

75¢ PUBLISHED BI-MONTHLY

RADIO-TV EXPERIMENTER

FEBRUARY-MARCH

WHITE'S RADIO LOG



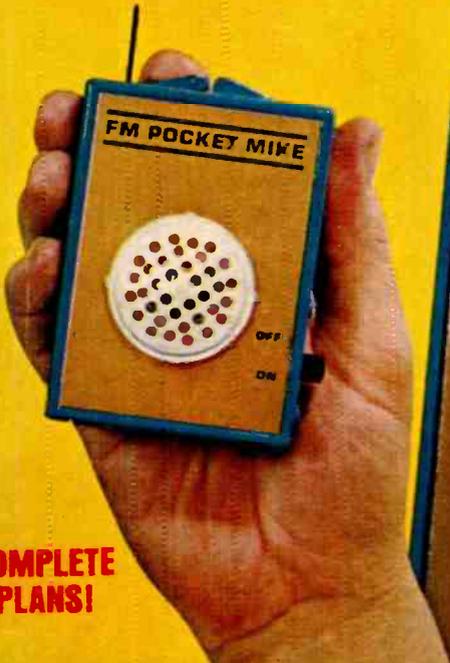
AM-FM-TV STATIONS
NEW EXPANDED
WORLD-WIDE
SHORT-WAVE LISTINGS!

28 HOTTEST NEW KITS FOR '64!

New FCC Rulings On Taxes, Licensing!

PLANS FOR 10 PROJECTS, including—

- \$1 BROADCAST BAND BOOSTER!
- \$15 LIGHT METER CALIBRATOR!
- \$7⁵⁰ POWER TOOL SPEED CONTROLLER!



COMPLETE PLANS!



\$10 FM TRANSMITTER
100 USES! BUILD IT IN 4 HOURS!



American Basic Science Club's Amazing MASTER LAB!

You Get ALL the Equipment on this Page in 8 Monthly Kits

SEND ONLY \$200 WITH COUPON PAY \$395 FOR EACH OF THE 8 KITS - ONE A MONTH TOTAL PRICE FOR THIS MASTER LAB \$3360

ELECTRONICS LAB AND RADIO COURSE

SHORTWAVE AND BROADCAST RADIOS. 3-tube regenerative circuit. Uses 115V AC house current. Complete with Headset, CARBON MICROPHONE, 2-stage AUDIO AMPLIFIER...
RADIO TRANSMITTER for code or voice.
DC POWER SUPPLY (Power Transformer, Vacuum Tube Rectifier and 20-20 mfd. capacitor filter circuit) converts home line AC to the DC required for electronics.

STROBE LIGHT — oscillator controlled Neon Lamp. Freezes the motion of vibrating or rotating objects and checks RPM.

RIPPLE TANK WAVE GENERATOR with variable frequency. Produces standing waves, nodal lines, etc. Invaluable in understanding wave theory.

CODE PRACTICE OSCILLATOR with manual, "Steps to A Ham License." All you need to pass the FCC Ham License Exam.

SIGNAL TRACER AND CONTINUITY TESTER. Valuable trouble shooting tools. Use explained in accompanying manual. "Simplified Radio-TV Servicing."

PLUS—WHEATSTONE BRIDGE (Measures Resistance), **MAGNETIZER AND DEMAGNETIZER**, **ELECTRO-MAGNETIC RELAY**, **BURGALAR ALARM**, **PROXIMITY DETECTOR**, **EXTINCTION VOLTMETER**, **GALVANOMETER**, **THERMO-COUPLER**, **SOLENOID COIN TOSSEUR**, and many more! The best starting way to a solid background in electronics. **BASIC ENOUGH FOR BEGINNERS. REWARDING ENOUGH FOR THE "PROS."**

A VALUABLE ELECTRONICS LAB with quality parts by RCA, GE, Pyramid, Centralab, Trim, Stackpole, Cinch, Motorola and other reliable manufacturers. Retail value of parts alone is over \$25.00. Includes hardware, hook up wire, solder and a bonus **ELECTRIC SOLDERING IRON**.

(Available as a Separate Unit for \$17.80 Postpaid)

35MM AND MICRO-PROJECTOR

Surely black steel lamp housing with screw chimney and baffle for cool operation. 140 Watt GE Projection Lamp; Large Twin Condensing Lenses for extra brightness. Rotary Switch, 6 Foot Cord. Includes on extra projection assembly to make it a micro-projector.

(Available as a Separate Unit for \$6.95 Postpaid)

SURVEYOR'S TRANSIT AND RANGE FINDER

A practical transit, 6X erect image telescope with Range Finder Reticle for measuring remote distances and heights. Vernier reading for both horizontal and vertical scales. Leveling Head with Thumb Screw Adjustment and Spirit Level. Clamps under head hold wooden legs of Tripod. (Legs not included). Instrument cover, elementary surveying, range-finding.

(Available as a Separate Unit for \$5.95 Postpaid)

TELESCOPE AND MOUNT

30X erect image. Extends to 30" length. Five ground and polished lenses. Ramsden Eyepiece. Surety Equatorial Mount. Ramsden Eyepiece. Low the movement of heavenly bodies. Also has fittings for wooden legs that complete the tripod (legs not included).

(Available as a Separate Unit for \$4.95 Postpaid)

MICROSCOPE

100X, 150X and 200X. Precision ground and polished lenses. Ramsden Eyepiece gives large field. Substage Illuminator with Condensing Lens. Surety Equatorial Mount. Ramsden Eyepiece. Filters give a jewel-like brilliance to crystals, etc. Slides and cover glasses included with Manual on Microscopy.

(Available as a Separate Unit for \$5.95 Postpaid)

ATOMIC ENERGY LAB

ATOMIC CLOUD CHAMBER WITH PROJECTOR ILLUMINATOR. See the vapor trails of alpha and beta particles, and of cosmic rays.
SPINTHARSCOPE. Shows exploding atoms.
ELECTROSCOPE — metal housed with Steel and Magnifying Viewer. Measures back-ground radiation, etc. Tests sample sources.
SAFE RADIOACTIVE MATERIALS. Alpha Source in handy container and Uranium Ore. Full instructions and explanations open up the fascinating field of nuclear physics.

(Available as a Separate Unit for \$6.95 Postpaid)

WEATHER STATION

A REMOTE READING ANEMOMETER AND WIND. VANE — Flushing Neon Lights on outdoor indicator board show wind speed and direction. Operates on less than 1 cent. per month. **Safety Power Cord** makes all connections safe. **150 Ft. Lead in Wire Plus** — **Alt. Tank Barometer** with 4 ft. indicator card. **Umm. Sling Psychrometer** measures relative humidity. **Rain Gauge** measures rainfall to 1/100 inch. **ALSO** Cloud Chart, Weather Map and Forecasting Manual — a complete set-up for amateur meteorology.

(Available as a Separate Unit for \$7.95 Postpaid)

PHOTO DARKROOM LAB

A PRECISION 35MM ENLARGER — horizontal type lens. Produces quality enlargements up to 8" x 10". Contact Print Frame takes negatives up to 3 1/2" x 4 1/2". **3 Plastic Developing Trays**, **Neon Safetylight**, **Tray Thermometer**, **Film Clips**, **Developing Chemicals**, **Printing and Enlarging Paper** and **Darkroom Manual**. **Includes** — quality enlargements for 3c. Make plans for only 2c.

(Available as a Separate Unit for \$9.95 Postpaid)

ULTRAVIOLET LAMP

140 Watt filter type UV LAMP. Heavy metal cabinet. 6 Foot Cord, Rotary Switch. Produces dazzling color effects with invisible blue light. Has many uses in the fields of Mineralogy, Gem, Dendrology and Science. Accessories include Invisible Ink, Trace Powder, Fluorescent Cavans.

(Available as a Separate Unit for \$6.95 Postpaid)

SPECTROSCOPE

Analyze the spectra of glowing gases. See and identify the Fraunhofer lines. Measure the wave length of light rays. A quality instrument featuring an easy-to-read built-in scale and a powerful condensing system for a bright spectrum. Equipment includes an Alcohol Burner and a 2 Wear Neon Spectral Lamp. Full instructions cover theory and use.

(Available as a Separate Unit for \$5.95 Postpaid)

LIGHT BEAM TRANSMITTER-RECEIVER

TRANSMITTER consists of a Light Source, a Modulating Reflector, Diaphragm and an Optical Projective System. **THE RECEIVER** is a Two-Stage Audio Amplifier, controlled by a Photo-Electronic Cell that catches the projected light beam and causes the original sound waves to be reproduced in the headphones.

(Available as a Separate Unit for \$14.95 Postpaid)

ANALOG COMPUTER

Electronic Computer multiplies, divides, calculates powers, roots, logarithms. Set up the problem on the scales of two rear potentiometers and find the answer by listening for the full point on the third potentiometer. **Very accurate, educational, and practical** than similar computers that sell for several times the price. Easy to assemble. **Complete with Headphone.**

(Available as a Separate Unit for \$4.95 Postpaid)

PHOTOELECTRONIC RELAY

Crystal Photocell, Electronic Amplifier, Relay, large Condensing Lens in Cabinet Mount. Features automatic "on-off" or holding circuit operation. Sensitivity Control. Plug-in Outlet for controlled circuit. Use for alarm, burglar, etc. Operates on 115V AC. A basic unit for many exciting experiments.

(Available as a Separate Unit for \$7.95 Postpaid)

8 KIT MASTER LAB Includes ALL the Equipment for ALL the Above...only \$3360

SEND ONLY \$200 WITH COUPON PAY \$395 PLUS POSTAGE FOR EACH OF THE MASTER LAB'S 8 MONTHLY KITS. YOUR SATISFACTION OR MONEY BACK... CANCEL ANY TIME YOU WISH

HOW IS IT POSSIBLE?... A GOOD QUESTION!

All the above equipment, as separate units, adds up to over \$10000

How can the 8 kit Master Lab have it all for only \$33.60?

The answer is in the versatile, multi-purpose equipment. For example: the 35MM Projector quickly and easily converts into the housing for the Ultraviolet Lamp, Spectroscopic Photo Enlarger, Cloud Chamber Illuminator, etc. Similarly, the Surveyor's Transit Head doubles as an Equatorial Mount for the Telescope. The unique Light Beam Transmitter-Receiver is made up of the two stage Audio-Amplifier of the Electronics Lab and parts of the Slide Projector and Photoelectronic Units. Such multi-purpose use makes it possible for the Master Lab to provide a wide range of practical equipment at a fraction of the customary cost. Multi-purpose design is not used where it would be impractical: for the permanently mounted weather instruments, for example.

KIT-A-MONTH OR ALL AT ONCE

The Master Lab may be received either on the kit-a-month plan, or all 8 kits in one shipment (see coupon). You may start out on the kit-a-month plan and change at any time. For example: if, after having received 3 kits, you decide you would like the remaining 5 all at once, you would send \$19.75 (5 x \$3.95) for full payment, postage paid. We suggest you start with the kit-a-month plan. It is preferred by many.

SEPARATE UNITS ALL GOOD BUYS

Although we strongly recommend the complete Master Lab — you can order any of the individual units and still get the best buy in its field. Nowhere else can you get a Photo Lab with Enlarger, Contact Printer, and all the other accessories for only \$9.95; or a practical Transit for only \$5.95. Similarly, all units are priced far below competitive items of comparable quality.

DEVELOPED BY TOP SCIENTISTS

The Master Lab was developed with the Southwest Research Institute of San Antonio, Texas, a non-profit public service organization, nationally known as the center of scientific activity in the Southwest. Its varied programs range from polar expeditions to high temperature experiments for missile research. The Master Lab is the result of the enthusiastic efforts of top scientists of this highly regarded research organization.

ACCLAIMED BY EDUCATORS

"You offer a range of experiments usually performed only in the better high school and college laboratories. The number of concepts presented and the clarity and correctness of their development is amazing."

R. M. HELM, Prof. of Physics
East Carolina College, Greenville, N. C.



Order MASTER LAB Today
Get **MYSTERY SHOCK BOX** with your first kit!

MASTER LAB A REAL SCIENCE COURSE

The 8 Instruction Manuals and 6 Auxiliary Texts are Expertly Written, Clearly Illustrated, Excitingly Different... over 480 pages... more than 270 illustrations.

WITHOUT PREVIOUS EXPERIENCE you can build more than 120 projects and gain a VALUABLE SCIENCE BACKGROUND.

Actual Use is the Only Way to Appreciate the MASTER LAB! Order Yours Today on 10 Day Approval. See for Yourself!

You Will be **SURPRISED! AMAZED! DELIGHTED!**

MAIL COUPON TODAY

All Orders on 10 Day Approval — Your Satisfaction or Your Money Back

- Send me the complete MASTER LAB in 8 monthly kits. I enclose \$2.00 and will pay \$3.95 plus COD postage on receipt of each kit. I may cancel unshipped kits at any time.
- Send me complete MASTER LAB (all 8 kits) in one shipment I enclose \$33.60 Full Payment, Postage Paid.
- Send me only the _____ Unit. I enclose \$____ Full Payment, Postage Paid.

NAME _____
ADDRESS _____
CITY & STATE _____

AMERICAN BASIC SCIENCE CLUB, INC.
501 East Crockett St., San Antonio 2, Texas, 78202

ARTHUR GODFREY SAYS: "I.C.S. MADE THE IMPOSSIBLE—EASY!"



You've probably heard Arthur Godfrey on his coast-to-coast TV and radio programs. But have you ever heard what this famous personality has to say on the subject of International Correspondence Schools?

"I had to quit high school before the end of my second year. Later in life, at the U. S. Naval Materiel School at Bellevue, D. C., I had to master a working knowledge of math, all the way from simple decimals and fractions through trigonometry, in the first six weeks or be dropped from the course. So I took an I.C.S. course and finished at the head of the class! I.C.S. made the impossible—easy!"

As usual, Arthur Godfrey knows what he's talking about. And as an I.C.S. graduate, Mr. Godfrey is in the best of all positions to tell you about the educational system for men and women that's served so long as talent scout for American business and industry.

Read what he has to say carefully. Then mark your interest on the coupon and mail it today for full information on what I.C.S. can do for you!

Clip coupon here—and take your first big step to real success!

I. C. S., Scranton, Penna. 18515

Accredited Member
National Home Study Council

INTERNATIONAL CORRESPONDENCE SCHOOLS I C S

Box F4534M, 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 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—Suprv'n
- Personnel—Lab. Rel'n's

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

February-March 1964

Cover Photo by Don Lothrop

CONTENTS/INDEX		Feature	Theory	Construction	Ham Radio	CB—R/C	SWL	Audio/Hi-Fi	Kits—Products	Test Gear	AM/FM/TV	Related Sciences	Gadget
FM Pocket Mike	41			•							•		•
Echo Collecting	47	•	•	•				•				•	•
Indoor Antenna Systems	52	•							•		•		
Hams Make Happy Husbands	54	•			•								
Putting the Middle Channel to Work	57		•	•				•					•
Kit Builders Report	61	•		•	•		•		•				
Lissajous Figure Quiz	64	•	•							•			
CB Keeps Hot News Hot	65	•				•							
Wacky Woman with Wollensak	67	•						•					
Electronics Monitors Body Functions	68	•	•									•	
Neon Switch Photocell Relay	72		•	•									•
Stereo Goes Early American	76			•				•			•		
Potted Preamp	80			•				•					•
New Slant on Receivers	82	•		•	•	•	•						•
Special Section on 1964 Kits	83	•		•	•	•	•	•	•	•	•		
Manure Battery	90	•	•									•	
Astro-Ears for DX'ing	94	•	•									•	
Fly the R/C Champ	97	•				•							•
Speed Control for Power Tools	102		•	•									•
Passive Booster for DX-ing	106		•	•			•				•		•
Maid for Your (Light) Meter	107			•								•	•
DX Offbeat	110	•					•						
Field Day for Hams	112	•			•								
Crystal Ball	116	•					•						
Ham License Fees/Taxes	119	•			•	•							

WHITE'S RADIO LOG, Vol. 41, No. 1—128

DEPARTMENTS • Positive Feedback 6 • Bookmark 16 • New Products 22
 Ask Me Another 35 • Free Literature 122

These men are getting practical training in **NEW Shop-Labs of**

ELECTRICITY

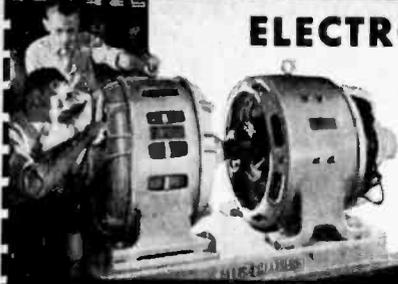
COYNE



ELECTRONICS

ON REAL

Motors—Generators
—Switchboards—
Controls—Modern
Appliances—
Automatic
Electronic
Control Units



TELEVISION

RADIO ELECTRONICS

ON REAL

TV Receivers—
Black and White
and Color
AM-FM and
Auto Radios
Transistors
Printed Circuits
Test Equipment



in Chicago—prepare for today's **TOP OPPORTUNITY FIELD**. Train on real full-size equipment at **COYNE** where thousands of successful men have trained for over 60 years—largest, oldest, best equipped school of its kind. Professional and experienced instructors show you how, then do practical jobs yourself. No previous experience or advanced education needed. Employment Service to Graduates.

START NOW—PAY LATER—Liberal Finance and Payment Plans. Part-time employment help for students. **GET FREE BOOK**—"Your Opportunities in Electronics" which describes all training offered in **ELECTRICITY** and **TELEVISION-RADIO ELECTRONICS**—no obligation; **NO SALESMAN WILL VISIT**.

Coyne Electrical School, 1501 W. Congress Parkway
Chartered Not For Profit • Chicago 7, Dept. 14-B

MAIL COUPON OR WRITE TO ADDRESS BELOW



COYNE ELECTRICAL SCHOOL
Dept. 14-B —New Coyne Building
1501 W. Congress Pkwy., Chicago 7, Ill.
Send **BIG FREE** book and details of all the training you offer.

Name _____ Phone _____
Address _____ Age _____
City _____ State _____

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



Mr. B. W. Cooke, Pres.
HOME TRAINING DIVISION, Dept. 14-B9
1501 W. Congress Parkway, Chicago 7, Ill.

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 _____



B. W. COOKE, President

COYNE

ELECTRICAL SCHOOL

Chartered as an Educational Institution Not For Profit
The largest, oldest, best equipped resident school of its kind. Founded 1899.
1501 W. Congress Parkway, Dept. 14-B9 Chicago 7, Ill.

SAVE OVER \$150. BUILD YOUR OWN CUSTOM 23" TV SET

Designed for all types of Hi-Fi and Custom installations—walls, bookcases, cabinets. Precision engineered in kit form, which you can assemble in less than 30 hours. Exclusive circuit layout for simplification and ease in construction. Large diagrams illustrate each wiring step clearly.

The Arkay 14 T 23 features:
Ultra linear sweep circuits
Special low noise tubes
Vertical chassis
Vertical retraced blanking
Reflex audio I.F. amplifier for true FM sound
Automatic gain control circuits
Most advanced turret tuner
6 Microvolt sensitivity
4 Megacycle picture bandwidth



Enjoy the thrill of constructing your own TV set and save over \$150, while learning the basic principles of TV. Cost only \$79.95* f.o.b. Brooklyn. * Less picture tube.

For full information write:

ARKAY International, Inc.

2372 Linden Blvd.

Brooklyn 8, N. Y.

MATHEMATICS ELECTRONICS

These great new courses are the result of many years of study and thought by the President of Indiana Home Study, who has personally lectured in the classroom to thousands of men, from all walks of life, on mathematics, and electrical and electronic engineering.

You will have to see the lessons to appreciate them!

YOU SIGN NO CONTRACTS—you pay only AFTER you have completed each Lesson of your course. If you aren't satisfied you don't pay, and there are no strings attached.

Write today for your outline of courses. You have nothing to lose, and everything to gain!

The INDIANA Home Study Institute
Eastern Div.

64 Hemenway Road

Framingham, Mass.

TRANSISTOR IGNITION



KITS—COMPLETE kit of PARTS to build WARD circuit in February 1962 Science and Mechanics. Includes: TRANSFIRE decal, 2 transistors, 2 Zener diodes, FINNED aluminum HEAT SINK, ignition coil, leads, ballasts, and small parts. EVERYTHING NEEDED for a PROFESSIONAL job—at net prices.

T-KX2 with 250:1 coil for 30 kv output. . \$34.95
TS-KX2 with 400:1 coil for 40 kv output. . \$36.95
250:1 coil for Ward circuit. . \$ 9.95
400:1 coil—High efficiency. . \$11.95

Add postage and insurance for 4 lbs. \$5 deposit with C.O.D.

FULL LINE of PARTS and WIRED CONVERSIONS for car, trucks, boats, etc. at LOWEST PRICES.

Write for lists. Dealer Inquiries Invited.

PALMER ELECTRONICS LABORATORIES, INC.

Dept. RT-41 CARLISLE, MASS. 617-AL 6-2626

FEBRUARY-MARCH 1964

VOLUME 16 No. 1



RADIO-TV EXPERIMENTER

JULIAN M. SIENKIEWICZ Editor

JOSEPH D'AMATO Art Editor

SID GREIFF Art Director

ANTHONY MACCARRONE Associate Art Director

ALBERT DE QUERQUIS Art Associate

ERNST J. LANZENDORFER Art Associate

P. D. URBAIN Production Editor

MARIANNE SULLIVAN Production Assistant

LEONARD F. PINTO Production Director

AARON DANIELS Advertising Director

CARL BARTEE Advertising Production Manager

STEWART S. JURIST Circulation Promotion Manager

President and Publisher

B. G. DAVIS

Executive Vice President and Assistant Publisher

JOEL DAVIS

Vice President and Editorial Director

HERB LEAVY

Cover Art Director

FRANK A. TAGGART

Managing Editor, S&M Handbooks

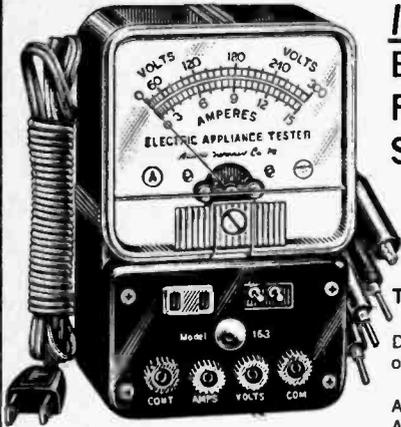
JOSEPH DAFFRON



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): \$3 domestic, \$4 foreign. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 6363 Wilshire Blvd., 653-5037. Application for second-class postage rates is pending at New York, N. Y., and at additional mailing offices. Copyright 1963 by Science & Mechanics Publishing Co.

Use new improved Model 163

FOR REPAIRING ALL ELECTRICAL APPLIANCES



INCLUDING Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Switches, Thermostats, etc.

CHECK ALL ELECTRIC LINES TEST ALL TV TUBES

The Model 163

Measures A.C. and D.C. voltages, 0 to 300 volts; A.C. and D.C. current, 0 to 15 amperes; indicates continuity to 100,000 ohms.

The ranges specified above are sufficient to test all Home Appliances without exception and the vast majority of Industrial Appliances and Utilities.

The Model 163

Will measure the current consumption of any home electrical appliance without the necessity of breaking any of the wires and while the unit is in operation. You simply insert the plug of the appliance into a special socket on the front panel of Model 163, plug the line cord of the Model 163 into the electric line outlet, and read the current consumption in amperes direct on the meter. This is a feature not included in many ampere testers selling from \$25.00 to \$100.00.

Testing TV tubes with Model 163

Please note Model 163 will not test the quality of the tube (an emission tester is required for that purpose) but Model 163 will test all tubes used in your TV set, including picture tubes, for open filaments, burned out tubes, etc.

Testing electric lines and outlets

The Model 163 will measure the voltage of any electrical line, outlet or socket. Most lines vary between 110 volts and 125 volts depending upon power line load. Some lines are 220 volts (actually vary between 208 volts and 240 volts). Model 163 will accurately measure all such lines. A.C. or D.C.

Motors

The model 163 will test all motors—single phase, multi-phase, universal, squirrel cage, induction; in fact every type from fractional H.P. to 2 H.P.

Meter movement

The Model 163 employs a rugged, accurate, highly damped meter movement with sealed air-damping chamber. Because the meter is of the A.C. type, rectification of current is not required, greatly reducing the possibility of ever damaging the meter or its associated components.

Test leads

Model 163 includes both a prod type lead and an alligator clip lead allowing maximum flexibility. **Operating procedure book**

The 36-page manual provided with Model 163 is practically a condensed course in electricity. In addition to detailed step-by-step procedure for using Model 163, the manual explains in easy-to-understand language what electricity is, discusses current voltage and wattage, and includes many, many simplified explanations usually included only in costly correspondence courses.

Guarantee

Model 163 is guaranteed for one year.

Model 163 comes complete with all test leads and operating instructional manual. Ready to use. **Only.....**

\$9⁸⁵

SEND NO MONEY WITH ORDER PAY POSTMAN NOTHING ON DELIVERY

Try it for 10 days before you buy. If completely satisfied then send \$3.00 and pay the balance at the rate of \$3.00 per month until the total price of \$9.85 (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-310 911 Faile St., Bronx 59, N. Y.

Please rush me one Model 163. If satisfactory I agree to pay \$3.00 within 10 days and balance at rate of \$3.00 per month until total price of \$9.85 (plus small P.P. and budget charge) is paid. If not satisfactory, I may return for cancellation of account.

Name _____

Address _____

City _____ Zone _____ State _____

NO MATTER WHAT YOUR JOB IS TODAY

There's BIG MONEY to be Made In COLOR TELEVISION!

DUE TO SHORTAGE OF TRAINED MEN



Get into fast-growing field! Learn COLOR TV servicing at home in spare time. Many *earn cash* while training! Move ahead to a better job, a business of your own!

Get 20 Valuable Kits to Build 21" TV Set and Test Instruments!

Become expert the fast, easy way . . . by working on actual TV problems. Your training includes 20 valuable kits of parts and tools, yours to keep. Build a complete 21" TV set, tube tester, and electronic voltmeter as part of your training.

HERE'S HOW TO GET STARTED:
MAIL COUPON TODAY FOR
FREE BOOKLET!

Commercial Trades Institute
1400 Greenleaf Ave., Chicago, Illinois 60626

Rush my FREE booklet (without cost or obligation) on C.T.I. training for job opportunities in television-electronics—including COLOR TV servicing.

NAME _____
ADDRESS _____
CITY _____ ZONE _____ STATE _____



Accredited Member National Home Study Council

POSITIVE FEEDBACK

By Julian M. Sienkiewicz
Editor

RADIO-TV EXPERIMENTER, beginning with this issue, is now a bi-monthly magazine that will be coming your way six times a year. Considering that this magazine started out as an annual publication, and not too annual at that, its growth is a bit surprising. Also, the regular readers of RADIO-TV EXPERIMENTER would notice that the magazine has a new Editor.

One of the diseases that afflicts new Editors is called *changitus*. Once they get control of a publication, they want to change everything about the old magazine and come up with an entirely new format. Well, this is one Editor who will not set the publishing world on fire. I liked the old RADIO-TV EXPERIMENTER; its articles were top notch, construction projects were many and good, and it gave a healthy dose of theory.

You may well ask, "What will be new in RADIO-TV EXPERIMENTER, and if nothing, who needs you?" I can answer that question by saying that electronics is a growing field, that is creeping into practically every facet of our lives. The transistor, that was big news several years ago has yielded to the tunnel diode, silicon controlled semiconductors, lasers and more to come. In order to keep this magazine up-to-the-minute with our fast moving world, changes and additions have to be made each issue. It is true these changes will be small ones, but if we let them escape us for any length of time, we will be bypassed by the other publications in the field.

What's New in This Issue. First, I suggest you thumb through the issue before you read any more of my chit chat. See for yourself! The issue looks a lot like the last issue but there are some new *ideas* to be seen.

First, there is this column, which will be in every issue hereafter and placed up front at approximately the same position. If you enjoy reading this chit chat and getting the low down on what's new in electronics, just

NEW FOR '64

DOUBLE BONUS FREE

\$25 WORTH OF TRANSISTORS, DIODES, RECTIFIERS, ETC. ETC. Add 25¢ handling. ANY \$1.00 POLY PAK BELOW FREE WITH ANY \$10 ORDER

- | | |
|---|--|
| <ul style="list-style-type: none"> WORLD FAMOUS POLY PAK INFRA-RED PHOTO DETECTOR transducer \$1 3-40 WATT POWER TRANSISTORS, pnp \$1 6 RCA 2N408 TRANSISTORS output, pnp \$1 HOFFMAN SATELITE SILICON SUN CELL \$1 15 PNP TRANSISTORS, CK222, 2N107 equals \$1 15 NPN TRANSISTORS, 2N055, 2N170 equals \$1 15 GERMANIUM DIODES, 1N34, 1N48 equals \$1 30-WATT TRANSISTORS, 2N1321, stud, mnt \$1 4 SYLVANIA NPN 2N35 transistors \$1 4 GE 2N170 RF NPN transistors \$1 5 GE 2N107 PNP transistors \$1 4 TRANSISTOR TRANSFORMERS, worth \$25 \$1 40 1% PRECISION resistors, 1/2, 1, 2W \$1 4 TIME DELAYS, 1.2 microsecond, encapsulated \$1 10 TRANSISTOR ELECTROLYTICS, asst. values \$1 60 SOCKETS, plugs, receptacles, audio \$1 35 TWO WATERS, Allen Bradley, 5¢ too \$1 40 WORLD'S SMALLEST resistors, 5¢ too \$1 10 RCA PLUG-N-JACK sets for phono tuners \$1 50 TERMINAL STRIPS, 1 to 8 lug types \$1 \$25 RADIO-TV SURPRISE transistors, etc \$1 10 VOLUME CONTROLS to 1 meg, switch too \$1 50 ONE WATERS, INC. Allen Bradley, 5¢ too \$1 5 SUN BATTERIES to 1.5V, lite sensitive \$1 INFRA-RED PARABOLIC reflector-n-filter \$1 | <ul style="list-style-type: none"> KITS—BRAND NEW PARTS 10 30-MC PHILCO MADT pnp transistors \$1 4 SYLVANIA 2N219 mixer/osc, pnp, TO22 \$1 2-2 AMP SCR silicon control rectifiers \$1 5 2N155 TYPE POWER TRANSISTORS, TO3 case \$1 25 AMP SWITCHING transistor, TO3 case \$1 4 RAYTHEON CK721 PNP transistors, alum case \$1 2-35-WATT TRANSISTORS, 2N1434, pnp \$1 10 750-MIL 400V SILICON rectifiers, top hat \$1 100 HALF WATERS, 5¢ too, 100 ohm to 1 meg \$1 40 DISC CAPACITORS 27mmf to .05mf to 5KV \$1 30 POWER RESISTORS, to 50W, to 24K ohms \$1 10 TRANSISTOR SOCKETS for pnp and npns \$1 60 CERAMIC CONDENSERS, disc, etc., to .05mf \$1 60 TUBULAR CONDENSERS .0002 to .1mf \$1 40 SUBMINI CONDENSERS, .0002 to .05mf \$1 50 RADIO-n-TV KNOBS, asst shapers, colors, etc \$1 50 COIL-SN-CHOKES, rf, osc, lf, peaking, etc \$1 50 MICA CONDENSERS, asst silvers too, 1N474 \$1 60 HI-Q RESISTORS, 1-1W to 2 met., 5¢ too \$1 100 PARTS SURPRISE, worth \$50 \$1 10 RAYTHEON CK722 pnp transistors \$1 3 20-WATT TRANSISTORS, pnp, 2N1320, stud \$1 15 UPRIGHT SILICON diodes, Raytheon, 1N474 \$1 150-WATT TRANSISTOR, silicon, stud, 2N1015 \$1 |
|---|--|

INCLUDE POSTAGE. AVERAGE WEIGHT PER PAK 1 lb. Send 10¢ for bargain flyer on semiconductors, paks, parts

POLY-PAKS

P. O. BOX 942X
So. Lynnfield, Mass.

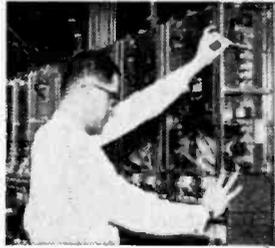
Pick the course for your career...

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

Cleveland Institute of Electronics

1776 E. 17th Street, Dept. EX-5
Cleveland 14, Ohio



Accredited Member

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.

Mail Coupon TODAY For FREE Catalog

Cleveland Institute of Electronics

1776 E. 17th St., Dept. EX-5
Cleveland 14, Ohio

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

CHECK AREA OF MOST INTEREST—

- | | |
|---|--|
| <input type="checkbox"/> Electronics Technology | <input type="checkbox"/> First Class FCC License |
| <input type="checkbox"/> Industrial Electronics | <input type="checkbox"/> Electronic Communications |
| <input type="checkbox"/> Broadcast Engineering | <input type="checkbox"/> _____ other |

Your present occupation _____

Name _____ Age _____
(please print)

Address _____

City _____ Zone _____ State _____

Approved for Veteran's Training under Korean GI Bill. EX-5

How to Succeed in Electronics

EARN BIG MONEY!
Learn Electric APPLIANCE REPAIRING
At Home In Your Spare Time



START YOUR OWN BUSINESS!
EARN WHILE YOU LEARN!

You can now be trained to fix refrigerators, irons, washing machines, motors, and all kinds of electrical equipment in homes, stores and factories. Using our Electronic Tracer Kit and easy-to-understand, illustrated instructions you quickly learn to make professional repairs. Set up your own profitable fix-it shop in your kitchen, basement, or garage. Earn \$5 to \$6 per hour, even while you learn. Age is no barrier—nor are minor physical handicaps. Start now . . . **PAY LATER** from your earnings. *Rush name, address, for FREE BOOK.*

CHRISTY TRADES SCHOOL
 Dept. A-911, 3214 W. Lawrence Ave., Chicago 60625

NAME _____
 ADDRESS _____
 CITY _____ ZONE _____ STATE _____

Send FOR FREE BOOK!



PROFESSIONAL 10 SCALE Engineering SLIDE RULE

With Free Instruction Manual
 Scientists! Engineers! Students! Compute complicated math problems rapidly. Quality made rule with manual . . . Illustrated self teaching course. . . . \$2 Combination \$4.95 ppd.

\$4

ALSYNCO RTE-3, 171 B. Main St., Natick, Mass.

12 WATT TRANSISTOR AMPLIFIER

A beautifully engineered 12 watt Transistor Amplifier for music systems, public address, paging, and many other uses. Complete with husky A.C. power supply. Uses two power transistors with thermister bias protection. Input impedance 16 ohms. Output impedance 200 ohm line. Two volts across 16 ohm input drives to full 12 watt output. Room for additional stages if desired to increase gain. These amplifiers built to run continuous duty. Chassis 9 1/4" L x 2 3/4" W x 4 7/8" high. New original manufacture packing. Shipping weight 12 lbs.

\$995 Plus Postage

TRANSISTOR BROADCASTER

A unique 2 Transistor Phono Oscillator which plays through any broadcast band. Radio will operate mike or phono pickup. Originally designed to add Stereo to regular monaural system and priced at \$16.75 each.

SPECIAL CLOSE-OUT PRICE ONLY . . . **\$250** Plus Postage & Handling **EACH**



CAPITOL COMMODITIES CO. INC.

4757 N. Ravenswood Ave., Chicago 40, Illinois
 PHONES: LO 1-3355

Positive Feedback

thumb to the first few pages in the following issues and there I will be.

There are two new columns in the front part of the issue. *Bookmark* is a book review column that is aimed at the man in electronics, or wanting "in." The unusual scope of the column is described fully in the column itself. I suggest you read it. The other new column is *New Products*, which in itself is not really new. Many magazines have departments just like it and I am sure they enjoy the same name. So what is new about this column? It is not the column but the products that this column singles out. You can rely on the editorial staff to weed out the chaff and serve up only the best in new products (and maybe a few oldies that are perennials).

White's Radio Log. Beginning with this issue the short-wave coverage will receive a boost with the new expanded short-wave section in *White's*. Turn to the first page of the *Log* and learn about this valuable addition to RADIO-TV EXPERIMENTER.

FM Pocket Mike. Last summer the FCC decided to toss aside its pince-nez and let the Part 15 section of Rules allow unlicensed



transmitters in the flea-watt range to operate on the FM broadcasting band. With this bit of news still hot, a construction assignment was made almost at once and the result—you can now build your own pocket-size FM transmitter. Turn to page 41 for the details. A nice four-color photo of the device is shown on this month's cover. As I

BUILD YOUR OWN RADIO

CIRCUITS AT HOME

with the Deluxe PROGRESSIVE RADIO "EDU-KIT"®

only
\$26.95

A Practical Home Radio Course



Reg. U. S. Pat. Off.

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 trouble-shooting, using the Progressive Signal Tracer, Progressive Code Oscillator, Progressive Dynamic Radio & Electronics Tester, Square Wave Generator and the accompanying instructional materials.

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 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 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, 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.

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.

Printed Circuitry 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.

Training Electronics Technicians Since 1946

FREE EXTRAS

• SET OF TOOLS

- SOLDERING IRON
- ELECTRONICS TESTER
- PLIERS-CUTTERS
- ALIGNMENT POOL
- 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. Statkatis, of 25 Poplar Pl., Waterbury, Conn., writes: "I have repaired several sets for my friends, and made money. The "Edu-Kit" paid for itself. I was ready to spend \$240 for a course, but I found your ad and sent for your Kit."

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

Robert L. Shuff, 1534 Monroe Ave., Huntington, W. Va.: "Thought I would drop you a few lines to say that I received my Edu-Kit, and was really amazed that such a bargain can be had at such a low price. I have already started repairing radios and phonographs. My friends were really surprised to see me get into the fixing 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."

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. 516NN, Hewlett, N. Y.

FREE GIANT NEW CATALOG

100's OF BIG PAGES CRAMMED WITH SAVINGS

BURSTEIN-APPLEBEE CO.
 Dept. RT, 1012 McGee St., Kansas City 6, Mo.
 FREE 1964 B-A Catalog. **SEND FOR IT TODAY**

Name _____

Address _____

City _____ State _____

FREE

ELECTROSTATIC GENERATORS

NOW—4 Models—150,000
 250,000 and 400,000 VOLTS
 PLUS NEW SUB-MINIATURE



Complete Kits
 150,000 VOLT MODEL.....\$27.95 PP.
 250,000 VOLT MODEL..... 32.95 PP.

Also Plastic Materials for:

- REPULSION COIL\$ 4.00
- MINIATURE TESLA COIL..... 21.00
- SOUPED UP TESLA COIL..... 24.00
- WIMSHURST STATIC MACH..... 20.00
- TURBO GENERATOR KIT..... 4.25
- OPAQUE PROJECTOR..... 4.50
- WILSON CLOUD CHAMBER..... 9.50
- SUB-MIN. GENERATOR ... 5.95 & 4.95
- VACUUM CHAMBER KIT... 9.00 & 11.50

FOREST PRODUCTS, INC.
 Dept. RT-41 145 Portland Street
 Cambridge, Massachusetts

FREE Catalog OF THE WORLD'S FINEST ELECTRONIC GOV'T SURPLUS BARGAINS



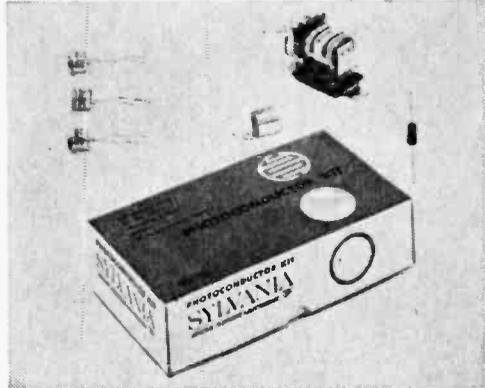
HUNDREDS OF TOP QUALITY ITEMS—Receivers, Transmitters, Microphones, Inverters, Power Supplies, Meters, Phones, Antennas, Indicators, Filters, Transformers, Amplifiers, Headsets, Converters, Control Boxes, Dynamometers, Test Equipment, Motors, Blowers, Cable, Keyers, Chokes, Handsets, Switches, etc., etc. Send for FREE Catalog—Dept. 24.

FAIR RADIO SALES
 2133 ELIDA RD. • Box 1105 • LIMA, OHIO

Positive Feedback

write this, it is not known whether RADIO-TV EXPERIMENTER scooped the other electronics magazines or not. But you can be sure we tried.

Sylvania and General Electric have realized the gigantic buying power of the electronics experimenter and hobbyist, and have come up with some new ideas. Sylvania has a



Sylvania

brand new Photoconductive Kit which contains three photoconductors, cell bracket, an AC/DC relay, resistor and a 52-page booklet on interesting circuits using these parts. Priced at \$9.95, the kit is available through Sylvania distributors or direct from the fac-

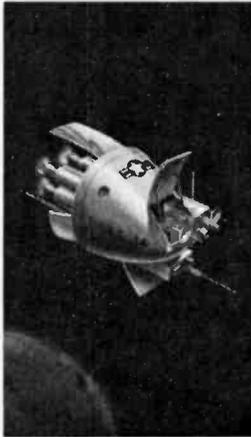


General Electric

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



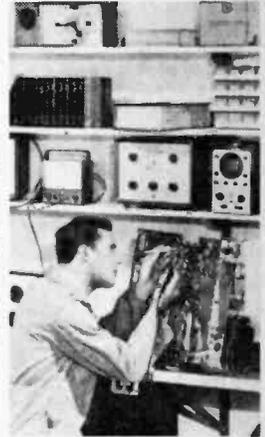
You can install and maintain electronic circuitry in missiles and rockets ... specialize in micro-waves, radar and sonar.



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.

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.



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.



19 BIG KITS
YOURS TO KEEP

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-14
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.

GIANT GROVE SALE!!

- 9 TRANSISTOR WALKIE-TALKIE (Famous Make) reg. \$35.00 Incl: Leather Case, earphones, batteries, Chan. 9 SALE \$23.99
- SPECIAL!! Two walkie-talkies as above COMPLETE PAIR \$46.99
- AUTO BURGLAR ALARM—Protect your car 24 hours a day, Hooks up easily to all 6 & 12 volt cars. SALE \$ 2.99
- 15-PC NOISE SUPPRESSOR KIT (Model SN-3) Includes Generator Noise Suppressor, Feed-thrus, other sup. SALE \$ 4.99
- GROUND PLANE ANTENNA SALE (discontinued model) Solid radials, accepts PL-259, all sales final SALE \$ 5.99
- CB RADIO MOBILE HANDBOOK (Reg \$2.95). SPECIAL \$.99
- REMINGTON-RAND COMPUTOR CHASSIS (used, good condx) SALE \$ 1.49
- 4 TRANSISTOR P.P. AUDIO AMP w/schematic. SALE \$ 3.99
- MULTI-TAP TUBE TESTER TRANSFORMERS. SPECIAL \$.69
- 6V and 12V VIBRATOR TRANSFORMER (Sec. 285V @ 70 MA). SALE \$ 1.49
- 60W P.P. OUTPUT TRANSFORMER (Matches 6L6's etc) SALE \$ 4.99
- TURNER 254C DESK STAND MICROPHONE (\$23.50 list) SALE \$10.99
- 6CW4 NUVISTOR TUBES (Special deal: 3 for \$4.79) SALE \$ 1.69
- 8 INCH SPEAKER & WALL BAFFLE SALE \$ 3.99
- 4 INCH PM SPEAKER SPECIAL \$.79
- 5 INCH PM SPEAKER SPECIAL \$.99

Check items wanted. Return ad or order with check or money order. Include postage, excess refunded. 50¢ service on orders under \$5.00. Ground plane antenna shipped Railway Express. 50% deposit in C.O.D.'s.

• SEND POST CARD FOR LATEST CATALOG

GROVE ELECTRONIC SUPPLY COMPANY

4109 W. Belmont Ave.

Chicago, Ill. 60641

AMAZING NEW

"LISTEN-IN-COIL"

PICKS UP ANY TELEPHONE CONVERSATION!

NO CONNECTION TO TELEPHONE NECESSARY!

Simply place Super-Sensitive "LISTEN-IN-COIL" in vicinity of telephone. Picks up voices on both sides of telephone conversation. Easily concealed.

Wonderful fun. Hundreds of practical uses:

- RECORD CONVERSATIONS! Amazing "LISTEN-IN-COIL" can be used to RECORD entire telephone conversations!
- PLAY TELEPHONE THRU RADIO! Also plays telephone conversations thru any radio, from smallest TRANSISTOR to biggest CONSOLIDATED!

SAVE MONEY BACK GUARANTEE

Save C.O.D. fee and send Check, Cash or M.O. to Dept. 23, 1302 Washington St. Hoboken, N. J.

\$2.98

Consolidated Acoustics



When Answering
Advertisements Say
You Saw It In
Radio-TV Experimenter

SUPER SURPLUS SPECIALS

All items genuine unused government surplus, (or removed from unused equipment), all items sent **POSTPAID** (unless noted otherwise)

- | | |
|--|--|
| <p>TUBES</p> <p>80% or more off list price</p> <p>6AL5 . . .35¢ 12AT7 . .60¢</p> <p>6AQ5 . .40¢ 12AU7 . .45¢</p> <p>6J6 . . .55¢</p> <p>50 ASSORTED RESISTORS \$1.00</p> <p>½ W. to 2 W., many 5%.</p> <p>50 ASSORTED CONDENSERS \$1.00</p> <p>micas, molded tubulars.</p> <p>EXPERIMENTER'S DREAM \$2.00</p> <p>over 100 valuable assorted parts.</p> <p>Minimum postpaid orders \$5.00. Orders under \$5.00 please add 50¢.</p> <p>Century Electronics P.O. Box 327 Hicksville, N. Y.</p> | <p>FILAMENT TRANSFORMER \$2.95</p> <p>Primary 110 volts, 60 cycles. Secondaries 6.3 volts @ 5.5 amps and 6.3 volts @ 2.75 amps. 2500 volts insulation.</p> <p>220 VOLT POWER SUPPLY \$15.00</p> <p>DC outputs: 800 volts @ 350 ma., 395 volts @ 300 ma., 315 volts @ 650 ma. (not postpaid—F.O.B. N. Y.)</p> <p>CIRCUIT BREAKERS \$1.00</p> <p>5 ampere. Ideal for car radios. TV sets, work bench, ham equipment, etc.</p> |
|--|--|

Positive Feedback

tory. Just write to Sylvania, Dept. PCK-10, 1025 Westminister Drive, Williamsport, Pa. and include 50¢ extra for postage and handling.

General Electric has come up with an "Experimenter Line" of 15 different types of electronic control devices that are available at their authorized distributors of electronic components. With each individually-packaged control device come schematic diagrams for building suggested electronic gadgets ranging from burglar alarms to slave photoflash circuits. Where necessary, hardware items are included in the package. Next time you're at your local electronics parts dealer, ask to see the General Electric "Experimenter Line."

Bye-Bye Univac I. The world's first data processing computer, *Univac I, Serial No. 1*, completed its last tabulation for the Bureau of Census, U.S. Department of Commerce, and was formally presented to the Smithsonian Institution. *Univac's* retirement took



Bureau of Census

place 12½ years after it first went into operation. Now, I for one, favor the idea of retiring the dusty bones of distant Pharaohs to deep recesses of museums, but *Univac I* still has a useful life. There are many colleges throughout the land that teach prospective engineers all about computers and the like without having the likes of one on the campus to show the students, or give them the opportunity to work on one. *Univac* is not that ancient that students could not learn by using it. I wonder if the retirement of *Univac I* was nothing more than a public relations man's dream come true. **The FCC Means Business.** Lately, there seems to be an increasing number of press releases from the FCC crossing my desk



DeVry Stands Behind Every Man It Trains

**These Opportunity
Packed Fields
Need YOU!**

Space & Missile
Electronics
Television & Radio
Microwaves
Automation Electronics
Radar
Communications
Computers
Broadcasting
Industrial Electronics

Count-down, blast-off, orbital communication! Back of every space-age achievement is the magic of electronics. And back of most electronic applications — in space, in the industrial plant, studio, or laboratory — is the electronics technician. Thousands of technicians have been trained by DeVry Technical Institute since 1931 and back of each man stands the school that has trained him. Yes, DeVry Tech backs him with continuing Employment Service through the years of his career; DeVry backs him with its practical Consultation Service, helping him solve technical problems he may meet, on his job, at any time. All this tops off DeVry's practical training: at home in spare time, or full or part-time in DeVry's modern, well-equipped training centers in Chicago or Toronto. If you're 17-55, find out all that DeVry has to offer you in the exciting field of electronics.

YOU'VE NOTHING TO LOSE, YOU'VE MUCH TO GAIN! MAIL COUPON NOW!



DeVRY TECHNICAL INSTITUTE
4141 Belmont Ave., Chicago 41, Ill., Dept. RTE-1-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):

- | | |
|--|---|
| <input type="checkbox"/> Space & Missile Electronics | <input type="checkbox"/> Communications |
| <input type="checkbox"/> Television and Radio | <input type="checkbox"/> Computers |
| <input type="checkbox"/> Microwaves | <input type="checkbox"/> Broadcasting |
| <input type="checkbox"/> Radar | <input type="checkbox"/> Industrial Electronics |
| <input type="checkbox"/> Automation Electronics | <input type="checkbox"/> 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

2083



Accredited member of National Home Study Council

DeVry --- Tops in Electronics
Chicago — Toronto

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

- Enclosed is \$_____ Please send me the S&M Handbooks circled below. Each volume is \$1 (includes postage and handling). Please allow four weeks for delivery.
669 671
- Enclosed is \$3. Enter my special 4 Issue subscription to BOATCRAFT, starting with No. 669.

Name _____
(Please print)

Address _____

City _____ State _____ Zip _____
Code _____

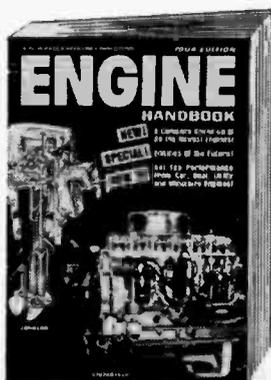
2 BEST NEWSTAND BUYS

OR USE COUPON ABOVE



669—BOATCRAFT

Contains a complete knowledge of boating—it is a veritable how-to-do almost everything guide and idea book, plus a superior library-reference source of boating information.



671—ENGINE HANDBOOK

A ready reference guide to operation and servicing of various engine types designed for mechanically-minded hobbyists. Contains troubleshooting charts and numerous repairs suggestions.

Positive Feedback

listing names of CB'ers who are about to lose their licenses as well as \$100. Almost to the man, each license is being lifted because the CB license holder failed to respond to official notices. I personally believe that if each licensee had answered all citations as soon as they were received explaining that they were sorry for what they did and will not do it again, the FCC would be more than happy to forget about the complaint. However, if you fail to answer their letters (even if you are innocent of the stated charges) you can lose your license and \$100 to boot. So get on the ball when you get that complaint from the FCC if you want to stay on the air.

One other interesting FCC item is the repeated stand by the Commission on its UHF policy. As it now stands, all TV sets manufactured after April 30, 1964 must be capable of receiving all television broadcast channels (VHF and UHF). The FCC means business and the TV set manufacturers are beginning to believe it.

And just in case you did not read our cover blurb, the FCC is charging a fee for CB and Amateur licenses. A detail story is in this issue. Check the table of contents. **WWVH Makes a Change.** The National Bureau of Standards' station WWVH in Maui, Hawaii has eliminated the 34-minute silent VH period at 1900 UT daily. The silent period from 15 to 19 minutes past each hour will be continued. WWVH can be heard on 5, 10 and 15 kc. ■



"Stop saying 'ain't!'!"

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 ppa.**



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; 1/2" thick. Approx. wt.: 6 oz. Uses potassium hydroxide (30% Electrolyte). **\$1.95**



SILICON RECTIFIERS

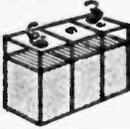
All rectifiers listed at maximum peak inverse voltage ratings; approximate forward voltage drop, 1.5 volts.

1N1446	.075 amp.	100 volts	.50
1N1477	.075 amp.	200 volts	.75
1N1448	.075 amp.	300 volts	.80
1N1449	.075 amp.	400 volts	.85
1N1450	5 amp.	100 volts	1.00
1N1451	5 amp.	200 volts	1.25
1N1452	5 amp.	200 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
1N0517	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
1N0577	150 amp.	50 volts	16.50
1N1474	150 amp.	100 volts	17.00



NT-6 WILLARD 6-VOLT STORAGE BATTERY

Rated 2.4 amp. hr. Approx. dimensions: 3 1/2" l. x 1 3/4" w. x 2 1/2" h. Weight: 1 lb. 3 oz. (plastic case) Dry-charged. **\$2.50**



POTTER & BRUMFIELD RELAY

8M5LS SP1D
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 4 1/4" high x 1 1/2" 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 8 1/2" high, approx. wt.: 70 lbs. **PRICE** **\$49.50 each**

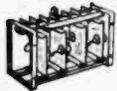


OIL CAPACITORS

1 mfd. 25,000 V. DC Westinghouse Interteen Type F1 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: 4 1/2" x 4 1/2" x 7 1/2" long weight: 3 1/2 lbs **PRICE** **\$9.95 each**



TEST SCOPE—SYNCHROSCOPE—PULSE ANALYZER

ID-59/APA-11. Late production. Modular subassembly construction. Video amplifier is flat to 4 mc. 3BPI 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. Sine-wave-oscillator calibrator measures recurrence rates from 200 to 600 cps 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**

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: 1 1/4" x 1 5/16" x 1 11/16" high. Weight: 4 1/2 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 2 1/2 amps. Steel case is hermetically sealed, 3 1/2" x 4 1/2". Wt. 3 1/4 pounds. **\$2.95**



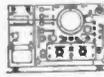
DIRECT-READING MAGNETIC COMPASS

Full-floating card, compensating magnets, and dial light avail. In 6- or 12-v. bulb. Luminous dial. Mfgd. by Bendix-Hooper, 3 1/4" x 3 1/4" x 2 3/4". 1 1/2 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

H5/ARN7 Frequency 100 to 1750 KC Price **\$17.50**
R5A/ARN7 Price **\$27.50**
Loop L121 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 H/101/ARN-6, 100-1750 kc. In 4 bands. Excellent condition. **Price** **\$34.50**
Loop AS313-B. Excellent Condition. **Price** **\$27.50**
Indicator ID191/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.**



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**



TS-102/AP RANGE CALIBRATOR

This crystal controlled pulse generator produces a square-topped, 50-volt synchronizing pulse of .8 microseconds at a prf of 400, 800, 1600 or 2000 cps, and a triangular marker pulse of 0.4 microseconds duration at a prf corresponding to a pulse-echo distance of 1500 ft. The phase between the marker and sync. pulses is continuously variable from -180 to +180 degrees. **PRICE** **\$12.50 each**



BC1335 2-CHANNEL FM TRANSCIEVER

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**

400-CYCLE FREQUENCY METER IN PORTABLE METAL CASE

Range, 380-400 cps, 100-130 VAC. Nine vibrating reeds. Frequency increments of 5 cps. Frequency accuracy is +/- 0.3% at 77° F. with sine wave input. With test leads, 3 1/2" x 3 1/4" x 6". Winslow Model 360 **\$12.50**



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 I-7393

new Allen hex screwdrivers

work faster, easier... reach where wrenches won't go



fixed handle SCREWDRIVERS

11 hex sizes:
.050" to 1/4"
Precision formed,
alloy steel blades
Shockproof,
breakproof,
amber plastic
(UL) handles

detachable BLADES

8 hex sizes:
1/16" to 3/16"
Fit all "99" Series
handles
Available singly —
as a set of six in
free plastic pouch
— or in roll kit
with handle

XCELITE

XCELITE INC. • 64 BANK ST., ORCHARD PARK, N. Y.
Please send free literature N763.

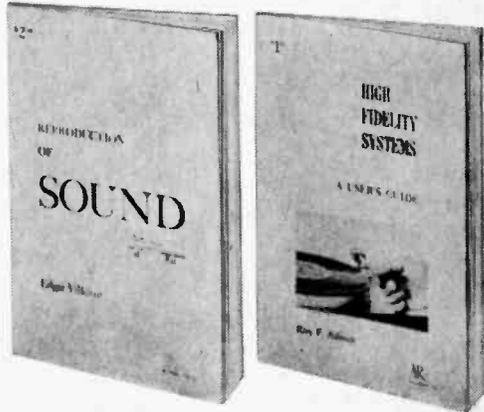
name _____
address _____
city _____ state & zone _____

BOOKMARK

by Bookworm

ONE of the big problems with book reviews in most magazines and newspapers is that not enough space is made available to review all the good books that are published throughout the year. This bookworm finds that the electronics books seem to suffer most from lack of reviews. Many good books are released and not reviewed immediately, hence they will never more be reviewed. Not so in this column. As one bookworm to another, you can expect the best of books to be reviewed in this column no matter when they were published. True, most of the books will be new ones, but a few choice volumes will pop up from time to time.

Audio. Two very good soft cover books were published in 1962 by Acoustic Research, Inc. They are *Reproduction of Sound* by Edgar Villchur (\$2.00) now in its second edition, and *High Fidelity Systems* by Roy F. Allison (\$1.00). Villchur's masterpiece begins with a lay description on the



theory of sound and how this ties in with high fidelity standards. Then the author takes you on a guided tour of sound reproducing systems. You get a bookworm's eye view of disc recording, pickups and pickup arms, all amplifier types, loudspeakers and enclosures. You even have an excursion into negative feedback and the importance of

What in the world is going on?



With Heathkit SWL receivers - you know!



You're there when it happens... with just the touch of the tuning knob on your Heathkit Shortwave Listener's Radio! Enjoy on-the-spot news and sporting events from Tokyo, England, France, Germany, Moscow... anywhere! Tune in fascinating amateur radio broadcasts, or listen to your favorite programs on popular AM stations! Take your pick! You *know* "what in the world is going on" with a Heathkit SWL radio!

Heathkit Shortwave Listener's Radio ... Fun to build, a top performer!

- Covers standard broadcast and 3 shortwave bands—550 KC to 30 MC • Large, easy-to-read illuminated slide-rule dial • Complete controls for full operating convenience • Built-in speaker and tuning "S" meter • Simple circuit board construction for "beginner" building.

Kit GR-91... 14 lbs. \$39.95

SPECIFICATIONS—Frequency range: 550 kc to 30 mc in four bands. Short wave, broadcast bands clearly marked on dial. **Controls:** General coverage tuning, Bandspread tuning, Antenna trimmer, Bandswitch, Noise Limiter—ON/OFF, phone-Standby-CW switch, BFO control, Audio Gain, AC-ON/OFF, Headphone jack, Q-multiplier input jack. **Power requirements:** 105-125 V 50/60 cycles AC, 30 watts. **Dimensions:** 12¼"W x 5¼"H x 8¼"D.

Heathkit All-Transistor Portable Shortwave Receiver... Now Only \$95

- Deluxe ten-transistor, six-diode circuit • Covers standard broadcast and shortwave bands—550 KC to 32 MC • Ceramic IF filters for fixed aligned band pass • Telescoping 50" whip antenna—built-in tuning meter • Sturdy one-piece metal cabinet with

carrying handle • Operates anywhere with built-in battery power supply.

Kit GC-1A... 18 lbs... Was \$109.95.. Now... \$95.00
Assembled GCW-1A... 20 lbs. Was \$193.50..... \$165.00
Now.....

SPECIFICATIONS—IF Frequency: 455 kc. Frequency coverage: 550 kc to 32 mc in 5 bands with calibrated bandspread scales (oscillator tuning) for 80, 40, 20, 15 and 10 meter amateur bands and 11 meter citizens band. **Selectivity:** 3 kc wide at 6 db down. **Sensitivity:** 10 uv broadcast band, 2 uv short wave bands for 10 db signal-to-noise ratio. **Output:** 400 milliwatts max. **Battery life:** up to 400 hours normal intermittent service using 8 standard size "C" cells. **Dimensions:** 6¼"H. x 12"W. x 10"D.



FREE 1964 HEATHKIT CATALOG

See these and over 250 other exciting Heathkits available in easy-to-build kit form. Save 50% or more by doing the easy assembly yourself! Send for your free catalog today!



HEATH COMPANY

Dept. 19, Benton Harbor, Mich. 49023

Enclosed is \$_____, plus postage. Please send model (s) _____

Please send my Free 1964 Heathkit Catalog.

Name _____

Address _____

City _____ State _____ Zip _____

GX-125

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

Enclosed is \$_____ Please send me the S&M Handbooks circled below. Each volume is \$1 (includes postage and handling). Please allow four weeks for delivery.

672 673

Name _____
(Please print)

Address _____

City _____ State _____ Zip Code _____

BEST NEWSTAND BUYS



672—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.

673—SMALL HOME PLANS

A selection of 10 varied plans for homes of 1,800 sq. feet of finished floor area or less—within the means of moderate-income families. Plans and specs available from over 20 architects.



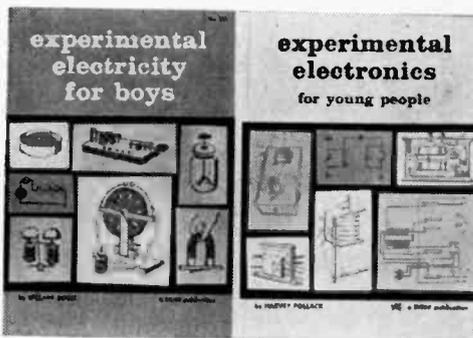
Bookmark

room environment. Villchur's book is the kind of reading material one should have before and after one buys a high fidelity system.

Allison's text on *High Fidelity Systems* is aimed at the more timid audiophile who is apt to be a bit more flustered than others once the chit-chat gets technical. It tells the hi-fi system owner how to hookup his components, giving installation tips and a neat little chapter titled "In Case of Difficulty." The low purchase price makes this soft cover a real buy.

Both *Reproduction of Sound* and *High Fidelity Systems* are available postpaid from Acoustic Research, Inc., 24 Thorndike Street, Cambridge 41, Massachusetts.

For boys only. If you have a youngster beginning to nose his way through books on electronic subjects, there are two Rider publications he should be reading. *Experimental Electricity for Boys* by Willard Doan (\$3.45) and *Experimental Electronics for Young People* by Harvey Pollack \$3.45).



In the *Electricity* hard cover volume, youngsters between the ages of 12 to 16 are introduced to the mysteries of magnetism and electricity in a dramatic style yet with complete accuracy. The *Electronics* hard cover text is authored by one of America's leading science high school teachers. In his text, Mr. Pollack offers 49 experiments that are highly organized and logically presented to take the young experimenter from the simple to the more difficult in easy steps. The final group of experiments includes instructions for building an audio amplifier and a two-transistor radio receiver.

If you can't pick up a copy of these basic books at your local book store, send a note

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



AMAZING SCIENCE BUYS

for FUN, STUDY or PROFIT



AUTOMATICALLY SHOWS TIME, TIDES, POSITION OF SUN, MOON, STARS



NEW SPILHAUS SPACE CLOCK

19 DIFFERENT READINGS AT A GLANCE

Starting scientific achievement, yet completely practical and functional. Designed for the space age by world renowned scientist, Dr. Athelstan Spilhaus, Dean of Technology, University of Minnesota. Handsome conversation piece—constantly up-to-date encyclopedia of the sky. The Spilhaus Space clock has beautiful fruitwood case and 3 sky-blue dials. Blends with decor of any home, office, club room, classroom, museum, display window, hotel, etc. Large dial shows sun position, daily sun rise and set, moon position, moon rise and set, phase of moon, low and high tide time, current stage of tide, day and month of year, current position of stars in sky, time of star rise and star set, relationships of sun, moon and stars, sidereal or star time. Left dial shows local time. Right dial shows world time including major U. S. cities and Universal (Greenwich) time. Operates on house current—requires only one simple setting for any geographic location. Measures 16" high x 11 1/2" wide x 4 1/2" deep. Presentation plaques available. Complete satisfaction guaranteed or money refunded.

Stock No. 1201-HP \$150.00 Plus Fed. Excise Tax



NEW LOW-COST, LIGHT-WEIGHT VARI-VOLTMETER

Provides complete variable brightness and speed control in one small size, high wattage unit. Made possible by new silicon-controlled rectifier. Makes present lighting equipment up to 1,000 watts and small AC-DC power tools more flexible, versatile. Ideal for home, workshop, photographic, light industrial uses. Heavy duty plastic body 3 3/4" x 6 1/4" x 2". 1 1/2 lbs. 68¢ cord.

Stock No. 70,666-HP \$19.95 Postpaid



HOME WEATHER STATION

New "Weather Station" is highly sensitive to weather changes. Consistently accurate thermometer to $\pm 2\%$; barometer accurate to $\pm .25\%$ and hygrometer to $\pm 5\%$. Foretells weather changes from 12 to 24 hours in advance. Hygrometer calibrated in percent relative humidity. Excellent for teaching weather phenomena and meteorological hobby work. Instrument mounted on handsome wood-grained wall panel 15 1/2" x 5 1/2". Meter cases heavily metallized—combines beauty and protection. Dials in etched aluminum, of high precision. Full instructions.

Stock No. 70,607-HP \$9.95 Postpaid

LARGE SIZE OPAQUE PROJECTOR

Ideal for photographers. This low-cost unit projects 3 1/2 ft. sq. image at 6 ft.—7 1/2 ft. sq. image at 12 ft. Projects photos, drawings, sketches, clippings, any opaque copy up to 8" x 6"—larger pieces in sections. Lenses are 2 plano-convex. 3 1/2" dia. mounted in 5 1/4" barrel. Projector is 11 1/2" high, 13 3/4" wide, 3 1/2" front to back, pressed steel in black wrinkle finish, bakelite handle. Uses two 200 watt bulbs—not included. Complete with slide platform to hold illustrations, 6 ft. elec. cord, heat resist. plate glass mirror.



Stock No. 80,066-HP \$42.00 Postpaid



NEW! STATIC ELECTRICITY GENERATOR

Sturdy, Improved Model
See a thrilling spark display as yet set off a miniature bolt of lightning. Absolutely safe. Sturdily made—14" high. Turn the handle and two 9" plastic discs rotate in opposite directions. Metal brushes pick up the static electricity, store it in the Leyden jar condenser until discharged by the jumping spark. 24 page instruction booklet.

Order Stock No. 70,070-HP \$12.95 Postpaid



Terrific Buy! American Model OPAQUE PROJECTOR

Projects illustrations up to 3" x 3 1/4" and enlarges them to 35" x 30" if screen is 6 1/2 ft. from projector; larger pictures if screen is further away. No film or negatives needed. Projects charts, diagrams, pictures, photos, lettering in full color or black-and-white. Operates on 115 volt. A.C. current, 6ft. extension cord and plug included. Operates on 60 watt bulb, not included. Size 12" x 8" x 4 1/4" wide. Weight 1 lb., 2 oz. Plastic case with built-in handle.

Stock No. 70,199-HP \$7.95 Postpaid

ORDER BY STOCK NUMBER. SEND CHECK OR MONEY ORDER. SATISFACTION GUARANTEED.
EDMUND SCIENTIFIC CO., BARRINGTON, N. J.

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

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



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

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

4 1/2" Reflecting Telescope—up to 225 Power
Stock No. 85,105-HP \$79.50 F.O.B.



MINIATURE WATER PUMP

Wonderful for experiments, miniature waterfalls, fountains, HO gauge railroad backdrops, etc. Tiny (2 3/8" x 1 3/4") electric motor and pump ideal for hobbyists, labs, schools. Pumps continuous flow of water at rate of one pint per minute at a 12" head. With 2 D Batteries in series will pump to 24" high. Runs 48 hrs. on battery. Works in either direction. Self-priming.

Stock No. 50,345-HP \$2.25 Postpaid



SCIENCE TREASURE CHESTS

Science Treasure Chest—Extra-powerful magnets, polarizing filters, compass, one-way-mirror film, prism, diffraction grating, and lots of other items for hundreds of thrilling experiments, plus a Ten Lens Kit for making telescopes, microscopes, etc. Full instructions included.

Stock No. 70,342-HP \$5.00 Postpaid

SCIENCE TREASURE CHEST DELUXE
Stock No. 70,343-HP \$10.00 Postpaid

'FISH' WITH A MAGNET

Go Treasure Hunting On The Bottom
Great Ideal Fascinating fun and sometimes tremendously profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Trawl it along the bottom—your "treasure" haul can be outboard motors, anchors, fishing tackle, all kinds of metal valuables. 5-lb. Magnet is war surplus—Alnico V Type—Gov't Cost \$50. Lifts over 150 lbs. on land—much greater weights under water. Order now and try this new sport.

Stock No. 70,571-HP 5-lb. Magnet \$12.50 Postpaid

Stock No. 70,570-HP 3 1/2 lb. lifts 40 lbs. \$8.75 Postpaid

Stock No. 70,572-HP 7 1/2 lb. lifts 175 lbs. \$18.75 Postpaid

Stock No. 85,152-HP 15 lb. size lifts over 350 lbs. \$33.60 FOB

MAKE YOUR OWN POWERFUL ASTRONOMICAL TELESCOPE

Grind Your Own Astronomical Mirror
Kits contain mirror blank, tool, abrasives, diagonal mirror and eyepieces, etc. Build instruments ranging in value from \$75.00 to hundreds of dollars.

Stock No.	Diam.	Mirror Thickness	Price
70,003-HP	4 1/4"	1 1/4"	\$ 7.50 ppd.
70,004-HP	6"	1 3/4"	11.95 ppd.
70,005-HP	8"	1 3/4"	19.50 ppd.
70,006-HP	10"	1 3/4"	30.75 f.o.b.
70,007-HP	12 1/2"	2 1/4"	59.95 Barrington

SPELLBINDING EXPERIMENTS WITH SILICON SOLAR CELL AND SUN BATTERY!

Experience endless fascination in converting sunlight into electricity to power small motors, amplifiers, etc. Ideal for scientific student projects. Plastic case 1 1/2" x 1 1/4" x 3/16". Produces 3 to 45 volts—10 to 60 milliamperes. 24-page Handbook gives full data on 12 pat. experiments.
Stock No. 60,216-HP \$2.25 Postpaid
Selenium Photocell. Lower power, lower price than Silicon Cell.
Stock No. 30,411-HP \$1.50 Postpaid
page Handbook on Silicon-Cell and Selenium projects, demonstrations, etc. Explains photovoltaic theory, performance. Gives infrared and ultra-violet applications. Paperbound 6" x 9".
Stock No. 9230-HP \$2.00 Postpaid

MAIL COUPON for FREE CATALOG "HP"

Completely New and Enlarged. 148 pages. Nearly 4000 Bargains.
EDMUND SCIENTIFIC CO., Barrington, N. J.
Please rush Free Giant Catalog-HP.
Name
Address
City Zone State

ARE YOU ENJOYING THIS ISSUE OF RADIO-TV EXPERIMENTER?

Sure you are . . . and in that case, you won't want to be without the issue that was published just before the one you hold in your hands.

It's chock-full of the same kind of helpful and useful information you'll enjoy reading—and keeping.

How to get a copy? Easy: fill out the coupon below. But hurry: we've only a limited number of copies available. Once they are gone: that's it!

79

SCIENCE & MECHANICS—Handbook Division
505 Park Avenue / New York, N. Y. 10022

Yes: Send me _____ copies of RADIO-TV EXPERIMENTER—No. 659 at \$1 each (includes postage and handling).

NAME _____ (Please print)
ADDRESS _____
CITY _____ STATE _____ ZIP CODE _____

Nickel-Cadmium Batteries . . . 95¢ ea. The Battery That's Used in Guided Missiles Now Released as Government Surplus

Ideal for photography, models, searchlights, anywhere a lightweight high capacity storage battery is needed. Sintered-plate Nickel-Cadmium, plastic-cased, alkaline storage batteries designed for "NIKE" Missile and now surplus. A lifetime battery with no known limit of service (over 5000 recharges on test without loss of capacity). Other features: Virtually indestructible, compact and lightweight, withstands heavy shock and vibration, flat voltage curve during discharge retains charge year or more, high discharge rate up to 50 amps for this cell. No corrosive fumes to harm clothing or equipment, spill-proof construction, discharges in any position, indefinite storage without deterioration, operates in temperatures -60°F. to +200°F. Each cell is approx. 4 ampere hour capacity. Nominal voltage per cell is 1.25 volts. (A 6-volt battery requires 5 cells.) Cell size 6" H. x 2" W. x 1/2" T. Wt. 6 ozs. ea. Uses Potassium-Hydroxide (30% by weight) electrolyte. Add only distilled water periodically. A fraction of Government cost. Used cells As Rec'd from Govt. \$.95 ea. Brand New cells 2.49 ea.

MOTOR STARTING CELLS
30 A.H. cells. Nickel-Cadmium, steel-cased, with 1/2" screw terminals for mom. current drains to 1000 amps. Size 8 1/2" H. x 3" W. x 1 3/8" T. Wt. approx. 3 1/4 lbs. Permanently sealed. No filling necessary.
Used cells \$2.95 ea.
New cells 5.95 ea.
All cells guaranteed to your satisfaction or money refunded (less postage).

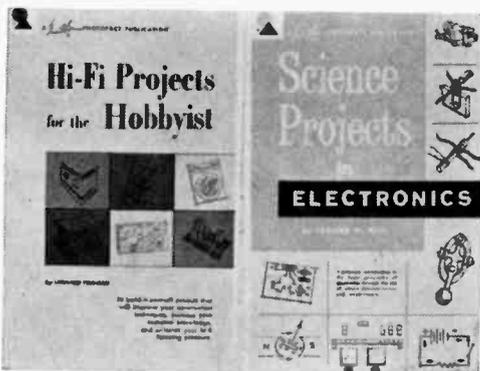
ESSE RADIO COMPANY, Dept. RT
42 W. South St., Indianapolis 25, Indiana, 46225

Bookmark

to Hayden Book Co., 850 Third Avenue, New York, N. Y. 10022. They publish the Rider books.

Science and Hi-Fi Projects. If you are the kind of bookworm that likes to build as he learns, then these new soft cover books published by Howard W. Sams & Co., Inc. are just for you.

Hi-Fi Projects for the Hobbyist by Leonard Feldman (\$2.50) is a "how to" text on popular audio projects with heavy emphasis on easy-to-make printed circuit boards. Twenty interesting and useful projects with plans let you build projects such as phono preamp, peak power indicator, speaker enclosures, universal power supply and many others.



Science Projects in Electronics by Edward M. Noll (\$2.95) has a two-fold purpose: to show basic electronic principles through simple projects, and to help the reader to develop practical construction and testing skills. Like RADIO-TV EXPERIMENTER, all the projects are designed around the use of inexpensive and readily available parts.

Both of the above Sams' publications are available from electronic parts distributors and bookstores or direct from the publisher in Indianapolis 6, Indiana.

50¢ buy. *Getting Started in Electronics* is the title of a new book published by Allied Radio aimed at both young and old interested in a simple explanation of basic electronics. Portions of the text provide information for the average non-technical person on AM and FM radio, TV, VHF, UHF, Citizens Band and Amateur Radio, kit

(Continued on page 124)

**master
higher
mathematics
at home**

**PROGRAMMED
LEARNING**

exclusive with Britannica  Schools

BASIC MATHEMATICS • WHOLE NUMBERS AND NUMERALS • ALGEBRA I • ALGEBRA II • PLANE GEOMETRY • SOLID GEOMETRY • THE LANGUAGE OF ALGEBRA • TRIGONOMETRY • ANALYTIC TRIGONOMETRY • INTRODUCTORY CALCULUS I & II • MANAGEMENT DECISION MAKING • VERBAL PROBLEMS • INTRODUCTION TO SETS, INEQUALITIES AND FUNCTIONS • DESCRIPTIVE STATISTICS

These 14 courses—developed by a group of skilled, carefully trained specialists in the fields of home study and mathematics—are offered by Britannica Schools in Programmed Learning format together with individualized, home-study guidance.

What is Programmed Learning? Considered by many educators as the finest way to teach mathematics that has been discovered, Programmed Learning is the technique used in teaching machines. Programmed Learning course material is presented in small, sequential segments, or "frames," each containing 1) a single piece of information closely related to the information preceding it; 2) a question to test your understanding of the information; and 3) a masked, correct answer. When you are ready to check your response to a frame,

you simply move the mask. Thus, you proceed systematically through the course, frame by frame, at the pace best suited to yourself.

What is Britannica Schools? A division of world-famous Encyclopaedia Britannica family, Britannica Schools is the first new approach to learning at home in 50 years, because it is the first, and, to date, the only home study institution that offers courses utilizing Programmed Learning techniques. As a Britannica Schools enrollee, you also have your own, individual instructor who—through phased examinations and correspondence—reviews your progress, checks your grasp and retention of sections of the course material, and insures your complete mastery of the subject.

For full, **FREE** details on any Britannica Schools course in mathematics, fill out and send us the coupon today. no obligation, **SOLD ONLY THROUGH THE MAIL.**

Britannica  Schools

**NO OBLIGATION...
ACT TODAY**

14 East Jackson Boulevard
Chicago 4, Illinois
RTV 3

Please send me full details on the course(s) I have checked. I understand there is no obligation, and no salesman will call.

- Basic Mathematics Whole Numbers and Numerals
- Algebra I Algebra II Plane Geometry
- Solid Geometry The Language of Algebra
- Analytic Trigonometry Introductory Calculus I & II
- Trigonometry Management Decision Making
- Verbal Problems Introduction to Sets, Inequalities and Functions Descriptive Statistics

Name _____ Age _____
Occupation _____
Address _____
City _____ Zone _____ State _____

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

Enclosed is \$_____ Please send me _____
issues of No. 677 KITCHEN & BATH IMPROVEMENTS at \$1 each
(includes postage and handling).

Name _____
(Please print)

Address _____

City _____ State _____ Zip _____
Code _____

YOUR BEST NEWSTAND BUYS

On sale now or use coupon above



Idea book for craftsmen who want to re-do or add to these two most expensive rooms in the house; economically and beautifully. Detailed how-to information on design, modernization, alteration and repair work.

NEW PRODUCTS

Play As You Go With New Portable Radio-Phono

Designed with the teen-ager in mind, Channel Master has introduced a transistorized radio and phonograph combination unit. The radio section is a 6 transistor circuit which has been designed to provide high sensitivity with better-than-normal selectivity for a portable. The phonograph plays 45 rpm records and has the interesting fea-



ture of permitting the record to be played while the unit is in any position, or even while it is being carried. The mechanism which accomplishes this trick includes a tone arm which plays from *underneath* the record (it contains a sapphire needle). Known as the "Swing Along," the unit is claimed to have what the manufacturer calls "remarkably big audio." The unit weighs 6 lbs., operates from four *D* batteries. Price: \$79.95. (Channel Master, Ellenville, N. Y.)

40-Watt De Luxe Stereo Amplifier

The model SA-40K is a new 40-watt stereo amplifier which features a Williamson circuit. Designed to sell at a relatively low cost, the people at Merrell Electronics, have turned out a unit with the specifications and external design of units selling for considerably more money. The frequency response

"VALUES" THAT DEFY ALL COMPETITION

Our TREMENDOUS BUYING POWER & PURCHASING EXPERIENCE make it possible. We invest Thousands of Dollars (in just a single item) to create a good DOLLAR BUY, resulting in the AMAZING & EXCITING OFFERS that follow:

10% OFF & FREE GIFT - ON PURCHASE OF \$10 OR OVER

- 1-CHAPT. ZU DI MITZIA \$1 "JACKPOT" double your money back if not completely satisfied
- 2-ASST. SIZES RADIO CHAS-\$15 PANS drilled & plated
- 2-VARIABLE CONDENSERS same popular paper-bolt type
- 1-5" PM SPEAKER Alnico 25 magnet
- 1-4" PM SPEAKER Alnico 25 magnet
- 3 - SPEAKER CABINETS for 2 1/2" to 3" speaker, all purpose
- 1-3" PM SPEAKER for above cabinet or others
- 4-AUDIO OUTPUT TRANSFORMERS 50L5 type
- 3-AUDIO OUTPUT TRANSFORMERS 6K6 or 6V6 type
- 3-1/2 MEG VOLUME CONTROLS with switch, 3" shaft
- 5-ASST. 4 WATT WIREWOUND CONTROLS
- 10 - ASSORTED VOLUME CONTROLS line switch
- 5-ASSORTED VOLUME CONTROLS with switch
- 4-TOGGLE SWITCHES SPST, SPDT, DPST, DPDT
- 10 - ASSORTED SLIDE SWITCHES SPST, DPST, etc.
- 4 - I.F. COIL TRANSFORMERS 450kc. most popular type
- 3 - I.F. COIL TRANSFORMERS 202kc. for Auto Radio
- 3 - I.F. COIL TRANSFORMERS 10.7mc for FM
- 5-OVAL LOOP ANTENNAS assorted popular sizes
- 3-LOOPSTICK ANTENNAS hi-gain, ferrite, adjustable
- 15 - RADIO OSCILLATOR COILS standard 450kc
- 100 - STANDARD ZIP CORD 2 conductor 218 white or brown
- 100 - MINIATURE ZIP CORD 2 conductor, various sizes
- 20 - INSTRUMENT POINTER KNOBS selected popular types
- 30-ASST. RADIO KNOBS all selected popular types
- 250-ASST. WOOD SCREWS best popular selection
- 250-ASST. SELF TAPPING SCREWS 2.0, 2.5, etc.
- 150-ASST. 6/32 SCREWS and 150 6/32 HEX NUTS
- 150-ASST. 8/32 SCREWS and 150 8/32 HEX NUTS
- 150-4/32 HEX NUTS and 150-8/32 HEX NUTS
- 250-ASST. SOLDERING LUGS best types and sizes
- 1-18 SPOOL ROSIN-CORE SOLDER 40/60
- 1000-ASST. HARDWARE KIT screws, nuts, washers, 1001 items
- 500 - ASSORTED WASHERS most useful selected sizes
- 500 - ASSORTED RIVETS most useful selected sizes
- 1-4" x 9" OVAL PM SPEAKER (same to a customer)
- 8-ASST. LUCITE CASES hinged cover, handy for parts
- 50 - ASSORTED TERMINAL STRIPS 1, 2, 3, 4 lugs
- 100 - FINEST NYLON DIAL CORD best size, .028 gauge
- 50-RADIO & TV SOCKETS all type 7 pin, 8 pin, 9 pin
- 25-ASSORTED PRINTED CIRCUIT SOCKETS best types

- 100-ASSORTED 1/2 WATT 5% RESISTORS some in 2%
- 70 - ASSORTED 1 WATT 5% RESISTORS some in 2%
- 35 - ASSORTED 2 WATT RESISTORS some in 2%
- 50-PRECISION RESISTORS cost. list price \$90 less 98%
- 20 - ASS'TED WIREWOUND RESISTORS 5, 10, 20 watt
- 10 - ASST. RADIO ELECTROLYTIC CONDENSERS
- 5-ASST. TV ELECTROLYTIC CONDENSERS
- 8 - ASTRON ELECTROLYTIC CONDENSERS 8md-450v
- 5-C D ELECTROLYTIC CONDENSERS 30/20-350v, 10-210v
- 15-STANDARD ELECTROLYTIC CONDENSERS 2mf - 450v
- 15-STANDARD ELECTROLYTIC CONDENSERS 400md - 25v
- 3 - ELECTROLYTIC CONDENSERS 50/20-150v
- 50 - ASST. TUBULAR CONDENSERS .500 to .47 to 600v
- 30 - ASST. MOLDED CONDENSERS 100-150 and 100-400v
- 20-GOODALL TUBULAR CONDENSERS .047-600v
- 50 - GOODALL CONDENSERS molded 1-200v (list 900v)
- 200 - TUBULAR CONDENSERS 100-150 and 100-400
- 50-ASST. MICA CONDENSERS some in 5%
- 50 - ASST. DISC. CERAMIC CONDENSERS popular numbers
- 10-ASST. DIODE CRYSTALS 100-500 ohm leads
- 3-SILICON RECTIFIERS 150ma, 400 PIV
- 3-SILICON RECTIFIERS Top list 500ma-400 PIV
- 4-PNP TRANSISTORS general purpose, 70-5 case
- STANDARD TUNER UHF STRIPS 26K, 34K, 48K, 51K each
- 50 - ASST. CERAMIC CONDENSERS some in 5%
- 200-ASST. 1/2 WATT RESISTORS Top Brand, short leads, excellent
- 3-SELENIUM RECTIFIERS 1-45ma and 1-450ma
- 50 - RESISTORS 1K 2W 10%
- 10-SILICON RECTIFIERS Top list, 250 ma, 200 piv
- 5 - ASST. SELENIUM RECTIFIERS 95ma, 100ma, 300ma, etc.
- 20 - ASS'TED WIREWOUND RESISTORS, 5, 10, 20 watt
- 15-ASST. ROTARY SWITCHES all popular types \$30 value
- 50-ASSORTED FUSES 5A0 and other popular uses
- 10-DUAL CONTROLS 250-1 mag, long shaft, 101 uses
- 5-1/2 MEG VOLUME CONTROLS 1 1/2" mesh
- 10 - SURE-GRIP ALLIGATOR CLIPS 2" plated
- 10 - SETS PHONO PLUGS & PIN JACKS RCA type
- 20-ASST. PILOT LIGHTS 24, 40, 47, 51, etc.
- 20 - PILOT LIGHT SOCKETS bayonet type, wired
- STANDARD 41mc TV TUNERS Complete with Tubes, schematic

- \$15.00 TELEVISION PARTS "JACKPOT" best buy ever
- 6-TV ALIGNMENT TOOLS
- 50-ASSORTED TV COILS 1.F. video, sound ratio, etc.
- 1-510 INDOOR TV ANTENNA hi-gain, 3 section, 1111proof
- 20 - ASSORTED TV KNOBS ESCUTCHEONS etc. \$20 value
- 90° TV DEFLECTION YOKES wired network, schematic diag.
- 50 FLYBACK TRANSFORMERS schematic shows many uses
- 70° TV DEFLECTION YOKES wired network, long leads
- 1-70° FLYBACK TRANSFORMER Incl. Schematic Diagram
- 10 - ASSORTED STANDARD TUNER VHF STRIPS
- TV VERTICAL OUTPUT TRANSFORMER 10 to 1 ratio
- 2-RATIO DETECTOR COILS 4.5mc or 10.7mc
- 2-TV SOUND I. F. COILS 4.5mc or 21.25 mc
- 2 - SOUND DISCRIMINATOR COILS 4.5mc or 10.7mc
- 3-AUDIO OUTPUT TRANSFORMERS 3Q4 3Q5, 3B4
- 3-PUSH-PULL AUDIO OUTPUT TRANSFORMERS 50L6
- 3 1/2" TWEEZER SPEAKER 4000 type for HI-FI
- 99 TRIM HEADPHONES \$0
- 1000-BLACK NICKEL SCREWS 28/40, 3/4" long, 1111proof
- 50-100K 1/2 WATT RESISTORS 10%
- 50-470K 1/2 WATT RESISTORS 10%
- 30-MICAMOLDED ASST TUBULAR COND. molded plastic
- 3-SELENIUM RECTIFIERS 1-45ma and 1-450ma
- 50-3A0 FUSES 8-AAMP
- 30-3A0 FUSES 8-AAMP
- 3-CONNECTORS #PL-239
- 3-CONNECTORS #50-239
- 10-4' ELECTRIC LINE CORDS with plug
- 4 - 50 SPOONS HOOK-UP WIRE 4 different colors
- 50 - STRIPS ASSORTED SPAGHETTI handy sizes
- 100 - ASSORTED RUBBER GROMMETS best sizes
- 50 - INSULATED SHIELDED WIRE #20 braided metal jacket
- 22-TEST PROD WIRE deluxe quality, red or black
- 50-HI-VOLTAGE WIRE for TV, special circuits, etc.
- 100' - TWIN TV LEAD-IN WIRE 300 ohm, heavy duty
- 50' - FLAT 4-CONDUCTOR WIRE many purposes
- 5 - TV HI-VOLT ANODE LEADS 20" length
- 10-TV PICTURE TUBE SOCKETS wired with 20" leads
- 5-TV CHEATER CORDS with both plugs
- 200' - BUSS WIRE #30 for busbars, special circuits, etc.

- ## MARKET SCOOP COLUMN
- \$17.50 WEBSTER DIAMOND CARTRIDGE #C2-D Stereo
 - 4-IBM COMPUTER SECTIONS loaded with valuable parts
 - 10 - TOGGLE SWITCHES deluxe U.L. approved, SPST, 101 uses
 - G. E. EQUIPMENT SECTION with sockets, condensers, etc.
 - 20-GE #NE-2 TUBES Neon Glow Lamp for 101 uses
 - 50-GE FLASHTIGHT BULBS #FR-9, 2" volts
 - 10-SYLVANIA 10A TUBES brand new 200. Individual cartons also serve as 174
 - 3-TOP BRAND 35W4 TUBES
 - 10-ASSORTED TUBES Radio, Television and Industrial
 - 5 -SYLVANIA 6AK4 TUBES
 - 3-MOTOROLA 12B6 TUBES
 - 10-SYLVANIA 2C4 TUBES
 - 6-TRANS. RADIO BATTERIES 9 volt, same as Eveready 2310
 - 20-BALL POINT PENS retractable, assorted colors
 - 20 - ELECTRIC LINE CORDS approved 3 1/2" with plug
 - 50-ASSORTED TV COILS 1.F. video, sound, ratio, etc.
 - 20 - ASSORTED TV KNOBS ESCUTCHEONS etc. \$20 value
 - 1-HEARING AID AMPLIFIER Incl. 3 Tubes, Mike, etc. (as is)
 - 2-\$3 TELEX EARPIECES standard 4 ohm for radio or TV, also serves as a microphone
 - \$15.00 RADIO PARTS "JACKPOT" handy assortment
 - 1-HEARING AID AMPLIFIER Incl. 3 Tubes, Mike, etc. (as is)
 - EMERGENCY AUTO LAMP Red dome hinker, incl. battery saves lives on highway stops
 - 1-50. YARD GRILLE CLOTH most popular brown & gold design
 - STANDARD UHF IMPUTNER (clear cabinet & GAF tube) as is
 - G. E. SINE WAVE GENERATOR sold as is, test tubes
 - G. E. EQUIPMENT SECTION with sockets, condensers, etc.
 - 3-3" RECORDER TAPES quality acetate, 150 feet
 - 10-3" RECORDER TAPE REELS
 - 100 - ASST RUBBER & FELT FEET FOR CABINETS best sizes
 - WEBSTER #PT-1 MONAURAL CARTRIDGE in factory carton
 - WEBSTER #MC-3 MONAURAL CARTRIDGE in factory carton
 - WEBSTER #SC-3 STEREO CARTRIDGE in factory carton
 - 3 - \$2.50 SAPPHIRE NEEDLES guaranteed 2000 playings for all type pickups
 - 2-SAPPHIRE STYLUS NEEDLES for all type pickups
 - RONETTE DUAL SAPPHIRE CARTRIDGE 8-needle type
 - \$20-SHURE M-70 DIAMOND NEEDLE exact replacement
 - 1 - STANDARD 1A2 TUBE and 1 STANDARD 35W4 TUBE
 - UA-14 MONARCH RECORDS 18 CHANGER complete with 45 rpm spindle

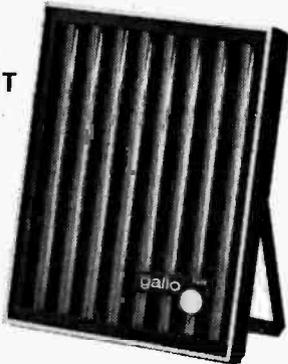
IMMEDIATE DELIVERY... SCIENTIFIC LIGHT PACKING for safe delivery at minimum cost. HANDY WAY TO ORDER - Pencil mark items & enclose with check or money order, add extra for shipping, excess refunded with advantage to customer. Tearsheet returned with order, as your packing slip.

BROOKS RADIO & TV CORP., 84 Vesey St., Dept. E, New York 7, N. Y. TELEPHONE CORland 7-2359

AT LAST... An Indoor TV Antenna That Brings In Every Station Sharp and Clear...

- BEAUTIFUL
- CONVENIENT
- SAFE and
- EFFICIENT

ONLY
\$9.95



7" x 9" x 1" GALLO TWIN TV ANTENNA, Engineered for Black and White, Color, VHF and UHF stations/

One of the most remarkable indoor TV antennas ever developed, the GALLO TWIN TV ANTENNA delivers highest quality intense signals on both VHF and UHF bands. Precision-engineered in the Gallo laboratories to provide ideal reception in metropolitan areas — up to 30 miles from stations. Only 7" x 9" x 1", easel backed to stand on set or hang on wall like a picture frame. No ugly "ears" protrude dangerously. Nothing spoils your room decor.

LOOK AT THESE ADVANTAGES

Strongest signals because it's factory-tuned and has exclusive "clarity control" that snaps in both pictures and sound.

Non-directional — receives stations equally well from all directions.

Completely portable — ideal for apartment dwellers and second-set owners.

Rejects noise and interference because it is tuned to accept TV signals, reject unwanted frequencies.

SEE WHAT USERS SAY

"Loaned TWIN to a friend; he won't give it back." RSN, Sewickley, Pa. "Old set is now better than when we purchased it 13 years ago." BW, Brooklyn, N.Y. "Very decorative; my friends don't even know it's an antenna until I tell them." BPL, San Francisco. "Great difference in picture. Send me another TWIN." FNL, Chicago. (Copies of letters on request.)

AT LEADING DEALERS, DEPT. STORES.

Or send check or money order — you may charge your TWIN on any credit card, too.

GALLO ELECTRONICS CORPORATION, Dept. E-1
12 Potter Ave., New Rochelle, N.Y.

Rush me _____ GALLO TWIN TV ANTENNAS @ \$9.95 each, post paid. I enclose check () or money order (). Please charge my Credit Card

_____ issued by _____ name of company

which expires on _____ date

Name _____

Address _____

City _____ Zone _____ State _____

My telephone number is _____

ALL CREDIT CARDS HONORED, including Diners' Club; Am. Express; Carte Blanche; Bell Telephone; Major Oil Companies; Airlines; Playboy Club; National Credit Service, etc. (You will be billed by National Credit Service for your order.)

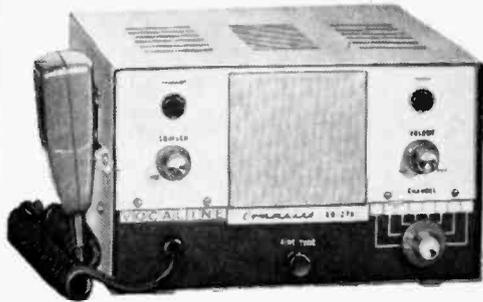
NEW PRODUCTS

is ± 1 db 20-20,000 CPS. Outputs are provided for 4, 8 and 16 ohms. The circuit contains 8 tubes and 2 silicon rectifiers. Price \$49.95. (Merrell Electronics, Inc., 519 Hendrix St., Brooklyn 7, N. Y.)



Veteran CB Manufacturer Releases New Transceiver

Vocaline, one of the earliest CB manufacturers, has developed a new transceiver, the model ED-278 "Commaire." The "Commaire" operates on any 8 channels in the 11-meter Citizens Band, but may also be operated within the 10 meter Amateur band (by licensed Amateur operators only). Outstanding features of the unit include: patented high efficiency squelch circuit, new design mike which removes unwanted background noises, two-tone grey cabinet, dual conversion superheterodyne receiver, sensitivity better than one-tenth of a microvolt for 10 db S/N ratio, selectivity 6 db down at ± 2.5 kc/s, 3.2 watts output. Price: \$189.50. (The Vocaline Company of America, Old Saybrook, Conn.)



New Audiophile Cartridge Features High Compliance

The "Mark IV" is a new version of Sonotone's well known "Velocitone" series phono cartridges. It offers high compliance of 15×10^{-6} cm/dyne in all directions, clear 30 db separation in each channel and low tracking force (1.5 to 3 grams for professional arms and 3 to 4 grams for chambers).

RAD-TEL'S

QUALITY

BRAND NEW TUBE SALE!

LOW, LOW PRICES--COMPARE

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
• **FREE!** 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

Easy to work on set white panel is off.
6 ft., No. 154..... 29¢ ea. Lots of 3-25¢ ea.



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 \$5.00 handling charge plus postage. Orders over \$5.00 plus postage. Approx. 8 tubes per 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 29¢ ea. Lots of 3 - 25¢ 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

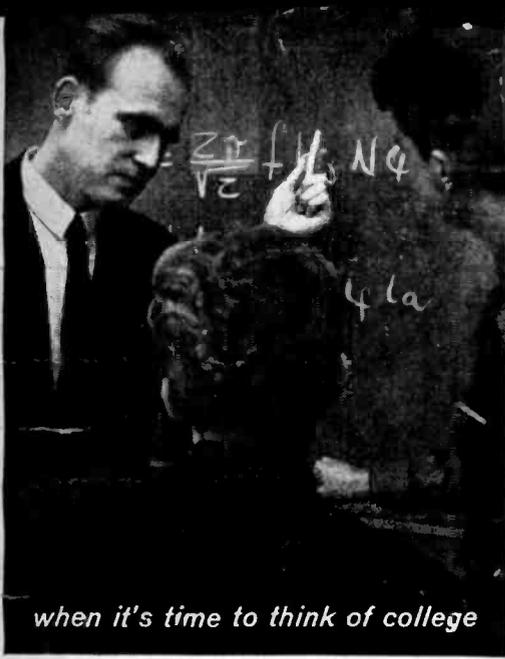
Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price	Qty.	Type	Price
024	.79	6A08	.87	6K6	.63	12CU5	.58				
1AX2	.62	6AV6	.41	6S4	.52	12CU6	1.06				
1B3	.79	6AW8	.90	6SA7GT	.99	12CX6	.54				
1DN5	.55	6AX4	.66	6SH7	1.02	12DA	.69				
1G3	.79	6AX5	.74	6SJ7	.88	12DE8	.83				
1J3	.79	6BA6	.50	6SK7GT	.95	12DL8	.88				
1K3	.79	6BC5	.61	6SL7GT	.84	12DQ6	1.04				
1R5	.77	6BC8	1.04	6SN7	.65	12D57	.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	6VG6T	.54	12DZ6	.62				
3AL5	.46	6BJ6	.65	6WA	.61	12ED5	.62				
3AU6	.54	6BJ7	.79	6W6	.71	12EG6	.62				
3AV6	.42	6BK7	.85	6XA	.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	6C08	.92	12A4	.60	12U7	.62
4GM6	.60	6CR6	.60	12AB5	.60	12V6	.83
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	18Y6	.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	19E8	.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	.61	25C5	.53
5U4	.60	6DT6	.53	12AV6	.41	25C5A	.59
5UB	.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	.94	12AY7	1.44	25EH5	.55
6AB4	.46	6EM5	.77	12AZ7	.86	25L6	.57
6AC7	.96	6EM7	.82	12A84	.68	25W4	.68
6AF4	1.01	6EU8	.79	12BD6	.50	32ET5	.55
6AG5	.70	6EV5	.75	12BE6	.53	35C5	.51
6AM4	.81	6EW6	.57	12BF6	.60	35L6	.60
6AH6	1.10	6EY6	.75	12BH7	.77	35W4	.42
6AK5	.95	6FG7	.69	12BK5	1.00	35Z5	.80
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	6JSCT	.51	12CN5	.56	117Z3	.85
6AU6	.52	6J6	.71	12CR6	.67	807	.79



when it's time to think of college

find out about engineering at MSOE

Planning your education correctly now will enhance your career later! That's why you should obtain all the facts about MSOE programs in Electrical and Mechanical Engineering and Technology.

Learn about courses leading to 4-year Bachelor of Science and 2-year Associate in Applied Science degrees. Find out about MSOE scholarships, financial aids, job placement opportunities, and other services.

Assure yourself of a bright future in the exciting field of space age engineering and technology. Write for your free "Career" booklet which will tell you about educational advantages at MSOE.



MSOE



The "Mark IV" is a ceramic cartridge and has approved RIAA response characteristics, $\pm 1/2$ db from 20 to 8,000 CPS, ± 2 db to 17,000 CPS with deliberate roll-off to 20,000 CPS. The needle is virtually breakproof and may be flexed in any direction without damage. The "Mark IV" is available in two models, the 9TAF-D77HCV with a pair of diamond needles, and the 9TAF-SDHCV with one diamond and one sapphire needle. Price: 9TAF-D77HCV is \$24.25, 9TAF-SDHCV is \$20.25. (Sonotone Corp., Elmsford, N. Y.)

De Luxe
Horn Tweeter



What in the world is going on?



With Heathkit SWL receivers - you know!



You're there when it happens... with just the touch of the tuning knob on your Heathkit Shortwave Listener's Radio! Enjoy on-the-spot news and sporting events from Tokyo, England, France, Germany, Moscow... anywhere! Tune in fascinating amateur radio broadcasts, or listen to your favorite programs on popular AM stations! Take your pick! You *know* "what in the world is going on" with a Heathkit SWL radio!

Heathkit Shortwave Listener's Radio ... Fun to build, a top performer!

- Covers standard broadcast and 3 shortwave bands—550 KC to 30 MC • Large, easy-to-read illuminated slide-rule dial • Complete controls for full operating convenience • Built-in speaker and tuning "S" meter • Simple circuit board construction for "beginner" building.

Kit GR-91... 14 lbs. \$39.95

SPECIFICATIONS—Frequency range: 550 kc to 30 mc in four bands. Short wave, broadcast bands clearly marked on dial. **Controls:** General coverage tuning, Bandsread tuning, Antenna trimmer, Bandswitch, Noise Limiter—ON/OFF, phone-Standby-CW switch, BFO control, Audio Gain, AC-ON/OFF, Headphone jack, Q-multiplier Input jack. **Power requirements:** 105-125 V 50/60 cycles AC, 30 watts. **Dimensions:** 12 1/4" W x 5 1/4" H x 8 1/4" D.

Heathkit All-Transistor Portable Shortwave Receiver... Now Only \$95

- Deluxe ten-transistor, six-diode circuit • Covers standard broadcast and shortwave bands—550 KC to 32 MC • Ceramic IF filters for fixed aligned band pass • Telescoping 50" whip antenna—built-in tuning meter • Sturdy one-piece metal cabinet with

carrying handle • Operates anywhere with built-in battery power supply.

Kit GC-1A... 18 lbs. . . Was \$109.95 . . Now \$95.00
Assembled GCW-1A... 20 lbs. Was \$193.50 \$165.00
Now

SPECIFICATIONS—IF Frequency: 455 kc. Frequency coverage: 550 kc to 32 mc in 5 bands with calibrated bandsread scales (oscillator tuning) for 80, 40, 20, 15 and 10 meter amateur bands and 11 meter citizens band. **Selectivity:** 3 kc wide at 6 db down. **Sensitivity:** 10 uv broadcast band, 2 uv short wave bands for 10 db signal-to-noise ratio. **Output:** 400 milliwatts max. **Battery life:** up to 400 hours normal intermittent service using 8 standard size "C" cells. **Dimensions:** 6 1/4" H. x 12" W. x 10" D.



FREE 1964 HEATHKIT CATALOG

See these and over 250 other exciting Heathkits available in easy-to-build kit form. Save 50% or more by doing the easy assembly yourself! Send for your free catalog today!



HEATH COMPANY

Dept. 19, Benton Harbor, Mich. 49023

- Enclosed is \$ _____, plus postage. Please send model (s) _____

- Please send my Free 1964 Heathkit Catalog.

Name _____

Address _____

City _____ State _____ Zip _____

GX-125

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

☐ Enclosed is \$_____ Please send me the S&M
Handbooks circled below. Each volume is \$1 (includes post-
age and handling). Please allow four weeks for delivery.

672 673

Name _____
(Please print)

Address _____

City _____ State _____ Zip _____
Code _____

BEST NEWSTAND BUYS



672—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.

673—SMALL HOME PLANS

A selection of 10 varied plans for homes of 1,800 sq. feet of finished floor area or less—within the means of moderate-income families. Plans and specs available from over 20 architects.



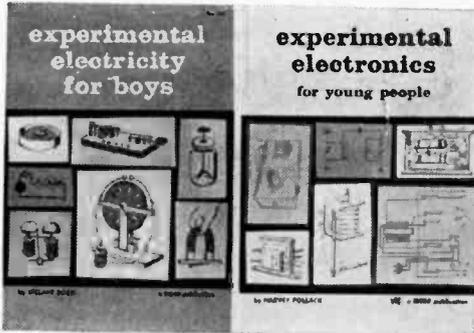
Books

room environment. Villchur's book is the kind of reading material one should have before and after one buys a high fidelity system.

Allison's text on *High Fidelity Systems* is aimed at the more timid audiophile who is apt to be a bit more flustered than others once the chit-chat gets technical. It tells the hi-fi system owner how to hookup his components, giving installation tips and a neat little chapter titled "In Case of Difficulty." The low purchase price makes this soft cover a real buy.

Both *Reproduction of Sound* and *High Fidelity Systems* are available postpaid from Acoustic Research, Inc., 24 Thorndike Street, Cambridge 41, Massachusetts.

For boys only. If you have a youngster beginning to nose his way through books on electronic subjects, there are two Rider publications he should be reading. *Experimental Electricity for Boys* by Willard Doan (\$3.45) and *Experimental Electronics for Young People* by Harvey Pollack (\$3.45).



In the *Electricity* hard cover volume, youngsters between the ages of 12 to 16 are introduced to the mysteries of magnetism and electricity in a dramatic style yet with complete accuracy. The *Electronics* hard cover text is authored by one of America's leading science high school teachers. In his text, Mr. Pollack offers 49 experiments that are highly organized and logically presented to take the young experimenter from the simple to the more difficult in easy steps. The final group of experiments includes instructions for building an audio amplifier and a two-transistor radio receiver.

If you can't pick up a copy of these basic books at your local book store, send a note

From Parts...



To Picture In Just 25 Hours



Heathkit High Fidelity Color TV For As Low As \$349

25 hours of relaxing fun! That's all! And you've built the *new* Heathkit High Fidelity 21" Color TV with the finest color circuitry, components, and performance possible today. 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!

Compare These Heathkit Features With Others! 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.

Learn Color TV Theory—Save on Maintenance Costs! The Heathkit instruction manual contains circuit diagrams, alignment, and theory sections so you can easily make necessary adjustments with confidence.

Enjoy The Beauty Of Color TV with the added fun and satisfaction of a Heathkit! 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
 Dept. 19, Benton Harbor, Mich. 49023

Enclosed is \$_____, plus shipping. Please send model (s) _____

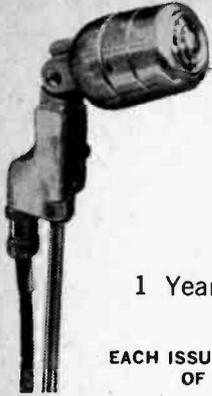
Please send my Free 1964 Heathkit Catalog.

Name _____

Address _____

City _____ State _____ Zip _____

CL-166R



A special
subscription to

RADIO-TV EXPERIMENTER

brings you more
make-it-yourself
projects

1 Year Subscription—\$4.50
(6 Big Issues)

EACH ISSUE INCLUDES LATEST EDITION
OF WHITE'S RADIO LOG

93

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

Please enter my special 6 issue subscription to RADIO-TV
EXPERIMENTER

I enclose \$4.50

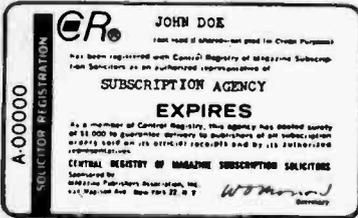
Bill me later

NAME _____ (Please print)

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

**SUBSCRIBE WITH CONFIDENCE
AT YOUR DOOR**



Subscription agency members of Central Registry have deposited a BOND with CR to guarantee delivery of orders to publishers. When their representatives call at your home, their credentials are your assurance of dependable service and continuing reading enjoyment.

CENTRAL REGISTRY
of Magazine Subscription Solicitors

(Sponsored by Magazine Publishers Assn., Inc.)

444 Madison Ave., New York 22, N. Y.

NEW PRODUCTS

Expander-Compressor For Hi-Fi Music-System

The Knight model KN-777 is a device which has been designed to come to the aid of hi-fi music enthusiasts. The unit restores the realistic quality to disc and tape recordings and FM broadcasts. The unit automatically increases the dynamic range (ratio between loudest and softest sounds) of program material which has been compressed by record and tape manufacturers. There is no



change in frequency response, low and average-level passages are not altered. A switch permits the process to be reversed, compressing the high levels for use with background music. The KN-777 is quickly connected between the program source and the amplifier, it requires no power supply, and can be used with any amplifier providing a 4 or 16 ohm output. For stereo, only one unit is required, it provides up to 8 db of expansion per channel, up to 15 db compression per channel without distortion. The KN-777 weighs only 3 lbs. Price: \$49.95. (Allied Radio, 100 North Western Ave., Chicago, Ill. 60680)

UHF-TV Converter Combines Preamplification And Style



The "Ultra-Vista" is the first (and only) UHF-TV converter to be manufactured with

All Purpose SHOP TACHOMETER



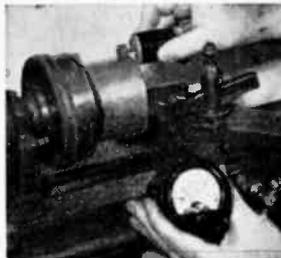
Motor Speeds



Tape Recorder Speeds



Drilling Speeds



Lathe Cutting Speeds

Here is a real surplus scoop that we're anxious to share with you. The components of this kit if purchased individually cost over \$50.00. Yet because of a surplus windfall we're able to send it complete to you postpaid for only \$16.95. Once more this tachometer is guaranteed to outperform any \$50 tachometer available today or your money will be refunded.

MEASURES 0-15,000 RPM IN 3 RANGES

Use it to measure speeds on:

- TAPE RECORDERS • LATHES • CUTTING TOOLS • KART ENGINES • MODEL PLANE ENGINES • HIGH SPEED DRILLS • APPLIANCE MOTORS • PULLEY BELTS • AUTO ENGINES • MANY OTHER USES

Complete kit and instructions make it easy to assemble entire kit in less than two hours using only hand tools.

\$16⁹⁵

SCIENCE and MECHANICS, Kit Division
Dept. 876, 505 Park Avenue, New York 22, N. Y.
Add 10% for Canadian and Foreign orders.

Enclosed is \$16.95. Please send me your complete kit and plans for assembling the S&M all purpose tachometer. I understand that if I am not completely satisfied, I may return the kit within 10 days for a complete refund.

NAME (PLEASE PRINT)

ADDRESS

CITY, ZONE, STATE.....

Buying a New or Used Car?



Protect Yourself with a Checklist

Make sure you know what you're getting—and what you're paying—compare deals, break down optional equipment costs, new and used car charges and financing terms with the Car Buyer's Checklist. A packet of 8 four-page, money-saving Checklists for \$1.00.

Order No. 406

SCIENCE AND MECHANICS, Craftprint Division
505 Park Avenue, New York 22, N. Y. 52

WRITE NOW FOR **McGEE'S**
1964 CATALOG
SENT FREE
1001 BARGAINS IN
SPEAKERS—PARTS—TUBES—HIGH FIDELITY
COMPONENTS—RECORD CHANGERS—
TAPE RECORDERS—KITS—
EVERYTHING IN ELECTRONICS

McGEE RADIO CO.
1907 McGee St.
Kansas City 8, Missouri

SEND 1964 McGEE CATALOG

NAME

ADDRESS

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

Imported Stiletto Knife

OPENS WITH FLICK OF FINGERS and LOCKS INTO POSITION.

Prevents blade from snapping shut when in use. Push button release. Convenient pocket size, yet rugged. Fine quality, polished nickel-steel razor-sharp blade. PIERCES METAL. Narrow, tapered stiletto blade with thick rigid backbone for heavy duty use. Fine outdoor knife for sportsmen and emergencies. Comfortable handle. Safety guard. P.P.D. **\$2.50**
JOHNSON SMITH & CO., Dept. 405, Detroit 7, Mich.

BIG Throwing Knife \$1.00
Special PIERCES METAL

Specially weighted & balanced point zeroes right into bull's eye with a wallop! Positive accuracy! Deep penetration! Easy throwing! Hard hitting! Excellent for hunting game, self-defense, fun. Cutlery steel, double edge. Big 10" long. Leather handle. You must be delighted or your money back. Price Postpaid \$1.00. Matched set: 2 for \$1.85; 3 for \$2.65. Leather sheath 50c. Professional Knife Throwing Book 25c.
JOHNSON SMITH & CO. Dept. 405 Detroit 7, Mich.

New Jet Engine Burns Gasoline

JET ENGINE Powerful continual thrust for models, experiments, thrills! Operates by itself or drives model car, boat, plane, etc. Lowest Priced Gas Engine. Ram jet principle. No moving parts. Easy starting. Runs on regular gas. About 6" long. Use two for double **\$1.50**
JOHNSON SMITH & CO. Dept. 405 Detroit 7, Mich.

Powerful Electric Generator

Cost U. S. Gov't \$20.00! Generates Up To 100 Volts. Use to generate electricity, to ring bells, light up lights, as a medical battery, deliver terrific electrical shock as joke, many electrical experiments, classroom uses, etc. Hand crank or gear wheel drive. Made by leading electrical companies. Powerfulnico magnets (gone worth more than total cost). Ready for use. Postpaid **\$3.95**
JOHNSON SMITH & CO. Dept. 405 Detroit 7, Mich.

Enjoy the Savings and Pleasure of Building Your Own:

Precision Decade Resistance Box



Designed so the electronic experimenter can get any value of resistance at 1% accuracy. Made of precision components, this decade resistant box offers such advantages as:

Speed . . . Fast finger-tip switching action provides any resistance value from 1 ohm to 1,111,110 ohms within seconds.

Accuracy . . . Add or subtract as little as 1 ohm in critical circuits with 1% accuracy.

Convenience . . . No knobs to fiddle with when changing from range-to-range. Working handle can be set to hold the box at an easy to work angle and efficient bench-top visibility.

Quick Assembly . . . Ordinary hand tools are all that's required to assemble this precision instrument in less than 2 hours.

This S&M Decade Resistance Box kit carries an unconditional guarantee of performance and accuracy. If for any reason you are unsatisfied with the performance, it may be returned within 10 days and your money will be refunded.

SCIENCE AND MECHANICS, Kits Division
505 Park Avenue, New York 22, New York

Add 10% for Canadian and Foreign orders.

Please send me Complete Kits and plans for assembling the S&M Decade Resistance Box @ \$24.95 each. I understand that if I am not completely satisfied I may return the kit within 10 days for a complete refund.

Add 10% for Canadian and Foreign orders. New York City residents add 4% for N.Y.C. sales tax.

Check or money order enclosed, ship post-paid. Send Decade Resistance Kit C.O.D. I will pay \$24.95 plus postage and C.O.D. charges.

Name (please print)

Address

City Zone State

Decade Resistance Box is also available fully assembled and tested at \$29.95.

NEW PRODUCTS

a built-in stage of RF preamplification to help TV signals override "snow." The "Ultra-Vista" is designed to be a welcome addition to the decor of a room, with its modern, low-silhouette cabinet. The circuit of the "Ultra-Vista" contains a frame-grid tube (6DL4/EC88), a Nuvistor (A15300), a diode (K3D), and a transistor (PADT-28) arranged for low-noise and high-gain. The noise figure is not more than 14 db, with the gain at least 10 db. Its input and output impedances are 300 ohms with a VSWR of 1.5:1 maximum. The "Ultra-Vista" consumes 10 watts at 117 volts AC. Price: \$49.95. (Jerrold Electronics Corp., 15th & Lehigh Ave., Philadelphia 32, Pa.)

Auto/Professional Hi-Fi Turntable

The new United Audio Dual 1009 is a turntable with a dynamically balanced tonearm which can track and trip below 1/2 gram, making it suitable for use with very high compliance cartridges. The tonearm has virtually frictionless pivots and ball bearings and can be precision balanced by means of a fine-thread counterweight. The high torque motor maintains a speed accuracy within one-tenth of 1%, even with line voltage



variations of 10%. The Dual 1009 has a variable speed control (6% variation) and has a built in switch which turns off the amplifier after play. Other features include: 4 speeds, 7 lb. non-ferrous turntable, interchangeable single play and changer spindles, continuous repeat, neutral gear, and slide switch controls. Specs for rumble, wow and flutter are claimed to match or surpass all professional caliber turntables. Price: \$94.75. (United Audio, 12 West 18th St., New York, N. Y. 10011)

(Continued on page 126)



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

AGENTS WANTED

I'LL Send You full-size famous Blair home products for Free Trial, to help you make more money, spare time or full time. Show friends, neighbors, take easy big orders, make generous profits. Write Blair, Dept. 521-AB, Lynchburg, Va.

AUTOMATIC Bed Warmer you sleep on, not under. Beats electric blankets 10 ways. Generous profits. Patented Products, A-14, Danville, Ohio.

AUTHOR'S SERVICE

WANTED: Short stories, books, articles, plays of all descriptions for sale to publishers, producers. Free Literature! 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 PARTS & ACCESSORIES

TRANSISTOR Ignition Coil—Instructions. Special \$8.50. Anderson Engineering, Wrentham, Mass.

BATTERIES, GENERATORS

REBUILD Batteries! Complete Manual \$3.00. C.O.D. Accepted. Bayer Publications, 938AK, Betty Avenue, Neenah, Wis.

BUSINESS OPPORTUNITIES

INVESTIGATE Accidents. Earn \$750.00 to \$1,000.00 monthly. Men urgently needed. Car furnished. Business expenses paid. No selling. No college education necessary. Pick own job location. Investigate full time. Or earn \$6.44 hour spare time. Write for Free Literature. No obligation. Universal CMH-2, 6801 Hillcrest, Dallas 5, Texas.

VENDING Machines—No selling. Operate a route of coin machines and earn amazing profits. 32-page catalog Free! Parkway Machine Corporation, Dept. 41, 715 Ensor St., Baltimore, Md., 21202.

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.

LEARN Flower Arrangement & Floristry. Start your own business, part or full time. Many good paying positions open. Earn while learning. A Lifetime Career's home study course. Send for Free Booklet. National Floral Institute, Studio SAC-14, 11826 San Vicente Blvd., Los Angeles 49, California.

MAIL Order Pays Big! Tested, proven, home moneymaking opportunity! Everything furnished. Mann, 286-DG, Hillsdale, New Jersey.

MAIL Baby Catalogs imprinted with your address to New Mothers for Big Profits! Catalog 25¢. Volz, SM10, Ypsilanti, Michigan.

CHROME-Plating Equipment and Supplies; All other finishes. Home workshop and industrial sizes. Complete setups for bumpers, with technical assistance at your plant. Industrial portable platers as low as \$100.00. Send \$1.00 (refundable) for equipment guide, formulas, operating data, catalog: HBS Equipment Division 84, 3445 Union Pacific Ave., Los Angeles 23, Calif.

START your own Business. Free Details. D. Pastam Co., P.O. Box 156, Levittown, Pennsylvania.

LEARN Landscaping and growing of plants. Latest information on propagation, soil testing, plant growth regulators, garden design and color. Many money-making opportunities. Free booklet. Lifetime Career Schools, Dept. SAC-14, 11826 San Vicente Blvd., Los Angeles 49, Calif.

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.

BUY IT WHOLESALE

DEALERS Cost—all 1963 Cars—\$1.00. Petros, 5404-S South Mozart, Chicago 22.

DRUG Sundries. Vitamins. Wholesale catalog 10¢. SM Tretts Co., Box 186, Buffalo 1, N. Y.

CAMERA & PHOTO SUPPLIES

THINGS Japanese—from Cameras to General Merchandise. Any inquiries answered. Catalog, information and price-list \$1.00. Tomio Ueno, 538 Shimbatacho, Katushikaku, Tokyo, Japan.

BUILD your own supersensitive light meter. Use newest cadmium sulfide light cell, shows ASA speeds 3 to 25,000, F stops .7 to 90 measures accurately moonlight to bright sunlight. Send \$19.95 to Kit Division, Science & Mechanics, 505 Park Ave., New York, N. Y., 10022.

CHEMICALS & APPARATUS

PYROTECHNICS Manual contains formulas for Flares, Explosives and "Stars." \$1.00. Kcl-Tec Laboratory, Box 804, Burlington, Vermont.

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 111, California.

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

10 DIFFERENT Indian Cents or V Nickels plus Bargain List \$2.50. Rettew, 5618 Pico Blvd., Los Angeles 19, Calif.

EARTHWORMS

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

EDUCATION & INSTRUCTION

USED Courses, Books. List 10¢. Smith's, 124 Marlborough, Salem, Mass.

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.

USED Correspondence School Courses. Educational Material. Some Free. Large Listing 25¢. Amity, P.O. Box 2471, Detroit, Mich., 48231.

1001 How-To-Ideas—Loaded with practical, money-saving tips for do-it-yourselfers. Kinks cover home maintenance, car servicing, boating, outdoor sports, electronics, etc. A new quarterly Handbook #637. Send \$1.00 to Science & Mechanics, Handbook Div., 505 Park Ave., New York, New York, 10022.

ELECTRICAL EQUIPMENT & SUPPLIES

BUILD a high precision all purpose tachometer. 3 ranges. Measures speeds on tape recorders, lathes, cutting tools, auto engines, many more uses. Only \$16.95. Kit Division, Science & Mechanics, 505 Park Ave., New York, N. Y., 10022.

EMPLOYMENT INFORMATION

OVERSEAS Jobs. List \$2.00. Universal, P. O. Box 643, Kenosha, Wisc. 53141.

FLORIDA LAND

FLORIDA Water Wonderland: Homesites, Cottagesites, Mobilsites. Established area. \$390.00 Full Price, \$5.00 Month. Swimming, Fishing, Boating, Hunting, Golfing. Write Lake Weir 80, Silver Springs, Florida. Ad 6-1070-(F-O).

FOR INVENTORS

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

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

HELP WANTED

\$23.00 WEEKLY for wearing lovely dresses supplied to you by us as extra rewards. Just show Fashion Frocks to friends in spare time. No investment, canvassing, experience necessary. Fashion Frocks, Dept. F-16001, Cincinnati, Ohio, 45202.

HOME WORKSHOP SUPPLIES

FREE New Catalog, 2447 Plans, Pat- terns. World's greatest selection things to do, make. Fun. Profit. Craftplans, 1825-H, Harwood, Homewood, Ill.

ANSWERS to your woodworking prob- lem? We've got them in Woodworker's Encyclopedia No. 634. How the pros use tools. A must book. Send \$1 to Science & Mechanics, 505 Park Ave., New York, New York, 10022.

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 Para- graphs! 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.

SELL Jewelry to friends; Assemble yourself; Kits pricelist. Cash, 910 Bell- rose N.W., Albuquerque, New Mexico.

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.

OPTICAL GOODS

CUSTOM Telescopes, Lens, Tripods, Equatorials, Magnifiers, and Accessories, UPCO, Sunbury, Penna.

PATENT SERVICE

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

PATENT Searches, \$6.00! For free "Invention Record" and "Important In- formation Inventor's Need," write: Miss Hayward, 1029-D Vermont, Washington 5, District of Columbia.

PETS—DOGS, BIRDS, RABBITS, HAMSTERS, ETC.

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

EARN \$10,000 Yearly Raising Angora Rabbit Wool For Us. Information 25¢. Coin, American Angora Company, Malta 77, Montana.

RADIO & TELEVISION

LEARN Radio Electronics. Big 35 Les- son Home Study Course \$12.00. Particulars Free. Zak, Nampa, Alberta, Canada.

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

SALESMEN—DISTRIBUTORS

YOUR Own Business Without Invest- ment! 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 com- missions. Match Corporation of America, Dept. CH-14, Chicago 32.

SCIENCE EXPERIMENTS

FIREWORKS! Rocket Fuels! Explosives! Easily prepared formulas \$1.00. U. S. Pyrotechnics, Box 234, Cedarhurst, N. Y.

"SCIENCE EXPERIMENTER"—A must Handbook for high school science students, spelling out the kind of projects they can develop into Science Fair winners. Semi- annual—a favorite of teachers. Send \$1.00 to Science & Mechanics, Handbook Div., 505 Park Ave., New York, N. Y., 10022.

SPORTING GOODS, FISHING TACKLE, ARCHERY, ETC.

KNIVES, Catalog a quarter. Hunting, Collectors. Pocket. Hartstone, Seneca Falls, N. Y. 13148.

START YOUR OWN BUSINESS

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

TREASURE FINDERS

GOLD, Silver Indicators and Locators. Write, Box 51, Plant City, Florida.

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 rang- ing 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 per- formance, "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 com- pletely satisfied.

Name (PLEASE PRINT)

Street

City, Zone, State.....

Ask Me Another

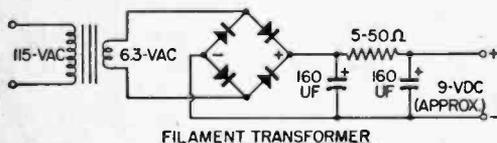
By Joseph Marshall

RADIO-TV EXPERIMENTER brings the know-how of an electronics expert to its readers. If you have a question to ask of Joe, just type or print 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: How can I turn a plain 6.3-volt filament transformer with no center tap into a filtered 6 volts for operating my transistor radio?

RK, Montreal, Canada

Answer: Try the circuit below. Since your radio draws only a fraction of an amp., the inexpensive top-hat rectifiers will do. Lafayette offers four 750 mil., 100 PIV diodes for 89¢ (Lafayette Part No. SP-276). You can use the miniature electrolytic condensers rate at 160 mfd; 15 WVDC, or for better filtering a 2000 mfd., 15 WVDC, following the resistor. The output voltage will depend on the resistor. It will run about 9 volts without a resistor; this would replace the typical 9 volt battery. If you need 6 volts try resistors in the 5 to 50 ohm range. The resistance will depend on the current drawn by the radio.



Question: How can I convert a Knight-Kit transistor to the broadcast band for use in a "carrier-current" radio station, and how would I couple it to the power line?

BG, Cincinnati, Ohio

Answer: It can be done but first, it would

YOUR BEST NEWSTAND BUYS

On sale now or use coupon below



Dedicated to the mechanically-minded reader with an automotive interest. Features latest Detroit and foreign models, karts, customizing, sports cars, hot-rods, etc. Also, step-by-step articles on car servicing, maintenance and modifications.

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

- Enclosed is \$_____ Please send me _____ copies of No. 675 CAR & MOTOR at \$1 each (includes postage and handling).
- Enclosed is \$3. Enter my special 4-issue subscription to CAR & Motor, starting with No. 675.

Name _____ (Please print)

Address _____

City _____ State _____ Zip Code _____

Ask Me Another

take a pretty long article to tell you how and second, unless precautions are observed you might easily run afoul of the Federal Communications Commission and become a candidate for one of those nice stiff fines they are imposing. My suggestion is that you go to your library and obtain a copy of the Radio Amateur's Handbook for 1944—the 21st edition. This has an entire chapter on this subject of carrier current communication. And if you enjoy assembling kits, many of the major kit manufacturers carry power line intercoms in their kit line.

Question: I overheard someone say that with a simple revision on a transistor pocket radio it can be turned into a broadcast band "walkie talkie." How can I do this?

AWB, Providence, R.I.

Answer: Get hold of the guy and ask him to give you the secret; and if he'll write it up the chances are the RADIO-TV EXPERIMENTER would be interested in publishing it and paying him for it.

Yes, this could be done but the only way I can think of it would require quite a bit of rewiring and reconnecting which is far from simple, especially considering the miniature size of a transistor pocket radio.

Keep in mind that there are some FCC regulations on radio equipment of this type. Best thing to do is check into Part 15 of the FCC regulations before any soldering is started.

Question: How long should a short-wave antenna be? How long should an antenna be for DX on broadcast band? What commercial wire is best and most economical for this purpose?

FJC, San Francisco, Calif.

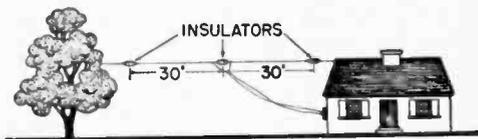
Answer: It isn't that simple but we'll try to give a simple answer. The modern receiver is so sensitive that it does not need an elaborate antenna. Much more important is favoring the pick-up of signal over the pick-up of noise, especially man-made electrical noise. A simple antenna that will give good results consists of two pieces of 30-foot wire fed at the center with twisted pair wire, as diagrammed below. The antenna should be

located where noise pick-up would be low—away from power and telephone lines, transformers, and house wiring. It is best not to put it over the roof of a house because usually there is a lot of electric wiring in the ceiling of a home which can transfer noise to antenna. Stretching from your house to a garage, tree, or pole is better. You can buy kits for this kind of antenna for between \$2 and \$5.

To give more uniform results over entire short-wave spectrum there are antennas which have two or three or more dipoles like the above—or a single long dipole with tuned traps which is equivalent to several dipoles. Hy-Gain and Mosley offer multiple trap antennas for about \$15.

The simplest antenna for broadcast band reception is simply a 50-foot piece of wire run from the receiver, out a window, to any convenient tall support. It will not have the interference rejection of the di-poles fed with the twisted pair line, but in a quiet location it will do a good job with a good receiver. And if you are on a budget, this long-wire antenna can also serve for short-wave reception.

As for wire, insulated hook-up wire will do for the last type of antenna. No. 7 x 24 braided copper wire has been the standard antenna wire for generations and runs about a penny a foot.



Question: I have a 10-watt Sargent-Rayment hi-fi amplifier and I wonder if it would do any good to hook it up to my AM-FM-SW radio, and if so how can I do it?

FJC, San Francisco, Calif.

Question: I have a Hallicrafter short-wave radio and I would like to feed it into my hi-fi system. How can I do this without modifying the receiver?

JKK, Little Rock, Ark.

Answer: Both you gentlemen will probably get a decided improvement in tone quality in this way: connect an 8-ohm resistor from 1 to 4 watts across the speaker terminals of the radio and disconnect the speaker terminals to the input jack on the hi-fi system. Now run a shielded lead from the same speaker terminals to the input jack on the hi-fi system.

Ask Me Another?

or to the accessory input jack on the hi-fi preamplifier.

Question: I cannot find the GE 1493 lamp for the Microscope Illuminator described in ELECTRICAL HANDBOOK, Volume 3. Is there a substitute?

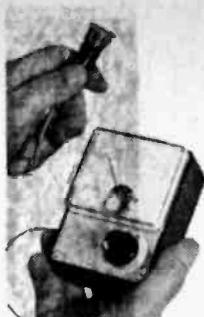
RR, Reading, Pa.

Answer: You can buy the GE 1943 from Allied Radio (Catalog No. 52 E 656) or Lafayette Radio (Catalog No. PL-86). It is best to use this lamp. However, it may be that you can find something that will do the job for you at your automobile dealer. It should be rated at 6 volts, have a single-contact bayonet base, and put out at least 50 candlepower.

Question: We are interested in installing a city wide community antenna TV distribution system. Can we have information on what is needed, and the name and address of some firms which make the equipment needed?

J. T. Camden, Ark.

Answer: There are two ways of serving a community with TV signals from stations too remote to be receivable with good quality with ordinary TVs and antennas. The oldest is the community antenna system. In this system a high gain antenna is located in a good location; it picks up the signals which are amplified in amplifiers and then distributed through coaxial cables to the individual homes. This is a pretty expensive proposition because of the amount of cable required. A more recent system uses "translators." This, too, starts with an antenna in a very good location. However, after being amplified the signal or signals are fed into a small transmitter and re-broadcast through an antenna array covering the community. No complex cable system is necessary. Each customer picks up the signal with his own regular type TV antenna. The total cost is lower and maintenance is simpler. Translators, however, are regulated by the Federal Communications Commission and a license is required to install and operate one. It is suggested that you write the commission (Washington 25, D. C.) requesting a copy



TRY THIS

SUPER SENSITIVE PHOTO METER

FOR 10 DAYS

—AT OUR EXPENSE

Science & Mechanics GUARANTEES it will outperform any other meter—and give you better pictures right away—or the 10-day trial costs you nothing!

TREMENDOUS RANGE! PIN-POINT ACCURACY!

Just look at these amazing specifications:

- Super-sensitive CdS cell "sees" light from 0 to 10,000 ft/lamberts
- ASA speeds 3—25,000!
- F 0.7 to F 90!
- Exposures from 1/1500 sec. to 8 full hours!
- EV-EVS-LV settings
- 43° acceptance angle
- 4 sensitivity ranges—from "pitch dark" to sun bright!
- Compact in size—weighs only 10 oz.

PLUS—New plastic cap used for reading incident light, also shields cell from light when not in use . . . new positive meter lock holds needle securely in OFF position . . . reads both reflected and incident light . . . use for movies, stills, microscopes, telescopes—even densitometers . . . plus built-in battery test switch.

ACCLAIMED BY LEADING PHOTOGRAPHY JOURNALS

"As sensitive as anything on the market . . . so adaptable—4 separate ranges have the effect of spreading the meter's scale."
—U.S. Camera

"Certainly one of the most unusual, most versatile, most sensitive exposure meters at any price today."
—Modern Photography

Available—with rich-grained carrying case included—either as a fascinating to build Kit, or completely assembled and tested. Kit can be put together with just a soldering iron and screwdriver in less than 2 hours with easy step-by-step instructions.

KIT (no. 101)
\$24.95
ASSEMBLED (no. 102)
\$29.95



Complete with Handsome Custom-Designed Carrying case and Strap

CARRYING CASE ONLY (no. 103)—\$2.00

-----MAIL THIS COUPON TODAY-----

Science & Mechanics—Kit Division
505 Park Avenue, New York, N.Y. 10022

Please rush me the new S&M super-sensitive Photo Meter as checked below. If not completely satisfied I will return the Meter within 10 days for an immediate refund of my purchase price—in full!

- | | |
|--|---|
| <input type="checkbox"/> KIT (no. 101) \$24.95 | <input type="checkbox"/> Check or money order enclosed—ship prepaid. |
| <input type="checkbox"/> ASSEMBLED (no. 102) \$29.95 | <input type="checkbox"/> \$3 deposit enclosed—ship C.O.D. for balance plus postage and charges. |
| <input type="checkbox"/> CARRYING CASE ONLY (no. 103) \$2.00 | |

NAME _____ (Please print)

ADDRESS _____

CITY _____ ZONE _____ STATE _____

N.Y.C. residents add 4% city sales tax. Canada and foreign add 10%.

Ask Me Another

of the regulations applicable to community TV distribution systems and a list of manufacturers supplying approved equipment for this service. Jerrold Electronics Corp., 15th and Lehigh St., Philadelphia, Penna., is one of the largest manufacturers, and operators, of community TV systems.

Question: In my area and on my receiver I hear station WKBW on 1520 kc and also on 610 kc. Can you tell me the reason for this?

RAS, New York, N. Y.

Answer: Your receiver is undoubtedly a superheterodyne in which the local oscillator frequency is equal to the station frequency plus the intermediate frequency, which typically is in the region of 455kc. When you have your receiver tuned to 1620, the local oscillator is at 1975 and the difference beat note is 455 which goes through the IF amplifier, is detected and becomes audible. When you tune to 610, the local oscillator is at 1075. The difference between 1520 and 610 is also 455 and goes through the IF amplifier to become audible though probably at reduced volume. This unwanted signal at 610 on the dial is called an "image."

Question: Which is more harmful to people, to get shocked by a 6-volt 10-ampere source or by a 500-volt 10-milliampere source?

CG, Lincolnwood, Ill.

Answer: Ohm's Law also applies to people when they become part of an electric circuit. You will recall that Ohm's Law says that the current (I) flowing through a circuit, or branch of a circuit will depend on the voltage (E) across the circuit and the resistance (R) of the circuit. Your body resistance is very high, usually well over 10,000 ohms. If you insert it across an electric circuit, your body will be the resistance in the circuit.

Assuming your body resistance is quite low, say 60,000 ohms, in the case of the 6-volt source the current flowing through your body would be 6/60,000 or 100 microamperes, the total power would be .0006 watt. In the case of the 500-volt supply the current would be 500/60,000 or 8.3 milliamps

and you would be called to dissipate 500 x .0083 or 4.15 watts. Clearly the latter is more dangerous.

There are no hard and fast rules, however, on how much voltage and current a body can stand without damage. Anything above 10 milliamps can be dangerous and anything above 50 milliamps can be fatal. In view of high body resistance it usually takes a high voltage to draw that much current. But if the body resistance is low, as for instance if it is moist, a relatively high current may flow with even a relatively low-voltage source. The only way to outwit Ohm's Law is by keeping your body out of electric circuits.

Incidentally, in about 90 per cent of the cases of electric shock where breathing has ceased, a fatality can be avoided if "mouth-to-mouth" artificial respiration is applied to the shocked individual within about 4 minutes. Everybody who has occasion to work with dangerous electrical currents, and his associates and family, should learn the technique. Consult your local Red Cross Chapter or family doctor.

Question: Many times I have heard the term "WPE Short-Wave Monitor" How can I become one?

RF, Birmingham, Ala.

Answer: The WPE program is sponsored by one of our competitors, Popular Electronics, One Park Ave., New York, N. Y. 10016. Write them and ask for an application form, enclosing a dime.

Question: When the power supply transformer of an AC superhet shorts or burns out, is it feasible to convert the power supply to AC-DC without altering any other section of the set?

WW, Greensboro, N. C.

Answer: It would be possible but not very feasible in terms of the cost and labor involved. Trouble is that transformer type sets have the filaments of the tubes wired in parallel and supplied from the 6.3-volt (or 2.5-volt) winding of the transformer. To adapt to AC-DC it would be necessary either to rewire the filaments in series, possibly changing tube types, and/or add a series resistor or ballast tube to bring the line voltage down to the proper value. You will find it much simpler, cheaper and more satisfactory to get another transformer. You can find suitable ones in other old radios, or pick one up from a surplus dealer. McGee

Radio, 1901 McGee St., Kansas City 8, Mo. is the best source I know of for replacement transformers suitable for such an application. You can get one that will do the job for between \$3 and \$6, from them; and believe me this will save you money and bushels of trouble.

Question: What's the best product for cleaning records and keeping them free of pops and crackles?

JNB, Dallas, Texas.

Answer: It is called *water*, produced by your city, county or sanitary district, and comes out of the faucets in your kitchen or bathroom. Let a gentle stream of it flow over the surfaces of the record, then wipe in a circular direction following the grooves, with a very soft, very fine piece of chamois. If you touch the record to the faucet while washing or, preferably, after chamoising, the static charge will be discharged. If the record is very dirty, or has fingerprints or signs of any kind of film or grease, or is heavily charged with static put just a little household detergent into a pan of water, and wash record with this, rinsing with flow of clean water and chamoising as above. Incidentally, here is a very simple test to check whether any record has a static charge: tear a small piece of newspaper into small bits, like confetti, and place on any surface. Bring record near bits of paper. If paper is attracted and jumps to record, it is charged. If record does not attract bits of paper it is neutral. Aside from the fact that it is cheap, the big virtue of WATER is that (if it is fit to drink) it will leave no grease, silicone, or any other kind of film to bind dust to record.



"Can't say right now, Bill, the William Ida Frank Edward's antenna is tuned in."



 **FREE**



Fill in coupon for a FREE One Year Subscription to OLSON ELECTRONICS' Fantastic Bargain Packed Catalog — Unheard of LOW, LOW, WHOLESALE PRICES on Brand Name Speakers, Changers, Tubes, Tools, Stereo Amps, Tuners, CB, and other Bargains.

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

If you have a friend interested in electronics send his name and address for a FREE subscription also.

OLSON ELECTRONICS
INCORPORATED

530 S. Forge Street Akron, Ohio 44308

SURPLUS BARGAINS

Hoffman Silicon Solar Cells	\$1.00
Sigma #4F Sensitive Relay	1.50
Silicon Rectifiers, stud mount 2 amp.	8/1.00
2N38 Audio Freq. Transistors	12/1.00
1N82 Diodes, UHF & Gen. Purp.	25/1.00
MADT RF Osc. HF Transistors	5/1.00
Tophat Silicon Rectifiers unchecked	15/1.00
40 Watt Silicon Transistor 2N389 type	1.00
Computer Boards over 100 resistors, diodes, RF Chokes, Transistors, etc. 1.00 ea.	6/5.00
Geiger Counter Kit with \$55.00 Hi-volt sply ...	9.50
Disc Capacitors, kit of 100 pieces	1.00
Navy Remote Control cost \$250.00 with tel. dial, selsyn indicators, lights, knobs, switch- es, etc. Brand new. Wgt. 29 lbs.	6.00
Infra-Red Filter 5½ inch dia.	1.75
Sound Power Fones w/100 ft wire	1.00
Snooperoscope Viewing Tube #6032 cost \$100. New with instruction sheet	6.50
Solar Cell Kit, 5 cells with instruction book ...	1.50
CK-722 Transistors	6/1.00
IBM MEMORY PLANE 4096 bit, perfect, cost \$4,000	12.50

All material FOB Lynn Mass. (you pay shipping)
Many many more bargains in our large catalog.

JOHN MESHNA JR. 19 Allerton,
Lynn, Mass.

LATEST SAMS BOOKS FOR EVERYONE IN ELECTRONICS



USE THIS HANDY ORDER FORM

- How To Read Schematic Diagrams.** Not only shows you how to read and interpret diagrams, but analyzes each component, its construction, and its circuit purpose. Order RSD-1, *only*..... \$1.50
- Computer Circuit Projects You Can Build.** Starting with a simple flip-flop circuit, this book details the construction of 13 basic analog and digital computer-circuit projects. You not only learn computer circuitry but build useful devices as well. Order BOC-1, *only* \$2.95
- ABC's of Short-Wave Listening.** Your introduction to the exciting world of short-wave radio; tells what programs are available; gives practical advice on receivers, antennas, best listening times; a wonderful guide to this great hobby. Order SWL-1, *only* ..\$1.95
- North American Radio-TV Station Guide.** Full data on 1000 VHF and UHF TV stations, over 5000 AM stations and 1500 FM stations; includes 14 valuable station location maps. Invaluable for DXers, TV-radio technicians, etc. Order RSG-1, *only* ..\$1.95
- Sams PHOTOFACT Guide to TV Troubles.** Causes of more than 90% of TV troubles can be isolated in minutes by following the procedures described in this book; shows symptoms, analysis checks and where to look for troubles. Order PFG-1, *only* ..\$2.95
- How to Repair Major Appliances.** Explains operating principles and shows how to repair refrigerators, freezers, automatic washers, dryers, dishwashers, garbage disposal units, air conditioners, water heaters, etc. Order MAJ-1, *only*..... \$3.95
- Automotive Electronics Test Equipment.** The "why and how" of test equipment used in automotive servicing. Shows how to use instruments to repair carburetion and electrical systems. Order AEL-1, *only* \$2.50
- Basic Electronics Series, 4 Vols.** Dynamic new explanation of circuit action through the use of unique 4-color diagrams which show you what takes place during every moment of circuit operation. Volumes cover Amplifier, Detector & Rectifier, Oscillator, and Transistor Circuits. Save \$1.85. Order BEL-40, *all 4 volumes, only* \$9.95
- TV Diagnosis & Repair. TDR-1**..... \$1.50
- Radio Receiver Servicing. RS-2**..... 2.95
- Modern Dictionary of Electronics. DIC-2**..... 6.95
- TV Servicing Guide. SGS-1**..... 2.00
- Handbook of Electronic Tables & Formulas. MTF-2**.... 3.95
- Electronic Experiments & Projects. ESE-1**..... 2.50
- Tube Substitution Handbook. TUB-6**..... 1.50
- 101 Ways to Use Your VOM & VTVM**..... 2.00

Famous ABC's Books

- | | |
|---|---|
| <input type="checkbox"/> Computer Programming. CPL-1. \$1.95 | <input type="checkbox"/> Electronics Drafting. DRA-1 \$1.95 |
| <input type="checkbox"/> Boolean Algebra. BAB-1. 1.95 | <input type="checkbox"/> Transistors. TRA-1 1.25 |
| <input type="checkbox"/> Electronic Test Equipment. STE-1. 1.95 | <input type="checkbox"/> Electronic Organs. ECO-1..... 1.95 |
| <input type="checkbox"/> Electronics. ELW-1..... 1.95 | <input type="checkbox"/> Lasers & Masers. LAL-1..... 1.95 |

HOWARD W. SAMS & CO., INC.

Order from any Electronic Parts Distributor or mail to Howard W. Sams & Co., Inc., Dept. A-144 4300 W. 62nd St., Indianapolis 6, Ind.

Send books checked above. \$ _____ enclosed.

Send FREE Booklist. Send Photofact Index.

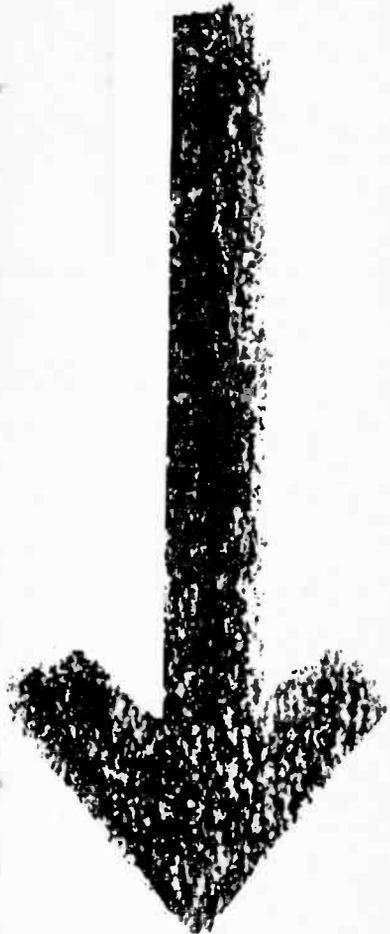
Name _____

Address _____

City _____ Zone _____ State _____

IN CANADA: A. C. Simmonds & Sons, Ltd., Toronto 7

BEWARE!



THE MAN-OF-WAR!

What is it?

What can it do to you?

Read all about it in the

FEBRUARY
SCIENCE
& MECHANICS

On sale Jan. 1

BUILD THE... FM POCKET MIKE

Just assemble
ten dollars
worth of parts and
you can transmit
your voice
to any FM receiver
up to 200 feet away

By Mort Schultz



FCC Regulations now permit unlicensed flea-power transmissions on the 88- to 108-megacycle FM band. If you want to be the first to build your own FM Pocket Mike, follow the instructions in this article.

WHEN you were on vacation last year, the Federal Communications Commission made publicly available the FM frequency band of 88 to 108 megacycles for short-range micropower communication without the need for a station or operator license. Now for the first time experimenters and just plain folk can build their own shirt-pocket size FM pocket mike for less than ten dollars.

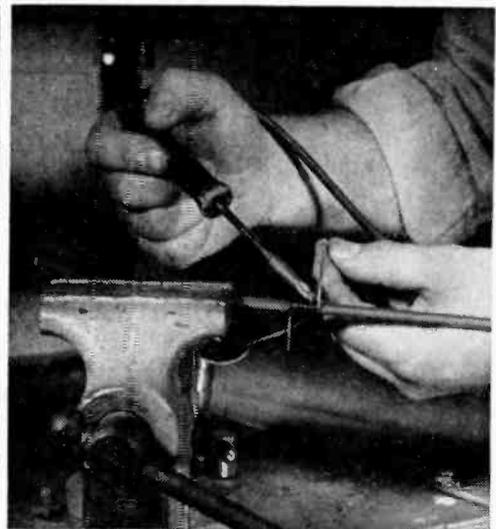
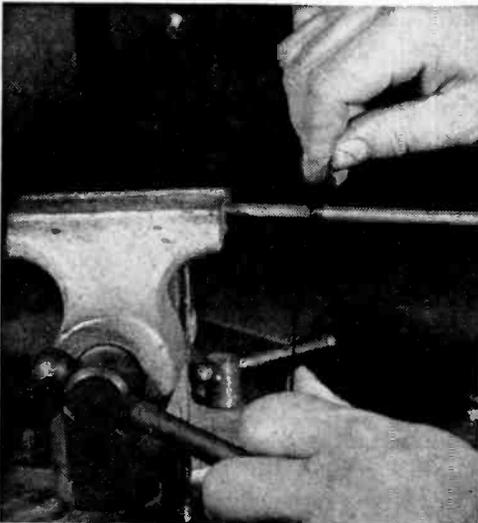
This new FCC ruling opens up infinite possibilities to the electronics experimenter. This was emphasized by the fact that immediately after the news was released several manufacturers announced that they plan to come out with a completely transistorized battery-powered FM wireless transmitter.

The FM pocket mike described in this article operated on a blank spot between 88 and 108 mc. on any FM tuner, FM table model or portable radio, or FM car radio. Your talk into the transmitter's microphone can be received loud and clear from 50 to 200 feet away.

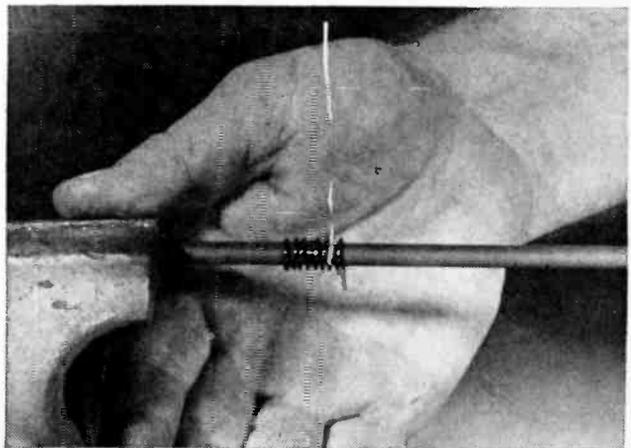
It doesn't take a quick mind to discover the many uses capable of a low-powered FM pocket mike. One can, for example, use it as a PA system, you can use it as a burglar

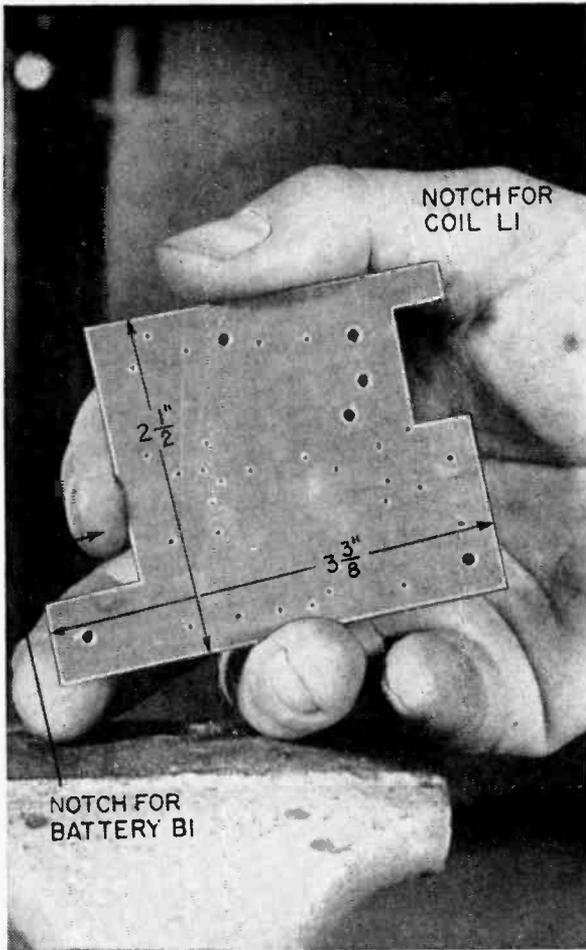
alarm (a few of these placed around the house will permit you to pick up any sound on an FM receiver you have in the bedroom, for example); you can use it as a baby-sitter intercom (Suppose you are visiting the next door neighbor. The transmitter placed near baby's crib will let you pick up his cries and stir on the neighbor's FM receiver). In other words, you can use this transmitter in most situations that call for a short-range transmitter.

Putting it Together. The FM pocket mike consists of two circuits—an r.f. oscillator that's tunable to the FM range between 88 and 108 mc., and an audio amplifier. Both circuits are placed on one circuit board and in a plastic box along with a battery, on-off switch, and crystal microphone. The list of



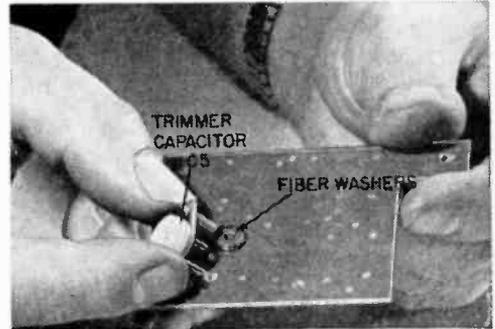
Coil L1 is wound on a $\frac{1}{4}$ -inch dowel (top left) with #16 enameled copper wire. A short length of tinned copper wire (top right) is soldered in place. The completed coil is shown at right. Details are given in text.





Phenolic board (left) serves to hold circuit parts. Notches provide room to locate battery and antenna coil. Holes may be pre-drilled.

Before mounting trimmer capacitor C5 (below), insert two fiber washers to serve as spacers between tuning capacitor and phenolic board.



materials you will need for the construction are given in the parts list.

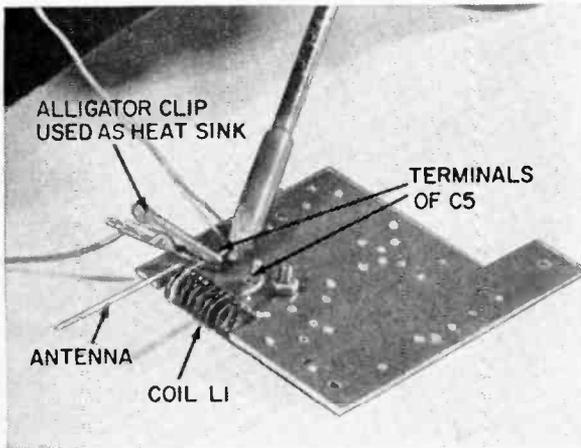
Start by building the r.f. oscillator circuit. Make the oscillator coil L1, first.

1. Wind a length of No. 16 copper wire on a 1/4-inch plastic or metal rod. Make eight full turns and spread the turns until the overall coil length is 3/4 of an inch. The best wire to use is unenameled, silver-plated stock since it cuts down on your work and makes a better high frequency coil because of its more suitable electrical qualities. However, the wire used to construct the model for RADIO-TV EXPERIMENTER is enameled in order to show what has to be done with this type of material should you use it. The antenna end of coil L1 should be a straight piece of wire about 2 inches long. The other end should be a straight piece of wire about 1/2 inch long.

2. Clean the enamel from the ends of the wire with emery cloth or sandpaper. If you use unenameled, silver-plated wire this step is not necessary. Just make sure the wire ends are clean.

3. Locate a battery voltage tap 1 3/4 turns away from the antenna end of the coil, plus or minus 1/8 of a turn. If enameled wire is used, file the tap with a square edge file down to the base copper. If the wire you use is unenameled and silver-plated, just locate the tap—you don't have to file it.

4. Solder a piece of No. 20 tinned cop-



Use an alligator clip as a heat sink to connect wire tap from coil L1 to terminal on C5.

FM POCKET MIKE



per wire that is 2 inches long to the tap. Refer to photos.

The next step is to make the circuit board. Use a piece of 2- $\frac{1}{2}$ x 3- $\frac{3}{8}$ inch paper-base phenolic material. A perforated circuit board, if available, can be used. Make a $\frac{3}{4}$ inch cut-out on one end of the board for the battery and a $\frac{7}{8}$ inch notch on the other end for the coil.

You can now lay out all the components, following the schematic diagram and photos to pre-drill the circuit board, or you can drill as you go along. Note that only holes for leads and mounting are needed. There are no terminal connections to make since point-to-point soldering will be used.

Drill the holes for component leads with a No. 50 drill. The two mounting holes for the variable trimmer capacitor are drilled with a No. 31 drill. Three holes for mounting the board to the case are also drilled using a No. 31 drill.

Begin mounting the components of the r.f. oscillator circuit in the board. Put the trimmer capacitor C5, into place first, as close as possible to the coil notch. Fasten the capacitor down with screws, placing washers (preferably non-metallic) beneath the capacitor to keep C5's rotor spring off the board.

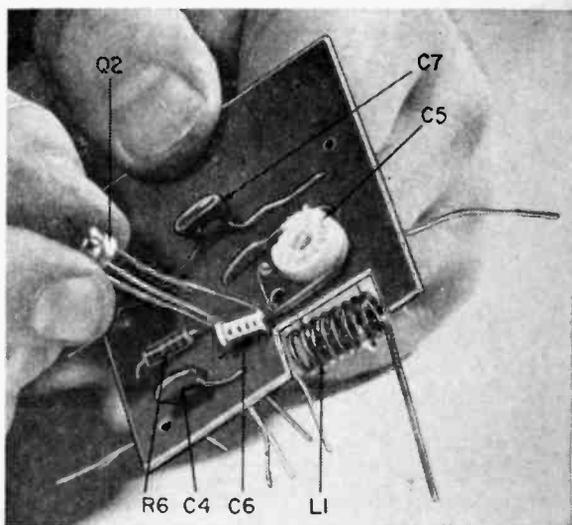
Put the coil into its notch and solder it to trimmer capacitor C5. The short end of coil L1 is soldered to the lower end of capacitor C5 and the coil tap is soldered to the trimmer capacitor's upper end (see photo). Allow the long end of coil L1 to extend beyond the board as the antenna.

When you solder the tapped wire to the capacitor, use a **heat sink on that wire**. An ordinary alligator clip will serve nicely. This prevents soldering iron heat from traveling from the point of solder back to the tap, which could melt the joint at the tap.

Now place the 2N1748A oscillator transistor Q2, adjacent to trimmer capacitor C5. After the transistor is in the board, bend its leads slightly to keep it from falling out. Do this to all components as you mount them.

Locate the emitter-to-collector coupling capacitor, C6, which should be as close as possible to the emitter and collector terminals of transistor, Q2. The remaining components for the r.f. oscillator transistor. These components are the 91K base-bias resistor, R5; at this point, the leads of the r.f. oscillator circuit components are tied together on the circuit board's reverse side and soldered. Be sure to use heat sinks on Q2's wire leads.

Before soldering, wrap components' leads around the leads of other components in the same circuit (see schematic diagram). Point-to-point soldering is then employed as close as possible to the board. Caution: keep leads very short.



The R.F. oscillator section is nearing completion. Parts are pushed through pre-drilled holes and wired in place. Cut leads short.

When soldering, use an alligator clip as a heat sink between the point of solder and the end of the component. This prevents heat damage to the component.

Pre-Testing. At this point, the r.f. oscillator circuit is completed. It should now be powered and tuned. To do this, hook a clip lead from B1's negative terminal to L1's coil tap. Hook another clip lead from B1's positive terminal to the junction of resistor R6 and capacitor C7.

Locate the r.f. oscillator close to a FM

receiver and tune the receiver to a blank spot around 88 mc. Adjust trimmer capacitor C5 by turning its screw until you hear a click in the audio output of the receiver. Make this adjustment with a non-metallic screwdriver.

Try successive points from 88 to 108 mc to insure that you can only tune the circuit throughout the entire FM range. Variations beyond the range of the FM band can be eliminated by either compressing or expanding r.f. oscillator coil L1.

Audio Circuit. Now, build the audio amplifier circuit, which includes a 2N414 transistor, Q1. Place Q1 near the input end of the r.f. oscillator circuit's 20 mf. input capacitor, C3. The transistor leads should be so oriented that the four resistor components in the audio circuit can extend to plus or minus supply leads. Refer to photos. In other words, components shouldn't be placed so their leads cross each other to get to their respective terminating voltages. The four resistor components are the 1.5K collector resistor R3; 3.3K emitter resistor, R4; and a base-bias divider network made up of a 62K and a 33K resistor, R1 and R2 respectively.

Resistor R3 is bypassed by the 50 mf. electrolytic capacitor, C2. A 20 mf. input

electrolytic capacitor, C1; is tied to the base-bias network, R1 and R2; and the free end is available as input to the audio amplifier. The crystal microphone is connected across the free end of C1 and the junction of R2, R4 and C2.

After putting the audio amplifier components in place, solder them together as you did with the r.f. oscillator circuit, making sure to use a heat sink.

Packaging. With the circuit board wiring completed, turn your attention to the plastic case. You could use the case from an old transistor radio, or you could use a plastic utility case as the author did. Place the circuit board into the case and locate the mounting holes (this, by the way, can be done either before or after the components

CERTIFICATE OF EXAMINATION

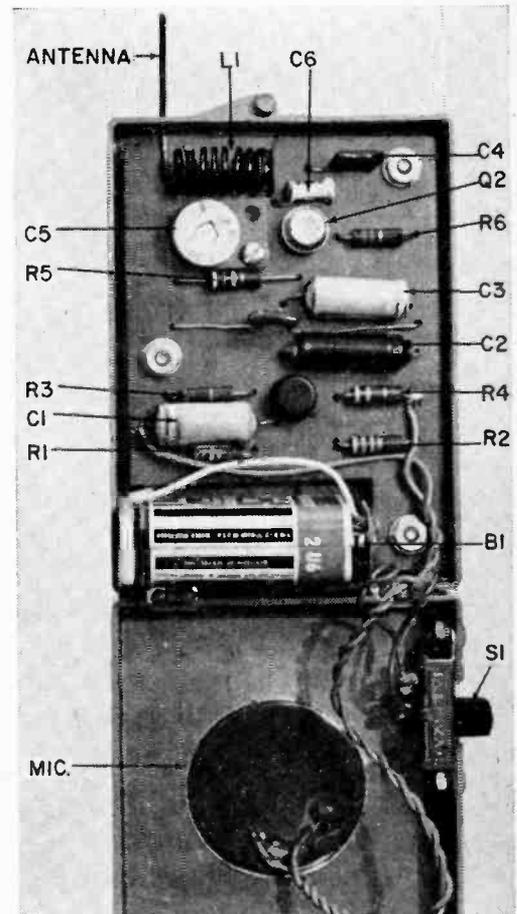
I have examined this low-power communications device and find that it will comply with Section 15.205 of the Rules and Regulations of the Federal Communications Commission, provided that the antenna is a single element not more than 2" long and provided that the d.c. battery used to power this device does not exceed 9 volts. Further, the operating frequency shall be checked against FM broadcast stations of known frequencies after each frequency adjustment.

Date _____

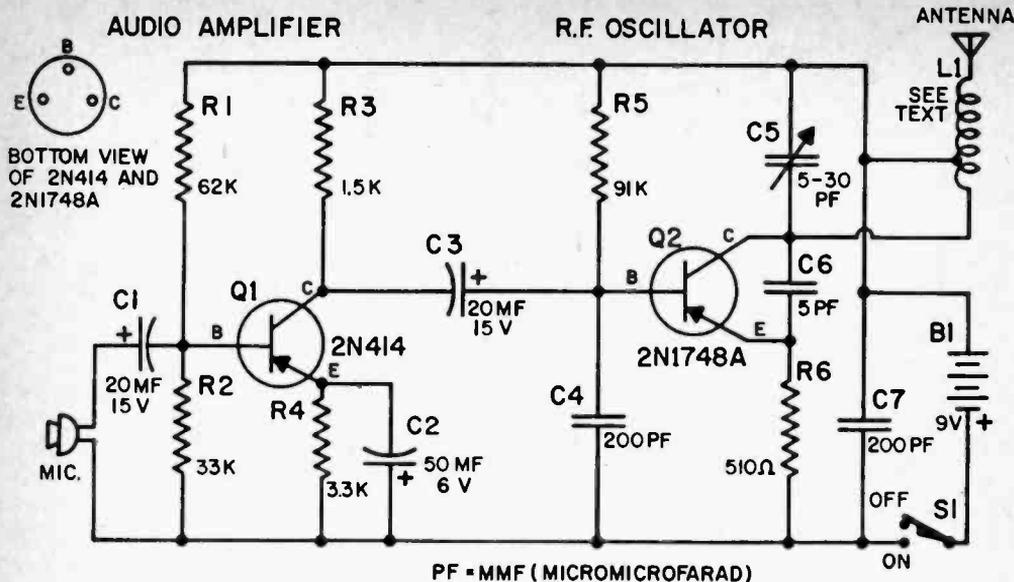
Signature
of Technician _____

Address _____

Before you put the FM Pocket Mike on the air, the unit must be tested by a competent technician and certified by him that the device complies with Part 15 of the Federal Communications Commission's Rules and Regulations. Then, the technician must sign a copy of the Certificate of Examination (shown above) and cement it to the back of the FM Pocket Mike.



Completed unit showing location of all parts. Try to duplicate this parts layout to insure unit's proper operation and meeting the Federal Communications Commission rules.



are mounted). Drill the mounting holes into the case with a No. 31 drill. Also drill a

No. 31 hole to accept the antenna, fly-cut a hole in the case for the microphone, and notch out an area for on-off switch S1.

Now mount the wired board into the case using three ¼-inch stand-offs between the bottom of the board and the case.

The type of microphone you use in the FM pocket mike is left entirely to you. It can be either a crystal or magnetic kind and can run anywhere from \$1.50 to \$10.00. The author used an inexpensive Lafayette MS-108. The crystal microphone is connected across the free end of C1 and the junction of R2, R4 and C2.

Finally, put on-off switch S1 in place with the positive lead from the battery connect to one terminal another to the junction of R6 and C7 and the remaining terminal on S1.

Snap in the battery and close the case, but be careful. Make sure the leads of the microphone do not interfere with the battery.

Testing. Now turn on the transmitter and pick a spot near the center of your FM tuner dial to operate on a frequency that is not near any FM stations. Adjust C5 until you are on the frequency. While talking into the microphone, have someone tune nearby stations to be sure you are not interfering with them. Keep several feet away from the FM tuner or receiver when testing. Once operation is satisfactory, check with nearby neighbors for FMI (that's FM Interference).

(Continued on page 149)

PARTS LIST

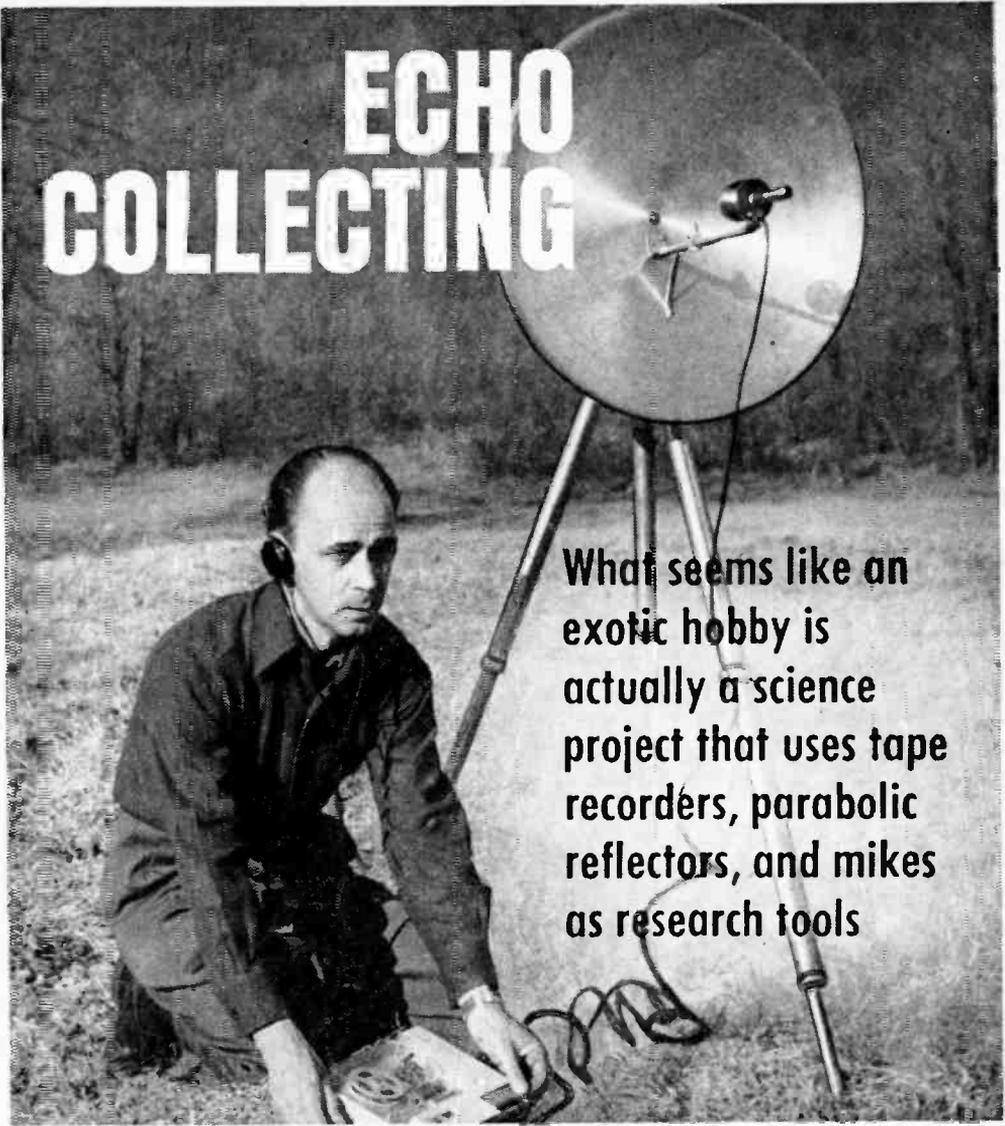
- Q1—2N414 transistor (RCA)
- Q2—2N1748A transistor (Philco)
- R1—62K ½-watt resistor (5%)
- R2—33K ½-watt resistor (5%)
- R5—91K ½-watt resistor (5%)
- R3—1.5K ½-watt resistor (5%)
- R4—3.3K ½-watt resistor (5%)
- R6—50 ohm ½-watt resistor (5%)
- C1, C3—20 mf. 15-volt electrolytic capacitor
- C2—50 mf. 6-volt electrolytic capacitor
- C4, C7—200 pf. 50-volt capacitor (Centralab Type TCZ or equivalent)
- C6—5 pf. negative temperature coefficient capacitor (Centralab Type TCN or equivalent)
- L1—r.f. oscillator coil made from No. 16 wire (see text)
- C5—6-30 pf. trimmer capacitor, (Centralab Type 827-C)
- MIC.—Crystal microphone (Lafayette MS-108 or equivalent)
- B1—9-volt battery (Burgess 2U6 or equivalent)
- S1—Single-pole, single-throw slide switch
- 1—Battery clip for B1 (Lafayette CN-193)

Note: pf. equals mmf.

Estimated construction time—3 hours.

Estimated cost—under \$10.00.

ECHO COLLECTING



What seems like an exotic hobby is actually a science project that uses tape recorders, parabolic reflectors, and mikes as research tools

By Jorma Hyypia

FOR SEVERAL MINUTES I had been standing quietly in the hot New Mexico sun while staring at the impressive, cavernous *Echo Amphitheatre* that had been eroded into the enormous cliff. I then looked about for my companion who, I discovered, had wandered out of sight behind the surrounding shrubbery.

"Where are you?" I called, raising my voice barely above normal conversation levels.

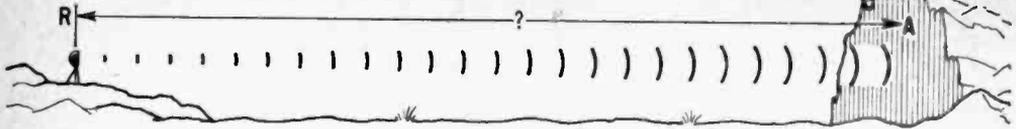
"Where are you?" a strange voice promptly mocked me.

So uncannily clear, and seemingly nearby, was the echo of my own voice. Of course I had anticipated hearing good echoes in a place called Echo Amphitheatre; but I had fully expected that I would have to *shout* to create the acoustic effect. On the contrary, I soon discovered that words spoken at near-whisper levels were echoed as distinctly as those that were shouted.

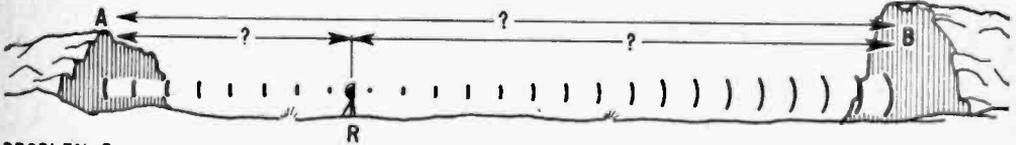
ECHO SURVEYING

HOW WOULD YOU MEASURE THESE DISTANCES?
(SEE TEXT FOR ANSWERS)

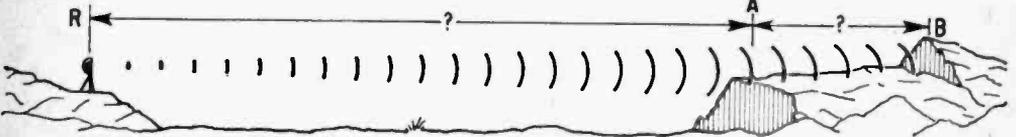
PROBLEM 1



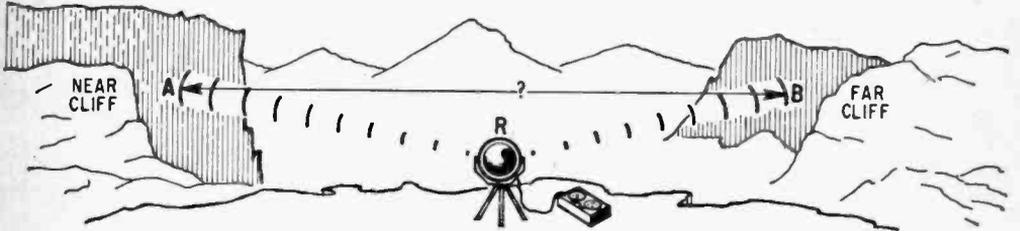
PROBLEM 2



PROBLEM 3



PROBLEM 4



After a half hour of talking, shouting, hand-clapping and general noise-making with my portable tape recorder taking it all down, I have become a confirmed *echo collector*. During the rest of the trip every cliff and canyon deserved at least one test shout. Not all produced echoes of the same quality as did Echo Amphitheatre, but there were plenty that created bona fide collector's items.

Equipment: You already have the most important piece of equipment. Your ears. Although this seems obvious, you will have to learn how to *use* them more efficiently by training them to be more responsive to echoes. This actually means that you should develop more critical listening habits.

If you want to *collect* echoes, you should have some sort of portable tape recorder. Other accessories such as parabolic reflectors are worthwhile refinements if you take echo collecting seriously.

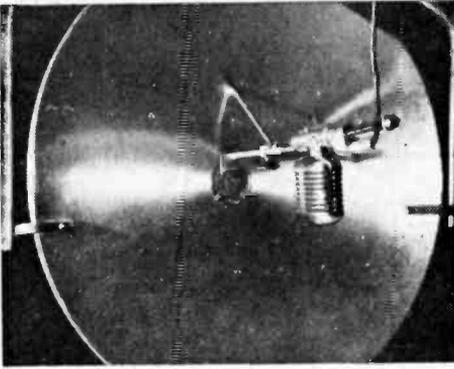
How to Make Sounds: Your first im-

portant problem involves the creation of sounds suitable for echo collecting. You need a sound of sufficient short duration so that the returning echo does not overlap it, otherwise you would not hear the echo as a distinct separate sound.

The human voice is one of the least useful sounds for echo studies; it is too variable in quality and even the shortest shout you could produce lasts much too long for many echo tests.

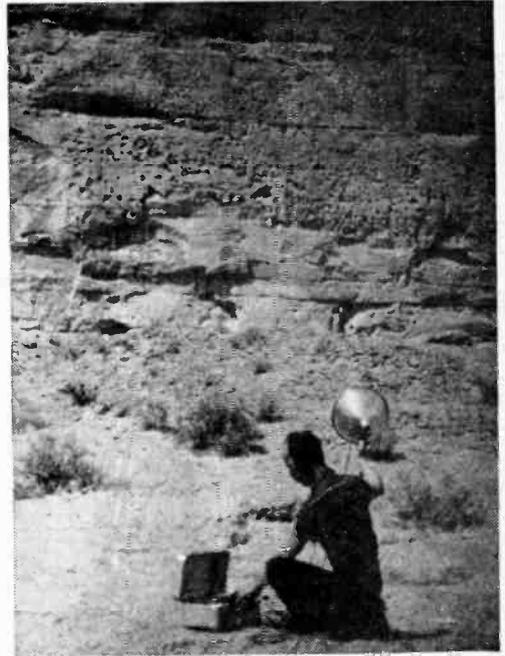
A toy clicker ("cricket") that consists of a piece of flat spring steel that is bent with the thumb to produce a sharp click is a good short-duration sound producer. The sound from such a clicker usually falls to one-tenth of its maximum volume within 10 milliseconds. Such a click would permit the detection of an echo from an object five feet or more away; a 1 millisecond click would produce a detectable echo from an object six inches or more away.

However, such clicks may be impractical



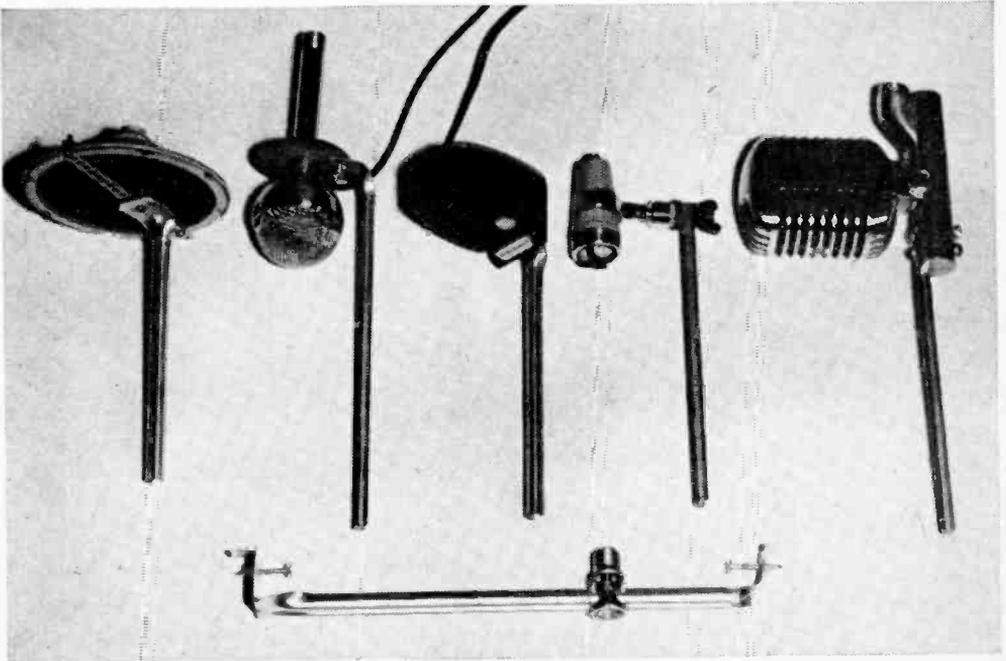
Method of mounting heavy-duty dynamic microphone on a government surplus radar parabola reflector. Lower bracket adds to rigidity needed for the heavy microphones.

Recording echoes off a New Mexico canyon wall. The small microphone reflector (a photographer's light reflector) serves mainly to shield the microphone from extraneous sounds and to increase directionality of pickup. Reflector provides little sound amplification but is adequate in locations where noise is nil.



◀ Echo surveying is quite simple and once you get the hang of it, you can rate as an expert. Answer details can be found on page 147.

Various methods of mounting speaker and microphones on brackets are shown below. Bracket attaches to center of parabola and positions the devices at the focus. Reading left to right: 5" speaker and the following are microphones: Spherex omni-directional, Shure ceramic, Rystl DY21 dynamic, and Shure variable impedance dynamic. Steel bracket (very bottom) attaches mikes to parabola.





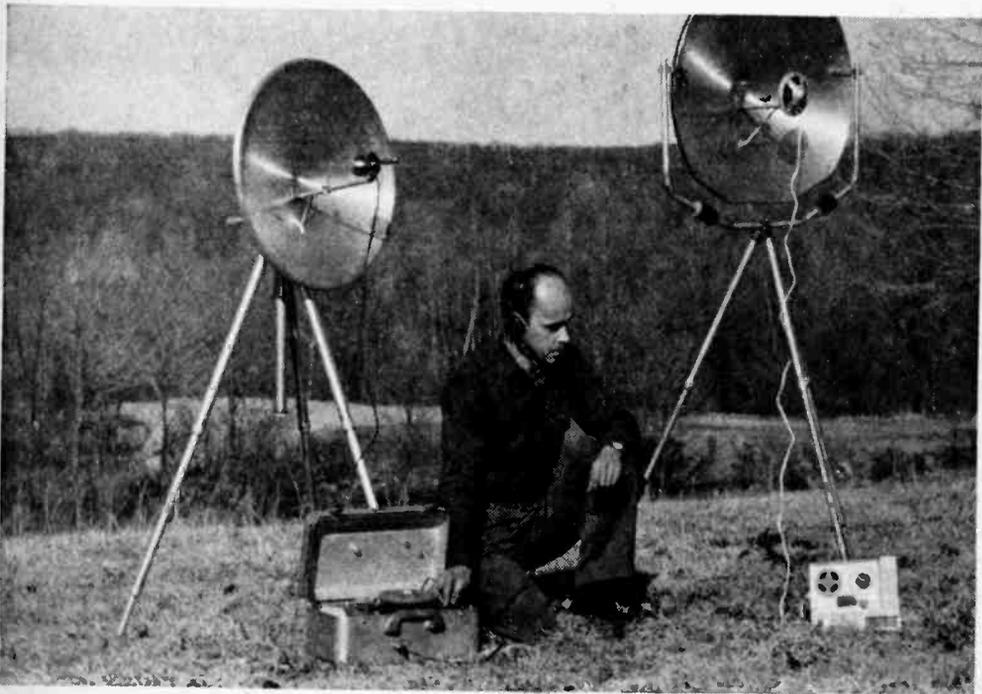
A child's cap pistol (top) and a wood clap board (below) made from two hinged blocks of wood offer good sound for echo tests.



in tests involving long distances; louder noise makers may be required. The clapboard used on movie sets is easily made from two pieces of wood and a strap hinge. Slapping the upper board against the lower one produces a loud, fairly sharp loud sound. Also convenient to use is a child's repeating cap pistol.

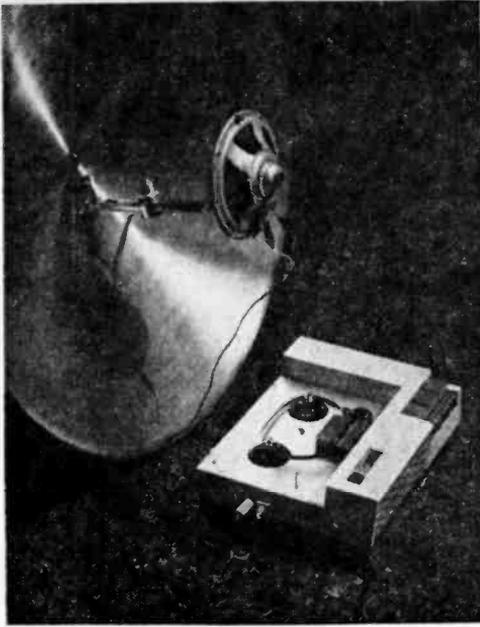
If you have two tape recorders—or if you can work with someone else who also owns a recorder—one of the units can be used to create the original sound while the other is used to record the echo. This enables you to pre-record on tape such sounds as spark discharges (amplified as they are put on the tape) and other sounds not conveniently made in the field.

Whatever sound source you use, try to shield it as effectively as possible from the microphone used to pick up the echoes. The intensity of the recorded echo will always be considerably weaker than the original sound which is also picked up by the microphone. If the imbalance in intensities is too great,



Elaborate echo-study equipment is shown above operated by the author. On the right,

a radar with speaker is used to beam sounds taken from a pre-recorded tape. At left, microphone and reflector combination pick up echos for recording from distant cliff and is recorded.



Continuous loop of tape provides repeated, pre-recorded test sounds. In this case the sounds are fed to a small speaker mounted on a parabolic reflector in order to intensify and beam the sound into a desired direction. The reflector is a 25" parabola made by C. W. Torngren Co. located in Somerville, Mass.

the tapes will be uncomfortable to study later.

Recording Equipment: Echoes can be collected using almost any type of tape recorder although some will do the job much better than others. For example, an ordinary 115-volt ac operated recorder must be used within extension-cord reach of a power supply; this greatly limits the echo-hunting prospects.

Obviously portability is a highly desirable feature. However most modestly-priced battery-powered portable tape recorders utilize slow tape transport speeds and are intended primarily for voice recordings; they are not suitable for recording high fidelity music or such difficult subjects as bird songs.

Echo-collecting per se does not call for the ultimate in high fidelity because you will be working mostly with simple noises. But there is another, more important reason to use the fastest tape speed possible. The faster the tape moves, the farther apart on the tape will be the original sound signal and its echo. Measurement of this distance is the basis of calculating how far the echo-reflect-

ing object is from your position. The longer the sound-to-echo distance is on the tape, the more easily and accurately you can make these measurements.

If a tape recorder has a slow tape speed, but is otherwise suitable for field work, the tape speed can be stepped up. The tape is moved along by means of a rotating metal rod (capstan) against which the tape is pressed by a rubber roller. A metal or plastic sleeve fitted over the capstan—in order to increase its diameter—will increase the tape transport speed.

The circumference of the sleeve would have to be calculated and machined very carefully to obtain *standard* higher tape speeds such as 7½ inches per second or 15 inches per second. But this is not really necessary. You can use any arbitrary tape speed provided (1) you replay the tape with the same recorder and (2) calibrate the new tape speed. To calibrate, simply run through some tape for a minute and measure the length of tape transported; express this information in terms of inches-per-second.

Finally, you can provide at least a certain degree of portability to your ac operated recorder if you fit the family car with a converter that changes the 6-volt or 12-volt battery power to 115 volts ac. This will at least enable use of the recorder at such locations as can be reached by car.

Parabolic reflectors: Echo recordings can be made with no other equipment than a tape recorder and a microphone but the use of a parabolic reflector offers certain distinct advantages. It will greatly increase loudness of the recorded echo and also eliminate much unwanted background noise. A second reflector can be used to good advantage to beam the original sound, pre-recorded on tape, toward the reflecting object.

The larger the reflector the greater sound *gathering power* it has; but of course prices go up commensurately. On rare occasions you can pick up a government surplus radar reflector at very small cost; a 28" diameter reflector used by the author cost five dollars at a New York surplus store.

Microphone mounts: None of the parabolic reflectors are provided with mounts to hold the microphones. The simplest way to attach a microphone is to drill a ¼" hole in the exact center of the reflector and attach a threaded rod to the hole with nuts. The microphone is fastened to the end of the rod

(Continued on page 147)

NEW Indoor Antenna Systems

Built-in tuned amplifiers pep up
snowy pictures in the fringe suburbs

By B. G. Waterman

IN THE DAYS before these electronic marvels came into being, audiophiles had a choice. They could string a simple FM dipole (made of TV twinlead) behind or inside the hi-fi set, or they could run a twin-lead wire up to the roof and there erect a fancy rig. Some of the more usual FM antennas used in the early days were named for their appearance—the turnstile, the "S," or the unipole.

Things have changed: New indoor FM antennas with built-in wide-band amplifiers have altered the picture quite a bit. However, let's face the facts! While the new units are far more effective in a fair-to-good signal area than the folded dipole ever was, they aren't much of a match for a good out-

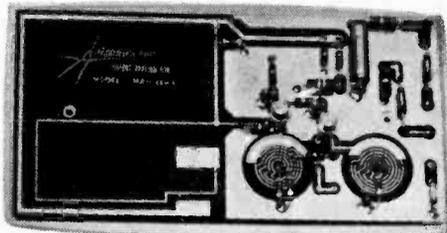
door antenna array. Fortunately for the manufacturers, people who had settled for folded dipoles in the past, are more than happy with the new indoor antenna systems, while others, who had given up and erected outdoor rigs leave well enough alone.

The new antenna systems have one other added bonus, in that they are attractively designed, and available in a choice of colors too. There's no need to hide these little beauties inside or behind the cabinet! What's more, installation is simple. Just connect the antenna terminals of your FM tuner to the antenna wire leading from the unit, and plug its AC line cord into the *switched* AC receptacle on your FM tuner.

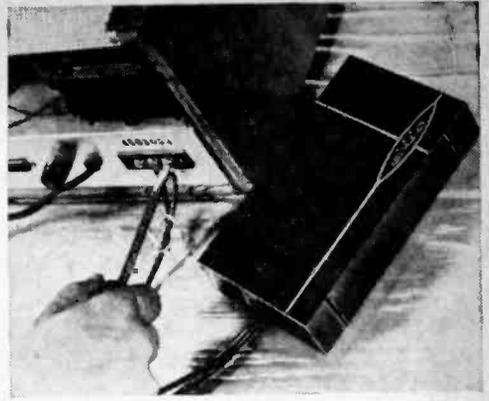
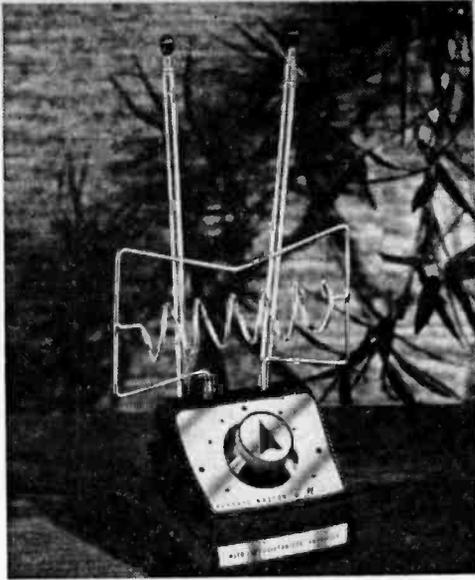
Look inside: Basically, these antennas



Antronics Multitron high-gain FM unit (above) uses printed-circuit board construction (below).



The Gallo Twin indoor television antenna (left) stands on TV set or hangs on wall.



Hookup of antenna system is easy. Just connect to set's antenna screw terminals.

New Channel Master indoor antenna (left) uses rabbit-ears and transistorized amp.

consist of a printed circuit board on which the antenna pattern itself is etched. The remainder of the circuit board is devoted to a high-gain, transistorized amplifier and its associated power supply. The circuit board is housed in an attractive cabinet, with only a piece of twin-lead fitted with spade lugs, and a power (AC) cord protruding. For the most part, antenna orientation has been completely eliminated as a problem.

So far, there are two companies that are currently producing FM/FM-Stereo antennas of this type. One is Gallo Electronics (12 Potter Ave., New Rochelle, N. Y.) and the other is Antronics, Inc. (309 Queen Anne Road, Teaneck, N. J.)

Gallo has several other products in the same line that will be of interest. One of these is the Gallo *Twin* indoor antenna, which somewhat resembles a picture frame with no picture inside it. It measures 1x7x9-in. and supports itself on its own easel back.

The Gallo *Color Master* is usable on color or black and white TV, and also for FM. It measures the same as the *Twin*, but instead of an easel back, the base tapers to three inches. In addition to the antenna connection, this unit also has a power cord which must be plugged into a convenience outlet, and a switch on the antenna controls the power.

Never say, "Die!" Rabbit ear antennas have served the consumer a good many years with success. The engineers at Channel

Master Corporation (Ellenville, New York) mated the telescoping dipole with a transistorized signal amplifier to pull in signals from great distances. However, the Channel Master unit is designed for fringe areas only where present indoor dipoles fail to operate or produce snowy pictures. One unit, the *Apollo*, is designed to operate from 15 to 45 miles away from the TV transmitter.

In the FM reception department, Channel Master has come up a unit designed for the critical demands of FM stereo reception. Fringe reception up to 60 miles from the transmitter is possible with their indoor FM antenna with transistorized amplifier.

What to buy? This is the question that plagues all consumers especially in the TV and FM indoor antenna market place. Who should the buyer consult? Well, there is no one like the local TV serviceman. He is not only trained to advise you, but he, and almost he alone, is the authority in your locality on TV and FM signal propagation. Also, he has had experience installing and servicing many antenna TV and FM systems to know what is best for *your set in your neighborhood*.

If you want to eliminate the poor reception you get with your present indoor antenna setup, start thinking about an indoor antenna with built-in signal-boosting amplifier. You can replace whatever you are now using with a twist from your screwdriver. The whole job takes five minutes. ■



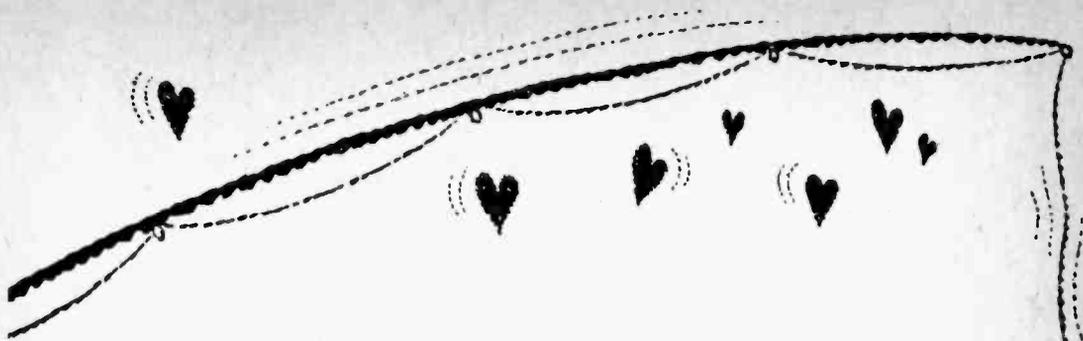
By Byron G. Wels, K2AVB

GIRLS, are you hearing the term "career girl" less and less and "spinster" more and more? Well, now you can stop traveling to summer resorts and sneaking off to friendship clubs. "Out there" is a vast, untapped reservoir of males riding the airwaves, with a healthy dollop of unattached types just waiting for a friendly CQ from a feminine ham.

Let's examine the average male *Ham-o sapien* from the point of view of marital possibilities.

This lad has been an avid radio buff since early youth. He and most of his fellow hams got started in their teens. So the formative years for these fanatics were spent in pursuing what they call "rare DX," or far-away foreign stations. This pursuit took the place of pursuing female company. After all, dating costs about as much as a new final amplifier tube, and you *know* there's no decision to be made on *that* score!

As a result of this nocturnal babbling, the ham takes on a strange personality. Over the air, he is outgoing, friendly, a gay blade, even witty at times. But in company (alas), he tends to retreat into his shell. On the air, he



never sees the people he speaks to. In person, he is prone to blush, mumble, stare at his shoes and exhibit other nervous reactions.

While he may become embarrassed in the presence of people (especially girl-type people), dim the lights, put a microphone in his hand and talk to him about sloping Windom antennas or open-wire feed lines, and he'll wax romantic!

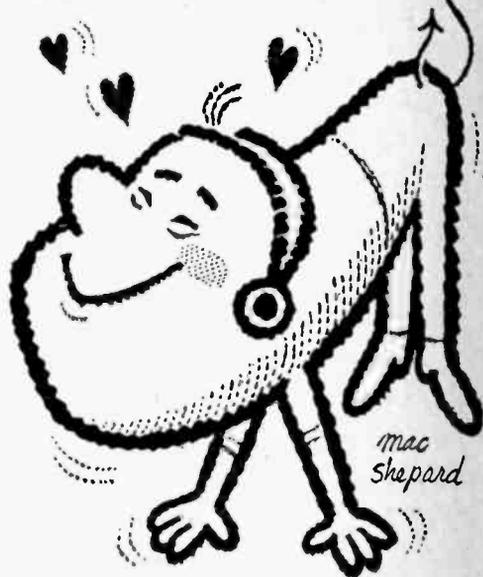
The average ham is usually well-fixed economically too. Girls, ham equipment is fairly costly if you go into it the way some of these boys do, and you can usually estimate the income of the ham by how he describes his rig. The more elaborate it is, the more he spent on it; therefore, the more he *had* to spend.

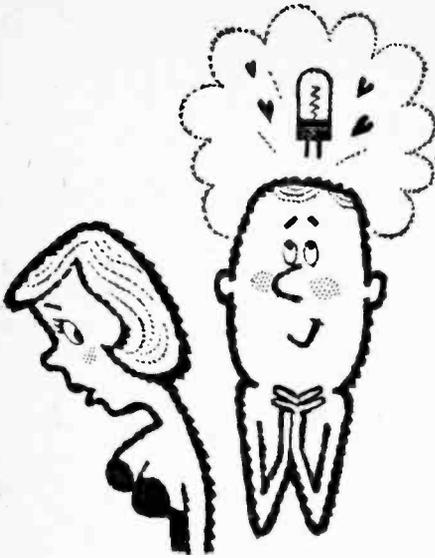
The logical way to meet a ham is to become a ham yourself. Never underestimate the power of a woman ham. To demonstrate this point, visit a local (unattached!) ham and exhibit an interest in his hobby. Then ask him to let you send a CQ or general call. Try to keep count of all the replies you get. 'Simpossible. Women are so rare on the ham bands that a torrent of replies is always elicited.

There have been many happy out-comings of boy-girl meetings on the ham air waves, and in many cases the offspring of such marriages become hams too. There's no age limit, either, at the top or bottom, so the wary she-ham will be strictly noncommittal on the air until she can arrange an "eyeball QSO" (ham lingo for face-to-face contact). It's not hard to do, for hams are notoriously helpful, gender notwithstanding. A helpless YL—we'd better translate again: YL is a young lady; an XYL (or ex-young lady) is a wife—can easily mention on the air

that she's got a frammis in her receiver widget and, before she can sign off, the streets will be filled with helpful hams, soldering guns at the ready.

There also are other opportunities for the hamette (?) to meet other hams. There are ham club meetings (female hams are *always* made club secretary), field day outings, and hidden transmitter hunts. Here's where the female can meet the male on his own ground and earn his respect. There's nothing particularly masculine about pressing a microphone switch and making more contacts than the other fellow! The funny thing about it is that ham radio seems particularly well-oriented to feminine instincts. Even Morse code, long touted as difficult, is easier for the female, whose ear seems to be better attuned to this sort of thing. The ladies always pick it up faster and are more





YOUTHFUL hams tend to pursue their hobby rather than pursue girls. After all, a date could cost as much as a final amplifier tube.

accurate. What do you get when you marry a ham? For one thing, this guy isn't going to be chasing around the local rathskeller. He won't go out bowling. He'd rather sit in the attic and make contacts with his rig. He's also very easy to please. He'll hurry home at night (to the transmitter and you, in that order) and will settle for a sandwich and coffee, sit up half the night talking to faceless voices and holding his ham-spouse's hand.

So how do you get into this air-waves-get-acquainted club the quickest, easiest way without investing a lot of time and money? The following minimum requirements are all that are required for this happy husband-hunting hobby.

What It Takes To Get A License: Forget the rumors you've heard. Amateur radio is for amateurs, and no heavy engineering knowledge is necessary. True, you have to pass a test, but the test is designed only to make sure that you won't get into trouble on the air. There are three major grades of amateur license, each requiring a more stringent examination. Let's examine these classes of licenses and the privileges they extend.

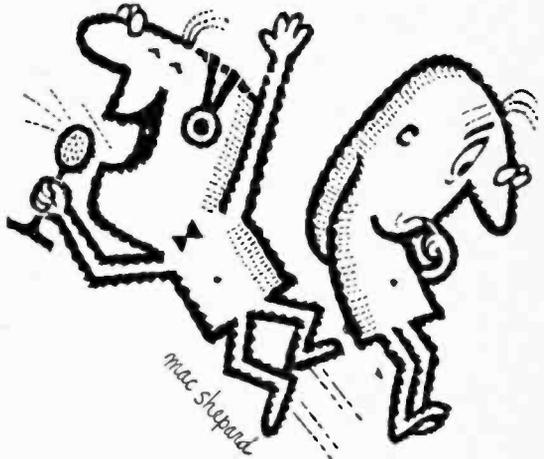
The Novice License: The requirement is twofold. You must pass a Morse code test and demonstrate you can receive at a speed of five words per minute. Common five-letter

words are used and you must copy 25 consecutive letters, or one minute's worth. A written test is also required consisting of 20 multiple-choice questions. You must score 75% or better. The questions range in difficulty from "What is the abbreviation for Eastern Standard Time" to "What is a parasitic oscillation." This license is good for one year and is not renewable. The written test can be administered by any adult American citizen. The code test must be administered by a ham with at least a General Class license.

The Technician License: The code requirement here is the same as for Novice, but the written exam is the same as that given for the next higher grade—General Class. This ticket is good for five years and is renewable.

The General Class License: Here the code required is 13 words per minute and the written exam is a bit stiffer. You have to report to your local FCC office to take this test, but the license is good for five years, is renewable, and includes extended operating privileges.

But getting the license (or ticket, as the hams call it), is just half the battle, honey. You can't operate without equipment (as every smart girl knows), but don't let this
(Continued on page 125)



ON THE AIR, the ham is outgoing, friendly, even witty at times. But in company the same fellow will blush, mumble, stare at his shoes.

Putting the Middle Channel to work

What does one do with a derived center channel on a stereo system? The author powers a remote speaker

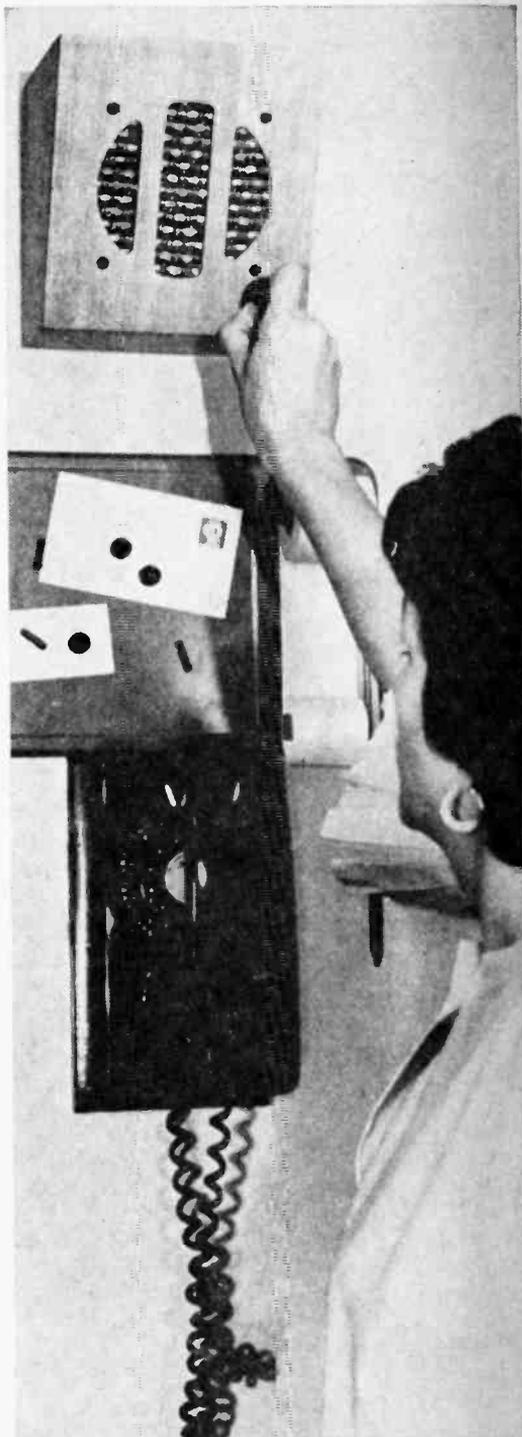
By Julian M. Sienkiewicz

Editor

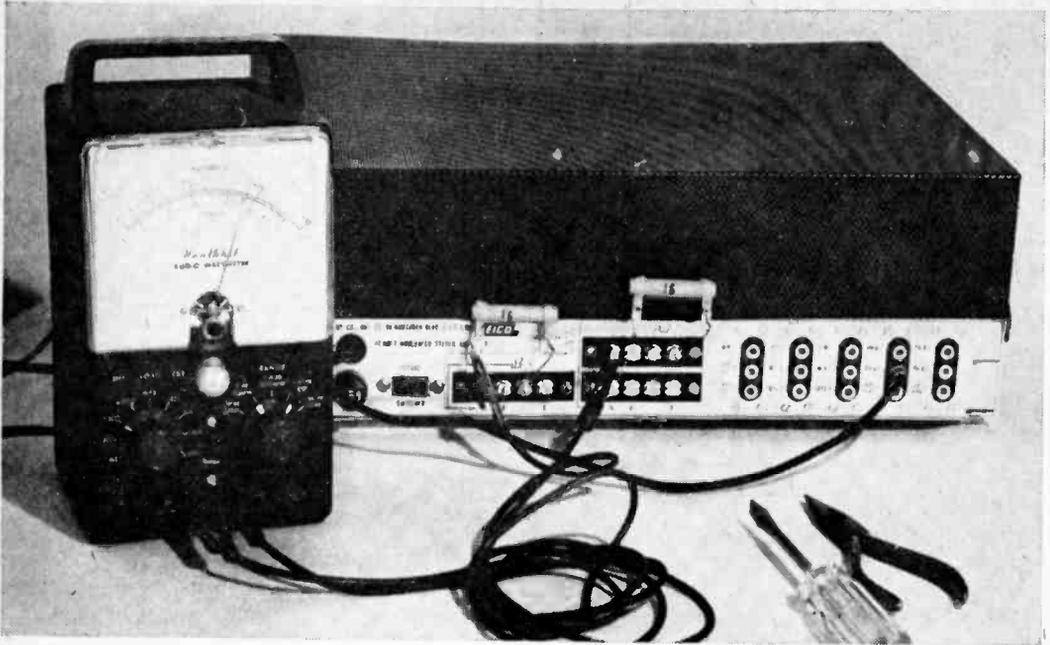
MANY hi-fi fans do not plan to use the middle speaker output provided in almost all of today's stereo amplifiers. In many cases, the listeners are satisfied with their present two speaker setups now being used. As a result, a good monophonic sound source often remains untapped. Not so in the author's house. There, the middle channel is used to supply FM and phono programs to the kitchen where the better-half spends most of her listening time during daylight hours of the day.

The cost of putting your middle channel to work in the kitchen, den or workshop is not excessive and if you are a *do-it-yourselfer*, the chances are you have the 6-in. speaker, hookup wire and maybe the L-pad (to control volume) in the basement workshop. The speaker and L-pad are installed in a plywood baffle. The baffle wood and style are determined by the wife's style tastes and your pocket book. However, if you want to keep costs down, a baffle can be had for as low as \$2.50 or you could make your own.

Nothing for Nothing. The power output needed to drive the middle speaker is *stolen* from both power output stages of the stereo amplifier. So, if you are using a dual 10-watt-per-channel stereo amplifier at full power, do not attempt to squeeze out more power to drive a third or middle speaker. The author's stereo amplifier is rated at 20-watts per channel, and at normal room listening



PUT THE MIDDLE SPEAKER where it will do the most good. Wires can be hidden in wall or follow telephone wires.

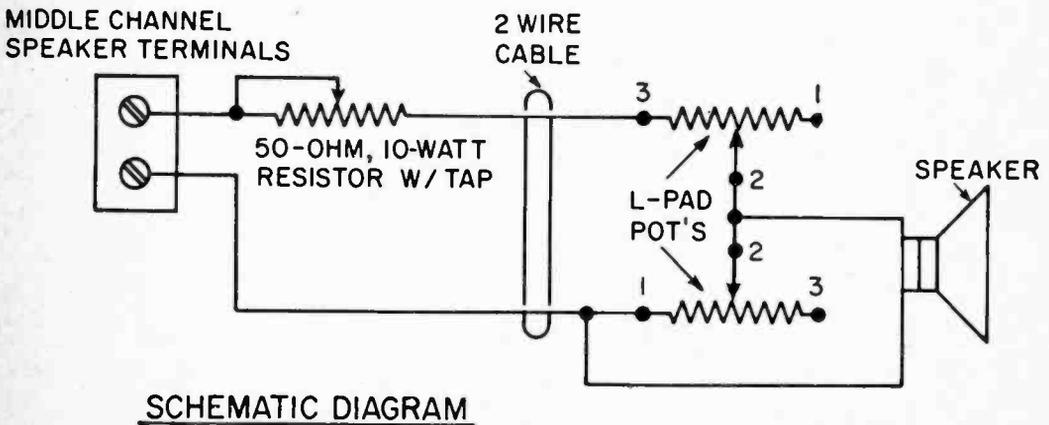


HEATH AUDIO WATTMETER checks power delivered to a 16-ohm load (built into wattmeter) from middle channel terminals of EICO ST-40 amplifier. Resistors load down outputs. Amplifier is driven by 1 kc tone from a test record.

levels for his high-fidelity system only five to eight watts per channel are used during peak loud passages. A third middle speaker requiring five watts of drive power would not overload this hi-fi setup.

A test hookup was made to determine exactly how much power can be tapped from the middle speaker output terminals when the two stereo channels are delivering equal amounts of power to equal loads. The first

series of tests were made using an EICO ST-40 integrated amplifier whose speaker output circuits are typical of many other medium and high-power units. Two calibrated 16-ohm high wattage resistors were used in place of the left and right speaker loads. An audio wattmeter with internally calibrated 16-ohm resistor was used to make power measurements. A 1000-cycle tone signal was supplied to the input jack of the amplifier set for mono





IF Baffle Panel is too thick, counterbore mounting hole and attach dial plate to L-Pad with radio cement or Duco.

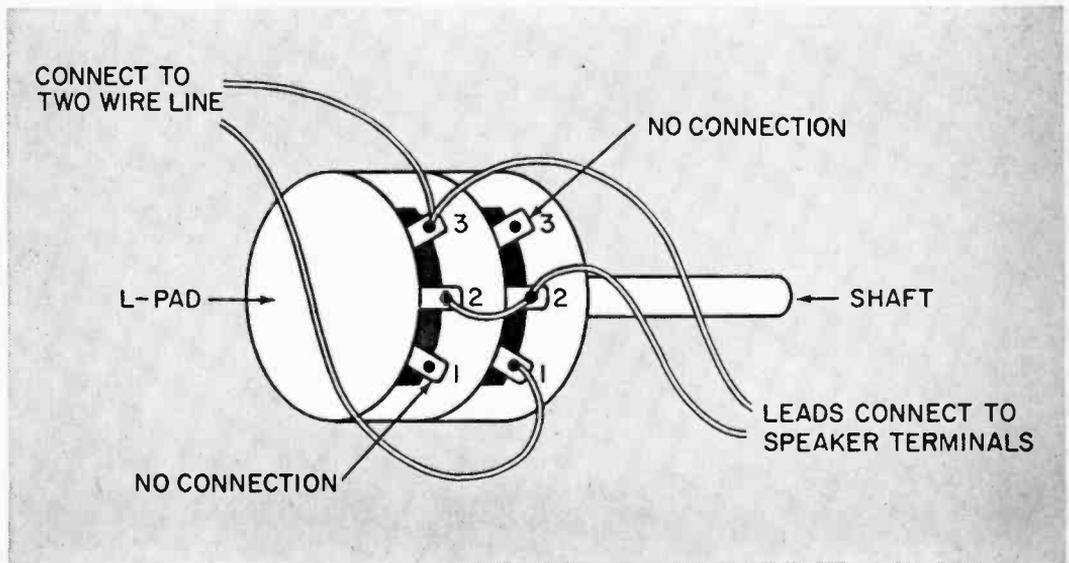


NO BACK PANEL NEEDED! Wire the L-Pad in place and just hang up. Wall behind baffle serves as back panel.

operation and the level controls were adjusted until the wattmeter indicated 10 watts output per channel. Then a third 16-ohm high-wattage resistor was connected across the "middle" speaker output terminals. A slight power drop was noted in each channel. The level controls were adjusted again to bring the power output drop across the 16-ohm left and right channel resistors back to 10 watts. Then, power across the middle

channel resistor was found to be 10 watts, too!

Obviously, each channel was supplying one half the power for the middle channel, and this was checked by alternately reducing the outputs of the left and right channels to zero. Lo and behold . . . the power output at the middle speaker output terminals dropped to 5 watts—which is the average power of 10 and zero watts.



Several other checks were made at the 7.5-, 5.0-, 2.5-, and 1.0-watt levels on the EICO ST-40. Other power checks were made on a Heathkit AA-121 power amplifier at levels up to 25 watts. Results were always the same. The power available at the middle speaker terminals is always the average of the power delivered to the left and right channels provided the amplifier was not called on to provide 75% of its rated output.

Too Much Power. Since the power available for the kitchen speaker is much more than needed to drive a typical replacement-type PM speaker or even the 6-in. thin line speakers currently on the market, a high wattage resistor should be inserted in series with the middle speaker so that the L-pad volume control can be set for maximum loudness without overloading the middle speaker. This is a trial and error process, the results of which are determined by the amplifier and speaker you are using. However, a 10-watt 50-ohm resistor with adjustable tap should fill the bill in all cases. In fact, for very low settings of the amplifier by low power amplifiers, this resistor may not be necessary.

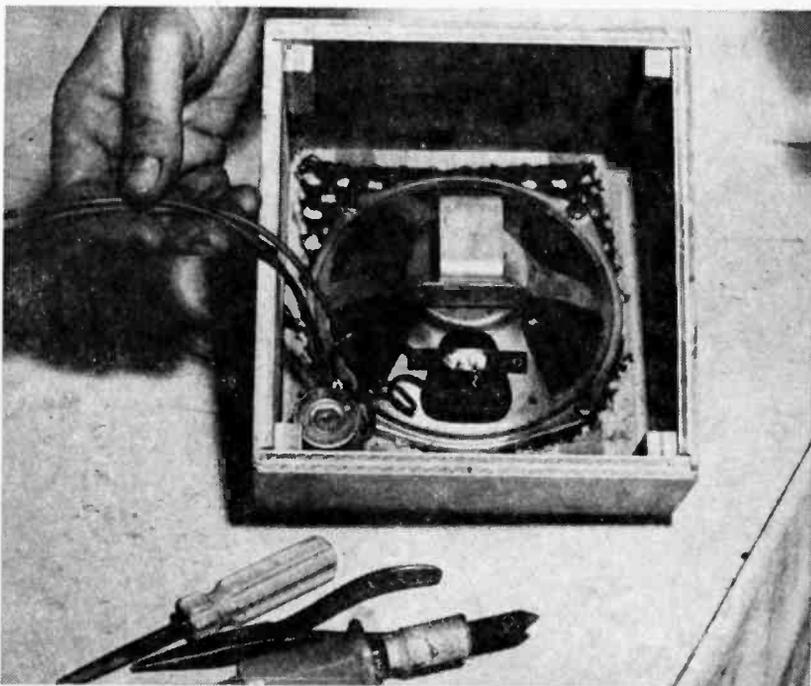
Hooking-up the Kitchen Speaker. This is easily done. Do the hard work first, and that is running a two-wire cable from the power amplifier to the site of the speaker in the kitchen. Use zip cord, TV lead-in wire, or just about anything that is available. Don't worry about power loss because you will need only a fraction of the total power avail-

able at the middle speaker terminals. Next, the speaker and L-pad are mounted in the baffle. The threaded bushing on the L-pad may not be long enough to pass through the plywood of the baffle so some counterboring may be necessary. A drop of radio cement on the hardware threads will prevent loosening due to speaker vibrations. Wire the baffle carefully following the schematic diagram and L-pad pictorial drawing. Finally, connect the baffle to the two-wire line. At the amplifier end, be sure to insert the high-wattage resistor with the adjustable tap set at maximum resistance.

Now is the time to turn on the amplifier and set it to operate at normal room listening level you prefer. Then set the L-pad control for maximum sound. Not much will come out of the kitchen speaker until the tap on the high-wattage resistor is lowered. This is done to a point where the sound output is a notch or two above requirements.

MATERIALS LIST—MIDDLE CHANNEL

amt. req.	Size & Description
1	5, 6 or 8" diameter speaker, 3.2, 8, or 16 ohms
1	4, 8 or 15 ohm L-pad to match impedance of speaker selected (IRC LP4, LP8, LP15)
1	Baffle—wall mounted to house speaker selected
1	50-ohm, 10-watt resistor with adjustable tap
1	2-wire line—length as required
	Solder, radio cement, hookup wire, etc.



COMPLETE BAFFLE is ready for wall mounting. Leads held in hand connect to middle channel output on amplifier unit. These leads should be at least 12 inches long.



KIT BUILDERS



REPORT

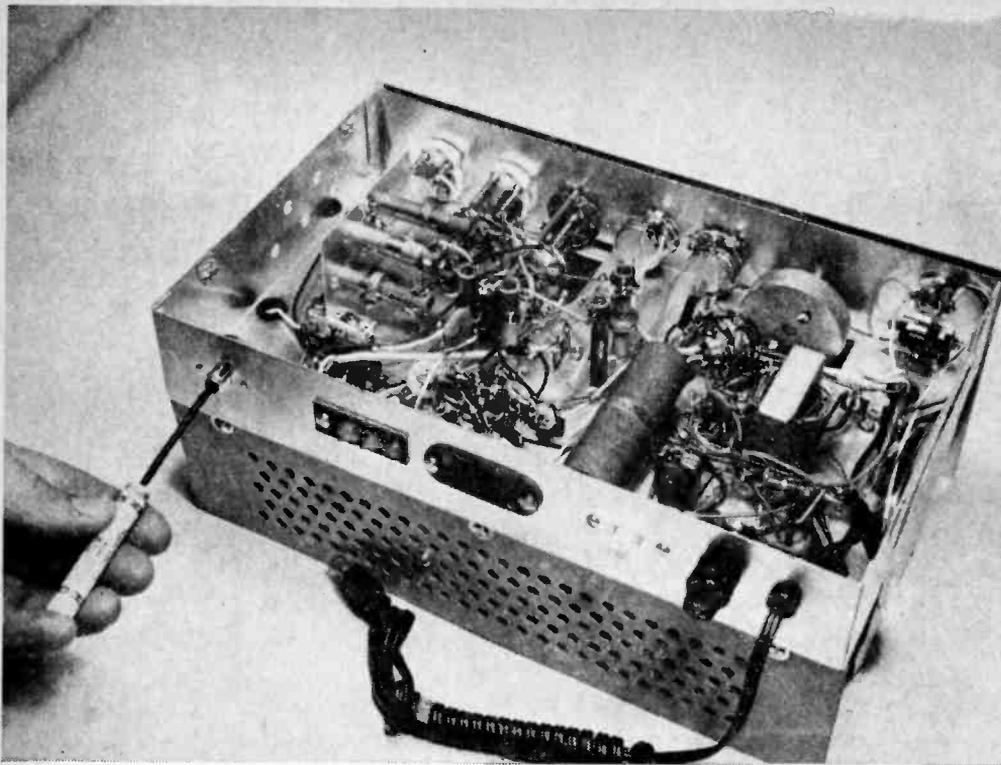
The exciting world of short-wave radio is open to you when you put together the Knight-Kit Star Roamer all-band receiver

FOR the hobbyist seeking a receiver somewhere between the 2-tube regenerative job and the high-priced SWL set, Allied Radio has introduced the Star Roamer. Covering 200 KC to 30 MC in five bands, it's replete with S-meter, noise limiter and nearly a dozen operating controls to please the most avid knob-twirler in search of DX. But how about the price, pegged at a piddling \$39.95? Is it possible to load deluxe features into an economy model and come up with a more than a fancy front panel? After assembling and checking a Star Roamer, it's evident that the kit achieves some solid successes. But the engineers have slipped in some "gingerbread," like the car-makers back in their tailfin days.

Constructing the kit requires care—there are plenty of coils and a big bandswitch

loaded with contacts to be wired. But the manual, which could be followed by a groggy chimpanzee, is a marvel of clarity. It avoids bloopers like wiring steps on one page, drawings on another. More features that coddle the kit-builder: wires are cut and stripped, hardware neatly divided into many packages, resistors and capacitors numbered and card-mounted. If you're not the duffer who cooks up cold-solder joints, the completed kit might pull in Bombay first try. The job takes about 15 hours for the meticulous builder, 10 if you're reckless.

As anyone who's strung a dial cord knows, it can be trickier than the porpoises at Marineland. The manual tells you how to do the job. However, play safe as we did by cutting the dial cord in the *last* step of installation, not the first.



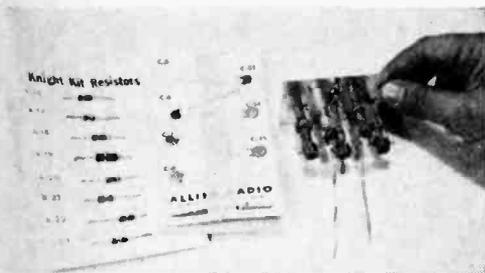
Underside view of the chassis shows all the front panel controls neatly lined up on front

apron of chassis. Screw driver points to rear panel adjustment potentiometer for S-meter.

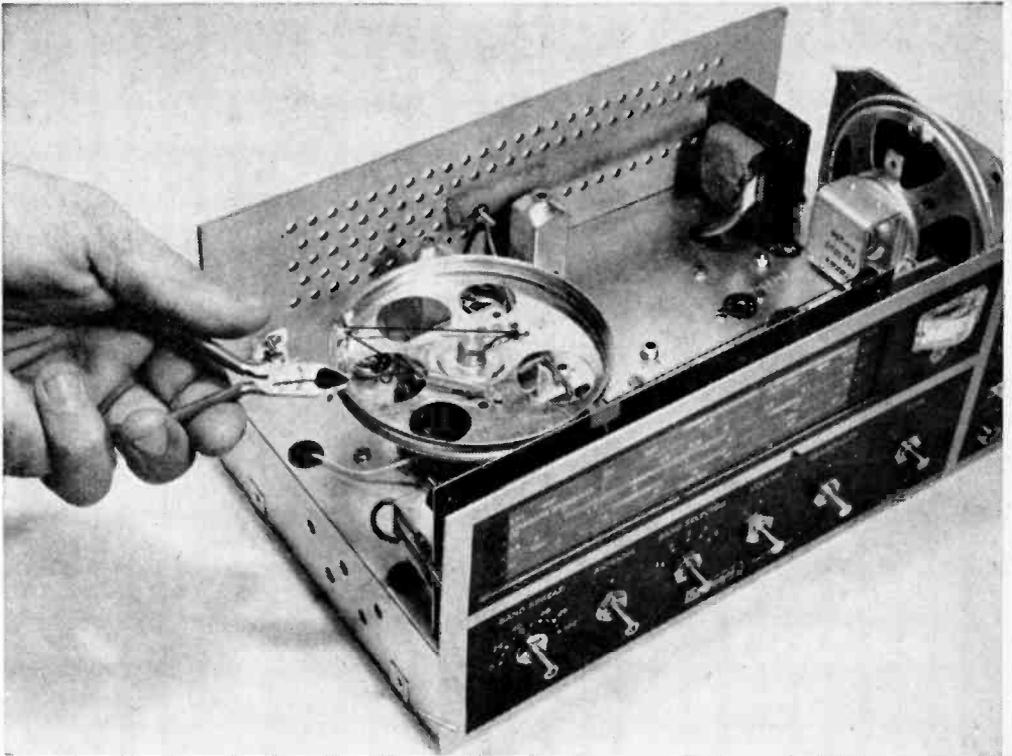
No doubt the completed kit turns in its best performance after alignment of the various coils and transformers. Though pre-tuned at the factory, these adjustments only get you into the ball field. Some "touch up" is needed to account for differences in wiring layout from one kit to another. The manual gives two approaches with and without test equipment. Since the SWLer may not have

an RF signal generator handy the second alternative is usually more attractive. The manual is on the right track in recommending the powerful, accurate (and free) reference signals emitted by WWV, the National Bureau of Standards station in Maryland. It could ease the alignment job for hobbyists spotted anywhere in the country. Our kit checked out nicely; none of the pre-set factory adjustments were more than a turn or so from the ideal settings.

After snaring local broadcast stations with a finger touched to the antenna terminals, we decided to give the Roamer a real workout on a big outdoor skyhook (a 60-ft. long-wire). A raft of stations from Europe and the Mid-East barreled in during early evening reception. We sampled the Voice of America's transmission from Greenville, N. C. (though they were beaming Count Basie toward Europe and Africa at the time). Some Air Force boys were busy with air-traffic control on one frequency, while Radio Moscow spouted news on another. Hams



Small parts are readily located on numbered cards. Hand holds factory-wound coils that are prewired before mounting in chassis.

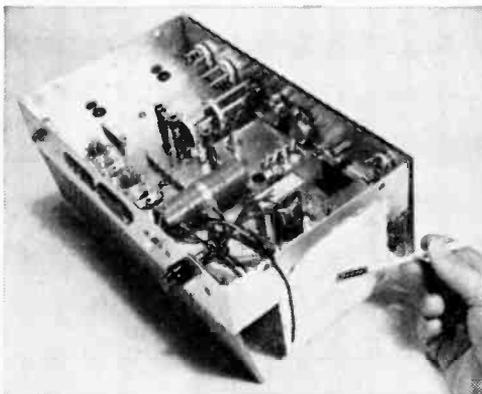


For some kit builders it takes three hands to install a dial cord. In the Star Roamer it is

recommended that the dial cord be cut to size only after stringing large tuning dial drum.

chattered on 40 and 80 meters, a shipboard station worked in the 2-3 MC band. A couple of hours of monitoring proved that sensitivity of the set was easily adequate for most shortwave listening.

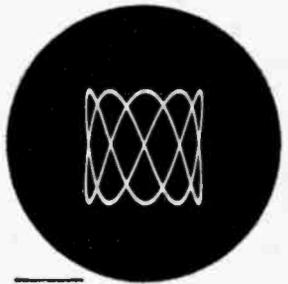
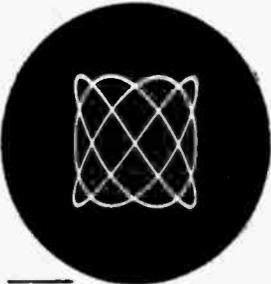
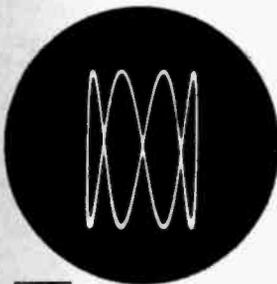
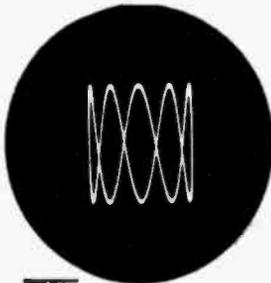
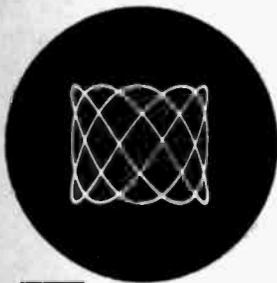
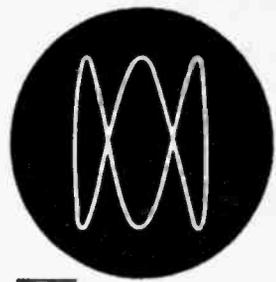
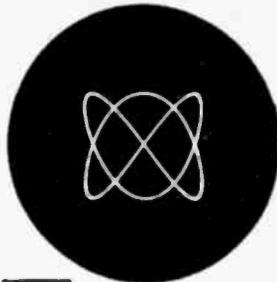
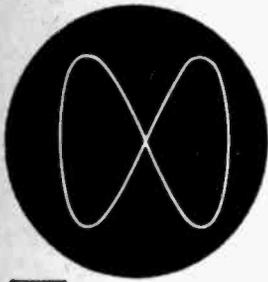
The set's lack of an RF amplifier stage shows up in two ways. Up in the high band, sensitivity falls off. Copying ham stations on 10 meters, for example, is not easy. And hearing citizens banders proved successful only after a regular CB antenna was hooked in place of the longwire. But this is no problem on the international shortwave bands, mostly in the mid-bands where a good longwire pulls in just about everything. You can also expect some "images" due to the lack of an RF amplifier. It is possible that a strong signal will pop up on two places on the dial.



After mounting speaker on chassis, cover the cone with cardboard to avoid tear damage.

An interesting bit of legerdemain in the Roamer's circuitry is the sensitivity control, a front-panel knob that gives the SWL'er three functions. For one, it's the BFO to provide the missing tone needed for code reception. To make audible the hiss-and-puff sounds of CW transmissions the knob is advanced until tone is heard. What occurs in the circuit is IF regeneration; the IF tube
(Continued on page 149)

Lissajous Figure Quiz



By Irvin L. Holt

LISSAJOUS figures viewed on oscilloscopes offer a very useful technique for measuring frequency of an unknown signal when a standard frequency is available. The unknown frequency is normally placed across the oscilloscope's vertical terminals and the known frequency is connected to the horizontal terminals. The 'scope is set to operate on external sweep and when the two frequencies are whole number ratios (2:1,

3:2, etc.), the 'scope displays Lissajous figures.

Each Lissajous figure indicates a frequency ratio; that is, the vertical frequency compared to the horizontal frequency. For example, if the vertical frequency is 240 cps. and the horizontal frequency is 60 cps., the Lissajous figure would indicate a 2:1 ratio. See if you can match the Lissajous figures with the ratios below. *Answers on page 146.*

5:1 4:3 2:1 3:2 1:1 4:1 5:3 3:1 5:2



REPORTER TOM LANKFORD uses CB equipment from his car to relay the fast-breaking news as it happens to Al Stanton at the city desk.

WHEN frenzied violence exploded in a southern city recently, it literally *exploded!* Destructive bombing took place, and both the police and newsmen were vitally in need of the facts as they were happening. They needed the hot news *hot!*

Communications were important now. Police Intelligence Squad Detective Marcus Jones had installed six-channel citizens band equipment at a base station and in several cars. CB communications were needed because the high traffic on the department's only police frequency channel was too heavy and more communications were needed . . . *at once!*

While the use of CB helped, ordinary CB traffic on the six channels caused interference, and the police CB units weren't much help. Detective Jones was in the process of ordering new crystals to change the channels police used and was faced with several days delay. Dwayne M. Berner, president of Regency Electronics, offered detective Jones the use of several of the new Regency Range Gain CB units. These units offer crystal controlled selections for all 23 CB channels, and

CB KEEPS HOT NEWS HOT



By G. Ronwell

AL STANTON, Assistant City Editor. Mr. Stanton maintained his vigil at the CB rig, relaying story material to the rewrite men, and directing other reporters to the scenes of action.



DETECTIVE MARCUS JONES poses beside his unmarked police car with the CB rig that helped police keep on top of the action. Units were placed on car seats for easy handling.

24 hours later, the CB sets were in operation.

The policemen found communications now greatly improved. They could move to any CB channel to avoid other traffic. What's more, this facility permitted them to change channels at will, and virtually prevent unauthorized monitoring of police traffic.

That was half the story. There was another group that was highly interested in what was happening where, when the city exploded. The newspapers had to follow the fast-breaking events, and keep the public advised of what was happening where.

The same CB equipment was put to use by one of the major local newspapers, and was used to good advantage. Reporters for other papers tried to use telephones, and were quickly overrun. Those who got too close to the action soon found themselves a part of it. Those who stayed well out of range couldn't get the story.

Teams of reporters were dispatched to the various centers of the city by CB radio, with the base station located at the newspaper's City Desk. As violent groups moved from place to place, reporters were warned in sufficient time to let them relocate to a safer position. As the violence passed a car, the car was dispatched to another area where it was about to flare up anew. Stories from the very centers of the activity were relayed to the newspaper's City Desk. As the story came into focus, the editors at the copy desk pounded out the facts with their typewriters.

Fed to the composing room, the linotype operators took over and soon the type was locked up into forms for the press run. Still the news kept coming in. And as it did, the editors incorporated the facts into late editions on the same day. After the regular press runs, the newspaper began to get ready a wrap-up story for their Sunday edition.

How it was done: The *Regency Range Gain* units use a double sideband reduced carrier to provide added range without exceeding the legal five-watt limitation. This extended range in the heart of a metropolitan city stood the users in good stead during the moments of peak action.

The news reporters had the CB units mounted under their auto dashboards, but the police preferred to place the units on the seat beside the officer. A window cowl antenna mount was used, and this added to the overall flexibility of the operation, for the units could easily be transferred from car to car at will.

As of this writing, there's no way to tell how the mob problems in this city will be resolved. One can but hope for the best. One thing is certain however, when it's finally over with. . . . When that last vicious bomb has been hurled. . . . When the last vehement oath has been uttered, and when peace once again descends, you can bet that the news will be relayed by CB radio! ■



Regency Range Gain CB unit mentioned in text tunes in any of the 23 CB channels. Frequency synthesis provides crystal-control operation for the transmitter and receiver. A 3.5-kc. vernier control on the front panel can be used to zero in on those CB signals that are "off channel." Ready to operate, the unit sells for \$269.95.

WACKY WOMAN WITH WOLLENSAK



Equipped with sax and stereo headset, Phyllis Diller accompanies a Brubeck recording and records her debut solo.

PHYLLIS DILLER (the Wacky Woman in this story) finds the life of a professional comic a fast one with many scenery changes. One piece of her luggage (she tours with 38) is a Wollensak tape recorder that is put to use daily for professional and amateur reasons.

Aside from entertainment purposes, Phyllis uses her Wollensak to tape letters to her 5 children. After her evening's final performance, she rehearses new theatrical material, writing 95 per cent of her own scripts with the aid of the recorder. As a silent secretary, the Wollensak took down the first draft of her new book entitled "Phyllis Diller Tells All About Fang."

At a closing night in Chicago, Phyllis gave a party and in no time the town's top talent were singing and talking into her tape recorder. Result: watch your local disc shop for a new Phyllis Diller album. ■



"Get outdoors and record ants working," Phyllis tells us. But don't you believe it; she was working up a new act at home when the camera caught her.



1: THE SANBORN COMPANY'S Viso-Monitor in action.

Now the doctors know all about seriously ill patients, thanks to . . .

Electronic Monitoring

By HARRIS E. DARK

LUB-DUB, lub-DUB, lub-DUB— 72 times a minute, 100,000 times a day, nearly 40 million times a year—the human heart chugs along, pumping 4,000 gallons of life a day to all parts of the body. Time was, heart failure from any cause had positive, decisive, permanent effect. Now in some of the more progressive hospitals, victims of heart failure are frequently saved by the pressing of a button.

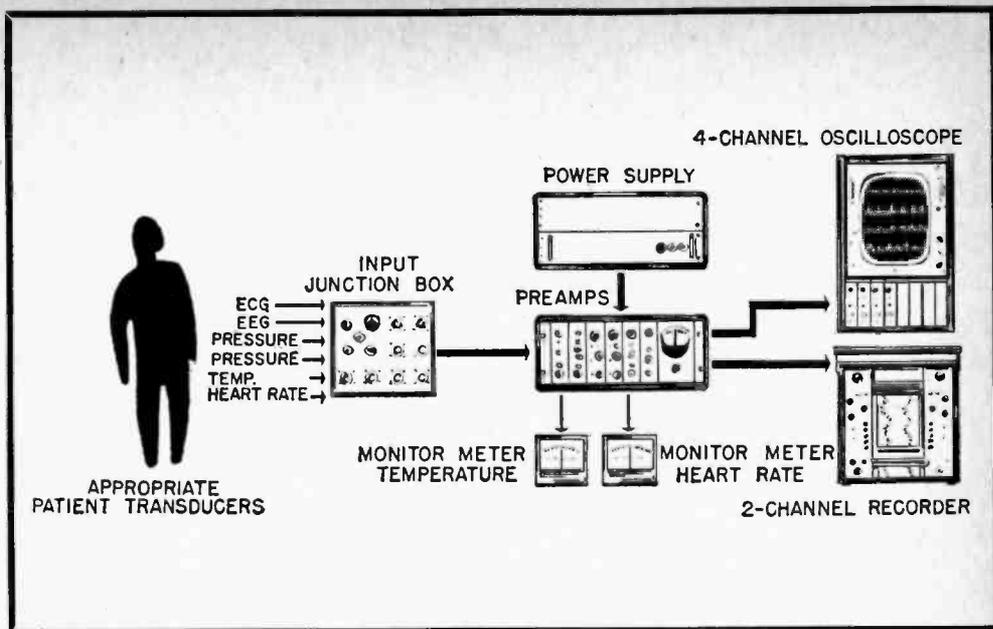
The secret of electronic life saving is keeping a constant check on the patient's heart condition and several other vital body functions. A whole new science of electronic monitoring has been recently developed to do this. (Figs. 1 and 2.)

Electronic monitoring is an extension of the "intensive care" method of strict patient supervision which has been inaugurated by leading hospitals in recent years. When a patient requires constant bedside guard duty, this service is offered in an IC ward, superior in many respects

to having three private nurses, and at only a fraction of the cost.

In an IC ward two or more specially trained nurses are in attendance at all times, and more can be called in when needed. There is a supply of emergency drugs and appliances in the room and direct telephone lines to the various doctors. The doctor will receive information on special portable equipment (Fig. 6), or, if he is in his office, he feeds the signal directly into his electrocardiogram machine for study. Should consultation be desired, the same signal can be sent to a specialist by long distance telephone.

A typical system is the Medtronic cardiac monitoring system installed at St. John's Hospital in Springfield, Mo. Each of the indicating panels on the console shows, when a patient is connected to it, a lighted graph of heartbeat rate. Each patient's doctor supervises the adjustment of the max-min settings.



2: SANBORN'S SYSTEM of monitoring. EEG is electroencephalogram, ECG is electrocardiogram.

of Body Functions

If the indicator should go above or below the preset rate, the appropriate part of the panel will light up red. In either instance, a discreet buzzer will sound. Thus any nurse in the room will know immediately if any patient is in trouble.

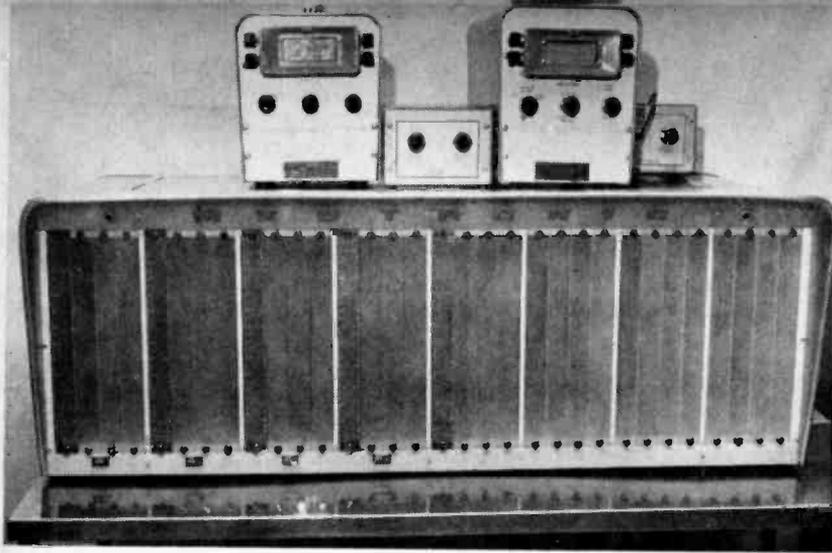
Strapped to each patient's chest is an unobtrusive transistorized transmitter (Fig. 7); connected to the transmitter is a pulse transducer similar to the pair of electrodes used in an ECG pickup. The tiny transmitter's signal is picked up by a receiver-transmitter attached to the bed. This allows the patient to be moved about on the bed without restriction.

The receiver-transmitter is plugged into the nearest 110-volt electrical outlet; as is the monitor console. So long as they are joined through a common electrical supply system, Bed One will transmit to Panel One whether the bed is in the same room or several wings away.

For a detailed look at a typical monitor-

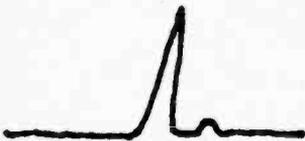


3: THE WIRELESS ECG preamp (left) picks up patient's heartbeat and transfers it to the monitoring equipment. Gadget on right converts the signal to an audio frequency and sends it into the phone mike.



4: MEDTRONIC console at St. John's, showing identical portable oscilloscopes (on top), each with its own eight-position "patient selector" switch box.

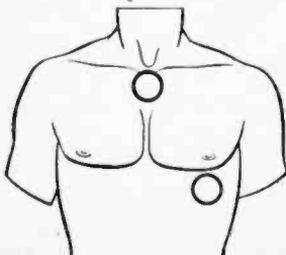
ing operation, let's say the heart of the patient in Bed Three, though still within the limits preset and dialed into the panel, has been showing considerable variation and deserves a closer look. The nurse dials the "patient selector" switch on a small portable oscilloscope (Fig. 3) and gets a small instantaneous picture of the Panel Three heartbeat as it would appear on an electrocardiogram, something like this:



If there is need to make a permanent recording of the heart action an ECG machine can be plugged into Panel Three to make an electrocardiogram on the spot.

According to Dr. Glenn O. Turner, prominent internist and heart specialist on the staff of St. John's, there is about a two-minute margin between the instant

5: POSITIONING of the counter-shock electrodes.



of heart block and the point of no return. For this reason monitoring, with its instantaneous announcement of cardiac arrest or even the threat of it, gives the hospital personnel the benefit of the 120-second period of action during which the life may be recovered. Without such an efficient warning device, it is possible for an apparently peacefully sleeping patient to be in mortal distress *too long* before even the most conscientious personal attendant might become aware of the problem.

For years, lives have been "brought back" by injections of stimulant drugs such as adrenalin, which sometimes can boost the heart into action; and, if the cause of the failure has been removed, the heart may continue to pump normally. But drugs are not dependable in the correction of ordinary heart failure and if the problem is fibrillation, drugs are useless.

Ventricular fibrillation, a chaotic, twitching condition of the heart's individual muscle fibers, is often the result of accidental electrocution, but the deadly spasms can also be caused by body ailments such as occlusion from a blood clot.

Strangely, a powerful electrical shock, expertly administered with delicate, precise equipment, will effect a cure.

Countershock to arrest ventricular fibrillation can today be applied either internally or externally. In an operating-room situation where opening the chest by surgery is not so difficult, the current (1 to 1½ amps. at 120-135 volts for a few tenths of a second) may be applied directly to the surface of the heart. The open-chest



6: PATIENT with Medtronic chest strap that sends signals on heartbeat, temperature, and respiration rate. Receiver-transmitter under bed receives signals from chest strap and sends them to the console.

method has the advantage of allowing the surgeon to squeeze the heart with his hand to maintain the circulation of oxygenated blood (while artificial respiration is also being administered) until the heart is restarted and on its own again. This method has been widely used since 1947 and has been instrumental in saving 25% of patients suffering from cardiac arrest.

But for outside the operating room where surgery is not feasible, an electrode is placed at the neck (just under the

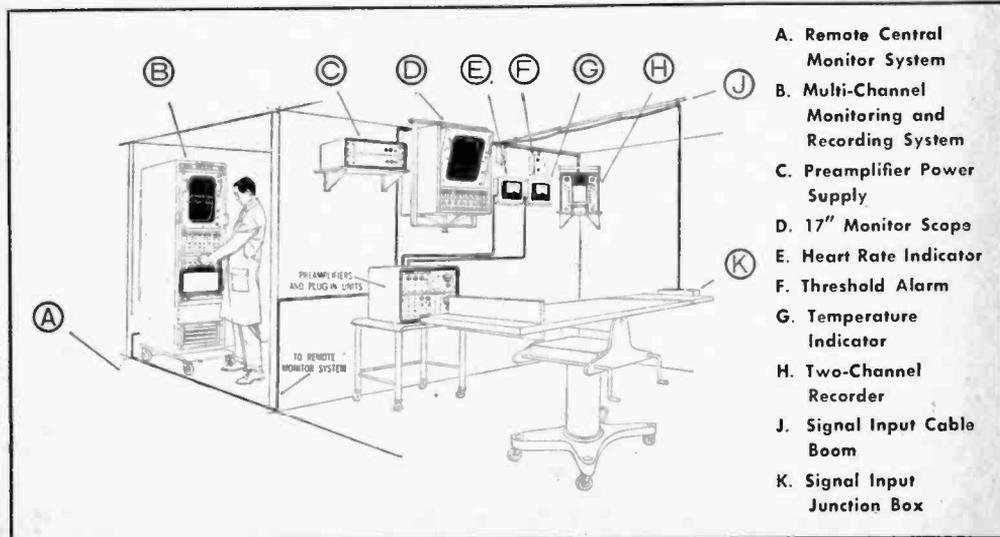
Adam's apple) and another at the apex of the heart (just under the left breast). The 480 volts will send five amperes through the body, with 1.5 amps. of this current flowing longitudinally through the heart; this will bring the twitching fibers to rest. A further, and undoubtedly more important, development is the portable defibrillator. The latter has been applied to 12 patients at Johns Hopkins Hospital with 100% success.

One further question in the matter of patient resuscitation: Once the heart is defibrillated but fails to start, or if it was not in fibrillation but had merely gone into quiet cardiac arrest, how is it restarted?

For this there is the electronic pacemaker (Fig. 4) that can supply, internally or externally, a regular, timed current to the heart muscles which is very similar to that normally produced by the heart's own pacemaker. In extreme cases, a completely portable pacemaker about the size of a cigarette lighter can be implanted in the patient's abdomen. A minor incision every three to five years to make a change of batteries is all the maintenance required.

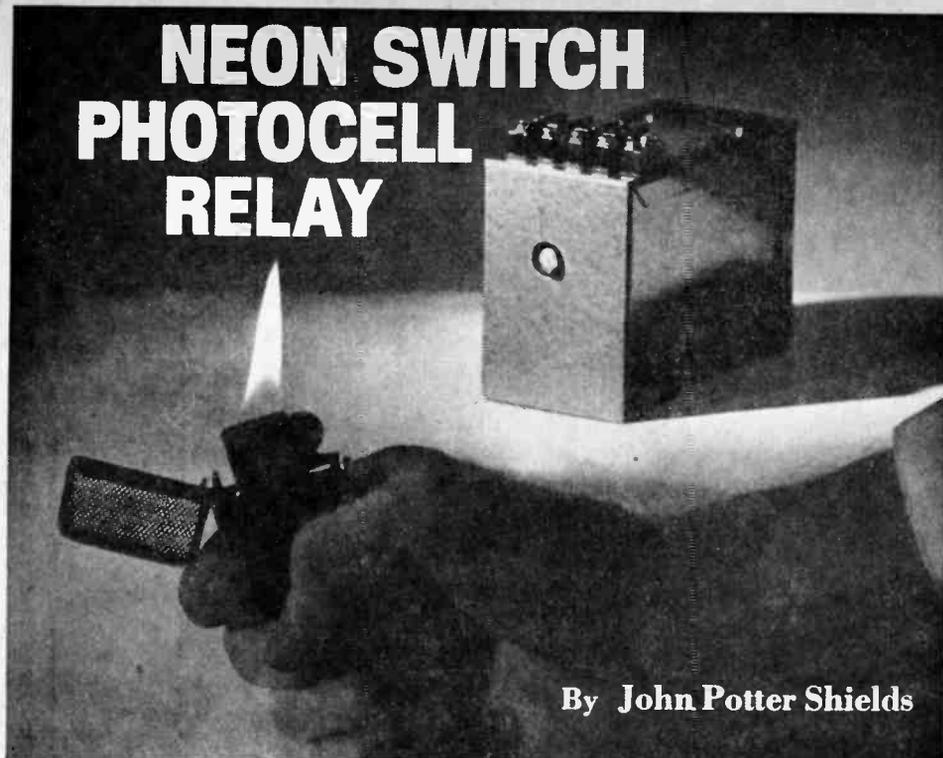
Each new improvement in the electro-inspection of the human body, lends greater accuracy, more convenience, increased lifesaving ability to the marvelous tools now in the grasp of modern medicine. As one observer put it the other day, "It's getting harder and harder to die." ■

7: TYPICAL Sanborn 760 series setup of electronic monitoring and recording equipment for an operating room.



- A. Remote Central Monitor System
- B. Multi-Channel Monitoring and Recording System
- C. Preamplifier Power Supply
- D. 17" Monitor Scope
- E. Heart Rate Indicator
- F. Threshold Alarm
- G. Temperature Indicator
- H. Two-Channel Recorder
- J. Signal Input Cable Boom
- K. Signal Input Junction Box

NEON SWITCH PHOTOCELL RELAY



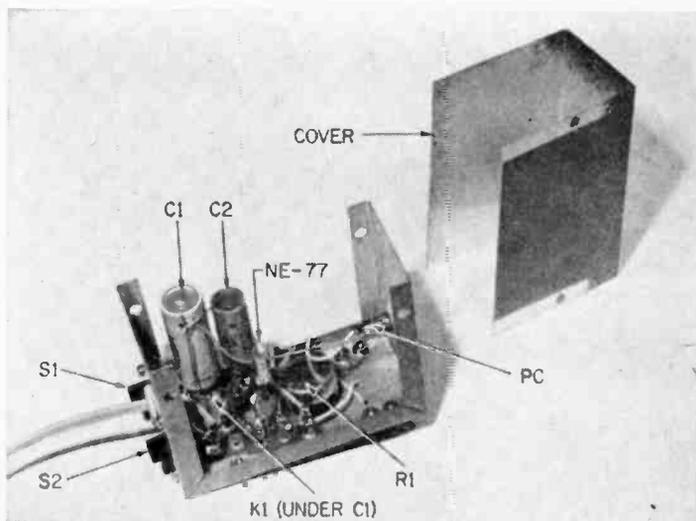
By John Potter Shields

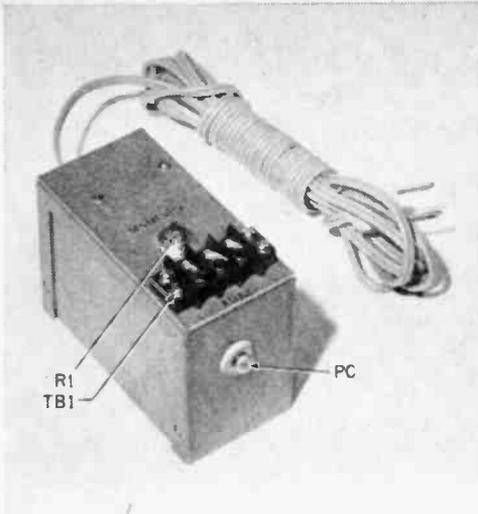
HERE'S a novel photocell relay that combines excellent sensitivity with extreme simplicity by using a neon bulb as an electronic switch. Although it uses neither vacuum tubes nor transistors, its sensitivity ranks with the best of these types. As an

added bonus, the circuit offers both *latching relay action* (relay remains closed after actuating light source is removed), or *automatic recycle* (relay opens after actuating light is removed).

Another nice feature of the photocell relay

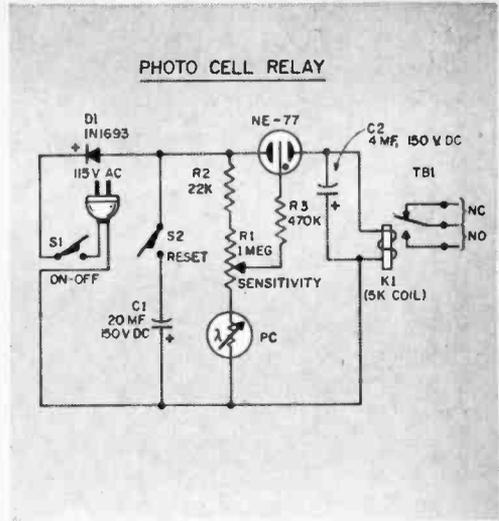
All the parts for the photocell relay are mounted on one half of a Bud chassis box. Wiring is not critical, however a neatly wired unit will work the first time without the need for annoying trouble shooting.





Top of unit mounts sensitivity adjustment and terminal block for external connection.

is that it draws essentially no current from the power line during standby periods when the relay is not energized. This means that the unit can be left permanently connected to the power line without fear of running up



Greek letter lambda inside photocell PC symbol indicates the light-sensitive device.

the electric bill. The operation of the circuit is such that the relay is energized in a "snap-action" fashion, thus assuring its positive operation and maximum contact life.

About the circuit. The heart of the unit is the NE-77 neon lamp which resembles a standard NE-2 with a third electrode added between the two existing electrodes. The operation of the NE-77 is like an electronic switch. A control voltage applied to the neon bulb's center electrode will cause it to fire, allowing current to flow between its two outer electrodes.

Let's first assume that the RESET switch, S2, is in the open position. With power applied to the unit, the diode, D1, provides pulsating DC voltage across the two outer electrodes of the NE-77 via the relay coil, K1. This same pulsating DC appears across the voltage divider formed by the series connected photocell, PC, and sensitivity control, R1.

With no light striking the photocell, PC, the sensitivity control, R1, is adjusted to the point where the voltage applied to the NE-77's control electrode is not sufficient to fire the NE-77. When the PC is illuminated, its internal resistance lowers, firing the NE-77 . . . this in turn energizing the relay. The capacitor, C2, connected across the relay coil, K1, prevents the relay from chattering as pulsating DC is applied to K1.

When the RESET switch S2, is in the

(Continued on page 126)

Parts List

- C1—20 mf., 150-volt DC electrolytic capacitor
- C2—4 mf., 150-volt DC electrolytic capacitor
- D1—1N1693 diode, 600 ma., 200 PIV (General Electric)
- K1—s.p.d.p., 5000-ohm coil relay (Potter & Brumfield type RS5D-5000 or equiv.)
- NE-77—neon bulb, tree terminal (GE type NE-77)
- PC—cadmium sulphide photocell (Lafayette #MS-855)
- R1—1,000,000-ohm potentiometer, linear taper, slotted 1/4" shaft
- R2—22,000-ohm 1/2-watt resistor, 10%
- R3—470,000-ohm 1/2-watt resistor, 10%
- S1, S2—s.p.d.t. slide or toggle switch
- TB1—3-terminal barrier terminal block (Cinch-Jones Series 3-164)
- 1—3x4x5" aluminum chassis box (Bud CU2105-A)
- Misc.—Grommets, terminal strip, hardware, wire, solder, etc.

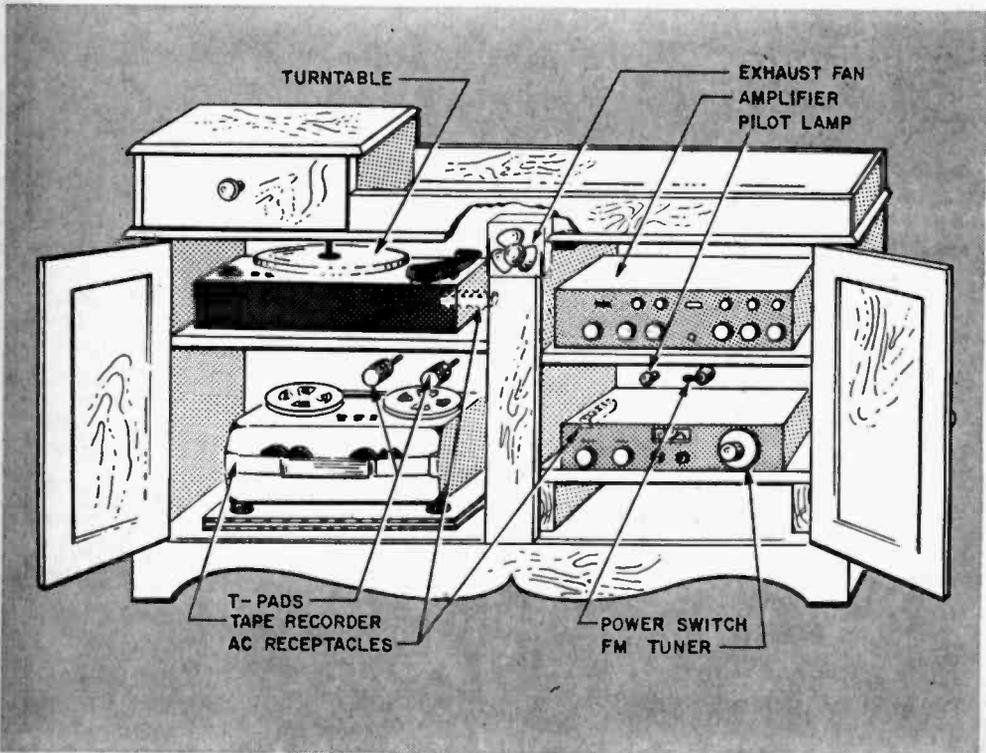
Estimated cost: \$12.25

Estimated construction time: 3 hours

*Customized into a colonial-period
dry sink, this novel high-fidelity
stereo installation whets the desire
and imagination of the home designer*

STEREO Goes "Early American"

By Walter G. Salm



STEREO equipment and early American furniture can mix—provided the components aren't sitting out on open shelves à la Danish modern. The object is not to hide the equipment, but to conceal it in an unobtrusive, authentic piece of furniture.

Many items of early Americana are either too big or too small. The ideal piece should be able to accommodate a reasonably powerful stereo amplifier, an FM stereo tuner, a turntable and a tape recorder. Trying to stuff the speakers into such a cabinet is sheer folly and would partially defeat the purpose of buying quality components in the first place.

What is necessary here is an equipment cabinet—a stereo center that will be authentic early American on the outside and will have a custom-built appearance when opened.

Dry Sink. A furniture piece that lends itself ideally to this application is a small dry sink. Originally used in kitchens in colonial homes, the dry sink is now a fully accepted piece for dining and living rooms. The one shown in this article is the Agawam dry sink (Catalog No. GV 145 U) available unfinished for \$65 (express collect) from



The dry sink will house a complete stereo system, including an 80-watt amplifier, FM stereo tuner, manual turntable and recorder.

Sturbridge Yankee Workshop, Brimfield Turnpike, Sturbridge, Mass. If you would like to build your own dry sink, then pick up a copy of the new **FURNITURE HANDBOOK**, a Davis Publication, No. 666 for the complete plans and "how to" information.

The components used in this installation were chosen on a basis both of high performance and reasonably compact size. When choosing a record player, remember that an oversize turntable just won't fit in the space provided. Yet a unit such as the Thorens TD-135 offers big-turntable performance and still remains well within the space limitations imposed by a cabinet installation. You probably know from experience that a quality manual turntable is usually very difficult to hide and still use conveniently.

The tape recorder is the Wollensak T-1580 which rests on a sliding platform. The platform makes the entire unit readily accessible even though it's on the bottom shelf.

The amplifier and FM stereo tuner are the H. H. Scott LK-72 and LT-110 and come in kit form. Both are the same size in front, so the same template can be used when making the trim panel cutouts. The LK-72 is an 80-watt amplifier and like all power amplifiers, must be adequately ventilated. One method of assuring sufficient cooling is the use of an exhaust fan such as the Rotron "Whisper Fan." Mounted at the top rear of the cabinet, the fan will move a large volume of warm air, helping to create convection currents. The cabinet also includes cool-air inlets located behind the amplifier and tuner.

Adding Shelves. The first step is to add two new shelves to the cabinet. Since these will be hidden by the front trim panel, $\frac{3}{4}$ -inch plywood can be used. A thinner board would not adequately support the weight of the amplifier.

The doors will have to be removed for staining, and it would be just as well to remove them at the outset, since this will make it easier to work on the interior. Also, remove the magnetic latch.

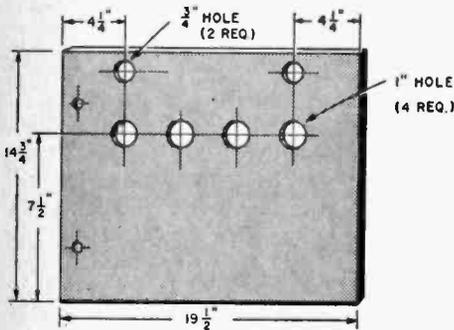
For the amplifier and tuner shelves, cut two pieces of $\frac{3}{4}$ -inch plywood $19\frac{1}{2}$ " wide x $14\frac{1}{2}$ " deep. Drill holes in the shelves as required. Refer to the diagrams.

Cut two wood blocks from $\frac{3}{4}$ -inch scrap, drill and countersink two $\frac{1}{4}$ -inch holes in each, and mount them on the right wall. These blocks will brace the right side of the amplifier shelf. Mount the shelf flush with

STEREO Goes "Early American"

the rear of the cabinet. Mark off the underhang of the built-in half-shelf. This will have to be cut out to make room for the trim panel. Remove the shelf and cut a notch in the built-in shelf. When cutting the notch, be careful not to ruin the saw blade on the nails holding the shelf to the center post in front.

The height of the lower shelf is optional, but it must be low enough so the tuner has enough "breathing room" above for ventilation. Cut four scrap blocks to size—all equal in height. A single screw through the



Shelf for the amplifier is cut from 3/4-inch plywood. One-inch holes are for ventilation purposes; 3/4-inch holes allow cables to pass between shelves to interconnect components.

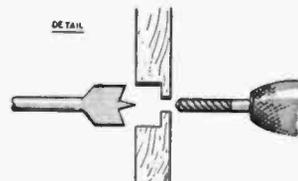
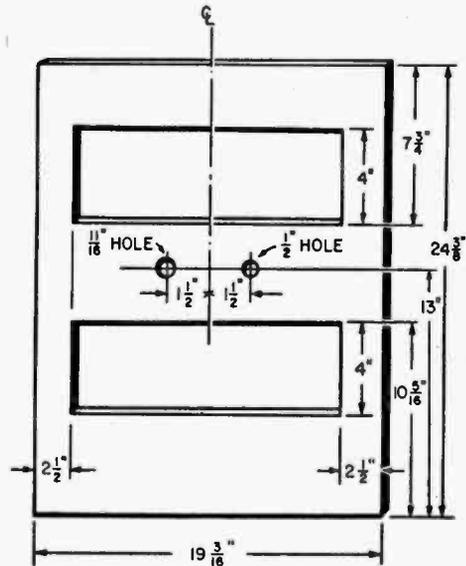
The details for the trim board (left) are determined by the author's hi-fi equipment. Except for outside dimensions, holes should be cut and drilled on location for an exact fit. The lower detail (right) shows how to countersink holes and avoid splinters when drilling.

plywood into each of the four legs will be sufficient to stabilize the "table" that this shelf will look like.

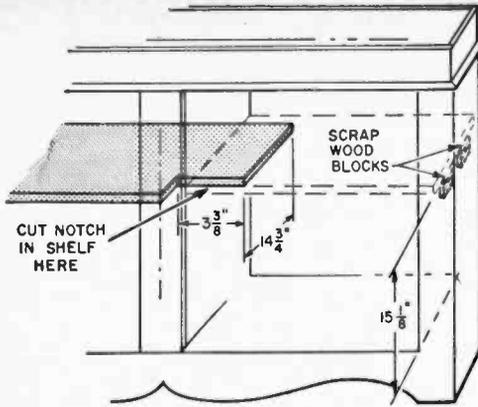
At this point, if you want to mount the amplifier and tuner on the shelves, rather than have them just rest on them, mark off the hole locations on the shelves. These should line up with the holes on the bottom plates of the amplifier and tuner.

Trim Panel. Once the shelves are in place and the notch has been cut out of the half-shelf, make a template for the trim panel. Use any convenient large piece of paper, such as brown wrapping paper. The outside dimensions will be 19 1/2" x 24 3/8". Remove the knobs and the brass trim plates from the tuner and amplifier and place them on the shelves and tack the template in place with tape. Cut square holes as shown in the trim panel drawing.

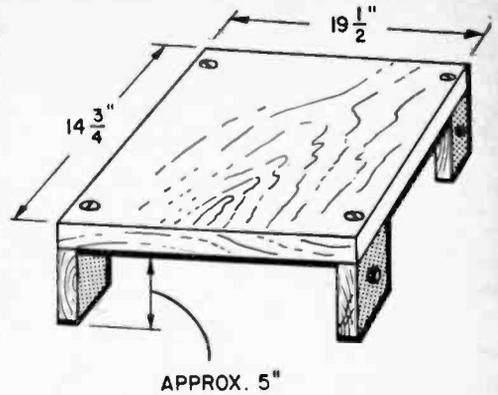
Once you have the template exactly right, use it to lay out the holes on the wood



panel. The type of wood you use will depend on what kind of finish you want it to take. If you want it to match the dry sink finish, use a clear pine. Knotty pine would be a closer match, but some knots may lie right on the lines that have to be cut, making a neat job very difficult.



The amplifier shelf, cut from $\frac{3}{4}$ -inch plywood rests on two scrap wood blocks and on the overhang of the turntable shelf at the left.



APPROX. 5"

Shelf for the FM tuner is cut from $\frac{3}{4}$ -inch plywood. Scrap wood blocks raise the "table" approximately five inches; height is optional.

For the panel, glue several pieces of clear pine together, clamp and let dry overnight. If you have a power saw, make the panel somewhat oversize, and trim it to the $19\frac{1}{2}$ " x $24\frac{3}{8}$ " size after it dries, to get the best fit.

An electric sabre saw is the most convenient way of making the rectangular cutouts. The edges won't be exactly even unless you have an exceptionally steady hand, but clear pine is very soft and easy to sand—and easy to ruin with marks, so be careful when you work it.

Drill two holes about midway between the two cutouts, the right hole $\frac{1}{2}$ " diameter, the left hole $\frac{11}{16}$ " diameter. These are for the main power switch and pilot light. If you are using $\frac{3}{4}$ -inch wood for the trim panel, then cut a 1-inch diameter hole partway into the panel from the rear, since the switch and pilot light assemblies will not reach all the way through a board this thick. Be careful not to drill all the way through the panel.

Mounting Accessories. Remove the two shelves for the amplifier and tuner. Take the paper template and fasten it to the thin plyscore board on the rear of the dry sink directly behind the space where the amplifier and tuner will be located. Mark off square cutouts from the template. They don't have to be as high as the trim panel cutouts, but should be the same width. Remember, you will have to get your hand through these cutouts to attach plugs and cords.

Select a position for the exhaust fan. The best spot is flush with the top of the cabinet

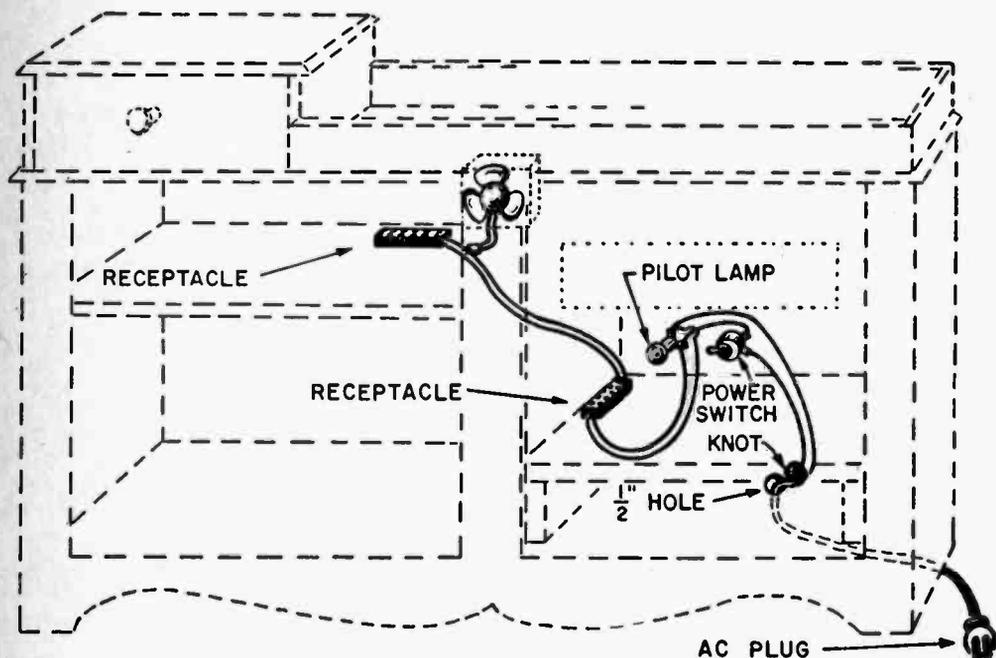
interior approximately in the center. Outline the inside of the fan on the plyscore with a pencil and cut out. Mount the fan, using the hardware and the foam vibration pad provided. In spite of the fan, the amplifier is going to throw off a lot of heat and this may affect the finish of the dry sink area directly above. To avoid this, take some corrugated heavy aluminum foil—the type that is ready-cut and corrugated for use in kitchen broilers. Tack two sheets of this to the top of the amplifier compartment. Do not use this foil unless you use an exhaust fan.

Next, drill holes in the plyscore for the T-pads. These are a special kind of local volume control for each loudspeaker and will be a great help in adjusting the stereo balance when unmatched speakers are used or when room acoustics affect the balance. Once these T-pads are installed and adjusted properly, you will probably never have to move the balance control off its center position—the most efficient way of using a stereo amplifier. The T-pads are available from Lafayette Radio Corp., 111 Jericho Turnpike, Syosset, N. Y. (16-ohm pad, VC-52; the 8-ohm pad, VC-51; price is \$3.85 each, and two are needed for stereo.)

Tape Recorder. In the installation, the vertical position of the tape recorder wasn't critical, since the Wollensak unit used takes up relatively little room. To be on the safe side, mount the pads near the shelf at the top of the tape recorder compartment. Drill two $\frac{1}{8}$ " holes for the mounting screws and a

STEREO

Goes "Early American"



1" hole for the shaft of the pad. The threaded shaft is too short to pass all the way through the plyscore and this 1" hole will permit mounting directly on the brass plate itself.

Wire the pads using a color-coded pair of wires and maintain similar connection points for both speakers so they will be in phase when the wiring is completed.

Mount a five-terminal board on the back of the cabinet with nuts and bolts as shown and drill two $\frac{1}{4}$ " holes just below the terminal strip for wires.

Staining the Cabinet. At this point, you should stain the cabinet and all inside surfaces that will be exposed. Stain the trim panel and the tape recorder platform. Whatever else you intend to do in the way of finishing the wood, such as applying a hard wax surface, should be done at this time.

When the finishing is completed, remove the amplifier and the tuner shelves completely. The front support block for the amplifier shelf will have to come out, too, since it will be in the way.

Mount the power switch and pilot lamp assembly with red jewel.

Use heavy-duty zip-cord for all the AC power cable runs. Drill a $\frac{1}{2}$ " hole in the plyscore back near the bottom of the cabinet on the FM tuner's side. Feed the zip cord through the hole so about 6 feet protrude outside the cabinet. Tie a loose knot in the zip cord inside the cabinet and place one large BX cable staple in the cabinet floor between the knot and the hole. The staple shouldn't be hammered down too tight—just enough so the knot in the cord can't pull through. Install an AC plug on the loose end.

Run the cord end in the cabinet to the trim panel and wire in place. A length of zip cord goes from the pilot light terminals to the AC receptacle on the FM tuner shelf; another length from there to the second receptacle on the rear of the turntable shelf. Solder all connections, even where screws are provided in the receptacles. This is a permanent installation and it will be very annoying if any wires come loose later.

Trim the AC cord from the fan so it will reach the receptacle with a little slack left over and attach an AC plug. Plug it into the receptacle directly below it.

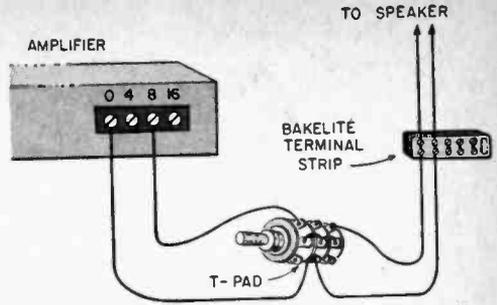
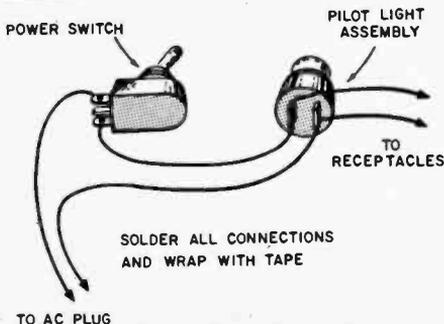
Wire the interior of the dry sink (left) prior to installing the hi-fi components. Wiring detail for switch and pilot lamp is shown at the bottom of this page. The pilot lamp is optional.

MATERIALS LIST

- Cabinet**
- 1—unfinished dry sink (no. GV 145 U, Sturbridge Yankee Workshop, Brimfield Turnpike, Sturbridge, Mass.)
- Components & Parts**
- 1—80-watt stereo amplifier kit, H. M. Scott LK-72
 - 1—FM stereo tuner kit, H. M. Scott LT-110
 - 1—Thorens TD-135 integrated turntable & arm
 - 1—walnut base for turntable
 - 1—magnetic stereo cartridge
 - 1—Wollensak T-1580 stereo tape recorder
 - 1—Rotron Whisper Fan (Lafayette PK-328)
 - 1 pr.—15-inch drawer slides
 - 2—T-pads 8 or 16 ohms
 - 1—5-terminal Cinch barrier strip
 - 1—neon lamp assembly w/resistor (Dialco 95408X-931)
 - 1—NE-51 neon pilot bulb
 - 1—s.p.d.t. toggle switch
- Miscellaneous**
- 2 sheets—corrugated broiler aluminum foil
 - 2—AC plugs
 - 12 ft.—rubber lamp (zip) cord, heavy duty
 - 2—AC receptacles (3-outlet baseboard mounting type)
 - 1—BX staple
 - 12—flathead woodscrews, 1/4"
 - 12—carpet tacks
 - 7 ft.—300-ohm flat twin-lead (TV) wire
- Wood**
- 1—Clear pine, glued, 19 3/8" x 24 5/16"
 - 2—Plywood, 3/4" stock, 19 1/2" x 14 1/2"
 - 1—Plywood, 3/4" stock, 13 1/2" x 14 1/2"
 - 1—Clear pine, 1/4" to 1/2" x 24 5/16" (see text)

Place the shelves behind the trim panel by sliding them in from the left side. First replace the wood block amplifier shelf support that was removed. You can reach through the trim panel cutout to fasten it. The same will be possible for screwing down the shelf itself. The tuner shelf is another matter. After you have shoved it into place, a long arm and a long screwdriver will be necessary to place the wood screws.

After the trim panel is in place, there will be a gap between the front of the panel and the center post at the front of the cabinet. You can do two things, either leave it the way it is, or attach a strip of wood to block the gap. Cut a strip of this stock 24-5/16"



Wire the T-pads (there is one per loudspeaker channel) as shown above.

long and from 1 1/4" to 1 1/2" wide, depending on how much air space you have to fill. A single countersunk woodscrew in the center of the strip will attach it firmly to the side of the notch in the half-shelf. Before attaching to the cabinet, you will want to stain and wax *both sides* of this trim strip. Be sure to drill the hole full size to avoid splitting.

Tape Recorder Slides. Remove the stop pins from the two drawer slides (Lafayette Radio catalog No. ML-34, \$1.75 per pair). Pull the slides apart.

Turn the tape recorder platform upside-down and fasten the two smaller (inside) slider bars to it as shown in drawing. The ends with the holes for the stop pins should be flush with one end of the wood platform. This end will be at the rear of the cabinet. Be careful to mount these pieces *perfectly parallel*.

Using the position of these slide bars as a guide, mark off center lines for the outside tracks on the bottom of the left side of the cabinet (the tape recorder compartment). Mount these tracks, again being careful to keep them perfectly parallel. In mounting all of this hardware, use shallow round-head screws that are about 1/32" diameter smaller than the holes in the metal.

Insert the platform's runners into the tracks and shove it all the way to the rear of the cabinet. If it doesn't slide freely, look down the tracks to see which elements are out of skew. Then remove the platform, loosen screws where needed, and adjust the tracks or runners.

Re-insert the runners and again shove the platform all the way to the rear. Then move

(Continued on page 149)

BEEN HAVING TROUBLE trying to operate that transistor amplifier from a crystal microphone? Does that portable all transistor phono amplifier you've just designed have inadequate bass response when used with a crystal or ceramic phono cartridge? Is the output voltage from both crystal microphones and phono cartridges much lower than normal when fed into a transistor stage? Your affirmative answer to these questions indicates that you are suffering from the *low input impedance blues*.

The problems outlined above are due to the fact that any *conventional* transistor amplifier stage has a quite low input impedance. While it is true that certain circuit arrangements can raise this impedance somewhat, it still falls far short of the recommended load for crystal or ceramic microphones or phono cartridges. These devices are designed to operate into load impedances in the neighborhood of one megohm or more . . . lower impedance greatly reduces their output voltage level and restrict frequency response.

The little FET (*field-effect transistor*) impedance matching circuit used in the potted preamp neatly takes care of this impedance problem, while also providing a sizeable bit of gain to boot. The potted preamp is designed to be placed between the output of a crystal mike or phono cartridge and the low impedance input of a standard transistor amplifier. While the preamp is shown as a separate, encapsulated unit in the accompanying photos, there's no reason at all why it can't

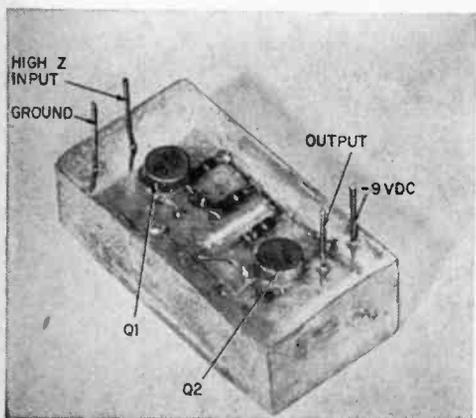
be built right into either an existing amplifier or an amplifier under design. The little unit can also be used to advantage with a conventional vacuum tube amplifier as it has a fair amount of voltage gain.

Circuit Operation. Signals from either a crystal or ceramic phono cartridge or microphone are fed to the *gate* electrode of the field-effect transistor, Q1, connected as a *source follower* . . . this is similar to a vacuum tube cathode follower, to achieve the required high value of input impedance.

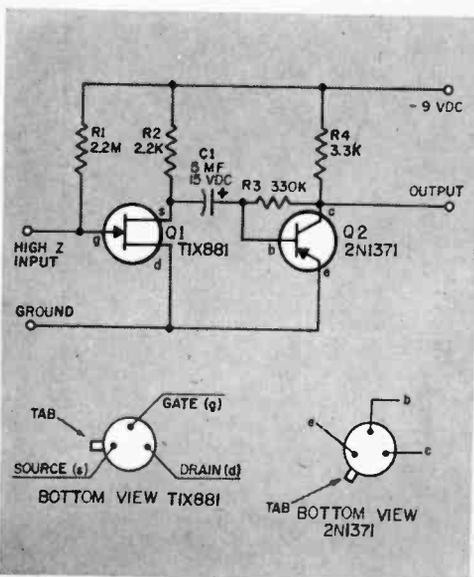
Signals appearing at Q1's *source* electrode are applied to the base of Q2, via the blocking capacitor, C2. Q2, is operated as a conventional *common emitter* amplifier stage to boost the signal before it is applied to the output. Resistor R3, provides proper base bias for Q2. The preamp's output signal is

POTTED PREAMP

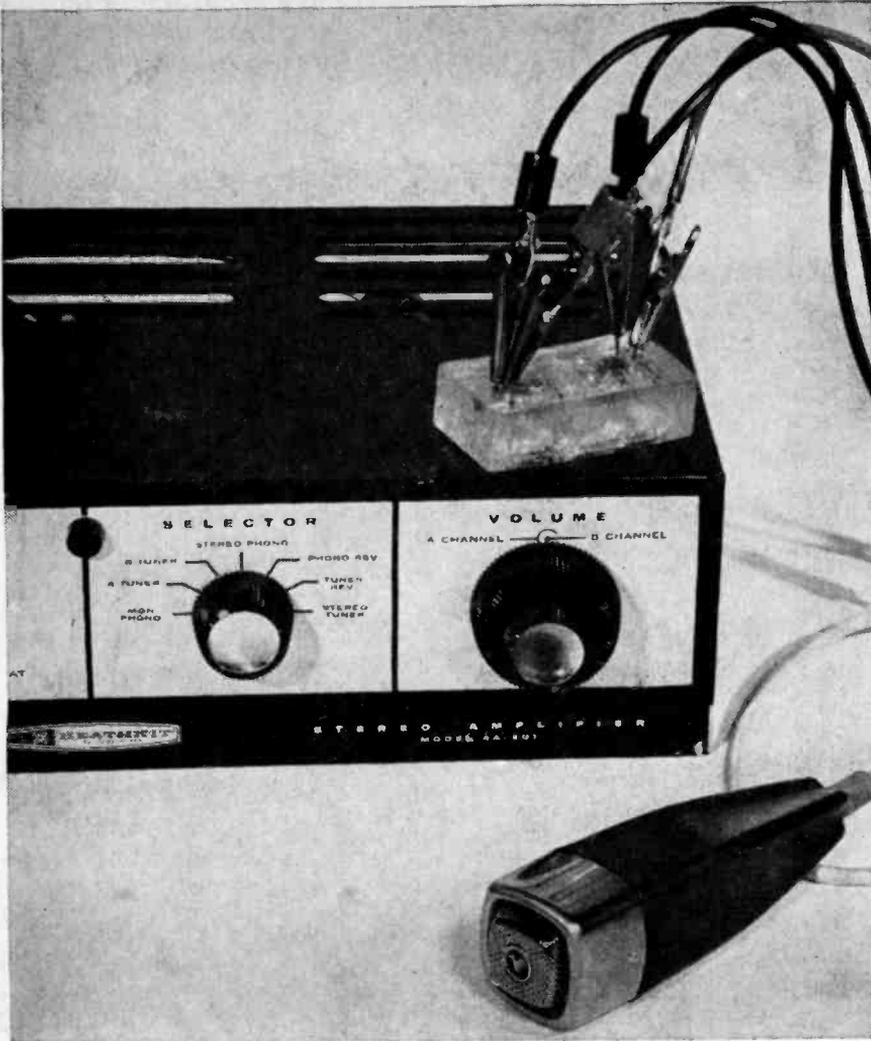
shake the lo-impedance blues
with this hi-Z microphone
and phono preamplifier



The preamp circuit has only four terminal points; high impedance (Z) input and common ground, -9-VDC input and signal output.



By
John
Potter
Shields



Practically indestructible, the parts for the Potted Preamp are held in place by a clear, transparent plastic making an easy-to-use component.

PARTS LIST

- C1—5 mf., 15-volts DC electrolytic capacitor
- Q1—T1X881 (Texas Instrument)
- Q2—2N1371 (Texas Instrument)
- R1—2,200,000-ohms ½-watt 10% resistor
- R2—2,000-ohms ½-watt 10% resistor
- R3—330,000-ohms ½-watt 10% resistor
- R4—3,300-ohm ½-watt 10% resistor
- 1 lb.—Castolite "X" liquid plastic #L-1
- 1 unit—Castolite "X" hardener #G-2

(The Castolite products are available from The Castolite Company, Woodstock, Illinois 60098 for \$3.30 postpaid.)

taken from the collector of Q2. The potted preamp is powered by any convenient 9-volt source such as a miniature 9-volt battery of the type used in pocket-portable transistor receivers. Current consumption is slight so battery life will be most reasonable.

Construction Details. The unit was encapsulated in a block of clear plastic to protect it as well as providing an attractive package. The material used to *pot* the completed preamp is known as "Castolite", which is manufactured by the Castolite Company, Woodstock, Ill. This preparation can be obtained from the collector of Q2. (Continued on page 124)

By Howard S. Pyle, W7OE

HAVE you been resigned these many years to distorting your body while making an *accurate* adjustment on your receiver dial? You don't need to . . . why "dip the body" when you can get the same results by tilting the receiver?

Quite a few receiver manufacturers have adopted an innovation that lets you install a receiver on a flat surface, such as a desk-top, and then tilt the front of the cabinet so that the panel is more nearly in the direct line-of-sight of the operator. Some receivers have a metal foot hinged along the bottom front edge of the receiver that can be snapped in place. Others furnish large rubber feet on the bottom front of the cabinet and small rubber feet on the rear.

Parallax is the cause of many incorrect dial settings or readings. Look at your receiver's dial at a distance of 14 inches and move your head from side to side. Unless the dial pointer is resting right on the dial face, this head motion will cause the dial indication to change with head position. This effect, called parallax, can be eliminated only by looking at the dial head on. To help keep your eyes directly over the pointer, it is wiser to tilt the front panel up to you and not have to bend for each dial setting.

You can tilt your receiver by replacing the two front rubber-bumper feet with a pair of a larger size. This will tilt the front panel

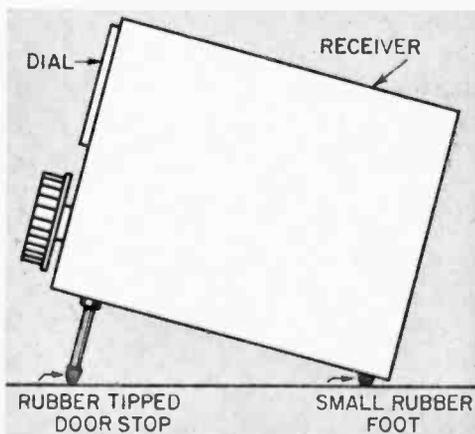
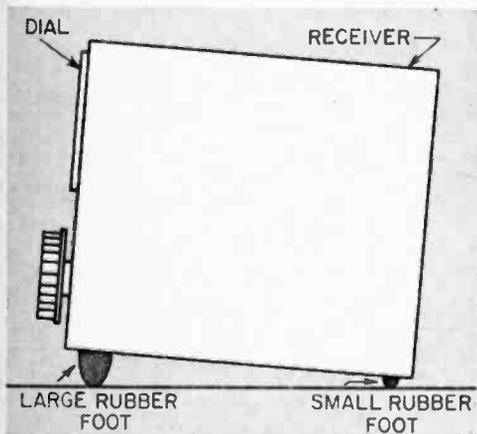
NEW SLANT



on receivers

upward and back so that you may easily see the settings of the various dials and controls. If you are a stickler for even greater accuracy, you can buy, for a few cents, a couple of rubber-tipped door-bumpers at your local hardware store and use these in place of the front rubber feet.

Try this stunt; you'll find tuning and adjustment of controls infinitely easier, not only with receivers but with ham transmitters as well where you may want to make frequent quick accurate adjustments. ■



How far you tilt back the front panel of your receiver is best determined by you at the listening station. A rubber foot (left) does the

job nicely for short lifts. A rubber tipped door-stop (right) gives lifts up to three inches. Bench with built in tilt top is another idea,



Special Section:

NEW ELECTRONIC KITS

By Tom Kneitel

ARE you a newcomer to electronics? Do you find electronics gear amusing but confusing? Do you want to expand your practical knowledge of electronics on a tight-as-a-drum budget?

Or, are you one of those pioneer do-it-yourself he-men who builds all needed electronic gear "from scratch," going so far as to wind your own transformers?

Whichever of these two fellows you might be, you owe it to yourself to take a close look at 1964's electronic kits, because the kits which are available today are vastly different than those which were on the market only a few years ago. They are easier to build, less expensive, styled to the times and (to the surprise of many) actually *fun* to build.

Yes, 1964's kits make full use of the most recent electronic innovations, plus the best of the ideas which have turned up in the past few years. A look through the new kits shows you printed circuit boards, transistors, pre-wired modular circuits, and even Nu-vistors. The exterior styling of the new kits shows a stepped up campaign on the part of kit manufacturers to make their wares attractive to the "little woman" of the house.

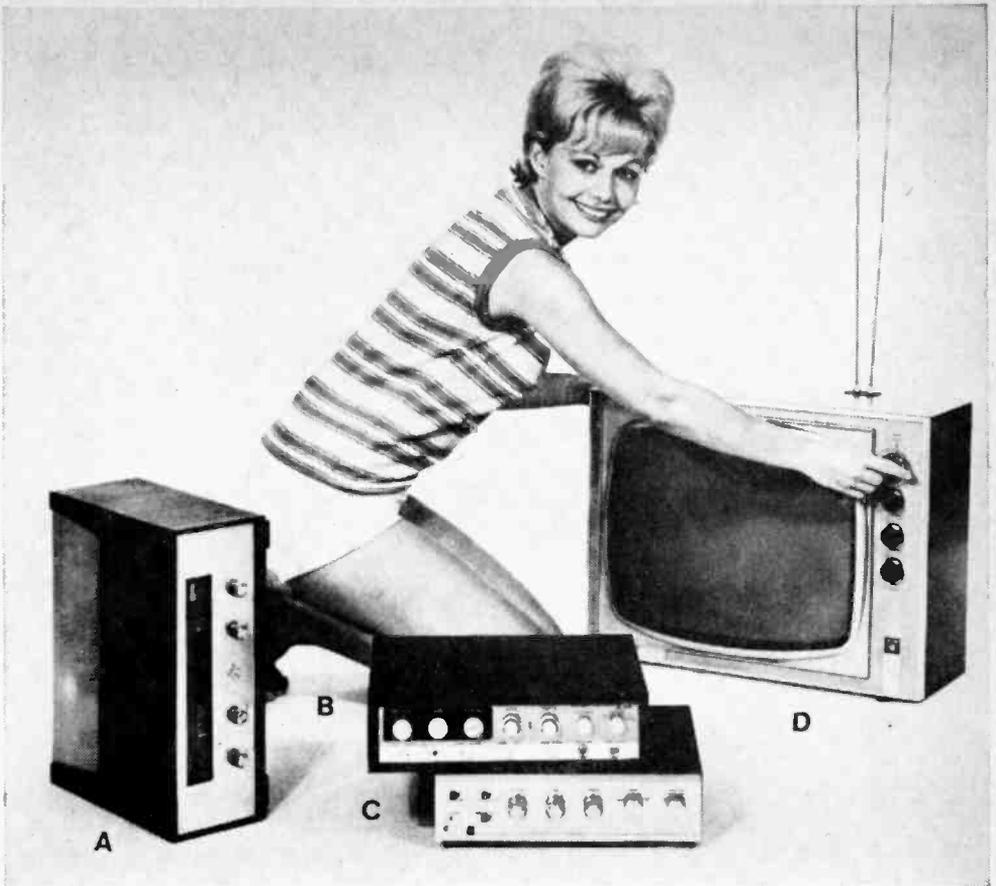
Decorator words like "lowboy," "oiled walnut finish," "oiled walnut finish," and color combinations of antique white and gold, or chrome and black are part of the 1964 electronic kit scene.

If you haven't been following the skyrocketing of kits, perhaps a few facts might be in order at this point. The cost of a kit averages about 40% less than the same unit factory wired, or a similar factory wired unit

not available in kit form; most cost less than if you went out and bought the components individually. These factors are some of the major reasons behind the substantial increases in kit sales recently. Manufacturers agree on this, however they add several other reasons which they feel are of equal importance.

The 1960's are a period of leisure time;





A. The Fisher KM-60 stereo multiplex FM tuner is a kit product with commercial characteristics and costs \$169.50! **B.** The Knight-Kit model KG870 is an integrated stereo amplifier for \$99.95. **C.** Lafayette has this all-transistorized stereo amplifier kit for \$134.50. **D.** Conar Instruments lets you build a TV set, \$135.

A. Conar model 219 all transistor portable, \$29.95. **B.** Progressive Ed-U-Kits is really an educational unit, you can build all 20 radio circuits, \$26.95. **C.** Conar model 211 VTVM boasts 6-inch meter, \$29.95. **D.** Conar model 220 tube tester, cathode conductance type, \$47.75. **E.** EMC model 205 tube tester, emission type, \$36.20. **F.** EMC model 109 Voltmeter, VOM, comes in kit form for only \$19.25. **G.** EMC model 212 transistor analyzer kit, costs \$13.50, tests transistors and diodes.

people are generally working fewer hours per day than they were in the '50's. They have more spare time available. Spare time means hobbies, and in the rocket-and-missile 1960's, "hobbies" almost invariably means electronics in one form or another—hi-fi, ham radio, Citizens Band radio, or just experimenting. This, coupled with the natural desire to broaden our understanding of the sciences, has created an unprecedented demand for kits. And what a demand!

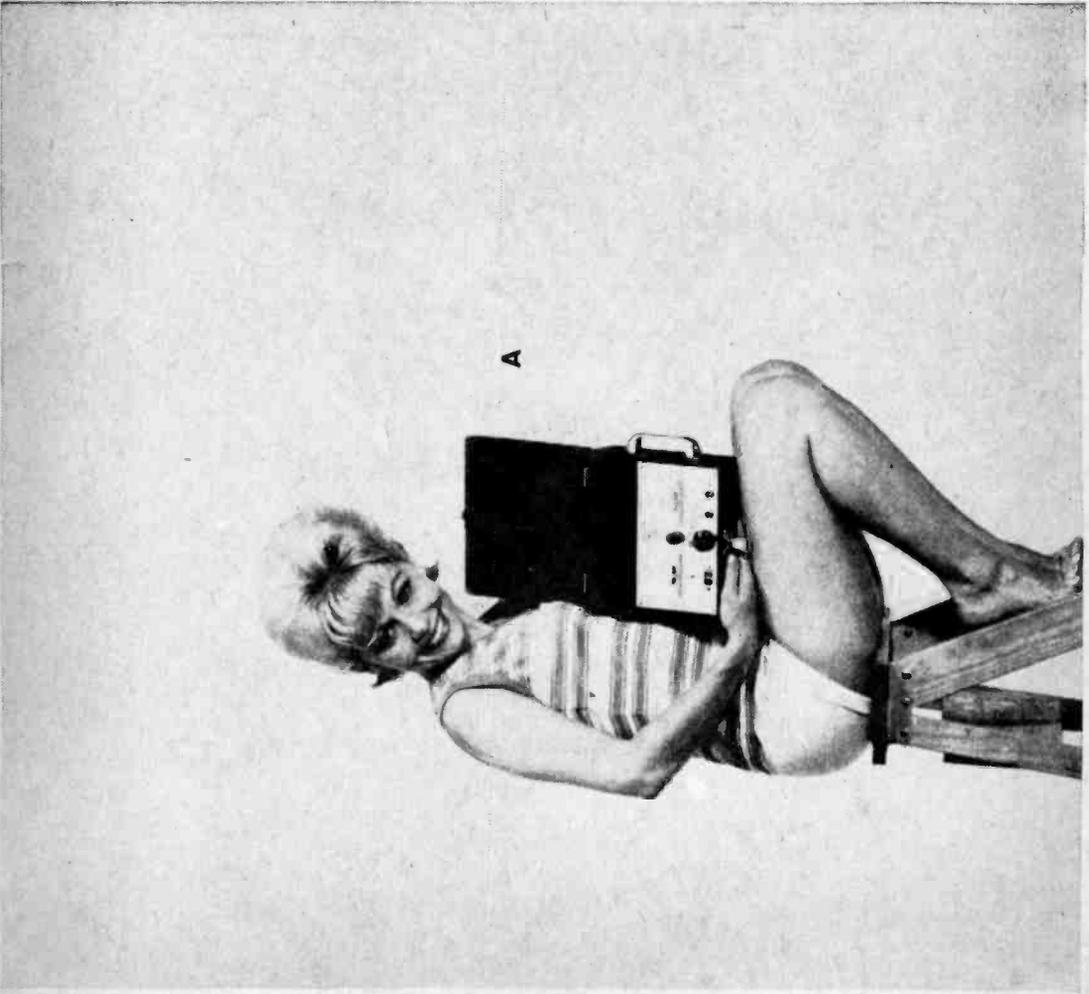
There are kits today which cover every conceivable segment of electronics. You can build yourself all manner of hi-fi gear, even a thousand dollar electronic organ. Or you can whip together a depth finder for your boat, a clock-radio, a computer, a radio transceiver, a color TV set, or any of a num-

ber of pieces of test equipment which can be put to use in helping you to service radios, TV sets and other electronic gear. There are even kits available which are akin to chemistry sets in that they consist of a selection of components which can be assembled and disassembled into as many as 25 different circuits. The components are used over and over.

By now you may be saying to yourself, "That's all well and good, but I never could get one of those kits wired up, much less to work. Even with the 40 percent I saved, it would be faster to go out and buy a wired unit." Nobody is going to debate the fact that it is certainly faster to buy a wired unit, but you will get an argument from anyone who has built a recent vintage kit about the fact that you couldn't get it wired or working. Take it from one who has built his share of kits, if you can read and understand the English language, you won't be stumped by a kit, vintage of 1964.

Kit manufacturers, long used to hearing this common doubt from prospective kit

A. Conar model 200 appliance tester for troubleshooting nearly all household devices costs \$20.00. **B.** Conar model 230 signal tracer uses magic eye indicator, helps service all electronic equipment. Costs \$39.95 in kit form. **C.** Conar model 280 signal generator gives accuracy to 1 percent, costs \$24.95. **D.** EMC model 502 RF signal generator is extremely compact, is a natural for a service kit. Costs

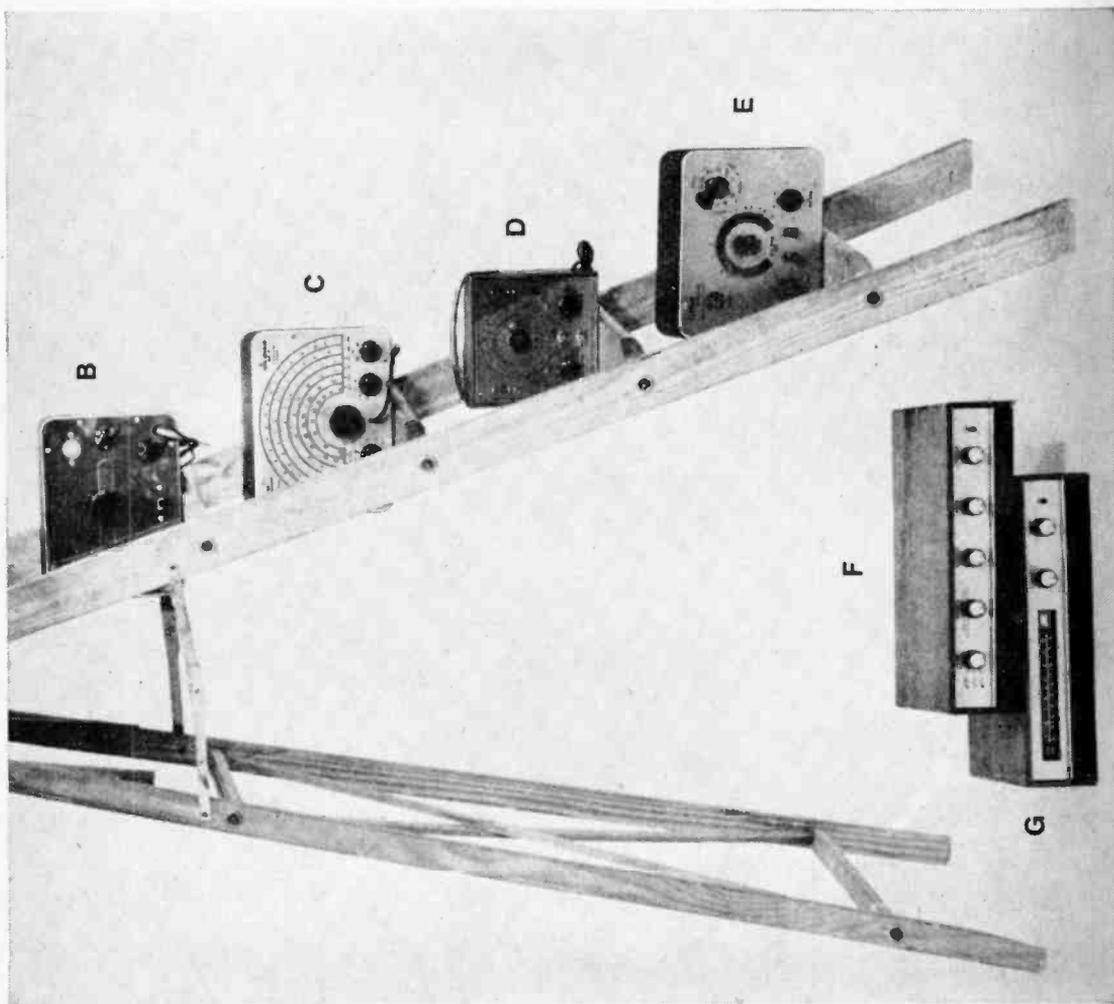


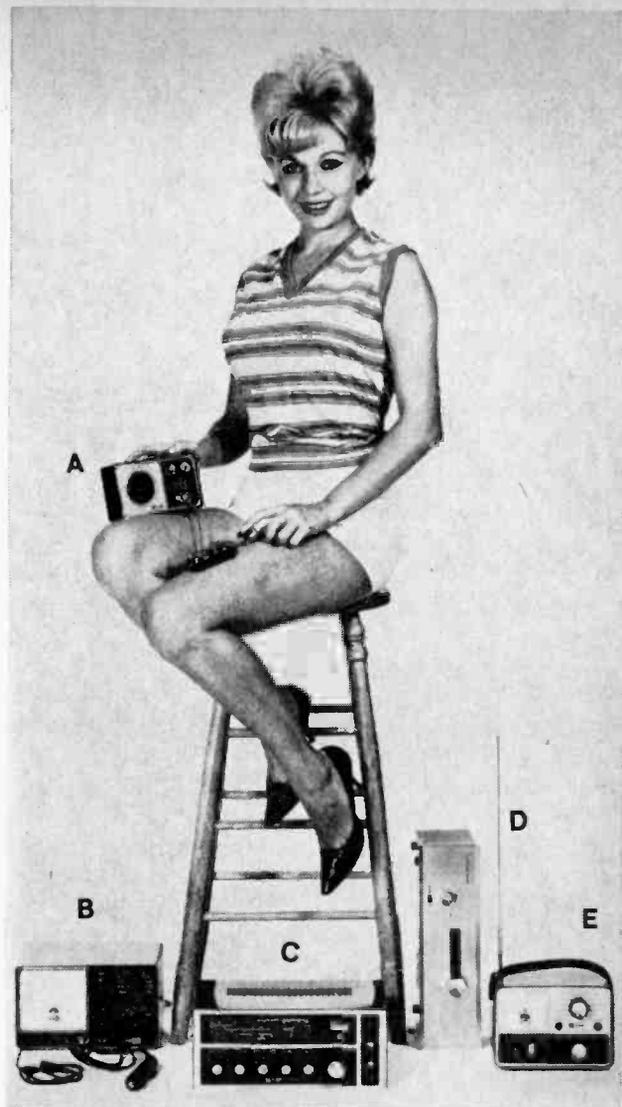
\$17.95 in kit form. E. Conar model 311 resistor-capacitor tester gives fast, accurate and reliable tests on all resistors and capacitors including in-circuit tests. \$21.95 in kit form. F. & G. A fine pair of hi-fi's are shown in the Heath model AA-21 amplifier kit, and the AJ-33 FM-AM tuner kit. The tuner and amplifier are all-transistor units, and are "lowboy" styled in walnut. Each kit is priced at \$99.95.

builders, have spent considerable time and research on the instruction manuals packed with the kits and also with the construction procedures for the kits.

Before a new kit goes on sale from any of the leading companies it has been built, rebuilt, checked, tested, criticized, completed and then built again by dozens of finicky staff members. Sample prototype kits are then sent out to people in all walks of life to get their reactions. They build the kits and then send detailed reports on the kit and its instruction manual. Nothing is left to chance and the kit is not placed on sale until *everybody* involved is satisfied that the kit works and is able to be *easily* constructed from the instructions provided.

As an added protection for their customers, kit manufacturers provide a free consultation service to help builders of their kits over any spots which might *still* not be clearly stated to an individual builder. The manufacturer is extremely courteous and patient in this respect as he wants the builder to be satisfied with his kits.





A. A Knight-Kit (Allied Radio) transistor code oscillator, \$7.95. **B.** Knight-Kit "10-2" CB Tester, \$25.95. **C.** Knight-Kit "Star-Roader" SW Receiver, \$39.95. **D.** Dynakit FM-3 stereo multiplex tuner kit, \$98.95. **E.** Lafayette model 174 vacuum tube volt meter kit, \$44.50.

The only things you will need to construct most electronic kits are: pliers, wire cutters, a screw driver, a soldering gun or iron, and some solder. The kit comes with everything else, including all necessary wires, a punched chassis, switches, tubes or transistors, a cabinet, and all resistors, capacitors, and other components. Some even have the solder.

Usually the resistors and capacitors are mounted on cards with the value of each individual component clearly indicated to reduce any possibility of your putting the wrong component into the wrong part of the circuit.

The instruction manual will show you, in both schematic diagrams and progressive pictorial wiring illustrations, just how the piece of equipment is supposed to look during each stage of its construction. The instructions themselves are usually in step-by-step fashion, with color codes used where possible to provide for maximum identification of the various circuits in a particular piece of equipment. The manual will also explain, in detail, how to solder correctly. Many manuals also discuss the electronic theory of the circuits.

The thought occurs that you may be ask-

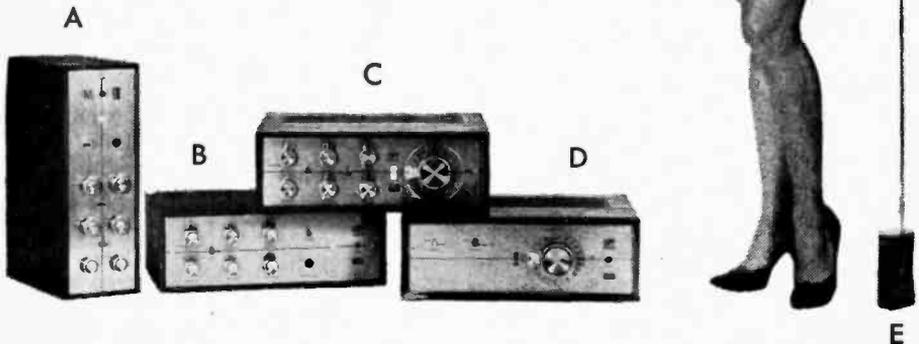
ing yourself, "How long does it take to build a kit?" Well the answer depends on several variables such as the nature of the kit, the experience of the builder, and the time-per-day spent on construction.

Some small kits can be finished off in less than an hour, some big kits may take weeks. Actually it's a peculiar question to ask because kit building is relaxing and is a worthwhile way of spending your time. You wouldn't ask how long it takes to read a book or listen to a symphony. Think of a kit as an equal form of relaxation.

Many kits which might at first look like lifetime projects offer unexpected shortcuts. These include printed circuit boards which contain a great deal of the circuitry, pre-wired on the board. It is then necessary to place the board on the chassis, wire it into place and add a few components by "point-to-point" wiring to complete the unit.

Admittedly, 1964's kits are a far cry from kits of yesteryear which were a challenge to even the most solder hardened builder. The only complaint common among kit builders is that "putting kits together is downright habit forming, building one is like trying to eat only one peanut." ■

A. EICO's new classic series is wrapped in a two-tone panel. Model 2036 is a 36-watt stereo amplifier, \$74.95. B. Twin is model 2050, a 50-watt unit at \$92.50. C. EICO classic stereo FM receiver with 36 watts amplification, \$154.95. D. EICO model 2200 classic series FM tuner sells for \$92.50. E. A popular item: Knight-Kit C-100 walkie-talkie, \$9.95 ea.



The Manure Battery

By Robert Hertzberg

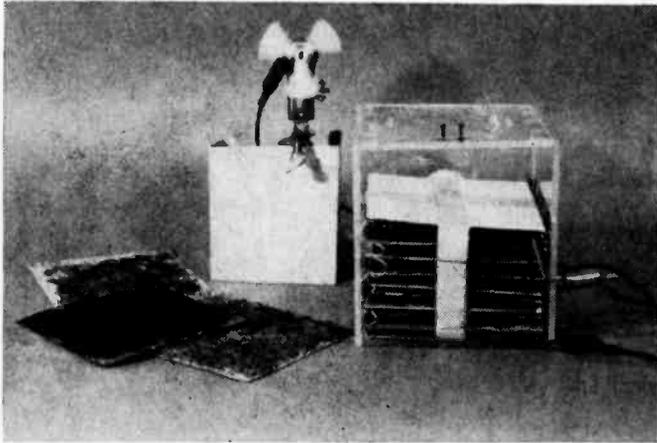
AN extremely cheap and simple battery, using cow manure as the active electrolyte in combination with scrap pieces of common roofing metals, promises to solve the problem of powering transistor radios for large masses of people in India who are now virtually cut off from the outside world. Called a "bio-galvanic" cell, it is under development in the General Electric Space Technology Center in Valley Forge, Pa., where it has already demonstrated its potential by running a miniature electric fan and other small-current devices for hours at a time. Measured outputs as high as two milliwatts, considered more than adequate for transistor purposes, are being obtained from experimental models, according to reports.

Because cows in many areas of India are treated as sacred animals and are allowed to roam everywhere unmolested, their droppings are available in almost unlimited quantity for reactivation of batteries when the latter run down. The latent energy in the chemical-rich manure is very high, according to John J. Konikoff, manager of the Physical Biology Operation at the GE Center where the research is being carried on.

In its present form the cell is merely a wooden box, measuring about six inches on each side, in which alternating plates of copper and galvanized sheet iron are mounted

with each plate separated a fraction of an inch from the others above and below. When the manure is added, the electrolytic action starts immediately and current is produced.

As in conventional batteries using more sophisticated materials, the damp electrolyte eventually becomes exhausted and the plates are finally eaten away. However, very long life of the bio-chemical cell is expected because at the low current drain of transistor sets the eroding action is relatively slow. It



SCRAP METAL plates covered with cow manure provide enough current to operate a miniature fan when properly hooked up.

is felt that, in normal service in a country like India, a battery will accommodate repeated "chargings" with fresh manure long before the plates wear through.

Cow manure lends itself conveniently for this unusual purpose because its odor is comparatively mild. The possibilities of other animal feces and compost piles are also being investigated. ■

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.

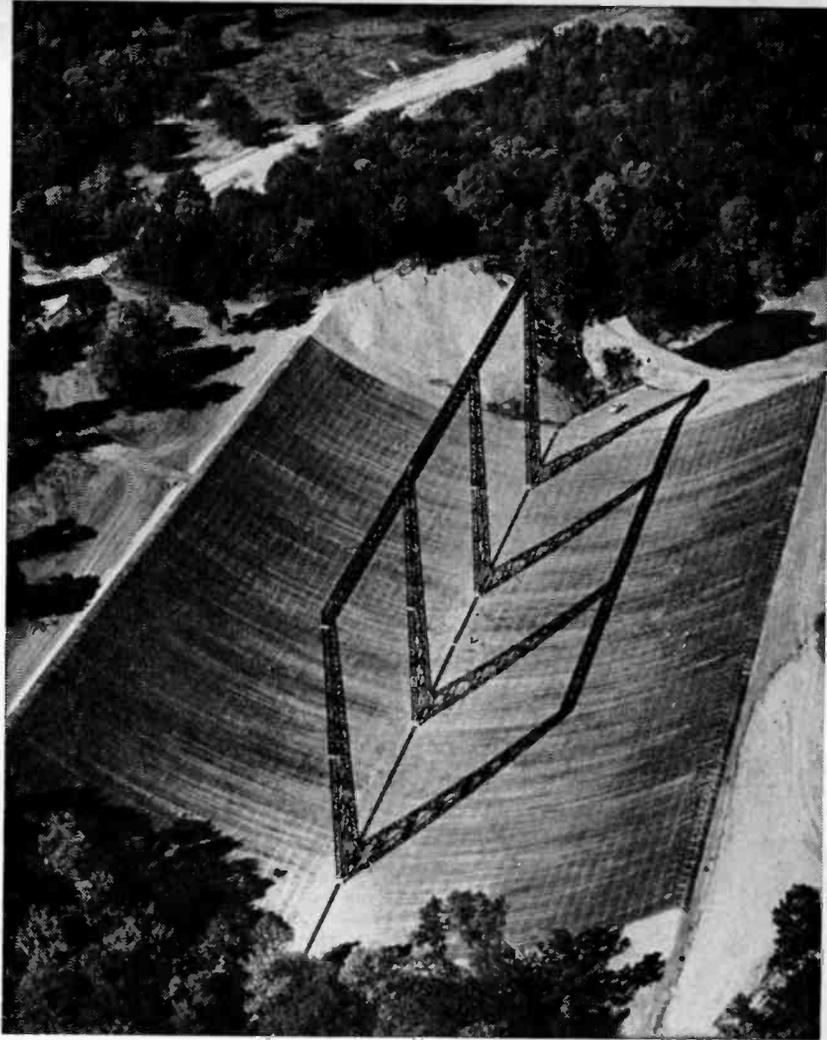
Send postcard for free illustrated book today! Specify home training or classroom training!

RCA INSTITUTES, INC., Dept. RX-24
A Service of Radio Corporation of America
350 West 4th St., New York, N. Y. 10014



THE MOST TRUSTED NAME IN ELECTRONICS

ASTRO- EARS for DX-ing



A radio telescope made
in a 5-acre ravine is scanning
the heavens to tell
us about the distant
galaxies in outer space

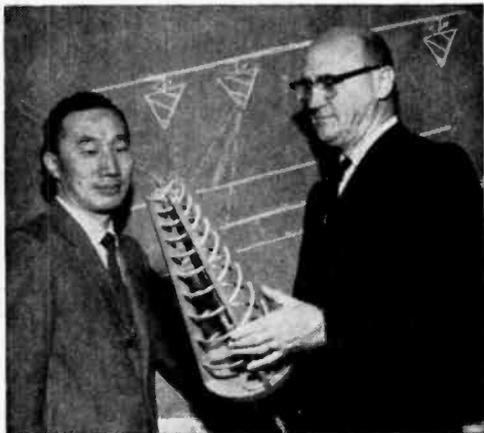
By Don Arthur Torgersen

SOMEWHERE at a secluded site in central Illinois, a gigantic astro-ear is listening to the universe—recording what the stars have to tell us. Is the universe flying to pieces? What happened to Andromeda, the great galaxy, one million years ago? How will the activity of the expanding universe affect our earth? These are some of the mysteries that the newly developed radio telescope at the University of Illinois' Vermilion River project will attempt to probe.

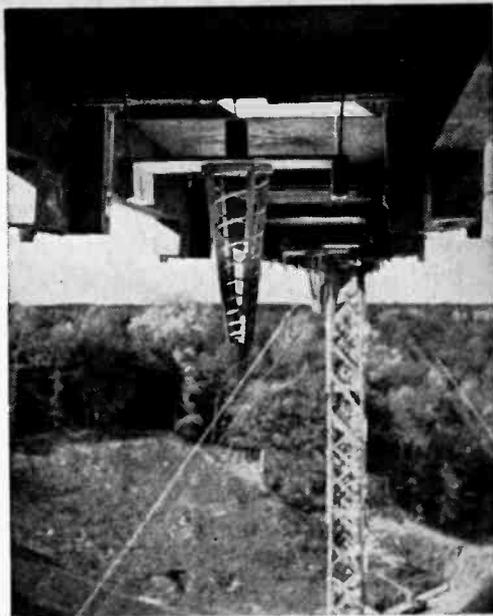
Construction of this giant astro-ear was a phenomenal event in itself. One might say that the engineers took pragmatic advantage of the earth's own face. To dig a hole of the necessary size in flat country would have required moving 150,000 cu. yds. of earth and posed a difficult drainage problem. The obvious solution was to utilize a natural depression in the ground to save on earth moving and to provide ready-made drainage. Such a site was found in a ravine leading to the Vermilion River about five miles southwest of Danville, Illinois, it is out of the way of busy highways, power lines, radio and television stations, and other man-made sources of radio interference.

To get the contours, 50,000 cu. yds. of earth had to be removed from the ravine.

The design of the radio telescope represents the combined efforts of astronomy and electrical engineering and the minds of such men as George C. McVittie, Edward C. Jordan, and George W. Swenson, all professors at the University of Illinois. The project was financed primarily by the Office of Naval Research, and partially by the National Science Foundation and University funds. Similar projects are operating at Cornell University, University of Michigan, University of California and California Institute of Technology.



Professors Lo and Dyson combined efforts to develop the astro-ear's spiral-like antenna.



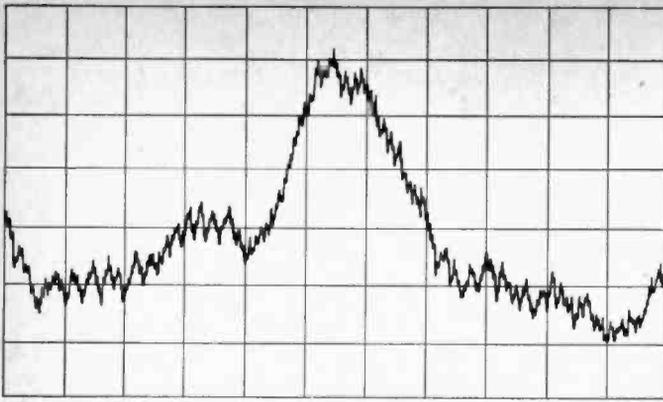
Signals from outer space reflect off the curved ground up to the 276 spiral-like antennas.

The natural stream was straightened and now flows through a concrete channel along the center line of the reflector. Storage capacity for flash floods was provided by building two dams upstream.

The massive reflector is 600 ft. long and 400 ft. wide. The surface of the earth is covered with asphalt liner, a material similar to very thick roofing felt. The reflector itself consists of 2x2-in. galvanized wire mesh, stapled to the asphalt liner and with successive rolls crimped to one another so that each half of the reflector forms a continuous electrical surface, accurate to within 1 in. of a perfect parabolic cylinder. This radio mirror concentrates incoming signals onto a line 153 ft. above the bottom of the reflector.

Here 276 antennas are attached to the underside of a wooden truss 425 ft. long, 10 ft. high, and 4 ft. wide. The truss is carried on four wooden towers which are self-supporting in the north-south direction and guyed east and west. Wood was selected in order to minimize the electrical interference that metal towers would have produced. When it was found that many bolts were necessarily about one wave length long, they were also made of wood instead of metal.

An array of logarithmic spiral antennas



Graphic record of radio signals received by the astro-ear during an 11-hour period. Signal peak is due to broad complex of radio sources located in constellation Cygnus.

was developed at the university. By combining variable spacing and coupling of the antennas to the receiver, a well-concentrated, main beam 15 minutes of an arc wide is obtained. This means that the radio-telescope is largely free of one of the main problems that have limited radio scopes of the past—it can receive and record signals coming in from more than one direction at once.

The receiver operates at 611 megacycles, and can detect signals emanating from sources billions of light years away. It is said to be ten trillion times as sensitive as a good television set, and infinitely more valuable.

The receiver utilizes a low-noise amplifier backed up by a radiometer. A semiconductor switch connects the receiver in rapid alternation with the many antennas and with a standard source of electrical noise to measure the difference between these sources. This difference is recorded graphically. Eventually

the recording will be punched out on paper tape to be processed by a digital computer.

The first observational program underway for the astro-ear is a survey of radio sources in the accessible part of the northern sky—that part which crosses the north-south line between 10° and 70° above the southern horizon. To do this, each antenna is mechanically turned once a day to aim the beam that sweeps the heavens as the earth rotates. Allowing for overlap between successive scans and possible re-runs necessitated by man-made radio interference, the task is expected to take five years.

Is it true that radio sources in the past were more numerous than they are now? Do they die out? If so, what causes them to do so? What will this tell us about the life expectancy of our own solar system? Undoubtedly the big astro-ear at Vermillion will prove invaluable as it probes into the deeper mysteries and nature of the universe. ■

THE FIGHT FOR A CHANNEL

The University of Illinois has located its radio-telescope at a remote site in order to prevent interference from such accidental sources as neon signs, fluorescent lighting, ignition systems, and electric machinery and high-voltage fences. However, the new radio telescope can be jammed by transmitters broadcasting on channel 37 of the ultra high frequency television band (UHF-TV). At present there are no television transmitters operating on this channel within several hundred miles of the project, but there is no assurance that this favorable situation will continue.

The radio-telescope is necessarily so sensitive that a television transmitter 1000

miles away could easily jam it completely. Even a man-made satellite or the moon could reflect a television signal broadcast on the other side of the earth and be mistaken for a cosmic radio source. The reason for operating on the channel 37 was not a matter of choice. The telescope had to operate somewhere in a broad band between 200 and 1000 megacycles. Virtually all of these frequencies are assigned either to the military or to broadcasters.

This past fall, 1963, the Federal Communications Commission has reserved channel 37 frequencies exclusively for radio-telescope explorations up to 1974. Until then, science may investigate signals from space.



**Minor Modifications to Perigee
R/C Champion Plane Make it
Possible to Fit Sampey 404
Proportional Controls for
1-stick Flying
Just Like A Real Plane**

FLY THE R/C CHAMP

By Tom Drake

FANTASTIC. The "kick" that tops them all. That's Tom Brett's World Championship Radio Control Perigee with fully proportional radio controls.

Built from a kit put out by DeBolt Engineering Co., the 61-in. wingspan model plane is an exact duplicate of the design which won the famous King of the Belgians Cup for Tom Brett in 1962. The radio

control unit used is the Sampey 404 Quad-Channel and power is from the Johnson .36 R/C engine with throttle control.

Radio controlled functions include infinitely variable engine speed, rudder, ailerons, elevators, wheel brakes, and steerable nose wheel. Fully simultaneous flight controls are augmented by transmitter trim knobs which make adjustments for roll,

yaw, and pitch channels while airborne. Receivers are available in super-regenerative or superheterodyne models. The latter costs \$22 more, but offers far greater sensitivity and selectivity.

Just what is proportional control? How does it differ from "reeds"? While the typical reed system transmitter has four sticks or push buttons plus engine control, the fully proportional Sampey has only one control stick plus an engine control knob. Reeds give an all-or-nothing servo action and so require skilled "pulsing" to make smooth maneuvers.

With proportional radio control, you can move the single stick in any direction to combine primary controls in infinite combinations just as you can in a real airplane.

Airborne System. The Quad-Channel 404-S receiver and three closed-loop (Steeb) servos for motor, rudder, and elevator control are shown in Fig. 2. Mount the receiver vertically against the forward bulkhead and nest it in foam rubber or plastic (not shown) for shock protection in case of a rough landing. Mount switch on fuselage side away from exhaust.

For details of cabin area see Figs. 2 and 3. Mount the 37-hole power junction socket in servo board (Fig. 3, B). Use 6-pin connectors to plug in the power converter (Fig. 4, A), receiver (Fig. 2, A), and servo cables (Figs. 2 and 3). Cut a slot in the forward bulkhead (Fig. 3, H) to pass cable to power converter (Fig. 4, A) located in the nose compartment under the fuel tank. Pack nose under fuel tank with shock absorbing foam rubber. (Modifications to kit eliminate bulkhead #3 which is replaced by a $\frac{3}{16}$ -in. sheet balsa bulkhead in front of converter and call for nylon control horns.)

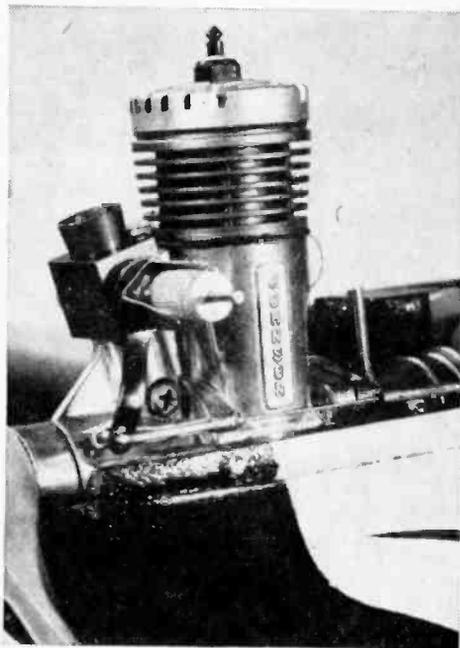
Make servo board from $\frac{1}{8}$ -in. rather than $\frac{3}{32}$ -in. plywood to save weight. Attach servos to board with 2-56 bolts and stop nuts. Install removable board to hardwood corner runners (Fig. 3, J) with six #4 wood screws or 2-56 bolts and DuBro blind nuts. Make sure servos operate smoothly without any pushrod binding to insure faithful tracking. Also see to it that servos can rotate 360° to protect servo amplifiers if power is applied with receiver not plugged in. This can make the servos whirl like dervishes.

The jackshaft (see drawing and Fig. 2,

F) provides easy adjustment to rudder and nose wheel steering. It also reduces nose wheel action and absorbs shock to protect rudder servo. Make linkage between jackshaft and servo from .045 steel wire.

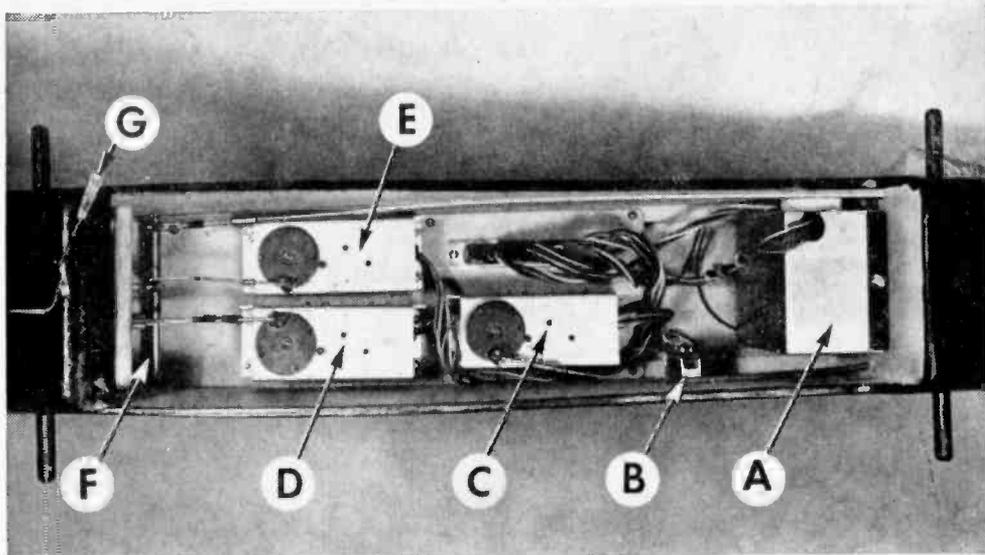
DuBro wheel brakes on the main wheels are actuated by 20-lb. Dacron line to slow model after landing. Nylon guide (Fig. 6, C) is from fishing tackle shop. Wire-wrap and solder the $\frac{3}{32}$ -in. brass tubing guides to landing gear struts. Modify Kwik-link (Fig. 6, B) by flattening end and drilling $\frac{1}{16}$ -in. hole for flexible cable to permit brake adjustments. The other end of the cable attaches to snap swivel which hooks into the elevator pushrod to operate brakes in conjunction with down-elevator control. Solder keeper. Bend $\frac{3}{32}$ -in. brass tubing guide 180° to take pull-line (Fig. 6, F) through fuselage bottom.

Make motor control pushrod from $\frac{1}{2}$ -in. steel wire. Slop in $\frac{3}{32}$ -in. brass tube guide. Prevents bind caused by slight S-bend in wire between bottom and top of fuselage. Slide pieces of $\frac{1}{16}$ -in. brass tube, bent at right angles, over wire ends and solder. Fit to servo and throttle linkages with safety wire keepers.



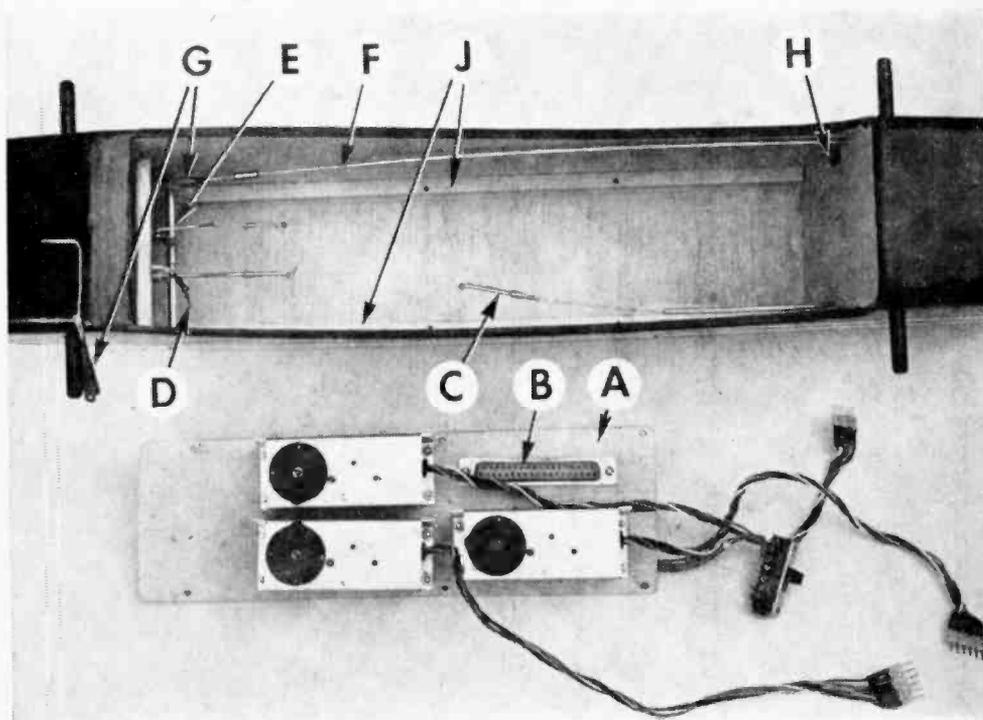
1: Johnson Automix throttle action: pushrod moves throttle fore and aft according to servo setting.

Sampey 404 Proportional Control for Perigee Champion Radio Controlled Model



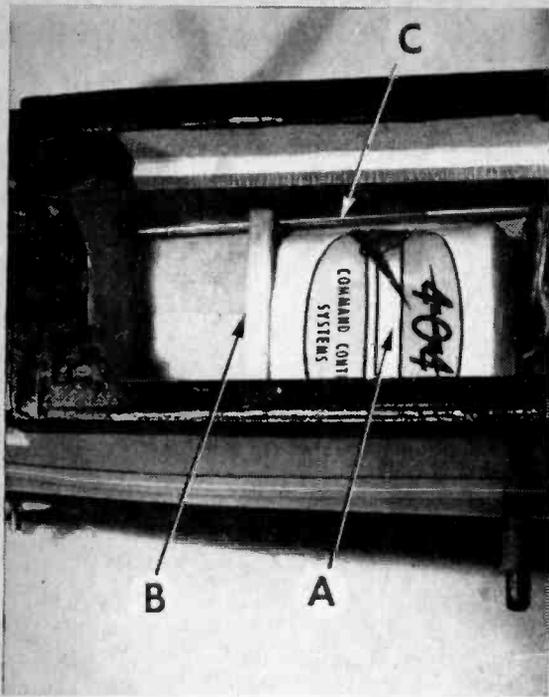
2: Receiver and servos mount neatly with good accessibility above the wing cutout. A—Receiver, B—Knife-action slide switch, C—Motor control servo,

D—Elevator servo, E—Rudder servo, F—Jackshaft, G—Kwik-link for attaching pull-line to brake harness which operates brakes at full down elevator.

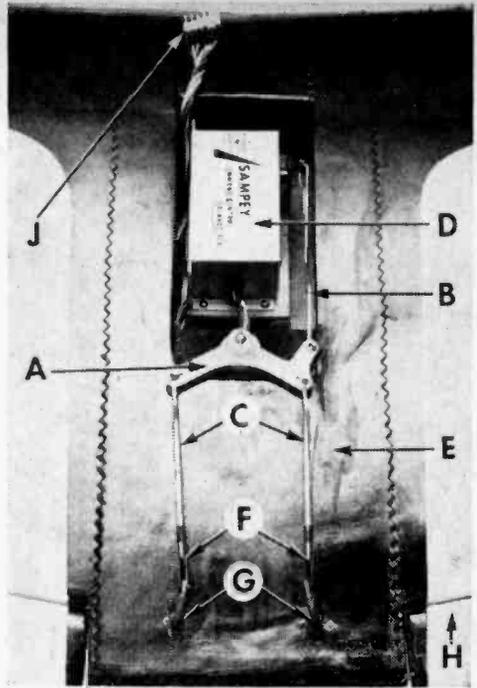


3: A— $\frac{1}{16}$ in. servo board, B—37-pin socket, C—Servo end of motor control pushrod, D—Snap-on swivel at brake pull-line on elevator pushrod, E—Jack

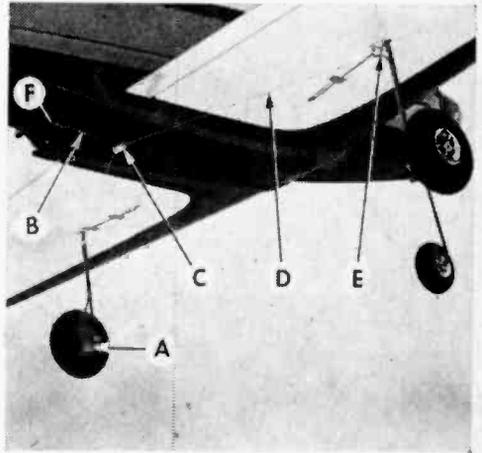
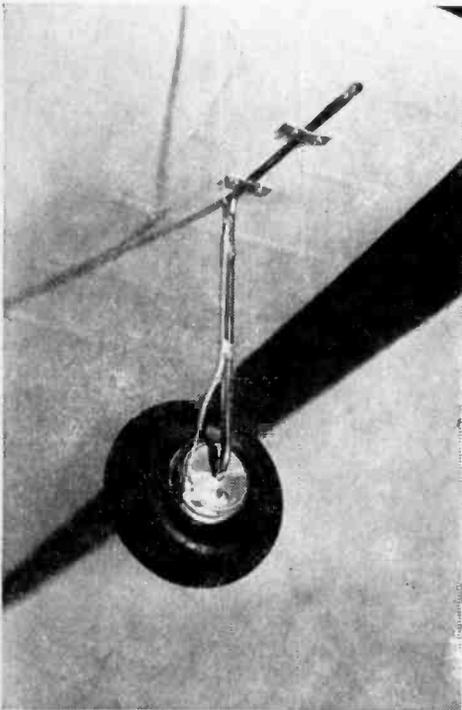
shaft, F—Steering pushrod to nose wheel, G—Kwik-link adjustable attachments, H—Power converter cable slot, J—Hardwood runner of servo board mount.



4: Power converter mounts in bottom of nose compartment just behind engine. A—Sampey 404 power converter, B— $\frac{3}{16}$ in. sheet balsa retainer bulkhead, C—Forward section of steerable nose wheel pushrod.

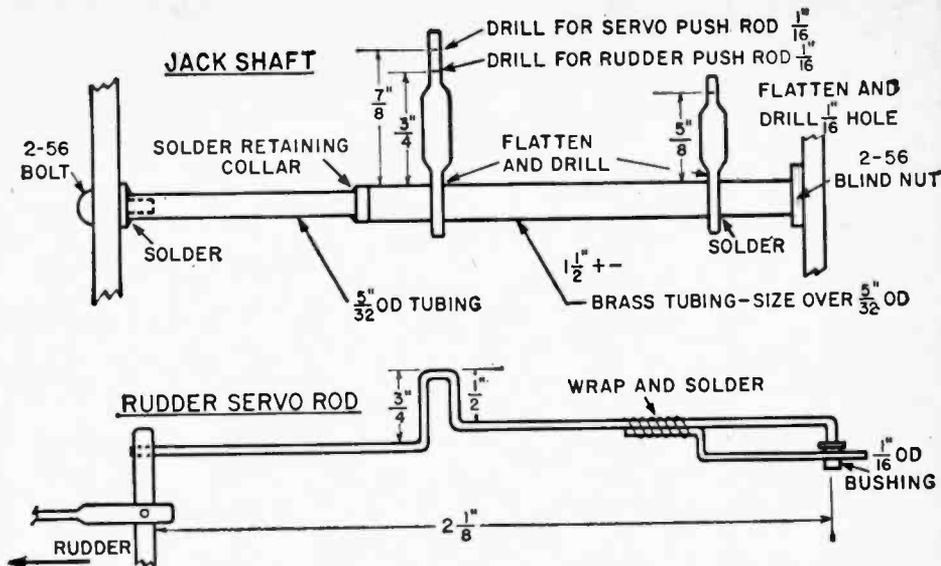


5: Aileron servo under wing center: A— 120° nylon bellcrank, B—pushrod, C—pushrods to nylon control horns G, D—servo, E—fiber glass wing reinforcement, F—kwik-links, H—strip aileron, J—plug connector.



6: Brake system: A—Du-Bro drum brake, B—Kwik-link for brake adjustment, C—nylon guide yoke, D—20-lb. test Dacron harness, E—brass tubing guide for line to brake, F—brass tubing guide to control.

7: Landing gear and wheel brake. Metal brackets bolt strut to plywood inside wing. Down-elevator movement pulls on Dacron line through metal tubing wire-wrapped and soldered to strut to actuate brake.



Steering pushrod is .045-in. wire in 5/32-in. brass tube guide. Bend wire end up at right angles after slipping through hole in horn at gear. Solder on retaining eyelet at horn. Secure aft end to jackshaft with Kwik-link.

Cut rudder and elevator pushrods from 5/16-in. dowels attaching 1/16-in. wire end on rudder rod at servo end. Kwik-link at horn. Slip wire through rudder control horn, bend wire 90°, and install 1/32-in. wire

keeper. Kwik-link holds jackshaft end. Adjustment is by clevis at jackshaft.

Aileron controls (Fig. 5) use servo attached to 5/32-in. ply platform under wing center section by 2-56 bolts in blind nuts. Use Top Flite 120° bellcrank. Pushrod to bellcrank is 1/16-in. wire with 1/32-in. wire keeper. Retain control rods with soldered eyelets.

For a pretty, tough finish, use Hobby-poxy according to makers directions. ■

MATERIALS LIST: PERIGEE WITH SAMPEY 404 PROPORTIONAL RADIO

No. Req.	Description	Use	Price
1	Perigee airplane kit. deBolt Model Engineering Co., 3833 Harlem Rd., Buffalo 15, N. Y.	Model	\$ 24.95
1	Model 404-S Quad-Channel transmitter. Sampey & Co., 633 N. Lake Barton Rd., Orlando, Fla.	Model Control	169.95
1	Model 404-S Quad-Channel receiver. Sampey & Co.		134.95
1	Model 404 power converter, Sampey & Co.	Model Control	49.95
4	Model 404 (Steeb) servos, Sampey & Co.	Surface Controls	(each) 38.95
1	Johnson .36 R/C Auto-Mix throttle, Dynamic Models, Inc., 13755 Saticoy St., Van Nuys, Calif.	Engine	29.95
1	set DuBro brakes, DuBro Products, 8121 N. Olcott Ave., Niles 48, Ill.	Wheel brakes	7.95
1 pr.	DuBro wheels, 2 3/4 in. also 1 nose wheel 1 3/4.	Landing gear	6.70

DuBro Kwik-links as required for connections.

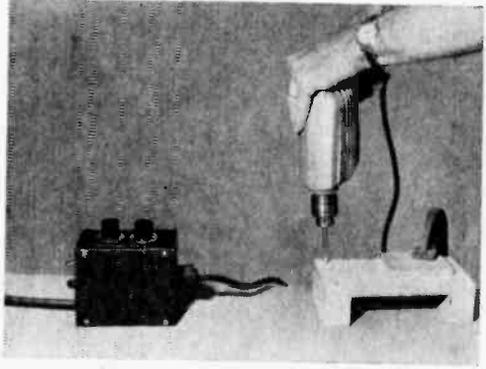
Paints and finishes: Hobbypoxy Pettit Paint Co., Belleville, N. J.

All above materials may be ordered direct from makers, all good hobby stores, or Lee's Hobby Distributors, 2072 Front St., East Meadow, N. Y.

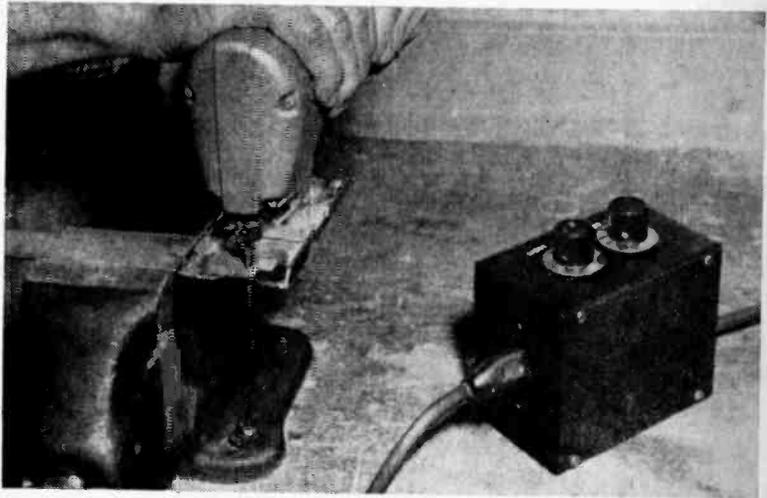


1

Four unusual applications for power tools that are made possible by the Speed Control. 1, Drilling holes in plastic at low speeds to avoid softening due to heat; 2, Using your power drill as a power screwdriver; 3, Slowing down the rated 3000 strokes per minute of a saber saw to cut steel; 4, Operating a circular saw at 500-800 rpm to cut asbestos-cement (Transite) board and plaster board.

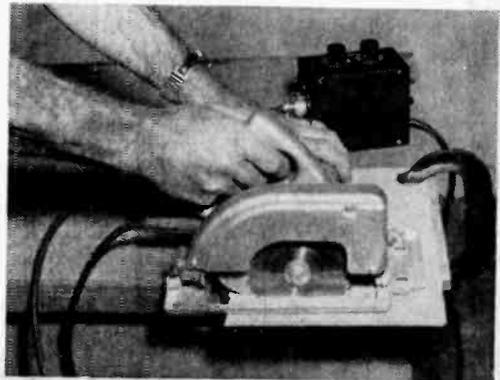


2



3

SPEED CONTROL FOR PORTABLE POWER TOOLS



4

REDUCING the normal speed of power tools having universal motors is often desirable to adapt them to load conditions. A series resistance to drop the AC line voltage will reduce the power tool's speed but unfortunately the torque is lost. Also, it is not possible to maintain the speed with varying load conditions.

A simple speed control unit can be built that will provide speeds down to a very low level with no appreciable loss in torque. Parts cost about \$7.50, but price drops if common parts are in stock in your workshop.

The circuit of this interesting speed control unit was first designed by the General Electric Company, Rectifier Components Department, Auburn, New York.

The circuit. The counter E.M.F. of the motor power tool's armature is used as a motor-speed feedback signal to maintain essentially constant speed characteristics with various torque requirements. As the speed

Silicon controlled rectifier slows down your power tool to usable speeds without sacrificing torque

By Harold P. Strand

of the motor tends to decrease with load, thus decreasing the counter E.M.F. of the motor armature, the sine wave "pot" voltage causes current to flow into the silicon controlled rectifier (SCR) gate earlier in the cycle. The SCR is triggered earlier and additional voltage is applied to the armature to compensate for the increased load and to maintain the pre-set speed.

Uses. A 3/8-inch portable drill being used with the control to make some holes in thick plastic in the top photo on page 102. At the usual high drill speed this material has a tendency to soften due to frictional

heat and sometimes the drill will become anchored in a deep hole as the material melts around it. Using a much lower speed will help to eliminate this condition. In either case, a coolant should be used when drilling plastic which can be water with a little liquid soap added.

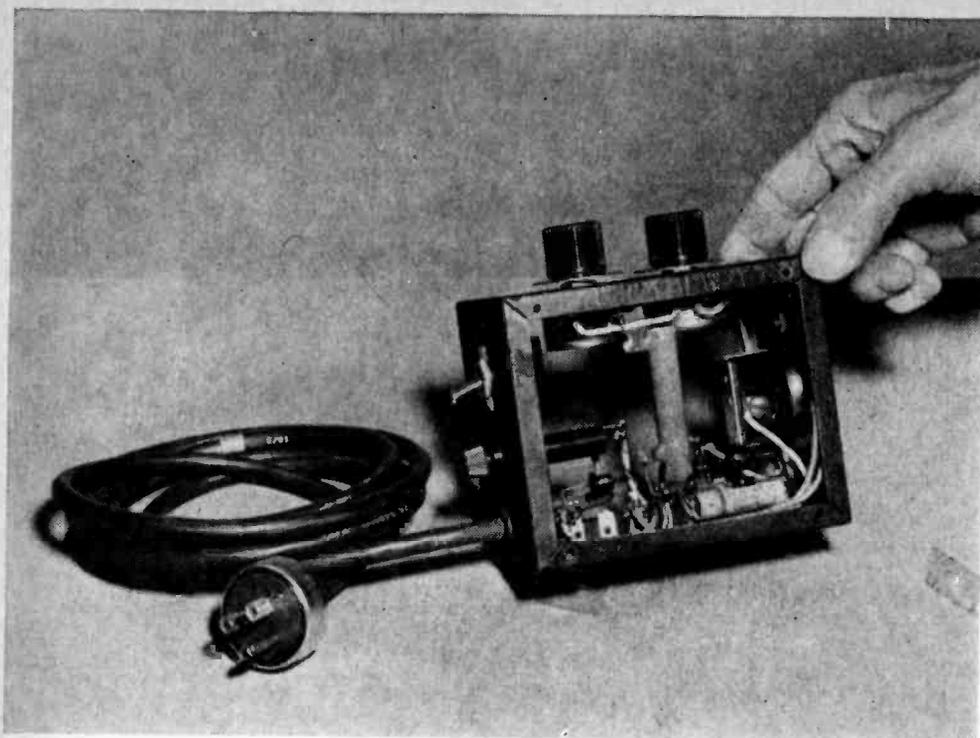
A demonstration of the strong torque possible at low speeds is shown in photo next to top where a screwdriver bit has been placed in the chuck and the tool is being used as a power screwdriver. Screws can be driven into wood easily without any pilot holes.

A small saber saw being employed as a power hacksaw to cut off a piece of 1/8-inch steel in photo next to bottom. The speed of the tool has been reduced to give about 60 strokes of the blade a minute or as required. A fine-tooth, metal-cutting blade is used in the chuck. Applying light pressure and using some oil at the cut, it works very well. You can imagine trying this at the normal speed of around 3000 strokes a minute. Sheet metal can also be cut in a similar manner if care is taken to feed the blade slowly.

A portable circular saw is another good subject for the control where such materials as Bakelite, plastic and asbestos-cement board (Transite) has to be cut. The latter is a very difficult material to cut except with special cut-off wheels in a table saw. Bottom photo shows a cut being made quite successfully with a 4-inch blade turning at about 500-800 rpm.

Connection. The tool cords simply plug into a receptacle at the side of the speed control unit. Two controls are provided on the top of the box for adjusting the speed and a toggle switch allows the drill to be operated at its normal full speed when this is desired. The line cord and a fuse holder are located on one end of the box with the switch, and a receptacle is at the other end. A three-wire cord and plug are used for the line connections for properly grounding the tool that plugs into a three-wire receptacle. This safety grounding employs the third wire in the cords as a ground conductor to eliminate the possibility of receiving a shock from the tool under conditions where leakage current to the frame of the tool, due to defective insulation, would otherwise present danger to the operator.

Putting it together. The diagrams show all parts and connections which should be easy to follow. A small black crackle 3" x 5" x 4" box is used to house the parts and



Parts for the speed control are mounted on the top, bottom and two sides of the steel

box. Removable sides should be installed when the device is put into use.

the required holes are drilled. The parts are assembled in the box and wired, making soldered joints to all terminals. A convenient terminal strip is provided in the bottom of the box for the diodes D1 and D2, resistor R4 and capacitor C1 as well as terminal points for some of the wire connections and one end of the resistor R1. The SCR device must be mounted on a heat sink which is a piece of sheet aluminum bent up to provide clearance for the center stud and secured at one end under a screw that holds the terminal strip so as to make firm contact with the box. The insulation kit supplied with the SCR should be used for attaching the rectifier to the heat sink.

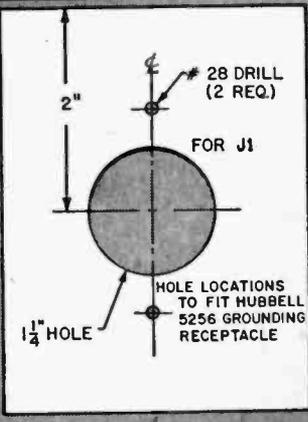
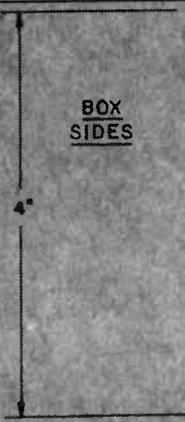
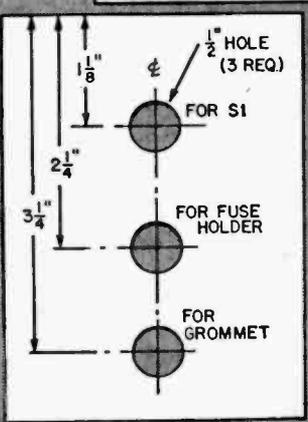
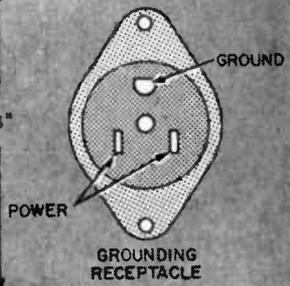
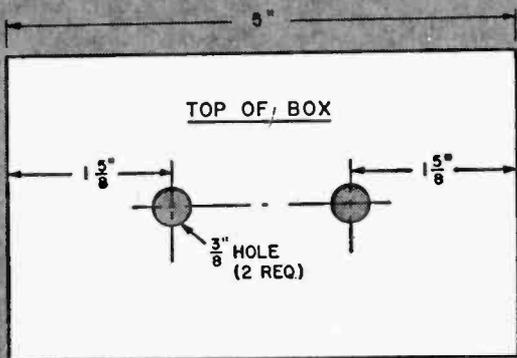
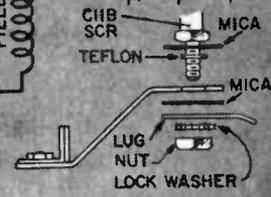
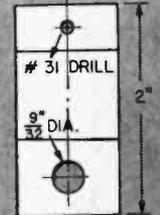
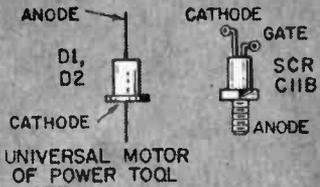
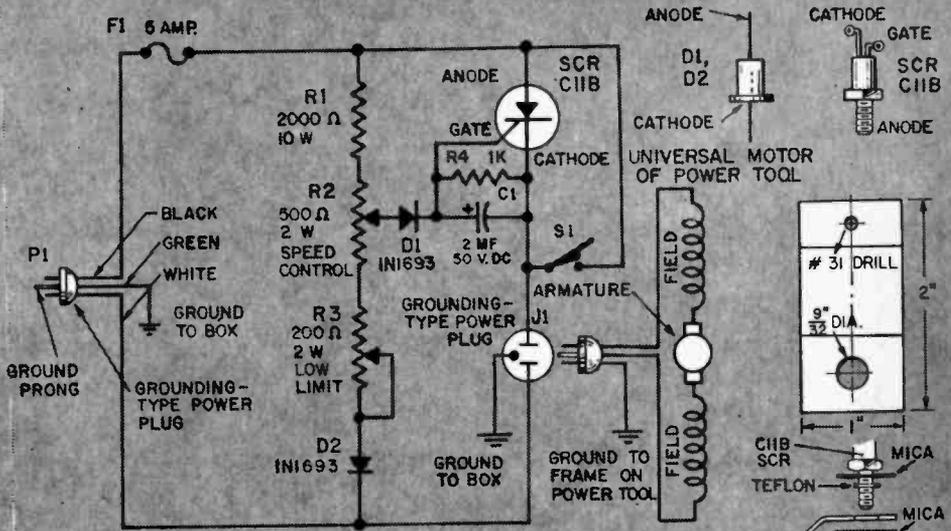
The silicon controlled rectifier used here is a C11B which has a rating of 6 amperes at a maximum temperature at the stud of 70 degrees C. A lower cost C15B could be substituted if desired but a larger heat sink would be required since this one has a lower current rating.

In using this control on power tools, care should be taken to avoid prolonged use since the tools are not designed for low speed

-
- PARTS LIST
- C1—2-mf. 50-volt electrolytic capacitor
 - D1, D2—1N1693 diode (General Electric)
 - F1—5 amp. type 3AG fuse
 - J1—Receptacle grounding type with oval mounting flange (Hubbell type 5256 or equivalent)
 - P1—Plug, grounding type (Hubbell type 5654 or equivalent)
 - R1—2000-ohm 10-watt resistor
 - R2—500-ohm 2-watt wire-wound potent cometer
 - R3—200-ohm 2-watt wire-wound control
 - R4—1000-ohm 1/2-watt resistor
 - S1—toggle switch, s.p.s.t. rated at 6 amperes—125 volts or better
 - SCR—C11B silicon controlled rectifier (General Electric)
 - 1—3" x 5" x 4" steel box, black crackle finish (Bud CU-728)
 - 1—fuse holder for 3AG fuses (Littelfuse No. 342001)
 - Misc.—rubber grommet for 1/2" hole, terminal strip with 6 insulated tie points, 2 knobs (National HRS-4), 6-feet of No. 18 3-wire appliance cord, type SJ, hardware, etc.
- Estimated construction time: 3 hours
Estimated Cost: \$7.50
-

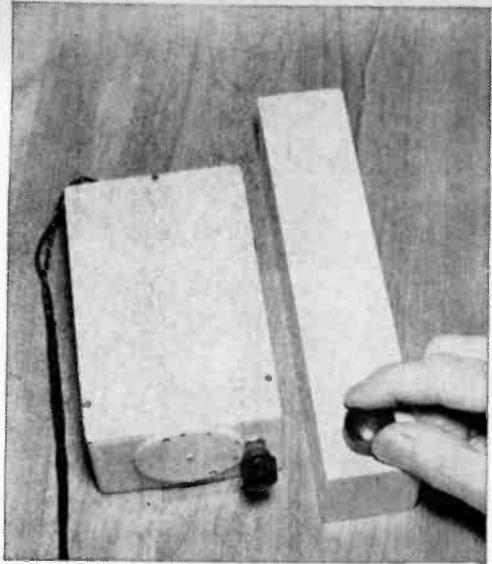
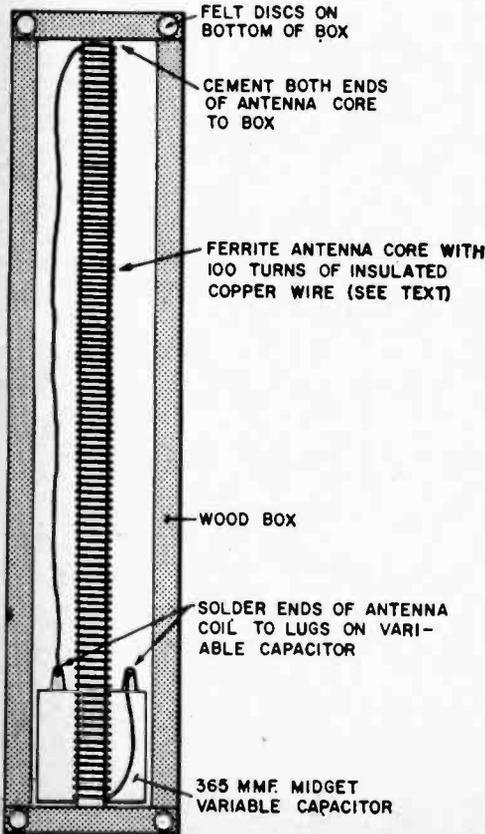
operation and may become damaged from overheating. This is mainly because their motors usually have a fan attached inside the motor on the shaft to provide cooling during operation which at low speeds cannot develop adequate ventilation. However, for intermittent use, there should be no problem. ■

SCHEMATIC DIAGRAM UNIVERSAL MOTOR SPEED CONTROL



Passive Booster for BCB DX-ing

By Art Trauffer



Passive booster (above right) helps pull in weak signals for AM broadcast tuner (left).

THE PASSIVE BOOSTER will greatly increase the sensitivity of 3- to 5-transistor portable radios as well as boost the input signals to 6 and 9 transistor radios and tube jobs. Many distant weak stations that you listen to for entertainment or DX'ing will pop in crisp and clear like the strong locals with this booster.

The booster's heart is a $7\frac{1}{2}$ " ferrite antenna core $\frac{1}{4}$ " in diameter. 100 turns of #24 enamelled cotton-covered wire are evenly spaced on the core and the ends are connected separately to the terminals on a midget 365 mmf. variable capacitor. This circuit is nothing more than a tunable "loop-stick" antenna covering the AM broadcast band. Both parts mount neatly in a wooden box fabricated for the project. Plastic or fiber material will do just as well.

The parts can be obtained from Lafayette Radio (part Nos. MS-331 for the core and MS-445 for the capacitor) or almost any parts supply house.

The passive booster (it gets its name because it has no amplifier and uses no power other than the signal's) is easy to use. First tune in a distant or weak station on the radio and rotate the radio until the signal is loudest. Now place the booster along side the radio with the booster's ferrite core parallel to the receiver's core. Tune the station on the booster for maximum signal. Now adjust the distance between the booster and receiver for optimum results. ■

FOR FOTO FANS



Maid For Your Meter

Look for fewer sad days in the darkroom once you start using this easily made unit to calibrate a lying little light meter

By Jan S. Paul

ONE of the more worrisome worries photographers worry about is whether their light meters (also known as exposure meters) are telling them the truth.

"Why in the world doesn't somebody come up with a decent light-meter testing device that doesn't cost like 17 Hasselblads—a gadget a guy could make himself?"

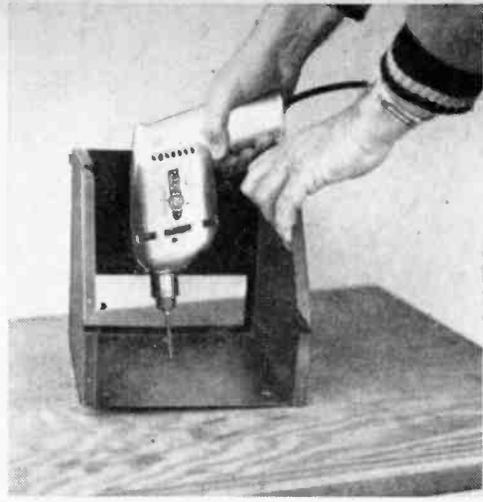
This explosion came from one of my more cantankerous fellow shutter-shovers the

other day after developing a roll of underexposed misbegottens that will never see the light of day because they didn't when they were shot. My friend blamed his hapless pictures on a lying light meter. So we checked it out at the local camera shop and sure enough it was off about 3 f-stops, enough to keep the shades drawn on any negative.

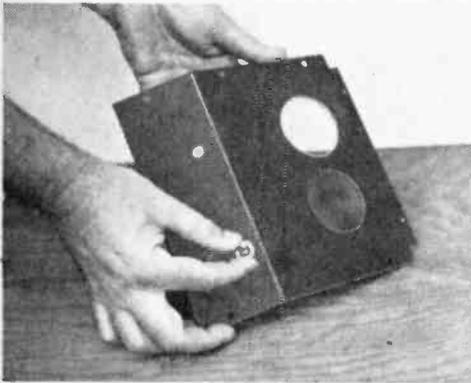
Leaving my brooding friend to his own devices (to repair light meter—cost \$15),



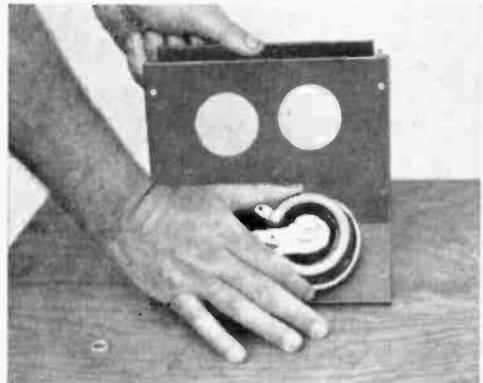
EXPANSION BIT is ideal for cutting the holes for the 4 different types of glass used in Meter Maid.



DRILL holes for the light socket. This must be set at a point to give equal lighting at the 4 holes.



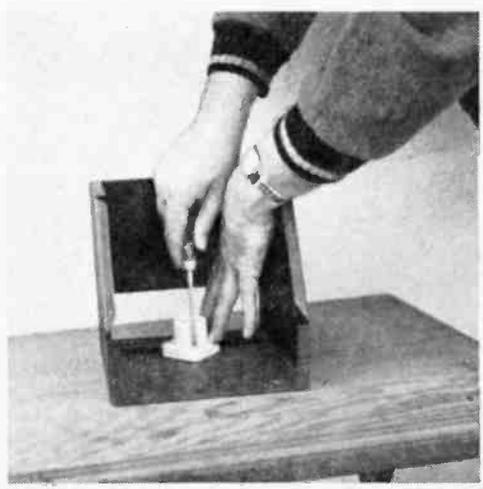
TOGGLE SWITCH (SPST) is located on lower panel at front of tester at same level as rheostat control.



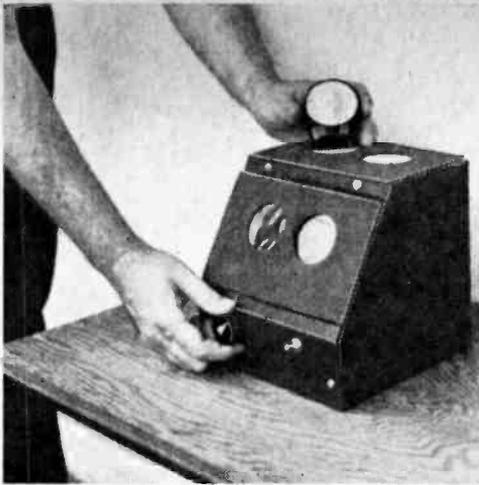
RHEOSTAT is mounted to back of lower panel. It is controlled by knob on numbered dial on panel front.



BRACKETS are cut from aluminum sheeting to serve as holders for glass. (An alternate installation.)



LIGHT SOCKET is screwed firmly in place only after determining best position for adequate illumination.



LIGHT METER of known accuracy and rheostat control are used to calibrate the unit's light intensity.

I retired to my basement shop with the germ of an idea which finally developed into the healthiest malady ever to afflict a crooked light meter.

The Meter Maid that resulted is reliable, of simple construction, and can be built for under \$15.00. It can be used over and over again to check out a meter on both high and low levels of light and also on relative

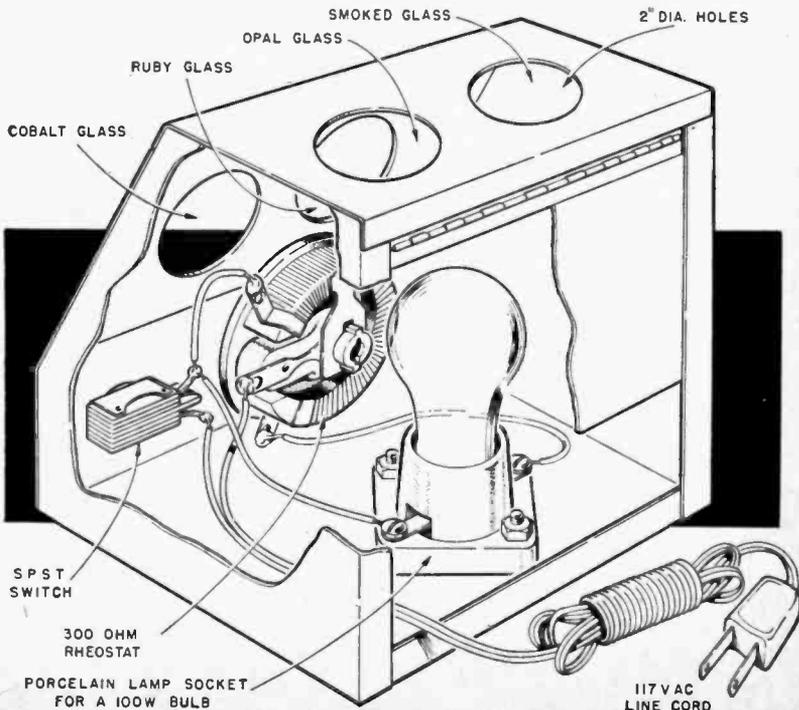
color temperatures.

Your first step will be to acquire the necessary parts (see Materials List, page 148). Then take the metal cabinet and cut or drill the two-inch diameter glass holes for the four squares of diffusing glass, and the smaller holes for the rheostat and switch controls as indicated in the drawing and photos.

A chassis punch is the ideal tool for cutting the large holes. Lacking this you can do the job by using an expansion bit fitted with a metal-cutting blade and chucked in your portable electric drill. Use plain old blackboard chalk to mark the holes before cutting; it's easy to see and wipes off easily and quickly with a damp cloth without damaging the surface.

Now install the switch, rheostat, and lamp socket. Take care that the socket is so installed that an equal amount of light will reach each of the four squares of glass when the 100-watt bulb is in place. To check this, wire the socket and temporarily position it in the cabinet. Then hold the square of smoked glass over each hole in succession, using a light meter to check light intensity at each hole. Move the socket until light emission is uniform at each hole, then mark its position and secure it in place.

(Continued on page 148)





By C. M. STANBURY II

THE surface of Short Wave is comparatively sane, predictable and conventional. Radio Sweden, S.B.C. etc. has its brand of non-political neutralism, Moscow and Peking hammer out the Communist line while our own Voice of America holds up the cause of liberal democracy. Similarly, DX is often a mere matter of statistics—stations heard, countries verified and distance. But beneath this surface tunnels a world wilder than the rarest DX catch, complete with odd stations and weird characters that would outdo the most fantastic science fiction.

For example, the most intriguing clandes-

UNO, DOS, TRES
CUATRO, CINCO
Y ENCHILADAS

DX OFF BEAT!



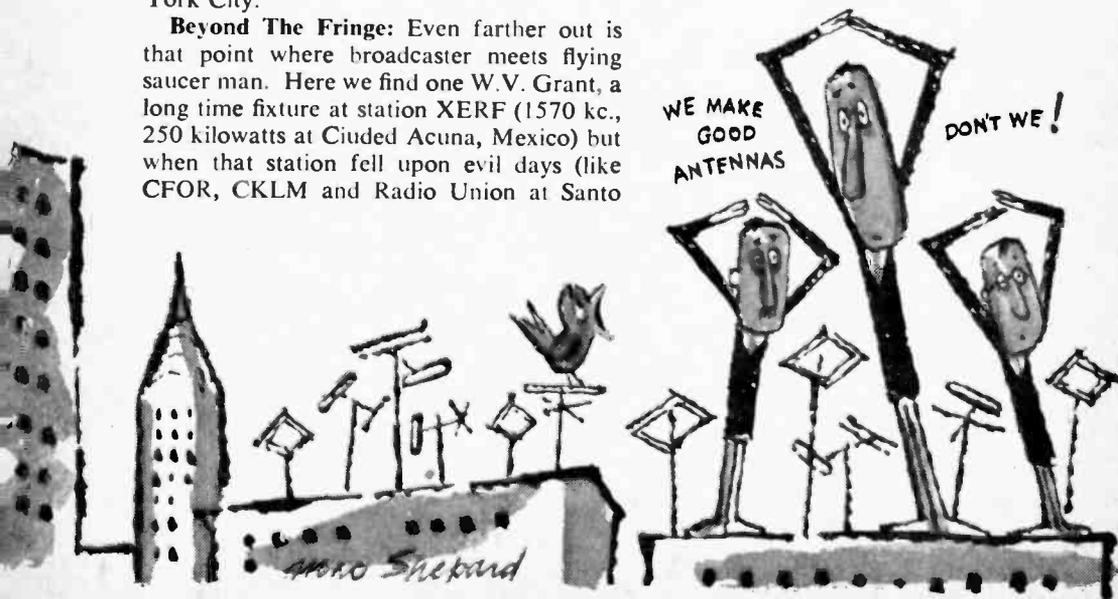
tine these days is that Spanish speaking mystery dubbed the "Phantom" and first spotted by a New York City DX'er. Actually the Phantom is not one, but two stations exchanging coded messages on a different frequency daily, ranging from 5500 to 6400 kc. and can be heard between 2330 and 0300 EST and/or 1500-1600 EST. These transmissions begin with a name and number combination (*Amedio 32* was one used) repeated continuously for about 4 minutes—possibly some sort of identification—followed by groups of five digit numbers. The messages have also been heard by a Radio Sweden reporter in Oklahoma, ASWLC members in Ohio and Illinois, and finally your *scribe* heard them himself. Incidentally one of the stations has local-like signal strength in New York City.

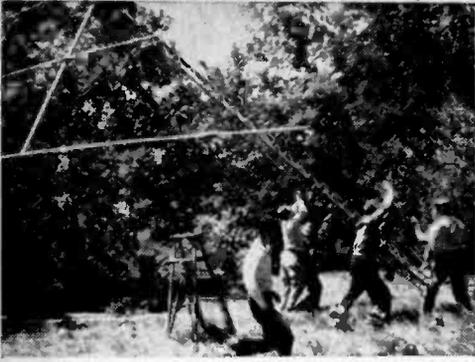
Beyond The Fringe: Even farther out is that point where broadcaster meets flying saucer man. Here we find one W.V. Grant, a long time fixture at station XERF (1570 kc., 250 kilowatts at Ciudad Acuna, Mexico) but when that station fell upon evil days (like CFOR, CKLM and Radio Union at Santo

Domingo are threatening to QRM the English speaking Mexican out of business), Brother Grant was heard via KPDQ 800 kc. Portland, Oregon.

Now Grant has not encountered any flying saucers himself but he has talked at length with a *Mr. B* who has ridden in one from the planet *Clarion* which is not visible from Earth). Based upon *B's* description, Brother Grant has decided that the saucer crew (who looked like Latin Americans) were actually demons in league with certain Soviet leaders who have supernatural powers. *Clarion* plots include the United Nations, disarmament, transmitting secret messages from

(Continued on page 148)





A little more sweat and the 3-band beam antenna will be up (left). Taking a bit longer,



Pompton Valley Radio Club members (right) rest before final effort on multi-band antenna.

Field Day for Hams

What was originally billed as a fresh air outing has mushroomed into hamdom's largest outdoor contest

Joseph Tartas, W2YKT

THE GENERATOR coughed and sputtered and whirled to a halt, followed by shouts of "Who shut that generator off!" and echoed by "It's all over 'till next year!"

The ninth annual Field Day contest had come to an end for the Pompton Valley Radio Club, a group known, collectively, only as W2OR for 24 consecutive hours. Log sheets, required by the FCC for any communication by amateur radio, were quickly gathered and spread out on a nearby table. A quick tabulation of the results produced a shout of exultation from the onlookers. "On the basis of this we've broken last year's record and, with luck, we might have top score this year," announced the chairman of the group.

The occasion was the 26th annual Field Day Contest sponsored by the American Radio Relay League (ARRL), the national

radio amateur organization. The first Field Day was originated in 1933 with the basic idea, to quote the original bulletin, "to get out in the open in this fine spring weather, the real object of this contest is to test portables (referring to portable radio equipment) wherever they may be available." Participation that year consisted of 50 stations with a top score of 98 contacts.

Since 1933, Field Day has been held yearly on the last weekend in June, except for the period of radio silence during World War II. In 1959, by comparison, the top score was over 2500 contacts by a single group, with over 1000 groups participating. It is estimated that over 14,000 of the more than 200,000 amateurs licensed in the United States participated in the 1961 contest.

The true aim in Field Day is to prepare amateurs in the use of unfamiliar equipment,

run on emergency power, for long periods of time so that they are capable of setting up quickly and maintaining communications during emergencies or disasters.

Actually, this is a full-scale test of emergency equipment for use in the Fall and Winter months to come, for Field Day is, in truth, a year-round affair.

In that first year of Field Day the experience was put to good use, for 1933 is to be well remembered for disaster and emergency work by hams with "portables." Even long before Field Day that year the amateurs had already seen service in the Guadalupe Valley of Texas where, in July of the previous year, the Valley had been inundated by a disastrous flood that wiped out all commu-

nications and transportation. The first news of the extent of the flood damage and of survivors was flashed to the outside world by ham radio, and contact was maintained *continuously* until wire lines were restored *3 days later!*

On August 29th, amateurs gathered information on an impending hurricane and maintained communications throughout the storm.

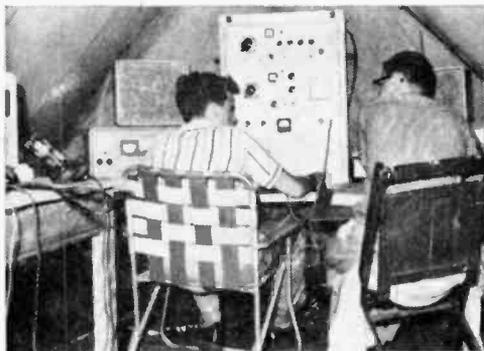
On September 30th the heavy rainstorm in California caused the destruction of six villages and railroad lines, and wiped out communications, leaving a twenty-mile-long path of death and destruction from the flash floods and avalanches that followed the inundation. Amateur radio operators, in conjunction with the California Highway Patrol,



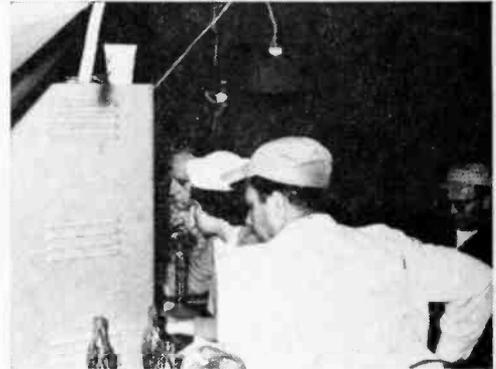
Once all the muscle work is done, the Pompton Valley Radio Club members went to work logging; VHF tent was first in operation.



Club President Don Diaz, K2QEM keeps things going with George Austin, WA2DPN, makes sure that log entries are properly made.



Into the wee hours of the night, Paul Haupt, W2PUO, and Frank Blatterman, W2PVO, keeps things humming on the 6 meter band.



Left to right, George Austin, WA2DPN, Ledi Kuklinski (YL), WV2HAD calls CQ, Sam Sambataro, K2HHC, and Hans Weiss standby.



The breakfast menu (left) looks good. And that's K2AID, Mildred Roll (right) doing the honors over a hot stove on Sunday morning. Toast was made over fireplace at your own risk. Chow was better than the prices.



set up communications within hours to aid rescue workers and authorities. It is ironic that the same area suffered a similar disaster in recent years, at which time some of the same amateurs provided assistance in the same way.

The year of 1933 was not yet at its midpoint when a violent earthquake shook southern California to its very core. Six hours elapsed before any wire line was restored to service to Long Beach, the center of the stricken area and hardest hit. Yet it was only *ten minutes* after the earthquake that an amateur station was telling the world of the disaster, and amateur radio was the sole means of communications during the first few critical hours.

Other items of interest through the remainder of that first Field Day year was the sailing of the Byrd Expedition to the Antarctic, with communications between the expedition and the rest of the world almost exclusively through U. S. Amateurs. The CCC was organized, and among their ranks were amateurs who helped maintain the morale of the youngsters by providing direct channels of communications to their homes.

The World's Fair opened in Chicago and amateurs participated. One highlight of the Fair was the winning of a code proficiency contest by Jean Elizabeth Hudson, *only nine years old*. At summer's end, the Gulf and East coasts were lashed by violent storms and hurricanes, during which the amateurs gave invaluable assistance.

Although amateurs were continuously giving assistance in one form or other, one notable event in ham annals occurred in 1937, when the Ohio River spilled over its banks flooding the Ohio River Valley from end to end. Covering such a wide area, it wreaked sufficient havoc to be classed, at that time, the greatest catastrophe since World War I. More than 1000 amateurs from all over the country converged on the area to set up the only dependable medium of communications under the existing difficult conditions, to handle more than 10,000 official messages concerning the disaster.

Like the California disaster, the Ohio River Valley Flood was repeated within the past year, with communications again being maintained by amateurs. Providing their own equipment and transportation without

any compensation, many of them operated for days on end without any sleep, some with the river rising around their feet.

In recent years, the greatest disasters were those that struck Texas City, Texas, the San Fernando Valley in the West, and one that struck in the East, almost obliterating the Connecticut towns of Winsted and Torrington. Had it not been for a radio amateur and his "portable," death and disease would have been rampant before the torrent ceased, and even with the tremendous loss suffered, it could have been far greater.

The Pompton Valley Radio Club started about 10 years ago as a handful of local hams, meeting informally in their homes every few weeks. As word spread between amateurs while talking "on the air," the membership expanded until eventually a public meeting place was needed to accommodate the large number of active members.

As was inevitable the group decided to participate in a Field Day contest, both for the sport involved, and the valuable experience to be gained in such teamwork. The initial planning began in January of that year, 1954, and by the time the last week-end in June had arrived, all the necessary equipment, tents and materials were located, checked out, and readied. Operations that year were conducted from a 500 foot hill in Kinnelon, N. J., in the Pompton Valley area. Using the call of Ernie Hufnagel, W2OR, a licensed amateur since 1923 and an experimenter long before that, the group began the twenty-four hour period with doubts as to the outcome. Final results put the group in 20th place in the four trans-

mitter class, the class they have continuously operated in each year since.

The second year, the group (still using Ernie's call, W2OR) chose 750 foot Sheep Hill, in Boonton, N. J. for their Field Day location, where they have operated every year since then. Using an overgrown, rock-strewn path to get the equipment to the top was finally achieved, although not without accident. One member cracked the oil-pan on his car when he bottomed on a grass-covered rock in the middle of the road. By the time he discovered it he had done \$45 worth of damage to the car. The following year the hill was made into a city park and the road was paved all the way to the top.

The results that second year put the club in eighth place, a vast improvement over the first year, and an excellent showing for a new group competing with older and more experienced clubs.

Year by year they edged their way up, until in 1959 they were in second place with a final score of 1561 contacts and 9,837 points. The high score went to the Crescenta Valley Radio Club of California, with a top score of 10,305 points, but 441 less contacts, the extra points due to the difference in power multipliers. Note that the Pompton Valley Radio Club was the highest for the Eastern part of the country, where group participation is heaviest.

Last year, the start of Field Day was accompanied by 40 mph winds that started with thunderstorms early on Friday evening. The rain subsided and the sky cleared, but the wind remained, knocking over equipment
(Continued on page 125)



Interior of club's truck. Power generator is located near the driver's seat. Control panel is mounted on right rear panel near rear door.



Right down to the wire. Operations continue as tents come down. Shown are W2OR, WA2GPF, W2RGD, K2HOE, W2ID, W2IBM and W2LOT.



The Crystal Ball

FEB.—MARCH 1964

By C. M. Stanbury, II

	0	0	0	0	1	1	1	2	2	
LOCAL	0	3	6	9	2	5	8	1	4	
TIME	0	0	0	0	0	0	0	0	0	
	0	0	0	0	0	0	0	0	0	
Europe, North Africa, & Near East	←49, 75→		←49, 41→		25, 31		←41, 49→		←49, 75→	
South Africa	←60, 90→ (41)		←41, 49→		NIL		←25→ (19, 31)	←25, 60→ (31, 41)	←41, 49→	←90, 60→
Asia (except Near East)	←41→ (31, 49)		←49→ (41)		←41→ (41, 49)		←25→	←25, 31→	←41→ (31)	
South Pacific	←49→		←49, 60→		←41, 31→		←25, 31→			
Latin America	←90, 60→			←49→		31		←90, 60→		

SUNSPOT activity should be at a minimum during 1964 thereby increasing the useful range of short-wave broadcasting frequencies. The 60- to 19-meter bands are expected to be wide open and some very unusual and uncommon DX's will be logged this year. If you are a *wildcatter* and like to roam the bands, the above table is set up for you.

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 128) 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. ■

Here—the dope on the . . .

HAM LICENSING FEES

The FCC is taxing amateur applications

It costs four dollars to get a General ticket

By Robert Hertzberg, W2DJJ

THE MOST RADICAL CHANGES in ham licensing procedure in the half-century of the game went into effect on January 1, 1964. It pays all amateurs, present and prospective, to become familiar with them.

"Pays" is the right word, because now for the first time the FCC rules call for a schedule of application "filing fees," as follows:

- For initial license, including new class of operator license, and for renewal of existing license: \$4.00.
- For modification of license without renewal: \$2.00.
- For combination of modification and renewal: \$4.00.
- For a specific call sign: \$20.00.

Fee Facts. However, fees are not required for Novice applications, for stations used for recreational purposes under military auspices, and for stations in the Radio Amateur Civil Emergency Service (RACES). As before, the Novice ticket is good only for one year and cannot be renewed. To stay on the air, a holder must qualify for a higher class.

It is important to note that the basic \$4.00 charge is for the *filing* of an application and not for the license itself, which, technically, is still free.

To obtain a General class license, which is by far the best to have because it affords maximum operating privileges, you must appear in person at a district office or an examination point of the Federal Communications Commission and take a two-part test. If you do not know where the nearest office is located, write to the FCC, Washington, D.C., 20554, and ask for a copy of the free bulletin entitled "Amateur Radio Service." This lists all offices and contains other useful information.

There is a difference between a "district office" and an "examination point." The

first is a permanent establishment, usually in a Federal building such as a court house or post office, and is generally open every business day during normal hours. The latter is a temporary office, open only at certain times of the year for the benefit of applicants for FCC licenses of all kinds who live a considerable distance from district offices.

If a district office is within convenient telephone range, call up and inquire about examination schedules. In the larger offices no appointments are necessary; in the smaller ones they may be. When you appear, be sure to have with you a personal check or money order for \$4.00 made out to the *Federal Communications Commission*. You must hand this in with the *Application Form 610* which you will obtain in the office and fill out there in a few minutes.

If you want to take the test at an examination point, first write to the district office nearest to your home and ask for a Form 610. Fill this out and return it, with a remittance for \$4.00 (no cash through the mails, please!) to that office. The latter will notify you by mail when and where to appear.

The Exam. The first part of the General

—CB Filing Fee—

The only change in the Class D Citizen Band licensing procedure is that an application form (FCC Form 505) must be accompanied by a check or money order for \$8.00, made out to the *Federal Communications Commission*. The fee for Class B and Class C is the same as the Class D filing fee, but a \$10 tab has been placed on Class A Citizen Band licenses. To obtain an FCC Form 505, write to any FCC district office or to the larger offices in Washington, D.C., 20554, and Gettysburg, Pa., 17325.

exam is the code test, run at 13 words per minute. If you pass this, the examiner hands you the written part. He grades this immediately. If you pass, you go home happily and simply wait for your "ticket" to reach you by mail. This takes about a month, because the FCC processes about 100,000 ham applications a year and its facilities are swamped. Incidentally, all this paper work is now handled in a new FCC office in Gettysburg, Penna., of all places, and not any longer in Washington.

If you flunk the code test you do not even see the written part. You are finished, at least for thirty days. If you pass the code but flunk the written, you are similarly through. *In either case your money is not refunded.* After a month you can make application again as if nothing had happened. In fact, you can pay and try every thirty days until you pass both halves of the test. The moral here is obvious: study hard before you make the trip, and save yourself money as well as time.

Mail-Order Tickets. The Novice, Technician and Conditional license tests continue to be mail-order "affairs of honor," conducted by volunteer examiners selected by the applicants. An examiner must be at least 21 years old and the holder of a current General class or better ham license¹ or of a current commercial radiotelegraph operator license. Previously, an examiner could be a former holder of a commercial ticket. Also qualified is an operator of a manually operated radiotelegraph station in the service of the United States Government. This pro-

1. Extra or Advanced, which are more or less honorary types and carry exactly the same operating privileges as the General.

vision takes care of the military forces, in which ham radio is a big morale activity.

One big change in the mail-order routine is that the applicant can take the code test from the examiner *before* making formal application to the FCC and before handing over money. However, it costs nothing to obtain the Form 610 and to have it ready for filing as soon as you pass the code. To get a copy, write to the Federal Communications Commission, Gettysburg, Penn., 17235. Within ten days after clearing the code test you must return Form 610 to Gettysburg, along with a written request from the examiner (not from you) for the appropriate examination papers. This request must include the names and addresses of both the examiner and the applicant, a description of the examiner's qualifications, a statement that the applicant has passed the prescribed code test, and the examiner's signature. The FCC will send the papers to the examiner, and he in turn will return them, after completion by the applicant, to Gettysburg.

As previously mentioned, there is no filing fee for a Novice application. You must send the usual \$4.00 for either the Technician or the Conditional papers, and as in the case of the office tests this is not refunded if you flunk.

The Novice test is the easiest and carries the fewest operating privileges. The code test is at only five words per minute, and the written is so simple that boys and girls under the age of ten pass it regularly. The Technician code test is also five words per minute, but the written part is exactly the same as for the General, and the operating privileges are only slightly better than for the Novice.



You can't argue with the precisely programmed tapes used by the FCC for code tests.



Remind you of school days? An anxious would-be ham is taking the FCC receiving test.



Two people sending to each other can learn the International Morse code very quickly. Headsets are used so as not to disturb others.

With only a little more code practice, a prospective Technician can be a permanent General.

The Conditional test comprises the full 13 w.p.m. and written of the General. It is available to people who live more than 75 miles from an FCC office, or who are physically disabled and cannot travel, or who are in military service and cannot get away. It carries all the privileges of the General class.

The Novice and Technician exams *must* be taken at home under voluntary examiners, regardless of where applicants live. You cannot take them in person at FCC offices, nor can you even get the papers for them at the latter. Your only point of contact is Gettysburg. The Conditional has a different status, since it is merely a substitute for an office test.

Contrary to a widespread misconception, you do not have to start with the lowest grade of license an work your way upward. By far the majority of would-be hams qualify right off for the General.

Other Fees. The \$2 "modification" fee is intended mainly to cover changes of address. Send such information, and also requests for license renewal when no change in operating privileges is involved, only to Gettysburg. The main FCC office in Washington is concerned now only with policy, information and special matters.

Speaking of special matters brings us to the announced filing fee of \$20 for "a specific call sign." This new item promises to be an administrative hot potato. You only have to thumb through the 500 pages of the Call Book to realize that virtually all possible letter combinations are already assigned;

many, in fact, are assigned three and four times, with different prefixes. To show how difficult the situation is, I need use only myself as an example. My original call, long ago, was 2ABK, and I have a sentimental attachment for it. I lost it when I moved temporarily into another district. Could I get an ABK combination today by sending in twenty and asking for it? Hardly. The Call Book already shows W2ABK, K2ABK, WA2ABK and WB2ABK!

It may occur to you that before you risk \$20 you might ask the FCC if certain combinations are obtainable, and thus save paper work for all concerned. Forget it! This is just the paper work the \$20 is supposed to cover. You must submit the money with your application, and if what you want is not free the money stays in Uncle Sam's pocket.

Personally, I feel that perhaps the FCC has put this price tag on special calls to discourage people from asking for them in the first place. The answers are so often, "Sorry," not available" that the whole operation takes on an unhappy, negative flavor.

The \$20 expenditure is less of a gamble for a relatively small group of hams who once held two-letter calls, let them drop, and now want to reclaim them. If their early ownership can be verified in the records of the FCC and its predecessors, the Federal Radio Commission and the old Department of Commerce, and if the calls are currently unassigned, these men are pretty sure to have their requests honored. If the original calls are not free, the Commission may offer them other two-letter combinations, which they can accept or reject without prejudice, but again with no choice of refund. ■

Free Literature

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 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, nam 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. If you know stereo, you know *Empire*. If you don't know *Empire*, you'd better ask for this four-page brochure, and get in on the news.

20. Tape recorder heads wear out. After all, the head of a tape deck is like the stylus of a phonograph, and *Rohins 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. J. 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

30. Want to see the latest in portable tape recorders? Curious about an intercom with a fabulous sound to-size ratio? *Mathew Stuart, Inc.* will send all the details at your request.

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. If you are serious about home tape recording, this technical bulletin and descriptive literature from *Kodak* will interest you. In case you didn't know, they are in the tape market.

34. Here's a list of a complete line of tape machines. Also, *SONY Super-scope* will include a list of ways that you can use a tape recorder, and some of these were new to us!

35. "40 and More Ways to Use Your Roberts Tape Recorder" tells you how to get the most from your tape recorder. Tips on language lessons, speeches, and many others are yours for the asking from *Roberts Electronics*.

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. *Stereosonic, 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.

52. One of the best ways to make a radio signal get up 'n' git is to put the antenna up high enough, and you will need a place to hang it. Take your pick from this catalog of towers by *Tri-Ex Tower Corp.*

53. When private citizens group together for the mutual good, something big happens. *Halicrafters, 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 Ecu-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.*

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!

64. Here's some more data on transistor ignition systems for cars. *Automotive Electronics Co.* has the whole story here, including typical wiring diagrams.

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.

SLIDE RULE

72. 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.

NATION-WIDE TUBE CO.



For all type
TUBES

ANY TYPE NOT LISTED MAY ALSO BE ORDERED AT 33¢ each. (\$30 per 100)

1-YEAR GUARANTEE ON ALL TUBES Individually boxed CODE DATED BRANDED

OZ4	6AN8	6J5	7A5	12AU7
1A7	6AC5	6J6	7A7	12AX7
1B3	6AU4	6K6	7B6	12BA6
1H5	6AU6	6SA7	7B8	12BE6
1K3	6AV5	6SQ7	7C5	12BH7
1L6	6AV6	6SF7	7E6	12BY7
1W5	6AW8	6SG7	7F7	12C5
1R5	6AX4	6SH7	7Q7	12CA5
1S5	6BA6	6SJ7	7Y4	12L6
1U4	6BC5	6SK7	8AW8	12R5
1X2	6BE6			12SA7
2C2	6BH6			12SG7
2D54	6BK7			12SK7
2DV4	6BL7			12SQ7
3B2	6BA6			12W6
3DT6	6BQ5			18FY6
3V4	6BQ6			18FX6
4BQ7	6BQ7			22DE4
5A7B	6C4	6SL7	8CC7	25L6
5J6	6CB8	6SN7	9AU7	25Z6
5U4	6CD6	6SQ7	10DE7	32L7
5Y3	6CG7	6S7	11CV7	50A5
6A7	6CM7	6U8	12AD6	50C5
6AB4	6CY5	6V6	12AF6	50L6
6AC7	6DA4	6W4	12AT7	50L6
6AF4	6DE6	6W6	12AV6	117L7
6AG5	6DK6	6X4	12AX4	117Z7
6AM4	6DD6			
6AL5	6DS4			
6AM8	6DV4			

FREE RCA CHEATER CORD with every order of \$10 or more

25¢ SPECIAL
NO limit on this list
Order any quantity!

1A4	26	58
1B4	27	71A
1B5	35	75
1B6	39/44	76
6CC	43	77
6Q6	47	84/6Z4
6U6	56	85
25Z5	57	

TERMS: Free Postage in USA on prepaid orders. Add 50¢ for handling on orders under \$5. Send 25% deposit on COD orders. Send approx. postage on Canadian & foreign orders.
Money refunded in 5 days if not completely satisfied. Tubes are new, used or seconds are so marked.

Send for special details on self-service tube testers and CRT prices

NATION WIDE TUBE CO.

406 HARRISON AVENUE, HARRISON, NEW JERSEY HU 4-9484

Potted Preamp

(Continued from page 83)

tained either from a local plastics distributor or direct from the manufacturer.

The plastic comes in a liquid form which is a pale blue in color . . . becoming water-clear upon hardening. Use of the material is extremely simple, the completely assembled preamp is placed in a small mold which can be a small cardboard or plastic box coated with petroleum jelly to serve as the release agent. Sufficient liquid plastic to completely cover the preamp is poured into a paper cup, and a few drops of hardening agent added. After stirring to thoroughly mix the plastic and hardener, the mixture is poured into the mold. This plastic will begin to gel in about 30 minutes . . . completely setting in 8 hours. Since the plastic shrinks very slightly during hardening, it is easily removed from the mold.

The gel cycle can be actuated by pre-heating the Castolite to be used to 125-150° F. This is easily done by pouring the plastic to be used into a small, clean container which is then placed in hot water for a few minutes. Complete instructions on how to use Castolite are packed with the product.

Since the frequency response of this little preamp is quite good (20 to 100,000 cycles plus) it can also find application as a vertical input amplifier preamp for inexpensive scopes which have limited vertical sensitivity. Along these same lines, it will tie in well with the AC range of a standard VOM, making it into an AC-VTVM.

All in all, this little potted preamp is well worth the slight amount of time and expense expended in its construction.

INVENTORS



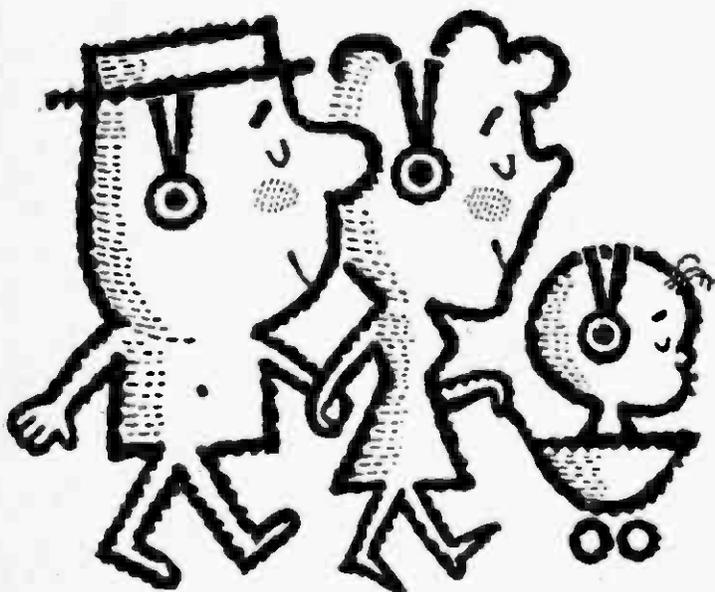
IS YOUR SALES PITCH MISSING SOMETHING?

Hams Make Happy Husbands

(Continued from page 56)

throw you either! It needn't cost a great deal, and with some experienced help you can probably get on the air to make your first contacts for under \$30. They won't be in romantic, far-off places, but don't let that discourage you. It may be deucedly glamorous to talk to a ham in far Cathay, but he can't take you out on non-ham dates!

So until you land your ham, forget the expensive, high-powered transmitters and content yourself with contacting the local operators. Remember that after you splice your wires, you can use *his* set and let him operate with *yours*. Nothing will be wasted, as the whole ham family will get into the act as time goes by.



MANY happy boy-girl meetings have happened on the ham air waves. When result is marriage, offspring usually become hams too.

Yes, girls, now is the time to get in the swim and send. As you learn the lingo you'll discover that the nice curves hams talk about are radio tube performance curves, and that if a ham asks for your key you needn't blush in embarrassment—he probably has a message to send and it's your telegraph key he's talking about.

There's a vast world of marriageable males waiting to be tapped, but it will take a smart gal to get 'em. Don't put the lipstick completely aside but supplement it with a few fancy QSL cards. Remember, if you want to hear a little voice saying "Dah-dah" around your house, the fastest way to begin is by saying "Dit-dah" yourself! ■

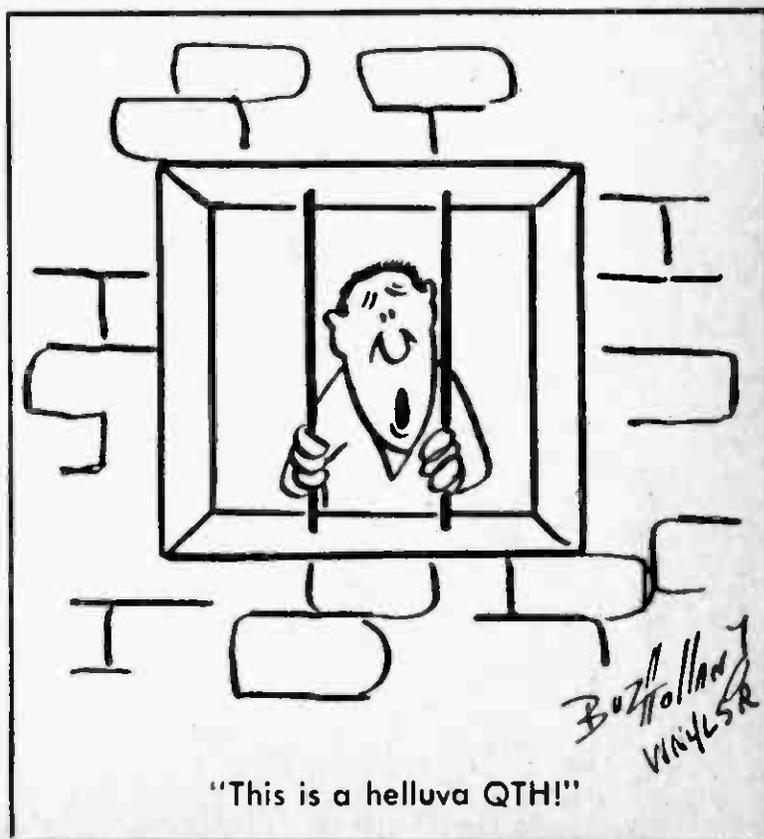
Field Day for Hams

(Continued from page 115)

that had been set up in the wee hours of the morning. After daybreak, beam antennas mounted on tall masts and framework towers had to be erected and guyed with the high winds continually trying to blow them down. Because of the excellent planning and experience gained in previous years, no damage resulted to equipment, nor injuries to the people involved.

Power was supplied for everything by a 5 kilowatt generator mounted in a 1948 panel truck purchased by the club several years ago. Two fifty gallon drums in the truck provided sufficient gasoline for continuous operation, and water for washing, through a faucet in the side of the truck. Running continuously for 36 hours at a time, the generator had yet to fail during operations in the seven years it has been in use.

Field Day is gradually becoming a family affair with the Pompton Valley Radio Club. Among the members operating, were husband-and-wife teams, father-and-daughter, and father-and-son combinations. The kids also help out. The younger ones help with soda bottles and cleanup, while the older ones, not yet licensed to operate run errands, help with cooking, and assist the operators in keeping the logs and check sheets up to date by recording contacts made, and keeping track of these stations alphabetically to avoid duplicate contacts, are another one of their chores. ■

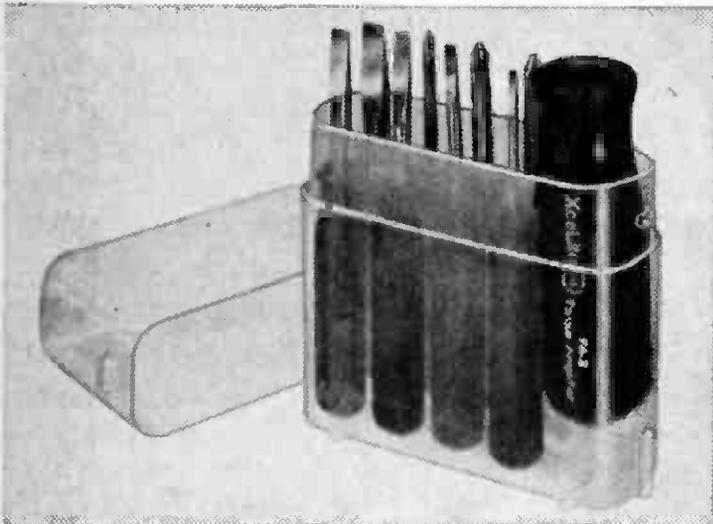


NEW PRODUCTS

(Continued from page 30)

Screwdriver Set Offers Double Duty

The large line of tools produced by Xcelite has been increased by a new double duty screwdriver set which includes an all-screwdriver version in addition to a nutdriver-screwdriver combination set. The PS88 set contains 8 midget tools, 5 slot tip types ($\frac{3}{32}$ " thru $\frac{1}{4}$ ") and 3 Phillips (No's. 0, 1 and 2) plus a special, hollow "torque ampli-



fier" handle. The hollow handle slips over the top of the midget tool handles to provide larger grip, longer reach and greater driving power. The sets are stored in a breakproof plastic pocket case which doubles as a bench stand. Prices range from \$5.25 to \$8.25. (Xcelite Incorporated, Orchard Park, N. Y.)

Two New Versions Of 6360 Tube Are Developed For Mobile Use

Amperex announces two new twin triode tubes especially designed for use as Class C amplifiers, oscillators and frequency multipliers in mobile transmitters at frequencies up to 200 mc. The type 8458 is designed for high R.F. power gain at 175 mc providing 30 watts load power from only one watt of drive. The 8457 driver can be operated as a cascaded doubler-multiplier driving the 8458 for a straight-through 160 mc amplifier. Both of these tubes replace the 6360 type in mobile transceivers to provide almost double the power with only minor power supply changes. Both tubes use a 13.5 volt center tapped heater. (Amperex Electronic Corp., Hicksville, L. I., N. Y. 11802) ■

Photo Cell Relay

(Continued from page 73)

closed position, capacitor C1 is connected across the output of D1, smoothing the pulsating DC to essentially pure DC. Now, when the NE-77 is fired by illumination of the photocell, PC, it will continue to fire; keeping the relay energized even after light is removed from the cell. Opening the RESET switch, S1, removes C1 from the circuit, again returning the circuit to its cycling mode of operation.

Operation and adjustment. As shown in the photos, the photocell relay was assembled in a small aluminum chassis box. Components were mounted on insulated tie-point terminal strips, with point to point wiring being used between components. The relay contacts were brought out to a three screw barrier terminal block, TB1, mounted on the top of the chassis box. The construction method illustrated is only a suggestion . . . the circuit lends itself to a number of different construction techniques.

After the photocell relay is completely assembled, and all wiring checked, connect its line cord to a source of 115-volt AC outlet and turn on switch S1. With the photocell covered to exclude light, rotate the sensitivity control (R1) to the point where the relay just opens. When the photocell is now illuminated, the relay will close. Depending upon the position of the reset switch, S2, the relay will either remain closed after the light is removed, or open when the cell is no longer illuminated. Now you are all set to hookup alarms and light controls that you have been dreaming about. ■



"Let's see, that makes six bothered with TVI."

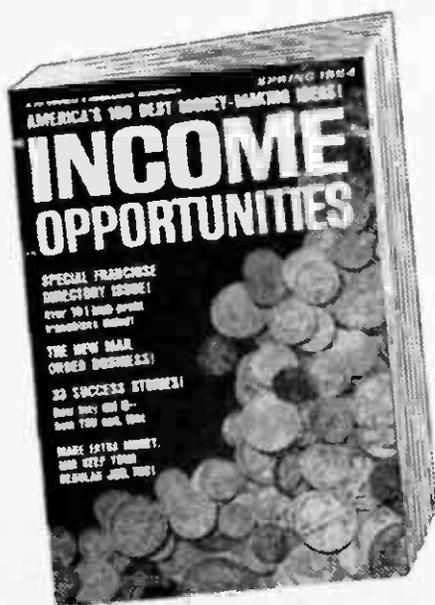
MAKE MORE



MONEY

You'll find proven money-making enterprises featured in every issue of **INCOME OPPORTUNITIES**. This quarterly magazine shows you dozens and dozens of successful ways to be your own boss—*successfully*—on a part-time or full-time basis. You get first-hand information through success stories that show you the growth of ideas that have resulted in high profit ventures.

Yes, you'll find the magic formula for success in the pages of **INCOME OPPORTUNITIES**—getting your own special four issue subscription could be the best investment you'll ever make.



INCOME OPPORTUNITIES 92
505 Park Avenue / New York, N.Y. 10022

- Enclosed is \$_____. Please send me _____ copies of No. 676 **INCOME OPPORTUNITIES** (includes postage and handling).
- Better than that: enter my special 4 issue subscription to **INCOME OPPORTUNITIES** starting with No. 676.
- Payment of \$3 enclosed Bill me later

NAME _____
(PLEASE PRINT)

ADDRESS _____

CITY _____ STATE _____ ZIP CODE _____

Volume 41, No. 1

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

WHITE'S RADIO LOG was founded by Charles DeWitt White in Providence, R.I. as an extension of his earlier publishing activities which, in turn, were a continuation of the business established by his father: the publication of city directories, street guides and municipal tax guides.

In the early days of broadcasting, the compilation of a list of operating stations and their frequencies was no simple task. Prior to the Dill-White Radio Act of 1927, if a feed merchant, auto dealer, barber or undertaker wanted to advertise his wares or services, he had only to select a frequency and go on the air.

Nevertheless, Mr. White's directory publishing experience had convinced him that he could successfully assemble a radio log, and in 1924 he justified his conviction with *The Rhode Island Radio Call Book*, following this shortly after with *White's Triple List of Radio Broadcasting Stations*.

In 1927 the two publications were merged, nationwide distribution was established and in ensuing years related publications, such as *Sponsored Radio Programs*, *Radio Announcer's Guide*, *Short-Wave Schedule Guide* and

a special Canadian edition of *White's Radio Log* (which has had its title shortened to the one it bears today), where also issued. The *Log* reached a combined circulation of well over 1,000,000 copies at one time.

The 1927 Fall-Winter issue of the *Log* listed 701 U.S. Stations. Most powerful were WEAJ (now WNBC), N. Y., with 50,000 watts, KDKA, Pittsburgh, WGY, Schenectady, and WJZ (now WABC), N. Y., each with 30,000 watts; WGN-WLIB, Chicago, with 15,000 watts; and Boston's WBZ, also with 15,000. Five stations listed (one a Junior High School in Norfolk, Va.) operated on a mighty 5 watts.

In 1957, Mr. White, who was then 76 years old, died in his sleep. His heirs sold all rights in and to the *Log* to the publisher of SCIENCE & MECHANICS and in January of 1958 the first edition of *White's Radio Log*, Vol. 35, No. 1, was published as a special supplement to the RADIO-TV EXPERIMENTER.

From 1958 to the end of 1961, the *Log* was published in each semiannual issue of RADIO-TV EXPERIMENTER until the beginning of 1962 when the magazine was published quarterly. Beginning with this issue, RADIO-TV EXPERIMENTER will be published bi-monthly.

With six issues a year hitting the newsstands throughout the United States, Canada and many other countries, it is necessary that *White's Radio Log* undergo its first major format change in over two decades. In-

Every effort has been made to ensure accuracy of the information listed in this publication, but absolute accuracy is not guaranteed and of course, only information available up to press-time could be included. Copyright 1963 by Science & Mechanics Publishing Co., a subsidiary of Davis Publications, Inc., 505 Park Avenue, New York, New York 10022.

creased listings due to the growth of VHF and UHF television and FM broadcasting have made it an almost impossible task to present the complete *Log* every two months with the listing accuracy demanded by the users. Add to these listings, stations located in Canada, Mexico and West Indies, and you can begin to imagine the enormous task it is to assemble *White's Radio Log*. To further increase the scope of the *Log*, the Short-Wave Section has been revised, and the station listings increased in scope and number. Complete details on the Short-Wave Section appear immediately before that section.

In this issue of *White's Radio Log* we have included the following listings: U.S. and Canadian AM Stations by Frequency, U.S. Television Stations by States, Canadian TV Stations by Location, and the newly expanded Short-Wave Section.

In our next issue, April/May 1964, the *Log* will contain the following listings: U.S. and Canadian AM Stations by Location, U.S. FM Stations by States, Canadian Stations by Location, Mexican and Cuban AM Stations by Location, and the expanded

Short-Wave Section. The short-wave listings will always be completely revised in each issue of *White's Radio Log* to insure 100 per cent up-to-date information leaving nothing to chance.

In the June/July issue of RADIO-TV EXPERIMENTER, the *Log* will contain the following listings: U.S. AM Stations by Call Letters, U.S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and the expanded Short-Wave Section.

Therefore, in any three consecutive 1964 issues of RADIO-TV EXPERIMENTER, you will have a complete cross-reference listings of *White's Radio Log* that is *always up-to-date*. The three consecutive issues are a complete volume of *White's Radio Log* that offers 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 Radio Log* format an unbeatable reference.

QUICK REFERENCE INDEX

U.S. and Canadian AM Stations by Frequency	129
U.S. Television Stations by States	140
Canadian Television Stations by Location	142
World-Wide Short-Wave Stations	142

U. S. and Canadian AM Stations by Frequency

U.S. stations listed alphabetically by states within groups, Canadian stations precede U.S. Abbreviations: Kc., frequency in kilocycles; W.P., watt power; d—operates daytime only. Wave length is given in meters.

Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.
540—555.5											
CBT	Grand Falls, N.F.	10000	CFBR	Sudbury, Ont.	1000d	KCRS	Midland, Tex.	5000	WFRB	Frostburg, Md.	1000
CBK	Regina, Sask.	50000	CHLN	Three Rivers, Que.	10000	KTSA	San Antonio, Tex.	5000	WHYN	Springfield, Mass.	1000
KVIP	Redding, Calif.	5000d	CKPG	Prince George, B.C.	250	WQEV	Waterbury, Vt.	5000	WQTE	Monroe, Mich.	500d
KFMB	San Diego, Calif.	5000	KENI	Anchorage, Alaska	5000	WSVA	Harrisonburg, Va.	5000	WEBC	Duluth, Minn.	5000
WGTO	Cypress Gardens, Florida	50000	KOY	Phoenix, Ariz.	5000	KARI	Blaine, Wash.	5000	KWTO	Springfield, Mo.	5000
WDAK	Columbus, Ga.	5000	KAFY	Bakersfield, Calif.	1000	KMRE	Spokane, Wash.	500d	KMON	Great Falls, Mont.	5000
KBRV	Soda Springs, Idaho	500d	KRAI	Craig, Colo.	1000	WSAU	Wausau, Wis.	5000	WGAI	Elizabeth City, N.C.	1000
KWMT	Ft. Dodge, Iowa	5000d	WAYR	Orange Park, Fla.	10000d	560—535.4					
KNOE	Monroe, La.	5000	WGGA	Gainesville, Ga.	5000	CJDC	Dawson Creek, B. C.	10000	KCYR	Milan, N. H.	560
WDMV	Pocomoke City, Md.	500d	KMVI	Wailuku, Hawaii	1000	CHCM	Marystown, Nfld., Can.	1kw	WFIL	Philadelphia, Pa.	5000
WBIC	Islip, N.Y.	250d	KFRM	Concordia, Kansas	5000d	CJKL	Kirkland Lake, Ont.	5000	WIS	Columbia, S.C.	5000
WETC	Wendell-Zebulon, N.C.	250d	WCBI	Columbus, Miss.	1000	CFOS	Owen Sound, Ont.	5000	WHBQ	Memphis, Tenn.	5000
WARO	Canonsburg, Pa.	250d	KSO	St. Louis, Mo.	5000	CKCN	Seven Iles, Que.	5000	KFDM	Beaumont, Tex.	5000
WYNN	Florence, S.C.	250d	KOPR	Butte, Mont.	1000	WOOF	Dothan, Ala.	5000d	KPQ	Wenatchee, Wash.	5000
WDXN	Clarksville, Tenn.	1000d	WGR	Buffalo, N.Y.	5000	KYUM	Yuma, Ariz.	1000	WJLS	Beckley, W.Va.	5000
WRIC	Richlands, Va.	1000d	WDBM	Statesville, N.C.	500d	KSFO	San Fran., Calif.	5000	570—526.0		
550—545.1											
CFNB	Fredericton, N.B.	50000	KFYR	Bismarck, N.Dak.	5000	KLZ	Denver, Colo.	5000	CKEK	Granbrook, B.C.	1000
			WKRC	Cincinnati, Ohio	5000	WQAM	Miami, Fla.	5000	CKCQ	Quesnel, B.C.	1000
			KOAC	Corvallis, Oreg.	5000	WIND	Chicago, Ill.	5000	CFCB	Corner Brook, N.F.	1000
			WHLM	Harrisburg, Pa.	1000	WMIK	Middlesboro, Ky.	500d	CJEM	Edmundston, N.B.	500d
			WPAB	Ponce, P.R.	5000	WGAN	Portland, Maine	5000	CFWH	Whitehorse, Y.T.	1000
			WXTR	Pawtucket, R.I.	1000				WAAX	Gadsden, Ala.	5000

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
KCNO	Alturas, Calif.	5000
KLAC	Los Angeles, Calif.	5000
WGMS	Washington, D.C.	5000
WACL	Waycross, Ga.	5000
WKYB	Paducah, Ky.	1000
WVMI	Biloxi, Miss.	1000d
KGRT	Las Cruces, N. Mex.	5000d
WMCA	New York, N.Y.	5000
WSYR	Syracuse, N.Y.	6000
WWNC	Ashville, N.C.	5000
WLE	Raleigh, N.C.	500d
WKBN	Youngstown, Ohio	5000
WNAK	Yankton, S. Dak.	5000
WFAA	Dallas, Tex.	5000
WBAP	Ft. Worth, Tex.	5000
KLUB	Salt Lake City, Utah	5000
KVI	Seattle, Wash.	5000
WMAM	Marinette, Wis.	5000
580—516.9		
CJFX	Antigonish, N.S.	5000
CFRA	Ottawa, Ont.	5000d
CKEY	Toronto, Ont.	5000
CKPR	Ft. William, Ont.	5000
CKUA	Edmonton, Alta.	1000d
CKY	Winnipeg, Man.	5000d
CHLC	Hauterive, Que.	5000
WABT	Tuskegee, Ala.	500d
KABI	Ketchikan, Alaska	1000
KTAN	Tucson, Ariz.	5000
KMJ	Fresno, Calif.	5000
KUBC	Montrose, Colo.	5000
WBOC	Orlando, Fla.	5000
WGAC	Augusta, Ga.	5000
KFXD	Nampa, Idaho	5000
WILL	Urbana, Ill.	5000d
KSAC	Manhattan, Kans.	5000
WIBW	Topeka, Kans.	5000
KALB	Alexandria, La.	5000
WTAG	Worcester, Mass.	5000
WELO	Tupelo, Miss.	1000
KANA	Anaconda, Mont.	1000
WAGR	Lumberton, N.C.	500
KWIN	Ashland, Oreg.	1000
WHP	Harrisburg, Pa.	5000
WKAQ	San Juan, P.R.	5000
KOBH	Hot Springs, S. Dak.	500d
WRKH	Rockwood, Tenn.	1000d
KOAV	Lubbock, Tex.	500d
WLES	Lawrenceville, Va.	500d
WCHS	Charleston, W. Va.	5000
WKTY	LaCrosse, Wis.	5000
590—508.2		
CFAR	Flin Flon, Man.	1000
CKRS	Jonquiere, Que.	1000
CFTK	Terrace, B.C.	1000
VOCM	St. Johns, N.F.	1000d
KHAR	Anchorage, Alaska	5000
WRAG	Carrington, Ala.	1000d
KBHS	Hot Springs, Ark.	5000d
KFXM	San Bernardino, Cal.	1000
KTHO	Tahoe Valley, Calif.	1000d
KCSJ	Pueblo, Colo.	1000
WOLP	Panama City, Fla.	1000
WPLO	Atlanta, Ga.	5000
KGMB	Honolulu, Hawaii	5000
KID	Idaho Falls, Idaho	5000
WBBY	Wood River, Ill.	500d
WYLK	Lexington, Ky.	5000
WEEI	Boston, Mass.	5000
WKZO	Kalamazoo, Mich.	5000
KGLE	Glendive, Mont.	500d
WOW	Omaha, Nebr.	5000
WROW	Albany, N.Y.	5000
WGTM	Wilson, N.C.	5000
KUGN	Eugene, Oreg.	5000
WARM	Scranton, Pa.	5000
WMBB	Uniontown, Pa.	1000
KTBC	Austin, Tex.	5000
KSUB	Cedar City, Utah	1000
WLVA	Lynchburg, Va.	1000
KHQ	Spokane, Wash.	5000
600—499.7		
CFCF	Montreal, Que.	5000
CFCH	North Bay, Ont.	1000d
CFQC	Saskatoon, Sask.	5000
CJOR	Vancouver, B.C.	1000d
CKLC	Truro, N.S.	1000
WIRB	Enterprise, Ala.	1000
KCLS	Flagstaff, Ariz.	5000
KVCV	Redding, Calif.	1000
KOGO	San Diego, Calif.	5000
KZIX	Ft. Collins, Colo.	1000d

Kc.	Wave Length	W.P.
WICC	Bridgeport, Conn.	5000
WPDQ	Jacksonville, Fla.	5000
WMT	Cedar Rapids, Iowa	5000
WWOM	New Orleans, La.	1000d
WFST	Caribou, Maine	5000d
WCAO	Baltimore, Md.	5000
WLST	Escanaba, Mich.	1000d
WTAC	Flint, Mich.	1000
KGEZ	Kalispell, Mont.	2000
WCVP	Murphy, N.C.	1000d
WSJS	Winston-Salem, N.C.	5000
KSJB	Jamestown, N.D.	5000
WFRM	Coudersport, Pa.	1000d
WAEL	Mayaguez, P.R.	1000
WREC	Memphis, Tenn.	5000
KROD	El Paso, Tex.	5000
KERB	Kermit, Tex.	1000d
KTBB	Tyler, Tex.	1000
610—491.5		
CKML	Mont Laurier, Que.	1000
CHNC	New Carlisle, Que.	5000
CJAT	Trail, B.C.	1000
CKKL	Thompson, Man.	1000
CTB	St. Catharines, Ont.	1000d
CKYL	Peace River, Alta.	1000d
WGSN	Birmingham, Ala.	5000
KFAR	Fairbanks, Alaska	5000
KAVL	Lancaster, Calif.	1000
KFRS	San Francisco, Calif.	5000
WTOR	Torrington, Conn.	1000d
WIOD	Miami, Fla.	5000
WMEL	Pensacola, Fla.	500d
WCEH	Hawkinsville, Ga.	500d
WRUS	Russellville, Ky.	500d
KDAL	Duluth, Minn.	5000
WDAF	Kansas City, Mo.	5000
KOJM	Havre, Mont.	1000
KCSR	Chadron, Nebr.	1000d
WGIR	Manchester, N.H.	5000
KGGM	Albuquerque, N. Mex.	5000
WAYS	Charlotte, N.C.	5000
WTVN	Columbus, Ohio	5000
WIP	Philadelphia, Pa.	5000
KILT	Houston, Tex.	5000
KVNU	Logan, Utah	5000
WSLS	Roanoke, Va.	5000
WHPL	Winchester, Va.	500d
KEPR	Kennewick, Wash.	5000
620—483.6		
CFCL	Timmins, Ont.	1000d
CKCK	Regina, Sask.	5000
CKCM	Grand Falls, Nfld.	1000d
KTAR	Phoenix, Ariz.	5000
KNGS	Hanford, Calif.	1000
KWSO	Mt. Shasta, Calif.	1000d
KSTR	Grand Junction, Colo.	5000d
WSUN	St. Petersburg, Fla.	5000
WTRP	LaGrange, Ga.	1000d
KWAL	Wallace, Idaho	1000
KMSN	Sioux City, Iowa	1000
WTMT	Louisville, Ky.	500d
WLBZ	Bangor, Maine	5000
WJOX	Jackson, Miss.	5000
WVNI	Newark, N.J.	5000
WHEN	Syracuse, N.Y.	5000
WONC	Durham, N.C.	5000
KGW	Portland, Oreg.	5000
WHJB	Greensburg, Pa.	1000
WCAY	Cayce, S.C.	500d
WATE	Knoxville, Tenn.	5000
KWFT	Wichita Falls, Tex.	5000
WVMT	Burlington, Vt.	5000
WWNR	Beckley, W. Va.	1000
WTMJ	Milwaukee, Wis.	5000
630—475.9		
CFCD	Chatham, Ont.	1000
CKAR	Huntsville, Ont.	1000
CHLT	Sherbrooke, Que.	1000d
CFCY	Charlottetown, P.E.I.	1000d
CJET	Smith Falls, Ont.	1000
CKRC	Winnipeg, Man.	1000d
CKOV	Kelowna, B.C.	1000
WAYU	Albertville, Ala.	1000d
WJOB	Thomasville, Ala.	1000d
KJNO	Juneau, Alaska	1000
KVMA	Magnolia, Ark.	1000d
KIOD	Monterey, Calif.	1000
KHOW	Denver, Colo.	5000
WMAL	Washington, D.C.	5000
WSAV	Savannah, Ga.	5000
WNEG	Toccoa, Ga.	500d
KIOD	Boise, Idaho	5000
WLAP	Lexington, Ky.	5000
KTIB	Thibodaux, La.	500d
WJMS	Ironwood, Mich.	1000
KOWB	So. St. Paul, Minn.	5000
KXDK	St. Louis, Mo.	5000
KGWV	Belgrade, Mont.	1000d
KOH	Reno, Nev.	5000
KLEA	Livingston, N. Mex.	500d
WIRC	Hickory, N.C.	1000d
WMFO	Wilmington, N.C.	1000
KWRO	Coquille, Oreg.	5000d
WEJL	Scranton, Pa.	500d
WKYN	San Juan, P.R.	5000
WPRO	Providence, R.I.	5000
KGFX	Pierre, S. Dak.	200d

Kc.	Wave Length	W.P.
KMAC	San Antonio, Tex.	5000
KSXX	Salt Lake City, Utah	1000d
KGDN	Edmunds, Wash.	5000d
KZUN	Opportunity, Wash.	500d
640—468.5		
CBN	St. John's, N.F.	1000d
KFI	Los Angeles, Calif.	5000d
WOI	Ames, Iowa	5000
WHLO	Akron, Ohio	1000
WNAD	Norman, Okla.	1000d
650—461.3		
KORL	Honolulu, Hawaii	1000d
WSM	Nashville, Tenn.	5000d
KIKK	Pasadena, Texas	250d
660—454.3		
KMED	Omaha, Nebr.	500d
WNBC	New York, N.Y.	5000d
WESC	Greenville, S.C.	1000d
KSKY	Dallas, Tex.	1000
670—447.5		
WMAQ	Chicago, Ill.	5000d
680—440.9		
CHFA	Edmonton, Alta.	5000d
CHLO	St. Thomas, Ont.	1000
CJOB	Winnipeg, Man.	1000d
CKGB	Timmins, Ont.	1000d
KNBR	San Fran., Calif.	5000d
WPIN	St. Petersburg, Fla.	1000d
WCTT	Corbin, Ky.	1000
WCBM	Baltimore, Md.	1000d
WNAC	Boston, Mass.	5000d
WDBC	Escanaba, Mich.	1000d
KFEQ	St. Joseph, Mo.	5000
WINR	Binghamton, N.Y.	1000
WVVM	Rochester, N.Y.	250d
WPTF	Raleigh, N.C.	5000d
WISR	Butler, Pa.	250d
WAPA	San Juan, P.Rico.	1000d
WMPS	Memphis, Tenn.	1000d
KBAT	San Antonio, Tex.	5000d
KOMW	Omaha, Wash.	1000d
WCAW	Charleston, W. Va.	1000d
690—434.5		
CBU	Vancouver, B.C.	1000d
CBF	Montreal, Que.	5000d
WVOK	Birmingham, Ala.	5000d
KYNA	Flagstaff, Ariz.	1000
KEYT	Tucson, Ariz.	250d
KBBA	Benton, Ark.	250d
KAPI	Pueblo, Colo.	250d
WADS	Ansonia, Conn.	500d
WAPE	Jacksonville, Fla.	2500d
KULA	Honolulu, Hawaii	1000d
KBLI	Blackfoot, Idaho	1000d
KGGF	Coffeyville, Kans.	1000d
WTIX	New Orleans, La.	5000
KTCR	Minneapolis, Minn.	500d
KSTL	St. Louis, Mo.	1000d
KEYR	Terrytown, Nebr.	1000d
KRCO	Prineville, Oreg.	1000d
WXUR	Media, Pa.	500
KUSD	Vermillion, S. Dak.	1000d
KHEY	El Paso, Tex.	1000d
KPET	Lamesa, Tex.	250
KZEY	Tyler, Tex.	250d
WCYB	Bristol, Va.	1000d
WNNT	Warsaw, Va.	250d
WELO	Fisher, W. Va.	500d
700—428.3		
WLW	Cincinnati, Ohio	5000d
710—422.3		
CJSP	Leamington, Ont.	1000d
CFRG	Gravelbourg, Sask.	5000d
CKVM	Ville Marie, Que.	1000d
WKRQ	Mobile, Ala.	1000
KMPC	Los Angeles, Calif.	5000d
KBTR	Denver, Colo.	5000
WGBS	Miami, Fla.	5000d
WROM	Rome, Ga.	1000d
KEEL	Shreveport, La.	5000d
WHB	Kansas City, Mo.	1000d
WDR	New York, N.Y.	5000d
OZRH	Manila, P.I.	1000d
WKJB	Mayaguez, P.Rico	1000
WTPR	Paris, Tenn.	250d
KGNC	Amarillo, Tex.	1000d
KURY	Edinburg, Tex.	250
KIRO	Seattle, Wash.	5000d
WDSM	Superior, Wis.	5000
720—416.4		
WGN	Chicago, Ill.	5000d
730—410.7		
CJNR	Blind River, Ont.	1000
CKAC	Montreal, Que.	5000d
CKDM	Dauphin, Man.	1000d
CKLG	No. Vancouver, B.C.	1000d
WJMW	Athens, Ala.	1000
KFQD	Anchorage, Alaska	1000d
KSUD	W. Memphis, Ark.	250d

Kc.	Wave Length	W.P.
WKTG	Thomasville, Ga.	1000d
KLOE	Goodland, Kans.	1000d
WFMW	Madisonville, Ky	500
WMTG	Van Cleve, Ky.	1000d
KTRY	Bastrop, La.	250d
WARB	Covington, La.	250d
WJTO	Bath, Maine	1000d
WACE	Chicopee, Mass.	5000d
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N. Mex.	1000d
WDOE	Oneonta, N.Y.	1000d
WFMC	Goldsboro, N.C.	1000d
WOSH	Shelby, N.C.	1000d
WMSG	Bowling Green, Ohio	1000d
KBOY	Medford, Oreg.	1000d
WNAK	Nanticoke, Pa.	1000d
WPIT	Pittsburgh, Pa.	5000d
WPAL	Charleston, S.C.	1000d
WLIL	Lenoir, Tenn.	1000d
KPCN	Grand Prairie, Tex.	500d
KSVN	Ogden, Utah	1000d
WPIK	Alexandria, Va.	5000d
WMNA	Gretna, Va.	1000d
KULE	Ephrata, Wash.	1000d
WXMT	Merrill, Wis.	1000d
740—405.2		
CBXA	Edmonton, Alta.	5000d
CBL	Toronto, Ont.	5000d
WBAM	Montgomery, Ala.	5000d
KUEQ	Phoenix, Ariz.	1000d
KGLM	Avalon, Calif.	1000d
KCBS	San Francisco, Calif.	5000d
KSSS	Colo. Springs, Colo.	1000
KVFC	Cortez, Colo.	1000d
WFSG	Boca Raton, Fla.	1000d
WKMK	Blountston, Fla.	1000d
WKIS	Orlando, Fla.	5000
KYME	Boise, Idaho	500d
WVLN	Olney, Ill.	1000d
KBOE	Oskaloosa, Iowa	250d
WNOP	Newport, Ky.	1000d
WTAD	Cambridge, Mass.	250d
KPBM	Carlsbad, N. Mex.	1000d
WGSN	Huntington, N.Y.	5000d
WMBL	Morehead City, N.C.	1000d
WPAQ	Mount Airy, N.C.	1000d
KRMG	Tulsa, Okla.	5000d
WVCH	Chester, Pa.	1000d
WIAC	San Juan, P.Rico	1000d
WBAW	Barnwell, S.C.	1000d
WIRJ	Humbolt, Tenn.	250d
WJIG	Tullahoma, Tenn.	250d
KTRH	Houston, Tex.	5000d
KCMC	Texarkana, Tex.	1000
WBCI	Williamsburg, Va.	500d
750—399.8		
WSB	Atlanta, Ga.	5000d
WBMD	Baltimore, Md.	1000d
KMMJ	Grand Island, Neb.	1000d
WHEB	Portsmouth, N.H.	1000d
KSEO	Durant, Okla.	250d
KXL	Portland, Oreg.	5000d
WPOX	Clarksburg, W. Va.	1000d
760—394.5		
KGU	Honolulu, Hawaii	1000d
WJR	Detroit, Mich.	5000d
WCPS	Tarboro, N.C.	1000d
WORA	Mayaguez, P.R.	5000
770—389.4		
KUOM	Minneapolis, Minn.	5000d
WCAL	Northfield, Minn.	5000d
WEW	St. Louis, Mo.	1000d
KOB	Albuquerque, N. Mex.	5000d
WABC	New York, N.Y.	5000d
KXA	Seattle, Wash.	1000d
780—384.4		
WBBM	Chicago, Ill.	5000d
WJAG	Norfolk, Neb.	1000d
WCKB	Dunn, N.C.	1000d
WBBO	Forest City, N.C.	1000d
KSPI	Stillwater, Okla.	250d
WAVA	Arlington, Va.	1000d
790—379.5		
CFCW	Camrose, Alta.	1000d
CFOR	Oranmouthe, N. S.	5000
CKMR	Newcastle, N.B.	1000
CHIC	Brompton, Ont.	1000
CKSO	Sudbury, Ont.	1000d
WTUG	Tuscaloosa, Ala.	500d
KCEE	Tucson, Ariz.	5000d
KOSY	Texarkana, Ark.	1000
KOAN	Eureka, Calif.	

Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.
KXXX	Colby, Kans.	5000d	WJW	Cleveland, Ohio	10000	WFLN	Philadelphia, Pa.	1000d	KELP	El Paso, Tex.	1000
WAKY	Louisville, Ky.	5000	WJAC	Johnstown, Pa.	10000	WKXV	Knoxville, Tenn.	1000d	KECK	Odessa, Tex.	1000
WRUM	Runiford, Me.	1000d	WEUU	Reading, Pa.	1000	WGOR	Lebanon, Tenn.	500d	KTLW	Texas City, Tex.	1000d
WSGW	Saginaw, Mich.	5000	WABA	Aquadilla, P.R.	500	KALT	Atlanta, Tex.	1000d	KITN	Olympia, Wash.	1000d
WSJC	Magee, Miss.	1000d	WRAP	Norfolk, Va.	5000	KMCO	Conroe, Tex.	500d	KXLY	Spokane, Wash.	5000
KGHL	Billings, Mont.	5000	KTAC	Tacoma, Wash.	1000	KFLD	Floydada, Tex.	250d	WMMN	Fairmont, W.Va.	5000
WWNY	Watertown, N.Y.	1000				KCLW	Hamilton, Tex.	250d	WOKY	Milwaukee, Wis.	1000
WLSV	Wellsville, N.Y.	1000d				WDDY	Bassett, Va.	500d			
WTNC	Thomasville, N.C.	1000d				WAFY	Staunton, Va.	1000d			
KXGO	Fargo, N. Dak.	5000				KUEN	Wanatchee, Wash.	1000d			
KWIL	Albany, Dreg.	1000				WATK	Antigo, Wis.	250d			
WAEB	Allentown, Pa.	500									
WPIC	Sharon, Pa.	1000d									
WEAN	Providence, R.I.	5000									
WWBD	Bamberg, S.C.	1000d									
WETB	Johnson City, Tenn.	1000d									
WMC	Memphis, Tenn.	5000									
KTHT	Houston, Tex.	5000									
KFYD	Lubbock, Tex.	5000									
KUTA	Blanding, Utah	1000d									
WSIG	Mount Jackson, Va.	1000d									
WTAR	Norfolk, Va.	5000									
KGMI	Bellingham, Wash.	5000									
KNEW	Spokane, Wash.	5000									
WEAQ	Eau Claire, Wis.	5000									
800—374.8											
CHAB	Moose Jaw, Sask.	10000									
CKOK	Pentieton, B.C.	10000									
CFOB	Ft. Frances, Ont.	1000									
CJLX	Ft. William, Ont.	10000									
CJBQ	Belleville, Ont.	1000									
CKLW	Windsor, Ont.	50000									
CHRC	Quebec, Que.	10000									
CJAD	Montreal, Que.	10000									
VOWR	St. Johns, N.F.	1000									
WHOS	Decatur, Ala.	1000d									
WMGY	Montgomery, Ala.	1000d									
KINY	Juneau, Alaska	5000									
KAGH	Crossett, Ark.	250d									
KVOM	Morrilton, Ark.	250d									
KUZZ	Bakersfield, Calif.	250d									
KDAD	Weed, Calif.	1000d									
KBRN	Brighton, Colo.	500d									
WLAD	Danbury, Conn.	250d									
WSUZ	Palatka, Fla.	1000d									
WJAT	Swainsboro, Ga.	1000d									
WKZI	Casey, Ill.	1000d									
KXIC	Iowa City, Iowa	1000d									
WBOK	New Orleans, La.	1000d									
WCCM	Lawrence, Mass.	1000d									
WVAL	Sauk Rapids, Minn.	5000									
KREI	Farmington, Mo.	1000d									
KDBM	Dillon, Mont.	1000d									
WKDN	Camden, N.J.	1000d									
KJEM	Okla City, Okla.	250d									
KPDQ	Portland, Oreg.	1000d									
WCHA	Chambersburg, Pa.	1000d									
WDSC	Dillon, S.C.	1000d									
WEAB	Greer, S.C.	250d									
WDEH	Sweetwater, Tenn.	1000d									
KDDD	Dumas, Tex.	250d									
KBUH	Brigham City, Utah	250d									
WSVS	Crewe, Va.	5000d									
WKEE	Huntington, W.Va.	1000d									
WDUX	Waupaca, Wis.	1000d									
810—370.2											
KGO	San Francisco, Calif.	50000									
WIGO	Indianapolis, Ind.	250d									
WABW	Annapolis, Md.	250d									
KCMO	Kansas City, Mo.	50000									
WGY	Schenectady, N.Y.	50000									
WKBC	N. Wilkesboro, N.C.	1000d									
WCEC	Rocky Mount, N.C.	1000d									
WEDO	McKeesport, Pa.	1000d									
WKVM	San Juan, P.R.	25000									
820—365.6											
WAIT	Chicago, Ill.	5000d									
WIKY	Evansville, Ind.	250d									
WOSU	Columbus, Ohio	5000d									
WFAA	Dallas, Tex.	50000									
WBAP	Ft. Worth, Tex.	50000									
830—361.2											
KIKI	Honolulu, Hawaii	250									
WCCO	Minneapolis, Minn.	50000									
KBOA	Kennett, Mo.	1000d									
WNYC	New York, N.Y.	1000									
840—356.9											
WTUF	Mobile, Ala.	1000d									
WRYM	New Britain, Conn.	1000d									
WHAS	Louisville, Ky.	50000									
WVPO	Stroudsburg, Pa.	250d									
850—352.7											
CKVL	Verdun, Que.	50000									
CKRD	Red Deer, Alta.	10000									
CJJC	Langley Prairie, B.C.	1000									
WYDE	Birmingham, Ala.	10000									
KICY	Nome, Alaska	5000									
KOA	Denver, Colo.	50000									
WRUF	Gainesville, Fla.	5000									
WEAT	W. Palm Beach, Fla.	1000									
KIMO	Hilo, Hawaii	1000									
WHDH	Boston, Mass.	50000									
WKBZ	Muskegon, Mich.	1000									
KFUD	St. Louis, Mo.	5000d									
WKIX	Raleigh, N.C.	10000									
WJW	Cleveland, Ohio	10000									
WJAC	Johnstown, Pa.	10000									
WEUU	Reading, Pa.	1000									
WABA	Aquadilla, P.R.	500									
WRAP	Norfolk, Va.	5000									
KTAC	Tacoma, Wash.	1000									
860—348.6											
CBH	Halifax, N.S.	10000									
CHAK	Inuvik, N.W.T.	1000									
CJBC	Toronto, Ont.	50000									
WHRT	Hartselle, Ala.	250d									
WAMI	Opp, Ala.	1000d									
KIFN	Phoenix, Ariz.	1000d									
KOSE	Osceola, Ark.	1000d									
KWRF	Warren, Ark.	250d									
KTRB	Modesto, Calif.	10000									
WOWW	Naugatuck, Conn.	250d									
WAZE	Clearwater, Fla.	500d									
WKKO	Cocoa, Fla.	1000d									
WERD	Atlanta, Ga.	1000									
WDMG	Douglas, Ga.	5000d									
WMRI	Marion, Ind.	250d									
KWPC	Muscataine, Iowa	250d									
KOAM	Pittsburg, Kans.	10000									
WSON	Henderson, Ky.	500d									
WAYE	Dundalk, Md.	500d									
WSBS	Gt. Barrington, Mass.	250d									
KNUJ	New Ulm, Minn.	1000d									
WMAG	Forest, Miss.	500d									
KARS	Belen, N. Mex.	250d									
WFMO	Fairmont, N.C.	1000d									
WSTH	Taylorville, N. C.	250d									
KSHA	Medford, Oreg.	1000d									
WAMO	Pittsburgh, Pa.	1000d									
WTEL	Philadelphia, Pa.	10000d									
WLBG	Laurens, S.C.	1000d									
WIVK	Knoxville, Tenn.	1000d									
WMTS	Murfreesboro, Tenn.	250d									
KFST	Ft. Stockton, Tex.	250d									
KPAN	Hereford, Tex.	250d									
KSFA	Nacogdoches, Tex.	1000d									
KONO	San Antonio, Tex.	5000									
KWHO	Salt Lake City, Utah	1000d									

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
WIBX	Utica, N.Y.	5000
WPET	Greensboro, N.C.	5000d
KYES	Roseburg, Oreg.	1000d
WNCC	Barnesboro, Pa.	5000
WPEN	Philadelphia, Pa.	5000
WBER	Moncks Corner, S. C.	5000
WSPA	Spartanburg, S.C.	5000
KWAT	Watertown, S.Dak.	1000
WAGG	Franklin, Tenn.	1000d
KDSX	Denison, Tex.	500
KPRC	Houston, Tex.	5000
KSEL	Lubbock, Tex.	5000
WXGI	Richmond, Va.	5000d
KMER	Kemmerer, Wash.	1000
KJR	Seattle, Wash.	5000
WERL	Eagle River, Wis.	1000d
WKAZ	Charleston, W.Va.	5000
WKTS	Sheboygan, Wis.	5000
KMER	Kemmerer, Wyo.	1000

960—312.3

CFAC	Calgary, Alta.	10000
CHNS	Halifax, N.S.	10000
CKWS	Kingston, Ont.	5000
WBRC	Birmingham, Ala.	5000
WMOZ	Mobile, Ala.	1000
WCYQ	Kodiak, Alaska	250
KOOL	Phoenix, Ariz.	5000
KAYR	Apple Valley, Calif.	5000d
KNEZ	Lompoc, Calif.	500
KABL	Oakland, Calif.	5000
WELL	New Haven, Conn.	5000
WGRO	Lake City, Fla.	5000
WJCM	Sebring, Fla.	1000d
WJAZ	Albany, Ga.	5000d
WRFC	Athens, Ga.	5000
KSRA	Salmon, Idaho	1000d
WDLM	E. Moline, Ill.	1000d
WSBT	South Bend, Ind.	5000
KMA	Shenandoah, Iowa	5000
WPRT	Prestonsburg, Ky.	5000d
KROF	Abbeville, La.	1000d
WBOC	Salisbury, Md.	5000
WFGM	Fitchburg, Mass.	1000
WHAK	Rogers City, Mich.	5000d
KLTF	Little Falls, Minn.	500d
WABG	Greenwood, Miss.	1000
KFVS	Cape Girardeau, Mo.	5000
KNEB	Scottsbluff, Nebr.	1000
KWYK	Farmington, N.Mex.	1000d
KRIK	Roswell, N. Mex.	1000d
WEAY	Plattsburg, N.Y.	5000
WAAK	Dallas, N.C.	1000d
WFTC	Kinston, N.C.	5000
WWSW	Wooster, Ohio	1000d
KGWA	Enid, Okla.	1000
KLAD	Klamath Falls, Oreg.	5000d
WHYL	Carlisle, Pa.	5000d
WADP	Kane, Pa.	1000d
WATS	Sayre, Pa.	1000d
WBEU	Beaufort, S.C.	1000d
WBMC	McMinnville, Tenn.	500d
KIMP	Mt. Pleasant, Tex.	1000d
KGKL	San Angelo, Tex.	5000
KOVO	Provo, Utah	5000
WDBJ	Roanoke, Va.	5000
KALE	Richland, Wash.	1000
WTCH	Shawano, Wis.	1000

970—309.1

CKCH	Hull, Que.	5000
CKNL	Ft. St. John, B. C.	1000
WERH	Hamilton, Ala.	5000d
WTBF	Troy, Ala.	5000
KNEA	Jonesboro, Ark.	1000d
KBIS	Bakersfield, Calif.	1000
KCHV	Coachella, Calif.	5000
KBEE	Modesto, Calif.	1000
KFEL	Pueblo, Colo.	1000d
WFLA	Tampa, Fla.	5000
WIIN	Atlanta, Ga.	5000d
WVOP	Vidalia, Ga.	5000d
KHBC	Hilo, Hawaii	1000
KAYT	Rupert, Idaho	1000d
WMAY	Springfield, Ill.	1000
WAVE	Louisville, Ky.	5000
KSYL	Alexandria, La.	1000
WCSH	Portland, Maine	5000
WAMD	Aberdeen, Md.	500
WESO	Southbridge, Mass.	1000d
WJAN	Ishpeming, Mich.	5000d
WKHM	Jackson, Mich.	1000
KQAG	Austin, Minn.	5000d
KOOK	Billings, Mont.	5000
KJLT	No. Platte, Nebr.	5000d
KVEG	Las Vegas, Nev.	5000
WJRZ	Newark, N.J.	5000

Kc.	Wave Length	W.P.
KDCE	Espanola, N. M.	1000d
WEBR	Buffalo, N.Y.	5000
WCHN	Norwich, N.Y.	5000
WRCS	Ahokkie, N.C.	1000d
WWIT	Canton, N.C.	1000d
WDAY	Fargo, N.Dak.	5000
WREO	Ashtabula, Ohio	5000
WATH	Athens, Ohio	1000d
KAKC	Tulsa, Okla.	1000
KOIN	Portland, Oreg.	5000
WWSW	Pittsburgh, Pa.	5000
WJMX	Florence, S.C.	5000
KASE	Austin, Tex.	1000d
KNOK	Ft. Worth, Tex.	1000d
WIVI	Christiansted, V. I.	5000
WYPR	Danville, Va.	1000d
WBVA	Waynesboro, Va.	5000
KREM	Spokane, Wash.	5000
WWYO	Pineville, W.Va.	1000d
WHA	Madison, Wis.	5000d
WIGL	Superior, Wis.	5000

980—305.9

CKNW	New Westminster, Brit. Columbia	10000
CFPL	London, Ont.	10000
CKGM	Montreal, Que.	10000
CBV	Quebec, Que.	5000
CHEX	Peterboro, Ont.	5000
CKRM	Regina, Sask.	10000
WKLF	Clanton, Ala.	1000d
WXLL	Big Delta, Alaska	100
KINS	Eureka, Calif.	5000
KEAP	Fresno, Calif.	500d
KFWB	Los Angeles, Calif.	5000
KCTY	Salinas, Calif.	1000d
KGLN	GlenwoodSprgs., Colo.	1000d
WSUB	Groton, Conn.	1000d
WRC	Washington, D.C.	5000
WDVH	Gainesville, Fla.	5000d
WTOT	Marianna, Fla.	1000d
WBOP	Pensacola, Fla.	1000d
WLOD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	500d
WRIP	Rossville, Ga.	500d
KUPI	Idaho Falls, Idaho	1000d
KSGM	Chester, Ill.	500
WITY	Danville, Ill.	1000
KREB	Shreveport, La.	5000d
WCAP	Lowell, Mass.	1000d
WDMC	Otsego, Mich.	500
WPBC	Minneapolis, Minn.	1000d
WAPF	McComb, Miss.	1000d
KMBC	Kansas City, Mo.	5000
KLYQ	Hamilton, Mont.	1000d
KVLY	Fallon, Nev.	5000d
KICA	Clovis, N. Mex.	1000
KMIN	Grants, N. Mex.	1000d
WTRY	Troy, N.Y.	5000
WKLM	Wilmington, N.C.	5000d
WAAA	Win. Salem, N.C.	1000d
WONE	Dayton, Ohio	5000
WILK	Wilkes-Barre, Pa.	5000
WAZS	Summerville, S.C.	500d
WRBI	Winnsboro, S.C.	500d
KDSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
KFRV	Rosenberg, Tex.	1000d
KSVC	Richfield, Utah	5000
WFHG	Bristol, Va.	5000
WMEK	Chase City, Va.	500d
KUTI	Yakima, Wash.	5000d
WHAW	Weston, W.Va.	1000d
WCUB	Manitowoc, Wis.	1000d
WPRE	Prairie du Chien, Wis.	1000

990—302.8

CBW	Winnipeg, Man.	50000
CBY	Corner Brook, Nfld.	10000
WEIS	Center, Ala.	250
WWWF	Fayette, Ala.	1000d
WTCB	Flomaton, Ala.	500d
KTCT	Tucson, Ariz.	10000
KKIS	Pittsburg, Calif.	5000
KGUO	Santa Barbara, Calif.	1000d
KLIR	Denver, Colo.	1000d
WBZY	Torrington, Conn.	1000d
WFAB	Miami, Fla.	5000
WHOO	Orlando, Fla.	10000
WDWD	Dawson, Ga.	1000d
WGML	Hinesville, Ga.	250d
KTRG	Honolulu, Hawaii	5000
WCAZ	Carthage, Ill.	1000d
WITZ	Jasper, Ind.	1000d
KAYL	Storm Lake, Iowa	250d
KRSL	Russell, Kans.	250d
WJMR	New Orleans, La.	250d
KRIH	Rayville, La.	250d
WCRM	Clare, Mich.	250d
WABO	Waynesboro, Miss.	250d
KRMO	Monett, Mo.	250d
KSVP	Artesia, N.Mex.	1000
WEEB	Southern Pines, N.C.	5000d
WJEH	Gallatin, Ohio	1000d
WTIG	Massillon, Ohio	250d
KRKT	Albany, Oreg.	250d
WIBG	Philadelphia, Pa.	50000
WVSC	Somerset, Pa.	250d
WPRR	Mayaguez, P.R.	10000
WLKW	Providence, R.I.	50000
WAKN	Aiken, S.C.	1000d

Kc.	Wave Length	W.P.
WNOX	Knoxville, Tenn.	10000
KWAM	Memphis, Tenn.	1000d
KTRM	Beaumont, Tex.	1000
KAML	Kenedy, Tex.	250d
KNIN	Wichita Falls, Tex.	10000
KDYL	Tooele, Utah	1000d
WNRV	Narrows, Va.	1000d
WANT	Richmond, Va.	1000d
WKLJ	Sparta, Wis.	250

1000—299.8

CKBW	Bridgewater, N.S.	10000
WCFL	Chicago, Ill.	50000
KTOK	Okla. City, Okla.	5000
KSTA	Coleman, Tex.	250d
KGRI	Henderson, Tex.	250d
WHWB	Rutland, Vt.	1000d
WBNB	Charlotte Amelle, Virgin Islands	1000
KOMO	Seattle, Wash.	50000

1010—296.9

CBX	Calgary, Alta.	50000d
CFRB	Toronto, Ont.	50000
KCAC	Phoenix, Ariz.	5000
KVNC	Winslow, Ariz.	1000
KLRA	Little Rock, Ark.	10000
KCHJ	Delano, Calif.	5000
KCMJ	Palm Sprgs., Calif.	1000
KSAY	San Fran., Calif.	10000d
WCNU	Crestview, Fla.	1000d
WZRO	Jacksonville Beach, Florida	2500d

WINQ	Tampa, Fla.	50000d
WGUN	Decatur, Ga.	50000d
KATN	Boise, Idaho	1000d
WCSI	Columbus, Ind.	500d
KSMN	Mason City, Iowa	1000d
KIND	Independence, Kans.	250d
KDLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WMRT	Lansing, Mich.	5000d
WGHM	Maplewood, Minn.	10000
WMOX	Meridian, Miss.	250d
KCHI	Chillicothe, Mo.	5000d
KXEN	Festus, Mo.	50000d
KRVN	Lexington, Nebr.	25000d
WCNL	Newport, N.H.	250d
WINS	New York, N.Y.	50000
WABZ	Albermarle, N.C.	1000d
WFGW	Black Mountain, N.C.	10000d

WELS	Kinston, N.C.	1000d
WIOI	New Boston, Ohio	1000d
KBEV	Portland, Oreg.	1000d
WUNS	Lewisburg, Pa.	250d
WHIN	Gallatin, Tenn.	1000d
WORM	Savannah, Tenn.	250d
KBUY	Amarillo, Tex.	5000
KODA	Houston, Tex.	1000d
KAWA	Waco, Tex.	10000d
WELK	Charlottesville, Va.	1000d
WNEV	Marion, Va.	1000d
WPMH	Portsmouth, Va.	5000d
WCST	Berkeley Sprgs., W.Va.	250d
WSPT	Stevens Pt., Wis.	1000d

1020—293.9

KGBS	Los Angeles, Calif.	50000
WCIL	Carbondale, Ill.	1000d
WPEO	Peoria, Ill.	1000d
KDKA	Pittsburgh, Pa.	50000

1030—291.1

WBZ	Boston, Mass.	50000
KCTA	Corpus Christi, Tex.	50000d

1040—288.3

KHVN	Honolulu, Hawaii	5000
WHO	Des Moines, Iowa	50000
KIXL	Dallas, Tex.	1000d

1050—285.5

CFGP	Grande Prairie, Alta.	10000
CKSB	St. Boniface, Man.	10000
CJIC	Sault Ste. Marie, Ont.	10000
CHUM	Toronto, Ont.	5000
WRFS	Alexander City, Ala.	1000d
WCRI	Scottsboro, Ala.	250d
KVWM	Show Low, Ariz.	250d
KVLC	Little Rock, Ark.	1000d
KOFY	San Mateo, Calif.	1000d
KWSO	Wasco, Calif.	1000d
KLMO	Longmont, Colo.	250d
WJSB	Crestview, Fla.	1000d
VIVY	Jacksonville, Fla.	1000d
WHBO	Tampa, Fla.	250d
WRMF	Titusville, Fla.	5000
WAUG	Augusta, Ga.	5000d
WBIE	Marietta, Ga.	500d
WMNZ	Montezuma, Ga.	250d
WDZ	Decatur, Ill.	1000d
KNCO	Garden City, Kans.	1000d
WNES	Central City, Ky.	500d
KLPL	Lake Providence, La.	250d
KCIJ	Shreveport, La.	250d
KVPI	Villa Platte, La.	250d
WMSG	Oakland, Md.	500d
WQMR	Silver Sprg., Md.	1000d
WPAG	Ann Arbor, Mich.	5000d
KLOH	Pipestone, Minn.	1000d

Kc.	Wave Length	W.P.
WACR	Columbus, Miss.	1000d
KMIS	Portageville, Mo.	250d
KSIS	Sedalia, Mo.	1000d
KLVC	Las Vegas, Nev.	500d
WBNC	Conway, N.H.	1000d
WSEN	Baldwinsville, N.Y.	250d
WSTS	Massena, N.Y.	10000
WHN	New York, N.Y.	50000
WFSC	Franklin, N.C.	1000d
WLON	Lincolnton, N.C.	1000d
WWGP	Sanford, N.C.	1000d
WZIP	Cincinnati, Ohio	1000d
KCCO	Lawton, Okla.	250d
KFMJ	Tulsa, Okla.	1000d
KUBE	Pendleton, Oreg.	1000d
KEED	Springfield, Oreg.	1000d
WBUT	Butler, Pa.	1000d
WVDS	Everett, Pa.	250d
WLYC	Williamsport, Pa.	1000d
WSMT	Sparta, Tenn.	1000d
KLEN	Killeen, Tex.	250d
KWLO	Liberty, Tex.	250d
KPLA	Plainview, Tex.	1000d
KCAS	Slaton, Tex.	250d
WGAT	Gate City, Va.	250d
WBRG	Lynchburg, Va.	1000d
WCMS	Norfolk, Va.	1000d
KNBX	Kirkland, Wash.	1000d
WCEF	Parkersburg, W. Va.	5000d
WECL	Eau Claire, Wis.	1000d
WLIP	Kenosha, Wis.	250d
KWIV	Douglas, Wyo.	250d

1060—282.8

CFCN	Calgary, Alta.	10000
CJLR	Quebec, Que.	10000
KUPD	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
WNOE	New Orleans, La.	50000
WHFB	Benton Harbor, Mich.	1000d
WMAP	Monroe, N.C.	250d
WHOF	Canton, Ohio	1000d
WRCV	Philadelphia, Pa.	50000
WRJS	San German, P. R.	250

1070—280.2

CFAX	Victoria, B.C.	10000
CBA	Sackville, N.B.	50000
CHOK	Sarnia, Ont.	5000
WAPI	Birmingham, Ala.	50000
KNX	Los Angeles, Calif.	50000
WVCG	Coral Gables, Fla.	1000d
WIBC	Indianapolis, Ind.	50000
KFDI	Wich	

Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.
KMOX	St. Louis, Mo.	50000	KV00	Tulsa, Okla.	50000	WNUZ	Talledega, Ala.	250	WCOL	Columbus, Ohio	1000
WWOL	Buffalo, N.Y.	1000d	WLEO	Ponce, P.R.	250	WTBC	Tuscaloosa, Ala.	250	WIRO	Ironton, Ohio	250
KCLE	Cleburne, Tex.	250d	KPUG	Bellingham, Wash.	1000	KIFW	Sitka, Alaska	250	WTOL	Toledo, Ohio	1000d
1130—265.3			WWVA	Wheeling, W.Va.	50000	KSUN	Bisbee, Ariz.	250	KADA	N. of Ada, Okla.	250
CKWX	Vancouver, B.C.	50000	1180—254.1			KAAB	Kingman, Ariz.	250	WBBZ	Ponca City, Okla.	250
KRDU	Dinuba, Calif.	1000	WLDS	Jacksonville, Ill.	1000d	KRIZ	Phoenix, Ariz.	250	KIAL	Astoria, Oreg.	1000
KSDO	San Diego, Calif.	5000	WHAM	Rochester, N.Y.	50000	KATD	Safford, Ariz.	250	KRNS	Burns, Oreg.	250
KLEI	Kailua, Hawaii	1000	1190—252.0			KINO	Winslow, Ariz.	250	KOOS	Coos Bay, Oreg.	250
KWKH	Shreveport, La.	50000	KRDS	Tolleson, Ariz.	250	KCON	Conway, Ark.	250	KRDR	Gresham, Oreg.	1000
WCAR	Detroit, Mich.	50000	KEZY	Anaheim, Calif.	1000	KFPW	Ft. Smith, Ark.	1000	KYJC	Medford, Oreg.	1000
WDGY	Minneapolis, Minn.	50000	KNBA	Vallejo, Calif.	250d	KBTM	Jonesboro, Ark.	1000	KQIK	Lakeview, Oreg.	250
WNEW	New York, N.Y.	50000	WOWO	Ft. Wayne, Ind.	50000	KGEE	Bakersfield, Calif.	1000	KTDO	Toledo, Oreg.	250
1140—263.0			WANN	Annapolis, Md.	1000d	KWTC	Barstow, Calif.	1000	WBVP	Beaver Falls, Pa.	1000
CKXL	Calgary, Alta.	10000	WKOX	Fram'gham, Mass.	1000d	KIBS	Bishop, Calif.	1000	WEEX	Easton, Pa.	1000
CBI	Sydney, N.S.	5000	WLIB	New York, N.Y.	1000d	KXO	El Centro, Calif.	250	WKBO	Harrisburg, Pa.	1000
KRAK	Sacramento, Calif.	50000	KEX	Portland, Oreg.	50000	KDAC	Ft. Bragg, Calif.	250	WCRO	Johnstown, Pa.	1000
WMIE	Miami, Fla.	10000	KLIF	Dallas, Tex.	50000	KGJF	Los Angeles, Calif.	1000	WBPZ	Lock Haven, Pa.	250
KGEM	Boise, Idaho	10000	1200—249.9			KPRL	Paso Robles, Calif.	1000	WTVI	Titusville, Pa.	500d
WSIV	Pekin, Ill.	1000d	WDAI	San Antonio, Tex.	50000	KRDG	Redding, Calif.	250	WNIK	Arecibo, P.R.	1000
KLPR	Oklahoma City, Okla.	1000d	1210—247.8			KWG	Stockton, Calif.	1000	WERI	Westerly, R.I.	1000
WITA	San Juan, P.R.	500	KZOD	Honolulu, Hawaii	1000	KXEO	Grand Junc., Colo.	250	WAIM	Anderson, S.C.	1000
KSOO	Sioux Falls, S.Dak.	10000	WCNT	Centralia, Ill.	1000d	KBRR	Leadville, Colo.	250	WNOK	Columbia, S.C.	1000d
KORC	Mineral Wells, Tex.	250d	WKNX	Saginaw, Mich.	10000d	KDZA	Pueblo, Colo.	1000	WOLS	Florence, S.C.	1000
WRVA	Richmond, Va.	50000	WADE	Wadesboro, N.C.	1000d	KGKE	Sterling, Colo.	1000d	KISD	Sioux Falls, S.Dak.	1000d
1150—260.7			WAVI	Dayton, Ohio	250d	WINF	Manchester, Conn.	1000	WAKI	McMinnville, Tenn.	1000
CKSA	Lloydminster, Alta.	10000	WCAU	Philadelphia, Pa.	50000	WGGG	Gainesville, Fla.	1000	KSIX	Corpus Christi, Tex.	1000
CHSJ	Saint John, N.B.	10000	1220—245.8			WONN	Lakeland, Fla.	1000	KDLK	Del Rio, Tex.	250
CKOC	Hamilton, Ont.	10000	CJOC	Lethbridge, Alta.	10000	WMAF	Madison, Fla.	1000	KNUZ	Houston, Tex.	1000
CKX	Brandon, Man.	10000	CKDA	Victoria, B.C.	10000	WSBB	New Smyrna Bch., Florida	1000	KERV	Kerrville, Tex.	1000
CKTR	Three Rivers, Que.	10000	CJRL	Kenora, Ont.	1000	WNVY	Pensacola, Fla.	1000	KLVT	Levelland, Tex.	250
WBCA	Bay Minette, Ala.	1000d	CJMW	Moncton, N.B.	10000	WCNH	Quincy, Fla.	1000d	KEEE	Nacogdoches, Tex.	1000
WGEA	Geneva, Ala.	1000d	CJSS	Cornwall, Ont.	10000	WJNO	W. Palm Beach, Fla.	250	KOSA	Odessa, Tex.	250
WJRD	Tuscaloosa, Ala.	5000	CKSM	Shawinigan, Quebec	1000	WBA	Augusta, Ga.	1000d	KHHH	Pampa, Tex.	250
KCKY	Coolidge, Ariz.	1000	WEZB	Birmingham, Ala.	1000d	WBLJ	Dalton, Ga.	1000	KSEY	Seymour, Tex.	1000
KXLR	No. Little Rock, Ark.	5000	WABF	Fairhope, Ala.	1000	WXLJ	Dublin, Ga.	1000	KSTT	Sulphur Spres., Tex.	250
KFSG	Los Angeles, Calif.	2500	KVSA	McGehee, Ark.	1000d	WFOM	Marietta, Ga.	1000	KWTX	Waco, Tex.	1000d
KRKD	Los Angeles, Calif.	5000	KLIP	Fowler, Calif.	250d	WFOK	Savannah, Ga.	1000	KMUR	Murray, Utah	250
KJAX	Santa Rosa, Calif.	5000	KIBE	Palo Alto, Calif.	1000d	WAYX	Waycross, Ga.	1000	KUAL	Price, Utah	250
KGMC	Englewood, Colo.	1000d	KKAR	Pomona, Calif.	250d	KBAR	Burley, Idaho	250	WJOY	Burlington, Vt.	1000
WCNX	Middletown, Conn.	500d	KFSC	Denver, Colo.	1000d	KORT	Grangeville, Idaho	250	WBBI	Abingdon, Va.	1000d
WDEL	Wilmington, Del.	5000	WDEE	Hamden, Conn.	1000d	KRXK	Rexburg, Idaho	1000	WCFV	Clifton Forge, Va.	1000
WNOB	Daytona Bch., Fla.	1000	WQTY	Arlington, Fla.	1000d	WJBC	Bloomington, Ill.	1000	WFVA	Fredericksburg, Va.	1000
WTMP	Tampa, Fla.	5000d	WOSL	Kissimmee, Fla.	1000d	WQUA	Moline, Ill.	1000	WNOR	Norfolk, Va.	1000
WFPM	Fort Valley, Ga.	1000d	WMET	Miami, Fla.	250d	WHCO	Sparta, Ill.	250	KWYZ	Everett, Wash.	1000
WJEM	Valdosta, Ga.	1000d	WSAF	Sarasota, Fla.	1000d	WJOB	Hammond, Ind.	1000	KLYK	Spokane, Wash.	250
WGGH	Marion, Ill.	5000d	WCLB	Camilla, Ga.	1000d	WSAL	Logansport, Ind.	1000	KREW	Sunnyside, Wash.	1000
WJRL	Rockford, Ill.	500d	WPLK	Rockmart, Ga.	500d	WTCJ	Tell City, Ind.	1000	WLOG	Logan, W.Va.	1000
KWKY	Des Moines, Iowa	1000	WSFT	Thomasston, Ga.	250d	WBOW	Terre Haute, Ind.	1000d	WTAP	Parkersburg, W.Va.	1000
KSAL	Salina, Kans.	5000	WLPO	LaSalle, Ill.	1000d	KFJB	Marshalltown, Iowa	1000	WHBY	Appleton, Wis.	1000
WMST	Mt. Sterling, Ky.	500d	WKRS	Waukegan, Ill.	1000d	WHIR	Danville, Ky.	1000d	WCLO	Janesville, Wis.	1000
WLOC	Mumfordsville, Ky.	1000d	WSLM	Salem, Ind.	5000d	WHOP	Hopkinsville, Ky.	1000	WHVF	Wausau, Wis.	1000d
WJBO	Baton Rouge, La.	5000	KJAN	Atlantic, Iowa	250d	WMLF	Pineville, Ky.	1000d	KVOC	Casper, Wyo.	1000
WGHM	Skowhegan, Maine	5000d	KOUR	Independence, Iowa	250d	KLIC	Monroe, La.	1000	1240—241.8		
WHMC	Gaithersburg, Md.	1000	KOFO	Ottawa, Kans.	250d	WSHO	New Orleans, La.	1000	ZNS-2	Nassau, Bahamas	250
WCOP	Boston, Mass.	5000	WFKN	Franklin, Ky.	250d	KSLO	Opelousas, La.	1000	CFLM	La Tuque, Que.	1000
WCEN	Mt. Pleasant, Mich.	1000	KBCL	Shreveport, La.	250d	WSJR	Madawaska, Me.	1000	CFNW	Norman Wells, Northwest Terr.	100
KASM	Albany, Minn.	1000d	WLBI	Denham Springs, La.	250d	WQDY	Calais, Maine	1000	CFPR	Prince Rupert, B.C.	250
WXTN	Lexington, Miss.	500d	WSME	Sanford, Maine	1000d	WITH	Baltimore, Md.	1000d	CFVR	Abbotsford, B.C.	250
KRMS	Osage Beach, Mo.	1000d	WBCH	Hastings, Mich.	250d	WCUM	Cumberland, Md.	1000	CJAV	Port Alberni, B.C.	250
KSEN	Shelby, Mont.	1000	WAVN	Stillwater, Minn.	5000d	WMNB	No. Adams, Mass.	1000d	CJCS	Stratford, Ont.	1000
KDEF	Albuquerque, N.Mex.	1000	WMDC	Hazlehurst, Miss.	250d	WESX	Salem, Mass.	1000	CJRW	Summerside, P.E.I.	250
WRUN	Utica, N.Y.	5000	KBHM	Branson, Mo.	1000d	WNEB	Worcester, Mass.	1000	CKBS	St. Hyacinthe, Que.	250
WBAG	Burlington, N.C.	1000d	KLPW	Union, Mo.	1000d	WJEF	Grand Rapids, Mich.	1000	CKCQ-1	Williams Lake, B.C.	250
WGBR	Goldsboro, N.C.	5000	WBKB	Keene, N.H.	1000d	WIKB	Iron River, Mich.	1000	CKLS	LaSarre, Que.	250
WCUE	Cuyahoga Falls, Ohio	1000d	WGNV	Newburgh, N.Y.	5000d	WMPC	Lapeer, Mich.	250	WBEJ	Brewton, Ala.	250
WIMA	Lima, Ohio	1000	WSOQ	N. Syracuse, N.Y.	1000d	WSOO	Sit. Ste. Marie, Mich.	1000	WPRN	Butler, Ala.	1000d
KNEO	McAlester, Okla.	1000	WKMT	Kings Mtn., N.C.	1000d	WSTU	Sturgis, Mich.	1000d	WULA	Eufaula, Ala.	250
KAGO	Klamath Falls, Oreg.	5000	WREW	Reidsville, N.C.	1000d	KXRA	Alexandria, Minn.	250	WOLF	Florence, Ala.	1000
WHUN	Huntingdon, Pa.	5000d	WENC	Whiteville, N.C.	1000d	WKLK	Cloquet, Minn.	1000	WARF	Jasper, Ala.	1000
WYNS	Lehighton, Pa.	1000d	KEYD	Oakes, N.Dak.	1000d	KGHS	Internat'l Falls, Minn.	250	KVRD	Cottonwood, Ariz.	250
WKPA	New Kensington, Pa.	1000d	WGAR	Cleveland, Ohio	50000	KYMS	Mankato, Minn.	1000	KZOW	So. of Globe, Ariz.	1000
WDIX	Orangeburg, S.C.	5000	WERT	Van Wert, Ohio	250d	KMRS	Morris, Minn.	250	KVRC	Arkadelphia, Ark.	250
WTYC	Rock Hill, S.C.	1000d	KGYN	Guymon, Okla.	1000d	KTRF	Thief Riv. Falls, Minn.	250	KWAK	Stuttgart, Ark.	250
WSNW	Seneca Township, South Carolina	1000d	KAPT	Salem, Ore.	1000	KWNO	Winona, Minn.	1000d	KPLY	Prescott City, Calif.	250
KIMM	Rapid City, S.Dak.	5000d	WJUN	Mexico, Pa.	1000d	WCMA	Corinth, Miss.	1000	KMBY	Monterey, Calif.	1000
WAPQ	Chattanooga, Tenn.	5000	WRIB	Providence, R.I.	1000d	WHSY	Hattiesburg, Miss.	1000	KPPC	Pasadena, Calif.	100
WCRK	Morrisstown, Tenn.	1000	WALD	Walterboro, S.C.	1000d	WSSO	Starkville, Miss.	250	KLOA	Ridgecrest, Calif.	250
WTAW	Bryan, Tex.	1000d	WFWL	Camden, Tenn.	250d	WAZF	Yazoo City, Miss.	250	KROY	Sacramento, Calif.	1000
KCCT	Corpus Christi, Tex.	1000d	WCPH	Etowah, Tenn.	1000d	KODE	Joplin, Mo.	1000	KRNO	San Bernardino, California	1000d
KIZZ	El Paso, Tex.	1000d	WHEY	Millington, Tenn.	250d	KLWT	Lebanon, Mo.	250	KSON	San Diego, Calif.	250
KVIL	Highland Park, Tex.	1000d	KVLL	Livingston, Tex.	250d	KNCM	Moberly, Mo.	1000	KSMA	Santa Maria, Calif.	250
KJBC	Midland, Tex.	1000d	KZEE	Weatherford, Tex.	250d	KHDN	Hardin, Mont.	1000	KSUE	Susanville, Calif.	1000
KPNG	Port Neches, Tex.	500d	WLSD	Big Stone Gap, Va.	1000d	KXLO	Lewiston, Mont.	1000	KRDO	Colorado Sprgs., Colo.	1000
KOLJ	Quanah, Tex.	500d	WFAH	Falls Church, Va.	5000d	KLBC	Libby, Mont.	250	KDGO	Durango, Colo.	1000
KBER	San Antonio, Tex.	1000d	KASY	Auburn, Wash.	250d	KLNC	Falls City, Nebr.	100	KSLV	Monte Vista, Colo.	1000
KOFE	Pullman, Wash.	1000d	KOZI	Chelan, Wash.	1000d	KHAS	Hastings, Nebr.	250	KCRT	Trinidad, Colo.	250
KAYO	Seattle, Wash.	5000	WRNE	Wis. Rapids, Wis.	500d	KELY	Ely, Nev.	250	WCO	Waterbury, Conn.	1000
KKEY	Vancouver, Wash.	1000d	1230—243.8			KLAS	Las Vegas, Nev.	250	WBG	Chipley, Fla.	250
WABH	Deerfield, Va.	1000d	CHFC	Churchill, Man.	250	KCBN	Reno, Nev.	250	WLCO	Eustis, Fla.	250
WELC	Welch, W.Va.	1000d	CFKL	Schefferville, Que.	250	WMOU	Berlin, N.H.	1000d	WINK	Fort Myers, Fla.	250
WAXX	Chippewa Falls, Wis.	5000d	CFGR	Gravelbourg, Sask.	250	WTSV	Claremont, N.H.	1000	WMMB	Melbourne, Fla.	1000
WISN	Milwaukee, Wis.	5000	CFHR	Hay River, Nwt.	100	WCMG	Wildwood, N.J.	100	WFOY	St. Augustine, Fla.	1000
1160—258.5			CFYT	Dawson City, Yukon T.	100	KALG	Alamogordo, N.Mex.	250	WBHB	Fitzgerald, Ga.	1000
WJJD	Chicago, Ill.	50000	CFPA	Port Arthur, Ont.	1000	KOTS	Deming, N.Mex.	250	WOUN	Gainesville, Ga.	1000
KSL	Salt Lake City, Utah	50000	CKLD	Thetford Mines, Que.	250	KYVA	Gallup, N. Mex.	1000	WLAG	LaGrange, Ga.	1000
1170—256.3			CKMP	Midland, Ont.	250	KRSY	Roswell, N. Mex.	1000	WBML	Macon, Ga.	1000
CFNS	Saskatoon, Sask.	1000	VOAR	St. John's, Nfld.	100	WNIA	Cheektowaga, N.Y.	500	WNNS	Statesboro, Ga.	1000
WCOV	Montgomery, Ala.	10000	CKVD	Val D'Or, Que.	1000	WENY	Elmira, N.Y.	1000	WPAX	Thomasville, Ga.	250
KCBQ	San Diego, Calif.	50000	WAUD	Auburn, Ala.	1000	WHUC	Hudson, N. Y.	1000	WTWA	Thomson, Ga.	250
KLOK	San Jose, Calif.	10000	WJBB	Haleyville, Ala.	1000	WLFH	Little Falls, N. Y.	1000	KVNI	Coeur d'Alene, Idaho	250
KHOH	Honolulu, Hawaii	1000	WBHP	Huntsville, Ala.	1000	WFAS	White Plains, N. Y.	1000	K		

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
KDEC	Decorah, Iowa	1000
KWLC	Decorah, Iowa	1000
KBIZ	Ottumwa, Iowa	1000
KICD	Spencer, Iowa	1000
KIUL	Garden City, Kans.	1000
KAKE	Wichita, Kans.	250
WINN	Louisville, Ky.	1000
WFTM	Maysville, Ky.	1000
WPKE	Pikeville, Ky.	1000d
WSFC	Somerset, Ky.	1000
KASO	Minden, La.	1000
KANE	New Iberia, La.	1000
WCOU	Lewiston, Maine	1000
WCEM	Cambridge, Md.	1000
WJEJ	Hagerstown, Md.	1000
WHA1	Greenfield, Mass.	250
WOCB	W. Yarmouth, Mass.	1000
WATT	Cadillac, Mich.	1000
WCBY	Cheboygan, Mich.	250
WJPD	Ishpeming, Mich.	1000
WJIM	Lansing, Mich.	1000d
WMFG	Hibbing, Minn.	1000
KPRM	Park Rapids, Minn.	100
WJON	St. Cloud, Minn.	1000
WMPA	Aberdeen, Miss.	250
WGRM	Greenwood, Miss.	250
WGCM	Gulfport, Miss.	1000
WMIS	Natchez, Miss.	250
KFMO	Flat River, Mo.	250
KWOS	Jefferson City, Mo.	1000d
KODE	Joplin, Mo.	1000d
KNEM	Nevada, Mo.	250
KBMY	Billings, Mont.	1000
KLTZ	Glasgow, Mont.	250
KBLL	Helena, Mont.	250
KFOR	Lincoln, Nebr.	1000
KODY	North Platte, Nebr.	1000
KELK	Elko, Nev.	1000
WSNJ	Bridgeton, N. J.	1000
KAVE	Carlsbad, N. Mex.	250
KCLV	Clovis, N. Mex.	1000
WGBB	Freeport, N. Y.	1000
WGVA	Geneva, N. Y.	1000d
WJTM	Jamestown, N. Y.	500d
WVOS	Liberty, N. Y.	1000
WNBZ	Saranac Lake, N. Y.	1000
WSNY	Schenectady, N. Y.	1000d
WATN	Watertown, N. Y.	1000
WPNF	Brevard, N. C.	250
WIST	Charlotte, N. C.	1000
WCNC	Elizabeth City, N. C.	1000d
WJNC	Jacksonville, N. C.	1000
WRAL	Raleigh, N. C.	1000
KDLR	Devils Lake, N. Dak.	250
WBBW	Youngstown, Ohio	1000
WHIZ	Zanesville, Ohio	1000
KVSO	Ardmore, Okla.	250
KBEC	Elk City, Okla.	250
KBEL	Idabel, Okla.	250
KDKL	Okmulgee, Okla.	250
KFLY	Corvallis, Oreg.	1000d
KTIX	Pendleton, Oreg.	1000
KPRB	Redmond, Oreg.	250
WRTA	Altoona, Pa.	1000
WHUM	Reading, Pa.	1000
WKOK	Sunbury, Pa.	250
WBAX	Wilkes-Barre, Pa.	1000
WALO	Humacao, P. R.	1000
WWON	Woonsocket, R. I.	1000
WKDK	Newberry, S. C.	250
WDXY	Sumter, S. C.	250
WBEJ	Elizabethton, Tenn.	1000
WEKR	Fayetteville, Tenn.	1000
WBIR	Knoxville, Tenn.	1000
WKDA	Nashville, Tenn.	1000
WENK	Union City, Tenn.	1000
KVLF	Alpine, Tex.	1000
KEAN	Brownwood, Tex.	1000
KORA	Bryan, Tex.	250
KOCA	Kilgore, Tex.	250
KSOX	Raymondville, Tex.	250
KCKX	Sonora, Tex.	1000
KXOX	Sweetwater, Tex.	1000
WSKI	Montpellier, Vt.	1000
WSSV	Petersburg, Va.	1000
WROV	Roanoke, Va.	1000
WTON	Staunton, Va.	1000
KXLE	Ellensburg, Wash.	250
KGY	Olympia, Wash.	1000
WKOY	Bluefield, W. Va.	1000
WTIP	Charleston, W. Va.	1000
WDNE	Elkins, W. Va.	1000
WOMT	Manitowoc, Wis.	1000d
WIBU	Poynette, Wis.	1000d
WOBT	Rhinelander, Wis.	1000
WJMC	Rice Lake, Wis.	1000

Kc.	Wave Length	W.P.
KFBC	Cheyenne, Wyo.	1000
KEVA	Evanston, Wyo.	1000
KASL	Newcastle, Wyo.	250
KRAL	Rawlins, Wyo.	1000
KTHE	Thermopolis, Wyo.	1000

1250—239.9

Kc.	Wave Length	W.P.
CHWO	Oakville, Ont.	1000
CKBL	Matane, Que.	5000
CKOM	Saskatoon, Sask.	10000
WZOB	Ft. Payne, Ala.	1000d
WETU	Wetumpka, Ala.	5000d
KAKA	Wickenburg, Ariz.	500d
KHIL	Willcox, Ariz.	1000d
KFAY	Fayetteville, Ark.	1000d
KALO	Little Rock, Ark.	1000
KHOT	Madera, Calif.	500d
KTMS	Santa Barbara, Calif.	1000
KDHI	Twenty-Nine Palms, California	1000d
KMSL	Ukiah, Calif.	500d
KICM	Golden, Colo.	1000d
WNER	Live Oak, Fla.	1000d
WRIM	Pahokee, Fla.	500d
WDAE	Tampa, Fla.	5000
WLYB	Albany, Ga.	1000d
WYTH	Madison, Ga.	1000d
WIZZ	Streator, Ill.	500d
WGL	Ft. Wayne, Ind.	1000
WRAY	Princeton, Ind.	1000d
KCFI	Cedar Falls, Iowa	500d
KFKU	Lawrence, Kans.	5000
WREN	Topeka, Kans.	5000
WNVL	Nicholasville, Ky.	500
WLCK	Scottsville, Ky.	500d
WGUY	Bangor, Maine	5000d
WARE	Ware, Mass.	1000
WWBC	Bay City, Mich.	1000d
KOTE	Fergus Falls, Minn.	1000
KCUE	Red Wing, Minn.	1000d
WHNY	McComb, Miss.	5000
KBTC	Houston, Mo.	500d
WKBR	Manchester, N. H.	5000
WMTR	Morristown, N. J.	5000d
WIPS	Ticonderoga, N. Y.	1000d
WFAG	Farmville, N. C.	500d
WKDX	Hamlet, N. C.	1000d
WBRM	Marion, N. C.	1000d
WCHO	Washington Court House, Ohio	500d
KQEN	Roseburg, Oreg.	5000d
WLEM	Emporium, Pa.	1000d
WPEL	Montrose, Pa.	1000d
WRYT	Pittsburgh, Pa.	5000
WNOW	York, Pa.	1000d
WTMA	Charleston, S. C.	5000
WCKM	Winnsboro, S. C.	500d
WKBL	Covington, Tenn.	1000d
WNTT	Tazewell, Tenn.	500d
KFTV	Paris, Tex.	500d
KPAC	Port Arthur, Tex.	5000
KUKA	San Antonio, Tex.	1000d
KTFO	Seminole, Tex.	1000d
KANN	Ogden, Utah	1000d
KVEL	Vernal, Utah	5000d
WDVA	Danville, Va.	5000
WYSR	Franklin, Va.	1000d
KWSC	Pullman, Wash.	5000
KTW	Seattle, Wash.	1000
WEMP	Milwaukee, Wis.	5000

1260—238.0

Kc.	Wave Length	W.P.
CFRN	Edmonton, Alta.	50000
DYBU	Cebu, P. I.	1000
WCRT	Birmingham, Ala.	5000d
KPIN	Casa Grande, Ariz.	1000d
KCCB	Corning, Ark.	500d
KBHC	Nashville, Ark.	500d
KGIL	San Fernando, Calif.	5000
KYA	San Francisco, Calif.	5000
KSNO	Aspen, Colo.	5000d
WMNM	Westport, Conn.	1000d
WNRK	Newark, Del.	500d
WWDG	Washington, D. C.	5000
WFTW	Fort Walton Beach, Florida	1000d
WAME	Miami, Fla.	5000d
WPPF	Palatka, Fla.	1000
WHAB	Baxley, Ga.	5000d
WBBK	Blakely, Ga.	1000d
WTJH	East Point, Ga.	5000d
KIFI	Idaho Falls, Idaho	5000
KWEI	Weiser, Ida.	1000d
WIBV	Belleville, Ill.	5000d
WFBM	Indianapolis, Ind.	5000
KFGQ	Boone, Iowa	1000d
KWHK	Hutchinson, Kans.	1000
WXOK	Baton Rouge, La.	1000d
WEZE	Boston, Mass.	5000
WALM	Ablon, Mich.	1000
WJBL	Holland, Mich.	5000d
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
KGBX	Springfield, Mo.	5000
KIMB	Kimball, Nebr.	1000d
WBUD	Trenton, N. J.	5000
KVSF	Santa Fe, N. Mex.	1000

Kc.	Wave Length	W.P.
WBNR	Beacon, N. Y.	1000d
WNDR	Syracuse, N. Y.	5000
WGRW	Asheboro, N. C.	5000d
WCDJ	Edenton, N. C.	1000d
WDOK	Cleveland, Ohio	5000
WNXT	Portsmouth, Ohio	5000
KWSH	Wewoka-Seminole, Oklahoma	1000
KMCM	McMinnville, Oreg.	1000
WVYN	Erie, Pa.	5000
WPHB	Philipsburg, Pa.	5000d
WISO	Ponce, P. R.	1000
WMUU	Greenville, S. C.	5000d
WJOT	Lake City, S. C.	1000d
KWYR	Winner, S. Dak.	5000d
WNOC	Chattanooga, Tenn.	1000d
WMCH	Church Hill, Tenn.	1000d
WDKN	Dickson, Tenn.	1000d
WCLC	Jamestown, Tenn.	1000d
KSPD	Diboll, Tex.	1000d
KPSO	Falfurrias, Tex.	500d
KWFR	San Angelo, Tex.	1000d
KTUE	Tulia, Tex.	1000d
KTAE	Taylor, Tex.	1000d
WCHV	Charlottesville, Va.	5000
WBCR	Christiansburg, Va.	1000d
KWIQ	Moses Lake, Wash.	1000d
WVVV	Grafton, W. Va.	500d
WWIS	Black River Falls, Wis.	1000d
WEKZ	Monroe, Wis.	1000d
KPOW	Powell, Wyo.	5000

1270—236.1

Kc.	Wave Length	W.P.
CHAT	Medicine Hat, Alta.	10000
CHWK	Chilliwack, B. C.	10000
CJCB	Sydney, N. S.	10000
CFGT	St. Joseph d'Alma, Quebec	1000
WGSV	Guntersville, Ala.	1000d
WSIM	Prichard, Ala.	1000d
KBYS	Anchorage, Alaska	1000
KDJI	Holbrook, Ariz.	1000d
KADL	Pine Bluff, Ark.	5000d
KGOL	Palm Desert, Calif.	1000d
KCOK	Tulare, Calif.	5000d
WNOG	Naples, Fla.	500d
WHIY	Orlando, Fla.	5000d
WTNT	Tallahassee, Fla.	5000
KWRW	Cartersville, Ga.	500d
WGBA	Columbus, Ga.	5000d
WJJC	Commerce, Ga.	1000d
KNDI	Honolulu, Hawaii	5000
KTFI	Twin Falls, Idaho	5000
WEIC	Charleston, Ill.	1000d
WHBF	Rock Island, Ill.	5000
WCMR	Elkhart, Ind.	5000
WVCA	Gary, Ind.	1000
WORX	Madison, Ind.	1000d
KSCB	Liberal, Kans.	1000
WAIN	Columbia, Ky.	1000d
WFUL	Fulton, Ky.	1000d
KVCL	Winnfield, La.	1000d
WSPR	Springfield, Mass.	5000
KWYZ	Detroit, Mich.	5000
KWEB	Rochester, Minn.	500d
WVOM	Ioka, Miss.	1000d
WLSM	Louisville, Miss.	1000d
KUSN	St. Joseph, Mo.	1000d
KBUB	Sparks, Nev.	1000d
WTSN	Dover, N. H.	5000
WDVL	Vineland, N. J.	500d
KRAC	Alamogordo, N. Mex.	1000d
WHLN	Niagara Falls, N. Y.	5000d
WDLA	Walton, N. Y.	1000d
WCGC	Belmont, N. C.	1000
WMPM	Smithfield, N. C.	5000d
KBOM	Mandan, N. Dak.	1000
WILE	Cambridge, Ohio	1000d
KWPR	Claremore, Okla.	500d
KAJO	Grants Pass, Oreg.	5000d
WLRB	Labanon, Pa.	5000
WBHC	Hampton, S. C.	1000d
KNWC	Sioux Falls, S. Dak.	1000
WLK	Newport, Tenn.	5000d
KIOX	Bay City, Tex.	1000
KHEM	Big Spring, Tex.	1000d
KEPS	Eagle Pass, Tex.	1000d
KFJZ	Fort Worth, Tex.	5000
WTID	Newport News, Va.	1000d
WHEO	Stuart, Va.	1000d
KCVL	Colville, Wash.	1000d
KBAM	Longview, Wash.	5000d
WKYR	Keyser, W. Va.	5000d
WRJC	Mauston, Wis.	500d
WWJC	Superior, Wis.	5000d

1280—234.2

Kc.	Wave Length	W.P.
CHIQ	Hamilton, Ont.	5000
CJMS	Montreal, Que.	10000
CKCV	Quebec, Que.	10000
CJSL	Estevan, Sask.	1000
WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KCGH	Arroyo Grande, Calif.	500d
KFOX	Long Beach, Calif.	1000
KCJH	San Luis Obispo, Cal.	500d

Kc.	Wave Length	W.P.
KJOY	Stockton, Calif.	1000
KTLN	Denver, Colo.	5000
WSUX	Seaford, Del.	1000d
WDSP	DeFuniak Springs, Florida	5000d
WQIK	Jacksonville, Fla.	5000d
WIPC	Lake Wales, Fla.	1000d
WYND	Sarasota, Fla.	500d
WIBB	Macon, Ga.	5000d
WMRO	Aurora, Ill.	1000d
WGBF	Evansville, Ind.	5000
KCOB	Newton, Iowa	1000d
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d
WDSU	New Orleans, La.	5000
KWCL	Oak Grove, La.	500d
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WTCN	Minneapolis, Minn.	5000
KVOX	Minneapolis, Minn.	1000
KDKD	Clinton, Mo.	1000d
KYRO	Potosi, Mo.	500d
KCNI	Broken Bow, Nebr.	1000d
KTOO	Henderson, Nev.	5000d
KRZE	Farmington, N. Mex.	5000d
WADO	New York, N. Y.	5000
WROC	Rochester, N. Y.	5000d
WSAT	Salisbury, N. C.	1000
WYAL	Scotland Neck, N. C.	5000d
WONW	Defiance, Ohio	1000
WLMJ	Jackson, Ohio	1000d
KLCO	Poteau, Okla.	1000d
KERG	Eugene, Oreg.	5000
WBRX	Berwick, Pa.	1000d
WHVR	Hanover, Pa.	5000
WKST	New Castle, Pa.	1000
WCMN	Arecibo, P. R.	5000
WANS	Anderson, S. C.	5000
WJAY	Mullins, S. C.	5000d
KBHB	Sturgis, S. D.	1000d
WMCP	Columbia, Tenn.	1000d
WDNT	Dayton, Tenn.	1000d
KNIT	Abilene, Tex.	500d
KWHI	Brenham, Tex.	1000d
KLUE	Longview, Tex.	1000d
KRAN	Morton, Tex.	500
KVWG	Pearsall, Tex.	500d
KNAK	Salt Lake City, Utah	5000
WKDE	Altavista, Va.	500d
WYVE	Wytheville, Va.	1000d
KMAS	Shelton, Wash.	1000d
KUDY	Spokane, Wash.	5000d
KIT	Yakima, Wash.	5000
WVAR	Richwood, W. Va.	1000d
WNAM	Neenah, Wis.	5000

1290—232.4

Kc.	Wave Length	W.P.
CFAM	Altona, Man.	10000
CKSL	London, Ont.	5000
WTHG	Jackson, Ala.	1000d
WSHF	Sheffield, Ala.	1000d
WMLS	Sylacauga, Ala.	1000d
KEOS	Flagstaff, Ariz.	1000
KUCB	Tucson, Ariz.	1000
KDMS	El Dorado, Ark.	5000d
KUOA	Siloam Sprgs., Ark.	5000d
KHSL	Chico, Calif.	5000
KPER	Gilroy, Calif.	5000d
KMEN	San Bernardino, California	5000
KACL	Santa Barbara, Calif.	5000d
WCCO	Hartford, Conn.	5000
WTUX	Wilmington, Del.	1000d
WTMC	Ocala, Fla.	5000
WSCM	Panama City Beach, Florida	500d
WIRK	W. Palm Beh., Fla.	5000
WDEC	Americus, Ga.	1000d
WCHK	C	

Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.
KTRN	Wichita Falls, Tex.	5000	WXXX	Hattiesburg, Miss.	1000d	WJPS	Evansville, Ind.	5000	KLIL	Estherville, Iowa	100
WPVA	Colonial Hgts., Va.	5000d	KFSB	Joplin, Mo.	5000	WGRB	Greenburg, Ind.	5000	KCKN	Kansas City, Kans.	1000d
WAGE	Leesburg, Va.	1000d	KFBB	Great Falls, Mont.	5000	KWVL	Waterloo, Iowa	5000	KSEK	Pittsburg, Kans.	1000
WKWS	Rocky Mount, Va.	1000d	KGMT	Fairbury, Nebr.	500d	KFH	Wichita, Kans.	5000	WCMI	Ashland, Ky.	1000
WVOW	Logan, W. Va.	5000	WJLK	Asbury Park, N. J.	1000	WYGO	Corbin, Ky.	5000d	WBGW	Bowling Green, Ky.	250
KAPY	Port Angeles, Wash.	1000d	WCAM	Camden, N. J.	1000	WMOR	Morehead, Ky.	1000d	WNBS	Murray, Ky.	1000d
WMIL	Milwaukee, Wis.	1000d	KARA	Albuquerque, N.M.	1000d	KVOL	Lafayette, La.	1000	WEKY	Richmond, Ky.	1000
WCOW	Sparta, Wis.	5000d	WVIP	Mt. Kisco, N.Y.	5000d	WASA	Havre de Grace, Md.	1000d	KVOB	Bastrop, La.	250
KOWB	Laramie, Wyo.	5000	WTLB	Utica, N.Y.	1000	WCRB	Waltham, Mass.	5000	KRMD	Shreveport, La.	250
			WISE	Asheville, N.C.	5000	WTRX	Flint, Mich.	5000	WFAU	Augusta, Maine	1000
1300—230.6			WKTC	Charlotte, N.C.	1000	WLQL	Minneapolis, Minn.	5000	WHOU	Houlton, Maine	1000
CBAF	Moncton, N.B.	5000	WTK	Durham, N.C.	1000	WJPR	Greenville, Miss.	1000	WGAW	Gardner, Mass.	1000
CJME	Regina, Sask.	1000	KNOX	Grand Forks, N.Dak.	5000	WDAL	Meridian, Miss.	1000d	WNBH	New Bedford, Mass.	1000
WBSA	Boaz, Ala.	1000d	WFAH	Alliance, Ohio	1000d	KUKU	Willow Springs, Mo.	1000d	WBRK	Pittsfield, Mass.	1000
WTL	Tallassee, Ala.	1000d	KNPT	Newport, Ore.	5000d	WEVD	New York, N.Y.	5000	WLEW	Bad Axe, Mich.	1000
WEZQ	Winfield, Ala.	500d	WBF	Bedford, Pa.	5000d	WPOW	New York, N.Y.	5000	WLA	Grand Rapids, Mich.	1000
KWCB	Searcy, Ark.	1000d	WGSA	Ephrata, Pa.	5000d	WBO	Owego, N.Y.	1000d	WCSR	Hillsdale, Mich.	1000
KROP	Brawley, Calif.	1000	WNAE	Warren, Pa.	5000d	WHAZ	Troy, N.Y.	1000	WMTE	Manistee, Mich.	1000
KYNO	Fresno, Calif.	5000	WPKD	Kingstree, S.C.	5000d	WUSM	Havelock, N.C.	1000d	WAGN	Menominee, Mich.	1000
KWKW	Pasadena, Calif.	5000	WDOD	Chattanooga, Tenn.	5000	WHOT	Campbell, Ohio	1000	WMBN	Petoskey, Mich.	1000
KVOR	Colo. Sprgs., Colo.	1000	WDXI	Jackson, Tenn.	1000d	WFIN	Findlay, Ohio	1000d	WEXL	Royal Oak, Mich.	1000
WAVZ	New Haven, Conn.	1000	WBNT	Oneida, Tenn.	1000d	WKOV	Wellston, Ohio	500d	KDLM	Detroit Lakes, Minn.	1000
WRKT	Cocoa Beach, Fla.	500d	KZIP	Amarillo, Tex.	1000d	WELW	Willoughby, O.	500d	WEVE	Eveleth, Minn.	1000
WFFG	Marathon, Fla.	500d	WRR	Dallas, Tex.	5000	KPOJ	Portland, Ore.	5000	KROC	Rochester, Minn.	1000
WSOL	Tampa, Fla.	5000d	KOYL	Odesa, Tex.	1000d	WBLF	Bellefonte, Pa.	500	KWLM	Willmar, Minn.	1000
WMTM	Moultrie, Ga.	5000d	KUBO	San Antonio, Tex.	500d	WICU	Erle, Pa.	5000	WJMB	Brookhaven, Miss.	250
WNEA	Newman, Ga.	500	WEEL	Fairfax, Va.	1000	WLAT	Conway, S.C.	5000	WAML	Laurel, Miss.	250
WIMO	Winder, Ga.	1000d	WGH	Newport News, Va.	5000	WFBC	Greenville, S.C.	5000	KXEO	Mexico, Mo.	1000d
KOZE	Lawiston, Idaho	5000	KARY	Prosser, Wash.	1000d	WAEW	Crossville, Tenn.	1000d	KLID	Poplar Bluff, Mo.	1000d
WTAQ	LaGrange, Ill.	1000	WIBA	Madison, Wis.	5000	WTR	Dyersburg, Tenn.	500d	KSMO	Salem, Mo.	1000
WFRX	W. Frankfort, Ill.	1000d				KMIL	Cameron, Tex.	500d	KICK	Springfield, Mo.	1000
WHLT	Huntington, Ind.	500d	1320—227.1			KSWA	Graham, Tex.	1000d	KCAP	Helena, Mont.	1000
WAAC	Terra Haute, Ind.	500d	CHQM	Vancouver, B.C.	10000	KINE	Kingsville, Tex.	5000	KPRK	Livingston, Mont.	1000
KGLO	Mason City, Iowa	5000	CKEC	New Glasgow, N.S.	5000	KVKM	Monahans, Tex.	1000d	KHUB	Fremont, Nebr.	500
WBLG	Lexington, Ky.	1000	CJSO	Sorel, P.Q.	1000	KDOK	Tyler, Tex.	1000d	KGFW	Kearney, Nebr.	1000
WBR	Baton Rouge, La.	1000	CKKW	Kitchener, Ont.	1000	WBTM	Danville, Va.	5000	KSID	Sidney, Nebr.	1000
KANB	Shreveport, La.	1000d	WAGF	Dothan, Ala.	1000	WRAA	Luray, Va.	1000d	KORK	Las Vegas, Nev.	250
WFB	Baltimore, Md.	5000	WENN	Birmingham, Ala.	5000d	WOLD	Marion, Va.	1000d	KKBT	Kenner, Nev.	1000
WJDA	Quincy, Mass.	1000d	KBLU	Yuma, Ariz.	500d	WESR	Tasley, Va.	5000d	WDCR	Hanover, N.H.	1000
WOO	Grand Rapids, Mich.	5000	KWHN	Fort Smith, Ark.	5000	KFKF	Bellevue, Wash.	5000d	WMID	Atlantic City, N.J.	1000
WRBC	Jackson, Miss.	5000	KRLW	Walnut Ridge, Ark.	1000d	KCFA	Spokane, Wash.	5000d	KHAP	Aztec, N.Mex.	1000
KMMO	Marshall, Mo.	1000d	KHSJ	Hemet, Calif.	500d	WETZ	New Martinsville, W.Va.	1000d	KRRR	Ruidoso, N. Mex.	1000
KBRL	McCook, Nebr.	5000d	KLAN	Lemoore, Calif.	500	WHBL	Sheboygan, Wis.	1000	KKIT	Taos, N.Mex.	250
KPTL	Carson City, Nev.	5000	KUDE	Oceanside, Calif.	5000	KOVE	Lander, Wyo.	5000	KSIL	Silver City, N.Mex.	1000
WAAT	Trenton, N.J.	250d	KCRA	Sacramento, Calif.	1000d				WMBO	Auburn, N.Y.	1000
WOSC	Fulton, N.Y.	1000d	KAVI	Rocky Ford, Colo.	1000d	1340—223.7			WENT	Gloversville, N.Y.	1000
WEEE	Rensselaer, N.Y.	5000d	WATR	Waterbury, Conn.	5000	CFGB	Goose Bay, Nfld.	1000	WXYJ	Jamestown, N.Y.	250
WGOL	Goldsboro, N.C.	1000d	WGMA	Hollywood, Fla.	5000	CJAF	Cabano, Que.	250	WUSJ	Lockport, N.Y.	250
WLNC	Laurensburg, N.C.	500	WZOK	Jacksonville, Fla.	5000	CFSL	Weyburn, Sask.	1000	WMSA	Massena, N.Y.	1000
WSYD	Mt. Airy, N.C.	5000	WAMR	Venice, Fla.	500d	CFYK	Yellow Knife, N.W.T.	250	WALL	Middletown, N.Y.	1000
WERE	Cleveland, Ohio	5000	WHIE	Griffin, Ga.	5000d	CHAD	Amos, Que.	250	WIRY	Plattsburgh, N.Y.	1000
WMVO	Mt. Vernon, Ohio	500	WKAN	Kankakee, Ill.	1000	CHAS	Amos, Que.	250	WJRI	Lenoir, N.C.	1000
WOME	Tulsa, Okla.	5000	KNIA	Knoxville, Iowa	500d	CJLS	Yarmouth, N.S.	250	WTSB	Lumberton, N.C.	1000
KDOV	Medford, Ore.	5000d	KMAQ	Maquoketa, Iowa	500d	CHRD	Drummondville, Que.	250	WOXF	Oxford, N.C.	1000
KACI	The Dalles, Ore.	1000d	KLWN	Lawrence, Kans.	500d	CJOC	Quebec, Que.	250	WOOV	Greenville, N.C.	1000
WCHC	Clarion, Pa.	500d	WBRT	Bardonia, Ky.	1000d	CKAR-1	Parry Sound, Ont.	250	WGN	Wilmington, N.C.	1000
WTHL	Hazleton, Pa.	1000d	WNGO	Mayfield, Ky.	1000d	CKOX	Woodstock, Ont.	250	WAI	Winston-Salem, N.C.	250
WTL	Meyaguez, P.R.	1000	KHAL	Homer, La.	1000d	WKUL	Cullman, Ala.	1000	KGPC	Grafton, N.Dak.	1000
WLOW	Aiken, S.C.	500d	WICO	Salisbury, Md.	1000d	WJOI	Florence, Ala.	1000	WNCO	Ashland, Ohio	250
WCKI	Greer, S.C.	1000d	WARA	Attleboro, Mass.	1000	WJWC	Selma, Ala.	250	WUB	Athens, Ohio	250
WKSC	Kershaw, S.C.	500d	WILS	Lansing, Mich.	5000	WFEB	Sylacauga, Ala.	250	WIZE	Springfield, Ohio	1000
WQIZ	St. George, S.C.	500d	WDMJ	Marquette, Mich.	1000	KIBH	Seward, Alaska	250	WSTV	Steuersville, Ohio	1000
KOLY	Mobridge, S.Dak.	1000d	WRJW	Picayune, Miss.	5000d	KIKO	Miami, Ariz.	250	KIHN	Hugo, Okla.	250
WMTN	Morristown, Tenn.	5000d	KXLW	Clayton, Mo.	1000d	KKIT	Taos, N.M.	250	KOCY	Okla. City, Okla.	1000
WMAK	Nashville, Tenn.	5000	KOLT	Scottsbluff, Nebr.	5000d	KNOG	Mogales, Ariz.	250	KTOW	Sand Springs, Okla.	250
KVET	Austin, Tex.	1000	WVHG	Hornell, N.Y.	5000d	KPGE	Page, Ariz.	250	KWVR	Enterprise, Ore.	250
KTFY	Brownfield, Tex.	1000d	WQSR	Solvay, N.Y.	500d	KENT	Prescott, Ariz.	250	KIHR	Hood River, Ore.	250
KGNS	Laredo, Tex.	500d	WAGY	Forest City, N.C.	1000	KBTA	Batesville, Ark.	1000	KFIR	North Bend, Ore.	1000
KKAS	Silsbee, Tex.	500d	WCOG	Greensboro, N.C.	5000	KBAH	Hot Springs, Ark.	500	WCVI	Connellsville, Pa.	1000d
KSTU	Logan, Utah	1000	WKRK	Murphy, N.C.	5000d	KBR	Springdale, Ark.	1000	WSAJ	Grove City, Pa.	1000
KOL	Seattle, Wash.	5000	WEW	Washington, N.C.	500d	KATA	Arcata, Calif.	250	WKRZ	Oil City, Pa.	1000
WCLG	Morgantown, W.Va.	1000d	KQDY	Minot, N.Dak.	1000d	KMAK	Fresno, Calif.	1000	WHAT	Philadelphia, Pa.	1000
WKLC	St. Albans, W.Va.	1000d	WHOK	Lancaster, Ohio	1000d	KDOL	Mojave, Calif.	100	WRAW	Reading, Pa.	1000
			KWOE	Clinton, Okla.	1000d	KSFE	Needles, Calif.	250	WTRN	Tyrone, Pa.	1000
			KATR	Eugene, Ore.	1000d	KAOR	Oroville, Calif.	250	WBRE	Wilkes-Barre, Pa.	1000
1310—228.9			WKAP	Allentown, Pa.	5000	KATY	San Luis Obispo, Calif.	1000	WWPA	Williamsport, Pa.	1000
CKOY	Ottawa, Ont.	5000	WGTT	Gettysburg, Pa.	1000	KIST	Santa Barbara, Calif.	1000	WGRF	Aguadilla, P.R.	250
CFGM	Richmond Hill, Ont.	10000	WJAS	Pittsburgh, Pa.	5000	KOMY	Watsonville, Calif.	1000	WKE	Charleston, S.C.	1000
WHEP	Foley, Ala.	1000d	WSCR	Scranton, Pa.	5000	KDEN	Denver, Colo.	1000	WRHI	Rock Hill, S.C.	1000
CHGB	St. Anne-de-la-Pocatiere, Quebec	5000d	WUNO	Rio Piedras, P.R.	5000	KWSL	Grand Junction, Colo.	250	WRSS	Sumter, S.C.	1000
WJAM	Marion, Ala.	5000d	WVIC	Columbia, S.C.	5000	KVRH	Salida, Colo.	250	KIJV	Huron, S.D.	1000
KBUZ	Mesa, Ariz.	5000	KELO	Sioux Falls, S.Dak.	5000d	WNHC	New Haven, Conn.	1000	KRSD	Rapid City, S.Dak.	1000
KBOK	Malvern, Ark.	1000d	WKIN	Kingsport, Tenn.	5000d	WNOK	Washington, D.C.	1000	WBAC	Cleveland, Tenn.	1000
KIOT	Barstow, Calif.	500d	WMSR	Manchester, Tenn.	5000d	WWSL	Clermont, Fla.	250	WKRM	Columbia, Tenn.	1000
KPOD	Crescent City, Calif.	1000d	KVMC	Colorado City, Tex.	1000d	WTAN	Clearwater, Fla.	250	WGRV	Greenville, Tenn.	1000
KDIA	Oakland, Calif.	1000	KXYZ	Houston, Tex.	5000	WROD	Daytona Beach, Fla.	1000	WGN	Knoxville, Tenn.	1000
KTKR	Taft, Calif.	1000d	KCPX	Salt Lake City, Utah	5000	WDSR	Lake City, Fla.	1000	WHHM	Memphis, Tenn.	1000d
KFKA	Greeley, Colo.	1000	WDMS	Lynchburg, Va.	1000d	WTYS	Marianna, Fla.	1000	WCDT	Winchester, Tenn.	1000
WICH	Norwich, Conn.	5000	WEET	Richmond, Va.	1000d	WQXT	Palm Beach, Fla.	250	KWKC	Ablene, Tex.	250
WIOC	Deland, Fla.	5000d	KXRO	Aberdeen, Wash.	5000	WSEB	Sebring, Fla.	250	KTSL	Burnett, Tex.	250
WGKR	Perry, Fla.	500d	KHIT	Walla Walla, Wash.	1000d	WNSM	Valparaiso-Niceville, Fla.	250	KAND	Corsicana, Tex.	250
WAUC	Wauchula, Fla.	500d	WQMN	Superior, Wis.	1000d	WAKE	Atlanta, Ga.	1000	KSET	El Paso, Tex.	250
WLKB	Decatur, Ga.	500	WFHR	Wisconsin Rapids, Wis.	5000	WGAU	Athens, Ga.	1000	KLBK	Lubbock, Tex.	250
WOKA	Douglas, Ga.	1000d				WBBQ	Augusta, Ga.	1000	KRBA	Lufkin, Tex.	250
WBRD	Waynesboro, Ga.	1000d	1330—225.4			WGAA	Cedartown, Ga.	1000	KPDN	Pampa, Tex.	250
WBMK	West Point, Ga.	1000d	WROS	Scottsboro, Ala.	1000d	WOKS	Columbus, Ga.	1000	KOLE	Port Arthur, Tex.	250
KNUU	Makawao, Hawaii	1000	KMOP	Tucson, Ariz.	500d	WBBT	Lyons, Ga.	1000	KTEO	San Angelo, Tex.	250
KLIX	Twin Falls, Idaho	5000	KVEE	Conway, Ark.	500d	WTIF	Tifton, Ga.	1000	KVIC	Victoria, Tex.	250
WISH	Indianapolis, Ind.	5000	KLOM	Lompoc, Calif.	1kd	KAIN	Nampa, Idaho	1000	WTWN	St. Johnsbury, Vt.	1000
KDL3	Perry, Iowa	500d	KFAC	Los Angeles, Calif.	5000	KPST	Preston, Idaho	250	WSTA	Charlotte Amalie, V.I.	250
KOKX	Keokuk, Iowa	1000d	KLBS	Los Banos, Calif.	500d	KSKI	Sun Valley, Idaho	1000	WKEY	Covington, Va.	1000

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
WMON	Montgomery, W. Va.	250
WWE	Welch, W. Va.	1000
WLDY	Ladysmith, Wis.	1000
WRIT	Milwaukee, Wis.	1000d
KSGT	Jackson, Wyo.	250
KYCN	Wheatland, Wyo.	250
KWOR	Worland, Wyo.	1000

1350—222.1

CHOV	Pembroke, Ont.	1000
CJLM	Joliette, Que.	1000
CKLB	Oshawa, Ont.	10000
CKEN	Kentville, N.S.	1000
WJWT	Demopolis, Ala.	5000d
WELB	Elba, Ala.	1000d
WGAD	Gadsden, Ala.	5000
KLYD	Bakersfield, Calif.	1000d
KCKC	San Bernardino, Calif.	500
KSRO	Santa Rosa, Calif.	5000
KGHF	Pueblo, Colo.	5000
WNLK	Norwalk, Conn.	1000
WINY	Putnam, Conn.	1000d
WEZY	Cocoa, Fla.	1000
WDCF	Dade City, Fla.	1000d
WXYC	Ft. Myers, Fla.	1000d
WBSG	Blackshear, Ga.	5000
WRWH	Cleveland, Ga.	1000d
WRPB	Warner Robins, Ga.	5000d
KRLC	Lewiston, Idaho	5000
WAAP	Peoria, Ill.	1000
WJBD	Salem, Ill.	5000
WIOU	Kokomo, Ind.	5000
KRNT	Des Moines, Iowa	5000
KMAN	Manhattan, Kans.	5000
WLOU	Louisville, Ky.	5000d
WSMB	New Orleans, La.	5000
WHMI	Howell, Mich.	500
KDIO	Ortonville, Minn.	1000d
WCMP	Pine City, Minn.	1000d
WKOZ	Kosciusko, Miss.	5000d
KCHR	Charleston, Mo.	1000d
KBRX	O'Neill, Nebr.	1000d
WLNH	Laconia, N.H.	5000d
WVWH	Princeton, N.J.	5000
KABQ	Albuquerque, N.M.	5000
WCBA	Corning, N.Y.	1000d
WRNY	Rome, N.Y.	5000
WBMT	Black Mountain, N.C.	5000
WHIP	Mooresville, N.C.	1000d
WLLY	Wilson, N.C.	1000d
KBMR	Bismarck, N. D.	5000
WADC	Akron, Ohio	5000
WCSM	Celina, Ohio	5000
WCHI	Chillicothe, Ohio	1000d
KRHD	Duncan, Okla.	250
KTLQ	Tahlequah, Okla.	1000d
KRVC	Ashland, Oreg.	1000d
KLOO	Corvallis, Oreg.	1000d
WORK	York, Pa.	5000
WWBR	Windber, Pa.	1000d
WDAR	Darlington, S.C.	1000d
WGSW	Greenwood, S.C.	1000d
WRKM	Carthage, Tenn.	1000d
KCAR	Clarksville, Tex.	5000
KTXJ	Jasper, Tex.	1000d
KCOR	San Antonio, Tex.	5000
WBLT	Bedford, Va.	1000d
WFLS	Fredericksburg, Va.	5000
WNVA	Norton, Va.	5000d
WAVY	Portsmouth, Va.	5000
WPDR	Portage, Wis.	5000d

1360—220.4

CKBC	Bathurst, Nfld.	10000
WWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WELR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	5000
KFFA	Helena, Ark.	1000
KFIV	Modesto, Calif.	1000
KRCK	Ridgecrest, Calif.	1000d
KGB	San Diego, Calif.	5000
WDR	Hartford, Conn.	5000
WBS	Jacksonville, Fla.	5000d
WKAT	Miami Beach, Fla.	5000
WSFR	Sanford, Fla.	5000
WINT	Winter Haven, Fla.	1000d
WAZA	Bainbridge, Ga.	1000d
WLAW	Lawrenceville, Ga.	1000d
WMAC	Metter, Ga.	5000
WIYN	Rome, Ga.	5000
WLBK	DeKalb, Ill.	1000d
WVMC	Mt. Carmel, Ill.	5000

Kc.	Wave Length	W.P.
WGFA	Watsika, Ill.	1000d
KHAK	Cedar Rapids, Iowa	1000d
KXGI	Ft. Madison, Iowa	1000d
KSCJ	Sioux City, Iowa	5000
KBTO	El Dorado, Kans.	5000
WFLW	Monticello, Ky.	1000d
KDBC	Mansfield, La.	1000d
KVIM	New Iberia, La.	1000d
KTLD	Tallulah, La.	5000
WEBB	Dundalk, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYO	Caro, Mich.	5000
WKMI	Kalamazoo, Mich.	5000
KLRS	Mountain Grove, Mo.	1000d
KWRV	McCook, Nebr.	1000d
WNNJ	Newton, N.J.	1000d
WWBZ	Vineland, N.J.	1000
WKOP	Binghamton, N.Y.	5000
WMNS	Olean, N.Y.	1000d
WCHL	Chapel Hill, N.C.	1000d
KEYZ	Williston, N.D.	5000
WSAI	Cincinnati, Ohio	5000
WWOW	Conneaut, Ohio	5000
KUIK	Hillsboro, Oreg.	1000d
WPQR	McKeesport, Pa.	5000
WPPA	Pottsville, Pa.	5000
WELP	Easley, S.C.	1000d
WLCM	Lancaster, S.C.	1000d
WNAH	Nashville, Tenn.	1000d
KRAY	Amarillo, Tex.	5000
KACT	Andrews, Tex.	1000d
KWBA	Baytown, Tex.	1000
KRYS	Corpus Christi, Tex.	1000
KXOL	Ft. Worth, Tex.	5000
WBOB	Galax, Va.	1000d
WHBG	Harrisonburg, Va.	5000d
KFDR	Grand Coulee, Wash.	1000d
KMO	Tacoma, Wash.	5000
WHJC	Matawan, W. Va.	1000d
WMOV	Ravenswood, W. Va.	1000d
WBAY	Green Bay, Wis.	5000
WISV	Virouqua, Wis.	1000
WMNE	Menomonie, Wis.	1000d
KVRS	Rock Springs, Wyo.	1000

1370—218.8

WBYE	Calera, Ala.	1000d
CFLV	Valleyfield, P.Q.	1000
KTPA	Prescott, Ark.	5000
KBUC	Corona, Calif.	1000
KQCY	Quincy, Calif.	5000
KEEN	San Jose, Calif.	5000
KGEM	Tulare, Calif.	1000d
WKMK	Blountstown, Fla.	5000
WKOS	Ocala, Fla.	5000d
WCOA	Pensacola, Fla.	5000
WAXE	Vero Beach, Fla.	1000d
WBGR	Jesup, Ga.	5000
WFDR	Manchester, Ga.	1000d
WKLE	Washington, Ga.	1000d
WPRC	Lincoln, Ill.	1000d
WTTT	Bloomington, Ind.	5000
WGRY	Gary, Ind.	1000d
KOTH	Dubuque, Iowa	5000
KGNO	Dodge City, Kans.	5000
KALN	Iola, Kans.	5000
WGOH	Grayson, Ky.	5000d
WTKY	Tompkinsville, Ky.	1000d
KAPB	Marksville, La.	1000d
WMHI	Braddocks Hts., Md.	5000
WKIK	Leonardtown, Md.	1000d
WDEA	Ellsworth, Me.	5000d
WGHN	Grand Haven, Mich.	5000
KSUM	Fairmont, Minn.	1000
WMGO	Canton, Miss.	1000d
KWRT	Boonville, Mo.	1000d
KCRV	Caruthersville, Mo.	1000d
KXLF	Butte, Mont.	5000
KAWL	York, Nebr.	5000
WFEA	Manchester, N.H.	5000
WALK	Patchogue, N.Y.	5000
WSAY	Rochester, N.Y.	5000
WLTC	Gastonia, N.C.	5000d
WTAB	Tabor City, N.C.	5000d
KFJM	Grand Forks, N.D.	1000d
WSPD	Toledo, Ohio	5000
KAST	Astoria, Oreg.	1000
WOTR	Corry, Pa.	1000
WPAZ	Pottstown, Pa.	1000d
WKMC	Roaring Sprgs., Pa.	1000d
WIVV	Vieques, P.R.	1000
WKFD	Wickford, R.I.	5000
WDEF	Chattanooga, Tenn.	5000
WDXE	Lawrenceburg, Tenn.	1000d
WRGS	Rogersville, Tenn.	1000d
KOKE	Austin, Tex.	1000d
KFRO	Longview, Tex.	1000
KPOS	Post, Tex.	5000
KSOP	Salt Lake City, Utah	1000d
WBTN	Bennington, Vt.	1000d
WHEE	Martinsville, Va.	5000d
WJWS	South Hill, Va.	5000d
KPOR	Quincy, Wash.	1000d
WMOD	Moundsville, W. Va.	1000d
WCCN	Neillsville, Wis.	5000d
KVVO	Cheyenne, Wyo.	1000

1380—217.3

CFDA	Victoriaville, Que.	1000
CKPC	Brantford, Ont.	10000

Kc.	Wave Length	W.P.
CKLC	Kingston, Ont.	5000
WRAB	Arab, Ala.	1000d
WGYV	Greenville, Ala.	1000d
KDXE	N. Little Rock, Ark.	1000d
KBVM	Lancaster, Calif.	1000d
KGMS	Sacramento, Calif.	1000
KSBW	Salinas, Calif.	5000
KFLJ	Walsenburg, Colo.	1000d
WAMS	Wilmington, Del.	5000
WLIZ	Lake Worth, Fla.	5000
WQXQ	Ormond Bch., Fla.	1000d
WLCY	St. Petersburg, Fla.	5000
WAOK	Atlanta, Ga.	5000
WSIZ	Ocala, Ga.	5000d
KPOI	Honolulu, Hawaii	5000
WBZI	Brazil, Ind.	5000
WKJG	Ft. Wayne, Ind.	5000
KCIM	Carroll, Iowa	1000
KCII	Washington, Iowa	5000d
WMTA	Central City, Ky.	5000d
WKYK	Winchester, Ky.	1000d
WYNK	Baton Rouge, La.	5000
WKTJ	Farmington, Me.	1000d
WTTH	Port Huron, Mich.	1000
WPLB	Greenville, Mich.	5000
KLIZ	Brainerd, Minn.	1000d
KAGE	Winona, Minn.	1000
WDLT	Indianola, Miss.	5000d
KUDL	Kansas City, Mo.	5000
KUVR	Holdrege, Nebr.	500
WBBX	Portsmouth, N.H.	1000
WAWZ	Zarephath, N.J.	5000
WFSR	Bath, N.Y.	5000
WBNX	New York, N.Y.	5000
WLOS	Asheville, N.C.	5000
WTOB	Winston-Salem, N.C.	5000
WWIZ	Lorain, Ohio	5000
WPKO	Waverly, Ohio	1000d
KSWO	Lawton, Okla.	1000
KMUS	Muskogee, Okla.	1000
KBCH	Ocean Lake, Oreg.	1000d
KSRV	Ontario, Oreg.	5000
WACB	Kittanning, Pa.	1000d
WMLP	Milton, Pa.	1000d
WAYZ	Waynesboro, Pa.	1000d
WNRI	Woonsocket, R.I.	1000d
WAGS	Bishopville, S.C.	1000d
WGUS	N. Augusta, S.C.	1000d
KOTA	Rapid City, S. Dak.	5000
KFCB	Redfield, S. Dak.	5000
WYSH	Clinton, Tenn.	1000d
WGMM	Millington, Tenn.	5000
KJET	Beaumont, Tex.	1000
KBWD	Brownwood, Tex.	1000
KCRM	Crane, Tex.	1000d
KTSM	El Paso, Tex.	5000
KMUL	Muleshoe, Tex.	1000d
KBOP	Pleasanton, Tex.	1000d
WSYB	Rutland, Vt.	5000
WMBG	Richmond, Va.	5000
KRKO	Everett, Wash.	5000
KPEG	Spokane, Wash.	5000d
WMTD	Hinton, W. Va.	1000d
WBEL	Beloit, Wis.	5000

1390—215.7

CKLN	Nelson, B.C.	1000
WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	5000
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo.	1000d
WAVP	Avon Park, Fla.	1000d
WPUP	Gainesville, Fla.	5000d
WYNR	Chicago, Ill.	5000
WFIW	Fairfield, Ill.	1000
WJCD	Seymour, Ind.	1000d
KCLN	Clinton, Iowa	1000d
KCBC	Des Moines, Iowa	1000
KNCK	Concordia, Kans.	5000
WANY	Albany, Ky.	1000d
WKIC	Hazard, Ky.	5000d
KFRA	Franklin, La.	5000
WEGP	Presque Isle, Me.	5000d
KJPW	Waynesville, Mo.	1000d
WCAT	Orange, Mass.	1000d
WPLM	Plymouth, Mass.	5000
WCER	Charlotte, Mich.	1000d
KAOH	Duluth, Minn.	500
KRFO	Owatonna, Minn.	5000
WROA	Gulfport, Miss.	1000d
WQIC	Meridian, Miss.	5000d
KJPW	Waynesville, Mo.	1000d
KENN	Farmington, N. Mex.	5000
KHOB	Hobbs, N. Mex.	5000d
WEOK	Poughkeepsie, N.Y.	5000d
WRIV	Riverhead, N.Y.	1000d
WFBL	Syracuse, N.Y.	5000
WEED	Rocky Mount, N.C.	5000
WADA	Shelby, N.C.	5000
WJRM	Troy, N.C.	5000d
KLPM	Minot, N. Dak.	5000
WOHP	Bellefontaine, Ohio	5000
WMPO	Middleport-Pomroy, Ohio	1000d
WFMJ	Youngstown, Ohio	5000
KCRC	Enid, Okla.	1000
KSLM	Salem, Oreg.	5000
WLAN	Lancaster, Pa.	5000
WRSC	State College, Pa.	1000d

Kc.	Wave Length	W.P.
WISA	Isabella, P.R.	1000
WHPB	Belton, S.C.	5000
WCSC	Charleston, S.C.	5000
KJAM	Madison, S.D.	5000d
WTJS	Jackson, Tenn.	5000
KULP	El Campo, Tex.	5000
KBEC	Waxahatche, Tex.	5000
KLGN	Logan, Utah	1000
WEAM	Arlington, Va.	5000
WWOD	Lynchburg, Va.	5000
WKLP	Keyser, W. Va.	1390
KBBO	Yakima, Wash.	1000

1400—214.2

Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.	Kc.	Wave Length	W.P.
WLTN	Littleton, N. H.	250	WBKN	Newton, Miss.	500d	KMRC	Morgan City, La.	500d	WDIG	Dothan, Ala.	1000
KTRC	Santa Fe, N. Mex.	250	KNOP	N. Platte, Nebr.	1000d	WNAV	Annapolis, Md.	5000	WFIX	Huntsville, Ala.	1000
KCHS	Truth or Consequences, New Mexico	250	WHTG	Eatontown, N.J.	500d	WTTT	Amherst, Mass.	5000d	WLAY	Muscle Shoals City, Alabama	1000
KTNM	Tucumcari, N. Mex.	250	WDOE	Dunkirk, N.Y.	1000	WHIL	Medford, Mass.	5000d	KLAM	Cordova, Alaska	250
WOND	Pleasantville, N.J.	1000	WELM	Elmira, N.Y.	1000	WION	Ionia, Mich.	5000d	KAWT	Douglas, Ariz.	250
WABY	Albany, N.Y.	1000	WSET	Glen Falls, N.Y.	1000d	WBRB	Mt. Clemens, Mich.	5000d	KNOT	Prescott, Ariz.	250
WYSL	Buffalo, N.Y.	1000d	WOTT	Watertown, N.Y.	5000	WLAU	Laurel, Miss.	5000d	KOLD	Tucson, Ariz.	250
WSLB	Ogdensburg, N.Y.	1000	WEGO	Concord, N.C.	1000d	KAOL	Carrollton, Mo.	500d	KENA	Mena, Ark.	250
WBMA	Beaufort, N.C.	250	WSRC	Durham, N.C.	1000d	WIL	St. Louis, Mo.	5000	KYOR	Blythe, Calif.	250
WGBG	Greensboro, N.C.	1000	WING	Dayton, Ohio	5000	KRGI	Grand Island, Nebr.	5000	KOWN	Escondido, Calif.	250
WSIC	Statesville, N.C.	1000	KPAM	Portland, Oreg.	5000d	WNJR	Newark, N.J.	5000	KPAL	Palm Springs, Calif.	250
WLSE	Wallace, N. C.	1000	WLSH	Lansford, Pa.	5000d	KGFL	Roswell, N.M.	5000d	KTIP	Porterville, Calif.	1000
WHCC	Waynesville, N.C.	1000	KQV	Pittsburgh, Pa.	5000	WENE	Endicott, N.Y.	5000	KSAN	San Francisco, Calif.	1000
WCNF	Weidon, N.C.	1000d	WPCC	Clinton, S.C.	1000d	WMNC	Morganton, N.C.	5000d	KVML	Sonora, Calif.	250
KEYJ	Jamestown, N. Dak.	1000	WYMB	Manning, S.C.	1000d	WDJS	Mt. Olive, N.C.	1000d	KVEN	Ventura, Calif.	1000
WMAN	Mansfield, Ohio	1000d	WCMT	Martin, Tenn.	1000d	WRXO	Roxboro, N.C.	1000d	KAGR	Yuba City, Calif.	100
WPAY	Portsmouth, Ohio	1000	KBUD	Athens, Tex.	1000d	WFOB	Fostoria, Ohio	1000	KGIW	Alamosa, Colo.	250
KWON	Bartlesville, Okla.	250	KBAN	Bowie, Tex.	500d	WCLT	Newark, Ohio	500d	KYOU	Greeley, Colo.	1000
KTMC	McAlester, Okla.	250	KVLB	Cleveland, Tex.	500	KALV	Alva, Okla.	500	WNAB	Bridgeport, Conn.	1000
KNOR	Norman, Okla.	250	KXIT	Dalhart, Tex.	500d	KELI	Tulsa, Okla.	5000	WILM	Wilmington, Del.	1000
KNNO	Cottage Grove, Oreg.	1000d	KADO	Marshall, Tex.	500	KAGY	Salem, Oreg.	5000d	WOL	Washington, D. C.	1000
WEST	Easton, Pa.	1000	KRIG	Odessa, Tex.	1000	WVAM	Altoona, Pa.	1000	WJWB	Brooksville, Fla.	250
WJET	Erie, Pa.	1000	KBAL	San Saba, Tex.	500d	WFRF	Franklin, Pa.	500d	WMFJ	Daytona Beach, Fla.	1000
WFEC	Harrisburg, Pa.	1000d	KNAL	Victoria, Tex.	500	WNEL	Caguas, P.R.	1000	WSPK	Miami, Fla.	250
WKBI	St. Marys, Pa.	1000	WRIS	Roanoke, Va.	5000d	WBLR	Batesburg, S.C.	5000d	WBSR	Pensacola, Fla.	1000
WICK	Scranton, Pa.	1000	WRDS	S. Charleston, W. Va.	5000	WATP	Marion, S.C.	1000d	WSPB	Sarasota, Fla.	1000
WRAK	Williamsport, Pa.	1000	WKBH	LaCrosse, Wis.	5000	KBRK	Brookings, S. Dak.	1000d	WSTU	Stuart, Fla.	250
WCOS	Columbia, S.C.	1000	KWYO	Sheridan, Wyo.	1000	WGYW	Fountain City, Tenn.	1000d	WTAL	Tallahassee, Fla.	1000
WGTN	Georgetown, S.C.	250				WENO	Madison, Tenn.	5000d	WGPC	Albany, Ga.	1000
WZOO	Spartanburg, S.C.	1000d				WHER	Memphis, Tenn.	1000	WBHF	Cartersville, Ga.	1000
WJZM	Clarksville, Tenn.	1000				KSTB	Breckenridge, Tex.	1000d	WCON	Cornelia, Ga.	250
WHUB	Cookeville, Tenn.	1000				KEES	Gladewater, Tex.	1000d	WKEU	Grimm, Ga.	1000
WLSB	Copper Hill, Tenn.	250				KCOH	Houston, Tex.	1000d	WMEV	Milledgeville, Ga.	1000
WGAP	Maryville, Tenn.	1000d				KLO	Ogden, Utah	5000	WBYG	Savannah, Ga.	1000
WHAL	Smelbyville, Tenn.	1000				WIVE	Ashland, Va.	1000d	WVLD	Valdosta, Ga.	1000
KRUN	Ballinger, Tex.	250				WDIC	Clincho, Va.	1000d	KEOK	Payette, Idaho	250
KBYG	Big Spring, Tex.	250				KBRC	Mt. Vernon, Wash.	5000	KEEP	Twin Falls, Idaho	1000
KUNO	Corpus Christi, Tex.	250				WEIR	Weirton, W. Va.	1000	WVON	Cicero, Ill.	1000
KILE	Galveston, Tex.	250				WBEV	Beaver Dam, Wis.	1000d	WKEI	Kewanee, Ill.	100
KGLV	Greenville, Tex.	250							WCVS	Springfield, Ill.	1000
KEBE	Jacksonville, Tex.	250							WANE	Ft. Wayne, Ind.	1000
KIUN	Pecos, Tex.	1000							WXVW	Jeffersonville, Ind.	250
KEYE	Perryton, Tex.	250							WASK	Lafayette, Ind.	1000
KVOP	Plainview, Tex.	250							WAOV	Vincennes, Ind.	1000
KOWT	Stamford, Tex.	250							KLWN	Cedar Rapids, Iowa	250
KTEM	Temple, Tex.	1000							KWBW	Hutchinson, Kans.	1000
KTFS	Texarkana, Tex.	250							WTCO	Campbellsville, Ky.	1000
KVOU	Uvalde, Tex.	250							WWXL	Manchester, Ky.	1000
KIXX	Frovo, Utah	250							WPAD	Paducah, Ky.	1000
WDOT	Burlington, Vt.	1000							KSIG	Crowley, La.	1000
WINA	Charlottesville, Va.	1000							KNOC	Natchitoches, La.	1000
WHHV	Hillsville, Va.	250							WNPS	New Orleans, La.	250
WHIH	Portsmouth, Va.	1000							WRKO	Rockland, Maine	250
WHLF	So. Boston, Va.	1000							WKTQ	South Paris, Maine	250
WINC	Winchester, Va.	1000							WTBO	Cumberland, Md.	1000
KEDO	Longview, Wash.	250							WMAS	Springfield, Mass.	1000
KRSC	Othello, Wash.	250							WATZ	Alpena Township, Michigan	1000
KTNT	Tacoma, Wash.	1000							WHTC	Holland, Mich.	1000
WBOY	Clarksburg, W. Va.	1000							WMIQ	Iron Mtn., Mich.	250
WRON	Ronceverte, W. Va.	1000							WIBM	Jackson, Mich.	1000
WSPZ	Spencer, W. Va.	1000							WBLA	Ludington, Mich.	250
WKWK	Wheeling, W. Va.	250							WHLA	Port Huron, Mich.	1000
WBTH	Williamson, W. Va.	1000							KATE	Albert Lea, Minn.	250
WATW	Ashland, Wis.	1000							KBUN	Bemidji, Minn.	1000
WBIZ	Eau Claire, Wis.	1000							KBMV	Breckenridge, Minn.	1000
WDUZ	Green Bay, Wis.	1000							WELY	Ely, Minn.	1000
WRJN	Racine, Wis.	1000							KFAM	St. Cloud, Minn.	1000
WROB	Reedsburg, Wis.	1000							WROX	Clarksdale, Miss.	250
WRIG	Wausau, Wis.	1000							WCJU	Columbia, Miss.	250
KATI	Caspar, Wyo.	1000							WJXN	Jackson, Miss.	250
KODI	Cody, Wyo.	1000							WOKK	Meridian, Miss.	1000
									WNAT	Natchez, Miss.	250
									WROB	West Point, Miss.	250
									KFTW	Fredericktown, Mo.	250
									WMBH	Joplin, Mo.	1000
									KIRX	Kirkville, Mo.	1000
									KOKO	Warrensburg, Mo.	1000
									KWPM	West Plains, Mo.	1000
									KXXL	Bozeman, Mont.	1000
									KUDI	Great Falls, Mont.	1000
									KXLL	Missoula, Mont.	250
									KRBN	Red Lodge, Mont.	1000
									KVCK	Wolf Point, Mont.	1000
									KWBE	Beatrice, Nebr.	250
									KONE	Renov, Nev.	250
									WKXL	Concord, N.H.	1000
									WFPG	Atlantic City, N.J.	1000
									WTC	New Brunswick, N. J.	1000
									KLOS	Albuquerque, N. Mex.	250
									KLMX	Clayton, N. Mex.	1000d
									KOBE	Las Cruces, N. Mex.	250
									KENM	Portales, N. Mex.	1000
									WCLI	Corning, N.Y.	1000
									WWSG	Glen Falls, N.Y.	1000d
									WHDL	Olean, N.Y.	1000
									WKIP	Poughkeepsie, N. Y.	1000
									WKAL	Rome, N.Y.	250
									WATA	Boone, N. C.	1000
									WGNC	Gastonia, N.C.	1000
									WISZ	Henderson, N.C.	1000
									WHKP	Hendersonville, N.C.	1000
									WHIT	New Bern, N.C.	250
									WFBS	Spring Lake, N. C.	250
									KGCA	Rugby, N. Dak.	250
									WJER	Dover, Ohio	1000
									WMOH	Hamilton, Ohio	1000d
									WLEC	Sandusky, Ohio	1000
									KWHW	Altus, Okla.	1000

WHITE'S RADIO LOG

Kc.	Wave Length	W.P.
KGFF	Shawnee, Okla.	1000
KSIW	Woodward, Okla.	1000
KORE	Eugene, Oreg.	1000
KFLW	Klamath Falls, Oreg.	250
KLBM	La Grande, Oreg.	1000
KBPS	Portland, Ore.	250
WLEU	Erie, Pa.	1000d
WDAD	Indiana, Pa.	1000
WPAM	Pottsville, Pa.	1000
WMPT	So. Williamsport, Pa.	250
WMAJ	State College, Pa.	1000d
WJPA	Washington, Pa.	250
WWRI	W. Warwick, R.I.	1000
WQSN	Charleston, S.C.	1000
WCRS	Greenwood, S.C.	1000
WMYB	Myrtle Beach, S.C.	1000
WHSC	Hartsville, S.C.	1000
KBFS	Belle Fourche, S. Dak.	1000
KYNT	Yankton, S. Dak.	250
WLAR	Athens, Tenn.	1000
WMOC	Chattanooga, Tenn.	1000
WDSG	Dyersburg, Tenn.	250
WSMG	Greenville, Tenn.	250
WLFM	LaFollette, Tenn.	100
WGNS	Murfreesboro, Tenn.	1000
KAYC	Beaumont, Tex.	1000
KBEN	Carrizo Sprgs., Tex.	250
KCTI	Gonzales, Tex.	250
KMBL	Junction, Tex.	250
KCYL	Lampasas, Tex.	250
KMHT	Marshall, Tex.	1000
KAMY	McCombs, Tex.	250
KNET	Palestine, Tex.	250
KSNY	Snyder, Tex.	1000
KURA	Moab, Utah	1000
KEYY	Provo, Utah	250
KDXU	St. George, Utah	250
WSNO	Barre, Vt.	1000
WISA	Brattleboro, Vt.	1000
WETR	Front Royal, Va.	1000
WENZ	Highland Springs, Va.	250
WREL	Lexington, Va.	1000
WMVA	Martinsville, Va.	1000
KBKW	Aberdeen, Wash.	1000
KCLX	Colfax, Wash.	1000
KONP	Port Angeles, Wash.	250
KAYE	Puyallup, Wash.	1000
WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	250
WDLB	Marshfield, Wis.	1000
WFPF	Park Falls, Wis.	1000
WRCO	Richland Center, Wis.	1000
KBBS	Buffalo, Wyo.	250
KVOW	Riverton, Wyo.	1000

1460—205.4

CJOY	Guelph, Ont.	10000
CKRB	Ville St. Georges, Quebec	10000
CJNB	N. Battleford, Sask.	10000
WFMH	Cullman, Ala.	5000d
WPNX	Phenix City, Ala.	5000
KZOT	Marianna, Ark.	500
KCCL	Paris, Ark.	500d
KTYM	Inglewood, Calif.	5000d
KDON	Salinas, Calif.	5000
KVRE	Santa Rosa, Calif.	1000d
KDEY	Boulder, Colo.	500d
KYSN	Colo. Sprgs., Colo.	1000
WBAR	Bartow, Fla.	1000d
WZEP	DeFuniak Springs, Florida	1000d
WMBR	Jacksonville, Fla.	5000
WDMF	Buford, Ga.	1000d
WROY	Carmi, Ill.	1000d
WIXN	Dixon, Ill.	1000d
WRTL	Rantoul, Ill.	250d
WKAM	Goshen, Ind.	1000d
WOCH	North Vernon, Ind.	1000d
KSO	Des Moines, Iowa	5000
KCRB	Chanute, Kans.	1000d
WRVK	Mt. Vernon, Ky.	500d
WAIL	Baton Rouge, La.	5000
KBSF	Springhill, La.	1000d
WEMO	Easton, Md.	500d
WBET	Brockton, Mass.	5000
WBRN	Big Rapids, Mich.	1000d
WPON	Pontiac, Mich.	1000
KDMA	Montevideo, Minn.	1000
WELZ	Belzoni, Miss.	1000d
KADY	St. Charles, Mo.	5000d
KRNY	Kearney, Nebr.	5000d
KENO	Las Vegas, Nev.	1000
WOKO	Albany, N.Y.	5000
WVOX	New Rochelle, N.Y.	500d
WHEC	Rochester, N.Y.	5000

Kc.	Wave Length	W.P.
WFVG	Fuquay Sprgs., N.C.	1000d
WRKB	Kannapolis, N.C.	500d
WMMH	Marshall, N.C.	500d
WBNS	Columbus, Ohio	5000
WPVL	Painesville, Ohio	5000
KROW	Dallas, Oreg.	5000d
KELR	El Reno, Okla.	500
WMBA	Ambridge, Pa.	500d
WCMB	Harrisburg, Pa.	5000
WBCU	Union, S.C.	1000
WGOG	Walhalla, S.C.	500d
WJAK	Jackson, Tenn.	5000d
WEEN	Lafayette, Tenn.	1000d
KBRZ	Freeport, Tex.	500d
KLLL	Lubbock, Tex.	1000d
WACO	Waco, Tex.	1000
WPRW	Manassas, Va.	500d
WRAD	Radford, Va.	5000
WLPM	Suffolk, Va.	5000d
KCDI	Kirkland, Wash.	5000d
KIMA	Yakima, Wash.	5000
WBUC	Buckhannon, W. Va.	5000d
WRAC	Racine, Wis.	500d
WTMB	Tomah, Wis.	1000d

1470—204.0

CHOW	Welland, Ontario	1000
CFOX	Pointe Claire, Que.	5000
WBLO	Evergreen, Ala.	1000d
KMVS	Sierra Vista, Ariz.	1000d
KZNG	Hot Springs, Ark.	1000d
KBMX	Coalinga, Calif.	500d
KUTY	Palmdale, Calif.	5000
KXOA	Sacramento, Calif.	5000
WMMW	Meriden, Conn.	1000d
WRBD	Pompano Beach, Fla.	5000
WRBB	Tarpon Sprgs., Fla.	5000d
WAAG	Adel, Ga.	1000d
WDOL	Athens, Ga.	1000d
WCLA	Claxton, Ga.	1000
WRGA	Rome, Ga.	5000
WMPP	Chicago Heights, Ill.	1000d
WMBD	Peoria, Ill.	5000
WHUT	Anderson, Ind.	1000d
KTRI	Sioux City, Iowa	5000
KWVY	Waverly, Iowa	1000d
KARE	Atchison, Kans.	1000
KLIB	Liberal, Kans.	500d
WSAC	Fort Knox, Ky.	1000d
KTDL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJDY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KANO	Anoka, Minn.	1000d
WCHJ	Brookhaven, Miss.	1000d
WNAU	New Albany, Miss.	500d
KGHM	Brookfield, Mo.	500d
KTCB	Malden, Mo.	1000d
WTKO	Ithaca, N.Y.	1000d
WPDM	Potsdam, N.Y.	1000d
WBIG	Greensboro, N.C.	5000
WPNC	Plymouth, N.C.	1000d
WTOE	Spruce Pine, N.C.	1000d
WOHO	Toledo, Ohio	1000
KVLH	Pauls Valley, Okla.	250d
KVIN	Vinita, Okla.	500d
KRAF	Reedsport, Oreg.	5000d
WSAN	Allentown, Pa.	5000
WFAE	Farrell, Pa.	1000d
WMLL	Portage, Pa.	500d
WQXL	Columbia, S.C.	5000d
WG00	Georgetown, S. C.	500d
WEAG	Alcoa, Tenn.	1000d
WVOL	Berry Hill, Tenn.	5000
KRBC	Abilene, Tex.	5000
KDHN	Dimmitt, Tex.	5000
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
KELA	Centralia, Wash.	5000
KSEM	Moses Lake, Wash.	5000
KAPS	Mount Vernon, Wash.	500d
WWHY	Huntington, W. Va.	5000d
WBZE	Wheeling, W. Va.	500d
WBKV	West Bend, Wis.	1000d
KTWO	Casper, Wyo.	5000

1480—202.6

VOUS	Argentia, Nfld.	250
WARI	Abbeville, Ala.	1000
WBTS	Bridgeport, Ala.	1000d
WIXI	Irondale, Ala.	5000d
WABB	Mobile, Ala.	5000
KHAT	Phoenix, Ariz.	500
KGLU	Safford, Ariz.	1000
KTHS	Berryville, Ark.	1000
KWUN	Concord, Calif.	500d
KRED	Eureka, Calif.	5000
KYOS	Merced, Calif.	5000
KWIZ	Santa Ana, Calif.	5000
KSEE	Santa Maria, Calif.	1000
KPUB	Pueblo, Colo.	1000d
WSOR	Windsor, Conn.	500d
WAPG	Arcadia, Fla.	1000d
WTHR	Panama Beach, Fla.	500d
WXIV	Windemere, Fla.	1000d
WYZE	Atlanta, Ga.	5000d

Kc.	Wave Length	W.P.
WRDW	Augusta, Ga.	5000
WGSB	Geneva, Ill.	1000
WJBM	Jerseyville, Ill.	500d
WTHI	Terre Haute, Ind.	1000
WRSW	Warsaw, Ind.	1000
KLEE	Ottumwa, Iowa	500d
KBEA	Mission, Kans.	1000d
KLEO	Wichita, Kans.	5000
WKOA	Hopkinsville, Ky.	1000d
WNKY	Neon, Ky.	1000d
WTLO	Somerset, Ky.	1000d
KCKW	Jena, La.	500d
KANY	Jonesville, La.	500d
KJOE	Shreveport, La.	1000d
WSAR	Fall River, Mass.	5000
WMAX	Grand Rapids, Michigan	1000d
WIOS	Tawas City, Mich.	1000d
WYSI	Ypsilanti, Mich.	5000d
KKAUS	Austin, Minn.	1000
KGCX	Sidney, Mont.	5000
KLMS	Lincoln, Nebr.	1000
KWEW	Hobbs, N. Mex.	5000
WLEA	Hornell, N.Y.	1000d
WHOM	New York, N.Y.	5000
WREM	Remsen, N.Y.	5000d
WWOK	Charlotte, N.C.	5000
WYRN	Louisburg, N.C.	500d
WMSJ	Sylva, N.C.	5000d
WHBC	Canton, Ohio	5000
WCIN	Cincinnati, Ohio	5000
WTRA	Latrobe, Pa.	500d
WDAS	Philadelphia, Pa.	5000
WISL	Shamokin, Pa.	1000
WSHP	Shippensburg, Pa.	500d
WMDD	Fajardo, P.R.	5000
KSDR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500
WLOK	Memphis, Tenn.	5000d
KBOX	Dallas, Tex.	5000
KLVL	Pasadena, Tex.	1000
KAPE	San Antonio, Tex.	500d
KONI	Spanish Fork, Utah	1000d
WCFR	Springfield, Vt.	1000d
WBBL	Richmond, Va.	5000
WLEE	Richmond, Va.	5000
WBLU	Salem, Va.	5000d
KFHA	Lakewood, Wash.	1000d
KVAN	Vancouver, Wash.	1000d
WISM	Madison, Wis.	5000
KRAE	Cheyenne, Wyo.	1000d

1490—201.2

CKAD	Wilmot Station, N.S.	1000
CFMR	Fort Simpson, N.W.T.	250
CFRC	Kingston, Ont.	100
CKCR	Kitchener, Ont.	5000
CKBM	Montmagny, Que.	1000
WANA	Anniston, Ala.	250
WJAF	Decatur, Ala.	1000
WRLD	Lawton, Ala.	250
WHBB	Selma, Ala.	250
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	250
KTLO	Mtn. Home, Ark.	250
KDRS	Paragould, Ark.	250
KOTN	Pine Bluff, Ark.	250
KXRJ	Russellville, Ark.	1000
KWAC	Bakersfield, Calif.	1000
KPAS	Banning, Calif.	250
KICO	Calexico, Calif.	250
KRKC	King City, Calif.	1000
KOWL	Lake Tahoe, Calif.	250
KTOB	Petaluma, Calif.	1000
KBLF	Red Bluff, Calif.	1000
KDB	Santa Barbara, Calif.	1000
KSYC	Yreka, Calif.	1000
KBOL	Boulder, Colo.	1000
KGUC	Gunnison, Colo.	250
KCMS	Manitou Sprgs., Colo.	100
KOLR	Sterling, Colo.	250
WTOR	Torrington, Conn.	250
WTRL	Bradenton, Fla.	250
WJBS	DeLand, Fla.	250
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	250
WPXE	Starke, Fla.	250
WTTB	Vero Beach, Fla.	250
WSIR	Winter Haven, Fla.	250
WMGG	Brunswick, Ga.	250
WMJM	Cordale, Ga.	1000
WMRE	Monroe, Ga.	1000d
WSFB	Quitman, Ga.	250
WSNT	Sandersville, Ga.	500
WSYL	Sylvania, Ga.	250
KTOH	Lihue, Hawaii	250
KCID	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WDAN	Danville, Ill.	1000
WAMV	East St. Louis, Ill.	500
WOPA	Oak Park, Ill.	1000
WZOE	Princeton, Ind.	1000
WKBY	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Iowa	1000
KRIB	Mason City, Iowa	250
KKAN	Phillipsburg, Kans.	250
KTOP	Topeka, Kans.	250
WFKY	Frankfort, Ky.	1000d

Kc.	Wave Length	W.P.
WKAY	Glasgow, Ky.	1000
WOMI	Owensboro, Ky.	1000
WSPJ	Paintsville, Ky.	1000
WKIC	Bogalusa, La.	1000
KEUN	Eunice, La.	250
KCIL	Houma, La.	1000
KRUS	Ruston, La.	1000
WPOR	Portland, Maine	1000
WTVL	Waterville, Maine	1000
WARK	Hagerstown, Md.	1000
WHAV	Haverhill, Mass.	250
WMRC	Milford, Mass.	250
WTXL	W. Springfield, Mass.	1000
WABJ	Adrian, Mich.	1000
WBFC	Fremont, Mich.	250
WMDN	Midland, Mich.	1000
WCBQ	Whitehall, Mich.	1000
KOZY	Grand Rapids, Minn.	250
KLGR	Redwd. Falls, Minn.	1000
WLOX	Bloomington, Miss.	1000
WCLO	Cleveland, Miss.	250
WHOC	Philadelphia, Miss.	250
WTUP	Tupelo, Miss.	250
WVIM	Vicksburg, Miss.	250
KDMO	Carthage, Mo.	250
KTRR	Rolla, Mo.	1000
KDRO	Sedalia, Mo.	250
KBOW	Butte, Mont.	1000
KBON	Omaha, Nebr.	1000
WEMJ	Laconia, N.H.	1000
WLDJ	Atlantic City, N. J.	1000
KRSN	Los Alamos, N. Mex.	1000
KRTN	Raton, N. Mex.	1000
WCSS	Amsterdam, N.Y.	1000
WBTA	Batavia, N.Y.	250
WKNY	Kingston, N.Y.	1000
WICY	Malone, N.Y.	1000
WDLC	Port Jervis, N. Y.	1000
WOLF	Syracuse, N. Y.	1000
WSSB	Durham, N. C.	1000
WFLB	Fayetteville, N.C.	250
WLOE	Leaksville, N.C.	250
WRNB	New Bern, N.C.	1000
WRMT	Rocky Mount, N. C.	1000
WSTP	Salisbury, N.C.	250
WSVM	Valdese, N.C.	250
KNDK	Hettinger, N. Dak.	250
WHSL	Wilmington, N.C.	250
KOVC	Valley City, N. Dak.	1000
WBEX	Chillicothe, Ohio	1000
WJMO	Cleveland Hghts., O.	1000
WOHI	E. Liverpool, Ohio	250
WMOA	Marietta, Ohio	1000
WMRN	Marion, Ohio	1000
KWRW	Guthrie, Okla.	100
KBIX	Muskogee, Okla.	250
KBKR	Baker, Oreg.	1000
KRNR	Roseburg, Oreg.	1000
KBZY	Salem, Oreg.	1000
WESB	Bradford, Pa.	1000
WAZL	Hazleton, Pa.	1000
WARD	Johnstown, Pa.	1000
WGAL	Lancaster, Pa.	1000
WBCB	Levittown, Pa.	1000
WMBF	Lewiston, Pa.	1000
WMGW	Meadville, Pa.	1000d
WNBT	Wellsboro, Pa.	1000
WSIB	Beaufort, S.C.	100
WGCD	Chester, S.C.	250
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S. Dak.	250

WHITE'S RADIO LOG

Location	C.L. Chan.	Location	C.L. Chan.
Milwaukee	WISN-TV 12	PUERTO RICO	
	WITI-TV 6	Aquadilla	WOLE-TV 12
	WMVS-TV *10	Caaguas	WKBM-TV 11
	WMVT *36	Mayaguez	WORA-TV 5
	WTMJ-TV 4		WIPM-TV *3
	WXIX 18	Ponce	WRIK-TV 7
Wausau	WSAU-TV 7		WSUR-TV 9
WYOMING			
Casper	KTWO-TV 2	San Juan	WAPA-TV 4
Cheyenne	KFBC-TV 5		WIPR-TV 6
Riverton	KWRB-TV 10		WKAQ-TV 2

Canadian Television Stations by Location

Location	C.L. Chan.	Location	C.L. Chan.	Location	C.L. Chan.	Location	C.L. Chan.
ALBERTA				QUEBEC			
Burmis	CJLH-TV-3 3	Vernon	CHBC-TV-3 7	Sydney	CJCB-TV 4	Carleton	CHAU-TV 5
Calgary	CHCT-TV 2	Victoria	CHEK-TV 6	Yarmouth	CBHT-3 11		CJAO-TV-1 80
	CFCN-TV 8	LABRADOR					CHSM-TV 7
Drumheller	CFCN-TV-1 8	Goose Bay	CFLA-TV 8	ONTARIO			
	CBXT-TV 5	MANITOBA					CFCV-TV-1 75
Edmonton	CFRN-TV 3	Baldy Mountain	CKOS-TV-1 8	Barrle	CKVR-TV 11	Clermont	CJES-TV-1 70
Lethbridge	CJLH-TV 7	Brandon	CKX-TV 5	Cornwall	CJSS-TV 8	Estcourt	CFGW-TV-1 6
Lloydminster	CHSA-TV 2	Winnipeg	CBWT 3	Elk Lake	CFCL-TV-2 2	Gaspe West	CKRS-TV 12
Medicine Hat	CHAT-TV 6		CBWFT 6	Elliot Lake	CKSO-TV-1 3	Jonquiere	CKBL-TV 9
Pivot	CHAT-TV 4		CJAY-TV 7	Hamilton	CFCL-TV-1 3	Matane	CBFT 2
Red Deer	CHCA-TV 6	NEW BRUNSWICK				Montreal	CFCF-TV 12
	CHCA-TV-2 10	Campbellton	CRCD-TV 7	Kingston	CKWS-TV 11		CFTM-TV 10
BRITISH COLUMBIA				London	CKCO-TV 13		CBMT 6
Ashcroft	CFCR-TV-2 10	Moncton	CKAM-TV 2	North Bay	CFPL-TV 10	New Carlisle	CHAU-TV 5
Burnaby	CHAN-TV 8		CBAFT 11	Ottawa	CKGN-TV 10	Quebec	CFCM-TV 4
Crescent Valley	CHMS-TV 5	Saint John	CHSJ-TV 4		CBOFT 9		CKMI-TV 5
Dawson Creek	CJDC-TV 5	Upsalquitch Lake	CKAM 12		CBOT 4	Rimouski	CJBR-TV 3
Enderby	CHBC-TV-8 5	NEWFOUNDLAND				Riviere du-Loup	CKRT-TV 7
Kamloops	CFCR-TV 4	Argentia	CJOX-TV 10	Parry Sound	CKVR-TV-1 11	Rouyn	CKRN-TV 4
Kelowna	CHBC-TV 2	Corner Brook	CBYT 5	Pembroke	CHOV-TV 5	Sherbrooke	CHLT-TV 7
	CHGP-TV-1 72	Grand Falls	CHEK-TV 6	Peterborough	CHEX-TV 12	Three Rivers	CKTM-TV 13
	CABC-TV-4 4	St. John's	CJCN-TV 4	Port Arthur	CKPR-TV-1 2	SASKATCHEWAN	
Karemeos	CHBC-TV-9 5	Stephenville	CJON-TV 6	Sault Ste. Marie	CJIC-TV 2	Carlyle Lake	CKDS-TV-2 7
Lumby	CHBC-TV-4 5		CFSN-TV 8	Sioux Lookout	CHSL-TV 9	East End	CJFB-TV 2
Nelson	CBUAT-TV-7 9	NOVA SCOTIA				Sturgeon Falls	CHAB-TV 4
Oliver	CHBC-TV-3 8	Antigonish	CFXU-TV 9	Sudbury	CKSO-TV 5	Moose Jaw	CKBI-TV-4 2
Peachland	CHBC-TV-10 5	Halifax	CBHT 3	Timmins	CFCL-TV 2	Nipawin	CKBI-TV-1 2
Penticton	CHBC-TV-2 13		CJCH-TV 5	Toronto	CBLT 6	Prince Albert	CKCK-TV 2
Prince George	CKPG-TV 3	Inverness	CJCB-TV-1 6	Windsor	CFTO-TV 9	Regina	CFQC-TV 8
Saddle Mountain	CHHC-TV-1 4	Liverpool	CBHT-1 12	Wingham	CKLW-TV 9	Saskatoon	CFJB-TV 5
Salmon Arm	CHBC-TV-6 5	New Glasgow	CFCY-TV-1 7	PRINCE EDWARD ISLAND			
Trail	CBUAT 11	Shelburne	CBHT-2 8	Charlottetown	CFCY-TV 13	Swift Current	CFJB-TV 5
Vancouver	CBUT 2					Val Marie	CJFB 2
						Wanganui	CKBI-TV-2 7
						Yorkton	CKOS-TV 7

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 and periods indicated:

- 60-meter band= Winter nights.
- 49-meter band= Winter nights.
- 41-meter band= Winter nights.
- 31-meter band= Nights, all year.
- 25-meter band= Nights, all year.
- 19-meter band= Days all year, and Summer nights.
- 16-meter band= Days, all year, and Summer nights.
- 13-meter band= Days, all year.
- 11-meter band= Days, all year.

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.

Good DX! (And don't forget to report your loggings to DX CENTRAL.)

Location	Name	Call	Kc.	EST
EUROPE				
ALBANIA				
Tirana	R. Tirana	—	9677	1630
ANDORRA				
Andorra	R. Andorra	—	5995	1000
AUSTRIA				
Vienna	R. Austria	—	15240	0600
Vienna	R. Austria	—	17765	1430
Vienna	R. Austria	—	17805	1430
BELGIUM				
Brussels	Belg. R. & TV	ORU	9720	1615
Brussels	Belg. R. & TV	ORU	9730	1330
Brussels	Belg. R. & TV	ORU	11720	1950
Brussels	Belg. R. & TV	ORU	11850	1330
Brussels	Belg. R. & TV	ORU	17860	1330
BULGARIA				
Sofia	R. Sofia	—	6070	1630
Sofia	R. Sofia	—	9560	1400

Location	Name	Call	Kc.	EST
CZECHOSLOVAKIA				
Prague	R. Prague	OLR3A	9550	2230
Prague	R. Prague	—	11990	2240
DENMARK				
Copenhagen	V. of Denmark	OZF5	9520	2110
Copenhagen	V. of Denmark	OZF7	15165	1000
FINLAND				
Helsinki	Finnish BC	OIX4	15190	1105
FRANCE				
Paris	Paris Vous Parle	—	5955	1630
Paris	Paris Vous Parle	—	6145	0700
Paris	Paris Vous Parle	—	7160	1630
Paris	Paris Vous Parle	—	7240	0030
Paris	Paris Vous Parle	—	7280	2300
Paris	Paris Vous Parle	—	9560	2300
Paris	Paris Vous Parle	—	9585	0100
Paris	Paris Vous Parle	—	9755	2125
Paris	Paris Vous Parle	—	11845	2125
Paris	Paris Vous Parle	—	11920	2128
Paris	Paris Vous Parle	—	15130	0200

WHITE'S RADIO LOG

Location	Name	Call	Kc.	EST
Paris	Paris Vous Parle	—	15160	1329
Paris	Paris Vous Parle	—	17850	1230
GERMANY (EAST)				
Berlin	R. Berlin Int'l.	—	11920	2115
Leipzig	R. Golos	—	10896	1000
Potsdam	R. Wolga	—	11990	0700
Potsdam	R. Wolga	—	15260	0708
Potsdam	R. Wolga	—	15280	0710
GERMANY (WEST)				
Cologne	Deutsche Welle	DMQ6	6100	1940
Cologne	Deutsche Welle	DMQ6	6145	0530
Cologne	Deutsche Welle	DMQ9	9545	2040
Cologne	Deutsche Welle	DMQ9	9605	1444
Cologne	Deutsche Welle	DMQ15	15275	1205
Lampertheim	R. Liberty	—	7220	0600
Munich	V. of America	—	5975	1550
GREAT BRITAIN				
London	BBC	MCM	3953	1900
London	BBC	GRK	7185	2250
London	BBC	GRJ	7325	2245
London	BBC	GSC	9580	2030
London	BBC	GRH	9825	2230
London	BBC	GSD	11750	1700
London	BBC	GSF	15140	1725
London	BBC	GSO	15180	1245
London	BBC	GWR	15300	1630
London	BBC	—	15400	1703
London	BBC	—	17705	1636
London	BBC	—	17990	1630
GREECE				
Thesaloniki	R. Thesaloniki	—	9710	0715
HUNGARY				
Budapest	R. Budapest	—	7220	1900
Budapest	R. Budapest	—	9833	1914
Budapest	R. Budapest	—	11910	1915
IRELAND				
Baile Atha Cliath	R. Oglaiigh Na H-Eireann	—	17544	1155
ITALY				
Rome	RAI	—	9575	2200
Rome	RAI	—	15400	0905
Rome	RAI	—	17800	0913
LUXEMBOURG				
Villa Louvigny	R. Luxembourg	—	6090	1330
MONACO				
Monte Carlo	Trans World R.	—	7255	0130
Monte Carlo	Trans World R.	—	9633	1025
NETHERLANDS				
Hilversum	R. Netherlands	—	5985	2100
Hilversum	R. Netherlands	—	6020	1430
Hilversum	R. Netherlands	—	6085	1430
Hilversum	R. Netherlands	—	9525	0200
Hilversum	R. Netherlands	—	9590	0945
Hilversum	R. Netherlands	—	11730	0202
Hilversum	R. Netherlands	—	15425	1100
Hilversum	R. Netherlands	—	15445	0900
Hilversum	R. Netherlands	—	17775	1104
Hilversum	R. Netherlands	—	17810	0900
NORWAY				
Oslo	R. Norway	LKJ	6130	0000
Oslo	R. Norway	LLG	9610	0008
Oslo	R. Norway	LLK	11850	2030
Oslo	R. Norway	LLM	15175	1235
POLAND				
Warsaw	R. Warsaw	—	7125	1700
Warsaw	R. Warsaw	—	7925	1700
Warsaw	R. Warsaw	—	9540	1230
Warsaw	R. Warsaw	—	9925	1704
Warsaw	R. Warsaw	—	11800	1706
Warsaw	R. Warsaw	—	11840	1704
Warsaw	R. Warsaw	—	15120	1726
PORTUGAL				
Lisbon	Lisbon Calling	—	6025	2100
Lisbon	Lisbon Calling	—	6185	2245
Lisbon	Lisbon Calling	—	15380	0915
SPAIN				
Madrid	R. Nacional	—	9360	1520
Madrid	R. Nacional	—	9615	1525

Location	Name	Call	Kc.	EST
SWEDEN				
Stockholm	R. Sweden	—	11805	2230
Stockholm	R. Sweden	—	17840	2348
SWITZERLAND				
Berne	Swiss BC	HER2	6055	1430
Berne	Swiss BC	HER3	6165	2330
Berne	Swiss BC	HER4	9535	2033
Berne	Swiss BC	HEU3	9665	1345
Berne	Swiss BC	HER5	11865	2215
Berne	Swiss BC	HE18	17795	1030
U.S.S.R.				
Alma-Ata	R. Alma-Ata	—	10530	0920
Kiev	R. Kiev	—	9665	1715
Kiev	R. Kiev	—	11790	0000
Magadan	R. Moscow	—	9500	1300
Moscow	R. Moscow	—	9650	1750
Moscow	R. Moscow	—	9860	1725
Moscow	R. Moscow	—	11730	1830
Moscow	R. Moscow	—	11735	2015
Yerevan	R. Yerevan	—	11850	1430
VATICAN				
Vatican City	Vatican R.	—	7250	1950
Vatican City	Vatican R.	—	9645	1700
Vatican City	Vatican R.	—	11740	1900
Vatican City	Vatican R.	—	11930	0630
Vatican City	Vatican R.	—	15120	0640
YUGOSLAVIA				
Belgrade	R. Belgrade	—	15240	1030
AFRICA				
CAMEROON				
Yaounde	R. Yaounde	—	6050	0630
CONGO REPUBLIC				
Leopoldville	R. Kamina	—	3520	0100
CONGO (FRENCH-AFRICAN)				
Brazzaville	R. Congo	—	3364	2330
Brazzaville	R. Congo	—	4843	2336
Brazzaville	R. Congo	—	11725	0015
Brazzaville	R. Congo	—	15020	1345
Brazzaville	R. Congo	—	15190	1400
ETHIOPIA				
Addis Ababa	R. V. of Gospel	ETLF	15410	0830
EGYPT (U.A.R.)				
Cairo	U.A.R. BC	—	9493	1630
Cairo	U.A.R. BC	—	9635	1530
Cairo	U.A.R. BC	—	9780	2050
Cairo	U.A.R. BC	—	11915	1645
GHANA				
Accra	Ghana BC	—	4915	1745
Accra	Ghana BC	—	6070	0945
Accra	Ghana BC	—	9545	1630
Accra	Ghana BC	—	11800	1550
Accra	Ghana BC	—	15220	0900
Accra	Ghana BC	—	15285	1503
Accra	Ghana BC	—	17910	0945
GUINEA REPUBLIC				
Conakry	V. of Revolution	—	9650	1745
IVORY COAST				
Abidjan	R. Abidjan	—	11820	1330
LIBERIA				
Monrovia	—	ELBC	3255	0100
Monrovia	—	ELBC	6090	0745
Monrovia	R. Village	ELWA	11975	0245
Monrovia	R. Village	ELWA	15155	1400
MAURITIUS				
Forest Side	Mauritius BC	—	9710	2300
MOROCCO				
Rabat	Moroccan BC	—	11735	1745
MOZAMBIQUE				
Lourenco Marques	R. Club	—	4835	2230
Lourenco Marques	R. Club	—	4865	0000
Lourenco Marques	R. Club	—	6050	2230
Lourenco Marques	R. Club	—	6115	2330
Lourenco Marques	R. Club	CR7BR	7210	2330
Lourenco Marques	R. Club	CR7AA	7250	0000
Lourenco Marques	R. Club	—	11760	0005
Lourenco Marques	R. Club	—	11835	0100
NIGERIA (FEDERATION)				
Enugu	Nigerian BC	—	4855	2359
Ibadan	Nigerian BC	—	6185	0035
RHODESIA & NYASALAND				
Lusaka	Federal BC	—	7285	0145
SENEGAL REPUBLIC				
Dakar	R. Senegal	—	5960	0100
Dakar	R. Senegal	—	9720	1730

Location	Name	Call	Kc.	EST	Location	Name	Call	Kc.	EST
S. AFRICA (REPUBLIC)					VIETNAM (NORTH)				
Paradys	Springbrook R.	—	11900	0600	Hanoi	V. of Vietnam	—	11760	0700
					Hanoi	V. of Vietnam	—	15100	1030
ASIA AND NEAR EAST					PACIFIC				
BURMA					AUSTRALIA				
Rangoon	Burma BC	—	5040	0600	Brisbane	Austr. BC	VLM4	4920	0615
Rangoon	Burma BC	—	6035	1945	Melbourne	Austr. BC	—	7220	1100
CAMBODIA					Melbourne	R. Australia	—	9570	0200
Phnom Penh	R. Nationale Khmere	—	17705	2100	Melbourne	R. Australia	VLR9	9680	0740
CEYLON					Melbourne	R. Australia	—	11790	0830
Colombo	R. Ceylon	—	9670	1000	Melbourne	R. Australia	—	15220	2230
CHINA (COMMUNIST)					Melbourne	R. Australia	—	15240	2215
Peking	R. Peking	—	9785	1650	Melbourne	R. Australia	—	15315	2240
Peking	R. Peking	—	11800	2330	Perth	Austr. BC	VLW6	6140	1100
Peking	R. Peking	—	15095	2000	NEW ZEALAND				
CHINA (FREE)					Wellington	N.Z. Calling	ZL2	9540	0200
Taipei	BC of China	—	11860	0515	Wellington	N.Z. Calling	ZL4	15280	2210
Taipei	BC of China	BED57	15345	2115	PHILIPPINES				
Taipei	BC of China	BED77	17890	2120	Manila	Far East BC	—	11850	0415
CYPRUS					SOLOMON ISLANDS				
Limassol	BBC	—	15375	0800	Honiara	Solomon Is. BC	VQO2	5980	0300
INDIA					TAHITI				
Delhi	All India R.	VUD	6065	1000	Papeete	R.-TV Francaise	—	6135	0130
Delhi	All India R.	VUD	11710	1950	Papeete	R.-TV Francaise	—	11825	2330
Delhi	All India R.	VUD	15225	0830	NORTH AMERICA				
Delhi	All India R.	VUD	15310	2130	CANADA				
Delhi	All India R.	VUD	17705	0615	Montreal, P.Q.	R. Canada	CKNA	5970	1800
INDONESIA					Montreal, P.Q.	R. Canada	CKYU	9625	1818
Djakarta	V. of Indonesia	—	9770	0820	Montreal, P.Q.	R. Canada	CKLO	9630	1807
Djakarta	V. of Indonesia	YDF8	9865	1400	Montreal, P.Q.	R. Canada	CHOL	11720	1821
Djakarta	V. of Indonesia	YDF2	11715	1410	St. Johns, Nfld.	Canadian BC	CBNX	6160	0000
IRAN					Toronto, Ont.	—	—	6070	2230
Tehran	R. Iran	—	7100	1545	Vancouver, B.C.	Canadian BC	CBUX	6160	0205
ISRAEL					UNITED STATES OF AMERICA				
Jerusalem	Kol Yisrael	4XB31	9009	1515	Greenville, N.C.	V. of America	—	5965	2128
Jerusalem	Kol Yisrael	—	9630	1525	Los Angeles, Cal.	AFRTS	KCBRS	15210	2000
JAPAN					New York, N.Y.	AFRTS	WDSI	15225	0930
Tokyo	BC of Japan	JOA17	17875	1835	New York, N.Y.	AFRTS	WDSI3	15270	0941
Tokyo	Far East Network	—	3910	2000	New York, N.Y.	—	WRUL	6015	1730
Tokyo	Far East Network	—	6155	2000	New York, N.Y.	—	WRUL	6095	1733
Tokyo	Far East Network	—	11750	2022	New York, N.Y.	—	—	6190	0030
Tokyo	Far East Network	—	15260	2030	New York, N.Y.	U.N. R.	—	6590	0037
Tokyo	R. Japan NHK	—	9740	1100	New York, N.Y.	U.N. R.	—	11795	1600
Tokyo	R. Japan NHK	JOA11	11725	1000	Red Lion, Pa.	—	—	—	—
Tokyo	R. Japan NHK	JOA11	11780	1830	CENTRAL AMERICA AND CARIBBEAN				
Tokyo	R. Japan NHK	—	11815	1000	COSTA RICA				
Tokyo	R. Japan NHK	—	15170	1830	San Jose	Faro del Caribe	TIFC	6037	2200
Tokyo	R. Japan NHK	—	15285	1830	San Jose	Faro del Caribe	TIFC	9645	2213
Tokyo	R. Japan NHK	—	15325	2215	CUBA				
Tokyo	R. Japan NHK	JOB15	15385	1833	Havana	R. Havana	—	9670	0130
JORDAN					Havana	R. Havana	—	11865	1135
Amman	R. Amman	—	9560	2015	Havana	R. Havana	—	11950	1830
KOREA (NORTH)					Havana	R. Havana	—	11970	0015
Pyongyang	Korean Central BC	—	7225	1500	Havana	R. Havana	—	15135	1615
Pyongyang	Korean Central BC	—	9752	2200	Havana	R. Havana	—	15230	1400
Pyongyang	Korean Central BC	—	15240	2208	DOMINICAN REPUBLIC				
KOREA (REPUBLIC OF)					Santo Domingo	E. Nacionales	HIZ	6110	0545
Seoul	V. of Free Korea	HLK5	9640	0530	Santo Domingo	R. Santo Domingo	H17SD	3210	2200
Seoul	V. of Free Korea	HLK41	15125	0230	Santo Domingo	Santo Domingo TV	H14U	9505	2200
LEBANON					EL SALVADOR				
Beirut	Lebanese BC	—	9620	0745	San Salvador	R. Nacional	YSS	9555	2130
Beirut	Lebanese BC	—	11715	1635	GUATEMALA				
Beirut	Lebanese BC	—	11770	1630	Guatem. Cty.	E. Cultural	TGNB	9670	2200
Beirut	Lebanese BC	—	11890	1632	Guatem. Cty.	R. Nacional	TGWB	6180	0000
Beirut	Lebanese BC	—	15295	1330	Guatem. Cty.	R. Nacional	TGWA	9760	0740
PAKISTAN					Guatem. Cty.	R. Quetzal	TGRQ	5985	0350
Karachi	R. Pakistan	—	15190	0330	Quezaltenango	R. Nac. Quetzalt.	TGQB	11700	1050
Karachi	R. Pakistan	—	17760	0334	HAITI				
Karachi	R. Pakistan	—	17825	0200	Cap Haitien	R. Citadelle	4VWA	6156	2000
SARAWAK					Cap Haitien	V. Evangelique	4VEH	9770	1845
Kuching	R. Sarawak	—	4950	1755	Cap Haitien	V. Evangelique	4VEJ	11835	0800
Kuching	R. Sarawak	—	7160	1800	Les Cayes	R. Lumiere	4VU	2410	1945
Kuching	R. Sarawak	—	7270	2000	Les Cayes	R. Lumiere	4VU	9635	0805
SYRIA					Pt. au Prince	R. Commerce	4VB	5980	1815
Damascus	R. Damascus	—	15165	1155	Pt. au Prince	R. Manrese	4VM	6165	1845
Damascus	R. Damascus	—	15190	1820	HONDURAS				
THAILAND					S. Pedro Sula	Eco de Honduras	HRP1	5995	1830
Bangkok	R. Bangkok	—	6160	2315	MARTINIQUE				
Bangkok	R. Bangkok	—	7305	2315	Ft. de France	R. Francaise	—	3315	1940
Bangkok	R. Bangkok	—	11910	2318					
TURKEY									
Ankara	R. Ankara	TAU	15160	1600					
Ankara	R. Ankara	TAV	17820	0845					

WHITE'S RADIO LOG

Location	Name	Call	Kc.	EST
MEXICO				
Mexico City	La Hora Exacta	XETT	9555	1000
Mexico City	R. Comerciales	XEHH	11880	1850
Mexico City	V. Amer. Latina	XEWW	9515	2100
Mexico City	V. Amer. Latina	XEWW	15160	2000
Sonora	R. Universidad	XEUDS	6140	1200
NICARAGUA				
Managua	R. Cultural	YNRC	5816	2000
Puerto Cabezo	R. Puerto	—	5920	2300
SWAN ISLAND				
Swan	R. Americas	—	6000	1755
Swan	R. Americas	—	11780	1330
WINDWARD ISLANDS				
St. Georges	Windward I. BC	—	3280	1730
St. Georges	Windward I. BC	—	5010	1500
St. Georges	Windward I. BC	—	11730	2030
St. Georges	Windward I. BC	—	15085	1500

SOUTH AMERICA

ARGENTINA				
Buenos Aires	R. Belgrano	LRY1	6090	0130
Buenos Aires	R. Belgrano	LRY	9690	0125
Buenos Aires	R. Nacional	LRA32	9690	0100
Buenos Aires	R. Nacional	—	15295	2025
Buenos Aires	R. Splendid	LRS1	9740	0455
BOLIVIA				
La Paz	R. Amauta	—	7275	2000
La Paz	R. Nacional	—	5860	2000
Llallagua	R. Pio Doce	CP81	5955	0350
BRAZIL				
Aparecida	R. Aparecida	ZYR83	9635	1700
Belo Horizonte	R. Guarani	PRH6	6175	1945
Florianapolis	R. Dario da Manha	ZYT29	9675	0510
Goiania	R. Brasil Central	ZYX2	4995	0300
Recife	R. Journal do Comercio	ZYK33	15145	1635
Rio de Janero	R. Nacional	PRL7	9720	2020
Rio de Janero	R. Rio de Janero	ZYP23	5045	2030
Salvador	R. Cultura	ZYN29	9595	2030
Sao Luis	R. de Maranhao	ZYF24	4710	0335
Sao Luis	R. Timbira	ZYV9	4975	1600
Sao Luis	R. Timbira	ZYV9	15215	0408
Sao Paulo	R. Cultura	ZYR60	4915	0300
Sao Paulo	R. Excelsior	ZYR56	9585	0400
Sao Paulo	R. Nove de Julho	ZYR96	9620	0530

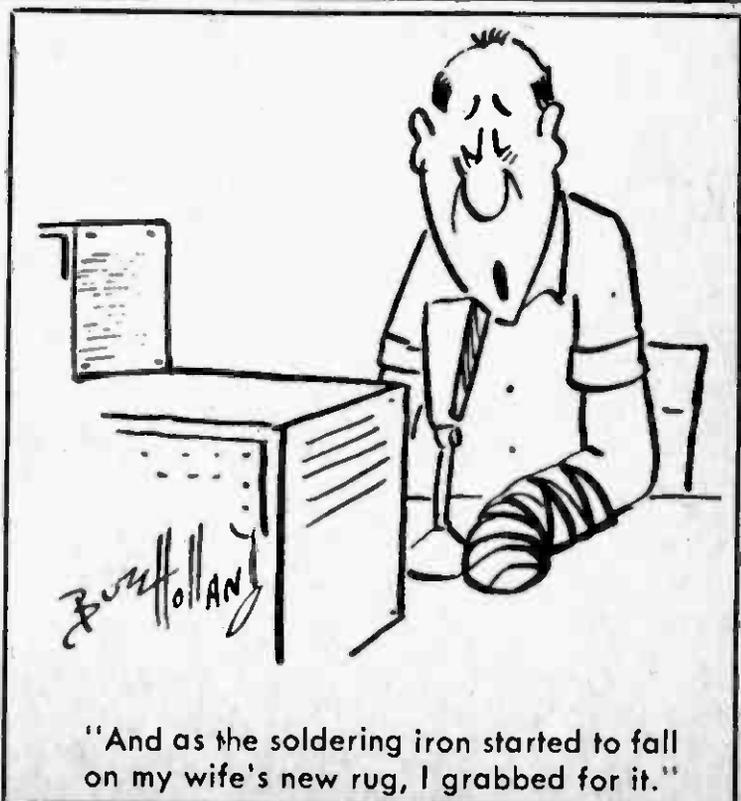
Location	Name	Call	Kc.	EST
CHILE				
Santiago	R. Corp. de Sant.	CEI515	15150	1920
COLOMBIA				
Cali	R. el Sol	—	5040	2330
Cali	R. el Sol	HJNE	6115	0725
Ibaque	V. de la Tolima	HJLB	6040	1200
Villavicencio	V. del Llano	HJIK	5955	2240
ECUADOR				
Cariamanga	R. Cariamanga	HCNK3	6235	2000
Esmeraldas	R. Iris	HCDY4	3945	0540
Quito	R. Atahualpa	HCHQ1	4780	2315
Quito	R. Equitatoria	HCDG1	5032	2000
Quito	R. Nacional	HCYZI	4940	2200
Quito	R. Quito	HCQRJ	4923	2330
Quito	V. de los Andes	HCJB	6050	0200
Quito	V. de los Andes	HCJB	9745	2115
Quito	V. de los Andes	HCJB	15115	1500
Quito	V. de los Andes	HCJB	17890	1700
PERU				
Arequipa	R. Continental	OAX6D	9350	2200
Ayaviri	R. Ayaviri	—	5710	2130
Chiclayo	R. Chiclayo	—	5520	2345
Cuzco	R. Cuzco	OAX7A	6250	1800
Cuzco	T. Tahuantisuyo	OAX7C	6248	0000
Huancayo	R. Mundo	OCX4G	6160	0030
Huaraz	R. Huaraz	OAX3E	5710	0000
Iquitos	R. Amazonas	OAX80	9770	1000
Iquitos	R. Atlantida	OAX8K	9625	1200
Iquitos	R. Nacional	OAX8C	9610	1715
Juliaca	R. Juliaca	OAX7Z	5900	2345
Lima	Onda Popular	OAX4S	6260	0045
Lima	R. America	OAX4W	9412	0050
Lima	R. La Cronica	—	9504	0115
Lima	R. El Sol	OBX4C	15180	1910
Lima	R. Inca	OCX4W	4765	2330
Lima	R. Nacional	—	9562	2220
Lima	R. Nacional	OAX4T	15150	1040
Lima	R. Victoria	OAX4Q	6010	0045
Piura	R. Progreso	—	5910	0045
Puno	R. Nacional	OAX7F	9570	2315
Tarapote	R. Tropical	OAX9D	9710	0630
SURINAM				
Paramaribo	R. Surinam	PZC	15445	1630
URUGUAY				
Montevideo	R. Espectador	CXA19	11835	2200
VENEZUELA				
Barquisimeto	R. Barquisimeto	YVMQ	4990	1910
Caracas	V. de la Patria	YVKX	3305	1942
Caracas	R. Nacional	YVKO	6170	1845
Caracas	R. Rumbos	YVLK	4970	0100
Maracaibo	R. Popular	YVMG	4810	2200
CLANDESTINE				
—	R. Libertad	—	7313	1800
—	R. Omega	—	11550	1515
—	R. Portugal Livre	—	9575	1630
—	R. Peykje	—	11400	1100
—	R. Peykje	—	11695	1107

Lissajous Figure Quiz

(Quiz on page 64)

2:1	3:2	3:1
5:3	5:1	1:1
4:1	4:3	5:2

Lissajous figures should not be a mystery to you. If you never saw them on an oscilloscope, it is high time that you did. Try to dig up two audio signal generators and an oscilloscope on one test bench. The results are worth the effort. ■



"And as the soldering iron started to fall on my wife's new rug, I grabbed for it."

Echo Collecting

(Continued from page 51)

so that it is positioned at the focal point of the particular reflector.

A more versatile mount can be made from an electrical outlet box bracket obtainable from hardware and electricians' supply stores. The bracket is used to hold outlet boxes between ceiling beams in basements; it can be adjusted to different lengths by sliding the inside section in or out and then fastening the clamp in the middle. If you buy several of these brackets and mount one of the outer members on your reflector you can attach several microphones and a speaker to separate inside members to permit rapid interchangeability of the accessories. Shorten the brackets if necessary to bring the microphones to the focal point of the parabolic reflector.

Reflector stands: The reflectors are clumsy to handle unless you mount them on a suitable stand. A photographer's tripod is ideal. If the tripod has a two-way tilt-top, the reflector can be bolted to the bolt that ordinarily holds the camera. Fit a large angle iron to the back of the reflector and drill a hole through the projecting portion through which the tripod bolt can project; a nut holds the assembly together. A counterweight may be installed, too!

Echo Surveying: Before reading this section, study the Echo Survey Quiz drawings to see if you can suggest suitable solutions to the theoretical echo surveying problems described. Compare your solutions with those given below:

The distance measurements are all based on measuring the length of time required to send a sound, created near the tape recorder, to the reflecting surface and back again to the recorder. After the original sound and its echo have been recorded, play the tape back slowly and carefully work the position of each signal on the tape with a wax pencil. Measure the distance between these marks.

Suppose the measured distance is exactly 15 inches and you are using a tape transport speed of $7\frac{1}{2}$ inches per second. It obviously took the sound 2 seconds to travel the entire distance to and from the reflecting surface. It therefore required 1 second for the sound to travel the distance from its source to the reflecting surface. Sound travels at a speed of about 1088 feet per second in air—

hence you know that the object (cliff) is 1088 feet away.

Here is how this general method of distance measurement would apply to the problems posed.

Problem I: The recorder and sound source are located at position R. A clear echo is obtained from cliff A. How far is the cliff from R?

The tape recorder is turned on and a test sound is created; this sound and its echo are taped and the tape is analyzed by the method described above. Divide the total time by two and multiply by 1088 to get the answer in feet.

Problem II: The recorder and sound source are located somewhere between two facing cliffs, as in a canyon. How would you measure the distance between the canyon walls and the distance of the recorder from each wall?

Beam the sound from R to either cliff A or B. Calculate this distance as in problem I. Repeat for the other cliff. These answers locate the position R in the canyon; the sum of the answers indicates the canyon width.

Problem III: The two cliffs A and B are very nearly in the same direction but B is farther away than A. The recorder and sound source are at R. How far is position R from cliffs A and B. What is the direction from A to B?

This problem is obviously quite similar to problem II. The tape will record the original sound and two echoes. Distances RA and RB can be calculated from the tape measurements (signal to echo A and signal to echo B). Subtracting distance RA from distance RB will reveal the distance AB.

Problem IV: A test sound is beamed from R to a nearby cliff A; the test sound and its echo are recorded. A second sound is similarly beamed at cliff B and recorded. Note that these cliffs neither face each other nor are they in line with each other as in problem III. How far is R from each cliff? How far is cliff A from cliff B?

First the angle ARB must be determined. This can be done by mounting a large protractor horizontally under your parabolic reflector and putting a pointer on the reflector edge. When the reflector is swung from one cliff to the other the angle of movement can be read off the protractor.

If you are a mathematics buff you now have all the required information to calculate the desired answers. ■

Meter Maid

(Continued from page 109)

Place the glass squares over their respective holes (see drawing) in such a manner that light does not escape between glass and cabinet. The technique used was to glue the glass squares to the outside of the cabinet, then frame them with black felt cut and glued to the cabinet exterior as shown.

Since both rheostat and switch are on the same panel, wire the power line first. Then wire the switch to the rheostat and jump two wires from the rheostat to the lamp socket. The hinged front panel can now be connected to the cabinet.

Operation of the Meter Maid is simplicity itself. Its initial calibration, however, must be made with a light meter of known accuracy.

Calibrate as follows: Position an accurate meter directly above the opal glass, then turn the rheostat to vary the light and note the meter reading at various points on the numbered rheostat dial. Note the proper meter exposure for each dial position and make a calibration chart. For greater accuracy, different combinations of shutter speeds should be calibrated.

The calibration for low-level light scales is made in the same manner, but with readings taken from the smoked glass. The ruby and cobalt glasses allow the same calibrating technique, but these are used for running checks on *hot* and *cold* colors for color film.

MATERIAL LIST—METER MAID

Amt. Req.	Size & Description	Price
1	Allied 51M761, 100-watt, 300-ohm rheostat (Allied Radio, 100 N. Western Ave., Chicago 80, Ill.)	\$7.21
1	porcelain lamp socket, Allied 52E850	.13
1	SPST toggle switch, Lafayette SW-21 (Lafayette Radio, 111 Jericho T'pike, Syoset, N.Y.)	.22
1	metal 8x8x8" cabinet, Lafayette MC-410	4.17
1	8-ft. cord with male plug, Newark 36F854 (Newark Electronics, 223 W. Madison St., Chicago 6, Ill.)	.37
1	3x3" opal diffusing glass	} see local photo shop-dealer
1	3x3" smoked glass	
1	3x3" ruby glass	
1	3x3" cobalt glass	
1	100-watt bulb	.40
1	4x4" scrap aluminum or copper sheet	
1	pointer knob for rheostat, Lafayette KN-30	.19
1	numbered dial plate, Allied 74M405	.29
2	5x8" pieces of scrap felt to make scuff-proof surface around glass ports (if desired)	
	assorted screws, nuts, connecting wire	

DX Offbeat

(Continued from page 111)

nation to nation (our Spanish phantom???), National Council of Churches and black magic.

It also seems that the space ship from *Clarion* had a lady captain who liked to dance all night, swim, laugh and with whom *Mr. B* became very friendly. Grant considered this highly improper. As he puts it "Yes, I suppose if she were here, she would be in the dance halls, pool rooms, beer joints, road houses and night clubs."

If an American SWL were to believe Grant, he might decide to give up the cold war right now. After all, according to Radio Moscow, the Soviet observatory at Pulkovo did discover a planet *outside* our Solar System. But from the DX viewpoint, a QSL from *Clarion* has all the essential qualifications for "catch of a lifetime." First, it certainly is difficult to hear, even rougher than KPDQ which operates daytime only. Second, it would require years of waiting (and how). Then the content would apparently be attractive, like Cairo's dancing girl QSL. Finally, and most important, it would have that clandestine "netherworld" character required by many DX natures. In short a QSL from *Clarion* would be the ultimate DX—that which could never quite be logged, a *Nibi Nibe* or *Radio Windhoax*.

DXers too: Just to complete our picture, we have some wild equipment. Specifically, that old device making a come back, the human antenna. Spiritualists, astrologers, clairvoyants, etc. usually peg their claims on the body's reception of various vibrations, cosmic, mental and other dubious categories. But your body actually is bombarded by one vibration type—radio waves—and can serve as a pretty fair antenna.

If your receiver is equipped with an external antenna connection, hitch a short piece of bare copper wire onto it and grip the end of this wire. If your set has only a built in loop, you can obtain similar results by placing a finger on it. **WARNING:** *If your receiver is an ac-dc model of that type which is currently on the market, skip the human antenna hit.*

Now we can't *promise* you'll log *Clarion* via this method but your scribe did bag NUZY, the *Campeche patrol vessel* operated by the U. S. Coast Guard and which has marine weather broadcasts on 2670 kc at 1920, 0120 and 0720 EST.

Stereo

(Continued from page 79)

it forward just enough so you can slide your hand behind it. Insert the stop pins and their locking springs.

Mounting the Equipment. Slide the amplifier and FM tuner into place on their shelves, still minus the brass trim plates. Push the two units forward until they protrude slightly. If you plan to use the shelf-mounting hardware available from H. H. Scott, this is the time to fasten the equipment. Then cover the fronts of the units with the brass trim plates, place the locking nuts and attach the knobs.

The turntable installation is quite simple—just place it on the shelf and attach the plugs. Place it so the front of the wood base is flush with the front of the shelf. This will bring the controls out to a point where they are easily accessible. If you want a more permanent installation, insert two wood screws through the bottom of the shelf into the wood base.

Wire the T-pads to the amplifier and the terminal strip on the rear of the cabinet. The left-hand pad and terminals, as you face the cabinet from the front, should go to the left speaker; the right-hand pad to the right speaker. Solder spade lugs to the ends of the wires that will be attached to screw terminals. The last step in wiring the cabinet is attaching the FM antenna. A folded-dipole type made of 300-ohm antenna lead-in wire

is provided with the Scott Tuner. This type of antenna will work properly where a strong signal is available, such as in large city metropolitan areas. In rural areas, an outside antenna will be needed.

The last step is placing the tape recorder on the platform. Run the connecting cables to the amplifier and plug them into the appropriate jacks on the recorder. Note that these wires will pass through the 1-inch holes in the rear of the amplifier shelf. Since the recorder will be playing back through the stereo components, shut off the recorder's local speakers by inserting blank phone plugs into the two jacks marked "*Ext. Speakers.*" Plug it in and you're set for action.

Check out the wiring before you plug in the main AC power cord. Make sure there are no bare wires and that all soldered connections have been taped. Plug the unit in and throw the main power switch. The fan will start immediately, and will run continuously as long as the main power switch is on. The individual units all have on-off switches of one kind or another. You can turn on the amplifier and tuner switches and leave them on all the time. The turntable and tape recorder should always be turned off independently, even though the main power switch will shut them off too. This is to conserve the rubber parts which may not be disengaged if the unit is playing when you turn off the main switch, and can cause "flats" in the turntable idler wheel and the tape recorder capstan pressure roller. ■

FM Pocket Mike

(Continued from page 46)

One other test you should include is checking for interference to the side bands of the FM band. Fortunately, these side bands are channels 6 and 7 on your TV set and can be checked easily. Operate the FM transmitter while tuning to the channels one at a time. If you do not interfere with the audio or sound signals, you did a good wiring job.

Interference can only mean a sloppy wiring job, a poorly assembled oscillator coil L1, or adjustments are needed. The physical length of L1 is very critical—squeezing or extending of L1 alters the tuning range.

Once proved to be operating correctly, the FM transmitter can serve to tie into any FM tuner up to 200 feet away. Remember, do not attempt to go into the broadcasting business or interfere with your neighbors. ■

Kit Report

(Continued from page 63)

is made to oscillate and beat against the incoming signal. It's a neat system for providing code reception without an extra tube. And since the control introduces feedback in the IF amplifier, it also has an effect on the set's selectivity, or ability to separate close-packed signals. Of course, the knob also controls sensitivity of the set when excessively strong signals cause overloading.

Thus, the Star Roamer shapes up as a package that should be of interest to the SWL'er who is pinched in the pocket but who wants the superiority of a superhet-type circuit. There are compromises, but the kit shows plenty of resourcefulness on the part of its designers. Despite the \$39.95 limit, they've managed to ram a number of appealing features into the set. ■

FREE! Seven Steps to the Job You Want

See Coupon



NOW YOU CAN SOLVE "TOUGH" MATH PROBLEMS LIKE THIS!

$$47892 \times 39421 = ?$$

AS EASY AS $1 + 1 = 2$

GET A BETTER JOB WITH HIGHER PAY, SECURITY IN THIS ATOMIC AGE!

This man didn't "set the world on fire" when he was a schoolboy. In fact, he was a BELOW AVERAGE student. But look at him now! He is multiplying numbers that should ordinarily produce the answer in about 4 minutes. Yet here he is writing the correct answer on the blackboard in less than 15 seconds flat! He knows little about math—he ever failed arithmetic in school. Read on to discover the fantastic new method that even a child can learn easily in just a few short hours—*at home* . . .

Yes, in just hours you can turn into a "math wizard" even though you know little about arithmetic! Surprise your friends with your "E-Z MATH" ability . . . enjoy job security and advancement . . . a better job . . . Increase your self-confidence and prestige—all through amazing new "E-Z MATH".

CAN YOU SOLVE THESE EVERY-DAY BUSINESS AND SOCIAL ARITHMETIC PROBLEMS IN THE TIME ALLOWED? YOU CAN DO THEM EASILY EVEN WHEN BLINDFOLDED—AFTER YOU'VE READ "E-Z MATH"!

The world is moving *fast* these days. In good times and bad the ability to handle mathematical problems in our age of electronics, automation and nuclear science is becoming more and more necessary for promotion on the job and for higher pay. If you don't think you have what it takes—and if you believe that "math" is beyond your power—then you're in for the biggest surprise of your life!

For now you CAN learn to DIVIDE, MULTIPLY, ADD and SUBTRACT figures not only quickly and easily—but also in a FRACTION of the time the average person requires! You can actually solve such tough problems as multiplying a 5-figure number by a 7-figure number in your head without ever touching pencil to paper . . . or dividing 836791 by 284, for example, in exactly 15 seconds—even if you "flunked" math in school!

The secret of success in "math" is NOT laborious study and wearisome practice—but, on the contrary, knowledge of SPECIAL SHORT CUTS, LITTLE-KNOWN METHODS of calculation and arithmetical "tricks" that take the work and gamble out of figuring. These methods—so new and radical that they have not yet been incorporated in our school systems—take but a few hours to learn. Yet they permit you to OUT-THINK and OUT-FIGURE the average high school and college graduate who hasn't had the benefit of these amazing methods! You can even BEAT AN ELECTRIC CALCULATOR in answering many problems!



Figure with SPEED and ACCURACY!

"E-Z MATH" shows you in plain, easy-to-understand language how to cut figuring time in HALF and even in QUARTERS—and at the same time arrive at the correct answer in every case! The methods and short cuts you learn in "E-Z MATH" are fool-proof . . . require almost NO memorization . . . and are so practical that you'll find yourself using these systems virtually every day. You'll become an expert in no time at all. Before you know it—you're ready to move into that important job you've always wanted . . . to drive ahead and in greater responsibility at higher pay . . . and to amaze, surprise and delight your friends with your new magic powers of mental arithmetic! Yes, "math" will open up new opportunities for you, since the person with "math" know-how can just about "write his own ticket."

Sharpen Your Brain Power— with Short-Cut "E-Z MATH"!

Imagine being asked to divide 38634 by $89\frac{1}{2}$ —and rattling off the answer absolutely correctly in 7 seconds! Or—multiplying 369.34 by 982.7 and coming up with the correct result in 11 seconds! Or adding 29 numbers each with 6 digits—and supplying the right total every time! People will GASP at your fabulous lightning-quick mind. You'll be able to JUGGLE numbers . . . do STUNNING TRICKS . . . amaze your friends and boss—and be a "master mind!"

With a knowledge of "E-Z MATH" you no longer need be puzzled by such every-day figuring as computing interest charges on installment purchases . . . division, multiplication and addition of fractions . . . adding long rows of numbers with 100% accuracy . . . adding and subtracting fractions from whole numbers—plus many, many other practical and valuable pointers you will use daily to your advantage. The few hours you spend with this course will really pay off. Numbers are the basic instrument of all scientific and technical work. The man or woman who can use "math" is rewarded, recognized quickly, moves ahead in his job faster and more surely!

Order Today on No-Risk Free Home Trial!

Send for "E-Z MATH" today on our no-risk money-back guarantee: use the book for 30 days . . . prove to your own satisfaction how far a knowledge of "E-Z MATH" can advance you in business and social life. If you don't agree that this is the *best investment* you've ever made . . . if your family and friends aren't AMAZED by your new ability—return the book for full and prompt refund.

WHAT THEY SAY:

"My 10-year old had nearly always failed arithmetic with old-method arithmetic. Then he found my copy of 'E-Z MATH'. Now in less time than you can put the numbers on a blackboard, he can multiply 8391726547 by 12. It's amazing and incredibly easy. I use it myself on my job and my wife uses it to check grocery lists."

"You have a unique new teaching approach for which I compliment you. It's the best I have ever seen. Pupils' marks seem to be climbing as a result. Should help in any job. Excellent for home tutoring use."

—SCHOOL PRINCIPAL
"Thank you! Thank you! Thank you! All our children are using your system too, and it is terrific. My husband and I are using it—and it works! My husband has already received a job advancement with tremendous boost in pay. Best investment we have ever made!"

—HOUSEWIFE



(Solve in 6 seconds) ?

Blindfold yourself and have someone call the following numbers to you as you add them:

- 739
- 463
- 906
- 785
- 642

$$\frac{9864372}{8146} = ? \quad (\text{Solve in 9 seconds})$$

$$\frac{4}{7} \times \frac{9}{4} = ? \quad (\text{Solve in 4 seconds})$$

$1\frac{3}{4}\%$ interest per month amounts to what percentage yearly? (Solve in 4 seconds)

$$367 \times 75 = ? \quad (\text{Solve in 3 seconds})$$

WHAT IS "E-Z MATH"?

"E-Z MATH" is based on an amazing new method of working with numbers—easier to learn and remarkably faster and more accurate than you ever dreamed possible when you were in school. You'll be shown the newest way of reading numbers—just as though they were words—and of adding and subtracting them almost at a glance—INSTANTLY! You'll be shown a unique new technique for adding hundreds and even thousands of numbers without ever making a mistake . . . yet now on you'll whiz through all figuring problems without wasting your valuable time—through income tax, checking grocery lists, homework—as fast as a calculator. You'll never again dislike or avoid numbers—you'll actually ENJOY using them to get ahead in business!

FREE! FREE! FREE!

"7 STEPS TOWARD GETTING A JOB" Reader's Digest author reveals little known but amazingly effective methods to help you win the job you want. Just pick your job and land it! To learn how mail coupon below with your order for "E-Z MATH" & for your FREE copy of "7 STEPS TOWARD GETTING A JOB."

MAIL NO-RISK COUPON NOW!

This coupon brings you FREE READER'S DIGEST

"7 Steps Toward Getting A Job"

E-Z MATH PROGRAM DEPT. R-123
285 Market St., Newark, NEW JERSEY

OK! Prove to me that "E-Z MATH" can bring me higher pay, prestige and social advancement! Rush book to me postpaid in plain wrapper for 30-day free examination and use. If I don't agree with everything you say about "E-Z MATH"—I may return book for prompt refund. I am enclosing \$2.98 as payment in full. Include my free copy of "7 STEPS TOWARD GETTING A JOB," which I may keep even if I return E-Z MATH.

NAME AGE.....
(Please Print)

ADDRESS

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

E-Z MATH PROGRAM
© Entire contents copyright 1963

DEPT. R-123 285 Market ST.
Newark, NEW JERSEY

WHERE You Train is as Important As Your Decision to Train



Electronics is a growing and expanding industry. That's why so many ambitious men are training for careers in this exciting field. They recognize the opportunities to fill in interesting and important positions. But *where* a man trains and *how* the school

of his choice teaches the many fields of Electronics—Automation, Radio-Television . . . how it encourages him to reach his goals and realize his ambitions . . . is most important to his success.

This is a fast changing world. A school offering Electronics courses must keep pace. That's why NRI—with nearly 50 years of specialized experience—now offers nine choices of training. Select the course of most interest to you and receive the kind of home-study training that prepares you for a *specialized career*. NRI's large staff of specialists is always on the job keeping your course material up-to-date . . . helping you earn your way while you train . . . assisting you with job placement. In short, NRI is qualified to help you grow.

Special Training Equipment Included



The NRI "learn-by practice" method is the time-proved way to better pay. It makes training easier, faster, better. Most NRI courses include—at no extra cost—special training equipment to give shop and laboratory experience in your own home. All equipment is yours to keep.

Projects you build, experiments you perform, make NRI lessons come to life. Complex subjects take on real meaning. You measure voltage and current in circuits you build yourself. You use a Vacuum Tube Voltmeter which you construct. Later on, you progress to more involved experiments. If you like working with your hands, you'll enjoy learning Electronics with NRI.

Oldest and largest School of its kind

NRI training of the 60's is based on nearly half a century of experience gained from training thousands of men like yourself for new careers. NRI has earned the confidence of students, graduates and the Electronics industry. They all recognize NRI training material as an outstanding educational value. And as the oldest and largest Radio-Television-Electronics home-study school, NRI can supply training at reasonable cost. Mail the postage-free card today for facts on the school, on opportunities in Electronics, on monthly payment plans and special Trial Enrollment Offer. NRI TRAINING, Washington 16, D. C.



BACKED BY NEARLY 50 YEARS
EXPERIENCE TRAINING MEN
FOR SUCCESS BY HOME STUDY



JOIN THE THOUSANDS WHO TRAINED AT HOME FOR NEW CAREERS WITH NRI



"I want to thank NRI for making it all possible," says Robert L. L'Heureux of Needham, Mass., who sought our job consultant's advice in making applications and is now an assistant Field Engineer in the DATAMatic Div. of Minneapolis-Honeywell, working on data systems.

"I have gone ahead financially ever since I enrolled with NRI," writes Gerald W. Kallies, now a chief Instrument Technician of Rio Algom Nordic uranium mines and part-time TV engineer for CKSO-TV, Elliott Lake, Ont. He enrolled with NRI on finishing high school.



His own full-time Radio-TV shop has brought steadily rising income to Harlin C. Robertson of Oroville, Calif. In addition to employing a full-time technician, two NRI students work for him part-time. He remarks about NRI training: "I think it's tops!"

NOW 9 NRI COURSES

SEE OTHER SIDE

FIRST CLASS
PERMIT
NO. 20-R
(Sec. 34.9, PL&P)
Washington, D.C.



BUSINESS REPLY MAIL

NO POSTAGE STAMP NECESSARY IF MAILED IN THE UNITED STATES

POSTAGE WILL BE PAID BY



3939 Wisconsin Avenue
Washington 16, D.C.

NOW 9 WAYS to Assure Advancement or Turn Your Hobby Into a New Career

No matter how much or how little education you have, one of NRI's nine carefully designed home-study courses can help you toward a bright future in the great and growing fields of Automation, Radio-Television. There has never been a time when ambitious men with specialized Electronics knowledge were in as much demand as today. Industries, business, government, the military all need men with practical training to install, operate, service and supervise. Automation continues to eliminate jobs for unskilled labor as fast as skilled technicians are available to service electronically-controlled machines.

**TRAIN AT HOME
WITH THE LEADER** 

Good jobs await Communications technicians, since broadcasting now means more than entertainment; becoming an essential in trucks, cars, trains, planes, ships, etc. In the home, Color TV has come of age along with FM stereo multiplexing and increasing popularity of Hi-Fi; television and radio means more opportunities for Service Technicians in spare time or full time businesses of their own. NRI training has been tailored to meet present and future needs of Electronics, Communications and Servicing. Check the field of most interest to you and mail the postage-free card now. NRI TRAINING, Washington 16, D. C.

SEE OTHER SIDE

Cut Out and Mail Now

**FREE 64-PAGE
CATALOG**

**NO STAMP NECESSARY
NRI PAYS POSTAGE**

**National Radio Institute
Washington 16, D.C. 4AB3**

Please send me, without cost or obligation, the latest NRI catalog telling about your school and the 9 ways to train at home for a career in Electronics-Automation, Radio-Television. (No salesman will call.)

Name _____ Age _____
(Please Print)

Address _____

City _____ Zone _____ State _____

ACCREDITED MEMBER NATIONAL HOME STUDY COUNCIL



1 RADIO AND TELEVISION SERVICING
Learn to service AM-FM Radios, black and white and color TV sets, Stereo Hi-Fi, PA systems, etc. A profitable, interesting field for part-time or full-time business of your own.

2 INDUSTRIAL-MILITARY ELECTRONICS
Learn Principles, Practices, Maintenance of Electronic equipment used today in business, industry, defense. Covers Electronic controls and measurement, computers, servos, telemetry, multiplexing, many other subjects.

3 COMPLETE COMMUNICATIONS
A comprehensive training course for men seeking careers operating and maintaining transmitting equipment in Radio-TV Broadcasting or mobile, marine, aviation communications. Prepares you for FCC License.

4 FCC LICENSE
Prepares you quickly for First Class License exams. Every communications station must have one or more FCC-licensed operators. Also valuable for Service Technicians. You train at home.

5 BASIC ELECTRONICS
An abbreviated, 26-lesson course covering Automation-Electronics, Radio-Television language, components and principles. Ideal for salesmen, hobbyists and others who find it valuable to be familiar with the fundamentals of this fast-growing industry.

6 MATH FOR ELECTRONICS
A short course package of five carefully prepared texts that take you from basic arithmetic review through graphs and electronic formulas. Quick, complete and low in cost.

7 AVIATION COMMUNICATIONS
For men who want careers working with and around planes. Covers direction finders, ranges, markers, loran, shoran, radar, landing systems, transmitters. Prepares you for FCC License exams.

8 MARINE COMMUNICATIONS
Shipboard transmitting equipment, direction finders, depth indicators, radar are all covered in this course. You prepare for your First Class Radiotelephone License with Radar Endorsement.

9 MOBILE COMMUNICATIONS
Training in installation and maintenance of mobile equipment and associated base stations like those used by fire and police, taxi companies, etc. Prepares you for First Class FCC License exams.

**CUT OUT AND MAIL
POSTAGE-FREE CARD**