeals. In essence, the radar —like any other—is simply applying Doppler know-how, the principle that says a sound or radio wave shortens as the emitting object moves toward the listener, lengthens as the object moves away. And the Doppler effect in this 2-lb. radar wonder results from the frequency- or pitch-change in the radar's 9-gHz signals, which, converted to sound frequencies in a headset, can tell the soldier which type of target he has spotted and where it is.

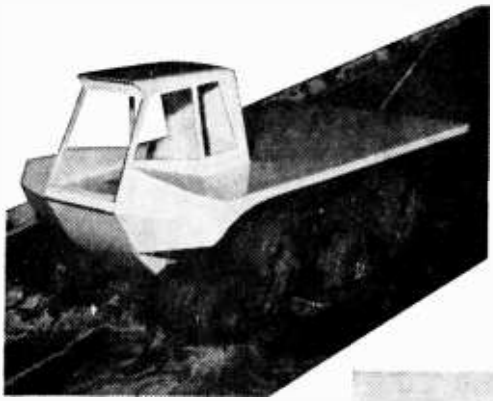
In battlefield operation, the Doppler return will sound much like an off-key siren winding up when the vehicle it spots is moving away. Since the up and down and lateral vibrations of a truck all show different rates from those of a small vehicle such as a jeep, the characteristic differences between targets are distinctly discernible—even when pickup targets are traveling at the same rate of speed over a particular terrain.

The new radar spots almost anything that moves and at almost any speed—from 2 feet per second to over 45 miles per hour. And while performing its duties it puts up with no nonsense from the enemy. In fact, it is virtually immune to jamming, and a scrambler turns the radar beam into radio noise for enemy detectors.

Over Yonder. Should Mr. Radar miss the enemy lurking over the horizon, Lockheed's clever "Ping Pong" will spot him. For Lockheed engineers have just tested the world's first round-trip missile, a lightweight fellow that scouts the enemy, takes his picture, and return-trips on its own.

All the future soldier will have to do is aim and shoot, then wait for "Ping Pong" to return, guided by its programmed sensors and sliding fins. Already flight-tested near Lockheed's Burbank plant in California, the first-of-its-kind carries a rocket on each end. And in spite of all its propulsion power, Ping Pong makes little noise except for a brief "sput" when fired. After that it is as mum as any other cloak-and-dagger agent.

Spot The Sneak. But what if the enemy hides his tank or jeep under a camouflage net? Fairchild Space and Defense Systems has built a see-through-everything camera that will spot the sneak in its hiding place. Applying spectograph technique, the camera



Another Lockheed creation is this multi-purpose vehicle that finds itself at home almost anywhere—on highways, in swamps and marshlands, even in water.

Ping Pong, a photo-reconnaissance missile developed by Lockheed, returns to launch area after flight that includes mid-air stop and "bounce-back."

filters densities of light by wavelength, detects minute differences in living, dying, and dead foliage by chlorophyll content so that a photointerpreter can see tiny shadows that may reveal a tank's hiding place.

Four rotating lenses of 3-in. focal length record images of the target through filters of different wavelengths side by side on 9½-in. infrared roll film. The blue, green, red, and near-infrared filters show up as black-and-white densities proportioned to the brightness of the filtered light.

To the person inexperienced in interpreting the finer points of photos, these gradations indicate changes in terrain unspottable in conventional photography. When advanced color techniques are added, the Fairchild picture may show the terrain in blue, the hiding tank in shocking pink.

Calling Centers. With all these electronic aids, tomorrow's soldier won't need worry too much about enemy surprise attack. But speeding information to command centers will call for split-second communications.

To this end, Litton Industries has built a microminiature radio transmitter that weighs only four pounds, complete with batteries. Formally named the "Digital Message Entry Device," it will sped messages in digital form in less than half a second. The sender-soldier need only set one of 22 "thumbwheel" switches in position and press the transmitting switch. Instantly, the digital message will burst over the airwaves to be picked up at a command center by a standard receiver.

Each of the 22 numbers represent a prearranged message. And when the sender hears a responsive hum in his helmet he knows his message has been decoded. Immune to jamming, the "entry" will be especially valuable for future allied soldiers who speak different languages, since they will be able to communicate in code.

Tiny TV. Though digital messages cannot show tactical situations as they happen on the battlefield, the television picture can. To send pictures to field commanders behind the front lines, Westinghouse has devised the world's tiniest TV camera. Even today the smallest space camera weighs up to four pounds, calls for 100 to 200 cubic inches of space and 9 to 30 watts of power. But not this tiny viewer.

The Westinghouse molecularized wonder weighs only 1 lb., 7 oz. and is believed to be the lightest and smallest TV camera ever built. With a 1-in. vidicon camera tube, the unit is about as long as a two-cell flashlight. Without lens, it measures 7½ in. long, 2 in. wide, 3¼ in. deep, occupies only 50 cu. in. and runs on 4 watts of power.

Asked how they can make a camera that dainty, Westinghouse engineers say they owe

THE "NEW MOD" SOLDIER

all to a special electrostatic tube that includes a binary countdown synchronizing generator capsule of producing standard interlaced 525-line scanning at 30 frames per second. Its 197 miniature components—compared to 582 in conventional circuitry—include 36 molecular blocks, giving the camera its sync generation, amplification, and scanning. And the midget even manages picture quality comparable to its grown-up TV-studio sisters.

To match the tiny camera, Westinghouse offers a receiver mate, 3½ in. high, 1½ in. wide, 4½ in. deep, adding up to 21 cu. in. in all. Truly microelectronic, the VHF receiver midget gets its gumption from rechargeable silver-cadimum batteries.

Soft Touchdowns. As important to the New Mod soldier as intelligence and communications will be the ability to land on his feet in the new helicopter warfare. To fashion "shoes" for the foot soldier forced to parachute-land or drop onto a tree-top landing mat from a helicopter, Lockheed borrowed from its moon-landing know-how.

Originally designed to cushion the lunar excursion modules (LEM) when they land on the moon, the DynaSorb "shoes" are fashioned of metal tubing slotted at one end. Under stress the metal curls in upon itself, much in the manner of a party noisemaker. In this way, the new shoes will absorb energy impact on landing.

In Lockheed's design, a cylindrical tube is notched at measured intervals around its base. On impact a cone rises within the tube and extends the splits which have a natural tendency to coil. A control ring on the outside of the tube will govern the splitting rate and the tightness of the coils which bear the impact. The "shoes" come in a variety of hardy metals that can withstand Superman stresses.

Red-Eye. But probably the most amazing of all the new-day small-wonder weaponry is an anti-aircraft missile a soldier can fire from his shoulder, giving him for the first time an effective weapon to protect himself against low-flying aircraft. General Dynamics has already tested a 4-ft., solid-fuel, infrared-nosed weapon weighing only 28 lbs. Not only will it fire from the shoulder, but the device also is designed to home onto any low-flying craft and blast it with a high-explosive warhead.

DynaSorb footwear, originally intended to cushion moon landings, may also come in handy for parachute jumps and helicopter exitings. Design of device is such that it automatically absorbs stress of impact.

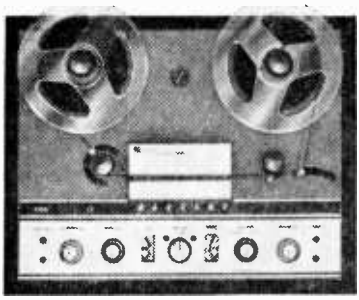
Tomorrow's soldier will simply point the fiber-glass launcher toward the target. And when the missile signals audibly or visually that it's sighted the target, the gunner will uncage the seeker, let the red-nosed wonder soar toward the heat of the enemy's engine.

A two-stage job, the first stage will thrust 20 ft. after firing, sufficient distance to safeguard the soldier. The second stage will then soar on target, with the missile's control taking in continuous target information and signalling the fin wings just what to do to speed toward enemy rendezvous.

With its microelectronic circuits all on tiny silicon chips, the amazing small-wonder missile will form part of the harness tomorrow's soldier will carry. Significantly, a pack including all the new weapons systems just described will weigh no more than a portable television set. But it will give tomorrow's soldier the most sophisticated weaponry man has ever known. ■

RADIO-TV EXPERIMENTER LAB CHECK

HEATHKIT MODEL AD-16
Solid-State
Stereo Tape Recorder



■ It's not uncommon these days to run into people who automatically assume that anything offered as professional equipment is pure junk. And they do have a point, since anyone exposed to "professional recorders" at $29.95 and "professional amplifiers" at $19.95 could hardly believe otherwise.

This makes it all the more unusual to find a really professional recorder that isn't touted as such. Yet the Heath AD-16 is just that—a professional recorder of the type you could very well find in a broadcast or recording studio. What makes the Heath a professional recorder is that it originally started out as a professional machine—a *Magnecord*.

It appears that Heath took an already existing "professional" recorder, reduced it to its component parts, and eliminated some tricky equalization adjustments that could give the nontechnical user some headaches. Heath then added a construction manual, packed the unit in a shipping carton, and offered it at a savings of almost $200 below the wired (Magnecord) price. As far as we can determine, the major difference between the Heath AD-16 and the original Magnecord lies in the elimination of the adjustable frequency equalization—the Heath model provides only fixed equalization for a basic "flat" response.

Sound interesting? You bet it is. And there are some other surprises. Unlike some other recorders that are jam-packed with almost useless features and accessories, the Heath is as straightforward as a sunny day in June. There are no slide-projector control circuits, no automatic echo, no automatic sound-on-sound; in fact, no automatic anything to run up the cost. The price of the Heath AD-16 represents only the transport

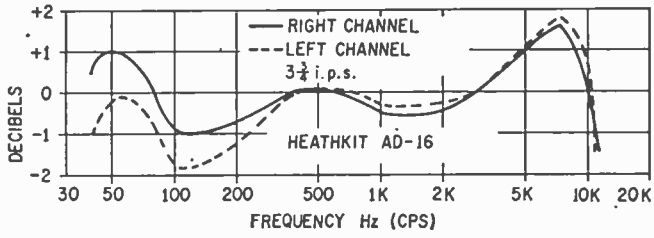


Fig. 1. Record-play response of Heath AD-16 at 3¾ ips was in keeping with company's claim of ± 3 db, 30 to 10,000 Hz. Note that both channels offer approximately the same response.

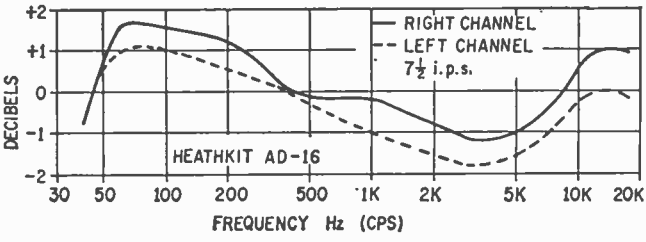


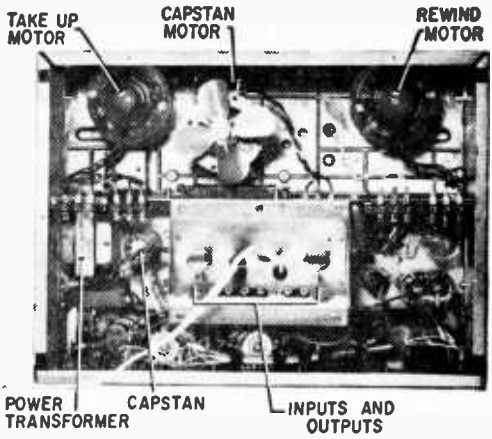
Fig. 2. Overall record-play response of Heath AD-16 at 7½ ips again was generally in line with manufacturer's specifications. Two channels differ by factor of only 1 db.

and electronics necessary for straight four track stereo recording.

Focus On Features. Among the many features of the AD-16 are three heads—for simultaneous playback (monitoring) while recording; an L-Stereo-R mode switch that permits recording on either the *L* or *R* track or both; pilot lamps to indicate the track(s) in the record mode; a built-in mixer that permits mixing the signals from the microphone and auxiliary input jacks; independent, friction-clutched controls for microphone, auxiliary, and output level; two stereo (or mono) headphone jacks that can accommodate *any* headphone inpedance; two *amplified* VU meters that monitor the input and playback levels. In short, the AD-16 boasts every feature you would expect to find in any truly professional (broadcast-quality) recorder.

The tape transport is a three-motor affair, with one for the capstan, one for the supply reel, and one for the take-up reel. Pushbutton-operated solenoids, rather than complex mechanical levers, activate the appropriate drive mechanisms. In addition to the usual play, fast forward, fast rewind, record, and interlock buttons, there is a cue button that is perfect for locating a specific spot on a recording and for doing professional-style editing.

Putting It Together. Except for the head assembly, the entire AD-16 is user-assembled. Building the electronic side of the AD-16 consists primarily of pushing components into a printed circuit board and soldering. And putting the transport together is not notably difficult since solenoid operation sharply reduces the number of mechanical components and simplifies adjustment of those which remain. The all-important head assembly is pre-mounted at the factory to insure that tracks are properly positioned on the tape, although the builder must make final head-azimuth alignments. A full set of height and positioning adjustments is provided for each head should the need arise for head replacement or repair. The instruction manual goes into detail on this.

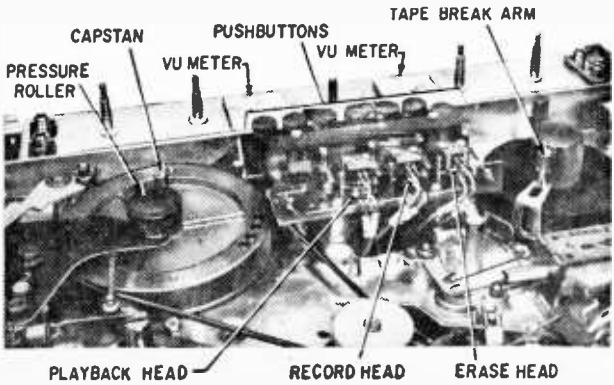


Bottom view of recorder reveals input and output jacks mounted on access plate, which also contains posts for storing line cord.

Pushbutton controls are part of the transport deck, as is a belt-driven, resettable revolutions counter. A "tape gate" is also part of the transport and is pulled in by a solenoid in the *play*, *record*, and *cue* modes. A built-in tape-break switch (auto-stop) doubles as a supply-reel compliance arm, and a compliance arm is also provided for the take-up reel.

The deck is completely operative upon completion of assembly except for the minor spring tension adjustments. Only setting the bias current and aligning the heads remain, and Heath provides a special tape for these two adjustments. The tape provides

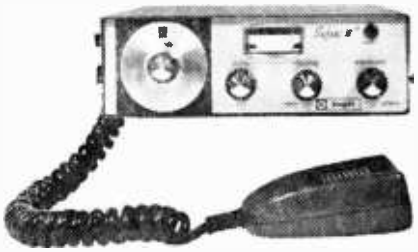
(Continued on page 114)



Top view of unit shows location of heads, VU meters, and pushbutton controls. Use of push-on terminals on leads to and from head and between transport and printed-circuit board obviates need for soldering.

RADIO-TV EXPERIMENTER LAB CHECK

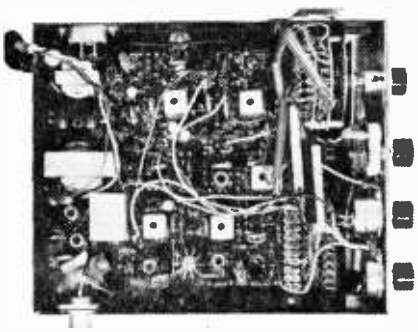
KNIGHT-KIT SAFARI III
23-Channel Portable
CB Transceiver



■ The latest addition to Knight's line of CB transceivers really offers something different and unusual, which, although it may not appeal to all, will certainly find a home with some.

The Safari III looks much the same as any other solid-state rig, with the usual PTT microphone. But the difference is that the mike is in reality a speaker/mike; release the PTT switch, and the sound is right out there in front of your face. Ambient noise too high? Just move the mike next to your ear and literally pour the sound down the canal.

Priced at $84.50, the Safari III is available only as a semi-kit. To insure that the transmitter meets FCC regulations, the entire transmitter section is factory-wired, tuned, and adjusted. The builder makes absolutely no adjustments to the transmitter section during or after construction. Building the kit consists, essentially, of mounting the receiver and modulator components on the printed circuit board (the transmitter and receiver utilize the same board). And with the exception of the front panel controls and power-cord socket, there are few components which are not mounted on the PC board.



Since output jack is part of printed-circuit assembly, entire transceiver can be removed as unit for service and adjustment.

Push And Solder. Construction is not difficult since most of the work consists of pushing the components through the matching holes and soldering. Typical of Knight-kits utilizing printed-circuit wiring, the printed wiring in this unit has an "anti-run" coating that exposes the copper foil only at the point to be soldered. Even if you use excessive heat or solder, the solder will be confined to the exposed copper (a good feature for beginners and oldtimers alike).

The only point at which extreme care must be taken is with the crystal-socket-to-selector-switch wiring. Although the transceiver is normally supplied with but one set of crystals, there are sockets for full 23-channel operation. That means 46 crystals, and, therefore, 46 leads running to the selector switch. While the selector switch wires are color-coded, the same color is used several times. As a result, extra care must be used to insure that the right socket lead goes to the right selector terminal (yep, we goofed).

Ready To Go. When the kit assembly is completed you're in for a real surprise. For with the exception of the three second-oscillator coil adjustments, all receive coils are pre-aligned. Even a careful instrument alignment made absolutely no improvement in performance!

The finished transceiver line-up is one stage of RF, two stages of overload-protected IF amplification, a noise limiter, an S-meter amplifier, and the usual audio section. The transmitter uses three transistors.

Performance is just about what you would expect from this line-up. Power output at

Although it looks like any other microphone, this one doubles as the Safari III's speaker. Sound quality is quite good.

13.6 V (battery supply) was 4.6 watts into a 50-ohm load. Modulation, under the best conditions, peaked at 80%, running about 50% on an average voice level (if there is such a thing as an average voice level).

Receiver sensitivity checked out at 1.8 *uv* for a 10 db S + N/N (signal plus noise to noise) ratio. AGC action, that is, the variation in audio output for a 94 db variation in RF input signal, was 23 db. Adjacent channel rejection was slightly better than 35 db—not super-selective by any means but adequate in all but the most heavily congested CB areas and certainly adequate for straight family and business communications.

Talk And Listen. Because of the speaker arrangement we could not use the standard test for audio power output as it would be meaningless. Subjectively, the signal reproduction is quite good if you favor having the speaker in the microphone. Unlike very early CB transceivers which utilized speaker/mikes and delivered a muffled, "hollow" sound, the Safari III delivers a notably intelligible signal from the speaker/mike.

To us, response appeared devoid of all highs and lows—it was all mid-range, such as you'd expect from a very good quality intercom. While it was a bit unusual to have the sound coming from the mike, under high ambient noise levels it proved advantageous to be able to direct the sound directly into the ear. But it might prove a bit cumbersome to utilize this system in a quiet office.

Many options are available for the Safari III. You may purchase individual crystals at $2.50 each, or a full set at $69.95. There is a portable battery pack that accepts D cells or rechargeable alkalines, and an AC power pack that also doubles as a battery charger. For field use there is a canvas carrying bag and a portable antenna specially designed to be used with the battery pack.

For additional information on the Safari III, write Dept. 20, Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680. ■

Shrunken Antenna for Expanded DX

■ Limited in antenna space? Here is a low-cost three-band system that will fit the average backyard and is ideal for the novice amateur operator since it's designed for 80, 40 and 15 meters.

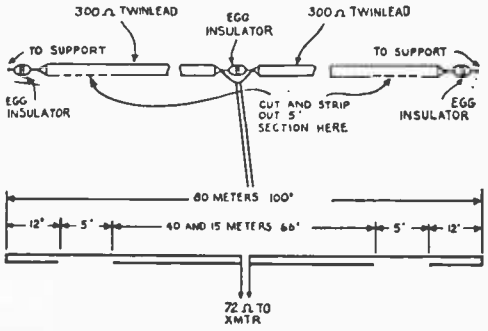
The system is constructed with 300-ohm television twin lead and consists of a 40- and 80-meter dipole with the same feed line at the center. The entire system is "shrunk" to 100 ft. by bending the 80-meter section back 12 ft. at each end. There is no noticeable sacrifice in performance.

Construct the antenna to the dimensions in the diagram, using copper-clad steel TV twin lead. Start by cutting two 50-ft. lengths of twin lead and attaching an egg insulator to a single insulator to form the center feed point.

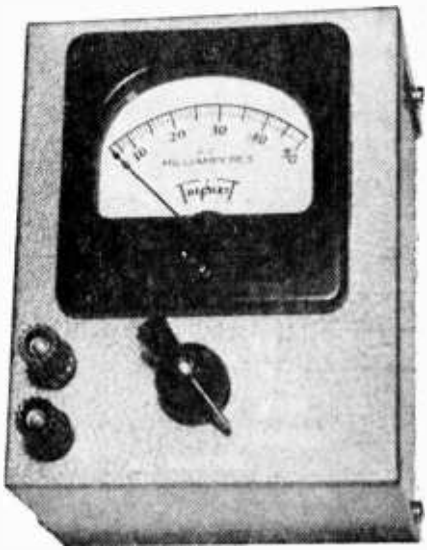
From each outer end, measure back 12 ft. toward the center, then remove a 5-ft. section of conductor from one side of the twin lead. Attach the feed line and the system is ready to go on the air.

Either 72-ohm coax or twin lead may be used for feeding the system. A 72-ohm twin lead reduces the weight which the antenna must support and keeps the system electrically balanced.

You should obtain adequate results with this antenna system of 80, 40, and 15, and it will also work fairly well on 20 and 10 meters. But for the best overall performance, use an antenna tuner, if available. ■



ac ammeter for experimenters



by James A. Fred

Measuring the current drawn by an AC-powered circuit will often pinpoint those obscure defects in power transformers and other parts.

■ One of the benchmarks that separates the tinkerer from the serious electronic experimenter is an AC ammeter. Everyone has a VOM or a VTVM, but very few tinkerers ever measure AC amperes. There are many times when the ability to measure current will save the day on a repair job or an electronic design project.

To keep from draining the bank account an ammeter should be a multi-range job. I started with a 0-50 AC milliammeter simply because I had acquired one in a trade. You can usually pick up a good used one from Bigelow Electronics, P. O. Box 71, Bluffton, Ohio 45817 or buy an inexpensive new one. There are two general types of AC milliameters in use today. One is called an *iron vane* type while the other is simply a DC movement with a rectifier to change the AC-circuit current to DC-meter current. The second is referred to as a rectifier-type ammeter. For the experimenters the inexpensive iron-vane type is preferred and is the one used here.

Since the meter has a full-scale reading of 50 ma it is best to make it read three different values of current beginning with a *five*. The selected ranges were: 0-50 AC ma., 0-500 AC ma., and 0-5 AC amperes.

It's The Shunt. You can make any range current meter that you need by following these directions. To make a milliameter read higher values of current it is necessary to put a shunt across the meter—you put a lower value resistance in parallel with the meter-coil resistance. To make the 0-50 ma meter indicate 500 ma select the shunt so that 50 ma goes through the meter and 450 ma goes through the shunt. On the 5 ampere range there will be 50 ma flowing through the meter and 4.950 amperes through the shunt.

Internal Resistance. To find the resistance of the shunt you must know the *internal resistance* of the meter. To find this value connect the unknown meter in series with a battery and a rheostat. Adjust the series rheostat until the meter reads full scale. Connect a second rheostat in shunt (across the meter) and adjust the shunt until the meter reads half scale. See the drawing for this circuit. Disconnect the rheostat from across the meter and carefully measure its resistance. This value of resistance is equal to the resistance of the meter.

AC Ammeter

Shunt-Resistance Value. Using the following formula with the meter resistance just found you can determine the values of the shunt resistors.

$$R = \frac{R\,m}{(n-1)}$$

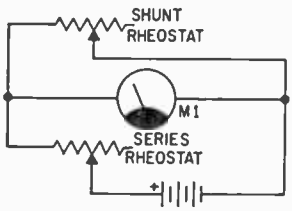
In this formula R equals the shunt resistance. Rm is the meter resistance and n is the scale multiplication factor. For example let's convert the 0-50 ma meter to read 0-5 amperes. The scale multiplying factor is 100. If the meter resistance is 100 ohms then:

$$R = (100-1) = 1.01 \text{ ohms.}$$

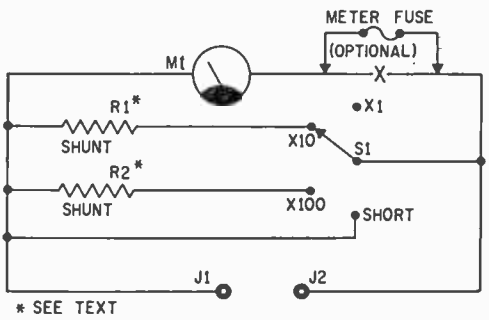
The 1.01-ohm shunt will have to carry 4.950 amperes at the full scale reading. By using the power equation

$$P = I^2R$$

we find that we need a 27-watt resistor. A 50-watt adjustable resistor will work nicely here—if you actually intend to measure 5 amperes. (If all your work will be in the 2 ampere neighborhood a 25-watt, 1-ohm resistor will be adequate.) If the shunt resistance figures out to less than one ohm it may be necessary to make it from copper or nichrome wire. Remember it will be necessary to multiply the scale readings by 100 when using this shunt. You can use the same formula to figure other values of shunts.



To find internal resistance of meter set series rheostat for full scale on M1 then connect shunt rheostat and set it for a half-scale indication on M1. Next measure resistance of shunt rheostat—it equals meter resistance. Schematic diagram below is a practical multirange ammeter—circuit is for AC or DC meter.



Calibration. When you get ready to check the calibration of your meter it would be wise to have another meter to use as a standard. Connect the standard ammeter, your meter, and a load of the proper size in series. (See the circuit diagram for this step.) Adjust the load for 2.5 amperes through the standard meter and adjust the shunt's resistance until your meter reads 2.5 amperes. Recheck the meter with a 5-ampere load. A four-position single-pole switch is wired, as shown, to select the different meter ranges. A meter short-circuit position is included because it is good practice to always short out the meter until you are sure of your circuit. A phenolic board is used to mount the switch and resistor. The meter is mounted first in the aluminum box and then the phenolic board is mounted to the meter by the meter studs. The photographs show how everything goes together.

Easier Testing. Not only is an ammeter useful to an electronics experimenter, but many radio-TV repairmen are finding set

PARTS LIST FOR AC AMMETER

J1, J2—5-way binding posts; 1 red, 1 black (Lafayette 99C6233 or equiv.)
J3, J4—banana jack (to attach ammeter to adapter—optional)
M1—AC milliammeter (see text)
R1, R2—wirewound shunt resistors (see text)
S1—Selector switch (Mallory 1313L; Allied 56A4253 or equiv.)
1—Chassis box, 5 x 4 x 3-in. (Bud CU2105A; Allied 42D7621 or equiv.)

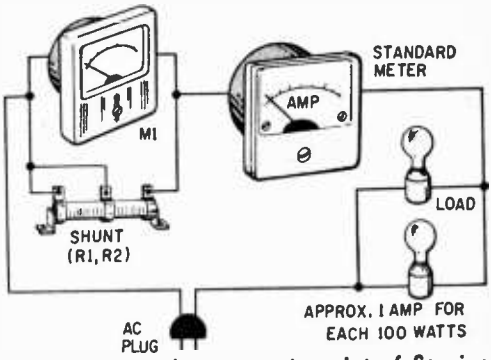
PARTS LIST FOR AMMETER ADAPTER

F1—Fuse of proper rating for range in use (see text)
J5, J6—5-way binding posts; 1 red, 1 black (Lafayette 99C6233 or equiv.)
J7—Chassis-mount AC receptacle (Amphenol 61-F; Allied 40H677 or equiv.)
P1, P2—Banana plug (to attach adapter to ammeter—optional)
P3—Chassis-mount AC plug (Amphenol 61-M; Allied 40H675 or equiv.)
1—Recessed steel shell for P3 (Amphenol 61-61; Allied 40H086 or equiv.)
1—Chassis box, 4 x 2 x 2¾-in. (Bud CU-2115A; Allied 42D7631 or equiv.)
Misc.—machine screws, nuts, wire, solder, phenolic board, wire, etc.

Estimated cost: $14.00
Construction time: 2 hours

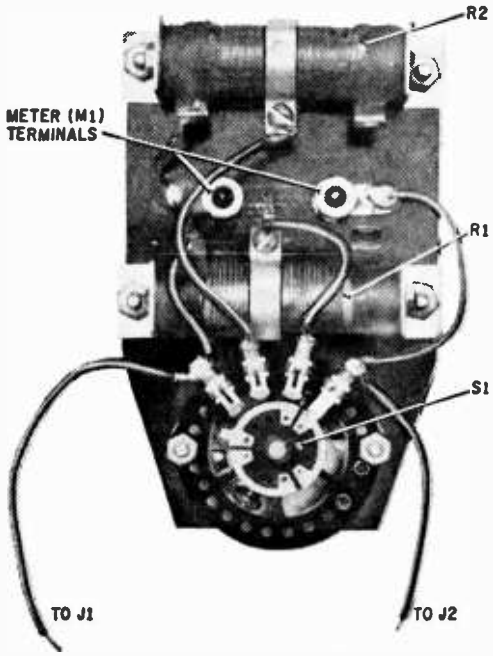
troubles with an AC ammeter. The ammeter described above will work on most radios, audio amplifiers, and TV sets. Do not use it on irons, toasters, or other high current devices. To make this meter more useful in checking line-cord powered devices an adapter (shown in the photographs) was developed.

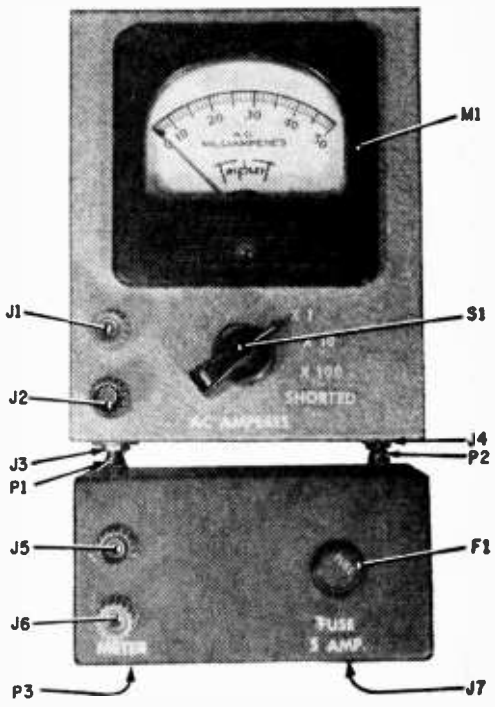
Since there was no room in the meter box for an AC receptacle or fuse holder I decided to make an additional box that could be easily fastened to the meter box. The end dimension of the meter box was 4-inches wide by 3-inches high. A box 2-inches deep that would match this would be great. but none are available. The nearest standard-size box is 4 x 2¾ x 2-inches or you could cut down a 3 x 4 x 5-inch box to match the meter case. An AC socket and plug are mounted on the front of the box—on the top is a fuse holder and two 5-way binding posts. The back of this box has two banana plugs that mate with two banana jacks mounted in the meter box. These banana plugs and jacks just hold the two boxes together and do not carry the meter current. Be sure and use an *instrument fuse* to protect the meter—they are faster than a conventional fuse.



You don't need to resort to a lot of figuring if you use the cut-and-try method of shunt design. Just connect the two meters in series and increase the resistance of the shunt until meters indicate the same. Refer to the text.

How It Works. The device to be tested is plugged into the AC socket. A jumper cord, with banana plugs, connects the adapter and ammeter through the 5-way binding posts on each box. This connection puts the meter circuitry in series with the fuse and AC plug. An AC cord with a male plug on one



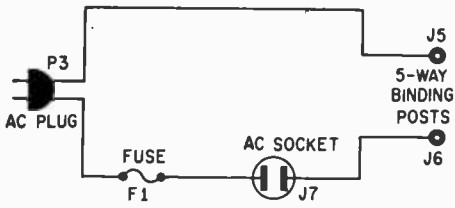


All circuitry inside meter case (left) is on phenolic board that mounts directly on meter terminals. Tapered end of phenolic board is to give better clearance for leads to J1 and J2. If you start with a larger case, adapter can be built in, eliminating J3, J4, J5 and J6 as well as P1 and P2. The 5-amp fuse will not protect M1 if shunt resistor should open up.

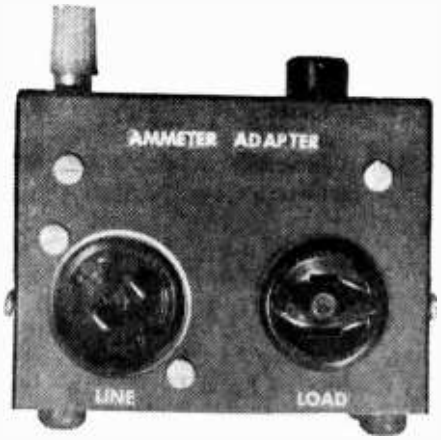
AC Ammeter

end and a female socket on the other end is used to connect the ammeter adapter to a wall outlet.

One Use. I had no sooner finished the ammeter adapter than an opportunity came to use it. A two-cabinet stereo set came into my shop with the complaint that it was popping fuses. When I checked the units I found both fuses popped. I connected each unit to the ammeter adapter and found that each unit alone drew approximately one ampere. Tapping the tubes in the changer cabinet showed up a bad 5Y3GT tube that caused the ammeter to read 3 amperes. Since each unit should have had a 1.5 ampere fuse to start with, it was easy to figure why the fuse had gone. Further examination showed that the blown fuse in the other cabinet was only a ¾ ampere size. Proper (1½ ampere) fuses were put into both amplifiers along with a new 5Y3GT tube and no more trouble was found. Monitoring the current for short intervals over a period of several days showed no change.



Adapter circuit is simple to add to any ammeter. Fuse protects instrument but it will not prevent meter overload if a shunt should burn out—use meter fuse (see ammeter schematic) of meter rating.

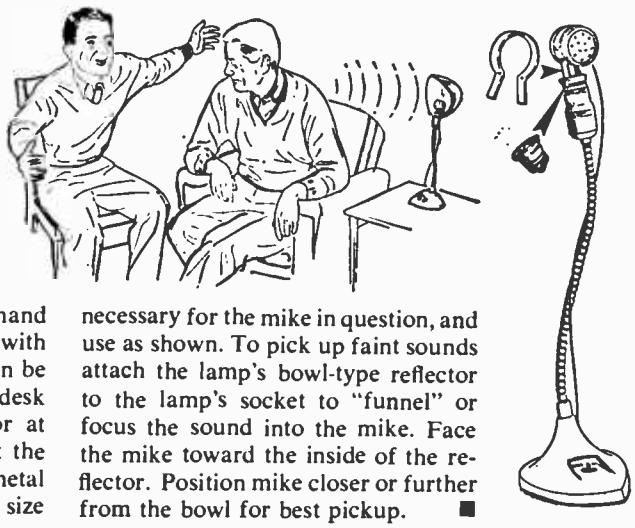


Bottom of adapter shows male and female connectors. Chassis-mount male plug (on left) is mounted in a shell to recess it below surface of adapter box to protect pins from damage. Fuse and J6 at top.

Many defects in electronic equipment can be detected with an AC ammeter. Some of these are: shorted or partially-shorted power transformers, bad tubes, and bad or leaky filter capacitors. It also makes it easy to decide what size fuse to put into newly designed (and built) electronic equipment. A safe rule-of-thumb is to install a fuse rated about one and a half times higher than the operating current. ■

Desk Lamp Mike Stand

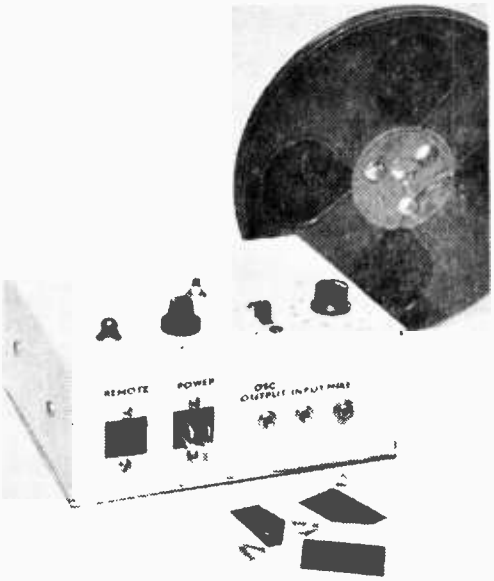
Record that tall story using the desk lamp reflector to increase pickup range



A microphone stand for hand mikes (such as those that come with less expensive tape recorders) can be improvised from a flexible neck desk lamp with its cord removed (or at least disconnected), a plug to fit the lamp's socket, and a ⅛ x ⅜ in. metal strip. Bend the metal strip to the size necessary for the mike in question, and use as shown. To pick up faint sounds attach the lamp's bowl-type reflector to the lamp's socket to "funnel" or focus the sound into the mike. Face the mike toward the inside of the reflector. Position mike closer or further from the bowl for best pickup. ■

UNIVERSAL TAPE-SLIDE SYNCHRONIZER

by Robert S. Havenhill*



Constructing a unit with no springs to adjust and no relay contacts to pit or stick is possible if you switch with a regular unilateral SCR wired across a diode bridge.

■ **Just think about it!** The next time you show color slides of your last vacation you can sit on your duff and enjoy a cool, mixed drink while your tape recorder does the work. A rich, clear narration prepared in advance patters out in step with changing slides without any effort on your part. Your guests will be entertained as well as curious about that gadget you call the *Tape-Slide Synchronizer*.

The *Tape-Slide Synchronizer* is an electromechanical device which automatically actuates the slide-changer mechanism at the exact instant dictated by the commentary on the magnetic recording tape—thus assuring perfect synchronization of commentary and slides at all times. A taped slide-show commentary has a number of advantages over live, *off-the-cuff* commentary. One advantage is that important facts (that are hard to come by) will not be forgotten on successive showings as time goes by. Another advantage is that the show need not be postponed if your voice goes bad the night of the performance. You can sit back, relax and enjoy yourself. (Don't forget that drink!)

Early units were difficult to use. Some required conductive marks to be placed on the tape, others used a high-level audio signal in the sound track (which was objectionable as it could be heard). In order to overcome the objection of the noise from the sync signal, one unit operated on the complete absence of sound on the tape. A four-second (or longer) silent period would activate the slide-changer mechanism. This system was workable with monaural tapes but it was difficult to record the commentary without pausing, thus causing unwanted slide changes. Some success was also had using inaudible (ultrasonic) sync signals.

For Stereo Tape Recorders. With the advent of the two- and four-track stereo-tape record and playback equipment the disadvantages of the early units were automatically eliminated as the commentary could be recorded on one channel and the sync signal on the other. On playback the sync signal would operate the slide changer via the switch in the synchronizer. But even with this there were relay contact problems.

A Unique Circuit. This *Tape-Slide Synchronizer* is solid state. Using the unilateral SCR (silicon-controlled rectifer) alone will pass only one half of the AC (sine wave) power—still requiring a relay to switch *on*

* Former head of Electronic Research Laboratory and Director of Product and Service Laboratories, St. Joseph Lead Co., Monaca, Pa. Now retired

TAPE-SLIDE SYNCHRONIZER

and *off* the AC to the shaded-pole induction motor—which normally powers the semi-automatic slide changers. By using the SCR with a diode bridge circuit both halves of the 60-cycle (Hz) power are passed and the relay can be eliminated. Another way to eliminate the relay is to use two SCRs in inverse parallel but this is more expensive.

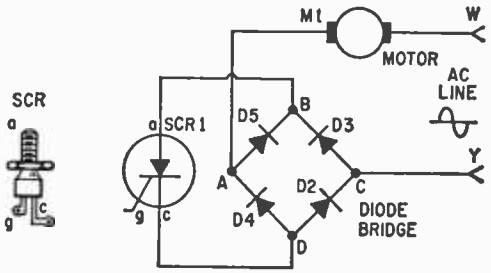
Originally this *Tape-Slide Synchronizer* was used with a stereo record-playback tape deck with only one power amplifier and speaker—for the commentary channel.

The three-stage transistor amplifier operates the SCR circuit. It provides plenty of gain for use with the tape deck and even a small crystal microphone can be used to operate the slide changer and put a sync signal on the tape.

SCR-Diode Bridge Switch. The heart of this unit is the SCR-diode bridge switch—the basic switch circuit is shown top right. The SCR has high resistance between *anode* (A) and *cathode* (C) when there is no signal on the *gate* (G), and no AC can flow through the diode bridge to power the motor—it is off.

When the *gate* of SCR1 is made positive (by a positive-going signal between *gate* and *cathode*) the resistance of SCR1 becomes very low between *anode* and *cathode* (it conducts) and the motor runs.

Conduction of both halves of the AC-power sine wave is brought about as follows: when the AC cycle is positive at W, current



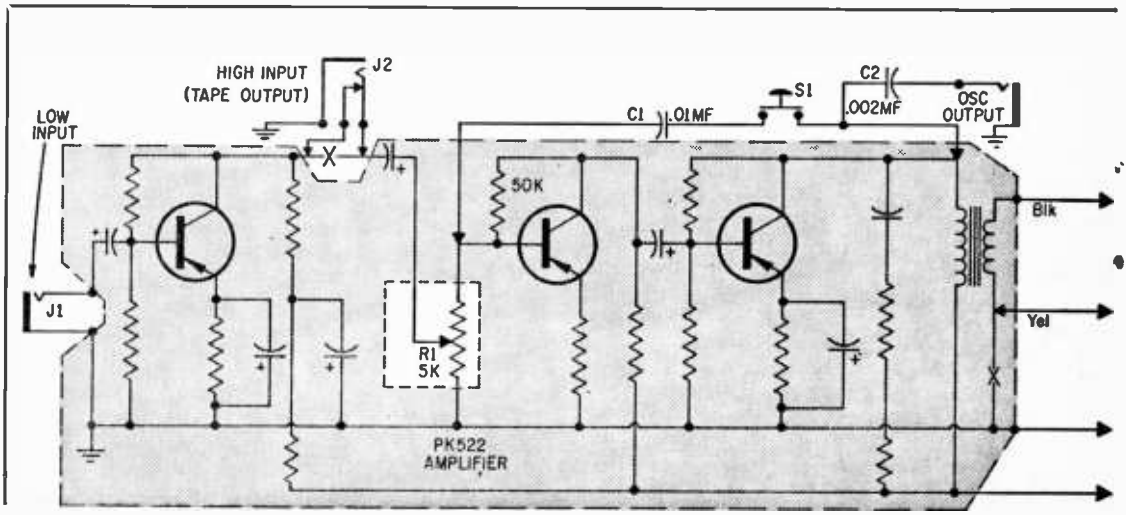
Unique basic circuit is heart of Slide Synchronizer. Power-line AC flows through motor M1 but DC flows through SCR1 by way of diode bridge—simple and inexpensive.

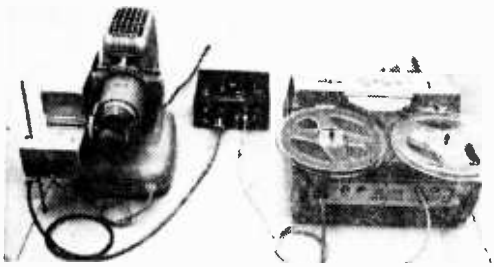
flows through motor M1, then through D5 from A to B, through SCR1 to D2 (from D to C) back to the other side of the line (Y).

When the positive cycle of the AC line is at Y, current flows through D3 (from C to B), through SCR1 to D4 (from D to A), then back through motor M1 to the other side of the line (W).

In like manner, the sync signal from the output of the tape recorder, when rectified and applied as a positive (+) pulse to the *gate* of the SCR-diode bridge, switches the slide-changer motor.

Solid-State Synchronizer. The complete schematic wiring diagram, including that for the slide changer, is shown below. Remote pushbutton S2 is used to operate the slide changer. An Airquipt (model Y) semi-automatic slide changer is used here. However, practically any remote-pushbutton operated unit could be used. The slide changer is shown attached to a TDC





Complete setup, ready for an automated slide show, has Tape-Slide Synchronizer between slide projector and tape machine. Use any automatic projector, stereo unit.

(model D) slide projector.

Current flows through the motor when S3 is pressed. (Numbers 1 through 4 shown on the slide-changer portion of the schematic are the actual contact numbers molded into the Cinch-Jones 4-contact chassis socket in the slide changer.)

When the motor starts it operates the motor-driven cam switch (S4—wired in parallel with S3) keeping current flowing when S3 is released. After the changer has completed its cycle the cam switch opens, the motor stops—and everything is ready for another slide change when S3 is pressed again.

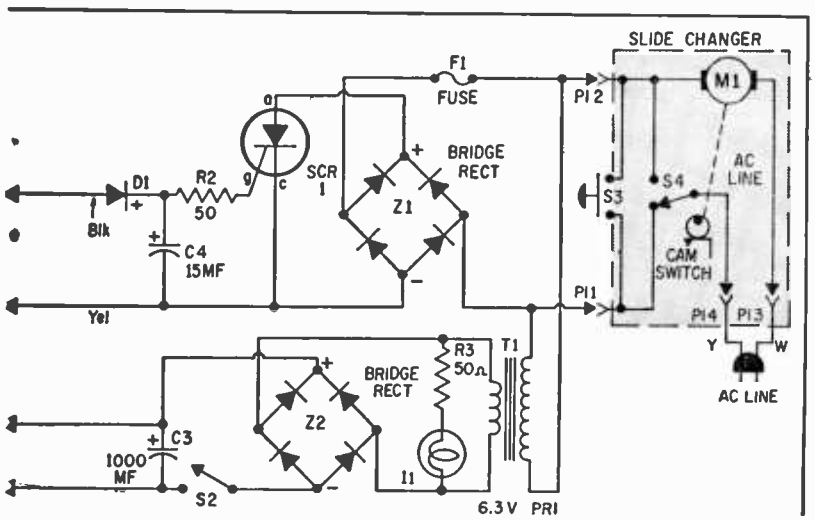
The *Tape-Slide Synchronizer* is connected electrically to the slide changer through the 4-contact plug and operates as follows:

Depressing S1 connects the *collector* of the last stage of the three-transistor audio amplifier (through C1) to the input of the previous (second) stage converting it into a 1000-Hz feedback oscillator. The 1000-Hz signal from the ungrounded secondary of the output transformer is rectified by D1, passed through the RC filter (R2 and C4) to the *gate* of SCR1. The 1000-Hz signal appears at the *gate* of SCR1 as a positive-going pulse—activating the solid-state switch which in turn powers the slide-changer motor as

PARTS LIST

C1—.01-mf, 200 volt, capacitor (miniature)
C2—.002-mf, 200 volt, capacitor (miniature)
C3—1000-mf, 15-volt, electrolytic capacitor
C4—15-mf, 15-volt, electrolytic capacitor
D1—1N540 silicon diode
F1—2-amp 3AG fuse
I1—6.3-volt miniature pilot lamp
J1, J3—Phone jack, miniature open circuit
J2—Phone jack, miniature closed-circuit
P1—4-contact plug (Cinch-Jones P-304-CCT to fit slide-changer socket)
R1—5000-ohm miniature potentiometer
R2, R3—50-ohm (47-ohm), 1-watt resistor
S1—S.p.s.t. normally-open pushbutton (Grayhill 30-1 s.p.s.t. or equiv.)
S2—S.p.s.t. slide switch (Wirt or equiv.)
SCR1—117-volt, 4.7-amp silicon controlled rectifier (GE-Z1 or equiv.)
T1—Filament transformer, 117-volt to 6.3-volt, 0.6 amp Stancor P-6465 or equiv.
Z1—500-volt, 1-amp (Mallory FW-500 full-wave silicon bridge or equiv.)
Z2—200-volt, 1-amp (Mallory FW-200 full-wave silicon bridge or equiv.)
1—3-transistor, miniature audio amplifier (Lafayette PK-522 99C9039 or equiv.)
1—Chassis box, 6x5x2½-in. (cut down from 9½x5x2½; Bud AC403 or equiv.)
Misc.—Phenolic board, terminals, machine screws, nuts, wire, solder, fuse holder, plastic (spaghetti) tubing, plugs, etc.

Estimated cost: $14.00
Construction time: 3 hours



Large shaded areas show original circuitry of prewired units used in Tape-Slide Synchronizer. Added circuitry is outside of shaded boxes.

TAPE-SLIDE SYNCHRONIZER

previously explained. R2 limits the current through the *gate* circuit of SCR1 to a safe value. C4 is the filter capacitor.

The output of the oscillator is also fed to the stereo-recorder input (from J3) and it is recorded as the sync signal on the control channel of the tape. The commentary is recorded in the usual manner on the other channel of the tape at the same time.

During playback the output of the control channel of the recorder is connected (via J2) to the input of the second stage of the audio amplifier where it is amplified, rectified by D1 and applied to the *gate* of SCR1 —the solid-state switch powers the slide-changer motor.

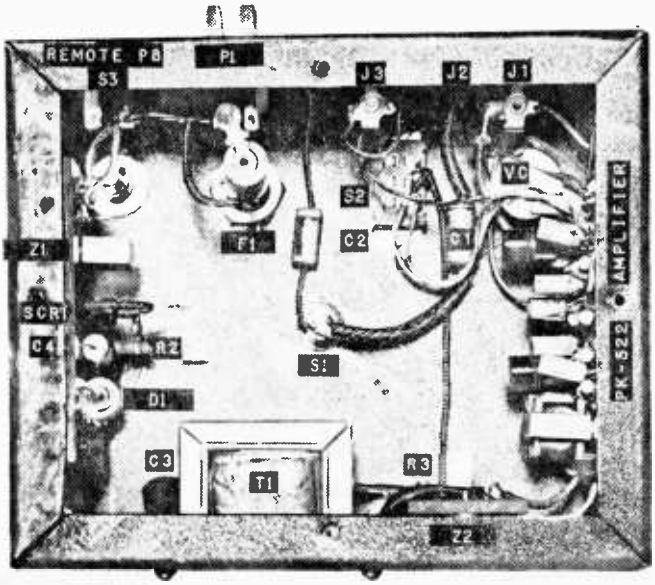
Microphone Sync. A small crystal microphone can be plugged into J1 and when the word "change" is spoken into the mike there is adequate amplification to operate the slide changer mechanism and record a sync signal on the control channel of the tape.

Tape Deck. If only a stereo tape deck (without power amplifier) is available, there is ample amplification for both recording and playback of the sync signal on the control channel using either the microphone or S1. On playback, the output of the tape-deck preamp (which contains the sync signal) should be connected to J1 for the necessary amplification. During recording the sync signal from jack J3 is connected to the input of the tape-deck preamp.

This version of Tape-Slide Synchronizer has top-of-the-cabinet lettering facing operator. Cables come out of unit on the side of cabinet away from the operator.

Using Stereo Recorder. Extremely smooth operation has been obtained using the *Tape-Slide Synchronizer* with a Wollensak T 1580 stereo recorder. With this recorder the sync signal can be taken off at J2 (instead of J3) and applied to the input of the control channel to record the sync signal. On playback the output of the control channel can be taken from the external speaker jack and fed to J2 where it is amplified and operates the solid-state switch.

With this setup, output jack J3 is never used and the recorder cable need not be changed from J3 to J2 (in the *Tape-Slide Synchronizer*) when going from record to playback. *(Continued on page 118)*



Inside view of the Tape-Slide Synchronizer shows most of circuitry is contained on circuit boards mounted vertically on skirts of metal chassis box. Ready-made plate covers bottom when finished.

The Invasion

■ We all shared the same license. Me, my girl Ora and my *sometimes* buddy, Nat. And tonight, the big night, I (Unit 1) had a date with Ora (Unit 2) at 8:00 sharp. And I was late, already a half hour late. Traffic being light, I'd taken the ocean drive (to pick out a parking place in advance) and no sooner was I committed to this route than fog commenced to roll in. At 8:30 I crawled along at 10 per, still a good 15 minutes from Ora's beach house. I tried to find some jazz on FM, which is scarce along this coast. Nearest station is on the island, 50 miles away, and it wasn't making it through the fog.

I switched over to CB just as Ora put her carrier on and pinned my needle. "This is Unit 2," she said softly. "Unit 1, where are you?" A sweat trickled down my spine.

I came back, "Crawling along in this darn fog. I'll be there by 8:45." I speeded up a little.

"That's nice, because at 8:50 I *lock* the doors—", a bit of dead carrier indicated Ora considered her next thought, "—and call Nat."

Nat and I both have a thing for her but so far the competition had been more or less polite. Anyway Unit 3 must have heard Ora because on the air he came. Darn it!

"Unit 1, CQ Unit 1." His carrier cut out briefly. "This is Unit 3 with emergency traffic." He sounded breathless and all that.

I pretended not to hear and speeded up a little more.

by C. M. Stanbury II

"Unit 1, come back. We've been invaded. I'm driving from Cometland toward Ora's. They're only a mile or so behind me on the highway." Nat paused for breath and assumed his most desperate tone. "Do you read me?"

Cometland is a resort about 20 miles up the coast. With one hand on the wheel and the other on my transceiver, I decided to play along. I put myself on the air. "Unit 1 to Unit 3, invaded by what? Dragons from Mercury or gnomes from who knows where?"

"Giants in spaceships. A whole army of them. They've completely taken over Cometland." His signal inched up a little on the S-meter.

Ora broke in. "With this fog, how can you tell?"

Unit 3, undaunted. "Unit 1, you'd better turn back. I'll pick up Ora and meet you further south."

Yours truly pushed a little harder on that accelerator. *"Sure you will."*

She, sweetly, "Whoever gets here first . . ."

Nat kept it up. "I'm not fooling, Unit 1. They've turned Cometland into a base and more spaceships are landing right now. You can hear them coming in from here." There was a loud hum in the background.

I yawned a little. "So you brought your shaver with you. And don't forget the last CB'er who sent a phony distress got two years in the pen."

It was her turn. "Maybe he's not worried because the license is in your name. Anyway, man, you'd better make it here within five minutes."

"Just passed the lighthouse, Ora. That makes it less than a mile." The fog horn was really blowing up a storm and now the visibility had dropped to absolute zero. I slowed down, thought about that license bit, and began to sweat a little. "Unit 3, this is Unit 1. As licensee I've just cancelled your operating privileges."

A moment of quiet and then he returned. But now that hum was really tremendous. "One of their ships is right overhead. I think it's after me. The thing is draining power from my batteries." His signal dipped appropriately. "Now my car has stalled and I can't move." With the most tremendous panic you ever heard come out of a CB receiver, "They're landing on the road in front of me." He faded out completely.

Ora took over the channel. "Hey, Unit 1, it's now 8:45. Do you figure those astronauts out there in the fog would treat me better than you guys do?"

I inched around a final curve by following the shoulder of the road. "Wouldn't bet on it."

"Well, I may get the chance to find out because there's a big bright light coming up over the northern horizon."

I put myself back on the air quick. "If Nat's arrived there first, both your operating privileges are cancelled."

Thirty seconds of dead air.

"Nobody here except me, yet. But if he's kidding, how come we're the only two people on the air?" She laughed ever so slightly, almost nervous. "Anywhere, any band."

Enough! Between the fog and Nat's phony distress, I was really hung up. "All right, girl, if you really want to play, standby." I switched on my general coverage converter and began working down through the international SWBC bands. 16 and 19 meters were absolutely dead but on 15,016 kHz some bird with a phony accent and a made-up language was sending messages. I returned to CB and hit the airwaves again. "Nat, it's also illegal to transmit off the Citizen's Band. Do you *read* me?"

Silence.

On 15,016 those weird messages continued to flow. I moved on down through 25 and 31 meters which were also blank. Static showed up around 6 MHz but still no stations. A funny feeling crept into the pit of my stomach.

The AM broadcast band was also silent.

I put my CB transmitter on in a hurry. "Ora, do you read me?"

Her signals were so weak I couldn't make out what she said but now I was close enough to see her house through the fog. In front of it—a spaceship and astronauts. Giants, most of them six feet tall, well over 175 pounds, no tails at all. And that's how in the year X/4000 Venus was conquered by invaders from the planet Earth. ■

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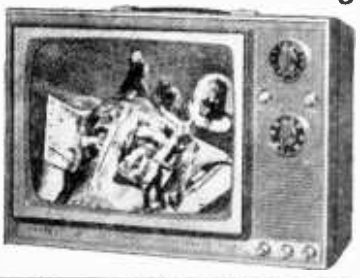

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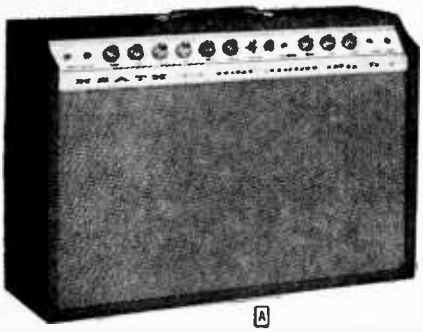

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[B] Deluxe Guitar . . . 3 Pickups . . . Hollow Body
Double-cutaway for easy fingering of 16 frets; ultra-slim fingerboard — 24½″ scale; ultra-slim "uniform feel" neck with adjustable Torque-Lok reinforcing rod; 3 pickups with individually adjustable pole-pieces under each string for emphasis and balance; 3 silent switches select 7 pickup combinations; 6 controls for pickup tone and volume; professional Bigsby vibrato tail-piece; curly maple arched body — 2″ rim — shaded cherry red. 17 lbs.

[C] Silhouette Solid-Body Guitar . . . 2 Pickups
Modified double cutaway leaves 15 frets clear of body; ultra-slim fingerboard — 24½″ scale; ultra-slim neck for "uniform feel"; Torque-Lok adjustable reinforcing rod; 2 pickups with individually adjustable pole-pieces under each string; 4 controls for tone and volume; Harmony type 'W' vibrato tail-piece; hardwood solid body, 1½″ rim, shaded cherry red. 13 lbs.

[D] "Rocket" Guitar . . . 2 Pickups . . . Hollow Body
Single cutaway style; ultra-slim fingerboard; ultra-slim neck, steel rod reinforced; 2 pickups with individually adjustable pole-pieces for each string; silent switch selects 3 combinations of pickups; 4 controls for tone and volume; Harmony type 'W' vibrato tailpiece; laminated maple arched body, 2″ rim; shaded cherry red. 17 lbs.

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Propagation Forecast

By C. M. Stanbury II

February/March 1967

■ Starting this issue we have made our propagation forecasts even easier for shortwave listeners to use. If you are DXing at a certain hour, simply run down the left-hand column in the Forecast table until you find the appropriate time slot, then look across to the right and determine what is available on which bands for each major area in the world. Bands in brackets are promising second choices. Time intervals are for your local standard time. If you live in the Central Standard Time (CST) zone then the *Time* column in our Forecast table is CST.

On the other hand, if you are listening for one particular part of the world *only*, check the Peak DX Periods table first to see what time the best DX is available from that area. Follow this time slot across in Forecast table to determine the best bands. If you live in the CST zone, use the *Eastern* column but deduct 1 hour. ■

Peak DX Periods

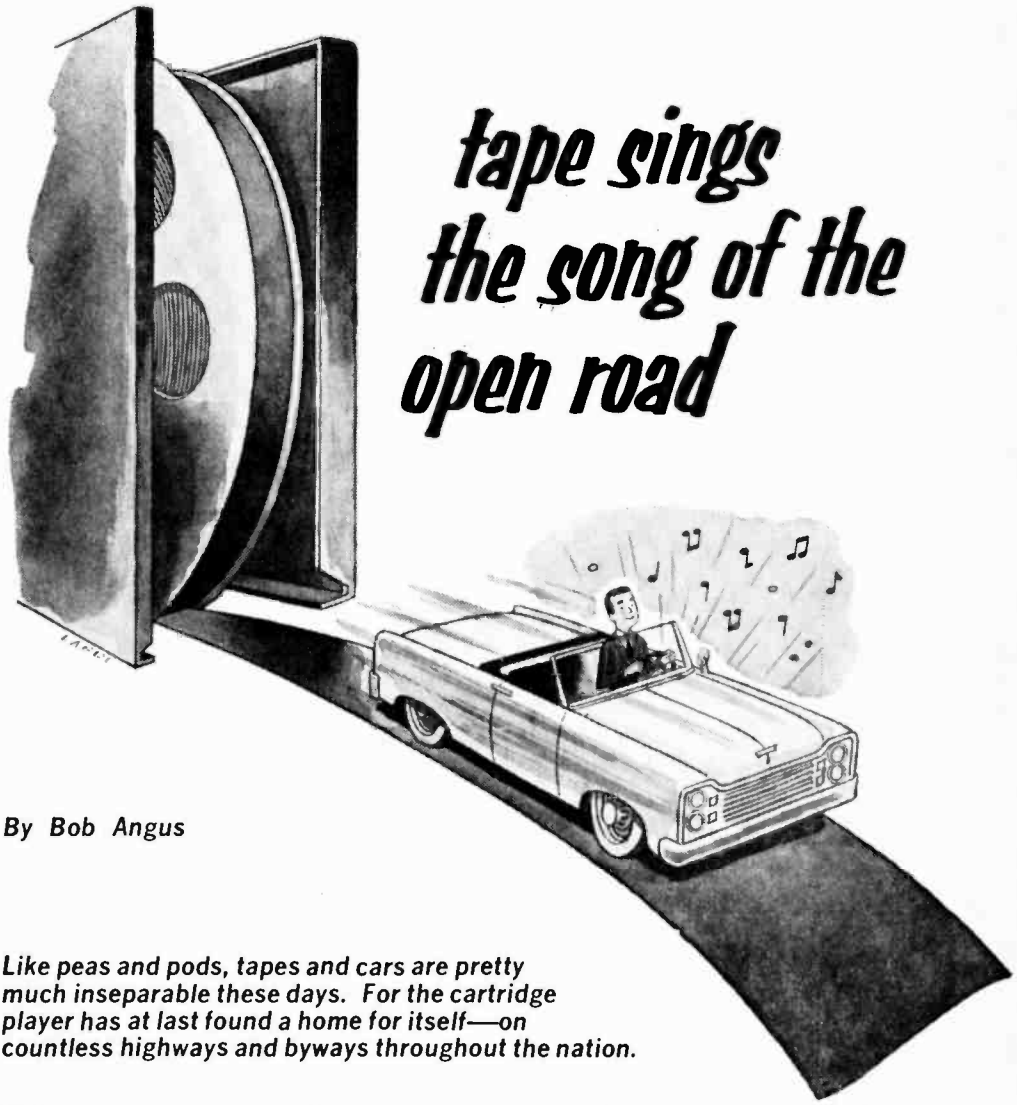
Area	Eastern (EST)	Western (PST)
Asia (except Near East)	0000-0900	1800-0900
Europe, Near East & Africa (N. of the Sahara)	1200-2400	1200-2400
Africa (S. of the Sahara)	1500-1800 2200-0200	1900-2300
South Pacific	0300-0600	0000-0600
Latin America	1800-0600	1630-0500

RADIO-TV EXPERIMENTER PROPAGATION FORECAST

Feb.-March 1967 LISTENER'S STANDARD TIME	ASIA (except Near East)	EUROPE, NEAR EAST & AFRICA (N. of the Sahara)	AFRICA (S. of the Sahara)	SOUTH PACIFIC	LATIN AMERICA
0000-0300	31, 25	31, 25	31, 60 (25)	31, 25	90, 60, 49
0300-0600	31, 25 (49, 60)	31 (poor)	31 (poor)	49 (60, 90)	90, 60, 49
0600-0900	25, 19	19	nil	31	49, 31
0900-1200	19, 16	16, 19	16, 19	25 (poor)	19
1200-1500	19 (poor)	16, 19	16, 19	25 (poor)	19
1500-1800	16, 19	25 (19, 31)	31, 25 (41)	25 (poor)	31, 49
1800-2100	16, 19	25 (19, 31)	31, 25	25	90, 60, 49
2100-2400	16, 19	31 (49)	31, 60 (90)	25	90, 60, 49

To use the table put your finger on the region you want to hear and log, move your finger down until it is along side the local standard time at which you will be listening and lift your finger. Underneath your pointing digit will be the shortwave 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 easier to tune on the east coast. The shortwave bands in brackets are given as second choices. Refer to White's Radio Log for World-Wide Shortwave Broadcast Stations list.

tape sings the song of the open road



By Bob Angus

Like peas and pods, tapes and cars are pretty much inseparable these days. For the cartridge player has at last found a home for itself—on countless highways and byways throughout the nation.

■ **If there's a Ford** in your future, you may well find a stereo tape-cartridge system in it. And Ford's not alone. For today's boom in car-cartridge players is so big it's second only to the craze for color TV. Some industry optimists even see highway hi-fi as the greatest thing to hit the recording industry since the LP.

But what's the big deal about car-cartridge players? (They have, after all, been around for more than a decade.) And given four tracks (and often eight) at a tape speed of 3¾ ips (sometimes 1⅞), the question is whether such players produce any stereo worth having. In short, just how bad is highway hi-fi?

The answer, as we'll see shortly, depends on what we define as hi-fi and which particular highway hi-fi is under discussion. For the fact is that at the moment, there's not one but three major and several minor systems for putting stereo tape in your car. The majors include the Fidelipac system, developed in 1956 by George Eash; the Lear-Jet system, introduced in 1965 and espoused by Ford and RCA Victor; and the Norelco system, introduced in 1964 but only recently adapted for automotive use.

Also clouding the picture is a major battle-of-the-systems. At the moment, the industry is going through a set-to reminiscent of the one between RCA Victor (with its 45s) and Columbia (with its then-new LPs) over a decade ago. Significantly enough, no system

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seems to have a clear technical superiority. Instead, each seems able to provide satisfactory sound reproduction in the car, and at least two of the three have plenty of music available to match most tastes. All three can move from car to home, so you can play the identical cartridge in your car or your living room. And all three, in large part, became possible as the result of the development of reliable, low-cost transistors.

Fidelipac. The Fidelipac cartridge features an endless loop of tape wound around a hub inside a plastic shell. The tape feeds from the pack's center, travels past notches cut in the plastic to accommodate a playback head and pinch roller, then rewinds at the outside of the tape pack. The cartridges are recorded at 3¾ ips in four-track stereo and sell at prices ranging from $2.95 for about 15 minutes' playing time to $9.95 for over an hour's worth of music. Prices for players run from about $70 to $140.

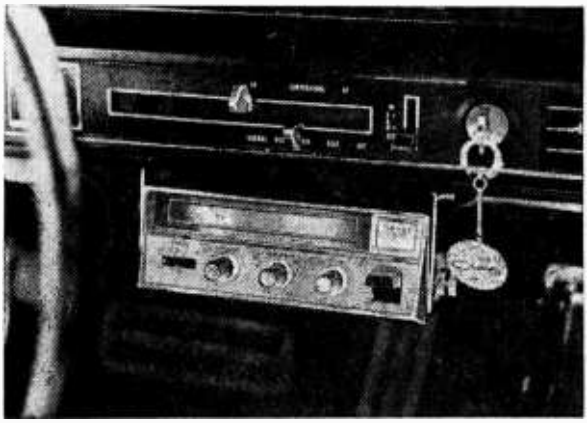
Fidelipac players are sold by such manufacturers as Craig Panorama; SJB, Inc.; Telepro Industries; Trans-World, Inc.; Midland International; Viking of Minneapolis; Muntz Stereo-Pak; Auto-Sonic; Nu-Vox; Audio Stereo; and Metra Electronics. These and other manufacturers provide a wide range of music from the libraries of MGM, Command, Verve, ABC Paramount, Westminster, Pickwick, Audio Fidelity, Mercury, Dot, Elektra, and a host of other record companies. Prices for the players themselves vary, depending on whether speakers are included, whether the unit plays back through an existing car radio, whether AM or FM radio is included, and so on.

In view of Fidelipac's lead time over the other systems, it's hardly surprising that an estimated 70 per cent of the car-cartridge players now in use utilize this system. All of these units were bought for cars already on the road. At the moment, Fidelipac also accounts for better than 60 per cent of cartridge sales.

Lear-Jet. Lear-Jet units are to be found mainly in current-model Fords, Mustangs, Thunderbirds, some Mercurys and Lincolns. The cartridge is about the same size and shape as the Fidelipac, and it is also recorded at 3¾ ips. However, recordings are in eight-track rather than four-track stereo. Further, unlike the Fidelipac four-track units, a pinch roller is included in each cartridge. Prices for recorded cartridges are comparable to Fidelipac's, and the catalogs include many of the same titles plus albums from RCA Victor, London, Decca, and Capitol. Player prices are comparable to Fidelipac's.

In addition to the units Ford is installing in its new cars, players are available from Lear-Jet and Soundex Corporation for cars already on the road. And Lear hopes to entice General Motors into joining Ford and Chrysler into putting its players in their new cars. "With the auto industry turning out over nine million cars a year," a Lear spokesman said recently, "it looks like something between 15 and 20 per cent of these new

With inputs for mike, tuner, and phonograph, in-home tape-cartridge recorder (below) by Craig Panorama makes perfect mate for Craig's in-car tape player (at right).



cars will have stereo tape playing systems."

Norelco. With all this activity, another cartridge system would seem to have little chance of gaining a foothold. Nevertheless, Norelco last year introduced a dashboard harness for its battery-operated portable tape-cartridge recorder and thus made a bid to capture part of the growing market. And the real breakthrough came when Norelco managed to persuade Mercury Records, Minnesota Mining, General Electric, Sony, Aiwa, Concord, Panasonic, and 31 other firms to adopt its system. Norelco-type players now cost from $70 to $100 and, unlike the others, are powered by self-contained flashlight batteries.

The Norelco system centers around a two-hub cartridge roughly a fifth the size of the other two. Similar to a design that was introduced by RCA in 1959, the Norelco model utilizes ⅛-in. tape recorded at 1⅞ ips. At the moment, recording is twin-track mono only—but the developers plan to introduce compatible four-track stereo soon. Blank cartridges, which cost from $2.65 to $3.25, hold 45 minutes of uninterrupted recording and are available from Norelco, Mercury, and Minnesota Mining. Prerecorded cartridges will cost about $4.95 for 32 minutes (about the same price as a stereo LP).

Among the machines which now fill the Norelco car harness are the Norelco Carry-Corder ($89.95), the Mercury TS8000 ($89.95), the Wollensak 4100 ($89.95), and the General Electric M8300 Lively Set (about $90). Both Norelco and Mercury project four-track stereo models using ⅛-in. tape at prices around $150.

The versatility of a 3-lb. recorder that operates equally well in a living room, at the beach, or under the dashboard—plus the fact that the owner can record his own fare —are the major assets of the Norelco system. Of course, given the know-how, it is possible to record Fidelipac tapes on a conventional four-track recorder, then load the tape into a cartridge. And Soundex now offers a Lear-Jet record/playback deck, while Roberts has introduced eight-track cartridge record/playback as an extra feature on its model 1725-8L recorder.

But for the most part, Fidelipac and Lear users are limited to commercially-recorded cartridges. At press time, there were only 50 prerecorded Norelco-type cartridges—all monaural, and all from the Mercury, Philips, Smash, Wing, and Limelight catalogs. But more were promised.

SJB, Tenna. For those who can't make up their minds as to which of the three major systems they prefer, there are a number of hybrid compatible units on the market. SJB's line, for example, includes six models, ranging in price from $100 to $170. The model ST308, at the bottom of the scale, comes with indicator light. For $130 you have a choice of model ST408, with indicator light and automatic light or model 603M/48, an all-chrome unit with speakers, adjustable bracket, cigarette lighter plug, and carrying handle. Another $10 adds FM radio to the ST308. Shell out $170, and you have a choice of two compatible tape-FM units, models ST408/FM and 603M/48/FM.

Still another compatible unit comes from Tenna Corporation. Said to be the least expensive on the market, it sells for $69.95 and features automatic sensing of cartridge,

Mark 8 player by RCA Victor permits use of 8-track car-cartridge tapes anywhere in the home. Device comes in two models: unit at left contains built-in speakers, while model below must be attached to stereo system.

tape sings the song of the open road

automatic switch-on, a reject bar, and optional foot switch control.

Homeward Bound. With most of the cartridge problems licked, manufacturers are beginning to design players for the living room (and a few models which can be connected directly to a component hi-fi system). Accepting Lear-Jet cartridges are Soundex's $80 player, RCA's Mark 8, and models from Lear-Jet, Roberts, and General Electric. Fidelipac units are available from Muntz Stereo-Pak, Telepro, SJB, and others.

Among the four-track home players are Telepro's Satellite II; and Muntz's A-HW-1, AR-300 and AR-400. The latter two are complete home-entertainment centers with record changer, amplifier and tape-cartridge handler. The AR-400, mounted in a cabinet, also contains two speaker systems, while the AR-300 is the heart of a stereo compact system.

Installation. In theory, some of the prices quoted by manufacturers include installation of the player in your car. In practice, you can save money on virtually any model by installing the unit yourself. Just how much work is involved depends on the type of unit you buy. The Norelco models, for example, simply slip into their harness with no additional work required. Those which operate through an existing car radio fit in a bracket mounted below the dashboard. (You'll also have to connect the player output to the radio amplifier—often merely a matter of inserting a jack.)

The most complicated to mount are the stereo models with speakers, since you'll have to cut holes for the speakers in your door panels. Which tools you'll need depends on the type of padding your car has inside the door. Speaker brackets and protectors usually are supplied with the do-it-yourself kits. Wiring from the player to the speakers is fairly simple, and consists of tucking the wire up under the dash, then running it through the panelling to the point where it meets the door frame.

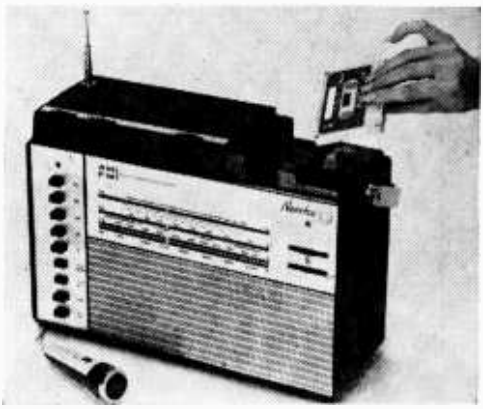
Sound-Box-On-Wheels. Where does it all lead? Surely eight-track tape must have a significantly higher tape hiss than four-track? And isn't it logical to expect 3¾-ips or 1⅞-ips recordings to sound inferior to 7½ ips? Actually, there's an aural trick involved. Tapes that sound very ordinary in a living room sound very good (if not excellent) in a car. The trick is similar to the one which permits 3½-in. speakers in stereo headphones to produce such startling bass tones.

In short, much of the system's success stems from the setup itself; you're enclosed in a relatively small space with two speakers and are in effect smack in the middle of a veritable sound-box-on-wheels. At the same time, road and traffic noises mask any imperfections in the recording or the equipment so that you hear—or think you hear—strikingly good sound.

In the living room, however, it can be

(Continued on page 115)

Unlike both Fidelipac and Lear-Jet systems, Norelco's cartridge contains two separate reel hubs that unwind and wind in standard fashion. Cassette (seen in hand in photo at right) can be used with car-player (below) or even AM/FM/SW portable.



WHITE'S RADIO LOG

Volume 47, No. 1

An up-to-date Broadcasting Directory of North American AM, FM and TV Stations. Including a Special Section on World-Wide Shortwave Stations

In this issue of *White's Radio Log* we have included the following listings: U.S. AM Stations by Frequency, Canadian AM Stations by Frequency, U.S. Commercial Television Stations by States, U.S. Educational Television Stations by States, Canadian Television Stations by Cities, and the World-Wide Shortwave Stations.

In Our Next Issue, April-May, 1967, the *Log* will contain the following listings: U.S. AM Stations by Location, U.S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, and the expanded Shortwave Section. The shortwave listings will always be completely revised in each issue of *Log* to insure 100 percent up-to-date information.

In the JUNE-JULY, 1967, issue of RADIO-TV EXPERIMENTER, the *Log* will contain the following listings: U.S. AM Stations by Call Letters, U.S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and the expanded World-Wide Shortwave Section.

Therefore, in any three consecutive 1967 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: kHz, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length is given in meters.

kHz	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	Salina, Kans.	5000d
WCBI	Columbus, Miss.	1000
KSD	St. Louis, Mo.	5000
KBOW	Butte, Mont.	1000
WGR	Buffalo, N.Y.	5000
WDBM	Statesville, N.C.	500d
KFYR	Bismarck, N.Dak.	5000
WKRC	Cincinnati, Ohio	5000
KOAC	Corvallis, Oreg.	5000
WHLM	Bloomsburg, Pa.	1000
WPAB	Ponce, P.R.	5000
WXTR	Pawtucket, R.I.	1000
KCRS	Midland, Tex.	5000
KTSA	San Antonio, Tex.	5000
WDEV	Waterbury, Vt.	5000
WSVA	Harrisonburg, Va.	5000
KARI	Blaine, Wash.	5000d
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.	5000
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.	500d
WACL	Waycross, Ga.	5000
WKYX	Paducah, Ky.	1000
WVMI	Biloxi, Miss.	1000d
KGRT	Las Cruces, N.Mex.	5000d
WMCA	New York, N.Y.	5000
WSYR	Syracuse, N.Y.	5000
WWNC	Asheville, N.C.	5000
WLLE	Raleigh, N.C.	500d
WKBN	Youngstown, Ohio	5000
WNAX	Yankton, S.Dak.	5000
WFAA	Dallas, Tex.	5000
WBAP	Ft. Worth, Tex.	5000
KLUB	Salt Lake City, Utah	5000
KVI	Seattle, Wash.	5000
WMAM	Marinette, Wis.	250d
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
WRTH	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, Ohio	500d
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
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-Richmond-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
WJRC	Hickory, N.C.	1000d
WMFD	Wilmington, N.C.	1000
KWRO	Coquille, Ores.	5000d
WEJL	Scranton, Pa.	500d
WKYN	San Juan, P.R.	5000
WPRO	Providence, R.I.	5000
KMAC	San Antonio, Tex.	5000
KSXX	Salt Lake City, Utah	1000d
KGDN	Edmonds, Wash.	5000
KZUN	Opportunity, Wash.	500d
640—468.5		
KFI	Los Angeles, Calif.	50000
WOI	Ames, Iowa	5000d
WHLO	Akron, O.	1000d
WNAD	Norman, Okla.	1000d
650—461.3		
KORL	Honolulu, Hawaii	10000
WSM	Nashville, Tenn.	50000
KIKK	Pasadena, Texas	250d
660—454.3		
KFAR	Fairbanks, Alaska	10000
KOWH	Omaha, Neb.	1000d
WNBC	New York, N.Y.	50000
WESC	Greenville, S.C.	10000d
KSKY	Dallas, Tex	10000d
670—447.5		
KBOI	Boise, Ida.	50000
WMAQ	Chicago, Ill.	50000
680—440.9		
KNBR	San Francisco, Cal.	50000
WPIN	St. Petersburg, Fla.	1000d
WATY	N. Atlanta, Ga.	5000
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
WNYR	Rochester, N.Y.	250
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.	10000d
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.	5000
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
WUFF	Eastman, Ga.	1000d
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, Hawaii	5000
WGN	Chicago, Ill.	50000
730—410.7		
WJMW	Athens, Ala.	1000
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.	500
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N.Mex.	1000d
WOOS	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

kHz	Wave Length	W.P.
740—405.2		
WBAM	Montgomery, Ala.	50000d
KUEQ	Phoenix, Ariz.	1000d
KBIG	Avalon, Cal.	10000d
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
WYHR	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		
KFQD	Anchorage, Alaska	10000
WSB	Atlanta, Ga.	50000
WBMD	Baltimore, Md.	1000d
KMMJ	Grand Island, Neb.	10000d
WHEB	Portsmouth, N.H.	1000d
KSEO	Durant, Okla.	250d
KXL	Portland, Oreg.	50000
WPDX	Clarksburg, W.Va.	1000d
WHA	Madison, Wis.	5000d
760—394.5		
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.	1000d
KCAM	Glennallen, Alaska	5000
KCEE	Tucson, Ariz.	5000
KDSY	Texarkana, Ark.	1000
KDAN	Eureka, Calif.	5000d
KABC	Los Angeles, Calif.	5000
WLBE	Leesburg, Fla.	5000
WFUN	Miami Beach, Fla.	5000
WYNR	Brunswick, Ga.	500d
WGRA	Cairo, Ga.	1000d
KONA	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
KFGO	Fargo, N.D.	5000
KWIL	Albany, Oreg.	1000
WAEB	Allentown, Pa.	1000
WPIC	Sharon, Pa.	1000d
WEAN	Providence, R.I.	5000
WWBD	Bamberg-Denmark, 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
KJRB	Spokane, Wash	5000
WEAQ	Eau Claire, Wis.	5000
800—374.8		
WHOS	Decatur, Ala.	1000d
WMGY	Montgomery, Ala.	1000d
KINY	Juneau, Alaska	5000
KAGH	Crossett, Ark.	250d
KVOM	Morrilton, Ark.	250d
KUZZ	Bakersfield, Calif.	250d
KDAD	Weed, Calif.	1000d
KBRN	Brighton, Colo.	500d
WLAD	Danbury, Conn.	1000d
WRKV	Rockville, Conn.	
WSUZ	Palatka, Fla.	1000d
WJAT	Swainsboro, Ga.	1000d
WKZI	Casey, Ill.	250d
KXIC	Iowa City, Iowa	1000d
WCCM	Lawrence, Mass.	1000d
WVAL	Sauk Rapids, Minn.	250d
KREI	Farmington, Mo.	1000d
KDBM	Dillon, Mont.	1000
WKDN	Camden, N. J.	5000d
KJEM	Okla. City, Okla.	250d
KPDQ	Portland, Ore.	5000d
WCHA	Chambersburg, Pa.	1000d
WDSC	Dillon, S.C.	1000d
WEAB	Greer, S.C.	250d
WDEH	Sweetwater, Tenn.	1000d
KDDD	Dumas, Tex.	250d
KBUH	Brigham City, Utah	250d
WSVS	Crewe, Va.	5000d
WKEE	Huntington, W.Va.	5000d
WDUX	Waupaca, Wis.	5000d
810—370.2		
KGO	San Francisco, Calif.	50000
WATI	Indianapolis, Ind.	2500d
WYRE	Annapolis, Md.	250d
WJPW	Rockford, Mich.	500d
WSJC	Magee, Miss.	50000
KCMO	Kansas City, Mo.	50000
KAFE	Santa Fe, N.M.	
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	50000
WFAA	Dallas, Tex.	50000
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
KGKO	Benton, Ark.	1000d
KOA	Denver, Colo.	50000
WRUF	Gainesville, Fla.	5000
WEAT	W. Palm Beach, Fla.	1000
KIMO	Hilo, Hawaii	1000
WCLR	Crystal Lake, Ill.	500d
WHDH	Boston, Mass.	50000
WBBZ	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
WIVK	Knoxville, Tenn.	50000
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	Baltimore, 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
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.	500d
KAIM	Honolulu, Hawaii	5000
WWL	New Orleans, La.	50000
WKAR	E. Lansing, Mich.	10000d
WHCU	Ithaca, N.Y.	5000
WGTL	Kannapolis, N.C.	1000d
WHOA	San Juan, P.R.	5000
KJIM	Ft. Worth, Tex.	250
WFLO	Farmville, Va.	1000d
880—340.7		
WCBS	New York, N.Y.	50000
WRRZ	Clinton, N.C.	1000d
WRFD	Worthington, Ohio	5000d
890—336.9		
WLS	Chicago, Ill.	50000
WHNC	Henderson, N.C.	1000d
KBYE	Okla. City, Okla.	1000d
900—333.1		
WATV	Birmingham, Ala.	1000d
WGOK	Mobile, Ala.	1000d
WOZK	Ozark, Ala.	1000d
KPRB	Fairbanks, Alaska	10000
KHOZ	Harrison, Ark.	1000d
KBIF	Fresno, Calif.	1000d
KGRB	West Covina, Cal.	250d
WJWL	Georgetown, Del.	5000d
WSWN	Belle Glade, Fla.	1000d
WMOP	Ocala, Fla.	1000d
WCGA	Calhoun, Ga.	1000d
WCRY	Macon, Ga.	250d
WEAS	Savannah, Ga.	5000d
KTEE	Idaho Falls, Ida.	1000d
KSIR	Wichita, Kan.	250d
WFIA	Louisville, Ky.	1000d
WLSI	Pikeville, Ky.	5000d
KREH	Oakdale, La.	250d
WCME	Brunswick, Maine	1000d
WLMD	Laurel, Md.	1000d
WATC	Gaylord, Mich.	1000d
KTIS	Minneapolis, Minn.	1000d
WDDT	Greenville, Miss.	1000d
KFAL	Fulton, Mo.	1000d
KJSK	Columbus, Nebr.	1000d
WOTW	Nashua, N.H.	1000d
WBRV	Boonville, N.Y.	1000d
WKAJ	Saratoga Springs, N.Y.	250d
WAYN	Rockingham, N.C.	1000d
WIAM	Williamston, N.C.	1000d
KFNW	Fargo, N.Dak.	1000d
WCNS	Canton, Ohio	500d
WFRO	Fremont, Ohio	500d
WCPA	Clearfield, Pa.	1000d
WFLN	Philadelphia, Pa.	1000d
WKXV	Knoxville, Tenn.	1000d
WCOR	Lebanon, Tenn.	500d
KALT	Atlanta, Tex.	1000d
KMCO	Conroe, Tex.	500d
KFLD	Floydada, Tex.	250d
KCLW	Hamilton, Tex.	250d
WODY	Bassett, Va.	500d
WAFC	Staunton, Va.	1000d
KUEN	Wenatchee, Wash.	1000d
WATK	Antigo, Wis.	250d
910—329.5		
WDVC	Dadeville, Ala.	500d
KPHO	Phoenix, Ariz.	5000
KLCN	Blytheville, Ark.	5000d
KAMD	Camden, Ark.	5000
KDEO	El Cajon, Calif.	1000
KNEW	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 City, 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
WPXI	Roanoke, Va.	1000d
KORD	Pasco, Wash.	1000d
KIXI	Seattle, Wash.	1000
KISN	Vancouver, Wash.	5000
WHSM	Hayward, Wis.	5000d
WDOR	Sturgeon Bay, Wis.	1000d
920—325.9		
WCTA	Adalusia, Ala.	5000
WWWR	Russellville, Ala.	1000d
KARK	Little Rock, Ark.	5000
KLOC	Ceres, Calif.	500d
KDES	Palm Springs, Cal.	5000
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.	500d
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	Fairbault, Minn.	5000
KWAD	Wadena, Minn.	1000
KRAM	Las Vegas, Nev.	1000
KOLO	Reno, Nev.	1000
KQEO	Albuquerque, N.Mex.	1000
WTTM	Trenton, N.J.	1000
WKRT	Cortland, N.Y.	1000
WGHQ	Kingston, N.Y.	5000d
WIRD	Lake Placid, N.Y.	1000
WBBB	Burlington, N.C.	5000d
WMNI	Columbus, Ohio	1000
KGAL	Lebanon, Oreg.	1000
WKVA	Lewistown, Pa.	1000
WJAR	Providence, R.I.	5000
WTND	Orangeburg, S.C.	1000d
KEZU	Rapid City, S.Dak.	1000d
WLIV	Livingston, Tenn.	1000d
KELP	El Paso, Tex.	1000
KECK	Odessa, Tex.	1000
KTLW	Texas City, Tex.	1000d
KITN	Olympia, Wash.	1000d
KXLY	Spokane, Wash.	5000
WMMN	Fairmont, W.Va.	5000
WOKY	Milwaukee, Wis.	5000
930—322.4		
WETO	Gadsden, Ala.	1000d
KTKN	Ketchikan, Alaska	5000
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
WTAO	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.	5000d
KOGA	Ogallala, Nebr.	500d
KCCC	Carlsbad, N.M.	
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
WIZR	Johnstown, N.Y.	1000d
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
KOET	Center, Tex.	1000d
KITE	San Antonio, Tex.	5000
WLLL	Lynchburg, Va.	1000d
KENY	Bellingham-Ferndale, Wash.	1000d
KQOT	Yakima, Wash.	1000d
WSAZ	Huntington, W.Va.	5000
KROE	Sheridan, Wyo.	1000d
WLBL	Auburndale, Wis.	5000d

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
940—319.0		
KHOS	Tueson, 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
KIDA	Des Moines, Iowa	10000
WCND	Shelbyville, Ky.	1000d
WYLO	New Orleans, La.	10000
WIDG	St. Ignace, Mich.	5000
WJDR	South Haven, Mich.	1000d
WQPC	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.	250d
WESA	Charleroi, Pa.	250d
WGRP	Greenville, Pa.	1000d
WIPR	San Juan, P.R.	10000
KIXZ	Amarillo, Tex.	5000
KTON	Belton, Tex.	1000d
KATQ	Texarkana, Tex.	1000d
WNRG	Grundy, Va.	5000d
WFAW	Ft. Atkinson, Wis.	250
950—315.6		
WRMA	Montgomery, Ala.	1000d
KJBM	Seward, Alaska	1000
KXJK	Forrest City, Ark.	5000d
KFSA	Ft. Smith, Ark.	1000
KAHI	Auburn, Calif.	5000d
KJMN	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
WAGM	Presque Isle, Maine	5000
WXLN	Potomac-Cabin John, Md.	1000d
WRYT	Boston, Mass.	5000d
WWJ	Detroit, Mich.	5000
KRSI	St. Louis Park, Minn.	1000
WBKH	Hattiesburg, Miss.	5000d
KLIK	Jefferson City, Mo.	5000d
WRVW	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
KJR	Seattle, Wash.	5000
WERL	Eagle River, Wis.	1000d
WKAZ	Charleston, W.Va.	5000d
WKTS	Sheboygan, Wis.	500d
KMER	Kemmerer, Wyo.	1000d
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
WGRD	Lake City, Fla.	500d
WJCM	Sebring, Fla.	1000d
WJAZ	Albany, Ga.	5000
WRFC	Athens, Ga.	5000
KSRA	Salmon, Idaho	1000d
WOLM	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.	5000d
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
WKZA	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
WBOM	Jacksonville, Fla.	
WFLA	Tampa, Fla.	5000
WIIN	Atlanta, Ga.	5000d
WVOP	Vidalia, Ga.	5000d
KPUA	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
WCKO	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
KOCE	Espanola, N. M.	1000d
WEBR	Buffalo, N.Y.	5000
WCHN	Norwich, N.Y.	500d
WRCS	Ahoskie, N.C.	1000d
WWIT	Canton, N.C.	1000d
WOAY	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.	1000d
KBSN	Crane, Tex.	1000d
KNOK	Ft. Worth, Tex.	1000d
WIVI	Christiansted, V. I.	5000
WYPR	Danville, Va.	1000d
WANV	Waynesboro, Va.	5000d
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
WTDT	Marianna, Fla.	1000d
WBDP	Pensacola, Fla.	1000d
WLDD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	1000d
WRIP	Rossville, Ga.	500d
KUPI	Idaho Falls, Idaho	1000d
WITY	Danville, Ill.	1000
KREB	Shreveport, La.	5000d
WCAP	Lowell, Mass.	1000d
WADP	Otsego, Mich.	1000d
WPBC	Richfield, 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
WYCL	York, S. C.	1000d
KOSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
KFRO	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
KENO	Cheyenne, Wyo.	500d
990—302.8		
WEIS	Center, Ala.	250
WWWF	Fayette, Ala.	1000d
WTCB	Flomaton, Ala.	500d
KTKT	Tueson, Ariz.	10000
KKIS	Pittsburg, Calif.	5000
KGUO	Santa Barbara, Calif.	1000d
KLIR	Denver, Colo.	1000d
WFAB	Miami, Fla.	5000
WHDO	Orlando, Fla.	50000
WDWD	Dawson, Ga.	1000d
WGML	Hinesville, Ga.	250d
KTRG	Honolulu, Hawaii	5000
WCAZ	Carthage, Ill.	1000d
WITZ	Jasper, Ind.	1000d
WERK	Muncie, Ind.	250d
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.	5000d
WPRA	Mayaguez, P.R.	10000
WLKW	Providence, R.I.	50000
WAKN	Aiken, S.C.	1000d
WNOX	Knoxville, Tenn.	10000
KWAM	Memphis, Tenn.	10000d
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
WXTN	Lexington, Miss.	5000d
WSPF	Hickory, N.C.	1000d
KTOK	Okla. City, Okla.	5000
WIOD	Carlisle, Pa.	1000
WGDG	Wahalla, S. C.	1000d
KSTA	Coleman, Tex.	250d
KGRI	Henderson, Tex.	250d
WKOE	Altavista, Va.	1000d
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	Atlanta-Decatur, Ga.	50000d
KATN	Boise, Idaho	1000d
WCSI	Columbus, Ind.	500d
KSMN	Mason City, Iowa	1000d
KINO	Independence, Kans.	250d
KOLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WITL	Lansing, Mich.	5000d
WRCR	Maplewood, Minn.	250d
WMOX	Meridian, Miss.	10000
KCHI	Chillicothe, Mo.	250d
KXEN	Festus-St. Louis, Mo.	50000d
KRVN	Lexington, Nebr.	25000d
WCNL	Newport, N.H.	250d
WINS	New York, N.Y.	50000
WABZ	Albermarle, N.C.	1000d
WFGW	Black Mountain, N.C.	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.	10000d
KSWS	Roswell, N.M.	50000d
KOKA	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
KTDT	Big Bear Lake, Cal.	250d
KDFY	San Mateo, Calif.	1000d
KWSD	Wasco, Calif.	1000d
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.	250d
KUPK	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
KLDH	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
WYBG	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
KEEO	Springfield-Eugene, Ore.	1000d
WBUT	Butler, Pa.	1000d
WWOS	Everett, Pa.	250d
WLYC	Williamsport, Pa.	1000d
WSMT	Sparta, Tenn.	1000d
KLEN	Killeen, Tex.	250d
KFAZ	Liberty, Tex.	250d
KCAS	Slaton, Tex.	250d
WGAT	Gate City, Va.	1000d
WBRG	Lynchburg, Va.	1000d
WCMS	Norfolk, Va.	1000d
KBLE	Seattle, Wash.	5000d
WCEF	Parkersburg, W. Va.	5000d
WECL	Eau Claire, Wis.	1000d
WKAU	Kaukauna, Wis.	1000
WLIP	Kenosha, Wis.	250d
KWIV	Douglas, Wyo.	250d
1060—282.8		
KUPO	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
KLMO	Longmont, Colo.	10000d
WRHL	Rochelle, Ill.	
WNOE	New Orleans, La.	50000
WHFB	Benton Harbor-St. Joseph, Mich.	5000d
KFIL	Preston, Minn.	
KNLV	Ord, Neb.	1000
WMAP	Monroe, N.C.	1000d
WBYB	St. Pauls, N.C.	
WDID	Canton, O.	5000d
KYW	Philadelphia, Pa.	50000
WRJS	San German, P. R.	250
WALO	Walterboro, S. C.	1000d
WPHC	Waverly, Tenn.	1000d
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.	50000
WOIA	Memphis, Tenn.	50000
KOPY	Alice, Tex.	1000
KNNN	Friona, Tex.	
KENR	Houston, Tex.	10000d
WINA	Charlottesville, Va.	5000
WKOW	Madison, Wis.	10000

kHz	Wave Length	W.P.
1080—277.6		
WKAC	Athens, Ala.	1000d
KSCO	Santa Cruz, Calif.	10000
WTIC	Hartford, Conn.	50000
WVCG	Coral Gables, Fla.	10000
WFIV	Kissimmee, Fla.	250
WBIE	Marietta, Ga.	10000d
WJBG	Pontiac, Ill.	
WNWI	Valparaiso, Ind.	5000d
WKLD	Louisville, Ky.	5000
WDAP	Owosso, Mich.	1000d
KGCL	East Prairie, Mo.	
WUFO	Amherst, N.Y.	1000d
WEWD	Laurinburg, N.C.	5000d
WWDR	Murfreesboro, N.C.	500d
WMVR	Sidney, O.	250d
KWJJ	Portland, Oreg.	50000
WEEP	Pittsburgh, Pa.	1000d
WLEY	Cayey, P.R.	250
KGFX	Pierre, S. D.	10000d
KRLD	Dallas, Tex.	50000
WKBY	Chatham, Va.	
1090—275.1		
KAAY	Little Rock, Ark.	50000
WQIK	Jacksonville, Fla.	50000d
WWSD	Monticello, Fla.	1000d
WBAF	Barnesville, Ga.	
WCRA	Effingham, Ill.	1000
WGLC	Mendota, Ill.	250d
KHAI	Honolulu, Hawaii	5000
KNWS	Waterloo, Iowa	1000d
WBAL	Baltimore, Md.	50000
WILD	Boston, Mass.	1000d
WMUS	Muskegon, Mich.	1000d
WTAK	Garden City, Mich.	250d
WKTE	King, N.C	500d
WBZB	Selma, N. C.	1000d
WMWM	Wilmington, O.	1000d
WJKM	Hartsville, Tenn.	
KING	Seattle, Wash.	50000
1100—272.6		
KFAX	San Francisco, Calif.	50000
WLBB	Carrollton, Ga.	1000d
WHLI	Hempstead, N.Y.	10000d
WKYC	Cleveland, O.	50000
WGPA	Bethlehem, Pa.	250d
1110—270.1		
WBCA	Bay Minette, Ala.	10000d
WBIB	Centreville, Ala.	1000d
KRLA	Pasadena, Cal.	50000
WALT	Tampa, Fla.	50000d
KIPA	Hilo, Hawaii	1000
WMBI	Chicago, Ill.	5000d
WKDZ	Cadiz, Ky.	
WFCG	Franklinton, La.	
WUST	Bethesda, Md.	
WUNN	Mason, Mich.	
WKRA	Holly Springs, Miss.	
KFAB	Omaha, Nebr.	50000
WBT	Charlotte, N.C.	50000
KEOR	Atoka, Okla.	
KBND	Bend, Oreg.	5000
WNAR	Norristown, Penn.	50000d
WVJP	Caguas, P.R.	250
WHIM	Providence, R.I.	1000d
WPHC	Waverly, Tenn.	1000d
KDRY	Alamo Heights, Tex.	1000d
1120—267.7		
WUST	Bethesda, Md.	250d
KMOX	St. Louis, Mo.	50000
WWOL	Buffalo, N.Y.	1000d
KEED	Springfield-Eugene, Ore.	1000d
KCLE	Cleburne, Tex.	250d
1130—265.3		
KRDU	Dinuba, Calif.	1000
KSDO	San Diego, Cal.	5000d
KLEI	Kailua, Hawaii	1000
KLEY	Wellington, Kans.	
KWKH	Shreveport, La.	50000
WCAR	Detroit, Mich.	50000
WDGY	Minneapolis, Minn.	50000
WNEW	New York, N.Y.	50000
WAMG	Gallatin, Tenn.	
KBGH	Memphis, Tex.	
WISN	Milwaukee, Wis.	50000
1140—263.0		
KRAK	Sacramento, Calif.	50000
WMIE	Miami, Fla.	10000
KGEM	Boise, Idaho	10000
WSIV	Pekin, Ill.	5000d
WAWK	Kendallville, Ind.	250d
KPWB	Piedmont, Mo.	
WCLW	Mansfield, O.	250d
KLPR	Oklahoma City, Okla.	1000d
WITA	San Juan, P.R.	10000
KSOO	Sioux Falls, S.Dak.	10000
KORC	Mineral Wells, Tex.	250d
WRVA	Richmond, Va.	50000
1150—260.7		
WBCA	Bay Minette, Ala.	1000d
WGEA	Geneva, Ala.	1000d
WJRD	Tuscaloosa, Ala.	5000
KCKY	Coolidge, Ariz.	1000
KXLR	No. Little Rock, Ark.	5000
KRKD	Los Angeles, Calif.	5000
KJAX	Santa Rosa, Calif.	5000
KGMC	Englewood, Colo.	1000d
WCNX	Middletown, Conn.	1000d
WDEL	Wilmington, Del.	5000
WNDB	Daytona Beh., Fla.	1000
WTMP	Tampa, Fla.	5000d
WFPM	Fort Valley, Ga.	1000d
WJEM	Valdosta, Ga.	1000d
WGGH	Marion, Ill.	5000d
WYFE	Rockford, Ill.	500d
KYED	Burlington, Ia.	500d
KWKY	Des Moines, Iowa	1000
KSAL	Salina, Kans.	5000
WMST	Mt. Sterling, Ky.	500d
WLDC	Mumfordville, Ky.	1000d
WJBO	Baton Rouge, La.	5000
WGHM	Skowhegan, Maine	5000d
WHMC	Gaithersburg, Md.	1000
WCDP	Boston, Mass.	5000
WCEN	Mt. Pleasant, Mich.	5000
KASM	Albany, Minn.	1000d
KRMS	Osage Beach, Mo.	1000d
KSEN	Shelby, Mont.	1000
KDEF	Albuquerque, N. M.	5000
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, S.C.	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
KDLJ	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
1160—258.5		
WJJD	Chicago, Ill.	50000d
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.	5000
WWVA	Wheeling, W.Va.	50000
WLKE	Waupun, Wis.	
1180—254.1		
WLDS	Jacksonville, Ill.	1000d
WHAM	Rochester, N.Y.	50000
1190—252.0		
KRDS	Tolleson, Ariz.	250
KEZY	Anaheim, Calif	5000
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		
WDAI	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.	10000d
WPRN	Butler, 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
WDCJ	Arlington, Fla.	10000d
WJPB	Kissimmee, Fla.	
WOAH	Miami, Fla.	250d
WSAF	Sarasota, Fla.	1000d
WCLB	Camilla, Ga.	10000d
WPLK	Rockmart, Ga.	500d
WSFT	Thomaston, Ga.	250d
WLPO	LaSalle, Ill.	1000d
WKRS	Waukegan, Ill.	10000d
WSLM	Salem, Ind.	5000d
KJAN	Atlantic, Iowa	250d
KOUR	Independence, Iowa	250d
KOFO	Dttawa, 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
KZYM	Cape Girardeau, Mo.	250d
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
WFWL	Camden, Tenn.	250d
WCPH	Etowah, Tenn.	1000d
KVLL	Livingston, Tex.	250d
KZEE	Weatherford, Tex.	250d
WLSD	Big Stone Gap, Va.	1000d
WFAX	Falls Church, Va.	5000d
KASY	Auburn, Wash.	250d
KOZI	Chelan, Wash.	1000d
WRNE	Wis. Rapids, Wis.	500d
1230—243.8		
WAUD	Auburn, Ala.	1000
WJBB	Haleyville, Ala.	1000
WBHP	Huntsville, Ala.	1000
WNUZ	Talledega, Ala.	1000
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.	250
KXO	El Centro, Calif.	250
KDAC	Ft. Bragg, Calif.	1000
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.	1000d
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	1000d
WHIR	Danville, Ky.	1000
WHOP	Hopkinsville, Ky.	1000d
WMLF	Pineville, Ky.	1000d
KLIC	Monroe, La.	1000d
WSHO	New Orleans, La.	1000
KSLO	Opelousas, La.	250
WBME	Belfast, Me.	1000d
WQDY	Calais, Maine	1000
WSJR	Madawaska, Me.	1000d
WITH	Baltimore, Md.	1000d
WCUM	Cumberland, Md.	1000
WMNB	No. Adams, Mass.	1000d
WESX	Salem, Mass.	1000
WNEB	Worcester, Mass.	1000
WJEF	Grand Rapids, Mich.	1000
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. Falls, 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.	1000
KTNC	Falls City, Nebr.	100
KHAS	Hastings, Neb.	1000
KELY	Ely, Nev.	250
KLAV	Las Vegas, Nev.	250
KCBN	Reno, Nev.	1000
WMOU	Berlin, N.H.	1000d
WTSV	Claremont, N.H.	1000
WCMC	Wildwood, N.J.	1000
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.	1000
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
WCWA	Toledo, O.	1000d
KADA	N. of Ada, Okla.	250
WBBZ	Ponca City, Okla.	250
KVAS	Astoria, Ore.	1000
KRNS	Burns, Ore.	1000
KOOS	Coos Bay, Ore.	1000
KRDR	Gresham, Oreg.	1000
KYJC	Medford, Oreg.	1000
KQIK	Lakeview, Ore.	1000
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
KISO	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.	1000
KEEE	Nacogdoches, Tex.	1000
KOSA	Odessa, Tex.	1000
KHHH	Pampa, Tex.	1000
KSEY	Seymour, Tex.	1000
KSST	Sulphur Sprgs., Tex.	1000
KWTX	Waco, Tex.	1000d
KMOR	Murray, Utah	250
KOAL	Price, Utah	1000
WJOY	Burlington, Vt.	1000
WBBI	Abingdon, Va.	1000d
WODI	Brookneal, Va.	1000
WCFV	Clifton Forge, Va.	1000
WFVA	Fredericksburg, Va.	1000
WNOR	Norfolk, Va.	1000
KWYZ	Everett, Wash.	1000
KSPO	Spokane, Wash.	1000
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
KVDC	Casper, Wyo.	1000
1240—241.8		
WEBJ	Brewton, Ala.	250
WPRN	Butler, Ala.	1000d
WULA	Eufaula, Ala.	250
WOWL	Florence, Ala.	1000

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
WARF	Jasper, Ala.	1000
KVRD	Cottonwood, Ariz.	250
KZOW	So. of Globe, Ariz.	1000
KVRC	Arkadelphia, Ark.	250
KTLD	Mountain Home, Ark.	1000
KWAK	Stuttgart, Ark.	250
KPLY	Crescent City, Calif.	250
KOAD	Lemoore, Cal.	250
KMBY	Monterey, Calif.	1000
KPPC	Pasadena, Calif.	100
KLDA	Ridgecrest, Calif.	250
KRDY	Sacramento, Calif.	1000
KRNO	San Bernardino, California	1000d
KSDN	San Diego, Calif.	250
KSMA	Santa Maria, Calif.	250
KSUE	Susanville, Calif.	1000
KRDO	Colo. Springs, Colo.	1000d
KDGO	Durango, Colo.	1000
KSLV	Monte Vista, Colo.	1000
KCRT	Trinidad, Colo.	250
WWCD	Waterbury, Conn.	1000
WBGC	Chipley, Fla.	1000
WLCO	Eustis, Fla.	1000
WINK	Ft. Myers, Fla.	1000
WMMB	Melbourne, Fla.	1000
WFDY	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
KFLI	Mountain Home, Idaho	250
KMCL	McCall, Ida.	1000
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.	1000
WGRM	Greenwood, Miss.	250
WGCM	Gulfport, Miss.	1000
WMIS	Natchez, Miss.	250
KWDS	Jefferson City, Mo.	1000d
KODE	Joplin, Mo.	1000d
KNEM	Nevada, Mo.	250
KBMY	Billings, Mont.	1000
KLTZ	Glasgow, Mont.	1000
KBLL	Helena, Mont.	1000
KFDR	Lincoln, Nebr.	1000
KODY	North Platte, Nebr.	1000
KELK	Elko, Nev.	1000
WFTN	Franklin, N.H.	250
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.	1000
WIST	Charlotte, N.C.	1000
WCNC	Elizabeth City, N.C.	1000d
WJNC	Jacksonville, N.C.	1000
WRNC	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
KCCR	Pierre, S. D.	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
KDRA	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
WRDV	Roanoke, Va.	1000
WTON	Staunton, Va.	1000
KXLE	Ellensburg, Wash.	1000
KGY	Olympia, Wash.	1000
WKOY	Bluefield, W.Va.	1000
WTIP	Charleston, W.Va.	1000d
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
KKA	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.	1000d
WNER	Live Oak, Fla.	1000d
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
WXDX	Bay City, Mich.	1000
KOTE	Fergus Falls, Minn.	1000
KCUE	Red Wing, Minn.	1000d
WHNY	McComb, Miss.	5000
KFMD	Flat River, Mo.	1000
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
WCHD	Washington Court House, Ohio	500d
WLEM	Emporium, Pa.	1000d
WPEL	Montrose, Pa.	1000d
WTAE	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

KPIN	Casa Grande, Ariz.	1000d
KCCB	Corning, Ark.	1000d
KBHC	Nashville, Ark.	500d
KGIL	San Fernando, Calif.	5000
KYA	San Francisco, Calif.	5000
KSNO	Aspen, Colo.	5000d
WCRT	Birmingham, Ala.	5000d
WMMM	Westport, Conn.	1000d
WNRK	Newark, Del.	500d
WWDC	Washington, D.C.	5000
WFTW	Fort Walton Beach, Florida	1000d
WAME	Miami, Fla.	5000
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
WAIL	Baton Rouge, La.	1000d
WEZE	Boston, Mass.	5000
WALM	Albion, Mich.	1000
WJBL	Holland, Mich.	5000
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
WCSA	Ripley, Miss.	500
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.	5000
WCDJ	Edenton, N.C.	1000d
WIXY	Cleveland, O.	5000
WNXT	Portsmouth, Ohio	5000
KWSH	Weweka-Seminole, Oklahoma	1000
KMCM	McMinnville, Oreg.	1000
WWYN	Erie, Pa.	5000
WPHB	Philipsburg, Pa.	5000d
WISO	Ponce, P.R.	1000
WMUU	Greenville, S.C.	5000d
WJDT	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.	1000d
KWIQ	Moses Lake, Wash.	1000d
WVVW	Grafton, W.Va.	500
WWIS	Black River FaHs, Wis.	1000d
WEKZ	Monroe, Wis.	1000d
WOCO	Oconto, Wis.	
KPOW	Powell, Wyo.	5000

1270—236.1

WGSV	Guntersville, Ala.	1000d
WZAM	Prichard, Ala.	1000d
KBYR	Anchorage, Alaska	1000
KDJI	Holbrook, Ariz.	1000d
KADL	Pine Bluff, Ark.	5000d
KBLC	Lakeport, Calif.	
KGOL	Palm Desert, Cal.	500d
KCDK	Tulare, Calif.	5000d
WNOG	Naples, Fla.	500d
WHIY	Orlando, Fla.	5000d
WTNT	Tallahassee, Fla.	5000
WKRW	Cartersville, Ga.	500d
WHYD	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
WKYR	Cumberland, Md.	5000
WSPR	Springfield, Mass.	5000
WXYZ	Detroit, Mich.	5000
KWEB	Rochester, Minn.	5000
WVOM	Ioka, Miss.	1000d
WLSM	Louisville, Miss.	5000d
KUSN	St. Joseph, Mo.	1000d
KBUB	Sparks, Nev.	1000d
WTSN	Dover, N.H.	5000
WDVL	Vineland, N.J.	500d
KINN	Alamogordo, N.M.	1000d
WHLD	Niagara Falls, N.Y.	5000d
WDLA	Walton, N.Y.	1000d
WCGC	Belmont, N. C.	1000
WMPM	Smithfield, N.C.	5000d
KBOM	Mandan, N.Dak.	1000
WILE	Cambridge, Ohio	1000d
KWPR	Claremore, Okla.	500d
KAJO	Grants Pass, Oreg.	5000d
WLBR	Lebanon, Pa.	5000
WBHC	Hampton, S.C.	1000d
KNWC	Sioux Falls, S.Dak.	1000
WLIK	Newport, Tenn.	5000d
KIOX	Bay City, Tex.	1000
KHEM	Big Spring, Tex.	1000d
KEPS	Eagle Pass, Tex.	1000d
KFJZ	Fort Worth, Tex.	5000
WTID	Newport News, Va.	1000d
WHED	Stuart, Va.	1000d
KCVL	Colville, Wash.	1000d
KBAM	Longview, Wash.	5000d
WRJC	Mauston, Wis.	500d
WWJC	Superior, Wis.	5000d
KIML	Gillette, Wyo.	5000

1280—234.2

WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KOAG	Arroyo Grande, Cal.	1000
KIXF	Fortuna, Calif	
KFDX	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
WIPC	Lake Wales, Fla.	1000d
WYNO	Sarasota, Fla.	500d
WIBB	Macon, Ga.	5000d
WMRO	Aurora, Ill.	1000d
WGBF	Evansville, Ind.	5000
KCOB	Newton, Iowa	1000d
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d
KWCL	Oak Grove, La.	500d
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WWTC	Minneapolis, Minn.	5000
KVOX	Moorhead, Minn.	1000
KDKD	Clinton, Mo.	1000d
KYRD	Potosi, Mo.	500d
KCNI	Broken Bow, Nebr.	1000d
KTOO	Henderson, Nev.	5000d
KRZE	Farmington, N.Mex.	5000d
WADO	New York, N.Y.	5000
WROC	Rochester, N.Y.	5000d
WSAT	Salisbury, N.C.	1000
WYAL	Scotland Neck, N.C.	5000d
WONW	Defiance, Ohio	1000
WLMJ	Jackson, Ohio	1000d
KLCO	Poteau, Okla.	1000d
KERG	Eugene, Oreg.	5000
WBRX	Berwick, P.	1000d
WHVR	Hanover, Pa.	5000
WKST	New Castle, Pa.	1000
WCMN	Arecibo, P.R.	5000
WANS	Anderson, S.C.	5000
WJAY	Mullins, S.C.	5000d
KBHB	Sturgis, S. D.	1000d
WMCP	Columbia, Tenn.	1000d
WDNT	Dayton, Tenn.	1000d
KNIT	Abilene, Tex.	500d
KWHI	Brenham, Tex.	1000d
KLUE	Longview, Tex.	1000d
KRAN	Morton, Tex.	500
KVWG	Pearsall, Tex.	500d
KNAK	Salt Lake City, Utah	5000
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
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
WREY	New Albany, Ind.	5000
KWNS	Pratt, Kansas	5000
WCBL	Benton, Ky.	5000d
KJEF	Jennings, La.	1000d
WHGR	Houghton Lake, Mich.	5000
WNIL	Niles, Mich.	500d
WOIB	Saline, Mich.	500d
KBMO	Benson, Minn.	500d

kHz	Wave Length	W.P.
WBLE	Batesville, Miss.	1000d
KALM	Thayer, Mo.	1000d
KGVO	Missoula, Mont.	5000
KOIL	Omaha, Nebr.	5000
WKNE	Keene, N.H.	5000
KSRC	Socorro, N.M.	1000d
WGLI	Babylon, N. Y.	5000
WBBF	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

1300—230.6

WBSA	Boaz, Ala.	1000d
WTLS	Tallassee, Ala.	1000d
WEZQ	Winfield, Ala.	500d
KHAC	Window Rock, Ariz.	
KWCB	Searcy, Ark.	1000d
KROP	Brawley, Calif.	1000
KYNO	Fresno, Calif.	5000
KWKW	Pasadena, Calif.	5000
KVOR	Colo. Sprgs., Colo.	1000
WAVZ	New Haven, Conn.	1000
WRKT	Cocoa Beach, Fla.	5000
WFFG	Marathon, Fla.	500
WSOL	Tampa, Fla.	5000d
WMTM	Moultrie, Ga.	5000d
WNEA	Newman, Ga.	500
WIMO	Winder, Ga.	1000d
KOZE	Lewiston, Idaho	5000
WTAQ	La Grange, Ill.	5000
WFRX	W. Frankfort, Ill.	1000d
WHLT	Huntington, Ind.	500d
WAAC	Terre Haute, Ind.	500d
KGLO	Mason City, Iowa	5000
WBLG	Lexington, Ky.	1000
WIBR	Baton Rouge, La.	1000
KANB	Shreveport, La.	1000d
WFBR	Baltimore, Md.	5000
WJDA	Quincy, Mass.	1000d
WOOD	Grand Rapids, Mich.	5000
WRBC	Jackson, Miss.	5000
KMMO	Marshall, Mo.	1000d
KBRL	McCook, Nebr.	5000d
KPTL	Carson City, Nev.	5000
WPNH	Plymouth, N.H.	1000d
WAAT	Trenton, N.J.	5000d
WOSC	Fulton, N.Y.	1000d
WMMJ	Lancaster, N.Y.	1000d
WEEE	Rensselaer, N.Y.	5000d
WRRC	Spring Valley, N.Y.	500d
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.	5000
KKUB	Brownfield, Tex.	1000d
KGNS	Laredo, Tex.	1000d
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.	5000d
KPOD	Crescent City, Calif.	1000d
KDIA	Oakland, Cal.	5000
KTKR	Taft, Calif.	1000d
KFKA	Greeley, Colo.	5000d
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
WLOB	Portland, Me.	5000
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
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.	5000
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.	1000d
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
WZDK	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.	500d
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
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.	1000d
WHOK	Lancaster, Ohio	1000d
KWOE	Clinton, Okla.	1000d
KATR	Eugene, Ore.	1000d
WKAP	Allentown, Pa.	5000
WGET	Gettysburg, Pa.	1000
WJAS	Pittsburgh, Pa.	5000
WSCR	Scranton, Pa.	1000
WUNO	Rio Piedras, P.R.	5000
WOIC	Columbia, S. C.	5000
KELO	Sioux Falls, S.Dak.	5000
WKIN	Kingsport, Tenn.	5000d
WMSR	Manchester, Tenn.	5000d
KVMC	Colo. City, Tex.	1000d
KXYZ	Houston, Tex.	5000
KCPX	Salt Lake City, Utah	5000
WDMS	Lynchburg, Va.	1000
WEET	Richmond, Va.	1000d
KXRO	Aberdeen, Wash.	5000
KHIT	Walla Walla, Wash.	1000d
WAXK	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.	5000
WEAW	Evanston, Ill.	5000
WRAM	Monmouth, Ill.	1000d
WRRR	Rockford, Ill.	1000d
WJPS	Evansville, Ind.	5000
WTRE	Greensburg, Ind.	5000
KWWL	Waterloo, Iowa	5000
KFH	Wichita, Kans.	5000
WYGO	Corbin, Ky.	5000d
WMOR	Morehead, Ky.	1000d
KVOL	Lafayette, La.	5000
WASA	Havre de Grace, Md.	5000d
WCRB	Waltham, Mass.	5000
WTRX	Flint, Mich.	5000
WLOL	Minneapolis, Minn.	5000
WJPR	Greenville, Miss.	1000
WMAD	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.	500d
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
KZAK	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
KIKO	Miami, Ariz.	1000
KNOG	Nogales, Ariz.	250
KENT	Prescott, Ariz.	250
KBTA	Batesville, Ark.	1000
KBRS	Springdale, Ark.	1000
KATA	Arcata, Cal.	1000
KWXY	Cathedral City, Cal.	250
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
WOOK	Washington, D. C.	1000
WSLC	Clermont, Fla.	250
WTAN	Clearwater, Fla.	250
WROD	Daytona Bch., Fla.	1000
WDSR	Lake City, Fla.	1000
WTYS	Marianna, Fla.	1000
WNSM	Niceville-Valparaiso, Fla.	1000
WQXT	Palm Beach, Fla.	500
WSEB	Sebring, Fla.	1000
WNSM	Valparaiso-Niceville, Fla.	1000
WIGO	Atlanta, Ga.	1000d
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
WCMJ	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.	1000
KDLM	Detroit Lakes, Minn.	1000
WEVE	Eveleth, Minn.	1000
KROC	Rochester, Minn.	1000
KWLM	Willmar, Minn.	1000
WIMB	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
WMBO	Auburn, N.Y.	1000
WENT	Gloversville, N.Y.	1000
WKSN	Jamestown, N.Y.	250
WUSJ	Lockport, N.Y.	250
WMSA	Massena, N.Y.	1000
WALL	Middletown, N.Y.	1000
WIRY	Plattsburgh, N.Y.	1000
WJRI	Lenoir, N.C.	1000
WTSB	Lumberton, N.C.	1000
WOXF	Oxford, N.C.	1000
WOOW	Greenville, N.C.	1000
WGNI	Wilmington, N.C.	1000
WAIR	Winston-Salem, N.C.	250
KGPC	Grafton, N.Dak.	1000
WNCO	Ashland, O.	1000
WOUB	Athens, Ohio	250
WIZE	Springfield, Ohio	1000
WSTV	Steubenville, Ohio	1000
KIHN	Hugo, Okla.	250
KOCY	Okla. City, Okla.	1000
KTOW	Sand Springs, Okla.	500
KLOO	Corvallis, Ore.	1000
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	Aguadilla, P.R.	250
WOKE	Charleston, S.C.	1000
WRHI	Rock Hill, S.C.	1000
WSSC	Sumter, S.C.	1000
KIJV	Huron, S. D.	1000
KRSD	Rapid City, S.Dak.	1000
WBAC	Cleveland, Tenn.	1000
WKRM	Columbia, Tenn.	1000
WGRV	Greeneville, Tenn.	1000
WKGN	Knoxville, Tenn.	1000
WLOK	Memphis, Tenn.	1000d
WCDT	Winchester, Tenn.	1000
KWKC	Abilene, Tex.	1000
KTSL	Burnett, Tex.	250
KANO	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
KSMK	Kennewick, Wash.	1000
KAPA	Raymond, Wash.	1000

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
KMEL	Wenatchee, Wash.	250
WHAR	Clarksburg, W.Va.	1000
WEPM	Martinsburg, W. Va.	1000
WMON	Montgomery, W.Va.	250
WOVE	Weleh, 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

WELB	Elba, Ala.	1000d
WGAD	Gadsden, Ala.	5000d
KLYD	Bakersfield, Calif.	1000d
KCKC	San Bernardino, Cal.	5000
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
WAVC	Warner Robins, Ga.	5000d
KALC	Lewiston, Ida.-Clarkston, Wash.	5000d
WXCL	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
WKCU	Corinth, Miss.	1000
WKOZ	Kosciusko, Miss.	5000d
KCHR	Charleston, Mo.	1000d
KBRX	O'Neill, Nebr.	1000d
WLNH	Laconia, N.H.	5000d
WHWH	Princeton, N.J.	5000
KABQ	Albuquerque, N.M.	5000
WCBA	Corning, N.Y.	1000d
WRNY	Rome, N.Y.	500d
WBMS	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

WWWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WELR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	500d
KFFA	Helena, Ark.	1000
KFIV	Modesto, Cal.	5000
KRCK	Ridgecrest, Calif.	1000d
KGB	San Diego, Calif.	5000
KOEY	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
KNIR	New Iberia, La.	1000d
KTLD	Tallulah, La.	500d
WEBB	Baltimore, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYO	Caro, Mich.	500d
WKMI	Kalamazoo, Mich.	5000
KLRS	Mountain Grove, Mo.	1000d
KICX	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
WBLC	Lenoir City, Tenn.	
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
WHBQ	Harrisonburg, Va.	5000d
KFDR	Grand Coulee, Wash.	1000d
KMO	Tacoma, Wash.	5000
WHJC	Matewan, W.Va.	1000d
WMOV	Ravenswood, W.Va.	1000d
WBAY	Green Bay, Wis.	5000
WISV	Viroqua, Wis.	1000
WMNE	Menomonie, Wis.	1000d
KVRS	Rock Springs, Wyo.	1000

1370—218.8

WBYE	Calera, Ala.	1000d
KAWW	Heber Springs, Ark.	500
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
WWKE	Ocala, Fla.	5000d
WCOA	Pensacola, Fla.	5000
WAXE	Vero Beach, Fla.	1000d
WLOP	Jesup, Ga.	5000
WFDR	Manchester, Ga.	1000d
WLOV	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.	5000d
WMHI	Braddocks Hts., Md.	500d
WKIK	Leonardtown, Md.	1000d
WGHN	Grand Haven, Mich.	500d
KSUM	Fairmont, Minn.	1000
WMKT	S. St. Paul, Minn.	500d
WMGO	Canton, Miss.	1000d
KWRT	Boonville, Mo.	1000d
KCRV	Caruthersville, Mo.	1000d
KXLF	Butte, Mont.	5000
KAWL	York, Nebr.	500d
WFEA	Manchester, N.H.	5000
WELV	Ellenville, N.Y.	500
WALK	Patchogue, N.Y.	500d
WSAY	Rochester, N.Y.	5000
WLTC	Gastonia, N.C.	5000d
WTAB	Tabor City, N.C.	5000d
KFJM	Grand Forks, N.D.	1000d
WSPD	Toledo, Ohio	5000
KVYL	Holdenville, Okla.	500d
KAST	Astoria, Oreg.	1000
WOTR	Corry, Pa.	1000
WPAZ	Pottstown, Pa.	1000d
WKMC	Roaring Sprgs., Pa.	1000d
WIVV	Vieques, P.R.	1000
WKFD	Wickford, R.I.	500d
WDEF	Chattanooga, Tenn.	5000
WDXE	Lawrenceburg, Tenn.	1000d
WRGS	Rogersville, Tenn.	1000d
KOKE	Austin, Tex.	1000d
KFRO	Longview, Tex.	1000
KPOS	Post, Tex.	1000d
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	Cheyenne, Wyo.	1000

1380—217.3

WRAB	Arab, Ala.	1000d
WGYV	Greenville, Ala.	1000d
WVSA	Vernon, Ala.	
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	Cedilla, 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.	5000
KAGE	Winona, Minn.	1000
WDLT	Indianola, Miss.	500d
KWK	St. Louis, Mo.	5000d
KUVR	Holdredge, Nebr.	500
WBBX	Portsmouth, N.H.	1000
WAWZ	Zarephath, N.J.	5000
WSSR	Bath, N.Y.	500d
WBNY	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
WTVR	Richmond, Va.	5000
KRKO	Everett, Wash.	5000
KPEG	Spokane, Wash.	5000d
WMTD	Hinton, W.Va.	1000d
WBEL	Beloit, Wis.	5000

1390—215.7

WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	500d
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo	5000d
WAVP	Avon Park, Fla.	1000d
WUWU	Gainsville, 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
WYXI	Athens, Tenn.	
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

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.	1000
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
KIGO	St. Anthony, Ida.	
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.	1000
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.	1000
WJLB	Detroit, Mich.	1000d
WHOF	Houghton, Mich.	250
WGON	Munising, Mich.	1000
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.	1000
WNAG	Grenada, Miss.	1000
WFOR	Hattiesburg, Miss.	1000
WJQS	Jackson, Miss.	1000
WMBC	Macon, Miss.	1000
KFRU	Columbia, Mo.	1000
KJCF	Festus, Mo.	1000
KSIM	Sikeston, Mo.	1000
KTTS	Springfield, Mo.	1000
KDRG	Deer Lodge, Mont.	250
KXGN	Glendive, Mont.	250
KARR	Great Falls, Mont.	1000
KCOW	Alliance, Nebr.	1000
KLIN	Lincoln, 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

kHz	Wave Length	W.P.
WYSL	Buffalo, N.Y.	1000
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.	1000
WEST	Easton, Pa.	1000
WJET	Erie, Pa.	1000
WFEC	Harrisburg, Pa.	1000d
WWSF	Loretto, Pa.	250
WICK	Scranton, Pa.	250
WRAK	Williamsport, Pa.	1000
WVOZ	Carolina, P. R.	500
WCOS	Columbia, S.C.	1000
WGTN	Georgetown, S.C.	1000
WHCQ	Spartanburg, S.C.	1000d
WBJM	Lemmon, S.D.	1000
WJZM	Clarksville, Tenn.	1000
WHUB	Cookeville, Tenn.	1000
WLSB	Copperhill, Tenn.	1000
WGAP	Maryville, Tenn.	1000d
WHAL	Shelbyville, Tenn.	1000
KRUN	Ballinger, Tex.	1000
KBYG	Big Springs, Tex.	1000
KUNO	Corpus Christi, Tex.	1000
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.	1000
KRSC	Othello, Wash.	250
KTNT	Tacoma, Wash.	1000
WBOY	Clarkesburg, W.Va.	1000
WRON	Ronceverte, W.Va.	1000
WVRC	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	Casper, 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
WDOV	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.	1000
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
WBZA	Glens Falls, N. Y.	1000d
WOTT	Watertown, N.Y.	5000
WVCB	Shallotte, N.C.	500d
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.	1000
WPCC	Clinton, S.C.	1000d
WYMB	Manning, S.C.	1000d
WCMT	Martin, Tenn.	1000d
KBUD	Athens, Tex.	500d
KBAN	Bowie, Tex.	500
KVLB	Cleveland, Tex.	500d
KXIT	Dalhart, Tex.	500
KDOX	Marshall, Tex.	1000
KRIG	Odessa, Tex.	500d
KBAL	San Saba, Tex.	500
KNAL	Victoria, Tex.	5000d
WIKI	Chester, Va.	5000d
WRIS	Roanoke, Va.	1000d
WRDS	S. Charleston, W.Va.	5000
WKBH	LaCrosse, Wis.	1000
KWYO	Sheridan, Wyo.	

1420—211.1

WACT	Tuscaloosa, Ala.	5000d
KHFH	Sierra Vista, Ariz.	1000
KXOW	Hot Sprinks, Ark.	
KPOC	Pocahuntas, 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
WAVD	Avondale Estates, Ga.	1000d
WRBL	Columbus, Ga.	5000d
WPEH	Louisville, Ga.	1000d
WLET	Toccoa, Ga.	5000d
KCCN	Honolulu, Hawaii	5000
WINI	Murphysboro, Ill.	500d
WIMS	Michigan City, Ind.	5000d
WOC	Davenport, Iowa	5000
KJCK	Junction City, Kans.	1000d
KULY	Ulysses, Kans.	1000d
WTCR	Ashland, Ky.	5000d
WHBN	Harrodsburg, Ky.	1000d
WVJS	Owensboro, Ky.	5000
KPEL	Lafayette, La.	1000
WBSM	New Bedford, Mass.	5000
WBEC	Pittsfield, Mass.	1000
WAMM	Flint, Mich.	1000d
WKPR	Kalamazoo, Mich.	1000d
KTOE	Mankato, Minn.	5000
WSUH	Oxford, Miss.	1000d
WQBC	Vicksburg, Miss.	1000
KBTN	Neosho, Mo.	5000
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
KGNU	Santa Clara, Cal.	1000
KOSI	Aurora, Colo.	5000
WILI	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
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	Clinchco, 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, Cal.	1000
KPRO	Riverside, Calif.	1000
KCOY	Santa Maria, Calif.	1000
WBIS	Bristol, Conn.	500d
WABR	Winter Park, Fla.	5000
WWCC	Bremen, Ga.	1000d
WGIG	Brunswick, Ga.	5000
WVMG	Cochran, Ga.	
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
WPDE	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	Dowaglac, Mich.	1000d
WCHB	Inkster, Mich.	1000
KQRS	Golden Valley, Minn.	5000d
KEYL	Long Prairie, Minn.	1000
WHHT	Lucedale, Miss.	1000d
WSEL	Pontotoc, Miss.	1000d
WJLK	Asbury Park, N.J.	1000
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
KPUR	Amarillo, Tex.	5000
KEYS	Corpus Christi, Tex.	1000
KDNT	Denton, Tex.	5000
KGVL	Greenville, Tex.	1000
KWEL	Midland, Tex.	5000d
KETX	Livingston, Tex.	5000d
WKLV	Blackstone, Va.	5000d
WHRN	Herndon, Va.	1000
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.	1000d
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.	1000d
KJWH	Camden, Ark.	
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.	1000
KVEN	Ventura, Calif.	1000
KZIN	Yuba City, Calif.	100
KGIW	Alamosa, Colo.	1000
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
WOCN	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
KVSI	Montpelier, Ida.	1000
KEEP	Twin Falls, Idaho	1000
WVON	Cicero, Ill.	1000
WKEI	Kewanee, Ill.	500
WCVS	Springfield, Ill.	1000
WLYV	Ft. Wayne, Ind.	1000
WXVW	Jeffersonville, Ind.	1000
WASK	Lafayette, Ind.	1000
WAOV	Vincennes, Ind.	1000
KLWW	Cedar Rapids, Ia.	250
KYET	Payette, Ida.	250
KWBW	Hutchinson, Kans.	1000
WTCO	Campbellsville, Ky.	1000
WWXL	Manchester, Ky.	1000
WPAD	Paducah, Ky.	1000
WLKS	W. Liberty, Ky.	1000
KSIG	Crowley, La.	1000
KNOC	Natchitoches, La.	250
WNPS	New Orleans, La.	1000d
WLKN	Lincoln, Me.	250
WRKD	Rockland, Maine	1000
WKTQ	South Paris, Maine	1000d
WTBO	Cumberland, Md.	1000
WMAS	Springfield, Mass.	
WATZ	Alpena Township, Michigan	1000
WHTC	Holland, Mich.	1000
WMIQ	Iron Mtn., Mich.	250
WIBM	Jackson, Mich.	1000
WKLA	Ludington, Mich.	1000
WNBY	Newberry, Mich.	
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
KRZY	Albuquerque, N.M.	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.	1000
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.	1000
WFBS	Spring Lake, N.C.	1000
KGCA	Rugby, N.Dak.	250
WTBO	Cumberland, O.	1000d
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

WHITE'S RADIO LOG

kHz	Wave Length	W.P.
WWGO	Erie, Pa.	1000d
WFRA	Franklin, Pa.	1000
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.	1000
KCYL	Lampasas, Tex.	1000
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	1000
WSNO	Barre, Vt.	1000
WTSA	Brattleboro, Vt.	1000
WFTR	Front Royal, Va.	1000
WENZ	Highland Springs, Va.	1000
WREL	Lexington, Va.	1000
WMVA	Martinsville, Va.	1000
KBKW	Aberdeen, Wash.	1000
KCLX	Colfax, Wash.	1000
KONP	Port Angeles, Wash.	250
KAYE	Puyallup, Wash.	1000
WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	1000
WDLB	Marshfield, Wis.	1000
WPFP	Park Falls, Wis.	1000
WRCO	Richland Center, Wis.	1000
KBBS	Buffalo, Wyo.	250
KVOW	Riverton, Wyo.	1000

1460—205.4

WFMH	Cullman, Ala.	5000d
WPNX	Phenix City, Ala.	5000
KZOT	Marianna, Ark.	500
KCCL	Paris, Ark.	500d
KTYM	Inglewood, Calif.	5000
KDON	Salinas, Calif.	5000
KVRE	Santa Rosa, Calif.	1000d
KYSN	Colo. Sprgs., Colo.	1000
WBAR	Bartow, Fla.	1000d
WZEP	DeFuniak Springs, Florida	1000d
WMBR	Jacksonville, Fla.	5000
WDYX	Buford, Ga.	5000d
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
WXOK	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
KDWA	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
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, O.	1000d
KROW	Dallas, Oreg.	5000d
KELR	El Reno, Okla.	500
WMBA	Ambridge, Pa.	500d
WCMB	Harrisburg, Pa.	5000
WFBA	San Sebastian, P.R.	500
WDOG	Allendale, S. C.	

kHz	Wave Length	W.P.
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
KOLI	Coalinga, Calif.	500d
KUTY	Palmdale, Cal.	5000d
KXOA	Sacramento, Calif.	5000
WMMW	Meriden, Conn.	1000d
WRBO	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.	1000d
WSAC	Fort Knox, Ky.	1000d
KTDL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJDY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KANO	Anoka, Minn.	1000d
WCHJ	Brookhaven, Miss.	1000d
WNAU	New Albany, Miss.	500d
KGHM	Brookfield, Mo.	500d
KTCB	Malden, Mo.	1000d
WTKO	Ithaca, N.Y.	1000d
WPDM	Potsdam, N.Y.	1000d
WBIG	Greensboro, N.C.	5000
WPNC	Plymouth, N.C.	1000d
WTOE	Spruce Pine, N.C.	1000d
WOHO	Toledo, Ohio	1000
KVLH	Pauls Valley, Okla.	250d
KVIN	Vinita, Okla.	500d
KRAF	Reedsport, Oreg.	5000d
WSAN	Allentown, Pa.	5000
WFAR	Farrell, Pa.	1000d
WWML	Portage, Pa.	500d
WQXL	Columbia, S.C.	5000d
WGOG	Georgetown, S. C.	1000d
WEAG	Alcoa, Tenn.	1000d
WVOL	Berry Hill, Tenn.	5000
KRBC	Abilene, Tex.	5000
KDHN	Dimmitt, Tex.	500d
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
WTZE	Tazewell, Va.	
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.	1000d
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
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
WGNE	Panama Beach, Fla.	500d
WVCF	Windermere, 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

kHz	Wave Length	W.P.
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
KEHG	Fosston, Minn.	
WECP	Carthage, Miss.	500d
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.	5000
WHBC	Canton, Ohio	5000
WCIN	Cincinnati, Ohio	5000
WTRA	Latrobe, Pa.	500d
WDAS	Philadelphia, Pa.	5000
WISL	Shamokin, Pa.	1000
WSHP	Shippensburg, Pa.	500d
WMDO	Fajardo, P.R.	5000
KSDR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500
WMQM	Memphis, Tenn.	5000d
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.—West Point, Ga.	1000
WHBB	Selma, Ala.	1000
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	1000
KDRS	Paragould, Ark.	1000
KOTN	Pine Bluff, Ark.	250
KXRJ	Russellville, Ark.	1000
KWAC	Bakersfield, Calif.	1000
KPAS	Banning, Calif.	250
KOWL	Bijou, Cal.	1000
KICO	Calexico, Calif.	250
KRKC	King City, Calif.	1000
KOWL	Lake Tahoe, Calif.	250
KTOB	Petaluma, Calif.	1000
KBLF	Red Bluff, Calif.	1000
KDB	Santa Barbara, Calif.	1000
KSYC	Yreka, Calif.	1000
KBOL	Boulder, Colo.	1000d
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	Immokalie, Fla.	250
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	1000
WPXE	Starke, Fla.	1000
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
WRLD	W.Point, Ga.-Lanett, Ala.	250
KTOH	Lihue, Hawaii	1000
KCID	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WDAN	Danville, Ill.	1000
WAMV	East St. Louis, Ill.	1000
WOPA	Oak Park, Ill.	1000
WZOE	Princeton, Ill.	1000
WKBV	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Ia.	500
KRIB	Mason City, Ia.	1000
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

kHz	Wave Length	W.P.
WHAV	Haverhill, Mass.	250
WMRC	Milford, Mass.	1000
WTXL	W. Springfield, Mass.	1000d
WABJ	Adrian, Mich.	1000
WMDN	Midland, Mich.	1000
WLRC	Whitehall, Mich.	1000
KXRA	Alexandria, Minn.	250
KOZY	Grand Rapids, Minn.	1000
KLGR	Redwd. Falls, Minn.	1000
WLOX	Biloxi, Miss.	1000
WCLD	Cleveland, Miss.	1000
WHOC	Philadelphia, Miss.	1000
WTUP	Tupelo, Miss.	1000
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
WDLC	Port Jervis, N. Y.	1000
WOLF	Syracuse, N. Y.	1000
WSSB	Durham, N. C.	1000
WFLB	Fayetteville, N.C.	1000
WLOE	Leaksville, N.C.	1000
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.	1000
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.	500
WGCD	Chester, S.C.	1000d
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S.Dak.	1000
WOPI	Bristol, Tenn.	1000
WDXB	Chattanooga, Tenn.	1000
WROL	Fountain City, Tenn.	1000
WJJM	Lewisburg, Tenn.	1000
WDXL	Lexington, Tenn.	1000
KNOW	Austin, Tex.	250
KIBL	Beeville, Tex.	250
KBST	Big Spring, Tex.	1000
KHUZ	Borger, Tex.	250
KNEL	Brady, Tex.	250d
KSAM	Huntsville, Tex.	250
KVOZ	Laredo, Tex.	250
KZZN	Littlefield, Tex.	1000
KPLT	Paris, Tex.	1000
KDOK	Tyler, Tex.	250
KVWC	Vernon, Tex.	250
KVOG	Ogden, Utah	1000
WKVT	Brattleboro, Vt.	1000
WFAD	Middlebury, Vt.	
WIKE	Newport, Vt.	1000
WCVA	Culpeper, Va.	1000
WVEC	Hampton, Va.	1000
WAYB	Waynesboro, Va.	1000
KBRO	Bremerton, Wash.	1000
KLOG	Kelso, Wash.	1000
KENE	Toppenish, Wash.	1000
KTEL	Walla Walla, Wash.	1000
WGKV	Charleston, W.Va.	1000
WTCS	Fairmont, W.Va.	1000d
WLOH	Princeton, W. Va.	1000
WSGB	Sutton, W.Va.	1000
WGEZ	Beloit, Wis.	1000d
WLCX	LaCrosse, Wis.	1000
WIGM	Medford, Wis.	1000
WOSH	Oshkosh, Wis.	1000
KLME	Laramie, Wyo.	500
KRTR	Thermopolis, Wyo.	250
KGOS	Torrington, Wyo.	1000

1500—199.9

WFMI	Montgomery, Ala.	500d
KGMR	Jacksonville, Ark.	1000d
KBLA	Burbank, Calif.	1000d
KXRX	San Jose, Cal.	10000
WFIF	Milford, Conn.	5000d
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

kHz	Wave Length	W.P.
WZBN	Zion, Ill.	250d
WBRI	Indianapolis, Ind.	5000d
WAYK	Valparaiso, Ind.	1000d
KWRG	New Roads, La.	1000d
WVOC	Battle Creek, Mich.	1000d
WJBK	Detroit, Mich.	10000
KSTP	St. Paul, Minn.	50000
KOFN	Doniphan, Mo.	1000d
WKER	Pompton Lakes, N.J.	500
WKBX	Winston-Salem, N.C.	1000d
KOSG	Pawhuska, Okla.	5000
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.	250d
WINU	Highland, Ill.	250d
WJRC	Joliet, Ill.	500d
WKAI	Macomb, Ill.	1000d
KIFG	Iowa Falls, Iowa	500d
KANS	Larned, Kan.	1000d
KPBC	Port Sulpher, La.	
WMEX	Boston, Mass.	50000
WJCO	Jackson, Mich.	5000d
WLKM	Three Rivers, Mich.	500
WKPO	Prentiss, Miss.	1000
KCCV	Independence, Mo.	1000d
KTTT	Columbus, Nebr.	500d
WRAN	Dover, N.J.	1000
WJIC	Salem, N.J.	250d
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
KROB	Robstown, Tex.	500d
KSTV	Stephenville, Tex.	250d
KGA	Spokane, Wash.	50000
WAUK	Waukesha, Wis.	10000d

1520—197.4

KMPG	Hollister, Cal.	500
KACY	Port Hueneme, Calif.	10000
WVCF	Apopka, Fla.	1000d
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
WVOB	Bel Air, Md.	250d
WKJR	Muskegon Hts., Mich.	1000d
WYNZ	Ypsilanti, Mich.	250d
KOLM	Rochester, Minn.	1000d
KMPL	Sikeston, Mo.	5000
WSLT	Ocean City-Somers Pt., N. J.	1000d
KHIP	Albuquerque, N.Mex.	500d
WKBW	Buffalo, N.Y.	50000
WTHE	Mineola, N. Y.	10000d
WDSL	Mocksville, N.C.	5000
KMAV	Mayville, N.D.	
WBNO	Bryan, Ohio	500d
WINW	Canton, O.	1000d
WKNT	Kent, O.	1000d
WTTO	Toledo, O.	1000d
KOMA	Okla. City, Okla.	50000
KYMN	Oregon City, Ore.	10000
WCHE	West Chester, Pa.	250
WRAI	Rio Piedras, P. R.	250
WTGR	Myrtle Beach, S.C.	250
WBHT	Brownsville, Tenn.	250d
WIDD	Elizabethton, Tenn.	1000d

1530—196.1

WAAO	Andalusia, Ala.	
WLCB	Moulton, Ala.	1000d
WCTR	Chestertown, Md.	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.	10000d
KNBI	Norton, Kan.	1000d
KWLA	Many, La.	1000d
WCTR	Chestertown, Md.	250d
WRPM	Poplarville, Miss.	1000d
WTHM	Lapeer, Mich.	5000d
WERX	Wyoming, Mich.	500d
KSMM	Shakopee, Minn.	500d
KMAM	Butler, Mo.	250
KLOL	Lincoln, Neb.	50000
WCKY	Cincinnati, Ohio	50000
KWLG	Wagoner, Okla.	
WHYP	North East, Pa.	
WMBT	Shenandoah, Pa.	250d
WUPR	Utuado, P.R.	1000d
WASC	Spartanburg, S.C.	1000
KGTN	Georgetown, Tex.	1000d
KGBT	Harlingen, Tex.	50000
KCLR	Ralls, Tex.	5000d
WQVA	Quantico, Va.	250
KCHY	Cheyenne, Wy.	10000

1540—195.0

KPOL	Los Angeles, Calif.	50000
WBSR	Pensacola, Fla.	1000
WGGA	Sylvester, Ga.	1000d
WSMI	Litchfield, Ill.	1000d
WBNL	Boonville, Ind.	250d
WADM	Decatur, Ind	250d
WLOI	LaPorte, Ind.	250d
KXEL	Waterloo, Iowa	50000
KNEX	McPherson, Kans.	250d
KLKC	Parsons, Kans.	250d
WDON	Wheaton, Md.	1000
WMRR	Marshall, Mich.	250d
WLEF	Greenwood, Miss.	1000d
KBXM	Kennett, Mo.	250d
WKXR	Exeter, N.H.	
WPTR	Albany, N.Y.	50000
WPAW	E. Syracuse, N.Y.	1000d
WKYK	Burnsville, N.C.	
WRPL	Charlotte, N.C.	1000d
WIFM	Elkin, N.C.	1000d
WBCO	Bucyrus, Ohio	500d
WABQ	Cleveland, Ohio	1000d
WNIO	Niles, Ohio	500d
WBTC	Ulrichville, O.	250
KWFS	Eugene, Ore.	1000d
WRCP	Philadelphia, Pa.	50000d
WPTS	Pittston, Pa.	1000d
WPME	Punxsutawney, Pa.	1000d
WADK	Newport, R.I.	1000d
WBFJ	Woodbury, Tenn.	500d
KCUL	Ft. Worth, Tex.	50000d
KGBC	Galveston, Tex.	1000
KEDA	San Antonio, Tex.	
WRGM	Richmond, Va.	10000
KBVU	Bellevue, Wash.	1000
WTKM	Hartford, Wis.	500d

1550—193.5

WAAY	Huntsville, Ala.	5000d
WMOO	Mobile, Ala.	50000d
KFIF	Tueson, Ariz.	50000d
KXEX	Fresno, Calif.	500d
KKHI	San Fran., Calif.	10000
KQXI	Arvada, Colo.	10000d
WEXT	W. Hartford, Conn.	1000d
WRIZ	Coral Gables, Fla.	10000d
WOGO	New Smyrna Beach, Fla.	250
WYOU	Tampa, Fla.	10000d
WYNX	Smyrna, Ga.	10000
WJIL	Jacksonville, Ill.	1000d
WCSJ	Morris, Ill.	250d
WPDF	Corydon, Ind.	250d
WCVL	Crawfordsville, Ind.	250
WCTW	New Castle, Ind.	250
WKQV	Sullivan, Ind.	250d
KIWA	Sheldon, Iowa	500d
KEDD	Dodge City, Kans.	1000d
KNIC	Winnfield, Kan.	250d
WIRV	Irvine, Ky.	1000d
WMSK	Morganfield, Ky.	250d
WLUX	Baton Rouge, La.	5000d
KDKA	Shreveport, La.	10000
WSER	Elkton, Md.	1000d
WNTN	Newton, Mass.	10000d
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	Canadaigua, N.Y.	250
WBAZ	Kingston, N.Y.	500d
WBVM	Utica, N.Y.	1000
WPXY	Greenville, N. C.	500d
WYNA	Raleigh, N.C.	1000d
WTYN	Tryon, N.C.	1000d
WPEG	Winston-Salem, N.C.	1000d
KQWB	Fargo, N.D.	5000d
WDLR	Delaware, Ohio	500d
KMAD	Madill, Okla.	250
KREK	Sapulpa, Okla.	500d
WLOA	Braddock, Pa.	1000d
WTTC	Towanda, Pa.	500d
WKFE	Yauco, P.R.	250
WBSC	Bennetsville, S.C.	10000
WAGL	Lancaster, S.C.	10000d
WTHB	N. Augusta, S.C.	1000d
KCAN	Canyon, Tex.	
KWBC	Navasota, Tex.	250d
WKYE	Bristol, Tenn.	1000d
WPTN	Cookeville, Tenn.	250d
WTPI	Cookville, Tenn.	250d
WKPT	Kingsport, Tenn.	10000d
KCOM	Comanche, Tex.	250d
KWIC	Salt Lake City, Utah	10000d
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.	1000d
WMAD	Madison, Wis.	5000d

1560—192.3

WAGC	Centre, Ala.	1000d
KDDA	Dumas, Ark.	
KBIB	Monette, Ark.	250d
KPMC	Bakersfield, Calif.	10000
KIQS	Willows, Calif.	250d
WYSE	Inverness, Fla.	1000
WBYS	Canton, Ill.	250d
WVAK	Paoli, Ind.	250d
WRIN	Rensselaer, Ind.	250d
KSWI	Council Bluffs, Iowa	1000d
KABI	Abilene, Kan.	250d
WPHN	Liberty, Ky.	250d
WDXR	Paducah, Ky.	5000
WBGS	Sidell, La.	1000d
WSMD	LaPlata, Md.	250d
WTPS	Portage, Mich.	1000d
KBEW	Blue Earth, Minn.	1000
KQYX	Joplin, Mo.	250d
KLTI	Macon, Mo.	250d
KTUI	Sullivan, Mo.	250d
WQXR	New York, N.Y.	50000
WTNS	Coshocton, Ohio	1000d
WCNW	Hamilton, O.	5000
WTOD	Toledo, Ohio	5000d
KWCO	Chickasha, Okla.	1000
WRSJ	Bayamon, P.R.	5000
WAGL	Lancaster, S.C.	10000d
WWGM	Nashville, Tenn.	10000d
WBOL	Bolivar, Tenn.	250d
KCAD	Abilene, Tex.	500d
KEGG	Daingerfield, Tex.	
KHBR	Hillsboro, Tex.	250d
KGUL	Port Lavaca, Tex.	500d
KGHO	Hoquiam, Wash.	1000d
KDFL	Sumner, Wash.	250d
WGLB	Port Washington, Wis.	250d

1570—191.1

WCRL	Oneonta, Ala.	1000d
WRWJ	Selma, Ala.	5000d
KBRI	Brinkley, Ark.	250d
KBJT	Ferdyce, Ark.	250d
KRSA	Alisal, Calif.	250d
KCVR	Lodi, Cal.	5000d
KACE	Riverside, Calif.	1000d
KLOV	Loveland, Colo.	250d
WTWB	Auburndale, Fla.	5000d
WFBF	Fernandine Beach, Fla.	1000d
WOKC	Okeechobee, Fla.	1000
WJOE	Ward Ridge, Fla.	250
WMES	Ashburn, Ga.	1000d
WGHC	Clayton, Ga.	1000d
WAIA	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
WHEL	New Albany, Ind.	10000d
KMCD	Fairfield, Iowa	250d
KJFJ	Webster City, Iowa	250d
KNDY	Marysville, Kans.	250d
WKKS	Vanceburg, Ky.	250d
WABL	Amite, La.	500d
KLLA	Leesville, La.	1000
KMAR	Winnsboro, La.	1000
WAQE	Towson, Md.	5000d
WPEP	Taunton, Mass.	1000d
WMLO	Beverly, Mass.	500d
WDEW	Westfield, Mass.	1000d
WMRP	Flint, Mich.	1000d
WFUR	Grand Rapids, Michigan	1000d
KUXL	Golden Valley, Minn.	1000d
WONA	Winona, Miss.	1000d
KLEX	Lexington, Mo.	250d
WAFS	Amsterdam, N.Y.	1000d
WFLR	Dundee, N.Y.	1000d
WBUZ	Fredonia, N.Y.	250d
WAPC	Riverhead, N.Y.	1000d
WTLK	Taylorsville, N.C.	500
WNCA	Siler City, N.C.	1000d
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.	250d
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
WSWV	Pennington Gap, Va.	1000d
WYTI	Rocky Mount, Va.	1000d
WEER	Warrenton, Va.	1000d
WAPL	Appleton, Wis.	1000d

1580—189.2

WEYY	Talladega, Ala.	1000d
KYNO	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
WCUF	Punta Gorda, Fla.	1000d
WCLS	Columbus, Ga.	1000
WLBA	Gainesville, Ga.	5000d
WKIG	Glenville, Ga.	1000d
WKKD	Aurora, Ill.	250d
WDQN	DuQuoin, Ill.	250d
WBBA	Pittsfield, Ill.	250d
WKID	Urbana, Ill.	250d
WCNB	Connersville, Ind.	250d
WJVA	South Bend, Ind.	1000d
WAMW	Washington, Ind.	250d
KCHA	Charles City, Iowa	500d
KWNT	Davenport, Iowa	500d
KDSN	Denison, Iowa	500d
WAXU	Georgetown, Ky.	10000d
WMTL	Leitchfield, Ky.	250d
WPKY	Princeton, Ky.	250d
KLUV	Haynesville, La.	250d
KLOU	Lake Charles, La.	1000
WPGC	Bradbury Hgts., Md.	10000
WJUD	St. Johns, Mich.	1000d
KDOM	Windom, Minn.	250d
WAMY	Amory, Miss.	5000d
WESY	Leland, Miss.	1000
WPMP	Pascagoula-Moss Point, Mississippi	1000d
KCGM	Columbia, Mo.	250d
KESM	Eldorado Springs, Mo.	250d
KNIM	Maryville, Mo.	250d
KAMI	Cozad, Neb.	1000d
WNJH	Hammonton, N.J.	250d
WCRV	Washington, N.J.	500d
KLOS	Albuquerque, N.M.	1000d
WPAC	Patchogue, N.Y.	10000d
WZKY	Albemarle, N.C.	250d
WKJK	Granite Falls, N. C.	500d
WPYB	Benson, N.C.	500d
WVKO	Columbus, Ohio	1000d
KLTR	Blackwell, Okla.	1000d
WCOY	Columbia, Pa.	500d
WEND	Ebensburg, Pa.	1000d
WANB	Waynesburg, Pa.	250d
WORQ	Orangeburg, S.C.	1000d
WBBR	Travelers Rest, S.C.	500d
WSKT	Colonial Village, Tenn.	250d
WLIJ	Shelbyville, Tenn.	1000d
WSKT	South Knoxville, Tenn.	250
KKAL	Denver City, Tex.	250d
KGAF	Gainesville, Tex.	250d
KIRT	Mission, Tex.	1000d
KTLU	Rusk, Tex.	500d
KWED	Seguin, Tex.	1000d
KBYP	Shamrock, Tex.	250d
KBGO	Waco, Tex.	1000
WILA	Danville, Va.	1000d
WPUV	Pulaski, Va.	5000d
WTTN	Watertown, Wis.	1000d

1590—188.7

WATM	Atmore, Ala.	5000d
WBIB	Centerville, Ala.	1000d
WVNA	Tuscumbia, Ala.	5000
KPBA	Pine Bluff, Ark.	1000d
KSPR	Springdale, Ark.	
KLIV	San Jose, Cal.	5000d
KUDU	Ventura, Cal.	10000
KCIN	Victorville, Calif.	500d
WBRY	Waterbury, Conn.	5000
WDWY	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
WSMA	Marine City, Mich.	1000d
WMIC	St. Helen, Mich.	500d

WHITE'S

RADIO LOG

kHz	Wave Length	W.P.
KRAD	E. Grand Forks, Minn.	1000d
WWUN	Jackson, Miss.	5000
KDEX	Dexter, Mo.	1000d
KPRS	Kansas City, Mo.	1000d
KCLU	Rolla, Mo.	1000d
WSMN	Nashua, N.H.	5000
WERA	Plainfield, N.J.	500d
WAUB	Auburn, N.Y.	500d
WEHH	Elmira Heights-Horseheads, N.Y.	500d
WGGO	Salamanca, N.Y.	5000d
WCSL	Cherryville, N.C.	500d
WVOE	Chadburn, N.C.	1000
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
WPIP	Collierville, Tenn.	500d
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
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
KGST	Fresno, Cal.	5000d
KWOW	Pomona, Cal.	5000
KHER	Santa Maria, Calif.	500d
KUBA	Yuba City, Calif.	5000
KLAK	Lakewood, Colo.	5000
WKEN	Dover, Del.	500d
WKTX	Atlantic Beach, Fla.	1000d
WKWF	Key West, Fla.	500
WHEW	Riviera Beach, Fla.	1000
WPRV	Wauchula, Fla.	500d
WOKB	Winter Garden, Fla.	5000d
WGKA	Atlanta, Ga.	1000d
WNGA	Nashville, Ga.	1000d
WRBN	Warner Robins, Ga.	1000d
WCGO	Chicago Hgts., Ill.	1000d
WMCW	Harvard, Ill.	500d
WBTO	Linton, Ind.	500d
WARU	Peru, Ind.	1000d
KLGA	Algona, Iowa	5000d
KCRG	Cedar Rapids, Iowa	5000
KMDO	Ft. Scott, Kans.	500d
WSTL	Eminence, Ky.	500d
WKYF	Greenville, Ky.	500d
KFNV	Ferriday, La.	1000d
KLEB	Golden Meadow, La.	1000d
KNCB	Vivian, La.	500d
WINX	Rockville, Md.	1000
WBOS	Brookline, Mass.	5000
WTYM	East Longmeadow, Mass.	5000d
WAAM	Ann Arbor, Mich.	5000
WTRU	Muskegon, Mich.	5000
WKDL	Clarksdale, Miss.	1000d
WFFF	Columbia, Miss.	500d
KATZ	St. Louis, Mo.	5000
KTTN	Trenton, Mo.	500d
KNCY	Nebraska City, Nebr.	500d
KRFS	Superior, Nebr.	500d
WWRL	New York, N. Y.	5000
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.	1000d
WFRC	Reidsville, N.C.	1000
WKSK	W. Jefferson, N.C.	1000d
KDAK	Carrington, N.Dak.	500d
WAQI	Ashtabula, Ohio	1000d
WBLY	Springfield, Ohio	1000d
WTTF	Tiffin, Ohio	500d
KUSH	Cushing, Okla.	1000d
KASH	Eugene, Oreg.	5000
KOHI	St. Helens, Ore.	1000d
WHOL	Allentown, Pa.	500d
WHRY	Elizabethtown, Pa.	500d
WBPR	Bayamon, P.R.	1000
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
KYAL	McKinney, Tex.	1000d
KOGT	Orange, Tex.	1000
KBBC	Centerville, Utah	1000d
WSJT	Chesapeake, Va.	1000d
WHLL	Wheeling, W.Va.	5000d
WCWC	Ripon, Wis.	5000

Canadian AM Stations by Frequency

Canadian stations listed alphabetically by call letters within groups. Abbreviations: kHz, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length is given in meters.

kHz	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-Rivières, Que.	10,000d
		5,000n
CKPG	Prince George, B.C.	10,000
560—525.4		
CFOS	Owen Sound, Ont.	1,000
CHCM	Marystown, Nfld.	1,000d
		500n
CHTK	Prince Rupert, B.C.	1,000d
		250n
CJKL	Kirkland Lake, Ont.	5,000
CKCN	Sept-Iles, Que.	10,000d
		5,000n
CKNL	Fort St. John, B.C.	1,000
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.	10,000
CKAP	Kapuskasing, Ont.	1,000
CKPR	Port Arthur, Ont.	5,000d
		1,000n
CKUA	Edmonton, Alta.	10,000
CKWW	Windsor, Ont.	500
CKXR	Salmon Arm, B. C.	1,000
CKY	Winnipeg, Man.	50,000
590—508.2		
CFAR	Flin Flon, Man.	10,000d
		1,000n
CKEY	Toronto, Ont.	10,000d
		5,000n
CKRS	Jonquiere, Que.	1,000
CFTK	Terrace, B.C.	1,000
VOCM	St. John's, Nfld.	10,000
600—499.7		
CFCF	Montreal, Que.	5,000
CFCH	Callander, Ont.	10,000d
		5,000n
CFQC	Saskatoon, Sask.	5,000
CJOR	Vancouver, B.C.	10,000
CKCL	Truro, N.S.	1,000
610—491.7		
CHNC	New Carlisle, Que.	10,000d
		5,000n
CHTM	Thompson, 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.	10,000d
		1,000n
620—483.6		
CFCL	Timmins, Ont.	10,000d
		5,000n
CKCK	Regina, Sask.	5,000
CKCM	Grand Falls, Nfld.	10,000
630—475.9		
CFCO	Chatham, Ont.	10,000d
		1,000n
CFCY	Charlottetown, P. E. I.	10,000
CHED	Edmonton, Alta.	10,000
CHLT	Sherbrooke, Que.	10,000d
		5,000n
CJET	Smiths Falls, Ont.	10,000
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
CHFI	Toronto, Ont.	1,000d
		10,000n
CHLO	St. Thomas, Ont.	1,000
CJCN	Grand Falls, Nfld.	10,000
CJOB	Winnipeg, Man.	10,000d
		2,500n
CKGB	Timmins, Ont.	10,000
690—434.5		
CBF	Montreal, Que.	50,000
CBU	Vancouver, B.C.	10,000
710—422.3		
CJSP	Leamington, Ont.	1,000
CFRG	Gravelbourg, Sask.	5,000d
CKVM	Ville-Marie, Que.	10,000d
		1,000n
CJOX	Grand Bank, Nfld.	1,000
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.	50,000
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
		500n
CHAB	Moose Jaw, Sask.	10,000d
		5,000n
CHRC	Quebec, Que.	10,000
CJAD	Montreal, Que.	50,000d
		10,000n
CJBQ	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.	10,000
850—352.7		
CJJC	Langley, B.C.	1,000
CKRD	Red Deer, Alta.	10,000d
		1,000n
CKVL	Verdun, Que.	50,000d
		10,000n
860—348.6		
CBH	Halifax, N.S.	10,000
CFPR	Prince Rupert, B.C.	10,000
CHAK	Inuvik, N.W.T.	1,000
CJBC	Toronto, Ont.	50,000
900—333.1		
CHML	Hamilton, Ont.	5,000
CHNO	Sudbury, Ont.	10,000d
		1,000n
CJBR	Rimouski, Que.	10,000
CJVI	Victoria, B.C.	10,000
CKBI	Prince Albert, Sask.	10,000
CKOR	Dryden, Ont.	1,000d
		250n
CKDH	Amherst, N.S.	1,000
CKTS	Sherbrooke, Que.	1,000
CKJL	St. Jérôme, Que.	1,000
CKVD	Val D'Or, Que.	10,000d
		2,500n
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
		5,000
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.	10,000
CJIB	Vernon, B. C.	10,000d
950—315.6		
CHER	Sydney, N.S.	10,000
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
CBZ	Fredericton, N.B.	10,000
980—305.9		
CBV	Quebec, Que.	5,000
CFPL	London, Ontario	10,000d
		5,000n
CHEX	Peterborough, Ont.	5,000
CKGM	Montreal, Que.	10,000
CKNW	New Westminster, B.C.	50,000
CKRM	Regina, Sask.	10,000d
		5,000n
990—302.8		
CBW	Winnipeg, Man.	50,000
CBY	Corner Brook, Nfld.	10,000

kHz	Wave Length	W.P.
1000—299.8		
CKBW	Bridgewater, N.S.	10,000
1010—296.9		
CBR	Calgary, Alta.	50,000
CFRB	Toronto, Ont.	50,000
1050—285.5		
CFGP	Grande Prairie, Alta.	10,000
CHUM	Toronto, Ont.	50,000
CJIC	Sault Ste. Marie, Ont.	10,000d 2,500n
CJNB	North Battleford, Sask.	10,000
CKSB	St. Boniface, Man.	10,000
1060—282.8		
CFCN	Calgary, Alta.	50,000d 2,500n
CJLR	Quebec, Que.	10,000
1070—280.2		
CBA	Sackville, N.B.	50,000
CFAX	Victoria, B.C.	1,000
CHOK	Sarnia, Ont.	5,000d 1,000n
1080—277.6		
CKSA	Lloydminster, Alta.	10,000
1090—275.1		
CHEC	Lethbridge, Alta.	5,000
CHRS	St. Jean, Que.	10,000d
1110—272.6		
CBD	Saint John, N.B.	10,000
CFML	Cornwall, Ont.	1,000
CFTJ	Galt, Ont.	250d
CHQT	Edmonton, Alta.	10,000
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
CKTR	Trois-Rivières, 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, Ontario	1,000
CJRL	Kenora, Ont.	1,000
CKDA	Victoria, B.C.	10,000
CKCW	Moncton, N.B.	10,000
CKSM	Shawinigan, Que.	1,000

kHz	Wave Length	W.P.
1230—243.8		
CBDR	Schefferville, Que.	250
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, Ontario	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.	1,000d 250n
CJAF	Cabano, Que.	250
CJAV	Port Alberni, B.C.	1,000d 250n
CJCS	Stratford	500d 250n
CJRW	Summerside, P.E.I.	250
CJWA	Wawa, Ont.	1,000d 250n
CKWL	Williams Lake, B.C.	250
CKBS	St. Hyacinthe, Que.	250
CKLS	La Sarre, Que.	250
1250—239.9		
CBOF	Ottawa, Ont.	10,000
CHWO	Oakville, Ont.	1,000d
CHSM	Steinbach, Man.	10,000
CKBL	Matane, Que.	10,000d 5,000n
CKOM	Saskatoon, Sask.	10,000
1260—238.0		
CFRN	Edmonton, Alta.	50,000
1270—263.1		
CFGT	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.	10,000d 5,000n
CJMS	Montreal, Que.	50,000
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.	1,000
1310—228.9		
CFGM	Richmond Hill, Ont.	10,000d 2,500n

kHz	Wave Length	W.P.
CHGB	Ste-Anne-de-la-Pocatière, 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
CFSL	Weyburn, Sask.	1,000d 250n
CFYK	Yellowknife, N.W.T.	1,000
CHAD	Amos, Que.	250
CHRD	Drummondville, Que.	250
CJLS	Yarmouth, N.S.	250
CFOM	Quebec, Que.	250
CKAR-1	Parry Sound, Ont.	250
CKCR	Revelstoke, B. C.	250
CKOX	Woodstock, Ont.	1,000d 250n
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.	10,000d 5,000n
CKPC	Brantford, Ont.	10,000
1390—215.7		
CKLN	Nelson, B.C.	1,000
1400—214.2		
CFLD	Burns Lake, B. C.	250
CJFP	Rivière du Loup, Que.	10,000d 250n
CKCB	Collingwood, Ont.	250
CKRN	Rouyn, Que.	250
CKSW	Swift Current, Sask.	1,000d 250n
1410—212.6		
CFMB	Montreal, Que.	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

kHz	Wave Length	W.P.
1440—208.2		
CFCP	Courtenay, B.C.	1,000
CKPM	Ottawa, Ont.	10,000
1450—206.8		
CBG	Gander, Nfld.	250
CFAB	Windsor, N.S.	250
CFJR	Brockville, Ont.	1,000d 250n
CHEF	Granby, Que.	1,000d 250n
CHUC	Cobourg, Ont.	1,000
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
1490—201.2		
CFMR	Fort Simpson, N.W.T.	25
CFRC	Kingston, Ont.	100
CHYM	Kitchener, Ont.	10,000d 5,000n
CKAD	Middleton, N.S.	1,000d 250n
CKBM	Montmagny, Que.	1,000d 250n
CFWB	Campbell River, B.C.	250
1500—199.9		
CKAY	Ducan, B.C.	1,000
1510—199.1		
CKOT	Tillsonburg, Ont.	1,000
1540—195.0		
CHIN	Toronto, Ont.	50,000
1550—193.5		
CBE	Windsor, Ont.	10,000
1560—192.3		
CFRS	Simcoe, Ont.	250d
1570—191.1		
CFOR	Orillia, Dnt.	10,000d 1,000n
CHUB	Nanaimo, B.C.	10,000
CKLM	Montreal, Que.	10,000
1580—189.2		
CBJ	Chicoutimi, Que.	10,000
1600—187.5		
CJRN	Niagara Falls, Ont.	10,000

U. S. Commercial Television Stations by States

U. S. stations listed alphabetically by cities within state groups. Territories and possessions follow states. Chan., channel; C.L., call letters.

Location	C.L.	Chan.
ALABAMA		
Anniston	WHMA-TV	40
Birmingham	WAPI-TV	13
	WBMG	42
	WBRC-TV	6
Decatur	WMSL-TV	23
Dothan	WTVY	4
Florence	WOWL-TV	15
Huntsville	WAAY-TV	31
	WHNT-TV	19
Mobile	WALA-TV	10
	WKRG-TV	5
Montgomery	WCOV-TV	20
	WSFA-TV	12
	WKAB-TV	32
Selma	WSLA	8
Tuscaloosa	WCFT-TV	33
ALASKA		
Anchorage	KENI-TV	2
	KHAR-TV	13
	KTVA	11
Fairbanks	KFAR-TV	2
	KTVF	11
Juneau	KINY-TV	8
Sitka	KIFW-TV	13

Location	C.L.	Chan.
ARIZONA		
Nogales	XHFA-TV	2
	KZAZ	11
Phoenix	KOOL-TV	10
	KPAZ-TV	21
	KPHO-TV	5
	KTVK	3
	KTAR-TV	12
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

Location	C.L.	Chan.
	KERO-TV	23
	KLYD-TV	17
Chico	KHSL-TV	12
Concord	KCFT-TV	42
Corona-Los Angeles	KMTW	52
El Centro-Mexicali	XEM-TV	8
Eureka	KIEM-TV	3
	KVIQ-TV	6
Fresno	KAIL	53
	KFRE-TV	30
	KJEO	47
	KMJ-TV	24
Los Angeles	KABC-TV	7
	KCOP	13
	KHJ-TV	9
	KMEX-TV	34
	KNBC	4
	KNXT	2
	KWHY-TV	22
	KTLA	5
	KTTV	11
Modesto	KLOC-TV	19
Oakland-San Francisco	KTVU	2
Redding	KRCR-TV	7
Sacramento	KCRA-TV	3
Sacramento	KXTV	10
	KPXL	29

Location	C.L.	Chan.
Salinas-Monterey	KSBW-TV	8
San Bernardino	KITR	30
San Diego	KFMB-TV	8
	KJOG-TV	51
	KAAR	39
	KDGO-TV	10
Tijuana-San Diego	XETV	6
	XEWT-TV	12
San Francisco	KGO-TV	7
	KPIX	5
	KRON-TV	4
	KSAN-TV	32
San Jose	KNTV	11
San Luis Obispo	KSBY-TV	6
Santa Barbara	KEYT	3
	KIHP-TV	26
Santa Maria	KCOY-TV	12
Stockton-Sacramento	KOVR	13
Visalia-(Fresno)	KICU-TV	43
COLORADO		
Colorado Springs	KKTV	11
	KRDO-TV	13
Denver	KBTV	9
	KWGN-TV	2
	KLZ-TV	7

WHITE'S RADIO LOG

Location	C.L.	Chan.
	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
	WUHF-TV	61
New Britain-Hartford	WHNB-TV	30
New Haven	WTVU	59
New Haven-Hartford	WNHC-TV	8
Waterbury	WATR-TV	20

DELAWARE

No Stations

DISTRICT OF COLUMBIA

Washington	WOOK-TV	14
	WDCA-TV	20
	WMAL-TV	7
	WRC-TV	4
	WTOP-TV	9
	WTTG	5

FLORIDA

Clearwater	WHJR-TV	22
Daytona Beach-Orlando	WESH-TV	2
Ft. Myers	WINK-TV	11
Ft. Pierce-Vero Beach	WTVX	34
Jacksonville	WFGA-TV	12
	WDUV-TV	30
	WJKS-TV	17
	WJXT	4
Miami	WCKT	7
	WLBW-TV	10
	WTVJ	4
Orlando	WDBO-TV	6
	WFTV	9
Palm Beach	WPTV	5
Panama City	WJHG-TV	7
Pensacola-Mobile, Ala.	WEAR-TV	3
St. Petersburg-Tampa	WSUN-TV	38
Tallahassee-Thomasville, Ga.	WCTV	6
Tampa	WFLA-TV	8
Tampa-St. Petersburg	WLCY-TV	10
	WTVT	13
West Palm Beach	WEAT-TV	12

GEORGIA

Albany	WALB-TV	10
Atlanta	WAII-TV	11
	WAGA-TV	5
	WBMO-TV	36
	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	KHAW-TV	11
	KPUA-TV	9
	KHVO	13
Honolulu	KGMB-TV	9
	KHVH-TV	4
	KHON-TV	2
	KTRG-TV	13
Wailuku	KAII-TV	7
	KMAU-TV	3
	KMVI-TV	12

IDAHO

Boise	KBOI-TV	2
	KTVB	7
Idaho Falls	KID-TV	3
	KIFI-TV	8
Lewiston	KLEW-TV	3
Twin Falls	KMVT	11

ILLINOIS

Champaign	WCHU	33
	WCIA	3
Chicago	WBBM-TV	2
	WBKB-TV	7
	WCIU-TV	26
	WFLD	32
	WGN-TV	9
	WMAQ-TV	5
Danville	WICD	24
Decatur	WAND	17
Freeport-Rockford	WCEE-TV	23
Harrisburg	WSIL-TV	3
LaSalle	WEEQ-TV	35
Moline	WQAD-TV	8
Peoria	WIRL-TV	19
	WEEK-TV	25
	WMBD-TV	31
Quincy-Hannibal, Mo.	WGEM-TV	10
Rockford	WTVO	39
	WREX-TV	13
Rock Island	WHBF-TV	4
Springfield	WICS	20

INDIANA

Bloomington-Indianapolis	WTTV	4
Evansville	WEHT	50
	WFIE-TV	14
	WTVW	7
Fort Wayne	WANE-TV	15
	WPTA	21
	WKJG-TV	33
Indianapolis	WFBM-TV	6
	WISH-TV	8
	WLWI	13
Lafayette	WFAM-TV	18
Marion	WTAF-TV	31
Muncie	WLBC-TV	49
South Bend	WNDU-TV	16
	WSBT-TV	22
South Bend-Elkhart	WSJV	28
Terre Haute	WTHI-TV	10
	WTWO	2

IOWA

Ames-Des Moines	WOI-TV	5
Cedar Rapids	KCRG-TV	9
Cedar Rapids-Waterloo	WMT-TV	2
Davenport	WOC-TV	6
Des Moines	KRNT-TV	8
	WHO-TV	13
Fort Dodge	KQTV	21
Mason City	KGLO-TV	3
Sioux City	KTIV	4
	KVTV	9
Waterloo-Cedar Rapids	KWWL-TV	7

KANSAS

Ensign	KTVC	6
Garden City	KGLD	11
	KUPK-TV	13
Goodland	KLOE-TV	10
Great Bend	KCKT	2
Hays	KAYS-TV	7
Hutchinson-Wichita	KTVH	12
Pittsburg-Joplin, Mo.	KOAM-TV	7
Topeka	WIBW-TV	13
Wichita	KAKE-TV	10
	KARD-TV	3
	KWIS-TV	24

KENTUCKY

Bowling Green	WLTV	13
Lexington	WKYT-TV	27
	WLEX-TV	18
Louisville	WHAS-TV	11
	WAVE-TV	3
	WDRB-TV	41
	WLKY-TV	32
Newport	WNOP-TV	74
Owensboro	WVJS-TV	19
Paducah	WPSD-TV	6

LOUISIANA

Alexandria	KALB-TV	5
Baton Rouge	WAFB-TV	9
	WBRZ	2
Lafayette	KATC	3
	KLFY-TV	10
Lake Charles	KPLC-TV	7
	KIKS-TV	29
Monroe	KNOE-TV	8
New Orleans	WDSU-TV	6
	WWL-TV	4
	WWOM-TV	26
	WVUE	12
Shreveport	KSLA-TV	12
	KTAL-TV	6
Shreveport	KTBS-TV	3
West Monroe	KUZN-TV	39

MAINE

Bangor	WABI-TV	5
	WEMT	7
	WLBZ-TV	2
Poland Spring	WMTW-TV	8
Portland	WCSH-TV	6
	WGAN-TV	13
Presque Isle	WAGM-TV	8

MARYLAND

Baltimore	WBAL-TV	11
	WJZ-TV	13
	WMAR-TV	2
	WMET-TV	24
	WBOC-TV	16
Salisbury		

MASSACHUSETTS

Adams	WCDC	19
Boston	WBZ-TV	4
	WIHS-TV	38
	WHDH-TV	5
	WNAC-TV	7
	WREP	25
Greenfield	WRLP	32
Springfield	WWLP	22
	WHYN-TV	40
Worcester	WJZB-TV	14

MICHIGAN

Bay City-Saginaw	WNEM	5
Cadillac-Traverse City	WWTV	9
Cheboygan	WTOM-TV	4
Detroit	WJBK-TV	2
	WWJ-TV	4
	WKBD	50
	WXON	62
	WXYZ-TV	7
Detroit-Windsor	CKLW-TV	9
Flint	WJRT	12
Grand Rapids	WZZM-TV	13
Grand Rapids-Kalamazoo	WOOD-TV	8
Kalamazoo	WKZO-TV	3
Lansing	WJIM-TV	6
Lansing-Onondaga	WILX-TV	10
Marquette	WLUC-TV	6
Saginaw-Bay City	WKNX-TV	57
Sault Ste. Marie	WWUP-TV	10
Traverse City	WPBN-TV	7

MINNESOTA

Alexandria	KCMT	7
Austin	KMMT	6
Duluth	WDIO-TV	10
Duluth-Superior, Wis.	KDAL-TV	3
	WDSM-TV	6
Mankato	KEYC-TV	12
Minneapolis-St. Paul	WCCO-TV	4
	KMSP-TV	9
	WTCN-TV	11
Rochester	KROC-TV	10
St. Paul-Minneapolis	KSTP-TV	5
Thief River Falls	KNOX-TV	10
Walker	KNMT	12

MISSISSIPPI

Biloxi	WLOX-TV	13
Columbus	WCBI-TV	4
Greenwood	WABG-TV	6
Jackson	WJTV	12
	WLBT	3
Laurel-Hattiesburg	WDAM-TV	7
Meridian	WTOK-TV	11
Tupelo	WTWV	9

MISSOURI

Cape Girardeau	KFVS-TV	12
Columbia	KOMU-TV	8
Hannibal-Quincy, Ill.	KHQA-TV	7
Jefferson City	KRCG	13
Joplin	KODE-TV	12
	KUHI-TV	16
Kansas City	KCMO-TV	5
	WDAF-TV	4
	KMBC-TV	9
	KCIT-TV	50
Kirksville-Ottumwa, La.	KTVO	3
St. Joseph	KFEQ-TV	2
St. Louis	KMOX-TV	4
	KSD-TV	5
	KPLR-TV	11
	KTVI	2
Sedalia	KMOS-TV	6
Springfield	KTTS-TV	10
	KYTV	3

MONTANA

Billings	KULR-TV	8
	KOOK-TV	2
Butte	KXLF-TV	4
Glendive	KXGN-TV	5
Great Falls	KFBB-TV	5
	KRTV	3
Helena	KBLL-TV	12
Missoula	KGVO-TV	13

NEBRASKA

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
	WOW-TV	6
	KMTV	3
Scottsbluff-Gering	KSTF	10
Superior	KHTL-TV	4

NEVADA

Las Vegas	KLAS-TV	8
	KORK-TV	3
Reno	KCRL	4
	KOLO-TV	8

NEW HAMPSHIRE

Lebanon	WRLH	49
Manchester	WMUR-TV	9

NEW JERSEY

Burlington	WKBS	41
Linden-Newark	WNJU-TV	47
Paterson	WXTV	41
Wildwood	WCMC-TV	40

NEW MEXICO

Albuquerque	KGGM-TV	13
	KOAT-TV	7
	KOB-TV	4
Carlsbad	KAVE-TV	6
Clovis	KICA-TV	12
Roswell	KSWS-TV	8
	KBIM-TV	10

NEW YORK

Albany	WTEN	10
	WAST	13
Binghamton	WBJA-TV	34
	WINR-TV	40
	WNBF-TV	12
Buffalo	WBEN-TV	4
	WGR-TV	2
	WKBW-TV	7
Carthage-Watertown	WWNY	7
Elmira-Corning	WSYE-TV	18
Ithaca	WCIC	52
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
Schenectady	WRGB	6
Syracuse	WHEN-TV	5
	WSYR-TV	3
	WNYS-TV	9
Utica	WKTV	2

NORTH CAROLINA

Asheville	WISE-TV	62
	WLOS-TV	13
Charlotte	WBTV	3
	WSOC-TV	9
	WCTU-TV	36
Durham-Raleigh	WTVD	11
Greensboro	WFMY-TV	2
Greenville	WNCT-TV	9
High Pt.-Greensboro-Winston Salem	WGHP-TV	8
Hickory	WHKY-TV	14
New Bern	WNBE-TV	12
Raleigh-Durham	WRAL-TV	5
Washington	WITN-TV	7
Wilmington	WECT	6
	WWAY	3
Winston-Salem	WSJS-TV	12

NORTH DAKOTA

Bismarck	KFYR-TV	5
	KXMB-TV	12
Devils Lake	WDAZ-TV	8
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

Akron	WAKR-TV	49
Ashtabula	WICA-TV	15
Canton	WJAN	29
Cincinnati	WCPO-TV	9
	WKRC-TV	12
	WLW-T	5
Cleveland	WEWS	5
	WAFT-TV	61
	WRCV-TV	3
	WJW-TV	8
Columbus	WBNS-TV	10
	WLWC	4

Location	C.L.	Chan.
	WTVN-TV	6
Dayton	WHIO-TV	7
	WKEF	22
	WLW-D	2
Lima	WIMA-TV	35
Portsmouth	WRLO	30
Springfield	WSWD-TV	66
Steubenville-Wheeling, West Va.	WSTV-TV	9
Toledo	WSPD-TV	13
	WDHD	24
	WTDL-TV	11
Youngstown	WFMJ-TV	21
	WKBN-TV	27
	WYTV	33
Zanesville	WHIZ-TV	18

OKLAHOMA

Ada	KTEN	10
Ardmore & Sherman-Denison, Texas	KXII	12
Elk City	KSWB	8
Lawton	KSWD-TV	7
Oklahoma City	KWTV	9
	WKY-TV	4
	KOCO-TV	5
	KLPR-TV	14
Sayre	KFDO-TV	8
Tulsa	KOTV	6
	KVOO-TV	2
	KTUL-TV	8

OREGON

Coos Bay	KCBY-TV	11
Eugene	KEZI-TV	9
	KVAL-TV	13
Klamath Falls	KOTI	2
LaGrande	KTVR	13
Medford	KTVM	5
	KMED-TV	10
Portland	KATU	2
	KGW-TV	8
	KDIN-TV	6
	KPTV	12
Roseburg	KPIC	4

PENNSYLVANIA

Altoona	WFBG-TV	10
Erie	WICU-TV	12
	WJET-TV	24
	WSEE	35
Harrisburg	WHP-TV	21
	WTPA	27
Johnstown	WJAC-TV	6
	WARD-TV	56
Lancaster	WGAL-TV	8
Lebanon	WLYH-TV	15
Philadelphia	WCAU-TV	10
	WFIL-TV	6
	KYW-TV	3
	WKBS	41
	WPHL-TV	17
	WIBF-TV	29
Pittsburgh	KDKA-TV	2
	WECO-TV	53
	WIIC-TV	11
	WTAE-TV	4
Scranton	WDAU-TV	22
Scranton & Wilkes-Barre	WNEP-TV	16
York	WBRE-TV	28
	WSBA-TV	43

RHODE ISLAND

Providence	WJAR-TV	10
	WPRD-TV	12
Providence (New Bedford, Mass.)	WTEV	6

SOUTH CAROLINA

Anderson	WAIM-TV	40
Charleston	WCIV	4
	WCSC-TV	5
	WUSN-TV	2
	WIS-TV	10
	WNDK-TV	19
	WDLO-TV	25
Florence	WBTW	13
	WPDT	15
Greenville	WFBC-TV	4
Spartanburg	WSPA-TV	7

SOUTH DAKOTA

Aberdeen	KXAB-TV	9
Deadwood-Lead	KDSJ-TV	5
Florence-Watertown	KDLO-TV	3
Mitchell	KORN-TV	5
Rapid City	KOTA-TV	3
	KRSD-TV	7
Reliance	KPLO-TV	6
Sioux Falls	KELO-TV	11
	KSOO-TV	13

TENNESSEE

Chattanooga	WDEF-TV	12
	WRCB-TV	3
	WTVC	9
Jackson	WDXI-TV	7
Johnson City-Bristol-Kingsport	WJHL-TV	11
Knoxville	WATE-TV	6
	WBIR-TV	10
	WTVK	26
Memphis	WMCT	5
	WHBQ-TV	13
	WMTU-TV	30
	WREC-TV	3
Nashville	WLAC-TV	5
	WSIX-TV	8
	WSM-TV	4

TEXAS

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	KROD-TV	4
	KTSM-TV	9
El Paso-Juarez, Mex.	XEJ-TV	5
	KELP-TV	13
	XEPM-TV	2
Ft. Worth	KTVT	11
	KFWT	40
Ft. Worth-Dallas	WBAP-TV	5
Harlingen	KGBT-TV	4
Houston	KHDU-TV	11
	KHTV	39
	KTRK-TV	13
	KUAB	20
	KPRC-TV	2
Laredo	KGNS-TV	8
Lubbock	KCBD-TV	11
	KKBC-TV	34
	KLBK-TV	13
Lufkin	KTRE-TV	9
Midland & Ddessa	KMID-TV	2
Monahans	KVKM-TV	9
Odessa	KOSA-TV	7
Port Arthur-Beaumont	KPAC-TV	4
Rosenberg	KJDO-TV	58
San Angelo	KACB-TV	3
	KCTV	8
San Antonio	KENS-TV	5
	WOAI-TV	4
	KONO-TV	12
	KWEX-TV	41
Sweetwater-Abilene	KPAR-TV	12
Temple-Waco	KCEN-TV	6
Tyler-Longview	KLTV	7
Waco	KWTX-TV	10
	WACO-TV	25
Weslaco	KRGV-TV	5
Wichita Falls	KFDX-TV	3
	KAUZ-TV	6

UTAH

Salt Lake City	KCPX-TV	4
	KUTV	2
	KSL-TV	5

VERMONT

Burlington	WCAX-TV	3

VIRGINIA

Bristol	WCYB-TV	5
Charlottesville	WINA-TV	29
Hampton-Norfolk	WVEC-TV	13
Harrisonburg	WSVA-TV	3
Lynchburg-Roanoke	WLVA-TV	13
Norfolk	WTAR-TV	3
	WNTU-TV	33
Portsmouth-Norfolk-Newport News	WAVY-TV	10
Richmond	WRVA-TV	12
	WTVR-TV	6
Richmond-Petersburg	WXEX-TV	8
Roanoke	WDBJ-TV	7
	WRFT-TV	27
	WSLS-TV	10

WASHINGTON

Bellingham	KVOS-TV	12
Pasco-Kennewick-Richland	KEPR-TV	19
Richland-Pasco-Kennewick	KNDU	25
Seattle	KING-TV	5
	KOMO-TV	4
	KIRO-TV	7
Spokane	KHQ-TV	6
	KREM-TV	2
	KXLY-TV	4
Tacoma-Seattle	KTNT-TV	11
Tacoma	KTVW	13
Yakima	KIMA-TV	29
	KNDO	23

WEST VIRGINIA

Bluefield	WHIS-TV	6
Charleston	WCHS-TV	8
Clarksburg	WBDY-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-Steubenville, O.	WTRF-TV	7

WISCONSIN

Eau Claire	WEAU-TV	13
Green Bay	WBAY-TV	2
	WFRV	5
	WLUK-TV	11
La Crosse	WKBT	8
Madison	WISC-TV	3
	WMTV	15
	WKOW-TV	27
Milwaukee	WISN-TV	12
	WTMJ-TV	4
	WITI-TV	6
	WVTV	18
Rhinelander	WAEO-TV	12
Wausau	WSAU-TV	7

WYOMING

Casper	KTWO-TV	2
Cheyenne	KFBC-TV	5
	KDWN-TV	27
Riverton	KWRB-TV	10

GUAM

Agana	KUAM-TV	8

PUERTO RICO

Aguadilla-Mayaguez	WOLE-TV	12
Caguas	WKBM-TV	11
Mayaquez	WORA-TV	5
	WITB-TV	22
	WMGZ	16
Ponce	WSUR-TV	9
	WITP-TV	20
	WRIK-TV	7
	WPSJ	14
San Juan	WAPA-TV	4
	WITA-TV	30
	WKAQ-TV	2
	WRST	18

VIRGIN ISLANDS

Charlotte Amalie	WBNB-TV	10
Christiansted, St. Croix	WSVI	8

U. S. Educational Television Stations by States

Includes Non-Commercial Stations. U. S. Stations listed alphabetically by cities in state groups. Territories and possessions follow states.
Abbreviations: Chan., channel; C.L., call letters.

ALABAMA

Birmingham	WBIQ	10
Dozier	WOIQ	2
Florence	WFIQ	36
Huntsville	WHIQ	25
Mobile	WEIQ	42
Montgomery	WAIQ	26
Mount Cheaha State Park	WCIQ	7

ARIZONA

Phoenix	KAET	8
	KPAZ-TV	21
Tucson	KUAT	6

ARKANSAS

Little Rock	KETS	2

CALIFORNIA

Los Angeles	KCET	28
Redding	KIXE-TV	9
Sacramento	KVIE	6
San Bernardino	KVCR-TV	24
San Francisco	KQED	9
San Jose	KTEH	54
San Mateo	KCSM-TV	14

COLORADO

Denver	KRMA-TV	6

CONNECTICUT

Hartford	WEDH	24

DELAWARE

Wilmington	WHYY-TV	12

DISTRICT OF COLUMBIA

Washington	WETA-TV	26

FLORIDA

Gainesville	WUFT	5
Jacksonville	WJCT	7
Miami	WSEC-TV	17
	WTHS-TV	2
Orlando	WMFE-TV	24
Tallahassee	WFSU-TV	11
Tampa	WUSF-TV	16
Tampa-St. Petersburg	WEDU	3

GEORGIA

Ashburn	WJIA-TV	34
Athens	WGTV	8
Atlanta	WETV	30
Chatsworth	WCLP-TV	18
Columbus	WJSP-TV	28
Savannah	WVAN-TV	9
Waycross	WXGA-TV	8
Wrens	WCES-TV	20

HAWAII

Honolulu	KHET	11

IDAHO

Moscow	KUID-TV	12

ILLINOIS

Carbondale	WSIU	8
Chicago	WTTW	11
	WXXW	20
Olney	WUSI-TV	45
Urbana-Champaign	WILL-TV	12

INDIANA

Vincennes	WVUT	34

IOWA

Des Moines	KDPS-TV	11

KANSAS

Topeka	KTWU	11

KENTUCKY

Louisville	WFPK-TV	15

LOUISIANA

New Orleans	WYES-TV	8

MAINE

Augusta	WCBB	10
Calais	WMED-TV	13
Orono	WMEB-TV	12
Presque Isle	WMEM-TV	10

MASSACHUSETTS

Boston	WGBH-TV	2

MICHIGAN

Detroit	WTVS	56
Onondaga-East Lansing	WMSB	10
University Center (Bay City)	WUCM-TV	19

MINNESOTA

Appleton	KWCM-TV	10
Duluth	WDSE-TV	8
St. Paul	KTCI-TV	17
St. Paul-Minneapolis	KTCA-TV	2

WHITE'S

RADIO LOG

Location	C.L.	Chan.
MISSOURI		
Kansas City	KCSD-TV	19
St. Louis	KETC	9
NEBRASKA		
Alliance	KTNE-TV	13
Lexington	KLNE-TV	3
Lincoln	KUON-TV	12
N. Platte	KPNE-TV	9
Omaha	KYNE-TV	26
NEW HAMPSHIRE		
Durham	WENH	11
NEW MEXICO		
Albuquerque	KNME-TV	5
NEW YORK		
Buffalo	WNED-TV	17
New York	WNDT	13
	WNYC-TV	31
Rochester	WXXI	21
Schenectady	WMHT	17
Syracuse	WCNY-TV	24
NORTH CAROLINA		
Chapel Hill	WUNC-TV	4
Charlotte	WTVI	42
Columbia	WUNB-TV	2
NORTH DAKOTA		
Fargo	KFME	13
OHIO		
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		
Oklahoma City	KETA	13
	KOKH-TV	25
Tulsa	KOED-TV	11
OREGON		
Corvallis	KOAC-TV	7
Portland	KOAP-TV	10
PENNSYLVANIA		
Allentown-Bethlehem	WLVT-TV	39
	WPSX-TV	3
Clearfield	WITF-TV	33
Hershey	WUHY-TV	35
Philadelphia	WQED	13
Pittsburgh	WQEX	16
	WVIA-TV	44
Scranton		
SOUTH CAROLINA		
Charleston	WITV	7
Columbia	WRLK-TV	35
Greenville	WNTV	29
SOUTH DAKOTA		
Vermillion	KUSD-TV	2
TENNESSEE		
Lexington	WLJT-TV	11
Memphis	WKNO-TV	10
Nashville	WDCN-TV	2
Sneedville	WSJK-TV	2
TEXAS		
Dallas-Ft. Worth	KERA-TV	13
Houston	KUHT	8
Lubbock	KTXT-TV	5
Richardson	KRET-TV	23
San Antonio-Austin	KLRN-TV	9
UTAH		
Logan	KUSU-TV	12
Ogden	KWCS-TV	18
	KOET	9
Provo	KBYU-TV	11
Salt Lake City	KUED	7
VIRGINIA		
Hampton-Norfolk	WHRO-TV	15
Portsmouth	WYAH-TV	27
Richmond	WCVE-TV	23
WASHINGTON		
Pullman	KWSC-TV	10
Seattle	KCTS-TV	9
Spokane	KSPS-TV	7
Tacoma	KPEC-TV	56
	KTPS	62
Yakima	KYVE-TV	47
WISCONSIN		
Madison	WHA-TV	21
Milwaukee	WMVS	10
	WMVT	36
PUERTO RICO		
Mayaguez	WIPM-TV	3
San Juan	WIPR-TV	6

Canadian Television Stations by Cities

Canadian stations listed alphabetically by cities. Abbreviations: Chan., channel: C.L., call letters.

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.	CJCB-TV-2	9
Argentia, Nfld.	CJOX-TV	3
Ashcroft, B.C.	CFCR-TV-2	10
Ashmont, Alta.	CFRN-TV-4	12
Atikokan, Ont.	CBWCT-1	7
Baldy Mountain, Man.	CKSS-TV	8
Baie St. Paul, Que.	CKRT-TV-1	2
Bancroft, Ont.	CHEX-TV-1	2
Banff, Alta.	CKRO-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-2	10
Boston Bar, B.C.	CFCR-TV-9	5
Bralorne, B.C.	CFCR-TV-15	3
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
Camp Woss, B.C.	CFNV-TV-1	3
Canning, N.S.	CJCH-TV-1	10
Canoe, B.C.	CHBC-TV-8	3
Canoe Mountain, Near Valemont, B.C.	CFCR-TV-14	8
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
Celista, B.C.	CHBC-TV-6	6
Chandler, Que.	CHAU-TV-4	7
Charlottetown, P.E.I.	CFCY-TV	13
Cherryville, B.C.	CJWR-TV-1	10
Chicoutimi, P.Q.	CJPM-TV	6
Chilliwack, B.C.	CHAN-TV-1	11
Cheticamp, N.S.	CBFCT	10
Chicoutimi, Que.	CKRS-TV-2	2
Churchill, Man.	CHGH-TV	4
Clearwater, B.C.	CFCR-TV-10	2
Clermont, Que.	CFCV-TV-1	75
Clinton, B.C.	CFCR-TV-4	9
Cloridorme, Que.	CHAU-TV-8	6
Corner Brook, Nfld.	CBYT	5
Corner Brook, Nfld.	CJON-TV-1	10
Cornwall, Ont.	CJSS-TV	8
Coronation, Alta.	CKRD-TV	10
Courtenay, B.C.	CBUT-1	9
Colgate, Saskatchewan	CKCK-TV-1	12
Cranbrook, B.C.	CBYBT	10
Crescent Valley, B.C.	CHMS-TV-1	5
Dawson Creek, B.C.	CJDC-TV	5
Deer Lake, Nfld.	CBYAT	12
Drumheller, Alta.	CFCN-TV-1	12
Drumheller, Alta.	CHCT-TV-1	8
Dryden, Ontario	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.	CBWCT	5
Fort Fraser, B.C.	CKPG-TV-3	6
Foxwarren, Man.	CKX-TV-1	11
Gaspe, Que.	CHAU-TV-6	10
Gaspe West, Que. (Bechervaise Mountain)	CFGW-TV-1	6
Goose Bay, Nfld.	CFLA-TV	8
Grand Bank, Nfld.	CJOX-TV-1	10
Grand Falls, Nfld.	CJCN-TV	4
Grande Prairie, Alta.	CBXAT	10
Grande Vallee	CKBL-TV-3	11
Greenwater Lake, Sask.	CKBI-TV-3	4
Haliburton, Ont.	CKVR-TV-3	5
Halifax, N.S.	CBHT	3
Halifax, N.S.	CJCH-TV	5
Hamilton, Ont.	CHCH-TV	11
Hearst, Ont.	CBFOT-2	7
	CFCL-TV-4	4
High Prairie, Alta.	CBXAT-2	2
Hixon, B.C.	CKPG-TV-1	10
Hudson Hope, B.C.	CJDC-TV-1	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
Juskatla, B.C.	CFTK-TV-7	2
Kamloops, B.C.	CFCR-TV	4
Kapuskasing, Ont.	CBFOT-1	12
Kapuskasing, Ont.	CFCL-TV-3	3
Kearns, Ont.	CFCL-TV-2	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
Labrador City, Nfld.	CJCL-TV	13
L'Anse a Vaileau, Que.	CHAU-TV-9	7
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
Lookout Ridge, Near Chilliwack, B.C.	CBUT-2	3
Lumby, B.C.	CHID-TV-1	5
Mabel Lake, B.C.	CHPP-TV-1	8
Magdalen Islands, Que.	CBFCT-1	12
Malakwa, B.C.	CFFI-TV-1	5
Malartic, Que.	CFCL-TV-5	5
Manicouagan, Que.	CKHQ-TV-1	10
Marquis, Sask.	CKMJ-TV	7
Marystown, Nfld.	CBNT-3	5
Matagami, Que.	CKRN-TV-4	7
Matane, Que.	CKBL-TV	9
Meadow Lake, Sask.	CKSA-TV-1	12
Medicine Hat, Alta.	CHAT-TV	6
Melita, Man.	CKX-TV-2	9
Merritt, B.C.	CFCR-TV-3	10
Midway, B.C.	CKMY-TV-1	7
Moncton, N.B.	CBAFT	11
Moncton, N.B.	CKCW-TV	2
Mont Blanc Perce, Que.	CFGW-TV-2	8
Mont Climont, Que.	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
Moyle, B.C.	CKVS-TV-1	5
Murdochville, Que.	CKBL-TV-2	6
	CKMU-TV-1	3
Nakusp, B.C.	CJNP-TV-1	2
Nakusp, B.C.	CJNP-TV-2	4
Nass Camp (Near Lava Lake) B.C.	CFTK-TV-6	5
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
Ninkish, B.C.	CFNV-TV-2	6
Nipawin, Sask.	CKBI-TV-4	2
North Battleford, Sask.	CKBI-TV-2	7
Olalla	CHKC-TV-2	11
Oliver, B.C.	CHBC-TV-3	8
Ottawa, Ont.	CBOFT	9
Ottawa, Ont.	CBOT	4
Ottawa, Ont.	CJOH-TV	13
Outardes, Que.	CKHQ-TV-2	12
Parry Sound, Ont.	CKVR-TV-1	11
Passmore, B.C.	CHMS-TV-2	7
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
Placentia, Nfld.	CBNT-2	12
Port Alfred, Que.	CKRS-TV-1	9
Port Alice, B.C.	CKPA-TV-1	2
Port Arthur, Ont.	CKPR-TV	2
Port Daniel, Que.	CHAU-TV-3	10
Port Hardy, B.C.	CFKB-TV-3	3
Port Rexton, Nfld.	CBNT-1	13
Prince Albert, Sask.	CKBI-TV	5
Prince George, B.C.	CKPG-TV	2
Princeton, B.C.	CHGP-TV-1	5
Prince Rupert	CFTK-TV-1	6
Promontory Mountain, B.C.	CFCR-TV-12	5
Quebec, Que.	CBVT	11
	CFCM-TV	4
	CKMI-TV	5
Quesnel, B.C.	CFCR-TV-11	7
Quesnel, B.C.	CKCQ-TV-1	13
Red Lake, Ont.	CBWAT-3	10
Regina, Sask.	CHRE-TV	9
Regina, Sask.	CKCK-TV	2
Red Deer, Alta.	CKRD-TV	6
Rimouski, Que.	CJBR-TV	3
Riverhurst, Sask.	CJFB-TV-3	10
Rivière-au-Renard	CHAU-TV-7	7
Rivière du Loup, Que.	CKRT-TV	7
Riviere du Loup, Que.	CKRT-TV-3	13
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	9
Saskatoon, Sask.	CFQC-TV	8
Sault Ste. Marie, Ont.	CJIC-TV	2
Savona, B.C.	CFCR-TV-7	8
Schefferville, Que.	CFKL-TV	11
Senneterre, Que.	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.	CBNT	8
St. John's, Nfld.	CJON-TV	6
Ste. Marguerite-Marie, Que.	CHAU-TV-1	2
St. Quentin, N.B.	CHAU-TV-2	10
Ste. Rose du Dégelé, Que.	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, Que.	CBFST-2	12
Temiscaming, Que.	CJTK-TV-1	3
Terrace, B.C.	CFTK-TV	3
The Pas, Man.	CBWBT-1	7
Timmins, Ont.	CFCL-TV	6
Timmins, Ont.	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	Williams Lake, B.C.	CFCR-TV-5 8	Wingham, Ont.	CKNX-TV 8	Yorkton, Sask.	CKOS-TV 3
Waterton Park, Alta.	CJWP-TV-1 12	Willow Bunch, Sask.	CKCK-TV-2 6	Winnipeg, Man.	CBWFT 3	Yarmouth, N.S.	CBHT-3 11
Westwold, B.C.	CFWS-TV-2 12	Windsor, Ont.	CKLW-TV 9	Winnipeg, Man.	CBWT 6	Yuill Mountain, Balfour, B.C.	CKBF-TV-1 5
Whitecourt, Alta.	CFRN-TV-3 12			Winnipeg, Man.	CJAY-TV 7		
				Wynyard, Sask.	CKOS-TV-3 6		

World-Wide Shortwave Stations

With this copy of *White's Radio Log* at your operating desk you will be able to quickly identify and spot over 300 international broadcasting stations—the majority of the currently active stations being monitored by our readers and by the RADIO-TV EXPERIMENTER monitoring station, DX Central.

Each issue brings you a completely revised and updated version of the shortwave section which reflects new frequencies and schedule changes by the broadcasters. Our list may lack only one thing, that is your own personal listening experiences.

Yes, we find that the best way to compile a listing of active shortwave stations is to rely upon the latest reception loggings of our readers and, although we know that thousands of our readers make use of White's, only a handful of readers take the trouble to send us a copy of their loggings. Naturally we don't expect to hear from each and every reader for each and every issue, but we would like to hear from you at least once in a while. Why not let us know when you stumble upon particularly difficult station to log, or when you come upon a revised broadcast schedule, you might even tell us if a regularly heard station has left the air.

In your report to us please indicate the name and/or call of the station, the location, the approximate frequency, and the time (in GMT) monitored. Send as many as you like. We will use as many as we can.

Victorio Rodriguez G., Mexicali, B. C., Mex.
Floyd Damron, Anchorage, Alaska
John J. Deno, Coatesville, Pa.
David Anderson, Grace, Idaho
Sp/4 Richard Prudy, Union Lake, Mich.
Allan Levite, Chicago, Ill.
Jeff Miller, Beckley, W. Va.
Mike Fine, Poughkeepsie, N. Y.
Roger E. Melvin, Pocasset, Mass.
David Schoeller, Elmhurst, Ill.
Robert N. Platt, Elk Grove Village, Ill.
B. T. Nawrocki, Maywood, Calif.
Elwin F. Young, Dorchester, Mass.
Tom Kneitel, New York, N. Y.
Jack Cooper, Hutchinson, Kans.
Rick Slattery, Key West, Fla.
B. Glassberg, Brooklyn, N. Y.
B. E. Kinahan, Yonkers, N. Y.
Carl Durnavich, Riverdale, Ill.
Walter O'Brien, Jr., Clark, N. J.
Michael A. Oswald, Grand Island, N. Y.
Norman D. Meer, Richmond, Va.
Julian Sienkiewicz, Brooklyn, N. Y.

kHz	Call	Name	Location	GMT
2410	4VU	R. Lumiere	Port au Prince, Haiti	0340
2455	—	R. Zambia	Lusaka, Zambia	0455

31 Meter Band—9500 to 9775 Kc/s

3215	BED59	V. of Free China	Taipei, Formosa	1245
3225	ELWA	R. Village	Monrovia, Liberia	0615
3230	VRH8	Fiji BC	Suva, Fiji Is.	0945
3240	—	BC Service Rep. Iraq	Baghdad, Iraq	1930
3245	YVKT	R. Libertador	Caracas, Venezuela	2325
3275	ZYR31	Bauru R. Club	Bauru, Brazil	0530
3284	VRH9	Fiji BC	Suva, Fiji Is.	0930
3300	—	Brit. Hond. BC	Belize, Brit. Honduras	0200
3305	YVKX	V. de la Patria	Caracas, Venez.	0240
3315	—	R. Martinique	Ft. de France, Martinique	0100
3316	—	Sierra Leone BC	Freetown, Sierra Leone	0610
3325	YVRA	R. Monagas	Maturin, Venezuela	0240
3335	VL9CD	R. Wewak	Wewak, Paupa	1000
3346	—	R. Zambia	Lusaka, Zambia	2000
3350	—	Ghana BC	Accra, Ghana	0605
3375	YVMI	V. de la Fe	Maracaibo, Venezuela	0245
3385	HIDA	R. Hit Musical	Santo Domingo, Dom. Rep.	1100
3395	HIAZ	R. Santiago	Santo Domingo, Dom. Rep.	1100
3905	—	R. Port Vila	Port Vila, New Hebrides	0615
3910	—	Far East Network	Tokyo, Japan	1340
3935	9UB92	R. Cordac	Bujumbura, Burundi	0400
3995	—	R. Budepest	Budapest, Hungary	2200
4544	—	R. Alma Ata	Alma Ata, USSR	0410
4640	—	R. Dushanbe	Dushanbe, USSR	0000
4720	CR4AB	R. Club Mindelo	Cape Verde Is.	2200

60-Meter Band—4750-5060 kHz

4770	ELWA	R. Village	Monrovia, Liberia	0615
4795	—	R. Comercial	Sa da Bandeira, Angola	2330
4815	—	R. Ouagadougou	Ouagadougou, Upper Volta	0600
4820	HRVC	R. Evangelica	Tegucigalpa, Honduras	0200
4850	—	Mauritius BC	Forest Side, Mauritius	1300
4860	YVQE	R. Cumana	Cumana, Venezuela	0030
4865	CSA97	E. Regional	Ponta Delgada, Azores	2230
4870	—	R. Dahomey	Contonou, Dahomey	2230
4872	—	R. Sorong	Sorong, Indonesia	0800
4885	ZYG26	R. Pioneira de Teresina	Teresina, Brazil	0230
4914	HRSY	V. del Pacifico	San Lorenzo, Honduras	0315
4915	—	Ghana BC	Accra, Ghana	0330
4920	9UB94	R. Cordac	Bujumbura, Burundi	0400

WHITE'S

RADIO LOG

kHz	Call	Name	Location	GMT
4926	EAJ206	R. Equatorial	Bata, Spanish Guinea	2130
4940	—	R. Abidjan	Abidjan, Ivory Coast	2300
4950	—	R. du Senegal	Dakar, Senegal	0630
4955	PRF7	R. Cultura de Campos	Campos, Brazil	1030
4965	—	R. Zambia	Lusaka, Zambia	1830
4970	YVLK	R. Rumbos	Caracas, Venezuela	2200
4985	ZYY2	R. Brazil Central	Goiana, Brazil	0900
5010	—	R. Garoua	Garoua, Cameroon	2115
5041	—	E. da Guine	Bissau, Port. Guinea	2230
5047	—	R. du Togo	Lome, Togo	2200
5050	—	R. Tanzania	Dar es Salaam, Tanzania	1830
5250	HCPS5	Ondas Canaris	Azogues, Ecuador	0250
5260	—	R. Alma Ata	Alma Ata, USSR	0410
5875	HRN	V. de Honduras	Tegucigalpa, Honduras	1130
5930	—	R. Prague	Prague, Czech.	0100

49 Meter Band—5950 to 6200 Kc/s

5950	—	R. Warsaw	Warsaw, Poland	1530
	—	R. Zelaya	Bluefields, Nicaragua	1100
5955	—	R. Casino	Puerto Limon, Costa Rica	1100
5960	—	Trans World R.	Bonaire, Neth. Antilles	0400
5970	—	R. Alma Ata	Alma Ata, USSR	0410
5980	—	Gronlands R.	Godthab, Greenland	0300
		R. Demerara	Georgetown, Guyana	0950
5990	—	R. Sweden	Stockholm, Sweden	0230
6010	VUD	All India R.	New Delhi, India	1845
	HJFK	V. Amiga	Pereira, Colombia	1015
6020	PCJ	R. Nederland	Hilversum, Neth.	1930
6025	CSA52	V. of West	Lisbon, Portugal	0345
6030	CFVP	V. of Praries	Calgary, Alta., Canada	1200
	—	BC Service Rep. Iraq	Baghdad, Iraq	1930
6040	HJCB	V. del Tolima	Ibague, Colombia	0215
6055	—	R. Prague	Prague, Czech.	0700
6060	—	R. Habana	Havana, Cuba	2200
6075	HIDB	R. Liberdad	Santiago, Dom. Rep.	1100
6082	OAX4Z	R. Nacional	Lima, Peru	0200
6085	PCJ	R. Nederland	Hilversum, Netherlands	1500
6090	—	R. Kaduna	Kaduna, Nigeria	0520
	LRY1	R. Belgrano	Buenos Aires, Argentina	0600
6095	—	BC Service Rep. Iraq	Baghdad, Iraq	1930
6100	—	R. Habana	Havana, Cuba	0100
	—	R. Malaysia	Kuala Lumpur, Malaysia	1130
6110	—	Ghana BC	Accra, Ghana	0330
6120	OIX7	Finnish BC	Helsinki, Finland	2100
	—	BBC Relay	Nicosia, Cyprus	0257
6135	—	R. Warsaw	Warsaw, Poland	1530
	—	R. Habana	Havana, Cuba	0330
6145	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	1545
6155	OEI21	Austrian R.	Vienna, Austria	1700
6160	HSK4	R. Thailand	Bangkok, Thailand	0415
	HJKJ	R. Nueva Grenada	Nueva Grenada, Colombia	0210
6170	—	R. Habana	Havana, Cuba	0700
6175	—	R. Malaysia	Kuala Lumpur, Malaysia	1115
6180	—	BBC	London, England	2115
	—	V. America Relay	Monrovia, Liberia	0600
	—	R. Alma Ata	Alma Ata, USSR	0410
6185	CSA29	V. of West	Lisbon, Portugal	0345
6190	—	R-TV Morocco	Sebaa-Aioun, Morocco	2130
6195	—	BBC	London, England	1830
6200	—	R. Moscow	Moscow, USSR	0200
6234	—	R. Budapest	Budapest, Hungary	2200
6345	—	R. Peking	Peking, China	1500
6850	—	Rozglosnia Harcerska	Warsaw, Poland	1130

41 Meter Band—7100 to 7300 Kc/s

7100	—	R. Budapest	Budapest, Hungary	2200
7110	—	R. Erevan	Erevan, Armenia, USSR	0800
7115	—	R. Prague	Prague, Czech.	0100
7125	—	R. Warsaw	Warsaw, Poland	1530
7140	—	BBC Relay	Nicosia, Cyprus	0257
7145	—	R. Warsaw	Warsaw, Poland	1530
7175	—	V. America Relay	Monrovia, Liberia	0600
7180	—	BC Service Rep. Iraq	Baghdad, Iraq	0320
7185	HSK7	R. Thailand	Bangkok, Thailand	0415
7210	—	BBC	London, England	1315
7215	VUD	All India R.	New Delhi, India	2215
	—	V. of Vietnam	Hanoi, N. Vietnam	1300
7220	—	R. Budapest	Budapest, Hungary	2300
7230	—	R. Ouagadougou	Ouagadougou, Upper Volta	0600
7245	OEI33	Austrian R.	Vienna, Austria	1700
7260	—	BBC	London, England	2100
	BEC71	Air Force	Taiwan, Formosa	1100
7265	—	R. Tirana	Tirana, Albania	2200
7270	—	R. South Africa	Paradys, S. Africa	2100
7285	—	R. Warsaw	Warsaw, Poland	1530
7295	—	Trans World R.	Monte Carlo, Monaco	0630
	VUD	All India R.	New Delhi, India	1845
7305	—	R. Budapest	Budapest, Hungary	2200
7306	—	Rozglosnia Harcerska	Warsaw, Poland	1130
7320	—	BBC	London, England	1830
7325	—	BBC	London, England	2115
7345	—	R. Prague	Prague, Czech.	0100
7504	—	R. Peking	Peking, China	1500
8237	—	R. Peking	Peking, China	1500
8245	—	R. Peking	Peking, China	0100
9009	—	Kol Zion	Tel Aviv, Israel	1835
9250	—	R. Alma Ata	Alma Ata, USSR	0410
9360	—	R. Nacional	Madrid, Spain	2020
9380	—	R. Alma Ata	Alma Ata, USSR	0410
9457	—	R. Peking	Peking, China	0300

31-Meter Band—9500-9775 kHz

9505	—	R. Prague	Prague, Czech.	0100
	—	R. Japan	Tokyo, Japan	0600
9508	—	R. Omdurman	Omdurman, Sudan	0420
9510	—	BBC	London, England	1315
9515	TAT	R. Ankara	Ankara, Turkey	1530
9525	—	R. South Africa	Paradys, S. Africa	2330
9535	CR6RZ	R. Angola	Luanda, Angola	1715
9540	ETLF	R. Voice of Gospel	Addis Ababa, Ethiopia	0400
9550	LLD	R. Norway	Oslo, Norway	0300
	—	R. Moscow	Moscow, USSR	1230
9535	OIX2	Finnish BC	Helsinki, Finland	1600
	—	Syrian BC	Damascus, Syria	1400
	YSS	R. Nacional	San Salvador, El Salvador	0200
9560	—	R. Tanzania	Dar es Salaam, Tanzania	1000
9570	ETLF	R. Voice of Gospel	Addis Ababa, Ethiopia	1715
	—	R. Australia	Melbourne, Australia	0730
9580	—	R. Erevan	Erevan, Armenia, USSR	0800
9585	YSV	V. del Comercio	Santa Ana, El Salvador	1335
9590	—	R. Erevan	Erevan, Armenia, USSR	0800
	—	Trans World R.	Bonaire, Neth. Antilles	0130
9595	JOZ3	Okiki no Houso	Tokyo, Japan	0817
	ZYN29	R. Cultura	Bahia, Brazil	0200
9600	—	V. America Relay	Monrovia, Liberia	0600
	CE960	R. Pres. Balmaceda	Santiago, Chile	2310

kHz	Call	Name	Location	GMT
9610	LLG	R. Norway	Oslo, Norway	2300
	VLX9	R. Australia	Melbourne, Australia	1100
9615	ORU4	V. Friendship	Brussels, Belgium	2200
9620	—	R. New Zealand	Wellington, N.Z.	0600
	—	VTVN	Saigon, S. Vietnam	0800
	CXA6	S.O.D.R.E.	Montevideo, Uruguay	0200
9640	HLK5	V. Free Korea	Seoul, S. Korea	1030
9660	—	R. Habana	Havana, Cuba	0700
	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	0330
9667	—	R. Ceylon	Colombo, Ceylon	0130
9675	—	R. Warsaw	Warsaw, Poland	1530
9685	—	Vatican R.	Vatican City	2200
9690	VUD	All India R.	New Delhi, India	1945
	LRA32	R. Nacional	Buenos Aires, Argentina	0600
9700	—	R. Sofia	Sofia, Bulgaria	0000
9705	—	R. Sweden	Stockholm, Sweden	1100
	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	1815
9710	—	R. Malaysia	Kuala Lumpur, Malaysia	1300
	—	R. Kiev	Kiev, USSR	0030
	—	Mauritius BC	Forest Side, Mauritius	0230
9720	—	R. South Africa	Paradys, S. Africa	2100
	—	Sawt al Islam	Riyadh, Saudi Arabia	2200
9740	WNYW	R. New York Worldwide	New York, N.Y.	2305
	LRS1	R. Splendid	Buenos Aires, Argentina	2150
9745	BEC62	Air Force	Taipei, Formosa	1100
	TAP	R. Ankara	Ankara, Turkey	1930
	HCJB	V. of Andes	Quito, Ecuador	0230
9760	—	R. Hanoi	Hanoi, N. Vietnam	1300
9765	—	R. South Africa	Paradys, S. Africa	2330
9810	—	R. Kiev	Kiev, USSR	0030
9833	—	R. Budapest	Budapest, Hungary	2200
9915	VUD	All India R.	New Delhi, India	2215
10530	—	R. Alma Ata	Alma Ata, USSR	0410
10865	—	R. Peking	Peking, China	0100
11440	—	R. Peking	Peking, China	2300
11610	—	R. Peking	Peking, China	2300
11672	—	R. Pakistan	Karachi, Pakistan	1500
11685	CR6RR	R. Diamang	Lusaka, Angola	1900

25-Meter Band—11700-11975 kHz

11710	—	R. Australia	Melbourne, Australia	0730
	LRA35	R. Nacional	Buenos Aires, Argentina	2300
11720	—	R. Canada	Montreal, P.Q.	1745
	PRL8	R. Nacional	Brasalia, Braz.	2130
11730	PCJ	R. Nederland	Hilversum, Netherlands	1930
11735	—	R. Iran	Tehran, Iran	2000
11735	—	R. Habana	Havana, Cuba	0730
11740	—	V. America Relay	Monrovia, Liberia	0500
	VUD	All India R.	New Delhi, India	1945
11750	—	BBC Relay	Malaysia	1145
11760	—	R. Habana	Havana, Cuba	0100
11765	—	R. Sweden	Stockholm, Sweden	1230
11770	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	0500
	—	Vatican R.	Vatican City	0110
11780	—	BBC	London, England	1315
	—	R. Moscow	Moscow, USSR	1930
	ZL3	R. New Zealand	Wellington, N.Z.	0545
	LRY2	R. Belgrano	Buenos Aires, Argentina	2000
11785	OE152	Austrian R.	Vienna, Austria	1300
11805	OIX8	Finnish BC	Helsinki, Finland	1600
11815	—	R. Japan	Tokyo, Japan	2200
11820	—	R. Tahiti	Papeete, Tahiti	0230
	—	Trans World R.	Bonaire, Neth. Antilles	1205
11825	—	R. Tahiti	Papeete, Tahiti	0430
11835	—	R-TV Algerienne	Algiers, Algeria	1330
	4VEJ	V. Evangelique	Cap Haitien, Haiti	1800
11850	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	1700
	LLK	R. Norway	Oslo, Norway	2300
	—	R. Moscow	Moscow, USSR	1230
11875	—	R. Pakistan	Karachi, Pakistan	1125
	ZYN32	R. Society Bahia	Salvador, Brazil	0100
11890	—	R. Berlin Int'l.	Berlin, E. Germany	0100
	—	RAI	Rome, Italy	2230
	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	0400
11895	DMQ11	Deutsche Welle	Cologne, W. Germany	0500
11900	—	R. South Africa	Paradys, S. Africa	2330
11905	—	BBC Relay	Nicosia, Cyprus	1130
	VUD	All India R.	New Delhi, India	2222
11910	—	Kol Zion	Tel Aviv, Israel	1000
	HSK9	R. Thailand	Bangkok, Thailand	0415
11915	HCJ8	V. of Andes	Quito, Ecuador	0230
11925	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	0350
	ZYR78	R. Bandeirantes	Sao Paulo, Brazil	2110
	ELWA	R. Village	Monrovia, Liberia	0500
	—	Sawt al Islam	Riyadh, Saudi Arabia	2200
11970	WNYW	R. New York Worldwide	New York, N.Y.	2305
11975	ELWA	R. Village	Monrovia, Liberia	0500
11990	—	R. Prague	Prague, Czech.	0100
14345	—	Hellenic BC	Athens, Greece	1830
14520	—	Korean Central BC	Pyongyang, N. Korea	0100

19-Meter Band—15100-15450 kHz

15100	—	RH de Mexico	Mexico	2300
	—	R. Euzkadi	(clandestine)	2130
15110	—	R. Moscow	Moscow, USSR	1430
15115	—	R. Free Europe	Munich, Germany	1300
	HCJB	V. of Andes	Quito, Ecuador	0230
15125	HLK41	V. Free Korea	Seoul, S. Korea	0630
	BED60	V. Free China	Taipei, Formosa	1715
15145	—	R. Free Europe	Munich, Germany	1715
15148	CE1515	Corp. Chilena BC	Santiago, Chile	0100
	TAU	R. Ankara	Ankara, Turkey	0420
15165	OZF7	V. Denmark	Copenhagen, Denmark	1330
15170	—	Hashemite BC	Amman, Jordan	2300
15175	LLM	R. Norway	Oslo, Norway	1500
15185	OIX4	Finnish BC	Helsinki, Finland	1600
	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	1500
15195	—	R. Japan	Tokyo, Japan	0600
15205	—	R. Ceylon	Colombo, Ceylon	0100
15210	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	1600
15220	—	R. Australia	Melbourne, Australia	2245
15230	—	R. Ceylon	Colombo, Ceylon	0130
	ETLF	R. Voice of Gospel	Addis Ababa, Ethiopia	1830
15235	—	BBC	London, England	1315
	—	R. Japan	Tokyo, Japan	0630
15245	—	Trans World R.	Bonaire, Neth. Antilles	2100
15255	—	R. Berlin Int'l.	Berlin, E. Germany	1435
15285	—	R. Prague	Prague, Czech.	0330
	—	Ghana BC	Accra, Ghana	1900
15295	—	R. Club Mozambique	Lourenco Marques, Mozamb.	1630
15315	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	1345
15320	—	R. Canada	Montreal, P.Q.	1745
15340	—	R. Habana	Habana, Cuba	2200
15350	—	BBC Relay	Ascension I.	1745
15370	ZYC9	R. Tupi	Rio de Janeiro, Brazil	2030
15400	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	0430
15410	ETLF	R. Voice Gospel	Addis Ababa, Ethiopia	1300
15415	ZYR206	R. Club Ribeirao	Preto, Brazil	0045
15425	PCJ	R. Nederland	Hilversum, Netherlands	1930
15440	WNYW	R. New York Worldwide	New York, N.Y.	2305
17680	—	R. Peking	Peking, China	0000
17697	—	R. Berlin Int'l.	Berlin, E. Germany	1600

16 Meter Band—17700 to 17900 Kc/s

17705	—	V. America Relay	Honolulu, Hawaii	2220
17730	WNYW	R. New York Worldwide	New York, N.Y.	1305
17795	—	R. Budapest	Budapest, Hungary	1930

(Continued on page 115)

LITERATURE

★ Starred items indicate advertisers in this issue. Consult their ads for additional information and specifications.

LIBRARY

CB—BUSINESS RADIO SHORTWAVE RADIO

★**93.** *Heath Co.* has a new 23-channel all-transistor 5-watt CB rig at the lowest cost on the market, plus a full line of CB gear. See their new 10-band AM/FM/Shortwave portable and line of shortwave radios.

★**101.** If it's a CB product, chances are *International Crystal* has it listed in their colorful catalog. Whether kit or wired, accessory or test gear, this CB oriented company can be relied on to fill the bill.

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

107. Get with the mobile set with *Tram's* XL'100. The new Titan CB base station, another *Tram* great, is worth knowing about.

111. Get the scoop on *Versa-Tronics'* Versa-Tenna with instant magnetic mounting. Antenna models available for CB'ers, hams and mobile units from 27 MHz to 1000 MHz.

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!

45. Catering to 2-way radio buffs for 30 years, *World Radio Laboratories* has a new free catalog which includes the latest CB transceivers, etc. Quarterly fliers chock-full of bargains are also available.

50. Make your connection with *Amphenol*—tune in to the latest on CB product news with specs and pics on new gear. Keep informed on Amphenol's new products.

100. You can get increased CB range and clarity using the "Cobra" transceiver with speech compressor—receiver sensitivity is excellent. Catalog sheet will be mailed by *B&K Division* of *Dynascan Corporation.*

54. A catalog for CB'ers, hams and experimenters, with outstanding values. Terrific buys on *Grove Electronics'* antennas. mikes and accessories.

96. If a rugged low-cost business/industrial two-way radio is what you've been looking for, be sure to send for the brochure on *E. F. Johnson Co.'s* brand new Messenger "202."

102. *Sentry Mfg. Co.* has some interesting poop sheets on speech clippers, converters, talk power kits and the like for interested CB'ers, hams and SWL'ers, too.

103. *Squires-Sanders* would like you to know about their CB transceivers, the "23'er" and the new "S5S." Also, CB accessories that add versatility to their 5-watters.

ELECTRONIC PRODUCTS

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

108. Get the facts on *Mercury's* line of test equipment kits—designed to make troubleshooting easier, faster and more profitable.

67. "Get the most measurement value per dollar," says *Electronics Measurements Corp.* Send for their catalog and find out how!

92. How about installing a transistorized electronic ignition system in your current car? *AEC Laboratories* will mail their brochure giving you specifications, schematics.

109. *Seco* offers a line of specialized and standard test equipment that's ideal for the home experimenter and pro. Get specs and prices today.

HI-FI/AUDIO

★**26.** Always a leader, *H. H. Scott* introduces a new concept in stereo console catalogs. "At Home With Stereo," offers decorating ideas, a complete explanation of the more technical aspects of stereo consoles.

85. Need a tuner? Preamp? Amp? Tape deck? Then inspect *Dyna* for kits or wired units. It's worthwhile looking at test reports *Dyna* sends your way.

110. Get the latest facts on sound columns. *American Geloso Electronics Inc.* offers a ten-page booklet giving the hows and whys plus method of installation and arrangement of sound columns.

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. Discover how Cueing Control, anti-scating and other *Garrard* features in the Lab 80 offer tops in audio listening. 32-page *Garrard* Comparator Guide will make you a wiser buyer—get it.

17. Build your own bass reflex enclosures from fool-proof plans offered by *Electro-Voice.* At the same time get the specs on *EV's* solid-state hi-fi line—a new pace setter for the audio industry.

19. *Empire Scientific's* new 8-page, full color catalog is now available to our readers. Don't miss the sparkling decorating-with-sound ideas.

24. Need a hi-fi or PA mike? *University Sound* has an interesting microphone booklet audio fans should read before making a purchase.

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.

95. Confused about stereo? Want to beat the high cost of hi-fi without compromising on the results? Then you need the new 24-page catalog by *Jensen Manufacturing.*

99. Interested in learning about amplifier specifications as well as what's available in kit and wired form from *Acoustech?* Then get your copy of *Acoustech's* 8-page colorful brochure.

34. You can't pick the tape recorder you need without a program—and *Sony Superscope* has one. Full color 16-page booklet is as good as your dealer's showcase. Includes accessories.

TAPE RECORDERS AND TAPE

113. *Scotch* is the product and it's made by *Minnesota Mining and Mfg. Co. (3M).* Get a packet full of facts and tape data from *3M* and learn all about your tape recorder and the tape it needs.

31. All the facts about *Concord Electronics Corp.* 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. "Everybody's Tape Recording Handbook" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 24-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.

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.

91. Sound begins and ends with a *Uher* tape recorder. Write for this new 20 page catalog showing the entire line of *Uher* recorders and accessories. How to synchronize your slide projector, execute sound on sound, and many other exclusive features.

HI-FI ACCESSORIES

112. *Telex* would like you to know about their improved Serenata Headset—and their entire line of quality stereo headsets.

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!

98. Swinging to hi-fi stereo headsets? Then get your copy of *Superex Electronics'* 16-page catalog featuring a large selection of quality headsets.

104. You can't bear FM stereo unless your FM antenna can pull 'em in. Learn more and discover what's available from *Finco's* 6-pager "Third Dimensional Sound."

KITS

★42. Here's a colorful 108-page catalog containing a wide assortment of electronic kits. You'll find something for any interest, any budget. And *Heath Co.* will happily send you a copy.

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

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Heath AD-16 Recorder

Continued from page 70

sustained 400 Hz and 15 kHz tones for both azimuth and bias adjustments, using the built-in VU meters as indicators. For those who prefer it, an instrument alignment procedure is described, although it is neither easier nor better than that with the test tape.

How It Performed. The actual frequency response of the AD-16 is shown in Figs. 1 and 2. Although the response "wavers," it is well within Heath's specs which are given in the table. (The "waver," by the way, is normal with professional recorders that don't attempt to get a "ruler flat" frequency response by excess equalization at the expense of substantially higher high-frequency distortion.)

The 1 kHz THD (total harmonic distortion) was right on the button of Heath's claims. In fact, a record input level that exceeded 0 VU did not noticeably increase the reference distortion of 1.5% THD, even with the pointer full into the "red region" at +3 VU. The noise level was a shade poorer than Heath's claims—at 7½ ips it measured −49 db on the right channel and −45 db on the left channel (referenced to 3% THD).

The AD-16's price of $399.50 represents only the recorder; the walnut base is an optional extra at $19.95. For additional information write to Dept. EB, Heath Co., Benton Harbor, Mich. 49023. ■

SPECIFICATIONS

Speeds—7½ and 3¾ ips
Wow and flutter—0.18% at 7½ ips; 0.25% at 3¾ ips
Max. reel size—8¼ in.
Freq. response (record/playback)—±2 db, 45 to 18,000 Hz at 7½ ips; ±3 db, 30 to 10,000 Hz at 3¾ ips
Signal-to-noise ratio—52 db or better at 7½ ips (referred to 3% THD)
THD—less than 1.5% at 0 VU record and 0 VU playback
Output—Phone jack: 1 volt unloaded at 0 VU. Monitor output: 1 volt unloaded at 0 VU. Tape output: 1 volt at 0 VU.

Spy in the Tie

Continued from page 53

right through the case. . . . If desired, melt a hole opposite the adjusting screw of C5—so you can change frequency without removing the transmitter from the case.

Checkout. Insert the battery into the clips —get the polarity right—close the case, place an FM receiver near the transmitter, and place the mike near the receiver's speaker. As you tune the receiver you can't miss the transmitter's frequency, the feedback will be unbearable. To change the transmitter's frequency, adjust C5 until there is no interference from strong FM-broadcast stations.

Protecting yourself. To use the Tie-Spy, clip the mike to your tie, place the transmitter in your trouser's side pocket, and run the antenna around your waist under your belt or under the back of your shirt, or wherever you prefer. The effective transmitter range will be about 25 to 50 feet. Don't try to speak directly into the mike as the gain is very high and the modulation will severely "pop"—the gain is designed to pick up voices from one to three feet. Naturally, the better the mike the better the reproduction.

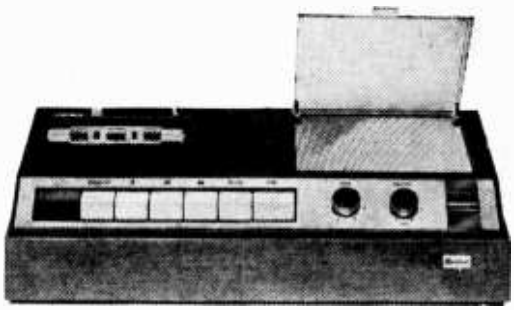
A Note of Warning. The transmitter *must* operate between 88 and 108 MHz (mc) and it must not interfere with a commercial broadcast signal. And the transmitter must be certified by an electronics technician that it has no spurious emissions and conforms to FCC requirements. For more details concerning wireless-mike FM transmitters we suggest you write to the FCC, Washington, D.C. 20554 and request Bulletins 11 and 12 concerning FCC rules pertaining to license-free, low-power transmitters. ■

Tape Sings

Continued from page 92

another story. Played through their own speakers most cartridge systems sound like table-model FM radios. Bass is not really adequate by audiophile standards, and treble has been boosted to provide a slightly unnatural sound. Played through a component system, Fidelipac, Lear, and Norelco cartridges all sound somewhat better—though none is the equal of a good 7½-ips reel-to-reel tape.

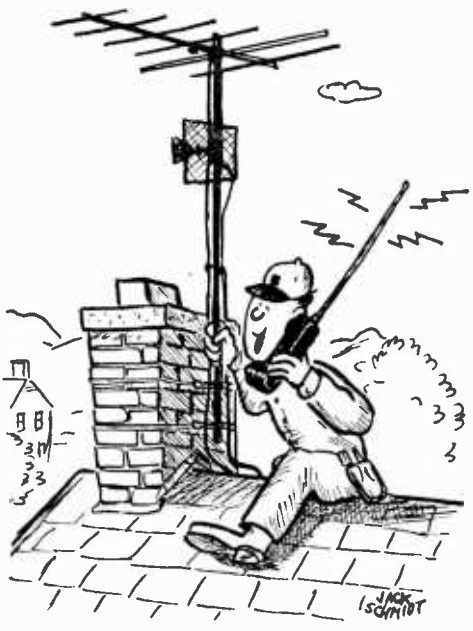
The best sound comes from Fidelipac (we sampled some of International Tape Cartridge Corp.'s *Command* titles), which provides generally good and full bass response through a big speaker system. Mid-range is accurately reproduced, as is treble. We found only a slight mellowing of the upper ranges, compared with a disc copy of the same music. The Lear-Jet system produces a similar frequency response (on the basis of *RCA Victor* recordings by Morton Gould, the Boston Pops, and Peter Nero), but there is a definite increase in tape hiss and a slight accentuation of treble response compared to Fidelipac.



This table-model player also accepts Norelco cassette. Lid exposes speaker grille.

Norelco's 1⅞-ips tape has slightly less audible tape hiss than Lear-Jet, but a slightly less natural treble sound as well. At the same time, Norelco's bass tones are not as clear or crisp as Fidelipac's (tests were made with cartridges recorded from *Command* discs).

Wow and flutter, however, which used to bedevil reel-to-reel slow-speed recordings, are inaudible on all these systems. And while none of these systems offers a hi-fi alternative to a good component disc- or tape-reproducing system, one significant fact remains. For the truth of the matter is that all can produce excellent results on the road. ■



"Check the side window, Boss! There's a blond, about 23, 5' 9", 120 lbs. . . ."

White's Radio Log

Continued from page 111

17805	—	Deutsche Welle Relay	Kigali, Rwanda	1745
17810	PCJ	R. Nederland	Hilversum, Netherlands	1500
17815	—	R. de Sao Paulo	Sao Paulo, Brazil	2200
17820	TAV	R. Ankara	Ankara, Turkey	1415
	—	R. Australia	Melbourne, Australia	0330
	—	R. Canada	Montreal, P.Q.	1745
17825	LLN	R. Norway	Oslo, Norway	1500
	—	R. Japan	Tokyo, Japan	0800
17845	—	R. Sweden	Stockholm, Sweden	1400
	WNYW	R. New York Worldwide	New York, N.Y.	1305
			Cairo, Egypt	1330
17850	—	United Arab BC	Brussels, Belg.	1715
17860	ORU	V. Friendship	Nicosia, Cyprus	0900
17885	—	BBC Relay	Budapest, Hungary	1930
17890	—	R. Budapest	Accra, Ghana	1500
17910	—	Ghana BC	Prague, Czech.	0330

13-Meter Band—21450-21750 kHz

21450	—	R. Prague	Lisbon, Portugal	1815
21495	CSA67	R. Nacional	Melbourne, Australia	0100
21540	—	R. Australia	Accra, Ghana	1457
21545	—	Ghana BC	Dar es Salaam, Tanzania	1530
21600	—	R. Tanzania	Budapest, Hungary	1930
21665	—	R. Budapest	Oslo, Norway	1500
21670	LLP	R. Norway	Budapest, Hungary	1930
21685	—	R. Budapest	Oslo, Norway	1500
21730	LLQ	R. Norway	Copenhagen, Denmark	1330
21790	—	V. Denmark		

Personal Hi-Fi

Continued from page 54

J2 are mounted directly on one metal panel, and the stereo headphone jack (J3) is mounted directly on the other metal panel—no insulating washers are necessary. Resistors R1 and R2, and transistors Q1 and Q2, are all mounted by their own leads, and no spaghetti (insulating tubing) is needed if you keep all leads well apart. When soldering the transistor leads, use a pair of long-nose pliers as a heat sink.

How It Works. The PS-15 low-voltage DC source feeds a current through the piezoresistive elements in the phono cartridge. As the stylus rides in the stereo record grooves, the piezoresistive elements are flexed and stretched and act as rapidly varying resistances. The varying currents from the cartridge are given one stage of transistor AF amplification in the PS-15 unit.

The output from the PS-15 is fed into the input of our little headphone driver and given another stage of transistor AF amplification to drive the stereo headphones. The two 2.2K (2200 ohms) resistors (R1, R2) provide base bias for Q1 and Q2; you might experiment with other values for best results with your particular transistors.

The amplifier is turned off simply by pulling the headphone plug out of the jack. ■

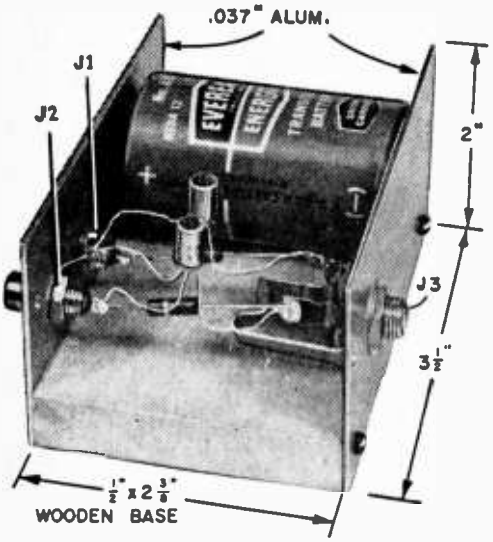


Photo shows all necessary dimensions for duplicating author's unit. If you prefer, amplifier can be mounted in small Minibox.

The Body's Ills

Continued from page 41

ulus blocks pain stimuli coming from other parts of the body and prevents their traveling on to the brain. Still experimental, it promises to ease suffering now relieved only by narcotics or dangerous operations.

Another remedial operation that can be ruled out is the one often necessitated by accidental swallowing of a ferrous object. General Electric engineers have come up with a gadget that has already removed a padlock, a coffee-can key, coins, pins, dental burrs, hypodermic needles, and metal toys from innocent human tummies.

About 30 in. long and ¼-in. in diameter, the new wizard consists of a stainless steel cable in a plastic tube and ends with an iron tip. When the magnet at the end of the control cable is slid forward until it touches the iron tip, the tip magnetizes. When the permanent magnet is retracted into a magnetic shield, the tip loses its magnetism.

An important breakthrough, the new instrument can retrieve foreign objects in a matter of two to three minutes. No anesthesia is needed, and a general practitioner requires the help of only a fluoroscope. ■

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Tape-Slide Synchronizer

Continued from page 80

R1 and J2 are added to the PK-522 amplifier to make this simplification of operation possible. Volume control R1 is set to about its mid-range position for this setup.

Shock Hazard and Grounding. The yellow lead of the output transformer was grounded to the positive (+) battery terminal in the original PK-522 circuit. To completely eliminate shock hazard the printed-circuit foil was cut leaving the secondary ungrounded as shown at X in Fig. 2.

A separate transformer power supply (T2-R2 and C3) provides DC for the amplifier—eliminating possible shock hazards from this source. To prolong its life, R3 is used to reduce the light output of the pilot lamp. The value of C3 must be at least 1000 mf as it holds the power supply voltage on the amplifier for good operation, after the AC supply to T2 has been cut off by the motor-driven cam switch (S4) in the slide changer.

Construction Details. Placement of parts is not critical. And using subassemblies for the amplifier, SCR switch and the amplifier power supply makes for a neat and compact unit which should be easy to service if this should ever be necessary.

The photo of the under side of the chassis (Fig. 3) shows the location of parts. The PK-522 amplifier is shown fastened to the right side of the chassis box on ⅜-inch stand-off insulators. These can easily be made from test-lead handles or banana-plug insulators.

The SCR-diode bridge switch (SCR1, Z1, D1, R2 and C4) is mounted on a phenolic panel and fastened to the left side of the cabinet with ½-inch spacers. The power supply (Z2 and R3) is mounted on another small phenolic panel which is then attached to the bottom side of the chassis box with ½-inch spacers. T2 is mounted direct to the lower side of chassis as shown.

Fig. 4 is a photograph of the *Tape-Slide Synchronizer* and shows, in conjunction with Fig. 3, the location of the other components.

Cables. The two-wire power cable which connects the slide-changer unit to the *Tape-Slide Synchronizer* has a 4-contact plug number Jones P-304-CCT on one end which mates with the original Jones 4-contact socket S-304-AB on the slide changer. The other end of the power cable has a female Jones cable socket S-304-CCT which mates with a male chassis plug P-304-AB on the *Tape-Slide Synchronizer*.

The female Cinch-Jones chassis socket S-304-AB shown on the chassis is not essential unless the original remote pushbutton cable operation is desired.

The shielded wire connecting the synchronizer unit with the recorder has a miniature phone plug on one end and whatever type fittings needed (on the other end) to mate with the input and output of the particular recorder used.

Conclusion. The *Tape-Slide Synchronizer* can be used with any stereo-tape record/playback unit and practically any remote-pushbutton-operated semiautomatic slide changer. Adequate gain is available from the 3-transistor amplifier to operate with the preamps of most stereo tape decks. Furthermore, if desired, a small crystal microphone can be plugged into the synchronizer's input for voice operation of the slide changer and simultaneous recording of the sync signal on the tape.

Since the *Tape-Slide Synchronizer* is all solid state there are no relays, contacts or moving parts to wear out. This unit has been in service for nearly a year and has required no service of any kind to date.

Perfect synchronization of commentary and slides is assured at all times because the sync pulse and commentary are recorded on a single 2-track tape. ■

International Crystal C-12B

Continued from page 58

"wo-o-of," or "hello-o-o-o," the C-12B indicated somewhat in excess of 90% modulation. The actual scope value under these conditions was 100%.

Summing Up. The C-12B frequency meter, functioning as a frequency meter, precision signal generator, RF power output meter, and modulation meter, essentially performs all the tests required to insure a CB set is completely legal in its operation and that it is performing at optimum efficiency. We therefore recommend it as a *must-have* item for any shop doing CB servicing.

The C-12B is priced at $300.00. Additional information is available from Dept. RF, International Crystal Mfg. Co., 18 N. Lee, Oklahoma City, Okla. 73102. ■

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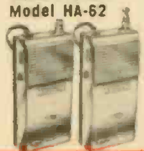

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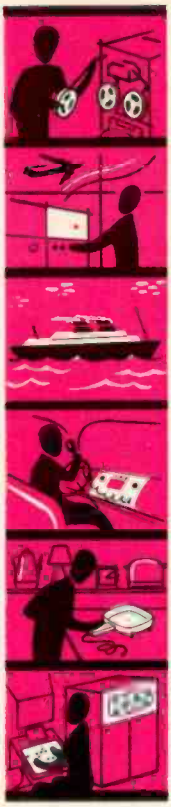

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