CAN BRAIN WAVES RUN SPACE SHIPS?

RADIO-TV EXPERIMENTER

WHITE'S RADIO LOG

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

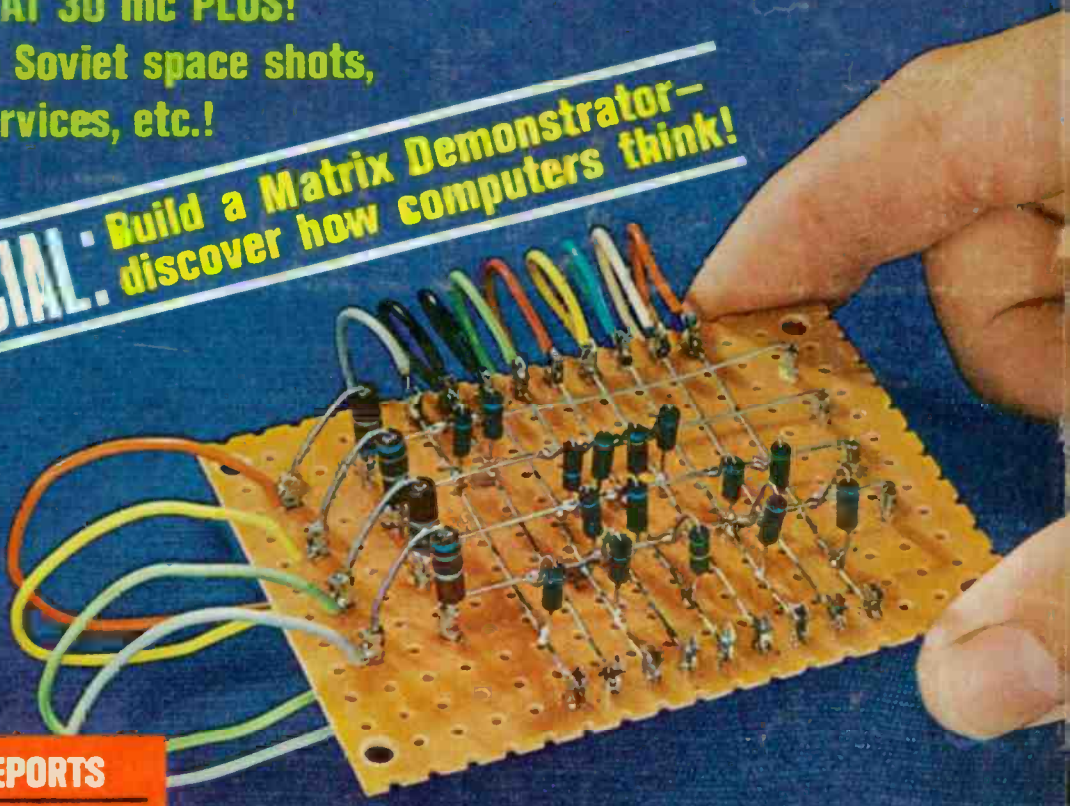
OCTOBER—NOVEMBER 75¢

INSIDE VLF EXPERIMENTS IN ANTARCTICA!

HOW TO WIRE AUTO GAUGES!

DX-ing AT 30 mc PLUS!
Tune in Soviet space shots,
land services, etc.!

SPECIAL: Build a Matrix Demonstrator—discover how computers think!



TEST REPORTS

EICO Model 3566
Solid-State Receiver

Sonotone
Sonomaster RM-1K
Speaker System Kit

Amphenol Model 524
CB Selective Call Unit

Complete Plans for:
110-volt Auto Inverter—$12
Midget Desk Speaker—$1.50
Photo-Slave For Flashgun—$7

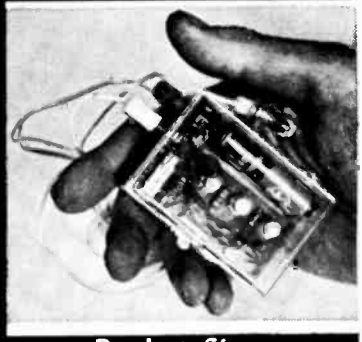
Anyone Can Build These High Quality
Precision S&M Kits
At a Substantial Savings

Precision Decade Resistance Box

Designed so the electronic experimenter can get any value of resistance at 1% accuracy. Made of precision components, this decade box offers such advantages as fast fingertip switching from any resistance value from 1 ohm to 1,111,110 ohms within seconds. Add or subtract as little as 1 ohm with 1% accuracy. And ordinary hand tools are all that's needed to assemble it in less than 2 hours.

All Purpose Shop Tachometer

This tachometer is guaranteed to outperform any $50 tach available today or your money will be refunded. This tach belongs in the tool chest of every machinist, electrician, model maker, motor serviceman and inventor. A six position rotary switch enables you to select three speed ranges in either forward or reverse rotation. Three ranges—0—500, 5000 and 15,000—cover the gamut of rpms in the home workshop or laboratory on machine tools, such as lathe cutting speeds, motor rpm, drilling speeds and other motor driven tools where rpm is an important factor.



Pocket-Size Hearing Aid

New hearing aid design provides a minimum of 42 decibels of gain and is adequate for 75% of all cases of partial deafness. The aid weighs only three ounces and is smaller than a king-size cigarette pack. Uses latest electromagnetic earphone and miniature crystal microphone. Powered by a 10¢ pen light flashlight battery and has a switch for turning power off when not in use and a control that lets you adjust the volume to a comfortable sound level.

SCIENCE & MECHANICS, KIT DIVISION
505 Park Avenue, New York, N. Y. 10022

RTV-1065 106

Please send the S&M kits that have complete asssembly plans, or the assembled and fully tested electronic alds checked below. I understand that if I am not completely satisfied I may return the kits within 10 days for a complete refund of the purchase price.

Hearing Aid	☐ $24.95 Kit	☐ $34.95 Assembled
Tachometer	☐ $16.95 Kit	☐ $21.95 Assembled
Decade Box	☐ $24.95 Kit	☐ $29.95 Assembled

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

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(Please Print)

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☐ Check or money order enclosed, ship post paid.

☐ Enclosed $3.00 deposit, ship balance C.O.D., plus postage and C.O.D. charges.

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RADIO-TV EXPERIMENTER

Cover Photo
by Don Lothrop

October-November 1965 CONTENTS/INDEX

☆Cover Highlights

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OCTOBER 1965—
NOVEMBER 1965

VOLUME 19 No. 2

RADIO-TV EXPERIMENTER

RADIO-TV EXPERIMENTER, Vol. 19, No. 2 (#756), is published bi-monthly by SCIENCE & MECHANICS PUBLISHING CO., a subsidiary of Davis Publications, Inc. Editorial, business and subscription offices: 505 Park Ave., New York, N. Y. 10022. One-year subscription (six issues)—$4.00; two-year subscription (12 issues)—$7.00; and three-year subscription (18 issues)—$10.00. Add $1.00 per year for postage outside the U.S.A. and Canada. Advertising offices: New York, 505 Park Ave., PL-2-6200; Chicago: 520 N. Michigan Ave., 527-0330; Los Angeles: 6253 Hollywood Blvd., 213-463-5143; Atlanta: Pirnie & Brown, 3108 Piedmont Rd., N.E., 404-233-6729; Long Island: Len Osten, 9 Garden Street, Great Neck, N.Y., 516-487-3305; Southwestern advertising representative: Jim Wright, 4 N. Eight St., St. Louis, CH 1-1965.

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

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Test and Repair:

ALL ELECTRICAL APPLIANCES and MOTORS

ELECTRICAL CIRCUITS in AUTOMOBILES

ALL TV TUBES (INCLUDING PICTURE TUBES)

WITH NEW MODEL 161

* REG. U.S. PAT. OFFICE

UTILITY TESTER

"Utility Tester" is a trade-mark registered in the United States Patent Office to identify the design and production of a multi-range and multi-service instrument providing all the services required for the repair of Electrical Appliances, Motors, Automotive Equipment and TV tubes.

THE MOST VERSATILE ALL-AROUND TROUBLE SHOOTER EVER PRODUCED!

AS AN ELECTRICAL TROUBLE SHOOTER THE MODEL 161:

- Will test Toasters, Irons, Broilers, Heating Pads, Clocks, Fans, Vacuum Cleaners, Refrigerators, Lamps including Fluorescents, Fuses, Switches, Thermostats, etc.
- Will test ALL MOTORS—single phase, multi-phase, universal, squirrel cage, induction, in fact every type of motor from fractional H.P. to 2 H.P.
- Will measure the actual voltage, A.C. or D.C., 110 Volt or 220 Volt lines.
- Will measure the actual current consumption of any appliance or utility either A.C. or D.C. and will measure it while the unit is in operation. The reading will be direct in amperes. The appliance or utility may be plugged directly into the front panel receptacle.
- Incorporates a sensitive direct-reading resistance range, which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range also will enable continuity checks and tests for shorts and opens.
- Will instantly locate opens, shorts and grounds.

AS A TELEVISION TUBE TESTER:

The majority of inoperative tubes stop functioning due to open and burned out filaments. Please note, the Model 161 will not test the quality of a tube (an emission tester is required for that purpose), but the Model 161 will test ALL the tubes used in your TV set for open filaments, burned out tubes, etc. A safe-guard resistor included in the circuit network of the Model 161 limits the output to approximately one one-thousandth of an ampere. This insures positive safety for the non-technical user and also eliminates the possibility of ever burning out a tube under test. The Model 161 is capable of testing every type of tube used in any and ALL TV sets (including picture tubes).

AS AN AUTOMOTIVE TESTER THE MODEL 161 WILL TEST:

• BOTH 6 VOLT AND 12 VOLT STORAGE BATTERIES • GENERATORS • STARTERS • DISTRIBUTORS • IGNITION COILS • REGULATORS • RELAYS • CIRCUIT BREAKERS • CIGARETTE LIGHTERS • STOP LIGHTS • CONDENSERS • DIRECTIONAL SIGNAL SYSTEMS • ALL LAMPS AND BULBS • FUSES • HEATING SYSTEMS • HORNS • **Also will locate poor grounds, breaks in wiring, poor connections, etc.**

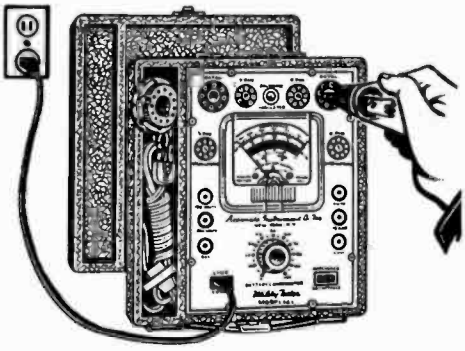
The Model 161 comes housed in a handsome portable case. Complete with all test leads and a profusely illustrated book written in plain, easy-to-understand language..... ONLY **$22.50**

NO MONEY WITH ORDER • NO C.O.D. — SEE PAGE 12

ACCURATE INSTRUMENT CO., INC. • 911 FAILE STREET • BRONX, N. Y. 10474

THE MOST VERSATILE ALL-AROUND

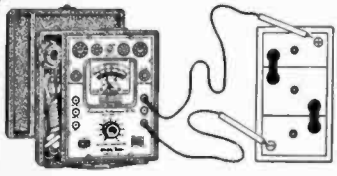
TESTING TV TUBES (Including Picture Tubes) FOR BURNED OUT AND OPEN FILAMENTS



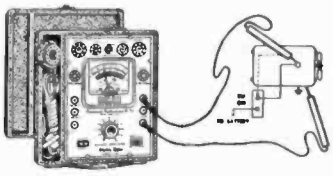
It has been estimated that more than 80% of TV breakdowns are due to defective tubes. Since the symptom provides a perfect clue as to which tube or tubes are responsible for the fault, the Model 161 Utility Tester provides 12 illustrated symptoms. The Model 161 manual lists the particular tube or tubes which are probably responsible for the defective operation. The Model 161 will test all tubes for open or burned out filaments.

First, locate the suspect tubes, by referring to the particular illustration. You will then learn the specific tube or tubes which need to be checked. Then, simply insert the tube in the appropriate socket of Model 161. If a picture tube, use the accessory picture tube socket.

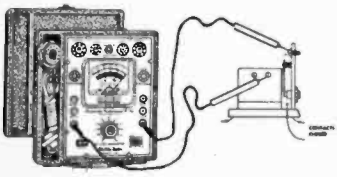
CHECKING AUTOMOTIVE CIRCUITS and PARTS



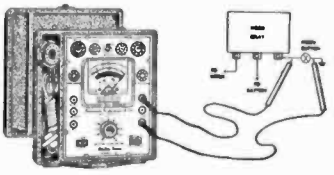
Model 161 enables you to test all automotive batteries including 6 volt and 12 volt batteries under load. Readings are provided on a special green auto battery voltage calibration.



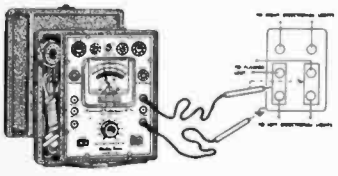
Testing heating systems. The causes of trouble vary but Model 161 will check out all. Detailed instructions are included in the Model 161 manual.



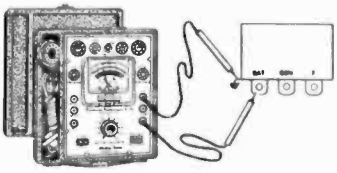
Model 161 Utility Tester tests all circuit breakers including the magnetic type.



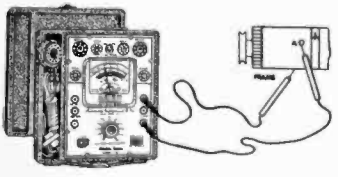
Ever experience anything more embarrassing and frustrating than trouble with the auto horn? Model 161 will check out the complete horn system including relays, buttons, etc.



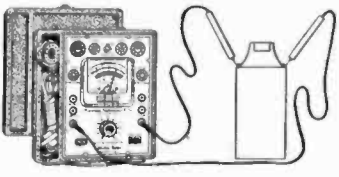
The complete flash directional system of any automobile can easily be tested with Model 161. The resistance and voltage ranges are employed for such tests.



Proper test of regulators requires measurement of voltage, resistance and current drain. The Model 161 is one of the very few testers ever produced which provides all those services.



To test generators use the voltage range of Model 161 and when necessary the resistance range. Model 161 will test generators with external field coil terminals.



Model 161 tests both single and two post ignition coils.

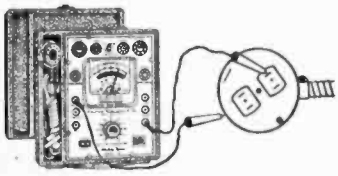
plus many more automotive parts

NO MONEY WITH ORDER • NO C.O.D. — SEE PAGE 12

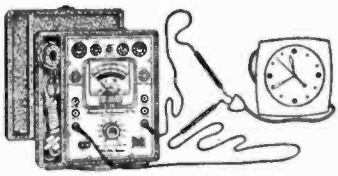
ACCURATE INSTRUMENT CO., INC. • 911 FAILE STREET • BRONX, N. Y. 10474

TROUBLE SHOOTER EVER PRODUCED!

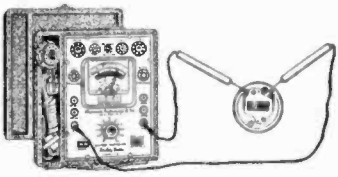
CHECKING ELECTRICAL APPLIANCES, MOTORS, SWITCHES, etc.



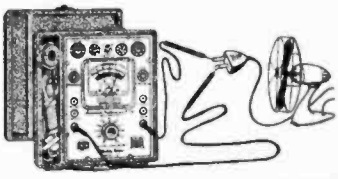
How to determine which side of power circuit is grounded! Simply connect one Model 161 lead to BX and the other lead to one of the two slots in the outlet. The side which is grounded will cause the meter to read.



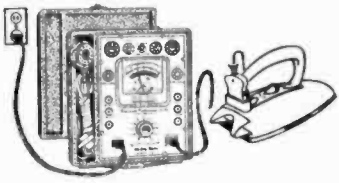
Electric clocks consume so very little current it is impractical to test them with line meters. The Model 161 will check such clocks accurately by simple connection to the electric cord.



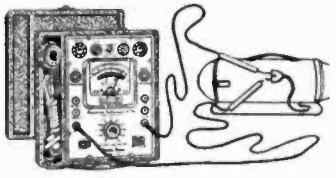
Avoid time consuming and embarrassing repair of appliances when the switch is suspect. Model 161 will indicate if the switch is okay, open, or has a faulty intermittent contact.



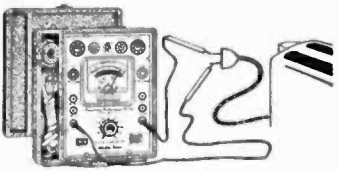
Electric fans and other small motor driven devices may be checked instantly and accurately with Model 161.



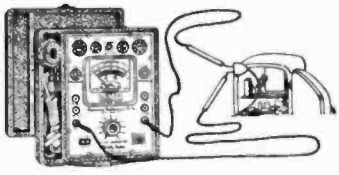
With the Model 161 you can measure first the actual current consumption in amperes while the unit is in operation and then the resistance in ohms of the heating element.



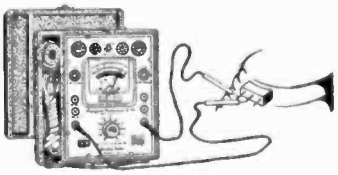
A vacuum cleaner can be tested best by resistance measurement first, and then, if necessary current consumption and applied voltage. All three measurements including leakage when necessary are supplied by Model 161.



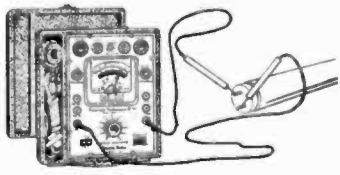
To check toasters, simply connect the Model 161 test leads to the toaster plug. A resistance test in ohms is the fastest way to test that particular appliance.



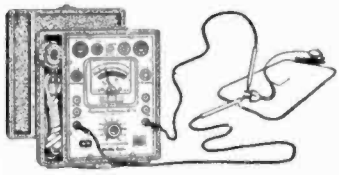
The manual supplied with Model 161 will give you detailed directions for testing refrigerators.



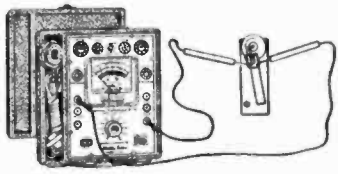
Two-heat broiler testing is a cinch with the Model 161. The "low" contacts should read 40 ohms and the "high" contacts should read 20 ohms.



Model 161 will enable you to test all fluorescent lamps also the ballast units used in conjunction with such lamps.



Detailed Instructions provided with the Model 161 show you how to test a heating pad in less than a minute with the Model 161. Accurate checks will be made on all three "speeds."



The thermostat is a very frequent cause of trouble in furnace control systems. The 24 voltage secondary usual with such units can be accurately measured with Model 161.

plus many more tests on parts listed in the Model 161 Utility Tester Book

NO MONEY WITH ORDER • NO C.O.D. — SEE PAGE 12

ACCURATE INSTRUMENT CO., INC. • 911 FAILE STREET • BRONX, N. Y. 10474

THE MODEL 161 is the latest of a long line of UTILITY TESTERS produced and improved since 1935. Although made primarily for the non-professional experimenter and homeowner, the Model 161 because of its compact size and multiplicity of services is the ideal unit for Electricians, Industrial Maintenance Men, Auto Repairmen and Radio Servicemen.

CHECK THESE RANGES

6 VOLTAGE RANGES

0-15 volts on A.C.
0-150 volts on A.C.
0-300 volts on A.C.
0-15 volts on D.C.
0-150 volts on D.C.
0-300 volts on D.C.

2 CURRENT RANGES

0-15 amperes on A.C.
0-15 amperes on D.C.

RESISTANCE RANGE

0-1,000 ohms

UNIQUE FEATURE!

The Model 161 will measure the current consumption of a circuit or appliance without breaking any wires and while the unit is in operation.

Simply insert plug of appliance into special socket on front panel of Model 161, plug line cord of Model 161 into outlet, and read the current consumption in amperes direct on the meter.

PLUS TV TUBE TESTING

Tests ALL TV tubes including loctal, 7 pin, octal, 9 pin, and picture tubes for open or burned out filaments. Separate sockets are provided for each type so that you cannot insert a tube in the wrong socket. Alignment pin straighteners are included to prevent damage to pins which are frequently bent when tubes are removed from a TV chassis.

PLUS AUTO BATTERY CALIBRATIONS:

2 volts (single cell)
6 volts (old battery)
12 volts (new batteries)

EXAMINE BEFORE YOU BUY! — SEE PRECEDING THREE PAGES!

READ THIS IMPORTANT MESSAGE NOW!!

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

SEND NO MONEY WITH ORDER

PAY POSTMAN NOTHING ON DELIVERY!

Yes, when you send in the coupon below, you are merely giving us permission to submit the Model 161 for your approval. If, after trying it you decide to keep it, then and only then do you send us $5.00 and pay the balance at the rate of $5.00 per month until the total price of $22.50 (plus small p.p. and budget charge) is paid. If not completely satisfied (we can't please everyone) you simply return the unit to us; no explanation necessary.

ACCURATE INSTRUMENT CO., INC.
Dept. D-418, 911 Faile St.,
Bronx, N. Y. 10474

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

Name_____

Address_____

City_____

State_____ Zip_____

POSITIVE FEEDBACK

Julian M. Sienkiewicz, Editor
WA2CQL/KMD4313

EVERYONE has heard about the FCC rules changes earlier this year affecting Part 95, the Citizens Band, but how many have actually read them. Except for a few *ship's lawyers* and the like, CB'ers have been listening to hearsay. So, to clear the air, here are some of the most significant provisions of the amended rules:

Section 95.41(d) is amended to permit communication between units of different stations (interstation) only on Channels 9-14 and 23; 27.065, 27.075, 27.085, 27.105, 27.125 and 27.255 mc., respectively. Communications between units of the same station (intrastation) continue to be permitted on any of the 23 channels.

Section 95.83(a) contains a list of prohibited uses for citizens radio stations. The following is a partial List:

(a) For engaging in radio communications as a hobby or diversion, i.e., operating the radio station as an activity in and of itself.

(b) For the transmission of communications containing obscene, indecent, or profane words, language, or meaning.

(c) To communicate with stations authorized or operated under the provisions of other parts of the Commission's rules, with unlicensed stations, or with United States Government or foreign stations, except for communications pursuant to 95.85 (b) and 95.121 (emergency and civil defense communications).

(d) For any communication not directed to specific stations or persons, except for: (1) emergency and civil defense communications as provided in 95.85(b) and 95.93, and (111) communications from a mobile unit to other units or stations for the sole purpose of requesting routing directions, assistance to disabled vehicles or vessels, information concerning the

Positive Feedback

availability of food or lodging, or any other assistance necessary to a licensee in transit.

(e) To interfere maliciously with the communications of another station.

(f) To transmit superfluous communications, i.e., any transmissions which are not necessary to communications which are permissible.

(g) For the transmission of music, whistling, sound effects, or any material for amusement or entertainment purposes, or solely to attract attention.

(h) For transmitting communications to stations of other licensees which relate to the technical performance, capabilities, or testing of any transmitter or other radio equipment, including transmissions concerning the signal strength or frequency stability of a transmitter, except as necessary to establish or maintain the specific communication.

(i) For relaying messages or transmitting communications for a person other than the licensee or members of his immediate family, except:

(1) communications transmitted pursuant to 95.85(b), 95.87(b)(7), and 95.121; and (ii), upon specific prior Commission approval, communications between citizens radio stations at fixed locations where public telephone service is not provided.

Section 95.83(b) prohibits a Class D station from communicating with any unit over a distance of more than 150 miles.

Section 95.87 with limited exceptions prohibits the operation of any citizens radio station by persons other than (a) the licensee, (b) members of the licensee's immediate family living in the same household, and (c) employees of the licensee, only while acting within the scope of their employment. Any person under the control or supervision of the licensee may operate a Class B or Class C station used solely for the control of remote objects or devices other than devices used to attract attention.

Section 95.91(b) limits the duration of Class D station transmissions as follows:

Communications between or among Class D stations shall not exceed 5 consecutive minutes. At the conclusion of this 5 minute period, or upon termination of the exchange if less than 5 minutes, the station transmit-

New Lower Prices On Heathkit® CB!

Save $20 On Deluxe 5-Channel "Master Station" Transceiver!

• 5 crystal-controlled transmit & receive channels • Receives all 23 channels • Built-in 4-tone selective call • Tuning meter • Adjustable squelch • Built-in 3-way power supply—6 or 12 v. DC, 117 v. AC • PTT mike, power cables & crystals for 1 channel. 23 lbs.

Kit GW-42 **$99.95**

(was $119.95)

Save $15 On Selective Call Transceiver!

Kit GW-32A (117 v. AC) **$69.95**

(was $84.95)

• 5 crystal-controlled transmit & receive channels • Built-in selective call • PTT mike, cable & crystals for 1 channel • Kit GW-32D (6 or 12 v. DC), $74.95—15 lbs.

Save $12 On 5-Channel Transceiver!

Kit GW-22A (117 v. AC) **$47.95**

(was $59.95)

• 5 crystal controlled transmit & receive channels • Superhet receiver with RF stage • PTT mike, cable & crystals for 1 channel • Kit GW-22D (6 or 12 v. DC) . . . $49.95—13 lbs.

Save $5 On 1-Watt Walkie-Talkie!

Kit GW-52 **$69.95**

(pair $129.95)

• Operates up to 3 miles • Rechargeable battery charges from 117 v. AC or cars 12 v. battery • 10 transistor, 2-diode circuit • Case, earphones, crystals. 4 lbs.

Save $5 On 5-Channel Transceiver!

Kit MW-34 **$84.95**

(was $89.95)

• All-channel receiver tuning • One front-panel transmit crystal socket • 5 crystal-controlled transmit & receive channels • 3-way power supply . . . 117 v. AC, 6 or 12 v. DC • PTT mike, cables, crystals for 1 channel. 16 lbs.

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GX-140

Positive Feedback

ting and the stations participating in the exchange shall remain silent for a period of at least 5 minutes and monitor the frequency or frequencies involved before any further transmissions are made. However, for the limited purpose of acknowledging receipt of a call, such a station or stations may answer a calling station and request that it stand by for the duration of the silent period. The time limitations contained in this paragraph may not be avoided by changing the operating frequency of the station and shall apply to all the transmissions of an operator who, under the other provisions of this part, may operate a unit of more than one Citizens Radio station. ■

Science Facts

• Human "gills" that will let man breathe under water like a fish, improved heart-lung machines for open heart surgery and "breathing" systems for submarines and underwater experimental stations: these are just a few practical applications slated for a new synthetic membrane recently invented by a General Electric scientist. The membrane can resist passage of water while allowing oxygen intake and dimissal of carbon dioxide.

• Nuclear energy is now being used by General Electric scientists to make novel changes in the chemical properties of wood. The wood is impregnated with plastic materials and then exposed to radiation. The result . . . an extremely hard wood-plastic alloy. Anticipated uses range from table-tops to vinyl floor tiles.

• A new type of photography which uses no chemical developer and produces an image in a fraction of a second is being studied. Light and heat alone produce the completely developed picture. Reheating will erase the picture and the film can be used again and again.

• While rocket launch vehicles continue to grow in size, the radio guidance equipment is shrinking. This equipment weighed more than 200 pounds in 1957, compared to a 47 pound system in the recent Gemini manned orbital flight. ■

Some plain talk from Kodak about tape:

Noisemanship...modulation noise... and how to get extra dbs. of silence

Starting at the beginning

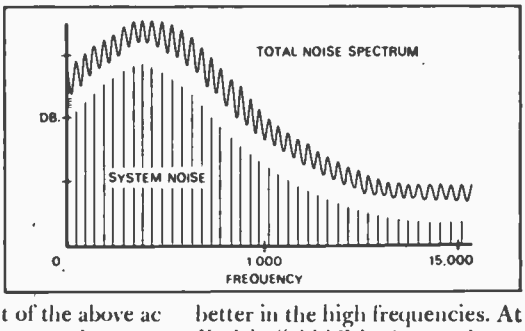
Kodak tape is mighty quiet when it leaves the factory. Because of special milling techniques and our now-famous "R-type" binder, the gamma ferric oxide particles are more uniform in size and shape and more uniformly dispersed than was ever before possible. Result: a superior degree of magnetic randomness, and thus, built-in quietness. To make sure that the roll of Kodak tape you purchase is as "quiet" as possible, we also bulk erase each roll. By "randomizing" the particles' polarity in *all* dimensions, foreign signals picked up during manufacture are eliminated.

This fairly pristine state doesn't last long. Once the tape has been subjected to the erase field and record bias from your recorder, a certain degree of randomness is lost. So-called zero-signal noise results because a recorder's erase system is not as efficient as a bulk eraser. Whereas bulk erasers cause 3-dimensional decay of the remnant signal, an erase head causes decay in one dimension only—along the length of the tape. This explains why zero-signal noise is always higher than bulk-erase noise.

Blue plate special—noisewise

Noise in the presence of a recorded signal—modulation noise—is the real meat and potatoes of tape performance. Testing for modulation noise is a bit tricky, however, because ac program and noise get mixed up in the amplifier. And if we are to determine the amount of noise in a system, it's imperative that we distinguish between one and the other. One way to do this is to use what our scientists refer to as a dc equivalent in r.m.s. milliamps of an ac signal.

Simply explained, we select the ac signal level that represents the practical limit for linear recording—2% third harmonic distortion. Then we apply a dc signal to the record head and increase the record current until it reaches the same level as that of the above ac signal. On the tape we have recorded a "zero frequency" program plus the modulation noise contributed by both equipment and tape. Since the reproduce amplifier filters out dc signals, only the modulation noise comes through, and this can be measured by an output meter.



Strike up the band pass

Final proof-of-the-pudding is to examine the total noise spectrum through band pass filters. Fun! One could, for example, measure the noise that comes through a 1-cycle band pass filter—even get a signal-to-noise ratio of about 115 db. But this really tells nothing about the tape's practical performance. For as the graph shows, there is much more noise in the lower frequencies than in the higher. For more meaningful evaluation, we specify two signal-to-noise ratios...one for the average low frequencies (20-1000 cycles at 15 ips) and one for the high frequencies (1000-15,000 cycles at 15 ips). We are happy to report that Type 31A (Kodak's general-purpose/low-print tape) rates as much as 6.5 dbs better in the low frequencies and 1.5 dbs better in the high frequencies. At Kodak, "shhh" is the word.

KODAK Sound Recording Tapes are available at most electronic, camera and department stores.

New, 24-page, comprehensive "Plain Talk" booklet covers all the important aspects of tape performance, and is free on request. Write: Department 8, Eastman Kodak Company, Rochester, N.Y. 14650.

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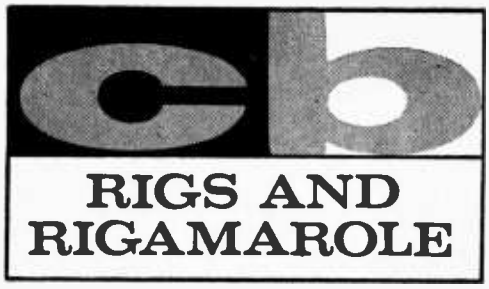

■ Hope that all of you are finding the new CB rules and regulations relatively easy to live with. The basic rules are easy enough to remember—if you find it necessary to talk to a station which isn't part of your own network (that is, if it has a callsign which is different than yours), keep the yakking on Channels 9 through 14, or on Channel 23. Keep your transmissions short and if you feel the need to discuss the technical merits of your equipment, use the telephone or (even better yet), get a Ham radio license. We at RADIO-TV EXPERIMENTER are doing our share in keeping the band "clean" by keeping our readers informed on the latest FCC rules (See *Positive Feedback* in this issue) and encouraging good CB operating procedures.

Tiny But Tough. One of the more exciting entries into the CB equipment field during recent months is the new Raytheon TWR-7 rig—an all transistor unit which is probably the smallest full-power 5-channel set ever offered for CB use.

This slick looking little set (not much larger than a pair of eyeglasses) mounts handily in any car or truck, has a universal bracket which further simplifies installation and allows the unit to be tilted for maximum accessibility.

Our photo shows the TWR-7 being put through its paces by Susie Henriksen (in New York's Central Park) who told us that among the unit's features are push-to-talk, a highly effective 2-stage noise limiter, an adjustable squelch and a micro-lamp which indicates amplifier output. Having a provision for an external loudspeaker, the Raytheon TWR-7 may also be used as a mobile public address system.

Designed for use in the new H.E.L.P. (Highway Emergency Locating Plan) program, which, it is hoped, will give all motorists the ability to summon immediate aid in cases of road emergencies, the TWR-7 comes

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Rigs and Rigamarole

equipped with crystals for CB Channel 9, which has been designated as the National CB Calling and Emergency Channel. This channel is monitored by thousands of clubs and individual CB'ers across the nation.

You would have to look hard to see the tiny, but tough, Raytheon TWR-7 CB rig in the photo. Just squint down at the area between the dashboard and the young Miss's right foot.

One emergency which seems to face all of us, for instance, is a "dead battery." The Raytheon people claim that their rig will even run from such a battery—one which is so dead that it not only fails to start the engine, but won't operate the cigar lighter, or headlights, or heater, or even light the tail lights—and that's about as "dead" as you'll ever have to worry about.

The Raytheon TWR-7, which is selling for $129.95, is available from many CB shops and is also being offered by authorized dealers as optional equipment on both Ford and International Harvester vehicles. Furth data on the TWR-7 may be obtained f Raytheon Company, Dept. RR, 21 Grand Avenue, South San Francis

Mike Booster. If you have ev your CB rig was short changing modulation department, a new the CB market may be the sol

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Glenn Horning, Local Equipment Supervisor, Western Reserve Telephone Company.

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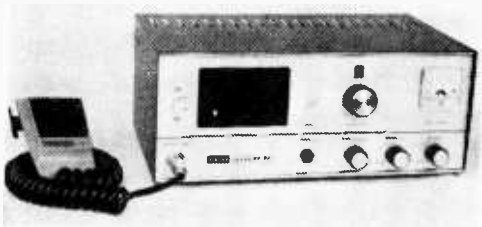
problems. It's the Nuvistor microphone preamplifier and booster being manufactured by Sentry Manufacturing Corp., Dept. RR, P. O. Box 12322, Oklahoma City, Okla. 73112. This little gadget hooks up in seconds between the microphone and the rig to give your voice the much needed muscle to blast you through even the busiest, messiest, interference on the channel. If you have an older rig (one from the days when the manufacturers weren't incorporating such fancy gizmos as speech clippers and compressors in their units), then this may be all you need to give your gear the "modern" sound and performance. If you have a new rig, this Nuvistor microphone booster will surely make you the big signal in your area. By the way, Sentry Manufacturing is headed by the famous "Uncle George" Beyers who, for many years, was associated with International Crystal Mfg. Co. The amplifier sells for only $9 from Sentry, who will also be happy to send you further information on the device plus news of some of their other new products. Attention dealers: Sentry is looking for new outlets for their switches, converters, and other CB gear.

The Full 23. Eico Electronic Instrument Co., Inc., of 131-01 39th Avenue, Flushing, N. Y. 11352, let us have a look at their new "Sentinel 23," a 23 channel dual conversion transceiver which takes advantage of the latest frequency synthesis techniques in its design.

Priced at $169.95 (wired and tested), the unit incorporates a 6-mc/s first IF stage for high image rejection (rated at better than 60 db) and a second IF of 455 kc/s with six tuned circuits to provide a high degree of selectivity (rated at 6 kc/s at points 6 db



Desk top view of EICO's new "Sentinel 23" CB transceiver with full frequency synthesis on all channels. Unit comes complete with push-to-talk, noise cancelling microphone.

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

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

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

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

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

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down) for the squashing of any adjacent channel interference. Sensitivity is a most respectable quarter of one microvolt for a 10 db signal to noise ratio.

Powered from either 117 VAC or 12 VDC, the "Sentinel 23" features a transistorized power supply which eliminates the possibility of annoying vibrator "hash" which has plagued mobile CB'ers in the past.

The transmitter puts more than 3 watts into the antenna, and the output amplifier is designed for maximum power transfer into antenna loads ranging from 30 to 100 ohms by means of an adjustable pi-network. A built-in TVI filter will also be found as a handy addition in many areas.

Other goodies include a very effective automatic impulse noise limiter, wide range automatic gain control, adjustable squelch, a standby switch, a built-in public address system (when used with an external speaker), a Turner Model 333 noise cancelling mike and even a jack for a pair of headphones.

Weighing in at 14 lbs. and measuring 4¾" high, 12" wide, 7½" deep, the "Sentinel 23" looks like it will be a popular member of the CB fraternity. Ask Eico to send you additional information on this one.

Guess that's about it for this issue. Next time around we'll have a look at some more exciting additions to 11 meters. ■

"Looks screwy, but I find my car's antenna gives much better reception."

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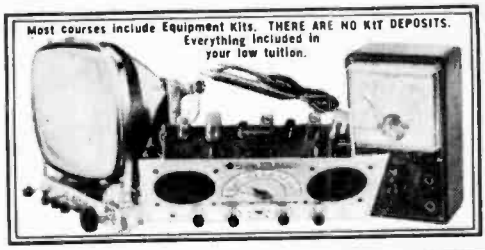

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to and from distant points on the globe filling their leisure hours with armchair excitement and adventure. Interested? Then pick up a copy of *Getting Started in Amateur Radio* by *Julius Berens, W2PIK* and *Jack Berens, W2MDL*. This study guide rapidly moves the prospective Ham radio operator toward the goal of operating his own licensed station. The text tells how to quickly learn the International Morse Code, gives the fundamentals of electronic theory, lists the current FCC rules and regulations, and fully prepares you, through study questions and sample examinations, for either the Novice, Technician, or General-Class license tests. To get your copy write to *John F. Rider Publishers, Inc.*, 850 Third Avenue, New York, New York 10022. Authors Berens co-authored one other volume of interest, *Building the Amateur Radio Station*, available at the same publisher.

Transistor Specs. Anyone who works with transistors is familiar with the difficulties involved in locating electrical and physi-

160 pages
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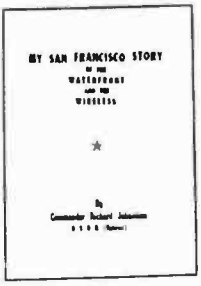
cal data for a specific transistor. A new book, *Transistor Specifications Manual*, has been compiled so as to alleviate these troublesome problems. The text lists the electrical and physical parameters along with manufacturers of more than 3500 transistor types. Electrical specification data includes all the important electrical data required to make a practical analysis of the transistor in a circuit. Each transistor is referred to an outline drawing that provides all of the physical measurements necessary to install or mount the unit or to determine whether the transistor will meet a particular set of requirements. All transistors listed in this manual are referenced to a diagram that indicates

the physical position of the emitter, collector, base, and any other terminal located on the semi-conductor. A section of older transistor types is included to help identify types that are usually thought to be unobtainable. In many instances these older types are now available but are identified with the newer type number. To get your copy of this handy workbench transistor guide write to *Howard W. Sams and Co., Inc.*, 4300 West 62nd Street, Indianapolis 6, Indiana.

Calling All Old Salts. If you would like to rediscover the romance of yesteryear's wireless then pick up a copy of *My San Francisco Story (on the Waterfront and the Wireless)* by *Commander Richard Johnstone* U.S.N.R. (Retired). This biography reveals colorful facts on early Pacific coast ships as well as the young years of radio, then known as the *Wireless*. The author goes way back before ships had 3-letter calls (1911) and amateurs were free to operate on any frequency above 200 meters. Admittedly, the manuscript should have been edited heavily before publication, however the thoughts and facts presented by *Commander Johnstone* will become a valuable guide to future historians. For your copy of *My San Francisco Story* send $2.75 to *Richard Johnstone*, 67 Heather Way, Larkspur, California 94939.



160 pages
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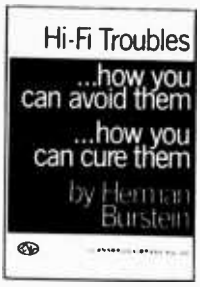
Hi-Fi Troubles. The *Gernsback Library* has come up with a new title that may be one of the largest on record—*Hi-Fi Troubles . . . how you can avoid them . . . how you can cure them* by *Herman Burstein*. High fidelity equipment is complex and sophisticated, and the more complex it is, the more apt it is to develop troubles. This text tells you how to maintain your audio system to keep it in peak performance. It tells you why you have troubles, how to locate them, and how to eliminate them. More important, it tells you what *not* to do. This is an invaluable book for every audiophile that helps him eliminate

Bookmark



160 pages
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problems like excessive hum; deteriorating equipment; noise in switches, tubes, resistors; distortion; bass and treble headaches; installation; problems faced by kit builders; and stereo and tape problems. Eleven jam-packed chapters make this informative text a top buy. Published by *Gernsback Library, Inc.*, 154 West 14th Street, New York, N. Y. 10011.

Beginner's Special. *Electronic Projects for Students, Beginners, & Hobbyists*, published by *Semitronics Corporation*, contains 50 easy-to-build transistor circuit projects anyone can make with readily available inexpensive parts and simple tools (soldering iron, pliers, screwdriver). Parts are available from Semitronics or your local electronic parts dealer. An educational service program designed to provide an introduction to electronics and the space age, this 100-page book requires no technical knowledge on the part

96 pages
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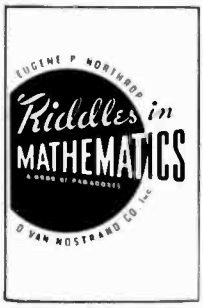
$1.95

of the reader, and tells him how to solder, recognize electronic parts, and read electronic symbols. Clear photos, and pictorial and wiring diagrams make instructions easy. The reader can make crystal radios, sun-powered radio, electronic megaphone, flashers, hi-fi testers, appliance tester, tachometer, stereo balance, code transmitter, and 40 other useful devices, providing many enjoyable hours in the world of electronics. The text's strong point is its parts lists which are

complete for each project. Price of the handbook is $1.95 at the local electronics dealer, or from *Semitronics Corporation*, 265 Canal Street, New York, New York 10013.

Mathematical Who-Done-Its. More than two hundred fascinating riddles—drawn from every branch of mathematics



262 pages
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$4.50

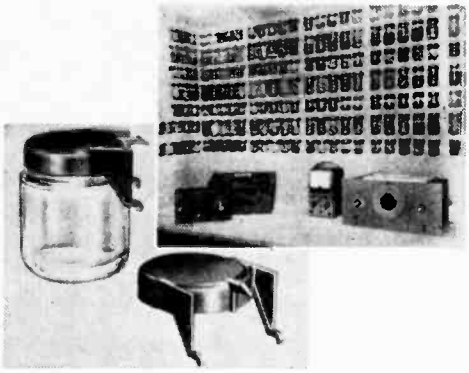
from arithmetic to calculus offer you countless hours of interest and entertainment in a new title *Riddles in Mathematics—a Book of Paradoxes* by *Eugene P. Northrop*. The mathematical background for everyone of these paradoxes is clearly explained, and then the solutions to all are fully stated at the end of the book, so you can easily check every step in reaching the final result. These absorbing riddles give you a wide range of the fundamental reasoning that underlies all mathematics. You will enjoy sharpening your wits upon these fascinating paradoxes —and at the same time you will find they add materially to your knowledge of arithmetic, algebra, geometry, trigonometry, and calculus. Interested? Then stop by your local bookstore or write to *D. Van Nostrand Co., Inc.*, 120 Alexander Street, Princeton, New Jersey. ■

"I'd no idea we were on the same frequency."

NEW products

Baby Food Jars Become Storage Containers

A million empty baby food jars are thrown away every day, it has been estimated, and yet these empty jars make the most practical kind of storage container for thousands of things necessary in every home, office, factory, garage or store. Because a Cleveland inventor had accumulated hundreds of these baby food jars and began using them to store his workshop supplies such as bolts, nuts, nails, washers, diodes, transistors, resistors, terminals, capacitors, and a hundred other things, he had to design a practical jar holder and dustproof cover to keep these workshop supplies neat and



Wickliffe Industries Handy Dandys

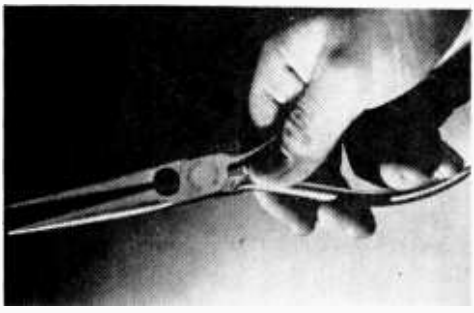
orderly. That's how Handy Dandys were developed. They are a combination dust-tite cover and holder that can be snapped into ⅛" thick pegboard. Handy Dandys are made of durable plastic, flexible enough to snap into the pegboard without breaking the holding prongs.

According to the manufacturer, Wickliffe Industries, Inc. empty baby food jars are easy to get without cost. If no one in the immediate or near family is raising an infant, no neighbors or friends are buying baby foods, just wait in any super market at the baby food display. Chances are you can meet a dozen mothers or fathers in an hour who have accumulated empty jars and will be glad to have you pick them up—and thus solve their disposal problem. Handy Dandys

are inexpensive, priced at $1 for 1 doz., $2.50 for 3 doz., $4.00 for 6 doz., and $25.00 for 500. The only other expense to having neat and orderly storage of everything from paper clips to fishing hooks is a piece of ⅛" thick pegboard. This too is inexpensive. Send orders directly to Wickliffe Industries, Inc., Dept. 56, Wickliffe, Ohio.

Stainless Steel Pliers

These new all stainless steel pliers are the first rust proof, corrosion proof stainless pliers to be offered commercially in the world. They are fully drop forged and precision hardened and tempered for rugged service. The jaw serrations are precision



Witherby Stainless-Steel Pliers

machined for full interlock enabling the thinnest objects to be securely held. Cutter will easily cut toughest wire. These pliers will always open and close freely; no binding, stiffening, freezing or rusting. This is an ideal tool for boat owners, fishermen, hunters, gardeners, motorists, mechanics, electricians, plumbers, repairmen and handymen. Comes complete with leathercloth wallet-belt holster for only $5.95. Write to Witherby Products Division, John H. Graham & Co., Inc., Dept. 756, 105 Duane Street, New York, N. Y. 10008.

Linear Kilowatt Goes Mobile

Here's a kilowatt final that'll fit in any size car and just about any size operating position you have at home. In the new Heathkit HA-14 *KW Kompact*, a full kw SSB linear amplifier in a cabinet that measures just 3-3/16" high x 12-3/16" wide x 10" deep. And what's more, the *KW Kompact* kit goes for only $99.95!

The "KW Kompact" is a five band linear amplifier (80 through 10 meters) that devel-

NEW products ★★★★★★★★★★★★

ops a 1000 watts *pep* to a pair of 572-B's (T160-L's) in parallel. It features provisions for ALC, a tuned input circuit, and built-in

Heathkit HA-14 Kilowatt SSB Linear & HW-12 "Single-Bander" SSB Transceiver

antenna changeover relay. Heath's choice of final tubes means a rugged, shock-resistant amplifier that can be driven by any of the popular SSB exciter/transmitters of 100 watts or more. The specs on this linear reveal a clean amplifier with third order harmonics 30 db down or better at the full 1000 watts PEP input. Built-in SWR meter aids in maintaining top efficiency after frequency changes in mobile operation. Small size and remotely located power supply make installation convenient and easy. The HA-14 mates handily with the Heath HW-12 SSB transceiver.

Comparing the Heath KW Kompact with other manufacturers' fixed KW linears shows it to stack up well, feature for feature, at a fraction of the cost and size. Complete details and specifications can be obtained by writing to Heath Company, Dept. 756, Benton Harbor, Michigan 49023.

Explorer Short-Wave Receiver

Zenith Sales Corporation today announced the *Explorer*, an all-new, highly sensitive 5-band table radio. The set lets the user "eavesdrop" on international short wave broadcasts from foreign stations, tune domestic broadcasts of news, sports and entertainment, and obtain around-the-clock area weather reports and periodic marine weather

news from U. S. government stations. The set also tunes time signals broadcast by government stations, marine distress signals, ship-to-ship and ship-to-shore channel, and Citizens Band and amateur broadcasts. The Explorer is ideal for foreign language students, journalists, "armchair travelers," and other short wave radio listeners. Farmers, fruit growers, road builders, fliers and those needing weather information, will find the *Explorer* useful in obtaining advance notice of weather dangerous to life or property. In addition, boatmen can use the set for weather news as well as a wide range of listening at home, dockside, or on boats wherever a 110 volt electrical outlet is handy.

The *Explorer's* 5-band coverage ranges from 150 through 400 kilocycles on the long wave band and continuous coverage from 500 kilocycles through the AM standard broadcast band to 30 megacycles in the short

Zenith Explorer 5-Band Table Radio

wave radio spectrum. Other special features include: a separate electrical bandspread dial with a bandspread control for superfine signal selection, especially necessary for tuning short wave and amateur stations; three professional-type slide switches: a Receive-Standby switch to silence the radio yet keep it in operating mode for instant use while waiting for a particular program; an Automatic Noise Limiter (ANL) switch for "clipping out" severe static or manmade electrical "noise" capable of over-riding the station signal, and a beat-frequency-oscillator (BFO) switch that permits listening to International Morse Code transmissions.

The *Explorer*, model M660A, is available in a distinctively styled grained walnut color vinyl-covered cabinet with a metal trim. Manufacturer's suggested retail price is $99.95, and is available at most Zenith dealers. ■

ASK ME another

By Leo G. Sands

RADIO-TV EXPERIMENTER *brings the know-how of electronics experts to its readers. If you have any questions to ask of this reader-service column, just type it on the back of a 4¢ postal card and send it to "Ask Me Another,"* RADIO-TV EXPERIMENTER, *505 Park Avenue, New York, New York 10022. The experts will try to answer your questions in the available space in upcoming issues. Sorry, the experts will be unable to answer your questions by mail.*

Garbage

I have an early vintage short wave receiver and a special short wave antenna which has a can, containing a coil or condenser, at each end of the transmission line. What is the correct way to hook it up?
—H. E. P., Cleaves, Ohio

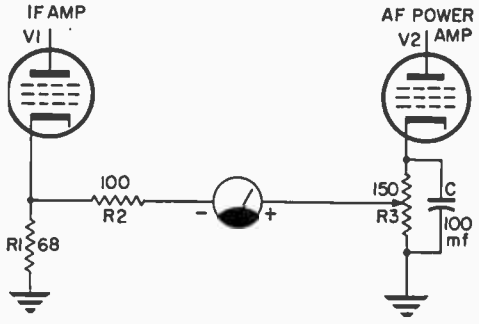
Throw the antenna away and get a Hy-Gain SWL-4, SYL-7, SWO or Consolidated 635 or equivalent doublet antenna kit. The one you have was undoubtedly made long before the modern lead-in cables were developed. The cans you refer to are impedance matching transformers which were popular long ago.

Add An S-Meter

How can I add an S-meter to my CB set?
—H. C. R., Beloit, Wis.

The diagram shows the S-meter circuit used in the USL Contact 23. The meter is a 0-1 DC milliammeter connected between the cathode of an IF amplifier and the cathode

of the AF power amplifier. When no signal is being received, the voltage drop across R is at a maximum since the AVC applies minimum bias to the grid of V1. The meter is set to read zero by adjusting R3 so that the voltage at the positive terminal of the meter will be the same as at its negative terminal (equal to the drop across R1).



When a signal is received, the voltage drop across R1 falls off because V1 cathode current is decreased by the AVC voltage which is now higher. Hence, the voltage at the positive meter terminal is higher than at the negative terminal. The meter reading varies with the voltage drop across R1. The voltage drop across R3 remains steady. The value of R2 can be varied from the indicated value to calibrate the meter.

Bad Image

Why is it that I receive several local radio stations on other than their assigned frequencies with my 200 kc to 30 mc Brand "X" receiver? One operating on 1590 kc, for example, can be heard at about 670 kc and at other frequencies. I am told this is spurious radiation. Is this true?

—E. N., Jackson, Miss.

It is unlikely that spurious radiation is the cause if more than one station can be heard at two or more frequencies. It is more likely to be due to inadequate "image" rejection in your receiver. If your receiver has a 465-kc IF amplifier, the local oscillator is tuned to 1125 kc when the tuning dial is set to 670 kc. It is the 1590-kc signal getting through to the mixer, beating with the 1125-kc local oscillator signal, that causes a 465-kc IF signal to be produced, just the same as when the dial is set to 1590 kc and your local oscillator operates at 2055 kc to produce a 465-kc IF signal, except that the received signal is weaker.

Since you are experiencing this with sev-

ASK ME another

eral stations, a single, fixed tuned wave trap at the antenna won't do. Try shortening your antenna in order to reduce pick-up of the strong broadcast signals. Your set has an antenna trimmer with which you should be able to attenuate the unwanted image signal and accentuate signals at the frequency to which the dial is tuned. Image interference is less troubesome with more expensive receivers with more RF selectivity (ahead of the mixer).

Ham Exams

What source does the FCC use when preparing license exams? I am trying for the third time to pass the test for a general class ham license.

—R. G., Waco, Texas

FCC engineers undoubtedly make up the test questions. All they want to know is if you understand basic theory, basic laws and amateur practice. There are several good books on the subject. If you understand what is in any of these books you'll pass the test easily. Most electronic part supply houses list these books in their catalog. A better bet is to visit your local Ham supplier and thumb through the books he has to offer.

Get Off the Air, Quick!

Can I build my own FM wireless microphone for use in the 88-108 mc. FM broadcast band? I understand that the F.C.C. allows use of wireless microphones in this band.

—H. B. H., San Francisco, Calif.

Use of wireless microphones in the 88-108 mc. band is now permitted. However, homemade transmitters cannot be used. They must be "type approved" by the F.C.C. which requires costly and elaborate procedures.

CQ FCC

Where shall I apply for a "ham" radio license? What are the requirements and where can I get more information?

—L. M. Independence, Ky.

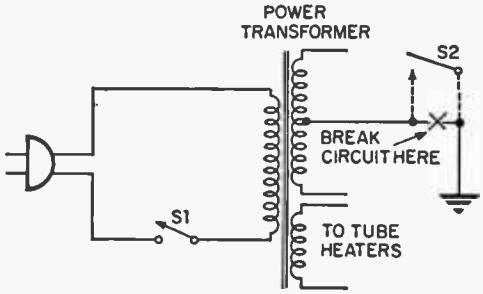
Several books about amateur radio license examinations are available at radio parts stores and mail order houses. You can get an amateur radio license guide free from EICO Electronic Instrument Co., Inc., Flushing, N. Y. 11352. The code test and written examination for a novice license may be administered by a licensed ham. It is not necessary to go to an FCC office to take the test. You can get an amateur radio operator license application form by writing to the Federal Communications Commission, Washington, D. C. 20554.

Instant TV

How can I modify my TV set so it will turn on instantly like those advertised on TV commercials?

—V. G., Snohomish, Wash.

If your set has a power transformer and its tube heaters are not connected in a series string. you can add a switch (S2) in the secondary circuit of the low voltage power supply as shown at *X* in the diagram. The main switch (S1) is left turned on. The other switch (S) is turned on to make the set operative. But, get a schematic of your set and see if this circuit will work.



Fixing Up An Old Timer

My old radio has a magnetic speaker and my parents object to the noise. How can I connect an earphone jack so I can plug in a pair of phones and cut out the speaker?

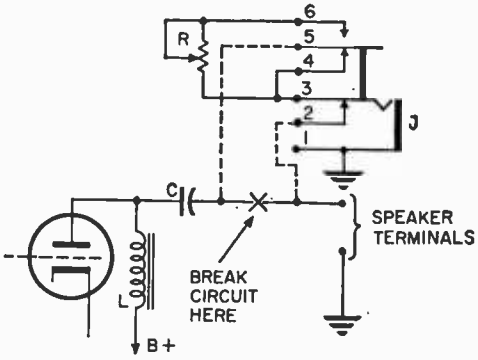
—A. W., St. Peter, Minn.

It must be a very old radio since the electro-dynamic speaker superseded the magnetic types more than 35 years ago. This kind of set does not usually have an output transformer but has instead a choke (L) and a capacitor (C) as shown in the diagram to keep the B+ out of the speaker.

Mount a Mallory Type 5 jack (J) on the

(Continued on page 40)

ASK ME another

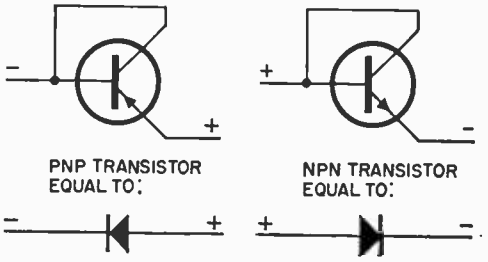


chassis or cabinet, break the circuit at *X* in the diagram and add R, a 10,000 ohm potentiometer, all connected as shown. When the phone plug is inserted in the jack, its 4-5 and 2-3 contacts open, disconnecting the speaker. Its 5-6 contacts connect the audio output to the ungrounded headphone lead (tip of phone plug) through R which is connected as a series rheostat and serves as a headphone volume control.

Kicking the P out of PNP

Can a transformer be used as a diode?
—A. H., Aberdeen, Wash.

A transistor is a "triode" which, like a triode tube, can be connected as a diode as shown in the diagram. At the left a PNP transistor has its base and collector connected together. When the collector is made negative with respect to the emitter, the base is forward-biased. At the right the circuit for an NPN transistor is the same except that the collector is made positive with respect to the emitter. The base, here too, is forward-biased. The forward voltage drop (in the direction of conduction) is much lower than for a conventional diode.



Quiet, Please!

How can I locate noisy vacuum tubes when all tubes check out OK on a tube tester?

—E. R., Mukilteo, Wash.

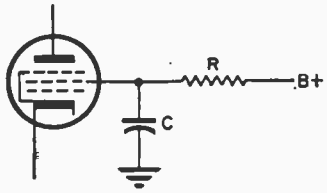
Connect an RF signal generator to the antenna and ground terminals of the receiver. If the set has a loop antenna or loop stick, connect the signal generator output to the grid of the first tube through a small capacitor (10-100 pf). Set the signal generator and receiver to the same frequency and turn up the signal generator output, with the RF signal unmodulated. Now, just tap the tubes and other components with the eraser on the end of a pencil and you will quickly detect the noisy ones.

Red, White and Blue Smoke

The screen bypass resistor in my record player blew and no circuit diagram was furnished. What value of replacement should I use?

—M. M., Westfield, N. J.

The screen resistor probably burned out as a result of shorting of the screen bypass capacitor (condenser). Unsolder both and take them to a radio parts store and buy re-



placements. The resistor should be color-coded to indicate its resistance. If the color code has been burned off, try various values from 50,000 ohms to 500,000 ohms until the sound is cleanest. Use an 0.1 mf. tubular rated at 200 volts or higher as the replacement bypass capacitor. Its value isn't critical.

TD-FM Radio Is No Help

How can I modify the TD-FM radio (June-July 1964 issue) for the 150-274 mc range?

—G. C. M., Jacksonville, Fla. & F. S., Wallington, N. J.

While it is possible to change the coils to alter the frequency range, you probably would not be pleased with the results. The 150-174 mc mobile radio band channels are spaced only 30 kc apart and the FM signals deviate only ±5 kc. In the FM broadcast

ASK ME another

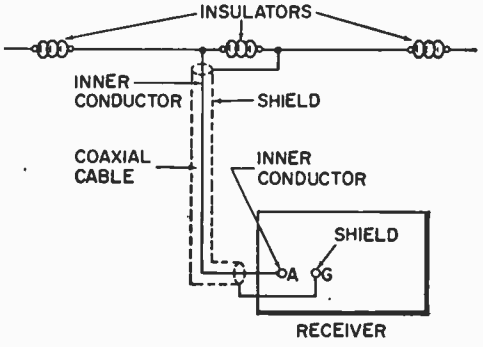
band, the channels are 200 kc apart and the signals deviate ±75 kc. Even in the 2-meter amateur band (144-148 mc) the signals usually deviate ±15 kc. Extremely good selectivity is required to separate the signals in the 150-174 mc. band and an FM discriminator is required which will provide adequate audio recovery. Only a multi-stage superhetrodyne receiver with very sharp selectivity will provide satisfaction.

Coax Lead-In

How can I concert my end-fed antenna radio receiver so I can use a dipole antenna?
—N. S., Waterford, Wis.

How can I connect a dipole to a receiver with only one antenna terminal and one ground terminal?
—J. C., Decatur, Ga.

Use 75-ohm coaxial cable, such as RG-11/U, as the transmission line as shown in the diagram. Connect the center conductor of the coax to the antenna terminal and the shield braid to the ground terminal. If there is no ground terminal, connect the shield to the chassis—but not if it is an AC/DC set.



Long Wire Is Best

I have built an antenna for the 19 and 25-meter bands. When I connect it to the receiver, I get a bubbling sound. How can I eliminate it? Also, can you give me a plan for an all-band antenna?
—K. D., Wallingford, Conn.

I can't advise you on the bubbling sound

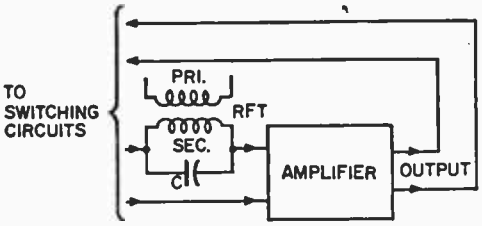
without hearing it? Shep Fields isn't on the air any more. The most universally used all-band antenna is a single wire from 50 to 100 feet long. It won't suffer so badly from directional effects as a doublet and is less frequency sensitive.

Dropping Pick Up

I have a home-made intercom using a Lafayette PK-544 amplifier (5-transistor, push-pull output). I hear a radio station on 1520 kc, sometimes very strong. What can I do to correct this problem?

—F. S., Portland, Ore.

Pick up of signals from nearby broadcasting staitons is a common problem. The signal. picked up by the speaker leads, when the speaker functions as a microphone, is sometimes demodulated by the first stage of the amplifier acting as a detector. Try grounding the common side of the speaker lines. Or connect a stop-filter (wave trap) in series with the amplifier input as shown



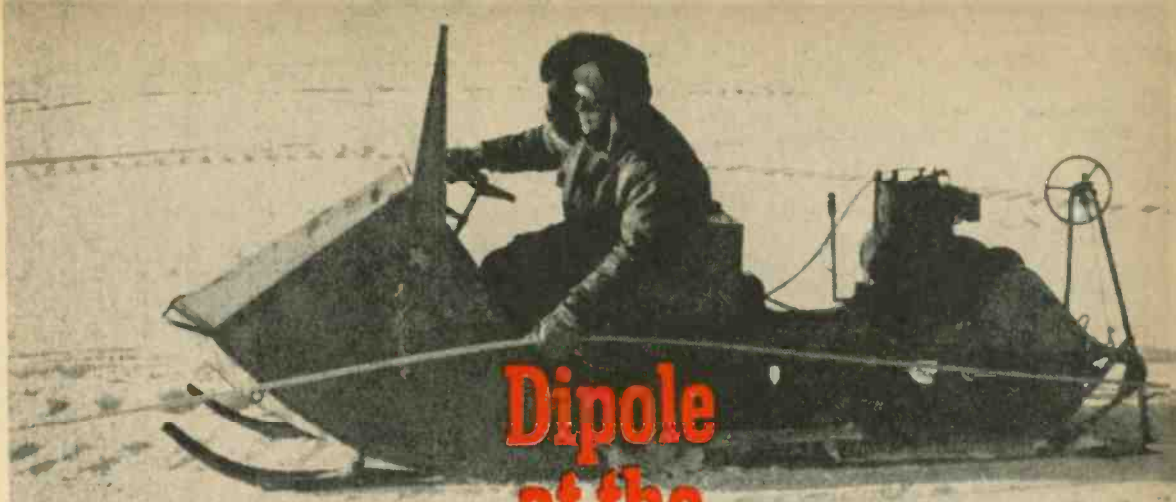
in the diagram. Use the secondary of a shielded RF transformer as the coil and an adjustable mica trimmer capacitor as the filter. Tune it carefully to 1520 kc, the point at which the radio signal is at a minimum or eliminated.

Noisy Dirt

When I turn the volume control on my radio, I hear a scratchy noise. Should I replace the volume control?

—J .R., Ashland, Va.

Often, cleaning the volume control will make it quiet. Get some volume control cleaning fluid and drop some of it with an eye dropper into any openings you can find on the volume control, including the shaft bushing. Twirl the volume control shaft rapidly. If the cure does not last more than a few days, install a new volume control. But, be sure to get an equivalent replacement. They may look alike and have the same resistance, but they are not all the same. ■



Dipole at the South Pole

By Wesley Robinson
THE BOEING COMPANY

A 21-mile-long antenna laid in the Antarctic snow helps us collect data on radio frequencies down to 1100 cycles per second!

Inside a makeshift shelter of blankets on a 9,000-foot-high Antarctic plateau, three Boeing men in heavy parkas huddled over a tape recorder playing Julie Andrews recording of "I've Grown Accustomed to Your Face." Waves of music pulsated through the whiteout of the bitter Antarctic summer, skimmed across endless ice wastes, rose and fell over crusty hills of snow. Twelve miles away, the music came booming in to engineers in the staid scientific Stanford University field laboratory at Byrd Station. Entertainment? No. This strange two-part act was a scientific experiment similar to S. F. B. Morse's first telegraphic message "What hath God wrought?" It was the first test operation of a 21-mile-long dipole antenna designed to collect scientific data at extremely low frequencies near one kilocycle. Other antennas using existing

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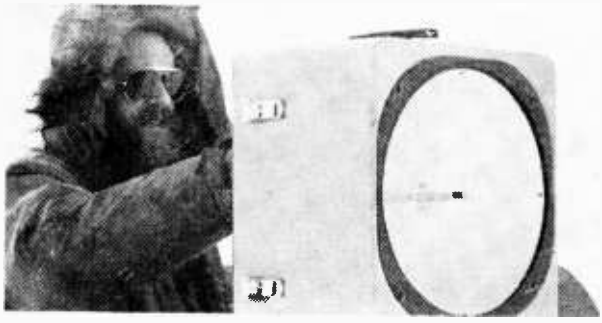


Distances across the vast and eerie Antarctic wastes were measured using electronic survey equipment. Protected by warm parka and beard, Boeing man adjusts the equipment which was mounted on snow vehicle to get it above the snow-whipped ground surface. As shown at the top, the men relaxed by conquering a *mountain* of snow near camp.

power transmission lines have dipped into the one-kilocycle region, but none of them was built specifically to study extremely low frequencies and their scientific applications on a sustained basis.

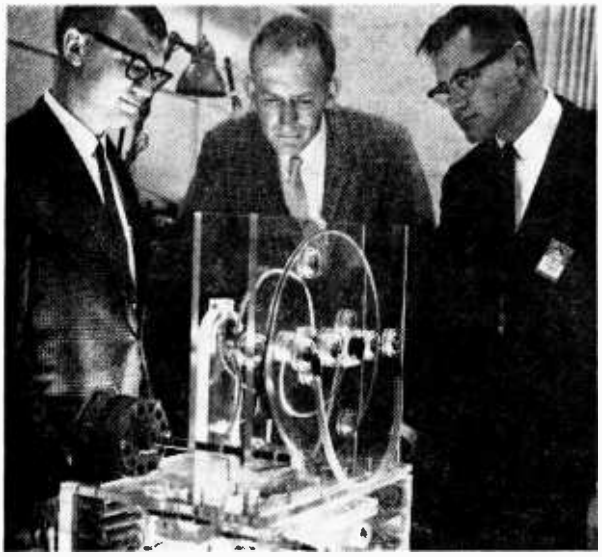
The Boeing men used no broadcasting equipment to transmit Miss Andrews' sentimental song. They fed the music directly from the tape recorder to the dipole antenna in the same way it would be fed to an auxiliary speaker.

Music played no part in most of the antenna-experiment work. The bulk of the testing involved 8,000,000-watt narrow-band multiple pulses, mere microseconds long, which were directed to stations as far north as Great Whale River on Hudson's Bay. A report of reception is being compiled.

The Dipole. Success of the whole venture hinged on careful installation of a long-wire dipole antenna excited from terminals at its center, with two equal-length arms stretching in opposite directions on a straight line across the Antarctic plain from the makeshift central shack. For three months, Boeing engineers Robert Tighe, Ted Johnson and Art Guy had unreeled big spools of ¾-inch polyethylene cable over the frozen surface in 1,000-foot segments, carefully surveying and aligning it as they went.

Their efforts paid handsome dividends: the antenna actually performed better than expected. Considerable new data was gathered, especially below *five* kilocycles.

The Electronics of It. Arriving in Antarctica, determination of the dielectric properties of the ice and snow was first on the



Boeing Company antenna experts T. L. Johnson, Robert Tighe, and Arthur Guy study the electrical impulse generator they designed for subsurface antenna experiments in the Antarctic. One of the Boeing team, shown below, has his turn at the morning chore—digging antenna cable and supplies out of snowbanks constantly formed by drifting snow.

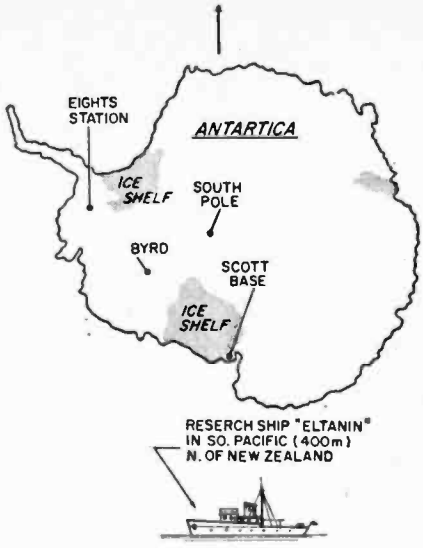
agenda. Four-electrode conductivity measurements were made over a frequency range of 100 cps to 100 kc. A 3-inch diameter coaxial capacitor was used to measure the dielectric constant and loss factor of small samples of snow near the surface. The capacity between two small diameter cylinders was also measured. These measurements included self-impedance versus frequency, current distributions, and relative efficiency measurements on dipoles having lengths of 1000, 2000, 4000, 8000 and 12,000 feet.

At the same time mutual impedances between parallel dipoles were measured. In the mutual impedance measurements the dipole spacings were changed four times for each dipole length. The lengths used were 1000, 2000, 4000 and 6000 feet. Spacings were different for each length and varied from 0.75 meters to 500 meters. Upon completion of the mutual coupling tests, a single dipole 12,000 feet long was installed.

The next few days were used for completing a series of tests on 1000 and 2000 foot dipoles made up of: 1) the core of RG-58 coax, about ⅛ the diameter of the larger RG-17 cable, and 2) the uninsulated center conductor of RG-17, about the size of No. 5 wire. The tests included self-impedance, current distributions, and mutual coupling measurements.

The dipole antenna then was extended in 2000-foot increments from 12,000 to 24,000 feet. At each increment the dipole resonance was determined and the driving point impedance at resonance was measured. With the length of 24,000 feet ($f_o = 7.5$ kc), a

In Antarctic desolation men are men; Soviet scientist, right, "drops in" for hot coffee.

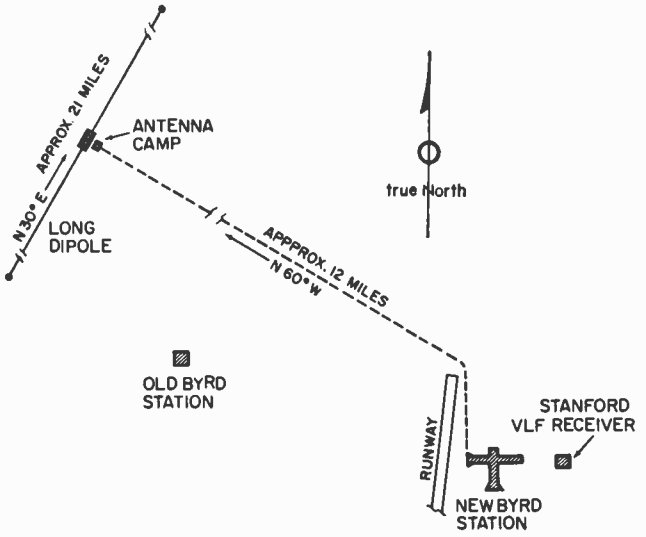


Map of Antarctica shows locations of VLF receiver stations for the propagation tests.

detailed series of measurements was completed. Tests included self-impedance over a very wide frequency range, current distributions, relative efficiency measurements by the receiving technique, near zone cw transmission, and spectrum measurements of the dipole radiation with high intensity 10 cps square wave inputs (pulse discharges). Again the antenna was increased in length, this time in increments of 4000 feet until the length reached 50,000 feet. The resonant frequency and driving point impedance were again measured as a function of length. The more detailed measurements outlined previously were repeated for the new length of 56,000 feet—a resonant frequency of 2800 cps.

Finally, the measurement increments were increased to 8000 feet and by the last week in January, 1965 the goal of 110,000 feet, or 20.8 miles, was achieved. This dipole was resonant at 1100 cps.

Supplies and equipment were unloaded from a ski-equipped C-130 right in front of the camp.



Sketch of the Byrd Station area shows the location and orientation of the dipole along the magnetic meridian 30° east of true north.

Propagation Tests. By opening or closing the dipole at appropriate points the resonant frequency could be set at nominal values of 1.1, 2, 3, 4, 6, 9, 15 and 30 kc. Transmissions were made using each of these frequencies at various times. The actual tests involved transmitting both pulses and CW at selected times. A number of receiving locations were in operation, including those at Byrd, South Pole, Eights Station, Scott Base and the ship Eltanin in the South Pacific. Data were recorded on magnetic tape.

Things to Come. The big Antarctic antenna will continue to be a versatile basic research tool for many years. "The door is now open to new ionospheric, propagation and geophysical research studies," said Boeing engineer Ted Johnson. "For example, we now can experiment with long-distance point-to-point radio communication outside the ionosphere via whistler modes. We can study ways of improving conventional modes of communication using propagation under the ionosphere. We can do research on solar flares and perhaps eventually give predictions of intense solar storms that disrupt the earth's magnetic field. Also, we can study the electrical properties of materials deep under the Antarctic icecap."

Dollars and Sense. The lower the frequency, the more stable the signal and the less likely it is to fade out during research and communication experiments. Big antenna systems reaching as low as 14 kilocycles are in operation in Maine and at Washington State's Jim Creek station, but the cost of building each of these stations was well over the fifty-million dollar mark.

"For $12,000 worth of wire, we were able to build a bigger, more efficient research antenna which will operate at lower frequencies than any now in existence," said Art Guy. "It was a remarkably successful venture."

The antenna project is being financed by a National Science Foundation grant administered by the University of Washington, with major assistance from Boeing in manpower and equipment. Guy is on a nine-month doctoral leave from Boeing to the University and is doing some of the research for his doctoral thesis. Tighe and Johnson are Aero-Space Division employees.

Antenna Site. Antarctica was picked for the antenna installation because it has high, unpopulated plateaus on which wire can be laid in straight lines for miles, and a frigid coating which prevents signal loss. Next to free space, ice is the best, most abundant insulating material naturally available on earth. Generally the colder the ice, the lower the signal loss.

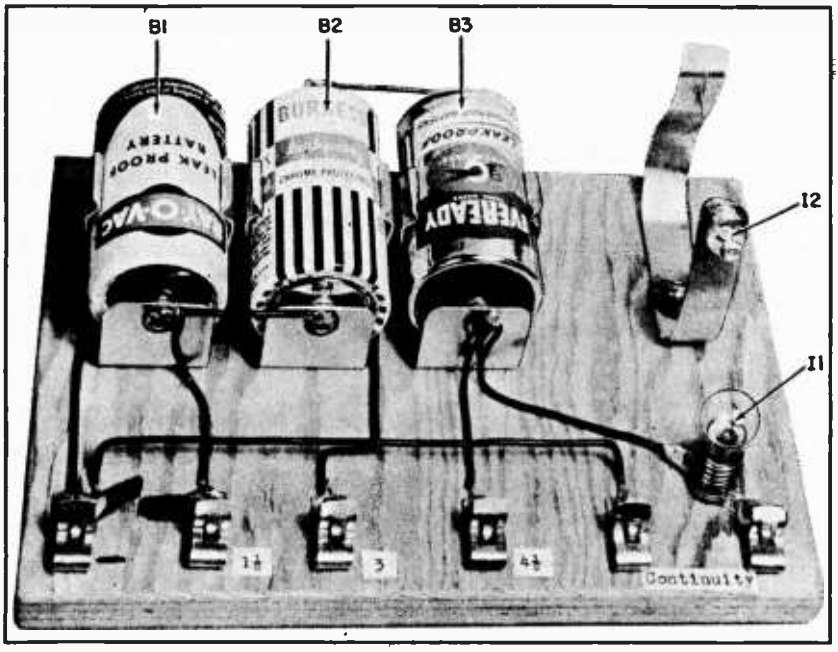
The antenna location was about 12 miles from Byrd Station, roughly 450 miles from the coast and 700 miles from the South Pole. The antenna was oriented along the magnetic meridian 30 degrees east of true north.

At the antenna site, summer temperatures fluctuated between 26 degrees above and 26 below zero. No sooner had the Boeing men located their campsite and erected their small shelter than a three-day blizzard hit, burying their equipment in 10 to 20 inches of snow.

(Continued on page 136)

Workbench Weegee Board

by Art Trauffer



Your lab workbench may be equipped with everything in test equipment from an *Annunciation* relay to a *Z*-angle meter, but do you have a Ouija board?

■ This innocent looking "Weegee" board is actually a low-voltage power supply for transistor experiments, a continuity checker, a bulb tester, an emergency flashlight, a cell tester, a code practice blinker, and anything else for which you can put it to use. (Incidentally, the correct spelling for "Weegee" is "Ouija", but how many people know how to pronounce it?)

Start With The Chassis. As shown in the photographs, the parts are mounted and wired on a ½-inch plywood board about 5 inches by 72 inches. The three D flashlight cells, B1, B2, and B3, can be mounted in Keystone battery holders, as shown, or simply soldered in series and strapped onto the board. The bulb tester is simply two strips of metal, brass, copper, or tin, about ¼-inch wide and ¾-inch long, soldered to the Fahnestock clips, as shown. The left-hand strip is bent up a little, as shown in the detail photograph.

The continuity tester is simply a miniature light bulb, I1, screw base type, mounted in a socket and wired in series with the 4½-volt power supply. One socket lug can be soldered directly to the right-hand Fahnestock clip, as shown.

The flashlight cell tester is simply a ½-inch by 6-inch springy metal band bent into

a U, and screw-fastened onto the board. A 1.2-volt flashlight bulb, I2 is soldered into a hole near one end of the U, and a brass tack is soldered near the other end. Make the U from any springy metal that's easy to solder. Bend the U so it can be spread or compressed to accommodate any flashlight cell from penlite to D size. All the circuits are shown in the schematic diagram.

It's important to note that, since we are dealing with low voltage, it is advisable that all connections be soldered, where possible.

Some Uses. For transistor experiments, or other low voltage experiments, the four left-hand Fahnestock clips will give you 4½ volts in 1½-volt steps.

Any flashlight bulb, or radio dial bulb, can be tested as shown. Even a No. 47 radio dial bulb will glow faintly if the filament is not open. Series strung Christmas tree bulbs can be tested by twisting them into the bulb socket and shorting the *continuity* clips.

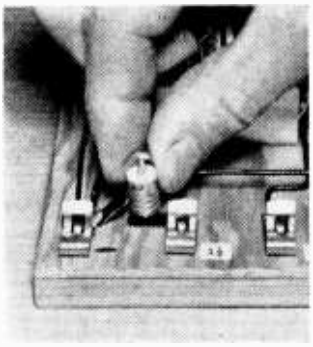
Fuses, low-resistance coils, etc., can be continulty-tested by connecting a pair of test prods to the *continuity* clips. Variable capacitors can be tested for shorts: I1 will light if the plates in the capacitor are shorted.

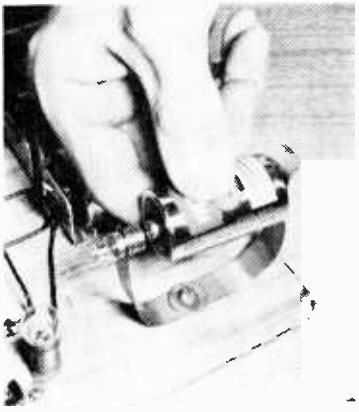
Connect a telegraph transmitting key to the *continuity* clips and you have a "blinker" code practice set.

Connect a wire jumper across the *continuity* clips and you have an emergency flashlight.

Any flashlight cell, from penlite to "D", can be tested as shown. I2 lights brightly if the cell is in good shape, but glows dimly, or fades out, if the cell is weak.

We will leave it to you to continue listing other uses for this board. ■



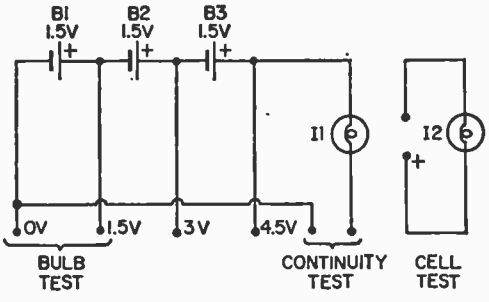


Bulb is quickly tested using the test prongs attached to the first two Fahnestock clips. The 1.5 volts is enough to check for an open filament. Flashlight cells are checked in a flash in the fabricated bulb holder and strip. Brightly lighted or dimly lit bulb indicates strength.

PARTS LIST

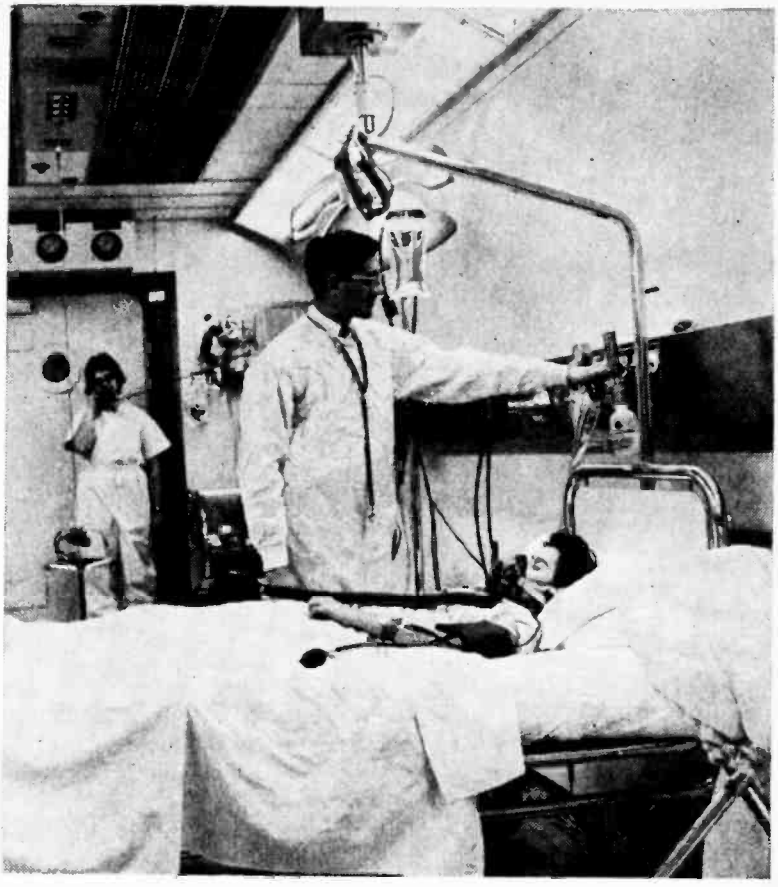
B1, B2, B3—D size flashlight cells
I1—4.9-volt, screw-base miniature lamp (GE 407 or equiv.)
I2—1.2-volt, screw-base miniature lamp (GE 112 or equiv.)
3—Battery holders (Keystone No. 175 or equiv.)
1—Miniature screw socket for I1 (Leecraft 5-06 or equiv.)
6—¾" x 5/16" Fahnestock clips (Mueller No. 10 or equiv.)
Misc.—Scrap metal for cell and bulb testers; plywood for baseboard, nominally 5" x 7" x ½"; round head wood screws; hookup wire; brass tack; washers; solder; etc.

Estimated cost: $2.00
Estimated construction time: 1 hour



Simplicity of the Weegee Board schematic diagram belies its tremendous usefulness in giving you a quick answer to your "good or bad?" electrical questions in the shop.

ELECTRONICS IN THE OXYGEN TANK



Oxygen tank patients need constant attention; but doctors and nurses have other patients too, so electronics takes over to keep tabs on the tank

■ A wide variety of illnesses can be treated in a new oxygen tank that resembles a small submarine more so than the high pressure medical oxygen chamber that it is in reality. Recently put into use at New York's Mount Sinai Hospital, the 37-ton tank and its complex of electronic equipment forces up to 30 times as much oxygen as normal into a patient's blood. Up to ten patients can be treated in the tank's three rooms, one of which is equipped as an operating room where surgery has been performed.

The tank, 45 feet long and 12 feet in diameter, is a boon to patients suffering from a common and very dangerous ailment—oxygen starvation. Such starvation occurs, explains Dr. Julius H. Jacobson, II, the facility's director, when loss of blood or a stoppage, blockage, or other circulatory difficulty in the blood vessels prevents the red blood cells from delivering their vital allowance of oxygen to the body's tissues. The result is the death of the oxygen deprived cells. The deprived areas may be a foot, the brain, or the heart. But by saturating the patient with oxygen, he points out, it appears possible to maintain the tissues in a healthy state, even without red blood cells in the circulation, for several hours. This also means that the tank is useful in treating stroke and heart attack patients. In these cases, hyperbaric (high pressure) oxygen therapy adds a margin of safety.

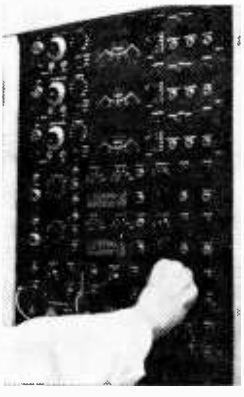
Inside the tank, patients breathe 100 per cent pure oxygen at a pressure four times that of sea level. The tank is also being used in treating patients with poor blood circulation in their legs or arms. If permitted to go untreated, the condition would result in gangrene, which would necessitate amputation of the limb.

Working inside the tank is a dangerous occupation so complex control boards outside electronically display all the conditions inside the tank both environmental and physiological. The patient's *lifebeat* is monitored and closed circuit TV even permits visual monitoring. ■

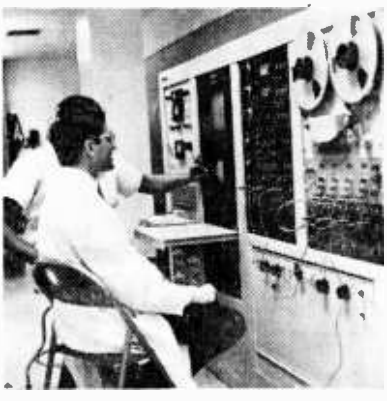
The control board outside provides communication with personnel in the tank via sound powered telephones. Note the three television screens in the console; they monitor activity in each of the three rooms within the oxygen chamber.

Television receiver screen on console is one of three that monitors activity in the three rooms or chambers of oxygen tank facility. Here, as in any form of technical communication, a picture is worth a thousand words, or in this case it is worth valuable time that might be lost in diagnosing meter readings when a picture might reveal the nature of the situation within the oxygen chamber

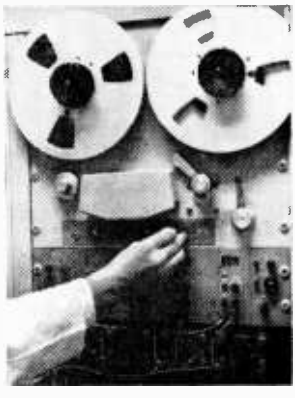
A technician adjusts the graph displayed on the console oscilloscope The console controls parameters that must be adjustable for successful hyperbaric oxygen therapy. This medical technique has proved extremely useful in treating stroke and heart attack patients, curing gas gangrene infections, carbon monoxide and other poisonings, and in treating patients with poor blood circulation in body's limbs.



The physiological monitoring console keeps tabs on the patient being treated for any one of many various physical malfunctions The readings are always at hand and make quick action possible in event of emergency.



While relaxing at home you very often view a drama of life and death on your TV screen; these doctors are also witnessing a drama of life and death on a screen but they're not relaxed about it and their concern means that, more often than not, death will lose.

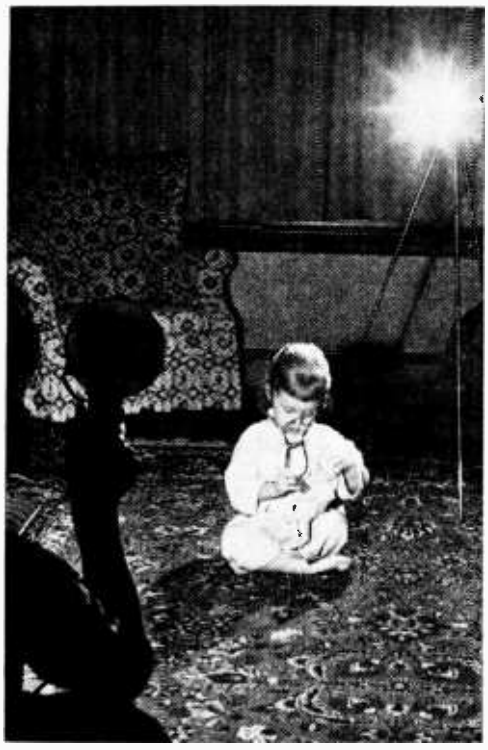


Patient's heart beat is taped using recorders on the physiological monitoring console. Inside the tank, the patient is breathing 100% oxygen under high pressure to increase the heart's capability, where the organ is damaged or blood is low in red corpuscles.

SCR Slave Photoflash

By Clarence Jones

Fill in unwanted shadows in your photographs with a second flash unit that's instantly activated by the light from your camera flash



■ Ever look at a professional photographer's flash shots and wonder, "what's he got that I haven't?" Probably, a slave—an extension flashgun.

For seven dollars, you can build a wireless slave photoflash that outperforms anything now on the market. It's small enough to slip into a shirt pocket and can be put together in about an hour.

Professional photographers never use one flashgun when they can take the time and trouble to rig more. Pictures lighted by a single bulb near the camera are harsh and unreal. Aunt Brawnhilda, close to the bulb, comes out flat and pasty. Uncle Baskerville is that shadow lurking behind her.

Auxiliary flash units are rarely found in amateur gadget bags. The flashguns rarely have an outlet for an extension flash that is connected to the main flash by a two-conductor wire. And stringing a wire across the room ties down the photographer anyway. Most wireless units—the true slaves—are strobe lights. Rather sophisticated, bulky pieces of equipment with price tags to match.

Light Activation. This wireless slave is essentially a battery-capacitor flashgun, triggered by a GE-X2 silicon-controlled rectifier. SCR1 functions as a light-activated switch for the circuit. (See the schematic diagram.) It becomes a conductor the instant the flashbulb near the camera ignites. There's no lag to amplify the current. The slave flashbulb fires simultaneously with the main flash, in perfect synchronization at speeds up to 1/250th of a second. As an example of this performance, the closest competition in the photo stores is a unit not recommended for speeds faster than 1/25 of a second and it lists for $19.95.

Everything in the parts list for constructing this home-brew is available at most electronics and camera stores. The only odd-ball is the metal *Sucrets* throat lozenge box which makes an ideal case for the unit. But any small metal or plastic box with a hinged lid that you can find will work fine.

Start By Drilling. Drill seven holes in the hinged box as follows: (See photo.)

1. 5/16-in. centered in the left end panel. This will hold SCR1. Drill low enough to clear the lid rim when it's closed.

2. 3/16-in. at left center of the lid. Lead wires to the flashbulb socket will come through here.

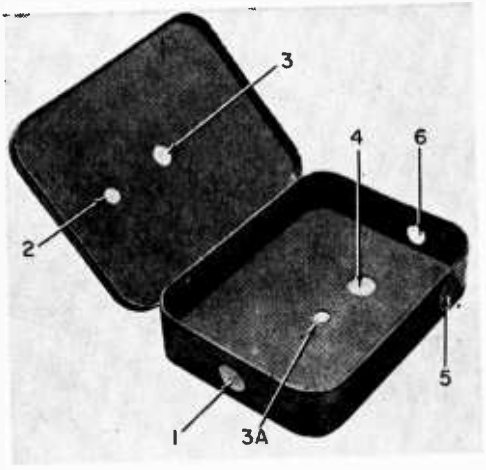
3. and 3A. 3/16-in. through the center of both lid and case bottom, for the socket mounting stove bolt.

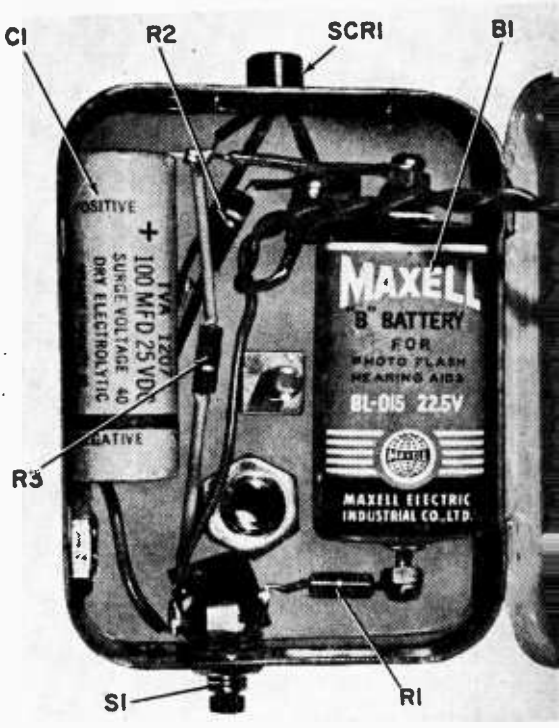
4. 5/16-in. at right center of bottom, for tripod socket adapter.

5. 5/16-in. at right front panel, for tripod socket adapter.

6. 1/4-in. at left center of right end panel for switch S1.

Now ream the 3/16-in. hole (3) in the lid to 1/4-in. so it will close more easily when the stove bolt is installed. Smooth all holes and make sure components will fit.





Refer to the text for dimensions of the holes drilled in the hinged metal box shown above. After drilling, deburr the holes and, after preliminary wiring, mount and finish wiring the components as shown at the right.

Screw the tripod socket adapters into holes 4 and 5, fastening on the inside of the case with ⅜-in. flat hex nuts. Fit the stove bolt up through hole 3 and secure it with a corresponding nut. Install switch S1 in hole 6.

Wire As You Go Along. For all wiring, use sleeving or insulated hookup wire. This will prevent a short circuit if the unit gets dropped hard enough to dislocate a component. Solder resistor R1 between the gate and cathode leads of SCR1. Use a heat sink to prevent overheating of both parts on an alligator clip between the soldering point and the component which will act to drain off the heat.

Install SCR1 in hole 1. Use a thin strip of plastic friction tape to hold it flush against the left end panel. Dress the gate and cathode leads flat against the bottom of the case.

Binding posts for the contacts of a 22.5-volt "B" battery are made by force-threading 1/10-in. machine screws into the battery poles. Thread a nut onto each screw before threading the screw into the battery pole. Be careful not to damage the battery. Place the battery in the case, with its positive pole toward SCR1 at the left.

Place capacitor C1 in the case, positive lead toward SCR1. Now wire the positive lead to the positive binding post of B1. Make a hook in the wire and tighten the nut on the binding post so that the wire is clamped securely between the nut and the screw head. Leave the capacitor lead long enough to brace the battery and C1 against opposite sides of the case.

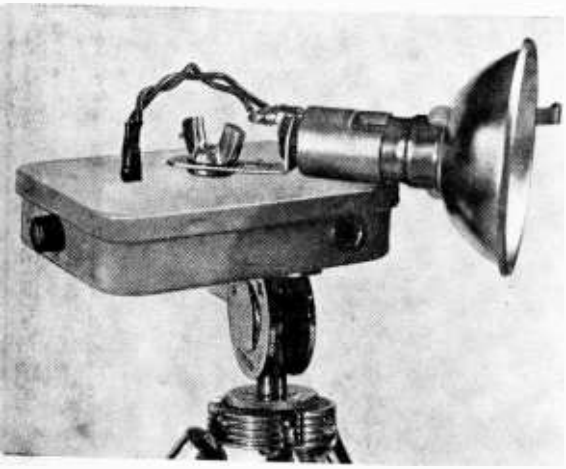
Connect the anode lead of SCR1 to the positive lead of C1, close to the capacitor. Do not solder yet.

Now attach the negative lead of C1 to the common pole of switch S1. Do not solder yet.

Connect one lead of resistor R2 to the negative binding post of the battery. Tighten the nut to make a good contact. Solder the other lead of R2 to a pole of S1 so that the circuit between the battery and C1 will be complete when the switch is at normal position.

Connect a lead of resistor R3 to the remaining post of S1 and solder. Connect the other lead of R3 to the positive lead of C1, where the anode lead of SCR1 is crimped. Solder the connection using a heat sink. Pressing the button on S1 now should break the connection between the C1 negative lead and the battery and unload the capacitor through R3.

SCR Slave



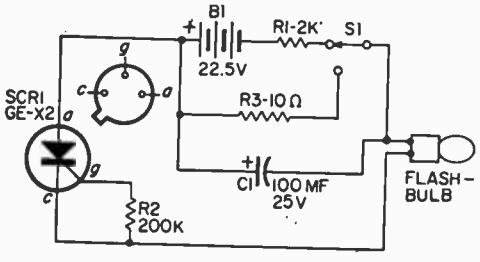
The completed slave photoflash can be mounted on a tripod as shown here. Enough twisted lead is left so the flash can be swiveled in any direction by loosening the wingnut.

PARTS LIST

B1—22.5-volt "B" battery (Eveready 412 or equiv.)
C1—100-mf, 25-volt electrolytic capacitor
R1—2000-ohm, ½-watt resistor
R2—200,000-ohm, ½-watt resistor
R3—10-ohm, ½-watt resistor
S1—S.p.d.t. subminiature momentary contact switch (Switchcraft 963 or equiv.)
SCR1—Silicon controlled rectifier, light activated power switch (GE-X2 or equiv.)
1—Small metal or plastic chassis box (see text)
1—3/16" x 1" stove bolt; 2 nuts, 1 washer, and 1 wing nut to fit
1—Bayonet-base flashbulb adapter for AG-1 or M-3 flashbulbs, and reflector
2—European-American tripod socket adapters
2—1/10" x ¼" machine screws with nuts
2—⅜" flat hex nuts
Misc.—Hookup wire, spaghetti, solder, etc.

Estimated cost: $7.00
Estimated construction time: 2 hours

Schematic diagram of the slave photoflash shows how S1 provides capacitor unloading.



Cut two lengths of insulated hookup wire about 8 inches long. Twist them together to make a two-wire lead. Feed the twisted lead through hole 2 in the case lid. Fasten one of the wires to the cathode lead of SCR1 and solder. Solder the other wire to the pole of S1 where the negative lead of C1 is attached.

Close the lid and using a washer and a wing nut, install the flash socket on the stove bolt protruding through the lid. Solder the twisted lead wires to the socket poles, leaving the lead long enough to swing the socket easily. The slave is now ready for work.

A Number 5 flashbulb can be used in the socket without a reflector, or bayonet-base adapters with built-in reflectors and bulb ejectors, available at all camera stores for both AG-1 flashbulbs and miniature-base bulbs such as the M-2 and M-3, can be used.

Caution: Be sure to press the button on S1 while inserting a bulb in the slave. This unloads the capacitor and prevents a misfire. After the bulb is firmly in the socket, release the button.

Let There Be Light. To add a new dimension to flash shots of an individual or group, place the slave high and at either side of the subject, outside of camera range. It is also an effective back-light. The two tripod sockets and the wing nut swivel adjustment for the flash head give a complete circle of coverage while the SCR is pointed at the main flash.

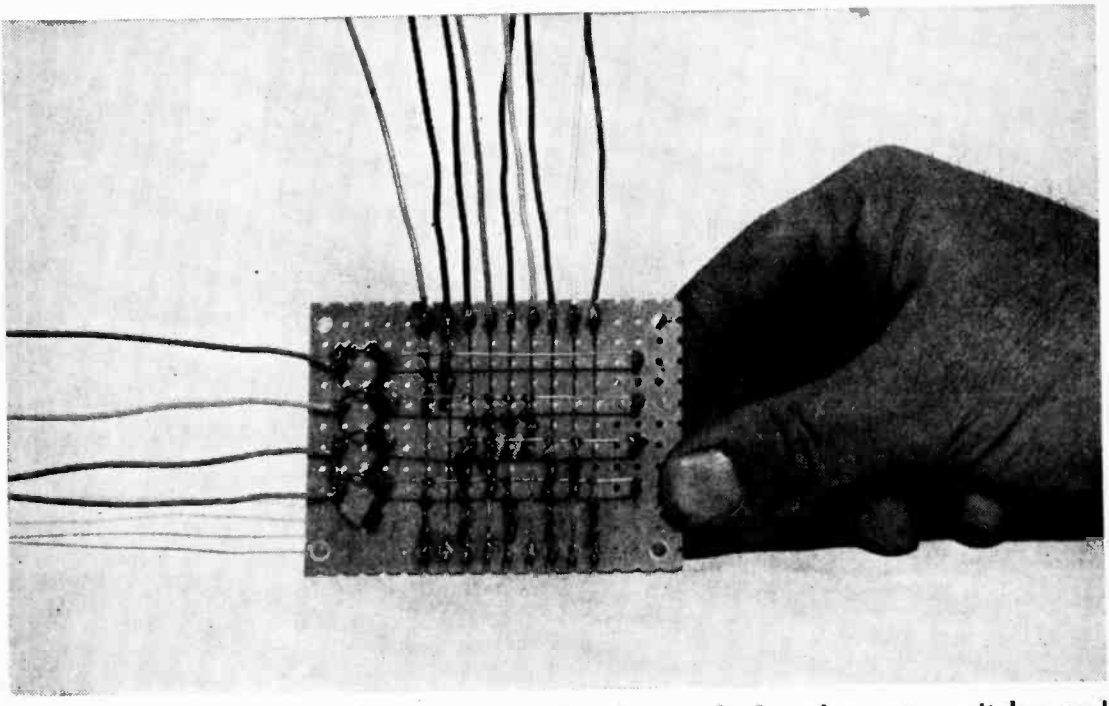
When your picture has a great deal of depth, use the slave to light the area farthest from the camera. The light from the slave can also be bounced against the ceiling to give a soft fill-in that eliminates all harsh shadows. If you're shooting color, make sure the ceiling is white.

Effective distance at which the slave will fire depends on the brightness of the main flashbulb. A No. 5 bulb will fire the slave from about 30 feet. Maximum range when activated by an M-3 or M-5 is 20 feet. An AG-1 or M-2 will trigger the slave about 15 feet away.

There is no need to adjust the slave for variable lighting conditions. It won't accidentally fire except in direct sunlight or when SCR1 is brought within about a foot of a bright indoor light. Sensitivity of the GE-X2 varies with the resistance between the gate and cathode. The higher the resistance, the greater the sensitivity. The author found the 200,000-ohm resistance gave ideal sensitivity for most photo jobs with maximum safety from misfires. ■

MATRIX CIRCUITS

by Jack Brayton
& Herb Friedman



A simple rectangular array of semiconductor diodes plus some switches and lamps can be assembled by you to convert decimal numbers to binary digits

■ When we were in grade school we learned to perform simple arithmetical problems using the decimal number system—mainly because we have *ten* fingers. But computers can't understand the decimal number system. They understand only their own language: the binary number system and for good reason—they have only *two* fingers (*on* and *off*). As a result everything fed into a computer must be translated from *decimal* to *binary* before any calculations can take place.

The electronic circuit which does the translating is called a *matrix*. In spite of the function it performs it's neither large nor complicated. In fact—it's simple to build and easy to understand. The parts used are inexpensive and readily available. Even its many diodes aren't expensive because they're offered in ten-for-a-dollar lots in many parts supply catalogs.

To help you learn all about the matrix, we have prepared three experiments that can be easily assembled from low-cost parts. Just in case you would like to make a simple demonstrator for the class room or Science Fair project, the first experiment is followed by complete plans for a simple, low-cost decimal-binary demonstrator.

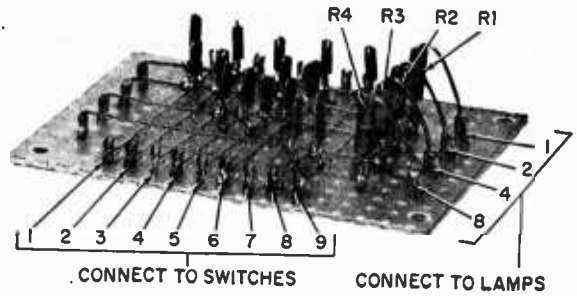
Experiment 1. A basic matrix circuit that can be breadboarded is shown in Fig. 1. The one and zero of the binary system is represented by lighted and unlighted lamps, respectively. Its input consists of normally-

open button switches numbered 1 through 9.

If we wanted the number 7 converted to binary we would simply press the number 7 switch, S7. With the switch closed the positive voltage of the battery is applied to the *anodes* of 3 diodes, D10, D11, D12, and 3 circuits are activated. *Each* of the activated circuits is a series circuit consisting of a diode, a resistor (R3, R2, R1), and a lamp (I4, I2, I1). Each circuit has 9 volts across it.

Since a diode conducts whenever its anode is positive with respect to its cathode the three diodes, D10, D11, D12, conduct. Current flows through the diode, the resistor, and the lamp of each circuit. As a result the lamps light. In this case lights numbered 1, 2, and 4 on the front panel would be lighted and lamp 8 remains unlit.

A lighted lamp represents a one while an unlighted lamp represents a zero. Thus, we can see that the output reads 0111. This, of course, is the binary number for 7. It means that the number 7 is composed of *zero* eights, *one* four, *one* two, and *one* one. So all the observer has to do is add up the numbers associated with the illuminated lamps to learn whether or not the matrix converted the decimal number to the correct binary number.



Bare copper leads suspended between flea clips serve as busses to form the matrix.

Optional Design Note. 68-ohm resistors can replace the diodes in Fig. 1 which are marked with an asterisk (*). Their input switches go to only one output and the isolation provided by the diode isn't needed. However, if the inputs were connected directly to the outputs (without the resistor) the current through the lamp would be too high.

Why and Why Not. Now is a good time as any to discover for yourself why the other lamps do not light. Starting from the positive terminal of battery, B1, try to work your way through the depressed #7 switch, S7 to lamp I8. Remember, you cannot pass through a diode unless you travel in the same direction as the arrowhead in its symbol. Try every possible path and you will discover you just can't get to lamp I8. Hence, when S7 is depressed, I8 will never light.

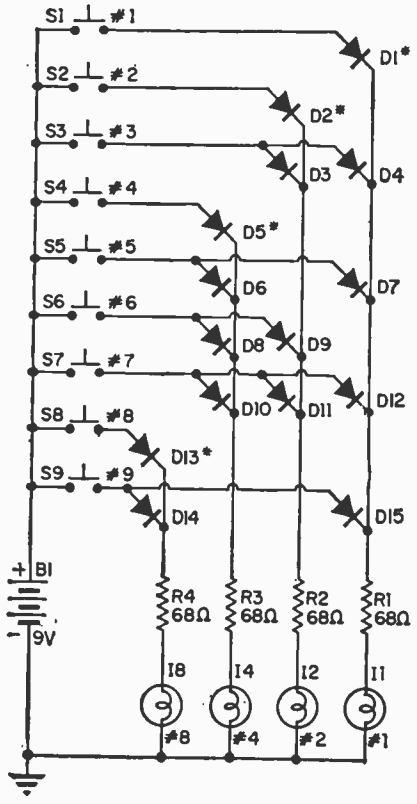


Fig. 1. Schematic diagram for an easy-to-build four digit, decimal-to-binary demonstrator.

PARTS LIST FOR EXPERIMENT 1

B1—9-volt battery (Eveready 216 or equiv.) (See text)
D1 through D15—1N34, 1N34A or equivalent (Two packages of Lafayette 19G6001 diodes or equiv.)
I1, I2, I4, I8—#49 pilot lamps (GE)
R1, R2, R3, R4—68-ohm, ½-watt resistor
R5, R6, R7, R8—68-ohm, ½-watt resistor (Optional—used in place of diodes D1, D2, D5, D13. See text)
S1 through S9—Single-pole, normally-open pushbutton switch (Lafayette 99G6218 or equiv.)
4—Bayonet sockets for #49 lamps (Leecraft type 7-11 or equiv.)

This is true for the other switches, too. The table below lists the lamps which should light when a selected switch is depressed. Using the circuit tracing technique described in the preceding paragraph, select a few numbers and find out for yourself whether the table is correct or not. *(Editor's note: the table is correct. If you differ—you're wrong.)*

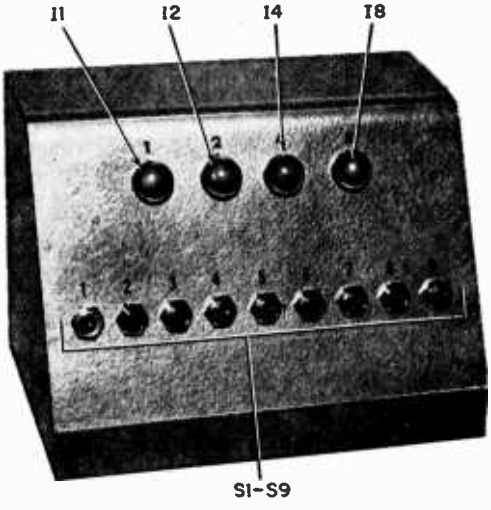
Switch/Lamp/Number Relationships

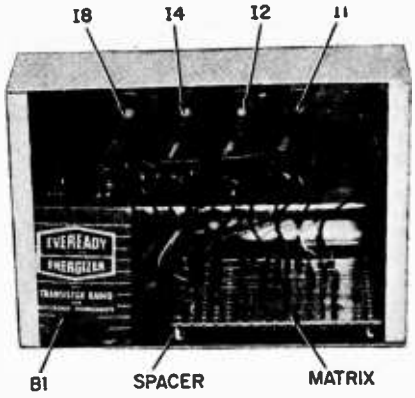
Depress Switch	Lamps That Will Light I1	I2	L4	I8	Numbered Lamps Add Up To (*)
S1	●				1
S2		●			2
S3	●	●			3
S4			●		4
S5	●		●		5
S6		●	●		6
S7	●	●	●		7
S8				●	8
S9	●			●	9

** When no lamps are lit, they add up to zero—hence, no switch is needed for the number 0.*

Experiment 2. Fig. 2 shows another matrix circuit. Excluding its output it works exactly like the first shown in Fig. 1. In this new circuit a one is indicated by positive voltage while a zero is indicated by no voltage. When an input switch is closed positive voltage is applied to the proper diodes. When the diodes conduct they have a very low resistance compared with the 10,000-ohm loading resistors. Since we measure the voltage at the top of the resistors almost the entire positive 1.5 volts of battery B1 can be measured whenever a diode conducts.

Diodes D1, D2, D5 and D13 in Fig. 2

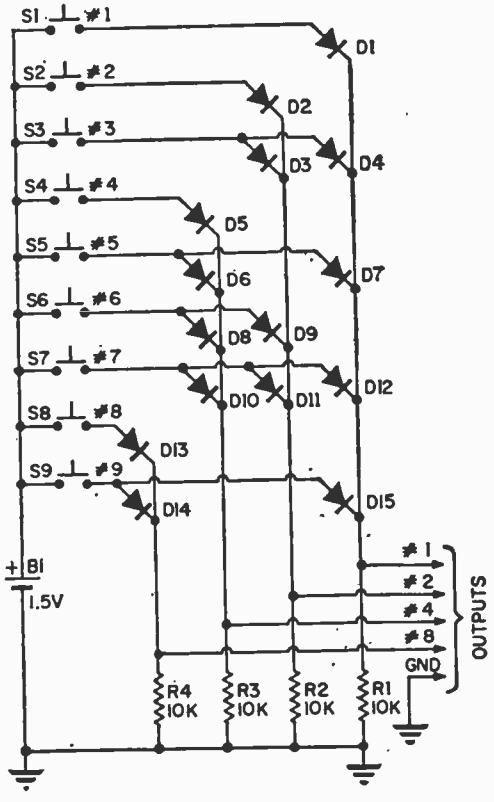




Rear view of the demonstrator shows location of lamps, switches, battery and matrix.

Photo at lower-left corner of page shows location of front panel lamps and switches on the demonstrator. Exact parts location is not critical—lamp jewels are all red.

Fig. 2. Basically the same as Fig. 1, the circuit below provides positive voltage output on binary busses in place of lamps.



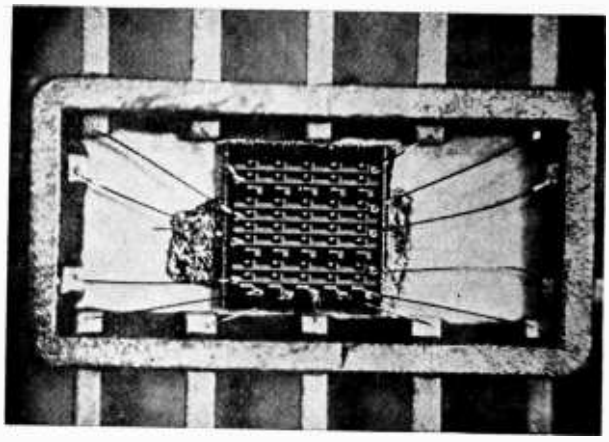
can be eliminated (shorted out) and their inputs connected directly to the outputs because neither the diode's isolation or resistance is needed in this circuit.

Experiment 3. The last circuit which we'll experiment with is a matrix whose output signal is *positive* voltage and no output is negative voltage. This circuit is shown in Fig. 3.

The basic diode arrangement is still the same. However, the output circuit operates differently. Whenever a diode is forward biased (S1 in Fig. 3 is depressed) we have a circuit equivalent to the one shown in Fig. 4.

Since batteries B1 and B2 are in series their voltages add. Thus, we have 3 volts across a series circuit consisting of the conducting diode and the resistor. Using the *current-flowing-from-plus-to-minus* theory, current flows from the positive terminal of B1 through D1 and R1 then through B2 and back to B1's negative terminal. The diode drops only a few one hundredths of a volt because its forward resistance compared with R1 is very small. This means that the 10,000-ohm resistor, R1, drops almost the entire 3 volts. Now then, the voltage seen at the output is the sum of the positive 3-volt drop on R1 and the negative 1.5-volt voltage rise in B2—therefore the output signal is the algebraic sum of the two, 1.5 volts *positive*.

(Continued on page 133)



Microminiature matrix circuit designed for computer application—enlarged ten times.

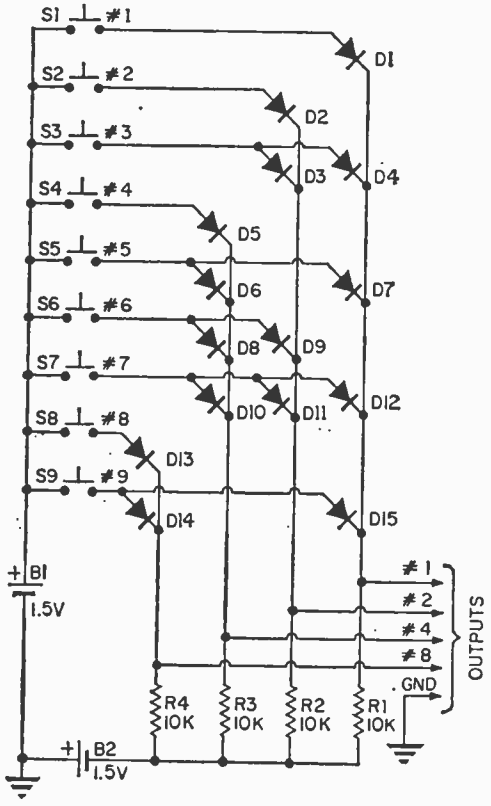


Fig. 3. Diagram of a matrix circuit capable of positive (on) and negative (off) signals.

PARTS LIST FOR EXPERIMENTS 2 & 3

B1, B2—1.5 volt (D cell or equiv.). B2 used in Experiment 3 only
D1 through D15—Same as Experiment 1
I1, I2, I4, I8—Same as Experiment 1
R1, R2, R3, R4—10,000-ohm, ½-watt resistor
S1 through S9—Same as Experiment 1
4—Bayonet sockets. Same as Experiment 1

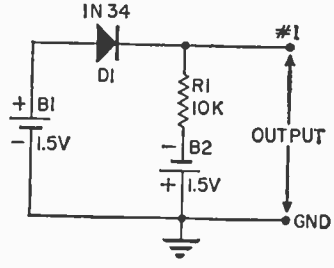


Fig. 4. Equivalent circuit for on signal.

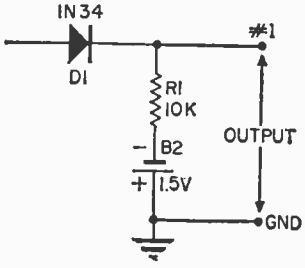


Fig. 5. Equivalent circuit for off signal.

HUMAN THOUGHT IN ORBIT

By K. C. Kirkbride

■ In the early Spring of 1960, a French popular science magazine ran a bizarre story describing an experiment in ship-to-shore mental telepathy aboard the underwater U.S. atomic submarine, the Nautilus. In distant Russia, a 67-year-old scientist, Director of Physiology at Leningrad University, Leonid L. Vasiliev, leafed through the magazine, spotted the startling story and rushed in alarm to the Kremlin. His country had been first in space, he argued, it must be first in harnessing the powers of the mind.

A few weeks later, Washington, D. C. sources officially denied the submarine story. Captain William Anderson, first skipper of the Nautilus, claimed his sub had been tied up in drydock at the time and the story was a hoax. But true or false, the incident sparked an explosion of scientific investigation in Soviet Russia that could well prove the undoing of the free world.

"Mental Radio." A few months later, the elderly Soviet Professor opened the first fully-equipped "mental radio" laboratory. Within weeks, seven more centers opened: at Kiev, Tblisi, Omsk, Saratov, Tarty, Odessa, Moscow. The Pavlovian Institute of Higher Nervous Activity in Moscow top-priority'd a "subliminal perception" program titled "Problem of Transmission of Information." Followed the University of Kharkov and the Durov Institute, already famed for its suggestion research on animals.

Top Men. The Institute's Dr. E. K. Naumov added some fifty scientists to its staff to research "Transmission of Biological Information" through telepathy. All the Soviet laboratories teamed experts in biology, physics, mathematics, electronics, cybernetics. For the Soviets spurned mystical theories of telepathy. As one scientist put it: "We are not interested in ghosts!" Biological communication, they insisted, would be mastered by cybernetical studies.

Headlines Again. Three years later, news pages headlined stories of telepathic wonders to dim the Nautilus story, experiments proved out under strict procedures of scientific documentation. To the consternation of the free world, the Soviets claimed they had proved mental telepathy existed and

had been tested, person to person in one room, person to person over a distance of several rooms, finally over distances of hundreds of miles!

Vasiliev himself claimed to have mentally projected the picture of a bird to a subject enclosed in a screening chamber, the subject picking up the word "crow." The elderly scientist explained his projects showed, "It is not usually a word-for-word thought transference, but simply two-way biological rapport."

Thought Picture. The Soviets claimed

(Continued on page 131)

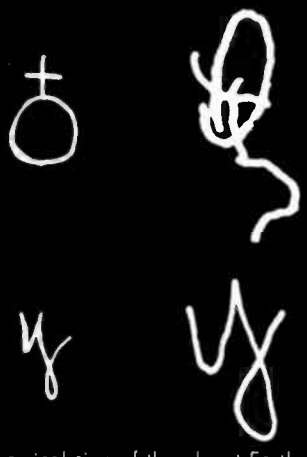
"THINK" TO YOUR FRIENDS

■ The radio "wireless" was revolutionary in its throwing off the need of interconnecting wires between transmitter and receiver. Will we soon discard even the *transmitter* and *receiver* and communicate from mind to mind?! Such communication, known in popular circles as "mental telepathy," *is* accepted as a reality in scientific circles. As mentioned in the text, Dr. Andrija Puharich, an American neurologist, speaks for the many biological and physical scientists throughout the world who, from the positive results of their experiments, would certainly concur with him in endorsing the fact that telepathic communication does exist and repeated laboratory experiments prove it.

Mental Suggestion. In thousands of carefully controlled experiments, agents (transmitters) have communicated to percipients (receivers) and results, such as shown here, have been recorded. The simplest experiments of mental suggestion involve the *transmission* of letters, symbols, and other characters on which the agent concentrates. More complex communication is more subjective in nature and evokes from the percipients a subjective response. This aspect of mental suggestion is finding increasing use in the field of psychotherapy.

Keep Your Antenna Up. Make no mistakes about it: telepathy is serious business! Research is still in the embryonic stage, but the results of continued research could affect not only the external circumstances of our lives but change our view of ourselves as men.

Why not get together with a fellow agent or percipient and try your hand at a little *CQ*. You can never underestimate the power of the human mind. With your mind on frequency, your "mental radio," which incidentally, is the title of Upton Sinclair's book on the subject, may net you a few QSL cards! ■



The astronomical sign of the planet Earth and the letter "Y" were mentally suggested to the percipient in the Russian experiments and the resulting automatic writing response is shown at the right. The "Y" was faithfully transmitted, and so was the symbol despite the fact that the crossed tail was misplaced during the automatic writing process. Many experiments of this nature have been performed, even including transmission of entire scenes containing many varied types of objects.

This may look like Greek to you, but it's actually Russian. It's the automatic writing response of the percipient in a Russian experiment. The name "Elma," that of a deceased young girl known to the percipient, was mentally suggested and it evoked what translates to: "Mamara...die...sleep I want." It provides an excellent example of the nature of response evoked by subjective stimulus. Writing below recipient's shows the response clarified in a carefully written Russian hand.

the DXpedition

BY C. M. STANBURY II

Anna discovered you can't CB skip to Mexico without true love down the road

■ XEZ3øøø claimed to be the world's first CB expedition to a rare country—the Revila Gigedo Islands, 500 miles off Mexico's Pacific coast. For two months he said, for two whole months, he'd be there and would make as many contacts as skip permitted.

So come April 15, the day it was scheduled to start, all of us Central County CB'ers were waiting on channel 7, myself (KEZ-62226) included. Up at dawn, nothing. Had breakfast, then the band opened up.

"This is XEZ3øøø calling CO DX, CO DX." Big deep voice.

Almost everyone in the CCCB scrambled onto the channel at once, with KEZ51515 loudest of them all. KEZ51515 is President of our group, master DX'er and champion CB cheat. Oh yes, KEZ51515 is also a *her*, Anna Shedoom.

I glanced at that FCC violation already on my desk (for working skip no less) and lost my nerve momentarily. My blood froze!

XEZ3øøø made contact with an operator in Pennsylvania and we all had to wait.

I decided to fill the gap, put myself on the air. So I called KEZ51515. "Anna, do we have a date for tonight?"

"Who's that QRM'ing the Mexican?"

Timidly, I answered "KEZ62626."

"KEZ51515 to KEZ62626." Crisp. "We have a date tomorrow night, if I make this contact."

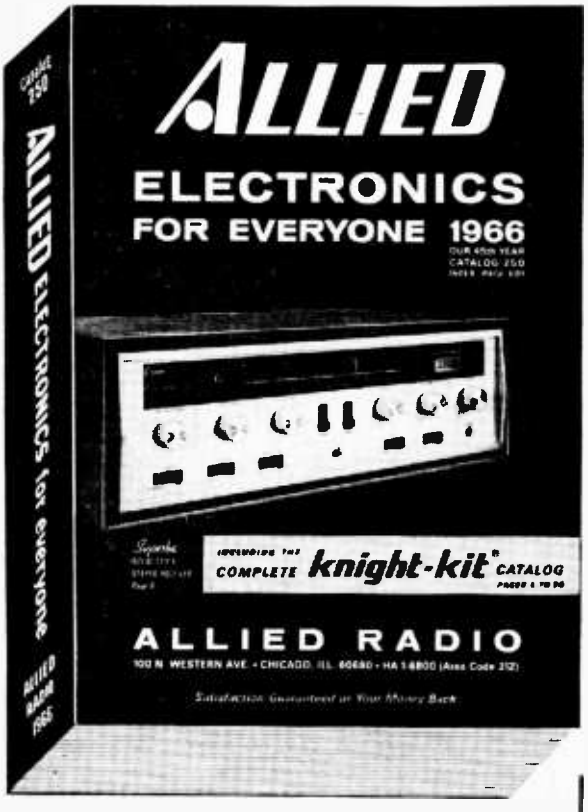
It wouldn't matter what I did, really, she'd bag her quarry anyway.

The CB'er in Pennsylvania signed off.

"XEZ3øøø, this is KEZ51515. How do you read?" Our fair president swamped the channel and the others gave up. Until she made her own contact, no one else stood a chance. KEZ51515 ranged from a mighty ten watts on up. This illegal feat Anna ac-

(Continued on page 74)

FREE



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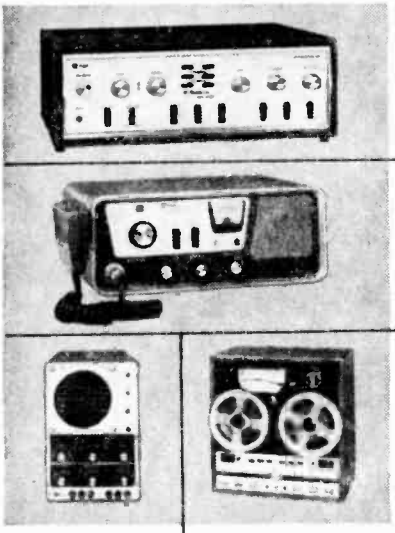

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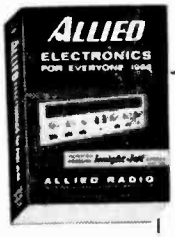

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complished via two transmitters. A remote controlled giant buried under the basement floor and a legitimate model upstairs just in case the FCC should call. They did once and found absolutely nothing.

XEZ3øøø answered her. "KEZ51515, I read you loud and clear. How me?"

"5 by 5." Her usual victorious tone. "Am I your first contact in New York State?"

"That's right."

I broke in. "XEZ3øøø, do you read KEZ-62626?" My nerve coming back now. If Anna could defy the FCC . . .

She drowned me out. "XEZ3øøø, do you still read me okay or am I starting to fade?" Anna pushed her power up at least another 10 watts.

"You're still loud and clear, miss. Did I

hear someone else calling just before you came back this time?"

Softly. "Don't think so."

I silently described her, my pad all of one block from Anna's. And again she was back on before I really had a chance to break in. Some of the other CCCB'ers tried but nothing was going to override her mighty carrier.

She made idle conversation. "What kind of a location have you? Right on the beach?" Not only did this girl want to be the first but, if she could arrange it, the only one to work XEZ3øøø.

Anna stayed president of the CCCB by juggling boy friends. If I recall right, I'm currently number two man. But the sucker who is now last will next month be top dog, for a while. Of course anyone who votes against Anna knows he'll be dropped from the rotation.

XEZ3øøø again, and stronger. "I am transmitting from between two hills but facing the sea, facing the mainland. Those hills are covered with tropic vegetation, dark green, gentle rolling slopes."

Anna sighed. "It sounds like paradise." Then she put on her sultry voice, "Any *girls* on the island?"

The Mexican laughed, "No, not on this one?"

I figured the skip was good for another two hours. Even Anna couldn't hold a man on the air that long. So I waited.

"I'm using an eight-element beam with rotor." Then she asked, "What's your array?"

"Non-directional vertical atop 66 foot tower which is in a stand of palm trees with guy wires strung between them."

XEZ3øøø's signal pinned my needle at 40 db over S/9.

"No girls at all." Her laughter, feminine, like wind tinkling through a crystal window piece. "Would you like some company?"

And me, all I ever got from Anna were the icy blasts.

XEZ3øøø switched on his transmitter but didn't modulate it for a moment. "Might be fun . . . when there wasn't any skip."

My receiver began to overload, his signal was fantastic.

Anna returned to matters technical. "Hey, how many watts are you putting out from paradise?"

"Just the legal three."

More tinkle. "I'll bet. Can see where we'd get along real well on that island."

I cut my gain down to nil and he still had plenty of signal.

KEZ51515, from XEZ3øøø. My receiver is acting up. Would you give me a long count."

I saw it then. Out the window. A silver gray FCC monitor's van moving up the street slowly, past my place and toward Anna's.

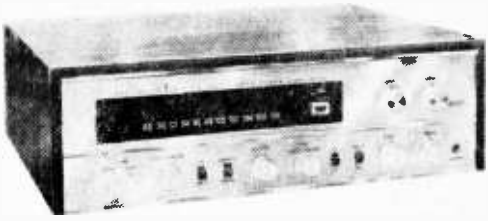
She began the long count.

It took a second for me to get the picture. There was no Mexican at all, just a roving FCC decoy who was about to catch Anna right in the act. The long count was to keep Anna talking while he pinpointed that transmitter.

I can still save her of course. Just pick up the phone and she'd cut out. Then Anna could claim her call had been pirated. Such a favor is worth a whole week of dates.

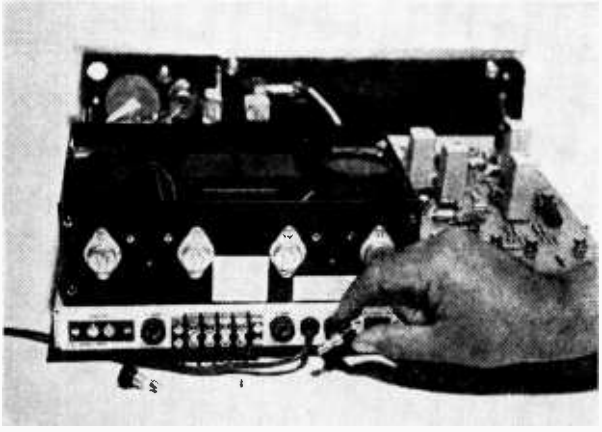
Or I can keep quiet, remove that "her" menace from the air once and for all. What would you do? ■

EICO MODEL 3566
FM-Stereo/Multiplex Tuner/Amplifier



■ Just a few short years ago even the cheapest Hi-Fi gear had enough controls on the front panel to make a Gemini space capsule obsolete. And it was only last year that manufacturers were still talking in terms of hybrid tuners using tubes and transistors because *all-transistor* usually meant problems, problems, problems. But how times change; today, even the finest of equipment uses non-complicated ("family styled") front panels; and of course, all-transistor—or as it's now called, all *solid state*—is the byword to success. A good example of the latest in design and performance is EICO's model 3566 all-transistor FM stereo tuner/amplifier (receiver).

The front panel is stark simplicity. All controls and function switches are ganged for both channels. As far as the user is concerned, except for the balance and mode control the 3566 looks like a mono receiver. And there are no concealed or rear panel controls—even a child would have no difficulty using this receiver.



Chassis layout is neat and clean with all parts exposed from the top. In kit form the EICO 3566 offers no assembly problems.

The Music Goes In. Two standard inputs, an auxiliary and a magnetic phono, are provided. A tape input is somewhat unusual as it is designed to be driven from a tape recorder pre-amp; a tape head cannot be connected directly to the amplifier. The tape output jack which feeds the receiver's audio signal to the recorder is connected ahead of the tone and volume controls so that changes made to the amplifier don't affect the recording. Switching is provided so that three head recorders can be monitored for playback quality while simultaneously recording the receiver's audio input signal.

The Music Goes Out. The amplifier will match 4, 8 or 16 ohm speakers; the maximum power being determined by the speaker impedance (as is typical of transistor amplifiers). While the amplifier is rated at 112 watts (total) IHF Music Power it must be kept in mind that this is a totally meaningless specification and the 52 watt total RMS (sine-wave) Power is the realistic rating. What is unusual is that the 3566 we tested actually exceeded the specs for RMS power, though we conducted the tests at the rated IHF power.

Lab Tests. As shown, the frequency response is outstanding—one could almost place a ruler on the graph paper and draw a straight line. The curve shown was taken at a constant 25 watts per channel with the tone controls set to the indicated flat position. By correcting the tone controls very slightly the amplifier can be made almost *ruler flat*. At 25 watts RMS output the distortion is

0.5% THD (total harmonic distortion) from 20 to 16,000 cycles, falling to 22 watts at 20 kc.

The rather excellent measurements are reflected in what the ear senses. The sound appears notably clean with no masking effects caused by hum or hiss—what is called *transparent sound*. Only with the volume control wide open is a slight hiss discernable —with no hum. The actual noise level was better than 70 db down.

Tone control variation is wide: boost was 14.5 db at 20 cycles and 17 db at 20 kc.; cut was 18 db at 20 cycles and 23.5 db at 20 kc.

Input sensitivities for full power output checked out at:

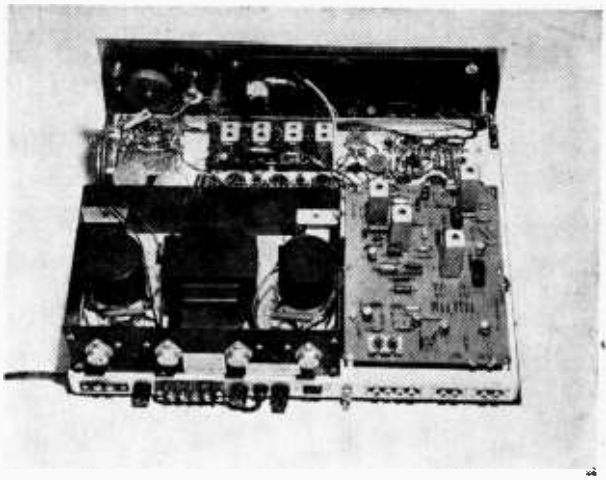
3.4 mv. for magnetic phono
155 mv. for auxiliary and tape

The Tuner Section. The FM performance is in keeping with the amplifier. Tuning is noticeably easy as a broad adjustment of the tuning knob is translated into a small tuning correction. A tuning meter is used to "center" the station. The selectable AFC is excellent; it can lock-up even if the tuning is set to the sideband edges of a weak station.

A bright full-time stereo indicator is provided which indicates stereo transmissions whether the mode switch is set to mono or stereo.

The stereo reception ranks very high. Selectivity is good and the receiver did not overlap two strong local stations which often overlapped on older FM tuners. Separation is excellent, as is freedom from "breakup" on high modulation levels. (It's difficult to describe something which is good in all aspects.)

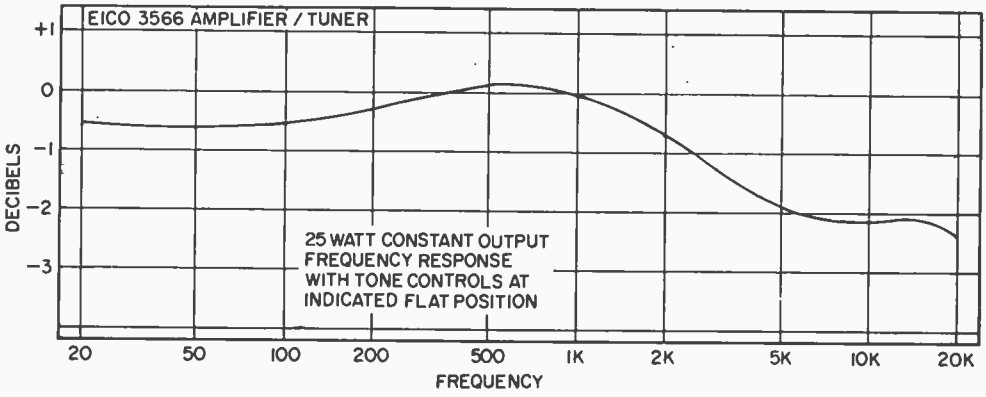
One feature we came to appreciate—though we would have never given it a second thought until one blew—is the external speaker fuses which protect the output transistors from damage caused by shorted speaker leads. We goofed, and shorted a pair of speaker leads, and it was a distinct pleasure not to disassemble the cabinet to get at the fuses. (Why are some manufacturers still burying fuses under the chassis?)



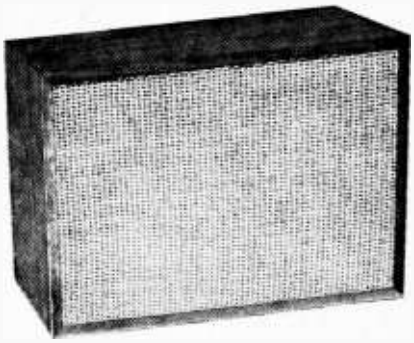
Though usually little thought of—but proven very convenient—external speaker fuse holders allow fuse replacement w/o disassembly.

Finally, a stereo headphone jack is located on the front panel. The isolating (gain reducing) resistors are internally wired so that stereo phones can be plugged in directly.

Considering its fine electrical performance and neat decorator styling the EICO 3566 is a rather impressive stereo receiver. Priced at $325.00 factory wired ($219.95 in kit form) the buyer will find himself giving the EICO 3566 more praises per dollar than any other hi-fi purchase he ever made. For more information and specifications on the EICO 3566 visit your local audio center or write to EICO Electronic Instrument Co., Dept. RT, 131-01 39th Ave., Flushing, New York 11352. ■



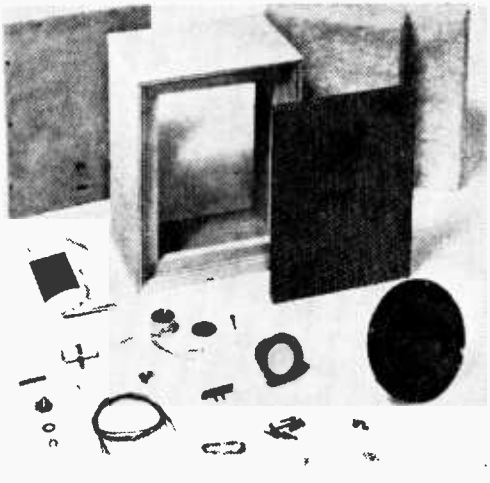
SONOTONE SONOMASTER RM-1K
High-Compliance
Speaker System Kit



■ The thing that gives any cabinet a classy hand-crafted appearance is mitered corners; where two sides come together with a 45-degree joint. Many is the home-brew cabinet which looks home-brewed simply because the corners don't have that professional made miter. But the new Sonotone Model RM-1K Sonomaster High-Compliance Speaker System Kit is a horse of a different color as every effort has been made to insure a "factory look". And we must admit that Sonotone has succeeded quite well.

The secret of the RM-1K's success is that it's a *semi-kit*. The cabinet frame, the top, bottom and sides is factory assembled, as is the front panel/grill cloth assembly. In short, the cabinetry which is immediately apparent to the eye is done at the factory by craftsmen; the builder need only screw the cabinet non-resonant panels together and wire the electronic components. Even if you are all thumbs, Sonotone sees to it that you set a screw straight by pre-drilling all screw holes.

When you open the RM-1K kit to check the parts, this is all you will find and need to assemble the complete hi-fi sound system.



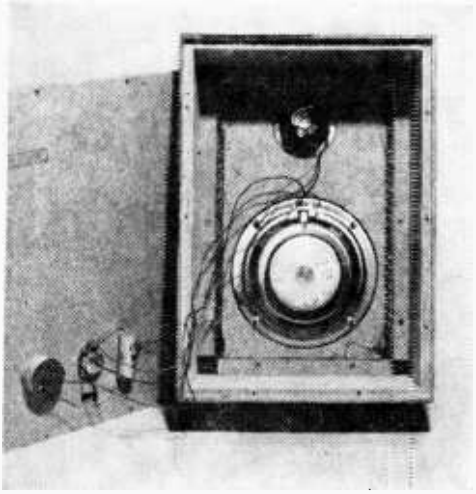
Electronically, the RM-1K consists of one of the new linear high-compliance six-inch woofers, a sealed tweeter and a cross-over network. While the user must assemble the crossover it's a simple job as the coil is supplied pre-wound and the rear panel is pre-drilled for the cross-over's mounting screws. Similarly, the rear panel is pre-drilled for the tweeter's level control. Sonotone leaves nothing to chance by supplying a pictorial wiring diagram. Follow it carefully and errors are impossible.

Assembly. No glue is involved in the assembly. The front panel is held in place by several screws which pass through full-length cleats on all four sides of the front panel. The rear panel fits into a dado cut on the rear of the cabinet and is retained by screws. Two large, thick pieces of acoustic fiberglass insulation are provided which almost completely fill the interior of the cabinet.

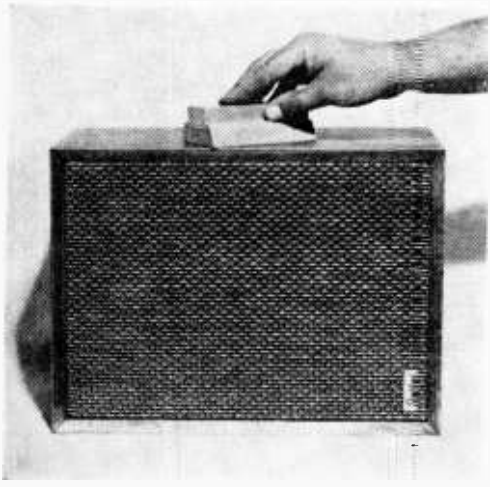
Speaking of fiberglass, Sonotone has been quite thoughtful in eliminating "fiberglass itch". When using fiberglass, just routine handling breaks off small slivers which immediately dig into the skin and cause an almost intolerable itching; and it often takes days to dig out the fiberglass slivers. Sonotone avoids the itch by supplying a pair of disposable plastic gloves which are to be worn when handling the fiberglass insulation.

Finishing. While the cabinet, when assembled, has the construction appearance of fine furniture it is unfinished—the user must

LAB CHECK



The completed speaker kit (left) is ready for its fiberglass stuffing. Now is the time to check your wiring. Below, a coat or two of clear lacquer will protect the oil stain finish.



After the unit is completely assembled, a fine sanding will remove surface scratches and blemishes. Then wipe on an oil stain of your own choosing to bring out the wood's natural grain to your taste. Wipe off excess.

do his own staining or waxing, and a lot of sanding. Our kit was not fine sanded, and any finishing treatment we would have done would result in a strictly amateurish appearance. Ten cents worth of sandpaper and a bit of elbow grease to prepare the cabinet for the stain. We suggest you follow Sonotone's recommendation and finish the cabinet before the electrical assembly to avoid a speaker covered with sawdust and stain.

Listening Test. Electrically, the Sonotone delivers what we'd call "good-fi," and considering that this is a *midget-speaker system* the sound is quite good. (Sonotone has larger speakers of similar appearance for those who insist on the widest possible frequency range.) While the bass doesn't shake the floor, we could not detect excessive frequency doubling, and the bass through the lower midrange was well balanced—producing a decidedly mellow sound which was very pleasant in a small music room.

The tweeter is very efficient and with the tweeter's level control wide-open the sound is excessively bright. However, the level control adjusts the tweeter from full-on to essentially full-off so the user can obtain the exact tweeter balance he desires. While the tweeter is *clean*, there is a slight edgy quality.

The total sound quality is quite good considering the RM-1K's price and size, and this becomes apparent when AB'ed to the sound from speakers selling for much more. Basically it is a mellow sound comparable to sound quality of the higher priced console phonographs.

Considering its low price of $35.50 the Sonotone RM-1K is a good choice when you're trying to cram big sound into a small budget. If you prefer an assembled unit with oiled walnut finish, the tab is only $44.50 audiophile net. For more information, write to Sonotone Corporation, Dept. 756, Elmsford, New York. ■

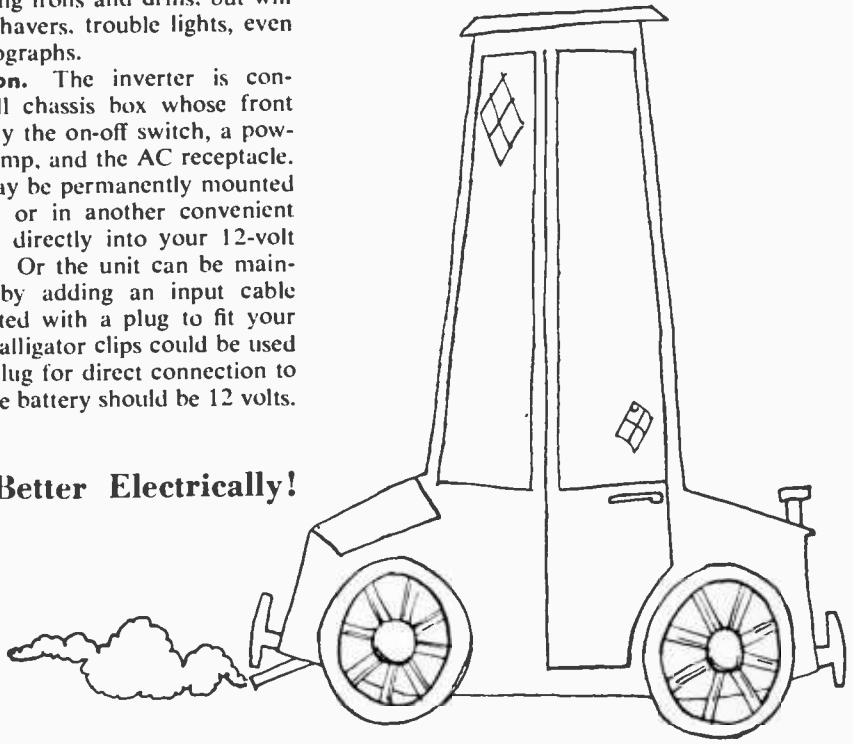
110 VOLT POWER FOR YOUR CAR

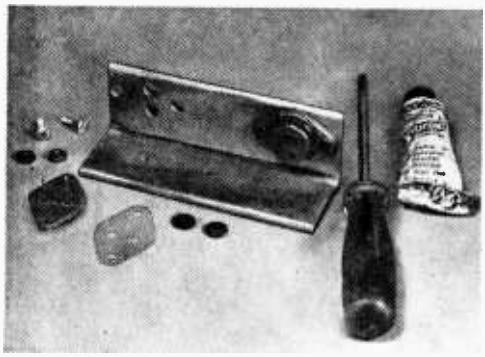
DONALD E. LANCASTER

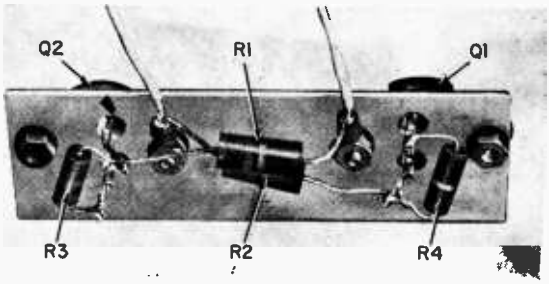
■ How often have you needed a soldering iron for working on your car's electrical system? How many times have you needed a small electric drill to perform some modification or repair? And what have you done when there was no AC outlet? Most likely you were inconvenienced with long extension cables or possibly were just plain out of luck. Your problem would have been solved if you had a commercial inverter but they *cost*. But you can wire your own inverter using the circuit shown here. For only $12.00 you can build a 60-watt inverter that is not only limited to soldering irons and drills, but will operate electric shavers, trouble lights, even radios and phonographs.

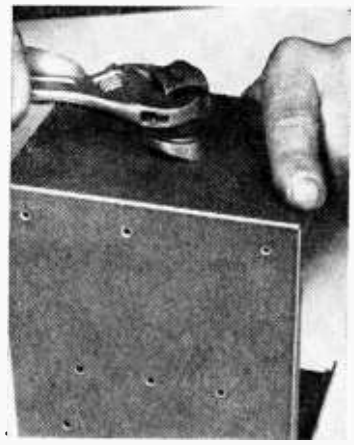
The Installation. The inverter is contained in a small chassis box whose front panel mounts only the on-off switch, a power-on indicator lamp, and the AC receptacle. The enclosure may be permanently mounted under your dash or in another convenient place, and wired directly into your 12-volt electrical system. Or the unit can be maintained portable by adding an input cable which can be fitted with a plug to fit your cigarette lighter; alligator clips could be used rather than the plug for direct connection to your battery. The battery should be 12 volts.

Drive Better Electrically!









Transistors Q1 and Q2 are mounted on aluminum angle stock which acts as a heat sink. After transistors are mounted by following details in text, wire resistors R1 through R4 as shown above. Chassis punch, left is excellent for cutting a circular hole for the AC outlet, J1.

Experiments with a 6-volt input and a different transformer did not give satisfactory operation of the circuit.

The Circuit. Commercially available electronic parts are used throughout the inverter except for the aluminum heat sink which is cut from aluminum angle stock. The circuit, about 75% efficient at full output, draws between .3 and 7 amperes from the battery depending on the load.

Incidentally, the inverter was constructed with *pop* rivets and this project is an ideal justification for one of these new tools if you have been looking for an excuse to buy one. The pop rivets make the circuit completely shock and vibration proof which is important for a permanent automotive installation. Compared to #6 hardware, they cost less, go on faster, and look better.

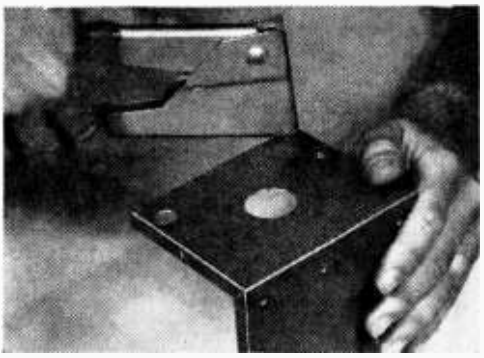
As shown in the schematic diagram, the heart of the inverter is a two transistor multivibrator, Q1 and Q2, and a step-up transformer. Transistors Q1 and Q2 are low cost germanium 150-watt power transistors, while T1 is a stock control transformer. In operation, one transistor is always *off*, while the other is always *on*. Because of the inductance of T1 and the two biasing resistors R1 and R2, the two transistors alternate conducting roughly 120 times a second. This means that current first flows from your auto battery through Q1 and the left half secondary of T1, and then flows through Q2 and the right half secondary of T1. This produces a square wave of ± 12 volts at the T1 secondary, which is stepped up and appears at the primary. C1, L1, and C2 form a filter that first de-spikes the square wave, then forms it into a trapezodial wave that is a fair approximation to a 60-cps sinewave.

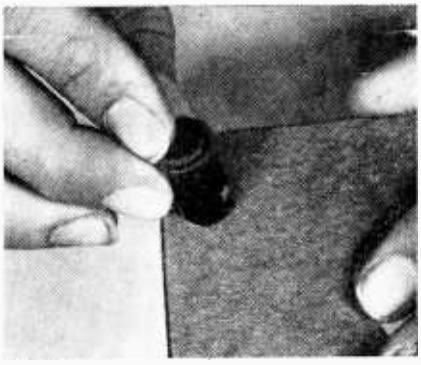
Power Out. Output voltage is around 110 volts rms for no load, dropping to about 105 for a 50-watt load and about 95 for a 60-watt load. The voltage drops off badly if you try to draw more than 60 watts out of this circuit.

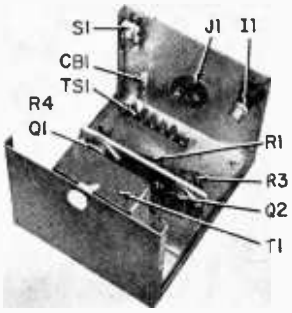
Switch S1 is a 6-ampere s.p.d.t. slide switch in series with a thermal circuit breaker, CB1, that opens at eight amps to protect the car's electrical system from a short or an attempt to load the inverter too heavily. A neon pilot lamp, I1, across the output draws very little current and reminds you whether the inverter is on or not. AC output is via a standard chassis mounting socket, J1.

Chassis Assembly. The chassis layout is shown in the photographs. For assembly you will need a chassis punch (1 5/32" round or 1 11/64" keyed), or else a file and a lot of patience for the big hole for the AC outlet.

Continue chassis preparations by drilling the front holes for the switch and pilot lite.







Power switch S1 is shown being installed with a pop riveter, above. Indicator lamp I1, above right, just snaps into place on the chassis. Partially assembled unit, right, shows the mounted heatsink subassembly and the transformer; the terminal strip, TS1, mounts CB1.

Next, turn the chassis upside down and drill all the ⅛" (#30) holes for terminal strip TS-1, the heatsink, and transformer T1. If your inverter is to be portable, drill four additional holes for rubber feet on the bottom. Finally, drill the hole in the rear for the input power cable. Use a *Heyco* or other strain relief if you can get one; otherwise use a tight fitting rubber grommet. This completes the sheet metal work. Snap in the output socket J1 and pilot lite I1, and rivet S1 in place. Make sure S1 is right side up. Follow this up by riveting T1, TS1, and the feet, if used, in place.

The heatsink comes next. A 4½" length of 1½" aluminum angle stock is used; any piece of aluminum about the same size will work as well. Drill and cut as shown in the heatsink detail photographs. Make certain there are no ridges or burrs on the transistor mounting holes. The transistors must be insulated from the heatsink using the mica washer and insulated bushings provided. Use silicone grease between transistor, washer, and chassis. You can rivet the transistors in place, otherwise use #6 hardware. Now, solder resistors R1 through R4 to the transistors and add the two collector leads (4" long) and jumper the two emitters. The heatsink is then riveted into the chassis.

Corrections. Wiring is easiest if you start at the output and work backwards, starting with the output socket J1, capacitor C2, and the pilot lamp I1. Both primary windings of T1 are wired in parallel by jumpering lugs 1 and 2, and 3 and 4.

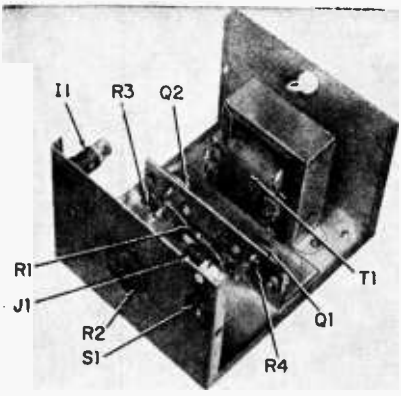
Connect one collector lead to T1 primary lug 5, the other to lug 8. It doesn't matter which goes where. Route a lead from the transistor emitters to switch S1; then a second from the other switch terminal to terminal strip TS1 and one end of the circuit breaker CB1.

The input cable is run through the strain relief next. If the cable will be less than four feet long, ordinary lamp cord will do. If you need greater length, go to a heavier cable. *Watch polarity!* Connect the negative input lead to transformer secondary lugs 6 and 7. The positive lead goes to one end of the circuit breaker. This completes the internal wiring.

Prepare the input cable using a cigarette lighter adaptor or adding two large alligator clips. Use one red and one black insulator over the clips. Again, *watch polarity!*

Test the inverter first with no load; the pilot should light. Then load the inverter with a 25 and finally a 50-watt light bulb. It is better to turn on the inverter and then plug in the load, as the multivibrator might be reluctant to start under heavy load.

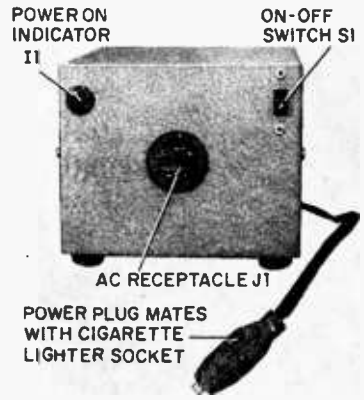
The choice of input connector type is yours.



PARTS LIST

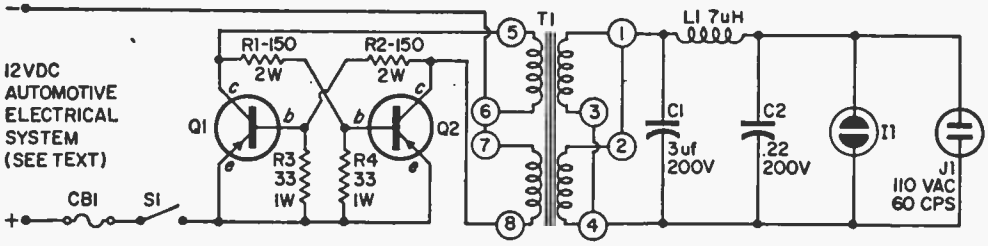
C1—3-uf, 200-volt *Mylar* paper capacitor
C2—.22-uf, 200-volt *Mylar* paper capacitor
CB1—4-amp rated current circuit breaker; trip current, 8 amperes (Sylvania MB-318 or equiv.)
I1—Neon indicator lamp assembly (red) (Allied 8E126)
J1—Chassis mounting AC receptacle (Amphenol 61F or equiv.)
L1—RF choke coil, 7 uh, 1000 ma (Ohmite Z50 or equiv.)
Q1, Q2—Germanium power transistors (Texas Instruments TI3027 or equiv.)
R1, R2—150-ohm, 2-watt resistors
R3, R4—33-ohm, 1-watt resistors
S1—S.p.s.t. slide switch, 6-ampere rating (Allied 35B026)
T1—Control transformer, 115-volt, 60-cps primary; 24-volt center tapped secondary @ 2 amperes (Allied 62G353)
TS1—2-lug terminal strip
1—4" x 5" x 6" chassis box (Bud CU2107A or equiv.)
Misc.—Aluminum angle stock heat sink, cigarette lighter adapter plug or alligator clips, lamp cord, strain relief grommet, pop rivets, hardware, rubber feet, hookup wire, silicone grease, solder, etc.

Estimated cost: $12.00
Estimated construction time: 4 hours

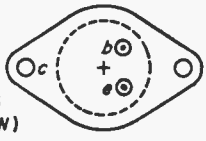


Inside view of the inverter, top, shows power cord strain relief grommet above the transformer. Power-on indicator, I1, on front panel provides a good visual "power-on" reminder.

The stability of the 60 cps is fair as may be evinced by some phonograph *wow*, particularly as engine speed is varied. This is to be expected of a circuit this simple. But unless you're using your phonograph in your car, and listening with your hi-fi ear, you shouldn't have any difficulties with the performance of this inverter. ■



Schematic diagram of inverter shows two-transistor multivibrator heart and step-up transformer T1. Filter L1-C1-C2 de-spikes the transformer output and forms a trapezoidal wave approximating a sinewave shape.



If your definition of radio includes "sending information via electromagnetic waves," then radio was born circa 1866

By Benjamin Ruhe

MAHLON LOOMIS Discoverer of Radio

It was a day cool and clear in the month of October. The date has not been recorded, but the year was 1866. Mahlon Loomis, a Washington dentist was preparing to demonstrate in the presence of eminent scientists and electricians of his day an invention he had made.

He had come to Bear's Den Mountain in the Blue Ridge near Bluemont, Va., just south of the present Route 7 as it passes through Snickers Gap and crosses the Appalachian Trail. A second team of men had been posted by Loomis 18 miles away atop Furnace Mountain, directly across the Potomac River from Point of Rocks, Md.

They were poised for an historic event—an event whose meaning and implications were to be widely debated in the following years and now, a century later, are still far from being settled.

First, two kites were let up, one from each summit. The kites had wire gauze attached to their undersides and were flown from 600-foot lengths of copper wire. The timepieces of both parties had been synchronized. Then one of the aerial wires was touched to the binding post of an "indicator"—a modified compass whose directional orientation could be disturbed by an electrical impulse.

As the connection was made, electrons drawn from the atmosphere jumped from the wire to the grounded "indicator," or detector, and created a spark, the spark caused the antenna to pulsate with electrical vibrations and this in turn produced electromagnetic waves which radiated into space. The signal, traveling with the speed of light, instantly registered on the second kite 18 miles away, traveled down that antenna and was recorded on a detector under observation by the group there.

A series of signals was now given, following a prearranged pattern. Each spark "deflected or moved the needle at the other station with vigor and precision," wrote Loomis in his record of the experiment. The arrangement was then reversed and the station sent signals back, "a perfect duplicate of those sent."

Continued Overleaf

"A solemn feeling seemed to be impressed upon those who witnessed the little performance," Loomis continued, "as if some grave mystery hovered there around that little scene."

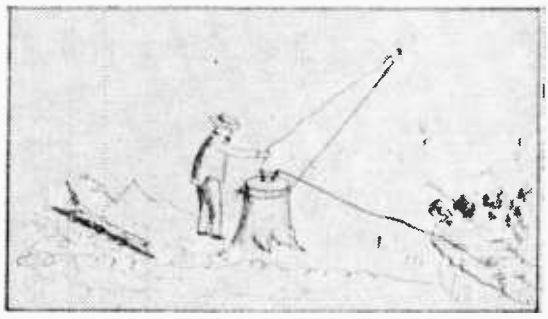
Radio Is Born. Grave mystery it was indeed. What Loomis had almost certainly just demonstrated for the first time was wireless—or radio, one of the most useful of all inventions. The spark was the key element. It generated RF oscillations in the copper aerial and no one had ever done this before. Loomis was to say later, "The time will come when this discovery will be regarded as of more consequence to mankind than was Columbus' discovery of the New World."

A Disciple. Did things happen on Bear's Den Mountain just as Loomis described them? Thomas Appleby, a retired Navy commander and a radio expert for 66 of his 79 years of life, thinks so and he has in recent years made the recognition of Loomis' achievement a principal goal in life. Commander Appleby has been researching the history of early wireless five years. When he started, he had never heard of Loomis, but the trail quickly led to the dentist, he says, and Appleby is now a firm believer in the dentist's greatness.

"The neglect of Dr. Loomis is long overdue for correction," he says. "He is a pioneer in whose work the United States is entitled to take great pride."

"If the man on the street is asked who invented wireless, he will say 'Marconi' every time," says Appleby. Yet the Italian was not yet born when Loomis conducted his first successful experiment, he points out, and adds: "Guglielmo Marconi didn't claim to have invented wireless, he was the first to *commercialize* it."

Who Was Loomis. Born in 1826 in Oppenheim, N. Y., of a renowned family of poets and professors, Loomis was reared in Springvale, Va., about 20 miles from Washington. He was largely educated from his father's library. At 20, he walked to Cleveland, Ohio, and learned dentistry in the office of a family friend. He soon invented a porcelain denture and this product won him renown in the profession. After marrying, he came to Washington and set up a practice at 907 Pennsylvania Ave. NW in a building which still stands, although it is marked for early demolition. From Loomis' brain



Diagrams from Loomis' notes record for posterity the equipment setup used in 1866. Above, receiving station consists of detector on log, antenna suspended by kite and ground wire in lake; below, identical setup, however, antenna is connected to detector to trigger impulse.

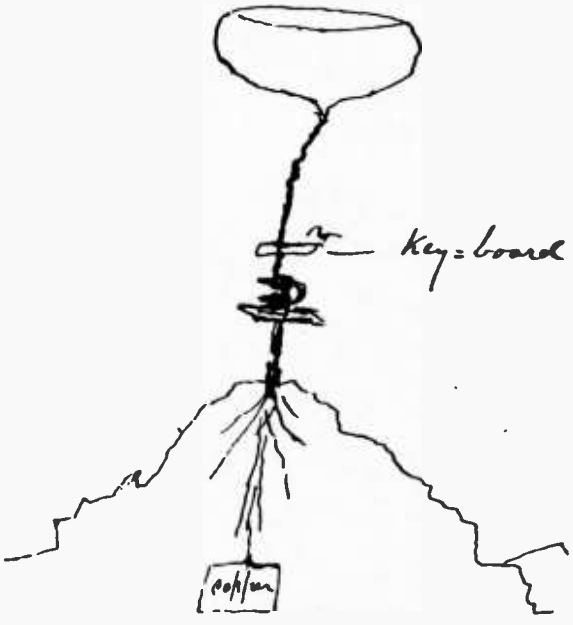
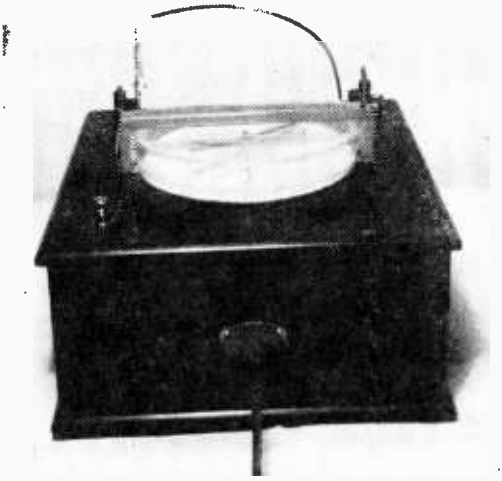
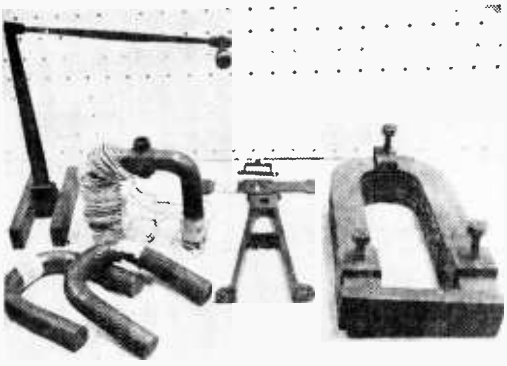


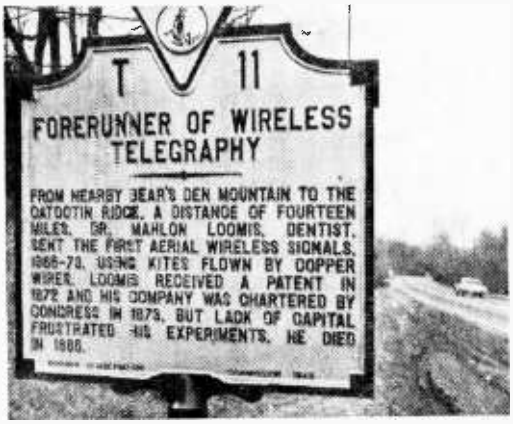
Diagram made by Loomis circa 1864. Note that this early sketch depicts first experiment.



Transmitter made recently from Loomis' notes by Thomas Appleby to duplicate early tests.



Remnants of the original equipment made by Loomis displayed at the Smithsonian Institute.



Signpost on Route 7 south of Bear's Den Mountain informs travelers of site's history.

poured useful ideas: a patented convertible valise, a collar fastener and an electrical thermostat.

Having become interested in electricity while a student, Loomis tinkered with it for years. A magazine, reporting on this at the turn of the century, said, "It worked successfully, too; for the finest of grapes and produce were grown there, as people from miles around could testify." Scientists now believe that such "fertilization" may in fact work because the current heats up the earth and this may stimulate plant growth. Loomis studied Samuel F. B. Morse's invention of the wire telegraph and eventually conceived of a better system. He theorized that instead of a wire it would be possible to use the upper atmosphere to complete the electrical circuit. On July 21, 1864, with the Civil War dragging on, Loomis sat in his office at 907 Pennsylvania and made a drawing of a peak with a kind of martini glass having roots sprouting from it. Two words were written down—"copper," referring to the electrical ground, and "key-board," referring to the spark point.

The drawing shows a complete wireless telegraph system. It has a grounded vertical antenna, top-loading capacity, a spark-gap and this may stimulate plant growth. Loomis only dimly grasped what he was doing since the theory of high frequency electromagnetic waves in space had not yet been formulated. In Appleby's view, this makes Loomis' achievement the more amazing.

Loomis apparently thought that an elevated aerial would conduct the charge from overhead clouds to the ground and this lessening of the cloud charge would in some manner affect the aerial system at a distant station—an apparently erroneous theory. Loomis also spoke vaguely of his system creating "pulsations" and with this thought he was on the right track.

Does He Deserve Credit? Elliot Sivowitch, assistant to the curator in the Division of Electricity at the Smithsonian states, "Certainly Loomis is the first to have done wireless experiments in such an organized fashion." But Sivowitch wonders whether it is proper to give Loomis credit for an invention he didn't understand. "The state of the art just wasn't advanced enough," he says.

Sivowitch feels that more corroborative evidence of Loomis' experiments is needed.

(Continued on page 134)

Canned Sound

By Hugh Gaugler

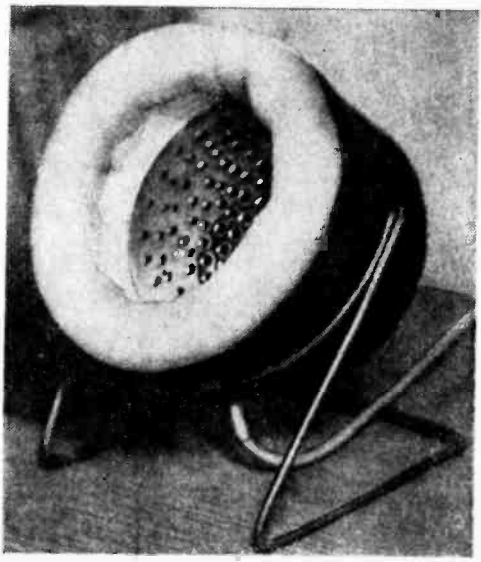
When you arrive home from work for your next free evening, leave your coat on the chair, take the wire hanger to the dinner table, empty two cans of beans or stewed tomatoes, enjoy your meal, wash the cans, add a small speaker, some wire, foam rubber, fabric, and tape, and you'll be all set, and have all you need to relax and fabricate an ultra-low cost earphone-desk speaker. Despite its lowly origins, this little unit has such a professional look, it could have come from an NBC sound studio.

This tin-can trick will revive the status the tin can lost when you discarded your boyhood walkie-talkie

The First Can. Remove one end from a can about 4 inches high with a 3-inch diameter and mark it with horizontal and vertical lines as shown. The middle horizontal line should be about ½-inch above the little speaker when it is set in the can cone up. The line above should divide the remaining part of the can in half. The vertical lines should be about ½-inch apart: make sure a line does not fall on the seam of the can. Cut down each vertical line to the second line and fold each resulting strip in half. Squeeze fold line with pliers.

Mount the 3-inch diameter replacement speaker, which you could get from Lafayette Radio (99G6099) for about $1.50, in the can by drilling two holes in the bottom of the can and a third in the side for the speaker wire. Tie a knot in the wire near the speaker and place a grommet in speaker wire hole.

The Second Can. To make the perforated cover for the speaker, take the second can and, using a nail and hammer, punch holes in its bottom. Then push the bottom outward from the inside since it will have curved in from punching the holes, and cut it out with a can opener. Place the cover over the mounted speaker, after the speaker cone is covered with a piece of dark grille material, and bend every other strip in half again and fold into the can to hold the perforated cover in place.



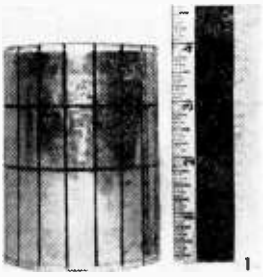
Foam Rubber Pad. Wrap a ¼-inch thick, 3-inch wide foam rubber strip around the circumference of the can and cut to fit. Then, after scribing a line the length of the strip ¾-inch from the top, fold the strip in

half along its length and sew or staple the two halves together along the scribed line. Then carefully cut off *one* of the tag ends.

Holding the rubber around the end strips of the can, mark the rubber on each side of the strips and thread a piece of hookup wire through as shown in the photo. Also, thread a wire through the roll of foam rubber that will form the ear pad; this will firm its shape. The foam pad is now placed on the can and pushed down on the protruding strips. Tie the ends of the support wires together and fold down the remaining strips.

Professional Polish. Now tape the foam tag end around the can, and also run tape around inside the earpiece to cover the folded strips. Cover the entire unit with a suitable fabric, securing it with glue. Finish by fashioning a table stand and headset holder from the coat hanger you hijacked from the closet, and terminating the speaker wire with plug or connectors to suit your applications from your spare parts box.

Now put your earphone-desk speaker to good use knowing that tomorrow night you won't have to eat out of a can. ■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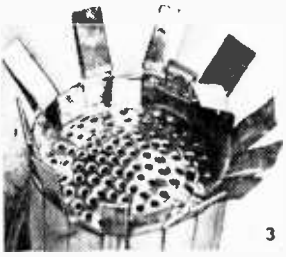
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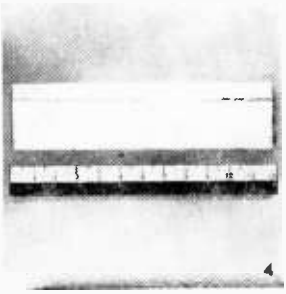
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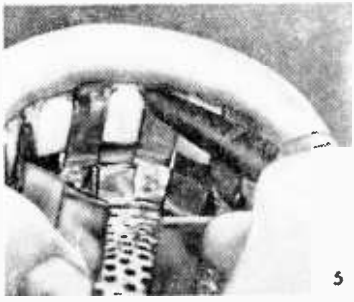
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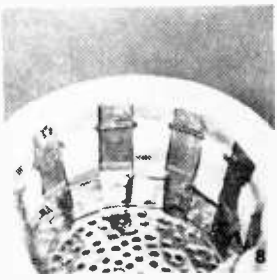
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9

After removing the top of the first can, mark it as shown in (1) and cut down the vertical lines to the second horizontal line. Fold each of the strips as shown in (2) and begin the installation of the speaker. Fabricate a perforated cover for the speaker using a second can and following the instructions in the text. Then place the cover over the speaker and secure it in place by folding every other strip as shown in (3). The foam rubber strip (4) is folded in half and stapled or sewn along the line. Then, after one of the tag ends is cut off, wrap the foam ear pad around the can and mark it on each side of the remaining strips (5) so a wire lacing can be threaded through to secure it. Before mounting the pad, run a wire through the center (6) to firm its shape. Then lace the pad (7) and place it on the strips (8). Tie the lacing wire ends together and fold down the strips. Run tape around the foam tag end (9) and then just cover the speaker with a material of your choice. Finish up by making a table stand and headset from coat hangers.

Propagation Forecast

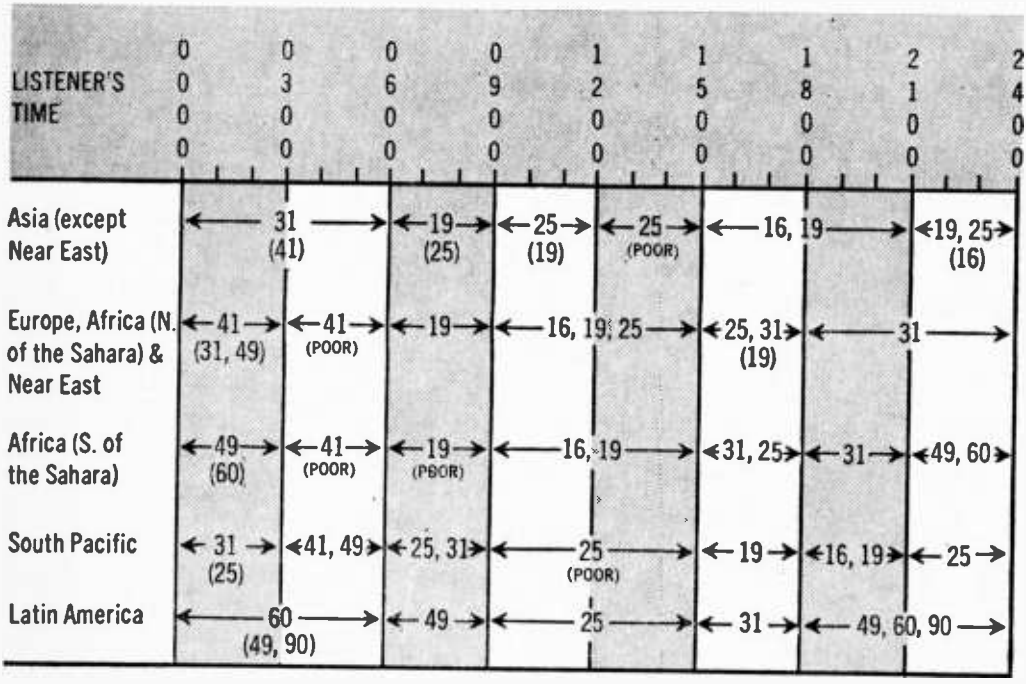
by C. M. Stanbury

■ One of the most important changes since our last edition does not show in the chart below. This is the drastic reduction in noise level on 90, 60 and 49 meters. While you will should try for the same areas at approximately the same times on these bands, reception conditions will be much better.

Along with the above goes a continued improvement of Latin American reception on 49 meters. Unlike last year at this time, the band will not be blanketed by trans-Atlantic QRM although a few stations like the BBC and Radio Portugal will still provide some interference. Because signals from the Caribbean, South and Central America will be so strong, almost any SW receiver can be used for fishing in these troubled waters.

Latin American stations usually identify by slogan (La Voz de Columbia, Radio Reloj etc.), city and country—and reports can be addressed to them by simply using this information. South-of-the-Border transmitters have a habit of drifting off their assigned frequencies, thus the SWL can never be sure where he'll find them. Further, use of non standard frequencies means a multitude of annoying hetrodynes (whistles). Most Latins speak Spanish of course, but NOT in Brazil where the language is Portuguese.

Meanwhile the number of high powered regional transmitters in Africa on 49 meters has also increased and this will mean more interesting DX—J-4 particularly from 9.00 p.m. until 3.00 a.m. as noted on the chart. Abidjan, Ivory Coast potent rig on 6015 kc is an especially good bet starting at 1.00 a.m. EST. ■



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

DX from upper limbo

by C. M. Stanbury II

There's a whole new world of DX'ing a notch above 30 mc. on your receiver that pulls in space shots, 19-meter SW harmonics, fixed stations and more

■ In the event you haven't noticed, most short-wave receivers extend slightly above SW's limit (30 mc.). Some go to 32 mc., others to 31 mc. And just how do you count this extra 2000 kc? As SW (which it isn't) or VHF? Such controversy makes for interesting DX and we have no less than three different varieties.

Way Out DX. The rarest type appears within the first 10 kc. above 30 mc. This is a Soviet space band. Cosmos 31 transmitted on 30007 kc., Elektron 1 on 30008—the latter may still be in business. How many other Soviet satellites have used this band, and will use it in the future, that only the Reds know and they're not telling. By monitoring this band constantly, you might detect one of their secret satellites, but such DX certainly will be rough. You can of course determine that it is a satellite by turning on your BFO. If when a signal is heard, the pitch varies (as the space vehicle approaches then passes on) you have found your quarry. But check your BFO against a fixed station first—you can't QSL a drifting receiver.

Harmonics. While those other two varieties of limbo DX aren't nearly so mysterious, they will be considerably easier to hear. Probably the easiest, although reception will still be sporadic, are harmonics generated by short-wave broadcast stations. Usually it will be those operating on 19 Meters (15,100 to 15,450 kc.) which will appear, however once in a while a fugitive from 49 Meters will make it too. When the latter event does occur, you can consider it almost as rare as any Soviet space vehicle. For the benefit of newcomers, a harmonic is a multiple of that frequency upon which the station intends to transmit. Thus, the fifth harmonic of HJKJ 6160 kc. (see QSL card) was logged on 30,800 kc.

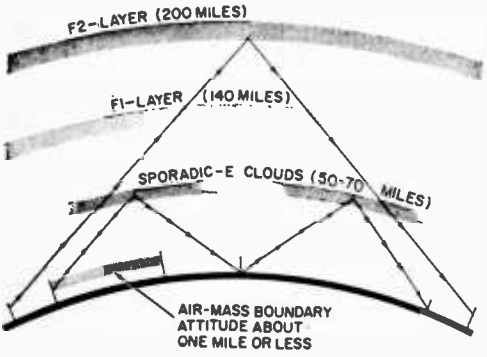
Skips. Short-wave broadcast harmonics are nearly always weak but can be heard up here because of virtually no QRM. Such reception (beyond the horizon) depends upon the *Ionosphere*, that region of ionized gasses which reflects radio signals back to, and around, the curvature of the earth. Two ionospheric phenomena make earth bound DX possible in upper limbo—F2 reflection and sporadic E layer skip. Reflection by the F2 layer produces the most spectacular DX results and can be considered a natural occurrence. It is best in winter, during daytime hours and when the sunspot count is way up. The count is now rising. When it reaches a peak around 1968, 31 mc. reception may occur from any part of the world.

The Sporadic E layer is an abnormally good reflector that occurs at approximately the same height as the normal E layer (which would never reflect 31 mc. signals). Cause of Sporadic E is unknown and it's appearance is for the most part unpredictable, although late spring and summer seem best.

East of the Mississippi, Sporadic E will on occasions produce harmonic reception from Radio Canada with transmitter at Sackville, New Brunswick. WRUL and the Voice of America at Greenville. Out West, watch for KGEI ("Voice of Friendship" at San Francisco), plus the VOA stations at Dixon and Delano, California. Getting this type of reception verified is always touch and go. Some stations will acknowledge it, others won't. Such radiation is of course technically illegal even if to a certain extent *unavoidable*.

Locals. All right, who in the U.S. is supposed to operate here? Well, the first 560 kc. is assigned to the military and no information is available on their activities in this area. Above 30,560, the FCC licenses land transportation services (railways, truckers,

(Continued on page 135)



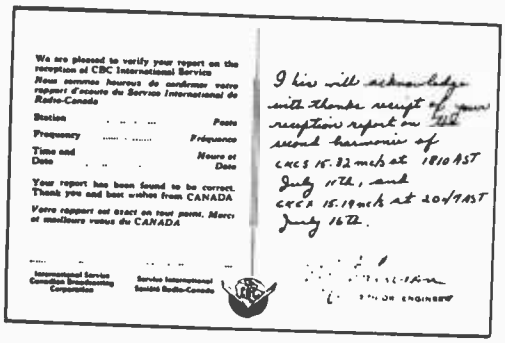
Scattered clouds of relatively dense ionization occasionally appear at the same approximate height as the E-layer. Very good 30-mc.-and-up skip can be expected in North America during spring and early summer.

Upper Limbo Call Letter Chart

KA-KB, WA-WB	Colorado, Iowa, Kansas, Minnesota, Missouri, Nebraska, North, S. Dakota
KC-KD, WC-WD	Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont
KE-KF, WE-WF	New Jersey, New York
KG-KH, WG-WH	Delaware, D.C., Maryland, Pennsylvania
KI-KJ, WI-WJ	Alabama, Georgia, Florida, Kentucky, North & South Carolina, Tennessee, Virginia (including off-shore oil rigs)
KK-KL, WK-WL	Arkansas, Louisiana, Mississippi, New Mexico, Oklahoma, Texas (including off-shore oil rigs)
KM-KN, WM-WN	California
KO-KP, WO-WP	Arizona, Idaho, Montana, Nevada, Oregon, Utah, Washington, Wyoming
KQ-KR, WQ-WR	Michigan, Ohio, West Virginia
KS-KT, WS-WT	Illinois, Indiana, Wisconsin
KU-KV	Pacific (including Hawaii)
KW-KZ	Alaska
WW	Atlantic-Caribbean

This table applies to those stations officially designated by the FCC as "Land Stations".

At left are front and back views of a QSL received from CBC, Canada and QSL-letter (below) from Radio Cadena Nacional, Colombia.


We are pleased to verify your report on the reception of CBC International Service

Nous sommes heureux de confirmer votre rapport d'ecoute du Service International de Radio-Canada

Station ... Poste

Frequency ... Fréquence

Time and Date ... Heure et Date

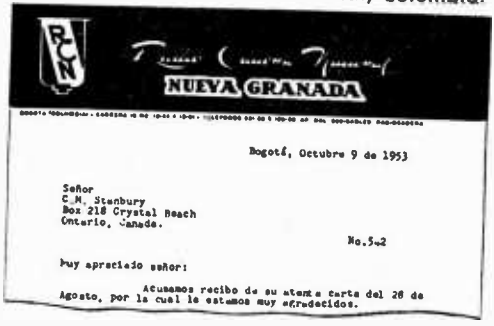
Your report has been found to be correct. Thank you and best wishes from CANADA

Votre rapport est exact en tous points. Merci et meilleurs voeux du CANADA

I bis will acknowledge with thanks receipt of your reception report on 9.61 second harmonic of CKCS 15.32 mch at 1810 AST July 11th, and CKCS 15.19 mch at 2049 AST July 16th.

International Service Canadian Broadcasting Corporation

Service International Société Radio-Canada



Bogotá, Octubre 9 de 1953

Señor
C.M. Stanbury
Box 218 Crystal Beach
Ontario, Canada.

No.542

Muy apreciado señor:

Acusamos recibo de su atenta carta del 28 de Agosto, por la cual le estamos muy agradecidos.

En cuanto al segundo párrafo de su carta, le informamos que después de chequear nuestros equipos, nó nos fue posible encontrar la causa de la 5ª armónica de nuestra emisora, ya que nosotros operamos en 6.160 KC y la frecuencia que usted escuchó de 30800 KC es justamente nuestra 5ª Armónica.

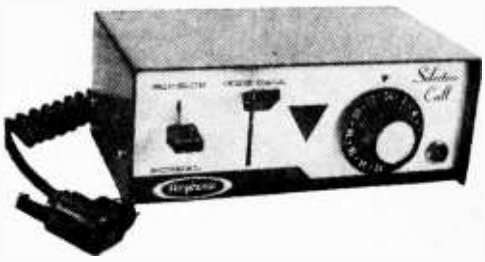
Sin otro particular y esperando seguirlo contando como nuestro asiduo oyente, nos complace suscribirnos,

Attos. Ss. Ss. y amigos

RADIO CADENA NACIONAL
Emisora Nueva Granada

Mario Ramírez O.
Gerente.

AMPHENOL MODEL 524
3-Tone, 24-Code
Selective Call Unit



■ From its inception, perhaps the greatest problem with the Citizens Band is its total lack of privacy. Not the privacy associated with transmission as CB was designed and is a "party line system." For our purposes privacy is the elimination of signals not specifically intended *for you*. The earliest attempts at privacy was the *squelch control* which eliminated noise when no signals were being received. But the squelch is not selective and any signal, whether intended for you or someone else, can be heard. Since a busy office, the home and even a mobile station is not necessarily the place for a continuous stream of radio signals, the CB manufacturers looked for some means to "code" transmissions so that only the appropriate receivers would be activated. From their first efforts came what is known as the "Selective Calling Adaptor" or "Selective Call."

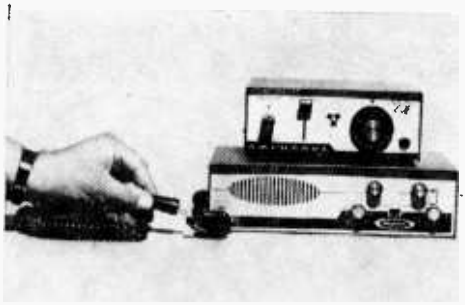
False Calls. While the single tone selective call is effective to a high degree, it is possible for two stations on the same channel to be off the center channel just enough so that the beat (heterodyning) produced by the two signals is exactly the frequency to which the single tone selective call responds. And it is even possible for noise pulses to trip a single frequency selective call. As effective as the inexpensive call is, *falsing*—the activation of the receiver by signals other than the proper tone—can be annoying.

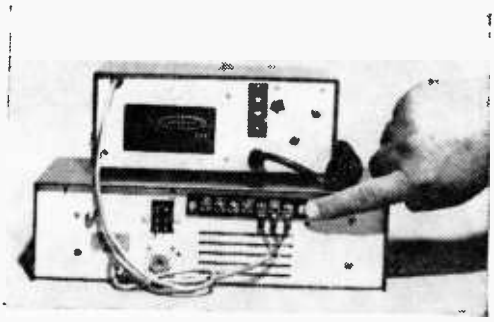
Another difficulty with the single frequency selective call is that several stations in a given area might all be using the same type of equipment and they can easily activate each other.

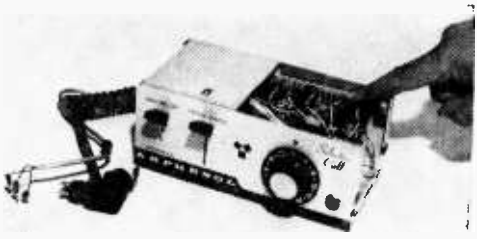
One way to almost eliminate the problems of *falsing* and high density selective calls is to use a selective calling system that uses *several different tone bursts* to activate a receiver, and the Amphenol Model 524 Selective Call is a perfect example of this type of operation.

How Amphenol Did It. The 524 uses a four-channel resonant reed relay for control, and all channels are used for a single code—the total available codes is 24 for transmitting and one for receiving. Here's how it would be used. Assume you run a delivery service with 23 trucks. For maximum efficiency there's no need to tie up 24 vehicles in radio communications when comments are addressed to one vehicle. So each vehicle's receiver is preset to its own selective code. For the sake of discussion we'll assume the base station—the control point—is set to the #10 code. To reach any given vehicle the base operator simply sets the 524's dial to the code number corresponding to the desired truck and presses a lever. If the dial was set to #15 only the truck with the #15 receiving code would be notified that it was being paged; the other vehicles would have no inkling a radio contact was taking place.

In a similar manner, each vehicle could initiate a call to the base. Since their selective call dial are set to the #10 channel—the base channel—the base receiver would be activated by any truck in the fleet. The operator would know who it is and could answer by using the code signal or could answer as a straight CB operation without using code (an important feature we'll get to later); either way, only the base and the single vehicle hear each other, again the other vehicles have no idea a conversation is in progress. When more than one vehicle must be involved the base station can page the appropriate stations using coding, then everyone switches their selective call to







Amphenol's selective call unit can be placed directly on the transceiver (top, left) or mounted to an auto dash. Connection to CB set is simple. Since speaker muting is provided in Amphenol CB rigs, only three connections are made to the rig (top, right). The receiving code is easily changed (left) by rearranging four plug-in leads. No desoldering is necessary to pick one of 24 codes. Dial selects any transmitting code.

normal operation and they use their transceivers as if the selective call didn't exist.

While at first reading the foregoing might appear complex, read it through again and you'll see it's about the easiest way to insure absolute privacy. First, there's virtually no *falsing* caused by noise or other stations; receivers activate only when they receive the correct code. Second, since the selective calls are switched to *normal* operation as soon as the receiver is activated it doesn't interfere with the simplified operation common to CB gear. And finally, since the selective call can be bypassed the CB transceivers can be used as originally intended—as if the selective call didn't exist.

CB Tie-in. The 524 is specifically intended for operation with Amphenol's and Cadre's all-transistor transceivers—models 500 and up. These transceivers are already equipped to accept selective call adaptors—a terminal strip on the rear apron provides the B+ (battery) and speaker connections. You simply connect the three lead cable from the selective call to the matching terminal strip connections. A special adaptor, part of the selective call, plugs into the transceiver's mike jack and the mike plugs into the adaptor. No changes are made to the transceiver's wiring.

When the tone burst (actually a sequence) arrives at the receiver, the receiver's speaker is automatically connected and a light flashes on the front of the selective call. If remote paging is required, a bell, buzzer or lamp can be connected to relay contacts which are connected to a terminal strip on the rear of the selective call. When the contact is completed the call's mode switch is set to *normal*—releasing the call's holding relays. When the lever is returned to the *squelch* position the receiver is muted until the correct tone sequence is received.

While the Amphenol 524 can be connected to virtually any transceiver, it's a major undertaking: the existing mike connector must be replaced, the transceiver wiring must be modified and a terminal strip or socket must be installed on the transceiver. While it is not a difficult job for an experienced technician or a service shop we don't suggest the modification be tackled by the average CB'er. If you think the 524 is your cup of tea let an experience technician do the installation; or obtain the Amphenol or Cadre CB transceiver.

How It Worked. In our field tests the 524 worked to perfection; never once did we experience falsing; the shop has never been so quiet. Even though Amphenol states that 4 of the 24 codes are more susceptible to falsing because they use an ascending or descending tone sequence, we experienced no falsing under all conditions of interference. We feel the Amphenol 524, priced at $84.95, is unquestionably the answer to eliminating the contact grind in high density CB areas; and it's the best answer so far for establishing your own "private" communications system on 11 meters. ■

take a Tape Break

Let a tape recorder take over in your shack ham today! CQ automatically, make Morse code tapes for Novices, record Oscar's space signals, and relay back test signals!

■ Take a tape break in your shack and make life easier for your DX ears and CW cramped fingers. Many operators like yourself have access to tape recorders or are ready to update their audio rigs with tape gear. Here are several shack tape recorder applications to get those reels rolling.

It's All In the Input. Nearly every tape recorder has a "radio" and/or "phono" input in addition to a mike input, additional inputs which make it easy to hook a recorder into a communications receiver. Usually, the recorder "phono input" is plugged into the receiver headphone jack, while "radio input" usually means you clip onto the voice coil of the receiver speaker. Most recorders allow you to monitor phono input through the recorder audio system, but not when using "radio" or "microphone" input —because of possible feedback between recorder speaker and mike or between recorder speaker and receiver speaker. When you decide how you are going to hook receiver to recorder, make up a shielded "patch cord" with the proper plugs (or clips) on the ends, making sure you're going to have a good ground between the two instruments.

If plugging into the receiver headphone jack doesn't automatically cut out the receiver speaker (as it does in most communication receivers), don't panic. Use the receiver speaker for monitoring instead of the recorder speaker, and drop the recorder audio to zero. Do the same thing if you're latching on to the receiver speaker voice coil. If your recorder doesn't permit monitoring by means of the recorder speaker, you're stuck with the hook-up that leaves the receiver speaker on—unless you can rig up a Siamese connnector at the headphone jack so you can monitor with a pair of headphones.

If you have a "phone patch," take a good look at the circuit and you will probably find ideal conditions for matching both input and output of the tape recorder to the receiver and transmitter. We won't attempt here to detail custom circuits, but at my station a single switch was added to the phone patch, which switched all circuits. Potentiometers were added to both the input and output of the recorder so that a single setting of the recorder volume control would balance both record and playback levels to match the receiver and transmitter.

Don't Get Buggy. For absolute simplicity, I've found that sticking the recorder mike up to the receiver speaker is unbeatable. But you get *bugs*. Bug No. 1 is room noise and reverberation. Bug No. 2 is that introducing a less-than-perfect microphone might reduce the fidelity of the incoming signal. In certain applications this won't do, as in attempting to tape a fellow-ham's modulation characteristics for playback. Your mike characteristics added to his modulation characteristics doesn't give him a true result.

By Art Brown
WA2TDF

For playback, your recorder output has to be patched into your speech amplifier; and if you have no "output" jack on the recorder, you'll have to clip onto the recorder speaker leads. Your speech amplifier input probably is of relatively high impedance, and the speaker leads are relatively low. If you use a carbon mike, either type of recorder output *might* match your speech input fairly well. But if you use a crystal mike, neither method is going to be too good and you may have to work up an audio transformer which will more nearly match recorder output impedance to transmitter mike input. Impedance mismatch which merely results in lowering gain is not much of a problem since you have gain to spare. But it's not good if the mismatch results in distortion.

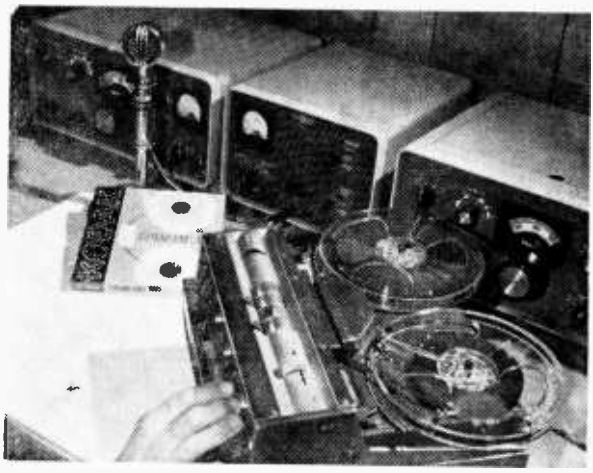
Tape It Back. Probably the widest use of tape on the amateur bands is to play the other fellow's phone signal back to him as a check on his modulation or his CW signal. This is a big help to anyone trying to improve his audio quality and perfecting the modulation of his rig or who is working on his CW note.

Realize, though, that you can make the other fellow's signal sound bad if you have not tested your equipment "on the air" with someone who will give you a critical report. All too often the major bug is too much output from the recorder which causes overmodulation and distortion.

Now a legal note: No message you hear on the air may be repeated to anyone to whom it is not "addressed." It is generally interpreted that *everybody* is addressed by broadcast stations, amateur stations and stations transmitting other types of material (time signals, weather, etc.) for the use of the general public.

When playing back another station's signal, be sure you are properly identified. The FCC takes a dim view of improper identification at any time but, when using another person's voice and call identification, you should be extra careful to identify yourself before replaying the tape.

When the Oscar gang has a satellite in the sky and you can copy it and the other fellows can't, you do everybody a big favor by *giving them a listen*. Further, only through *recording* Oscar's signals, including its telemetering, can an Oscarite derive all the information the satellite is putting out. Generally, standard time signals are recorded simultaneously to aid in analyzing what Oscar is doing. Almost a dozen bits of information could be derived from Oscar III's signal, right down to the voltage available from its battery system!



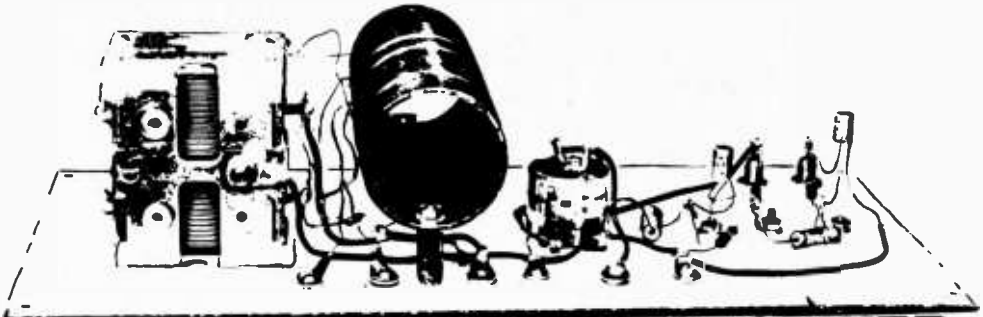
What's in the shack: Collins 32S-1 transmitter, Collins 312B-4 speaker control, Collins 75S-1 receiver, Wollensak T-1580 tape recorder loaded with Kodak high-output audio tape.

One fellow we know has a hobby of recording world-wide time and telemetering signals, navigation signals and such oddments and acquiring from the available sources the explanations necessary to understand what these signals are saying.

Make Your Own Code Tapes. Another valuable use of tape is the recording of W1AW code practice transmissions to aid beginners in learning the code. And if you're fairly clean with a key, you can lash up a code oscillator and make up "lessons" yourself to loan to the struggling beginners.

We have said nothing here about recording musical programs for replay, but there is an important point to make: if anything is worth recording, it is worth the highest fidelity you can get out of your recorder. And this means *good tape*. It costs but little more than junk tape with its multitude of splices, skewed slitting and uneven coating. But it pays you back a thousand times over in durability, tonal quality, freedom from noise, and loving kindness to recording heads!

If you'd like an easy-to-read booklet on the technology of tape and tape recording, one of the best is put out by Eastman Kodak Company, Magnetic Products Department, Rochester, New York 14650, "Some Plain Talk from Kodak About Sound Recording Tape" is free for the asking. It's a good book to read while your tape recorder is knocking out. "CQ CQ CQ DE WA2TDF" as mine does during the wee hours of the a.m. I'll be DX'ing you. ■



PUSH-PULL CRYSTAL RECEIVER

Supersensitive circuit pulls in distant AM stations. Has a double-tuned detector and two transistors to raise signal to speaker level.

The crystal receiver has long been the first project of electronics enthusiasts for many reasons. The primary one is that the crystal radio utilizes the many principles of electronics that are first gleaned from textbooks, but can be demonstrated and experimented with when you build this simple radio. The theory of antennas, detection and demodulation of information-carrying electromagnetic energy, and energy transfer in a set of earphones, all that had previously been only theoretical discussion, suddenly becomes a reality. And real not in the sense of laboratory meter deflections and readings, but in the reception of actual radio broadcasts where tuning across the band becomes a much more exiting way to witness that theory in action than watching a meter needle. One other *big* reason for the popularity of the crystal radio is cost—the *price* is *right*.

Extra Crystal and Two Transistors. This crystal receiver uses two crystal diodes in a push-pull detector circuit that improves sensitivity. The detector circuit is very much like a full-wave rectifier which utilizes the positive and negative sweeps of the incoming signal. And, in addition, two transistors amplify the audio output from the detector. A two-stage amplifier following a push-pull detector stage gives results that will be more than you would have expected. Several optional circuits and the inclusion of a few signal taps in the circuit can further improve reception and increase the receiver's versatility.

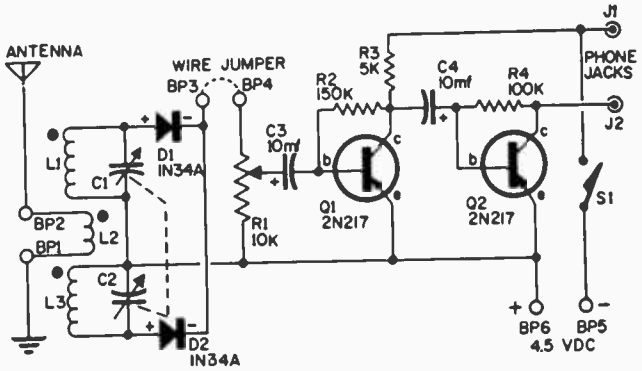
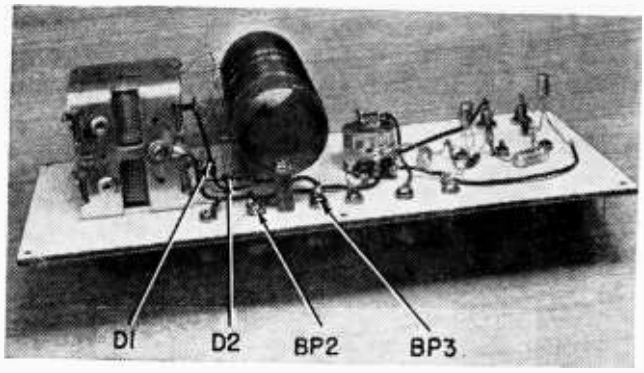
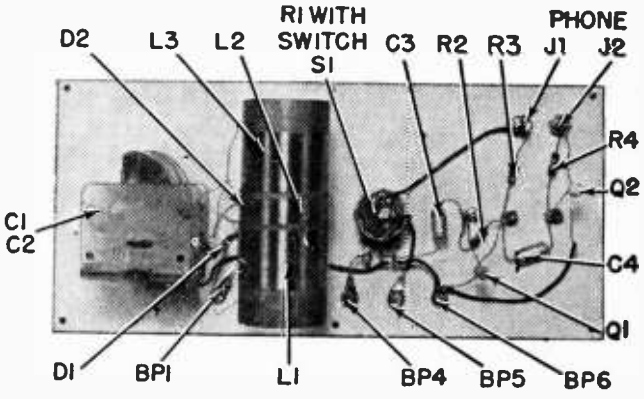


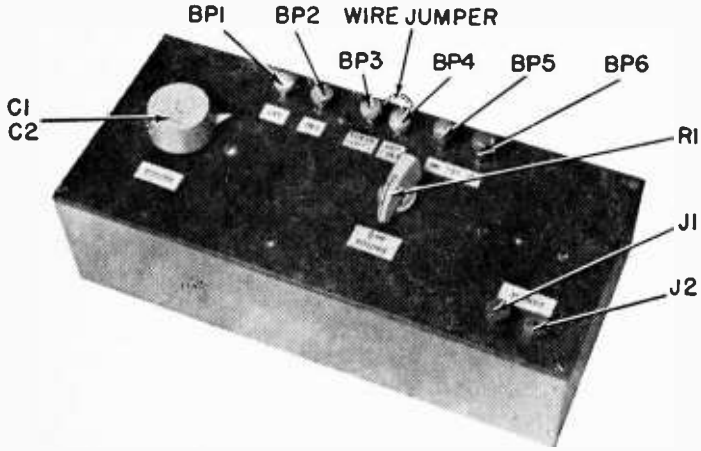
Fig. 1. Schematic diagram. Tuning circuits (L1-C1 and L3-C2) provide push-pull action to capture more signal than in regular detector. Signals from diodes D1, D2 are fed to volume control R1. Two-stage transistor amplifier increases audio for earphone monitoring. Loudspeaker hookup (see Fig. 3) may be added to rig.



Coil is mounted above surface of panel with spacers or piece of wood dowel. Note the tuning capacitor at left; a solder lug is screwed in one threaded hole on frame. Lug receives wire from control R1 and BP6.

Parts placement, underside of panel. Use wood or fiber board for panel, not metal. Scrape enamel off ends of coil leads before soldering. Battery, not shown, is external. It may be mounted in cabinet if desired.





Front-panel view shows tuning and volume knobs. Binding posts along top edge are for connecting battery, antenna and jumper. Use a red post for BP6, black one for BP5. Other posts are white. Output is obtained at jacks J1 and J2.

Tuning the Antenna Coil. As shown in the schematic diagram, Fig. 1, a split secondary coil, with antenna coil between, is tuned by a two-section variable capacitor. If a single-section variable capacitor is added in the antenna circuit, Fig. 2, the antenna coil can be tuned to obtain both improved sensitivity and selectivity. Using a long outdoor antenna and a good water pipe ground takes further advantage of the added circuit. For frequencies below 850 kc, close the s.p.s.t switch to connect the .001 mfd. fixed capacitor across the variable capacitor. This combination is necessary to cover the entire broadcast band.

Speaker Listening. Adding an audio output transformer to the crystal receiver enables you to connect a speaker for room listening to local stations. As shown in Fig. 3, the 2000-ohm primary of transformer T1 is connected across the headphone jacks J1 and J2. A small 4-ohm speaker can then be con-

PARTS LIST

B1—4½-volt battery (Burgess F3 or equiv.)
BP1 through BP6—Six binding posts, 4 white, 1 red, 1 black
C1, C2—Two-section variable condenser, each section 365 mmf. (Allied Radio 13L521 or equiv.)
C3, C4—10 mfd., 15-volt miniature electrolytic capacitors
C5*—365 mmf., single-section variable condenser (Allied 13L524 or equiv.)
C6*—.001 mfd. ceramic capacitor
D1, D2—1N34A germanium diodes
J1, J2—Phone tip jacks
L1, L2, L3—Antenna and input tank coils; No. 32 enameled copper wire wound on 1½-in. coil form, 95-30-95 turns, respectively (See text for winding instructions)
Q1, Q2—2N217 PNP transistors
R1—10,000-ohm potentiometer, logarithmic taper with s.p.s.t. attachable switch (Allied 30M307 and 30M358, respectively)
R2—150,000-ohm, ½-watt resistor
R3—5,000-ohm, ½-watt resistor
R4—100,000-ohm, ½-watt resistor
S1—S.p.s.t. attachable switch (see R1 above)
S2*—S.p.s.t. toggle switch
T1*—Audio output transformer; Primary: 2000 ohms, secondary: 4 ohms (Allied 61G401 or equiv.)
1—¼-pound spool enameled magnet wire No. 32 (Lafayette Radio 32G3074 or equiv.)
1—Coil form, 1½-inch diameter x 3 inches long
Misc.—Tuning and pointer knobs, Fahnestock clips, phone plug, composition board, hardwood stock, machine screws, 4-ohm speaker*, lock washers, hex nuts, wood screws, solder lugs, insulated copper hookup wire, spaghetti, varnish, wood glue, solder, etc.

Estimated cost for basic receiver: $8.00
Estimated construction time: 6 hours
*Optional components

nected to the secondary. If you choose to add the speaker listening option to the crystal receiver, you can mount the transformer and speaker in a small commercial enclosure or build a compact speaker box.

Headphone Connections. Binding posts BP1 through BP6 actually tap the receiver circuit in significant places: BP1 and BP2 are the ground and antenna connecting points, respectively; BP3 and BP4 split the circuit between the detector stage and the two-transistor amplifier; BP5 and BP6 are the negative and positive input points for the 4½-volt battery power supply. Jacks J1 and J2 are the audio output points where earphones are connected for listening with two stages of amplification. When receiving a powerful signal that can be easily heard from

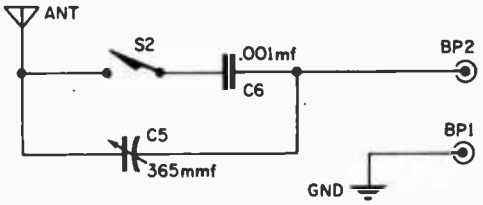


Fig. 2. Optional hookup improves antenna.

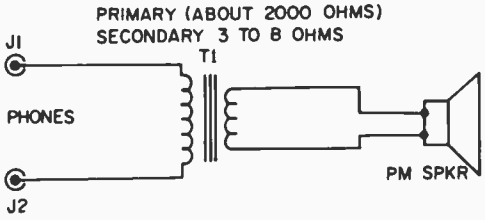


Fig. 3. How to add loudspeaker operation.

the detector without any amplification, you can connect the earphones right across binding posts BP3 and BP6, without using the battery at all! Remember the wire jumper across BP3 and BP4. Disconnect it when you don't want the detector output fed to the amplifier.

AM Tuner For Hi-fi Systém. Perhaps you have a hi-fi rig that, like many others, doesn't have an AM tuner. And now you find that you miss some of the program fare that a few of those AM-only broadcasters have to offer. All you have to do to receive AM on your rig is pick off the signal from your push-pull crystal detector at BP3 and BP6 and feed it to your hi-fi amplifier. To make the connection use a phono cable with one end terminated in two pin plugs for the receiver binding posts.

If you can use the detector stage of the crystal receiver alone, you can do the same with the amplifier stage and use it as a utility amplifier. Connect the 4½-volt battery across binding posts BP5 and BP6 and connect the high impedance headset or transformer and speaker to jacks J1 and J2. Then connect the output from either microphone or turntable (either crystal or ceramic cartridge pickup) to binding posts BP4 and BP6.

Putting It Together. The crystal receiver shown in the illustration was built as an experimental project with the possibility of the parts being used again elsewhere. But if you plan to use the receiver regularly, you can plan the construction, lay-

(Continued on page 136)

BFO

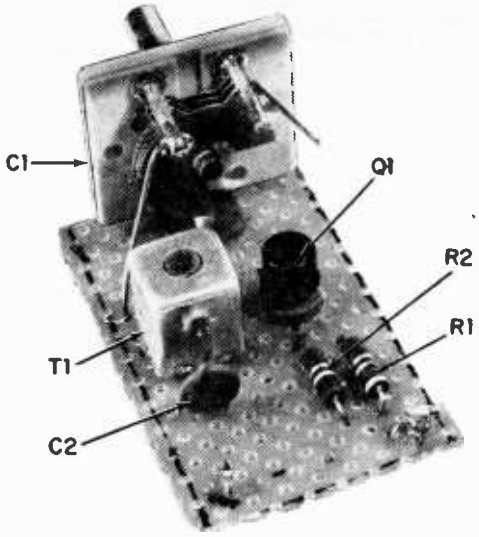
BY STEVEN SUMMER

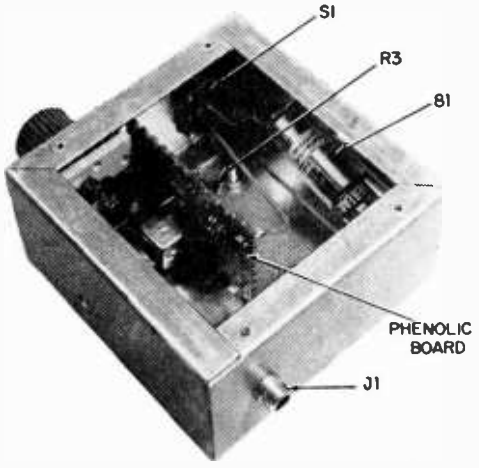
Many hams and short-wave listeners are still equipped with an old receiver that merely "tunes the short wave bands." Such receivers, along with many inexpensive, modern receivers cannot receive code or sideband signals because they have no BFO—beat frequency oscillator. Yet adding an external BFO need not be difficult or expensive. The BFO described in this article is easy to build and will cost less than $7. It can be added to any superhet radio, AC-DC or transformer operated, whose IF frequency is in the 455 kc range.

The remote BFO makes an ideal *external* accessory because it may be placed a few feet away from the receiver. A single penlite cell furnishes power to a transistorized Hartley oscillator. To avoid coil winding, a miniature transistor IF transformer is used as the tank circuit—supplying all necessary taps and windings. The pitch of the beat note is adjusted by C1, a 17-picofarad variable capacitor. A 2N508 audio transistor is used because it gives a high output.

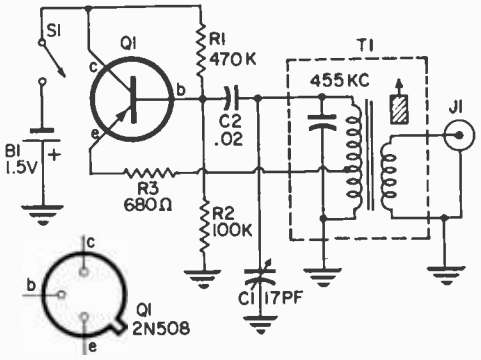
Construction. In order to simplify construction, a phenolic board sub-chassis was used. All parts, except the battery and switch were mounted on the 1½" x 2½" perforated phenolic board. The parts layout is shown in the photographs. There is a small bracket on the bottom of C1, to which the phenolic board is attached with a (6-32 x ¼") machine screw. Because the bushing on C1 connects the subassembly to ground, only two wires need to be connected to the board to complete the circuit. One wire goes to the output jack, J1, the other to the on-off switch. In order to make removal of the subassembly from the aluminum box easy, these two wires are connected with "Flea Clips."

An aluminum utility box was chosen to house the BFO because its removable top and bottom offer a maximum ease of access. Although the builder may desire four mounting feet, it was found that three mounting feet in a triangular arrangement prevented wobbling. In no case should the builder omit the rubber feet because the screws holding the bottom plate will scratch the operating table or the top of the receiver. On the right hand side of the case a quarter inch hole was drilled so that the slug in the IF transformer could be adjusted with the case sealed up. No drilling location is given in the mechanical layout, since location depends on placement of the IF transformer on the phenolic board. The builder will have to determine the exact location for himself. The output jack, J1, is a phono jack of the single-hole mounting variety. Actually, other connectors would serve equally well, but the phono jack was chosen because of its availability and low cost. A smaller or larger IF transformer can be used if it is electrically similar.





Board mounts vertically in case, held in by the tuning capacitor. BFO signal is at J1.



Be sure to follow Q1 connections, as shown in schematic above. Q1 mounts in transistor socket seen in left photo. Wire complete board before inserting in metal case.

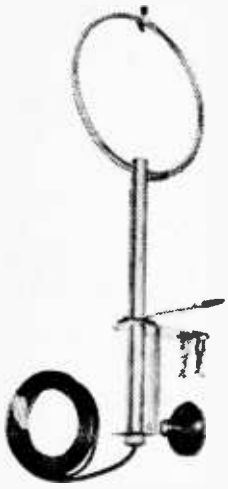
PARTS LIST

B1—Penlite cell (Burgess type Z or equiv.)
C1—17-picofarad (17-mmf.) variable capacitor (Hammarlund HF-15 or equiv.)
C2—.02-mf., 100-volt, ceramic disc capacitor
J1—Phono jack (Switchcraft 3501FP or equiv.)
Q1—2N508 (GE)
R1—470,000-ohm, ½-watt resistor
R2—100,000-ohm, ½-watt resistor
R3—680-ohm, ½-watt resistor
S1—S.p.s.t. slide switch (Continental-Wirt G723 or equiv.)
T1—Miniature transistor IF transformer for 455 kc: primary-25,000 ohms; Secondary-600 ohms, tapped pri. (Miller 2041, Lafayette MS-168A, Argonne AR60 or equiv.)
1—Aluminum utility case, 4" x 4" x 2" (Premier AC-442 or equiv.)
1—Battery holder for one penlite cell
Misc. Phenolic board, hardware, flea clips, knob, wire, solder, etc.

Estimated Cost: $7.00
Estimated construction time: 3 hours

Using It. The BFO is easily connected to the receiver. In fact, no actual physical connection is needed. A one foot piece of insulated hook-up wire, acting as a gimmick capacitor, injects a sufficient signal when wrapped around an IF transformer or the IF amplifier tube. If this arrangement couples in *too much* BFO signal, try wrapping the hookup wire around the power cord or the detector tube. It is important to feed into the receiver a signal of sufficient volume, and not higher. Too much BFO signal will cause the AVC to operate, making the receiver less sensitive. A good test for proper volume is to use the BFO on a sideband signal. With the proper amount of BFO injection even a strong signal can be easily demodulated. If the BFO is heard on other nearby receivers, use microphone cable (the center lead only). Don't ground BFO case to AC-DC set.

Being transistorized and battery operated, the BFO has no warm up drift and is not affected by line voltage variations. The battery drain is only ½ milliampere—hence, long battery life can be expected. It is electrically stable, and drifts only slightly with changes in ambient temperature and mechanical shock. This BFO is a valuable addition to any receiver that lacks one. Because of its electrical and mechanical simplicity, it can be constructed in a few hours, even by an inexperienced builder. ■



DF for CB

Now you can track down CB signals with a direction-finding CB loop antenna

■ Are you tired of the jokers that jam the local group with dead carriers? Are you prepared to find a distressed motorist shouting for *HELP* when he hasn't the vaguest idea where he's at? Or maybe you'd like to soup-up those dreary REACT meetings with a little fun, not to mention experience at tracking down "lost stations". Whatever your bent, whether it's revenge, concern for your fellow man, or just a unique rescue drill, you can track it down with the *Signal Hunter*.

While the Signal Hunter is yet another CB antenna there's a *big* difference. Unlike other CB antennas which are designed to "boost" transmission the Signal Hunter is a DF (direction finding) antenna designed only for receiving. Typical of DF's, the Signal Hunter is a loop (about 12 inches in diameter) having sensitivity to the sides and a very sharp null towards the front and back.

Putting It In Operation. The DF loop is mounted on a short shaft assembly having two clips and a suction cup. With the car window half-lowered the clips fit over the top of the glass and the suction cup holds the antenna against the window. The shaft, and therefore the antenna, can be rotated by moving a pointer handle attached to the shaft. The antenna is equipped with a coaxial cable terminated in the standard PL-259 coax connector.

The DF loop is tuned by adjusting the small variable capacitor at the top center of the loop for maximum interstation noise. Then, with a walkie-talkie or another transceiver located some distance away the DF pointer is aimed at the station and the capacitor is adjusted for minimum signal.

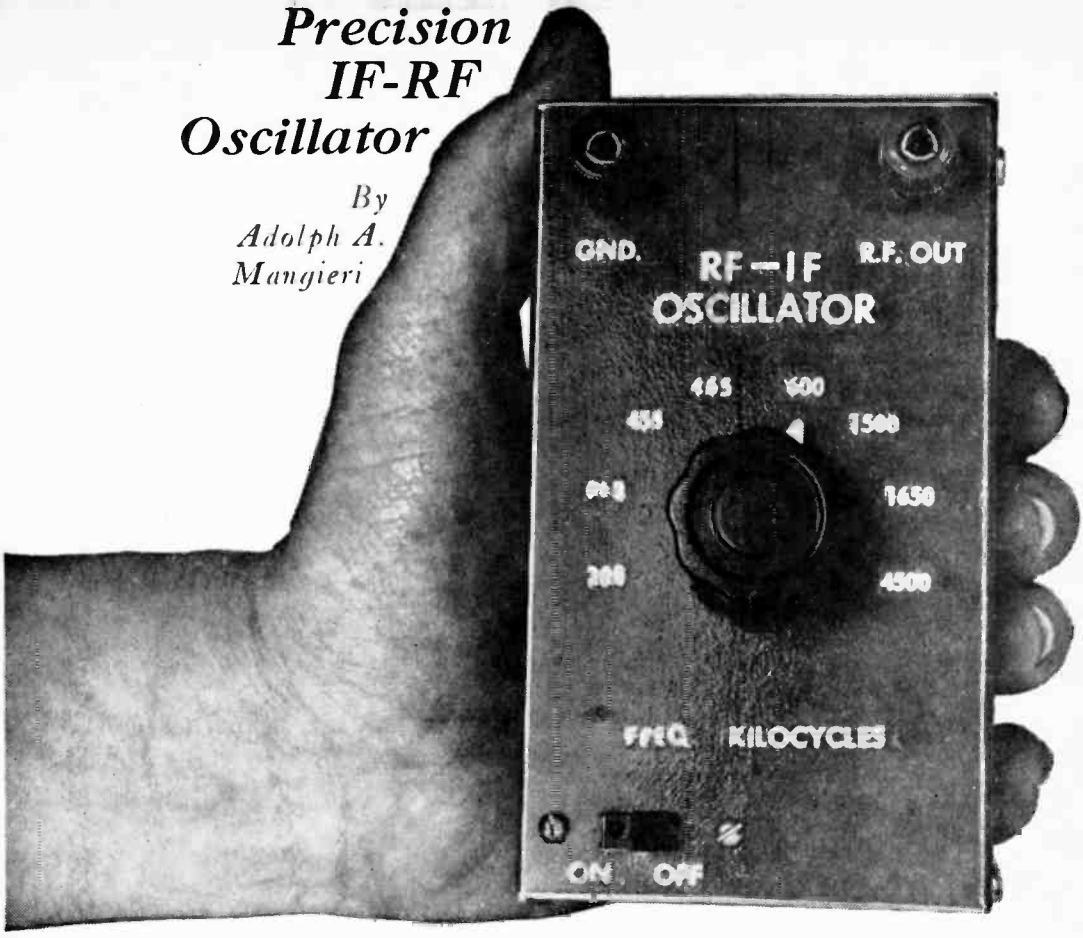
The question might come to mind: "Exactly how does one know from which direction the signal is received as the loop nulls towards the front and rear?" While the double null does exist in free space it does not exist when the loop is mounted on a vehicle: in practice the loop is slightly more sensitive towards the side of the car

(Continued on page 127)

To attach the Signal Hunter two clips are placed over the top of the window glass edge and the suction cup is pushed against the side glass. Mounting is extremely rigid —almost like a permanent auto installation.

Precision IF-RF Oscillator

By Adolph A. Mangieri



Stability and accuracy combine for excellent performance in a home brew!

■ Frequency stability and accuracy are features of this transistorized step frequency RF-IF test oscillator, used to align radio RF-IF circuits. Accuracy far exceeds that of the usual continuously tuned oscillator; and frequency shift due to battery aging and output circuit loading is negligible.

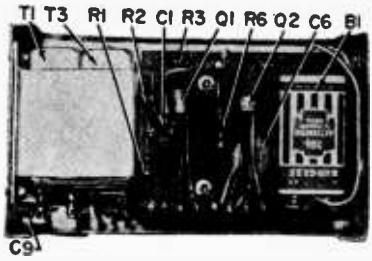
Using only two inexpensive transistors and a Zener diode, the oscillator provides eight fixed frequencies from 200 KC to 4500 KC. As shown in the photographs the self-contained test instrument is quite compact but nevertheless big in performance, truly a hand-held and handy alignment tool.

Circuit Theory. The oscillator circuit is a Colpitts type connected in a common base circuit using a 2N1179 high frequency transistor, Q1. This stage is followed by transistor Q2, a grounded collector stage, which provides low output impedance and isolates the oscillator from the circuit being aligned.

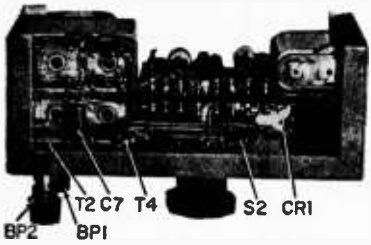
Battery B1, resistor R4, and Zener diode CR1 provide a regulated voltage for the transistors to minimize frequency shift due to battery aging. Resistors R1 and R2, bypassed by capacitors C4 and C5 provide a small forward bias to the emitter of Q1 through resistor R3.

Frequency selector switch S2 selects the individual tank circuits of intermediate frequency transformers T1 through T4 and places them in the collector circuit of Q1. Capacitors C7, C8, and C9 lower the resonant frequency of their tank circuits. These capacitors may require selection depending on the particular transformer used. Capacitors C1 and C2 form a capacitive voltage divider across any selected tank and provides feedback to sustain oscillations.

RF voltage developed across C2 is fed to the base of Q2 through blocking capacitor C3. Resistor R5 provides bias for transistor Q2. Resistor R6 is the load resistor of Q2. Voltage developed across R6 is fed to the oscillator output terminals through C6, R7, and R8.



View of the oscillator with the chassis back removed shows components mounted on the insulation board which is then secured to S2.



Side view of the unit shows grouping of IF cans held by the fabricated metal bracket. Carefully drill four holes in back half of the cabinet for tuning the cans with the back on.

The peak to peak output voltage of the oscillator is better than 100,000 microvolts at most switch positions. The outputs are more than enough for receiver alignment. Output impedance of the oscillator is about 700 ohms, somewhat less than the value of R8. Resistor R8 may be replaced by a 1000-ohm miniature pot and output voltage taken from the arm of the pot.

Construction Details. First, form a metal bracket to hold the group of IF transformers at the upper end of the chassis box as shown in the parts photographs. Allow clearance for the output terminals under the bracket. Next, locate and drill holes for mounting switches S1 and S2.

Most of the small parts are supported on a ⅛ x 2½ x 3¼-inch insulation board provided with feedthru terminals which acts as a sub-chassis. Support the board above the switch as shown. By replacing the screws supporting the switch wafer with longer ones removed from a discarded wafer switch, you can mount the board directly on the switch. Mount parts on both sides of the board. Install the transistors last and use long nose pliers as a heat sink when soldering the transistors and other miniature parts.

Intermediate Bench Testing. Before final installation, bench test the wired sub-chassis board using clip leads to connect the battery and a tank circuit. Check each transformer coil for oscillation and identify the adjustable ferrite shell core belonging to each coil.

For these tests, use a broadcast or all-band radio to pick up the generated signal. As an example, for the 200 KC frequency, set the radio to a broadcast station falling on one of the harmonics of 200 KC (i.e. 600, 800, 100 KC, etc.). Connect a short wire to resistor R7 and place it near the loop antenna of the radio or connect it to the antenna terminal. Connect the lower end of R8 to earth ground. Adjust each core of the transformers until a heterodyne or whistle is heard on the broadcast station. Label each transformer, identifying terminal pairs, core location, and IF frequency. This will eliminate much confusion when wiring rotary switch S2 and when calibrating the completed instrument.

During these bench tests, check to see if the values of C7, C8, and C9 require alteration depending on the particular transformer used. Increase the value to lower the frequency and vice versa. Screw the cores inward almost to the limit stop and use the least amount of shunt capacitance to obtain the desired frequency.

On T4, which is rather heavily shunted by C7, try adjusting each coil if oscillations cannot be brought down to 1650 KC. If neither coil will oscillate at 1650 KC, delete this frequency and replace it with another higher frequency of your choice such as 2000 KC. Excessive capacitive shunting of a coil prevents oscillations due to increased circuit losses.

If no radio receiver or other means of checking the 4500 KC frequency is available, you can delete T4 and replace it with a lower frequency transformer of your choice. Radio antenna and oscillator coils may be used as tank circuits.

Complete Construction. The transistors used were those on hand, but most any RF transistor may be used. Since transistor leakage currents and gains vary widely, the value of resistor R5 may have to be ascertained. To check this, connect a milliameter in series with R6. Use a value of R5 to obtain a current of 500 microamperes in R6.

Before installing and wiring the tested

circuit board, solder six-inch lengths of No. 20 solid insulated wire to the lugs on S2 for later connection to the transformers. Label each wire accordingly. Then, install all components in the box and complete the wiring. Allow clearances for the slip-on bottom of the box. Locate and drill holes in the sides of the bottom half to permit screwdriver adjustment of the transformers. Finally, label the panel using decals or other lettering.

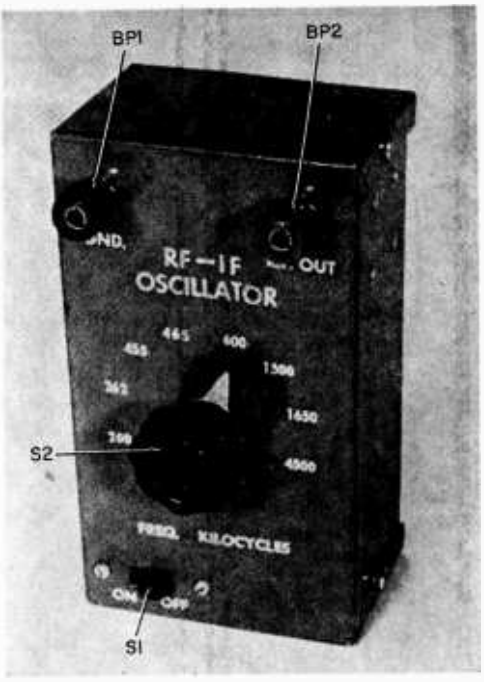
Calibration Procedure. To calibrate the oscillator, run a wire from the RF output terminal to the radio antenna terminal or near the loop antenna of the broadcast band radio. Connect the ground terminal to an earth ground. Set S2 to 200 KC and tune in a radio station transmitting at 600 KC or any harmonic of 200 KC. Refer to *White's Radio Log* for station frequencies.

Adjust the appropriate tuning core in transformer T1 until a whistle is heard which rises and falls in pitch as you tune the oscillator through zero beat with the station.

PARTS LIST

B1—9-volt battery (Burgess 2U6 or equiv.)
BP1, BP2—Red and black 6-way binding posts
C1, C9—50-mmf., 10% mica capacitor
C2—350-mmf., 10% mica capacitor
C3—.001-mfd., 10% mica capacitor
C4, C5—.01-mfd., 50-volt disc capacitors
C6—.01-mfd., 600-volt disc capacitor
C7—600-mmf., 10% mica capacitor
C8—200-mmf., 10% mica capacitor
CR1—Zener diode, 3.8 volts nominal (Motorola 1N3823A or equiv.)
Q1—2N1179 transistor
Q2—2N1379 transistor
R1—30,000-ohm, ½-watt, 10% resistor
R2, R3—3,000-ohm, ½-watt, 10% resistors
R4—2,000-ohm, ½-watt, 10% resistor
R5—450,000-ohm, ½-watt, 10% resistor
R6, R8—1,000-ohm, ½-watt, 10% resistors
R7—2,000-ohm, ½-watt, 10% resistor
S1—S.p.s.t. slide switch
S2—Single-pole, 11-position rotory switch (Centralab 1001 or equiv.)
T1—262KC miniature IF transformer (Miller 12H1, Stancor RTC8638, or equiv.)
T2—455KC miniature IF transformer (Miller 12C7, Stancor RTC8675, or equiv.)
T3—1500KC miniature IF transformer (Miller 13W1, Stancor RTC8686, or equiv.)
T4—4.5MC miniature IF transformer (Miller 6203, Stancor RTC8545, or equiv.)
1—5¼" x 3" x 2⅛" aluminum chassis box (Bud CU2106A or equiv.)
Misc.—Indicator knob, insulator sub-chassis board, No. 22 solid insulated hookup wire, hardware, panel markings, solder, etc.

Estimated cost: $22.00
Estimated construction and calibration time: 5 hours

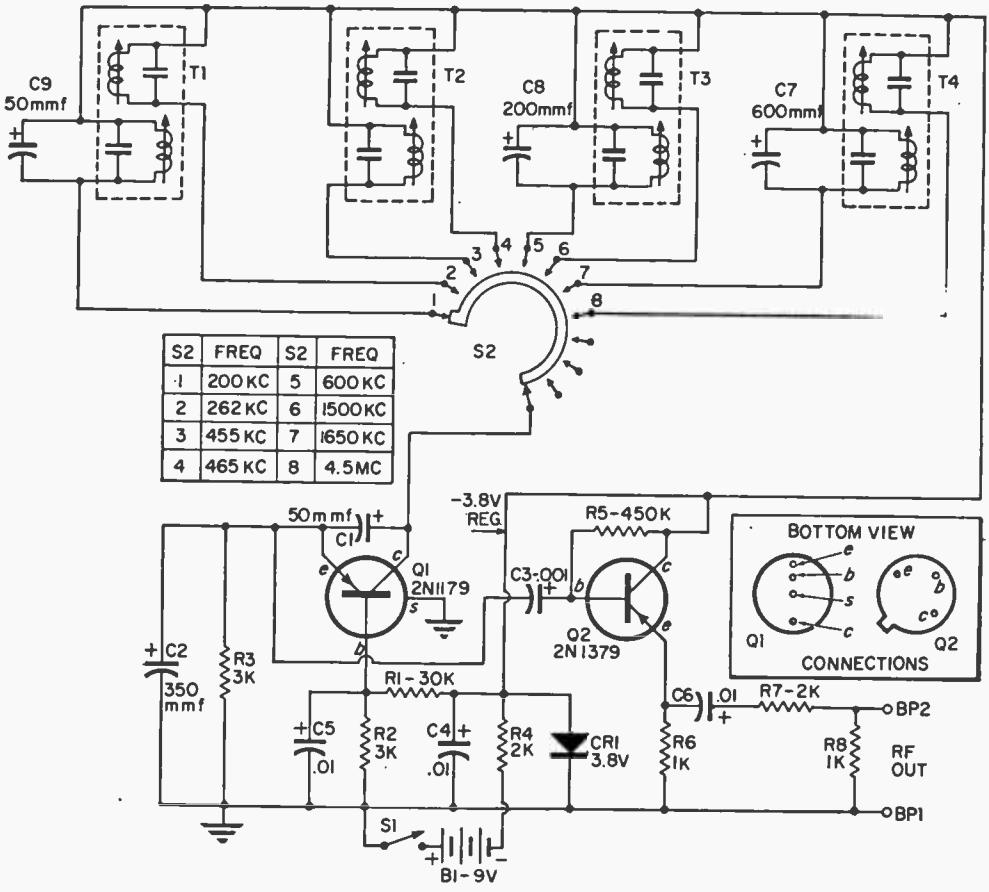


Large indicator knob with pointer and front panel decal markings allow for quick and easy selection of the desired fixed frequency.

Adjust the core to obtain zero beat during a break in the station's transmission. Use a non-metal alignment screwdriver during adjustment with the bottom of the box in place. Check to see that the other harmonics are spaced by 200 KC. If not, screw the core in or out to decrease the spacing between the received harmonics. On blank radio channels, the signal can be recognized by a hissing sound.

At switch position 2 (262 KC), zero beat with a station transmitting at 1310 KC (fifth harmonic of 262 KC). At 455 KC, zero beat with a station at 910 KC (second harmonic of 455 KC). At 465 KC, zero beat with a station at 930 KC (second harmonic of 465 KC). Zero beat the 600 KC frequency with a station at 600 or 1200 KC, whichever is available. The 1500 and 1650 KC frequencies are zero-beat with stations at those respective frequencies. All of the above frequencies, when set to zero beat, will be quite accurate because the station frequencies are extremely accurate.

The 4500 KC frequency cannot be adjusted to high accuracy unless you have a high frequency receiver and a 100 KC



Frequency determining tank circuits are selected by switch S2 and passed to collector of Q1.

crystal oscillator available. If these are available, adjust the frequency to zero beat with the 45th harmonic of the 100 KC crystal oscillator as received by the receiver. If a crystal standard is not available, simply adjust the frequency to nominal accuracy as indicated by the receiver dial.

At each of these frequencies, listen carefully to a steady beatnote of about 1000 cps. It should be steady and clear. If the beatnote wavers, the cause may be due to an erratic transistor, a cold soldered joint, poor grounds, or oscillations on the verge of dying out. If you replace a transistor, recheck the calibration.

Going to Work. When using the oscillator, follow the usual alignment procedures detailed in many publications and service literature. Since the oscillator is not modulated, connect a VTVM or other high impedance DC voltmeter, set to a low range, to the receiver's second detector diode load resistor to indicate alignment. Use only enough signal to provide a convenient indication on the meter.

Modulation was omitted in this oscillator because direct modulation of any transistor oscillator also introduces frequency modulation which is not desirable for the intended purpose of the oscillator.

The accurate IF frequencies obtainable from the oscillator may be used as markers when aligning IF amplifiers with a sweep oscillator. This will accurately identify the center frequency on the scope display.

Replace battery B1 when its terminal voltage, with S1 on, drops to 5.75 volts or when the voltage across CR1 drops below the Zener voltage.

Some Notes From the Lab. Several tests were performed for the purpose of knowing just what could be expected from the oscillator. One test was determining the fre-

(Continued on page 130)

Volume 44, Part 2

WHITE'S RADIO LOG

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

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

In this issue of *White's Radio Log* we have included the following listings: U. S. AM Stations by Location, U. S. FM Stations by States, Canadian AM Stations by Location, Canadian FM Stations by Location, and the expanded, up-to-date World-Wide Short-Wave Section.

In the December/January issue of RADIO-TV EXPERIMENTER, the *Log* will contain the following listings: U. S. AM Stations by Call Letters, U. S. FM Stations by Call Letters, Canadian AM Stations by Call Letters, Canadian FM Stations by Call Letters, and the expanded World-Wide Short-Wave Section.

In the event you missed any part of the *Log* published earlier this year, you will have a complete copy of *White's Radio Log* by collecting any three consecutive issues of RADIO-TV EXPERIMENTER during 1964. The three consecutive issues comprise a complete volume of *White's Radio Log* that offers complete listings with last minute station change data that can not be offered in any other magazine or book. If you are a broadcast band DX'er, FM station logger, like to photograph distant TV test patterns, or tune the short-wave bands, you will find *White's Radio Log* an unbeatable reference.

QUICK REFERENCE INDEX

WHITE'S

RADIO LOG

U. S. AM Stations by Location

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

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

WHITE'S RADIO LOG

Location	C.L.	Kc.
Columbia, Mo.	KFRU	1400
	KCGM	1580
Columbia, Pa.	WCOY	1580
Columbia, S.C.	WCOS	1400
	WIS	560
	WOIC	1320
	WNOK	1230
	WQXL	1470
Columbia, Tenn.	WMCP	1280
	WKRM	1340
Columbus, Ga.	WDAK	540
	WRBL	1420
	WGBA	1270
	WCLS	1580
	WOKS	1340
Columbus, Ind.	WCSI	1010
Columbus, Miss.	WACR	1050
	WCBI	550
Columbus, Nebr.	KJSK	900
	KTTT	1510
Columbus, Ohio	WBNS	1460
	WCOL	1230
	WMNI	920
	WOSU	820
	WTVN	610
	WVKO	1580
Colville, Wash.	KCVL	1270
Comanche, Tex.	KCOM	1550
Commerce, Ga.	WJJC	1270
Concord, Calif.	KWUN	1480
Concord, N.H.	WKXL	1450
Concord, N.C.	WEGO	1410
Concordia, Kans.	KNCK	1390
Conneaut, Ohio	WWOW	1360
Connellsville, Pa.	WCVI	1340
Connersville, Ind.	WCNB	1580
Conroe, Tex.	KMCO	900
Conway, Ark.	KCON	1230
	KVEE	1330
Conway, N.H.	WBNC	1050
Conway, S.C.	WLAT	1330
Cookeville, Tenn.	WHUB	1400
	WPTN	1550
Coolidge, Ariz.	KCKY	1150
Coos Bay, Oreg.	KOOS	1230
	KYNG	1420
Copper Hill, Tenn.	WLSB	1400
Coquille, Oreg.	KWRO	630
Coral Gables, Fla.	WRIZ	1550
	WVCG	1080
Corbin, Ky.	WCTT	680
	WYGO	1330
Cordele, Ga.	WMJM	1490
Cordova, Alaska	KLAM	1450
Corinth, Miss.	WCMA	1230
Cornelia, Ga.	WCON	1450
Corning, Ark.	KCCB	1260
Corning, N.Y.	WCBA	1350
	WCLI	1450
Corona, Cal.	KREL	1370
Corpus Christi, Tex.		
	KCTA	1030
	KCCT	1150
	KEYS	1440
	KRYS	1360
	KSIX	1230
	KUNO	1400
Corry, Pa.	WOTR	1370
Corsicana, Tex.	KAND	1340
Cortez, Colo.	KVFC	740
Cortland, N.Y.	WKRT	920
	KFLY	1240
	KLOO	1350
Corvallis, Ore.	KLOO	1340
Corydon, Ind.	WPDF	1550
Coshocton, Ohio	WTNS	1360
Cottage Grove, Ore.	KNND	1400
Cottonwood, Ariz.	KVRD	1240
	KVIO	1600
Coudersport, Pa.	WFRM	600
Council Bluffs, Iowa		
	KFNF	920
	KRCB	1360
Courtenay, B.C.	CFCP	1440
Covington, Ga.	WGFS	1430
Covington, Ky.	WCLU	1320
Covington, La.	WARB	730
Covington, Tenn.	WKBL	1250
Covington, Va.	WKEY	1340
Cowan, Tenn.	WZYX	1440
Crais, Colo.	KRAI	550
Crane, Tex.	KCRR	1380
	KBSN	970
Crawfordsville, Ind.		
	WCVL	1550
Crescent City, Calif.	KPLY	1240
	KPOD	1310
Creston, Iowa	KSIB	1520
Crestview, Fla.	WCNU	1010
Crewe, Va.	WJSB	1050
Crockett, Tex.	WSVS	800
Crookston, Minn.	KIVY	1290
Cressett, Ark.	KROX	1260
Crossville, Tenn.	KAGH	800
Crowley, La.	WAEW	1330
Cuero, Tex.	KSIG	1450
Cullman, Ala.	KCFH	1600
	WFMH	1460
	WKUL	1340
Culpeper, Va.	WCVA	1490
Cumberland, Ky.	WCPM	1280
Cumberland, Md.	WCUM	1230
	WTBO	1450
Cummings, Ga.	WSNE	1410
Cushing, Okla.	KUSH	1600
Cuyahoga Falls, Ohio	WCUE	1150
Cypress Gardens, Fla.		
	WGTO	540
Cynthiana, Ky.	WCYN	1400
Dade City, Fla.	WDCF	1350
Dadeville, Ala.	WDVC	910
Dalhart, Tex.	KXIT	1410
Dallas, N.C.	WAAK	960
Dallas, Oreg.	KROW	1460
Dalias, Tex.	KRLD	1080
	KIXL	1040
	KSKY	660
	KLIF	1190
	WFAA	570
	WFAA	820
	KBOX	1480
	WRR	1310
Dalton, Ga.	WBLJ	1290
	WRCD	1430
	WTTI	1530
Danbury, Conn.	WLAD	800
Danville, Ill.	WDAN	1490
	WITY	980
Danville, Ky.	WHIR	1230
Danville, Pa.	WPGM	1570
Danville, Va.	WBTM	1330
	WYPR	970
	WDVA	1250
	WILA	1580
Dardanelle, Ark.	KCAB	980
Darlington, S.C.	WDAR	1350
Davenport, Iowa	WOC	1420
	KWNT	1580
	KSTT	1170
Dawson, Ga.	WDWD	990
Dayton, Ohio	WHIO	1290
	WING	1410
	WONE	980
	WAVI	1210
Dayton, Tenn.	WDNT	1280
Daytona Beach, Fla.		
	WNDB	1150
	WMFJ	1450
	WROD	1340
Deadwood, S.Dak.	KDSJ	980
Dearborn, Mich	WKNR	1310
Decatur, Ala.	WHOS	800
	WAJF	1490
	WMSL	1400
Decatur-Atlanta, Ga.		
	KGUN	1010
	WOMN	1310
Decatur, Ill.	WDZ	1050
	WSOY	1340
Decatur, Ind.	WADM	1540
Decorah, Iowa	KDEC	1240
	KWLC	1240
Deer Lodge, Mont.	KDRG	1400
Deerfield, Va.	WABH	1150
Defiance, Ohio	WONW	1280
De Funiak Springs, Fla.		
	WDSP	1280
	WZEP	1460
De Kalb, Ill.	WLBK	1360
De Land, Fla.	WJBS	1490
	WOOO	1310
Delano, Calif.	KCHJ	1010
Delaware, Ohio	WDLE	1550
Delray, Bch., Fla.	WDBF	1420
Del Rio, Tex.	KDLK	1230
Delta, Colo.	KDTA	1400
Deming, N.Mex.	KOTS	1230
Demopolis, Ala.	WXAL	1400
	WJWT	1350
Denham Sprgs., La.	WLBI	1220
Denison, Iowa	KDSN	1580
Denison-Sherman, Tex.		
	KDSX	950
Denton, Tex.	KDNT	1440
Denver, Colo.	KDEN	1340
	KFML	1390
	KHOW	630
	KIMN	850
	KLIR	990
	KLZ	560
	KBTR	710
	KOA	850
	KPOF	910
	KFSC	1220
	KTLN	1280
Denver City, Tex.	KKAL	1580
De Queen, Ark.	KDQN	1390
DeRidder, La.	KDLA	1010
Des Moines, Iowa	KCBC	1390
	KIOA	940
	KRNT	1350
	KSO	1460
	KWKY	1150
	WHO	1040
Detroit, Mich.	WCAR	1130
	WJBK	1500
	WJLB	1400
	WJR	760
	WWJ	950
	WXYZ	1270
Detroit Lakes, Minn.		
	KDLM	1340
Devils Lake, N.Dak.		
	KDLR	1240
Dexter, Mo.	KDEX	1590
Diboll, Tex.	KSPL	1260
Dickinson, N.Dak.	KDIX	1230
Dickson, Tenn.	WDKN	1260
Dillon, Mont.	KDBM	800
Dillon, S.C.	WDSC	800
Dimmitt, Tex.	KDHN	1470
Dinuba, Calif.	KRDU	1130
Dixon, Ill.	WIXN	1460
Dodge City, Kans.	KGNO	1370
	KEDD	1550
Donaldsonville, Ga.	WSEM	1500
Doniphan, Mo.	KDFN	1500
Dothan, Ala.	WAGF	1320
	WDIG	1450
	WOOF	560
Douglas, Ariz.	KAWT	1450
	KAPR	930
Douglas, Ga.	WDMG	860
	WOKA	1310
Douglas, Wyo.	KWIV	1050
Douglasville, Ga.	WDGL	1520
Dover, Del.	WDOV	1410
	WKEN	1600
Dover, N.J.	WRAN	1510
Dover, N.H.	WTSN	1270
Dover, Ohio	WJER	1450
Dowagiac, Mich.	WDOW	1440
Doylestown, Pa.	WBUX	1570
Dublin, Ga.	WMLT	1330
	WXLI	1230
Du Bois, Pa.	WCED	1420
Dubuque, Iowa	KDTH	1370
	WDBQ	1490
Duluth, Minn.	KDAL	610
	WEBC	560
	KAOH	1390
Dumas, Tex.	KDDD	800
Duncan, Okla.	KRHD	1350
Dundalk, Md.	WAYE	860
Dundee, N.Y.	WFLR	1570
Dunkirk, N.Y.	WDOE	1410
Dunn, N.C.	WCKB	780
Du Quoin, Ill.	WDQN	1580
Durango, Colo.	KIUP	930
	KDGO	1240
Durant, Okla.	KSFO	750
Durham, N.C.	WDNC	620
	WSRC	1410
	WSSB	1490
	WTIK	1310
Dyersburg, Tenn.	WDSG	1450
	WTRO	1330
Eagle Pass, Tex.	KEPS	1270
Eagle River, Wis.	WERL	950
Easley, S.C.	WELP	1360
E. Grand Forks, Minn.		
	KRAD	1590
Eastland, Tex.	KERC	1590
E. Lansing, Mich.	WKAR	870
	WVIC	730
E. Liverpool, Ohio	WOHI	1490
East Longmeadow, Mass.		
	WTYM	1600
Eastman, Ga.	WPFE	710
E. Moline, Ill.	WDLM	960
E. Point, Ga.	WTJH	1260
Easton, Md.	WEMD	1460
Easton, Pa.	WEEX	1230
	WEST	1400
Eatontown, N.J.	WHTG	1410
Eau Claire, Wis.	WEAQ	790
	WBIZ	1400
	WECL	1050
Eau Gallie, Fla.	WMEG	920
Ebensburg, Pa.	WEND	1580
Edenton, N.C.	WCDJ	1260
Edinburg, Tex.	KURV	710
Edmonds, Wash.	KGDN	630
Emmgham, Ill.	WCRA	1090
Elba, Ala.	WELB	1350
Elberton, Ga.	WSGC	1400
El Cajon, Calif.	KDEO	910
El Campo, Tex.	KULP	1390
El Centro, Calif.	KXO	1230
	KAMP	1430
El Dorado, Ark.	KDMS	1290
	KELD	1400
Eldorado, Kans.	KBTO	1360
Eldorado Springs, Mo.		
	KESM	1580
Eleele, Kanai, Hawaii		
	KUAI	720
Elgin, Ill.	WRMN	1410
Elizabeth City, N. C.		
	WCNC	1240
	WGAI	560
Elizabethton, Tenn.	WBEJ	1240
	WIDD	1520
Elizabethtown, Ky.	WIEL	1400
Elizabethtown, N.C.	WBLA	1440
Elizabethtown, Pa.	WHRY	1600
Elk City, Okla.	KBEK	1240
Elkhart, Ind.	WTRC	1340
	WCMR	1270
Elkins, N.C.	WIFM	1540
Elkins, W.Va.	WDNE	1240
Elko, Nev.	KELK	1240
Elkton, Md.	WSER	1550
Ellensburg, Wash.	KXLE	1240
Ellenville, N.Y.	WELV	1370
Ellsworth, Me.	WDEA	1370
Elmira, N.Y.	WELM	1410
	WENY	1230
Elmira Heights, Horseheads, N.Y.		
	WEHH	1590
El Paso, Tex.	KROD	600
	KELP	920
	KHEY	690
	KINT	1590
	KIZZ	1150
	KSET	1340
	KTSM	1380
El Reno, Okla.	KELR	1460
Ely, Minn.	WELY	1450
Ely, Nev.	KELY	1280
Elyria, Ohio	WEOL	930
Eminence, Ky.	WSTL	1600
Emporia, Kans.	KVOE	1400
Emporia, Va.	WEVA	860
Emporium, Pa.	WLEM	1250
Endicott, N.Y.	WENE	1430
Englewood, Colo.	KGMC	1150
Englewood, Fla.	WENG	1530
Enid, Okla.	KCRC	1390
	KGWA	960
Enterprise, Ala.	WIRB	600
Enterprise, Oreg.	KWVR	1340
Ephrata, Pa.	WGSA	1310
Ephrata, Wash.	KULF	730
Erie, Pa.	WWYN	1260
	WICU	1380
	WJET	1400
	WWGO	1450
Erwin, Tenn.	WEMB	1420
Escanaba, Mich.	WDBC	680
	WLST	600
Escondido, Calif.	KOWN	1450
Espanola, N. M.	KDCE	970
Etowah, Tenn.	WCPH	1220
Eufaula, Ala.	WULA	1240
Eugene, Oreg.	KORE	1450
	KPIR	1500
	KASH	1600
	KATR	1320
	KERG	1280
	KUGN	590
	KWFS	1540
Eunice, La.	KEUN	1490
Eureka, Calif.	KINS	980
	KDAN	790
Eustis, Fla.	WLCO	1240
Evanston, Ill.	WEAW	1330
	WNMP	1590
Evanston, Wyo.	KEVA	1240
Evansville, Ind.	WROZ	1400
	WGBF	1280
	WIKY	820
	WJPS	1330
Eveleth, Minn.	WEVE	1340
Everett, Pa.	WWDS	1110
Everett, Wash.	KRKO	1380
	KWYZ	1230
Evergreen, Ala.	WBLO	1470
Fairbanks, Alaska	KFAR	610
	KFRB	900
Fairbury, Nebr.	KGMT	1310
Fairfax, Va.	WEEL	1310
Fairfield, Ill.	WFIW	1390
Fairfield, Iowa	KMCD	1570
Fairhope, Ala.	WABF	1220
Fairmont, Minn.	KSUM	1370
Fairmont, N.C.	WFMO	860
Fairmont, W.Va.	WMMN	920
	WTCS	1490
Fairway, Kan.	KUDL	1380
Fajardo, P.R.	WMDD	1480
Falfurrias, Tex.	KPSO	1260
Fall River, Mass.	WALE	1400
	WSAR	1480
	KVLV	980
Falls Church, Va.	WFAX	1220
Falls City, Nebr.	KTNC	1230
Fargo, N.Dak.	WDAY	970
	KFNW	900
	KQWB	1550
	KXGO	790
Faribault, Minn.	KDHL	920
Farmersville, La.	KTDL	1470
Farmington, Me.	WKTJ	1380
Farmington, Mo.	KREI	800
Farmington, N.M.	KENN	1890
	KWYK	960
	KRZE	1280
Farmville, N.C.	WFAG	1250
Farmville, Va.	WFLO	870
Farrell, Pa.	WFAR	1470
Farwell, Tex.	KZOL	1570
Fayette, Ala.	WWWF	990
Fayetteville, Ark.	KHOG	1440
	KFAY	1250

Location	C.L.	Kc.
Fayetteville, N.C.	WFAI	1230
	WFNC	940
	WFLB	1490
	WIDU	1600
Fayetteville, Tenn.	WEKR	1240
Fergus Falls, Minn.	KDTE	1250
Fernandino Beach, Fla.	WFBF	1570
Ferriday, La.	KFNV	1600
Festus, Mo.	KJCF	1400
Festus-St. Louis, Mo.	KXEN	1010
Findlay, Ohio	WFIN	1330
Fisher, W.Va.	WELD	690
Fitchburg, Mass.	WEIM	1280
	WFGM	960
Fitzgerald, Ga.	WBHB	1240
Flagstaff, Ariz.	KCLS	600
	KJKJ	1400
	KEOS	690
	KEOS	1290
Flat River, Mo.	KFMO	1240
Flint, Mich.	WFDF	910
	WTRX	1330
	WAMM	1420
	WMRP	1570
	WKMF	1470
	WTAC	600
Flomaton, Ala.	WTCB	990
Florence, Ala.	WJOI	1340
	WOWL	1240
Florence, S.C.	WJMX	970
	WOLS	1230
	WYNN	540
Floydada, Tex.	KFLD	900
Foley, Ala.	WHEP	1310
Fond du Lac, Wis.	KFIZ	1450
Fordyce, Ark.	KBJT	1570
Forest, Miss.	WMAG	860
Forest City, N.C.	WBBO	780
	WAGY	1320
Forest Grove, Ore.	KWAY	1570
Forrest City, Ark.	KXJK	950
Ft. Atkinson, Wis.	WFAW	940
Ft. Bragg, Calif.	KDAC	1230
Ft. Campbell, Ky.	WABD	1370
Ft. Collins, Colo.	KCOL	1410
	KZIX	600
Ft. Dodge, Iowa	KVFD	1400
	KWMT	540
Ft. Knox, Ky.	WSAC	1470
Ft. Lauderdale, Fla.	WFTL	1400
	WWIL	1580
Ft. Madison, Iowa	KXGI	1360
Ft. Morgan, Colo.	KFTM	1400
Ft. Myers, Fla.	WINK	1240
	WMYR	1410
	WCAI	1350
Ft. Payne, Ala.	WFPA	1400
	WZOB	1250
Ft. Pierce, Fla.	WARN	1330
	WIRA	1400
Ft. Scott, Kans.	KMDO	1600
Ft. Smith, Ark.	KFPW	1230
	KFSA	950
	KTCS	1410
	KWHN	1320
Ft. Stockton, Tex.	KFST	860
Ft. Valley, Ga.	WFPM	1150
Ft. Walton Beach, Fla.	WNUE	1400
	WFTW	1260
Ft. Wayne, Ind.	WGL	1250
	WOWO	1190
	WANE	1450
	WKJG	1380
Ft. Worth, Tex.	KJIM	870
	KCUL	1540
	KFJZ	1270
	KNOK	970
	WBAP	570
	WBAP	820
	KXOL	1360
Fostoria, Ohio	WFOB	1430
Fountain City, Tenn.	WGYW	1430
	WROL	1490
Fountain Inn, S.C.	WFIS	1600
Fowler, Calif.	KLIP	1220
Framingham, Mass.	WKOX	1190
Frankfort, Ind.	WILO	1570
Frankfort, Ky.	WFKY	1490
Franklin, Ky.	WFKN	1220
Franklin, La.	KFRA	1390
Franklin, N.C.	WFSC	1050
Franklin, N.H.	WFTN	1240
Franklin, Pa.	WFRA	1450
Franklin, Tenn.	WAGG	950
Franklin, Va.	WYSR	1250
Frederick, Md.	WFMD	930
Frederick, Okla.	KTAT	1570
Fredericksburg, Tex.	KNAF	910
Fredericksburg, Va.	WFVA	1230
	WFLS	1350
Fredericktown, Mo.	KFTW	1450
Fredonia, N.Y.	WBUZ	1570
Freeport, Ill.	WFRL	1570
Freeport, N.Y.	WGBB	1240
Freeport, Tex.	KBRZ	1460
Fremont, Mich.	WBFC	1490
	WSHN	1550
Fremont, Nebr.	KHUB	1340
Fremont, Ohio	WFRO	900
Fresno, Calif.	KARM	1430
	KBIF	900
	KIRV	1510
	KEAP	980
	KXEX	1550
	KFRE	940
	KGST	1600
	KMAK	1340
	KYNO	580
	KYNO	1300
Front Royal, Va.	WFTR	1450
Frostburg, Md.	WFRB	560
Fulton, Ky.	WFUL	1270
Fulton, Mo.	KFAL	900
Fulton, N.Y.	WDSC	1300
Fuquay Sprgs., N.C.	WFVG	1460
Gadsden, Ala.	WGAD	1350
	WETD	930
	WAAX	570
	WEAC	1500
Gaffney, S.C.	WFGN	1570
Gainesville, Fla.	WDVH	980
	WGGG	1230
	WRUF	850
	WUWU	1390
Gainesville, Ga.	WGGA	550
	WDUN	1240
	WLBA	1580
Gainesville, Tex.	KGAF	1580
Gaithersburg, Md.	WHMC	1150
Galax, Va.	WBOB	1360
Galesburg, Ill.	WGIL	1400
	WAIK	1590
Gallatin, Tenn.	WHIN	1010
Gallipolis, Ohio	WJEH	990
Gallup, N. Mex.	KGAK	1330
	KYVA	1230
Galveston, Tex.	KILE	1400
	KGBC	1540
Gander, Nfld.	CBG	1450
Garden City, Kans.	KNCO	1050
	KIUL	1240
Garden City, Mich.	WERB	1090
Gardner, Mass.	WGAW	1340
Gary, Ind.	WWCA	1270
	WLTH	1370
Gastonia, N.C.	WGNC	1450
	WLTC	1370
Gate City, Va.	WGAT	1050
Gaylord, Mich.	WATC	900
Geneseo, Ill.	WGEN	1500
Geneva, Ala.	WGEA	1150
Geneva, Ill.	WGSB	1480
Geneva, N.Y.	WGVA	1240
Georgetown, Del.	WJWL	900
Georgetown, Ky.	WAXU	1580
Georgetown, S.C.	WGTN	1400
	WGOD	1470
Georgetown, Tex.	KGTN	1530
Gettysburg, Pa.	WGET	1320
Gillette, Wyo.	KIML	1490
Gilroy, Calif.	KPER	1290
Gladewater, Tex.	KEES	1430
Glasgow, Ky.	WKAY	1490
	WCDS	1440
Glasgow, Mont.	KLTZ	1240
Glen Burnie, Md.	WISZ	1590
Glendale, Ariz.	KRUX	1360
Glendale, Calif.	KIEV	870
Glendive, Mont.	KXGN	1400
	KGLE	590
Glennallen, Alaska	KCAM	790
Glens Falls, N.Y.	WSET	1410
	WWSC	1450
Glenville, Ga.	WKIG	1580
Glenwood Sprgs., Colo.	KGLN	980
Globe, Ariz.	KZDW	1240
Gloucester, Va.	WDDY	1420
Gloversville-Johnston, N.Y.	WENT	1340
Gold Beach, Oreg.	KBLY	1220
Golden, Colo.	KICM	1250
Golden Meadow, La.	KLEB	1600
Golden Valley, Minn.	KQRS	1440
	KUXL	1570
Goldsboro, N.C.	WFMC	730
	WGBR	1150
	WGOL	1300
Gonzales, Tex.	KCTI	1450
Goodland, Kans.	KLOE	730
Goshen, Ind.	WKAM	1460
Gouverneur, N.Y.	WIGS	1230
Grafton, N.D.	KGPC	1340
Grafton, W.Va.	WVVW	1260
Graham, Tex.	KSWA	1330
Grand Coulee, Wash.	KFDR	1360
Grand Forks, N.D.	KFJM	1370
	KILD	1440
	KNOX	1310
Grand Haven, Mich.	WGHN	1370
Grand Island, Nebr.	KMMJ	750
	KRGI	1430
Grand Junction, Colo.	KREX	920
	KEXO	1230
	KSTR	620
	KWSL	1340
Grand Prairie, Tex.	KPCW	730
Grand Rapids, Mich.	WJEF	1230
	WFUR	1570
	WGRD	1410
	WLAV	1340
	WMAX	1480
	WODD	1300
Grand Rapids, Minn.	KDZY	1490
Grangeville, Idaho	KORT	1230
Granite City, Ill.	WGNU	920
Granite Falls, N.C.	WKJK	1580
Grants, N.Mex.	KMIN	980
Grants Pass, Oreg.	KAGI	930
	KAJO	1270
Grayson, Ky.	WGDH	1370
Gt. Barrington, Mass.	WSBS	860
Gt. Bend, Kans.	KVGB	1590
Gt. Falls, Mont.	KFBB	1310
	KUDI	1450
	KMDN	560
	KARR	1400
Greeley, Colo.	KFKA	1310
	KYOU	1450
Green Bay, Wis.	WBAY	1360
	WJPG	1440
	WDUZ	1400
Greeneville, Tenn.	WGRV	1340
	WSMG	1450
Greenfield, Mass.	WHAI	1240
Greensboro, N.C.	WBIG	1470
	WCOG	1320
	WEAL	1510
	WKTB	1550
	WGBG	1400
	WPET	950
Greensburg, Pa.	WHJB	620
Greenville, Ala.	WGYV	1380
Greenville, Ky.	WKYF	1600
Greenville, Mich.	WPLB	1380
Greenville, Miss.	WJPR	1380
	WDDT	900
	WGVM	1260
Greenville, Pa.	WGRP	940
Greenville, N.C.	WNCT	590
	WOOW	1340
	WPXY	1550
Greenville, S.C.	WESC	660
	WFBC	1330
	WMRB	1490
	WMUU	1260
	WQDK	1440
Greenville, Tex.	KGVL	1400
Greenwich, Conn.	WGCH	1490
Greenwood, Miss.	WABG	960
	WGRM	1240
	WLEF	1540
Greenwood, S.C.	WCRS	1450
	WGSW	1350
Greer, S.C.	WEAB	800
	WCKI	1300
Grenada, Miss.	WNAG	1400
Gresham, Oreg.	KRDR	1230
Gretna, Va.	WMNA	730
Griffin, Ga.	WKEU	1450
	WHIE	1320
	WGRI	1410
Grinnell, Iowa	KGRN	1410
Groton, Conn.	WSUB	980
Grove City, Pa.	WSAJ	1340
Grundy, Va.	WNRG	940
Guayama, P.R.	WXRF	1590
Gulfport, Miss.	WRDA	1390
	WGCM	1240
Gunnison, Colo.	KGUC	1490
Guntersville, Ala.	WGSV	1270
Guthrie, Okla.	KWRW	1490
Guymon, Okla.	KGYN	1220
Hagerstown, Md.	WARK	1490
	WJEJ	1240
Haines City, Fla.	WHAN	930
Haleyville, Ala.	WJBB	1230
Halfway, Md.	WHAG	1410
Hamden, Conn.	WDEE	1220
Hamilton, Ala.	WERH	970
Hamilton, Mont.	KYLQ	980
Hamilton, Ohio	WMOH	1450
	WCNW	1560
Hamilton, Tex.	KCLW	900
Hamlet, N.C.	WKDX	1250
Hammond, Ind.	WJOB	1230
Hammond, La.	WFPR	1400
Hammonton, N.J.	WNJH	1580
Hampton, S.C.	WBHC	1270
Hampton, Va.	WVEC	1490
Hancock, Mich.	WMPL	920
Hanford, Calif.	KNGS	620
Hannibal, Mo.	KHMO	1070
Hanover, N.H.	WTSL	1400
	WDCR	1340
Hanover, Pa.	WHVR	1280
Hardin, Mont.	KHDN	1230
Harlan, Ky.	WHLN	1410
Harlingen, Tex.	KGBT	1530
Harriman, Tenn.	WHBT	1600
Harrisburg, Ill.	WEBQ	1240
Harrisburg, Pa.	WFEC	1400
	WCMB	1460
	WHP	580
	WKBO	1230
Harrison, Ark.	KHOZ	900
Harrisonburg, Va.	WHBG	1360
	WSVA	550
Harrodsburg, Ky.	WHBN	1420
Hartford, Conn.	WDRC	1360
	WCCC	1290
	WPOP	1410
	WTIC	1080
Hartford, Wis.	WTKM	1340
Hartselle, Ala.	WHRT	860
Hartsville, S.C.	WHSC	1450
Hartwell, Ga.	WKLY	980
Harvard, Ill.	WMCW	1600
Harvey, Ill.	WBEE	1570
Hastings, Mich.	WBCH	1220
Hastings, Minn.	KDWA	1460
Hastings, Nebr.	KHAS	1230
	KICS	1550
Hattiesburg, Miss.	WBKH	950
	WFDR	1400
	WHSY	1230
	WXXX	1310
Havelock, N.C.	WUSM	1330
Haverhill, Mass.	WHAV	1490
Havre, Mont.	KDJM	810
Havre de Grace, Md.	WASA	1330
Hawkinsville, Ga.	WCEH	610
Haynesville, La.	KLUV	1580
Hays, Kans.	KAYS	1400
Hayward, Wis.	WHSM	910
Hazard, Ky.	WKIC	1390
Hazelhurst, Ga.	WVOH	920
Hazlehurst, Miss.	WMDC	1220
Hazleton, Pa.	WAZL	1490
Helena, Ark.	KFFA	1360
Helena, Mont.	KCAP	1340
	KBLL	1240
Hemet, Calif.	KHSJ	1320
Hempstead, N.Y.	WHLI	1100
Henderson, Ky.	WSON	860
Henderson, Nev.	KBMI	1400
	KTDO	1280
Henderson, N.C.	WHNC	890
	WIZS	1450
Henderson, Tex.	KGRI	1000
	KWRD	1470
Hendersonville, N.C.	WHKP	1450
	WHVL	1600
Henryetta, Okla.	KHEN	1590
Hereford, Tex.	KPAN	860
Herkimer, N.Y.	WALY	1420
Hermiston, Oreg.	KOHU	1570
Herendon, Va.	WHRN	1440
Herrin, Ill.	WJPF	1340
Hettinger, N.Dak.	KNDC	1490
Hibbing, Minn.	WMFG	1240
Hickory, N.C.	WHKY	1290
	WIRC	680
	WSPF	1000
Highland, Ill.	WINU	1510
Highland Park, Ill.	WEEF	1430
Highland Park, Tex.	KVIL	1150
Highland Springs, Va.	WENZ	1450
High Point, N.C.	WMFR	1230
	WNOS	1590
	WHPE	1070
Hillsboro, Ohio	WSRW	1590
Hillsboro, Oreg.	KUIK	1360
Hillsboro, Tex.	KHBR	1560
Hillsdale, Mich.	WCSR	1340
Hillsville, Va.	WHHV	1400
Hilo, Hawaii	KHBC	970
	KIPA	1110
	KIMO	850
Hinesville, Ga.	KGML	990
Hinton, W. Va.	WMTD	1380
Hobbs, N.Mex.	KWEW	1480
	KHOB	1390
Holbrook, Ariz.	KDJI	1270
Holdenville, Okla.	KVYL	1370
Holdredge, Nebr.	KUVR	1380
Holland, Mich.	WHTC	1450
	WJRL	1260
Hollister, Calif.	KGHT	1520
Hollywood, Fla.	WGMA	1320
Holly Hill, S.C.	WHHL	1440
Holyoke, Mass.	WREB	930
Homer, La.	KHAL	1320
Homestead, Fla.	WIII	1430
Homewood, Ala.	WJLD	1400
Honolulu, Hawaii	KAIM	870
	KGMB	590
	KZOO	1210
	KHAI	1090
	KPOI	1380
	KIKI	830
	KGU	760
	KHVH	1040
	KNDI	1270
	KOHO	1170
	KOLL	1420
	KORL	650
	KTRG	990

WHITE'S RADIO LOG

Location	C.L.	Kc.
	KULA	690
Hood River, Oreg.	KIHR	1340
Hope, Ark.	KXAR	1490
Hopewell, Va.	WHAP	1340
Hopkinsville, Ky.	WHOP	1230
	WKOA	1480
Hoquiam, Wash.	KHOK	1560
Horneil, N.Y.	WWHG	1320
	WLEA	1480
Hot Springs, Ark.	KAAB	1340
	KBHS	590
	KZNG	1470
Hot Springs, S.Dak.	KOBH	580
Houghton, Mich.	WHDF	1400
Houghton Lake, Mich.	WHGR	1290
Houlton, Maine	WHOU	1340
Houma, La.	KCIL	1490
Houston, Miss.	WCPC	940
Houston, Mo.	KTBC	1250
Houston, Tex.	KCOH	1430
	KENR	1070
	KILT	610
	KNUZ	1230
	KODA	1010
	KPRC	950
	KTHT	790
	KTRH	740
	KXYZ	1320
	KYOK	1590
Howell, Mich.	WHMI	1350
Hudson, N.Y.	WHUC	1230
Hugo, Okla.	KIHN	1340
Humacao, P.R.	WALO	1240
Humboldt, Tenn.	WIRJ	740
Huntingdon, Pa.	WHUN	1150
Huntington, Ind.	WHLT	1300
Huntington, N.Y.	WGSM	740
Huntington, W.Va.	WKEE	800
	WSAZ	930
	WWHY	1470
Huntsville, Ala.	WBHP	1230
	WEUP	1600
	WFIX	1450
	WAAY	1550
Huntsville, Tex.	KSAM	1490
Huron, S.Dak.	KIJV	1340
Hutchinson, Kans.	KWBW	1450
	KWHK	1260
Hutchinson, Minn.	KDUZ	1260
Hyde Park, N.Y.	WHVW	950
Idabel, Okla.	KBEL	1240
Idaho Falls, Idaho	KID	590
	KTEE	1260
Immokalee, Fla.	WCOF	1490
Independence, Ia.	KUPI	960
	KDUR	1220
Independence, Kans.	KIND	1010
Independence, Mo.	KCCX	1510
Indiana, Pa.	WDAD	1450
Indianapolis, Ind.	WATI	810
	WBRI	1500
	WFBM	1260
	WGEE	1590
	WIBC	1070
	WIFE	1310
	WIRE	1430
	WXLW	950
Indianola, Iowa	KBAB	1490
Indianola, La.	KBAB	1490
Indianola, Miss.	WNLA	1380
Indian Rocks Beach, Fla.	WGNP	1520
Indio, Calif.	KRED	1400
Inglewood, Calif.	KTYM	1460
Inkster, Mich.	WCHB	1440
International Falls, Minn.	KGHS	1230
Iola, Kansas	KALN	1370
Ionia, Mich.	WION	1430
Iowa City, Iowa	KXIC	800
	WSUI	910
Iowa Falls, Iowa	KFIG	1510
Iron Mtn., Mich.	WMIQ	1450
Irondale, Ala.	WIXI	1480
Ironton, Ohio	WIRO	1230
Ironwood, Mich.	WJMS	630
Irvine, Ky.	WIRV	1550
Isabella, P.R.	WISA	1390
Ishpeming, Mich.	WJPD	1240
	WCKD	970
Islip, N.Y.	WBIC	540
Ithaca, N.Y.	WHCU	870
	WTKD	1470
Iuka, Miss.	WVOM	1270
Jackson, Ala.	WHDD	1290

Location	C.L.	Kc.
Jackson, Mich.	WIBM	1450
	WKHM	970
	WJCO	1510
Jackson, Miss.	WJDX	620
	WJQS	1400
	WJXN	1450
	WOKJ	1550
	WWUN	1590
	WRBC	1300
	WSLI	980
Jackson, Ohio	WLMJ	1280
Jackson, Tenn.	WDXI	1810
	WJAK	1460
	WTJS	1390
Jackson, Wis.	WYLO	540
Jackson, Wyo.	KSGT	1340
Jacksonville, Ark.	KGMR	1500
Jacksonville, Fla.	WJAX	930
	WAPE	690
	WZOK	1320
	WIVY	1050
	WMBR	1460
	WOBS	1360
	WPDQ	600
	WQIK	1280
	WRHC	1400
Jacksonville, Ill.	WJIL	1550
	WLDS	1180
Jacksonville, Miss.	WJQS	1400
Jacksonville, N.C.	WJNC	1240
	WLAS	910
Jacksonville, Tex.	KEBE	1400
Jacksonville Beh., Fla.	WBIX	1010
Jamestown, N.Dak.	KEYJ	1400
	KSJB	600
Jamestown, N.Y.	WJTN	1240
	WKSN	1340
Jamestown, Tenn.	WCLC	1280
Janesville, Wis.	WCLO	1230
Jasper, Ala.	WWWB	1360
	WARF	1240
Jasper, Ind.	WITZ	990
Jasper, Tex.	KTXJ	1350
Jefferson City, Mo.	KLIK	950
	KWOS	1240
Jefferson City, Tenn.	WJFC	1480
Jeffersonville, Ind.	WXVW	1450
Jena, La.	KCKW	1480
Jennings, La.	KJEF	1290
Jerome, Idaho	KART	1400
Jerseyville, Ill.	WJBM	1480
Jesup, Ga.	WBGR	1370
John Day, Ore.	KJDY	1400
Johnson City, Tenn.	WJCW	910
	WETB	790
Johnston, S.C.	WJES	250
Johnstown, N.Y.	WIZR	930
Johnstown, Pa.	WJAC	850
	WARD	1490
	WCRO	1230
Joliet, Ill.	WJOL	1340
	WJRC	1510
Joliette, Que.	CJLM	1350
Jonesboro, Ark.	KBTM	1230
	KNEA	970
Jonesboro, La.	KTOC	920
Jonesboro, Tenn.	WJSO	1590
Jonesville, La.	KANV	1480
Joplin, Mo.	WMBH	1450
	KQYX	1560
	KFSB	1310
	KODE	1230
Junction, Tex.	KMBL	1450
June. City, Kans.	KJCK	1420
Juneau, Alaska	KINY	800
	KJNO	630
Kailua, Hawaii	KLEI	1180
Kalamazoo, Mich.	WKPR	1420
	WKZO	590
	WKLZ	1470
	WKMI	1360
Kalispell, Mont.	KGEZ	800
	KOFI	930
Kane, Pa.	WADP	960
Kankakee, Ill.	WKAN	1320
Kannapolis, N.C.	WGTL	870
	WRKB	1460
Kans. City, Kans.	KCKN	1340
Kansas City, Mo.	KCMD	810
	KMBC	980
	KPRS	1590
	WDAF	610
	WHB	710
Kaukauna, Wis.	WKAU	1050
Kenedy-Karnes City, Texas	KAML	990
Kealakekua, Hawaii	KEKD	790
Kearney, Nebr.	KGFW	1340
	KRNY	1460
Keene, N.H.	WKNE	1290
	WKBK	1220
Kelso, Wash.	KLOG	1490
Kemmerer, Wyo.	KMER	950
Kendallville, Ind.	WAWK	1570
Kenedy, Tex.	KAML	990
Kennett, Mo.	KBOA	830
	KBXN	1540
Kennewick-Pasco-Richland, Wash.	KEPR	610
Kenosha, Wis.	WLIP	1050

Location	C.L.	Kc.
Kent, O.	WKNT	1520
Keokuk, Iowa	KOKX	1310
Kermit, Tex.	KERB	600
Kerrville, Tex.	KERV	1230
Kershaw, S.C.	WKSC	1300
Ketchikan, Alaska	KTKN	930
Kewanee, Ill.	WKEI	1450
Keyser, W.Va.	WKYR	1270
	WKLP	1390
Key West, Fla.	WKWF	1600
	WKIZ	1500
Kilgore, Tex.	KDCA	1240
Killeen, Tex.	KLEN	1050
Kimball, Nebr.	KIMB	1260
King, N. C.	WKTE	1090
King City, Calif.	KRKC	1490
Kingman, Ariz.	KAAA	1230
Kings Mountain, N.C.	WKMT	1220
Kingsport, Tenn.	WKIN	1320
	WKPT	1550
Kingston, N.Y.	WBAZ	1550
	WGHQ	920
	WKNY	1490
Kingstree, S.C.	WDKD	1310
Kingsville, Tex.	KINE	1330
Kinston, N.C.	WELS	1010
	WFTC	960
	WISP	1230
Kirkland, Wash.	KYAC	1460
	KBLE	1050
Kirksville, Mo.	KIRX	1450
Kissimmee, Fla.	WOSL	1220
Kittanning, Pa.	WACB	1380
Klamath Falls, Oreg.	KAGO	1150
	KFLW	1450
	KLAD	960
Knoxville, Iowa	KNIA	1320
Knoxville, Tenn.	WBIR	1240
	WIVK	860
	WATE	620
	WKXV	900
	WNOX	990
	WROL	1490
Kokomo, Ind.	WIOU	1350
Koseiusko, Miss.	WKOZ	1350
Laconia, N.H.	WLNH	1350
	WEMJ	1490
LaCrosse, Wis.	WKBH	1410
	WLCX	1490
	WKTY	580
Ladysmith, Wis.	WLDY	1340
Lafayette, Ga.	WLFA	1590
Lafayette, Ind.	WASK	1450
	WAZY	1410
	WBAA	920
Lafayette, La.	KPEL	1420
	KVOL	1330
	KXKW	1520
Lafayette, Tenn.	WEEN	1460
LaFollette, Tenn.	WLAF	1450
LaGrande, Oreg.	KLBM	1450
LaGrange, Ga.	WLAG	1240
	WTRP	620
LaGrange, Ill.	WTAQ	1300
LaGrange, Tex.	KVLG	1570
Lajunta, Colo.	KBZZ	1400
Lake Charles, La.	KLDU	1580
	KPLC	1470
	KAOK	1400
Lake City, Fla.	WDSR	1340
	WGRD	960
Lake City, S.C.	WJDT	1260
Lake Geneva, Wis.	WMIR	1530
Lakeland, Fla.	WLAK	1430
	WONN	1230
	WWAB	1350
Lake Placid, N.Y.	WIRD	920
Lake Providence, La.	KLPL	1050
Lake Tahoe, Calif.	KOWL	1490
Lakeview, Oreg.	KQIK	1230
Lake Wales, Fla.	WIPC	1280
Lakewood, Colo.	KLAK	1600
Lakewood Center, Wash.	KFHA	1480
Lake Worth, Fla.	WLIZ	1380
Lamar, Colo.	KLMR	920
Lamesa, Tex.	KPET	690
Lampasas, Tex.	KCYL	1450
Lancaster, Calif.	KAVL	610
	KBVM	1380
Lancaster, N.Y.	WMMJ	1300
Lancaster, Ohio	WHOK	1320
Lancaster, Pa.	WGAL	1490
	WLAN	1390
Lancaster, S.C.	WLCM	1360
	WAGL	1560
Lander, Wyo.	KOVE	1330
Lanett, Ala.-W. Point, Ga.	WRLD	1490
Lansdale, Pa.	WNPV	1440
Lansford, Pa.	WLSH	1410
Lansing, Mich.	WILS	1320
	WJIM	1240
	WITL	1010
LaPeer, Mich.	WMPC	1230
	WTHM	1530
LaPorte, Ind.	WLOI	1540
Laramie, Wyo.	KLME	1490
	KOWB	1290
Laredo, Tex.	KGNS	1300
	KVDZ	1490

Location	C.L.	Kc.
Larned, Kans.	KANS	1510
LaSalle, Ill.	WLPO	1220
LasCruees, N.Mex.	KOBE	1450
	KGRT	570
Las Vegas, Nev.	KENO	1460
	KLAV	1230
	KORK	1340
	KRAM	920
	KLUC	1050
	KVEG	970
Las Vegas, N.Mex.	KFUN	1230
Latrobe, Pa.	WPKV	1570
	WQTW	1570
	WTRA	1480
Laurel, Md.	WLMD	900
Laurel, Miss.	WAML	1340
	WLAU	1600
	WNSL	1260
Laurens, S.C.	WLBG	860
Laurinburg, N.C.	WEWO	1080
	WLNC	1300
Lawrence, Kans.	KFKU	1250
	KLWN	1320
Lawrence, Mass.	WCCM	800
Lawrenceburg, Tenn.	WDXE	1370
Lawrenceville, Ga.	WLAW	1360
Lawrenceville, Ill.	WAKO	910
Lawrenceville, Va.	WLES	580
Lawton, Okla.	KSWO	1380
	KCCO	1050
Leadville, Colo.	KBRR	1280
Leaksville, N.C.	WLOE	1490
Leavenworth, Kans.	KCLO	1410
Lebanon, Ky.	WLBN	1590
Lebanon, Mo.	KLWT	1280
Lebanon, Oreg.	KGAL	920
Lebanon, Pa.	WLBR	1270
Lebanon, Tenn.	WCOR	900
Leesburg, Fla.	WLBE	790
	WBIL	1410
Leesburg, Va.	WAGE	1290
Leesville, La.	KLLA	1570
Lehighton, Pa.	WYNS	1150
Leitchfield, Ky.	WMTL	1580
Leland, Miss.	WESY	1580
LeMars, Iowa	KLEM	1410
Lemoore, Calif.	KLAN	1320
	KOAD	1240
Lenoir, N.C.	WJRI	1340
Lenoir, Tenn.	WLIL	780
Leonardtown, Md.	WKIK	1570
Levelland, Tex.	KLVT	1230
Levittown, Pa.	WBCB	1490
Lewisburg, Pa.	WUNS	1010
Lewisburg, Tenn.	WJJM	1490
Lewiston, Idaho	KRLC	1350
	KOZE	1300
Lewiston, Maine	WCOU	1240
	WLAM	1470
Lewistown, Mont.	KXLO	1230
Lewistown, Pa.	WKVA	920
	WMRF	1490
Lexington, Ky.	WLAP	630
	WBLG	1300
	WVLK	590
Lexington, Miss.	WXTN	1150
Lexington, Mo.	KLEX	1570
Lexington, Nebr.	KRVN	1010
Lexington, N.C.	WBUY	1440
Lexington, Tenn.	WDXL	1490
Lexington, Va.	WREL	1450
Lexington Pk., Md.	WPTX	920
Libby, Mont.	KLCB	1230
	KLIB	1470
Liberal, Kans.	KSCB	1270
Liberty, Ky.	WPHN	1560
Liberty, N.Y.	WVOS	1240
Liberty, Tex.	KFAZ	1050
Lihue, Hawaii	KTOH	1490
Lima, Ohio	WIMA	1150
	WCIT	940
Lincoln, Ill.	WPRC	1370
Lincoln, Me.	WLKN	1450
Lincoln, Nebr.	KFOR	1240
	KLIN	1400
	KLMS	1480
	KLOL	1530
Lincolnton, N.C.	WLON	1050
Linton, Ind.	WBTO	1600
Litchfield, Ill.	WSMI	1540
Litchfield, Minn.	KLFD	1410
Little Falls, Minn.	KLTF	960
Little Falls, N.Y.	WLFH	1280
Littlefield, Tex.	KZZN	1490
Little Rock, Ark.	KARK	920
	KALO	1250
	KLRA	1010
	KOKY	1440
	KAAY	1090
	KVLC	1050
Littleton, Colo.	KDKO	1510
Littleton, N. H.	WLTN	1400
Live Oak, Fla.	WNER	1250
Livingston, Mont.	KPRK	1340
Livingston, Tenn.	WLIV	920
Livingston, Tex.	KETX	1440
	KVLL	1220
Lock Haven, Pa.	WBPZ	1230
Lockport, N.Y.	WUSI	1340
Lodi, Calif.	KCVR	1570
Logan, Utah	KVNU	610

Location	C.L.	Kc.
	KSTU	1300
	KLGN	1390
Logan, W.Va.	WLOG	1230
	WVOW	1290
Logansport, Ind.	WSAL	1230
Lompoc, Calif.	KKOK	1410
	KLOM	1330
	KNEZ	960
London, Ky.	WFTG	1400
Long Beach, Calif.	KFOX	1280
	KGER	1390
Longmont, Colo.	KLMO	1060
Long Prairie, Minn.	KEYL	1400
Longview, Tex.	KFRO	1370
	KLUE	1280
Longview, Wash.	KEDO	1400
	KBAM	1270
Lookout Mtn., Tenn.	WFLI	1070
Lorain, Ohio	WWIZ	1380
Loretto, Pa.	WWSF	1400
Loris, S.C.	WLSC	1570
Los Alamos, N.Mex.	KRSN	1490
Los Angeles, Calif.	KABC	790
	KFI	640
	KHJ	930
	KFWB	980
	KGFJ	1230
	KFAC	1330
	KLAC	570
	KMPC	710
	KNX	1070
	KPOL	1540
	KGBS	1020
	KRKD	1150
Los Banos, Calif.	KLBS	1330
Louisburg, N.C.	WYRN	1480
Louisville, Ga.	WPEH	1420
Louisville, Ky.	WAVE	970
	WAKY	790
	WHAS	840
	WKLO	1080
	WINN	1240
	WKYW	900
	WLOU	1350
	WTMT	620
Louisville, Miss.	WLSM	1270
Loveland, Colo.	KLOV	1570
Loves Park, Ill.	WLUV	1520
Lovington, N.Mex.	KLEA	630
Lowell, Mass.	WCAP	980
	WLLH	1400
Lubbock, Tex.	KCBD	1590
	KDAV	580
	KLBK	1340
	KFYO	790
	KLLL	1460
	KSEL	950
Lucedale, Miss.	WHHT	1440
Ludington, Mich.	WKLA	1450
Lufkin, Tex.	KRBA	1340
	KTRE	1420
Lumberton, N.C.	WAGR	580
	WTSB	1340
Luray, Va.	WRAA	1330
Lynchburg, Va.	WLVA	590
	WLLL	930
	WDMS	1320
	WWDO	1390
	WBRG	1050
Lynn, Mass.	WLYN	1360
Lyons, Ga.	WBBT	1340
Macomb, Ill.	WKAI	1510
Macon, Ga.	WBML	1240
	WCRY	900
	WIBB	1280
	WMAZ	940
	WNEX	1400
Macon, Miss.	WMBC	1400
Madawaska, Me.	WSJR	1230
Madera, Calif.	KHOT	1250
Madill, Okla.	KMAD	1550
Madison, Fla.	WMAF	1230
Madison, Ga.	WYTH	1250
Madison, Ind.	WORX	1270
Madison, S.D.	KJAM	1390
Madison, Tenn.	WENO	1430
Madison, Wis.	WHA	750
	WIBA	1310
	WISM	1480
	WKOW	1070
	WMAD	1550
Madisonville, Ky.	WFMW	730
	WTTL	1310
Magee, Miss.	WSJC	790
Magnolia, Ark.	KVMA	630
Makawao, Hawaii	KNUI	1310
Malden, Mo.	KTCB	1470
Malone, N.Y.	WICY	1490
Malvern, Ark.	KBOK	1310
Manassas, Va.	WPRW	1460
Manati, P.R.	WMNT	1500
Manchester, Conn.	WINF	1230
Manchester, Ga.	WFDR	1370
Manchester, Ky.	WWXL	1450
Manchester, N.H.	WFEA	1370
	WGIR	610
	WKBR	1250
Manchester, Tenn.	WMSR	1320
Manhattan, Kans.	KSAC	580
	KMAN	1350
Manistee, Mich.	WMTE	1340
Manistique, Mich.	WTIQ	1490
Manitou Springs, Colo.	KCMS	1490
Manitowoc, Wis.	WCUB	980
	WOMT	1240
Mankato, Minn.	KYSM	1230
	KTOE	1420
Manning, S.C.	WYMB	1410
Mansfield, La.	KOXI	1360
Mansfield, Ohio	WMAN	1400
	WCLW	1570
Maplewood, Minn.	WRCR	1010
Maquoketa, Iowa	KMAQ	1320
Marathon, Fla.	WFFG	1300
Marianna, Ark.	KZOT	1460
Marianna, Fla.	WTYS	1340
	WTOT	980
Marietta, Ga.	WFOM	1230
	WBIE	1080
Marietta, Ohio	WMOA	1490
	WBRJ	910
Marine City Mich.	WDOG	1590
Marinette, Wis.	WMAN	570
Marion, Ala.	WJAM	1310
Marion, Ill.	WGGH	1150
Marion, Ind.	WBAT	1400
	WMRI	860
Marion, N.C.	WBRM	1250
Marion, Ohio	WMRN	1490
Marion, S.C.	WATP	1430
Marion, Va.	WMEV	1010
	WOLD	135
Marked Tree, Ark.	KPCA	1580
Marksville, La.	KAPB	1370
Marlborough, Mass.	WSRO	1470
Marquette, Mich.	WDMJ	1320
Marshall, Mich.	WMRR	1540
Marshall, Minn.	KMHL	1400
Marshall, Mo.	KMMO	1300
Marshall, N.C.	WMMH	1460
Marshall, Tex.	KMHT	1450
	KADO	1410
Marshalltown, Iowa	KFJB	1230
Marshfield, Wis.	WDLB	1450
Martin, Tenn.	WCMT	1410
Martinsburg, W.Va.	WEPM	1340
Martinsville, Va	WHEE	1370
	WMVA	1450
Marystown, Nfld. Can.	CHCM	560
Marysville, Calif.	KMYC	1410
Marysville, Kans.	KNDY	1570
Maryville, Tenn.	WGAP	1400
Mason City, Iowa	KGLO	1300
	KRIB	1490
	KSMN	1010
Massena, N.Y.	WMSA	1340
	WSTS	1050
Massillon, Ohio	WTIG	990
Matawan, W.Va.	WHJC	1360
Mattoon, Ill.	WLBH	1170
Mauston, Wis.	WRJC	1270
Mayaguez, P.R.	WAEL	600
	WKJB	710
	WORA	760
	WPRA	990
	WTIL	1300
Mayfield, Ky.	WNGO	1320
Mayodan, N.C.	WMYN	1420
Maysville, Ky.	WFTM	1240
McAlester, Okla.	KTMC	1400
	KNED	1150
McAllen, Tex.	KRIO	910
McCamey, Tex.	KAMY	1450
McComb, Miss.	WHNY	1250
	WAPF	980
McCook, Nebr.	KBRL	1300
	KWRV	1360
McGehee, Ark.	KVSA	1220
McKeesport, Pa.	WEDO	810
	WMCK	1360
McKenzie, Tenn.	WHDM	1440
McKinney, Tex.	KMAE	1600
McMinnville, Oreg.	KMCM	1260
McMinnville, Tenn.	WBMC	960
	WAKI	1230
McPherson, Kans.	KNEX	1540
McRae, Ga.	WDAX	1410
Mead, Wash.	KLFF	1590
Meadville, Pa.	WMGW	1490
Medford, Mass.	WHIL	1430
Medford, Oreg.	KMED	1440
	KSHA	860
	KDOV	1300
	KBOY	730
	KYJC	1230
Medford, Wis.	WIGM	1490
Media, Pa.	WXUR	690
Melbourne, Fla.	WMMB	1240
Memphis, Tenn.	WHBQ	560
	WHER	1430
	WMC	790
	WDIA	1070
	WMPS	680
	WLOK	1340
	WMQM	1480
	WREC	600
	KWAM	990
Mena, Ark.	KENA	1450
Mendota, Ill.	WGLC	1090
Menominee, Mich.	WAGN	1340
Menomonie, Wis.	WMNE	1360
Merced, Calif.	KYOS	1480
	KWIP	1580
Meriden, Conn.	WMMW	1470
Meridian, Miss.	WCOC	910
	WDAL	1330
	WMOX	1010
	WOKK	1450
	WQIC	1390
Merkle, Tex.	KWFA	1500
Merrill, Wis.	WXMT	730
Mesa, Ariz.	KBUZ	1310
	KALF	1510
Metropolis, Ill.	WMOK	920
Metter, Ga.	WMAC	1360
Mexia, Tex.	KBUS	1590
Mexico, Mo.	KXEO	1340
Mexico, Pa.	WJUN	1220
Miami, Ariz.	KIKO	1340
Miami, Fla.	WGBS	710
	WIOD	610
	WFAB	990
	WMBM	1220
	WAME	1260
	WMIE	1140
	WQAM	560
	WSKP	1450
	WINZ	940
Miami, Okla.	KGLC	910
Miami Beach, Fla.	WMBM	1490
	WKAT	1360
	WFUN	790
Michigan City, Ind.	WIMS	1420
Middleport-Pomeroy, Ohio	WMPO	1390
Middlesboro, Ky.	WMIK	580
Middletown, Conn.	WCNX	1150
Middletown, N.Y.	WALL	1340
Middletown, Ohio	WPFB	910
Midland, Mich.	WMON	1490
Midland, Tex.	KCRS	550
	KJBC	1150
	KWEL	1440
	KABH	1510
Milan, Tenn.	WKBJ	1600
Miles City, Mont.	KATL	1340
Milford, Conn.	WFIF	1500
Milford, Del.	WKSB	930
Milford, Mass.	WMRC	1490
Milledgeville, Ga.	WMVG	1450
Millen, Ga.	WGSR	1570
Millington, Tenn.	WGMM	1380
Millinocket, Me.	WMKR	1240
Millville, N.J.	WMVB	1440
Milton, Fla.	WEBY	1330
	WSRA	1490
Milton, Pa.	WMLP	1570
	WARC	1380
Milwaukee, Wis.	WEMP	1250
	WFOX	880
	WRIT	1340
	WISN	1150
	WMIL	1290
	WOKY	920
	WTMJ	620
Minden, La.	KASO	1240
Mineola, N.Y.	WFYI	1520
Mineola, Tex.	KMOO	1510
Mineral Wells, Tex.	KORC	1140
Minneapolis, Minn.	WCCO	830
	WLOL	1330
	WMIN	1400
	WDGY	1130
	WPBC	980
	WWTC	1280
	KTCR	690
	KTIS	900
	KUOM	770
	KSTP	1500
Minot, N. Dak.	KLPM	1390
	KHRT	1320
	KCJB	910
Mission, Kans.	KBEA	1480
Mission, Tex.	KIRT	1580
Missoula, Mont.	KGVO	1290
	KXLL	1450
	KQTE	1340
	KYSS	910
Mitchell, S.Dak.	KORN	1490
Moab, Utah	KURA	1450
Moberly, Mo.	KNCM	1230
Mobile, Ala.	WUNI	1410
	WABB	1480
	WGOK	900
	WMOD	1550
	WTUF	840
	WKRG	710
	WLIQ	1360
	WMOZ	960
Mobridge, S.Dak.	KOLY	1300
Mocksville, N.C.	WDSL	1520
Modesto, Calif.	KTRB	860
	KBEE	970
	KFIV	1360
Mojave, Calif.	KDOL	1340
Moline, Ill.	WQUA	1230
Monahans, Tex.	KVKM	1330
Moncks Corner, S. C.	WBER	950
	KRMO	990
Monett, Mo.	KBIB	1560
Monette, Ark.	WRAM	1330
Monmouth, Ill.	WMRE	1490
Monroe, Ga.	KMLB	1440
Monroe, La.	KLIC	1230
	KNOE	540
Monroe, Mich.	WQTE	580
Monroe, N.C.	WMAP	1060
Monroe, Wis.	WEKZ	1260
Monroeville, Ala.	WMFC	1360
Monterey, Calif.	KIDD	630
	KMBY	1240
Montevideo, Minn.	KDMA	1460
Monte Vista, Colo.	KSLV	1240
Montezuma, Ga.	WMNZ	1050
Montgomery, Ala.	WBAM	740
	WGOV	1170
	WAPX	1800
	WHHY	1440
	WMGY	800
	WRMA	950
Montgomery, W.Va.	WMON	1340
Monticello, Ark.	KHBM	1430
Monticello, Fla.	WWSO	1090
Monticello, Ky.	WFLW	1360
Montpelier-Barre, Vt.	WSKI	1240
Montrose, Colo.	KUBC	580
Montrose, Pa.	WPEL	1250
Mooresville, N.C.	WHIP	1350
Moorhead, Minn.	KVOX	1280
Morehead, Ky.	WMOR	1330
Morehead City, N.C.	WMBL	740
Morgan City, La.	KMRC	1430
Morganfield, Ky.	WMSK	1550
Morganton, N.C.	WMNC	1430
Morgantown, W.Va.	WAJR	1440
	WCLG	1300
Morrilton, Ark.	KVOM	800
Morris, Ill.	WCSJ	1550
Morris, Minn.	KMRS	1280
Morristown, N.J.	WMTR	1250
Morristown, Tenn.	WCRK	1150
	WMTN	1300
Morton, Tex.	KRAN	1280
Moscow, Idaho	KRPL	1400
Moses Lake, Wash.	KSEM	1470
	KWIQ	1260
Moss Point, Miss.	WACY	1460
Moulton, Ala.	WLCB	1530
Moultrie, Ga.	WMGA	1400
	WMTM	1300
Moundsville, W.Va.	WEIF	1370
Mountain Grove, Mo.	KLRS	1360
Mountain Home, Ark.	KTLO	1490
Mountain Home, Ida.	KFLI	1240
Mt. Airy, N.C.	WPAQ	740
	WSYD	1300
Mt. Carmel, Ill.	WVMC	1360
Mt. Clemens, Mich.	WBRB	1430
Mt. Dora, Fla.	WVGT	1580
Mt. Holly, N.J.	WJJZ	1480
Mt. Jackson, Va.	WSIG	790
Mt. Kisco, N.Y.	WVIP	1310
Mt. Olive, N.C.	WDJS	1450
Mt. Pleasant, Mich.	WCEN	1150
Mt. Pleasant, Tex.	KIMP	960
Mt. Shasta, Calif.	KWSO	620
Mt. Sterling, Ky.	WMST	1150
Mt. Vernon, Ill.	WMIX	940
Mt. Vernon, Ind.	WPCO	1590
Mt. Vernon, Ky.	WRVK	1480
Mt. Vernon, Ohio	WMVO	1300
Mt. Vernon, Wash.	KAPS	1470
	KBRC	1430
Muleshoe, Tex.	KMUL	1380
Mullins, S.C.	WJAY	1280
Muncie, Ind.	WLBC	1340
	WERK	990
Munfordville, Ky.	WLOC	1150
Munising, Mich.	WMAB	1400
Murfreesboro, N. C.	WWDR	1080
Murfreesboro, Tenn.	WGNS	1450
	WMTS	810
Murphy, N.C.	WCVP	600
	WKRK	1320
Murphysboro, Ill.	WINI	1420
Murray, Ky.	WNBS	1340
Murray, Utah	KMUR	1230
Muscatine, Iowa	KWPC	860
Muscle Shoals City, Ala.	WLAY	1450
Muskegon, Mich.	WKBZ	850
	WKJR	1520
	WTRU	1600
	WMUS	1090
Muskogee, Okla.	KBIX	1490
	KMUS	1380
Myrtle Beach, S.C.	WMYB	1450
	WTGR	1520
Nacogdoches, Tex.	KEEE	1230
	KSFA	860
Nampa, Idaho	KFXO	580
	KAIN	1340
Nanticoke, Pa.	WNAK	730
Napa, Calif.	KVON	1440
Naples, Fla.	WNOG	1270
Narrows, Va.	WNRV	990
Nashua, N.H.	WOTW	900
	WSMN	1590
Nashville, Ark.	KBHC	1260
Nashville, Ga.	WNGA	1600

WHITE'S RADIO LOG

Location	C.L.	Kc.
Nashville, Tenn.	WKDA	1240
	WLAC	1510
	WMAK	1300
	WNAH	1360
	WSIX	980
	WSM	650
	WWGM	1560
Nassau, Bahamas	ZNS-2	1240
Natchez, Miss.	WMIS	1240
	WNAT	1450
Natchitoches, La.	KNOC	1450
Naugatuck, Conn.	WOWW	860
Navasota, Tex.	KWBC	1550
Nebraska City, Nebr.	KNCY	1600
Needles, Calif.	KSFE	1340
Neenah, Wis.	WNAM	1280
Nellisville, Wis.	WCCN	1370
Neon, Ky.	WNKY	1480
Neosho, Mo.	KBTN	1420
Nevada, Mo.	KNEM	1240
New Albany, Ind.	WNUW	1570
New Albany, Miss.	WNAU	1470
Newark, Del.	WNRK	1260
Newark, N.J.	WJRZ	970
	WNJR	1430
	WVNJ	620
Newark, N.Y.	WACK	1420
Newark, Ohio	WCLT	1430
New Bedford, Mass.	WBSM	1420
	WNBH	1340
New Bern, N.C.	WHIT	1450
	WRNB	1490
Newberry, S.C.	WKOK	1240
New Boston, Ohio	WIOI	1010
New Braunfels, Tex.	KGNB	1420
New Britain, Conn.	WRCH	910
	WRYM	840
New Brunswick, N.J.	WCTC	1450
Newburgh, N.Y.	WGNY	1220
Newburyport, Mass.	WNBP	1470
New Castle, Ind.	WCTW	1550
New Castle, Pa.	WKST	1280
Newcastle, Wyo.	KASL	1240
New City, N. Y.	WRKL	910
New Haven, Conn.	WAVZ	1300
	WELI	960
	WNHC	1340
New Iberia, La.	KANE	1240
	KVIM	1360
New Kensington, Pa.	WKPA	1150
New London, Conn.	WNLC	1510
New Martinsville, W.Va.	WETZ	1330
Newnan, Ga.	WCOH	1400
	WNEA	1300
New Orleans, La.	WDSU	1280
	WNNR	990
	WBOK	800
	WNOE	1060
	WSMB	1350
	WNPS	1450
	WSHO	1230
	WTIX	690
	WWL	870
	WWOM	600
	WYLD	940
Newport, Ark.	KNBY	1280
Newport, N.H.	WCNL	1010
Newport, Oreg.	KNPT	1310
Newport, R.I.	WAOK	1540
Newport, Tenn.	WLIK	1270
Newport, Vt.	WIKE	1490
Newport News, Va.	WGH	1310
	WTID	1270
Newport Richey, Fla.	WGUL	1500
New Richmond, Wis.	WIXK	1590
New Roads, La.	KWRG	1500
New Rochelle, N.Y.	WVOX	1460
New Smyrna Beach, Fla.	WSBB	1230
	WORT	1550
Newton, Iowa	KCOB	1280
Newton, Kans.	KJRG	950
Newton, Miss.	WBKN	1410
Newton, N.J.	WNNJ	1360
Newton, N.C.	WNNC	1230
New Ulm, Minn.	KNUJ	860
New York, N.Y.	WABC	770
	WADO	1280
	WBNX	1380
	WCBS	880
	WEVD	1330
	WHN	1050
	WHOM	1480
	WINS	1010
	WLIB	1190
	WMCA	570
	WNBC	660
	WNEW	1130
	WNYC	830
	WOR	710
	WPOW	1330
	WQXR	1560
Niagara Falls, N.Y.	WHLO	1270
	WJJL	1440
Niceville-Valparaiso, Fla.	WNSM	1340
Nicholasville, Ky.	WNVL	1250
Niles, Mich.	WNIL	1290
Niles, Ohio	WNIO	1540
Nogales, Ariz.	KNOG	1340
Nome, Alaska	KICY	850
Norfolk, Nebr.	WJAG	780
Norfolk, Va.	WTAR	790
	WCMS	1050
	WNOR	1230
	WRAP	850
Normal, Ill.	WIOK	1440
Norman, Okla.	WNAO	640
	KNOR	1400
Norristown, Pa.	WNAR	1110
N. Adams, Mass.	WMNB	1230
N. Atlanta, Ga.	WATY	680
N. Augusta, S.C.	WGUS	1380
	WFNL	1600
	WTHB	1550
North Bend, Oreg.	KFIR	1340
North Charleston, S.C.	WNCG	910
Northampton, Mass.	WHMP	1400
Northfield, Minn.	WCAL	770
N. Little Rock, Ark.	KDXE	1380
	KXLR	1150
North Platte, Nebr.	KJLT	970
	KNOP	1410
	KODY	1240
No. Syracuse, N.Y.	WSOQ	1220
N. Vernon, Ind.	WOCH	1460
Northwestern, Ind.	WNWI	1080
No. Wilkesboro, N.C.	WKBC	810
Norton, Kans.	KNBI	1530
Norton, Va.	WNVA	1350
Norwalk, Conn.	WNLK	1350
Norwich, Conn.	WICH	1310
Norwich, N.Y.	WCHN	970
Oakdale, La.	KREH	900
Oakes, N.Dak.	KEYD	1220
Oak Grove, La.	KWCL	1280
Oak Hill, W.Va.	WOAY	860
Oakland, Calif.	KEWB	910
	KABL	960
	KDIA	1310
Oakland, Md.	WMSG	1050
Oakland Park, Fla.	WIXX	1520
Oak Park, Ill.	WOPA	1490
Oak Ridge, Tenn.	WATO	1290
Ocala, Fla.	WMOP	800
	WTMC	1290
	WKOS	1370
Ocean City, Md.	WETT	1590
Ocean City, Somers Pt., N.J.	WSLT	1520
Oceanlake, Oreg.	KBCH	1380
Oceanside, Calif.	KUOE	1320
Ocilla, Ga.	WSIZ	1380
Odessa, Tex.	KECK	920
	KOSA	1230
	KOYL	1310
	KRIG	1410
Oelwein, Iowa	KOEL	950
Ogallala, Nebr.	KOGA	930
Ogden, Utah	KLO	1430
	KANN	1250
	KSVN	730
	KVOG	1490
Ogdensburg, N.Y	WSLB	1400
Oil City, Pa.	WKRZ	1340
Okeechobee, Fla.	WOKC	1570
Okla. City, Okla.	KBYE	890
	KLPR	1140
	KOCY	1340
	KOMA	1520
	KTOK	1000
	KJEM	800
	WKY	930
Okmulgee, Okla.	KOKL	1240
Old Saybrook, Conn.	WLIS	1420
Olean, N.Y.	WMNS	1360
	WHDL	1450
Olney, Ill.	WVLN	740
Olympia, Wash.	KGY	1240
	KITN	920
Omaha, Nebr.	KBON	1490
	KFAB	1110
	KOIL	1290
	KOOO	1420
	KOWH	660
	WOW	590
Omak, Wash.	KOMW	680
Oneida, N.Y.	WMCR	1600
Oneida, Tenn.	WBNT	1310
O'Neill, Nebr.	KBRX	1350
Oneonta, Ala.	WCRL	1570
Oneonta, N.Y.	WDOS	730
Ontario, Calif.	KASK	1510
Ontario, Oreg.	KSRV	1380
Opelika, Ala.	WPHO	1400
Opelousas, La.	KSLO	1230
Opp, Ala.	WAMI	860
Opportunity, Wash.	KZUN	680
Orange, Mass.	WCAT	1390
Orange, Tex.	KOGT	1600
Orange, Va.	WJMA	1340
Orangeburg, S.C.	WDIX	1150
	WORG	1580
	WTND	920
Orange Park, Fla.	WAYR	550
Oregon City, Ore.	KYMN	1520
Orlando, Fla.	WDBO	580
	WHOO	990
	WHIY	1270
	WLOF	950
	WKIS	740
Ormond Bch., Fla.	WOMQ	1380
Orofino, Idaho	KLER	950
Oroville, Calif.	KAOR	1340
Ortonville, Minn.	KDIO	1350
Osage Bch., Mo.	KRMS	1150
Osceola, Ark.	KOSE	860
Oshkosh, Wis.	WOSH	1490
Oskaloosa, Iowa	KBOE	740
Oswego, N.Y.	WSGO	1440
Othello, Wash.	KRSC	1400
Ostego, Mich.	WAOP	980
Ottawa, Ill.	WCMY	1430
Ottawa, Kans.	KOFO	1220
Ottumwa, Iowa	KBIZ	1240
	KLEE	1480
Owatonna, Minn.	KRFO	1390
Owego, N.Y.	WEBO	1330
Owensboro, Ky.	WOMI	1490
	WVJS	1420
Owosso, Mich.	WOAP	1080
Oxford, Miss.	WSUH	1420
Oxford, N.C.	WOXF	1340
Oxnard, Calif.	KOXR	910
Ozark, Ala.	WOZK	900
Paducah, Ky.	WDXR	1560
	WKYX	570
	WPAD	1450
Page, Ariz.	KPGE	1340
Painesville, Ohio	WPVL	1460
Paintsville, Ky.	WSIP	1490
Palatka, Fla.	WWPF	1260
	WSUZ	800
Palestine, Tex.	KNET	1450
Palm Bch., Fla.	WQXT	1340
Palm Sprgs., Calif.	KCMJ	1010
	KDES	920
	KPAL	1450
Palmdale, Calif.	KUTY	1470
Palo Alto, Calif.	KIBE	1220
Pampa, Tex.	KPDN	1340
	KHHH	1230
Panama City, Fla.	WDLP	590
	WPCF	1430
Panama City Beach, Fla.	WTHR	1480
	WSCM	1290
Paoli, Ind.	WVAK	1560
Paradise, Calif.	KNGL	930
Paragould, Ark.	KDRS	1490
Paris, Ark.	KCCL	1460
Paris, Ill.	WPRS	1440
Paris, Ky.	WKLX	1440
Paris, Tenn.	WTPR	710
Paris, Tex.	KPLT	1490
	KFTV	1250
Parkersburg, W.Va.	WCEF	1050
	WPAR	1450
	WTAP	1230
Park Falls, Wis.	WPFP	1450
Park Rapids, Minn.	KPRM	1240
Parsons, Kans.	KLKC	1540
Pasadena, Cal.	KPPC	1240
	KRLA	1110
	KWKW	1300
Pasadena, Tex.	KLVL	1420
	KIKK	650
Pascagoula-Moss Point, Miss.	WPMP	1580
Pasco, Wash.	KORD	910
	KGRS	1340
Paso Robles, Calif.	KPRL	1230
Patchogue, L.I., N.Y.	WALK	1370
	WPAC	1580
Paterson, N.J.	WPAT	930
Pauls Valley, Okla.	KVLH	1470
Pawhuska, Okla.	KOSG	1500
Pawtucket, R.I.	WXTR	550
Pearsall, Tex.	KVWG	1280
Pecos, Tex.	KIUN	1400
Peekskill, N.Y.	WLNA	1420
Pekin, Ill.	WSIV	1140
Pell City, Ala.	WFHK	1430
Pendleton, Oreg.	KTIX	1240
	KUMA	1290
Pennington Gap, Va.	WSWV	1570
Pensacola, Fla.	WBOP	980
	WBSR	1540
	WMEL	610
	WNVY	1230
	WCOA	1370
Peoria, Ill.	WAAP	1350
	WMBD	1470
	WIRL	1280
	WPEO	1020
Perry, Fla.	WPRY	1400
	WGKR	1310
Perry, Ga.	WPGA	980
Perry, Iowa	KDLS	1310
Perryton, Tex.	KEYE	1400
Peru, Ind.	WARU	1600
Petaluma, Calif.	KTOB	1490
Petersburg, Va.	WSSV	1240
Petoskey, Mich.	WMBN	1340
Phenix City, Ala.	WPNX	1460
Philadelphia, Miss.	WHOC	1490
Philadelphia, Pa.	WCAU	1210
	WDAS	1480
	WFIL	560
	WFLN	900
	WHAT	1340
	WIBG	990
	WIP	610
	WJMJ	1540
	WPEN	950
	WRCV	1060
	WTEL	860
Philipsburg, Pa.	WPHB	1260
Phillipsburg, Kans.	KKAN	1490
Phoenix, Ariz.	KIFN	860
	KXIV	1400
	KHAT	1480
	KHEP	1280
	KCAC	1010
	KOY	550
	KOOL	960
	KPHO	910
	KUEQ	740
	KRIZ	1230
	KTAR	620
Phoenix City, Ala.	WPNX	1460
Piedmont, Ala.	WPID	1280
Pierre, S.Dak.	KGFX	630
	KCCR	1240
Pikeville, Ky.	WLSI	900
	WPKE	1240
Pine Bluff, Ark.	KCLA	1400
	KADL	1270
	KOTN	1490
	KGAT	1530
	KPBA	1590
Pine City, Minn.	WCMP	1350
Pinellas Park, Fla.	WFSO	570
Pineville, Ky.	WMLF	1230
Pineville, W.Va.	WWYO	970
Pipestone, Minn.	KLOH	1050
Piqua, Ohio	WPTW	1570
Pittsburg, Calif.	KKIS	990
Pittsburg, Kans.	KOAM	860
	KSEK	1340
Pittsburgh, Pa.	KDKA	1020
	KQV	1410
	WAMO	860
	WJAS	1320
	WPIT	730
	WRYT	1250
	WEEP	1080
	WWSW	970
Pittsfield, Ill.	WBBA	1580
Pittsfield, Mass.	WBEC	1420
	WBRK	1340
Pittston, Pa.	WPTS	1540
Plainfield, N.J.	WERA	1590
Plainview, Tex.	KVOP	1400
Plant City, Fla.	WPLA	910
Platteville, Wis.	WSWW	1590
Plattsburg, N.Y.	WEAV	960
	WIRY	1340
Pleasanton, Tex.	KBOP	1380
Pleasantville, N.J.	WOND	1400
Plymouth, Ind.	WTCA	1050
Plymouth, Mass.	WPLM	1390
Plymouth, N.C.	WPNC	1470
Plymouth, N.H.	WPNH	1300
Plymouth, Wis.	WPLY	1420
Pocahontas, Ark.	KPOC	1420
Pocatello, Idaho	KSEI	930
	KWIK	1240
	KSNN	1290
Pocomoke City, Md.	WOMV	540
Pomona, Calif.	KWOW	1600
	KKAR	1220
Pompton Lakes, N. J.	WKER	1500
Pompano Beach, Fla.	WLOD	980
	WRBD	1470
Ponca City, Okla.	WBBZ	1230
Ponce, P.R.	WPRP	910
	WEUC	1420
	WPAB	550
	WLEO	1170
	WISO	1260
Pontiac, Ill.	WJBG	1080
Pontiac, Mich.	WPON	1460
Pontotoc, Miss.	WSEL	1440
Pooli, Ind.	WVAK	1560
Poplar Bluff, Mo.	KWOC	930
	KLID	1340
Poplarville, Miss.	WRPM	1530

Location	C.L.	Kc.
Portage, Pa.	WWML	1470
Portage, Wis.	WPDR	1350
Portageville, Mo.	KMIS	1050
Portales, N.Mex.	KENM	1450
Port Angeles, Wash.	KAPY	1000
	KONP	1450
Port Arthur, Tex.	KOLE	1340
	KPAC	1250
Porterville, Calif.	KTIP	1450
Port Hueneme,Calif.	KACY	1520
Port Huron, Mich.	WHLS	1450
	WTTH	1380
Port Jervis, N.Y.	WDLC	1490
Port Lavaca, Tex.	KGUL	1560
Portland, Ind.	WPGW	1440
Portland, Maine	WCSH	970
	WGAN	560
	WLOB	1310
	WPOR	1490
Portland, Oreg.	KBPS	1450
	KBEV	1010
	KLIQ	1290
	KEX	1190
	KGW	620
	KOIN	970
	KPAM	1410
	KPDQ	800
	KPOJ	1330
	KWJJ	1080
	KXL	750
Port Neches, Tex.	KPNG	1150
Portsmouth, N.H.	WBBX	1380
	WHEB	750
Portsmouth, Ohio	WPAY	1400
	WNXT	1260
Portsmouth, Va.	WHIH	1400
	WPMH	1010
	WAVY	1350
Port Washington, Wis.	WGLB	1560
Post, Tex.	KPOS	1370
Poteau, Okla.	KLCO	1280
Potomac-Cabin John, Md.	WXLN	950
Potosi, Mo.	KYRD	1280
Potsdam, N.Y.	WPDM	1470
Pottstown, Pa.	WPAZ	1370
Pottsville, Pa.	WPAM	1450
	WPPA	1360
Poughkeepsie, N.Y.	WEOK	1390
	WKIP	1450
Powell, Wyo.	KPOW	1260
Poynette, Wis.	WIBU	1240
Prairie du Chien, Wis.	WPRE	980
Pratt, Kan.	KWNS	1290
Prescott, Ariz.	KYCA	1480
	KEST	1340
	KNOT	1450
Prescott, Ark.	KTPA	1370
Presque Isle, Me.	WAGM	950
	WEGP	1390
Preston, Idaho	KPST	1340
Prestonsburg, Ky.	WPRT	960
	WDOC	1310
Price, Utah	KOAL	1230
Prichard, Ala.	WSIM	1270
Prince Albert, Sask.	CKBI	900
Princeton, Ill.	WZOE	1490
Princeton, Ind.	WRAY	1250
Princeton, Ky.	WPKY	1580
Princeton, N.J.	WHWH	1350
Princeton, W.Va.	WLDH	1490
Prineville, Ores.	KRCO	690
Prosser, Wash.	KARY	1310
Providence, R.I.	WEAN	790
	WHIM	1110
	WICE	1290
	WJAR	920
	WLKW	990
	WPRO	630
	WRIB	1220
Provo, Utah	KIXX	1400
	KEYY	1450
	KDVD	960
Pryor, Okla.	KOLS	1570
Pueblo, Colo.	KDZA	1230
	KAPI	690
	KCSJ	590
	KFEL	970
Pueblo, Colo.	KKAM	1350
	KPUB	1480
Pulaski, Tenn.	WKSR	1420
Pulaski, Va.	WPUV	1580
Pullman, Wash.	KWSC	1250
	KOFE	1150
Punta Gorda, Fla.	WCCF	1580
Punxsutawney, Pa.	WPME	1540
Putnam, Conn.	WINY	1350
Puyallup, Wash.	KPUY	1450
Quanah, Tex.	KOLJ	1150
Quantico, Va.	WQVA	1530
Quincy, Calif.	KQCY	500
Quincy, Fla.	WCNH	1230
Quincy, Ill.	WGEM	1440
	WTAD	930
Quincy, Mass.	WJDA	1300
Quincy, Wash.	KPDR	1370
Quitman, Ga.	WSFB	1490
Racine, Wis.	WRAC	1460
	WRJN	1400
Radford, Va.	WRAD	1460
Raeford, N.C.	WSHB	1400

Location	C.L.	Kc.
Raleigh, N.C.	WKIX	850
	WNOH	1550
	WPTF	680
	WLLE	570
	WRAL	1240
Ralls, Tex.	KCLR	1530
Rantoul, Ill.	WRTL	1460
Rapid City, S.Dak.	KOTA	1380
	KIMM	1150
	KRSD	1340
	KEZU	920
Raton, N.Mex.	KRTN	1490
Ravenswood, W.Va.	WMOV	1360
Rawlins, Wyo.	KRAL	1240
Raymond, Wash.	KAPA	1340
Raymondville, Tex.	KSOX	1240
Rayville, La.	KRIH	990
Reading, Pa.	WEEU	850
	WHUM	1240
	WRAW	1340
Redding, Calif.	KRDG	1230
	KAHR	1350
	KQMS	1400
	KVCV	600
	KVIP	540
Red Bluff, Calif.	KBLF	1490
Redfield, S.Dak.	KFCB	1380
Redlands, Calif.	KCAL	1410
Red Lion, Pa.	WGCB	1440
Red Lodge, Mont.	KRBN	1450
Redmond, Oreg.	KPRB	1240
Red Wing, Minn.	KCUE	1250
Redwood Falls, Minn.	KLGR	1490
Reedsburg, Wis.	WRDB	1400
Reedsport, Oreg.	KRAF	1470
Reidsville, N.C.	WFRC	1600
	WREV	1220
Remsen, N.Y.	WREM	1480
Reno, Nev.	KOH	630
	KBET	1340
	KOLO	920
	KONE	1450
	KCBN	1280
Rensselaer, Ind.	WRIN	1560
Rensselaer, N.Y.	WEEE	1300
Renton, Wash.	KREN	1420
Rexburg, Idaho	KRXK	1230
Rhinelander, Wis.	WOBT	1240
Rice Lake, Wis.	WJMC	1240
Richfield, Utah	KSVC	980
Richland, Wash.	KALE	960
Richland, Wis.	WRCD	1450
Richlands, Va.	WRIC	540
Richmond, Ind.	WKBV	1490
Richmond, Ky.	WEKY	1340
Richmond, Va.	WANT	990
	WBBL	1480
	WRGM	1540
	WLEE	1480
	WEET	1320
	WGOE	1590
	WMBG	1380
	WRNL	910
	WRVA	1140
	WXGI	950
	WRGM	1540
Richwood, W.Va.	WVAR	1280
Ridgecrest, Calif.	KRCK	1360
	KLDA	1240
Ridgeland, S.C.	WBUG	1430
Rio Piedras, P.R.	WUND	1320
	WRAI	1190
Ripley, Miss.	WSCA	1260
Ripley, Tenn.	WTRB	1570
Ripon, Wis.	WCWC	1600
Riverhead, N.Y.	WRIV	1390
	WAPC	1570
Riverside, Calif.	KPRO	1440
	KACE	1570
Riverton, Wyo.	KVDW	1450
Riviera Beach, Fla.	WHEW	1600
Roanoke, Ala.	WELR	1360
Roanoke, Va.	WDBJ	960
	WRIS	1410
	WHYE	910
	WROV	1240
	WSLS	610
Roanoke Rapids, N.C.	WCBT	1230
Roaring Sprgs., Pa.	WKMC	1370
Roberval, Que.	CHRL	910
Robinson, Ill.	WTAY	1570
Robstown, Tex.	KRDB	500
Rochester, Minn.	KRDC	1340
	KFAV	1520
	KWEB	1270
Rochester, Minn.	KOLM	1520
	KWEB	1270
Rochester, N.H.	WWNH	930
Rochester, N.Y.	WBBF	950
	WHAM	1180
	WHEC	1460
	WRVM	680
	WSAY	1370
	WROC	1280
Rockford, Ill.	WROK	1440
	WJRL	1150
	WRRR	1330
Rockford, Mich.	WJPW	810
Rock Hill, S.C.	WRHI	1340
	WTYC	1150

Location	C.L.	Kc.
Rockingham, N.C.	WAYN	900
Rock Island, Ill.	WHBF	1270
Rockland, Maine	WRKD	1450
Rockmart, Ga.	WPLK	1220
Rock Springs, Wyo.	KVRS	1360
Rockville, Md.	WINX	1600
Rockwood,Tenn.	WRKH	580
Rocky Ford, Colo.	KAVI	1320
Rocky Mount, N.C.	WCEC	810
	WEED	1390
	WRMT	1490
	WKWS	1290
Rocky Mount, Va.	WYYT	1570
Rogers, Ark.	KAMO	1390
Rogers City, Mich.	WHAK	960
Rogersville, Tenn.	WRGS	1370
Rolla, Mo.	KCLU	1590
	KTTR	1490
Rome, Ga.	WLAQ	1410
	WJYN	1360
	WRGA	1470
	WROM	710
Rome, N.Y.	WKAL	1450
	WRNY	1350
Roncoverte, W.Va.	WRON	1400
Roseau, Minn.	KRWB	1410
Roseburg, Oreg.	KRNR	1490
	KQEN	1240
	KRXL	1250
	KYES	950
Rosenberg, Tex.	KFRD	980
Roservelt, N.M.	KRDD	1320
Rossville, Ga.	WRIP	980
Roswell, N.Mex.	KRSY	1230
	KGFL	1430
	KBIM	910
	KRDD	1320
	KRIK	960
Roxboro, N.C.	WRXO	1430
Royal Oak, Mich.	WEXL	1340
Rugby, N. Dak.	KGCA	1450
Ruidoso, N.Mex.	KRRR	1340
Rumford, Me.	WRUM	790
Rupert, Idaho	KAYT	970
Rushton, La.	KRUS	1490
Rusk, Texas	KTLU	1580
Russell, Kans.	KRSL	990
Russellville, Ala.	WWWR	920
Russellville, Ark.	KXRJ	1490
Russellville, Ky.	WRUS	610
Rutland, Vt.	WHWB	1000
	WSYB	1380
Sacramento, Calif.	KCRA	1320
	KFBK	1530
	KGMS	1380
	KJAY	1430
	KRAK	1140
	KROY	1240
	KXDA	1470
Safford, Ariz.	KGLU	1480
	KATO	1230
Sag Harbor, N.Y.	WLNG	1600
Saginaw, Mich.	WKNX	1210
	WSAM	1400
	WSGW	790
St. Albans, Vt.	WWSR	1420
St. Albans, W.Va.	WKLC	1300
St. Augustine, Fla.	WFOY	1240
	WETH	1420
St. Charles, Mo.	KADY	1460
St. Cloud, Minn.	KFAM	1450
	WJON	1240
Ste. Genevieve, Mo.	KSGM	1340
St. George, S.C.	WQIZ	1300
St. George, Utah	KDXU	1450
St. Helen, Mich.	WMIC	1590
St. Helens, Oreg.	KOHI	1600
St. Johns, Mich.	WJUD	1580
St. Johnsbury, Vt.	WTWN	1340
St. Joseph, Mich.	WSJM	1400
St. Joseph-Benton Harbor, Mich.	WHFB	1060
St. Joseph, Mo.	KFEQ	680
	KKJO	1550
	KUSN	1270
St. Louis, Mo.	KATZ	1600
	KMOX	1120
	KSD	550
	KSTL	690
	KWK	1380
	KXDK	630
	WEW	770
	WIL	1430
	KXEN	1010
St. Louis Park, Minn.	KRSI	950
St. Mary's, Pa.	WKBI	1400
St. Paul, Minn.	KSTP	1500
	KDWB	630
	WMIN	1400
	WCCO	830
St. Peter, Minn.	KRBI	1310
St. Petersburg, Fla.	WPIN	680
	WSUN	620
	WLCY	1380
St. Petersburg Beach, Fla.	WILZ	1590
Salamanca, N.Y.	WGGO	1590
Salem, Ill.	WJBD	1350
Salem, Ind.	WSLM	1220
Salem, Mass.	WESX	1230
Salem, Mo.	KSMO	1340
Salem, N. J.	WJIC	1510

Location	C.L.	Kc.
Salem, O.	WSOM	600
Salem, Oreg.	KSLM	1390
	KAPT	1220
	KBZY	1490
	KGAY	1430
Salem, Va.	WBLU	1480
Salida, Colo.	KVRH	1340
Salina, Kans.	KSAL	1150
	KFRM	550
	KISI	910
Salinas, Calif.	KDON	1460
	KSBW	1380
Salinas, Calif.	KCTY	980-1000
Saline, Mich.	WOIB	1290
Salisbury, Md.	WBOC	960
	WICO	1320
	WJDY	1470
Salisbury, N.C.	WSTP	1490
	WSAT	1280
Salmon, Idaho	KSRA	960
Salt Lake City, Utah	KALL	910
	KCPX	1320
	KLUB	570
	KNAK	1280
	KSL	1160
	KSOP	1370
	KSXX	630
	KWHO	860
	KWIC	1550
San Angelo, Tex.	KTEO	1340
	KGKL	960
	KPEP	1420
	KWFR	1260
San Antonio, Tex.	KAPE	1480
	KBAT	680
	KBER	1150
	KCOR	1350
	KITE	930
	KUKA	1250
	KUBO	1310
	KMAC	630
	KONO	860
	KTSA	550
	WDAI	1200
San Bernardino, Calif.	KCKC	1350
	KFXM	590
	KRND	1240
	KMEN	1290
Sandersville, Ga.	WSNT	1490
San Diego, Calif.	KCBQ	1170
	KFMB	760
	KOGD	600
	KGB	1360
	KSON	1240
	KSDO	1130
Sandpoint, Idaho	KSPT	1400
Sand Spring, Okla.	KTOW	1340
Sandusky, Ohio	WLEC	1450
San Fernando, Calif.	KGIL	1260
Sanford, Fla.	WTRR	1400
Sanford, Me.	WSME	1220
Sanford, N.C.	WEYE	1290
	WWGP	1050
San Francisco, Calif.	KFRC	610
	KCBS	740
	KFAX	1100
	KGO	810
	KNBR	680
	KKHI	1550
	KSAY	1010
	KSFO	560
	KSOL	1450
	KYA	1260
San Gabriel, Cal.	KAIL	1430
San German, P. R.	WRJS	1060
Sanitobia, Miss.	WSAO	1550
San Jose, Calif.	KLOK	1170
	KLIV	1590
	KEEN	1370
	KXRX	1500
San Juan, P.R.	WAPA	680
	WHDA	870
	WIAC	740
	WIPR	940
	WKAQ	580
	WKVM	810
	WKYN	630
	WITA	1140
San Luis Obispo, Calif.	KATY	1340
	KSLY	1400
	KVEC	920
San Marcos, Tex.	KCNY	1470
San Mateo, Calif.	KOFY	1050
San Rafael, Calif.	KTIM	1510
San Saba, Tex.	KBAL	1410
San Sebastion, P.R.	WFBA	1460
Santa Ana, Calif.	KWIZ	1480
Santa Barbara, Cal.	KDB	1490
	KGUD	990
	KIST	1340
	KTMS	1250
	KACL	1290
Santa Clara, Calif.	KGBA	1430
Santa Cruz, Calif.	KSCO	1080
Santa Fe, N.Mex.	KTRC	1400
	KVSF	1260
Santa Maria, Cal.	KCO'/	1400
	KHER	1600

WHITE'S RADIO LOG

Location	C.L.	Kc.
	KSMA	1240
	KSEE	1480
Santa Monica, Cal.	KDAY	1580
Santa Paula, Calif.	KSPA	1400
Santa Rosa, Calif.	KSRO	1350
	KHUM	1580
	KVRE	1460
	KJAX	1150
Santa Rosa, N.Mex.	KSYX	1420
Sapulpa, Okla.	KREK	1550
Saranac Lake, N.Y.	WNBZ	1240
Sarasota, Fla.	WKXY	930
	WSAF	1220
	WSPB	1450
	WYND	1280
Saratoga, N.Y.	WSPN	900
Saratoga Springs, N.Y.	WKAJ	900
Sauk Rapids, Minn.	WVAL	800
Sault Ste. Marie, Mich.	WSOO	1230
Savannah, Ga.	WBYG	1450
	WEAS	900
	WSAV	630
	WSGA	1400
	WTOC	1290
	WSOK	1230
Savannah, Tenn.	WORM	1010
Sayre, Pa.	WATS	960
Scheffield, Ala.	WSHF	1290
Schenectady, N.Y.	WGY	810
	WSNY	1240
Scotland Neck, N.C.	WYAL	1280
Scott City, Kans.	KFLA	1310
Scottsbluff, Nebr.	KNEB	960
	KOLT	1320
Scottsboro, Ala.	WCRI	1050
	WROS	1330
Scottsdale, Ariz.	KDOT	1440
Scottsville, Ky.	WLCK	1250
Scranton, Pa.	WARM	590
	WEJL	630
	WGBI	910
	WICK	1400
	WSCR	1320
Seaford, Del.	WSUX	1280
Searcy, Ark.	KWCB	1300
Seaside, Oreg.	KSRG	730
Seattle, Wash.	KAYO	1150
	KIXI	910
	KING	1090
	KIRO	710
	KJR	950
	KOL	1300
	KOMO	1000
	KETO	1590
	KTW	1250
	KVI	570
	KXA	770
	KBLE	1050
Sebring, Fla.	WJCM	960
	WSEB	1340
Sedalia, Mo.	KDRO	1340
	KSIS	1050
Seguin, Tex.	KWED	1580
Selma, Ala.	WGWC	1340
	WHBB	1490
Selma, N. C.	WBZB	1510
Seminole, Tex.	KTFO	1250
Senatobia, Miss.	WSAO	1550
Seneca Township, S.C.	WSNW	1150
Sevierville, Tenn.	WSEV	930
Seward, Alaska	KIBH	950
Seymour, Ind.	WJCD	1390
Seymour, Tex.	KSEY	1230
Shakopee, Minn.	KSMM	1530
Shallotte, N.C.	WVCB	1410
Shamokin, Pa.	WISL	1480
Shamrock, Tex.	KBYP	1580
Sharon, Pa.	WPIC	790
Shawano, Wis.	WTCH	960
Shawnee, Okla.	KGFF	1450
Sheboygan, Wis.	WHBL	1330
	WKTS	950
Sheffield, Ala.	WSHF	1290
Shelby, Mont.	KSEN	1150
Shelby, N.C.	WOHS	730
	WADA	1390
Shelbyville, Ind.	WSVL	1520
Shelbyville, Ky.	WCND	940
Shelbyville, Tenn.	WHAL	1400
	WLIJ	1580
Sheldon, Iowa	KIWA	1550
Shelton, Wash.	KMAS	1280
Shenandoah, Iowa	KMA	960
	KFNF	920
Shenandoah, Pa.	WMBT	1530
Sheridan, Wyo.	KWYO	1410
	KROE	930
Sherman, Tex.	KRRV	910
	KTXO	1500
Shippensburg, Pa.	WSHP	1480
Show Low, Ariz.	KVWM	970
Shreveport, La.	KANB	1300
	KBCL	1220
	KEEL	710
	KOKA	1550
	KJOE	1480
	KCIJ	980
	KRMD	1340
	KWKH	1130
Sidney, Mont.	KGCX	1480
Sidney, Nebr.	KSID	1340
Sidney, O.	WMVR	1080
Sierra Vista, Ariz.	KHFH	1420
Sikeston, Mo.	KSIM	1400
	KMPL	1520
Siler City, N.C.	WNCA	1570
Siloam Sprgs., Ark.	KUOA	1290
Silsbee, Tex.	KKAS	1300
Silver City, N.Mex.	KSIL	1340
Silver Sprgs., Md.	WQMR	1050
Simcoe, Ont.	CFRS	1560
Sinton, Tex.	KTOD	1590
Sioux City, Iowa	KSCJ	1360
	KMNS	620
	KTRI	1470
Sioux Falls, S.Dak.	KISD	1230
	KELO	1320
	KNWC	1270
	KSOO	1140
Sitka, Alaska	KIFW	1230
	KSEW	1400
Skowhegan, Maine	WGHM	1150
Slaton, Tex.	KCAS	1050
Slidell, La.	WBGS	1560
Smithfield, N.C.	WMPM	1270
Smithville, Tenn.	WLE	1480
Smyrna, Ga.	WYNX	1550
Snyder, Tex.	KSNY	1450
Socorro, N.Mex.	KSRC	1290
Soda Sprgs., Idaho	KBRV	540
Solvay, N.Y.	WQSR	1320
Somerset, Ky.	WSFC	1240
	WTLO	1480
Somerset, Pa.	WVSC	990
Sonora, Calif.	KVML	1450
Sonora, Tex.	KCKG	1240
So. Bend, Ind.	WNDU	1490
	WJVA	1580
	WSBT	960
Southbridge, Mass.	WESO	970
So. Boston, Va.	WHLF	1400
Southern Pines, N.C.	WEEB	990
South Charleston, W. Va.	WROS	1410
South Daytona Beach, Fla.	WELE	1590
So. Gastonia, N.C.	WGAS	1420
So. Haven, Mich.	WJOR	940
So. Knoxville, Tenn.	WSKT	1580
So. Paris, Me.	WKTQ	1450
So. Pittsburg, Tenn.	WEPG	910
So. St. Paul, Minn.	KDWB	630
So. Williamsport, Pa.	WMPT	1450
Spanish Fork, Utah	KONI	1480
Sparks, Nev.	KBUB	1270
Sparta, Ill.	WHCO	1230
Sparta, Tenn.	WSMT	1050
Sparta, Wis.	WKLJ	990
	WCOW	1290
Spartanburg, S.C.	WHCQ	1400
	WDRD	910
	WSPA	950
Spencer, Iowa	KICD	1240
Spencer, W.Va.	WSPZ	1400
Spokane, Wash.	KGA	1510
	KDNC	1440
	KSPO	1230
	KPEG	1380
	KHQ	590
	KNEW	790
	KREM	970
	KXLY	920
	KCFA	1330
	KUDY	1280
Springdale, Ark.	KBRS	1340
Springfield, Ill.	WCVS	1450
	WMAY	970
	WTAX	1240
Springfield, Mass.	WHYN	560
	WMAS	1450
	WSPR	1270
Springfield, Mo.	KGBX	1260
	KICK	1340
	KTTS	1400
	KWTO	560
Springfield, Ohio	WIZE	1340
	WBLY	1600
Springfield-Eugene, Ore.	KEED	1120
Springfield, Tenn.	WDBL	1590
Springfield, Vt.	WCFR	1480
Springhill, La	KBSF	1460
Spring Lake, N. C.	WFBS	1450
Spring Valley, N.Y.	WRRC	1300
Spruce Pine, N.C.	WTOE	1470
Stamford, Conn.	WSTC	1400
Stamford, Tex.	KDWT	1400
Stanford, Ky.	WRSL	1520
Starke, Fla.	WPXE	1490
Starkville, Miss.	WSSO	1230
State College, Pa.	WMAJ	1450
	WRSC	1390
Statesboro, Ga.	WWNS	1240
Statesville, N.C.	WSIC	1400
	WDBM	550
Staunton, Va.	WTON	1240
	WAFC	900
Stephenville, Tex.	KSTV	1510
Sterling, Colo.	KGEK	1230
	KOLR	1490
Sterling, Ill.	WSDR	1240
Steubenville, Ohio	WSTV	1340
Stevens Point, Wis.	WSPT	1010
Stillwater, Minn.	WAVN	1220
Stillwater, Okla.	KSPI	780
Stockton, Calif.	KJOY	1280
	KSTN	1420
	KWG	1230
Storm Lake, Iowa	KAYL	990
Streator, Ill.	WIZZ	1250
Stroudsburg, Pa.	WVPO	840
Stuart, Fla.	WSTU	1450
Stuart, Va.	WHEO	1270
Sturgeon Bay, Wis.	WOOR	910
Sturgis, Mich.	WSTR	1230
Sturgis, S. D.	KBNB	1280
Stuttgart, Ark.	KWAK	1240
Suffolk, Va.	WLPM	1460
Sullivan, Ind.	WKQV	1550
Sulphur, La.	KIKS	1310
Sulphur Sprgs., Tex.	KSST	1230
Summerville, Ga.	WGTA	950
Summerville, S.C.	WALS	980
Sumter, S.C.	WFIG	1290
	WDXY	1240
	WSSC	1340
Sunbury, Pa.	WKOK	1070
Sunnyside, Wash.	KREW	1230
Sun Valley, Ida.	KSKI	1340
Superior, Nebr.	KRFS	1600
Superior, Wis.	WDSM	710
	WIGL	970
	WWJC	1270
	WAXK	1320
Susanville, Calif.	KSUE	1240
Sutton, W. Va.	WSGB	1490
Swainsboro, Ga.	WJAT	800
Sweetwater, Tenn.	WDEH	800
Sweetwater, Tex.	KXOX	1240
Sylacauga, Ala.	WFEB	1340
	WMLS	1290
Sylva, N.C.	WMSJ	1480
Sylvania, Ga.	WSYL	1490
Sylvester, Ga.	WOGA	1540
Syracuse, N.Y.	WHEN	620
	WFBL	1390
	WNDR	1260
	WOLF	1490
	WSYR	570
Tabor City, N.C.	WTAB	1370
Tacoma, Wash.	KMO	1360
	KTAC	850
	KTNT	1400
	KVI	570
Taft, Calif.	KTKR	1310
Tahlequah, Okla.	KTLQ	1350
Tahoe Valley, Calif.	KTHO	590
Talladega, Ala.	WEYY	1580
	WNUZ	1230
Tallahassee, Fla.	WMEN	1330
	WONS	1410
	WTAL	1450
	WTNT	1270
Tallassee, Ala.	WTLS	1300
Tallulah, La.	KTLD	1360
Tampa, Fla.	WALT	1110
	WOAE	1250
	WYOU	1550
	WFLA	970
	WHBO	1050
	WINQ	1010
	WTMP	1150
	WSOL	1300
Taos, N. Mex.	KKIT	1340
Tarboro, N.C.	WCPS	760
Tarpon Springs, Fla.	WCWR	1470
Tasley, Va.	WESR	1330
Taunton, Mass.	WPEP	1570
Tawas City, Mich.	WIOS	1480
Taylor, Tex.	KTAE	1260
Taylorsville, N. C.	WSTH	860
	WTLK	1570
Taylorville, Ill.	WTIM	1410
Tazewell, Tenn.	WNTT	1250
Tell City, Ind.	WTCJ	1230
Tempe, Ariz.	KUPD	1060
	KYND	1580
Temple, Tex.	KTEM	1400
Terre Haute, Ind.	WBOW	1230
	WAAC	1300
	WTHI	1480
Terrell, Tex.	KTER	1570
Terrytown, Nebr.	KEYR	690
Texarkana, Ark.	KOSY	790
Texarkana, Tex.	KCMC	740
	KATQ	940
	KTFS	1400
Texas City, Tex.	KTLW	920
Thayer, Mo.	KALM	1290
The Dalles, Oreg.	KODL	1440
	KACI	1300
Thermopolis, Wyo.	KRTR	1490
	KTHE	1240
Thief River Falls, Minn.	KTRF	1230
Thibodaux, La.	KTIB	680
Thomaston, Ga.	WSFT	1220
	WTGA	1590
	WTHN	1500
Thomasville, Ala.	WJDB	630
Thomasville, Ga.	WPAX	1240
	WLDR	730
Thomasville, N.C.	WTNC	790
Thomson, Ga.	WTWA	1240
Three Rivers, Mich.	WLKM	1510
Ticonderoga, N.Y.	WIPS	1250
Tiffin, Ohio	WTTF	1600
Tifton, Ga.	WTIF	1340
	WWGS	1430
Tillamook, Oreg.	KTIL	1590
Titusville, Fla.	WRMF	1050
Titusville, Pa.	WTIV	1230
Toccoa, Ga.	WLET	1420
	WNES	630
Toledo, Ohio	WOHO	1470
	WSPD	1370
	WTOD	1560
	WCWA	1230
	WTTO	1520
Toledo, Oreg.	KTDD	1230
Tolleson, Ariz.	KRDS	1190
Tomah, Wis.	WTMB	1460
Tompkinsville, Ky.	WTKY	1370
Tooele, Utah	KDYL	990
Topeka, Kans.	WIBW	580
	KEWI	1440
	WREN	1250
	KTOP	1490
Toppenish, Wash.	KENE	1490
Torrington, Conn.	WTOR	610
Torrington, Wyo.	KGOS	1490
Towanda, Pa.	WTTC	1550
Towson, Md.	WAQE	1570
Trail, B.C.	CJAT	610
Travelers Rest, S.C.	WBBR	1580
Traverse City, Mich.	WTCM	1400
	WCCW	1310
Trenton, Mo.	KTTN	1600
Trenton, N.J.	WAAT	1300
	WBUD	1260
	WTTM	920
Trinidad, Colo.	KCRT	1240
Troy, Ala.	WTBF	970
Troy, N.Y.	WHAZ	1330
	WTRY	980
	WXKW	1600
Troy, N. C.	WJRM	1390
Truckee, Calif.	KHOE	1400
Trumann, Ark.	KTMN	1530
Truth or Consequences, New Mexico	KCHS	1400
Tryon, N.C.	WTYN	1550
Tucson, Ariz.	KTUC	1400
	KXEW	1600
	KAIR	1490
	KCEE	790
	KTAN	580
	KCUB	1290
	KEVT	690
	KHOS	940
	KMOP	1330
	KFIF	1550
	KTKT	990
	KOLD	1450
Tucumcari, N.Mex.	KTNM	1400
Tulare, Calif.	KCOK	1270
	KGEN	1370
Tulia, Tex.	KTUE	1260
Tullahoma, Tenn.	WJIG	740
Tulsa, Okla.	KAKC	970
	KOME	1300
	KRMG	740
	KELI	1430
	KVOO	1170
	KFMJ	1050
Tupelo, Miss.	WELO	580
	WTUP	1490
Turlock, Calif.	KCEY	1390
Tuscaloosa, Ala.	WJRD	1150
	WACT	1420
	WNPT	1280
	WTUG	790
	WTBC	1230
Tuscumbia, Ala.	WVNA	1590
	WRCK	1410
Tuskegee, Ala.	WABT	580
Twenty-Nine Palms, Calif.	KDHI	1250
Twin Falls, Idaho	KTFI	1270
	KLIX	1310
	KEEP	1450
Two Rivers, Wis.	WTRW	1590
Tyler, Tex.	KDOK	1330
	KGJB	1490
	KTBB	600

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

U. S. FM Stations by States

Location	C.L.	Mc.
ALABAMA		
Albertville	WAVU-FM	105.1
Alexander City	WRFS-FM	106.1
Andalusia	WCTA-FM	98.1
Anniston	WHMA-FM	100.5
Athens	WJDF	104.3
Bay Minette	WBCA-FM	105.5
Birmingham	WAPI-FM	99.5
	WBRC-FM	106.9
	WSFM	93.7
Clanton	WKLF-FM	100.9
Cullman	WFMH-FM	101.1
Decatur	WHOS-FM	102.1
Dothan	WOOF-FM	99.7
Homewood	WJLN	104.7
Huntsville	WAHR	99.1
	WNDA	92.9
Jackson	WHOD-FM	104.9
Mobile	WKRG-FM	99.9
Montgomery	WLPR	96.1
	WFMI	98.9
	WAJM	103.3
	WHHY-FM	101.9
Muscle Shoals	WLAY-FM	105.5
Sylacauga	WMLS-FM	98.3
Tuscumbia	WVNA	100.3
Tuscaloosa	WTBD-FM	95.7
	WUOA	*91.7
ALASKA		
Anchorage	KNIK	105.5
	KBYR-FM	102.1
College	KUAC	104.9
ARIZONA		
Globe	KWJB-FM	100.3
Mesa	KBUZ-FM	104.7
Phoenix	KRFM	95.5
	KFCA	*88.5
	KITH	101.3
	KDDL-FM	94.5
	KNIX-FM	102.5
	KDY-FM	92.5
	KMEO	96.9
	KTAR-FM	98.7
	KYEW	93.3
	KHEP-FM	101.5
Show Low	KVWM	93.5
Tempe	KUPD-FM	97.9
Tucson	KFMM	99.5
	KCEE-FM	96.1
	KSOM	92.9
	KVOA-FM	93.7
ARKANSAS		
Blytheville	KLCN-FM	96.1
Dardanelle	KCAB-FM	102.3
El Dorado	KRIL	99.3
	KELD-FM	103.1
Fayetteville	KFAY-FM	92.1
Ft. Smith	KFPW-FM	94.9
	KMAG	99.1
	KTCS-FM	99.9
Harrison	KHDZ-FM	102.9
Hot Springs	KBHS-FM	96.7
Jonesboro	KBTM-FM	101.9
	KASU	91.9
Little Rock	KARK	103.7
Mammoth Springs	KAMS	103.9
Osceola	KOSE-FM	98.1
Pine Bluff	KOTN-FM	92.3
Siloam Springs	KUDA-FM	105.7
CALIFORNIA		
Alameda	KJAZ	92.7
Anaheim	KEZR-FM	95.9
Angwin	KANG	88.1
Apple Valley	KAVR-FM	102.3
Arcata	KTOO	*90.5

WHITE'S RADIO LOG

Location	C.L.	Mc.
Atherton	KPEN	101.3
Auburn	KAFI	101.1
Avalon	KBIG	104.3
Bakersfield	KERN-FM	94.1
	KGEE-FM	97.5
	KIFM	96.5
Berkeley	KPFA	94.1
	KPFB	*89.3
	KPAT-FM	102.9
Bijou	KHUR	99.9
Carlsbad	KARL-FM	95.9
Carmel	KRML-FM	101.7
Claremont	KSPC	*88.9
Coachella	KCHQ-FM	93.7
El Cajon	KECR	93.3
Escondido	KOWN-FM	92.1
Fremont	KFMR	104.9
Fresno	KARM-FM	101.9
	KCIB-FM	94.5
	KFRE-FM	93.7
	KMJ-FM	97.9
	KXQR	102.7
Garden Grove	KGGK	94.3
Glendale	KFMU	97.1
	KUTE	101.9
Hayward	KBBM	101.7
Hemet	KHSJ-FM	105.5
Inglewood	KTYM-FM	103.9
LaSierra	KSDA	*89.7
Lodi	KCVR-FM	97.7
Lompoc	KLOM-FM	92.7
Long Beach	KILB	102.3
	KLON	*88.1
	KNOB	97.9
Los Altos	KPGM	97.7
	KFJC	88.7
Los Angeles	KABC-FM	95.5
	KBBI	107.5
	KBCA	105.1
	KBMS	105.9
	KCBH	98.7
	KFAC-FM	92.3
	KFOX-FM	100.3
	KGLA	*103.5
	KHJ	101.1
	KMLA	100.3
	KNX-FM	93.1
	KPFK	*90.7
	KPOL-FM	99.9
	KRHM	94.7
	KRKD-FM	96.3
	KLAC-FM	102.7
	KUSC	*91.5
	KXLU	*89.1
	KHOF	99.5
Los Angeles-Avalon	KBIG-FM	104.3
Los Banos	KLBS-FM	95.9
Los Gatos	KLGS	95.3
Marysville	KRFD	99.9
Merced	KWIP-FM	101.5
Modesto	KBEE-FM	103.3
	KTRB-FM	104 1
Monterey	KHFR	96.9
Newport Beach	KNBB	103.1
Northridge	KEDC-FM	88.5
Oakland	KAFE	98.1
Oceanside	KUDE	102.1
Ontario	KASK-FM	93.5
Oxnard	KPMJ	104.7
Pasadena	KPCS	89.3
	KPPC-FM	106.7
Palm Springs	KDES-FM	104.7
Redding	KCER	92.9
Redondo Beach	KKOP	93 5
Redlands	KCAL-FM	96.7
Ridgecrest	KLOA-FM	105.5
Riverside	KBBL	99.1
	KACE-FM	92.7
	KDUO	97.5
Sacramento	KCRA-FM	96.1
	KERS	*88 9
	KFBK-FM	96 9
	KJML	106.5
	KEBR	100.5
	KHIQ	105.1
	KJML	95.3
	KRAK-FM	92.9
	KSFM	96.9
	KXRQ	98.5
	KXOA-FM	107.9
Salinas	KSBW-FM	102.5
	KRSA-FM	100.7
	KERR	103.9
San Bernardino	KVCR	*91.9
	KFMW	99 9
	KEBS	*89.5
San Diego	KOGO-FM	94.1
	KFMB-FM	100.7
	KFMX	96.5
	KGB-FM	101.5
	KITT	105.3
	KJLM	98.1
	KLRO	94.9
	KPRI	106.5
	KSDS	*88.3
	KBBW	102.9
	KSDO-FM	103.7
	KSEA	97.3
San Fernando	KVFM	94.3
San Francisco	KALW	*91.7
	KBRG	105.3
	KCBS-FM	98.9
	KDFC	102.1
	KEAR	97.3
	KFOG	104.5
	KFRC-FM	106.1
	KGO-FM	103.7
	KNBR-FM	99.7
	KMPX	106.9
	KPEN	101.3
	KRON-FM	96.5
	KSFR	94.9
	KXKX	88.5
	KYA-FM	93.3
	KCMA	*90.3
	KBRG	105.3
	KABL-FM	98.1
	KKHI-FM	95.7
San Jose	KSJO-FM	92.3
	KRPM	98.5
	KSJS	90.7
	KPLX	106.5
	KEEN-FM	100.3
San Luis Obispo	KATY-FM	96.1
	KVEC-FM	93.3
San Mateo	KCSM	*90.9
	KUFY	107.7
San Rafael	KTIM	100.9
Santa Ana	KWIZ-FM	96.7
	KYMS	106.3
Santa Barbara	KRCW	97.5
	KDB-FM	93.7
	KMUZ	103.3
	KCSB-FM	91.1
Santa Clara	KSCU	*90.1
	KREP	105.7
Santa Cruz	KSCO-FM	99.1
Santa Maria	KXFM	99.1
	KSMA-FM	102.5
Santa Monica	KCRW	*89.9
	KSRF	103.1
Santa Rosa	KEFM	100.1
Sierra Madre	KMAX	107.1
Stanford	KZSU	*90.1
Stockton	KUOP	*91.3
	KSTN-FM	107.3
	KWG-FM	105.7
Thousand Oaks	KNJO	92.7
Tulare	KOFR	106.7
	KGEN-FM	94.9
Turlock	KHOM	92.9
Twenty-Nine Palms	KDHI-FM	95.3
Ventura-Oxnard	KVEN-FM	100.7
Visalia	KONG-FM	92.9
Walnut Creek	KDFM	92.1
West Covina	KSGV	98.3
Woodland	KATT	95.3

COLORADO

Boulder	KRNW	97.3
Colorado Springs	KRCC	*91.3
	KKFM	96.5
	KSHS	*90 5
	KVOR-FM	92.9
	KLST	94.3
	KRYT-FM	101.9
Cortez	KZFM	94.1
Denver	KFML-FM	96.5
	KLIR-FM	100.3
	KLZ-FM	106.7
	KMET	99.5
	KOA-FM	103.5
	KOCI-FM	101.1
	KTGM	105.1
	KIMN-FM	95.5
	KBPI	105.9
Ft. Collins	KCSU-FM	*90.9
	KZIX-FM	93.3
Grand Junction	KREX-FM	92.3
Longmount	KLMO-FM	104.3
Manitou Springs	KCMS-FM	102.7

CONNECTICUT

Bridgeport	WJZZ	99.9
	WPKN	88.1
Brookfield	WGHF	95.1
Danbury	WLAD-FM	98.3
Darien	WDRM	95.9
Fairfield	WSHU	*91.1
Hamden	WDEE	101.3
Hartford	WHCN	105.9
	WDRC-FM	102.9
	WCCC-FM	106.9
	WLAE	93.7
	WRTC-FM	*89.3
	WTIC-FM	96.5
Meriden	WBMI	95.7
Middletown	WESU	88.1
New Haven	WNHC-FM	99.1
	WYBC-FM	94.3
Norwalk	WDRN	
Stamford	WSTC-FM	96.7
Storrs	WHUS	*90.5
Waterbury	WATR-FM	92.5
Westport	WMMM	107.9

DELAWARE

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

D. C.

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

FLORIDA

Atlantic Beach	WKTZ-FM	96.1
Belle Glade	WSWN-FM	93.5
Boca Raton	WWOG	103.3
Bradenton	WBRD-FM	103.3
Clear Water	WTAN-FM	95.7
Cocoa	WEZY-FM	99.3
Cocoa Beach	WXBR	101.1
	WRKT-FM	104.3
Coral Gables	WVCG-FM	105.1
Crestview	WAAZ-FM	104.9
Daytona Beach	WNDB-FM	94.5
De Funiak Springs	WZEP-FM	103.1
Fort Lauderdale	WWIL-FM	103.5
	WFLM	105.9
	WFTL-FM	106.7
	WMJR	100.7
Ft. Meyers	WINK-FM	96.9
	WMYR-FM	101.9
Ft. Pierce	WARN-FM	98.7
Ft. Walton Beach	WFTW-FM	99.3
Gainesville	WRUF-FM	*104.1
Jacksonville	WJAX-FM	95.1
	WALZ-FM	99.1
	WIVY-FM	92.5
	WKTZ-FM	96.1
Key West	WKIZ-FM	92.5
Lakeland	WVFM	94.1
Marianna	WTOT-FM	100.9
Melbourne	WMMB-FM	102.3
Miami	WKAT-FM	93.3
	WGBS	96.3
	WIOD-FM	97.3
	WTHS	*91.7
	WEDR	99.1
	WWPB	101.5
Miami Beach	WKAT-FM	93.1
	WAEZ-FM	94.9
	WMBM-FM	93.9
Milton	WXBM-FM	102.3
Mount Dora	WFAC	107.7
Naples	WNFM	94.5
Ocala	WMOP-FM	93.7
Okeechobee	WLMC	103.1
Orlando	WOBO-FM	92.3
	WHOO-FM	96.5
	WKIS-FM	100.3
Palm Beach	WWOS-FM	97.9
Panama City	WMAI-FM	107.9
	WOLP-FM	92.5
Pensacola	WPEX-FM	94.1
	WCOA-FM	100.7
St. Augustine	WFOY-FM	97.7
St. Petersburg	WGNB	101.5
	WTCX	99.5
	WPIN-FN	107.3
Sarasota	WYAK	102.5
	WSPB-FM	106.3
Sebring	WSEB	105.5
Stuart	WMCF	92.7
Tallahassee	WFSU-FM	*91.5
	WBGM	98.9
Tampa	WDAE-FM	100.7
	WEMI	94.9
	WFLA-FM	93.3
	WPKM	104.7
	WTUN	*88.9
	WUSF	*89.7
West Palm Beach	WPBF	107.9
Winter Haven	WINT-FM	97.5
Winter Park	WPRK	*91.5
	WLOQ	103.1

GEORGIA

Albany	WGPC-FM	104.5
	WJIZ	96.3
Americus	WDEC-FM	94.3
Athens	WGAU-FM	102.5
	WOOL-FM	104.7
Atlanta	WABE	*90.1
	WAVQ	94.9
	WPLO-FM	103.3
	WGKA-FM	92.9
	WSB-FM	98.5
	WLTA-FM	99.7
Augusta	WAUG-FM	105.7
	WBBQ-FM	103.7
Brunswick	WGIG-FM	100.7
Canton	WCHK-FM	105.5
Carrollton	WLBB-FM	92.1
Columbus	WRBL-FM	102.9
	WGBA-FM	107.3
Cornelia	WCON-FM	99.3
Gainesville	WOUN-FM	103.9
Lagrange	WLAG-FM	104.1
Macon	WMAZ-FM	99.1
Manchester	WFDR-FM	99.3
Marietta	WBIE-FM	101.5
	WKLS	96.1
Moultrie	WMTM-FM	93.9
Newnan	WCOH-FM	96.7
Rome	WRGA-FM	102.3
	WROM-FM	97.7
Rossville	WRIP-FM	105.5
Savannah	WTOC-FM	94.1
	WEAS-FM	93.1
Smyrna	WDJK	*91.4
Swainsboro	WJAT-FM	101.7
Toccoa	WLET-FM	106.1
Valdosta	WGDV-FM	92.9
West Point	WBMK-FM	100.9

HAWAII

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

IDAHO

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

ILLINOIS

Alton	WOKZ-FM	100.3
Anna	WRAJ-FM	92.7
Arlington Heights	WNWC	92.7
Aurora	WKKO-FM	95.9
	WMRD-FM	107.9
Bloomington	WJBC-FM	101.5
Carbondale	WSIU	*91.9
Carmi	WRDY-FM	97.3
Centralia	WCNT-FM	95.3
Champaign	WDWS-FM	97.5
	WLRW-FM	94.5
Charleston	WEIC-FM	92.1
Chicago	WBBM-FM	96.3
	WBEZ	*91.5
	WCLM	101.9
	WLS-FM	94.7
	WDHF	95.5
	WEBH	93.9
	WEFM	99.5
	WSDM	97.9
	WFMF	100.3
	WNUS-FM	107.5
	WFMT	98.7
	WKFM	103.5
	WMAQ-FM	101.1
	WMBI	90.1
	WNIB	97.1
	WXRT	93.1
	WJJD-FM	104.3
Columbia	WCBW	104.9
Crete	WTAS	102.3
Decatur	WSOY-FM	102.9
DeKalb	WNIC	*89.7
	WLBK-FM	92.5
Dixon	WIXN-FM	101.7
E. St. Louis	WBBR	101.1
Effingham	WCRA-FM	95.7
	WELG	103.9
	WRMN-FM	94.3
Elgin	WEPS	*88.1
	WELG	103.9
	WRMN-FM	94.3
Elmhurst	WRSE-FM	*88.7
Elmwood Park	WXFM	105.9
Evanston	WEAW	105.1
	WNUR	*88.7
Fairfield	WFIW-FM	104 9
Flossmoor	WHFH	*88.5
Freeport	WFRL-FM	98 5
Galesburg	WYKC-FM	*88.1
Glen Ellyn	WELF	107 1
Greenville	WGRN	*89.3
Harrisburg	WEBQ-FM	99.9
Highland Park	WEEF-FM	103.1
Jacksonville	WLDS-FM	100.5
	WAJP	93.5
Joliet	WJOL-FM	96.7
Kankakee	WKAK-FM	99.9
Lansing	WLNR-FM	106.3
LaSalle	WLPD-FM	99.3
Lawrenceville	WAKO-FM	103 1
Litchfield	WSMI-FM	106.1
Loves Park	WLUV-FM	96.7
Macomb	WWKS	*91.3
Madison	WGNO	106.5
Mattoon	WLBH-FM	96.9

Location	C.L.	Mc.
Mendota	WGLC-FM	100.9
Morris	WRMI-FM	104.7
Mt. Carmel	WSAB	94.9
	WVMC-FM	101.1
Mt. Vernon	WMIX-FM	94.1
Oak Park	WOPA-FM	102.7
Olney	WSEI-FM	92.9
Ottawa	WOLI	98.3
Paris	WPRS-FM	98.3
Park Forest	WRHS	*88.1
Park Ridge	WMTH	*88.5
Pekin	WSIV-FM	95.3
Peoria	WMBD-FM	93.3
Quincy	WGEM-FM	105.1
	WTAD-FM	99.5
Robinson	WTAY-FM	100.7
Rockford	WROK-FM	97.5
Rock Island	WHBF-FM	98.9
	WVIK	90.9
Skokie	WRSV	98.3
South Beloit	WBEL-FM	103.1
Springfield	WTAX-FM	103.7
	WFMB	104.5
	WVEM	101.9
Streator	WIZZ-FM	97.7
Taylorville	WGGM	95.0
Urbana	WILL-FM	*90.9
Waukegan	WEFA	102.3
Wheaton	WETN-FM	*88.1
Winnetka	WNTH	*88.1
Woodstock	WREK	105.5

INDIANA

Anderson	WAFM	97.9
Bloomington	WFIU	*103.7
	WTTV-FM	92.3
Bluffton	WCRD	100.1
Columbus	WCSI-FM	98.3
Connersville	WCNB-FM	100.3
Crawfordsville	WBBS-FM	106.3
Elkhart	WCMR-FM	104.7
	WTRC-FM	100.7
	WXAX	104.7
Elwood	WBMP	101.7
Evansville	WIKY-FM	104.1
	WEVC	*91.5
	WPSR	90.7
	WVHI	105.3
Fort Wayne	WPTH	95.1
	WKJG-FM	97.3
Franklin	WFCI	*89.3
	WIFN	95.9
Frankfort	WILO-FM	99.7
Gary	WGVE	*88.1
Goshen	WGCS	91.1
Greencastle	WGRE	*91.7
Greenfield	WSMJ	99.5
Greensburg	WTRE	107.3
Hammond	WYCA	92.3
Hartford City	WHCI	*91.9
	WWHC	104.9
Huntington	WVSH	*91.9
Indianapolis	WAJC	*104.5
	WBDG	90.9
	WICR	*88.7
	WISH-FM	107.9
	WAIV	105.7
	WFBM-FM	94.7
	WFMS	95.5
	WGEE-FM	103.3
	WIAN	*90.1
	WIBC-FM	93.1
Jasper	WITZ-FM	104.7
Kendallville, Ind.	WAWK-FM	93.3
Kokomo	WFKO	100.5
	WKMO	93.5
Lafayette	WASK-FM	105.3
	WAZY-FM	96.7
La Porte	WLOI-FM	96.7
Madison	WORX-FM	96.7
Marion	WMRI-FM	106.9
	WBST	*90.7
Muncie	WMUN	104.1
	WWHI	*91.5
New Albany	WNAS	*88.1
New Castle	WCTW-FM	102.5
	WYSN	*91.1
North Vernon	WOCH-FM	108.1
Peru	WARU-FM	98.3
Plainfield	WJMK	98.3
Princeton	WRAY-FM	98.1
Richmond	WGLM	96.1
	WECI	*91.5
	WKBV-FM	101.3
Seymour	WJDD	93.7
Shelbyville	WSVL-FM	97.1
South Bend	WETL	*91.9
	WHME	103.1
	WNDU-FM	92.9
	WPFR	102.7
	WJVA-FM	103.9
Terre Haute	WTHI-FM	99.9
	WBOW-FM	107.5
	WVTS	100.7
	WISU	*89.7
	WSKS	*91.3
Wabash	WRSW-FM	107.3
Warsaw	WFML	106.5
Washington	WBAA-FM	99.1
West Lafayette	WAOV-FM	96.7
Vincennes		

IOWA

Ames	WOI-FM	*90.1
Boone	KFGQ	*99.3
Cedar Falls	KTCF	*88.1
Cedar Rapids	KHAK-FM	98.1
	WMT-FM	104.5
Clarion	KRIT	96.9
Clinton	KROS-FM	96.1
Davenport	WOC-FM	103.7
Des Moines	KDPS	*88.1
	KDMI-FM	97.3
	KSO	98.5
	WHO-FM	100.3
	KFMG	94.9
	KWDM	93.3
Iowa City	WMT-FM	*91.7
Mt. Vernon	KRNL-FM	*89.7
Muscatine	KWPC-FM	99.7
Oskaloosa	KBOE-FM	106.3
Sioux City	KDVR	97.9
	KTFC	103.3
Storm Lake	KAYL-FM	101.5
Waterloo	KNWS-FM	101.9
Waverly	KWAR	89.1

KANSAS

Emporia	KSTE	*88.7
Garden City	KNCD-FM	97.3
Junction City	KJCK-FM	94.5
Kansas City	KCFC	88.1
	KCKN-FM	94.1
Lawrence	KANU	*91.5
	KLWN-FM	105.9
Leavenworth	KCLO-FM	98.9
Manhattan	KSDB-FM	*88.1
Newton	KJRG-FM	92.3
Ottawa	KTJO-FM	*88.1
	KOFO-FM	95.7
Parsons	KPPS-FM	*91.1
Pratt	KWNS-FM	93.1
Russell	KRSL-FM	95.9
Salina	KAFM	99.9
Scott City	KFLA-FM	95.3
Topeka	KTOP	103.3
	WIBW-FM	97.3
Wichita	KFH-FM	100.3
	KQTY	101.3
	KMUW	*89.1
	KCBM-FM	107.3

KENTUCKY

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

LOUISIANA

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

MAINE

Augusta	WFAU-FM	101.3
Bangor	WABI-FM	97.1
Brunswick	WBOR	*91.1
	WCME-FM	98.9
Caribou	WFST-FM	97.7
Lewiston	WCOU-FM	93.9
	WLAM-FM	107.5
	WRJR	91.5
Orono	WMEB-FM	91.9
Poland Springs	WMTW-FM	94.9
Portland	WLOB-FM	97.9

MARYLAND

Annapolis	WNAV-FM	99.1
	WANN-FM	107.9
	WXTC	107.9
	WAQE-FM	101.9
Baltimore	WBJC	*88.1
	WCAO-FM	102.7
	WCBM-FM	106.5
	WFMM-FM	93.1
	WRBS	95.1
	WSID	92.3
	WBAL-FM	97.9
	WITH-FM	104.3
	WSID-FM	92.3
Bethesda	WJMD	94.7
	WHFS	102.3
Bradbury Heights	WPGC	95.5
Catonsville, Md.	WCBC	105.7
Cumberland	WCUM-FM	102.9
Frederick	WFMD-FM	99.9
Frostburg	WFRB-FM	105.3
Glen Burnie	WISZ-FM	95.9
Hagerstown	WJEJ-FM	104.7
	WARK-FM	106.9
Halfway	WHAG-FM	96.7
Havre de Grace	WASA-FM	103.7
Oakland	WBUZ	95.5
Salisbury	WBOC-FM	94.3
Tacoma Park	WGTS-FM	*91.9
Waldorf	WSMD	104.1
Westminster	WTTR-FM	100.7

MASSACHUSETTS

Amherst	WAMF	*88.1
	WFCR	*88.5
	WMUA	*91.1
Andover	WPAA	91.7
Boston	WBUR	*90.9
	WBCN	104.1
	WBZ-FM	106.7
	WCOP-FM	100.7
	WEEI-FM	103.3
	WERS	*88.9
	WHDH-FM	94.5
	WRKO-FM	98.5
	WXHR-FM	96.9
Brockton	WBET-FM	97.7
Brookline	WBOS-FM	92.9
Cambridge	WGBH-FM	*89.7
	WHRB-FM	95.3
	WTBS	88.1
Fitchburg	WBNE-FM	104.5
Framingham	WKDX-FM	105.7
Gloucester	WVCA-FM	104.9
Greenfield	WHAI-FM	98.3
Haverhill	WHAV-FM	92.5
Lawrence	WCCM-FM	93.7
Lowell	WLLH-FM	99.5
Lynn	WLYM-FM	101.7
Medford	WHIL-FM	107.9
New Bedford	WBSM-FM	97.3
	WNBH-FM	98.1
N. Adams	WMNB-FM	100.1
Northampton	WHMP-FM	99.3
Pittsfield	WQRB-FM	105.5
Plymouth	WPLM-FM	99.1
S. Hadley	WMHC	*88.5
Springfield	WHYN-FM	99.1
	WSCB	*88.9
	WMAS-FM	94.7
Waltham	WCRB-FM	102.5
W. Yarmouth	WOCB-FM	94.9
Williamstown	WCFM	*91.3
Winchester	WHSR-FM	*91.9
Worcester	WAAB	107.3
	WSRS	96.1

MICHIGAN

Adrian	WLEN	103.9
Alma	WFYC-FM	104.9
Alpena	WHSB	107.7
Battle Creek	WKFR-FM	103.3
Big Rapids	WBRN-FM	100.9
Ann Arbor	WUOM	*91.7
Bay City	WBCM-FM	96.1
	WNEM-FM	102.5
Benton Hrbr.	WHFB-FM	99.9
Birmingham	WHFI	94.7
Charlotte	WCER-FM	92.7
Coldwater	WTVB-FM	98.3
Dearborn	WKNR-FM	100.3
Detroit	WDET-FM	*101.9
	WBFG	98.7
	WCHD	105.9
	WDTM	106.7
	WABX	99.5
	WDTR	*90.9
	WGPM	107.5
	WJBK-FM	93.1
	WMUZ	103.5
	WGPR	97.9
	WJR-FM	96.3
	WOMC-FM	104.3
	WQRS-FM	105.1
	WRMK-FM	98.7
	WWJ-FM	97.1
	WXYZ-FM	101.1
	WCAR-FM	92.3
E. Lansing	WKAR-FM	*90.5
	WSWM	99.1
	WVIC-FM	95.7
Flint	WFBE	*95.1
	WGMZ-FM	107.9
Grand Rapids	WMRP-FM	105.5
	WFUR-FM	102.9
	WJEF-FM	93.7
	WLAV-FM	96.9
	WYON	101.3
	WODD-FM	105.7 (s)
	WVGA-FM	104.1
	WXTO-FM	97.9
	WKLW-FM	95.7
Greenville, Mich.	WPLB-FM	107.3
Highland Pk.	WHPR	*88.1
Holland	WJBL-FM	94.5
	WHTC-FM	96.1
Houghton Lake	WJGS	98.5
Interlochen	WGYA	*103.1
	WIAA	89.7
Jackson	WIBM-FM	94.1
	WKHM-FM	106.1
Kalamazoo	WMUK	102.1
	WKMI-FM	106.5
Lansing	WJIM-FM	97.5
	WILS-FM	*89.7
	WYFE	100.7
Marquette	WNMR	90.1
Midland	WQDC-FM	99.7
Mount Clemens	WBRB-FM	102.7
Mount Pleasant	WCMU	*90.1
Muskegon	WMUS-FM	106.9
Oak Park	WLDM	95.5
Port Huron	WHLS-FM	107.1
Royal Oak	WDAK	*89.3
	WOMC	104.3
Saginaw	WSAM-FM	98.1
Spring Arbor	WSAE	*89.3
Sturgis	WSTR-FM	103.1
Traverse City	WLDR-FM	101.9
	WTCM-FM	103.7
Warren	WPHS	91.5

MINNESOTA

Brainerd	KLIZ-FM	95.9
Golden Valley	KQRS-FM	92.5
Mankato	KMSO	*90.5
	KYSM-FM	103.5
Minneapolis	KTIS-FM	*98.5
	KWFM	97.1
	WLOL-FM	99.5
	WPBC-FM	101.3
	WAYL	93.7
	WCTS-FM	100.3
Red Wing	KCUE-FM	105.5
Richfield	WPBC-FM	101.3
Rochester	KROC-FM	106.9
	KNXR	97.5
St. Cloud	KFAM-FM	104.7
St. Louis Park	KRSI-FM	104.1
St. Paul	KNOF	95.3
Willmar	KWLM-FM	102.5
Worthington	KWOA-FM	94.9

MISSISSIPPI

Forest	WMAG-FM	93.5
Greenwood	WSWG	99.1
Gulfport	WROA-FM	107.1
Hattiesburg	WHSY-FM	104.5
Jackson	WJDX-FM	102.9
	WWHO	94.7
Kosciusko	WKOZ-FM	105.1
Laurel	WNSL-FM	100.3
Meridian	WMMI	*88.1
Moss Point	WACY-FM	104.9
Pascagoula	WPMP-FM	98.9
Poplarville	WRPM-FM	107.9

MISSOURI

Carrollton	KAOL-FM	101.1
Clayton	KFUO-FM	99.1
Clinton	KCIC	95.3
Columbia	KWWC-FM	90.5
El Dorado Springs	KESM-FM	107.1
Houston	WBTC-FM	99.3
Joplin	WMBH-FM	96.1
	KSYN	92.5
Kansas City	KCMO-FM	94.9
	KBEY	104.3
	KTSR	*90.1
	WDAF-FM	102.1
	KCMK	93.3
	KCUR-FM	*89.3
	KMBC-FM	99.7

WHITE'S RADIO LOG

Location	C.L.	Mc.
	KPRS-FM	103.3
	KXTR	96.5
Kennett	KBOA-FM	98.9
Osage Beach	KRMS-FM	93.5
Poplar Bluff	KWOC-FM	94.5
Rolla	KCLU-FM	94.3
	KMSM	*88.5
St. Joseph	KUSN-FM	105.1
St. Louis	KCFM	98.7
	KADI	96.5
	WAMV-FM	101.1
	WIL-FM	92.3
	KSLH	*91.5
	KSTL-FM	98.1
	KRFO	106.9
Sedalia	KSIS-FM	92.1
Springfield	KTTS-FM	94.7
	KTXR	101.5
Waynesville	KFBD	97.7
West Plains	KWPM-FM	98.9

MONTANA

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

NEBRASKA

Beatrice	KWBE-FM	92.9
Columbus	KJSK-FM	101.1
Hastings	KICS-FM	93.5
Kearney-Holdrege		
	KHOL-FM	98.9
Lexington	KRUN-FM	93.1
Lincoln	KFMQ	95.3
	KWHG	106.3
Omaha	KQAL-FM	94.3
	KFAB-FM	99.9
	KGBI-FM	100.7
	WOW-FM	92.3
	KICN	96.1
Scottsbluff	KNEW-FM	94.1

NEVADA

Las Vegas	KDRK-FM	97.1
	KRGN	101.9
	KLUC-FM	98.5
	KVEG-FM	92.3
	KXLV	93.1
Reno	KNEV	95.5
	KUNR	88.1

NEW HAMPSHIRE

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

NEW JERSEY

Asbury Park	WJLK-FM	94.3
	WHTG-FM	105.5
Atlantic City	WFPG-FM	96.9
	WMGM	103.7
	WRNJ	95.1
Bridgeton	WSNJ-FM	107.7
Camden	WKDN-FM	106.9
Dover	WDHA-FM	105.5
E. Orange	WFMU	*91.1
Eatontown	WHTG-FM	105.3
Franklin	WLVP	102.3
Franklin Lakes	WRRH	88.7
Glassboro	WGLS-FM	*89.7
Hackettstown	WNTI	*91.9
Long Branch	WRLB	107.1
Millville	WMVB-FM	97.3
Newark	WHBI	105.9
	WFME	94.7
	WVNJ-FM	100.3
	WBGD	*88.3
New Brunswk.	WCTC-FM	98.3
Paterson	WPAT-FM	93.1
Princeton	WPRB	103.3
Red Bank	WFHA-FM	106.3
South Orange	WSOU	*89.5
Trenton	WBUD-FM	101.5
	WTOA	97.5
Wildwood	WCMC-FM	100.7
Zarephath	WAWZ-FM	99.1

Location	C.L.	Mc.

NEW MEXICO

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

NEW YORK

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

NORTH CAROLINA

Albemarle	WABZ-FM	100.9
Asheboro	WGWR-FM	92.3
Asheville	WLOS-FM	104.3
Burlington	WBBB-FM	101.1
	WFNS-FM	93.9
Black Mountain	WMIT	106.9
Burgaw	WPGF-FM	99.9
Burlington-Graham		
	WBAG-FM	92.9
Chapel Hill	WUNC	*91.5
Charlotte	WBT-FM	107.9
	WIST-FM	95.1
	WSOC-FM	103.7
	WYFM	104.7
Clingman's Pk.	WMIT	106.9
Concord	WEGO-FM	97.9
Durham	WDNC-FM	105.1
Elkin	WIFM-FM	100.9
Fayetteville	WFNC-FM	98.1
Forest City	WBBO-FM	93.3
	WAGY-FM	105.3
Gastonia	WGNC-FM	101.9
Goldsboro	WEQR	96.9
Greensboro	WMDE	98.7
	WQMG-FM	97.1
	WUAG	*89.9
Greenville	WWWS	*91.3
	WNCT-FM	107.7
Grifton	WITN-FM	93.3
Henderson	WHNC-FM	92.5
	WHKP-FM	102.5
Hendersonville	WHKP-FM	102.5
Hickory	WHKY-FM	102.9
	WIRC-FM	95.7
High Point	WHPE-FM	95.5
	WHPS	*89.3
	WMFR-FM	99.5
	WNOS-FM	100.3
Jacksonville	WJNC-FM	92.1
	WXQR-FM	105.5
Kannapolis	WRKB-FM	99.7
Laurinburg	WEWO-FM	96.5
Leaksville	WLOE-FM	94.5
Lexington	WBUY-FM	94.3
Lumberton	WTSB-FM	95.7
	WAGR-FM	102.3
North Wilkesboro		
	WKBC-FM	97.3
Raleigh	WKIX-FM	98.1
	WPTF-FM	94.7
	WRAL-FM	101.5
Reidsville	WWMO-FM	102.1
Rocky Mount	WEED-FM	92.1
	WFMA	100.7
Rochester	WVDR	92.5
Roxboro	WRXO-FM	96.7
Salisbury	WSTP-FM	106.5
Sanford	WWGP-FM	105.5
Shelby	WOHS-FM	96.1
Statesville	WFMX	105.7
Tarboro	WCPS-FM	104.3
Thomasville	WTNC-FM	98.3
Washington	WITN-FM	93.3
Williamston	WIAM	103.7
Wilmington	WPRV	98.9
Wilson	WVOT-FM	106.1
Winston-Salem	WAIR-FM	93.1
	WYFS	107.5
	WFOD-FM	*88.1
	WSJS-FM	104.1

NORTH DAKOTA

Fargo	KFNW-FM	97.9
	WDAY-FM	93.7

OHIO

Akron	WAKR-FM	97.5
	WAPS	*89.1
	WCUF	96.5
Alliance	WFAH-FM	101.7
Ashland	WNCO-FM	101.3
Ashtabula	WREO-FM	97.1
Athens	WOUB-FM	*91.5
	WATH-FM	105.5
Barberton	WOBN	94.9
Bellaire	WOMP-FM	100.5
Berea	WBWC	*88.3
Bowling Green	WAWR-FM	93.5
	WBGU	*88.1
Bryan	WBNO-FM	100.9
Bucyrus	WBCO-FM	92.7
Cambridge	WILE-FM	96.7
Canton	WHRC-FM	94.1
	WCND	108.9
	WTOF	98.1
Celina	WMER-FM	94.3
	WCSM-FM	96.7
Chillicothe	WBEX-FM	93.3
Cincinnati	WAEF-FM	98.5
	WCPO-FM	105.1
	WAKW-FM	93.3
	WGUC	*90.9
	WKRC-FM	101.9
	WJBI	102.7
	WDID	94.1
	WZIP-FM	92.5
Circleville	WNRE	104.9
Cleveland	KYW-FM	105.7
	WBDE	*90.3
	WCRF-FM	103.3
	WCLV	95.5
	WOOK-FM	102.1
	WERE-FM	98.5
	WGAR-FM	99.5
	WHK-FM	100.7
	WJW-FM	104.1
	WNOB	107.9
	WXEN	106.5
	WZAK	93.1
Cleveland Hts.	WCUY-FM	92.3
Columbus	WCBE	*90.5
	WBNS-FM	97.1
	WCOL-FM	92.3
	WMNI-FM	99.7
	WOSU-FM	*89.7
	WTVN-FM	96.3
	WVKO	94.7
Conneault	WFIZ	104.9
Dayton	WHIO-FM	99.1
	WONE-FM	104.7
	WDAO	107.7
Delaware	WSLN	*91.1
East Liverpool	WOHI-FM	104.3
Eaton	WCTM	92.9
Elyria	WEOL-FM	107.3
Findlay	WFIN-FM	100.5
Fostoria	WFOB	96.7
Fremont	WFRO-FM	99.3
Gallipolis	WJEH-FM	101.5
Granville	WDUB-FM	91.8
Greenville	WDRK-FM	106.5
Hamilton	WQMS	96.7
	WHOH	103.5
	WCNW-FM	94.9
Hillsboro	WSRW-FM	106.7
Kent	WKSU-FM	*88.1
	WKNT-FM	100.1
Kenton	WKTN-FM	98.3
Kettering	WVUD-FM	99.9
Lancaster	WHOK-FM	95.5
Lima	WIMA-FM	102.1
London	WLNO	106.3
Mansfield	WVNO	106.1
Marietta	WCMO	*89.3
Marion	WMRN-FM	106.9
Miamisburg	WFCJ	98.9
Middletown	WPFB-FM	105.9
Mt. Vernon	WMVO-FM	93.7
New Concord	WMCO-FM	*91.9
Newark	WCLT-FM	100.3
Norwalk	WLKR-FM	95.3
Oxford	WMUB	*88.5
	WOXR	97.7
Piqua	WPTW-FM	95.7
Port Clinton	WRWR-FM	94.5
Portsmouth	WPAY-FM	104.1
	WNXT-FM	99.3
Salem	WSDM-FM	105.1
Sandusky	WLEC-FM	102.7
Sidney	WMVR-FM	105.5
Springfield	WBLY-FM	103.9
	WEEC-FM	100.7
Steubenville	WSTV-FM	103.5
Struthers	WKTL	90.7
Tiffin	WTTF-FM	103.7
Toledo	WSPD-FM	101.5
	WMHE	92.5
	WTOS	*91.3
	WTOL-FM	104.7
	WTRT	99.9
Urbana	WCDM-FM	101.7
Van Wert	WERT-FM	98.9
Wapakoneta	WERM	92.1
Washington Court House		
	WCHO-FM	105.5
Westerville	WOBN	*91.5
Wilberforce	WJSC-FM	*88.9
Wooster	WWST-FM	104.5
Worthington-Columbus		
	WRFO-FM	97.9
Xenia	WHBM-FM	103.9
Yellow Springs	WYSD	*91.5
Youngstown	WKBN-FM	98.9
	WBBW-FM	93.3
	WRED	101.1
Zanesville	WHIZ-FM	102.5

OKLAHOMA

Durant	KSEO-FM	107.3
Edmond	KWHB	97.7
Lawton	KLAW	101.5
McAlester	KNEO-FM	101.3
Midwest City	KMWC	94.7
	KTEA-FM	92.5
Norman	WNAO-FM	*90.9
Newata	KNFB	94.3
Oklahoma City	KOKH	*88.9
	KEFM	94.7
	KIOD	100.5
	KJEM-FM	102.7
	KOCY-FM	96.1
	KOFM	104.1
	KYFM	98.9
	KFNB	101.9
Shawnee	KBGC	*89.9
Stillwater	KOSU-FM	*91.7

Location	C.L.	Mc.
Tulsa	KSPI-FM	93.9
	KWGS	*90.5
	KRMG-FM	95.5
	KOCW	97.5
	KOGM-FM	92.9
	KRAV	96.5
OREGON		
Corvallis	KFLY-FM	101.5
Eugene	KRVM	*91.9
	KEED-FM	93.1
	KFMY	97.9
	KUGN-FM	99.1
	KWAX	*91.1
	KBMC	94.5
Grants Pass	KGPO	96.9
Medford	KBOY-FM	95.3
Oretech	KTEC	*88.3
Portland	KOAP-FM	92.3
	KGMG	95.5
	KOIN-FM	101.1
	KPDQ-FM	105.3
	KPFM	97.1
	KPOJ-FM	98.5
	KQFM	100.3
	KRRC	*89.3
PENNSYLVANIA		
Allentown	WFMZ	100.7
	WAEB-FM	104.1
Altoona	WVAM-FM	100.1
	WFBG-FM	98.1
Beaver Falls	WBVP-FM	106.7
Bethlehem	WGPA-FM	95.1
Bloomsburg	WHLM-FM	106.5
Boyertown	WBYC-FM	107.5
Braddock	WLOA-FM	96.9
Butler	WBUT-FM	97.7
Carbondale	WODL-FM	94.3
Carlisle	WHYL-FM	102.3
Chambersburg	WCHA-FM	95.1 (s)
DuBois	WCEO-FM	102.1
Easton	WEST-FM	107.9
	WJRH	*90.5
	WEEX-FM	99.9
Edensburg	WEND	103.9
Elizabethtown	WMSH-FM	106.7
Erie	WJET-FM	103.7
	WWYN-FM	99.9
Gettysburg	WGET-FM	107.7
Glenside	WIFI	92.5
Greensburg	WHJB	107.1
Greenville	WGRP-FM	107.1
Grove City	WEDA-FM	
Harrisburg	WHP-FM	97.3
	WMSP	94.9
	WTPA-FM	104.1
	WCMB-FM	99.3
Havertown	WHHS	*89.3
Hazleton	WAZL-FM	97.9
Jenkintown	WIBF	103.9
Johnstown	WARD-FM	92.1
	WJAC-FM	95.5
Lancaster	WGAL-FM	101.3
	WDAC	94.5
	WLAN-FM	96.9
Lebanon	WLBR-FM	100.1
Lewisburg	WVBU-FM	95.9
Lewiston	WMRF-FM	95.9
Lock Haven	WBPZ-FM	92.1
Martinsburg	WJSM	92.7
Meadville	WARC	*90.3
	WMGW-FM	100.3
Media	WXUR-FM	100.3
Montrose	WPEL-FM	96.5
New Kensington-Tarentum	WYDD	100.7
Oil City	WDJR	98.5
Palmyra	WJWR	92.1
Philadelphia	WCAU-FM	98.1
	WPBS-FM	105.3
	WDAS-FM	105.3
	WJMJ-FM	104.5
	WFIL-FM	102.1
	WDVR	101.1
	WFLN	95.7
	WHAT-FM	96.5
	WUHY-FM	*90.9
	WIFI	92.5
	WIBG-FM	94.1
	WIP-FM	93.3
	WPEN-FM	102.9
	WPWT	*91.7
	WQAL	106.1
	WRTI-FM	*90.1
	WXPN	*88.9
Pittsburgh	KDKA-FM	92.9
	WAMO	105.5
	WEEP-FM	107.9
	WRYT-FM	106.1
	KQV-FM	102.5
	WDUQ	*91.5
	WJAS-FM	99.7
	WKJF	93.7
	WPIT-FM	101.5
	WWSW-FM	94.5
Pottsville	WPPA-FM	101.9
Reading	WRFY-FM	102.5
Red Lion	WGCB-FM	96.1
Scranton	WGBI-FM	101.3
	WUSV	*88.9
	WWDL-FM	104.9
Sharon	WPIC-FM	102.9
Somerset	WVSC-FM	97.7
State College	WMAJ-FM	103.1
	WDFM	*91.1
	WRSC-FM	96.7
Stroudsburg	WVPO-FM	93.5
Sunbury	WKOK-FM	94.1
Tamaqua	WSVB	105.5
Towanda	WTTC-FM	95.3
Tyrone	WGMR-FM	102.3
University Park	WDFM	*91.1
Warren	WRRN	92.3
Washington	WJPA-FM	95.3
Waynesboro	WAYZ-FM	101.5
Wilkes-Barre	WBRE-FM	98.5
	WYZZ	92.9
Williamsport	WLYC-FM	105.1
	WRAK-FM	100.3
York	WNOW-FM	105.7
	WSBA-FM	103.3
RHODE ISLAND		
Cranston	WLOV	99.9
Kingston	WRIU	*91.1
Providence	WPJB-FM	105.1
	WICE-FM	107.7
	WPFM	95.5
	WPRO-FM	92.3
	WCRQ	101.5
	WHIM-FM	94.1
Woonsocket	WWON-FM	106.3
SOUTH CAROLINA		
Anderson	WCAC	101.1
Batesburg	WBLR-FM	92.1
Beaufort	WBEU-FM	98.7
Charleston	WCSC-FM	96.9
	WTMA-FM	95.1
Clemson	WSBF-FM	*88.1
Columbia	WCOS-FM	97.9
	WNOK-FM	104.7
	WUSC-FM	*89.9
Conway	WLAT-FM	104.1
Dillon	WDSC-FM	92.9
Easley	WELP-FM	103.9
Florence	WJMX-FM	103.1
Greenville	WESC-FM	92.5
	WFBC-FM	93.7
	WMUU-FM	94.5
Greenwood	WCRS-FM	96.7
Lancaster	WLCM-FM	107.1
Laurens-Clinton	WLBG-FM	100.5
Myrtle Beach	WMYB-FM	92.1
N. Charleston	WKTM	102.5
Rock Hill	WRHI-FM	98.3
Seneca	WSNW-FM	98.1
Spartanburg	WSPA-FM	98.9
Sumter	WFIG-FM	101.3
SOUTH DAKOTA		
Hot Springs	KOBH-FM	96.7
Sioux Falls	KELO-FM	92.5
TENNESSEE		
Bristol	WOPI-FM	96.9
Chattanooga	WDOD-FM	96.5
	WLON	106.5
	WDEF-FM	92.3
Cleveland	WCLE-FM	100.7
Collegedale	WSMC-FM	*88.1
Cookeville	WHUB-FM	98.3
	WPTN-FM	94.3
Covington	WKBL-FM	93.5
Dickson	WDKN-FM	102.3
Franklin	WFLT-FM	100.1
Gallatin	WFMG	104.5
Greeneville	WGRV-FM	94.9
Humboldt	WIRJ-FM	102.3
Jackson	WTJS-FM	104.1
Johnson City	WJCW-FM	101.5
Kingsport	WKPT-FM	98.5
Knoxville	WBIR-FM	93.5
	WKCS	*91.1
	WUOT	*91.9
	WCAS	97.5
Lawrenceburg	WDXE-FM	95.9
Lexington	WDXL-FM	99.3
Livingston	WLIV-FM	95.9
Manchester	WMSR-FM	99.7
McKenzie	WKTA	106.9
McMinnville	WHNR	101.7
Memphis	WMC-FM	99.7
	KLYX	101.1
	WMPS-FM	97.1
	WNTL	102.7
	WREC-FM	104.5
Milan	WKBJ-FM	92.3
Morristown	WMTN-FM	95.9
Nashville	WLAC-FM	105.9
	WPLN	90.3
	WSIX-FM	97.9
Oneida	WBNT-FM	105.5
Sevierville	WSEV-FM	102.1
Sparta	WSMT-FM	105.5
Springfield	WDBL-FM	94.3
Tullahoma	WJIG-FM	93.3
TEXAS		
Abernathy	KWGN-FM	99.5
Abilene	KACC-FM	*91.1
	KFMN	99.3
	KWKC-FM	105.1
Amarillo	KGNC-FM	93.1
	KVII-FM	94.1
Austin	KHFI-FM	98.3
	KAZZ	95.5
	KTBC-FM	93.7
	KUT-FM	*90.7
Beaumont	KHCB-FM	105.7
	KAYD-FM	97.5
Big Spring	KFNE	95.3
Brenham	KWHI-FM	106.3
Brownwood	KHPC	88.1
Clear Lake City	KMSC	102.1
Cleburne	KCLE-FM	94.9
College Station	WTAW-FM	92.1
Conroe	KNRO	106.9
Corpus Christi	KZFM	95.5
Dallas	KIXL-FM	104.5
	KMAP	105.3
	KNER	*88.1
	KRLD-FM	92.5
	KLIF-FM	98.7
	WFAA-FM	97.9
	WRR-FM	101.1
	KVTT	*91.7
	KQRO	102.9
	KBOX-FM	100.3
Denton	KDNT-FM	106.1
DiBoll	KSPL-FM	95.5
Dumas	KDDD-FM	95.3
El Paso	KVOF-FM	*88.5
	KTSM-FM	99.9
	KHMS	94.7
Ft. Worth	WBAP-FM	96.3
	KFJZ-FM	97.1
	KJIM-FM	102.1
	KCUL-FM	93.9
	KNOK-FM	107.5
	KTCU-FM	*89.1
Gainesville	KGAF-FM	94.5
Galveston	KGBC-FM	106.5
Harlingen	KELT	94.5
Henderson	KGRI-FM	100.1
Hereford	KPAN-FM	106.3
Highland Park-Dallas	KVIL-FM	103.7
Hillsboro	KHBR-FM	102.3
Houston	KHGM	102.9
	KHCB-FM	105.7
	KHUL	95.7
	KFMK	97.9
	KODA-FM	99.1
	KLEF	94.5
	KOST	100.3
	KQUE	102.9
	KRBE	104.1
	KXYZ-FM	96.5
	KTRH-FM	101.1
	KUHF	*91.3
	KBNO	93.7
Hilleen	KLEN-FM	93.3
Humboldt	WIRJ-FM	102.3
Huntsville	KSAM-FM	101.7
Jasper	KTXJ-FM	102.3
Lake Jackson	KLJT	107.3
Lamesa	KPET-FM	100.3
Longview	KLUE-FM	105.7
Lubbock	KSEL-FM	93.7
	KBFM	96.3
	KTXT-FM	*91.9
Marshall	KMHT-FM	97.3
Midland	KNFM	92.3
	KMOD-FM	93.3
Mt. Pleasant	KIMP-FM	100.7
Odessa	KQIP	96.7
	KWMO	99.1
	KOCV	91.3
	KOYL-FM	97.9
Pasadena	KLVL-FM	92.5
Plainview	KHBL	*88.1
Port Arthur	KFMP	93.3
	KPAC-FM	98.5
San Angelo	KWLW	93.9
	KSJT	97.5
San Antonio	KISS	99.5
	KEEZ	97.3
	KAKI-FM	98.1
	KITY	92.9
	KMFM	96.1
Sinton	KTOD-FM	101.3
Spearman	KBMF-FM	98.3
Temple	KYLE-FM	104.9
Texarkana	KTAL-FM	98.1
	KOSY-FM	102.5
Tyler	KZAK	93.1
Victoria	KDOK-FM	101.5
Waco	KTXN-FM	92.1
Wichita Falls	KEFC	97.5
	KLUR	99.9
	KNTO	95.1
UTAH		
Ephraim	KEPH	*88.9
Logan	KUSU-FM	*91.5
Ogden	KBOC	101.9
Provo	KBYU-FM	*88.9
Salt Lake City	KCPX-FM	98.7
	KLUB-FM	97.1
	KSL-FM	100.3
	KSOP-FM	104.3
	KWHO-FM	93.3
VERMONT		
Burlington	WJOY-FM	98.5
VIRGINIA		
Arlington	WAVA-FM	105.1
	WCCV-FM	97.5
Blocksburg	WVVV	104.9
Charlottesville	WINA-FM	95.3
	WTJU	91.3
Covington	WKEY-FM	100.9
Crewe	WSVS-FM	104.7
Farmville	WFLO-FM	95.7
Fredericksburg	WFVA-FM	101.5
Gretna	WMNA-FM	103.3
Grundy	WNRG-FM	97.7
Hampton	WVEC-FM	101.3
	WHOV	*88.3
Harrisonburg	WEMC	*91.7
	WSVA-FM	100.7
Lynchburg	WWOD-FM	100.1
	WDMS-FM	101.7
Manassas	WPRW-FM	106.7
Marion	WMEV-FM	93.9
Martinsville	WMVA-FM	96.3
Newport News	WGH-FM	97.3
Norfolk	WMTI	*91.5
	WCMS-FM	100.5
	WNOR-FM	98.7
	WRVC	102.5
	WTAR-FM	95.7
	WXRI	105.3
	WYFI-FM	99.7
Portsmouth	WAVY-FM	96.9
Radford	WRAD-FM	101.7
Richmond	WCOD	98.1
	WRFK	91.1
	WRVA-FM	94.5
	WRNL-FM	102.1
Roanoke	WDBJ-FM	94.9
	WLRJ	92.3
	WROV-FM	103.7
	WSLS-FM	99.1
South Boston	WHLF-FM	97.5
South Norfolk	WFOS	*90.5
Staunton	WSGM-FM	93.5
Suffolk	WXYW	92.9
Williamsburg	WCWM	89.1
	WRCI	96.5
Winchester	WRFL	92.5
Woodbridge	WXRA	105.9
WASHINGTON		
Aberdeen	WDUX-FM	104.7
Bellingham	KGMI-FM	92.9
	KERI	104.3
Bremerton	KBRO-FM	106.9
Centralia	KGME-FM	102.9
Cheney	KEWC-FM	*89.1
College Place	KGTS	91.3
Edmunds	KGFM	105.3
Ellensburg	KCWS-FM	*91.5
Eugene	KBMC	104.5
Hoquiam	KHOK-FM	103.9
Lynden	KLYN-FM	106.5
Opportunity	KZUN-FM	96.1
Prosser	KACA	102.3
Seattle	KING-FM	98.1
	KBLE-FM	93.3
	KETO-FM	101.5
	KGMJ	95.7
	KIRO-FM	100.7
	KISW	99.9
	KLXN	96.5
	KMCS	98.9
	KOL-FM	94.1
	KRAB	107.7
	KTW-FM	102.5
	KUOW	94.9
	KIXI-FM	95.7
	KZAM	92.5
Spokane	KREM-FM	92.9
	KXLY-FM	99.9
	KHQ-FM	98.1
Tacoma	KCPS	90.9
	KLAY-FM	106.1
	KTNT-FM	97.3
	KTOY	*91.7
	KTAC-FM	103.9
Yakima	KNDX-FM	106.3
WEST VIRGINIA		
Beckley	WBKW	99.5
Berkeley Springs	WCST-FM	93.5
Bluefield	WHIS-FM	104.5
Charleston	WKAZ-FM	97.5
	WKNA	98.5
	WTIO	105.9
	WVAF	99.9
Huntington	WKEE-FM	100.5
	WMUL	*88.1
	WVQM	103.3
Martinsburg	WEPM-FM	97.5
Morgantown	WAJR-FM	101.9
Norfolk	WCMS-FM	100.5
Oak Hill	WOAY-FM	94.1
Parkersburg	WTAP-FM	103.1
	WCEF-FM	99.3
Wheeling	WKWK-FM	97.3
	WWVA-FM	98.7
	WTRF-FM	107.5

WHITE'S RADIO LOG

WISCONSIN

Location	C.L.	Mc.
Appleton	WLFM	*91.1
	WAPL-FM	105.7
Chilton	WHKW	*89.3
Colfax	WHWC	*88.3
Delafield	WHAD	*90.7
Eau Claire	WIAL	94.1
	WEAU-FM	100.7
Fort Atkinson	WFAW	107.3
Green Bay	WBAY-FM	101.1
Greenfield Twp.	WWCF	94.9
Highland	WHHI	91.3
Highland Twp.	WHSA	*89.9
Janesville	WCLO-FM	99.9
Kenosha	WLIP	95.1
La Crosse	WHLA	*90.3
	WWLA	99.3
Madison	WHA-FM	*88.7
	WIBA-FM	101.5
	WISM-FM	98.1
	WMFM	104.1(s)
	WRVB-FM	102.5
Marinette	WHMD	*91.5
Marshfield	WDLB-FM	106.5
Merrill	WLIN	100.7
Milwaukee	WFMR	96.5
	WMIL-FM	95.7
	WISN-FM	97.3
	WRIT-FM	102.9
	WMKE	102.1
	WQFM	93.3
	WTMJ	94.5
	WBON	107.7
	WEMP-FM	99.1
	WUWM	*89.7
Menroe	WEKZ-FM	93.7
Mt. Horeb	WFMK	92.3
Neillsville	WCCN-FM	107.5
Platteville	WSUP	*89.5
Racine	WRJN-FM	100.7
	WFNY	92.1
Rice Lake	WJMC-FM	96.3
Ripon	WCWC-FM	95.9
Sauk City	WVLR	96.7
Sparta	WCOW-FM	97.1
Stevens Point	WSPT-FM	97.9
Superior	WWJC-FM	105.1
Tomah	WTMB-FM	98.9
Watertown	WTTN-FM	104.7
Waukesha	WAUK-FM	106.1
Wausau	WHRM	*91.9
	WRIG-FM	101.9
Wauwatosa	WTOS	103.7
West Bend	WBKV-FM	92.5
Whitewater	WSUW	91.7
Wisc. Rapids	WFHR-FM	103.3

WYOMING

Location	C.L.	Mc.
Cheyenne	KVWO-FM	106.3

PUERTO RICO

Location	C.L.	Mc.
Arecibo	WNIK-FM	106.3
Aguadilla	WABA-FM	100.3
Bayamon	WRSJ-FM	100.7
Carolina	WVOZ-FM	107.7
Fajardo	WMDD-FM	96.5
Guayama	WXRF-FM	106.9
Mayaguez	WKJB-FM	99.1
Ponce	WLEO-FM	101.9
	WPAB-FM	93.3
San Juan	WIPR-FM	*91.3
	WIAC-FM	102.3
	WITA-FM	93.7
	WOLA	105.7

VIRGIN ISLANDS

Location	C.L.	Mc.
St. Croix, Christiansted	WIVI-FM	99.5
Christiansted, St. Croix	WIVI-FM	99.5

Canadian AM Stations by Location

Location	C.L.	Kc.
Abbotsford, B.C.	CFVR	1240
Altona, Man.	CFAM	1290
Amherst, N.S.	CKDH	900
Amos, Que.	CHAD	1340
Antigonish, N.S.	CJFX	580
Barrie, Ont.	CKBB	950
Bathurst, N.B.	CKBC	1360
Belleville, Ont.	CJBQ	800
Blind River, Ont.	CJNR	730
Brampton, Ont.	CHIC	790
Brandon, Man.	CKX	1150
Brantford, Ont.	CKPC	1380
Bridgewater, N.S.	CKBW	1000
Brockville, Ont.	CFJR	1450
Cabano, Que.	CJAF	1240
Calgary, Alta.	CBR	1010
	CFAC	960
	CFCN	1060
	CHQR	810
	CKXL	1140
Callender, Ont.	CFCH	600
Campbell River, B.C.	CFWB	1490
Campbellton, N.B.	CKNB	950
Camrose, Alta.	CFCW	790
Causapscal, Qué.	CJBM	1450
Charlottetown, P.E.I.	CFCY	630
Chatham, Ont.	CFCO	630
Chicoutimi, Que.	CBJ	1580
	CJMT	1420
Chilliwack, B.C.	CHWK	1270
Churchill, Man.	CHFC	1230
Cobourg, Ont.	CHUC	1450
Corner Brook, Nfld.	CBY	990
	CFCB	570
Cornwall, Ont.	CFML	1110
	CJSS	1220
Courtenay, B.C.	CFCP	1440
Cranbrook, B.C.	CKEK	570
Dartmouth, N.S.	CFDR	790
Dauphin, Man.	CKDM	730
Dawson Creek, B.C.	CJDC	1350
Drumheller, Alta.	CJDV	910
Drummondville, Que.	CHRD	1340
Dryden, Ont.	CKDR	900
Duncan, B.C.	CKAY	1500
Edmonton, Alta	CBX	740
	CFRN	1260
	CHED	630
	CHFA	680
	CJCA	930
	CKUA	580
Edmundston, N.B.	CJEM	570
Estevan, Sask.	CJSL	1280
Flin Flon, Man.	CFAR	590
Fort Frances, Ont.	CFOB	800
Fort Simpson, N.W.T.	CFMR	1490
Fort St. John, B.C.	CKNL	560
Fort William, Ont.	CJLX	800
Fredericton, N.B.	CBZ	970
	CFNB	550
Galt, Ont.	CFTJ	1110
Gander, Nfld.	CBG	1450
Goose Bay, Nfld.	CFGB	1340
Granby, Que.	CHEF	1450
Grande Prairie, Alt.	CFGP	1050
Grand Bank, Nfld.	CJOX	710
Grand Falls, Nfld.	CBT	540
	CKCM	620
	CJCN	680
Gravelbourg, Sask.	CFRG	710
	CFGR	1230
Guelph, Ont.	CJOY	1460
Halifax, N.S.	CBH	860
	CHNS	960
	CHNX	6130
	CJCH	920
Hamilton, Ont.	CHML	900
	CKOC	1150
	CHIQ	1280
Hauterive, Que.	CHLC	580
Huntsville, Ont.	CKAR	630
Hull, Que.	CKCH	970
Inuvik, N.W.T.	CHAK	860
Joliette, Que.	CJLM	1350
Jonquiere, Que.	CKRS	590
Kamloops, B.C.	CFJC	910
Kelowna, B.C.	CKOV	630
Kenora, Ont.	CJRL	1220
Kentville, N.S.	CKEN	1350
Kingston, Ont.	CFRC	1490
	CKLC	1380
	CKWS	960
Kirkland Lake, Que.	CJK-L	560
Kitchener, Ont.	CKCR	1490
Kitimat, B.C.	CKTK	1230
	CKKW	1320
Langley, B.C.	CJJC	850
La Sarre, Que.	CKLS	1240
La Tuque, Que.	CFLM	1240
Leamington, Ont.	CJSP	710
Lethbridge, Alta.	CHEC	1090
	CJOC	1220
Lindsay, Ont.	CKLY	910
Middleton, N.S.	CKAD	1490
Lloydminster, Alta.	CKSA	1080
London, Ont.	CFPL	980
	CKSL	1410
Marystown, Nfld.	CHCM	560
Matane, Que.	CKBL	1250
Medicine Hat, Alta.	CHAT	1270
Midland, Ont.	CKMP	1230
Moncton, N.B.	CBAF	1300
	CKCW	1220
Mont Laurier, Que.	CKML	610
Montmagny, Que.	CKBM	1490
Montreal, Que.	CBF	690
	CBM	940
	CFCF	600
	CFMB	1410
	CJAD	800
	CJMS	1280
	CKAC	730
	CKLM	1570
	CKGM	980
Moose Jaw, Sask.	CHAB	600
Nanaimo, B.C.	CHUB	1570
Nelson, B.C.	CKLN	1390
New Carlisle, Que.	CHNC	610
Newcastle, N.B.	CKMR	790
New Glasgow, N.S.	CKEC	1320
New Westminster, B.C.	CKNW	980
Niagara Falls, Ont.	CJRN	1600
North Battleford, Sask.	CJNB	1050
North Vancouver, B.C.	CKLG	730
Oakville, Ont.	CHWO	1250
Orillia, Ont.	CFOR	1570
Oshawa, Ont.	CKLB	1350
Ottawa, Ont.	CBO	910
	CBOF	1250
	CFRA	580
	CKOY	1310
	CKPM	1440
Owen Sound, Ont.	CFOS	560
Parry Sound, Ont.	CKAR-1	1340
Peace River, Alta.	CKYL	610
Pembroke, Ont.	CHOV	1350
Penticton, B.C.	CKOK	800
Peterborough, Ont.	CHEX	980
	CKPT	1420
Pointe Claire, Que.	CFOX	1470
Portage La Prarie, Man.	CFRY	920
Port Alberni, B.C.	CJAV	1240
Port Arthur, Ont.	CFPA	1230
	CKPR	580
Prince Albert, Sask.	CKBI	900
Prince George, B.C.	CKPG	550
Prince Rupert, B.C.	CFPR	860
Quebec, Que.	CBV	980
	CFOM	1340
	CHRC	800
	CJLR	1060
	CKCV	1280
Quesnel, B.C.	CKCQ	570
Red Deer, Alta.	CKRD	850
Regina, Sask.	CBK	540
	CJME	1300
	CKCK	620
	CKRM	980
Richmond Hill, Ont.	CFGM	1310
Rimouski, Que.	CJBR	900
Riviere du Loup, Que.	CJFP	1400
Roberval, Que.	CHRL	910
Rouyn, Que.	CKRN	1400
Ste. Anne de la Pocatiere, Que.	CHGB	1310
St. Boniface, Man.	CKSB	1050
St. Catharines, Ont.	CKTB	610
St. Hyacinthe, Ont.	CKBS	1240
St. Jean, Que.	CHRS	1090
St. Jérome, Que.	CKJL	900
Saint John, N.B.	CBN	1110
St. John's, Nfld.	CBN	640
	CJON	930
	VOAR	1230
	VOCM	590
	VOWR	800
St. Joseph d'Alma, Que.	CFGT	1270
St. Thomas, Ont.	CHLO	680
Sackville, N.B.	CBA	1070
Saint John, N.B.	CFBC	930
	CHSJ	1150
Sarnia, Ont.	CHOK	1070
Saskatoon, Sask.	CFSN	1170
	CFQC	600
	CKOM	1250
Sault Ste. Marie, Ont.	CJIC	1050
	CKCY	920
Sept-Iles, Que.	CKCN	560
Shawinigan, Que.	CKSM	1220
Shefferville, Que.	CFKL	1230
Sherbrooke, Que.	CHLT	630
Simcoe, Ont.	CKTS	900
Smiths Falls, Ont.	CFRS	1560
Smithers, B.C.	CJET	630
Sorel, Que.	CFBV	1230
Stratford, Ont.	CJSO	1320
Steinbach, Man.	CJCS	1240
Stephenville, Nfld.	CHSM	1250
Sudbury, Ont.	CFSX	910
	CFBR	550
	CHNO	900
	CKSO	790
Summerside, P.E.I.	CJRW	1240
Swift Current, Sask.	CKSW	1400
Sydney, N.S.	CBI	1140
	CJCB	1270
Terrace, B.C.	CFTK	590
Thetford Mines, Que.	CKLD	1230
Thomson, Man.	CHTM	610
Trois-Rivières, Que.	CHLN	550
	CKTR	1150
Tillsonburg, Ont.	CKOT	1510
Timmins, Ont.	CFCL	620
	CKGB	680
Toronto, Ont.	CBL	740
	CFRB	1010
	CHFI	1540
	CHUM	1050
	CJBC	860
	CKEY	590
	CKFH	1430
Trail, B.C.	CJAT	610
Truro, N.S.	CKCL	600
Val d'Or, Que.	CKVD	1230
Valleyfield, Que.	CFLV	1370
Vancouver, B.C.	CBU	690
	CFUN	1410
	CHQM	1320
	CJOR	600
	CKLG	730
	CKWX	1130
Verdun, Que.	CKVL	850
Vernon, B.C.	CJIB	940
Victoria, B.C.	CFAX	1070
	CJVI	900
	CKDA	1220
Victoriaville, Que.	CFDA	1380
Ville Marie, Que.	CKVM	710
Ville St. Georges, Que.	CKRB	1460
Wawa, Ont.	CJWA	1240
Welland, Ont.	CHOW	1470
Weyburn, Sask.	CFSL	1340
Whitehorse, Y.T.	CFWH	570
Williams Lake, B.C.	CKWL	1240
Windsor, N.S.	CFAB	1450
Windsor, Ont.	CBE	1550
	CKLW	800
	CKWW	580
Wingham, Ont.	CKNX	920
Winnipeg, Man.	CBW	990
	CJOB	680
	CJQM	1470
	CKRC	630
	CJQM	1470
	CKY	580
Woodstock, N.B.	CJCJ	920
Woodstock, Ont.	CKOX	1340
Yarmouth, N.S.	CJLS	1340
Yellowknife, N.W.T.	CFYK	1340
Yorkton, Sask.	CJGX	940

Canadian FM Stations by Location

Location	C.L.	Mc.
Belleville, Ont.	CJBQ-FM	97.1
Brandon, Man.	CKX-FM	96.1
Calgary, Alta.	CHFM-FM	95.9
Cornwall, Ont.	CJSS-FM	104.5
Edmonton, Alta.	CFRN-FM	100.3
	CJCA-FM	99.5
	CKUA-FM	98.1
Halifax, N.S.	CHNS-FM	96.1
Hamilton, Ont.	CHML-FM	95.3
Kamloops, B.C.	CFFM-FM	98.3
Kelowna, B.C.	CJOV-FM	104.7
Kentville, N.S.	CKWM-FM	97.7
Kingston, Ont.	CFRC-FM	91.9
	CKLC-FM	99.5
	CKWS-FM	96.3
Kitchener, Ont.	CKRC-FM	96.7
Lethbridge, Alta.	CHEC-FM	100.9
London, Ont.	CFPL-FM	95.9
Montreal, Que.	CBF-FM	95.1
	CBM-FM	100.7
	CFCF-FM	92.5
	CJFM-FM	95.9
	CJMS-FM	94.3
	CKGM-FM	97.7
Oshawa, Ont.	CKLB-FM	93.5
Ottawa, Ont.	CBO-FM	103.3
	CFMO-FM	93.9
Port Arthur, Ont.	CKPR-FM	94.3
Quebec, P.Q.	CHRC-FM	98.1
Red Deer, Alta.	CKRD-FM	98.9
Rimouski, Que.	CJBR-FM	101.5
Saint John, N.B.	CFBC-FM	98.9
Saskatoon, Sask.	CFMC-FM	103.9
Sault St. Marie, Ont.	CJIC-FM	100.5
	CKCY-FM	104.3
Sherbrooke, Que.	CHLT-FM	102.7
St. Catharines, Ont.	CKTB-FM	97.7
St. Norbert (Winnipeg), Man.	CFMW-FM	98.3
Sydney, N.S.	CJCB-FM	94.9
Timmins, Ont.	CKGB-FM	94.5
Toronto, Ont.	CBC-FM	99.1
Vancouver, B.C.	CHFI-FM	98.1
	CHUM-FM	104.5
	CJRT-FM	91.1
	CKFM-FM	99.9
	CBU-FM	105.7
	CFQM-FM	103.5
	CKLG-FM	99.3
Verdun, Que.	CKVL-FM	96.9
Victoria, B.C.	CFMS-FM	98.5
Windsor, Ont.	CKLW-FM	98.9
Winnipeg, Man.	CJOB-FM	97.5
	CKQM-FM	94.3
	CKY-FM	92.1

World-Wide Short Wave Stations

The World-Wide short wave stations section of *White's Radio Log* is, as its name implies, a *log*, that lists stations actually monitored by listeners in the United States, Canada and overseas. It is *not* intended to be a listing of *all* shortwave transmitters, licensed as such listings contain numerous inactive transmitters, and low powered stations which are rarely heard by DX'ers. The stations listed here, therefore, are those most often reported and consistently heard during the past few months. Many have been monitored by DX CENTRAL, the official RADIO-TV EXPERIMENTER monitoring post in New York City.

Because of the fact that this log represents actual monitoring reports rather than data taken from published program schedules received from the stations, you may find that frequencies (and operating times) given here differ from *official listings*. This is because foreign short-wave stations frequently operate several kilocycles away from their assigned (and announced) frequencies. In addition, the schedules of these stations are often changed and the changes are not published in the schedules until many months later. We feel that the type of log which *White's Radio Log* is presenting represents a very realistic picture of the current status of short-wave broadcasting, and is something which cannot be obtained elsewhere.

For the DX'er. If you care to roam the bands for DX, we present here some information which will be of invaluable use to you in tracking down DX stations.

Although the current radio propagation conditions have made the high frequency bands (11 and 13 meter bands) relatively poor for DX'ers, the other bands are generally good during certain periods of the year. As a general rule, the following bands are "hot for DX" during the daily and seasonal times indicated:

60-meter band=Winter nights.
49-meter band=Winter nights.
41-meter band=Winter nights.
31-meter band=Nights, all year.
25-meter band=Nights, all year.
19-meter band=Days all year, and Summer nights.
16- meter band=Days, all year, and Summer nights.
13-meter band=Days, all year.
11-meter band=Days, all year.

More on QSL's. In a recent issue of RADIO-TV EXPERIMENTER we discussed the collecting of QSL cards from broadcasting stations, one of the finer aspects of the art of DX'ing. When our issue came out we received considerable mail asking about the possibilities of QSL cards from *non*-broadcasting radio stations, such as hams, police, ships, etc.

Ham stations generally swap QSL cards with each other after a "contact," and a good percentage of ham operators will also QSL a monitoring report if they find it useful. The addresses of ham operators may be obtained from *The Radio Amateurs Callbook* which may be purchased at Ham radio stores or by mail from any of the major parts supply houses.

Pclice stations, ships, and other "odd ball" stations sometimes QSL, but generally they will ignore your report unless you include with it a prepared QSL card (stamped, too) which they can sign and return to you without much bother. The radio-telephone stations frequently heard with test tapes on single-sideband are tough to QSL because they prefer to keep their transmissions as un-

WHITE'S RADIO LOG

publicized as possible. However, a nice letter may get results.

Citizens Band operators will frequently QSL SWL reports, but finding their addresses is a problem because of the absence of adequate callbooks. Each month there is a listing of about 1000 CB operators in *S9 Magazine*, which is available on many newsstands throughout the United States and Canada.

In our listings, a station or frequency marked with an asterisk (*) indicates a non-broadcast station or frequency. This might include aeronautical, maritime, military, or other type of transmission, either in regular AM or single sideband (SSB). In instances where many non-broadcast stations use the same frequency, we have given you a clue as to the type of stations to be found there, rather than pin down only one station.

Let Us Know. Listeners are invited to submit their loggings to us for publication in the Shortwave section of *White's Radio Log*. Be sure to include the following information for each station you report: approximate frequency, callsign and/or station name, city and country, and time heard in Eastern Standard Time, 24 hour clock. Address your reports to: DX CENTRAL, *White's Radio Log*, c/o RADIO-TV EXPERIMENTER, 505 Park Avenue, New York, N. Y. 10022, U.S.A.

Time To Listen. All times shown in *White's Radio Log* are in the 24 hour EST clock system. For example, 0800 is 8:00 AM EST, 1200 is noon EST, 1800 is 6 PM EST, and so on. For conversion to other time zones, subtract 1 hour for CST (0800 EST is 7 AM CST), 2 hours for MST, 3 hours for PST.

The following abbreviations are used in our listings: BC—Broadcasting Company, Corporation, or System; E—Emissora; R—Radio or Radiodiffusion; V—Voice or Voz.

TNX. We are indebted to the following DX'ers who added their loggings to those of DX CENTRAL, the official RADIO-TV EXPERIMENTER monitoring station in New York City, to bring you this month's listings:

Doug McKirahan, Oak Park, Ill.
Chris Thompson, Rexdale, Ont.
Carl Dyrnavich, Riverdale, Ill.
Steven & Larry Levine, West Hartford, Conn.
Phyllis J. Kline, Coventry, R.I.
Terry Silvernail, Lake Worth, Fla.
Ronald Tlachac, Marshfield, Wisc.
Jess Dyer, Dearborn, Mich.
Steve Wilkes, Dallas, Tex.
Frank Priore, College Pt., N.Y.
Julian Sienkiewicz, Brooklyn, N.Y.
Robert D. Fontaine, Natick, Mass.
Doris Lautrisi, West Warwick, R.I.
Bruce Zuckerman, Clark, N.J.
H. Handrei, Burnaby, B.C.
James Palmer, Deer Park, N.Y.
Noel M. Moss, New York, N.Y.
Tom Kneitel, New York, N.Y.
David Wynn, Elysburg, Pa.
Philip A. Jones, Whittier, Calif.
John T. Casey, Charlestown, Mass.
Alan Statman, Caldwell, N.J.
Wade M. Smith, Wayne, Pa.
S. Leo Bance, Norwalk, Calif.
Ira Schultz, White Plains, N.Y.
Edward T. Zebrowski, Holyoke, Mass.
Darrel Bender, Camp Hill, Pa.
Lud Elliman, Damariscotta, Me.
Alfred H. Howe, Candor, N.Y.
Karl Simmons, Jacksonville, Fla.
Allan Cunningham, Willowick, Ohio
L. Bruce Meyer, Portland, Ore.
Jon B. Elso, Manchester, Mass.
Rick Slattery, Miami, Fla.
Frank J. Miller, Hampstead, Md.
Dale Koby, Van Nuys, Calif.
John J. Herro, Glenview, Ill.
Dave Schmidt, Green Ridge, Pa.
Andrew G. Rekay, Chicago, Ill.
Steve Congdon, East Homer, N.Y.
Roger Camire, Manchester, N.H.
F. R. Lane, Wellesley, Mass.
Richard G. Abrams, Norwalk, Conn.
Marian K. Ely, Delray Beach, Fla.
Townsend F. Groce, Coatesville, Pa.
Bruce Robertson, West Hill, Ont.

Short-Wave Listings

Kc/s	Call	Name	Location	EST
2355	—	Zambia BC	Lusaka, Zambia	0005
3240	—	R. Brazzaville	Brazzaville, Congo	0000
3250	ELWA	R. Village	Monrovia, Liberia	1645
3270	—	Zambia BC	Lusaka, Zambia	0005

Kc/s	Call	Name	Location	EST
3315	—	R-TV Francaise	Ft. de France, Martinique	0530
3356	—	R. Bechuanaland	Gaberones, Bechuanaland	1000

Kc/s	Call	Name	Location	EST
3620	HC2KH	R. el Sagrario	Guayaquil, Ecu.	2300
3701	CR6RD	R. Club do Huambo	Huambo, Angola	0100
3910	—	Far East Network	Tokyo, Japan	0400
3980	—	R. Commercial	Sa da Bandeira, Angola	0030

60 Meter Band—4750 to 5060 Kc/s

4750	HCBK2	R. El Mundo	Guayaquil, Ecuador	2200
4765	—	R. Brazzaville	Brazzaville, Congo	0000
4770	ELWA	R. Village	Monrovia, Liberia	1720
	HCMX4	R. Cenit	Portoviejo, Ecuador	2320
	—	R. Comercial	Sa da Bandeira, Angola	0030
4780	YVLA	V. de Carabobo	Valencia, Venezuela	2120
	HCLC1	R. Atahualpa	Quito, Ecuador	2320
4795	CP73	R. Nueva America	La Paz, Bolivia	2050
4810	HCFA4	V. de Manabi	Portoviejo, Ecuador	0100
4850	—	Mauritius BC	Forest Side, Mauritius	0800
4861	OAZ4T	R. Chanchamayo	La Merced, Peru	1900
4867	HJFV	R. Neiva	Neiva, Colombia	2330
4870	—	R. Cotonou	Cotonou, Dahomey	1630
	YVKP	R. Tropical	Caracas, Venezuela	1900
4890	YVKB	R. Venezuela	Caracas, Venezuela	2228
4911	—	Zambia BC	Lusaka, Zambia	0245
4913	HCMJ1	R. Gran Colombia	Quito, Ecuador	0030
	VTW2	R. Tarawa	Tarawa, Gilbert & Ellice Is.	0230
4916	—	R. Trebol	Zaruma, Ecuador	2230
4921	OBX7H	Ondas del Titicaca	Puno, Peru	2130
4923	HCQR1	R. Quito	Quito, Ecuador	0030
4926	EAJ206	R. Ecuatorial	Bata, Sp. Guinea	1640
4940	YVMO	R. Lara	Barquisimeto, Venezuela	1930
4943	HCXZ1	R. Nacional	Quito, Ecuador	2030
4970	—	R. Mogadiscio	Mogadiscio, Somalia	1415
	YVLK	R. Rumbos	Caracas, Venezuela	2200
5020	—	R. Cronos	Barquisimeto, Venezuela	1930
5035	—	R. Bangui	Bangui, Centr. Afr. Rep.	1710
5042	CR6RF	R. Clube Benguela	Benguela, Angola	0050
5065	CR6RD	R. Clube Huambo	Huambo, Angola	0100
5075	HJGC	R. Sutatenza	Sutatenza, Colombia	2022
5095	HJGC	R. Sutatenza	Sutatenza, Colombia	2025
5805	—	R. Sanaa	Sanaa, Yemen	2230

49 Meter Band—5950 to 6200 Kc/s

5950	—	R. Warsaw	Warsaw, Poland	1630
5960	—	Trans World R.	Monte Carlo, Monago	1430
5970	—	R. Brazzaville	Brazzaville, Congo	0000
	CKNA	R. Canada	Montreal, Que.	0230
5980	—	Lebanese BC	Beirut, Lebanon	0915
5990	—	Malawi BC	Zomba, Malawi	1100
5995	—	R. Warsaw	Warsaw, Poland	0600
6000	—	R. Americas	Swan Island	2227
6010	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	1045
6035	—	V. of America	Monrovia, Liberia	1715
6050	—	R. Union	Pt. au Prince, Haiti	2100
	—	R. Moscow	Moscow USSR	1440
6060	—	R. Havana	Havana, Cuba	2100
6065	ZYR3	R. Nacional	Brazilia, Brasil	1800
6070	—	R. el Condor	La Paz, Bolivia	1800
6075	DMQ6	Deutsche Welle	Cologne, W. Germany	1445
6080	—	V. of America	Tangiers, Morocco	1740
	—	R. Stanleyville	Stanleyville, Congo	0015
6090	—	R. Koduna	Koduna, Nigeria	0030
6100	DMQ6	Deutsche Welle	Cologne, W. Germany	2130
	—	R. Belgrade	Belgrade, Yugoslavia	1330
6109	YVPN	R. Escuelas R.	San Fernando, Venezuela	1930
6115	—	R. Reloj	Lima(?), Peru	2100
6120	HER3	Swiss BC	Berne, Switz.	2015
6125	CP15	R. el Condor	La Paz, Bolivia	1800
6130	LKJ	R. Norway	Oslo, Norway	0700
6140	TISRHB2	R. Popular	San Jose, Costa Rica	2230
6145	DMQ6	Deutsche Welle	Cologne, W. Germany	2000
6150	HCEM4	R. Costa Azul	Portoviejo, Ecuador	2320
	—	R. Bucharest	Bucharest, Rumania	1730
	—	R. South Africa	Capetown, S. Africa	2200
6160	—	R. Algiers	Algiers, Algeria	1530
	CKZU	CKZU	Vancouver, B.C.	1622
6165	—	Zambia BC	Lusaka, Zambia	0345
6175	—	R. Guarani	Belo Horizonte, Brazil	0045
6180	VUD	All India R.	Delhi, India	1345
6185	LLI	R. Norway	Oslo, Norway	0000
6190	—	R. Bucharest	Bucharest, Rumania	1730
6195	—	R. Burundi	Usumbura, Burundi	0000
6202	TIJCV	R. Atenas	Atenas, Costa Rica	1800
6210	—	R. Tabriz	Tabriz, Iran	1320
6540	—	R. Pyongyang	Pyongyang, N. Korea	0310
6610	—	R. Atlantico	Las Palmas, Canary Is.	1400
7090	—	R. Tirana	Tirana, Albania	0135

41 Meter Band—7100 to 7300 Kc/s

7105	—	R. Brazzaville	Brazzaville, Congo	0000
7113	—	Gorovit Vilnus	Vilnus, Lithuanian SSR	1800
7125	—	R. Warsaw	Warsaw, Poland	0130
7130	BED7	V. Free China	Taipei, Formosa	1030
7135	—	R. Tehran	Tehran, Iran	1830
7145	—	R. Warsaw	Warsaw, Poland	1630
7150	—	R. Comercial	Sa da Bandeira, Angola	0030
7160	—	R. Moscow	Moscow, USSR	1500
	CR6RD	R. Clube Huambo	Huambo, Angola	0100
7170	—	Nat'l BC Service	Leopoldville, Congo	2300
7185	—	Gorovit Vilnus	Vilnus, Lithuanian SSR	1800
	—	R. Thailand	Bangkok, Thailand	2315
7195	—	R. Bucharest	Bucharest, Rumania	1730
7200	—	R. Belgrade	Belgrade, Yugoslavia	1330
7220	—	R. Australia	Melbourne, Australia	1030
7225	—	R. Bucharest	Bucharest, Rumania	1430
7240	—	R. Moscow	Moscow, USSR	0200
7260	—	R. Moscow	Moscow, USSR	1600
	DMQ7	Deutsche Welle	Cologne, W. Germany	1445
7265	—	R. Lome	Lome, Togo	0700
7267	—	R. Addis Ababa	Addis Ababa, Ethiopia	1115
7270	—	R. Warsaw	Warsaw, Poland	0600
	—	R. South Africa	Capetown, South Africa	1150
7275	—	V. Nigeria	Lagos, Nigeria	0800
7285	—	R. Warsaw	Warsaw, Poland	0600
	VUD	All India R.	Delhi, India	1345
	—	N.H.K.	Tokyo, Japan	0215
7310	—	Gorovit Vilnus	Vilnus, Lithuania SSR	1800
7340	—	R. Moscow	Moscow, USSR	1440
7580	—	R. Pyongyang	Pyongyang, N. Korea	0500
7670	—	Sawt Al Islam	Jedda, Saudi Arabia	1200
9009	4XB31	Kol Zion	Jerusalem, Israel	1545
9360	—	R. Nacional	Madrid, Spain	1520
9390	—	R. Tirana	Tirana, Albania	1640
9410	GRI	BBC	London, England	1330
9455	OAX4W	R. Americas	Lima, Peru	2200
9480	—	R. Moscow	Moscow, USSR	0200
9485	4VC	R. Comerce	Pt. au Prince, Haiti	2100

31 Meter Band—9500 to 9775 Kc/s

9505	—	R. Belgrade	Belgrade, Yugoslavia	1030
9510	GSB	BBC	London, England	1735
	—	R. Bucharest	Bucharest, Rumania	1430
9515	—	R. Kuwait	Kuwait	1615
9525	—	R. South Africa	Capetown, South Africa	0945
9530	DMQ9	Deutsche Welle	Cologne, W. Germany	1445
9540	—	Ankhararai Ulanbatras	Ulan Bator, Mongolia	1630

WHITE'S RADIO LOG

Kc/s	Call	Name	Location	EST
9545	DMQ9	Deutsche Welle	Cologne, W. Germany	2130
	—	Lebanese BC	Beirut, Lebanon	0430
9550	LLD	R. Norway	Oslo, Norway	0000
9555	YSS	R. Nacional	San Salvador, El Salvador	2035
9560	—	Gorovit Yerevan	Yerevan, Armenian SSR	1515
	—	V. of Holy Land	Amman, Jordan	2000
9560	PCJ	R. Nederland	Hilversum, Neth.	1300
9562	OAX4R	R. Nacional	Lima, Peru	2318
9570	—	R. Bucharest	Bucharest, Rumania	1430
	—	R. Australia	Melbourne, Australia	0230
9575	DMQ9	Deutsche Welle	Cologne, W. Germany	2000
	—	RAI	Rome, Italy	1410
9580	—	BBC	Nicosia, Cyprus	1315
9590	—	R. Bucharest	Bucharest, Rumania	1730
9600	—	R. Australia	Melbourne, Australia	1430
	—	R. Moscow	Moscow, USSR	0200
9605	DMQ9	Deutsche Welle	Cologne, W. Germany	1808
9610	LLG	R. Norway	Oslo, Norway	1900
	OAX8C	R. Nacional	Iquitos, Peru	0600
9625	CKLO	R. Canada	Montreal, Que.	0230
	PCJ	R. Nederland	Hilversum, Neth.	0900
	—	Kol Zion	Jerusalem, Israel	1545
9635	—	V. of West	Lisbon, Portugal	1700
9640	—	R. Conakry	Conakry, Guinea Rep.	1700
9640	DMQ9	Deutsche Welle	Cologne, W. Germany	1330
	—	Trans World R.	Bonaire, Neth. Ant.	1600
9645	TIFC	Faro del Caribe	San Jose, Costa Rica	0800
9651	—	R. Maldive Isl.	Maladive Is.	0230
9660	—	Lebanese BC	Beirut, Lebanon	2330
	—	R. Nacional de Espana	Tenerife, Canary Isl.	0900
9675	—	R. Warsaw	Warsaw, Poland	0600
9690	—	V. Nigeria	Lagos, Nigeria	0800
9700	—	R. Sofia	Sofia, Bulgaria	1400
9710	—	Far East BC	Manila, Philippines	2100
	—	R. Moscow	Moscow, USSR	0200
	LRX2	R. El Mundo	Buenos Aires, Arg.	2350
	OAX9D	R. Tropical	Tarapoto, Peru	0600
9725	—	N.H.K.	Tokyo, Japan	0455
	4XB51	Kol Zion	Jerusalem, Israel	1545
9730	—	R. Brazzaville	Brazzaville, Congo	0000
9735	DMQ9	Deutsche Welle	Cologne, W. Germany	0415
9740	—	R. Pakistan	Karachi, Pakistan	1445
9752	—	R. Pyongyang	Pyongyang, N. Korea	0500
9755	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	1000
9760	TGWB	V. de Guatemala	Guatemala City, Guat.	1740
	—	R. V. of Vietnam	Hanoi, N. Vietnam	1900
9780	—	R. Moscow	Moscow, USSR	0700
	—	Windward I. BC	St. Georges, Grenada	1615
9840	—	R. V. of Vietnam	Hanoi, N. Vietnam	2330
9915	VUD	All India R.	Delhi, India	1345
11672	—	R. Pakistan	Karachi, Pakistan	1445

25 Meter Band—11700 to 11975 Kc/s

11700	—	R. Moscow	Moscow, USSR	0700
11710	—	R. Australia	Melbourne, Australia	0015
	—	R. Brazzaville	Brazzaville, Congo	0000
11715	—	R. Australia	Melbourne, Australia	1700
11720	—	V. of Nigeria	Lagos, Nigeria	0800
	CHOL	R. Canada	Montreal, Que.	1330
11725	—	R. Brazzaville	Brazzaville, Congo	1200
11730	—	R. Tehran	Tehran, Iran	1830
11735	—	R. Belgrade	Belgrade, Yugoslavia	1030
11738	XEMP	La Charita del Cuad.	Mexico, D.F., Mexico	1600
11740	—	Far East BC	Manila, Philippines	2100
	CE1174	R. Nuevo Mundo	Santiago, Chile	1900
11755	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	1330
	—	BBC	London, England	1735
11760	—	R. V. of Vietnam	Hanoi, N. Vietnam	1900
11765	—	R. Sofia	Sofia, Bulgaria	1400
	—	R-TV Francaise	Paris, France	1330
11785	DMQ11	Deutsche Welle	Cologne, W. Germany	1445
11790	—	AFRTS	Los Angeles, Calif.	2120
11795	DMQ11	Deutsche Welle	Cologne, W. Germany	0415
	—	R. Berlin Int'l	Berlin, E. Germany	1100
	—	Nat'l BC Svce.	Leopoldville, Congo	2300
	YDF3	R. Repub. Indonesia	Djakarta, Indonesia	1200
11800	—	R. Nac. de Espana	Tenerife, Canary Is.	1900
	—	R. Ceylon	Colombo, Ceylon	2030
11805	ZYZ36	R. Globo	Rio de Janeiro, Brazil	1850
11810	—	Lebanese BC	Beirut, Lebanon	1500
	—	R. Bucharest	Bucharest, Rumania	1730
11815	ZYW24	R. Brazil Cent.	Rio de Janeiro, Brazil	0400
11820	—	R-TV Ivorienne	Abidjan, Ivory Coast	0745
11825	BED69	V. of Free China	Taipei, Formosa	1030
11830	—	R. Moscow	Moscow, USSR	0200
11835	—	R. Algiers	Algiers, Algeria	1530
	4VEH	V. Evangelique	Cap Haitien, Haiti	1700
11840	—	R. V. of Vietnam	Hanoi, N. Vietnam	2300
	—	R. Australia	Melbourne, Australia	1930
	—	V. of West	Lisbon, Portugal	1700
11845	—	R-TV Francaise	Paris, France	1330
11850	LLK	R. Norway	Oslo, Norway	0700
	—	Ankhararai Ulanbatras	Ulan Bator, Mongolia	1630
	ZPA3	R. Teleco	Asuncion, Paraguay	1900
11855	—	Sawt Al Islam	Jedda, Saudi Arabia	1200
	—	R. Paranaense	Paranaense, Brazil	0400
11860	BED45	V. of Free China	Taipei, Formosa	1030
11865	—	R. Havana	Havana, Cuba	2200
11870	—	Nat'l BC Service	Leopoldville, Congo	2300
11875	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	1200
	ZYN32	R Soc. de Bahia	Bahia, Brazil	0400
11880	XEHH	R. Comerciales	Mexico D.F., Mexico	1710
11885	ORU	R-TV Belge	Brussels, Belgium	1615
11900	—	V. of Nigeria	Lagos, Nigeria	0800
	—	R. S. Africa	Capetown, S. Africa	0500
11920	DZF2	Far East BC	Manila, Philippines	0330
11930	—	R. Moscow	Moscow, USSR	0700
	—	Windward I. BC	St. Georges, Grenada	1710
11935	—	Lebanese BC	Beirut, Lebanon	1830
	—	R. Brazzaville	Brazzaville, Congo	1330
11940	—	R. Japan	Tokyo, Japan	0115
	—	R. Bucharest	Bucharest, Rumania	1730
11945	MCO	BBC	London, England	0955
11950	PCJ	R. Nederland	Hilversum, Netherlands	1030
11965	DMQ11	Deutsche Welle	Cologne, W. Germany	1020
11970	PCJ	R. Nederland	Hilversum, Netherlands	1300
11975	—	R. Brazzaville	Brazzaville, Congo	0600
	—	R. Peking	Peking, China	0700
12095	GRF	BBC	London, England	1300
14530	—	R. Pyongyang	Pyongyang, N. Korea	2000
15050	—	R. Peking	Peking, China	2000
15060	—	R. Peking	Peking, China	0700
15070	GWC	BBC	London, England	1735
15095	—	R. Peking	Peking, China	0700

19 Meter Band—15100 to 15450 Kc/s

Kc/s	Call	Name	Location	EST
15100	—	R. V. of Vietnam	Hanoi, N. Vietnam	1900
15110	—	R-TV Francaise	Paris, France	0505
	ZL4	R. New Zealand	Wellington, N.Z.	2345
15115	—	R. Peking	Peking, China	0700
	HCJB	V. of the Andes	Quito, Ecuador	1530
15125	—	V. of Free China	Taipei, Formosa	1030
	—	V. of West	Lisbon, Portugal	1700
15135	—	V. of Free Korea	Seoul, Korea	0130
	—	R. Havana	Havana, Cuba	1550
	—	R. Tehran	Tehran, Iran	0300
15140	ETLF	R. V. of Gospel	Addis Ababa, Ethiopia	0815
15150	—	V. of America	Okinawa	1930
15155	—	R. Havana	Havana, Cuba	1510
	—	R. South Africa	Capetown, S. Africa	0500
	—	Vatican Radio	Vatican City	0630
15160	TAU	R. Ankara	Ankara, Turkey	1700
15165	OZF7	V. of Denmark	Copenhagen, Denmark	0700
15175	LIM	R. Norway	Oslo, Norway	0700
15180	—	R. Australia	Melbourne, Australia	0015
15185	OIX4	Finnish BC	Pori, Finland	0945
15190	—	R. Brazzaville	Brazzaville, Congo	0600
15205	DMQ15	Deutsche Welle	Cologne, W. Germany	0415
15220	—	R. Australia	Melbourne, Australia	0015
	PCJ	R. Nederland	Hilversum, Netherlands	1300
15225	—	Swiss BC	Berne, Switz.	0330
	—	R. Afghanistan	Kabul, Afghanistan	1300
15240	—	R. Sweden	Stockholm, Sweden	0900
	—	R. Australia	Melbourne, Australia	1700
	—	R. Belgrade	Belgrade, Yugoslavia	1030
15250	—	R. Bucharest	Bucharest, Rumania	1000
15255	—	V. of Nigeria	Lagos, Nigeria	0800
15275	DMQ15	Deutsche Welle	Cologne, W. Germany	1020
15280	—	R. New Zealand	Wellington, N.Z.	2345
15290	—	Trans World R.	Nonaire, Neth. Ant.	1830
	—	R. Clube de Mozambique	Lourenco Marques, Mozambique	1130
15300	—	R. Havana	Havana, Cuba	1610
	GWR	BBC	London, England	1015
	DZH9	Far East BC	Manila, Philippines	1815
	—	R. Sweden	Stockholm, Sweden	0900
15305	—	Swiss BC	Berne, Switz.	0330
15315	—	R. Bucharest	Bucharest, Rumania	1000
15320	CKNC	R. Canada	Montreal, Que.	1330
15330	—	AFRS	New York, N.Y.	0830
15340	—	R. Havana	Havana, Cuba	1800
15350	—	AFRS	New York, N.Y.	0830
15380	DZF3	Far East BC	Manila, Philippines	1930
15425	PCJ	R. Nederland	Hilversum, Netherlands	0900
15430	—	Far East BC	Manila, Philippines	0730
	—	AFRTS	New York, N.Y.	0830
15440	WRUL	R. N.Y. Worldwide	New York, N.Y.	0700
15445	—	R. Brazzaville	Brazzaville, Congo	1000
15448	—	R. Prague	Prague, Czech.	1125
15470	—	R. Moscow	Moscow, USSR	0700

16 Meter Band—17700 to 17900 Kc/s

17710	DZ16	Far East BC	Manila, Philippines	1930
17715	—	R. Australia	Melbourne, Australia	1835
17720	—	R. Brazzaville	Brazzaville, Congo	0730
17730	WRUL	R. N.Y. Worldwide	New York, N.Y.	1000
17840	WRUL	R. N.Y Worldwide	New York, N.Y.	1100
17845	WRUL	R. N.Y. Worldwide	New York, N.Y.	0745
17750	—	Austrian Radio	Vienna, Austria	0200
17810	—	Austrian Radio	Vienna, Austria	0400
17820	—	R. Australia	Melbourne, Australia	0015
17820	CKNC	R. Canada	Montreal, Que.	1330
	TAV	R. Ankara	Ankara, Turkey	0915
17825	LLN	R. Norway	Oslo, Norway	0700
17830	—	Swiss BC	Berne, Switz.	0330
17840	—	R. Australia	Melbourne, Australia	1430
	—	R. Sweden	Stockholm, Sweden	0900
17855	—	AFRTS	New York, N.Y.	0830
17875	—	R. Japan	Tokyo, Japan	1600
17890	BED40	V. of Free China	Taipei, Formosa	1030
	HCJB	V. of The Andes	Quito, Ecuador	1530
17910	—	R. Ghana	Accra, Ghana	0945
18195	—	R. Pyongyang	Pyongyang, N. Korea	0100
21470	GSH	BBC	London, England	1015
21500	—	R. Brazzaville	Brazzaville, Congo	0600
21540	—	R. Ghana	Accra, Ghana	0945
21590	—	R. Pakistan	Karachi, Pakistan	0345
21730	LLQ	R. Norway	Oslo, Norway	0700

DF for CB

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it is mounted on. The sensitivity difference can be handled by rotating the car: First, a fix would be taken from a parked vehicle. Then, the car would be turned around 180 degrees. The side that produces the higher of the two signal levels is the direction of the unknown signal. Note that only the vehicle is moved, not the DF loop. Once the loop has been adjusted for bearing (minimum signal) it is not touched, only the car is moved.

Of course, DF'ing is easier if two stations use the well known triangulation method. One DF takes a bearing and plots the pointer bearing on the map. The second DF located some distance from the first takes its bearing and its pointer bearing is entered on the map. At the intersection of the two lines drawn through the DF pointers lies the "lost station".

When triangulation cannot be used, and when you don't feel like jockeying the car around, you can use the old *S-meter search*. Connect the DF, determine the pointer position, then reconnect the main antenna and drive in the direction indicated by the pointer. If the signal level increases you're headed in the right direction. If the signal level decreases turn around and head in an opposite direction to the pointer.

Whether your CB direction finding purposes be either public service or fun, the Signal Hunter direction finding CB antenna can put a little of the old *zing* back into CB'ing. Priced at $9.95, the Signal-Hunter is available from electronic distributors such as Lafayette Radio or direct from the manufacturer, Gold Line Co., Dept. 756, Muller Avenue, Norwalk, Conn. 06852. ■

LITERATURE LIBRARY

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ELECTRONIC PARTS

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

2. The new 516-page 1965 edition of *Lafayette Radio's* multi-colored catalog is a perfect buyer's guide for hi-fi'ers, experimenters, kit builders, CB'ers and hams. Get your free copy, today!

3. *Progressive "Edu-Kits" Inc.* now has available their new 1965 catalog featuring hi-fi, CB, Amateur, test equipment in kit and wired form. Also lists books, parts, tools, etc.

4. We'll exert our influence to get you on the *Olson* mailing list. This catalog comes out regularly with lots of new and surplus items. If you find your name hidden in the pages, you win $5 in free merchandise!

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

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

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

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

9. Are you still paying drugstore prices for tubes? *Nationwide Tube Co.* will send you their special bargain list of tubes. This will make you light up!

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

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

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

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

25. Unusual surplus and new equipment/parts are priced "way down" in a 32-page flyer from *Edlie Electronics*. Get one.

75. *Transistors Unlimited* has a brand new catalog listing hundreds of parts at exceptionally low prices. Don't miss these bargains!

HI-FI/AUDIO

13. Here's a beautifully presented brochure from *Altec Lansing Corp.* Studio-type mikes, two-way speaker components and other hi-fi products.

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

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

17. Two brand new full-color booklets are being offered by *Electro-Voice, Inc.* that every audiophile should read. They are: "Guide to Outdoor High Fidelity" and "Guide to Compact Loudspeaker Systems."

19. A valuable 8-page brochure from *Empire Scientific Corp.* describes technical features of their record playback equipment. Also included are sections on basic facts and stereo record library.

20. Tape recorder heads wear out. After all, the head of a tape deck is like the stylus of a phonograph, and *Robins Industries* has a booklet showing exact replacements. Lots of good info on how the things are built, too.

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

24. Here's a complete catalog of high-styled speaker enclosures and loudspeaker components. *University* is one of the pioneers in the field that keeps things up to date.

26. When a manufacturer of high-quality high fidelity equipment produces a line of kits, you can just bet that they're going to be of the same high quality! *H. H. Scott, Inc.*, has a catalog showing you the full-color, behind-the-panel story.

27. An assortment of high fidelity components and cabinets are described in the *Sherwood* brochure. The cabinets can almost be designed to your requirements, as they use modules.

28. Very pretty, very efficient, that's the word for the new *Betacom* intercom. It's ideal for stores, offices, or just for use in the home, where it doubles as a baby-sitter.

30. Tone-arms, cartridges, hi-fi, and stereo preamps and replacement tape heads and conversions are listed in a complete *Shure Bros.* catalog.

TAPE RECORDERS AND TAPE

31. "All the Facts" about *Concord Electronics Corporation* 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. "The Care and Feeding of Tape Recorders" is the title of a booklet that *Sarkes-Tarzian* will send you. It's 16-pages jam-packed with info for the home recording enthusiast. Includes a valuable table of recording times for various tapes.

33. Become the first to learn about *Norelco's* complete Carry-Corder 150 portable tape recorder outfit. Four-color booklet describes this new cartridge-tape unit.

34. The 1964 line of *Sony* tape recorders, microphones and accessories is illustrated in a new 16-page full color booklet just released by *Superscope, Inc.*, exclusive U.S. distributor.

35. If you are a serious tape audiophile, you will be interested in the new *Viking of Minneapolis* line—they carry both reel and cartridge recorders you should know about.

HI-FI ACCESSORIES

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

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

KITS

41. Here's a firm that makes everything from TV kits to a complete line of test equipment. *Conar* would like to send you their latest catalog—just ask for it.

42. Here's a 100-page catalog of a wide assortment of kits. They're high-styled, highly-versatile, and *Heath Co.* will happily add your name to the mailing list.

Human Thought in Orbit

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their tests proved a human "sender" could transmit pictures of objects, the page of a book, diagrams of pictures, geometrical figures, even letters. Subjects in a state of hypnosis, Vasiliev claimed, could pick up visual images projected by the hypnologist.

The famed Dr. K. D. Kotkov of Kharkov University reported experiments he had recorded, worked out with an 18-year-old girl. With the Doctor in one room, the girl in the laboratory, he had put her to sleep while she stood peering at a test tube. When the Doctor awakened her, she continued to look at the tube, picked up her conversation as though nothing had happened. Another time, the Doctor hypnotized her into a sleeping state when she was waltzing to the tune of a piano.

Meet Me At The Lab. The Kharkov Doctor even claimed he had reached the girl's mind when he was at his home, and she at hers. He would mentally suggest she meet him at the University laboratory and when he reached the lab she would be there, or on her way. When he asked why she had come she said, "I don't know. I just did. I wanted to."

How It's Done. The Doctor then described how he put the young girl to sleep: "I used to sit in a comfortable chair in complete silence. I closed my eyes, then would mentally murmur to my subject the suggestion, 'sleep, sleep.' " I pictured her to myself as being fast asleep with closed eyes. But most important factor. I strongly wished the girl would fall asleep. Finally, when this wish turned into a certain feeling," he would stop the experiment, for he knew "it had been completed."

Though the reported tests had been documented by witnesses in the Soviet laboratories, now the scientists announced an experiment held before hundreds of people in the lecture hall at Leningrad University. The receiver, M, sat at a table on the stage, half facing a Professor A. V. Gerver. Behind M was a blackboard, and behind the board stood the sender, Professor K. I. Platonov, visible too, to the audience.

"I Must Have Slept." Before M mounted the stage, Platonov had told the audience the experiment would begin when he covered his face with his hands. As there was no way the Professor could contact M except mentally, the audience thrilled when it watched Platonov, first cover his face to visualize M falling asleep, then seconds later saw M fall asleep on the stage. When asked what happened, M said: "I don't know. I think I must have slept." "Why did you fall asleep?" "I just did. I felt like going to sleep."

These early tests led to more complicated ones, "sending" the name of a person, suggesting automatic writing, mental-suggestion tests with the receiver sitting in a Faraday chamber to prove performance through metals; finally sending hypnotic suggestion over distances.

Long Distance Mental Operators. Probably most spectacular, one touted by Pravda, was an experiment held between Sevastopol and Leningrad, a distance of some 1200 miles. The first day tests were to be held, nothing happened. The sender was ill. But two days later, on July 15, the receiver, Ivanova, went to the laboratory in Leningrad at the appointed time, 10 o'clock, and by 10:01, was fast asleep. Half an hour later, the sender, alone on a Sevastopol sea front 1200 miles from Ivanova, awakened the woman at exactly 10:40 P.M. Watches and clocks at both points had been checked with Moscow time.

Soviet scientists claimed this test proved distances, the curvature of the earth, hills and water surfaces, did not affect brain phenomena. "Brain radio," they insisted, from this experiment, did not differ much from radio telegraphy.

Theories. But when they tried to explain the unusual phenomena, theories varied. All claimed mental suggestion, thought transference, had been proved out scientifically, but just what made it tick was something else again. Most compared the process to radio.

"The nervous system is a collection of radio installations or sets of microscopic size," said famed physiologist, A. V. Leontovich, "capable of generating and receiving ultra-short radio waves." Academician P. P. Lazarev suggested, "We must consider the possibility of catching in space a thought in the shape of an electromagnetic wave," and claimed brain wave lengths were 6,000 to 30,000 km. Famed V. M. Bechterev put it: "Mental suggestion is effected by short high-frequency electromagnetic waves."

New Form of Energy. An attempt to pin down field theory was worked out with a quadrant electrometer connected to a receiv-

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Human Thought in Orbit

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ing plate. When a human being neared the plate, the electrometer reading changed. Additional tests proved muscle constrictions or tensions caused generation of an electric low frequency field. Hans Berger believed electrical charges from the brain changed to "psychic waves" which diffused through space and changed again to electric vibrations when they reached the receiver.

Many thought they could be dealing with a new form of energy, a brain factor "so far unknown to us, yet belonging to the highest stage of development of matter." To "discover such energy or factor would be tantamount to discovery of nuclear energy," for "everything that exists in the universe is not discovered yet."

All Agreed. But while theories clashed, all agreed solution of thought transfer must ultimately come through fundamental cybernetical sources and if they could construct a thinking machine that could generate artificial brain waves "designed to influence mental activity of people" the machine would show them how the process worked out in humans!

The West. All of which might have been shrugged off and dubbed thought-out-of-control by the Western scientific community but for the amount of money and calibre of men Russia was pouring into the program. Top-flight rocket pioneer K. E. Ciolkovski told the Soviet press: "The phenomenon of telepathy can no longer be questioned. In this era of space flights, telepathic abilities are necessary."

If Only Half. The famed Dr. J. B. Rhine of Duke University, Durham, N. C., warned "Successful demonstrations were given (in Russia), including induction of hypnotic states. The experiments were successful even when the subjects were inside chambers with an entrance trap door which, when closed, was submerged in a gully filled with mercury."

While our Director of Biotechnology and Human Research in the NASA Office of Advanced Research, Dr. Eugene B. Konecci, recognized that if the results of these experiments are "half as good as claimed," the Russians "may put a human thought in orbit" before we do. Konecci says Soviet Russia gives this program "top priority under its Soviet manned space program," may achieve man-to-man communication with men on the moon before we do, and even now strives to build an "electronic hypnotizer" to send thought suggestion over distances.

From Space. But commenting on American efforts, the top Doctor can only say: "Specific U.S. experiments (not NASA) in energy and information transfer phenomena . . . are being carried out . . ." and mentions but one United States scientist active in this field—the famed neurologist, Dr. Andrija Puharich. Puharich, he says, believes we could attempt "energy transfer" tests as part of our space program from a manned orbital laboratory where a human receiver would be in the platform, the "sender" on earth subjected to high gravitational force conditions.

This way he thinks we would find the most effective "interaction of energy transfers" for the brilliant young doctor believes gravitational forces affect thought transfer.

Moon Affects Thought. For he says telepathic tests performed during a full lunar month showed marked improvement during the full moon phase when gravitational forces lowered.

That telepathy exists has been repeatedly shown in the laboratory, but actually rational explanation has been handicapped by the very nature of the phenomenon, the problem of establishing conditions of repeatability in testing. He believes telepathy may well be based on transmission of electromagnetic waves between humans, that it follows definite laws of electronics and physics. In his tests, taped on recorders, he cites experiments between two people, three people "telepathic networks" of four or more, separated sometimes by hundreds of miles.

The Rope. In his book, "Beyond Telepathy," he tells of an experiment staged by Dr. Rudolph von Urban and a Dr. Alexander Pilcz who long studied the Indian Rope Trick. The two scientists gathered several hundred people together with a Fakir, and his helper, to put on a show.

All the people watching the performance, *including the scientists,* saw the Fakir throw a coil of rope into the air, saw a small boy climb up the rope and disappear. A few seconds later, dismembered parts of the boy tumbled to the ground. The Fakir gathered them into his basket, scrambled up the rope and then both boy and Fakir came down smiling.

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Matrix Circuits

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When diode D1 isn't conducting we have a circuit equivalent to the one shown in Fig. 5.

It can be seen that when the input switch is open the diode is out of the circuit. If a VTVM is connected across the output it measures the battery's negative 1.5 volts: through R1. Resistor R1 drops almost no voltage because its resistance is small compared with the VTVM's.

Again, diodes D1, D2, D5 and D13 can be eliminated (shorted out) and their inputs connected directly to the outputs because neither the diodes' isolation or resistance is needed in this circuit.

Matrix Demonstrator. While you can always throw a matrix together on a breadboard just to get the hang of things, it takes just a little extra finesse and a sloping panel cabinet to turn out a classy matrix demonstrator suitable for class discussions, science fairs, or just plain fun for the family's junior members. The unit assembled in this article is made from the schematic diagram in Fig. 1.

The heart of the unit is the matrix which is built on a 2 7/16 x 3 3/8 inch section of perforated board (Lafayette 19G3601). This is a stock size so you won't have any cutting problems. The matrix grid is formed by stretching #22 solid hook-up wire between flea clips (Lafayette 19G3301) at each end of the board. Place a row of nine clips at two opposite sides and connect matching clips together. Stretch the wire as tight as possible laying it flat against the board; wrap the wire around the base of the flea clip. Then mount four clips at the two remaining sides spacing them *two holes apart*; the extra space is needed to avoid jamming the diodes together. Stretch the connecting wires across the top of the clips so you form a grid with nine leads on the bottom and four leads on the top. Make certain the top leads do not sag into the bottom leads.

Any cheap diode of the 1N34 type can be used. The specified type are subminiature and extra-easy to connect. Connect them as shown in the photographs—on end. The cathode is indicated by a color band. If the diode has several bands only one will be on the end—ignore the other bands. Cut the anode lead (the one without a color band) to ½ inch and form a small hook. Snag the hook around one of the nine bottom leads and solder. Do not use a soldering gun, or an iron in excess of 75 watts—the heat will destroy the diodes (there isn't room to use a heat sink). Make the connection fast and with a minimum amount of solder.

Fold down the remaining cathode lead and connect it to the appropriate top lead. Again, solder quickly. If possible, use a different color wire for each input and output connection to avoid a wiring error during final assembly.

The Panel Sub-Assembly. The panel must be completed and pre-wired on the cabinet (sloping panel utility box, Premier ASPC 1202) before the matrix is installed. S1 through S9 are normally-open miniature push button switches; use the least expensive type. For a *professional appearance*, suitable for display, use standard red panel pilot lamp assemblies. For reduced costs, the lamps can be mounted in a ½-inch rubber grommet with the connecting leads soldered directly to the lamps. Wire both the switch and lamp common leads and the battery terminals before installing the matrix.

Insulating the Matrix. The matrix is mounted on the cabinet's bottom plate. Since the flea clips extend through the board the assembly must be raised to prevent the clips from shorting to the cabinet. Place a ¼-inch spacer or fiber washers under the board at the four mounting corners.

Number the appropriate panel lamps—1, 2, 4, and 8. Number the switches in the appropriate order 1 through 9. Connect the 9-volt clip-on battery (Burgess M6), depress any switch and the total of the illuminated lamps should equal the switch number. For example, if 7 is depressed the 4, 2, and 1 lamps (representing 4 + 2 + 1 = 7) should light. Check all switches in a similar manner. If a switch produces an incorrect total either a diode is installed with reversed polarity, a diode is defective, or there is a wiring error.

You are now armed with some solid theory and practical knowledge on the subject of "the matrix." Don't hesitate to put it to full use the next time one of your chums pipes up with big words like *EDP-electronic data processing* or *computer language*. Just pipe in with, "Well let me tell you about *matrix circuits*. They work this way. . . ." You will be solidifying your acquired knowledge and passing some of it on to your buddy at the same time. ■

Discoverer of Radio

Continued from page 85

He points out that almost everything that is known about the dentist's early electrical work comes from the inventor's own records. It is not even known who the "eminent scientists" were who Loomis said witnessed the Bear's Den Mountain test.

After further experimentation, Loomis asked Congress for $50,000 to develop his system. The Congressional Globe of Jan. 13, 1869, reports that Senator Sumner presented the petition with this comment: "I content myself with remarking that it is certainly a great case of moonshine or it marks a great epoch in the progress of the invention." Sen. Wilson: "I do not know if there is anything in the invention; probably there is not; but it is not worth our while to meet any propositions of this sort with a sneer.

Patent Granted. Loomis' request for funds died in committee, but the patent he asked for was granted on July 30, 1872, and the following year Congress incorporated the Loomis Aerial Telegraph Co. The bill was signed by President Grant. Loomis' patent is interesting. He presented and was allowed the broadest possible claim he could make. Anything that would cause electrical signals to be radiated into space, or control them, or detect them, was within the scope of his award.

Loomis was now in a position to become a rich, famous man. He became neither.

Instead, his life from 1878 on went abruptly downhill. His ideas and claims were ridiculed, although in fact he was the first to employ a vertical antenna and RF ground, the first to employ spark signaling, the first to employ kites and balloons for support, the first to specify an "indicator" (now called a detector) in his receiving system, the first to recognize the value of electrical agreement between sending and receiving systems (resonance) and the first to patent a wireless.

No Money—No Fame. Financial panics had been occurring, and these served to cripple Loomis' attempts to raise capital. All told, he sold only 100 shares of his stock at $100 a share and was forced to spend his own money, earned from his dwindling practice and from his lectures, to keep on with his experimental work. Loomis took a job as a geologist in Virginia, sought a consular appointment to New Zealand, practiced dentistry in Chicago for a brief period and at last disheartened, died on Oct. 13, 1886, at the age of 60.

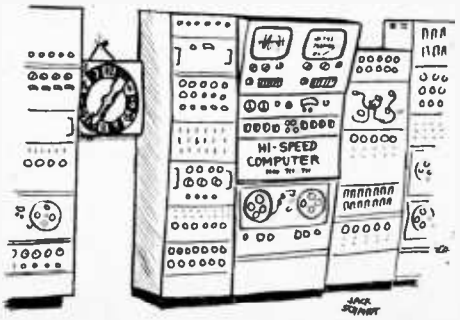
19 Century DaVinci. That Loomis was a great visionary is confirmed by his notebooks, which show that he conceived and described in detail the operation of the recently perfected fuel cell in which hydrogen and oxygen are combined to produce electricity without moving parts, excessive heat or explosion; he predicted communication between planets and space vehicles; and he envisioned mankind some day tapping the celestial "battery" of electrons and other energy particles found in space in order to obtain an unlimited source of power.

These were the far reaches of an extraordinary mind says Commander Appleby. "He was a man with big ideas who was born too soon."

Loomis, a dreamer of lofty dreams, a man of tremendous persistency and the possessor of a strong scientific bent and an acute analytical ability, had a premonitory talk with his brother before his death.

The inventor wanted mankind to enjoy the fruits of his discoverings, maintaining that it would be the means of establishing brotherhood among the nations and races. In Loomis' own words, "In the distant future, when the possibilities of this discovery, as I see them, are more fully developed, public attention will be directed to the originator, and the Congressional records will furnish indisputable evidence that the credit belongs to me.

"It would be gratifying, I confess," the neglected genius continued, "to live to see the world acknowledge such a crank as God employs to move the world. By confining myself to the ordinary routine of affairs, I could have made, no doubt, a comfortable living, even more than a competency—then passed away and be forgotten, but an impulse has driven me I could not resist." ■



Human Thought in Orbit

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Of the several hundred people who watched, all saw the same scene. Yet when motion pictures were developed, pictures showed the Fakir walk into the center of the group, throw the rope into the air. The rope fell to the ground, and the Fakir and boy stood motionless by it. The rope did not stay in the air; the boy did not go up the rope. But everyone present had experienced the same hallucination, there was not one dissent in the crowd. One sender had hypnotized several hundred people. Other Fakirs have been known to hypnotize thousands.

Awesome Weapon. Applied over distances, as the Soviet scientists claim they have hypnotized over a distance of 1200 miles, this "trick" has awesome, frightening connotations. Dr. Rhine points out: "If just a few persons around the world can develop and regulate their super-sensory powers to a reliable degree" it would be impossible for any nation to keep a new weapon secret. Let alone the menacing implication of long-distance hypnosis practiced on hundreds, or thousands of people!

No Research? Yet when we contacted the United States space agency to inquire what this country was doing in this area, the answer was cryptic: "There is no research being conducted by NASA or our contractors in this field." In a field where Russia reportedly concentrates money and top-flight manpower, *in an area that can mean survival of the free world or submission to tyranny*, the U.S. space agency emphasizes "the National Aeronautics and Space Administration is *not* engaged in *any* ESP research." Perhaps our space agency is adopting a "no-talk" policy in this vital area. Perhaps, despite the fact some of our greatest minds, Marconi, Burbank, Edison, believed in mental phenomenon, it is influenced by recent association of telepathy with the esoteric. But whatever the reason, whether the U.S. Agency is not active in this field, or will not assure the people it is active, we must not play ostrich too long.

For in time of serious international emergency, we might find the President of the United States, his Secretaries of State and Defense, the SAC Command, our missile, plane and submarine crews all fast asleep, happily dozing in the Land of Nod! ■

DX from Upper Limbo

Continued from page 90

busses and taxis) plus industrial communications stations. The latter includes a multitude of things but most interesting and most widely heard are the off-shore oil rigs in the Gulf of Mexico which constitute another DX puzzler. For scoring purposes, do they count as international waters or the United States? In any event, here is one way to put realism into your listening, realism ranging from the crisp dispatcher to the oil rig "roughneck."

For the time being, most DX from these utility stations will be via the Sporadic E layer. A minor technical problem is provided by their modulation which is FM. But it's the narrow band variety so if your receiver is not intended for frequency modulation, simply tune to one side of the carrier frequency. With a little practice, you'll have no trouble identifying the station and understanding its transmissions.

All these stations announce their call letters often and those operating from a fixed position (and licenses to communicate only with certain other stations) will have calls consisting of three letters and three digits. To find the general location of any fixed station, consult the "Upper Limbo Call Letter Chart." If you want to report for the purpose of QSL'ing, you can purchase utility lists of industrial and communications stations published by Communications Engineering Book Co., Monterrey, Mass. Write them for prices of the latest editions. ■

". . . Built my own antenna booster . . ."

South Pole Dipole

Continued from page 49

It proved to be the worst storm of the trip until just before time came to break camp and return home. At that critical moment, another fierce blizzard struck.

About the Men. Much of the time the men worked either in bright sunshine or a calm whiteout, a condition under which there is no horizon, no perspective and no shadows. A whiteout is caused by a combination of the unbroken white landscape and a high-altitude fog, which completely diffuses sunlight reaching the icecap.

"Visibility is excellent in a whiteout," said Johnson. "Often you can see for miles. The trouble is, if you notice something you can't recognize, you simply cannot judge if it is a huge object several miles away, or a small object a few hundred yards away."

Snow, cold and constant daylight were not the only problems. A husky dog named Old Byrd Dog Sastrugus became the group's unofficial mascot. One afternoon Sastrugus ate $400 worth of Guy's travelers checks.

"Just try to explain something like that to the American Express Company," said Guy.

Two of the men—Guy and Johnson—flew back early in March, leaving Bob Tighe to load the bulkiest equipment aboard the Seattle-based Navy icebreaker STATEN ISLAND. When the two men reached McMurdo Sound airstrip for their return flight, they found the place in an uproar. Several cracks, one running right through the camp, had been discovered in the 40-foot-thick fast-ice runway, heretofore considered unbreakable. Strong February winds had caused the problem.

Guy and Johnson flew out on the next to the last aircraft to leave the damaged airstrip. A few hours after their departure the runway broke apart and began floating away. ■

Push-Pull Crystal Receiver

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out, and wood finish for a more professional appearance. Here, the parts were placed for reasonably short leads, but some were purposely left long so the parts could be removed and used for other projects. Placement of parts is not critical so you can use your own ideas in locating and mounting the parts. Doing so will develop originality and exercise your ingenuity for more advanced *home brew* projects.

The receiver wiring is simple, but be sure to observe correct polarity on the crystal diodes and electrolytic capacitors. The other major precaution is keeping the amplifier output leads away from the input leads. The mounting board photographs show how the parts are mounted on a 10 in. x 4½ in. panel of ⅛ in. thick composition board. The two-section variable capacitor (C1-C2) is mounted with two or three short machine screws, and the coil form with two 6-32 one-inch machine screws covered with stand-off sleeves about ¾ in. long. If you use a 1½-inch diameter wood dowel as a coil form, mount it with wood screws. Be sure that you use brass hardware *only* near RF coils L1, L2 and L3. Ferrous metals will tap precious RF signals from the tuned circuit.

Winding the Coils. The three coils, L1, L2, and L3, are wound on a 1½-inch diameter bakelite or plastic tube coil form about 3 inches long. If you use a wood dowel or cardboard tubing as a coil form, give it a coat of shellac to moisture-proof it; let it dry thoroughly before winding the coils. The two secondary coils, L1 and L3, are each 95 close-spaced turns of No. 32 enameled copper wire. The primary coil, L2, is 30 close-spaced turns of No. 32 enameled copper wire, wound between L1 and L3 leaving a space of ⅛ inch on either side. All three coils are wound in the same direction. Remember that neatness counts.

The two 2N217 PNP transistors are mounted by their own leads. Use long-nose pliers to function as a heat sink when soldering the transistors and diodes in the circuit. To prevent shorts, use spaghetti tubing over bare leads where necessary.

Finishing Touches. The 10″x 4½″x 2⅜″ cabinet was made of ⅜″ hardwood, and put together with small nails and wood glue. Moisture-proof the inside of the cabinet with shellac, and finish the outside according to your own taste and requirements. Mount the front panel with six flat-head, ½-inch wood screws. The front panel dial knobs, binding posts, and phone jacks can be labeled with typewritten strips or decals. Now, all that remains is to slip on your headphones and tune in those stations! ■

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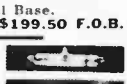

Time your car ignition, use for photo flash, signal light, control device or as strobe light. These flash tubes, filled with Xenon gas, have glass envelopes with sealed electrode at each end. Mfd. by G. E. Instructions incl.

Low voltage tube for low energy repetitive flash applications. Operates on an anode between 120 and 500-V., 2-1/16" lg. x ¼" diam. For ignition timing, uses 130-V. with 30 mfd. discharge capacitor, 4-sec. av. flash rate, 20-hr. approx. life.

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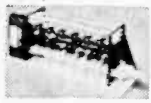

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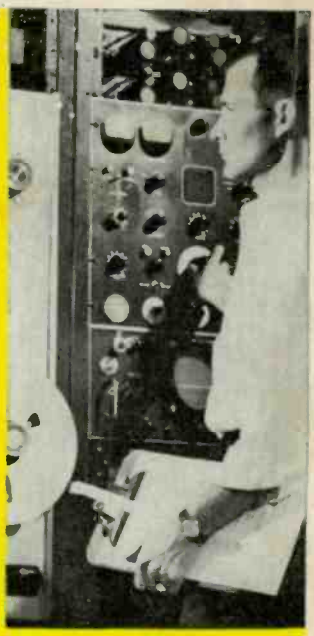

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