HOW TO BUG A ROOM!

RADIO-TV EXPERIMENTER

WHITE'S RADIO LOG

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

APRIL-MAY 75¢

PUBLISHED BI-MONTHLY

DX'ing World-Wide SPY Broadcasts!

DO-IT-YOURSELF TV CAMERA KIT

Barry Goldwater—Ham and CB'er

SHORT-WAVE RECEIVER ROUNDUP

BUILD THIS PROJECT:
enjoy commercial-free
background music at home

Here is the NEW S&M Supersensitive PHOTO METER

NOW complete with carrying case

Every photographer knows that the high quality of his photos depends on the accuracy of his equipment. Here is a precision instrument that meets the highest standards of any meter available. **Modern Photography** says "This is certainly one of the most unusual, most versatile and most sensitive exposure meters at any price today." **U. S. Camera** wrote "It is as sensitive as anything on the market. It's so adaptable—those 4 separate ranges of sensitivity have the effect of spreading the meter's scale."

Now, the S&M Supersensitive Photo Meter is better than ever! A new plastic cap protects the probe and permits diffused light to be read with the cap on. The probe can still be used to read direct light with the cap removed. A new positive meter-lock in the OFF position protects the meter's needle.

The S&M Supersensitive Photo Meter uses the newest cadmium sulfide light cell to measure light levels from 0 to 10,000 foot lamberts at ASA speeds of 3 to 25,000. It is successfully used with movie or still cameras, microscope, telescope—as well as a densitometer. The computer gives F stops from .7 to 90 and lists exposure time from 1/15,000 sec. to 8 hours. 43° angle of acceptance; 4 range selection; EV-EVS-LV settings; weighs only 10 ounces.

And yet—this all-inclusive kit can be assembled with soldering iron and screw driver in less than 2 hours. Step by step instructions make it easy—or, order your S&M Supersensitive Photo Meter, fully assembled and fully tested. Complete with attractive carrying case.

$24.95	**$29.95**	**$2.00**
in kit form No. 101	assembled No. 102	carrying case only No. 103

SCIENCE and MECHANICS—Kit Division/505 Park Avenue, New York 22, N. Y. 49

Please send the new S&M Supersensitive Photo Meter as checked below, complete with carrying case. I understand that if I am not completely satisfied, I may return the meter within 10 days for a complete refund.

No. 101	No. 102	No. 103
☐ $24.95—in kit form	☐ $29.95—assembled	☐ $2—Carrying case only

Add 10% for Canadian and foreign orders. New York City residents add 3% for N.Y.C. sales tax.

Name_____
(Please print)

Address_____

City_____ Zone_____ State_____

☐ Check or money order enclosed, ship prepaid

☐ Enclosed is $3 deposit, ship COD for balance, plus postage and COD charges

PICK YOUR OWN SUCCESS STORY FROM THIS PAGE

Wins $3000 contest—"After my I. C. S. courses I secured a new position." says Mr. Cecil Rhodes. "My income has more than doubled and I recently won a $3000 sales contest."

From clerk to Assistant Estimator, thanks to I.C.S. "Any way you look at it," writes Mrs. Edna James, "the time and money one spends for I. C. S. Courses will be repaid a thousandfold."

These are the true stories of people who seemed trapped in routine, low-pay, shaky jobs. Handicapped by lack of proper training, they couldn't get the things they wanted out of life—more money, a job they liked, security and happiness.

They are a small sample of the thousands of men and women—young and old—who turn to I.C.S. for help. Their will to learn plus I.C.S. training has changed the course of their lives.

Are you discouraged with your job and pay and feel you can't improve yourself because of lack of specialized education? Well, these men and women were in the same boat. With I.C.S. training, one of these success stories could be about *you*.

I. C. S. is the oldest and largest correspondence school. 223 courses. Business, industrial, engineering, academic, high school. One for you. Direct, job-related. Bedrock facts and theory plus practical application. Complete lesson and answer service. No skimping. Diploma to graduates.

"The I.C.S. Advertising Course still serves as a foundation for my professional achievements." College grad Robert Lee rose from promotion manager to account executive, now heads own counseling firm.

Reports 20% increase in salary! Gregory C. Johns says. "I. C. S. training gave me unlimited opportunity! I have completed one course, and am now enrolled in Practical Plumbing."

3 FREE BOOKLETS—a 20-page guide to advancement, a gold mine of tips on "How to Succeed." Also a big catalog outlining opportunities in your field of interest and a sample I.C.S. lesson.

Accredited Member
National Home Study Council

Clip coupon here—and take your first big step to real success! I.C.S., Scranton, Penna. 18515

INTERNATIONAL CORRESPONDENCE SCHOOLS ICS

Box J3534B, Scranton, Penna. 18515 (In Hawaii: P. O. Box 418, Honolulu. In Canada: I. C. S. Canadian, Ltd., Montreal.)

Without cost or obligation, rush me FREE Success Kit, with 3 valuable booklets: (1) How to Succeed; (2) opportunity booklet about the field I've checked below; (3) sample I. C. S. lesson.

ARCHITECTURE and BUILDING TRADES
- ☐ Air Conditioning
- ☐ Architecture
- ☐ Arch. Drawing
- ☐ Building Contractor
- ☐ Carpentry & Millwork
- ☐ House Planning
- ☐ Painting
- ☐ Plumbing & Heating

ART and DESIGN
- ☐ Commercial Art
- ☐ Interior Decorating
- ☐ Magazine Illustrating
- ☐ Show Card & Sign Painting
- ☐ Sketching and Painting

AUTOMOTIVE
- ☐ Auto Body Rebuilding
- ☐ Auto Electric Technician
- ☐ Automobile Mechanic
- ☐ Engine (Gas & Diesel)
- ☐ Engine Tune-Up
- ☐ Transmission Specialist

AVIATION
- ☐ Aero Engineering
- ☐ Aircraft Drafting
- ☐ Aircraft Mechanic

BUSINESS
- ☐ Accounting
- ☐ Cost Accounting
- ☐ Public Accounting
- ☐ Bus. Administration
- ☐ Executive Training
- ☐ Mgmt. Accounting
- ☐ Marketing
- ☐ Personnel-Labor Relations
- ☐ Programming for Digital Computers
- ☐ Purchasing Agent
- ☐ Real Estate
- ☐ Salesmanship
- ☐ Sales Mgmt.
- ☐ Small Business Mgmt.
- ☐ Traffic Mgmt.

CHEMICAL
- ☐ Analytical Chemistry
- ☐ Chem. Engineering
- ☐ General Chemistry
- ☐ Lab. Technician
- ☐ Nuclear Energy
- ☐ Plastics
- ☐ Pulp, Paper

CIVIL ENGINEERING
- ☐ Civil Engineering
- ☐ Highway Blueprints
- ☐ Highway Engineering
- ☐ Structural Blueprints
- ☐ Sanitary Engineering
- ☐ Structural Engineering
- ☐ Surveying & Mapping

DRAFTING
- ☐ Architectural
- ☐ Drafting Technology
- ☐ Electrical and Electronic
- ☐ Mechanical

ELECTRICAL
- ☐ Elec. Appliance Servicing
- ☐ Electrical Engineering
- ☐ Elec. Motor Repairman
- ☐ Industrial Telemetering
- ☐ Instrument Technician
- ☐ Practical Electrician
- ☐ Practical Lineman

ELECTRONICS
- ☐ Automation
- ☐ Basic Electronics
- ☐ Electronic Computers
- ☐ Electronics Technician
- ☐ HI-FI Stereo and Sound Systems
- ☐ Industrial Electronics

ENGINEERING (Professional)
- ☐ Chemical
- ☐ Civil
- ☐ Electrical
- ☐ Mechanical

ENGLISH and WRITING
- ☐ Better Business Writing
- ☐ Introductory Technical Writing
- ☐ Short Story Writing
- ☐ Practical English

HIGH SCHOOL (Diploma)
- ☐ High School General
- ☐ High School Math
- ☐ High School Secretarial
- ☐ High School Vocational
- ☐ College Preparatory

LANGUAGES (Edited by Berlitz)
- ☐ French
- ☐ German
- ☐ Italian
- ☐ Spanish

MECHANICAL and SHOP
- ☐ Gas and Electric Welding
- ☐ Industrial Engineering
- ☐ Industrial Instrumentation
- ☐ Machine Design
- ☐ Machine Shop Practice
- ☐ Mechanical Engineering
- ☐ Reading Shop Blueprints
- ☐ Tool Design
- ☐ Toolmaking
- ☐ Safety Engineering

SECRETARIAL
- ☐ Clerk-Typist
- ☐ Professional Secretary
- ☐ Shorthand
- ☐ Stenographic
- ☐ Typist

STEAM and DIESEL POWER
- ☐ Boiler Inspector
- ☐ Power Plant Engineering
- ☐ Stationary Diesel Engineering
- ☐ Steam Engineering

SUPERVISION
- ☐ Foremanship—Supv'n
- ☐ Personnel—Lab. Rel'ns

TV-RADIO
- ☐ Radio and TV Servicing
- ☐ Radio-Telephone License
- ☐ TV Technician
- ☐ Practical Radio-TV Engineering

MISCELLANEOUS
- ☐ Textile
- ☐ Other (please specify)

Name_____ Age____ Sex____

Home Address_____

City_____ Zone____ State_____

Occupation_____

Employed by_____ Working Hours_____ **Special low rates to members of U. S. Armed Forces!**

RADIO-TV EXPERIMENTER

April-May 1964

Cover Photo by Dan Rubin

CONTENTS/INDEX

WHITE'S RADIO LOG, Vol. 41, No. 2—124

Learn ELECTRONICS in Classrooms and Labs of COYNE ELECTRONICS INSTITUTE

PARTICIPATING RESEARCH SCHOOL

ELECTRICITY·ELECTRONICS: Motors, Generators, Computer Circuitry, Appliances, Automatic Electronic Control Units, Refrigeration and Air Conditioning.

TELEVISION·ELECTRONICS: TV Receivers—Black and White and Color AM-FM and Auto Radios, Transistors, Printed Circuits Test Equipment, Closed Circuit TV.

Now is the time to train for a top-pay job in electronics. When you train at Coyne, you work on the same type of equipment you will work on outside in industry. You will be getting your training at one of the largest and best equipped schools in the country. During the past 65 years, we have put thousands of ambitious men on the road to security and personal independence in the fast-growing field of Electronics. No previous experience needed. No advanced education required.

START NOW—PAY LATER. Liberal Finance and Payment Plans. Part-time employment help for students. Mail coupon now for FREE copy of "Your Opportunities in Electronics." *No salesman will visit.* Send coupon, postcard or letter right away . . . before you forget.

MAIL COUPON OR WRITE TO ADDRESS BELOW

COYNE ELECTRONICS INSTITUTE*
Dept 34-B
1501 W. Congress Pkwy., Chicago, Ill. 60607

Name_____

Address_____

City_____ State_____

Age_____ Phone_____

*Chartered as an Educational Institution Not for Profit

COYNE offers LOW COST TELEVISION RADIO - COLOR TV Training in Spare Time AT HOME

—*PLUS* Two Weeks Personal Training in our Chicago Shop-Labs—FREE of any extra Tuition!

Coyne—and only Coyne—can make you such a sensational offer. No increase in cost of home training, but as soon as you graduate you are qualified to spend two weeks in Chicago, working on actual projects, getting personal instruction—without one cent of extra tuition. Like getting a post-graduate course free. This offer may be withdrawn at any time, but those who inquire about Coyne's home training now will be guaranteed two weeks of shop training at Coyne's expense for resident tuition. Send name for FREE BOOK.

Now, you can quit *wishing* you had a profitable Radio-TV Service Business of your own. Now, you can quit *dreaming* about a big pay job in Television—and *do something* to make your dreams come true. Start your basic training at home in spare time. We train you to do the work, *and* show you how to get the work to do—even while you are learning. No costly "put together" kits to pay for. Lowest tuition—low monthly payments. Free employment service to graduates. Send name for all facts. No salesman will call.

Send Name for FREE BOOK. No salesman will call

Founded 1899

The largest, oldest, best equipped resident school of its kind.

COYNE ELECTRONICS INSTITUTE

Chartered as an Educational Institution Not For Profit
1501 West Congress Parkway, Dept. 34-H9, Chicago 60607

COYNE ELECTRONICS INSTITUTE
HOME TRAINING DIVISION, Dept. 34-H9
1501 W. Congress, Chicago 60607

Please mail free book and offer of two weeks personal training in Chicago without extra tuition for home study graduates. Explain low monthly payments.

Name_____

Address_____

City & State_____

APRIL-MAY 1964
VOLUME 16 No. 2

RADIO-TV EXPERIMENTER

RADIO-TV EXPERIMENTER, Vol. 16, No. 1, is published bi-monthly by SCIENCE & MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Editorial, business and subscription offices: 505 Park Ave., New York, N. Y. 10022. One-year subscription (six issues)—$4.50—two-year subscription (12 issues)—$9.00; and three-year subscription (18 issues)—$13.00. Add $1.00 per year for postage outside the U.S.A. and Canada. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 6363 Wilshire Blvd., 653-5037; Southwestern advertising representative: Jim Wright, 4 N. Eight St., St. Louis, CH 1-1965. Application for second-class postage rates is pending at New York, N. Y., and at additional mailing offices.

New Model 161 UTILITY TESTER®

FOR REPAIRING ALL ELECTRICAL APPLIANCES MOTORS • AUTOMOBILES • TV TUBES

As an electrical trouble shooter the Model 161:

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

As an Automotive Tester the Model 161 will test:

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

IT'S SO EASY!!

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

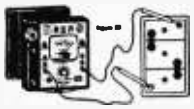
Simply insert tube in appropriate socket then follow procedure as outlined in our manual.

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

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

Test Generators

READ THIS!



Test Storage Batteries

READ THIS!

Test Circuit Breakers

READ THIS!

INCLUDED FREE!!

This 56-page-book—practically a condensed course in electricity. Learn by doing.

Just read the following partial list of contents:

• What is electricity? • Simplified version of Ohms Law • What is wattage? • Simplified wattage charts • How to measure voltage, current, resistance and leakage • How to test all electrical appliances and motors using a simplified trouble-shooting technique.

• How to test all TV tubes; also simple procedure for determining which specific tube (or tubes) is causing the trouble.

• How to trace trouble in the electrical circuits and parts in automobiles and trucks.

Model 161 comes complete with above book and test leads. Only..... $22.50

You don't pay for the Model 161 until AFTER you have examined it in the privacy of your home!

SEND NO MONEY WITH ORDER
PAY POSTMAN NOTHING ON DELIVERY

Try it for 10 days before you buy. If completely satisfied *then* send $5.00 and pay the balance at the rate of $5.00 per month until the total price of $22.50 (plus small P.P. and budget charge) is paid. If not completely satisfied, return to us, no explanation necessary.

ACCURATE INSTRUMENT CO., INC.
Dept. D-320, 911 Faile St., Bronx 59, N. Y.

Please rush me one Model 161. If satisfactory I agree to pay $5.00 within 10 days and balance at rate of $5 per month until total price of $22.50 (plus small P.P. and budget charge) is paid. If not satisfactory, I may return for cancellation of account.

Name_____

Address_____

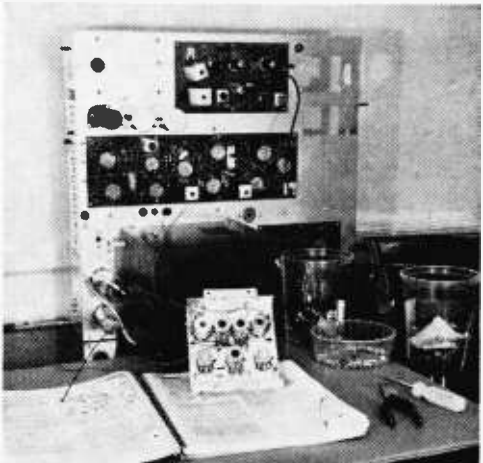
City_____ Zone_____ State_____

POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor

SINCE the early post-war years, TV has been a common household word and its younger sister, color television, has seen its tenth birthday. So, what could be new in the television world that could shake the consumer market? If you answered, "Color TV and TV camera kits," you and I would be of the same mind.

The Heath Co. has come up with a foolproof 21" color TV set that sells for $349 complete with picture tube. The price alone is big news, but you would have to see this kit to appreciate the big step forward the kit-building industry has made. Your editor assembled the color-TV kit in 22 hours flat, which makes the Heath-advertised 25 hours a bit conservative. If you have assembled kits before, there will be no unusual kit building experience except for the thrill of a new adventure. Alignment is no problem. Built-in servicing circuits such as a dot generator are valuable aids in getting the set operating the first time and eliminating expensive service calls and bills when realign-



The best way for an editor to wire a kit is on his kitchen table, because that is how many of his readers do it. Shown above is the Heathkit Color TV set being wired up.

In any CB application...you'll outperform 'em all with a

MESSENGER

Personal Messenger

Compact, hand-held 100 milliwatt or 1½ watt models! Rugged and reliable – 11 transistors, 4 diodes. Twice the sensitivity and 40% more range than similar units with conventional circuitry – more output than similar units with same rated inputs!

Cat. No. 242-101
100 milliwatts.....$109.50 Net
Cat. No. 242-102
1½ watts.....$129.50 Net

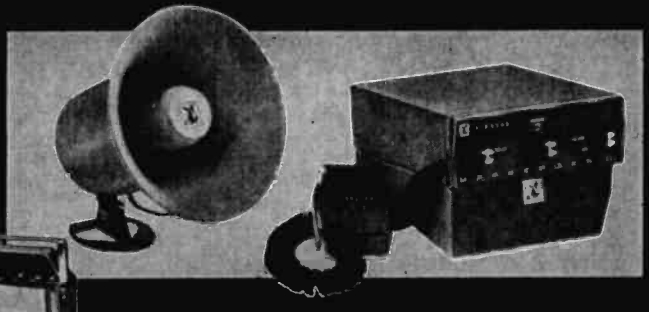
Messenger and Messenger Two

For mobile or base stations. High efficiency design makes full use of maximum allowable legal power. Excellent receiver sensitivity and selectivity. Automatic "squelch" control 5 crystal controlled channels on the "Messenger" and 10 crystal controlled channels plus a tunable receiver on the "Messenger Two."

MESSENGER
Cat. No. 242-127
115 Volts AC/ 6 Volts DC...$109.95 Net
Cat. No. 242-128
115 Volts AC/12 Volts DC...$109.95 Net

MESSENGER TWO
Cat. No. 242-162
115 Volts AC/ 6 Volts DC...$169.95 Net
Cat. No. 242-163
115 Volts AC/12 Volts DC...$169.95 Net

New!



MESSENGER III

The "Messenger III" offers everything you ever wanted in a CB transceiver . . . compact size, a husky signal, extreme sensitivity, razor-sharp selectivity – and complete flexibility for base station, mobile, public address, or battery powered portable use! Double conversion receiver – set-and-forget "Volume" and "Squelch" controls – 11 channel coverage – "Tone Alert" Selective Calling System available as accessory.

Cat. No. 242-150 12 Volts DC Messenger III.....**$189.95 Net**
Cat. No. 250-823 117 Volt AC Power Supply.....**$ 29.95 Net**

WRITE TODAY
for full details
SEE YOUR DEALER/DISTRIBUTOR AND ASK FOR A DEMONSTRATION

E. F. JOHNSON COMPANY
7311 TENTH AVE. SW. • WASECA, MINNESOTA

Positive Feedback

ment or part replacement is needed later on. More details on this new kit will be given in the next issue of RADIO-TV EXPERIMENTER. Watch for it!

Olson Electronics will be the first United States distributor to offer a TV camera kit to the public. In a telephone chat with Irving Olson, your editor learned that the camera kit will be imported from England and will sell for about $250. The camera is designed around an all-transistor circuit and uses a Vidicon-type camera tube. The English manufacturer claims that the average kit builder will be able to assemble the camera in about 20 hours, following the step-by-step instructions provided for the 154 parts. And don't let the "Made in England" label worry you. The camera is compatible with 525-line American TV standard and operates on 115-volts 60-cycles power. Interested? Then read the article on page 41 in this issue.

The cost of CB'ing. We got to thinking about what it means to go out and buy a CB rig these days. Back in 1959, when CB rigs began hitting the market *en-masse*, the going price for the average quality rig was in the range of $125 to $150, with many good rigs selling for as little as $100. Obviously these rigs must have sold well because the CB services blossomed with them as the sole equipment.

As the years went on the rigs became more sophisticated, exotic circuits were added, more knobs, more tubes, more switches, more meters, more buttons, clipping, compression, and all sorts of other exciting developments—they became the ingredients of the "standard" rigs of 1964. The prices

Here is a 5-channel, superhet rig that sold for $135.95 in the "old days" of CB radio. It even had push-to-talk but not much in the "looks department". This real hot performer was yanked off the market by the manufacturer and replaced with a new $189.95 unit.

BUILD 20 RADIO CIRCUITS AT HOME with the Deluxe PROGRESSIVE RADIO "EDU-KIT"®

A Practical Home Radio Course

only $26.95

Reg. U. S. Pat. Off.

Training Electronics Technicians Since 1946

Now Includes

- ★ 12 RECEIVERS
- ★ 3 TRANSMITTERS
- ★ SQ. WAVE GENERATOR
- ★ SIGNAL TRACER
- ★ AMPLIFIER
- ★ SIGNAL INJECTOR
- ★ CODE OSCILLATOR

- ★ No Knowledge of Radio Necessary
- ★ No Additional Parts or Tools Needed
- ★ EXCELLENT BACKGROUND FOR TV
- ★ School Inquiries Invited
- ★ Sold In 79 Countries

YOU DON'T HAVE TO SPEND HUNDREDS OF DOLLARS FOR A RADIO COURSE

The "Edu-Kit" offers you an outstanding PRACTICAL HOME RADIO COURSE at a rock-bottom price. Our Kit is designed to train Radio & Electronics Technicians, making use of the most modern methods of home training. You will learn radio theory, construction practice and servicing. THIS IS A COMPLETE RADIO COURSE IN EVERY DETAIL.

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

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

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

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

THE KIT FOR EVERYONE

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

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

PROGRESSIVE TEACHING METHOD

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

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

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

THE "EDU-KIT" IS COMPLETE

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

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

FREE EXTRAS

• SET OF TOOLS

- • SOLDERING IRON
- • ELECTRONICS TESTER
- • PLIERS-CUTTERS
- • ALIGNMENT TOOL
- • WRENCH SET
- • VALUABLE DISCOUNT CARD
- • CERTIFICATE OF MERIT
- • TESTER INSTRUCTION MANUAL
- • HIGH FIDELITY GUIDE • QUIZZES
- • TELEVISION BOOK • RADIO TROUBLE-SHOOTING BOOK
- • MEMBERSHIP IN RADIO-TV CLUB: CONSULTATION SERVICE • FCC AMATEUR LICENSE TRAINING
- • PRINTED CIRCUITRY

SERVICING LESSONS

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

FROM OUR MAIL BAG

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

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

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

PRINTED CIRCUITRY

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

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

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

UNCONDITIONAL MONEY-BACK GUARANTEE

ORDER DIRECT FROM AD—RECEIVE FREE BONUS RESISTOR AND CONDENSER KITS WORTH $7

- ☐ Send "Edu-Kit" postpaid. I enclose full payment of $26.95.
- ☐ Send "Edu-Kit" C.O.D. I will pay $26.95 plus postage.
- ☐ Rush me FREE descriptive literature concerning "Edu-Kit."

Name.....

Address.....

.....

PROGRESSIVE "EDU-KITS" INC.

1186 Broadway, Dept.517NN, Hewlett, N. Y.

Positive Feedback

of the rigs have kept pace with the additional components and workmanship, and we fully expect to spend $200 to $300 for a 1964 dazzler. If you've had a chance to play with one of these delights, I'm sure that you will agree that they are *worth* every penny.

Here's a thought which the manufacturers might want to mull around. While not wanting to appear reactionary in suggesting that the developments of manufacturing be put aside, it seems to us that there is still a market for a few more quality low-cost, unsophisticated, *schmaltz*-less CB rigs to sell at 1959 prices.

Many CB'ers pass up $2 per pound cuts of steak, wear last year's suits, and also pass up the fancy 1964 CB rigs because they just can't afford them. True, there are *some* low-cost rigs available, but not enough of them for friend CB'er to make a choice from.

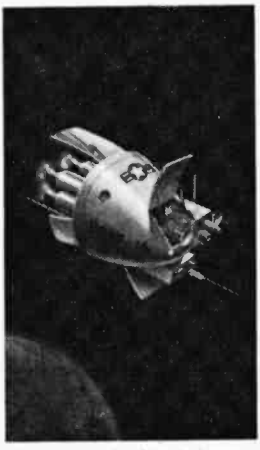
Anybody out there go along with me in adding their bid for a few more 1 or 2 channel, single conversion, no push-to-talk, no frills CB rigs? Here's a chance for manufacturers to regain part of a market which has been apparently "lost in the shuffle."

Lafayette HA-63

Opps. No sooner do we prepare an article on short-wave receivers and have it set up in type than a new one hits the market. Our round up article on "How to Buy Your First Short-Wave Receiver" on page 91 was complete until Lafayette Radio came out with their new HA-63 general coverage communications receiver. The HA-63 provides full fingertip coverage from .55 mc to 31 mc in for bands with bandspread. The receiver uses a superhet circuit with RF amplifier. Other features are an S-meter, automatic noise limiter, switchable AVC/MVC, antenna trimmer, headphone jack and outstanding selectivity and a sensitivity of 1.5 microvolts. The HA-63 is priced at $59.95 and optional speaker costs $7.95. ■

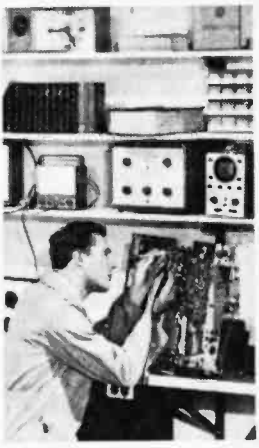
A NEW WORLD OF OPPORTUNITY AWAITS YOU WITH
N.T.S. ALL-PHASE HOME TRAINING IN ELECTRONICS

You can install and maintain electronic circuitry in missiles and rockets ... specialize in micro-waves, radar and sonar.



You can succeed in TV-Radio Communications ... prepare for F.C.C. License, service advanced satellites for industry and defense.

You can service and repair the electronic "brains" of industry — computers, data processing, and other automation equipment.



You can become a highly-paid TV-Radio Technician, an electronics field engineer, or succeed in your own sales & service business.

The N.T.S. Master Course enables you to do more, earn more in ELECTRONICS • TELEVISION • RADIO

Yet N.T.S. Training costs no more than other courses far less complete

There's a good reason why N.T.S. Master-Training opens a wide new world of opportunity for you in Electronics, Television, Radio.

Everything you learn, from start to finish, can be applied directly to all phases of the Electronics Industry.

As a result, the N.T.S.-Trained Technician can move ahead faster, in any direction — from TV-Servicing to Radio Communications to Space-Missile Electronics and Automation for industry and defense. You can go wherever pay is highest and opportunity unlimited.

Electronic circuitry, for example, is one of science's miracles that is basic to the entire field of Electronics. It is used in satellites, computers and space capsules as well as in today's television sets and high fidelity equipment. N.T.S. shows you how to service and repair electronic circuitry for all electronic applications.

YOU WORK ON MANY PRACTICAL JOB PROJECTS.
You build a short-wave, long-wave superhet receiver, plus a large-screen television set from the ground up. N.T.S. training kits contain all the parts you need, at no extra cost. (See box at right.) You also receive a professional Multitester to use during training and on the job.

ONE LOW TUITION. You need training related to all phases of Electronics. Industry demands it. Only N.T.S. provides it ... in ONE Master Course at ONE low tuition.

YOU ENROLL BY MAIL AND SAVE MONEY. No salesmen means lower costs for us, lower tuition for you.

START NOW. A whole new world of opportunity awaits the man with Electronic Home-Training from National Technical Schools — a recognized leader in technical training for 58 years.

MAIL COUPON NOW FOR FREE BOOK AND ACTUAL LESSON!

NO OBLIGATION.
NO SALESMAN WILL CALL.

NATIONAL TECHNICAL SCHOOLS
WORLD-WIDE TRAINING SINCE 1905

National Technical Schools, Dept. RKK-34
4000 S. Figueroa St., Los Angeles 37, Calif.

Please Rush FREE Electronics-TV-Radio "Opportunity" Book and Actual Lesson. No Salesman Will Call.

Name_____ Age_____

Address_____

City_____ Zone____ State_____

☐ **Check if interested ONLY in Resident Training at L.A.**

High school home study courses also offered. Check for free catalog. ☐

RESIDENT TRAINING AT LOS ANGELES

If you wish to take your Electronics-TV-Radio training in our famous Resident School in Los Angeles — the oldest and largest school of its kind in the world — write for special Resident School catalog and information, or check coupon.

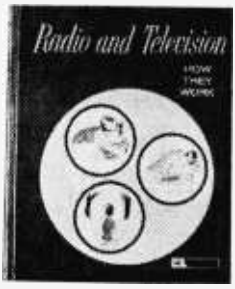
NATIONAL TECHNICAL SCHOOLS
WORLD-WIDE TRAINING SINCE 1905
4000 So. Figueroa St., Los Angeles 37, Calif.

Accredited Member N.H.S.C.

BOOKMARK
by Bookworm

SINCE the first of the year, your Bookworm has received many letters from many readers requesting titles of basic texts on electricity, electronics, science projects, radio servicing, and the like. Prescribing books by the mails is as dangerous as reaching into the medicine cabinet blindfolded during a lunar eclipse. A book reviewer can only hope to reveal the contents of selected books and make recommendations. It is up to the reader to make the final choice. Since this column is all too short for its large reading audience, this Bookworm will review only the best volumes and let the lesser titles fall by the wayside.

Boys Department. If you have a boy around age 10 to 13 or so who is beginning to ask, "Say, Dad, how does a radio work?," then here is a good book for the boy and you, too! *Radio and Television—How They Work* by *Mike Bienstock* ($2.95). This Rider publication changes radio and television concepts



into language and pictures a youngster can understand. It may even clear up points on which father is a bit hazy!

The introduction to this hard-cover text gives the necessary groundwork in electronics and explains radio waves and transmitters. Succeeding chapters thoroughly, yet simply, discuss: how we receive radio waves; what FM means; the use of a cathode ray tube in TV; what transistors are; and much more.

If you can't pick up a copy of this basic text at your local bookstore, send a note to Hayden Book Co., 850 Third Avenue, New York, New York, 10022—they distribute the Rider books.

Men 17-55

JOB OPPORTUNITIES!
EXCITEMENT!
MONEY!

All this can be Yours as a trained

Electronics

TECHNICIAN

Let DeVry help you to prepare and blueprint a Solid Career in this fast-Growing Field!

TELEVISION

COMPUTERS

MICRO-WAVES

RADAR

BROADCASTING

OVER 6,000 FIRMS HAVE EMPLOYED DeVRY TECH GRADUATES!

Thousands of companies in the United States and Canada who have employed DeVry Tech men prove two most important facts: (1) Electronics is one of the biggest, fastest growing opportunity fields of our time; and (2) DeVry Tech graduates are "WANTED" MEN.

Whether DeVry Tech prepares you in spare time at home or in its modern Chicago or Toronto Laboratories, your training is designed to get you ready to meet the exacting standards of industry. You get practical training that not only helps to fit you for a job or a service shop of your own — but also gives you a foundation for a career that can be profitable the rest of your life.

You work over 300 learn-by-doing experiments at home, using DeVry Tech's exclusive Electro-Lab method. You build and KEEP valuable equipment. With another DeVry Tech exclusive, you have the benefit of training movies that you can show over and over again until basic points are crystal clear. Special texts guide you every step of the way as well.

HOW DeVRY TECH CAN "BLUEPRINT" YOUR CAREER!

DeVry's faculty not only know how to teach Electronics, but they also understand men. They most likely know the type of problems you face. From this staff you get help, advice and understanding. It is this "human" side of DeVry's program that has caused many of our graduates to say: "DeVry Tech not only trains you for a job, they actually help you blueprint a profitable future!"

NO ADVANCED EDUCATION NEEDED!

Why don't you write for FREE FACTS today? Learn how you TOO can be a member of the great fraternity of DeVry Tech graduates across the continent . . . men who were properly trained, encouraged, appreciated and understood! SEND IN COUPON NOW!

EFFECTIVE EMPLOYMENT SERVICE

DeVry Tech's effective Employment Service is available to all graduates without additional cost.

2 FREE BOOKLETS! Send Coupon Today!

"One of North America's Foremost Electronics Training Centers"

DeVry TECHNICAL INSTITUTE

Accredited Member of National Home Study Council

CHICAGO • TORONTO

DeVRY TECHNICAL INSTITUTE
4141 Belmont Ave., Chicago, Ill. 60641, Dept. RTE-2-U

Please give me your two free booklets, "Pocket Guide to Real Earnings" and "Electronics In Space Travel"; also include details on how to prepare for a career in Electronics. I am interested in the following opportunity fields (check one or more):

- ☐ Space & Missile Electronics
- ☐ Television and Radio
- ☐ Microwaves
- ☐ Radar
- ☐ Automation Electronics
- ☐ Communications
- ☐ Computers
- ☐ Broadcasting
- ☐ Industrial Electronics
- ☐ Electronic Control

Name_____ Age_____

Address_____ Apt._____

City_____ Zone_____ State_____

☐ Check here if you are under 16 years of age.

Canadian residents: Write DeVry Tech of Canada, Ltd.
970 Lawrence Avenue West, Toronto 19, Ontario

2075-A

Bookmark

One other book worth mentioning at this time is a Howard W. Sams & Co., Inc. hardcover text, *Electronics for the Beginner* by *J. A. Stanley* ($3.95). Using a hardware ap-

proach, this volume has just one idea in mind —the best way to get started in electronics is to build useful gadgets which are fun to build and fun to use. Each project is more advanced than the preceding one, so youngsters can learn as they go through the pages. Some of the projects are: miniature broadcasting station, all-transistor amplifier, speaker enclosure, and others.

This Sam's publication is available from electronic parts distributors and bookstores, or direct from the publisher—4300 West 62nd Street, Indianapolis 6, Indiana.

Circuits. If you find your neighbors' radios and TV's piling up on your hobby bench in need of repair, you will surely need one or more of Supreme Publications compiled by *M. N. Beitman.* The latest soft-cover volume *—Most-Often-Needed 1964 Radio Diagrams* ($2.50) is the 24th volume in a series packed with circuit diagrams plus needed service

data on radios of 1964 vintage. All types of radio sets, including portables, auto, FM, are covered as well as stereo equipment.

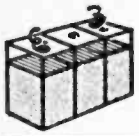
This 192 page, 8½ x 11 manual can be had postpaid direct from Supreme Publications, 1760 Balsam Road, Highland Park, Illinois.

ELECTRONIC SURPLUS BARGAINS
SAVE UP TO 90%

RCA 6032 IMAGE-CONVERTER TUBE

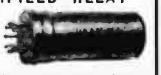
Combined with suitable optical systems, this 3-electrode tube permits viewing of scene with infrared radiation. Scene to be viewed is imaged by optical objective upon semi-transparent photocathode. Spectral resp., S-1; good response up to about 1200A. Max. rating, absolute, grid #2, 20,000VDC or peak AC. grid #1,2700VDC. $9.95 ppd.

NT-6 WILLARD 6-VOLT STORAGE BATTERY



Rated 2.4 amp. hr. Approx. dimensions: 3⅛" l. x 1¾" w. x 2⅛" h. Weight: 1 lb. 3 oz. (plastic case) Dry-charged. $2.50

POTTER & BRUMFIELD RELAY



#SM5LS SPDT 8,000 ohm 11/16" dia. x 1 11/16" long. Approx. weight 1 oz. Hermetically sealed. Standard 7-pin miniature base. $2.00

MINOR SWITCH

10-position, 3-pole with stopper coil and reset coil 6-12 volts D.C. off-normal non-bridging wiper approx. dimensions: 4" long x 4½" high x 1⅝" wide, weight: 1 lb. $9.95

24 VOLT DC POWER SUPPLY

Input: 115/440 volts A. C. 60 cycle, single phase. Output: 24 volts D. C. at 25 amps tapped primary and secondary to vary voltage unit contains 0-30 volt D. C. meter and 0-30 amp meter, circuit breaker, filtered, selenium type rectifier approx. dim: 16" wide, 18" long 8⅛" high, approx. wt.: 70 lbs.
PRICE .....$49.50 each

OIL CAPACITORS

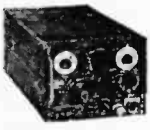
1 mfd. 25,000 V. DC Westinghouse Interteen Type FP Style 1313854. $39.95 each

10 or more. $35.00 each.

GENERAL ELECTRIC FULL WAVE BRIDGE GERMANIUM RECTIFIER

Input 117 volt AC, output 115 volt DC at 10 amperes approximate dimensions: 4⅜" x 4¾" x 7½" long weight: 3½ lbs.
PRICE .....$9.95 each

TEST SCOPE—SYNCHROSCOPE—PULSE ANALYZER



1D-59/APA-11. Late production. Modular subassembly construction. Video amplifier is flat to 4 mc. 3BP1 presentation. Test-scope sawtooth 25-20,000 cy. Has all normal test-scope controls. As synchroscope and pulse analyzer, accepts positive or negative pulses. Video delay circuit permits leading edge of pulse to be seen. Calibrated-dial horizontal shift measures pulse durations from 0.5 to 100 microseconds. Sinewave-oscillator calibrator measures recurrence rates from 200 to 6000 pps accurate within 0.4%. Built-in power supply requires 115v, 400 cy, 196 watts. External 60 cy power supply may be made to furnish plus 350 and—1300 vdc and 6.3 vac. In excellent condition, with all 19 tubes, schematic with parts values, parts-location pictures, operating instructions, theory explanation, and maintenance charts. Shipping weight 60 lbs. Used, good. Price each $19.50

RG 58A COAX CABLE

52 OHM, 100 ft. lengths $3.95

NICKEL CADMIUM BATTERY 1.2 VOLTS

Rechargeable thousands of times. Alkaline storage battery sintered-plate. Flat voltage curve during discharge. Will hold charge for long period of time. High discharge rate up to 50 amps. Spill-proof, may be used in any position. Approx. 6-ampere-hour capacity. Dimensions: 6" high; 2" wide; ⅛" thick. Approx. wt.: 6 oz. Uses potassium hydroxide (30% Electrolite). $1.95

SIGMA EXTRA-SENSITIVE PRECISION RELAY—SERIES 5F

Extremely precise, rugged DC general purpose sensitive relay. Balanced armature, single-pole, double-throw. Suitable for wide range of adjustments. Dimensions: 1¾"x1 5/16"x 1 11/16" high. Weight: 4¼ oz.
5F-10,000S: 10,000 coil ohms. Operates 1.0 ma DC $3.95
5F-16,000-S: 16,000 coil ohms. Operates 0.5, ma DC $4.95

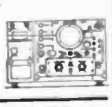
POWER TRANSFORMER

Output: 12, 24, 36 volts. Input: 100 volts, 60 cycles, single-phase. Will handle 2½ amps. Steel case is hermetically sealed. 3½"x 2¾"x4⅛". Wt. 3¼ pounds. $2.95

DIRECT-READING MAGNETIC COMPASS

Full-floating card, compensating magnets, and dial light avail. in 6- or 12-v. bulb. Luminous dial. Mfgd. by Bendix-Pioneer. 3¼" x 3¼" x 3½". 1¾ lbs.
$8.50 postpaid.

LORAN RECEIVER AND INDICATOR, MODEL DAS



110 volt, 60 cycle, single phase. 1700 to 2000 kc frequency range, 1 band. 4 channel, 5" screen, used in good condition.
Price .....$49.50 each

RADIO COMPASS RECEIVER

B5/ABN7 Frequency 100 to 1750 KC Price $17.50
R5A/ARN7 Price $27.50
Loop LP21 LM Price $12.50
Control Box C4/ARN7 Price .....$ 7.50
Indicator 181A Price.....$ 4.95

VARIAC TYPE V20

Input 120 volt AC 50/60 cycles output range 0-140 volts, 20 amperes.
PRICE .....$37.50 each

TYPE AN/ARN-6 RADIO COMPASS

Receiver R/101/ARNN-6. 100-1750 kc. in 4 bands. Excellent condition.
Price $34.50
Loop AS313-B. Excellent Condition. Price $27.50
Indicator ID91B/ARN-6 Excellent Condition. Price .....$ 9.95
Mounts MT-273 or MT-274 Excellent Condition. Price Ea. .....$ 9.95
Control Box C-149A. Price $15.00

MANUAL

Handbook of operating instructions, general installation adjustment plus 5 pages of diagrams and Schematics. Price $ 3.50

ANTENNA WIRE

150 ft. stranded copper on windup reel complete.
PRICE .....$2.95 ea.

12 FT. TELEPHONE STRETCH CORD

3 conductor wire with JK-53 and a U31/GT plug.
PRICE .....$1.49 ea.

SILICON RECTIFIERS

All rectifiers listed at maximum peak inverse voltage ratings; approximate forward voltage drop, 1.5 volts.

1N1446	.075	amp.	100 volts	.50
1N1447	.075	amp.	200 volts	.60
1N1448	.075	amp.	300 volts	.75
1N1449	.075	amp.	400 volts	.85
1N1450	5	amp.	100 volts	1.00
1N1451	5	amp.	200 volts	1.25
1N1452	5	amp.	300 volts	1.50
1N1453	5	amp.	400 volts	2.00
1N1454	25	amp.	100 volts	3.00
1N1455	25	amp.	200 volts	3.50
1N1456	25	amp.	300 volts	4.50
1N1458	35	amp.	100 volts	3.50
1N1459	35	amp.	200 volts	4.00
1N05P7	50	amp.	50 volts	6.00
1N1462	50	amp.	100 volts	7.00
1N1466	75	amp.	100 volts	10.00
1N1467	75	amp.	300 volts	11.00
1N1468	75	amp.	300 volts	12.50
1N05V7	150	amp.	50 volts	16.50
1N1474	150	amp.	100 volts	17.00

X-BAND POWER LEVEL TEST SET, TS-36/AP

Brand new, in original packing, was accessories. Measures 10 to 30 dbm. 8700-9500 mc.
$14.95

RT-82/APX-6 TRANSCEIVER

Easy to convert to 1215 Mc Ham Station. Good Condition. Less Tubes.....$9.95

TS-34A/AP OSCILLOSCOPE

This is ready to plug into 120 v, 60 cy. Used, but checked out and OK'd. In carrying case, less cords which are easy to make. You look into light-shielding hood, thru a magnifying lens, and the small-tube picture is same as on a 5" screen. 0-40 db attenuators in 2 db steps are so accurate that you use as a VTVM. Video flat 40 cy-2½ mc. Contin. variable sweep 10 cy-50 kc. BEST OF ALL, there is a "Start-Stop" sw. position in which pulses to be viewed each trigger their own sweep; sweeps can be varied 4½-8, 20-50, and 120-280 microseconds so accurate and linear that you use to measure pulse width. INVALUABLE TO VIEW TV PULSES! Pulses may be periodic or random, pos. or neg., as low as 0.1 v. and from a pip to 200 u-sec wd. Built-in delay lets sweep start before pulse appears. AT THIS LOW PRICE NO ONE NEED DO WITHOUT THIS WONDERFUL SCOPE!
USED, GOOD CONDITION.....$29.95

BC1335 2-CHANNEL FM TRANSCEIVER

30-39 mc. This unit is complete with 18 tubes operating from either 6 or 16 volts D.C. (Self-contained power supply). Crystal control, sensitive supreme circuit. Approx. dimensions 11" x 10" x 6". Approx. 24 lbs. Unit complete with tubes, schematic diagram and presetting instructions. Like new..$25.00

POWERSTAT TYPE 20

Input 120 volt AC, 50/60 cycle output range 0-140 volts AC, 2 amperes.
PRICE .....$9.95 each

POWERSTAT TYPE 116

Input 120 volts, 50/60 cycle output range 0-140 volts AC, 7.5 amperes.
PRICE .....$16.95 each

COAX CABLE RG59A/U

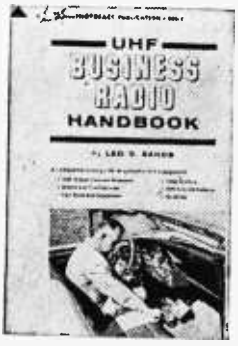
50 ft. roll complete with coax fittings.
PRICE .....$2.49 ea.

All prices FOB Pasadena unless otherwise noted. No COD's.

C & H SALES CO.
2176 E. Colorado St., Pasadena, Calif.
MUrray 1-7393

Bookmark

Business Radio. During the past few years the Business Radio Service has opened the door to thousands who wish to use two-way radio in the pursuit of their business or occupation. *UHF Business Radio Handbook* ($3.95), a 192 page soft-cover text, covers all aspects of the Business Radio Service, and UHF radiocommunications systems and techniques. Ten comprehensive chapters provide the answers to questions concerning the purpose of business radio, types of equipment and its operation, UHF mobile and fixed stations, antenna systems, servicing and the interpretation of Federal Communications Commission Rules and Regulations governing the business service.

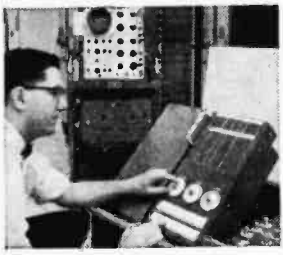


This Bookworm has known the text's author, *Leo G. Sands*, for many years dating back to one of his earlier efforts—the first hard-cover text on CB radio. Leo's credentails are of the first magnitude and so is this latest volume published by Howard W. Sams & Co., Inc. ■

"How 'ya coming, Ed?"

Pick the course for your career...

Electronics Technology



A comprehensive program covering Automation, Communications, Computers, Industrial Controls, Television, Transistors, and preparation for a 1st Class FCC License.

Electronic Communications

Mobile Radio, Microwave and 2nd Class FCC Preparation are just a few of the topics covered in this "compact" program . . . Carrier Telephony too, if you so desire.

First Class FCC License

If you want a 1st Class FCC ticket quickly, this streamlined program will do the trick and enable you to maintain and service all types of transmitting equipment.

Broadcast Engineering

Here's an excellent studio engineering program which will get you a 1st Class FCC License and teach you all about Program Transmission and Broadcast Transmitters.

Get A Commercial FCC License ...Or Your Money Back!

A Commercial FCC License is proof of electronics skill and knowledge. Many top jobs require it . . . every employer understands its significance. In your possession, an FCC Commercial Ticket stamps you as a man who knows and understands electronics theory . . . a man who's ready for the high-paid, more challenging positions.

Cleveland Institute home study is far and away the quickest, most economical way to prepare for the FCC License examination. And that's why we can make this exclusive statement:

> The training programs described above will prepare you for the FCC License specified. Should you fail to pass the FCC examination after completing the course, we will refund *all* tuition payments. You get an FCC License . . . or your money back!

Before you turn this page, select the program that fits your career objective. Then, mark your selection on the coupon below and mail it to us today. We'll send you . . . without obligation . . . complete details on our effective Cleveland Institute home study. Act NOW . . . and insure *your* future in electronics.

Cleveland Institute of Electronics

1776 E. 17th Street, Dept. EX-6
Cleveland 14, Ohio

Accredited Member

Mail Coupon TODAY For FREE Catalog

Cleveland Institute of Electronics
1776 E. 17th St., Dept. EX-6
Cleveland 14, Ohio

How to Succeed in Electronics

Please send FREE Career Information prepared to help me get ahead in Electronics, without further obligation.

CHECK AREA OF MOST INTEREST—

- ☐ Electronics Technology
- ☐ Industrial Electronics
- ☐ Broadcast Engineering
- ☐ First Class FCC License
- ☐ Electronic Communications
- ☐ _____ other

Your present occupation _____

Name _____ Age ____
(please print)

Address _____

City _____ Zone ____ State _____

Approved for Veteran's Training under Korean GI Bill. EX-6

NEW PRODUCTS

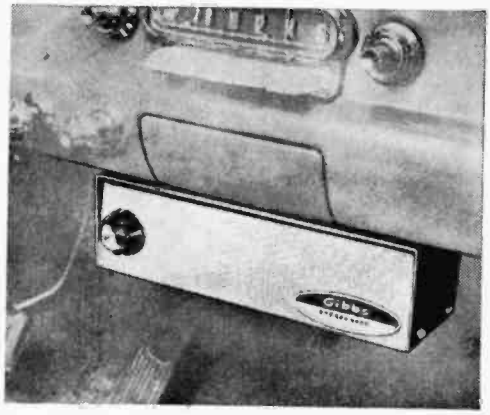
Garage Door Opener

Home owners who would like to drive right into the garage and let *electronics* open and close the garage door have a new system available—the "Alliance Genie" remote control. The transmitter and its companion receiver are certified to meet FCC rules, Part 15, Sub-Part C. The palm-sized transistorized transmitter operates on a single, low-cost

22½-volt battery on one of 21 channels and triggers the receiver from 50 to 125 feet away. The list price of the complete "Alliance Genie" remote control system, including AT-10 transmitter, AC-10 receiver mounting kit, hardware and full instructions, is $78.95 *(For more details, write to The Alliance Manufacturing Co., Inc., Dept. MJ682, Alliance, Ohio.)*

"Stereo-Verb" For Car Radio

All of the listening pleasure of stereo can now be applied to any car radio, inexpensively and in only ten minutes, with the "Stereo-Verb" made by the Gibbs Special Products Corp. The Stereo-Verb, a reverberator that connects to either your car's radio's front or rear speaker, develops a rich *stereophonic effect* by restoring natural sound reverberations that are lost in ordinary radio transmission. The device develops this effect by delaying sound through electronic



means to produce pure, large-hall tones, even inside an automobile. Priced at $34.95, the attractive unit mounts under the dashboard. *(Full details may be obtained by writing to Gibbs Special Products Corp., Division of Hammond Organ Company, Dept. 682, Janesville, Wisconsin.*

FM Communications Receivers 30-50 Mc. and 152-174 Mc.

Two new 8-tube FM communications receivers priced at $59.95 each are now available from Lafayette Radio. The HB-75 tunes 30-50 mc. and the HB-76 tunes 152-174 mc. Useful for monitoring emergency, commercial or industrial communications, the receivers offer a new bonanza to the SWL specialist. Each set has seven-tube performance with a 3-gang tuned RF stage that really

pulls-in stations. Other features include: sensitivity of 4 microvolts or less for 20 db quieting; all-electronic squelch circuit; 5" PM speaker; illuminated 7¼" slide-rule dial;

Waiting For A Lower Priced Color TV?

HERE IT IS!

Heathkit High Fidelity 21″ Color TV For As Low As $349!

The Waiting's Over! The *new* Heathkit High Fidelity Color TV with the finest color circuitry, components, and performance possible today is yours for as little as $349! Goes together quickly, easily. No special skills or knowledge required! And you enjoy quality features and "true-to-life" color pictures comparable to units costing $600 or more!

Finest Color TV Possible! 27 tube, 8-diode circuit with optional UHF • High definition RCA 70° 21″ color tube with anti-glare, bonded-face safety glass • Degaussing coil & built-in dot generator for perfect picture adjustments • Automatic Color Control • Gated Automatic Gain Control for peak performance • 24,000 volt regulated picture power • Hi-Fi sound with outputs for speaker and hi-fi amp • Deluxe Nuvistor tuner with "push-to-tune" fine tuning for individual channels • 3-stage high gain video I.F. • Line thermistor for longer tube life and thermal circuit breaker for component protection • All critical circuits factory built & tested • Can be custom mounted (requires GRA-53-3 mounting kit) or installed in handsome walnut-finish hardboard cabinet • One year warranty on picture tube, 90 days on parts.

Save On Maintenance Costs! The Heathkit instruction manual contains circuit diagrams, alignment and theory sections so *you* can easily make adjustments and replacements should it become necessary. *No* expensive service contract or calls!

Enjoy The Beauty Of Color TV with the added fun and satisfaction of a Heathkit! Wait no longer! Order yours now!

Kit GR-53, chassis & tubes, 118 lbs.....$349.00
GRA-53-1, walnut hardboard cabinet, 70 lbs...$49.00
GRA-53-3, custom mounting kit, 10 lbs.....$4.00
GRA-53-2, UHF Converter, 3 lbs.....$20.00

FREE 1964 HEATHKIT CATALOG
Gives full description and specifications of Color TV, plus over 250 others in Test, Amateur Radio, Hi-Fi, Marine, Educational fields! Send for your Free copy now!

HEATHKIT by Daystrom

HEATH COMPANY
Benton Harbor, Mich. 49023 19-4-1

☐ Enclosed is $_____, plus shipping. Please send model(s) _____
☐ Please send my Free 1964 Heathkit Catalog.

Name_____
Address_____
City_____State_____Zip_____
Prices & specifications subject to change without notice. CL-172R

and transformer-type power supply. (*Lafayette Radio, 111 Jericho Turnpike, Syosset, L. I., New York.*)

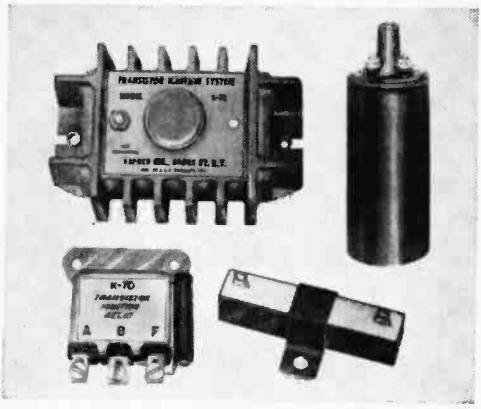
Brainac for the Brainy Child

Here is a combination informative manual and junior electrical lab that lets the junior scientist perform 32 experiments. The experiments range from simple electrical circuits, switching circuits and electric signs to information and quiz games, codes and combination locks, computing machines, and logic and reasoning machines. Circuits for the experiments can be wired upon a stamped

masonite circuit board. Two switch disks, a bank of five bulbs, supply of electrical contacts, battery holder, wire and hardware complete the equipment in the computer set. Priced at $6.95, the BRAINAC K-25 is now available in toy and hobby stores and major department stores throughout the country. (*Science Materials Center, Inc., 220 East 23rd Street, New York, New York 10010.*)

Transistorized Ignition System

Why transistorized ignition systems? Simple: elimination of bluing or burning of points; improved gas mileage; faster starting in cold weather; smoother performance at all engine speeds; higher maximum engine speeds and power output, and more just to name a few. The Kapner Model K-70 transistorized ignition system, priced at $34.95, is designed for use with any car, truck or marine engine



whether it be 4, 6, or 8 cylinders. Installation of the K-70 is accomplished without the necessity of disturbing in any way either the old ignition ballast resistance or by-pass. This trouble free feature is made possible by the inclusion of a specially designed ignition relay. The system is offered on an "examine-and-try-before-purchase" basis letting the user try before buying. (*Request free offer #L-50-682. Kapner, Inc., 1924 Washington Avenue, Bronx 57, New York.*)

Single Sideband CB Transceiver

The makers of the Mark Sidewinder Model SSB-27 CB Transceiver claim to have come up with the first true single sideband unit

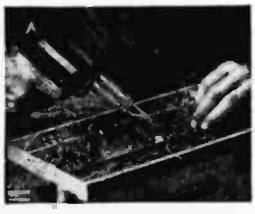
that creates 46 out of the present 23 citizens band channels, with selectable upper and lower sideband. There is no carrier to waste power or cause interference, and there is no duplicated sideband. All of the legal five

Get two soldering temperatures in a single soldering tool!

Weller® Dual Heat Soldering Gun Kit

Everything that's needed for quick, easy soldering and scores of household repairs. Features the same Weller "Expert" Dual Heat Gun that's used by professional servicemen and homecrafters the world over. Pull the trigger—tip heats instantly and spotlight illuminates work. Two trigger positions give a choice of two soldering temperatures. You can switch instantly to high 140-watt or low 100-watt heat to suit the job. By using high heat only when necessary you prolong tip life. Tip is made of copper for superior heat transfer and premium plated for rigidity and long life. Included: 3 soldering tips, tip-changing wrench, flux brush, soldering aid, solder. And everything is in a colorful, break-proof plastic carrying case. Model 8200PK. **$8.95** list
Weller Electric Corp., Easton, Pa.

For hi-fi kit building



For electrical repairs

For mending metal

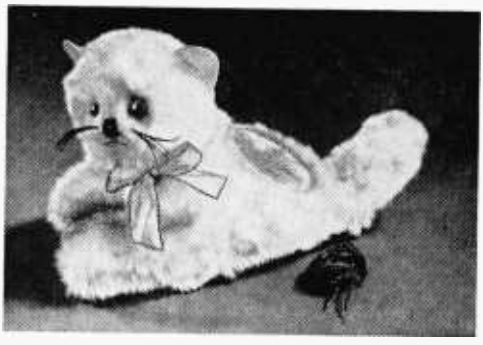
For many other jobs

New Products

watts is concentrated in only one sideband. Gone are the whistles and heterodynes normally encountered in AM. The CB net price is $299.50, but you will want to learn more about the unit to realize the price tag is a rock bottom price. Just write to the manufacturer and tell them RADIO-TV EXPERIMENTER said that all the facts can be had for the asking in Bulletin MP-63X. (*Mark Products, Division of Dynascan, 1801 West Belle Plaine Ave., Chicago, Illinois 60613.*)

Talking Cat Rear Speaker Kit

The latest addition to the "pussy cat" craze is a "Talking Cat" rear speaker kit which is both functional and decorative.



Looking more like a feline than the enclosure for a 2½ inch speaker, it provides an easy-on-the-eyes extension loudspeaker for car, home or office with ultra-simple installation (no need to drill large holes) in minutes. The cat has white fur and a pink ribbon around its neck. It comes with 10 feet of installation wire. Price: $8.95. (*Wallfrin Industries, 3820 14th Avenue, Brooklyn 18, N. Y.*)

Transistorized Hi-Fi Receiver

The latest trend in hi-fi components is the integrated wide-band AM, FM and FM Stereo tuner, preamplifiers and power amplifiers in one cabinet—usually walnut. Just add a hank of wire for an antenna and two speaker systems and presto—instant hi-fi. The new all-transistor, all-mode stereo receiver, Model AR-13, by Heathkit is just such a unit and sells for $195.00 in kit form. Some of the specifications are: 20 watts/8-ohm load

RAD-TEL'S

QUALITY

BRAND NEW TUBE SALE!

LOW, LOW PRICES--COMPARE

SAVE UP TO 75% OFF*

*Manufacturers Suggested List Price

ONE YEAR GUARANTEE

RAD-TEL WILL REPLACE ANY TUBE THAT DOES NOT GIVE EFFICIENT PERFORMANCE FOR 1 YEAR FROM DATE OF PURCHASE.

ONE DAY SERVICE

OVER 500 TYPES IN STOCK

ORDER TYPES NOT LISTED

FREE! Send For New Tube & Parts Catalog
Send For Trouble Shooting Guide

TUBE SUBSTITUTION BOOK

$1.25 No. 193

- Over 11,000 direct tube substitutes
- Only all-inclusive directory of electron tube equivalents:
  - For USA electron tubes
  - Substitutes for foreign tubes
  - Picture tubes, newer models
  - Picture tubes, older models
  - transistor replacements
  - Army-Navy, V.T. substitutes

CHEATER CORD 6 ft., No. 154..... 29¢ ea. Lots of 3—25¢ ea.

Easy to work on set while panel is off.

RAD-TEL TUBE CO. TV, RADIO AND HI-FI

DEPT. RTV. 55 CHAMBERS STREET, NEWARK, NEW JERSEY 07105

TERMS 25% deposit must accompany all orders, balance C.O.D. Orders under $5 add $1 handling charge plus postage. Orders over $5 plus postage. Approx. 8 tubes per 1 lb. Subject to prior sale. No C.O.D.'s outside continental U.S.A.

Fast, Dependable service — Selling direct by mail for over 16 years

RAD-TEL Tube Co.
Dept. RTV
55 Chambers Street
Newark, New Jersey 07105

Total Tubes $_____
Total Part(s) $_____
Postage $_____
Grand Total $_____

ENCLOSED IS $_____ Please rush order.

SEND: ____TUBE SUBSTITUTION BOOK, No. 193 @ 1.25 EACH
____Cheater Cord 29c ea. Lots of 3 - 25c ea. #154
Orders under $5.00 - Add $1.00 handling charge - plus postage.

FREE! ☐ Send FREE Tube and Parts Catalog
☐ Send FREE Trouble Shooting Guide

NAME .....

ADDRESS .....

CITY ..... ZONE..... STATE.....

EACH TUBE ATTRACTIVELY BOXED & BRANDED RAD-TEL

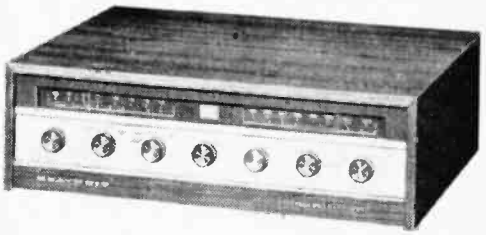
Qty. Type	Price	Qty. Type	Price	Qty. Type	Price	Qty. Type	Price
___0Z4	.79	___6AU8	.87	___6K6	.63	___12CU5	.58
___1AX2	.62	___6AV6	.41	___6S4	.52	___12CU6	1.06
___1B3	.79	___6AW8	.90	___6SA7GT	.99	___12CX6	.54
___1DN5	.55	___6AX4	.66	___6SH7	1.02	___12D4	.69
___1G3	.79	___6AX5	.74	___6SJ7	.88	___12DE8	.83
___1J3	.79	___6BA6	.50	___6SK7GT	.95	___12DL8	.88
___1K3	.79	___6BC5	.61	___6SL7GT	.84	___12DQ6	1.04
___1R5	.77	___6BC8	1.04	___6SN7	.65	___12DS7	.84
___1S5	.75	___6BE6	.55	___6SQ7GT	.94	___12DT5	.76
___1T4	.72	___6BF5	.90	___6T4	.99	___12DT7	.79
___1U5	.65	___6BF6	.44	___6T8	.85	___12DT8	.78
___1X2B	.82	___6BG6	1.70	___6U8	.83	___12DW8	.89
___2AF4	.96	___6BH8	.98	___6V6GT	.54	___12DZ6	.62
___3AL5	.46	___6BJ6	.65	___6W4	.61	___12ED5	.62
___3AU6	.54	___6BJ7	.79	___6W6	.71	___12EG6	.62
___3AV6	.42	___6BK7	.85	___6X4	.41	___12EK6	.62
___3BC5	.63	___6BL7	1.09	___6X8	.80	___12EL6	.50
___3BN6	.75	___6BN6	.74	___7A8	.68	___12EZ6	.57
___3BU8	.78	___6BQ6	1.12	___7AU7	.65	___12F8	.66
___3BY6	.58	___6BQ7	1.00	___7EY6	.75	___12FA6	.79
___3BZ6	.56	___6BU8	.70	___7Y4	.69	___12FM6	.50
___3CB6	.56	___6BX7	1.11	___8AU8	.90	___12FR8	.97
___3CS6	.58	___6BZ6	.55	___8AW8	.93	___12FX8	.90
___3DG4	.85	___6BZ7	1.03	___8BQ5	.60	___12GC6	1.06
___3DK6	.60	___6C4	.45	___8CG7	.63	___12J8	.84
___3DT6	.54	___6CB6	.55	___8CM7	.70	___12K5	.75
___3GK5	.99	___6CD6	1.51	___8CN7	.97	___12L6	.73
___3Q4	.63	___6CG7	.61	___8CS7	.74	___12SF7	.69
___3S4	.75	___6CG8	.80	___8EB8	.94	___12SK7GT	.95
___3V4	.63	___6CL8	.79	___8FQ7	.56	___12SL7	.80
___4BQ7	1.01	___6CM7	.69	___9CL8	.79	___12SN7	.67
___4CS6	.61	___6CN7	.70	___11CY7	.75	___12SQ7GT	.91
___4DT6	.55	___6CQ8	.92	___12A4	.60	___12U7	.62
___4GM6	.60	___6CR6	.60	___12AB5	.60	___12V6	.63
___5AM8	.79	___6CS6	.57	___12AC6	.55	___12W6	.71
___5AN8	.90	___6CS7	.69	___12AD6	.57	___12X4	.47

RAD-TEL TUBE CO. NOT AFFILIATED WITH ANY OTHER MAIL ORDER TUBE COMPANY

___5AQ5	.54	___6CU5	.58	___12AE6	.50	___17AX4	.67
___5AT8	.83	___6CU6	1.08	___12AE7	.94	___17DQ6	1.06
___5BK7	.86	___6CY5	.70	___12AF3	.73	___18FW6	.49
___5BQ7	1.01	___6CY7	.71	___12AF6	.67	___18FX6	.53
___5BR8	.83	___6DA4	.68	___12AJ6	.62	___18FY6	.50
___5CG8	.81	___6DE6	.61	___12AL5	.47	___19AU4	.87
___5CL8	.76	___6DG6	.62	___12AL8	.95	___19BG6	1.39
___5CQ8	.84	___6DJ8	1.21	___12AQ5	.60	___19EA8	.79
___5EA8	.80	___6DK6	.59	___12AT6	.50	___19T8	.85
___5EU8	.80	___6DN6	1.55	___12AT7	.76	___21EX6	1.49
___5J6	.72	___6DQ6	1.10	___12AU6	.51	___25AX4	.70
___5T8	.86	___6DT5	.81	___12AU7	.81	___25C5	.53
___5U4	.60	___6DT6	.53	___12AV6	.41	___25CA5	.59
___5U8	.84	___6DT8	.94	___12AV7	.82	___25CD6	1.52
___5V6	.56	___6EA8	.79	___12AX4	.67	___25CU6	1.11
___5X8	.82	___6EB5	.73	___12AX7	.63	___25DN6	1.42
___5Y3	.46	___6EB8	.84	___12AY7	1.44	___25EH5	.55
___6AB4	.46	___6EM5	.77	___12AZ7	.86	___25L6	.57
___6AC7	.96	___6EM7	.82	___12B4	.68	___25W4	.68
___6AF4	1.01	___6EU8	.79	___12BD6	.50	___32ET5	.55
___6AQ5	.70	___6EV5	.75	___12BE6	.53	___35C5	.51
___6AH4	.81	___6EW6	.57	___12BF6	.60	___35L6	.60
___6AH6	1.10	___6EY6	.75	___12BH7	.77	___35W4	.42
___6AK5	.95	___6FG7	.69	___12BK5	1.00	___35Z5	.60
___6AL5	.47	___6FV8	.79	___12BL6	.56	___36AM3	.36
___6AM8	.78	___6GH8	.80	___12BQ6	1.16	___50B5	.69
___6AQ5	.53	___6GK5	.61	___12BR7	.74	___50C5	.53
___6AS5	.60	___6GK6	.79	___12BV7	.76	___50EH5	.55
___6AT6	.49	___6GN8	.94	___12BY7	.77	___50L6	.61
___6AT8	.86	___6H6	.58	___12BZ7	.86	___70L7	.97
___6AU4	.85	___6J5GT	.51	___12CN5	.56	___117Z3	.85
___6AU6	.52	___6J6	.71	___12CR6	.67	___807	.75

New Products

(Heath Rating) or 33 watts/8-ohm load at 0.7% total harmonic distortion, 1 kc.; ±1 db from 15 cps to 30 kc at rated output; ±3 db from 10 cps to 60 kc at rated output; hum and noise at least 50 db; channel separation



40 db at 20 cps and 20 kc. Overall dimensions are 17″ long x 5⅜″ high x 14¾″ deep and has an extruded gold-anodized aluminum front panel. (*The Heath Company, Benton Harbor, Michigan.*)

Jensen Adds Multitude Of New Speakers

The Jensen Manufacturing Company, long a pace-setter in the hi-fi scene, has expanded its Concert and Viking loudspeaker lines to consist of 164 units. The new additions make it possible for Jensen distributors to fill all general purpose and replacement speaker requirements. The speakers range

in size from 2″ to 15″ in size, in a wide variety of impedances and in both oval and round shapes. Specific design speakers fill needs in the following areas: general purpose, auto, communications, theatre, hi-fi, miniature, musical instrument, and concert/fidelity. Prices vary. (*Jensen Manufacturing Company, 6601 South Laramie Ave., Chicago 38, Ill.*)

13 Boats You Can Build on a Budget

Here they are! 13 Boats designed for the amateur boatbuilder with built-in budget appeal. Their very low costs have been achieved through special economy designs that are sure to give you more boat for every dollar spent. Listed below each boat are your approximate material cost and your time of construction to make it easy to choose the boat best suited to your needs and to your budget.

Remember, too, it's easy to build a boat from an S&M craftprint—as witness over a quarter million amateur boat builders who have. Each craftprint comes complete with fully detailed, enlarged-size drawings, a complete materials list and step-by-step building instructions. No special tools are needed to build a professional looking boat from our plans, no special skills. For the boat of your dreams at a price you can afford order the craftprint of your choice today!

24—RANGER—Outboard Cruiser
Materials cost: $227.00
Construction time: 70 hrs.

17-ft. outboard cruiser. Seats four or sleeps two. Takes 25 to 50 hp motors. High-speed Vee-bottom design. All accommodations included. Plywood construction.

157—SKEETER—Light Racer
Materials cost: $31.00
Construction time: 15 hrs.

8-ft. lightning-fast, blunt-nosed racing hydroplane. Will take outboard motors up to 10 hp. Plywood and canvas construction makes it light and easy to handle.

106—PETREL—Multi-purpose sloop
Materials cost: $163.00
Construction time: 85 hrs.

16-ft. sailer that can be built as an open-cockpit racing craft or as a cabin sailing model with accommodations for overnight trips. Can also be adapted to outboard or air-cooled inboard motors from 1 to 6 hp. Seats four. Weight complete, 650 lbs.

165—YELLOW JACKET—Racing Hydro
Materials cost: $39.00
Construction time: 20 hrs.

8-ft. Class A racing hydroplane for use with 7½ hp motor. Fast, seaworthy. Simple construction.

150—NANCY JANE—Inboard Runabout
Materials cost: $137.00
Construction time: 120 hrs.

19-ft. all-purpose inboard runabout of durable cockpit design with or without cabin. Takes marine or converted auto engines up to 100 hp. Single screw. Plywood construction over oak frame.

239—SEA ROVER—Tri-model Outbd.
Materials cost: $212.00
Construction time: 65 hrs.

Can be built as a sports, utility or cabin model in either a 15 or 17 ft. length. Weight of hull: 350 lbs. Capacity: sports model seats three persons in forward seat and four persons in cockpit on aluminum folding chairs. Construction is exterior plywood over framework. The unusual design of this boat gives it excellent maneuvering qualities.

154—MUSTANG—Speed Runabout
Materials cost: $62.00
Construction time: 38 hrs.

16-ft. high-speed runabout that seats three comfortably. Ideal for use with motors up to 8 hp. Good auto-top boat. Sturdy plywood construction.

267—SCAT CAT—3 Point Racer
Materials cost: $58.00
Construction time: 45 hrs.

8½-ft. 3-point racing hydroplane meets requirements of Class A and B racing rules. New advanced hull design. May be built in fraction of time ordinarily required for such a craft. Three-ply fir over spruce construction.

206—TERN—Sailing Racer
Materials cost: $153.00
Construction time: 75 hrs.

There's a charm about the tiller of a sailer that's not matched by the wheel of a motor-powered boat. Even with her 72 sq. ft. of sail, "Tern" is remarkably stable, and packs as many as four persons aboard. She's remarkably easy to build. Common hand tools are all you really need.

201—PLAYBOY—Sports Runabout
Materials cost: $155.00
Construction time: 50 hrs.

Sharp! Styled like a sporty inboard—that's "Playboy." From her wrap-around spray rails to the forward cockpit, "Playboy" simply exudes class—superior to any factory-built runabout in looks and performance. With a Johnson or Evinrude 35, "Playboy" will step around lively at 32 mph. Length, 14 ft. Beam, 5 ft. 9 in. overall. Weight of hull, 300 lbs. with all equipment aboard except motor. Ideal for extended trips afloat, hauling water skiers and aquaplanes, or as a sporty fishing craft.

270—SEA FLEA—Midget Sailer
Materials cost: $33.00
Construction time: 24 hrs.

The lug rig utilizes short, easily dismantled spars that can be carried atop an auto as conveniently as the boat itself. Length, 10 ft. Beam, 48 in. Weight: Hull, 90 lbs.; spars, 15 lbs.

210—SEA BABE—Sports Cruiser
Materials cost: $254.00
Construction time: 70 hrs.

15-ft. sports cruiser, ideal for trips in protected waters, hauling water skiers or aquaplanes and trolling or deep-water fishing. Sleeps two persons for overnight cruising or seats four persons. Speeds up to 32 mph with a 25 hp outboard. Handles easily on a 2-wheel trailer.

266—GLIDE EASY—Canoe
Materials cost: $50.00
Construction time: 30 hrs.

15-ft. combination plywood and fiberglass construction. Can be used as a double-ender-paddling canoe or with square stern and powered by outboard motors up to 4 hp. Includes plans for outrigger and pontoon.

THE CRAFT PRINTS ABOVE ARE $3 EACH

SCIENCE & MECHANICS / Craftprint Division
505 Park Avenue, New York, N. Y. 10022 90

Enclosed is $_____ for which please send me the boat plans circled below.

24 106 150 154 157 165 201
206 210 239 266 267 270

Complete plans for any of the above boats are $3.00 for each plan ordered. However, if you order two or more plans at the same time, you may deduct 25¢ per plan. That is, for two plans you may deduct 50¢; three plans 75¢, etc.

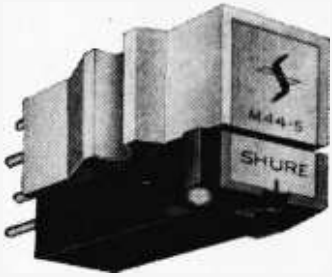
Name_____
(Please print)
Address_____
City_____ State_____ Zip Code_____

(Sorry, no C.O.D.'s or stamps. Satisfaction guaranteed or money refunded.)

New Products

15° Stylus Hi-Fi Cartridge

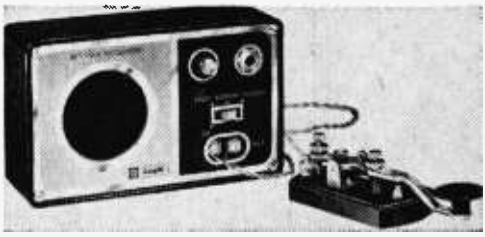
The new Shure Stereo Dynetic cartridge, called the M44, represents a notable advancement in cartridge design. It is one of the first to use a 15° stylus especially set to track records at the same effective vertical



stylus angle major recording companies are now using to cut records. The 15° angle has also been proposed as the standard of the Record Industry Association of America and the Electronic Industries Association. The M44 reduces IM and harmonic distortion form 75% to 90% when compared to previous *distortion-free* cartridges. The stylus is tipped with a diamond with either a .0005 or .0007 diameter tip—$49.50 and $44.50 respectively. (*Complete specifications are available from Shure Brothers, Inc., Dept. 682, 222 Hartrey Avenue, Evanston, Illinois.*)

Simple Kit Makes Code Practice Oscillator

The Knight-Kit model LC-1 code practice oscillator is specially designed to lend a helping hand to aspiring Hams, scouts, students,



hobbyists and short-wave listeners wishing to learn Morse Code. The kit includes an adjustable hand key and provides code reception via built-in loudspeaker, external headphones, or by means of a flashing light.

Power is obtained from a "C" battery. Construction time is a few hours. Price: $7.95. *(Allied Radio, 100 North Western Ave., Chicago, Ill. 60680)*

36-Watt Stereo Amplifier

A new addition to the EICO Classic Series is the Model 2036 36-watt integrated stereo amplifier. If you prefer continuous power, the unit is rated at 28 watts, total of both channels. Harmonic distortion at 10-watts per channel is 0.5 per cent and the unit exhibits excellent overload, transient, and regulation characteristics. Considering the price (Kit—$74.95, Wired—$114.95) here are two specifications that bring the Model 2036 into the *best buy* category: IHFM power bandwidth at rated continuous power, 1% harmonic distortion—30 cps to 20 kc., and

frequency response—±1 db from 15 cps to 40 kc. Noise is down 65 db on phono input, 80 db on tuner, tape and AUX inputs. *(EICO Electronic Instrument Co., Inc., 131-01 39th Avenue, Flushing, New York 11352)*

Photo-Electronic Relay System

The new Lafayette PC-45 Photo-Electronic Relay System is a complete warning or counting system consisting of two units—a light projector and a relay. Uses of the PC-45 include an intrusion alarm, a counter for merchandise or people, and to signal the arrival of persons entering a room or store. A removable infra-red filter is used on the light projector when the PC-45 is used for security purposes. Maximum operating distance between units is 15 to 20 feet with the filter, 35 to 45 feet without the filter. The device may be used to trigger electric bells, buzzers and counters. Price: $18.95. *(Lafayette Radio Electronics Corp., 111 Jericho Turnpike, Syosset, L. I., N. Y.)* ■

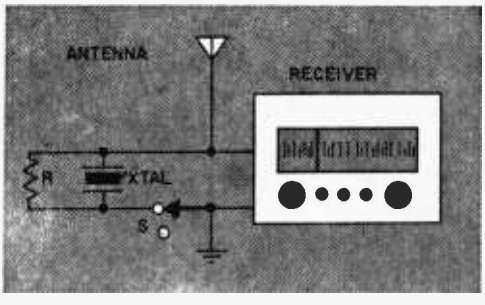
Ask Me Another

By Joseph Marshall

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

Question: I want to listen to a station on 1500 kc., 300 miles away; but a local station on 1520 kc., causes too much interference. What can I do to eliminate the interference?
GAS, Cranford, N.J.

Answer: The simplest and least expensive way to handle this problem is to obtain a transmitting type crystal cut for 1520 kc., and connect it as indicated below, with a switch so you can cut it out of the circuit when you want to listen to the local station. Suitable crystals can be bought surplus for as little as one dollar, or for between $3.00 and $5.00 from Texas Crystal Co. and other crystal manufacturers. A tolerance of .05 percent is good enough. If you still have interference from the sidebands, try resistors across the crystal from 50 ohms up; use the highest value that will do the job.



Question: I note that the transmission of music by amateurs is banned. Why?
ADC, Los Angeles, Calif.

Answer: Once upon a time amateurs were permitted to test with music; but as so often happens the privilege was abused and tests became broadcasts. The FCC then banned musical transmission.

It makes sense. No really useful purpose is served in amateur service by transmitting music and unless the bandwidth of the transmitter is carefully limited to 3 kc., music can produce sidebands 10 kc. or more from the carrier and thus cause a great deal of interference. On the other hand if the bandwidth is limited to 3 kc. music is scarcely worth listening to.

Question: Can you give me the titles of some books on fundamentals of radio and electronics that are really simple to understand?
LJ, Bryan, Ohio

Answer: We think one of the best is our own ELEMENTARY ELECTRONICS. The 1964 edition should be obtainable on your newsstand for only 75¢. We can also recommend the following:

Getting Started in Electronics
Allied Radio Corp. #37K705 50¢

Understanding Amateur Radio
American Radio Relay League 2.00

ABC's of Electronics
Howard W. Sams Co. 1.95

After a few bites of the above you should be able to make sense out of:

Radio Amateur's Handbook
American Radio Relay League 3.00

In each and every issue of RADIO-TV EXPERIMENTER there is an interesting column called *Bookshelf* that highlights the best in hard and soft cover books. The column's author, *Bookworm*, reviews both new and old texts that are rated the best in their areas.

Your local library undoubtedly has others that will serve the need. Why not visit it and look over the shelf on radio and electronics and pick one that seems right for you.

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

Answer: Research also shows that the average American male wears a size 40 suit

Ask Me Another

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

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

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

Question: Exactly what causes an FM tuner to distort the signal of some stations. None of the books I consulted could specifically answer the question?

SRW, Los Gatos, Calif.

Answer: In FM transmission the higher the modulation level the wider the bandwidth of the transmitted signal. If the tuner has a wide enough bandpass to accept the wide deviation there is no distortion; but if the tuner bandpass is narrower than the deviation of the signal, there will be distortion.

A deviation of 75 kc. is allowed for FM broadcasting. Theoretically, a receiver needs a bandpass of around 240 kc. to pass a fully modulated signal without distortion. Very few tuners do; most have a bandpass between 150 and 200 kc. This is usually sufficient because the maximum deviation occurs usually on occasional peaks and at the very highest frequencies only.

But some stations use a lot of compression or limiting, so that their *average* modulation tends to approach the maximum permissible level. The result is that the distortion occurs a considerable percentage of time, instead of only occasionally, and is of course very noticeable.

Question: I notice that most experts have a very high opinion of acoustic suspension speakers like the AR and KLH; but they sound dull and dry to me as compared with several others. I really favor another speaker but on the other hand I don't like to go against the judgment of so many people who ought to know. What do you say?

E.G., Aiken, S.C.

Answer: The obvious answer is to go ahead and buy the speaker you like and the devil take the experts; after all it's you, not they, who's going to be listening to it.

On the other hand, there is this to be said for the experts—a lot of the best things in life take getting used to—like very-dry, very-pale sherry, caviar, camembert cheese, yenidge tobacco, and black-eyed peas, not to mention snails, whether French or Chinese, and abstract art. The tastes of experts and connoisseurs are always more highly developed and sophisticated than those of the newcomer to any field. Specifically, in the case of speakers, the expert usually listens for sharp definition and the ability to reproduce the finest detail of music. The dullness and dryness you mention is evidence of a fine transient response which reveals the fine detail. On the other hand the brightness you like evidences some hangover which, though it may produce a liver, more reverberant and possibly even a more pleasant sound, tends to obscure the finer details of music and sound.

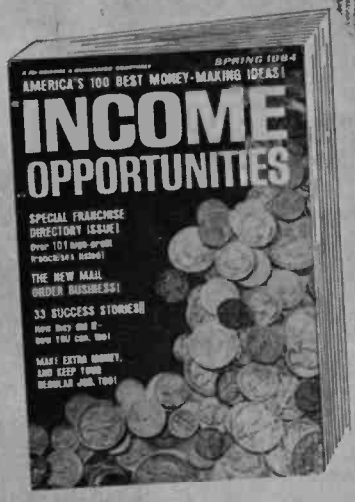
Your choice should be based not so much on the word of experts or your own off-the-cuff judgment or preference, but on how you want to enjoy the music or sound that comes from the hi-fi. If you want the maximum detail, choose as the experts choose because that's their criterion; but if your interest in music is casual, or more emotional than analytical, choose the speaker that sounds best and produces the highest emotional appeal to you. But remember, you too may like caviar, camembert, or black-eyed peas if you permit yourself to acquire a taste for them.

(Continued on page 36)

MAKE MORE MONEY

This amazing book is chock-full of proven money-making ideas and enterprises!

On sale at leading newsstands ONLY 75¢ per copy (or use coupon below)



Here are dozens of ways you can be your own boss—successfully—on a part-time or full-time basis. You get first-hand information through success stories that show the growth of ideas that have resulted in high profits. Yes, you'll find the magic formula in the pages of INCOME OPPORTUNITIES. Here is the best investment you'll ever make.

Look at just a few of the subjects covered in this astonishing volume:

Secure Your Future with a Franchise • How to Sell by Mail • Business Briefs • Cash in on Carry-Out Food • Multi-Line General Store • There's Dollars in Donuts • No Sale . . . But Business Booms • Motels and Vacation Homes • Placing People for Profit • Tape Recording Weddings • The Payoff is Puppies • Pairing People for Profit • Home Party Selling • Cash In on Cleaning Cars • Running a Re-Sale Store • *plus* a giant bonus section: Directory of Franchise Offers.

Use the coupon below to order your copy—better than that, order a special 4 issue subscription to INCOME OPPORTUNITIES—only $3.00.

YOU'LL ALSO BE INTERESTED IN:

INVESTOR'S GUIDE—A Handbook for the individual investor: whether new or experienced. Filled with tips by the experts on how to investigate before you invest. Studies of various investing methods. $1 per copy.

HOME STUDY COURSES—An invaluable guide to college and trade school correspondence courses for those desiring to train for a career in growth fields. Gives time and scope of training plus job prospects. Available February 1st. $1 per copy.

SCIENCE & MECHANICS HANDBOOKS / 505 PARK AVENUE, NEW YORK, N. Y. 10022

Enclosed is $_____. Rush the S&M Handbooks checked below. Each book is $1 (includes postage and handling).

- ☐ No. 676 Newest Edition of Income Opportunities
- ☐ No. 658A Fall Edition of Income Opportunities
- ☐ No. 672 Investor's Guide
- ☐ No. 679 Home Study Courses

☐ Enclosed is my full payment of $3. Send me a special 4 issue subscription of INCOME OPPORTUNITIES. I don't want to miss a single copy! Start my subscription with the newest edition.

Name_____
(Please print)

Address_____

City_____ State_____ Zip Code_____

Classified MARKET PLACE

For information on Classified ads—to be included in our next RADIO-TV EXPERIMENTER HANDBOOK and other Handbooks—write C. D. Wilson, Mgr., Classified Advertising, SCIENCE & MECHANICS HANDBOOK DEPT., 595 Park Ave., New York, N. Y. 10022

AUTHOR'S SERVICE

WANTED: Book manuscripts, all descriptions: fiction, nonfiction, religious, adventure, romance, biography, etc. for sale to royalty publishers. Write: Literary Agent Mead, Dept. 33A, 915 Broadway, New York City 10.

PUBLISH your book! Join our successful authors; publicity advertising promotion, beautiful books. All subjects invited. Send for free manuscript report and detailed booklet. Carlton Press, Dept. SMH, 84 Fifth Avenue, New York 11.

AUTO TRAILERS & SUPPLIES

BUILD Expanding eight foot Trailer. Accommodates five. Literature 10¢. Fra-Mar Company, Wilmington, Mass.

BOATS, MOTORS & MARINE SUPPLIES

BOAT Trailers. 6 Different Plans. Manual $2.50. Wholesale prices, circulars 30¢. Kamcraft, Box 1153, Milwaukee 1, Wisconsin.

BRITISH Seagull Outboard Motors—Shipped Anywhere. Imco, 76 E. Jackson, Wilkes-Barre, Pennsylvania.

BESTSELLER Boatfixit Book. Everything on Small Boats. Motors, sails, hulls. A Complete non-technical manual 60¢ postpaid. 2 for $1.00. Boatfixit, Box 714, Manhasset 3, N. Y.

BUSINESS OPPORTUNITIES

I Made $40,000.00 Year by Mailorder. Helped others make money! Start with $10.00—Free Proof. Torrey, Box 3566-T, Oklahoma City 6, Okla.

AMAZING New Guide, "How To Acquire An Adequate Income For Life." Information Free! Mann, H-266, Hillsdale, New Jersey.

CAMPING, EQUIPMENT & TENTS

WORLD'S largest selection of Camping Equipment, Tents, Sleeping Bags. Send 25¢ for 96 page catalogue. Morsan, 810-Q Route 17, Paramus, New Jersey.

FAMILY Campground—Beautiful Sites. Pool. Brochure. Box 136, Spring Glen, New York.

COINS, CURRENCY & TOKENS

TRUNKFUL 25,000 Indian-Lincoln cents mixed (from the 1920's & older). Will pack "Grab-Bag" style. 400 mixed—$25.00. Sample bag of 20—$2.00. Mrs. Fischer, Box 5490, Sherman Oaks 119, California.

UNCIRCULATED 1935 Pony Express Silver Commemorative Medal $1.00. Coin Lists Free. Sayers, 1000 Unaka, Johnson City, Tennessee.

EARTHWORMS

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

EDUCATION & INSTRUCTION

OIL Color Photographs at Home. Good spare-time income, interesting hobby. New, easy method qualifies you for immediate earnings. Write for Free Booklet. "Magic of Photo Coloring." Hamilton Studios, Box 39, Dept. T-14, Claymont, Delaware.

COMPLETE Your High School at home in spare time with 67-year-old school. Texts furnished. No classes. Diploma. Information booklet free. American School, Dept. X-34, Drexel at 58th, Chicago 37, Illinois.

EMPLOYMENT INFORMATION

OVERSEAS Jobs, List $2.00 (cash). Universal, P.O.B. 643-A, Kenosha, Wisc.

HOW to find vacancies not advertised for a better job, $2.00. Walter Kazaks, 234 East 58th Street, New York 22.

FIREARMS & AMMUNITION

NEW, 20-page catalog contains pictures, specifications and prices of Marlin Guns for 1964 . . . 35 different models of rifles and shotguns in all . . . at prices ranging from $17.95 to $126.95. This comprehensive catalog gives you all the information needed to select the best gun for anybody young or old . . . novice or marksman . . . target-shooter or big game hunter. You'll also learn why America's finest marksmen and huntsmen agree . . . "you pay less and get more from a Marlin." Bonus: Copy of the Bill of Rights, guaranteeing Americans the right to keep and bear arms printed on parchment paper and suitable for framing included free with every catalog. Write Dept. 373C, The Marlin Firearms Co., New Haven 2, Connecticut, U.S.A.

FLORIDA LAND

FLORIDA Lake Living, Homesites near everything. Established area. $390 Full Price—$5.00 Month. Write: Lake Weir Shores 88, Silver Springs, Florida. Ad-1070-(F-O).

FOR INVENTORS

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

FORMULAS & TRADE SECRETS

FORTUNES In Formulas—10,000 trade secrets and formulas—Book—867 pages—$3.95 prepaid—cash-check-M. O. Southern Enterprises, Box 246, Atlanta, Ga. 30303.

HI-FI EQUIPMENT

MIRACLE Hi-Fi enclosure, construction plans $2.00. Gough & Company, Box 254A, San Carlos, Calif.

HOME WORKSHOP SUPPLIES

SCREWS, Nuts, Bolts and Washers Assortment in Plastic Box $1.00 Postpaid. Write for Free Catalog. Mapes Home Supply Company, Box 169, Whitesville, N. Y.

HYPNOTISM

NEW concept teaches you self-hypnosis quickly! Free literature. Smith-McKinley, Box 3088, San Bernardino, Calif.

MONEY-MAKING OPPORTUNITIES

MEN-WOMEN! Start Money-Making Plastic Laminating Business at home in spare time. Materials that costs 11¢ brings back $2.58. No canvassing or selling but mail orders bring in $20.00 a day. Write for full particulars free. Rush name on postcard to Warner, Room CL-426J, 1512 Jarvis, Chicago 26, Ill.

MAKE Money Writing Short Paragraphs! No tedious study. I tell you what to write, where and how to sell; and supply list of editors buying from beginners. Many small checks add up quickly. Write to sell, right away. Send for free facts. Benson Barrett, Dept. C309-H, 7464 Clark, Chicago 26.

EASY to start rubber stamp business at home in spare time. Make up to $9.80 an hour without experience. Facts free. Write to Roberts, 1512 Jarvis, Room CR-426J, Chicago 26.

OF INTEREST TO WOMEN

$25.00 DAY Easy With 60% Profit! Friends, neighbors will thank you for demonstrating new beauty secrets and glamorous ways to use famous Studio Girl Hollywood Cosmetics. Information I send quickly qualifies you as Beauty Advisor. $5.00 hour for spare time alone . . . or $25.00 day full time. Send name on postcard to me personally for free samples, details. Harry Taylor, Studio Girl Cosmetics, Dept. 58X43, Glendale 1, Calif.

PATENT SERVICE

PATENT Searches, $6.00! For free "Invention Record" and "Important Information Inventors Need," write: Miss Hayward, 1029-D Vermont, Washington 5, District of Columbia.

PETS—DOGS, BIRDS, RABBITS, ETC.

MAKE big money raising rabbits for us. Information 25¢. Kenney Brothers, New Freedom, Penna.

PHOTO FINISHING, ETC.

30 WALLET Photos $1.00. 2 beautiful 8x10 enlargements $1.00. Finest Oil color 8x10 $2.00. Dick's Photo, Louisville 12, Ky.

RADIO & TELEVISION

TELEFIXIT: Alltime Best Seller. Non-technical TV Repair Book with famous troubleshooting charts 60¢ postpaid. 2 for $1.00. Telefixit, Box 714, Manhasset 3, New York.

SALESMEN—DISTRIBUTORS

YOUR Own Business Without Investment! Sell advertising matchbooks to local businesses. No experience needed—free sales kit tells how and where to get orders. Part or full time. Big cash commissions. Match Corporation of America, Dept. JO-34, Chicago 32.

START YOUR OWN BUSINESS

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

Exclusive with **RCA** ...

AUTOTEXT®
new, faster, easier way toward a career in electronics

EXCLUSIVE WITH RCA. "AUTOTEXT," developed by RCA and introduced by RCA Institutes, Inc., is a system of programmed instruction, accurately planned so that as you read a series of statements, questions, and answers, you learn almost without realizing it! It's fast! It's easy! It's fun!

NEW TREND IN EDUCATION! Programmed instruction has been proved with thousands of students. People who have had trouble with conventional home training methods in the past can now master the fundamentals of electronics almost automatically!

PROVE IT TO YOURSELF NOW! An interest or inclination in electronics is all you need. RCA "AUTOTEXT" will help you do the rest. And the future is unlimited; the jobs are available! The important thing is to get started now!

COMPLETE COURSE AVAILABLE. RCA Institutes now offers you a complete Home Training Course ("Introduction to Electronics") using the "AUTOTEXT" method. You get a complete set of theory lessons, service practice lessons, experiment lessons, and all the kits you need. You'll learn faster with less effort!

FREE OFFER!

We'll send you complete information on the amazing new RCA "Autotext", along with a FREE SAMPLE of a Home Training lesson to prove to you how easy it is to learn this new way. Check "Autotext", and information will be rushed to you.

Complete selection of Home Training Courses, in addition to "AUTOTEXT" Introduction to Electronics.

- Electronic Fundamentals (also available in Spanish)
- TV Servicing
- Color TV Servicing
- Communications Electronics
- FCC License Preparation
- Mobile Communications
- Computer Programming
- Electronic Drafting
- Automation Electronics
- Transistors
- Industrial Electronics
  - Automatic Controls
  - Industrial Applications
  - Nuclear Instrumentation
  - Digital Techniques

- **LIBERAL TUITION PLAN FOR ALL HOME TRAINING COURSES**

This plan affords you the most economical possible method of home study training. You pay for lessons only as you order them. If, for any reason you wish to interrupt your training, you can do so and not owe one cent. No other obligations! No installment payments required.

- **YOU GET PRIME QUALITY EQUIPMENT**

All kits furnished with home training courses are complete in every respect and the equipment is top grade. You keep all the equipment furnished to you for actual use on the job, and you never have to take apart one piece to build another!

Licensed by the New York State Department of Education. Approved for Veterans.

Classroom Training Available in New York City, and Cherry Hill (near Camden) New Jersey.

Send postcard for free illustrated book today! Specify home training or classroom training!

RCA INSTITUTES, INC., Dept. RX-44
A Service of Radio Corporation of America
350 West 4th St., New York, N. Y. 10014

RCA®

THE MOST TRUSTED NAME IN ELECTRONICS

Ask Me Another

(Continued from page 30)

Question: I have my FM tuner and TV connected to the same antenna with a two-set coupler. This works fine except that when I tune the FM to a station on 94.9 mc, I get serious interference on TV channel 13. What causes this and what can I do about it?

EP, Winslow, Maine

Answer: When your FM is tuned to 94.9 mc, the local oscillator is operating at 105.6. The second harmonic, 211.2 is smack in Channel 13. Hence, the interference.

You could make a harmonic filter and install it between tuner and coupler but actually the sensible solution is not to use the FM when you're looking at Channel 13. Or else, listen to FM stations above about 100 mc so the second harmonic falls outside channel 13.

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

L.P., Brooklyn, N.Y.

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

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

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

The assumptions are by no means completely valid; but even if they were the resulting rating doesn't offer much guidance and can be quite deceiving because it makes a poor amplifier look much better than it is and a good amplifier little of any better than it is.

It is almost as if we measured the power of automobiles by replacing the motor that we are going to buy, with another more ideal motor. With this procedure the *Falcon* would enjoy a much greater improvement in rating than a *Jaguar* or *Ferrari* which already have nearly ideal motors. The music power output of a poor amplifier may be twice as high as its continuous sine wave power output; on the other hand in the case of the superb amplifier there may be little if any difference. Hence, two amplifiers with the same music power output may have a difference as great as 50 per cent in their continuous sine-wave power output.

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

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

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

Question: I plan to take two Edu-Kit courses. Both of these include a broadcast receiver and transmitter. I wonder if the transmitters would be of good enough quality to use in Novice amateur operation? After I get my General license I would naturally go to bet-

ter equipment.

TB, Evansville, Ind.

Answer: The courses are excellent ways to learn about radio. However, the transmitters would not be suitable for amateur operation although they will teach you a good deal about transmitters. By all means take the courses, but figure on buying more suitable equipment for actual use on the ham bands.

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

T.C.K., Clearwater, Fla.

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

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

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

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

Of course, if you have a one-package deal in which the speakers and changer are mounted in the same cabinet there is nothing much you can do except keep the volume low and the bass down.

Question: Is it possible to obtain a schematic diagram of electronic equipment by sending a patent number to the patent office? If this is not a practical way of obtaining schematics is there a way of getting them other than

Ask Me Another

waiting for a magazine to publish them?
RJH, Lincoln, Nebr.

Answer: Electronic patents do include schematics of the specific circuit patented. However, this is not a practical way of obtaining schematics for a specific radio, TV, or other gadget. First, the schematics are usually very generalized and sometimes in block form and would require considerable engineering knowledge to adapt to useful form. Secondly, the patent is always for one specific portion of piece of equipment, and even if you got all of the dozen or more patents covering a piece of gear, you wouldn't have anything useful.

The manufacturer of a radio, TV or test instruments will usually supply a schematic or service manual for a small charge or none at all. Service manuals of TVs, radios, phonographs, hi-fi amplifiers, etc., can also be obtained from Howard W. Sams & Co. Inc. 4300 W. 62nd St., Indianapolis, Ind. for $2.25 a set. Schematics of older radios can be obtained from Rider Manuals and most city libraries have complete sets of these which you can consult.

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

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

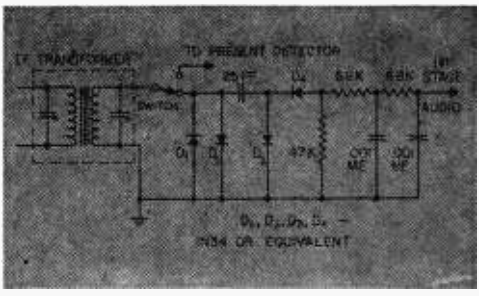
Transistors cannot be serviced or tested safely with the ordinary type of equipment used for tube amplifiers, TV's and radios. Putting the probe of an ohmmeter on a VTVM at the wrong spot could destroy a transistor or two. There are special instruments for safely trouble shooting transistor gadgets such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

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

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

Question: I added the converter you described some time ago to my broadcast receiver and it works fine. Can you give me the circuit for an FM detector I can add to it now?
FF, Ontario, Canada

Answer: The simple circuit diagrammed below will operate with I.F. between 125 and 500 kc. It should be switched into the circuit in place of the present diode detector. However, assuming you use it with a broadcast or communications receiver, it will only detect narrow-band FM such as is permissible but seldom used on the ham bands; and possibly that used in the 30-40 mc emergency services band. It will not provide reception of stations on the FM broadcast band which require a bandpass at least 150 kc. wide. But it is a very convenient, simple and inexpensive way to add capability of receiving FM to an amateur receiver. For FM reception disable the AVC and run the R.F. gain up as high as possible.



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

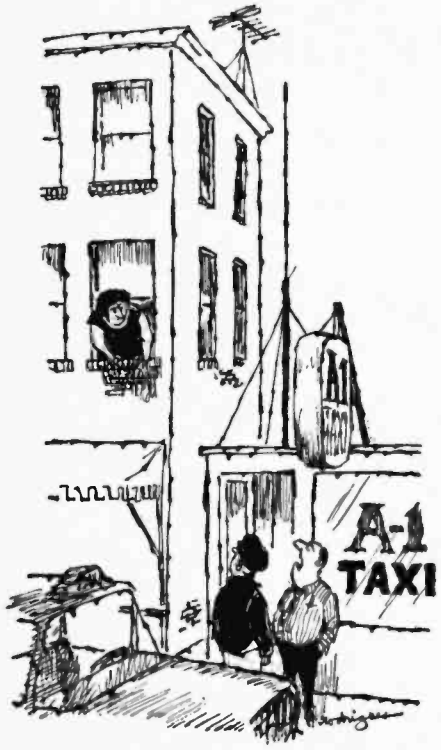
Answer: Take your discs into the kitchen. Dissolve a couple of pinches of detergent

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

Question: If one does not understand the language spoken by a foreign station, what data should one take down to prove reception when sending for a QSL card?

EJR, Philadelphia, Pa.

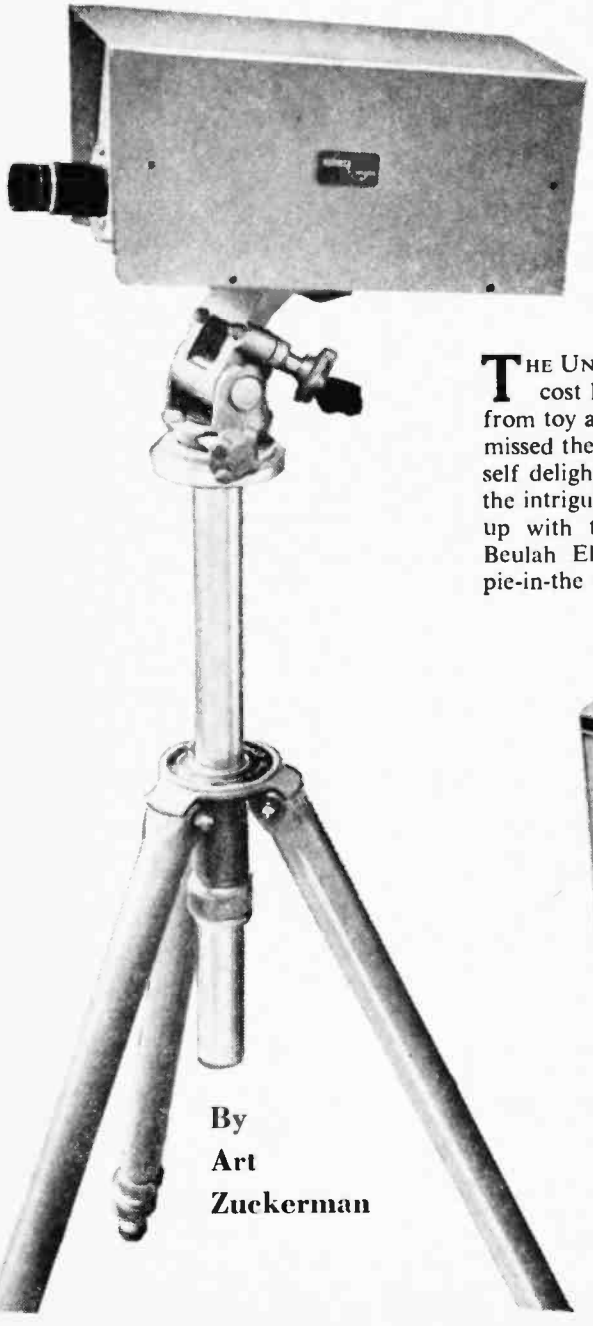
Answer: Note the exact time in Greenwich Mean Time. State whether voice or music, and if voice, whether male or female; if music, give general description—like brass band, symphony, guitar, etc. . . . Give the station frequency as near as you can and the quality of reception. Add any other information that you may understand or deduce. ■



"You keep getting us on your TV set? So whaddya want, a QSL card?"

INTRODUCING THE FIRST

TV CAMERA KIT



By
Art
Zuckerman

THE UNITED STATES, which can lay claim to low cost kits which go together to form anything from toy autos to electronic organs, seems to have missed the boat with the latest low cost do-it-yourself delight—nothing less than a TV camera with the intriguing name of "Beukit." The British came up with this particular gem, more specifically, Beulah Electronics of London. And this is no pie-in-the sky thing that we can *look forward to;*

Designed and packaged for the kit builder, the TV camera kit is easy to put together.

the Beaukit is here *now*, right in the United States, and for about $250.

Unlike the spectacularly low priced (but still unavailable) home video recorder, you can order a Beaukit TV camera from the American distributor, Olson Electronics, 260 South Forge St., Akron 8, Ohio.

What is it? Like virtually all closed-circuit TV cameras, the Beukit used a vidicon-type tube. Vidicons were the first broadcast cameras and are still used, especially to scan film clips and other projected artwork.

To use the Beukit, you need only to attach a length of output cable from the camera to the antenna terminals of any standard, unmodified TV receiver and switch to an unused channel. Should the home video *recorder* ever hit the market, Beukit's makers say that the two units may be used in conjunction with each other.

The camera is designed around an all-transistor circuit. A printed-circuit board, diagrammed and numbered to easily show the location of all components, makes construction relatively simple. The manufacturer claims that the average kit builder should be able to assemble the camera in about 20 hours, following the step-by-step instructions provided for the 154 parts.

Features. Simplicity is a major design factor. For example, a newly developed, wide-band video amplifier calls for the builder having to tune only *one* coil slug. As a result, the unit may be constructed and placed *on-the-air* without the need for special complex and expensive TV test equipment. Other circuits are combined in one modular unit.

An interesting feature of the Beukit is its f/2 lens, the equivalent of a 1½" lens which can focus from infinity to 9 inches. Unlike film-camera lenses, it has a fixed diaphragm.

Light values are electronically adjusted by the varying of the camera's beam and target voltage controls, with the electronic fine-focus adjusted by a third control. These controls, simple as they may be, nevertheless permit Beukit to be operated in normal room lighting without the need for special floods or movie lights.

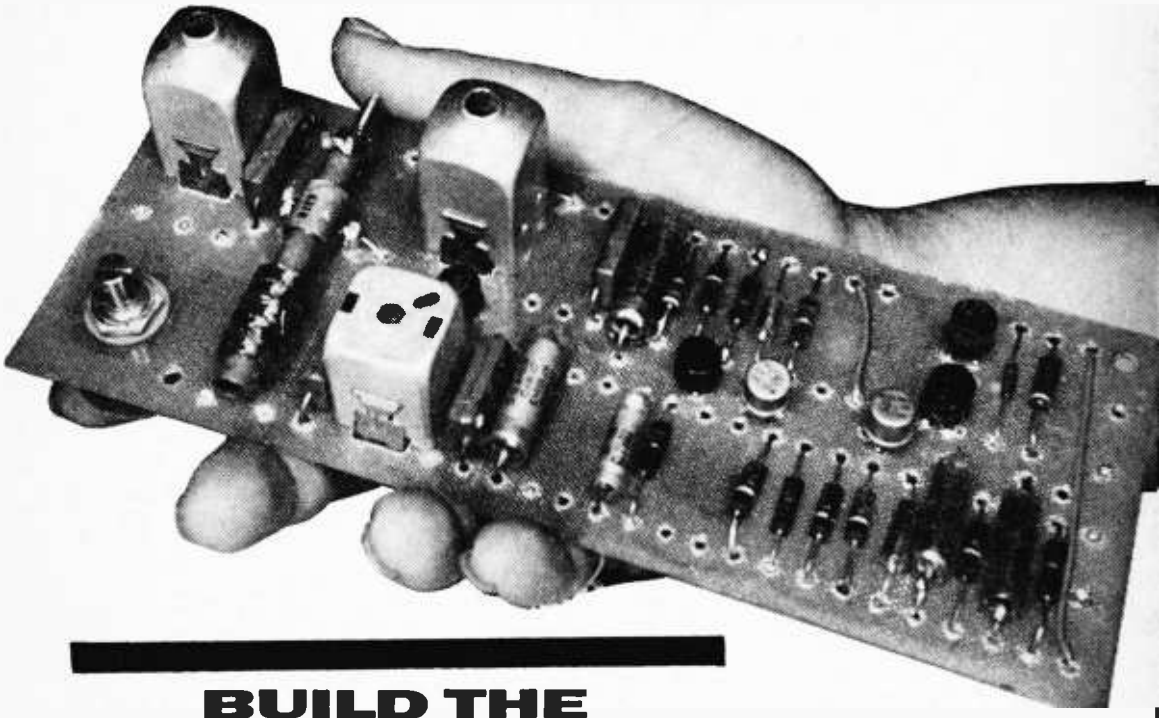
The Beukit camera's vidicon pick-up is a standard 1-inch type and the low-cost model "basic" Beukit admittedly performs below broadcast standards with its 2.5 mc/s resolution. While this may, at first, appear to be a distinct disadvantage, the pictures delivered by Beukit are perfectly acceptable for all home uses and most industrial applications. The photo on the preceding page shows an actual TV reproduction via the Beukit.

The Beukit weighs-in at only 10½ pounds and measures 12" deep, 6" wide, and 6" high. Unlike a broadcasting type TV camera, there is no provision for optical sighting or visual monitoring at the camera. This must be done by checking the transmitted images on a TV receiver, a normal enough arrangement for closed-circuit TV cameras costing much more than Beukit.

Designed and packaged for the kit builder, the TV camera kit is easy to put together.

The version of the Beukit which is being supplied in the United States is compatible with the 525-line American television standard and will operate on our 115-volt 60-cycle alternating current lines, this will produce 60 frames (or pictures) per second.

We can see many uses for the Beukit TV camera. Its low price and easy assembly should help it to become popular as a "TV intercom," a baby sitter, a source of party games, and even a unique method of showing home movies. The manufacturer points out that, if used with a microscope, it can put the world of invisible critters on the video screen. ■



BUILD THE

Third Channel Music Adapter

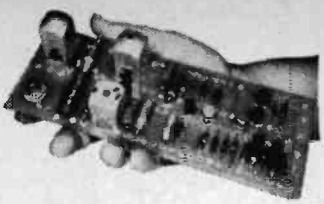
Eavesdrop on FM's third channel, SCA, and fill your home with uninterrupted music — free of those very tiresome commercials

By P. A. Walter

MANY FM broadcasting stations throughout the country now broadcast continuous background music on a subcarrier channel in addition to the standard FM monaural or FM stereo broadcast. This channel, commonly known as SCA (*Subsidiary Carrier Authorization*), uninterrupted with commercials or station breaks, can be heard by you at home if you build the "third channel music adapter." In the Los Angeles area, for example, there are at least seven FM stations now broadcasting SCA concurrently with their regular programming. Most SCA programming consists of popular music maintained at nearly constant volume. You have probably heard this music in your local food

BUILD THE

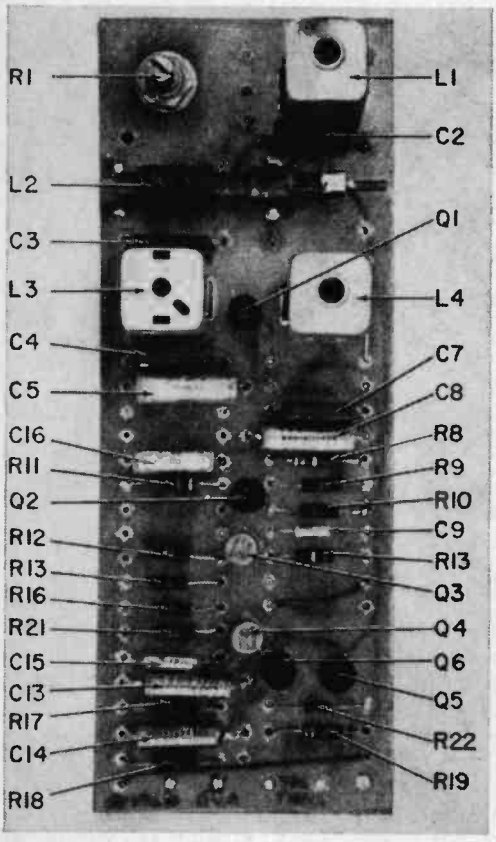
Third Channel Music Adapter



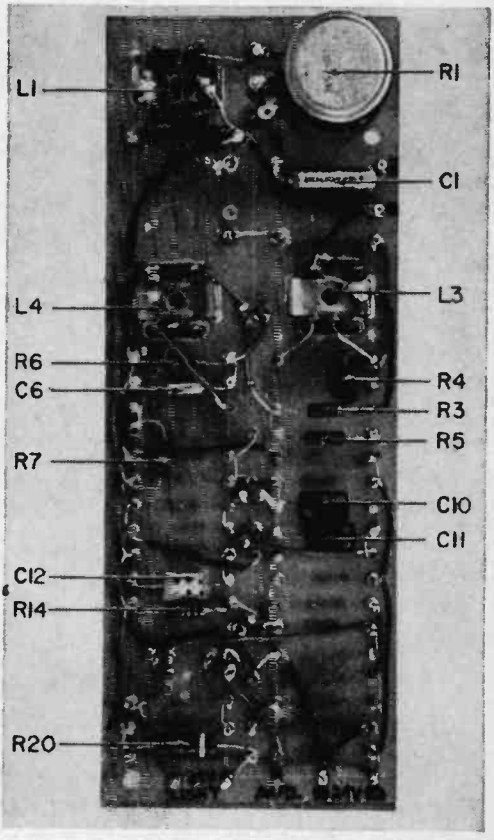
market or dental office since it is intended as a subscription service for business use. Other types of programming are also used; for instance, one Los Angeles station carries Japanese music and Japanese plays exclusively.

The extra channel. Figure 1 shows the composite modulation spectrum of an FM station broadcasting monaural, multiplex stereo and SCA simultaneously. The SCA subcarrier has a center frequency of 67 kc and a peak deviation of plus and minus 8 kc. The total bandpass required to receive this subcarrier is therefore 59 kc to 75 kc. The maximum modulating frequency is limited to 8 kc. This is not nearly as good as the main channel which passes 15 kc, but is completely adequate to provide a pleasant musical background, and is certainly better than AM broadcasts which are limited to a 5 kc maximum frequency and loaded with noise.

There are still a few SCA channels whose center frequencies are lower than 67 kc. These stations were in existence before the coming of FM-stereo and are now a vanish-



Top view of the music adapter circuit board showing the neat uncluttered arrangement of parts. Location is important. Refer to the detail circuit board drawing on page 48.



Almost all of the interconnecting wiring are on the bottom side of the circuit board. Small press-in terminals allow handy anchor and interconnection points between parts.

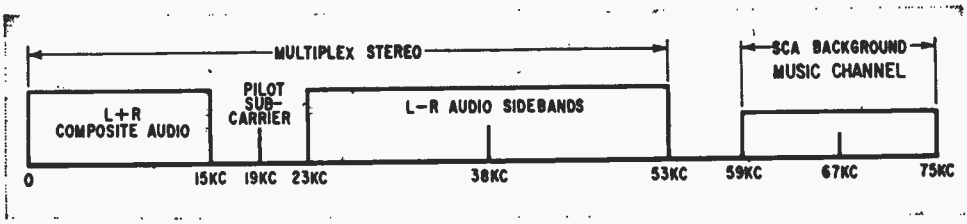


Fig. 1. Composite modulation spectrum of an FM signal using a SCA channel.

ing breed. If you live in a town with several FM stations within listening range, then you can be sure at least one has a SCA channel at 67 kc.

This fully transistorized "third channel music adapter" was designed and built for home use with any wide-band FM tuner and a monaural amplifier. It uses six inexpensive transistors and standard Miller coils. An optional indicator light is provided which glows when the subcarrier is received, so you can turn across the dial and spot the stations broadcasting SCA at that time. The power required to operate the music adapter is *+24 volts* at *55 milliamperes*. Without the indicator light the current required is only *30 milliamperes*. This power could readily be obtained from the audio amplifier power supply using a dropping resistor and a zener diode to limit the maximum voltage to 24 volts. Alternately a small power supply powered by regular 60 cycle 117 volts may be used.

A schematic of the power supply used by the author is shown in Figure 6. A less exotic power supply could be used but the ripple must not exceed 10 millivolts or hum will be heard in the output.

The music adapter is installed into a hi-fi system as shown in block diagram below.

Circuit description. A functional diagram of the music adapter is shown in Figure 3. A schematic diagram is shown in Figure 4.

The music adapter input signal comes from the multiplex output connection of the FM tuner where broad band frequency response to at least 75 kc is imperative. The potentiometer (R1) is used to control the input signal level and at the same time increase the adapter input impedance. This prevents overloading the FM tuner output which would interfere with the normal use of the tuner. The input signal drives a full pi-section band pass filter of the constant K type. This filter has an input impedance of 2200 ohms and an output impedance of 220 ohms and a pass band of 59 kc to 75 kc. This impedance step down is necessary to properly match the high tuner impedance to the low transistor input impedance.

The filter output signal is amplified by transistor Q1 and tuned by transformer L4. Q2 is driven from a tap on L4 and serves as a limiter amplifier. The limiter output drives a pulse counting discriminator composed of transistors Q3 and Q4. These two transistors are connected as a one-shot multivibrator with a pulse width of 7 microseconds. The output is filtered by R16, C13, R17 and C14. This network also provides de-emphasis. Transistor Q6 is a squelch controlled amplifier (explained below) driven from the output of the de-emphasis network. The output of Q6 drives the external audio amplifier.

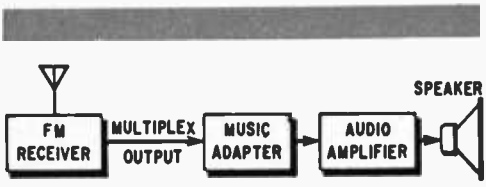


Fig. 2. The music adapter is a special-type multiplex unit that connects between FM tuner and amp. Keep coax cables short.

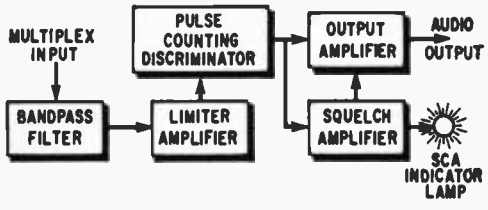
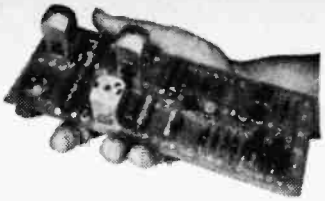


Fig. 3. Block diagram of the music adapter reveals unusual pulse counting discriminator used in missile radar telemetering systems.

BUILD THE

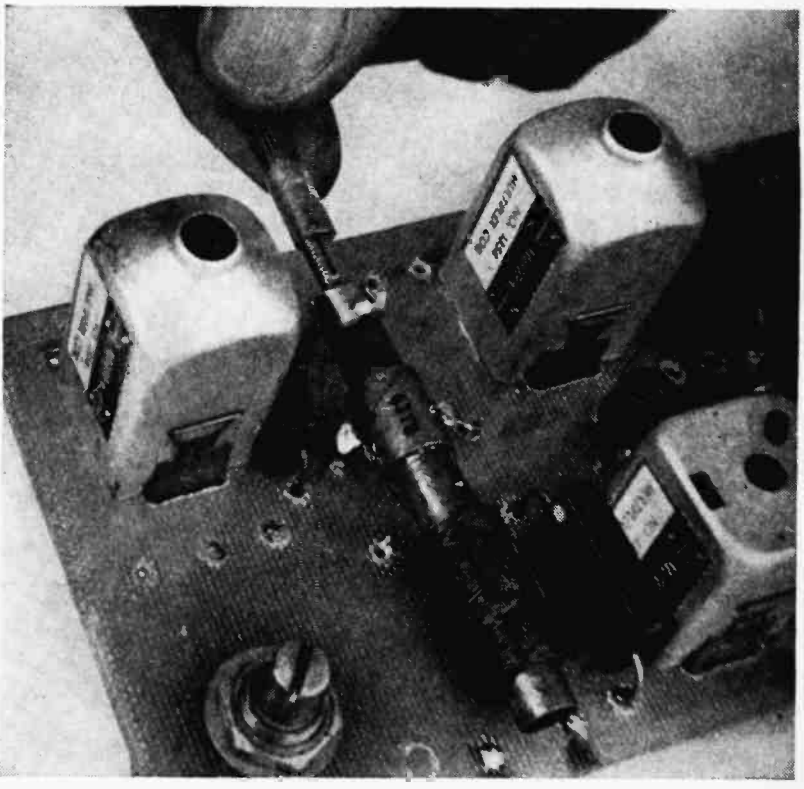
Third Channel Music Adapter



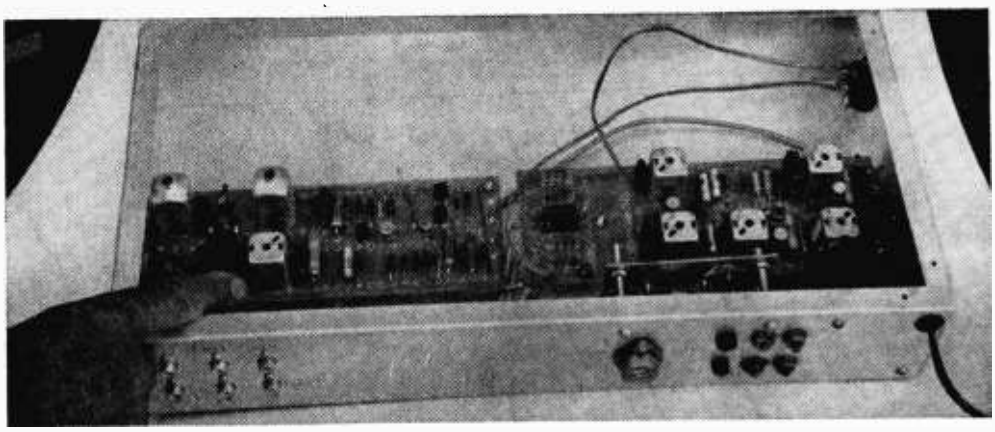
PARTS LIST

C1, C5, C8—.01 uf., paper capacitor
C2, C4, C7—1000 pf., mica capacitor, 5 %
C3—2200 pf., mica capacitor, 5 %
C6, C9—.68 uf., 35-volt tantalytic capacitor
C10—27 pf., mica capacitor, 5 %
C11—22 pf., mica capacitor, 5 %
C12—270 pf., mica capacitor, 5 %
C13, C14—.0047 uf., paper nylar capacitor
C15—4.7 uf., 35-volt tantalytic capacitor
C16—1 uf., 35-volt tantalytic capacitor
Electrolytic capacitors may be used instead of tantalytic for C6, 9, 15 and 16, as these units are not critical.
I1—28-volt lamp (Dialco series 39-28-973)
1—lampholder for I1 (Dialco 7545)
1 pkg.—Terminals (USECO #2010B)
L1, L3, L4—Miller coil #1354
L2—Miller coil #6318
Q1, Q2, Q6—2N696 transistor
Q3, Q4—2N1304 transistor
Q5—2N697 transistor
R1—25,000-ohms linear potentiometer
R2, R18—2,200-ohms, ½-watt resistor, 5 %
R3—3,300-ohms, ½-watt resistor, 5 %
R4, R7—220-ohms, ½-watt resistor, 5 %
R5, R16, R21—10,000-ohms, ½-watt resistor, 5 %
R6, R22—1,000-ohms, ½-watt-resistor, 5 %
R8—4,700-ohms, ½-watt-resistor, 5 %
R9—20,000-ohms, ½-watt resistor, 5 %
R10—2,000-ohms, ½-watt resistor, 5 %
R11—5,600-ohms, ½-watt resistor, 5 %
R12—22,000-ohms, ½-watt resistor, 5 %
R13—2,700-ohms, ½-watt resistor, 5 %
R14—33,000-ohms, ½-watt resistor, 5 %
R15—1,500-ohms, ½-watt resistor, 5 %
R17—15,000-ohms, ½-watt resistor, 5 %
R19—3,600-ohms, ½-watt resistor, 5 %
R20—390-ohms, 1-watt resistor, 5 %
Estimated cost: $37.00
Estimated construction time: 6 hours

(All transistors made by Texas Instrument.)



Alignment of the completed music adapter requires an audio signal generator and either an oscilloscope or an AC VTVM. There are four tunable Miller coils.



Music adapter is mounted by author in chassis along side home-brew multiplex adapter.

The average voltage output of the pulse-counting discriminator is about +6.7 volts at the center frequency of 67 kc. When no music is being broadcast the 67 kc subcarrier is removed at the FM station; consequently, the voltage at the discriminator output drops to almost zero volts. This signal level change is used to drive transistor Q5 through filter network R21 and C15. When the subcarrier is present Q5 saturated and Q6 is properly biased to amplify. Q5 also causes the indicator lamp to light. When the subcarrier disappears Q5 turns off, the lamp goes off and Q6 is biased off so no audio output occurs. The squelch circuit was included because, without it the output is quite noisy in the absence of a subcarrier.

Construction. The music adapter is constructed on a 3 x 8 x 1/16-inch epoxy circuit board. A perforated phenolic circuit board will do just as well. The layout of the circuit board is shown in Figure 5. The board is first drilled for hollow USECO terminals and cutouts made for mounting the coils. The metal mounting plate which comes with the coils makes a good template for making the cutout. Transistor sockets may be used if desired; however, the author mounted the transistors directly on the terminals. USECO #2010B terminals are then mounted on the

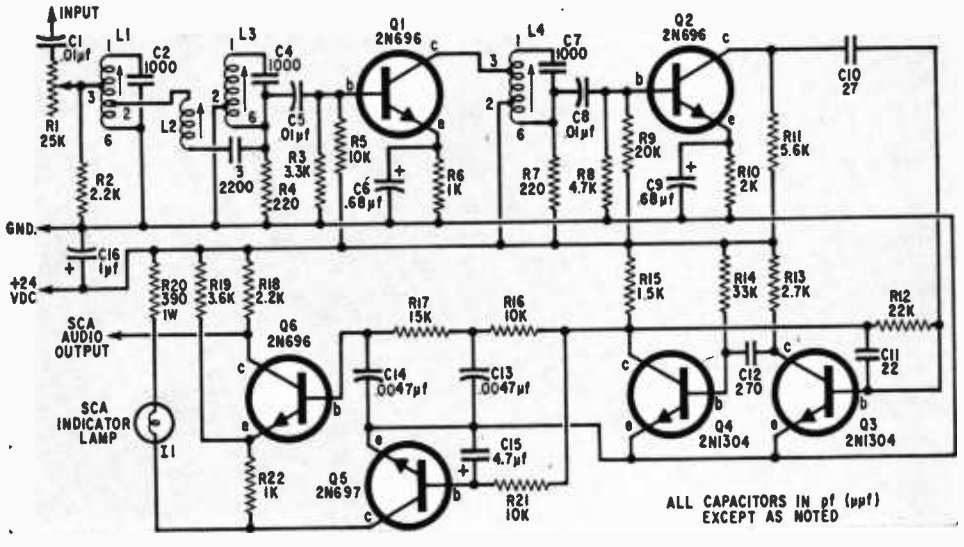


Fig. 4. Schematic diagram of the transistorized music adapter—operates on 24 volts.

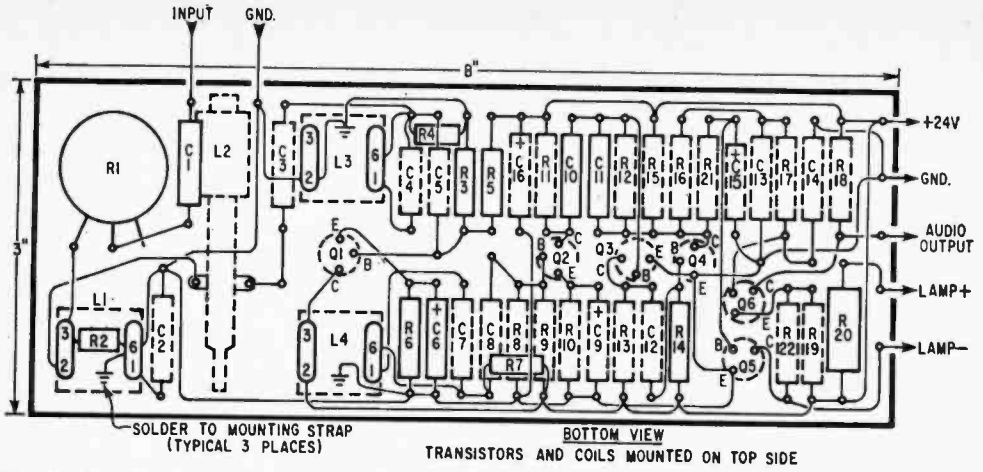


Fig. 5. Detail layout of parts on circuit board. Dashed lines indicate parts under board.

bottom side of the board and the coils on the top side. Then the resistors, transistors and capacitors are mounted on the terminals and the wiring completed. The band pass filter and tuned amplifier uses four mica capacitors C2, C3, C4 and C7. Do not substitute paper capacitors or misalignment may develop with age. The cans for the coils must be grounded by soldering to the spring brass strap which mounts the coils.

Alignment. The "third channel music adapter" is quite simple to align. It is *not* recommended that alignment be attempted using only the station signal. An audio oscillator with an output of about 1 volt is connected to the input and an oscilloscope or AC VTVM connected to terminal 6 of L3. Set the oscillator to 67 kc and peak L1, L2 and L3. Then vary the oscillator frequency from 59 kc to 75 kc and observe the output. The output should be flat within 3 db (7/10 of maximum value) over the frequency range. A slight amount of stagger-tuning may be required to obtain this flat response.

Next, connect the scope or VTVM to the collector of Q2. Temporarily remove Q3 or disconnect C10. Peak L4 at 67 kc reducing the input signal to a low value to prevent the output from saturating the transistor. Again sweep the oscillator from 59 kc to 75 kc. The output should still be flat within 3 db. Some slight retuning of L1, L2, L3 and L4 may be necessary. This completes the alignment. Reinstall Q3 or reconnect C10. You are now ready to connect the adapter to the FM tuner. After tuning in a station, adjust R1 for the best squelch action.

(*Continued on page 122*)

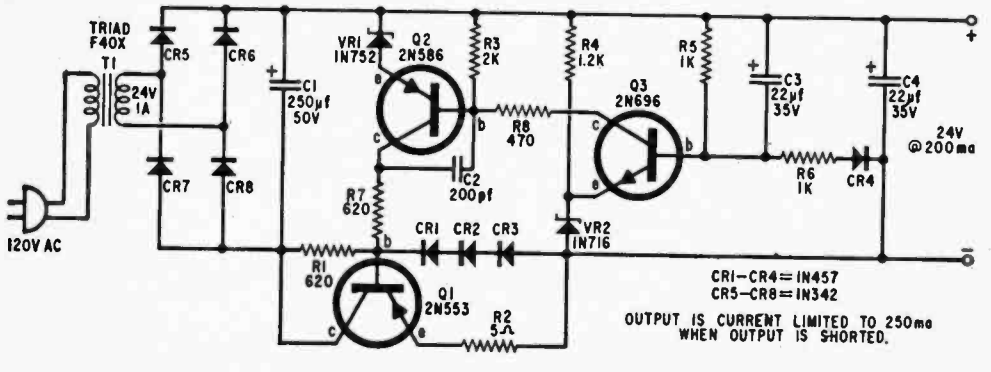


Fig. 6. Schematic diagram of 24-volt regulated power supply that powers the music adapter.

AudiAmp for Xtal Sets

Simple one-transistor stage peps up those weak AM signals

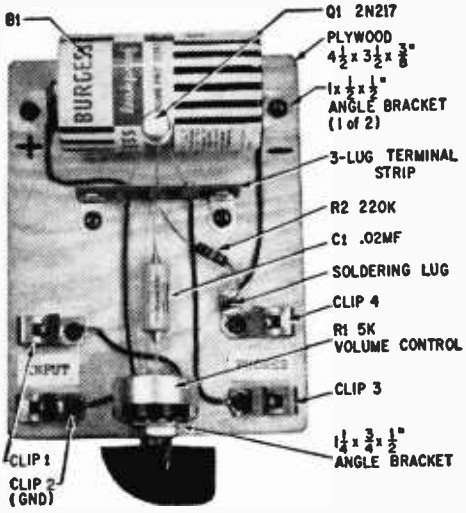
By Art Trauffer

CRYSTAL SETS are as popular today as they were before World War I. However, today the reliable semi-conductor diode has replaced the ticklish crystal and the transistor audio amplifier is pepping up the detected AM signals before they reach the headset. In case you would like to add the AudiAmp to a crystal receiver, just follow the details shown in the photos and schematic diagram.

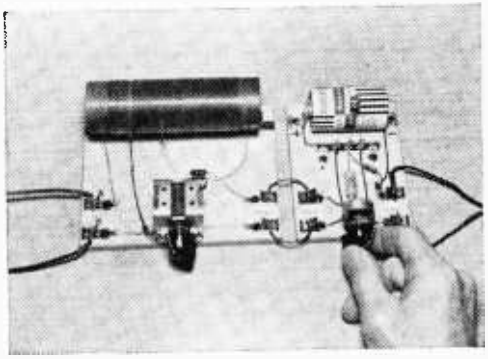
The transistor used can be a 2N217 or CK722 type. In fact, just about any *pnp* very low power audio transistor will do the job. Just in case you have a few *npn's* about, they may be used but be sure to reverse the battery connections so that B1's negative terminal connects to the transistor's emitter.

The output terminals should look into a high impedance headset. Magnetic headsets rated at 2000 ohms or better or crystal headsets will do fine. In the event you use a crystal job, connect a 4700-ohm, ½-watt resistor across the output terminals so that a DC path is provided from the battery negative terminal to the transistor's collector.

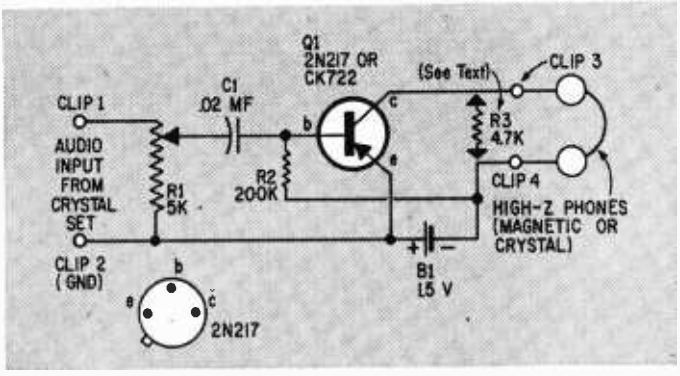
The simple transistor amplifier can also be used to amplify weak signals from telephone pickups, phono cartridges, etc. ■



Parts needed to assemble the AudiAmp are shown above wired on a plywood chassis.



In a typical set-up, the AudiAmp (above) is connected to the phone terminals of the Knight-Kit Crystal Set 83 Y 261D.



Removing either the magnetic headset or 1.5-volt dry cell will de-energize the AudiAmp's circuit.

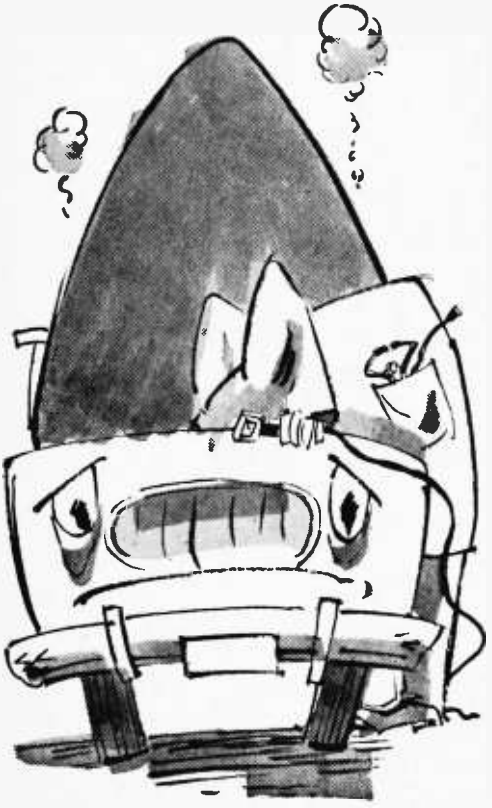
Reduce your electrical troubleshooting time and detect malfunctions before they develop into costly repairs by

ANALYZING

By Mort Schultz

THOSE of us who take their cars seriously and find it more advantageous to do their own work are faced, sooner or later, with the problem of what test equipment to buy. Although each item in itself isn't going to break us, the cash outlay for the whole kit-and-caboodle could make a big dent in any experimenter's pocketbook.

The best advice one can offer to those who are thinking of buying test equipment is this: be practical in deciding whether you need one, two or all of the equipment mentioned here. It's true that the purchase of any of this equipment could save you money in the long run by pre-empting the need for taking your car to a shop and paying someone else to check it. These instruments are accompanied by instruction booklets that enable you to become familiar with the unit and the step-by-step procedures on use.



Generally, this isn't designed to tell you how to use the test devices. We've left this to the instructional material that comes with the equipment and to your own knowledge. Instead, we will deal with what the equipment is used for and essential cost information.

Before starting, one piece of "equipment" you will surely need in any work you do is a tuneup or shop manual giving full specifications on your car. There is no substitute for it. If you don't have a manual or can't get one, forget about buying the other equipment which, in most cases, will do you little good because it won't list all the specs for your car.

You'll notice that the equipment discussed here is categorized under four headings: electrical, ignition, general, and mechanical. This is done so you can mentally place an item of equipment in the specific area it is meant to serve.

Electrical Testing

Voltmeter. This instrument is a must if you are going to do any diagnosing, troubleshooting or tuning of your car's electrical system. It measures voltage (electrical pressure) going through a circuit (Fig. 1). It is

1: COMBINATION volt and ammeter is used to record battery voltage. Volt meter is connected in parallel with circuit being tested. Ammeter is attached in series to show draw.

AUTO AILMENTS

always connected in parallel to that circuit.

The type of voltmeter you buy depends on the type of electrical system in your car. If you have a 12-volt system, you should get a meter that's calibrated from 0 to at least 15 volts. If you have a six-volt system, the meter you buy should be calibrated from 0 to at least 8 volts.

Each of these meters should also have another scale of from 0 to 3, 4, or 5 volts for detecting voltage drop in a circuit and for measuring the voltage of individual battery cells.

The voltmeter performs four basic functions:

1. It checks battery condition by measuring the difference in voltage between individual cells.
2. It measures the voltage available at any point in an electrical circuit.
3. It detects resistance by measuring voltage drop between any two points in a circuit.
4. It checks the continuity of a circuit.

An ammeter measures the amount of current (amperage) flowing in a circuit as contrasted with the voltmeter which, as we said, measures the pressure that makes the current flow. Although not as essential to electrical work as the voltmeter, the ammeter is the only sure way of telling whether current is flowing in a circuit and the degree of that flow.

It's important to remember that an ammeter must be connected in series. This means that a circuit you wish to check has to be broken at some point and the meter inserted (Fig. 1). It doesn't matter where the meter is connected in that circuit since current should flow at the same rate through every part of the system—something like water flowing at a constant speed through a pipe.

In determining which ammeter to buy keep in mind that an important part of this instrument is a shunt that's calibrated to carry a specific current in amperes at certain voltages.

The ammeter can be used for:

1. Making a battery capacity test.
2. Checking the current draw of a starting motor.
3. Measuring the amount of current flowing through the ignition system.
4. When inserted in the generator (alternator) field circuit, the ammeter will tell you

2: STARTING CIRCUIT TESTER measures battery and starter voltage, cable and solenoid resistance without changing the connections.

if you have a high voltage regulator setting, a high current regulator setting, and a partly shorted field winding.

5. When connected in series with the generator (alternator) output at the "A" terminal of the voltage regulator or charging unit, the ammeter will tell you whether it is putting out current and, if so, how much at different engine speeds. It will also tell you the controlled maximum generator (alternator) output.

If you decide to buy a voltmeter and ammeter, you might be better off economically and convenience-wise if you purchased a combination tester. This gives you both instruments on one panel.

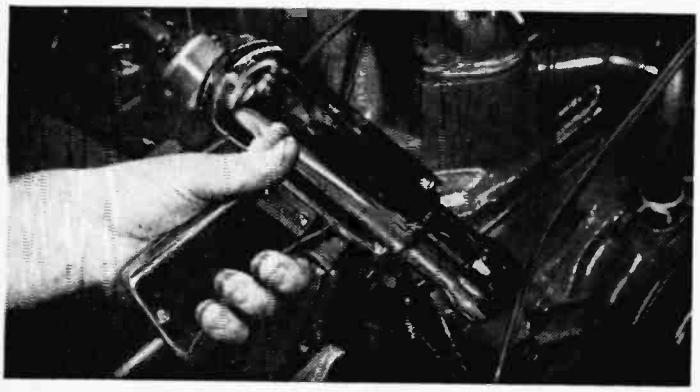
The ohmmeter is not absolutely essential, especially if you have a voltmeter that's calibrated to record voltage drop.

Resistance in a circuit is the thing that cuts down on amperage flow. If your ammeter shows the amperage to be below par, the cause might be high resistance. Yet, you have no way of knowing for sure and could spend hours trying to figure out the cause. The ohmmeter eliminates the doubt immediately by measuring resistance between two points in a circuit and detecting whether that resistance is normal or excessive (Fig. 2).

Ignition Testing

A timing light has increased in importance as engines have increased in compression. Proper ignition timing is a basic factor affecting an engine's fuel octane requirements, as well as its overall performance and economy. Improper timing leads to shortened spark plug life, pre-ignition and a general letdown in engine performance.

Here, though, is one place we might come to a parting of the way insofar as instruments are concerned. All U. S. and Canadian



3: STROBOSCOPIC timing light used for dynamic timing is one of the most important of all tuneup instruments you can own if you have a U.S.-made car. It can also be used on some of the imported models.

built cars and trucks use the dynamic timing method. To do this type of tuneup service we need the familiar stroboscopic timing light.

Some foreign cars, however, require static timing which makes use of different equipment. If you have a foreign car, you should check the manual to see which timing procedure is recommended. Never use one when the other is required. For example, on some imports automatic distributor advance may begin at a very low engine rpm. Thus, use of a stroboscopic light could give you considerable inaccuracy.

Let's review the differences between dynamic and static timing so you'll see why different instruments are needed.

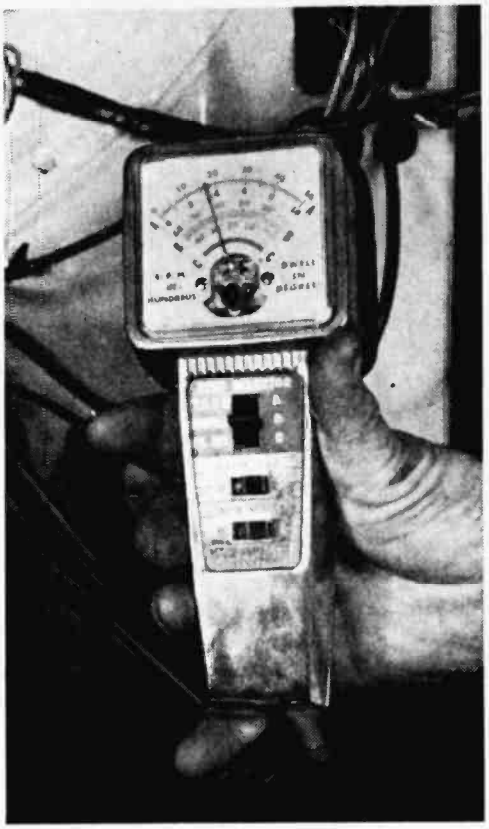
Static timing consists of adjusting the breaker contacts to open precisely in relationship to a specified and measured distance of the piston to top dead center. It is accomplished by connecting a continuity meter or test light in series with the points, using the breaker contacts as part of the circuit (Fig. 3).

The points are adjusted to break at an indicated reference to piston reciprocal movement. When the continuity meter registers open circuit or the test light goes out, point opening is indicated. This is timed in relation to piston travel to TDC.

Dynamic timing, as was said, is done with a stroboscopic light that flashes each instant the spark plug fires (Fig. 3). When the beam of the light is aimed at the reference (timing) marks located on the flywheel, vibration damper or crankshaft pulley, the marks appear to stand still in relation to a pointer.

When the spark plug fires (and the points open) early or late in reference to TDC within its cylinder, the timing mark or marks will be either to the right or left of the pointer, depending on the direction of rotor rotation. Moving the entire distributor housing right or left simply changes the physical relationship of the rubbing block on the contact point riding on the distributor cam. This, in turn, causes the points to open earlier or later in relation to piston location.

Sorry to say that timing marks are not standardized on domestic cars. As a matter of fact, variations could even be found among different engines of the same manufacturer. Therefore, it's absolutely essential that you know where these marks are located and the proper timing degree of your car.

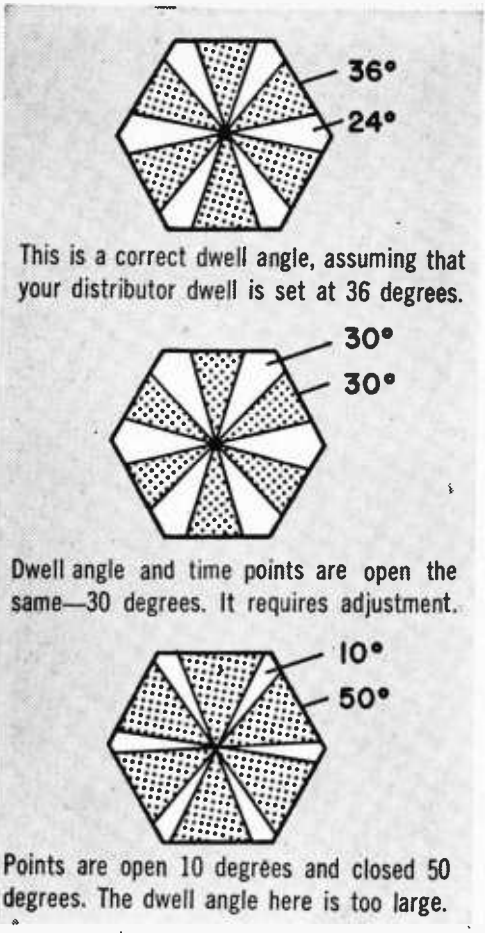


4: COMBINATION dwell-tach meter is also equipped to register point resistance. Several switches permit you to take readings on six or eight cylinder engines with one instrument.

There are certain things you must keep in mind when using a stroboscopic light (those an instruction manual often fails to bring out) or else your timing will be inaccurate. These are:

1. Avoid parallax. Position the timing light and your eyes in a common plane in

5: STATIC TIMING device is screwed into a cylinder. As piston reaches a position near top dead center, it hits meter counter, which records whether engine timing is set correctly.



6: DWELL ANGLES vary considerably from car to car, so be sure to check your manual.

line with the timing marks and pointer on the engine.

2. Follow the manufacturer's instructions. Run the engine at the specified rpm. If a vacuum advance unit is used, disconnect the vacuum line and close the carburetor opening with a piece of tape.

3. Check to see that centrifugal advance is functioning. With the timing light still connected, slowly accelerate the engine to about 2000 rpm. Timing marks should advance smoothly. If "fanning" or fluttering of the marks is noticed at any speed with a spread of more than three degrees, the distributor should be overhauled.

4. Check to see that the vacuum advance is operating. With the timing light connected, run the engine at about 1000 rpm. Rapid opening and closing of the throttle, without changing engine speed, should cause the timing marks to move rapidly.

5. Check for excessive cylinder-to-cylinder variation in timing. After adjusting the distributor to No. 1 cylinder, connect the light to the alternate firing cylinder. Timing marks on this alternate cylinder should line up with No. 1. If variation exceeds three degrees, cam lobe variation is excessive.

6. Keep in mind that a change in breaker point spacing affects timing. When points are replaced or re-spaced, check the timing again.

Dwell (cam angle) meter. This meter has just one purpose: to indicate the dwell angle or, as it's sometimes called, the cam angle.

What is dwell? It's simply the number of degrees through which the distributor cam rotates while the breaker points are closed. In a 6-cylinder car, for example, during one complete revolution of the distributor shaft, the cam rotates 360 degrees. The points go through six cycles of opening and closing. If we divide 360 by six, we find that for each of these cycles the cam rotates through 60 degrees.

Now, suppose our system is so set up as to have the points open for 24 of these 60 degrees. That means that the points are closed for 36 degrees. Consequently, our angle of dwell is 36 degrees (Fig. 6). The dwell angle thus determines the length of time current flows through the primary winding of the coil.

Dwell angles vary from distributor to distributor, so be sure to check your manual. Keep this important point in mind, however: no car is in tune if the dwell angle is off. Here's why—

If the dwell angle is too small—points are set with a wide gap—the points open too slowly, causing excessive arcing and burning (Fig. 6). They don't stay closed long enough to allow the coil time for full saturation. The result is an engine that misses at high speed.

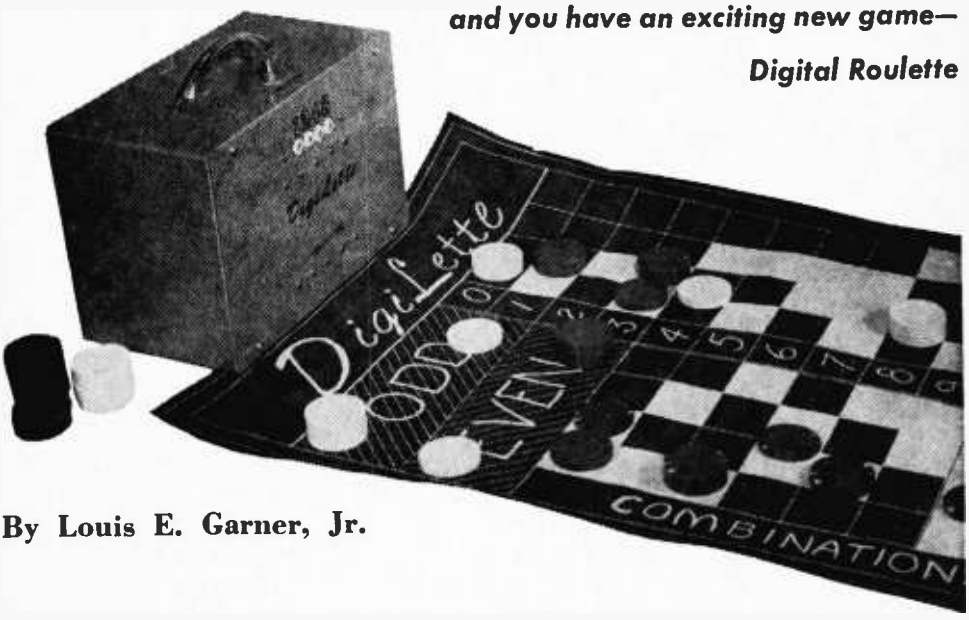
If the cam angle is too large—points are set with a small gap—the contacts open and close with a hammerlike action (Fig. 6). This causes point bounce and erratic coil action. In addition, the coil and condenser don't get a chance to discharge completely. This will cause rough engine operation at low speeds, missing at high speeds, and burned and battered points.

Auto buffs should seriously consider the *ignition analyzer*. This simple instrument will let you become an ignition expert with almost no training. The instrument, actually a spe-

(Continued on page 146)

DIGILETTE

Take three flip-flop circuits, add a fast clock and indicator lights, plus some computer logic and you have an exciting new game—Digital Roulette



By Louis E. Garner, Jr.

NOT TOO LONG AGO, all electronic equipment was designed *from the ground up.* The engineer responsible would design the complete circuit for the entire equipment. Today, however, there is a growing trend towards the use of *modular circuits* . . . which are, basically, predesigned and prewired circuit stages. With this approach, the equipment designer can concentrate on overall equipment operation and on the interconnection and selection of optimum circuit elements rather than on the design of individual circuits. There are other advantages to the modular design concept . . . for example, (a) by using proven circuits, there are fewer chances that *bugs* will creep into the design, (b) the equipment itself is more flexible, for individual stages may be changed without redesigning the entire equipment, (c) the completed equipment is easier to maintain and service, and (d), finally, the basic design, once finished, may be "upgraded" simply by using more advanced modular elements.

Modular design method can be applied best to equipment and systems using a relatively large number of identical or similar circuits—typically, computers, data processing equipment, counters, and so on. This fact, plus the comparatively high cost of circuit modules, has, in the past, limited the use of modular techniques among experimenters and hobbyists. More recently, however, one firm (*Tech Serv. Inc.*, Beltsville, Maryland) has introduced a series of low-cost modules suitable for home projects. It is now possible, then, for a hobbyist of modest means to gain experience in using the modular design concept by assembling useful and

DIGILETTE

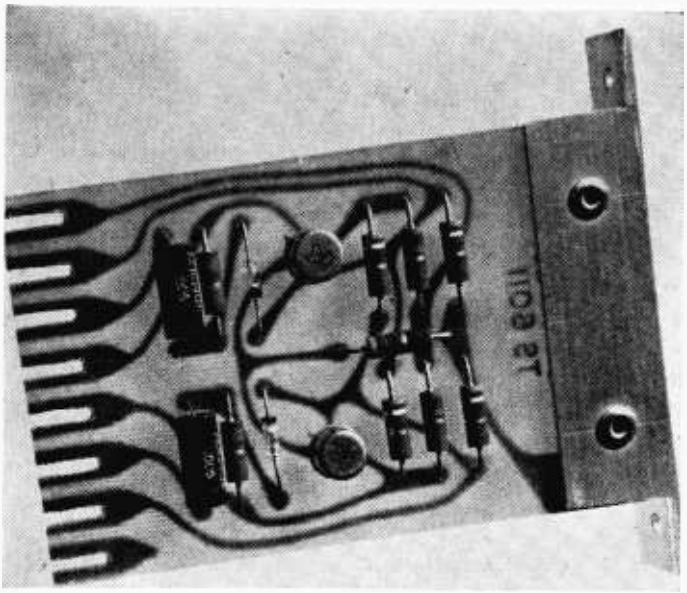
interesting projects . . . one possible project, *Digilette,* is illustrated in the photographs.

Digilette. Essentially a gaming device, Digilette derives its name from the words "*Digi*tal Rou*lette.*" It is, then, a type of electronic roulette "wheel," providing a *random* selection of numbers from 0 to 15 whenever operated. These random numbers may be used as the basis for a variety of games, including modified versions of roulette and craps, as well as in determining playing piece movement in such board games as Parcheesi and Monopoly. Although basically a toy, the device itself demonstrates the operation of several of the basic circuits used in advanced digital computers and thus can be of real *educational* value.

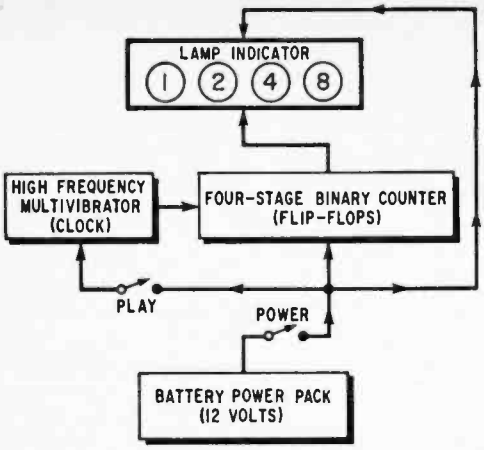
Circuit Operation. The Digilette's block diagram shows the basic elements of the Digilette. They are: a 12-volt power pack, a high frequency multivibrator (or "clock"), a four-stage binary counter, and a lamp read-out. The clock's power is controlled by a push-button *Play* switch.

In operation, the clock supplies a 1 kc to 2 kc signal to the binary counter which, in turn, furnishes a control signal to the read-out indicator. Since the binary circuit can *count* only up to 15, it repeats this count (0 to 15) rapidly as long as the clock is operating. If, for example, the clock is operating at 1500 cps, the 0 to 15 count will be repeated at approximately *100 times per second.* The read-out lamps are unable to follow this high counting rate and, therefore, remain lit (although dimly) as long as the clock is operating. When the clock is switched off (by opening the *Play* switch), the "count" (from 0 to 15) in the binary circuit *at that instant* is locked in, with the read-out panel indicating that number. The final read-out number, then, is a purely random selection that cannot be controlled by a player.

The binary counter itself is made up of



Component side view of the Tech Serv's Digibit flip-flop circuit panel. Bracket seen at right serves as common ground that connects to the positive terminal of the 12-volt DC supply.



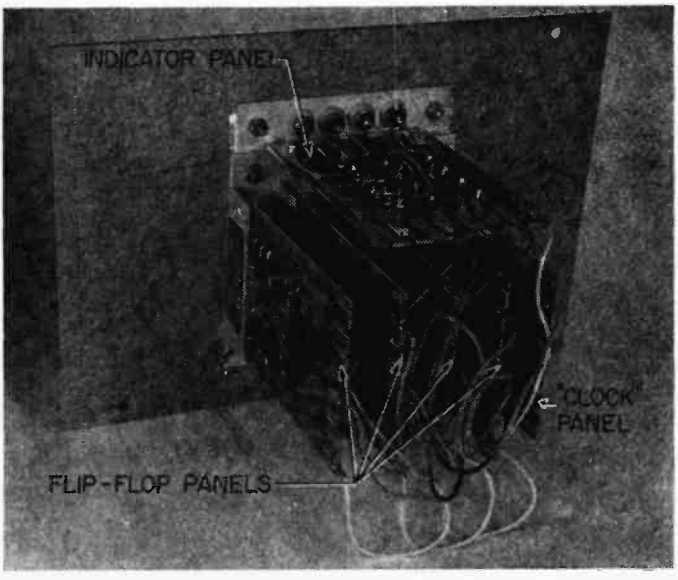
The Digilette simplified block diagram showing the four basic computer elements.

four "flip-flop," or bistable circuits, interconnected so that the first drives the second, the second the third, and so on. Each of these four stages has two stable states . . . identified, arbitarily, as **1** and **0**. Since the drive pulse is derived only when an individual stage changes from one stable state to the other, the first stage responds to every input pulse, the second to every other pulse, and so forth, doubling the *count* each time. The read-out signals also are derived from each of the four stages in the counter, with the four indicator lamps lit in an alternate fashion, depending on total circuit count. On a count of **0** for example, all lamps are out, on the count of **1**, the first lamp is lit, on the count of **2**, the second lamp is lit, on the count of **3**, the first and second lamps are lit, and so on, until all four lamps are lit on the count of **15**. The total count, at any time, is obtained simply by adding the total of lamps lit indicating the individual counts of **1**, **2**, **4** and **8**.

Construction. The author's version of Digilette, as shown in the photographs, was assembled in a standard aluminum *Minibox* using Tech Serv's *Digibit* digital modules. The Digilette functional logic (and wiring) diagram is useful in understanding and wiring up the unit. The individual numerals shown in the logic diagram refer to the terminal connections of the Digibit modules. The multivibrator (clock), flip-flop and indicator panel schematic diagrams are given separately with their corresponding logic diagram symbols and Digibit terminal connections.

An experimenter may duplicate the author's version of the instrument simply by following the photographs and functional logic diagram or, if preferred, may wire the circuit from individual components. All parts values and semiconductor types are identified on the individual schematic diagrams; the resistors are half-watt units, the capacitors small disc ceramics.

If Tech Serv's Digibits are used for assembly, individual terminal boards connections



Rear view of the Digilette front panel shows all the circuit panels secured in place and interconnected. Some careful planning is necessary in order to avoid unsightly holes or marks on front panel.

DIGILETTE

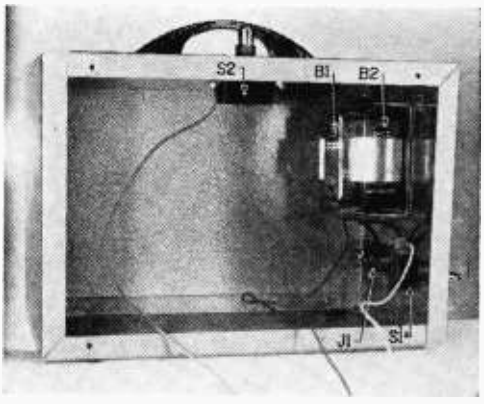
may be made quite easily using pre-assembled *Edg-On* jumper leads (supplied with the Digibit boards). This type of wiring not only saves time during initial assembly, but simplifies disassembly in the event the builder wishes to use the Digibit panels in other projects.

Several modifications in the basic design are possible to meet individual needs or to reduce cost. A simplified version may be assembled, for example, using one, two, or three flip-flops, providing total counts of 1 (plus 0), 3, or 7, respectively, with the remaining flip-flop modules added at a later date. If a more elaborate version is preferred, two indicator panels and an eight-stage binary counter may be used (eight flip-flops), providing a total count of 255 (plus 0). In either case, the basic wiring is essentially as shown in the functional logic diagram, with the **I** output of each flip-flop connected to the appropriate indicator panel terminal and the **0** output of each connected to the **I** and **0** inputs (in parallel) of the succeeding flip-flop.

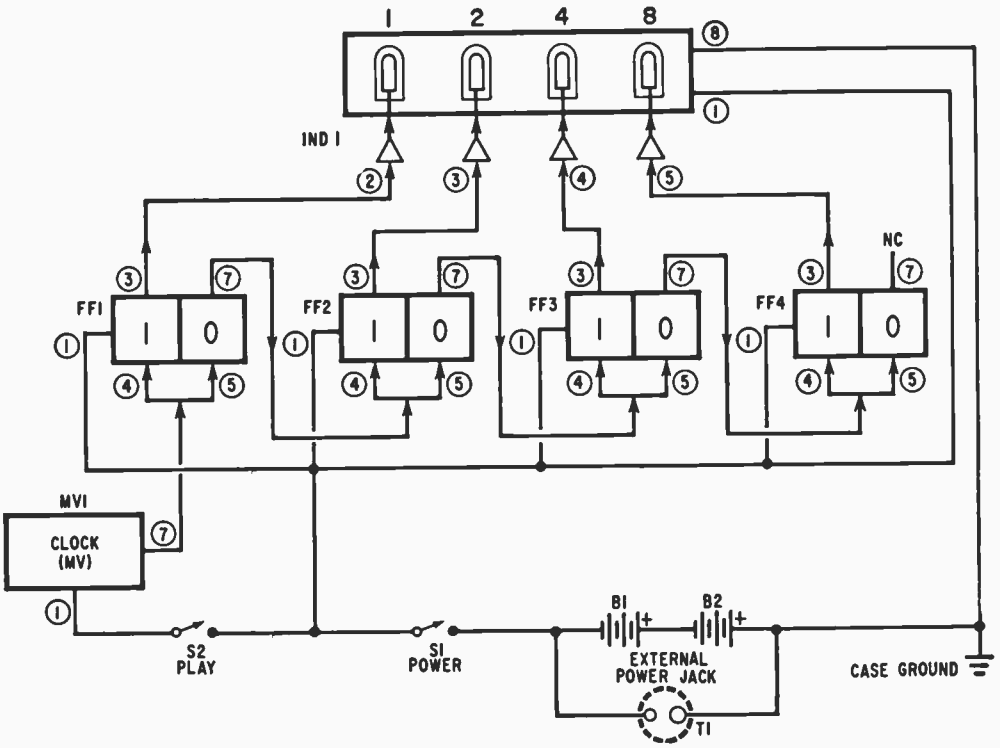
The specified battery power pack is quite adequate for short-term intermittent use. If Digilette is to be used for extended play, heavier batteries should be used . . . typically, eight standard flashlight batteries in series or a 12-volt lantern battery. In the author's model, an extra jack has been provided for connecting external heavy-duty batteries, when needed.

Using Digilette. The device, once assembled, is quite easy to use. The *power* switch (S1) is closed first. Then the *Play* switch (S2) is closed and the instrument allowed to *run* for a second or two. All the indicator lamps should light (although dimly) during the *run*. When the *Play* switch is opened, the final count appears . . . all the lamps may go dark, or one or more (including all) may be lit. The number and position of the lamps remaining on indicates the number selected, as identified by the table shown below. All lights off may indicate a count of either **0** or **16**, as preferred. The next random number is selected by closing, then opening, the *play* switch again . . . and so on.

Number	Four Light Binary Read-out			
	1	2	4	8
0	O	O	O	O
1	I	O	O	O
2	O	I	O	O
3	I	I	O	O
4	O	O	I	O
5	I	O	I	O
6	O	I	I	O
7	I	I	I	O
8	O	O	O	I
9	I	O	O	I
10	O	I	O	I
11	I	I	O	I
12	O	O	I	I
13	I	O	I	I
14	O	I	I	I
15	I	I	I	I



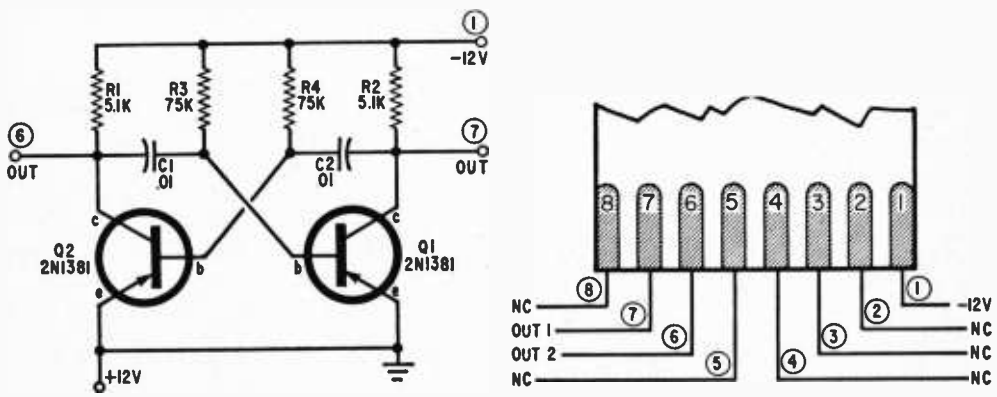
Inside view of the Digilette showing the location of power supply circuit parts.



Wiring diagram for the Digilette. Logic symbols are used for the flip-flop, clock, and indicator modules to simplify the drawing and promote rapid understanding.

If the instrument is to be used for a roulette-type game, a suitable playing board or sheet is needed. This is essentially a large sheet or paper or cloth laid out in a pattern of squares for each number to be played, with each square large enough for standard poker chips or similar counters. Wagers are made against the "house," with the house paying "odds" in chips.

Referring to the drawing of the Digilette playing board and the playing odds table, a single number wager can be made on any number, with the house paying 14 to 1 if that number appears (this retains a percentage in favor of the house, as in conventional roulette). An *Odd* wager covers any uneven



Circuit diagram of the Tech Serv Clock MV-1 (left) that operates at about 1 kc. determined by the R-C time constants of C1, C2, R3, and R4. Terminal connections shown at the right.

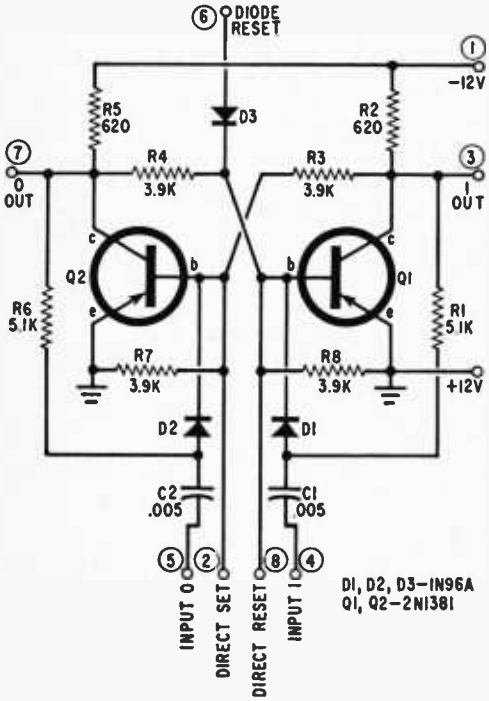
DIGILETTE

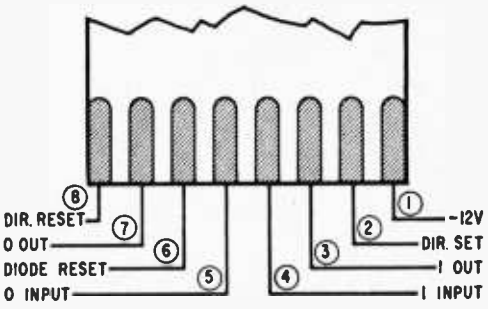
number from 1 through 13, the house paying even money. An *Even* bet covers any even number from 2 through 14, with the house paying even money. An *across the board* wager, covers the light position bet, whether or not other lights are lit. Thus, an across the board bet on 2 would pay on **2, 3** (1 and 2 lit), **6** (2 and 4 lit), **7** (1, 2 and 4 lit), **10** (2 and 8 lit), **11** (1, 2 and 8 lit), and **14** (2, 4 and 8 lit); the house doesn't pay on either 0 or 15 on across the board wagers.

A modified version of *craps* may be played using the device, except that the numbers which can be "thrown" extend from 0 to 15 (or 1 to 16) rather than from 2 to 12. The rules remain essentially the same, with the individual players taking turns operating Digilette's *play* switch, as in regular craps.

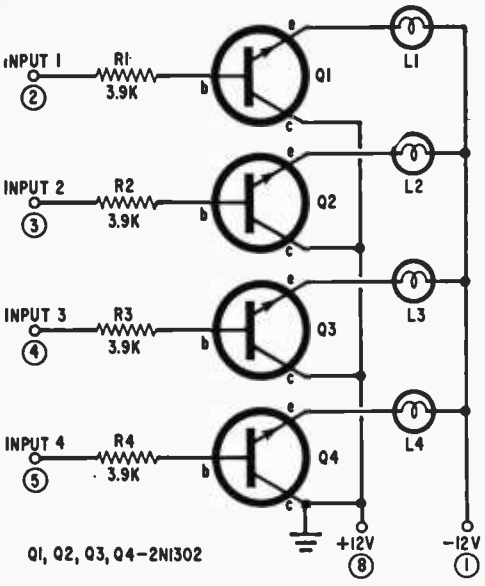
Play	Exceptions —No Pay	House Paying Odds
Single Number (Any from 0 to 15)	None	14 to 1
ACROSS THE BOARD		
Singles—1, 2, 4, 8	0 & 15	1 to 1
Odd—1, 3, 5, 7, 9, 11, 13	0 & 15	1 to 1
Even—2, 4, 6, 8, 10, 12, 14	0	1 to 1
Two Number Combinations 1-2,1-4, 1-8, 2-4, 2-8, 4-8	0	3 to 1
Three NumberCombinations 1-2-4, 1-2-8, 1-4-8, 2-4-8	0	7 to 1

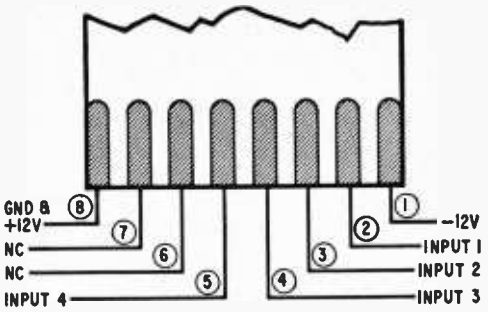
If desired, Digilette may be used instead of dice or a spinner wheel for playing any board game in which the position and move-





The Tech Serv Flip-Flop FF-1 (left) is a bistable multivibrator that is the basic oogic element used in the Digilette. The flip-flop is activated by a positive-going input pulse. The terminal module connections are diagrammed above.





The schematic diagram for the indicator circuit is shown at left. This Tech Serv unit contains four amplifiers, each driving a lamp mounted on the front panel. When the input to any amplifier is at ground level, an appropriate lamp will light up. Drawing above shows terminal connects for the module. Lamps are General Electric type 1201.

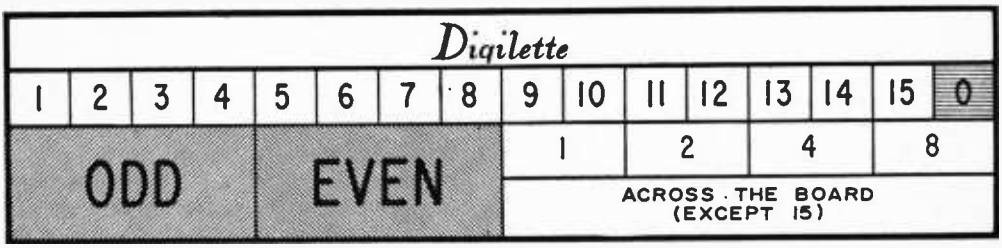
PARTS LIST

S1—S.p.s.t. toggle switch
S2—S.p.s.t. push-button switch
B1, B2—6-volt batteries (Burgess type Z4 or RCA type VS-068)
J1—2-terminal jack
MV1—*DigiBit "Clock" at about 1 to 2 KC (Tech Serv type MV-1, $7.95)
FF1, FF2, FF3, FF4—*DigiBit Flip-Flops (Tech Serv type FF1, $9.95 each)
IND1—*DigiBit 4-lamp indicator panel (Tech Serv type IND-1, $14.25 each)
Misc.—Cabinet, 9" x 5" x 6" (Bud No. AU-1040, gray); battery holder for two type Z4 (Keystone No. 176); four (4)—½" rubber grommets (or rubber feet); metal or plastic handle; hook-up wire and/or Edg-On jumper leads; solder, machine screws, lockwashers, hex nuts, sheet metal screws, decals, etc.

*DigiBits are available through some distributors and direct from the manufacturer, TECH SERV, INC., 5451 Holland Drive, Beltsville, Maryland. If preferred, the multi-vibrator, flip-flop, and indicator circuits may be assembled from individual components, following the schematic diagrams given.

ment of a player's piece is determined by a random number. Again, the range of numbers available is from 0 to 15 rather than from 2 to 12. Typical games include " horse race," in which the players' pieces are miniature toy horses which move around an oval "track" divided into number segments, Monopoly, Parcheesi, and so on. All standard game rules apply, with the players taking turns operating the device.

Other special games may be devised quite easily by making up a suitable playing board and establishing basic rules . . . let your imagination be your guide! ■



In order to play Digilette you will need to make up a game board or cloth very much like those used at Monte Carlo and Las Vegas. Follow the above layout but make it as long as a table top. Regular poker chips can be used as counters—now spin the electronic wheel.

UPI Photo

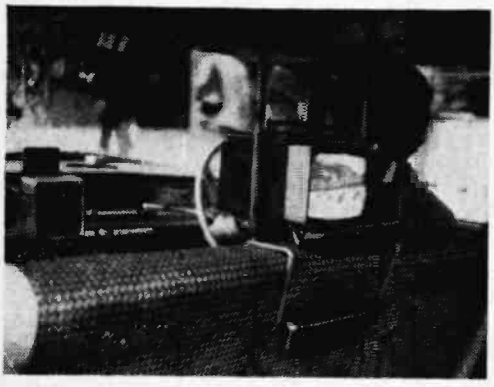
HELMET HELLO. A miniature radio receiver clipped to the side of a GI's helmet keeps him in constant touch with his company. Pocket transmitter enables soldier to hold two-way conversations to pass on vital information. Units are still being tested.

UPI Photo

TUNED FOR DANCING. The newest feature in Paris is that a couple can look into each others eyes, but can't whisper sweet nothings while dancing. Reason: They're wearing headsets tuned to a small transmitter installed in a juke box—dancing on air!

ON THE AIR

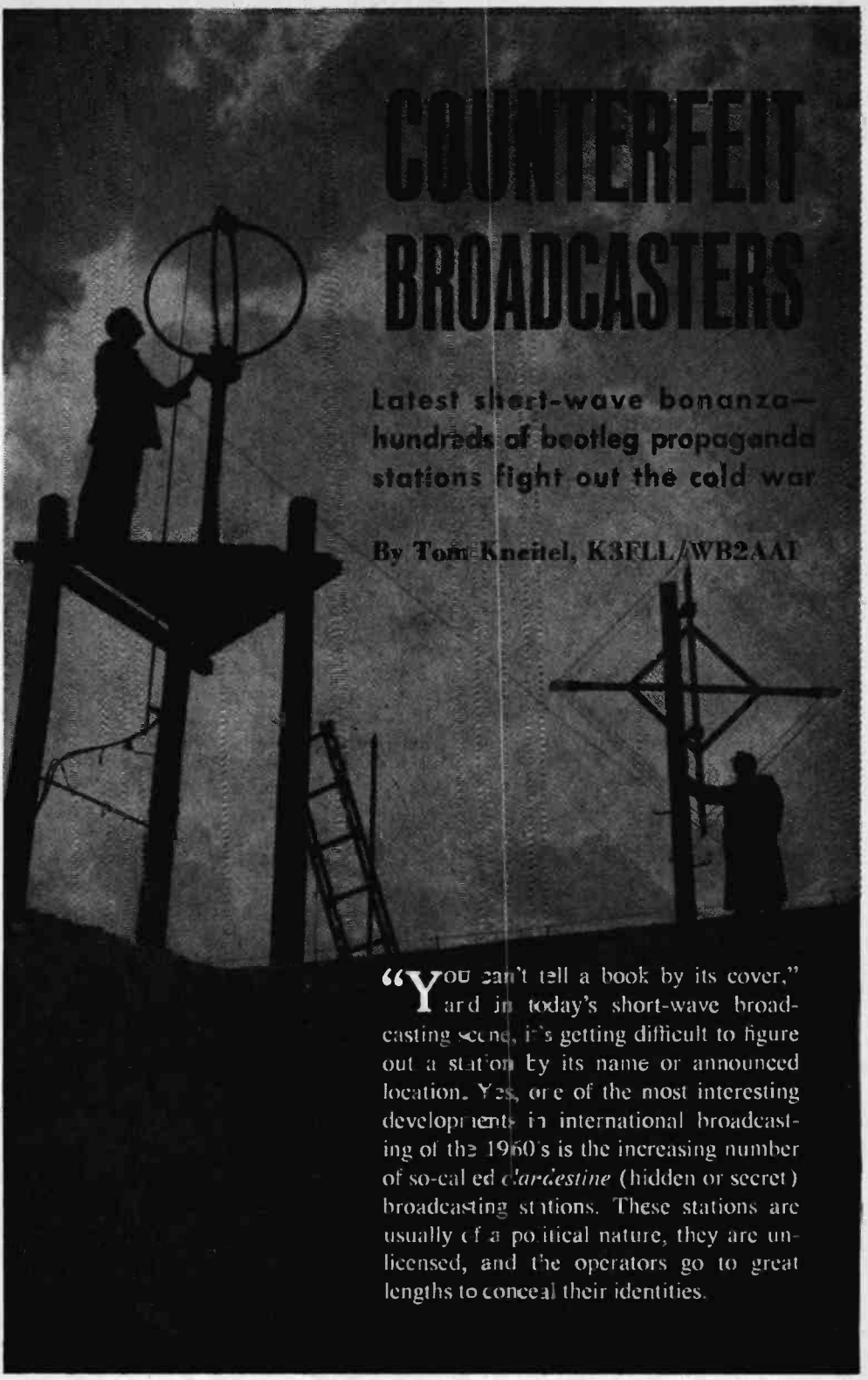
UPI Photo



TAXI TV. Americans may be saying, "Once around the park and Channel 2, please!", if the present Tokyo trend continues. Portable TV set operates off car's 12-volt battery.

Wide World Photo

MISS SPARKS. The beauty in the radio shack —Inga Bomert, 19, shown above, listens to radio messages aboard the German motorship Bakersand in the harbor at Muskegon, Mich. Said to be the youngest radio operator in the German service, Inga is probably the youngest in the world. Her duties require her to handle code traffic on ship's radio.



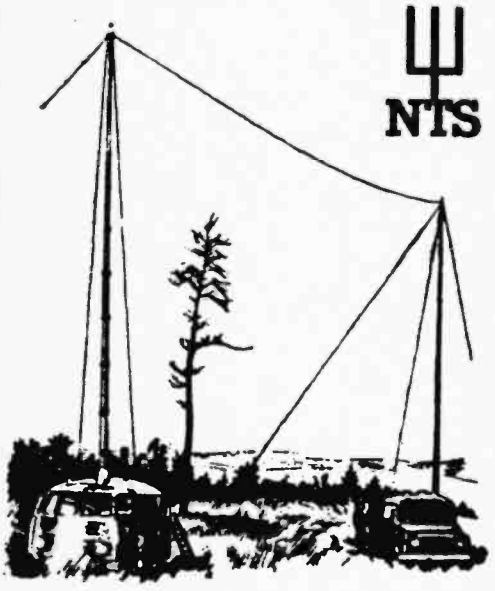
COUNTERFEIT BROADCASTERS

Latest short-wave bonanza—hundreds of bootleg propaganda stations fight out the cold war

By Tom Kneitel, K3FLL/WB2AAI

"You can't tell a book by its cover," and in today's short-wave broadcasting scene, it's getting difficult to figure out a station by its name or announced location. Yes, one of the most interesting developments in international broadcasting of the 1960's is the increasing number of so-called *clandestine* (hidden or secret) broadcasting stations. These stations are usually of a political nature, they are unlicensed, and the operators go to great lengths to conceal their identities.

COUNTERFEIT BROADCASTERS



„Свободная Россия"
radio - station
„FREE RUSSIA"

Do not get into your mind that all of these stations are operated by a small group of ambitious patriots huddled around a makeshift transmitter—while this may be true in some instances, it is certainly not the rule.

Clandestine broadcasting has become a highly specialized art and is almost an industry in itself behind the Iron Curtain, where Kremlin trained professional revolutionaries beam powerful transmitters into particular *hot spot* countries. Frequently the transmitters used are the same ones used for the *legitimate* broadcasting activities of the countries involved. As clandestine stations, however, the stations assume the guise of patriotic stations set up by patriotic exiles wanting to "free their homeland." These stations are, of course, operated with the sanctions of the governments involved and the transmitters are guarded like military installations to protect them from being sabotaged.

On the other hand, there are those clandestine stations which *are* actually operated by

Post card QSL's from clandestine broadcasters aren't too common, however Radio Americas and Radio Free Russia both apparently feel kindly towards DX'ers and appreciate monitor reports.

A great many clandestine broadcasters are actually high-powered, professionally operated propaganda stations from behind the Iron Curtain. These stations are generally guarded like military installations to keep snoopers and underground agents outside. Guards and dogs (right) are often on perimeter patrol while remote antenna sites (below) are monitored by super sensitive electronic devices.

patriots and exiles. These stations are operated in constant fear of detection (detection usually means loss of both equipment and life). Many of these stations operate in, or near, ham bands and we can surmise that the equipment is actually ham gear which has been adapted for the purpose. Ham equipment is actually well suited for these purposes because it is easily transportable (to avoid detection), some of it can be battery operated, the frequency can be changed to avoid jamming, and it can usually be operated with many types of home-made antennas.

Monitoring these clandestine stations can be a hobby in itself, and trying to pin down their actual locations involves both radio experimenting and political analysis. The radio experimenting end uses either direction finding equipment and/or propagation pattern analysis. It's sometimes an especially difficult task because the stations are known to change frequency and location on short

COUNTERFEIT BROADCASTERS

notice (or with no notice at all), the schedules of the transmissions are also sporadic.

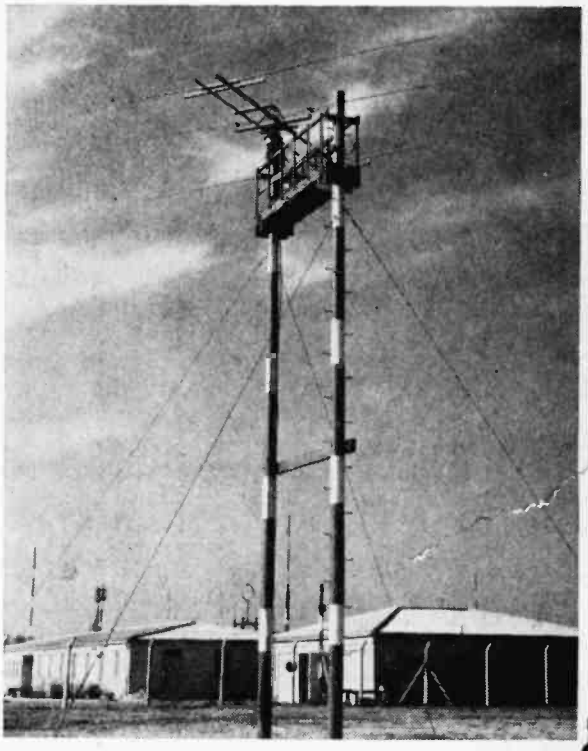
Listed here are the results of numerous monitoring efforts from listening posts throughout the U.S., the world and RADIO-TV EXPERIMENTER's own short-wave listening post—DX CENTRAL. We believe that this is the most comprehensive discussion of clandestine broadcasters ever attempted. Remember that schedules change, as do frequencies, and that you may have to put some extra effort into hearing some of these stations. All times shown are Eastern Standard, all frequencies shown are all of these which have been monitored for a particular station, however some may not be currently in use.

In addition to these stations, there are some interesting transmissions which are reported to be instructions for spies throughout the world. A woman reads a series of numbers in German language on 4050, 6400, 6800 kc/s at about 1515 EST, the march "River Kwai" is often played as an identification. A woman reads similar numbers in Czech on 6780, 7400, 9355 kc/s, and a man reads them in Spanish on 5260 and 5750 kc/s.

These clandestine stations come and go, and if you stick by your receiver long enough you'll fill your log easily. Other clandestine broadcasters which were on during the past few years include: Our Russia, The White Legion, West Irian Struggle Broadcasting Station, Voice of Istria, Voice of Free Egypt, Voice of Free Albania, Radio Return to Homeland, Escambray Libre, Radio Baikal, Radio Romania Viitoara, Radio Goryanin, and no less than two different stations calling themselves The Voice of Justice (one anti-Nasser and the other involved with Korea).

Unlicensed stations aren't limited only to land. Not long ago there was a station aboard a yacht, Radio Cuba, on 6150 kc/s. It is believed that this station was operated by a group known as the Democratic Revolutionary Front in Miami.

Europe saw an outbreak of these unlicensed shipboard broadcasters, known as "pirates," among them: Radio Mecur, Radio DCR, Radio Nord and Radio Veronica. While not of a political nature, these stations irritated many people by transmitting commercial broadcasts from international waters adjacent to countries where commercial broadcasting is not permitted. After four years of aggravation, the Danish Government finally figured out a way of silencing Radio Mecur by means of legislation, true to the code of the "pirate," and with a unique dignity, the station (according to Reuters story) hauled down the Jolly Roger—to the tune of the Admiral's Song from Gilbert and Sullivan's "HMS Pinafore," and pulled the master switch for the final time.

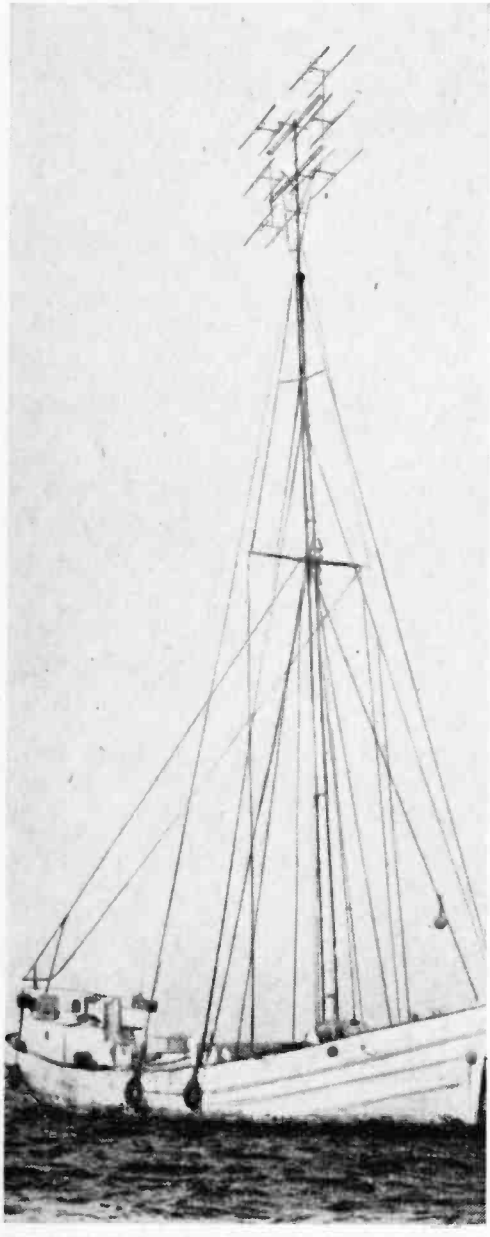


Clandestine broadcasters are difficult to pin down. Here a Radio Free Europe antenna is picking one out of the communist QRM. A good beam antenna is mandatory.

Clandestine Stations on Short-Wave Frequencies

Azad Kashmir, 3250, 3625 kc/s. 0900-1230 EST. Programs and commentaries in Kashmiri and Urdu, plus music.

Fukien Frontier Station. Programs in Mandarin dialect of Chinese language. No other data known.



The "pirate" broadcaster, Radio Mercur, operated while moored in international waters before the Danes put an end to it.

German Soldiers' Station, announcing "Deutscher Soldatensender" 935 kc/s, 0015-0115, 1200-1245, 1415-1445, 1730-1925 EST. Station is anti-NATO and against the West German government. It claims to be in West Germany but is actually located near Magdeburg in East Germany. Programs are supplied from East Berlin.

German Truth Station, announcing "Deutscher Freiheitssender Neun Hundert Vier." 904 kc/s, 2230-0000, 1300-1400, 1500-1630 EST. Probably the same equipment used for "German Soldiers' Station," similar programming with the addition of music.

Imre Nagy Radio. 6218 kc/s, 0500-0900, 1200-1700 EST. Broadcasts directed to Hungary. Location not known.

Khmer Freedom Station. Transmissions in Cambodian and French beamed to Cambodia. Station is relatively new and no further details are available.

La Voix de Revolucion. 11964 kc/s, 1645-1915 EST. All French programs, believed to be located in Conakry, Guinea Republic.

Liberation Broadcasting Station to South Vietnam, announcing "Dai Phat-thanh Giai-phong." 7422, 9807 kc/s, 0000-1945. This station transmits in Vietnamese and tries very hard to make listeners believe that they are actually located in South Vietnam. Also transmits in Thai language.

National Voice of Iran. 6025 kc/s, 1230-1415 EST. Programs in Persian, Kurdish and Azerbaijani languages. This station preaches the downfall of the Shah of Iran and is anti-American. It is probably located near Tbilisi, Georgia, U.S.S.R.

Radio Americas, formerly "Radio Swan." 1165, 6000, 11800 kc/s, station operates a large schedule in Spanish and English throughout the day and night, beamed to Cuba. Despite speculations that this station is in the Florida Keys, on a boat, or on Navassa Island, it is located on Swan Island, as indicated on the station's QSL card. The QSL card was obtained by addressing a reception report to P.O. Box 1833, Miami 1, Fla. No location is announced on the air.

Radio Espana Independiente, 6950, 7602, 10110, 11265, 12140, 14480 kc/s, 0100-0200, 0800-0900, 1100-1800 EST. Station is operated by the Spanish Communist Party in Exile, it is anti-Franco, and is frequently heavily jammed. They announce that they are located in the Pyrenees Mountains, but most probably they are in Rumania or Czechoslovakia. They have announced a mailing address of "c/o L'Humanite, Paris, France," although this address has not been verified.

Radio For The Liberation of Great Russia. 5990, 9360 kc/s, 0200-0230, 0600-0630, 1400-1430 EST. Station transmits anti-communist propaganda in the Russian language. The identification includes portions of the "1812 Overture," and it is believed that the station uses the transmitters of "Radio Nacional de Espana," the official

COUNTERFEIT BROADCASTERS

broadcasting station of the Spanish government.

Radio Free Algeria, announces "Radio Algerie Libre." 6410, 11539 kc./s. Station was on during fight for Algerian independence from France. It used French and Arabic languages at 1545 EST.

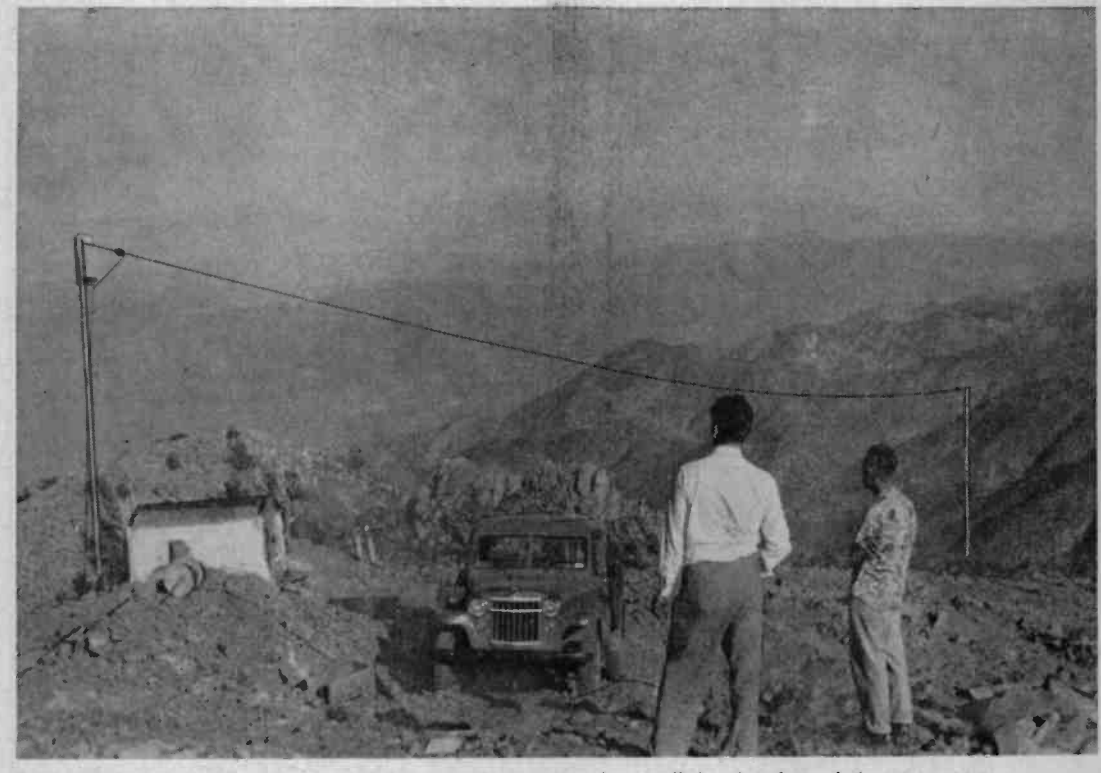
Radio Free Iran, announcing "Radio Peyk-e Iran." 9560, 11410, 11695 kc/s, 0930-1310 EST. Programs in Persian, Kurdish and Azerbaijani languages. Station is probably located in Bulgaria. There is a good chance that this station uses the same transmitters as "The Voice of The Iraqui People."

Radio Free Portugal, announces "Radio Portugal Livre." 7005, 7410, 8065, 8332, 9453, 9500, 9784, 11510, 11669, 12005, 14955, 15500 kc/s, 0700-0730, 1400-1430, 1615-1645, 1830-1850 EST. Station broadcasts propaganda against the Salazar government and in favor of communism. Transmitter may be in Rumania.

Radio Free Russia, operated by Narodno Trudovoi Soyuz (National Alliance of Russian Solidarists). 6350, 6424, 6787, 10714, 11550 kc/s, 0530-1030, 1230-1530 EST. Station transmits from trucks located in Sprendlingen (near Frankfort), West Germany and has been on for 14 years. QSL's have been received from reports addressed to NTS at 125 bis rue Blomet, Paris 15 (e), France.

Radio Free Scotland. Station of the Scottish Nationalists in Aberdeen expected to be on air shortly. Details not known.

Radio Great and Free Russia. Indentification sometimes used by "Radio For The Liberation of Great Russia."



Some clandestine stations are operated from remote locations by small bands of revolutionary patriots. Broadcasting equipment is frequently nothing more than converted amateur-band transmitting equipment.

Keeping track of coming-and-going clandestine broadcasters is a hobby to DX'ers, but it's a full time task for these people at Radio Free Europe monitoring station located in West Germany near the Iron Curtain.

Radio Gusano. 6205 kc/s, 2100-2300 EST. Anti-Castro station. The name means "Radio Worm," gusano is the name Castro has given to those who oppose him. Location unknown.

Radio Habana Libre. Identification frequently used by "Radio Liberdad."

Radio Kemam, The Voice of the Free Malay Union. 7202 kc/s, 1030-1130 EST. Station transmits propaganda against Malaysia.

Radio Liberdad, La Voz Anti-Communista de America. 1560, 3390, 3660, 3675, 4005, 5075, 5650, 6240, 6999, 7308, 7405, 8960, 9336, 11935, 11970, 15050, 15370, 15430, 17745, 17885 kc/s, 1800-2200 EST. Station which transmits anti-communist programs in Spanish, announcing that the programs come "from the studios of Eugenio Fernandez Ortega," which are apparently in Venezuela. Several false P.O. Boxes in Miami have been given as QSL addresses, however the station has been QSL'd by a report sent in care of "Radio Free Russia." The station is reportedly controlled by a group known as "The Eleven."

Radio Medea. 8665, 11194, 11485 kc/s, 0600-0815 EST. Station believed to be in Algeria.

Radio of The Laotian Kingdom, announcing "Stani Withayu Krachaiseing Hang Prathet Laos." 6235, 7085, 7410 kc/s, 1815-1915, 0000-0100, 0615-0715, 0815-0915 EST. The station claims to represent neutralist interests but is actually communist controlled.

Radio Omega. 6352, 11550 kc/s, 0915-0945 EST. Religious station using Russian Language, probably via the facilities of "Radio Free Russia." Address is reportedly P.O. Box 272. Antwerp, Belgium.

Radio Pathet Lao, announcing "Stani Withayu Krachaiseing Kong Fai Pathet Lao." 6212, 6345, 7310 kc/s, 1930-2100, 2315-2345, 0530-0600, 0730-0800, 0930-1000. Station is part of the Pathet Lao (Communist) Party, location unknown.

Radio Socialist Albania, announcing "Radio Shqiperia Socialiste." 7150 or 7250, 9663 or 9776, 11775 or 11875 kc/s, 0400-0430, 0630-0700, 1030-1100, 1400-1430, 1600-1630, 1815-1845 EST. The station is pro-communist but opposes Stalin, supports co-existence with the west. The Albanian government has claimed that the United States operates this station in Athens, receiving propaganda from Yugoslavia.

Radio Tehran. Identification sometimes used by "Radio Free Iran."

Russel Society. A station operated by this organization is reported to be preparing for operation in Europe.

Voice of Free Africa. 17890 kc/s, 1200-1240 EST. Station which tries to stir national movements in African nations by means of stressing racial tensions. Attacks colonial

(Continued on page 120)

HOW TO
Hear the Rare Ones

A few tips from one SWL'er to another

C. M. Stanbury II

MANY SWL's will spend an entire year tuning the short-wave bands, yet come up with a mere scattering of mediocre DX. Why? Because consistent DX results are not a matter of mere luck. If you want to reach DXing's top rung, you must use the right methods.

Inside dope. The most common mistake made by novice listeners is too much random tuning. A certain amount of general listening is required in order to know the bands you intend to work. To be a successful listener you must pick your targets in advance and stick with them until successful or until you determine that the hunt is impossible.

Picture postcard QSL SWL'ers received if they logged the USSR's spacecraft Vostok V.

Which stations you select depends upon your special interests, geographical location and listening equipment. If the DX'er lives in the Western U.S. and is long on patience, he might try for KPDQ just before sunset. Of course if he's not blessed with plenty of patience, his DX career isn't going to be much anyway.

Sometimes a station will be available or important for only a very brief period. As example, the Voice of America's Courier was target for every BCB DX'er during those few days it broadcast from the Panama Canal Zone and is now a target for SWL's as it will soon be replaced by a more powerful land based facility. Similarly, space flights, both American and Russian, fall into this category. In fact, for many they top the list. Then the DX'er may be after news, or QSL's, from a certain country, state or city. In this case you'd check *White's Radio Log* for the appropriate frequency and station call sign. At all times a listener should have at least two targets—one for the daytime and another at night. Maximum numbers of targets you can handle at once depends primarly upon the time available.

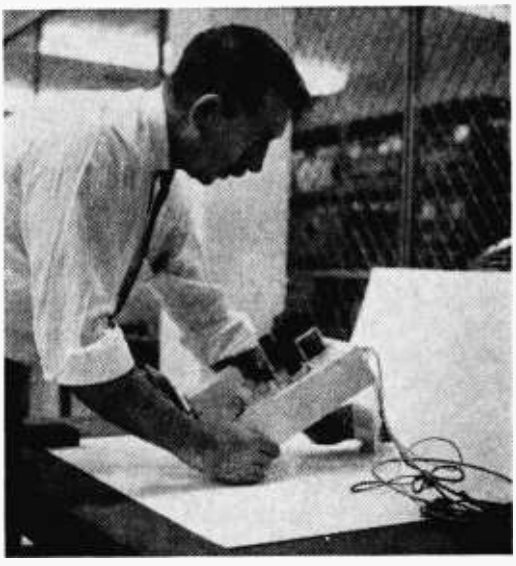
Know the bands: No matter from what source you pick your targets, the next step is to know the bands upon which they operate. Our *Crystal Ball* (page 90) will tell you which band is best at any given time but there's more to it. On each of the bands involved you must know about the other transmitters that operate on (or near) your target's channel. From this DX'ers will learn not only what to expect in the line of QRM, but which strong stations will help you spot your target's channel on the dial.

These conditions vary on a seasonal basis and in regular 27 day cycles corresponding with one rotation of the Sun upon its axis. Further, short-wave broadcast stations are constantly altering their schedules and even frequencies. One day the DX'er may encounter almost impossible QRM (nothing in DX

(Continued on page 121)

Photographing ELECTRONIC Equipment

Here are a few tips on how to take professional quality snaps of your electronic gear using equipment you most likely now own



HOW many times have you tried to explain some physical feature of your new ham gear or audio system—when it's back home on the bench and not in view? You can draw some of it out on paper, maybe, but that's not really adequate. What you want to do is *show* someone your newest and best construction project.

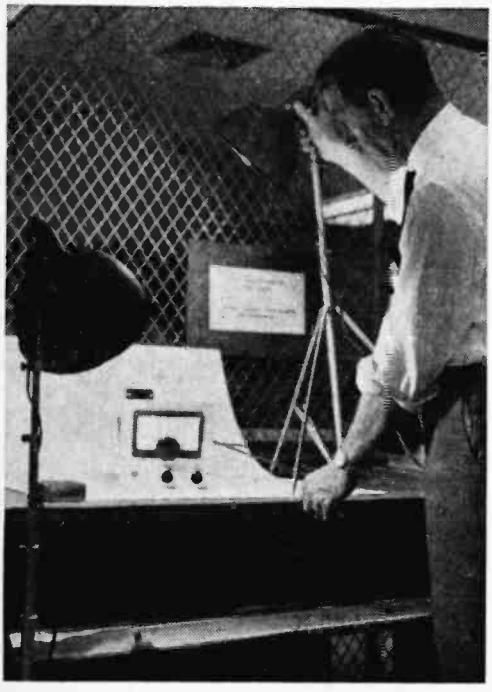
Photography offers you an opportunity to *bring your chassis with you* to the office coffee break—or whatever the get-together happens to be. Frank Beaudin, official photographer for the *American Radio Relay League*, has volunteered to show our readers how to take professional quality pictures of electronic gear, using photographic equipment you most likely own already.

Professional tips on chassis photography, which probably have never before been presented in picture-story form, are yours for the reading in the following "how-to" picture story. While Frank's photographic subject here is an amateur radio VFO or variable frequency oscillator, the instructions apply equal, to any electronic equipment, whether you're shooting a simple electronic accessory or an elaborate built-in hi-fi stereo system.

Most shots are likely to be black-and-white, but color snapshot film or slide film can often be used to clarify extra details, where wiring is color-coded. As a matter of fact, electronic manufacturers use such photos to guide assembly workers.

Even if you don't intend to try this new field of photography immediately, you will find that Frank Beaudin's method, based on over 30 years experience, takes a good deal of the mystery out of the excellent equipment shots you've seen (and wondered about) in magazines such as S & M and your very

Set up two lights for even glare-free lighting (bottom). The top light is positioned to cast a slight shadow that adds depth. Check lighting (right) as the camera sees it to discover and eliminate confusing reflections. Then distance is checked, settings made and photo taken.



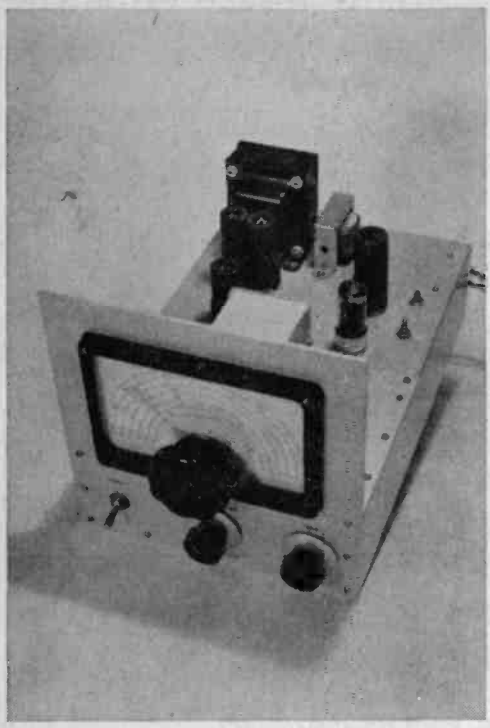
own magazine, RADIO-TV EXPERIMENTER.

Although Frank customarily uses an 8 x 10 view camera in his commercial work, he volunteered that an adjustable 35mm camera and tripod would yield excellent results for any amateur photographer.

We met Frank at the table he ordinarily uses for taking his shots of electronic equipment. "There's one thing I insist upon," Beaudin said. "The table has to be clean and uncluttered." A sign hung up over his "shooting" bench reads: "For photographic use only—do not deposit your *sundry paraphernalia.*" That's a fancy way of saying, "Keep free of junk."

"I begin with a large white cardboard to serve as a one-piece background," he said. This cardboard is available at most art supply stores for a few pennies. "This keeps the lighting even and when propped up against the wall and held in place by a weight, it cuts out any extraneous background. All that clutter in the background tends to distract when the equipment being photographed is surrounded by it."

The Prop. Reaching for a small plastic

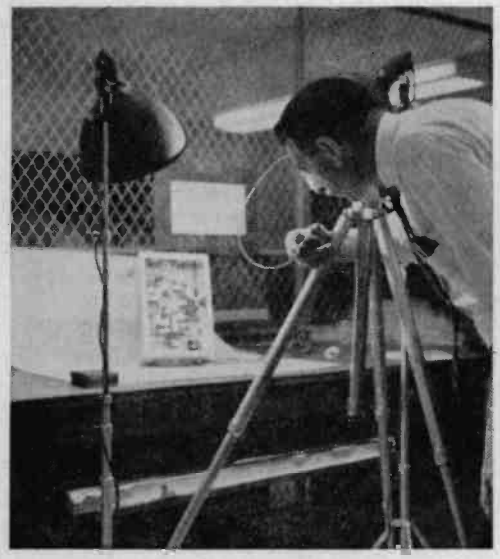


Final print shows smooth all-over lighting plus some shadow for sense of depth.

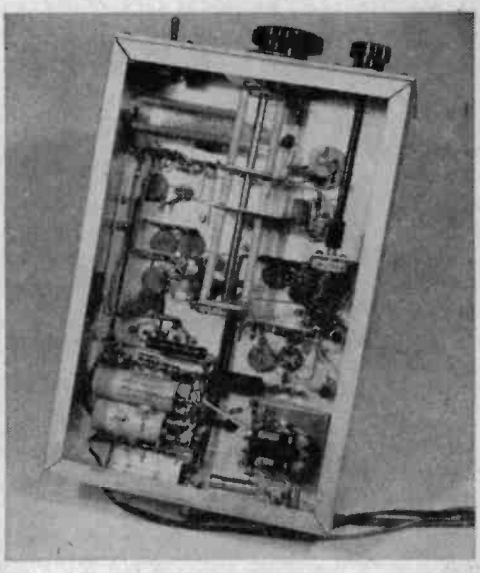
box, Beaudin continued: "Use a prop to tilt the chassis up." (See photo on page 71.) This gives the picture perspective and identifies the panel with the chassis, without hiding any of the components behind the panel. Make sure that the prop will not be visible in the final picture and either hide output cables behind the chassis where they won't show or lay them out in such a way that they can be clearly distinguished. Sometimes a finger or pencil tip is used to point out an important feature. This is OK provided the pointer doesn't hide the feature or become distractive.

Lighting. Frank paused to point out that commercial photographers like himself rely heavily on photofloods for lighting, usually using "EBV" or No. 2 lamps in reflectors. If you don't already have 2 'floods,' you can put together reflectors, spring clamps, bulbs and lamp cord for $5-10 with materials available in any photo shop.

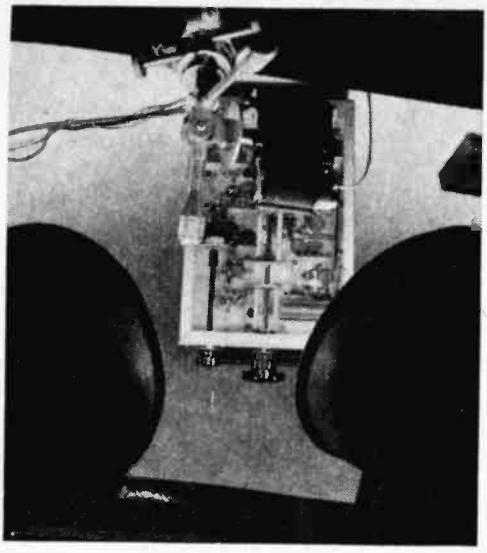
Reaching for two photofloods, Beaudin continued his running commentary: "We have two surfaces to light here and in order to do this evenly and without glare we will have to use a top light to illuminate the chassis and another flood for the panel." (See photo on page 72.)

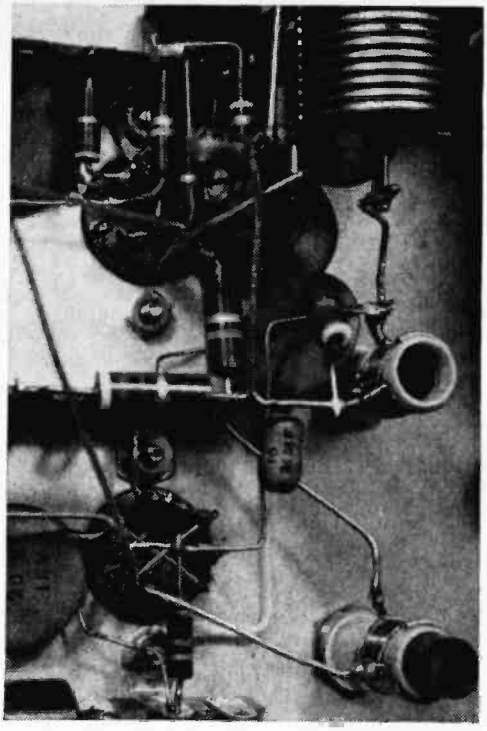


Under chassis shots require lights to be set wider apart than normal to eliminate shadows in deep corners. Check very carefully in order to prevent confusing reflections.



This un-retouched photograph shows almost total elimination of shadows with each part clearly illuminated. Feeling for depth is maintained without overexposure or glare spots.





For extreme close-ups, use supplementary close-up lens available from your local photo dealer. Measure distances carefully to be sure you are in focus. Careful planning will produce sharply-detailed photographs like the close-up glare-free shot on the right.

"The top light is most easily placed right on the bench, aiming down on the chassis at a 40-60 degree angle, like sunlight. The other light stands on the floor, aimed at the panel from about the same angle on the other side." Both lights were about three feet from the chassis, with the top light casting a slight shadow in front of the panel for "3D" effect.

Composition. "The next stop," according to Frank, "is to bring in the camera, mounted on a tripod or any steady platform." He then recommends that, after lining up the subject in the viewfinder, you walk around in front of the camera and view the subject directly, with your eye as nearly as possible in the camera-lens position. The reasons for this are:

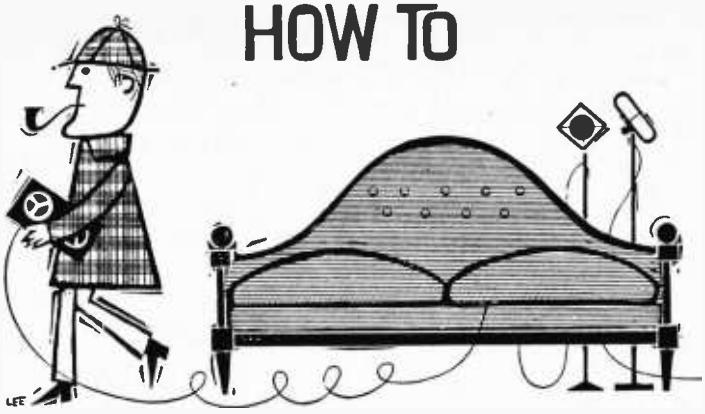
- In close-up shots, viewfinder parallax can fool you—make you cut off the top edge of the subject if you have framed it tightly. The solution, with *most* viewfinder cameras, is to tilt the camera up very slightly, so as to allow a little extra space above the top of the subject. Some cameras have parallax markings in the viewfinder.
- The *in-front-of-the-lens* viewing position sometimes reveals glare or hot spots from the subject, which are easily overlooked when viewing through the finder. Glare can be corrected by adjusting the positions of the lights, in most cases.

Shoot. Take a variety of exposures after double checking all your camera settings. We used 1/8 of a second at *f*/22 and came up with the photo shown at the upper left on page 73.

You can use almost any brand of quality film. We used a roll of Kodak Plux-X film which makes very good pocket-size snaps or enlargements up to 5 x 7. Kodak Panatomic-X (Pan-X for short) requires a slightly longer exposure (about ½ of a second) at *f*/22. Enlargements up to 8 x 10 made from Plus-X negatives are clear and sharp without any *fuzzing* grains.

Under-Chassis Views. Quite often, Frank is asked to photograph under-chassis views. "The basic setup is the same," he says, "but the lighting is more critical than it was for the shot described previously. I set up both lights shooting down and into the two sides of the chassis," Frank continues. "The two lights coming in at different angles prevent harsh shadows. Again, shoot from an angle to give enough side-lighting to keep the sense of a third dimension."

(Continued on page 146)



HOW TO BUG A ROOM

Electronic eavesdropping, an art developed by spies and industry snoopers, can be used by the amateur for entertainment purposes.

By Byron G. Wels

THERE are a great many misconceptions extant when it comes to the art of *bugging*. People seem to visualize bugging or eavesdropping as a sneaky, foul, underhanded way of obtaining otherwise unavailable information. Bugging, in truth, is an art, a science, and a challenge. The average home experimenter may probably resort to bugging a room to tape record a party or family conversation under natural conditions. Gone are the emotional stresses called *stage fright*, when a microphone is present.

Evaluate the Situation. There are many things to be considered in planting the bugs, or mike pickups. Of utmost importance, is how much time is available to complete the job of planting, what the location is like, and whether the subject of the bugging may be suspicious of hidden pickups.

Given an unlimited amount of time to plant (or conceal) the bugs, even you can do a truly magnificent job. Unfortunately, you are not always able to spend as much time as you'd like, and very often, may not have access to the room in which the bugs are to be placed, at all! This does not deter the professional bugger. The art of bugging consists for the most part of concealing or disguising the pickups. This can be done in a great number of ways. It becomes a function of the type(s) of units used, and the circumstances.

Let's take a few typical examples, and maximum efficiency.

The Room. In a private home, or in a hotel room, there are many innocuous pieces of furniture that lend themselves to concealment. If the subject is not suspicious, a simple expedient is to firmly anchor a transmitter (the transmitter section of a Part 15 license-free transceiver will do fine) under a convenient table. Arrange to turn the transmitter on, just before the subject enters, to insure that the batteries will not be run down.

Another excellent technique is to use the telephone in the room to dial your own number elsewhere, and have a confederate lift your receiver at the remote location. Place two small pieces of black sponge rubber between the handset and the cradle of the phone, so it doesn't cut off the call when the handset is placed on the cradle. Should the subject see fit to use the phone, all you have to do is hang up at your end, and as he lifts the phone from its cradle, the rubber pieces will spring away, and probably not be seen!

Find a closet door with a wooden panel enclosed in a wood frame. Such panels can be used as sound pickups, for they act like diaphragms do in mikes. The pickup need

HOW TO BUG A ROOM

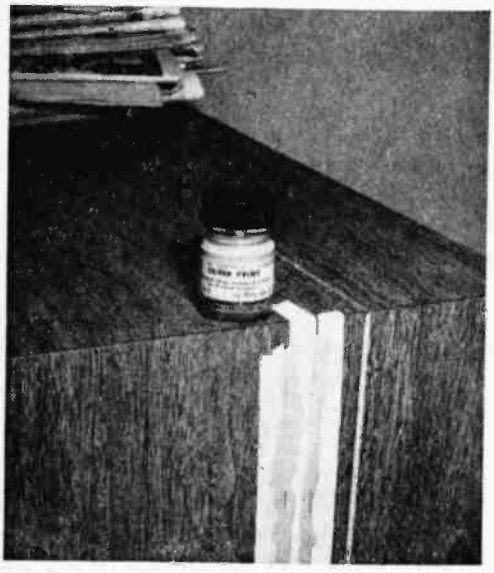
only be an inexpensive stereophonic or monophonic phonograph cartridge attached to the unseen side of the door.

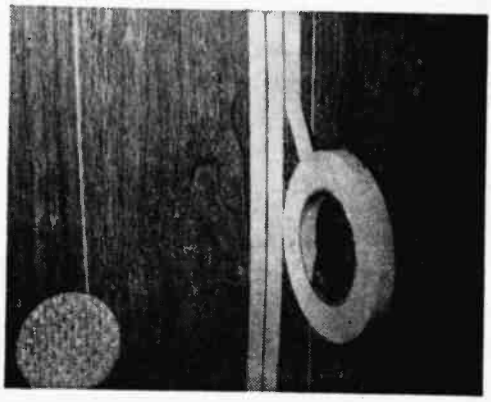
Camouflage. Remember that disguise is your best bet. Any of several magic shops or joke shops can provide you with what looks like an electric light blub, but is really made of plastic. A bit of advance work with a fine hack-saw blade and a drill will permit you to conceal a microphone button in such a bulb, and perforating the bulb with a few holes will allow sound to enter. All you have to do is ascertain that there is more than one source of illumination in the room, and replace the bulb in one of the less-likely to be used lamps with your own bulb. The lamp wires will then serve as conductors to your amplifier. Make sure you turn the lamp switch on, however, to permit the sound-carrying current to flow!

Don't overlook electronic appliances which might ordinarily be accepted as commonplaces! Any radio technician knows that a loudspeaker is a microphone, in reverse! You can disconnect the loudspeaker wires in any small radio, and connect your own lead wires to the speaker! It will then serve as an additional pickup in the room. What's more, the radio doesn't have to be turned on to operate!

How Many and Where? Remember that all pickup devices must be considered expendable. Assume that you will not be able to recover them, and proceed on that basis. Remember too, that because of the need for concealment, pickup quality will not be the best. People may wander away from the range of one pickup, and it's nice to know that should this happen, you have another planted wherever they happen to be going! Plant the pickups scientifically, first seeking the places that people are likely to move to in a given room, while talking, and then chose the best location in each area. Test each pickup well in advance, to determine its total effective range, and attempt to plant the unit so as to completely cover the room.

Suspicious Subjects: If you are involved in an intrigue of some sort, you can almost bet that your subject is expecting trouble of this sort from you, and there's more than one way to skin the proverbial cat! You can assume that Mr. Subject will look for hidden microphones, so you might try a stunt that succeeded for your author one time! The subject challenged him to bug his living room in his absence, and when the job was done, we planted one more microphone. . . . It wasn't *really* a microphone, it was an empty microphone plastic case that we had long since removed the element from. This dum-





Painting wires to serve as leads for hidden microphones is one way to avoid detection. To paint a line, first place three strips of masking tape (above) over the surface the leads must travel, fill the masking tape spaces (left) with conductive silver paint, then as the paint

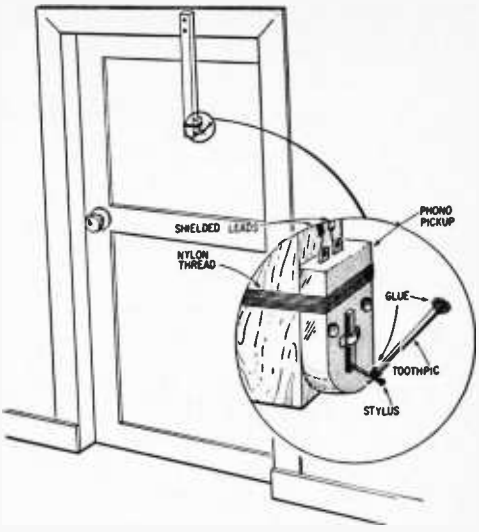
my was planted in a vase of flowers, used as a table centerpiece.

From the next room, we heard the subject enter, and quietly start a methodical search. He soon located the "hidden mike," and we heard him say (through an entirely *different* mike) "Ah-ha! I found your mike, and I'm going to smash it with this hammer!"

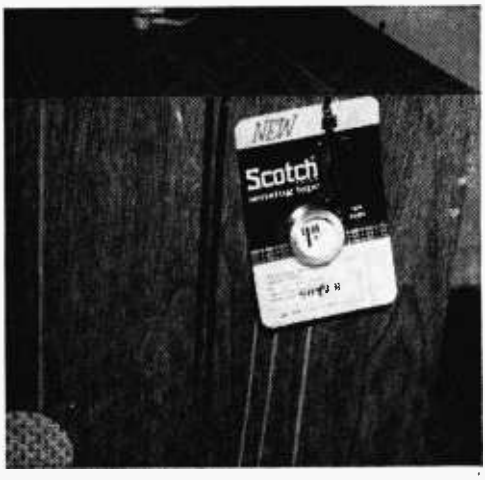
We heard the empty case crunch, and continued to listen for the rest of the evening. It was when we heard him settle back with a hot cup of coffee that we announced our audible presence. (Took the liberty of reverse-bugging through the radio.) We asked if there was enough coffee for an extra cup, and Mr. "X" nearly flipped with surprise. It was not much of a surprise however, to see him sputtering and flustered when we walked in, for in his shock and disbelief, he had spewed a mouthful of hot coffee all over the front of his shirt!

Concealment. If the subject expects trouble from you, you must take additional steps to conceal your equipment.

Carry a 1-in. wood drill in your bag of



Ordinary mono or stereo cartridges can be utilized as sensitive sound pick-ups.



Scotch's new aluminum sensing tape can serve as wire leads on back of furniture.

is drying (above) peel the tape off leaving two silvered lines that can serve as conductive leads. Wood finishers used to cover and hide deep scratches (right) hide the silver leads and restore the wood finish. A little practice at home is a good idea.

HOW TO BUG A ROOM

tricks, and you can easily bore a hole under a desk or table to conceal the microphone. Hold it in place, and patch most of the hole with some colored wood putty. This is available for furniture repair, and you can get one-ounce tubes in an assortment of woodtones to match the furniture.

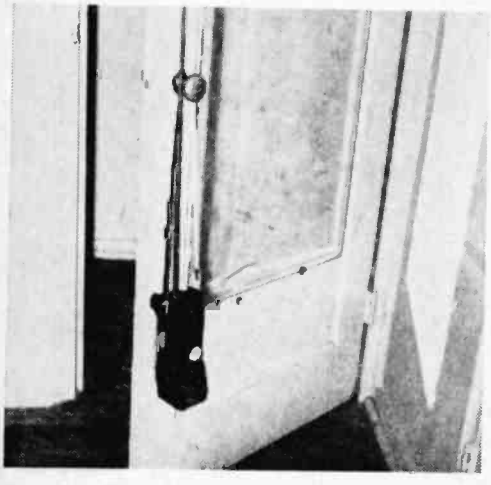
Unfortunately, many an otherwise well-planted bug is given away by wire leads. These are very easy to trace to their source, and for this reason, use radio bugs wherever possible. Where microphone pickups must be used, additional steps are required to conceal the leads.

The best solution is not to use wires. What's that? Oh yes. Carry two additional items. . . . One of these is a pressure-sensitive aluminum tape, about 3/16-in. wide. It is used with tape recorders to signal the machine to reverse, or to synchronise a slide projector. If you are working with a porous surface such as wood, this tape is an excellent conductor. Simply run a double strip of the tape from the microphone down one leg of the table (back of the leg, please) and then connect to the tape by using a small quantity of silver conductive paint, such as is used to repair printed circuit boards. Use ordinary masking tape to hold everything together until it dries. Conceal the tape with a coat of varnish stain in a color matching the wood surface. It is of course wise to carry small ½ or ¼ ounce bottles of the common wood colors.

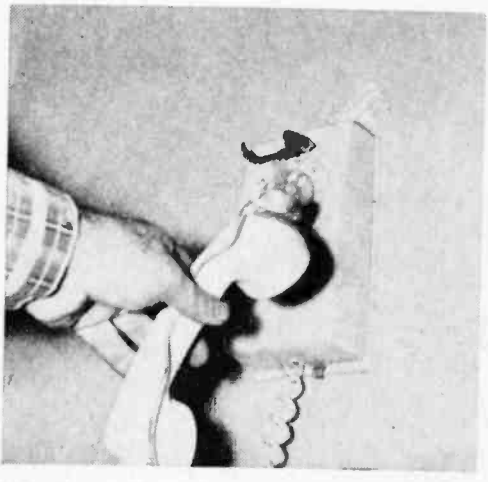
If you are dealing with non-porous surfaces, run three strips of masking tape under the tabletop and down one leg of the table. Place the strips about 1/16-in. apart, and fill in the space with the silver conducting paint. When it dries, peel the tape away, and you will have a double band of conductors!

Tricks with Telephones. There are numerous devices to enable you to record directly from a telephone, and none of these will tip the fact that you are making a recording, to the person you are speaking with. There *is* a federal law that concerns tape recording telephone conversations, but this law requires only that an audible "beep" be sounded every fifteen seconds. Contrary to popular belief, there is no law against *obtaining* it!

Tapping phones. There's been a lot of publicity given to this subject, and a lot of it is misinformed. However, the telephone and its associated equipment is *not* your property, it is loaned to you by the telephone company. Don't fool around with this unit or its associated wiring. You're just asking for trouble. If Ellery Queen wants one of his secret operatives to risk a law suit, that's his affair. Don't tamper with telephones or telephone wiring. It isn't worth the danger



Part 15 device, taped to "talk," broadcasts private chit-chats many city blocks away.



Inductive pickup lets you tape telephone conversations without connecting to wires.

and you are only bringing a third party, the telephone company, into the act. Besides, they can afford more and better lawyers than you can, so hands off.

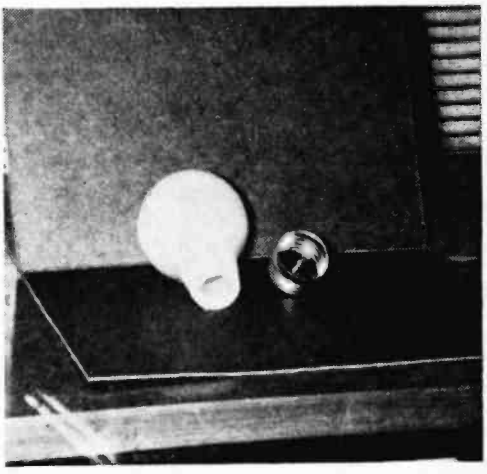
Personal Bugs. No, we're not talking about the infamous "cooties" of World War I! You can be talking face-to-face with somebody and be totally unaware that he is recording your every word!

In the first case, a complete miniature tape recorder is concealed under the clothing, but with push-button switches that can be activated by an imperceptible movement. The microphones can be disguised to look like anything BUT microphones. Tie-clips, women's barretts, fountain pens, all can actually be miniature concealed microphones.

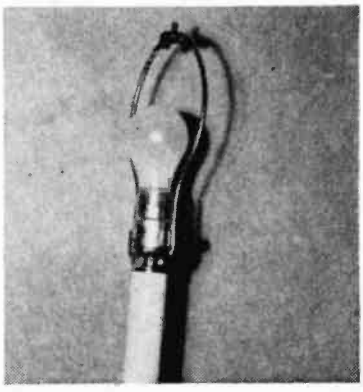
At the Remote Site. No matter what method or combination of methods you use, you will require that the information be properly recorded at a remote location. As soon as you have brought the lead wires away from the room and the possible sight of the subject, connect these wires via coaxial audio cable to tape recorder plugs. Your author has found it convenient to use a rotary switch set-up, so that he can plug all of these cables into a "little black box" and switch any one (or combination of) pickups into the tape recorder. By thus eliminating from the circuit any pickups which are contributing little to the overall recording level, and accenting those which contribute greatly, a good recording is always obtained.

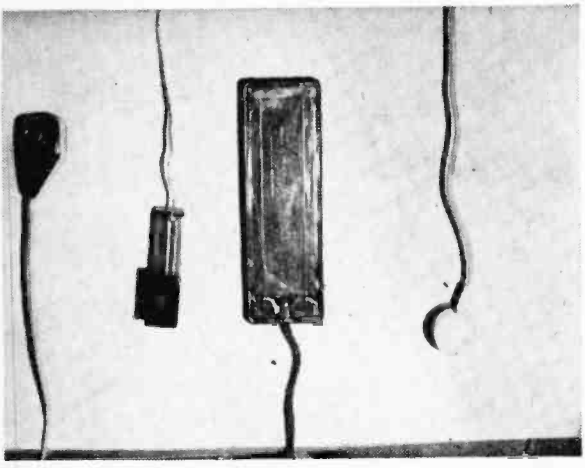
Where to buy it. Almost all of the items mentioned in this article and necessary for bugging a room can be obtained from electronic parts supply houses. Mail order catalogs from the major parts houses list the items and describe them in detail. The plastic electric light bulb can be obtained from toy novelty stores.

Finally. Bugging can be fun, or it can be profitable, or informative. It can also be tragic. Use this knowledge with a moderating dollop of common sense, for most people resent being bugged. If you tape someone at a party *shooting his mouth off*, be a gentleman and destroy the tape if the loud mouth objects or is offended. In fact, if no one objects to the contents of a party tape, still play safe—destroy the tape in front of your guests. This way they will always be at ease in your home—and theirs. ■



A bugger's delight is the plastic light bulb. Remove base (top) and insert tiny mike. Installed in lamp socket (below) line cord serves as audio cable. Keep switch set at on.





Almost all radio parts houses carry phone pickups in several varieties of useful shapes.

TABLE-TOP ELECTROPLATER uses dry cell batteries, rheostat, milliammeter and plating jar.

EXPERIMENTAL ELECTROPLATING

Why not try it? You can replate parts or do it just for fun.

ELECTROPLATING is a simple process. All you do is coat one piece of metal (called the cathode) with a thin layer of another kind of metal (from the anode) by immersing both in a liquid (the electrolyte) and passing an electric current from one (the anode) to the other (the cathode).

Copper and nickel are the easiest metals to plate. Here's what you need to get started: a wide-mouth glass jar, two short brass rods, a small sheet of copper, two large dry cells, a milliammeter or low-reading DC ammeter, four alligator clips and electrolyte. Get eight-ounce jars of electrolyte crystals from a hobby store or from Central Scientific Co., 1700 W. Irving Park Blvd., Chicago 13, Ill. Order #81136 for copper plating, #81158 for nickel.

After mixing the copper electrolyte crystals in warm water add about ½ teaspoon of sulphuric acid. You can get it from a battery shop or filling station. A 2 x 3¾-inch sheet of roofing copper makes a good anode. Hang it in the electrolyte from a brass rod.

Clean the work piece (cathode) of all traces of oil or grease and do not touch it with your fingers after you finish cleaning it. Hot water, detergent and a tooth brush do a fair job, but you can do better with a caustic cleaner such as sal soda. Polishing a steel surface with fine abrasive paper or a wire brush helps. The quality of this cleaning operation will contribute more to your plating job than anything else.

Connect the batteries as shown in the top diagram, opposite page, and plate for about five minutes at 500 milliamps (.5 amp). Lift out the plated piece and check it. Light pink indicates the copper is being deposited, but the job is not done until a full rose color is achieved. —*Harold P. Strand*

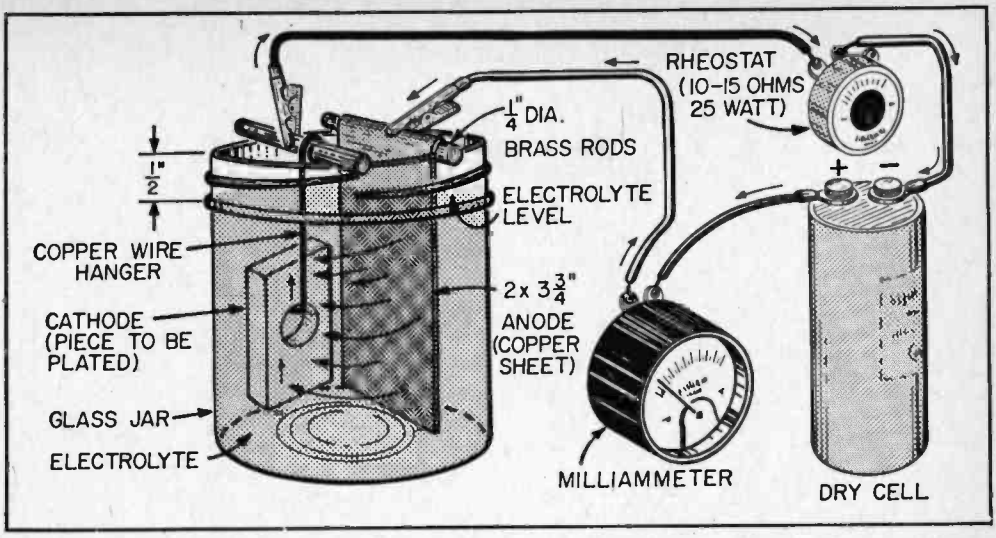
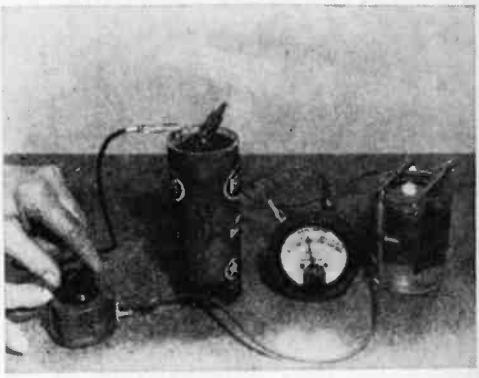
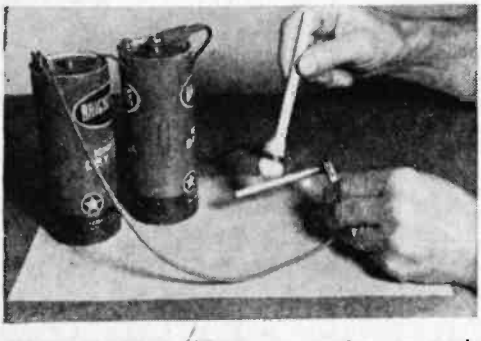


DIAGRAM SHOWS plating tank with cathode (piece being plated) suspended in electrolyte.

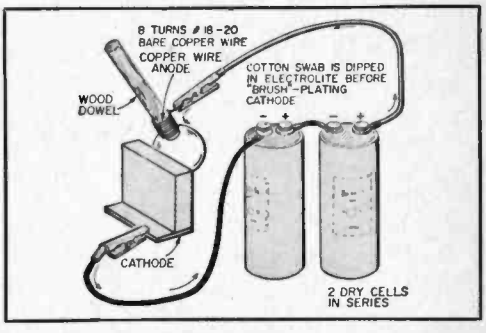
MIX ELECTROLYTE by stirring about 2 oz. of crystals in wide-mouth jar that's nearly full of water. Use care when adding ½ teaspoon of sulphuric acid with a hydrometer or glass syringe; avoid spills which could burn skin.



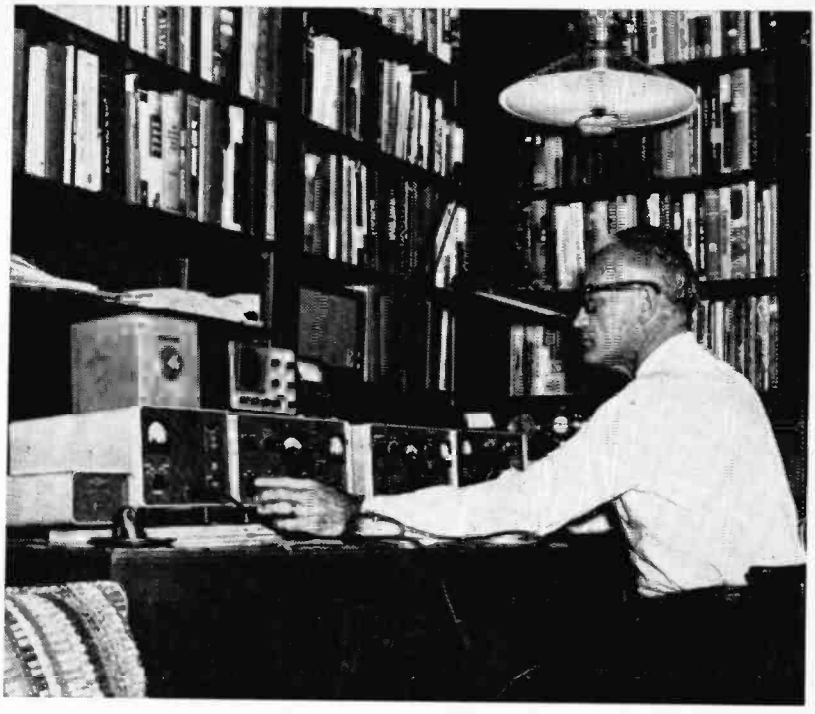
RHEOSTAT (left) makes it easy to adjust current. Meter should read 500 milliamps for uniform plating. Positive terminal of battery connects to anode through rheostat. Connect negative to cathode through milliammeter.



BRUSH-PLATING SETUP is similar to tank method with brush replacing tanks as means of applying electrolyte bath to cathode. This system is useful when you are plating small objects, can be used to repair worn plating.



THE BRUSH-PLATING circuit diagram shown here has a cotton swab with copper wire anode connected to the positive terminal. Copper and nickel are the easiest metals to plate. Clean the cathode of all traces of oil.

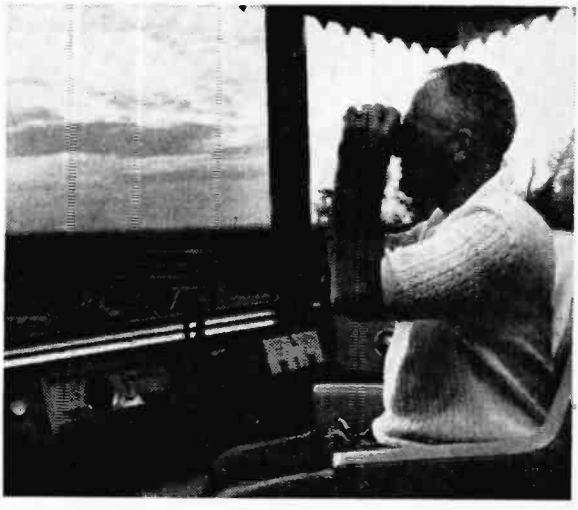


Senator Barry Goldwater shown operating his ultra-modern kilowatt ham station — it rivals any ham shack in the nation.

CQ DE K7UGA/K3UIG

In Washington they call him Senator Goldwater, but on 80-meters he's just plain "Barry"

By Ebby Hawerlander



A two shack man, Barry operates out of Washington, D. C. (top photo) and at home in Phoenix, Arizona. Perched up high, Barry can establish eye-ball contact while viewing local mobile unit.

IT'S NO SECRET that electronics is the one hobby which spans all "normal" social, economic, and political barriers. It's the one "great equalizer," and probably the only hobby which could produce the unlikely scene of a 16 year old high school student chatting with a United States senator on the subject of unjamming a stubborn DC relay.

It was exactly such a scene which we witnessed on a recent visit to the ham shack of Senator Barry Goldwater at his unique Arizona home. The Senator was at the controls of his ham station, K7UGA, and was in contact with a young fellow in Connecticut. After several exchanges, Senator Goldwater identified himself as "Barry, Baker . . . Able . . . Robert . . . Robert . . . Yankee," and the Connecticut operator countered with, "This isn't Senator Goldwater by any chance, is it?"

This happens all the time, and the reply is always, "It's not *Senator*, it's *Barry* . . . I'm just one of the boys!"

Actually, Senator Goldwater *is* "just one of the boys" when it comes to electronics, in fact he has what can best be described as an advanced case of *electronic gadget-itis*.

His entire house is a power company's dream come true, from an intricate control panel in the headboard of his bed, to the electronically controlled flagpole in the yard.

The control panel operates such other gadgets as a burglar alarm, an artificial waterfall, piped in music and TV. It also turns on and off the lights and regulates the temperature in the house. The bedroom is also equipped with a sound effects device which produces sleep inducing sounds such as ocean waves breaking on the surf, the sound of rain on a tin roof, or "white" sound (it's an odd hissing). The "sleep sounds" come in handy during one of the many catnaps the Senator takes when his schedule gets hectic.

The flagpole in the front yard is an interesting device which is fitted out with an electronic eye. When the sun comes up (and the Senator is quick to point out that it does this 365 days a year in Arizona), the flag is automatically raised. At sundown, the flag lowers into a metal protecting tube.

Electronic eye controls this unique flagpole in the Senator's yard. When the sun rises, so does the flag. At dusk, the flag lowers automatically. Note container at bottom of pole.

In the Goldwater living room there is an electronically operated motion picture projector and a movie screen which silently emerges from behind a panel at the touch of a button.

But communications seems to be the Senator's special delight, and it has been since he took out his first ham ticket in 1922 (his call sign was "6BPI" in those days). Today, in addition to his ham station in Phoenix, Arizona, he also has a well equipped station in Washington, D. C., with the call K3UIG.

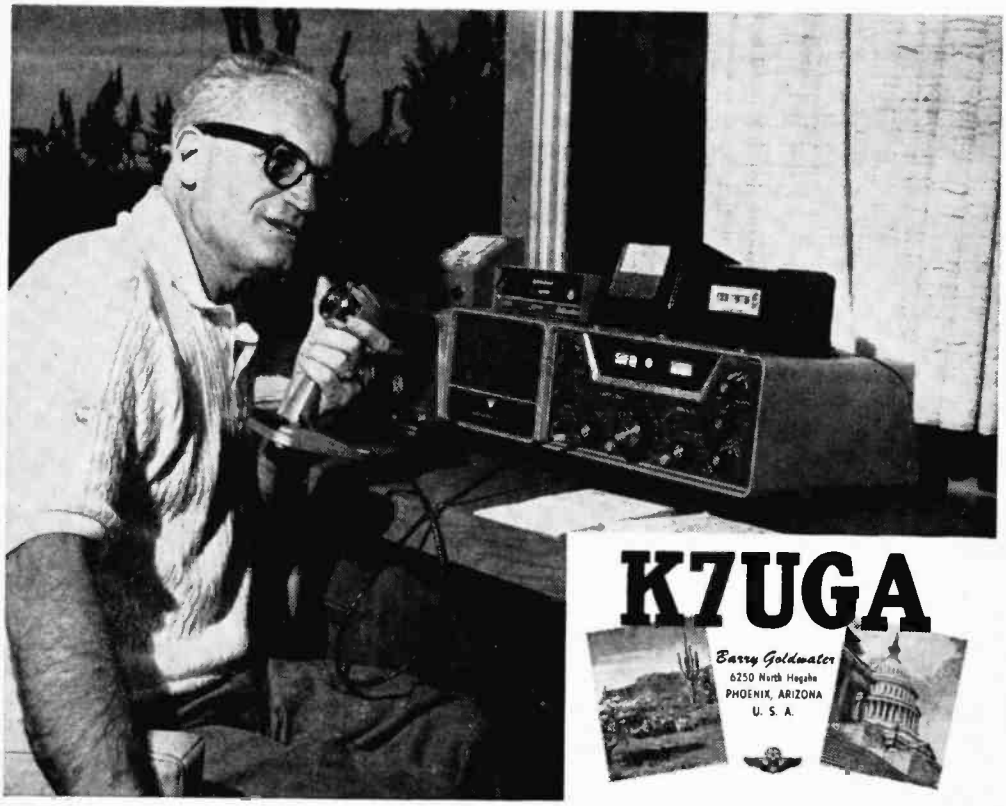
In Arizona, he also maintains a complete "Unicom" aeronautical VHF communications station to keep his family posted as he comes within a 100 mile radius of his home (he flies his own plane too, but that's a story in itself). In addition to this, he keeps tabs on the weather with low frequency gear and an anemometer (it checks wind velocity).

As a ham, he is an active member of the Quarter Century Wireless Association, the Amateur Radio Editorial Society, the Flying Ham Operators, and a pioneer group known as the SPARCS.

Typical activities at K7UGA might include passing along a message to a serviceman or running a phone patch with a ship at sea. The Arizona station is really elite, centering around a Hallicrafters SR-150 single-sideband rig which runs 150 watts PEP on all bands from 80 through 10 meters. For those extra difficult contacts, or when conditions are rough, the Senator flips on his Hallicrafters Loudenboomer linear amplifier which gives him a cool thousand watt signal, the maximum allowed on the ham bands. All of this gear is connected to a gigantic beam, the envy of hams who see it.

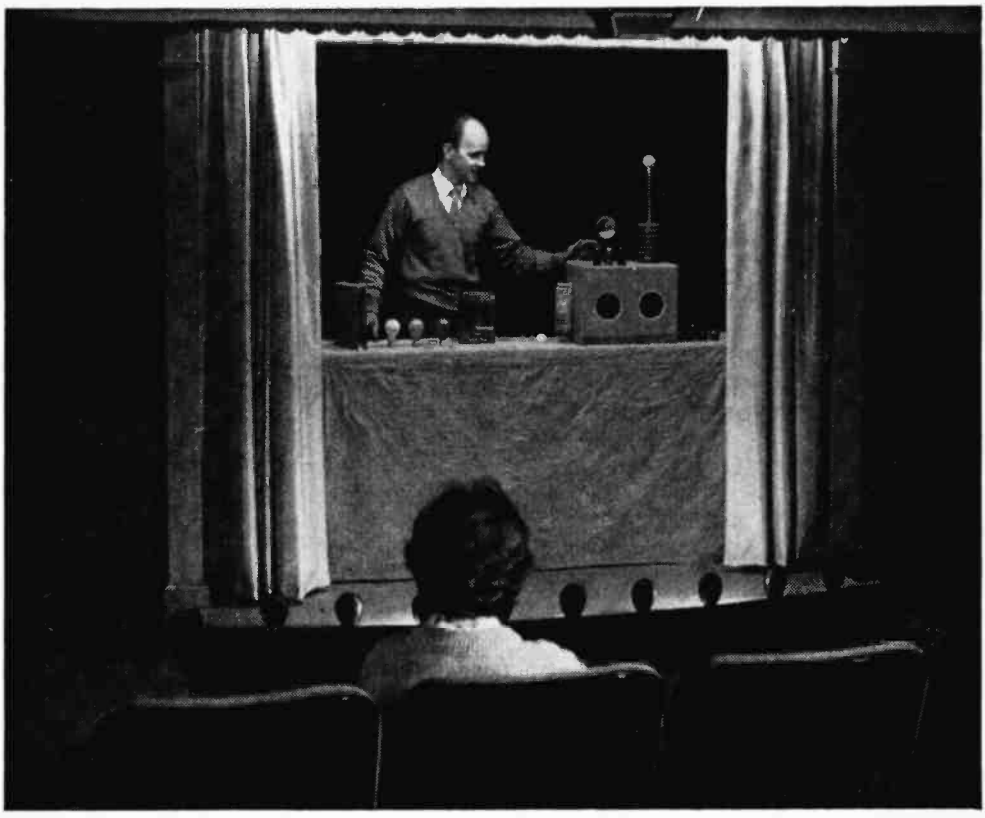
Senator Goldwater frankly states that ham radio is one of the nation's strongest, but least publicised, deterrents to the "common enemy" and one of our greatest cold war weapons.

What's next in electronics for the Senator? Barry won't venture a guess, what with so many new developments to choose from. We do know he operated on CB but Barry isn't licensed for 11 meters. That's about the only band he hasn't yet conquered. ■



SPARE TIME is a rare commodity in the busy schedule of a United States senator, but Senator Goldwater still manages a few relaxing moments as "just plain Barry."

BLACK ART



WITH BLACK LIGHT

Dab into scientific legerdemain using ultraviolet light

By Jorma Hyypia

Would you like to have your friends think of you as a scientific wizard? Would you like to get more than the usual amount of pleasure and stimulation from your experimentation? Would you like to find a way to jog your creative instincts into new channels of scientific exploration?

Then try staging a scientific "magic" show. Whether you are interested in electronics or some other field of science you can probably think of many ways to use your science knowledge to create fascinating illusions.

The planning and preparation of such illusions will sharpen your own perceptiveness of the manifold applications of common scientific principles. You will find showmanship to be a fascinating past time in itself. And you will have the satisfaction of stimulating others into greater appreciation of the basic sciences.

Finally, the experience will stand you in good stead when you start planning your next science fair exhibit; good showmanship goes a long way in presenting ideas clearly and forcefully—and in the winning of science fair awards.

Why Black Light? Because ultraviolet (black light) experiments are conducted in the dark, they are especially suitable for the presentation of mystifying illusions. More-

over relatively few people are familiar with the many unique properties of U.V. light so the simplest of experiments—properly staged —win immediate audience approval. Fortunately you won't have to spend a lot of money buying expensive equipment. The basic U.V. light unit in kit form is inexpensive, and the other apparatus is either available in most homes or can be purchased locally at modest cost.

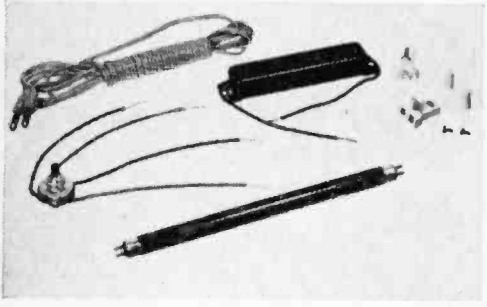
First—and most important—don't play around with *short-wave* ultraviolet light in your experiments; the rays can be very damaging to the eyes. Short wave equipment should be used only by experienced adults. But this is no handicap. The safe *long-wave* U.V. is actually better for your purposes because the materials you will want to use fluoresce more strongly with this form of ultraviolet light.

Basic Equipment. A wholly adequate U.V. lamp is a six-watt tubular bulb that has a built-in filter to eliminate almost all visible light, passing only the desired long U.V. light. The bulb and wiring accessories can be purchased for $5.25 from *Edmund Scientific Co.* of Barrington, New Jersey. You can buy the lamp at this price and get other materials locally. But if you want some fluorescent chemicals, papers and liquids (and a book of experiments) you can buy the lamp in a larger kit for $11.95.

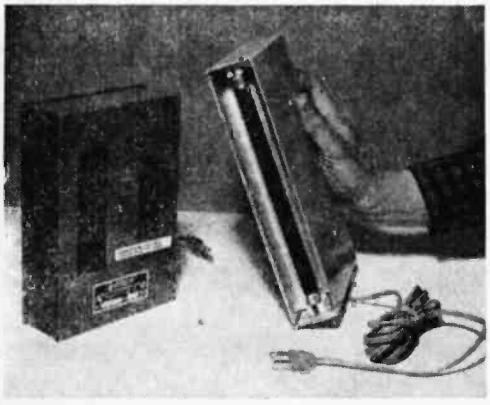
Mounting the lamp. The U.V. lamp kit provides you with all necessary wires, switches, clips and starter but does not include a case. But this you can make quickly —at no cost—from an old cigar box.

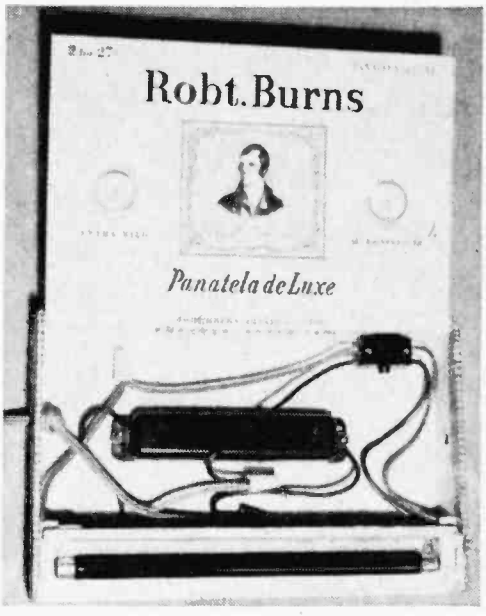
Obtain a cigar box measuring about 9" x 6" x 1½". Be sure the box you pick is fully nine inches (length of the U.V. bulb and its mounting clips.

Pull off the front 9" x 1½" panel of the box and shorten it about ⅛" if necessary to make it fit further inside the box as a partition and mounting board for the bulb. (Refer to photo.) After the bulb parts have been



Playing with ultraviolet can be safe if you use a long wave source like the Edmund Scientific UV Kit 70,586. Priced at $5.25, the kit contains all the necessary lamp parts and plans.





The ultraviolet lamp kit can be installed in a cigar box as shown above. Text explains construction details. Home made unit is compared to Edmund Scientific professional unit (left). The large window in the pro type unit passes long waves and the small window passes the harmful short UV light waves.

attached to the panel it will be glued inside the box, about 1¼" further back from its original position.

To mount the bulb on this panel, notch the ends so that you can fasten the two bulb holders or clips into place with small bolts. Insert the bulb and check to see that the panel will fit inside the box without bulging the sides of the box.

Attach the black ballast block to the bottom of the cigar box with small bolts as shown. Drill a hole in the back panel of the box to take the switch (position as shown for convenient manipulation of the switch when the box is held in the hand).

Finally, tape the lid of the cigar box closed and paint the small chamber, containing the hulb, with aluminum paint to increase reflectance. Also, paint the outside of the box to make it look like a finished piece of equipment.

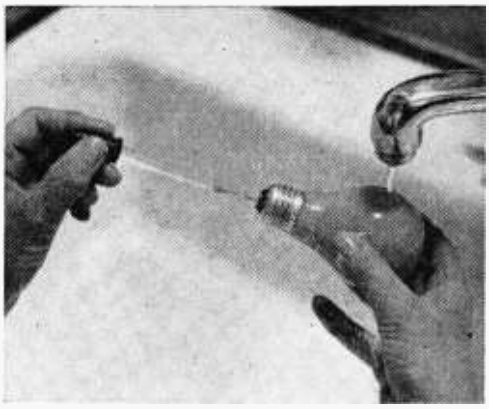
Staging the Show. For best effect, the room in which you put on your U.V. show should be almost completely dark. Check the room with the U.V. light to see that draperies, knick-knacks and other objects do not fluoresce. Best of all, set off a stage area with black-cloth drapes.

The U.V. lamp itself will give off a small amount of visible purplish light. You can draw attention away from this visible light—which would reveal the presence of your U.V. unit—by placing one or two very weak bulbs painted purple somewhere in the stage area. These will give you enough light to find your equipment in the dark and will dupe your audience into thinking that all the purple light comes from these lamps.

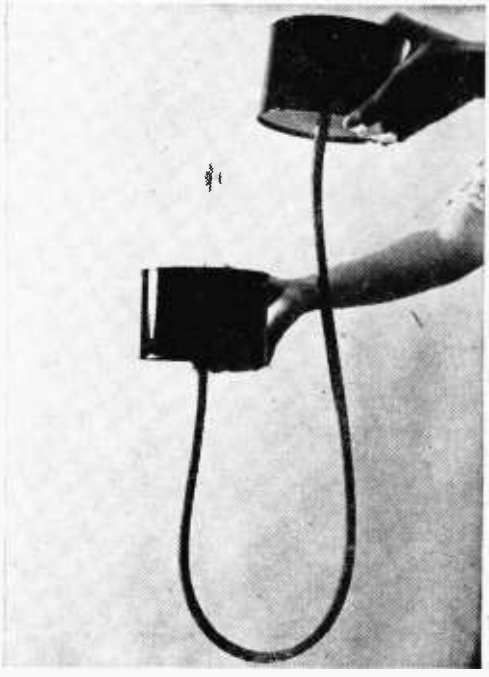
You should have a table on which to place equipment; a cloth draped across the front will hide equipment under the table. The U.V. lamp is hung out of sight behind the table in such a way that the light shines upward. Try to keep its direct light out of your eyes. Best of all, make a small table from some shelf board and cut a hole in the middle through which the U.V. light can be beamed upward into your experimental set-ups.

Dress yourself completely in black if possible; avoid colored clothes and white shirts which may fluoresce brilliantly. Rehearse all details of your presentation carefully, including the explanatory and diversionary talking you will do. The magician's talk—*patter* as it is called—is an integral part of showmanship.

Starting with the experiments described in this article, you will almost surely be stimulated to invent more of your own. These may well provide a "showstopper" of an exhibit at your next school science fair!



Special bulbs are prepared by alternately heating and cooling light bulbs with hot and cold tap water. See text for details.



Apparatus for creating the luminous fountain illusion. The demonstration is performed in the dark—only the rising water is seen.

Aladdin's Lamps. "Here, ladies and gentlemen, are three ordinary electric light bulbs, differing from each other only in that one is white, the second is blue and the third is red. You can see I have no convenient sockets or source of electric power. So I shall simply stand them on end, in a row, where you can

all observe them carefully."

"We shall put the blue bulb on the left, the red in the middle, and the white on the right. Please observe their colors and positions; it will be most important for you to remember in what order they are arranged."

"I shall now place this large piece of cardboard before the bulbs so that you cannot see them. You will note that I am not touching or disturbing the bulbs. Now, let us refresh our memories. What colors are they and how are they arranged?"

"Wait! To better concentrate, let us turn off the room lights—the mind thinks so much more clearly when not distracted." (Turns off white room or stage lights.)

"Now that we are in the dark, let us recall what the colors of the bulbs are and how they are arranged." (Audience reminds him that the blue bulb is on the left, the red in the middle, and the white on the right.)

The performer removes the cardboard to reveal that there are now *two* blue bulbs, one red bulb, and no white bulb. More startling: all bulbs glow brightly in the dark room although obviously still not connected to any source of electric power.

"It seems there has been some error, sir, because I do not see the white bulb you mentioned. But then we all make mistakes so I shall not judge your memory too harshly."

"But let us proceed. Which of the three bulbs would you say is the brightest?"

(Most will select the red; a few may point out the blue bulb on the left.)

The performer places the cardboard before the bulbs to conceal them again and talks for a few moments about the unusual fact that the bulbs were lit although not connected to an electric circuit. He then asks the audience to remind him which bulb was brightest. But when he removes the cardboard, the two selected bulbs are not lit at all while the blue bulb on the right remains lit.

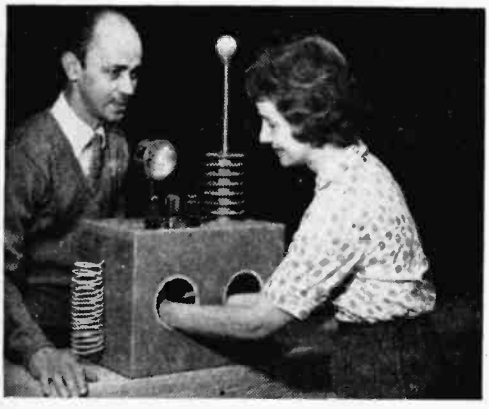
"You seem to have erred again! The bulb you ignored is the only one glowing so it clearly is the brightest!"

The performer picks up the glowing bulb and walks through the audience with it, letting spectators handle it to prove there are no connecting cords. He then returns to the stage, places the bulb back in its original position with the others, and conceals all bulbs with the cardboard.

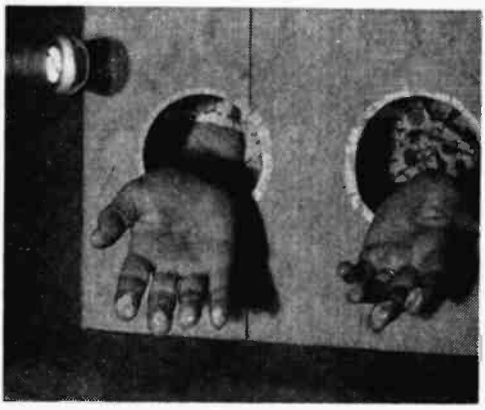
When he now questions the audience about the colors of the bulbs there is marked hesitancy about answering. So he turns on the room lights, removes the cardboard, and reveals a blue, red and white bulb arranged as at the beginning of the experiment.

Inspection shows that the bulbs are not connected to power sources and there is no evidence of tampering with the bulbs.

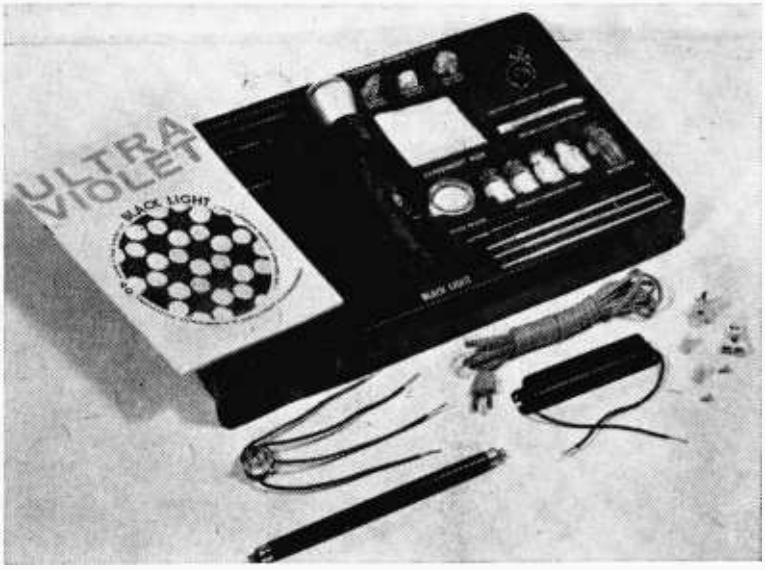
How it is Done. The bulbs have, of course, been altered. The inside of the blue bulb has been coated with a blue fluorescent paint, the red bulb with red fluorescent paint, and the white bulb with phosphorescent paint (which appears blue in the dark). Under ordinary white light all look exactly like



Author watches suspect insert hands into a "Dick Tracy" type criminal detector. Odd shapes on top and side of box serve no useful purpose except for magical atmosphere.



Ultraviolet lamp inside "crime detector" box spots incriminating fluorescent tell-tale smudges on thief's fingertips. Low cost Argon bulb provides adequate ultraviolet light.



A complete lamp and accessories kit is available from Edmund Scientific. Besides the lamp kit, invisible water paints, invisible ink and dye, tracer powder, rock specimens and special crayons are included: at $11.95.

the colored bulbs you can buy at the hardware store.

Just as the performer places the cardboard before the bulbs the first time, he snaps on the U.V. light with a hidden switch. When the room lights are turned off and the cardboard is removed, all bulbs fluoresce because they are excited by the virtually invisible U.V. light.

As the performer replaces the cardboard before the bulbs he simultaneously snaps off the U.V. light. On removing the cardboard the blue and red bulb do not glow because the *fluorescent* coatings will not glow except when U.V. light strikes them. But the other blue bulb (white in white light) glows because it contains phosphorescent paint which can store up energy from the U.V. light and continue to emit visible blue light even when the U.V. source is turned off.

When the white room lights are turned on again, all bulbs look as they did before. The phosphorescent bulb continues to glow but this is not at all obvious when the much brighter white lights are on. For best effect, place the red bulb between the two blue bulbs so that slight differences in the intensities of the two blue bulbs is less conspicuous.

The experiment demonstrates dramatically how fluorescence and phosphorescence differ and shows how brightly modern fluorescent pigments can fluoresce.

Preparation of the Bulbs. The success of the trick depends on careful preparation of the bulbs so that it seems impossible that the bulbs could have been opened and doctored on the inside.

Choose three bulbs of the same size. All should be frosted white bulbs. Burned out bulbs are just as good as new ones. Touch a hot soldering iron to the bit of solder you will find on the flat part of each bulb base; when the solder melts, give the bulb a quick shake and the solder will fly off to reveal a small hole.

Wrap the bulb in a heavy towel (to protect yourself in case of breakage) and drill down through the hole with a drill bit of the proper size. Use a hand drill and drill slowly and carefully. Drilling is completed when you hear the air sucked into the bulb. The drill must also pass through a glass seal inside the base, so continue until the bit drops easily at least an inch into the bulb. The glass rod that holds the lamp filaments is not broken, but the little copper disc on the bottom of the base (where the solder was removed) may come off during the drilling operation. Save this for replacement later.

First coat the inside of one bulb with phosphorescent paint. This can be purchased at most paint or hardware stores. It is an oil-base paint, thinnable with turpentine or mineral spirits. However do not thin unless absolutely necessary; the thicker you can keep it the better.

(Continued on page 118)

The Crystal Ball

APRIL—MAY 1964

By C. M. Stanbury, II

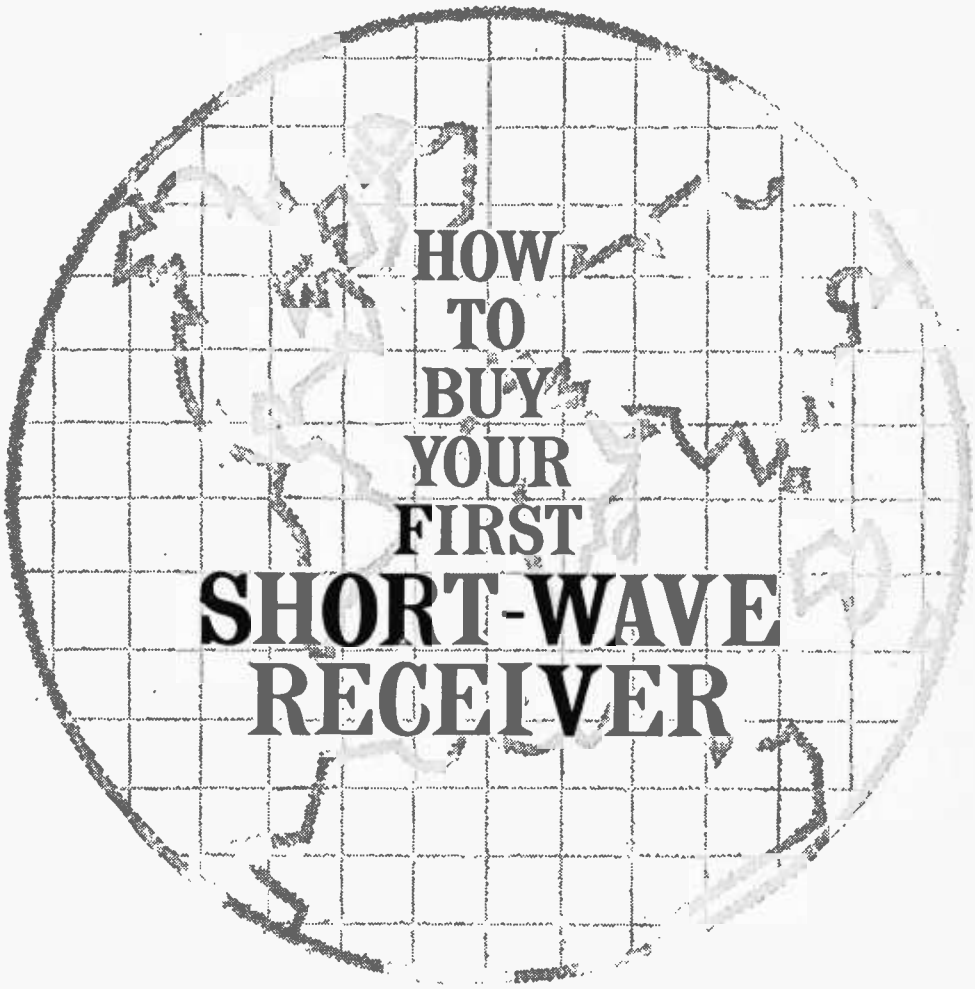
LOCAL TIME	0000	0300	0600	0900	1200	1500	1800	2100	2400
Europe, North Africa, & Near East	49 (90)	49 (41)	(19)	19, 25	25, 31	31, 41	41, 49, 75		
South Africa	60, 90		31, 49	25, 31			60, 90		
Asia (except Near East)	(41)	49	19, 25	25	(25, 31)	31, 41	41		
South Pacific	31, 41 49	49, 60	31	25			31, 41	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

DECLINING sunspot activity and the coming of spring will result in the best DX atmospheric *weather* in 11 years. Daytime monitoring will be optimum on 25 meters, and good results can be had on 41 and 49 meters when the birds are asleep. This will be a good time of the year to log clandestine stations cluttering the spectrum. See page 63—Counterfeit Broadcasters.

To use the table, put your finger on the region you want to hear and log, move your finger to the right until it is under the time you will be listening and lift your finger. Underneath your pointing digit will be the short-wave band or bands that will give the best DX results.

The time in the above propagation prediction table is given in *standard time* at the listener's location which effectively compensates for 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 good second choices.

White's Radio Log (see page 124) now lists many new short-wave stations in its improved Short-Wave Section. You can use the Crystal Ball propagation table to determine your chances of hearing a given station. If the station broadcasts on more than one frequency, you will know which one will offer the best listening possibilities. Happy DX'ing. ■



HOW TO BUY YOUR FIRST SHORT-WAVE RECEIVER

An up-to-the-minute roundup of short-wave receivers that you can buy for under $200

By Tom Kneitel, K3FLL/WB2AAI

SOONER OR LATER each of us is faced with the prospect of buying a short-wave receiver. However to the radio newcomer this is often a hairy task and frequently results in *friend newcomer* deciding that he has purchased a piece of gear which is considerably less than he had bargained for. On the other hand, a newcomer may be high-pressured into buying a receiver which is far more sophisticated (and expensive) than is necessary for his purposes. This article is to give the newcomer (and anyone else who wants to tag along) a few things to think about while making the grand tour of the receiver catalogue sheets.

What's available. The number of receivers which are available to the prospective buyer is staggering. They range from very basic super-regenerative jobs to plus-ultra-super receiving monsters, with prices ranging from $15 right on up to $1500.

For our purposes we can eliminate many

of these receivers and narrow the field of possibilities down to a highly select few.

The first sets to get weeded out are the super-regenerative sets because they are not really suitable for serious DX'ing, SWL'ing, monitoring (or whatever you want to call it). We are going to avoid all receivers which are not specifically designed for *communications* purposes. This includes the small table model radios which are primarily designed for broadcast listening but also throw in one or two "bonus" bands of short-wave frequencies. These sets do not provide sufficient frequency coverage or operating flexibility for DX listening.

We will not consider "ham band only" receivers, taking instead so-called "general coverage" (all frequency) receivers. This is because the new listener wants to try his DX'ing hand on all the available services; ham, broadcast, point-to-point communications, military stations, etc. While ham band only receivers are swell for their intended purpose, they rob the newcomer of some of the tastier fruit of DX'ing which is to be found on the non-ham frequencies.

On the other end of the scale, we are going to draw an arbitrary price line at $200 for our receiver because the beginner simply does not need to spend more to achieve his DX'ing goals. With today's advances in design, you really can get "a lot of set" for less than $200.

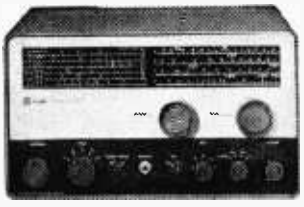
Our selections. We list here, on page 93 the receivers presented by the nation's reputable manufacturers (never buy off-brand electronic equipment) which falls into the category discussed above. These sets are listed in order of their price because (let's face it) price always seems to be the single most important factor for the newcomer.

To enable you to get the maximum use from this chart we will give you a few pointers on the various features involved, without going into involved and confusing Rube Goldberg technical aspects.

Sensitivity and noise. For our purposes, *sensitivity* can be defined as the least amount of signal which is needed to produce a predetermined output level in a receiver. Manufacturers have mutually agreed upon this output level and therefore all of their sensitivity figures are uniform, permitting the prospec-

Heath GR-91

Knight Star Roamer



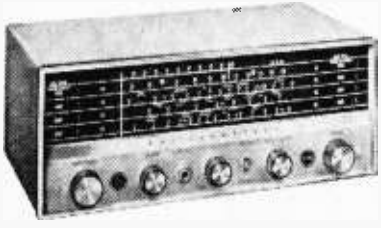
Knight R-55A

Lafayette KT-320 (kit)
Lafayette HE-30 (wired)

National NC-77X

Price ($)	Manufacturer	Tubes	Freq. (mc)	R.F. Stages	I.F. Stages	Sensitivity	Selectivity	S-Meter	Antenna Trim	Band Spread	Notes
39.95	HEATH GR-91	4	.550-30	0	1	*	9.2 kc	Yes	Yes	Yes	1
39.95	KNIGHT Star Roamer	4	.200-30	0	1	10 uv	8 kc	Yes	Yes	Yes	1
64.95	KNIGHT R-55A	6	.530-36	0	2	N.A	4.5 kc	No	No	Yes	
64.95	LAFAYETTE KT-320	9	.550-30	1	2	1 uv	800 cps-4 kc	Yes	Yes	Yes	1
69.95	NATIONAL NC-77X	5	.540-31	0	1	N.A.	N.A.	No	No	Yes	
69.95	HALLICRAFTERS S-120	5	.550-30	0	1	*	*	No	No	Yes	
69.95	HAMMARLUND CR-1	6	.540-30	1	2	N.A.	N.A.	No	Yes	No	2,4
79.95	LAFAYETTE HE-30	9	.550-30	1	2	1 uv	800 cps-4 kc	Yes	Yes	Yes	
95.00	HEATH Mohican	12	.550-32	1	3	2 uv	3 kc	Yes	Yes	Yes	1,3
99.95	KNIGHT R-100A	9	.540-30	1	2	1.5 uv	300 cps-4 kc	Yes	Yes	Yes	1
99.95	HALLICRAFTERS S-118	7	.185-31	0	2	*	*	No	No	Yes	
124.95	HALLICRAFTERS WR-2000	6	.540-18 + FM	1	1	*	*	No	No	No	3,5
129.50	LAFAYETTE HE-80WX	14	.550-54	1	2	1 uv	700 cps-7 kc	Yes	Yes	Yes	
129.95	NATIONAL NC-121	6	.550-30	0	2	*	500 cps-7 kc	Yes	No	Yes	
139.95	HALLICRAFTERS S-108	8	.538-34	1	2	*	*	No	No	Yes	
169.95	HALLICRAFTERS SX-110	8	.538-34	1	2	*	*	Yes	Yes	Yes	
189.00	HAMMARLUND HQ-100A	10	.540-30	1	2	1.75 uv	100 cps-3 kc	Yes	Yes	Yes	
199.50	HALLICRAFTERS WR-3000	13	.185-23	0	1	*	*	No	No	No	3,6

NOTES: 1-Kit. 2-Tentative specs. 3-Semiconductors instead of tubes. 4-Uses 2 compactrons, equals 6 tubes. 5-R.F. stage on FM band only. 6-Battery operated. *-Figures not supplied by manufacturer. N.A.-Figures not available.



Hallicrafters S-120

Heath Mohican

Hammarlund CR-1

Knight R-100A

SHORT-WAVE RECEIVER

tive purchaser to easily compare the sensitivity of one receiver against another.

Let us first understand that even if you live in a relatively "quiet" area you are going to be faced with a certain amount of noise—noise generated within the receiver itself. This noise, known as "thermal noise," is generated within the front end of the receiver (the part of the circuit which receives the signal from the antenna).

A stage of R.F. amplification in the front end (found in the more expensive receivers) cuts down this noise considerably, as compared to receivers which have the antenna hooked directly into the converter tube. The internal noise in a receiver without an R.F. amplification stage can actually run one or two "S units."

Our table shows the amount of signal, in microvolts (uv.), which must be present at the antenna terminals of a receiver to produce a signal level of 10 decibels.

If the bandwidth of the receiver is reduced (another way of saying increased selectivity) the noise voltages will be reduced.

Selectivity. Our next consideration is the *selectivity* of the receiver we are to buy. In using this term we usually mean the ability of the receiver to distinguish between adjacent signals, in other words, the ability to *select* the desired signal and reject undesired signals, including "image" signals generated within the receiver.

Before we go further into selectivity, we should realize that front end sensitivity with a stage of R.F. amplification will minimize cross-modulation and provide rejection of the "image" signals discussed in the foregoing paragraph.

To obtain maximum selectivity you will want a receiver which passes only a narrow frequency band at a particular dial setting. Methods of obtaining narrow bandwidth center around the intermediate frequency (IF) stage(s) of the receiver and include the use of tuned circuits, the use of hi-Q IF transformers, band pass filters, crystal and mechanical filters, a "Q multiplier" (which allows the bandwidth to be varied by the operator), and by the use of a dual conversion circuit (which also provides image rejection while giving a narrow bandwidth).

The selectivity figures on our chart show the amount of selectivity at "points 6 db down," and the lower the selectivity figure, the narrower the bandwidth. You will note that some figures are shown to cover a range (such as 500 cps—8 kc/s) and this indicates that a variable IF bandwidth is available.

Bandspread. In selective receivers it will be a definite advantage for you to have the use of a "bandspread." This might be considered to be a "fine tuning" control and will permit you to take a microscopic examination of any particular segment of the radio spectrum tuned in on the receiver's main tuning dial.

Other Considerations. We have listed information on S-meters and antenna trimmers

Hallicrafters S-118

Lafayette HE-80WX

Hallicrafters WR-2000

National NC-121

on your chart. The antenna trimmer is a front panel control which permits you to keep the R.F. stage in tune over a wide range of frequencies. Different antennas used will change the loading factor of the receiver, making this feature a handy bonus. This is a nice extra, but it will usually not make the difference in whether or not you hear a particular station.

An S-meter will give you a graphic representation of the relative signal strengths of the stations being heard on your receiver and will permit you to tune a station in "dead center" by using the station's maximum reading on the meter. Another nice "extra," but not a necessity.

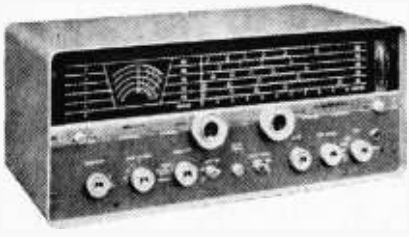
Let's Not Forget. Not covered on our chart, but frequently discussed in specification sheets:

- *Beat Frequency Oscillator (BFO).* The BFO is a feature of some receivers which permits the operator to apply a modulated tone to incoming code signals. It isn't a necessity unless you expect to go into ham radio or want to bone up on learning the code.
- *Stability.* Most sets will drift (in frequency) for the first 15 or 20 minutes, however sets which are solidly constructed on a heavy chassis will provide better stability.
- *Distortion.* Don't worry about this. You're not interested in high fidelity and the increasing use of speech clipping and audio compression by the transmitting stations should convince you that preoccupation with high-fidelity audio systems in a communications receiver is unnecessary.
- *Audio output.* While audio output specifications always are impressive on specification sheets, and it would seem that some sets offer a considerable amount of audio power output, most people do not realize that one-tenth of a watt of audio power will make more than enough noise in a modern speaker.
- *Logging scale.* A very handy feature. It is an arbitrary scale on the dial of the receiver, usually numbered from 1 to 100. It provides a rapid method of spotting a frequency which has been previously monitored.
- *Noise limiter.* Most receivers now provide some form of noise limiting circuitry. If you live in an area with a high level of man-made noise (auto ignition, power line, etc.) you should be certain that the particular receiver which you select has a noise limiter.
- *Styling.* Strictly a matter of your own taste. As a matter of fact, the inexpensive sets available today look every bit as nice as many of the expensive units. This *can* be a disadvantage if you buy a set for looks alone because the looks of the receiver won't pull in the DX when the cards are down. Buy a nice looking set, but be certain that the innards meet the operating specifications which you require, desire and expect.

Keep in Mind. When buying a receiver today, remember that tomorrow you may want to be a ham operator. Ham operation means crowded bands, weak signals, and lots of noise. Make certain that your receiver will be able to cope with this or you may find yourself buying another receiver in a few short months, or (ugh) trying to operate on a ham band with an inadequate receiver. ■

Hallicrafters S-108

Hammarlund HQ-100A



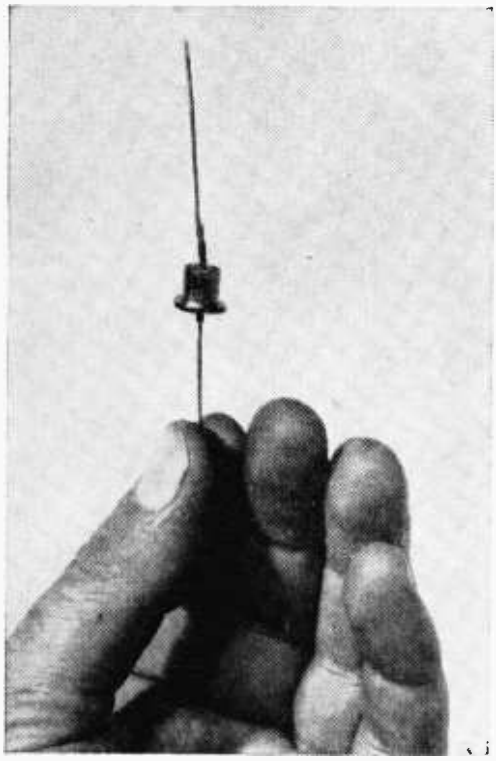
Hallicrafters SX-110

Hallicrafters WR-3000

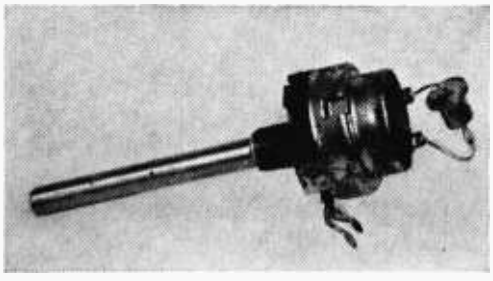
Keep your receiver on

Standby

Call on a silicon power diode to give your receiver "instant-on" operation—just like a transistor radio



All it takes is any silicon diode (top) soldered across the AC switch terminals of the volume control (below) to do the job.



By Herb Friedman,
W2ZLF/KBI9457

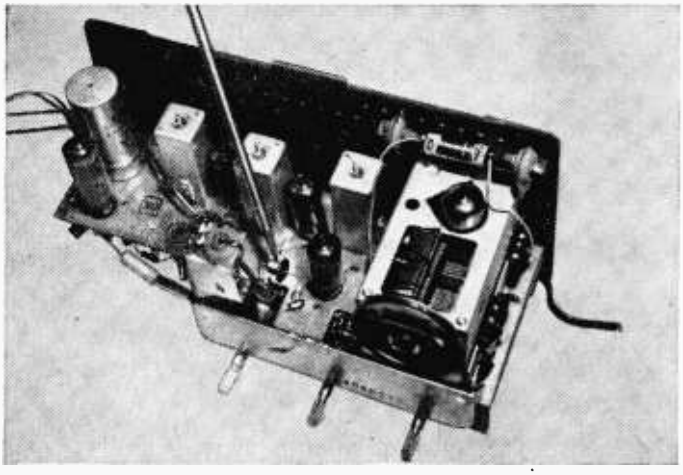
IS IT worth a dollar or so, and perhaps a half hour's work, to extend the life of your radio and television tubes by 50 percent or more? You're *durn* right it is! It's the best electronic bargain you are ever going to get. And, as a free bonus, we'll throw in "instantaneous start"—the instant you turn the power switch the sound or picture goes on—yes, just like transistors, no more warm-up time.

How to do it? Simple. Just connect a silicon power diode across your radio or television set's power switch. The only hitch is that the idea can only be used with an AC-DC chassis; that is, the set must not have a power transformer. Since most table radios and many FM and TV receivers meet this requirement, chances are you're one of the "lucky ones."

When the diode is connected across the power switch "in the right direction" reduced power is continuously applied to the filament circuit even though the power switch is "off"; and no power is applied to the rectifier circuit so the receiver is inoperative; all that happens is the receiver tubes are kept at "standby"—ready to start the instant you turn the power switch.

Where's the saving? In not turning the filaments on and off. As any broadcast engineer will tell you, maximum tube life is obtained when the tubes are turned on and *left on*. And since with the diode you idle the filament voltage at about 50 percent you can expect a markedly extended tube life.

The Hook Up. The schematic diagram shows the connection of the silicon diode rectifier plus two neon light indicators. S1 is



Installing the silicon power diode rectifier is a simple matter. If there is not enough room on the off-on switch or under the chassis, mount it on the chassis top away from tubes.

the receiver's power switch (usually on the rear of the volume control) and SR1 is a silicon diode rectifier. Be certain that SR1's *cathode* is connected to the B− or ground side of S1. SR1's anode (plate) is connected to the S1 terminal which is attached to the AC line. If you reverse the diode the receiver will be on permanently.

SR1 is rated at 400 PRV (or PIV) at 600 milliamperes or higher. While this rating may far exceed what your individual equipment may require, it's a good safe value. Listed below are common, nationally distributed silicon diodes which will do the job; your local parts distributor is sure to have at least one of them.

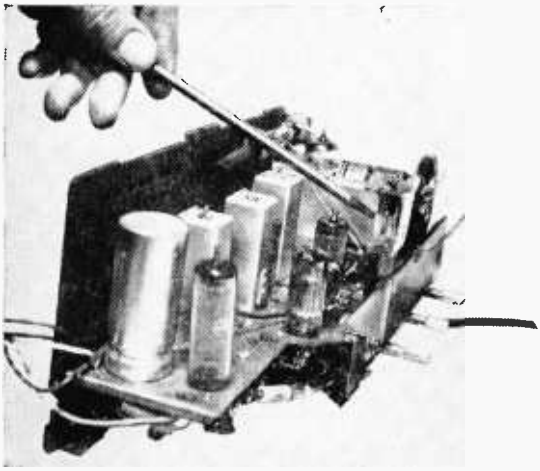
Manufacturer	Diode Type
General Electric	1N539, 1N1489
Motorola	1N2612
RCA	1N1763, 1N2861

If your equipment doesn't have one it's a good idea to install a pilot light, to indicate power is on. The I1 (and R1) neon bulb circuit will indicate when the receiver is standing-by, it will extinguish when S1 is closed. If you want to indicate when the receiver is plugged into the outlet (whether it's on standby or operating) use the I2 and R2 neon bulb circuit. ■

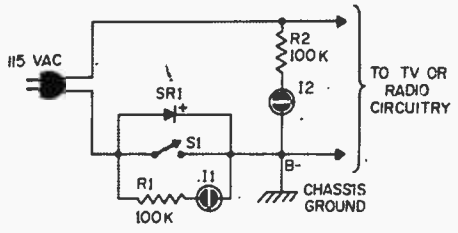
PARTS LIST

SR1—Silicon diode rectifier type 1N539, 1N1489, 1N1763, 1N2612 or 1N2861 (See text for details.)
I1, I2—Neon light, type NE-2
R1, R2—100,000-ohm ½-watt resistor, 10%

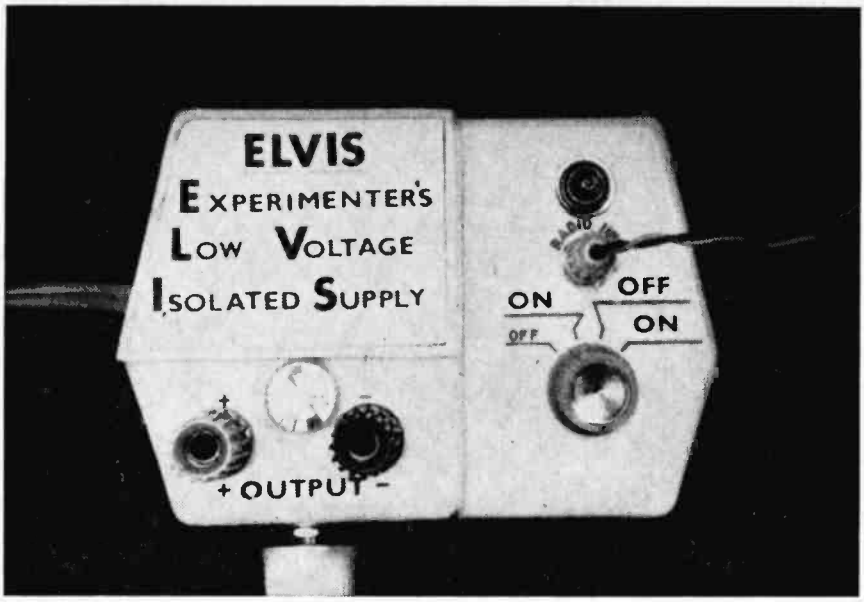
Estimated cost: $1.25
Estimated construction time: 30 minutes



Author points out neon bulb he installed. Bulb can be seen through radio's cabinet.



Schematic diagram of AC circuit additions that can be made in any AC/DC receiver.



EXPERIMENTER'S LOW VOLTAGE ISOLATED SUPPLY

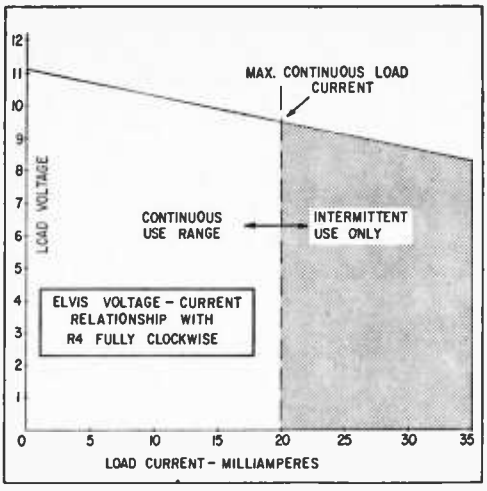
By Fred Blechman, K6UGT

THIS ELVIS, unlike its more well known namesake, does not shake, rattle, roll or make odd noises. It does, however, provide the transistor experimenter with an adjustable 0-11 volt line-isolated filtered DC power source, including a built-in voltmeter!

A lot for a little. The total cost for ELVIS, including the subminiature meter, is less than seven dollars, a remarkably low price made possible by modifying a product that contains most of the parts. The *Lafayette F-790 9-Volt Battery Eliminator and Charger* for transistor radios contains a midget isolation step-down transformer, a full wave bridge rectifier, heavy filtering, pilot light, four position function switch, output jack, battery snap terminals and an assortment of adapters, and comes completely assembled for $2.95. It plugs into any 115-volt 60-cycle outlet and provides well-filtered DC at a voltage level fixed slightly over 9 volts to power most common transistor radios. Adding a subminiature meter, a miniature potentiometer and binding posts converts the F-790 to a variable metered supply—ELVIS.

Circuit description. The schematic diagram shows the original F-790 wiring details. The dotted lines show the necessary changes and additional parts to create ELVIS. Switch S1 is a 3-pole, 4-position miniature rotary switch. When placed in position 2, power is applied across the primary of stepdown transformer T1 and the series combination of the neon bulb and current-limiting resistor R1. The bulb lights and power from the secondary of T1 is applied across the full-wave bridge selenium rectifier, SR1, points A and C. The rectified output from terminals E-D and B is applied to the pi-filter consisting of C1-R2-C2, then through S1c to the output jack J1.

Resistor R3 acts as a "bleeder" to stabilize the voltage. When the battery adapter (furnished with the F-790) is plugged into J1, the voltage appears across the adapter snap terminals, which connect to the 2U6 type battery snaps of most common 9-volt transistor radios. The radio plays loud and hum-free. With switch S1 in position 3, relatively unfiltered DC is applied to the battery-charging snap terminals. Two additional



Exactly what ELVIS can put out is shown in volt-current graph with R4 fully CW.

adapters allow you to "recharge" a large variety of 9 volt batteries. In position 4, switch S1 applies voltage to both J1 (filtered) and the snap terminals (relatively unfiltered) at the same time, allowing you to play the radio and recharge the radio battery simultaneously. Notice (and this is quite important) that all output connections are fully insulated from the power line by T1—no shock hazard!

Battery "Recharging." A dry cell battery is *not* rechargeable in the accepted sense. It may be "depolarized" by the process used in the F-790, which will temporarily increase the battery output. The long term value, however, is very dubious. As a battery eliminator the F-790 is very fine; the recharge feature is just a bonus.

Step-by-step modification. Creating ELVIS from the F-790 is not complicated, but there are enough wires in the original unit to confuse the inexperienced builder, so we'll go through the conversion step-by-step.

1. Remove the bottom cover.

2. Remove and discard resistor R3 (600-ohms).

3. Remove three screws securing printed circuit board, and tilt board back out of the way.

4. Remove the battery charging snap terminals by unsoldering the blue and green wires from the nuts, and then unsoldering the nuts from the inside of the unit while turning the screws from the outside.

5. Enlarge the snap mounting holes to 3/16-inch diameter.

6. Drill a 7/16 inch diameter hole for the meter and a 1/4 inch diameter hole for potentiometer R4. See photos.

7. Install meter M1 and cement in position.

8. Install the binding posts BP1 (red) and BP2 (black). The fiber insulators are not used.

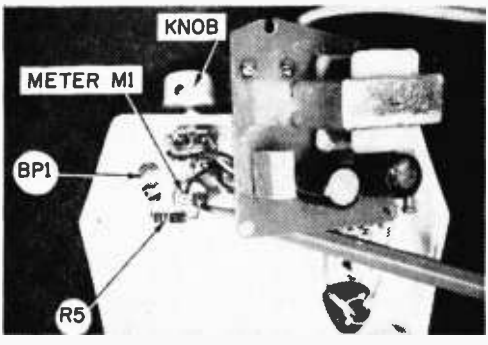
9. Solder a 56.000-ohm 1/2-watt 10% resistor (R5) from the soldering lug of binding post BP1 to the meter *positive* terminal.

10. Solder an insulated wire, 1 1/2 inches long, to positive binding post BP1 lug. You'll connect the other end of this wire in Step 14.

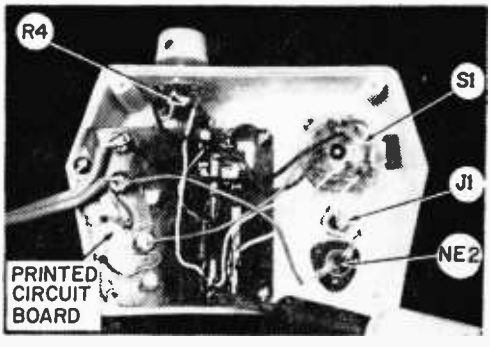
11. Solder the blue wire (this wire was connected to the negative snap terminal removed in Step 4 to the negative binding post BP2 solder lug. Solder a short jumper wire from this BP1's lug to the meter *negative* terminal.

12. Install the 1000-ohm miniature potentiometer (R4) with the lugs up. Bend the lugs slightly down.

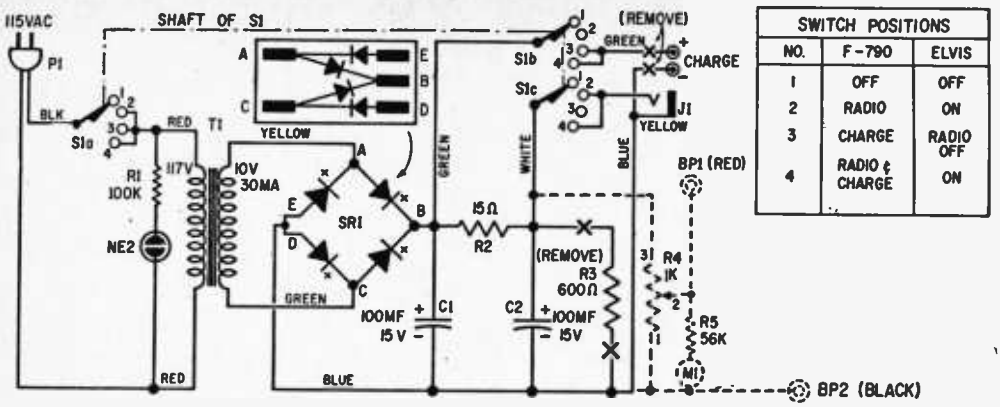
13. Replace the printed circuit board in



With the circuit board lifted out of the way, parts added underneath can be seen.



The 600-ohm resistor is unsoldered from the circuit board at the location shown.



SWITCH POSITIONS		
NO.	F-790	ELVIS
1	OFF	OFF
2	RADIO	ON
3	CHARGE	RADIO OFF
4	RADIO & CHARGE	ON

Schematic diagram for ELVIS. Dashed lines are circuit parts added to the Lafayette F-790.

position with the three screws removed in Step 3.

14. Solder the added wire (Step 10) to the center terminal of potentiometer R4.

15. Locate the point on the rear of the printed circuit board to which a white wire from the switch is soldered. Solder a new wire from this point to the right terminal on R4. See photos.

16. Locate the blue wire connected to the printed circuit board. Solder an insulated wire from this point on the printed circuit to the left terminal on potentiometer R4. See photos.

17. Unsolder and remove two green wires that connect to switch S1.

18. Replace the bottom cover.

19. Add the small set-screw knob for ⅛ inch diameter shafts in place.

20. If desired, relabelling can be done with decals or dry transfer letter put on white paper and cemented over the old markings. See photos.

How it works. Voltage appears at binding posts BP1 and BP2 in switch positions 2, 3 or 4, and is controlled by the setting of potentiometer R4 with the voltage indicated by meter M1. Full scale meter reading, established by series resistor R5, is roughly 10 volts, with ½ scale at 5 volts, and 0 volts at zero on the meter. Intermediate voltages can be estimated quite closely. Unfortunately, the potentiometer resistance variation with rotation ("taper") is not linear, and you'll find the greatest voltage increase near the clockwise end of the rotation, but this is not critical.

ELVIS is *not* regulated, but *is* well filtered.

PARTS LIST

R4—1000-ohm subminiature potentiometer (Lafayette VC-32)
R5—56,000-ohm, ½-watt resistor 10%
M1—200 microamp miniature meter (Lafayette TM-27)
BP1, BP2—Binding posts (one red, one black) (Lafayette MS-566)
1—Knob, ivory set-screw type for ⅛-inch shaft (Lafayette KN-57)
Misc.—Insulated wire, solder

All other parts are included in Lafayette F-790 9-volt Transistor

Battery Elimininator, $2.95
Estimated cost: $6.50
Estimated construction time: 2 hours

When a circuit is connected to the binding posts, the current drawn will cause the voltage to drop. Just advance the control knob to increase the voltage to the desired value. Of course, a more accurate external voltmeter may be placed across the binding posts if the voltage requirement is critical.

Just for the record. A graph of the average ELVIS output current-voltage relationship with the potentiometer set fully clockwise is given. Drawing more than 20 milliamperes continuous (35 ma. intermittant) from ELVIS is not recommended. If ELVIS gets too much exercise, he blows his stack (selenium rectifier stack, that is). The radio output jack, J1, is used as before, with the switch in positions 2 or 4. This output is *not* controlled by the new potentiometer. Do *not* use the radio jack when using the binding posts; the total current drawn may exceed the rectifier current rating. ■

THE HOTTEST STUFF!

Shooting the works with a gun that's hotter than the sun

PLASMA GUN developed by Avco produces a super heat that vaporizes tough metals such as tungsten, enabling it to be sprayed in same manner an ordinary spray gun sprays paint.

Plasma, reaching temperatures up to 100 million degrees F., is now regarded as the world's greatest known source of raw energy

By Hans Fantel

EVEN the fastest rocket known today is slow transportation on an interplanetary journey. A trip to Mars—our next planned step beyond the moon—would take at least four to five months, one way, at present speeds. To an astronaut cooped in his capsule, his spacecraft speeding along at 25,000 mph would still seem as pokey as a slow boat to China. A journey to the outer planets would take years.

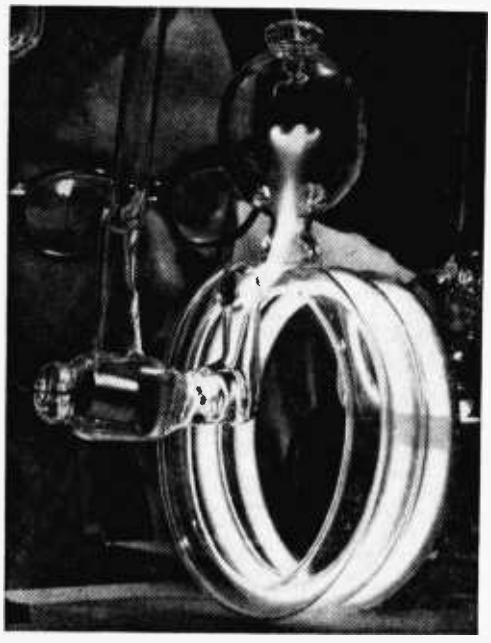
That's why space scientists are now searching for faster and more efficient rocket propulsion. High hopes are pinned on the plasma engine, which can push spacecraft faster than 100,000 mph and produce four times more thrust per pound of fuel than the best

Low-cost electricity provided by generators without moving parts, as well as more powerful spacecraft engines, are plasma projects

conventional rocket. The driving force of these new engines, now being tested at Avco, Republic Aviation and elsewhere, is plasma. Literally, it's the hottest stuff in the world, reaching temperatures up to 100 million degrees F.!

The term "plasma" is somewhat confusing. To most people plasma means the liquid part of blood, the clear fluid kept in bottles at hospitals and dripped into the veins of accident victims. But to physicists, plasma means something entirely different: a gas so hot that its molecules rip apart, leaving a frantic swirl of energy-packed ions, electrons and atoms. Full of charged particles, plasma is a kind of raw electricity in the form of hot turbulent jelly, quite unlike any normal gas, liquid, or solid. Only recently have scientists recognized plasma for what it really is: the fourth state of matter.

Because the Earth, at least on its surface, is a relatively cool place, plasma rarely occurs naturally on our planet, although it's plentiful elsewhere in the universe. Some estimates even claim that 95% of all the stuff in the universe is plasma. The stars are made of it. Like our own Sun, they are huge plasma balls hopped-up with energy, radiating heat, light, and electromagnetic waves. Plasma is therefore the principal source of raw energy in the world.



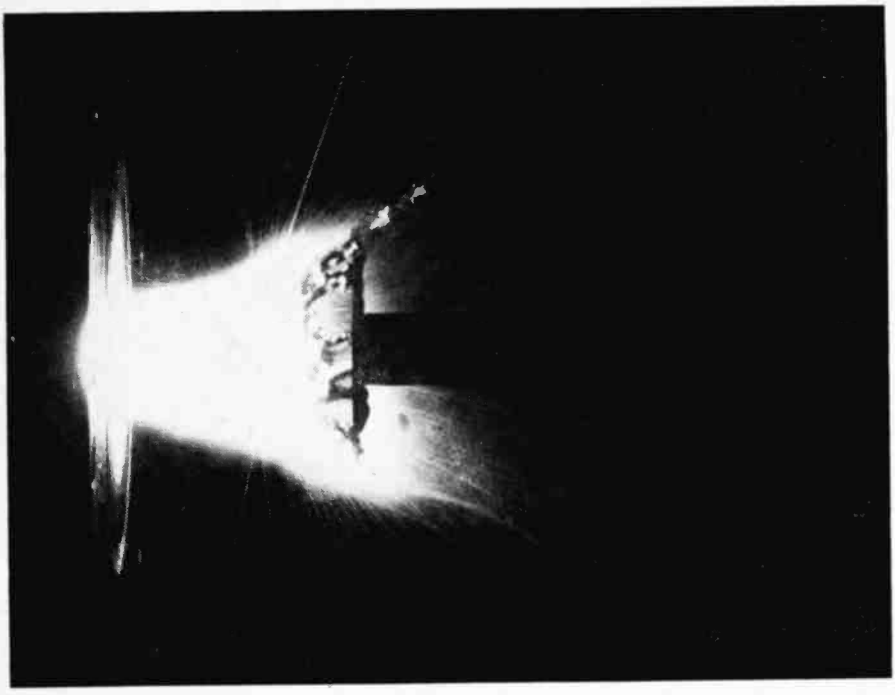
GLOWING neon plasma in coiled tube acts as sensing element for Honeywell's "Purple Peeper." It signals flame failure in burners.

At Republic Aviation's test lab on Long Island, I saw a "plasma pinch engine" spewing bursts of white-blue brilliance from its nozzle. It works by pushing a propellent gas through an electric arc like that of an arc welder. The heat tears the gas molecules apart, converting the gas into an electrically-conductive plasma. The plasma then travels through a magnetic field, which "pinches" it like toothpaste and squirts it out the rear nozzle at velocities far greater than those attainable with ordinary rocket fuels.

True, each "pinch" lasts only four millionths of a second and doesn't pack a lot of punch, but once you're out in space and away from the gravitational pull of the earth, you don't need much force to set you on your way and keep you going. It's the speed of the jet exhaust that counts. Scientists expect future space vehicles to be lifted into orbit by conventional high-thrust rockets. From there, plasma engines would take over, pushing the craft to its destination with slight, but incredibly swift, nudges. And thanks to their efficiency, plasma-propelled spacecraft would get a lot of mileage from a light fuel load.

While spacemen see plasma as just the ticket for trips out of this world, other scientists are exploring its down-to-earth uses. High on the priority list is the development of more efficient ways to generate electric power. At Westinghouse and RCA, engineers are now testing generators without mechanical moving parts. The rotating armature is replaced by an electrically-conductive stream of plasma whizzing past magnets at speeds that would make a hurricane envious. The principle of using the plasma flow as an electric conductor is known by the tongue-twisting name of magnetohydrodynamics, or MHD for short.

One obstinate problem is to make the magnets strong enough to control the plasma flow

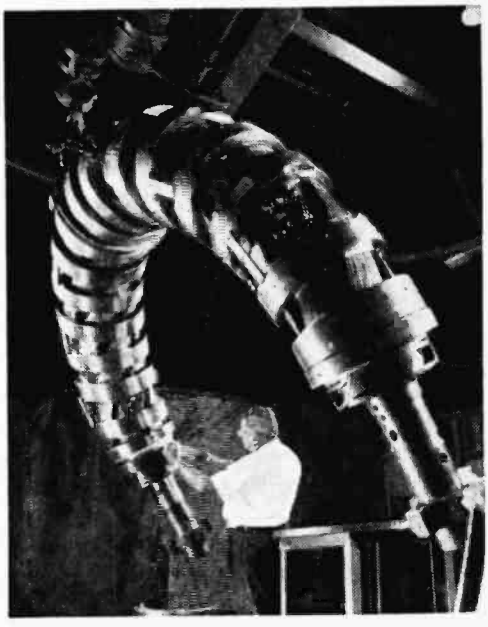


zipping by at 4400 mph, especially since the 4500°F. temperature of the plasma weakens the magnetic field. Westinghouse solved the dilemma with a superconducting magnet, kept cool in liquid helium at minus 452°F. (only about seven degrees above absolute zero) while scarcely an inch away the searing plasma storms on its path. A wall of liquid nitrogen and plenty of cooling water running around the hot plasma duct isolate these two extremes of temperatures.

So far, MHD is strictly experimental, but scientists at Princeton University and General Atomic Division of General Dynamics Corporation are already thinking far beyond it to an even more radical method of producing power from plasma. Their project is nothing less than an attempt to imitate the way in which the stars produce energy from hydrogen. The vast energy of the Sun, for instance, is derived from the direct conversion of hydrogen plasma into radiant energy. One generator of this kind already exists: the H-bomb. The trouble is that the H-bomb bundles its total output into a few millionths of a second. What scientists are now trying to do is to slow down the fusion reaction of the bomb to provide for a gradual and controlled release of energy.

One reason why fusion energy, released

PLASMA STREAM at 15,000° F blasts a missile nose cone in test simulating re-entry into atmosphere (above). "Magnetic bottle" (below) generates magnetic field that suspends superhot plasma so it won't contact bottle's walls. The unit is part of Princeton University's C-Stellerator. Photo provided by Allis-Chalmers.



via plasma, so fascinates the researchers is that it would let us use sea water as fuel. Potentially, it would be possible to burn the ocean! To process a gallon of sea water for fusion reactions would cost only four cents, and the energy content would be equivalent to 300 gallons of gasoline!

Aside from wanting to tap the ocean as a limitless source of cheap energy, scientists have a more urgent reason for seeking practical power by fusion: the reactions leave no dangerous leftovers. The atomic fission powerplants now being built in various parts of the world produce "hot" ashes. Nobody yet knows how to dump them safely. Buried in the ground, their radiation might seep into ground water and poison our springs. Dumped into the sea, radioactive substances may become dangerously concentrated in the bodies of edible fish. Fusion reaction, leaving no waste, would eliminate the need for radioactive "garbage" disposal.

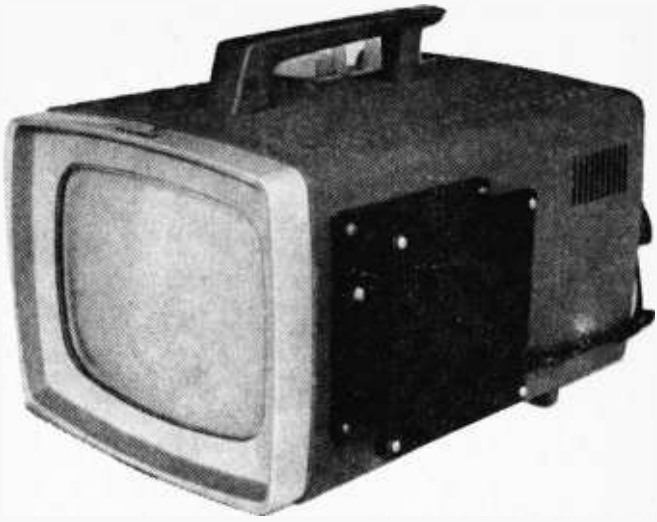
Dr. Melvin Gottlieb of the Princeton Plas-

(*Continued on page* 145)

EXPERIMENTAL electric generator directs plasma past magnets in tank of liquid helium.

TURBULENT deuterium gas is shown being heated to 100,000° F in a plasma "gun" during a fusion experiment to emulate energy-making process present in the sun and stars.

With a fan added to your TV set, cool air can be pushed into the front of the set, circulated around hot tubes, and vented out the rear louvers and grille.



PLAN TO BEAT THE HEAT

It's like the Sahara in your TV set unless you fan it cool

By Fred Blechman, K6UGT

IF you own a portable television set, you may find the handle too hot to handle after a few hours of continuous use. Many of the sets on the market today are not adequately ventilated and the heat build up inside the set results in costly repairs and a shortened life for your TV set. Therefore, it will be wise to add an air circulating fan to the set to prolong its useful entertaining life.

An aluminum grille panel cut to size mounts directly over the "Whisper Fan" input port to prevent accidental injuries and sucking up large particles and papers into the TV cabinet.

Originally designed for hi-fi installations, the Rotron "Whisper Fan" is engineered to operate at an inaudible sound level (minus 18 db speech interference) while delivering 65 cubic feet of air per minute. The 4¾" x 4¾" x 1½" unit draws 7 watts from the 115-volt power line. Pre-lubricated bearings and relatively low speed for a fan (2000 rpm) ensure long-life operation for the fan and the TV set. There are other fans on the market, both new and surplus. Be very careful when you buy. The fan must be able to work off the AC power line continuously without overheating and to operate at a very low noise level so as not to disturb your listening pleasure. Also, avoid fans with brushes—they may cause TV snow.

The fan can be installed directly over existing vent holes without cutting any holes as the author did. However, efficiency will be higher if you reduce back pressure on the fan by cutting or punching a larger hole. Secure the fan in place and connect the fan's leads to the TV set's circuitry so that it comes on when the set is turned on. To avoid broken or cut fingers, cut a piece of decorative aluminum grille to fit over the fan's input port. The grille will keep fingers out of harms way. The brackets, pressure-sensitive foam pad, vibration grommets, bolts and nuts come with the fan, however the author found the vibration isolation unnecessary. ■

Small power craft skippers who want to hold down their investment

THE average small powerboat owner, anxious to communicate with his fellow skippers, has several choices.

He can shout, wigwag flags, send blinker signals, or hire a small Indian to send up smoke puffs in code. None are very practical for small craft. Even if you tote a smoking brave about you can't use him unless other boats are similarly equipped. Sooner or later you come to the inevitable conclusion that radio is the only answer.

Then comes the real problem: What kind of radio?

You soon discover there are many. Medium frequency marine radio in the 2 to 3 megacycle band is touted by many—too many—as the only thing. Its adherents cling grimly to one selling point: it's monitored by the U. S. Coast Guard, so help for the hapless boatman, distressed by running aground or out of fuel, losing an engine or springing a leak, is always within call.

Proponents of standard marine radio overlook several disadvantages, some of them serious. For one thing the frequency used is subject to extraordinary collapse from static and interference. Lightning, even over the horizon, raises hob with reception. Sometimes it is impossible to bottle all the noise produced by the boat—engine spark plugs, generators and alternators, shaft noise, and static noise from the wired instruments on the control console or dash. On many small boats you must sometimes shut the engine off to talk on the radio—a hazardous procedure in nasty water.

But this isn't all. Standard marine radio is often rather costly, relatively speaking. It has considerable range—sometimes too much. So many skippers can be yakking it up simultaneously that you can't get a word in edgewise.

It has happened: Skippers in distress try to call the Coast Guard but can't be heard through the din created by hoggish souls cluttering up the airways with inconsequential gab. Marine radio does you no good at all if your "Mayday" call for help is succeeded by a series of deep "Glubs!" and then utter silence.

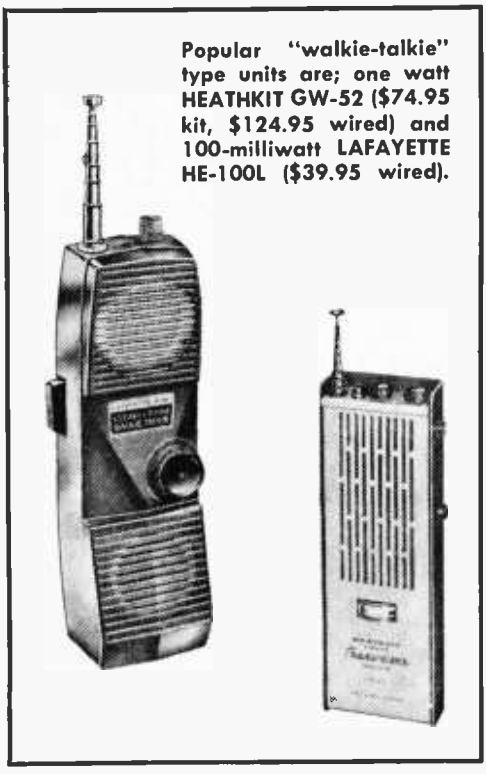
Most boatmen want to get away from that. They can, if they want to. There is one form of radio communications that seems, on the surface of it, to be ideal for boatmen—particularly those owning small power craft.

It's Citizens Band, usually abbreviated

By Jim Martenhoff

LARGEST PARTY LINE

in communications equipment should look into Class D CB radio



Popular "walkie-talkie" type units are; one watt HEATHKIT GW-52 ($74.95 kit, $124.95 wired) and 100-milliwatt LAFAYETTE HE-100L ($39.95 wired).

just as "CB." Citizens Band radio is here to stay. It has been around for several years, ever since the Federal Communications Commission took the almost-idle band away from the ham operators—the amateurs—and created the idea of a band for "citizens."

They almost created a monster. Applications at first trickled into Washington, then turned into a flood. The FCC fell far behind; today it takes about two months—maybe more, by the time this piece sees print—to get a license. About 1,500,000 citizens have licenses, and no one knows how many more use the unlicensed, tiny, one-tenth-of-a-watt sets for which no license is required.

Citizens Band is just about the world's largest party line.

What is it? It's a 23-channel chunk of the airways in the 27-megacycle range, set apart by the FCC for Joe Citizen who has past his eighteenth birthday. The FCC calls this popular band of frequencies Class D CB. You can have your own, private, CB communications network; transceivers in your car, home, boat and office—anywhere you wish.

If you use the five-watt sets, a license is

required but it's a simple matter. No tests or examinations. Only a form to fill out and mail in with an eight dollar check. Eventually you get part of the form back as a license for a network of your own. As already stated, even this isn't needed if you use the 100-milliwatt walkie-talkies, with their limited range. Just buy 'em and use 'em.

The 23 channels of Class D CB range from 26.965 to 27.255 megacycles. That last one is shared with Class C radio control—the people who fly airplane models via radio control, for example. It still leaves 22 channels wide open.

Many sets tune all channels on the receiver side, transmit over one, two or more channels via crystals and rotary selector switches. Costs are amazingly low. You can buy a five-watt Class D CB kit for less than $50, and put it together yourself. Assembled sets often run less than $100, with really good ones just a few dollars more.

The one-watt walkie-talkie, an amazingly good set, runs somewhat less. The 100-milliwatt sets, with one-tenth-of-one-watt power, are genuine bargains. They run as low as $30 or a little less, with kits for home assembly selling for under $20.

Two sets make a network. You can talk to yourself all day (within the limits of FCC regulations, that is).

Range is limited, but not nearly as limited as opponents of CB think. I have personally used two walkie-talkies as much as seven miles apart, talking to a man who was not only seven miles away but on the other side of a small island. Combine one 100-milliwatt walkie-talkie with a five-watt set—a combination that must be licensed—and range goes up to 20 or 25 miles. Once I used a one-watt walkie-talkie and got 30 miles out of it, to a five-watt set.

Class D CB is becoming very popular with some commercial fishermen. Shrimpers equipped with CB masthead antennas have reached 70 miles. You should hear them talking in the Carolinas—all night long.

Once I was on a boat which was having mechanical trouble, and we were seeking advice from an engineer via CB. We were at least 20 miles from shore, and could hear shrimpers all over the area. A captain's wife on shore, who had been listening, broke in to call the shrimpers she knew and ask them to switch to other channels so we could get our business finished and our problem solved. They heard her over a tremendous range, and promptly switched.

This relatively small range is of value, of course. Interference from other transmissions is held to a minimum—and as the story of an experience in Carolina waters show, it can be dealt with. There are, after all, other channels to go to. It is very much unlike standard marine radio, which buzzes and clicks endlessly with conversation, and no amount of begging can turn it off.

Theoretically, CB'ers are subject to medical and industrial interference. A doctor's diathermy machine can raise hob with CB reception in its area. This is often quoted as a defect by everyone from FCC officials down to the inevitable marine radio fan. Few of them, however, see this fact: the diathermy machine in the middle of a lake or bay is a rare goose. I haven't seen one yet, and don't expect to. Such medical interference, as far as the boatman is concerned, can be forgotten.

What about the lack of protection by the U. S. Coast Guard? This argument fails to hold water when analyzed, and when viewed in a proper perspective.

First of all, the Coast Guard can't do a thing for you on good, old Lake Hopscotch

KNIGHT-KIT KG-4000A, rated at one-watt, is ideal for short-range communication and fits in coat pocket ($59.95).

GLOBE STAR CB unit is designed for mobile use. Features five channel operation and an automatic squelch ($159.95).

900 miles inland. In vast areas of the U. S. you simply do not need radio for the Coast Guard, because they just aren't there. CB is sufficient. Even in coastal areas, so long as you are reasonably close to shore and some sort of civilization, CB is adequate.

For one thing, boaters make an unofficial effort to use Channel 13 as a calling and distress frequency. It is entirely unofficial. The FCC can't, and won't, sanction it. But if you know everyone else is listening on Channel 13, you know any distress call you may make is going to be heard.

It may even be heard by a member of a safety organization. It's called REACT. The letters stand for "Radio Emergency Associated Citizens Teams." REACT is a loosely organized, non-profit, nationwide network of CB radio owners. Started by the Hallicrafters Company, it has headquarters at 4401 W. 5th Ave., Chicago 24, Illinois. Local chapters cover the nation.

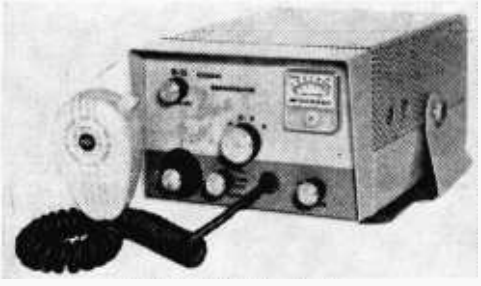
REACT members, on land or water, are pledged to help others should the need arise. Their list of rescues and cases of securing aid when needed is a long, long roll of honor.

Chances are good, if you are near a large body of popular boating water, there is a REACT chapter near you. Its members, when not actually at work or busy at private chores, monitor Channel 13 and pass on any call for aid.

Additionally, greater attention is being paid to monitoring the Channel by private interests. A number of marinas have CB equipment, private safety for those who are boating within range. In Florida, a fire department monitors Channel 13; the firemen in a small coastal town listen to the Channel when on duty, report all calls for assistance to the proper authorities. In another area, a bridge tender—with much time on his hands —monitors Channel 13 in the same way.

And as more and more boatmen add CB equipment to their craft, the network grows and grows. Already, for the outboarder or owner of a small outdrive craft, used primarily fairly close to shore along the coasts or on lakes inland, CB radio is the best bet. It is lowest in cost, simplest to install, less subject to interference, and near major boating centers it is monitored by many listening ears.

In some parts of the nation's coastal regions, even yachtsmen with the best medium frequency equipment are swinging toward CB as subsidiary communications. With intership frequencies solidly jammed with traffic, it's a relief to pick up a CB mike and

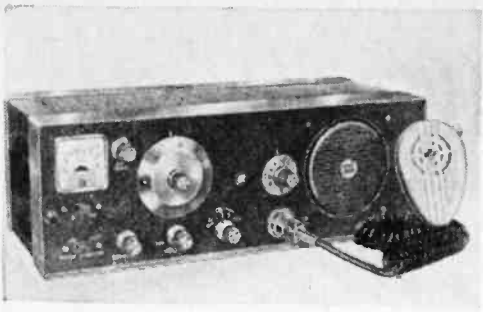


GONSET G-15 mobile unit costs about $199.50.

HAMMARLUND CB-23 has price of $249.50.

LAFAYETTE HB-115 bargain priced at $59.95.

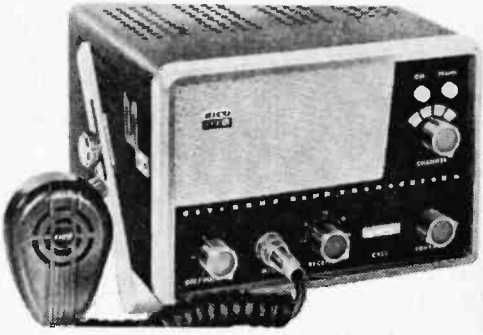
EICO 777 kit costs $119.95. Wired, $189.95.



ECI Courier 1M comes ready-made, $229.50.

KNIGHTKIT C-22 is priced at $64.95 for kit.

HEATHKIT MW-33 kit $89.95, $159.95 wired.



EICO 772 as kit is $89.95, wired at $119.95.

easily contact a yachting friend similarly equipped. Yachtsmen also find it convenient to carry a walkie-talkie to boot. When they take the dinghy on a bonefishing expedition, as some yachtsmen do in the British Bahamas, they carry the hand set. It keeps them in touch with the yacht, via its five-watt Class D rig.

Yacht clubs everywhere are discovering the value of CB in running regattas. Communications during sailing races are easy with a single five-watt unit and a few walkie-talkies distributed among patrol and committee craft. (Walkie-talkies must be licensed when used with five-watt sets.)

If we've made CB sound like the answer to an outboarder's prayer, it is. But even while the number of CB sets edges toward 2,000,000, it is plain that it has by no means blanketed American waters. Those who installed CB in recent years are still short of company afloat. So if you go into it, it pays to start with a network.

How? If you belong to a boating club, consider joining with others in purchasing CB rigs. Many clubs do exactly that.

If you fish or cruise with another family in a two-boat fleet, start out with two—even a pair of walkie-talkies.

If you go it alone, you may have no one to talk to at first. But don't make it a habit to get on the air with "CQ's," the universal call of the radio ham looking for someone to chat with. It is forbidden by regulation. You can use CB freely on your own network, but when you try to talk to another licensee it is supposed to be only because you have important personal business to conduct. (Like, where the fish are really biting!)

CB does have disadvantages. One has already been pointed out—that there are still large "pockets" in the nation where few sets are in use. Another is in transmission. CB is a line-of-sight proposition, meaning the signal cannot go through or over hills or thick forest. Even this, in a way, can be to the good. When the air seems loaded with chatter, you can just run around the bend or point and be free again.

Its limited range means there is always room for a pair of boating buddies, out on lake or bay in a two-boat fishing fleet, to share the air. It's nice to get a call from your anglin' friend and hear those magic words crackle out of the loud speaker:

"C'mon over here, Joe. The fish are really hittin'."

It beats Indian smoke signals all hollow. ■

A COLUMN SPEAKER FOR YOUR HI-FI

Small enough to be set anywhere in a room, yet large enough to produce big-speaker sound, this novel unit can be completely assembled in about three hours, plus paint-drying time. Build two and get stereo performance

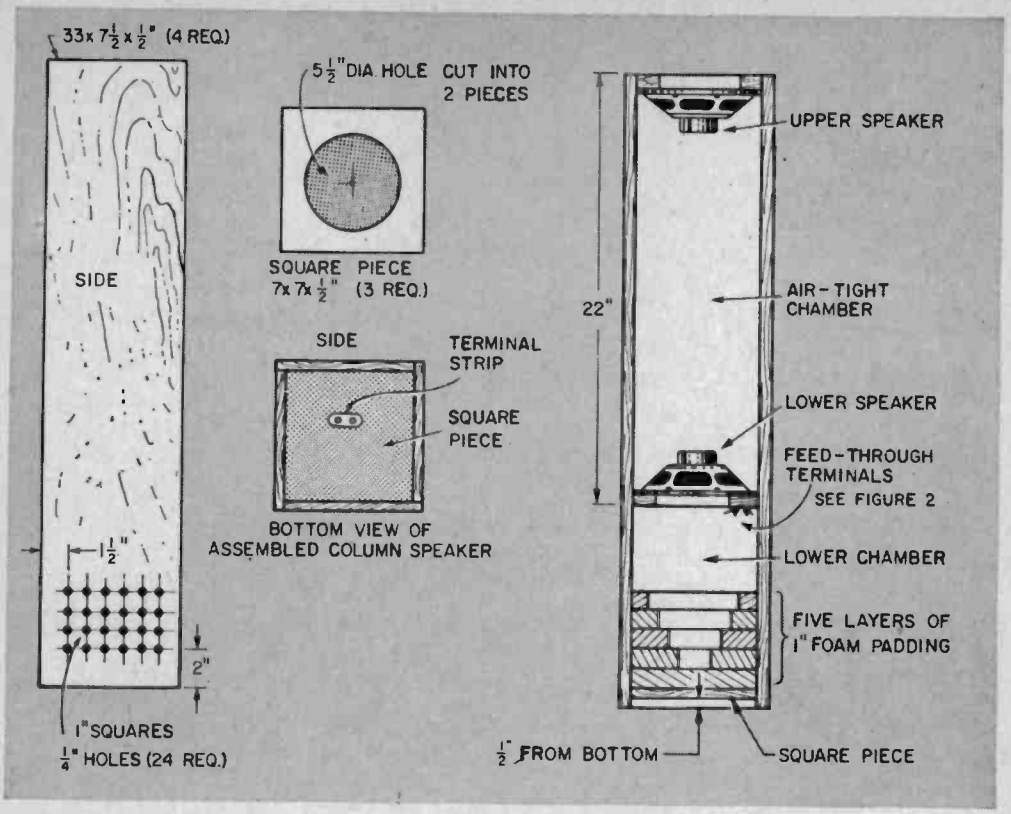
By Julian M. Sienkiewicz
WA2CQL, 2W5115

YOU'LL be more than pleased with both the appearance and performance of this two-speaker hi-fi system. It's so easy to construct that you might as well build two of them and thus achieve stereo operation.

After scanning the materials list, buying the required items, and carefully studying the drawings you could probably assemble the system without detailed instructions—it's that simple in design.

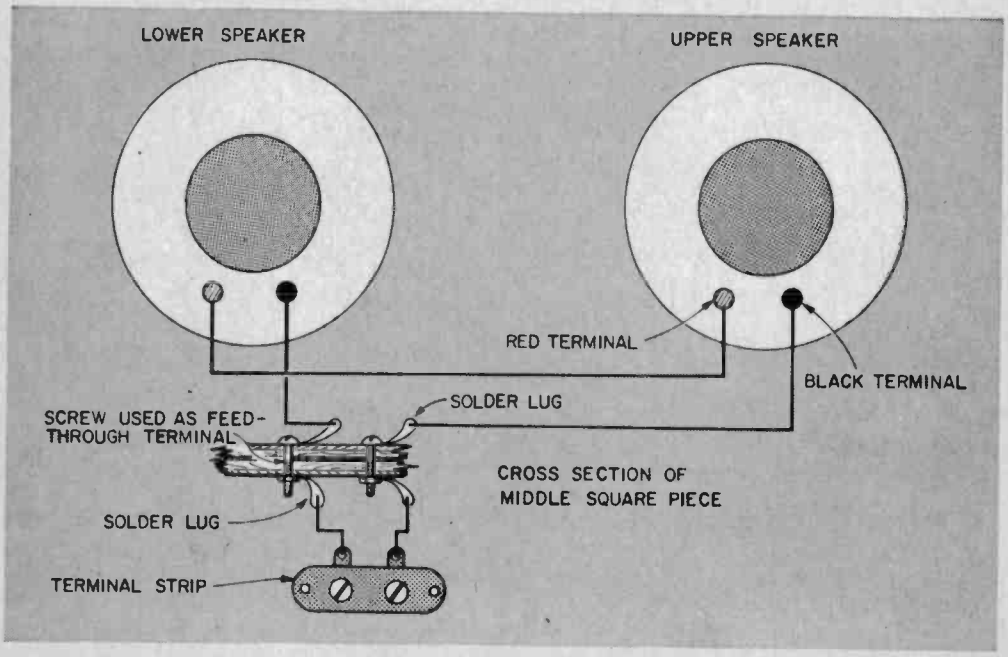
How it works. The main function of the speaker cabinet is to prevent the mixing of sound waves from the rear of the speaker with those from the front of the speaker. Since the former is 180° out-of-phase with the latter, any mixing of the two waves would cause sound cancellation, especially at the low frequencies.

The column speaker cabinet simulates an enormously large baffle in an unusual way. Two thin (2-in.-depth) high-fidelity speakers are connected out-of-phase, and located at the top and toward the bottom of a small air-



Column speaker can be assembled by following construction details shown above. Construction can be speeded up by having lumber dealer cut plywood to exact sizes.

Wiring details for the column speaker are shown below. Feedthrough terminals are necessary to prevent air leaks between the unit's air-tight and lower chambers.

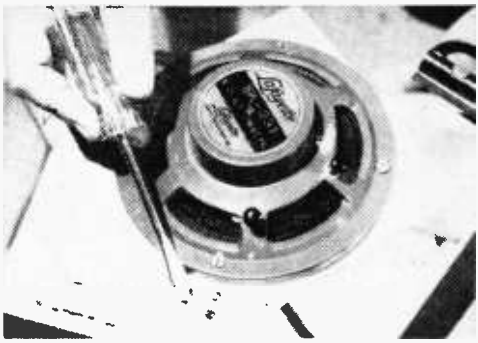


tight chamber. When the upper speaker's cone pushes up, it causes the airtight chamber to expand, which in turn thins the air, resulting in "suction." This suction loads down the upper speaker's cone. Hence, sound distortion. However, the lower speaker in the airtight chamber is doing just the opposite: When the upper speaker is enlarging the airtight chamber's volume, the lower speaker is reducing the volume by pushing its cone into the chamber. Therefore, the volume of the airtight chamber remains almost constant, simulating large-cabinet volume.

The two Lafayette SK-231 speakers are wide-range types designed to give optimum performance under adverse conditions. In the column speaker, bass response comes down to below 60 cycles, with fair results at 50 cycles. Considering the size of the speakers and column cabinet, along with the moderate cost of assembly, the column speaker is a high-fidelity miracle.

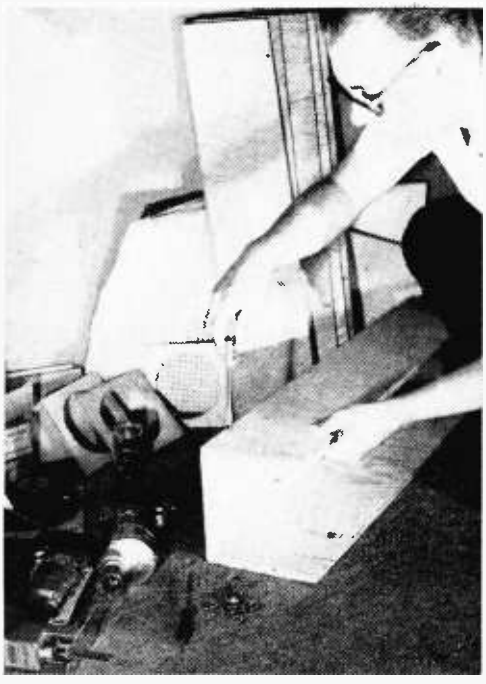
Assembly. Screw three of the four plywood sides (33 x 7½ x ½-in.) together with 2-in. flathead screws, as shown in photo. Drill holes and countersink before screwing the overlapping pieces in place.

Cut 5½-in. holes in two of the three

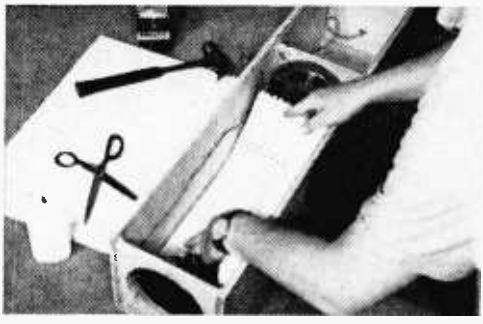


SPEAKER is mounted on 7-in. square of plywood. Screwdriver points to two solder lugs.

AFTER wiring the speakers, seams of upper chamber are sealed with Mortite house putty.



FITTING the four 33x7½x½-in. plywood sides together with screws is the first step.



FOAM RUBBER is used as acoustical padding to line all sides of the airtight upper chamber.

7x7-in. plywood pieces. Mount the two high-fidelity speakers on these pieces, using 1¼-in. roundhead screws. On the piece used to mount the lower speaker, drill two holes to pass a pair of 8/32 x 1-in. machine screws. These will serve as feed-through terminals to connect the speaker leads. Use solder lugs at both ends of each screw, and nuts and lock washers at end of each.

Using 2-in. fh screws, attach the speaker-mounted plywood squares in place at the points indicated in drawing. The third square is attached at bottom of cabinet. Now wire the speakers in series, following the diagram. Install a two-post screw-type terminal strip on the bottom square, as shown in drawing.

Seal the chamber joints with household putty and install foam rubber acoustical padding. These steps are shown in accompanying photos. Attach the fourth side piece and then paint the cabinet black.

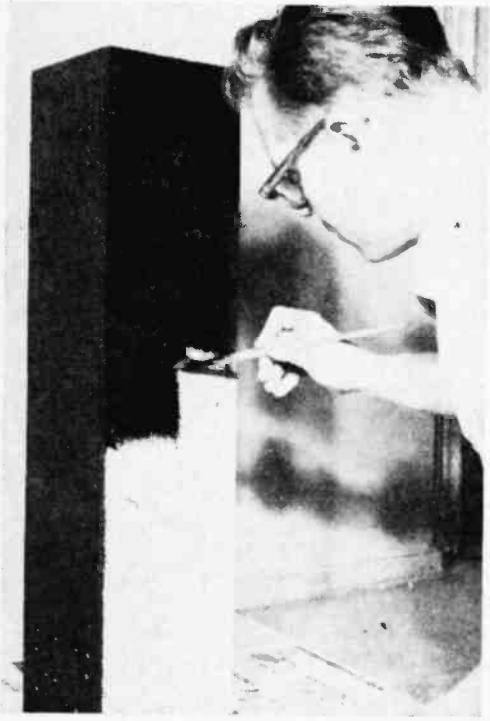
A square yard of grille cloth will cover the sides. A smaller, 10-in. square of it will cover the top. Fold in place and attach with staples until snug. Then attach with upholstery tacks, removing staples. Connect the column speaker to the 16-ohm terminals of your amplifier and you're set to enjoy that hi-fi sound. An aluminum Jell-O mold can be used to decorate the column top. ■

MATERIAL LIST

4—33" x 7½" x ½" plywood sides
3—7" x 7" x ½" plywood squares
5 sq. ft.—foam rubber padding 1" thick
2—6½" dia. high-fidelity speakers, 2" deep (Lafayette Radio SK-231 or equiv.)
1—2-post, screw-type terminal strip
2—8/32-1" machine screws
4—8/32 machine hex. nuts
4—#8 soldering lugs with lock washers
1 package—upholsterer's finishing tacks
1—36" x 36" grille cloth for sides
1—10" x 10" grille cloth for top
Misc.—flathead wood screws, glue, Mortite putty (29¢ size), wire, black paint, sandpaper, aluminum Jello mold (for top of column, if desired).

Estimated Cost: $16.00 for one column speaker and $28.00 for two (saving made in quantity purchases).

Estimated construction time: 3 hours per column speaker provided wood is purchased cut-to-size. Paint drying time not included.



COAT the assembled column with flat, black paint. It will highlight grille cloth's coloring.

GRILLE CLOTH is used to cover column. Use staples until secured with upholstery tacks.

TOP of speaker system (right) is also covered, using upholstery tacks to attach cloth.

Experimenter's Crossword

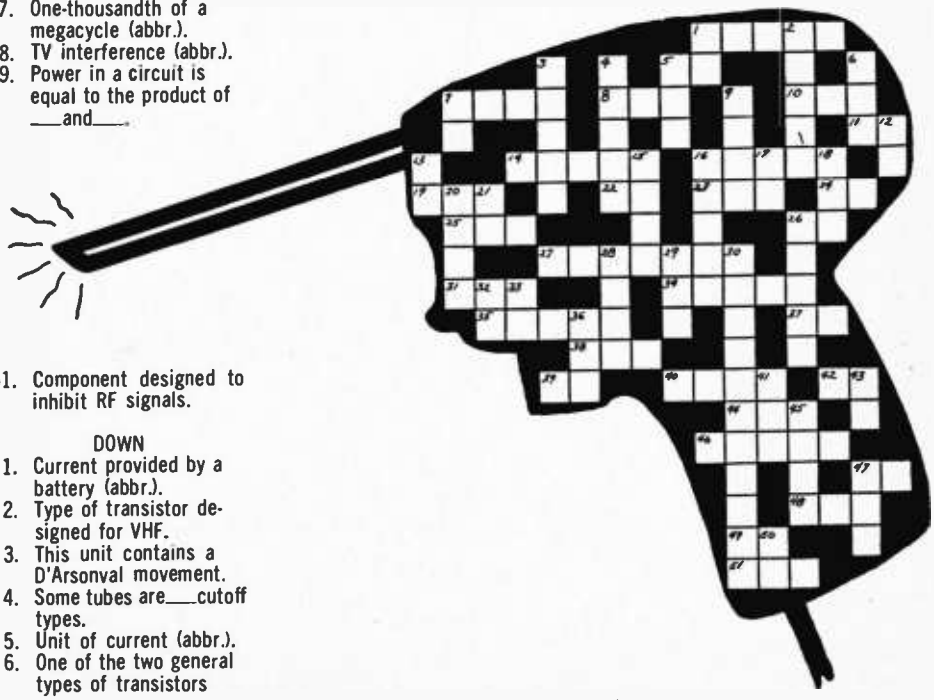
The *Experimenter's Crossword* is a simple puzzle provided you allow yourself enough time. However, set a ten minute time limit and you will have to be up on your electronics to do it all. *Answers on page 143.*

ACROSS

1. Two-element vacuum tube.
5. Converted to pulsating direct current by 1 across (abbr.).
7. Standing wave has one.
8. Undesirable AC noise.
10. Charged particle.
11. Public address (abbr.).
14. Unit of inductance.
16. The positively charged element of 1 across.
19. Replaces rocks (abbr.).
22. Hi-fi unit (abbr.).
23. On-___switch.
24. One million cycles (abbr.).
25. Effective current value of AC (abbr.).
26. Radio frequency (abbr.).
27. Measure of loudness.
31. Ham Q-signal for "interference."
34. ___-to-back ratio.
35. Unit of capacitance.
37. Incoming radio signals are heterodyned to this frequency (abbr.).
38. Short for 1,000,000 ohms.
39. Hi-fi record (abbr.).
40. Transistor element.
42. Band between 550 kc —1600 kc (abbr.).
44. Provides variable resistance used for volume controls (abbr.).
46. Special type of silicon junction diode.
47. One-thousandth of a megacycle (abbr.).
48. TV interference (abbr.).
49. Power in a circuit is equal to the product of ___and___.
51. Component designed to inhibit RF signals.

DOWN

1. Current provided by a battery (abbr.).
2. Type of transistor designed for VHF.
3. This unit contains a D'Arsonval movement.
4. Some tubes are___cutoff types.
5. Unit of current (abbr.).
6. One of the two general types of transistors
7. A gas filled indicator light (abbr.).
9. ___-wave rectifier.
12. Modulation used in transmitting (abbr.).
13. Phono cartridge output is often measured by this unit (abbr.).
15. Antenna type.
16. Measured in watts.
17. Frequencies between 15 and 15,000 cycles (abbr.)
18. Measured in volts (abbr.).
20. Measured in cycles per second (abbr.).
21. Slang for male ham op.
26. Mismatch of load to transmission line is measured by the standing-wave___.
28. C.W.
29. Circuit used to make code signals carriers audible (abbr.).
30. Audio output transformer drives a___.
32. Electromagnetic waves above 15,000 cycles (abbr.).
33. One-thousandth of an ampere (abbr.).
36. Circuit used to amplify signals (abbr.).
41. A geological age.
43. Citizens band radio (abbr.).
45. Equipment check for proper operation.
47. Test equipment often comes in___form.
50. Intermediate frequency (abbr.).



LITERATURE LIBRARY

A Radio-TV Experimenter Service

ELECTRONIC PARTS

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

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

3. Here's another catalog that's bursting with goodies from *Radio Shack Corp.* Included is the exclusive line of *Realistic* equipment. If you can't find it here, you just can't find it!

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

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

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

7. *Brooks Radio & Television Corp.* offers a $1,000 reward to anyone that can find a competitor who can match their prices. Get facts and list of interesting offers today.

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

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

10. Solder is not solder. To learn about the difference, read up on *Ersin* 5-core solder. This Multicore alloy provides faster and better solder joints.

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

HI-FI/AUDIO

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

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

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

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

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

17. For hobbyists designing loudspeaker enclosures, *Electro-Voice Inc.* offers Bulletin #10 which gives general suggestions for construction of all popular enclosures. A new high fidelity catalog is also available.

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

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

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

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

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

23. Here's a "plus" deal. *EICO* will send you a complete catalog of their new electronic kits, PLUS a four-page course leading to a novice class amateur license, PLUS a chart of electronic symbols, and finally, a booklet explaining the "why" of stereo!

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

25. Nothing to hide, that *Harmon-Kardon!* They send you a batch of literature describing their products, complete with technical laboratory reports. The equipment is of course, beautiful. It sounds as good as it looks.

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

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

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

TAPE RECORDERS AND TAPE

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

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

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

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

HI-FI ACCESSORIES

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

37. Here's some info on a wireless remote control for your hi-fi, or if you prefer, they have a wired version for you. There's also a sweet little phase and balance meter. *Stereosonics, Inc.* will send it all if you ask for it.

38. An entirely new concept in customizing electron tubes has generated a new replacement line. *Gold Lion* tubes give higher output and lower

distortion than ordinary production high-fidelity tubes.

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

KITS

41. Here's a firm that makes everything from television kits to pocket stoves. The *Conar* catalog is yours for the asking.

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

43. A complete line of test equipment as well as a wide assortment of hi-fi and stereo gear from *PACO Kits* will come your way if you circle 43.

AMATEUR RADIO

45. Catering to hams for many years *World Radio Laboratories* has a few flyers for you to look over. These include their new transmitter and an assortment of other products that deserve space in any ham shack.

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

47. Here's a goodly assortment of literature covering the products of the *Dow-Key Co.* They make coaxial relays, switches, and preamps for hams and CB'ers.

CITIZENS BAND SHORT-WAVE RADIO

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

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

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

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

54. A catalog for CB'ers, hams and experimenters, with outstanding values. Terrific buys on antennas, mikes and accessories. Just circle #54 to get *Grove Electronics* free 1963 Catalog of Values.

Also see items 46 and 47.

SCHOOLS AND EDUCATIONAL

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

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

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

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

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

ORGANS

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

AUTOMOTIVE

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

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

TEST EQUIPMENT

67. Get the most measurement value per dollar." That's what *Electronic Measurements Corp.* says. Looking through the catalogue they send out, they very well might be right!

TELEVISION

69. Interested in tackling a TV kit? *Arkay Kits, Inc.* will send you full literature (including a schematic) of this truly educational kit. It's used in many of the electronic schools.

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

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

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

SLIDE RULE

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

TOOLS

77. Get the right tool for the right job by checking *Moody Machine Products'* new Catalog that lists Moody Kit tool sets. Dealers invited.

78. Xcelite's Allen hex-type screwdriver kits in plastic cases are must items for the home experimenter's tool box. Learn about what's available to keep your tool box filled with the right tool for the right job.

Radio-TV Experimenter, Dept. LL-682
505 Park Avenue, New York, N. Y. 10022

☐ I am a subscriber

☐ Indicate total number of booklets requested

Please arrange to have the literature whose numbers I have encircled sent to me as soon as possible.
I am enclosing 25¢ to cover handling charges.

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

NAME (Print clearly) _____

ADDRESS _____

CITY _____ **STATE** _____ **ZIP CODE** _____

Service on this coupon expires July 1, 1964

Black Art

(Continued from page 89)

Heat the outside of the bulb by running hot water from a tap over the glass for about half a minute. Now hold the bulb base up and dribble the paint—a drop at a time—over the small hole you drilled. The initial heating of the bulb expanded the air in it; as the bulb cools, the air moves back in and sucks the thick paint into the bulb.

Reheating the bulb periodically, keep adding paint until you have enough to thoroughly coat the inside of the bulb. You will have to keep turning the bulb to make it flow; vigorous shaking will help. Use no more paint than is necessary; any great excess will puddle inside the bulb and will be virtually impossible to remove.

Paint the insides of the other bulbs in essentially the same manner using blue and red fluorescent paints. When the bulbs are smoothly coated, set aside to cool. Leave all bulbs unsealed for a few days to permit drying.

When the paints have dried, reseal the base. First glue on the copper disc, then add a spot of solder to close the hole. Properly done, the bulb reveals no evidence of tampering.

Luminous Fountain. In a totally dark room a tiny spot of light appears in mid-air; this quickly grows into a sparkling, luminous water fountain that rises and falls in height. There is no obvious source of water; and when the water drops back down it seems to continually disappear mysteriously into the darkness of the room. All the while the fountain as a whole moves about sideways and up-and-down. Finally it grows smaller and smaller until it disappears completely, leaving the room as dark as it was before.

In a few moments the fountain reappears but instead of being blue-white, it is a brilliant red. It plays through, disappears, and is replaced by a brilliant fluorescent blue fountain—which also eventually disappears.

How it is Done. Obtain two one-pound tobacco or coffee cans and drill a ¼" diameter hole in the exact center of the bottom of each. Fit a short length of copper tubing into each hole to form a snug fit. For one can, flare the end of the tube slightly and let it project outside the can about one inch. It should not project upward into the can. Solder into the hole to make a water-tight seal.

The tube in the other can projects about an inch both outward and into the can. This is also soldered into place. To the end of the tube extending into the can fasten a glass nozzle (medicine dropper) with a short piece of rigid rubber tubing. Link the copper tubes extending outside of each can with two or three feet of flexible rubber tubing. Paint both cans, inside and out, with flat black paint.

Before the performance hide the equipment out of sight. The reservoir can (without the nozzle) is about one-third full of water to which a fluorescent chemical has been added.

The room should be made as dark as possible for this experiment. Arrange your source of U.V. light to minimize the purplish visible part of the light; you may be able to mask off part of the broad beam and still get enough ultraviolet to activate the fountain.

Pick up the prepared cans, keeping the reservoir can with the solution slightly below the other can. Place the fountain can (with the nozzle) into the U.V. beam and slowly lift the reservoir can higher; this will send the water through the tube and out of the nozzle to form the luminous fountain. By raising and lowering the reservoir, you can control the height of the fountain.

The experiment demonstrates the fluorescence of solutions and provides a most beautiful and intriguing illusion.

Catch the Culprits. The magician places two small boxes on a table near the audience. One is red, the other is blue. Each has a lid held closed with a simple hasp catch.

The magician says that the *red* box contains some money. While he is out of the room (or turns his back) a spectator is to get the money from the box, note its denomination and examine it carefully to make certain it is bona fide currency. He is to pass it on to a second spectator for examination after which it may go to a third or fourth person. The last person to see it is to place the money in the *blue* box, close the lid and lock the box.

When this done, and the spectator returns to his seat, the magician re-enters the room. He obviously does not know how many persons handled the money or who they were.

The magician places the unopened blue box, containing the money, into a large piece of scientific equipment standing on a table on the stage. The equipment consists of a large box from which protrude various dials, bulbs, radio tubes, coils and other paraphernalia. The box also has two round holes, each about four inches in diameter, in the front side of

the box.

Each person in the audience is in turn asked to thrust his hands through these openings. (If the audience is large, limit the potential participants to, say, the first row of spectators and subject only these persons to the "crime detection" test.)

If an individual has not handled the "stolen" money, he is promptly excused and the next person is put to test. Each time a "guilty" person places his hands in the box a dial indicator deflects, lights flash on and a bell or buzzer sounds loudly.

After all the "confederates in crime" have been identified, the magician announces the name of the person who took the money from the red box and also identifies the person who returned it to the blue box.

How it is Done. The dollar bill in the red box is specially prepared in advance of the performance by being coated with a suitable fluorescent powder that is invisible when the bill is viewed in ordinary light, but fluoresces with a white, yellow or pale green color when viewed under ultraviolet light. You can use a chemical such as anthracene or the "tracer powder" included in the U.V. accessories kit sold by *Edmund Scientific Co.*

Using a small pad of absorbent cotton, rub the powder evenly over both sides of the dollar bill until it fluoresces brightly under U.V. light. Apply as much powder as it will take without becoming visible when the bill is viewed in ordinary white light.

The exterior surfaces of the two boxes are also prepared with suitable fluorescent materials. You can do this easily by using the fluorescent water-base poster paints obtainable from paint and artists' supply stores. First paint one box red and the other blue.

Now mix one part of the red fluorescent paint with about two parts of powdered calcium carbonate (chalk), adding enough water to make the mixture loose enough to apply with a brush. Paint the red box with this mixture; for best effect follow this with a second application of the red paint-chalk mixture.

Now prepare and apply a similar chalk-modified blue fluorescent poster paint on the outside of the blue box. The chalk makes each top coat of paint adhere poorly; a small amount will rub off on the fingers when the boxes are handled. The paint smudges so transferred to the fingers are too slight to be noticed in ordinary light, but they glow bright red and blue under U.V. light.

These smudges will enable you to identify all persons involved in the "theft" conspiracy. Those who merely handled the money will have white (yellow or green) smudges on their fingers. The person who took the bill from the red box will also have red smudges while the person who returned the bill to the blue box will have blue smudges.

Your identifications will be easier if you can subtly encourage the audience participants to handle the bill and the boxes rather deliberately, thereby ensuring an adequate transfer of the tell-tale powders.

You can really let your inventiveness run wild when you construct the crime detection apparatus. The box can be a large corrugated cardboard box obtained from a grocery store. After painting it a suitable color, fasten onto it various r.f. coils, vacuum tubes and other parts you may have in your spare parts box. These are just for show, serving no useful purpose except to attract attention away from your actual crime detection procedure.

The magician's side of the box is open so that he—and he alone—can see the hands of the suspects when they are thrust through the two openings in the front. A mirror placed on the bottom of the box will enable you to see both sides of the hands at the same time. The box also contains a U.V. light source which makes the fluorescent smudges visible and enables you to quickly make the correct identifications.

This U.V. experiment is unique in that it is conducted with the bright room lights turned on; the box provides enough darkness so that you can see the pigments on the fingers fluoresce. Remember that at no time should the audience be permitted to see the doctored money or the red and blue boxes when U.V. light can strike them; they would fluoresce brightly, immediately revealing the secret of the trick.

Beyond U.V. Remember that the use of ultraviolet light is only one of many ways to create scientific "magic." There is just as much latent magic in other natural phenomena and you can perform equally mystifying tricks using imaginative application of electronic principles.

Above all, remember that your own safety and the safety of your audience is paramount. Check all chemicals, equipment and electrical wiring thoroughly to make certain that they are safe to use. If you are in doubt, seek the advice of your science teacher or of a professional scientist you may know. Any trick—however spectacular it may be—is a bad one if it endangers you or someone else.■

Counterfeit Broadcasters

(Continued from page 69)

powers in Africa. Believed to be one of the transmitters of the Egyptian Broadcasting Co.

Voice of Free Angola. 7170, 11830 kc/s, 1400-1500 EST. No further information available.

Voice of Freedom. 890, 11835 kc/s, 1530-1920 EST. New anti-Fascist and anti-Salazar station beamed to Portugal.

Voice of Freedom Fighters of North Borneo of The Unitary State of Kalimantan Utara. 11942 kc/s, 0630-0815 EST. Station using Iban language. Presumed to be located in Indonesia.

Voice of Free Iran. 9000 kc/s, 1000-1100 EST. Incites the overthrow of the Iranian government. Station believed to be in Egypt.

Voice of Iraqui People, announcing "Huna Sauti Al Iraq." 9560, 11410, 11965 kc/s, 0900-1340 EST. Similar programming as "Radio Free Iran," and most likely the same transmitter.

Voice of Liberation. 8122 kc/s, 0900-0930 EST. Propaganda broadcasts directed to South Vietnam.

Voice of The Arab Nation. 9750 kc/s, 0500-1430 EST. This station is anti-Jordan, Israel, Syria, Saudi Arabia, and Iraq. It incites the Arab tribes on the Arabian peninsula to revolt. Claims it is broadcasting from "The land of Arabism," probably Egypt.

Voice of The Democratic Front, 6754 kc/s, 0830 EST. Propaganda to Vietnam.

Voice of The Liberals. 9560, 11510, 11850, 15090, 15250 kc/s, 0000 EST. Broadcasts in Moslem language using theme from "Aida" for identification signal.

Voice of The Masses, announcing "Sawt Al-jamahir." 7242, 9636 kc/s, 1200-1400 EST. This is a station which is opposed to the Ben Bella government and against "imperialists." Believed to be in Baghdad, Iraq.

Voice of The People of Thailand, announcing "Sathanni Vithayu Sieng Prachaon Hang Prathat Thai." 9527 and 12095, or 9430 and 12080 kc/s, 1800-1835, 2200-2235, 0000-0535, 0730-0805, 0900-0935, 1000-1105 EST. Owned by "The People's Movement," a pro-communist organization, the station speaks against the U.S. and Thai governments.

Voice of The People's Army. 6600, 7346, 7541, 8180 kc/s, 0900-0930 EST. Believed to be located in North Vietnam, broadcasting communist propaganda to South Vietnam.

Voice of The Truth, announcing "Radiofonikos Stathmos I Foni Tis Alithias." 6215, 8070, 9335, 9730, 9932 kc/s, 0010-0045, 0200-0230, 0700-0750, 1130-1150, 1235-1255, 1400-1425 EST. Broadcasting communist propaganda to Greece and Cyprus, probably using same equipment as "Bizim Radio."

Voz del Boac, 6256 kc/s, 2055-2125 EST. Anti-communist broadcasts to Cuba in Spanish language. Location unknown. □

Rare Ones

(Continued from page 70)

is absolutely impossible) then a week later find his favorite channel suddenly clear.

Vast changes may also occur in your target's operating habits. In addition to those shifts in short-wave channels and schedules, local emergencies can put a station on the air 24 hours a day. Internationally, such an emergency usually takes the form of a revolt or small war. Overseas services are often unfortunately suspended during such periods and you will have to listen for regional trans-

Cover of the souvenir booklet from Voice of America's Courier commemorating its broadcasts from the Panama Canal Zone.

mitters on 90, 60 and 49 Meters. Regional transmitters will also remain on continuously in *lesser* disasters such as floods, typhoons, etc. It follows from this that no DX'er will be really successful unless he is thoroughly familiar with these lower bands. A novice SWL should spend half his night time listening between 3 and 7 mc.

The "emergency" approach also applies to the broadcast band. In the United States, even *daytime only* stations can remain on all night in the event of flood, hurricane or major riot. All U.S. BCB stations are listed in *White's Radio Log* but one should do enough monitoring to know which channels

in your area are clearest after 1:00 AM.

Keep up to date: because events within the target area are so important, a DX'er must listen regularly to newscasts. Not only those on local AM, FM or TV bands but, because these local mediums are often thin on international coverage, you should also listen to overseas short-wave news programs. Some good bets are Voice of America, British Broadcasting Corporation, Radio Canada and Radio Australia, all of which can be heard at a wide variety of times and frequencies.

Finally, to keep posted on new frequencies and last minute schedule revisions, one should join a radio club. The following are currently the most important operating in North America:

- American Short Wave Listeners Club, 6204 E. 109th Terrace, Kansas City, Missouri 64134. Covers short wave, broadcast band and space. Annual dues—$4.00. Sample copy of monthly "SWL"—20¢.
- National Radio Club, Box 63, Buffalo 15, N. Y. Covers the broadcast band only and publishes "DX News" weekly during BCB season. Sample copy—25¢. Annual dues—$4.00.
- Newark News Radio Club, 215 Market St., Newark 1, N. J. Covers all forms of DX. Annual dues—$5.00. Sample copy of monthly bulletin—25¢. ■

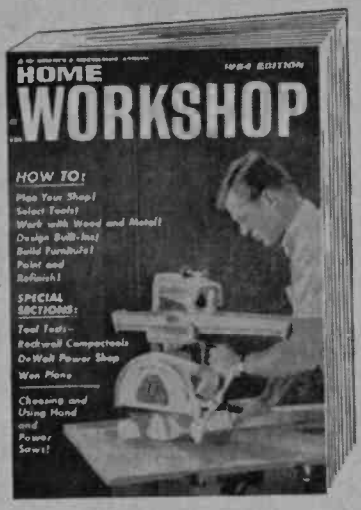
Music Adapter

(Continued from page 48)

Alignment notes. The author's alignment procedure is satisfactory, however, the editors suggest the following if you are running into a little difficulty. Use an oscilloscope if at all possible to cut down alignment time. Peak L1 at 67 kc, L2 at 72 kc, L3 at 62 kc, and L4 at 67 kc. These adjustments will make it easier for a beginner to get the broadband response which will then require only slight trimming. There will be three noticeable peaks which can be minimized but almost never eliminated. After the alignment is completed be sure to replace Q3 or reconnect C10.

Due to a time delay in the lamp circuit, the indicator lamp will come on one or two seconds *after* the tuner is placed on a station with SCA centered at 67 kc. Therefore, tune slowly to each station and wait a moment for the light to come on and indicate SCA transmissions. ■

YOUR BEST NEWSSTAND BUY!



ON SALE AT YOUR NEWSSTAND NOW
OR USE COUPON BELOW

S&M HANDBOOKS
505 Park Avenue / New York, N. Y. 10022

Enclosed is $_____. Please send me_____ copies of No. 685 HOME WORKSHOP at $1 each (includes postage and handling)

NAME_____
(Please print)

ADDRESS_____

CITY_____STATE_____ZIP CODE_____

Here are rewarding projects for the craftsman. Special section gives you test reports on Wen Electric Plane, DeWalt Power Shop and Rockwell Compactools plus how to

- Plan Your Shop
- Select Tools
- Work with Wood and Metal
- Design Built-Ins
- Build Furniture
- Paint and Refinish

No. 685 HOME WORKSHOP 75¢

In One Evening The "MINIMAX"

EASY to build Your Own Boat

Minimum cost—maximum performance. You get both in "Minimax." Built in one day at a very low cost, it will carry 2 people, take outboard motors ranging from 3 to 15 hp. and has a water-tight air compartment that will support 900 lbs. even with the cockpit completely filled with water. As to performance, "Minimax" will plane a 165 lb. man up to 15 mph. with a 3 hp. outboard motor. With 10 hp. and over, the hull planing area diminishes until "Minimax" becomes air-borne and rides upon the motor's cavitation plate. Length 8 ft. Beam, 4 ft. Weight 68 lbs. It's easy to build.

Enlarged Drawings Craft Print #255 available at $3

Full-size Patterns Craft Print #347 available at $8

SCIENCE and MECHANICS,
Craft Print Division
505 Park Avenue, New York 22, N. Y.

Enclosed is $_____. Please send me
☐ No. 255 Minimax Craft Print at $3
☐ No. 347 Minimax Full-Size Pattern at $8
I understand money will be refunded if I am not completely satisfied.

Name .....
(PLEASE PRINT)

Street .....

City, Zone, State.....

Volume 41, No. 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 change, the first in over two decades, enables the Editors of RADIO-TV EXPERIMENTER to offer to its readers two complete volumes of *White's Radio Log* each year, while increasing the scope of the *Log* and its accuracy.

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 call letters, Canadian FM stations by location, and the newly expanded world-wide short-wave section.

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

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

QUICK REFERENCE INDEX

U. S. AM Stations by Location

Abbreviations: C.L., call letters; Kc., frequency in kilocycles; N.A., network affiliation—A: American Broadcasting Co.; C: Columbia Broadcasting System, Inc.; M: Mutual Broadcasting System; N: National Broadcasting Co., Inc.

Location	C.L.	Kc.	N.A.
Abbeville, Ala.	WARI	1480	
Abbeville, La.	KROF	960	
Abbeville, S.C.	WABV	1590	
Aberdeen, Md.	WAMO	970	
Aberdeen, Miss.	WMPA	1240	
Aberdeen, S. Oak.	KOLE	1420	
	KSON	930	A
	KXRO	1320	
Aberdeen, Wash.	KBKW	1450	
Abilene, Tex.	KRBC	1470	A
	KCAD	1560	
	KNIT	1280	
	KWKC	1340	M
Abilene, Kansas	KABI	250-d	
Abingdon, Va.	WBBI	1280	
Ada, Okla.	KAOA	1230	A
Adel, Ga.	WAAG	1470	
Adrian, Mich.	WABJ	1490	A
Aguadilla, P.R.	WABA	850	
	WGRF	1340	
Ahoskie, N.C.	WRCS	970	
Aiken, S.C.	WAKN	990	
	WLOW	1330	O
Aitkin, Minn.	KKIN	1000	O
Akron, Ohio	WAKR	1590	A
	WADC	1350	C
	WCUE	1150	M
	WHLO	640	M
Alamogordo, N.M.	KALG	1280	M
	KRAC	1270	
Alamosa, Colo.	KGIW	1450	M
Albany, Ga.	WALG	1590	A
	WLYB	1250	
	WGPC	1450	C
	WJAZ	960	
Albany, Ky.	WANY	1390	
Albany, Minn.	KASM	1150	
Albany, N.Y.	WABY	1400	
	WOKO	1460	M
	WPTR	1540	A
	WROW	590	C
Albany, Oreg.	KWIL	790	M
	KRKT	990	
Albemarle, N.C.	WABZ	1010	
	WZKY	1580	
Albert Lea, Minn.	KATE	1450	A
Albertville, Ala.	WAVU	630	
Albion, Mich.	WALM	1260	
Albuquerque, N.M.	KABQ	1350	
	KDEF	1150	A
	KGGM	610	C
	KOB	770	N
	KQEO	920	M
	KARA	1310	
	KVOO	730	
	KLOS	1450	
	KMNF	1520	
	KRZY	1580	A
Alcoa, Tenn.	WEAG	1470	
Alexander City, Ala.			
	WRFS	1050	
Alexandria, La.	KALB	580	A
	KOBS	1410	
	KSYL	970	N
Alexandria, Minn.	KXRA	1230	A
Alexandria, Va.	WPIK	730	M
Algona, Iowa	KLGA	1600	
Alice, Tex.	KOPY	1070	
Allegan, Mich.	WOWE	1580	
Allentown, Pa.	WHOL	1600	
	WAEB	790	
	WKAP	1320	
	WSAN	1470	N
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	M
Altavista, Va.	WKDE	1280	
Alton, Ill.	WOKZ	1570	
Altona, Man.	CFAM	1290	
Altoona, Pa.	WFBG	1290	N
	WRTA	1240	A
	WVAM	1430	C
Alturas, Calif.	KCNO	570	
Altus, Okla.	KWHW	1450	
Alva, Okla.	KALV	1430	
Amarillo, Tex.	KBUY	1010	M
	KFOA	1440	A
	KGNC	710	N
	KIXZ	940	C
	KRAY	1360	
	KZIP	1310	
Ambridge, Pa.	WMBA	1460	
Americus, Ga.	WQEC	1290	
Ames, Iowa	KSAI	1430	
	WOI	640	
Amherst, Mass.	WTTT	1430	
Amherst, N.S.	CKOH	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	C-A
	KENI	550	A-M-N
Andalusia, Ala.	WCTA	920	
Anderson, Calif.	KPON	1580	
Anderson, Ind.	WHUT	1470	M
	WHBU	1240	C
Anderson, S.C.	WAIM	1230	C
	WANS	1280	M
Andrews, Tex.	KACT	1360	
Annapolis, Md.	WANN	1190	
	WYRE	810	
	WNAV	1480	
Ann Arbor, Mich.	WAAM	1600	M
	WPAG	1050	
Anna, Ill.	WRAJ	1440	
Anniston, Ala.	WANA	1490	
	WDNG	1450	A
	WHMA	1390	
Anoka, Minn.	KANO	1470	
Ansonia, Conn.	WADS	690	M
Antigo, Wis.	WATK	900	
Apollo, Pa.	WAVL	910	
Apopka, Fla.	WVCF	1520	
Apple Valley, Cal.	KAVR	960	
Appleton, Wis.	WAPL	1570	
	WHBY	1230	M
Arab, Ala.	WRAB	1380	
Arcadia, Fla.	WAPG	1480	
Arcata, Calif.	KENL	1340	
Arcata, Calif.	KATA	1340	
Ardmore, Okla.	KVSO	1240	A
Arecibo, P.R.	WCMN	1260	
	WMIA	1070	
	WNIK	1230	
Argentia, Nfld.	VOUS	1480	
Arkadelphia, Ark.	KVRC	1240	M
Arkan. City, Kans.	KSOK	1280	
Arlington, Fla.	WQTY	1220	
Arlington, Va.	WAVA	780	
	WEAM	1390	
Artesia, N.M.	KSVP	990	M
Arvada, Colo.	KOAB	1550	
Arroyo Grande, Calif.			
	KCGH	1280	
Ashburn, Ga.	WMES	1570	
Asbury Park, N.J.	WJLK	1310	
Asheboro, N.C.	WGWR	1260	
Asheville, N.C.	WISE	1310	
	WLOS	1380	N-M-A
	WSKY	1230	
	WWNC	570	C
Ashland, Ky.	WCMI	1340	C
	WTCR	1420	
Ashland, Ohio	WNCO	1340	
Ashland, Oreg.	KWIN	1400	M
	KRVC	1350	
Ashland, Va.	WIVE	1430	
Ashland, Wis.	WATW	1400	
Ashtabula, Ohio	WAQI	1600	
	WREO	970	
Aspen, Colo.	KSNO	5000	O
Astoria, Oreg.	KAST	1370	M
	KIAL	1230	
Atchison, Kans.	KARE	1470	
Athens, Ga.	WGAU	1340	C
	WOOL	1470	
	WRFC	960	
Athens, Ohio	WATH	970	
	WOUB	1340	
Athens, Tenn.	WLAR	1450	M
Athens, Tex.	KBUO	1410	
Atlanta, Ga.	WPLO	590	C
	WAKE	1340	
	WAOK	1380	
	WERO	860	
	WGKA	1600	
	WGST	920	A
	WIIN	970	
	WQXI	790	
	WSB	750	N
	WYZE	1480	C
Atlanta, Tex.	KALT	900	
Atlantic, Iowa	KJAN	1220	
Atlantic Beach, Fla.	WKTX	1600	
Atlantic City, N.J.	WFPG	1450	C
	WLOB	1490	A-M
	WMID	1340	A
Atmore, Ala.	WATM	1590	
Attleboro, Mass.	WARA	1320	
Auburn, Ala.	WAUD	1250	A
Auburn, Calif.	KAHI	950	
Auburn, N.Y.	WMBO	1340	M
	WAUB	1590	
Auburn, Wash.	KASY	1220	
Auburndale, Fla.	WTWB	1570	
Auburndale, Wis.	WLBL	930	
Augusta, Ga.	WAUG	1050	
	WBBQ	1340	M
	WBIA	1230	N
	WGAC	580	A
	WROW	1480	C
Augusta, Maine	WROO	1400	N
	WFAU	1340	M
	KOSI	1430	M
Aurora, Colo.	WHRO	1280	
Aurora, Ill.	WKKD	1580	
Aurora, Mo.	KSWM	940	
Austin, Minn.	KAUS	1480	M
	KQAQ	970	
Austin, Tex.	KNOW	1490	A
	KASE	970	
	KTBC	590	C
	KOKE	1370	
	KVET	1300	M
Avalon, Calif.	KGLM	740	
Avon Park, Fla.	WAVP	1390	
Avondale Estates, Ga.	WAVO	1420	
Aztec, N. Mex.	KHAP	1340	
Babylon, N.Y.	WBAB	1440	M
	WGLI	1290	
Bad Axe, Mich.	WLEW	1340	
Bainbridge, Ga.	WMGR	930	
	WAZA	1360	
Baker, Oreg.	KBKR	1490	
Bakersfield, Calif.	KAFY	550	M
	KBIS	970	
	KERN	1410	C
	KGEE	1230	
	KUZZ	800	
	KLYO	1350	
	KWAC	1490	
	KPMC	1560	A
Bellingham, Wash.	KPUG	1170	M
Baldwinsville, N.Y.	WSEN	1050	
Ballinger, Tex.	KRUN	1400	
Baltimore, Md.	WBAL	1090	N
	WBMD	750	
	WCAO	600	
	WCBM	680	C
	WFBR	1300	
	WITH	1230	M
	WSID	1010	
	WWIN	1400	A-M
Bamberg, S.C.	WWBO	790	
Bangor, Maine	WABI	910	A-M
	WGUY	1250	C
	WLBZ	620	N
Banning, Calif.	KPAS	1490	
Barboursville, Ky.	WBVL	950	
Bardstown, Ky.	WBRT	1320	
Barnesboro, Pa.	WNCC	950	
Barnwell, S.C.	WBAW	740	
Barre, Vt.	WSNO	1450	
Barstow, Calif.	KWTC	1230	A
	KIOT	1310	
Bartlesville, Okla.	KWON	1400	M
Bartow, Fla.	WBAR	1480	
Bassett, Va.	WOOY	900	
Bastrop, La.	KTRY	730	
	KVOB	1340	
Batavia, N.Y.	WBTA	1490	M
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	1460	M
	WLUX	1550	
	WYNK	1380	
	WIBR	1300	
	WJBO	1150	N
	WLCS	910	
	WXOK	1260	
Battle Creek, Mich.	WBCK	930	
	WELL	1400	A
Baxley, Ga.	WHAB	1260	
Bay City, Mich.	WBCM	1440	A
	WWBC	1250	
Bay City, Tex.	KIOX	1270	M
Bay Minette, Ala.	WBCA	1150	
Bayamon, P.R.	WRSJ	1580	
Baytown, Tex.	KWBA	1380	
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.	KFDM	560	A
	KPYC	1450	
	KTRM	990	
Beaver Dam, Wis.	WBEV	1430	
Beaver Falls, Pa.	WBVP	1230	
Beckley, W. Va.	WJLS	560	C
	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	
Belgrade, Mont.	KGVW	630	
Bellaire, Ohio	WOMP	1290	M
Bellefontaine, Ohio	WOHP	1390	
Bellefonte, Pa.	WBLF	1330	
Bell Fourche, S.Oak.	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	M
	KGMI	790	A
	KOQT	1550	
Bellingham-Ferndale, Wash.			
	KENY	930	
Belmont, N.C.	WCGC	1270	M-A
Beloit, Wis.	WGEZ	1490	M
	WBEL	1380	
Belton, S.C.	WHPB	1390	
Belton, Tex.	KTON	940	
Belzoni, Miss.	WELZ	1460	
Bemidji, Minn.	KBUN	1450	M
Bend, Oreg.	KBND	1110	A
	KGRL	940	
Bennetsville, S.C.	WBSC	1550	M
Bennington, Vt.	WBTN	1370	
Benson, Minn.	KBMO	1290	
Benson, N.C.	WPYB	1580	
Benton, Ark.	KBBA	690	
	KGKO	1600	
Benton, Ky.	WCBL	1290	
Benton Harbor, 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	WIOE	1400	M
Big Delta, Alaska	WXLL	980	
Big Lake, Tex.	KBLT	1290	
Big Rapids, Mich.	WBRN	1480	
Big Spring, Tex.	KBST	1490	A
	KHEM	1270	
	KBYG	1400	M
Big Stone Gap, Va.	WLSO	1220	
Biloxi, Miss.	WLOX	1490	M
	WVMI	570	
Billings, Mont.	KBMY	1240	M
	KGHL	790	N
	KOOK	970	C
	KOYN	910	
	KURL	730	
Binghamton, N.Y.	WINR	680	N
	WKOP	1360	M
	WNBF	1290	C
Birmingham, Ala.	WAPI	1070	N
	WBHM	1550	
	WBRC	960	A
	WCRT	1260	A
	WEZB	1220	
	WENN	1320	M
	WATV	900	C
	WSGN	610	
	WYOE	850	
	WVOK	690	
Bisbee, Ariz.	KSUN	1230	A
Bishop, Calif.	KIBS	1230	A
Bishopville, S.C.	WAGS	1380	
Bismarck, N.Oak.	KFYR	550	N

WHITE'S RADIO LOG

Location	C.L.	Kc.	N.A.
	KBMR	1350	
Bismarck-Mandan, N.Dak.	KBOM	1270	
Black Mountain, N.C.	WBMT	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	A
Bloomington, Ind.	WTTS	1370	A
Bloomsburg, Pa.	WCNR	930	
	WHLM	550	
Blountstown, Fla.	WKMK	1370	
Blue Earth, Minn.	KBEN	1560	
Bluefield, W.Va.	WHIS	1440	N
	WKOY	1240	M
Blythe, Calif.	KYOR	1450	A
Blytheville, Ark.	KLCN	910	
Boaz, Ala.	WBSA	1300	
Boca Raton, Fla.	WFSG	730	
Bogalusa, La.	WIKC	1490	N
	WBOX	920	
Boise, Idaho	KATN	1010	
	KBOI	950	C
	KEST	790	
	KGEM	1140	M
	KIDO	630	N
	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	A
Boonville, N.Y.	WBRV	900	
Borger, Tex.	KHUZ	1490	M
	KBBB	1600	
Boston, Mass.	WBZ	1030	
	WCOP	1150	
	WILD	1090	
	WNAC	680	
	WEZE	1260	N
	WEEI	590	C
	WHDH	850	
	WMEX	1510	
	WORL	950	M
Boulder, Colo.	KBOL	1490	
	KDEY	1460	
Bowie, Tex.	KBAN	1410	
Bowling Green, Ky.	WKCT	930	A
	WBGN	1340	
	WLBJ	1410	M
Bowl. Green, Ohio	WMGS	730	
Boynton Beach, Fla.	WZZZ	1510	
Bozeman, Mont.	KXXL	1450	N
	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	M
Brady, Tex.	KNEL	1490	
Brainerd, Minn.	KLIZ	1380	
Branson, Mo.	KBHM	1220	
Brantford, Ont.	CKPC	1380	
Brattleboro, Vt.	WTSA	1450	N
	WKVT	1490	
Brawley, Calif.	KROP	1300	A
Brazil, Ind.	WBZI	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	M-N
Brewster, N.Y.	WBRW	1510	
Brewton, Ala.	WEBJ	1240	M
Bridgeport, Ala.	WBTS	1480	
Bridgeport, Conn.	WICC	600	M
	WNAB	1450	A-M
Bridgeton, N.J.	WSNJ	1240	M
Brigham City, Utah	KRUH	800	
Brighton, Colo.	KBRN	800	
Brinkley, Ark.	KBRI	1570	
Bristol, Conn.	WBIS	1440	
Bristol, Tenn.	WOPI	1490	N
	WYKE	1550	
Bristol, Va.	WCYB	690	A
	WFHG	980	M
Brockton, Mass.	WBET	1460	
	WOKW	1410	
Brockville, Ont.	CFJR	1450	
Broken Bow, Nebr.	KCNI	1280	
Brookfield, Mo.	KGHM	1470	
Brookhaven, Miss.	WCHJ	1470	
	WJMB	1340	M
Brookings, Oreg.	KURY	910	
Brookings, S.Dak.	KBRK	1430	
Brookline, Mass.	WBOS	1600	
Brooksville, Fla.	WWJB	1450	
Brownfield, Tex.	KTFY	1300	
Brownsville, Tenn.	WBHT	1520	
Brownsville, Tex.	KBOR	1600	A
Brownwood, Tex.	KBWD	1380	M
	KEAN	1240	
Brunswick, Ga.	WGIG	1440	A
	WMOG	1490	
Brunswick, Maine	WCME	900	
Bryan, Ohio	WBNO	1520	
Bryan, Tex.	KORA	1240	M
	KTAW	1150	
Buckhannon, W.Va.	WBUC	1460	
Bucyrus, Ohio	WBCO	1540	
Buffalo, N.Y.	WBEN	930	C
	WYSL	1400	
	WEBR	970	M
	WGR	550	N
	WKBW	1520	N
	WWOL	1120	A
Buffalo, Wyo.	KBBS	1450	
Buford, Ga.	WDMF	1460	
Burbank, Calif.	KBLA	1500	
Burley, Idaho	KBAR	1230	A-M
Burlington, Iowa	KBUR	1490	A
Burlington, N.C.	WBBB	920	M
	WBAG	1150	
Burlington, Vt.	WDOT	1400	
	WJOY	1230	A
	WVMT	620	N
Burnett, Tex.	KTSL	1340	
Burns, Oreg.	KRNS	1230	
Butler, Ala.	WPRN	1240	
Butler, Mo.	KMAM	1530	
Butler, Pa.	WBUT	1050	
	WISR	680	
Butte, Mont.	KBOW	1490	C
	KOPR	550	M
	KXLF	1370	N
Cadillac, Mich.	WATT	1240	M
Caguas, P.R.	WNEL	1430	
	WVJP	1110	
Cairo, Ga.	WGRA	790	
Cairo, Ill.	WKRO	1490	
Calais, Maine	WQDY	1230	N
Caldwell, Idaho	KCID	1490	
	KBGN	910	
Calera, Ala.	WBYE	1370	
Calexico, Calif.	KICO	1490	A
Calhoun, Ga.	WCGA	900	
Cambridge, Md.	WCEM	1240	
Cambridge, Mass.	WTAO	740	A
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	M
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	M
	WHOF	1060	
	WHBC	1480	A
Canyon, Tex.	KCAN	1550	
Cape Girardeau, Mo.	KFVS	960	
	KZIM	1220	
	KGMO	1550	
Carbondale, Ill.	WCIL	1020	
Carbondale, Pa.	WCDL	1440	
Caribou, Maine	WFST	600	
Carlisle, Pa.	WHYL	960	
Carlsbad, N.Mex.	KAVE	1240	C
	KPRM	740	
Carmel, Calif.	KRML	1410	
Carmi, Ill.	WROY	1480	
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.	KAOL	1430	
Carson City, Nev.	KPTL	1300	
Cartersville, Ga.	WBHF	1450	M
	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.	KTWO	1470	C
	KATI	1400	
Cathedral City, Calif.	KWXY	1340	
	KVOC	1230	A-M
Cayce, S.C.	WCAY	620	C
Cedar City, Utah	KSUB	590	C
Cedar Falls, Iowa	KCFI	1250	
Cedar Rapids, Iowa	KCRG	1600	A
	KLWN	1450	
	WMT	600	C
Cedartown, Ga.	WGAA	1340	
Celina, Ohio	WCSM	1350	
Center, Ala.	WEIS	990	
	WAGC	1550	
Center, Tex.	KDET	930	
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, Miss.	WLBS	1580	
Ceres, Calif.	KLOC	920	
Chadburn, N.C.	WVOE	1590	
Chadron, Nebr.	KCSR	610	
Chambersburg, Pa.	WCHA	800	
	WCBG	1590	
Champaign, Ill.	WDWS	1400	C
Chanute, Kans.	KCRB	1460	
Chapel Hill, N.C.	WCHL	1360	
Chardon, Ohio	WGLD	1560	
Charlerol, Pa.	WESA	940	
Charles City, Iowa	KCHA	1580	
Charleston, Ill.	WEIC	1270	
Charleston, Mo.	KCHR	1350	
Charleston, S.C.	WCSC	1390	C
	WOKE	1340	A-M
	WPAL	730	
	WQSN	1450	
	WTMA	1250	N
Charleston, W.Va.	WCAW	680	
	WCHS	580	C
	WGKV	1490	A
	WKAZ	950	N
	WTIP	1240	M
	WXVA	1550	
Charlotte, Mich.	WCER	1390	
Charlotte, N.C.	WBT	1100	C
	WAYS	610	M
	WGIV	1600	
	WKTC	1310	
	WSOC	930	M
	WIST	1240	N
	WWOK	1480	
Charlotte,	WRPL	1540	
Charlotte Amalie, V.I.	WBNB	1000	
	WSTA	1340	
	WBNB	1000	
Charlottesville, Va.	WCHV	1260	A
	WELK	1010	
	WINA	1400	M
Chase City, Va.	WMEK	980	
Chattanooga, Tenn.	WMOC	1450	M
	WAPO	1150	A-M
	WDEF	1370	N
	WDOD	1310	C
	WDXB	1490	
	WNOO	1250	
Cheboygan, Mich.	WCBY	1240	
Cheektowaga, N.Y.	WNIA	1230	
Chehalis, Wash.	KITI	1420	
Chelan, Wash.	KOZI	1220	
Cheraw, S.C.	WCRE	1420	
Cherryville, N. C.	WCSL	1590	
Cherokee, Iowa	KCHE	1440	
Chester, Ill.	KSGM	980	
Chester, Pa.	WEEZ	1590	
	WVCH	740	
Chester, S.C.	WGCD	1490	
Chestertown, Md.	WCTR	1530	
Cheyenne, Wyo.	KFBC	1240	A
	KCHY	1590	
	KRAE	1480	
	KVWO	1370	M
Chicago, Ill.	WAAF	950	
	WAIT	820	M
	WBBM	780	C
	WCFL	1000	
	WCRW	1240	
	WEDC	1240	
	WYNR	1390	
	WGN	720	M
	WIND	560	
	WJJD	1160	
	WLS	890	A
	WMAQ	670	N
	WMBI	1110	
	WSBC	1240	
Chicago Hgts., Ill.	WMPP	1470	
	WCGO	1600	
Chickasha, Okla.	KWCO	1560	
Chico, Calif.	KHSL	1290	C
	KPAY	1060	
Chicopee, Mass.	WACE	730	
Childress, Tex.	KCTX	1510	
Chillicothe, Mo.	KCHI	1010	
Chillicothe, Ohio	WBEX	1490	A
	WCHI	1350	
Chipley, Fla.	WBGC	1240	
Chippewa Falls, Wis.	WAXX	1150	
Christiansburg, Va.	WBCR	1260	
Christiansted, V.I.	WIVI	970	
Church Hill, Tenn.	WMCH	1260	
Cicero, Ill.	WVON	1450	
Cincinnati, Ohio	WCKY	1530	M
	WCIN	1480	
	WCPO	1230	
	WKRC	550	C
	WLW	700	N-A
	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	N
	WHAR	1340	M
	WPDX	750	
Clarksdale, Miss.	WROX	1450	M
	WKDL	1600	
Clarksville, Ark.	KLYR	1360	
Clarksville, Tenn.	WJZM	1400	M
	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	KYW	1100	
	WDOK	1260	M
	WERE	1300	
	WGAR	1220	C
	WHK	1420	
	WABQ	1540	
	WJW	850	N
Cleveland, Tenn.	WBAC	1340	M
	WCLE	1570	
Cleveland, Tex.	KVLB	1410	
Cleve. Hgts., Ohio	WJMO	1490	A
Clewiston, Fla.	WOWY	1590	
Clifton, Ariz.	KCLF	1400	A
Clifton Forge, Va.	WCFV	1230	M
Clincho, Va.	WDIC	1430	
Clinton, Ill.	WHOW	1520	
Clinton, Iowa	KCLN	1390	
	KROS	1340	M
Clinton, Mo.	KDKD	1280	
Clinton, N.C.	WRRZ	880	A
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	
Cocoa, Fla.	WKKO	860	
	WEZY	1350	
Cocoa Beach, Fla.	WRKT	1300	
Cody, Wyo.	KODI	1400	A
Coeur d'Alene, Ida.	KVNI	1240	M
Coffeyville, Kans.	KGGF	690	A
Colby, Kans.	KXXX	790	
Coldwater, Mich.	WTVB	1590	
Coleman, Tex.	KSTA	1000	
Colfax, Wash.	KCLX	1450	
College Park, Ga.	WEAD	1570	
Colonial Heights, Va.	WPVA	1290	
Colorado City, Tex.	KVMC	1320	
Colo. Sprgs., Colo.	KRDO	1240	
	KPIK	1580	
	KVOR	1300	C
	KSSS	740	
	KYSN	1460	M
	KRYT	1530	
Columbia, Ky.	WAIN	1270	
Columbia, Miss.	WCJU	1450	M
Columbia, Mo.	KFRU	1400	A
	KCGM	1580	
Columbia, Pa.	WCOY	1580	
Columbia, S.C.	WCOS	1400	A
	WIS	560	N
	WOIC	1320	C
	WNOK	1230	M
	WQXL	1470	
Columbia, Tenn.	WMCP	1280	
	WKRM	1340	
Columbus, Ga.	WDAK	540	N
	WRBL	1420	C
	WGBA	1270	M
	WCLS	1580	
	WOKS	1340	
Columbus, Ind.	WCSI	1010	

Location	C.L.	Kc.	N.A.
Columbus, Miss.	WACR	1050	
	WCBI	550	M
Columbus, Nebr.	KJSK	900	
	KTTT	1510	
Columbus, Ohio	WBNS	1460	C
	WCOL	1250	A
	WMNI	920	M
	WOSU	820	
	WTVN	610	A
	WVKD	1580	
Colville, Wash.	KCVL	1270	
Comanche, Tex.	KCOM	1550	
Commerce, Ga.	WJJC	1270	
Concord, Calif.	KWUN	1480	
Concord, N.H.	WKXL	1450	C
Concord, N.C.	WEGO	1410	
Concordia, Kans.	KNCK	1390	
	KFRM	550	A
Conneaut, Ohio	WWOW	1360	
Connellsville, Pa.	WCVI	1340	
Connersville, Ind.	WCNB	1580	
Conroe, Tex.	KMCD	900	
Conway, Ark.	KCON	1230	
	KVEE	1330	
Conway, N.H.	WBNC	1050	
Conway, S.C.	WLAT	1330	M
Cookeville, Tenn.	WHUB	1400	C
	WPTN	1550	
Coolidge, Ariz.	KCKY	1150	C
Coos Bay, Oreg.	KDDS	1280	M
	KYNG	1420	
Copper Hill, Tenn.	WLSB	1400	
Coquille, Oreg.	KWRO	630	
Coral Gables, Fla.	WRIZ	1550	
	WVCG	1070	
Corbin, Ky.	WCTT	680	M
	WYGO	1330	
Cordele, Ga.	WMJM	1490	M
Cordova, Alaska	KLAM	1450	
Corinth, Miss.	WCMA	1280	
Cornelia, Ga.	WCDN	1450	
Corning, Ark.	KCCB	1260	
Corning, N.Y.	WCBA	1350	
	WCLI	1450	A
Corona, Calif.	KBUC	1370	
Corpus Christi, Tex.			
	KCTA	1030	M
	KCCT	1150	
	KEYS	1440	
	KRYS	1360	N
	KSIX	1280	A-M
	KUNO	1400	
Corry, Pa.	WOTR	1370	
Corsicana, Tex.	KAND	1340	
Cortez, Colo.	KVFC	740	
Cortland, N.Y.	WKRT	920	
Corvallis, Oreg.	KOAC	550	
	KFLY	1240	
	KLDD	1350	
Coshocton, Ohio	WTNS	1580	
Cottage Grove, Ore.	KNND	1400	
Cottonwood, Ariz.	KVRD	1240	
	KVID	1600	
Coudersport, Pa.	WFRM	600	
Council Bluffs, Iowa			
	KFNF	920	
	KSWI	1560	M-A
Courtenay, B.C.	CFCP	1440	
Covington, Ga.	WGFS	1430	
Covington, La.	WARB	750	
Covington, Tenn.	WKBL	1250	
Covington, Va.	WKEY	1340	A
Cowan, Tenn.	WZYX	1440	
Craig, Colo.	KRAI	550	
Crane, Tex.	KCRR	1380	
Crane, Texas	KBSN	1380	
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.	KRDX	1260	
Crossett, Ark.	KAGH	800	
Crossville, Tenn.	WAEW	1330	
	KSIG	1450	M
Crowley, La.	KCFH	1600	
Cuero, Tex.	WFMH	1460	
Cullman, Ala.	WKUL	1340	
Culpeper, Va.	WCVA	1490	M
Cumberland, Ky.	WCPM	1280	
Cumberland, Md.	WCUM	1230	C
	WTBO	1450	
Cummings, Ga.	WSNE	1410	
Cushing, Okla.	KUSH	1600	
Cuyahoga Falls, Ohio			
	WCVE	1150	
Cypress Gardens, Fla.	WGTD	540	
Cynthiana, Ky.	WCYN	1400	
Dade City, Fla.	WDCF	1350	
Dadeville, Ala.	WDVC	910	
Dalhart, Tex.	KXIT	1410	
Dallas, N.C.	WAAK	960	
Dallas, Oreg.	KRDW	1460	
Dallas, Tex.	KRLD	1080	C
	KIXL	1040	
	KSKY	660	
	KLIF	1190	
	WFAA	570	A
	WFAA	820	N
	KBOX	1480	
	WRR	1310	M
The Dalles, Oreg.	KACI	1300	
	KODL	1440	A
Dalton, Ga.	WBLJ	1230	M
	WRCD	1430	
Danbury, Conn.	WLAD	800	
Danville, Ill.	WDAN	1490	C
	WITY	980	
Danville, Ky.	WHIR	1250	M
Danville, Pa.	WBDS	1570	
Danville, Va.	WBTM	1390	A
	WYPR	970	
	WDVA	1250	M
	WILA	1580	
Darlington, S.C.	WDAR	1350	
Davenport, Iowa	WOC	1420	N
	KWNT	1560	
	KSTT	1170	M
Dawson, Ga.	WDWD	990	
Dayton, Ohio	WHIO	1290	C
	WING	1410	
	WDNE	980	
	WAVI	1210	
Dayton, Tenn.	WDNT	1280	
Daytona Beach, Fla.			
	WNDB	1150	M-A
	WMFJ	1450	
	WRDD	1340	
Deadwood, S.Dak.	KDSJ	980	
Dearborn, Mich	WKNR	1310	M
Decatur, Ala.	WHOS	800	
	WAJF	1490	
	WMSL	1400	M
Decatur, Ga.	WGUN	1010	A
	WLKB	1310	
Decatur, Ill.	WDZ	1050	
	WSDY	1340	C
Decorah, Iowa	KDEC	1240	
	KWLC	1240	
Deer Lodge, Mont.	KDRG	1400	
Deerfield, Va.	WABH	1150	
Defiance, Ohio	WDNW	1280	
De Funiak Springs, Fla.			
	WDSP	1280	
	WZEP	1460	
De Kalb, Ill.	WLBK	1360	
De Land, Fla.	WJBS	1490	
	WODD	1310	
Delano, Calif.	KCHJ	1010	
Delaware, Ohio	WDLE	1550	
Delray, Beh., Fla.	WDBF	1420	
Del Rio, Tex.	KDLK	1230	
Delta, Colo.	KDTA	1400	
Deming, N.Mex.	KDTS	1230	
Demopolis, Ala.	WXAL	1400	M
	WJWT	1350	
Denham Sprgs., La.	WLBI	1220	
Denison, Iowa	KDSN	1580	
Denison, Tex.	KDSX	950	
Denton, Tex.	KDNT	1440	
Denver, Colo.	KDEN	1340	
	KFML	1390	
	KHOW	630	A
	KIMN	950	A
	KLIR	990	
	KLZ	560	C
	KBTR	710	
	KOA	850	N
	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	A
	KIOA	940	M
	KRNT	1350	C
	KSO	1460	
	KWKY	1150	M
	WHO	1040	N
Detroit, Mich.	WCAR	1130	
	WJBK	1500	
	WJLB	1400	
	WJR	760	
	WWJ	950	N
	WXYZ	1270	A
Detroit Lakes, Minn.			
	KDLM	1340	
Devils Lake, N.Dak.			
	KDLR	1240	M
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	A
Dimmitt, Tex.	KDHN	1470	
Dinuba, Calif.	KRDU	1130	
Dixon, Ill.	WIXN	1460	
Dodge City, Kans.	KGNO	1370	M
	KEDD	1550	
Donaldsonville, Ga.	WSEM	1500	
Doniphan, Mo.	KDFN	1500	
Dothan, Ala.	WAGF	1320	
	WDIG	1450	M
	WDDF	560	
Douglas, Ariz.	KAWT	1450	M
	KAPR	930	
Douglas, Ga.	WDMG	860	
	WOKA	1310	
Douglas, Wyo.	KWIV	1050	
Dover, Del.	WDOV	1410	M
	WKEN	1600	A
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	C
Dubuque, Iowa	KOTH	1370	A
	WDBQ	1490	M
Duluth, Minn.	KDAL	610	C
	WEBC	560	
	KAOH	1390	
Dumas, Tex.	KODD	800	
Duncan, Okla.	KRHD	1350	M
Dundalk, Md.	WAYE	860	
	WEBB	1360	
Dundee, N.Y.	WFLR	1570	
Dunkirk, N.Y.	WDOE	1410	
Dunn, N.C.	WCKB	780	
Du Quoin, Ill.	WDQN	1580	
Durango, Colo.	KIUP	930	
	KDGD	1240	
Durant, Okla.	KSFD	750	
Durham, N.C.	WDNC	620	C
	WSRC	1410	
	WSSB	1490	
	WTIK	1310	A
Dyersburg, Tenn.	WDSG	1450	
	WTRD	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	
E. Liverpool, Ohio	WOHI	1490	A
East Longmeadow, Mass.			
	WTYM	1600	
	WPFE	1580	
Eastman, Ga.	WDLM	960	
E. Moline, Ill.	WTJH	1260	
E. Point, Ga.	WAMV	1490	A
E. St. Louis, Ill.	WEMD	1460	
Easton, Md.	WEEX	1230	
Easton, Pa.	WEST	1400	N
	WHTG	1410	
Eatontown, N.J.	WEAQ	790	N
Eau Claire, Wis.	WBIZ	1400	M
	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	A
El Campo, Tex.	KULP	1390	M
El Centro, Calif.	KXO	1230	M
	KAMP	1430	
El Dorado, Ark.	KDMS	1290	
	KELD	1400	A
Eldorado, Kans.	KBTD	1360	
Eldorado Springs, Mo.			
	KESM	1580	
Elgin, Ill.	WRMN	1410	
Elizabeth City, N. C.			
	WCNC	1240	
	WGAI	560	M
Elizabethton, Tenn.	WBEJ	1240	
Elizabethtown, Ky.	WIEL	1400	
Elizabethtown, N.C.			
	WBLA	1440	
Elizabethtown, Pa.	WEZN	1600	
Elk City, Okla.	KBEK	1240	A
Elkhart, Ind.	WTRC	1340	N
	WCMR	1270	
Elkin, N.C.	WIFM	1540	
Elkins, W.Va.	WDNE	1240	
Elko, Nev.	KELK	1240	M
Elkton, Md.	WSER	1550	
Ellensburg, Wash.	KXLE	1240	
Ellsworth, Me.	WDEA	1370	
Elmira, N.Y.	WELM	1410	A-C
	WENY	1250	N
Elmira Heights-Horseheads, N.Y.			
	WEHH	1590	M
El Paso, Tex.	KRDD	600	C
	KELP	920	
	KHEY	690	
	KINT	1590	
	KIZZ	1150	
	KSET	1340	M
	KTSM	1380	N
El Reno, Okla.	KELR	1460	
Ely, Minn.	WELY	1450	M
Ely, Nev.	KELY	1280	
Elyria, Ohio	WEDL	930	
Eminence, Ky.	WSTL	1600	
Emporia, Kans.	KVOE	1400	
Emporia, Va.	WEVA	860	
Emporium, Pa.	WLEM	1250	
Endicott, N.Y.	WENE	1430	A
Englewood, Colo.	KGMC	1150	
Englewood, Fla.	WENG	1530	
Enid, Okla.	KCRC	1390	A
	KGWA	960	M
Enterprise, Ala.	WIRB	600	
Enterprise, Oreg.	KWVR	1340	
Ephrata, Pa.	WGSA	1310	
Ephrata, Wash.	KULF	730	
Erie, Pa.	WWYN	1260	A
	WICU	1330	N
	WJET	1400	M
	WWGO	1450	
Erwin, Tenn.	WEMB	1420	
Escanaba, Mich.	WDBC	680	M
	WLST	600	A
Escondido, Calif.	KOWN	1450	
Espanola, N. M.	KDCE	970	
Estherville, Iowa	KLIL	1340	
Etowah, Tenn.	WCPH	1220	
Eufaula, Ala.	WULA	1240	M
Eugene, Oreg.	KORE	1450	M
	KPIR	1500	
	KASH	1600	A
	KATR	1320	
	KERG	1280	C
	KUGN	590	N
	KWFS	1540	
	KEUN	1490	M
Eunice, La.	KINS	980	C
Eureka, Calif.	KDAN	790	
	KRED	1480	M
	WLCD	1240	
Eustis, Fla.	WEAW	1330	
Evanston, Ill.	WNMP	1590	
	KEVA	1240	
Evanston, Wyo.	WROZ	1400	C
Evansville, Ind.	WGBF	1280	N
	WIKY	820	
	WJPS	1330	A
	WEVE	1340	M
Eveleth, Minn.	WWDS	1050	
Everett, Pa.	KRKO	1380	
Everett, Wash.	KWYZ	1230	
	WBLD	1470	
Evergreen, Ala.	KFAR	610	A-M-N
Fairbanks, Alaska	KFRB	900	C-A
Fairbury, Nebr.	KGMT	1310	
Fairfax, Va.	WEEL	1310	
Fairfield, Ill.	WFIW	1390	
Fairfield, Iowa	KMCD	1570	
Fairhope, Ala.	WABF	1220	
Fairmont, Minn.	KSUM	1370	M
Fairmont, N.C.	WFMO	880	
Fairmont, W.Va.	WMMN	920	C
	WTCS	1490	A
	WMDD	1480	
Fajardo, P.R.	KPSO	1260	
Falfurrias, Tex.	WALE	1400	M
Fall River, Mass.	WSAR	1480	A
Falls Church, Va.	WFAX	1220	
Falls City, Nebr.	KTNC	1230	
Fargo, N.Dak.	WDAY	970	N
	KFNW	900	
	KUTT	1550	
	KXGO	790	A
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.	KZDL	1570	
Fayette, Ala.	WWWF	990	
Fayetteville, Ark.	KHDG	1440	
	KFAY	1250	M
Fayetteville, N.C.	WFAI	1230	C
	WFNC	940	M
	WFLB	1490	A
	WIDU	1600	
Fayetteville, Tenn.	WEKR	1240	M
Fergus Falls, Minn.	KDTE	1250	M
Fernandina Beach, Fla.	WPAP	1570	
	KFNV	1600	
Ferriday, La.	KJCF	1400	
Festus, Mo.	KXEN	1010	
	WFIN	1330	
Findlay, Ohio	WELD	690	A
Fisher, W.Va.	WEIM	1280	M
Fitchburg, Mass.	WFGM	960	
	WBHB	1240	M
Fitzgerald, Ga.	KCLS	600	N
Flagstaff, Ariz.	KAFF	1000	
	KJKJ	1400	
	KVNA	690	A
	KEDS	1290	
Flat River, Mo.	KFMO	1240	M
Flint, Mich.	WFDF	910	N
	WTRX	1330	A
	WAMM	1420	
	WMRP	1570	
	WKMF	1470	M
	WTAC	600	A
Flomaton, Ala.	WTCB	990	
Florence, Ala.	WJDI	1340	M
	WOWL	1240	A
Florence, S.C.	WJMX	970	A
	WDLS	1230	
	WYNN	540	
Floydada, Tex.	KFLD	900	
Foley, Ala.	WHEP	1310	
Fond du Lac, Wis.	KFIZ	1450	N
Fordyce, Ark.	KBJT	1570	

WHITE'S RADIO LOG

Location	C.L.	Kc.	N.A.
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. Collins, Colo.	KCOL	1410	A
	KZIX	600	
Ft. Dodge, Iowa	KVFD	1400	M
	KWMT	540	A
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	C
	WMYR	1410	
	WXYC	1350	
Ft. Payne, Ala.	WFPA	1400	
	WZOB	1250	
Ft. Pierce, Fla.	WARN	1330	
	WIRA	1400	
Ft. Scott, Kans.	KMOO	1600	
Ft. Smith, Ark.	KFPW	1230	C
	KFSA	950	A
	KTCS	1410	M
	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	A
	WOWO	1190	
	WANE	1450	C
	WKJG	1380	N
Ft. Worth, Tex.	KJIM	870	
	KCUL	1540	
	KFJZ	1270	
	KNOK	970	
	WBAP	570	A
	WBAP	820	N
	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	M
Franklin, Ky.	WFKN	1220	
Franklin, La.	KFRA	1390	
Franklin, N.C.	WFSC	1050	
Franklin, Pa.	WFRA	1430	
Franklin, Tenn.	WAGG	950	
Franklin, Va.	WYSR	1250	
Frederick, Md.	WFMD	930	C
Frederick, Okla.	KTAT	1570	
Fredericksburg, Tex.	KNAF	910	M
Fredericksburg, Va.	WFVA	1230	A
	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	A
	KBIF	900	
	KIRV	1510	
	KEAP	980	
	KXEX	1550	
	KFRE	940	C
	KGST	1600	
	KMAK	1340	
	KMJ	580	N
	KYNO	1300	
Front Royal, Va.	WFTR	1450	M
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	A
	WETO	930	M
	WAAX	570	
	WEAC	1500	
Gaffney, S.C.	WFGN	1570	
Gainesville, Fla.	WDVH	980	
	WGGG	1230	M
	WRUF	850	N
Gainesville, Ga.	WGGA	550	C
	WDUN	1240	A
	WLBA	1580	
Gainesville, Tex.	KGAF	1580	
Gaithersburg, Md.	WHMC	1150	
Galax, Va.	WBOB	1360	M
Galesburg, Ill.	WGIL	1400	
	WAIK	1590	A
Gallatin, Tenn.	WHIN	1010	
Gallipolis, Ohio	WJEH	990	
Gallup, N. Mex.	KGAK	1330	A
	KYVA	1230	
Galveston, Tex.	KILE	1400	
	KGBC	1540	
Gander, Nfld.	CBG	1450	
Garden City, Kans.	KNCO	1050	
	KIUL	1240	M
Garden City, Mich.	WERB	1090	
Gardner, Mass.	WGAW	1340	
Gary, Ind.	WWCA	1270	
	WGRY	1370	
	WGNC	1450	A
Gastonia, N.C.	WLTC	1370	
Gate City, Va.	WGAT	1050	
Gaylord, Mich.	WATC	900	
Geneva, Ala.	WGEA	1150	
Geneva, Ill.	WGSB	1480	
Geneva, N.Y.	WGVA	1240	A
Georgetown, Del.	WJWL	900	
Georgetown, Ky.	WAXU	1580	
Georgetown, S.C.	WGTN	1400	M
	WGOO	1470	
Georgetown, Tex.	KGTN	1530	
Gettysburg, Pa.	WGET	1320	M
Gillette, Wyo.	KIML	1490	
Gilroy, Calif.	KPER	1290	
Gladewater, Tex.	KEES	1430	
Glasgow, Ky.	WKAY	1490	
	WCDS	1440	D
Glasgow, Mont.	KLTZ	1240	
Glen Burnie, Md.	WISZ	1590	
Glendale, Ariz.	KRUX	1360	
Glendale, Calif.	KIEV	870	
Glendive, Mont.	KXGN	1400	
	KGLE	590	
Glens Falls, N.Y.	WSET	1410	
	WWSC	1450	A
Glenville, Ga.	WKIG	1580	
Glenwood Sprgs., Colo.	KGLN	980	M
Globe, Ariz.	KZOW	1240	A
Gloucester, Va.	WDOY	1420	
Gloversville-Johnston, N.Y.	WENT	1340	C
Gold Beach, Oreg.	KBLY	1220	
Golden, Colo.	KICM	1250	
Golden Meadow, La.	KLEB	1000-d	
Golden Valley, Minn.	KEVE	1440	M
	KUXL	1570	
Goldsboro, N.C.	WFMC	730	
	WGBR	1150	A
	WGOL	1300	
Gonzales, Tex.	KCTI	1450	
Goodland, Kans.	KLOE	730	M
Goshen, Ind.	WKAM	1460	
Grafton, N.D.	KGPC	1340	
Grafton, W.Va.	WVVW	1260	
Graham, Tex.	KSWA	1330	
Grand Coulee, Wash.	KFOR	1360	
Grand Forks, N.D.	KFJM	1370	
	KILO	1440	C
	KNOX	1310	M
Grand Haven, Mich.	WGHN	1370	
Grand Island, Nebr.	KMMJ	750	A
	KRGI	1430	
Grand Junction, Colo.	KREX	920	C
	KEXO	1230	A
	KSTR	620	
	KWSL	1340	
Grand Prairie, Tex.	KPCW	730	
Grand Rapids, Mich.	WJEF	1230	C
	WFUR	1570	
	WGRD	1410	
	WLAV	1340	A
	WMAX	1480	M
	WOOD	1300	N
Grand Rapids, Minn.	KOZY	1490	M
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	M
	KAJO	1270	
Grayson, Ky.	WGOH	1370	
Gt. Barrington, Mass.	WSBS	860	
Gt. Bend, Kans.	KVGB	1590	N
Gt. Falls, Mont.	KFBB	1310	C
	KUOI	1450	
	KMON	560	M
	KARR	1400	N
Greeley, Colo.	KFKA	1310	
	KYOU	1450	
Green Bay, Wis.	WBAY	1360	C
	WJPG	1440	M
	WDUZ	1400	A
Greeneville, Tenn.	WGRV	1340	
	WSMG	1450	
Greenfield, Mass.	WHAI	1240	M
Greensboro, N.C.	WBIG	1470	C
	WCOG	1320	
	WEAL	1510	
	WKTB	1550	
	WGBG	1400	A
	WPET	950	
Greensburg, Ind.	WGRB	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.	WGTC	1590	M
	WOOW	1340	
	WPXY	1550	
Greenville, S.C.	WESC	680	
	WFBC	1330	N
	WMRB	1490	C-M
	WMUU	1260	
	WQOK	1440	C
Greenville, Tex.	KGVL	1400	
Greenwood, Miss.	WABG	960	A
	WGRM	1240	N
Greenwood, S.C.	WCRS	1450	N
	WGSW	1350	
Greer, S.C.	WEAB	800	
	WCKI	1300	A
Grenada, Miss.	WNAG	1400	M
Gresham, Oreg.	KRDR	1230	
Gretna, Va.	WMNA	730	
Griffin, Ga.	WKEU	1450	M
	WHIE	1320	
	WRIX	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.	WRDA	1390	
	WGCM	1240	A
Gunnison, Colo.	KGUC	1490	
Guntersville, Ala.	WGSV	1270	
Guthrie, Okla.	KWRW	1490	
Guymon, Okla.	KGYN	1220	
Hagerstown, Md.	WARK	1490	C
	WJEJ	1240	A-M
Haines City, Fla.	WHAN	930	
Haleyville, Ala.	WJBB	1230	M
Halfway, Md.	WHAG	1410	
Hamden, Conn.	WOEE	1220	
Hamilton, Ala.	WERH	970	
Hamilton, Mont.	KYLQ	980	
Hamilton, Ohio	WMOH	1450	
Hamilton, Tex.	KCLW	900	
Hamlet, N. C.	WKOX	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.	WSSL	1400	
	WDCR	1340	
Hanover, Pa.	WHVR	1280	
Hardin, Mont.	KHON	1230	
Harlan, Ky.	WHLN	1410	
Harlingen, Tex.	KGBT	1530	
Harriman, Tenn.	WHBT	1600	
Harrisburg, Ill.	WEBQ	1240	
Harrisburg, Pa.	WFEC	1400	A
	WCMB	1460	M
	WHP	580	C
	WKBO	1230	N
Harrison, Ark.	KHOZ	900	
Harrisonburg, Va.	WHBG	1360	
	WSVA	550	N
Harrodsburg, Ky.	WHBN	1420	
Hartford, Conn.	WDRC	1360	C
	WCCC	1290	M
	WPOP	1410	M-A
	WTIC	1080	N
Hartford, Wis.	WTKM	1540	
Hartselle, Ala.	WHRT	860	
Hartsville, S.C.	WHSC	1450	M
Hartwell, Ga.	WKLY	980	
Harvard, Ill.	WMCW	1600	
Harvey, Ill.	WBEE	1570	
Hastings, Mich.	WBCH	1220	
Hastings, Minn.	KOWA	1460	
Hastings, Nebr.	KHAS	1230	
Hattiesburg, Miss.	WBKH	950	
	WFOR	1400	N
	WHSY	1230	A
	WXXX	1310	
Havelock, N.C.	WUSM	1330	
Haverhill, Mass.	WHAV	1490	
Havre, Mont.	KOJM	610	M
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	M
Hazelhurst, Ga.	WVOH	920	D
Hazlehurst, Miss.	WMOC	1220	
Hazleton, Pa.	WAZL	1490	N-M
	WTHT	1300	
Helena, Ark.	KFFA	1360	M
Helena, Mont.	KCAP	1340	M
	KBLL	1240	N
Hemet, Calif.	KHSJ	1320	
Hempstead, N.Y.	WHLI	1100	
Henderson, Ky.	WSON	880	
Henderson, Nev.	KBMI	1400	
	KTOO	1280	
Henderson, N.C.	WHNC	890	M
	WIZS	1450	
Henderson, Tex.	KGRI	1000	
	KWRO	1470	
Hendersonville, N.C.	WHKP	1450	A
Henryetta, Okla.	KHEN	1590	
Hereford, Tex.	KPAN	860	
Herkimer, N.Y.	WALY	1420	
Hermiston, Oreg.	KOHU	1570	
Herrin, Ill.	WJPF	1340	M
Hettinger, N.Dak.	KNDC	1490	
Hibbing, Minn.	WMFG	1240	N
Hickory, N.C.	WHKY	1290	A
	WIRC	680	
Highland, Ill.	WIWU	1510	
Highland Park, Ill.	WEEF	1430	
Highland Park, Tex.	KVIL	1150	
Highland Springs, Va.	WENZ	1450	
High Point, N.C.	WMFR	1230	A
	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	KHBC	970	C
	KIPA	1110	
	KIMO	850	M
Hinesville, Ga.	KGML	990	
Hinton, W. Va.	WMTD	1380	
Hobart, Okla.	KTJS	1420	
Hobbs, N.Mex.	KWEW	1480	M
	KHOB	1390	
Holbrook, Ariz.	KDJI	1270	
Holdredge, Nebr.	KUVR	1380	
Holland, Mich.	WHTC	1450	
	WJBL	1260	
Hollister, Calif.	KGHT	1520	
Hollywood, Fla.	WGMA	1320	
Holly Hill, S.C.	WHHL	1440	D
Holyoke, Mass.	WREB	930	
Homer, La.	KHAL	1320	
Homestead, Fla.	WIII	1430	
Homewood, Ala.	WJLO	1400	
	KAIM	870	
Honolulu, Hawaii	KGMB	590	C
	KZOO	1210	
	KHAI	1090	
	KPOI	1380	
	KIKI	830	
	KGU	760	N
	KHVH	1040	
	KORL	650	M
	KNDI	1270	
	KOHO	1170	
	KTRG	990	
	KULA	690	A
	KUMU	1500	
	KOLL	1420	
Hood River, Oreg.	KIHR	1340	
Hope, Ark.	KXAR	1490	
Hopewell, Va.	WHAP	1340	
Hopkinsville, Ky.	WHOP	1230	C
	WKOA	1480	
Hoquiam, Wash.	KHOK	1560	
Hornell, N.Y.	WWHG	1320	
	WLEA	1480	M
Hot Springs, Ark.	KAAB	1340	A
	KBHS	590	
	KZNG	1470	M
Hot Springs, S. Dak.	KOBH	580	
Houghton, Mich.	WHDF	1400	
Houghton Lake, Mich.	WHGR	1290	
Houlton, Maine	WHOU	1340	
Houma, La.	KCIL	1490	N
Houston, Miss.	WCPC	940	
Houston, Mo.	KTBC	1250	
Houston, Tex.	KCOH	1430	
	KILT	610	
	KNUZ	1230	
	KODA	1010	
	KPRC	950	N
	KTHT	790	
	KTRH	740	C
	KXYZ	1320	A
	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	

Location	C.L.	Kc.	N.A.
Huntington, W.Va.	WKEE	800	M-A
	WSAZ	930	N
	WWHY	1470	M
Huntsville, Ala.	WBHP	1280	M
	WEUP	1600	
	WFIX	1450	
	WAAY	1550	A
Huntsville, Tex.	KSAM	1490	
Huron, S.Dak.	KIJV	1340	
Hutchinson, Kans.	KWBW	1450	N
	KWHK	1260	
Hutchinson, Minn.	KDUZ	1260	
Hyde Park, N. Y.	WHVW	950-500	D
Idabel, Okla.	KBEL	1240	
Idaho Falls, Idaho	KID	590	C
	KIFI	1260	A-M
	KTEE	900	
Independence, Ia.	KUPI	980	
	KOUR	1220	
Independence, Kans.	KIND	1010	M
Independence, Mo.	KCCX	1510	
Indiana, Pa.	WDAD	1450	C
Indianapolis, Ind.	WFBM	1260	A
	WGEE	1590	
	WIBC	1070	
	WIGO	810	
	WIRE	1430	N
	WISH	1310	C
	WXLW	950	M
Indianola, Iowa	KBAB	1490	
Indianola, La.	KBAB	1490	
Indianola, Miss.	WNLA	1380	
Indian Rocks Beach, Fla.	WGNP	1520	
Indio, Calif.	KREO	1400	A
Inglewood, Calif.	KTYM	1460	
Inkster, Mich.	WCHB	1440	
International Falls, Minn.	KGHS	1230	
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	A
Iron River, Mich.	WIKB	1230	M
Irondale, Ala.	WIXI	1480	
Ironton, Ohio	WIRO	1230	M
Ironwood, Mich.	WJMS	630	M
Irvine, Ky.	WIRV	1550	
Isabella, P.R.	WISA	1390	
Ishpeming, Mich.	WJPD	1240	
	WJAN	970	
Islip, N.Y.	WBIC	540	
Ithaca, N.Y.	WHCU	870	C
	WTKO	1470	A
Iuka, Miss.	WVOM	1270	
Jackson, Ala.	WTHG	1290	M
Jackson, Mich.	WIBM	1450	A
	WKHM	970	M
	WJCO	1510	
Jackson, Miss.	WJDX	620	N
	WJQS	1400	M
	WJXN	1450	
	WJAQ	1550	
	WOKJ	1590	
	WRBC	1300	M
	WSLI	980	
Jackson, Ohio	WLMJ	1280	
Jackson, Tenn.	WDXI	1310	
	WJAK	1460	
	WTJS	1390	A
Jackson, Wis.	WYLO	540	
Jackson, Wyo.	KSGT	1340	
Jacksonville, Ark.	KGMR	1500	
Jacksonville, Fla.	WJAX	930	N
	WAPE	690	
	WZOK	1320	A-M
	WIVY	1050	
	WMBR	1480	C
	WOBS	1380	
	WPDQ	600	
	WQIK	1280	
	WRHC	1400	
Jacksonville, Ill.	WJIL	1550	
	WLOS	1180	
Jacksonville, N.C.	WJNC	1240	M
	WLAS	910	
Jacksonville, Tex.	KEBE	1400	
Jacksonville Beh., Fla.	WZRO	1010	
Jamestown, N.Dak.	KEYJ	1400	M
	KSJB	600	C
Jamestown, N.Y.	WJTN	1240	A
	WXYJ	1340	M
Jamestown, Tenn.	WCLC	1260	
Janesville, Wis.	WCLO	1230	M
Jasper, Ala.	WWWB	1360	
	WARF	1240	
Jasper, Ind.	WITZ	990	
Jasper, Tex.	KTXJ	1350	
Jefferson City, Mo.	KLIK	950	
	KWOS	1240	M
Jefferson City, Tenn.	WJFC	1480	
Jeffersonville, Ind.	WXVW	250	
Jena, La.	KCKW	1480	
Jennings, La.	KJEF	1290	
Jerome, Idaho	KART	1400	
Jerseyville, Ill.	WJBM	1480	
Jesup, Ga.	WBGR	1370	
Johnson City, Tenn.	WJCW	910	C
	WETB	790	M
Johnston, S.C.	WJES	250	
Johnstown, N.Y.	WIZR	930	
Johnstown, Pa.	WJAC	850	
	WARD	1490	C
	WCRO	1230	M
	WJOL	1340	
Joliet, Ill.	WJRC	1510	
	CJLM	1350	
Joliette, Que.	KBTM	1230	M
Jonesboro, Ark.	KNEA	970	
Jonesboro, La.	KTOC	920	
Jonesboro, Tenn.	WJSO	1590	
Jonesville, La.	KANV	1490	
Joplin, Mo.	WMBH	1450	M
	KQYX	1560	
	KFSB	1310	
	KODE	1230	C
Junction, Tex.	KMBL	1450	
Junc. City, Kans.	KJCK	1420	
Juneau, Alaska	KINY	800	C-A
	KJNO	630	A-M-N
Kailua, Hawaii	KLEI	1130	
Kaimuki, Hawaii	KAIM	870	
Kalamazoo, Mich.	WKPR	1420	
	WKZO	590	C
	WKLZ	1470	M
	WKMI	1360	
Kalispell, Mont.	KGEZ	600	M
	KOFI	930	
Kane, Pa.	WADP	960	
Kankakee, Ill.	WKAN	1320	
Kannapolis, N.C.	WGTL	870	
	WRKB	1460	
Kans. City, Kans.	KCKN	1340	
Kansas City, Mo.	KCMO	810	C
	KMBC	980	A
	KPRS	1590	
	KUDL	1380	
	WDAF	610	N
	WHB	710	
Kealakekua, Hawaii	KEKO	790	
Kearney, Nebr.	KGFW	1340	M
	KRNY	1460	
Keene, N.H.	WKNE	1290	N
	WKBK	1220	
Kelso, Wash.	KLOG	1490	
Kemmerer, Wyo.	KMER	950	
Kendallville, Ind.	WAWK	1570	
Kenedy, Tex.	KAML	990	
Kennett, Mo.	KBOA	830	
Kennewick-Pasco-Richland, Wash.	KEPR	610	C
Kenosha, Wis.	WLIP	1050	
Keokuk, Iowa	KOKX	1310	
Kermit, Tex.	KERB	600	
Kerrville, Tex.	KERV	1230	
Kershaw, S.C.	WKSC	1300	
Ketchikan, Alaska	KTKN	930	C-A
	KABI	580	
Kewanee, Ill.	WKEI	1450	
Keyser, W.Va.	WKYR	1270	M
	WKLP	1390	
Key West, Fla.	WKWF	1600	A-M
	WKIZ	1500	
Kilgore, Tex.	KOCA	1240	
Killeen, Tex.	KLEN	1050	M
Kimball, Nebr.	KIMB	1260	
King, N. C.	WKTE	1090	
King City, Calif.	KRKC	1490	
Kingman, Ariz.	KAAA	1230	A
Kings Mountain, N.C.	WKMT	1220	
Kingsport, Tenn.	WKIN	1320	
	WKPT	1550	N
Kingston, N.Y.	WBAZ	1550	M
	WGHQ	920	
	WKNY	1490	C
Kingstree, S.C.	WDKD	1310	
Kingsville, Tex.	KINE	1380	
Kinston, N.C.	WELS	1010	
	WFTC	960	A
	WISP	1230	M
Kirkland, Wash.	KCDI	1460	
	KNBX	1050	
Kirksville, Mo.	KIRX	1450	A
Kissimmee, Fla.	WOSL	1220	
Kittanning, Pa.	WACB	1360	
Klamath Falls, Oreg.	KAGO	1150	M
	KFLW	1450	A-C
	KLAD	960	
Knoxville, Iowa	KNIA	1320	
Knoxville, Tenn.	WBIR	1240	A
	WIVK	980	
	WATE	820	N
	WKGN	1340	M
	WKXV	900	M
	WNOX	990	C
Kodiak, Alaska	WCVQ	960	
Kokomo, Ind.	WIOU	1350	C
Kosciusko, Miss.	WKOZ	1350	A
Laconia, N.H.	WLNH	1350	
	WEMJ	1490	
LaCrosse, Wis.	WKBH	1410	N
	WLCX	1490	
	WKTY	580	A
Ladysmith, Wis.	WLOY	1340	
Lafayette, Ga.	WLFA	1590	
Lafayette, Ind.	WASK	1450	M
	WAZY	1410	
	WBAA	920	
Lafayette, La.	KPEL	1420	A
	KVOL	1330	N
	KXKW	1520	
Lafayette, Tenn.	WEEN	1460	
LaFollette, Tenn.	WLAF	1450	
LaGrande, Oreg.	KLBM	1450	
LaGrange, Ga.	WLAG	1240	M
	WTRP	620	
LaGrange, Ill.	WTAQ	1300	
LaGrange, Tex.	KVLG	1570	
LaJunta, Colo.	KBZZ	1400	M
Lake Charles, La.	KLOU	1580	
	KPLC	1470	N
	KAOK	1400	M
Lake City, Fla.	WDSR	1340	
	WGRO	960	
Lake City, S.C.	WJOT	1260	
Lakeland, Fla.	WLAK	1430	N
	WONN	1230	M
	WWAB	1330	
Lake Placid, N.Y.	WIRD	920	
Lake Providence, La.	KLPL	1050	
Lake Tahoe, Calif.	KOWL	1490	
Lakeview, Oreg.	KQIK	1230	
Lake Wales, Fla.	WIPC	1280	
Lakewood, Colo.	KLAK	1600	
Lakewood, Wash.	KFHA	1480	
Lake Worth, Fla.	WLIZ	1380	
Lamar, Colo.	KLMR	920	M
Lamesa, Tex.	KPET	690	
Lampasas, Tex.	KCYL	1450	
Lancaster, Calif.	KAVL	610	
	KBVM	1580	
Lancaster, Ohio	WHOK	1320	
Lancaster, Pa.	WGAL	1490	N
	WLAN	1390	A-M
Lancaster, S.C.	WLCM	1360	
	WAGL	1580	
Lander, Wyo.	KOVE	1330	M
Lanett, Ala.	WRLD	1490	A
Lansdale, Pa.	WNPV	1440	
Lansford, Pa.	WLSH	1410	
Lansing, Mich.	WILS	1320	
	WJIM	1240	A-N
	WMRT	1010	
Lapeer, Mich.	WMPC	1280	
	WTHM	1530	
LaPorte, Ind.	WLOI	1540	
Laramie, Wyo.	KLME	1490	
	KOWB	1290	M
Laredo, Tex.	KGNS	1300	
	KVOZ	1490	M
LaSalle, Ill.	WLPO	1220	
LasCruces, N.Mex.	KOBE	1450	
	KGRT	570	
Las Vegas, Nev.	KENO	1460	A
	KLAS	1230	C
	KORK	1340	M
	KRAM	920	
	KLUC	1050	
	KVEG	970	
Las Vegas, N.Mex.	KFUN	1230	A
Latrobe, Pa.	WPKV	1570	M
	WQTW	1570	
	WTRA	1480	
Laurel, Miss.	WAML	1340	N
	WLAU	1600	A
	WNSL	1260	
Laurens, S.C.	WLBG	860	
Laurinburg, N.C.	WEWO	1080	
	WLCW	1300	
Lawrence, Kans.	KFKU	1250	
	KLWN	1320	
Lawrence, Mass.	WCCM	800	M
Lawrenceburg, Tenn.	WDXE	1370	
Lawrenceville, Ga.	WLAW	1360	
Lawrenceville, Ill.	WAKO	910	
Lawrenceville, Va.	WLES	580	
Lawton, Okla.	KSWO	1380	A
	KCCO	1050	
Leadville, Colo.	KBRR	1230	
Leaksville, N.C.	WLOE	1490	M
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	M
	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	
Lemoore, Calif.	KLAN	1320	
Lenoir, N.C.	WJRI	1340	M
Lenoir, Tenn.	WLIL	730	
Leonardtown, Md.	WKIK	1370	
Levelland, Tex.	KLVT	1230	
Levittown, Pa.	WBCB	1490	
Lewisburg, Pa.	WUNS	1010	
Lewisburg, Tenn.	WJJM	1490	M
Lewiston, Idaho	KRLC	1350	M
	KOZE	1300	
Lewiston, Maine	WCOU	1240	M
	WLAM	1470	A
Lewistown, Mont.	KXLO	1230	M
Lewistown, Pa.	WKVA	920	A
	WMRF	1490	N
Lexington, Ky.	WLAP	630	M
	WBLG	1300	A
	WVLK	590	C
Lexington, Miss.	WXTN	1150	
Lexington, Mo.	KLEX	1570	
Lexington, Nebr.	KRVN	1010	
Lexington, N.C.	WBUY	1440	
Lexington, Tenn.	WDXL	1490	
Lexington, Va.	WREL	1450	N
Lexington Pk., Md.	WPTX	920	
Libby, Mont.	KLCB	1230	M
	KLIB	1470	
Liberal, Kans.	KSCB	1270	
Liberty, Ky.	WPNN	1560	
Liberty, N.Y.	WVOS	1240	
Liberty, Tex.	KWLD	1050	
Lihue, Hawaii	KTOH	1490	
Lima, Ohio	WIMA	1150	A
Lincoln, Ill.	WPRC	1370	
Lincoln, Nebr.	KFOR	1240	A
	KLIN	1400	
	KLMS	1480	
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	N
	KALO	1250	M
	KLRA	1010	A
	KOKY	1440	
	KAAY	1090	C-M
	KVLC	1050	
Littleton, Colo.	KMOR	1510	
Littleton, N. H.	WLTN	1400	
Live Oak, Fla.	WNER	1250	
Livingston, Mont.	KPRK	1340	M
Livingston, Tenn.	WLIV	920	
Livingston, Tex.	KETX	1440	
	KVLL	1220	
Lock Haven, Pa.	WBPZ	1280	M
Lockport, N.Y.	WUSJ	1340	
Lodi, Calif.	KCVR	1570	
Logan, Utah	KVNU	610	M
	KSTU	1300	
	KLGN	1390	
Logan, W.Va.	WLOG	1230	M
	WVOW	1290	
Logansport, Ind.	WSAL	1250	M
Lompoc, Calif.	KKOK	1410	
	KLOM	1330	D
	KNEZ	960	
London, Ky.	WFTG	1400	
Long Beach, Calif.	KFOX	1280	
	KGER	1390	
Longmont, Colo.	KLMO	1050	
Long Prairie, Minn.	KEYL	1400	
Longview, Tex.	KFRO	1370	A
	KLUE	1280	
Longview, Wash.	KEDO	1400	A
	KBAM	1270	
Lookout Mtn., Tenn.	WFLI	1070	
Lorain, Ohio	WWIZ	1380	A
Lordsburg, N.Mex.	KLHS	950	-
Loris, S.C.	WLSC	1570	
Los Alamos, N.Mex.	KRSN	1490	A
Los Angeles, Calif.	KABC	790	A
	KFI	640	N
	KHJ	930	M
	KFSG	1150	
	KFWB	980	
	KGFJ	1230	
	KFAC	1330	
	KLAC	570	
	KMPC	710	
	KNX	1070	C
	KPOL	1540	
	KGBS	1020	
	KRKD	1150	
Los Banos, Calif.	KLBS	1330	
Louisburg, N.C.	WYRN	1490	
Louisville, Ga.	WPEH	1420	
Louisville, Ky.	WAVE	970	N
	WAKY	790	M
	WHAS	840	C
	WKLO	1080	A
	WINN	1240	
	WKYW	900	C
	WLOU	1350	
	WTMT	620	A-M
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	M-N
	KDAV	580	
	KLBK	1340	
	KFYO	790	C
	KLLL	1460	M
	KSEL	950	A
Lucedale, Miss.	WHHT	1440	
Ludington, Mich.	WKLA	1450	A
Lufkin, Tex.	KRBA	1340	A
	KTRE	1420	M
Lumberton, N.C.	WAGR	580	
	WTSB	1340	M

WHITE'S

RADIO LOG

Location	C.L.	Kc.	N.A.
Luray, Va.	WRAA	1330	
Lynchburg, Va.	WLVA	590	A
	WDMS	1320	
	WWOD	1390	M
	WBRG	1050	
Lynn, Mass.	WLYN	1360	
Lyons, Ga.	WBBT	1340	
Macomb, Ill.	WKAI	1510	
Macon, Ga.	WBML	1240	
	WCRY	900	
	WIBB	1280	
	WMAZ	940	C
	WNEX	1400	A-M
Macon, Miss.	WMBC	1400	
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	970	
	WIBA	1310	N
	WISM	1480	A-M
	WKOW	1070	C
Madisonville, Ky.	WFMW	730	
	WTTL	1310	
Magee, Miss.	WSJC	790	
Magnolia, Ark.	KVMA	630	M
Makawao, Hawaii	KNUI	1310	
Malden, Mo.	KTCB	1470	
Malone, N.Y.	WICY	1490	M
Malvern, Ark.	KBOK	1310	
Manassas, Va.	WPRW	1460	
Manati, P.R.	WMNT	1500	
Manchester, Conn.	WINF	1230	C
Manchester, Ga.	WFDR	1370	
Manchester, Ky.	WWXL	1450	
Manchester, N.H.	WFEA	1370	M
	WGIR	610	C
	WKBR	1250	
Manchester, Tenn.	WMSR	1320	
Manhattan, Kans.	KSAC	580	
	KMAN	1350	
Manistee, Mich.	WMTE	1340	
Manitou Springs, Colo.	KCMS	1490	
Manitowoc, Wis.	WCUB	980	
	WOMT	1240	M
Mankato, Minn.	KYSM	1230	N
	KTOE	1420	A
Manning, S.C.	WYMB	1410	
Mansfield, La.	KDBC	1360	
Mansfield, Ohio	WMAN	1400	A
	WCLW	1370	
Maplewood, Minn.	WGHB	1010	
Maquoketa, Iowa	KMAQ	1320	
Marathon, Fla.	WEFG	1300	
Marianna, Ark.	KZOT	1460	
Marianna, Fla.	WTYS	1340	M
	WTOT	980	
Marietta, Ga.	WFOM	1230	
	WBIE	1050	
Marietta, Ohio	WMOA	1490	A
Marine City Mich.	WDOG	1590	
Marinette, Wis.	WMAN	570	N
Marion, Ala.	WJAM	1310	
Marion, Ill.	WGGH	1150	
Marion, Ind.	WBAT	1400	A
	WMRI	860	
Marion, N.C.	WBRM	1250	
Marion, Ohio	WMRN	1490	A
Marion, S.C.	WATP	1430	
Marion, Va.	WMEV	1010	A
	WOLO	133	
Marked Tree, Ark.	KPCA	1580	
Marksville, La.	KAPB	1370	
Marlborough, Mass.	WSRO	1470	
Marquette, Mich.	WDMJ	1320	M
Marshall, Minn.	KMHL	1400	A
Marshall, Mo.	KMMO	1300	
Marshall, N.C.	WMMH	1460	
Marshall, Tex.	KMHT	1450	
	KADO	1410	
Marshalltown, Iowa	KFJB	1230	
Marshfield, Wis.	WDLB	1450	
Martin, Tenn.	WCMT	1410	
Martinsburg, W.Va.	WEPM	1340	
Martinsville, Va	WHEE	1370	
	WMVA	1450	N
Marystown, Nfld. Can.	CHCM	560	
Marysville, Calif.	KMYC	1410	M
Marysville, Kans	KNDY	1570	
Maryville, Mo.	KNIM	1580	
Maryville, Tenn.	WGAP	1400	
Mason City, Iowa	KGLO	1300	C
	KRIB	1490	
Massena, N.Y.	KSMN	1010	
	WMSA	1340	A
	WSTS	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	
Maysville, Ky.	WFTM	1240	M
McAlester, Okla.	KTMC	1400	
	KNED	1150	
McAllen, Tex.	KRIO	910	M
McCamey, Tex.	KAMY	1450	
McComb, Miss.	WHNY	1250	A
	WAPF	980	
McCook, Nebr.	KBRL	1300	M
	KWRV	1360	
McGehee, Ark.	KVSA	1220	
McKeesport, Pa.	WEDO	810	C
	WPQR	1360	M
McKenzie, Tenn.	WHDM	1440	
McKinney, Tex.	KMAE	1600	
McMinnville, Oreg.	KMCM	1260	
McMinnville, Tenn.	WBMC	960	
	WAKI	1230	M
McPherson, Kans.	KNEX	1540	
McRae, Ga.	WDAX	1410	
Mead, Wash.	KLFF	1590	
Meadville, Pa.	WMGW	1490	
Medford, Mass.	WHIL	1430	
Medford, Oreg.	KMED	1440	A
	KSHA	860	
	KDOV	1300	
	KBOY	730	
	KYJC	1230	A-C
Medford, Wis.	WIGM	1490	M
Media, Pa.	WXUR	690	
Melbourne, Fla.	WMMB	1240	M
Memphis, Tenn.	WHBQ	560	M
	WHER	1430	
	WMC	790	N
	WDIA	1070	
	WMPS	680	
	WHHM	1340	A
	WLOK	1480	
	WREC	600	C
	KWAM	990	
Mena, Ark.	KENA	1450	
Menominee, Mich.	WAGN	1340	A
Menomonie, Wis.	WMNE	1360	
Merced, Calif.	KYOS	1480	M
	KWIP	1580	
Meriden, Conn.	WMMW	1470	
Meridian, Miss.	WCOC	910	C
	WDAL	1330	M
	WMOX	1010	
	WOKK	1450	A
	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	M
Mexico, Pa.	WJUN	1220	
Miami, Ariz.	KIKO	1340	
Miami, Fla.	WGBS	710	C
	WIOD	610	N
	WFAB	990	
	WMBM	1220	
	WAME	1260	A
	WMIE	1140	
	WQAM	560	
	WSKP	1450	
	WINZ	940	M
Miami, Okla.	KGLC	910	
Miami Beach, Fla.	WMBM	1490	
	WKAT	1360	C
	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	A
	KJBC	1150	
	KWEL	1600	
Milan, N. H.	KCYR	560	
Milan, Tenn.	WKBJ	1600	
Miles City, Mont.	KATL	1340	M
Milford, Del.	WKSB	930	
Milford, Mass.	WMRC	1490	
Milledgeville, Ga.	WMVG	1450	M
Millen, Ga.	WGSR	1570	
Millington, Tenn.	WHEY	1220	
	WGMM	1380	
Millville, N.J.	WMVB	1440	
Milton, Fla.	WEBY	1330	M
	WSRA	1490	
Milton, Pa.	WMLP	1570	
	WARC	1380	
Milwaukee, Wis.	WEMP	1250	
	WFOX	860	M
	WRIT	1340	
	WISN	1150	A
	WMIL	1290	
	WOKY	920	
	WTMJ	620	N
Minden, La.	KASO	1240	
Mineola, N.Y.	WFYI	1520	D
Mineola, Tex.	KMOO	1510	
Mineral Wells, Tex.	KORC	1140	
Minneapolis, Minn.	WCCO	830	C
	WLOL	1330	
	WMIN	1400	
	WDGY	1130	
	WPBC	980	
	WTCN	1280	A
	KTCR	690	
	KTIS	900	
	KUOM	770	
Minot, N. Dak.	KLPM	1390	M
	KQDY	1320	
	KCJB	910	C
Mission, Kans.	KBEA	1480	
Mission, Tex.	KIRT	1580	
Missoula, Mont.	KGVO	1290	C
	KXLL	1450	N
	KQTE	1340	M
	KYSS	910	
Mitchell, S.Dak.	KORN	1490	M
Moab, Utah	KURA	1450	
Moberly, Mo.	KNCM	1230	
Mobile, Ala.	WALA	1410	N
	WMOE	1550	
	WABB	1480	A
	WGOK	900	
	WTUF	840	
	WKRG	710	C
	WLIQ	1360	
	WMOZ	960	
Mobridge, S.Dak.	KOLY	1300	
Mocksville, N.C.	WSDC	1560	D
	WDSL	1520	
Modesto, Calif.	KTRB	860	
	KBEE	970	A
	KFIV	1360	A
Mojave, Calif.	KOOL	1340	
Moline, Ill.	WQUA	1230	A
Monahans, Tex.	KVKM	1330	M
Moncks Corner, S. C.	WBER	950	
Monett, Mo.	KRMO	990	
Monmouth, Ill.	WRAM	1330	
Monroe, Ga.	WMRE	1490	
Monroe, La.	KMLB	1440	A-N
	KLIC	1230	M
	KNOE	540	
Monroe, Mich.	WQTE	560	
Monroe, N.C.	WMAP	1060	
Monroe, Wis.	WEKZ	1260	
Monroeville, Ala.	WMFC	1360	
Monterey, Calif.	KIDD	630	
	KMBY	1240	C
Montevideo, Minn.	KDMA	1460	A
Monte Vista, Colo.	KSLV	1240	
Montezuma, Ga.	WMNZ	1050	
Montgomery, Ala.	WBAM	740	
	WCOV	1170	C
	WAPX	1600	N
	WHHY	1440	N
	WMGY	800	M
	WRMA	950	
Montgomery, W.Va.	WMON	1340	M
Monticello, Ark.	KHBM	1430	
Monticello, Ky.	WFLW	1360	
Montpelier-Barre, Vt.	WSKI	1240	A
Montrose, Colo.	KUBC	580	
Montrose, Pa.	WPEL	1250	
Mooresville, N.C.	WHIP	1350	
Moorhead, Minn.	KVOX	1280	M
Morehead, Ky.	WMOR	1330	
Morehead City, N.C.	WMBL	740	
Morgan City, La.	KMRC	1430	M
Morganfield, Ky.	WMSK	1550	
Morganton, N.C.	WMNC	1430	
Morgantown, W.Va.	WAJR	1440	N
	WCLG	1300	
Morrilton, Ark.	KVOM	800	
Morris, Minn.	KMRS	1230	
Morristown, N.J.	WMTR	1250	
Morristown, Tenn.	WCRK	1150	M
	WMTN	1300	
Morton, Tex.	KRAN	1280	
Moscow, Idaho	KRPL	1400	
Moses Lake, Wash.	KSEM	1470	
	KWIQ	1260	
Moultrie, Ga.	WMGA	1400	A
	WMTM	1300	
Moundsville, W.Va.	WMOD	1370	
Mountain Grove, Mo.	KLRS	1360	
Mountain Home, Ark.	KTLO	1490	
Mountain Home, Ida.	KFLI	1240	
Mt. Airy, N.C.	WPAQ	740	
	WSYD	1300	M
Mt. Carmel, Ill.	WVMC	1360	
Mt. Clemens, Mich.	WBRB	1430	
Mt. Dora, 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	C
Munfordville, Ky.	WLOC	1150	
Munising, Mich.	WMAB	1400	
Murfreesboro, Tenn.	WGNS	1450	
	WMTS	860	
Murphy, N.C.	WCVP	600	
	WKRK	1320	
Murphysboro, Ill.	WINI	1420	
Murray, Ky.	WNBS	1340	
Murray, Utah	KMUR	1230	
Muscatine, Iowa	KWPC	860	
Muscle Shoals City, Alabama	WLAY	1450	
Muskegon, Mich.	WKBZ	850	A
	WKJR	1520	
	WTRU	1600	
	WMUS	1090	
Muskogee, Okla.	KBIX	1490	A
	KMUS	1380	
Myrtle Beach, S.C.	WMYB	1450	
Nacogdoches, Tex.	KEEE	1230	A
	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.	WKOA	1240	
	WLAC	1510	C
	WMAK	1300	
	WLVN	1560	
	WNAH	1360	M
	WSIX	980	A
	WSM	650	N
Nassau, Bahamas	ZNS-2	1240	
Natchez, Miss.	WMIS	1240	N
	WNAT	1450	M
Natchitoches, La.	KNOC	1450	M
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.	WOWI	1570	
New Albany, Miss.	WNAU	1470	
Newark, Del.	WWRK	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	M
New Bern, N.C.	WHIT	1450	M
	WRNB	1490	
Newberry, S.C.	WKDK	1240	
New Boston, Ohio	WIOI	1010	
New Braunfels, Tex.	KGNB	1420	
New Britain, Conn.	WHAY	910	A
	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	A
Newcastle, Wyo.	KASL	1240	
New Haven, Conn.	WAVZ	1300	
	WELI	960	
	WNHC	1340	A
New Iberia, La.	KANE	1240	
	KVIM	1360	
New Kensington, Pa.	WKPA	1150	
New London, Conn.	WNLC	1510	M
New Martinsville, W.Va.	WETZ	1330	M
Newnan, Ga.	WCOH	1400	M
	WNEA	1300	
New Orleans, La.	WDSU	1280	N
	WJMR	990	M
	WBOK	800	
	WNOE	1060	
	WSMB	1350	A
	WNPS	1450	
	WTIX	690	
	WWL	870	C
	WWOM	600	
	WYLD	940	M
Newport, Ark.	KNBY	1280	
Newport, Ky.	WNOP	740	
Newport, N.H.	WCNL	1010	
Newport, Oreg.	KNPT	1310	

Location	C.L.	Kc.	N.A.
Newport, R.I.	WADK	1540	
Newport, Tenn.	WLIK	1270	
Newport, Vt.	WIKE	1490	
Newport News, Va.	WGH	1310	A
	WTID	1270	
New Richmond, Wis.	WIXK	1590	
New Rochelle, N.Y.	WVOX	1460	
New Smyrna Beach, Fla.	WSBB	1230	M
	WORT	1550	
Newton, Iowa	KCOB	1280	
Newton, Kans.	KJRG	950	
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	A
	WBNX	1380	
	WCBS	880	C
	WEVD	1330	
	WHOM	1480	
	WINS	1010	M
	WLIB	1190	
	WMCA	570	
	WHN	1050	
	WNEW	1130	
	WNYC	830	
	WOR	710	
	WADO	1280	
	WPOW	1330	
	WQXR	1560	
	WNBC	660	N
Niagara Falls, N.Y.	WHLD	1270	
	WJJL	1440	M
Nicholasville, Ky.	WNVL	1250	
Niles, Mich.	WNIL	1290	
Niles, Ohio	WNIO	1540	
Nogales, Ariz.	KNOG	1340	A
Nome, Alaska	KICY	850	
Norfolk, Nebr.	WJAG	780	
Norfolk, Va.	WTAR	790	C
	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. Augusta, S.C.	WGUS	1380	
	WFNL	1600	
	WTHB	1550	
North Bend, Oreg.	KFIR	1340	C
North Charleston, S.C.	WNCG	910	
Northampton, Mass.	WHMP	1400	M
Northfield, Minn.	WCAL	770	
N. Little Rock, Ark.	KDXE	1380	A
	KXLR	1150	
North Platte, Nebr.	KJLT	970	
	KNOP	1410	
	KODY	1240	N
No. Syracuse, N.Y.	WSOQ	1220	M
N. Vernon, Ind.	WOCH	1460	
No. Wilkesboro, N.C.	WKBC	810	
Norton, Va.	WNVA	1350	M
Norwalk, Conn.	WNLK	1350	
Norwich, Conn.	WICH	1310	
Norwich, N.Y.	WCHN	970	
Oakdale, La.	KREH	900	
Oakes, N.Dak.	KEYD	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	M
Ocala, Fla.	WMOP	900	
	WTMC	1290	N
	WKOS	1370	
Ocean City, Md.	WETT	1590	
Ocean City, N. J.	WYKP	1520	
Oceanlake, Oreg.	KBCH	1380	
Oceanside, Calif.	KUDE	1320	
Ocilla, Ga.	WBIZ	1380	
Odessa, Tex.	KECK	920	
	KOSA	1230	C
	KOYL	1310	
	KRIG	1410	M
Oelwein, Iowa	KOEL	950	
Ogallala, Nebr.	KOGA	980	
Ogden, Utah	KLO	1430	M
	KANN	1250	
	KSVN	730	
	KVOG	1490	
Ogdensburg, N.Y.	WSLB	1400	M
Oil City, Pa.	WKRZ	1340	
Okeechobee, Fla.	WOKC	1570	
Okla. City, Okla.	KBYE	890	A
	KLPR	1140	
	KOCY	1340	
	KOMA	1520	
	KTOK	1000	A-M
	KJEM	800	
	WKY	930	
Okmulgee, Okla.	KOKL	1240	
Old Saybrook, Conn.	WLIS	1420	
Olean, N.Y.	WMNS	1360	
	WHDL	1450	A
Olney, Ill.	WVLN	740	
Olympia, Wash.	KGY	1240	M
	KITN	920	
Omaha, Nebr.	KBON	1490	
	KFAB	1110	N
	KOIL	1290	
	KOOO	1420	
	KMEO	660	M
	WOW	590	C
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	M
Opelousas, La.	KSLO	1230	A
Opp, Ala.	WAMI	860	
Opportunity, Wash.	KZUN	680	
Orange, Mass.	WCAT	1390	
Orange, Tex.	KOGT	1600	
Orange, Va.	WJMA	1340	
Orangeburg, S.C.	WDIX	1150	A
	WORG	1580	
	WTND	920	
Orange Park, Fla.	WAYR	550	
Oregon City, Oreg.	KGON	1520	M
Orlando, Fla.	WDBO	580	C
	WHOO	990	M
	WHIY	1270	
	WLOF	950	
	WKIS	740	N
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	A
Oskaloosa, Iowa	KBOE	740	
Oswego, N.Y.	WSGO	1440	
Othello, Wash.	KRSC	1400	
Otsego, Mich.	WDMC	980	
Ottawa, Ill.	WCMY	1430	
Ottawa, Kans.	KOFO	1220	
Ottumwa, Iowa	KBIZ	1240	A
	KLEE	1480	
Owatonna, Minn.	KRFO	1390	
Owego, N.Y.	WEBO	1330	
Owensboro, Ky.	WOMI	1490	M
	WVJS	1420	A
Owosso, Mich.	WOAP	1080	
Oxford, Miss.	WSUH	1420	
Oxford, N.C.	WOXF	1340	
Oxnard, Calif.	KOXR	910	
Ozark, Ala.	WOZK	900	
Paducah, Ky.	WKYB	570	M
	WDXR	1560	N
	WPAD	1450	C
Page, Ariz.	KPGE	1340	
Pahokee, Fla.	WRIM	1250	
Painesville, Ohio	WPVL	1460	
Paintsville, Ky.	WSIP	1490	M
Palatka, Fla.	WWPF	1260	
	WSUZ	800	
Palestine, Tex.	KNET	1450	
Palm Bch., Fla.	WQXT	1340	A
Palm Sprgs., Calif.	KCMJ	1010	C
	KDES	920	
	KPAL	1450	
Palmdale, Calif.	KUTY	1470	
Palo Alto, Calif.	KIBE	1220	
Pampa, Tex.	KPDN	1340	M
	KHHH	1230	
Panama City, Fla.	WDLP	590	
	WPCF	1430	A
Panama City Beach, Fla.	WTHR	1480	
	WSCM	1290	
Paradise, Calif.	KNGL	930	
Paragould, Ark.	KDRS	1490	
Paris, Ark.	KCCL	1460	
Paris, Ill.	WPRS	1440	
Paris, Ky.	WKLX	1440	
Paris, Tenn.	WTPR	710	
Paris, Tex.	KPLT	1490	A
	KFTV	1250	
Parkersburg, W.Va.	WCEF	1050	
	WPAR	1450	C
	WTAP	1230	A-M
Park Falls, Wis.	WPFP	1450	
Park Rapids, Minn.	KPRM	1240	
Parsons, Kans.	KLKC	1540	
Pasadena, Calif.	KALI	1430	
	KPPC	1240	
	KRLA	1110	
	KWKW	1300	
Pasadena, Tex.	KLVL	1480	
	KIKK	650	
Pascagoula-Moss Point, Miss.	WPMP	1580	A
Pasco, Wash.	KORD	910	
	KGRS	1340	
Paso Robles, Calif.	KPRL	1230	M
Patchogue, L.I., N.Y.	WALK	1370	
Paterson, N.J.	WPAC	1580	
Pauls Valley, Okla.	KVLH	1470	
Pawtucket, R.I.	WXTR	550	A
Payette, Idaho	KEOK	1450	
Pearsall, Tex.	KVWG	1280	
Pecos, Tex.	KIUN	1400	M
Peekskill, N.Y.	WLNA	1420	
Pekin, Ill.	WSIV	1140	
Pell City, Ala.	WFHK	1480	
Pendleton, Oreg.	KTIX	1240	A
	KUBE	1050	
Pennington Gap, Va.	KUMA	1290	A
	WSWV	1570	
Pensacola, Fla.	WBOP	980	
	WBSR	1450	
	WMEL	610	C
	WNVY	1230	A
	WCOA	1370	N
	WPFA	790	
Peoria, Ill.	WAAP	1350	N
	WMBD	1470	C
	WIRL	1290	
	WPEO	1020	M
Perry, Fla.	WPRY	1400	
	WGKR	1310	
Perry, Ga.	WPGA	980	
Perry, Iowa	KDLS	1310	
Perryton, Tex.	KEYE	1400	M
Peru, Ind.	WARU	1600	
Petaluma, Calif.	KTOB	1490	
Petersburg, Va.	WSSV	1240	M
Petoskey, Mich.	WMBN	1340	
Phenix City, Ala.	WPNX	1460	A
Philadelphia, Miss.	WHOC	1490	
Philadelphia, Pa.	WCAU	1210	C
	WDAS	1480	
	WFIL	560	A
	WFLN	900	
	WHAT	1340	
	WIBG	990	
	WIP	610	
	WJMJ	1540	
	WPEN	950	M
	WRCV	1060	N
	WTEL	860	
Phillipsburg, Pa.	WPHB	1260	
Phillipsburg, Kans.	KKAN	1490	
Phoenix, Ariz.	KIFN	860	
	KXIV	1400	
	KHAT	1480	
	KHEP	1280	
	KCAC	1010	
	KOY	550	A
	KOOL	960	C
	KPHO	910	A
	KUEQ	740	
	KRIZ	1230	
	KTAR	620	N
Picayune, Miss.	WRJW	1320	
Piedmont, Ala.	WPID	1280	
Pierre, S.Dak.	KGFX	690	
	KCCR	1590	
Pikeville, Ky.	WLSI	900	
	WPKE	1240	M
Pine Bluff, Ark.	KCLA	1400	
	KADL	1270	
	KOTN	1490	M
	KCAT	1530	
	KPBA	1590	
Pine City, Minn.	WCMP	1350	
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	N
	KSEK	1340	
Pittsburgh, Pa.	KDKA	1020	
	KQV	1410	A
	WAMO	860	
	WJAS	1320	N
	WPIT	730	
	WRYT	1250	
	WEEP	1080	M
	WWSW	970	
Pittsfield, Ill.	WBBA	1580	
Pittsfield, Mass.	WBEC	1420	A
	WBRK	1340	M
Pittston, Pa.	WPTS	1540	
Plainfield, N.J.	WERA	1590	
Plainview, Tex.	KVOP	1400	M
	KPLA	1050	
Plant City, Fla.	WPLA	910	
Platteville, Wis.	WSWW	1590	
Plattsburg, N.Y.	WEAV	960	A-N
	WIRY	1340	M
Pleasanton, Tex.	KBOP	1380	
Pleasantville, N.J.	WOND	1400	
Plymouth, Mass.	WPLM	1390	
Plymouth, N.C.	WPNC	1470	
Plymouth, Wis.	WPLY	1420	
Pocahontas, Ark.	KPOC	1420	
Pocatello, Idaho	KSEI	930	N
	KWIK	1240	M
	KSNN	1290	
Pocomoke City, Md.	WDMV	540	
Pomona, Calif.	KWOW	1600	
	KKAR	1220	
Pompano Beach, Fla.	WLOD	980	
	WRBD	1470	A
Ponca City, Okla.	WBBZ	1230	M
Ponce, P.R.	WPRP	910	
	WEUC	1420	
	WPAB	550	
	WLEO	1170	
	WISO	1260	
Pontiac, Mich.	WPON	1460	
Pontotoc, Miss.	WSEL	1440	
Poplar Bluff, Mo.	KWOC	980	
	KLID	1340	
Poplarville, Miss.	WRPM	1530	
Portage, Pa.	WWML	1470	
Portage, Wis.	WPDR	1350	
Portageville, Mo.	KMIS	1050	
Portales, N.Mex.	KENM	1450	
Port Angeles, Wash.	KAPY	1000	D
	KONP	1450	
Port Arthur, Tex.	KOLE	1340	
	KPAC	1250	M
Porterville, Calif.	KTIP	1450	A
Port Hueneme, Calif.	KACY	1520	
Port Huron, Mich.	WHLS	1450	
	WTTH	1380	A
Port Jervis, N.Y.	WDLC	1490	
Port Lavaca, Tex.	KGUL	1580	
Portland, Ind.	WPGW	1440	
Portland, Maine	WCSH	970	N
	WGAN	560	C
	WLOB	1310	
	WPOR	1490	A-M
Portland, Oreg.	KBPS	1450	
	KBEV	1010	
	KLIQ	1290	
	KEX	1190	
	KGW	620	N
	KOIN	970	C
	KPAM	1410	
	KPDQ	800	
	KPOJ	1330	
	KWJJ	1080	A
	KXL	750	
Port Neches, Tex.	KPNG	1150	
Portsmouth, N.H.	WBBX	1380	
	WHEB	750	
Portsmouth, Ohio	WPAY	1400	C
	WNXT	1280	A
Portsmouth, Va.	WHIH	1400	A-M
	WPMH	1010	
	WAVY	1350	N
Port Washington, Wis.	WGLB	1560	
Post, Tex.	KPOS	1370	
Poteau, Okla.	KLCO	1280	
Potosi, Mo.	KYRO	1260	
Potsdam, N.Y.	WPDM	1470	
Pottstown, Pa.	WPAZ	1370	
Pottsville, Pa.	WPAM	1450	
	WPPA	1360	M
Poughkeepsie, N.Y.	WEOK	1390	
	WKIP	1450	A
Powell, Wyo.	KPOW	1260	A-M
Poynette, Wis.	WIBU	1240	
Prairie du Chien, Wis.	WPRE	980	
Pratt, Kans.	KWSK	1570	
	KWNS	1290	
Prescott, Ariz.	KYCA	1490	N
	KENT	1340	
	KNOT	1450	A
Prescott, Ark.	KTPA	1370	
Presque Isle, Me.	WAGM	950	
	WEGP	1390	
Preston, Idaho	KPST	1340	
Prestonsburg, Ky.	WPRT	960	
	WDOC	1310	
Price, Utah	KOAL	1230	M
Prichard, Ala.	WSIM	1270	
Prince Albert, Sask.	CKBI	900	
Princeton, Ind.	WRAY	1250	
Princeton, Ky.	WPKY	1580	
Princeton, N.J.	WHWH	1350	
Princeton, W.Va.	WLOH	1490	A
Prineville, Oreg.	KRCO	690	
Prosser, Wash.	KARY	1310	
Providence, R.I.	WEAN	790	C
	WHIM	1110	
	WICE	1290	
	WJAR	920	N
	WLKW	990	
	WPRO	630	
	WRIB	1220	M
Provo, Utah	KIXX	1400	A
	KEYY	1450	
	KOVO	960	M
Pryor, Okla.	KOLS	1570	
Pueblo, Colo.	KDZA	1230	
	KAPI	690	
	KFEL	970	
	KGHF	1350	A-M
	KCSJ	590	
	KPUB	1480	
Pulaski, Tenn.	WKSR	1420	A
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.	KOLJ	1150	
Quantico, Va.	WQVA	1530	
Quincy, Calif.	KQCY	500	D
Quincy, Fla.	WCNH	1280	M
Quincy, Ill.	WGEM	1440	A

WHITE'S RADIO LOG

Location	C.L.	Kc.	N.A.
Quincy, Mass.	WTAD	930	C
Quincy, Wash.	WJDA	1300	
Quitman, Ga.	KPOR	1370	
Racine, Wis.	WSFB	1490	
	WRAC	1480	
	WRJN	1400	A
Radford, Va.	WRAD	1460	
Raleigh, N.C.	WKIX	850	A
	WNOH	1550	
	WPTF	680	N
	WLLE	570	
	WRAL	1240	
Ralls, Tex.	KCLR	1530	
Rantoul, Ill.	WRTL	1460	
Rapid City, S.Dak.	KOTA	1380	C
	KIMM	1150	
	KRSD	1340	
	KEZU	920	
Raton, N.Mex.	KRTN	1490	A
Ravenswood, W.Va.	WMOV	1360	
Rawlins, Wyo.	KRAL	1240	A-M
Raymond, Wash.	KAPA	1340	
Raymondville, Tex.	KSOX	1240	
Rayville, La.	KRIH	990	
Reading, Pa.	WEEU	850	A
	WHUM	1240	C
	WRAW	1340	N
Redding, Calif.	KROG	1230	M
	KAHR	1330	
	KQMS	1400	
	KVCV	600	C
	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.	WROB	1400	
Reedsport, Oreg.	KRAF	1470	
Reidsville, N.C.	WFRC	1600	A
	WREV	1220	
Remsen, N.Y.	WREM	1480	
Reno, Nev.	KOH	630	N
	KBET	1340	M
	KOLO	920	C
	KONE	1450	
	KCBN	1280	
Rensselaer, N.Y.	WEEE	1300	
Rexburg, Idaho	KRXK	1230	
Rhinelander, Wis.	WOBT	1240	
Rice Lake, Wis.	WJMC	1240	M
Richfield, Utah	KSVC	980	
Richland, Wash.	KALE	960	
Richland, Wis.	WRCO	1450	
Richlands, Va.	WRIC	540	
Richmond, Ind.	WKBV	1490	A
Richmond, Ky.	WEKY	1340	M
Richmond, Va.	WANT	990	
	WBBL	1480	
	WRGM	1590	
	WLEE	1480	M
	WEET	1320	
	WMBG	1380	A
	WRNL	910	C
	WRVA	1140	N
	WXGI	950	
	WWWW	1540	
Richwood, W.Va.	WVAR	1280	
Ridgecrest, Calif.	KRCK	1360	
	KLOA	1240	
Rio Piedras, P.R.	WUNO	1320	
	WRAI	1520	
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	M
Riviera Beach, Fla.	WHEW	1600	
Roanoke, Ala.	WELR	1360	
Roanoke, Va.	WOBJ	960	C
	WRIS	1410	M
	WHYE	910	
	WROV	1240	A
	WSLS	610	N
Roanoke Rapids, N.C.	WCBT	1280	M
Roaring Sprgs., Pa.	WKMC	1370	
Reberval, Que.	CHRL	910	
Robinson, Ill.	WTAY	1570	
Robstown, Tex.	KROB	500	O
Rochester, Minn.	KROC	1340	N
	KFAV	1520	
	KWEB	1270	
Rochester, Minn.	KOLM		
Rochester, N.H.	WWNH	990	
Rochester, N.Y.	WBBF	950	M
	WHAM	1180	N
	WHEC	1460	C
	WRVM	680	
	WSAY	1370	
	WROC	1280	N
Rockford, Ill.	WROK	1440	A
	WJRL	1150	
	WRRR	1330	
Rock Hill, S.C.	WRHI	1340	M
	WTYC	1150	
Rockingham, N.C.	WAYN	900	
Rock Island, Ill.	WHBF	1270	C
Rockland, Maine	WRKD	1450	A
Rockmart, Ga.	WPLK	1220	
Rock Springs, Wyo.	KVRS	1360	A-M
Rockville, Md.	WINX	1600	
Rockwood, Tenn.	WRKH	580	
Rocky Ford, Colo.	KAVI	1320	
Rocky Mount, N.C.	WCEC	810	
	WEED	1390	A
	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	A
	WIYN	1360	
	WRGA	1470	C
	WROM	710	
Rome, N.Y.	WKAL	1450	A
	WRNY	1350	
Ronceverte, W.Va.	WRON	1400	
Roseau, Minn.	KRWB	1410	
Roseburg, Oreg.	KRNR	1490	C
	KRXL	1250	
	KYES	950	
Rosenberg, Tex.	KFRD	980	
Rossville, Ga.	WRIP	980	
Roswell, N.Mex.	KRSY	1230	
	KGFL	1430	M
	KBIM	910	
	KRIK	960	
Roswell, N.Mex.	KRDD	1320-1000	D
Roxboro, N.C.	WRXO	1430	
Royal Oak, Mich.	WEXL	1340	
Rugby, N. Dak.	KGCA	1450	
Ruidoso, N.Mex.	KRRR	1340	
Rumford, Me.	WRUM	790	
Rupert, 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	M
Sacramento, Calif.	KCRA	1320	N
	KFBK	1530	A
	KGMS	1380	M
	KJAY	1430	
	KRAK	1140	M
	KROY	1240	C
	KXOA	1470	
Safford, Ariz.	KGLU	1480	A
	KATO	1230	
Sag Harbor, N.Y.	WLNG	1600	
Saginaw, Mich.	WKNX	1210	
	WSAM	1400	N
	WSGW	790	C
St. Albans, Vt.	WWSR	1420	
St. Albans, W.Va.	WKLC	1300	
St. Augustine, Fla.	WFOY	1240	C
	WETH	1420	
St. Charles, Mo.	KAOY	1460	
St. Cloud, Minn.	KFAM	1450	N
	WJON	1240	
St. George, S.C.	WQIZ	1300	
St. George, Utah	KDXU	1450	
St. Helen, Mich.	WMIC	1590	
St. Helens, Oreg.	KOHI	1600	
St. Johns, Mich.	WJUO	1580	
St. Johnsbury, Vt.	WTWN	1340	
St. Joseph, Mich.	WSJM	1400	
St. Joseph, Mo.	KFEQ	680	
	KKJO	1550	M
	KUSN	1270	
St. Louis, Mo.	KATZ	1600	
	KFUO	850	
	KMOX	1120	C
	KSO	550	N
	KSTL	690	
	KXOK	630	
	WEW	770	M
	WIL	1430	A
St. Louis Park, Minn.	KRSI	950	
St. Mary's, Pa.	WKBI	1400	
St. Paul, Minn.	KSTP	1500	N
	KOWB	630	M
	WMIN	1400	
St. Peter, Minn.	KRBI	1310	
St. Petersburg, Fla.	WPIN	860	
	WSUN	620	A
	WLCY	1380	M
St. Petersburg Beach, Fla.	WILZ	1590	
Salamanca, N.Y.	WGGO	1590	
Salem, Ill.	WJBD	1350	
Salem, Ind.	WSLM	1220	
Salem, Mass.	WESX	1230	M
Salem, Mo.	KSMO	1340	
Salem, Oreg.	KSLM	1390	A
	KAPT	1220	
	KBZY	1490	N
	KGAY	1430	
Salem, Va.	WBLU	1480	
Salida, Colo.	KVRH	1340	M
Salina, Kans.	KSAL	1150	M
	KCTY	980	
	KQTY	910	
Salinas, Calif.	KDON	1460	
	KSBW	1380	M
Salinas, Calif.	KCTY	980-1000	D
Saline, Mich.	WOIA	1290	
Salisbury, Md.	WBOC	960	
	WICO	1320	A
	WJDY	1470	
Salisbury, N.C.	WSTP	1490	M
	WSAT	1280	A
Salmon, Idaho	KSRA	960	
Salt Lake City, Utah	KALL	910	A
	KCPX	1320	N
	KLUB	570	M
	KNAK	1280	
	KSL	1160	C
	KSOP	1370	
	KSXX	830	
	KWHO	860	
	KWIC	1570	
San Angelo, Tex.	KTEO	1340	
	KGKL	960	A
	KPEP	1420	
	KWFR	1260	
San Antonio, Tex.	KAPE	1480	
	KCOR	1350	
	KBAT	680	C
	KBER	1150	
	KITE	930	
	KUKA	1250	
	KUBO	1310	
	KMAC	630	A & C
	KONO	860	
	KTSA	550	
	WOAI	1200	N
San Bernardine, Calif.	KCKC	1350	
	KFXM	590	
	KRNO	1240	
	KMEN	1290	M
Sandersville, Ga.	WSNT	1490	
San Diego, Calif.	KCBQ	1170	
	KFMB	540	O
	KOGO	600	N
	KGB	1360	A
	KSON	1240	
	KSOO	1130	
Sandpoint, Idaho	KSPT	1400	
Sand Spring, Okla.	KTOW	1340	
Sandusky, Ohio	WLEC	1450	M
San Fernando, Calif.	KGIL	1260	
Sanford, Fla.	WTRR	1400	
	WSFR	1360	
Sanford, Me.	WSME	1220	
Sanford, N.C.	WEYE	1290	
	WWGP	1050	
San Francisco, Calif.	KFRC	610	M
	KCBS	740	C
	KFAX	1100	
	KGO	810	A
	KNBR	680	N
	KKHI	1550	M
	KSAY	1010	
	KSAN	1450	
	KSFO	560	
	KYA	1260	
San German, P. R.	WRJS	1060	
Sanitobia, Miss.	WSAO	1550	
San Jose, Calif.	KLOK	1170	
	KLIV	1590	M
	KEEN	1370	
	KXRX	1300	
San Juan, P.R.	WAPA	680	M
	WHOA	870	
	WIAC	740	
	WIPR	940	
	WKAQ	580	C
	WKVM	810	
	WKYN	630	
	WITA	1140	
San Luis Obispo, Calif.	KATY	1340	
	KCJH	1280	
	KSLY	1400	
	KVEC	920	M
San Marcos, Tex.	KCNY	1470	
San Mateo, Calif.	KOFY	1050	
San Rafael, Calif.	KTIM	1510	
San Saba, Tex.	KBAL	1410	
Santa Ana, Calif.	KWIZ	1480	
Santa Barbara, Cal.	KOB	1490	
	KGUO	990	
	KIST	1340	N
	KTMS	1250	A-M
	KACL	1290	
Santa Clara, Calif.	KGBB	1490	
Santa Cruz, Calif.	KSCO	1080	
Santa Fe, N.Mex.	KTRC	1400	A
	KVSF	1260	C
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	A
Sarasota, Fla.	WKXY	930	
	WSAF	1220	
	WSPB	1450	C
	WYND	1280	
Saratoga Springs, N.Y.	WSPN	900	
Sauk Rapids, Minn.	KVAL	800	
Sault Ste. Marie, Michigan	WSOO	1280	
Savannah, Ga.	WBYG	1450	M
	WEAS	900	
	WSAV	630	N
	WSGA	1400	
	WTOC	1290	C
	WSOK	1230	A
Savannah, Tenn.	WORM	1010	
Sayre, Pa.	WATS	960	
Scheffield, Ala.	WSHF	1290	
Schenectady, N.Y.	WGY	810	N
	WSNY	1240	
Scotland Neck, N.C.	WYAL	1280	
Scott City, Kans.	KFLA	1310	
Scottsbluff, Nebr.	KNEB	960	A-M
	KOLT	1320	C
Scottsboro, Ala.	WCRI	1050	
	WROS	1330	
Scottsdale, Ariz.	KWBY	1440	
Scottsville, Ky.	WLCK	1250	
Scranton, Pa.	WARM	590	A
	WEJL	630	
	WGBI	910	C
	WICK	1400	
	WSCR	1320	N
Seaford, Del.	WSUX	1280	
Searcy, Ark.	KWCB	1300	
Seaside, Oreg.	KSRG	730	
Seattle, Wash.	KAYO	1150	M
	KIXI	910	
	KING	1090	A
	KIRO	710	C
	KJR	950	
	KOL	1300	
	KOMO	1000	N
	KETO	1590	
	KTW	1250	
	KVI	570	
	KXA	770	
Sebring, Fla.	WJCM	980	
	WSEB	1340	
Sedalia, Mo.	KDRO	1490	
	KSIS	1050	
Seguin, Tex.	KWED	1580	
Selma, Ala.	WGWC	1340	C
	WHBB	1490	
	WRWJ	1570	
	KTFO	1250	
Seminole, Tex.	WSNW	1150	
Seneca Township, S.C.	WSEV	930	
Sevierville, Tenn.	WJEC	1390	
Seward, Alaska	KIBH	1340	C-A
Seymour, Ind.	WSEY	1230	
Seymour, Tex.	WVCB	1410	
Shallotte, N.C.	WISL	1480	
Shamokin, Pa.	KBYP	1580	
Shamrock, Tex.	WPIC	790	
Sharon, Pa.	WTCH	960	
Shawano, Wis.	KGFF	1450	M
Shawnee, Okla.	WHBL	1330	A
Sheboygan, Wis.	WKTS	950	
Sheffield, Ala.	WSHF	1290	
Shelby, Mont.	KSEN	1150	M
Shelby, N.C.	WOHS	730	M
	WAOA	1390	
Shelbyville, Ind.	WSVL	1520	
Shelbyville, Ky.	WCNO	940	
Shelbyville, Tenn.	WHAL	1400	
	WLIJ	1580	
Sheldon, Iowa	KIWA	1550	
Shelton, Wash.	KMAS	1280	
Shenandoah, Iowa	KMA	960	A
Shenandoah, Pa.	WMBT	1530	
Sheridan, Wyo.	KWYO	1410	M
	KROE	930	
Sherman, Tex.	KRRV	910	M
	KTXO	1500	
Shippensburg, Pa.	WSHP	1460	
Show Low, Ariz.	KVWM	1050	
Shreveport, La.	KANB	1300	
	KBCL	1220	
	KEEL	710	
	KOKA	1550	M
	KJOE	1480	M
	KCIJ	980	
	KRMD	1340	A
	KWKH	1130	C

Location	C.L.	Kc.	N.A.
Sidney, Mont.	KGCX	1480	M
Sidney, Nebr.	KSID	1340	A
Sierra Vista, Ariz.	KHFH	1420	A
	KMVS	1470	
Sikeston, Mo.	KSIM	1400	
Siler City, N.C.	WNCA	1570	
Siloam Sprgs., Ark.	KUOA	1290	M
Silsbee, Tex.	KKAS	1300	
Silver City, N.Mex.	KSIL	1340	C
Silver Sprgs., Md.	WQMR	1050	
Simcoe, Ont.	CFRS	1560	
Sinton, Tex.	KTOD	1590	
Sioux City, Iowa	KSCJ	1360	A
	KMNS	620	M
	KTRI	1470	
Sioux Falls, S.Dak.	KISD	1230	
	KELO	1320	
	KNWC	1270	
	KSOO	1140	A
Sitka, Alaska	KIFW	1230	C-A
	KSEW	1400	
Skowhegan, Maine	WGHM	1150	
Slaton, Tex.	KCAS	1050	
Smithfield, N.C.	WMPM	1270	
Smyrna, Ga.	WSMA	1550	
Snyder, Tex.	KSNY	1450	M
Socorro, N.Mex.	KSRC	1290	
Soda Sprgs., Idaho	KBRV	540	
Solvay, N.Y.	WQSR	1320	
Somerset, Ky.	WSFC	1240	M
	WTLO	1480	
Somerset, Pa.	WVSC	990	
Sonora, Calif.	KVML	1450	
Sonora, Tex.	KCKG	1240	
So. Bend, Ind.	WNDU	1490	A
	WJVA	1580	M
	WSBT	960	C
Southbridge, Mass.	WESO	970	
So. Boston, Va.	WHLF	1400	A
Southern Pines, N.C.	WEEB	990	
South Charleston, W. Va.	WRDS	1410	
South Daytona Beach, Florida	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	M
So. Williamsport, Pa.	WMPT	1450	
Spanish Fork, Utah	KONI	1490	
Sparks, Nev.	KBUB	1270	
Sparta, Ill.	WHCO	1230	
Sparta, Tenn.	WSMT	1050	
Sparta, Wis.	WKLJ	990	
	WCOW	1290	
Spartanburg, S.C.	WZOO	1400	M
	WORD	910	N
	WSPA	950	C
Spencer, Iowa	KICD	1240	
Spencer, W.Va.	WSPZ	1400	
Spokane, Wash.	KGA	1510	A
	KDNC	1440	
	KLYK	1230	
	KPEG	1380	
	KHQ	590	N
	KMRE	550	
	KNEW	790	M
	KREM	970	
	KXLY	920	C
	KCFA	1330	
Springdale, Ark.	KBRS	1340	A
Springfield, Ill.	WCVS	1450	A-M
	WMAY	970	N
	WTAX	1240	C
Springfield, Mass.	WHYN	560	C
	WMAS	1450	M
	WSPR	1270	
Springfield, Mo.	KGBX	1260	N
	KICK	1340	
	KTTS	1400	C
	KWTO	560	A
Springfield, Ohio	WIZE	1340	A
	WBLY	1600	
Springfield, Oreg.	KEED	1050	
Springfield, Tenn.	WDBL	1590	
Springfield, Vt.	WCFR	1480	
Springhill, La.	KBSF	1460	
Spring Lake, N. C.	WFBS	1450	
Spruce Pine, N.C.	WTOE	1470	
Stamford, Conn.	WSTC	1400	A
Stamford, Tex.	KDWT	1400	
Stanford, Ky.	WRSL	1520	
Starke, Fla.	WPXE	1490	
Starkville, Miss.	WSSO	1230	
State College, Pa.	WMAJ	1450	N
	WRSC	1390	
Statesboro, Ga.	WWNS	1240	
Statesville, N.C.	WSIC	1400	
	WDBM	550	
Staunton, Va.	WTON	1240	A
	WAFC	900	
Stephenville, Tex.	KSTV	1510	
Sterling, Colo.	KGEK	1230	
	KOLR	1490	
Sterling, Ill.	WSDR	1240	
Steubenville, Ohio	WSTV	1340	M
Stevens Point, Wis.	WSPT	1010	
Stillwater, Minn.	WAVN	1220	
Stillwater, Okla.	KSPI	780	
Stockton, Calif.	KJOY	1280	
	KSTN	1420	
	KWG	1230	A
Storm Lake, Iowa	KAYL	990	
Streator, Ill.	WIZZ	1250	
Stroudsburg, Pa.	WVPO	840	
Stuart, Fla.	WSTU	1450	M
Stuart, Va.	WHEO	1270	
Sturgeon Bay, Wis.	WDOR	910	
Sturgis, Mich.	WSTR	1230	
Sturgis, S. D.	KBNB	1280	
Stuttgart, Ark.	KWAK	1240	M
Suffolk, Va.	WLPM	1460	A
Sulphur, La.	KIKS	1310	
Sulphur Sprgs., Tex.	KSST	1230	
Summerville, Ga.	WGTA	950	
Summerville, S.C.	WALS	980	
Sumter, S.C.	WFIG	1290	M
	WDXY	1240	
	WSSC	1340	A
Sunbury, Pa.	WKOK	1240	C
Sunnyside, Wash.	KREW	1230	
Sun Valley, Ida.	KSKI	1340	
Superior, Nebr.	KRFS	1600	
Superior, Wis.	WDSM	710	N
	WIGL	970	
	WWJC	1270	
	WQMN	1320	
Susanville, Calif.	KSUE	1240	
Swainsboro, Ga.	WJAT	800	
Sweetwater, Tenn.	WDEH	800	
Sweetwater, Tex.	KXOX	1240	
Sylacauga, Ala.	WFEB	1340	M
	WMLS	1290	
Sylva, N.C.	WMSJ	1480	
Sylvania, Ga.	WSYL	1490	
Syracuse, N.Y.	WHEN	620	C
	WFBL	1390	M
	WNDR	1280	
	WOLF	1490	A
	WSYR	570	N
Tabor City, N.C.	WTAB	1370	
Tacoma, Wash.	KMO	1360	
	KTAC	850	
	KTNT	1400	
	KVI	570	M
Taft, Calif.	KTKR	1310	
Tahlequah, Okla.	KTLQ	1350	
Tahoe Valley, Calif.	KTHO	590	
Talladega, Ala.	WEYY	1580	
	WNUZ	1230	M
Tallahassee, Fla.	WMEN	1330	
	WRFB	1410	
	WTAL	1450	M
	WTNT	1270	C
Tallassee, Ala.	WTLS	1300	
Tallulah, La.	KTLD	1360	
Tampa, Fla.	WALT	1110	
	WDAE	1250	C
	WYOU	1550	
	WFLA	970	N
	WHBO	1050	M
	WINQ	1010	
	WTMP	1150	
	WSOL	1300	
Taos, N. Mex.	KKIT	1340	
Tarboro, N.C.	WCPS	760	
Tarpon Sprgs., Fla.	WRBB	1470	
Tasley, Va.	WESR	1330	
Taunton, Mass.	WPEP	1570	
Tawas City, Mich.	WIOS	1480	
Taylor, Tex.	KTAE	1280	
Taylorsville, N. C.	WSTH	860	
	WTLK	1570	
Taylorville, Ill.	WTIM	1410	
Tazewell, Tenn.	WNTT	1250	
Tell City, Ind.	WTCJ	1230	
Tempe, Ariz.	KUPD	1060	
	KYND	1580	
Temple, Tex.	KTEM	1400	
Terre Haute, Ind.	WBOW	1230	N
	WAAC	1300	A
	WTHI	1480	C
Terrell, Tex.	KTER	1570	
Terrytown, Nebr.	KEYR	690	
Texarkana, Ark.	KOSY	790	M
Texarkana, Tex.	KCMC	740	A
	KATQ	940	
	KTFS	1400	
Texas City, Tex.	KTLW	920	
Thayer, Mo.	KALM	1290	
The Dalles, Oreg.	KODL	1440	
	KRMW	1300	
Thermopolis, Wyo.	KRTR	1490	M
	KTHE	1240	
Thief River Falls, Minn.	KTRF	1230	
Thibodaux, La.	KTIB	650	
Thomaston, Ga.	WSFT	1220	
	WTGA	1590	
	WTHN	1500	
Thomasville, Ala.	WJDB	630	
Thomasville, Ga.	WPAX	1240	
	WKTG	730	
Thomasville, N.C.	WTNC	790	
Thomson, Ga.	WTWA	1240	M
Three Rivers, Mich.	WLKM	1510	
Ticonderoga, N.Y.	WIPS	1250	
Tiffin, Ohio	WTTF	1600	M
Tifton, Ga.	WTIF	1340	
Tillamook, Oreg.	KTIL	1590	
Titusville, Fla.	WRMF	1050	
Titusville, Pa.	WTIV	1280	
Toccoa, Ga.	WLET	1420	M
	WNES	630	
Toledo, Ohio	WOHO	1470	M
	WSPD	1370	N
	WTOD	1560	C
	WTOL	1230	A
Toledo, Oreg.	KTDO	1230	
Tolleson, Ariz.	KRDS	1190	
Tomah, Wis.	WTMB	1460	
Tompkinsville, Ky.	WTKY	1370	
Tooele, Utah	KDYL	990	
Topeka, Kans.	WIBW	580	C
	KEWI	1440	
	WREN	1250	A
	KTOP	1490	M
Toppenish, Wash.	KENE	1490	
Torrington, Conn.	WBZY	990	
	WTOR	610	M
Torrington, Wyo.	KGOS	1490	
Towanda, Pa.	WTTC	1550	
Towson, Md.	WAQE	1570	
Trail, B.C.	CJAT	610	
Traverse City, Mich.	WTCM	1400	
	WCCW	1310	
Trenton, Mo.	KTTN	1600	
Trenton, N.J.	WAAT	1300	
	WBUD	1260	
	WTTM	920	M
Trinidad, Colo.	KCRT	1240	M
Troy, Ala.	WTBF	970	M
Troy, N.Y.	WHAZ	1330	
	WTRY	980	
	WXKW	1600	
Troy, N. C.	WJRM	1390	
Truckee, Calif.	KHOE	1400	
Truth or Consequences, New Mexico	KCHS	1400	
Tryon, N.C.	WTYN	1550	M
Tucson, Ariz.	KTUC	1400	A
	KXEW	1600	
	KAIR	1490	
	KCEE	790	
	KTAN	580	A
	KCUB	1290	M
	KEVT	690	
	KHOS	940	
	KMOP	1330	
	KFIF	1550	
	KTKT	990	
	KOLD	1450	C
Tucumcari, N.Mex.	KTNM	1400	M
Tulare, Calif.	KCOK	1270	M
	KGEN	1370	
Tulia, Tex.	KTUE	1260	
Tullahoma, Tenn.	WJIG	740	
Tulsa, Okla.	KAKC	970	
	KOME	1300	
	KRMG	740	C
	KELI	1430	C
	KVOO	1170	N
	KFMJ	1050	
Tupelo, Miss.	WELO	580	M
	WTUP	1490	A
Turlock, Calif.	KCEY	1390	
Tuscaloosa, Ala.	WJRD	1150	
	WACT	1420	
	WNPT	1280	A
	WTUG	790	
	WTBC	1230	M
Tuscumbia, Ala.	WVNA	1590	
	WRCK	1410	
Tuskegee, Ala.	WABT	580	
Twenty-Nine Palms, Calif.	KDHI	1250	
Twin Falls, Idaho	KTFI	1270	N
	KLIX	1310	M
	KEEP	1450	
Two Rivers, Wis.	WTRW	1590	
Tyler, Tex.	KDOK	1330	
	KGJB	1490	M
	KTBB	600	A
	KZEY	690	
Tyrone, Pa.	WTRN	1340	
Uhrichsville, Ohio	WUND	1540	
Uhrichsville, Ohio	WBTC		
Ukiah, Calif.	KUKI	1400	
	KMSL	1250	
Union, Me.	KLPW	1220	
Union, S.C.	WBCU	1460	
Union City, Tenn.	WENK	1240	
Uniontown, Pa.	WMBS	590	C
Urbana, Ill.	WILL	580	
	WKID	1580	
Utica, N.Y.	WIBX	950	C
	WBVM	1550	
	WRUN	1150	
	WTLB	1310	A
Uvalde, Tex.	KVOU	1400	
Valdese, N.C.	WSUM	1490	
Valdosta, Ga.	WGOV	950	M
	WGAF	910	A
	WJEM	1150	
	WVLD	1450	
Valentine, Nebr.	KVSH	940	
Vallejo, Calif.	KNBA	1490	M
Valley City, N.Dak.	KOVC	1490	M
Valparaiso-Niceville, Fla.	WNSM	1340	
Van Buren, Ark.	KFDF	1580	
Van Cleve, Ky.	WMTC	780	
Van Wert, Ohio	WERT	1220	
Vanceburg, Ky.	WKKS	1570	
Vancouver, Wash.	KISN	910	
	KKEY	1150	
	KVAN	1480	
	KGAR	1550	
Vandalia, Ill.	WPMB	1500	
Venice, Fla.	WAMR	1320	
Ventura, Calif.	KVEN	1450	M
	KUDU	1590	
Vermillion, S.Dak.	KUSD	890	
Vernal, Utah	KVEL	1250	
Vernon, Tex.	KVWC	1490	
Vero Beach, Fla.	WAXE	1370	
	WTTB	1490	A
	WQBC	1420	M
Vicksburg, Miss.	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	M
Vineland, N.J.	WWBZ	1360	
	WDVL	1270	
Vinita, Okla.	KVIN	1470	
Vinton, Va.	WKBA	1550	
Virginia, Minn.	WHLB	1400	N
Virginia Bch., Va.	WBOF	1550	
Viroqua, Wis.	WISV	1380	
Visalia, Calif.	KONG	1400	
Vivian, La.	KLVI	1600	
Waco, Tex.	WACO	1580	A
	KAWA	1010	
	KBGO	1580	
	KWTX	1230	M
Wadena, Minn.	KWAD	920	M
Wadesboro, N.C.	WADE	1210	
Wailuku, Hawaii	KMVI	550	N
Waipahu, Hawaii	KAHU	940	
Walhalla, S.C.	WGOG	1460	
Wallace, Idaho	KWAL	620	M
Wallace, N.C.	WLSE	1400	
Walla Walla, Wash.	KHIT	1320	
	KUJ	1420	M
	KTEL	1490	A
Walnut Ridge, Ark.	KRLW	1320	
Walsenburg, Colo.	KFLJ	1380	
Walterboro, S.C.	WALD	1220	A
Waltham, Mass.	WCRB	1330	
Walton, N.Y.	WDLA	1270	
Ward Ridge, Fla.	WJOE	1570	
Ware, Mass.	WARE	1250	M
Warner Robbins, Ga.	WRPB	1350	A
Warren, Ark.	KWRF	660	
Warren, Ohio	WHHH	1440	
Warren, Pa.	WNAE	1310	
Warrensburg, Mo.	KOKO	1450	
Warrenton, Mo.	KWRE	730	
Warrenton, Va.	WEER	1570	
	WKCW	1420	
Warsaw, Ind.	WRSW	1480	
Warsaw, Va.	WNNT	690	
Warwick-E.Greenwich, R.I.	WYNG	1590	
Wasco, Calif.	KWSO	1050	
Washington, D.C.	WGMS	570	
	WMAL	630	A
	WOL	1450	M
	WOOK	1340	
	WWDC	1260	
	WRC	980	N
	WTOP	1500	C
Washington, Ga.	WKLE	1370	
Washington, Ind.	WAMW	1580	
Washington, Iowa	KCII	1380	
Washington, N.J.	WCRV	1580	
	WITN	930	A
Washington, N.C.	WEEW	1320	
Washington, Pa.	WJPA	1450	M
Washington Court House, Ohio	WCHO	1250	
Waterbury, Conn.	WATR	1320	A
	WBRY	1590	C
	WWCO	1240	M
Waterbury, Vt.	WDEV	550	M
Waterloo, Iowa	KXEL	1540	A
	KNWS	1090	
	KWWL	1330	M
Watertown, N.Y.	WATN	1240	
	WOTT	1410	
	WWNY	790	C
Watertown, S.Dak.	KSDR	1480	
	KWAT	950	M
Watertown, Wis.	WTTN	1580	
Waterville, Me.	WTVL	1490	A
Watseka, Ill.	WGFA	1360	
Watsonville, Calif.	KOMY	1340	
Wauchula, Fla.	WAUC	1310	
Waukegan, Ill.	WKRS	1220	
Waukesha, Wis.	WAUX	1510	
Waupaca, Wis.	WDUX	800	A
Wausau, Wis.	WRIG	1400	N
	WSAU	550	A
	WHVF	1230	
Waverly, Iowa	KWVY	1470	
Waverly, Ohio	WPKO	1380	
Waverly, Tenn.	WPHC	1540	
Waxahachie, Tex.	KBEC	1390	

WHITE'S RADIO LOG

Location	C.L.	Kc.	N.A.
Wayeross, Ga.	WACL	570	
	WAYX	1230	M
Waynesboro, Ga.	WBRO	1310	
Waynesboro, Miss.	WABO	990	
Waynesboro, Pa.	WAYZ	1380	
Waynesboro, Va.	WAYB	1490	M
	WRWV	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	1450	N
Weiser, Idaho	KWEI	1260	
Welch, W.Va.	WELC	1150	
	WOVE	1340	M
Weldon, N.C.	WCNF	1400	
Wellsboro, Pa.	WNBT	1490	M
Wellston, Ohio	WKOV	1330	
Wellsville, N.Y.	WLSV	790	
Wenatchee, Wash.	KPQ	560	A
	KUEN	900	
	KMEL	1340	M
Wendell-Zebulon, N.C.			
	WETC	540	
Weslaco, Tex.	KRGV	1290	N
West Allis, Wis.	WAWA	1590	
W. Bend, Wis.	WBKV	1470	
Westbrook, Me.	WJAB	1440	
West Chester, Pa.	WCHE	1520	
W. Frankfort, Ill.	WFRX	1300	
West Jefferson, N.C.			
	WKSK	1600	
W. Memphis, Ark.	KSUD	730	
W. Monroe, La.	KUZN	1310	
W. Palm Beach, Fla.			
	WEAT	850	M
	WJNO	1230	C
	WIRK	1290	M
West Plains, Mo.	KWPM	1450	
West Point, Ga.	WBMK	1310	
West Point, Miss.	WROB	1450	M
Westport, Conn.	WMMM	1260	M
W. Springfield, Mass.			
	WTXL	1490	A
W. Yarmouth, Mass.			
	WOCB	1240	M
Westerly, R.I.	WERI	1230	M
Westfield, Mass.	WDEW	1570	
Westminster, Md.	WTTR	1470	
Weston, W.Va.	WHAW	980	M
W. Warwick, R.I.	WWRI	1450	
Wetumpka, Ala.	WETU	1250	
Wewoka-Seminole, Okla.			
	KWSH	1260	A
Wharton, Tex.	KANI	1500	
Wheatland, Wyo.	KYCN	1340	
Wheaton, Md.	WDON	1540	
Wheeling, W.Va.	WHLL	1600	
	WBZE	1470	
	WKWK	1400	A
	WWVA	1170	C
White Castle, La.	KEVL	1590	
White Plains, N.Y.	WFAS	1230	
White River Junc., Vt.			
	WVTR	910	
Whitehall, Mich.	WCBP	1490	
Whitesburg, Ky.	WTCW	920	
Whiteville, N.C.	WENC	1220	
Wichita, Kans.	KAKE	1240	M
	KLEO	1480	M
	KFDI	1070	N
	KFH	1330	C
	KSIR	900	
	KWBB	1410	
Wichita Falls, Tex.	KNIN	990	M
	KTRN	1290	
	KWFT	620	C
Wickenburg, Ariz.	KAKA	1250	
Wickford, R.I.	WKFD	1370	
Wildwood, N.J.	WCMC	1230	M
Wilkes-Barre, Pa.	WBAX	1240	M
	WBRE	1340	N
	WILK	980	A
Willcox, Ariz.	KHIL	1250	
Williamsburg, Ky.	WEZJ	1440	
Williamsburg, Va.	WBCI	740	
Williamson, W.Va.	WBTH	1400	M
Williamsport, Pa.	WLYC	1050	
	WRAK	1400	N
	WWPA	1340	C
Williamston, N.C.	WIAM	900	
Willimantic, Conn.	WILI	1400	M
Williston, N.D.	KEYZ	1360	
Willmar, Minn.	KWLM	1340	A
Willoughby, Ohio	WELW	1330	D
Willow Springs, Mo.	KUKU	1330	
Willows, Calif.	KIQS	1580	
Wilmington, Del.	WAMS	1380	M
	WDEL	1150	N
	WILM	1450	A
	WTUX	1290	
Wilmington, N.C.	WMFD	630	A
	WHSL	1490	
	WKLM	980	
	WGNI	1340	M
Wilson, N.C.	WGTM	590	C
	WLLY	1350	
	WVOT	1420	M
Winchester, Ky.	WWKY	1380	
Winchester, Tenn.	WCDT	1340	
Winchester, Va.	WINC	1400	A
	WHPL	810	
Windber, Pa.	WWBR	1350	
Windemere, Fla.	WXIV	1480	
Winder, Ga.	WIMO	1300	
Windom, Minn.	KDOM	1580	
Windsor, Conn.	WSOR	1480	
Winfield, Ala.	WEZQ	1300	
Winfield, Kan.	KNIC	1550-2500	D
Winnemucca, Nev.	KWNA	1400	
Winnfield, La.	KVCL	1270	
Winner, S.Dak.	KWYR	1260	
Winnsboro, La.	KMAR	1570	
Winnsboro, S.C.	WCKM	1250	
	WRBI	980	
Winona, Minn.	KWNO	1230	A
	KAGE	1380	
Winona, Miss.	WONA	1570	
Winslow, Ariz.	KVNC	1010	A
	KINO	1230	
Winston-Salem, N.C.			
	WAAA	980	
	WAIR	1340	
	WPEG	1550	
	WSJS	600	N
	WTOB	1380	M-C
Winter Garden, Fla.	WOKB	1600	
Winter Haven, Fla.	WSIR	1490	M
	WINT	1360	
Winter Park, Fla.	WABR	1440	M
Wisconsin Rapids, Wis.			
	WFHR	1320	M
	WRNE	1220	
Wolf Pt., Mont.	KVCK	1450	M
Wood River, Ill.	WBBY	590	M
Woodside, N.Y.	WWRL	1600	
Woodward, Okla.	KSIW	1450	
Woonsocket, R.I.	WNRI	1380	
	WWON	1240	
Wooster, Ohio	WWST	960	
Worcester, Mass.			
	WAAB	1440	M-N-A
	WNEB	1230	
	WORC	1310	
	WTAG	580	C
Worland, Wyo.	KWOR	1340	M
Worthington, Minn.	KWOA	730	
Worthington, Ohio	WRFD	880	
Wynne, Ark.	KWYN	1400	
Wyoming, Mich.	WERX	1530	
Wytheville, Va.	WYVE	1280	
Yakima, Wash.	KIT	1280	
	KIMA	1460	C
	KBBO	1390	
	KQOT	940	
	KUTI	980	
	KYAK	1390	M
Yankton, S.D.	KYNT	1450	
	WNAX	570	C
Yauco, P.R.	WKFE	1550	
Yazoo City, Miss.	WAZF	1230	
York, Nebr.	KAWL	1370	
York, Pa.	WNOW	1250	M
	WORK	1350	N
	WSBA	910	A
York, S.C.	WYCL	1580	
Youngstown, Ohio.	WBBW	1240	M
	WFMJ	1390	N
	WKBN	570	C
Ypsilanti, Mich.	WYSI	1480	
	WYNZ	1520	
Yreka, Calif.	KSYC	1490	
Yuba City, Calif.	KUBA	1600	
	KAGR	1450	
Yuma, Ariz.	KBLU	1320	
	KVOY	1400	A
	KYUM	560	N
Zanesville, Ohio	WHIZ	1240	N
Zarephath, N.J.	WAWZ	1380	
Zephyr Hills, Fla.	WZRH	1400	

U. S. FM Stations by States

Abbreviations: Mc., megacycles; asterisk (*) indicates educational station

Location	C.L.	Mc.
ALABAMA		
Albertville	WAVU-FM	105.1
Alexander City	WRFS-FM	106.1
Andalusia	WCTA-FM	98.1
Anniston	WHMA-FM	100.5
Athens	WJOF	104.3
Birmingham	WAPI-FM	99.5
	WBRC-FM	106.9
	WSFM	93.7
Clanton	WKLF-FM	100.9
Cullman	WFMH-FM	101.1
Decatur	WHOS-FM	102.1
Homewood	WJLN	104.7
Huntsville	WAHR	99.1
	WNDA	92.9
Mobile	WKRG-FM	99.9
Montgomery	WFMI	98.9
Sylacauga	WMLS-FM	98.3
Tuscumbia	WVNA	100.3
Tuscaloosa	WTBO-FM	95.7
	WUOA	*91.7
Montgomery	WAJM-FM	103.3
ALASKA		
Anchorage	KNIK	105.5
	KBYR-FM	102.1
College	KUAC	104.9
ARIZONA		
Globe	KWJB-FM	100.3
Mesa	KBUZ-FM	104.7
Phoenix	KRFM-FM	95.5
	KFCA	*88.5
	KOOL-FM	94.5
	KITH	101.3
	KNIZ	102.5
	KOY-FM	92.5
	KPHO-FM	96.9
	KTAR-FM	98.7
	KYEW	93.3
Sun City	KTPM	106.3
Tempe	KUPD-FM	97.9
Tucson	KFMM	99.5
	KSOM	92.1
ARKANSAS		
Blytheville	KLCN-FM	96.1
El Dorado	KRIL-FM	99.3
Ft. Smith	KFPW-FM	94.9
Harrison	KHOZ-FM	102.9
Jonesboro	KBTM-FM	101.9
	KASU	91.9
Little Rock	KARK	103.7
Mammoth Springs	KAMS	103.9
Osceola	KOSE-FM	98.1
Pine Bluff	KOTN-FM	92.3
Siloam Springs	KUOA-FM	105.7
CALIFORNIA		
Alameda	KJAZ	92.7
Anaheim	KEZR-FM	95.9
Arcata	KTOO	*90.5
Atherton	KPEN	101.3
Auburn	KAFI	101.1
Avalon	KBIG	104.3
Bakersfield	KERN-FM	94.1
	KQXR	101.5
Berkeley	KPFA	94.1
	KPFB	*89.3
	KPAT-FM	102.9
Bijou	KHUR	99.9
Claremont	KSPC	*88.9
Coachella	KCHQ-FM	93.7
El Cajon	KECR	93.3
Fresno	KARM-FM	101.9
	KCIB-FM	94.5
	KFRE-FM	93.7
	KMJ-FM	97.9
	KXQR	102.7
Garden Grove	KGGK	94.3
Glendale	KFMU	97.1
	KUTE	101.9
Hayward	KBBM	101.7
Inglewood	KTYM-FM	103.9
LaSierra	KSDA	*89.7
Lodi	KCVR-FM	97.7
Long Beach	KFOX-FM	102.3
	KLON	*88.1
	KNOB	97.9
Los Altos	KPGM	97.7
Los Angeles	KABC-FM	95.5
	KBBI	107.5
	KBCA	105.1
	KBIQ	104.3
	KBMS	105.9
	KCBH	98.7
	KFAC-FM	92.3
	KGLA	*103.5
	KHJ	101.1
	KMLA	100.3
	KNX-FM	93.1
	KPFK	*90.7
	KPOL-FM	93.9
	KRHM	94.7
	KRKD-FM	96.3
	KLAC-FM	102.7
	KUSC	*91.5
	KXLU	*88.7
	KHOF	99.5
Marysville	KRFD	99.9
Modesto	KBEE-FM	103.3
	KTRB-FM	104.1
Monterey	KHFR	96.9
Mountain View	KFJC	*88.5
Newport Beach	KNBB	103.1
Oakland	KAFE	98.1
Oceanside	KUDE	102.1
Ontario	KASK-FM	93.5
Oxnard	KAAR	104.7
Pasadena	KPCS	89.3
	KPPC-FM	106.7
Palm Springs	KDES-FM	104.7
Redondo Beach	KAPP	93.5
Redlands	KCHL FM	96.7
Ridgecrest	KLOA-FM	105.5
Riverside	KPLI	99.1
	KACE-FM	92.7
	KDUO	97.5
Sacramento	KCRA-FM	96.1
	KFBK-FM	96.9
	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
San Bernardino	KVCR	*91.9
	KFMW	99.9
	KEBS	*89.5
San Diego	KOGO-FM	94.1
	KFMB-FM	100.7
	KFMX-FM	96.5
	KGB-FM	101.5
	KITT	105.3
	KJLM	98.1
	KLRO	94.9
	KPRI	106.5
	KSDS	*88.3
	KBBW	102.9
San Fernando	KVFM	94.3
San Francisco	KALW	*91.7
	KBCD	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
	KHIP	106.9
	KRON-FM	96.5
	KSFR	94.9
	KQBY-FM	95.7
	KXKX	88.5
	KYA-FM	93.3
San Jose	KSJO-FM	92.3
	KRPM	98.5
	KSJS	90.7
San Luis Obispo	KATY-FM	96.1
San Rafael	KTIM	100.9
San Mateo	KCSM	*90.9
San Mateo	KUFY	107.7

Location	C.L.	Mc.
Santa Ana	KWIZ-FM	96.7
	KFIL	106.3
Santa Barbara	KRCW	97.5
	KOB-FM	93.7
	KMUZ	103.3
Santa Clara	KSCU	*90.1
Santa Cruz	KSCO-FM	99.1
Santa Maria	KEYM	99.1
	KSMA-FM	102.5
Santa Monica	KCRW	*89.9
	KSRF	103.1
Sierra Madre	KMAX	107.1
Stockton	KUOP	*91.3
	KSTN-FM	107.3
	KWG-FM	105.7
Thousand Oaks	KNJO	92.7
Turlock	KHOM	92.9
Ventura-Oxnard	KVEN-FM	100.7
Visalia	KONG-FM	92.9
Walnut Creek	KWME-FM	92.1
West Covina	KDWC	98.3
Woodland	KATT	95.3

COLORADO

Boulder	KRNW	97.3
Colorado Springs	KRCC	*91.3
	KFMH	96.5
	KSHS	*90 5
	KVOR-FM	92.9
Cortez	KZFM	94.1
Denver	KFML-FM	98.5
	KDEN-FM	99.5
	KLIR-FM	100.3
	KLZ-FM	106.7
	KOA-FM	103.5
	KTGM	105.1
Grand Junction	KREX-FM	92.3
Manitou Springs	KCMS-FM	102.7

CONNECTICUT

Bridgeport	WJZZ	99.9
Bridgeport	WPKN	88.1
Brookfield	WGHF	95.1
Danbury	WLAD-FM	98.3
Hartford	WHCN	105.9
	WDRC-FM	102.9
	WCCC-FM	106.9
	WSCH	93.7
	WRTC-FM	*89.3
	WTIC-FM	96.5
Manchester	WINF-FM	107.9
Meriden	WBMI	95.7
Middletown	WESU	88.1
New Haven	WNHC-FM	99.1
	WYBC-FM	94.3
Stamford	WSTC-FM	96.7
Storrs	WHUS	*90.5
Waterbury	WATR-FM	92.5
Westport	WMMM	107.9

DELAWARE

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

D. C.

Washington	WASH-FM	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

Clear Water	WTAN-FM	95.7
Cocoa Beach	WXBR	101.1
Coral Gables	WVCG-FM	105.1
Daytona Beach	WNDB-FM	94.5
Fort Lauderdale	WWIL-FM	103.5
	WFLM	105.9
	WFTL-FM	106.7
	WMJR	100.7
	WARN	98.7
Fort Pierce	WRUF-FM	*104.1
Gainesville	WJAX-FM	95.1
Jacksonville	WMBR-FM	98.1
Miami	WKAT-FM	93.3
	WGBS-FM	96.3
	WIOO-FM	97.3
	WTHS	*91.7
	WEDR	99.1
	WWPB-FM	101.5
Miami Beach	WKAT-FM	93.1
	WAEZ-FM	94.9
	WMBM-FM	93.9
Ocala	WMOP-FM	93.7
Orlando	WDBO-FM	92.3
	WHOO-FM	96.5
	WKIS-FM	100.3
Palm Beach	WWOS-FM	97.9
Pensacola	WPEX-FM	94.1
St. Petersburg	WGNB	101.5
	WTCX	99.5
Sarasota	WYAK	102.5
Tallahassee	WFSU-FM	*91.5
	WBGM-FM	98.9
Tampa	WDAE-FM	100.7
	WFLA-FM	93.3
	WPKM	104.7
	WTUN	*88.9
Winter Haven	WINT-FM	97.5
Winter Park	WPRK	*91.5

GEORGIA

Albany	WGPC-FM	104.5
Athens	WGAU-FM	102.5
Atlanta	WABE	*90.1
	WAVQ	94.9
	WPLO-FM	103.3
	WGKA-FM	92.9
	WSB-FM	98.5
Augusta	WAUG-FM	105.7
	WBBQ-FM	103.7
Columbus	WRBL-FM	93.3
Gainesville	WDUN-FM	103.9
Lagrange	WLAG-FM	104.1
Macon	WMAZ-FM	99.1
Marietta	WBIE-FM	101.5
	WKLS	96.1
Newnan	WCOH-FM	96.7
Savannah	WTOC-FM	97.3
Swainsboro	WJAT-FM	101.7
Toccoa	WLET-FM	106.1

HAWAII

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

IDAHO

Boise	KBOI-FM	97.9
Lewiston	KOZE-FM	96.7
Pocatello	KBGL	*88.7

ILLINOIS

Alton	WOKZ-FM	100.3
Anna	WRAJ-FM	92.7
Arlington Heights	WNWC	92.7
Aurora	WKKO-FM	95.9
Bloomington	WJBC-FM	101.5
Carbondale	WSIU	*91.9
Carmi	WROY-FM	97.3
Champaign	WDWS-FM	97.5
	WLRW-FM	94.5
Chicago	WBBM-FM	96.3
	WBEZ	*91.5
	WCLM	101.9
	WDHF	95.5
	WEBH	93.9
	WEFM	99.5
	WHFC	97.9
	WENR-FM	94.7
	WFMF	100.3
	WFMQ	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
Decatur	WSOY-FM	102.9
DeKalb	WNIC	*91.1
	WLBK-FM	92.5
E. St. Louis	WBBR	101.7
Effingham	WCRA-FM	95.7
	WELG	103.9
	WRMN-FM	94.3
Elgin	WEPS	*88.1
Elmhurst	WRSE-FM	*88.7
Elmwood Park	WXFM	105.9
Evanston	WEAW	105.1
	WNUR	*89.3
Galesburg	WYKC-FM	*88.1
Glen Ellyn	WELF-FM	107.1
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	WKSD	*91.9
Litchfield	WSMI-FM	106.1
Loves Park	WLUV-FM	96.7
Macomb	WWKS	*91.3
Mattoon	WLBH-FM	96.9
Morris	WRMI-FM	104.7
Mt. Carmel	WSAB	94.9
	WVMC-FM	101.1
Mt. Vernon	WMIX-FM	94.1
Oak Park	WOPA-FM	102.7
Olney	WSEI-FM	92.9
Paris	WPRS-FM	98.3
Park Forest	WRHS	*88.1
Park Ridge	WMTH	*88.5
Peoria	WMBO-FM	92.5
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
Rock Island	WVIK	90.9
Skokie	WRSV	98.3
South Beloit	WBEL-FM	103.1
Springfield	WTAX-FM	103.7
Taylorville	WGGM	95.0
Urbana	WILL-FM	*90.9
Waukegan	WEFA	102.3
Wheaton	WETN-FM	*88.1
Winnetka	WNTH	*88.1

INDIANA

Anderson	WAFM	97.9
Bloomington	WFIU	*103.7
	WTTV-FM	92.3
Columbus	WCSI-FM	98.3
Connersville	WCNB-FM	100.3
Crawfordsville	WBBS-FM	106.3
Elkhart	WCMR-FM	104.7
	WTRC-FM	100.7
Evansville	WIKY-FM	104.1
	WEVC	*91.5
	WPSR	90.7
Franklin	WFCI	*89.3
Frankfort	WILO-FM	99.7
Fort Wayne	WPTH	95.1
Gary	WGVE	*88.1
Goshen	WGCS	91.1
Greencastle	WGRE	*91.7
Greenfield	WSMJ	99.5
Greensburg	WTRE	107.3
Hammond	WYCA	92.3
Hartford City	WHCI	*91.9
Huntington	WVSH	*91.9
Indianapolis	WAJC	*104.5
	WICR	*88.7
	WISH-FM	107.9
	WALV	105.7
	WFBM-FM	94.7
	WFMS	95.5
	WIAN	*90.1
	WIBC-FM	93.1
	WITZ-FM	104.7
Jasper	WFKO	100.5
Kokomo	WASK-FM	105.3
Lafayette	WLOI-FM	96.7
La Porte	WORX-FM	96.7
Madison	WMRI-FM	106.9
Marion	WBST	*90.7
	WMUN	104.1
Muncie	WWHI	*91.5
	WNAS	*88.1
New Albany	WCTW-FM	102.5
New Castle	WYSN	*91.1
North Vernon	WOCH-FM	106.1
Princeton	WRAY-FM	98.1
Richmond	WGLM	96.1
Salem	WSIM-FM	98.9
Seymour	WJOD	93.7
South Bend	WETL	*91.9
	WNDU-FM	92.9
	WPFR	102.7
Terre Haute	WTHI-FM	99.9
	WVTS	100.7(s)
Wabash	WSKS	*91.3
Warsaw	WRSW-FM	107.3
Washington	WFML	106.5
West Lafayette	WBAA-FM	99.1

IOWA

Ames	WOI-FM	*90.1
Boone	KFGQ	*99.3
Cedar Falls	KTCF	*88.1
Cedar Rapids	KHAK-FM	98.1
	WMT-FM	104.5
Clinton	KROS-FM	96.1
Davenport	WOC-FM	103.7
Des Moines	KDPS	*88.1
	KOMI	97.3
	KSO	98.5
	WHO-FM	100.3
Iowa City	WMT-FM	*91.7
Muscatine	KWPC-FM	99.7
Sioux City	KDVR	97.9
Storm Lake	KAYL-FM	101.5
Waverly	KWAR	89.1

KANSAS

Emporia	KSTE	*88.7
Garden City	KNCO-FM	97.3
Kansas City	KCJC	98.1
	KCKN	94.1
Lawrence	KANU	*91.5
Leavenworth	KCLO-FM	98.9
Manhattan	KSDB-FM	*88.1
Newton	KJRG-FM	92.1
Ottawa	KTJO-FM	*88.1
Parsons	KPPS-FM	*91.1
Salina	KAFM	99.9
Topeka	KTOP-FM	100.3
Wichita	KFH-FM	100.3
	KWBB-FM	101.3
	KMUW	*89.1
	KCBM-FM	107.3

KENTUCKY

Ashland	WCMI-FM	93.7
Central City	WNES-FM	101.9
Fulton	WFUL-FM	104.9
Georgetown	WRVG	90.1
Glasgow	WGGC	95.1
Greenville	WKYF-FM	101.1
Hazard	WKIC-FM	96.5
Henderson	WSON-FM	99.5
Hopkinsville	WRLX	98.7
	WKOF	100.3
Lexington	WBKY	*91.3
	WLAP-FM	94.5
Louisville	WFPK	*91.9
	WFPL	*89.3
	WKLO-FM	99.7
Madisonville	WFMW-FM	93.9
	WNGO-FM	94.7
Owensboro	WOMI-FM	92.5
	WVJS-FM	96.1
Paducah	WPAD-FM	96.9
	WKYB-FM	93.3
Prestonburg	WDOC-FM	95.5

LOUISIANA

Alexandria	KALB-FM	96.9
Baton Rouge	WJBO-FM	96.1
Jennings	KJEF-FM	92.7
Monroe	KMLB-FM	104.1
Mt. Vernon	KRNL-FM	105.3
New Orleans	WBEH	89.3
	WDSU-FM	105.3
	WRCM	97.1
	WMMT	95.7
Shreveport	KRMD-FM	101.1
	KBCL-FM	96.5
	KWKH-FM	94.5

MAINE

Augusta	WFAU-FM	101.3
Bangor	WABI-FM	97.1
Brunswick	WBOR	*91.1
Caribou	WFST-FM	97.7
Lewiston	WCOU-FM	93.9
	WRJR	91.5
Orono	WMEB-FM	91.9
Poland Springs	WMTW-FM	94.9
Portland	WLOB-FM	97.9

MARYLAND

Annapolis	WNAV-FM	99.1
	WANN-FM	107.9
	WXTC	107.9
	WAQE-FM	101.9
Baltimore	WBJC	*88.1
	WCAO-FM	102.7
	WCBM-FM	108.5
	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	(s)
	WHFS-FM	102.5
Bradbury Heights	WPGC	95.5
Cumberland	WCUM-FM	102.9
Frederick	WFMD-FM	99.9
Hagerstown	WJEJ-FM	104.7
	WARK-FM	106.9
Havre de Grace	WASA-FM	103.7
Oakland	WBUZ	95.5
Tacoma Park	WGTS-FM	*91.9
Waldorf	WSMD	104.1
Westminster	WTTR-FM	100.7

MASSACHUSETTS

Amherst	WAMF	*88.1
	WFCR	*88.5
	WMUA	*91.1
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	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	WFGM-FM	104.7
Framingham	WKOX-FM	105.7
Greenfield	WHAI-FM	98.3
Haverhill	WHAV-FM	92.5
Lawrence	WGHJ	93.7
Lowell	WLLH-FM	99.5
Lynn	WHIL-FM	107.9
Medford	WISK	107.9
New Bedford	WBSM-FM	97.3
	WNBH-FM	98.1
Plymouth	WPLM-FM	99.1
S. Hadley	WMHC	*88.5

WHITE'S RADIO LOG

Location	C.L.	Mc.
Springfield	WHYN-FM	93.1
	WEOK	*91.7
	WSCB	*88.9
	WMAS-FM	94.7
Waltham	WCRB-FM	102.5
W. Yarmouth	WOCB-FM	94.3
Williamstown	WCFM	*90.1
Winchester	WHSR-FM	*91.9
Worcester	WAAB	107.3
	WTAG-FM	96.1

MICHIGAN

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
Coldwater	WTVB-FM	98.3
Dearborn	WKNR-FM	100.3
Detroit	WOET-FM	*101.9
	WBFG-FM	98.7
	WCHD	105.9
	WOTM	106.7
	WABX	99.5
	WOTR	*90.9
	WGPM	107.5
	WJBK-FM	93.1
	WMUZ	103.5
	WMZK	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
E. Lansing	WKAR-FM	*90.5
	WSWM	99.1
Flint	WFBE	*95.1
	WGMZ-FM	107.9
Grand Rapids	WFUR-FM	102.9
	WJEF-FM	93.7
	WLAV-FM	96.9
	WMAX-FM	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
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	WBBC	94.1
	WKHM-FM	106.1
Kalamazoo	WMCR	102.1
	WKMI-FM	106.5
Lansing	WJIM-FM	97.5
	WMRT-FM	100.7
Marquette	WNMR	90.1
Midland	WQDC-FM	99.7
Mount Clemens	WBRB-FM	102.7
Mount Pleasant	WCMU	90.1
Muskegon	WMUS-FM	106.9
Oak Park	WLDM	95.5
Royal Oak	WOAK	*89.3
	WOMC	104.3
Saginaw	WSAM-FM	98.1
Spring Arbor	WSAE	*89.3
Sturgis	WSTR-FM	103.1

MINNESOTA

Brainerd	KLIZ-FM	95.7
Mankato	KMSO	*90.5
	KYSM-FM	103.5
Minneapolis	KTIS-FM	*98.5
	KWFM	97.1
	WLOL-FM	99.5
	WPBC-FM	101.3
	WAYL	96.1
St. Cloud	KFAM-FM	104.7
St. Louis Park	KRSI-FM	104.1
St. Paul	KNOF	95.3
Worthington	KWOA-FM	94.9

MISSISSIPPI

Jackson	WJOX-FM	102.9
Laurel	WNSL-FM	100.3
Meridian	WMMI	*88.1

MISSOURI

Clayton	KFUO-FM	99.1
Joplin	WMBH-FM	98.1
	KSYN	92.5
Kansas City	KCMO-FM	94.9
	KBEY	104.3
	KTSR	*90.1
	WOAF-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
Poplar Bluff	KWOC-FM	94.5
St. Joseph	KUSN-FM	105.1
St. Louis	KCFM	98.7
	KADI	96.5
	WAMV-FM	101.1
	WIL-FM	92.3
	KSLH	*91.5
	KSTL-FM	98.1
	KRFO	106.9
Springfield	KTTS-FM	94.7
	KTXR	101.5
West Plains	KWPM-FM	93.9

MONTANA

Belgrade	KGVW-FM	96.7
Billings	KURL-FM	97.1
Great Falls	KARR-FM	106.3

NEBRASKA

Beatrice	KWBE-FM	92.9
Columbus	KJSK-FM	96.7
Kearney-Holdrege	KRNY-FM	98.9
Lexington	KRUN-FM	93.1
Lincoln	KFMQ	95.3
Omaha	KQAL-FM	94.3
	KFAB-FM	99.9
	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
Reno	KNEV	95.5
	KUNR	88.1

NEW HAMPSHIRE

Berlin	WMOU-FM	103.7
Claremont	WTSV-FM	106.1
Durham	WUNH	90.3
Manchester	WKBR-FM	95.7
	WGIR-FM	101.1
Mt. Washington	WMTW-FM	94.9
Nashua	WOTW-FM	106.3

NEW JERSEY

Asbury Park	WJLK-FM	94.3
Atlantic City	WFPG-FM	96.9
	WMGM	103.7
	WRNJ	95.1
Bridgeton	WSNJ-FM	107.7
Camden	WKON-FM	108.9
Dover	WOHA-FM	105.5
E. Orange	WFMU	*91.1
Eatontown	WHTG-FM	105.3
Franklin Lakes	WRRH	88.7
Glassboro	WGLS-FM	89.7
Hackettstown	WNTI	*91.9
Long Branch	WRLB	107.1
Millville	WMVB-FM	97.3
Newark	WHBI	105.9
	WFME-FM	94.7
	WVNJ-FM	100.3
	WBGO	*88.3
New Brunswk.	WCTC-FM	98.3
Paterson	WPAT-FM	93.1
Princeton	WPRB	103.9
Red Bank	WFHA-FM	106.3
South Orange	WSOU	*89.5
Trenton	WBUD-FM	101.5
	WTOA	97.5
Wildwood	WCMC-FM	100.7
Zarephath	WAWZ-FM	99.1

NEW MEXICO

Alamogora	KQOI	94.3
Albuquerque	KANW	*89.1
	KHFM	96.3
Clovis	KTQM-FM	99.9
Los Alamos	KRSN-FM	98.5
Mountain Park	KMFM	97.9
Roswell	KBIM-FM	97.1

NEW YORK

Albany	WAMC	*90.3
Auburn	WMBO-FM	96.1
Babylon	WTFM	103.5
	WGU-FM	102.3
Binghamton	WNBF-FM	98.1
	WKOP-FM	95.3
Brooklyn	WNYE	*91.5
Brookville	WCWP	88.1
Buffalo	WBEN-FM	102.5
	WOCX	99.5
	WBFO	*88.7
	WEBR	94.5
	WGR-FM	94.9
	WBUF	93.3
	KWOL-FM	104.1
	WIFE-FM	103.3
Central Square	WCSQ	*89.3
Cherry Valley	WJIV	101.9
Clinton	WHCL-FM	88.7
Corning	WCLI-FM	106.1
Cortland	WKRT-FM	99.9
DeRuyter	WOIV	105.1
Elmira	WECW	*88.1
Floral Park	WSHS	*90.3
Garden City	WLIR	92.7
Geneseo	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	101.7
Jamestown	WJTN-FM	93.3
Kenmore	WYSL-FM	103.3
Loudonville	WVCR-FM	89.1
Mt. Kisco	WRNW	107.1
New Rochelle	WVOX-FM	93.5
New York	WABC-FM	95.5
	WBAI	99.5
	WBFM	101.9
	WCBS-FM	101.1
	WEVD-FM	97.9
	WFUV	*90.7
	WHOM-FM	92.3
	WKCR-FM	*89.9
	WLIB	107.5
	WNCN	104.3
	WNEW-FM	102.7
	WNYC-FM	93.9
	WNYE	91.5
	WOR-FM	98.7
	WQXR-FM	96.3
	WNBC-FM	97.1
	WRFM	105.1
	WRVR	106.7
Niagara Falls	WHLO-FM	98.5
Olean	WHOL-FM	95.7
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	100.1
	WCMF	96.5
	WIRQ	*90.9
	WROC-FM	97.9
Schenectady	WGFM	99.5
South Bristol	WMHW	95.1
Springville	WSPE	*88.1
Syracuse	WAER	*88.1
	WOOS-FM	93.1
	WONO	100.9
	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
Burlington	WBBB-FM	101.1
	WFNS-FM	93.9
Burlington-Graham	WBAG-FM	92.9
Chapel Hill	WUNC	*91.5
Charlotte	WBT-FM	107.9
	WIST-FM	95.1
	WSOC-FM	103.5
	WYFM	104.7
Clingman's Pk.	WMIT	106.9
Concord	WEGO-FM	97.9
Durham	WDNC-FM	105.1
Elkin	WIFM-FM	100.9
Fayetteville	WFNC-FM	98.1
Forest City	WBBO-FM	93.3
	WAGY-FM	105.3
Gastonia	WGNC-FM	101.9
Goldsboro	WEQR	96.9
Greensboro	WMQE	98.7
	WQMG-FM	97.1
Greenville	WWWS	*91.3
Henderson	WHNC-FM	92.5
	WHKP-FM	102.5
Hendersonville	WHKP-FM	102.5
Hickory	WHKY-FM	102.9
	WIRC-FM	95.7
High Point	WHPE-FM	95.5
	WHPS	*89.3
	WMFR-FM	99.5
	WNOS-FM	100.3
Laurinburg	WEWO-FM	96.5
Leaksville	WLOE-FM	94.5
Lexington	WBUY-FM	94.3
Lumberton	WTSB-FM	95.7
North Wilkesboro	WKBC-FM	97.3
Raleigh	WKIX-FM	96.1
	WPTF-FM	94.7
	WRAL-FM	101.5
Reidsville	WREV-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
Tarboro	WCPS-FM	104.3
Thomasville	WTNC-FM	98.3
Williamston	WIAM	103.7
Wilmington	WPRV	98.9
Wilson	WVOT-FM	106.1
Winston-Salem	WAIR-FM	93.1
	WYFS	107.5
	WFOO-FM	*88.1
	WSJS-FM	104.1

OHIO

Akron	WAKR-FM	97.5
	WAPS	*89.1
	WCUF	96.5
Alliance	WFAH-FM	101.7
Ashland	WNCO-FM	101.3
Ashtabula	WREO-FM	97.1
Athens	WOUB-FM	*91.5
Barberton	WDBN	94.9
Bellaire	WOMP-FM	100.5
Berea	WBWC	*88.3
Bowling Green	WBGU	*88.1
Canton	WHBC-FM	94.1
	WCNO	106.9
	WTOF-FM	98.1
Celina	WMER-FM	94.3
Chillicothe	WBEX-FM	98.3
Cincinnati	WCPO-FM	105.1
	WAEF-FM	104.3
	WGUC	*90.9
	WAKW-FM	97.3
	WKRC-FM	101.9
	WSAI-FM	102.7
Cleveland	KYW-FM	105.7
	WXEN-FM	106.6
	WBOE	*90.3
	WCRF	103.3
	WDGO	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
Cleveland Hts.	WCUY-FM	92.5
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
Dayton	WHIO-FM	99.1
	WONE	104.7
Delaware	WSLN	*91.1
East Liverpool	WOHI-FM	104.3
Eaton	WCTM	92.9
Elyria	WEOL-FM	107.3
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
	WFOL-FM	94.9(s)
Hillsboro	WSRW-FM	106.7
Kent	WKSU-FM	*88.1
Kenton	WKTN	
Lancaster	WHOK-FM	95.5
Lima	WIMA-FM	102.1
Mansfield	WVNO-FM	*106.1
Marietta	WCMO	*89.3
Marion	WMRN-FM	106.9
Miamisburg	WFCJ	99.9
Middletown	WPFB-FM	103.9
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
Salem	WSOM-FM	105.1
Sandusky	WLEC-FM	102.7
Springfield	WBLY-FM	103.9
	WEEC-FM	100.7
Steubenville	WSTV-FM	103.5
Tiffin	WTTF-FM	103.7
Toledo	WSPD-FM	101.5
	WMHE	92.5

Location	C.L.	Mc.
	WTOS	*91.3
	WTOL-FM	104.7
	WTRT	99.9
Van Wert	WERT-FM	96.9
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	96.9
	WBBW-FM	99.3
	WRED	101.1
Zanesville	WHIZ-FM	102.5

OKLAHOMA

Durant	KSEO-FM	107.3
Midwest City	KMWC	94.7
Norman	WNAD-FM	*90.9
Oklahoma City	KOKH	*88.9
	KIOO	100.5
	KEFM	94.7
	KYFM	98.9
Shawnee	KBGC	*89.9
Stillwater	KOSU-FM	*91.7
	KSPI-FM	93.9
Tulsa	KWGS	*90.5
	KIHI	95.5
	KOCW	97.5
	KOGM-FM	92.9
	KRAV	96.5

OREGON

Eugene	KRVM	*91.9
	KEEO-FM	98.1
	KFMY	97.9
	KUGN-FM	99.1
	KWAX	*91.1
Grants Pass	KGPO	96.9
Medford	KBOY-FM	95.3
Oretech	KTEC	*88.1
Portland	KOAP-FM	92.3
	KGMG	95.5
	KOIN-FM	101.1
	KPOQ-FM	105.8
	KPFM	97.1
	KPOJ-FM	98.7
	KQFM	100.3
	KRRC	*89.3

PENNSYLVANIA

Allentown	WFMZ	100.7
	WAEB-FM	104.1
Altoona	WVAM-FM	100.1
	WFBG-FM	98.1
Beaver Falls	WBVP-FM	106.7
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
Carlisle	WHYL-FM	102.5
Chambersburg	WCHA-FM	95.1 (s)
Dubois	WCED-FM	102.1
Easton	WEST-FM	107.9
	WTRH	90.5
	WEEX-FM	99.9
Edensburg	WENO	103.9
Erie	WWYN-FM	99.9
Gettysburg	WGET-FM	107.7
Glenside	WIFI	92.5
Harrisburg	WHP-FM	97.9
	WMSP	94.9
	WTPA-FM	104.1
Havertown	WHHS	*89.3
Hazleton	WAZL-FM	97.9
Jenkintown	WIBF	103.9
Johnstown	WARD-FM	92.1
	WJAC-FM	95.5
Lancaster	WGAL-FM	101.3
	WOAC	94.5
	WLAN-FM	96.9
Lebanon	WLBR-FM	100.1
Meadville	WMGW-FM	100.3
	WARC	88.1
Montrose	WPEL-FM	96.5
New Kensington-Tarentum	WYDD	100.7
Oil City	WOJR	98.5
Palmyra	WJWR	92.1
Philadelphia	WCAU-FM	98.1
	WPBS-FM	105.3
	WDAS-FM	105.3
	WPCA-FM	104.5
	WFIL-FM	102.1
	WOVR	101.1
	WFLN	95.7
	WHAT-FM	96.5
	WUHY-FM	*90.9
	WIFI	92.5
	WIBG-FM	94.1
	WIP-FM	93.3

Location	C.L.	Mc.
	WPEN-FM	102.9
	WPWT	*91.7
	WQAL	106.1
	WRTI-FM	*90.1
	WXPN	*88.9
Pittsburgh	KDKA-FM	92.9
	WAMO	105.9
	WRYT-FM	96.1
	KQV-FM	102.5
	WOUQ	*91.5
	WYRE-FM	107.9
	WILY	105.9
	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
Red Lion	WGCB-FM	96.1
Scranton	WGBI-FM	101.3
	WUSV	*88.9
Sharon	WPIC-FM	102.9
State College	WDFM	*91.1
Sunbury	WKOK-FM	94.1
Towanda	WTTC-FM	92.7
Tyrone	WGMR-FM	101.1
Warren	WRRN	92.3
Washington	WJPA-FM	104.3
Waynesboro	WAYZ-FM	101.5
Wilkes-Barre	WBRE-FM	98.5
	WYZZ	103.3
Williamsport	WLYC-FM	105.1
	WRAK-FM	100.3
York	WNOW-FM	105.7
	WSBA-FM	103.3

RHODE ISLAND

Cranston	WLOV	99.9
Providence	WPJB-FM	105.1
	WICE-FM	107.7
	WPFM	95.5
	WPRO-FM	92.3
	WXCN	101.5
Woonsocket	WWON-FM	106.3

SOUTH CAROLINA

Anderson	WCAC	101.1
Beaufort	WBEU-FM	98.7
Charleston	WCSC-FM	96.9
	WTMA-FM	95.5
Clemson	WSBF-FM	*88.1
Columbia	WCOS-FM	97.9
	WNOK-FM	104.7
	WUSC-FM	*89.9
	WOSC-FM	92.9
Dillon	WESC-FM	92.5
Greenville	WFBC-FM	93.7
	WMYU-FM	94.5
Laurens-Clinton	WLBG-FM	100.5
N. Charleston	WKTM	102.5
Rock Hill	WRHI-FM	96.3
Seneca	WSNW-FM	98.1
Spartanburg	WSPA-FM	98.9
Sumter	WFIG-FM	101.3

SOUTH DAKOTA

Hot Springs	KOBH	96.7

TENNESSEE

Bristol	WOPI-FM	96.9
Chattanooga	WOOD-FM	96.5
	WLON	106.5
Cleveland	WCLE-FM	100.7
Collegedale	WSMC-FM	*88.1
Franklin	WFLT-FM	100.1
Gallatin	WFMG	104.5
Greeneville	WGRV-FM	94.9
Jackson	WTJS-FM	104.1
Johnson City	WJCW-FM	100.7
Kingsport	WKPT-FM	98.5
Knoxville	WBIR-FM	93.3
	WKCS	*91.1
	WUOT	*91.9
Manchester	WMSR-FM	99.7
McKenzie	WKTA	106.9
Memphis	WMC-FM	99.7
	WMPS-FM	97.1
	WDIA-FM	102.7
Nashville	WFMB	103.5
	WLAC-FM	90.3
	WSIX-FM	97.5
Sevierville	WSEV-FM	102.1
Tullahoma	WJIG-FM	93.3

TEXAS

Abilene	KACC-FM	*91.1
	KFMN	99.3
Alvin	KAJC-FM	102.1
Amarillo	KGNC-FM	93.1
Austin	KHFI	98.3

Location	C.L.	Mc.
	KAZZ	95.5
	KTBC-FM	93.7
	KUT-FM	*90.7
Beaumont	KHCB-FM	105.7
	KAYD-FM	97.5
Big Spring	KFNE-FM	95.3
Brownwood	KHPC	88.1
Cleburne	KCLE-FM	94.9
Corpus Christi	KMFM	95.5
Dallas	KIXL-FM	104.5
	KMAP	105.3
	KNER	*88.1
	KRLD-FM	92.5
	KLIF-FM	93.7
	WFAA-FM	97.8
	WRR-FM	101.1
	KVIT	*91.7
	KQRO	102.9
Denton	KDNT-FM	106.3
DiBoll	KSPL-FM	95.5
Dumas	KOOD-FM	95.3
El Paso	KVOF-FM	*88.5
	KTSM-FM	99.9
	KHMS	94.7
Ft. Worth	WBAP-FM	96.3
	KXFM	99.5
	KFJZ-FM	97.1
	KJIM-FM	102.1
	KGAF-FM	94.5
	KELT	94.5
Gainesville	KUIL-FM	103.7
Harlingen	KHBR-FM	102.3
Highland Pk.	KHGM	102.9
Hillsboro	KHCB-FM	105.7
Houston	KHUL	95.7
	KFMK	97.9
	KODA-FM	99.1
	KARO	94.5
	KOST	100.3
	KQUE	102.9
	KRBE	104.1
	KXYZ-FM	96.5
	KTRH-FM	101.1
	KUHF	*91.3
Hilleon	KLEN-FM	93.3
Longview	KLUE-FM	105.7
Lubbock	KSCL-FM	93.7
	KBFM	96.3
	KTXT-FM	*91.9
Marshall	KMHT-FM	97.3
Midland	KNFM	92.3
	KMOD-FM	93.3
Mt. Pleasant	KIMP-FM	96.1
Odessa	KQIP	96.7
	KWMO	99.1
Odessa	KOCV	91.3
Pasadena	KLVL-FM	92.5
Plainview	KHBL	*88.1
Port Arthur	KFMP	93.3
	KPAC-FM	98.5
San Antonio	KISS	99.5
	KEEZ	97.3
	KAKI-FM	98.1
	KITY	92.9
Sinton	KTOD-FM	101.3
Texarkana	KTAL-FM	98.1
Tyler	KSLT	93.1
Waco	KEFC	95.5 (s)
Wichita Falls	KLUR	99.9
	KNTO	95.1

UTAH

Ephraim	KEPH	*88.9
Logan	KUSU-FM	*88.1
Provo	KBYU-FM	*88.9
Salt Lake City	KCPX-FM	98.7
	KLUB-FM	97.1
	KSL-FM	100.3

VIRGINIA

Arlington	WAVA-FM	105.1
	WCCV-FM	97.5
Charlottesville	WINA-FM	95.3
	WTJU	91.3
Crewe	WSVS-FM	104.7
Farmville	WFLO-FM	95.7
Fredericksburg	WFVA-FM	101.5
Gretna	WMNA-FM	103.3
Hampton	WVEC-FM	101.3
	WHOV	88.3
Harrisonburg	WEMC	*91.7
	WSVA-FM	100.7
Lynchburg	WWDD-FM	100.1
Manassas	WPRW-FM	106.7
Marion	WMEV-FM	93.9
Martinsville	WMVA-FM	96.3
Newport News	WGH-FM	97.3
Norfolk	WMTI	*91.3
	WNOR-FM	98.7
	WRVC	102.5
	WTAR-FM	95.7
	WXRI	104.5
	WYFI-FM	99.7
Portsmouth	WAVY-FM	96.9

Location	C.L.	Mc.
Richmond	WCOD	98.1
	WRFK	91.1
	WRVA-FM	94.5
	WRNL-FM	102.1
Roanoke	WDBJ-FM	94.9
	WLRJ	92.3
	WRDV-FM	103.7
	WSLS-FM	99.1
South Boston	WHLF-FM	97.5
South Norfolk	WFOS	*90.5
Staunton	WSGM-FM	98.5
Williamsburg	WCWM	89.1
	WBCI	96.5
Winchester	WRFL	92.5
Woodbridge	WXRA	103.9

WASHINGTON

Bellingham	KGMI-FM	92.9
	KERI	104.3
Cheney	KEWC-FM	*89.9
College Place	KGTS	91.3
Edmunds	KGFM	105.8
Ellensburg	KCWS-FM	*91.5
Eugene	KBMC	104.5
Lynden	KLYN-FM	106.5
Opportunity	KZUN-FM	96.1
Prosser	KACA	102.3
Seattle	KING-FM	98.1
	KBLE	93.3
	KETO-FM	101.5
	KGMJ	95.7
	KIRO-FM	100.7
	KISW	99.9
	KLSN	96.5
	KMCS	98.9
	KOL-FM	94.1
	KRAB	107.7
	KUOW	94.9
Spokane	KREM-FM	92.9
	KXLY-FM	99.9
	KHQ-FM	98.1
Tacoma	KCPS	90.9
	KLAY-FM	106.3
	KTNT-FM	97.3
	KTOY	*91.7
	KTWR	103.9
Yakima	KNOX-FM	106.3

WEST VIRGINIA

Beckley	WBKW	99.5
Bluefield	WHIS-FM	104.5
Charleston	WKAZ-FM	97.5
	WKNA	98.5
Huntington	WKEE-FM	100.5
	WMUL	*88.1
Martinsburg	WEPM-FM	94.3
Morgantown	WAJR-FM	99.3
Oak Hill	WDAY-FM	94.1
Wheeling	WKWK-FM	97.3
	WWVA-FM	98.7

WISCONSIN

Appleton	WLFM	*91.1
Chilton	WHKW	*89.3
Colfax	WHWC	*88.3
Delafield	WHAD	*90.7
Eau Claire	WIAL	94.1
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
La Crosse	WHLA	*90.3
Madison	WHA-FM	*88.7
	WIBA-FM	101.5
	WISM-FM	98.1
	WMFM	104.1 (s)
	WRVB-FM	102.5
Merrill	WLIN	100.7
Milwaukee	WFMR	96.5
	WMIL-FM	95.7
	WISN-FM	97.3
	WRIT-FM	102.9
	WMKE	102.1
	WQFM	93.3
	WTMJ-FM	94.1
	WEKZ-FM	93.7
Monroe	WRJN-FM	100.7
Racine	WFNY	92.1
Rice Lake	WJMC-FM	98.3
Sparta	WCOW-FM	97.1
Stevens Point	WSPT-FM	97.9
Watertown	WTTN-FM	104.7
Waukesha	WAUK-FM	106.1
Wausau	WHRM	*91.9
Wauwatosa	WTDS	103.7
West Bend	WBKV-FM	92.5
Wisc. Rapids	WFHR-FM	103.3

WYOMING

Cheyenne	KVOW-FM	106.3

WHITE'S RADIO LOG

Canadian AM Stations by Location

Location	C.L.	Kc.
Abbotsford, B.C.	CFVR	1240
Altona, Man.	CFAM	1290
Amherst, N.S.	CKOH	1400
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	1090
Brandon, Man	CKX	1150
Brantford, Ont.	CKPC	1380
Bridgewater, N.S.	CKBW	1000
Brockville, Ont.	CFJR	1450
Cabano, Que.	CJAF	1340
Calgary, Alta.	CFAC	960
	CFCN	1060
	CFVP	6030
	CKXL	1140
Callander, Ont.	CFCH	600
Campbellton, N.B.	CKNB	950
Camrose, Alta.	CFCW	790
Causapscal, Que.	CJBM	1450
Charlottetown, P.E.I.	CFCY	630
Chatham, Ont.	CFCO	630
Chicoutimi, Que.	CBJ	1580
	CJMT	1420
Chilliwack, B.C.	CHWK	1270
Churchill, Man.	CHFC	1230
Cobourg, Ont.	CHUC	1500
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
Edmonton, Alta.	CBX	1010
	CBXA	740
	CFRN	1260
	CHFA	680
	CJCA	930
	CKUA	580
Edmundston, N.B.	CJEM	570
Estevan, Sask.	SJSL	1280
Flin Flon, Man.	CFAR	590
Fort Frances, Ont.	CFOB	800
Fort Simpson, N.W.T.	CFMR	1490
Fort St. John, B.C.	CKNL	970
Fort William, Ont.	CJLX	800
Fredericton, N.B.	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 Falls, Nfld.	CBT	540
	CKCM	620
Gravelbourg, Sask.	CFRG	710
	CFGR	1230
Guelph, Ont.	CJOY	1460
	CJOY	1460
Halifax, N.S.	CBH	860
	CHNS	960
	CHNX	6130
	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
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.	CKCR	1490
	CKKW	1320
Langley, B.C.	CJJC	850
La Sarre, Que.	SKLS	1240
La Tuque, Que.	CFLM	1240
Leamington, Ont.	CJSP	710
Lethbridge, Alta.	CHEC	1090
	CJOC	1220
Lindsay, Ont.	CKLY	910
Lloydminster, Alta.	CKSA	1150
London, Ont.	CFPL	980
	CKSL	1290
Marystown, Nfld.	CHCM	560
Matane, Que.	CKBL	1250
Medicine Hat, Alta.	CHAT	1270
Midland, Ont.	CKMP	1230
Moncton, N.B.	CBAF	1300
	CKCW	1220
Mont Laurier, P.Q.	CKML	610
Montmagny, Que.	CKBM	1490
Montreal, Que.	CBF	690
	CBFA	11760
	CBFL	11720
	CBFO	9630
	CBFR	9520
	CBFW	6090
	CBFX	9610
	CBFY	11705
	CBFZ	15190
	CBM	940
	CFCF	600
	CFCX	6005
	CFMB	1410
	CHAC	6180
	CHAY	5990
	CHFO	9740
	CHLA	21710
	CHLR	9710
	CHLS	9610
	CHOL	11720
	CHRX	17735
	CHSB	17710
	CHYS	17865
	CJAD	800
	CJMS	1280
	CKAC	730
	CKBR	15275
	CKCS	15320
	CKCX	15190
	CKEX	11900
	CKGM	980
	CKLM	1570
	CKLO	9630
	CKLP	9585
	CKNA	5970
	CKNC	17820
	CKNC	11945
	CKOB	6090
	CKRA	11760
	CKRP	21600
	CKRZ	6060
	CKSR	15255
	CKUS	15105
	CKXA	11705
	CKYS	9655
	CKYU	9625
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.	CHVC	1600
North Battleford, Sask.	CJNB	1460
North Vancouver, B.C.	CKLG	730
Oakville, Ont.	CHWO	1250
Orillia, Ont.	CFOR	1570
Oshawa, Ont.	CKLB	1350
Ottawa, Ont.	CBO	910
	CFRA	580
	CKOY	1310
Owen Sound, Ont.	CFOS	560
Parry Sound, Ont.	CKAR-1	1340
Peace River, Alta.	CKYL	610
Pembroke, Ont.	CHOV	1350
Pentieton, 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	1240
Quebec, Que.	CBV	980
	CHRC	800
	CJLR	1060
	CJQC	1340
	CKCV	1280
Quesnel, C.C.	CKCQ	570
Red Deer, Alta.	CKRD	850
Regina, Sask.	CBK	540
	CJME	1300
	CKCK	620
	CKRM	980
Richmond Hill, Ont.	CFQM	1310
Rimouski, Que.	CJBR	900
Riviere 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
St. John's, Nfld.	CBN	640
	CBNX	6160
	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
Sarnia, Ont.	CHOK	1070
Saskatoon, Sask.	CFNS	1170
	CFQC	600
	CKOM	1250
Sault Ste. Marie, Ont.	CJIC	1050
	CKCY	920
Sept-Iles, Que.	CKCN	560
Shawinigan, Que.	CKSM	1220
Shefferville, Que.	CFKL	1230
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
Sudbury, Ont.	CFBR	550
	CHNO	900
	CKSO	790
Summerside, P.E.I.	CJRW	1240
Swift Current, Sask.	CKSW	1400
Sydney, N.S.	CBI	1140
	CJCB	1270
	CJCX	6010
Terrace, B.C.	CFTK	1140
Thetford Mines, Que.	CKLD	1230
Trois-Rivieres, Que.	CHLN	550
	CKTR	1150
Tillsonburg, Ont.	CKOT	1510
Timmins, Ont.	CFCL	620
	CKGB	680
Toronto, Ont.	CBL	740
	CFRB	1010
	CFRX	6070
	CHFI	1540
	CHUM	1050
	CJBC	860
	CKEY	580
	CKFH	1430
Trail, B.C.	CJAT	610
Truro, N.S.	CKCL	600
Val d'Or, Que.	CKVO	1230
Valleyfield, Que.	CFLY	1370
Vancouver, B.C.	CBU	690
	CBUX	6160
	CFUN	1410
	CHQM	1320
	CJOR	600
	CKFX	6080
	CKWX	1130
Verdun, Que.	CKVL	850
Vernon, B.C.	CJIB	940
Victoria, B.C.	CFAX	810
	CJVI	900
	CKDA	1220
Victoriaville, Que.	CFDA	1380
Ville Marie, Que.	CKVM	710
Ville St. Georges, Que.	CKRB	1460
Welland, Ont.	CHOW	1470
Weyburn, Sask.	CFSL	1340
Whitehorse, Y. T.	CFWH	570
Williams Lake, B.C.	CKCQ-1	1240
Wilmot Station, N.S.	CKAD	1490
Windsor, N.S.	CFAB	1450
Windsor, Ont.	CBE	1550
	CKLW	800
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.	CPLS	1340
Yellowknife, N.W.T.	CFYK	1340
Yorkton, Sask.	CJGX	940

Canadian FM Stations by Call Letters

C.L.	Location
CBC-FM	Toronto, Ont.
CBF-FM	Montreal, Que.
CBM-FM	Montreal, Que.
CBO-FM	Ottawa, Ont.
CBU-FM	Vancouver, B.C.
CFCF-FM	Montreal, Que.
CFFM-FM	Kamloops, B.C.
CFMO-FM	Ottawa, Ont.
CFMW-FM	St. Norbert, (Winnipeg) Man.
CFPL-FM	London, Ont.
CFRC-FM	Kingston, Ont.
CFRN-FM	Edmonton, Alta.
CHEC-FM	Lethbridge, Alta.
CHFI-FM	Toronto, Ont.
CHFM-FM	Calgary, Alta.
CHIC-FM	Brampton, Ont.
CHLT-FM	Sherbrooke, Que.
CHNS-FM	Halifax, N.S.
CHRC-FM	Quebec (P.Q.)
CHQM-FM	Vancouver, B.C.
CJBQ-FM	Belleville, Ont.
CJBR-FM	Rimouski, Que.
CJCA-FM	Edmonton, Alta.
CJCB-FM	Sydney, N.S.
CJFM-FM	Montreal, Que.
CJOB-FM	Winnipeg, Man.
CJRT-FM	Toronto, Ont.
CJSS-FM	Cornwall, Ont.
CKCR-FM	Kitchener, Ont.
CKOA-FM	Victoria, B.C.
CKFM-FM	Toronto, Ont.
CKGB-FM	Timmins, Ont.
CKGM-FM	Montreal, P.Q.
CKLB-FM	Oshawa, Ont.
CKLC-FM	Kingston, Ont.
CKLW-FM	Windsor, Ont.
CKPC-FM	Brantford, Ont.
CKPR-FM	Ft. William, Ont.
CKTB-FM	St. Catharines, Ont.
CKUA-FM	Edmonton, Alta.
CKVL-FM	Verdun, Que.
CKWS-FM	Kingston, Ont.
CKY-FM	Manitoba

Canadian FM Stations by Location

Location	C.L.	Mc.	Location	C.L.	Mc.	Location	C.L.	Mc.	Location	C.L.	Mc.
Belleville, Ont.	CJBQ-FM	97.1		CKWS-FM	96.3	Port Arthur, Ont.	CKPR-FM	94.3		CHFI-FM	98.1
Brampton, Ont.	CHIC-FM	102.1	Kitchener, Ont.	CKCR-FM	96.7	Quebec, Que.	CHRC-FM	98.1		CHUM-FM	104.5
Brantford, Ont.	CKPC-FM	92.1	Lethbridge, Alta.	CHEC-FM	100.9	Rimouski, Que.	CJBR-FM	101.5		CJRT-FM	91.1
Calgary, Alta	CHFM-FM	95.9	London, Ont.	CFPL-FM	95.9	St. Catharines, Ont.	CKTB-FM	97.7		CKFM-FM	99.9
Cornwall, Ont.	CJSS-FM	104.5	Montreal, Que.	CBF-FM	95.1				Vancouver, B.C.	CBU-FM	105.7
Edmonton, Alta.	CFRN-FM	100.3		CBM-FM	100.7					CHQM-FM	103.5
	CJCA-FM	99.5		CFCF-FM	106.5	St. Norbet. (Winnipeg) Man.	CFMW-FM	98.3	Verdun, Que.	CKVL-FM	96.9
	CKUA-FM	98.1		CJFM-FM	95.9	Sherbrooke, Que.	CHLT-FM	102.7	Victoria, B.C.	CKDA-FM	98.5
Halifax, N.S.	CHNS-FM	96.1		CKGM-FM	97.7	Sydney, N.S.	CJCB-FM	94.9	Windsor, Ont.	CKLW-FM	93.9
Kamloops, B.C.	CFFM-FM	98.9	Oshawa, Ont.	CKLB-FM	93.5	Timmins, Ont.	CKGB-FM	94.5	Winnipeg, Man.	CJOB-FM	97.5
Kingston, Ont.	CFRC-FM	91.9	Ottawa, Ont.	CBO-FM	103.3	Toronto, Ont.	CBC-FM	99.1		CKY-FM	92.1
	CKLC-FM	99.5		CFMO-FM	93.9						

World-Wide Short-Wave Stations

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

Because of the fact that this log represents actual monitoring reports rather than data taken from published program schedules received from the stations, you may find that frequencies (and operating times) given here differ from *official* listings. This is because foreign short-wave stations frequently operate several kilocycles away from their assigned (and announced) frequencies. In addition, the schedules of these stations are often changed and the changes are not published in the schedules until many months later. We feel that the type of log which *White's Radio Log* is presenting represents a very realistic picture of the current status of short-wave broadcasting, and is something which cannot be obtained from any other sources.

Let us know. Although you will be able to hear a great majority of the stations listed here, keep in mind that there will undoubtedly be a number of stations which cannot be heard at your location—just as there will be many stations which you will here which are not in our listing for this issue. We invite you to submit your short-wave broadcast station loggings for inclusion in forthcoming issues. Please be sure to include the following information on each station reported to us: approximate frequency, call sign and/or station name, city and country, time heard. Send this information to: DX CENTRAL, *White's Radio Log*, c/o RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, N.Y. 10022, U.S.A.

For the DX'er. If you care to roam the bands for DX, we present here some information which will be of invaluable use to you in tracking down DX stations.

It should be noted that most short-wave broadcasting stations operate within 9 specific frequency bands, established by international agreement. Each of these bands has a number, corresponding to the average wavelength of the frequencies within the band. The 9 bands are as follows:

60-meter band= 4750 kc to 5060 kc
49-meter band= 5950 kc to 6200 kc
41-meter band= 7100 kc to 7300 kc
31-meter band= 9500 kc to 9775 kc
25-meter band=11700 kc to 11975 kc
19-meter band=15100 kc to 15450 kc
16-meter band=17700 kc to 17900 kc
13-meter band=21450 kc to 21750 kc
11-meter band=25600 kc to 26100 kc

Although the current radio propagation conditions have made the high frequency bands (11 and 13 meter bands) relatively poor for DX'ers, the other bands are generally good during certain periods of the year. As a general rule, the following bands are "hot for DX" during the times indicated:

60-meter band=Winter nights.
49-meter band=Winter nights.
41-meter band=Winter nights.
31-meter band=Nights, all year.
25-meter band=Nights, all year.
19-meter band=Days all year, and Summer nights.

WHITE'S RADIO LOG

16-meter band=Days, all year, and Summer nights.
13-meter band=Days, all year.
11-meter band=Days, all year.

Time to listen. The times shown in the Short-Wave Section of *White's Radio Log* reflect only the fact that the stations happened to be monitored in one part of the world at a particular time. Since the schedules of these stations probably span several hour's time, you should check a station's frequency several times over a two or three hour period if it is not heard at your location at the time it is listed here. Stations will probably be heard on additional frequencies not listed here (Radio Moscow, for example, operates on about 150 different frequencies).

All times shown here are in the 24-hour EST clock system. For example, 0800 is 8:00 A.M. EST, 1200 is noon EST, 1800 is 6:00 P.M. EST, and so on. For conversion to other time zones, subtract 1 hour for CST (0800 EST is 7:00 A.M. CST), 2 hours for MST, 3 hours for PST.

The following abbreviations are used in *White's Radio Log:* BC—Broadcasting Company, Corporation, or System; E—Emissora; R—Radio or Radiodiffusion; V—Voice or Voz.

This Month's Specials. If you're interested in sitting in on what may very well be cloak and dagger activities, we direct your attention to two stations operating on approximately 6400 and 6800 kc/s between the hours of 1500 and 1800 EST. You will hear a woman announcer reading off numbers in German and playing the "River Kwai" march. These transmissions are also frequently reported around 2100 hours on approximately 9900 kc/s. A news item from an overseas agency claims that these transmissions are allegedly instructions for spies.

Good DX! (And don't forget to report your loggings to DX CENTRAL.)

EUROPE

Location	Name	Call	Kc.	EST
ALBANIA				
Tirana	R. Tirana	—	9677	1630
Tirana	R. Tirana	—	11945	1833
AUSTRIA				
Vienna	R. Austria	OEI21	6155	0615
Vienna	R. Austria	OEI22	7245	0615
Vienna	R. Austria	—	9770	0619
Vienna	R. Austria	OEI21	6155	1700
Vienna	R. Austria	OEI47	9770	1900
BELGIUM				
Brussels	Belg. R. & TV	ORU	6140	1800
BULGARIA				
Sofia	R. Sofia	—	6070	1900
Sofia	R. Sofia	—	7290	1503
FINLAND				
Helsinki	Finnish BC	OIX2	9555	2100
Helsinki	Finnish BC	—	11805	0600
Helsinki	Finnish BC	OIX4	15185	0606
FRANCE				
Paris	Paris Vous Parle	—	11885	1830
Paris	Paris Vous Parle	—	15245	1200
GERMANY (EAST)				
Berlin	R. Berlin Int'l.	—	11795	1404
Berlin	R. Berlin Int'l.	—	15395	1706
GERMANY (WEST)				
Cologne	Deutsche Welle	DMQ6	5980	1612
Cologne	Deutsche Welle	DMQ7	7160	1520
Cologne	Deutsche Welle	DMQ7	7205	1616
Cologne	Deutsche Welle	DMQ9	9735	1520
Cologne	Deutsche Welle	DMQ11	11925	0345
Cologne	Deutsche Welle	—	15185	0348
Cologne	Deutsche Welle	DMQ15	15275	1125
Cologne	Deutsche Welle	DMQ17	17845	0345
GREAT BRITAIN				
London	BBC	MCM	3952	0000
London	BBC	GRM	7120	0100
London	BBC	GRK	7185	0730
London	BBC	GSB	9510	0000
London	BBC	—	9610	0008
London	BBC	GVU	11770	1630
London	BBC	GRF	12095	1307
GREECE				
Athens	Armed Forces	—	6045	0010
Serres	Forces BC	—	7010	1132
HUNGARY				
Budapest	R. Budapest	—	5900	1700
Budapest	R. Budapest	—	6234	1430
Budapest	R. Budapest	—	7215	1433
Budapest	R. Budapest	—	9833	1900
ITALY				
Rome	RAI	—	5960	1930
Rome	RAI	—	6010	0830
Rome	RAI	—	7235	0830
Rome	RAI	—	7275	1255
Rome	RAI	—	7290	0420
Rome	RAI	—	9575	1930
Rome	RAI	—	9630	0831
Rome	RAI	—	11810	0420
Rome	RAI	—	11905	0545
Rome	RAI	—	15400	0400
Rome	RAI	—	17740	0400
Rome	RAI	—	17770	1035
Rome	RAI	—	17800	0408
Rome	RAI	—	21565	1037
LUXEMBOURG				
Villa Louvigny	R. Luxembourg	—	6090	0000
MONACO				
Monte Carlo	Trans World R.	—	5975	1145
Monte Carlo	Trans World R.	—	7260	1148
NETHERLANDS				
Hilversum	R. Netherlands	—	5980	0520
Hilversum	R. Netherlands	—	6020	0520
Hilversum	R. Netherlands	—	9630	0100
Hilversum	R. Netherlands	—	11710	1100
Hilversum	R. Netherlands	—	15220	1031
Hilversum	R. Netherlands	—	15425	1100
NORWAY				
Oslo	R. Norway	LKJ	6130	1157
Oslo	R. Norway	LLM	15175	1155
Oslo	R. Norway	LLN	17825	1157
Oslo	R. Norway	LLQ	21730	1157
POLAND				
Warsaw	R. Warsaw	—	5950	1530
Warsaw	R. Warsaw	—	6135	1330
Warsaw	R. Warsaw	—	7125	1330
Warsaw	R. Warsaw	—	7285	1530
Warsaw	R. Warsaw	—	9540	1730
Warsaw	R. Warsaw	—	9675	0330
Warsaw	R. Warsaw	—	11840	0330
Warsaw	R. Warsaw	—	15275	0334

Location	Name	Call	Kc.	EST
PORTUGAL				
Lisbon	Lisbon Calling	CSA72	11935	1330
Lisbon	Lisbon Calling	—	15380	1430
Lisbon	Lisbon Calling	CSA49	21700	0912
SPAIN				
Madrid	R. Nacional	—	9630	2237
SWEDEN				
Stockholm	R. Sweden	—	5990	1530
Stockholm	R. Sweden	—	6065	1630
Stockholm	R. Sweden	—	9620	0430
Stockholm	R. Sweden	—	9660	2130
Stockholm	R. Sweden	—	11705	2000
Stockholm	R. Sweden	—	11810	0730
Stockholm	R. Sweden	—	17840	0900
SWITZERLAND				
Berne	Swiss BC	HER3	6165	0010
Berne	Swiss BC	HER4	9535	2145
Berne	Swiss BC	HER5	11865	0007
U.S.S.R.				
Kiev	R. Kiev	—	7190	2300
Kiev	R. Kiev	—	7210	2100
Kiev	R. Kiev	—	9610	2100
Kiev	R. Kiev	—	9670	2100
Kiev	R. Kiev	—	9710	2102
Minsk	R. Minsk	—	5940	1630
Moscow	R. Moscow	—	9630	0030
Moscow	R. Moscow	—	9680	2000
Tashkent	R. Tashkent	—	9600	0710
VATICAN				
Vatican City	Vatican R.	—	11740	1100
Vatican City	Vatican R.	—	15120	1100

AFRICA

Location	Name	Call	Kc.	EST
ALGERIA				
Algers	R. Algeria	—	6160	0600
Algers	R. Algeria	—	9685	0130
Algers	R. Algeria	—	11835	1030
BECHUANALAND				
Lobatsi	—	ZND	3355	1030
CAMEROON				
Buea	Ici Buea	—	5984	0000
Garoua	Ici Garoua	—	5010	1610
Yaounde	Ici Yaounde	—	7205	1600
CONGO REPUBLIC				
Leopoldville	R. Leopoldville	—	4880	2300
Leopoldville	R. Leopoldville	—	7156	2300
Leopoldville	R. Leopoldville	—	11830	2300
Leopoldville	R. Leopoldville	—	11865	1005
Leopoldville	R. Leopoldville	—	15245	1005
CONGO (FRENCH-AFRICAN)				
Brazzaville	R. Brazzaville	—	5970	1330
Brazzaville	R. Brazzaville	—	9545	1500
Brazzaville	R. Brazzaville	—	9680	1600
Brazzaville	R. Brazzaville	—	9730	1330
Brazzaville	R. Brazzaville	—	9735	1100
Brazzaville	R. Brazzaville	—	9770	1500
Brazzaville	R. Brazzaville	—	11725	1332
Brazzaville	R. Brazzaville	—	11950	1505
Brazzaville	R. Brazzaville	—	11970	0530
Brazzaville	R. Brazzaville	—	15010	1300
Brazzaville	R. Brazzaville	—	15235	1500
Brazzaville	R. Brazzaville	—	15245	1330
Brazzaville	R. Brazzaville	—	15440	0530
Brazzaville	R. Brazzaville	—	17720	0700
Brazzaville	R. Brazzaville	—	21500	1337
DAHOMEY				
Cotonou	Ici Cotonou	—	4875	0058
EGYPT (U.A.R.)				
Cairo	U.A.R. BC	—	9475	1707
Cairo	U.A.R. BC	—	11915	1702
Cairo	U.A.R. BC	—	17785	1307
ETHIOPIA				
Addis Ababa	R. Addis Ababa	—	6186	1845
Addis Ababa	R. Addis Ababa	—	7291	1848
Addis Ababa	R. V. of Gospel	ETLF	15440	1836
GHANA				
Accra	Ghana BC	—	6070	0945
Accra	Ghana BC	—	9545	1630
Accra	Ghana BC	—	11800	1532
Accra	Ghana BC	—	15190	0900
Accra	Ghana BC	—	17910	1130
Accra	Ghana BC	—	21545	1010
GUINEA REPUBLIC				
Conakry	R. Conakry	—	3360	1725
GUINEA (SPANISH)				
Bata, Rio Muni	R. Equatorial	—	4926	1500
LIBERIA				
Monrovia	R. Village	ELWA	11825	0130
Monrovia	R. Village	ELWA	15155	1600
Monrovia	V. of America	—	3965	1620
MALI				
Bamako	R. Mali	—	7145	1640
MOROCCO				
Rabat	Moroccan BC	—	11735	1615
Tangier	UN Radio	—	9760	1230
MOZAMBIQUE				
Lourenco Marques	R. Club	—	3620	1100
Lourenco Marques	R. Club	—	4835	2230
Lourenco Marques	R. Club	CR7BV	4925	1230
Lourenco Marques	R. Club	—	6050	2330
Lourenco Marques	R. Club	—	9660	0200
Lourenco Marques	R. Club	—	11835	1045
Lourenco Marques	R. Club	—	17755	1236
NIGERIA (FEDERATION)				
Ibadan	W. Nigerian BC	—	3380	0000
Ibidan	W. Nigerian BC	—	6185	0000
Lagos	V. of Nigeria	—	9690	1400
Lagos	V. of Nigeria	—	11900	0800
Lagos	V. of Nigeria	—	11915	0809
SENEGAL				
Ziguinchor	R. Senegal	—	3336	2200
Ziguinchor	R. Senegal	—	6070	2200
S. AFRICA (REPUBLIC)				
Paradays	R. S. Africa	—	6150	2200
Paradays	R. S. Africa	—	7275	2200
Paradays	R. S. Africa	—	9525	1025
Paradays	R. S. Africa	—	11900	1245
Paradays	R. S. Africa	—	15080	0600
Paradays	R. S. Africa	—	15115	0600
Paradays	R. S. Africa	—	15305	0600

ASIA AND NEAR EAST

Location	Name	Call	Kc.	EST
AFGHANISTAN				
Kabul	R. Kabul	—	9635	1330
CAMBODIA				
Phnom Penh	V. of Cambodia	—	6090	0100
Phnom Penh	V. of Cambodia	—	11945	2214
Phnom Penh	V. of Cambodia	—	17720	2038
CEYLON				
Colombo	R. Ceylon	—	15310	0130
Colombo	R. Ceylon	—	15333	1130
Colombo	R. Ceylon	—	17820	1415
Colombo	V. of America	—	15415	1011
CHINA (COMMUNIST)				
Peking	R. Peking	—	6210	1530
Peking	R. Peking	—	6270	1635
Peking	R. Peking	—	7080	1530
Peking	R. Peking	—	7230	1530
Peking	R. Peking	—	9457	1533
Peking	R. Peking	—	11820	0730
Peking	R. Peking	—	15095	1845
CHINA (FREE)				
Taipei	V. of Free China	—	6095	0750
Taipei	V. of Free China	—	7130	0755
Taipei	V. of Free China	—	7285	2031
Taipei	V. of Free China	BED36	9685	0758
Taipei	V. of Free China	—	9720	2033
Taipei	V. of Free China	—	11725	1510
Taipei	V. of Free China	—	11825	0750
Taipei	V. of Free China	BED57	15345	0759
Taipei	V. of Free China	—	15395	0806
INDIA				
Delhi	All India R.	VUD	5995	0045
Delhi	All India R.	VUD	7125	1340
Delhi	All India R.	VUD	7235	0051
Delhi	All India R.	VUD	9680	1340
Delhi	All India R.	VUD	9915	0041
Delhi	All India R.	VUD	11790	1347
INDONESIA				
Djakarta	V. of Indonesia	—	9700	1000
IRAN				
Teheran	R. Iran	—	7070	1430
Teheran	R. Iran	—	7225	1200
Teheran	R. Iran	—	9680	1214
IRAQ				
Baghdad	Al Iraqiya	—	6030	1640
Baghdad	Al Iraqiya	—	6095	1636
ISRAEL				
Jerusalem	Kol Yisrael	4XB31	9009	1515
Jerusalem	Kol Yisrael	—	9885	1526
JAPAN				
Tokyo	R. Japan	—	6140	1400
Tokyo	R. Japan	—	7195	1000
Tokyo	R. Japan	JOB9	9525	2100
Tokyo	R. Japan	—	9530	0730
Tokyo	R. Japan	JOA11	11705	1838
Tokyo	R. Japan	JOA11	11780	1831

WHITE'S RADIO LOG

Location	Name	Call	Kc.	EST
Tokyo	R. Japan	JOAI5	15135	1830
Tokyo	R. Japan	JOBI5	15235	2108
Tokyo	R. Japan	—	15425	0115
Tokyo	R. Japan	—	17725	2107
JORDAN				
Amman	R. Amman	—	7155	2330
Amman	R. Amman	—	8938	0303
Amman	R. Amman	—	9530	2346
Amman	R. Amman	—	9650	2048
Amman	R. Amman	—	11810	2334
KOREA (REPUBLIC OF)				
Seoul	V. of Free Korea	HLK5	9640	2230
Seoul	V. of Free Korea	HLK6	11925	0030
Seoul	V. of Free Korea	—	15125	0206
KUWAIT				
Kuwait	Al Kuwaitieh	—	4968	1109
Kuwait	Al Kuwaitieh	—	6055	1194
LEBANON				
Beirut	Lebanese BC	—	11890	1640
MALAYSIA				
Singapore	R. Malaysia	—	6105	1830
Singapore	R. Malaysia	—	7110	0305
Singapore	R. Malaysia	—	9635	0930
Singapore	R. Malaysia	—	11900	0902
PAKISTAN				
Karachi	R. Pakistan	—	7295	1445
Karachi	R. Pakistan	—	9740	1447
Karachi	R. Pakistan	—	11672	1445
Karachi	R. Pakistan	—	15300	0835
SAUDI ARABIA				
Riyadh	Saudi Arabia BC	—	7220	1348
Riyadh	Saudi Arabia BC	—	9670	1345
SYRIA				
Damascus	R. Damascus	—	11750	0445
TURKEY				
Ankara	R. Ankara	TAS	7285	1707
Ankara	R. Ankara	TAT	9515	0900
Ankara	R. Ankara	TAU	15160	1500
Ankara	R. Ankara	TAQ	15195	1333
Ankara	R. Ankara	TAV	17820	0845
VIETNAM (NORTH)				
Hanoi	V. of Vietnam	—	9840	1030
Hanoi	V. of Vietnam	—	11840	0501
Hanoi	V. of Vietnam	—	15100	0509
YEMEN				
Sanaa	Huna Sana	—	5985	1700

PACIFIC

AUSTRALIA				
Melbourne	R. Australia	—	7220	0900
Melbourne	R. Australia	—	9570	1453
Melbourne	R. Australia	—	9580	0607
Melbourne	R. Australia	—	11810	0618
Melbourne	R. Australia	—	15220	1715
Melbourne	R. Australia	—	17820	0930
Melbourne	R. Australia	—	17870	1932
Melbourne	R. Australia	—	21540	2000
FIJI ISLANDS				
Suva	Fiji BC	VRH10	9715	2347
NEW CALEDONIA				
Noumea	R. Noumea	—	7170	0518
NEW GUINEA (AUSTRALIAN)				
Port Moresby	Australian BC	VLK3	3925	1510
Port Moresby	Australian BC	VLT	4890	1530
NEW ZEALAND				
Wellington	N.Z. Calling	ZL18	9520	0108
Wellington	N.Z. Calling	ZL3	11780	2230
Wellington	N.Z. Calling	—	11820	2315
PHILIPPINES				
Malolos	V. of America	—	15210	1400
Manila	Far East BC	DZH7	9715	1830
Manila	Far East BC	—	15230	0730
Manila	V. of Manila	DZ17	6080	0350
REUNION				
St. Denis	R. Reunion	—	4807	1309
RYUKYU ISLANDS				
Okinawa	V. of America	—	7165	1600
Okinawa	V. of America	—	15125	1130
TAHITI				
Papeete	R. TV Francaise	—	11827	2230

NORTH AMERICA

CANADA				
Montreal, P.Q.	R. Canada	CFCX	6005	1300
Montreal, P.Q.	R. Canada	CKLO	9630	0700
Montreal, P.Q.	R. Canada	CHOL	11720	0708
Montreal, P.Q.	R. Canada	CKCS	15320	0703
UNITED STATES OF AMERICA				
Cincinnati, Ohio	U.N. R.	WLWO	15250	1300
Delano, Calif.	U.N. R.	KCBR	6185	2100
Greenville, N.C.	U.N. R.	—	15385	1200
Greenville, N.C.	U.N. R.	—	17795	1214
New York, N.Y.	R. N.Y. Worldwide	WRUL	9520	1345
New York, N.Y.	R. N.Y. Worldwide	WRUL	11950	2022
New York, N.Y.	R. N.Y. Worldwide	WRUL	15385	2000
Red Lion, Pa.	—	WINB	11785	1605
Red Lion, Pa.	WINB 17720 1302	WINB	11825	1508
Red Lion, Pa.	—	—		

CENTRAL AMERICA AND CARIBBEAN

BRITISH HONDOURAS				
Belize	Brit. Hond. BC	—	3300	2120
COSTA RICA				
Puerto Limon	R. Casino	TIQ	5950	0100
San Jose	Faro del Caribe	TIFC	9645	2241
San Jose	R. Reloj	TIHBG	6005	0005
CUBA				
Havana	R. Havana	—	6100	0130
Havana	R. Havana	—	6135	2300
Havana	R. Havana	—	11865	1407
Havana	R. Havana	—	15340	1602
DOMINICAN REPUBLIC				
Santiago	R. Liberdad	HI5B	6080	1545
Santiago	R. Santiago	HI8Z	6060	1900
Santo Domingo	BC Nacional	HI1Z	6112	0605
Santo Domingo	Onda Musical	HI2S	4780	2208
Santo Domingo	R. Caribe	HI4U	9505	2200
EL SALVADOR				
San Salvador	R. Nacional	YSS	9555	1532
Sonsonate	V. del Pacifico	YSCB	4840	2045
GUATEMALA				
Guatemala City	E. Cultural	TGNB	9668	2100
Guatemala City	R. Internacional	TGTQ	6030	2032
Guatemala City	R. Nacional	TGWA	9760	1845
Quezaltenango	R. Nac. Quezalt.	TGQB	11700	1529
Retalhuleu	R. Modelo Retalh.	TGRE	11750	1925
HAITI				
Cap Haitien	V. Evangelique	4VE	6120	0634
Cap Haitien	V. Evangelique	4VEH	9770	0637
Cap Haitien	V. Evangelique	4VEJ	11835	0656
Port au Prince	R. Commerce	4VB	5985	0410
Port au Prince	R. Commerce	—	9545	0730
Port au Prince	R. Haiti	—	6198	1730
Port au Prince	R. Nacional	—	5920	2005
HONDOURAS				
Quezaltepeque	R. Quezalt.	HROL	10078	1830
San Pedro Sula	Eco de Hondouras	HRPI	5994	1730
Tegucigalpa	R. Centro	—	6060	0607
Tegucigalpa	V. de Hondouras	HRN	5875	2000
Tela	V. de Trajador	HRST	4790	2250
MEXICO				
Mexico City	Ststema R. Yucatan	XEQM	6105	0038
Mexico City	La Hora Exacta	XETT	9555	1845
Mexico City	R. Comerciales	XEHH	11880	1304
Mexico City	R. Comerciales	XERR	15110	0708
Tapachula	R. XETS	XETS	6120	2345
NICARAGUA				
Granada	R. Sport	YNWW	5965	2030
SWAN ISLAND				
Swan	R. Americas	—	11800	1230
WINDWARD ISLANDS				
St. George Grenada	Windw. Is. BC	—	3280	2100
St. George Grenada	Windw. Is. BC	—	9591	2200
St. Georges Grenada	Windw. Is. BC	—	11730	2103

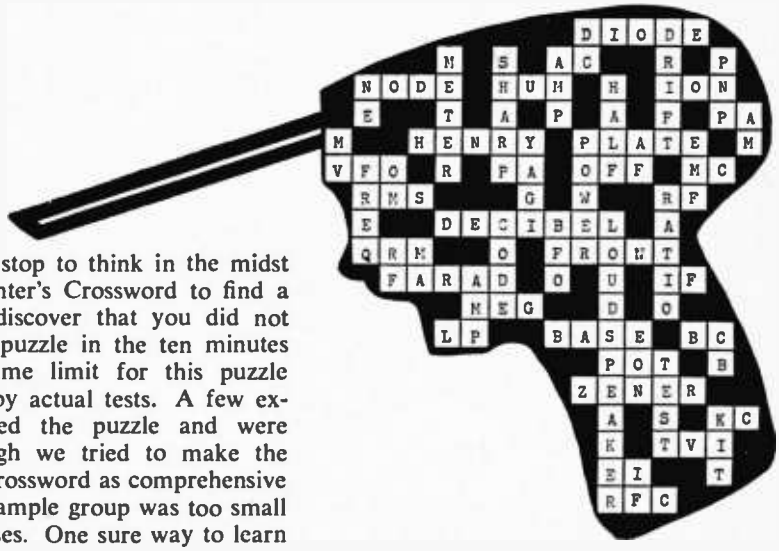
SOUTH AMERICA

ARGENTINA				
Buenos Aires	R. El Mundo	LRX	9660	0537
Buenos Aires	R. Belgrano	LRAI	6090	2137
BOLIVIA				
Huanuni	R. Nacional	—	5860	2000

Location	Name	Call	Kc.	EST
BRAZIL				
Brasilia	R. Nac. Brasilia	—	11720	1800
Goiania	R. Cl. de Goiania	ZYW28	11735	2208
Rio de Janero	Emis. Continental	PRD21	6125	0200
Rio de Janero	R. Globo	ZYZ36	11805	1907
Rio de Janero	R. Mayrinck Velga	ZYZ27	9575	2207
Rio de Janero	R. Rural	ZYZ31	6065	1905
Sao Jose dos Campos	R. Univ. San. Dumont	ZYR232	17725	0030
Sao Luis	R. de Marinhao	ZYF24	4750	2015
Sao Paulo	R. Bandeirantes	ZYR78	11925	1330
CHILE				
Santiago	R. Nuevo Mundo	CE1174	11740	2230
Santiago	R. Yungay	CE965	9658	2310
Santiago	Soc. Nac. de Agric.	CE1180	11800	2006
Santiago	Soc. Nac. de Mineria	CE1196	11960	2208
Valpariso	Voz de Chile	CE1190	11900	2030
COLOMBIA				
Bogota	R. Santa Fe	HJAE	4965	2315
Bogota	R. Sutatenza	HJGT	6075	2100
Bogota	R. TV Nacional	HJKZ	11825	2107
Bucaramanga	R. Bucaramanga	HJGF	4845	2245
Cali	R. El Sol	HJNE	5040	2357
Ibaque	V. del Tolima	HJLB	6040	2100
Pereira	V. Amiga	HJFK	6010	0002
ECUADOR				
Bahia	V. de los Caras	HCAS4	4793	0000
Cuenca	R. Rio Tarqui	—	3995	0210
Esmereldas	R. Iris	HCDY4	3945	2357
Loja	R. Centinela	HCVC3	6242	2318
Portoviejo	R. Cenit	HCMX4	4770	2316
Quito	R. Nac. Espejo	HCWE1	4880	0027
Quito	R. Quito	—	4925	2100
Quito	V. de los Andes	HCJB	9785	1730
PARAGUAY				
Asuncion	R. Teleco	ZPA3	11852	1834
Encarnacion	R. Encarnacion	ZPA5	11947	1808
PERU				
Chiclayo	R. Chiclayo	OAX10	5520	2341
Huaraz	R. Huaraz	—	5968	2322
Iquitos	R. Eco	OAX8V	5010	2230
Iquitos	R. Nacional	OAX8C	9610	2236
Lima	Onda Popular	OAX4S	6260	2118
Lima	R. Central	OAX4K	9545	2057
Lima	R. del Pacifico	OAZ4L	9675	1300
Lima	R. Excelsior	OBX4G	6150	2100
Lima	R. la Cronica	OAX4J	9390	2005
Lima	R. la Cronica	—	9520	2100
Lima	R. Nac. de Peru	OAX4T	15150	2037
Tacna	T. Tacna	OAX6H	9500	2145
URUGUAY				
Montevideo	R. Carve	CXA13	6155	2139
VENEZUELA				
Barcelona	R. Barcelona	YVQI	3385	2130
Caracas	R. de Venezuela	YVKB	4890	2030
Caracas	R. Libertador	YVKT	3245	1758
Caracas	R. Nacional	—	6500	1015
Caracas	R. Rumbos	YVLK	4970	0100
Caracas	R. Tropical	YVKP	4875	2140
Caracas	V. de la Patria	YVKX	3305	2040
Maturin	R. Monages	YVRA	3325	2331
CLANDESTINE				
—	Azad R. Kashmir	—	3250	2230
—	R. Espana Indep.	—	11280	1008
—	R. Liberdad	—	7308	0800
—	R. Liberdad	—	9327	2014

Experimenter's Crossword

(Puzzle on page 115)



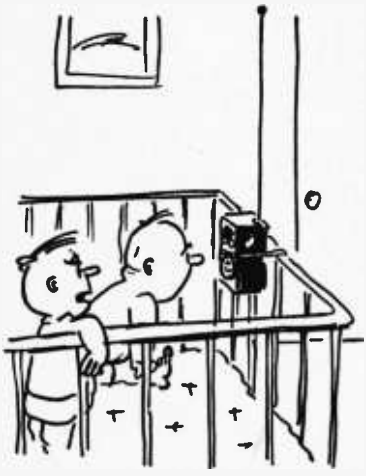
If you had to stop to think in the midst of the Experimenter's Crossword to find a word, you will discover that you did not finish all of the puzzle in the ten minutes allocated. The time limit for this puzzle was determined by actual tests. A few experimenters solved the puzzle and were clocked. Although we tried to make the Experimenter's Crossword as comprehensive as possible, our sample group was too small for testing purposes. One sure way to learn whether our ten minute time limit is accurate or not, let us know how you did.

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

Now that you know your rating, you may agree with us, or you may want to take issue with us. Either way, please let us know what you think. Send a postal card to the Editor, RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, New York 10022 and comment on the time interval. If you believe ten minutes is enough, say so. Otherwise, let us know what you believe time limit should be. We're waiting for your cards. ■

Putting Out On Part 15

By Alvin H. Bloodworth



"It's a Squealer. It tells Mama every-time you do something wrong."

". . . and a can of beans. 10-4"

"This is PDG122 cutting out . . . . . 'till further notice."

"Okay, dear, as long as you're at the office and not at some bar!"

The Hottest Stuff

(Continued from page 104)

ma Physics Lab admits that fusion fuels may be a pipe dream: "We still don't know if the basic physics of it are possible," he says. To test the feasibility of fusion generators, Princeton University, in cooperation with RCA and Allis Chalmers, built one of the most fantastic machines ever devised. It fills a room large enough to hold a football field, and its associated control equipment spreads through endless corridors around it.

Called the C-Stellerator (short for "stellar generator"), the machine attempts to produce energy through the fusion of hydrogen-derived deuterium atoms, just like the Sun. Simple in principle, the Stellerator involves some incredibly difficult engineering. Main problem: at 100 million degrees F. the plasma is simply too hot to handle. The white-hot hurricane would melt, burn, vaporize, erode or otherwise disintegrate any known material. But a recent development—magnetic bottles—may hold the answer.

In a magnetic bottle, powerful magnets create an invisible magnetic curtain inside the reaction tube. This keeps the moiling plasma stream in magnetic suspension so that it doesn't come in contact with the metal walls. Theoretically, this would work fine if the superhot plasma moved in an even flow, but the ornery stuff is so full of wild energy that it swirls, sways, and bubbles in a way that makes it hard to control. Dr. Edward Teller, the fusion specialist of H-bomb fame, says it's like trying to hold lukewarm jelly in a cage of rubber bands.

Not all plasma projects are in outer space or the distant future. In its less violent forms, plasma is already doing regular jobs in industry. Honeywell Company recently perfected a plasma flame detector called "the purple peeper." Ultraviolet radiation from any flame converts neon gas in the peeper's sensing organ into purple-colored plasma, making it electrically conductive. By this conductivity change, the peeper acts as a fire alarm or, conversely, signals flame failure in burners. Because the plasma can distinguish radiation of the flame itself from a hot environment, it is a far more reliable flame sensor than thermostats or similar devices that merely register temperature. Industry can use it to signal flame failure in oil and gas burners.

The Linde Company has built a plasma-heated furnace, called Plasmarc, for melting and alloying metals. Four times hotter than the Sun's surface, the plasma heat source can be accurately controlled during every stage of the melting process. Unlike an arc furnace, the Plasmarc doesn't contaminate the melt with carbon from the electrodes. Metallurgists hope to improve alloys with the new process, perhaps even to create new synthetic materials that can't be produced at lower temperatures.

Westinghouse uses the intense glow of white-hot plasma as a light source for the brightest lamp ever designed. Soon plasma lamps may be used for airport lighting, searchlights, and special military applications. Avco now markets plasma guns in which the superhot plasma vaporizes tough metals like tungsten so they can be sprayed like paint. Even refractory ceramics can be sprayed with these guns. This method is expected to open up new ways for making more durable surface coatings.

By filling radio tubes with plasma, RCA has been able to develop more efficient high-frequency generators that are already providing longer range and clearer pictures for our defense radar. Next step: high-frequency sources in the tricky millimeter wave band, powerful enough to modulate laser beams so they will carry TV, telemeter, and voice information or provide jam-proof military communications.

Probably the most important present use of plasma is testing missile materials. Are they rugged enough to hold up under the intense heat and abrasion of re-entry into the atmosphere? Plasma jets provide a clear answer. Raging past space vehicles in test tunnels, plasma streams as hot as 30,000°F. simulate the outer atmosphere where the air itself is converted into plasma by friction against the re-entering missile.

Now that scientists have recognized plasma as a form of free electricity, they can explain some natural phenomena that had so far remained mysterious. We now know the gigantic flares erupting from the Sun cause radio static: the solar flares are plasma, pumping electromagnetic waves into space. The aurora borealis—the beautiful northern lights—are now recognized as space plasma pouring into the outer atmosphere.

At the present stepped-up rate of plasma research, scientists expect astonishing developments in this still largely unexplored field that may affect the future as profoundly as electricity has affected our age. ■

Analyzing Auto Ailments

(Continued from page 54)

cialized oscilloscope, enables the operator to quickly identify many common ignition faults; shorted spark plugs, bad points, defective wiring, worn distributor parts, incorrect dwell time, coil and condenser problems.

The ignition analyzer permits the operator to test the car's entire ignition system with just one hookup and without removing a single component from the car or engine. In fact, the hookup can be done with a white shirt on and the cuff's buttoned. Testing is done with the engine running, so you are actually performing a road test while standing still. In fact, with a DC-to-AC inverter to power the analyzer off the car's battery, engine tests can be performed while on the road. It is best to have a driver whose sole responsibility is driving, and a test mechanic sitting in the back seat of the car where the ignition analyzer is also located.

Heathkit Ignition Analyzer sells for $89.95 in kit form. Also available is a timing light that plugs into back of the analyzer.

One of the extras that comes with some analyzers is a timing light. This gadget uses the stroboscopic principle of light flashes synchronized with motion. The light flashes are of short duration that they appear to *fix* the position of the fan belt pulley or flywheel —an important feature necessary for *timing* engines. Exact details on engine timing should be obtained from the auto manufacturer.

Electronics is creeping into every facet of our lives—it's in our automobiles, too. An experimenter who takes advantage of his electronics hobby instincts while working on his car can save many dollars in repair bills and increase the life of his car. ■

Photographing Electronic Gear

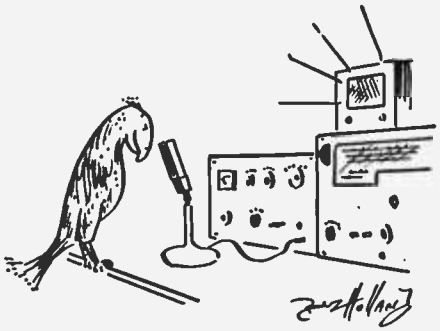
(Continued from page 74)

We tried it, and eliminated all shadows with our floodlights while avoiding reflections as much as possible. The result, suitable for enlarging, was the shadow-free, evenly lit shot shown here as in the upper right photo on page 74.

Extreme Close-ups. Frank pointed out that supplementary lenses or *close-up* lenses are available for most 35mm cameras at low cost. Using his set of supplementaries, Beaudin set up the equipment as shown above. He came up with this sharply detailed view of a tuner assembly at about twice the actual size. "Just be extremely careful of measuring distance," he warned, "and read the instructions that come with the lenses carefully."

As Frank prepared to leave for his studio, we asked him for three or four basic guidelines for photographing chassis or panels. Here are Frank's check points:

- ✓ "Keep your background clear and uncluttered. Use non-glossy (*no shine*) white cardboard."
- ✓ "Don't let your prop show. It's usually best to hide connecting cables and/or wires too."
- ✓ "When shooting a chassis from the rear, keep large transformers and similar parts from dominating the picture and from casting heavy shadows."
- ✓ "Beware of reflections. Set your lights on an angle and watch for "hot spots" off shiny parts or off the glass covers of meters."
- ✓ "Watch your settings—distance . . . exposure . . . diaphragm. And try more than one exposure."
- ✓ "Good luck!" ■



"YL, your name is Polly 'what'?"

TRAIN AT HOME with NRI

For 50 years the leader in training men for careers in Electronics, Radio-TV

Training men to succeed in the many fields of Electronics has been NRI's **only** business for half a century. The NRI diploma is respected and recognized by prospective employers in business and industry throughout the U.S. and Canada. NRI graduates are enjoying higher pay, more interesting work, better futures in every field of Electronics . . . performing work for which **you** could qualify through NRI "learn-by-practice" methods. And NRI provides training at reasonable cost because it is the oldest, largest home-study school of its kind. If you want the security, prestige and freedom from financial worries that come with training . . . then you want to investigate NRI's specialized instruction plans and the many career opportunities in the fast-growing Electronics industry. Write **now** for our two free books. Use the postage-free card below.

SEE OTHER SIDE

THE DEMAND IS GREAT FOR SKILLED TECHNICIANS

NRI's Servicing course trains you to fix black-and-white and color TV sets, radios, hi-fi, etc., shows you how to make $3 to $5 an hour in spare time soon after enrolling. Leads to a good full time business of your own, servicing Electronic products for the home.

Prepare for a career as an Electronic Technician in industry, business, government, the military, with NRI training in Industrial Electronics. Computers, telemetry, automation, etc. all employ the same basic electronic principles, and that is what NRI training stresses.

Communications offers a choice of careers operating or servicing transmitting equipment in broadcasting, aviation, marine, mobile radio, etc. From simple circuits to FCC exams, NRI courses train you quickly in one or all of the Communications fields.

MAIL POSTAGE FREE CARD FOR **2** NEW BOOKS

First Class Permit (Sec. 34.9, P.L. & R.) Washington, D.C. No. 20-R

BUSINESS REPLY MAIL
No Postage Stamp Necessary If Mailed In The United States

Postage Will Be Paid By

nri

3939 Wisconsin Avenue
Washington, D.C. 20016

PICK YOUR CAREER

Join the thousands who gained success through NRI training

Thousands of ambitious men have moved up to career-level jobs or businesses of their own in Radio-TV Servicing, Communications, Industrial and Military Electronics through NRI training. The demand for skilled Technicians in this age of color TV, stereo, rockets, missiles, computers, telemetry, microwave, lasers, masers and automation is greater than the demand for engineers—4 to 7 times greater. Whether you're working in Electronics now, are a hobbyist or beginner . . . whether you're a college graduate or a man who had to leave school early . . . whatever your desire or education, there's Electronics training for you among NRI's specialized instruction plans. Choose from "short courses," specialized training in fields of Communications or intensive training for career positions. Get full details about the course of your choice without obligation. Mail card below.

1. Television-Radio Servicing
2. Industrial-Military Electronics
3. Complete Communications
4. FCC License
5. Basic Electronics
6. Math for Electronics
7. Aviation Communications
8. Marine Communications
9. Mobile Communications
10. Electronics for Automation

SPECIAL NRI EQUIPMENT MAKES TRAINING FASTER, EASIER

When you train with NRI, you "learn-by-doing" with carefully developed custom-designed equipment included—at no extra cost—with most courses. All equipment is yours to keep. Projects you build, experiments you perform, make NRI illustrated lessons come to life. Complex subjects take on practical meaning. Actual shop and laboratory experience makes learning faster, easier, makes you more valuable to prospective employers—or use it to make extra money in your own spare time or full time service business. Free books we send you show equipment, tell about the NRI Trial Enrollment Plan. Convenient monthly payments. Mail postage-free card.

SEE OTHER SIDE

MAIL FOR
2 NEW BOOKS

NO STAMP NECESSARY—NRI PAYS POSTAGE

4CB3

NATIONAL RADIO INSTITUTE, WASHINGTON, D.C.

Please send me your two books about opportunities in Electronics-Automation, Radio-TV and your specialized instruction plans. (No salesman will call. Please print)

Name.....Age.....

Address.....

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

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL

nri

NATIONAL RADIO INSTITUTE
WASHINGTON, D.C.
Oldest and largest school of its kind

ACCREDITED SCHOOL · NATIONAL HOME STUDY COUNCIL · NHSC