RADIO-TV EXPERIMENTER

OCTOBER-NOVEMBER 75c

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2 GREAT NOVICE PROJECTS:

The step-up transmitter that starts you toward your general ticket!

T-R electronic switch allows listening as you send!

Page 47

ANTENNA TUNER
PAGE 45

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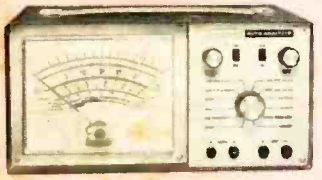

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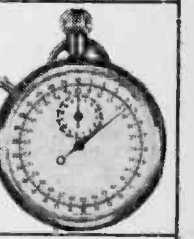

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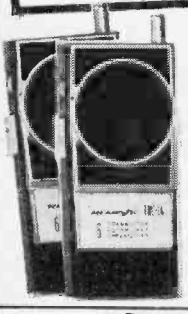

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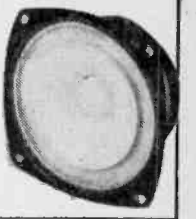

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OCT.-NOV. 1966

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RADIO-TV EXPERIMENTER

Dedicated to America's Electronics Experimenters

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

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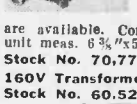

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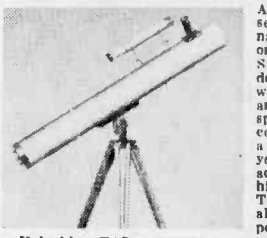

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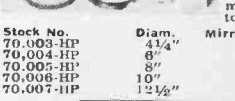

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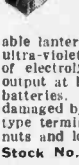

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POSITIVE FEEDBACK

JULIAN M. SIENKIEWICZ, EDITOR
WA2CQL/KMD4313

■ Nine-foot flames shooting forth from the oxygen mask of a seriously ill hospital patient illuminated a "bizarre" accident caused by a simple short circuit. At Peter Bent Brigham Hospital in Boston, two patients with "life-endangering illness" were breathing through respirator devices when a nurse moved a floor lamp for a better look.

Faulty insulation in the lamp allowed current to flow into the lamp's metal base. Poor design of the respirator created an all-metal pathway running from a caster in the base up to the body of the instrument, along a spring inside one of the air hoses, through a valve and along a set-screw to the wire that connected the unit to the electrical ground. When the lamp base came into contact with the caster, the current in the lamp flowed through the respirator and heated the spring to "glowing red." The oxygen-rich atmosphere in the hose ignited instantly.

The result—a flame shot about three to nine feet from the face of the respirator. The room was dark and filled with sparks, smoke and fumes.

The patients were wheeled safely out the room. The investigation that followed revealed that the lamp had not one but three breaks in its insulation. In addition, it turned out that several polarized sockets had been improperly wired, which would have created "an intolerable shock hazard" for any patient on whom more than one instrument were being used.

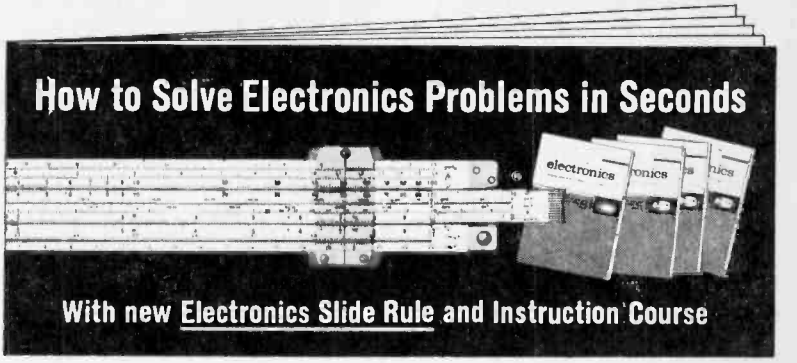
Can It Happen in Your Home? Hospitals buy the very best of equipment and employ maintenance men to keep their electrical equipment in top shape. Yet, disasters do happen endangering the very lives doctors are trying to save. Hospitals have their problems but, remember, they are safer than your home. Don't take our word for it, check it out yourself.

Start today! Check all electrical appliances for defective power cords. Inspect lamps for loose fitting sockets. Are you using too many

(Continued on page 8)

Why solve electronics problems the old-fashioned pencil and paper way?

This free booklet shows a faster way.



IT JUST DOESN'T MAKE SENSE! A complicated calculation can be solved by a computer in milliseconds. But a relatively simple problem in reactance is usually worked out the old-fashioned pencil-and-paper way... and takes one or two minutes.

Now there is a better way. You can solve many electronics problems in 20 seconds or less without doing any figuring at all. Our exclusive new, specially-designed electronics slide rule does the figuring for you.

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EX-102

extension cords and are these cords in good condition? Peep into the fuse box—make sure no overated fuse or penny is being used. Check that AC outlets do not overheat and make a positive grab when plugs are inserted.

There is much you can do to make your home safe from an electrical disaster. Start now, the lights just went out. . . .

Keeping an Eye on Us. Tiros VII, the world's most traveled shutterbug, has celebrated its third birthday doing what comes naturally. Launched June 19, 1963, from Cape Kennedy, Tiros VII has traveled more than one-half-billion miles, has made more than 16,500 trips around the earth and has returned more than 125,000 television pictures of the earth's cloud formations, storms, hurricanes and typhoons from its 500-mile orbit. Its cameras still are fully operational. Tiros VII, like all its predecessors and successors, was built by RCA's Astro-Electronics Division, Princeton, N. J., under the technical direction of the NASA Goddard Space Flight Center located at Greenbelt, Maryland.

The other five orbiting Tiros/Essa weather satellites are Tiros VIII launched 36 months ago; Tiros IX, the first polar orbiting, wheel-oriented weather satellite launched January 22, 1964, and Tiros X launched July 1, 1965. The first Tiros Operational Satellite, Essa 1, launched February 3, 1966, and Essa 2, launched February 28, 1966, now provide daily global weather observation.

Twelve Tiros satellites in a row have been orbited successfully and have operated well beyond their mission requirements in what has been termed as "the nation's most successful unmanned space program." They have returned more 750,000 weather photos in more than six years of operation and have traveled about 6 billion miles. Four of the spacecraft have had a useful life of more than one year, with a fifth, Tiros X, approaching that mark.

In addition, the U. S. Weather Bureau, as principal user of Tiros information, has been able to depend upon the satellites for the advanced report of major storms brewing in remote parts of the globe. Since 1962, not a day has passed without the Weather Bureau being able to obtain Tiros pictures. As a result Tiros is the first spacecraft used daily on an operational basis in the performance of a public service by the U. S. Government. We will now devote the remainder of this column to a discussion on Russian successes in the space-weather arena. . . . ■

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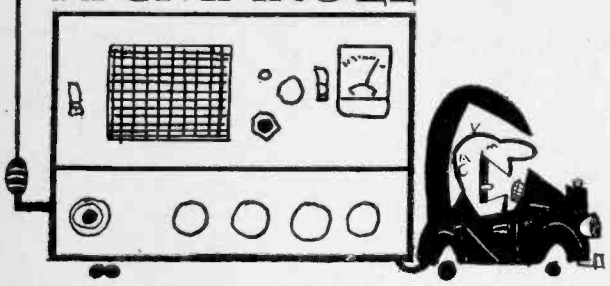
CB RIGS & RIGMAROLE



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

■ *G. Whiz, it's a G. E.!* It's always a warm feeling when one of the really big manufacturers of electronic products jumps into the CB field. Insiders have long know that General Electric has been doing quiet research on the CB field—so it seems that the sales experts at GE feel that CB is worth bothering with.

GE has made their entry into CB with two new hand held transceivers, for Part 15 (unlicensed) operation.

Externally, both models are similar—each is about seven inches high, weighs slightly more than one pound, has similar styling. Operation is on any single channel and powered with penlight batteries.

Here are the main differences. The model Y-7000 operates with about a two mile maximum range. It sells for $59.95 per pair.

The Y-7010 is the deluxe model, it goes over the counter and on the air for $75.00, but it flips out a signal over a three mile range and may be operated from an operational AC power supply. Using two Y-7010 sets with the AC power supplies, you can have a CB intercom in your home, even in your home and a friend's home anywhere within the three-mile maximum range of the units.

By the way, with these unlicensed units, you don't have to tow the mark with the FCC's strict Part 95 (licensed 5-watt station) rules. You can gab for hours, work "skip," even play music! The only things to remember are that you can't cause interference to the 5-watt CB stations, as they have priority use of the channels. Here's a hint: don't operate on any of the 5 watt channels, use the so-called "radio control" channels which lie *between* the regular CB channels. The radio-control people seldom use the channels (they seem to favor CB channel 23, and will shortly be moving to 75 MHz (mc.), at least most of them). See if you can get crystals for: 26.965, 27.045, 27.145, 27.195, 27.235, 27.245 MHz.

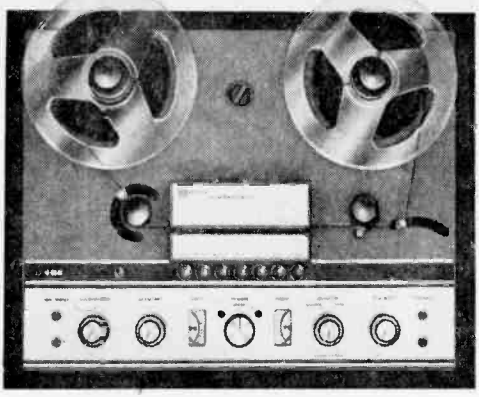
General Electric's Walkie-Talkie at work

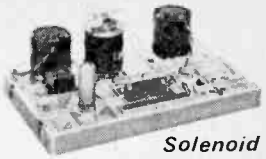
Hooked on a New Sky Hook. Here's a nice looking piece of hardware from the people at New-Tronics Corporation, 3455 Vega Avenue, Cleveland, Ohio 44113. Thing is called the RTG-27 *Hustler* and it's "little, it's lovely, it's light," to adapt an old quote from AT&T.

Little means it's a CB antenna with a total

(Continued on page 12)

How To Get A $570 Stereo Recorder For $400





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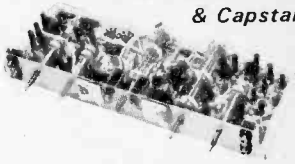

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You can record "live" from microphones, or from auxiliary sources like tuners, phonographs, TV's, etc., and playback . . . in 4-track stereo or mono at either 7½ or 3¾ ips. And you can make sound-on-sound, and sound-with-sound (mixing) recordings, or create interesting echo effects.

Professional Tape Transport

The tape transport is powered by 3 separate motors . . . a hysteresis synchronous capstan motor for constant, accurate speed, and two split-capacitor types to drive the reels. And with the push button controls, you can change operation instantly with just a touch of a button. Compliance arms insure correct tape tension.

The fail-safe brakes, tape gate and pressure roller are solenoid operated for instant, gentle stops. And when the tape runs out, an automatic switch shuts off all motors and retracts the pressure roller.

3 Professional Tape Heads

Selectable ¼ track ease, record and play. Removable shields afford double protection against external magnetic fields. Snap-mounted head covers provide easy access for cleaning and de-magnetizing. And for quick, accurate editing, there are center-line marks.

Other Professional Features

All parts mount on a thick, die-cast mainplate that won't warp, reduces wear, provides rigid support and alignment. Two V. U. meters for visual monitoring of signal levels from tape or source. Front panel inputs and outputs for microphones and headphones. Digital counter with push-button reset. Low impedance emitter-follower outputs deliver 500 millivolts or more to amplifier inputs. Individual gain controls for each channel. And a 21 transistor, 4 diode circuit for cool, instant operation, and long life.

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Simple step-by-step instructions and giant pictorials guide you every step of the way. And to make construction even easier, the connecting wires and shielded cables are precut, stripped and marked . . . even the connectors are installed where necessary; just plug them in! You just wire two circuit boards and mount the transport components. Total assembly time is around 25 hours!

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CB Rigs & Rigmarole

Continued from page 10

New-Tronics
Model RTG-27
Hustler Antenna

height of only 25 inches, and just in case you don't do well in the cipherin' department, that's two feet (give or take an inch). This means that your Hustler equipped car will now be able to get into the family garage, into automatic car washes, and cease being a menace to low flying planes or high flying butterflies.

The antenna comes complete with a chrome plated split-ball at its base, which in turn is mounted on a heavy gauge chrome plated steel gutter clamp. This means that if your car has a rain gutter, all it takes is a screw driver and 5 minutes between unpacking and yakking—almost "instant CB," mobile style.

You can peak the Hustler for maximum efficiency on your favorite channel, and then lock it into the peaked position. A spring at the base of the antenna is given as extra protection—just in case you *should* hit something, despite the shortened length of the antenna. It even comes complete with 12 feet of 52-ohm coax, tipped off with a soldered on connector. Everything you need for mobile operation, except the rig itself. Price is $12.95!

Push Me Daddy, 9 to the Bar! That's what you'll be singing with the new Raytel TWR-9 base station super-fantastic dream rig. This transceiver has so many new things (new to the CB world, that is) incorporated, that we hardly know where to begin.

For one thing, it has a walnut veneer trim on the front panel. It *does not* have a microphone, because the mike is built into the set itself, and aimed in the direction of the

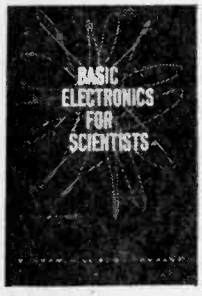
(Continued on page 123)

BOOKMARK
BY BOOKWORM

☐☐ The ol' Bookworm has to take up a bit more space in this issue of RADIO-TV EXPERIMENTER because he has so many goodies to chat about. So, thanks for the space, Editor, and away we go. . . .

☐☐ **Great Text.** *Basic Electronics for Scientists* has been written to provide the scientist and engineer, particularly the non-electrical-with a basic understanding of electronic devices and circuits. The volume is authored by James J. Brophy, Vice President, IIT Research Institute

The book begins with basic *dc* circuit theory, so that the treatment is completely self-contained. Topics covered include *ac* circuit theories, vacuum tubes and transistors, and other semiconductor devices.



Hard cover
471 pages
$12.75

Also included is a chapter on digital circuits, and both analog and digital computers are discussed. Wherever appropriate, electronic instrument circuits are used as examples, and all modern instrumental approaches are presented. Emphasis is on electronic instruments rather than communications as commonly found in electrical engineering books.

Basic Electronics for Scientists is an excellent review book for the skilled technician who has learned his electronics in dribs and drabs through the years as well as those who have learned much but need some of the gaps filled in. Published by the McGraw-Hill Book Company, this text is obtainable at most book stores or by writing directly to the publisher at 330 West 42nd Street, New York, New York.

☐☐ **Color TV De-Pooping.** The advent of color TV has resulted in receivers employing more vacuum tubes than the black and white sets and it has also meant the introduction of more sophisticated circuits requiring special test equipment to locate and cure color troubles.

One factor has not changed. The tubes used in color TV are subject to the same troubles as those in the black and white sets and tube troubles amount to over 80 per cent of the faults which occur in any television set. In the case of the color TV set. tube troubles have been greatly increased due merely to the increase in the number of tubes in the color TV receiver.

Up to the present time, very little has been done to help the serviceman in locating faulty tubes in color sets. As a matter of fact, color set manufacturers added to the difficulty by introducing new names to describe tube functions and in too many instances have not standardized the use of these names although the circuits of all the leading color TV sets bear a very close resemblance to each other. As a result a tube having an identical function, may have different names.

A new booklet, *Color TV-Magic Fault Finder* by H. G. Cisin, has devised a novel system of standardizing the designation of tube functions whereby the tubes in all color TV sets regardless of make or model can be coded according to tube functions. As a result, the locating of defective tubes is speeded up and becomes almost automatic. Actually, the new system outlined in this book is so simplified, that a faulty tube can be located without knowledge of color TV theory, thus making it easier for TV servicemen to get started in color set servicing. A table of troubles due to misadjustments has been included and this should be of help where tube troubles are not indicated. *Color-TV-Magic Fault Finder* is published by Harry G. Cisin, Publisher, Amagansett, L. I., New York.

Soft cover
69 pages
$2.00

(Continued on page 16)

NOW FIELD EFFECT TRANSISTOR and INTEGRATED CIRCUIT PROJECTS

IN 3 HEP SOLID-STATE PROJECT BOOKS FROM MOTOROLA

Motorola's HEP program provides you with the latest in quality semiconductors and offers proven projects incorporating these new devices. These project books, prepared for beginner and expert, contain easy-to-follow text and illustrations that make construction as easy as "electronics by the numbers." These books open new vistas for using semiconductors in test equipment, computers, musical instruments and fun circuits.

The first Integrated Circuit Project Book for hobbyist and experimenters contains eight chapters, 96 pages, including a basic introduction to integrated circuits. Build your own completely portable square wave generator featuring a 10 nanosecond rise time, and frequency response from 6 Hz to 60 kHz in four ranges. For fun you can build an I/C 4-octave organ with separate voicing controls. Other projects include a glidetone, binary computer, oscillator, electronic string guitar etc. Price **$1.00**

Ten chapters, including a basic description on semiconductor fundamentals. Projects include a regulated power supply, intercom, motor speed control, 6-meter converter, minifi amplifier, signal generator and other circuits. Price **$.50**

Another HEP first—a project book full of circuits utilizing the field effect transistor (FET), 96 pages. Projects include a high impedance DC Voltmeter (22 mega-ohms) with a scale of accuracy of ±2% that requires no rezeroing when changing ranges; a four-input audio-mixer with a flat frequency response of 20 Hz to over 100 kHz, as well as such projects as a timer, crystal calibrator, vibrato preamp etc. Price **$1.00**

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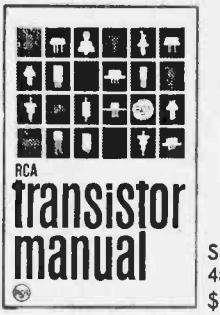
☐☐ **Q. Guide.** The new *RCA Transistor Manual* (SC-12) is expanded by more than 20 per cent to a total of 480 information-packed pages as compared to its previous edition. The manual contains new easy-to-read text on semiconductor devices and applications not covered in previous editions, a "streamlined" data section with more extensive data on active transistors, up-to-date transistor selection charts, information on military-specification types and on mounting hardware, and a revised circuits section including descriptive writeups of circuit functions and operation. The manual is intended for use by designers, students, hobbyists, and others interested in the dynamic field of semiconductor devices.



Soft cover
480 pages
$1.50

A new feature of the manual is the inclusion of a descriptive writeup for each circuit to explain the over-all operation and the functions of the individual stages. This expanded and revised section contains more than 40 circuits, complete with parts lists. Included are portable, automobile, and ac/dc radio receivers; AM/FM radio receivers; a three-band radio receiver; an FM tuner and an FM stereo multiplex adapter; a preamplifier for phono, FM, or tape pickup; audio power amplifiers with power outputs from 10 to 70 watts; stereo amplifiers with outputs from 1 to 15 watts per channel; CB and CW transmitters; crystal and power oscillators; a grid-dip meter; a code-practice oscillator; an electronic keyer; a power supply for amateur transmitters; series-and-shunt-type voltage regulators; a "light minder" for automobiles; battery chargers; a universal motor speed control (which can also be used as a light dimmer); a speed control for model trains and race cars; an electronic timer; an electronic heat control with a "ready" light; an integral-cycle ratio power control; a servo amplifier; an ac voltmeter; a shift register or ring counter; astable and bistable multivibrators; and a light flasher.

Copies of the *RCA Transistor Manual* (SC-12) may be obtained from RCA Distributors, or by sending $1.50 to Commercial Engineer-

ing, Dept. RTV, RCA Electronic Components and Devices, Harrison, New Jersey 07029.

☐☐ **For the Beginner.** Learning by doing is one of the best ways to study any subject. Audel's *Practical Science Projects in Electricity-Electronics,* by Edward M. Noll, enables the reader to do just that while learning about the wonderful science of electronics. The purpose of this book is twofold: to show basic electrical and electronics principles through simple projects and demonstrations, and to help the reader develop practical construction and testing skills. Information is given on the step-by-step construction of a radio-frequency amplifier, which along with higher-powered audio amplifier, permits the reader to use signals derived from various types of tuners and detectors. The book teaches feedback, oscillation, modulation, detection, and the reception of code signals. Every chapter contains sufficient text material to explain what happens in each of the demonstrations.

All of the projects are designed to be both useful and educational; and they can be constructed from inexpensive, readily available parts. For those interested in pursuing amateur radio as a hobby, material has been included on the construction and use of a code practice oscillator. This book will not only permit you to perform interesting experiments, it will also help you learn electrical and electronic fundamentals in the easiest and most enjoyable way. *Practical Science Projects in Electricity-Electronics* is available from bookstores throughout the country or from Theo. Audel & Company, Dept. RT, Indianapolis, Indiana 46206. This 480 page text costs only $4.95. ■

"It is weather like this that makes me glad I have my gear well grounded!"

In-Line Preamps

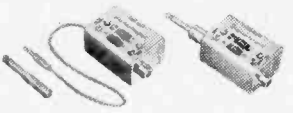
Two, new, high-gain audio preamplifiers, designed for internal DC power operation, have been introduced by Switchcraft. Called "Mix-Amps," these miniature transistorized devices provide uniform gain across the audio frequency range and are particularly suited for increasing output of low level microphones and reducing high frequency response loss in long microphone cable runs. These devices are also valuable for impedance matching and fixed gain applications, and, particularly, for boosting low level outputs of attenuating networks and pads.

Both "Mix-Amps," Model 503 and 504 have uniform response (±1 db) across the audio frequency spectrum from 20 to 20,000 Hz (cps). An impedance switch allows selection of "LOW" impedance output (2000 ohms) with 25 db gain and a "HI" impedance output (35,000 ohms) with 6 db gain. The "Mix-Amp" has a separate on-off switch, and a standard AA *penlite* cell provides up to 1000 hours or more of operating time.

A high signal-to-noise (S/N) ratio may be assured for long wiring and cabling runs when "Mix-Amps" are used. Connecting "Mix-Amps" close to electrical sources (microphones, signal generators, audio transducers, etc.) provides immediate amplification so that interference (induced hum and noise) will have greatly reduced effect on the audio signals. For laboratory applications, test equipment, experimental circuits, attenuating networks such as T-pads and L-pads and other low level signal devices, "Mix-Amps" offer the immediate solution to the

need for a well-shielded, linear, audio amplification device.

Model 503 "Mix-Amp" accepts standard ¼" phone plug. Amplified output is connected through a molded 12" 2-conductor cable to a "Tini-Plug." A Model 364A adapter plug is included to convert the output connector to a standard, 2-conductor phone plug, and a size



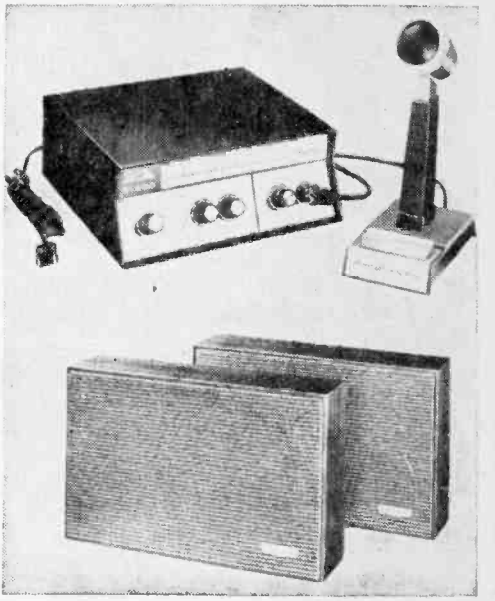
Switchcraft Mix-Amps 503 (left) & 504 (right)

AA dry cell is also included. The metal preamp housing is finished in attractive metallic-tan color and provides complete electrical shielding for all internal circuits. Model 504 has the same design features except the output plug is a long-shouldered, standard phone plug which may be used for all normal connections and for equipment with recessed jacks.

List price for Model 503 is $16.50 and for the Model 504, $14.50. For complete specification details write to Switchcraft, Inc., Dept. RTV, 5555 North Elston Avenue, Chicago, Illinois 60630 and ask for free New Product Bulletin No. 159.

Background Music-Paging System

An easy-to-install, easy-to-operate Ampli-Vox system makes it possible for even the smallest plants, stores, and offices to enjoy the many benefits of pleasant background music. Perma-Power's new Ampli-Vox Model S-410 provides



Perma Power's Ampli-Vox Model S-410

New Products

fine music reproduction; and, of utmost importance for commercial and industrial usage, does not interfere with paging. The amplifier of the Model S-410 permits the convenient adjustment of background music volume level and paging volume level *separately*. The message comes through clearly, with no loss of music program continuity.

The Ampli-Vox Model S-410 is a complete package, including an all-transistor amplifier, two loudspeakers, and a paging microphone. Any music source—tape recorder, phonograph, FM or AM tuner or radio—can be used with the Ampli-Vox system. The system is easy to install (without any tools), and any receptionist or switchboard operator can use it without special training. The transistor design provides much greater dependability than can be achieved with tube-type units, as well as instant performance with no wait while tubes warm up. Transistors also result in an amplifier compact enough to fit in a desk drawer! The audio amplifier is rated at 35 watts, E.I.A. music power, 50 watts peak. For paging convenience, the desk microphone has a push-to-talk button and a plug-in cable. Manufacturers suggested *net* price is $189.95.

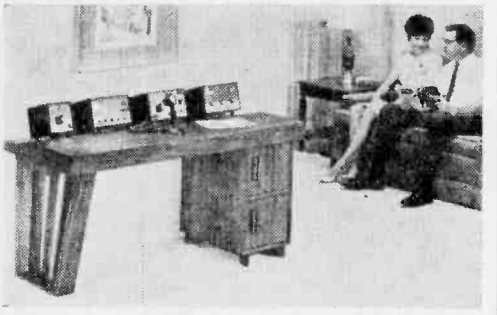
Detailed literature on the new system is available from the manufacturer, Perma-Power Company, 5740 North Tripp Avenue, Chicago, Illinois 60646. Ampli-Vox products are available everywhere in the United States and Canada, through electronic parts distributors, sound specialists, and similar outlets.

Furniture Styled Communications Consoles & Desks

A handsome and practical line of walnut communications consoles and desks have been offered by Design Industries, Inc., to house amateur radio equipment. Both console and desk feature fine furniture styling and are especially designed to bring amateur radio equipment out of attics, garages and basements and into the living room. When not in use, the console looks like a small organ or attractive desk. Its walnut finish and simple design complement any decor. Although originally designed for the ham, CB'ers and SWL's will find the units equally attractive.

Equipment is neatly flush-mounted in a durable white formica panel for easy operation. The door folds down to provide a roomy, scratch-proof formica work surface. The usual tangle of wires amid an assortment of boxes is gone. All the communications equipment fits neatly into the console. Precision cut-outs are available for most manufacturer's equipment and the front panel is easily removable for future equipment changes. Each console door has a piano

Ambassador Communications Console, Walnut—$395.00



Diplomat Communications Desk, Walnut—$139.95

hinge for durability and a lock to protect equipment when not in use. The console moves easily on heavy-duty casters.

A natural chimney is provided to pass air through all equipment and there is easy access to tubes and body of each piece of equipment for adjustments and maintenance.

In addition to consoles, Design Industries offers a budget-priced walnut communications desk that groups all amateur equipment neatly on its top. It features a tilted work surface to hold equipment at just the proper operating angle. A cable trough along the rear of the desk leaves the top uncluttered for easy operating. *Collins, R. L. Drake, Galaxy, Hallicrafters,* and most other modern equipment fits the desk. Three drawers provide ample storage room. The desk's simple styling and beautiful walnut finish fit right in any room setting.

Additional information on either custom communications consoles or communications desks is available from Design Industries, Inc., Dept. RTV, P.O. Box 19406, Dallas, Texas 75219.

Sine-Square Wave Generator

A new, professional quality AF sine-square wave generator, the Model 636, has been added to the "Green Line" of electronic test instruments manufactured by Precise Electronics. The Model 636 provides a complete source of sine and square wave signals from 20 Hz (cps) to 200 kHz (kc.), for a wide range of audio and

New Products

Precise Electronics Model 636
Sine-Square Wave Signal Generator

video testing, servicing, and experimental work. The instrument is designed with one scale frequency dial to simplify readings for both sine and square wave outputs, and a smooth, dual-function output control. Other notable features of the Model 636 include: negligible distortion and high stability of sine wave output; "Schmitt Trigger" multivibrator and buffer provides isolated optimum waveform square wave output; negligible square wave tilt and fast rise time at all square wave frequencies; extensive shielding for minimum radiation pickup. For more information and specifications on the Model 636 as well as other Precise test equipment, write to Precise Electronics, Division of Designatronics Inc., 76 East Second St., Mineola, New York.

Auto Analyzer for the Saturday Mechanic

A new solid-state universal self-powered engine analyzer, the EICO Model 888, permits the layman to electronically tune up and troubleshoot all automotive and boat engines exactly as do *professional* automotive technicians. No technical knowledge or background is necessary. EICO's exclusive "how to" manual lists the idle speeds and the dwell angles for many manual and automatic transmissions in use today. Makes no-never-mind whether the battery voltage is 6 or 12 or the engine has 4, 6 or 8 cylinders with negative or positive ground—the 888 engine analyzer can do the job. It exactly tests and checks the total electrical/ignition system including: storage battery; generator; alternator; voltage regulator; alternator diodes; starter; starter solenoid; distributor; points; condenser; ignition coil; spark plugs; dwell angle; carburetor; fuses; bulbs; switches, accessories; all electrical wiring—sorry, no electric cigarette lighters.

EICO Model 888 Auto Analyzer

Not a "compromise" design but rather an *all-professional* unit, the 888's solid-state circuitry includes a transistorized Schmitt trigger pulse counter, and calibration and adjust controls for "RPM" and "Ohms" tests. Its 6-inch D'Arsonval meter reads out: Volts, Engine RPM, Dwell Angle, Amperes, Ohms, Spark Output, Diode/Leakage. Compact (5¾"H, 11½"W, 5"D), portable (6 lbs.), self-powered (4 "D" batteries supplied), the user may take it into car or boat for actual car-running, boat-running tests—no line cord to tie you down to an outlet. In kit form, cost is only $44.95—wired, it's $59.95. Want more specs? Write to EICO Electronic Instrument Co., Inc., Dept. RTV, 131-01 39th Avenue, Flushing, N. Y. 11352.

VOM-Pro Model

Triplett's new portable volt-ohm-milliammeter, Model 630-APLK, has a transistorized switching circuit that guards against accidental burn-outs, provides comprehensive overload protection and virtually eliminates bent pointers, burned out resistors, shunts and coils, and changes in accuracy due to overheating. Great for the hobbyist who is most likely to fritz a meter.

Featuring high sensitivity of 20,000-ohms-

Triplett Model 630-APLK VOM

New Products

per-volt DC and 5,000-ohms-per-volt AC, the VOM has an accuracy of ±1-½% DC and ±3% AC with the unit on its back. The VOM is usable with frequencies through 500 kHz (kc.). A single, easy-to-read selector switch minimizes chances of error when changing ranges, and a mirror-backed scale insures accuracy by eliminating parallax.

Weighing 5 pounds, the meter is encased in durable black molded plastic with a clear, unbreakable plastic scale window and is 3 11/32" by 5½" by 7½" in size. The 630-APLK comes with batteries, leather carrying handle, 50 inch banana type leads and test prods with removable alligator clips. A variety of leather carrying cases and an accessory AC ammeter adapter with long lead attachment are available for the unit. Priced at $95 (user net). Write to Marketing Department, Triplett Electrical Instrument Company, Bluffton, Ohio 45817.

Power Tool for the Microminiature Workshop

Let's face it, you need a miniature power tool for precision fine finishing jobs that pop up in your home workshop, hobby bench or on the job. A tool designed for such jobs is the Micro Miniature Workshop by Howard Industries. This new miniature powerhouse tool (actually kit) features streamlined design with a rugged heavy duty plastic case that's shaped for easier handling and built for longer wear, cooler operation. It is fully guaranteed for 2 years. Included with the new tool is a complete set of micro accessories including sanding discs, bristle brushes, cut-off discs, mandrel, grinding stones, buff, file, and drills. There are 24 attachments in all. An instant action Wrenchless Chuck allows quick, easy changing from one tool accessory to another.

Called "The Tool Of A 1001 Uses," the versatile new Micro Miniature Workshop cuts, grinds, sands, polishes, burnishes, cleans, carves, saws, drills and engraves. For the home craftsman or hobbyist it handles precision jobs faster, more efficiently than hand tools . . . gives fingertip ease in fine engraving, carving, cutting, drilling, etc., with smooth, cool, vibration-free operation. Also ideal for industrial applications, it speeds through jobs like production debur-

Howard Industries Micro Miniature Workshop

ring, industrial model building, pattern making, grinding of dies and molds. In the professions, its convenient shaped-to-the-hand-design and easy operation make it ideal for jewelry polishing, fine carving on dental plates and a variety of other precision jobs.

It is packaged in its own storage case, with all accessories, but also includes a convenient hanger hook for tool-rack placement. List price is $34.50. Available nationally through hardware and appliance dealers, or write to Howard Industries, Dept. DP-1, Division of MSL Industries, Inc., Racine, Wisconsin 53404.

Push-to-Talk Mike

Push-to-talk microphones for use with two-way mobile, ship-to-shore, ham radio and similar applications are now available from Geloso. Highly sensitive (1.2 mV/microbar) with a frequency response of 80 to 12,000 Hz (cps), the microphone has a positive-lock-action switch to hold the circuit closed. A high impact rubber case assures protection against shock and damage. Two impedance models are available—low, 250 ohms (No. M-2) and high, 45,000 ohms (No. M-3). Also available is a crystal high-impedance push-to-talk microphone (No. M-40). Descriptive literature and prices are available from Audio Division, American Geloso Electronics, Inc., 251 Park Avenue South, New York, N. Y. 10010.

Geloso Push-to-Talk Microphone (Models M-2, M-3 and M-40)

Educational Kits for Everyone

In a move to meet the needs of all age levels, *Trans-Tek Manufacturing Co.* has expanded its series of educational electronic kits. Two new kits have been added to the company's *SCHEMAT-A-KIT* series, bringing the total of kits in this series to eight. Four of the kits constitute the "basic" kits for the beginner and the other four kits belong to the "advanced" group for the more experienced experimenter.

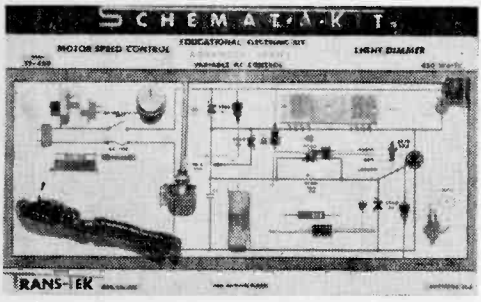
Trans-Tek's ability to add new kits to the *SCHEMAT-A-KIT* series is an innovation which is described as the "library" approach. This concept also has proven useful in the educational field, where the *SCHEMAT-A-KIT* series can be adapted to training courses in public, private and vocational schools and colleges, and in special training courses conducted by companies and organizations.

One of the latest additions to the SCHEMAT-A-KIT series is a solid-state (transistorized)

New Products

metronome which provides a "true metered beat for music and other uses." The kit is priced at $2.25. Also added to the series is a code practice oscillator, designed for the beginner hobbyist and priced at $1.79.

Trans-Tek has been granted a patent on its method of mounting its educational kits. This technique consists of mounting all components directly onto a drawn circuit schematic by means of skin-packing. Each component therefore is displayed in its actual position in the circuit. In each kit, circuit and pictorial diagrams, theory of operation and step-by-step instructions are included so as to assist the hobbyist, experimenter or educator to construct useful products with ease.



Trans-Tek Schemat-A-Kit

Other kits in the SCHEMAT-A-KIT series include: *ST-125W—Hi-Lo Switch.* This unit can dim house lights and dark rooms, and control electrical drills and small electrical tools up to 125 watts. Price $1.79.

ST-500W—Hi-Lo Switch. This can dim house lamps and other lights and control drills and other small electrical tools up to 500 watts. Price $2.49.

ST-612RS—Regulated Power Supply 6-12 volts. This kit breaks the power supply down into four basic parts—power transformer, full-wave bridge, filter and voltage regulator. When completed, the unit yields between 6 and 12 volts of regulated voltage at currents up to 200 milliamps. Price $5.75.

ST-210—Intercom Amplifier. This circuit was designed as a simple amplifier employing a speaker as input. It also can be used as an intercom if the input and output connections are reversed. As an amplifier, a 3.2-ohm speaker is used and a 16-ohm speaker is recommended for output load. When completed, the amplifier will yield good room volume. Price $5.95.

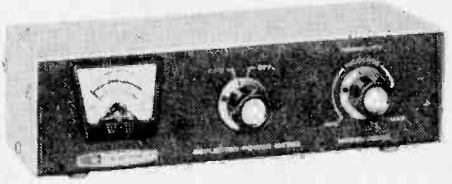
ST-313—Ultra-Hi Gain Amplifier. This three-transistor direct-coupled amplifier has a gain of more than 100,000 times. It can be used as a low-cost hearing aid or for eavesdropping. Price $5.95.

ST-450—Variable AC Control. Using a Silicon Controlled Rectifier, this can be used as a light dimmer or motor speed control, permitting 0 to 100 per cent variations. Price $7.50.

To get more information and specifications on the Trans-Tek line write to *Trans-Tek Manufacturing Co., Inc.*, Dept. RTV, Garwood, New Jersey.

SWR

The new Heath HM-15 Reflected Power Meter shows *standing wave ratios* (SWR) from 1:1 to over 3:1 on 50 or 75-ohm transmission lines. It can be used with transmitters with peak power outputs as high as one kilowatt and can be used throughout the wavelength range of 160 through 6 meters. The HM-15 is calibrated in both SWR and per cent reflected power. Styled to match the Heath SB-Series equipment,



Heath Model HM-15 Reflected Power Meter

the HM-15 is an ideal instrument for use in designing and matching new antenna systems. It can be used for matching impedances between exciters and final amplifiers. The HM-15 enables the ham radio operator to obtain peak efficiency from his transmitting equipment. Costs only $14.95. Complete specifications and details on this valuable ham radio accessory may be obtained by writing *Heath Company*, Dept. RTV, Benton Harbor, Michigan 49022.

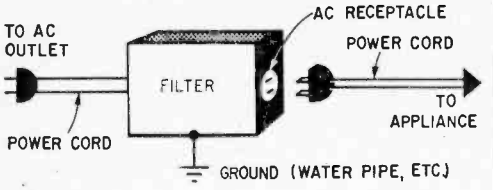
"Have a nice trip, Hon.
Phone me when you get there!"

Appliance Static

We have interference on our television and FM radio, all the time, from an electrical appliance—on all channels! It is quite bad. What should I do about it?

—J. C., Grimsley, Ontario, Canada

Install a line filter between the appliance and the power line as shown in the diagram. Cornell-Dublilier and others make filters for this purpose.



Time Plods on!

Can you give me the circuit of an Atwater-Kent Model 20 and an AC power supply for it?

—D. E. H., Mt. Orab, Ohio

Atwater Kent, a very great man, operated a huge factory in Philadelphia where outstanding radios were produced. One day, long ago, Mr. Kent closed up his place and moved to California. Now, Philco has his plant which is so huge that employees easily get lost in it. But, even Philco can't find diagrams of its own radios, of which Philco built more than anybody else. All there is left to remind one of Atwater Kent is a fireplace in his former office, now occupied by a Philco vice-president. History was made within those brick walls (now owned by Ford), but no schematics of yesteryear are

Ask Me Another

to be found. Don't bother with a power supply for your Model 20. Give it to a museum. It is worthy of that honor.

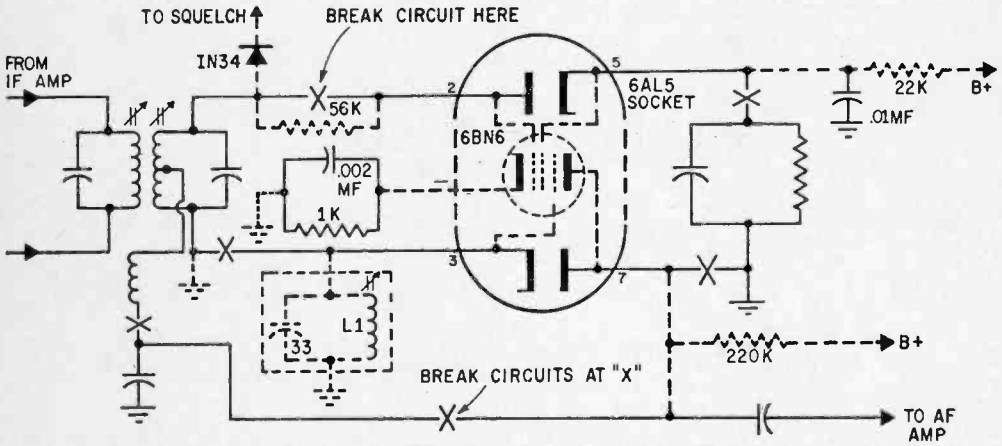
FM Deviation Makes Audio

I have a 152-174 mc band FM monitor receiver. I have to have the volume wide open to hear the local police. How can I improve my reception?

—J. P. H., St. Cloud, Minn.

Your receiver is undoubtedly designed to receive wideband FM (± 15 kc deviation). Nearly all stations in that band, except marine, employ narrowband FM (± 5-kc deviation). You can hear them but not as loudly as wideband FM stations. Volume depends upon the frequency deviation, not on signal strength. Unless you want to go to the expense of installing a gated-beam FM detector, as shown in the diagram, just leave the volume control set full on.

Coil L1 is a 10.7-mc quadrature coil such as Sonar 22-130-003 ($3.00). Add circuits and components shown in heavy lines. The 6BN6



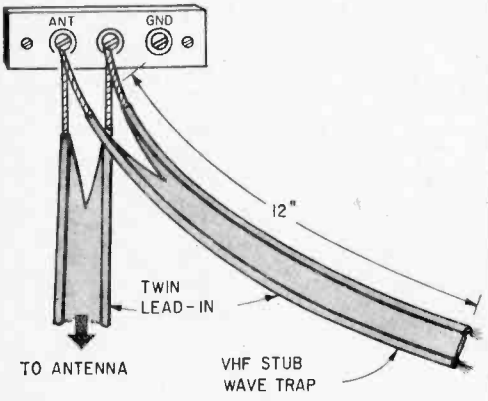
tube is shown superimposed on 6AL5 tube to show both "old" and "new" circuitry.

VHF Wave Traps

On my FM receiver, I get interference from a Channel-11 TV station just above one of our local FM stations. Is there a filter I can add to remove the TVI?

—J. A. B., Kingston, Ontario

Your trouble could be due to intermodulation of strong local signals. The picture carrier of Channel 11 is at 199.25 MHz (mc) and the sound carrier is at 203.75 MHz. When your receiver is tuned to 96.525 MHz, the local oscillator operates 107.225 MHz, if your set has a 10.7-MHz IF. Now, if the receiver mixer picks up the second harmonic of the local oscillator signal, this harmonic at 214.45 MHz heterodyned with the 203.75 MHz signal apparently gets through the RF circuits of your receiver.



Try a series-resonant filter or wave trap across your receiver's antenna terminals as shown in the diagram. The wave trap is a one-foot length of twin lead. Snip off its free end an eighth of an inch at a time until the interference is minimized.

Output-Transformer Problem

Where can I get an output transformer for an all-transistor Vico amplifier built in about 1958?

—L.C.F., Ardmore, Pa.

The manufacturer, Video Instruments, Inc., no longer makes Vico amplifiers. The design and manufacturing rights were sold to another company some years ago. It is doubtful that identical replacement output transformers are still available. You can rewind the transformer yourself using wire of identical size and type as the original. Or, you can have it rewound at a motor or transformer repair shop. This output transformer (an autotransformer) usually burns out because of a transistor puncture or accidental

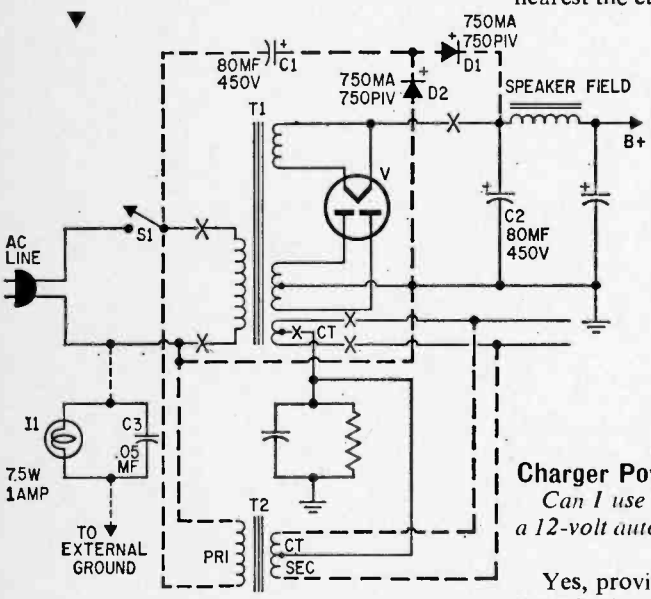
grounding of the speaker terminals to the chassis. Similar transformers are used in some hybrid (12-volt tube/transistor) automobile radios.

A Big Job!

Where can I get a replacement for a burned out power transformer for an old radio using two type 35, one type 24A, one type 45 and one type 80 tubes?

—J.L., New York, N.Y.

Possibly at what is left of Radio Row. Or, you can get it rewound at a transformer or motor shop, but at considerable expense. Instead, you can install a 2.5-volt filament transformer (T2), two diodes (D1, D2) and two capacitors (C1, C2), connected as shown in dotted lines in the diagram. Cut the original circuits at the points marked with an X. You will then have a half-wave voltage doubler rectifier. But, the chassis will be hot electrically and the fuse might blow when the set is connected to a ground if the AC line plug is inserted into the electric outlet so that the ungrounded side of the power line is connected to the chassis. To avoid this problem, don't connect a ground to the radio's ground binding post. Instead, add a 7.5-watt, 120-volt lamp and an 0.05 mf capacitor, connected to one side of the line (inside the set) and an external ground (water pipe or radiator) as shown by the dotted lines. If the lamp lights when the plug is inserted into an electric outlet, reverse its position. This time the lamp should not light.



All Around the Whip

Why is it that I can pick up so many stations on my car radio, even though the antenna is very small?

—J. D., Livingston, N.J.

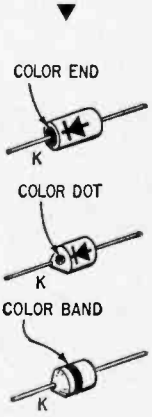
Auto radios are very sensitive. The omnidirection whip antenna has a lot more pick up than the built-in bidirectional loop of most home radios.

You Can Always Tell One!

How can I tell which end of a diode is the cathode and which end is the anode?

—C. E., New York, N.Y.

Some diodes are marked with its schematic symbol, as shown in the diagram. The straight line is the cathode; the arrow is the anode. The cathode end is often identified by color at that end or a color dot or color band nearest the cathode lead.



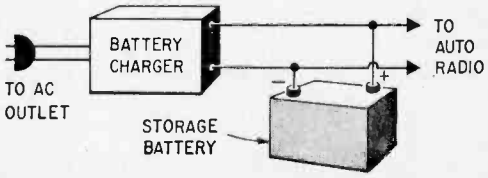
Charger Powers Auto Radio

Can I use a 12-volt battery charger to run a 12-volt auto radio on house current?

—D. F., Scranton, Pa.

Yes, provided the charger's output voltage doesn't rise too high without a battery as a load and stabilizer. The charger must be able to supply several amperes and probably will need a very good filter circuit added to reduce hum to a tolerable level.

Best bet is to use a 12-volt battery for



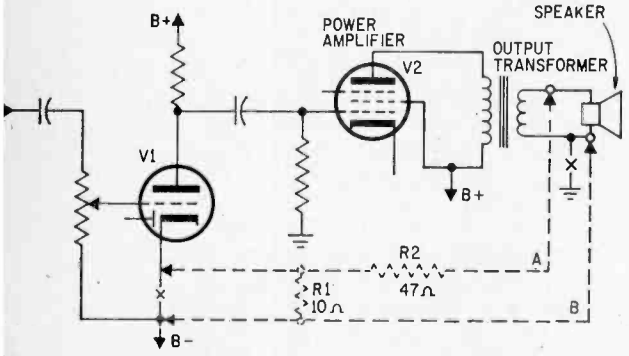
filtering, as shown in the diagram. But, why spend all that money when you can buy a transistor radio for less than $10 and an AC job for not much more?

Improves Audio

How can I add feedback to the audio section of an AC-DC radio?

—J. N. L., New York, N. Y.

Break the first audio amplifier (V1) cathode circuit as indicated by X in the simplified diagram and insert R1 (10-ohm, ½-watt resistor) in the circuit. Disconnect the lead which grounds one side of the speaker voice coil to the chassis, also as noted by an "X". Connect R2 (47-ohm, ½-watt resistor) from one side of the speaker voice coil to the cathode of V1. Connect the other side of the speaker voice coil to the common ground buss. If the set squeals or sounds distorted (positive feedback), reverse leads A and B to obtain negative feedback.



Crystals for RF Generator

How can an inexpensive RF Signal generator such as the Eico 324 be modified for crystal controlled accuracy?

—C.J.O., Duquesne, Pa

A different crystal would be required for each frequency and its harmonics, or a frequency synthesizer would be needed, and you would not have continuous frequency coverage. An easier way is to get a 100-kc calibrator (Hammarlund XC100 etc.) which contains a 100-kc crystal and use it to check the accuracy of your signal generator at every 100-kc point throughout the generator's tuning range. Simply feed the output of the claibrator into a radio receiver and tune in on one of its 100-kc harmonics. Also feed the signal generator output into the receiver and tune it to get a beat note with the 100-kc harmonic. Readjust the signal

Ask Me Another

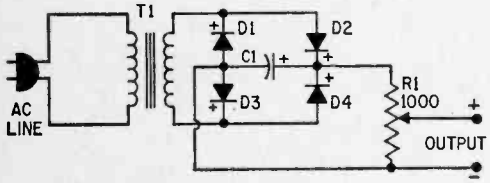
generator to get zero beat (whistle on both sides) and it will be at some multiple of 100 kc. Note the difference between its dial reading at zero beat and the nearest 100-kc multiple marker.

Variable Battery Eliminator

Can you give me a circuit for an AC to DC power supply which delivers from 0 to around 12 volts at 6 milliamperes?

—L. D., Bradenton, Fla.

In the diagram T1 is a 12-volt filament, transformer, C1 is a 500-mf, 15-volt electrolytic capacitor, R1 is a 1000-ohm linear-taper potentiometer. The diodes may be of the garden variety.



AC/DC-Radio Does All

How can I use an ordinary AC-DC radio as a power supply, oscillator and intercom amplifier?

—N. G., New Carlisle, Ind.

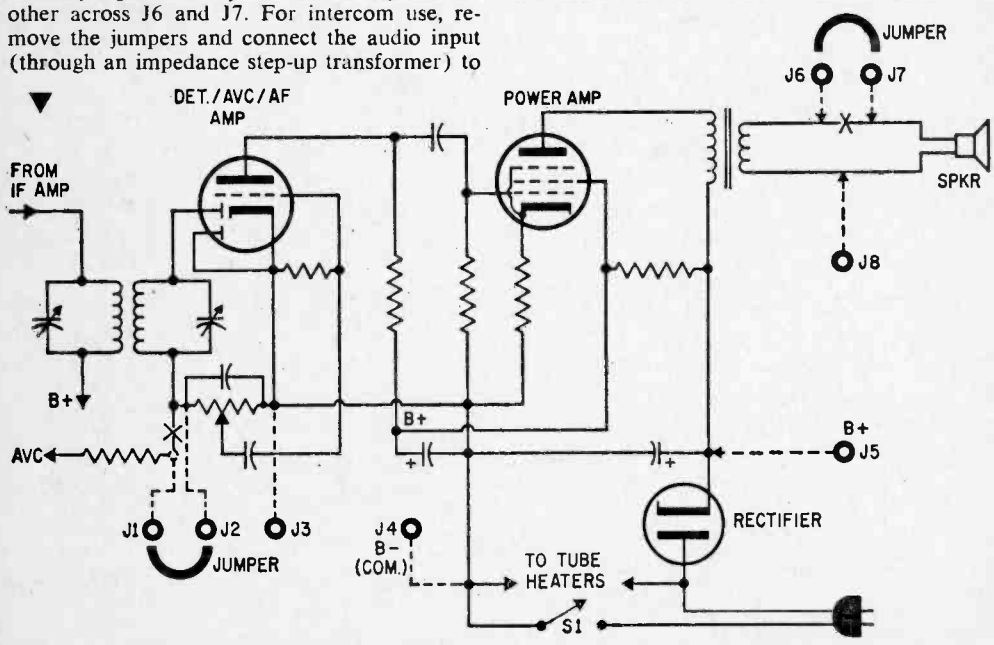
Install jacks on the chassis (with proper insulating washers) or on a strip near the chassis connected as shown by dotted lines, and break the circuits at the X's. For radio reception, connect a jumper across jacks J1 and J2, and another across J6 and J7. For intercom use, remove the jumpers and connect the audio input (through an impedance step-up transformer) to J2 and J3, and the output to J6 and J8. To obtain about 100 volts DC, connect leads to J4 (−) and J5 (+). To use the local oscillator as a test oscillator (tunes from about 1000 kc to 2060 kc), use an alligator clip to connect to the stator terminal of the oscillator section of the tuning capacitor (not shown). Use a small capacitor in series with the clip (about 22 pf) and jack J3 or J4 as the ground side. Be very careful. The whole thing can be hot—electrically, above ground—and a shock hazard exists. An isolation transformer will be a big safety factor that should not be ignored.

CRT and Then Some!

I have had a G.E. TV set for five years. Last year, I had the picture tube replaced because of loss of brightness. But now, the picture is not as bright and clear as it should be. If there is any writing, it comes out blurry. Also, whenever there is high contrast in the picture, the set produces a loud hum and the picture loses its horizontal stability. Can you please tell me what the trouble is?

—I. S., Bronx, N. Y.

After five years of use, other tubes and parts can also wear out and change in characteristics. If you want to try to do it yourself, go to a parts jobber and get a Photofacts Set on your particular set. Or, if you don't have the time, call the GE service operation (see Yellow Pages). They'll dispatch an expert—via two-way radio. Another alternative is to give it to your local ham club and buy a new set. (*Continued on page 36*)



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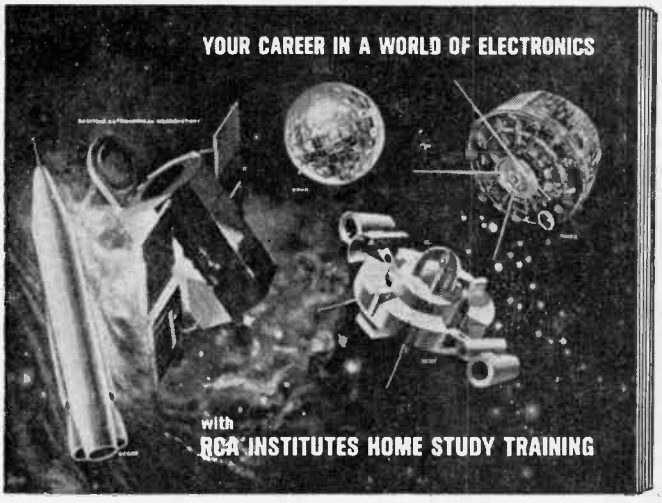

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Ask Me Another

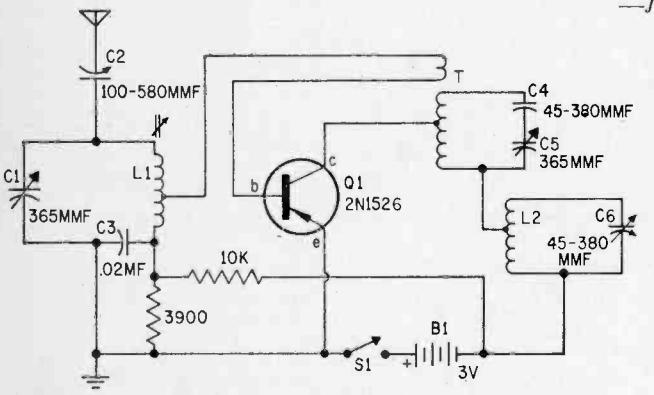
(Continued from page 32)

Longwave Up-Verter

Can I use a frequency doubler ahead of my BCB receiver so I can receive from 275 to 700 kc (kHz)?

—J. L. D., New Orleans, La.

Don't try to double the frequency ahead of the BCB receiver. Instead, try an up-converter using a circuit like the one shown in the diagram. Coil L1 (a tapped coil adjustable up to 3 mh) is tuned to the signal frequency (by C1; a 365 pf (mmf) tuning capacitor)—from about 170 to 500 kHz.



Transformer T is a BCB oscillator coil for 455 kHz IF which, when tuned with C5, covers from about 970 to 1300 kHz. C4 is a trimmer for limiting the tuning range of C5. Coil L2 is a BCB loopstick tuned to about 800 kHz with trimmer C6. To use it, place L2 close to the loop antenna of a BCB radio set to about 800 kHz. Tune in longwave stations with C5 and adjust C1 for best reception.

Not Legal!

On what frequency band can I operate a wireless microphone installed in the men's room in my gas station so I can listen to young punks planning trouble?

—D. K., Forest Hills, N. Y.

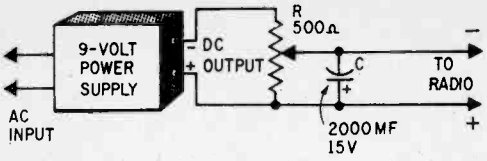
You can't do so lawfully any more. The FCC recently outlawed electronic eavesdropping devices except for police use. Install an electric lock on the men's room door and push the unlocking button only to let in those you trust.

9-Volts to 6-Volts DC

How can I use my AC power supply, which delivers 9-volts DC, with my 6-volt radio?

W. A., Des Moines, Iowa

Put a voltage divider (potentiometer R) and storage capacitor (C) across it as shown in the diagram. Adjust R for 6-volts output with the radio turned *on* while measuring the voltage across C with a DC voltmeter. It had better be a transistor radio. Automobile radios often draw as much as 9 amperes.



Another Orphan

I have Sun Ace Model PD-401 4-transistor portable tape recorder. The pushbutton system is not working. Could you tell me where it came from so I can send it back to the manufacturer for repair?

—J. G., Shawinigan South, Quebec

Never heard of that make. Where did you buy it? It's probably an import. Why don't you take it to a local radio repair shop?

Time to Retire It

How can I make an AC converter for a radio? It uses 2 size "G" batteries wired in parallel and a 67½ volt battery.

—R. K., Morton Grove, Ill.

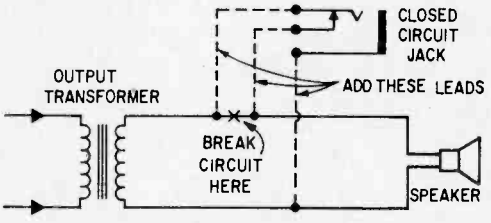
Don't waste your money. I just bought a 12-transistor ultra-portable radio for $4.50 which performs rings around an old tube-type set. You ought to be able to find similar bargains in "Chicagoland."

Anti-Noise Listener

How can I hook a phone jack to my radio so that I could listen to it privately with headphones?

—W. N., Mattituck, N. Y.

Connect a phone jack to the speaker circuit as shown in the diagram and use a low-impedance (4- to 16-ohm) headset (Superex, etc.).



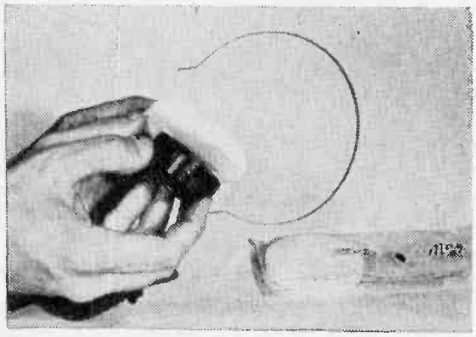
Never the Twain Shall Meet

I would like to change my 200-400 kHz (kc), 550 kHz-30 MHz (mc), 5-band re-

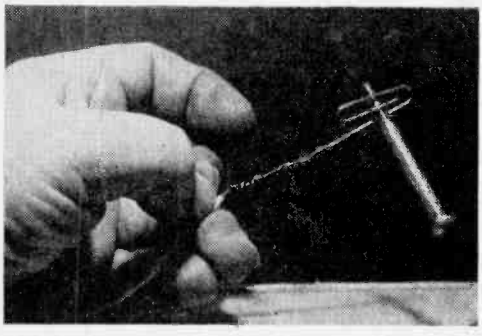
(Continued on page 123)

Workbench Tips

■ If your SW ear phones weigh heavy on your head, take a tip from the makers of hi-fi headsets and pad them with foam rubber. Foam rubber powder puffs are ideal for the purpose and are available at most cosmetic counters. To install, simply cut a ¾" hole in the puff's center, and cement in place as shown in photo below. Install puffs wherever headband meets top of your head.



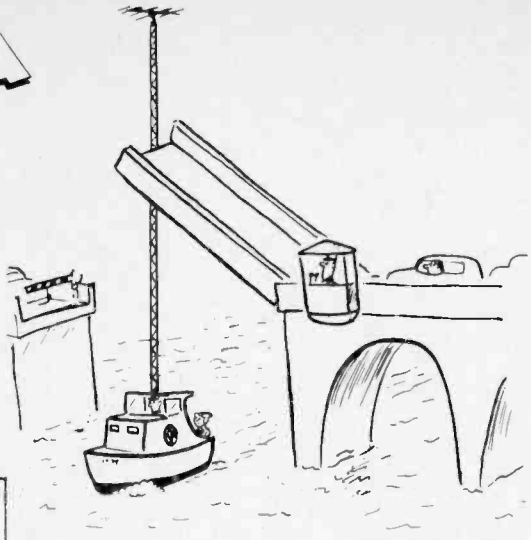
■ Ordinary paper clips (thousands are discarded hourly) make handy, quick detachable, connectors for electrical wire ends with only slight alteration. Simply straighten out one end of the clip and attach the wire. The wire end may be spot soldered or inserted in a loop, then the loop is squeezed together in a vise or with pliers. The remaining portion of the paper clip may be used as a washer with the tab end under a terminal nut or as a simple hookup as shown in photo below.



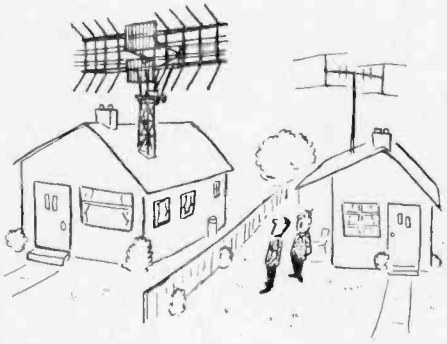
■ A frequent cause of hum (and sometimes even whistles from radios) is an improperly grounded can-type filter capacitor. Most can installations rely on their twist lock for connection to ground. In time an oxide forms—a high resistance circuit occurs. To prevent trouble, always solder at least one lug to ground in kits and when replacing.

ANTENNA ANTICS

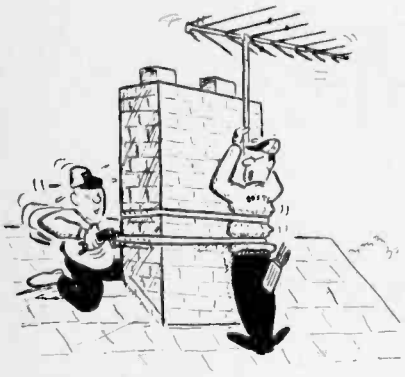
By Jack Schmidt



They finally got here to trim the trees!



It's a fake!
He doesn't even have a TV set.



Hold it—hold it—hold it!!!

Relax Bud, this isn't mine! It's part of the instrument system for a new airport here!

INSTANT HAMMING

An ideal first transmitter for the Novice ham, this little rig requires but a single tube and a handful of junk-box components.

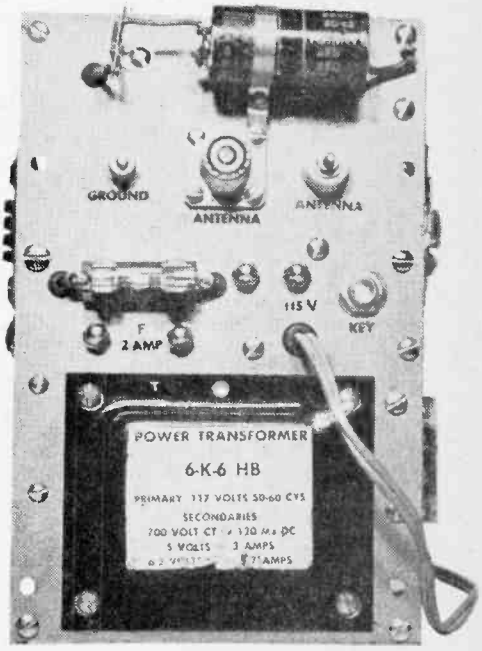
by Howard S. Pyle, W70E

■ This project started out as a low-power transmitter specifically for Novice-class use. As the design progressed, however, it became increasingly evident that a few simple changes would produce a versatile and flexible transmitter well suited to a variety of applications. Construction of the prototype then proceeded on this basis; the final outcome is this compact little rig which is not only ideal for Novice operation but could well be carried on to other Ham activities through many years.

Band-switching offers instantaneous shifting to the three VHF bands permitted the Novice. Complementary to this is choice of an appropriate crystal in each of the three bands or, if so desired, any one of three crystal frequencies in a chosen band. This is accomplished through a rotary selector switch.

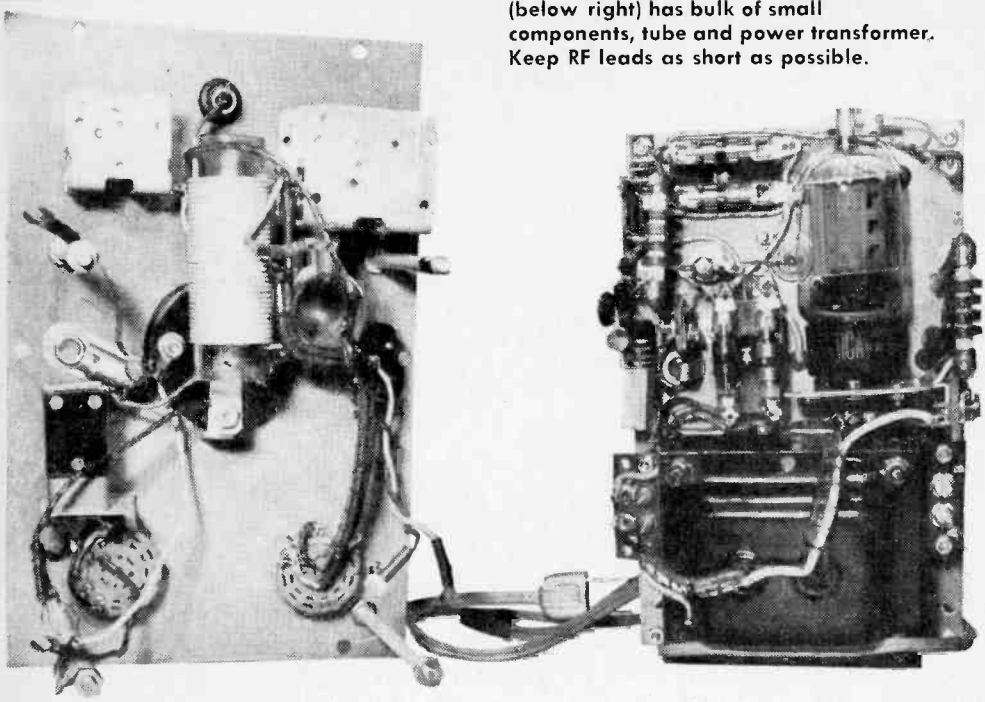
After the Novice has secured the additional privileges of a General-class amateur, it will be found that proportioning of the LC tuning circuit is such that the 20-meter band may also be tuned with the band switch in the 15-meter position. Additionally, if VFO rather than crystal-controlled operation is later desired, an external VFO may be plugged into one of the crystal positions and used on any of the bands within the limits of the transmitter.

This rig can serve the Novice well dur-



Rear view of the compact rig (above) shows both antenna connections, jack for key and fuse. Watch out for positive connection on electrolytic capacitor—it's hot! Front panel of rig is shown at top of page.

Rear of front panel (below left) has relatively few components mounted on it—just tuning capacitors and coils, and the switches. Rear panel (below right) has bulk of small components, tube and power transformer. Keep RF leads as short as possible.



PARTS LIST FOR LOW-POWER, GENERAL PURPOSE TRANSMITTER

C1, C2—.001-mf, 600-volt, ceramic-disc capacitor
C3—409-mmf, (pf) variable capacitor (Allied 13U524 or equiv.)
C4—365-mmf, dual variable capacitor (Allied 13U521 or equiv.)
C5—10-mmf, ceramic capacitor
C6—100-mmf, mica capacitor
C7, C8, C9, C10—.001-mf, 600-volt ceramic capacitor
C11—16-, 16-mf, 450-volt dual tubular electrolytic capacitor (or single section equiv.—approx. 40-mf. minimum)
C12—1000-mmf, mica capacitor
D1, D2, D3, D4—150-ma, 400-piv (prv) silicon rectifier (see text)
F1—2-amp. 3AG fuse
FT—Feedthrough insulator (Birnbach 458 or equiv.)
I1—6-8 volt, 150-ma pilot lamp (Type 40, 47, 50, 51—to fit assembly)
I2—Neon lamp, S.C. miniature bayonet base (NE-51 or equiv.)
J1—Phone jack (for key)
J2—Coaxial panel receptacle (Amphenol 83-1R or equiv.)
L1—15-meter coil (6 turns on 1-inch form—see text)
L2—40-/80-meter coil (34 turns on 1-inch form—see text)
L3—Parasitic choke (6-turns AWG-20 enameled wire wound on R2)
L4, L5—2.5-millihenry RF choke
M1—0-150 ma DC milliameter (Shurite 850 or equiv.)
R1—47,000-ohm, ½-watt resistor
R2—100-ohm, 1-watt resistor
R3—47,000-ohm, 2-watt resistor
R4—10,000-ohm, 10-watt resistor
R5—126-ohm, 5-watt resistor (IRC PW5 or equiv.)
S1, S2—S.p. 3-p rotary selector switch (Centralab 1401 or equiv.)
S3—S.p.s.t. toggle switch
T1—Power transformer, 117-volt pri.; 700-volt CT at 120-ma., 6.3-volt CT at 4.7-amp., 5-volt at 3-amp. sec. (Knight 62Z044 or equiv.)
V1—6DQ6B type vacuum tube
X1, X2, X3—Fundamental-frequency quartz crystals—select for frequency of operation.
1—Portable aluminum carrying case, 9x6x5-inch (Bud ACC2095 or equiv.)
Misc.—Tube socket, fuse holder, diode holder(s), terminal strips, plate cap, threaded rod, tie strips, coil forms, pilot-lamp assemblies, grommets, line cord, cable lacing cord, hookup wire, solder, machine screws, nuts, washers, etc.

Estimated cost: $30.00 (crystals not included)
Estimated construction time: 9 hours.

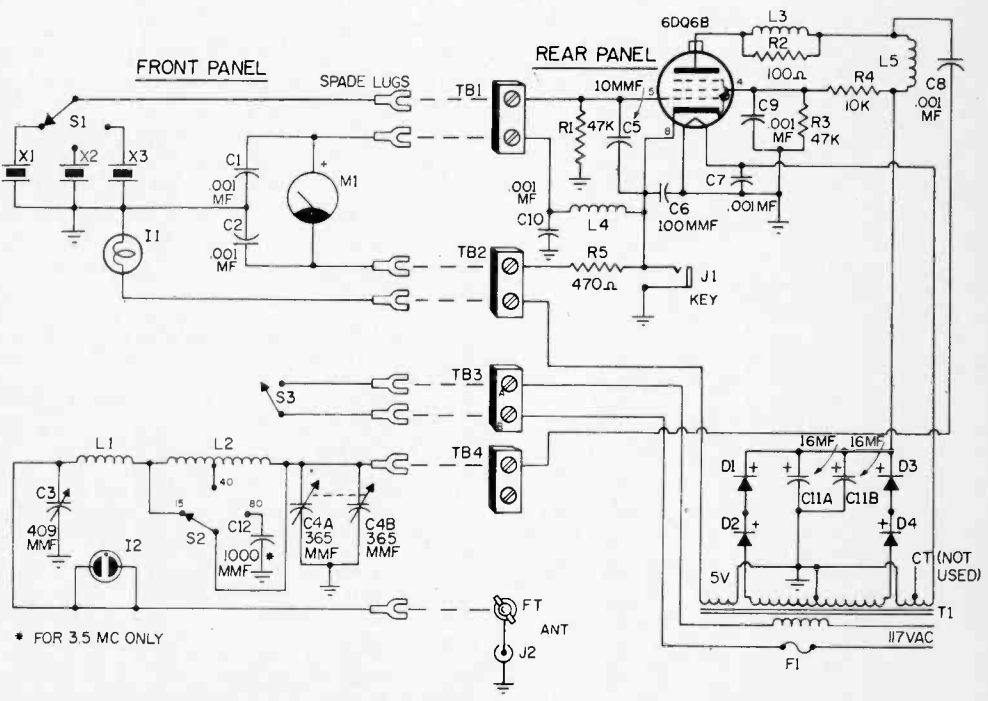
ing his "apprenticeship" in Ham radio and can carry right on into General-class operation. For the Ham already holding a General-class license, this little rig is an excellent stand-by for the main transmitter when the latter requires servicing or modifications are being made. For local work, particularly in spot frequency nets, operation can be carried on without resorting to the probably much greater power of the main rig. And, for a portable transmitter for the traveling ham and for vacation contacts, a smaller, more compact little job would be difficult to imagine.

The Circuit. Basic and simple, as is evident from the schematic, the circuit employs parts and components which are readily available from local or mail-order sources. Many, in fact, can be found in your 'junk-box'. We used what we had insofar as possible, finding it necessary to purchase only a few additional items such as the cabinet, milliammeter and tube. The portable aluminum carrying case is supplied complete with both front and rear panels and a carrying handle.

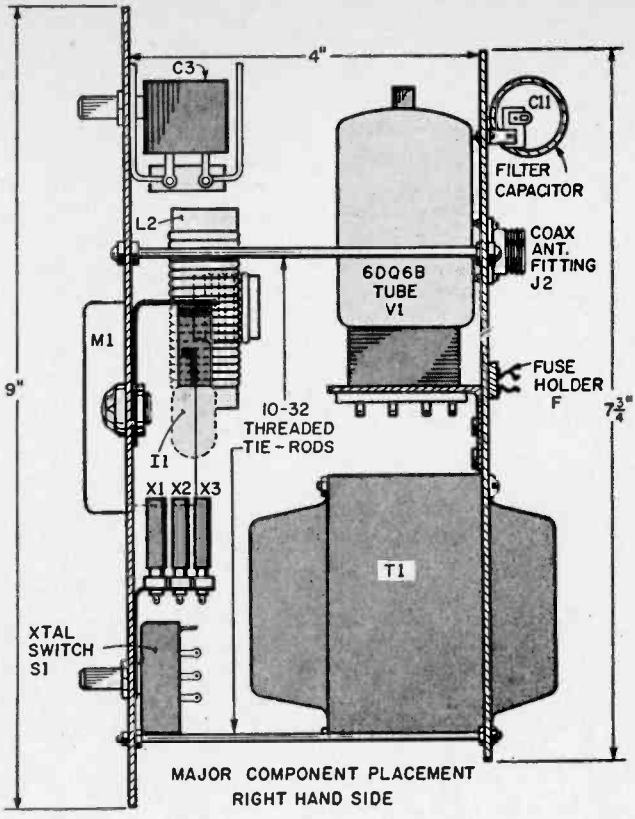
Unitize. In this design we used the *unitizing* method of assembly (see March-April 1966 issue of ELEMENTARY ELECTRONICS), thus eliminating the conventional chassis. The rear panel of the enclosure (cut down to 5 x 7¾ in.) serves to mount the majority of circuit components including the power supply. By *unitizing* most of the assembly, wiring can be done on flat panels without delving deep within a chassis pan to solder difficult-to-reach terminals.

The milliammeter, power on/off switch, band selector, crystal switches, variable (tuning) capacitors, 'power-on' indicator and the output indicator are mounted conventionally on the front panel. The two panels, after wiring, are then assembled back-to-back—sandwich style—using four lengths of 10-32 threaded brass rod (available at most hardware stores) to separate the two panels by 4 inches. The back of the cabinet is left uncovered with the cut-down original rear cover panel serving as the enclosure as well as supporting many parts both on front and rear.

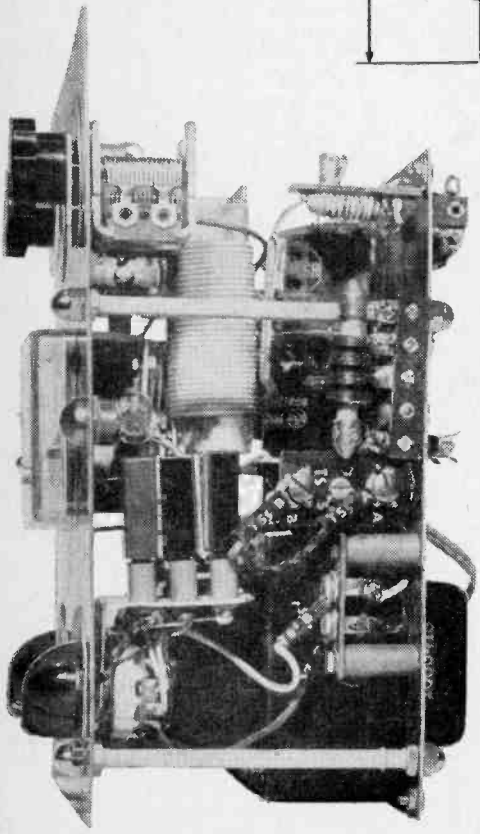
Construction. As shown in the photo, the back of the rear panel carries the electrolytic filter capacitor, a ground screw terminal, a coax connector (for the antenna) which is paralleled to a feed-through bushing (for a single-wire fed antenna, when desired), the AC fuse, key jack, AC-power-cord grommet and half the power transformer. On the in-



Right-side view of rig has major components called out on drawing at right. Some components are partly obscured in photo below. If you're buying components select small-size versions where you have a choice. Make sure pilot lamp I1 matches filament-to-jewel for maximum brightness. You might want to mount crystals for removal without opening metal cabinet.



MAJOR COMPONENT PLACEMENT
RIGHT HAND SIDE



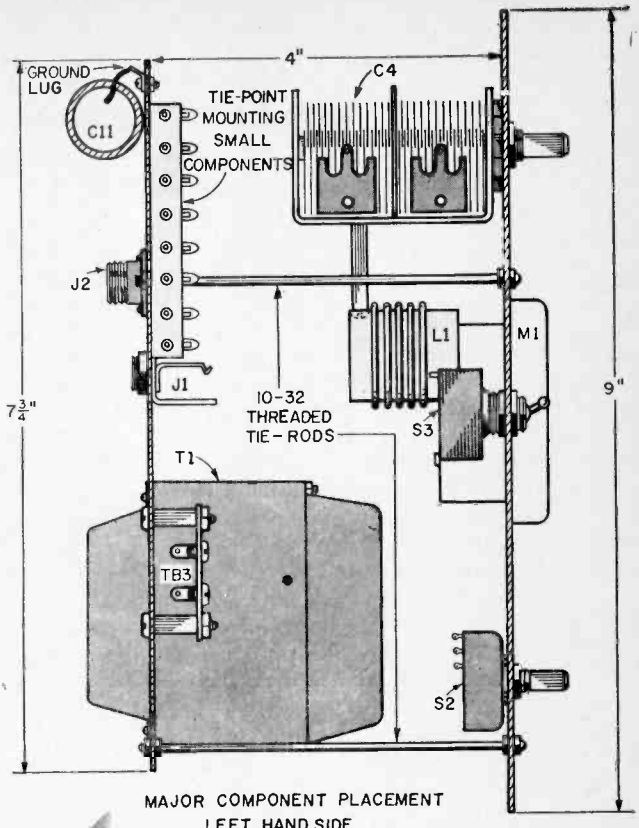
side of this panel, shown in another photo, is the main section of the power transformer with the bracket for the 6DQ6B tube mounted above and to the right of the transformer shell.

The balance of this side of the panel accommodates a number of tie-points mounting a number of smaller components such as resistors, capacitors, RF chokes, etc. The silicon rectifiers were also mounted here in the fuse-clip type of holder. Two 400 PIV diodes are used in series in each leg of the high-voltage secondary windings; however, if you use diodes of 750 PIV rating or higher, you can get by nicely with two.

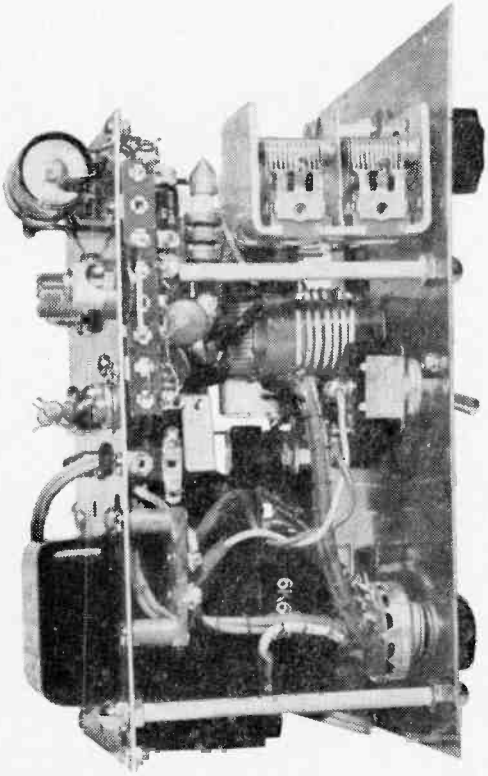
Small screw-type terminal strips were variously placed where they would be conveniently accessible with a screwdriver after the panels were sandwiched. The few wires from front-panel components were soldered in their positions on the rear of the front panel with spade-type solder lugs at the loose ends to permit easy connection to the rear-panel terminal strips.

Winding Coils. The two variable (tuning) capacitors appear at the top rear of the front panel with the 40/80/meter coil be-

Way over-rated filament windings of transformer take up much room that could have been used for components. Top bell of transformer was removed and reassembled with rear-panel cutout between bell and laminations to cover rough edges of cutout. If you open transformer case be careful of leads, winding insulation. Add ventilation holes if you send long messages.



MAJOR COMPONENT PLACEMENT
LEFT HAND SIDE



tween them. The 15-meter coil (L1—which will also cover 20 meters) is placed at right angles to the main coil just below the loading capacitor. Both coils are wound on 1 in. O.D Lucite tubing with AWG-14 insulated automotive primary ignition wire (available at many automotive supply houses and gasoline service stations). The insulation on the wire serves to automatically *space-wind* the inductor.

The larger coil (L2) is 34 turns—tapped at the 17th. The small coil (L1) is six turns and is spaced additionally about the thickness of the wire. Both coils are used in series on 40 and 80 meters. The large coil is automatically switched out of the circuit on 15 or 20. The larger coil is supported at the bottom by a small metal strap to one of the meter mounting screws and at the top by its connection to the loading capacitor. The small coil is attached to the bottom of the loading capacitor by a convenient (threaded 6-32) hole in the bracket, of the type capacitor specified. A 1-in. 6-32 machine screw and a ¾-in. spacer collar are used for this.

Front Panel. The power on/off indicator

light assembly and a small bracket (held under the mounting stud of the crystal selector switch) appear to the left. On the right of the panel is the s.p.s.t. toggle switch for power and below it, the band-change switch. The lug-fitted pigtail leads, for connection to terminals on the rear panel, can be clearly seen in the photo which also shows the 10-32 threaded rods (spaghetti covered for a more finished appearance) which clamp the two panels together. The output indicator lamp (I2), at the top center of the panel, is mounted by merely pushing it part way through a snug fitting grommet and soldering the RF lead to its base.

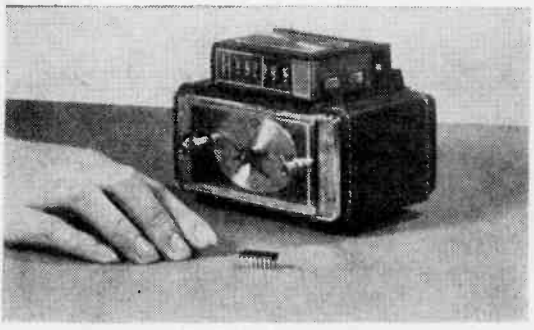
Putting It Together. Actual construction and wiring involve the usual drilling and cutting and normal soldering operations. And since construction of this little rig is adaptable to just about any parts you may have as well as those you choose to buy, we have included no dimensional details. However, there are two restrictions to keep in mind: component values should be as close as possible to those given and their physical sizes must be such that the cabinet and two panels will accommodate them.

Having gathered general ideas from the preceding paragraphs, your resourcefulness and initiative should enable you to duplicate this little transmitter in performance and rather closely in physical appearance. In the parts list, keyed to the schematic, we have shown the actual parts which we used, together with their electrical values. This will serve as a guide in choosing your components.

Tuning. This, of course, follows the conventional procedure; with the *tuning* capacitor, dip the milliammeter reading to minimum. With the *load* capacitor build the meter reading up to about 80 or 90 milliamperes, readjusting the tuning capacitor as required to keep the 'dip' point which, in the final setting, will coincide with the 80 to 90 milliampere reading.

Careful planning and attention to constructional details will produce a piece of equipment with workmanship, appearance and performance you can well be proud of. Even more important, it should provide you with many hundreds of hours of pleasurable operation. ■

WORLD'S SMALLEST CLOCK RADIO?



■ First consumer entertainment product to use microelectronic circuitry for all primary functions, General Electric's new miniature rechargeable radio is no larger than a pack of cigarettes. All essential electronic elements are contained in a single microcircuit.

The unique new portable comes with a recharger base containing a clock, resulting in what may be the world's smallest clock radio. The radio portion can be detached from the charger and carried anywhere. When fully charged, it will play up to 12 hours completely unattended.

The radio is the first of a full line of GE products to incorporate microcircuits. Actually the third generation of electronic components, microcircuits are an outgrowth of both the vacuum tube, invented before the turn of the century, and the transistor, introduced in 1948.

Measuring 1 x 2 3/16 x 3 in., the new radio has a textured plastic case, a slide-rule dial, and thumbwheels for easy tuning. The clock recharger unit includes an extra speaker, giving the radio added fidelity whenever it is plugged into the recharger.

The clock radio sells for $39.95; another model with a non-clock charger is $29.95. ■

RECEIVERS NEED ANTENNA TUNERS TOO!

by Howard S. Pyle, W7OE

You can squeeze a few more microvolts of signal out of your sky wire with this simple circuit that has been used to funnel power into the atmosphere.

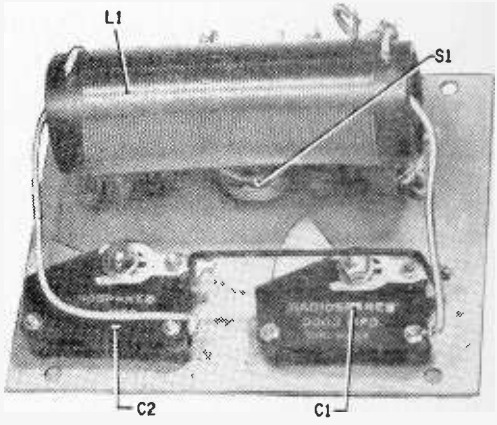
■ The expression, *antenna tuner,* is a household word around the Ham shack. Instantly it is associated with transmitting equipment. And even though 9-out-of-10 current-model Ham transmitters incorporate an integral pi-network tuning arrangement, most present-day hams have built, or purchased, and installed, an external antenna tuner—using any one of a number of circuits. The thinking is, such a device improves the transmitting capability of a station (and those who use it insist that it does) why not apply the same thinking to the receiver?

The average Ham communications receiver has little provision for resonating the antenna circuits and the receiver input. What is generally provided is nothing more or less than a trimmer capacitor in series with the input or in parallel to the RF-stage tuned circuit. Where one antenna is used for both transmission and reception, installations including an antenna tuner or coupler, often feed the incoming signal through the antenna tuner—automatically matching the antenna to the receiver-input circuits. Many however are not so well arranged.

In the case of the Ham who uses a separate receiving antenna, this antenna is invariably connected directly to the antenna terminal on the receiver.

A Wee Bit of Theory. At my station, W7OE, I use separate antennas for receiving only on the three popular amateur bands—20, 40 and 80 meters. I decided to try an external antenna tuning network. The thought was inspired through my fairly recent acquisition of one of the novel British-made *JoySTICK* antenna systems. With the shipment was included one of their Type 5 *JoyMATCH* tuners, a simple variable LC network for use with transmitters, and a Type 3, receiver *JoyMATCH*. This latter was a conventional pi-network tuner identical to the arrangement used in practically all *transmitters* used by the Ham.

As a firm believer in following manufacturers' instructions to the letter—especially in handling any electronic gear, I connected the Type 3 antenna tuner into the circuit according to the instruction sheet. As the antenna tuner incorporates a tapped inductance and variable series capacitors, close tuning over the full LC range is possible. The tap may be placed to select any amount of



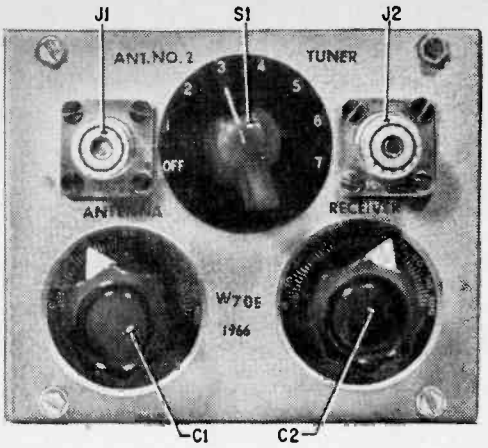
It only takes four components to make a signal-boosting antenna tuner for more DX.

winding, in small increments, or to completely eliminate the tuner from the circuit.

A bit of experimenting soon indicated that using the antenna in the conventional manner (with the tuner out of the circuit), provided normal signal reception—the same as with any conventional antenna connection. However, by adjusting taps on the coil and balancing the input by adjusting variable capacitors C1 and C2 a very noticeable improvement in signal strength was immediately evident. An added bonus was that as the signal level came up, the noise level went down!

Reasoning along the same lines, it appeared that whereas the *JoySTICK* antenna was rather novel in physical construction, it nevertheless embodied the same LC characteristics of more conventional antennas. So why shouldn't *any* antenna respond with improved input to the receiver if an antenna tuner were inserted?

Having six antennas available, I tried it with each one. Three of my antennas are dipoles—each cut to a half wavelength for one of the three popular Ham bands—20, 40 and 80. The other three, used interchangeably for receiving, are a conventional 18-foot base-loaded vertical, a random-length wire (about 75-feet) and of course, the *JoySTICK*. With the coax switching arrangement I have, I can instantly switch any one of the six antennas to any one of three transmitters or three receivers. Therefore it was possible to make comparison tests with all six antennas on the receivers only.



Front panel of antenna tuner may seem a little crowded—miniature knobs and RF connectors will give you a little more knuckle room. Connectors can go on rear.

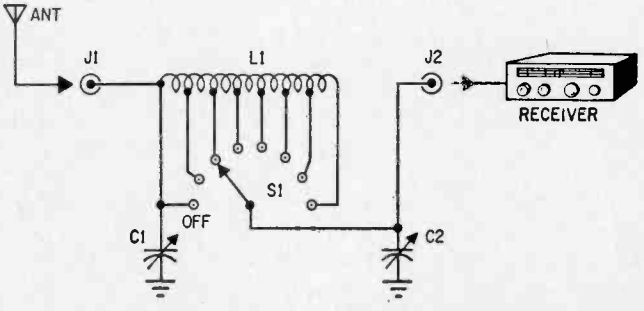
PARTS LIST

C1, C2—365 mmf variable capacitor (Lafayette 99R6217) or 15-409 mmf variable capacitor (Allied 13 U524)
J1, J2—Coaxial connector (Amphenol 83-1SPN or equiv.)
L1—80 turns, AWG 18 enameled wire on 1¼-inch dia. coil form 4-inches long (tapped every 10 turns)
S1—1-pole, 2-17 position rotary switch (Centralab 32117J or equiv.)
1—Cabinet, 3 x 4 x 5-inch aluminum utility cabinet (Bud CU728 or equiv.)
Misc.—Dial plates, hookup wire, solder, etc.

Estimated cost: $7.00
Estimated Construction time: 2 hours

Significant Results. In every case substantial improvement in signal strength and signal-to-noise ratio were apparent when *any antenna* was connected to *any receiver* through the antenna tuner. After a few weeks of experimenting (through actual on-the-air operation), I was sold; the antenna tuner would stay as a permanent station accessory. As I already had the components in the Type 3 *JoyMATCH*, I simply mounted them in an aluminum utility cabinet, and wired in a rotary tap switch in place of the alligator clip originally supplied.

(*Continued on page 124*)



Simple circuit is quite like those used for early crystal radios. Tuner can be used to get more out of low-power rigs that do not have built-in antenna tuners or pi-networks. For high-power transmitters you'll need wide-spaced-plate capacitors and heavier wire.

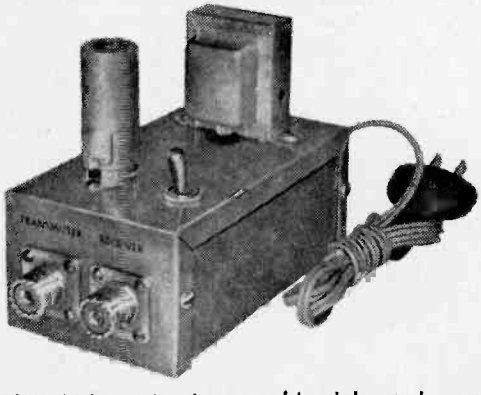
All-Electronic T/R Switch for Hams

by Marshall Lincoln
K9KTL

Take a hint from the professional brass pounders—use a T-R switch for instant break-in during pauses in CW transmissions—and make your CW contacts enjoyable.

■ It happens to every newcomer to the amateur CW bands. You start what promises to be a long QSO with an interesting op who has a smooth fist and a strong sig—599 and "in the clear."

With confidence, you launch forth with a rundown on the rig, the antenna, the weather and the gossip from last night's radio club meeting. Then you sign over to the other op,



This little unit does a big job and can be stashed in any little nook on the desk.

snap the plate switch off, . . . and listen with dismay to the ten other QSOs that sprang up on your previously clear frequency while you were transmitting. You just barely manage to hear your 599 contact whisper "SRI OM — —QRM VY BAD— —HPE CU AGN 73 . . ."

Drat and Fiddlesticks. Another QSO shot full of holes by bunch of dad-blast-its who came on while you were transmitting. If you could have heard them when they started, you would have asked them to join your QSO, or moved to a different frequency to maintain contact. But now the damage has been done. Looks like it's either buy a kilowatt or take up stamp collecting. If only there were a way to have your cake and eat it too.

There Is, You Know! With the inexpensive accessory shown here, and nothing more, you really can transmit and receive at the same time! Impossible? Not at all!

This little helper for the frustrated CW man is a *T-R* switch. The *T-R* stands for *transmit-receive*. The CW traffic hounds

T/R Switch for Hams

have been using such wonder boxes for years. A T-R switch is guaranteed to cure more headaches than a boxcar load of those super pain killers you see nightly on the 21-inch magic lantern. Although there are a multitude of different designs for these handy gadgets, the one shown here is one of the simplest and easiest to build—an evening or two should put you in business.

How? What it does is allow your receiver to operate *all the time.* (You don't mute the receiver when you transmit.) You monitor your own signal (always an excellent idea), and you also hear the other guy—along with any crud that shows up on the frequency—in between your own dits and dahs.

When you use a T-R switch, you take out your antenna relay—there no longer is any need for it. This is because the T-R switch does the work of the relay, and more besides. The principle is illustrated in Fig. 1. Note the transmitter is connected directly to the antenna *all the time.* The receiver is connected to the antenna through the T-R switch, which uses a vacuum tube in place of a set of relay contacts to switch the receiver into the antenna circuit whenever you open the key.

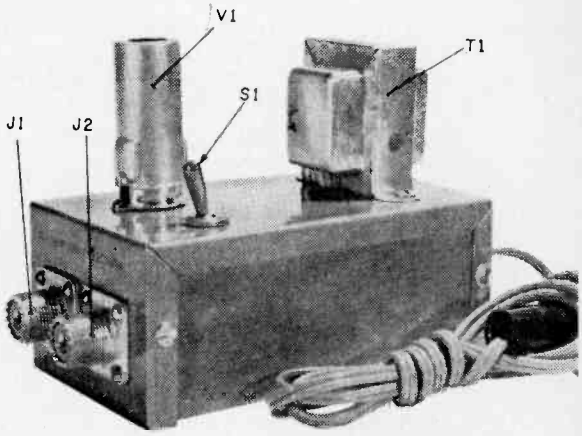
When your key is up, the transmitter is not putting power into the antenna, so the receiver is free to use the antenna for receiving signals. When you press the key down, the transmitter radiates energy into the antenna. The T-R switch jumps into action at this time to stop that bolt of energy from going into the receiver input terminals. In short, the T-R switch isolates the receiver from the antenna whenever the transmitter is keyed, and it allows normal operation of the receiver whenever the rig is unkeyed.

It's That Easy. Look at Fig. 2—it shows the working principle of a T-R switch. The grid of the tube in the switch is connected to the antenna feed line through a capacitor, which couples incoming signals to the tube. The receiver, in turn, is connected across the tube's cathode resistor to "pick off" these signals.

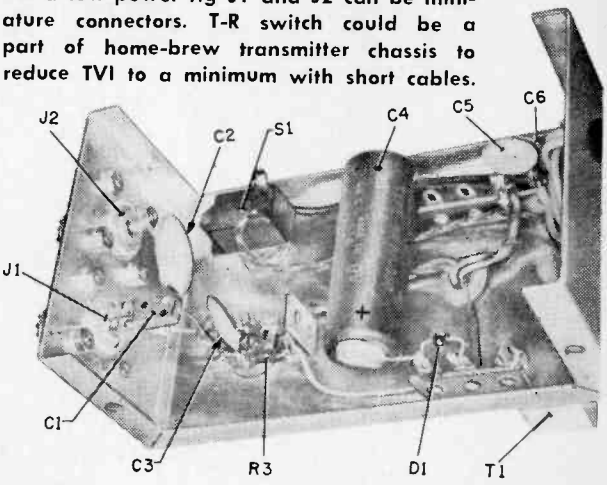
When the transmitter is keyed, its signal must pass from grid to cathode of the T-R tube, which effectively prevents it from passing along a sizable signal to the receiver. In this way, the tube prevents the disaster which would occur if the receiver were coupled directly to the transmitter while it was keyed.

Although the receiver is isolated from the antenna during key-down periods, it still receives the transmitter's signal because of its proximity. As a result, you hear your own sending when your key is down, and you hear everyone else on the frequency when your key is up.

This makes it easy for another station to "break" you, since you can hear him during each tiny interval your key is up. This explains why traffic handlers use such an arrangement in their stations. If the station receiving traffic misses a word in a message, the operator merely holds his key down or sends a string of dits with his bug. The sending operator, because he has a T-R switch, hears this and stops until the receiving operator tells him what he missed. This saves a lot of time which would be



For a low-power rig J1 and J2 can be miniature connectors. T-R switch could be a part of home-brew transmitter chassis to reduce TVI to a minimum with short cables.



consumed by getting "fills" after the message was sent.

The T-R switch also helps make for faster traffic work and smoother QSOs by enabling a sending operator to know immediately when interference pops up on his frequency. When it does, he can check to see if the guy he's working is still copying satisfactorily, and, if not, take corrective action. The other fellow, of course, can break in anytime to report any trouble he's having in copying.

The unit pictured here has been kept as simple as possible while incorporating its own power supply. You can eliminate the power supply if you want to steal a little power from your receiver to operate the T-R switch. Its needs are very moderate—6.3 volts @ .15 amp (150 milliamperes) for the heater and 150 to 250 volts at a few milliamps for the plate. Fig. 3 shows the circuit for the unit pictured here.

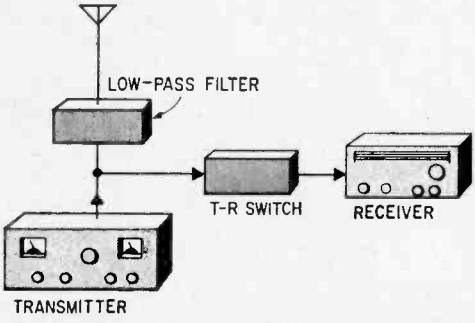


Fig. 1. Block diagram of connections makes it easy to hook up T-R switch. T-R switch, filter and transmitter can be in one unit.

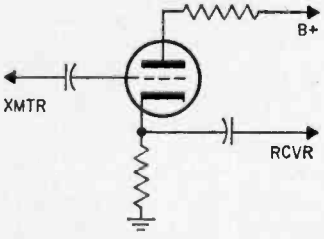


Fig. 2. Simplified circuit of the T-R switch makes it easier to understand the operation of this worthwhile addition to any station.

Be sure the unit is well shielded and keep the coax lead from the T-R switch to transmitter as short as possible to guard against TVI. The simplest way to connect the antenna and T-R switch to the transmitter is with a coax T-fitting on the back of the rig. If a low-pass filter is used, it should be connected in the feed line *beyond* the T-R switch—in other words, the T-R switch should be closer to the transmitter in the line than the low pass filter. The proper position for a low-pass filter is indicated by the dotted box in Fig. 1.

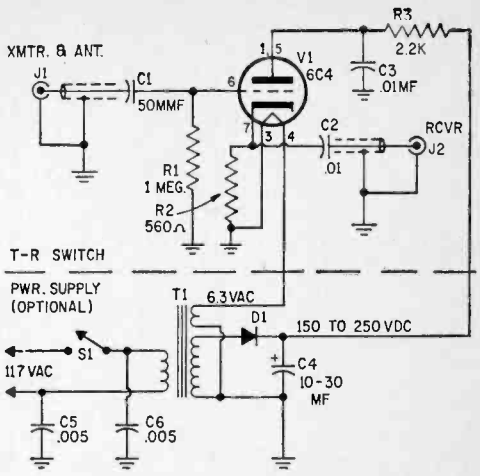


Fig. 3. Complete schematic diagram details optional DC power supply and T-R switch.

T-R SWITCH PARTS LIST

C1—50-mmf., mica capacitor
C2, C3—.01-mf., disc capacitor
J1, J2—coax connector (Amphenol 83-1RTY or equiv.)
R1—1,000,000-ohm ½-watt resistor
R2—560-ohm, ½-watt resistor
R3—2,200-ohm, ½-watt resistor
V1—Vacuum tube (type 6C4, 6C4W, 6C4WA, 6100 or equiv.)

POWER SUPPLY PARTS LIST

T1—primary 117VAC; secondaries, 6.3-VAC @ .15 amp and 150 to 250-VAC @ 15 ma.
C4—10 to 30 mf., 350-V electrolytic capacitor
D1—Silicon rectifier (Lafayette 19R5001 or equiv.)
C5, C6—.005 mf., disc capacitor
Misc.—Tube socket, tube shield, chassis box, coax, wire, solder, hardware, etc.

Estimated cost: $7.50
Estimated construction time: 4 hours

Parts Placement. It's not critical, and components may be installed differently from the arrangement shown here as long as good RF-construction practice is followed. Also, the unit can be constructed in a much smaller box than the 5¼ x 3 x 2⅛-inch chassis box shown here, if you wish. However, be sure that C1 has a voltage rating high enough to safeguard it from breakdown due to the high voltage in your rig.

The power transformer (T1) in the unit is a surplus job having a 150-volt secondary. Any transformer which has a high-voltage

T/R Switch for Hams

secondary that will give 150 to 250 volts DC for the B-plus will be satisfactory. The filter capacitor and diode ratings are not critical either, as long as they have adequate voltage ratings for the transformer you select.

Hook Up. Coax connectors on the end are for connections to transmitter (and antenna) and to receiver—and don't get them mixed up! The line cord could be fed into the receiver, if you wish, so the T-R switch is turned *on* and *off* at the same time as the receiver. (Remember, the T-R switch must be turned *on*, even if you do not plan to transmit, to feed the signal from the antenna to the receiver.)

If you get heater and plate power directly from the receiver instead of building the self-contained power supply shown here, the T-R switch also will be automatically turned *on* and *off* with the receiver—a very convenient feature.

Do you now have a relay, actuated by either the transmitter or receiver changeover switch, to mute the receiver when the transmitter plate switch is *on*? You must disconnect this relay. The receiver must operate *all the time* to get benefit of the T-R switch.

If you want to operate both phone and CW, you have to keep the muting relay in operation when working phone—otherwise, the unmuted receiver will feed a signal into the mike, causing audio feedback. So, install a switch so you can disable the muting relay when you are operating CW break-in.

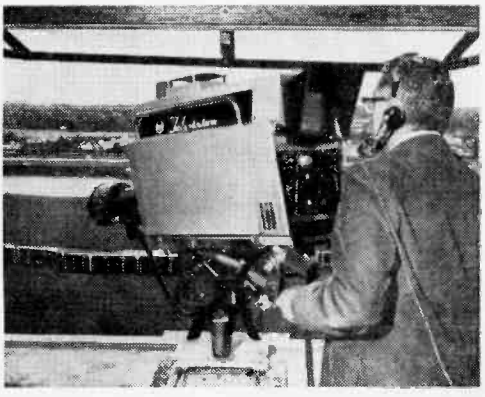
Using It. When using the T-R switch, you may notice that tuning the transmitter tank circuit, even without the transmitter being turned on, will have an effect on the signal strength in the receiver. This is because the transmitter final tank is, in effect, now connected in parallel with the receiver antenna coil. So, even if you are just listening around the band, and maybe don't even have the transmitter turned on, you will have to adjust the final tank tuning capacitor to get the strongest signal in your receiver.

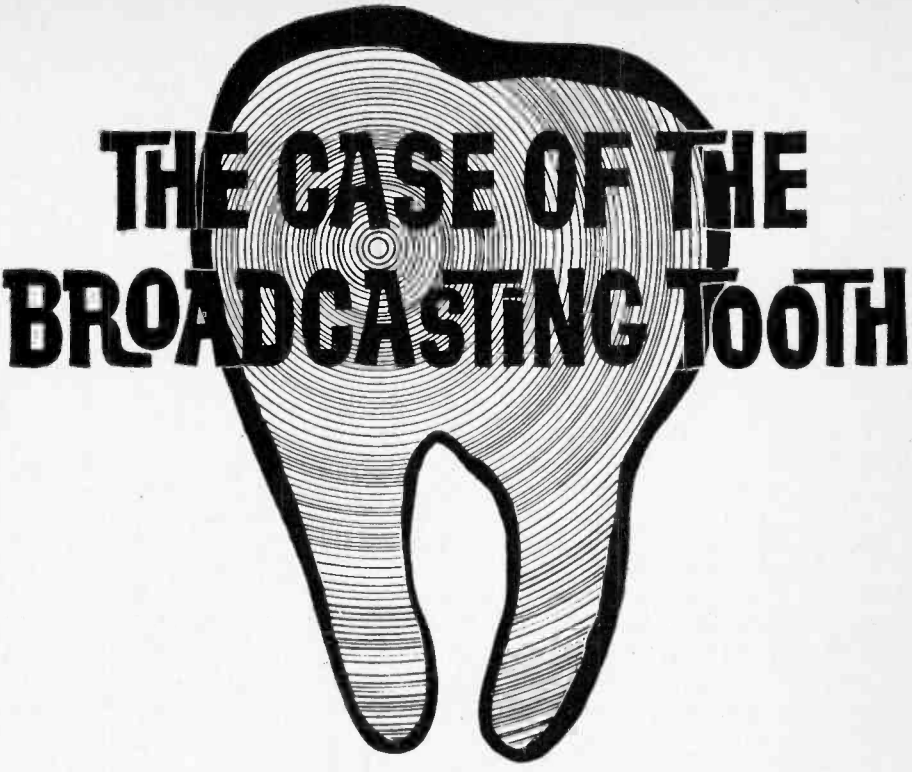
When you tune up the transmitter for operation on a given frequency, you automatically get the final tuning capacitor setting that will reinforce the incoming signal for maximum strength in the receiver on that frequency. ■

TV IS BEST AT THE RACES

■ Since this extensive closed-circuit TV system has been installed at the Monmouth Park Racetrack, N. J., you can forgo the many inconveniences often encountered at the track—like sitting on the hard grandstand seats, getting sunburned or caught in the press of sporting humanity. You no longer have to worry about someone filching your favorite refreshment when you run from the bar to the rail—in fact you don't even have to unbend your elbow to be right in at the photo finish.

Equipment made by the RCA Broadcast and Communications Products Division is used to give the track patrons, gathered around the sixty 23-inch monitors, the same picture quality they'd get at home—complete with special effects like a zoom lens for following the race; split screens, lap dissolves and text insert. ■





THE CASE OF THE BROADCASTING TOOTH

BY K.C. KIRKBRIDE

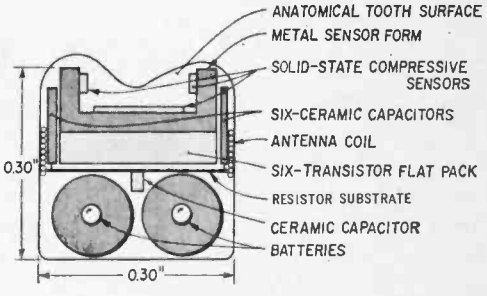
When your teeth start hearing things—that's bad. But, when they start talking back, you've had it.

■ A young man walked into the reception room of a radio station in upstate New York, claimed he could hear the station's programs without benefit of radio receiver.

Before packing and mailing the gentleman to the local koo-koo place the station employees decided to give his weird story a whirl. Taking their new-found friend to a room on another floor of the building where they could be sure he would not hear either receiver or speaker, they asked him what program was now "on the air." And he told them.

Further investigation proved a deposit of carborundum lodged in the man's tooth was acting as a rectifier, receiving radio programs, saliva in his mouth acting as a conductor. Still further investigation proved this occurrence not as rare as it seemed.

A similar incident had been reported at Bellevue Hospital, New York City, where a famed neurophysiologist saved a similar "listener" from the jacket department when he said, "study his teeth." This specialist describes the phenomenon as one that can happen when carborundum dust seeps into a new filling, or into the well of a tooth when it is being filled, the carborundum acting as



This artist's representation of the tooth is more than 3-times actual tooth size.

BROADCASTING TOOTH

a rectifier and turning a perfectly innocent, well-meaning tooth into a radio receiver.

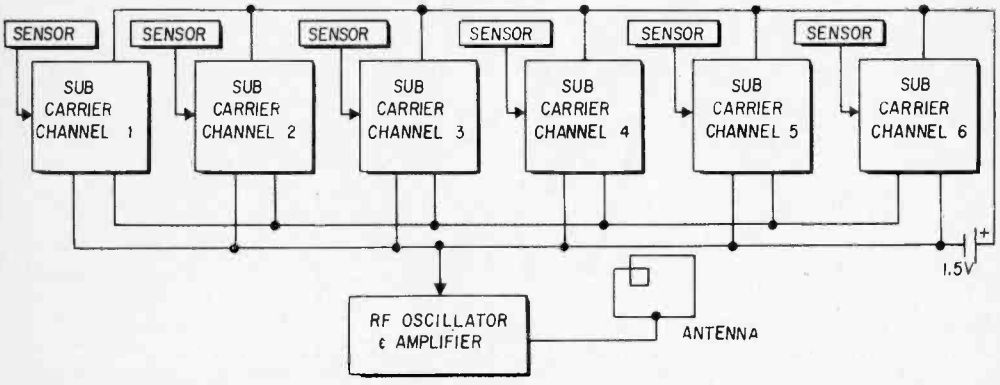
All of which seemed quite harmless until recently. For no one would quite think of asking dentists to deliberately add carborundum to dental fillings, and certainly no one knew how to pack a radio receiver into a tooth. But now we're not sure.

For a dentist-engineer team at the School of Dentistry, University of Michigan, have developed a tooth, packed with miniaturized electronic components so it can broadcast.

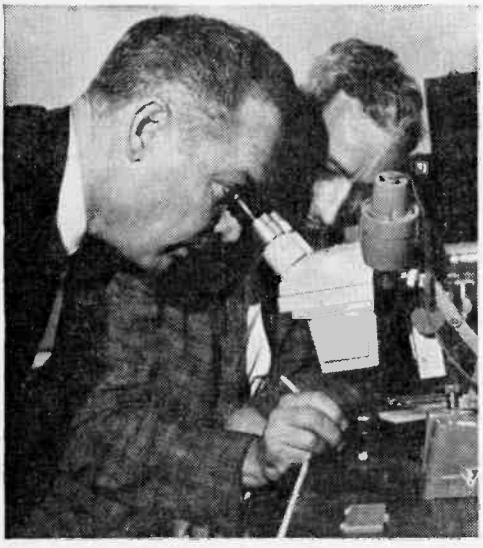
A young volunteer sat down in a dental chair in the dentistry department at the University in Ann Arbor. When Dr. Major Ash looked at his mouth he found an upper first molar missing. In its place Ash inserted a tooth that looks like any other molar-bridge, except this one, packaged in plastic, is wired for transmitting and costs $15,000.

As the volunteer chewed food, smoked, and even rested, the tooth telemetered how it felt about the other teeth around it so Ash and his associate, Scott, could register data for the use of all dentists on a Honeywell Visacorder located nearby.

For years it has been known nature pro-



It may be hard to believe but all six of the channels, with their sensors, transistors and rechargable cells (batteries) can be put into less than one hundredth of a cubic inch.



To study the broadcasting tooth you have to have a steady hand, a gentle touch and a stereo microscope as well as patience.

vides a pretty complex protective system for its teeth, but the strain of chewing and flaws in bite can wear a good tooth down. Ill-fitting bridgework can damage adjacent teeth, while if a dentist truly understood the stresses a tooth goes through in a day, he could design better bridgework, prevent gum complications, even formation of tartar and cavities.

The idea of attempting to solve this problem through electrical methods is not new, goes back to such men as B. Jankelson and G. Hoffman, followed later by A. A. Brewer and D. C. Hudson who overcame early disadvantages of studying the tooth's daily battles through wires extending from the mouth. This they did by trying to insert a radio transmitter into an upper denture to telemeter frequency of tooth contacts.

However, it has taken Scott and Ash, spending two years of study to fashion the ultimate electronic tooth. And before they achieved their difficult goal, they discarded

(Continued on page 116)

SILENCE IS GOLDEN

Just build Blab-Off and see for yourself how much fun it is to blast those commercials into stony silence.

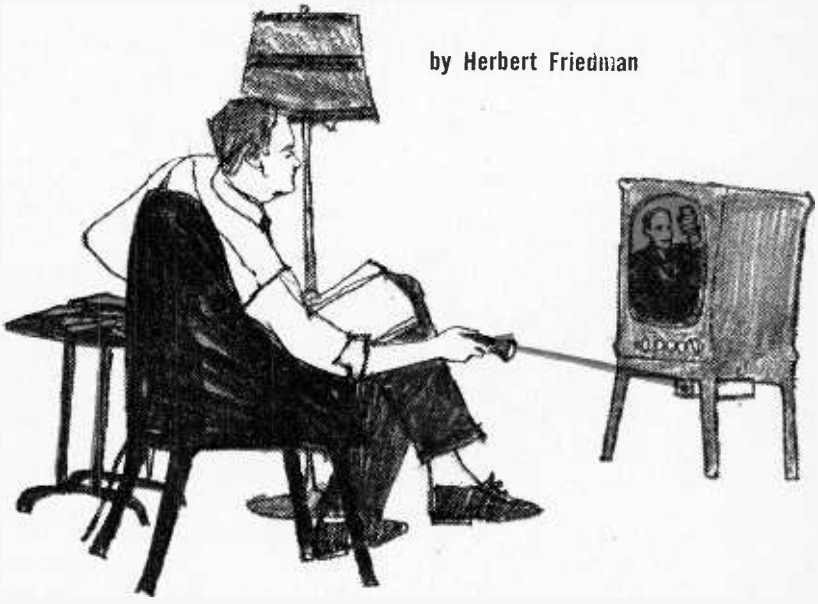
by Herbert Friedman

■ Have you *had it?* Are you sick of Katy Winters telling you how to stop perspiration? Are you waiting for the Knight-in-Armor to run someone through with that lance instead of turning lovely grease-covered overalls sparkling white? Do you wish that kook running around with a sheet and screaming, "It's sparkling white," would step off that 300-foot cliff in the background? Do you have an insane urge to belt that blond in the mouth next time she says "Take it off"—and *it* turns out to be some jerk stripping whipped cream off his face? (What, you really believed shaving cream looked like that?)

In short, are you sick of TV commercials? If you are, why not dispatch them to the great beyond with the Blab-Off?

There you sit, the Blab-Off connected to your TV receiver and your ray gun (it's really a flashlight) on the table next to you. The man from U.N.C.L.E. has just about convinced the girl from the Society of International Noodnicks that she's on the wrong team when there's a quick cut to some idiot, dressed in a maid's uniform, flying through the air and waving a container of gook—which not only cleans something but makes your hands kissing soft in three minutes. Of course, while you can always look down at the latest issue of Playboy (concealed inside a copy of R-TV E) the audio portion of this throwback to the Inquisition is enough to make one gag on a really cold beer (and one should enjoy a really cold beer).

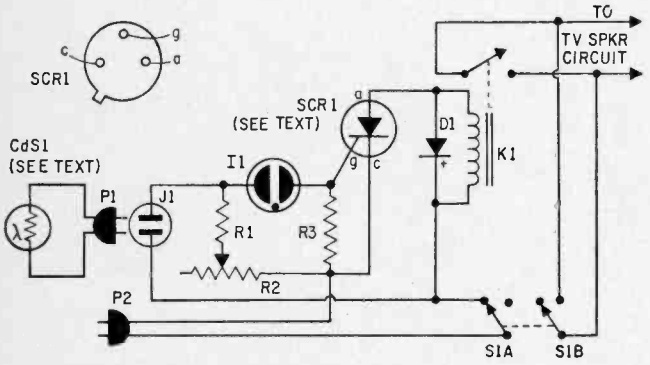
But this time, instead of muttering that the sponsor thinks everyone has the mind of a 2-year-old, you grab the *ray gun,* fire a



SILENCE IS GOLDEN

a 2-year-old, you grab the *ray gun,* fire a short burst of instant death ray at the TV and peace descends—no more sound. When the insult to your intelligence is over, you fire a quick burst of rejuvenating light at the TV and the sound comes back.

The Inside Story. By now you no doubt have guessed that the Blab-Off is a light-controlled relay that mutes the TV receiver's sound and turns it back on whenever you give the command. Fig. 1 shows how it's done.



Schematic is simple. Largest component is relay with J1 about next in size. J1 and P1 can be eliminated if you can mount CdS1 in same box as other components.

Relay K1 is connected in series with SCR1, a silicon controlled rectifier. Note that photo-resistor (photo conductive cell) CdS1—which is connected into the circuit via P1 and J1—is part of a series-connected voltage divider consisting of CdS1, R1 and R2. Light falling on CdS1 lowers its resistance, thereby causing a greater voltage to appear across R1-R2. When the voltage reaches the breakdown (ionization) potential of neon lamp I1, I1 conducts, applying a voltage to the SCR gate. The SCR conducts and relay K1 is activated, thereby opening the TV speaker circuit.

How it stays open and closed. The relay is a special type known as an *impulse* or *latching relay.* Assuming K1's contacts are *closed,* a single pulse of current through the coil causes the contacts to *open,* and the contacts stay *open* even after the current pulse has passed. A second pulse will cause the relay contacts to *close* and stay *closed.* Once the contacts are either opened or closed they stay in that condition even after current is removed from the relay coil.

The Blab-Off is so sensitive it will respond to an ordinary two-cell flashlight located 30 feet from CdS1. In fact, it's not even necessary to "hit" CdS1 with the full light beam. Just sweep the flashlight beam across the area where CdS1 is located. As soon as any part of the beam, even the edges, passes over CdS1—even for an instant—the Blab-Off will be activated.

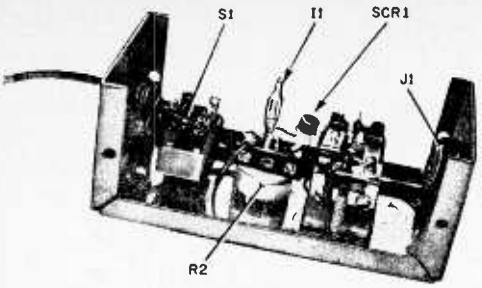
The Blab-Off's sensitivity actually creates a minor problem. It is so sensitive that it can only work in a room where the room lights are properly dimmed for TV viewing. If you enjoy watching TV while taking a sun-bath from light streaming in the window, forget the Blab-Off. The excess light will "jam" the photo-resistor.

If you plan to use the Blab-Off under high-ambient light conditions, it will be necessary to experiment with photo-resistors having a higher resistance rating at 2 foot-candles than the model specified in the parts list. Since the Clairex type CL505 is rated at 9000 ohms at 2 foot-candles, a good experimenting model for high light levels might be the Clairex type CL704 or CL705 or some similar photo-resistor.

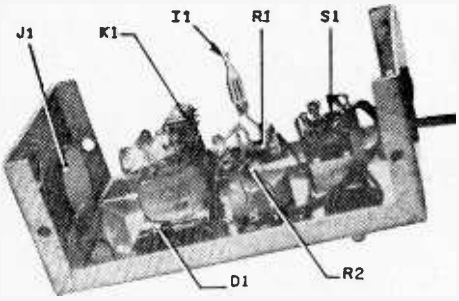
While many different photo-resistors will work in the Blab-Off, the CL505 was selected as its relatively large diameter (½ inch). This makes it sensitive to the fringes of the light beam and means that the light beam doesn't have to fall directly on the target area.

Construction. The Blab-Off consists of three units: the flashlight, the photo-resistor and its holder, and the control box.

The control is assembled in an aluminum chassis box or cabinet measuring 2⅛x3x5¼ inches. Since the Blab-Off is operated directly from the line, take extra care that no part of the circuit is connected to or touches the cabinet. Do *not* use the cabinet as a common ground connection.



Internal views of the Blab-Off show locations of most components. Once you have the major ones positioned the placement of the others will be quite obvious—even if you don't keep leads as short as practical you won't have any problems with placement.



Socket J1 is a standard chassis-mounting AC receptacle, though any socket with two *insulated* terminals may be substituted. I1 is a special neon lamp made for "dark" applications—inside an enclosure, for example—so no substitution should be made. While the Blab-Off will work with a "standard" neon such as the NE2 it will tend to be intermittent in operation.

Note extra carefully D1's connections across K1. D1, which is any standard silicon diode rated at 200 piv or higher, *must* be connected so its cathode (the end marked with a "+" or a band) "faces" power switch S1. If the diode's polarity is reversed the relay will not operate when the SCR is tripped. Diode D1 should not be eliminated as it sharply reduces relay chatter (the noise could drive you nuts, otherwise).

Also take extra note of S1's connections. When it is in the normal (N) or *power off* position, the second set of contacts short K1's contacts so the speaker is connected at all times. When S1 is set to the control (C) or *power on* position, the speaker-is *on* or *off*.

In the unit shown, the terminal strip was soldered directly to the top of R2 to conserve space. Since the leads around R2 and the terminal strip are somewhat close don't be afraid to use plastic tubing (spaghetti) freely on all bare leads.

For normal low-ambient light levels R1 is 22,000 ohms and sensitivity control R2 is 1 megohm. If you do any experimenting for high light levels R2 may be changed but R1 should never be less than 22,000 ohms.

Assembling the photo-resistor pickup. The specified CdS1 mounts in a three-inch section of ½-inch copper tubing of the type used by plumbers for water pipes. (Other photo-resistors might fit into ⅜-inch tubing.) Attach a length of standard "zip" cord (or speaker wire) to CdS1's terminals and thoroughly insulate the leads, right up to the glass enclosure. Position the photo-resistor

Photo-resistor is shown here somewhat larger than actual size. The connecting wires have been attached and bare leads covered to prevent shorts from occurring.

PARTS LIST

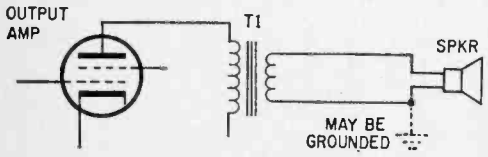
CdS1—Photoconductive cell (Clairex CL505 or equiv.—see text)
D1—750 ma, 200 prv (piv) or higher rating silicon rectifier
I1—Neon lamp (type NE-23 or equiv.)
J1—Jack, 2 wire insulated (see text)
K1—S.p.s.t. latching relay (Guardian IR-610L-A115 or equiv.)
P1—Plug to match J1 (see text)
P2—Plug for AC line cord
R1—22,000-ohm, ½-watt, resistor
R2—1,000,000-ohm potentiometer (see text)
R3—100-ohm, ½-watt, resistor
R4—47-ohm, ½-watt, resistor
S1—D.p.d.t. slide or toggle switch
SCR1—Silicon controlled rectifier (G.E. C6B or equiv.)
1—Chassis box, 2⅛ by 3 by 5¼ inches (Premier AMC-1006 or PMC-1006 or equiv.)
Misc.—terminal strip, grommets, wire, solder, mounting screws, etc.

Estimated cost: $12.00
Estimated construction: 3 hours

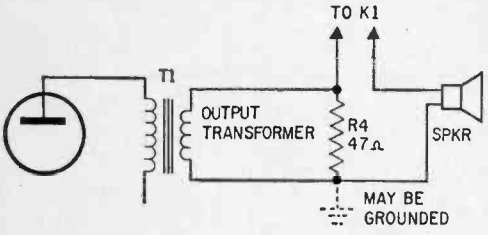
SILENCE IS GOLDEN

about half-way into the tubing and apply a liberal quantity of silcon rubber adhesive (such as RTV or Silastic) to the wire end of the tubing. When the adhesive hardens both the connecting "zip" cord and CdS1 will be held firmly in place.

Connecting the Blab-Off. The schematic diagram in Fig. 2A shows speaker output circuit of a typical TV set. Open one speaker



Factory-wired speaker connections (above) can be easily modified (below) to make connections to Blab-Off. R4 keeps some load on output transformer, even with the speaker disconnected, to prevent excessive plate current flow.

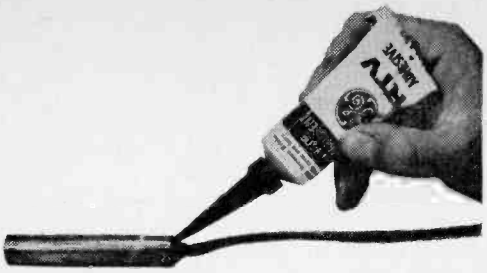


lead at the speaker terminal. (If one of the speaker leads is grounded open the ungrounded lead.) As shown in Fig. 2B, connect a 47-ohm, ½-watt resistor across the output transformer and bring out two leads from inside the cabinet—the leads to K1's contacts.

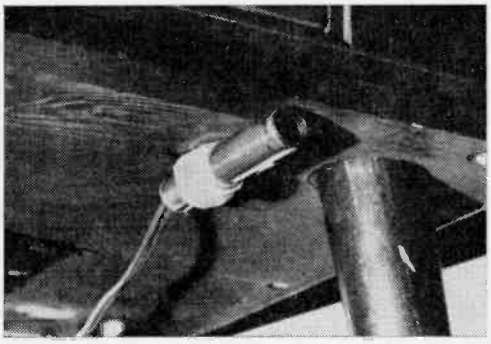
Mount the control box on the rear of the TV receiver and connect the speaker leads to K1's contacts. To avoid short circuits run the speaker leads through a rubber-grommeted hole in the control cabinet.

The photo-resistor assembly can be mounted under the TV receiver; it is held in place with a single electrical pipe strap—a half-U clamp.

Adjustment. Set the room lights to the normal viewing illumination and temporarily remove the cover from the control cabinet. Turn S1 to *on*—the speaker may or may not disconnect—and adjust R1 until I1 is *not* illuminated. (If I1 stays on, SCR1 is



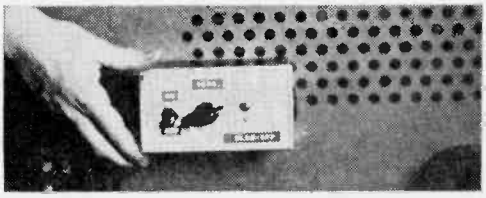
Room-temperature vulcanizing (RTV) silicone rubber (used for caulking sinks, tubs, etc.) seals leads and CdS1 into section of tubing (above). The completed light pickup (below) is shown mounted under TV cabinet.



continuously conducting and K1 might burn out.) If I1 cannot be extinguished with R1, the room illumination is too high; try painting the inside of the photo-resistor assembly black before experimenting with other photo-resistors. Set R1 to the highest value which will still cause K1 to trip when a flashlight is beamed at CdS1.

Since strong light will always trip K1, make certain the Blab-Off is always turned off with the TV receiver, or when the room lighting is raised.

Next time an aspirin commercial *gives* you a headache simply *zap* the Blab-Off with the flashlight—and bid that headache goodbye. ■



Mounted on the rear of the TV cabinet the controls for Blab-Off are easy to reach.

Making Light Work of Power Wiring

by Paul Hertzberg, K2DUX

AC power receptacles are just about the same no matter where you install them but hanging a light entails many varied techniques that are very simple—when you know how.

ADDING light fixtures is much more of a problem than adding an outlet. The styles of receptacles are quite limited by comparison—and generally they will be mounted in one of three types of outlet boxes. The most common box, used for wall outlets and switches, is the Gem box—the one that comes apart.

Round (octagonal) and square boxes in 3- and 4-inch sizes are used in different ways to hang lighting fixtures. Some are fitted with adjustable hangers (brackets).

Because of the weight of many ceiling fixtures the support must be more secure. While some light-weight lighting fixtures can be installed *after* the ceiling has been finished, most must be attached to brackets (or some cross member) that are fastened to the beams *before* the ceiling has been closed up.

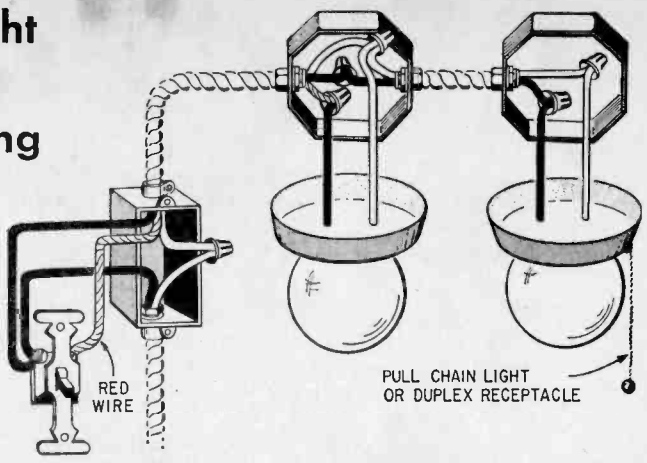
Trying to refinish a ceiling to look like new after it has been broken open is quite a job—it's one for an expert!

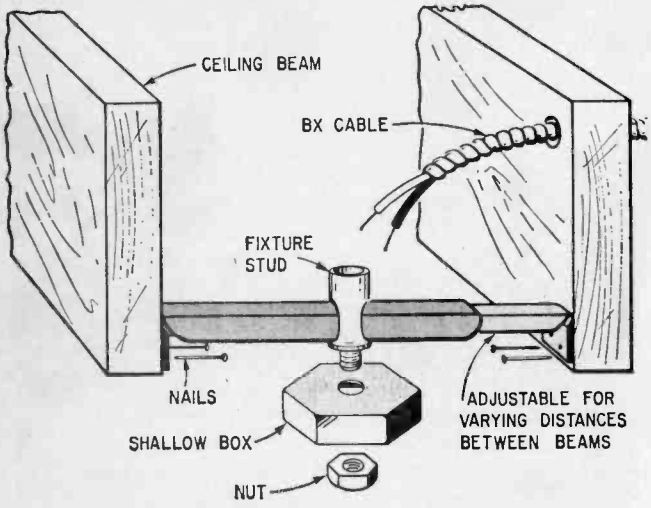
While we can't tell you how to re-plaster a ceiling, we can show you some of the ceiling-fixture assembly methods.

So if you can work *down* from an unfinished attic or are finishing an attic or basement that still has an open ceiling, here are some tips on finishing sooner and ending up with a neat-looking job that you can be proud of when company comes. Now, before you roll up your sleeves to start work, turn the page

Making Light Work Of Power Wiring

Two lights can be controlled independently (one with a pull chain or from a second switch mounted in wall box). You do need a 3-wire cable from the wall-switch box to the first ceiling box—two wires to the last box.

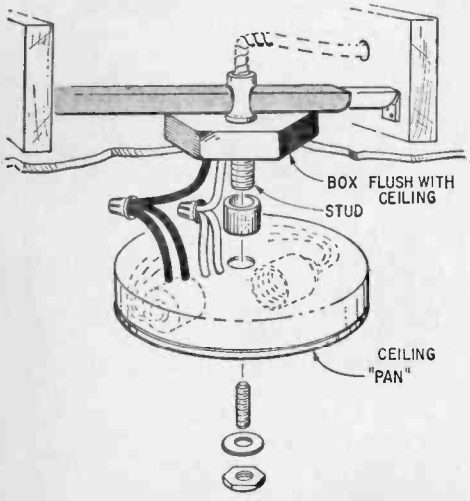


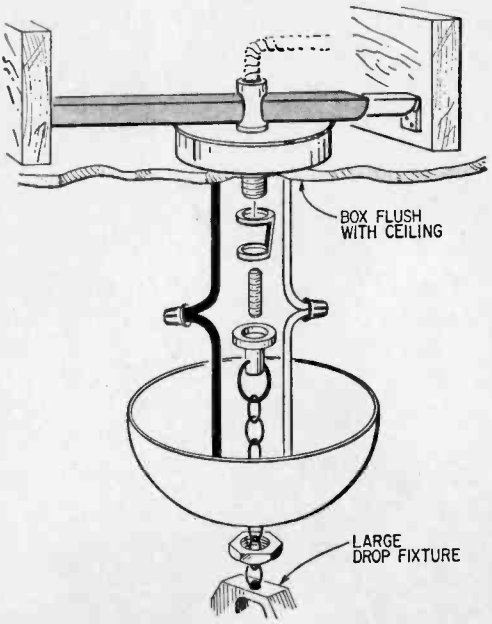


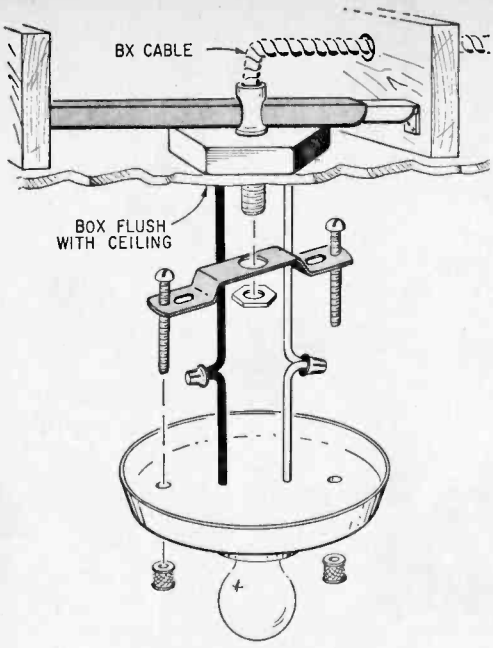
Nails are used to attach the hanger (bracket) between the beams. Just be careful that you don't split the edge of the beam while driving nails. Fixture stud can be positioned on hanger.

Wires may go through box or through stud and C-shaped fixture hickey. Bowl-shaped canopy covers up ceiling opening and wiring splices.

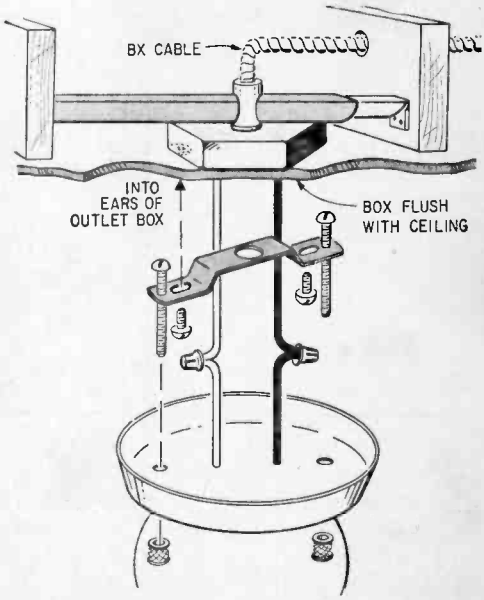
Ceiling-pan fixture has two lamp sockets. Watch wiring for a flush fit to ceiling.



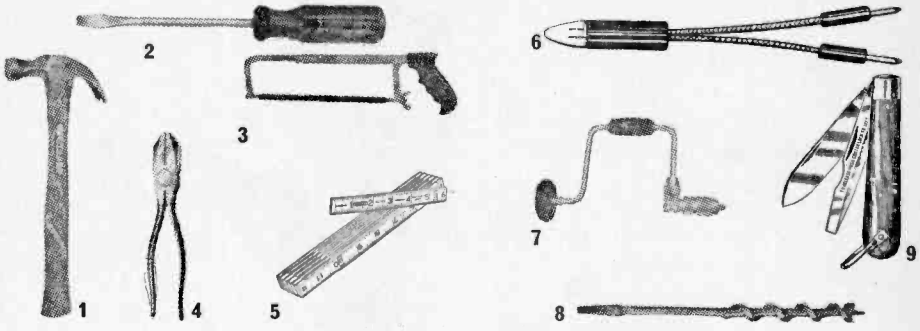




Single-lamp fixture uses a fixture hanger bracket mounted on fixture stud in ceiling box. Machine screws in tapped holes bottom in fancy nuts and pull pan tight against ceiling to cover box.



Here, short machine screws attach fixture hanger to tapped holes in ears or tabs bent into edge of box. The fixture-stud extension is not needed in this type of fixture installation.



TOOLS FOR INSTALLING BX WIRING

1 Claw Hammer—for driving in staples, nails, wood supports, mounting boxes.

2 Screwdriver—3" type with insulated handle for tightening screws on connectors, outlets and switches.

3 Hacksaw—for cutting BX cable, metal supports.

4 Linesman's Pliers—for cutting wire, tightening nuts, stripping insulation.

5 Folding Rule or Tape—for measuring position of boxes, cable lengths.

6 Neon Test Light—for checking live wires, tracing circuits, testing outlets.

7 Brace and Bit—for boring holes through walls, studs, floors (a #12—¾-inch—bit is the right size for BX cable).

8 Electric Drill—¾-inch power wood bit and extension cord (if power is available from a finished area).

9 Electrician's Knife—for cutting insulation, scraping ends, wire.

COPPER WIRE CURRENT RATING

Wire Size (AWG)	No. 14	No. 12	No. 10	No. 8	No. 6
Maximum Current	15 Amps	20 Amps	30 Amps	40 Amps	55 Amps

build a THD tester

A simple adapter you can use with your AC VTVM or Hi-Z VOM.

by Herbert Friedman

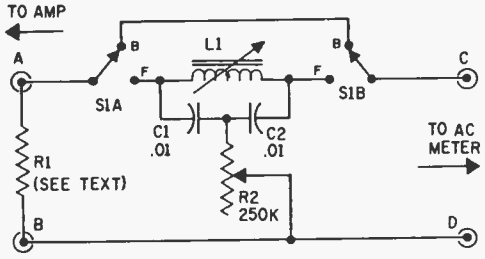


Fig. 1. This simple circuit is the heart of audio analyzers that are designed to measure the total harmonic distortion (THD) of amplifiers.

■ If you do any serious experimental work in audio, or if you've got a little audio service business going on the side, you probably know the importance of *THD* (total harmonic distortion) measurements. The *THD* of an amplifier is important because it is generally the design center for overall performance, to which the frequency response, power output, noise level, and sensitivity are referred.

Since all manufacturers specify performance, particularly power output, at a given *THD* reference level, the experimenter or service technician can easily check against the like-new performance specifications. For example, if an amplifier is rated at 20 watts for 0.1% *THD*, a repair that restores this rating can generally be presumed to have restored all other characteristics.

While it is true that amplifier distortion is also dependent on frequency as well as power output level, it has become the general practice in all but the most expensive "high performance" amplifiers to use the *THD* rating at 1 kHz (1000 cps) as the reference. And it can be generally assumed that an amplifier exceeding the distortion specifications at 1 kHz will also display evidence of a degradation in frequency response and signal-to-noise ratio. Even when a manufacturer specifies the more esoteric *intermodulation distortion*, he also gives the 1 kHz *THD* since it is a more universal measurement when dealing with reproduction of sound through a loudspeaker.

Much of a distortion meter's cost goes into making it tunable over the 20 to 20,000 Hz

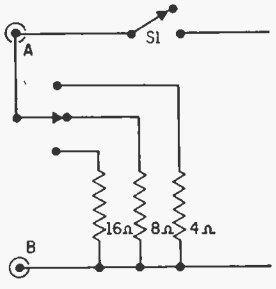
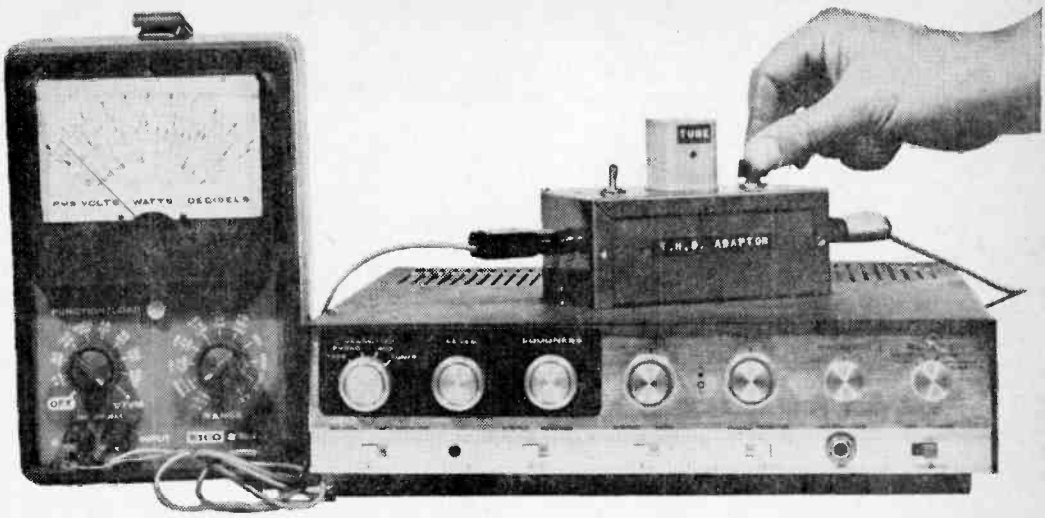


Fig. 2. R1 can be replaced by the above circuit to make amplifier-output loading easier. When testing use heavy-current rotary switch.



The setup is simple—connect the THD Adaptor to the output terminals of the amplifier; connect the audio (AC) VTVM to the C-D terminals of the THD Adaptor and read THD.

PARTS LIST

C1, C2—.01 mf., 100 WVDC disc capacitor

L1—Variable inductor, UTC type VC-15 (available from Allied Radio as their part #62Z914; $7.50)

R1—Amplifier load termination (see text)

R2—250,000-ohm, linear-taper potentiometer

S1—S.p.d.t. toggle switch

4—Insulated binding posts

1—Chassis box, aluminum, 5¼ x 3 x 2⅛" (Bud 3006A or equiv.)

Misc.—Wire, solder, hardware, etc.

Estimated construction cost: $7.50 plus junk box parts. About $10.75 with new parts.

Construction time: 2 hours or less

(cps) range. Another high-cost circuit is the built-in AC-VTVM used to measure the distortion level. But since you get the key to overall performance by knowing the 1-kHz distortion value, you can dispense with the tunable circuits. Substitute your own AC-VTVM for the built-in job and you come up with the *THD Adaptor*, a distortion meter you can throw together in an hour for only $7.50 plus some parts from your junk box.

How It Works. The THD Adaptor schematic diagram is shown in Fig. 1. Note that it is simply a parallel-T network for filtering 1 kHz and that it includes R1, a terminating resistor for the amplifier. If a 1-kHz sine-waveform signal is passed through a distortion-free amplifier, only 1 kHz appears at the output. If you connect a VTVM to terminals C and D, the meter would indicate zero as the filter consisting of L1, C1, C2 and R2 would "block" the 1-kHz output before it got to the meter. If the amplifier caused distortion, in addition to the 1-kHz signal there would appear at the output many harmonics of the 1-kHz input—2 kHz, 3 kHz, 4 kHz, etc. (The greater the distortion the greater the harmonic output.) Since the filter would "block" the 1-kHz signal component, only the distortion components would appear at terminals C and D.

Since $\%THD = \frac{Vrms\ Harmonic}{Vrms\ Total\ Signal\ Voltage} \times 100$, the percent harmonic distortion of an amplifier equals the voltage indicated across C and D divided by the voltage across R1 times 100. (Bypass switch S1 allows the meter connected to C and D to indicate the total amplifier output voltage.)

Using the THD Adaptor. Let's look at a practical application. Assume that the 1-kHz test input signal causes the meter connected to C and D to indicate 10 volts when S1 is in the *bypass* or *B* position. With S1 in the *filter* or *F* position the meter indicates 1 volt. The amplifier's percent *THD* then equals $1/10 \times 100$ or 10%.

While we have chosen convenient numbers (1 and 10) for illustration, the actual

THD tester

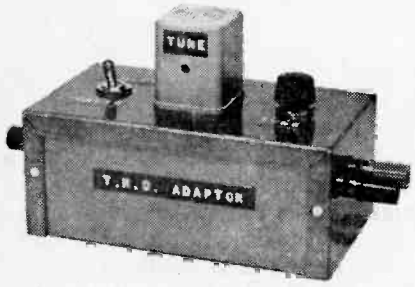
voltage readings could be anything. For example, an amplifier might deliver a total output voltage of 6 volts with a filtered voltage of 0.45. The *%THD* in this instance would be 0.45/6 × 100 or 7.5% *THD*.

While we have referred to using an AC-VTM, an ordinary VOM could be used as long as its impedance is at least 10 times the value of the amplifier's load impedance. An AC-VTVM would probably only be required when measuring voltages smaller than 0.5 Vrms (audio or AC-VTVMs go down to 1 millivolt full scale, while VOM's are generally limited to a bottom range of 1 or 3 volts.)

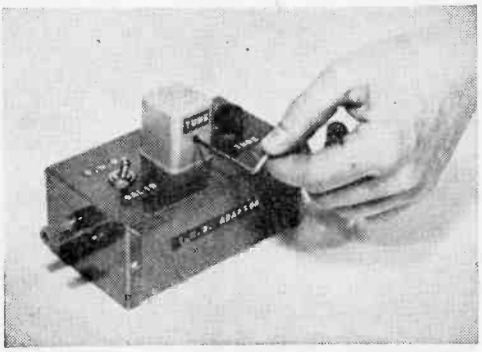
Building the THD Adaptor. The unit shown is built in an aluminum cabinet measuring approximately 2⅛ x 3 x 5¼ inches. The layout isn't critical and you can use any component arrangement you desire. Since some transistor amplifiers don't have a common output (grounded) connection, to avoid the possibility of short circuits with the resultant destruction of the output transistors, the *THD Adaptor's* case is "floating"—all input and output binding posts are insulated from the cabinet.

Resistor R1, the amplifier load, should have a power rating equal to at least twice the maximum power at which the amplifier will be tested. For example, if you plan to test at 10 watts output, R1 should be rated for 20 watts. Either a single resistor or a parallel wired group (as shown) can be used.

If you want to make the adaptor universal, substitute the switch-selected load circuit shown in Fig. 2. While 4-, 8-, and 16-ohm terminations are more or less standard, you can add any desired load value to the selector switch.



When laying out chassis box be sure to space 5-way binding posts ¾ inch to fit double-banana plugs used to connect most professionally-styled laboratory instruments.



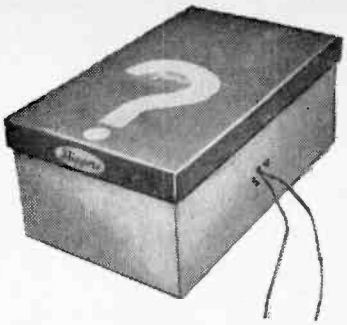
Adjustable inductor L1 is tuned for minimum output at 1 kHz—you can also tune generator to null frequency for making quick THD test.

Tuning Up. L1 is tuned via a small Allen screw in the side of its case. Connect terminals A and B to the amplifier and C and D to the AC voltmeter. Feed a 1-kHz signal through the amplifier—from a signal generator, pre-recorded tape, or phono record—and adjust L1 and R2 for minimum meter reading. L1 and R2's adjustment interact to a degree and it will be necessary to go back and forth several times. Since the tuning is extremely critical you probably will have to adjust the filter each time the adaptor is used.

Don't worry about getting an exact 1-kHz signal source as the filter tunes the range of 800 to 1200 Hz. You can tune either the inductor (L1) or the generator—whichever is easier. It won't really matter a lot if you use 990 Hz or 1010 Hz—this is 1%. And, under normal temperatures, the inductor shouldn't change much at all. So just tune for the null.

Making the measurement. Feed the test signal into the amplifier and adjust the amplifier for the desired power output. Set S1 to the B position and note the meter reading. Then set S1 to the F position and adjust L1 and R2 for minimum meter reading (a null). The *%THD* is equal to the *B-reading/F-reading* times 100. ■

Talking Shoe Box



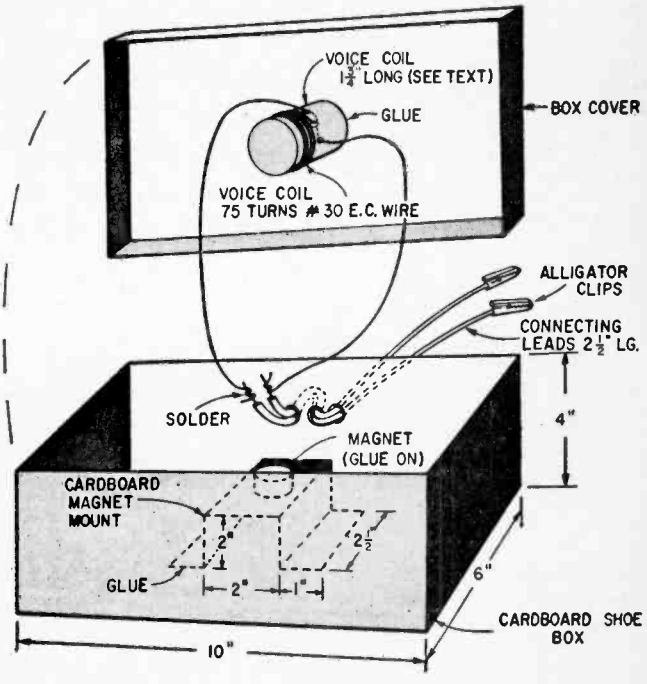
Dirt-cheap and ultra-simple, this weirdo does everything speakers do!

■ Here's a project that is exciting to build and informative; exciting because you construct it and informative because you see in operation a device that is basic to most all electronic reproducing equipment. *What is it?* It's a permanent-magnet (PM) speaker—one that operates on the same principle as the speaker in your transistor radio, or like those in a hi-fi set. We call this project the "Talking Shoe Box" speaker.

A cardboard shoe box serves as both the frame and cone. The cover of the box becomes the cone of the speaker. It vibrates in accordance with the currents that flow through a coil (called a voice coil) mounted on the inside of the cover. The vibrations of the cover compress and rarefy the surrounding air—putting sound waves in motion in exactly the same manner as a speaker does.

Making One. Perhaps the most important part of any PM speaker is the magnet itself. The magnet used was salvaged from a smaller speaker that had been discarded. Most electronics repair shops have one or two defective speakers around. Ask for a few defective units if you don't have any of your own. The magnet is removed from the speaker frame by giving it several light taps with a small hammer. Don't hit it too hard—each tap knocks out some of the magnetism.

The coil form used here measures a little more than 1-inch in diameter, but the size you use will depend on the magnet you have.



Shoe box acts as frame, its cover as cone of this novel speaker. Magnet can be salvaged from a discarded PM speaker, though more powerful assemblies can often be obtained from hobby supply houses.

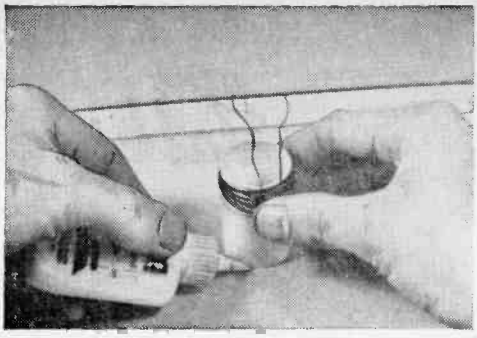
By Robert E. Kelland

Talking Shoe Box

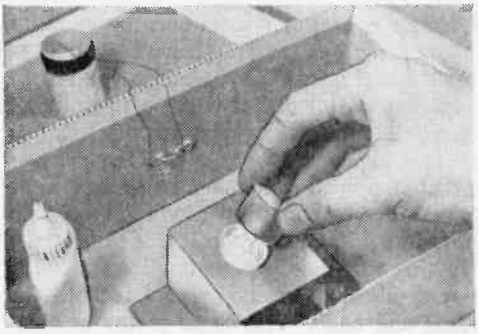
The coil form must fit over the magnet with a comfortable clearance. The coil consists of about 75 turns of AWG-30 enamel-covered copper wire. The wire is scramble wound around one end of the form. Cut two slots (or make small holes) for the beginning and end of the wire. A touch of all-purpose cement will keep the coil from unwinding. The form is glued to the *exact center* of the underside of the box cover. Use diagonal lines from corner to corner to find the center point.

The magnet mount is made from an 8" x 2½" piece of stiff cardboard but there is no reason you can't use a block of wood cut to size. After forming, the magnet mount is cemented to the inside bottom of the box —the magnet is cemented to the mount. It is important that you center the magnet exactly, otherwise the coil form will rub against the magnet and cause poor operation. Use extreme care. Add a few corner braces so the cardboard magnet mount will not sway.

Finish the "Talking Shoe-Box" speaker by scraping the enamel insulation off the free ends of the voice coil wire, and then solder two lengths of hookup wire to both ends. Weave the hookup wire through three small holes in the side of the box, and attach alligator clips to both ends.



Voice-coil form should be glued to the exact center of the inside of the shoe-box cover.



Cardboard mount supports carefully-positioned permanent magnet in bottom of box.

PARTS LIST

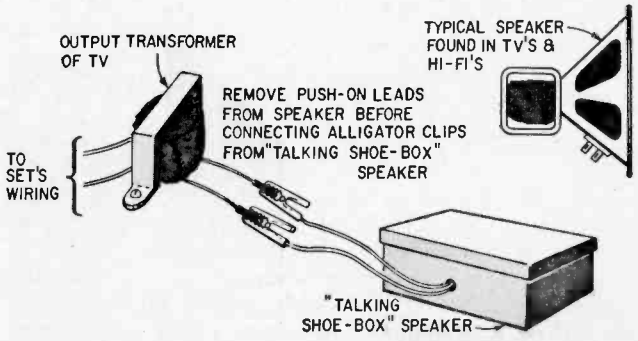
1—Small permanent magnet (see text)
1—Cardboard tube 1 to 1¼-inch dia. x 1¾ inch long
1—Slippers or shoe box—10 x 6 x 4 inches
20'—AWG #30 enamel-covered wire
2—Alligator clips
Misc.—Scrap cardboard, hookup wire, all-purpose cement, solder, etc.

Estimated cost: 50 cents
Construction time: 1 hour

Connection. To use the "Talking Shoe Box" speaker you must have access to the speaker terminals in a radio, TV or phonograph. A TV set is preferable, because the connections to the set's speaker are generally of the push-on type and are easily removed. Disconnect the speaker from the set before connecting up your home-made one.

To protect yourself from a possibly dangerous electrical shock, pull the line cord plug from the wall outlet before making any

(Continued on page 124)



TV sound will be heard over shoe-box speaker when unit is connected as shown. When interchanging speakers, be certain TV set is turned off unless one speaker or the other is actually in the circuit.

SPACE PUPPETS with Electronic Strings

Taking a spin in space someday may prove no more formidable than jetting cross-continent or around the world. But until that day arrives, most of us will happily settle for the next best thing—man-made monsters that do our ether-jaunting for us.

By K. C. Kirkbride

■ Ever think you would one day see space as a satellite sees it? Travel round the earth and peer down at land, seas and clouds as an astronaut does? Turn your head and view the moon, Mars and stars? Stand on a space platform, report weather conditions, survey space dangers, even repair craft on their way to far planets?

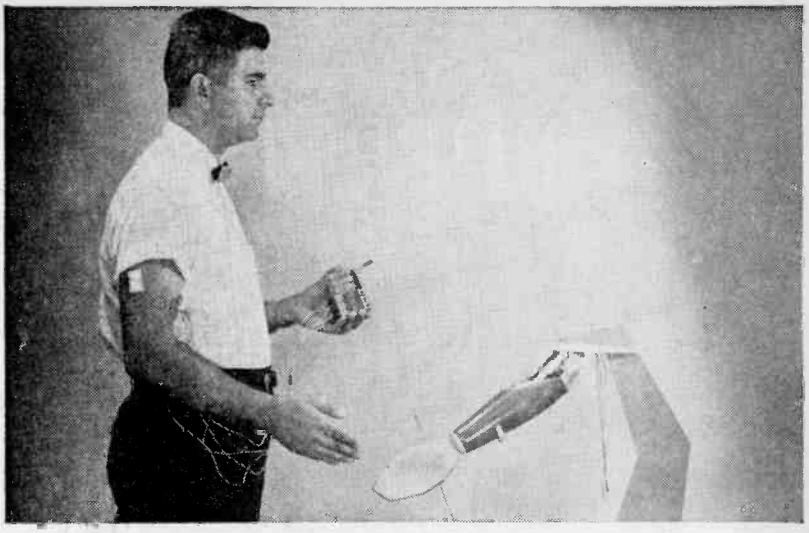
You may do just that and not too far in the future. And you won't have to spend even one day in *astronaut* or *Superman* training, for you may travel through space as you sit in your living room, watching your own non-orbiting television screen.

For, according to William E. Bradley of the Institute of Defense Analysis, in Arlington, Virginia, we may one day soon put telepuppets in space. These would be mechanical "men" strung to earth men by radio-wave strings, puppets that could survey weather, relay information, perform tasks too risky for human man to venture.

And most dramatic of all, the future telepuppet will see space through television-camera eyes, photograph the "bright lights" and 'opening nights" of the space show, relay instant live scenes to earth.

On Earth. A human operator on earth would sit before a television tube attached to his helmeted head. On his hands he would wear electrically-wired gloves. The scenes on the screen before him would be the same pic-

SPACE PUPPETS



Remote electrical signals from living human muscles control this artificial arm developed by Philco. Here, arm simulates handshake.

tured on a distant screen in a space satellite.

And when he tilts his head up, down, right, left, the distant space camera would also tilt, photograph the scene before it much as a movie-camera "shoots" sequences on earth. But transmission from satellite would be so instantaneous the operator would feel he too was in space seeing the scenes the camera "sees" at the moment the camera sees them. And this "instant" feeling would be relayed to home viewers so they too would feel they were in space.

As the electrically-wired hands of the operator moved, the counterpart "hands" of the puppet twenty-five hundred miles in space would move, adjust or manipulate machinery or perform missions the earth man did at the same time.

No Lag. And all with hardly a time-lag, for radio waves, transmitted to the satellite from the operator's helmet would not only focus the camera operating in space but would pull the strings of puppet man, "telling" him what to do.

Sound fantastic? Not when you jigsaw developments in bio-chemistry, atomic energy, remote control radio and closed circuit television. For a telepuppet would draw his intricate know-how from research done in a variety of areas, research to aid war-time amputees, nuclear reactor study, even the search to improve visibility of aircraft.

First. When Wor'd War Two ended, we had more amputees than at any other time in the nation's history. Something had to be done to make life livable for tragically-maimed persons left without one arm, two arms, sometimes no legs. The old peg leg belonged in the pirate movie, and it was an absolute "must" we find sophisticated appliances, and find them fast.

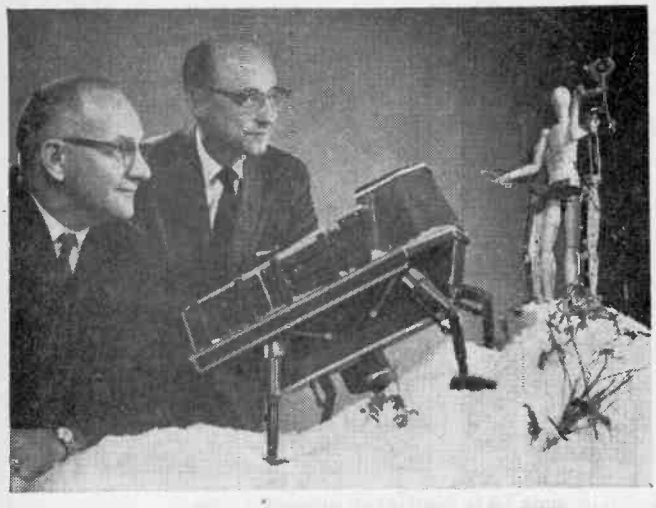
Seeking to develop new artificial limbs Philco Corporation engineers studied muscle signals as transmitted from the human brain, along the arm, to the hand, the signals that make fingers move, with the thought they might catch these signals before they reached the finger, intercept them, and power mechanical arms and hands.

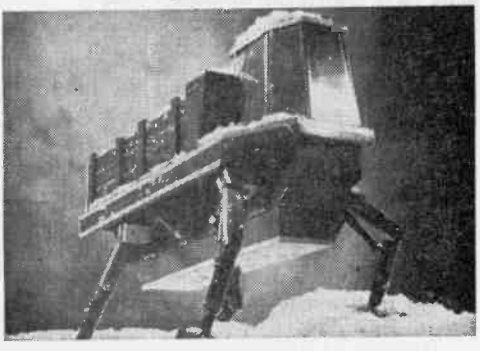
Signals are picked up on the skin's surface above motor points of the muscle by silver electrodes which are connected to a micro-miniature control circuit package the size of a king-size cigarette pack.

Weak Signals. This control box amplifies the weak bio signals and treats them electronically by signal processing, permitting the circuitry to choose between signal patterns associated with motions desired and the signals identified with activity not wanted. This discrimination guides the arm, prompts it to move as the patient wants it to move.

To work out the discriminatory process built into the pack, Philco built a myocoder to preprocess and digitize signals from muscular electricity for computer analysis. The computer then classified and separated patterns and identified signals with specific activity.

Walter Wasserman, manager of Philco's Bio-Cybernetics Laboratory at Willow Grove, Pennsylvania, says, "Many control signals can be generated simultaneously by simple conscious thought and reflection." It





A "mechanical muscles" machine and a four-legged "walking truck" (shown here in prototype form) are among the possible space puppets under study at the General Electric Research and Development Center. The mechanical muscles machine (above) will enable the average man to lift a 1500-lb load without exerting more than a small fraction of this force; the walking truck (left), being built for the U.S. Army, will carry cargo over terrain that is clearly "off limits" to humans and other living things.

takes this analysis and built-in guidance to pinpoint the motion needed out of the complex signal-processing of the human nervous system.

After analyzing this signal system, designing built-in discrimination into a control package, the Philco engineers designed an artificial arm that could bend at the elbow, and turn its hand, all by remote electrical signals from living, moving muscles.

When the arm was first demonstrated, an engineer wearing silver electrodes on his arm muscles stood on one side of a room, moved his elbow and turned his head. On the far side of the room, a model of the artificial arm mimic'd exactly the actions of the live engineer.

Next Step. To put our future telepuppet together we will need add these bio-electronic advances to master-slave techniques developed in the atomic energy field. Nuclear energy presented the problem of a hostile environment man could only control by developing machine extensions of his own faculties so that machines rather than men could pick up and handle dangerous materials.

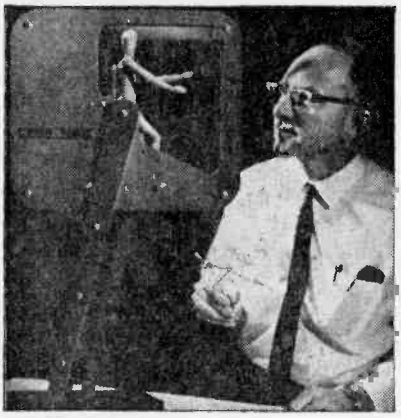
Master-slave hands built to reach inside reactors, combined with bio-electronic artificial arm technology, soon fathered a whole series of new machines. Man-machine manipulators ably mimic a man with such ease the man operating the machine can ignore his imitating machine, and concentrate on the task at hand.

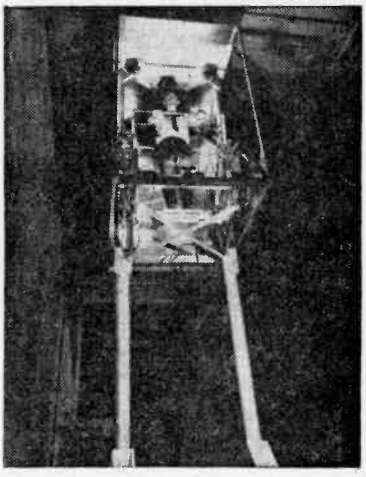
Handy Fellow. One of the first, one named Handyman, built by General Electric, consisted mainly of a pair of mechanical arms and hands, fashioned almost to human form, and connected electrically to a harness worn by the operator.

While the mechanical appartus mimic'd its human operator, it fed back information on force and position so the operator could *feel* what the machine felt. In fact, this machine was so coupled to the operator's human sensory and motor system by feedback integration that electric signals caused the machine arm and hand to carry out precisely the motions of its human operator.

Walking Now. Next came a number of

SPACE PUPPETS





Mechanical giant towering some 18 ft. high is still another device General Electric engineers hope to perfect. Preliminary model places a human oprator inside, but machine could be a pure robot.

man-machine manipulators including a "walking" machine, the "Pedipulator," controlled by human brain and nervous system with the same feedback precision of Handyman: a "walking truck" and Hardiman, a set of "mechanical muscles" that, attached to a human operator, could shame Tarzan himself when it came to weight-lifting.

While these amazing machines have so far been tested only in earth environment, advanced engineers feel they will strut their stuff every bit as efficiently in space. For bio-muscular signals have already proved remote response to radio waves. Witness the simplified test of the artificial arm on the far side of the room responding to its human counterpart.

Come See Now. But to build a true telepuppet the engineers realized they would have to add sight to make their puppet truly human. For that, they drew again on Philco research, but this time seeking out engineers who had been trying to extend the visibility of certain types of aircraft.

How could they provide a pilot with synthetic visual displacement? That had been their first problem. They thought of one way, a remote television camera could do it, if they could find a camera small enough.

With no small commercial cameras with the proper resolution available at the time, they built their own. A very small camera, one with a grainless screen and a small electronic gun, resulted in a tube six inches long with the high resolution required.

A New Cap. Next they put the tube on the operator's head, mounted it like a miner's lamp and folded up a binocular optical system so the operator could, when he put on the helmet carrying the tube, see the scene on the screen focused in front of him.

They then servo'd the man's head by Selsyn motors to a distant television camera. And by this means were able to direct the camera by merely turning the operator's head. When he looked up, down, left or right, he felt he was "on location" as he could see exactly the scenes the camera saw with a resolution of one thousand lines.

To adapt this to space, engineers would "string" the space puppet camera to its earth operator by radio waves, so the earth operator would "see" through the counterpart camera photographing in space. And William E. Bradley thinks this camera mated with the man-machine manipulators, guided by remote radio "strings," will give us our telepuppets in space.

Such puppets will perform tasks man can't. Such puppets will be cheaper to feed than man, and will photograph "instant" space spectaculars that today only astronauts and the satellites see. Then we will sit in our living rooms, see the greatest show in space, as only space itself can produce it.

And we may even look toward the day when we will direct maneuvers in space by the move of an arm or a hand from side to side and up and down, with the grace of a symphony conductor on earth. ■

RCA TYPE WR-52A FM-Stereo Signal Simulator

■ It wasn't too long ago that an experienced technician could align many FM receivers and tuners by "ear". And certainly, most FM receivers could be properly aligned with the least expensive of signal generators. But stereo transmission has completely eliminated the possibility of "shortcut" alignment.

Stereo FM receivers are highly critical devices, and there is no longer such a thing as performing a *good* alignment by ear. Just the slightest alignment error and there's no more stereo—it comes out mono—or if you do get stereo there's *very poor* channel separation.

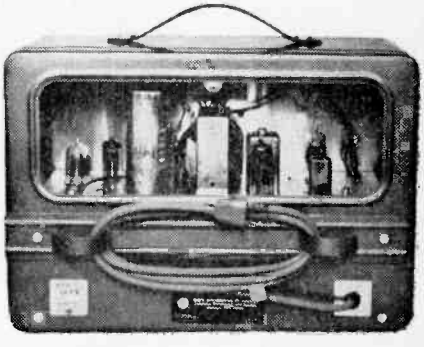
Proper FM stereo receiver alignment requires specially designed precision test gear; in fact, it requires a signal generator capable of simulating a transmitted stereo signal. Just such an item is RCA's WR-52A Stereo FM Signal Simulator.

What It Is. The WR-52A is basically two signal generators in a single cabinet. Firstly, it is a basic FM sweep generator used for alignment of the common, or *mono*, receiver circuits. The generator RF output frequency is 100 MHz (mc.); to allow for avoiding interference to the test signal caused by reception of a station near 100 MHz, the WR-52A's output frequency can be adjusted slightly above and below 100 MHz. A built-in sweep generator provides a sweep signal of up to 750 kHz (kc.) for alignment of the receiver's IF transformers and the discriminator. (A marker generator is not part of the WR-52A; the user can utilize any signal generator for this purpose.)

What It Has. The WR-52A's stereo test circuits are more than just another signal generator for in a sense they simulate an actual stereo transmission. Starting at the bottom there is an AF oscillator providing 400 Hz, 1000 Hz and 5 kHz modulation of the FM signal; the signals are also available as an AF output for signal tracing a receiver's audio circuits. If desired, an external AF signal generator can be used for the FM signal modulation.

Both a simulated FM-stereo RF signal is available, for checking through the entire receiver, and a composite signal which represents just the stereo modulation (used for testing only the receiver's multiplex circuits). The FM-stereo signals are available as "Stereo Left" and "Stereo Right."

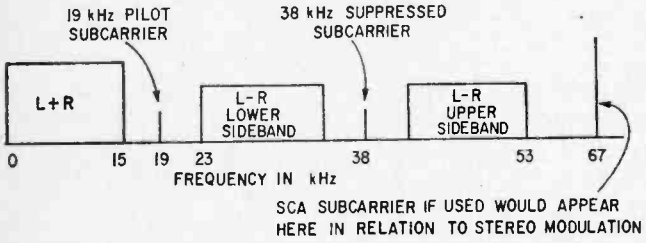
To insure proper alignment the stereo modulation can be adjusted to 100% (75 kHz deviation) by simply adjusting the modulation level until a built-in modulation



Cable bracket mounted on rear of generator provides convenient storage for unit's two output cables as well as the AC line cord.

(deviation) meter indicates 75 kHz deviation. Similarly, the 19 kHz pilot signal is set by adjusting its level to a reference mark on the meter scale representing 10% of the total stereo waveform.

Since stereo reception depends critically on the amplitude and phase of the 19 kHz pilot signal, and the 38 kHz signal which was the initial carrier frequency for the L-R multiplex modulation, the WR-52A is provided with a built-in check of it's own 19 kHz pilot signal. (After all, if your generator is defective and you don't know about it the receiver alignment will be a lot less than perfect.) This internal test signal is controlled by the function switch, and proper adjustment of the 19 kHz pilot signal is a minor service procedure.



Complex nature of FM-stereo transmissions is quite evident from cross-section of FM-station's 75-kHz bandwidth. SCA modulation, where used, covers 60 to 74-kHz region.

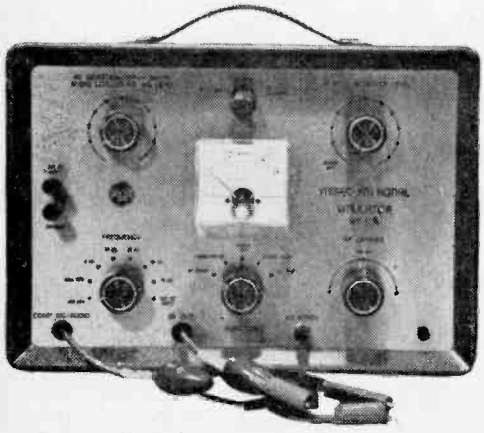
SCA Traps. During both mono and stereo FM transmissions some stations also broadcast an SCA (subsidiary carrier assignment) signal which is multiplexed with the main carrier signal. The SCA sub-carrier's center frequency is 67 kHz with modulation extending from 60 kHz to 74 kHz. This SCA signal must be removed with traps as it would interfere with proper operation of the stereo detector circuits. Receiver multiplex detectors have adjustable SCA traps and the WR-52A provides a 67 kHz output for adjustment of these traps. Since some multiplex detectors also employ 72 kHz traps the WR-52A also provides a 72 kHz output signal.

Easy To Use. While the WR-52A provides many test signals its operation is rather easy and quickly learned, as the controls are marked very clearly. And though the instruction book is rather thin by contemporary standards (where the manual for a VOM could run 50 pages), RCA was very thorough. Illustrated alignment procedure for both the *matrix-type* and *switching bridge* detectors are given; however, since there are many variations of multiplex detectors the receiver manufacturer's recommendations should be followed. The RCA illustrations in the manual provide the basic understanding of the alignment procedures everyone should know.

Similarly, the service section of the RCA manual is short but it is *complete* as to both checkout and adjustment of all generator circuits—it is not necessary to return the WR-52A to a service lab to have it checked or adjusted.

One of the most valuable features of the WR-52A is a trap door which simplifies servicing. Tubes, 19-kHz crystal, and adjustments all are readily accessible through a door at the rear of the cabinet.

While a stereo FM signal simulator is not needed in some experimenters' workshops, it is certainly a *must have* item for anyone doing service or alignment work on stereo FM receivers—one just can't do a proper alignment or checkout without it. In fact, it is a wise investment for experimenters breaking into the hi-fi service business. The RCA WR-52A Stereo FM Signal Simulator is priced at $250.00. Prices may be slightly higher in the West. Additional information is available at your local Authorized RCA Test Equipment Distributor or by writing direct to RCA Electronic Components and Devices, Dept. 451, Harrison, N. J. 07029. ■



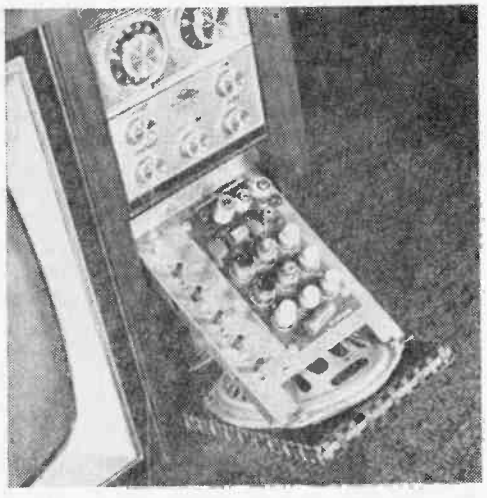
All controls are attractively grouped on front panel of the WR-52A. Meter in center of panel indicates modulation level.

RADIO-TV EXPERIMENTER LAB CHECK

HEATHKIT MODEL GR-25
25-in. Rectangular
Color TV Receiver

What makes the real difference between a good and a poor *color television* receiver? No, *a good picture* is not the answer as most modern color sets deliver an acceptable color picture. The real difference between what the consumer considers a good or bad color set is the number of service calls required to keep it going and the charges for those calls. Over the life of a color set, repair and service call costs can exceed $200. But, build the color set yourself and you will save several hundred dollars in repairs plus wind up with better color as you'll align the color reception to what *you*—not a serviceman—thinks is good to look at.

No, we haven't flipped our tri-color CRT, or our shadow mask either. If you build Heathkit's GR-25 Color TV Set you can do your own servicing because, firstly, the very process of building the kit will give you the confidence to do your own color alignment, and secondly, unlike other color receivers the Heath GR-25 has its own built-in *user oriented* service and alignment instructions. Absolutely no instruments are required to align the Heath; any test circuit you'll need is built into the GR-25.



Most-used controls appear at top right of set. Tilting special speaker panel downward exposes dynamic convergence controls.

For Example. Suppose a factory wired color receiver loses the color adjustments, or the set is moved to a new location and requires a degaussing. Obviously, this usually means a service call. But if you have a GR-25 you just lean on the speaker panel and the color dynamic convergence controls swing down in front of the set. What happens if you need a dot generator? Simple, you throw a switch on the back of the GR-25 and you get a dot pattern. Gun killers?—they're built in. As for degaussing, you do that with the supplied degausser when you build the kit so there's no big deal in doing it again. An automatic CRT degausser is built-in and works with the on-off switch.

It's Easy to Build. The actual kit construction is in a sense a *minor* assembly as the major components are supplied pre-wired—what's left for the user is the point to point wiring between the sub-assemblies and the non-critical circuitry. The combination VHF-UHF front-end is supplied pre-wired and pre-aligned. Similarly, the IF amplifiers are supplied pre-wired and pre-aligned on a printed circuit board. The user assembles the color, sound-sync, and convergence printed circuit boards. Wiring between the circuits is *via* a factory supplied wiring harness. Total construction time runs about 25 hours.

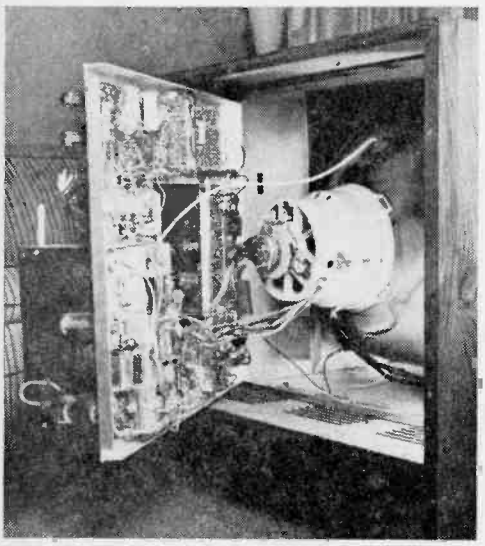
Color. When construction is completed you have an operating color receiver, just like your neighbors who have purchased theirs. The big difference is that *you* are able to adjust *your* receiver for optimum color reception. To assist you in color adjustment

the Heath service procedure is illustrated with 4-color pictures that show you exactly the results to be obtained.

Optimum color adjustment starts with the DC convergence adjustments (static alignment), and Heath's *service extras* start here. The static color gun adjustments snap into the plastic yoke and they are *knob* controlled; instead of pushing magnets around until the central dots on the screen turn white you simply *rotate* four knobs (two required for blue). The color-circuit board directly above the CRT has the dot generator on-off switch and the three gun-killers (no need to cut into the CRT wiring to kill any of the color guns for adjustment).

The dynamic convergence controls are mounted on a sub-panel behind the speaker. When the speaker is swung forward—it is hinged on the bottom—the dynamic convergence control panel swings into the position formerly occupied by the speaker. The panel contains 12 controls which adjust for convergence at the top, bottom and sides of the CRT in both the horizontal and vertical direction—central convergence is the original DC (static) adjustments. Once the dynamic convergence adjustments are made overall convergence is notably good.

To correct for pincushion distortion, when the top, bottom and sides of the picture squeeze together on the *H* and *V* central axis, there is a *user adjusted* pincushion control that is used in conjunction with the dot generator. The controls are common to all rectangular CRT color TV receivers.



Entire chassis on Heath GR-25 is hinged for convenient servicing. Note metal lining inside cabinet which serves as shield for CRT.

Final adjustment consists of adjusting the standard front panel *TINT* and *COLOR* controls, and the color burst phase transformer for normal flesh tones. A switch to a black and white picture indicates if the *color-killer control* needs adjustment—as evidenced by colored confetti in the picture.

And that's it. As you can see, not only are the GR-25's adjustments specifically oriented towards the non-technical constructor, but the builder, even without a technical background becomes familiar with color set adjustments and can routinely tackle color circuit re-alignment any time he is not satisfied with the color reception. At no time is it necessary for the builder to make a technical decision as far as color alignment is concerned; the built-in dot generator takes care of the technical requirements and the user makes simple mechanical adjustments whose effects can be seen directly on the CRT.

Service. Of course, it is possible for a breakdown to occur, but 99% of possible breakdowns can be handled by the builder—thanks in large measure to a very thorough service manual that indicates possible defects in 4-color photographs. In addition, there are two *signal flow* diagrams; the first showing the signal flow through individual circuits and the second indicating graphically the tubes, coils and transformers through which the individual signals pass.

We have concentrated on the service aspects of the Heath rectangular-CRT color receiver because color TV has meant a return to the service conditions of 1946-1947, when virtually everyone purchased a *black-&-white* receiver with a service contract costing in excess of $40. Whereas *black-&-white* TV has been improved to the point where many consumers can service their own set (it's generally a tube change), just a tube change or a minor component change can mean *complete servicing* for a color receiver. Therefore, the user who can service and adjust his own color receiver saves considerable monies over the life of the set as well as *always* enjoying excellent color reception.

Heath's 25-inch rectangular color TV kit —complete for wall or custom cabinet mounting—costs only $469.95. Three optional cabinet styles are also available. For additional information, specifications and prices on the cabinets and other TV kits write to The Heath Company, Dept. EB, Benton Harbor, Michigan 49023.

ERECTING A TV TOWER

by Homer L. Davidson

■ You don't have to be an expert to install your own TV tower. If you have a few ground tools around, such as a spade or shovel, and a strong back you are in business. A little elbow grease is all that is needed.

The TV tower has many advantages over the TV antenna pole installation on top of the house. One of the greatest assets is to get away from the wind vibration, in which the house acts as a sound board. With tight guy wires, running from the antenna mast and anchored to the house, vibration of the antenna itself, will play like a bass guitar. This noise on windy days can and will drive a person out of his mind, or make you want to push the panic button several times.

Also, the antenna on top of the house looks unsightly compared to a tower job. The antenna mast and foot mount corrodes and rusts out leaving brown rust spots on the new shingles. In level terrain the wind plays havoc with the guy wires, and if one guy wire breaks, as in many cases, down comes the antenna, mast and all. You might wind up with a damaged roof, and, of course, the antenna itself will probably be mangled and have to be replaced. And further, in parts of the country where ice and snow is a problem, it is much easier to climb a tower to fix the antenna or broken leadin.

Most TV tower installation between 20 and 40 feet do not need separate guy wires; these towers will stand alone. The cost of a TV tower will vary from $50.00 to $125.00 more than a roof top installation. Of course the exact amount will depend on the height of the TV tower.

Installing the Tower Base. First, pick out a good spot where the tower will not be in the way when walking or mowing the lawn. Install the tower close to the TV set or outlet.

ERECTING A TV TOWER

To plant tower you'll have to dig a hole first (left). Make it 40-inches or so deep—and some 2-feet square. If the soil is loose make base larger. Soil around new homes should be compacted or self-supporting tower may settle and tilt.

Do your digging in the cool weather and you won't be likely to have heat stroke (above). Just be sure it isn't freezing when you're ready to pour the concrete.

Work concrete into the hole—bubbles will only make foundation weak. Any looseness will increase the possibility of tower swaying and will reduce its ability to withstand bad storms, winds.

Spirit level is needed to get tower up straight. Prop it securely until concrete hardens.

If you have a small cement mixer don't wait too long between batches of concrete. It must be mixed into one solid mass. Keeping mixer close to hole eliminates need for barrowing.

You can just fill hole to within an inch or two of the soil's surface and cover with sod. Some prefer to place form around base for squared-off masonry top.

Keep away from flower beds and small shrubs. Most towers are mounted at the rear of the house, out of the way. You should never have over 100 feet of leadin wire overall. Do not mount it where the tower will block the view of a window. Locate a spot near the house where the tower will clear the eaves with a space of from 8 to 12 inches.

After you have found the best location dig a hole about 40 inches deep and 2 feet across. The diameter of the hole should vary according to the ground soil. If the soil is loose, like that around a new home, the sides will tumble in at the top. In hard firm soil a clean hole can be dug straight down. If you or your neighbor has a post hole auger handy, start first with this at the center of the hole. Auger down a couple of feet and spade off the remainder of the dirt.

When you have dug to the required depth, you may want to scale back at the bottom. In other words, flare out the bottom of the hole. When the cement is poured into this hole we have added strength to the tower base. Keep the loose dirt picked up. Either place it in a wheel barrow and haul it away or lay down heavy paper so the dirt isn't tracked all over. If you have a good stand of green grass growing, this is a must. You will need some dirt to go on top of the cement base if you want grass growing around the tower. Do not haul it all away. You may want to fill around the house, flower beds, or low spots in the lawn with the extra

ERECTING A TV TOWER

Concrete must be firmly set before you start adding the other sections to the section set in the concrete base.

Make sure concrete has cured completely before attempting to climb or work on mast. Poorly set concrete will loosen and crumble.

loose dirt you will have left over.

If the concrete base is to support a fifty foot tower or higher, a larger and deeper base should be used. A 50 foot tower with a house bracket can be supported with a 3½ foot by 18 inch square hole. If the tower is higher, use a 2 foot square cement base.

Before the tower is placed in the hole pour in about three inches of rock gravel. Set the bottom section of the tower into the hole. Be sure that the small tapered end of the tower is up. If the tower section bolts are found in one leg, be sure to remove them before placing into the ground. Many of the new galvanized towers have a protection plug in one leg in which the mounting bolts are packaged.

Now place the tower in the hole and throw a couple of inches of gravel around the three legs. This allows moisture to drain into the gravel. In parts of the country where water will seep into the tower legs and freeze in the winter months the tower legs will split open. Splitting of the tower base will weaken the tower and may come down under strong winds. This may take years for the water to build up in the legs of the tower, but it has happened.

By placing the bottom of the tower down into the concrete a strong base is made. You can buy three-foot tower legs to go down into the concrete but a weakened bolt joint is just above the cement base. You can gain back the forty inches of sunken tower by placing

Orient the antennas—the last step. Double-check all fastenings before you start down to ground.

Dress lead-in and attach stand-offs as you climb down mast.

Completely assemble the antennas on the ground and hoist the completed units to top of tower. If you're using a rotor mount that first.

a piece of antenna mast above the top tower section, if needed.

If you are going to mix your own cement with a small cement mixer use a 5, 3, 1 mixture. Use five parts rock to three parts sand to one part cement. These may be shoveled in or first mixed in a wooden box. It is quite expensive to have a small load of cement hauled in by a commercial cement company. You may want to check the prices first as these vary in different localities. In case there isn't a cement mixer in the neighborhood, rent one for a few dollars from a rent-all establishment.

Large rock or used brick may be used as filler. But, be sure and level up the tower after each cement mixer load. Check the level on each leg of the tower to see if it is perfectly straight. This bottom base section must be perfectly perpendicular so the tower will not lean in any direction. Always depend upon the level or even a plumb line hung through the center of the section from the top.

It will take from four to six loads of average cement mixture to fill this type of hole. If you plan on growing grass above the tower base leave six inches for dirt fill. You may want to have a square cement base above the ground. Simply nail four pieces of 1 x 4 together and level above the ground, around the tower. Pour the cement level with the top of the boards and trowel down the top surface.

After each cement load, push the cement around in the hole. If the cement is mixed quite wet, the mixture will pour and level much easier. The hole may be a little irregular, but fill it up with the concrete mixture.

Leave the concrete set up for at least two days before attempting to work on the tower. It is best to cover the top of the cement base with heavy cardboard, or paper, while ripening and setting up. This will keep rain, snow, or foreign objects from falling in on top of the fresh cement. Have you given that level a final check? Do it now; check the level of the bottom section several times during the setting up period.

On Upward. When the tower cement base has set up, you can now place the next ten foot section in place. If a reamer, or round file, is handy, clean out the sleeve of the enlarged end of the metal tower. A ten or twelve inch tapered punch will help to align up the tower ends.

One person can lift the second ten foot section of tower into place if need be. But, two men can do it a lot faster and safer. You can lift this section in place from the ground. You may have to tug on the last leg to get it to align up and then pull down on the tower. Line up the holes with the tapered punch. Insert the mounting bolts. Leave the nut and threaded end of the bolt toward the inside of the tower.

If the bolts are hammered through the tower sections, the threads will become stripped. Use the punch to align the sections so the bolt will pass easily through the legs. Do not drill the holes larger. Be sure to tighten all leg bolts until they partially flatten the sleeves, causing the sleeves to actually grip the legs inside. Upon tightening the

ERECTING A TV TOWER

bolts, there should be no vertical movement between tower section at the joints when working on the tower.

You do not need any special hoists, or gadgets to lift the tower sections in place. Simply put your arm through the second round section, from the top, and climb up the tower with the added section on your shoulder. The third section may be lifted in place with one person standing on the house and the other person on the tower. If not, one should climb to the top, stick one leg down through tower and out on the second brace. You cannot fall out of this position. A climbing belt is also useful, but not necessary when working on the TV tower.

While one person is in this position another can bring the tower section up the tower. Don't worry about the tower holding the two of you; it will hold up several people. The person in the tower can raise it and balance the tower while the other fits the sections together. Each section should be bolted before another section is raised in place.

The top tower section has a large piece of pipe for the antenna mast to stick down through. If the antenna is to be in a fixed position a set screw is located in the mast housing. A rotator may be mounted on top of this pipe and the antenna above it. You can install the rotator inside of the top section. There are rotator mounts for this type of installation.

If the rotator is to be mounted at the tip of the tower, fasten the leadin wire to the correct terminals before mounting. Now mount the rotator in place and tape the rotator cable to one leg of the TV tower. The antenna should be folded out and leadin cable added to the antenna terminals. Wrap these terminals with friction tape and place a mast standoff within six inches of this antenna connection.

Carry the antenna up the tower and swing in place. Tighten the antenna brackets and seek the right direction for the fixed antenna. If it is to be mounted on a rotator check and see if the rotator is a north to north direction rotator. Point the antenna north and bolt in place. Be sure and face the correct end of the antenna in the northerly direction. On yaggi or flat type antennas, the shorter end always points toward the front of the antenna, or towards the TV station.

Leave a loop of wire so the rotator will turn freely and not bind as the antenna is being turned. Place an antenna mast standoff above and below this loop. Space the antenna mast standoffs every four feet down one leg of the TV tower. Do not clamp this mast strap over the rotator cable as it can, when tightened, ground out the rotator cable to the TV tower.

Be sure to keep the antenna standoffs in line down the tower. For local UHF reception, place the UHF antenna below the rotator or the large VHF antenna. If there are several UHF stations in the area, mount the antenna above the VHF antenna on the TV rotator.

Cleaning Up. Clean up the area around the base of the TV tower. If the cement mixture has splattered on the legs of the tower, let dry, and then wipe off. Protect the brick or house siding from cement splattering with cardboard or heavy construction paper.

Remove any temporary guy wires, if used. Check the direction of the TV antenna. You should zero the antenna in with someone watching the TV reception on a fixed position.

You may want to use a house bracket and extend the tower another ten or twenty feet. These brackets come in adjustable lengths and lag to the side of the house. Most towers should not be mounted more than 30 feet above the house bracket. You may go up to greater heights by guying the TV tower. Fasten a set of three guys on every twenty feet of tower. ■

TOWER MANUFACTURERS

E-Z Way Towers, Inc.
5901 E. Broadway, Tampa, Fla.
Rohn Mfg. Co.
P.O. Box 2000, Peoria, Ill.
Tri-Ex Tower Corp.
7182 Rasmussen Ave., Visalio, Calif.
Vesto Co., Inc.
20th & Clay, N. Kansas City, Mo.
Tristao Tower Co.
415 East 5th Street, Hanford, Calif.
Aermotor Towers
Broken Arrow, Oklahoma 74012

It's OK with WDDD for ligit stations to broadcast on 1200 kc., but when some other outlaw muscles in on the same freq, then it's . . . .

One Too Many Pirates

by C. M. Stanbury II

■ Bill Doggit worked into the last few bars of "Honkey Tonk" and I prepared my best announcing voice nice and deep. Behind me, April tuned up her guitar. As Doggit hit his last wild note, I raised one hand and April hushed up. I switched on my mike, "This is WDDD, the swinging voice at 1200 on your dial, covering the county like a blanket, man. Right up tight." I paused for breath.

April fiddled with her guitar and accidently struck a chord. I gave her a dirty look.

"This is your ding-dong daddy from Michigantown, Paul Arrowood, broadcasting from Studio number 4, 3000 Illinois Avenue." It was a fictitious address complete with vacant lot. "Stay tuned in for just a few minutes and WDDD will bring you an exclusive—Folk Spotlight on Miss April West." I cut my mike, switched the turntable back into the circuit, and its automatic record changer brought forth Bob Dylan. I looked at April. "Dylan's a rough act to follow, honey."

She shrugged. "Should put everyone in the mood." April sang along with *"Times They Are a Changing."*

WDDD was a foolproof operation. We used the transmitter of Frontier University's carrier-current station WRFU 600 kHz (kc), but with the power of its 1200 kHz harmonic boosted and a good radiating antenna added. Even if the FCC should move in, only thing they'd catch would be Frontier U's own station WRFU, which specialized in the classics and basketball.

Dylan had reached "Oxfordtown."

April nodded, brushed a strand of hair from her eyes, raven black and hanging loose. "Hey, are you sure the channel is clear?"

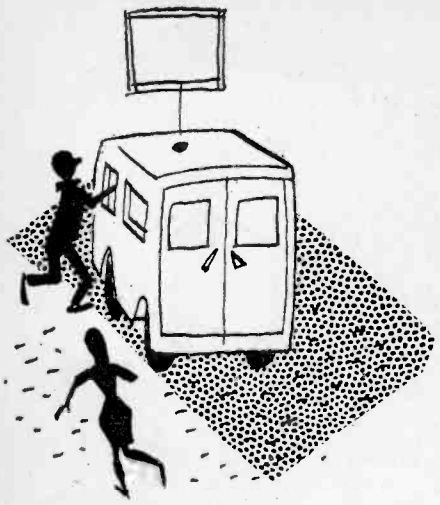
"Nearest station is San Antonio, Texas."

"I heard someone on yesterday morning." Softly, she moved her shoulder in time with the music.

"Must have been WRFU."

"With Lawrence Welk?"

"What do you want me to do? Turn the



station off and listen?"

April strummed her guitar. "Yes, that's what I want you to do."

I considered it. Like until April knew yours truly had his own radio station, and a clear channel, I couldn't get to first base with all that long, lovely hair. "Okay, I'll check but it'll have to be fast or we'll lose our audience." I cut Dylan, then the transmitter. Switched on my Zenith Super Navigator and located 1200 kHz.

We both did a double take. There was another station on the channel, complete with antique version of "Sweet Sixteen." I checked to make sure I had the right frequency. I did!

April tapped her guitar and glared at the receiver.

Then yon rival announcer came through loud and clear. "This is station ASCM, the American Society for Clean Music, dedicated to stamping out rock'n roll, rhythm'n blues, jazz and all folk music, transmitting from our new crystaline studios at 3000 Illinois Avenue."

I said something to myself which I hoped April didn't catch. ASCM had not only swiped WDDD's frequency but our phony address too.

They started on "Ah, Sweet Mystery of Life." April put down her guitar, came to the receiver and nulled them with its direction finder. The thing zeroed in on Illinois Avenue. April stood with hands on her hips. "What are you going to do about it?"

"We could just wait until they go off the air."

She shook her head and set the mouth. "Or we could take my Zenith out to the car and hunt ASCM down."

"You certainly could." April picked up the receiver and headed for my 1949 Ford.

I followed with the keys. She sat in the back while I drove. Every so often April would rock the direction finder to make sure I was still on course. As we got closer to Illinois Avenue, ASCM got so strong you could hear it loud and clear even with the null dead on them.

After 10 minutes of uninterrupted dirges, "Remember you are tuned to ASCM, the coming spot on your dial. ASCM is affiliated with the International Hygiene Alliance, a worldwide movement to sweep the Earth spotless."

At Illinois, we waited for a red light.

April swung the DF in a circle. "Can't tell whether it's North or South but try North toward 3000."

Light turned green but I hesitated. "Couldn't be 3000. That's a vacant lot, remember."

"Try North, anyway."

Somebody banged his horn behind us and I headed for 3000.

April watched the S-meter carefully. "It's getting louder." Victorious feminine tone.

ASCM switched to a series of musical V's for victory.

I looked back over my shoulder at April. "Suppose this guy is bigger than me?"

She shrugged her shoulders. "You can cross that bridge when you come to it."

It came quick. Every light turned green for us and in a few minutes I could make out 3000 ahead. Parked right in the middle of the vacant lot was a panel truck complete with portable antenna. I parked, got out and moved warily across weeds and assorted junk. April followed. Inside the truck was a little fellow with horn-rimmed glasses, mike in one hand and record player beside him on the seat. I began to feel brave. "ASCM?"

He looked up. "That's right."

I opened the door beside him. "Well, brother, you're on my channel."

He fiddled with his mike. "And who are you?"

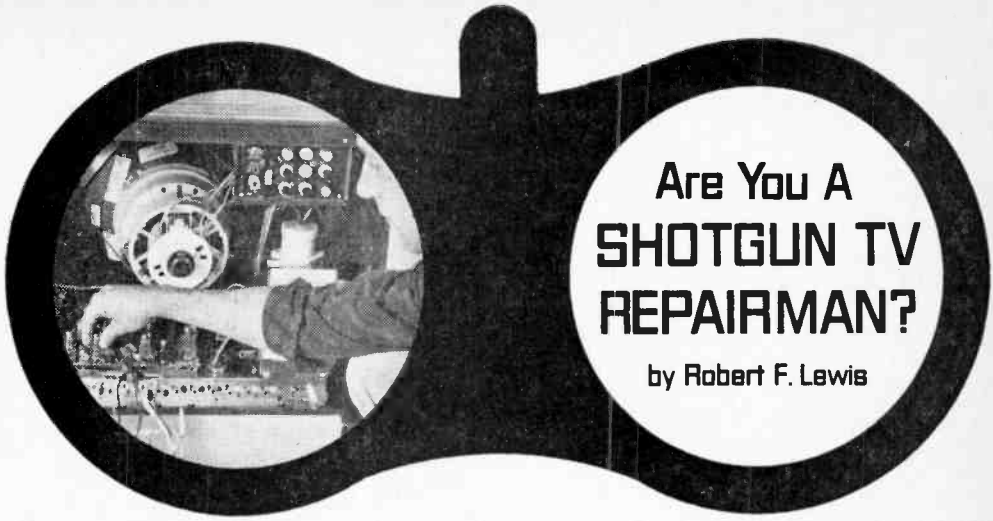
In my most menacing voice. "WDDD."

"That's your station?"

"Yes, and 1200 is my frequency."

"According to our records it belongs to WOAI." He put down that mike and brought forth some identification. *"Federal Communications Commission, Field Inspector."*

April slipped away, back toward the car as the FCC fink made out my summons.



Are You A SHOTGUN TV REPAIRMAN?

by Robert F. Lewis

Don't check all your TV tubes—just those in circuits most likely to cause those symptoms. Know where to look!

■ When it comes to do-it-yourself TV servicing, do you use the "shotgun" method to locate bad tubes? If you're the average, nontechnical, television set owner you probably do, since you couldn't be expected to know exactly where the target is. What do I mean by the "shotgun" method? Well, here's how it works:

Your TV set is acting up. So you pull out all or most of the tubes, cart them down to the corner drug store or supermarket, and run them through the do-it-yourself tube checker. You find two or three that show a "bad" or "questionable" reading, so you buy some new ones. When you get home and plug in the new tubes, you may find that you still haven't cured the sickness. Even if you have, there's a good chance you've replaced some tubes needlessly, since a questionable tube-checker reading doesn't always indicate a bad tube.

First Step Forward. What can you do to avoid this unnecessary expense? Here are some tips that may save you considerable cash and frustration the next time you tackle the one-eyed monster!

First, unless you have some technical knowledge of television, you shouldn't ordinarily attempt to carry servicing beyond the tube-changing point. You don't have to be an engineer or technician just to change a TV tube, but it does help to have a little familiarity with the inner workings of your set. This isn't as complicated as you might think; you can learn enough about it in the time it will take you to read this article.

Second, most TV receivers have, pasted somewhere inside the cabinet, a tube location diagram. This gives you a wealth of information; it tells you the type and location of each tube, plus the kind of job it does.

Now, with these two pieces of knowledge at hand, you should be able to direct most of your troubleshooting efforts to smaller sections of your set—to zero in on the exact tube or tubes ruining your viewing. You shouldn't have to use the expensive scattergun approach.

Before we go any further, let's agree to concern ourselves only with black-and-white TV. Unless you have considerable servicing know-how, it's best to leave most color TV repairs, even tube changing, to a competent repairman, since many of the circuits in color TV sets require critical adjustment for proper color rendition.

A Little Theory. What is a television picture composed of? If you look at any newspaper photograph—called a "halftone" illustration—through a magnifying glass you will

see that it is made up of rows of fine black dots. In the light areas of the picture the dots are very small, leaving considerable white space between. In the darker areas the black dots are larger, leaving less white space. At a distance your eye sees the whole mass as a complete picture, since it can't distinguish between the individual dots.

Now, turn on your TV set and tune it to some channel where no picture is being transmitted. Look closely at the screen. See how the picture is made up of a series of horizontal lines of light? These lines are actually traced on the screen by a rapidly moving spot of light produced when a sweeping electron beam inside the picture tube strikes the screen. The spot travels across the screen, starting at the upper left-hand corner and working down to the lower right-hand corner, in the manner shown in Fig. 1. For

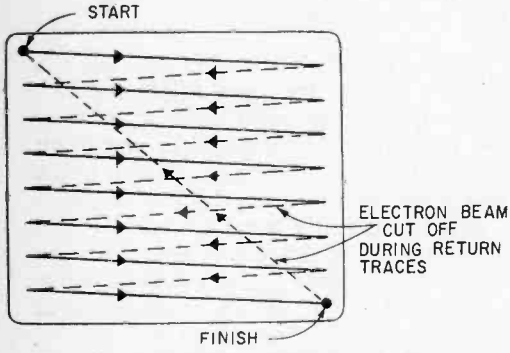


Fig. 1. Simplified diagram of TV raster does not show complicated interlacing.

the sake of clarity, we have shown the lines much farther apart than they really are on your TV screen. There are actually 525 of these lines on the screen.

When the spot gets to the lower right-hand corner, it returns almost instantly to the starting point and repeats the trace. This screen "painting" process is repeated at such a rapid rate that your eye cannot detect the movement of the spot, but sees the screen as though it were continuously lighted. The technical name for the lighted screen is the "raster." Keep this term in mind. We'll use it again later.

At the Studio. Now, if we were to break up the horizontal lines into dots of varying brightness, we would have all of the necessary elements for a picture, as we saw in the newspaper illustration. In practice, this is essentially what is done. The light and dark portions of a TV picture are produced by simply varying the intensity of the electron

TV TROUBLESHOOTING CHART

Symptom	Possible Source of Trouble
No picture, sound or raster	Low-voltage rectifier. Filament burned out in one tube of series-connected string. Fuse.
Picture dim, does not fill screen. Sound weak.	Low-voltage rectifier.
Picture and sound weak or dead. Raster OK.	RF amplifier, oscillator, mixer, video IF amplifier, video amplifier.
Picture dead or has low contrast. Raster OK. Sound may be dead in some sets.	Video amplifier.
No sound. Picture OK.	Sound IF amplifiers, ratio detector, audio amplifiers.
Picture does not fill screen vertically. Cannot be corrected with **height** control.	Vertical oscillator and vertical output, low-voltage rectifier.
Picture rolls vertically. Cannot be stabilized with **vertical hold** control.	Vertical oscillator, sync separator, sync amplifier.
Picture does not fill screen horizontally. May also be dim.	Horizontal oscillator, horizontal output, damper, low-voltage rectifier.
Picture flops over sideways and rolls vertically.	Sync separator, sync amplifier.
Picture flops over sideways. Cannot be stabilized with **horizontal hold** control.	Horizontal oscillator, sync separator, sync amplifier.
Picture dim but raster fills screen. Sound OK. Sync OK. Cannot be brightened with **brightness** control. Image sometimes "blooms" around edges when **brightness** control is turned up.	High voltage rectifier, damper, picture tube.
Picture does not fill screen either horizontally or vertically.	Low-voltage rectifier.
Picture contrast fades up and down, excessively.	AGC, RF and IF amplifier tubes.

beam as it paints the screen. The signals that produce this variation originate in the camera in the TV studio. The image "seen" by the camera is swept by an electron beam in the same manner we have just described for the receiver picture tube. But instead of painting a scene, the camera breaks the image it sees into bits, like the dots in the newspaper illustration. These bits are sent out in sequence by the TV station, received by your TV set, and reassembled on the picture tube screen in exactly the same order and position. To create the illusion of a complete picture, these bits are broken down and reassembled at an incredibly rapid rate, several million per second. Other signals transmitted by the TV station synchronize the picture tube in your set with the studio TV station synchronize the picture tube in your set with the studio TV camera so that both will begin "painting" at exactly the same instant. The third signal transmitted by the station is the sound or "audio" signal. If the picture is in color, additional color-information signals are transmitted. Sounds fantastic, doesn't it?

same as, or similar to, those indicated on our diagram. In some cases you'll notice that a single tube does several jobs, possibly in completely unrelated sections. This is because many tubes contain two or three sets of elements in one envelope, a space-saving trick.

Sound, picture, and synchronizing signals from the TV station arrive via your receiving antenna and are all processed in the ***RF amplifier, mixer, oscillator,*** and *video IF amplifier* tubes.

These signals continue on to the *video detector* and *video amplifier* tubes where they are further processed. The picture signal is extracted and applied to the picture tube where it controls the variations between dark and light on the screen.

The synchronizing signals are routed through the *sync amplifier* and *sync separator* tubes, then applied as locking signals to the *vertical oscillator* and *horizontal oscillator* tubes.

The sound signal is separated at this point and passed through the *sound IF amplifiers,*

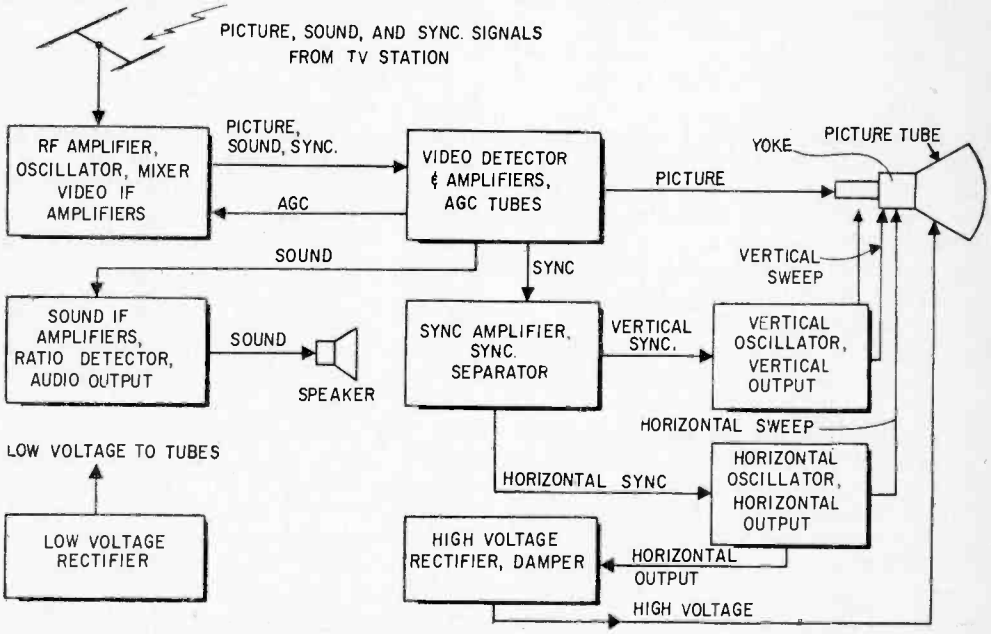


Fig. 2. Block diagram of TV circuitry is just about the same for all black & white TV sets.

Around the Block. Now, let's take a look into your TV set. Fig. 2 is a simplified block diagram showing the electronic-tube circuits in a *typical* black-and-white television set. Let's trace the routing of signals through the diagram. As we do this, refer to the tube location diagram in your own set and see if you can find tubes whose functions are the

ratio detector, and *audio amplifier* or *output* tubes, then to the loudspeaker.

Another circuit is the AGC or automatic gain control.

The purpose of the AGC tubes is to minimize fading or fluctuations in the picture contrast that may occur when the incoming TV signals fade. This often happens when

an airplane is flying overhead.

The *vertical oscillator* and *vertical output* tubes control the vertical sweeping of the electron beam in the picture tube. The horizontal sweeping of the beam is controlled by the *horizontal oscillator* and *horizontal output* tubes.

Every picture tube requires a potential of somewhere between 10,000 and 25,000 volts for its operation. This voltage is generated by the *horizontal oscillator, horizontal output, high voltage rectifier,* and *horizontal damper* tubes. Very little *current* is developed in most high-voltage systems, so it is generally not dangerous to human life; although if you get a jolt from it, it can be startling and uncomfortable; something like getting a shock from an automobile ignition system.

Finally, the *low voltage rectifier* tube supplies all of the lower voltages to the other tubes in your TV set. In the more recent models, a metallic rectifier is used instead of a tube for this purpose.

Zeroing In. Now that you have more than a nodding acquaintance with your TV set, how can you use this newly gained knowledge? Here's an example, a typical troubleshooting situation:

Let's assume that your picture tube screen is brilliantly lighted and that the raster completely fills the screen. Yet there is no sound and no picture. Looking at our block diagram, you can see that the sections that are common to both picture and sound are the ones that include the *RF amplifier, mixer, oscillator, video IF amplifiers, video detector,* and *video amplifier* tubes. So you proceed to check these tubes. Forget the others.

Another common TV complaint is vertical "rolling." The image keeps slipping up or down and cannot be stabilized by adjusting the *vertical hold* control. This symptom indicates that your TV set is not synchronized with the camera at the TV station. It is likely to be caused by a faulty *vertical oscillator tube,* or perhaps by a weak *sync amplifier* or *sync separator.* This narrows your search down to two or three tubes; no need to use the "shotgun" system. Our troubleshooting chart directs you to source of still more symptoms in a malfunctioning set.

Picture Tubes. The TV picture tube generally gives long life if properly installed and adjusted. Loss of electron emission due to old age is a common problem, however, and is indicated by a gradual dimming of the picture that cannot be restored by adjusting the brightness control or by replacing small tubes. The life of a picture tube that shows aging can often be extended by installing a *picture tube brightener.* However, you should not use a brightener on a perfectly good picture tube, since it increases the heater voltage and may reduce the life of the tube or even burn it out.

If you are going to use a picture tube brightener, first determine if your TV set has *series* or *parallel* connected tubes; then buy the corresponding type of brightener. If all of the tubes in your set (except the high voltage rectifier and picture tube) begin with the number 6 or 12, the tubes are probably parallel connected. If the tube designations start with various numbers other than 6 or 12, series connection is most probable.

Pulling Tubes. Here are a few tips to keep in mind when replacing the small tubes in your TV set.

1. Be sure to turn off the receiver and disconnect the power plug before working inside the cabinet.

2. Wait for the tubes to cool enough to handle before trying to pull them out.

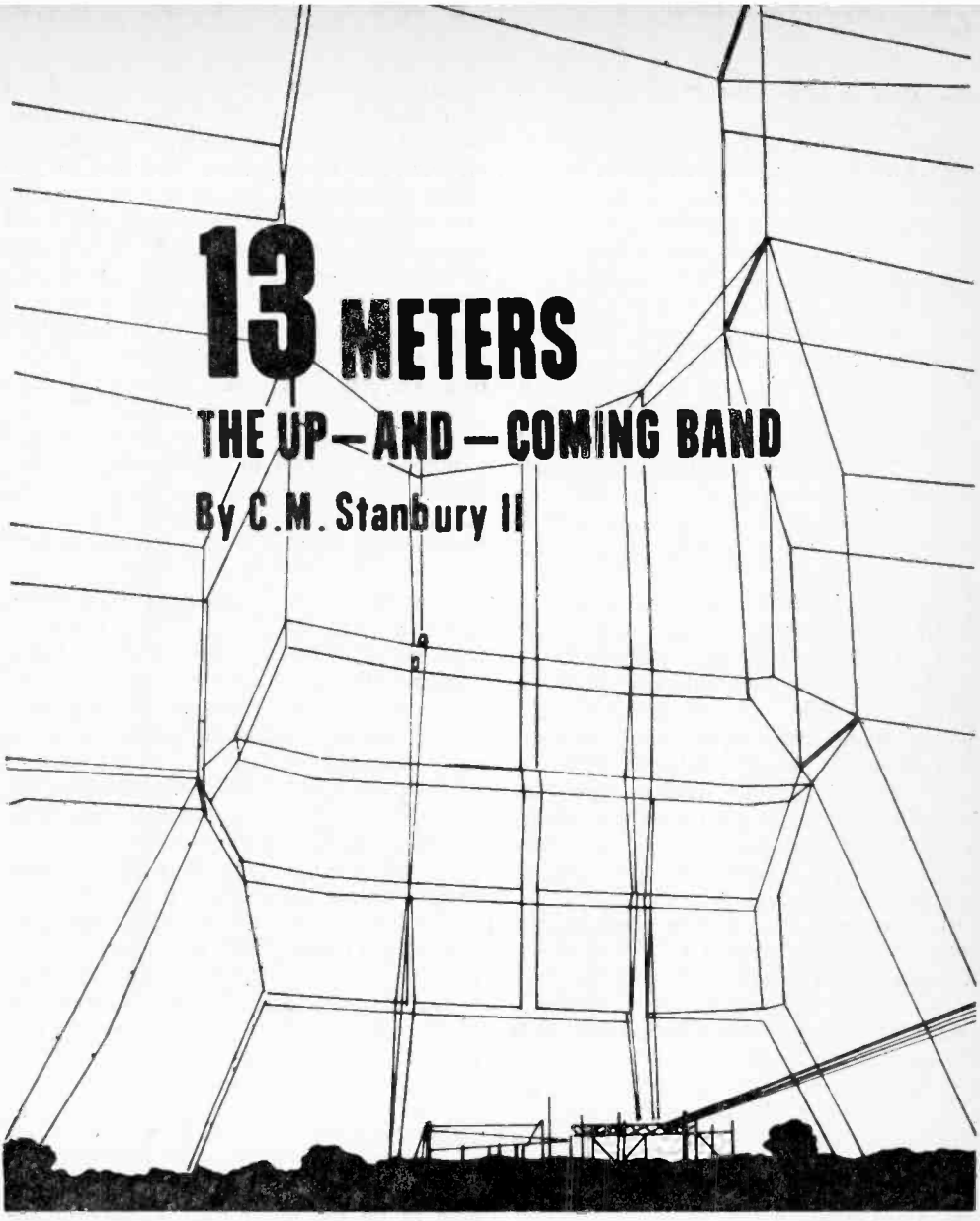
3. Discharge the stored high voltage from the picture tube by connecting one end of a *well-insulated* wire to the TV set chassis and touching the other end of the wire to the high-voltage terminal which connects to the side of the picture tube envelope. You'll probably have to slip the wire under the edge of the rubber insulator to make contact with the high-voltage terminal.

4. When you replace a tube, be sure that the new one is the correct type number as marked on the tube location diagram. Don't switch tubes around just because they look alike, unless they have the same number.

5. Be careful not to bend the pins on miniature tubes. Be sure the pins are straight before attempting to insert tubes in sockets.

6. If you doubt some of the readings you get on a do-it-yourself tube tester, recheck the tubes on another machine before investing in a new tube.

If your diagnosis fails to turn up a faulty tube because the trouble lies deeper, then you'd better turn the job over to your serviceman. However, if you're successful, you can sit back and bask in the glow of your TV set and the cash savings you've made! ■



13 METERS

THE UP—AND—COMING BAND

By C. M. Stanbury II

■ How many shortwave listeners even know there is an international broadcast band between 21,450 and 21,750 kHz (kc)? If you're one of those who didn't know, it's not surprising because due to the recent low sunspot activity the band has been virtually useless. But now as we enter a new phase in the solar cycle, these frequencies suddenly become important. Already there is a trickle of activity and it may soon become a flood.

Now we're sure it will surprise no one that *Sporadic-E skip,* a phenomena so important to the TV DXer and CBer, often occurs on 13 meters. But Sporadic-E reception is generally limited to, at best, 2000 miles, and about 1000 miles is by far the most common. Thus 13-meter E skip will produce strong signals from VOA transmitters at Greenville, N. C.; Bethany, Ohio, and Delano and Dixon, California, but not much else. International reception on these frequencies requires an active F2 layer. This is the uppermost layer of the ionosphere and its reflecting powers increase as the sunspot count goes up (but strangely enough, F2 reflection is best in winter; poorest during the summer.

When to Listen! Further, 13-meter F2 reception will peak at 1400 local time. But

wait. That is local time at the *mid-point longitude*—halfway between transmitter and receiver. Take for example an East-Coast North-American SWL (75 degrees West) and the BBC in England (0 degrees). The midpoint is 37½° West longitude and as each 15 degrees of longitude equals 1 hour, 1400 local time at 37½ degrees West occurs at 1130 EST.

Similarly, on the East Coast, reception from Oslo, Norway (10 degrees East) would occur about 20 minutes earlier. Of course it really isn't quite as cut and dried as we've indicated, nothing on shortwave is cut and dried, but nevertheless this method of rough calculation is a good guide. And again, the length of time reception occurs at these peak periods will keep pace with the sunspot count.

No Noise. With the exception of ignition noise (which depends entirely upon the listener's particular location), reflection (or lack of it) on 13 meters, is the only problem. Atmospheric noise virtually does not exist up here. And, because very few stations presently use these frequencies, interference is seldom a problem either. Which means that the band is at present ideal for novice shortwave listeners. Stations are easy to find—even on simple receivers and signals are not garbled by heterodynes.

For the uninitiated, a heterodyne is that annoying whistle produced by two transmitters only a few 1000 Hz apart. For example, if stations are separated by only 2 kHz, they will produce a noticeable 2000 Hz (cps) heterodyne even though one of the offenders may be comparatively weak. Another plus for the beginner—when 13-meter transmissions are reflected by the ionosphere, the resulting signals are generally strong, a really important factor when using low-priced receivers.

Sky Hook Facts. Also at present almost any antenna, including that random length of wire you probably use for general reception, will do. However a directional (half-wave) dipole can be readily constructed. It should be 22-feet long and run broadside to the direction from which you want to receive. For Europe and Australia it should run NW/SE; for Africa and Asia NE/SW. If possible, the lead-in should be attached to the middle of your dipole. Obviously the ideal arrangement would be a pair of dipoles at right angles to each other and a switching system which would enable you to take your pick of directional effects.

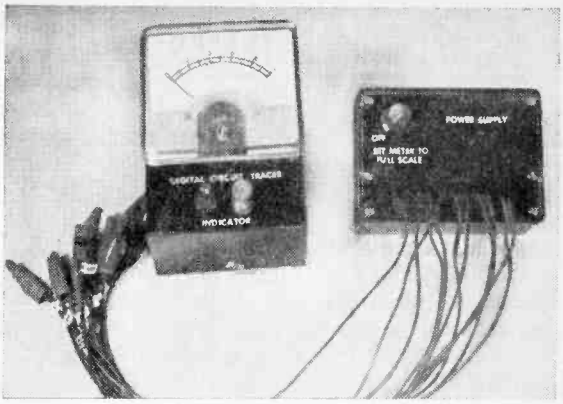
Here Comes Trouble. However, 13 meters will not stay a band solely for the novice very long. It is about to become a major daytime weapon in the shortwave radio war. Just take a look at what is happening on the bands below it. On 31, 25 and 19 meters international broadcasting is literally strangling on QRM with simply not enough channels to go around. As soon as one station finds a clear frequency, two or three others appear on that same spot within a few days. As a result the major powers have engaged in an extremely expensive, and for the most part fruitless, power race.

Obviously 13 meters' virgin territory—all 300 kHz of it beckons irresistibly. Further, as this band is normally open only to one part of the world at a time, interference can never be the problem it has become elsewhere. Even deliberate jamming will be more difficult—making it an ideal band for such stations as Radio Free Europe and Radio Liberty.

The first widespread use of 13 meters by northern latitude stations should occur early in 1967. Of southern hemisphere stations, Radio Australia is already active and during the summer of '67 (winter down there) they should be joined by Radio South Africa and possibly Radio New Zealand. While on paper 13-meter reception will not appear as reliable as on the lower bands, many broadcasters will be pushed by the QRM into *taking a chance* up here. Smart SWLs will be prepared to gamble along with them. ■

13-Meter (21,450-21,750 kHz) Frequency Guide

kHz (kc)	Station	kHz (kc)	Station	kHz (kc)	Station
21455	VOA, Tangier, Morocco	21545	R. Ghana	21670	VOA, Monrovia, Liberia
21470	BBC, England	21570	R. Nederland, Netherlands	21690	VOA, Tangier, Morocco
21485	VOA, Bethany, Ohio	21580	ORTF, Paris, France		
21495	Emisora, Nacional, Portugal	21590	R. Pakistan (Karachi)	21700	Emisora Nacional, Portugal
				21710	BBC, England
21520	SBC, Switzerland	21620	ORTF, Paris, France	21720	R. Free Europe, Portugal
	VOA, Greenville, N. C.	21630	BBC, England	21730	R. Norway
21530	BBC, England	21650	VOA, Bethany, Ohio	21740	VOA, Greenville, N. C.
21540	R. Australia	21665	R. Free Europe, Portugal		

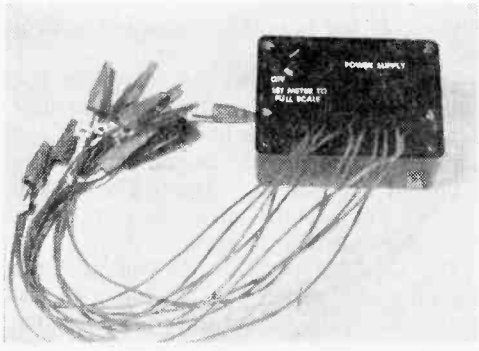


DIGITAL CIRCUIT TRACER

by James A. Fred

Build this adapter and watch your multimeter turn digital circuit tracer before your very eyes!

■ Guided-missile test facilities use many cables to connect the missile to the many pieces of test gear. Some cables are 100-feet long and have as many as fifty wires. Making these cables—soldering on the connectors—is a real job. Technicians normally solder the wires (if they are equal in size) to any pin in the connector. Then they test (with a lead from a buzzer, connected in series with a transformer, to a pin in the connector), touching each projecting wire from the other end of the cable until the buzzer sounds. This method of identifying wires takes a lot of time.



Adapter can be used with any VOM or VTVM. Miniature clips connect to one end of the circuit—common lead has dark insulator.

What To Do? Here is what I call a *Digital Circuit Tracer*. It indicates the number (digit) of the wire you are connected to. The meter only identifies circuits from one to ten, but if you have a meter calibrated 1.2 or 1.5 at the full-scale point you can add a few more resistors or make a new meter scale.

By using color-coded insulation you can divide the cable wires into groups of ten—or whatever grouping is best for you.

How It Works. The principle upon which this circuit tester works is simple. One of the two units consists of a 1.5-volt dry-cell, a potentiometer and a voltage divider of equal-value resistors.

The resistors' value and the supply voltage are determined by the meter scale. To use a 0-1 volt meter that was on hand, the voltage divider was designed to use each one of the major scale markings as a wire (circuit) number. That is: if the meter reads .4-volt, the leads are connected to circuit 4.

The voltage divider was designed to draw 1 milliampere for long dry-cell life with

a minimum of meter loading. Potentiometer R1 is connected in series with the voltage divider to compensate for dry-cell aging. Connecting the meter leads between the *common* and *circuit-10* clip lead, R2 is adjusted for full-scale (1 volt) meter indication.

One-tenth volt (0.1) can be measured across each of the ten 100-ohm resistors in the voltage divider. The meter is a 0-1 volt indicator. With one lead on the *common* connection, 0.1 volt will be indicated when the other meter lead is on the cable wire connected to *clip 1*, 0.2 volt when connected to *clip 2*, etc. The number on the meter scale always indicates the clip lead number.

The meter can be any voltmeter—a VTVM or VOM will do. Or you can use a 0-50 microampere basic movement with an 18,000-ohm multiplier resistor connected in series. Even a 0-1 milliammeter can be used but meter loading will prevent accurate indication unless you change the voltage divider to draw a higher current. Use 10-ohm resistors in the voltage divider to draw 10-times the current drawn by the meter and the needle won't point between numbers although it might be a little off. Of course, dry-cell life will be shorter.

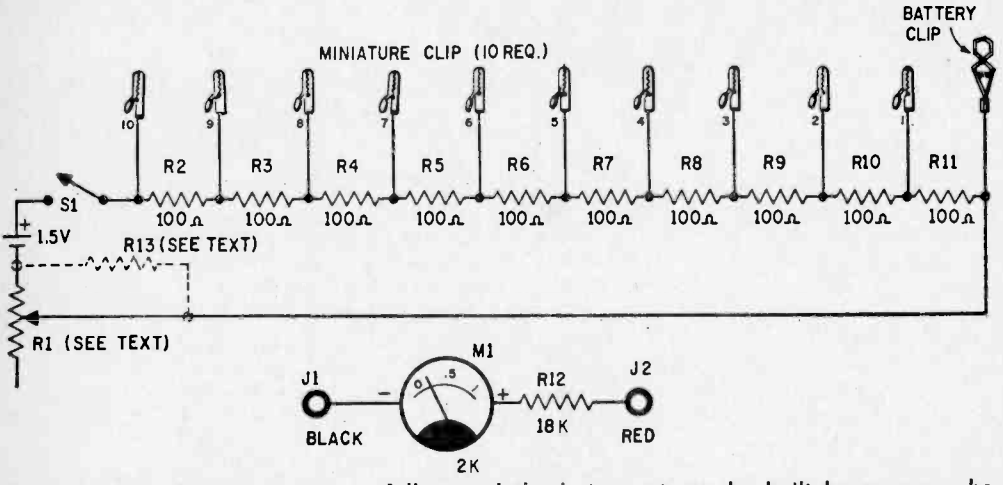
Construction. The components used in this tester were selected from those on hand. (Closest-available catalog parts are given in the parts list.)

Power Unit. You can house circuit tracer's power unit in a phenolic box with a cover. If you use a metal cover you'll need grommets for the clip-lead wires.

Just about any size 1.5-volt dry cell can be used—the larger it is the less often you'll have to change the cell. C- or D-size flashlight cells are readily available and one should last two or three months if you use it for only a short time each day. If the cells are easy to replace, it really doesn't matter.

Resistor R13 is used to reduce the voltage drop across R1 if you can't get anything but a 1K potentiometer. When the dry cell is new you'll probably need a total resistance of about 600 ohms for the combination of R1 and R13. Just be sure the minimum-resistance position is very close to zero ohms.

Indicator. Indicator-box dimensions are determined by the size of the meter that will be used—if you put your VOM or VTVM to work as the indicator you won't need a box at all.

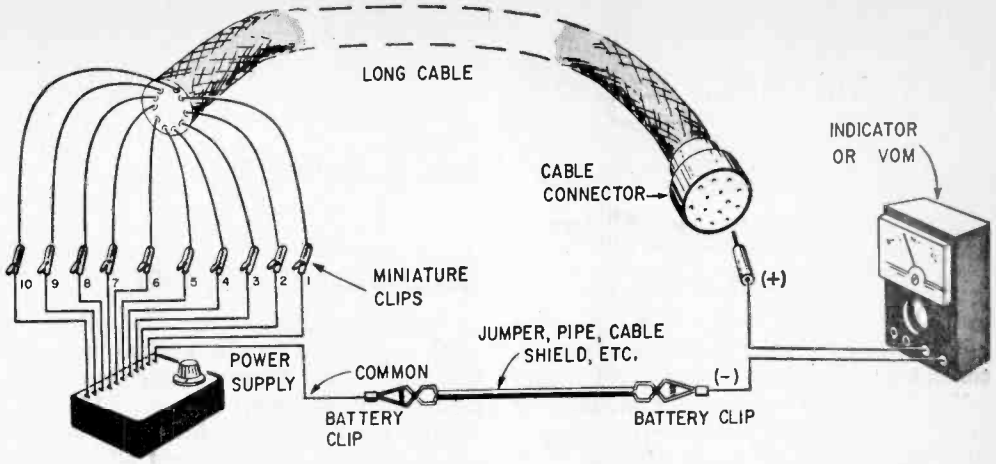


The schematic diagram is easy to follow and the instrument can be built by anyone who can use simple hand tools. Indicator unit can be used in place of workaday VOM or VTVM.

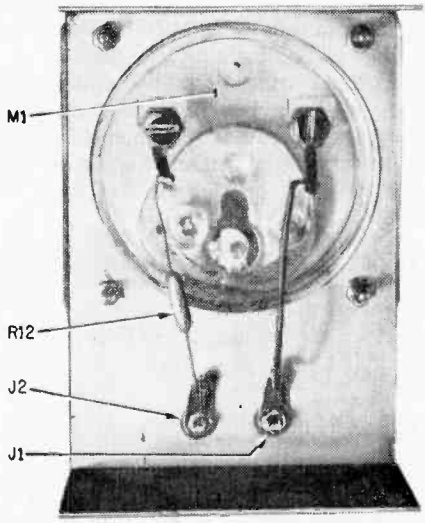
The parts list doesn't specify either the meter or the meter case since any practical physical-size meter can be used—if you can latch on to a 7-inch meter you can sit way back and not have to squint. Then again, you can put a 1-inch meter to work if it's more convenient for you.

Test and Calibrate. When you finish the assembly and wiring you are ready to test and calibrate the circuit tracer. Calibration is as easy as zeroing your ohmmeter.

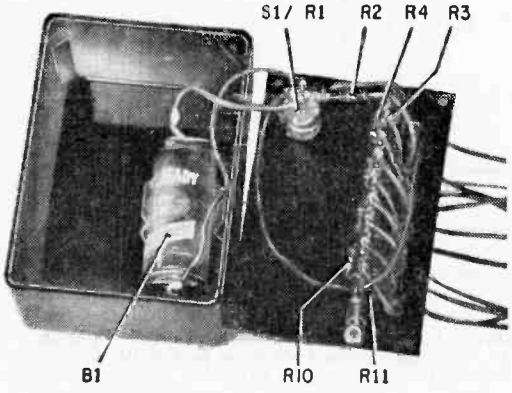
Connect the *black* lead of the power unit to the *black* binding post of the indicator or the negative lead of a VOM or VTVM.



The most common use for the Circuit Tracer is for checking cables. Plug is soldered to one end and power supply unit connected to the other end. Meter lead probes connector pins.



Inside of indicator unit shows the meter and multiplier resistor (above). Heart of instrument is handful of resistors, wired to tie strip, connected across dry cell.



PARTS LIST

B1—1.5-volt dry cell (any size to fit your case)
J1, J2—5-way binding post, 1 red, 1 black, for indicator (see text) (Lafayette 99R6623 or equiv.)
M1—Meter for indicator (see text)
R1—500-ohm, 750-ohm or 1,000-ohm miniature potentiometer with switch (Lafayette 32R7362—see text—or equiv.)
R2-R11—100-ohm, ½-watt, resistor ±5% (or better)
R12—18,000-ohm, ½-watt, resistor ±5% (or better)
R13—500- to 750-ohm, ½-watt resistor (see text)
S1—S.p.s.t. switch (part of R1)
1—Plastic box, 2⅞ x 4 x 1⅝-inches (Allied 87U895 or equiv.)
1—Box cover—phenolic sheet (Burstein-Applebee 11A179 or equiv.)
1—Dry-cell holder (to fit B1)
1—Meter case (to fit M1—see text)
10—Alligator clips, miniature (Allied 45U142 or equiv.)
10—Clip insulators, red, for alligator clips (Allied 45U046 or equiv.)
1—Battery clip (Allied 45U000 or equiv.)
1—Clip insulator, black, for battery clip (Allied 45U054 or equiv.)
Misc.—Knob, wire-marking number tabs, test-lead wire, terminal strip, hook-up wire, solder, machine screws, etc.

Estimated cost: $4.00
Estimated construction time: 2 hours

Connect the *number-10* power-unit lead to the red terminal of the indicator or the positive (+) of the VTVM or VOM.

Turn the switch *on* and adjust the *Meter Set* control (R1) for a full-scale reading on the meter.

Now, in turn, connect each of the numbered leads of the power unit to the *red*

(Continued on page 125)

Propagation Forecast

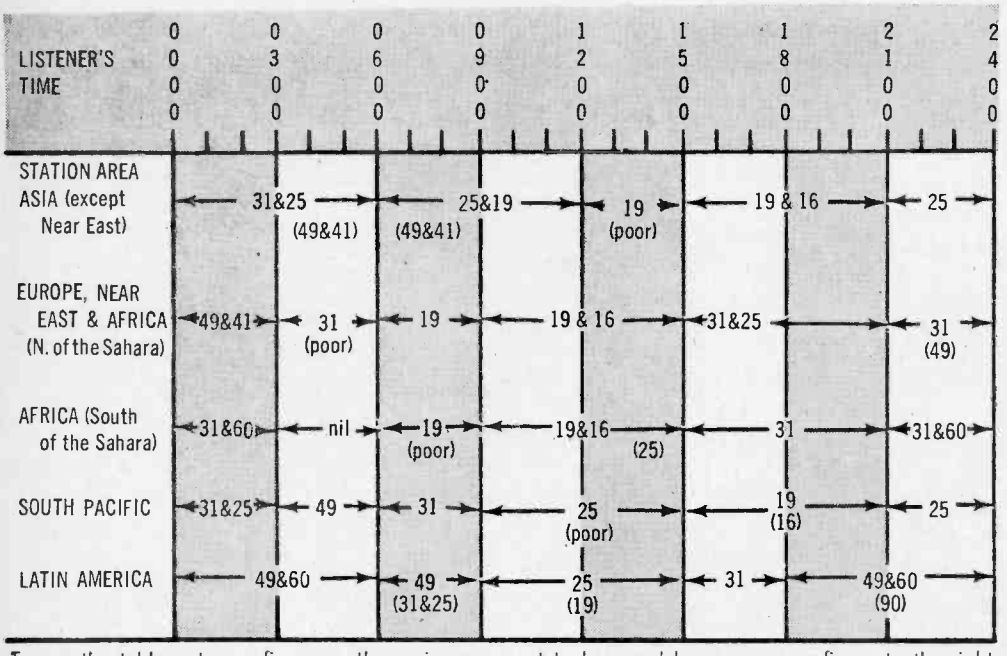
By C. M. Stanbury II

October/November 1966

With atmospheric noise (static) dropping to respectable levels throughout the country, conditions will at least be tolerable for both DXer and general listener. But one casualty of the rising sunspot count is 41 meters, at least from the broadcast point of view. (Not that BC stations won't be heard.) This band will be dominated by Hams, who are supposed to own it—in this hemisphere anyway.

Further, daytime reception on 31 meters will not be spectacular. This means that most real DX reception, at least the rare-country variety, will take place at night. During the hours of darkness 31 meters will be open to all parts of the world while at the same time 49 and 60 will continue to offer excellent Latin American reception.

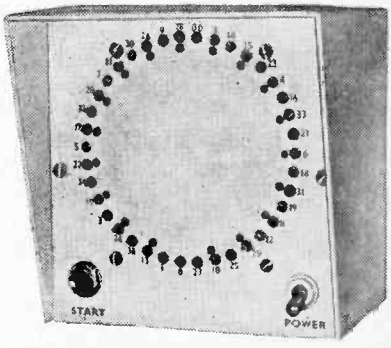
As a majority of the stations you can hear on 49 and 60 meters will be of the latin variety, you must take special care to identify them correctly. Many LA stations will operate on the same spot all speaking Spanish—except Brazil (Portuguese) and Haiti (French) plus of course some English in the West Indies. The Spanish-speaking broadcasters usually identify by slogan (Radio Union, La Voz de Colombia, etc.) besides often mentioning city and country. With a little practice you'll have no trouble picking out these announcements. Incidentally, most of the French you hear on 60 meters will not be Haitian, but West African.



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

electronic roulette

You can gamble on this little gadget to liven up any gathering. Just plug it in, spread out the Roulette cloth and go for a Space-Age spin.



by Jack Brayton

■ If you want to gather a crowd; be the hero of the block; put life into a dying party; or just want a fun-to-operate project then *Electronic Roulette* is designed especially for you. And besides this all-around fun aspect which, by the way, can be enjoyed by electronic enthusiasts and non-enthusiasts alike, it's also a good Science Fair project. Then—from another viewpoint—the serious experimenter should find dozens of applications for; and endless hours of experimentation in the somewhat unusual control circuits. This is especially true since three basic computer circuits are used to form a simple miniature "brain" which *tells* the unit exactly what to do and—when operated properly—selects numbers in a *random* fashion. The Electronic Roulette's brain actually *knows* whether or not a number on the panel is lit and in an instant decides what action to take. And, furthermore, the last command received is stored or remembered within the brain until the power is disconnected!

About The Circuit. As we've already mentioned, the Electronic Roulette is composed of three computer circuits. The complete schematic is given in Fig. 1. These circuits include a *clock*, a *flip flop* and a *coincidence* circuit. Next, let's take these circuits one at a time and see exactly what they do and how they do it.

The clock—as its name implies—generates *timing* pulses and makes sure that certain operations occur only at discrete (specific or individual) time intervals. In this instance, the pulses occur once every 2 or 3 seconds *as long as power is applied.* The exception is when the unit is first turned on, it then takes about 15 seconds for the first pulse to appear but after that they occur at shorter, regular intervals. These pulses *time* the specific instant when the motor shuts off and a number is selected. Numbers cannot be selected at any other time.

Clock pulses are generated by the circuit components Q1, R1, R2, R3, and C1. Q1 is a *unijunction* transistor and the entire circuit is a *unijunction relaxation oscillator.* And, if unijunctions are new to you, this needn't be a problem because they're simple to both use and understand.

The unijunction, of course, has 3 leads called *base-1, base-2,* and *emitter.* The characteristic which makes the unijunction useful is the *resistance* between *base-1* and *emitter.* It is very high until a certain, predetermined difference of potential exists across these leads. But—as soon as the difference of potential *exceeds* this level (and the emitter is positive with respect to base-1) the resistance between these leads becomes *very low,* causing a heavy current to flow.

The voltage at which the unijunction fires is called the *peak-point emitter voltage* and it's always a *fixed percentage* of the voltage which exists across the *base-1* and *base-2*

leads. Now let's see how these principles are applied in the relaxation oscillator.

When power is applied to the relaxation oscillator, C1 starts to *charge* through R1. Initially, the emitter-to-*base-1* resistance of Q1 is very high because the voltage across C1 is not large enough to fire the unijunction. However, as soon as the charge on C1 has built up to the firing voltage (around 7 volts in this case) of Q1, the emitter-to-*base-1* resistance of Q1 becomes very low; a heavy current flows which partly discharges C1 and produces a pulse across R3.

After the emitter-to-*base-1* current falls below that which is required to hold the unijunction *on;* Q1 cuts off and C1 starts to charge again. Thus, the entire cycle is repeated and clock pulses are produced regularly at the base top of R3 until the power is turned *off*. The clock pulses are then coupled through D1 and C2 to the flip flop.

Flip Flop. Along with the relay (K1), the flip-flop circuit is used to control the motor and thus the homebrew rotary switch which turns the neon lamps *on* and *off* in sequence. The flip flop also *stores* the last command received for an indefinite period of time.

Although it may not look much like a flip flop, the components which make up this circuit are Q2, Q3, R4, R5, R6, R7, and K1 (rectifier D2 merely clamps the reverse voltages which develop across the relay coil when Q3 cuts off).

To eliminate some of the confusion which

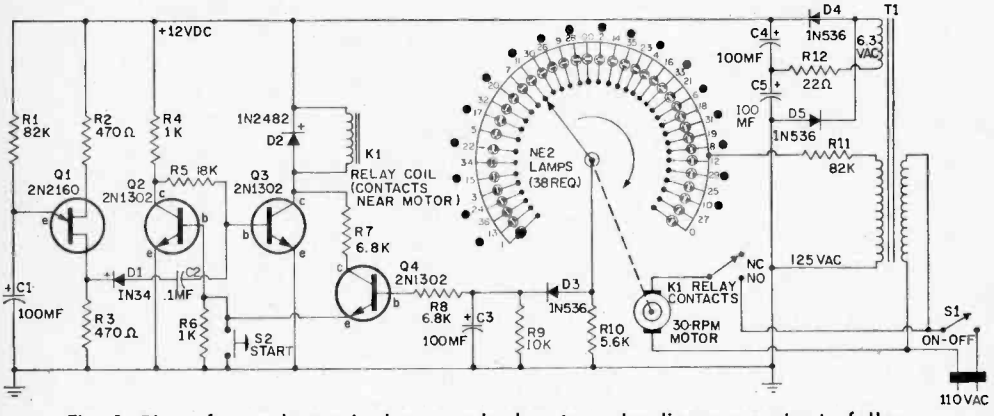


Fig. 1. Ring of neon lamps is shown as broken to make diagram easier to follow.

PARTS LIST FOR ELECTRONIC ROULETTE

C1, C4, C5—100-mf., 12-volt electrolytic capacitor
C2—.1-mf., 25-volt (or higher rating) ceramic capacitor
C3—10-mf., 25-volt electrolytic capacitor
D1—General-purpose diode (1N34, 1N38, 1N56, 1N295—Lafayette 19R4901 or equiv.)
D2—750-ma., 200-volt prv rectifier (1N2482, SK3016, 1N538 or equiv.)
D3, D4, D5—750-ma., 50-volt prv (or higher) rectifier (1N536, SK3016, 1N44OB or equiv.)
I1-I38—Neon Lamp (Type NE-2, NE-2E, NE-2H or equiv.)
K1—S.p.d.t. 12-volt relay (Potter & Brumfield RS5D or equiv.)
MTR—30-rpm., 60 Hz (cps) motor (Cramer 117P Newark 55F393 or equiv.)
Q1—Transistor, unijunction (2N2160 or equiv.)
Q2, Q3, Q4—Transistor, npn, (2N1302, SK3011, 2N823, 2N556 or equiv.)
R1, R11—82,000-ohm, ½-watt resistor
R2, R3—470-ohm, ½-watt resistor
R4, R6—1,000-ohm, ½-watt resistor
R5—18,000-ohm, ½-watt resistor
R7, R8—6,800-ohm, ½-watt resistor
R9—10,000-ohm, ½-watt resistor
R10—5,600-ohm, ½-watt resistor
R12—22-ohm, ½-watt resistor
S1—S.p.s.t. toggle switch
S2—S.p.s.t. pushbutton
T1—Power transformer, 117-volt pri; 125-volt, 15-ma and 6.3-volt, 600 ma sec. (Stancor PS-8415; Knight 61U410 or equiv.)
1—Cowl-type Minibox, 5 x 5 x 5-inches (Bud SC2133 or equiv.)
1—Copper-clad circuit board, unperforated 4 x 4-inch
1—Perforated circuit board, unclad, 3 21/32 x 6 3/4-inches
1—plyboard, ½-inch, 4 x 4-inch
Misc.—Linecord and plug, tie strip, spacers, machine screws, nuts, washers, circuit-board solder terminals, hook-up wire, solder, etc.

Estimated cost: $30.00
Estimated construction time: 7 hours

might result from trying to study the flip flop and the other control circuits at the same time, we've drawn a simplified flip-flop circuit in Fig. 2. This way the circuit looks more like the ordinary flip flop—with the exception of switch S3 and capacitor C6. Assuming S3 is closed and S2 is open, let's see what happens when power is applied to the circuit.

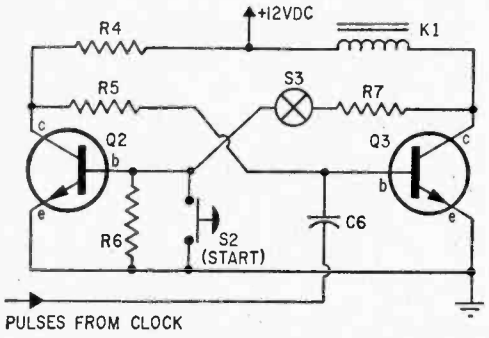


Fig. 2. Simplified diagram of Flip-flop makes it easier to understand circuitry. Callouts designations are identical with those in Fig. 1.

When power is first applied to the flip flop one of the transistors will saturate faster than the other. For the sake of this discussion we'll assume Q2 saturates faster than Q3. And, when Q2 becomes saturated its collector potential is at or near ground. This cuts off Q3 because its base current—coming through R5 and R4—has been removed (shorted to ground). Of course, since no collector current is flowing through Q3, very little current flows through relay K1. Its contacts remain *open;* and the motor is switched off. At the same time, Q2's base is *forward biased* through K1's coil, R-7 and switch S3. Thus, this condition can be held until something causes either Q2 to *cutoff* or Q3 to *saturate*.

Momentarily closing S2 (the start switch) sends Q2 to cutoff because its base current is, at that time, shorted to ground. Then, with Q2 at cutoff and the higher Q2 collector potential which results, Q3 is forward biased through R5. This causes Q3 to saturate and removes the forward bias from Q2 *even with S2 open*. Naturally, when Q3 conducts, a heavy current flows through K-1 causing its contacts to close and the motor to run. The motor will continue to run until a *negative-going* pulse is received from the clock. The negative going pulse (produced when the unijunction goes to cutoff after firing) is coupled, through C6, to the base of Q3. This sends Q3 to cutoff and the flip flop returns to its *off* position. But—and this is most important—the equivalent flip flop cannot return to the *off* position if S3 is open or *off*. With its base circuit open it is impossible for Q2 to saturate. Of course, S3, as such, isn't really used in the actual unit. However, in the simplified flip flop it represents the third computer circuit used in the Electronic Roulette's brain.

Coincidence. This circuit is merely a transistor switch which keeps the motor running unless: clock pulse is received at the base of Q3.

The arm of the motor-driven switch is on a contact and a number is lit. If a clock pulse is received at the base of Q-3 and a number on the panel is not lit the motor

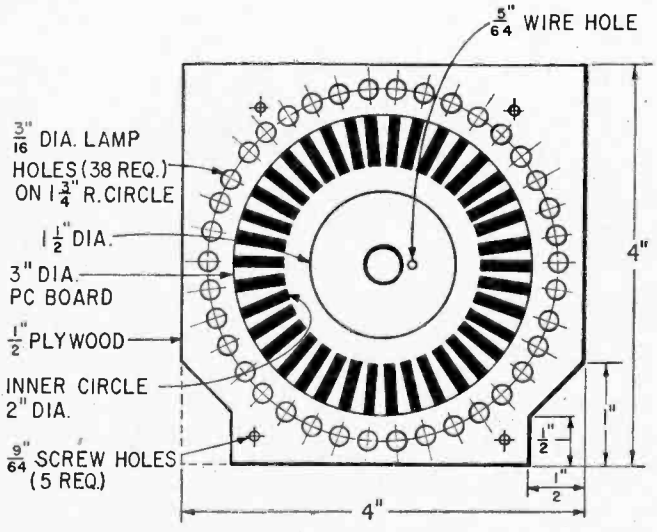


Fig. 3. Commutator is an ideal printed-circuit project which is almost impossible to manufacture as an assembled unit in a home workshop.

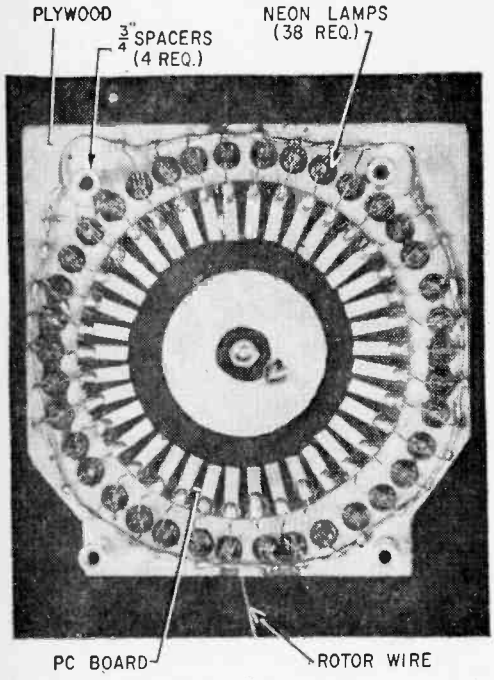


Fig. 4. View of commutator shows neon-lamp connections. You could use a larger PC board and use copper-clad as a common.

relay will drop out but only for a fraction of a second. It then recloses and the unit automatically recycles. This prevents the motor-driven switch arm from stopping when a number is not lit and helps select numbers at random.

The circuit is made up of Q4, R6, R7 and R8 (R7 is used both in the flip flop and in the coincidence circuit).

Two things must occur *simultaneously* in order for this circuit to operate; and for Q4 to saturate. First, Q3 must be at cutoff—driven there by a clock pulse which causes Q3's collector potential to become positive 12 volts. Second, the base of Q4 must be *forward biased* through R8 which—as we'll show—means a number is lit on the panel. But to understand how this bias is developed we'll have to look at the lamp circuit.

The *neon* lamps used in this project need about 75 volts to fire them. The 125-VAC winding on T1 provides this high potential and *isolates* the unit from the power line. This eliminates the shock hazard which might otherwise be present.

Looking at Fig. 1 we can see that the lamp circuit is a *series* circuit consisting of R11; one lamp (out of 38—depending on the motor-driven rotor's position) and R10. Naturally, a portion of the voltage is dropped across each component *whenever the motor's arm is on a contact* and a lamp is lit. Thus, a small AC voltage is across R10 whenever a lamp is lit. This voltage is rectified by D3; filtered by C3—providing forward bias (positive voltage) for Q4. Of course, there is no forward bias if the motor's arm is not on a contact.

When Q4 saturates current flows through R7, the emitter/collector junction of Q4, and the emitter/base junction of Q2. Some of this current also flows through R6 but most is bypassed by the base of Q2. This sets the flip flop to the *off* position and the motor shuts off and *stays* off until the start switch is once again pressed.

One question which comes up is: how do we obtain *random* number selection if stop pulses occur at *regular* intervals and the motor runs at a *constant* speed? The answer is: during an actual game there are varying lengths of time between plays and, since the timer is *always* running, there's no way of knowing how much time is left on the timer when the start button is pressed.

Of course, if the start button is pressed the instant the unit stops a pattern does emerge but even here you would have a hard time trying to pick the exact number it would stop on. Therefore, Electronic Roulette does give a good selection of numbers.

DC power (about 12 volts) for the transistors is supplied by the voltage doubler circuit shown (D4, D5, C4, C5) in Figure 1.

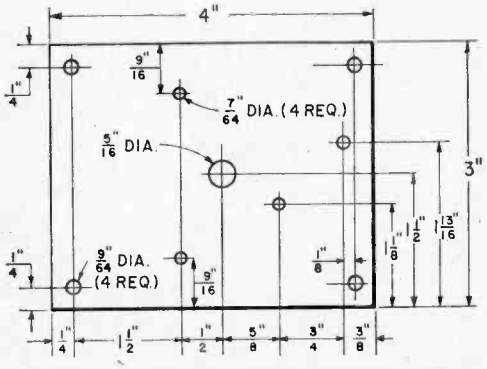


Fig. 5. Relay and motor are mounted on this insulating panel, which is mounted over the commutator board, as in Fig. 7.

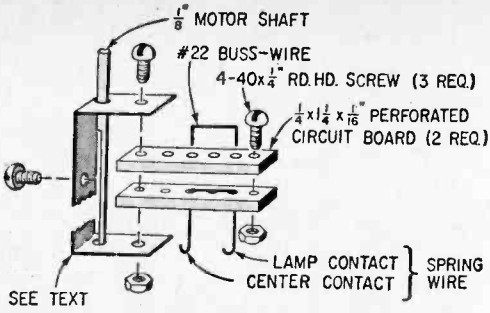


Fig. 6. Wiper arm of motor makes contact between center ring of commutator and the lamp contacts with spring-wire brushes.

R12 is a current limiting resistor that protects the diodes from current surges into C4 and C5 when the power switch is set to *on*.

Motor. All of the parts used in Electronic Roulette, except the motor, are widely available and can be obtained from any large supplier. The motor is available from Newark Electronics Corp., 223 West Madison St., Chicago, Ill. 60606 and can be ordered from them. Other motors with speeds from 30 to 60 rpm may be substituted.

Construction. The first step is laying out and drilling the panel. This is easy since we've given the lamp hole layout—along with the printed-circuit contact layout—roughly half size in Fig. 3. This template should be taped to the front panel; and the 3/16-inch lamp holes center-punched. The ½-inch thick block of plywood, used to mount the lamps and printed circuit contacts, should be fastened to the back of the panel (centered and the top placed flush with the cabinet top). Use four 6-32 x ¾-inch screws at the corners as shown. Drill the 3/16-inch lamp holes in the cabinet and plywood at the same time. Also—on the side of the plywood which will be against the panel—the center hole should be enlarged at the top to 3/16-inch and to a depth of about ¼-inch. This countersink is for the center screw head which *does not* go through the panel. The switch-hole centers are 9/16-inch from each edge and up ¾-inch from the bottom. Next, the *bottom front corner* flanges on the cover are cut back 1-inch in each direction to make room for the switches.

Lamp and Motor Assembly. Cut a piece of unpunched printed-circuit board (copper clad on one side only) to form a 3-inch circle. File the edges smooth and apply resist as shown in the layout (Fig. 3).

Although ⅛-inch tape resist is just right for the contacts a resist pen can also be used since layout isn't really critical. Check to make sure none of the contacts run into one another and that the copper foil in the center (around the hole) *hasn't* been covered with resist. Etch the board using a prepared solution.

When the board has been etched, washed and dried it can be attached to the plywood block using a 6-32 x ½-inch machine screw at the center as shown in Fig. 4.

Fig. 4 also shows how the lamps are mounted and wired. And, since the lamps are friction fitted, the holes may have to be reamed slightly if any of the lamps are too tight.

Form AWG-22 buss-wire around the *outside* as shown and—if metal spacers are used—be sure the buss-wire does not touch against the spacers. Slip a ¾-inch piece of insulated tubing over the spacers to be certain. One wire of each lamp is soldered to the outside edge of a contact and the other is soldered to the buss-wire. Also a short length of wire should be soldered to the *center* contact and run through the hole provided.

Motor and Relay Mount. Board can be cut from any insulating material such as unclad circuit board, pressed board, phenolic, and etc. Its layout is shown in Fig. 5.

The motor-driven contact arm is much simpler to make than it might appear. Fig.

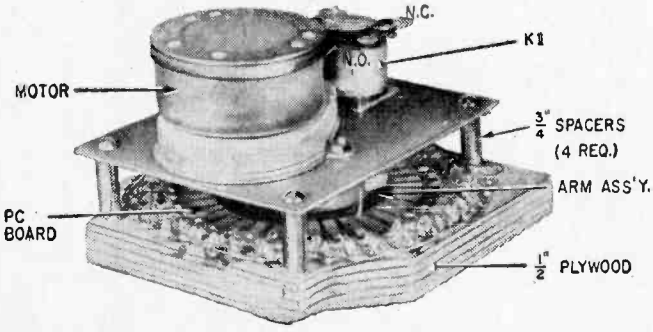


Fig. 7. Assembled drive unit shows motor, relay K1 and lamp commutator assembly. Proper alignment is very important.

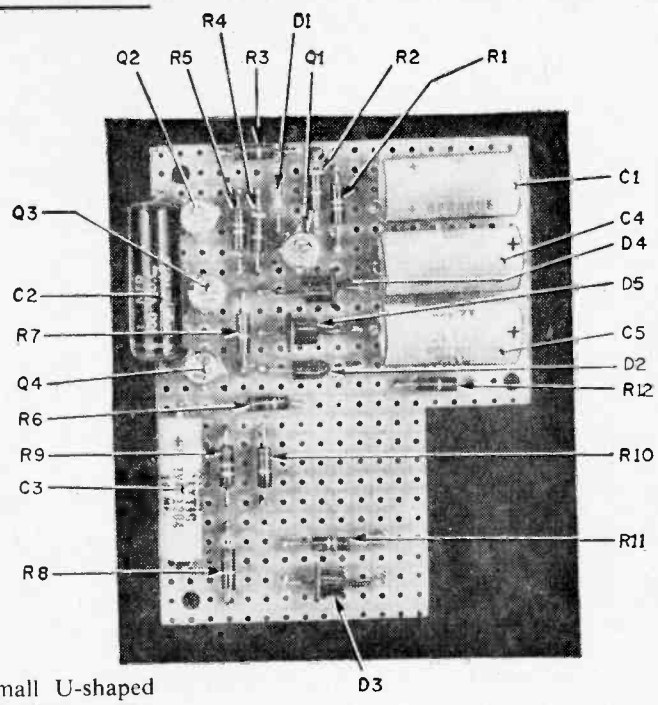


Fig. 8. Circuit-board layout shows most components used in the electronic circuitry that controls the motor-driven selector.

6 shows the details. The small U-shaped clamp is formed from ¼-inch strip of aluminum. Holes are drilled after the clamp is bent—to be sure they're in line. The *inside* measurement of the U-shaped clamp is the same as the *thickness* of the circuit boards.

The 4-40 screw which locks the arm against the motor's shaft will *thread itself* into a 3/32-inch (or No. 41 drill) hole so no tap is necessary.

Wire for the contacts can be obtained by straightening a small spring. The bus-wire is used to fill the larger-than-needed holes in the circuit board so the contacts won't wobble.

After the contact arm has been built the motor and lamp assembly is temporarily put together as shown in Fig. 7 and the spring contacts are adjusted so they ride *evenly* around the contacts. Slight differences in contact pressure at different points on the board can be corrected by placing flat washers between the spacers and the motor board. After this, the lamp assembly can be installed in the cabinet with four 6-32 x ¾-inch screws. Four flat washers should be placed *between the panel and the plywood* to prevent crushing the center contact wire (brought out at the bottom) and to allow room for the flange on the cover.

Most of the remaining parts are installed on a piece of perforated circuit board (3 21/32 x 4 5/8-inch) which is laid out and notched as shown in Fig. 8. Wire it according to Fig. 2—it is then mounted on ¼-inch spacers. Although not really necessary, it's somewhat safer to place a sheet of fish paper, or similar insulating material, between the circuit board and the cabinet to prevent shorts.

Placement of T1 and the 3-terminal tie strip, to which the line cord is attached, are not critical—watch connections. *Do not use the grounded center lug on the tie strip and be certain that the linecord junctions are thoroughly insulated from the chassis.*

Final wiring, and the panel numbers as well, are shown in Fig. 1. Also shown, and indicated by a black dot, are the numbers which should be black. The remaining numbers, except 00 and 0, are red. The zeros are green.

You need one more thing before you can begin the fun with your Electronic Roulette —a Roulette cloth. This is the playing board with all the numbers. Just spread it out on a convenient table, plug in the Electronic Roulette and give it a spin. ■

Volume 46, Part 2

WHITE'S RADIO LOG

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

This is the second part of *White's Radio Log*, now published in three parts twice each year. This format permits the Editors of RADIO-TV EXPERIMENTER to offer its readers two complete volumes of *White's Radio Log* each year, while increasing the scope of the *Log* and inserting station changes as they occur.

In this issue of *White's Radio Log* we have included 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, up-to-date World-Wide Short-Wave Section.

In the Dec./Jan. 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 Short-Wave Section.

In the event you missed any part of the *Log* published earlier this year, you will have a complete copy of *White's Radio Log* by collecting any three consecutive issues of RADIO-TV EXPERIMENTER during 1966. The three consecutive issues comprise a complete volume of *White's Radio Log* that offers complete listings with last minute station change data that can not be offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find *White's Radio Log* an unbeatable reference.

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WHITE'S

RADIO LOG

U. S. AM Stations by Location

Location	C.L.	Kc.
Abbeville, Ala.	WARI	1480
Abbeville, La.	KROF	960
Abbeville, S.C.	WABV	1590
Aberdeen, Md.	WAMD	970
Aberdeen, Miss.	WMPA	1240
Aberdeen, S.Dak.	KSON	930
	KXRO	1320
Aberdeen, Wash.	KBKW	1450
Abilene, Tex.	KRBC	1470
	KCAD	1560
	KNIT	1280
	KWKC	1340
Abilene, Kansas	KABI	250
Abingdon, Va.	WBBI	1230
Ada, Okla.	KADA	1230
Adel, Ga.	WAAG	1470
Adrian, Mich.	WABJ	1490
Agana, Guam	KUAM	610
Aguadilla, P.R.	WABA	850
	WGRF	1340
Ahoskie, N.C.	WRCS	970
Aiken, S.C.	WAKN	990
	WLOW	1300
Aitkin, Minn.	KKIN	1000
Akron, Ohio	WAKR	1590
	WSLR	1350
	WCUE	1150
	WHLO	640
Alamogordo, N.M.	KALG	1230
	KRAC	1270
Alamo Heights, Tex.	KORY	1110
Alamosa, Colo.	KGIW	1450
Albany, Ga.	WALG	1590
	WJAZ	960
	WLYB	1250
	WGPC	1450
	WJAZ	960
Albany, Ky.	WANY	1390
Albany, Minn.	KASM	1150
Albany, N.Y.	WABY	1400
	WOKO	1460
	WPTR	1540
	WROW	590
Albany, Oreg.	KWIL	790
	KRKT	990
Albemarle, N.C.	WABZ	1010
	WZKY	1580
Albert Lea, Minn.	KATE	1450
Albertville, Ala.	WAVU	630
Albion, Mich.	WALM	1260
Albuquerque, N.M.	KABQ	1350
	KDEF	1150
	KGGM	610
	KHIP	1520
	KOB	770
	KQEO	920
	KARA	1310
	KVOD	730
	KLOS	1580
	KRZY	1450
Alcoa, Tenn.	WEAG	1470
Alexander City, Ala.	WRFS	1050
Alexandria, La.	KALB	580
	KOBS	1410
	KSYL	970
Alexandria, Minn.	KXRA	1490
Alexandria, Va.	WPIK	730
Algona, Iowa	KLGA	1600
Alice, Tex.	KOPY	1070
Alisal, Cal.	KRSA	1570
Allendale, S.C.	WDOG	1450
Allentown, Pa.	WHOL	1600
	WAEB	790
	WKAP	1320
	WSAN	1470
Alliance, Nebr.	KCOW	1400
Alliance, Ohio	WFAH	1310
Alisal, Calif.	KRSA	1570
Alma, Ga.	WCQS	1400
Alma, Mich.	WFYC	1280
Alpena Township, Mich.	WATZ	1450
Alpine, Tex.	KVLF	1240
Altavista, Va.	WKDE	1000
Alton, Ill.	WOKZ	1570
Altona, Man.	CFAM	1290
Altoona, Pa.	WFBG	1290
	WRTA	1240
	WVAM	1430
Alturas, Calif.	KCNO	570
Altus, Okla.	KWHW	1450
Alva, Okla.	KALV	1430
Amarillo, Tex.	KBUY	1010
	KFDA	1440
	KGNC	710
	KIXZ	940
	KRAY	1360
	KZIP	1310
Ambridge, Pa.	WMBA	1460
Americus, Ga.	WDEC	1290
	WISK	1390
Ames, Iowa	KASI	1430
	WOI	640
Amherst, Mass.	WTTT	1430
Amherst, N.S.	CKDH	1400
Amherst, N.Y.	WUFO	1080
Amite, La.	WABL	1570
Amory, Miss.	WAMY	1580
Amsterdam, N.Y.	WAFS	1570
	WCSS	1490
Anaconda, Mont.	KANA	580
Anacortes, Wash.	KAGT	1340
Anaheim, Calif.	KEZY	1190
Anchorage, Alaska	KBYR	1270
	KFQD	750
	KENI	550
Andalusia, Ala.	WCTA	920
Anderson, Cal.	KMRE	1580
Anderson, Ind.	WHUT	1470
	WHBU	1240
Anderson, S.C.	WAIM	1230
	WANS	1280
Andrews, Tex.	KACT	1360
Annapolis, Md.	WANN	1190
	WYRE	810
	WNAV	1430
Ann Arbor, Mich.	WAAM	1600
	WPAG	1050
Anna, Ill.	WRAJ	1440
Anniston, Ala.	WANA	1490
	WDNG	1450
	WHMA	1390
Anoka, Minn.	KANO	1470
Ansonia, Conn.	WADS	690
Antigo, Wis.	WATK	900
Apollo, Pa.	WAVL	910
Apopka, Fla.	WVCF	1520
Apple Valley, Cal.	KAVR	960
Appleton, Wis.	WAPL	1570
	WHBY	1230
Aquadilla, P. R.	WUNA	1340
Arab, Ala.	WRAB	1380
Arcadia, Fla.	WAPG	1480
Arcata, Calif.	KENL	1340
	KATA	1340
Ardmore, Okla.	KVSO	1240
Arecibo, P.R.	WCMN	1280
	WMIA	1070
	WNIK	1230
Argentia, Nfld.	VOUS	1480
Arkadelphia, Ark.	KVRC	1240
Arkan. City, Kans.	KSOK	1280
Arlington, Fla.	WDCJ	1220
Arlington, Va.	WAVA	780
	WEAM	1390
Arroyo Grande, Calif.	KOAG	1280
Artesia, N.M.	KSVP	990
Arvada, Colo.	KQXI	1550
Ashburn, Ga.	WMES	1570
Asbury Park, N.J.	WJLK	1440
Asbury Park-Eatontown, N. J.	WHTG	1410
Asheboro, N.C.	WGWR	1260
Asheville, N.C.	WISE	1310
	WLOS	1380
	WSKY	1230
	WWNC	570
Ashland, Ky.	WCMI	1340
	WTCR	1420
Ashland, Ohio	WNCO	1340
Ashland, Oreg.	KWIN	1400
	KRVC	1350
Ashland, Va.	WIVE	1430
Asniand, Wis.	WATW	1400
Ashtabula, Ohio	WAQI	1600
	WREO	970
Aspen, Colo.	KSNO	1260
Astoria, Oreg.	KAST	1370
	KVAS	1230
Atchison, Kans.	KARE	1470
Athens, Ga.	WGAU	1340
	WDOL	1470
	WKAC	1080
	WRFC	960
	KQXI	790
Athens, Ohio	WATH	970
	WOUB	1340
Athens, Tenn.	WLAR	1450
Athens, Tex.	KBUD	1410
Atlanta, Ga.	WPLO	590
	WIGO	1340
	WAOK	1380
	WERD	860
	WGKA	1600
	WGST	920
	WIIN	970
	WQXI	790
	WSB	750
	WYZE	1480
Atlanta-Decatur, Ga.	WGUN	1010
Atlanta, Tex.	KALT	900
Atlantic, Iowa	KJAN	1220
Atlantic Beach, Fla.	WKTX	1600
Atlantic City, N.J.	WFPG	1450
	WLDB	1490
	WMID	1340
Atmore, Ala.	WATM	1590
Atoka, Okla.	KEOR	1110
Attleboro, Mass.	WARA	1320
Auburn, Ala.	WAUO	1230
Auburn, Calif.	KAHI	950
Auburn, N.Y.	WMBO	1340
	WAUB	1590
Auburn, Wash.	KASY	1220
Auburndale, Fla.	WTWB	1570
Auburndale, Wis.	WLBL	930
Augusta, Ga.	WAUG	1050
	WBBQ	1340
	WBIA	1230
	WGAC	580
	WRDW	1480
Augusta, Maine	WRDO	1400
	WFAU	1340
Aurora, Colo.	KOSI	1430
Aurora, Ill.	WMRO	1280
	WKKD	1580
Aurora, Mo.	KSWM	940
Austin, Minn.	KAUS	1480
	KQAQ	970
Austin, Tex.	KNOW	1490
	KHFI	970
	KTBC	590
	KOKE	1370
	KVET	1300
Avalon, Cal.	KBIG	740
Avon Park, Fla.	WAVP	1390
Avondale Estates, Ga.	WAVO	1420
Aztec, N. Mex.	KHAP	1340
Babylon, N.Y.	WBAB	1440
	WGLI	1290
Bad Axe, Mich.	WLEW	1340
Bainbridge, Ga.	WMGR	930
	WAZA	1360
Baker, Mont.	KFLN	960
Baker, Oreg.	KBKR	1490
Bakersfield, Calif.	KAFY	550
	KBIS	970
	KERN	1410
	KGEE	1230
	KUZZ	800
	KLYO	1350
	KWAC	1490
	KPMC	1560
Bellingham, Wash.	KPUG	1170
Baldwinsville, N.Y.	WSEN	1050
Ballinger, Tex.	KRUN	1400
Baltimore, Md.	WBAL	1090
	WAYE	860
	WBMD	750
	WCAO	600
	WCBM	680
	WEBB	1360
	WFBR	1300
	WITH	1230
	WSID	1010
	WWIN	1400
Bamberg-Oenmark, S.C.	WWBD	790
Bangor, Maine	WABI	910
	WGUY	1250
	WLBZ	620
Banning, Calif.	KPAS	1490
Barboursville, Ky.	WBVL	950
Bardstown, Ky.	WBRT	1320
Barnesboro, Pa.	WNCC	950
Barnesville, Ga.	WBAF	1090
Barnwell, S.C.	WBAW	740
Barre, Vt.	WSNO	1450
Barstow, Calif.	KWTC	1230
	KIOT	1310
Bartlesville, Okla.	KWON	1400
Bartow, Fla.	WBAR	1460
Bassett, Va.	WODY	900
Bastrop, La.	KTRY	730
	KVOB	1340
Batavia, N.Y.	WBTA	1490
Batesburg, S.C.	WBLR	1430
Batesville, Ark.	KBTA	1340
Batesville, Miss.	WBLE	1290
Bath, Maine	WJTO	730
Bath, N.Y.	WFSR	1580
Baton Rouge, La.	WAIL	1260
	WLUX	1550
	WYNK	1380
	WIBR	1300
	WJBO	1150
	WLCS	910
	WXOK	1460
Battle Creek, Mich.	WBCK	930
	WKFR	1400
	WVOC	1500
Baxley, Ga.	WHAB	1260
Bay City, Mich.	WBCM	1440
	WXOX	1250
Bay City, Tex.	KIOX	1270
Bay Minette, Ala.	WBCA	1110
Bayamon, P.R.	WBPR	1600
Bayamon, P.R.	WRSJ	1560
Baytown, Tex.	KWBA	1360
Beacon, N.Y.	WBNR	1260
Beardstown, Ill.	WRMS	790
Beatrice, Nebr.	KWBE	1450
Beaufort, N.C.	WBMA	1400
Beaufort, S.C.	WBEU	960
	WSIB	1490
Beaumont, Tex.	KLVI	560
	KPYC	1450
	KTRM	990
Beaver Dam, Wis.	WBEV	1430
Beaver Falls, Pa.	WBVP	1230
Beckley, W. Va.	WJLS	560
	WWNR	620
Bedford, Ind.	WBIW	1340
Bedford, Pa.	WBFD	1310
Bedford, Va.	WBLT	1350
Beeville, Tex.	KIBL	1490
Bel Air, Md.	WVOB	1520
Belen, N.Mex.	KARS	860
Belfast, Me.	WBME	1230
Belgrade, Mont.	KGVW	630
Bellaire, Ohio	WOMP	1290
Bellefontaine, Ohio	WOHP	1390
Bellefonte, Pa.	WBLF	1330
Bell Fourche, S.Dak.	KBFS	1450
Belle Glade, Fla.	WSWN	900
Belleville, Ont.	CJBQ	800
Belleville, Ill.	WIBV	1260
Bellevue, Wash.	KFKF	1330
	KBVU	1540
Bellingham, Wash.	KPUG	1170
	KGMI	790
	KOQT	1550
Bellingham-Ferndale, Wash.	KENY	930
Belmont, N.C.	WCGC	1270
Beloit, Wis.	WGEZ	1490
	WBEL	1380
Belton, S.C.	WHPB	1390
Belton, Tex.	KTON	940
Belzoni, Miss.	WELZ	1460
Bemidji, Minn.	KBUN	1450
Bend, Oreg.	KBND	1110
	KGRL	940
Bennetsville, S.C.	WBSC	1550
Bennington, Vt.	WBTN	1370
Benson, Minn.	KBMO	1290
Benson, N.C.	WPYB	1580
Benton, Ark.	KBBA	690
	KGKO	850
Benton, Ky.	WCBL	1290
Benton Harbor-St. Joseph, Mich.	WHFB	1060
Berkeley, Calif.	KPAT	1400
Berkeley Springs, W.Va.	WCST	1010
Berlin, N.H.	WMOU	1230
	WBRL	1400
Berry Hill, Tenn.	WVOL	1470
Berryville, Ark.	KTHS	1480
Berwick, Pa.	WBRX	1280
Bessemer, Ala.	WYAM	1450
Bethesda, Md.	WUST	1120
Bethlehem, Pa.	WGPA	1100
Beverly, Mass.	WMLO	1570
Biddeford, Maine	WIDE	1400
Big Bear Lake, Cal.	KTOT	1050
Big Delta, Alaska	WXLL	980
Big Lake, Tex.	KBLT	1290
Big Rapids, Mich.	WBRN	1460
Big Spng., Tex.	KBST	1490
	KHEM	1270
	KBYG	1400
Big Stone Gap, Va.	WLSD	1220
Bijou, Cal.	KOWL	1490
Biloxi, Miss.	WLOX	1490
	WVMI	570
Billings, Mont.	KBMY	1240
	KGHL	790
	KOOK	970
	KOYN	910
	KURL	730
Binghamton, N.Y.	WINR	680
	WKOP	1360

Location	C.L.	Kc.
	WNBF	1290
Birmingham, Ala.	WAPI	1070
	WBRC	960
	WCRT	1260
	WAQY	1220
	WERN	1320
	WATV	900
	WSGN	610
	WYDE	850
	WVOK	690
Bisbee, Ariz.	KSUN	1230
Bishop, Calif.	KIBS	1230
Bishopville, S.C.	WAGS	1380
Bismarck, N.Dak.	KFYR	550
	KBMR	1350
Bismarck-Mandan,	N.Dak.	
	KBOM	1270
Black Mountain, N.C.		
	WBMS	1350
	WFGW	1010
Black River Falls,	Wis.	
	WWIS	1260
Blackfoot, Idaho	KBLI	690
Blackshear, Ga.	WBSG	1350
Blackstone, Va.	WKLV	1440
Blackwell, Okla.	KLTR	1580
Blaine, Wash.	KARI	550
Blakely, Ga.	WBBK	1260
Blanding, Utah	KUTA	790
Bloomington, Ill.	WJBC	1230
Bloomington, Ind.	WTTS	1370
Bloomsburg, Pa.	WCNR	930
	WHLM	550
Blountstown, Fla.	WKMK	1370
Blue Earth, Minn.	KBEW	1560
Bluefield, W.Va.	WHIS	1440
	WKOY	1240
Blythe, Calif.	KYOR	1450
Blytheville, Ark.	KLCN	910
Boaz, Ala.	WBSA	1300
Boca Raton, Fla.	WSBR	740
Bogalusa, La.	WIKC	1490
	WBOX	920
Boise, Idaho	KATN	1010
	KBOI	670
	KEST	790
	KGEM	1140
	KIDO	630
	KYME	740
Bolivar, Mo.	KBLR	1550
Bolivar, Tenn.	WBOL	1560
Bonham, Tex.	KFYN	1420
Boone, Iowa	KFGQ	1260
	KWBG	1590
Boone, N.C.	WATA	1450
Boonville, Ind.	WBNL	1540
Boonville, Mo.	KWRT	1370
Booneville, Miss.	WBIP	1400
Boonville, N.Y.	WBRV	900
Borger, Tex.	KHUZ	1490
	KBSB	1600
Boston, Mass.	WBZ	1030
	WCOP	1150
	WILD	1090
	WNAC	680
	WEZE	1260
	WEEI	590
	WHDH	850
	WMEX	1510
	WORL	950
Boulder, Colo.	KBOL	1490
	KOEY	1360
Bowie, Tex.	KBAN	1410
Bowling Green, Ky.	WKCT	930
	WBGN	1340
	WLBJ	1410
Bowl, Green, Ohio	WMGS	730
Boynton Beach, Fla.		
	WZZZ	1510
Bozeman, Mont.	KXXL	1450
	KBMN	1230
Bradbury Hgts., Md.	WPGC	1580
Braddock, Pa.	WLOA	1550
Braddocks Heights,	Md.	
	WMHI	1370
Bradenton, Fla.	WTRL	1490
	WBRD	1420
Bradford, Pa.	WESB	1490
Brady, Tex.	KNEL	1490
Brainerd, Minn.	KLIZ	1380
	KVBR	1340
Branson, Mo.	KBHM	1220
Brantford, Ont.	CKPC	1380
Brattleboro, Vt.	WTSA	1450
	WKVT	1490
Brawley, Calif.	KROP	1300
Brazil, Ind.	WWCM	1380
Breckenridge, Minn.		
	KBMW	1450
Breckenridge, Tex.	KSTB	1430
Bremen, Ga.	WWCC	1440
Bremerton, Wash.	KBRO	1490
Brenham, Tex.	KWHI	1280
Brevard, N.C.	WPNF	1240
Brewster, N.Y.	WBRW	1510
Brewton, Ala.	WEBJ	1240
Bridgeport, Ala.	WBTS	1480
Bridgeport, Conn.	WICC	600
	WNAB	1450
Bridgeton, N.J.	WSNJ	1240
Brigham City, Utah	KBUH	800
Brighton, Colo.	KBRN	800
Brinkley, Ark.	KBRI	1570
Bristol, Conn.	WBIS	1440
Bristol, Tenn.	WOPI	1490
	WKYE	1550
Bristol, Va.	WCYB	690
	WFHG	980
Brockton, Mass.	WBET	1460
	WOKW	1410
Brockville, Ont.	CFJR	1450
Broken Bow, Nebr.	KCNI	1280
Bronson, Mo.	KBHM	1220
Brookfield, Conn.	WINE	940
Brookfield, Mo.	KGHM	1470
Brookhaven, Miss.	WCHJ	1470
	WJMB	1340
Brookings, Oreg.	KURY	910
Brookings, S.Dak.	KBRK	1430
Brookline, Mass.	WBOS	1600
Brookneal, Va.	WODI	1230
Brooksville, Fla.	WWJB	1450
Brownfield, Tex.	KKUB	1300
Brownsville, Tenn.	WBHT	1520
Brownsville, Tex.	KBOR	1600
Brownwood, Tex.	KBWD	1380
	KEAN	1240
Brunswick, Ga.	WGIG	1440
	WMOG	1490
	WYNR	790
Brunswick, Maine	WCME	900
Bryan, Ohio	WBNO	1520
Bryan, Tex.	KORA	1240
	WTAW	1150
Buckhannon, W.Va.	WBUC	1460
Bucyrus, Ohio	WBCO	1540
Buffalo, N.Y.	WBEN	930
	WYSL	1400
	WEBR	970
	WGR	550
	WKBW	1520
	WWOL	1120
Buffalo, Wyo.	KBBS	1450
Buford, Ga.	WDYX	1460
Burbank, Calif.	KBLA	1500
Burley, Idaho	KBAR	1230
Burlington, Iowa	KBUR	1490
	KYED	1150
Burlington, N.C.	WBBB	920
	WBAG	1150
Burlington, Vt.	WDOT	1400
	WJOY	1230
	WVMT	620
Burnett, Tex.	KTSL	1340
Burns, Oreg.	KRNS	1230
Butler, Ala.	WPRN	1220
Butler, Mo.	KMAM	1530
Butler, Pa.	WBUT	1050
	WISR	680
Butte, Mont.	KBOW	550
	KXLF	1370
Cabin, John, Potomac, Md.		
	WXLN	950
Cadillac, Mich.	WATT	1240
Cadiz, Ky.	WKDZ	1110
Caguas, P.R.	WNEL	1430
	WVJP	1110
Cairo, Ga.	WGRA	790
Cairo, Ill.	WKRO	1490
Calais, Maine	WQDY	1230
Caldwell, Idaho	KCID	1490
	KBGN	910
Calera, Ala.	WBYE	1370
Calexico, Calif.	KICO	1490
Calhoun, Ga.	WCGA	900
Camas, Wash.	KVAN	1480
Cambridge, Md.	WCEM	1240
Cambridge, Mass.	WYHR	740
Cambridge, Ohio	WILE	1270
Camden, Ark.	KAMD	910
	KJWH	1450
Camden, N.J.	WCAM	1310
	WKDN	800
Camden, S. C.	WACA	1590
Camden, Tenn.	WFWL	1220
Cameron, Tex.	KMIL	1330
Camilla, Ga.	WCLB	1220
Campbell, Ohio	WHOT	1330
Campbellsville, Ky.	WTCO	1450
Canandaigua, N.Y.	WCGR	1550
Cannon City, Colo.	KRLN	1400
Canonsburg, Pa.	WARO	540
Canton, Ga.	WCHK	1290
Canton, Ill.	WBYS	1560
Canton, Miss.	WMGO	1370
Canton, N.C.	WWIT	970
Canton, Ohio	WCNS	900
	WHOF	1060
	WHBC	1480
	WINW	1520
Canyon, Tex.	KCAN	1550
Cape Girardeau, Mo.	KFVS	960
	KZYM	1220
	KGMO	1550
Carbondale, Ill.	WCIL	1020
Carbondale, Pa.	WCDL	1440
Caribou, Maine	WFST	600
Carlisle, Pa.	WHYL	960
	WIOO	1000
Carlsbad, N.Mex.	KAVE	1240
	KCCC	930
	KPBM	740
Carmel, Calif.	KRML	1410
Carmi, Ill.	WROY	1460
Carnegie, Pa.	WZUM	1590
Caro, Mich.	WKYO	1360
Carolina, P. R.	WVOZ	1400
Carrington, N.Dak.	KDAK	1600
Carrizo Springs, Tex.		
	KBEN	1450
Carroll, Iowa	KCIM	1380
Carrollton, Ala.	WRAG	590
Carrollton, Ga.	WLBB	1100
Carrollton, Mo.	KAQL	1430
Carson City, Nev.	KPTL	1300
Cartersville, Ga.	WBHF	1450
	WKRW	1270
Carthage, Ill.	WCAZ	990
Carthage, Mo.	KDMO	1490
Carthage, Miss.	WECP	1480
Carthage, Tenn.	WRKM	1350
Carthage, Tex.	KGAS	1590
Caruthersville, Mo.	KCRV	1370
Casa Grande, Ariz.	KPIN	1260
Casey, Ill.	WKZI	800
Casper, Wyo.	KIWO	1470
	KATI	1400
Cathedral City, Calif.		
	KVOC	1230
	KWXY	1340
Cayce, S.C.	WCAY	620
Cayey, P.R.	WLEY	1080
Cedar City, Utah	KSUB	590
Cedar Falls, Iowa	KCFI	1250
Cedar Rapids, Iowa	KCRG	1600
	KLWW	1450
	WMT	600
	KHAK	1360
Cedartown, Ga.	WGAA	1340
Celina, Ohio	WCSM	1350
Center, Ala.	WEIS	990
	WAGC	1550
Center, Tex.	KDET	930
Centerville, Ala.	WBIB	1590
Centerville, Iowa	KCOG	1400
Centerville, Ind.	WHON	930
Centreville, Miss.	WLBS	1580
Centerville, Tenn.	WHLP	1570
Centerville, Utah	KBBC	1600
Central City, Ky.	WNES	1050
	WMTA	1380
Centralia, Ill.	WCNT	1210
Centralia & Chehalis, Wash.		
	KELA	1470
Centreville, Ala.	WBIB	1110
Ceres, Calif.	KLOC	920
Chadburn, N.C.	WVOE	1590
Chadron, Nebr.	KCSR	610
Chambersburg, Pa.	WCHA	800
	WCBG	1590
Champaign, Ill.	WDWS	1400
Chanute, Kans.	KCRB	1460
Chapel Hill, N.C.	WCHL	1360
Charleroi, Pa.	WESA	940
Charles City, Iowa	KCHA	1580
Charleston, Ill.	WEIC	1270
Charleston, Mo.	KCHR	1350
Charleston, S.C.	WCSC	1390
	WOKE	1340
	WPAL	730
	WQSN	1450
	WTMA	1250
Charleston, W.Va.	WCAW	680
	WCHS	580
	WGKV	1490
	WKAZ	950
	WTIP	1240
	WXVA	1550
Charlotte, Mich.	WCER	1390
Charlotte, N.C.	WBT	1100
	WAYS	610
	WGIV	1600
	WKIC	1310
	WSOC	930
	WIST	1240
	WWOK	1480
	WRPL	1540
Charlotte Amalie, V.I.		
	WBNB	1000
	WSTA	1340
	WBNB	1000
Charlottesville, Va.	WCHV	1260
	WELK	1010
	WINA	1070
Chase City, Va.	WMEK	980
Chattahoochee, Fla.		
	WSBP	1580
Chattanooga, Tenn.	WMOC	1450
	WAPO	1150
	WDEF	1370
	WDOD	1310
	WDXB	1490
	WNOO	1260
Cheboygan, Mich.	WCBY	1240
Cheektowaga, N.Y.	WNIA	1230
Chehalis-Centralia,	Wash.	
	KITI	1420
Chelan, Wash.	KOZI	1220
Cheraw, S.C.	WCRE	1420
Cherryville, N. C.	WCSL	1590
Cherokee, Iowa	KCHE	1440
Chesapeake, Va.	WSJT	1600
Chester, Ill.	KSGM	980
Chester, Pa.	WEEZ	1590
	WVCH	740
Chester, S.C.	WGCD	1490
Chester, Va.	WIKI	1410
Chestertown, Md.	WCTR	1530
Cheyenne, Wyo.	KFBC	1240
	KCHY	1530
	KRAE	1480
	KVWO	1370
	KEND	980
Chicago, Ill.	WAAF	950
	WAIT	820
	WBBM	780
	WCFL	1000
	WCRW	1240
	WEDC	1240
	WGN	720
	WIND	560
	WJJD	1160
	WLS	890
	WNAQ	670
	WMBI	1110
	WNUS	1390
	WSBC	1240
Chicago Hgts., Ill.	WMPP	1470
	WCGO	1600
Chickasha, Okla.	KWCO	1560
Chico, Calif.	KHSL	1290
	KPAY	1060
Chicopee, Mass.	WACE	730
Childress, Tex.	KCTX	1510
Chillicothe, Mo.	KCHI	1010
Chillicothe, Ohio	WBEX	1490
	WCHI	1350
Chipley, Fla.	WBGC	1240
Chippewa Falls, Wis.		
	WAXX	1150
Christiansburg, Va.	WJJJ	1260
Christiansted, V.I.	WIVI	970
Church Hill, Tenn.	WMCH	1260
Cicero, Ill.	WVON	1450
Cincinnati, Ohio	WCKY	1530
	WCIN	1480
	WCPO	1230
	WKRC	550
	WLW	700
	WSAI	1360
	WZIP	1050
Clanton, Ala.	WKLF	980
Clare, Mich.	WCRM	990
Claremont, N.H.	WTSV	1230
Claremore, Okla.	KWPR	1270
Clarion, Pa.	WWCH	1300
Clarksburg, W.Va.	WBOY	1400
	WHAR	1340
	WPDX	750
Clarksdale, Miss.	WROX	1450
	WKDL	1600
Clarksville, Ark.	KLYR	1360
Clarksville, Tenn.	WZM	1400
	WDXN	540
Clarksville, Tex.	KCAR	1350
Claxton, Ga.	WCLA	1470
Clayton, Ga.	WGHC	1570
Clayton, Mo.	KXLW	1320
	KFUO	850
Clayton, N.Mex.	KLMX	1450
Clearfield, Pa.	WCPA	900
Clearwater, Fla.	WTAN	1340
	WAZE	860
Cleburne, Tex.	KCLE	1120
Clermont, Fla.	WSLC	1340
Cleveland, Ga.	WRWH	1350
Cleveland, Miss.	WCLD	1490
	WDSK	1410
Cleveland, Ohio	WKYC	1100
	WDOK	1260
	WERE	1300
	WGAR	1220
	WHK	1420
	WABQ	1540
	WJW	850
Cleveland, Tenn.	WBAC	1340
	WCLE	1570
Cleveland, Tex.	KVLB	1410
Cleve. Hgts., Ohio	WJMO	1490
Clewiston, Fla.	WOWY	1590
Clifton, Ariz.	KCLF	1400
Clifton Forge, Va.	WCFV	1230
Clincho, Va.	WDIC	1430
Clinton, Ill.	WHOW	1520
Clinton, Iowa	KCLN	1390
	KROS	1340
Clinton, Mo.	KDKD	1280
Clinton, N.C.	WRRZ	880
Clinton, Okla.	KWOE	1320
Clinton, S.C.	WPCC	1410
Clinton, Tenn.	WYSH	1380
Cloquet, Minn.	WKLK	1230
Clovis, N.Mex.	KCLV	1240
	KICA	980
Coachella, Calif.	KCHV	970
Coalinga, Calif.	KBMX	1470
Coatesville, Pa.	WCOJ	1420
Cochran, Ga.	WVMG	1440
Cocoa, Fla.	WKKD	860
	WEZY	1350
	WWBC	1510
Cocoa Beach, Fla.	WRKT	1300
Cody, Wyo.	KODI	1400
Coeur d'Alene, Ida.	KVNI	1240
Coffeyville, Kans.	KGGF	690
Colby, Kans.	KXXX	790
Coldwater, Mich.	WTVB	1590
Coleman, Tex.	KSTA	1000
Colfax, Wash.	KCLX	1450
College Park, Ga.	WAIA	1570
Collierville, Tenn.	WPIP	1590
Colonial Heights,	Va.	
	WPVA	1290

WHITE'S RADIO LOG

Location	C.L.	Kc.
Colorado City, Tex.	KVMC	1320
Colo. Spgs., Colo.	KRDO	1240
	KPIK	1580
	KVOR	1300
	KSSS	740
	KYSN	1460
	KRYT	1530
Columbia, Ky.	WAIN	1270
Columbia, Miss.	WCJU	1450
Columbia, Mo.	KFRU	1400
	KCGM	1580
Columbia, Pa.	WCOY	1580
Columbia, S.C.	WCOS	1400
	WIS	560
	WOIC	1320
	WNOK	1230
	WQXL	1470
Columbia, Tenn.	WMCP	1280
	WKRM	1340
Columbus, Ga.	WDAK	540
	WRBL	1420
	WHYD	1270
	WCLS	1580
	WOKS	1340
Columbus, Ind.	WCSI	1010
Columbus, Miss.	WACR	1050
	WCBI	550
Columbus, Nebr.	KJSK	900
	KTTT	1510
Columbus, Ohio	WBNS	1460
	WCOL	1230
	WMNI	920
	WOSU	820
	WTVN	610
	WVKO	1580
Colville, Wash.	KCVL	1270
Comanche, Tex.	KCOM	1550
Commerce, Ga.	WJJC	1270
Concord, Calif.	KWUN	1480
Concord, N.H.	WKXL	1450
Concord, N.C.	WEGO	1410
Concordia, Kans.	KNCK	1390
Conneaut, Ohio	WWOW	1360
Connellsville, Pa.	WCVI	1340
Connersville, Ind.	WCNB	1580
Conroe, Tex.	KMCO	900
Conway, Ark.	KCON	1230
	KVEE	1330
Conway, N.H.	WBNC	1050
Conway, S.C.	WLAT	1330
Cookeville, Tenn.	WHUB	1400
	WPTN	1550
Coolidge, Ariz.	KCKY	1150
Coos Bay, Oreg.	KOOS	1230
	KYNG	1420
Copper Hill, Tenn.	WLSB	1400
Coquille, Oreg.	KWRO	630
Coral Gables, Fla.	WRIZ	1550
	WVCG	1080
Corbin, Ky.	WCTT	680
	WYGO	1330
Cordele, Ga.	WMJM	1490
Cordova, Alaska	KLAM	1450
Corinth, Miss.	WCMA	1230
	WKCU	1350
Cornelia, Ga.	WCON	1450
Corning, Ark.	KCCB	1260
Corning, N.Y.	WCBA	1350
	WCLI	1450
Corona, Cal.	KREL	1370
Corpus Christi, Tex.		
	KCTA	1030
	KCCT	1150
	KEYS	1440
	KRYS	1360
	KSIX	1230
	KUNO	1400
Corry, Pa.	WOTR	1370
Corsicana, Tex.	KAND	1340
Cortez, Colo.	KVFC	740
Cortland, N.Y.	WKRT	920
	KFLY	1240
	KLOO	1350
Corvallis, Ore.	KLOO	1340
Corydon, Ind.	WPDF	1550
Coshocton, Ohio	WTNS	1560
Cottage Grove, Ore.	KNND	1400
Cottonwood, Ariz.	KVRD	1240
	KVIO	1600
Coudersport, Pa.	WFRM	600
Council Bluffs, Iowa		
	KFNF	920
	KRCB	1360
Courtenay, B.C.	CFCP	1440
Covington, Ga.	WGFS	1430
Covington, Ky.	WCLU	1320
Covington, La.	WARB	730
Covington, Tenn.	WKBL	1250
Covington, Va.	WKEY	1340
Cowan, Tenn.	WZYX	1440
Cozad, Neb.	KAMI	1580
Craig, Colo.	KRAI	550
Crane, Tex.	KCRR	1380
	KBSN	970
Crawfordsville, Ind.		
	WCVL	1550
Crescent City, Calif.	KPLY	1240
	KPOD	1310
Creston, Iowa	KSIB	1520
Crestview, Fla.	WCNU	1010
	WJSB	1050
Crewe, Va.	WSVS	800
Crockett, Tex.	KIVY	1290
Crookston, Minn.	KROX	1260
Crossett, Ark.	KAGH	800
Crossville, Tenn.	WAEW	1330
Crowley, La.	KSIG	1450
Crystal Lake, Ill.	WCLR	850
Cuero, Tex.	KCFH	1600
Cullman, Ala.	WFMH	1460
	WKUL	1340
Culpeper, Va.	WCVA	1490
Cumberland, Ky.	WCPM	1280
Cumberland, Md.	WCUM	1230
	WTBO	1450
Cummings, Ga.	WSNE	1410
Cushing, Okla.	KUSH	1600
Cuyahoga Falls, Ohio		
	WCUE	1150
Cypress Gardens, Fla.		
	WGTO	540
Cynthiana, Ky.	WCYN	1400
Dade City, Fla.	WDCF	1350
Dadeville, Ala.	WDVC	910
Daingerfield, Tex.	KEGG	1560
Dalhart, Tex.	KXIT	1410
Dallas, N.C.	WAAK	960
Dallas, Oreg.	KROW	1480
Dallas, Tex.	KRLD	1080
	KIXL	1040
	KSKY	660
	KLIF	1190
	WFAA	570
	WFAA	820
	KBOX	1480
	WRR	1310
Dalton, Ga.	WBLJ	1230
	WRCD	1430
	WTTI	1530
Danbury, Conn.	WLAD	800
Danville, Ill.	WDAN	1490
	WITY	980
Danville, Ky.	WHIR	1230
Danville, Pa.	WPGM	1570
Danville, Va.	WBTM	1330
	WYPR	970
	WDVA	1250
	WILA	1580
Dardanelle, Ark.	KCAB	980
Darlington, S.C.	WDAR	1350
Davenport, Iowa	WOC	1420
	KWNT	1580
	KSTT	1170
Dawson, Ga.	WDWD	990
Dayton, Ohio	WHIO	1290
	WING	1410
	WONE	980
	WAVI	1210
Dayton, Tenn.	WDNT	1280
Daytona Beach, Fla.		
	WNDB	1150
	WMFJ	1450
	WRDD	1340
Deadwood, S.Dak.	KDSJ	980
Dearborn, Mich	WKNR	1310
Decatur, Ala.	WHOS	800
	WAJF	1490
	WMSL	1400
Decatur-Atlanta, Ga.		
	KGUN	1010
	WDMN	1310
Decatur, Ill.	WDZ	1050
	WSOY	1340
Decatur, Ind.	WADM	1540
Decorah, Iowa	KDEC	1240
	KWLC	1240
Deer Lodge, Mont.	KDRG	1400
Deerfield, Va.	WABH	1150
Defiance, Ohio	WONW	1280
De Funiak Springs, Fla.		
	WDSP	1280
	WZEP	1460
De Kalb, Ill.	WLBK	1360
De Land, Fla.	WJBS	1490
	WOOO	1310
Delano, Calif.	KCHJ	1010
Delaware, Ohio	WDLE	1550
Delray, Bch., Fla.	WDBF	1420
Del Rio, Tex.	KDLK	1230
Delta, Colo.	KDTA	1400
Deming, N.Mex.	KOTS	1230
Demopolis, Ala.	WXAL	1400
Denham Sprgs., La.	WLBI	1220
Denison, Iowa	KDSN	1580
Denison-Sherman, Tex.		
	KDSX	950
Denmark-Bamberg, S.C.		
	WWBD	790
Denton, Tex.	KDNT	1440
Denver, Colo.	KDEN	1340
	KFML	1390
	KHOW	630
	KIMN	950
	KLIR	990
	KLZ	560
	KBTR	710
	KOA	850
	KPOF	910
	KFSC	1220
	KTLN	1280
Denver City, Tex.	KKAL	1580
De Queen, Ark.	KDQN	1390
DeRidder, La.	KDLA	1010
Des Moines, Iowa	KCBC	1390
	KIOA	940
	KRNT	1350
	KSO	1460
	KWKY	1150
	WHO	1040
Detroit, Mich.	WCAR	1130
	WJBK	1500
	WJLB	1400
	WJR	760
	WWJ	950
	WXYZ	1270
Detroit Lakes, Minn.		
	KDLM	1340
Devils Lake, N.Dak.		
	KDLR	1240
Dexter, Mo.	KDEX	1590
Diboll, Tex.	KSPL	1260
Dickinson, N.Dak.	KDIX	1230
Dickson, Tenn.	WDKN	1260
Dillon, Mont.	KDBM	800
Dillon, S.C.	WDSC	800
Dimmitt, Tex.	KDHN	1470
Dinuba, Calif.	KRDU	1130
Dixon, Ill.	WIXN	1460
Dodge City, Kans.	KGNO	1370
	KEDD	1550
Donaldsonville, Ga.	WSEM	1500
Doniphan, Mo.	KDFN	1500
Dothan, Ala.	WAGF	1320
	WDIG	1450
	WOOF	560
Douglas, Ariz.	KAWT	1450
	KAPR	930
Douglas, Ga.	WDMG	860
	WOKA	1310
Douglas, Wyo.	KWIV	1050
Douglasville, Ga.	WDGL	1520
Dover, Del.	WDOV	1410
	WKEN	1600
Dover, N.J.	WRAN	1510
Dover, N.H.	WTSN	1270
Dover, Ohio	WJER	1450
Dowagiac, Mich.	WDOW	1440
Doylestown, Pa.	WBUX	1570
Dublin, Ga.	WMLT	1330
	WXLI	1230
Du Bois, Pa.	WCED	1420
Dubuque, Iowa	KDTH	1270
	WDBQ	1490
Duluth, Minn.	KDAL	610
	WEBC	560
	KAOH	1390
Dumas, Ark.	KDDA	1560
Dumas, Tex.	KDDD	800
Duncan, Okla.	KRHD	1350
Dundee, N.Y.	WFLR	1570
Dunkirk, N.Y.	WDOE	1410
Dunn, N.C.	WCKB	780
Du Quoin, Ill.	WDQN	1580
Durango, Colo.	KIUP	930
	KDGO	1240
Durant, Okla.	KSFO	750
Durham, N.C.	WDNC	620
	WSRC	1410
	WSSB	1490
	WTIK	1310
Dyersburg, Tenn.	WDSG	1450
	WTRO	1330
Eagle Pass, Tex.	KEPS	1270
Eagle River, Wis.	WERL	950
Easley, S.C.	WELP	1360
E. Grand Forks, Minn.		
	KRAD	1590
Eastland, Tex.	KERC	1590
E. Lansing, Mich.	WKAR	870
	WVIC	730
E. Liverpool, Ohio	WOHI	1490
East Longmeadow, Mass.		
	WTYM	1600
Eastman, Ga.	WUFF	710
E. Moline, Ill.	WDLM	960
E. Point, Ga.	WTJH	1260
East Prairie, Mo.	KGCL	1080
E. Syracuse, N.Y.	WPAW	1540
Easton, Md.	WEMD	1460
Easton, Pa.	WEEX	1230
	WEST	1400
Eatontown, N.J.	WHTG	1410
Eau Claire, Wis.	WEAQ	790
	WBIZ	1400
	WECL	1050
Eau Gallie, Fla.	WMEG	920
Ebensburg, Pa.	WEND	1580
Edenton, N.C.	WCDJ	1260
Edinburg, Tex.	KURV	710
Edmonds, Wash.	KGDN	630
Effingham, Ill.	WCRA	1090
Elba, Ala.	WELB	1350
Elberton, Ga.	WSGC	1400
El Cajon, Calif.	KDEO	910
El Campo, Tex.	KULP	1390
El Centro, Calif.	KXO	1230
	KAMP	1430
El Dorado, Ark.	KDMS	1290
	KELD	1400
Eldorado, Kans.	KBTO	1360
Eldorado Springs, Mo.		
	KESM	1580
Eleele, Kanai, Hawaii		
	KUAI	720
Elgin, Ill.	WRMN	1410
Elizabeth City, N.C.		
	WCNC	1240
	WGAI	560
Elizabethton, Tenn.	WBEJ	1240
	WIDD	1520
Elizabethtown, Ky.	WIEL	1400
Elizabethtown, N.C.		
	WBLA	1440
Elizabethtown, Pa.	WHRY	1600
Elk City, Okla.	KBEK	1240
Elkhart, Ind.	WTRC	1340
	WCMR	1270
Elkins, N.C.	WIFM	1540
Elkins, W.Va.	WDNE	1240
Elko, Nev.	KELK	1240
Elkton, Md.	WSER	1550
Ellensburg, Wash.	KXLE	1240
Ellenville, N.Y.	WELV	1370
Ellsworth, Me.	WDEA	1370
Elmira, N.Y.	WELM	1410
	WENY	1230
Elmira Heights-Horseheads, N.Y.		
	WEHH	1590
El Paso, Tex.	KROD	600
	KELP	920
	KHEY	690
	KINT	1590
	KIZZ	1150
	KSET	1340
	KTSM	1380
El Reno, Okla.	KELR	1460
Ely, Minn.	WELY	1450
Ely, Nev.	KELY	1230
Elyria, Ohio	WEOL	930
Eminence, Ky.	WSTL	1600
Emporia, Kans.	KVOE	1400
Emporia, Va.	WEVA	860
Emporium, Pa.	WLEM	1250
Endicott, N.Y.	WENE	1430
Englewood, Colo.	KGMC	1150
Englewood, Fla.	WENG	1530
Enid, Okla.	KCRC	1390
	KGWA	960
Enterprise, Ala.	WIRB	600
Enterprise, Oreg.	KWVR	1340
Ephrata, Pa.	WGSA	1310
Ephrata, Wash.	KULF	730
Erie, Pa.	WWYN	1260
	WICU	1330
	WJET	1400
	WWGO	1450
Erwin, Tenn.	WEMB	1420
Escanaba, Mich.	WDBC	680
	WLST	600
Escondido, Calif.	KOWN	1450
Espanola, N.M.	KDCE	970
Etowah, Tenn.	WCPH	1220
Eufaula, Ala.	WULA	1240
Eugene, Oreg.	KORE	1450
	KPIR	1500
	KASH	1600
	KATR	1320
	KERG	1280
	KUGN	590
	KWFS	1540
Eunice, La.	KEUN	1490
Eureka, Calif.	KINS	980
	KDAN	790
Eustis, Fla.	WLCO	1240
Evanston, Ill.	WEAW	1330
	WNMP	1590
Evanston, Wyo.	KEVA	1240
Evansville, Ind.	WROZ	1400
	WGBF	1280
	WIKY	820
	WJPS	1330
Eveleth, Minn.	WEVE	1340
Everett, Pa.	WWDS	1050
Everett, Wash.	KRKO	1380
	KWYZ	1230
Evergreen, Ala.	WBLO	1470
Exeter, N.H.	WKXR	1540
Fairbanks, Alaska	KFAR	660
	KFRB	900
Fairbault, Minn.	KDHL	920
Fairbury, Nebr.	KGMT	1310
Fairfax, Va.	WEEL	1310
Fairfield, Ill.	WFIW	1390
Fairfield, Iowa	KMCD	1570
Fairhope, Ala.	WABF	1220
Fairmont, Minn.	KSUM	1370
Fairmont, N.C.	WFMO	860
Fairmont, W.Va.	WMMN	920
	WTCS	1490
Fairway, Kan.	KUDL	1380
Fajardo, P.R.	WMDD	1480
Falfurrias, Tex.	KPSO	1260
Fall River, Mass.	WALE	1400
	WSAR	1480
	KVLV	980
Falls Church, Va.	WFAX	1220
Falls City, Nebr.	KTNC	1230

Location	C.L.	Kc.
Fargo, N.Dak.	WDAY	970
	KFGO	790
	KFNW	900
	KQWB	1550
Faribault, Minn.	KDHL	920
Farmersville, La.	KTDL	1470
Farmington, Me.	WKTJ	1380
Farmington, Mo.	KREI	800
Farmington, N.M.	KENN	1390
	KWYK	960
	KRZE	1280
Farmville, N.C.	WFAG	1250
Farmville, Va.	WFLO	870
Farrell, Pa.	WFAR	1470
Farwell, Tex.	KZOL	1570
Fayette, Ala.	WWWF	990
Fayetteville, Ark.	KHOG	1440
	KFAY	1250
Fayetteville, N.C.	WFAI	1230
	WFNC	940
	WFLB	1490
	WIDU	1600
Fayetteville, Tenn.	WEKR	1240
Fergus Falls, Minn.	KOTE	1250
Fernandino Beach, Fla.	WFBF	1570
Ferriday, La.	KFNV	1600
Festus, Mo.	KJCF	1400
Festus-St. Louis, Mo.	KXEN	1010
Findlay, Ohio	WFIN	1330
Fisher, W.Va.	WELD	690
Fitchburg, Mass.	WEIM	1280
	WFGM	960
Fitzgerald, Ga.	WBHB	1240
Flagstaff, Ariz.	KCLS	600
	KJKJ	1400
	KEOS	690
Flat River, Mo.	KFMO	1240
Flint, Mich.	WFDF	910
	WTRX	1330
	WAMM	1420
	WMRP	1570
	WKMF	1470
	WTAC	600
Flomaton, Ala.	WTCB	990
Florence, Ala.	WJOI	1340
	WOWL	1240
Florence, S.C.	WJMX	970
	WOLS	1230
	WYNN	540
Floydada, Tex.	KFLD	900
Foley, Ala.	WHEP	1310
Fond du Lac, Wis.	KFIZ	1450
Fordyce, Ark.	KBJT	1570
Forest, Miss.	WMAG	860
Forest City, N.C.	WBBO	780
	WAGY	1320
Forest Grove, Ore.	KWAY	1570
Forrest City, Ark.	KXJK	950
Ft. Atkinson, Wis.	WFAW	940
Ft. Bragg, Calif.	KDAC	1230
Ft. Campbell, Ky.	WABD	1370
Ft. Collins, Colo.	KCOL	1410
	KZIX	600
Ft. Dodge, Iowa	KVFD	1400
	KWMT	540
Ft. Knox, Ky.	WSAC	1470
Ft. Lauderdale, Fla.	WFTL	1400
	WWIL	1580
Ft. Madison, Iowa	KXGI	1360
Ft. Morgan, Colo.	KFTM	1400
Ft. Myers, Fla.	WINK	1240
	WMYR	1410
	WCAI	1350
Ft. Payne, Ala.	WFPA	1400
	WZOB	1250
Ft. Pierce, Fla.	WARN	1330
	WIRA	1400
Ft. Scott, Kans.	KMDO	1600
Ft. Smith, Ark.	KFPW	1230
	KFSA	950
	KTCS	1410
	KWHN	1320
Ft. Stockton, Tex.	KFST	860
Ft. Valley, Ga.	WFPM	1150
Ft. Walton Beach, Fla.	WNUE	1400
	WFTW	1260
Ft. Wayne, Ind.	WGL	1250
	WOWO	1190
	WLYV	1450
	WKJG	1380
Ft. Worth, Tex.	KJIM	870
	KCUL	1540
	KFJZ	1270
	KNOK	970
	WBAP	570
	WBAP	820
	KXOL	1360
Fostoria, Ohio	WFOB	1430
Fountain City, Tenn.	WGYW	1430
	WROL	1490
Fountain Inn, S.C.	WFIS	1600
Fowler, Calif.	KLIP	1220
Framingham, Mass.	WKOX	1190
Frankfort, Ind.	WILO	1570
Frankfort, Ky.	WFKY	1490
Franklin, Ky.	WFKN	1220
Franklin, La.	KFRA	1390
Franklin, N.C.	WFSC	1050
Franklin, N.H.	WFTN	1240
Franklin, Pa.	WFRA	1450
Franklin, Tenn.	WAGG	950
Franklin, Va.	WYSR	1250
Frederick, Md.	WFMD	930
Frederick, Okla.	KTAT	1570
Fredericksburg, Tex.	KNAF	910
Fredericksburg, Va.	WFVA	1230
	WFLS	1350
Fredericktown, Mo.	KFTW	1450
Fredonia, N.Y.	WBUZ	1570
Freeport, Ill.	WFRL	1570
Freeport, N.Y.	WGBB	1240
Freeport, Tex.	KBRZ	1460
Fremont, Mich.	WBFC	1490
	WSHN	1550
Fremont, Nebr.	KHUB	1340
Fremont, Ohio	WFRO	900
Fresno, Calif.	KARM	1430
	KBIF	900
	KIRV	1510
	KEAP	980
	KXEX	1550
	KFRE	940
	KGST	1600
	KMAK	1340
	KMJ	580
	KYNO	1300
Friona, Tex.	KNNN	1070
Front Royal, Va.	WFTR	1450
Frostburg, Md.	WFRB	560
Fulton, Ky.	WFUL	1270
Fulton, Mo.	KFAL	900
Fulton, N.Y.	WOSC	1300
Fuquay Sprgs., N.C.	WFVG	1460
Gadsden, Ala.	WGAD	1350
	WETO	930
	WAAX	570
	WEAC	1500
Gaffney, S.C.	WFGN	1570
Gainesville, Fla.	WDVH	980
	WGGG	1230
	WRUF	850
	WUWU	1390
Gainesville, Ga.	WGGA	550
	WDUN	1240
	WLBA	1580
Gainesville, Tex.	KGAF	1580
Gaithersburg, Md.	WHMC	1150
Galax, Va.	WBOB	1360
Galesburg, Ill.	WGIL	1400
	WAIK	1590
Gallatin, Tenn.	WHIN	1010
Gallipolis, Ohio	WJEH	990
Gallup, N. Mex.	KGAK	1330
	KYVA	1230
Galveston, Tex.	KILE	1400
	KGBC	1540
Gander, Nfld.	CBG	1450
Garden City, Kan.	KUIL	1240
	KUPK	1050
Garden City, Mich.	WTAK	1090
Gardner, Mass.	WGAW	1340
Gary, Ind.	WWCA	1270
	WLTH	1370
Gastonia, N.C.	WGNC	1450
	WLTC	1370
Gate City, Va.	WGAT	1050
Gaylord, Mich.	WATC	900
Geneseo, Ill.	WGEN	1500
Geneva, Ala.	WGEA	1150
Geneva, Ill.	WGSB	1480
Geneva, N.Y.	WGVA	1240
Georgetown, Del.	WJWL	900
Georgetown, Ky.	WAXU	1580
Georgetown, S.C.	WGTN	1400
	WGOO	1470
Georgetown, Tex.	KGTN	1530
Gettysburg, Pa.	WGET	1320
Gillette, Wyo.	KIML	1490
Gilroy, Calif.	KPER	1290
Gladewater, Tex.	KEES	1430
Glasgow, Ky.	WKAY	1490
	WCDS	1440
Glasgow, Mont.	KLTZ	1240
Glen Burnie, Md.	WISZ	1590
Glendale, Ariz.	KRUX	1360
Glendale, Calif.	KIEV	870
Glendive, Mont.	KXGN	1400
	KGLE	590
Glennallen, Alaska	KCAM	790
Glens Falls, N.Y.	WBZA	1410
	WWSC	1450
Glenville, Ga.	WKIG	1580
Glenwood Sprgs., Colo.	KGLN	980
Globe, Ariz.	KZOW	1240
Gloucester, Va.	WDDY	1420
Gloversville-Johnston, N.Y.	WENT	1340
Gold Beach, Oreg.	KBLY	1220
Golden, Colo.	KICM	1250
Golden Meadow, La.	KLEB	1600
Golden Valley, Minn.	KQRS	1440
	KUXL	1570
Goldsboro, N.C.	WFMC	730
	WGBR	1150
	WGOL	1300
Gonzales, Tex.	KCTI	1450
Goodland, Kans.	KLOE	730
Goshen, Ind.	WKAM	1460
Gouverneur, N.Y.	WIGS	1230
Grafton, N.D.	KGPC	1340
Grafton, W.Va.	WVVW	1260
Graham, Tex.	KSWA	1330
Grand Coulee, Wash.	KFDR	1360
Grand Forks, N.D.	KFJM	1370
	KILO	1440
	KNOX	1310
Grand Haven, Mich.	WGHN	1370
Grand Island, Nebr.	KMMJ	750
	KRGI	1430
Grand Junction, Colo.	KREX	920
	KEXO	1230
	KSTR	620
	KWSL	1340
Grand Prairie, Tex.	KPCW	730
Grand Rapids, Mich.	WJEF	1230
	WFUR	1570
	WGRD	1410
	WLAV	1340
	WMAX	1480
	WOOD	1300
Grand Rapids, Minn.	KOZY	1490
Grangeville, Idaho	KORT	1230
Granite City, Ill.	WGNU	920
Granite Falls, N. C.	WKJK	1580
Grants, N.Mex.	KMIN	980
Grants Pass, Oreg.	KAGI	930
	KAJO	1270
Grayson, Ky.	WGOH	1370
Gt. Barrington, Mass.	WSBS	860
Gt. Bend, Kans.	KVGB	1590
Gt. Falls, Mont.	KFBB	1310
	KUDI	1450
	KMON	560
	KARR	1400
Greeley, Colo.	KFKA	1310
	KYOU	1450
Green Bay, Wis.	WBAY	1360
	WJPG	1440
	WDUZ	1400
Greeneville, Tenn.	WGRV	1340
	WSMG	1450
Greenfield, Mass.	WHAI	1240
Greensboro, N.C.	WBIG	1470
	WCOG	1320
	WEAL	1510
	WKTB	1550
	WGBG	1400
	WPET	950
Greensburg, Ind.	WTRE	1330
Greensburg, Pa.	WHJB	620
Greenville, Ala.	WGYV	1380
Greenville, Ky.	WKYF	1600
Greenville, Mich.	WPLB	1380
Greenville, Miss.	WJPR	1330
	WDDT	900
	WGVM	1260
Greenville, Pa.	WGRP	940
Greenville, N. C.	WNCT	1590
	WOOW	1340
	WPXY	1550
Greenville, S.C.	WESC	660
	WFBC	1330
	WMRB	1490
	WMUU	1260
	WQOK	1440
Greenville, Tex.	KGVL	1400
Greenwich, Conn.	WGCH	1490
Greenwood, Miss.	WABG	960
	WGRM	1240
	WLEF	1540
Greenwood, S.C.	WCRS	1450
	WGSW	1350
Greer, S.C.	WEAB	800
	WCKI	1300
Grenada, Miss.	WNAG	1400
Gresham, Oreg.	KRDR	1230
Gretna, Va.	WMNA	730
Griffin, Ga.	WKEU	1450
	WHIE	1320
	WGRI	1410
Grinnell, Iowa	KGRN	1410
Groton, Conn.	WSUB	980
Grove City, Pa.	WSAJ	1340
Grundy, Va.	WNRG	940
Guayama, P.R.	WXRF	1590
Gulfport, Miss.	WROA	1390
	WGCM	1240
Gunnison, Colo.	KGUC	1490
Guntersville, Ala.	WGSV	1270
Guthrie, Okla.	KWRW	1490
Guymon, Okla.	KGYN	1220
Hagerstown, Md.	WARK	1490
	WJEJ	1240
Haines City, Fla.	WHAN	930
Haleyville, Ala.	WJBB	1230
Halfway, Md.	WHAG	1410
Hamden, Conn.	WDEE	1220
Hamilton, Ala.	WERH	970
Hamilton, Mont.	KYLQ	980
Hamilton, Ohio	WMOH	1450
	WCNW	1560
Hamilton, Tex.	KCLW	900
Hamlet, N. C.	WKDX	1250
Hammond, Ind.	WJOB	1230
Hammond, La.	WFPR	1400
Hammonton, N.J.	WNJH	1580
Hampton, S.C.	WBHC	1270
Hampton, Va.	WVEC	1490
Hancock, Mich.	WMPL	920
Hanford, Calif.	KNGS	620
Hannibal, Mo.	KHMO	1070
Hanover, N.H.	WTSL	1400
	WDCR	1340
Hanover, Pa.	WHVR	1280
Hardin, Mont.	KHDN	1230
Harlan, Ky.	WHLN	1410
Harlingen, Tex.	KGBT	1530
Harriman, Tenn.	WHBT	1600
Harrisburg, Ill.	WEBQ	1240
Harrisburg, Pa.	WFEC	1400
	WCMB	1460
	WHP	580
Harrison, Ark.	KHOZ	900
Harrisonburg, Va.	WHBG	1360
	WSVA	550
Harrodsburg, Ky.	WHBN	1420
Hartford, Conn.	WDRC	1360
	WCCC	1290
	WPOP	1410
	WTIC	1080
Hartford, Wis.	WTKM	1540
Hartselle, Ala.	WHRT	860
Hartsville, S.C.	WHSC	1450
Hartsville, Tenn.	WJKM	1090
Hartwell, Ga.	WKLY	980
Harvard, Ill.	WMCW	1600
Harvey, Ill.	WBEE	1570
Hastings, Mich.	WBCH	1220
Hastings, Minn.	KDWA	1460
Hastings, Nebr.	KHAS	1230
	KICS	1550
Hattiesburg, Miss.	WBKH	950
	WFOR	1400
	WHSY	1230
	WXXX	1310
Havelock, N.C.	WUSM	1330
Haverhill, Mass.	WHAV	1490
Havre, Mont.	KOJM	610
Havre de Grace, Md.	WASA	1330
Hawkinsville, Ga.	WCEH	610
Haynesville, La.	KLUV	1580
Hays, Kans.	KAYS	1400
Hayward, Wis.	WHSM	910
Hazard, Ky.	WKIC	1390
Hazelhurst, Ga.	WVOH	920
Hazlehurst, Miss.	WMDC	1220
Hazleton, Pa.	WAZL	1490
Heber Springs, Ark.	KHEB	1370
Helena, Ark.	KFFA	1360
Helena, Mont.	KCAP	1340
	KBLL	1240
Hemet, Calif.	KHSJ	1320
Hempstead, N.Y.	WHLI	1100
Henderson, Ky.	WSON	860
Henderson, Nev.	KBMI	1400
	KTOO	1280
Henderson, N.C.	WHNC	890
	WIZS	1450
Henderson, Tex.	KGRI	1000
	KWRD	1470
Hendersonville, N.C.	WHKP	1450
	WHVL	1600
Henryetta, Okla.	KHEN	1590
Hereford, Tex.	KPAN	860
Herkimer, N.Y.	WALY	1420
Hermiston, Oreg.	KOHU	1570
Herendon, Va.	WHRN	1440
Herrin, Ill.	WJPF	1340
Hettinger, N.Dak.	KNDC	1490
Hibbing, Minn.	WMFG	1240
Hickory, N.C.	WHKY	1290
	WIRC	680
	WSPF	1000
Highland, Ill.	WINU	1510
Highland Park, Ill.	WEEF	1430
Highland Park, Tex.	KVIL	1150
Highland Springs, Va.	WENZ	1450
High Point, N.C.	WMFR	1230
	WNOS	1590
	WHPE	1070
Hillsboro, Ohio	WSRW	1590
Hillsboro, Oreg.	KUIK	1360
Hillsboro, Tex.	KHBR	1560
Hillsdale, Mich.	WCSR	1340
Hillsville, Va.	WHHV	1400
Hilo, Hawaii	KPUA	970
	KIPA	1110
	KIMO	850
Hinesville, Ga.	KGML	990
Hinton, W. Va.	WMTD	1380
Hobbs, N.Mex.	KWEW	1480
	KHOB	1390
Holbrook, Ariz.	KDJI	1270
Holdenville, Okla.	KVYL	1370
Holdredge, Nebr.	KUVR	1380

WHITE'S RADIO LOG

Location	C.L.	Kc.
Holland, Mich.	WHTC	1450
	WJBL	1260
Hollister, Cal.	KMPG	1520
Hollywood, Fla.	WGMA	1320
Holly Hill, S.C.	WHHL	1440
Holly Springs, Miss.		
	WKRA	1110
Holyoke, Mass.	WREB	930
Homer, La.	KHAL	1320
Homestead, Fla.	WIII	1430
Homewood, Ala.	WJLD	1400
Honolulu, Hawaii	KAIM	870
Honolulu, Hawaii	KCCN	1420
	KGMB	590
	KZOO	1210
	KHAI	1090
	KPOI	1380
	KIKI	830
	KGU	760
	KHVH	1040
	KNDI	1270
	KOHO	1170
	KORL	650
	KTRG	990
	KULA	690
Hood River, Oreg.	KIHR	1340
Hope, Ark.	KXAR	1490
Hopewell, Va.	WHAP	1340
Hopkinsville, Ky.	WHOP	1230
	WKOA	1480
Hoquiam, Wash.	KGHO	1560
Hornell, N.Y.	WWHG	1320
	WLEA	1480
Hot Springs, Ark.	KBHS	590
	KZNG	1470
Hot Springs, S.Dak.		
	KOBH	580
Houghton, Mich.	WHDF	1400
Houghton Lake, Mich.		
	WHGR	1290
Houlton, Maine	WHOU	1340
Houma, La.	KCIL	1490
Houston, Miss.	WCPC	940
Houston, Mo.	KBTC	1250
Houston, Tex.	KCOH	1430
	KENR	1070
	KILT	610
	KNUZ	1230
	KODA	1010
	KPRC	950
	KTHT	790
	KTRH	740
	KXYZ	1320
	KYOK	1590
Howell, Mich.	WHMI	1350
Hudson, N.Y.	WHUC	1230
Hugo, Okla.	KIHN	1340
Humacao, P.R.	WALO	1240
Humboldt, Tenn.	WIRJ	740
Huntingdon, Pa.	WHUN	1150
Huntington, Ind.	WHLT	1300
Huntington, N.Y.	WGSM	740
Huntington, W.Va.		
	WKEE	800
	WSAZ	930
	WWHY	1470
Huntsville, Ala.	WBHP	1230
	WEUP	1600
	WFIX	1450
	WAAY	1550
Huntsville, Tex.	KSAM	1490
Huron, S.Dak.	KIJV	1340
Hutchinson, Kans.	KWBW	1450
	KWHK	1260
Hutchinson, Minn.	KDUZ	1260
Hyde Park, N.Y.	WHVW	950
Idabel, Okla.	KBEL	1240
Idaho Falls, Idaho	KID	590
	KTEE	1260
Immokalee, Fla.	WCOF	1490
Independence, Ia.	KUPI	980
	KOUR	1220
Independence, Kans.		
	KIND	1010
Independence, Mo.	KCCX	1510
Indiana, Pa.	WDAD	1450
Indianapolis, Ind.	WATI	810
	WBRI	1500
	WFBM	1260
	WGEE	1590
	WIBC	1070
	WIFE	1310
	WIRE	1430
	WXLW	950
Indianola, Iowa	KBAB	1490
Indianola, La.	KBAB	1490
Indianola, Miss.	WNLA	1380
Indian Rocks Beach, Fla.		
	WGNP	1520
Indio, Calif.	KREO	1400
Inglewood, Calif.	KTYM	1480
Inkster, Mich.	WCHB	1440
International Falls, Minn.		
	KGHS	1230
Inverness, Fla.	WYSE	1560
Iola, Kansas	KALN	1370
Ionia, Mich.	WION	1430
Iowa City, Iowa	KXIC	800
	WSUI	910
Iowa Falls, Iowa	KFIG	1510
Iron Mtn., Mich.	WMIQ	1450
Irondale, Ala.	WIXI	1480
Ironton, Ohio	WIRO	1230
Ironwood, Mich.	WJMS	630
Irvine, Ky.	WIRV	1550
Isabella, P.R.	WISA	1390
Ishpeming, Mich.	WJPD	1240
	WCKD	970
Islip, N.Y.	WBIC	540
Ithaca, N.Y.	WHCU	870
	WTKO	1470
Iuka, Miss.	WVOM	1270
Jackson, Ala.	WHOD	1290
Jackson, Mich.	WIBM	1450
	WKHM	970
	WJCO	1510
Jackson, Miss.	WJDX	620
	WJQS	1400
	WJXN	1450
	WOKJ	1550
	WWUN	1590
	WRBC	1300
	WSLI	980
Jackson, Ohio	WLMJ	1280
Jackson, Tenn.	WDXI	1310
	WJAK	1460
	WTJS	1390
Jackson, Wis.	WYLO	540
Jackson, Wyo.	KSGT	1340
Jacksonville, Ark.	KGMR	1500
Jacksonville, Fla.	WJAX	930
	WAPE	690
	WZOK	1320
	WIVY	1050
	WMBR	1460
	WOBS	1360
	WPDQ	600
	WQIK	1090
	WRHC	1400
Jacksonville, Ill.	WJIL	1550
	WLDS	1180
Jacksonville, Miss.	WJQS	1400
Jacksonville, N.C.	WJNC	1240
	WLAS	910
Jacksonville, Tex.	KEBE	1400
Jacksonville Beh., Fla.		
	WBIX	1010
Jamestown, N.Dak.	KEYJ	1400
	KSJB	600
Jamestown, N.Y.	WJTN	1240
	WKSN	1340
Jamestown, Tenn.	WCLC	1260
Janesville, Wis.	WCLO	1230
Jasper, Ala.	WWWB	1360
	WARF	1240
Jasper, Ind.	WITZ	990
Jasper, Tex.	KTXJ	1350
Jefferson City, Mo.	KLIK	950
	KWOS	1240
Jefferson City, Tenn.		
	WJFC	1480
Jeffersonville, Ind.	WXVW	1450
Jena, La.	KCKW	1480
Jennings, La.	KJEF	1290
Jerome, Idaho	KART	1400
Jerseyville, Ill.	WJBM	1480
Jesup, Ga.	WLOP	1370
John Day, Ore.	KJDY	1400
Johnson City, Tenn.		
	WJCW	910
	WETB	790
Johnston, S.C.	WJES	250
Johnstown, N.Y.	WIZR	930
Johnstown, Pa.	WJAC	850
	WARD	1490
	WCRO	1230
Joliet, Ill.	WJOL	1340
	WJRC	1510
Joliette, Que.	CJLM	1350
Jonesboro, Ark.	KBTM	1230
	KNEA	970
Jonesboro, La.	KTOC	920
Jonesboro, Tenn.	WJSO	1590
Jonesville, La.	KANV	1480
Joplin, Mo.	WMBH	1450
	KQYX	1560
	KFSB	1310
	KODE	1230
Junction, Tex.	KMBL	1450
June. City, Kans.	KJCK	1420
Juneau, Alaska	KINY	800
	KJNO	630
Kailua, Hawaii	KLEI	1150
Kalamazoo, Mich.	WKPR	1420
	WKZO	590
	WKLZ	1470
	WKMI	1360
Kalispell, Mont.	KGEZ	600
	KOFI	930
Kane, Pa.	WKZA	960
Kankakee, Ill.	WKAN	1320
Kannapolis, N.C.	WGTL	870
	WRKB	1460
Kans. City, Kans.	KCKN	1340
Kansas City, Mo.	KCMO	810
	KMBC	980
	KPRS	1590
	WDAF	610
	WHB	710
Kaukauna, Wis.	WKAU	1050
Kenedy-Karnes City, Texas		
	KAML	990
Kealakekua, Hawaii		
	KONA	790
Kearney, Nebr.	KGFW	1340
	KRNY	1460
Keene, N.H.	WKNE	1290
	WKBK	1220
Kelso, Wash.	KLOG	1490
Kemmerer, Wyo.	KMER	950
Kendallville, Ind.	WAWK	1570
Kenedy, Tex.	KAML	990
Kennett, Mo.	KBOA	830
	KBXN	1540
Kennewick-Pasco-Richland, Wash.	KEPR	610
Kenosha, Wis.	WLIP	1050
Kent, O.	WKNT	1520
Keokuk, Iowa	KOKX	1310
Kermit, Tex.	KERB	600
Kerrville, Tex.	KERV	1230
Kershaw, S.C.	WKSC	1300
Ketchikan, Alaska	KTKN	930
Kewanee, Ill.	WKEI	1450
Keyser, W.Va.	WKYR	1270
	WKLP	1390
Key West, Fla.	WKWF	1600
	WKIZ	1500
Kilgore, Tex.	KOCA	1240
Killeen, Tex.	KLEN	1050
Kimball, Nebr.	KIMB	1260
King, N. C.	WKTE	1090
King City, Calif.	KRKC	1490
Kingman, Ariz.	KAAA	1230
Kings Mountain, N.C.		
	WKMT	1220
Kingsport, Tenn.	WKIN	1320
	WKPT	1550
Kingston, N.Y.	WBAZ	1550
	WGHQ	920
	WKNY	1490
Kingstree, S.C.	WDKD	1310
Kingsville, Tex.	KINE	1330
Kinston, N.C.	WELS	1010
	WFTC	960
	WISP	1280
Kirkland, Wash.	KYAC	1460
	KBLE	1050
Kirksville, Mo.	KIRX	1450
Kissimmee, Fla.	WFIV	1080
	WJPB	1220
Kittanning, Pa.	WACB	1380
Klamath Falls, Oreg.		
	KAGO	1150
	KFLW	1450
	KLAD	960
Knoxville, Iowa	KNIA	1320
Knoxville, Tenn.	WBIR	1240
	WIVK	850
	WATE	620
	WKXV	900
	WNOX	990
	WROL	1490
Kokomo, Ind.	WIOU	1350
Kosciusko, Miss.	WKOZ	1350
Laconia, N.H.	WLNH	1350
	WEMJ	1490
LaCrosse, Wis.	WKBH	1410
	WLCX	1490
	WKTY	580
Ladysmith, Wis.	WLDY	1340
Lafayette, Ga.	WLFA	1590
Lafayette, Ind.	WASK	1450
	WAZY	1410
	WBAA	920
Lafayette, La.	KPEL	1420
	KVOL	1330
	KXKW	1520
Lafayette, Tenn.	WEEN	1460
LaFollette, Tenn.	WLAF	1450
LaGrande, Oreg.	KLBM	1450
LaGrange, Ga.	WLAG	1240
	WTRP	620
LaGrange, Ill.	WTAQ	1300
LaGrange, Tex.	KVLG	1570
LaJunta, Colo.	KBZZ	1400
Lake Charles, La.	KLOU	1580
	KPLC	1470
	KAOK	1400
Lake City, Fla.	WDSR	1340
	WGRO	960
Lake City, S.C.	WJOT	1260
Lake Geneva, Wis.	WMIR	1550
Lakeland, Fla.	WLAK	1430
	WONN	1230
	WWAB	1330
Lake Placid, N.Y.	WIRD	920
Lakeport, Cal.	KBIC	1270
Lake Providence, La.	KLPL	1050
Lake Tahoe, Calif.	KOWL	1490
Lakeview, Oreg.	KQIK	1230
Lake Wales, Fla.	WIPC	1280
Lakewood, Colo.	KLAK	1600
Lakewood Center, Wash.		
	KFHA	1480
Lake Worth, Fla.	WLIZ	1380
Lamar, Colo.	KLMR	920
Lamesa, Tex.	KPET	690
Lampasas, Tex.	KCYL	1450
Lancaster, Calif.	KAVL	610
	KBVM	1380
Lancaster, N.Y.	WMMJ	1300
Lancaster, Ohio	WHOK	1320
Lancaster, Pa.	WGAL	1490
	WLAN	1390
Lancaster, S.C.	WLCM	1360
	WAGL	1560
Lander, Wyo.	KOVE	1330
Lanett, Ala.-W. Point, Ga.		
	WRLD	1490
Lansdale, Pa.	WNPV	1440
Lansford, Pa.	WLSH	1410
Lansing, Mich.	WILS	1320
	WJIM	1240
	WITL	1010
Lapeer, Mich.	WMPC	1230
	WTHM	1530
LaPlata, Md.	WSMD	1560
LaPorte, Ind.	WLOI	1540
Laramie, Wyo.	KLME	1490
	KOWB	1290
Laredo, Tex.	KGNS	1300
	KVOZ	1490
Larned, Kans.	KANS	1510
LaSalle, Ill.	WLPO	1220
LasCruces, N.Mex.	KOBE	1450
	KGRT	570
Las Vegas, Nev.	KENO	1460
	KLAV	1230
	KORK	1340
	KRAM	920
	KLUC	1050
	KVEG	970
Las Vegas, N.Mex.	KFUN	1230
Latrobe, Pa.	WPKV	1570
	WQTW	1570
	WTRA	1480
Laurel, Md.	WLMD	900
Laurel, Miss.	WAML	1340
	WLAU	1600
	WNSL	1260
Laurens, S.C.	WLBG	860
Laurinburg, N.C.	WEWO	1080
	WLNC	1300
Lawrence, Kans.	KFKU	1250
	KLWN	1320
Lawrence, Mass.	WCCM	800
Lawrenceburg, Tenn.		
	WDXE	1370
Lawrenceville, Ga.	WLAW	1360
Lawrenceville, Ill.	WAKO	910
Lawrenceville, Va.	WLES	580
Lawton, Okla.	KSWO	1380
	KCCO	1050
Leadville, Colo.	KBRR	1230
Leaksville, N.C.	WLOE	1490
Leavenworth, Kans.	KCLO	1410
Lebanon, Ky.	WLBN	1590
Lebanon, Mo.	KLWT	1230
Lebanon, Oreg.	KGAL	920
Lebanon, Pa.	WLBR	1270
Lebanon, Tenn.	WCOR	900
Leesburg, Fla.	WLBE	790
	WBIL	1410
Leesburg, Va.	WAGE	1290
Leesville, La.	KLLA	1570
Lehighton, Pa.	WYNS	1150
Leitchfield, Ky.	WMTL	1580
Leland, Miss.	WESY	1580
LeMars, Iowa	KLEM	1410
Lemmon, S.D.	KBJM	1400
Lemoore, Calif.	KLAN	1320
	KOAD	1240
Lenoir, N.C.	WJRI	1340
Lenoir, Tenn.	WLIL	730
Lenoir City, Tenn.	WBLC	1360
Leonardtown, Md.	WKIK	1370
Levelland, Tex.	KLVT	1230
Levittown, Pa.	WBCB	1490
Lewisburg, Pa.	WUNS	1010
Lewisburg, Tenn.	WJJM	1490
Lewiston, Idaho	KRLC	1350
	KOZE	1300
Lewiston, Maine	WCOU	1240
	WLAM	1470
Lewistown, Mont.	KXLO	1230
Lewistown, Pa.	WKVA	920
	WMRF	1490
Lexington, Ky.	WLAP	630
	WBLG	1300
	WVLK	590
Lexington, Miss.	WXTN	1000
Lexington, Mo.	KLEX	1570
Lexington, Nebr.	KRVN	1010
Lexington, N.C.	WBUY	1440
Lexington, Tenn.	WDXL	1490
Lexington, Va.	WREL	1450
Lexington Pk., Md.	WPTX	920
Libby, Mont.	KLCB	1230
	KLIB	1470
Liberal, Kans.	KSCB	1270
Liberty, Ky.	WPHN	1560
Liberty, N.Y.	WVOS	1240
Liberty, Tex.	KFAZ	1050
Lihue, Hawaii	KTOH	1490
Lima, Ohio	WIMA	1150
	WCIT	940
Lincoln, Ill.	WPRC	1370

Location	C.L.	Kc.
Lincoln, Me.	WLKN	1450
Lincoln, Nebr.	KFOR	1240
	KLIN	1400
	KLMS	1480
	KLOL	1530
Lincolnton, N.C.	WLON	1050
Linton, Ind.	WBTO	1600
Litchfield, Ill.	WSMI	1540
Litchfield, Minn.	KLFD	1410
Little Falls, Minn.	KLTF	960
Little Falls, N.Y.	WLFH	1230
Littlefield, Tex.	KZZN	1490
Little Rock, Ark.	KARK	920
	KALO	1250
	KLRA	1010
	KOKY	1440
	KAAY	1090
	KVLC	1050
Littleton, Colo.	KDKO	1510
Littleton, N. H.	WLTN	1400
Live Oak, Fla.	WNER	1250
Livingston, Mont.	KPRK	1340
Livingston, Tenn.	WLIV	920
Livingston, Tex.	KETX	1440
	KVLL	1220
Lock Haven, Pa.	WBPZ	1230
Lockport, N.Y.	WUSJ	1340
Lodi, Calif.	KCVR	1570
Logan, Utah	KVNU	610
	KSTU	1300
	KLGN	1390
Logan, W.Va.	WLOG	1230
	WVOW	1290
Logansport, Ind.	WSAL	1230
Lompoc, Calif.	KKOK	1410
	KLOM	1330
	KNEZ	960
London, Ky.	WFTG	1400
Long Beach, Calif.	KFOX	1280
	KGER	1390
Longmont, Colo.	KLMO	1060
Long Prairie, Minn.	KEYL	1400
Longview, Tex.	KFRO	1370
	KLUE	1280
Longview, Wash.	KEDO	1400
	KBAM	1270
Lookout Mtn., Tenn.	WFLI	1070
Lorain, Ohio	WWIZ	1380
Loretto, Pa.	WWSF	1400
Loris, S.C.	WLSC	1570
Los Alamos, N.Mex.	KRSN	1490
Los Angeles, Calif.	KABC	790
	KFI	640
	KHJ	930
	KFWB	980
	KGFJ	1230
	KFAC	1330
	KLAC	570
	KMPC	710
	KNX	1070
	KPOL	1540
	KGBS	1020
	KRKD	1150
Los Banos, Calif.	KLBS	1330
Louisburg, N.C.	WYRN	1480
Louisville, Ga.	WPEH	1420
Louisville, Ky.	WAVE	970
	WAKY	790
	WHAS	840
	WKLO	1080
	WINN	1240
	WFIA	900
	WLOU	1350
	WTMT	620
Louisville, Miss.	WLSM	1270
Loveland, Colo.	KLOV	1570
Loves Park, Ill.	WLUV	1520
Lovington, N.Mex.	KLEA	630
Lowell, Mass.	WCAP	980
	WLLH	1400
Lubbock, Tex.	KCBD	1590
	KDAV	580
	KLBK	1340
	KFYO	790
	KLLL	1460
	KSEL	950
Lucedale, Miss.	WHHT	1440
Ludington, Mich.	WKLA	1450
Lufkin, Tex.	KRBA	1340
	KTRE	1420
Lumberton, N.C.	WAGR	580
	WTSB	1340
Luray, Va.	WRAA	1330
Lynchburg, Va.	WLVA	590
	WLLL	930
	WDMS	1320
	WWOD	1390
	WBRG	1050
Lynn, Mass.	WLYN	1360
Lyons, Ga.	WBBT	1340
Macomb, Ill.	WKAI	1510
Macon, Ga.	WBML	1240
	WCRY	900
	WIBB	1280
	WMAZ	940
	WNEX	1400
Macon, Miss.	WMBC	1400
Macon, Mo.	KLTI	1560
Madawaska, Me.	WSJR	1230
Madera, Calif.	KHOT	1250
Madill, Okla.	KMAD	1550
Madison, Fla.	WMAF	1230
Madison, Ga.	WYTH	1250
Madison, Ind.	WORX	1270
Madison, S.D.	KJAM	1390
Madison, Tenn.	WENO	1430
Madison, Wis.	WHA	750
	WIBA	1310
	WISM	1480
	WKOW	1070
	WMAD	1550
Madisonville, Ky.	WFMW	730
	WTTL	1310
Magee, Miss.	WSJC	810
Magnolia, Ark.	KVMA	630
Makawao, Hawaii	KNUI	1310
Malden, Mo.	KTCB	1470
Malone, N.Y.	WICY	1490
Malvern, Ark.	KBOK	1310
Manassas, Va.	WPRW	1460
Manati, P.R.	WMNT	1550
Manchester, Conn.	WINF	1230
Manchester, Ga.	WFOR	1370
Manchester, Ky.	WWXL	1450
Manchester, N.H.	WFEA	1370
	WGIR	610
	WKBR	1250
Manchester, Tenn.	WMSR	1320
Manhattan, Kans.	KSAC	580
	KMAN	1350
Manistee, Mich.	WMTE	1340
Manistique, Mich.	WTIQ	1490
Manitou Springs, Colo.	KCMS	1490
Manitowoc, Wis.	WCUB	980
	WOMT	1240
Mankato, Minn.	KYSM	1230
	KTOE	1420
Manning, S.C.	WYMB	1410
Mansfield, La.	KDXI	1360
Mansfield, Ohio	WMAN	1400
	WCLW	1140
Manlewood, Minn.	WRCR	1010
Maquoketa, Iowa	KMAQ	1320
Marathon, Fla.	WFFG	1300
Marianna, Ark.	KZOT	1460
Marianna, Fla.	WTYS	1340
	WTOT	980
Marietta, Ga.	WFOM	1230
	WBIE	1080
Marietta, Ohio	WMOA	1490
	WBRJ	910
Marine City, Mich.	WSMA	1590
	WMAM	570
Marion, Ala.	WJAM	1310
Marion, Ill.	WGGH	1150
Marion, Ind.	WBAT	1400
	WMRI	860
Marion, N.C.	WBRM	1250
Marion, Ohio	WMRN	1490
Marion, S.C.	WATP	1480
Marion, Va.	WMEV	1010
	WOLD	133
Marked Tree, Ark.	KPCA	1580
Marksville, La.	KAPB	1370
Marlborough, Mass.	WSRO	1470
Marquette, Mich.	WOMJ	1320
Marshall, Mich.	WMRR	1540
Marshall, Minn.	KMHL	1400
Marshall, Mo.	KMMO	1300
Marshall, N.C.	WMMH	1460
Marshall, Tex.	KMHT	1450
	KDOX	1410
Marshalltown, Iowa	KFJB	1230
Marshfield, Wis.	WDLB	1450
Martin, Tenn.	WCMT	1410
Martinsburg, W.Va.	WEPM	1340
Martinsville, Va	WHEE	1370
	WMVA	1450
Maryville, Mo.	KNIM	1580
Marysville, Calif	KMYC	1410
Marysville, Kans	KNOY	1570
Maryville, Tenn.	WGAP	1400
Mason City, Iowa	KGLO	1300
	KRIB	1490
	KSMN	1010
Massena, N.Y.	WMSA	1340
	WYBG	1050
Massillon, Ohio	WTIG	990
Matawan, W.Va.	WHJC	1360
Mattoon, Ill.	WLBH	1170
Mauston, Wis.	WRJC	1270
Mayaguez, P.R.	WAEL	600
	WKJB	710
	WORA	760
	WPRA	990
	WTIL	1300
Mayfield, Ky.	WNGO	1320
Mayodan, N.C.	WMYN	1420
Mayville, N.D.	KMAV	1520
Maysville, Ky.	WFTM	1240
McAlester, Okla.	KTMC	1400
	KNED	1150
McAllen, Tex.	KRIO	910
McCall, Ida.	KMCL	1240
McCamey, Tex.	KAMY	1450
McComb, Miss.	WHNY	1250
	WAPF	980
McCook, Nebr.	KBRL	1300
	KWRV	1360
McGehee, Ark.	KVSA	1220
McKeesport, Pa.	WEDD	810
	WMCK	1360
McKenzie, Tenn.	WHDM	1440
McKinney, Tex.	KYAL	1600
McMinnville, Oreg.	KMCM	1260
McMinnville, Tenn.	WBMC	960
	WAKI	1230
McPherson, Kans.	KNEX	1540
McRae, Ga.	WDAX	1410
Meadville, Pa.	WMGW	1490
Medford, Mass.	WHIL	1430
Medford, Oreg.	KMED	1440
	KSHA	860
	KDOV	1300
	KBOY	730
	KYJC	1230
Medford, Wis.	WIGM	1490
Media, Pa.	WXUR	690
Melbourne, Fla.	WMMB	1240
Memphis, Tenn.	WHBQ	560
	KEGH	1130
	WHER	1430
	WMC	790
	WDIA	1070
	WMPS	680
	WLOK	1340
	WMQM	1480
	WREC	600
	KWAM	990
Mena, Ark.	KENA	1450
Mendota, Ill.	WGLC	1090
Menominee, Mich.	WAGN	1340
Menomonie, Wis.	WMNE	1360
Merced, Calif.	KYOS	1480
	KWIP	1580
Meriden, Conn.	WMMW	1470
Meridian, Miss.	WCOC	910
	WDAL	1330
	WMOX	1010
	WOKK	1450
	WQIC	1390
Merkle, Tex.	KWFA	1500
Merrill, Wis.	WXMT	730
Mesa, Ariz.	KBUZ	1310
	KALF	1510
Metropolis, Ill.	WMOK	920
Metter, Ga.	WMAC	1360
Mexia, Tex.	KBUS	1590
Mexico, Mo.	KXEO	1340
Mexico, Pa.	WJUN	1220
Miami, Ariz.	KIKO	1340
Miami, Fla.	WGBS	710
	WIOD	610
	WFAB	990
	WAME	1260
	WMIE	1140
	WQAM	560
	WSKP	1450
	WINZ	940
Miami, Okla.	KGLC	910
Miami Beach, Fla.	WMBM	1490
	WKAT	1360
	WFUN	790
Michigan City, Ind.	WIMS	1420
Middleport-Pomeroy, Ohio	WMPO	1390
Middlesboro, Ky.	WMIK	560
Middletown, Conn.	WCNX	1150
Middletown, N.Y.	WALL	1340
Middletown, Ohio	WPFB	910
Midland, Mich.	WMDN	1490
Midland, Tex.	KCRS	550
	KJBC	1150
	KWEL	1440
	KABH	1510
Milan, Tenn.	WKBJ	1600
Miles City, Mont.	KATL	1340
Milford, Conn.	WFIF	1500
Milford, Del.	WKSB	930
Milford, Mass.	WMRC	1490
Milledgeville, Ga.	WMVG	1450
Millen, Ga.	WGSR	1570
Millington, Tenn.	WGMM	1380
Millinocket, Me.	WMKR	1240
Millville, N.J.	WMVB	1440
Milton, Fla.	WEBY	1330
	WSRA	1490
Milton, Pa.	WMLP	1380
	WARC	1380
Milwaukee, Wis.	WEMP	1250
	WFOX	860
	WRIT	1340
	WISN	1130
	WMIL	1290
	WOKY	920
	WTMJ	620
Minden, La.	KASO	1240
Mineola, N.Y.	WTHE	1520
Mineola, Tex.	KMOO	1510
Mineral Wells, Tex.	KORC	1140
Minneapolis, Minn.	WCCO	830
	WLOL	1330
	WMIN	1400
	WDGY	1130
	WWTC	1280
	KTCR	690
	KTIS	900
	KUOM	770
	KSTP	1500
Minot, N. Dak.	KLPM	1390
	KHRT	1320
	KCJB	910
Mission, Kans.	KBEA	1480
Mission, Tex.	KIRT	1580
Missoula, Mont.	KGVO	1290
	KXLL	1450
	KQTE	1340
	KYSS	910
Mitchell, S.Dak.	KORN	1490
Moab, Utah	KURA	1450
Moberly, Mo.	KNCM	1230
Mobile, Ala.	WUNI	1410
	WABB	1480
	WGOK	900
	WMOO	1550
	WTUF	840
	WKRG	710
	WLIQ	1360
	WMOZ	960
Mobridge, S.Oak.	KOLY	1300
Mocksville, N.C.	WOSL	1520
Modesto, Calif.	KTRB	860
	KBEE	970
	KFIV	1360
Mojave, Calif.	KDOL	1340
Moline, Ill.	WQUA	1230
Monahans, Tex.	KVKM	1330
Moncks Corner, S. C.	WBER	950
Monett, Mo.	KRMO	990
Monette, Ark.	KBIB	1560
Monmouth, Ill.	WRAM	1330
Monroe, Ga.	WMRE	1490
Monroe, La.	KMLB	1440
	KLIC	1230
	KNOE	540
Monroe, Mich.	WQTE	560
Monroe, N.C.	WMAP	1060
Monroe, Wis.	WEKZ	1260
Monroeville, Ala.	WMFC	1360
Monterey, Calif.	KIDO	630
	KMBY	1240
Montevideo, Minn.	KOMA	1460
Monte Vista, Colo.	KSLV	1240
Montezuma, Ga.	WMNZ	1050
Montgomery, Ala.	WBAM	740
	WAPX	1600
	WCOV	1170
	WFMI	1500
	WHHY	1440
	WMGY	800
	WRMA	950
Montgomery, W.Va.	WMON	1340
Monticello, Ark.	KHBM	1430
Monticello, Fla.	WWSO	1090
Monticello, Ky.	WFLW	1360
Montpelier, Ida.	KVSI	1450
Montpelier-Barre, Vt.	WSKI	1240
Montrose, Colo.	KUBC	580
Montrose, Pa.	WPEL	1250
Mooresville, N.C.	WHIP	1350
Moorhead, Minn.	KVOX	1280
Morehead, Ky.	WMOR	1330
Morehead City, N.C.	WMBL	740
Morgan City, La.	KMRC	1430
Morganfield, Ky.	WMSK	1550
Morgantown, N.C.	WMNC	1430
Morgantown, W.Va.	WAJR	1440
	WCLG	1300
Morrilton, Ark.	KVOM	800
Morris, Ill.	WCSJ	1550
Morris, Minn.	KMRS	1230
Morristown, N.J.	WMTR	1250
Morristown, Tenn.	WCRK	1150
	WMTN	1300
Morton, Tex.	KRAN	1280
Moscow, Idaho	KRPL	1400
Moses Lake, Wash.	KSEM	1470
	KWIQ	1260
Moss Point, Miss.	WACY	1460
Moulton, Ala.	WLCB	1530
Moultrie, Ga.	WMGA	1400
	WMTM	1300
Moundsville, W.Va.	WEIF	1370
Mountain Grove, Mo.	KLRS	1360
Mountain Home, Ark.	KTLO	1240
Mountain Home, Ida.	KFLI	1240
Mt. Airy, N.C.	WPAQ	740
	WSYD	1300
Mt. Carmel, Ill.	WVMC	1360
Mt. Clemens, Mich.	WBRB	1430
Mt. Oora, Fla.	WVGT	1580
Mt. Jackson, Va.	WSIG	790
Mt. Kisco, N.Y.	WVIP	1310
Mt. Olive, N.C.	WDJS	1430
Mt. Pleasant, Mich.	WCEN	1150
Mt. Pleasant, Tex.	KIMP	960
Mt. Shasta, Calif.	KWSD	620
Mt. Sterling, Ky.	WMST	1150
Mt. Vernon, Ill.	WMIX	940
Mt. Vernon, Ind.	WPCO	1590
Mt. Vernon, Ky.	WRVK	1460
Mt. Vernon, Ohio	WMVO	1300
Mt. Vernon, Wash.	KAPS	1470
	KBRC	1430
Muleshoe, Tex.	KMUL	1380
Mullins, S.C.	WJAY	1280
Muncie, Ind.	WLBC	1340
	WERK	990
Munfordville, Ky.	WLOC	1150
Munising, Mich.	WGON	1400

WHITE'S RADIO LOG

Location	C.L.	Kc.
Murfreesboro, N. C.	WWDR	1080
Murfreesboro, Tenn.	WGNS	1450
	WMTS	810
Murphy, N.C.	WCVP	600
	WKRK	1320
Murphysboro, Ill.	WINI	1420
Murray, Ky.	WNBS	1340
Murray, Utah	KMOR	1230
Muscatine, Iowa	KWPC	860
Muscle Shoals City, Ala.	WLAY	1450
Muskegon, Mich.	WKBZ	850
	WKJR	1520
	WTRU	1600
	WMUS	1090
Muskogee, Okla.	KBIX	1490
	KMUS	1380
Myrtle Beach, S.C.	WMYB	1450
	WTGR	1520
Nacogdoches, Tex.	KEEE	1230
	KSFA	860
Nampa, Idaho	KFXD	580
	KAIN	1340
Nanticoke, Pa.	WNAK	730
Napa, Calif.	KVON	1440
Naples, Fla.	WNOG	1270
Narrows, Va.	WNRV	990
Nashua, N.H.	WOTW	900
	WSMN	1590
Nashville, Ark.	KBHC	1260
Nashville, Ga.	WNGA	1600
Nashville, Tenn.	WKDA	1240
	WLAC	1510
	WMAK	1300
	WNAH	1360
	WSIX	980
	WSM	650
	WWGM	1560
Nassau, Bahamas	ZNS-2	1240
Natchez, Miss.	WMIS	1240
	WNAT	1450
Natchitoches, La.	KNOC	1450
Naugatuck, Conn.	WOWW	860
Navasota, Tex.	KWBC	1550
Nebraska City, Nebr.	KNCY	1600
Needles, Calif.	KSFE	1340
Neenah, Wis.	WNAM	1280
Neillsville, Wis.	WCCN	1370
Neon, Ky.	WNKY	1480
Neosho, Mo.	KBTN	1420
Nevada, Mo.	KNEM	1240
New Albany, Ind.	WNUW	1570
	WREY	1290
New Albany, Miss.	WNAU	1470
Newark, Del.	WNRK	1260
Newark, N.J.	WJRZ	970
	WNJR	1430
	WVNJ	620
Newark, N.Y.	WACK	1420
Newark, Ohio	WCLT	1430
New Bedford, Mass.	WBSM	1420
	WNBH	1340
New Bern, N.C.	WHIT	1450
	WRNB	1490
Newberry, Mich.	WNBY	1450
Newberry, S.C.	WKDK	1240
New Boston, Ohio	WIOI	1010
New Braunfels, Tex.	KGNB	1420
New Britain, Conn.	WRCH	910
	WRYM	840
New Brunswick, N.J.	WCTC	1450
Newburgh, N.Y.	WGNY	1220
Newburyport, Mass.	WNBP	1470
New Castle, Ind.	WCTW	1550
New Castle, Pa.	WKST	1280
Newcastle, Wyo.	KASL	1240
New City, N. Y.	WRKL	910
New Haven, Conn.	WAVZ	1300
	WELI	960
	WNHC	1340
New Iberia, La.	KANE	1240
	KNIR	1360
New Kensington, Pa.	WKPA	1150
New London, Conn.	WNLC	1510
New Martinsville, W.Va.	WETZ	1330
Newnan, Ga.	WCOH	1400
	WNEA	1300
New Orleans, La.	WDSU	1280
	WNNR	990
	WBOK	800
	WNOE	1060
	WSMB	1350
	WNPS	1450
	WSHO	1230
	WTIX	690
	WWL	870
	WWOM	600
	WYLD	940
Newport, Ark.	KNBY	1280
Newport, N.H.	WCNL	1010
Newport, Oreg.	KNPT	1310
Newport, R.I.	WAOK	1540
Newport, Tenn.	WLIK	1270
Newport, Vt.	WIKE	1490
Newport News, Va.	WGH	1310
	WTID	1270
Newport Richey, Fla.	WGUL	1500
New Richmond, Wis.	WIXK	1590
New Roads, La.	KWRG	1500
New Rochelle, N.Y.	WVOX	1460
New Smyrna Beach, Fla.	WSBB	1230
	WOGO	1550
Newton, Iowa	KCOB	1280
Newton, Kans.	KJRG	950
Newton, Mass.	WNTN	1550
Newton, Miss.	WBKN	1410
Newton, N.J.	WNNJ	1360
Newton, N.C.	WNNC	1230
New Ulm, Minn.	KNUJ	860
New York, N.Y.	WABC	770
	WADO	1280
	WBNX	1380
	WCBS	880
	WEVD	1330
	WHN	1050
	WHOM	1480
	WINS	1010
	WLIB	1190
	WMCA	570
	WNBC	660
	WNEW	1130
	WNYC	830
	WOR	710
	WPOW	1330
	WWRL	1600
Niagara Falls, N.Y.	WHLD	1270
	WJJL	1440
Niceville-Valparaiso, Fla.	WNSM	1340
Nicholasville, Ky.	WNVL	1250
Niles, Mich.	WNIL	1290
Niles, Ohio	WNIO	1540
Nogales, Ariz.	KNOG	1340
Nome, Alaska	KICY	850
Norfolk, Nebr.	WJAG	780
Norfolk, Va.	WTAR	790
	WCMS	1050
	WNOR	1230
	WRAP	850
Normal, Ill.	WIOK	1440
Norman, Okla.	WNAD	640
	KNOR	1400
Norristown, Pa.	WNAR	1110
N. Adams, Mass.	WMNB	1230
N. Atlanta, Ga.	WATY	680
N. Augusta, S.C.	WGUS	1380
	WFNL	1600
	WTHB	1550
North Bend, Oreg.	KFIR	1340
North Charleston, S.C.	WNCG	910
Northampton, Mass.	WHMP	1400
North East, Pa.	WHYP	1530
Northfield, Minn.	WCAL	770
N. Little Rock, Ark.	KDXE	1380
	KXLR	1150
North Platte, Nebr.	KJLT	970
	KNOP	1410
	KODY	1240
No. Syracuse, N.Y.	WSOQ	1220
N. Vernon, Ind.	WOCH	1460
Northwestern, Ind.	WNWI	1080
No. Wilkesboro, N.C.	WKBC	810
Norton, Kans.	KNBI	1530
Norton, Va.	WNVA	1350
Norwalk, Conn.	WNLK	1350
Norwich, Conn.	WICH	1310
Norwich, N.Y.	WCHN	970
Oakdale, La.	KREH	900
Oakes, N.Dak.	KEYO	1220
Oak Grove, La.	KWCL	1280
Oak Hill, W.Va.	WOAY	860
Oakland, Calif.	KEWB	910
	KABL	960
	KDIA	1310
Oakland, Md.	WMSG	1050
Oakland Park, Fla.	WIXX	1520
Oak Park, Ill.	WOPA	1490
Oak Ridge, Tenn.	WATO	1290
Ocala, Fla.	WMOP	900
	WTMC	1290
	WWKE	1370
Ocean City, Md.	WETT	1590
Ocean City, Somers Pt., N.J.	WSLT	1520
Oceanlake, Oreg.	KBCH	1380
Oceanside, Calif.	KUDE	1320
Ocilla, Ga.	WSIZ	1380
Oconto, Wis.	WOCO	1260
Odessa, Tex.	KECK	920
	KOSA	1230
	KOYL	1310
	KRIG	1410
Oelwein, Iowa	KOEL	950
Ogallala, Nebr.	KOGA	930
Ogden, Utah	KLO	1430
	KANN	1250
	KSVN	730
	KVOG	1490
Ogdensburg, N.Y.	WSLB	1400
Oil City, Pa.	WKRZ	1340
Okeechobee, Fla.	WOKC	1570
Okla. City, Okla.	KBYE	890
	KLPR	1140
	KOCY	1340
	KOMA	1520
	KTOK	1000
	KJEM	800
	WKY	930
Okmulgee, Okla.	KDKL	1240
Old Saybrook, Conn.	WLIS	1420
Olean, N.Y.	WMNS	1360
	WHDL	1450
Olney, Ill.	WVLN	740
Olympia, Wash.	KGY	1240
	KITN	920
Omaha, Nebr.	KBON	1490
	KFAB	1110
	KOIL	1290
	KOOO	1420
	KOWH	660
	WOW	590
Omak, Wash.	KOMW	680
Oneida, N.Y.	WMCR	1600
Oneida, Tenn.	WBNT	1310
O'Neill, Nebr.	KBRX	1350
Oneonta, Ala.	WCRL	1570
Oneonta, N.Y.	WDOS	730
Ontario, Calif.	KASK	1510
Ontario, Oreg.	KSRV	1380
Opelika, Ala.	WPHO	1400
Opelousas, La.	KSLO	1230
Opp, Ala.	WAMI	860
Opportunity, Wash.	KZUN	630
Orange, Mass.	WCAT	1390
Orange, Tex.	KOGT	1600
Orange, Va.	WJMA	1340
Orangeburg, S.C.	WDIX	1150
	WORG	1580
	WTND	920
Orange Park, Fla.	WAYR	550
Ord, Neb.	KNLV	1060
Oregon City, Ore.	KYMN	1520
Orlando, Fla.	WDBO	580
	WHOO	990
	WHIY	1270
	WLOF	950
	WKIS	740
Ormond Bch., Fla.	WQXQ	1380
Orofino, Idaho	KLER	950
Oroville, Calif.	KAOR	1340
Ortonville, Minn.	KDIO	1350
Osage Bch., Mo.	KRMS	1150
Osceola, Ark.	KOSE	860
Oshkosh, Wis.	WOSH	1490
Oskaloosa, Iowa	KBOE	740
Oswego, N.Y.	WSGO	1440
Othello, Wash.	KRSC	1400
Otsego, Mich.	WAOP	980
Ottawa, Ill.	WCMY	1480
Ottawa, Kans.	KOFO	1220
Ottumwa, Iowa	KBIZ	1240
	KLEE	1480
Owatonna, Minn.	KRFO	1390
Owego, N.Y.	WEBO	1330
Owensboro, Ky.	WOMI	1490
	WVJS	1420
Owosso, Mich.	WOAP	1080
Oxford, Miss.	WSUH	1420
Oxford, N.C.	WOXF	1340
Oxnard, Calif.	KOXR	910
Ozark, Ala.	WOZK	900
Paducah, Ky.	WDXR	1560
	WKYX	570
	WPAD	1450
Page, Ariz.	KPGE	1340
Painesville, Ohio	WPVL	1460
Paintsville, Ky.	WSIP	1490
Palatka, Fla.	WWPF	1260
	WSUZ	800
Palestine, Tex.	KNET	1450
Palm Bch., Fla.	WQXT	1340
Palm Sprgs., Calif.	KCMJ	1010
	KDES	920
	KPAL	1450
Palmdale, Calif.	KUTY	1470
Palm Desert, Cal.	KGOL	1270
Palo Alto, Calif.	KIBE	1220
Pampa, Tex.	KPDN	1340
	KHHH	1230
Panama Beach, Fla.	WGNE	1480
	WSCM	1290
Panama City, Fla.	WDLP	590
	WPCF	1430
Paoli, Ind.	WVAK	1560
Paradise, Calif.	KNGL	930
Paragould, Ark.	KDRS	1490
Paris, Ark.	KCCL	1460
Paris, Ill.	WPRS	1440
Paris, Ky.	WPDE	1440
Paris, Tenn.	WTPR	710
Paris, Tex.	KPLT	1490
	KFTV	1250
Parkersburg, W.Va.	WCEF	1050
	WPAR	1450
	WTAP	1230
Park Falls, Wis.	WPFP	1450
Park Rapids, Minn.	KPRM	1240
Parsons, Kans.	KLKC	1540
Pasadena, Cal.	KPPC	1240
	KRLA	1110
	KWKW	1300
Pasadena, Tex.	KLVL	1460
	KIKK	650
Pascagoula-Moss Point, Miss.	WPMP	1580
Pasco, Wash.	KORD	910
	KGRS	1340
Paso Robles, Calif.	KPRL	1230
Patchogue, L.I., N.Y.	WALK	1370
	WPAC	1580
Paterson, N.J.	WPAT	930
Pauls Valley, Okla.	KVLH	1470
Pawhuska, Okla.	KOSG	1500
Pawtucket, R.I.	WXTR	550
Payette, Ida.	KYET	1450
Pearsall, Tex.	KVWG	1280
Pecos, Tex.	KIUN	1400
Peekskill, N.Y.	WLNA	1420
Pekin, Ill.	WSIV	1140
Pell City, Ala.	WFHK	1430
Pendleton, Oreg.	KTIX	1240
	KUMA	1290
Pennington Gap, Va.	WSWV	1570
Pensacola, Fla.	WBDP	980
	WBSR	1540
	WMEL	610
	WNVY	1230
	WCOA	1370
Peoria, Ill.	WXCL	1350
	WMBD	1470
	WIRL	1290
	WPEO	1020
Perry, Fla.	WPRY	1400
	WGKR	1310
Perry, Ga.	WPGA	980
Perry, Iowa	KDLS	1310
Perryton, Tex.	KEYE	1400
Peru, Ind.	WARU	1600
Petaluma, Calif.	KTOB	1490
Petersburg, Va.	WSSV	1240
Petoskey, Mich.	WMBN	1340
Phenix City, Ala.	WPNX	1460
Philadelphia, Miss.	WHOC	1490
Philadelphia, Pa.	KYW	1060
	WCAU	1210
	WDAS	1480
	WFIL	560
	WFLN	900
	WHAT	1340
	WHOC	1490
	WIBG	990
	WIP	610
	WPEN	950
	WRCP	1540
	WTEL	860
Phillipsburg, Pa.	WPHB	1260
Phillipsburg, Kans.	KKAN	1490
Phoenix, Ariz.	KIFN	860
	KXIV	1400
	KHAT	1480
	KHEP	1280
	KCAC	1010
	KOY	550
	KOOL	960
	KPHO	910
	KUEQ	740
	KRIZ	1230
	KTAR	620
Phoenix City, Ala.	WPNX	1460
Piedmont, Ala.	WPID	1280
Piedmont, Mo.	KPWB	1140
Pierre, S.D.	KGFX	1080
	KCCR	1240
Pikeville, Ky.	WLSI	900
	WPKE	1240
Pine Bluff, Ark.	KCLA	1400
	KADL	1270
	KOTN	1490
	KCAT	1530
	KPBA	1590
Pine City, Minn.	WCMP	1350
Pinellas Park, Fla.	WFSO	570
Pineville, Ky.	WMLF	1230
Pineville, W.Va.	WWYO	970
Pipestone, Minn.	KLOH	1050
Piqua, Ohio	WPTW	1570
Pittsburg, Calif.	KKIS	990
Pittsburg, Kans.	KOAM	860
	KSEK	1340
Pittsburgh, Pa.	KDKA	1020
	KQV	1410
	WAMO	860
	WJAS	1320
	WPIT	730
	WRYT	1250
	WEEP	1080
	WWSW	970
Pittsfield, Ill.	WBBA	1580
Pittsfield, Mass.	WBEC	1420
	WBRK	1340
Pittston, Pa.	WPTS	1540

Location	C.L.	Kc.
Plainfield, N.J.	WERA	1590
Plainview, Tex.	KVOP	1400
Plant City, Fla.	WPLA	910
Platteville, Wis.	WSWW	1590
Plattsburg, N.Y.	WEAV	960
	WIRY	1340
Pleasanton, Tex.	KBOP	1380
Pleasantville, N.J.	WOND	1400
Plymouth, Ind.	WTCA	1050
Plymouth, Mass.	WPLM	1390
Plymouth, N.C.	WPNC	1470
Plymouth, N.H.	WPNH	1300
Plymouth, Wis.	WPLY	1420
Pocahontas, Ark.	KPOC	1420
Pocatello, Idaho	KSEI	930
	KWIK	1240
	KSNN	1290
Pocomoke City, Md.	WDMV	540
Pomona, Calif.	KWOW	1600
	KKAR	1220
Pompton Lakes, N. J.	WKER	1500
Pompano Beach, Fla.	WLOD	980
	WRBD	1470
Ponca City, Okla.	WBBZ	1230
Ponce, P.R.	WPRP	910
	WEUC	1420
	WPAB	550
	WLEO	1170
	WISO	1260
Pontiac, Ill.	WJBG	1080
Pontiac, Mich.	WPON	1460
Pontotoc, Miss.	WSEL	1440
Pooli, Ind.	WVAK	1560
Poplar Bluff, Mo.	KWOC	930
	KLID	1340
Poplarville, Miss.	WRPM	1530
Portage, Mich.	WTPS	1560
Portage, Pa.	WWML	1470
Portage, Wis.	WPDR	1350
Portageville, Mo.	KMIS	1050
Portales, N.Mex.	KENM	1450
Port Angeles, Wash.	KAPY	1000
	KONP	1450
Port Arthur, Tex.	KOLE	1340
	KPAC	1250
Porterville, Calif.	KTIP	1450
Port Hueneme, Calif.	KACY	1520
Port Huron, Mich.	WHLS	1450
	WTTH	1380
Port Jervis, N.Y.	WDLC	1490
Port Lavaca, Tex.	KGUL	1560
Portland, Ind.	WPGW	1440
Portland, Maine	WCSH	970
	WGAN	560
	WLOB	1310
	WPOR	1490
Portland, Oreg.	KBPS	1450
	KBEV	1010
	KLIQ	1290
	KEX	1190
	KGW	620
	KOIN	970
	KPAM	1410
	KPDQ	800
	KPOJ	1330
	KWJJ	1080
	KXL	750
Port Neches, Tex.	KPNG	1150
Portsmouth, N.H.	WBBX	1380
	WHEB	750
Portsmouth, Ohio	WPAY	1400
	WNXT	1260
Portsmouth, Va.	WHIH	1400
	WPMH	1010
	WAVY	1350
Port Sulphur, La.	KPBC	1510
Port Washington, Wis.	WGLB	1560
Post, Tex.	KPOS	1370
Poteau, Okla.	KLCO	1280
Potomac-Cabin John, Md.	WXLN	950
Potosi, Mo.	KYRO	1280
Potsdam, N.Y.	WPDM	1470
Pottstown, Pa.	WPAZ	1370
Pottsville, Pa.	WPAM	1450
	WPPA	1360
Poughkeepsie, N.Y.	WEOK	1390
	WKIP	1450
Powell, Wyo.	KPOW	1260
Poynette, Wis.	WIBU	1240
Prairie du Chien, Wis.	WPRE	980
Pratt, Kan.	KWNS	1290
Prentiss, Miss.	WKPO	1510
Prescott, Ariz.	KYCA	1490
	KENT	1340
	KNOT	1450
Prescott, Ark.	KTPA	1370
Presque Isle, Me.	WAGM	950
	WEGP	1390
Preston, Idaho	KPST	1340
Preston, Minn.	KFIL	1060
Prestonsburg, Ky.	WPRT	960
	WDOC	1310
Price, Utah	KOAL	1230
Prichard, Ala.	WSIM	1270
Prince Albert, Sask.	CKBI	900
Princeton, Ill.	WZOE	1490
Princeton, Ind.	WRAY	1250
Princeton, Ky.	WPKY	1580
Princeton, N.J.	WHWH	1350
Princeton, W.Va.	WLOH	1490
Prineville, Oreg.	KRCO	690
Prosser, Wash.	KARY	1310
Providence, R.I.	WEAN	790
	WHIM	1110
	WICE	1290
	WJAR	920
	WLKW	990
	WPRO	630
	WRIB	1220
Provo, Utah	KIXX	1400
	KEYY	1450
	KOVO	960
Pryor, Okla.	KOLS	1570
Pueblo, Colo.	KDZA	1230
	KAPI	690
	KCSJ	590
	KFEL	970
Pueblo, Colo.	KKAM	1350
	KPUB	1480
Pulaski, Tenn.	WKSR	1420
Pulaski, Va.	WPUV	1580
Pullman, Wash.	KWSC	1250
	KOFE	1150
Punta Gorda, Fla.	WCCF	1580
Punxsutawney, Pa.	WPME	1540
Putnam, Conn.	WINY	1350
Puyallup, Wash.	KAYE	1450
Quanah, Tex.	KQLJ	1150
Quantico, Va.	WQVA	1530
Quincy, Calif.	KQCY	500
Quincy, Fla.	WCNH	1230
Quincy, Ill.	WGEM	1440
	WTAD	980
Quincy, Mass.	WJDA	1300
Quincy, Wash.	KPOR	1370
Quitman, Ga.	WSFB	1490
Racine, Wis.	WRAC	1460
	WRJN	1400
Radford, Va.	WRAD	1460
Raeford, N.C.	WSHB	1400
Raleigh, N.C.	WKIX	850
	WYNA	1550
	WPTF	680
	WLLE	570
	WRNC	1240
Ralls, Tex.	KCLR	1530
Rantoul, Ill.	WRTL	1460
Rapid City, S.Dak.	KOTA	1380
	KIMM	1150
	KRSD	1340
	KEZU	920
Raton, N.Mex.	KRTN	1490
Ravenswood, W.Va.	WMOV	1360
Rawlins, Wyo.	KRAL	1240
Raymond, Wash.	KAPA	1340
Raymondville, Tex.	KSOX	1240
Rayville, La.	KRIH	990
Reading, Pa.	WEEU	850
	WHUM	1240
	WRAW	1340
Redding, Calif.	KRDG	1230
	KAHR	1330
	KQMS	1400
	KVCV	600
	KVIP	540
Red Bluff, Calif.	KBLF	1490
Redfield, S.Dak.	KFCB	1380
Redlands, Calif.	KCAL	1410
Red Lion, Pa.	WGCB	1440
Red Lodge, Mont.	KRBN	1450
Redmond, Oreg.	KPRB	1240
Red Wing, Minn.	KCUE	1250
Redwood Falls, Minn.	KLGR	1490
Reedsburg, Wis.	WRDB	1400
Reedsport, Oreg.	KRAF	1470
Reidsville, N.C.	WFRC	1600
	WREV	1220
Remsen, N.Y.	WREM	1480
Reno, Nev.	KOH	630
	KBET	1340
	KOLO	920
	KONE	1450
	KCBN	1230
Rensselaer, Ind.	WRIN	1560
Rensselaer, N.Y.	WEEE	1300
Renton, Wash.	KREN	1420
Rexburg, Idaho	KRXK	1230
Rhinelander, Wis.	WOBT	1240
Rice Lake, Wis.	WJMC	1240
Richfield, Minn.	WPBC	980
Richfield, Utah	KSVC	980
Richland, Wash.	KALE	960
Richland, Wis.	WRCO	1450
Richlands, Va.	WRIC	540
Richmond, Ind.	WKBV	1490
Richmond, Ky.	WEKY	1340
Richmond, Va.	WANT	990
	WBBL	1480
	WRGM	1540
	WLEE	1480
	WEET	1320
	WGOE	1590
	WMBG	1380
	WRNL	910
	WRVA	1140
	WXGI	950
	WRGM	1540
Richwood, W.Va.	WVAR	1280
Ridgecrest, Calif.	KRCK	1360
	KLOA	1240
Ridgeland, S.C.	WBUG	1430
Rio Piedras, P.R.	WUNO	1320
	WRAI	1190
Ripley, Miss.	WSCA	1260
Ripley, Tenn.	WTRB	1570
Ripon, Wis.	WCWC	1600
Riverhead, N.Y.	WRIV	1390
	WAPC	1570
Riverside, Calif.	KPRO	1440
	KACE	1570
Riverton, Wyo.	KVOW	1450
Riviera Beach, Fla.	WHEW	1600
Roanoke, Ala.	WELR	1360
Roanoke, Va.	WDBJ	960
	WRIS	1410
	WHYE	910
	WROV	1240
	WSLS	610
Roanoke Rapids, N.C.	WCBT	1230
Roaring Sprgs., Pa.	WKMC	1370
Roberval, Que.	CHRL	910
Robinson, Ill.	WTAY	1570
Robstown, Tex.	KROB	500
Rochester, Minn.	KROC	1340
	KFAV	1520
	KWEB	1270
Rochester, Minn.	KOLM	1520
	KWEB	1270
Rochester, N.H.	WWNH	930
Rochester, N.Y.	WBBF	950
	WHAM	1180
	WHEC	1460
	WNYR	680
	WSAY	1370
	WROC	1280
Rockford, Ill.	WROK	1440
	WJRL	1150
	WRRR	1330
Rockford, Mich.	WJPW	810
Rock Hill, S.C.	WRHI	1340
	WTYC	1150
Rockingham, N.C.	WAYN	900
Rock Island, Ill.	WHBF	1270
Rockland, Maine	WRKD	1450
Rockmart, Ga.	WPLK	1220
Rock Springs, Wyo.	KVRS	1360
Rockville, Conn.	WRIV	800
Rockville, Md.	WINX	1600
Rockwood, Tenn.	WRKH	580
Rocky Ford, Colo.	KAVI	1320
Rocky Mount, N.C.	WCEC	810
	WEED	1390
	WRMT	1490
	WKWS	1290
Rocky Mount, Va.	WYTI	1570
Rogers, Ark.	KAMO	1390
Rogers City, Mich.	WHAK	960
Rogersville, Tenn.	WRGS	1370
Rolla, Mo.	KCLU	1590
	KTTR	1490
Rome, Ga.	WLAQ	1410
	WLYN	1360
	WRGA	1470
	WROM	710
Rome, N.Y.	WKAL	1450
	WRNY	1350
Ronceverte, W.Va.	WRON	1400
Roseau, Minn.	KRWB	1410
Roseburg, Oreg.	KRNR	1490
	KQEN	1240
	KRXL	1250
	KYES	950
Rosenberg, Tex.	KFRD	980
Roservelt, N.M.	KRDD	1320
Rossville, Ga.	WRIP	980
Roswell, N.Mex.	KRSY	1230
	KGFL	1430
	KBIM	910
	KRDD	1320
	KRIK	960
	KSWS	1020
Roxboro, N.C.	WRXO	1430
Royal Oak, Mich.	WEXL	1340
Rugby, N. Dak.	KGCA	1450
Ruidoso, N.Mex.	KRRR	1340
Rumford, Me.	WRUM	790
Ruperl, Idaho	KAYT	970
Rushton, La.	KRUS	1490
Rusk, Texas	KTLU	1580
Russell, Kans.	KRSL	990
Russellville, Ala.	WWWR	920
Russellville, Ark.	KXRJ	1490
Russellville, Ky.	WRUS	610
Rutland, Vt.	WHWB	1000
	WSYB	1380
Sacramento, Calif.	KCRA	1320
	KFBK	1530
	KGMS	1380
	KJAY	1430
	KRAK	1140
	KROY	1240
	KXOA	1470
Safford, Ariz.	KGLU	1480
	KATO	1230
Sag Harbor, N.Y.	WLNG	1600
Saginaw, Mich.	WKNX	1210
	WSAM	1400
	WSGW	790
St. Albans, Vt.	WWSR	1420
St. Albans, W.Va.	WKLC	1300
St. Anthony, Ida.	KIGO	1400
St. Augustine, Fla.	WFOY	1240
	WETH	1420
St. Charles, Mo.	KADY	1460
St. Cloud, Minn.	KFAM	1450
	WJON	1240
Ste. Genevieve, Mo.	KSGM	1340
St. George, S.C.	WQIZ	1300
St. George, Utah	KDXU	1450
St. Helen, Mich.	WMIC	1590
St. Helens, Oreg.	KOHI	1600
St. Ignace, Mich.	WIDG	940
St. Johns, Mich.	WJUD	1580
St. Johnsbury, Vt.	WTWN	1340
St. Joseph, Mich.	WSJM	1400
St. Joseph-Benton Harbor, Mich.	WHFB	1060
St. Joseph, Mo.	KFEQ	680
	KKJO	1550
	KUSN	1270
St. Louis, Mo.	KATZ	1600
	KMOX	1120
	KSD	550
	KSTL	690
	KWK	1380
	KXOK	630
	WEW	770
	WIL	1430
	KXEN	1010
St. Louis Park, Minn.	KRSI	950
St. Mary's, Pa.	WKBI	1400
St. Paul, Minn.	KSTP	1500
	KDWB	630
	WMIN	1400
	WMKT	1370
	WCCO	830
St. Peter, Minn.	KRBI	1310
St. Petersburg, Fla.	WPIN	680
	WSUN	620
	WLCY	1380
St. Petersburg Beach, Fla.	WILZ	1590
Salamanca, N.Y.	WGGO	1590
Salem, Ill.	WJBD	1350
Salem, Ind.	WSLM	1220
Salem, Mass.	WESX	1230
Salem, Mo.	KSMO	1340
Salem, N. J.	WJIC	1510
Salem, O.	WSOM	600
Salem, Oreg.	KSLM	1390
	KAPT	1220
	KBZY	1490
	KGAY	1430
Salem, Va.	WBLU	1480
Salida, Colo.	KVRH	1340
Salina, Kans.	KSAL	1150
	KFRM	550
	KISI	910
Salinas, Calif.	KDON	1460
	KSBW	1380
Salinas, Calif.	KCTY	980-1000
Saline, Mich.	WOIB	1290
Salisbury, Md.	WBOC	960
	WICO	1320
	WJDY	1470
Salisbury, N.C.	WSTP	1490
	WSAT	1280
Salmon, Idaho	KSRA	960
Salt Lake City, Utah	KALL	910
	KCPX	1320
	KLUB	570
	KNAK	1280
	KSL	1160
	KSOP	1370
	KSXX	630
	KWHO	860
	KWIC	1550
San Angelo, Tex.	KTEO	1340
	KGKL	960
	KPEP	1420
	KWFR	1260
San Antonio, Tex.	KAPE	1480
	KBAT	680
	KBER	1150
	KCOR	1350
	KEDA	1540
	KITE	930
	KUKA	1250
	KUBO	1310
	KMAC	630
	KONO	860
	KTSA	550
	WOAI	1200
San Bernardino, Calif.	KCKC	1350
	KFXM	590
	KRNO	1240
	KMEN	1290
Sandersville, Ga.	WSNT	1490
San Diego, Calif.	KCBQ	1170
	KFMB	760
	KOGO	600
	KGB	1360
	KSON	1240
	KSDO	1130
Sandpoint, Idaho	KSPT	1400
Sand Spring, Okla.	KTOW	1340
Sandusky, Ohio	WLEC	1450
San Fernando, Calif.	KGIL	1260
Sanford, Fla.	WTRR	1400
Sanford, Me.	WSME	1220
Sanford, N.C.	WEYE	1290
	WWGP	1050

WHITE'S RADIO LOG

Location	C.L.	Kc.
San Francisco, Calif.	KFRC	610
	KCBS	740
	KFAX	1100
	KGO	810
	KNBR	680
	KKHI	1550
	KSAY	1010
	KSFO	560
	KSOL	1450
	KYA	1260
San Gabriel, Cal.	KAIL	1430
San German, P. R.	WRIS	1060
Sanitobia, Miss.	WSAO	1550
San Jose, Calif.	KLOK	1170
	KLIV	1590
	KEEN	1370
	KXRX	1500
San Juan, P.R.	WAPA	680
	WHOA	870
	WIAC	740
	WIPR	940
	WKAQ	580
	WKVM	810
	WKYN	630
	WITA	1140
San Luis Obispo, Calif.	KATY	1340
	KSLY	1400
	KVEC	920
San Marcos, Tex.	KCNY	1470
San Mateo, Calif.	KOFY	1050
San Rafael, Calif.	KTIM	1510
San Saba, Tex.	KBAL	1410
San Sebastion, P.R.	WFBA	1460
Santa Ana, Calif.	KWIZ	1480
Santa Barbara, Cal.	KDB	1490
	KGUD	990
	KIST	1340
	KTMS	1250
	KACL	1290
Santa Clara, Calif.	KGNU	1430
Santa Cruz, Calif.	KSCO	1080
Santa Fe, N.Mex.	KTRC	1400
	KAFE	810
	KVSF	1260
Santa Maria, Cal.	KCOY	1400
	KHER	1600
	KSMA	1240
	KSEE	1480
Santa Monica, Cal.	KDAY	1580
Santa Paula, Calif.	KSPA	1400
Santa Rosa, Calif.	KSRO	1350
	KHUM	1580
	KVRE	1460
	KJAX	1150
Santa Rosa, N.Mex.	KSYX	1420
Sapulpa, Okla.	KREK	1550
Saranac Lake, N.Y.	WNBZ	1240
Sarasota, Fla.	WKXY	930
	WSAF	1220
	WSPR	1450
	WYND	1280
Saratoga, N.Y.	WSPN	900
Saratoga Springs, N.Y.	WKAJ	900
Sauk Rapids, Minn.	WVAL	800
Sault Ste. Marie, Mich.	WSOO	1230
Savannah, Ga.	WBYG	1450
	WEAS	900
	WSAV	630
	WSGA	1400
	WTOC	1290
	WSOK	1230
Savannah, Tenn.	WORM	1010
Sayre, Pa.	WATS	960
Scheffield, Ala.	WSHF	1290
Schenectady, N.Y.	WGY	810
	WSNY	1240
Scotland Neck, N.C.	WYAL	1280
Scott City, Kans.	KFLA	1310
Scottsbluff, Nebr.	KNEB	960
	KOLT	1320
Scottsboro, Ala.	WCRI	1050
	WROS	1330
Scottsdale, Ariz.	KDOT	1440
Scottsville, Ky.	WLCK	1250
Scranton, Pa.	WARM	590
	WEJL	630
	WGBI	910
	WICK	1400
	WSCR	1320
Seaford, Del.	WSUX	1280
Searcy, Ark.	KWCB	1300
Seattle, Wash.	KAYO	1150
	KIXI	910
	KING	1090
	KIRO	710
	KJR	950
	KOL	1300
	KOMO	1000
	KETO	1590
	KTW	1250
	KVI	570
	KXA	770
	KBLE	1050
Sebring, Fla.	WJCM	960
	WSEB	1340
Sedalia, Mo.	KDRO	1340
	KSIS	1050
Seguin, Tex.	KWED	1580
Selma, Ala.	WGWC	1340
	WHBB	1490
Selma, N.C.	WBZB	1090
Seminole, Tex.	KTFO	1250
Senatobia, Miss.	WSAO	1550
Seneca Township, S.C.	WSNW	1150
Sevierville, Tenn.	WSEV	930
Seward, Alaska	KIBH	950
Seymour, Ind.	WJCD	1390
Seymour, Tex.	KSEY	1230
Shakopee, Minn.	KSMM	1530
Shallotte, N.C.	WVCB	1410
Shamokin, Pa.	WISL	1480
Shamrock, Tex.	KBYP	1580
Sharon, Pa.	WPIC	790
Shawano, Wis.	WTCH	960
Shawnee, Okla.	KGFF	1450
Sheboygan, Wis.	WHBL	1330
	WKTS	950
Sheffield, Ala.	WSHF	1290
Shelby, Mont.	KSEN	1150
Shelby, N.C.	WOHS	730
	WADA	1390
Shelbyville, Ind.	WSVL	1520
Shelbyville, Ky.	WCND	940
Shelbyville, Tenn.	WHAL	1400
	WLIJ	1580
Sheldon, Iowa	KIWA	1550
Shelton, Wash.	KMAS	1280
Shenandoah, Iowa	KMA	960
	KFNF	920
Shenandoah, Pa.	WMBT	1530
Sheridan, Wyo.	KWYO	1410
	KROE	930
Sherman, Tex.	KRRV	910
	KTXD	1500
Shippensburg, Pa.	WSHP	1480
Show Low, Ariz.	KVWM	970
Shreveport, La.	KANB	1300
	KBCL	1220
	KEEL	710
	KOKA	1550
	KJOE	1480
	KCIJ	980
	KRMD	1340
	KWKH	1130
Sidney, Mont.	KGCX	1480
Sidney, Nebr.	KSID	1340
Sidney, O.	WMVR	1080
Sierra Vista, Ariz.	KHFH	1420
Sikeston, Mo.	KSIM	1400
	KMPL	1520
Siler City, N.C.	WNCA	1570
Siloam Sprgs., Ark.	KUDA	1290
Silsbee, Tex.	KKAS	1300
Silver City, N.Mex.	KSIL	1340
Silver Sprgs., Md.	WQMR	1050
Simcoe, Ont.	CFRS	1560
Sinton, Tex.	KTOD	1590
Sioux City, Iowa	KSCJ	1360
	KMNS	620
	KTRI	1470
Sioux Falls, S.Dak.	KISD	1230
	KELO	1320
	KNWC	1270
	KSOO	1140
Sitka, Alaska	KIFW	1230
	KSEW	1400
Skowhegan, Maine	WGHM	1150
Slaton, Tex.	KCAS	1050
Slidell, La.	WBGS	1560
Smithfield, N.C.	WMPM	1270
Smithville, Tenn.	WJLE	1480
Smyrna, Ga.	WYNX	1550
Snyder, Tex.	KSNY	1450
Socorro, N.Mex.	KSRC	1290
Soda Sprgs., Idaho	KBRV	540
Somerset, Ky.	WSFC	1240
	WTLO	1480
Somerset, Pa.	WVSC	990
Sonora, Calif.	KVML	1450
Sonora, Tex.	KCKG	1240
So. Bend, Ind.	WNDU	1490
	WJVA	1580
	WSBT	960
Southbridge, Mass.	WESO	970
So. Boston, Va.	WHLF	1400
Southern Pines, N.C.	WEEB	990
South Charleston, W. Va.	WRDS	1410
South Daytona Beach, Fla.	WELE	1590
So. Gastonia, N.C.	WGAS	1420
So. Haven, Mich.	WJOR	940
So. Knoxville, Tenn.	WSKT	1580
So. Paris, Me.	WKTQ	1450
So. Pittsburg, Tenn.	WEPG	910
So. St. Paul, Minn.	KDWB	630
	WMKT	1370
So. Williamsport, Pa.	WMPT	1450
Spanish Fork, Utah	KONI	1480
Sparks, Nev.	KBUB	1270
Sparta, Ill.	WHCO	1230
Sparta, Tenn.	WSMT	1050
Sparta, Wis.	WKLJ	990
	WCOW	1290
Spartanburg, S.C.	WHCQ	1400
	WORD	910
	WSPA	950
	WASC	1530
Spencer, Iowa	KICD	1240
Spencer, W.Va.	WSPZ	1400
Spokane, Wash.	KGA	1510
	KDNC	1440
	KSPO	1230
	KPEG	1380
	KHQ	590
	KNEW	790
	KREM	970
	KXLY	920
	KCFA	1330
	KUDY	1280
Springdale, Ark.	KBRS	1340
	KSPR	1590
Springfield, Ill.	WCVS	1450
	WMAY	970
	WTAX	1240
Springfield, Mass.	WHYN	560
	WMAS	1450
	WSPR	1270
Springfield, Mo.	KGBX	1260
	KICK	1340
	KTTS	1400
	KWTO	560
Springfield, Ohio	WIZE	1340
	WBLY	1600
Springfield-Eugene, Ore.	KEED	1120
Springfield, Tenn.	WDBL	1590
Springfield, Vt.	WCFR	1480
Springhill, La.	KBSF	1460
Spring Lake, N. C.	WFBS	1450
Spring Valley, N.Y.	WRRC	1300
Spruce Pine, N.C.	WTOE	1470
Stamford, Conn.	WSTC	1400
Stamford, Tex.	KDWT	1400
Stanford, Ky.	WRSL	1520
Starke, Fla.	WPXE	1490
Starkville, Miss.	WSSO	1230
State College, Pa.	WMAJ	1450
	WRSC	1390
Statesboro, Ga.	WWNS	1240
Statesville, N.C.	WSIC	1400
	WDBM	550
Staunton, Va.	WTON	1240
	WAFC	900
Stephenville, Tex.	KSTV	1510
Sterling, Colo.	KGEK	1230
	KOLR	1490
Sterling, Ill.	WSDR	1240
Steubenville, Ohio	WSTV	1340
Stevens Point, Wis.	WSPT	1010
Stillwater, Minn.	WAVN	1220
Stillwater, Okla.	KSPI	780
Stockton, Calif.	KJOY	1280
	KSTN	1420
	KWG	1230
Storm Lake, Iowa	KAYL	990
Streator, Ill.	WIZZ	1250
Stroudsburg, Pa.	WVPO	840
Stuart, Fla.	WSTU	1450
Stuart, Va.	WHEO	1270
Sturgeon Bay, Wis.	WDOR	910
Sturgis, Mich.	WSTR	1230
Sturgis, S. D.	KBNB	1280
Stuttgart, Ark.	KWAK	1240
Suffolk, Va.	WLPM	1460
Sullivan, Ind.	WKQV	1550
Sullivan, Mo.	KTUI	1560
Sulphur, La.	KIKS	1310
Sulphur Sprgs., Tex.	KSST	1230
Summerville, Ga.	WGTA	950
Summerville, S.C.	WALS	980
Sumner, Wash.	KDFL	1560
Sumter, S.C.	WFIG	1290
	WDXY	1240
	WSSC	1340
Sunbury, Pa.	WKOK	1070
Sunnyside, Wash.	KREW	1230
Sun Valley, Ida.	KSKI	1340
Superior, Nebr.	KRFS	1600
Superior, Wis.	WDSM	710
	WIGL	970
	WWJC	1270
	WAXK	1320
Susanville, Calif.	KSUE	1240
Sutton, W. Va.	WSGB	1490
Swainsboro, Ga.	WJAT	800
Sweetwater, Tenn.	WDEH	800
Sweetwater, Tex.	KXOX	1240
Sylacauga, Ala.	WFEB	1340
	WMLS	1290
Sylva, N.C.	WMSJ	1480
Sylvania, Ga.	WSYL	1490
Sylvester, Ga.	WOGA	1540
Syracuse, N.Y.	WHEN	620
	WFBL	1390
	WNDR	1260
	WOLF	1490
	WSYR	570
Tabor City, N.C.	WTAB	1370
Tacoma, Wash.	KMO	1360
	KTAC	850
	KTNT	1400
	KVI	570
Taft, Calif.	KTKR	1310
Tahlequah, Okla.	KTLQ	1350
Tahoe Valley, Calif.	KTHO	590
Talladega, Ala.	WEYY	1580
	WNUZ	1230
Tallahassee, Fla.	WMEN	1330
	WONS	1410
	WTAL	1450
	WTNT	1270
Tallassee, Ala.	WTLS	1300
Tallulah, La.	KTLD	1360
Tampa, Fla.	WALT	1110
	WDAE	1250
	WYOU	1550
	WFLA	970
	WHBO	1050
	WINQ	1010
	WTMP	1150
	WSOL	1300
Taos, N. Mex.	KKIT	1340
Tarboro, N.C.	WCPS	760
Tarpon Springs, Fla.	WCWR	1470
Tasley, Va.	WESR	1330
Taunton, Mass.	WPEP	1570
Tawas City, Mich.	WIOS	1480
Taylor, Tex.	KTAE	1260
Taylorsville, N. C.	WSTH	860
	WTLK	1570
Taylorville, Ill.	WTIM	1410
Tazewell, Tenn.	WNTT	1250
Tazewell, Va.	WTZE	1470
Tell City, Ind.	WTCJ	1230
Tempe, Ariz.	KUPO	1060
	KYND	1580
Temple, Tex.	KTEM	1400
Terre Haute, Ind.	WBOW	1230
	WAAC	1300
	WTHI	1480
Terrell, Tex.	KTER	1570
Terrytown, Nebr.	KEYR	690
Texarkana, Ark.	KOSY	790
Texarkana, Tex.	KCMC	740
	KATQ	940
	KTFS	1400
Texas City, Tex.	KTLW	920
Thayer, Mo.	KALM	1290
The Dalles, Oreg.	KODL	1440
	KACI	1300
Thermopolis, Wyo.	KRTR	1490
	KTHE	1240
Thief River Falls, Minn.	KTRF	1230
Thibodaux, La.	KTIB	630
Thomaston, Ga.	WSFT	1220
	WTGA	1590
	WTHN	1500
Thomasville, Ala.	WJDB	630
Thomasville, Ga.	WPAX	1240
	WLDR	730
Thomasville, N.C.	WTNC	790
Thomson, Ga.	WTWA	1240
Three Rivers, Mich.	WLKM	1510
Ticonderoga, N.Y.	WIPS	1250
Tiffin, Ohio	WTTF	1600
Tifton, Ga.	WTIF	1340
	WWGS	1430
Tillamook, Oreg.	KTIL	1590
Titusville, Fla.	WRMF	1050
Titusville, Pa.	WTIV	1230
Toccoa, Ga.	WLET	1420
	WNES	630
Toledo, Ohio	WOHO	1470
	WSPD	1370
	WTOD	1560
	WCWA	1230
	WTTO	1520
Toledo, Oreg.	KTDO	1230
Tolleson, Ariz.	KRDS	1190
Tomah, Wis.	WTMB	1460
Tompkinsville, Ky.	WTKY	1370
Tooele, Utah	KDYL	990
Topeka, Kans.	WIBW	580
	KEWI	1440
	WREN	1250
	KTOP	1490
Toppenish, Wash.	KENE	1490
Torrington, Conn.	WTOR	610
Torrington, Wyo.	KGOS	1490
Towanda, Pa.	WTTC	1550
Towson, Md.	WAQE	1570
Trail, B.C.	CJAT	610
Travelers Rest, S.C.	WBBR	1580
Traverse City, Mich.	WTCM	1400
	WCCW	1310
Trenton, Mo.	KTTN	1600
Trenton, N.J.	WAAT	1300
	WBUD	1260
	WTTM	920
Trinidad, Colo.	KCRT	1240
Troy, Ala.	WTBF	970
Troy, N.Y.	WHAZ	1330

Location	C.L.	Kc.
	WTRY	980
	WXKW	1600
Troy, N. C.	WJRM	1390
Truckee, Calif.	KHOE	1400
Trumann, Ark.	KTMN	1530
Truth or Consequences, New Mexico	KCHS	1400
Tryon, N.C.	WTYN	1550
Tucson, Ariz.	KTUC	1400
	KXEW	1600
	KAIR	1490
	KCEE	790
	KTAN	580
	KCUB	1290
	KEVT	690
	KHQS	940
	KMOP	1330
	KFIF	1550
	KTKT	990
	KOLD	1450
Tucumcari, N.Mex.	KTNM	1400
Tulare, Calif.	KCOK	1270
	KGEN	1370
Tulia, Tex.	KTUE	1260
Tullahoma, Tenn.	WJIG	740
Tulsa, Okla.	KAKC	970
	KOME	1300
	KRMG	740
	KELI	1430
	KVOO	1170
	KFMJ	1050
Tupelo, Miss.	WELO	580
	WTUP	1490
Turlock, Calif.	KCEY	1390
Tuscaloosa, Ala.	WJRD	1150
	WACT	1420
	WNPT	1280
	WTUG	790
	WTBC	1230
Tuscumbia, Ala.	WVNA	1590
	WRCK	1410
Tuskegee, Ala.	WABT	580
Twenty-Nine Palms, Calif.	KDHI	1250
Twin Falls, Idaho	KTFI	1270
	KLIX	1310
	KEEP	1450
Two Rivers, Wis.	WTRW	1590
Tyler, Tex.	KZAK	1330
	KDOK	1490
	KTBB	600
	KZEY	690
Tyrone, Pa.	WTRN	1340
Uhrichsville, Ohio	WUND	1540
	WBTC	1540
Ukiah, Calif.	KUKI	1400
	KMSL	1250
Ulysses, Kan.	KULY	1420
Union, S.C.	WBCU	1460
Union City, Tenn.	WENK	1240
Uniontown, Pa.	WMBS	590
Urbana, Ill.	WILL	580
	WKID	1580
Utica, N.Y.	WIBX	950
	WBVM	1550
	WRUN	1150
	WTLB	1310
Utuado, P.R.	WUPR	1530
Uvalde, Tex.	KVOU	1400
Valdese, N.C.	WSVM	1490
Valdosta, Ga.	WGOV	950
	WGAF	910
	WJEM	1150
	WVLD	1450
Valentine, Nebr.	KVSH	940
Vallejo, Calif.	KNBA	1190
Valley City, N.Dak.	KDVC	1490
Valparaiso-Niceville, Fla.	WNSM	1340
Valparaiso, Ind.	WAYK	1500
	WNWI	1080
Van Buren, Ark.	KFDF	1580
Van Cleve, Ky.	WMTC	730
Vanceburg, Ky.	WKKS	1570
Vancouver, Wash.	KISN	910
	KKEY	1150
	KGAR	1550
Vandalia, Ill.	WPMB	1500
Van Wert, Ohio	WERT	1220
Venice, Fla.	WAMR	1320
Ventura, Calif.	KVEN	1450
	KUDU	1590
Vermillion, S.Dak.	KUSD	690
Vernal, Utah	KVEL	1250
Vernon, Ala.	WVSA	1380
Vernon, Tex.	KVWC	1490
Vero Beach, Fla.	WAXE	1370
	WTTB	1490
Vicksburg, Miss.	WQBC	1420
	WVIM	1490
Victoria, Tex.	KNAL	1410
	KVIC	1340
Victorville, Calif.	KCIN	1590
Vidalia, Ga.	WVOP	970
Vieques, P.R.	WIVV	1370
Ville Platte, La.	KVPI	1050
Vincennes, Ind.	WAOV	1450
Vineland, N.J.	WWBZ	1360
	WDVL	1270
Vinita, Okla.	KVIN	1470
Vinton, Va.	WKBA	1550
Virginia, Minn.	WHLB	1400
Virginia Beach, Va.	WKVK	1550
Virouqua, Wis.	WISV	1360
Visalia, Calif.	KONG	1400
Vivian, La.	KNCB	1600
Waco, Tex.	WACO	1580
	KAWA	1010
	KBGO	1580
	KWTX	1230
Wadena, Minn.	KWAD	920
Wadesboro, N.C.	WADE	1210
Wagoner, Okla.	KWLG	1530
Wahpeton, N.D.-Breckenridge, Minn.	KBMW	1450
Wailuku, Hawaii	KMVI	550
Waipahu, Hawaii	KAHU	940
Walhalla, S.C.	WGOG	1000
Wallace, Idaho	KWAL	620
Wallace, N.C.	WLSE	1400
Walla Walla, Wash.	KHIT	1320
	KUJ	1420
	KTEL	1490
Walnut Ridge, Ark.	KRLW	1320
Walsenburg, Colo.	KFLJ	1380
Walterboro, S.C.	WALD	1220
Waltham, Mass.	WCRB	1330
Walton, N.Y.	WDLA	1270
Ward Ridge, Fla.	WJDE	1570
Ware, Mass.	WARE	1250
Warner Robbins, Ga.	WRBN	1600
	WAVC	1350
Warren, Ark.	KWRF	860
Warren, Ohio	WHHH	1440
Warren, Pa.	WNAE	1310
Warrensburg, Mo.	KOKO	1450
Warrenton, Mo.	WRE	730
Warrenton, Va.	WEER	1570
	WKCW	1420
Warsaw, Ind.	WRSW	1480
Warsaw, Va.	WNNT	690
Warwick-E.Greenwich, R.I.	WYNG	1500
Wasco, Calif.	KWSD	1050
Washington, D.C.	WGMS	570
	WMAL	630
	WOL	1450
	WOOK	1340
	WWDC	1260
	WRC	980
	WTOP	1500
Washington, Ga.	WLDV	1370
Washington, Ind.	WAMW	1580
Washington, Iowa	KCII	1380
Washington, N.J.	WCRV	1580
Washington, N.C.	WEEW	1320
	WITN	930
Washington, Pa.	WJPA	1450
Washington Court House, Ohio	WCHO	1250
Walterboro, S.C.	WALD	1060
Waterbury, Conn.	WATR	1320
	WBRY	1590
	WWCO	1240
Waterbury, Vt.	WDEV	550
Waterloo, Iowa	KXEL	1540
	KNWS	1090
	KWWL	1330
Watertown, N.Y.	WATN	1240
	WOTT	1410
	WWNY	790
Watertown, S.Dak.	KSDR	1480
	KWAT	950
Watertown, Wis.	WTTN	1580
Waterville, Me.	WTVL	1490
Watseka, Ill.	WGFA	1360
Watsonville, Calif.	KOMY	1340
Wauchula, Fla.	WAUC	1310
	WPRV	1600
Waukegan, Ill.	WKRS	1220
Waukesha, Wis.	WAUK	1510
Waupaca, Wis.	WDUX	800
Waupun, Wis.	WLKE	1170
Wausau, Wis.	WRIG	1400
	WSAU	550
	WXCO	1230
Waverly, Iowa	KWVY	1470
Waverly, Ohio	WPKO	1380
Waverly, Tenn.	WPHC	1060
Waxahachie, Tex.	KBEC	1390
Waycross, Ga.	WACL	570
	WAYX	1230
Waynesboro, Ga.	WBRO	1310
Waynesboro, Miss.	WABO	990
Waynesboro, Pa.	WAYZ	1380
Waynesboro, Va.	WAYB	1490
	WANV	970
Waynesburg, Pa.	WANB	1580
Waynesville, Mo.	KJPW	1390
Waynesville, N.C.	WHCC	1400
Weatherford, Tex.	KZEE	1220
Webster City, Iowa	KJFJ	1570
Weed, Calif.	KDAD	800
Weirton, W.Va.	WEIR	1430
Weiser, Idaho	KWEI	1260
Welch, W.Va.	WELC	1150
	WOVE	1340
Weldon, N.C.	WCNF	1400
Wellsboro, Pa.	WNBT	1490
Wellston, Ohio	WKOV	1330
Wellsville, N.Y.	WLSV	790
Wenatchee, Wash.	KPQ	560
	KUEN	900
	KMEL	1340
Wendell-Zebulon, N.C.	WETC	540
Weslaco, Tex.	KRGV	1290
West Allis, Wis.	WAWA	1590
W. Bend, Wis.	WBKV	1470
Westbrook, Me.	WJAB	1440
West Chester, Pa.	WCHE	1520
West Covina, Cal.	KGRB	900
W. Frankfort, Ill.	WFRX	1300
W. Hartford, Conn.	WEXT	1550
West Jefferson, N.C.	WKSK	1600
W. Liberty, Ky.	WLKS	1450
West Looma, Cal.	KGRB	900
W. Memphis, Ark.	KSUD	730
W. Monroe, La.	KUZN	1310
W. Palm Beach, Fla.	WEAT	850
	WJNO	1230
	WIRK	1290
West Plains, Mo.	KWPM	1450
West Point, Ga.	WBMK	1310
W. Point, Ga.-Lanett, Ala.	WRLD	1490
West Point, Miss.	WROB	1450
Westport, Conn.	WMMM	1260
W. Springfield, Mass.	WTXL	1490
W. Yarmouth, Mass.	WOCB	1240
Westerly, R.I.	WERI	1230
Westfield, Mass.	WDEW	1570
Westminster, Md.	WTTR	1470
Weston, W.Va.	WHAW	980
W. Warwick, R.I.	WWRI	1450
Wetumpka, Ala.	WETU	1250
Wewoka-Seminole, Okla.	KWSH	1260
	KANI	1500
Wharton, Tex.	KYCN	1340
Wheatland, Wyo.	WDON	1540
Wheaton, Md.	WHLL	1600
Wheeling, W.Va.	WBZE	1470
	WKWK	1400
	WWVA	1170
White Castle, La.	KEVL	1590
Whitehall, Mich.	WLRC	1490
White Plains, N.Y.	WFAS	1230
White River Junc., Vt.	WVTR	910
Whitesburg, Ky.	WTCW	920
Whiteville, N.C.	WENC	1220
Wichita, Kans.	KAKE	1240
	KLEO	1480
	KFDI	1070
	KFH	1330
	KSIR	900
	KWBB	1410
Wichita Falls, Tex.	KNIN	990
	KTRN	1290
	KWFT	620
Wickenburg, Ariz.	KAKA	1250
Wickford, R.I.	WKFD	1370
Wildwood, N.J.	WCMC	1230
Wilkes-Barre, Pa.	WBAX	1240
	WBRE	1340
	WILK	980
Williamsburg, Ky.	WEZJ	1440
Williamsburg, Va.	WBCI	740
Williamson, W.Va.	WBTH	1400
Williamsport, Pa.	WLYC	1050
	WRAK	1400
	WWPA	1340
Williamston, N.C.	WIAM	900
Willimantic, Conn.	WILI	1400
Williston, N.D.	KEYZ	1360
Willmar, Minn.	KWLM	1340
Willoughby, Ohio	WELW	1330
Willow Springs, Mo.	KUKU	1330
Willows, Calif.	KIQS	1560
Wilmington, Del.	WAMS	1380
	WDEL	1150
	WILM	1450
	WTUX	1290
Wilmington, N.C.	WMFD	630
	WHSL	1490
	WKLM	980
	WGNI	1340
Wilmington, O.	WMWM	1090
Wilson, N.C.	WGTM	590
	WLLY	1350
	WVOT	1420
Winchester, Ky.	WWKY	1380
Winchester, Tenn.	WCOT	1340
Winchester, Va.	WINC	1400
	WHPL	610
Windber, Pa.	WWBR	1350
Windermere, Fla.	WVCF	1480
Winder, Ga.	WIMO	1300
Windom, Minn.	KDOM	1580
Windsor, Conn.	WSOR	1480
Winfield, Ala.	WEZQ	1300
Winfield, Kan.	KNIC	1550
Winnemucca, Nev.	KWNA	1400
Winnfield, La.	KVCL	1270
Winner, S.Dak.	KWYR	1260
Winnsboro, La.	KMAR	1570
Winnsboro, S.C.	WCKM	1250
Winona, Minn.	KWNO	1230
	KAGE	1380
Winona, Miss.	WONA	1570
Winslow, Ariz.	KVNC	1010
	KINO	1230
Winston-Salem, N.C.	WAAA	980
	WAIR	1340
	WPEG	1550
	WSJS	600
	WTOB	1380
	WKBX	1500
Winter Garden, Fla.	WOKB	1600
Winter Haven, Fla.	WSIR	1490
	WINT	1360
Winter Park, Fla.	WABR	1440
Wisconsin Rapids, Wis.	WFHR	1320
	WRNE	1220
Wolf Pt., Mont.	KVCK	1450
Woodburn, Ore.	KWRC	940
Woodbury, Tenn.	WBFJ	1540
Wood River, Ill.	WRTH	590
Woodside, N.Y.	WWRL	1600
Woodward, Okla.	KSIW	1450
Woonsocket, R.I.	WNRI	1380
	WWON	1240
Wooster, Ohio	WWST	960
Worcester, Mass.	WAAB	1440
	WNEB	1230
	WORC	1310
	WTAG	580
Worland, Wyo.	KWOR	1340
Worthington, Minn.	KWDA	730
Worthington, Ohio	WRFD	880
Wynne, Ark.	KWYN	1400
Wyoming, Mich.	WERX	1530
Wytheville, Va.	WYVE	1280
Yakima, Wash.	KIT	1280
	KIMA	1460
	KBBO	1390
	KQOT	930
	KUTI	980
	KYAK	1390
Yankton, S.D.	KYNT	1450
	WNAX	570
Yauco, P.R.	WKFE	1550
Yazoo City, Miss.	WAZF	1230
York, Nebr.	KAWL	1870
York, Pa.	WNOW	1250
	WORK	1350
	WSBA	910
York, S.C.	WYCL	980
Youngstown, Ohio.	WBBW	1240
	WFMJ	1390
	WKBN	570
Ypsilanti, Mich.	WYSI	1480
	WYNZ	1520
Yreka, Calif.	KSYC	1490
Yuba City, Calif.	KUBA	1600
	KZIN	1450
Yuma, Ariz.	KBLU	1320
	KVOY	1400
	KYUM	560
Zanesville, Ohio	WHIZ	1240
Zarephath, N.J.	WAWZ	1380
Zebulon-Wendell, N.C.	WETC	540
Zephyr Hills, Fla.	WZRH	1400
Zion, Ill.	WZBN	1500

U. S. FM Stations by States

Location	C.L.	Mc.
ALABAMA		
Albertville	WAVU-FM	105.1
Alexander City	WRFS-FM	106.1
Andalusia	WNBX	98.1
Anniston	WHMA-FM	100.5
Athens	WJOF	104.3
	WATM-FM	104.1
Bay Minette	WBCA-FM	105.5
Birmingham	WAPI-FM	99.5
	WBRC-FM	106.9
	WCRT	96.5
	WSFM	93.7
Clanton	WKLF-FM	97.7
Cullman	WFMH-FM	101.1
Decatur	WDRM	102.1
	WRSA	96.9
Dothan	WOOF-FM	99.7
Fairhope	WABF-FM	92.1
Florence	WJOI-FM	107.3

WHITE'S RADIO LOG

Location	C.L.	Mc.
Gadsden	WJBY-FM	103.7
Homewood	WJLN	104.7
Huntsville	WAHR	99.1
	WNDA	92.9
Jackson	WHOD-FM	104.9
Mobile	WKRG-FM	99.9
	WMFC-FM	98.5
	WLPR	96.1
Montgomery	WFMI	98.9
	WAJM	103.3
	WHHY-FM	101.9
Muscle Shoals	WLAY-FM	105.5
Scottsboro	WPJC-FM	98.3
Selma	WHBB-FM	100.1
	WHPD	100.1
Sylacauga	WMLS-FM	98.3
Tuscumbia	WVNA	100.9
Tuscaloosa	WTBO-FM	95.7
	WUOA	*91.7
	WACT-FM	105.5

ALASKA

Anchorage	KNIK	105.5
	KBYR-FM	102.1
	KHAR-FM	103.9
College	KUAC	104.9

ARIZONA

Globe	KWJB-FM	100.3
Mesa	KBUZ-FM	104.7
	KMND-FM	93.3
Phoenix	KRFM	95.5
	KFCA	*88.5
	KITH	101.3
	KOOL-FM	94.5
	KNIX-FM	102.5
	KOY-FM	92.5
	KMEO	96.9
	KTAR-FM	98.7
	KYEW	93.3
	KHEP-FM	101.5
Show Low	KVWM	93.5
Tempe	KUPD-FM	97.9
Tucson	KFMM	99.5
	KCEE-FM	96.1
	KSOM	92.9
	KVOA-FM	93.7

ARKANSAS

Blytheville	KLCN-FM	96.1
Dardanelle	KCAB-FM	102.3
El Dorado	KRIL	99.3
	KELD-FM	103.1
Fayetteville	KFAY-FM	92.1
	KNWA	103.9
Ft. Smith	KFPW-FM	94.9
	KMAG	99.1
	KTCS-FM	99.9
Harrison	KHOZ-FM	102.9
Hot Springs	KBHS-FM	96.7
	KGUS	97.5
Jacksonville	KGMR-FM	100.3
Jonesboro	KBTM-FM	101.9
	KASU	91.9
	KNEA-FM	107.9
Little Rock	KARK	103.7
	KMYO-FM	95.7
Mammoth Springs	KAMS	103.9
Osceola	KOSE-FM	98.1
Pine Bluff	KOTN-FM	92.3
Siloam Springs	KUOA-FM	105.7

CALIFORNIA

Akiah	KLIL	94.3
Alameda	KJAZ	92.7
Anaheim	KEZR-FM	95.9
Angwin	KANG	88.1
Apple Valley	KAVR-FM	102.3
Arcata	KTOO	*90.5
Atherton	KPEN	101.3
Auburn	KAFI	101.1
Avalon	KBIG	104.3
Bakersfield	KERN-FM	94.1
	KGEE-FM	97.5
	KIFM	96.5
Berkeley	KPFA	94.1
	KPFB	*89.3
	KPAT-FM	102.9
Bijou	KHUR	99.9
Bishop	KIBS-FM	100.7
Carlsbad	KARL-FM	95.9
Carmel	KRML-FM	101.7
Claremont	KSPC	*88.7
Coachella	KCHV-FM	93.7
El Cajon	KECR	93.3
Escondido	KOWN-FM	92.1
Fremont	KFMR	104.9
Fresno	KARM-FM	101.9
	KCIB-FM	94.5
	KFRE-FM	93.7
	KMJ-FM	97.9
	KXQR	102.7
Garden Grove	KTBT	94.3
Glendale	KFMU	97.1
	KUTE	101.9
Hayward	KTUX	101.7
Hemet	KHSJ-FM	105.5
Inglewood	KTYM-FM	103.9
La Canada	KUNF	*88.9
LaSierra	KSDA	*89.7
Lodi	KCVR-FM	97.7
Lompoc	KLOM-FM	92.7
Long Beach	KJLH	102.3
	KLON	*88.1
	KNOB	97.9
Los Altos	KPGM	97.7
	KFJC	88.7
Los Angeles	KABC-FM	95.5
	KBBI	107.5
	KBCA	105.1
	KBMS	105.9
	KCBH	98.7
	KFAC-FM	92.3
	KFOX-FM	100.3
	KGLA	*103.5
	KHJ	101.1
	KMET	94.7
	KMLA	100.3
	KNX-FM	93.1
	KPFK	*90.7
	KPOL-FM	99.9
	KRHM	102.7
	KRKD-FM	96.3
	KUSC	*91.5
	KXLU	*89.1
	KHOF	99.5
Los Angeles-Avalon	KBIG-FM	104.3
Los Banos	KLBS-FM	95.9
Los Gatos	KLGS	95.3
Marysville	KRFD	99.9
Merced	KWIP-FM	101.5
Modesto	KBEE-FM	103.3
	KTRB-FM	104.1
Monterey	KHFR	96.9
Newport Beach	KOCM	103.1
Northridge	KEDC-FM	88.5
Oakland	KAFE	98.1
Oceanside	KUDE	102.1
Ontario	KOXA	93.5
Oxnard	KPMJ	104.7
Pacific Grove	KMBY-FM	104.9
Pasadena	KPCS	89.3
	KPPC-FM	106.7
Palm Springs	KDES-FM	104.7
Redding	KCER	92.9
Redondo Beach	KKOP	93.5
Redlands	KCAL-FM	96.7
	KUOR-FM	*89.1
Ridgecrest	KLOA-FM	105.5
Riverside	KBBL	99.1
	KACE-FM	92.7
	KDUO	97.5
Sacramento	KCRA-FM	96.1
	KERS	*88.9
	KFBK-FM	96.9
	KJML	106.5
	KEBR	100.5
	KHIQ	105.1
	KJML	95.3
	KRAK-FM	92.9
	KSFM	96.9
	KXRQ	98.5
	KXOA-FM	107.9
Salinas	KSBW-FM	102.5
	KRSA-FM	100.7
	KERR	103.9
San Bernardino	KVCR	*91.9
	KFMW	99.9
	KEBS	*89.5
	KRCS	95.1
San Diego	KOGO-FM	94.1
	KFMB-FM	100.7
	KFMX	96.5
	KGB-FM	101.5
	KITT	105.3
	KJLM	98.1
	KLRO	94.9
	KPRI	106.5
	KSDS	*88.3
	KBBW	102.9
	KSDO-FM	103.7
	KSEA	97.3
San Fernando	KVFM	94.3
San Francisco	KALW	*91.7
	KBRG	105.3
	KCBS-FM	98.9
	KDFC	102.1
	KEAR	97.3
	KFOG	104.5
	KFRC-FM	106.1
	KGO-FM	103.7
	KNBR-FM	99.7
	KMPX	106.9
	KOIT	93.3
	KPEN	101.3
	KRON-FM	96.5
	KSFR	94.9
	KXKX	88.5
	KCMA	*90.3
	KBRG	105.3
	KABL-FM	98.1
	KKHI-FM	95.7
San Jose	KSJO-FM	92.3
	KRPM	98.5
	KSJS	90.7
	KPLX	106.5
	KEEN-FM	100.3
San Luis Obisbo	KATY-FM	96.1
	KSBY-FM	93.3
San Mateo	KCSM	*90.9
	KUFY	107.7
San Rafael	KTIM	100.9
Santa Ana	KWIZ-FM	96.7
	KYMS	106.3
Santa Barbara	KCSB-FM	91.1
	KDB-FM	93.7
	KMUZ	103.3
	KTMS	97.5
Santa Clara	KSCU	*90.1
	KREP	105.7
Santa Cruz	KSCO-FM	99.1
Santa Maria	KXFM	99.1
	KSMA-FM	102.5
Santa Monica	KCRW	*89.9
	KSRF	103.1
Sierra Madre	KMAX	107.1
Stanford	KZSU	*90.1
Stockton	KUOP	*91.3
	KSTN-FM	107.3
	KWG-FM	105.7
Tahoe Valley	KTHO-FM	103.1
Thousand Oaks	KNJO	92.7
Torrance	KNHS	*89.7
Tulare	KDFR	106.7
	KGEN-FM	94.9
Turlock	KOSO	93.1
Twenty-Nine Palms	KDHI-FM	95.7
Ukiah	KUKI-FM	93.5
Ventura-Oxnard	KVEN-FM	100.7
Visalia	KONG-FM	92.9
Walnut Creek	KDFM	92.1
West Covina	KSGV	98.3
Woodland	KATT	95.3

COLORADO

Boulder	KRNW	97.3
Colorado Springs	KRCC	*91.5
	KKFM	96.5
	KSHS	*90.5
	KVOR-FM	92.9
	KPIK-FM	94.3
	KRDO-FM	95.1
	KRYT-FM	101.9
Cortez	KZFM	94.1
Denver	KFML-FM	98.5
	KLIR-FM	100.3
	KLZ-FM	106.7
	KDEN-FM	99.5
	KOA-FM	103.5
	KOSI-FM	101.1
	KTGM	105.1
	KIMN-FM	95.5
	KBPI	105.9
Ft. Collins	KCSU-FM	*90.9
	KFMF	93.9
Grand Junction	KREX-FM	92.3
Lakewood	KLAK-FM	107.7
Longmount	KLMO-FM	104.3
Loveland	KLOV-FM	102.3
Manitou Springs	KCMS-FM	102.7
Rocky Ford	KAVI-FM	95.9

CONNECTICUT

Bridgeport	WJZZ	99.9
	WPKN	88.1
Brookfield	WGHF	95.1
Danbury	WLAD-FM	98.3
Darien	WDRM	95.9
Fairfield	WSHU	*91.1
Hamden	WDEE	101.3
Hartford	WHCN	105.9
	WDRC-FM	102.9
	WCCC-FM	104.9
	WLAE	93.7
	WRTC-FM	*89.3
	WTIC-FM	96.5
Meriden	WBMI	95.7
Middletown	WESU	88.1
New Haven	WNHC-FM	99.1
	WYBG-FM	94.3
Norwalk	WDRN	95.9
Stamford	WSTC-FM	96.7
Storrs	WHUS	*90.5
Waterbury	WATR-FM	92.5
	WWCO-FM	104.1
Westport	WMMM	107.9

DELAWARE

Dover	WDOV-FM	94.7
Wilmington	WDEL-FM	93.7
	WJBR	99.5

D. C.

Washington	WASH	97.1
	WAMU-FM	*88.5
	WFAN	100.3
	WGAY	99.5
	WGMS-FM	103.5
	WGTB	*90.1
	WMAL-FM	107.3
	WOL-FM	98.7
	WRC-FM	93.9
	WTOP-FM	96.3
	WWOC-FM	101.1

FLORIDA

Atlantic Beach	WKTZ-FM	96.1
	WAQB-FM	104.9
Belle Glade	WSWN-FM	93.5
Boca Ratan	WWOG	99.9
Bradenton	WBRD-FM	103.3
Clear Water	WTAN-FM	95.7
Cocoa	WEZY-FM	99.3
Cocoa Beach	WXBR	101.1
	WRKT-FM	104.3
Coral Gables	WVCG-FM	105.1
Crestview	WAAZ-FM	104.9
Daytona Beach	WNDB-FM	94.5
	WMFJ-FM	101.9
De Funiak Springs	WZEP-FM	103.1
Fort Lauderdale	WWIL-FM	103.5
	WFLM	105.9
	WFTL-FM	106.7
	WMJR	100.7
Ft. Meyers	WINK-FM	96.9
	WMYR-FM	101.9
Ft. Pierce	WARN-FM	98.7
Ft. Walton Beach	WFTW-FM	99.3
Gainesville	WRUF-FM	*104.1
Jacksonville	WJAX-FM	95.1
	WQIK-FM	99.1
	WIVY-FM	92.5
	WKTZ-FM	96.1
Key West	WKIZ-FM	92.5
Lakeland	WVFM	94.1
Maitland	WTLN-FM	95.3
Marianna	WTOT-FM	100.9
Melbourne	WMMB-FM	102.3
Miami	WKAT-FM	93.3
	WGBS	96.3
	WIOD-FM	97.3
	WTHS	*91.7
	WEDR	99.1
	WWPB	101.5
Miami Beach	WKAT-FM	93.1
	WAEZ-FM	94.9
	WGOS	93.9
Milton	WXBM-FM	102.3
Mt. Dora	WHIY-FM	107.7
Naples	WNFM	94.5
Ocala	WMOP-FM	93.7
Okeechobee	WLMC	103.1
Orlando	WDBO-FM	92.3
	WHOO-FM	96.5
	WKIS-FM	100.3
	WWQS	105.1
Palm Beach	WWOS-FM	97.9
	WPBA-FM	107.1
Panama City	WMAI-FM	107.9
	WDLP-FM	92.5
Pensacola	WPEX-FM	94.1
	WCOA-FM	100.7
St. Augustine	WFOY-FM	97.7
St. Petersburg	WGNB	101.5
	WTCX	99.5
	WPIN-FN	107.3
Sarasota	WYAK	102.5
	WSPB-FM	106.3
Sebring	WSEB	105.5
Stuart	WMCF	92.7
Tallahasseo	WFSU-FM	*91.5
	WBGM-FM	98.9
Tampa	WDAE-FM	100.7
	WEMI	94.9
	WFLA-FM	93.3
	WPKM	104.7
	WUSF	*89.7
West Palm Beach	WPBF	107.9
Winter Haven	WXKL	97.5
Winter Park	WPRK	*91.5
	WLOQ	103.1

GEORGIA

Albany	WGPC-FM	104.5
	WJIZ	96.3
Americus	WDEC-FM	94.3
Athens	WGAU-FM	102.5
	WDOL-FM	104.7
Atlanta	WABE	*90.1
	WAVO-FM	94.9
	WPLO-FM	103.3
	WGKA-FM	92.9
	WSB-FM	98.5
	WLTA-FM	99.7
Augusta	WAUG-FM	105.7
	WBBQ-FM	104.3
Brunswick	WGIG-FM	100.7
	WYNR-FM	101.5
Canton	WCHK-FM	105.5
Carrollton	WLBB-FM	102.3
Columbus	WRBL-FM	102.9
	WGBA-FM	107.3
Cornelia	WCON-FM	99.3
Dublin	WXLI-FM	92.7
Gainesville	WDUN-FM	103.9
	WWQT	97.1
Griffin	WKEU-FM	99.9

Location	C.L.	Mc.
Lagrange	WLAG-FM	104.1
Macon	WMAZ-FM	99.1
Manchester	WFDR-FM	99.3
Marietta	WBIE-FM	101.5
	WKLS	96.1
Milledgeville	WMVG-FM	102.3
Moultrie	WMTM-FM	93.9
Newnan	WCOH-FM	96.7
Perry	WPGA-FM	100.9
Rome	WRGA-FM	102.3
	WROM-FM	97.7
Rossville	WRIP-FM	105.5
Savannah	WTOC-FM	94.1
	WEAS-FM	93.1
Smyrna	WKXI	94.1
Swainsboro	WJAT-FM	101.7
Toccoa	WLET-FM	106.1
Valdosta	WGOV-FM	92.9
West Point	WBMK-FM	100.9

HAWAII

Honolulu	KAIM-FM	95.5
	KHVH-FM	93.9
	KPOI-FM	97.5
	KVOK	*88.1
	KUOH	*90.5

IDAHO

Boise	KBOI-FM	97.9
Idaho Falls	KID-FM	96.1
	KGVM	92.5
Lewiston	KOZE-FM	96.7
Moscow	KUID	*91.7
Pocatello	KBGL	*88.7

ILLINOIS

Alton	WOKZ-FM	100.3
Anna	WRAJ-FM	92.7
Arlington Heights	WNWC	92.7
Aurora	WKKD-FM	95.9
	WMRO-FM	107.9
Bloomington	WJBC-FM	101.5
Carbondale	WSIU	*91.9
Carmi	WROY-FM	97.3
Centralia	WCNT-FM	95.3
Champaign	WDWS-FM	97.5
	WLRW-FM	94.5
Charleston	WEIC-FM	92.1
Chicago	WBBM-FM	96.3
	WBEZ	*91.5
	WCLM	101.9
	WLS-FM	94.7
	WDHF	95.5
	WEBH	93.9
	WEFM	99.5
	WSDM	97.9
	WFMF	100.3
	WNUS-FM	107.5
	WFMT	98.7
	WKFM	103.5
	WMAQ-FM	101.1
	WMBI-FM	90.1
	WNIB	97.1
	WXRT	93.1
	WJJD-FM	104.3
Columbia	WCBW	104.9
Crete	WTAS	102.3
Decatur	WSOY-FM	102.9
DeKalb	WNIC	*89.7
	WLBK-FM	92.5
Dixon	WIXN-FM	101.7
Dundee	WVFV	103.9
E. St. Louis	WBBR	101.1
Effingham	WCRA-FM	95.7
	WELG	103.9
	WRMN-FM	94.3
Elgin	WEPS	*88.1
	WELG	103.9
	WRMN-FM	94.3
Elmhurst	WRSE-FM	*88.7
Elmwood Park	WXFM	105.9
Evanston	WEAW	105.1
	WNUR	*88.7
Fairfield	WFIW-FM	104.9
Flossmoor	WHFH	*88.5
Freeport	WELL-FM	98.5
Galesburg	WYKC-FM	*88.1
Glen Ellyn	WELF	107.1
Greenville	WGRN	*89.3
Harrisburg	WEBQ-FM	99.9
Highland Park	WEEF-FM	103.1
Jacksonville	WLDS-FM	100.5
	WAJP	93.5
Joliet	WJOL-FM	96.7
Kankakee	WKAK-FM	99.9
Kewanee	WKEI-FM	92.1
Lansing	WLNR-FM	106.3
LaSalle	WLPO-FM	99.3
Lawrenceville	WAKO-FM	103.1
Litchfield	WSMI-FM	106.1
Loves Park	WLUV-FM	96.7
Macomb	WWKS	*91.3
	WKAI-FM	100.1
Madison	WGNU-FM	106.5
Mattoon	WLBH-FM	96.9
Mendota	WGLC-FM	100.9
Morris	WRMI-FM	104.7
Morrison	WMHS	91.5
Mt. Carmel	WSAB	94.9
	WVMC-FM	101.1
Mt. Vernon	WMIX-FM	94.1
Normal	WGLT	91.7
Oak Park	WOPA-FM	102.7
Olney	WSEI-FM	92.9
Ottawa	WOLI	98.3
Paris	WPRS-FM	98.3
Park Forest	WRHS	*88.1
Park Ridge	WMTH	*88.5
Pekin	WSIV-FM	95.3
Peoria	WMBD-FM	93.3
	WJSI	106.9
Quincy	WGEM-FM	105.1
	WTAD-FM	99.5
Robinson	WTAY-FM	100.7
Rockford	WROK-FM	97.5
Rock Island	WHBF-FM	98.9
	WVIK	90.9
Skokie	WRSV	98.3
South Beloit	WBEL-FM	103.1
Springfield	WTAX-FM	103.7
	WFMB	104.5
	WVEM	101.9
Streator	WIZZ-FM	97.7
Taylorville	WGGM	95.0
Urbana	WILL-FM	*90.9
	WPGU	103.9
Waukegan	WEFA	102.3
Wheaton	WETN-FM	*88.1
Winnetka	WNTH	*88.1
Woodstock	WREK	105.5

INDIANA

Anderson	WAFM	97.9
Bloomington	WFIU	*103.7
	WTTV-FM	92.3
Bluffton	WCRD	100.1
Columbus	WCSI-FM	98.3
Connersville	WCNB-FM	100.3
Crawfordsville	WNDY	106.3
Elkhart	WCMR-FM	104.7
	WTRC-FM	100.7
	WXAX	104.7
Elwood	WBMP	101.7
Evansville	WIKY-FM	104.1
	WEVC	*91.5
	WPSR	90.7
	WVHI	105.3
Fort Wayne	WPTH	95.1
	WKJG-FM	97.3
Franklin	WFCI	*89.3
	WIFN	95.9
Frankfort	WILO-FM	99.7
Gary	WGVE	*88.1
Goshen	WGCS	91.1
Greencastle	WGRE	*91.7
	WXTA	94.3
Greenfield	WSMJ	99.5
Greensburg	WTRE-FM	107.3
Hammond	WYCA	92.3
Hartford City	WHCI	*91.9
	WWHC	104.9
Huntington	WVSH	*91.9
	WHLT-FM	103.1
Indianapolis	WAJC	*104.5
	WBDG	90.9
	WICR	*88.7
	WISH-FM	107.9
	WAIV	105.7
	WFBM-FM	94.7
	WFMS	95.5
	WGEE-FM	103.3
	WIAN	*90.1
	WIBC-FM	93.1
Jasper	WITZ-FM	104.7
Kendallville, Ind.		
	WAWK-FM	93.3
Kokomo	WFKO	100.5
	WKMO	93.5
Lafayette	WASK-FM	105.3
	WAZY-FM	96.7
La Porte	WLOI-FM	96.7
Logansport	WSAL-FM	102.3
Madison	WORX-FM	96.7
Marion	WMRI-FM	106.9
	WBST	*90.7
Michigan City	WMCB-FM	95.9
Muncie	WMUN	104.1
	WWHI	*91.5
New Albany	WNAS	*88.1
New Castle	WCTW-FM	102.5
	WYSN	*91.1
North Vernon	WOCH-FM	106.1
Peru	WARU-FM	98.3
Plainfield	WJMK	98.3
Plymouth	WTCA-FM	94.3
Princeton	WRAY-FM	98.1
Richmond	WGLM	96.1
	WECI	*91.5
	WKBV-FM	101.3
Seymour	WJOD	93.1
Shelbyville	WSVL-FM	97.1
South Bend	WETL	*91.9
	WHME	103.1
	WNDU-FM	92.9
	WPFR	102.7
	WJVA-FM	103.9
	WSBT-FM	101.5
Terre Haute	WTHI-FM	99.9
	WBOW-FM	107.5
	WPFR	102.7
	WVTS	100.7
	WISU	*89.7
Wabash	WSKS	*91.3
	WKUZ	95.9
Warsaw	WRSW-FM	107.3
Washington	WFML	106.5
West Lafayette	WBAA-FM	99.1
Valparaiso	WVUR-FM	*90.3
Vincennes	WAOV-FM	96.7

IOWA

Ames	WOI-FM	*90.1
Atlantic	KJAN-FM	103.7
Boone	KFGQ	*99.3
Cedar Falls	KTCF	*88.1
Cedar Rapids	KHAK-FM	98.1
	WMT-FM	104.5
Clarion	KRIT	96.9
Clinton	KROS-FM	96.1
Creston	KSIB-FM	101.7
Davenport	WOC-FM	103.7
	KWNT-FM	106.5
Des Moines	KDPS	*88.1
	KDMI-FM	97.3
	WHO-FM	100.3
	KFMG	94.9
	KWDM	93.3
Dubuque	WDBQ-FM	105.3
	KDTH-FM	92.9
Ft. Dodge	KWMT-FM	94.5
Iowa City	KSUI	91.7
	KXIC-FM	100.9
Iowa Falls	KIFG-FM	95.3
Mt. Vernon	KRNL-FM	*89.7
Muscatine	KWPC-FM	99.7
Newton	KUWS-FM	95.9
Oskaloosa	KBOE-FM	104.9
Sioux City	KDVR	97.9
	KTFC	103.3
Spencer	KICD-FM	107.7
Storm Lake	KAVL-FM	101.5
Waterloo	KNWS-FM	101.9
	KXEL-FM	105.7
Waverly	KWAR	89.1

KANSAS

Baldwin	KNBU	*88.9
Dodge City	KGNO-FM	95.5
Emporia	KSTE	*88.7
	KVOE-FM	104.9
Garden City	KUPK-FM	97.3
Junction City	KJCK-FM	94.5
Kansas City	KCFC	98.1
	KCKN-FM	94.1
Larned	KANS-FM	96.7
Lawrence	KANU	*91.5
	KLWN-FM	105.9
Leavenworth	KCLO-FM	98.9
Manhattan	KSDB-FM	*88.1
Newton	KJRG-FM	92.3
Ottawa	KTJO-FM	*88.1
	KOFO-FM	95.7
Parsons	KPPS-FM	*91.1
Pratt	KWNS-FM	93.1
Russell	KRSL-FM	95.9
Salina	KAFM	99.9
Scott City	KFLA-FM	94.5
Topeka	KTOP	100.3
	WIBW-FM	97.3
Wichita	KFH-FM	100.3
	KQTY	101.3
	KMUW	*89.1
	KCBM-FM	107.3

KENTUCKY

Albany	WANY-FM	106.3
Ashland	WCMI-FM	93.7
Beattyville	WLJC	102.3
Benton	WCBL-FM	102.3
Bowling Green	WLBJ-FM	96.7
Campbellsville	WTCO-FM	103.9
Central City	WNES-FM	101.9
Erlanger	WKKY-FM	100.9
Ft. Knox	WSAC-FM	105.5
Fulton	WFUL-FM	104.9
Georgetown	WRVG	*90.1
Glasgow	WGGC	95.1
Greenville	WKYF-FM	101.1
Hazard	WKIC-FM	101.1
Henderson	WSON-FM	99.5
Hopkinsville	WHOP-FM	98.7
	WKOF	100.3
Jamestown	WJRS-FM	103.1
Lexington	WBKY	*91.3
	WLAP-FM	94.5
	WVLK-FM	92.9
Louisville	WFPK	*91.9
	WFPL	*89.3
	WHAS-FM	97.5
	WKLO-FM	99.7
	WLRS	102.3
	WXEL	103.9
Madisonville	WFMW-FM	93.9
	WNGO-FM	94.7
Manfordville	WLOC-FM	102.3
Maysville	WFTM-FM	95.9
Monticello	WFLW-FM	101.7
Morehead	WMOR-FM	92.1
	WMKY-FM	91.1
Owensboro	WOMI-FM	92.5
	WVJS-FM	96.1
Paducah	WPAD-FM	96.9
	WKYX-FM	93.3
Paintsville	WSIP-FM	100.1
Pikeville	WPKE-FM	92.1
Prestonburg	WDOC-FM	95.5
Russellville	WRUS-FM	92.1
St. Mathews	WSTM	103.1
Somerset	WSFC-FM	96.7
Whitesburg	WTCW-FM	104.9

LOUISIANA

Alexandria	KALB-FM	96.9
Baton Rouge	WJBO-FM	102.5
DeRidder	KDLA-FM	101.7
Hammond	WTGI	107.1
Houma	KCIL-FM	107.1
Jennings	KJEF-FM	92.7
Lafayette	KRVS-FM	*88.3
	KPEL-FM	99.9
	KSMB	94.5
Lake Charles	KPLC-FM	99.5
	KIKS-FM	96.1
La Place	WCKW	92.3
Monroe	KMLB-FM	104.1
	KNOE-FM	101.9
	KREB	106.1
Mt. Vernon	KRNL-FM	105.3
Natchitoches	KNOC-FM	97.7
New Orleans	WBEH	89.3
	WDSU-FM	105.3
	WNNR-FM	97.1
	WWOM-FM	98.5
	WMMT	95.7
Opelousas	KSLO-FM	107.1
Ruston	KRUS-FM	107.1
Shreveport	KRMD-FM	101.1
	KBCL-FM	96.5
	KWKH-FM	94.5
Thibodaux	KTIB-FM	106.3

MAINE

Augusta	WFAU-FM	101.3
Bangor	WABI-FM	97.1
Brunswick	WBOR	*91.1
	WCME-FM	98.9
Caribou	WFST-FM	97.7
Ellsworth	WDEA-FM	95.7
Lewiston	WCOU-FM	93.9
	WRJR	91.5
Orono	WMEB-FM	91.9
Poland Springs	WMTW-FM	94.9
Portland	WLOB-FM	97.9
	WPOR-FM	101.9
	WGAN-FM	102.9

MARYLAND

Annapolis	WNAV-FM	99.1
	WANN-FM	107.9
	WXTC	107.9
	WAQE-FM	101.9
Baltimore	WBJC	91.5
	WCAO-FM	102.7
	WCBM-FM	106.5
	WFMM-FM	93.1
	WRBS	95.1
	WSID	92.3
	WBAL-FM	97.9
	WITH-FM	104.3
	WSID-FM	92.3
Bethesda	WJMD	94.7
	WHFS	102.3
Bradbury Heights	WPGC	95.5
Catonsville, Md.	WCBC	105.7
Cumberland	WCUM-FM	102.9
Frederick	WFMD-FM	99.9
Frostburg	WFRB-FM	105.3
Glen Burnie	WISZ-FM	95.9
Hagerstown	WJEJ-FM	104.7
	WARK-FM	106.9
Halfway	WHAG-FM	96.7
Havre de Grace	WASA-FM	103.7
Oakland	WBUZ	95.5
Salisbury	WBOC-FM	94.3
Tacoma Park	WGTS-FM	*91.9
Waldorf	WSMD-FM	104.1
Westminster	WTTR-FM	100.7

MASSACHUSETTS

Amherst	WAMF	*88.1
	WFCR	*88.5
	WMUA	*91.1
Andover	WPAA	91.7
Boston	WBUR	*90.9
	WBCN	104.1
	WBZ-FM	106.7
	WCOP-FM	100.7
	WEEI-FM	103.3
	WERS	*88.9
	WHDH-FM	94.5
	WRKO-FM	98.5
	WXHR-FM	96.9
Brockton	WBET-FM	97.7
Brookline	WBOS-FM	92.9
Cambridge	WGBH-FM	*89.7
	WHRB-FM	95.3
	WTBS	88.1
Fitchburg	WBNE-FM	104.5
Framingham	WKOX-FM	105.7
Gloucester	WVCA-FM	104.9
Greenfield	WHAI-FM	98.3
Haverhill	WHAV-FM	92.5
Hyannis	WKOD-FM	106.1
	WBRK-FM	101.7

WHITE'S

RADIO LOG

Location	C.L.	Mc.
Lawrence	WCCM-FM	93.7
Lowell	WLLH-FM	99.5
Lynn	WLYM-FM	101.7
Medford	WHIL-FM	107.9
New Bedford	WBSM-FM	97.3
	WNBH-FM	98.1
N. Adams	WMNB-FM	100.1
N. Attleboro	WRLM	93.3
Northampton	WHMP-FM	99.3
Pittsfield	WQRB-FM	105.5
	WBRK-FM	101.7
Plymouth	WPLM-FM	99.1
S. Hadley	WMHC	*88.5
Springfield	WHYN-FM	93.1
	WSCB	*88.9
	WMAS-FM	94.7
Taunton	WRLM	97.3
Waltham	WCRB-FM	102.5
W. Yarmouth	WOCB-FM	94.9
Williamstown	WCFM	*91.3
Winchester	WHSR-FM	*91.9
Worcester	WAAB	107.3
	WSRS	96.1

MICHIGAN

Adrian	WLEN	103.9
Alma	WFYC-FM	104.9
Alpena	WHSB	107.7
	WATZ-FM	93.5
Battle Creek	WKFR-FM	103.3
Big Rapids	WBRN-FM	100.9
Ann Arbor	WUOM	*91.7
Bay City	WBCM-FM	96.1
	WNEM-FM	102.5
Benton Hrbr.	WHFB-FM	99.9
Birmingham	WHFI	94.7
Charlotte	WCER-FM	92.7
Cheboygan	WCBY-FM	105.1
Coldwater	WTVB-FM	98.3
Dearborn	WKNR-FM	100.3
Detroit	WDET-FM	*101.9
	WBFG	98.7
	WCHD	105.9
	WDTM	106.7
	WABX	99.5
	WDTR	*90.9
	WGPM	107.5
	WJBK-FM	93.1
	WMUZ	103.5
	WGPR	97.9
	WJR-FM	96.3
	WOMC-FM	104.3
	WQRS-FM	105.1
	WRMK-FM	98.7
	WWJ-FM	97.1
	WXYZ-FM	101.1
	WCAR-FM	92.3
E. Lansing	WKAR-FM	*90.5
	WSWM	99.1
	WVIC-FM	95.7
Flint	WFBE	*95.1
	WGMZ-FM	107.9
	WMRP-FM	105.5
Grand Rapids	WFUR-FM	102.9
	WJEF-FM	93.7
	WLAV-FM	96.9
	WYON	101.3
	WOOD-FM	105.7 (s)
	WVGA-FM	104.1
	WXTO-FM	97.9
	WKLW-FM	95.7
Greenville, Mich.		
	WPLB-FM	107.3
Hancock	WMPL-FM	93.5
Highland Pk.	WHPR	*88.1
Holland	WJBL-FM	94.5
	WHTC-FM	96.1
Houghton Lake	WJGS	98.5
Interlochen	WGYA	*103.1
	WIAA	89.7
Jackson	WIBM-FM	94.1
	WKHM-FM	106.1
Kalamazoo	WMUK	102.1
	WSEO-FM	106.5
Lansing	WJIM-FM	97.5
	WILS-FM	*89.7
	WYFE	100.7
Marquette	WNMR	90.1
	WDMJ-FM	95.7
Midland	WQDC-FM	99.7
Mount Clemens	WBRB-FM	102.7
Mount Pleasant	WCMU	*90.1
Muskegon	WFFM	106.9
Oak Park	WLDM	95.5
Owasso	WOAP-FM	103.9
Petoskey	WJML	98.9
	WMBN-FM	96.7
Port Huron	WHLS-FM	107.1
Royal Oak	WOAK	*89.3
	WOMC	104.3
Saginaw	WSAM-FM	98.1
Spring Arbor	WSAE	*89.3
Sturgis	WSTR-FM	103.1
Traverse City	WLDR-FM	101.9
	WTCM-FM	103.5
Warren	WPHS	91.5
Ypsilanti	WEMU	*88.1

MINNESOTA

Anoka	KTWN	107.9
Brainerd	KLIZ-FM	95.9
Golden Valley	KQRS-FM	92.5
Mankato	KMSO	*90.5
	KYSM-FM	103.5
Minneapolis-St. Paul		
	KTIS-FM	98.5
	KWFM	97.1
	KNOF	95.3
	WPBC-FM	101.3
	KSTP-FM	94.5
	WAYL	93.7
	WCTS-FM	100.3
Moorhead	KVOX-FM	99.9
New Ulm	WNUJ-FM	93.1
Red Wing	KCUE-FM	105.5
Richfield	WPBC-FM	101.3
Rochester	KROC-FM	106.9
	KNXR	97.5
St. Cloud	KFAM-FM	104.7
St. Louis Park	KRSI-FM	104.1
Willmar	KWLM-FM	105.5
	KWOA-FM	95.1

MISSISSIPPI

Biloxi	WVMI-FM	106.3
Forest	WQST	92.5
Greenwood	WSWG	99.1
Gulfport	WROA-FM	107.1
Hattiesburg	WHSY-FM	104.5
Jackson	WJDX-FM	102.9
	WSLI-FM	96.3
	WWHO	94.7
Kosciusko	WKOZ-FM	105.1
Laurel	WNSL-FM	100.3
Louisville	WLSM-FM	107.1
Meridian	WMMI	*88.1
Moss Point	WACY-FM	104.9
Natchez	WNAT-FM	95.1
New Albany	WNAU-FM	103.5
Pascagoula	WPMP-FM	99.1
Poplarville	WRPM-FM	107.9
Pontotoc	WSEL-FM	96.7
Tupelo	WELO-FM	98.5
Vicksburg	WQMV	98.7

MISSOURI

Buffalo	KBFL	91.3
Cape Girardeau	KZYM-FM	102.9
Carrollton	KAOL-FM	101.1
Clayton	KFUO-FM	99.1
Columbia	KWWC-FM	90.5
Crestwood	KSHE	94.7
El Dorado Springs		
	KESM-FM	101.7
Houston	KBTC-FM	99.3
Joplin	WMBH-FM	96.1
	KSYN	92.5
Kansas City	KCMO-FM	94.9
	KBEY	104.3
	KTSR	*90.1
	WDAF-FM	102.1
	KCMK	93.3
	KCUR-FM	*89.3
	KMBC-FM	99.7
	KPRS-FM	103.3
	KXTR	96.5
Kennett	KBOA-FM	98.9
Osage Beach	KRMS-FM	93.5
Point Lookout	KSOZ	*88.1
Poplar Bluff	KWOC-FM	94.5
Rolla	KCLU-FM	94.3
	KMSM	*88.5
St. Joseph	KUSN-FM	105.1
St. Louis	KCFM	93.7
St. Louis	KACO	107.7
	KADI	96.5
	WAMV-FM	101.1
	WIL-FM	92.3
	KSLH	*91.5
	KSTL-FM	98.1
	KRFD	106.9
Sedalia	KSIS-FM	92.1
Springfield	KTTS-FM	94.7
	KTXR	101.5
Union	KLPW-FM	101.7
Waynesville	KFBD	97.7
West Plains	KWPM-FM	93.9

MONTANA

Belgrade	KGVW-FM	96.7
Billings	KURL-FM	97.1
Bozeman	KBHF	93.7
Great Falls	KOPR-FM	106.3
Missoula	KUFM	*88.1

NEBRASKA

Beatrice	KWBE-FM	92.9
Columbus	KJSK-FM	101.1
Hastings	KICS-FM	93.5
Kearney-Holdrege		
	KRNY-FM	98.9
Lexington	KRUN-FM	93.1
Lincoln	KFMQ	95.3
	KWHG	102.7
Omaha	KQAL-FM	94.3
	KFAB-FM	99.9
	KGBI-FM	100.7
	KOWH-FM	94.1
	WOW-FM	92.3
	KICN	96.1
Scottsbluff	KNEW-FM	94.1

NEVADA

Las Vegas	KORK-FM	97.1
	KRGN	101.9
	KLUC-FM	98.5
	KVEG-FM	92.3
Reno	KNEV	95.5
	KUNR	88.1

NEW HAMPSHIRE

Berlin	WMOU-FM	103.7
Claremont	WTSV-FM	106.1
Durham	WUNH	*90.3
Exeter	WPEA	*88.1
Laconia	WLNH-FM	98.3
Keene	WKNE-FM	103.7
Manchester	WKBR-FM	95.7
	WGIR-FM	101.1
Mt. Washington	WMTW-FM	94.9
Nashua	WOTW-FM	106.3
Portsmouth	WHEB-FM	100.3

NEW JERSEY

Asbury Park	WJLK-FM	94.3
	WHTG-FM	105.5
Atlantic City	WFPG-FM	96.9
	WMGM	103.7
	WRNJ	95.1
Bridgeton	WSNJ-FM	107.7
Camden	WKDN-FM	106.9
Dover	WDHA-FM	105.5
E. Orange	WFMU	*91.1
Eatontown	WHTG-FM	106.3
Franklin	WLVP	102.3
Franklin Lakes	WRRH	88.7
Glassboro	WGLS-FM	*89.7
Hackettstown	WNTI	*91.9
Hanover	WHPH	*90.3
Long Branch	WRLB	107.1
Millville	WMVB-FM	97.3
Newark	WHBI	105.9
	WFME	94.7
	WVNJ-FM	100.3
	WBGO	*88.3
New Brunswk.	WCTC-FM	98.3
Paterson	WPAT-FM	93.1
Princeton	WPRB	103.3
Red Bank	WFHA-FM	106.3
South Orange	WSOU	*89.5
Trenton	WBUD-FM	101.5
	WTOA	97.5
	WTSR	*89.7
	WTTM-FM	94.5
Wildwood	WCMC-FM	100.7
Zarephath	WAWZ-FM	99.1

NEW MEXICO

Alamogordo	KXXI	94.3
Albuquerque	KANW	*89.1
	KBNM	99.5
	KDEF-FM	94.1
	KRST	92.3
	KHFM	96.3
	KOAT-FM	100.3
	KOB-FM	93.3
Clovis	KTQM-FM	99.9
Hobbs	KHOB-FM	95.7
Los Alamos	KRSN-FM	98.5
Lovington	KLEA-FM	101.7
Mountain Park	KMFM	97.9
Roswell	KBIM-FM	94.9
Santa Fe	KSNM	95.5
Taos	KKIT-FM	99.3
University Park	KRWG	*91.7

NEW YORK

Albany	WAMC	*90.3
	WHRL	103.1
Auburn	WMBO-FM	106.9
Babylon	WTFM	103.5
	WGSM-FM	94.3
	WGU-FM	102.3
Binghamton	WNBF-FM	98.1
	WHRW	90.5
	WKOP-FM	99.1
Brooklyn	WNYE	*91.5
Brookville	WCWP	*88.1
Buffalo	WBEN-FM	102.5
	WDCX	99.5
	WBFO	*88.7
	WBUF	93.3
	WEBR	94.5
	WGR-FM	96.9
	WTSL-FM	103.3
	WWOL-FM	104.1
	WYSL-FM	103.3
	WDIF	96.1
Canton	WSLU	*89.7
Central Square	WCSQ	*89.3
Cherry Valley	WJIV	101.5
Clinton	WHCL-FM	88.7
Corning	WCLI-FM	106.1
Cortland	WKRT-FM	99.9
Denew	WBLK-FM	93.7
DeRuyter	WOIV	105.1
Elmira	WECW	*88.1
	WEHH-FM	94.3
	WENY-FM	92.7
Floral Park	WSHS	*90.3
Garden City	WLIR	92.7
Geneso	WGSU	88.3
Hempstead	WHLI-FM	98.3
	WVHC	*88.7
Hornell	WWHG-FM	105.3
Ithaca	WHCU-FM	97.3
	WICB	*91.7
	WEIV	103.7
	WVBR-FM	93.5
Jamestown	WJTN-FM	93.3
	WKSN-FM	101.7
Johnstown	WIZR-FM	104.9
Kenmore	WYSL-FM	103.3
Kingston	WGHQ-FM	94.3
Lake Success	WTFM	103.5
Liberty	WVOS-FM	95.9
Loudonville	WVCR-FM	89.1
Middletown	WALL-FM	92.7
Mt. Kisco	WRNW	107.1
	WVIP-FM	106.3
New Rochelle	WVOX-FM	93.5
New York	WABC-FM	95.5
	WBAI	99.5
	WCBS-FM	101.1
	WEVD-FM	97.9
	WFUV	*90.7
	WHOM-FM	92.3
	WKCR-FM	*89.9
	WLIB-FM	107.5
	WNCN	104.3
	WNEW-FM	102.7
	WNBC-FM	97.1
	WNYC-FM	93.9
	WNYE	91.5
	WOR-FM	98.7
	WPIX-FM	101.9
	WQXR-FM	96.3
	WREM	105.1
	WRVR	106.7
Niagara Falls	WHLD-FM	98.5
Norwich	WCHN-FM	93.9
Olean	WHDL-FM	95.7
Oswego	WOSE	104.9
Plattsburg	WEAV-FM	99.9
Patchogue	WALK-FM	97.5(s)
	WPAC-FM	106.1
Peekskill	WLNA-FM	100.7
Potsdam	WTSC-FM	91.1
Poughkeepsie	WKIP-FM	104.7
	WEOK-FM	101.5
Riverhead	WAPC-FM	103.9(s)
Rochester	WHFM	98.9
	WBBF-FM	92.5
	WCMF	96.5
	WIRQ	*90.9
	WNYR-FM	101.3
	WROC-FM	97.9
	WRUR-FM	*90.1
	WVOR	100.5
Schenectady	WGFM	99.5
South Bristol	WMIV	95.1
Springville	WSPE	*88.1
Syracuse	WAER	*88.1
	WDDS-FM	93.1
	WONO	107.9
	WSYR-FM	94.5
Troy	WFLY	92.3
	WRPI	*91.5
Utica	WRUN-FM	105.7
Wethersfield	WBIV	105.7
White Plains	WFAS-FM	103.9

NORTH CAROLINA

Albemarle	WABZ-FM	100.9
Asheboro	WGWR-FM	92.3
Asheville	WLOS-FM	104.3
Bridgeton	WVWB-FM	97.7
Burlington	WBBB-FM	101.1
	WFNS-FM	93.9
Black Mountain	WMIT	106.9
Burgaw	WPGF-FM	99.9
Burlington-Graham		
	WBAG-FM	92.9
Chapel Hill	WUNC	*91.5
Charlotte	WBT-FM	107.9
	WIST-FM	95.1
	WSOC-FM	103.7
	WYFM	104.7
Clingman's Pk.	WMIT	106.9
Clinton	WRRZ-FM	107.1
Concord	WEGO-FM	97.9
Durham	WDNC-FM	105.1
	WSRC-FM	107.1
Elkin	WIFM-FM	100.9
Fayetteville	WFNC-FM	98.1
Forest City	WBBO-FM	93.3
	WAGY-FM	105.3
Franklin	WFSC-FM	96.7
Gastonia	WGNC-FM	101.9
Goldsboro	WEQR	96.9

Location	C.L.	Mc.
Greensboro	WMDE	98.7
	WQMG-FM	97.1
	WUAG	*89.9
Greenville	WWWS	*91.3
	WNCT-FM	107.7
Grifton	WITN-FM	93.3
Henderson	WHNC-FM	92.5
	WHKP-FM	102.5
Hendersonville	WHKY-FM	102.9
Hickory	WIRC-FM	95.7
High Point	WHPE-FM	95.5
	WHPS	*89.3
	WMFR-FM	99.5
	WNOS-FM	100.3
Jacksonville	WJNC-FM	92.1
	WXQR-FM	105.5
Kannapolis	WRKB-FM	99.7
Laurinburg	WEWO-FM	96.5
Leaksville	WLOE-FM	94.5
Lexington	WBUY-FM	94.3
Lumberton	WTSB-FM	95.7
	WAGR-FM	102.3
North Wilkesboro		
	WKBC-FM	97.3
Raleigh	WKIX-FM	96.1
	WPTF-FM	94.7
	WRAL-FM	101.5
Reidsville	WWMO-FM	102.1
Rocky Mount	WEED-FM	92.1
	WFMA	100.7
Rochester	WVOR	92.5
Roxboro	WRXO-FM	96.7
Salisbury	WSTP-FM	106.5
Sanford	WWGP-FM	105.5
Shelby	WOHS-FM	96.1
Statesville	WFMX	105.7
Tabor City	WTAB-FM	104.9
Tarboro	WCPS-FM	104.3
Thomasville	WTNC-FM	98.3
Washington	WITN-FM	93.3
Williamston	WIAM	103.7
Wilmington	WPRV	93.9
	WHSL-FM	97.3
Wilson	WVOT-FM	106.1
Winston-Salem	WAIR-FM	93.1
	WYFS	107.5
	WFDD-FM	*88.1
	WSJS-FM	104.1

NORTH DAKOTA

Bismarck	KFYR-FM	92.9
Fargo	KFNW-FM	97.9
	WDAY-FM	93.7
	KDSU	91.9

OHIO

Akron	WAKR-FM	97.5
	WAPS	*89.1
	WCUE-FM	96.5
Alliance	WFAH-FM	101.7
Ashland	WNIC-FM	101.3
Ashtabula	WREO-FM	97.1
Athens	WOUB-FM	*91.5
	WATH-FM	105.5
Barberton	WDBN	94.9
Bellaire	WOMP-FM	100.5
Berea	WBWC	*88.3
Bowling Green	WAWR-FM	93.5
	WBGU	*88.1
Bryan	WBNO-FM	100.9
Bucyrus	WBCO-FM	92.7
Cambridge	WILE-FM	96.7
Canton	WHBC-FM	94.1
	WCNO	106.9
	WTOF	98.1
Celina	WMER-FM	94.3
	WCSM-FM	96.7
Chillicothe	WBEX-FM	93.3
Cincinnati	WAEF-FM	98.5
	WCPO-FM	105.1
	WAKW-FM	93.3
	WGUC	*90.9
	WKRC-FM	101.9
	WJBI	102.7
	WZIP-FM	92.5
Circleville	WNRE	104.9
Cleveland	KYW-FM	105.7
	WBOE	*90.3
	WCRF-FM	103.3
	WCLV	95.5
	WDOK-FM	102.1
	WERE-FM	98.5
	WGAR-FM	99.5
	WHK-FM	100.7
	WJW-FM	104.1
	WNOB	107.9
	WXEN	106.5
	WZAK	93.1
Cleveland Hts.	WCUY-FM	92.3
Columbus	WCBE	*90.5
	WBNS-FM	97.1
	WCOL-FM	92.3
	WMNI-FM	99.7
	WOSU-FM	*89.7
	WTVN-FM	96.3
	WVKO	94.7
Conneault	WFIZ	104.9
Dayton	WHIO-FM	99.1
	WONE-FM	104.7
	WDAO	107.7
Delaware	WSLN	*91.1
East Liverpool	WOHI-FM	104.3
Eaton	WCTM	92.9
Elyria	WEOL-FM	107.3
Fairfield	WCNW-FM	94.9
Findlay	WFIN-FM	100.5
Fostoria	WFOB	96.7
Fremont	WFRO-FM	99.3
Gallipolis	WJEH-FM	101.5
Granville	WDUB-FM	91.3
Greenville	WDRK-FM	106.5
Hamilton	WQMS	96.7
	WHOH	103.5
Hillsboro	WSRW-FM	106.7
Kent	WKSU-FM	*88.1
	WKNT-FM	100.1
Kenton	WKTN-FM	98.3
Kettering	WVUD-FM	99.9
Lancaster	WHOK-FM	95.5
Lima	WIMA-FM	102.1
Logan	WLGN-FM	98.3
London	WLNO	106.3
Mansfield	WVNO	106.1
Marietta	WCMO	*89.3
	WMOA-FM	94.3
Marion	WMRN-FM	106.9
Miamisburg	WFCJ	93.9
Middletown	WPFB-FM	105.9
Mt. Vernon	WMVO-FM	93.7
New Concord	WMCO-FM	*91.9
Newark	WCLT-FM	100.3
Norwalk	WLKR-FM	95.3
Oxford	WMUB	*88.5
	WOXR	97.7
Piqua	WPTW-FM	95.7
Port Clinton	WRWR-FM	94.5
Portsmouth	WPAY-FM	104.1
	WNXT-FM	99.3
Salem	WSOM-FM	105.1
Sandusky	WLEC-FM	102.7
Sidney	WMVR-FM	105.5
Springfield	WBLY-FM	103.9
	WEEC-FM	100.7
	WUSO	*89.1
Steubenville	WSTV-FM	103.5
Struthers	WKTL	90.7
Tiffin	WTTF-FM	103.7
Toledo	WSPD-FM	101.5
	WMHE	92.5
	WTDS	*91.3
	WTOL-FM	104.7
	WTRT	99.9
Urbana	WCOM-FM	101.7
Van Wert	WERT-FM	98.9
Wapakoneta	WERM	92.1
Washington Court House		
	WCHO-FM	105.5
Westerville	WOBN	*91.5
Wilberforce	WJSC-FM	*88.9
Wooster	WWST-FM	104.5
Worthington-Columbus		
	WRFD-FM	97.9
Xenia	WHBM-FM	103.9
Yellow Springs	WYSO	*91.5
Youngstown	WKBN-FM	98.9
	WBBW-FM	93.3
	WRED	101.1
Zanesville	WHIZ-FM	102.5

OKLAHOMA

Bethany	KNBQ	104.9
Chickasha	KNDR	105.5
Durant	KSEO-FM	107.3
Edmond	KWHB	97.7
	KCSC	*88.1
Lawton	KLAW	101.5
McAlester	KNED-FM	101.3
Midwest City	KTEA-FM	92.5
Norman	WNAD-FM	*90.9
Nowata	KNFB	94.3
Oklahoma City	KOKH	*88.9
	KEFM	94.7
	KIOO	100.5
	KJEM-FM	102.7
	KOCY-FM	96.1
	KOFM	104.1
	KYFM	98.9
	KFNB	101.9
Ponca City	KLOR-FM	99.3
Shawnee	KBGC	*89.9
Stillwater	KOSU-FM	*91.7
	KSPI-FM	93.9
Tahlequah	KTLQ-FM	101.7
Tulsa	KWGS	*90.5
	KRMG-FM	95.5
	KOCW	97.5
	KOGM-FM	92.9
	KORU	103.3
	KRAV	96.5

OREGON

Corvallis	KFLY-FM	101.5
	KBVR	*90.1
Eugene	KRVM	*91.9
	KEED-FM	93.1
	KFMY	97.9
	KUGN-FM	99.1
	KWAX	*91.1
	KBMC	94.5
Grants Pass	KGPO	96.9
Medford	KBOY-FM	95.3
Oretech	KTEC	*88.3
Portland	KOAP-FM	92.3
	KGMG	95.5
	KOIN-FM	101.1
	KPDQ-FM	105.3
	KPFM	97.1
	KPOJ-FM	98.5
	KQFM	100.3
	KRRC	*89.3

PENNSYLVANIA

Allentown	WFMZ	100.7
	WAEB-FM	104.1
	WMUH	*89.7
Altoona	WVAM-FM	100.1
	WFBG-FM	98.1
Beaver Falls	WBVP-FM	106.7
	WGEV	*88.3
Bellwood	WHGM	103.9
Bethlehem	WGPA-FM	95.1
Bloomsburg	WHLM-FM	106.5
Boyertown	WBYC-FM	107.5
Braddock	WLOA-FM	96.9
Butler	WBUT-FM	97.7
Carbondale	WODL-FM	94.3
Carlisle	WHYL-FM	102.3
Chambersburg	WCHA-FM	95.1(s)
DuBois	WCED-FM	102.1
Easton	WEST-FM	107.9
	WJRH	*90.5
	WEEX-FM	99.9
Ebensburg	WEND-FM	99.1
Elizabethtown	WMSH-FM	106.7
Erie	WJET-FM	103.7
	WWYN-FM	99.9
Gettysburg	WGET-FM	107.7
Greensburg	WOKU-FM	107.1
Greenville	WGRP-FM	107.1
Grove City	WEDA-FM	
Harrisburg	WHP-FM	97.3
	WMSP	94.9
	WTPA-FM	104.1
	WCMB-FM	99.3
Havertown	WHHS	*89.3
Hazleton	WAZL-FM	97.9
Jenkintown	WIBF-FM	103.9
Johnstown	WARD-FM	92.1
	WJAC-FM	95.5
Lancaster	WGAL-FM	101.3
	WDAC	94.5
	WLAN-FM	96.9
Lebanon	WLBR-FM	100.1
Lewisburg	WVBU-FM	90.5
Lewiston	WMRF-FM	95.9
Lock Haven	WBPZ-FM	92.1
Martinsburg	WJSM	92.7
Meadville	WARC	*90.3
	WMGW-FM	100.3
	WXUR-FM	100.3
Media	WPEL-FM	96.5
Montrose		
New Kensington-Tarentum	WYDD	100.7
Oil City	WDJR	98.5
Palmyre	WRLC	92.1
Philadelphia	WCAU-FM	98.1
	WPBS-FM	105.3
	WDAS-FM	105.3
	WRCP-FM	104.5
	WFIL-FM	102.1
	WDVR	101.1
	WFLN	95.7
	WHAT-FM	96.5
	WUHY-FM	*90.9
	WIFI	92.5
	WIBG-FM	94.1
	WIP-FM	93.3
	WPEN-FM	102.9
	WPWT	*91.7
	WQAL	106.1
	WRTI-FM	*90.1
	WXPN	*88.9
Pittsburgh	KDKA-FM	92.9
	WAMO	105.5
	WEEP-FM	107.9
	WRYT-FM	106.1
	KQV-FM	102.5
	WDUQ	*91.5
	WJAS-FM	99.7
	WKJF	93.7
	WPIT-FM	101.5
	WWSW-FM	94.5
Pottsville	WPPA-FM	101.9
Reading	WRFY-FM	102.5
	WXAC	91.3
Red Lion	WGCB-FM	96.1
Scranton	WGBI-FM	101.3
	WUSV	*88.9
	WWDL-FM	104.9
	WPIC-FM	102.9
Sharon	WVSC-FM	97.7
Somerset	WMAJ-FM	103.1
State College	WDFM	*91.1
	WRSC-FM	96.7
Stroudsburg	WVPO-FM	93.5
Sunbury	WKOK-FM	94.1
Tamaqua	WSVB	105.5
Telford	WBMR	*89.7
Towanda	WTTC-FM	95.3
Tyrone	WGMR-FM	102.3
University Park	WDFM	*91.1
Warren	WRRN	92.3
Washington	WJPA-FM	95.3
Waynesboro	WAYZ-FM	101.5
Wilkes-Barre	WBRE-FM	98.5
	WYZZ	92.9
Williamsport	WLYC-FM	105.1
	WRAK-FM	100.3
York	WNOW-FM	105.7
	WSBA-FM	103.3

RHODE ISLAND

Cranston	WLOV	99.9
Kingston	WRIU	*91.1
Providence	WPJB-FM	105.1
	WBRU	95.5
	WDOM	91.3
	WICE-FM	107.7
	WHIM-FM	94.1
	WPRO-FM	92.3
	WCRQ	101.5
Warwick	WBHS	*90.5
Woonsocket	WWON-FM	106.3

SOUTH CAROLINA

Aiken	WLOW-FM	95.9
	WAKN-FM	99.3
Anderson	WCAC	101.1
Bamberg	WWBD-FM	92.7
Batesburg	WBLR-FM	92.1
Beaufort	WBEU-FM	98.7
Charleston	WCSC-FM	96.9
	WTMA-FM	95.1
	WSBF-FM	*88.1
Clemson	WCOS-FM	97.9
Columbia	WNOK-FM	104.7
	WUSC-FM	*89.9
Conway	WLAT-FM	104.1
Darlington	WDAR-FM	105.5
Dillon	WDSC-FM	92.9
Easley	WELP-FM	103.9
Florence	WJMX-FM	103.1
Greenville	WESC-FM	92.5
	WFBC-FM	93.7
	WMUU-FM	94.5
Greenwood	WCRS-FM	96.7
Kingstree	WDKD-FM	100.1
Lancaster	WLCM-FM	107.1
Laurens-Clinton	WLBG-FM	100.5
Myrtle Beach	WMYB-FM	92.1
N. Charleston	WKTM	102.5
Rock Hill	WRHI-FM	98.3
Seneca	WBFM	98.1
Spartanburg	WSPA-FM	98.9
Sumter	WFIG-FM	101.3

SOUTH DAKOTA

Hot Springs	KDBH-FM	96.7
Sioux Falls	KELO-FM	92.5

TENNESSEE

Bristol	WOPI-FM	96.9
Brownsville	WBHT-FM	95.3
Chattanooga	WDOD-FM	96.5
	WLOM	106.5
	WDEF-FM	92.3
Cleveland	WCLE-FM	100.7
Clinton	WYSH-FM	104.9
Collegedale	WSMC-FM	*88.1
Columbia	WIVY-FM	101.7
Cookeville	WHUB-FM	98.3
	WPTN-FM	94.3
Covington	WKBL-FM	93.5
Dickson	WDKN-FM	102.3
Franklin	WFLT-FM	100.1
Gallatin	WFMG	104.5
Greeneville	WGRV-FM	94.9
Humboldt	WIRJ-FM	102.3
Jackson	WTJS-FM	104.1
Jamestown	WDEB	100.1
Johnson City	WJCW-FM	101.5
Kingsport	WKPT-FM	98.5
Knoxville	WBIR-FM	93.5
	WIVK-FM	107.7
	WKCS	*91.1
	WUOT	*91.9
	WCAS	97.5
Lawrenceburg	WDXE-FM	95.9
Lexington	WDXL-FM	99.3
Livingston	WLIV-FM	95.9
Manchester	WMSR-FM	99.7
McKenzie	WKTA	106.9
McMinnville	WHNR	101.7
Memphis	WMC-FM	99.7
	KLYX	101.1
	WMPS-FM	97.1
	WNTL	102.7
	WREC-FM	104.5
Milan	WKBJ-FM	92.3
Morristown	WMTN-FM	95.9
Murfreesboro	WMTS-FM	96.3
Nashville	WLAC-FM	105.9
	WPLN	*90.3
	WLWM	95.5
	WNFD	103.3
	WSIX-FM	97.9
	WATO-FM	94.3
Oneida	WBNT-FM	105.5
Savannah	WORM-FM	97.7
Sevierville	WSEV-FM	102.1
Sparta	WSMT-FM	105.5
Springfield	WDBL-FM	94.3
Tullahoma	WJIG-FM	93.3

WHITE'S RADIO LOG

Location	C.L.	Mc.
TEXAS		
Abernathy	KWGO-FM	99.5
Abilene	KACC-FM	*91.1
	KFMN	99.3
	KWKC-FM	105.1
Amarillo	KGNC-FM	93.1
	KVII-FM	94.1
Austin	KHFI-FM	98.3
	KAZZ	95.5
	KTBC-FM	98.7
	KUT-FM	*90.7
Beaumont	KHCB-FM	105.7
	KAYD-FM	97.5
	KTRM-FM	95.1
	KJET-FM	107.7
	KLVI-FM	94.1
Big Spring	KFNE	95.3
Brenham	KWHI-FM	106.3
Brownwood	KHPC	88.1
	KFRN-FM	99.3
Bryan	KORA-FM	98.3
Clear Lake City	KMSC	102.1
Cleburne	KCLE-FM	94.9
College Station	WTAW-FM	92.1
Conroe	KNRO	106.9
	KNRO-FM	106.5
Corpus Christi	KZFM	95.5
Dalhart	KXIT-FM	94.3
Dallas	KIXL-FM	104.5
	KEIR	102.9
	KMAP	105.3
	KNER	*88.1
	KNUS	98.7
	KRLD-FM	92.5
	WFAA-FM	97.9
	WRR-FM	101.1
	KVTT	*91.7
	KBOX-FM	100.3
Del Rio	KDLK-FM	94.3
Denton	KDNT-FM	106.1
DiBoll	KSPL-FM	95.5
Dumas	KDDD-FM	95.3
El Paso	KVOF-FM	*88.5
	KTSM-FM	99.9
	KHMS	94.7
Ft. Worth	WBAP-FM	96.3
	KFJZ-FM	97.1
	KJIM-FM	102.1
	KCUL-FM	93.9
	KNOK-FM	107.5
	KTCU-FM	*89.1
Gainesville	KGAF-FM	94.5
Galveston	KGBC-FM	106.5
Harlingen	KELT	94.5
Henderson	KGRI-FM	100.1
Hereford	KPAN-FM	106.3
Highland Park-Dallas		
	KVIL-FM	103.7
Hillsboro	KHBR-FM	102.3
Houston	KHGM	102.9
	KHCB-FM	105.7
	KHUL	95.7
	KFMK	97.9
	KODA-FM	99.1
	KLEF	94.5
	KOST	100.3
	KQUE	102.9
	KRBE	104.1
	KXYZ-FM	96.5
	KTRH-FM	101.1
	KUHF	*91.3
	KBNO	93.7
Hilleen	KLEN-FM	93.3
Humboldt	WIRJ-FM	102.3
Huntsville	KSAM-FM	101.7
Jasper	KTXJ-FM	102.3
Lake Jackson	KLJT	107.3
Lamesa	KPET-FM	100.3
Longview	KLUE-FM	105.7
Lubbock	KSEL-FM	93.7
	KBFM	96.3
	KTXT-FM	*91.9
Marshall	KMHT-FM	97.3
McAllen	KABG-FM	98.5
Midland	KNFM	92.3
	KMOD-FM	93.3
Mt. Pleasant	KIMP-FM	100.7
Muleshoe	KMUL-FM	103.1
Odessa	KQIP	96.7
	KWMO	99.1
	KOCV	91.3
	KOYL-FM	97.9
Paris	KPLT-FM	99.3
Pasadena	KLVL-FM	92.5
Plainview	KHBL	*88.1
Port Arthur	KFMP	93.3
	KPAC-FM	98.5
San Angelo	KWLW	93.9
	KSJT	97.5
San Antonio	KISS	99.5
	KBER-FM	100.3
	KEEZ	97.3
	KAKI-FM	98.1
	KITY	92.9
	KMFM	96.1
Sinton	KTOD-FM	101.3
Spearman	KBMF-FM	98.3
Temple	KYLE-FM	104.9
Texarkana	KTAL-FM	98.1
	KOSY-FM	102.5
Tyler	KZAK-FM	93.1
	KDOK-FM	101.5
Victoria	KTXN-FM	92.1
Waco	KEFC	95.5
	KWBU	*89.9
Wichita Falls	KLUR	99.9
	KNTO	95.1
UTAH		
Ephraim	KEPH	*88.9
Logan	KUSU-FM	*91.5
Ogden	KBOC	101.9
	KWCR-FM	*88.1
Provo	KBYU-FM	*88.9
Salt Lake City	KCPX-FM	98.7
	KLUB-FM	97.1
	KSL-FM	100.3
	KSOP-FM	104.3
	KWHO-FM	93.3
VERMONT		
Burlington	WJOY-FM	98.5
	WRUV	*90.1
VIRGINIA		
Arlington	WAVA-FM	105.1
	WCCV-FM	97.5
Blocksburg	WVVV	104.9
Charlottesville	WINA-FM	95.3
	WTJU	91.3
Covington	WKEY-FM	100.9
Crewe	WSVS-FM	104.7
Farmville	WFLO-FM	95.7
Fredericksburg	WFVA-FM	101.5
Gretna	WMNA-FM	103.3
Grundy	WNRG-FM	97.7
Hampton	WVEC-FM	101.3
	WHOV	*88.3
Harrisonburg	WEMC	*91.7
	WSVA-FM	100.7
Lynchburg	WWOD-FM	100.1
	WDMS-FM	101.7
Manassas	WPRW-FM	106.7
Marion	WMEV-FM	93.9
Martinsville	WMVA-FM	96.3
Newport News	WGH-FM	97.3
Norfolk	WMTI	*91.5
	WCMS-FM	100.5
	WNOR-FM	98.7
	WPHD	104.5
	WRVC	102.5
	WTAR-FM	95.7
	WXRI	105.3
	WYFI-FM	99.7
Portsmouth	WAVY-FM	96.9
Radford	WRAD-FM	101.7
Richmond	WCOD	98.1
	WRFK	91.1
	WRVA-FM	94.5
	WRNL-FM	102.1
Roanoke	WDBJ-FM	94.9
	WLRJ	92.3
	WROV-FM	103.7
	WSLS-FM	99.1
South Boston	WHLF-FM	97.5
South Norfolk	WFOS	*90.5
Staunton	WSGM-FM	93.5
Siffolk	WXYW	92.9
Williamsburg	WCWM	89.1
	WRCI	96.5
Winchester	WRFL	92.5
	WHPL-FM	102.5
Woodbridge	WXRA	105.9
Yorktown	WYCS	91.5
WASHINGTON		
Aberdeen	WDUX-FM	104.7
Bellevue	KFKF-FM	92.5
Bellingham	KGMI-FM	92.9
	KERI	104.3
Bremerton	KBRO-FM	106.9
Centralia	KGME-FM	102.9
Cheney	KEWC-FM	*89.1
College Place	KGTS	91.3
Edmunds	KGFM	105.3
Ellensburg	KCWS-FM	*91.5
Eugene	KBMC	104.5
Hoquiam	KGHO-FM	103.9
Lynden	KLYN-FM	106.5
Opportunity	KZUN-FM	96.1
Prosser	KACA	102.3
Richland	KCYS	95.1
Seattle	KING-FM	98.1
	KBBX	98.9
	KBLE-FM	93.3
	KETO-FM	101.5
	KIRO-FM	100.7
	KISW	99.9
	KLSN	96.5
	KOL-FM	94.1
	KRAB	107.7
	KTW-FM	102.5
	KUOW	94.9
	KIXI-FM	95.7
Spokane	KREM-FM	92.9
	KDNC-FM	93.7
	KTWD	105.7
	KXLY-FM	99.9
	KHQ-FM	98.1
Tacoma	KCPS	90.9
	KLAY-FM	106.1
	KTNT-FM	97.3
	KTOY	*91.7
	KTAC-FM	103.9
Yakima	KNDX-FM	106.3
WEST VIRGINIA		
Beckley	WBKW	99.5
Berkeley Springs	WSCF-FM	93.5
Bethany	WVBC	*88.1
Bluefield	WHIS-FM	104.5
Charleston	WKAZ-FM	97.5
	WCHS-FM	96.1
	WKNA	98.5
	WTIO	105.9
	WVAF	99.9
Huntington	WKEE-FM	100.5
	WMUL	*88.1
	WVQM	103.3
Martinsburg	WEPM-FM	97.5
Morgantown	WAJR-FM	101.9
Norfolk	WCMS-FM	100.5
Oak Hill	WOAY-FM	94.1
Parkersburg	WTAP-FM	103.1
	WCEF-FM	99.3
St. Albans	WKLC-FM	105.1
Wheeling	WKWK-FM	97.3
	WWVA-FM	98.7
	WTRF-FM	107.5
WISCONSIN		
Appleton	WLFM	*91.1
	WAPL-FM	105.7
Beloit	WBCR-FM	*88.1
Chilton	WHKW	*89.3
Colfax	WHWC	*88.3
Delafield	WHAD	*90.7
Eau Claire	WIAL	94.1
	WEAU-FM	100.7
Fort Atkinson	WFAW	107.3
Green Bay	WBAY-FM	101.1
Greenfield Twp.	WWCF	94.9
Highland	WHHI	91.3
Highland Twp.	WHSA	*89.9
Janesville	WCLO-FM	99.9
Kenosha	WLIP	95.1
La Crosse	WHLA	*90.3
	WWLA	93.3
Madison	WHA-FM	*88.7
	WIBA-FM	101.5
	WISM-FM	98.1
	WMFM	104.1(s)
	WRVB-FM	102.5
Manitowoc	WKUB	92.1
Marinette	WHMD	*91.5
Marshfield	WDLB-FM	106.5
Menomonee	WZMF	98.3
Merrill	WLIN	100.7
Milwaukee	WFMR	96.5
	WMIL-FM	95.7
	WISN-FM	97.3
	WRIT-FM	102.9
	WAWA-FM	102.1
	WQFM	93.3
	WTMJ	94.5
	WBON	107.7
	WEMP-FM	99.1
	WUWM	*89.7
Monroe	WEKZ-FM	93.7
Mt. Horeb	WFMK	92.3
Neenah-Menasha		
	WNAM-FM	99.3
Neillsville	WCCN-FM	107.5
Oshkosh	WMKC	96.7
	WRST-FM	*88.1
	WOSH-FM	103.9
Platteville	WSUP	*90.5
	WSWW-FM	99.3
Port Washington		
	WGLB-FM	100.1
Racine	WRJN-FM	100.7
	WFNY	92.1
Rhinelander	WOBT-FM	107.9
Rice Lake	WJMC-FM	96.3
Richland Center	WRCO-FM	100.9
Ripon	WCWC-FM	95.9
Sauk City	WVLR	96.7
Shawano	WTCH-FM	100.1
Sparta	WCOW-FM	97.1
Stevens Point	WSPT-FM	97.9
Sturgeon Bay	WDOR-FM	95.9
Superior	WWJC-FM	105.1
	WSSU	91.3
Tomah	WTMB-FM	98.9
Two Rivers	WTRW-FM	102.3
Watertown	WTTN-FM	104.7
Waukesha	WAUK-FM	106.1
Wausau	WHRM	*91.9
	WRIG-FM	101.9
Wauwatosa	WTOS	103.7
West Bend	WBKV-FM	92.5
Whitewater	WSUW	91.7
Wisc. Rapids	WFHR-FM	103.3
WYOMING		
Cheyenne	KVWO-FM	106.3
GUAM		
Agana	KUAM-FM	93.9
PUERTO RICO		
Arecibo	WCMN-FM	104.3
	WNIK-FM	107.3
Aguadilla	WABA-FM	100.3
Bayamon	WRSJ-FM	100.7
Carolina	WVOZ-FM	107.7
Corozal	WORO	92.5
Fajardo	WMDD-FM	96.5
Guayama	WXRF-FM	96.5
Mayaguez	WKJB-FM	99.1
	WORA-FM	97.5
	WOYE-FM	94.1
Ponce	WLEO-FM	101.9
	WPAB-FM	93.3
San Juan	WIPR-FM	*91.3
	WIAC-FM	102.3
	WITA-FM	107.7
	WOLA	105.7
VIRGIN ISLANDS		
St. Croix, Christiansted	WIVI-FM	99.5
Christiansted, St. Croix	WIVI-FM	99.5

Canadian AM Stations by Location

Location	C.L.	Kc.
Abbotsford, B.C.	CFVR	1240
Altona, Man.	CFAM	1290
Amherst, N.S.	CKDH	900
Amos, Que.	CHAD	1340
Antigonish, N.S.	CJFX	580
Barrie, Ont.	CKBB	950
Bathurst, N.B.	CKBC	1360
Belleville, Ont.	CJBQ	800
Blind River, Ont.	CJNR	730
Brampton, Ont.	CHIC	790
Brandon, Man.	CKX	1150
Brantford, Ont.	CKPC	1380
Bridgewater, N.S.	CKBW	1000
Brockville, Ont.	CFJR	1450
Burns Lake, B.C.	CFLD	1400
Cabano, Que.	CJAF	1240
Calgary, Alta.	CBR	1010
	CFAC	960
	CFCN	1060
	CHQR	810
	CKXL	1140
Callander, Ont.	CFCH	600
Cambell River, B.C.	CFWB	1490
Campbellton, N.B.	CKNB	950
Camrose, Atla.	CFCW	790
Causapscal, Que.	CJBM	1450
Charlottetown, P.E.I.	CFCY	630
Chatham, Ont.	CFCO	630

Location	C.L.	Kc.
Chicoutimi, Que.	CBJ	1580
	CJMT	1420
Chilliwack, B.C.	CHWK	1270
Churchill, Man.	CHFC	1230
Cobourg, Ont.	CHUC	1450
Collingwood, Ont.	CKCB	1400
Corner Brook, Nfld.	CBY	990
	CFCB	570
Cornwall, Ont.	CFML	1110
	CJSS	1220
Courtenay, B.C.	CFCP	1440
Cranbrook, B.C.	CKEK	570
Dartmouth, N.S.	CFDR	790
Dauphin, Man.	CKDM	730
Dawson Creek, B.C.	CJDC	1350
Drumheller, Alta.	CJDV	910
Drummondville, Que.	CHRD	1340
Dryden, Ont.	CKDR	900
Duncan, B.C.	CKAY	1500
Edmonton, Alta.	CBX	740
	CFRN	1260
	CHED	630
	CHFA	680
	CHQT	1110
	CJCA	930
	CKUA	580
Edmundston, N.B.	CJEM	570
Estevan, Sask.	CJSL	1280
Flin Flon, Man.	CFAR	590
Fort Frances, Ont.	CFOB	800
Fort Simpson, N.W.T.	CFMR	1490
Fort St. John, B.C.	CKNL	560
Fort William, Ont.	CJLX	800
Fredericton, N.B.	CBZ	970
	CFNB	550
Galt, Ont.	CFTJ	1110
Gander, Nfld.	CBG	1450
Goose Bay, Nfld.	CFGB	1340
Granby, Que.	CHEF	1450
Grande Prairie, Alta.	CFGP	1050
Grand Bank, Nfld.	CJOX	710
Grand Falls, Nfld.	CBT	540
	CKCM	620
	CJCN	680
Gravelbourg, Sask.	CFRG	710
	CFGR	1230
Guelph, Ont.	CJOY	1460
Halifax, N.S.	CBH	860
	CHNS	960
	CJCH	920
Hamilton, Ont.	CHML	900
	CKOC	1150
	CHIQ	1280
Hauterive, Que.	CHLC	580
Huntsville, Ont.	CKAR	630
Hull, Que.	CKCH	970
Inuvik, N.W.T.	CHAK	860
Joliette, Que.	CJLM	1350
Jonquiere, Que.	CKRS	590
Kamloops, B.C.	CFJC	910
Kapuskasing, Ont.	CKAP	580
Kelowna, B.C.	CKOV	630
Kenora, Ont	CJRL	1220
Kentville, N.S.	CKEN	1350
Kingston, Ont.	CFRC	1490
	CKLC	1380
	CKWS	960
Kirkland Lake, Ont.	CJKL	560
Kitchener, Ont.	CHYM	1490
	CKKW	1320
Kitimat, B.C.	CKTK	1230
Langley, B.C.	CJJC	850
La Sarre, Que.	CKLS	1240
La Tuque, Que.	CFLM	1240
Leamington, Ont.	CJSP	710
Lethbridge, Atla.	CHEC	1090
	CJOC	1220
Lindsay, Ont.	CKLY	910
Lloydminster, Atla.	CKSA	1080
London, Ont.	CFPL	980
	CKSL	1410
Marystown, Nfld.	CHCM	560
Matane, Que.	CKBL	1250
Medicine Hat, Alta.	CHAT	1270
Middleton, N.S.	CKAD	1490
Midland, Ont.	CKMP	1230
Moncton, N.B.	CBAF	1300
	CKCW	1220
Mont Laurier, Que.	CKML	610
Montmagny, Que.	CKBM	1490
Montreal, Que.	CBF	690
	CBM	940
	CFCF	600
	CFMB	1410
	CJAD	800
	CJMS	1280
	CKAC	730
	CKLM	1570
	CKGM	980
Moose Jaw, Sask.	CHAB	800
Nanaimo, B.C.	CHUB	1570
Nelson, B.C.	CKLN	1390
New Carlisle, Que.	CHNC	610
Newcastle, N.B.	CKMR	790
New Glasgow, N.S.	CKEC	1320
New Westminster, B.C.	CKNW	980
Niagara Falls, Ont.	CJRN	1600
North Battleford, Sask.	CJNB	1050
North Vancouver, B.C.	CKLG	730
Oakville, Ont.	CHWO	1250
Orillia, Ont.	CFOR	1570
Oshawa, Ont.	CKLB	1350
Ottawa, Ont.	CBO	910
	CBOF	1250
	CFRA	580
	CKOY	1310
	CKPM	1440
Owen Sound, Ont.	CFOS	560
Parry Sound, Ont.	CKAR-1	1340
Peace River, Alta.	CKYL	610
Pembroke, Ont.	CHOV	1350
Penticton, B.C.	CKOK	800
Peterborough, Ont.	CHEX	980
	CKPT	1420
Pointe Claire, Que.	CFOX	1470
Portage La Prairie, Man.	CFRY	920
Port Alberni, B.C.	CJAV	1240
Port Arthur, Ont.	CFPA	1230
	CKPR	580
Prince Albert, Sask.	CKBI	900
Prince George, B.C.	CKPG	550
Prince Rupert, B.C.	CFPR	860
	CHTK	560
Quebec, Que.	CBV	980
	CFOM	1340
	CHRC	800
	CJLR	1060
	CKCV	1280
Quesnel, B.C.	CKCQ	570
Red Deer, Alta.	CKRD	850
Regina, Sask.	CBK	540
	CJME	1300
	CKCK	620
	CKRM	980
Revelstoke, B.C.	CKCR	1340
Richmond Hill, Ont.	CFGM	1310
Rimouski, Que.	CJBR	900
Rivière du Loup, Que.	CJFP	1400
Roberval, Que.	CHRL	910
Rouyn, Que.	CKRN	1400
Ste. Anne de la Pocatiere, Que.	CHGB	1310
St. Boniface, Man.	CKSB	1050
St. Catharines, Ont.	CKTB	610
St. Hyacinthe, Que.	CKBS	1240
St. Jean, Que.	CHRS	1090
St. Jerome, Que.	CKJL	900
Saint John, N.B.	CBD	1110
St. John's Nfld.	CBN	640
	CJON	930
	VOAR	1230
	VOCM	590
	VOWR	800
St. Joseph d'Alma, Que.	CFGT	1270
St. Thomas, Ont.	CHLO	680
Sackville, N.B.	CBA	1070
Saint John, N.B.	CFBC	930
	CHSJ	1150
Salmon Arm, B.C.	CKXR	580
Sarnia, Ont.	CHOK	1070
Saskatoon, Sask.	CFNS	1170
	CFQC	600
	CKOM	1250
Sault Ste. Marie, Ont.	CJIC	1050
	CKCY	920
Schefferville, Que.	CBDR	1230
Sept-Iles, Que.	CKCN	560
Shawinigan, Que.	CKSM	1220
Sherbrooke, Que.	CHLT	630
	CKTS	900
Simcoe, Ont.	CFRS	1560
Smiths Falls, Ont.	CJET	630
Smithers, B.C.	CFBV	1230
Sorel, Que.	CJSO	1320
Stratford, Ont.	CJCS	1240
Steinbach, Man.	CHSM	1250
Stephenville, Nfld,	CFSX	910
Sudbury, Ont.	CFBR	550
	CHNO	900
	CKSO	790
Summerside, P.E.I.	CJRW	1240
Swift Current, Sask.	CKSW	1400
Sydney, N.S.	CBI	1140
	CHER	950
	CJCB	1270
Terrace, B.C.	CFTK	590
Thetford Mines, Que.	CKLD	1230
Thompson, Man.	CHTM	610
Trois-Rivières, Que.	CHLN	550
	CKTR	1150
Tillsonburg, Ont.	CKOT	1510
Timmins, Ont.	CFCL	620
	CKGB	680
Toronto, Ont.	CBL	740
	CFRB	1010
	CHFI	1540
	CHUM	1050
	CJBC	860
	CKEY	590
	CKFH	1430
Trail, B.C.	CJAT	610
Truro, N.S.	CKCL	600
Val d'Or, Que.	CKVD	1230
Valleyfield, Que.	CFLV	1370
Vancouver, B.C.	CBU	690
	CFUN	1410
	CHQM	1320
	CJOR	600
	CKLG	730
	CKWX	1130
Verdun, Que.	CKVL	850
Vernon, B.C.	CJIB	940
Victoria, B.C.	CFAX	1070
	CJVI	900
	CKDA	1220
Victoriaville, Que.	CFDA	1380
Ville Marie, Que.	CKVM	710
Ville St. Georges, Que.	CKRB	1460
Wawa, Ont.	CJWA	1240
Welland, Ont.	CHOW	1470
Weyburn, Sask.	CFSL	1340
Whitehorse, Y.T.	CFWH	570
Williams Lake, B.C.	CKWL	1240
Windsor, N.S.	CFAB	1450
Windsor, Ont.	CBE	1550
	CKLW	800
	CKWW	580
Wingham, Ont.	CKNX	920
Winnipeg, Man.	CBW	990
	CJOB	680
	CJQM	1470
	CKRC	630
	CKY	580
Woodstock, N.B.	CJCJ	920
Woodstock, Ont.	CKOX	1340
Yarmouth, N.S.	CJLS	1340
Yellowknife, N.W.T.	CFYK	1340
Yorkton, Sask.	CJGX	940

Canadian FM Stations by Location

Location	C.L.	Mc.
Belleville, Ont.	CJBQ-FM	97.1
Brampton, Ont.	CHIC-FM	102.1
Brandon, Man.	CKX-FM	96.1
Calgary, Alta.	CHFM-FM	95.9
Clearwater, B.C.	CFFM-FM-2	92.7
Cornwall, Ont.	CJSS-FM	104.5
Edmonton, Alta.	CFRN-FM	100.3
	CJCA-FM	99.5
	CKUA-FM	98.1
Halifax, N.S.	CHNS-FM	96.1
Hamilton, Ont.	CHML-FM	95.3
Kamloops, B.C.	CFFM-FM	98.3
Kelowna, B.C.	CJOV-FM	104.7
Kentville, N.S.	CKWM-FM	97.7
Kingston, Ont.	CFRC-FM	91.9
	CKLC-FM	98.3
	CKWS-FM	96.3
Kitchener, Ont.	CHYM-FM	96.7
Lethbridge, Alta.	CHEC-FM	100.9
London, Ont.	CFPL-FM	95.9
Merritt, B.C.	CFFM-FM-3	103.9
Montreal, Que.	CBF-FM	95.1
	CBM-FM	100.7
	CFCF-FM	92.5
	CJFM-FM	95.9
	CJMS-FM	94.3
	CKGM-FM	97.7
Oshawa, Ont.	CKLB-FM	93.5
Ottawa, Ont.	CBO-FM	103.3
	CFMO-FM	93.9
Penticton, B.C.	CKOK-FM	97.1
Port Arthur, Ont.	CKPR-FM	94.3
Quebec, Que.	CHRC-FM	98.1
Red Deer, Alta.	CKRD-FM	98.9
Regina, Sask.	CFMQ-FM	92.1
Rimouski, Que.	CJBR-FM	101.5
Saint John, N.B.	CFBC-FM	98.9
Saskatoon, Sask.	CFMC-FM	103.9
	CJUS-FM	89.7
Sault Ste. Marie, Ont.	CJIC-FM	100.5
	CKCY-FM	104.3
Savona, B.C.	CFFM-FM-1	101.9
Sherbrooke, Que.	CHLT-FM	102.7
St. Catharines, Ont.	CKTB-FM	97.7
Sudbury, Ont.	CKSO-FM	92.7
Sydney, N.S.	CJCB-FM	94.9
Tillsonburg, Ont.	CKOT-FM	100.5
Timmins, Ont.	CKGB-FM	94.5
Toronto, Ont.	CBC-FM	99.1
	CHFI-FM	98.1
	CHUM-FM	104.5
	CJRT-FM	91.1
	CKFM-FM	99.9
Truro, N.S.	CKCL-FM	100.9
Vancouver, B.C.	CBU-FM	105.7
	CHQM-FM	103.5
	CKGL-FM	99.3
Verdun, Que.	CKVL-FM	96.9
Victoria, B.C.	CFMS-FM	98.5
Windsor, Ont.	CKLW-FM	93.9
Winnipeg, Man.	CJOB-FM	97.5
	CBW-FM	98.3
	CKQM-FM	94.3
	CKY-FM	92.1

World-Wide Shortwave Stations

■ Although this is officially the shortwave section of White's Radio Log, we can't help but sneak a peek at the DX on the standard broadcasting band from time to time. It doesn't take very much equipment to pull 'em in, you can even inhale some excellent DX on nothing more than a 5-tube AC/DC set. Trick is to forget the internal loop antennas on these sets and string up a 100 foot wire for an antenna. It can be connected to

WHITE'S RADIO LOG

the loop antenna by simply wrapping it around the loop several times, without making an electrical connection. *Disconnect the set when doing this anyway—just for safety's sake.*

Our DX'ing is done on a slightly fancier receiver however, and some of the better stations just dropped right into the set. If you want to take a whack at BCB-DX you can whet your appetite with stations such as *Trans World Radio* in Bonaire, Netherlands Antillies (yup, some folks that operate on shortwaves). They pack a walloping signal when they test irregularly on 800 kHz, they run more than a half-a-million watts!

Radio Antilles, on the island of Montserrat in the Caribbean, has also been heard testing once in a while (according to one of our reporters) with 200,000 watts on 926 kHz.

Radio Americas, still and *always* on Swan Island (regardless of what you may read elsewhere) pounds in like a local on 1157 kHz most evenings. *Voice of America* stations bombarding Fidel from the Florida Keys can also be heard well (in Spanish) most PM's on 1040 kHz (Tortougas Key with 50 kw) and 1180 (Marathon Key with 50 kw).

Best bets also include the following winners: WOAI in San Antonio, Tex. on 1200 kHz; WWVA in Wheeling, W. Va., on 1170 kHz; WSM in Nashville, Tenn., on 650 kHz; WLW in Cincinnati, Ohio, on 700 kHz; WCCO in Minneapolis, Minn., on 830 kHz, and WCBS in New York, N. Y., on 880 kHz. If you can't hear at least four of these stations tonight, then forget about DX'ing and take up basketweaving or stamp collecting. *(Editor: What's wrong with stamp collecting?)* Let us know how you did.

We invite our readers to send in their loggings for inclusion in these listings. Be sure to include the following information for each station reported: approximate frequency, callsign and/or station name, and time monitored in Greenwich Mean Time (24 hour clock). Address your reports to: DX Central, White's Radio Log, RAD IO-TV EXPERIMENTER, 505 Park Avenue, New York, N. Y. 10022, U.S.A.

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Larry Nelson, Chicago, Ill.
Rickey Vezzani, E. Northport, N. Y.
Jerry Stuart, Lawton, Okla.
Walter O'Brien, Jr., Clark, N. Y.
Mary K. McNabb, Springdale, Ark.
Julian M. Sienkiewicz, Brooklyn, N. Y.
Leonard Kosko, Cleveland, Ohio
Dave Mateyka, Steger, Ill.
Carl Durnavich, Riverdale, Ill.
Harry McDonald, Clay City, Ill.
John M. Demchak, W. Mifflin, Pa.
Thomas Facer, Ithaca, N. Y.
Kerry Matthews, Miami Beach, Fla.
Tom Kneitel, K2AES, New York, N. Y.
Robert Orestes, Santa Ana, Calif.
Rick Slattery, Key West, Fla.
Skip Bradford, Commack, N. Y.
"Mandy" Seidenberg, Forest Hills, N. Y.

The following abbreviations are used: BC-Broadcasting Company, Corporation or System; E- Emissora; R- Radio; V- Voice or Voz.

90-Meter Band—3200 to 3400 kHz

kHz	Call	Name	Location	GMT
2420	—	R. Sao Carlos	Sao Carlos, Brazil	0330
2495	HCVA4	E. la Alegria	Esmeraldas, Ecuador	0330
3200	—	R. San Pedro	S. Pedro Macoris, Dom. Rep.	0330
3232	—	R. Brazzaville	Brazzaville, Congo	0500
3265	—	R. Demerara	Georgetown, Guiana	0200
3277	—	R. Kashmir	Srinagar, Kashmir	1530
3280	—	R. Ghana	Accra, Ghana	2135
3315	—	ORTF	Ft. de France, Martinique	0100
3318	ZYV63	R. Itatiala	Belo Horizonte, Brazil	0230
3331	—	ORTF	Dzaoudzi, Comores Isl.	1700
3345	HIAS	Onda Musical	Sto. Domingo	0445
3355	—	R. Brasileira	Uberlandia	0205
3385	VL9BR	R. Rabaul	Rabaul, Papua	1050
	—	ORTF	Cayenne, Fr. Guiana	0918
3435	—	R. Ondas Huallaga	Huanuco, Peru	0400
3925	VLK3	Australian BC	Port Moresby, Papua	0730
3985	—	E. R. Populares	Riobamba, Ecuador	0100
4580	—	R. Nepal	Kathmandu, Nepal	0740
4708	—	V. de Carera	Pasto, Colombia	0200

60-Meter Band—4750 to 5060 kHz

kHz	Call	Name	Location	GMT
4780	YVLA	V. de Carabobo	Valencia, Venez.	2330
4790	YVQN	Ondas Portenas	La Cruz, Venezuela	0120
4795	CP73	N. Neuva America	La Paz, Bolivia	0005
	—	R. Brazzaville	Brazzaville, Congo	0500
4840	—	R. Sao Carlos	Sao Carlos, Brazil	0330

kHz	Call	Name	Location	GMT
4845	—	BBC Relay	Francistown, Bechuanaland	0400
4855	—	E. Nigerian BC	Enugu, Nigeria	2230
4870	OCX4T	R. Cultural	Huancayo, Peru	0230
4885	HJIW	V. del Centro	Espinal, Colombia	1100
4890	VLK4	Australian BC	Port Moresby, Papua	0730
	—	Senegalese BC	Dakar, Senegal	0700
4895	—	S. African BC	Paradys, S. Africa	0430
4912	VTW2	R. Tarawa	Tarawa, Gilbert Is.	0655
4914	HRSY	V. del Pacifico	San Lorenzo, Honduras	0230
4935	OAX9E	R. Tropical	Tarapoto, Peru	0340
4965	—	R. Zambia	Lusaka, Zambia	0355
4972	—	R. Yaounde	Yaounde, Cameroon	2200
5045	ZYP23	R. Imperial	Petropolis, Brazil	0010
5055	—	R. Singapore	Singapore	1400
5065	—	R. Liberdad	(clandestine)	0015
5910	—	Govorit Ashkabad	Ashkabad, USSR	1723
5930	—	R. Prague	Prague, Czech.	0125

49-Meter Band—5950 to 6200 kHz

5950	—	R. Warsaw	Warsaw, Poland	2030
5955	CP41	R. Loyola	Sucre, Bolivia	0030
5960	CP5	R. Pio XII	Siglo Viente, Bolivia	0200
	HRHR	V. Occidente	S. Rosa Copan, Honduras	0150
5970	—	R. Alger	Algiers, Algeria	0700
	OBX4Q	R. El Sol	Lima, Peru	0430
5970	—	R. Brazzaville	Brazzaville, Congo	0500
5974	4VB	V. Revol. Duvalieriste	Port au Prince, Haiti	1400
5985	—	E. Nacional	Lisbon, Portugal	0300
5990	—	R. Canada	Montreal, P.Q.	0730
	—	RAI	Rome, Italy	1655
5994	ORTF	ORTF	Ft. de France, Martinique	1300
5995	—	R. Warsaw	Warsaw, Poland	1930
	—	V. America Relay	Tangier, Morocco	2230
6000	—	Austrian R.	Vienna, Austria	0430
6005	CFCX	Canadian Marconi	Montreal, P.Q.	0930
6010	YSS	R. Nacional	San Salvador, El Salvador	1135
6015	—	(relaying DZBC)	Manila, Philippines	1400
6020	—	R. Kiev	Kiev, USSR	1900
6025	HCJB	V. Andes	Quito, Ecuador	0530
6030	—	V. America	Greenville, N.C.	0045
	CFVP	V. Praries	Calgary, Alta.	0330
6065	XEXG	R. Mexico	Mexico DF, Mexico	0415
6080	—	Swiss BC	Berne, Switz.	0130
6085	—	Swiss BC	Berne, Switz.	0115
6095	—	R. Mogadiscio	Mogadiscio, Somalia	0329
6110	—	R. Ghana	Accra, Ghana	0330
6115	—	R. Leon	Lima, Peru	0530
6120	—	Swiss BC	Berne, Switz.	0115
6125	ORU	V. de l'Amitie	Brussels, Belg.	2240
6135	—	R. Havana	Havana, Cuba	2230
	—	R. Warsaw	Warsaw, Poland	1830
6140	—	R. Nacional	Madrid, Spain	1315
6150	—	Australian BC	Melbourne, Australia	2100
	—	S. African BC	Paradys, S. Africa	0356
6155	—	Austrian R.	Vienna, Austria	0500
6160	HSK4	R. Bangkok	Bangkok, Thailand	0415
6163	—	V. du Nord	Port au Prince, Haiti	1400
6175	—	R. Alger	Algiers, Algeria	2200
6195	GSF	BBC	London, England	1830
6290	—	R. Tirana	Tirana, Albania	2200
6620	—	R. Peking	Peking, China	2030
6645	—	R. Peking	Peking, China	2030
6825	—	R. Peking	Peking, China	1800
6890	—	R. Peking	Peking, China	2000
7006	—	R. Peking	Peking, China	1800
7075	—	R. Peking	Peking, China	1800
7090	—	R. Tirana	Tirana, Albania	2200
7100	—	R. Pakistan	Karachi, Pakistan	1945
7105	—	R. Nacional	Madrid, Spain	1315
	—	R. Brazzaville	Brazzaville, Congo	1100
	—	R. Nepal	Kathmandu, Nepal	0740
7115	—	R. Prague	Prague, Czech.	0100
7125	—	R. Warsaw	Warsaw, Poland	1830
7130	—	E. Nacional	Lisbon, Portugal	0800
7145	—	R. Warsaw	Warsaw, Poland	2030
7150	—	R. Moscow	Moscow, USSR	0000
7185	—	R. Vilnius	Vilnius, USSR	2230
7185	HSK7	R. Bangkok	Bangkok, Thailand	0415
7185	GSF	BBC	London, England	0500
7195	—	V. America Relay	Monrovia, Liberia	0330
7200	—	R. Moscow	Moscow, USSR	0000
7210	—	Senegalese BC	Dakar, Senegal	0700
7245	—	Austrian R.	Vienna, Austria	0600
7250	—	R. Moscow	Moscow, USSR	0000
	—	V. America Relay	Tangier, Morocco	2230
7265	—	R. Tirana	Tirana, Albania	2200
7270	—	R. Warsaw	Warsaw, Poland	2230
	—	S. African BC	Paradys, S. Africa	0356
7290	—	R. Moscow	Moscow, USSR	0000
7295	—	BBC Relay	Francistown, Bechuanaland	0915
7310	—	R. Moscow	Moscow, USSR	0000
7330	—	R. Moscow	Moscow, USSR	0000
7344	—	R. Prague	Prague, Czech.	0145
7360	—	R. Moscow	Moscow, USSR	0000
	—	R. Vilnius	Vilnius, USSR	2230
7570	—	R. Espana Independ	(clandestine)	2000
7655	—	V. America	Greenville, N.C.	2230
9009	4XB31	Kol Zion	Jerusalem, Israel	2040
9370	—	R. Nacional	Madrid, Spain	0730
9390	—	R. Tirana	Tirana, Albania	2200
9520	—	R. Alma Ata	Alma Ata, USSR	0340
9380	—	R. Alma Ata	Alma Ata, USSR	0340
9400	—	R. Peking	Peking, China	2200
9457	—	R. Peking	Peking, China	1800

31-Meter Band—9500 to 9775 kHz

9510	GSF	BBC	London, England	2200
9512	—	R. Alger	Algiers, Algeria	1600
9520	VLT9	Australian BC	Port Moresby, Australia	0730
	—	R. Tirana	Tirana, Albania	2200
	OZF5	V. Denmark	Copenhagen, Denmark	0200
9525	—	Austrian R.	Vienna, Austria	0000
	—	S. African BC	Paradys, S. Africa	0516
	PCJ	R. Nederland	Hilversum, Neth.	0730
9535	—	Swiss BC	Berne, Switz.	0115
9550	—	R. Habana	Havana, Cuba	2230
9555	—	BBC Relay	Monrovia, Liberia	0645
	YSS	R. Nacional	San Salvador, El Salvador	1135
	CP6	R. Illimani	La Paz, Bolivia	1100
9560	—	R. Australia	Melbourne, Australia	0645
9570	—	R. Nacional	Madrid, Spain	1315
9580	GSF	BBC	London, England	2200
9590	—	R. Nederland	Bonaire, Neth. Antilles	0150
9595	—	Swiss BC	Berne, Switz.	1745
9610	—	Austrian Radio	Vienna, Austria	1100
	—	R. Mauretanie	Nouakchott, Mauretania	1245
9625	—	R. Canada	Montreal, P.Q.	0730
9640	—	V. America	Greenville, N.C.	0045
	—	Utvarp Reykjavik	Reykjavik, Iceland	2030
	—	R. Kiev	Kiev, USSR	1900
9645	—	E. Nacional	Lisbon, Portugal	0800
	HCJB	V. Andes	Quito, Ecuador	0600
	—	Vatican R.	Vatican City	2000
9650	—	R. Canada	Montreal, P.Q.	2300
	—	V. America	Greenville, N.C.	0045
	—	R. Habana	Havana, Cuba	2230
9655	—	R. Habana	Havana, Cuba	0930
9660	—	R. Nacional	Canary Islands	1730
9670	—	V. America Relay	Tangiers, Morocco	1800
9675	—	Vatican R.	Vatican City	2220
	ZYT29	R. Diario Manha	Florianopolis, Braz.	1100
	—	V. Free China	Taipei, Formosa	1530
	—	R. Warsaw	Warsaw, Poland	0700
9680	—	Australian BC	Melbourne, Australia	2245
9700	—	R. Pakistan	Karachi, Pakistan	1945
	—	R. Japan	Tokyo, Japan	1930
9710	—	R. Tropical	Tarapoto, Peru	1300
9715	PCJ	R. Nederland	Hilversum, Netherlands	0730
9725	4XB51	Kol Zion	Jerusalem, Israel	2040
9730	—	R. Brazzaville	Brazzaville, Congo	0500
	—	R. Berlin Internat.	Berlin, E. Germany	0100
9750	OAX8W	R. Sideral	Pucallpa, Peru	1215
9755	—	VTVN	Saigon, S. Vietnam	1200
9760	—	V. Vietnam	Hanoi, N. Vietnam	1530
9770	—	Austrian R.	Vienna, Austria	2300
	OAX80	R. Amazonas	Iquitos, Peru	1100
9830	—	V. Vietnam	Hanoi, N. Vietnam	1530
9860	—	R. Peking	Peking, China	2000
9874	YDF6	V. Indonesia	Djakarta, Indonesia	1700

(Continued on page 122)

Literature Library

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

ELECTRONIC PARTS

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

★**2.** The new 510-page 1966 edition of *Lafayette Radio's* multi-colored catalog is a perfect buyer's guide for hi-fi'ers, experimenters, kit builders, CB'ers and hams. Get your free copy, today!

★**3.** Bargains galore! Parts, tools, test equipment, radios and many more shoppers' specials at ultra-low prices. *Progressive Edu-Kits* will send latest catalog.

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

106. With 70 million TV's and 240 million radios somebody somewhere will need a vacuum tube replacement at the rate of one a second! Get *Universal Tube Co.'s* Troubleshooting Chart and facts on their $1 flat rate per tube.

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

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

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

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

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

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

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

CB—BUSINESS RADIO SHORT-WAVE 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.

48. *Hy-Gain's* new CB antenna catalog is packed full of useful information and product data that every CB'er should know about. 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. Get complete specifications plus facts on other accessories.

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

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

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.

90. If two-way radio is your meat, send for *Pearce-Simpson's* new booklet! Its 18 pages cover equipment selection, license application, principles of two-way communications, reception, and installation.

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."

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.

102. *Sentry Mfg. Co.* has some interestng 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

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.

★**26.** Always a leader, *H. H. Scott* introduces a new concept in stereo console catalogs. "At Home With Stereo" the 1966 guide, offers decorating ideas, a complete explanation of the more technical aspects of stereo consoles, and, of course, the complete new line of *Scott* consoles.

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

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

17. 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. Just circle #19.

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

24. 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.

TAPE RECORDERS AND TAPE

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

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

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

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 hear 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.

★44. *EICO's* new 48-page 2-color pocket-size short form catalog is just off the press. Over 250 products: Ham radio, CB, hi-fi—in kit and wired form—are illustrated. Get your copy today.

AMATEUR RADIO

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

SCHOOLS AND EDUCATIONAL

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

74. How to get an F.C.C. license, plus a description of the complete electronic courses offered by *Cleveland Institute of Electronics* are in their free catalog.

105. Get the low-down on the latest in educational electronic kits from *Trans-Tek*. Build light dimmers, amplifiers, metronomes, and many more. *Trans-Tek* helps you to learn while building.

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

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

94. *Intercontinental Electronics School* offers three great courses: stereo radio & electronics; basic electricity; transistors. They are all described in *Inesco's* 1966, 16-page booklet.

TOOLS

★78. Do more jobs with fewer tools. *Xcelite's* bulletin N563 describes 3 double-duty sets containing midget nut and screwdrivers plus a special "piggy-hack" handle that packs power and reach.

TELEVISION

★70. *Heath Co.* now has a 21" round and 25" rectangular-tube color TV kit in addition to their highly successful 23" B&W model. All sets can be installed in a wall or cabinet: all are money-saving musts!

★72. Get your 1966 catalog of *Cisin's* TV, radio, and hi-fi service books. Bonus—TV tube substitution guide and trouble-chaser chart is yours for the asking.

29. Install your own TV or FM antenna! *Jefferson-King's* exclusive free booklet reveals secrets of installation, orientation; how to get TV-FM transmission data.

97. Interesting, helpful brochures describing the TV antenna discovery of the decade—the log periodic antenna for UHF and UHF-TV, and FM stereo. From *JFD Electronics Corporation*.

RADIO-TV EXPERIMENTER, Dept. LL-809
505 Park Avenue, New York, N. Y. 10022

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72	74	76	78	90	91	92	93	94	95	96	97	98
99	100	101	102	103	104	105	106	107	108	109	110	

NAME (Print clearly)_____

ADDRESS_____

CITY_____ STATE_____ ZIP CODE_____

World-Wide SW Stations

Continued from page 119

kHz	Call	Name	Location	GMT
10530	—	R. Alma Ata	Alma Ata, USSR	0340
11240	—	R. Euzkadi	(clandestine)	2130
11660	—	R. Peking	Peking, China	1530

25-Meter Band—11700 to 11975 kHz

11710	—	R. Brazzaville	Brazzaville, Congo	1100
	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0330
	—	R. Australia	Melbourne, Australia	0634
	—	R. Vilnius	Vilnius, USSR	2230
11720	—	R. Canada	Montreal, P.Q.	2145
	KGEI	V. Friendship	San Francisco, Calif.	0335
11725	—	R. Brazzaville	Brazzaville, Congo	0500
11730	PCJ	R. Nederland	Hilversum, Netherlands	0730
11737	—	T-TV Marocaine	Rabat, Morocco	2030
11740	—	Vatican R.	Vatican City	1640
	VUD	All India R.	Delhi, India	1800
11750	GSF	BBC	London, England	2200
11760	—	V. Vietnam	Hanoi, N. Vietnam	1300
11785	—	Austrian R.	Vienna, Austria	1100
	—	R. Berlin Int'l.	Berlin, E. Germany	0345
	DMQ11	Deutsche Welle	Cologne, W. Germany	0745
11795	—	R. Kinshasa	Kinshasa, Congo	1000
11800	—	E. Atlantico	Canary Islands	2130
11820	—	Trans World R.	Bonaire, Neth. Antilles	0335
11825	BED69	V. Free China	Taipei, Formosa	0100
	ZYK32	R. Jornal Comercio	Recife, Brazil	2300
11835	CXA19	El Espectador	Montevideo, Uruguay	0030
	—	R. Alger	Algiers, Algeria	1600
11840	—	V. Vietnam	Hanoi, N. Vietnam	1530
	—	R. Warsaw	Warsaw, Poland	0700
	—	E. Nacional	Lisbon, Portugal	0730
	GSF	BBC	London, England	1600
11850	GSF	BBC	London, England	1600
	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0500
	LLK	R. Norway	Oslo, Norway	1700
11870	—	V. America	Greenville, N.C.	1930
11873	—	R. Lubumbushi	Lubumbushi, Congo	1500
11874	ZYN32	R. Soc. Bahia	Salvador, Brazil	0300
11885	—	ORTF	Paris, France	2100
	CXA19	El Espectador	Montevideo, Uruguay	2100
11890	—	R. Berlin Int'l	Berlin, E. Germany	0100
	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0430
11895	—	Austrian R.	Vienna, Austria	1100
11900	—	Austrian R.	Vienna, Austria	1100
	—	S. African BC	Paradys, S. Africa	0515
	—	R. Kinshasa	Kinshasa, Congo	1000
11905	DMQ11	Deutsche Welle	Cologne, W. Germany	0545
11910	HCJB	V. Andes	Quito, Ecuador	0600
	HSK9	R. Bangkok	Bangkok, Thailand	0415
11920	—	R. Berlin Int'l.	Berlin, E. Germany	0345
11930	—	R. Brazzaville	Brazzaville, Congo	1730
11947	—	V. Revol. Duvalieriste	Port au Prince, Haiti	1400
11960	—	R. Habana	Havana, Cuba	2230
11965	—	R. Japan	Tokyo, Japan	1930
11970	—	R. Erevan	Erevan, USSR	0700
	—	R. Brazzaville	Brazzaville, Congo	1100
12095	GSF	BBC	London, England	1800
13250	—	R. Euzkadi	(clandestine)	2130
14885	—	E. Nacional	Lisbon, Portugal	1800
14970	—	E. Nacional	Lisbon, Portugal	1800
15015	—	V. Vietnam	Hanoi, N. Vietnam	0530
15052	—	R. Liberdad	(clandestine)	1300
15070	GSF	BBC	London, England	1800
15080	—	R. Peking	Peking, China	0830

19-Meter Band—15100 to 15450 kHz

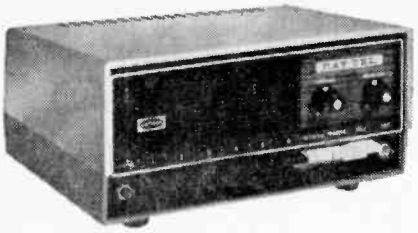
15110	HCJB	V. Andes	Quito, Ecuador	2300
	XERR	R. Comerciales	Mexico DF, Mexico	2200
15120	—	R. Warsaw	Warsaw, Poland	0700
15127	ZYN31	R. Soc. Bahia	Salvador, Brazil	0300
	—	V. Free China	Taipei, Formosa	1530
15130	—	R. Habana	Havana, Cuba	2110
15130	—	Windward I. BC	St. Georges, Grenada	2030
15135	—	R. Japan	Tokyo, Japan	0630
15140	GSF	BBC	London, England	2115
15152	—	R. Corporacion	Santiago, Chile	2200
15155	—	R. Habana	Havana, Cuba	2010
	ELWA	R. Village	Monrovia, Liberia	2145
15165	OZF7	V. Denmark	Copenhagen, Denmark	1230
15175	LLM	R. Norway	Oslo, Norway	1700
	—	V. America Relay	Honolulu, Hawaii	2300
15185	OIX4	R. Finland	Pori, Finland	1000
15190	—	R. Brazzaville	Brazzaville, Congo	1100
15203	—	E. Nacional	Lisbon, Portugal	1600
15215	—	R. Manha	Brazil	0200
15220	—	Australian BC	Melbourne, Australia	2100
	—	R. Nederland	Bonaire, Neth. Antilles	2020
15230	—	R. Habana	Havana, Cuba	2230
15235	—	V. America	Greenville, N.C.	1815
15240	KGEI	V. Friendship	San Francisco, Calif.	0300
15250	—	R. Euzkadi	(clandestine)	2130
15270	—	S. African BC	Paradys, S. Africa	0954
15275	DMQ15	Deutsche Welle	Cologne, W. Germany	0745
15280	ZL4	R. New Zealand	Wellington, N..Z	0450
15300	—	R. Habana	Havana, Cuba	2050
	WNYW	R. N.Y. Worldwide	New York, N.Y.	1330
15305	—	Swiss BC	Berne, Switzerland	1350
15320	—	R. Canada	Montreal, P.Q.	2115
15340	—	R. Habana	Havana, Cuba	2050
	—	Liberation R.	(clandestine) N. Vietnam(?)	1800
15342	BED49	V. Free China	Taipei, Formosa	0250
15350	GSF	BBC	London, England	1530
15370	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0400
15380	DMQ15	Deutsche Welle	Cologne, W. Germany	2150
15400	ETLF	R. V. Gospel	Addis Ababa, Ethiopia	0500
15405	HCJB	V. Andes	Quito, Ecuador	0600
15415	—	V. America	Greenville, N.C.	2144
15420	—	R. Peking	Peking, China	0830
15425	VLX15	Australian BC	Perth, Australia	0400
15440	WNYW	R. N.Y. Worldwide	New York, N.Y.	1330
	—	Far East BC	Manila, Philippines	1400
15445	—	R. Brazzaville	Brazzaville, Congo	0500
17705	ZYR97	R. Nove Julio	Sao Paulo, Brazil	0030
	—	V. America	Honolulu, Hawaii	2300
17715	—	R. Habana	Havana, Cuba	1620
17720	WINB	WINB	Red Lion, Pa.	2000
	—	R. Brazzaville	Brazzaville, Congo	1300
17730	—	R. Espana Indep.	(clandestine)	1600
	WNYW	R. N.Y. Worldwide	New York, N.Y.	1330
17720	—	V. Free China	Taipei, Formosa	0250
17755	—	Austrian R.	Vienna, Austria	0900
17782	—	V. Free China	Taipei, Formosa	0250
17790	GSF	BBC	London, England	1500
17800	—	Austrian R.	Vienna, Austria	0900
17805	—	S. African BC	Paradys, S. Africa	0954
17815	—	R. Tupi	Sao Paulo, Brazil	0130
17820	—	R. Canada	Montreal, P.Q.	2115
17825	LLN	R. Norway	Oslo, Norway	1700
17840	—	R. Australia	Melbourne, Australia	0100
17845	—	Swiss BC	Berne, Switzerland	1330
	WNYW	R. N.Y. Worldwide	New York, N.Y.	2130
	DMQ17	Deutsche Welle	Cologne, W. Germany	0745
17850	—	R. Peking	Peking, China	0830
17855	—	Austrian R.	Vienna, Austria	0500
	—	R. Habana	Havana, Cuba	1620
17875	—	R. Japan	Tokyo, Japan	0630
17880	WNYW	R. N.Y. Worldwide	New York, N.Y.	1330
	HCJ8	V. Andes	Quito, Ecuador	0600
	DMQ17	Deutsche Welle	Cologne, W. Germany	0800
17890	—	E. Nacional	Lisbon, Portugal	0730

13-Meter Band—21450 to 21750 kHz

21500	—	R. Brazzaville	Brazzaville, Congo	1100
21520	—	Swiss BC	Berne, Switzerland	1330
21730	LLQ	R. Norway	Oslo, Norway	1700
21740	—	V. America	Greenville, N.C.	1930

CB Rigs & Rigmarole

Continued from page 12



Raytheon's Ray-Tel TWR-9 CB Transceiver

operator's mouth. The 6 channels are selected by "touch tabs" on the front panel, as are other functions of the unit. Here's something else that's new: you can use the TWR-9 as a wired intercom in addition to a CB station, with the wired satellite slave unit added on as an optional accessory.

Price of the TWR-9 is $99.95, and the satellite station is $9.95. For more information write to Raytheon Company, Dept. PR, Lexington, Mass. 02173.

One for the Road. Lafayette Radio, 111 Jericho Turnpike, Syosset, N. Y., came up with something called the Model HB-525 23-channel mobile rig.

This is a little rig (all solid-state) with a complete set of crystals for 23 channel operation. Receiver has a 455 kHz mechanical filter, 3 position delta tuning, illuminated tuning dial. Transmitter has range boost audio, TVI filter—the whole bit! It can even be used as a PA system with very little effort.

Comes for operation on 12-volts (neg or pos ground), or on 117 VAC (with optional power supply) for $149.95. This should be a popular unit.

Lafayette Model HB-525 CB Transceiver

I think that you'll agree that we have seldom seen so many exciting new products coming onto the market in such a short period of time. Hope that you'll be with us next issue when we'll have some more! ■

Ask Me Another

Continued from page 36

ceiver to cover the 88-108 MHz FM band. Can this be done by changing the coils on any one band except the broadcast band?

—J. D. L., Montreal, Mo.

It isn't feasible. FM broadcasting stations transmit very wide band FM requiring a different detector and broad band IF amplifiers.

No Change Needed

I own an early RCA Victor 21-inch color television set. All channels come in color. The latest color television sets reproduce black and white programs too, and color programs only when broadcast in color. Please let me know what change I can make in the circuit to convert the set into the latest type.

—F. G., New York, N. Y.

Don't change the circuit! Just place a call to the RCA Service Company and get them to adjust it. You're not getting black and white programs in color—all your set needs is proper adjustment to kill the color when receiving black and white programs.

What Now?

An old time short wave radio was given to me recently and one tube is missing. I am unable to find a tube layout diagram. Here is a list of the tubes in place: 80, 6SF5, 6SQ7, 6F6, 6K8 and 6K7. Can you tell me the number of the tube missing?

—L. R., St. Jean, Quebec, Canada

Probably another 6K7, if there is a grid cap clip needing a tube to latch on to. Or, it might be another 6F6 if the set employs push-pull audio.

Guitar Pickup

How can I hook up an ordinary six-string guitar to an amplifier?

—M. L., Chicago, Ill.

Get a guitar "pickup" and connect it to an audio amplifier. You should be able to get one at Allied and many other radio parts stores in the Chicago area.

Talking Shoe Box

Continued from page 66

connections or disconnections. Additionally, for the protection of the set, you should not turn it on without a speaker connected to it; either the set's speaker or the home-made speaker must be across the secondary winding of the output transformer.

Science Fair. Parents and teachers will find the "Talking Shoe-Box" project quite simple for sixth and seventh graders to understand. In the preparation of an exhibit include a genuine 4- or 5-inch PM speaker for comparison of sound output and construction.

Admittedly, the efficiency of the "Talking Shoe-Box" speaker is considerably less than store-bought units—and commercial jobs sound better, too! Here are a few construction tips you should think about to improve speaker sound efficiency:

- The clearance between voice coil and magnet—the closer, the better.
- Magnet—the stronger the better.
- The resiliency of the cone (box cover) —should be stiff.
- The impedance of the voice coil relative to the impedance of the output-transformer's secondary winding. Exact impedance matching is best. Increase (or decrease) voice-coil impedance by adding (or subtracting) turns determined by trial and error. ■

Antenna Tuner

Continued from page 46

I am of course, reporting only my own findings with a pi-network to tune the antenna circuit of my receiver. Your antenna and your receiver may already be perfectly *matched* in which case use of such a tuner would be superfluous. To find out if it will help your reception I suggest you scrounge your junk box for a couple of variable capacitors in the range of .0003 to .0005 mfd (300 to 500 mmf) and a tapped coil of some sort—or you can quickly wind one. The inductor I am using is wound on a 1¼-inch diameter form and comprises 80 turns with seven taps—one every 10 turns; the circuit in the schematic diagram is conventional. Coil and capacitors can be temporarily bread-board mounted or haywired in any convenient manner while you give the unit a whirl. If no improvement is evident through its use, your antenna is apparently well-matched to the receiver input already and you don't need the external pi-network tuner.

If you *do* find that you can peak your incoming signals to advantage, go ahead and mount your components permanently in a suitable enclosure and adopt it as a valuable station accessory. The shortwave listener will also find this coupler of considerable aid in pulling in those rare DX stations!

Tuning. Adjustments will be just the reverse of those used with a transmitter; the antenna becomes the *input* and the receiver constitutes the *load*. Pick a steady signal or even use the noise background and adjust switch S1 and C2 to peak the signal or noise. Next adjust C1 in small increments, peaking C2 again each time C1 is changed. This process corresponds to *dipping the final* and adjusting the load in tuning a transmitter but here you will be doing it *aurally* rather than *visually* unless you have an S-meter to tell the story.

Some Tips. Remember this pi-network antenna tuner can also be used for low-power transmitters. For higher-powered transmitters you'll have to use transmitting-type variable capacitors and use a heavier gauge wire. The circuit will be just the same —and since everything is adjustable none of the parts are critical.

If you can't find a 1¼-inch form for the coil use a 1-inch or 1½-inch form. If you are against winding your very own coil, then pick up an Air Dux or B&W air-RF coil. Both coil manufacturers have a 1¼-inch coil form with 8 turns per inch (32 turns for 4-inch). Both should work well with minor adjustment of capacitors. For tuning capacitors you can use those from a discarded broadcast receiver or use a smaller capacitance unit with a selector switch to connect small fixed capacitors in parallel—it'll make tuning much easier; just like having a bandspread capacitor.

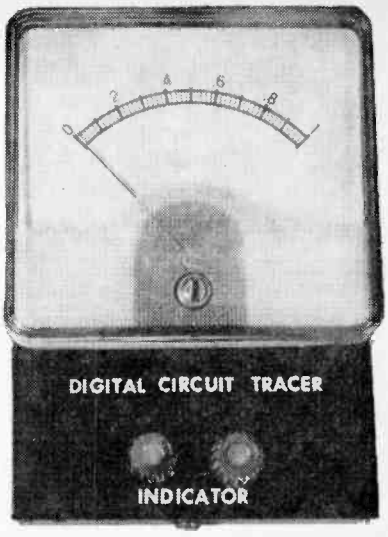
Also try the circuit with the end of the coil left disconnected. Shorted turns can reduce the effectiveness of L1 under some conditions. If you have to buy the 2-to-17-position switch you might want to use a coil with more turns—this could be most important for BC DX and low-frequency reception. Nothing says you can't have 17 taps on the coil—one every 10 turns. ■

Digital Circuit Tracer

Continued from page 91

bered leads of the power unit to the *red* binding post or positive lead of the VTVM or VOM. The indication on the meter, for each of the leads, should give a reading similar to the number on the lead. If you've used 5% or better resistors, the readings should be very close. Lead 1 should indicate 0.1 volt; lead 2, 0.2 volt; etc.

Circuit Tracing. The length of wire or cable will influence the meter readings to some extent but unless the wire is very fine —or exceptionally long—you won't really be thrown for a loss. If you're using a 20,000-ohm-per-volt VOM the 50 microamperes that flows won't lower the readings very much—a VTVM will have even less effect. ■



Front panel of Circuit Tracer contains a pair of 5-way binding posts and a meter.

BROADCASTING TOOTH

Continued from page 52

a number of transmitters and designed new ones, miniaturized components, studied solid state effects to improve them. Major problem for them was meeting size and power requirements in a miniaturized package in absence of real commercial demand for this size components.

The transmitter finally chosen has six channels of information telemetering simultaneously, six modulating codes or subcarriers on a single carrier, the code associated with a specific transducer and area of the tooth identified by frequency.

The transmitter, as Ash and Scott describe it, indicates bite forces and contacts in areas of the tooth by radiating frequency. Present size of the transmitter package is .4 by .3 by .3 inch. More work in thin film deposits, they hope, will reduce the size of the transmitter still further.

Although replaceable Mallory RS-312 batteries can be used in the tooth, the Bionetics TT-1003 batteries (.125 by .250 inch) are smaller, but can be used for short periods before recharge. Solid state sensors pick up molecular physical changes in the mouth.

Summed up, the electronic tooth packs almost enough hardware to equip a Gemini spaceship—its twenty-eight components include six tiny transmitters, solid state sensors, six ceramic capacitors, an antenna coil, a six transistor flatpack, a resistor substrate, as well as the two rechargeable batteries.

Right now, as smart as it is, it can only broadcast a distance of one foot to a 24-channel Honeywell Visacorder, but Scott and Ash promise to add a vest-pocket amplifier they say will make it possible for the tooth to broadcast several miles.

Then we will need face the odd-ball fact we will have on this earth both sending and receiving radio-station teeth. ■

"Hurry up, Harry! I'm getting an Italian station on XIVCXII kHz."

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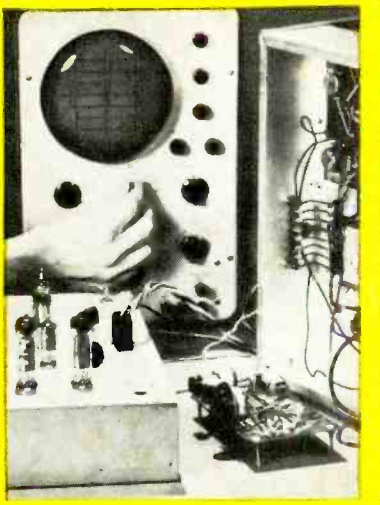

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