How To Get On The SWL Bandwagon

Radio-TV EXPERIMENTER

WHITE'S RADIO LOG
AM-TV STATIONS / WORLD-WIDE SHORTWAVE LISTINGS

FEBRUARY-MARCH 75¢

WHY FLEA-POWER HAMS HAVE MORE FUN

Get into the act by building MINI-MITTER!

QRP Transmitter is
- Peanut-Sized
- Band-Switched
- Crystal-Controlled

Miniscule Module - Heart of Mini-Mitter

AND NOW— A *TAPELESS* TV RECORDER!

COMPLETE PLANS! TWO GREAT SCOPE ACCESSORIES!

- Dual-Trace Signal Switcher
- Dynamic Duo Transistor Checker

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Radio-TV EXPERIMENTER

February/ March 1968

SPECIAL SECTION ON QRP HAMS

SPECIAL CONSTRUCTION FEATURES

ELECTRONICS FEATURES

COMMUNICATIONS: CB and SWL

FEATURETTES

REGULAR DEPARTMENTS

Cover photo by Leonard Heicklen

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SPECIAL 16-PAGE SECTION

RADIO SHACK®
CATALOG '68 PREVUE

Get the one electronics catalog that isn't "me too"

See the very latest in CB, audio, tape reels and cartridges and cassettes, communications, PA, radios, intercoms, antennas, electronic parts and kits, test equipment, transistors, Lifetime-Guaranteed tubes, mikes, speakers, walkie talkies. See what nobody but NOBODY but Radio Shack has. See why "The Shack" is the biggest chain of its kind in the country! See it in colorgravure — the kind of bargains shown on the next 15 pages. Exciting! New! Different! Get the book that isn't "me too" today!

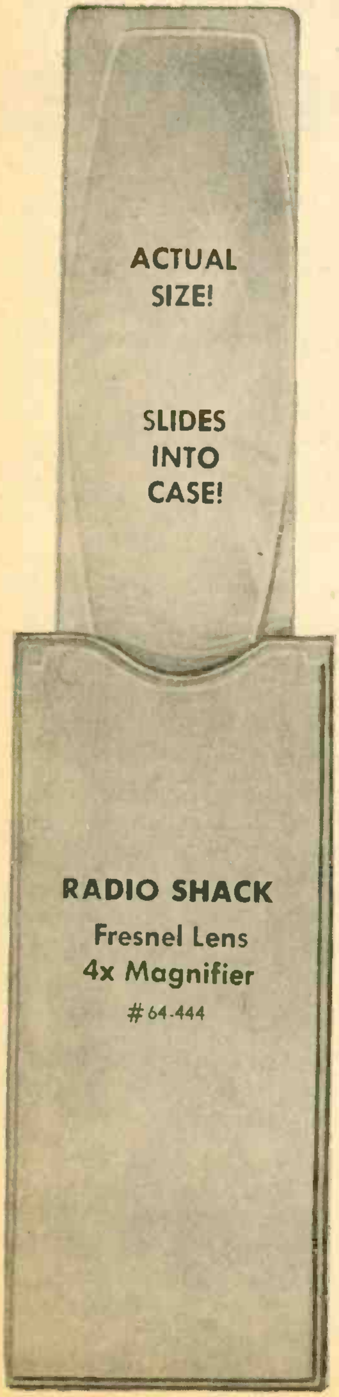
Just Published! FREE!

USE COUPON ON PAGE 20

Get Radio Shack's Holiday Special!

FREE!

with any mail or store order for any item in this special 16-page section



4X FRESNEL

Unbreakable! Flexible! 1/32" Thick!

MAGNIFIER!

Amazing new optical miracle with genuine fresnel lens! This wafer-thin magnifier measures just 3⅞" x 1¼" x 1/32" thick and slips easily into any pocket or wallet. Though the lens itself is no thicker than a credit card, its Fresnel-principle engraved surface actually enlarges 4 times with good linearity. Get yours FREE today with any mail order or store purchase of any item in this ad! Offer limited to supply available, so act promptly to avoid disappointment. Limit: one free per customer.

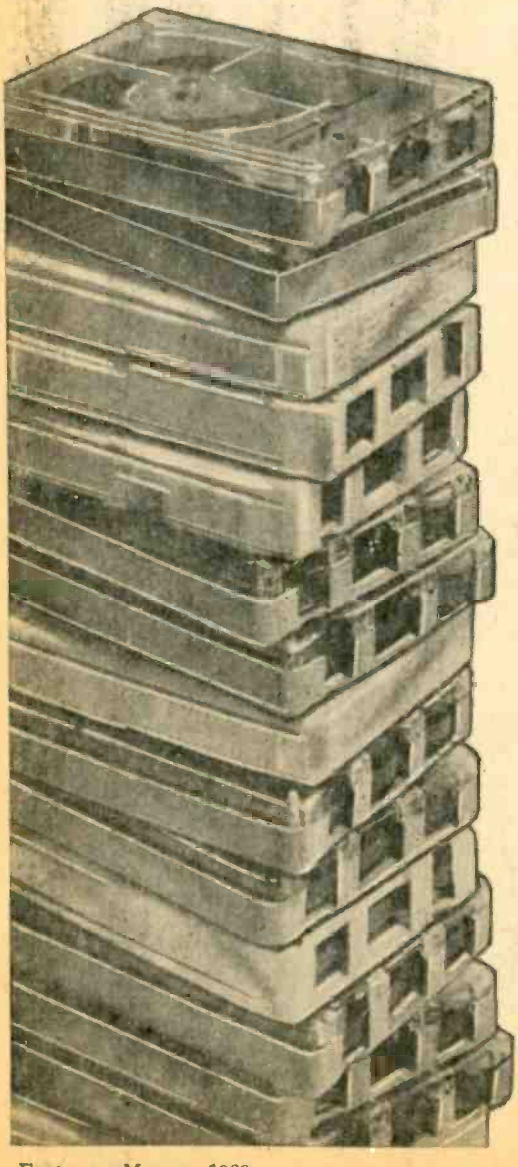
EXTRA 4X FRESNEL MAGNIFIERS (Cat. No. 64-444) **50¢ EA.**

Store Addresses, Order Form, See Page 20

RADIO SHACK SPECIAL PURCHASE!

4 AND 8-TRACK AUTO STEREO TAPE CARTRIDGES

FOR AUTO AND HOME PLAYERS / $2 TO $4 BELOW MARKET!



HUGE ASSORTMENT!

PRERECORDED

ATTENTION MAIL BUYERS: Space prohibits listing separate titles. Please specify quantity — we will send an assortment of all different titles.

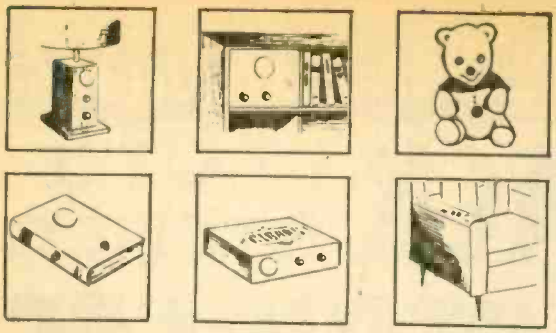
2.95 EACH 4-TRACK 51-1059

3.95 EACH 8-TRACK 51-1058

DEDUCT 10% IN LOTS OF 5 OR OVER

Now you can buy full length 4-track and 8-track auto stereo tape cartridges for $2 to $3 less per reel than ever before! Radio Shack cleaned out a famous U.S. tape cartridge manufacturer of thousands of popular auto stereo cartridges, and we're passing the savings to you! A vast assortment of over 50 titles: shows, jazz, country, folk, pop, western, classical. Buy now while our supply lasts! (NOTE: See recent Radio Shack catalogues for 4 and 8-track tape players at our low, low prices!)

Store Addresses, Order Form, See Page 20



What's your project for our "Build In" radio?

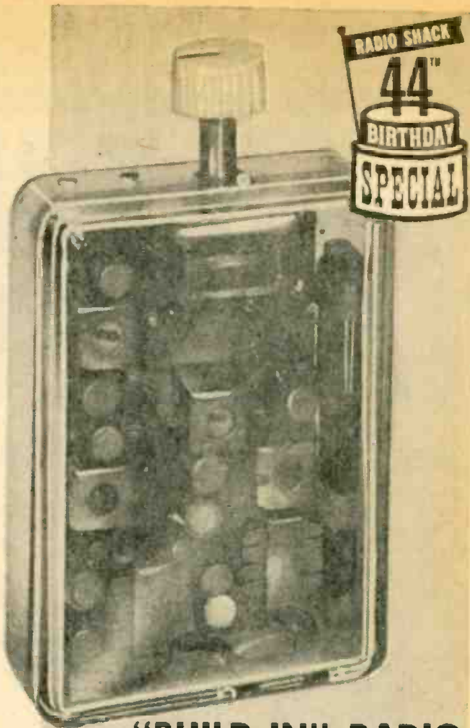
Here's a wired transistor radio in 3 pieces. Dextrous do-it-yourselfers should have a field-day with this one.

You carpenters, metal-workers and gift designers will really appreciate Radio Shack's novel "Build In" — a 6-transistor superhet that's really *a kit that isn't a kit.* Confused? Part *one* is the radio, 100% wired, installed in a crystalline 2¼ x 1 x 3⅛" case with the tuning knob sticking out of one end, and 8 wires out of the other. Part *two* is a separate volume control with built-in switch, knob, and soldered leads. Part *three* is a 2¼" PM speaker installed in a plastic case, with soldered leads.

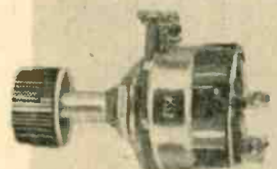
The three parts (plus a flat 9V battery, not included) can be installed in, on, or under anything, in just about any desired angle or position. And you don't have to be an engineer — Radio Shack's geniuses have provided a simple, idiot-proof lashup pictorial. Now all you need is the price *(just $6.98, Cat No. 12-1150)* and some Yankee ingenuity! Whether you hide "Build In" in a jug of corn likker, junior's wagon or Tillie's sewing box, the result is sure to please.

The basic radio itself looks like a little jewel, a real work of art — our photo doesn't do it justice. And the "kit that isn't a kit" is another of Radio Shacks's exciting exclusive products that can't be bought elsewhere. Get a "Build In" at your nearest Radio Shack store . . . and start your Christmas *project* early!

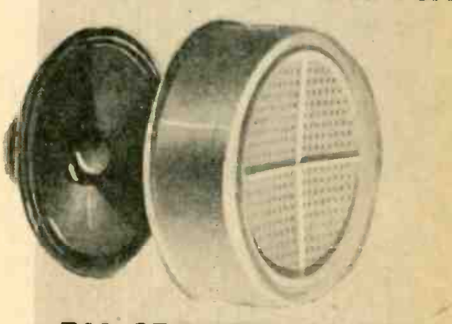
For Store Addresses, Order Form, See Page 20



"BUILD-IN" RADIO



VOLUME CONTROL AND SWITCH



PM SPEAKER IN CASE

RADIO SHACK PROJECT BOOKS (4¢ A PROJECT)

"50 EASY TO BUILD SOLID STATE PROJECTS"

Build your own transistor radios, electronic organs, amplifiers, code oscillators, megaphones, generators, etc. Ideal for hobbyists.

62-1050 .... Net 2.00

"A MODERN TRANSISTOR WORKBOOK"

Build your own wireless microphone, AM broadcast tuner, audio preamp, PA system, experimenter's power supply, etc. 50 schematics.

62-2025 .... Net 2.00

EACH BOOK $2

MIKES, SPEAKERS, HEADSETS, TOOLS FOR THE ELECTRONICS EXPERIMENTER

RADIO SHACK 44th BIRTHDAY SPECIAL

BUILD "EI'S" MIGHTY SUB-MINI SPEAKER

4" Acoustic Suspension FE-103 Speaker System!

The fabulous Realistic FE-103, complete with cabinet construction details as published in Electronics Illustrated! 30-17,000 cps; 15 watts; 8 Ω.

7.95

40-1197, FE-103, Wt. 5 lbs. Net 7.95

CONTOUR NETWORK KIT. With instructions.
40-808, coil, capacitor, etc., Net 3.95

MINIATURE PM SPEAKERS FOR TRANSISTOR PROJECTS, RADIOS

8 Ohm Impedance

Small in size but big in sound! Three sizes to choose from: 2½", 2¼", or 2". All for the same bargain price!

40-247, 2½", ... Net .98
40-246, 2¼", ... Net .98
40-245, 2", ... Net .98

ONLY 98¢ EACH!

MIDGET EARPHONES

For Transistor Radios

98¢

Resp. 50-9000 cps. With replaceable earplug, cord. 10 ohms.
33-175, Wt. 2 oz. ...... Net .98
33-174, w/3/32" plug, Net .98

STEREO HEADSET

Separate Transducers!

2.79

Perfect for use with receivers, tuners, amplifiers, kits and recorders! 8 ohms.
33-1008, ... Net 2.79

FABULOUS THERMO-ELECTRIC GLUE GUN REALLY WORKS!

60-Second Bonding Plus Instant-set Caulking! No Clamping! No Cleaning!

5.99

for make-or-mend jobs

Makes all other kinds of gluing obsolete! Uses unique hot-melt glue sticks: melted glue bonds permanently in 60 seconds, providing a flexible bond that's perfect for furniture, pottery, metal, leather, plastic or fabric. Use with white sealer sticks for water proof caulking. Glue and caulking included.

64-2860, Gun, 2 lbs..Net 5.99
64-2861, 7 Glue sticks, 1 lb. .... Net .49
64-2862, 7 Sealer Sticks, 1 lb. .... Net .49

CRYSTAL LAPEL MIKE

• *For Recorders, PA, Paging!*

1.89

Sensitive! Concealable! Response: 200-300 cps.
33-100, Wt. .8 oz. .... Net 1.89

CRYSTAL MIKE CARTRIDGE

89¢

Precision made crystals! Response up to 7000 cy.
270-095, 8 oz. .... Net .89

LAVALIER DYNAMIC MIKE

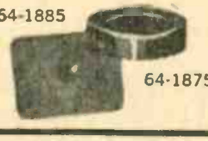
6.95

Neck/Hand/Desk Use!

Pencil-slim hi-Z for use at home, studio, or in PA and guitar systems! With cord, stand. 50K.
33-928, Ship. wt. 2 lbs. ...... Net 6.95

POWERFUL CERAMIC MAGNETS

1,000's of Home, Office, Auto Uses!



64-1885

64-1875

10¢	15¢	25¢
Each For 10	Each Singly	Per Pair

10 FOR 1.00

LOW COST 25-W. SOLDERING IRON

1.89

Precision designed! Comes complete with UL Cord and Plug. Uses 117V AC/DC.
64-2182, 1 lb. ...... Net 1.89
64-2178, Extra copper Tip .. Net .25

OUR OWN 60/40 SOLDER

69¢ Each

12 & UP

59¢ Each

U.S. made with superactive rosin core. Fits fed. specs. QQ-S-571d
64-0002 .... Net .69

STEEL CATCH-ALL STORAGE BOX

6"H x 8¼"D x 5¾"W

1.95

4 draws with adjustable compartments.
64-2050, 3 lbs. ...... Net 1.95

ASSORTED ELECTRIC HARDWARE

6"Hx8¼"Dx 5¾"W

99¢

Over 600 pieces! Something here for everyone! All brand new—no sweepings! One full pound. Comparable value: $4.50!
64-2890, Wt. 1 lb. .... Net .99

For Store Addresses, Order Form, See Page 20

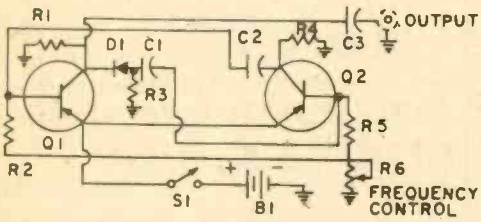
THESE ELECTRONIC PROJECTS HAVE EARNED CASH AWARDS FOR RADIO SHACK CUSTOMERS

Build Yourself — or Win Cash by Sending Us Your Own Ideas!

W. R.
San Francisco, California

SQUARE WAVE GENERATOR

Check Out the Frequency Response of Hi-Fi Amplifiers — Tape Recorders — Preamplifiers



PROJECT PARTS LIST

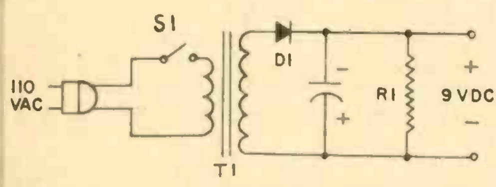
Stock No.	Item	Net
23-464	9V Rectangular Battery	.29
71-5194	.01 mfd Capacitors (C1, C2)	.18
71-0409	.1 mfd Capacitor (C3)	.22
276-1709	1N34 Germanium diode (D1)	.27
276-401	PNP Transistor (Q1, Q2)	.99
70-0195	3.3 K Resistor (R1, R3, R4)	.12
70-0195	6.8 K Resistor (R2, R5)	.12
271-1716	50 K Potentiometer (R6)	.59
275-602	SPST Toggle Switch	.30
270-325	Set of 5 battery connectors	.69
276-1390	Prepunch breadboards, 4½ x 5⅝"	.55
270-1395	Solderless terminals, (set of 5)	.99

Use this square wave generator, together with an oscilloscope, to analyze the frequency characteristics of any audio amplifier. The unit is adjustable over a broad range of audio frequencies.

F. R. F.
Chatsworth H.S. California

ELIMINATOR/CHARGER

Use Either in Place of a 9-Volt Battery or to Charge Batteries to Full Power. Save $$$!



PROJECT PARTS LIST

Stock No.	Item	Net
270-325	9 volt battery connectors (kit of 5)	.69
273-050	6.3V @ 1.2A Filament Transformer	1.19
274-687	Terminal strips (kit of 5)	.40
276-1135	Rectifier, epoxy (kit of 2)	.29
275-602	SPST Switch	.30
272-986	Capacitor 500 µf (1)	.72
70-0195	10 KΩ ½W Resistor (1)	.12
278-1253	6 Ft. Line cord (1)	.39
276-1390	Prepunched breadboard (1)	.55
275-602	SPST Toggle Switch	.30

Now you can run electronic kits and experiments that use 9V DC power without buying new batteries! Simply plug into any 117 VAC outlet; delivers up to 250 ma. at 9 VDC.

$$ FOR YOUR ELECTRONIC IDEAS!

Turn Ingenuity and Hobby into Spare-Time Profits!

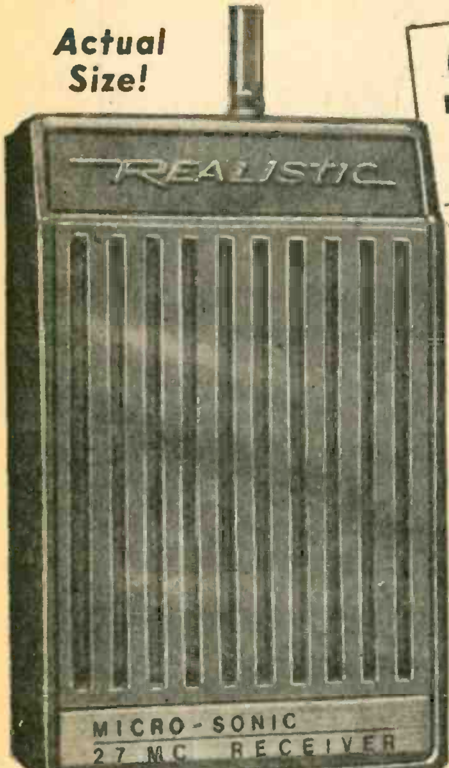
We are looking for experiments built around Radio Shack or other electronic parts. These will be published regularly in our catalogs. If published by us WE WILL PAY YOU AN AUTHOR'S FEE and reimburse you for parts bought from us — maximum $50 cost. By submitting it, you state it's original with you. If we accept it, it is understood we can publish it for use by our catalog, flyer, book and magazine readers. Submissions cannot be returned. Send description, parts list, stock numbers, and schematic. DO NOT SEND ACTUAL SAMPLE as we will build it here to see if and how it works. Write today!

SEND TO: Radio Shack, Attn: Lewis Kornfeld, Vice-President
730 Commonwealth Avenue, Boston, Mass. 02215

RADIO SHACK EXCLUSIVE! ADD A

SLAVE "WALKIE" TO YOUR BASE, MOBILE, OR WALKIE TALKIES!

Actual Size!



ONLY 7.95

Crystal-controlled superhet receiver ONLY! Add as many ears to your network as you want. Fits in a shirt pocket — an excellent paging or guided tour device!

This unusual Radio Shack product, called the Realistic Microsonic 27MC Receiver, comes complete with a Ch. 11 CB crystal — and because it's a plug-in, it can be changed to any of the 23 channels. It's a teeny 3½ x 2½ x 1⅜". It includes an earphone with clip, and the phone's lead acts as the antenna. So if you want to hide it away as a pager, there's nothing showing. For DX we've included a 16" telescopic whip to be used only if necessary. Let your imagination run wild with this novel device!

21-109 Microsonic 27MC Receiver .... Only 7.95

NEW IDEA #2 — as a companion to the above, or a wireless CB microphone (!), there's also the Realistic Microsonic CB transmitter. Same size, color, everything. But transmit only, 100mw of course, with plug-in crystal for Ch. 11. Uses? For example: one of these plus x-number of receivers and you have a guided tour technique that'll never quit!

21-110 Microsonic CB Transmitter .... Only 7.95

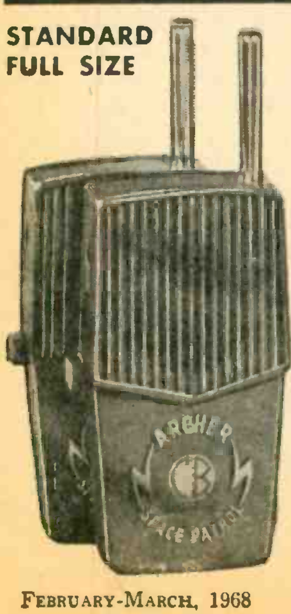
FREE ACCESSORIES:

- Receiver — earphone and whip antenna
- Transmitter — 35" telescopic antenna

Note: both units include crystals but require a 9V transistor battery to operate. 23-464, 29¢ each.

RADIO SHACK'S FABULOUS SPACE PATROL® TWOSOME

STANDARD FULL SIZE



ARCHER

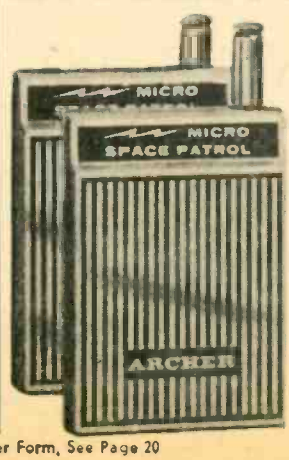
SPACE PATROL®

Talk up to ¼ mile with our perennial favorite in the 100MW no-license class. Over 100,000 of these transceivers now in use! "Lock-on" talk switch for continuous transmission when needed. Extra-long 43" telescopic antenna! Channel 14 crystal & battery included.

11.95 PER PAIR

ARCHER **MICRO**

SPACE PATROL®



Double transformer talk-power in the world's smallest (3-5/6 x 2-7/16 x 1¼") case. Fits easily in your shirt pocket (and your budget). Handsomely styled hi-impact, custom-chromed case. Easy to operate with a hideaway "push-to-talk" button. 9-section telescoping antenna. With channel 14 crystal and battery.

14.95 PER PAIR

For Store Addresses, Order Form, See Page 20

EASY-TO-USE MICRONTA TEST EQUIPMENT!

1,000 OHMS/VOLT MULTITESTER

5.95 *Factory Wired*

- *Convenient Thumb-Set Zero Adjustment!*
- *Reads AC/DC Volts in 3 Ranges: 0-5, 150, 1000!*

Only 3½ x 2⅛ x 1"!

Great for home or workshop! Pin jacks for all 5 ranges; 2-color 1¾" meter scale. DC Current 0-150 ma. Resistance: 0-100,000 ohms. Accuracy is ±3% of full scale value on DC ranges, ±4% of full scale on AC ranges. A rugged black bakelite case. Comes with pair of color-coded test leads, instructions, battery.

22-4027, Ship. Wt. 1 lb. .... Net 5.95

20,000 OHMS/VOLT MULTITESTER

14.95 *Factory Wired*

- *28-Ranges!*
- *Mirrored 2-Color Scale!*
- *Jewelled Movement!*

Only 3⅝ x 5-3/16 x 1¼"!

Single-knob range selector with separate ohms adjustment. Spec.: DC Volts 0-3/15/60/300/600/1200 @ 20,000 ohms/volt. AC Volts 0-6/30/120/600/1200 @ 10,000 ohms/volt. DC Current 0-60µ, a/3 ma, 30 ma, 300 ma. Resistance range 0-12K, 120K, 1.2 meg and 12 meg (at center scale 60, 600, 6K & 60K). Decibels: −20 to +63 db (5 ranges).

22-022, Ship. Wt. 2 lbs. .... Net 14.95

50,000 OHMS/VOLT MULTITESTER

27.95 *Factory Wired*

- *4" Full View Meter with Mirrored Scale!*
- *Meter Protection Circuit!*
- *1% Precision Resistors!*
- *26-Ranges!*

Only 7 x 5½ x 5⅝"!

Great for technicians, mechanics and hobbyists. Specs: DC volts: 0-0.5-2.5-10-50-250-500-1000V @ 50,000 Ω/volts. AC volts: 0-2.5-10-50-250-1000V @ 12,500 Ω/volts. DC current: 0-25ma-2.5ma-250ma-1 amp-10 amps. DC Resistance: 0-10,000/100,000/1 meg./10 meg-ohms. Center scale: 90/900/9000/900,000 ohms. Decibels: −20 to +62 (5 Ranges).

22-150, Ship. Wt. 5½ lbs. .... Net 27.95

MICRONTA 6½" VTVM METER

39.95 *Factory Wired*

- *Precision Resistors!*
- *Measures Peak-to-Peak and RMS (7 Ranges on Each Function)!*
- *Frequency Response: 30 cps to 10 mc!*
- *Easy-to-Read 2-Color Full View Mirrored Scale!*

Features a zero-center scale for alignment of FM-TV detector circuits. Specs: AC volts: RMS 0.1 to 1500 V. (7 ranges); DC volts: 0.1 to 1500 V. (7 ranges). Peak-to-peak 4-4000 V. (7 ranges). Output −20 db to +65 db (7 ranges). Resistance: 0.2Ω to 1000 meg-ohms (7 ranges). Tubes: 12AU7, 6AC5 and SR1A. Power: 117 VAC, 50/60 cycles.

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EXCITING ELECTRONIC PARTS VALUES

10 Germanium Diodes

Similar to 1N34, 1N34A, 1N60

99¢

Equivalent in use to silicon diodes with lower forward voltage drop.
276-821, Wt. 1/4 lb. .... Net .99

JUMPER LEAD CLIPS

99¢

Set of 10

Ten 14" jumper lead wires with miniature alligator clips on each end. Leads are color coded for testing!
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5" VERNIER DIAL

3.99 • *6:1 Drive Ratio!* • *5 Blank Scales!*

Large face is ideal for test equipment, calibration, etc. 0-180 logging scale. Hairline pointer 1/4" dial shaft in rear can be coupled with another shaft. Plastic see-through window, plus large easy-to-grip knob.
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Variable Loopstick Antenna Kit

99¢ Kit of 3

3-pc pack for general replacement in small radios. Variable core tunes to 365 mmf tuning condenser Tapped for transistor applications.
270-376 .... Net .99

JUMBO 100 PC. RESISTOR PAK

2.19

50 carbons, 30 precisions, 20 power resistors. Popular values. 1/2, 1, 2, 3, 5, 7, 10 watt sizes. Some 1% & 5% incl.
271-302, Ship. Wt. 2 lbs. .... Net 2.19

1" MATCHED KNOB KIT

99¢ Set of 5

Black knurled knobs w/polished aluminum inlay. Brass inserts for 1/4" shaft. Set screw. 1 x 3/4".
274-1552, Ship. Wt. 4 oz. .... Net .99

STANDARD 1/4" PHONE PLUG

99¢ Kit of 4

Plugs into standard 1/4-inch phone jack. Screw terminal connections.
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INSULATED CLIP SET

99¢ Set of 14

With rubber insulators — 7 black, 7 red. Solder type Length 1 3/8"
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500' HOOK UP WIRE

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Mammoth bargain. 5-100 ft. coils in popular colors. Sizes #18 thru #22, suitable for most wiring jobs. Stranded and solid types.
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Complete with miniature 6V bulbs. Contains 2 red and 2 green jewels. Mounts in 5/16" hole.
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1/2 lb. Jumbo Pack of Disc Capacitors

2.49 Per Pak

OVER 300 PIECES! All popular values and voltages. Most are marked with capacity and voltages.
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60-PC. TRANSISTOR SURPRISE PAK

2.98

Includes NPN's, PNP's. 10W, 20W and 50W transistors, as well as subminiature types, 60 in all!
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SCREW TERMINAL KIT

99¢

Kit of 13 Pc.

1 1/2, 2 1/4, and 2 3/4" lengths, by 3/8" H.
274-345, Ship. Wt. 1/4 lb. .... Net .99

NEON PILOT LIGHTS

Kit of 3 **99¢**

Built-in neon lamps. Jewel front; 2 red, 1 yellow. For 117 VAC use. With 3 dropping resistors.
272-338, 1/4 lb. .... Net .99

MINIATURE PUSHBUTTON SPST SWITCHES

99¢

Pkg of 5

Momentary pushbutton switches. Normally open circuit. Solder lug terminals. Panel mounting. Red button and black phenolic housing. 2 x 3/8".
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Set of two 3-circuit 1/4" phone plugs, jacks. Black bakelite handle. Solder lug terminals. Open circuit jack complete with mounting hardware.
274-323, Ship. wt. 1/4 lb. .... Net .99

Infra-Red Detector Transducer Kit

1.98

Parabolic reflector, 3" filter, and detector complete with pictorial diagram. Wonderful experimenters kit!
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SEMI-CONDUCTORS FOR THE HOBBYIST

ARCHER Replacement Transistors

PNP TYPES

For high frequency, RF-IF, and converter circuits. Replaces: 2N247, 2N248, 2N252, 2N267, 2N274, 2N308, 2N309, 2N310.
276-412, Wt. 3 oz. 1.29

For mixer/oscillator converter circuits. Replaces: 2N112, 2N113, 2N114, 2N135, 2N136, 2N137, 2N140, 2N175, etc.
276-401, Wt. 3 oz. .... .99

For universal IF circuits. Replaces: 2N111, 2N112, 2N139, 2N218, 2N219, 2N315, 2N366, 2N406, etc.
276-402, Wt. 3 oz. .... .99

For 6 volt audio circuits. Replaces: 2N77, 2N104, 2N105, 2N107, 2N109, 2N130, 2N131.
276-403, Wt. 3 oz. .... .99

For 12 volt audio circuits. Replaces: 2N36, 2N37, 2N38, 2N41, 2N43, 2N44, 2N45, 2N46, etc.
276-404, Wt. 3 oz. .... .99

For 9 volt audio circuits. Replaces: 2N188, 2N189, 2N190, 2N191, 2N192, 2N195, 2N196, 2N197, etc.
276-405, Wt. 3 oz. .... .99

For auto radio AF amplifier circuits. Replaces: 2N176, 2N178, 2N179, 2N234, 2N235, 2N35B, 2N236, 2N242, etc.
276-406, Wt. 3 oz. 1.19

For high power AF circuits in auto radios. Replaces: 2N173, 2N174, 2N277, 2N278, 2N441, 2N442, 2N443, 2N1515, etc.
276-407, Wt. 3 oz. 2.29

Silicon Epoxy high gain. Replaces: 2N940-2N946, 2N2333-2N2337, 2N3548-2N3550.
276-420, Wt. 3 oz. ... Net 1.09

Silicon Epoxy medium gain. Replaces: 2N1132, 2N923-2N928, 2N2372, 2N859, 2N865.
276-421, Wt. 3 oz. ..... Net .99

NPN TYPES

For mixer/oscillator converter circuits. Replaces: 2N193, 2N194/A, 2N211, 2N2-12, 2N233, 2N234, 2N357, 2N358.
276-408, Wt. 3 oz. 1.09

For universal IF amplifier circuits. Replaces: 2N98, 2N99, 2N100, 2N145, 2N146, 2N147, 2N148, 2N149, etc.
276-409, Wt. 3 oz. 1.15

For 9 volt AF amplifier circuits. Replaces: 2N35, 2N169A, 2N213, 2N214, 2N228, 2N306, 2N312, 2N313, etc.
276-410, Wt. 3 oz. .... .99

For 12 volt AF amplifier circuits. Replaces: 2N306A, 2N445A, 2N446A, 2N447A, 2N556, 2N557, 2N587, 2N649, etc.
276-411, Wt. 3 oz. .... .99

Silicon Epoxy high gain. Replaces: 2N3704-2N3709, 2N3415-2N3417, 2N3877.
276-422, Wt. 3 oz. .... Net 1.09

Silicon Epoxy Medium gain. Replaces: 2N706TPP, 2N3663, 2N3843A, 2N3900, 2N3901, etc.
276-423, Wt. 3 oz. .... Net .99

Silicon Field-Effect Transistors

1.98

- *High Impedance Input!*
- *Low Noise! High Gain!*
- *Characteristics Similar to Pentode Vacuum Tube!*

1000's of applications where pentode tubes are used in low level circuits: field strength meters, "gate dippers," receivers, flea power transmitters, etc. TO-5 case. Includes specifications.
276-664, Sh. wt. 2 oz. .... Net 1.98

IBM Component Boards

29¢

SAVE!

4 for 1.00

All quality American made parts. Each board contains at least two transistors, plus loads of other components: resistors, capacitors, coils, diodes, modules, chokes, and heat sinks. Size: 2⅜ x 3⅞".
276-616, Sh. wt. ¼ lb. .... Net .29

3 Amp Silicon-Controlled Rectifiers

1.95

TO-66 Case! 200V

Designed to deliver loads up to 3 amps. Ideal for use in speed control operation, power converters.
276-1065 .... Net 1.95
276-1066, TO-66 mtg. hdwr. .... .30

Integrated Circuit Specials!

Actual Size

1.98 Up

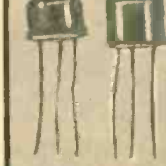
- *Ideal for the Hobbyist, Builder, Experimenter!*
- *Fantastic Savings!*

New from Radio Shack! Resistor-Transistor Logic type ICs are ideal for builders, hobbyists, labs, industry etc. Guaranteed to be 100% perfect electronically and mechanically. Each comes complete with diagram and lead locations. Power requirements: 3 volts. Flat Pak type. Size ¾ x 5/16 x 1/16".

DUAL 3 INPUT GATE. Can be used as a 6 input microphone mixer. Contains up to 6 transistors & 8 resistors in pak. Elements can be used parallel to increase current capabilities.
276-430, Wt. 3 oz. .... Net 1.98

DUAL JK FLIP-FLOP. Construct your own binary computers, digital adding machines, etc. Contains up to 26 transistors & 50 resistors per pak.
276-431, Wt. 3 oz. .... Net 2.49

100-Pc. Jumbo Pak Assorted Transistors



3.98

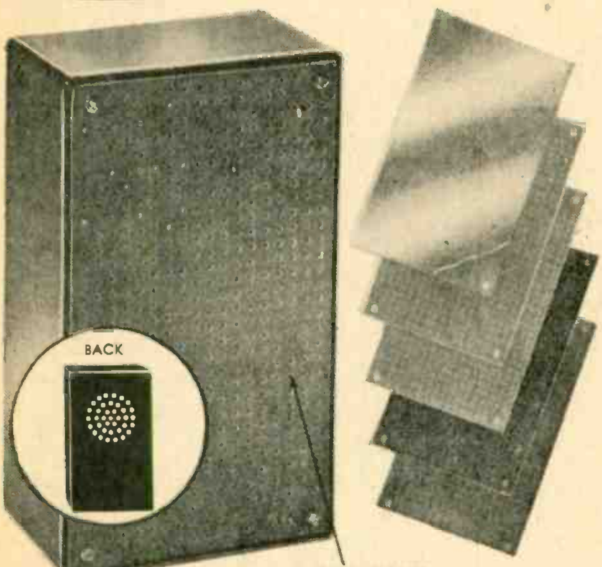
Includes Silicon & Planars

NPN & PNP in TO-5 case; power transistors, too! Ideal in RF & IF driver, output, switching, general audio purposes.
276-544, Sh. wt. 1 lb. .... Net 3.98

RADIO SHACK 44TH BIRTHDAY SPECIAL

Ingenious New Radio Shack PERFBOX™ "Professionalizes" Project Building!

The bloody-knuckle brigade will appreciate Radio Shack's effort to eliminate chassis cutting and drilling, and make things prettier!

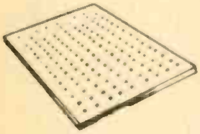


Somebody at "The Shack"—thank heaven!—must hate metal chassis and the generally sloppy look of breadboard projects. Now they've come up with a bakelite chassis box into which they've installed (4 screws) a 3½" x 6" perfboard top. But that's not all—the back of the box is pre-drilled for a 2¼" or other PM speaker, and there's a pre-drilled ¼" outlet hole on one side! This much-needed item is called the Radio Shack Experimenter's PERFBOX™. (*Cat. No. 270-097, price $1.69*) and should sell like film at Expo 67. As an added fillip, there's a companion deal they call Radio Shack Experimenter's 5-Piece Panel Set, consisting of 3 perfboards and 1 aluminum and 1 bakelite panel board, all 3¼"x6" predrilled to fit the PERFBOX™. The latter two boards are un-perfed (to coin a word), and the 5-piece set *(Cat. No. 270-100, price $1.69)* should answer just about any need for extending the usefulness of the PERFBOX short of filling it with champagne!

RECOMMENDED PARTS FOR USE IN PERFBOX PROJECTS

DESIGN, CONSTRUCT YOUR OWN CIRCUITS . . . using these time-saving phenolic boards, breadboard or permanent type. 3/32" holes punched on 0.265" centers. Can be sawed. Shipping weight 1 lb.

UNCLAD PERF-BOARD

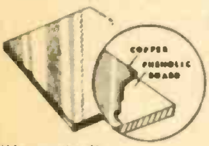


Punched

- *Accepts Miniature Components!*
- *Easy-In, Easy-Out Mounting!*
- *Ideal for Modular Construction!*

276-1582, 3.65x6.87x1/16" .... Net .59
276-1583, 6.87x9.8x1/16" .... Net 1.15

COPPER-CLAD SOLID BOARD

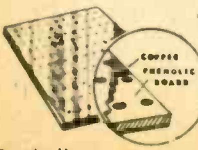


(Unpunched)

- *Make Your Own Printed Circuits!*
- *Quality-Manufactured Board*
- *Bonded with Copper!*

276-1586, 3.65 x 6.87 x 1/16" .... Net .79
276-1587, 6.87 x 9.8 x 1/16" .... Net 1.50

COPPER-CLAD PERF-BOARD

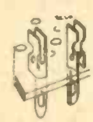


(Punched)

- *For Printed Circuit Design and Circuit Checkout!*
- *Easily Etched and Worked!*

276-1584, 3.65x6.87x1/16" .... Net. .89
276-1585, 6.87x9.8x1/16" .... Net 1.75

PUSH-IN TERMINAL KIT



1.49 Kit of 100

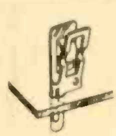
Use with prepunched perf boards. .062 diameter holes (1/16"). Serrated slots. Easy multiple connections.
270-1394, ¼ lb. Net 1.49

SPRING BANANA PLUGS

99¢ Set of 10

Ideal for 3/32" hole perforated boards. Overall length 1".
270-1543, 2 oz. .... Net 99¢

SOLDERLESS TERMINALS



99¢ Set of 15

Use with .093 diameter holes. Takes up to 7 leads without soldering. USA made. Spring action.
270-1395, 4 oz. .... Net 99¢

ALLIGATOR CLIP SET

99¢

10 brass plated 1⅜" long with insulated phenolic barrels. Strong spring: 5 red, 5 black.
270-1540, 2 oz. .... Net 99¢

For Store Addresses, Order Form, See Page 20

ANY ARCHER-PAK ON THIS PAGE **$1** PER PAK

Celebrating Our 44TH Anniversary

RADIO SHACK 44TH BIRTHDAY SPECIAL

20 Power Resistors

Package consists of high-quality vitreous, cand-ohm and wire-wound types. Includes 5 to 25-watt power resistors; individual catalog net — $10!
271-1202, 2 lbs. ...... **Net 1.00**

35 Precision 1% Resistors

Large assortment of popular ½, 1 and 2-watt values; includes encapsulated, bobbin, carbon film, etc. Made by Aerovox, Shellcross, IRC, and other famous names.
271-1196, 1 lb. .... **Net 1.00**

50 Tubular Capacitors

An assortment of quality tubular capacitors, 100 mmf to .1 mf to 600 WVDC. Includes molded, paper and porcelain types. $10 if purchased individually from catalog!
272-1568, 1 lb. .... **Net 1.00**

4 Subminiature 455KC IF Transformers

Slug tuned, made for printed circuitry mtg., shielded. Size: ⅜ x ⅜ x ½".
273-515, ¼ lb. .... **Net 1.00**

8 Sets - RCA Plugs & Jacks

Quality items, ideal for use in phono amplifiers, tuners, recorders, etc. Take advantage of this Radio Shack Special low price!
274-1575, ½ lb. ...... **Net 1.00**

35 Miniature Resistors

World's smallest ¼-watt carbon type resistors! All have axial leads; built for transistor and subminiature circuitry: Assorted values, with resistor color code chart.
271-1566, ½ lb. ...... **Net 1.00**

40 Coils and Chokes

Shop assortment consisting of RF, OSC, IF, parasitic, peaking and many more types. Individually purchased, this would cost you $15!
273-1569, 4 lb. .... **Net 1.00**

45 Mica Capacitors

Famous name micas — Aerovox, Sangamo, C.D., etc. This assortment includes popular values 100 mmf to .01 mf, as well as silver type condensers. A $10 catalog net value!
272-1573, 1 lb. .... **Net 1.00**

8 Volume Controls

Most Popular Values

Contains 8 assorted values including long and short shaft types. A tremendous bargain for servicemen!
271-127, 1 lb. .... **Net 1.00**

Special! 50 Capacitors

Assortment of many types including disc, ceramic, mylar, temperature coefficient, molded, paper, oil, Vit-Q. You save $9 over industrial net catalog prices!
272-1199, 1 lb. .... **Net 1.00**

60 Half-Watt Resistors

Made by Allen Bradley and IRC. Many 5% and 10% tolerance. Color chart. All most popular values. An absolute "must" for hobbyists and kit-builders.
271-1612, 1 lb. .... **Net 1.00**

50 Ceramic Capacitors

Wide variety of popular values by Centralab and other famous-name makers. 10 mmf to .04 mf to KV. Assortment includes tubulars, discs, NPO's, temp. coefficient, etc.
272-1566, 1 lb. ..... **Net 1.00**

48 Terminal Strips

You get a wide variety of screw and solder lug type terminal strips with 1 to 6 lugs. Outstanding value at this low price! 101 uses for the builder and experimenter.
274-1555, 1 lb. .... **Net 1.00**

35 Disc Type Capacitors

A varied assortment of types, including NPO's, Hi-Q, N-750's, mylar and ceramic. 10 mmf to .01 mf to 6 KV. A $10 catalog net value!
272-1567, ¼ lb. ...... **Net 1.00**

150' of Hook-Up Wire

Assortment consists of 6 V rolls of 25' each — solid and stranded wire. #18 through #22. Necessary for multitude of jobs and always useful!
278-025, ½ lb. .... **Net 1.00**

40 One-Watt Resistors

Here are resistors for hundreds of uses! Assortment has Allen Bradley and IRC carbons, with 5% values included. This pack is a regular $8.00 catalog net!
271-1576, 1 lb. .... **Net 1.00**

4 Transistor Transformers

Made by UTC and Remington Rand. Famous miniatures. Includes subouncer, mike, input types. Color coded leads.
273-1581, 1 lb. .... **Net 1.00**

$25 SURPRISE PACKAGE!

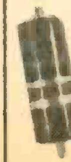
Loaded with Parts! **$1**

The biggest surprise package yet! Enough electronics components to make your eyes pop! Resistors, capacitors, condensers, diodes . . . your guess is as good as ours. The famous-make parts are worth *at least* $25.00!
270-1251, 1 lb., **Net 1.00**

50 Plugs and Sockets

Ideal bench assortment for servicemen, hams, etc. Subminiature and printed circuit types included! This assortment saves you $10 over individual catalog prices!
274-1562, 1 lb. .... **Net 1.00**

30 2-Watt Resistors



These quality 2-watt resistors are non-inductive, magnetic film, carbon types. Many with 5% values. Made by famous-name manufacturers.
271-1211, ½ lb. .... **Net 1.00**

For Store Addresses, Order Form, See Page 20

BRILLIANT NEW KIT LINE!

Science Fair™

Perf-board electronic projects make soldering optional, let builder re-use parts or change circuit!

At last! — electronic kits that let you work the same way engineers do — by "bread-boarding". Designed by Radio Shack's engineers and produced by its new Science Fair Electronics division, the kit line features step-numbered construction data, pictorial, schematic and add-on instructions.

AC/DC POWER SUPPLY KIT

6^{95} NO. 28-104

Converts 117 VAC (house current) to either 6 or 9 volts DC. Play battery operated equipment on house line! Also ideal for use with Science Fair™ kits & other projects.

"OTL" AUDIO AMPLIFIER KIT

4^{95} NO. 28-106

Ideal for use with tuners, mikes, phonograph systems. OTL output. Frequency response up to 15,000 cycles. Rated up to 2 watts peak.

For Store Addresses, Order Form, See Page 20

TRANSISTOR RADIO KIT

3^{95} No. 28-102

Tunes the standard AM broadcast band; can also be used as a tuner. Battery-operated. Comes complete with earphone. Perf-board construction.

TRANSISTOR ORGAN KIT

5^{95} NO. 28-101

Each note on the seven-note scale is separately tone variable. Unit is battery-operated and features perf-board construction. Fun to build & operate!

WIRELESS AM MIKE KIT

3^{95} NO. 28-103

Transmit through any radio up to 20 feet away! Battery-operated microphone is a real broadcaster! Constructed of sturdy perf-board.

1-TUBE DC RADIO KIT

3^{95} NO. 28-100

Battery-operated! Learn tube theory and build a real working radio. Equipped with sturdy perf-board construction. Kit comes complete with earphone.

Now Everyone Can Own a Second Telephone!

Standard Desk Telephone

Ready to Install **7.95**

Enjoy the extra convenience of an extra phone! Our most popular style; it's modern, low-cost, and easy to install. Each phone is factory reconditioned to give trouble-free service. Bakelite body and handset; metal base. Dial, bell and coil included. (Note: use of telephone equipment not installed by a telephone company may be subject to local tariff.)
279-371, Sh. wt. 10 lbs. .... Net 7.95

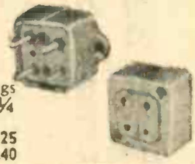
For Private Phone and Intercom Systems.

- Save Time!
- Save Steps!
- Save Money!

30 Ft. Telephone Extension Cord

Move your phone from room to room! Highest-quality 4-conductor flexible cord plus standard telephone jack and plug. Ideal for intercom. Use 2 or more for extra length.
279-1261, Sh. wt. 1¼ lbs. .... Net 2.98

Telephone Plugs & Jacks



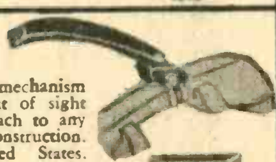
Ideal for making extensions, these plugs and jacks each weigh approximately ¼ pound.
279-366, plug .... Net 1.25
279-367, jack .... Net 1.40

Coiled Phone Cords

Stretches up to six feet. 3-conductor. Shipping weight: ¼ pound.
278-361 .... Net 1.19

Four conductor extends up to fifteen feet. Shipping weight: ½ pound.
278-1389 .... Net 5.95

Shoulder Rest



Frees both hands! Spring mechanism enables arm to be folded out of sight when not in use. Easy to attach to any phone. Long lasting metal construction. Manufactured in the United States. Weight: 1 pound.
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Telephone Wall Jack

For 2, 3, 4-wire systems. Fits standard wall conduit boxes. 1 lb.
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Carbon Type Handset

For Mobile and Replacement Use!

Great for use with mobiles & intercoms, or as outdoor mike for camps and construction sites. Withstands extreme temperatures. High output mike can be used with low gain circuits. Adapt to your CB transceiver or radio. Includes earpiece and 3-conductor cord.
279-1351, Sh. wt. 1 lb. .... Net 2.99

Sound-Powered Elements

Kit of two! Talk without electricity — your voice powers these devices. Hook them up and talk up to 300 feet. Shipping weight: ½ pound.
279-1353 .... Net .99

100 Ft. 3-Conductor Telephone Wire

Multi-use 100' 3-conductor wire for telephone work. Ideal for linking temporary phones for field uses.
278-370, Sh. wt. 2 lbs. .... Net 3.49

Handset Hanger

Hang up your phone without cutting off party on other end. Ideal for wall telephones. Anodized black aluminum.
279-1528, Sh. wt. ¼ lb. .... Net 1.25

Telephone Dials

Standard Western Electric unit. Can be used with automatic control circuits, & electronic combination lock circuits.
279-359, Sh. wt. 1¼ lbs. .... Net 2.99

Store Addresses, Order Form, See Page 20

POSITIVE FEEDBACK

JULIAN M. SIENKIEWICZ, EDITOR

■ Britain's Stone Age Mt. Palomar—Stonehenge—was built so that ancient sun worshippers could predict when their god would be eclipsed.

Stonehenge is a circular pattern of large stones in southern England that includes 56 in the outer ring. The stones are laid out in a scheme that obviously has meaning but there is no agreement as to what that is. The theory that Stonehenge served as astronomical observatory has been advanced by astronomers since early in this century, but archaeologists have not found the astronomical thinking convincing.

Now, however, Dr. Fred Hoyle, director of England's new Institute for Theoretical Astronomy at the University of Cambridge, has built a bridge between the two sciences, presenting evidence that eliminated many of the archaeologists' reasons for disagreement.

Archaeologists have generally attacked such theories on the grounds that Stone Age man lacked the sophistication to figure out the theoretical basis of such a complex observatory. Dr. Hoyle suggests that they didn't start with a theory, but with a pragmatic wooden model that they could change as its defects became obvious. Only when the observatory evolved and actually worked did they make it permanent.

Dr. Hoyle believes that the outer part of Stonehenge (the 56 circular markers) was built a little after 3000 B.C., and that the center structure for predicting solar and lunar eclipses was built several hundred years later. The great stone monoliths at the center of Stonehenge were put in place after a long, painstaking test by trial and error using wooden posts. The first wooden model tested could have resulted from the insight of a Stone Age genius equivalent to this century's Albert Einstein.

One of the most recent and ardent exponents of Stonehenge as an astronomical observatory is Dr. Gerald Hawkins of the Smithsonian Astrophysical Observatory in Cambridge, Mass. He also suggested that the large stone markers were placed in a pattern for predicting solar and lunar eclipses, but thought the ancient men had worked out the proper positions theoretically. Dr. Hoyle suggested, rather, that the pattern of Stonehenge was worked out as a field experiment by very observant men who noted that every year the sun's positon in the sky was the same at the same time, such as mid-summer or mid-winter.

To measure such positions accurately, they would have had to use relatively long distances for sighting, such as a circle about 100 yards in diameter, which is the size of Stonehenge. Many of the stones, however, seem to be slightly out of place for accurate measurements of solar and lunar positions.

Dr. Hoyle has found that 19 of the 23 positions that seem to be out of line would be correct if they were lined up for observing not the actual date of mid-summer, but for two other observations: one during the week the sun approached its solstice and one as it moved back again. The average of these two observations would give a more accurate astronomical position than a single sighting at the time of solstice.

After several years of such observations the Einstein-of-his-time would have noticed that solar eclipses occurred only when the sun, earth and moon were lined up. The group then added the markers necessary to predict solar eclipses, first using wooden posts and then replacing them with the immovable stones so that later generations could not move them out of line.

What amazes this editor is the enormous energies expended by scientists using complex electronic computers and carbon dating techniques to discover what our illiterate forefathers were up to at Stonehenge 5000 years ago.

Hal, the Mooch. Just the other day my friend Hal popped into the house. I say popped because doors are to keep out flies, not people to his way of thinking. Or should I say, "not to keep Hal out." Anyway, I wasn't too concerned. I had only a few coins in my pocket and the refrigerator was locked. After I exchanged a pleasantry with him, like "whatta you want?", we got down to business. Hal had to travel to the library and he was short the round trip carfare. Naturally, I posed my solution to the problem—walk! And he countered with his solution which would separate the coins I had from me.

Hal complained that he took the subway train several days ago and the round trip traveling time was only a half hour. Just yesterday he went to the library by train, but had to return on foot because some candy machine overpowered him. Riding away from and walking back home took an hour and a half for the trip. Therefore, I just couldn't ask him to walk both ways—it

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A selection of products available by mail for readers of Radio-TV Experimenter
All merchandise sold on a money-back guarantee. Order Direct by Stock No. Send check or M.O.

3" ASTRONOMICAL TELESCOPE

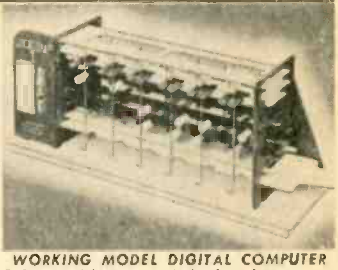
See stars, moon, phases of Venus, planets close up. 60 to 180 power—famous Mt. Palomar reflecting type. Aluminized & overcoated 3" diameter f/10 primary mirror, ventilated cell. Equipped with 60X eyepiece and mounted 3X finder scope, hardwood tripod. FREE: "STAR CHART"; 272-page "HANDBOOK OF HEAVENS"; "HOW TO USE YOUR TELESCOPE"

Stock No. 85,050HP..........$29.95 Ppd.

"FISH" WITH A MAGNET

Go treasure hunting on the bottom! Fascinating fun & sometimes profitable! Tie a line to our 5-lb. Magnet—drop it overboard in bay, river, lake or ocean. Troll it along bottom—your "treasure" haul can be outboard motors, anchors, other 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.

Stock No. 70,571HP..........$12.50 Ppd



WORKING MODEL DIGITAL COMPUTER

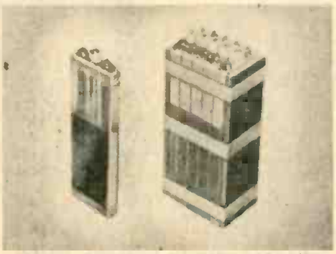
Solve problems, teach logic, play games with miniature version of giant electronic brains! Adds, subtracts, multiplies, shifts, complements, carries, memorizes. Colored plastic parts easily assembled. 12"x3½"x4¾". Incl. step-by-step assembly diagrams, 32-p. instruction book covering operation, computer language (binary system) programming, problems & 15 experiments.

Stock No. 70,683HP..........$5.98 Ppd.

ASTRONOMICAL TELESCOPE KITS

Grind your own mirror for powerful telescope. Kit contains fine annealed pyrex mirror blank, tool, abrasives, diagonal mirror, and eyepiece lenses. You build instruments valued from $75.00 up.

Stock No.	Diam.	Thickness	Price
70,003HP	4¼"	¾"	$8.00 Ppd.
70,004HP	6"	1"	12.95 Ppd.
70,005HP	8"	1⅜"	21.00 Ppd.
70,006HP	10"	1¾"	34.25 f.o.b.
70,007HP	12½"	2⅛"	65.85 f.o.b.



NICKEL-CADMIUM BATTERY BARGAINS

Terrific value—used government surplus. Quick-charge, lightweight 6-volt nickel-cadmium battery. 4-amp. hour capacity. Almost unlimited life. Charges in 1 hr. w/Edmund Charger Kit. Hundreds of uses. Few drops of water yearly for full maintenance. Minimum of electrolyte-sealed to prevent loss. Delivers nearly 100% output at below freezing. Five vented 1.2 volt cells. 3⅛"x2"x6".

Stock No. 70,942HP (battery) ...$15.00 Ppd.
Stock No. 40,798HP (1.2V. Cell) $ 3.95 Ppd.
Stock No. 70,807HP
(Charger Kit) ....$ 8.00 Ppd.

IT'S HERE—BIG, NEW DIGICOMP III

If you think DIGICOMP I was something—wait 'til you use DIGICOMP II! Loads of fun! Terrific challenge! Actually works like electronic digital computer but needs no power. Adds, subtracts, multiplies, divides, memorizes. 1st mechanical computer w/auto. switch action. 1st model designed for programming. Speed reduced by factor of million to 1—you can see what's happening. Demonstrates 'new' math. computer techniques.

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"Balls of fun" for kids, traffic stoppers for stores, terrific for amateur meteorologists. Create a neighborhood sensation. Great backyard fun. Exciting beach attraction. Amateur meteorologists use to measure cloud heights, wind speed, and temp. Made of heavy duty neoprene. Inflate with vacuum cleaner or auto air hose, or locally available helium for high rise.

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Completely new 1968 Catalog. 148 pages packed with nearly 4,000 unusual bargains. Exciting new categories. Many new items. 100's of charts, illustrations. Many hard-to-get war surplus bargains. Enormous selection of telescopes, microscopes, binoculars, magnets, magnifiers, prisms, photo components, etc. For hobbyists, experimenters, workshops, factories. Shop by mail. No salesman will call. Simply check coupon or write for Catalog "HP" to Edmund Scientific Co., Barrington, N. J. 08007.

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EDMUND SCIENTIFIC CO. 300 EDSCORP BUILDING BARRINGTON, NEW JERSEY 08007 was unkind. Not meaning to be tricked by Hal I asked, "How long would it take you to walk both ways?"

To which Hal replied, "Come on Dad, you should be able to solve this one in your head using *rate times time equals distance* equations. But I bet you the cost of the carfare plus a ham sandwich for lunch you can't solve the problem using addition and subtraction only!"

Well now, this was a challenge which I took up. After all, with pencil and paper plus the free use of addition and subtraction processes, I am a match for the best Hal has to offer, or am I? So, if you want to discover how bright your editor really is, start loitering near your favorite newsstand, or better still, bivouac next to your mailbox and wait for your subscription copy the mailman brings. That's right, the solution is in the next issue.

Last Issue's Puzzler

Come on now—do you really need an answer to the Who's for Dinner puzzler friend Hal posed last issue? OK, let's figure it out together. Draw a long table and place nine seats all on one side, numbering them in order from *one* through *nine*. Now, starting with seat *one*, begin counting to seven. At the seventh counted seat (which happens to be seat *seven*), draw an "X" through this seat, indicating the diner left for the kitchen (never to return!). Beginning with the next seat (seat *eight*), continue to count till you get to the end of the table. Now return to the first available seat at the low end of the table and continue the count until seven seats have been counted. Put an "X" on this seat. Keep this up, counting only those seats that are *not* "X"ed out until only one seat is left. This will be seat *two*. As you can guess by now, my friend Hal was in this seat. And what seat was I sitting in? Obviously, it turned out to be the seat that received the dinner check (there is always one loser in a crowd!).

Mate Ahoy! Just about everyone is swinging to electronics and to prove my point I am including a pic of Captain *Whosit* aboard the Good Ship *Whatsit*. A close inspection of the Captain reveals she is equipped with a Ray Jeff Marine Radio Telephone, Model 490 and Ray Jeff Depthfinder, Model 400. Priced at $299.95 and $117.95, respectively, one can readily recognize the low cost of these electronic safety accessories every boating bug should have on board before he takes to the water. Our hats are off to the Ray Jefferson, Division of Jetronics Industries, Inc., Main and Cotton Streets, Philadelphia, Pa. 19127 for keeping us informed and three cheers for the Ray Jeff company photographer. Just dig those polkie-dots!

Careful investigation of the photo indicates enormous inroads have been made by electronics in to the marine field—look again!

Boy, Oh Boy! Well, it happened again. We goofed. In our October/November 1967 issue of RADIO-TV EXPERIMENTER we made reference to a company whose initials were IRC. Naturally, perhaps, we assumed that the "R" stood for "Rectifier." But, alas, it stood for "Resistance."

The error appeared in the *Ask Me Another* column on page 40. We have reprinted the entire question and answer below to straighten out the mess we created and we have also included some other useful information to show our hearts are really where they're supposed to be.

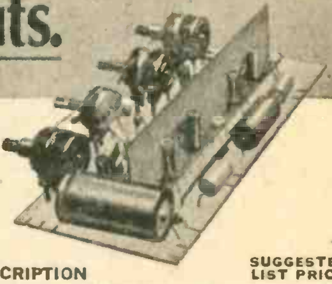
I have a bunch of transistors I salvaged from various radios. Where can I find out about their characteristics?

—E. M. L., Andalusia, Ala.

Write to IRC, Incorporated, Consumer and Distributor Products Division, 414 N. 13th Street, Philadelphia, Pa. 19108 and order a copy of their Transistor Reference Book ($3.95). They also publish General Purpose/Signal Diode Reference Book ($3.95) that's a good buy, too! Get both copies.

Now...18 different professional-quality amplifiers, tuners & preamps

- completely assembled...
- solid state, printed circuits...
- priced lower than kits.



There are so many ways you will use these easy-to-install, printed-circuit assemblies; in hi-fi equipment, ham gear, P.A. and intercom systems, or as guitar and organ amplifiers. Employing the most advanced Complementary-Symmetry transistorized designs, these assemblies provide the ultimate in economical circuitry for reliable audio applications from one watt to twenty. They have already become the design standard for a large group of audio equipment manufacturers, as well as a basic teaching tool in many educational institutions.

TYPE	DESCRIPTION	SUGGESTED LIST PRICE
PCA-1-9	1W, 9V D.C. 4 Transistor Amplifier	$7.20
PCA-1-14	2W, 14V D.C. 4 Transistor Amplifier	7.00
PCA-2-9	3/4W, 9V D.C. 3 Transistor Amplifier	5.90
PCA-2-14	1W, 14V D.C. 3 Transistor Amplifier	5.90
PCA-3B-18-1	4W/Channel Stereo Amplifier with Bass, Treble, Volume and Balance Controls	19.20
PCA-4-9	1W, 9V D.C. High Gain, 4 Transistor Amplifier for Radio, Ceramic or Crystal Phono Cartridge, etc.	8.30
PCA-4-9A	Same as PCA-4-9 with Tone Control Circuit	9.20
PCA-4-14	2W, 14V D.C. High Gain 4 Transistor Amplifier for Radio, Ceramic or Crystal Phono Cartridge, etc.	8.30
PCA-4-14A	Same as PCA-4-14 with Tone Control Circuit	9.20
PCA-4-18A	3W, High Sensitivity, 4 Transistor Amplifier with Volume and Tone Controls for use as Guitar, Radio or Phono Amplifier	9.52
PCA-5A-14	2W/Channel 14V D.C. Stereo Amplifier with Balance, Tone and Volume Controls	15.80
PCA-6A-25	8-10W/Channel Stereo Amplifier with Preamp for Ceramic Phono Cartridge and Bass, Treble, Balance, and Volume Controls	30.10
PCA-6A-25SCS	Same as PCA-6A-25 with Separate Control Assembly	31.80
PCA-7B-18	Tape Cartridge Stereo Preamp with Level Set Controls	12.00
PCA-7C-18	Same as PCA-7B-18 without Level Sets; 4 Transistor	9.50
PCA-8-36	20W Mono Basic Amplifier	18.85
PCA-9-18	3W/Channel, 10 Transistor Stereo Tape Playback Amplifier with Volume, Tone and Balance Controls	25.30
PCR-1-9	9V 2 Transistor AM Tuner	11.30

For brochure containing complete technical data on all 18 assemblies and for name of distributor nearest you, write: Amperex Electronic Corporation, Distributor Sales Dept., Hicksville, New York 11802.

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TOMORROW'S THINKING IN TODAY'S PRODUCTS

12 KIT-GIVING IDEAS FROM HEATH . . .

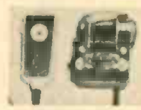
For The Whole Family . . .
New Deluxe "227" Color TV

Kit GR-227
$419.95 (less cabinet) $25 mo.

Exclusive Heathkit Self-Servicing Features. Like the famous Heathkit "295" and "180" color TV's, the new Heathkit "227" features a built-in dot generator plus full color photos and simple instructions so *you* can set-up, converge and maintain the best color pictures at all times. Add to this the detailed trouble-shooting charts in the manual, and you put an end to costly TV service calls for periodic picture convergence and minor repairs. No other brand of color TV has this money-saving self-servicing feature.

Advanced Features. Boasts new RCA Perma-Chrome picture tube for 38% brighter pictures . . . 227 sq. in. rectangular viewing area . . . 24,000 v. regulated picture power . . . improved phosphors for brilliant, livelier colors . . . new improved low voltage power supply with boosted B+ for best operation . . . automatic degaussing . . . exclusive Heath Magna-Shield to protect against stray magnetic fields and maintain color purity . . . ACC and AGC to reduce color fade and insure steady, flutter-free pictures under all conditions . . . preassembled & aligned IF with 3 stages instead of the usual 2 . . . preassembled & aligned 2-speed transistor UHF tuner . . . deluxe VHF turret tuner with "memory" fine tuning . . . 300 & 75 ohm VHF antenna inputs . . . two hi-fi sound outputs . . . 4" x 6" 8 ohm speaker . . . choice of installation — wall, custom or optional Heath factory assembled cabinets. Build in 25 hours.

Kit GR-227, (everything except cabinet) . . . $42 dn., as low as $25 mo. . . 114 lbs. **$419.95**
GRA-227-1, Walnut cabinet . . . no money dn., $6 mo. **$59.95**
GRA-227-2, Mediterranean Oak cabinet (shown above) . . . no money dn., $10 mo. **$94.50**



Kit GRA-27
$19.95

New Remote Control For Heathkit Color TV

Now change channels and turn your Heathkit color TV off and on from the comfort of your armchair with this new remote control kit. Use with Heathkit GR-227, GR-295 and GR-180 color TV's. Includes 20' cable.

Kit GR-295
$479.95
(less cabinet)
$42 mo.

Deluxe Heathkit "295" Color TV

Color TV's largest picture . . . 295 sq. in. viewing area. Same features and built-in servicing facilities as new GR-227. Universal main control panel for versatile in-wall installation. 6" x 9" speaker.

Kit GR-295, (everything except cabinet), 131 lbs. . . . $48 dn., $42 mo. **$479.95**
GRA-295-1, Walnut cabinet (shown above), 35 lbs. . . . no money dn., $7 mo. **$62.95**
Other cabinets from $94.50

Kit GR-180
$349.95
(less cabinet & cart)
$30 mo.

Deluxe Heathkit "180" Color TV

Same high performance features and exclusive self-servicing facilities as new GR-227 (above) except for 180 sq. in. viewing area.

Kit GR-180, (everything except cabinet), 102 lbs. . . . $35 dn., $30 mo. **$349.95**
GRS-180-5, table model cabinet & mobile cart (shown above), 57 lbs. . . . no money dn., $5 mo. **$39.95**
Other cabinets from $24.95

FREE 40-Lesson Record Course With Either Heathkit/Thomas Organ! A $50 Value! Includes four 33⅓ rpm records, music book & leatherette album.

Kit TO-67
$995
(including bench)
$200 dn.,
as low as $29 mo.

Heathkit®/Thomas "Paramount" Theatre Organ

Save Up To $500! Build in 80-100 hours. All Thomas factory-made parts . . . 15 manual, 4 pedal voices; instant-play Color-Glo; all-transistor circuit; 200 watts peak power; 2-speed rotating Leslie plus main speaker system with two 12" speakers; 44-note keyboards; horseshoe console with stop tablets; 28-note chimes; 13-note bass pedals; repeat & attack percussion; reverb; headset outlet; assembled walnut finish hardwood cabinet & bench; and more. 265 lbs. 7", 33⅓ rpm demonstration record 50c.

America's Lowest Cost Solid-State Organ

Kit GD-325B
$394.90
$40 dn., $34 mo.

Save Up To $205! Instant-play Color-Glo; 10 voices; 13-note bass pedals; repeat percussion; 37-note keyboards; 75-watt peak power; vibrato; assembled walnut cabinet & bench. 172 lbs. 7", 33⅓ rpm demonstration record 50c.

Exclusive Band Box Percussion

Automatically or manually adds 10 percussion voices to any Heathkit/Thomas organ. Build & install in 12 hours.
Kit TOA-67-1, no money dn., $14 mo. **$145.00**

Exclusive Playmate Rhythm Maker

Adds 15 fascinating rhythms to any Heathkit/Thomas Organ. Requires Band Box percussion (above) for operation.
Kit TOA-67-5, no money dn., $18 mo. **$189.90**

USE COUPON TO ORDER NOW!

TO-68
$349.95
$35 dn., $30 mo.

NEW! VOX "Jaguar" Transistor Combo Organ By Heathkit

Save Up To $150 on the world's most popular combo organ with this new Heathkit version. Features the most distinctive sound of any combo organ. Has a special bass output that gives a brilliant stereo bass effect when played through a separate or multi-channel amplifier, 4 complete octaves, vibrato, percussive effects and reversible bass keys. Includes hand crafted orange and black cabinet, fully plated heavy-duty stand, expression pedal and waterproof carrying cover and case for stand. Requires a bass or combo amplifier like Heathkit TA-17 (opposite page).

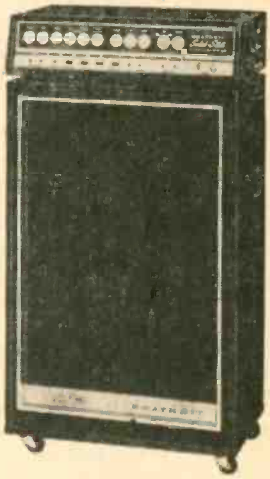
Kit TO-68, 80 lbs.... $35 dn., $30 mo................ **$349.95**

NEW! Deluxe Solid-State Combo Amplifier & Speaker System... Choose Kit Or Factory Assembled

Amplifier
Kit TA-17
$175
$17 mo.
(Assembled
TAW-17 $275)

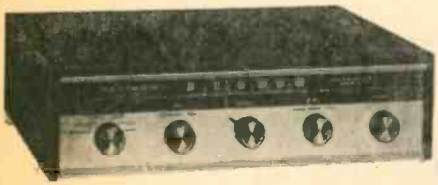
Speaker System
Kit TA-17-1
$120
$11 mo.
(Assembled
TAW-17-1 $150)

Special
Combination Offer
Amplifier & Two
Speaker Systems
Save $20
Kit TAS-17-2
$395
$40 dn.
$34 mo.
(Assembled
TAW-17-2 $545)



All the "big sound" features every combo wants . . . tremolo, built-in "fuzz", brightness, reverb, separate bass and treble boost and more. Delivers a shattering 120 watts EIA music power (240 watts peak power) through two TA-17-1 speakers . . . or 90 watts through one TA-17-1 speaker. Features 3 independent input channels, each with two inputs. Handles lead or bass guitars, combo organ, accordion, singer's mike, or even a record changer. All front panel controls keep you in full command of all the action.

Speaker system features two 12" woofers, special horn driver and matching black vinyl-covered wood cabinet with casters & handles for easy mobility.



Kit AR-17
$72.95
(less cabinet)
$8 mo.

NEW! Lowest Cost Solid-State Stereo Receiver

Features wide 18-60,000 Hz response @ ±1 db at full 5 watts RMS power per channel . . . 14 watts music power . . . inputs for phono and auxiliary . . . automatic stereo indicator . . . outputs for 4 thru 16 ohm speakers . . . adjustable phase for best stereo . . . flywheel tuning . . . and compact 9¾" D. x 2⅞" H. x 11¼" W. size. 12 lbs. Optional factory assembled cabinets (walnut $7.95, beige metal $3.50).

Kit AR-17, (less cab.) 12 lbs. . . . no money dn., $8 mo.. **$72.95**
Kit AR-27, 7-Watt FM Mono Only Receiver (less cab.) 9 lbs. . . . no money dn., $5 mo........................ **$49.95**

Kit IM-17
$19.95

NEW! Solid-State Portable Volt-Ohm-Meter

So Handy, So Low Cost we call it "every man's" meter. Just right for homeowners, hobbyists, boatowners, CBer's, hams . . . it's even sophisticated enough for radio & TV servicing! Features 12 ranges . . . 4 AC & 4 DC volt ranges, 4 ohm ranges; 11 megohm input on DC, 1 megohm input of AC; 4½" 200 uA meter; battery power; rugged polypropylene case and more. Easy 3 or 4 hour kit assembly. Ideal gift for any man! 4 lbs.

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☐ Enclosed is $____________, including shipping.
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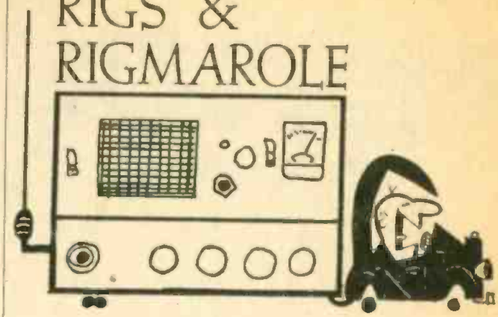
CL-312

CB RIGS & RIGMAROLE



• **Cape Kennedy Rides Again.** We recently saw a new CB rig which is just about guaranteed to bring a lump to CBers' throats. Fine business with your super-miniaturized rigs which can place so much talk power in a pint-sized cabinet—that's a popular trend in CB gear of late. What about Tram Corporation's (Lower Bay Road, Box 187, Winnisquam, N.H. 03289) new Tram Titan II?

Going their very own way, Tram has brought out a really BIG piece of CB ecstasy. Nothing miniature for this baby, it's a large, impressive, solid, massive, heavy, and sharp hunk of communications equipment intended for base station use. There's not a whisper of doubt as to what this thing is sitting there on your desk—you're either one of the world's most "in" CBers

One thing about the folks at Tram, they know how to show off their Titan II CB rig.

NOW

A low cost Crystal for the Experimenter

International  *type* "EX"

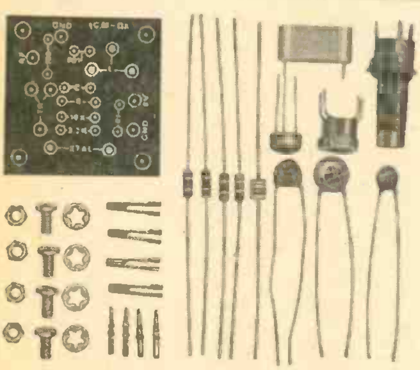
- LOW COST
- MINIMUM DELIVERY TIME

3,000 KHz to 60,000 KHz

$3.75 Postage Paid

SPECIFICATIONS: International Type "EX" Crystal is available from 3,000 KHz to 60,000 KHz. The "EX" Crystal is supplied only in the HC-6/U holder. Calibration is ± .02% when operated in International OX circuit or equivalent.

CONDITIONS OF SALE: All "EX" Crystals are sold on a cash basis, $3.75 each. Shipping and postage (inside U.S. and Canada only) will be prepaid by International. Crystals are guaranteed to operate only in the OX circuit or its equivalent.



COMPLETE OX OSCILLATOR KITS

Everything you need to build your own oscillator. Two kits available. "OX-L" kit 3,000 to 19,999 KHz. "OX-H" kit 20,000 to 60,000 KHz. Specify "OX-L" or "OX-H" when ordering. **$2.35** Postage Paid

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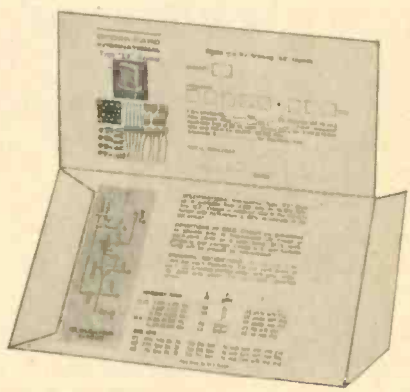

ORDERING INSTRUCTIONS

(1) Use one order card for each frequency. Fill out both sides of card.

(2) Enclose money order with order.

(3) Sold only under the conditions specified herein.

INTERNATIONAL

CRYSTAL MFG. CO., INC.
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or you're a Cape Kennedy missile control center.

The Tram Titan II is actually 2 complete transceivers in one cabinet, a standard amplitude modulated rig *plus* a rig which offers double-sideband suppressed carrier unit. The receiver can inhale amplitude modulated signals, single or double sideband (reduced or suppressed carrier).

Switching back and forth from one form of modulation to another means the flick of a switch. Sideband transmission offers greatly extended transmission range over amplitude modulation, in addition to also insuring some degree of privacy in your communications (the only people who can copy sideband signals are those equipped with receiving gear intended for this mode of transmission).

The receiver features a mechanical filter which cuts interfering signals down to virtually nothing. A meter on the front panel measures both the transmitter and antenna systems, showing forward power into the self-contained dummy load, the power to the antenna, and also the SWR.

TV interference is clipped out by a built-in filter. The chassis is designed for easy probing around inside (take a picnic lunch, it's a big place). As you can see, it's really spectacular!

Getting down to the nitty-gritty, the Tram Titan II will cost you $482 (you expected maybe $19.95?). It comes ready to go on all 23 CB channels and if it doesn't make you the most popular guy on the band in your area then maybe you've got a personality problem.

• **Shure Is Neat!** Pardon the pun, but we just couldn't resist it. In fact, Shure Brothers, Inc. (222 Hartrey Avenue, Evanston, Ill.) *did* resist it—their new Model 444T variable output mike, we mean.

They incorporated into the design of this base station mike a 2-transistor mike preamp which

Shure 444T Microphone with built-in Preamplifier will boost the modulation output of any CB rig which is slightly anemic in this department. The preamp runs from a self-contained battery with 300 hours of life. The height of the mike may also be adjusted to take into account the height of your operating desk and the length of your neck (no Charlie, it doesn't limit the length of your transmissions too).

So if you are being "shouted down" by others on your channel with newer and flashier rigs having more "talk power" than your old warhorse, try a Shure 444T and snarl back with a voice as loud as any on the band. ■

● **More Walkie, More Talkie:** How about a 3-channel walkie-talkie running a hefty ½-watt for, would you believe, $32.95? Well we aren't joshin' because Lafayette Radio, 111 Jericho Turnpike, Syosset, L.I., N.Y. 11791, really has one. It's their HA-305 and includes among its features: 14 transistors, 1 diode, 1 varistor, selective superhet receiver, variable squelch, 1

Lafayette 3-Channel, ½-Watt Walkie-Talkie

uV sensitivity, range boost modulation, provisions for tone call alert and 117-VAC operation with optional battery eliminator.

Now you will say that it is not enough for your investment? They've also included a battery condition meter, a set of batteries, a carrying case, a set of channel 9 crystals, and a CB license form (whew!). Looks like the only thing you *don't* get with this is shares of Lafayette stock! (You can also ask for their all-new 1968 catalog that's packed with great CB buys and many other goodies.) ■

Amateur Juvenile

I am not old enough to have a CB license. But I have heard that it does not matter what your age is for ham license. Is this true?

—*D. L. S., Brookfield, Mo.*

Wish I had your problem. Yes, it's true. *If* you can pass the test. Start studying.

Great Mind's Quick-Think

After reading the tornado article in your June-July issue of Radio-TV Experimenter, *I thought up a tornado warning device. Why not use a fluid type barometer with a photo-cell to detect the sharp drop in barometric pressure which occurs when a tornado approaches? The photo-cell can switch on a siren, buzzer or other alarm to warn people of the approach of a tornado.*

—*B. O., Bronx, N. Y.*

A call to the U. S. Weather Bureau reveals that the drop in barometric pressure occurs seconds before a tornado hits so don't bother patenting the idea.

Attention Megawatt CBers

I would like to know if the power of a CB walkie-talkie transmitter can be boosted from 0.2 watts to 1.0 watt. If not, why not?

—*H. M., Northampton, Pa.*

'Cause I'll bet you won't spend a couple of hundred bucks having a lab certify that the modification meets FCC specs.

Get With It You Guys

I enjoy your magazine and eagerly await its arrival here. I find it of much greater interest than its English counterparts. My problem is that I have trouble getting components. I have *written to both Allied and Lafayette asking for their catalogs but have received no reply. Could you possibly give me the name and address of a distributor in the United States who would take the trouble to ship parts outside of the United States? I am able to send dollars.*

—I. McK., Kitwe, Zambia

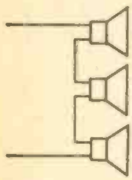
Allied, Lafayette, Radio Shack and anybody else interested in selling equipment to this gentleman, send your catalogs to Mr. I. McKenzie, 173 Philip St., Nkana East, Kitwe, Zambia.

Match a Mis

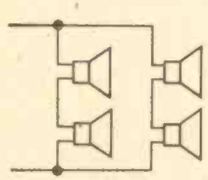
I have a transistorized amplifier and I'm plagued with a minimum impedance problem common to these units. Is there any way to connect more than two speakers to the unit, without dropping the impedance below 4 ohms?

—P. P., Castro Valley, Calif.

Sure, connect the speakers in series or series-parallel as shown.



3 IN SERIES



4 IN SERIES - PARALLEL

Searching, Ever Searching

I sent you a question over four years ago and I still haven't seen the answer.

—J. R. A., Big Sur, Calif.

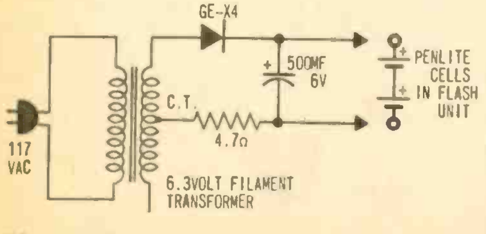
Sorry about that—what's the question?

For the Price of a Penlight Cell

I have a flash camera that uses AG-1(B) flashbulbs and two penlight cells. I would like to build an AC adaptor so I can take flash pictures with the unit using house current.

—R. T., Daytona Beach, Fla.

Cheapskate! The diagram shows an AC adaptor that could be used with your flash unit. It'll even recharge the batteries if they're left in the circuit, but at the cost of penlight cells, is it worth it?



Watch Those High-Powered Cartridges

In my hi-fi system, I have two turntables feeding into one input of my amplifier. I have been told that I am overloading the input and this will *damage the amplifier. Please tell me if this is so.*

—J. G. R., Quaker Hill, Conn.

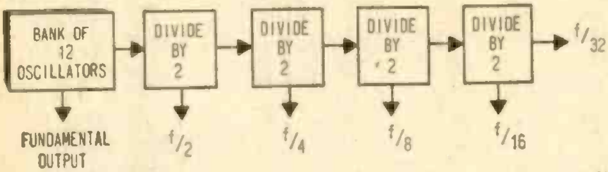
Only if the cartridges are 100-watt jobs.

Divide and Conquer

What is the trick used by organ manufacturers to get different notes? They surely don't have 88 different oscillators. Could you publish a simplified schematic?

—O. B., Council Grove, Kan.

Those tricky organ manufacturers use a bank of 12 tone oscillators followed by frequency dividers. The diagram will give you a quick idea of how it's done.



Come Again?

You sure have a boring column.

—W. K., Southhampton, U. K.

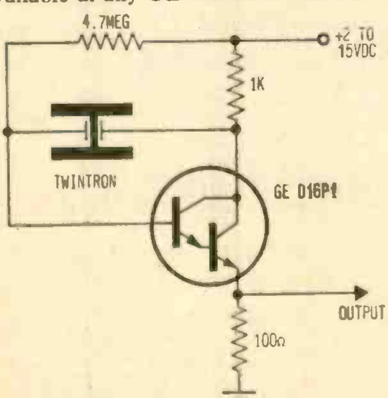
Thanks.

Immovable Audio

Can you give me a circuit for a very stable fixed frequency audio oscillator?

—N. G., Washington, D. C.

Be glad to. The schematic shows an oscillator employing a Twintron electro-mechanical resonator and a Darlington amplifier. You can get a fixed-tuned or tunable Twintron (300-3000 Hz, 100-700 Hz or 700-7000 Hz); they are available from H B Engineering Corp., 1101 Ripley Street, Silver Spring, Maryland. The transistor should be available at any GE transistor distributor.



Sure Is Interesting

Will I get improved TV reception if I place the TV signal booster between my portable TV's built-in antenna and the TV set's input circuit? You sure have an interesting magazine.

—E. M. L. Andalusia, Ala.

It's sure interesting that you think so. By the way, unless you're a TV expert, keep your cotton picking fingers out of that set. There are high voltages present and you might misadjust things. To improve your TV reception, use an outdoor antenna.

Technicolor Hope

I thought that your article on how to convert black and white TV to color was very interesting. However, I would like to know if there's any way to get color in front of the CRT without using the color wheel and still using the monochrome CRT.

—B. K., Cedar Falls, Iowa

Do it and you won't have to depend on Social Security.

BCB Blues

When I tune past 20 kHz on my shortwave set, all I get is AM band signals—distorted. I get no sign of life in the 10, 11 and 15 meter bands except these BCB stations. What can I do?

—G. C., Fords, N. J.

Punt!

Glutton for Punishment

For fun and games I built a double-conversion FM tuner using tubes. It has a cascode front end, four IF stages, a second convertor, one RC low IF stage and two limiters. The IF's are 10.7 MHz and 200 kHz. Can you give me a circuit for a cycle counting FM detector?

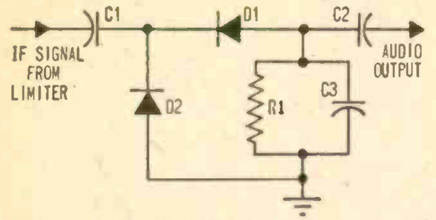
—R. F., Victoria, B. C.

Boy, will you need a wideband IF amp. Since the FM signal deviates ±75 kHZ, the low IF will swing from 125 to 275 kHz. You might try the detector circuit shown in the diagram. Ex-

(Continued on page 37)

"Hello, Ed's TV? About this problem of my picture pulling . . ."

Continued from page 34
periment with various values of resistors and capacitors until you get the best results. Good luck Charlie.



CYCLE COUNTING DETECTOR

Tape's Here to Stay

Could you supply me with the name of a company or companies which manufacture and sell home record cutters?

—G. J. D., Toledo, Ohio

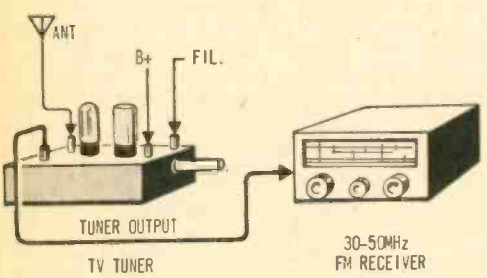
Nope. Only pro jobs available nowadays.

Unseen Commercials?

How can I receive just the sound from TV stations?

—S. S., South Bend, Ind.

Get a hold of a TV tuner somewhere and connect its output to the antenna terminals of a 30-50 MHz tunable FM communications receiver. Apply filament and B+ power to the tuner and set the receiver to the output IF of the tuner (around 45 MHz). Hook an antenna to the tuner, switch it to an active channel and you should be in business—but why bother?



Fringe FM

What can I do to improve the reception of my FM auto radio? I am using a 31-inch fiberglass antenna. I don't live in a fringe area.

—K. C., Leechburg, Pa.

Judging from an atlas, you are in a fringe area for picking up Pittsburgh FM stations with a car antenna. There are intervening hills and vegetation which have an adverse effect on VHF (FM-band) reception.

Canned Ham?

What company puts out a recorded general class amateur radio operator license course?

—J. C., Pea, Mo.

Don't know of any. Sounds like a great idea. Someone should do it. There are several code courses listed in electronics mail order catalogs. Pick up a headset at the same time and spare the family from *de-dah* noises.

Shocking!

Do you have any information on methods to combat excessive static electricity for an operator of buffing and polishing machines where the product is cleaned in gasoline? Is static electricity conductible by "wiring" the operator back to the press? Is this safe—in the event something should happen to the machine?

—M. M. A., Fayetteville, Ark.

In plants where static is a problem, special conductive shoes are worn by personnel who stand on grounded metal plates. For considerable information on static, write to National Fire Protection Association, 60 Battery March St., Boston 10, Mass. They have a publication, identified as 77-M, which is supposed to cover the subject quite well.

Lots a Space?

I have a National 188 receiver and would like to put an antenna in my window instead of putting out 100 feet of wire outside.

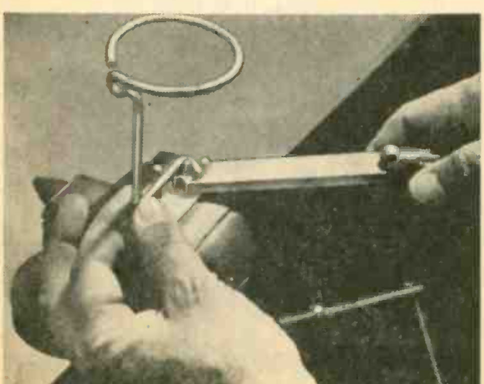
—P. T., Fargo, N. D.

You'll get much better results with an outside antenna. You should have plenty of room for one out there in North Dakota. Window antennas are what a New York cliff-dweller must put up with. But why you? ■

"A new squawker and woofer I can live without!"

Shape Up, Men!

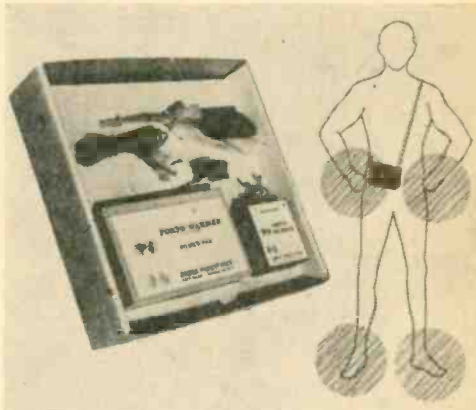
You can save heaps of time and money with the Wireformer. It bends, it straightens, it cuts —with this simple tool you can make your own peg-board hooks, shelfhangers, shelves, clamps, handles, etc. Wireformer works with any size wire up to $\frac{5}{32}$-in. diameter in any metal, including coat hangers. 'Twill bend in any shape, from a closed eye $\frac{3}{16}$-in. in diameter to a large perfect circle as large as the length of the wire permits. All parts are case-hardened, cold-rolled steel and the handle is plastic. Fits in your pocket. You can get the Wireformer, complete with illustrated instructions for precision forming and a special adapter for small size wire, direct from the manufacturer—Vinkemulder Mfg. Co., 917 Princeton Blvd., Grand Rapids, Mich. 49506—for a mere $3.98.



Vinkemulder Wireformer

Rechargeable Human Toaster

The Porto-Warmer from Esdee Industries will keep you snug and warm by means of a pocket-size power pack connected to thin warming pads. Back from the game or the hunt, you simply connect the power pack to the 117-VAC recharger. The 6-volt power supply produced over 1200 total hours of heating, at 6 hours use per charge. The heating pads are waterproof. The Porto-Warmer, complete with power pack, recharger, heating pads, and shoulder strap is available for $39.95 postpaid from Esdee Industries, 9219 W. Pico Blvd., Los Angeles, Calif. 90035.



Esdee Industries Porto-Warmer

Bingo Bango Bongos

New kit in the EICOCRAFT line is the Model EC-1600 Solid-State Bongos, $7.95, consisting of battery-operated, transistorized oscillators plus preamplifier. When touch plates are tapped the percussive sounds of bongos, tom-toms, etc., are electronically reproduced (can attach to any guitar amplifier, hi-fi system). Two other new EICOCRAFT kits are the

EICO's Eicocraft TruKits

☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆☆

Model EC-1400 FM Radio, $9.95, and Model EC-1500 AM Radio, $7.95. Both operate on respective broadcast bands, are battery-operated and tunable, and are employable as personal radios (earphones supplied), tuners, or wireless intercoms. No technical knowledge is needed. Step-by-step instructions are in each package and only a soldering iron and diagonal cutters are necessary for assembly. At distributors or write to EICO, 283 Malta St., Brooklyn, N.Y. 11207.

Set Your Head for Hi-Fi

Pioneer Electronics has brought out an impressive-looking headset in an elegant black Scotch-grain, satin-lined box for the low tab of $29.95. Model SE-30 is stereo, and has washable, comfortably thick ear cushions. Highly-styled in black, white, and chrome, the set has a frequency response of 20 to 20,000 Hz. Obtainable from local Pioneer dealers, or write: Pioneer Electronics, 140 Smith St., Farmingdale, N.Y. 11735.

Pioneer Model SE-30 Stereo Headset

The State? Solid! The Sound? Stereo!

The 1968 Knight-Kit Model KG-980 50-watt stereo-FM receiver is designed to include top features in the state of the art at a mass-market price, $149.95. The KG-980 uses all-silicon transistors and has transformerless driver and output circuits, so there is virtually no hum

Knight-kit Model KG-980 Stereo-FM Receiver or distortion. Frequency response is within 1 dB from 18 to 30,000 Hz. The FM tuner has a 4-stage front end, including two RF stages. Circuit automatically switches to stereo and an indicator light goes on when a stereo station is tuned. The critical FM front end and IF sections are factory-assembled and aligned. Other features: precision tuning meter, speaker muting switch, tape monitor, front-panel stereo headphone jack, and positive-action rocker-type switches. Inputs include magnetic phono, tape monitor, and auxiliary (ceramic phono). At all Allied distributors, or you may request Catalog No. 270 for more dope on the KG-980. Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

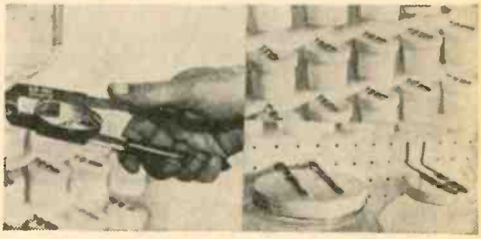
Be Scotch With Your Stickum

"Scotch" brand electrical tape now comes in a fully-enclosed plastic tape dispenser. Designed for electrical, household and marine applications, the rigid plastic dispenser is reusable and gives permanent dust and edge protection to the enclosed roll of tape. The dispenser has a flat bottom so it won't roll and a recessed sharp-tooth cutting bar. Each dispenser holds 60 feet of ¾-in. "Scotch" black vinyl plastic electrical tape No. 33. At dealers everywhere for $1.49; quantity lots available in 12-roll displays and in 24 and 48 display units. For further info write Dept. E17-39, 3M Co., 3M Center, St. Paul, Minn. 55101.

"Scotch" No. 33 Electrical Tape

Thrown for a Looper

A very handy tool for the hobbyist is the *LID L' LOOPER*, which forms a loop on jar lids, allowing them to be hung on a wall. Large enough to slide onto a pegboard hook or 8-penny finishing nail, the loop is easily formed by placing the lid between the handles of the *LOOPER* and squeezing. Such a loop is capable of supporting 50 pounds. At the quite low price of $2.50, you get the *LID L' LOOPER* by writing to Dahl Enterprises, Box 708, Hawthorne, Calif. 90250.



Dahl's L' Looper in action (left)
Results are shown at right!

Be a Square and Make Waves

At the very reasonable price of $75.00, the Knight-kit Model KG-688 Sine/Square Wave Generator will provide a signal source for all kinds of electronic equipment: audio amplifiers, transducers, sonar and supersonic apparatus, servos, video frequency circuits and low radio-frequency equipment. Sine wave frequency range from 20 Hz to 20 MHz includes the entire AM broadcast band. The square wave frequency range is from 20 Hz to 200 kHz. The KG-688 uses all silicon semiconductors with an FET (field effect transistor) in the Sulzer oscillator circuit. Operators will like the 6:1 ratio planetary-ball, antibacklash vernier drive and the convenience of a detachable line cord which

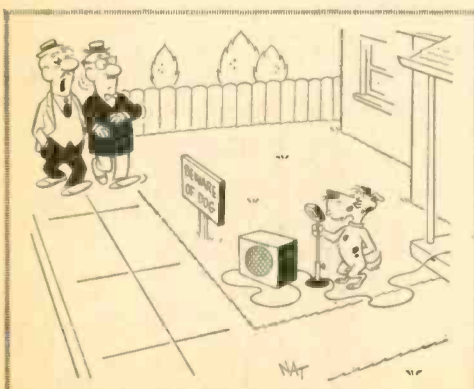
Knight-kit Model KG-688 Sine/Square Wave Generator can be stored when not in use. The cool-running instrument measures a mere 7⅜ x 7¾ x 10¼ in. Power requirements: 100-130 V, 50-60 Hz AC. Available from Allied Radio Corp., 100 N. Western Ave., Chicago, Ill. 60680.

Mini-Priced Maximus

Do you have champagne ears and a beer pocketbook? UTC Sound has a new line of compact and bookshelf speaker systems under their Maximus label with most attractive prices. Pictured is the Maximus 22, a two-way system for $39.95. Maximus 33 and 44 are $56.00 and $76.00, respectively. Maximus 55, at $99.50, is

UTC Sound Maximus 22 Speaker System

a full three-way system which may be used horizontally on bookshelves, or free-standing in a vertical position. All units have the acoustic suspension principle. But the manufacturer claims higher effectiveness than is usual with this type, and says their design permits the use of these speakers with amplifiers of relatively low power. All units have removable grilles and oiled walnut cabinetry. At most stores, or contact UTC Sound, Div. of TRW, 809 Stewart Ave., Garden City, N. Y. 11530. ■



"Oh, don't worry! His bark is worse than his bite."

BOOKMARK

BY BOOKWORM

This ol' Bookworm is working hard. So many good books are being published that the Editor said, "Okay, give some extra coverage." But then he has to be nice to me, because he goofed in the last issue. Get all the facts from his editorial "Positive Feedback" on page 21.

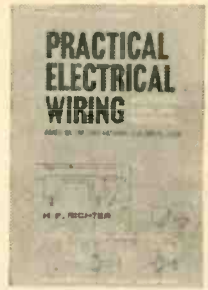
Amps Amplified. Many audio fans and experimenters want to enjoy the pleasure of designing and building their own audio amplifiers *from the ground up*, and the ol' Bookworm is no exception. To do this, we need more than an explanation of how an audio amplifier works. We need a practical understanding of audio equipment design and a simplified method of arriving at the numerical values of the various components. *Audio Amplifier Design*, by Farl J. Waters, fulfills these needs in a "one-book design course" showing how to design amplifiers from a single stage to a complete, multi-stage stereo system.

Soft cover
160 pages
$4.25

Each stage of an audio amplifier is first discussed in theory; then design methods are illustrated by working an example to show how component values may be determined. Finally, a design problem is tackled and solved. A feature that will appeal to those who find mathematics distasteful is the generous use of nomographs throughout the book. With these, problems can be solved merely by laying a straight edge across appropriate values and reading off the answers.

Copies of *Audio Amplifier Design* are available from electronics parts distributors and bookstores throughout the country, or from the publisher, Howard W. Sams & Co., Inc., 4300 W. 62nd St., Indianapolis, Ind. 46206.

Not New, but Great! When a book comes up for its *Seventh Edition*, this ol' Bookworm looks upon it as an old friend that's found the Fountain of Youth. *Practical Electrical Wiring* by H. P. Richter has been completely revised and updated to conform to the latest National Electrical Code. The text, designed as an instruction manual, enables the reader to learn electrical wiring in a practical fashion, for homes and farms, as well as for industrial and commercial structures, schools, and churches. Using a logical step-by-step procedure, from principle to method to execution, the author tells not only how to do things, but also clearly explains why.



Hard cover
594 pages
$8.50

Practical Electrical Wiring consists of three parts: Fundamentals of electrical work, terminology, basic principles, theory; wiring of residential buildings and farms; wiring of non-residential buildings. Major topics covered include theory, basic principles, measurements, power factor, transformers, circuits, overcurrent devices, wire sizes, connections, joints, grounding, switches, wiring methods, lighting, motors, appliances, power plants, and factories.

Most book stores will carry this valuable text and reference book. If you can't find it, write to McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. 10036.

Zeners Again. A completely new *Zener Diode Handbook* has just been published by Motorola Semiconductor Products Inc. This handbook supplies applications information for the widespread product advances in zener di-

Soft cover
Spiral bound
191 pages
$2.00

odes and zener-like devices. It covers applications for temperature compensated zeners, reference standards, current regulator diodes, and zener transient suppressors as well as the latest types of zener diodes.

The handbook is organized to give the circuit designer all the data necessary for the efficient use of zener components with the major emphasis on circuit design. Proven, basic circuits are also provided as take-off points for the designer's own requirements. You may find your next project diagrammed in this text.

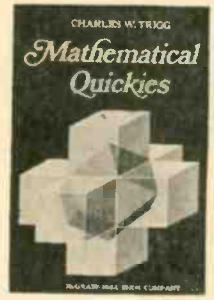
Chapters important to the experimenter include information on zener diode theory, zener characteristics, applications, and a cross reference-selector guide for zeners.

The *Zener Diode Handbook* is available from franchised Motorola distributors or the Technical Information Center, Motorola Semiconductor Products Inc., Box 13408, Phoenix, Arizona 85002.

By the Numbers. *Mathematical Quickies*, a diverse and intriguing collection of problems, offers a double challenge to the math puzzle enthusiast. The author, Charles W. Trigg, Dean Emeritus, Los Angeles City College, has for over thirty-five years been familiar to the readers of the problem section of various mathematical magazines. He has published over 600 articles and problem solutions and has proposed over 300 challenge problems in domestic and foreign mathematical periodicals. From his collection of over 16,000 problems he has selected 250 for the inclusion in his book. Although the problems are interesting in their own right, the emphasis is on the method of solution, thereby challenging the reader not only to solve the problems, but also to devise neater, quicker, more elegant solutions than those provided.

The problems involve elementary concepts in

the fields of arithmetic, algebra, plane and solid geometry, trigonometry, number theory, and general recreational mathematics, such as dissections, cryptarithms, and magic squares. A variety of methods of solution are employed—some conventional, some unorthodox though



Hard cover
210 pages
$7.95

mathematically sound—but the same special technique is seldom used in more than one solution. Since part of the challenge in solving problems is to identify the most appropriate mathematical discipline to use, the problems have not been segregated by field. The order of difficulty varies from the very simple to some that will challenge the graduate student. Difficult problems are interspersed with easier ones throughout. Approximately one third of the solutions and many of the problems are new.

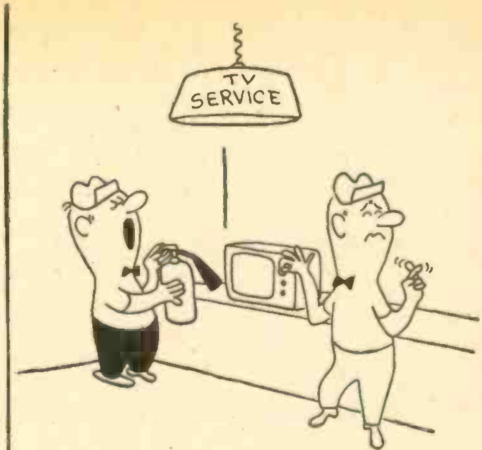
Mathematical Quickies is divided into two sections: The first consists of challenge problems consecutively numbered; the second contains the quickie solutions correspondingly numbered. Passage from problem to solution and vice versa is facilitated by the problem titles and the dictionary style page headings. The problems are clearly and concisely stated and illustrated where this will facilitate understanding.

Check your local bookstore for this book or write to McGraw-Hill Book Company, 330 W. 42nd St., New York, N. Y. 10036.

"Enough! You have to stop talking to hear the playback."

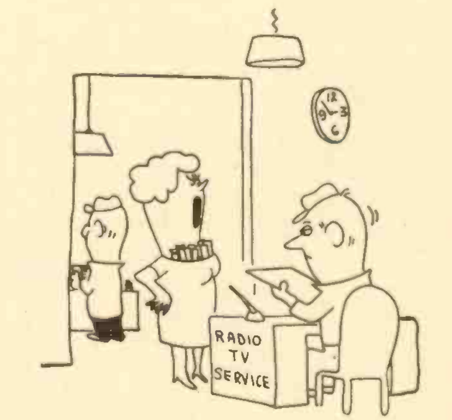
What A Way To Earn A BUCK

By Gene Lyons



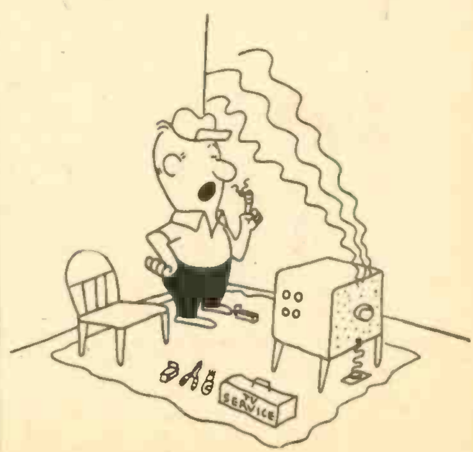
"Now!"

"Well, with a list that long, your TV needs a mortician, not a technician!"



"Enough is enough! Will you please get that new technician a tube caddy?"

"Look, lady, when I work on this model, I always bring my lunch!"



"Oh yeah, I've got to replace that shorted electrolytic capacitor."

Radio-TV FEBRUARY-MARCH
EXPERIMENTER

"Down with California kilowatts!"
squeak the QRPers.
Their argument:

Peanut Whistles Spell Progress

By Robert M. Brown, K2ZSQ

■ What's that? Talk halfway around the world with a peanut-whistle rig? Preposterous as this may seem, hundreds of low-power ham addicts are doing it every day—and to the confoundment of their kilowatt counterparts. Using in most instances only a single transistor or tube in the final of a home-brew transmitter, these chaps are racking up contacts all over the U.S., not to mention Britain, Germany, Czechoslovakia, and even Australia.

Key to this organized underground is challenge. In a world where just about everything is hell-bent on high power, these fellows—many of them in their teens—pride themselves on their operational skill and knowledge of propagational techniques. Kilowatts? Who needs them!

"If you're a polished operator who knows how to pull signals out of the noise level, you're halfway there," argues famed low-power addict W3RZL.

Up With QRP! Known in ham circles as "that crazy QRP crowd," the scattered group of die-hard anti-power enthusiasts insists that Federal Communications Commission is responsible for the whole thing. And well it may be. For hidden amongst paragraphs of regulations pertaining to amateur radio in the U.S. is a clause which states that "only so much power as is necessary to establish contact shall

(Continued overleaf.)

be used by participating stations." Of course, everyone knows that this clause runs unenforced, but the flea-power boys have formally adopted it as their motto. "Down With California Kilowatts" and "Switch To QRP" are more than mere slogans to the peanut-whistlers!

Another argument is the very definition of QRP itself. One of a series of Q-signals, this three-letter combo is used as an abbreviation for "Decrease Power" or "Must I Decrease Power?", depending on whether it is followed by a question mark. Like the other Q-signals used extensively in CW work, it makes for quick transmission of commonplace messages; it also eases communicating with a foreign counterpart who might not understand if everything were spelled out. But the fact that QRP is included at all in the official International Q-Signal List convinces the low-power crowd that flea-power is more than an integral part of hamming—it's a worldwide movement!

In With The Best. To add insult to injury, the low-power enthusiasts are constantly chalking up real names for themselves. News spread like wildfire when a certain 5-watter in Mozambique managed to work all Continents on 20 meters during one ten-hour stint. Others have embarrassed technicians time and again by shifting to the bands above 50 MHz and piling up rare states and counties using a bare minimum of RF output.

Even more incriminating (so far as the rest of hamdom is concerned) are the staggering totals these fellows rack up during on-the-air Sweepstakes and VHF Contests. In recent years, nearly every coveted ham award (Worked All Continents, Worked All States, Worked All Counties, etc.) has been picked up by at least a few very-low-power hams bent on "destroying the myth that you need 500 watts to call yourself a radio amateur."

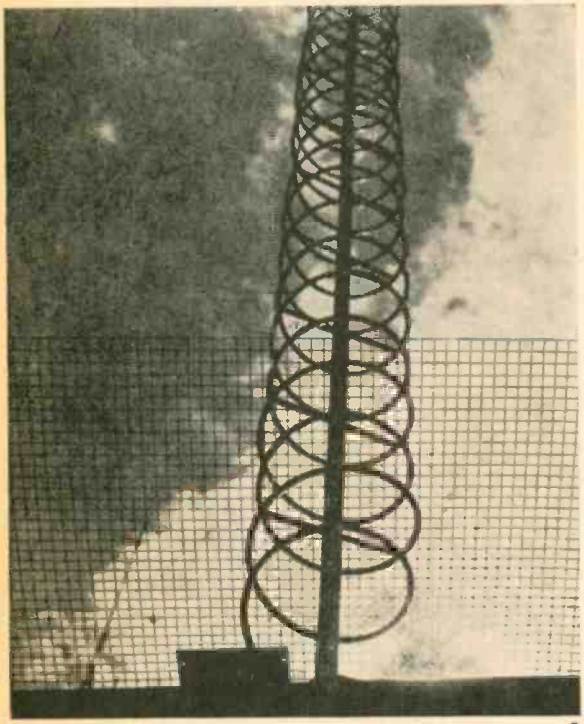
Actually, under a kind of unwritten inter-

1

2

3

1—Check, check, and recheck again! Flea-power mobileers, a rapidly growing group, delight in constantly retuning their trunk-mounted rigs for maximum signal output. 2—Typical QRP enthusiast uses minimum of equipment. The secret? Operational skill. 3—Basically a phone setup, this is shack of QRPer Ken Bourne, K9GHR, Lombard, Ill.



4

5

national agreement among hams, anything under 100 watts to the final of a transmitter can technically be referred to as QRP. And indeed when QRPism was in its infancy it abounded with 90-watters and the like who delighted in setting themselves off from the rest of the hobby by proclaiming "Up With QRP!" This, however, was short-lived. Today, top-eschelon flea-power addicts pride themselves in the latest state-of-the-art gear—much of it involving not mere transistors, but such devices as field effect transistors (FETs) and linear integrated circuits (ICs). Power levels generally run under one watt to the antenna. And while the 75- and 90-watters are still around, QRPdom's undisputed leaders are the semiconductor experimenters and propagational experts.

Flea Heroes. To the uninitiated, the "bible" of flea-power hamming is something called *Antennas*, a thick book written by John Kraus which deals exclusively with the problems of antennas and related subjects. Hard-core QRPers quote Kraus as frequently as today's in-crowd talk about Marshall McLuhan, devoting every waking hour to still another interpretation of what Kraus really means about low angles of radiation, 11-degree Yagi tilts, and the like.

To understand this devotion to a hero, you must first realize that a flea-power ham relies almost entirely upon his transmitting/receiving antenna for his success. The antenna is his mark upon the world (to say nothing of his neighborhood). His ham shack abounds with feedline indicators, neon bulbs, scratch paper with such jottings as "34 wavelengths = 10,645 feet," and the almighty SWR meter.

To compare Kraus with standing waves would be like talking about Henry Ford and gas mileage all in one breath. But the plain fact is that achieving a perfect 1:1 SWR is to a QRPer what getting 32 miles per gallon is to a Volkswagen owner. Maximum efficiency and energy transfer to the antenna are bywords that are all-important to the low-power boys, and the less wattage that is generated, the more crucial these factors become. If you're willing to settle for a 1.5:1

4—Believe it or not, you're looking at WA2FSQ/WB2DIE's 22-turn helical array, a formidable circularly-polarized radiator that would make the most devoted VHF flea-power addict's mouth water with envy. With 20 dB of gain, who needs a kilowatt? 5—What those Europeans won't try! The rig: a 1-watter. The site: the Austrian Alps.

Peanut Whistles

SWR or couldn't care less about multiple-wavelength feedlines, you'll never cut it with this crowd.

Second only to Kraus and his fervent group of rooftop followers is the Ultimate Reception Society, an informal group of QRPers who insist that "you can't work 'em if you can't hear 'em." These devotees will spend $3000 on the latest in a solid-state communications receiver with product detectors, automatic noise cancellers, and panoramic adaptors, yet invest perhaps $13 in their transmitter. Unlike the antenna people, this group has no permanent leader, though it tends to adopt certain favorites as the state-of-the-art advances.

Recently, for example, the URS boys are turning to Allen Katz, K2UYH, for guidance and direction. Katz, who innocently interpreted and publicized the wonders of a sophisticated receiving technique known as *synchronous detection*, presently finds himself receiving piles of mail from low-power hams who want to know how *they* can improve their receiving setups.

Unfortunately, Katz tends to talk in graphs and formulas, spouts such things as "equalization techniques" and "opposite pulsing," and generally requires interpretation by learned persons adept at translating engineering advances into ham-type practicalities. Understandably, then, anyone who can authoritatively quote Katz will most certainly be invited as a guest speaker at the next club meeting. In interviewing K2UYH for this article, however, we found the man personable and enthusiastic about his work and eager to pass on his findings to QRPers.

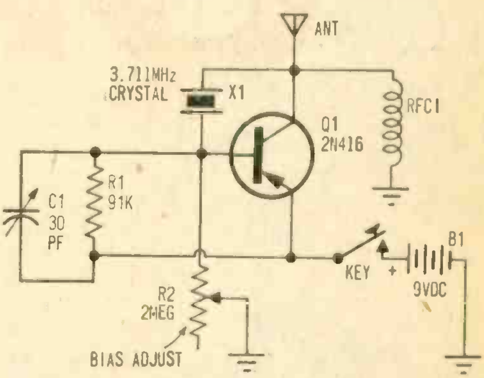
"What everyone seems to be forgetting," he states emphatically, "is that ultimate receiving equipment is still no substitute for a truly skilled operator." How many hams

(Continued on page 127)

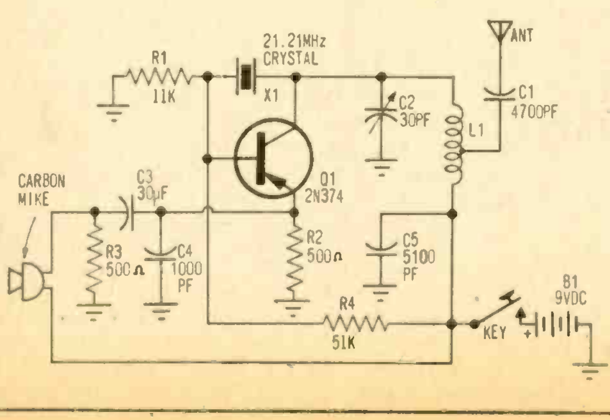
TWO SIMPLE RIGS FOR QRPing

PARTS LIST

B1—9-volt battery
C1—30-pF trimmer capacitor
Q1—2N416 transistor
R1—91,000-ohm, ½-watt resistor
R2—2,000,000-ohm potentiometer
RFC1—2.5-mH RF choke
1—key



One of smallest rigs going (above, right), this simple 80-meter job works with any standard crystal cut for 3.5- to 3.8-MHz CW band. Below, flea-power 21-MHz DX rig is equipped for both phone and CW; crystal can be any 15-meter, third-overtone type.



PARTS LIST

B1—9-volt battery
C1—4700-pF capacitor
C2—30-pF trimmer capacitor
C3—30-uF, 15-VDC electrolytic capacitor
C4—1000-pF capacitor
C5—5100-pF capacitor
L1—17 turns of B&W #3007, tapped 8 turns from bottom
Q1—2N374 transistor
R1—11,000-ohm, ½-watt resistor
R2, R3—500-ohm, ½-watt resistor
1—key (also acts as on/off switch on phone)
1—carbon microphone

COVER STORY

MINI-MITE QRP

By HOWARD S. PYLE, W7OE

■ QRP? An expression rapidly becoming popular in the dedicated Ham circles of low-power transmitter enthusiasts to describe flea-powered rigs . . . less than 10 watts input. And along with mini-cars, mini-skirts and the general trend to "mini" this and "mini" that, QRP Ham rigs are taking their place in the field of "Now you see it—now you don't."

Our little *Mini-Mite* really takes the cake with 15-, 20-, 40-, and 80-meter amateur CW bands instantly switchable from the front panel. The rig is adaptable to any type of antenna with no external matching units or similar gimmicks to fool with, and it provides instant choice of internal power source or external supply! In other words, *muchum en parvo*, or something like that, which, in the Italian language is supposed to mean "much in little." And all in an enclosure only 4 x 4 x 6 in. Want to hop on the QRP wagon?

Mini-Mite Autopsy. Let's play surgeon and start with the internal organs: they are as vital to *Mini-Mite* as the heart and lungs in a human. Unlike the human, however, this little jewel has four hearts; each a complete transmitter in its own right.

Basically, these "hearts" are the recently introduced of-

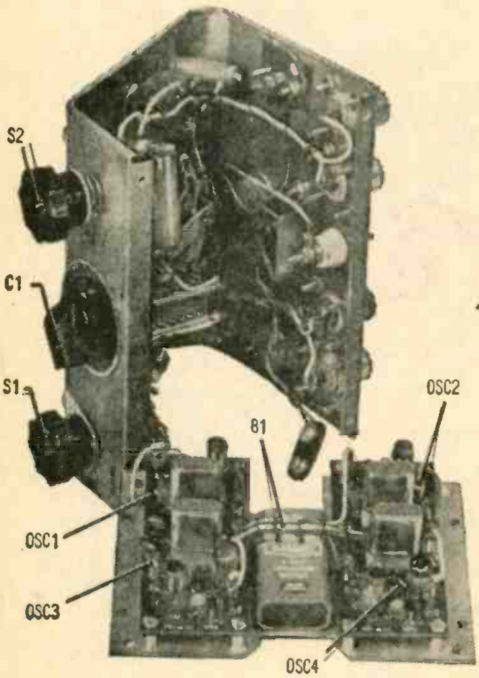
MINI-MITE QRP

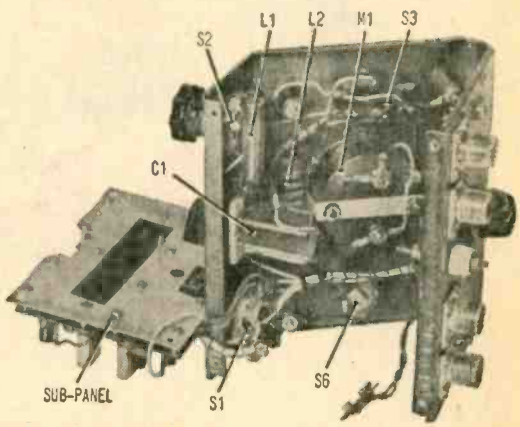
ferings of the International Crystal Manufacturing Co., and are known as the *OX Oscillator Kit.* Each is a self-contained transistor oscillator mounted on a neatly lettered printed circuit board only 1½-in. square! These are available for any frequency you want within a range of 300 to 60,000 kHz.

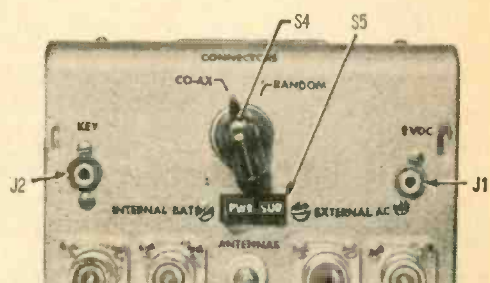
Fundamental crystals are used on all frequencies—you can use your own crystal or International's EX type—the choice is yours. Each complete oscillator kit costs but $2.35, which includes the transistor, printed circuit board and all components except the crystal. We stole a march on International as apparently these were designed solely for test oscillators with no thought of their communications possibilities.

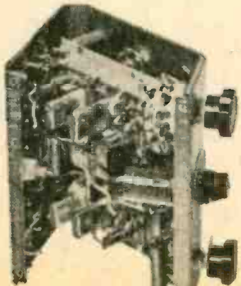
But with an input power of 1.2 watts using a 6-volt DC power source, and up to 1.8 watts with a 9-volt supply, the author has confirmed contacts of 1100 miles on 15 meters, 600 on 20 M, 300 on 40 M and 200 miles on 80 M. That's bad?

Making Mini-Mite. It will take you about twenty to thirty minutes to assemble and solder each kit from the simple instructions supplied. The four little units are then mounted on an aluminum sub-panel as shown in the photos. For those who want to duplicate the mechanical essentials of *Mini-Mite,* included is a dimensioned drawing of the sub-panel. This is really all the mechanical









A glance at schematic (above, far right) reveals that Mini-Mite actually consists of four separate oscillator assemblies (OSC1 through OSC4) powered by a single battery (B1). As photos show, oscillators and battery are mounted on sub-panel, balance of components on chassis box itself. Detail of aluminum sub-panel appears in drawing.

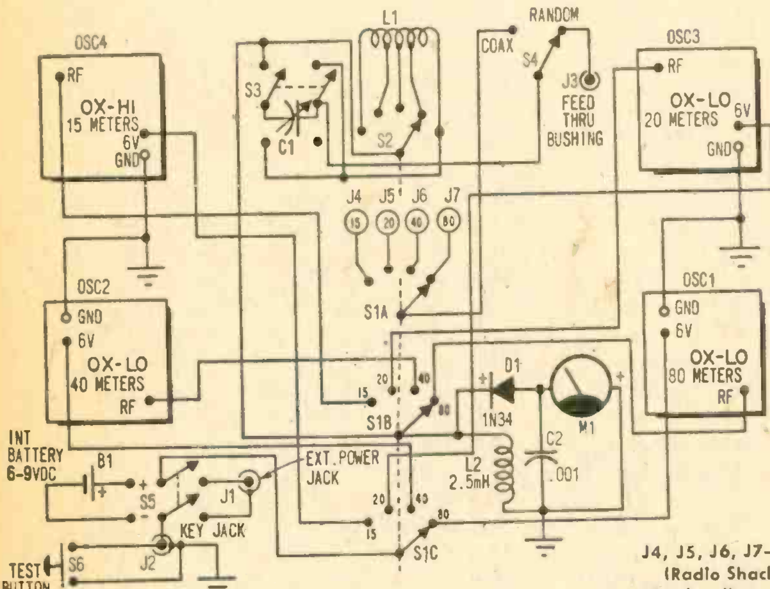
detail needed as any type of enclosure can be used and any parts of the non-critical type, such as switches, connectors, etc., that your junk-box may produce can be substituted. For these, you can easily work out your own component placement and drilling templates to match. Mounting screws and metal spacers are furnished with the oscillator kits, so no problem there.

By using a sub-panel, wiring is perfectly straightforward and there's little of it as the schematic indicates. Make all the internal connections you can before securing the sub-panel to the enclosure. In the prototype, the sub-panel is mounted with four 1½-in. lengths of 8/32 threaded brass rod (most any hardware or Ham supply house carries it).

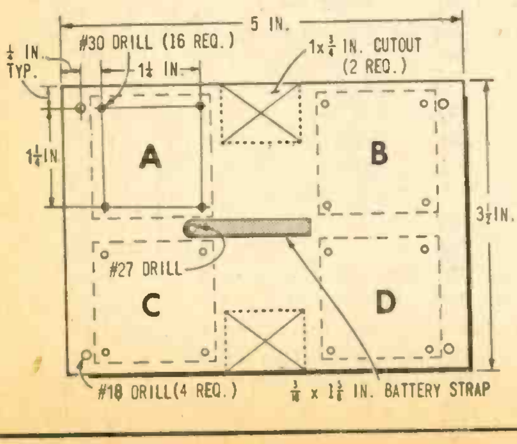
The sub-panel is spaced from the front panel with 1-in. spacers cut from ¼-in. copper tubing. An acorn nut on each end of the threaded rod holds the whole assembly firmly in place. The little 9-volt transistor battery, which serves as the internal power supply, is mounted on the sub-panel between the two pairs of oscillator boards. Incidentally, these batteries will last quite a while since current drain is only 20 mA and this, of course, is only in the "key down" condition.

The battery supply lets you take *Mini-Mite* with you on hunting, fishing and camping trips to keep contact with home base. Taking a couple of extra batteries along just to play it safe is a good idea if you're making an extended stay.

QRP Power. When using Mini-Mite at the home base, a conventional rectified AC



Schematic of Mini-Mite. Switch S1 selects any of four amateur bands—15, 20, 40, or 80 meters.



PARTS LIST

B1—9-VDC transistor battery (Eveready 216 or equiv.)
C1—100-uF variable capacitor (Lafayette 40C2885 or equiv.)
C2—.001-uF, 600-VDC capacitor
D1—1N34 diode
J1, J2—RCA-type phono jack, insulated mounting
J3—Feed-through connector, insulated (Lafayette 33C-3201 or equiv.)
J4, J5, J6, J7—75-ohm coax connector, SO-239 (Radio Shack 278-201 or equiv.)
L1—Loading coil, 72 turns #28 enameled wire on ⅜-in. form
M1—Field-strength meter (Shurite 8903Z or equiv.) (available from Shurite Meters, Box 1818, New Haven, Conn. 06508 at $4.50 postpaid)
Osc. 1, 2, 3, 4—OX oscillator kit, 3 OX-LO, 1 OX-HI (available from International Crystal, 10 N. Lee, Oklahoma City, Okla. 73102 at $2.35 ea. postpaid)
S1—3-pole, 4-throw single deck rotary switch
S2—5-position, 1-pole rotary switch (Lafayette 30C4013 or equiv.)
S3, S5—D.p.d.t. rotary or toggle switch
S4—S.p.s.t. rocker or toggle switch
S6—S.p.s.t. normally open pushbutton switch (Radio Shack 275-008 or equiv.)
Misc.—Wire, solder, 4x6x4-in. sloping-panel chassis box, decals, etc.

supply can be used to conserve the battery. Rather than build a little power box, the author used a *Radio Shack 22-023* regulated, variable-voltage transistorized DC power supply. This makes a perfect companion unit for *Mini-Mite* and will serve equally well as a power supply source for experimental transistorized equipment. This supply provides up to 20 VDC at 200 mA with exceptionally smooth control, and is more than adequate for most transistorized gear. Equipped with a meter that reads both volts and milliamperes, it makes a convenient way to check your power input instantly. Selection of either the internal battery power or the external AC source is accomplished by a d.p.d.t. rocker switch on the rear panel.

Note that *Mini-Mite* is equipped with four coax connectors and a feed-through insulator for antenna connections, all in line on the rear panel. This you can take or leave. It happens the author has four dipoles (one for each band) and preferred to leave *Mini-Mite* semi-permanently connected at the home station, hence the four coax connectors.

Any Old Antenna. The feed-through insulator provides for connection to any random length antenna for portable operation. The s.p.d.t. rotary switch in the top center of the rear panel, labelled *COAX* and *RANDOM*, permits switching any oscillator output to the feed-through insulator or to the series of coax connectors. The band selector switch on the front panel has one section which selects the appropriate coax connector for the band selected.

A second section on the band selector switch connects the positive lead from the power source to the oscillator assembly used for that band. The negative voltage is applied only when the hand key or test button is pressed; the power source, of course, remains idle at all other times. The third section on the band selector switch selects the RF output terminal on the desired oscillator and connects it to the radiating circuit.

While the oscillator functions on the fundamental of the crystal with no tuning adjustments, it does not necessarily mean that the most effective loading of the antenna will automatically result. This is particularly true when a random-length wire antenna is used in portable operation. Therefore, a means of resonating the antenna to the load will assist in getting maximum radiation characteristics. Accordingly, incorporated right in the *Mini-Mite* cabinet is an all-band L/C loading network that has proven most effective.

Not only has this L/C combination permitted resonating a random wire of reasonable length but has also proven to be of noticeable value when used with a frequency-conscious dipole or other conventional antenna.

Robust Radiation. Provision is also made for switching the antenna tuning capacitor in series with the loading inductance or in parallel across it, by means of a d.p.d.t. toggle switch. The inductance is adjustable in four steps by tapping the coil and connecting the taps to a 5-point rotary switch (single pole). By choosing the proper amount of coil inductance in combination with the variable capacitor in either series or shunt connection, proper loading of the antenna circuit is easily obtained.

The coil consists of a total of 72 turns of #28 enameled wire wound on two 3/8-in. diameter forms (wooden dowels), 36 turns on each. Splitting the coil makes it possible to fit it comfortably into the available space. Since the halves of the coil are connected in series, it is in effect a single inductance. Taps were taken at approximately equal distances along the length of the winding.

The meter is a desirable asset in tuning the antenna network and a resonant condition is indicated by the highest reading. This peak will be fairly broad but will vary from about quarter to half full scale reading on the meter selected, depending on the input voltage from the power source.

The meter used is a special field strength meter made by Shurite. If not available from local supply sources, it can be ordered directly from the manufacturer (see Parts List).

From the foregoing description, it should be simple to work up a reasonable facsimile of our *Mini-Mite* and enjoy a heretofore relatively unexplored and exciting field. There's a great deal of excitement in trying for the amazing results possible with an input power considerably less than that required for a conventional radio dial lamp! We suggest that in your initial efforts in the QRP field, first establish local contacts to get the feel of mini-power. Once you've mastered the simple QRP techniques, you're ready to demonstrate what the QRP Amateur Radio Club International often use as an unofficial slogan . . . "*POWER* is no substitute for *SKILL!*" Go to it, and good DX! ■

Short Wave for Non-SWL's

By Thomas R. Sundstrom

■ Today, one problem of the beginning shortwave listener (SWL) is that he's confronted with a confusing mass of information concerning equipment and stations to be heard. Also, though these beginners express a serious interest in SWLing, many soon fall by the wayside when their results fail to match the seemingly tremendous reports turned in by some of the old pros.

The beginning listener shouldn't be discouraged, since many of these top DXers have spent many years accumulating knowledge and experience of what to look for and when.

Another problem is that many listeners start SWLing with relatively inexpensive receivers, mostly those selling for less than $75. They often fail to realize that a 4-tube general coverage receiver that lacks an RF stage, selectivity provisions, a regulated power supply and other DX boosting circuitry just will not, under any circumstances, perform as well as an 18-tube giant that retails for $450.

Of course, when conditions are right, a small receiver can do wonders. For example, the author heard the Radio Nacional de España outlet on 684 kHz in Madrid, Spain one winter morning when 680 and 690 kHz were quiet. This was on the standard AM band and the receiver was a 4-tube clock radio!

DX Dollars. Of course, if the new listener is willing to invest just a little more money, he will find an excellent selection of receivers in a price range of $100 to $250. Both new and used receivers are available, and almost anything is better than the 4-tube job.

Older receivers can be an excellent buy since the previous owner may have traded one in just because he wanted a new model. Watching the classified ads in the local newspaper may turn up a used receiver faster than waiting for one in the local radio store; check out all the possible sources.

If you do purchase a used receiver, contact the local radio amateur club to determine who services communications equipment (or look in the telephone book). Normally, it is not a good idea to trust service work to the average local radio-TV repair shop, as most are not equipped to solve the problems pe-

One way to get started SWLing is with a homebrew regen receiver like this one. These sets often produce surprisingly good results.

Shortwave for Non-SWLs

culiar to these communications receivers.

You may find that a used receiver could use minor realignment and calibration before you start using it. The service man should be willing to discuss your prospective purchase and give you an estimate of cost involved.

Launching An SWL. To get the novice headed in the right direction, there are some preliminary items that ought to be mentioned. First, the receiver must have some degree of accuracy in spotting specific frequencies in order to be much good at locating desired stations.

If the receiver does not have a crystal calibrator built into the set, it would be very useful to purchase a separate unit. These can be had either in kit form or assembled; check the receiver manual to see if your rig has provisions for one inside the set before getting an outboard unit. Virtually all crystal calibrators are 100-kHz units, but the crystal can easily be changed to a 500-kHz unit if your receiver cannot separate the closely spaced 100-kHz signals.

With A Calibrator. By setting the main dial to the same point (one for each band) determined by the calibrator's marker signal appearing every 100 or 500 kHz, depending on the crystal used, the same frequencies will appear at the same bandspread dial settings each time you tune. Calibration graphs or tables can be prepared for receivers having a 0-to-100 bandspread dial. Once you are familiar with your receiver and you can use the crystal calibrator accurately, you are ready to go to work on locating some real DX.

Beginning listeners often just tune the shortwave bands at random and increase their total stations and countries heard by chance. But, if you plan your listening, much more can be accomplished. The organized approach requires some basic SW information as well as some means of updating the material.

For those who prefer to tune the SWBC bands, the SWL bible is the *World Radio-TV Handbook*, published annually in Denmark. This volume contains a complete listing of all broadcasting stations in the world, including schedules, addresses and reams of other helpful information. It does not cover U. S. and Canadian stations broadcasting on domestic (AM, FM and TV) frequencies, but these can be found in White's Radio Log. The *World Radio-TV Handbook* costs $5.95 from Gilfer Associates, Box 239, Park Ridge, N. J. 07656; ask about the Summer Supplement, too.

Ham Band Listening. If you are interested in the amateur bands, pick up one or both *Radio Amateur Callbooks*. Both are published quarterly, and may be obtained in almost any electronic supply house selling amateur radio equipment. The first callbook lists all the amateurs in the United States ($5.95) and the second lists amateurs elsewhere in the world ($3.95).

To up-date SW listings and other information, White's Radio Log and SWL club bulletins are the best sources available. There are

Knight Star Roamer · *Hallicrafters S-120* · *Heathkit GR-64* · *Lafayette HA-63*

A wide selection of receivers selling for less than $75 are available for the would-be SWL. Typically, these low-cost all-band receivers are a multi-band version of the all-American four-tube AC/DC table radio, though some use a power transformer.

The over-a-hundred dollar receiver will provide additional features, depending on price, that ensures the maximum in Hertz-snatching DX.

several fine SW clubs in the United States, and they have members from all over the world reporting each month. The Association of North American Radio Clubs (ANARC) is an organization of clubs; club representatives work together to better the lot of the SWL. Those clubs in the ANARC that have bulletins covering the SW field are the Newark News Radio Club, the American Short Wave Listeners Club, and the North American Short Wave Association, among others.

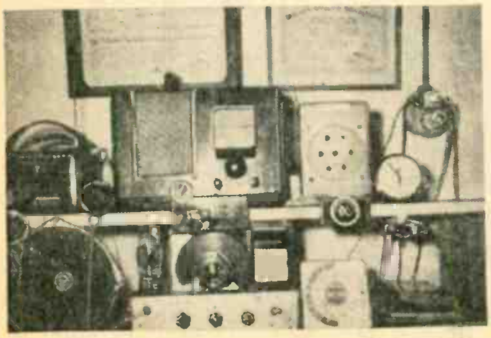
Clubs For SWLs. The Newark News Radio Club is the oldest SWL club in North America, having been established in 1927. Its monthly bulletin covers both SWBC and amateur DXing, as well as broadcast band, utilities, FM and TV. A sample bulletin may be obtained for 25¢ from the Newark News Radio Club, 215 Market St., Newark, N. J. 07101.

Incidentally, LeRoy Waite, NNRC amateur editor, works with Rod Newkirk of *QST's* column "How's DX?" Almost any amateur will have this magazine—perhaps you can borrow a copy to check the latest amateur news.

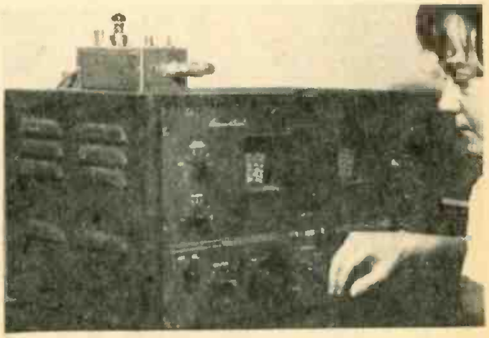
The North American Short Wave Association (NASWA) has a very fine SWBC-only bulletin. This club has grown rapidly in the last few years after changing from an all-band format. News is current and well-detailed. Write for a sample bulletin (25¢) to William P. Eddings, NASWA, Box 989, Altoona, Pa. 16601.

A very useful item for the SWL, this low-cost crystal calibrator is available from Allied Radio in kit form.

Another good club is the American Short Wave Listeners Club (ASWLC) that began operations in 1959. It, too, at one time dealt with all aspects of DXing, but in recent years the ASWLC has specialized in SWBC and utility band DX. For a sample bulletin



Many avenues are open to the SWL with a limited budget, such as this listening post equipped with vintage receivers obtained for next to nothing.



Another possibility for a low-cost/high-performance purchase for the beginning SWL is an ancient communications receiver like this old Hammarlund HQ-129-X.

Shortwave for Non-SWLs

(25¢), write to The Publisher, ASWLC, 16182 Ballad La., Huntington Beach, Calif. 92647. C. M. Stanbury II, whose articles frequently appear in RADIO-TV EXPERIMENTER, is an editor of this bulletin.

How can the beginning listener use all this information? It's really quite simple. The secret of a good session at the dials is organization.

Planning Your Catches. Examine the schedules of the stations in the countries you would like to add to your log. In the *World Radio-TV Handbook* you will find this information, as well as the stations' frequencies and slogans. Note anything peculiar about stations you want to bag. Compile another list from recent club bulletins, and check conflicts with the notes made from the WRTVH. Unless the reporter made a mistake, the bulletin's information can usually be depended on.

Arrange your listening notes by time. Having this information, you can tune your receiver to the best frequency—determined by Propagation Forecast in this issue—ahead of time, then just fine-tune the receiver when the interval signal opening the program begins. If the frequency you chose is not yielding a good signal, refer to your notes and select another frequency.

If reception conditions are such that it is impossible to hear the station you want, skip it for that day and go on to the next station on your list. If you check each day, you are bound to find conditions ripe to bag that elusive one.

When tuning the amateur bands, you have a slightly different problem. Obviously, Hams do not adhere to schedules and wander in transmitting frequency. However, there are various expeditions to remote areas or countries of the world that may have a Ham or two along and they sometimes announce preplanned transmission schedules and frequencies. Check *QST* for these; later, other ama-

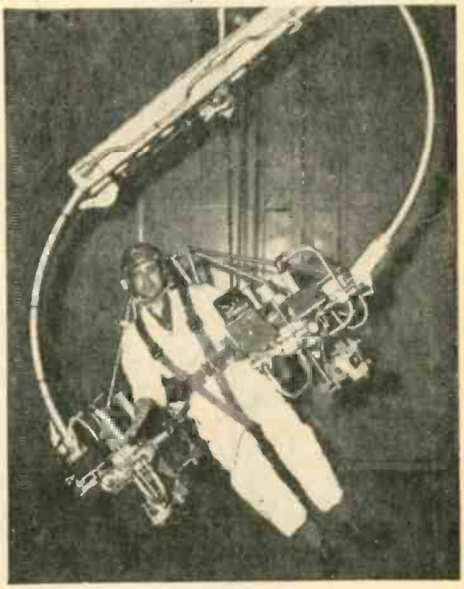
(Continued on page 130)

Some of those great old multi-band consoles are still around and can be had for a song. Look at the QSLs bagged with this one.

Commercial shortwave broadcasters all over the world are more than anxious to send the SWL a QSL card verifying reception; here are a few samples of what to expect.

3 WEIRDOS WE WONDER AT

FOR SPACE



Oversized tinker-toy makes mock up moon-jaunt for earth-bound spacemen

Lovely to behold, this clever device will give our spacemen lots of much-needed practice in the noble art of space-walking, which is somewhat different from other kinds. The setup here is a sort of simulator that approximates the conditions of weightlessness. If after carefully looking over this gadget, you're still a bit dubious about its value, don't be. At $280,000 it's a steal!

FOR INDUSTRY

How five million little data-bits went to Marlboro Country

Some sneaky scientists went and put five million bits of computer data on a piece of film in a container much like a pack of smokes. But caution: it may still be hazardous to your . . .

FOR HOME

Brotherhood, fraternity, and summer tang in winter fruit

If you thought that bread in every basket and copper-tone appliances in every kitchen were the standard bearers of the really Great Society, think again. It turns out that the mark of technological progress actually comes to us under the unassuming name of Gro-Lux. This end-all solution to everyone's problems puts cheer in your soul as it puts a healthy summertine glow on pale winter fruits placed in the bowl. How 'bout that!

CB Moonshine

By C. M. Stanbury II

It takes all kinds of people to make up the 11-meter band and I had to go tangle with the pea picker whose QSL card was as choice as his daughter!

■ "This is the Mountaineer calling, Mountaineer calling CQ. Anybody hear me out there?"

He pinned my S-meter as I snaked along West Virginia 17 on the East bank of the Kanawka River. Several times I'd worked him from California on skip, but now, here I was, right in the old man's back yard.

Mountaineer came back, and completely swamped channel 2. "I hear you New York. If you hear this old mountaineer, send him a QSL card." Like the FCC didn't exist. "Just send it to the Mountaineer, Seven Creek, West Virginia."

There were *actually* four guys from New York trying to work him.

I passed through a spot called Piny, which is right across the river from Buffalo. It was his QSL that brought me. I had sent him three of mine, one after each of our QSOs, but the mails had brought nothing back from Seven Creek.

He was on again. "Reason you hear the old mountaineer so good is because of my compressed modulation. Watch what happens when I spread it out to normal."

My needle dipped. A road sign ahead said *Seven Creek*. I swung off the highway hard-top onto a gravel one laner which led up out of the valley. Rumor had it that the old boy's QSL was something special, like solid gold maybe, or even some kind of a hillbilly Mona Lisa.

He returned my needle to the pin. "You see what I mean. And I build these little gadgets myself. They're my own invention." Paused for breath. "Sell em, postpaid, for 35 dollars cash." Big deep laugh. "Course I'll take a money order, too."

His "compressor" was an obvious fraud. All the old man did was push his power up a couple of hundred watts. Otherwise, it wouldn't show on an S-meter. Of course, there's another rumor that says unless you buy one of his "compressors," you don't

(Continued on page 131)

By Thomas R. Sear, WA6HOR

Two-Timer 'll Get You Traces by the Twos

■ Everyone agrees that the oscilloscope is by far the most useful and versatile instrument available for use by engineers, scientists, technicians, or hobbyists. With an oscilloscope, one can measure voltage, frequency, phase relationships, time, etc. You may not think that such an all purpose device could easily be improved on. However, for the electronics hobbyist the oscilloscope is not all that it could be.

High-class oscilloscopes used by electronics personnel in such places as calibration laboratories, repair shops, radar installations, etc., are equipped with a special feature that almost doubles their usefulness. These instruments have a dual-trace function that permits simultaneous observation of two different signals with different amplitudes and frequencies.

You can equip your own modest single-trace oscilloscope with this same unique function for a few bucks and half a dozen hours of construction time, and almost double its usefulness. Our Two-Timer described here is easy to construct, and no fancy adjustments are necessary.

The Circuit. Two-Timer's circuitry consists of a multivibrator (V1), two keyer stages (V2A and V3A), two signal amplifiers (V2B and V3B), and a full-wave solid-state power supply. The entire unit is contained within a 3 x 5 x 7-in. chassis box, which requires little area on your workbench, and uses only three vacuum tubes.

The operation of Two-Timer is straightforward. Referring to the schematic diagram, the initial stage (V1) is a twin-triode vacuum tube used as a balanced free-running multivibrator with a frequency of approximately 15,000 Hz. The two multivibrator square-wave outputs (taken from the plates of V1) are 180 degrees out of phase; i.e. when one output is + (positive) the other is — (negative), and vice versa. These two out-of-phase outputs are coupled to the keying stages (V2A and V3A) via C3 and C4, and are applied to the grids.

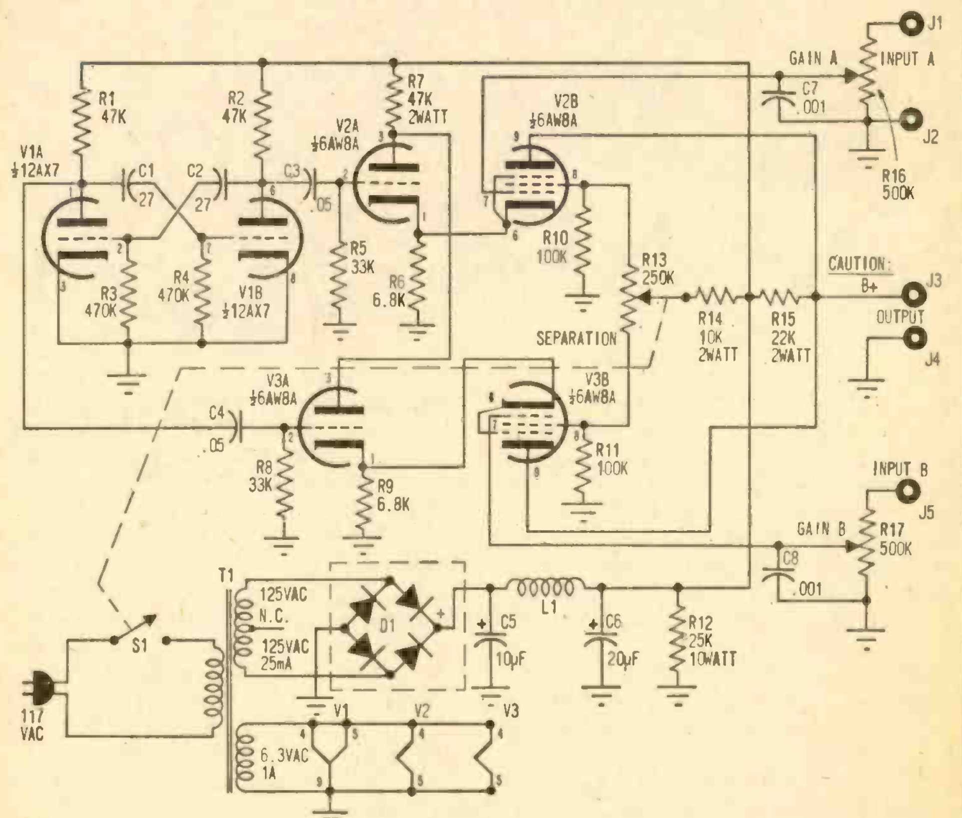
The keyer stages are the triode sections of triode-pentode vacuum tubes V2 and V3, and are used as cathode followers. The outputs of the two keyer stages are direct-coupled to the cathodes of the signal amplifiers (V2B and V3B), and maintain the phase relationship of the multivibrator outputs.

The keyer stages outputs alternately turn the signal amplifiers on and off at the multivibrator frequency (15,000 Hz), and in accordance with the multivibrator output's phase relationship; i.e., when V2B is turned on by V2A, and is passing its input signal on to the electronic switch output (J3), V3B is turned off by V3A, and is not passing its input signal on to the output. This condition is reversed 15,000 times a second. This means that the signals applied to the control grids of V2B and V3B are sampled 15,000 times each second, and alternately

Two-Timer'll Get You Traces By the Two's

applied to the electronic switch output from jack J3.

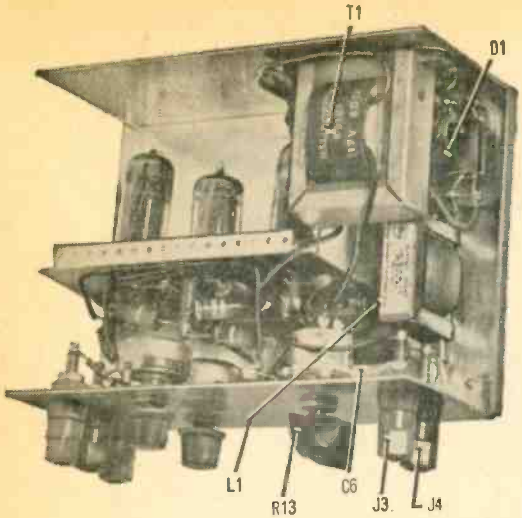
Electronic Switch. The signal amplifier input signals are applied to the control grids (pins 7), and come from the electronic switch *INPUT A* and *INPUT B* gain controls (R16 and R17), which control the amount of signal applied to each amplifier and, therefore, the amplitude of the output signals. R13 controls the DC levels of the two traces provided by the electronic switch by controlling the relative amounts of screen grid voltage applied to V2B and V3B. Without R13, the two output signals would be



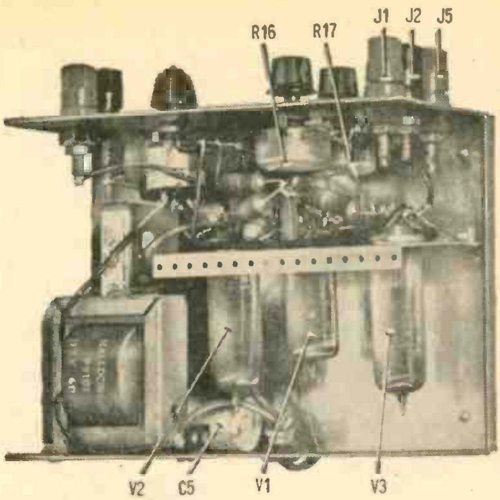
Schematic of Two-Timer shows straightforward approach to obtaining dual traces on a conventional single-trace scope. Unit is basically a high-speed electronic switch.

PARTS LIST FOR TWO-TIMER

C1, C2—27-pF, 1000-VDC capacitor
C3, C4—0.05-uF, 200-VDC capacitor
C5—10-uF, 450-VDC electrolytic capacitor
C6—20-uF, 450-VDC electrolytic capacitor
C7, C8—.001-uF, 1000-VDC capacitor
D1—400-PIV, 50-mA full-wave bridge rectifier
J1, J5—Binding posts, 3 red, 2 black (Radio Shack 274-736 or equiv.)
L1—7-H, 50-mA choke (Allied 54B1408 or equiv.)
R1, R2—47,000-ohm, ½-watt resistor
R3, R4—470,000-ohm, ½-watt resistor
R5, R8—33,000-ohm, ½-watt resistor
R6, R9—6800-ohm, ½-watt resistor
R7—47,000-ohm, 2-watt resistor
R10, R11—100,000-ohm, ½-watt resistor
R12—25,000-ohm, 10-watt resistor
R13—250,000-ohm, 1-watt potentiometer with s.p.s.t. switch S1
R14—10,000-ohm, 2-watt resistor
R15—22,000-ohm, 2-watt resistor
S1—S.p.s.t. switch (part of R13)
T1—Power transformer, 117-VAC pri.; 250-VAC, 25-mA and 6.3-VAC, 1-A sec. (Allied 54B2008 or equiv.)
V1—12AX7 tube
V2, V3—6AW8A tube
1—Chassis box, 7x5x3 in. (Radio Shack 77-0685 or equiv.)
3—9-pin miniature tube socket
Misc.—Wire, solder, knobs, rubber feet, line cord and plug, etc.



Most of circuitry is located on sub-chassis which mounts the three tubes. Nothing in circuit is critical and variations can be made.



If Two-Timer will see much continuous duty, holes should be drilled in cover above and below tubes to prevent overheating.

superimposed at the electronic switch output. By adjusting the DC levels of the signal amplifiers outputs, any desired amount of trace separation on the oscilloscope screen can be obtained.

The DC level of each signal amplifier output is modulated in accordance with the applicable input signal during the time that that particular amplifier is turned on for that "bit" of the signal output. Therefore, each time a signal amplifier is turned on the DC level of its output will have changed slightly as determined by the character of the input signal applied to the control grid. The DC level changes, or lack of them, will be displayed by the oscilloscope as a representation of the input signal, and is composed of 15,000 "bits" per second. This chopping of the signal into "bits" is the main limitation as to the highest frequencies that can be viewed using the electronic switch. As the frequency increases, the signal will be composed of fewer "bits" of DC level changes, and the display will not be an accurate representation of the signal applied to the input of the electronic switch. For example, a signal with a frequency of 500 Hz is composed of about 30 "bits" of information; at a frequency of 1000 Hz, this drops to about 15 "bits," and at a frequency of 5000 Hz, about 3 "bits." Since most hobbyist activities are at relatively low frequencies, the electronic switch should prove to be quite adequate.

Construction. In constructing the Two-Timer electronic switch, the positioning of the components is not critical. While the author chose to enclose all parts of the electronic switch within a box, an open chassis could be used at the discretion of the builder. The best procedure to follow is to determine the physical location of each part first. Then drill the applicable holes and mount the tube sockets, transformers, potentiometers, etc. Finally, wire the circuit. This procedure precludes damage to the electrical components when working the chassis.

Operation. When the electronic switch is assembled, it is ready to use. No adjustments are needed. But be careful since the output terminal J3 always has a potential of approximately 270 VDC when the unit is energized. Therefore, the output terminal must never be shorted to ground, and don't grab hold of it either.

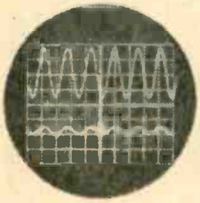
When using Two-Timer for the first time, and to perform a preliminary test of operation, set the SEPARATION control fully counterclockwise until the integral switch "clicks" and turns the unit off. Then connect the electronic switch output J3 and J4 to the input of the oscilloscope. Adjust the oscilloscope controls to obtain an AC coupled input, and a slow-speed trace.

Connect the line cord to the wall socket, and adjust the SEPARATION control clockwise to midrange. Allow the electronic

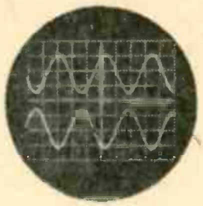
Two-Timer'll Get You Traces By the Two's

switch to warm up for about a minute, and then adjust the SEPARATION control to obtain two traces about one inch apart on the oscilloscope screen. It may be necessary to decrease the oscilloscope vertical sensitivity to keep both traces on the screen at the same time. Now connect an input signal to each of the electronic switch inputs (the same signal can be connected to both inputs for testing purposes).

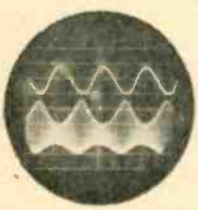
Typical Dual Scope Traces



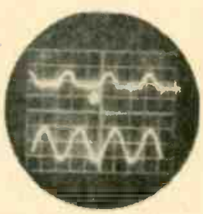
Amplification factor of stage can be determined by amplitude differences.



Phase relationship of two signals being compared — signals are 180° apart.



Signal at input (bottom) and output (top) of detector stage in an AM radio.



Signal before (bottom) and after (top) going through clipper circuit.

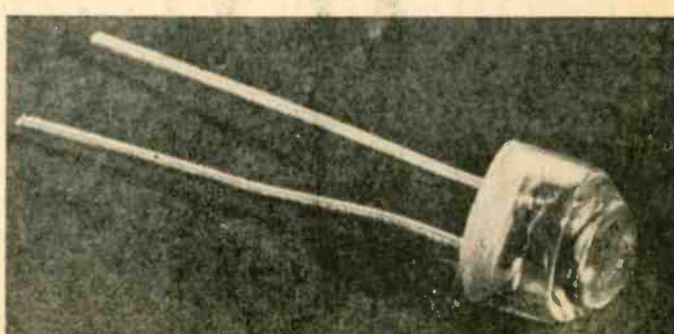
A good voltage source for the preliminary test is the filament voltage of the electronic switch tubes. Adjust the electronic switch GAIN A and GAIN B controls to obtain approximately the same signal amplitude on both traces. It may be necessary to adjust the oscilloscope sweep controls to obtain a stable display of the desired number of cycles of the signals. This verifies correct operation of Two-Timer. It is now ready for use.

Familiarity Breeds Usefulness. Once you have twisted the knobs of the oscilloscope and Two-Timer sufficiently to become familiar with the interaction of the combination, your imagination is the only limiting factor to usefulness of the dual-trace combination.

You can observe the phase relationship between a reference signal (the input to a hi-fi amplifier, for example) and signals at any other point in the circuit, measure amplifier gain, compare frequencies of signals (using the 60-Hz house current as a reference, your oscilloscope is a very accurate frequency meter), etc. Because of the amplification of the input signals—approximately seven times with the gain controls fully clockwise—you can observe signals with less amplitude than your oscilloscope could "see" before. With no signals applied to the inputs, Two-Timer provides a very good square wave output, with variable amplitude (controlled by adjusting the SEPARATION control), for amplifier testing. Two-timer will permit viewing of signal frequencies up to 5000 Hz, but works best if the signal frequency is 1000 Hz or less. Here's Two to you! ■

Tiny as a Thumbtack, Dazzling as a Dodo Bird

■ A lamp said to be ideally suited for photocell and indicator applications also happens to be a lamp quite unlike the kind most of us are used to. Reason is the new lamp is all solid-state, which means its filament is nowhere to be seen. One of the growing family of light-emitting diodes, the device was developed by General Electric and answers to the name of SSL-6. ■



CBS's TAPELESS TV RECORDER

Surprise of the decade, it's a play-only device using neither magnetic tape, motion picture film, nor even thermoplastics!

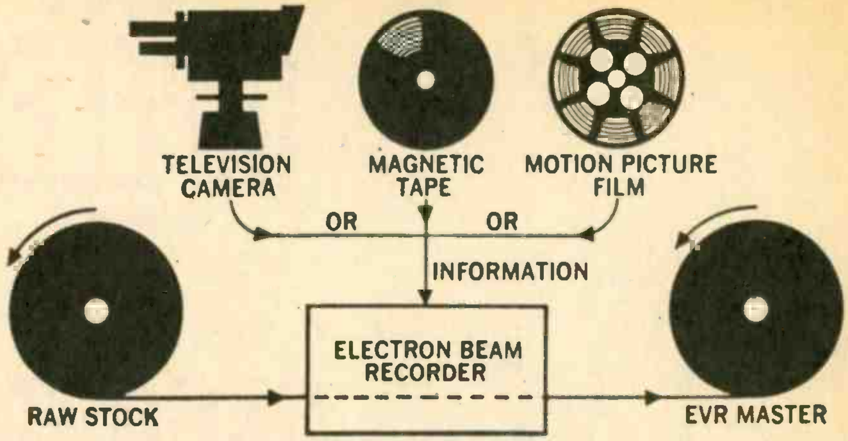
By Jorma Hyypia

The day may come when you will slip a can of Sophia Loren, Charlie Chaplin, or even Hamlet into your supermarket shopping cart. When you get home, you will dump the can into a "breadbox" near your TV set, settle down with a TV dinner, and enjoy an orgy of re-runs that you can now savor only during the summer TV doldrums. Moreover, you will view re-runs of your own choice rather than be captive to selections made by broadcast programmers.

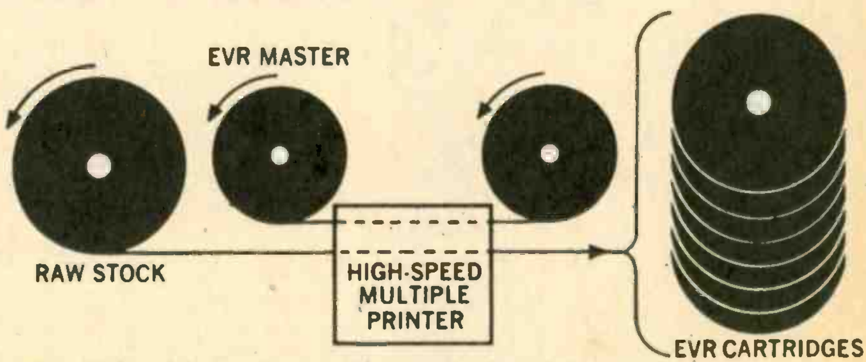
Columbia Broadcasting System's new Electronic Video Recording (EVR) system brings the era of canned video a step closer, though it is by no means certain whether EVR will be the system that eventually becomes standard for home use. At first, EVR will be used for educational purposes; the earliest full-scale application will be in England. Video cartridges and players won't be available world-wide until late 1969, perhaps 1970.

EVR is *not* a magnetic video tape system. And it can *not* be used for self-recording of broadcast or other material, only for play-

CBS's ELECTRONIC VIDEO RECORDING SYSTEM



EVR electron beam recorder takes program from TV camera, magnetic tape, or film and generates a master which can be in either color or black and white.



High-speed multiple printer produces multiple copies from EVR master. One twenty-minute film can be reproduced in approximately thirty seconds.

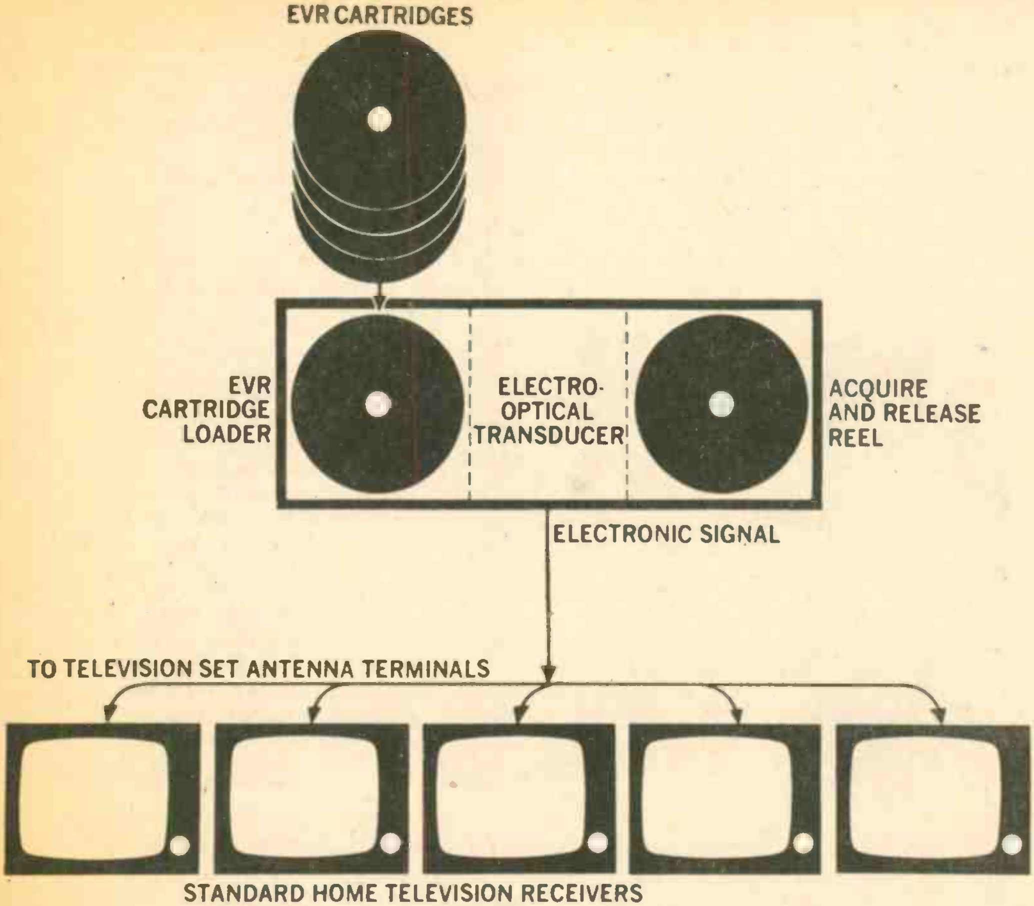
back of films already containing program material.

Operating the unit is deceptively simple. The user simply places the special film cartridge into a "breadbox"-size playback unit coupled to a TV set's antenna terminals. The cartridge automatically threads itself, plays the recorded material through the TV system, rewinds, and is ejected.

Initially, the films will contain educational material suitable for classroom and related purposes. But at least one Hollywood film studio is already exploring the possibility of making EVR films from old motion pictures. This could eventually lead to home as well as classroom playback of motion pictures.

EVR is unique in that the playback can be stopped at any time for prolonged viewing of a single scene—a feat that isn't possible with present magnetic video systems. The educational advantages of this feature are obvious. A teacher can hold a single scene as long as necessary to add his own comments. A golfer can pass slowly from one frame to the next to study the swing of a pro's golf club in detail. And the viewer of ordinary story-telling motion pictures will surely find many a scene that, for one reason or other, he would like to linger over and observe at length.

Electro-optics System. Both the preparation of the film and its playback involve the use of optics and sophisticated electron physics. In the factory, an optics-electronic process is used to transfer program material from a motion picture film or video tape to



Electro-optical transducer—probably some sort of flying dot scanner—reads cartridge to produce video and sound, which are then reproduced on one or more TV sets.

a special unperforated film, 8.75 millimeters wide. This master film is used to run off copies for purchase of EVR customers. Such copies are packaged in cartridges 7 in. in diameter and ½ in. thick—about the size of a standard reel of magnetic tape.

EVR film has two separate tracks. If both are used, a single cartridge can hold up to one hour of black-and-white programming. Both tracks must be used simultaneously to produce color pictures; one track contains luminance, the other chrominance information. Unlike ordinary color motion picture film, EVR color film appears wholly black-and-white to the eye; however, this ostensibly monochromatic information can be translated into full-color images by the playback unit.

Secret Process. CBS officials and technicians are sitting on their EVR breadbox, jealously guarding their hard-earned secrets from competing companies. Still, it is a virtual certainty that any astute electro-optics expert can make pretty shrewd guesses about the workings of EVR. But even they aren't talking, for sound competitive reasons.

So far, CBS has mainly revealed what EVR is *not*, rather than what it is. EVR is not a magnetic tape system. For though the film has visible images produced by some sort of photographic process, they are not created by such orthodox photographic methods as the use of light-sensitive silver compounds. Nor are the images produced by the action of laser light or infrared light on heat-sensitive plastic, though this would

TAPELESS TV RECORDER

theoretically be a workable possibility.

CBS isn't passing out samples of film for analysis, but it is probable that the images on the film are not recognizable as specific objects. In other words, if the film were placed into a movie or slide projector, no recognizable images would be seen on the projection screen—only coded patterns (perhaps in the form of micro-dots) that might represent a cat, a house, or Sophia Loren.

The electro-optical transducer in the playback unit is able to decode this audio and video information into an electronic signal to produce recognizable images on a TV screen. Amplitude-modulated light, produced from the film by a flying spot scanner, is amplified by a photomultiplier. This signal is converted to a video waveform that is used to modulate a TV carrier frequency.

Jiggling the Breadbox. If we shake the EVR breadbox—or rather, the limited information available about it—we can begin to hear some meaningful rattlings that just *might* give a hint about the nature of EVR film.

Attention is most profitably focused on the nature of EVR film and how it is made. First bear in mind that the images are probably coded data bits representing video and audio information. It is easier to cram this kind of information into small film space than to accurately record the same data in the form of continuous tone photographs as in the case of ordinary motion picture film.

Next, consider the extremely rapid reproduction of playback films from the master tape. CBS says that one 20-minute program can be printed in approximately 30 seconds by a high-speed multiple printer working from an EVR master film. On playback, the EVR film moves at a speed of 5 inches per second, hence the 20-minute film must be about 500 feet long.

But to be printed in 30 seconds, this film must zip through the processing system at a speed of over 16 feet per second. Moreover, the printing time is expected to be cut down to 13 seconds within a year or two! No ordinary photographic process involving development and fixing can yet do that.

Man behind new CBS tapeless TV system is also the man responsible for launching of first 33⅓-rpm microgroove disc way back in 1948. President and Director of Research for CBS Laboratories, he is Dr. Peter C. Goldmark, shown here examining a bit of the super-secret EVR film that makes the new video playback system possible. Either black-and-white or color program material can be packed into extremely narrow film.

What seems to be used, then, is some system that quickly produces an image on the film by optic (not mechanical) means and then desensitizes the film to prevent further image formation.

Photochromic Process? It is conceivable that CBS may be using photochromic techniques which have been actively researched by many companies in recent years. A large number of colorless organic chemicals (such as spiropyrans) become intensely colored when exposed to light waves in or near the ultraviolet region of the spectrum. These chemical dyes can also be treated to make them insensitive to light.

Thus it would seem possible that the EVR printing process may make use of photochromic dyes supported on the plastic film. The light patterns projected from the master film may create the coded images on the film by causing the dye to darken wherever the light strikes it. The unchanged dye remain

(Continued on page 132)

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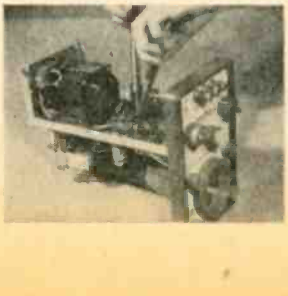
Transistor experiments on programmed breadboard – using oscilloscope.

Construction of Oscilloscope.



Construction of Multimeter.

Propagation Forecast

By C. M. Stanbury II

February/March, 1968

■ With the approach of the Spring equinox, DXers can look forward to a steady improvement in Southern hemisphere signals on appropriate bands. During the early evenings, watch for Brazilians on 60 and 90 meters as well as Argentine and Chilean regionals on 49. After midnight, R. Altiplano at La Paz, Bolivia, will often be good on 5045 kHz where they seem to operate all night. Incidentally, if you should hear another station on 5044 (just 1 kHz below R. Altiplano), and can make out what they're saying, it will probably turn out to be rare R. Cook Islands. Unfortunately, the latter signs off around 0300 EST.

We have listed 41 and 49 meters as the best bands for DX reception from the South Pacific during the early a.m. hours. But in this department, listeners on the West Coast have a decided advantage over the rest of us. Until the noise level begins to rise, they can expect regular reception from S. Pacific islands during the early a.m. period down on 60 and 90 meters. Generally, the lower the band an SWL can work from a given area, the more the DX counts. Pacific Coast DXers will also be in a good position for Asian reception.

And in conclusion, now is the time to watch for 60, 49 and 41 meter stations in such places as Mozambique, Rhodesia and the now famous Botswana (BBC 4845 kHz, S/On 2300 EST). ■

RADIO-TV EXPERIMENTER PROPAGATION FORECAST

Feb./Mar. 1968 LISTENER'S STANDARD TIME	ASIA (except Near East)	EUROPE, NEAR EAST & AFRICA (N. of the Sahara)	AFRICA (S. of the Sahara)	SOUTH PACIFIC	LATIN AMERICA
0000-0300	25	31 (41, 49)	41, 60 (49)	25, 31 (41)	49, 60, 90
0300-0600	25 (41, 60)	31	31 (poor)	41, 49	49, 60, 90
0600-0900	16, 19	19 (25, 16)	19	31	31, 49
0900-1200	16, 19	16, 19 (13)	19	25 (poor)	31
1200-1500	19 (poor)	16, 19 (13)	16, 19 (25)	25 (poor)	25 (19)
1500-1800	19, 31	25, 31 (49)	25, 31, 60	19, 16	31
1800-2100	19, 25	25, 31	31	16, 19	49, 60, 90
2100-2400	19, 25	25, 31	41, 60 (49)	19, 25	49, 60, 90

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

Lucky 13 for Bored DXers

By Michael Wilson

■ If you're looking for new DX territory to conquer on that SW receiver, here is an introduction to what's probably the hottest utility DX band under the present sunspot conditions: the 13 MHz marine band.

Here one can find dozens of countries waiting to be logged, and the renowned ability of CW to bite through the noise where phone fails is indeed evident.

Recently, the author connected his old S-38B SW receiver to a pair of TV rabbit ears and went for a quickie tour of the band, which stretches from about 12.5 to 13.2 MHz. The result? Thirty countries in one evening! Now add a good dipole and a preselector for the band and imagine how the countries scored will mount up!

The only trick necessary is to be able to copy code. And since most of the signals here are taped marker signals, giving the stations' call letters repeatedly to ships at sea, code should not pose as much of a problem as might be imagined. Here is a sample of the marker signal used by many of the stations: CQ CQ CQ DE JOU JOU JOU QSX 8 MC K.

This roughly translates as "Calling all stations, from (DE) JOU (the coast station at Nagasaki, Japan). We are listening for calls (QSX) on the 8 MHz band. Out." Some stations will use a series of Vs, or dots, or just the letters "DE", derived from the French word for "from."

Markers By The Hour. The marker signals are sent repeatedly, often for hours on end, with breaks for traffic (messages) from ships calling the station. Most coastal stations sport three-letter callsigns (ships usually have four), and sometimes a number follows the call letters.

QSLs from these stations are a little harder to collect than those of shortwave broadcasters. *First*, you must not repeat any message broadcast in actual traffic with another station (e.g. ship-to-shore). Marker signals can be repeated, for they contain no information other than the advertisement of facilities as they compete for traffic from ships.

Second, you must usually prepare a QSL card yourself which the station operator can quickly fill out and return.

Third, always include return postage. If you don't know the exact location of the station, other than its country of registry, address it C/O Ministry of Posts, Tele-

Everyone is familar with that speediest of passenger liners, the U.S.S. United States, yet many is the SWL who has never logged her or her sister ships. Most readily picked up by DXers along the Eastern Seaboard, the United States can be heard most anywhere. Shown here is her radioroom.

Lucky 13

Coastal Station WMH in Baltimore is one of a series of stations operated by the Radiomarine Corp. (see table below). WMH transmits on 12885 kHz and can be readily logged, given a little persistence and patience.

phones and Telegraphs in the country concerned. If this fails, try writing in care of that country's Navy.

Pep-Up Chart. With these pointers in mind, check the chart for a list of some of the stations in the 13 MHz band. Some frequencies are approximate and are marked by an *X*.

This can be your start in the fascinating world of marine station DXing. After you gain familiarity with the 12-13 MHz band, there are other bands to try, too, with more of the same and perhaps some other new countries. If your receiver has an RF stage, give the 17 MHz band a try, or even the 22 MHz band. Otherwise, tune down between 8.5 and 9 MHz, or even lower to 6.2-6.5 MHz.

The thing to remember is that if you ever get bored with standard SWBC DXing, there is fantastic and almost endless variety on these marine utility bands.

COASTAL STATION FREQUENCY CHART

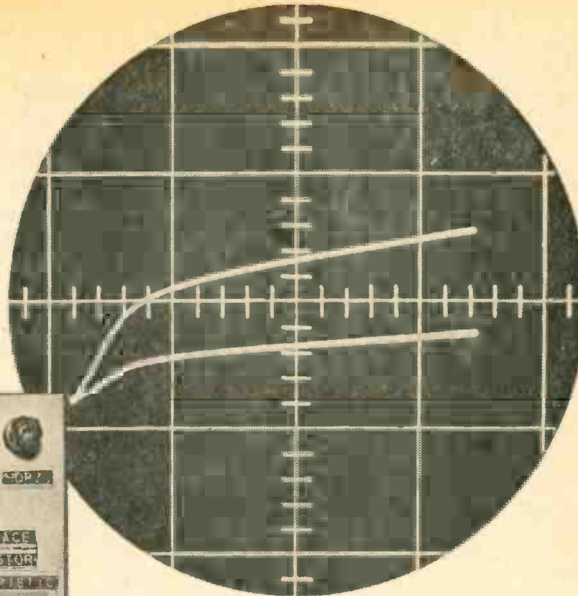
Frequency (kHz)	Call	Operator & Location
13123.5	WLO	Mobileradio Mobile, Ala.
13114.5	KFS	Mackay Radio Palo Alto, Calif.
13110 x	GYR	Royal Navy Lascaris, Malta
13110 x	NST	U.S. Navy Londonderry, N. Ireland
13101	DHS	Government Rugen, E. Germany
13095 x	HKA	Government Barranquilla, Colombia
13092	JOU	Government Nagasaki, Japan
13075 x	CLA	Government Havana, Cuba
13069.5	TFA	Gufunes Communications Centre Reykjavik, Iceland
13038	KLC	Mackay Radio Galveston, Texas
13033.5	WCC	Radiomarine Corp. Chatham, N.J.
13024.5	WSL	Mackay Radio Amagansett, N.Y.
13015 x	IAR	Government Rome, Italy
13015 x	WAX	Tropical Radio Tel. Hialeah, Fla.
13002.5	KPH	Radiomarine Corp. Bolinas, Calif.
12993	KOK	Mackay Radio Artesia, Calif.
12980 x	CFH	Dept. of Transport Gander, Nfld.
12970.5	WOE	Radiomarine Corp. Lantana, Fla.
12952.5	VIS5	Overseas Telecomm. Commission Sydney, Australia
12948	WSC	Radiomarine Corp. Tuckerton, N.J.
12943.5	ZLP5	N.Z. Navy Wellington, N.Z.
12930 x	VHP	Australian Navy Canberra, Australia
12925 x	CKN	Canadian Navy Aldergrove, B.C.
12898.5	DAN	Funkamt Hamburg Norddeich, W. Germany
12894	6WW (ex-FUW)	Navy Dakar, Senegal

*—Ships calling coastal stations x—Frequency approximate

(Continued on page 129)

By Charles D. Rakes

Dynamic-Duo



Novel checker draws a picture of all about a transistor you'll ever want to know.

■ Dynamic Duo is a perfect name for our dual-trace transistor characteristic curve tracer. With this simple tester you can adjust and observe two I_c/V_{ce} curves of the same transistor on a scope simultaneously. And from this dual trace you can determine AC current gain (H_{fe}), ideal base current for linear operation, and leakage current (I_{ceo}). You can even match transistors for amplifier applications. Sound complicated? Not at all.

The techniques employed to obtain the two curves are not difficult to understand, as we'll see shortly. What's more, switching from *pnp* to *npn* transistor types is accomplished simply by interchanging two program plugs.

Circuit Description. The simplified circuit diagram in Fig. 1 shows the unit in the *pnp* test position. With the power switch *on*, a negative voltage at the cathode of diodes D1, D5, D6, and D8 will produce a negative voltage at the collector and base of the transistor under test. The emitter-to-collector voltage follows a sine-wave variation (one half-cycle of 60 Hz); at the same time, the base voltage is limited early in the cycle to a fixed value determined by the forward voltage drop of diodes D5, D6, and D8.

The collector current is limited by R4, and the base current is adjustable with potentiometer R8 and limited by R6. Assuming both S2 and S3 are closed, diodes D9 and D10 isolate the base of the transistor from the positive voltage at the cathode of D3. Under these conditions the curve tracer will produce one I_c/V_{ce} trace on an attached scope.

The second trace, as shown in the photos, is produced in the same way but during the remaining half-cycle of the 60-Hz current. The base current during the second I_c/V_{ce} curve is adjustable by potentiometer R7. Pushbutton switches are provided so that the base currents can be set and read individually. Since each base current is monitored on meter M1 for a half-cycle, the actual meter reading is doubled for a correct base-current reading.

Construction. The transistor tester is housed in a two-piece aluminum case measuring 3½ x 6 x 8 in. The front of the tester can be arranged to suit the builder, but the author's layout worked well and can easily be followed from the photos. The 33-terminal female socket (J7) provides most of the tie points required for component mounting (see Fig. 3).

Base-bias potentiometer R7 is connected

Dynamic-Duo

in series with switch S3, and S3 is located directly over R7. Similarly, base-bias potentiometer R8 is connected in series with switch S2, and S2 is located directly over R8. Both R7 and R8 are wired so that a clockwise rotation lowers the resistance. The two program plugs (PL1 and PL2) are wired using spaghetti-covered #20 or 22 buss wire as shown in Fig. 2.

Scope Calibration. To set up your scope for use with our Dynamic Duo, the vertical gain should be calibrated by applying a 1-volt peak-to-peak AC signal to the scope's vertical input, then adjusting the vertical gain for a 1-in.-high pattern. The vertical gain is now set so a transistor base current of 10 milliamperes will result in a 1-inch deflection. If the same procedure is followed, but the AC input reduced to 0.1-volt peak-to-peak and the vertical gain readjusted for a 1-in.-high pattern, the scope is now calibrated so one milliampere of transistor base current causes a 1-inch deflection.

The horizontal gain is adjusted by applying a 3-volt peak-to-peak AC signal to the scope's horizontal input and adjusting the horizontal amplifier gain for a 1-in.-long trace. The scope is now set for a sensitivity of 3 volts per inch.

Using Dynamic Duo. Connect the tester to a scope calibrated as described, turn the base-bias potentiometers counterclockwise, and insert the appropriate program plug to match the types of transistors to be checked.

With three clip leads or a test socket, connect the transistor to the tester, press both pushbutton switches (S2 and S3) simultaneously, and observe the scope's trace. The horizontal component represents the AC voltage between the collector and emitter of the transistor, and the vertical component represents the transistor's leakage current (I_{ceo}).

To adjust the tester for a dual trace, press the pushbutton switch located above the bias potentiometer labeled IB2 (R7 on schematic in Fig. 3). With this switch pressed, adjust the base-bias potentiometer labeled IB1 (R8) for the desired base current (multiply M1's reading by 2 for actual current value) or until the desired trace is obtained. This sets up one I_c/V_{ce} curve.

Next, press the pushbutton switch located above the bias potentiometer labeled IB1. With this switch pressed, adjust the base-bias potentiometer labeled IB2 for the desired base current (multiply M1's reading by 2 for actual current value) or until the desired trace is obtained. This sets up the second I_c/V_{ce} trace. With both pushbutton switches simultaneously. A typical *pnp* dual characteristic curve is shown in the photo. The beta, or AC, gain and linear

(Continued on page 132)

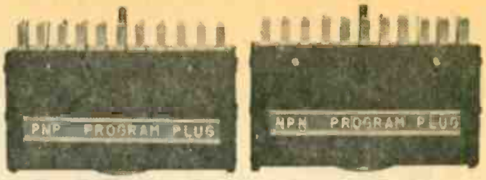
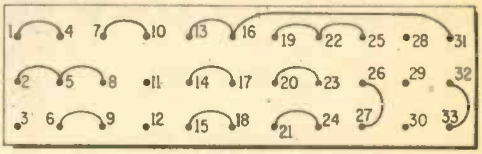
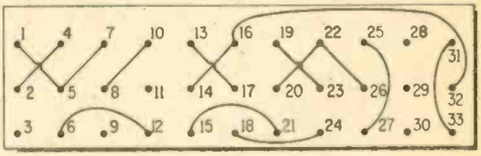


Fig. 2. The two 33-contact program plugs are wired as shown below. Plug PL1 is for PNP; plug PL2, for NPN transistors.



PL1



PL2

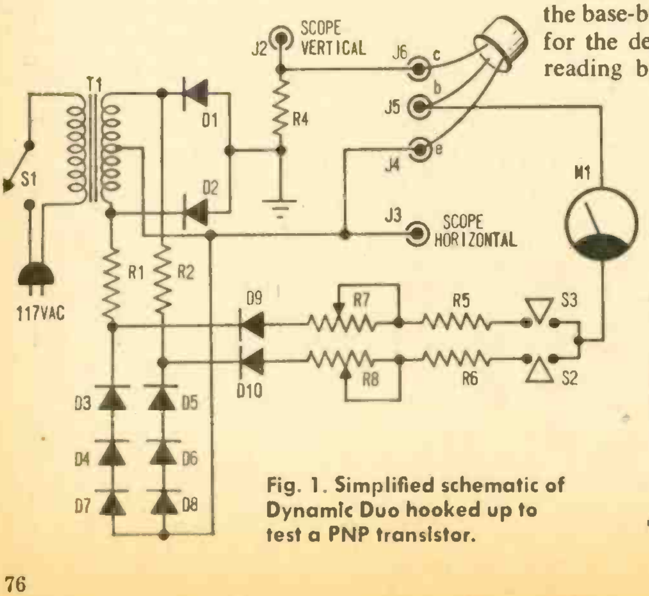


Fig. 1. Simplified schematic of Dynamic Duo hooked up to test a PNP transistor.

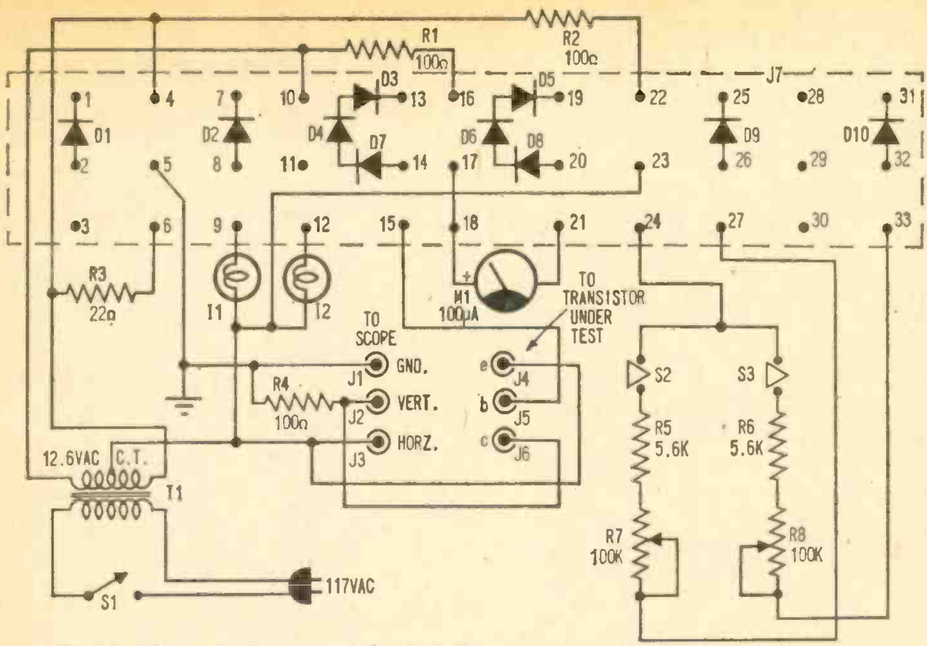
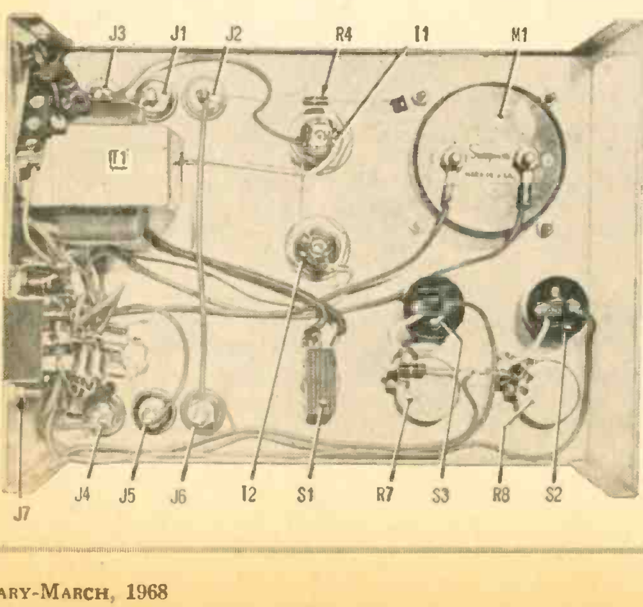


Fig. 3. Schematic diagram of Dynamic Duo transistor characteristic curve tracer.

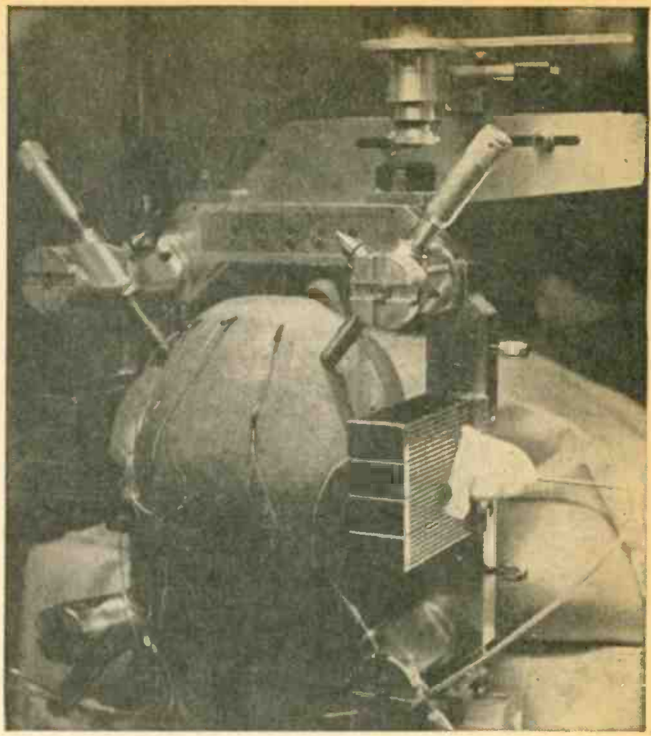
DYNAMIC-DUO PARTS LIST

D1, D2, D3, D4, D5, D6, D7, D8, D9, D10—500-mA, 200-PIV silicon diode (Radio Shack 276-1126 or equiv.)
I1, I2—#47 lamp and socket assembly (Radio Shack 272-1535 or equiv.)
J1, J2, J3, J4, J5, J6—5-way binding posts (Radio Shack 274-736 or equiv.)
J7—Jones 33-contact socket for chassis mount
M1—100-microampere, 2½-in. sq. meter
PL1, PL2—Jones 33-contact plug
R1, R2, R4—100-ohm, ½-watt resistor
R3—22-ohm, ½-watt resistor
R5, R6—5600-ohm, ½-watt resistor
R7, R8—100,000-ohm, linear-taper potentiometer
S1—S.p.s.t. toggle switch
S2, S3—Pushbutton switch, normally closed contacts (Lafayette 34C3402 or equiv.)
T1—Transformer: 117-VAC pri.; 12-VAC, 1.2-A center-tapped sec. (Radio Shack 273-1505 or equiv.)
1—3½ x 6 x 8-in. aluminum chassis box
Misc.—Line cord, wire, solder, screws, etc.



Internal layout of parts in Dynqmic Duo isn't critical and can be modified to suit. Terminals on socket J7 provide majority of required tiepoints.

Mood Monitoring Electronically



By K. C. Kirkbride

■ Electronics will soon be able to tell whether you are a happy and gay soul or a mean old grouch. Because, as a result of a revolutionary three-year research program, a group of Honeywell Corp. space scientists have related brain waves to states of mind. In their experiments, they have monitored volunteer subjects who were asleep, awake, alert or drowsy. Extension of this research promises to allow almost any mood to be monitored.

It all started when Honeywell scientists at the Military Products Division in Minneapolis faced the fact that as our space projects became more complicated, the success of a mission could hinge on the frame of mind of our astronauts. And unfortunately, to date, we've had only inadequate means of determining human awareness. Neither verbal nor visual reports are dependable.

As any knowledgeable employer will tell you, a man can be asleep with his eyes wide open and alert with his eyes closed. So Honeywell men decided that if we don't find accurate checks on alertness of future astronauts as they venture out in space, we may find ourselves minus some astronauts as well as some pretty nifty Tiffany-priced outer-space hardware.

It's All In The Mind. As we all know, the human brain consists of billions of cells wherein each action or reaction sets up bursts of waves in response to definite stimuli. Honeywell men, looking for a working premise, projected a series of electrical stimuli into the brain and watched the reaction. Could monitoring these induced brain-wave changes measure fluctuations of alertness? That was the multi-million dollar question.

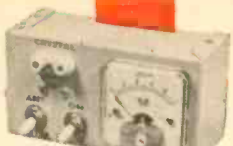
To find out, they chose twenty-three subjects and placed them in a closet-type steel chamber, four feet wide, eight long and eight high; the chamber being used to screen out electrical interferences, movements, sounds, or smells that might distract or set up conflicting brain waves in the subjects. Silver-disc electrodes were then attached to the scalps of each volunteer.

A pattern of clicks were beamed at the subjects through a speaker mounted in each chamber. Reactions were then recorded over 48-hour periods as the subjects slept, ate, were alert or drowsy. During this time, their reactions were monitored by both electrodes and a closed-circuit television camera.

Clicking Brain Potential. Brain potentials picked up by the electrodes were ampli-

(Continued on page 130)

By Ed Morris, KRP1830



Rates rocks for activity
Checks crystals for stability
Spots channels with rapidity

CB Rock Rater x 3

■ What can our CB Rock Rater do for you? Plenty! For one thing, it'll measure the relative activity of your CB crystals. What does this mean to you? It means that you can quickly determine if a crystal isn't up to par. And this is important because with a low activity crystal in your rig's transmitter, it just can't put out for you like it should, and the net result is decreased operating range!

This nifty little package can also check your crystals for other defects, such as jumping frequency, which, in extreme cases can put you far enough off frequency to throw you right out of the CB band!

Now about your receiver alignment. Are all the channels receiving dead on frequency where they should be? If not, our Rock Rater and a few CB transmit crystals lets you align the receiver yourself—and save the service fee.

Our multi-purpose CB test instrument is compact, measuring only 4 x 2⅛ x 1⅝ in., and it won't clutter your operating area. Being inexpensive to build, it won't put a crimp in a tight budget either. And last but no means least, simple circuitry makes it a snap to build, even for the beginner.

How Rock Rater Works. The heart of the operation of this device is a crystal controlled Colpitts oscillator. This oscillator, formed by transistor Q1 and its associated components, generates an RF signal output when an external CB crystal is inserted into the crystal socket. The frequency of the output signal is determined by the crystal frequency.

The amount of RF generated is, to a large extent, determined by the activity of the crystal under test. A weak crystal, one whose activity is low, will not permit the oscillator to generate as much output as another higher activity crystal.

The output from the oscillator is applied to the center arm of selector switch S2 (see schematic). When the switch is placed in the lower position, the RF is rectified by the action of diode D1. It is then filtered by capacitors C4, C5 and calibration potentiometer R3. The resulting DC, which is proportional to the original RF, is then read on meter M1.

When the switch is in the upper position, the RF oscillator output is applied to the antenna jack through capacitor C6. This is the position used when the Rock Rater is used as a channel spotter or an alignment generator.

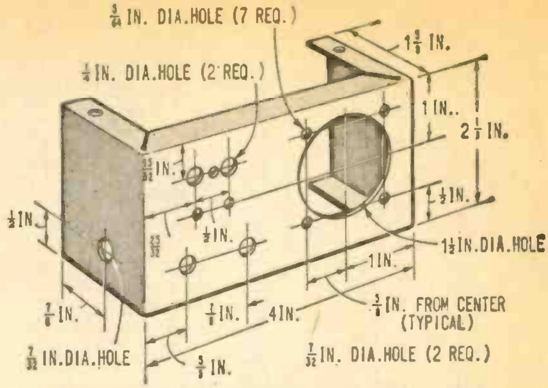
Mechanically Speaking. Although the exact layout of the Rock Rater is not critical, best results will be obtained, especially for the beginner, if the layout presented is followed. The more advanced builder should feel free to modify details to suit his needs. In any case, good high-frequency construction practices should be followed.

Start work on the case by drilling the proper size holes as shown in the drawings. The use of a T-square will aid in obtaining accurate placement of the various holes.

The cut-out for meter M1 can easily be made with the use of a chassis punch of the proper size. If one is not available, a hand nibbler will do the job.

The mounting clip for the battery is made from the center spring clip from a size "AA" cell holder. This clip is easily removed from the battery holder by drilling out the retaining eyelets with a .125-in. drill.

CB Rock Rater x 3



To insure easy construction, lay out chassis box holes as dimensioned above. Then remove burrs and apply several coats of spray paint for a professional appearance.

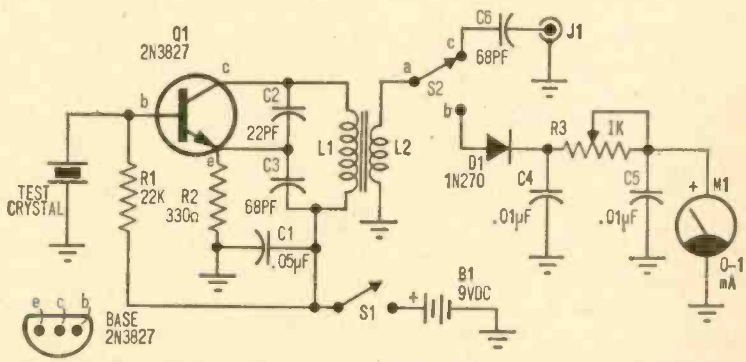
Finishing The Case. A strikingly professional appearance can be achieved, even by the beginner, by simply spray painting and lettering the case. The little additional time and effort involved will prove to be well worth the results. To prepare the case for painting, first remove all traces of dirt and oil from it. Any remaining dirt or oil will prevent the paint from adhering properly. The easiest way to clean it is to wash the case well with soap and water. After the case has dried, be sure to protect it from your own fingerprints.

When painting the case, remember to use very thin, light coats. The key to a good finish is to use a light touch. Allow each coat of paint to dry thoroughly before applying the next. For a really first-rate job, apply a primer coat to the bare metal first.

After the paint has dried hard, preferably overnight, it's time to apply the lettering. Whichever you use, whether dri-transfers or decals, be sure to follow the manufacturer's directions exactly. A final coat or two of a clear plastic acrylic spray may then be applied to protect the lettering.

Electrical Construction. Most of the electrical components are mounted on a 1¾ x 1¾-in. piece of perforated board. This board is mounted on the meter terminals as shown.

Begin the electrical construction by wiring

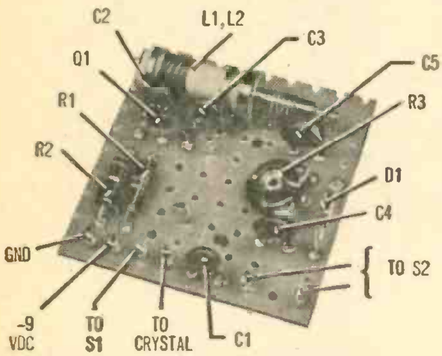


Schematic diagram of Rock Rater shows Colpitts oscillator whose output is fed to either meter M1 for rock-rating or to antenna jack J1 for channel spotting.

ROCK RATER PARTS LIST

B1—9-volt transistor battery (Burgess 2U6)
C1—0.05-uF, 12-VDC capacitor
C2—22-pF, 1000-VDC capacitor
C3, C6—68-pF, 1000-VDC capacitor
C4, C5—.01-uF, 200-VDC capacitor
D1—1N270 diode
J1—RCA phono jack, single whole mounting (Lafayette 99C6234 or equiv.)
L1—#28 enameled wire, 7-turns close-wound on ¼-in. ferrite-tuned coil form
L2—#28 enameled wire, 3-turns close-wound over ground end of L1
M1—1-mA miniature panel meter (Lafayette 99C5052 or equiv.)
Q1—2N3827 silicon transistor
R1—22,000-ohm, ½-watt resistor
R2—330-ohm, ½-watt resistor
R3—1000-ohm, miniature potentiometer (Lafayette 99C6142 or equiv.)
S1, S2—Miniature d.p.d.t. switch (Lafayette 99C6126 or equiv.)
1—Crystal socket (Lafayette 42C0901 or equiv.)
1—4x2⅛x1⅝-in. aluminum chassis box
Misc.—Wire, solder, nuts, screws, plastic tubing, perforated board, flea clips, lettering, spray paint, etc.

the board according to the schematic diagram. The general parts layout can be easily determined from the photos. Although transistor Q1 is a silicon transistor and is not easily damaged by heat, care should still be taken while soldering it into the circuit. This same care should be applied to diode D1, which is also easily damaged by excessive heat and mechanical actions that might break its glass case.

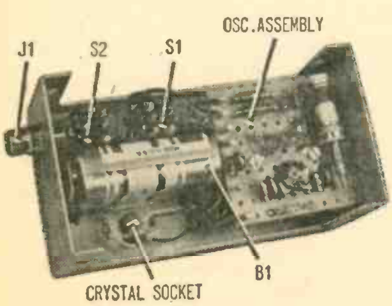


Majority of Rock Rater components are mounted on perf-board and wired following the schematic. Completed board assembly is then wired to chassis-mounted components and installed in chassis.

Note that for proper operation, coil L2 should be wound over the "cold" end of coil L1. In this case we mean the end connected to the junction of capacitor C3 and coil L1.

Particular care should be taken when wiring to observe polarity of components as indicated on the schematic. This is especially true for transistor Q1 and battery B1.

After the circuitry on the perforated board has been wired, carefully check it over for errors against the schematic.



Completed perf-board assembly is mounted in chassis by attaching it to the meter terminal screws. After wiring has been checked for errors and the battery installed, Rock Rater is ready for a trial run and calibration.

Completed Rock Rater has a professional appearance that lets it keep company with the snazziest of CB rigs. Here, it's befriending an all-channel Lafayette HB-525 CB rig. Don't they make a lovely couple?

Temporarily set the perforated board aside and install meter M1, switches S1, S2, the battery clip, and the crystal socket. Wire as you go along. Then mount the perforated board on the back of the meter terminals. Finish up the last of the interconnecting wiring between the board and the remainder of the components.

Testing and Calibration. Place selector switch S2 in the *meter* position. Adjust calibration potentiometer R3 to its minimum resistance position. Place a known good channel 9 transmit crystal, or other known good transmit crystal whose frequency is near the center of the band, in the crystal socket.

Turn Rock Rater on and tune coil L1 for a peak reading on the meter. Readjust the calibration potentiometer R3 as necessary to keep the meter from reading off scale as coil L1 is being peaked.

Once the coil has been peaked, adjust the calibration potentiometer for a ¾-scale reading (0.75 mA) on the meter. If you are not able to peak the coil, or to obtain an upscale meter reading, carefully recheck your work for possible errors. If the meter reads down-scale, reverse the meter's terminal connections.

When Rock Rater has been adjusted to read about ¾-scale with a known good crystal, this becomes your "average" good reading. Any crystal that fails to produce at least a ½-scale (0.5 mA) reading is suspect. Likewise, a crystal that exhibits an erratic or unstable meter reading should be considered defective. ■

What to do when the junk box is packed with high-wattage resistors. Build the . . .

LOAD BOX

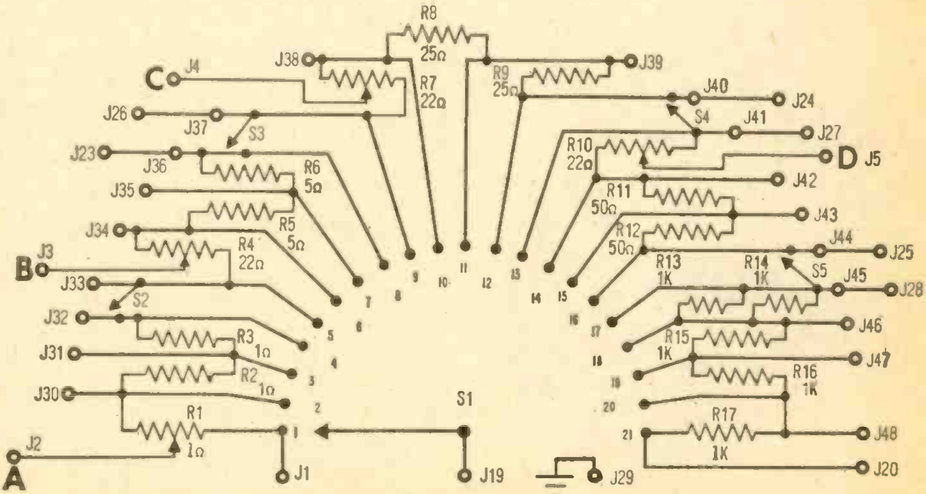
By J. R. Squires

■ Rare is the man who can lay claim to enough power resistors for his workbench or shop. For given sufficient power-handling capacity, such resistors come in handy for any number of uses—from dummy loads to power-supply bleeders to plain old voltage dividers.

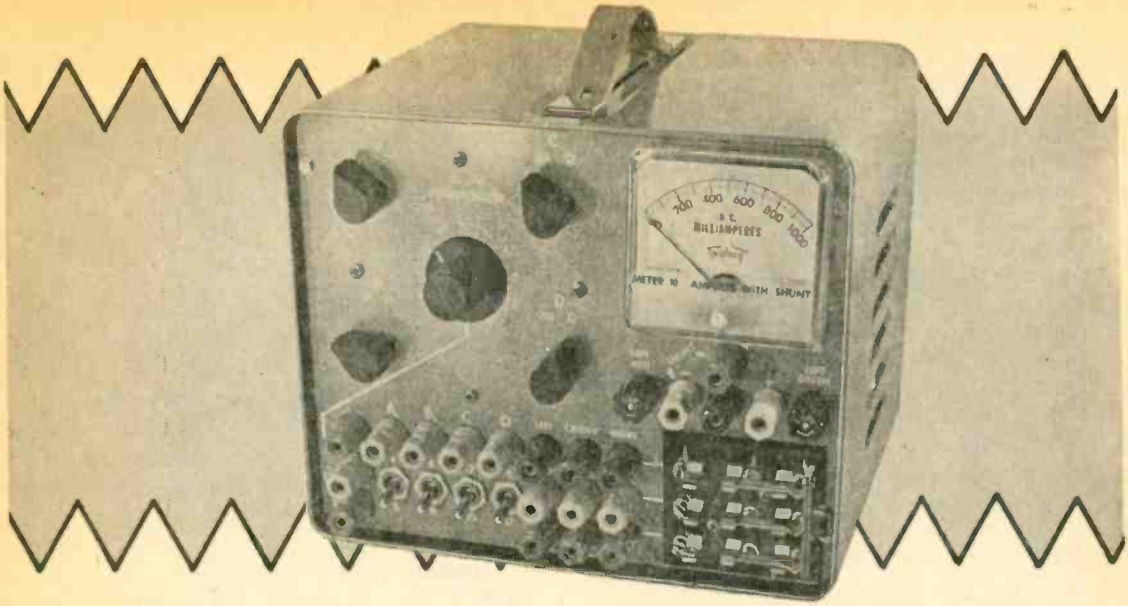
Typically, the experimenter dips into the junk box for power resistors, and jumpers them together as needed. But all too often, the values aren't ideal and the resistors, running hot, end up charring the bench, test leads, or a screwdriver handle or table top.

The Load Box presented here is the author's answer to power resistor problems. And though expensive to build if all new parts are used, variations on this design to suit individual requirements can be built using surplus or junk-box parts. The actual number of resistors and jacks used should be determined by individual requirements, since the unit presented here is what the author determined he wanted to fill his needs.

The prototype provides resistances from a



This is the schematic of the author's version of the load box; the string of power resistors, potentiometers, and series switches providing the ultimate in flexibility. At right, is the hookup employed in the knife-switch and monitoring meter circuits.

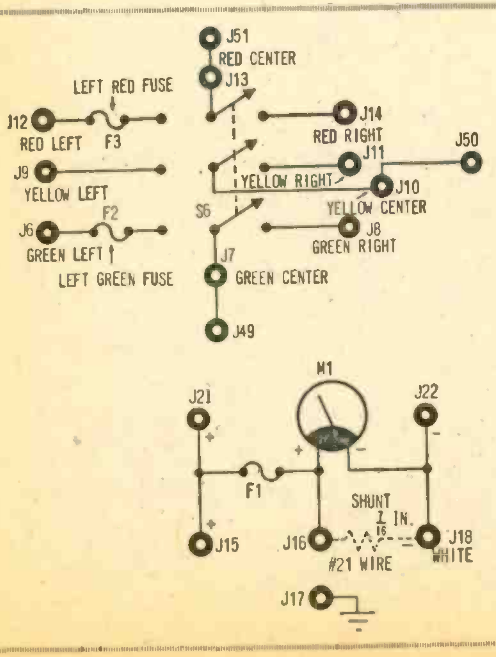


fraction of an ohm to more than 3700 ohms, with a power rating throughout in excess of 25 watts. Other features include built-in current-monitoring meter, fuses, and sufficient banana plug tie-points in the string of power resistors to provide a variety of series, series/parallel, and parallel connections.

As the schematic indicates, the number of interconnection possibilities is almost endless. What's more, the addition of four potentiometers in the series string makes the unit an extremely versatile tool wherever power handling is needed.

Load Box Put-Together. The prototype has a three-pole double-throw knife switch mounted on the front panel. It was chosen because of its simplicity, current carrying capacity, reliability, and low contact resistance. Of course, a double-pole switch could be substituted if deemed adequate or the switch and associated circuit could be deleted altogether.

Nine binding posts are positioned on the



PARTS LIST

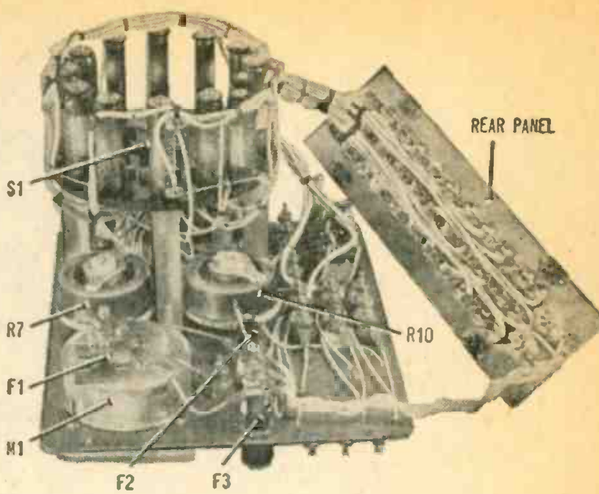
F1—1-amp fuse and holder
F2, F3—10-amp fuse and holder
J1-J22—Binding post (Radio Shack 274-736 or equiv.)
J23-J51—Banana jack
M1—1-A meter
R1—1-ohm, 25-watt potentiometer
R2, R3—1-ohm, 25-watt resistor
R4, R7, R10—25-ohm, 25-watt potentiometer
R5, R6—5-ohm, 25-watt resistor
R8, R9—25-ohm, 25-watt resistor
R11, R12—50-ohm, 25-watt resistor
R13, R14, R15, R16, R17—1000-ohm, 25-watt resistor
S1—2¼-in. sq., 1 deck, 15° shorting between position, 24-pole, 10-amp rotary switch (Daven 121-DM-24A or equiv.)
S2, S3, S4, S5—S.p.s.t. 10-amp toggle switch (Radio Shack 275-1533 or equiv.)
S6—Triple-pole, double throw, 10-amp knife switch
1—8 x 8 x 10-in. steel or aluminum cabinet
Misc.—Wire, solder, knobs, hardware, etc.

front panel in direct relation to the screw terminals on the knife switch. These binding posts are wired directly to their respective knife-switch screw terminals with the exception of two, as shown in the schematic. These two binding posts have a fuse holder in series with their knife-switch terminals. This arrangement makes it possible to fuse the line being switched.

The main frame chassis is grounded at the top mounting screw holding the knife switch. All other taps and terminals are isolated from ground. The three vertical terminals at the far left of the front panel are both ends of the 21-tap series of resistors and the center tap. The four toggle switches, S2 through S5, are also connected to the banana jacks on the rear panel as shown. This convenience enables the addition of any four external resistors which can be inserted into the circuit to modify total resistance. These plug-in resistors have the added feature that they can be quickly shorted out by their associated switch when no longer needed in the circuit.

The tap switch S1 was mounted away from the front panel with four polystyrene rods in the author's model. The photographs illustrate the positioning and wiring of the components, though this will vary depending on the type of switch used. The rear panel is laid out as shown or can be modified or deleted as required. Bear in mind that the power resistors can be expected to get hot so don't dress wiring along, or in contact with, the resistor bodies.

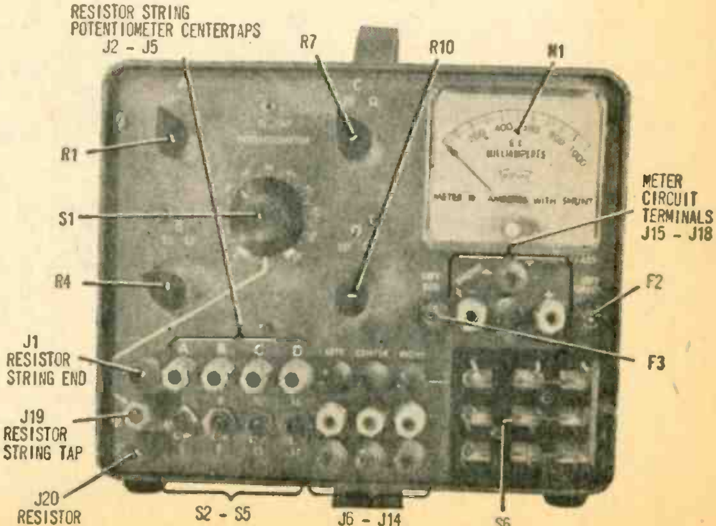
Handy Meter. A 0 to 1000 milliamp meter is used in the Load Box to conveniently monitor current. Since the meter has an internal resistance of 0.1 ohm, using a 100-ohm multiplier resistor (the resistance between taps 14 and 16), a 100-ohm-per-volt meter with 100-volt full-scale reading can be constructed. Using a 1000-ohm multiplier (the resistance between taps 18 and 19) provides a 1000-ohm-per-volt meter having 1000-volt full-scale indication.



Internal layout requires planning and careful construction to obtain good results.

Neither of the two voltmeter ranges described here are spectacular but they will serve in many applications. In addition, the 0 to 1000 meter can be shunted between the marked terminals J16 and J18 on the front panel to increase its range to 0 to 10 Amps. The shunt is made from a piece of #21 enameled copper wire 7/16-in. long strung between two single banana plugs. With the shunt plugged in, the ammeter scale reads 0 to 10 Amps ± 2 Amps.

Again, many variations in construction are possible. For example, if the builder doesn't require a built-in meter, provisions for an external VOM could be installed or the entire circuit eliminated. ■



All controls and major resistor string connections are accessible on front panel of author's version. Rear panel holds jacks J21 through J51.

S9er for SWLs

By W. Krag Brotby, Technical Editor

Low in cost, budget shortwave sets are also low in the one thing SWLs need most—gain. This six-buck soupup solves that problem.

■ There's no doubt that the inexpensive four- and five-tube superhet all-band receivers have made SWLing one of the country's most popular hobbies. Still, the inherent limits of one IF stage and no RF amplification can also prove one great big frustration. To solve this dilemma, some SWLs have gone the Q-multiplier route, while others have added a crystal or mechanical filter. Still others have put together a preselector or two, and the very well-heeled have turned to rigs in the $500 category.

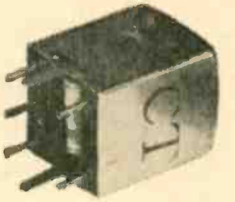
Addition of a Q-multiplier or a filter will improve selectivity but only at the expense of sorely needed gain. A preselector will provide more sensitivity and reduce image response but it won't improve selectivity much. A $500 rig would take care of matters, but it would also claim more clams than most SWLs have around.

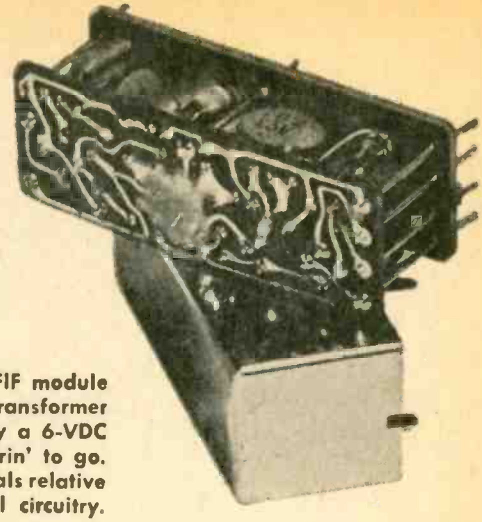
But there *is* a way out. And if you feel six bucks is a worthwhile investment in bringing home some rare ones (QSLs, that is), here's an answer just looking for your problem.

What we need is both more sensitivity and better selectivity—in other words, more plain old *zonk*. Unfortunately, *zonk* is just the thing the single IF stage found in most budget receivers simply can't provide. One tube can't provide enough gain, and there aren't enough tuned circuits (IF transformers) to deliver decent selectivity.

Given the problems of a typical, inexpensive SWL rig, the answer comes in a little module sold by Lafayette Radio. It's an aluminum box measuring only ½ x ½ x 1 in. but cram-packed with exciting stuff. It consists of two complete transistor IF stages, *plus* a crystal filter. Add the filter (not to mention two additional stages of IF

S9er for SWLs





Lafayette supplies its CFIF module complete with input transformer (above, left); unit requires only a 6-VDC power source and it's rarin' to go. Cover-off view at left reveals relative complexity of module's internal circuitry.

gain and three additional tuned circuits) to your receiver's IF strip, and you'll get lots of DX-making *zonk*. On the author's hookup to an EICO "Space Ranger," the little goody added 55 dB gain and knocked bandwidth down to about 3.5 kHz—an appreciable improvement.

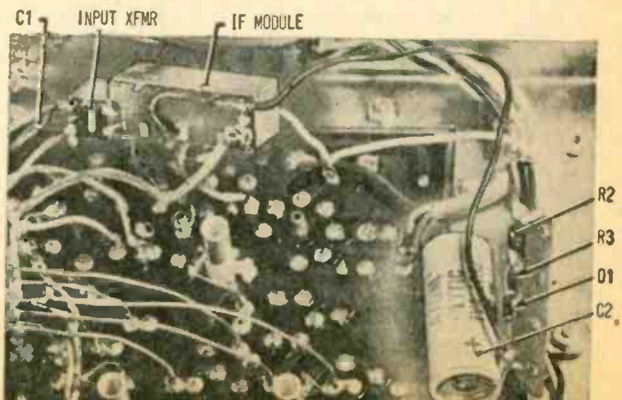
The module can be used with any radio with a 455-kHz IF, whether for SWL or BCB DXing. Its small size makes it simple to install and the power requirements of 6 VDC at about 2 mA are easily fulfilled.

Construction. The first step is to determine where to mount the IF module. It should preferably be as close as possible to the receiver's last IF transformer in order to keep leads short. The module can be mounted in any position and either on top or bottom of the chassis.

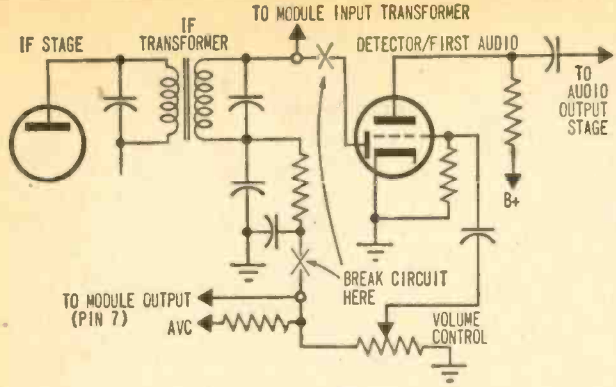
The author placed the unit on the bottom edge of the chassis skirt, as shown in the photos, for easy access to the module's connecting pins. The module can be readily attached with epoxy or other cement. The separate input transformer can be attached to the module or mounted separately. For ease of assembly, the author attached the input transformer to the module by carefully bending the connecting pins of both the transformer and the module so they could be soldered directly together. But bear in mind that the input transformer has a slug that can be reached only from the top and that *must* be accessible for final alignment. (In the author's case, this was accomplished through a hole drilled in the chassis.)

If the module cannot be conveniently located near the receiver's final IF transformer, use shielded cable to connect the input transformer. Otherwise, the receiver may actually go into oscillation.

Wiring The Module. The input transformer is wired to the receiver's last IF transformer. If you have a schematic of your rig it's easy to find. In any case, it's the transformer closest to the audio section. This



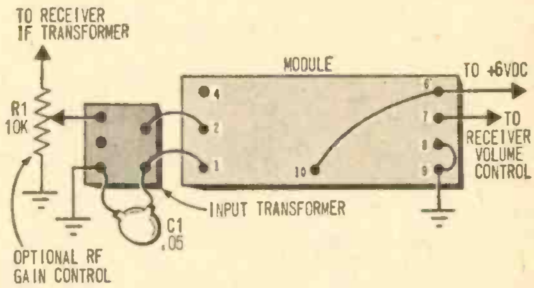
Author managed to tuck module, input transformer, and capacitor C1 along rear apron of his EICO Space Ranger; associated power supply (D1, C2, R2, R3) along one side. Module is ideally mounted as close as possible to receiver's last IF transformer.



Partial schematic of typical 4/5-tube superhet, showing few changes required to add module. Pictorial below presents bottom views of both input transformer and module and should be followed carefully. If optional RF gain control (R1) is not required, top left lug of transformer should be connected directly to IF transformer at point indicated in schematic. **See next page for power-supply schematics.**

PARTS LIST

D1—Silicon rectifier, 50-PIV, 50-mA
C1—.05-uF capacitor
C2—500-uF, 12-VDC miniature electrolytic capacitor
R1—10,000-ohm potentiometer
R2, R3—220-ohm, 1-watt resistor
1—IF module (includes input transformer) (Lafayette 99H6254)
Misc.—Wire, solder, terminal strip, hardware, etc.



transformer feeds the detector, which, in budget receivers is usually a 6- or 12AV6.

As shown in the hookup schematic, the circuit is broken at the output of the final IF transformer. One side of the module's input transformer is then wired to the secondary of the receiver's IF transformer; the other side is grounded.

The output of the module bypasses the receiver's detector and is wired directly to the audio section, since the module already contains a detector. The most convenient place is to tap into the hot side of the receiver's volume control.

The partial schematic of a typical budget receiver shows where to connect the module, this hookup being virtually identical in all receivers. You can also locate the point by touching your finger to each of the three volume control taps in turn: the outside tap with the loud hum is the one you want.

If the distance between the module and the volume control isn't too great, just hook the module output (pin 7) to the hot side of the volume control. If it's a long run, better use shielded cable to prevent hum pickup. Add the .05 bypass capacitor to the input transformer as shown, then connect pins 8 and 9 of the module to ground.

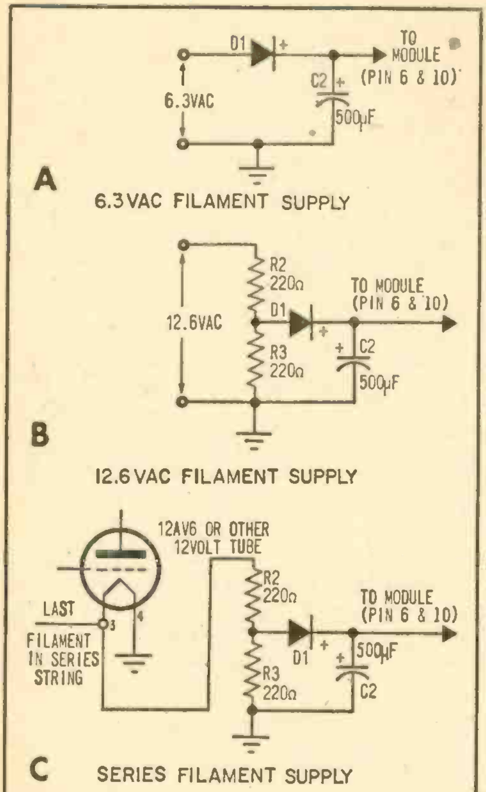
Power Supply. The module requires 6 VDC at about 2 mA for best operation. If your receiver has a 6-volt heater supply (check on your schematic or with a voltmeter), construct the supply shown in power supply schematic A on a 4-lug terminal strip and mount where there's room. The negative side is grounded and the positive side is hooked to pins 6 and 10 of the module.

If your receiver uses 12-volt tubes, construct the alternate supply (B) using an input voltage divider consisting of two 220-ohm resistors in series, the 6 volts being taken from between them, as shown.

The AC/DC series-filament type radio requires a little more care and a schematic. The series-filament string usually has a 12AV6 at the "cold" end of the string—confirm this by checking the schematic. (The cold end means one side of the filament is grounded and the other goes to the next filament in the series string.)

If this is so on your rig, simply attach the voltage divider consisting of two 220-ohm resistors across the 12AV6 filament connections and take 6 volts from between them, as shown in the third power supply schematic (C). If your set uses some other 12-volt tube in this position, connections remain the same. Of course, if a tube with another filament rating is used here, another ratio for the divider resistors will have to be used.

Operation. Recheck all wiring and make



Required 6-VDC to power module can be provided by 6-V battery or one of three supplies shown above (see Parts List on preceding page for component values.)

sure the polarity of the power supply diode and filter capacitor are correct. If everything checks out, you are ready for a trial run.

Turning on the receiver, probably the first thing you'll notice is a hissing sound—that's from the convertor. You get so much gain that internal noise of the mixer tube will come through if no signal is present.

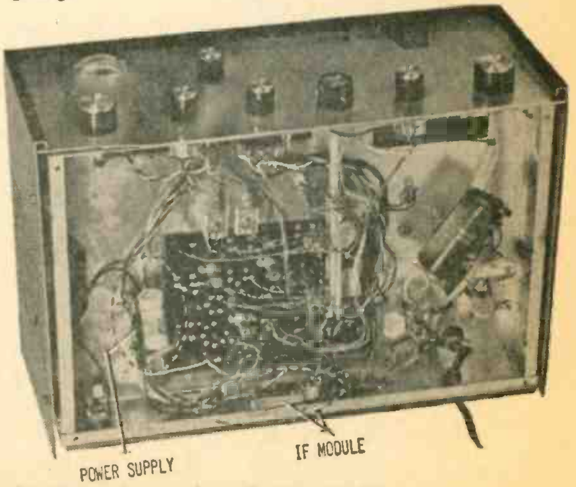
Tuning in a few stations will quickly show the tremendous increase in gain and the added selectivity. If you find that strong stations have a tendency to overload the IF strip and cause blocking or distortion, add the optional RF gain control shown in the pictorial. Again, either keep the leads quite short or use shielded cable for interconnection. Mount the control in any convenient location, preferably on the front panel where it's easy to reach.

Final Alignment. While odds are that the receiver will work pretty well right off, it should be aligned to get maximum benefit from the modification. Alignment can be accomplished with or without a signal generator.

With a generator, set the frequency to about 455 kHz and keep the RF output level quite low. Hook the generator's output to the module input transformer and hook a VOM (AC scale) to the speaker leads of the receiver. Tune the signal generator around 455 kHz until maximum signal gets through the module. This is the crystal filter's frequency, which isn't adjustable. Being careful not to detune the generator, transfer its output lead to the input of the receiver's first IF transformer. Reducing the signal generator's output level as needed, peak up all the IF transformers including the top slug of the module input transformer for maximum reading on the VOM.

If a generator isn't available, simply tune in a weak station whose signal is steady and free from fading. Using the VU meter (if your receiver has one) or a VOM (AC scale) hooked to the speaker leads of the receiver, peak all the IF transformers for maximum meter indication. Repeat the peaking procedure several times to make sure you're getting everything you can.

With the modification finished, a little further use of the receiver will soon convince you that the addition of this little crystal-filter-plus-IF module will give you more DX-making zonk per buck than anything else going. ■



Another view of author's receiver, showing placement of module and power supply. Since no two receivers are alike, location of module will depend on chassis layout.

HAM TRAFFIC
DE W7DQS

PICON, PICON, WHEREFORE ART THOU, PICON?

■ How long has it been since you helped a little old lady across a busy street?

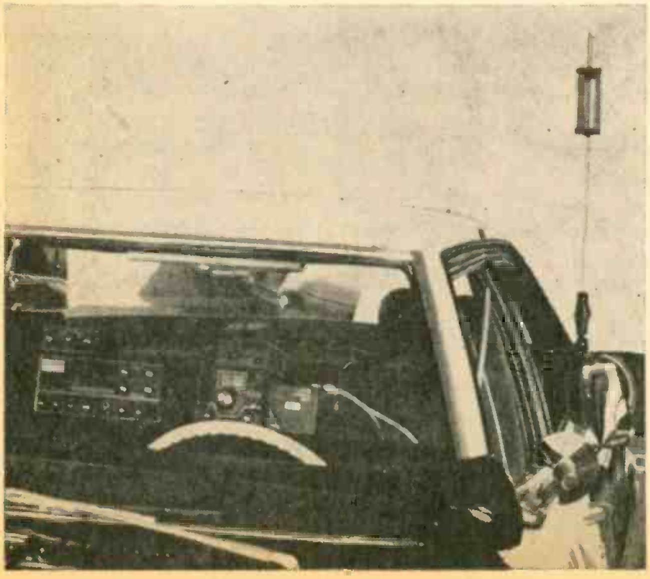
The Boy Scouts used to be noted for this kind of sincere, unselfish helpfulness (remember when one of Scouting's watchwords was "Do a good turn every day?"). This used to be a key function of ham radio, too, but a lot of hams have forgotten it. Some may never have learned it in the first place.

Just the other day I had lunch with a young fellow who works in an engineering lab of a leading electronics company. He's been an active ham for several years, but he never heard of this public-service function of ham radio! And he may be more typical than some of us realize.

For example, ask a dozen hams for the meaning of "PICON" and most of them probably won't even recognize that you're talking about ham radio. PICON, which used to be on the lips of thousands of active hams across the nation, stands for Public Interest, Convenience Or Necessity. Those are the key words that describe the intended operation of the Amateur Radio *Service*. (I emphasize the word service, because that's the correct name and it's also what we're supposed to provide, when needed.)

When we stop operating in the public interest, convenience, or necessity, we may stop being hams—by government decree. This doesn't mean every one of us must devote all our operating time every day to handling traffic, rescuing drowning victims, or dispatching fire trucks. It does mean, however, that enough of us must provide public-service communications, when there is a genuine need for such activity, to help justify use of our frequencies by *all* hams.

Public-service communications probably



A police car with a Ham rig in it? Sure is! Officer John Annis, WA6PCY, of the California Highway Patrol, monitors 7255 kHz while performing his regular duties; this is the frequency used by the West Coast Amateur Radio Service net.

will not do this all by itself. But it will help demonstrate to others that we hams have a sense of responsibility and are worth having around.

Service With A Smile. Fortunately, there still are some hams who take our responsibilities seriously. For example, a gang on the west coast, appropriately called the West Coast Amateur Radio Service, is doing its bit to perform some genuine public service. A friendly note from Ed Gribi, WB6IZF, offers the following rundown on this group's activities.

Members operate a net on 7255 kHz from 0800 to 1730 Pacific local time daily to provide "service to the public and other amateurs by assisting in emergencies, handling traffic, and facilitating contacts," Ed explained in his letter.

The net has been operating for four years now. In its ranks are some 370 regular members scattered from the state of Washington down into Mexico, and from Utah to maritime mobiles in the Pacific. There's a formal net session and roll call at noon daily to train members how to operate with efficiency, effectiveness, and discipline in the event of an emergency or disaster. Informal net operation is maintained the rest of the day, with base and mobile stations monitoring the frequency.

Ed says on a typical recent weekday, some 225 stations—135 of them net members—used the frequency. Two priority and 14 routine messages were handled, 15 phone patches were arranged, and at least 100 informal communications were completed, either on or off the net frequency.

Among members is the California Highway Patrol, whose headquarters amateur station, W6CDY, is a charter member of the West Coast Amateur Radio Service. The patrol has three SSB transceivers for coordinating official Patrol work with amateur communicators in emergencies. What's more, at least three members of the Patrol are hams involved in the net activities. They are Harold Samson, W6JBA, supervisor of the Patrol's electronic data processing section, and officers Jim Clark, WA6NSK, and John Annis, WA6PCY.

Samson recently received an outstanding performance award from the Patrol for helping set up a MARS (Military Affiliated Radio Service) operation for the Patrol. As for Annis, he has another claim to fame—he has one of the Patrol's amateur SSB transceivers in his police cruiser! In fact, the next cop car you see with a 40-meter whip just might be Officer John on patrol.

Direct Coupling. The 21st and 19th centuries have now been direct coupled, electronically speaking, by a new machine designed to train radio operators for the U.S. Army. For though Uncle Sam's boys have the latest in single sideband and Teletype gear to handle much of their traffic, at least some of them must be able to work Morse Code if necessary. Sometimes fancier gear breaks down or can't get through noise or interference. Then it's CW to the rescue.

Thing is, the crew-cut boys on the drawing boards have decided the stern-faced code instructor in the radio classroom is no longer needed. Some lads at Sylvania have replaced him with an automatic machine for teaching Morse. There are two dozen training consoles in the setup, each wired to give individual instructions in how to handle the dots and dashes.

Needless to say, the whole ball of wax is controlled by an electronic computer!

Novice News . . . The Friendly Chirp Checkers, otherwise known as the FCC, have added nine new questions to the Novice class exam study material.

At the risk of being called a nasty old man, I'm going to give just the questions here. If you're studying for the Novice exam, you should be able to determine in a jiffy whether or not you know the answers. If you don't, back to the books, lad.

1. When is one-way communication permissible?
2. What is a Hertz? kiloHertz? megaHertz?
3. What are some correct ways to call and answer other amateurs stations via telegraphy?
4. What are some common Q signals and what purposes do they serve? What do QRA, QRM, QRN, QRS and QRT mean when transmitted as questions via telegraphy?
5. What important functions do diodes perform?
6. What units are used to measure capacitance?
7. How are transistors made, used, and diagrammed? What are some common transistor parameters?
8. Why is impedance matching necessary?

(Continued on page 134)

By Herb Freidman, W2ZLF

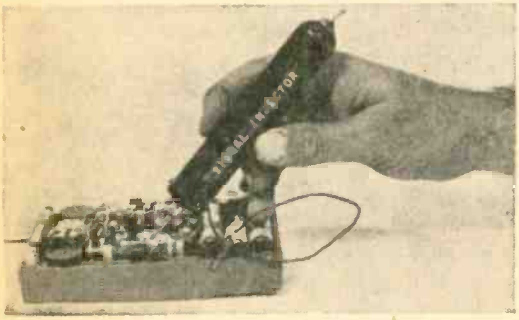
Make like a pro and troubleshoot the simple way with our easy to build self-contained solid-state signal injector.

MINI-JECTOR

■ Almost anyone, with a little training, can become a trouble-shooting expert if he's given a yard or two of test gear. But for those not fortunate to be blessed with several hundred (or thousand) dollars worth of test equipment, troubleshooting becomes a matter of brainwork.

Thing is, even the brain can't function if it has no information to go by. But feed the best "computer" of all just a wee bit of information, such as which circuits are go and which are no-go, and the brain can almost instantly point the way to the defective circuit.

How to tell which circuit in a dead receiver, recorder, or amplifier is go or no-go? Simplest way is with our multi-purpose signal injector.



A signal injector is a rather simple device—a square-wave - producing multi - vibrator with a fundamental output frequency somewhere in the audio range. Because the waveform is complex, either square or sawtooth, harmonics are produced well into the short-wave regions—as high as 30 MHz.

Place the output of the signal injector on the grid (or base) of an audio tube (or transistor), and you'll hear a somewhat distorted tone. Move the signal injector back to the IF amplifier and you'll still hear a tone because the injector is also producing output in the IF range. Move the injector further back to the RF input and again you'll hear the tone because the injector also has output in the RF spectrum.

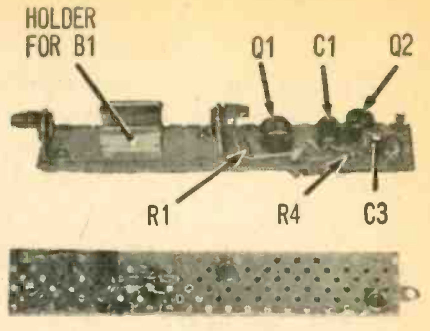
Fault Finder. If somewhere along the line you fail to push the tone through the set, you have isolated the defective stage. As a result, you now have something to feed into the human computer to solve the problem.

Our ultra-handy Mini-jector shown in the photo is complete within a standard test probe: the multi-vibrator, battery, and power switch are all self-contained. Flip the power switch on, and you'll get a signal output in the audio band up to approxi-

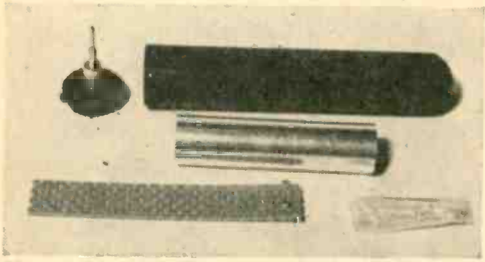
MINI-JECTOR

mately 12 mHz. Unlike some commercial signal injectors, this one doesn't produce a growl that can be confused with radio noise or interference; the multi-purpose signal injector's output is a crisp tone with a fundamental frequency between 1 and 2 kHz.

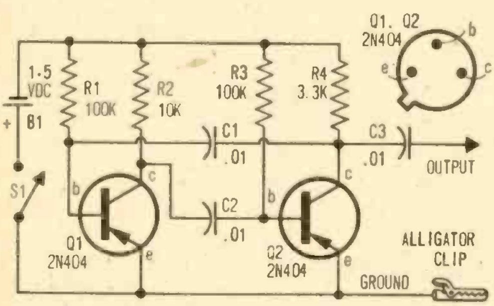
Making Mini-jector. The injector is assembled in a Keystone type 1810 test probe kit. The kit comes complete with an outer plastic handle with a 13/32-in. hole drilled at



Components are mounted on perf-board as shown. Completed assembly then slides into casing.



The test probe kit contains all mechanical parts required for Mini-jector including probe, brass shield, matching perf-board section and bag of push-in terminals.



Circuit diagram of Mini-jector.

one end. The other end is open to receive the screw-mounted cap and test prod. Also supplied is a section of perf-board, a bag of push-in terminals and a brass shield. The shield is not used for this project. (If your local Keystone dealer doesn't stock the 1810 test probe kit, see the Parts List for a source of supply.)

The entire signal injector is assembled on the perf-board. Note that one end of the perf-board has a staked terminal; this is the forward (test prod) end, and the terminal is used for the output connection to the test prod. Cut 1/4 in. off the back of the perf-board and mount a Keystone type 137 miniature cell holder (for AAA battery) in such a manner that the frame of the holder is exactly flush with the back of the perf-board.

Push-in Tiepoints. Except for the common battery negative-connection and the ground cable which use push-in terminals for tie points, all components are connected by simply passing their leads through holes in the perf-board, twisting, and soldering. Take care not to use excess heat when soldering the transistor leads.

Transistors Q1 and Q2 are the 2N404 type, but the low-cost Lafayette Radio type 19-4215 will work just as well. Space is at a premium so use 1/10- or 1/4-watt resistors and miniature 75- or 100-VDC capacitors. Position Q2 as close as possible to the staked terminal and Q1 as close as possible to the battery (cell) holder.

When the perf-board assembly is completed, install power switch S1. This can be either a low-cost pushbutton switch, in which case you will have to hold the button

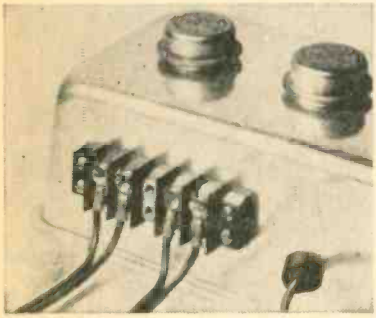
(Continued on page 129)

PARTS LIST

B1—1.5-volt size AAA battery (Eveready 912 or equiv.)
C1, C2, C3—0.01-uF, 6-VDC capacitor
Q1, Q2—2N404 transistor (see text)
R1, R3—100,000-ohm, 1/10-watt resistor
R2—10,000-ohm, 1/10-watt resistor
R4—3300-ohm, 1/10-watt resistor
S1—Miniature switch (see text)
1—Alligator ground clip
1—Cell holder for AAA battery (Keystone 137 or equiv.)
1—Test probe kit (Keystone 1810 or equiv.)
Misc—Wire, Solder, etc.

The Keystone test probe kit is available for $1.98 (postage and handling included) from Tridac Electronics Corp., Box 313, Alden Manor Branch, Elmont, N.Y. 11003. New York State residents add appropriate sales tax.

IMAGINEERING DESIGN TIPS



OUTPUT TRANSISTOR STOP-A-SHORT

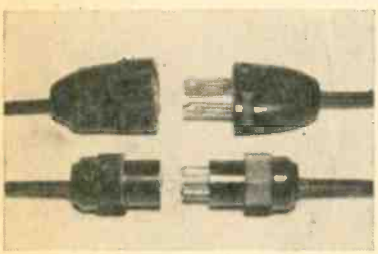
● When building your own transistorized power amplifiers, like this one using a cake pan for heat sink and chassis, take a tip from manufacturers and mount a barrier terminal strip for the speaker connections. This will help prevent shorts which can damage or destroy the output transistors. The response time of transistors is faster than that of fuses, and this is one good way to take care of the problem.

—J.M. McKeenan

NO-COST VOLUME GETTER

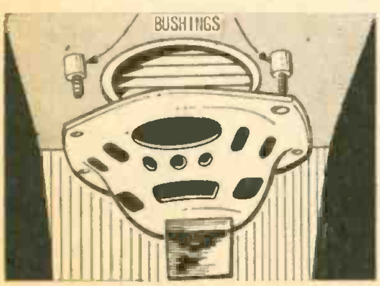
● At parties, dances, or other get-togethers, more volume can be had from that little transistor radio without resorting to complicated solutions. Simply attach a cheer-leader type megaphone to the radio with rubber bands or tape as shown, with the megaphone's mouthpiece centered over the radio's speaker. The end result is double or triple the volume.

—Art Trauffer



SPEAKER PHASE REVERSER

● Here's a quick and easy way to flip the connections to the speakers in a stereo set-up. The photo shows two types of connectors that can be used in the speaker wiring; one is a standard AC plug and socket, the other is an automotive type. Both types are un-polarized so that reversing speaker phase can be accomplished by simply reversing one of the plugs.—J. Hancock



BASS-REFLEX REAR-SEAT AUTO SPEAKER

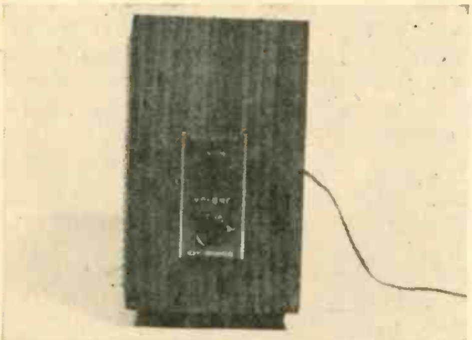
● When installing that rear-seat speaker in your car, mount the speaker on bushings as shown in the drawing. The bushings should be about ½-in. long. This creates a port for the speaker's backwave, thereby reinforcing the bass. Another advantage is that the fragile speaker cone is less subject to damage from excessive air pressure created when the trunk lid is slammed shut.

—Albert E. Hart

● Send your Imagineering Design Tips with full details and a photo or drawing to Radio-TV Experimenter, 505 Park Ave., New York, N. Y. 10022. The top ideas selected by the editors will win $10.00 each. Entries become the property of Radio-TV Experimenter and can't be returned.

By Herb Friedman

Decibel



Two controls on side of Duo-Remote extension speaker allow adjustment of both the TV and remote speaker volume.

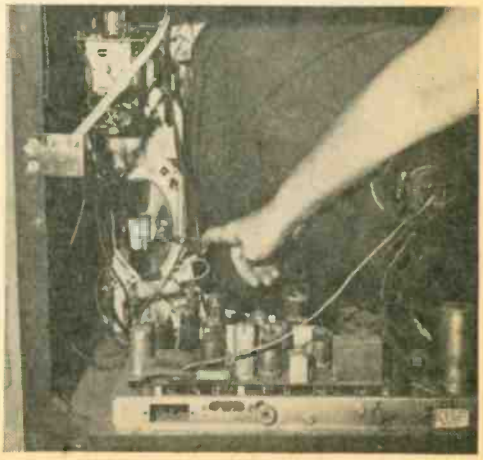
■ Do loud TV commercials take the pleasure out of your evening idiot-box viewing? Do you find extended lectures on sweaty armpits cause nausea? How about that rock singer with the booming voice who turns out to have a flea's whisper on TV, requiring a walk to the box to crank up the sound, and another walk to turn the sound level down when the M.C. comes back? Whatever the annoyance, it can be overcome with a remote TV speaker and remote volume controls placed next to your favorite armchair.

Adding a remote speaker and remote volume control for both the main TV speaker and the remote unit is an easy installation since virtually everything is supplied pre-wired in Lafayette Radio's Duo-Remote TV Speaker. As shown in the schematic, the Duo-Remote Speaker consists of all components inside the dotted line—and these are supplied pre-assembled in an attractive walnut-finished cabinet.

Control By The Twos. Note that two controls are provided: R1, which controls the level of the main TV speaker, and R2, which determines the remote speaker's sound level. R1 is a specially constructed potentiometer with a *full off* position—the schematic, in fact, shows the wiper in the *off* position. When installed, R1 completely disconnects the TV speaker, substituting R1 and R2 as the load for the TV receiver's output transformer. Since R2 and its associated remote speaker are connected across R1, the TV sound output appears across R2, with the remote speaker level determined by the position of R2's wiper.

The Duo-Remote Speaker requires a 3-wire connection to the TV receiver's speaker circuit in order to obtain control over both the main and remote speaker level. For convenience and maximum flexibility—like allowing the TV receiver to be "pulled" for servicing—a plug and jack arrangement such as shown in the schematic is suggested.

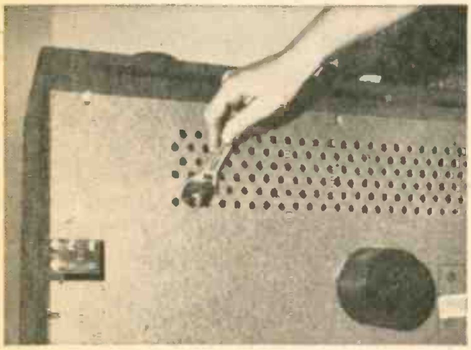
Note that J1 is a special version of the standard 3-circuit phone jack, having a through connection on the tip terminal. When connected as shown, removing the plug (thereby disconnecting the remote speaker) automatically restores the original TV speaker circuit. A further refinement as shown in the photos, is the use of a telephone type



First step is to remove one of the leads going to the speaker in the set.

When loud commercials give you the boob-tube blues, this neat and easy remote TV sound control will rest those weary ears.

Decimator



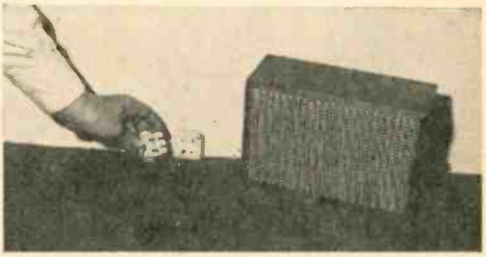
Remote speaker jack can be mounted in one of the ventilation holes in back of set, or 3/8-in. hole can be drilled to suit.

jack and wall plug at the remote speaker location, allowing the remote speaker to be unhooked at its location during housecleaning, etc.

Doin' It. The first step is to pull the TV power plug and remove the back of the cabinet. Locate the two wires leading from the audio output transformer to the speaker and disconnect *one* of them at the speaker terminal. Now install J1 on the back of the television receiver. Generally, the back cover has a series of 3/8-in. ventilation holes and J1 can be installed directly in a handy one, with no drilling required.

If there are no ventilation holes, you will, of course, have to drill a 3/8-in. hole for J1 in any convenient location. If the back is metal, J1 should be insulated for safety by using a set of fiber shoulder washers between J1 and the metal cover. After J1 is mounted, wire it up as shown in the schematic. Try to use the shortest possible leads and route them away from IF and RF circuits.

Now put the TV cover back and apply power. After the set warms up you should hear the program sound if no plug is in J1. If you don't hear the TV, better check for an error in wiring. If the sound is coming through, insert an unwired 3-wire phone plug in J1; the sound should be cut out. If it doesn't, check again for a wiring error.



Matching telephone plug connected to Duo-Remote allows unit to be readily disconnected for housecleaning.

Final Installation. If you want a quick-and-dirty finish, simply connect P1 to the existing Duo-Remote wiring as shown. Insert P1 to J1 and the installation is complete. However, since the wire supplied with the Duo-Remote unit is very thin and easily broken, a more permanent installation can

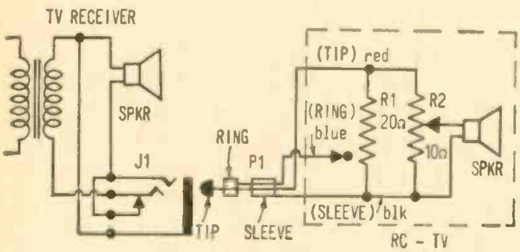
Telephone extension jack is mounted on baseboard near desired location of remote unit.

Decibel Decimator

be made by using standard #18 or #20 three-wire cable stapled to the moulding with an outlet plug at the speaker location.

Determine where the remote unit goes, then staple the 3-wire cable to the moulding with a round-staple stapler (the type used by electricians or telephone installers). If you have a tackless wall-to-wall carpet installation, the wire can often be pressed into the space between the carpet and the moulding.

Plug in P1 at the TV end of the cable and install a telephone-type jack (four connections) at the seating area. Connect the three wires of the cable to three of the four telephone jack terminals and connect the matching plug to the cable from the Duo-Remote Speaker.



Wire up the jack on the back of the set according to the schematic. The extension speaker, in the dotted lines, is pre-wired.

Decibel Decimator all hooked up and ready to go. With a little use, you'll find this inexpensive job's quite a step-saver.

PARTS LIST

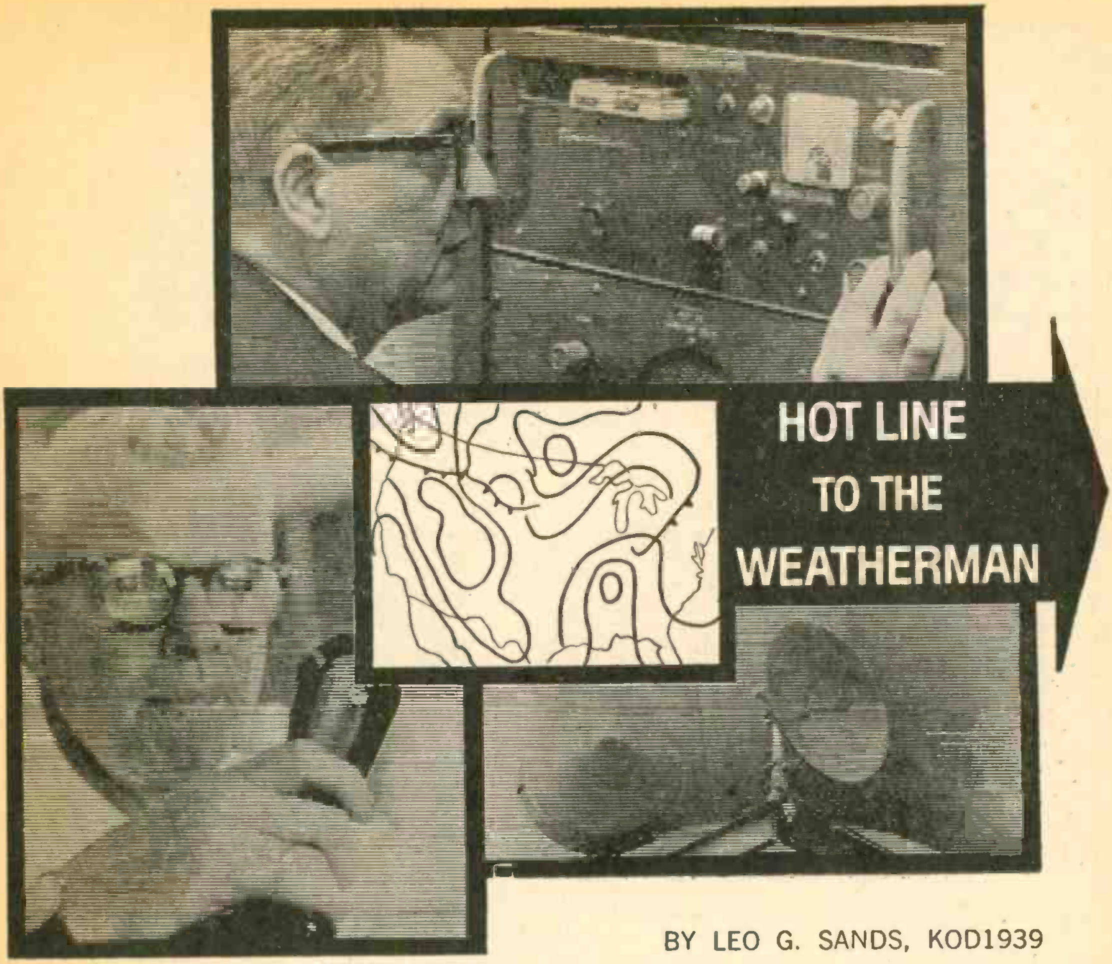
- J1—3-conductor jack (Switchcraft type 13B or equiv.)
- P1—3-conductor phone plug (Switchcraft type 267 or equiv.)
- 1—RC-TV Duo-Remote Speaker (Lafayette 99-H4596)
- 1—4-contact wall-mount telephone plug and socket (see text)
- Misc.—Wire, solder, staples, etc.

Usin' It. With P1 plugged into J1 and the telephone plug into the telephone jack, set the *main speaker* control on the Duo-Remote to maximum volume (full clockwise) and the *remote speaker* control to *off* (counterclockwise). Turn on the TV receiver and set the TV sound slightly louder than normal—the volume can then be set to a comfortable level with the *main speaker* control on the Duo-Remote. To kill the main speaker from the Duo-Remote, simply rotate the *main speaker* control counterclockwise. The level at the remote speaker can be adjusted at any time—either with the main speaker *on* or *off*—to any desired volume with the remote speaker control. Now when your ears are assaulted by unwanted TV sounds, you can fight back with but a flick of the wrist. ■

Bigger Antenna Feeds There Aren't

☐ Designed and built by Radiation Inc., the world's largest antenna feed is big as a two-story house and weighs in at 14,000 lbs. The feed is constructed with four outer VHF error horns located around a VHF sum horn, and it even sports a UHF sum horn in the center of the VHF job. Because of its multiple horns, the feed can provide four different types of polarization—vertical, horizontal, left and right, and circular. Its purpose is to gather maximum target information from a radar echo.

Intended for use with a 150-ft. detection and tracking antenna that is part of the nation's anti-missile defense program, the feed will be shipped to the South Pacific for permanent installation. ■



HOT LINE TO THE WEATHERMAN

BY LEO G. SANDS, KOD1939

Valuable, up to the minute weather information is being broadcast by the U. S. Weather Bureau, and, it's available to anyone free of charge. The U. S. Weather Bureau has in operation 19 weather bureau stations operating on 162.55 MHz. Approximately 150 more are scheduled to be added in the near future to cover all coastal areas and cities of over 100,000 population. These FM radio stations broadcast weather information for mariners, motorists, aviators, boatmen, etc.

•The Weather Bureau's radar and radio station (KWO-35) in New York City is atop the RCA Building. Meteorologists watch the radar and give cloud-by-cloud reports. The station's broadcasts can be heard at least 60 miles away and one yachtsman said he could pick up the broadcasts when 140 miles out to sea.

Where? Weather broadcasts are transmitted on a channel adjacent to the VHF Marine Public Correspondence Channels, within the 150-174 MHz mobile band. These are FM signals with ± 15 kHz deviation as used by VHF/FM marine radiotelephones, instead of ± 5 kHz used by the land mobile radio services.

You can't tune in these broadcasts with an FM broadcast receiver. In order to receive them, you must either have a fixed-tuned VHF/FM monitor receiver, or pocket paging receiver that can be tuned to 162.55 MHz, or, you can use a converter with an AM BCB auto or home radio which then employs "slope detection" to demodulate the FM signals. Here is a breakdown of the various means that can be used to receive these Weather Bureau broadcasts.

VHF/FM Monitor Receivers. There are numerous VHF/FM receivers available on the market that can tune the 150-174 MHz band. Some are available in kit form for less than $50 or you can pay as much as

Weather Broadcast Receivers

Sonar Monitor Receiver

Lafayette PB-150 FM Receiver

Lafayette HA-520 FM Communications Receiver

Allied Knight KG-221A FM Monitor Receiver

$200 for one completely assembled and ready to use.

Receivers are available which operate from 117 VAC, 12 VDC, or either one. There are also portable receivers that operate from self-contained batteries and some operate from AC as well as batteries. The advantage of a tunable receiver is that it can not only monitor weather broadcasts, but police, fire, railroad, mobile telephone, business and various other radio services as well.

Fixed-tuned VHF/FM receivers are also available which operate from 117 VAC or 12 VDC, or both. In some cases only one channel is used. In others, a front-panel switch enables selection of from two to six channels. These receivers are crystal controlled and a separate crystal (162.55 MHz for the weather bureau), is required for each channel you want to monitor.

Fixed-tuned receivers cost from approximately $75 to about $250. Realize that the more expensive receiver has additional features, such as better sensitivity and higher stability. All fixed frequency monitor receivers are crystal controlled and some have an RF stage to provide increased sensitivity and a squelch circuit to cut out noise when not receiving signals.

There are also combination type monitor receivers. These receivers can use a crystal for a specific channel, such as the Weather Bureau broadcasts, and a tuning dial for tuning in other channels. A switch is provided to change from fixed frequency mode to tunable mode. Prices for these units start at less than $100.

Portable Receivers. Until a short time ago, a pocket size VHF/FM portable receiver was very expensive. There is one now on the market for only $39.95 which makes it inexpensive and easy to receive weather broadcasts.

There are expensive types of pocket paging receivers, similar to the type IBM service technicans use to receive their orders. These paging receivers contain a decoding

Sonar FR-103 VHF Sentry

Unimetrics FM Minivox

Allied 2671 AM/FM Portable Communications Receiver

Radio Shack Realistic Patrolman MW/VHF Receiver

A variety of receivers capable of picking up the 162.55-MHz weather broadcasts are available within a price range to suit every budget. A sampling of these receivers is shown here.

device which prevents the receiver from operating until a special coding signal activates it. This decoding device is not included in receivers for listening to Weather Bureau broadcasts or other communications channels.

These little paging receivers are characteristically very sensitive and selective, have no external antenna protruding and have a built-in squelch circuit that keeps the receiver quiet until a signal activates it. A crystal, of course, is used to control frequency and self-contained batteries are utilized for power.

Available Pocket Portable. One of the newest pocket portable receivers that can be used for tuning in weather bureau broadcasts is the Sonar Sentry. It's a dual purpose radio, operable on the AM broadcast band or, as a fixed-frequency single- or dual-channel VHF receiver. In the VHF mode, two crystals can be installed, one for receiving the Weather Bureau and the other for some additional channel.

U.S. WEATHER BUREAU STATIONS

Location	Call Letters	Operational
Atlantic City	KHB38	During 1968
Boston	KHB35	By January, 1968
Charleston	KHB29	By January, 1968
Chicago	KWO39	Now
Corpus Christi	KHB41	By January, 1968
Galveston	KHB40	By January, 1968
Hartford	KHB47	During 1968
Honolulu	KHA99	Now
Jacksonville	KHB39	By January, 1968
Kansas City	KIB77	Now
Lake Charles	KHB42	By January, 1968
Los Angeles	KWO37	By January, 1968
Miami	KHB34	Now
New Orleans	KHB43	By January, 1968
New York	KWO35	Now
Norfolk	KHB37	During 1968
San Francisco	KHB49	Now
Suitland (Md.)	KHB36	By January, 1968
Tampa	KHB32	By January, 1968

The Sentry uses a telescoping whip as an antenna which extends to about 18 inches. Though it is not a true FM receiver and has

(Continued on page 128)

Radio-TV EXPERIMENTER LAB CHECK

AMPHENOL MODEL 870
Field Effect Transistor
Portable Voltohmmeter

■ The service grade VTVM has two outstanding defects. First, it is not portable—even with a battery power supply the relatively heavy current drain of tube circuits will result in run-down batteries just when you need the meter most. Second, the VTVM's lowest range is about 1-volt full scale—perhaps 0.5 volt if you have a late model. Therefore, the average experimenter and technician has always needed an AC-VTVM with sensitivity down to 1 millivolt to round out the test bench.

But with the advent of the FET (field effect transistor), it became possible to design around the basic VTVM faults, and a modern FETVM, such as the *Amphenol 870 Field Effect Transistor Voltohmmeter*, combines the best advantages of the VTVM with portability and low-voltage sensitivity. In fact, the *Amphenol FETVM* provides the performance of two meters—the VTVM and the AC-VTVM—in one instrument.

Fixed Input Z. Unlike transistorized VOMs with input impedances which, though high, still vary depending on the particular range in use, the *Amphenol 870* has a fixed input impedance regardless of the range in use. For DC measurements, the input impedance is 10.6 megohms. For AC ranges from 10 mV to 1 V, the input impedance is 10 megohms shunted by 31 pF. For AC ranges from 3 V to 300 V, the input impedance is still 10 megohms but the shunt capacity is only 20 pF.

Similar to the VTVM, the FETVM provides for measuring DC volts, AC volts, and resistance. Nine DC ranges provide full-scale measurement for 0.1 to 1000 volts using 1-3 decading (0.1, 0.3, 1, etc.) Nine AC ranges provide full-scale measurement from .01 (10 millivolts) to 300 volts.

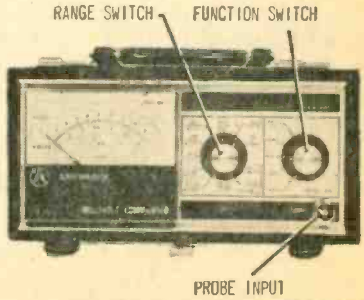
Six ranges from Rxl to Rxl-megohm provide resistance measurements from 10 ohms to 10 megohms center-scale.

Of particular interest to the audio experimenter and technician is the decibel range calibrated to the AC voltage ranges, with 1 VAC equal to 0 dB. The dB ranges decade down to −40 dB (.01 V) and up to +50 dB (300V). The associated dB meter scale conforms to the standard of 1 mW in 600 ohms.

Not including the dB scale, the meter face has but three highly legible scales. The ohms scale is a very bright, almost three-dimensional, red. Two linear black scales are all that's used for all AC and DC ranges. There is also a center-scale mark for zero-center pointer positioning though there is no calibrated zero-center scale.

Just as with the latest VTVMs, the FETVM utilizes a single probe for all functions—the AC-ohms/DC switch is built into the probe. The standard zero-adjust and ohms-adjust controls are also provided.

Testing . . . Testing . . . As far as accuracy is concerned, the *Amphenol 870* checked out its rated specifications of 2 percent of full-scale DC, 3 percent of full-scale AC. For DC measurements, the zero-set adjustment held within ¼ of a scale division

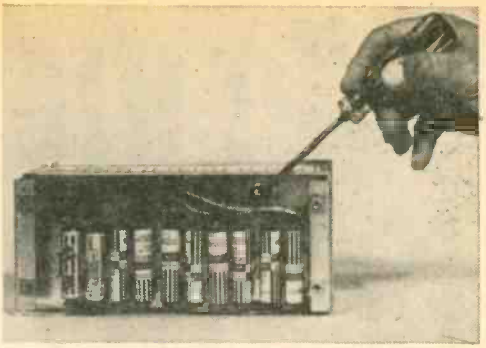


With cover removed, Amphenol FETVM can be used conveniently in either vertical or horizontal positions.

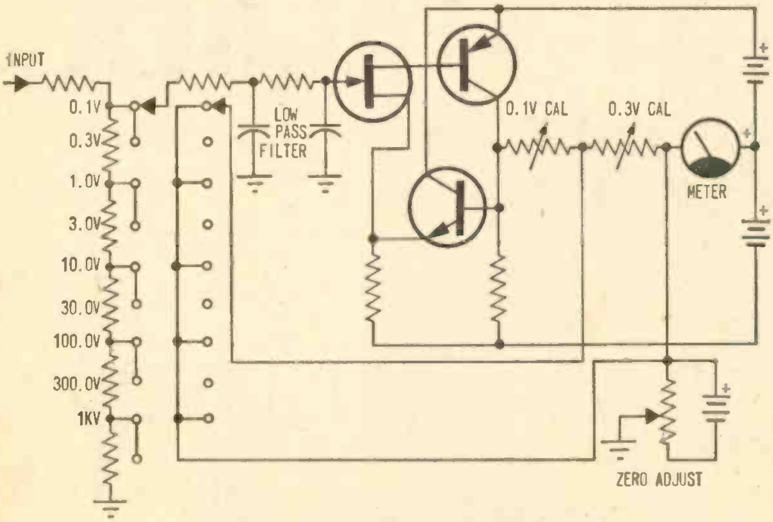
(negligible) for all DC voltage ranges. The AC zero set is automatic (there is no front panel adjustment) and, it too, is held on zero for all AC ranges.

While both the zero- and infinite-ohms adjustment hold with reasonable accuracy for all resistance ranges, there is no correlation between the ohms and DC zero-set control, and the user must readjust the control when switching between the DC and resistance functions.

The *Amphenol 870 FETVM* comes complete in a vinyl-covered wood case. The front panel, which contains a storage compartment for the test probe, swings up when the meter is in a horizontal position, or it can be removed for both vertical and horizontal viewing. A small swing-out bracket on the bottom of the case permits the meter to be tilted at a slight angle.



Rear apron of FETVM contains 10 batteries and coarse zero adjust control accessible through hole in rear cover.



Simplified circuit of Amphenol FETVM DC circuit. Note use of low-pass filter to remove AC from DC measurements.

How It Works. The heart of the instrument is the FET, which is the input amplifier for both the AC and DC functions. Unlike the usual transistor, which has a relatively low impedance even when connected in the Darlington configuration, the FET has an input impedance equal to that of vacuum tubes—up around 100 megohms.

If the input voltage divider totals 10 megohms, the connection of the FET's 100-megohm parallel load will obviously have no effect on the input impedance as the load represented by the FET is at least 10 times greater than that of the voltage divider. (When two resistors are connected in parallel and one is ten times the value of the other, the larger resistor has no effective relation to the total resistance.)

The output of the FET amplifier is then fed to a transistor booster amplifier/impedance invertor or a meter amplifier.

The Circuit. Have a look at the simplified schematic of the DC circuit. A minute voltage is tapped off the input voltage divider and fed to a low pass filter which removes most of any AC component which might be present in the DC circuit being measured. This allows DC to be measured in the presence of a 60-Hz voltage 40 dB greater than the full scale value of the DC range. The low pass filter output is then passed to the FET amplifier and on to the meter amplifier.

The AC circuit is somewhat different from the DC circuit as can be seen in the second schematic. Here, instead of the applied volt-

(Continued on page 108)

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—more value, more solid experience so essential to careers in Electronics. NRI's pioneering "discovery" method is the result of more than half a century of simplifying, organizing, dramatizing subject matter. In each of NRI's major courses you learn by doing. You demonstrate theory you read in "bite-size" texts programmed with NRI designed-for-learning professional lab equipment. Electronics comes alive in a unique, fascinating way. You'll take pleasure in evidence you can feel and touch of increasing skills in Electronics, as you introduce defects into circuits you build, perform experiments, discover the "why" of circuitry and equipment operation.

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NRI Has Trained More Men for Electronics Than Any Other School

—By actual count, the number of individuals who have enrolled for Electronics with NRI could easily populate a city the size of New Orleans or Indianapolis. Over three-quarters of a million have enrolled with NRI since 1914. How well NRI training has proved its value is evident from the thousands of letters we receive from graduates. Letters like those excerpted below. Take the first step to a rewarding new career today. Mail the postage-free card. No obligation. No salesman will call. NATIONAL RADIO INSTITUTE, Electronics Division, Washington, D.C. 20016.

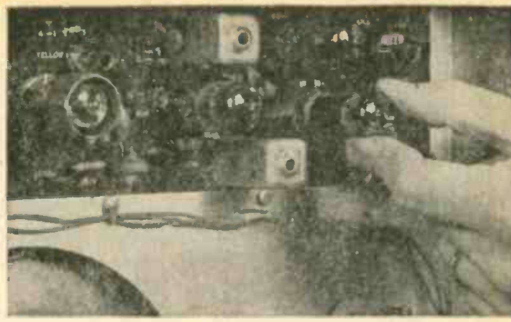
L. V. Lynch, Louisville, Ky., was a factory worker with American Tobacco Co., now he's an Electronics Technician with the same firm. "I don't see how the NRI way of teaching could be improved."

G. L. Roberts, Champaign, Ill., is Senior Technician at the U. of Illinois Coordinated Science Laboratory. In two years he received five pay raises. Says Roberts, "I attribute my present position to NRI training."

Don House, Lubbock, Tex., went into his own Servicing business six months after completing NRI training. This former clothes salesman just bought a new house and reports, "I look forward to making twice as much money as I would have in my former work."

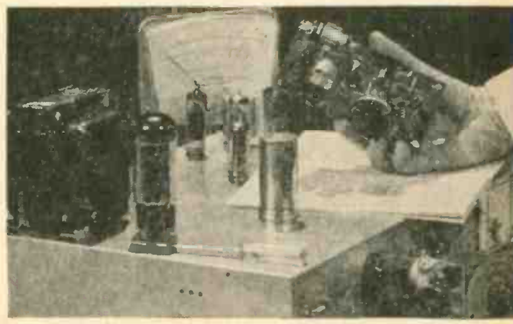
Ronald L. Ritter of Eatontown, N.J., received a promotion before finishing the NRI Communication course, scoring one of the highest grades in Army proficiency tests. He works with the U.S. Army Electronics Lab, Ft. Monmouth, N.J. "Through NRI, I know I can handle a job of responsibility."

APPROVED UNDER NEW GI BILL. If you served since January 31, 1955, or are in service, check GI line on postage-free card.



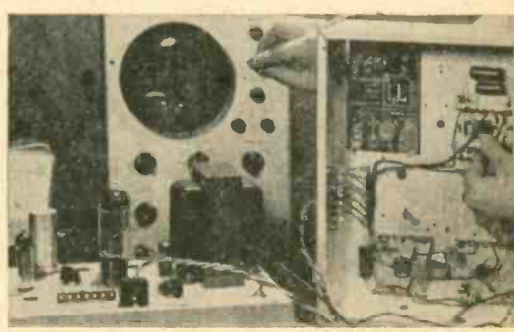
COLOR TV CIRCUITRY COMES ALIVE

as you build, stage-by-stage, the only custom Color-TV engineered for training. You grasp a professional understanding of all color circuits through logical demonstrations never before presented. The TV-Radio Servicing course includes your choice of black and white or color training equipment.



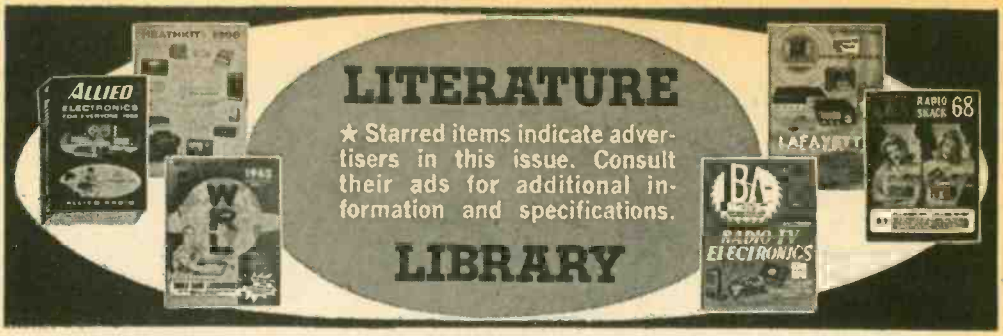
COMMUNICATIONS EXPERIENCE

comparable to many months on the job is yours as you build and use a VTVM with solid-state power supply, perform experiments on transmission line and antenna systems and build and work with an operating, phone-cw, 30-watt transmitter suitable for use on the 80-meter amateur band. Again, no other home-study school offers this equipment. You pass your FCC exams—or get your money back.



COMPETENT TECHNICAL ABILITY

can be instantly demonstrated by you on completing the NRI course in Industrial Electronics. As you learn, you actually build and use your own motor control circuits, telemetering devices and even digital computer circuits which you program to solve simple problems. All major NRI courses include use of transistors, solid-state devices, printed circuits.



CB—AMATEUR RADIO—SHORTWAVE RADIO

130. Bone up on CB with the latest *Sams* books. Titles range from "ABC's of CB Radio" to "99 Ways to Improve your CB Radio." So Circle 130 and get the facts from *Sams*.

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

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

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

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

★129. Boy, oh boy—if you want to read about a flock of CB winners, get your hands on *Lafayette's* new 1968 catalog. *Lafayette* has CB sets for all pocketbooks.

122. Discover the most inexpensive CB mobile, Citi-Fone II by *Multi-Elmac Company*. Get the facts plus other CB product data before you buy.

50. Get your copy of *Amphenol's* "User's Guide to CB Radio"—18 pages packed with CB know-how and chit-chat. Also, *Amphenol* will let you know what's new on their product line.

121. Going CB? Then go *CB Center of America*. Get their catalog and discover the *big bonus* offered with each major product—serves all 50 states.

107. Want a deluxe CB base station? Then get the specs on *Tram's* all new Titan II—it's the SSB/AM rig you've been waiting for!

116. Pep-up your CB rig's performance with *Turner's* M+2 mobile microphone. Get complete spec sheets and data on other *Turner* mikes.

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

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

45. Hams, CBers, experimenters! *World Radio Labs* 1968 catalog is a bargain hunter's delight. Get your copy—it's free.

115. Get the full story on *Polytronics Laboratories'* latest CB entry —Carry-Comm. Full 5-watts, great for mobile, base or portable use. Works on 12 VDC or 117 VAC.

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

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

ELECTRONIC PARTS

★1. Allied's catalog is so widely used as a reference book, that it's regarded as a standard by people in the electronics industry. Don't *you* have the 1968 *Allied Radio* catalog? The surprising thing is that it's free!

★2. The new 1968 Edition of *Lafayette's* catalog features sections on stereo hi-fi, CB, ham gear, test equipment, cameras, optics, tools and much more. Get your copy today.

★102. Before you buy your next *xtal*, get ahold of *Sentry's* 1968 catalog. *Sentry* lists the best in precision quartz crystals and communications goodies. Check off 102 now!

★8. Get it now! *John Meshna, Jr.'s* new 46-page catalog is jam packed with surplus buys—surplus radios, new parts, computer parts, etc.

23. No electronics bargain hunter should be caught without the 1968 copy of *Radio Shack's* catalog. Some equipment and kit offers are so low, they look like misprints. Buying is believing.

5. *Edmund Scientific's* new catalog contains over 4000 products that embrace many interests and fields. It's a 148-page buyers' guide for Science Fair fans.

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

★4. *Olson's* catalog is a multi-colored newspaper that's packed with more bargains than a phone book has names. Don't believe us? Get a copy.

★7. Before you build from scratch check the *Fair Radio Sales* latest catalog for electronic gear that can be modified to your needs. *Fair* way to save cash.

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

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

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

120. *Tab's* new electronics parts catalog is now off the press and you're welcome to have a copy. Some of *Tab's* bargains and odd-ball items are unbelievable offers.

117. Harried by the high cost of parts for projects? Examine *Bigelow's* 13th Anniversary catalog packed with "Lucky 13" specials.

ELECTRONIC PRODUCTS

128. If you can hammer a nail and miss your thumb, you can assemble a *Schober* organ. To prove the point, *Schober* will send you their catalog and a 7-in. disc recording.

126. *Delta Products* new capacitive discharge ignition system in kit form will pep up your car. Designed to cut gas costs and reduce point and plug wear. Get *Delta's* details in full-color literature.

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

★44. Get your copy of *EICO's* colorful 36-page catalog on 200 "best buys" products. Ham radio, CB, hi-fi, test gear, both wired and kit, are illustrated.

★125. Need TV camera kit, touch control lamp, hi-fi component, test unit or shop gear? Then you need *Conar's* latest catalog. Born from NRI, *Conar* has become a major supplier of electronics hobbyist parts.

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

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

SCHOOLS AND EDUCATIONAL

★61. *ICS (International Correspondence Schools)* wants to send you a 64-page booklet on the most often asked questions on preparing for an electronics career. You also get "How to Succeed" and a sample *ICS* lesson.

★74. A 40-page illustrated book on "How To Succeed In Electronics" and a 24-page book on "How to Get a Commercial FCC License" are yours for the asking from Cleveland Institute of Electronics.

114. Prepare for tomorrow by studying at home with *Technical Training International*. Get the facts today on how you can step up in your present job.

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*.

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

★3. Get all the facts on Progressive Edu-Kits Home Radio Course. Build 20 radios and electronic circuits; parts, tools and instructions come with course.

HI-FI/AUDIO

124. Now, *Sonotone* offers you young ideas in microphone use in their new catalog. Mikes for talk sessions, swinging combos, home recording, PA systems and many more uses.

26. Always a leader, *H. H. Scott* introduces a new concept in stereo console catalogs. The information-packed 1968 Stereo Guide and catalog are required reading for audio fans.

85. Write the specs for an ideal preamp and amp, and you've spelled out *Dynaco's* stereo 120 amp and PAS-3X preamp. So why not get all the facts from *Dynaco!*

119. *Kenwood* puts it right on the line. The all-new *Kenwood* stereo-FM receivers are described in a colorful 16-page booklet complete with easy-to-read-and-compare spec data. Get your copy today!

15. *Acoustic Research* would like to send you literature on their speaker systems and turntable. It's "must have" literature before you buy.

131. Let *Elpa* send you "The Record Omnibook." It's a great buy and *Elpa* wants you to have it free. Your records will thank you when the mailman delivers it.

16. *Garrard's* Comparator Guide clues you in on the new Synchro-Lab turntable/changer series. Discover how *Garrard* locks on to the correct disc speed.

17. Mikes, speakers, amps, receivers—you name it, *Electro-Voice* makes it and makes it good. Get the straight poop from *E-V* today.

19. *Empire* has made exceptional advances in speaker cabinet design you should read about. Also, *Empire's* successes in the turntable and cartridge fields are worth discovering.

27. 12 pages of *Sherwood* receivers, tuners, amplifiers, speaker systems, and cabinetry make up a colorful booklet every hi-fi bug should see.

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

99. Get the inside info on why *Telex/Acoustech's* solid-state amplifiers are the rage of the experts. Colorful brochure answers all your questions.

TAPE RECORDERS AND TAPE

123. Yours for the asking—*Elpa's* new "The Tape Recording Omnibook." 16 jam-packed pages on facts and tips you should know about before you buy a tape recorder.

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

32. "Everybody's Tape Recording Handbook" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 24-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

34. "All the Best from *Sony*" is an 8-page booklet describing *Sony-Superscope* products—tape recorders, microphones, tape and accessories. Get a copy before you buy!

35. If you are a serious tape audiophile, you will be interested in the all new *Viking/Telex* line of quality tape recorders.

HI-FI ACCESSORIES

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

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

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

TOOLS

★78. Need pliers to hold, bend or cut, fine wires? Check *Xcelite's* new line of miniatures shown in Catalog 166 along with a complete selection of regular pliers and snips.

118. Secure coax cables, speaker wires, phone wires, etc., with *Arrow* staple gun tackers. 3 models for wires and cables from 3/16" to ½" dia. Get fact-full Arrow literature.

TELEVISION

★70. Need a new TV set? Then assemble a *Heath* TV kit. *Heath* has all sizes. B&W and color, portable and fixed. Why not build, the next TV you watch?

127. *National Schools* will help you learn all about color TV as you assemble their 25-in. color TV kit. Just one of *National's* many exciting and rewarding courses.

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

RADIO-TV EXPERIMENTER
Dept. 268
505 Park Avenue
New York, N. Y. 10022

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100	101	102	103	104	105	106	107	109	111
112	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	

NAME (Print clearly)____________________

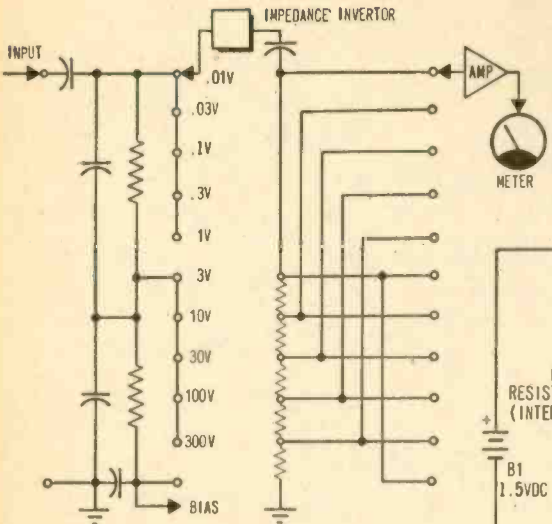
ADDRESS____________________

CITY____________________

STATE____________ZIP________

LAB CHECK

Continued from page 101

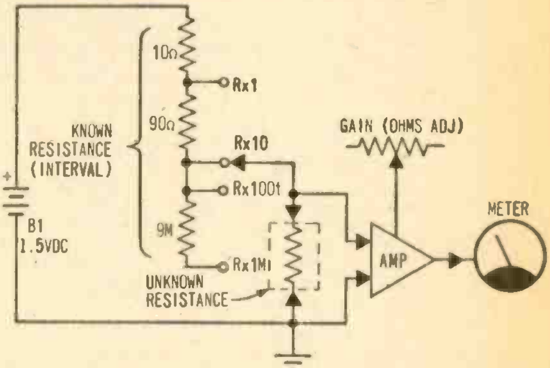


FETVM AC circuitry employs only two voltage divisions for input voltage to keep signal level to FET high.

age appearing across the normal voltage divider, the input voltage is divided only twice for a high and low range. One reason for this is to provide a high-level signal to the FET in order to prevent internal noise from interfering with very low voltage measurements.

The output of the two-step divider is then fed to the impedance invertor which consists of the FET and its associated transistor amplifier. The relatively high level output of the impedance invertor is now fed to a voltage divider where the voltage is tapped off for the meter amplifier. While at first glance this might appear to be the hard way of doing things, this method provides for the very low .01 V range and 3 percent accuracy between 50 and 50,000 Hz. And it's this range that effectively makes the *Amphenol 870* a combined FETVM and an AC-FETVM.

Summing Up. Within the limitation of the 300 V maximum AC range, the *Amphenol 870 FETVM* can be considered as a substitute for both a standard VTVM and an AC-VTVM, realizing the advantages of portability and price since the cost of the 870 is less than that of the two instruments it replaces. Also, while the low-voltage AC ranges



Resistance measuring circuit of FETVM is conventional providing six ranges to read from 10 ohms to 10 megohms center scale.

are particularly useful in audio service work, the very-low-voltage DC range of 0.1 V full-scale makes the instrument exceptionally useful for transistor servicing where voltages in the range of 0.1 to 0.5 volt are the rule rather than the exception.

The *Amphenol 870 FETVM* is priced at $99.95 including the case, probe and batteries. For more information write to the Amphenol Distributor Div., Amphenol Corp., Dept. DF, 2875 S. 25th Ave., Broadview, Ill. 60153. ■

As substitute for both VTVM and AC-VTVM, the Amphenol FETVM provides the user with a substantial number of useful features at a reasonable cost.

WHITE'S RADIO LOG

Volume 49, No. 1

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

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

In Our Next Issue, April-May, 1968, the *Log* will contain the following listings: U.S. AM Stations by Location, U.S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, and an expanded Shortwave Section. The shortwave listings are always completely revised in each issue of *Log* to insure 100 percent up-to-date and accurate information.

In the June-July, 1968 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 an expanded World-Wide Shortwave Section.

Therefore, in any three consecutive 1968 issues of RADIO-TV EXPERIMENTER magazine, you will have a complete cross-reference listings of *White's Radio Log* that is always up-to-date. The three consecutive issues are a complete volume of *White's Radio Log* that offers up to the minute listings that are not to be found 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 shortwave bands, you will find the new *White's Radio Log* format an unbeatable reference. □

QUICK REFERENCE INDEX

WHITE'S RADIO LOG

U.S. AM Stations by Frequency

U. S. stations listed alphabetically by states within groups. Abbreviations: kHz, frequency in kilocycles; W.P., power in watts; d, operates daytime only; n, operates nighttime only. Wave length is given in meters. Listing indicates stations on the air on October 1, 1967

kHz — Wave Length — W.P.

540—555.5

KVIP	Redding, Calif.	5000d
KFMB	San Diego, Calif.	5000
WGTO	Cypress Gardens, Fla.	50000d
WDAK	Columbus, Ga.	5000
KWMT	Ft. Dodge, Iowa	5000d
KNOE	Monroe, La.	5000
WDMV	Pocomoke City, Md.	500d
WLIX	Islip, N.J	250d
WETC	Wendell-Zebulon, N.C.	250d
WARO	Canonsburg, Pa.	250d
WYNN	Florence, S.C.	250d
WDXN	Clarksville, Tenn.	1000d
WRIC	Richlands, Va.	1000d
WYLO	Jackson, Wisc.	250d

550—545.1

KENI	Anchorage, Alaska	5000
KOY	Phoenix, Ariz.	5000
KAFY	Bakersfield, Calif.	1000
KRAI	Craig, Colo.	1000
WAYR	Orange Park, Fla.	1000d
WGGA	Gainesville, Ga.	5000
KMVI	Wailuku, Hawaii	5000
KFRM	Salina, Kans.	5000d
WCBI	Columbus, Miss.	1000
KSD	St. Louis, Mo.	5000
KBOW	Butte, Mont.	1000
WGR	Buffalo, N.Y.	5000
WDBM	Statesville, N.C.	500d
KFYR	Bismarck, N.Dak.	5000
WKRC	Cincinnati, Ohio	5000
KOAC	Corvallis, Oreg.	5000
WHLM	Bloomsburg, Pa.	1000
WPAB	Ponce, P.R.	5000
WXTR	Pawtucket, R.I.	1000
KCRS	Midland, Tex.	5000
KTSA	San Antonio, Tex.	5000
WDEV	Waterbury, Vt.	5000
WSVA	Harrisonburg, Va.	5000
KARI	Blaine, Wash.	5000d
WSAU	Wausau, Wis.	5000

560—535.4

WOOF	Dothan, Ala.	5000d
KYUM	Yuma, Ariz.	1000
KSFO	San Fran., Calif.	5000
KLZ	Denver, Colo.	5000
WQAM	Miami, Fla.	5000
WIND	Chicago, Ill.	5000
WMIK	Middlesboro, Ky.	500d
WGAN	Portland, Maine	5000
WFRB	Frostburg, Md.	1000
WHYN	Springfield, Mass.	5000
WQTE	Monroe, Mich.	500d
WEBC	Duluth, Minn.	5000
KWTO	Springfield, Mo.	5000
KMON	Great Falls, Mont.	5000
WGAI	Elizabeth City, N.C.	1000
WFIL	Philadelphia, Pa.	5000
WIS	Columbia, S.C.	5000
WHBQ	Memphis, Tenn.	5000
KLVI	Beaumont, Tex.	5000
KPQ	Wenatchee, Wash.	5000
WJLS	Beckley, W.Va.	5000

570—526.0

WAAX	Gadsden, Ala.	5000
KCNO	Alturas, Calif.	5000
KLAC	Los Angeles, Calif.	5000
WGMS	Washington, D.C.	5000
WFSO	Pinellas Park, Fla.	500d
WACL	Waycross, Ga.	5000
WKYX	Paducah, Ky.	1000
WVMI	Biloxi, Miss.	1000d
KGRT	Las Cruces, N.Mex.	5000d
WMCA	New York, N.Y.	5000
WSYR	Syracuse, N.Y.	5000
WWNC	Asheville, N.C.	5000
WLLE	Raleigh, N.C.	500d
WKBN	Youngstown, Ohio	5000
WNAX	Yankton, S.Dak.	5000
WFAA	Dallas, Tex.	5000
WBAP	Ft. Worth, Tex.	5000
KLUB	Salt Lake City, Utah	5000
KVI	Seattle, Wash.	5000
WMAM	Marinette, Wis.	250d

580—516.9

WABT	Tuskegee, Ala.	500d
KIKX	Tucson, Ariz.	5000
KMJ	Fresno, Calif.	5000
KUBC	Montrose, Colo.	5000
WDBO	Orlando, Fla.	5000
WGAC	Augusta, Ga.	5000
KFXD	Nampa, Idaho	5000
WILL	Urbana, Ill.	5000d
KSAC	Manhattan, Kans.	5000
WIBW	Topeka, Kans.	5000
KALB	Alexandria, La.	5000
WTAG	Worcester, Mass.	5000
WELO	Tupelo, Miss.	1000
KANA	Anaconda, Mont.	1000
WAGR	Lumberton, N.C.	500
KWIN	Ashland, Oreg.	1000
WHP	Harrisburg, Pa.	5000
WKAQ	San Juan, P.R.	5000
KOBH	Hot Springs, S.Dak.	500d
WRKH	Rockwood, Tenn.	1000d
KDAV	Lubbock, Tex.	500d
WLES	Lawrenceville, Va.	500d
WCHS	Charleston, W.Va.	5000
WKTY	LaCrosse, Wis.	5000

590—508.2

KHAR	Anchorage, Alaska	5000
WRAG	Carrollton, Ala.	1000d
KBHS	Hot Springs, Ark.	5000d
KFXM	San Bernardino, Cal.	1000
KTHO	So. Lake Tahoe, Cal.	1000
KCSJ	Pueblo, Colo.	1000
WDLP	Panama City, Fla.	1000
WPLO	Atlanta, Ga.	5000
KGMB	Honolulu, Hawaii	5000
KID	Idaho Falls, Idaho	5000
WRTH	Wood River, Ill.	1000
WVLK	Lexington, Ky.	5000
WEEI	Boston, Mass.	5000
WKZO	Kalamazoo, Mich.	5000
KGLE	Glendive, Mont.	500d
WOW	Omaha, Nebr.	5000
WROW	Albany, N.Y.	5000
WGTM	Wilson, N.C.	5000
KUGN	Eugene, Oreg.	5000
WARM	Scranton, Pa.	5000
WMBS	Uniontown, Pa.	1000
KTBC	Austin, Tex.	5000
KSUB	Cedar City, Utah	1000
WLVA	Lynchburg, Va.	1000
KHQ	Spokane, Wash.	5000

600—499.7

WIRB	Enterprise, Ala.	1000
KCLS	Flagstaff, Ariz.	5000
KVCV	Redding, Calif.	1000
KOGO	San Diego, Calif.	5000
KZIX	Ft. Collins, Colo.	1000d
WICC	Bridgeport, Conn.	5000
WPDQ	Jacksonville, Fla.	5000
WMT	Cedar Rapids, Iowa	5000
WWOM	New Orleans, La.	1000d
WFST	Caribou, Maine	5000d
WCAO	Baltimore, Md.	5000
WLST	Escanaba, Mich.	1000d
WTAC	Flint, Mich.	1000
KGEZ	Kalispell, Mont.	1000
WCVP	Murphy, N.C.	1000d
WSJS	Winston-Salem, N.C.	5000
KSJB	Jamestown, N.D.	5000
WSOM	Salem, Ohio	500d
WFRM	Coudersport, Pa.	1000d
WAEL	Mayaguez, P.R.	1000
WREC	Memphis, Tenn.	5000
KROD	El Paso, Tex.	5000
KERB	Kermit, Tex.	1000d
KTBB	Tyler, Tex.	1000
WVAR	Richwood, W.Va.	1000d

610—491.5

WSGN	Birmingham, Ala.	5000
KAVL	Lancaster, Calif.	1000
KFRC	San Francisco, Calif.	5000
WTOR	Torrington, Conn.	1000
WIOD	Miami, Fla.	5000
WMEL	Pensacola, Fla.	500d
WCEH	Hawkinsville, Ga.	500d
KUAM	Agana, Guam	10000
WRUS	Russellville, Ky.	500d
KOAL	Duluth, Minn.	5000
WDAF	Kansas City, Mo.	5000
KOJM	Havre, Mont.	1000
KCSR	Chadron, Nebr.	1000d
WGIR	Manchester, N.H.	5000
KGGM	Albuquerque, N.Mex.	5000
WAYS	Charlotte, N.C.	5000
WTVN	Columbus, Ohio	5000
WIP	Philadelphia, Pa.	5000
KILT	Houston, Tex.	5000
KVNU	Logan, Utah	5000
WSLS	Roanoke, Va.	5000
WHPL	Winchester, Va.	500
KEPR	Kennewick-Richmond-Pasco, Wash.	5000

620—483.6

KTAR	Phoenix, Ariz.	5000
KNGS	Hanford, Calif.	1000
KWSD	Mt. Shasta, Calif.	1000d
KSTR	Grand Junction, Colo.	5000d
WSUN	St. Petersburg, Fla.	5000
WTRP	LaGrange, Ga.	1000d
KWAL	Wallace, Idaho	1000
KMNS	Sioux City, Iowa	1000
WTMT	Louisville, Ky.	500d
WLBZ	Bangor, Maine	5000
WJDX	Jackson, Miss.	5000
WVNJ	Newark, N.J.	5000
WHEN	Syracuse, N.Y.	5000
WDNC	Durham, N.C.	5000
KGW	Portland, Oreg.	5000
WHJB	Greensburg, Pa.	1000
WCAY	Cayce, S.C.	500d
WATE	Knoxville, Tenn.	5000
KWFT	Wichita Falls, Tex.	5000
WVMT	Burlington, Vt.	5000
WWNR	Beckley, W.Va.	1000
WTMJ	Milwaukee, Wis.	5000

630—475.9

WAVU	Albertville, Ala.	1000d
WJDB	Thomasville, Ala.	1000d
KYAK	Anchorage, Alaska	
KJNO	Juneau, Alaska	1000
KVMA	Magnolia, Ark.	1000d
KIDD	Monterey, Calif.	1000
KHOW	Denver, Colo.	5000
WMAL	Washington, D.C.	5000
WSAV	Savannah, Ga.	5000
WNEG	Toccoa, Ga.	500d
KIDO	Boise, Idaho	5000
WLAP	Lexington, Ky.	5000
KTIB	Thibodaux, La.	500d
WJMS	Ironwood, Mich.	1000
KDWB	So. St. Paul, Minn.	5000
KXOK	St. Louis, Mo.	5000
KGVW	Belgrade, Mont.	1000d
KOH	Reno, Nev.	5000
KLEA	Lovington, N.Mex.	500d
WIRC	Hickory, N.C.	1000d
WMFD	Wilmington, N.C.	1000
KWRO	Coquille, Oreg.	5000d
WEJL	Scranton, Pa.	500d
WKYN	San Juan, P.R.	5000
WPRO	Providence, R.I.	5000
KMAC	San Antonio, Tex.	5000
KSXX	Salt Lake City, Utah	1000d
KGDN	Edmonds, Wash.	5000
KZUN	Opportunity, Wash.	500d

640—468.5

KFI	Los Angeles, Calif.	50000
WOI	Ames, Iowa	5000d
WHLO	Akron, O.	1000d
WNAD	Norman, Okla.	1000d

650—461.3

KORL	Honolulu, Hawaii	10000
WSM	Nashville, Tenn.	50000
KIKK	Pasadena, Texas	250d

660—454.3

KFAR	Fairbanks, Alaska	10000
KOWH	Omaha, Neb.	1000d
WNBC	New York, N.Y.	50000
WESC	Greenville, S.C.	10000d
KSKY	Dallas, Tex	10000d

670—447.5

WMAQ	Chicago, Ill.	50000

680—440.9

KNBR	San Francisco, Cal.	50000
WPIN	St. Petersburg, Fla.	1000d
WRNG	N. Atlanta, Ga.	5000
WCTT	Corbin, Ky.	1000
WCBM	Baltimore, Md.	10000
WRKO	Boston, Mass.	50000
WDBC	Escanaba, Mich.	10000
KFEQ	St. Joseph, Mo.	5000
WINR	Binghamton, N.Y.	1000
WNYR	Rochester, N.Y.	250
WPTF	Raleigh, N.C.	50000
WISR	Butler, Pa.	250d
WAPA	San Juan, P.Rico.	10000
WMPS	Memphis, Tenn.	10000
KBAT	San Antonio, Tex.	50000
KOMW	Omak, Wash.	1000d
WCAW	Charleston, W.Va.	10000d

690—434.5

WVOK	Birmingham, Ala.	50000d
KEOS	Flagstaff, Ariz.	1000
KEVT	Tucson, Ariz.	250d
KBBA	Benton, Ark.	250d
KAPI	Pueblo, Colo.	250d
WADS	Ansonia, Conn.	500d
WAPE	Jacksonville, Fla.	50000
KKUA	Honolulu, Hawaii	10000
KBLI	Blackfoot, Idaho	1000d
KGGF	Coffeyville, Kans.	10000
WTIX	New Orleans, La.	5000
KTCR	Minneapolis, Minn.	500d
KSTL	St. Louis, Mo.	1000d
KEYR	Terrytown, Nebr.	1000d
KRCO	Prineville, Oreg.	1000d
WXUR	Media, Pa.	500d
KUSD	Vermillion, S.Dak.	1000d
KHEY	El Paso, Tex.	10000
KPET	Lamesa, Tex.	250
KZEY	Tyler, Tex.	5000
WCYB	Bristol, Va.	10000d
WNNT	Warsaw, Va.	250d
WELD	Fisher, W. Va.	500d
WAGO	Oshkosh, Wis.	

700—428.3

WLW	Cincinnati, Ohio	50000

710—422.3

WKRG	Mobile, Ala.	1000
KMPC	Los Angeles, Calif.	50000
KBTR	Denver, Colo.	5000
WGBS	Miami, Fla.	50000
WUFF	Eastman, Ga.	1000d
WROM	Rome, Ga.	1000d
KEEL	Shreveport, La.	50000
WHB	Kansas City, Mo.	10000
WOR	New York, N.Y.	50000
DZRH	Manila, P.I.	10000
WKJB	Mayaguez, P.Rico	1000
WTPR	Paris, Tenn.	250d
KGNC	Amarillo, Tex.	10000
KURV	Edinburg, Tex.	250
KIRO	Seattle, Wash.	50000
WDSM	Superior, Wis.	5000

720—416.4

KUAI	Eleele, Hawaii	5000
WGN	Chicago, Ill.	50000

730—410.7

WJMW	Athens, Ala.	1000
KSUD	W. Memphis, Ark.	250d
WLOR	Thomasville, Ga.	5000d
KLOE	Goodland, Kans.	1000d
WFMW	Madisonville, Ky	500
WMTC	Van Cleve, Ky.	1000d
KTRY	Bastrop, La.	250d
WARB	Covington, La.	250d
WJTO	Bath, Maine	1000d
WACE	Chicopee, Mass.	5000d
WVIC	E. Lansing, Mich.	500
KWRE	Warrenton, Mo.	1000d
KWOA	Worthington, Minn.	1000d
KURL	Billings, Mont.	500d
KVOD	Albuquerque, N.Mex.	1000d
WDOS	Oneonta, N.Y.	1000d
WFMC	Goldsboro, N.C.	1000d
WOHS	Shelby, N.C.	1000d
WMGS	Bowling Green, Ohio	1000d
KBOY	Medford, Oreg.	1000d
WNAK	Nanticoke, Pa.	1000d
WPIT	Pittsburgh, Pa.	5000d
WPAL	Charleston, S.C.	1000d
WLIL	Lenoir, Tenn.	1000d
KPCN	Grand Prairie, Tex.	500d
KSVN	Ogden, Utah	1000d
WPIK	Alexandria, Va.	5000d
WMNA	Gretna, Va.	1000d

kHz	Wave Length	W.P.
KULE	Ephrata, Wash.	1000d
WXMT	Merrill, Wis.	1000d
740—405.2		
WBAM	Montgomery, Ala.	50000d
KMEO	Phoenix, Ariz.	1000d
KBIG	Avalon, Cal.	10000d
KCBS	San Francisco, Calif.	50000
KSSS	Colorado Springs, Colo.	1000d
KVFC	Cortez, Colo.	1000d
WSBR	Boca Raton, Fla.	1000
WKMK	Blountston, Fla.	1000d
WKIS	Orlando, Fla.	5000
KYME	Boise, Idaho	500d
WVLN	Olney, Ill.	1000d
KBOE	Oskaloosa, Iowa	250d
WCAS	Cambridge, Mass	250d
KPBM	Carlsbad, N.Mex.	1000d
WGSM	Huntington, N.Y.	5000d
WMBL	Morehead City, N.C.	1000d
WPAQ	Mount Airy, N.C.	10000d
KRMG	Tulsa, Okla.	50000
WVCH	Chester, Pa.	1000d
WIAC	San Juan, P.Rico	10000
WBAW	Barnwell, S.C.	1000d
WIRJ	Humbolt, Tenn.	250d
WJIG	Tullahoma, Tenn.	250d
KTRH	Houston, Tex.	50000
KCMC	Texarkana, Tex.	1000
WBCI	Williamsburg, Va.	500d
WBOD	Baraboo, Wis.	
750—399.8		
KFQD	Anchorage, Alaska	10000
WSB	Atlanta, Ga.	50000
WBMD	Baltimore, Md.	1000d
KMMJ	Grand Island, Neb.	10000d
WHEB	Portsmouth, N.H.	1000d
KSEO	Durant, Okla.	250d
KXL	Portland, Oreg.	50000
WPDX	Clarksburg, W.Va.	1000d
WHA	Madison, Wis.	5000d
760—394.5		
KFMB	San Diego, Cal.	5000
KGU	Honolulu, Hawaii	10000
WJR	Detroit, Mich.	50000
WCPS	Tarboro, N.C.	1000d
WORA	Mayaguez, P.R.	5000
770—389.4		
KUOM	Minneapolis, Minn.	5000d
WCAL	Northfield, Minn.	5000d
WEW	St. Louis, Mo.	1000d
KOB	Albuquerque, N.Mex.	50000
WABC	New York, N.Y.	50000
KXA	Seattle, Wash.	1000
780—384.4		
WBBM	Chicago, Ill.	50000
WJAG	Norfolk, Neb.	1000d
WCKB	Dunn, N.C.	1000d
WBBO	Forest City, N.C.	1000d
KSPI	Stillwater, Okla.	250d
WAVA	Arlington, Va.	1000d
790—379.5		
WTUG	Tuscaloosa, Ala.	1000d
KCAM	Glennallen, Alaska	5000
KCEE	Tucson, Ariz.	5000
KOSY	Texarkana, Ark.	1000
KDAN	Eureka, Calif.	5000d
KABC	Los Angeles, Calif.	5000
WLBE	Leesburg, Fla.	5000
WFUN	S. Miami, Fla.	5000
WYNR	Brunswick, Ga.	500d
WGRA	Cairo, Ga.	1000d
KONA	Kealakekua, Hawaii	1000
KEST	Boise, Idaho	1000d
KBRV	Soda Springs, Ida.	5000d
WRMS	Beardstown, Ill.	500d
KXXX	Colby, Kans.	5000d
WAKY	Louisville, Ky.	5000
WRUM	Rumford, Me.	1000d
WSGW	Saginaw, Mich.	5000
KGHL	Billings, Mont.	5000
WWNY	Watertown, N.Y.	1000
WLSV	Wellsville, N.Y.	1000d
WTNC	Thomasville, N.C.	1000d
KFGO	Fargo, N.D.	5000
KWIL	Albany, Oreg.	1000
WAEB	Allentown, Pa.	1000
WPIC	Sharon, Pa.	1000d
WEAN	Providence, R.I.	5000
WWBD	Bamberg-Denmark, S.C.	1000d
WETB	Johnson City, Tenn.	1000d
WMC	Memphis, Tenn.	5000
KTHT	Houston, Tex.	5000
KFYO	Lubbock, Tex.	5000
KUTA	Blanding, Utah	1000d
WSIG	Mount Jackson, Va.	1000d
WTAR	Norfolk, Va.	5000
KGMI	Bellingham, Wash.	5000
KJRB	Spokane, Wash	5000
WEAQ	Eau Claire, Wis.	5000
800—374.8		
WHOS	Decatur, Ala.	1000d
WMGY	Montgomery, Ala.	1000d
KINY	Juneau, Alaska	5000
KAGH	Crossett, Ark.	250d
KVOM	Morrilton, Ark.	250d
KUZZ	Bakersfield, Calif.	250d
KDAD	Weed, Calif.	1000d
KBRN	Brighton, Colo.	500d
WLAD	Danbury, Conn.	1000d
WRKV	Rockville, Conn.	
WSUZ	Palatka, Fla.	1000d
WJAT	Swainsboro, Ga.	1000d
WKZI	Casey, Ill.	250d
KXIC	Iowa City, Iowa	1000d
WCCM	Lawrence, Mass.	1000d
WVAL	Sauk Rapids, Minn.	250d
KREI	Farmington, Mo.	1000d
WKON	Camden, N. J.	5000d
KJEM	Okla. City, Okla.	250d
KPDQ	Portland, Ore.	5000d
WCHA	Chambersburg, Pa.	1000d
WDSC	Dillon, S.C.	1000d
WEAB	Greer, S.C.	250d
WDEH	Sweetwater, Tenn.	1000d
KDDD	Dumas, Tex.	250d
KBUH	Brigham City, Utah	250d
WSVS	Crewe, Va.	5000d
WKEE	Huntington, W.Va.	5000d
WDUX	Waupaca, Wis.	5000d
810—370.2		
KGO	San Francisco, Calif.	50000
KWSR	Rifle, Colo.	
WATI	Indianapolis, Ind.	2500d
WYRE	Annapolis, Md.	250d
WJPW	Rockford, Mich.	500d
WSJC	Magee, Miss.	50000
KCMO	Kansas City, Mo.	50000
KAFE	Santa Fe, N.M.	
WGY	Schenectady, N.Y.	50000
WKBC	N.Wilkesboro, N.C.	1000d
WCEC	Rocky Mount, N.C.	1000d
WEDO	McKeesport, Pa.	1000d
WKVM	San Juan, P.R.	50000
WQIZ	St. George, S.C.	5000d
KBHB	Sturgis, S.D.	5000d
WMTS	Murfreesboro, Tenn.	5000d
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	10000
WCCO	Minneapolis-St. Paul, Minn.	50000
KOFI	Kalispell, Mont.	1000
KBOA	Kennett, Mo.	1000d
WNYC	New York, N.Y.	1000
840—356.9		
WTUF	Mobile, Ala.	1000d
WRYM	New Britain, Conn.	1000d
WHAS	Louisville, Ky.	50000
WVPO	Stroudsburg, Pa.	250d
850—352.7		
WYDE	Birmingham, Ala.	10000
KICY	Nome, Alaska	5000
KGKO	Benton, Ark.	1000d
KOA	Denver, Colo.	50000
WRUF	Gainesville, Fla.	5000
WEAT	W. Palm Beach, Fla.	1000
KIMO	Hilo, Hawaii	1000
WCLR	Crystal Lake, Ill.	500d
WHDH	Boston, Mass.	50000
WKBZ	Muskegon, Mich.	1000
KFUO	Clayton, Mo.	5000
WKIX	Raleigh, N.C.	10000
WJW	Cleveland, Ohio	10000
WJAC	Johnstown, Pa.	10000
WEEU	Reading, Pa.	1000
WABA	Aguadilla, P.R.	500
WIVK	Knoxville, Tenn.	50000d
WRAP	Norfolk, Va.	5000
KTAC	Tacoma, Wash.	10000
860—348.6		
WHRT	Hartselle, Ala.	250d
WAMI	Opp, Ala.	1000d
KIFN	Phoenix, Ariz.	1000d
KOSE	Osceola, Ark.	1000d
KWRF	Warren, Ark.	250d
KTRB	Modesto, Calif.	10000
WAZE	Clearwater, Fla.	500d
WKKO	Cocoa, Fla.	1000
WERD	Atlanta, Ga.	1000
WDMG	Douglas, Ga.	5000d
WMRI	Marion, Ind.	250d
KWPC	Muscatine, Iowa	250d
KOAM	Pittsburg, Kan.	10000d
WSON	Henderson, Ky.	500d
WAYE	Baltimore, Md.	1000d
WSBS	Gt. Barrington, Mass.	250d
KNUJ	New Ulm, Minn.	1000d
WMAG	Forest, Miss.	500d
KARS	Belen, N. Mex.	250d
WFMO	Fairmont, N.C.	1000d
WSTH	Taylorsville, N. C.	250d
KSHA	Medford, Oreg.	1000d
WAMO	Pittsburgh, Pa.	1000d
WTEL	Philadelphia, Pa.	10000d
WLBG	Laurens, S.C.	1000d
KFST	Ft. Stockton, Tex.	250d
KPAN	Hereford, Tex.	250d
KSFA	Nacogdoches, Tex.	1000d
KONO	San Antonio, Tex.	5000
KWHO	Salt Lake City, Utah	1000d
WEVA	Emporia, Va.	1000d
WOAY	Oak Hill, W.Va.	10000d
WFOX	Milwaukee, Wis.	250d
870—344.6		
KIEV	Glendale, Calif.	500d
KAIM	Honolulu, Hawaii	5000
WWL	New Orleans, La.	50000
WKAR	E. Lansing, Mich.	10000d
WHCU	Ithaca, N.Y.	5000
WGTL	Kannapolis, N.C.	1000d
WHOA	San Juan, P.R.	5000
KJIM	Ft. Worth, Tex.	250
WFLO	Farmville, Va.	1000d
880—340.7		
WCBS	New York, N.Y.	50000
WRRZ	Clinton, N.C.	1000d
WRFD	Worthington, Ohio	5000d
890—336.9		
WLS	Chicago, Ill.	50000
WHNC	Henderson, N.C.	1000d
KBYE	Okla. City, Okla.	1000d
900—333.1		
WATV	Birmingham, Ala.	1000d
WGOK	Mobile, Ala.	1000d
WOZK	Ozark, Ala.	1000d
KPRB	Fairbanks, Alaska	10000
KHOZ	Harrison, Ark.	1000d
KBIF	Fresno, Calif.	1000d
KGRB	West Covina, Cal.	250d
WJWL	Georgetown, Del.	1000d
WSWN	Belle Glade, Fla.	1000d
WMOP	Ocala, Fla.	1000d
WCGA	Calhoun, Ga.	1000d
WCRY	Macon, Ga.	250d
WEAS	Savannah, Ga.	5000d
KTEE	Idaho Falls, Ida.	1000d
KEYN	Wichita, Kan.	250d
WFIA	Louisville, Ky.	1000d
WLSI	Pikeville, Ky.	5000d
KREH	Oakdale, La.	250d
WCME	Brunswick, Maine	1000d
WLMD	Laurel, Md.	1000d
WATC	Gaylord, Mich.	1000d
KTIS	Minneapolis, Minn.	1000d
WDDT	Greenville, Miss.	1000d
KFAL	Fulton, Mo.	1000d
KJSK	Columbus, Nebr.	1000d
WOTW	Nashua, N.H.	1000d
WBRV	Boonville, N.Y.	1000d
WKAJ	Saratoga Springs, N.Y.	250d
WKJK	Granite Falls, N.C.	500d
WAYN	Rockingham, N.C.	1000d
WIAM	Williamston, N.C.	1000d
KFNW	Fargo, N.Dak.	1000d
WNYN	Canton, O.	5000d
WFRO	Fremont, Ohio	500d
WCPA	Clearfield, Pa.	1000d
WFLN	Philadelphia, Pa.	1000d
WKXV	Knoxville, Tenn.	1000d
WCOR	Lebanon, Tenn.	500d
KALT	Atlanta, Tex.	1000d
KMCO	Conroe, Tex.	500d
KFLD	Floydada, Tex.	250d
KCLW	Hamilton, Tex.	250d
WODY	Bassett, Va.	500d
WAFC	Staunton, Va.	1000d
KUEN	Wenatchee, Wash.	1000d
WATK	Antigo, Wis.	250d
910—329.5		
WDVC	Dadeville, Ala.	500d
KPHO	Phoenix, Ariz.	5000
KLCN	Blytheville, Ark.	5000d
KAMD	Camden, Ark.	5000
KDEO	El Cajon, Calif.	1000
KNEW	Oakland, Calif.	5000
KOXR	Oxnard, Cal.	5000
KPOF	Denver, Colo.	5000d
WRCH	New Britain, Conn.	5000
WPLA	Plant City, Fla.	1000d
WGAF	Valdosta, Ga.	5000
KBGN	Caldwell, Ida.	1000d
WAKO	Lawrenceville, Ill.	500d
WSUI	Iowa City, Iowa	5000
KISI	Salina, Kan.	500d
WLCS	Baton Rouge, La.	1000
WABI	Bangor, Maine	5000
WFDF	Flint, Mich.	5000
WCOC	Meridian, Miss.	5000
KOYN	Billings, Mont.	1000d
KYSS	Missoula, Mont.	1000d
KBIM	Roswell, N. M.	5000
WRKL	New City, N.Y.	1000d
WLAS	Jacksonville, N.C.	5000d
KCJB	Minot, N.Dak.	1000
WBRJ	Marietta, O.	5000
WPFB	Middletown, Ohio	1000
KGLC	Miami, Okla.	1000
KURY	Brookings, Oreg.	1000d
WAVL	Apollo, Pa.	1000d
WGBI	Scranton, Pa.	1000
WSBA	York, Pa.	5000
WPRP	Ponce, P.R.	5000
WNCG	North Charleston, S.C.	500d
WORD	Spartanburg, S.C.	5000d
WJCW	Johnson City, Tenn.	5000
WEPG	S. Pittsburgh, Tenn.	500d
KNAF	Fredericksburg, Tex.	1000d
KRIO	McAllen, Tex.	5000
KRRV	Sherman, Tex.	1000
KALL	Salt Lake City, Utah	5000
WNHV	White River Jct., Vt.	1000d
WRNL	Richmond, Va.	5000
WPXI	Roanoke, Va.	1000d
KORD	Pasco, Wash.	1000d
KIXI	Seattle, Wash.	1000
KISN	Vancouver, Wash.	5000
WHSM	Hayward, Wis.	5000d
WDOR	Sturgeon Bay, Wis.	1000d
920—325.9		
WCTA	Adalusia, Ala.	5000
WWWR	Russellville, Ala.	1000d
KSRM	Soldatna, Alaska	
KARK	Little Rock, Ark.	5000
KLDC	Ceres, Calif.	500d
KDES	Palm Springs, Cal.	5000
KVEC	San Luis Dbispo, Cal.	1000
KREX	Grd. Junction, Colo.	5000
KLMR	Lamar, Colo.	5000
WMEG	Eau Gallie, Fla.	1000
WGST	Atlanta, Ga.	5000
WVOH	Hazelhurst, Ga.	500d
WGNU	Granite City, Ill.	500d
WMOK	Metropolis, Ill.	1000d
WBAA	W. Lafayette, Ind.	5000
KFNF	Council Bluffs, Ia.	5000
KFNF	Shenandoah, Ia.	1000d
WTCW	Whitesburg, Ky.	5000d
WBOX	Bogalusa, La.	1000d
KTOC	Jonesboro, La.	1000d
WPTX	Lexington Pk., Md.	500d
WMPL	Hancock, Mich.	1000d
KDHL	Faribault, Minn.	5000
KWAD	Wadena, Minn.	1000
KWYS	W. Yellowstone, Mont.	1000
KRAM	Las Vegas, Nev.	1000
KOLO	Reno, Nev.	1000
KQEO	Albuquerque, N.Mex.	1000
WTTM	Trenton, N.J.	1000
WKRT	Cortland, N.Y.	1000
WGHQ	Kingston, N.Y.	5000d
WIRD	Lake Placid, N.Y.	1000
WBBB	Burlington, N.C.	5000d
WMNI	Columbus, Ohio	1000
KGAL	Lebanon, Oreg.	1000
WKVA	Lewistown, Pa.	1000
WJAR	Providence, R.I.	5000
WTND	Orangeburg, S.C.	1000d
KEZU	Rapid City, S.Dak.	1000d
WLIV	Livingston, Tenn.	1000d
KELP	El Paso, Tex.	1000
WBZB	Odessa, Tex.	1000
KTLW	Texas City, Tex.	1000d
KITN	Olympia, Wash.	1000d
KXLY	Spokane, Wash.	5000
WMMN	Fairmont, W.Va.	5000
WOKY	Milwaukee, Wis.	5000
930—322.4		
WETO	Gadsden, Ala.	1000d
KTKN	Ketchikan, Alaska	5000
KAPR	Douglas, Ariz.	1000d
KAFF	Flagstaff, Ariz.	5000d
KHJ	Los Angeles, Calif.	5000
KEWQ	Paradise, Cal.	5000d
KIUP	Durango, Colo.	5000
WTHD	Milford, Del.	500d
WHAN	Haines City, Fla.	1000
WJAX	Jacksonville, Fla.	5000
WKXY	Sarasota, Fla.	1000
WMGR	Bainbridge, Ga.	5000
KSEI	Pocatello, Idaho	5000
WTAD	Quincy, Ill.	5000
WHON	Centerville, Ind.	500d
WKCT	Bowling Green, Ky.	1000
WFMD	Frederick, Md.	5000
WREB	Holyoke, Mass.	500d
WBCK	Battle Creek, Mich.	5000
KKIN	Aitkin, Minn.	1000d
WSLI	Jackson, Miss.	5000
KWOC	Poplar Bluff, Mo.	5000
KOFI	Kalispell, Mont.	5000d
KOGA	Ogallala, Nebr.	500d
KCCC	Carlsbad, N.M.	
WSOC	Charlotte, N.C.	5000
WITN	Washington, N.C.	5000
WWNH	Rochester, N.H.	5000
WPAT	Paterson, N.J.	5000
WBEN	Buffalo, N.Y.	5000
WIZR	Johnstown, N.Y.	1000d
WEOL	Elyria, Ohio	1000
WKY	Oklahoma City, Okla.	5000
KAGI	Grants Pass, Oreg.	5000
KSWB	Seaside, Ore.	
WCNR	Bloomsburg, Pa.	1000d

WHITE'S RADIO LOG

kHz Wave Length W.P.

KSDN	Aberdeen, S.D.	1000
WSEV	Sevierville, Tenn.	5000d
KDET	Center, Tex.	1000d
KITE	San Antonio, Tex.	5000
WLLL	Lynchburg, Va.	5000d
KENY	Bellingham-Ferndale, Wash.	1000d
KQOT	Yakima, Wash.	1000d
WSAZ	Huntington, W.Va.	5000
KROE	Sheridan, Wyo.	1000d
WLBL	Auburndale, Wis.	5000d

940—319.0

KHOS	Tucson, Ariz.	250
KFRE	Fresno, Calif.	50000
WINE	Brookfield, Conn.	1000d
WINZ	Miami, Fla.	50000
WMAZ	Macon, Ga.	50000
KAHU	Waipahu, Hawaii	10000
WMIX	Mt. Vernon, Ill.	5000d
KIOA	Des Moines, Iowa	10000
WCND	Shelbyville, Ky.	1000d
WYLD	New Orleans, La.	10000
WIDG	St. Ignace, Mich.	5000
WJOR	South Haven, Mich.	1000d
WCPC	Houston, Miss.	50000d
KSMW	Aurora, Mo.	500d
KVSH	Valentine, Nebr.	5000d
WFNC	Fayetteville, N. C.	10000
WCND	Shelbyville, N.Y.	250d
WCIT	Lima, Ohio	250d
KGRL	Bend, Oreg.	1000d
KWRC	Woodburn, Ore.	250d
WESA	Charleroi, Pa.	250d
WGRP	Greenville, Pa.	1000d
WIPR	San Juan, P.R.	10000
KIXZ	Amarillo, Tex.	5000
KTON	Belton, Tex.	1000d
KATQ	Texarkana, Tex.	1000d
WNRG	Grundy, Va.	5000d
WFAW	Ft. Atkinson, Wis.	500d

950—315.6

WRMA	Montgomery, Ala.	1000d
KIBH	Seward, Alaska	1000
KXJK	Forrest City, Ark.	5000d
KFSA	Ft. Smith, Ark.	1000
KAHI	Auburn, Calif.	5000d
KIMN	Denver, Colo.	5000
WLOF	Orlando, Fla.	5000
WGTA	Summerville, Ga.	5000d
WGOV	Valdosta, Ga.	5000
KATN	Boise, Ida.	5000d
KLER	Orofino, Idaho	1000d
WGRT	Chicago, Ill.	1000d
WXLW	Indianapolis, Ind.	5000d
KOEL	Oelwein, Ia.	5000
KJRG	Newton, Kans.	500d
WYWY	Barbourville, Ky.	
WAGM	Presque Isle, Maine	5000
WXLN	Potomac-Cabin John, Md.	1000d
WRYT	Boston, Mass.	5000d
WWJ	Detroit, Mich.	5000
KRSI	St. Louis Park, Minn.	1000
WBKH	Hattiesburg, Miss.	5000d
KLIK	Jefferson City, Mo.	5000d
WHVW	Hyde Park, N.Y.	500d
WBBF	Rochester, N.Y.	1000
WIBX	Utica, N.Y.	5000
WPET	Greensboro, N.C.	5000d
KYES	Roseburg, Oreg.	1000d
WNCC	Barnesboro, Pa.	500d
WPEN	Philadelphia, Pa.	5000
WBER	Moncks Corner, S. C.	500d
WSPA	Spartanburg, S.C.	5000
KWAT	Watertown, S.Dak.	1000
WAGG	Franklin, Tenn.	1000d
KDSX	Denison-Sherman, Tex.	500
KPRC	Houston, Tex.	5000
KSEL	Lubbock, Tex.	5000
WXGI	Richmond, Va.	5000d
KJR	Seattle, Wash.	5000
WERL	Eagle River, Wis.	1000d
WKAZ	Charleston, W.Va.	5000d
WKTS	Sheboygan, Wis.	500d
KMER	Kemmerer, Wyo.	1000d

960—312.3

WBRC	Birmingham, Ala.	5000
WMOZ	Mobile, Ala.	1000
KOOL	Phoenix, Ariz.	5000
KAVR	Apple Valley, Calif.	5000d
KNEZ	Lompoc, Calif.	500
KABL	Oakland, Calif.	5000
WELI	New Haven, Conn.	5000
WGRO	Lake City, Fla.	500d
WJCM	Sebring, Fla.	1000d
WJAZ	Albany, Ga.	5000
WRFC	Athens, Ga.	5000
KSRA	Salmon, Idaho	1000d
WDLM	E. Moline, Ill.	1000d
WSBT	South Bend, Ind.	5000
KMA	Shenandoah, Iowa	5000
WPRT	Prestonsburg, Ky.	5000d
KROF	Abbeville, La.	1000d
WBOC	Salisbury, Md.	5000
WFGL	Fitchburg, Mass.	1000
WHAK	Rogers City, Mich.	5000d
KLTF	Little Falls, Minn.	500d
WABG	Greenwood, Miss.	1000
KFVS	Cape Girardeau, Mo.	5000
KFLN	Baker, Mont.	5000d
KNEB	Scottsbluff, Nebr.	1000
KWYK	Farmington, N.Mex.	1000d
KRIK	Roswell, N. Mex.	1000d
WEAV	Plattsburg, N.Y.	5000
WAAK	Dallas, N.C.	1000d
WFTC	Kinston, N.C.	5000
WWST	Wooster, Ohio	1000d
KGWA	Enid, Okla.	1000
KLAD	Klamath Falls, Ore.	5000
WHYL	Carlisle, Pa.	5000d
WKZA	Kane, Pa.	1000d
WATS	Sayre, Pa.	1000d
WBEU	Beaufort, S.C.	1000d
WBMC	McMinnville, Tenn.	500d
KIMP	Mt. Pleasant, Tex.	1000d
KGKL	San Angelo, Tex.	5000
KOVO	Provo, Utah	5000
WDBJ	Roanoke, Va.	5000
KALE	Richland, Wash.	1000
WTCH	Shawano, Wis.	1000

970—309.1

WERH	Hamilton, Ala.	5000d
WTBF	Troy, Ala.	5000
KVWM	Show Low, Ariz.	5000d
KNEA	Jonesboro, Ark.	1000d
KBIS	Bakersfield, Calif.	1000
KCHV	Coachella, Calif.	5000
KBEE	Modesto, Calif.	1000
KFEL	Pueblo, Colo.	1000d
WBOM	Jacksonville, Fla.	
WFLA	Tampa, Fla.	5000
WIIN	Atlanta, Ga.	5000d
WVOP	Vidalia, Ga.	5000d
KPUA	Hilo, Hawaii	5000
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
WCKD	Ishpeming, Mich.	5000d
WKHM	Jackson, Mich.	1000
KQAQ	Austin, Minn.	5000
WRKN	Brandon, Miss.	
KOOK	Billings, Mont.	5000
KJLT	No. Platte, Nebr.	5000d
KVEG	Las Vegas, Nev.	500d
WJRZ	Newark, N.J.	5000
KDCE	Espanola, N. M.	1000d
WEBR	Buffalo, N.Y.	5000
WCHN	Norwich, N.Y.	500d
WRCS	Ahoskie, N.C.	1000d
WWIT	Canton, N.C.	1000d
WDAY	Fargo, N.Dak.	5000
WREO	Ashtabula, Ohio	5000
WATH	Athens, Ohio	1000d
KAKC	Tulsa, Okla.	1000
KOIN	Portland, Oreg.	5000
WWSW	Pittsburgh, Pa.	5000
WJMX	Florence, S.C.	5000
KHFI	Austin, Tex.	1000d
KBSN	Crane, Tex.	1000d
KNOK	Ft. Worth, Tex.	1000d
WIVI	Christiansted, V. I.	5000
WYPR	Danville, Va.	1000d
WANV	Waynesboro, Va.	5000d
KREM	Spokane, Wash.	5000
WWYD	Pineville, W.Va.	1000d
WHA	Madison, Wis.	5000d
WAKX	Superior, Wis.	500d

980—305.9

WKLF	Clanton, Ala.	1000d
WXLL	Big Delta, Alaska	100
KCAB	Dardanelle, Ark.	1000d
KINS	Eureka, Calif.	5000
KEAP	Fresno, Calif.	500d
KFWB	Los Angeles, Calif.	5000
KCTY	Salinas, Calif.	1000d
KGLN	Glennwood Springs, Colo.	1000d
WSUB	Groton, Conn.	1000d
WRC	Washington, D.C.	5000
WDVH	Gainesville, Fla.	5000d
WTOT	Marianna, Fla.	1000d
WBOP	Pensacola, Fla.	1000d
WLOD	Pompano Beach, Fla.	1000d
WKLY	Hartwell, Ga.	1000d
WPGA	Perry, Ga.	1000d
WRIP	Rossville, Ga.	500d
KUPI	Idaho Falls, Idaho	1000d
WITY	Danville, Ill.	1000
KREB	Shreveport, La.	5000d
WCAP	Lowell, Mass.	1000d
WAOP	Otsego, Mich.	1000d
WPBC	Richfield, Minn.	5000
WAPF	McComb, Miss.	5000d
KMBZ	Kansas City, Mo.	5000
KLYQ	Hamilton, Mont.	1000d
KVLV	Fallon, Nev.	5000d
KICA	Clovis, N. Mex.	1000
KMIN	Grants, N. Mex.	1000d
WTRY	Troy, N.Y.	5000
WKLM	Wilmington, N.C.	5000d
WAAA	Win.-Salem, N.C.	1000d
WONE	Dayton, Ohio	5000
WILK	Wilkes-Barre, Pa.	5000
WAZS	Summerville, S.C.	1000d
WYCL	York, S. C.	1000d
KOSJ	Deadwood, S.Dak.	1000
WSIX	Nashville, Tenn.	5000
KFRD	Rosenberg-Richmond, Tex.	1000d
KSVC	Richfield, Utah	5000
WFHG	Bristol, Va.	5000
WMEK	Chase City, Va.	500d
KUTI	Yakima, Wash.	5000d
WHAW	Weston, W.Va.	1000d
WCUB	Manitowoc, Wis.	1000d
WPRE	Prairie du Chien, Wis.	1000
KEND	Cheyenne, Wyo.	500d

990—302.8

WEIS	Center, Ala.	250
WWWF	Fayette, Ala.	1000d
WTCB	Flomaton, Ala.	500d
KTKT	Tucson, Ariz.	10000
KKIS	Pittsburg, Calif.	5000
KGUO	Santa Barbara, Calif.	1000d
KLIR	Denver, Colo.	1000d
WFAB	Miami, Fla.	5000
WHOO	Orlando, Fla.	50000
WDWD	Dawson, Ga.	1000d
WGML	Hinesville, Ga.	250d
KTRG	Honolulu, Hawaii	5000
WCAZ	Carthage, Ill.	1000d
WITZ	Jasper, Ind.	1000d
WERK	Muncie, Ind.	250d
KAYL	Storm Lake, Iowa	250d
KRSL	Russell, Kans.	250d
WNNR	New Orleans, La.	250d
KRIH	Rayville, La.	250d
WCRM	Clare, Mich.	250d
WABO	Waynesboro, Miss.	250d
KRMO	Monett, Mo.	250d
KSVP	Artesia, N.Mex.	1000
WEEB	Southern Pines, N.C.	5000d
WJEH	Gallipolis, Ohio	1000d
WTIG	Massillon, Ohio	250d
KRKT	Albany, Oreg.	250d
WIBG	Philadelphia, Pa.	50000
WVSC	Somerset, Pa.	5000d
WPRA	Mayaguez, P.R.	10000
WLKW	Providence, R.I.	50000
WAKN	Aiken, S.C.	1000d
WNOX	Knoxville, Tenn.	10000
KWAM	Memphis, Tenn.	10000d
KTRM	Beaumont, Tex.	1000
KAML	Kenedy-Karnes City, Tex.	250d
KNIN	Wichita Falls, Tex.	10000
KDYL	Tooele, Utah	1000d
WNRV	Narrows-Pearisburg, Va.	5000d
WANT	Richmond, Va.	1000d

1000—299.8

WKMK	Blountstown, Fla.	1000d
WJTS	Jupiter, Fla.	
WCFL	Chicago, Ill.	50000
WXTN	Lexington, Miss.	5000d
WIQT	Horseheads, N.Y.	
WSPF	Hickory, N.C.	1000d
KTOK	Okla. City, Okla.	5000
WIOO	Carlisle, Pa.	1000
WKYB	Hemingway, S.C.	
WGOG	Wahalla, S. C.	1000d
KSTA	Coleman, Tex.	250d
KGRI	Henderson, Tex.	250d
WKDE	Altavista, Va.	1000d
WHWB	Rutland, Vt.	1000d
WBNB	Charlotte Amalie, Virgin Islands	1000
KOMO	Seattle, Wash.	50000

1010—296.9

KCAC	Phoenix, Ariz.	500d
KVNC	Winslow, Ariz.	1000
KLRA	Little Rock, Ark.	10000
KCHJ	Delano, Calif.	5000
KCMJ	Palm Sprgs., Calif.	1000
KSAY	San Fran., Calif.	10000d
WCNU	Crestview, Fla.	1000d
WBIX	Jacksonville Beach, Fla.	10000d
WINQ	Tampa, Fla.	50000d
WGUN	Atlanta-Decatur, Ga.	50000d
KATN	Boise, Idaho	1000d
WCSI	Columbus, Ind.	500d
KSMN	Mason City, Iowa	1000d
KIND	Independence, Kans.	250d
KDLA	DeRidder, La.	1000d
WSID	Baltimore, Md.	1000d
WITL	Lansing, Mich.	5000d
WRCR	Maplewood, Minn.	250d
WMOX	Meridian, Miss.	10000
KCHI	Chillicothe, Mo.	250d
KXEN	Festus-St. Louis, Mo.	50000d
KRVN	Lexington, Nebr.	25000d
WCNL	Newport, N.H.	250d
WINS	New York, N.Y.	50000
WABZ	Albermarle, N.C.	1000d
WFGW	Black Mountain, N.C.	50000d
WELS	Kinston, N.C.	1000d
WIOI	New Boston, Ohio	1000d
KBEV	Portland, Oreg.	1000d
WUNS	Lewisburg, Pa.	250d
WHIN	Gallatin, Tenn.	1000d
WORM	Savannah, Tenn.	250d
KVII	Amarillo, Tex.	5000
KOOA	Houston, Tex.	5000d
KAWA	Waco-Marlin, Tex.	10000d
WELK	Charlottesville, Va.	1000d
WMEV	Marion, Va.	1000d
WPMH	Portsmouth, Va.	5000d
WCST	Berkeley Sprgs., W.Va.	250d
WSPT	Stevens Pt., Wis.	1000d

1020—293.9

KGBS	Los Angeles, Calif.	50000
WCLL	Carbondale, Ill.	1000d
WPEO	Peoria, Ill.	1000d
KSWS	Roswell, N.M.	50000d
KDKA	Pittsburgh, Pa.	50000

1030—291.1

WBZ	Boston, Mass.	50000
KCTA	Corpus Christi, Tex.	50000d
KTWO	Casper, Wyo.	10000

1040—288.3

KHVH	Honolulu, Hawaii	5000
WHO	Des Moines, Iowa	50000
KIXL	Dallas, Tex.	1000d

1050—285.5

WRFS	Alexander City, Ala.	1000d
WCRI	Scottsboro, Ala.	250d
KVLC	Little Rock, Ark.	1000d
KTOT	Big Bear Lake, Cal.	250d
KOFY	San Mateo, Calif.	1000d
KWSO	Wasco, Calif.	1000d
WJSB	Crestview, Fla.	1000d
WIVY	Jacksonville, Fla.	1000d
WHBD	Tampa, Fla.	250d
WRMF	Titusville, Fla.	500d
WAUG	Augusta, Ga.	5000d
WMNZ	Montezuma, Ga.	250d
WDZ	Decatur, Ill.	1000d
WTCA	Plymouth, Ind.	250d
KUPK	Garden City, Kan.	5000d
WNES	Central City, Ky.	500d
KLPL	Lake Providence, La.	250d
KCIJ	Shreveport, La.	250d
KVPI	Villa Platte, La.	250d
WMSG	Oakland, Md.	500d
WQMR	Silver Sprg., Md.	1000d
WPAG	Ann Arbor, Mich.	5000d
KLOH	Pipestone, Minn.	1000d
WACR	Columbus, Miss.	1000d
KMIS	Portageville, Mo.	1000d
KSIS	Sedalia, Mo.	1000d
KLVC	Las Vegas, Nev.	500d
WBNC	Conway, N.H.	1000d
WSEN	Baldwinsville, N.Y.	250d
WYBG	Massena, N.Y.	1000d
WHN	New York, N.Y.	50000
WFSC	Franklin, N.C.	1000d
WLON	Lincolnton, N.C.	1000d
WWGP	Sanford, N.C.	1000d
WZIP	Cincinnati, Ohio	1000d
KCCO	Lawton, Okla.	250d
KFMJ	Tulsa, Okla.	1000d
KORE	Eugene, Ore.	1000d
WBUT	Butler, Pa.	1000d
WWDS	Everett, Pa.	250d
WLYC	Williamsport, Pa.	1000d
WCGB	Pastillo, P.R.	
WSMT	Sparta, Tenn.	1000d
KLEN	Killeen, Tex.	250d
KPXE	Liberty, Tex.	
KCAS	Slaton, Tex.	250d
WINA	Charlottesville, Va.	5000
WGAT	Gate City, Va.	1000d
WBRG	Lynchburg, Va.	1000d
WCMS	Norfolk, Va.	5000d
KBLE	Seattle, Wash.	5000d
WCEF	Parkersburg, W. Va.	5000d
WECL	Eau Claire, Wis.	1000d
WKAU	Kaukauna, Wis.	1000
WLIP	Kenosha, Wis.	250d
KWIV	Douglas, Wyo.	250d

1060—282.8

KUPD	Tempe, Ariz.	500
KPAY	Chico, Calif.	10000
KLMO	Longmont, Colo.	10000d
WMCL	McLeansboro, Ill.	
WRHL	Rochelle, Ill.	
WJKY	Jamestown, Ky.	
WNOE	New Orleans, La.	50000
WHFB	Benton Harbor-St. Joseph, Mich.	5000d
KFIL	Preston, Minn.	
KNLV	Ord, Neb.	1000
WMAP	Monroe, N.C.	1000d
WBYB	St. Pauls, N.C.	250d

kHz Wave Length W.P.

WCOK	Sparta, N.C.	250d
WOIO	Canton, O.	5000d
KYW	Philadelphia, Pa.	50000
WRJS	San German, P. R.	250
WALD	Walterboro, S. C.	1000d
WPHC	Waverly, Tenn.	1000d
WCIR	Beckley, W.Va.	10000d
KHRB	Lockhart, Tex.	
KRSP	Salt Lake City, Utah	

1070—280.2

WAPI	Birmingham, Ala.	50000
KNX	Los Angeles, Calif.	50000
WVCG	Coral Gables, Fla.	1000d
WIBC	Indianapolis, Ind.	50000
KILR	Esterville, Ia.	
KFDI	Wichita, Kans.	10000
KHMO	Hannibal, Mo.	5000
WHPE	High Point, N.C.	1000d
WKOK	Sunbury, Penn.	10000
WMIA	Arecibo, P. R.	5000
WHYZ	Greenville, S.C.	50000d
WFLI	Lookout Mtn., Tenn.	50000
WDIA	Memphis, Tenn.	50000
KOPY	Alice, Tex.	1000
KNNN	Friona, Tex.	
KENR	Houston, Tex.	10000d
WINA	Charlottesville, Va.	5000
WKOW	Madison, Wis.	10000

1080—277.6

WKAC	Athens, Ala.	1000d
KSCO	Santa Cruz, Calif.	10000
WTIC	Hartford, Conn.	50000
WVCG	Coral Gables, Fla.	10000
WFIV	Kissimmee, Fla.	250
WBIE	Marietta, Ga.	10000d
WPOK	Pontiac, Ill.	1000d
WNWI	Valparaiso, Ind.	5000d
KOAK	Red Oak, Ia.	
WKLO	Louisville, Ky.	5000
WOAP	Owosso, Mich.	1000d
KGCL	East Prairie, Mo.	
WUFO	Amherst, N.Y.	1000d
WEWO	Laurinburg, N.C.	5000d
WWDR	Murfreesboro, N.C.	500d
KNDK	Langdon, N.D.	
WMVR	Sidney, O.	250d
KWJJ	Portland, Oreg.	50000
WEEP	Pittsburgh, Pa.	50000
WLEY	Cayey, P.R.	250
KGFX	Pierre, S. D.	10000d
KRLD	Dallas, Tex.	50000
WKBY	Chatham, Va.	1000d

1090—275.1

KAAY	Little Rock, Ark.	50000
WQIK	Jacksonville, Fla.	50000d
WWSD	Monticello, Fla.	1000d
WBAF	Barnesville, Ga.	
WCRA	Effingham, Ill.	1000
WGLC	Mendota, Ill.	250d
KHAI	Honolulu, Hawaii	5000
WFWR	Ft. Wayne, Ind.	
KNWS	Waterloo, Iowa	1000d
WDLV	Donalsonville, La.	
WBAL	Baltimore, Md.	50000
WILD	Boston, Mass.	1000d
WMUS	Muskegon, Mich.	1000d
WTAK	Garden City, Mich.	250d
WKTE	King, N.C.	500d
KTGO	Tioga, N.D.	
WMWM	Wilmington, O.	1000d
WKSP	Kingstree, S.C.	
WENR	Englewood, Tenn.	1000d
WJKM	Hartsville, Tenn.	250d
WGOC	Kingsport, Tenn.	
KANN	Ogden, Utah	1000d
KING	Seattle, Wash.	50000

1100—272.6

KFAX	San Francisco, Calif.	50000
WLBB	Carrollton, Ga.	1000d
WHLI	Hempstead, N.Y.	10000d
WKYC	Cleveland, O.	50000
WGPA	Bethlehem, Pa.	250d

1110—270.1

WBCA	Bay Minette, Ala.	10000d
WBIB	Centreville, Ala.	1000d
KRLA	Pasadena, Cal.	50000
KPOP	Roseville, Cal.	
WALT	Tampa, Fla.	50000d
WGKA	Atlanta, Ga.	1000d
WEBS	Calhoun, Ga.	250d
KIPA	Hilo, Hawaii	1000
WMBI	Chicago, Ill.	5000d
WKDZ	Cadiz, Ky.	
WFCC	Franklinton, La.	1000d
WUNN	Mason, Mich.	
WJML	Petoskey, Mich.	
WKRA	Holly Springs, Miss.	1000d
KFAB	Omaha, Nebr.	50000
WBT	Charlotte, N.C.	50000
WELX	Xenia, O.	
KEOR	Atoka, Okla.	
KBND	Bend, Oreg.	5000
WJSM	Martinsburg, Pa.	
WNAR	Norristown, Penn.	50000d
WVJP	Caguas, P.R.	250
WHIM	Providence, R.I.	1000d
WPHC	Waverly, Tenn.	1000d
KDRY	Alamo Heights, Tex.	1000d

1120—267.7

WUST	Bethesda, Md.	250d
KMOX	St. Louis, Mo.	50000
WWOL	Buffalo, N.Y.	1000d
KPIR	Eugene, Ore.	50000
KCLE	Cleburne, Tex.	250d

1130—265.3

KRDU	Djnuba, Calif.	1000
KSDO	San Diego, Cal.	5000d
WLBA	Gainsville, Ga.	10000d
KLEI	Kailua, Hawaii	1000
KLEY	Wellington, Kan.	250d
KWKH	Shreveport, La.	50000
WCAR	Detroit, Mich.	50000
WDGY	Minneapolis, Minn.	50000
KBLR	Bolivar, Mo.	250d
WNEW	New York, N.Y.	50000
KBGH	Memphis, Tenn.	1000d
WDTM	Selmer, Tenn.	
KBGH	Memphis, Tex.	

1140—263.0

KRAK	Sacramento, Calif.	50000
KNAB	Burlington, Colo.	
WMIE	Miami, Fla.	10000
KGEM	Boise, Idaho	10000
WSIV	Pekin, Ill.	5000d
WAWK	Kendallville, Ind.	250d
KNEI	Waukon, Ia.	
KBIL	Liberty, Mo.	500d
KPWB	Piedmont, Mo.	1000d
KLPR	Oklahoma City, Okla.	1000d
WITA	San Juan, P.R.	10000
KSOO	Sioux Falls, S.Dak.	10000
KORC	Mineral Wells, Tex.	250d
WRVA	Richmond, Va.	50000

1150—260.7

WBCA	Bay Minette, Ala.	1000d
WGEA	Geneva, Ala.	1000d
WJRD	Tuscaloosa, Ala.	5000
KCKY	Coolidge, Ariz.	1000
KXLR	No. Little Rock, Ark.	5000
KRKD	Los Angeles, Calif.	5000
KJAX	Santa Rosa, Calif.	5000
KGMC	Englewood, Colo.	1000d
WCNX	Middletown, Conn.	1000d
WDEL	Wilmington, Del.	5000
WNDB	Daytona Bch., Fla.	1000
WTMP	Tampa, Fla.	5000d
WFPM	Fort Valley, Ga.	1000d
WJEM	Valdosta, Ga.	1000d
WGGH	Marion, Ill.	5000d
WYFE	Rockford, Ill.	500d
KYED	Burlington, Ia.	500d
KWKY	Des Moines, Iowa	1000
KSAL	Salina, Kans.	5000
WMST	Mt. Sterling, Ky.	500d
WLOC	Mumfordville, Ky.	1000d
WJBO	Baton Rouge, La.	5000
WGHM	Skowhegan, Maine	5000d
WHMC	Gaithersburg, Md.	1000
WCOP	Boston, Mass.	5000
WCEN	Mt. Pleasant, Mich.	1000
KASM	Albany, Minn.	1000d
KRMS	Osage Beach, Mo.	1000d
KSEN	Shelby, Mont.	1000
KDEF	Albuquerque, N. M.	5000
WRUN	Utica, N.Y.	5000
WBAG	Burlington, N.C.	1000d
WGBR	Goldsboro, N.C.	5000
WCUE	Cuyahoga Falls, Ohio	1000d
WIMA	Lima, Ohio	1000
KNED	McAlester, Okla.	1000
KAGO	Klamath Falls, Oreg.	5000
WHUN	Huntingdon, Pa.	5000d
WYNS	Lehighton, Pa.	1000d
WKPA	New Kensington, Pa.	1000d
WDIX	Orangeburg, S.C.	5000
WTYC	Rock Hill, S.C.	1000d
WSNW	Seneca, S.C.	1000d
KIMM	Rapid City, S.Dak.	5000d
WAPO	Chattanooga, Tenn.	5000
WCRK	Morristown, Tenn.	1000
WTAW	Bryan, Tex.	1000d
KCCT	Corpus Christi, Tex.	1000d
KIZZ	El Paso, Tex.	1000d
KVIL	Highland Park, Tex.	1000d
KJBC	Midland, Tex.	1000d
KPNG	Port Neches, Tex.	500d
KOLJ	Quanah, Tex.	500d
KBER	San Antonio, Tex.	1000d
KPUL	Pullman, Wash.	1000d
KAYO	Seattle, Wash.	5000
KKEY	Vancouver, Wash.	1000d
WABH	Deerfield, Va.	1000d
WELC	Welch, W.Va.	1000d
WAXX	Chippewa Falls, Wis.	5000d
WISN	Milwaukee, Wis.	50000

1160—258.5

WJJD	Chicago, Ill.	50000d
KSL	Salt Lake City, Utah	50000

1170—256.3

WCOV	Montgomery, Ala.	10000
KJNP	North Pole, Alaska	
KCBQ	San Diego, Calif	50000
KLOK	San Jose, Calif.	10000
KOHO	Honolulu, Hawaii	1000
WLBH	Mattoon, Ill.	250d
KSTT	Davenport, Iowa	1000
KVOO	Tulsa, Okla.	50000
WLEO	Ponce, P.R.	250
KPUG	Bellingham, Wash.	5000
WWVA	Wheeling, W.Va.	50000
WLKE	Waupun, Wis.	

1180—254.1

WLDS	Jacksonville, Ill.	1000d
WHAM	Rochester, N.Y.	50000

1190—252.0

KRDS	Tolleson, Ariz.	250
KEZY	Anaheim, Calif	5000
KNBA	Vallejo, Calif.	250d
WGKA	Atlanta, Ga.	1000d
WOWO	Ft. Wayne, Ind.	50000
WANN	Annapolis, Md.	10000d
WKOX	Fram'gham, Mass.	1000d
WLIB	New York, N. Y.	1000d
KEX	Portland, Oreg.	50000
WRAI	Rio Piedras, P.R.	500
WBMJ	San Juan, P.R.	10000
KLIF	Dallas, Tex.	50000

1200—249.9

WOAI	San Antonio, Tex.	50000

1210—247.8

KZOO	Honolulu, Hawaii	1000
WCNT	Centralia, Ill.	1000d
WKNX	Saginaw, Mich.	10000d
WADE	Wadesboro, N.C.	1000d
WAVI	Dayton, Ohio	250d
WCAU	Philadelphia, Pa.	50000
WHOY	Salinas, P.R.	

1220—245.8

WAQY	Birmingham, Ala.	1000d
WPRN	Butler, Ala.	
WABF	Fairhope, Ala.	1000
KVSA	McGehee, Ark.	1000d
KLIP	Fowler, Calif.	250d
KIBE	Palo Alto, Cal.	5000d
KKAR	Pomona, Calif.	250d
KFSC	Denver, Colo.	1000d
WCDQ	Hamden, Conn.	1000d
WDCJ	Arlington, Fla.	1000d
WJPB	Kissimmee, Fla.	
WOAH	Miami, Fla.	250d
WSAF	Sarasota, Fla.	1000d
WCLB	Camilla, Ga.	1000d
WPLK	Rockmart, Ga.	500d
WSFT	Thomaston, Ga.	250d
WLPO	LaSalle, Ill.	1000d
WKRS	Waukegan, Ill.	1000d
WSLM	Salem, Ind.	5000d
KJAN	Atlantic, Iowa	250d
KOUR	Independence, Iowa	250d
KOFO	Ottawa, Kans.	250d
WFKN	Franklin, Ky.	250d
KBCL	Shreveport, La.	250d
WLBI	Denham Springs, La.	250d
WSME	Sanford, Maine	1000d
WBCH	Hastings, Mich.	250d
WAVN	Stillwater, Minn.	5000d
WMDC	Hazlehurst, Miss.	250d
KZYM	Cape Girardeau, Mo.	250d
KBHM	Branson, Mo.	1000d
WKBK	Keene, N.H.	1000d
WGNY	Newburgh, N.Y.	5000d
WSOQ	N. Syracuse, N.Y.	1000d
WKMT	Kings Mtn., N.C.	1000d
WREV	Reidsville, N.C.	1000d
WENC	Whiteville, N.C.	5000d
KEYD	Oakes, N.Dak.	1000d
WGAR	Cleveland, Ohio	50000
WERT	Van Wert, Ohio	250d
KGYN	Guymon, Okla.	1000d
KBLY	Goldbeach, Oreg.	1000d
KAPT	Salem, Ore.	1000
WJUN	Mexico, Pa.	1000d
WRIB	Providence, R.I.	1000d
WFWL	Camden, Tenn.	250d
WCPH	Etowah, Tenn.	1000d
KZEE	Weatherford, Tex.	250d
KVLL	Woodville, Tex.	250d
WLSD	Big Stone Gap, Va.	1000d
WFAX	Falls Church, Va.	5000d
KASY	Auburn, Wash.	250d
KOZI	Chelan, Wash.	1000d
WRNE	Wis. Rapids, Wis.	500d

1230—243.8

WAUD	Auburn, Ala.	1000
WJBB	Haleyville, Ala.	1000
WBHP	Huntsville, Ala.	1000
WNUZ	Talledega, Ala.	1000
WTBC	Tuscaloosa, Ala.	1000
KIFW	Sitka, Alaska	250
KSUN	Bisbee, Ariz.	250
KAAA	Kingman, Ariz.	1000
KRIZ	Phoenix, Ariz.	250
KATO	Safford, Ariz.	250
KINO	Winslow, Ariz.	1000
KCON	Conway, Ark.	250
KFPW	Ft. Smith, Ark.	1000
KBTM	Jonesboro, Ark.	1000
KCON	Conway, Ark.	1000
KGEE	Bakersfield, Calif.	1000
KWTC	Barstow, Calif.	1000
KIBS	Bishop, Calif.	1000
KXO	El Centro, Calif.	250
KDAC	Ft. Bragg, Calif.	250
KGFJ	Los Angeles, Calif.	1000
KPRL	Paso Robles, Calif.	1000
KRDG	Redding, Calif.	250
KWG	Stockton, Calif	1000
KEXO	Grand Junction, Colo.	1000
KBRR	Leadville, Colo.	250
KDZA	Pueblo, Colo.	1000d
KGEK	Sterling, Colo.	1000d
WINF	Manchester, Conn.	1000
WGGG	Gainesville, Fla.	1000
WONN	Lakeland, Fla	1000
WMAF	Madison, Fla.	1000
WSBB	New Smyrna Bch., Florida	1000
WNVY	Pensacola, Fla.	1000
WCNH	Quincy, Fla.	1000d
WJNO	W. Palm Beach, Fla.	250
WBIA	Augusta, Ga.	1000d
WBLJ	Dalton, Ga.	1000
WXLI	Dublin, Ga.	1000
WFOM	Marietta, Ga.	1000
WSOK	Savannah, Ga.	1000
WAYX	Waycross, Ga.	1000
KBAR	Burley, Idaho	1000
KORT	Grangeville, Idaho	250
KRXK	Rexburg, Idaho	1000
WJBC	Bloomington, Ill.	1000
WQUA	Moline, Ill.	1000
WHCO	Sparta, Ill.	250
WJOB	Hammond, Ind.	1000
WSAL	Logansport, Ind.	1000
WTCJ	Tell City, Ind.	1000
WBOW	Terre Haute, Ind.	1000d
KFJB	Marshalltown, Iowa	1000
WHIR	Danville, Ky.	1000d
WHOP	Hopkinsville, Ky.	1000
WANO	Pineville, Ky.	1000d
KLIC	Monroe, La.	1000d
WSHO	New Orleans, La.	1000d
KSLO	Opelousas, La.	1000
WBME	Belfast, Me.	250
WQDY	Calais, Maine	1000d
WSJR	Madawaska, Me.	1000
WITH	Baltimore, Md.	1000d
WCUM	Cumberland, Md.	1000
WMNB	No. Adams, Mass.	1000d
WESX	Salem, Mass.	1000
WNEB	Worcester, Mass.	1000
WJEF	Grand Rapids, Mich.	1000
WIKB	Iron River, Mich.	1000d
WMPC	Lapeer, Mich.	250
WSOO	Slt. Ste. Marie, Mich.	1000
WSTR	Sturgis, Mich.	1000d
WKLK	Cloquet, Minn.	1000
KGHS	Internat'l Falls, Minn.	250
KYSM	Mankato, Minn.	1000
KMRS	Morris, Minn.	250
KTRF	Thief Riv. Falls, Minn.	1000
KWNO	Winona, Minn.	1000d
WCMA	Corinth, Miss.	1000
WHSY	Hattiesburg, Miss.	1000
WSSO	Starkville, Miss.	1000
WAZF	Yazoo City, Miss.	1000
KODE	Joplin, Mo.	1000
KLWT	Lebanon, Mo.	250
KNCM	Moberly, Mo.	1000
KBMN	Bozeman, Mont.	1000d
KHDN	Hardin, Mont.	1000
KXLO	Lewiston, Mont.	1000
KLCB	Libby, Mont.	1000
KTNC	Falls City, Nebr.	100
KHAS	Hastings, Neb.	1000
KELY	Ely, Nev.	250
KLAV	Las Vegas, Nev.	250
KCBN	Reno, Nev.	1000
WMOU	Berlin, N.H.	1000d
WTSV	Claremont, N.H.	1000
WCMC	Wildwood, N.J.	1000
KALG	Alamogordo, N.Mex.	250
KOTS	Deming, N.Mex.	250
KYVA	Gallup, N. Mex.	1000
KFUN	Las Vegas, N.Mex.	250
KRSY	Roswell, N. Mex.	1000
WNIA	Cheektowaga, N.Y.	500
WENY	Elmira, N.Y.	1000
WIGS	Gouverneur, N. Y.	1000
WHUC	Hudson, N. Y.	1000
WLFH	Little Falls, N. Y.	1000
WFAS	White Plains, N. Y.	1000
WSKY	Asheville, N.C.	1000
WFAI	Fayetteville, N.C.	1000d
WMFR	High Point, N.C.	1000
WISP	Kinston, N.C.	1000d
WNNC	Newton, N. C.	1000
WCBT	Roanoke Rap., N. C.	1000
KDIX	Dickinson, N.Dak.	1000
WUBE	Cincinnati, O.	1000d
WCOL	Columbus, Ohio	1000
WIRO	Ironton, O.	1000
WCWA	Toledo, O.	1000d
KADA	N. of Ada, Okla.	250
WBBZ	Ponca City, Okla.	250
KVAS	Astoria, Ore.	1000

WHITE'S RADIO LOG

kHz Wave Length W.P.

KRNS	Burns, Ore.	1000
KOOS	Coos Bay, Ore.	1000
KRDR	Gresham, Oreg.	1000
KYJC	Medford, Oreg.	1000
KQIK	Lakeview, Ore.	1000
KTDO	Toledo, Ore.	1000
WBVP	Beaver Falls, Pa.	1000
WEEX	Easton, Pa.	1000
WKBO	Harrisburg, Pa.	1000
WCRO	Johnstown, Pa.	1000
WBPZ	Lock Haven, Pa.	1000
WTIV	Titusville, Pa.	1000
WNIK	Arecibo, P.R.	1000
WERI	Westerly, R.I.	1000
WAIM	Anderson, S.C.	1000
WNOK	Columbia, S.C.	1000d
WOLS	Florence, S.C.	1000
KISD	Sioux Falls, S.Dak.	1000d
WAKI	McMinnville, Tenn.	1000
KSIX	Corpus Christi, Tex.	1000
KDLK	Del Rio, Tex.	250
KNUZ	Houston, Tex.	1000
KERV	Kerrville, Tex.	1000
KLVT	Levelland, Tex.	1000
KEEE	Nacogdoches, Tex.	1000
KOSA	Odessa, Tex.	1000
KGRO	Pampa, Tex.	250
KSEY	Seymour, Tex.	1000
KSST	Sulphur Sprgs., Tex.	1000
KWTX	Waco, Tex.	1000d
KMOR	Murray, Utah	250
KOAL	Price, Utah	1000
WJOY	Burlington, Vt.	1000
WBBI	Abingdon, Va.	1000d
WODI	Brookneal, Va.	1000
WCFV	Clifton Forge, Va.	1000
WFVA	Fredericksburg, Va.	1000
WNOR	Norfolk, Va.	1000
KWYZ	Everett, Wash.	1000
KSPO	Spokane, Wash.	1000
KREW	Sunnyside, Wash.	1000
WLOG	Logan, W.Va.	1000
WTAP	Parkersburg, W.Va.	1000
WHBY	Appleton, Wis.	1000
WCLO	Janesville, Wis.	1000
WXCO	Wausau, Wis.	1000d
KVOC	Casper, Wyo.	1000

1240—241.8

WEBJ	Brewton, Ala.	250
WPRN	Butler, Ala.	1000
WULA	Eufaula, Ala.	250
WOWL	Florence, Ala.	1000
WARF	Jasper, Ala.	1000
KVRD	Cottonwood, Ariz.	250
KZOW	So. of Globe, Ariz.	1000
KVRC	Arkadelphia, Ark.	250
KTLO	Mountain Home, Ark.	1000
KWAK	Stuttgart, Ark.	250
KPLY	Crescent City, Calif.	250
KOAD	Lemoore, Cal.	250
KMBY	Monterey, Calif.	1000
KPPC	Pasadena, Calif.	100
KLOA	Ridgecrest, Calif.	250
KROY	Sacramento, Calif.	1000
KRNO	San Bernardino, California	1000d
KSON	San Diego, Calif.	250
KSMA	Santa Maria, Calif.	250
KSUE	Susanville, Calif.	1000
KRDO	Colo. Springs, Colo.	1000d
KDGO	Durango, Colo.	1000
KSLV	Monte Vista, Colo.	1000
KCRT	Trinidad, Colo.	250
WWCO	Waterbury, Conn.	1000
WBGC	Chipley, Fla.	1000
WLCO	Eustis, Fla.	1000
WINK	Ft. Myers, Fla.	1000
WMMB	Melbourne, Fla.	1000
WFOY	St. Augustine, Fla.	1000
WBHB	Fitzgerald, Ga.	1000
WDUN	Gainesville, Ga.	1000
WLAG	LaGrange, Ga.	1000
WBML	Macon, Ga.	1000
WWNS	Statesboro, Ga.	1000
WPAX	Thomasville, Ga.	1000
WTWA	Thomson, Ga.	250
KVNI	Coeur d'Alene, Idaho	1000
KFLI	Mountain Home, Idaho	250
KMCL	McCall, Ida.	1000
KWIK	Pocatello, Idaho	250
WCRW	Chicago, Ill.	1000
WEDC	Chicago, Ill.	1000d
WSBC	Chicago, Ill.	1000
WEBQ	Harrisburg, Ill.	1000
WTAX	Springfield, Ill.	1000
WSDR	Sterling, Ill.	500
WHBU	Anderson, Ind.	1000d
KDEC	Decorah, Iowa	1000
KWLC	Decorah, Iowa	1000
KBIZ	Ottumwa, Iowa	1000
KICD	Spencer, Iowa	1000
KIUL	Garden City, Kans.	1000
KAKE	Wichita, Kans.	250
WINN	Louisville, Ky.	1000
WFTM	Maysville, Ky.	1000
WPKE	Pikeville, Ky.	1000d
WSFC	Somerset, Ky.	1000
KASO	Minden, La.	1000
KANE	New Iberia, La.	1000
WCOU	Lewiston, Maine	1000
WMKR	Millinocket, Me.	1000
WCEM	Cambridge, Md.	1000
WJEJ	Hagerstown, Md.	1000
WHAI	Greenfield, Mass.	250
WOCB	W. Yarmouth, Mass.	1000
WATT	Cadillac, Mich.	1000
WCBY	Cheboygan, Mich.	1000
WJPD	Ishpeming, Mich.	1000
WJIM	Lansing, Mich.	1000d
WMFG	Hibbing, Minn.	1000
KPRM	Park Rapids, Minn.	1000
WJON	St. Cloud, Minn.	1000
WMPA	Aberdeen, Miss.	1000
WGRM	Greenwood, Miss.	250
WGCM	Gulfport, Miss.	1000
WMIS	Natchez, Miss.	250
KWDS	Jefferson City, Mo.	1000d
KODE	Joplin, Mo.	1000d
KNEM	Nevada, Mo.	250
KBMY	Billings, Mont.	1000
KLTZ	Glasgow, Mont.	1000
KBLL	Helena, Mont.	1000
KFOR	Lincoln, Nebr.	1000
KODY	North Platte, Nebr.	1000
KELK	Elko, Nev.	1000
WFTN	Franklin, N.H.	250
WSNJ	Bridgeton, N. J.	1000
KAVE	Carlsbad, N.Mex.	1000
KCLV	Clovis, N.Mex.	1000
WGBB	Freeport, N.Y.	1000
WGVA	Geneva, N.Y.	1000d
WJTN	Jamestown, N.Y.	500
WVOS	Liberty, N. Y.	1000
WNBZ	Saranac Lake, N.Y.	1000
WSNY	Schenectady, N.Y.	1000d
WATN	Watertown, N. Y.	1000
WPNF	Brevard, N.C.	1000
WIST	Charlotte, N.C.	1000
WCNC	Elizabeth City, N.C.	1000d
WJNC	Jacksonville, N.C.	1000
WRNC	Raleigh, N.C.	1000
KDLR	Devils Lake, N.Dak.	250
WBBW	Youngstown, Ohio	1000
WHIZ	Zanesville, Ohio	1000
KVSO	Ardmore, Okla.	250
KBEK	Elk City, Okla.	250
KBEL	Idabel, Okla.	250
KOKL	Okmulgee, Okla.	1000
KFLY	Corvallis, Oreg.	1000d
KTIX	Pendleton, Oreg.	1000
KPRB	Redmond, Oreg.	250
KQEN	Roseburg, Ore.	1000
WRTA	Altoona, Pa.	1000
WHUM	Reading, Pa.	1000
WSEW	Selinsgrove, Pa.	
WBAX	Wilkes-Barre, Pa.	1000
WALO	Humacao, P.R.	1000
WWON	Woonsocket, R.I.	1000
WKDK	Newberry, S.C.	1000
WDXY	Sumter, S. C.	1000
KCCR	Pierre, S. D.	1000
WBEJ	Elizabethton, Tenn.	1000
WEKR	Fayetteville, Tenn.	1000
WBIR	Knoxville, Tenn.	1000
WKDA	Nashville, Tenn.	1000
WENK	Union City, Tenn.	1000
KVLF	Alpine, Tex.	1000
KEAN	Brownwood, Tex.	1000
KORA	Bryan, Tex.	1000
KOCA	Kilgore, Tex.	1000
KSOX	Raymondville, Tex.	250
KCKG	Sonora, Tex.	1000
KXOX	Sweetwater, Tex.	1000
WSKI	Montpelier, Vt.	1000
WSSV	Petersburg, Va.	1000
WROV	Roanoke, Va.	1000
WTON	Staunton, Va.	1000
KXLE	Ellensburg, Wash.	1000
KGY	Olympia, Wash.	1000
WKOY	Bluefield, W.Va.	1000
WTIP	Charleston, W.Va.	1000d
WDNE	Elkins, W.Va.	1000
WOMT	Manitowoc, Wis.	1000d
WIBU	Poynette, Wis.	1000d
WOBT	Rhinelander, Wis.	1000
WJMC	Rice Lake, Wis.	1000
KFBC	Cheyenne, Wyo.	1000
KEVA	Evanston, Wyo.	1000
KASL	Newcastle, Wyo.	250
KRAL	Rawlins, Wyo.	1000
KTHE	Thermopolis, Wyo.	1000

1250—239.9

WZOB	Ft. Payne, Ala.	1000d
WETU	Wetumpka, Ala.	5000d
KAKA	Wickenburg, Ariz.	500d
KHIL	Willcox, Ariz.	5000d
KFAY	Fayetteville, Ark.	1000d
KALO	Little Rock, Ark.	1000
KHOT	Madera, Calif.	500d
KTMS	Santa Barbara, Calif.	1000
KDHI	Twenty-Nine Palms, California	1000d
KMSL	Ukiah, Calif.	500d
KICM	Golden, Colo.	1000d
WNER	Live Oak, Fla.	1000d
WDAE	Tampa, Fla.	5000
WLYB	Albany, Ga.	1000d
WYTH	Madison, Ga.	1000d
WIZZ	Streator, Ill.	500d
WGL	Ft. Wayne, Ind.	1000
WRAY	Princeton, Ind.	1000d
KCFI	Cedar Falls, Iowa	500d
KFKU	Lawrence, Kans.	5000
WREN	Topeka, Kans.	5000
WNVL	Nicholasville, Ky.	500
WLCK	Scottsville, Ky.	500d
WGUY	Bangor, Maine	5000d
WARE	Ware, Mass.	1000
WXOX	Bay City, Mich.	1000
KOTE	Fergus Falls, Minn.	1000
KCUE	Red Wing, Minn.	1000d
WHNY	McComb, Miss.	5000
KFMO	Flat River, Mo.	1000
KBTC	Houston, Mo.	1000d
WKBR	Manchester, N.H.	5000
WMTR	Morristown, N.J.	5000d
WIPS	Ticonderoga, N.Y.	1000d
WFAG	Farmville, N.C.	500d
WKDX	Hamlet, N. C.	1000d
WBRM	Marion, N.C.	1000d
WCHO	Washington Court House, Ohio	500d
WLEM	Emporium, Pa.	1000d
WPEL	Montrose, Pa.	1000d
WTAE	Pittsburgh, Pa.	5000
WNOW	York, Pa.	5000d
WTMA	Charleston, S.C.	5000
WCKM	Winnsboro, S.C.	500d
WKBL	Covington, Tenn.	1000d
WKYZ	Madisonville, Tenn.	
WNTT	Tazewell, Tenn.	500d
KFTV	Paris, Tex.	500d
KPAC	Port Arthur, Tex.	5000
KUKA	San Antonio, Tex.	1000d
KTFO	Seminole, Tex.	1000d
KANN	Ogden, Utah	1000d
KVEL	Vernal, Utah	5000d
WDVA	Danville, Va.	5000
WYSR	Franklin, Va.	1000d
WEER	Warrenton, Va.	1000d
KWSC	Pullman, Wash.	5000
KTW	Seattle, Wash.	5000
WEMP	Milwaukee, Wis.	5000

1260—238.0

KPIN	Casa Grande, Ariz.	1000d
KCCB	Corning, Ark.	1000d
KBHC	Nashville, Ark.	500d
KGIL	San Fernando, Calif.	5000
KYA	San Francisco, Calif.	5000
KSNO	Aspen, Colo.	5000d
WCRT	Birmingham, Ala.	5000d
WMMM	Westport, Conn.	1000d
WNRK	Newark, Del.	500d
WWDC	Washington, D.C.	5000
WFTW	Fort Walton Beach, Florida	1000d
WAME	Miami, Fla.	5000
WWPF	Palatka, Fla.	1000
WHAB	Baxley, Ga.	5000d
WBBK	Blakely, Ga.	1000d
WTJH	East Point, Ga.	5000d
KTEE	Idaho Falls, Ida.	5000d
KWEI	Weiser, Ida.	1000d
WIBV	Belleville, Ill.	5000d
WFBM	Indianapolis, Ind.	5000
KFGQ	Boone, Iowa	1000d
KWHK	Hutchinson, Kans.	1000
WAIL	Baton Rouge, La.	1000d
WEZE	Boston, Mass.	5000
WALM	Albion, Mich.	1000
WJBL	Holland, Mich.	5000
KROX	Crookston, Minn.	1000
KDUZ	Hutchinson, Minn.	1000d
WGVM	Greenville, Miss.	5000d
WNSL	Laurel, Miss.	5000d
WCSA	Ripley, Miss.	500
KGBX	Springfield, Mo.	5000
KIMB	Kimball, Nebr.	1000d
WBUD	Trenton, N.J.	5000
KVSF	Santa Fe, N.Mex.	1000
WBNR	Beacon, N.Y.	1000d
WNDR	Syracuse, N.Y.	5000
WGWR	Asheboro, N.C.	5000
WCDJ	Edenton, N.C.	1000d
WIXY	Cleveland, O.	5000
WNXT	Portsmouth, Ohio	5000
KWSH	Wewoka-Seminole, Oklahoma	1000
KMCM	McMinnville, Oreg.	1000
WWYN	Erie, Pa.	5000
WPHB	Philipsburg, Pa.	5000d
WISO	Ponce, P.R.	1000
WMUU	Greenville, S.C.	5000d
WJOT	Lake City, S.C.	1000d
KWYR	Winner, S.Dak.	5000d
WNOO	Chattanooga, Tenn.	1000d
WMCH	Church Hill, Tenn.	1000d
WDKN	Dickson, Tenn.	1000d
WCLC	Jamestown, Tenn.	1000d
KSPL	Diboll, Tex.	1000d
KPSO	Falfurrias, Tex.	500d
KWFR	San Angelo, Tex.	1000d
KTUE	Tulia, Tex.	1000d
KTAE	Taylor, Tex.	1000d
WCHV	Charlottesville, Va.	5000
WJJJ	Christiansburg, Va.	1000d
KWIQ	Moses Lake, Wash.	1000d
WVVW	Grafton, W.Va.	500
WWIS	Black River Falls, Wis.	1000d
WEKZ	Monroe, Wis.	1000d
WOCO	Oconto, Wis.	
KPOW	Powell, Wyo.	5000

1270—236.1

WGSV	Guntersville, Ala.	1000d
WZAM	Prichard, Ala.	1000d
KBYR	Anchorage, Alaska	1000
KDJI	Holbrook, Ariz.	5000d
KADL	Pine Bluff, Ark.	5000d
KBLC	Lakeport, Calif.	
KGOL	Palm Desert, Cal.	500d
KCOK	Tulare, Calif.	5000d
WNOG	Naples, Fla.	500d
WHIY	Orlando, Fla.	5000d
WTNT	Tallahassee, Fla.	5000
WKRW	Cartersville, Ga.	500d
WHYD	Columbus, Ga.	5000d
WJJC	Commerce, Ga.	1000d
KNDI	Honolulu, Hawaii	5000
KTFI	Twin Falls, Idaho	5000
WEIC	Charleston, Ill.	1000d
WHBF	Rock Island, Ill.	5000
WCMR	Elkhart, Ind.	5000
WWCA	Gary, Ind.	1000
WORX	Madison, Ind.	1000d
KSCB	Liberal, Kans.	1000
WAIN	Columbia, Ky.	1000d
WFUL	Fulton, Ky.	1000d
KVCL	Winnfield, La.	1000d
WKYR	Cumberland, Md.	5000
WSPR	Springfield, Mass.	5000
WXYZ	Detroit, Mich.	5000
KWEB	Rochester, Minn.	5000
WVOM	Ioka, Miss.	1000d
WLSM	Louisville, Miss.	5000d
KUSN	St. Joseph, Mo.	1000d
KBUB	Sparks, Nev.	1000d
WTSN	Dover, N.H.	5000
WDVL	Vineland, N.J.	500d
KINN	Alamogordo, N.M.	1000d
WHLD	Niagara Falls, N.Y.	5000d
WDLA	Walton, N.Y.	1000d
WCGC	Belmont, N. C.	1000
WMPM	Smithfield, N.C.	5000d
KBOM	Mandan, N.Dak.	1000
WILE	Cambridge, Ohio	1000d
KWPR	Claremore, Okla.	500d
KAJO	Grants Pass, Oreg.	5000d
WLBR	Lebanon, Pa.	5000
WBHC	Hampton, S.C.	1000d
KNWC	Sioux Falls, S.Dak.	1000
WLIK	Newport, Tenn.	5000d
KIDX	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
WRJC	Mauston, Wis.	500d
WWJC	Superior, Wis.	5000d
KIML	Gillette, Wyo.	5000

1280—234.2

WPID	Piedmont, Ala.	1000d
WNPT	Tuscaloosa, Ala.	5000
KHEP	Phoenix, Ariz.	1000d
KNBY	Newport, Ark.	1000d
KOAG	Arroyo Grande, Cal.	1000
KIXF	Fortuna, Cal.	1000d
KFOX	Long Beach, Calif.	1000
KCJH	San Luis Obispo, Cal.	500d
KJOY	Stockton, Calif.	1000
KTLN	Denver, Colo.	5000
WSUX	Seaford, Del.	1000d
WDSP	DeFuniak Springs, Florida	5000d
WIPC	Lake Wales, Fla.	1000d
WYND	Sarasota, Fla.	500d
WIBB	Macon, Ga.	5000d
WMRD	Aurora, Ill.	1000d
WGBF	Evansville, Ind.	5000
KCOB	Newton, Iowa	1000d
KSOK	Arkansas City, Kans.	1000
WCPM	Cumberland, Ky.	1000d
WIXI	Lancaster, Ky.	500d
KWCL	Oakgrove, La.	1000d
WEIM	Fitchburg, Mass.	5000
WFYC	Alma, Mich.	5000d
WWTC	Minneapolis, Minn.	5000
KVOX	Moorhead, Minn.	1000
KDKD	Clinton, Mo.	1000d
KYRO	Potosi, Mo.	500d
KCNI	Broken Bow, Nebr.	1000d
KTOO	Henderson, Nev.	5000d
KRZE	Farmington, N.Mex.	5000d
WADO	New York, N.Y.	5000
WROC	Rochester, N.Y.	5000d
WSAT	Salisbury, N.C.	1000
WYAL	Scotland Neck, N.C.	5000d

kHz Wave Length W.P.

WONW	Defiance, Ohio	1000
WLMJ	Jackson, Ohio	1000d
KLCD	Poteau, Okla.	1000d
KERG	Eugene, Oreg.	5000
WBRX	Berwick, P.	1000d
WHVR	Hanover, Pa.	5000
WKST	New Castle, Pa.	1000
WCMN	Arecibo, P.R.	5000
WANS	Anderson, S.C.	5000
WJAY	Mullins, S.C.	5000d
WMCP	Columbia, Tenn.	1000d
WDNT	Dayton, Tenn.	1000d
KNIT	Abilene, Tex.	500d
KWHI	Brenham, Tex.	1000d
KLUE	Longview, Tex.	1000d
KRAN	Morton, Tex.	500
KVWG	Pearsall, Tex.	500d
KNAK	Salt Lake City, Utah	5000
WYVE	Wytheville, Va.	1000d
KMAS	Shelton, Wash.	1000d
KUDY	Spokane, Wash.	5000d
KIT	Yakima, Wash.	5000
WVAR	Richwood, W.Va.	1000d
WNAM	Neenah, Wis.	5000

1290—232.4

WHOD	Jackson, Ala.	1000d
WSHF	Sheffield, Ala.	1000d
WMLS	Sylacauga, Ala.	1000d
KCUB	Tucson, Ariz.	1000
KDMS	El Dorado, Ark.	5000d
KUOA	Siloam Sprgs., Ark.	5000d
KHSL	Chico, Calif.	5000
KAZA	Gilroy, Cal.	
KMEN	San Bernardino, California	5000
KACL	Santa Barbara, Cal.	500d
WCCC	Hartford, Conn.	500d
WTUX	Wilmington, Del.	1000d
WTMC	Ocala, Fla.	5000
WSCM	Panama City Beach, Florida	500d
WIRK	W. Palm Bch., Fla.	5000
WDEC	Americus, Ga.	1000d
WCHK	Canton, Ga.	1000d
WTOC	Savannah, Ga.	5000
KSNN	Pocatello, Idaho	1000d
WIRL	Peoria, Ill.	5000
WREY	New Albany, Ind.	5000
KWNS	Pratt, Kansas	5000
WCBL	Benton, Ky.	5000d
KJEF	Jennings, La.	1000d
WHGR	Houghton Lake, Mich.	5000
WNIL	Niles, Mich.	500d
WOIB	Saline, Mich.	500d
KBMO	Benson, Minn.	500d
WBLE	Batesville, Miss.	1000d
KALM	Thayer, Mo.	1000d
KGVO	Missoula, Mont.	5000
KOIL	Omaha, Nebr.	5000
WKNE	Keene, N.H.	5000
KSRC	Socorro, N.M.	1000d
WGLI	Babylon, N.Y.	5000
WNBF	Binghamton, N.Y.	5000
WHKY	Hickory, N.C.	5000
WEYE	Sanford, N.C.	1000d
WOMP	Bellaire, Ohio	1000d
WHIO	Dayton, Ohio	5000
KUMA	Pendleton, Oreg.	5000
KLIQ	Portland, Oreg.	5000d
WFBG	Altoona, Pa.	5000
WICE	Providence, R.I.	5000
WFIG	Sumter, S.C.	1000
WATO	Oak Ridge, Tenn.	5000
KBLT	Big Lake, Tex.	1000d
KIVY	Crockett, Tex.	500d
KRGV	Weslaco, Tex.	5000
KTRN	Wichita Falls, Tex.	5000
WPVA	Colonial Hgts., Va.	5000d
WAGE	Leesburg, Va.	1000d
WKWS	Rocky Mount, Va.	1000d
WVOW	Logan, W.Va.	5000
KAPY	Port Angeles, Wash.	1000d
WMIL	Milwaukee, Wis.	1000d
WCOW	Sparta, Wis.	5000d
KDWB	Laramie, Wyo.	5000

1300—230.6

WBSA	Boaz, Ala.	1000d
WTLS	Tallassee, Ala.	1000d
WEZQ	Winfield, Ala.	1000d
KHAC	Window Rock, Ariz.	
KWCB	Searcy, Ark.	1000d
KROP	Brawley, Calif.	1000
KYNO	Fresno, Calif.	5000
KWKW	Pasadena, Calif.	5000
KVOR	Colorado Springs, Colo.	5000
WAVZ	New Haven, Conn.	1000
WRKT	Cocoa Beach, Fla.	5000
WFFG	Marathon, Fla.	500
WSOL	Tampa, Fla.	5000d
WMTM	Moultrie, Ga.	5000d
WNEA	Newnan, Ga.	500
WIMO	Winder, Ga.	1000d
KOZE	Lewiston, Idaho	5000
WTAQ	La Grange, Ill.	5000
WFRX	W. Frankfort, Ill.	1000d
WHLT	Huntington, Ind.	500d
WAAC	Terre Haute, Ind.	500d
KGLO	Mason City, Iowa	5000
WBLG	Lexington, Ky.	1000
WIBR	Baton Rouge, La.	1000
WFBR	Baltimore, Md.	5000
WJDA	Quincy, Mass.	1000d
WOOD	Grand Rapids, Mich.	5000
WKPM	Princeton, Minn.	
WRBC	Jackson, Miss.	5000
KMMO	Marshall, Mo.	1000d
KBRL	McCook, Nebr.	5000d
KPTL	Carson City, Nev.	5000
WPNH	Plymouth, N.H.	1000d
WAAT	Trenton, N.J.	5000d
WOSC	Fulton, N.Y.	1000d
WMMJ	Lancaster, N.Y.	1000d
WEEE	Rensselaer, N.Y.	5000d
WRRC	Spring Valley, N.Y.	500d
WGOL	Goldsboro, N.C.	1000d
WLNC	Laurinburg, N.C.	500
WSYD	Mt. Airy, N.C.	5000
WERE	Cleveland, Ohio	5000
WMVO	Mt. Vernon, Ohio	500
KOME	Tulsa, Okla.	5000
KDOV	Medford, Oreg.	5000d
KACI	The Dalles, Oreg.	1000d
WWCH	Clarion, Pa.	500d
WTHT	Hazleton, Pa.	1000d
WTIL	Mayaguez, P.R.	1000
WLOW	Aiken, S.C.	500d
WDOG	Allendale, S.C.	1000d
WCKI	Greer, S.C.	1000d
WKSC	Kershaw, S.C.	500d
KOLY	Mobridge, S.Dak.	1000d
WMTN	Morristown, Tenn.	5000d
WMAK	Nashville, Tenn.	5000
KVET	Austin, Tex.	5000
KKUB	Brownfield, Tex.	1000d
KGNS	Laredo, Tex.	1000d
KKAS	Silsbee, Tex.	500d
KSTU	Logan, Utah	1000
WKCY	Harrisonburg, Va.	
KOL	Seattle, Wash.	5000
WCLG	Morgantown, W.Va.	1000d
WKLC	St. Albans, W.Va.	1000d

1310—228.9

WHEP	Foley, Ala.	1000d
WJAM	Marion, Ala.	5000d
KBUZ	Mesa, Ariz.	5000
KBOK	Malvern, Ark.	1000d
KIOT	Barstow, Calif	5000d
KPOD	Crescent City, Calif.	1000d
KDIA	Oakland, Cal.	5000
KTKR	Taft, Calif.	1000d
KFKA	Greeley, Colo.	5000d
WICH	Norwich, Conn.	5000
WDOO	Deland, Fla.	5000d
WGKR	Perry, Fla.	1000d
WAUC	Wauchula, Fla.	500d
WOMN	Decatur, Ga.	500
WOKA	Douglas, Ga.	1000d
WBRO	Waynesboro, Ga.	1000d
WBMK	West Point, Ga.	1000d
KNUI	Makawao, Hawaii	5000
KLIX	Twin Falls, Idaho	5000
WIFE	Indianapolis, Ind.	5000
KDLS	Perry, Iowa	500d
KOKX	Keokuk, Iowa	1000d
KFLA	Scott City, Kans.	500d
WTTL	Madisonville, Ky.	1000
WDOC	Prestonsburg, Ky.	5000d
KIKS	Sulphur, La.	500d
KUZN	W. Monroe, La.	1000d
WLDB	Portland, Me.	5000
WORC	Worcester, Mass.	5000
WKNR	Dearborn, Mich.	5000
WCCW	Traverse City, Mich.	5000d
KRBI	St. Peter, Minn.	1000d
WXXX	Hattiesburg, Miss.	1000d
KFSB	Joplin, Mo.	5000
KFBB	Great Falls, Mont.	5000
KGMT	Fairbury, Nebr.	500d
WJLK	Asbury Park, N.J.	1000d
WCAM	Camden, N. J.	1000
KARA	Albuquerque, N.M.	1000d
WVIP	Mt. Kisco, N.Y.	5000d
WTLB	Utica, N.Y.	1000
WISE	Asheville, N.C.	5000
WKTC	Charlotte, N.C.	1000
WTIK	Durham, N.C.	5000
KNOX	Grand Forks, N.Dak.	5000
WFAH	Alliance, Ohio	1000d
KNPT	Newport, Oreg.	5000
WBFD	Bedford, Pa.	5000d
WGSA	Ephrata, Pa.	5000d
WNAE	Warren, Pa.	5000d
WDKD	Kingstree, S.C.	5000d
WDOD	Chattanooga, Tenn.	5000
WDXI	Jackson, Tenn.	5000
WBNT	Oneida, Tenn.	1000d
KZIP	Amarillo, Tex.	1000d
WRR	Dallas, Tex.	5000
KDYL	Odessa, Tex.	1000d
KBUC	San Antonio, Tex.	5000
WEEL	Fairfax, Va.	5000
WGH	Newport News, Va.	5000
KARY	Prosser, Wash.	1000d
WIBA	Madison, Wis.	5000

1320—227.1

WAGF	Dothan, Ala.	1000
WENN	Birmingham, Ala.	5000d
KBLU	Yuma, Ariz.	500d
KWHN	Fort Smith, Ark.	5000
KRLW	Walnut Ridge, Ark.	1000d
KHSJ	Hemet, Calif.	500d
KLAN	Lemoore, Calif.	1000d
KUDE	Oceanside, Calif.	500
KCRA	Sacramento, Calif.	5000
KAVI	Rocky Ford, Colo.	1000d
WATR	Waterbury, Conn.	5000
WGMA	Hollywood, Fla.	5000
WZDK	Jacksonville, Fla.	5000
WAMR	Venice, Fla.	500d
WHIE	Griffin, Ga.	5000d
WKAN	Kankakee, Ill.	1000
KNIA	Knoxville, Iowa	500d
KMAQ	Maquoketa, Iowa	500d
KLWN	Lawrence, Kans.	500d
WBRT	Bardstown, Ky.	1000d
WCLU	Covington, Ky.	500d
WNGO	Mayfield, Ky.	1000d
KHAL	Homer, La.	1000d
WICO	Salisbury, Md.	1000d
WARA	Attleboro, Mass.	1000
WILS	Lansing, Mich.	5000
WDMJ	Marquette, Mich.	1000
WRJW	Picayune, Miss.	5000d
KXLW	Clayton, Mo.	1000d
KOLT	Scottsbluff, Nebr.	5000
KRDD	Roswell, N.M.	1000d
WWHG	Hornell, N.Y.	5000d
WAGY	Forest City, N.C.	1000
WCOG	Greensboro, N.C.	5000
WKRK	Murphy, N.C.	5000d
WEEW	Washington, N.C.	500d
KHRT	Minot, N.D.	1000d
WHOK	Lancaster, Ohio	1000d
KWOE	Clinton, Okla.	1000d
KATR	Eugene, Ore.	1000d
WKAP	Allentown, Pa.	5000
WGET	Gettysburg, Pa.	1000
WJAS	Pittsburgh, Pa.	5000
WSCR	Scranton, Pa.	1000
WUNO	Rio Piedras, P.R.	5000
WOIC	Columbia, S. C.	5000
KELO	Sioux Falls, S.Dak.	5000
WKIN	Kingsport, Tenn.	5000d
WMSR	Manchester, Tenn.	5000d
KVMC	Colo. City, Tex.	1000d
KXYZ	Houston, Tex.	5000
KCPX	Salt Lake City, Utah	5000
WDMS	Lynchburg, Va.	1000
WEET	Richmond, Va.	1000d
KXRO	Aberdeen, Wash.	5000
KHIT	Walla Walla, Wash.	1000d
WFHR	Wisconsin Rapids, Wis.	5000

1330—225.4

WROS	Scottsboro, Ala.	1000d
KMOP	Tucson, Ariz.	500d
KVEE	Conway, Ark.	500d
KLOM	Lompoc, Cal.	1000d
KFAC	Los Angeles, Calif.	5000
KLBS	Los Banos, Calif.	500d
KAHR	Redding, Calif.	5000d
WARN	Ft. Pierce, Fla.	1000
WWAB	Lakeland, Fla.	1000d
WEBY	Milton, Fla.	5000d
WMEN	Tallahassee, Fla.	5000d
WMLT	Dublin, Ga.	5000
WEAW	Evanston, Ill.	5000
WRAM	Monmouth, Ill.	1000d
WRRR	Rockford, Ill.	1000d
WJPS	Evansville, Ind.	5000
WTRE	Greensburg, Ind.	
KWWL	Waterloo, Iowa	5000
KFH	Wichita, Kans.	5000
WYGO	Corbin, Ky.	5000d
WMOR	Morehead, Ky.	1000d
KVOL	Lafayette, La.	5000
WASA	Havre de Grace, Md.	5000d
WCRB	Waltham, Mass.	5000
WTRX	Flint, Mich.	5000
WLOL	Minneapolis, Minn.	5000
WFTO	Fulton, Miss.	
WJPR	Greenville, Miss.	1000
WDAL	Meridian, Miss.	1000d
KUKU	Willow Springs, Mo.	1000d
KGAK	Gallup, N.Mex.	5000
WEVD	New York, N.Y.	5000
WPOW	New York, N.Y.	5000
WEBO	Owego, N.Y.	1000d
WHAZ	Troy, N.Y.	1000
WUSM	Havelock, N.C.	1000d
WHOT	Campbell, Ohio	1000
WFIN	Findlay, Ohio	1000d
WKOV	Wellston, Ohio	500d
WELW	Willoughby, O.	500d
KPOJ	Portland, Oreg.	5000
WBLF	Bellefonte, Pa.	500
WICU	Erie, Pa.	5000
WLAT	Conway, S. C.	5000
WFBC	Greenville, S.C.	5000
WAEW	Crossville, Tenn.	1000d
WTRO	Dyersburg, Tenn.	500d
KMIL	Cameron, Tex.	500d
KSWA	Graham, Tex.	500d
KINE	Kingsville, Tex.	1000d
KVKM	Monahans, Tex.	5000
KZAK	Tyler, Tex.	1000d
WBTM	Danville, Va.	5000
WRAA	Luray, Va.	1000d
WOLD	Marion, Va.	1000d
WESR	Tasley, Va.	5000d
KCFA	Spokane, Wash.	5000d
WETZ	New Martinsville, W.Va.	1000d
WHBL	Sheboygan, Wis.	5000
KOVE	Lander, Wyo.	5000

1340—223.7

WKUL	Cullman, Ala.	1000
WJDI	Florence, Ala.	1000
WGWC	Selma, Ala.	250
WFEB	Sylacauga, Ala.	1000
KIKO	Miami, Ariz.	1000
KFBR	Nogales, Ariz.	250
KENT	Prescott, Ariz.	1000
KBTA	Batesville, Ark.	1000
KZNG	Hot Springs, Ark.	250
KBRS	Springdale, Ark.	1000
KATA	Arcata, Cal.	1000
KWXY	Cathedral City, Cal.	250
KMAK	Fresno, Calif	1000
KDOL	Mojave, Cal.	500
KSFE	Needles, Calif.	250
KAOR	Oroville, Cal.	1000
KATY	San Luis Obispo, California	1000
KIST	Santa Barbara, Calif.	1000
KOMY	Watsonville, Calif.	1000
KDEN	Denver, Colo.	1000
KWSL	Grand Junction, Colo.	250
KVRH	Salida, Colo.	1000
WNHC	New Haven, Conn.	1000
WOOK	Washington, D. C.	1000
WSLC	Clermont, Fla.	250
WTAN	Clearwater, Fla.	250
WROD	Daytona Bch., Fla.	1000
WDSR	Lake City, Fla.	1000
WTYS	Marianna, Fla.	1000
WQXT	Palm Beach, Fla.	500
WSEB	Sebring, Fla.	1000
WFSH	Valparaiso, Fla.	1000
WIGO	Atlanta, Ga.	1000d
WGAU	Athens, Ga.	1000
WBBQ	Augusta, Ga.	1000
WGAA	Cedartown, Ga.	1000
WOKS	Columbus, Ga.	1000
WBBT	Lyons, Ga.	1000
WTIF	Tifton, Ga.	1000
KAIN	Nampa, Idaho	1000
KPST	Preston, Idaho	250
KSKI	Sun Valley, Idaho	1000
WSOY	Decatur, Ill.	1000
WJPF	Herrin, Ill.	1000
WJOL	Joliet, Ill.	1000
WBIW	Bedford, Ind.	1000
WTRC	Elkhart, Ind.	1000
WLBC	Muncie, Ind.	1000
KROS	Clinton, Iowa	1000
KCKN	Kansas City, Kans.	1000d
KSEK	Pittsburg, Kans.	1000
WCMI	Ashland, Ky.	1000
KENT	Prescott, Ariz.	250
WNBS	Murray, Ky.	1000d
WEKY	Richmond, Ky.	1000
KVOB	Bastrop, La.	250
KRMD	Shreveport, La.	1000
WFAU	Augusta, Maine	1000
WDME	Dover-Foxcroft, Me.	
WHOU	Houlton, Maine	1000
WGAW	Gardner, Mass.	1000
WNBH	New Bedford, Mass.	1000
WBRK	Pittsfield, Mass.	1000
WLEW	Bad Axe, Mich.	1000
WLAV	Grand Rap., Mich.	1000
WCSR	Hillsdale, Mich.	1000
WMTE	Manistee, Mich.	1000
WAGN	Menominee, Mich.	1000
WMBN	Petoskey, Mich.	1000
WEXL	Royal Oak, Mich.	1000
KVBR	Brainerd, Minn.	1000
KDLM	Detroit Lakes, Minn.	1000
WEVE	Eveleth, Minn.	1000
KROC	Rochester, Minn.	1000
KWLM	Willmar, Minn.	1000
WJMB	Brookhaven, Miss.	250
WAML	Laurel, Miss.	250
KXEO	Mexico, Mo.	1000d
KLID	Poplar Bluff, Mo.	1000d
KSGM	St. Genevieve, Mo.	1000
KSMO	Salem, Mo.	1000
KDRO	Sedalia, Mo.	1000
KICK	Springfield, Mo.	1000
KCAP	Helena, Mont.	1000
KPRK	Livingston, Mont.	1000
KATL	Miles City, Mont.	1000
KYLT	Missoula, Mont.	250
KHUB	Fremont, Nebr.	500
KGFW	Kearney, Nebr.	1000
KSID	Sidney, Nebr.	1000
KORK	Las Vegas, Nev.	1000
KBET	Reno, Nev.	1000
WDCR	Hanover, N.H.	1000
WMID	Atlantic City, N.J.	1000
KHAP	Aztec, N.M.	1000d
KRRR	Ruidoso, N. Mex.	1000
KKIT	Taos, N.Mex.	250
KSIL	Silver City, N.Mex.	1000
WMBO	Auburn, N.Y.	1000
WENT	Gloversville, N.Y.	1000
WKSN	Jamestown, N.Y.	250
WUSJ	Lockport, N.Y.	250
WMSA	Massena, N.Y.	1000
WALL	Middletown, N.Y.	1000

WHITE'S

RADIO LOG

kHz	Wave Length	W.P.
WIRY	Plattsburgh, N.Y.	1000
WJRI	Lenoir, N.C.	1000
WTSB	Lumberton, N.C.	1000
WOXF	Oxford, N.C.	1000
WOOW	Greenville, N.C.	1000
WGNI	Wilmington, N.C.	1000
WAIR	Winston-Salem, N.C.	250
KGPC	Grafton, N.Dak.	1000
WNCO	Ashland, O.	1000
WOUB	Athens, Ohio	250
WIZE	Springfield, Ohio	1000
WSTV	Steubenville, Ohio	1000
KIHN	Hugo, Okla.	250
KOCY	Okla. City, Okla.	1000
KTOW	Sand Springs, Okla.	500
KLOO	Corvallis, Ore.	1000
KWVR	Enterprise, Oreg.	250
KIHR	Hood River, Oreg.	250
KBBR	N. Bend, Ore.	1000d
WCVI	Connellsville, Pa.	1000d
WSAJ	Grove City, Pa.	100
WKRZ	Oil City, Pa.	1000
WHAT	Philadelphia, Pa.	1000
WRAW	Reading, Pa.	1000
WTRN	Tyrone, Pa.	1000
WBRE	Wilkes-Barre, Pa.	1000
WWPA	Williamsport, Pa.	1000
WUNA	Aquadilla, P.R.	250
WOKE	Charleston, S.C.	1000
WRHI	Rock Hill, S.C.	1000
WSSC	Sumter, S.C.	1000
KIJV	Huron, S. D.	1000
KRSD	Rapid City, S.Dak.	1000
WBAC	Cleveland, Tenn.	1000
WKRM	Columbia, Tenn.	1000
WGRV	Greeneville, Tenn.	1000
WKGN	Knoxville, Tenn.	1000
WLOK	Memphis, Tenn.	1000d
WCDT	Winchester, Tenn.	1000
KWKC	Abilene, Tex.	1000
KTSL	Burnett, Tex.	250
KAND	Corsicana, Tex.	1000
KSET	El Paso, Tex.	250
KLBK	Lubbock, Tex.	1000
KRBA	Lufkin, Tex.	1000
KPDN	Pampa, Tex.	250
KOLE	Port Arthur, Tex.	250
KTEO	San Angelo, Tex.	250
KVIC	Victoria, Tex.	250
WTWN	St. Johnsbury, Vt.	1000
WSTA	Charlotte Amalie, V.I.	250
WKEY	Covington, Va.	1000
WHAP	Hopewell, Va.	1000
WJMA	Orange, Va.	1000
KAGT	Anacortes, Wash.	250
KSMK	Kennewick, Wash.	1000
KAPA	Raymond, Wash.	1000
KMEL	Wenatchee, Wash.	250
WHAR	Clarksburg, W.Va.	1000
WEPM	Martinsburg, W. Va.	1000
WMON	Montgomery, W.Va.	250
WDVE	Welch, W.Va.	1000
WLDY	Ladysmith, Wis.	1000
WRIT	Milwaukee, Wis.	1000
KSGT	Jackson, Wyo.	250
KYCN	Wheatland, Wyo.	250
KWOR	Worland, Wyo.	1000

1350—222.1

WELB	Elba, Ala.	1000d
WGAD	Gadsden, Ala.	5000d
KLYD	Bakersfield, Calif.	1000d
KCKC	San Bernardino, Cal.	5000
KSRO	Santa Rosa, Calif.	5000
KKAM	Pueblo, Colo.	5000
WNLK	Norwalk, Conn.	1000
WINY	Putnam, Conn.	1000d
WEZY	Cocoa, Fla.	1000
WDCF	Dade City, Fla.	1000d
WCAI	Ft. Myers, Fla.	1000d
WBSG	Blackshear, Ga.	500d
WRWH	Cleveland, Ga.	1000d
WAVC	Warner Robins, Ga.	5000d
KRLC	Lewiston, Ida.-Clarkston, Wash.	5000d
WXCL	Peoria, Ill.	1000
WJBD	Salem, Ill.	1000d
WIOU	Kokomo, Ind.	5000
KRNT	Des Moines, Iowa	5000
KMAN	Manhattan, Kans.	500d
WLOU	Louisville, Ky.	5000d
WSMB	New Orleans, La.	5000
WHMI	Howell, Mich.	500
KDIO	Ortonville, Minn.	1000d
WCMP	Pine City, Minn.	1000d
WKCU	Corinth, Miss.	1000
WKOZ	Kosciusko, Miss.	5000d
KCHR	Charleston, Mo.	1000d
KBRX	O'Neill, Nebr.	1000d
WLNH	Laconia, N.H.	5000d

kHz	Wave Length	W.P.
WHWH	Princeton, N.J.	5000
KABQ	Albuquerque, N.M.	5000
WCBA	Corning, N.Y.	1000d
WRNY	Rome, N.Y.	500d
WBMS	Black Mountain, N. C.	500d
WHIP	Mooresville, N.C.	1000d
WLLY	Wilson, N.C.	1000d
KBMR	Bismarck, N. D.	5000
WSLR	Akron, O.	5000
WCSM	Celina, Ohio	500d
WCHI	Chillicothe, Ohio	1000d
KRHD	Duncan, Okla.	250
KTLQ	Tahlequah, Okla.	1000d
KRVC	Ashland, Oreg.	1000d
WORK	York, Pa.	5000
WWBR	Windber, Pa.	1000d
WDAR	Darlington, S.C.	1000d
WGSW	Greenwood, S.C.	1000d
WRKM	Carthage, Tenn.	1000d
KCAR	Clarksville, Tex.	500d
KTXJ	Jasper, Tex.	1000d
KCOR	San Antonio, Tex.	5000
WBLT	Bedford, Va.	1000d
WFLS	Fredericksburg, Va.	1000d
WNVA	Norton, Va.	5000d
WAVY	Portsmouth, Va.	5000
WPDR	Portage, Wis.	5000d

1360—220.4

WWWB	Jasper, Ala.	1000d
WLIQ	Mobile, Ala.	5000d
WMFC	Monroeville, Ala.	1000d
WELR	Roanoke, Ala.	1000d
KRUX	Glendale, Ariz.	5000
KLYR	Clarksville, Ark.	500d
KFFA	Helena, Ark.	1000
KFIV	Modesto, Cal.	5000
KRCK	Ridgecrest, Calif.	1000d
KGB	San Diego, Calif.	5000
KDEY	Boulder, Colo.	500d
WDRC	Hartford, Conn.	5000
WOBS	Jacksonville, Fla.	5000d
WKAT	Miami Beach, Fla.	5000
WINT	Winter Haven, Fla.	1000d
WAZA	Bainbridge, Ga.	1000d
WLAW	Lawrenceville, Ga.	1000d
WMAC	Metter, Ga.	500d
WIYN	Rome, Ga.	500d
WLBK	DeKalb, Ill.	1000d
WVMC	Mt. Carmel, Ill.	500d
WGFA	Watseka, Ill.	1000d
KHAK	Cedar Rapids, Iowa	1000d
KRCB	Council Bluffs, Iowa	
KXGI	Ft. Madison, Iowa	1000d
KSCJ	Sioux City, Iowa	5000
KBTO	El Dorado, Kans.	500d
WFLW	Monticello, Ky.	1000d
KDXI	Mansfield, La.	1000d
KNIR	New Iberia, La.	1000d
KTLD	Tallulah, La.	500d
WEBB	Baltimore, Md.	5000d
WLYN	Lynn, Mass.	1000d
WKYO	Caro, Mich.	500d
WKMI	Kalamazoo, Mich.	5000
KLRS	Mountain Grove, Mo.	1000d
KICX	McCook, Nebr.	1000d
WNNJ	Newton, N.J.	1000d
WWBZ	Vineland, N.J.	1000
WKOP	Binghamton, N.Y.	5000
WMNS	Olean, N.Y.	1000d
WCHL	Chapel Hill, N.C.	1000d
KEYZ	Williston, N.D.	5000
WSAI	Cincinnati, Ohio	5000
WWOW	Conneaut, Ohio	500d
KUIK	Hillsboro, Oreg.	1000d
WMCK	McKeesport, Pa.	5000
WPPA	Pottsville, Pa.	5000
WELP	Easley, S.C.	1000d
WLCM	Lancaster, S.C.	1000d
WBLC	Lenoir City, Tenn.	
WNAH	Nashville, Tenn.	1000d
KRAY	Amarillo, Tex.	500d
KACT	Andrews, Tex.	1000d
KWBA	Baytown, Tex.	1000
KRYS	Corpus Christi, Tex.	1000
KXOL	Ft. Worth, Tex.	5000
WBDB	Galax, Va.	1000d
WHBG	Harrisonburg, Va.	5000d
KFDR	Grand Coulee, Wash.	1000d
KMO	Tacoma, Wash.	5000
WHJC	Matawan, W.Va.	1000d
WMOV	Ravenswood, W.Va.	1000d
WBAY	Green Bay, Wis.	5000
WISV	Viroqua, Wis.	1000
WMNE	Menomonie, Wis.	1000d
KVRS	Rock Springs, Wyo.	1000

1370—218.8

WBYE	Calera, Ala.	1000d
KAWW	Heber Springs, Ark.	500
KTPA	Prescott, Ark.	500d
KREL	Corona, Cal.	5000
KQCY	Quincy, Calif.	500d
KEEN	San Jose, Calif.	5000
KGEN	Tulare, Calif.	1000d
WKMK	Blountstown, Fla.	500d
WWKE	Ocala, Fla.	5000d
WCOA	Pensacola, Fla.	5000
WAXE	Vero Beach, Fla.	1000d
WLOP	Jesup, Ga.	5000

kHz	Wave Length	W.P.
WFDR	Manchester, Ga.	1000d
WLOV	Washington, Ga.	1000d
WPRC	Lincoln, Ill.	1000d
WTTS	Bloomington, Ind.	5000
WLTH	Gary, Ind.	1000d
KDTH	Dubuque, Iowa	5000
KGNO	Dodge City, Kans.	5000
KALN	Iola, Kans.	500d
WABD	Ft. Campbell, Ky.	500d
WGOH	Grayson, Ky.	5000d
WTKY	Tompkinsville, Ky.	1000d
KAPB	Marksville, La.	1000d
WDEA	Ellsworth, Me.	5000d
WMHI	Braddocks Hts., Md.	500d
WKIK	Leonardtown, Md.	1000d
WGHN	Grand Haven, Mich.	500d
KSUM	Fairmont, Minn.	1000
WMKT	S. St. Paul, Minn.	500d
WMGO	Canton, Miss.	1000d
KWRT	Boonville, Mo.	1000d
KCRV	Caruthersville, Mo.	1000d
KXLF	Butte, Mont.	5000
KAWL	York, Nebr.	500d
WFEA	Manchester, N.H.	5000
WELV	Ellenville, N.Y.	500
WALK	Patchogue, N.Y.	500d
WSAY	Rochester, N.Y.	5000
WLTC	Gastonia, N.C.	5000d
WTAB	Tabor City, N.C.	5000d
KFJM	Grand Forks, N.D.	1000d
WSPD	Toledo, Ohio	5000
KVYL	Holdenville, Okla.	500d
KAST	Astoria, Oreg.	1000
WOTR	Corry, Pa.	1000
WPAZ	Pottstown, Pa.	1000d
WKMC	Roaring Sprgs., Pa.	1000d
WIVV	Vieques, P.R.	1000
WKFD	Wickford, R.I.	500d
WDEF	Chattanooga, Tenn.	5000
WDXE	Lawrenceburg, Tenn.	1000d
WRGS	Rogersville, Tenn.	1000d
KOKE	Austin, Tex.	1000d
KFRD	Longview, Tex.	1000
KPOS	Post, Tex.	1000d
KSOP	Salt Lake City, Utah	1000d
WBTN	Bennington, Vt.	1000d
WHEE	Martinsville, Va.	5000d
WJWS	South Hill, Va.	5000d
KPOR	Quincy, Wash.	1000d
WEIF	Moundsville, W. Va.	1000d
WCCN	Neillsville, Wis.	5000d
KVWO	Cheyenne, Wyo.	1000

1380—217.3

WRAB	Arab, Ala.	1000d
WGYV	Greenville, Ala.	1000d
WVSA	Vernon, Ala.	
KDXE	N. Little Rock, Ark.	1000d
KBVM	Lancaster, Calif.	1000d
KGMS	Sacramento, Calif.	1000
KSBW	Salinas, Calif.	5000
KFLJ	Walsenburg, Colo.	1000d
WOWW	Naugatuck, Conn.	5000
WAMS	Wilmington, Del.	5000
WLIZ	Lake Worth, Fla.	500d
WQXQ	Ormond Bch., Fla.	1000d
WLCY	St. Petersburg, Fla.	5000
WAOK	Atlanta, Ga.	5000
WSIZ	Ocilla, Ga.	5000d
KPOI	Honolulu, Hawaii	5000
WWCM	Brazil, Ind.	500d
WKJG	Ft. Wayne, Ind.	5000
KCIM	Carroll, Iowa	1000
KCII	Washington, Iowa	500d
KUDL	Fairway, Kan.	5000
WMTA	Central City, Ky.	500d
WWKY	Winchester, Ky.	1000d
WYNK	Baton Rouge, La.	500d
WKTJ	Farmington, Me.	1000d
WTTH	Port Huron, Mich.	1000
WPLB	Greenville, Mich.	1000
KLIZ	Brainerd, Minn.	5000
KAGE	Winona, Minn.	1000
WDLT	Indianola, Miss.	500d
KWK	St. Louis, Mo.	5000d
KUVR	Holdredge, Nebr.	500
WBBX	Portsmouth, N.H.	1000
WAWZ	Zarephath, N.J.	5000
WFSR	Bath, N.Y.	500d
WBNX	New York, N.Y.	5000
WLOS	Asheville, N.C.	5000
WTOB	Winston-Salem, N.C.	5000
WWIZ	Lorain, Ohio	500d
WPKO	Waverly, Ohio	1000d
KSWD	Lawton, Okla.	1000
KMUS	Muskogee, Okla.	1000
KBCH	Ocean Lake, Oreg.	1000d
KSRV	Ontario, Oreg.	5000
WACB	Kittanning, Pa.	1000d
WMLP	Milton, Pa.	1000d
WAYZ	Waynesboro, Pa.	1000d
WNRI	Woonsocket, R.I.	1000d
WAGS	Bishopville, S.C.	1000d
WGUS	N. Augusta, S.C.	1000d
KOTA	Rapid City, S.Dak.	5000
KFCB	Redfield, S.Dak.	500d
WYSH	Clinton, Tenn.	1000d
WGMM	Millington, Tenn.	500d
KJET	Beaumont, Tex.	1000
KBWD	Brownwood, Tex.	1000
KCRM	Crane, Tex.	1000d
KTSM	El Paso, Tex.	5000

kHz	Wave Length	W.P.
KMUL	Muleshoe, Tex.	1000d
KBOP	Pleasanton, Tex.	1000d
WSYB	Rutland, Vt.	5000
WTVR	Richmond, Va.	5000
KRKO	Everett, Wash.	5000
KPEG	Spokane, Wash.	5000d
WMTD	Hinton, W.Va.	1000d
WBEL	Beloit, Wis.	5000

1390—215.7

WHMA	Anniston, Ala.	5000
KDQN	DeQueen, Ark.	500d
KAMO	Rogers, Ark.	1000d
KGER	Long Beach, Calif.	5000
KCEY	Turlock, Calif.	5000
KFML	Denver, Colo	5000d
WUWU	Gainsville, Fla.	5000d
WISK	Americus, Ga.	5000d
WNUS	Chicago, Ill.	5000
WFIW	Fairfield, Ill.	1000
WJCD	Seymour, Ind.	1000d
KCLN	Clinton, Iowa	1000d
KCBC	Des Moines, Iowa	1000
KNCK	Concordia, Kans.	500d
WANY	Albany, Ky.	1000d
WKIC	Hazard, Ky.	5000d
KFRA	Franklin, La.	500d
WEGP	Presque Isle, Me.	5000d
KJPW	Waynesville, Mo.	1000d
WCAT	Orange, Mass.	1000d
WPLM	Plymouth, Mass.	5000
WCER	Charlotte, Mich.	5000d
KAOH	Duluth, Minn.	500
KRFO	Owatonna, Minn.	500d
WROA	Gulfport, Miss.	1000d
WQIC	Meridian, Miss.	5000d
KJPW	Waynesville, Mo.	1000d
KENN	Farmington, N.Mex.	5000
KHOB	Hobbs, N.Mex.	5000d
WEOK	Poughkeepsie, N.Y.	5000
WRIV	Riverhead, N.Y.	1000d
WFBL	Syracuse, N.Y.	5000
WEED	Rocky Mount, N.C.	5000
WADA	Shelby, N.C.	1000
WJRM	Troy, N.C.	500d
KLPM	Minot, N.Dak.	5000
WOHP	Bellefontaine, Ohio	500d
WMPO	Middleport-Pomeroy, O.	5000d
WFMJ	Youngstown, Ohio	5000
KCRC	Enid, Okla.	1000
KSLM	Salem, Oreg.	5000
WLAN	Lancaster, Pa.	5000
WRSC	State College, Pa.	1000d
WISA	Isabella, P.R.	1000
WHPB	Belton, S.C.	1000d
WCSC	Charleston, S.C.	5000
KJAM	Madison, S.D.	5000d
WYXI	Athens, Tenn.	500d
WTJS	Jackson, Tenn.	5000
KULP	El Campo, Tex.	500d
KBEC	Waxahachie, Tex.	500d
KBLW	Logan, Utah	1000
WEAM	Arlington, Va.	5000
WWOD	Lynchburg, Va.	5000
WKLP	Keyser, W.Va.	1000d
KBBO	Yakima, Wash.	1000

1400—214.2

WMSL	Decatur, Ala.	1000
WXAL	Demopolis, Ala.	1000d
WFPA	Ft. Payne, Ala.	1000
WJLD	Homewood, Ala.	1000
WJHO	Opelika, Ala.	1000
KSEW	Sitka, Alaska	250
KCLF	Clifton, Ariz.	250
KXIV	Phoenix, Ariz.	1000
KTUC	Tucson, Ariz.	250
KVOY	Yuma, Ariz.	250
KELD	El Dorado, Ark.	1000
KCLA	Pine Bluff, Ark.	1000
KWYN	Wynne, Ark.	1000
KPAT	Berkeley, Calif.	1000
KREO	Indio, Calif.	250
KQMS	Redding, Calif.	250
KSLY	San Luis Obispo, Cal.	250
KSPA	Santa Paula, Calif.	250
KHOE	Truckee, Calif.	1000
KUKI	Ukiah, Calif.	1000
KONG	Visalia, Calif.	1000
KRLN	Canon City, Colo.	250
KDTA	Delta, Colo.	250
KFTM	Ft. Morgan, Colo.	250
KBZZ	La Junta, Colo.	1000
WSTC	Stamford, Conn.	1000
WILI	Willimantic, Conn.	1000
WFTL	Ft. Lauderdale, Fla.	1000
WIRA	Ft. Pierce, Fla.	1000
WNVE	Ft. Walton Bch., Fla.	1000d
WRHC	Jacksonville, Fla.	1000
WPRY	Perry, Fla.	1000
WTRR	Sanford, Fla.	1000
WZRH	Zephyr Hills, Fla.	250
WCQS	Alma, Ga.	1000
WSGC	Elberton, Ga.	1000
WNEX	Macon, Ga.	1000
WMGA	Moultrie, Ga.	1000
WCOH	Newnan, Ga.	1000
WGSA	Savannah, Ga.	1000
KART	Jerome, Ida.	1000
KRPL	Moscow, Ida.	1000

kHz Wave Length W.P.

KIGO	St. Anthony, Ida.	
KSPT	Sandpoint, Idaho	1000
WDWS	Champaign, Ill.	1000
WGIL	Galesburg, Ill.	1000
WROZ	Evansville, Ind.	1000
WBAT	Marion, Ind.	1000
KCOG	Centerville, Ia.	500
KVFD	Fort Dodge, Iowa	1000
KVOE	Emporia, Kans.	1000
KAYS	Hays, Kans.	1000
WCYN	Cynthiana, Ky.	250
WIEL	Elizabethtown, Ky.	1000
WFTG	London, Ky.	250
WFPR	Hammond, La.	1000
KAOK	Lake Charles, La.	1000
WRDO	Augusta, Maine	1000d
WIDE	Biddeford, Maine	1000
WWIN	Baltimore, Md.	1000
WALE	Fall River, Mass.	1000
WLLH	Lowell, Mass.	1000
WHMP	Northampton, Mass.	1000
WKFR	Battle Creek, Mich.	1000
WJLB	Detroit, Mich.	1000d
WHDF	Houghton, Mich.	250
WGON	Munising, Mich.	1000
WSAM	Saginaw, Mich.	1000
WSJM	St. Joseph, Mich.	1000
WTCM	Traverse City, Mich.	1000
KEYL	Long Prairie, Minn.	1000
KMHL	Marshall, Minn.	1000
WMIN	Mpls.-St. Paul, Minn.	1000
WHLB	Virginia, Minn.	1000
WBIP	Booneville, Miss.	1000
WNAG	Grenada, Miss.	1000
WFOR	Hattiesburg, Miss.	1000
WJQS	Jackson, Miss.	1000
WMBC	Macon, Miss.	1000
KFRU	Columbia, Mo.	1000
KJCF	Festus, Mo.	1000
KSIM	Sikeston, Mo.	1000
KTTS	Springfield, Mo.	1000
KDRG	Deer Lodge, Mont.	250
KXGN	Glendive, Mont.	250
KARR	Great Falls, Mont.	1000
KCOW	Alliance, Nebr.	1000
KLIN	Lincoln, Neb.	1000
KBMI	Henderson, Nev.	250
KWNA	Winnemucca, Nev.	1000
WBRL	Berlin, N.H.	250
WTSL	Hanover, N.H.	1000
WLTN	Littleton, N.H.	250
KTRC	Santa Fe, N.M.	1000
KCHS	Truth or Consequences, New Mexico	250
KTNM	Tucumcari, N.M.	1000
WOND	Pleasantville, N.J.	1000
WABY	Albany, N.Y.	1000
WYSL	Buffalo, N.Y.	1000
WSLB	Ogdensburg, N.Y.	1000
WBMA	Beaufort, N.C.	250
WGBG	Greensboro, N.C.	1000
WSHB	Raeford, N.C.	1000
WSIC	Statesville, N.C.	1000
WLSE	Wallace, N.C.	1000
WHCC	Waynesville, N.C.	1000
WSMY	Weldon, N.C.	1000d
KEYJ	Jamestown, N.Dak.	1000
WMAN	Mansfield, Ohio	1000d
WPAY	Portsmouth, Ohio	1000
KWON	Bartlesville, Okla.	1000
KTMC	McAlester, Okla.	250
KNOR	Norman, Okla.	250
KNND	Cottage Grove, Oreg.	1000d
KJDY	John Day, Ore.	1000
WEST	Easton, Pa.	1000
WJET	Erie, Pa.	1000
WFEC	Harrisburg, Pa.	1000d
WWSF	Loretto, Pa.	250
WICK	Scranton, Pa.	250
WRAK	Williamsport, Pa.	1000
WVOZ	Carolina, P.R.	500
WCOS	Columbia, S.C.	1000
WGTN	Georgetown, S.C.	1000
WHCQ	Spartanburg, S.C.	1000d
WBJM	Lemmon, S.D.	1000
WJZM	Clarksville, Tenn.	1000
WHUB	Cookeville, Tenn.	1000
WLSB	Copperhill, Tenn.	1000
WGAP	Maryville, Tenn.	1000d
WHAL	Shelbyville, Tenn.	1000
KRUN	Ballinger, Tex.	1000
KBYG	Big Springs, Tex.	1000
KUNO	Corpus Christi, Tex.	1000
KILE	nr. Galveston, Tex.	250
KGVL	Greenville, Tex.	1000
KEBE	Jacksonville, Tex.	1000
KIUN	Pecos, Tex.	1000
KEYE	Perryton, Tex.	250
KVOP	Plainview, Tex.	1000
KDWT	Stamford, Tex.	1000
KTEM	Temple, Tex.	1000
KTFS	Texarkana, Tex.	250
KVOU	Uvalde, Tex.	250
KIXX	Provo, Utah	250
WDOT	Burlington, Vt.	1000
WHHV	Hillsville, Va.	1000
WHIH	Portsmouth, Va.	1000
WHLF	So. Boston, Va.	1000
WINC	Winchester, Va.	1000
KEDO	Longview, Wash.	1000
KRSC	Othello, Wash.	250
KTNT	Tacoma, Wash.	1000
WBOY	Clarkesburg, W.Va.	1000
WRON	Ronceverte, W.Va.	1000
WVRC	Spencer, W.Va.	1000
WKWK	Wheeling, W.Va.	250
WBTH	Williamson, W.Va.	1000
WATW	Ashland, Wis.	1000
WBIZ	Eau Claire, Wis.	1000
WDUZ	Green Bay, Wis.	1000
WRJN	Racine, Wis.	1000
WRDB	Reedsburg, Wis.	1000
WRIG	Wausau, Wis.	1000d
KATI	Casper, Wyo.	1000
KODI	Cody, Wyo.	1000

1410—212.6

WUNI	Mobile, Ala.	5000
WRCK	Tuscumbia, Ala.	500d
KTCS	Fort Smith, Ark.	1000
KERN	Bakersfield, Calif.	1000
KRML	Carmel, Calif.	500d
KKOK	Lompoc, Calif.	500d
KMYC	Marysville, Calif.	5000
KCAL	Redlands, Cal.	5000
KCOL	Ft. Collins, Colo.	1000
WPOP	Hartford, Conn.	5000
WDOV	Dover, Del.	5000
WMYR	Fort Myers, Fla.	5000
WZST	Leesburg, Fla.	1000d
WONS	Tallahassee, Fla.	5000d
WGRI	Griffin, Ga.	1000d
WSNE	Cummings, Ga.	1000d
WDAX	McRae, Ga.	1000d
WLAQ	Rome, Ga.	1000
WRMN	Elgin, Ill.	1000d
WTIM	Taylorville, Ill.	1000d
WAZY	Lafayette, Ind.	1000d
KGRN	Grinnell, Iowa	500d
KLEM	LeMars, Iowa	1000d
KCLO	Leavenworth, Kans.	5000d
KWBB	Wichita, Kans.	5000
WLBJ	Bowling Green, Ky.	5000
WHLN	Harlan, Ky.	5000d
KDBS	Alexandria, La.	1000d
WHAG	Halfway, Md.	1000d
WOKW	Brockton, Mass.	1000d
WGRD	Grand Rap., Mich.	1000d
KLFD	Litchfield, Minn.	500d
KRWB	Roseau, Minn.	1000
WDSK	Cleveland, Miss.	1000d
WBKN	Newton, Miss.	500d
KNOP	North Platte, Neb.	1000
WHTG	Asbury Park-Eatontown, N.J.	500d
WDOE	Dunkirk, N.Y.	1000
WELM	Elmira, N.Y.	1000
WBZA	Glens Falls, N.Y.	1000d
WOTT	Watertown, N.Y.	5000
WVCB	Shallotte, N.C.	500d
WEGO	Concord, N.C.	1000d
WSRC	Durham, N.C.	1000d
WING	Dayton, Ohio	5000
KPAM	Portland, Oreg.	5000d
WLSH	Lansford, Pa.	5000d
KQV	Pittsburgh, Pa.	5000
WPCC	Clinton, S.C.	1000d
WYMB	Manning, S.C.	1000d
WCMT	Martin, Tenn.	1000d
KBUD	Athens, Tex.	1000d
KBAN	Bowie, Tex.	500d
KVLB	Cleveland, Tex.	500
KXIT	Dalhart, Tex.	500d
KDOX	Marshall, Tex.	500
KRIG	Odessa, Tex.	1000
KBAL	San Saba, Tex.	500d
KNAL	Victoria, Tex.	500
WIKI	Chester, Va.	5000d
WRIS	Roanoke, Va.	5000d
WRDS	S. Charleston, W.Va.	1000d
WKBH	LaCrosse, Wis.	5000
KWYO	Sheridan, Wyo.	1000

1420—211.1

WACT	Tuscaloosa, Ala.	5000d
KHFH	Sierra Vista, Ariz.	1000
KXOW	Hot Springs, Ark.	
KPOC	Pocahontas, Ark.	1000d
KRDO	Colo. Sprgs., Colo.	1000
KJST	Joshua Tree, Cal.	1000d
KSTN	Stockton, Calif.	5000
WLIS	Old Saybrook, Conn.	500d
WBRD	Bradenton, Fla.	1000
WDBF	Delray Beach, Fla.	5000d
WETH	St. Augustine, Fla.	1000d
WAVO	Avondale Estates, Ga.	1000d
WRBL	Columbus, Ga.	5000
WPEH	Louisville, Ga.	1000d
WLET	Toccoa, Ga.	5000d
KCCN	Honolulu, Hawaii	5000
WINI	Murphysboro, Ill.	500d
WIMS	Michigan City, Ind.	5000d
WOC	Davenport, Iowa	5000
KJCK	Junction City, Kans.	1000d
KULY	Ulysses, Kans.	1000d
WTCR	Ashland, Ky.	5000d
WHBN	Harrodsburg, Ky.	1000d
WVJS	Owensboro, Ky.	5000
KPEL	Lafayette, La.	1000
WBSM	New Bedford, Mass.	5000
WBEC	Pittsfield, Mass.	1000
WAMM	Flint, Mich.	1000d
WKPR	Kalamazoo, Mich.	1000d
KTOE	Mankato, Minn.	5000
WSUH	Oxford, Miss.	1000d
WQBC	Vicksburg, Miss.	1000
KBTN	Neosho, Mo.	500d
KOOO	Omaha, Nebr.	1000d
KSYX	Santa Rosa, N.Mex.	1000d
WALY	Herkimer, N.Y.	1000d
WACK	Newark, N.Y.	500
WLNA	Peekskill, N.Y.	1000d
WMYN	Mayodan, N.C.	500
WGAS	S. Gastonia, N.C.	500d
WVOT	Wilson, N.C.	1000
WHK	Cleveland, Ohio	5000
KYNG	Coos Bay, Oreg.	1000d
WCOJ	Coatesville, Pa.	5000
WCED	DuBois, Pa.	5000
WEUC	Ponce, P.R.	1000
WCRE	Cheraw, S.C.	1000d
WEMB	Erwin, Tenn.	5000d
WKSR	Pulaski, Tenn.	1000
KFYN	Bonham, Tex.	250d
KLFB	Lubbock, Tex.	
KTRE	Lufkin, Tex.	1000
KGNB	New Braunfels, Tex.	1000d
KPEP	San Angelo, Tex.	1000d
WWSR	St. Albans, Vt.	1000d
WDDY	Gloucester, Va.	1000d
WKCW	Warrenton, Va.	5000d
KITI	Chehalis-Centralia, Wash.	1000d
KREN	Renton, Wash.	500d
KUJ	Walla Walla, Wash.	5000
WPLY	Plymouth, Wis.	500d

1430—209.7

WFHK	Pell City, Ala.	1000d
KHBM	Monticello, Ark.	1000d
KAMP	El Centro, Calif.	1000d
KARM	Fresno, Calif.	5000
KALI	San Gabriel, Cal.	5000
KJAY	Sacramento, Calif.	500d
KGNU	Santa Clara, Cal.	1000
KOSI	Aurora, Colo.	5000
WIII	Homestead, Fla.	500d
WLAK	Lakeland, Fla.	5000
WPCF	Panama City, Fla.	5000
WGFS	Covington, Ga.	1000d
WRCD	Dalton, Ga.	1000d
WWGS	Tifton, Ga.	5000
WEEF	Highland Park, Ill.	1000d
WCMY	Ottawa, Ill.	500d
WIRE	Indianapolis, Ind.	5000
KASI	Ames, Iowa	1000d
KMRC	Morgan City, La.	500d
WNAV	Annapolis, Md.	5000
WTTT	Amherst, Mass.	5000d
WHIL	Medford, Mass.	5000d
WION	Ionia, Mich.	5000d
WBRB	Mt. Clemens, Mich.	500d
WLAU	Laurel, Miss.	5000d
KAOL	Carrollton, Mo.	500d
WIL	St. Louis, Mo.	5000
KRGI	Grand Island, Nebr.	5000
WNJR	Newark, N.J.	5000
KGFL	Roswell, N.M.	5000d
WENE	Endicott, N.Y.	5000
WMNC	Morganton, N.C.	5000
WDJS	Mt. Olive, N.C.	1000d
WRXO	Roxboro, N.C.	1000d
WFOB	Fostoria, Ohio	1000
WCLT	Newark, Ohio	500d
KALV	Alva, Okla.	500
KELI	Tulsa, Okla.	5000
KGAY	Salem, Oreg.	5000d
WVAM	Altoona, Pa.	5000
WNEL	Caguas, P.R.	5000
WBLR	Batesburg, S.C.	5000d
WATP	Marion, S.C.	1000d
WBUG	Ridgeland, S.C.	1000d
KBRK	Brookings, S.Dak.	1000d
WGYW	Fountain City, Tenn.	1000d
WENO	Madison, Tenn.	5000
WHER	Memphis, Tenn.	1000
KSTB	Breckenridge, Tex.	1000d
KEES	Gladewater, Tex.	1000d
KCOH	Houston, Tex.	1000d
KLO	Ogden, Utah	5000
WIVE	Ashland, Va.	1000d
WDIC	Clincho, Va.	1000d
KBRC	Mt. Vernon, Wash.	5000
WEIR	Weirton, W.Va.	1000
WBEV	Beaver Dam, Wis.	1000d

1440—208.2

WHHY	Montgomery, Ala.	5000
KDOT	Scottsdale, Ariz.	5000d
KHOG	Fayetteville, Ark.	1000d
KOKY	Little Rock, Ark.	5000d
KVON	Napa, Cal.	5000
KPRO	Riverside, Calif.	1000
KCOY	Santa Maria, Calif.	1000
WBIS	Bristol, Conn.	500d
WLEH	Lehigh Acres, Fla.	
WABR	Winter Park, Fla.	5000
WWCC	Bremen, Ga.	1000d
WGIG	Brunswick, Ga.	5000
WVMG	Cochran, Ga.	
WRAJ	Anna, Ill.	500d
WIOK	Normal, Ill.	1000
WPRS	Paris, Ill.	1000d
WGEM	Quincy, Ill.	5000
WROK	Rockford, Ill.	5000
WPGW	Portland, Ind.	500d
KCHE	Cherokee, Iowa	500d
KEWI	Topeka, Kans.	5000
WCDS	Glasgow, Ky.	1000d
WPDE	Paris, Ky.	1000d
WEZJ	Williamsburg, Ky.	1000d
KMLB	Monroe, La.	5000
WJAB	Westbrook, Me.	5000d
WAAB	Worcester, Mass.	5000
WBCM	Bay City, Mich.	1000
WDOW	Dowagiac, Mich.	1000d
WCHB	Inkster, Mich.	1000
KQRS	Golden Valley, Minn.	5000d
KEYL	Long Prairie, Minn.	1000
WHHT	Lucedale, Miss.	1000d
WSEL	Pontotoc, Miss.	1000d
WMVB	Millville, N.J.	1000d
WBAB	Babylon, N.Y.	1000d
WJJL	Niagara Falls, N.Y.	1000d
WSGO	Oswego, N.Y.	1000d
WBLA	Elizabethtown, N.C.	1000d
WBUY	Lexington, N.C.	5000
KILO	Grand Forks, N.D.	1000
WHHH	Warren, Ohio	5000
KMED	Medford, Oreg.	5000
KODL	The Dalles, Oreg.	1000
WCDL	Carbondale, Pa.	5000d
WNPV	Lansdale, Pa.	500d
WGCB	Red Lion, Pa.	1000d
WQOK	Greenville, S.C.	5000
WZYX	Cowan, Tenn.	1000d
WHDM	McKenzie, Tenn.	500d
KPUR	Amarillo, Tex.	5000
KEYS	Corpus Christi, Tex.	1000
KDNT	Denton, Tex.	5000
KGVL	Greenville, Tex.	1000
KWEL	Midland, Tex.	5000d
KETX	Livingston, Tex.	5000d
WKLV	Blackstone, Va.	5000d
WHRN	Herndon, Va.	1000
KDNC	Spokane, Wash.	5000d
WHIS	Bluefield, W.Va.	5000
WAJR	Morgantown, W.Va.	5000
WNFL	Green Bay, Wis.	5000

1450—206.8

WDNG	Anniston, Ala.	1000
WYAM	Bessemer, Ala.	1000
WDIG	Dothan, Ala.	1000
WFIX	Huntsville, Ala.	1000d
WLAY	Muscle Shoals City, Alabama	1000
KLAM	Cordova, Alaska	250
KAWT	Douglas, Ariz.	250
KNOT	Prescott, Ariz.	1000
KOLD	Tucson, Ariz.	250
KENA	Mena, Ark.	250
KJWH	Camden, Ark.	1000d
KYOR	Blythe, Cal.	1000
KAVA	Burney, Cal.	
KOWN	Escondido, Calif.	250
KPAL	Palm Springs, Cal.	1000
KTIP	Porterville, Calif.	1000
KSOL	San Francisco, Cal.	1000
KVML	Sonora, Calif.	1000
KVEN	Ventura, Calif.	1000
KZIN	Yuba City, Calif.	100
KGIW	Alamosa, Colo.	1000
KYOU	Greeley, Colo.	1000
WNAB	Bridgeport, Conn.	1000
WILM	Wilmington, Del.	1000
WOL	Washington, D.C.	1000
WWJB	Brooksville, Fla.	250
WMFJ	Daytona Beach, Fla.	1000
WOCN	Miami, Fla.	250
WBSR	Pensacola, Fla.	1000
WSPB	Sarasota, Fla.	1000
WSTU	Stuart, Fla.	250
WTAL	Tallahassee, Fla.	1000
WGPC	Albany, Ga.	1000
WBHF	Cartersville, Ga.	1000
WCON	Cornelia, Ga.	250
WKEU	Griffin, Ga.	1000
WMVG	Milledgeville, Ga.	1000
WBYG	Savannah, Ga.	1000
WVLD	Valdosta, Ga.	1000
KVSI	Montpelier, Ida.	1000
KEEP	Twin Falls, Idaho	1000
WVON	Cicero, Ill.	1000
WKEI	Kewanee, Ill.	500
WCVS	Springfield, Ill.	1000
WLYV	Ft. Wayne, Ind.	500
WXVW	Jeffersonville, Ind.	1000
WASK	Lafayette, Ind.	1000
WAOV	Vincennes, Ind.	1000
KLWW	Cedar Rapids, Ia.	250
KYET	Payette, Ida.	250
KWBW	Hutchinson, Kans.	1000
WTCO	Campbellsville, Ky.	1000
WWXL	Manchester, Ky.	1000
WPAD	Paducah, Ky.	1000
WLKS	W. Liberty, Ky.	1000
KSIG	Crowley, La.	1000
KNOC	Natchitoches, La.	1000
WNPS	New Orleans, La.	250
WLKN	Lincoln, Me.	1000d
WRKD	Rockland, Maine	250
WKTQ	South Paris, Maine	1000
WTBO	Cumberland, Md.	1000
WTHU	Thurmont, Md.	
WMAS	Springfield, Mass.	1000
WATZ	Alpena Township, Michigan	1000

WHITE'S

RADIO LOG

kHz	Wave Length	W.P.
WHTC	Holland, Mich.	1000
WMIQ	Iron Mtn., Mich.	250
WIBM	Jackson, Mich.	1000
WKLA	Ludington, Mich.	1000
WNBY	Newberry, Mich.	1000
WHLS	Port Huron, Mich.	1000
KATE	Albert Lea, Minn.	250
KBUN	Bemidji, Minn.	1000
KBMW	Wahpeton, N.D.-Breckinridge, Minn.	1000d
WELY	Ely, Minn.	1000
KFAM	St. Cloud, Minn.	1000
WROX	Clarksdale, Miss.	1000
WCJU	Columbia, Miss.	250
WJXN	Jackson, Miss.	250
WDKK	Meridian, Miss.	1000
WNAT	Natchez, Miss.	250
WROB	West Point, Miss.	1000
KFTW	Fredericktown, Mo.	1000
WMBH	Joplin, Mo.	1000
KIRX	Kirksville, Mo.	1000
KOKO	Warrensburg, Mo.	1000
KWPM	West Plains, Mo.	1000
KXXL	Bozeman, Mont.	1000
KUDI	Great Falls, Mont.	1000
KGMY	Missoula, Mont.	250
KRBN	Red Lodge, Mont.	1000
KVCK	Wolf Point, Mont.	1000
KWBE	Beatrice, Nebr.	250
KONE	Reno, Nev.	250
WKXL	Concord, N.H.	1000
WFPG	Atlantic City, N.J.	1000
WCTC	New Brunswick, N.J.	1000
KRZY	Albuquerque, N.M.	250
KLMX	Clayton, N.Mex.	1000d
KOBE	Las Cruces, N.Mex.	250
KENM	Portales, N.Mex.	1000
WCLI	Corning, N.Y.	1000
WWSC	Glen Falls, N.Y.	1000d
WHDL	Olean, N.Y.	1000
WKIP	Poughkeepsie, N.Y.	1000
WKAL	Rome, N.Y.	1000
WATA	Boone, N.C.	1000
WGNC	Gastonia, N.C.	1000
WIZS	Henderson, N.C.	1000
WHKP	Hendersonville, N.C.	1000
WHIT	New Bern, N.C.	1000
WFBS	Spring Lake, N.C.	1000
KGCA	Rugby, N.Dak.	250
WJER	Dover, Ohio	1000
WMOH	Hamilton, Ohio	1000d
WLEC	Sandusky, Ohio	1000
KWHW	Altus, Okla.	1000
KGFF	Shawnee, Okla.	1000
KSIW	Woodward, Okla.	1000
KEED	Eugene, Ore.	1000
KFLW	Klamath Falls, Ore.	1000
KLBM	La Grande, Oreg.	1000
KBPS	Portland, Ore.	250
WWGO	Erie, Pa.	1000d
WFRA	Franklin, Pa.	1000
WDAD	Indiana, Pa.	1000
WPAM	Pottsville, Pa.	1000
WMPT	So. Williamsport, Pa.	250
WMAJ	State College, Pa.	1000d
WJPA	Washington, Pa.	250
WCPR	Coamo, P.R.	
WWRI	W. Warwick, R.I.	1000
WQSN	Charleston, S.C.	1000
WCRS	Greenwood, S.C.	1000
WMYB	Myrtle Beach, S.C.	1000
WHSC	Hartsville, S.C.	1000
KBFS	Belle Fourche, S. Dak.	1000
KYNT	Yankton, S. D.	1000
WLAR	Athens, Tenn.	1000
WMOC	Chattanooga, Tenn.	1000
WDSG	Dyersburg, Tenn.	1000
WSMG	Greeneville, Tenn.	250
WLAF	LaFollette, Tenn.	1000
WGNS	Murfreesboro, Tenn.	1000
KAYC	Beaumont, Tex.	1000
KBEN	Carrizo Sprgs., Tex.	250
KCTI	Gonzales, Tex.	250
KMBL	Junction, Tex.	1000
KCYL	Lampasas, Tex.	1000
KMHT	Marshall, Tex.	1000
KAMY	McCamey, Tex.	250
KNET	Palestine, Tex.	250
KSNY	Snyder, Tex.	1000
KURA	Moab, Utah	1000
KEYY	Provo, Utah	1000
KDXU	St. George, Utah	1000
WSND	Barre, Vt.	1000
WTSA	Brattleboro, Vt.	1000
WFTR	Front Royal, Va.	1000
WENZ	Highland Springs, Va.	1000
WREL	Lexington, Va.	1000
WMVA	Martinsville, Va.	1000
WLPM	Suffolk, Va.	1000
KBKW	Aberdeen, Wash.	1000
KCLX	Colfax, Wash.	1000
KONP	Port Angeles, Wash.	250
KAYE	Puyallup, Wash.	1000
WPAR	Parkersburg, W. Va.	1000
KFIZ	Fond du Lac, Wis.	1000
WOLB	Marshfield, Wis.	1000
WPFP	Park Falls, Wis.	1000
WRCO	Richland Center, Wis.	1000
KBBS	Buffalo, Wyo.	250
KVOW	Riverton, Wyo.	1000

1460—205.4

kHz	Wave Length	W.P.
WFMH	Cullman, Ala.	5000d
WPNX	Phenix City, Ala.	5000
KZOT	Marianna, Ark.	500
KCCL	Paris, Ark.	500d
KTYM	Inglewood, Calif.	5000
KDON	Salinas, Calif.	5000
KVRE	Santa Rosa, Calif.	1000d
KYSN	Colo. Sprgs., Colo.	1000
WBAR	Bartow, Fla.	1000d
WZEP	DeFuniak Springs, Florida	1000d
WMBR	Jacksonville, Fla.	5000
WDYZ	Buford, Ga.	5000d
WPNX	Columbus, Ga.	1000
WROY	Carmi, Ill.	1000d
WIXN	Dixon, Ill.	1000d
WRTL	Rantoul, Ill.	250d
WKAM	Goshen, Ind.	1000
WOCH	North Vernon, Ind.	1000d
KSO	Des Moines, Iowa	5000
KCRB	Chanute, Kans.	1000d
WRVK	Mt. Vernon, Ky.	500d
WXOK	Baton Rouge, La.	5000
KBSF	Springhill, La.	1000d
WEMD	Easton, Md.	1000
WBET	Brockton, Mass.	5000
WBRN	Big Rapids, Mich.	1000d
WPON	Pontiac, Mich.	1000
KDWA	Hastings, Minn.	1000d
KDMA	Montevideo, Minn.	1000
WELZ	Belzoni, Miss.	1000d
WACY	Moss Point, Miss.	1000d
KADY	St. Charles, Mo.	5000d
KRNY	Kearney, Nebr.	5000d
KENO	Las Vegas, Nev.	1000
WJJZ	Mt. Holly, N.J.	
WOKD	Albany, N.Y.	5000
WVOX	New Rochelle, N.Y.	500d
WHEC	Rochester, N.Y.	5000
WFVG	Fuquay Sprgs., N.C.	1000d
WRKB	Kannapolis, N.C.	500d
WMMH	Marshall, N.C.	500d
WBNS	Columbus, Ohio	5000
WPVL	Painesville, O.	1000d
KRDW	Dallas, Oreg.	5000d
KELR	El Reno, Okla.	500
WMBA	Ambridge, Pa.	500d
WCMB	Harrisburg, Pa.	5000
WFBA	San Sebastian, P.R.	500
WBCU	Union, S.C.	1000
WJAK	Jackson, Tenn.	5000d
WEEN	Lafayette, Tenn.	1000d
KBRZ	Freeport, Tex.	500d
KLLL	Lubbock, Tex.	1000d
WACO	Waco, Tex.	1000
WPRW	Manassas, Va.	500d
WRAD	Radford, Va.	5000
KYAC	Kirkland, Wash.	5000d
KIMA	Yakima, Wash.	5000
WBUC	Buckhannon, W.Va.	5000d
WRAC	Racine, Wis.	500d
WTMB	Tomah, Wis.	1000d

1470—204.0

kHz	Wave Length	W.P.
WBLO	Evergreen, Ala.	1000d
KDLI	Coalinga, Calif.	500d
KUTY	Palmdale, Cal.	5000d
KXOA	Sacramento, Calif.	5000
KKEP	Estes Park, Colo.	
WMMW	Meriden, Conn.	1000d
WRBD	Pompano Beach, Fla.	5000
WCWR	Tarpon Springs, Fla.	5000d
WAAG	Adel, Ga.	1000d
WDOL	Athens, Ga.	1000d
WCLA	Claxton, Ga.	1000
WRGA	Rome, Ga.	5000
WMPP	Chicago Heights, Ill.	1000d
WMBD	Peoria, Ill.	5000
WHUT	Anderson, Ind.	1000d
KTRI	Sioux City, Iowa	5000
KWVY	Waverly, Iowa	1000d
KARE	Atchison, Kans.	1000
KLIB	Liberal, Kans.	1000d
WSAC	Fort Knox, Ky.	1000d
KTDL	Farmersville, La.	1000d
KPLC	Lake Charles, La.	5000
WLAM	Lewiston, Maine	5000
WJDY	Salisbury, Md.	5000d
WTTR	Westminster, Md.	1000d
WSRO	Marlborough, Mass.	1000d
WNBP	Newburyport, Mass.	500d
WKMF	Flint, Mich.	5000
WKLZ	Kalamazoo, Mich.	500d
KAND	Anoka, Minn.	1000d
WCHJ	Brookhaven, Miss.	1000d
WNAU	New Albany, Miss.	500d
KGHM	Brookfield, Mo.	500d
KTCB	Malden, Mo.	1000d
WTKO	Ithaca, N.Y.	1000d
WPDM	Potsdam, N.Y.	1000d
WBIG	Greensboro, N.C.	5000
WPNC	Plymouth, N.C.	1000d
WTOE	Spruce Pine, N.C.	1000d
WOHO	Toledo, Ohio	1000
KVLH	Pauls Valley, Okla.	250d
KVIN	Vinita, Okla.	500d
KRAF	Reedsport, Oreg.	5000d
WSAN	Allentown, Pa.	5000
WFAR	Farrell, Pa.	1000d
WWML	Portage, Pa.	500d
WQXL	Columbia, S.C.	5000d
WINH	Georgetown, S.C.	1000d
WEAG	Alcoa, Tenn.	1000d
WVOL	Berry Hill, Tenn.	5000
KRBC	Abilene, Tex.	5000
KDHN	Dimmitt, Tex.	500d
KWRD	Henderson, Tex.	500d
KCNY	San Marcos, Tex.	250d
WTZE	Tazewell, Va.	1000d
KELA	Centralia-Chehalis, Wash.	5000d
KSEM	Moses Lake, Wash.	5000
KAPS	Mount Vernon, Wash.	500d
WWHY	Huntington, W.Va.	5000d
WBZE	Wheeling, W.Va.	500d
WBKV	West Bend, Wis.	1000d

1480—202.6

kHz	Wave Length	W.P.
WARI	Abbeville, Ala.	1000d
WBTS	Bridgeport, Ala.	1000d
WABB	Mobile, Ala.	5000
KHAT	Phoenix, Ariz.	500
KGLU	Safford, Ariz.	1000
KTHS	Berryville, Ark	1000
KWUN	Concord, Calif.	500d
KYOS	Merced, Calif.	5000
KWIZ	Santa Ana, Calif.	5000
KSEE	Santa Maria, Calif.	1000
KCMS	Manitou Springs, Colo.	500
KPUB	Pueblo, Colo.	1000d
WSOR	Windsor, Conn.	500d
WAPG	Arcadia, Fla.	1000d
WGNE	Panama Beach, Fla.	500d
WVCF	Windermere, Fla.	1000d
WYZE	Atlanta, Ga.	5000d
WRDW	Augusta, Ga.	5000
WGSB	Geneva, Ill.	1000
WJBM	Jerseyville, Ill.	500d
WTHI	Terre Haute, Ind.	5000
WRSW	Warsaw, Ind.	1000
KLEE	Ottumwa, Iowa	500d
KBEA	Mission, Kan.	1000
KLEO	Wichita, Kans.	5000
WKOA	Hopkinsville, Ky.	1000d
WNKY	Neon, Ky.	1000d
WTLO	Somerset, Ky.	1000d
KCKW	Jena, La.	500d
KANV	Jonesville, La.	500d
KJOE	Shreveport, La.	1000d
WSAR	Fall River, Mass.	5000
WMAX	Grand Rapids, Mich.	5000d
WIOS	Tawas City, Mich.	1000d
WYSI	Ypsilanti, Mich.	500d
KAUS	Austin, Minn.	1000
KEHG	Fosston, Minn.	1000d
WECP	Carthage, Miss.	500d
KGCX	Sidney, Mont.	5000
KLMS	Lincoln, Nebr.	1000
KWEW	Hobbs, N. Mex.	5000
WLEA	Hornell, N.Y.	1000d
WHOM	New York, N.Y.	5000
WADR	Remsen, N.Y.	5000d
WWKO	Fair Bluff, N.C.	
WWOK	Charlotte, N.C.	5000
WYRN	Louisburg, N.C.	500d
WMSJ	Sylva, N.C.	5000
WHBC	Canton, Ohio	5000
WCIN	Cincinnati, Ohio	5000
WTRA	Latrobe, Pa.	500d
WDAS	Philadelphia, Pa.	5000
WISL	Shamokin, Pa.	1000
WSHP	Shippensburg, Pa.	500d
WMDD	Fajardo, P.R.	5000
KSDR	Waterton, S.D.	1000d
WJFC	Jefferson City, Tenn.	500
WMQM	Memphis, Tenn.	5000d
WJLE	Smithville, Tenn.	1000d
KBOX	Dallas, Tex.	5000
KLVL	Pasadena, Tex.	1000
KAPE	San Antonio, Tex.	500d
KONI	Spanish Fork, Utah	1000d
WCFR	Springfield, Vt.	1000d
WBBL	Richmond, Va.	5000
WLEE	Richmond, Va.	5000
WBLU	Salem, Va.	5000d
KFHA	Lakewood Center, Wash.	1000d
KVAN	Camas, Wash.	1000d
WISM	Madison, Wis.	5000
KRAE	Cheyenne, Wyo.	1000d

1490—201.2

kHz	Wave Length	W.P.
WANA	Anniston, Ala.	250
WAJF	Decatur, Ala.	1000
WRLD	Lanett, Ala.	1000
WHBB	Selma, Ala.	1000
KYCA	Prescott, Ariz.	1000
KAIR	Tucson, Ariz.	250
KXAR	Hope, Ark.	1000
KDRS	Paragould, Ark.	1000
KOTN	Pine Bluff, Ark.	1000
KXRJ	Russellville, Ark.	1000
KWAC	Bakersfield, Calif.	1000
KPAS	Banning, Calif.	250
KICO	Calexico, Calif.	250
KRKC	King City, Calif.	1000
KTOB	Petaluma, Calif.	1000
KBLF	Red Bluff, Calif.	1000
KDB	Santa Barbara, Calif.	1000
KOWL	So. Lake Tahoe, Cal.	250
KSYC	Yreka, Calif.	1000
KBOL	Boulder, Colo.	1000d
KGUC	Gunnison, Colo.	250
KCMS	Manitou Springs, Colo.	500
KOLR	Sterling, Colo.	250
WGCH	Greenwich, Conn.	250
WTRL	Bradenton, Fla.	250
WJBS	Deland, Fla.	1000
WIRA	Ft. Pierce, Fla.	250
WCOF	Immokalie, Fla.	250
WMBM	Miami Beach, Fla.	250
WSRA	Milton, Fla.	1000
WPXE	Starke, Fla.	1000
WTTB	Vero Beach, Fla.	1000
WSIR	Winter Haven, Fla.	500
WMOG	Brunswick, Ga.	1000
WMJM	Cordele, Ga.	1000
WMRE	Monroe, Ga.	1000d
WSFB	Quitman, Ga.	250
WSNT	Sandersville, Ga.	500
WSYL	Sylvania, Ga.	250
KTOH	Lihue, Hawaii	1000
KOID	Caldwell, Idaho	1000
WKRO	Cairo, Ill.	250
WDAN	Danville, Ill.	1000
WAMV	East St. Louis, Ill.	1000
WOPA	Oak Park, Ill.	1000
WZOE	Princeton, Ill.	1000
WKBV	Richmond, Ind.	1000
WNDU	South Bend, Ind.	1000
KBUR	Burlington, Iowa	1000
WDBQ	Dubuque, Iowa	1000
KBAB	Indianola, Ia.	500
KRIB	Mason City, Ia.	1000
KKAN	Phillipsburg, Kans.	250
KTOP	Topeka, Kan.	1000
WFKY	Frankfort, Ky.	1000d
WKAY	Glasgow, Ky.	1000
WOMI	Owensboro, Ky.	1000
WSIP	Paintsville, Ky.	1000
WIKC	Bogalusa, La.	1000
KEUN	Eunice, La.	1000
KJIN	Houma, La.	1000
KRUS	Ruston, La.	1000
WPOR	Portland, Maine	1000
WTVL	Waterville, Maine	1000
WARK	Hagerstown, Md.	1000
WHAV	Haverhill, Mass.	250
WMRC	Milford, Mass.	1000
WTXL	W. Springfield, Mass.	1000d
WABJ	Adrian, Mich.	1000
WMON	Midland, Mich.	1000
WLRC	Whitehall, Mich.	1000
KXRA	Alexandria, Minn.	250
KOZY	Grand Rapids, Minn.	1000
KLGR	Redwd. Falls, Minn.	1000
WLOX	Biloxi, Miss.	1000
WCLD	Cleveland, Miss.	1000
WHOC	Philadelphia, Miss.	1000
WTUP	Tupelo, Miss.	1000
WVIM	Vicksburg, Miss.	250
KDMO	Carthage, Mo.	250
KTTR	Rolla, Mo.	1000
KDRO	Sedalia, Mo.	1000
KDBM	Dillon, Mont.	1000
KBON	Omaha, Nebr.	1000
WEMJ	Laconia, N.H.	1000
WLDB	Atlantic City, N. J.	1000
KRSN	Los Alamos, N.Mex.	1000
KRTN	Raton, N.Mex.	1000
WCSS	Amsterdam, N.Y.	1000
WBTA	Batavia, N.Y.	250
WKNY	Kingston, N.Y.	1000
WICY	Malone, N.Y.	1000
WDLC	Port Jervis, N.Y.	1000
WOLF	Syracuse, N.Y.	1000
WSSB	Durham, N.C.	1000
WFLB	Fayetteville, N.C.	1000
WLOE	Leaksville, N.C.	1000
WRNB	New Bern, N.C.	1000
WRMT	Rocky Mount, N.C.	1000
WSTP	Salisbury, N.C.	1000
WSVM	Valdese, N.C.	1000
WHSL	Wilmington, N.C.	1000
KNDC	Hettinger, N.D.	1000
KOVC	Valley City, N. Dak.	1000
WBEX	Chillicothe, Ohio	1000
WJMO	Cleveland Hghts., O.	1000
WOHI	E. Liverpool, Ohio	250
WMOA	Marietta, Ohio	1000
WMRN	Marion, Ohio	1000
KWRW	Guthrie, Okla.	100
KBIX	Muskogee, Okla.	1000
KBKR	Baker, Oreg.	1000
KRNR	Roseburg, Oreg.	1000
KBZY	Salem, Oreg.	1000
WESB	Bradford, Pa.	1000
WAZL	Hazleton, Pa.	1000
WARD	Johnstown, Pa.	1000

kHz *Wave Length* **W.P.**

WGAL	Lancaster, Pa.	1000
WBCB	Levittown, Pa.	1000
WMRF	Lewiston, Pa.	1000
WMGW	Meadville, Pa.	1000d
WNBT	Wellsboro, Pa.	1000
WSIB	Beaufort, S.C.	500
WGCD	Chester, S.C.	1000d
WMRB	Greenville, S.C.	1000
KORN	Mitchell, S.Dak.	1000
WOPI	Bristol, Tenn.	1000
WDXB	Chattanooga, Tenn.	1000
WROL	Fountain City, Tenn.	1000
WJJM	Lewisburg, Tenn.	1000
WDXL	Lexington, Tenn.	1000
KNOW	Austin, Tex.	250
KIBL	Beeville, Tex.	250
KBST	Big Spring, Tex.	1000
KHUZ	Borger, Tex.	250
KNEL	Brady, Tex.	250d
KWMC	Del Rio, Tex.	
KSAM	Huntsville, Tex.	250
KVOZ	Laredo, Tex.	250
KZZN	Littlefield, Tex.	1000
KPLT	Paris, Tex.	1000
KDOK	Tyler, Tex.	250
KVWC	Vernon, Tex.	250
KVOG	Ogden, Utah	1000
WKVT	Brattleboro, Vt.	1000
WFAD	Middlebury, Vt.	1000
WIKE	Newport, Vt.	1000
WCVA	Culpeper, Va.	1000
WVEC	Hampton, Va.	1000
WAYB	Waynesboro, Va.	1000
KBRO	Bremerton, Wash.	1000
KLOG	Kelso, Wash.	1000
KENE	Toppenish, Wash.	1000
KTEL	Walla Walla, Wash.	1000
WGKV	Charleston, W.Va.	1000
WTCS	Fairmont, W.Va.	1000d
WLOH	Princeton, W. Va.	1000
WSGB	Sutton, W.Va.	1000
WGEZ	Beloit, Wis.	1000d
WLCX	LaCrosse, Wis.	1000
WIGM	Medford, Wis.	1000
WOSH	Oshkosh, Wis.	1000
KLME	Laramie, Wyo.	500
KRTR	Thermapolis, Wyo.	250
KGOS	Torrington, Wyo.	1000

1500—199.9

WFMI	Montgomery, Ala.	500d
WVSM	Rainsville, Ala.	
KGMR	Jacksonville, Ark.	1000d
KBBQ	Burbank, Cal.	
KXRX	San Jose, Cal.	10000
WFIF	Milford, Conn.	5000d
WTOP	Washington, D.C.	50000
WKIZ	Key West, Fla.	250
WGUL	New Port Richey, Fla.	250d
WSEM	Donaldsonville, Ga.	1000d
WDEN	Macon, Ga.	
WTHN	Thomaston, Ga.	1000d
WPMB	Vandalia, Ill.	250
WZBN	Zion, Ill.	250d
WBRI	Indianapolis, Ind.	5000d
WAKE	Valparaiso, Ind.	1000d
KWRG	New Roads, La.	1000d
WVOC	Battle Creek, Mich.	1000d
WJBK	Detroit, Mich.	50000d
KSTP	St. Paul, Minn.	50000
KDFN	Doniphan, Mo.	1000d
WKER	Pompton Lakes, N.J.	500
WKBX	Winston-Salem, N.C.	1000d
KOSG	Pawhuska, Okla.	5000d
WMNT	Manati, P.R.	250
WEAC	Gaffney, S. C.	1000d
WTNE	Trenton, Tenn.	250d
KWFA	Merkle, Tex.	250d
KTXO	Sherman, Tex.	250
KANI	Wharton, Tex.	500

1510—199.1

KALF	Mesa, Ariz.	10000d
KASK	Ontario, Calif.	1000
KIRV	Fresno, Cal.	500d
KTIM	San Rafael, Calif.	1000d
KDKO	Littleton, Colo.	1000
WNLC	New London, Conn.	10000
WWBC	Cocoa, Fla.	250d
WINU	Highland, Ill.	250d
WJRC	Joliet, Ill.	500d
WKAI	Macomb, Ill.	1000d
KIFG	Iowa Falls, Iowa	500d
KANS	Larned, Kan.	1000d
KPBC	Port Sulpher, La.	500d
WMEX	Boston, Mass.	50000
WJCO	Jackson, Mich.	5000d
WLKM	Three Rivers, Mich.	500
WKPO	Prentiss, Miss.	1000
KCCV	Independence, Mo.	1000d
KTTT	Columbus, Nebr.	500d
WRAN	Dover, N.J.	1000
WJIC	Salem, N.J.	250d
WBRW	Brewster, N.Y.	1000d
WEAL	Greensboro, N.C.	1000d
WBZB	Selma, N. C.	500d
WLKR	Norwalk, O.	
WAHT	Annville-Cleona, Pa.	5000d
WPSL	Monroeville, Penn.	250d
WSJW	Woodruff, S.C.	
WLAC	Nashville, Tenn.	50000
KCTX	Childress, Tex.	250d
KABH	Midland, Tex.	500d
KMOO	Mineola, Tex.	250d
KROB	Robstown, Tex.	500d
KSTV	Stephenville, Tex.	250d
KGA	Spokane, Wash.	50000
WAUK	Waukesha, Wis.	10000d

1520—197.4

WAOA	Opelika, Ala.	
KMPG	Hollister, Cal.	500
KMFB	Mendocino, Cal.	1000d
KACY	Port Hueneme, Calif.	10000
WTLN	Apopka, Fla.	
WGNP	Indian Rocks Beach, Fla.	1000d
WIXX	Oakland Park, Fla.	1000d
WXPQ	Eatonton, Ga.	500d
WHOW	Clinton, Ill.	5000d
WLUV	Loves Park, Ill.	500d
WSVL	Shelbyville, Ind.	1000
KSIB	Creston, Iowa	1000d
WRSL	Stanford, Ky.	500d
KXKW	Lafayette, La.	1000
WVOB	Bel Air, Md.	250d
WTRI	Brunswick, Md.	250d
WKJR	Muskegon Hts., Mich.	1000d
WYNZ	Ypsilanti, Mich.	250d
KOLM	Rochester, Minn.	10000d
KMPL	Sikeston, Mo.	5000
WSLT	Ocean City-Somers Pt., N. J.	1000d
KHIP	Albuquerque, N.Mex.	500d
WKBW	Buffalo, N.Y.	50000
WTHE	Mineola, N. Y.	10000d
WDSL	Mocksville, N.C.	5000
WCAB	Rutherfordton, N.C.	250d
KMAV	Mayville, N.D.	
WBNO	Bryan, Ohio	500d
WINW	Canton, O.	1000d
WKNT	Kent, O.	1000d
WTTO	Toledo, O.	1000d
KOMA	Okla. City, Okla.	50000
KYMN	Oregon City, Ore.	10000
WCHE	West Chester, Pa.	250
WRAI	Rio Piedras, P. R.	250
WTGR	Myrtle Beach, S.C.	250
WSLV	Ardmore, Tenn.	
WBHT	Brownsville, Tenn.	250d
WIDD	Elizabethton, Tenn.	1000d

1530—196.1

WAAO	Andalusia, Ala.	
WLCB	Moulton, Ala.	1000d
WCTR	Chestertown, Mo.	1530
KCAT	Pine Bluff, Ark	250d
KTMN	Trumann, Ark.	250d
KFBK	Sacramento, Calif.	50000
KRYT	Colorado Springs, Colo.	1000d
WDJZ	Bridgeport, Conn.	
WENG	Englewood, Fla.	1000
WTTI	Dalton, Ga.	10000d
KNBI	Norton, Kan.	1000d
KWLA	Many, La.	1000d
WCTR	Chestertown, Md.	250d
WRPM	Poplarville, Miss.	10000d
WTHM	Lapeer, Mich.	5000d
WERX	Wyoming, Mich.	500d
KSMM	Shakopee, Minn.	500d
KPCR	Bowling Green, Mo.	250
KMAM	Butler, Mo.	500d
KLOL	Lincoln, Neb.	5000d
WCKY	Cincinnati, Ohio	50000
KWLG	Wagoner, Okla.	
WHYP	North East, Pa.	1000d
WMBT	Shenandoah, Pa.	250d
WUPR	Utuado, P.R.	1000d
WASC	Spartanburg, S.C.	1000
KGTN	Georgetown, Tex.	1000d
KGBT	Harlingen, Tex.	50000
KCLR	Ralls, Tex.	5000d
WQVA	Quantico, Va.	250
KCHY	Cheyenne, Wy.	10000

1540—195.0

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

1550—193.5

WAAY	Huntsville, Ala.	5000d
WMOO	Mobile, Ala.	50000d
KUAT	Tucson, Ariz.	50000d
KXEX	Fresno, Calif.	500d
KKHI	San Fran., Calif.	10000
KQXI	Arvada, Colo.	10000d
WEXT	W. Hartford, Conn.	1000d
WRIZ	Coral Gables, Fla.	10000d
WOGO	New Smyrna Beach, Fla.	250
WYOU	Tampa, Fla.	10000d
WTHB	Augusta, Ga.	5000d
WYNX	Smyrna, Ga.	10000
WJIL	Jacksonville, Ill.	1000d
WCSJ	Morris, Ill.	250d
WPDF	Corydon, Ind.	250d
WCVL	Crawfordsville, Ind.	250
WCTW	New Castle, Ind.	250
WKQV	Sullivan, Ind.	250d
KIWA	Sheldon, Iowa	500d
KEDD	Dodge City, Kans.	1000d
KNIC	Winfield, Kan.	250d
WIRV	Irvine, Ky.	1000d
WMSK	Morganfield, Ky.	250d
WLUX	Baton Rouge, La.	5000d
KOKA	Shreveport, La.	10000
WSER	Elkton, Md.	1000d
WNTN	Newton, Mass.	10000d
WSHN	Fremont, Mich.	1000d
WOKJ	Jackson, Miss.	50000
WSAO	Senatobia, Miss.	5000d
KGMO	Cape Girardeau, Mo.	5000d
KKJO	St. Joseph, Mo.	5000
KICS	Hastings, Neb.	500d
WCGR	Canandaigua, N.Y.	250
WBAZ	Kingston, N.Y.	500d
WBVM	Utica, N.Y.	1000
WPXY	Greenville, N. C.	500d
WYNA	Raleigh, N.C.	1000d
WTYN	Tryon, N.C.	1000d
WFCM	Winston-Salem, N.C.	1000d
KQWB	Fargo, N.D.	5000d
WDLR	Delaware, Ohio	500d
KMAD	Madill, Okla.	250
KREK	Sapulpa, Okla.	500d
WLOA	Braddock, Pa.	1000d
WTTC	Towanda, Pa.	500d
WKFE	Yauco, P.R.	250
WBSC	Bennetsville, S.C.	10000
KCAN	Canyon, Tex.	1000
KWBC	Navasota, Tex.	250d
WKYE	Bristol, Tenn.	1000d
WPTN	Cookeville, Tenn.	250d
WTPI	Cookville, Tenn.	250d
WKPT	Kingsport, Tenn.	10000d
KCOM	Comanche, Tex.	250d
KWIC	Salt Lake City, Utah	10000d
WKBA	Vinton, Va.	10000d
WVAB	Virginia Bch., Va.	5000d
WXVA	Charlestown, W.Va.	500d
KOQT	Bellingham, Wash.	1000d
KGAR	Vancouver, Wash.	1000d
WMIR	Lake Geneva, Wis.	1000d
WMAD	Madison, Wis.	5000d

1560—192.3

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

1570—191.1

WCRL	Oneonta, Ala.	1000d
WTQX	Selma, Ala.	5000d
KBRI	Brinkley, Ark.	250d
KBJT	Fordyce, Ark.	250d
KRSA	Alisal, Calif.	250d
KCVR	Lodi, Cal.	5000d
KACE	Riverside, Calif.	1000d
KLOV	Loveland, Colo.	250d
WTWB	Auburndale, Fla.	5000d
WFBF	Fernandino Beach, Fla.	1000d
WOKC	Okeechobee, Fla.	1000
WJOE	Ward Ridge, Fla.	250
WMES	Ashburn, Ga.	1000d
WGHC	Clayton, Ga.	1000d
WBAD	College Park, Ga.	1000d
WGSR	Millen, Ga.	250d
WOKZ	Alton, Ill.	1000d
WFRL	Freeport, Ill.	5000d
WBEE	Harvey, Ill.	5000d
WTAY	Robinson, Ill.	250d
WILO	Frankfort, Ind.	250d
WHEL	New Albany, Ind.	10000d
KMCD	Fairfield, Iowa	250d
KJFJ	Webster City, Iowa	250d
KNDY	Marysville, Kans.	250d
WKKS	Vanceburg, Ky.	250d
WABL	Amite, La.	500d
KLLA	Leesville, La.	1000
KMAR	Winnsboro, La.	1000
WPEP	Taunton, Mass.	1000d
WMLO	Beverly, Mass.	500d
WDEW	Westfield, Mass.	1000d
WMRP	Flint, Mich.	1000d
WFUR	Grand Rapids, Michigan	1000d
KUXL	Golden Valley, Minn.	1000d
WONA	Winona, Miss.	1000d
KLEX	Lexington, Mo.	250d
WAFS	Amsterdam, N.Y.	1000d
WFLR	Dundee, N.Y.	1000d
WBUZ	Fredonia, N.Y.	250d
WAPC	Riverhead, N.Y.	1000d
WTLK	Taylorsville, N.C.	500
WNCA	Siler City, N.C.	1000d
WCLW	Mansfield, O.	1000d
WPTW	Piqua, Ohio	250d
KTAT	Frederick, Okla.	250d
KOLS	Pryor, Okla.	1000d
KWAY	Forest Grove, Oreg.	1000d
KOHU	Hermiston, Oreg.	1000d
WPGM	Danville, Penn.	1000d
WBUX	Doylestown, Pa.	5000d
WQTW	Latrobe, Pa.	1000d
WFGN	Gaffney, S.C.	250d
WJES	Johnston, S.C.	250d
WLSC	Loris, S.C.	1000d
KVRA	Vermillion, S.D.	
WHLP	Centerville, Tenn.	1000d
WCLE	Cleveland, Tenn.	1000d
WTRB	Ripley, Tenn.	1000d
KZOL	Farwell, Tex.	250d
KVLG	La Grange, Tex.	250d
KTER	Terrell, Tex.	250d
WSWV	Pennington Gap, Va.	1000d
WYTI	Rocky Mount, Va.	1000d
WEER	Warrenton, Va.	1000d
WAPL	Appleton, Wis.	1000d

1580—189.2

WEYY	Talladega, Ala.	1000d
KTUF	Tempe, Ariz.	50000
KPCA	Marked Tree, Ark.	250d
KFDF	Van Buren, Ark.	1000d
KMRE	Anderson, Cal.	1000d
KWIP	Merced, Calif.	500d
KDAY	Santa Monica, Cal.	50000
KHUM	Santa Rosa, Calif.	500d
KPIK	Colorado Sprgs., Colo.	5000d
WSBP	Chattachoochee, Fla.	1000d
WSRF	Ft. Lauderdale, Fla.	10000
WVGT	Mount Dora, Fla.	1000d
WCCF	Punta Gorda, Fla.	1000d
WCLS	Columbus, Ga.	1000
WKIG	Glenville, Ga.	1000d
WKKD	Aurora, Ill.	250d
WDQN	DuQuoin, Ill.	250d
WBBA	Pittsfield, Ill.	250d
WKID	Urbana, Ill.	250d
WCNB	Connersville, Ind.	250d

WHITE'S RADIO LOG

kHz Wave Length	W.P.
WJVA South Bend, Ind.	1000d
WAMW Washington, Ind.	250d
KCHA Charles City, Iowa	500d
KWNT Davenport, Iowa	500d
KDSN Denison, Iowa	500d
WAXU Georgetown, Ky.	10000d
WMTL Leitchfield, Ky.	250d
WPKY Princeton, Ky.	250d
KLUV Haynesville, La.	250d
KLOU Lake Charles, La.	1000
WPGC Bradbury Hts., Md.	10000d
WAQE Towson, Md.	5000
WRBJ St. Johns, Mich.	1000d
KOOM Windom, Minn.	250d
WAMY Amory, Miss.	5000d
WESY Leland, Miss.	1000
WPMP Pascagoula-Moss Point, Mississippi	1000d
KTGR Columbia, Mo.	250d
KESM El Dorado Springs, Mo.	500d
KNIM Maryville, Mo.	250d
KAMI Cozad, Neb.	1000d
WNJH Hammonton, N.J.	250d
WCRV Washington, N.J.	500d
KLOS Albuquerque, N.M.	1000d
WPAC Patchogue, N.Y.	10000d
WZKY Albemarle, N.C.	250d
WPYB Benson, N.C.	500d
WVKO Columbus, Ohio	1000d
KLTR Blackwell, Okla.	1000d
WCOY Columbia, Pa.	500d
WEND Ebensburg, Pa.	1000d
WANB Waynesburg, Pa.	250d
WORG Orangeburg, S.C.	1000d
WBBR Travelers Rest, S.C.	500d
WSKT Colonial Village, Tenn.	250d
WHHM Henderson, Tenn.	
WLIJ Shelbyville, Tenn.	1000d
WSKT South Knoxville, Tenn.	250
KKAL Denver City, Tex.	250d
KGAF Gainesville, Tex.	250d

kHz Wave Length	W.P.
KIRT Mission, Tex.	1000d
KTLU Rusk, Tex.	500d
KWED Seguin, Tex.	1000d
KBYP Shamrock, Tex.	250d
KBGO Waco, Tex.	1000
WILA Danville, Va.	1000d
WPUV Pulaski, Va.	5000d
WTTN Watertown, Wis.	1000d

1590—188.7

	W.P.
WATM Atmore, Ala.	5000d
WBIB Centerville, Ala.	1000d
WVNA Tuscumbia, Ala.	5000
KPBA Pine Bluff, Ark.	1000d
KSPR Springdale, Ark.	
KLIV San Jose, Cal.	5000d
KUDU Ventura, Cal.	10000
KCIN Victorville, Calif.	500d
WARV Warwick-E. Greenwich, Conn.	
WBRY Waterbury, Conn.	5000
WILZ St. Petersburg Beach, Florida	1000d
WELE S. Daytona Bch., Fla.	1000d
WALG Albany, Ga.	1000
WLFA Lafayette, Ga.	5000d
WTGA Thomaston, Ga.	500d
WNMP Evanston, Ill.	1000d
WAIK Galesburg, Ill.	5000d
WGEE Indianapolis, Ind.	5000d
WPCO Mt. Vernon, Ind.	500d
KWBG Boone, Iowa	1000
KVGB Great Bend, Kans.	5000
WLBN Lebanon, Ky.	1000d
KEVL White Castle, La.	1000d
WETT Ocean City, Md.	1000
WTVB Coldwater, Mich.	5000
WSMA Marine City, Mich.	1000d
WMIC St. Helen, Mich.	500d
KRAD E. Grand Forks, Minn.	1000d
WWUN Jackson, Miss.	5000
KDEX Dexter, Mo.	1000d
KPRS Kansas City, Mo.	1000d
KCLU Rolla, Mo.	1000d
WSMN Nashua, N.H.	5000
WERA Plainfield, N.J.	500d
WAUB Auburn, N.Y.	500d
WEHH Elmira Heights-Horseheads, N.Y.	500d
WGGO Salamanca, N.Y.	5000d
WBHN Bryson City, N.C.	
WCSL Cherryville, N.C.	500d

kHz Wave Length	W.P.
WVOE Chadburn, N.C.	1000
WNCT Greenville, N.C.	500
WNOS High Point, N.C.	1000d
WAKR Akron, Ohio	5000
WSRW Hillsboro, Ohio	500d
KHEN Henryetta, Okla.	500d
KTIL Tillamook, Ore.	5000
WZUM Carnegie, Pa.	1000d
WCBG Chambersburg, Pa.	5000
WEEZ Chester, Pa.	1000
WXRF Guayama, P.R.	1000
WYNG Warwick, R.I.	1000d
WABV Abbeville, S.C.	1000d
WACA Camden, S.C.	1000d
KCCR Pierre, S.D.	250
WPIP Collierville, Tenn.	500d
WJSO Jonesboro, Tenn.	5000d
WDBL Springfield, Tenn.	1000d
KGAS Carthage, Tex.	1000d
KERC Eastland, Tex.	500d
KINT El Paso, Tex.	1000d
KYOK Houston, Tex.	5000
KCBD Lubbock, Tex.	1000
KBUS Mexia, Tex.	500d
KTOD Sinton, Tex.	1000
WISZ Glen Burnie, Md.	500
WRGM Richmond, Va.	5000d
KETO Seattle, Wash.	5000d
WIXK New Richmond, Wis.	5000d
WSWW Platteville, Wis.	5000
WTRW Two Rivers, Wis.	1000d
WAWA West Allis, Wis.	1000d

1600—187.5

	W.P.
WEUP Huntsville, Ala.	5000d
WAPX Montgomery, Ala.	1000
KVIO Cottonwood, Ariz.	1000d
KXEW Tucson, Ariz.	1000
KGST Fresno, Cal.	5000d
KWOW Pomona, Cal.	5000
KZON Santa Maria, Cal.	500d
KUBA Yuba City, Calif.	5000
KLAK Lakewood, Colo.	5000
WKEN Dover, Del.	1000
WKTX Atlantic Beach, Fla.	1000d
WKWF Key West, Fla.	500
WHEW Riviera Beach, Fla.	1000
WPRV Wauchula, Fla.	500d
WDKB Winter Garden, Fla.	5000d
WNGA Nashville, Ga.	1000d
WRBN Warner Robins, Ga.	1000d
WCGO Chicago Hgts., Ill.	1000d
WMCW Harvard, Ill.	500d
WBTO Linton, Ind.	500d
WARU Peru, Ind.	1000d
KLGA Algona, Iowa	5000d
KCRG Cedar Rapids, Iowa	5000
KMDO Ft. Scott, Kans.	500d
WSTL Eminence, Ky.	500d
WKYF Greenville, Ky.	500d
KFNV Ferriday, La.	1000d
KLEB Golden Meadow, La.	1000d
KNCB Vivian, La.	5000d
WINX Rockville, Md.	1000
WBOS Brookline, Mass.	5000
WTYM East Longmeadow, Mass.	5000d
WAAM Ann Arbor, Mich.	5000
WTRU Muskegon, Mich.	5000
WKOL Clarksdale, Miss.	1000d
WFFF Columbia, Miss.	500d
KATZ St. Louis, Mo.	5000
KTTN Trenton, Mo.	500d
KNCY Nebraska City, Nebr.	500d
KRFS Superior, Nebr.	500d
WWRL New York, N.Y.	5000
WMCR Oneida, N.Y.	1000d
WLNG Sag Harbor, N.Y.	500
WXKW Troy, N.Y.	500d
WWRL Woodside, N.Y.	5000
WGIV Charlotte, N.C.	1000
WIDU Fayetteville, N.C.	1000d
WHVL Hendersonville, N.C.	1000d
WFRC Reidsville, N.C.	1000
WKSK W. Jefferson, N.C.	1000d
KDAK Carrington, N.Dak.	500d
WAQI Ashtabula, Ohio	1000d
WBLY Springfield, Ohio	1000d
WTTF Tiffin, Ohio	500d
KUSH Cushing, Okla.	1000d
KASH Eugene, Oreg.	5000
KOHI St. Helens, Ore.	1000d
WHOL Allentown, Pa.	500d
WHRY Elizabethtown, Pa.	500d
WFIS Fountain Inn, S.C.	1000d
WFNL No. Augusta, S.C.	500d
WHBT Harriman, Tenn.	5000d
WKBJ Milan, Tenn.	1000d
KBBB Borger, Tex.	5000d
KBOR Brownsville, Tex.	1000
KWEL Midland, Tex.	1000d
KCFH Cuero, Tex.	500d
KYAL McKinney, Tex.	1000d
KOGT Orange, Tex.	1000
KBBC Centerville, Utah	1000d
WSJT Chesapeake, Va.	1000d
WHLL Wheeling, W.Va.	5000d
WCWC Ripon, Wis.	5000

Canadian AM Stations by Frequency

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

540—555.5

kHz Wave Length	W.P.
CBK Regina, Sask.	50,000
CBT Grand Falls, Nfld.	10,000

550—545.1

	W.P.
CFBR Sudbury, Ont.	1,000d
CFNB Fredericton, N.B.	50,000
CHLN Trois-Rivières, Que.	10,000d 5,000n
CKPG Prince George, B.C.	10,000

560—525.4

	W.P.
CFOS Owen Sound, Ont.	1,000
CHCM Marystown, Nfld.	1,000d 500n
CHTK Prince Rupert, B.C.	1,000d 250n
CJKL Kirkland Lake, Ont.	5,000
CKCN Sept-Iles, Que.	10,000d 5,000n
CKNL Fort St. John, B.C.	1,000

570—526.0

	W.P.
CFCB Corner Brook, Nfld.	1,000
CJEM Edmundston, N.B.	5,000d 1,000n
CKCQ Quesnel, B.C.	1,000
CKEK Cranbrook, B.C.	1,000
CFWH Whitehorse, Y.T.	1,000

580—516.9

	W.P.
CFRA Ottawa, Ont.	50,000d 10,000n
CHLC Hauterive, Que.	5,000d 2,500n
CJFX Antigonish, N. S.	10,000
CKAP Kapuskasing, Ont.	1,000
CKPR Port Arthur, Ont.	5,000d 1,000n
CKUA Edmonton, Alta.	10,000
CKWW Windsor, Ont.	500
CKXR Salmon Arm, B. C.	1,000
CKY Winnipeg, Man.	50,000

590—508.2

	W.P.
CFAR Flin Flon, Man.	10,000d 1,000n
CKEY Toronto, Ont.	10,000d 5,000n
CKRS Jonquiere, Que.	1,000
CFTK Terrace, B.C.	1,000
VOCM St. John's, Nfld.	10,000

600—499.7

	W.P.
CFCF Montreal, Que.	5,000
CFCH Callander, Ont.	10,000d 5,000n
CFQC Saskatoon, Sask.	5,000
CJOR Vancouver, B.C.	10,000
CKCL Truro, N.S.	1,000

610—491.7

	W.P.
CHNC New Carlisle, Que.	10,000d 5,000n
CHTM Thompson, Man.	1,000
CJAT Trail, B.C.	1,000
CKML Mont Laurier, P.Q.	1,000
CKTB St. Catharines, Ont.	10,000d 5,000n
CKYL Peace River, Alta.	10,000d 1,000n

620—483.6

	W.P.
CFCL Timmins, Ont.	10,000d 5,000n
CKCK Regina, Sask.	5,000
CKCM Grand Falls, Nfld.	10,000

630—475.9

	W.P.
CFCO Chatham, Ont.	10,000d 1,000n
CFCY Charlottetown, P. E. I.	10,000
CHED Edmonton, Alta.	10,000
CHLT Sherbrooke, Que.	10,000d 5,000n
CJET Smiths Falls, Ont.	10,000
CKAR Huntsville, Ont.	1,000
CKOV Kelowna, B.C.	1,000
CKRC Winnipeg, Man.	10,000

640—468.5

	W.P.
CBN St. John's, Nfld.	10,000

680—440.9

	W.P.
CHFA Edmonton, Alta.	5,000
CHFI Toronto, Ont.	1,000d 10,000n
CHLO St. Thomas, Ont.	1,000
CJCN Grand Falls, Nfld.	10,000
CJOB Winnipeg, Man.	10,000d 2,500n
CKGB Timmins, Ont.	10,000

690—434.5

	W.P.
CBF Montreal, Que.	50,000
CBU Vancouver, B.C.	10,000

710—422.3

	W.P.
CJSP Leamington, Ont.	1000d
CFRG Gravelbourg, Sask.	5,000d
CKVM Ville-Marie, Que.	10,000d 1,000n
CJOX Grand Bank, Nfld.	1,000

730—410.7

	W.P.
CJNR Blind River, Ont.	1,000
CKAC Montreal, Que.	50,000
CKDM Dauphin, Man.	10,000d 5,000n
CKLG North Vancouver, B.C.	10,000

740—405.2

	W.P.
CBL Toronto, Ont.	50,000
CBX Edmonton, Alta.	50,000

790—379.5

	W.P.
CFDR Dartmouth, N.S.	5,000
CFCW Camrose, Alta.	10,000
CKMR Newcastle, N.B.	1,000
CKSO Sudbury, Ont.	10,000d 5,000n
CHIC Brampton, Ont.	1,000d 500n

800—374.8

	W.P.
CFOB Fort Frances, Ont.	1,000d 500n
CHAB Moose Jaw, Sask.	10,000d 5,000n
CHRC Quebec, Que.	50000
CJAD Montreal, Que.	50,000d 10,000n
CJBQ Belleville, Ont.	1,000
CJLX Fort William, Ont.	10,000d 5,000n
CKOK Penticton, B.C.	10,000d 500n
CKLW Windsor, Ont.	50,000
VOWR St. John's, Nfld.	1,000

810—370.2

	W.P.
CHQR Calgary, Alta.	10,000

850—352.7

	W.P.
CJJC Langley, B.C.	1,000
CKRD Red Deer, Alta.	10,000d 1,000n
CKVL Verdun, Que.	50,000d 10,000n

860—348.6

	W.P.
CBH Halifax, N.S.	10,000
CFPR Prince Rupert, B.C.	10,000
CHAK Inuvik, N.W.T.	1,000
CJBC Toronto, Ont.	50,000

900—333.1

	W.P.
CHML Hamilton, Ont.	5,000
CHNO Sudbury, Ont.	10,000d 1,000n
CJBR Rimouski, Que.	10,000
CJVI Victoria, B.C.	10,000
CKBI Prince Albert, Sask.	10,000
CKDR Dryden, Ont.	1,000d 250n
CKDH Amherst, N.S.	1,000
CKJL St. Jérôme, Que.	1,000
CKTS Sherbrooke, Que.	1,000
CKVD Val D'Or, Que.	10,000d 2,500n

kHz Wave Length	W.P.
910—329.5	
CBO Ottawa, Ont.	5,000
CFJC Kamloops, B.C.	10,000d 1,000n
CFSX Stephenville, Nfld.	500
CHRL Roberval, Que.	1,000
CJDV Drumheller, Alta.	5,000
CKLY Lindsay, Ont.	1,000
920—329.9	
CFRY Portage La Prairie, Man.	1,000
CJCH Halifax, N.S.	10,000d 5,000
CJCJ Woodstock, N.B.	1,000
CKCY Sault Ste. Marie, Ont.	10,000d 5,000n
CKNX Wingham, Ont.	2,500d 1,000n
930—322.4	
CFBC Saint John, N.B.	10,000d 5,000n
CJCA Edmonton, Alberta	10,000d 5,000n
CJON St. John's, Nfld.	10,000
940—319.0	
CBM Montreal, Que.	50,000
CJGX Yorkton, Sask.	10,000
CJIB Vernon, B. C.	10,000d
950—315.6	
CHER Sydney, N.S.	10,000
CKBB Barrie, Ont.	10,000d 2,500n
CKNB Campbellton, N.B.	10,000d 1,000n
960—312.3	
CFAC Calgary, Alta.	10,000
CHNS Halifax, N.S.	10,000
CKWS Kingston, Ont.	10000d 5000n
970—309.1	
CKCH Hull, Que.	5,000
CBZ Fredericton, N.B.	10,000
980—305.9	
CBV Quebec, Que.	5,000
CFPL London, Ontario	10,000d 5,000n
CHEX Peterborough, Ont.	10000d 5000n
CKGM Montreal, Que.	10,000
CKNW New Westminster, B.C.	50,000
CKRM Regina, Sask.	10,000d 5,000n
990—302.8	
CBW Winnipeg, Man.	50,000
CBY Corner Brook, Nfld.	10,000
1000—299.8	
CKBW Bridgewater, N.S.	10,000
1010—296.9	
CBR Calgary, Alta.	50,000
CFRB Toronto, Ont.	50,000
1050—285.5	
CFGP Grande Prairie, Alta.	10,000
CHUM Toronto, Ont.	50,000
CJIC Sault Ste. Marie, Ont.	10,000d 2,500n
CJNB North Battleford, Sask.	10,000
CKSB St. Boniface, Man.	10,000
1060—282.8	
CFCN Calgary, Alta.	50000
CJLR Quebec, Que.	10,000
1070—280.2	
CBA Sackville, N.B.	50,000
CFAX Victoria, B.C.	1,000
CHOK Sarnia, Ont.	5,000d 1,000n
1080—277.6	
CKSA Lloydminster, Alta.	10,000
1090—275.1	
CHEC Lethbridge, Alta.	5,000
CHRS St. Jean, Que.	10,000d
1110—272.6	
CBD Saint John, N.B.	10,000
CFML Cornwall, Ont.	1,000
CFTJ Galt, Ont.	250d
CHQT Edmonton, Alta.	10,000
1130—265.3	
CKWX Vancouver, B.C.	50,000
1140—263.0	
CBI Sydney, N.S.	10,000
CKXL Calgary, Alta.	10,000
1150—260.7	
CHSJ Saint John, N.B.	10,000d 5,000n
CKOC Hamilton, Ont.	5,000
CKTR Trois-Rivières, Que.	10,000d 1,000n
CKX Brandon, Man.	10,000d 1,000n
1170—256.3	
CFNS Saskatoon, Sask.	1,000
1220—245.8	
CJOC Lethbridge, Alta	10,000d 5,000n
CJRL Kenora, Ont.	1,000
CJSS Cornwall, Ontario	1,000
CKDA Victoria, B.C.	10,000
CKCW Moncton, N.B.	10,000
CKSM Shawinigan, Que.	1,000
1230—243.8	
CBDR Schefferville, Que.	250
CFBV Smithers, B.C.	1,000d 250n
CFGR Gravelbourg, Sask.	250n
CFLK Kapuskasing, Ont.	100
CFPA Port Arthur, Ont.	1,000d 250n
CHFC Churchill, Man.	250
CHVD Dolbeau, P.Q.	1000d 250n
CKLD Thetford Mines, Que.	1,000d 250n
CKMP Midland, Ont.	1000d 250n
CKTK Kitimat, B.C.	1,000d 250n
VOAR St. John's, Nfld.	100
1240—241.8	
CFLM La Tuque, Que.	1,000d 250n
CFVR Abbotsford, B. C.	1,000d 250n
CJAF Cabano, Que.	250
CJAV Port Alberni, B.C.	1,000d 250n
CJCS Stratford	500d 250n
CJRW Summerside, P.E.I.	250
CJWA Wawa, Ont.	1,000d 250n
CKWL Williams Lake, B.C.	250
CKBS St. Hyacinthe, Que.	250
CKLS Ls Sarre, Que.	250
CKOO Osoyoos, B.C.	1,000d 250n
1250—239.9	
CBOF Ottawa, Ont.	10,000
CHWO Oakville, Ont.	1,000d
CHSM Steinbach, Man.	10,000
CKBL Matane, Que.	10,000d 5,000n
CKOM Saskatoon, Sask.	10,000
1260—238.0	
CFRN Edmonton, Alta.	50,000
1270—263.1	
CFGT Alma, Que.	1,000
CHAT Medicine Hat, Alta.	10,000
CHWK Chilliwack, B.C.	10,000
CJCB Sydney, N.S.	10,000
1280—234.2	
CHIQ Hamilton, Ont.	10,000d 5,000n
CHQB Powell River, B.C.	1000
CJMS Montreal, Que.	50,000
CJSL Estevan, Sask.	1,000
CKCV Quebec, Que.	10,000d 5,000n
1290—232.4	
CFAM Altona, Man.	10,000d 5,000n
CJOE London, Ont.	10,000
1300—230.6	
CBAF Moncton, N.B.	5,000
CJME Regina, Sask.	1,000
1310—228.9	
CFGM Richmond Hill, Ont.	10,000d 2,500n
CHGB Ste-Anne-de-la-Pocatière, Que.	5,000
CKOY Ottawa, Ont.	50,000
1320—227.1	
CHQM Vancouver, B.C.	10,000
CJSO Sorel, Que.	10,000d 5,000n
CKEC New Glasgow, N.S.	5,000
CKKW Kitchener, Ont.	1,000
1330—225.4	
CKKR Rosetown, Sask.	10,000
1340—223.7	
CFGB Goose Bay, Nfld.	1,000
CFLH Hearst, Ont.	100
CFSL Weyburn, Sask.	1,000d 250n
CFYK Yellowknife, N.W.T.	1,000
CHAD Amos, Que.	250
CJLS Yarmouth, N.S.	250
CFOM Ville Vanier, Que.	250
CKAR-1 Parry Sound, Ont.	250
CKCR Revelstoke, B. C.	250
CKNR Elliott Lake, Ont.	250
CKOX Woodstock, Ont.	1,000d 250n
1350—222.1	
CHOV Pembroke, Ont.	1,000
CJDC Dawson Creek, B.C.	1,000
CJLM Joliette, Que.	1,000
CKEN Kentville, N.S.	1,000
CKLB Oshawa, Ont.	10,000d 5,000n
1360—220.4	
CKBC Bathurst, N.B.	10,000
1370—218.8	
CFLV Valleyfield, Que.	1,000
1380—217.3	
CFDA Victoriaville, Que.	1,000
CKLC Kingston, Ont.	10,000d 5,000n
CKPC Brantford, Ont.	10,000
1390—215.7	
CKLN Nelson, B.C.	1,000
1400—214.2	
CFLD Burns Lake, B. C.	250
CJFP Rivière du Loup, Que.	10,000d 250n
CKCB Collingwood, Ont.	250
CKRN Rouyn, Que.	250
CKSW Swift Current, Sask.	1,000d 250n
1410—212.6	
CFMB Montreal, Que.	10,000
CFUN Vancouver, B.C.	10,000
CKSL London, Ont.	10,000
1420—211.1	
CJMT Chicoutimi, Que.	1,000
CJVR Melfort, Sask.	10,000
CKPT Peterborough, Ont.	5000
1430—209.7	
CKFH Toronto, Ont.	10000
1440—208.2	
CFCP Courtenay, B.C.	1,000
CKPM Ottawa, Ont.	10,000
1450—206.8	
CBG Gander, Nfld.	250
CFAB Windsor, N.S.	250
CFJR Brockville, Ont.	1,000d 250n
CHEF Granby, Que.	1,000d 250n
CHUC Cobourg, Ont.	1,000
CJBM Causapscal, Que.	1,000d 250n
1460—205.4	
CJOY Guelph, Ont.	10,000d 5,000n
CKRB Ville St. Georges, Que.	10,000d 5,000n
1470—204.0	
CFOX Pointe Claire, Que.	10,000d 5,000n
CFRW Winnipeg, Man.	5,000
CHOW Welland, Ont.	1,000d 500n
1480—202.6	
CHRD Drummondville, Que.	10000
1490—201.2	
CFMR Fort Simpson, N.W.T.	25
CFRC Kingston, Ont.	100
CHYM Kitchener, Ont.	10,000d 5,000n
CJSN Shaunavon, Sask.	1,000d 250n
CKAD Middleton, N.S.	1,000d 250n
CKBM Montmagny, Que.	1,000d 250n
CFWB Campbell River, B.C.	250
1500—199.9	
CKAY Ducan, B.C.	1,000
1510—199.1	
CKOT Tillsonburg, Ont.	1,000
1540—195.0	
CHIN Toronto, Ont.	50,000
1550—193.5	
CBE Windsor, Ont.	10,000
1560—192.3	
CFRS Simcoe, Ont.	250d
1570—191.1	
CFOR Orillia, Ont.	10,000d 1,000n
CHUB Nanaimo, B.C.	10,000
CKLM Montreal, Que.	50,000
1580—189.2	
CBJ Chicoutimi, Que.	10,000
1600—187.5	
CJRN Niagara Falls, Ont.	10,000

Are your home-town AM stations listed correctly in *White's Radio Log?* If you believe there is a correction to *White's* listings, please check first with your local station. For each callsign obtain the correct city location, frequency, and power. (Remember, even though your local paper may list a station as a "home-town" station, it may be officially licensed by the FCC for operation in the next city.) Get all the facts on a piece of paper (be very brief), include your name and address, and mail to *White's Radio Log*, RADIO-TV EXPERIMENTER, 505 Park Ave., New York, N. Y. 10022. Your help in contributing to the accuracy and completeness of White's Radio Log will be sincerely appreciated.

—Editor

U. S. Television Stations by States

U. S. stations listed alphabetically by cities within state groups. Territories and possessions follow states. Chan., channel; C.L., call letters. †, educational stations. Listing indicates stations on the air on October 1, 1967

WHITE'S RADIO LOG

ALABAMA

Location	C.L.	Chan.
Birmingham	WBRC-TV	6
	WAPI-TV	13
	WBMG	42
	†WBIQ	10
Decatur	WMSL-TV	23
Dothan	WTVY	4
Dozier	†WDIQ	2
Florence	†WFIQ	36
	WOWL-TV	15
Huntsville	WHNT-TV	19
	†WHIQ	25
	WAAY-TV	31
Mobile	WKRG-TV	5
	WALA-TV	10
	†WEIQ	42
Montgomery	WSFA-TV	12
	WCOV-TV	20
	WKAB-TV	32
	†WAIQ	26
Mount Cheaha State Park	†WCIQ	7
Selma	WSLA	8
Tuscaloosa	WCFT-TV	33

ALASKA

Location	C.L.	Chan.
Anchorage	KENI-TV	2
	KTVA	11
Fairbanks	KFAR-TV	2
	KTVF	11
Juneau	KINY-TV	8
Sitka	KIFW-TV	13

ARIZONA

Location	C.L.	Chan.
Nogales	XHFA-TV	2
	KZAZ	11
Phoenix	KTVK	3
	KPAZ-TV	21
	KPHO-TV	5
	KOOL-TV	10
	KTAR-TV	12
	†KAET	8
	*KPAZ-TV	21
Tucson	KVOA-TV	4
	KGUN-TV	9
	KOLD-TV	13
	†KUAT-TV	6
Yuma	KIVA	11
	KBLU-TV	13

ARKANSAS

Location	C.L.	Chan.
El Dorado	KTVE	10
Ft. Smith	KFSA-TV	5
Jonesboro	KAIT-TV	8
Little Rock	KARK-TV	4
	KATV	7
	KTHV	11
	†KETS	2

CALIFORNIA

Location	C.L.	Chan.
Bakersfield	KLYD-TV	17
	KERO-TV	23
	KBAK-TV	29
Chico	KHSL-TV	12
C rona	*KMTW	52
El Centro-Mexicali	XHBC-TV	3
Eureka	KIEM-TV	3
	KVIQ-TV	6
Fontana	KXLA-TV	40
Fresno	KMJ-TV	24
	KFRE-TV	30
	KJED	47
	KAIL	53
Hanford	*KSJV-TV	21
Los Angeles	KNXT	2
	KNBC	4
	KTLA	5
	KABC-TV	7
	KHJ-TV	9
	KTTV	11
	KCOP	13
	KWHY-TV	22
	KMEX-TV	34
	†KCET	28
Modesto	KLOC-TV	19
Monterey	KMBY-TV	46
Oakland-San Francisco	KTVU	2
Redding	KRCR-TV	7
	†KIXE-TV	9
Sacramento	KCRA-TV	3
	KXTV	10
	†KVIE	6
Salinas-Monterey	KSBW-TV	8
San Bernardino	†KVCR-TV	24
	*KITR	30
San Diego	†KEBS-TV	15
	KFMB-TV	8
	KOGO-TV	10
	KAAR	39
San Diego-Tijuana	XETV	6
	XEWT-TV	12
San Francisco	KRON-TV	4
	KPIX	5
	KGO-TV	7
	†KQED	9
	KSAN-TV	32
San Jose	KNTV	11
	†KTEH	54
San Luis Obispo	KSBY-TV	6
San Mateo	†KCSM-TV	14
Santa Barbara	KEYT	3
Santa Maria	KCOY-TV	12
Stockton-Sacramento	KOVR	13
Visalia	KICU-TV	43

COLORADO

Location	C.L.	Chan.
Colo. Springs	KKTV	11
	KRDO-TV	13
Denver	KWGN-TV	2
	KOA-TV	4
	KLZ-TV	7
	KBTV	9
	†KRMA-TV	6
Durango	KREZ-TV	6
Grand Junction	KREX-TV	5
Montrose	KREY-TV	10
Pueblo	KOAA-TV	5
Sterling	KTVS	3

CONNECTICUT

Location	C.L.	Chan.
Bridgeport	*WFTT	43
Hartford	WTIC-TV	3
	WHCT	18
	†WEDH	24
New Britain-Hartford	WHNB-TV	30
New Haven	WNHC-TV	8
Norwich	†WEDN	53
Waterbury	WATR-TV	20

DELAWARE

Location	C.L.	Chan.
Wilmington	†WHYY-TV	12

DISTRICT OF COLUMBIA

Location	C.L.	Chan.
Washington	WRC-TV	4
	WTTG	5
	WMAL-TV	7
	WTOP-TV	9
	WOOK-TV	14
	†WETA-TV	26
	WDCA-TV	20

FLORIDA

Location	C.L.	Chan.
Daytona Beach-Orlando	WESH-TV	2
Ft. Myers	WINK-TV	11
Ft. Pierce	WTVX	34
Gainesville	†WUFT	5
Jacksonville	WJXT	4
	WFGA-TV	12
	WJKS-TV	17
	†WJCT	7
Miami	WTVJ	4
	WCKT	7
	WLBW-TV	10
	†WTHS-TV	2
	†WSEC-TV	17
Orlando	WDBO-TV	6
	WFTV	9
	†WMFE-TV	24
Palm Beach	WPTV	5
Panama City	WJHG-TV	7
Pensacola	WEAR-TV	3
St. Petersburg-Tampa	WSUN-TV	38
	†WEDU	3
Tallahassee-Thomasville	WCTV	6
Tallahassee	†WFSU-TV	11
Tampa-St. Petersburg	WFLA-TV	8
	WLCY-TV	10
	WTVT	13
	†WUSF-TV	16
W. Palm Beach	WEAT-TV	12

GEORGIA

Location	C.L.	Chan.
Albany	WALB-TV	10
Athens	†WGTV	8
Atlanta	WSB-TV	2
	WAGA-TV	5
	WAII-TV	11
	†WETV	30
	*WBMO-TV	36
	WJRJ-TV	17
Augusta	WJBF	6
	WRDW-TV	12
Chatsworth	†WCLP-TV	18
Columbus	WRBL-TV	3
	WTVM	9
	†WJSP-TV	28
Dawson	†WACS-TV	25
Macon	WMAZ-TV	13
Pelham	†WABW-TV	14
Savannah	WSAV-TV	3
	WTOC-TV	11
	†WVAN-TV	9
Waycross	†WXGA-TV	8
Wrens	†WCES-TV	20

HAWAII

Location	C.L.	Chan.
Hilo	KPUA-TV	9
	KHAW-TV	11
	KHVO	13
Honolulu	KHON-TV	2
	KHVH-TV	4
	KGMB-TV	9
	KTRG-TV	13
	†KHET	11
Wailuku	KMAU-TV	3
	KAII-TV	7
	KMVI-TV	12
	†KMEB	10

IDAHO

Location	C.L.	Chan.
Boise	KBOI-TV	2
	KTVB	7
Idaho Falls-Pocatello	KID-TV	3
	KIFI-TV	8
Lewiston	KLEW-TV	3
Moscow	†KUID-TV	12
Twin Falls	KMVT	11

ILLINOIS

Location	C.L.	Chan.
Carbondale	†WSIU	8
Champaign	WCIA	3
	WICD	15
	†WILL-TV	12
Chicago	WBBM-TV	2
	WMAQ-TV	5
	WBKB-TV	7
	WGN-TV	9
	WCIU-TV	26
	WFLD	32
	†WTTW	11
	†WXXW	20
Danville	WICD	24
Decatur	WAND	17
Freeport	WCEE-TV	23
Harrisburg	WSIL-TV	3
La Salle	WEEQ-TV	35
Moline	WQAD-TV	8
Peoria	WIRL-TV	19
	WEEK-TV	25
	WMBD-TV	31
Quincy-Hannibal	WGEM-TV	10
Rockford	WREX-TV	13
	WTVO	17
Rock Island	WHBF-TV	4
Springfield	WICS	20

INDIANA

Location	C.L.	Chan.
Bloomington-Indianapolis	WTTV	4
Evansville	WTVW	7
	WFIE-TV	14
	WEHT	50
Ft. Wayne	WANE-TV	15
	WPTA	21
	WKJG-TV	33
Indianapolis	WFBM-TV	6
	WISH-TV	8
	WLWI	13
Lafayette	WFAM-TV	18
Marion	WTAF-TV	31
Muncie	WLBC-TV	49
South Bend	WNDU-TV	16
	WSBT-TV	22
South Bend-Elkhart	WSJV	28
Terre Haute	WTWO	2
	WTHI-TV	10
Vincennes	*†WVUT	34

IOWA

Location	C.L.	Chan.
Ames-Des Moines	WOI-TV	5
Cedar Rapids	KCRG-TV	9
Cedar Rapids-Waterloo	WMT-TV	2
Davenport	WOC-TV	6
Des Moines	KRNT-TV	8
	WHO-TV	13
	†KDPS-TV	11
Ft. Dodge	KVFD-TV	21
Sioux City	KCAU-TV	9
	KMEG	14
	KTIV	4
Waterloo-Cedar Rapids	KWWL-TV	7

KANSAS

Location	C.L.	Chan.
Ensign	KTVC	6
Garden City	KGLD	11
	KUPK-TV	13
Goodland	KLOE-TV	10
Great Bend	KCKT	2
Hays	KAYS-TV	7
Hutchinson-Wichita	KTVH	12
Pittsburg-Joplin, Mo.	KOAM-TV	7
Salina	*KSLN-TV	34
Topeka	WIBW-TV	13
Wichita	KARD-TV	3
	KAKE-TV	10

KENTUCKY

Location	C.L.	Chan.
Bowling Green	WLTV	13
Lexington	WLEX-TV	18
	WKYT-TV	27
Louisville	WAVE-TV	3
	WHAS-TV	11
	WLKY-TV	32
	†WFPK-TV	15
Paducah	WPSD-TV	6

LOUISIANA

Location	C.L.	Chan.
Alexandria	KALB-TV	5
Baton Rouge	WBRZ	2
	WAFB-TV	9
Lafayette	KATC	3
	KLFY-TV	10
Lake Charles	KPLC-TV	7
Monroe	KNOE-TV	8
New Orleans	WWL-TV	4
	WDSU-TV	6
	WVUE	12
	†WYES-TV	8
	*WWOM-TV	26
Shreveport	KTBS-TV	3
	KTAL-TV	6
	KSLA-TV	12
W. Monroe	KUZN-TV	39

MAINE

Location	C.L.	Chan.
Augusta	†WCBB	10
Bangor	WLBZ-TV	2
	WABI-TV	5
	WEMT	7
Calais	†WMED-TV	13
Orono	†WMEB-TV	12
Poland Spring	WMTW-TV	8
Portland	WCSH-TV	6
	WGAN-TV	13
Presque Isle	WAGM-TV	8
	†WMEM-TV	10

MARYLAND

Location	C.L.	Chan.
Baltimore	WMAR-TV	2
	WBAL-TV	11
	WJZ-TV	13
	WMET-TV	24
Salisbury	WBOC-TV	16

MASSACHUSETTS

Location	C.L.	Chan.
Adams	WCDC	19
Boston	WBZ-TV	4
	WHDH-TV	5
	WNAC-TV	7
	WSBK-TV	38
	†WGBH-TV	2
Cambridge-Boston	WKBG-TV	56
Greenfield	WRLP	32
Springfield	WWLP	22
	WHYN-TV	40
Worcester	WJZB-TV	14

MICHIGAN

Location	C.L.	Chan.
Bay City-Saginaw	WNEM-TV	5
Cadillac-Traverse City	WWTV	9
Cheboygan	WTOM-TV	4
Detroit	WJBK-TV	2
	WWJ-TV	4
	WXYZ-TV	7
	WKBD-TV	50
	†WTVS	56
Detroit-Windsor	CKLW-TV	9
Flint	WJRT-TV	12
Grand Rapids	WZZM-TV	13
Grand Rapids-Kalamazoo	WOOD-TV	8
Kalamazoo	WKZO-TV	3
Lansing	WJIM-TV	6
Lansing (Onondaga)	WILX-TV	10
Marquette	WLUC-TV	6
Mt. Pleasant	*†WCMU-TV	14
Muskegon	WMKG	54
Onondaga-East Lansing	†WMSB	10

Location	C.L.	Chan.
Saginaw-Bay City	WKNX-TV	25
Sault Ste. Marie	WWUP-TV	10
Traverse City	WPBN-TV	7
University Center (Bay City)	†WUCM-TV	19

MINNESOTA

Location	C.L.	Chan.
Appleton	†KWCM-TV	10
Alexandria	KCMT	7
Austin	KAUS-TV	6
Duluth	†WDSE-TV	8
	WDIO-TV	10
Duluth-Superior	KDAL-TV	3
	WDSM-TV	6
	†WDSE-TV	8
Hibbing	WIRT	13
Mankato	KEYC-TV	12
Minneapolis-St. Paul	WCCO-TV	4
	KMSP-TV	9
	WTCN-TV	11
Rochester	KROC-TV	10
St. Paul	†KTCI-TV	17
St. Paul-Minneapolis	KSTP-TV	5
	†KTCA-TV	2
Walker	KNMT	12

MISSISSIPPI

Location	C.L.	Chan.
Biloxi-Gulfport-Pascagoula	WLOX-TV	13
Columbus	WCBI-TV	4
Greenwood	WABG-TV	6
Hattiesburg-Laurel	WDAM-TV	7
Jackson	WLBT	3
	WJTV	12
Meridian	WTOK-TV	11
Tupelo	WTWV	9

MISSOURI

Location	C.L.	Chan.
Cape Girardeau	KFVS-TV	12
Columbia	KOMU-TV	8
Hannibal-Quincy	KHQA-TV	7
Jefferson City	KRCG	13
Joplin	KODE-TV	12
	KUHI-TV	16
Kansas City	WDAF-TV	4
	KCMO-TV	5
	KMBC-TV	9
	†KCSD-TV	19
Kirksville-Ottumwa, Ia.	KTVO	3
Poplar Bluff	*KPOB-TV	15
St. Joseph	KFEQ-TV	2
St. Louis	KTVI	2
	KMOX-TV	4
	KSD-TV	5
	KPLR-TV	11
	†KETC	9
Sedalia	KMOS-TV	6
Springfield	KYTV	3
	KTTS-TV	10

MONTANA

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

NEBRASKA

Location	C.L.	Chan.
Albion	KHQL-TV	8
Alliance	†KTNE-TV	13
Bassett	†KMNE-TV	7
Grand Island	KGIN-TV	11
Hastings	KHAS-TV	5
Hayes Center	KHPL-TV	6
Hay Springs	KDUH-TV	4
Henderson	KHBV	5
Kearney-Holdrege	KHOL-TV	13
Lexington	†KLNE-TV	3
Lincoln	KOLN-TV	10
	†KUON-TV	12
McCook	KOMC	8
No. Platte	KNOP-TV	2
	†KPNE-TV	9
Omaha	KMTV	3
	WOW-TV	6
	KETV	7
	†KYNE-TV	26
Scottsbluff-Gering	KSTF	10
Superior	KHTL-TV	4

NEVADA

Location	C.L.	Chan.
Las Vegas	KORK-TV	2
	KLAS-TV	8
	KSHO-TV	13
Reno	KCRL	4
	KOLO-TV	8
	KTVN	2

NEW HAMPSHIRE

Location	C.L.	Chan.
Durham	†WENH	11
Lebanon	WRLH	49
Manchester	WMUR-TV	9

NEW JERSEY

Location	C.L.	Chan.
Burlington	WKBS-TV	48
Linden (Newark)	WNJU-TV	47
Wildwood	WCMC-TV	40

NEW MEXICO

Location	C.L.	Chan.
Albuquerque	KOB-TV	4
	KOAT-TV	7
	KGGM-TV	13
	†KNME-TV	5
Carlsbad	KAVE-TV	6
Clovis	KFDW-TV	12
Roswell	KSWS-TV	8
	KBIM-TV	10

NEW YORK

Location	C.L.	Chan.
Albany	WTEN	10
	WAST	13
Binghamton	WNBF-TV	12
	WBJA-TV	34
	WINR-TV	40
Buffalo	WGR-TV	2
	WBEN-TV	4
	WKBW-TV	7
	†WNED-TV	17
Carthage-Watertown	WWNY-TV	7
Elmira	WSYE-TV	18
New York	WCBS-TV	2
	WNBC-TV	4
	WNEW-TV	5
	WABC-TV	7
	†WNYE-TV	25
	WOR-TV	9
	WPIX	11
	†WNDT	13
	#WNYC-TV	31
Plattsburgh	WPTZ	5
Rochester	WROC-TV	8
	WHEC-TV	10
	WOKR	13
	†WXXI	21
Schenectady	WRGB	6
	†WMHT	17
Syracuse	WSYR-TV	3
	WHEN-TV	5
	WNYS-TV	9
	†WCNY-TV	24
Utica	WKTV	2

NORTH CAROLINA

Location	C.L.	Chan.
Asheville	WLOS-TV	13
	WISE-TV	62
	†WUNF-TV	33
Chapel Hill	†WUNC-TV	4
Charlotte	WBTV	3
	WCTU-TV	36
	WSOC-TV	9
	†WTVI	42
	*WCTU-TV	36
Columbia	†WUNB-TV	2
Concord	†WUNG-TV	58
Durham-Raleigh	WTVD	11
Greensboro	WFMY-TV	2
Greenville	WNCT-TV	9
High Point	WGHP-TV	8
New Bern	WNBE-TV	12
Linville	†WUNE-TV	17
Raleigh-Durham	WRAL-TV	5
Washington	WITN-TV	7
Wilmington	WWAY	3
	WECT	6
Winston-Salem	WSJS-TV	12

NORTH DAKOTA

Location	C.L.	Chan.
Bismarck	KFYR-TV	5
	KXMB-TV	12
Devils Lake	WDAZ-TV	8
Dickinson	KDIX-TV	2
Fargo	WDAY-TV	6
	KTHI-TV	11
	†KFME	13
Minot	KMOT	10
	KXMC-TV	13
Pembina	KCND-TV	12
Valley City	KXJB-TV	4
Williston	KUMV-TV	8

OHIO

Location	C.L.	Chan.
Akron	WAKR-TV	49
Ashtabula	WICA-TV	15
Athens	†WOUB-TV	20
Bowling Green	†WBGU-TV	70
Canton	WJAN	29
Cincinnati	WLWT	5
	WCPO-TV	9
	WKRC-TV	12
	†WCET	48
	*WSCO-TV	19
Cleveland	WKYC-TV	3
	WEWS	5
	WJW-TV	8
	†WVIZ-TV	25
Columbus	WLWC	4
	WTVN-TV	6
	WBNS-TV	10
	†WOSU-TV	34
Dayton	WLWD	2
	WHIO-TV	7
	WKEF	22
Kettering (Dayton)	WKTR-TV	16
Lima	WIMA-TV	35
Newark	†WGSF	28
Oxford	†WMUB-TV	14
Portsmouth	WRLO	30
Steubenville-Wheeling, W. Va.	WSTV-TV	9
Toledo	WTOL-TV	11
	WSPD-TV	13
	WDHO-TV	24
	†WGTE-TV	30
Youngstown	WFMJ-TV	21
	WKBN-TV	27
	WYTV	33
Zanesville	WHIZ-TV	18

OKLAHOMA

Location	C.L.	Chan.
Ada	KTEN	10
Ardmore-Sherman-Denison, Tex.	KXII	12
Lawton	KSWO-TV	7
Oklahoma City	WKY-TV	4
	KOCO-TV	5
	KWTV	9
	KLPR-TV	14
	†KETA	13
	†KOKH-TV	25
Sayre	KFDO-TV	8
Tulsa	KVOO-TV	2
	KDTV	6
	KTUL-TV	8
	†KOED-TV	11

OREGON

Location	C.L.	Chan.
Coos Bay	KCBY-TV	11
Corvallis	†KOAC-TV	7
Eugene	KEZI-TV	9
	KVAL-TV	13
Klamath Falls	KOTI	2
La Grande	KTVR	13
Medford	KTVM	5
	KMED-TV	10
Portland	KATU	2
	KOIN-TV	6
	KGW-TV	8
	KPTV	12
	†KOAP-TV	10
Roseburg	KPIC	4

PENNSYLVANIA

Location	C.L.	Chan.
Allentown	†WLVT-TV	39
Altoona	WFBG-TV	10
Clearfield	†WPSX-TV	3
Erie	WICU-TV	12
	WJET-TV	24
	WSEE	35
	†WQLN	54
Harrisburg	WHP-TV	21
	WTPA	27
Hershey	†WITF-TV	33
Johnstown	WJAC-TV	6
	WARD-TV	56
Lancaster	WGAL-TV	8
Lebanon	WLYH-TV	15
Philadelphia	KYW-TV	3
	WFIL-TV	6
	WCAU-TV	10
	WPHL-TV	17
	WIBF-TV	29
	WKBS-TV	48
	†WUHY-TV	35
Pittsburgh	KDKA-TV	2
	WTAE-TV	4
	WIIC-TV	11
	†WQED	13
	†WQEX	16
	*WECO-TV	53
Scranton	WDAU-TV	22
	†WVIA-TV	44
Scranton-Wilkes-Barre	WNEP-TV	16
	WBRE-TV	28
York	WSBA-TV	43

RHODE ISLAND

Location	C.L.	Chan.
Providence	WJAR-TV	10
	WPRI-TV	12
	†WSBE	36
Providence-New Bedford	WTEV	6

SOUTH CAROLINA

Location	C.L.	Chan.
Anderson	WAIM-TV	40
Charleston	WUSN-TV	2
	WCIV	4
	WCSC-TV	5
	†WITV	7
Columbia	WIS-TV	10
	WNOK-TV	19
	WOLO-TV	25
	†WRLK-TV	35
Florence	WBTW	13
	†WJPM-TV	33
Greenville	WFBC-TV	4
	†WNTV	29
Spartanburg	WSPA-TV	7

SOUTH DAKOTA

Location	C.L.	Chan.
Aberdeen	KXAB-TV	9
Deadwood-Lead	KDSJ-TV	5
Florence (Watertown)	KDLO-TV	3
Lead	KHSD-TV	11
Mitchell	KORN-TV	5
Rapid City	†KBHE-TV	9
	KOTA-TV	3
	KRSD-TV	7
Reliance	KPLO-TV	6
Sioux Falls	KELO-TV	11
	KSOO-TV	13
Vermillion	†KUSD-TV	2

TENNESSEE

Location	C.L.	Chan.
Chattanooga	WRCB-TV	3
	WTVC	9
	WDEF-TV	12
Jackson	WBBJ-TV	7
Johnson City-Bristol-Kingsport	WJHL-TV	11
Knoxville	WATE-TV	6
	WBIR-TV	10
	WTVK	26
Memphis	WREC-TV	3
	WMCT	5
	WHBQ-TV	13
	†WKNO-TV	10
Nashville	WSM-TV	4
	WLAC-TV	5
	WSIX-TV	8
	†WDCN-TV	2
Sneedville	†WSJK-TV	2

TEXAS

Location	C.L.	Chan.
Abilene	KRBC-TV	9
Amarillo	KGNC-TV	4
	KVII-TV	7
	KFDA-TV	10
Austin	KTBC-TV	7
	KHFI-TV	42
Beaumont	KFDM-TV	6
	KBMT	12
Big Spring	KWAB-TV	4
Bryan	KBTX-TV	3
Corpus Christi	KIII	3
	KRIS-TV	6
	KZTV	10
Dallas-Fort Worth	KRLD-TV	4
	WFAA-TV	8
	†KERA-TV	13
El Paso	KROD-TV	4
	KTSM-TV	9
	KELP-TV	13
El Paso-Juarez	XEPM-TV	2
	XEJ-TV	5
Ft. Worth-Dallas	WBAP-TV	5
	KFWT	21
	KTVT	11
Harlingen	KGBT-TV	4
Houston	KPRC-TV	2
	KHOU-TV	11
	KTRK-TV	13
	KHTV	39
	†KUHT	8
Longview	KHER	16
Laredo	KGNS-TV	8
Lubbock	KCBD-TV	11
	KLBK-TV	13
	†KTXT-TV	5
Lufkin	KTRE-TV	9
Midland-Odessa	KMID-TV	2
Monahans	KVKM-TV	9
Odessa	KOSA-TV	7
Port Arthur-Beaumont	KJAC-TV	4
Richardson	†KRET-TV	23
San Angelo	KACB-TV	3
	KCTV	8
San Antonio	WOAI-TV	4
	KENS-TV	5
	KONO-TV	12
	KWEX-TV	41
San Antonio-Austin	†KLRN-TV	9
Sweetwater-Abilene	KTXS-TV	12
Temple-Waco	KCEN-TV	6
Tyler-Longview	KLTV	7
Waco	KWTX-TV	10
Weslaco	KRGV-TV	5
Wichita Falls	KFDX-TV	3
	KAUZ-TV	6

UTAH

Location	C.L.	Chan.
Logan	†KUSU-TV	12
Ogden	†KOET	9
	†KWCS-TV	18
Provo	†KBYU-TV	11
Salt Lake City	KUTV	2
	KCPX-TV	4
	KSL-TV	5
	†KUED	7

VERMONT

Location	C.L.	Chan.
Burlington	WCAX-TV	3

VIRGINIA

Location	C.L.	Chan.
Bristol	WCYB-TV	5
Hampton-Norfolk	WVEC-TV	13
	†WHRO-TV	15
Harrisonburg	WSVA-TV	3
Lynchburg-Roanoke	WLVA-TV	13

WHITE'S

RADIO LOG

Location	C.L.	Chan.
Norfolk	WTAR-TV	3
Petersburg-Richmond	WXEX-TV	8
Portsmouth	#WYAH-TV	27
Portsmouth-Norfolk	WAVY-TV	10
Richmond	WTVR-TV	6
	WRVA-TV	12
	†WCVE-TV	23
	†WCVW	57
Roanoke	†WBRA-TV	15
	WDBJ-TV	7
	WSLS-TV	10
	WRFT-TV	27

WASHINGTON

Location	C.L.	Chan.
Bellingham	KVOS-TV	12
Pasco	KEPR-TV	19
Pullman	†KWSC-TV	10
Richland	KNDU	25
Seattle	KOMO-TV	4
	KING-TV	5
	KIRO-TV	7
	†KCTS-TV	9
Spokane	KREM-TV	2
	KXLY-TV	4
	KHQ-TV	6
	†KSPS-TV	7
Tacoma-Seattle	KTNT-TV	11
Tacoma	KTVW	13
	†KPEC-TV	56
	†KTPS	62
Yakima	KNOO	23
	KIMA-TV	29
	†KYVE-TV	47

WEST VIRGINIA

Location	C.L.	Chan.
Bluefield	WHIS-TV	6
Charleston	WCHS-TV	8
Clarksburg	WBOY-TV	12
Huntington-Charleston	WSAZ-TV	3
	WHTN-TV	13
Oak Hill	WOAY-TV	4
Parkersburg-Marietta, O.	WTAP-TV	15
Weston	WDTV	5
Wheeling Steubenville, O	WTRF-TV	7

WISCONSIN

Location	C.L.	Chan.
Eau Claire	WEAU-TV	13
Green Bay	WBAY-TV	2
	WFRV-TV	5
	WLUK-TV	11
LaCrosse	WKBT	8
Madison	WISC-TV	3
	WMTV	15
	WKOW-TV	27
	†WHA-TV	21
Milwaukee	WTMJ-TV	4
	WITI-TV	6
	WISN-TV	12
	WVTV	18
	†WMVS	10
	†WMVT	36
Rhinelander	WAEO-TV	12
Wausau	WSAU-TV	7
	WAOW-TV	9

WYOMING

Location	C.L.	Chan.
Casper	KTWO-TV	2
Cheyenne	KFBC-TV	5
Riverton	KWRB-TV	10

GUAM

Location	C.L.	Chan.
Agana	KUAM-TV	8

PUERTO RICO

Location	C.L.	Chan.
Aguadilla	WOLE-TV	12
Caguas	WKBM-TV	11
Mayaguez	WORA-TV	5
	†WIPM-TV	3
Ponce	WRIK-TV	7
	WSUR-TV	9
	*WPSJ	14
San Juan	WKAQ-TV	2
	WAPA-TV	4
	†WIPR-TV	6
	WITA	30
	WTSJ	18
	WITA-TV	30

VIRGIN ISLANDS

Location	C.L.	Chan.
Charlotte Amalie	WBNB-TV	10
Christiansted	WSVI	8

Canadian Television Stations by Cities

Canadian stations listed alphabetically by cities. Abbreviations: Chan., ehannel; C.L., eall letters.

Location	C.L.	Chan.
Adams Hill, B.C.	CFCR-TV-8	11
Alticane, Sask.	CKBI-TV-1	10
Amherst, N.S.	CJCH-TV-3	8
Antigonish, N.S.	CJCB-TV-2	9
Argentia, Nfld.	CJOX-TV	3
Ashcroft, B.C.	CFCR-TV-2	10
Ashmont, Alta.	CFRN-TV-4	12
Athabasca, Alta.	CBXT-1	8
Atikokan, Ont.	CBWCT-1	7
Avola, B.C.	CFCR-TV-13	3
Baldy Mountain, Man.	CKSS-TV	8
Baie St. Paul, Que.	CKRT-TV-1	2
Bancroft, Ont.	CHEX-TV-1	2
Banff, Alta.	CKRD-TV-2	10
	CFCN-TV-2	8
	CHCT-TV-2	13
Barrie, Ont.	CKVR-TV	3
Bayview, N.S.	CJCH-TV-2	6
Big River, Sask.	CKBI-TV-5	9
Bon Accord, N.B.	CHSJ-TV-1	6
Bonavista, Nfld.	CJON-TV-2	10
Bonnyville, Alta.	CKSA-TV-2	9
Boss Mountain, B.C.	CFCR-TV-16	7
Boston Bar, B.C.	CFCR-TV-9	5
Bowen Island, B.C.	CBUT-4	13
Bowen Island, B.C.	CHAN-TV-2	3
Bralorne, B.C.	CFCR-TV-15	3
Brandon, Man.	CKX-TV	5
Brooks, Alta.	CFCN-TV-3	9
Bullhead Mt., B.C.	CJDC-TV-2	8
Burmis, Alta.	CJLH-TV-3	3
Burnaby, B.C.	CHAN-TV	8
Burns Lake, B.C.	CFTK-TV-3	4
Cabano, P.Q.	CKRT-TV-4	5
Calgary, Alta.	CFCN-TV	4
Calgary, Alta.	CHCT-TV	2
Callander, Ont.	CFCH-TV	10
Campbellton, N.B.	CKCD-TV	7
Camp Woss, B.C.	CFNV-TV-1	3
Canning, N.S.	CJCH-TV-1	10
Canoe, B.C.	CHBC-TV-8	3
Canoe Mountain, Near Valemont, B.C.	CFCR-TV-14	8
Carleton, Que.	CHAU-TV	5
Carlyle Lake, Sask.	CFSS-TV	7
Castlegar, B.C.	CBUAT-2	3
Causapscal, Que.	CKBL-TV-5	6
Cawston, B.C.	CHKC-TV-3	3
Celista, B.C.	CHBC-TV-6	6
Chandler, Que.	CHAU-TV-4	7
Chapleau, Ont.	CFCL-TV-6	7
Charlottetown, P.E.I.	CFCY-TV	13
Cherryville, B.C.	CJWR-TV-1	10
Chicoutimi, P.Q.	CJPM-TV	6
Chilliwack, B.C.	CHAN-TV-1	11
Cheticamp, N.S.	CBFCT	10
Chicoutimi, Que.	CKRS-TV-2	2
Churchill, Man.	CHGH-TV	4
Clearwater, B.C.	CFCR-TV-10	2
Clinton, B.C.	CFCR-TV-4	9
Cloridorme, Que.	CHAU-TV-8	6
Coleman, Alta.	CJLH-TV-1	12
Corner Brook, Nfld.	CBYT	5
Corner Brook, Nfld.	CJON-TV-1	10
Cornwall, Ont.	CJSS-TV	8
Coronation, Alta.	CKRD-TV	10
Courtenay, B.C.	CBUT-1	9
Colgate, Saskatchewan	CKCK-TV-1	12
Cranbrook, B.C.	CBUBT	10
Crescent Valley, B.C.	CHMS-TV-1	5
Dawson Creek, B.C.	CJDC-TV	5
Deer Lake, Nfld.	CBYAT	12
Drumheller, Alta.	CFCN-TV-1	12
Drumheller, Alta.	CHCT-TV-1	8
Dryden, Ontario	CBWAT-1	9
Eastend, Sask.	CJFB-TV-1	2
Edmonton, Alta.	CBXT	5
Edmonton, Alta.	CFRN-TV	3
Edmundston, N.B.	CJBR-TV-1	13
Elliot Lake, Ont.	CKSO-TV-1	3
Enderby, B.C.	CFEN-TV-1	5
Enderby, B.C.	CHBC-TV-5	72
Falkland, B.C.	CFWS-TV-1	5
Fisher Branch, Man.	CBWT-1	10
Flin Flon, Man.	CBWBT	10
Fort Francis, Ont.	CBWCT	5
Fort Fraser, B.C.	CKPG-TV-3	6
Foxwarren, Man.	CKX-TV-1	11
Gaspe, Que.	CHAU-TV-6	10
Gaspe West, Que. (Bechervaise Mountain)	CFGW-TV-1	6
Goose Bay, Nfld.	CFLA-TV	8
Grand Bank, Nfld.	CJOX-TV-1	10
Grand Falls, Nfld.	CJCN-TV	4
Grande Prairie, Alta.	CBXAT	10
Grande Vallee	CKBL-TV-3	11
Greenwater Lake, Sask.	CKBI-TV-3	4
Haliburton, Ont.	CKVR-TV-3	5
Halifax, N.S.	CBHT	3
Halifax, N.S.	CJCH-TV	5
Hamilton, Ont.	CHCH-TV	11
Hearst, Ont.	CBFOT-2	7
	CFCL-TV-4	4
High Prairie, Alta.	CBXAT-2	2
Hixon, B.C.	CKPG-TV-1	10
Houston, B.C.	CFTK-TV-10	2
Hudson Hope, B.C.	CJDC-TV-1	11
Huntsville, Ont.	CKVR-TV-2	8
Invermere, B.C.	CFWL-TV-1	6
Inverness, N.S.	CJCB-TV-1	6
Jonquiere, Que.	CKRS-TV	12
Jubilee Mountain, B.C.	CFWL-TV-2	8
Juskatla, B.C.	CFTK-TV-7	2
Kamloops, B.C.	CFCR-TV	4
Kapuskasing, Ont.	CBFOT-1	12
Kapuskasing, Ont.	CFCL-TV-3	3
Kearns, Ont.	CFCL-TV-2	2
Kemano, B.C.	CFTK-TV-5	2
Kelowna, B.C.	CHBC-TV	2
Kenora, Ont.	CBWAT	8
Keremeos, B.C.	CHKC-TV-1	5
Kildala, B.C.	CFTK-TV-4	5
Kingston, Ont.	CKWS-TV	11
Kitchener, Ont.	CKCO-TV	13
Kokish, B.C.	CFKB-TV-2	9
Labrador City, Nfld.	CJCL-TV	13
L'Anse a Valleau, Que.	CHAU-TV-9	7
Lethbridge, Alta.	CJLH-TV	7
Lillooet, B.C.	CFCR-TV-1	11
Liverpool, N.S.	CBHT-1	12
Lloydminster, Alta.	CKSA-TV	2
London, Ont.	CFPL-TV	10
Lookout Ridge, Near Chilliwack, B.C.	CBUT-2	3
Lumby, B.C.	CHID-TV-1	5
Mabel Lake, B.C.	CHPP-TV-1	8
Magdalen Islands, Que.	CBFCT-1	12
Malakwa, B.C.	CFFI-TV-1	5
Malartic, Que.	CFCL-TV-5	5
Manicouagan, Que.	CKHQ-TV-1	10
Marquis, Sask.	CKMJ-TV	7
Marystown, Nfld.	CBNT-3	5
Matagami, Que.	CKRN-TV-4	7
Matane, Que.	CKBL-TV	9
Meadow Lake, Sask.	CKSA-TV-1	12
Medicine Hat, Alta.	CHAT-TV	6
Melita, Man.	CKX-TV-2	9
Merritt, B.C.	CFCR-TV-3	10
Mica Creek Village, B.C.	CFZQ-TV-2	5
Micoua, Que.	CKHQ-TV-3	6
Midway, B.C.	CKMY-TV-1	7
Minden, Ont.	CHEX-TV-2	10
Moncton, N.B.	CBAFT	11
Moncton, N.B.	CKCW-TV	2
Mont Blanc Perce, Que.	CFGW-TV-2	8
Mont Climont, Que.	CKBL-TV-1	11
Mont Georges, Que.	CKHQ-TV-5	13
Mont-Laurier, Que.	CBFT-2	3
Mont-Louis, Que.	CKBL-TV-4	2
Mont Tremblant, Que.	CBFT-1	11
Montreal, Que.	CBFT	2
Montreal, Que.	CBMT	6
Montreal, Que.	CFCF-TV	12
Montreal, Que.	CFTM-TV	10
Moose Jaw, Sask.	CHAB-TV	4
Mount Timothy, B.C.	CFCR-TV-6	5
Moyie, B.C.	CKVS-TV-1	5
Mt. Parizeau, B.C.	CFTK-TV-8	5
Mt. Poole (near Queen Charlotte) B.C.	CHQC-TV-1	4
Murdochville, Que.	CKBL-TV-2	6
	CKMU-TV-1	3
Nakusp, B.C.	CJNP-TV-1	2
	CJNP-TV-2	4
Nass Camp (Near Lava Lake) B.C.	CFTK-TV-6	5
Nelson, B.C.	CBUAT-1	9
Newcastle, N.B.	CKAM-TV-1	7
Newcastle Ridge, B.C.	CFKB-TV-1	7
New Glasgow, N.S.	CFCY-TV-1	7
Ninkish, B.C.	CFNV-TV-2	6
Nipawin, Sask.	CKBI-TV-4	2
North Battleford, Sask.	CKBI-TV-2	7
Ocean Falls, B.C.	CFTK-TV-9	2
Olalla	CHKC-TV-2	11
Oliver, B.C.	CHBC-TV-3	8
Ottawa, Ont.	CBOFT	9
	CBOT	4
	CJOH-TV	13
Outardes, Que.	CKHQ-TV-2	12
	CKHQ-TV-4	7
Parry Sound, Ont.	CKVR-TV-1	11
Passmore, B.C.	CHMS-TV-2	2
Peace River, Alta.	CBXAT-1	7
Peachland, B.C.	CHPT-TV-1	5
Pembroke, Ont.	CHOV-TV	5
Penticton, B.C.	CHBC-TV-1	13
Perce, Que.	CHAU-TV-5	2
Perrys, B.C.	CHMS-TV-3	5
Peterborough, Ont.	CHEX-TV	12
Pivot, Alta.	CHAT-TV-1	4
Placentia, Nfld.	CBNT-2	12
Port Albernie, B.C.	CBUT-3	4
Port Alfred, Que.	CKRS-TV-1	9
Port Alice, B.C.	CKPA-TV-1	2
Port Arthur, Ont.	CKPR-TV	2
Port Daniel, Que.	CHAU-TV-3	10
Port Hardy, B.C.	CFKB-TV-3	3
Port Rexton, Nfld.	CBNT-1	13
Prince Albert, Sask.	CKBI-TV	5
Prince George, B.C.	CKPG-TV	2
Princeton, B.C.	CHGP.TV-1	5
Prince Rupert	CFTK-TV-1	6
Promontory Mountain, B.C.	CFCR-TV-12	5
Quebec, Que.	CBVT	11
	CFCM-TV	4
	CKMI-TV	5
Quesnel, B.C.	CFCR-TV-11	7
Quesnel, B.C.	CKCQ-TV-1	13
Red Lake, Ont.	CBWAT-3	10
Regina, Sask.	CHRE-TV	9
Regina, Sask.	CKCK-TV	2
Red Deer, Alta.	CKRD-TV	6
Revelstoke, B.C.	CFZQ-TV-1	9
Rimouski, Que.	CJBR-TV	3
Riverhurst, Sask.	CJFB-TV-3	10
Rivière-au-Renard	CHAU-TV-7	7
Rivière du Loup, Que.	CKRT-TV	7
Riviere du Loup, Que.	CKRT-TV-3	13
Roberval, Que.	CKRS-TV-3	8
Rouyn, Que.	CKRN-TV	4
Saint John, N.B.	CHSJ-TV	4
Salmon Arm, B.C.	CHBC-TV-4	9
Saskatoon, Sask.	CFQC-TV	8
Sault Ste. Marie, Ont.	CJIC-TV	2
Savona, B.C.	CFCR-TV-7	8
Schefferville, Que.	CFKL-TV	11
Senneterre, Que.	CKRN-TV-1	7
Sheet Harbour, N.S.	CBHT-4	11
Shelburne, N.S.	CBHT-2	8
Sherbrooke, Que.	CHLT-TV	7
Sioux Lookout, Ont.	CBWAT-2	12
Skaha Lake (near Penticton), B.C.	CHBC-TV-7	10
Smithers, B.C.	CFTK-TV-2	5
Sointula, B.C.	CFKB-TV-4	5
Spences Bridge, B.C.	CJNA-TV-1	3
Squamish, B.C.	CHAR-TV-1	7
Squamish, B. C.	CBUT-5	11
St. John's, Nfld.	CBNT	8
	CJON-TV	6
Ste. Marguerite-Marie, Que.	CHAU-TV-1	2
St. Quentin, N.B.	CHAU-TV-2	10
Ste. Rose du Dégelé, Que.	CKRT-TV-2	2
Stephenville, Nfld.	CFSN-TV	8
Stranraer, Sask.	CFQC-TV-1	3
Sturgeon Falls, Ont.	CBFST	7

Location	C.L.	Chan.
Sudbury, Ont.	CBFST-1	13
	CKSO-TV	5
Swift Current, Sask.	CJFB-TV	5
Sydney, N.S.	CJCB-TV	4
Temiscaming, Que.	CBFST-2	12
	CJTK-TV-1	3
Terrace, B.C.	CFTK-TV	3
The Pas, Man.	CBWBT-1	7
Timmins, Ont.	CFCL-TV	6
	CBFOT	9
Toronto, Ont.	CBLT	6
	CFTO.TV	9
Trail, B.C.	CBUAT	11
Trois-Rivières, Que.	CKTM-TV	13
Upsalquitch Lake, N.B.	CKAM-TV	12
Val D'Or, Que.	CKRN-TV-2	8
Val Marie, Sask.	CJFB-TV-2	2
Vancouver, B.C.	CBUT	2
Vernon, B.C.	CHBC-TV-2	7
Victoria, B.C.	CHEK-TV	6
Ville Marie, Que.	CKRN-TV-3	6
Waterton Park, Alta.	CJWP-TV-1	12
Westwold, B.C.	CFWS-TV-2	12
Whitecourt, Alta.	CBXT-2	9
	CFRN-TV-3	12
Williams Lake, B.C.	CFCR-TV-5	8
Willow Bunch, Sask.	CKCK-TV-2	6
Windsor, Ont.	CKLW-TV	9
Wingham, Ont.	CKNX-TV	8
Winnipeg, Man.	CBWFT	3
	CBWT	6
	CJAY-TV	7
Wynyard, Sask.	CKOS-TV-3	6
Yellowknife, N.W.T.	CFYK-TV	8
Yorkton, Sask.	CKOS-TV	3
Yarmouth, N.S.	CBHT-3	11
Yuill Mountain, Balfour, B.C.	CKBF-TV-1	5

World-Wide Shortwave Stations

■ Once again we take off on our big DX contest—the one without the prizes—but also the one that separates the novices from the know-it-alls. Take a whack at these and see how you do:

1. Hooray! Several DX'ers have reported hearing the Voice of the U.N. Command at Deragawa, Okinawa—long an elusive exclusive DX catch. Look for it on 9845 kHz around 1130 GMT.

2. How about a rather hard-to-hear country: Spanish Sahara? They're on the standard broadcast band just to make things more difficult, but they're running a shiny new 50,000-watt rig to help you along. Schedule is 0900 to 1300 and 2000 to 2400 GMT.

3. How many ship stations can you log in a 30-minute period on 2738 kHz? That's an intership channel.

4. New country? Try on Biafra, a breakaway state in Western Africa—might be a short-lived one too. As of this writing, they're on the air as the Voice of Biafra from Enugu. Watch for them on 4855 kHz (also 4775 kHz) at 1830 to 2230 GMT.

5. You'll adore Andorra if you hear their shortwave transmitter on 6065 kHz and 6190 to 6200 kHz. Would you believe 1300 to 1600 GMT?

Now for the scoring, each item (except number 3) earns you 20 points. For number 3, score 1 point for each station logged.

If you score 20 you're in sad shape, 40—you show promise, 60—means you're on the ball, 80—*fantastique!* 100—we don't believe you! ■

This Issue's Contributors

Wilfred Adams, New Hope, Pa.
Bennie Martino, Brooklyn, N. Y.
Al Schwartz, Olympia, Wash.
Fred Nottingham, Ardmore, Okla.
James Gibson, Kew Gardens, N. Y.
Richard Curtis, Ft. Valley, Ga.
Kerry Matthews, Miami Beach, Fla.
N. LaRosa, New York, N. Y.
Phil Ohman, Vancouver, B. C.
Martin Kortlander, Buffalo, N. Y.
Ted Arndt, Cleveland, O.
William Crosby, Chicago, Ill.
Donald Brownson, Alliance, O.
Tom Kneitel, New York, N. Y.
Sy Reynolds, Atlanta, Ga.
Barry O'Brien, Salt Lake City, Utah
Steve Francisco, El Paso, Tex.
Irwin Morton, Montreal, Que.
Greg Hobart, Fargo, N. D.
Charles Cotton, Augusta, Ga.
Russel Cook, Ottawa, Ont.
Thor Nordstrom, Minneapolis, Minn.

kHz	Call	Name	Location	GMT
90-Meter Band—3200-3400 kHz				
3230	VRH8	Fiji I. BC	Suva, Fiji Is.	0400
3990	—	V. America	Monrovia, Liberia	0700
3995	VQO4	—	Solomon Is.	1010
60-Meter Band—4750-5060 kHz				
4870	—	R. du Dahomey	Cotonou, Dahomey	0530
4872	TGQH	R. Santa Cruz	Santa Cruz, Guat.	0135
4890	—	R. Senegal	Dakar, Senegal	0610
	VLK4	Australian BC	Port Moresby, Papua	0905
4915	—	R. Ghana	Accra, Ghana	0550
4923	HCQR1	R. Quito	Quito, Ecuador	2230
4940	—	R. Abidjan	Abidjan, Ivory Coast	0600
4955	HJCQ	R. Nacional	Bogota, Colombia	0030
4965	HJAF	R. Santa Fe	Bogota, Colombia	0515
5025	—	V. Amazona	Manaus, Brazil	0345
5030	YVKM	R. Continente	Caracas, Venez.	0710
49-Meter Band—5950-6200 kHz				
5970	—	R. Canada	Montreal, P.Q.	0900
5985	—	R. Portugal	Lisbon, Port.	0310
5990	TGJA	R. Nuevo Mundo	Guatemala City, Guat.	0045
6000	PRK5	R. Inconfidencia	Belo Horizonte	0015
6005	CFCX	—	Montreal, P.Q.	2000
6010	YSS	R. Nacional	San Salvador, El Sal.	0505
6035	—	R. Globo	Rio de Janeiro	2345
6040	HJCB	V. del Tolima	Ibaque, Colombia	0350
6065	PRL8	R. Nacional	Rio de Janeiro, Braz.	0625
6070	CFRX	—	Toronto, Ont.	0920
6075	—	R. RSA	Johannesburg, S. Africa	0500
6082	OAX6Z	R. Nacional	Lima, Peru	0300
6085	ZYK2	R. Jornal	Recife, Brazil	2340
6090	HISD	R-TV Dominicana	Santo Domingo, D.R.	1045
	VL16	Australian BC	Sydney, Austral.	1025
6100	DMQ6	Deutsche Welle	Cologne, W. Germany	0005
6120	—	Swiss BC	Berne, Switz.	0545
6130	CHNX	—	Halifax, N.S.	0900
6135	—	R. Habana	Havana, Cuba	0415
6150	VLR6	R. Australia	Melbourne, Austral.	1035
6180	—	BBC	London, England	0400
6215	TIHBG	R. Reloj	San Jose, C.R.	0130
6257	—	R. Centinela	Loja, Ecuador	0235

41-Meter Band—7100-7300 kHz

kHz	Call	Name	Location	GMT
7105	—	R. Free Europe	Munich, Germany	0400
7120	—	BBC	Tebrau, Singapore	1130
7130	—	V. Free China	Taipei, Formosa	1113
7135	—	R. Monte Carlo	Monte Carlo, Monaco	0500
7150	—	R. Moscow	Moscow, USSR	0200
7185	—	R. RSA	Johannesburg, S. Afr.	0515
7190	—	R. Australia	Melbourne, Austral.	0340
7210	—	R. Senegal	Dakar, Senegal	0700
7225	—	R-TV Marocainne	Rabat, Morocco	0600
7265	—	R. Tirana	Tirana, Albania	2005
7270	—	R. RSA	Johannesburg, S. Afr.	0500
9360	—	R. Nacional	Madrid, Spain	2320
9491	OAX6H	R. Tacna	Lima, Peru	0250

31-Meter Band—9500-9775 kHz

kHz	Call	Name	Location	GMT
9500	CE950	R. Corporacion	Santiago, Chile	0345
9505	—	NHK	Tokyo, Japan	0900
	PRB22	R. Record	Sao Paulo, Brazil	0935
9510	YVXJ	R. Barquisimeto	Barquisimeto, Braz.	1120
9515	XEWW	V. America Latina	Mexico City, Mex.	0115
9520	ZL18	V. New Zealand	Wellington, N.Z.	0730
	—	V. America	Tangier, Morocco	2235
9525	—	R. RSA	Johannesburg, S. Afr.	2135
9530	VUD	All India R.	Delhi, India	2330
9535	—	Swiss BC	Berne, Switz.	2310
9540	ZL2	R. New Zealand	Wellington, N.Z.	1115
9580	—	R. Australia	Melbourne, Austral.	1000
9590	—	R. Nederland	Bonaire, Neth. Ant.	0200
9595	JOZ3	Nihon BC	Tokyo, Japan	1045
9600	CE960	R. Presidente	Santiago, Chile	2320
9605	DMQ9	Deutsche Welle	Cologne, W. Germ.	0250
9610	VLX9	Australian BC	Perth, Austral.	1120
9615	VUD	All India R.	Delhi, India	1130
	—	V. America	Tangier, Morocco	0530
9625	—	BBC	London, England	0545
	4XB51	Kol Yisrael	Tel Aviv, Israel	2020
9640	—	V. Free Korea	Seoul, S. Korea	1035
9645	HCJB	V. of Andes	Quito, Ecuador	0835
9655	—	R. Habana	Havana, Cuba	0630
9660	—	Australian BC	Brisbane, Austral.	0720
9665	HEU3	Swiss BC	Berne, Switz.	2015
9667	—	R. Colombo	Colombo, Ceylon	1240
9675	—	R. Habana	Havana, Cuba	0630
	—	R. Japan	Tokyo, Japan	1020
9680	—	R. Nacional	Lisbon, Portugal	0305
9685	ZYR227	R. Gazeta	Sao Paulo, Braz.	2340
9690	LRA32	RAE	Buenos Aires, Arg.	0605
9695	—	Swiss BC	Berne, Switz.	0510
9700	—	R. Sofia	Sofia, Bulgaria	2330
9705	—	R. RSA	Johannesburg, S. Afr.	1010
9710	—	RAI	Rome, Italy	2030
9715	—	R. Tirana	Tirana, Albania	2000
9725	—	Kol Yisrael	Tel Aviv, Israel	2115
9730	—	R. Berlin Int'l	Berlin, E. Germ.	0230
9735	DMQ9	Deutsche Welle	Cologne, W. Germ.	0515
9755	—	R-TV Francaise	Paris, France	0000
9760	—	R. Ghana	Accra, Ghana	2030
	—	R. Nacional Espana	Madrid, Spain	0305
9770	—	Viennese R.	Vienna, Austria	2300
9833	—	R. Budapest	Budapest, Hungary	0340
9865	YDF6	RRI	Djakarta, Indonesia	1100
9883	—	R. Peking	Peking, China	0345
9915	VUD	All India R.	Delhi, India	2145
9920	—	R. Peking	Peking, China	2225
11672	—	R. Pakistan	Karachi, Pakistan	2015
11705	—	R. Vatican	Vatican City	1930
	—	R. Sweden	Stockholm, Sweden	0400
11710	—	R. Moscow	Moscow, USSR	0400
11715	PJB	PJB	Bonaire, Neth. Antilles	0410
11720	—	R. Canada	Montreal, Que.	2200
11725	—	R. Brazzaville	Brazzaville, Congo	0515
11730	—	R. Nederland	Hilversum, Netherlands	0645
	—	R. Moscow	Moscow, USSR	0330
11740	CE1174	R. Nuevo Mundo	Santiago, Chile	1110

25-Meter Band—11750-11975 kHz

kHz	Call	Name	Location	GMT
11750	—	R. Kiev	Kiev, USSR	0410
11760	—	Vatican R.	Vatican City	0110
11775	—	Swiss BC	Berne, Switz.	0715
11780	—	R. Japan	Tokyo, Japan	1130
11785	—	Radio Berlin Int'l	Berlin, E. Germ.	2200
11795	—	R. Nacional	Rio de Janeiro, Braz.	0000
11800	—	R. Nacional Espana	Tenerife, Canary I.	2230
11805	—	R. Sweden	Stockholm, Sweden	0200
11810	—	R. Australia	Melbourne, Australia	0950
11815	—	NHK	Tokyo, Japan	1000
11820	PJB	PJB	Bonaire, Neth. Antilles	1105
11855	—	Far East BC	Manila, Philippines	0935
11860	—	R. Accra	Accra, Ghana	2020
	—	BBC	London, England	0630
11875	—	R. Berlin Int'l	Berlin, E. Germ.	1045
11895	—	R. Senegal	Dakar, Senegal	2330
11900	—	R. RSA	Johannesburg, S. Afr.	2100
11910	HSK9	R. Thailand	Bangkok, Thailand	1115
	HCJB	V. of Andes	Quito, Ecuador	0230
11940	—	R. Bucharest	Bucharest, Rumania	0150
11945	—	R. Canada	Montreal, Que.	2300
11950	ELWA	R. Village	Monrovia, Liberia	0710
11970	—	R. Tunis	Tunis, Tunisia	0145
11990	—	R. Prague	Prague, Czech.	0000
12095	—	BBC	London, England	0300
15030	—	R. Peking	Peking, China	1255
15050	—	R. Liberdad	(clandestine)	0005
15056	—	R. Euzkadi	(clandestine)	1530
15060	—	R. Peking	Peking, China	0000

19-Meter Band—15100-15450 kHz

kHz	Call	Name	Location	GMT
15110	ZL21	R. New Zealand	Wellington, N.Z.	0540
15115	HCJB	V. of Andes	Quito, Ecuador	0300
15125		R. Nacional	Lisbon, Portugal	2335
15135	—	Trans World R.	Bonaire, Neth. Antilles	1300
15140	—	R. Moscow	Moscow, USSR	1115
15155	ZYB9	R. de Sao Paulo	Sao Paulo, Brazil	2100
15160	—	R. TV Francaise	Paris, France	1600
15165	—	V. Denmark	Copenhagen, Denmark	1245
15175	—	R. Norway	Oslo, Norway	2300
15180	—	R. Moscow	Moscow, USSR	0610
15185	—	R. Habana	Havana, Cuba	1000
	OIX4	R. Finland	Helsinki, Finland	1645
15200	—	R. Moscow	Moscow, USSR	1600
15215	—	R. Free Europe	Munich, W. Germ.	2200
15225	—	R. Bucharest	Bucharest, Rumania	0230
15230	—	R. Habana	Havana, Cuba	0335
15240	—	R. Sweden	Stockholm, Sweden	1905
15285	—	R. Ghana	Accra, Ghana	1830
15315	ETLF	R. Voice of Gospel	Addis Ababa, Ethiopia	1340
15320	—	R. Moscow	Moscow, USSR	2035
15325	HCJB	V. Andes	Quito, Ecuador	2000
15350	—	R. Berlin Int'l	Berlin, E. Germ.	2250
15380	—	R. Nac. Espana	Tenerife, Canary Is.	2015
15440	WNYW	R. N.Y. Worldwide	New York, N.Y.	1735
17680	—	R. Peking	Peking, China	0125

16-Meter Band—17700-17900 kHz

kHz	Call	Name	Location	GMT
17720	BED39	V. Free China	Taipei, Formosa	0245
17740	—	R. Moscow	Moscow, USSR	2030
17765	—	Deutsche Welle	Kigali, Rwanda	1745
17770	—	R. Liberty	Munich, W. Germ.	0400
17775	—	R. Nederland	Hilversum, Neth.	2310

13-Meter Band—21450-21750 kHz

kHz	Call	Name	Location	GMT
21485	—	R. Vatican	Vatican City	1050
21535	—	Springbrook R.	Johannesburg, S. Afr.	1400
21545	—	R. Ghana	Accra, Ghana	1500
21630	—	BBC	London, England	1630
21710	—	BBC	London, England	2100
21735	—	R. Prague	Prague, Czech.	1500
25650	—	BBC	London, England	1610

Peanut-Whistle Hams

Continued from page 50

really know how to use their present shortwave receivers to best advantage? "Perhaps 1 in 500," declares Katz.

Trade Secrets. Skilled operators are indeed few and far between. Unlike the receiving and antenna sub-categories, there is no loyal following nor guidelines which a new flea-power enthusiast can look to for direction. No leader exists who will acknowledge that he is any more than an "average" operator, and few reports have ever been published which reveal the secret techniques those sacred few employ to achieve 12,000-mile DX contacts with about $45 worth of equipment. Two things are clear, however. Nearly all record-breaking QRP contacts have been scheduled well ahead of time, and most seem to have taken place in the wee hours of the morning. But aside from this, the boys just arn't talking.

Closer examination, however, reveals that the tricks the truly skilled use are nothing more than exemplifications of the Ultimate Receiver and Kraus theories: (1) The more gain and efficiency you have in your antenna, the less power you need to make contact; (2) the more "trained" your ear is the better your chances of interpreting what an average ham would call an "unreadable signal." Add to this the fact that nearly 85 percent of the hard-core QRPers use code transmissions (CW) for DX work, and you begin to see the light.

The fact that power limitations overseas are far more stringent than in the U.S. may help explain why peanut-whistles tend to be the *in* Hgs abroad. Particularly in the U.S.S.R., Germany, and Australia, transistorized transmitters are the vogue and QRPers talk not in terms of watts, but milliwatts.

In the U.S. and Canada, enthusiasts generally build transmitters that are simpler in design. Yet they conduct themselves in the same manner on the air. Once a contact has been established—regardless of the distance involved—power is cranked down to the barest minimum and then measured. This provides for follow-up QSL cards that read: "Transmitter—1/65th watt input to an RCA 2N247."

Three Thousand Strong. For Novices (who under the recently-adopted Incentive Licensing Regulations now get a 2-year license term) probably one of the most gung-ho organizations to join is the QRP Amateur Radio Club-International. This is a group of some 3000 amateurs scattered throughout the world who are dedicated to low-power operation as their contribution toward relieving the tremendous QRM and congestion now running rampant on all popular ham frequencies. With the built-in 75-watt restriction on Novices, the QRP Amateur Radio Club is practically tailor-made for these newcomers (though it by no means is restricted to Novice operators alone). Qualifications: You must run under 100 watts input (200 watts p.e.p on sideband) to be eligible. Hitch: If you're ever caught manning a transmitter which exceeds this limitation, you're drummed out permanently.

With supporters the world over, the QRP A.R.C. sponsors contests for its members, presents awards for best performances with the least power, and publishes a quarterly newsletter chock full of interesting accounts of organizational news and individual case histories. Cost for lifetime membership is only $2.00, easily within reach of the average low-power enthusiast. Send your fee along with a request for membership to QRP A.R.C. secretary John E. Huetter, K8DZR, 2146 Chesterland Ave., Lakewood, Ohio 44107.

What can you expect if you join the flea-power community? Heterodynes, swishing VFOs, pileups, clobbering, and plenty of QRM—to say nothing of a gradually increasing feeling of insecurity and inferiority. If you're willing to weather the disadvantages, however, you may be as lucky as New Zealand's Les Earnshaw, ZL1AAX, who managed a fine QSO with Kentucky running only 20 milliwatts input! Or maybe W6TNS who received his Worked All Continents award back in 1959 using only 80 milliwatts with a homebrew transmitter designed for Novice band operation. Or maybe even the author, who managed 40 states (confirmed through QSLs) simultaneously on both 80 meters (with 3 watts) and 6 meters (with 5 watts).

But if you become a true dyed-in-the-wool QRPer, look out. Just exceed 100 watts once, and you'll have all of hamdom's low-power addicts to contend with—to say nothing of a formal QRP International drumming-out ceremony! ■

Hot Line To Weatherman

Continued from page 99

no squelch, it works remarkably well. It makes use of the AM receiver and a crystal controlled convertor to receive VHF, and employs the slope detection method to demodulate the FM signal.

Convertors. There are numerous manufacturers that offer VHF convertors that are used in conjunction with AM receivers. The receiver can be either an auto radio, home BCB radio, shortwave receiver, BCB transistor portable, etc. This type convertor has to be wired into the receiver and instructions outlining how to do it are supplied.

Some types, such as the Metrotek "Listen-in" portable convertor, doesn't have to be wired into the receiver. Just place it alongside.

Ameco offers a selection of models which can be used for various receivers. One of the Ameco convertors can be connected to an AM marine radiotelephone and used to receive weather broadcasts by setting the radiotelephone on an unused channel. Of the types available are a selection utilizing tubes or transistors. Some are tunable through several bands.

VHF Marine Radio. If you have VHF/FM marine radiotelephone, it is easy to provide for reception of weather broadcasts. Just install a 162.55-MHz crystal in an unused marine channel setting and that is all it takes. If you have a VHF/FM marine band walkie-talkie, you can do the same thing, that is, if you have an unused channel available.

Used Equipment. A two-way VHF/FM mobile radio will operate beautifully as a weather broadcast receiver. These units can be picked up from two-way radio equipment dealers who take them in on trade when new units are sold.

Much of this equipment is obsolete wide band FM that cannot be used commercially, so can be gotten cheaply. Realize that you won't use the transmitter portion, so install a crystal in the receiver section for 162.55 MHz and you have an excellent weather receiver. Removing the tubes from the transmitter section will cut down considerably on power drain. You should be able to get one for about $75.

There are also lots of obsolete wideband VHF/FM walkie-talkies around that can be equipped with a crystal for 162.55 MHz and then used as a portable weather receiver.

Construction. You might try your hand at constructing a receiver to get the weather broadcasts. A very sensitive and easily made receiver is the superregenerative type. These receivers work well at 162.55 MHz and are quite sensitive. They present few construction problems and a number of articles have been published on building them.

Reception. As is well known, the distance that you can receive VHF frequencies well depends to a great degree on the height of your antenna as well as the height of the antenna at the transmitter. Hills and valleys between the two antennas can cause dead spots, or poor reception. It is recommended that a good antenna, mounted high and in the clear, be installed. This will result in more consistently good reception.

A proper VHF antenna is needed for fixed, tunable and combination receivers as well as two-way mobile radios for best results when used as weather receivers. When close to the Weather Bureau station, an 18-in.-length of copper wire can be used as an antenna. It is positioned vertically and then connected to the receiver "ANT" terminal. In a car, an 18-in. whip can be installed in the center of the roof. As mentioned before, better results can be obtained when an external antenna is used, mounted as high (in the clear) as possible. The use of coaxial cable between the antenna and receiver is recommended.

Shipboard. On boats, where space is at a premium, the antenna can be one of several varieties. All of them are verticals or variations thereof and should be mounted as high as practical. Coaxial cable is required between the antenna and receiver.

Noise in the VHF band is usually much lower than in the AM broadcast and MF marine band. Also, a true FM receiver discriminates against noise impulses.

An FM receiver will give the clearest and most noise free reception. When a VHF convertor is used with an AM receiver, speech will not sound as clear because the detector is not as efficient as an FM demodulator, which uses a discriminator, ratio detector or gated beam circuit.

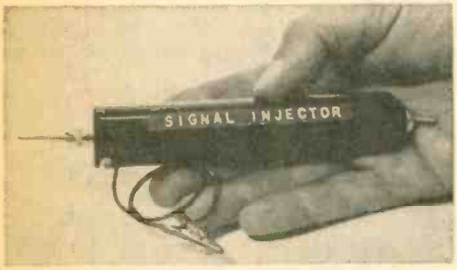
Whether you use a true FM receiver, or an AM receiver/VHF convertor combination, there are benefits derived from hearing up-to-date weather broadcasts from United States Weather Bureau stations, a government service for the public. ■

Mini-Jector

Continued from page 92

down when using Mini-jector, or a miniature toggle switch. Solder the connecting leads to the switch before installation. The wires should be long enough to allow the board to be removed for battery replacement.

After the switch is installed, position the board so it is just ready to enter the probe handle, then cut the leads from S1 to the exact length and solder. Since the leads must fold under the perf-board when the assembly is inserted in the tube, S1's con-



Completed Mini-jector is ready to go to work tracking down the culprit in just about any piece of electronic gear, from hi-fi tuners to public address systems.

necting leads should be #24 stranded hook-up wire or thinner.

The common test lead (ground) will be connected to the common push-in terminal. On the front of the probe body, directly opposite the common push-in terminal, cut a slot with cutters; then solder about 6 in. of insulated stranded wire to the common terminal. Solder about 2 in. of #20 or #22 solid wire to the staked terminal (the output), slide the wire into the test prod tip, and mount the front of the test probe. Two screws hold the front assembly in place. Now Mini-jector is ready for use.

Using Mini-jector. As a general rule, the injector's ground lead must be connected to the equipment under test, even for RF signal injection. The injector's output has been deliberately limited to about 0.1 volt, so you need not be afraid to apply the injector's output to a transistor base—you won't damage the transistor.

Should you check Mini-jector's output with a scope, you will note that the signal at Q1's collector is essentially a square wave, while the output at Q2's collector is not square—it is more like a sawtooth. This is normal. The component values for Q2 have been selected for a sawtooth output, which has a higher harmonic content than a square wave.

The total battery current drain is approximately 0.25 to 0.5 mA, and the battery, under normal usage should rival shelf life. If you don't use the unit for a considerable length of time, remove the battery—to avoid damage in case the battery corrodes and leaks on the circuitry. ■

Lucky 13 for Bored DXers

Continued from page 74

Frequency (kHz)	Call	Operator & Location
12890 x	VCS	Dept. of Transport Camperdown, N.S., Canada
12885	WMH	Radiomarine Corp. Baltimore, Md.
12885 x	SAG	Government Goteburg, Sweden
12883	NBA	U.S. Navy Balboa, Canal Zone
12878	JCU	Government Choshi, Japan
12875 x	NPG/NLK	U.S. Navy Vallejo, Calif.
12840	WPA	Radiomarine Corp. Pt. Arthur, Texas
12826.5	WNU	Tropical Radio Tel. Slidell, La.
12826.5	JCS	Government Tokyo, Japan
12825 x	FFP7	Government Fort-de-France, Martinique
12808	KPH	Radiomarine Corp. Bolinas, Calif.
12781.5	OST	Government Brussells, Belgium
12770 x	NDT	U.S. Navy Tokosuka, Japan
12768	PCH5	Government Scheveningen, Netherlands
12765 x	HJQ	Government Cartagena, Colombia
12763.5	DAM	Funkamt Hamburg Norddeich, W. Germany
12760 x	OXZ	Government Lyngby, Denmark
12750	PJK	Dutch Navy Suffisant, Curacao
12534		Ships at Sea *
12558		Ships at Sea *

Shortwave For Non-SWLS

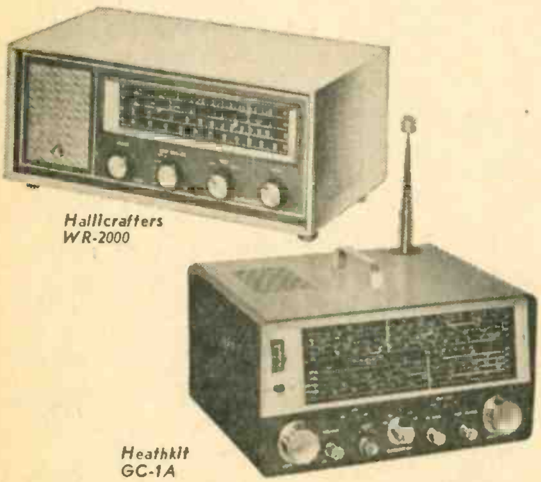
Continued from page 58

teur news media will pick up the information and pass it around.

Overseas Hams. Some foreign amateurs tend to stay on one or two frequencies and have approximate hours and/or days of operation. Such information can be gleaned from examination of the NRRC's amateur section. Again, notes can be arranged by time.

One DXer prepares a 3x5 card on each amateur representing a new country, listing information mentioned above, then tacks the cards to a bulletin board. Thus, he can quickly refer to any item at a glance.

Another method of picking up information is just by listening. American amateurs tend to concentrate in the low end of the phone band when calling foreign Hams and you can quickly spot band openings by listening for DX hounds calling "CQ DX."



Hallicrafters WR-2000

Heathkit GC-1A

Some special types of receivers can be used for SWLing. For example, above is a deluxe table model set featuring several SW bands; below is portable transistor all-band job.

Regardless of what set of frequencies you like to tune, your organization and preparation is the key to logging good DX. After you are familiar with the bands and can almost identify a station by its modulation characteristics and transmitting frequency, random tuning can yield good results.

By knowing the characteristics of the band or bands, and knowing the stations that are normally present, a stranger will stand out.

One of the keys to being a good SW DXer is keeping your equipment in good shape. Install the best antenna you can—a wire as high and as long as your space limitations permit. And arranging your listening post for convenience will make those dial-twiddling hours more fun and productive.

When making logs, put your notes in one book and, when full, file it away.

Happy SWLing. Shortwave listening can be an interesting hobby. You can be Johnny-on-the-spot rather than waiting for the six o'clock evening news on television. And, you can get first-hand experience at comparing political points of view.

The basics of joyful SWLing is to acquire some of the above-mentioned reference materials and at least one club bulletin, and then plan your listening. See how other listeners do it, use the best of their ideas, and compare notes. Ask questions and do some reading. You'll be surprised at the results of a little diligence and perseverance when you go back to those dials, and put your "ear to the world," as it were. ■

Mood Monitoring

Continued from page 78

fied and average responses were computed with a Mneumotron Computer. The computer is triggered by the output of the same waveform generator producing the clicks. Therefore, the brain potentials in response to the clicks are treated as signals by the computer. Other brain potentials, not in response to the computer stimuli, are treated as noise and effectively cancelled out.

Output is recorded on an X-Y plotter and on punched paper tape. The tape is then fed into a Honeywell H-800 computer for analysis.

This revolutionary three-year experiment proved to the Honeywell scientists that they could definitely monitor brain waves in response to defined stimuli. These patterns correlated very closely with conventional patterns of sleep and awareness, and were confirmed by the TV monitoring of the subject's behavior. As Honeywell scientist Donald I. Tepas summed up: "We can now effectively monitor human behavior."

He concludes that we will one day be able to tell whether or not a soldier on the battlefield is weary, a pilot in the air alert, an astronaut far out in space awake or asleep. ■

CB Moonshine

Continued from page 60

latch onto that legendary QSL. So, coming East and passing this close anyway, figured I might as well give it a good personal try.

Climbed slowly to the top of a ridge, and there just below and beyond was Seven Creek—three unpainted houses, general store, church and a one room school—just like I pictured it. I parked in front of the general store which doubled as a post office. A bunch of kids gathered round to stare at my '68 Buick. I took my keys out of the ignition, moved out the car and into post office past a blonde Daisy-May type in the doorway who was also admiring the Buick.

I walked kind of tall up to the old fellow behind the cash register. "Where can I find the Mountaineer?"

He looked me over a few seconds then gave out with a long hillbilly type laugh. "We're all mountaineers, boy."

"I mean the fellow that gets his mail under that name. The one that talks on the radio."

"Never heard of him."

There were a couple others seated in the far corner. They shook their heads in unison then all three decided to ignore me. But as I left, the gal in the doorway followed me to my car. "What do you want with the Mountaineer?"

Lying smoothly. "I'm interested in his CB compressor."

She got in the car without being asked. "You can get one of those by mail." She ran her hand along the upholstery.

"I'm in the wholesale business." Decided to meet con with con. "Thought maybe we could work out a deal." Once I got that QSL, yours truly would be long gone.

"You're one of them engineer fellows."

I nodded. It was the truth.

"Papa's been working on some refinements for his compressor." She considered it. "Maybe you could help him."

"He's your father?"

"That's right." She produced a packet of CB mail all addressed to the Mountaineer. "You start this thing and I'll direct you."

"Okay." We headed West, out of town and over another ridge. "What's your name?"

"Mary June, an' when you get to the next fork turn left." She began opening mail. Those letters containing money Mary June put in her shirt pocket. Everything else she pitched out the window.

At that fork, the road turned to clay.

"Take it easy now, or you'll skid right off the road." Mary June scanned an FCC complaint. It went out the window, too!

I laughed. "What happens then?"

"We'll have to walk the next four miles."

"Nice day for a walk." Like I said, once I got the QSL Seven Creek and I would permanently part.

"Wouldn't bother me none. I do it every day. But don't figure you're in shape."

Decided I wasn't so we crawled along at 10 miles per hour.

Mary June put my rig on the air. "Mountaineer, this is daughter. I'll be there directly. I'm bringing somebody with me you'll want to meet."

He came back. "I'll be waiting, girl."

Mary June shut the CB off entirely and a funny feeling began around the back of my neck. Five minutes later the road came to a dead end in front of their cabin.

"Come on, papa'll be waiting inside." She moved on out of the car and up the path.

I took a long deep breath, followed. Just as soon as I was well clear of the car, Mountaineer stepped from behind a big pine tree with shotgun pointed squarely at my middle. He stood silent for a few seconds, looked me over. "Who is he, girl?"

"He's an engineer and he says he wants to help you sell your compressor." Mary June brought forth the batch of orders from her pocket.

"Don't need no selling help."

"But being an engineer he can help you with that technical problem." A gleam in her eye. "You know, the meter."

The old man grinned. "And besides, being kind of a pretty man, you'd like to keep him a while."

Mary June blushed. "Well, he *is* a man."

Mountaineer motioned toward the cabin and we all started walking that way. "Yeah, boy, maybe you can help me. You've seen how the S-meter on your rig tends to jump when I use the compressor?"

I nodded and Mary June opened the door for us.

"Well, that don't look so good?" He put himself down in a rocking chair. "And to keep Mary June happy, I figure you can just be my guest until you figure out a way to keep it from *jumping*."

So it seems I'll latch onto that rare QSL for sure, but how do I get home with it? ■

Dynamic Duo

Continued from page 77

operation range can be determined from the curves by using the following formula:

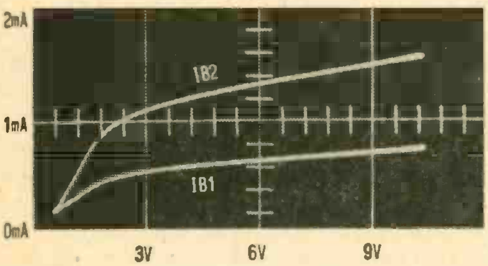
$$Beta = \frac{I_c}{I_b} \text{ or } Beta = \frac{\Delta I_c}{\Delta I_b}$$

$$\Delta I_c = I_{c2} - I_{c1} \text{ and } \Delta I_b = I_{b2} - I_{b1}$$

Following this formula and using the values given on the curves, we can determine beta and see if the transistor is operating within its linear range.

Beta for curve 1:

$$\frac{1mA}{.02mA} = 50$$



Typical curves that finished Dynamic Duo will display on your scope let you check vital transistor statistics.

Beta for curve 2:

$$\frac{2mA}{.04mA} = 50$$

If the two values of beta are equal or very close in value, the transistor in both curves is operating within its linear region. As a check, figure the beta using the delta currents.

$$\Delta I_c = 2mA - 1mA \text{ or } 1mA$$

$$\Delta I_b = 40uA - 20uA \text{ or } 20uA$$

$$Beta = \frac{1mA}{.02mA} \text{ or } 50$$

To match transistors for any applications, pick a desired transistor and connect it to the tracer. Adjust the curve tracer for the desired curves and grease-pencil the two curves on the scope's screen. Now, without disturbing the tracer or scope controls, connect similar transistors to the tracer until you find one that has approximately the same curves. ■

Tapeless TV Recorder

Continued from page 68

ing could then be made insensitive to the action of light. This may be what CBS says is a "sort of development process."

The basic characteristics of the photochromic dyes would fit the needs of EVR admirably, since they can provide images of extremely high resolution. (In actual fact, a square inch of film treated with such a dye can record the contents of a large book!) This is in keeping with CBS's claims that the EVR film can store much more information than can magnetic tape, and that the EVR system could be coupled with such devices as the firm's Linotron electronic typesetter.

The idea that a photochromic process such as this, or something akin to it, underlies the EVR process gains credence when it is noted that one collaborating company is a major manufacturer of dyes. Ciba Ltd. (a Swiss manufacturer of dyes) and Imperial Chemical Industries (England) jointly own Ilford Ltd., a well-known manufacturer of photographic materials. All three are involved with CBS in the EVR project.

It is only a guess on our part that CBS might be using a photochromic process, and CBS isn't ready to either confirm or deny the idea at this time. But until CBS actually reveals the techniques used, this guess is as good as any other.

EVR Vs. VTR. Manufacturers of EVR equipment, and those making magnetic video tape recording (VTR) systems, will undoubtedly battle hard for future educational and home consumer markets. For video equipment customers this spells better equipment at lower prices.

As things stand now, EVR may have a significant price advantage over VTR. EVR playback units are tentatively pegged at $280, but even this relatively low price may drop as demand for the equipment increases. In comparison, most VTR equipment now costs upward of $1000, but prices are going down steadily and may drop more because of technologic advances and the pressure of imminent rough competition from EVR.

In fact, one California company (Newell Associates) reports that it has devised a new magnetic video tape deck that can bring color video into homes at prices approximating the cost of an ordinary TV set. The company has also developed a very compact tape reel (less than 2 in. in diameter) that can pack about 45 minutes of program material into channels on standard ¼ in. tape. A full-length color movie can reportedly by put on this magnetic tape for only $20.

The anticipated cost of EVR film is from $7 to $14 per 20 minutes of black-and-white material. This figures out to $21 to $42 per hour. The cost of color hasn't been estimated as yet, but it would undoubtedly be substantially more inasmuch as double the amount of film is needed. The magnetic tape and EVR film costs already appear to be competitive.

Premium For Flexibility? Price is not the only factor involved when a customer attempts to choose between a magnetic video system and the EVR system. Flexibility of operation can be a deciding factor for many. And in this respect EVR has to take a back seat.

EVR can only be used to play films that have been factory-programmed; it cannot be used to record video programs directly off the air. On the other hand, VTR can play purchased tapes, record programs from TV broadcasts, or tape live action by the use of video cameras. Moreover, magnetic tapes can be erased and used to record new program material; this is not possible with EVR film.

You can bet a silver dollar against a burned-out resistor that video experts in many companies are working feverishly to develop other systems they aren't breathing a word about. There is no telling what may be up their electronic sleeves. Whatever it is, it will be shaken out as quickly as possible to prevent EVR from getting too much of a head start in what promises to be a revolution in TV use.

No one system is ever likely to monopolize the video recording business. There will undoubtedly be a demand for both EVR-type systems as well as for magnetic tape systems. The situation is analogous to the present healthy demand for both magnetic tape recorders and LP records. Not everyone cares about recording his own material; to these people playback alone is sufficient, and they will go on buying ready-made LP records and pre-recorded tapes. Similarly, some will want flexible equipment that can do all things in the video field; others will be quite happy with only playback equipment such as EVR, especially if the cost is lower.

Intrepid Inventor. The EVR system created by CBS came into being under the guidance of Dr. Peter C. Goldmark, President and Director of Research of the CBS Laboratories in Stamford, Connecticut.

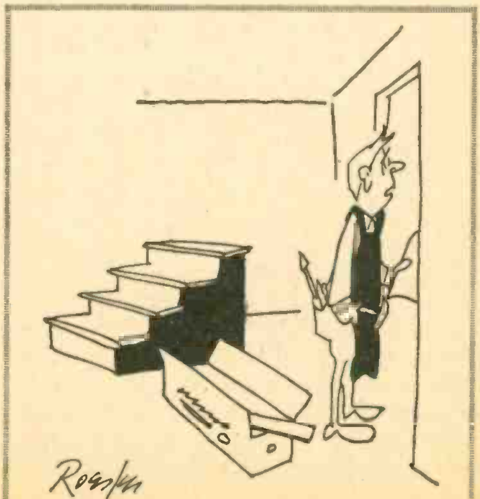
Twenty years ago Goldmark turned a groovy technological trick by inventing the 33⅓-rpm record which was to revolutionize the recording industry. But the flip side of Goldmark's success story came out more than a little scratchy. The color-TV system he also invented lost out to the now standard system developed by RCA, the arch rival of CBS.

Has Goldmark avenged his loss by beating out RCA and others in the educational and perhaps home video recording field? It's much too early to tally the final score. But if RCA or anyone else has anything to show, they will show it at first opportunity. Dr. Goldmark has already amply demonstrated that he is not given to twiddling his thumbs after one or two successes—or failures. If EVR can be improved in any way, he is surely trying to find out how.

But that's a battle the technological giants will have to wage on their own. The rest of us can only sit at ringside and make our bets about the final outcome. One way or the other, we can't lose. It is bound to be a good show in more ways than one.

The only real problem for us is this: when friend husband stops his new EVR film to contemplate the virtues of a contemporary Gina Lollobrigida for twenty minutes, does his wife have the right to demand equal ogle time with male cinematic idols?

Beer and pretzels, anyone? ■



"Oh Gladys, you know that kit you got me with those step-by-step instructions . . ."

Ham Traffic

Continued from page 90

9. What is chirp and how can it be remedied in a CW transmitter?

Don't let number 7 scare you. It sounds like they want a description of the manufacturing process for making transistors, which could take an engineer all day to explain. Actually, they merely want you to understand that transistors are made of layers of *n*- and *p*-types of semiconductor material. Then they want to know which layer is the emitter, which is the base, and which is the collector. You're supposed to be able to identify each on a schematic diagram of a transistor and know the difference between a *pnp* and *npn* transistor. Then they want you to know the key characteristics such as alpha, beta, and cutoff frequency. That's all.

. . . And Not So News. Due to a slip of the typewriter, the table of new FCC amateur frequency assignments on page 108 of the January 1968 RADIO-TV EXPERIMENTER carried an error that may have inadvertently discouraged some Novice operators.

A footnote to the table said Novices would not be allowed on two meters after November 22, 1968. This is not correct, since the word "phone" was accidentally left out of the copy. The new rules prohibit Novice *phone* operation on two meters after the date given, but still allow Novice CW operation on two meters. Present Novice operation on 80, 40, and 15 meters is unaffected by the new rules.

Sorry if my sloppy typewriter scared any of you fellows intending to work CW on two meters. There's very little brass-pounding up there in most areas, but it's a good place to gain valuable experience if you can find someone to talk to you.

Another item that will encourage prospective Novices is that they will get the first benefits of the new incentive rules. While the rest of the rules don't go into effect until November, the part about two-year license terms for Novices *is now in effect!* I don't know how Frank Charlie Charlie decided to be so generous, but his big computer is now spitting out these two-year Novice tickets.

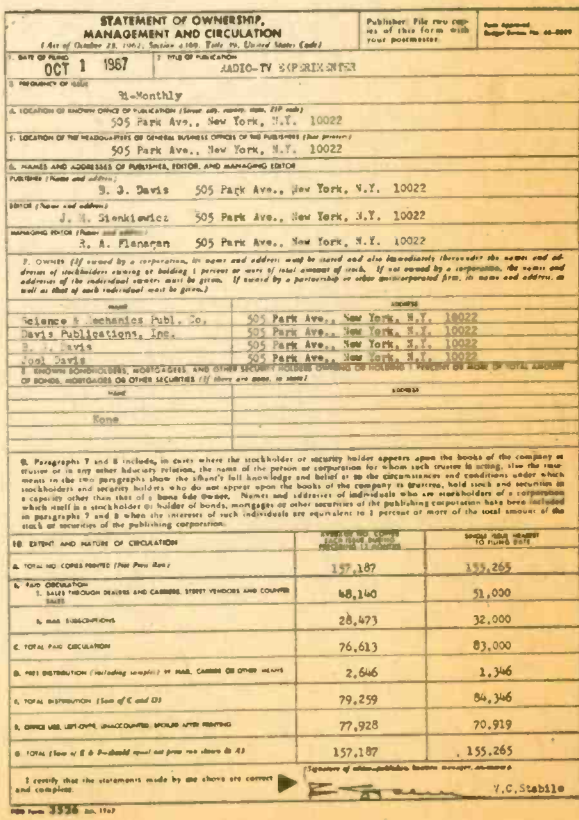
So, if you really want to be a ham, this is your golden opportunity. The added year will give all you fellows more time to practice the code on the air as you prepare for that General test. This should be ample time for anyone with a real desire for a higher ticket to get it.

Oscar Again. Project Oscar, forgotten by many hams since its spectacular appearance in the headlines a few years ago when the first ham radio satellite was orbited, is still in business and growing.

It's now a permanent organization, based at Foothill College, Los Altos, Calif., coordinating world-wide amateur interests in satellite projects. The staff is an outgrowth of the Oscar I crew.

Though many of us don't have the equipment or the know-how to actively participate in future Oscar experiments, we'd still like to keep up to date on what the space bunch is doing. A good way to do this—and just about the only way for the casual ham—is to monitor Oscar bulletins, which are transmitted on 40- and 20-meter CW frequencies whenever there's Oscar news to report.

To get the latest from Oscar, look for W6ASH on 14.030 MHz at 0200 GMT and on 7.015 MHz at 5055 GMT on Fridays. Remember your GMT conversion, fellows. Those transmissions both occur on Thursday evenings, local USA time. ■



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