RAY-O-VAC

Radio Manual and BROADCASTING STATION *Directory*

FRENCH BATTERY COMPANY
MADISON - WISCONSIN

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FRENCH

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RADIO

OPERATING MANUAL

AND

BROADCASTING STATION

DIRECTORY

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A complete list of Broadcasting Stations in North America and a Guide for the location and elimination of trouble in Radio Receiving Sets.

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Introductory Note

RADIO, as a means for entertainment, education, and the dissemination of general information, has reached a high degree of development.

Standard radio instruments themselves have reached a degree of excellence comparable to the precision work in fine motor cars.

The "Operating Manual" portion of this booklet is offered to the radio enthusiast with the hope that it will help to overcome any of the difficulties which may prevent the efficient operation of a set. The normal condition of a radio set is a healthy one. This book of instruction in the proper operation of a radio set is comparable to the instruction book which every wise owner of a motor car will always have on hand.

INFORMATION FOR THE BEGINNER

WHEN the "around the world" aviators reached the end of their trip at Boston, one of them made a speech over the radio. The newspapers wrote this event up under the headlines "Air Hero Makes Radio Speech From Boston While Mother Listens In From Pacific Coast." When a political speaker recently talked over the radio, the papers told of the millions who listened to him.

Such articles as these, often written by reporters who have never even operated a home radio set give the impression that all the radio owner has to do is to push a button, call the number he wants, and listen in, just as over a telephone, regardless of time of day or night, winter or summer, in fair or stormy weather.

To avoid disappointment you should realize at the start, that a radio is not like a phonograph. It is not always ready to bring in any station you want. Weather conditions, local buildings, hills, and other obstructions exercise a marked effect on the operation of all radio sets.

Broadcasting stations that are entirely out of range in the daytime may come in loud and clear at night. The night range is approximately ten times that of the daylight range. In winter, when trees have lost their conductive sap, when the air is dry, and atmospheric electricity (static) is at a minimum, greater distances can be covered, and more freedom from static interference is enjoyed.

If the above is new to you, don't let it discourage your interest in radio, for it is this very uncertainty that makes radio attractive. How many fishermen would there be if it were only necessary to drop in the hook in order to pull out a five-pound bass? One of the most fascinating features about radio is that you can sit down at your set and listen to nearly any form of entertainment that you please, from coast to coast; and the next night you may hear an entirely different set of stations. Of course the powerful stations that are near, will be readily tuned in night after night, at will. But for real distant stations this is not the case. Some radio enthusiasts find their pleasure in listening an hour at a time to the excellent programs. Most of them would rather listen to one number, just long enough to find out the location of the station. Then they are ready to turn to another, content with tuning in as many stations as possible.

General Information

THERE are as many types and classes of radio sets as there are motor cars. There are broad principles of design that must be followed in all sets. In addition to the necessary parts there are many refinements and improvements which are found in the better class sets.

Fifteen years ago automobiles were sold without top, windshield, or side curtains. These "unnecessaries" were available, but at an added price. Today a good automobile is really not complete unless it has a closed body, balloon tires, speedometer, bumpers, and countless other refinements that we now look upon as things which should go with any good car.

Likewise, in the early days of radio, an amplifier or loud-speaker was looked upon as an admirable equipment for the scientific laboratory, but beyond the hopes of the amateur enthusiast. Today nearly any radio fan contemplates a ten-tube super-heterodyne with considerably less emotion than we used to display toward the first "quick-detachable" tire. So when you buy a radio set remember that you have the opportunity to purchase anything from a "flivver" to the Rolls-Royce of the radio; your choice depending on your needs—and also on your purse.

Radio Essentials. Every radio set must have in some form or another, these two units: (1) the tuning unit, (2) the detector unit.

The tuning unit or tuner, is for the purpose of **selecting** the broadcasting station you wish to hear, and **rejecting** all others. It is composed of one or more coils (of wire) and condensers, the electrical value of which can be varied by means of the knobs on the panel of the radio cabinet. Just as the violinist tunes his instrument to the piano which is to accompany him, so the radio set must be tuned to the broadcasting station you desire to hear.

The detector changes the electrical impulses received from the broadcasting station into such a form that they will actuate the phones, and thus reproduce the sounds which originate in the broadcasting station studio.

Radio Refinements. The above units represent the radio set in its simplest form. Improvements on this two-unit radio set almost invariably take the form of (1) low-frequency amplifiers (commonly called audio-frequency or tone-frequency amplifiers), and (2) high-frequency amplifiers (radio frequency), and the tuning units which the latter include.

The low-frequency, or audio-frequency amplifier, serves one purpose: to build up the currents given out by the detector to a point where they are stronger, usually for the purpose of operating a loud-speaking horn. Regardless of the strength of the incoming signals, a detector alone is not sufficient for this.

The high-frequency, or radio-frequency amplifier serves one or more of three purposes: (1) it builds up signals which are received in the aerial but too weak to actuate the detector, to a point where satisfactory reception is possible, or (2) it makes the use of an aerial unnecessary, due to its great sensitivity, or (3) by means of the tuning coils embodied in the amplifier, it gives great **selectivity**, that is, assists the primary tuner to reject unwanted signals. The radio-frequency amplifier comes ahead of the detector, and is used **only** for the three purposes mentioned, and never for the operation of a loud speaker.

A study of the above will make it easy to understand the part which follows, on "Types of Radio Receiving Sets."

Types of Radio Receiving Sets

The man who wants a means of transportation finds that there is no lack of vehicles that will serve his purpose. He may buy a bicycle, motorcycle, or an automobile. He may buy a Ford, a steam car, an electric, or a Rolls-Royce. The purchaser of a radio set finds that there are no less numerous possibilities in the field of radio communication. In an attempt to classify these in a logical fashion that will help the prospective purchaser of a radio set, we present the following:

1. **The Crystal Set.** Simplest of all radio sets, this consists of a tuner and a crystal detector containing Galena, Silicon, or some patented composition which functions as a detector without the use of batteries or vacuum tubes. Its average range with a good aerial does not exceed 25 miles. Its outstanding features are low cost, simplicity, and clearness of signals received. Worthless for long distance reception except when used with a radio-frequency amplifier.

2. **Two-Tube Regenerative.** Requires batteries. Consists of two tubes,—a detector-tube and one audio-amplifier tube. Uses a coil in the plate circuit of the detector tube to produce regeneration, and so increase signal strength of incoming signals. In considerable use by amateurs for receiving short wave code signals. Special short wave coils are used in the tuning circuit capable of being tuned to short wave signals, usually used with head phones.

3. **Five to Six Tube Tuned Radio Frequency Set.** This type and the type discussed under No. 4 have largely replaced the three tube regenerative sets of former years. If properly made, they do not radiate power to the antenna circuit, as was the case with the three and four tube regenerative types of radio receivers, and so avoid causing radio interference. Special tuning coils are usually provided in this type of receiver which reduce magnetic coupling between radio frequency stages, thus preventing oscillation of radio frequency amplifier tubes. Sometimes all three stages of radio frequency are tuned by a single gang-condenser which operates from one dial, in this way cutting down tuning controls to one dial. Frequently, however, the antenna circuit is tuned by a separate condenser, thus permitting greater selectivity from the receiver. The use of straight line frequency tuning condensers gives equal spacing on the tuning dial between broadcasting stations. Two stages of audio frequency amplification are used. This set gives satisfactory operation of loud speakers on nearly all broadcasting stations. An adequate source of "B" battery voltage, such as the heavy duty type of "B" battery, is required for this type of receiver.

4. **Neutrodyne Radio Frequency.** Usually built in four, five, or six tube models. These sets have two or three stages of radio frequency amplification so balanced by the patented neutrodyne principle that high selectivity is obtained, as well as great volume amplification. Two stages of audio frequency amplification permit the use of a loud speaker on nearly all occasions. The refinements of single dial control and straight line frequency tuning condensers have also been added to this type of radio receiver. Some method of supplying high plate voltage, such as the use of the heavy duty "B" battery, is required for this type of radio receiver.

5. **Super-Heterodyne.** The super-heterodyne is built in all sizes, six to twelve vacuum tubes are most common, with the average about eight. In principle it is decidedly different from other sets. Instead of tuning each stage of radio-frequency amplification to the incoming signal, the super-heterodyne requires no variation of the amplifier circuits, but instead changes the frequency of the signal to meet the fixed values of the amplifier circuits. Although the most complex in construction it is one of the easiest sets to operate. It is primarily meant for use with a loop aerial, which may fit inside the cabinet, thus making the set entirely portable. As with any "loop" set, however, best results will be obtained when an outside aerial is used. When an aerial is used with such sets, however, it must be connected to a coil several feet from the set, instead of direct-connected, as the high sensitivity of these sets makes a closer connection unnecessary.

The high efficiency of the intermediate frequency amplifier in super-heterodyne sets makes possible the use of dry cell tubes, such as the UX199 and CX299. A complete dry cell battery installation can be used. Special radio "A" dry cells are used for the filament current, and dry cell "B" and "C" batteries, for plate and grid circuits. Loop aerial operation, together with the possibility of using dry cell batteries to energize all circuits, makes the super-heterodyne set peculiarly adaptable as a portable radio set. Your dealer can give exact information on any particular set and on the best connections.

Reflex Sets

The fact that universal vacuum tubes, such as the UX201-A and UX199, may be used for radio frequency as well as audio frequency amplification, is made use of in the type of receiver known as the reflex set. In the reflex circuit a vacuum type operates simultaneously in amplifying both radio and audio frequencies. The name reflex signifies that the circuit doubles back on itself. A signal which has gone through the detector tube is brought back to the radio frequency tubes again and put through the same tubes as audio frequency. The distinctive feature of the reflex set is that it operates on fewer tubes than does the usual five or six tube set. A reflex set is usually a difficult problem for the beginner who wishes to build his own set. Even the factory-built reflex sets have not had all their problems solved. There is, however, a decided saving in cost and maintenance on a reflex set which works properly. The principle of the reflex set is not new. It has been used by the army and in France for about ten years.

NOTE

All vacuum tube sets require "A", "B", and sometimes "C" batteries and either head phones or a loud speaker or both. An aerial is necessary in order to get best results from practically all sets. However, some radio-frequency sets operate well on a long indoor aerial. Lamp socket aerials are very satisfactory in many places. In others they completely fail. Dealers usually sell them on a returnable basis for this reason.

Wave Traps

It frequently happens that the broadcast from an interfering station is being received along with the broadcast which you desire to hear, and the selectivity of the set is not good enough to tune out the interfering station. In order to give the set additional selectivity, use is made of what is called a wave trap. This is a combination of an inductance and a condenser, usually connected between the aerial and the antenna binding post of the set. In operation, the wave trap is tuned to offer an extremely high resistance to the interfering wave, which is thus prevented from entering the radio

set. A wave trap will exclude only one station at a given setting. Therefore more than one wave trap is required where it is necessary to tune out more than one interfering station at a time.

Wave traps which cover the broadcast range can be bought in radio stores, or the proper inductance and condenser can be bought and the wave trap constructed at home. When the interference is coming from a strong local station, the coils of the set may be picking up the signal. In such cases a wave trap will not tune out the interference unless the coils of the set are properly shielded with metallic shields to block the heavy local signal away from the coils of the set.

Loud Speakers and Amplifiers

A loud speaker is not an amplifier. A loud speaker can only transform a given amount of electrical energy into sound energy. That is, the amount of electrical energy received on the aerial is insufficient, when transformed into sound energy, to fill a room with sound. A loud speaker cannot be connected directly to a crystal or a one-tube set and give reception loud enough to be satisfactory for a room.

The combination of radio set and loud speaker should be such that satisfactory volume is obtained without overworking either tubes or batteries. This is an important point because there is a tendency on the part of some operators, when satisfactory volume is not being received, to turn up the filament rheostats of the radio set as far as they will go in order to increase the volume. Such practice will rapidly exhaust tubes and will also drain both "A" and "B" batteries unnecessarily.

The amplifier increases the electrical energy from the set to a point where it will operate the loud speaker with sufficient volume. The amplifier amplifies audio frequencies after they have been rectified by the detector tube. The amplifier may be a component part of the radio set or may be connected to the radio set by external connection. When such external connection is made, the amplifier is usually coupled to the first audio amplifier tube of the radio set. It may, however, be coupled directly to the detector tube of the set. Present amplifiers, usually, make use of the new power tubes, such as the UX171, or for even greater volume tubes such as the UX210.

The use of resistance coupling instead of audio-frequency transformers in the audio-frequency end of radio sets is being used in many amateur and some commercial sets. The windings of the transformers are avoided by this method of amplification and greater clarity is obtained. A condenser connected across the resistances transfers the signal from one tube to the next. Special resistance units and mountings for the whole amplifier are now being manufactured.

For proper reproduction a loud speaker should receive all audio frequencies between 60 and 5000 cycles without over-emphasis or repression of any frequencies. In general, two types of loud speakers have been manufactured for radio. These are the cone and horn type speakers.

The cone type speaker is a disc or saucer shaped speaker in which the vibrating surface pushes directly against the outside air. The cone type speaker has been generally credited with superior reproduction of low frequencies, such as the bass notes, as compared with the horn type speaker.

In the horn type speaker the air column in the horn is caused to vibrate by a movable diaphragm. This diaphragm does not beat directly against the air, as in the case of the cone speaker, but communicates its vibrations to the air chamber of the horn. Recently, a type of horn speaker, known as the exponential horn, has come on the market. Its distinguishing feature is that the cross section area of the horn doubles at fixed intervals along its length. The rate at which the horn expands determines the lowest frequency to which the speaker will respond. By increasing the rate of expansion in correct ratio, the exponential horn speaker may be made to respond to all frequencies occuring in radio broadcasts. The exponential horn is said to do away with the advantage of the cone type speaker in reproducing low frequencies more faithfully than the horn type speaker.

Aerials, Loops and Counterpoises

IN THE past all radio sets depended on aerials or elevated wires to "catch" the radio impulses and bring them to the set. With the widespread popularity of the home radio, the erection of an aerial has been something of a problem, particularly in districts where there were many apartment buildings. This condition has led to the adoption of "trick" aerials of many kinds, and also to the

popularity of many-tube sets, which will operate over long distances without the use of an outdoor aerial.

Substitute aerials include bedsprings, fire escapes, indoor clothes lines (metal), wires concealed behind picture mouldings, and the like. All of these fulfill their purpose in some degree. Still more effective substitutes are small aerials built in the top story of the buildings, and patterned after the outdoor aerial. These work, in many cases, nearly as well as the outdoor installation." Aerial Plugs," to be connected to the lamp socket, are often as satisfactory as aerials; although they sometimes fail completely, the results being dependent mainly on the conditions in the wiring of the house. For this reason, most dealers will sell these plugs on a trial basis. Whenever practical, however, it is urged that standard installation be used.

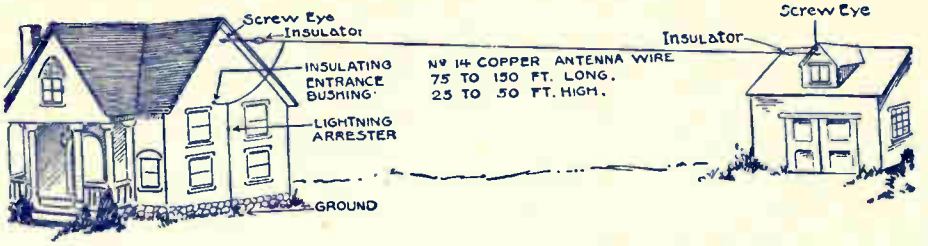
In order to make up for the inefficiency of the above makeshifts, it was found desirable to increase the sensitivity of the radio set itself, to overcome the losses introduced at the start. This has been accomplished mainly by the use of more and more vacuum tubes as amplifiers. Eighteen months ago a five tube set was a curiosity; today eight and ten tube sets are common. It was found that by increasing the sensitivity of the set, the same results could be obtained with smaller aerials, until finally it was found that a simple coil of wire about eighteen inches in diameter, and with about ten to twenty turns of wire would serve as a collector, without the use of a ground connection or aerial of any other kind. This "loop" aerial is all that is needed with many sets of three to twelve tubes, for receiving from distances up to several thousand miles. The loop also possesses the property of receiving best from the direction in which it is pointed, which is an aid in eliminating unwanted signals. To operate a loop it is necessary to use several stages of radio-frequency amplification. The most popular loop sets are those with plain radio-frequency amplification or those with the super-heterodyne feature. By using the reflex principle, the same tubes can be made to serve as radio-frequency and audio-frequency amplifiers. Satisfactory loop sets may be made with as few as three tubes.

The natural thing might seem to be the combination of these ultra-sensitive sets with an outdoor aerial. But the advantage of both can be secured only to a limited degree, for this reason: There seems to be a certain distance, beyond which no set can receive. Of course the actual distance will be governed on any particular date by atmospheric conditions. But, although the super-sensitive sets may bring in signals that are inaudible to the ordinary good sets, the static and other interferences will also be amplified by the super set, so that the very distant signals are unintelligible, though audible. There is always some static in the atmosphere, although you may not hear it. Connect up a more sensitive set than the one you have been using, and, while you may bring in more distant stations, you will usually also bring in static enough to blanket them.

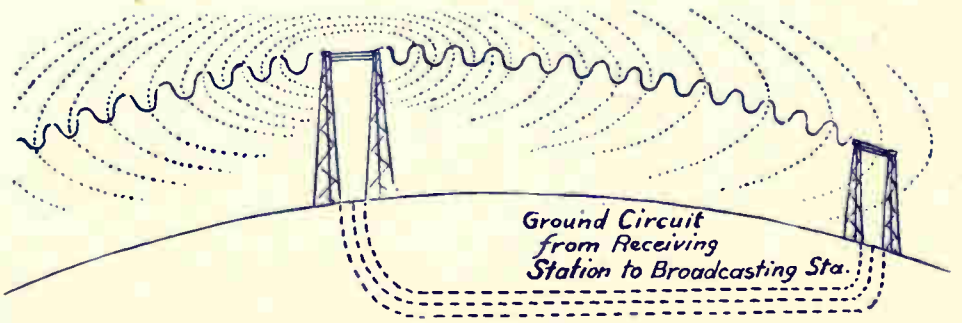
There is this much to be said, for the use of an aerial with a loop set: If the set does not bring in distant stations as well as others which use an aerial, a small aerial can be erected, and merely passed through the room in which the set is located, the lead-in being one or two feet from the loop. This will usually increase the range of the set. Or instead of leading directly to the ground, the lead-in may pass through a small tuning coil, or fixed coil and condenser. Your dealer can give you data on the size of coil that will be best for your set. As a rule, a tapped coil, with fifty turns and about ten taps, will be right for all purposes.

The loop will pick up energy from the lead-in without any physical connection. Of course this will remove the directive property of the loop to some degree.

In using an outdoor aerial, it has been found that under some conditions better results could be obtained by using a "counterpoise" in place of a connection to the ground. The customary means to a "ground" is by connection to water pipes, radiators, or rods driven into moist ground. The counterpoise is really little more than a second aerial, ordinarily nearer the earth than the aerial, but not necessarily so. The counterpoise is insulated from other objects in the same way as the aerial itself. It may be twenty to fifty feet or more from the aerial, or it may be a fraction of an inch from it. Some manufacturers are now making "counterpoise aerial wire", which has a core of copper wire, which is the aerial, a composition insulating jacket, and a braided wire covering over that, the latter being the counterpoise. The unit is erected just as an aerial, with two lead-ins; one from the inner wire, which attaches to the "aerial" post on the set, and the other from the outer braided covering, which goes to the "ground" terminal. In dry climates a counterpoise is usually



Radio waves traveling out in all directions from transmitting to receiving stations.



A typical antenna system for a radio receiving station

preferable to a ground, and the same is often true in other places where the ground connection is not perfect.

The day of the long aerial is past. The best length for broadcasting purposes is about fifty to sixty feet. The lead-in should be as direct as possible, and should touch as few insulators (and nothing else) as possible. There is a theoretical advantage in using stranded wire, which advantage is seldom evident in a practical sense. Theoretically the best aerial wire is that which is made up of a number of strands of enameled wire braided together. There is absolutely no advantage in using more than one wire in the aerial, although some people persist in erecting three and four wire aerials. A four wire aerial is of advantage only when a transmitting outfit is used.

Lightning Protection. With a loop or an indoor aerial there is of course no need for lightning protectors. In the case of the outdoor aerial, the condition is somewhat different. During a lightning storm the aerial picks up a considerable amount of static electricity, which should have a fairly easy path to the ground, in order to protect the receiving instruments. The danger is not that the lightning will strike the aerial and then set fire to the house. If lightning strikes an aerial, it burns up the wire before it gets to the ground—but the static charges coming from flashes of lightning some distance away are liable to do some harm if not provided for by a grounding switch or protector of some kind.

Any good lightning protector, approved by Underwriters, will serve. An aerial so protected actually makes the house more safe than when there is no aerial. If a counterpoise is used, it should be protected in the same way as the aerial.

Radio Batteries

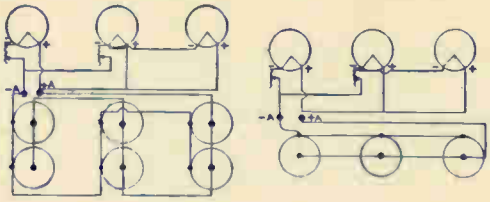
RADIO batteries are called "A", "B" and "C" batteries. The "A", "B" and "C" refers to the particular circuit of the radio set which is served by the battery.

Radio "A" batteries are of two general types, storage "A" batteries and dry cell "A" batteries. Storage batteries are required for the economical operation of all radio tubes which use more than ¼ ampere for lighting filaments. Such tubes are the UV200, C300, UV201 and C301. Storage batteries have the advantage over dry cells in that they can withstand heavy current drains without losing voltage efficiency. They are open to the objection that they require recharging; and that their sulphuric acid electrolyte is extremely corrosive. Dry cells have the advantages of light weight low initial cost, and low maintenance cost, if properly used, on dry cell types of vacuum tubes. The dry cell electrolyte remains inside the cell during its discharge, and the cell may be used without any especial attention until its energy is exhausted.

The purpose of the "A" battery in the radio set is to heat the filament in the tube to the point where it will expel sufficient electrons to permit the "B" battery to function. It has no other purpose. For the convenience of those who use dry cells as "A" batteries, the most economical grouping of cells for each particular radio tube is shown below.

Proper Number of Cells for Radio "A" Batteries

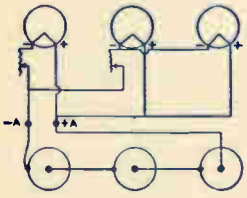
Perhaps the most important consideration for securing the best results is to use the right number of cells and to connect them properly. The combination differs with each type of tube.



WX11, WX12, CX12 and any 1½ Volt Tubes

Not less than one and preferably two dry cells for each tube in the set. (See diagram directly above at left.)

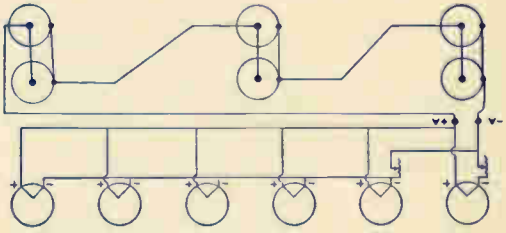
Dry cells should be wired in parallel when more than one cell is used. (See diagram directly above at right.)

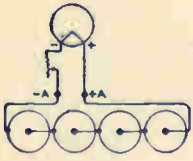


UX199, CX299, DV3 Tubes and any 3 Volt Tubes

Three dry cells in series for one to three tubes. (See diagram at left.)

For four to six tubes, three banks of two dry cells each in parallel; the three banks connected in series. (See diagram directly following.)

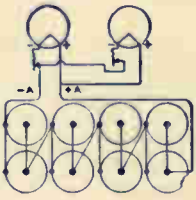




UX201-A, CX301-A Tubes

Four dry cells in series for a single tube.

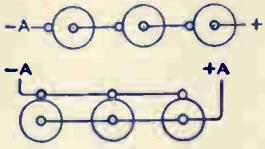
For two tubes, use four banks of two in parallel, the four banks connected in series.



For three tubes, four banks of three in parallel, the four banks connected in series. However, a storage battery is recommended for three or more tubes. (See chart, page 13.)

For four tubes, four banks of four each in parallel, the four banks connected in series.

Connection in series means connecting center or carbon post of one cell to the zinc or outside post of the next cell. (Upper diagram at right.) Connecting in parallel means connecting center post of one cell to center post of next cell, and zinc or outside post of one cell to zinc or outside post of next cell. (See lower diagram at right.) A bank of four cells in parallel would have all center posts connected together and all zinc posts connected together. To connect this bank in series to another such bank, connect zinc post of end cell of one bank to end carbon or center post of next bank.



Follow these diagrams carefully with reference to the particular tubes in the radio set in order to get maximum efficiency from dry cells. Parallel and series grouping of dry cells as required of certain tubes is shown more clearly by these diagrams than can be done descriptively. Special attention is directed to the use of three (not two) dry cells in connection with UX199, CX299, or DV3 tubes in order to maintain the battery voltage at the point where it will efficiently operate these tubes. The "B" battery furnishes the electrical energy which actuates the loud speaker or phones of the radio set. Without the "B" battery the radio set would be dumb. Through the wonderfully delicate control of the grid element of the tube on the electron flow from filament to plate, the "B" battery energy is released in modulated trains corresponding exactly to the sounds introduced into the transmitter at the broadcasting station.

With the exception of the UV200, or C300 soft detector tube, the amount of "B" battery voltage applied to the detector tube may be either 22.5 or 45 volts. Radio-frequency and audio-frequency amplifier tubes require high "B" battery voltages—varying from 45 to 135 volts, depending on the tubes, radio sets used and the amount of volume desired from the set. In general high "B" battery voltages applied to audio-frequency tubes will give greater volume. The 45 volt "B" battery is the highest voltage unit now being made by battery companies. Where higher "B" battery voltages are desired for amplifier tubes either 22.5 volt or 45 volt blocks are connected in series. For instance four 22.5 volt "B" batteries with three of the +22.5 volt terminals connected to three of the — "B" terminals will give 90 volts at the last or open +22.5 volt terminal. Similarly two 45 volt batteries with one + 45 volt terminal connected to one —"B" terminal will give 90 volts at the free or open + 45 volt terminal. "B" batteries are made in both horizontal and vertical types, present popular taste preferring the vertical types because the battery in this position does not occupy as much table space. Horizontal and vertical types are equally efficient. "B" battery energy, like many other commodities, becomes much cheaper when bought in quantity. To illustrate: Two No. 4151 22.5 Volt Ray-O-Vac Batteries will cost $3.00. Whereas one No. 9303 45 Volt Ray-O-Vac "B" Battery which contains ten times as much electricity will cost $4.75. This makes electricity from the No. 9303 battery 6½ times cheaper than from the two No. 4151 Ray-O-Vacs.

Before connecting batteries to a radio set it is a wise precaution to first connect the "A" battery to the — "B" and + "B" binding posts. If the tubes light, some connection is wrong. This should be corrected before the high voltage "B" batteries are connected to the "B" battery binding posts. This simple test may save a whole row of tubes and is well worth while.

"B" batteries are blamed for much extraneous noise which occurs in radio sets. Most often the noise is not in the set at all. A simple test to determine this is to disconnect the aerial and ground wires of the set, leaving the batteries connected. If the extraneous noise disappears it is not in the set at all, but comes from some interference which reacts on the aerial or ground.

"C" Batteries

"C" batteries are used in the grid circuits of audio amplifying tubes to prevent large positive swings of grid voltage, which will cause distorted reception. They also reduce enormously the amount of current drawn from "B" batteries by audio amplifier tubes. (See table of tube characteristics which shows "B" battery currents drawn by various types of vacuum tubes with and without "C" batteries). The remarkable reduction in "B" battery current produced by the use of the proper "C" battery make it practically indispensable in present day radio sets. A "C" battery, which costs only a fraction of the price of a 45 volt "B" battery may save an entire replacement of a set of "B" batteries totaling 135 volts.

The "C" battery therefore pays for itself many times over. The amount of current taken from the "C" battery is very small. It will therefore last a long while in a radio set. The proper Ray-O-Vac "C" batteries for various values of Ray-O-Vac "B" battery voltages are shown in the battery chart. For special information on "C" batteries, a folder, "Ray-O-Vac Radio "C" Batteries", form 234, will be sent on request.

How To Test Ray-O-Vac Batteries

TESTING "A" BATTERIES. To determine whether a dry cell "A" battery is still serviceable connect it to the "A" circuit of the set and turn on the filament rheostats so that all tubes of the set are lighted. Now test with an accurate voltmeter, preferably one that reads to a hundredth of a volt, the voltage across the terminals of the "A" battery. Under these conditions, the battery voltage is being tested under the load which it must carry in actual service. If the voltage shown is above the voltage rating of the tube (this rating is usually found printed on the tube base), the battery is still capable of giving service. On this test fresh "A" batteries should show a drop only slightly lower than their open circuit voltage which is about 1½ volts per cell. Open circuit amperage readings on Radio "A" batteries do not give any information about the quality of an "A" battery and may even prove misleading, as some factors in dry batteries which really make for a more uniformly maintained voltage on a load will lower the open circuit amperage reading.

Never use an ammeter in testing "B" batteries. A test with an ammeter drawing 8 amperes for three seconds will consume enough "B" battery energy to run a detector tube for 10 hours, or a UX201-A amplifier tube at 90 volts on the plate for a full hour.

"A", "B" and "C" Socket Power Units

Devices designed to permit the use of ordinary house lighting circuits for furnishing the voltage and current required to run a radio set have appeared on the market within the last three years. These devices have been advertised under the names "A", "B", and "C" "Eliminators". Recently the more positive name, "socket power unit", has been proposed for this class of power supply devices, the name referring to the fact that they take their power from the light socket.

Radio in its present stage of development requires direct current for plate, grid, and filament circuits, with the exception of the new A. C. Tubes and the last audio amplifier tube, usually a power tube, which can make use of alternating current for heating the filaments. Practically all house lighting circuits employ alternating current. The socket power unit is a device for changing this alternating current to direct current. In its usual form, whether it is a "B" or "C" socket power unit, it consists of a transformer to increase or decrease the voltage of the house lighting circuit, a rectifying device to change the alternating current to direct current, and a filter to smooth out the pulsations of the rectified current.

"A" socket power units have been made in a number of different ways. Perhaps the most popular method has been the use of a small storage battery connected to a trickle charging device, which is automatically switched on when the filament switch of the radio set is turned to the "off" position. The trickle charger then begins immediately to charge the small storage battery.

Other "A" socket power units operate on the same plan as the "B" and "C" socket powers except that they furnish current at 6 volts. Recently, rectifying tubes have appeared on the market which can furnish up to 0.3 ampere. By connecting all the filaments of the radio set in series and increasing the voltage sufficiently to compensate for the voltage drop in the tube filaments, the output of direct current from such tubes will suffice to run a radio set, if the last tube, the power tube, which draws 0.5 ampere, is run on alternating current.

Recently metallic rectifiers have appeared which are made in Cartridge form. In combination with a proper filter, they will furnish enough current to run the filament circuits of most radio sets.

By use of step-up transformers, "B" socket power units can furnish the high voltages required for power tubes, such as +180 volts. The rectified current, which has passed through the rectifying tube, is then passed through the system of choke coils and condensers, called the filter, to smooth out the pulsations in the direct current. The current is then delivered to a resistance. By taking off taps at various points along this resistance, the different voltages required for a radio set, such as 45 volts, 90 volts, 135 volts, and 180 volts are made available.

BATTERY CHART

Showing Proper Ray-O-Vac "A", "B" and "C" Batteries for Your Set

No. of Tubes	Type of Tube	Proper Ray-O-Vac "A" Battery	Proper Ray-O-Vac "B" Battery	Proper Ray-O-Vac "C" Battery
1*	UX199—CX299—DV3	3 No. 1211's in series	1 No. 2153	None
2	UX199—CX299—DV3	3 No. 1211's in series	1 or 2 No. 2303's	None
3	UX199—CX299—DV3	3 No. 1211's in series	2 No. 2303's	1 No. 231-R
4	UX199—CX299—DV3	6 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
5	UX199—CX299—DV3	6 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
6	UX199—CX299—DV3	6 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
7	UX199—CX299—DV3	9 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
8	UX199—CX299—DV3	12 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
1	UX120 or CX220 with 4-5-6 or 7 UX199 or CX299	Same as for UX199 or CX299	2 No. 9303, 1 No. 2303	1 No. 5151
1	WX11—WX12—CX11—CX12	2 No. 1211's (see p. 10 to 11)	1 No. 2153	None
2	WX11—WX12—CX11—CX12	4 No. 1211's (see p. 10 to 11)	1 or 2 No. 2303's	None
3	WX11—WX12—CX11—CX12	6 No. 1211's (see p. 10 to 11)	2 No. 2303's	1 No. 231-R
4	WX11—WX12—CX11—CX12	8 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
5	WX11—WX12—CX11—CX12	10 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
6	WX11—WX12—CX11—CX12	12 No. 1211's (see p. 10 to 11)	2 No. 9303's	1 No. 231-R
1	UX201A or CX301A	4 No. 1211's in series	1 No. 2153	None
2	UX201A or CX301A	8 No. 1211's (see p. 10 to 11)	1 or 2 No. 2303's	None
3	UX201A or CX301A	Storage Battery	2 No. 2303's	1 No. 231-R
4	UX201A or CX301A	Storage Battery	2 No. 9303's	1 No. 231-R
5	UX201A or CX301A	Storage Battery	2 No. 9303's and 2 No. 9303's and 1 No. 2303*	1 No. 231-R or 2 No. 231-R's
6	UX201A or CX301A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
7	UX201A or CX301A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
8	UX201A or CX301A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
1	UX112 or CX112 with 4-5-6 or 7 UX201A or CX301-A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
1	UX171 or CX371 with 4-5-6 or 7 WX201-A or CX301-A	Storage Battery	2 No. 9303's and 1 No. 2303	1 No. 231-R and 1 No. 5151
1	UX171 or CX371 with 4-5-6 or 7 UX201-A or CX301-A	Storage Battery	Plate voltages of +157½ or +180 volts	2 No. 5151's

*UX199 and C299 are the same electrically as UX199 and CX299, the difference being in the base only.

(Continued on following page)

BATTERY CHART (Continued)

Showing Proper Ray-O-Vac "A", "B" and "C" Batteries for Your Set

No. of Tubes	Type of Tube	Proper Ray-O-Vac "A" Battery	Proper Ray-O-Vac "B" Battery	Proper Ray-O-Vac "C" Battery
1	UX240, or CX340 with 4-5-6 or 7 UX201-A or CX301-A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
1	UX240, or CX340 with 1 UX112 or CX112 other tubes, UX201-A or CX301-A	Storage Battery	2 No. 9303's and 1 No. 2303	2 No. 231-R's
1	UX240, or CX340 with 1 UX171, or CX371, other tubes UX201-A or CX301-A	Storage Battery	2 No. 9303's and 1 No. 2303	1 No. 231-R and 1 No. 5151
1	UX240—same as directly above	Storage Battery	+180 volts or higher	2 No. 5151's
1	UV200 Detector in any combination		1 No. 5151 as Detector "B" battery	
1	UX200-A or CX300-A Detector in any combination		No special "B" battery required	
1	UX240 or CX340 as Detector		2 No. 9303's and 1 No. 2303	1 No. 231-R
1	UX240 or CX340 as Detector		+180 volts	1 No. 231-R

Vacuum Tubes

THE vacuum tube is the very heart of a modern radio set. It is used in transmitting stations as well as in receiving sets. In the home radio set, vacuum tubes are used for two purposes: as detectors, and as amplifiers. The detector serves to change the character of the waves into electrical impulses which will operate the "phones". When used as an amplifier, the vacuum tube either strengthens this phone current so that it will operate a loud speaker (audio- frequency amplifier), or it builds up weak incoming waves to a point where they will operate the detector (radio-frequency amplifier). As mentioned before, all sets use a detector. Many use both detector and audio-frequency amplifiers. Some use radio-frequency amplifiers as well.

The vacuum tube consists of three essential parts enclosed in a glass envelope, from which the air has been exhausted. In the center is the **filament**, which is heated to a point near incandescence by the "A" battery. Next to the filament is the **grid**, a metal ladder or screen, and on the other side of the grid is the **plate**, a square or tubular piece of metal.

The heated filament gives off electrically charged particles of matter, which fly past the grid, to the plate. The incoming current, which is impressed on the grid, causes that element to regulate the flow of current from the filament to the plate, so that the tube may serve as a relay or amplifier. A weak current entering at the grid is increased by the local current emanating from the hot filament so that the current leaving the plate is a **magnified duplicate** of the current that entered by way of the grid. This is the function of amplification. The detecting of the wave, or making it change to such a form as will operate the phones, is also done by means of the grid electrode, which modified the current passing through the tube. The four prongs at the base of the tube are the terminals of the enclosed elements; two for the filament, and one each for the grid and plate. The prongs should be kept clean, to assure good contact with the socket.

New Developments

New developments in vacuum tubes are the new detector tubes UX200A, UX240, or their equivalents and the new "power" tubes UX112, UX171, and UX240, or their equivalents, the last being both a detector and amplifier tube.

The UX200A is an extremely sensitive detector tube of the gas filled type. It is similar to the old UV200, except that it operates on ¼ ampere, and is not critical regarding plate voltage. It operates on 45 volts of "B" battery. The UX240, primarily an amplifier tube, may also be used as a detector tube when quality is desired instead of extreme sensitivity. As a detector tube it operates at 135, or 180 plate voltage with either a grid leak and condenser or by means of "C" battery voltage. A "C" battery furnishing 1½ volts is required when the tube is used as an amplifier with 135 volts, "B" battery, or —3 to —4.5 volts of "C" battery, when 180 volts, "B" battery, are used on the tube.

The UX240 tube, or its equivalent, is especially adaptable to resistance or impedance coupled sets. Such sets have heretofore required three audio amplifier tubes instead of two audio tubes used with transformer coupled sets.

The UX240, on account of its large amplifying characteristic, allows of the use of a resistance coupled audio amplifier of two tubes instead of three, thus removing one of the principal objections to resistance coupling in an audio frequency amplifier.

The new audio amplifier tubes, UX112, and UX171, or their equivalents, are called "power tubes". The tubes are capable of handling high voltages without overloading and were designed primarily to permit the reception of large volume without distortion. The name "power tube" does not mean that these tubes amplify the received signal tremendously, but that they are capable of taking the maximum output of the detector and first audio amplifier tube without overloading.

The new raw AC tubes UX226 and UY227, or their equivalents, are made to operate directly from alternating current. The arrangement usually provided is to use a part of the voltage available from the transformer of the "B" socket power to supply the AC voltage for the tubes. In general, their characteristics are such that they correspond to the well known UX201-A tube with the exception of their ability to use alternating current for the filaments.

The following table of vacuum tube characteristics is taken from the Data Book edited by E. T. Cunningham, Inc., entitled "Cunningham Radio Tubes."

Type	Use	"A" Battery Supply Volts	Filament Terminal Volts	"A" Battery Current-Amps.	"B" Battery Volts Detector	"B" Battery Volts-Amplifier	Negative "C" Battery Volts	Plate current milliamperes with "C" Battery or Rheostat Bias	Plate current milliamperes without "C" Battery
C11 or C12	Detector Amplifier	1.5	1.1	.25	22½	45 67½ 90	1.5 3.0 4.5	1.1 1.8 2.6	2.75 4.1
C or CX299	Detector Amplifier	3.0 to 4.5	3.3	.06	22½ to 45	45 67½ 90	1.5 3.0 4.5	1.0 1.7 2.5	3.0 4.50
CX220	Power Amplifier	4.5	3.3	.125		90 135	11.5 22.5	3.2 7.0	12.8 22.0
C300A	Special Detector	6.0	5.0	.25	45			1.5	
CX301A	Detector Amplifier	6.0	5.0	.25	45	45 67½ 90 135	1.5 3.0 4.5 9.0	0.9 1.7 2.0 2.5	1.6 3.4 6.0 12.0
CX112	Power Amplifier	6.0	5.0	.50		90 135 157	4.5 9.0 10.5	4.0 5.8 7.9	13.2 24.8 29.0
CX371	Power Amplifier	6.0	5.0	.50		90 135 157 180	16.0 27.0 33.0 40.0	11 16 18 20	38.0 68 80 95
CX340	Detector Amplifier	6.0	5.0	.25	135–180	135 180	3–4.5 1½ 3 4.5	.75* .75* .25*	

* Without plate resistor, with .25 meg ohm resistor, plate current .20 m. a.

Tuning Units

THE radio set is adjusted or "tuned" to any particular station by means of **condensers** and **coils** (of insulated wire). In order to make the range of tuning continuously variable, so as to include the greatest number of stations, either or both the coils and condensers are variable in capacity. That is, the tuning unit may be made up of fixed coils and variable condensers, or fixed condensers and variable coils, or variable condensers and variable coils. Any of these combinations may be found in a set.

Variability in a tuning coil is commonly secured in one of two ways. Taps are taken off from the coil at regular intervals, and so connected that by means of a switch any desired number of turns

can be secured. Or the tuning coil may consist of two identical coils, one of which rotates within or in close proximity to the other. This combination is called a variometer. When the movable coil is parallel to the other, in one position the tuning value is maximum, while a half turn reduces the tuning value to approximately zero.

A condenser is made up of sheets of conducting material, separated from each other by some insulator. In the case of fixed condensers, it is common to have copper foil conductors, and sheet mica insulators. A variable condenser, due to mechanical requirements, is somewhat different. The plates are semicircular and are made of aluminum or brass. The insulator is air, and the movable plates are so mounted as to permit them to "sandwich" between the stationary plates without touching. One connection is made to each set of plates. A tuning coil should show a continuous electrical circuit from one terminal to the other. A condenser should show no circuit, or "open circuit." To preserve the good operation of a variable condenser, frequently remove the dust from the plates so that there will be no danger of the metal particles or moisture in the dust accidentally making a conductive path between the rotating and stationary plates. A pipe cleaner can be used advantageously for cleaning.

Locating and Eliminating Trouble

WHEN your set doesn't work right, remember that the trouble is pretty sure to be due to some mistake of your own. Every manufactured set is tested at the factory, and most dealers test sets a second time. So before you call on the dealer for help, first make sure that you have not done something wrong. Look over the instructions that came with the set. Then refer to the instructions which follow here. In nine cases out of ten you will be able to correct the trouble without help.

A radio set like any other piece of fine electrical or mechanical apparatus, is a delicate and sensitive instrument, and must be treated as such. Certain troubles are bound to occur if proper attention is not given to it, or if instructions are not followed. The following pages give a fairly complete list of instructions for locating and remedying the trouble.

Troubles Outside of the Set

The quickest way to make sure that a disturbing noise is not in the set is to remove the aerial wire from the set; then if the noise stops you can be sure that it was caused by the aerial rubbing against some obstruction, by static or some local electrical disturbance. Static cannot be eliminated, for it is essentially identical to the very impulses your set was meant to receive. Buzzing, humming sounds, which disappear when the aerial connection is removed, may be due to battery chargers in the neighborhood, defective electric lighting transformers, arc lights, telephone exchanges, power houses, X-Ray machines, and the like.

Troubles in Set or Installation

Tubes do not light. This may be caused by: Dead "A" battery, defective rheostat, dirty or poor contact on socket or tube prongs, burnt out tubes, broken wire from "A" battery to set, broken or disconnected wire inside of set, "A" battery connected wrong, so that cells oppose each other, or in parallel when connection should be series.

Tubes light, but no sound in phones or loud speaker. Dead "B" battery, "B" battery reversed (negative terminal where positive should be connected), "B" batteries connected together wrong, poor contact in tube socket at plate or grid terminal, broken phone or loud speaker cord, tubes paralyzed from too much "B" battery, short circuit in phone condenser, broken wire in phone circuit, amplifying transformer, phones or loud speaker.

Signals good in detector circuit, weak in amplifier. "A" battery in poor condition, transformer reversed or burned out, poor contact in amplifier sockets, section of "B" battery dead, "A" battery dead, "A" battery polarity reversed, "C" battery reversed or disconnected, moisture in transformers or condensers, condenser across transformer short-circuited, defective amplifier tube, defective jacks or plugs.

Signals in detector weak, amplifier O. K. Batteries run down, phone condenser short circuited, "A" battery reversed, defective tuner, too much or too little grid leak, poor grid connection on socket, aerial or ground disconnected, aerial grounded outside, too much or not enough "B" battery on detector, moisture in coils, dirty variable condenser, short circuited aerial protector.

Signals clear in detector, distorted in amplifier. To little "B" battery on amplifier, too much "B" battery, without "C" battery to prevent distortion, broken wire in amplifying transformer, poor contact in socket, disconnected or broken wire leading to transformer, transformers too close together, too many stages of amplification, transformers have too high step-up ratio, signals too loud for tubes, transformers need grid leak or condenser across secondaries, connections to transformers reversed.

Knocking, scraping, scratching, popping sounds, affected by tuning. Dust between plates of variable condenser, fingers of operator touching set-screw on dial, or other metal, too much "B" battery on detector, too much wire in tickler coil or radio-frequency transformer, too much "A" battery current, poor contact in rheostat, not enough grid leak.

Same as above, but not affected by tuning. Poor connection to aerial or ground, aerial rubbing against grounded object, loose contact in set, dirty variable condenser, defective detector circuit jack, tubes burning too bright, transformer burned out, not enough grid leak, transformers need grid leak or condenser across secondaries.

Howls, hisses, squeals, whistles, affected by tuning. Too much "B" battery on detector, too much wire in tickler or radio frequency transformer, too much filament current, tickler advanced too far, improper resistance in grid leak, near-by regenerative sets improperly operated, aerial or ground disconnected, poor ground, broken wire in tuning coil, lack of shielding (in case of R. F. or regenerative set.)

Same as above, not affected by tuning. Too much filament current, too much "B" battery, short circuited grid condenser, improper resistance of grid leak, poor contact in socket, local regenerative sets interfering, transformers too close together, transformers with too high step-up ratio, wiring in set bunched together too much, too many stages of amplification, primary of transformer connections reversed, transformers need condenser or leak across secondaries.

Unsteady, wavering signals. Leakage in aerial, due to swinging against other objects, sooty insulators, batteries run down, loose bearings in coils or condensers, tickler advanced too far, no grid leak, local regenerative receiver interfering.

Simple Repairs

WHEN you have located a source of trouble, by referring to the trouble-finding guide just given, the following instructions will tell you how to make most repairs yourself. You should have an electric soldering iron, small screw driver, tweezers, and wire cutters. With these tools, you can make most radio repairs.

PHONES OR LOUD SPEAKER. To find out if the phones or loud speaker are in working order hold one cord terminal on one binding post of a single dry cell, while you touch the other cord terminal on the remaining binding post. A loud click shows that all is well. If no sound is made, the trouble may be either in the cord or in the instrument itself. Unscrew the cap of the phone or speaker, and apply the battery current to the binding posts inside the instrument. A click shows the instrument to be all right, which definitely locates the trouble in the cord. It is best to get a new one, as a worn out cord is like a rotten inner tube, ready to give trouble again at any time. If the phone still fails to respond, look for broken wires, solder them together, and drop a trace of shellac on the joint. If nothing wrong can be seen take the instrument to a repair shop.

TUBES. A tube which has become paralyzed from too much "B" battery can usually be restored to working order by disconnecting the "B" battery entirely and lighting the filament for about 20 minutes. If the filament is burned out, get a new tube.

LOOSE OR BROKEN WIRES. Broken wires in tuning coils, connections, etc., should be soldered, and the connection wrapped with a layer or two of insulating tape. Wires which are loose under the set-screws should be clamped down tightly by means of a screw driver.

FIXED CONDENSERS. A fixed condenser is practically impossible to repair. The cost of replacement is slight, and a new one of the proper capacity should be provided. The capacity will be found stamped on most condensers.

VARIABLE CONDENSERS. These sometimes short-circuit, due to dust on the plates. Clean the spaces between the plates with a pipe cleaner, being careful not to bend the plates. If the rotating plates get out of alignment, so that the whole gang rubs against the stationary plates, use the adjusting screw on the end of the instrument to set them in alignment again. If only one or two plates touch, due to accidental bending, the judicious use of tweezers and screw driver may restore them to position. Poor connections within the condenser may be due to grease, weak spring contacts, unsoldered or broken flexible contacts.

SOCKETS. The most common trouble with a tube socket is in weak or dirty springs. Polish the springs with sandpaper or a knife edge, and tighten the retaining screws. If any springs have become bent out of shape, bend them back with the tweezers.

RHEOSTATS. Sometimes the rheostat becomes loose, and causes the filament of the tubes to flicker. By means of the set-screw on the rotating arm, readjust the arm so that it bears down on the resistance coil with more pressure. In some rheostats there is a metal strip under the rotating collar, which should make contact with the collar. If the spring in this strip is weak, remove the collar and bend up the connecting strip; then replace the collar. This will put most any wire rheostat into working order.

LOOSE DIALS. Dials are held on by a set-screw or clutch. Tighten the set-screw. If the threads are stripped, take out the screw, insert a tiny cylinder made by rolling a piece of paper, and again insert the screw, using only as much pressure as is needed to hold the dial.

BURNED-OUT TRANSFORMERS usually cannot be repaired. You run little risk of further damage in opening the instrument yourself and searching for broken wires to solder. In most cases a burned-out transformer is ready for the discard.

LOOSE TUBE PRONGS AND BASES do no harm if not irritated by constant handling and twisting. The glass envelope is sealed independent of the base, and a loose base in no way effects the vacuum. The best course is to put the tube into the socket and leave it there for the rest of its period of service.

JACKS. The usual trouble that comes to radio jacks is the weakening of the springs, which are, of course, the heart of the instrument. The only practical repair is to disconnect the wires from the back, by means of a soldering iron, completely take down the jack, bend the springs into shape, file lightly the contacts, and reassemble. Don't push in the plug farther than necessary.

DUST AND MOISTURE are the worst enemies of the radio set. Keep the cover of your set closed as much as possible, and away from moist air currents. Dust contains much mineral matter, which causes leakage of the currents that should go to your phones. Frequently dust off the coils and other parts.

Common Questions and Answers

Q. If a three-tube set will receive 1,500 miles, why won't a six or eight-tube set receive 3,000 or 4,000 miles?

A. Because the sensitivity of a receiving set is not the only factor that determines receiving range. If a broadcasting station can send radio impulses only to a distance of 1,000 miles, under normal conditions, it stands to reason that no receiving set will pick up the message from that station at a distance of 1,500 miles, because (in a practical sense) the signals will not be there to pick up at that distance. **By increasing the sensitivity of a set to weak signals, you are at the same time increasing its sensitivity to static impulses.** There is a certain "threshold point" where static will drown signals completely, and any signals which are weaker than those which can barely be heard, will be lost in static. Conceive of a gasoline tractor which would climb a 50% grade. Could you, by increasing the power of the machine, induce it to climb a vertical surface? The answer is obvious. On such a grade there would be no traction, nothing for the wheels to grip, and the increase in power would count for nothing. Too many persons look upon

receiving range as merely a matter of getting an infinitely sensitive set, without considering that to get unlimited range they must first develop a transmitter with unlimited range, and reduce static and interference to zero; an impossibility.

Q. If I get good results from a 60-foot aerial, why won't I get better results by adding more wires and making them longer?

A. Because there is a certain aerial that is best for your set. A shorter or a longer aerial will result in diminished sensitivity. Too long an aerial will absolutely prevent your receiving radio signals at all. Remember the story of the lady who had a mania for patent medicines? She acted on the supposition that "if a little's good, more's better," and took four times the prescribed dose. The analogy is evident.

Q. If my set works well with 22½ volts "B" battery on the detector, as the instructions said, why not use a stronger battery and get better results?

A. See answer above. The same reasoning applies to batteries.

Q. If I buy a set today, isn't it liable to be obsolete within a year?

A. Although refinements in radio are constantly being made, no set built in the past ten years has become really obsolete. The underlying principles of radio do not change, and a set that does satisfactory service today, will perform just as well a year from today. Changes that are being made from day to day are concerned more with the cabinet work and attractive workmanship of a set rather than with radical developments in design and principle. Take, for instance, the super-heterodyne, which is frequently referred to as the latest development. This set has been in use by advanced amateurs for six or seven years. It has only sprung into popularity recently because people have become convinced of the permanency of radio, and are willing to pay for higher priced sets. When radio was considered as a fad, buyers hesitated to spend as much money on a radio set as they would on a phonograph. Now that radio is established as an institution, and there is a market for high priced sets, the principles which have been known for years are finding expression in the production for the market.

Q. My set has a range of 200 to 600 meters wave length. How far does that mean it will receive?

A. The term "wave length" or "wave frequency" has no direct relation to the sending power or range of a sending set, nor does it refer to the distance from which you can receive with a given receiving set. To say that a station is sending at 417 meters wave length is comparable to the statement that a violin string is tuned to "G" of the pianoforte. A low power radio transmitter with a maximum range of ten miles might be tuned to 417 meters, while another transmitter with a range of 1,000 miles could use the same wave length. Likewise, the violin string at "G" might be heard from a distance of 200 feet; a steam whistle also pitched at "G" might be audible from two miles away. The question "How far will that set receive"? is seldom answered in an intelligent manner. Probably this is because the question itself is somewhat ambiguous. It amounts to saying: "How far can you hear the tone of middle C?" The answer to the latter is of course that it depends on the volume of that tone at its source; whether the tone is emitted by a steam whistle or a child's mouth organ; whether the sound originated in a valley or from a hill top; whether the listener was on a country prairie or in the midst of city traffic noises; whether the air was rare or dense, humid or dry. A rather mediocre receiving set may bring in signals from a 1,000-watt broadcasting station 800 miles away; but a receiving set that will record the signals from a "10-watter" 100 miles away will have accomplished a much greater feat.

BROADCASTING STATIONS

Listed alphabetically by call letters beginning with the stations in the United States and followed by Canadian and Mexican stations.

USE OF KILOCYCLE

The use of kilocycles instead of wave lengths for designating the position of a broadcasting station has been adopted by leading broadcasting stations and the Bureau of Standards. Some of the reasons why it is advantageous to use kilocycles instead of wave lengths follow.

1. Broadcasting stations regulate their transmissions by using kilocycles instead of wave lengths.
2. All stations are separated by at least ten kilocycles according to assignments made by the Federal Radio Commission.
3. With the standardization of kilocycles instead of wave lengths, wave lengths frequently come out a fraction instead of a whole number. On the other hand kilocycles will always be stated in whole numbers.

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	Dials 2	Dials 3
KDKA	E. Pittsburgh, Pa. Westinghouse E. & M. Co.	30 KW	950	315.6			
KDLR	Devils Lake, N. D. Radio Electric Co.	15	1300	230.6			
KDYL	Salt Lake City, Utah Intermountain Brdcstg. Corp.	100	1160	258.5			
KELW	Burbank, Calif. Earl L. White (KPPC)	250	1310	228.9			
KEX	Portland, Ore. Western Brdcstg. Co.	2500	1250	239.9			
KFAB	Lincoln, Neb. Nebr. Buick Auto Co.	2000 5000–6 to 7	970	309.1			
KFAD	Phoenix, Ariz. Electrical Equipment Co.	500	1100	272.6			
KFAU	Boise, Idaho Independent School Dist.	2000 4000–6 to 6	1050	285.5			
KFBB	Havre, Mont. F. A. Buttrey Co.	50	1090	275.1			
KFBC	San Diego, Calif. Dr. Arthur	100	1210	247.8			
KFBK	Sacramento, Calif. Kimball-Upson Co. (W. Yale)	100	560	535.4			
KFBL	Everett, Wash. Leese Bros.	50	1340	223.7			
KFBU	Laramie, Wyoming Bishop N. S. Thomas	500	700	428.3			
KFCB	Phoenix, Ariz. Nielsen Radio Supply Co.	125	1230	243.8			
KFCR	Santa Barbara, Calif. Santa Barbara Brdcstg. Co.	50	1420	211.1			
KFDM	Beaumont, Texas Magnolia Petroleum Co.	500	800	374.8			
KFDX	Shreveport, La. First Baptist Church	250	1270	236.1			
KFDY	Brookings, S. D. S. D. State College	500	760	394.5			
KFDZ	Minneapolis, Minn. Harry O. Iverson	10	1390	215.7			
KFEC	Portland, Ore. Meier & Frank Co. (KF1F)	50	1400	214.2			
KFEL	Denver, Colo. Eugene P. O'Fallon, Inc.	250	1210	247.8			
KFEQ	St. Joseph, Mo. Scroggin & Co., Bank	1000	1300	230.6			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
KFEY	Kellogg, Idaho Union High School	10	1290	232.4			
KFGQ	Boone, Iowa Boone Biblical College	10	1430	209.7			
KFH	Wichita, Kansas Hotel Lassen	500	1220	245.8			
KFHA	Gunnison, Colo. Western St. Col. of Colorado	50	1180	254.1			
KFHL	Oskaloosa, Iowa Penn College	10	1410	212.6			
KFI	Los Angeles, Calif. Earle C. Anthony, Inc.	5000	640	468.5			
KFIF	Portland, Ore. Benson Poly. Institute (KFEC)	50	1400	214.2			
KFIO	Spokane, Wash. North Central H. S. (KFPY)	100	1220	245.8			
KFIQ	Yakima, Wash. Dr. I. M. Miller	100	1440	208.2			
KFIU	Juneau, Alaska Alaska Elec. Lt. & Pr. Co.	10	1330	225.4			
KFIZ	Fond du Lac, Wis. Fond du Lac Comw'th R'pt'r	100	1120	267.7			
KFJB	Marshalltown, Ia. Marshall Electric Co.	100	1210	247.8			
KFJF	Oklahoma City, Okla. Nat'l Radio Mfg. Co.	750 1000	1100 6 to 6	272.6			
KFJI	Astoria, Ore. E. E. Marsh (KMED)	15	1200	249.9			
KFJM	Grand Forks, N. D. University of N. Dakota	100	900	333.1			
KFJR	Portland, Ore. Ashley C. Dixon & Son (KTBR)	100	1060	282.8			
KFJY	Ft. Dodge, Ia. C. S. Tunwall	100	1250	239.9			
KFJZ	Fort Worth, Texas W. E. Branch	50	1200	249.9			
KFKA	Greeley, Colo. Colo. St. Teachers College	200	750	399.8			
KFKB	Milford, Kan. Dr. J. R. Brinkley	1500 2500	1240 7 to 7	241.8			
KFKU	Lawrence, Kan. Univ. of Kan. (WREN)	500	1180	254.1			
KFKX	Hastings, Neb. Westinghouse E. & M. Co. (KYW)	2500	570	526.0			
KFKZ	Kirksville, Mo. Northeast Mo. St. Teach. Col.	15	1330	225.4			
KFLV	Rockford, Ill. Swedish Evan. Mission Church	100	1120	267.7			
KFLX	Galveston, Tex. George Roy Clough	100	1110	270.1			
KFMR	Sioux City, Iowa Morningside College	100	680	440.9			
KFMX	Northfield, Minn. Carlton College (WCAL)	500	1270	236.1			
KFNF	Shenandoah, Ia. Henry Field Seed Co.	2000 6 to 7 only	650	461.3			
KFOA	Seattle, Wash. Rhodes Department Store	1000	670	447.5			
KFON	Long Beach, Calif. Nichols & Warinner, Inc.	500	1240	241.8			
KFOR	Lincoln, Neb. Lincoln Hatchery	100	1380	217.3			
KFOX	Omaha, Neb. Bd. of Ed. (KOCH-WNAL)	100	1160	258.5			
KFOY	St. Paul, Minn. Maurice Gordon Goldberg	250	1050	285.5			
KFPL	Dublin, Texas C. C. Baxter	15	1090	275.1			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
KFPM	Greenville, Texas The New Furniture Co.	15	1300	230.6			
KFPR	Los Angeles, Calif. L. A. Co. For'stry Dept.(KFQZ)	250	1290	232.4			
KFPW	Cartersville, Mo. Rev. Lannie W. Stewart	50	1140	263.0			
KFPY	Spokane, Wash. Symons Investment Co. (KFIO)	250	1220	245.8			
KFQA	St. Louis, Mo. The Principia	50	930	322.4			
KFQB	Ft. Worth, Tex. Lone Star Broadcast. Co.	1000	1150	260.7			
KFQD	Anchorage, Alaska Anchorage Radio Club	100	870	344.6			
KFQU	Holy City, Calif. W. E. Riker	100	1200	249.9			
KFQW	Seattle, Wash. Carl F. Knierim	100	1380	217.3			
KFQZ	Hollywood, Calif. Taft R. & B. Co. Inc. (KFPR)	100	1290	232.4			
KFRC	San Francisco, Calif. Don Lee, Inc.	500 1000–7 to 7	660	454.3			
KFRU	Columbia, Mo. Stephens College	500	1200	249.9			
KFSD	San Diego, Calif. Airfan Radio Corp.	500	680	440.9			
KFSG	Los Angeles, Calif. Echo Park Evan. Assn.	500	1090	275.1			
KFUL	Galveston, Texas Thomas Goggan & Bros.	500	1160	258.5			
KFUM	Colorado Springs, Colo. W. D. Corley	100	1270	236.1			
KFUO	St. Louis, Mo. Concordia Theol. Sem. (KSD)	500	550	545.1			
KFUP	Denver, Colo. Fitzsimmons General Hospital	100	1320	227.1			
KFUR	Ogden, Utah Peery Building Co.	50	1330	225.4			
KFUS	Oakland, Calif. Dr. L. L. Sherman (KRE)	50	1170	256.3			
KFUT	Salt Lake City, Utah University of Utah	50	600	499.7			
KFVD	Venice, Calif. W. J. & C. I. McWhinnie(KGFJ)	250	1440	208.2			
KFVE	St. Louis, Mo. Greater St. Louis Brdcstg. Corp.	1000 2000–6 to 6	1280	234.2			
KFVG	Independence, Kan. First M. E. Church	50	1330	225.4			
KFVI	Houston, Texas Hdq. Troop, 56th Cavalry	50	1260	238.0			
KFVN	Fairmont, Minn. Carl E. Bagley	100	1310	228.9			
KFVS	Cape Girardeau, Mo. Hirsch Bat. & Radio Co.	50	1340	223.7			
KFWB	Los Angeles, Calif. Warner Bros. Brdcstg. Corp.	500	830	361.2			
KFWC	San Bernardino, Calif. Lawrence E. Wall	100	1350	222.1			
KFWF	St. Louis, Mo. St. Louis Truth Center, Inc.	250	1400	214.2			
KFWH	Eureka, Calif. F. Wellington Morse	100	1180	254.1			
KFWI	San Francisco, Calif. Radio Entertainments, Inc.	500	1120	267.7			
KFWM	Oakland, Calif. Oakland Educational Soc.	500 1000–6 to 6	1270	236.1			
KFWO	Avalon, Calif. Lawrence Mott	250	1000	299.8			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
KFXD	Jerome, Idaho Service Radio Co.	15	1470	204.0			
KFXF	Denver, Colo. Pikes Peak Brdcstg. Co., Inc.	500	1060	282.8			
KFXH	El Paso, Texas W. S. Bledsoe	100	1240	241.8			
KFXJ	Edgewater, Colo. R. G. Howell	15	1390	215.7			
KFXR	Oklahoma City, Okla. Exchange Ave. Baptist Church	50	1340	223.7			
KFXY	Flagstaff, Ariz. Mary M. Costigan	25	1460	205.4			
KFYF	Oxnard, Calif. Carl's Radio Den	25	1260	238.0			
KFYR	Bismarck, N. D. Hoskins-Meyer	1250 500–6 to 6	1250	239.9			
KGA	Spokane, Wash. Northwest Radio Serv. Co.	2000	1150	260.7			
KGAR	Tucson, Ariz. Citizens Publishing Co.	100	1280	234.2			
KGBS	Seattle, Wash. Arthur C. Dailey	100	1480	202.6			
KGBU	Ketchikan, Alaska Alaska Radio & Service Co.	500	1310	228.9			
KGBX	St. Joseph, Mo. Foster-Hall Tire Co.	100	1040	288.3			
KGBY	Shelby, Nebr. Thelen & Taddiken	50	1480	202.6			
KGBZ	York, Nebr. Federal Live Stock Rem. Co.	100	1410	212.6			
KGCA	Decorah, Ia. Charles W. Greenley (KWLC)	10	1210	247.8			
KGCB	Oklahoma City, Okla. Wallace Radio Inst. (KGFG)	50	1390	215.7			
KGCG	Newark, Ark. Moore Motor Co.	100	1340	223.7			
KGCH	Wayne, Nebr. S. A. Lutgen, M. D.	250	1020	293.9			
KGCI	San Antonio, Texas Liberto Radio Sales (KGRC)	15	1360	220.4			
KGCL	Seattle, Wash. A. Taft & L. Wasmer (KPCB)	50	1300	230.6			
KGCN	Concordia, Kan. Concordia Brdcstg. Co.	50	1440	208.2			
KGCR	Brookings, S. D. Cutler's Radio Brdcstg. Serv.Inc.	15	1440	208.2			
KGCU	Mandan, N. D. Mandan Radio Assn.	100	1440	208.2			
KGCX	Vida, Mont. First State Bank of Vida	10	1230	243.8			
KGDA	Dell Rapids, S. D. Home Auto Co. (6 to 6)	15	1180	254.1			
KGDE	Barrett, Minn. Jaren Drug Co.	50	1460	205.4			
KGDJ	Cresco, Ia. R. R. Rathert	10	1480	202.6			
KGDM	Stockton, Calif. V. G. Koping & E. F. Peffer	10	1380	217.3			
KGDP	Pueblo, Colo. Boy Scouts of America	10	1340	223.7			
KGDR	San Antonio, Texas Joe B. McShane	15	1480	202.6			
KGDW	Humboldt, Nebr. Frank J. Rist	100	1450	206.8			
KGDX	Shreveport, La. William E. Anthony (KGGH)	250	1410	212.6			
KGDY	Oldham, S. D. J. Albert Loesch	15	1450	206.8			
KGEF	Los Angeles, Calif. Trinity Methodist Church	500	1140	263.0			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
KGEH	Eugene, Ore. Eugene Broadcast Station	50	1490	201.2			
KGEK	Yuma, Colo. Beehler El. Eq. Co.(7 to 7 only)	10	1140	263.0			
KGEN	El Centro, Calif. E. R. Irey & F. M. Bowles	15	1330	225.4			
KGEO	Grand Island, Nebr. Hotel Yancey	100	1460	205.4			
KGEQ	Minneapolis, Minn. Fred W. Herrmann	50	1480	202.6			
KGER	Long Beach, Calif. C. Merwin Dobyns (KRLO)	100	1390	215.7			
KGES	Central City, Nebr. Central Broadcast Co.	10	1470	204.0			
KGEU	Lower Lake, Calif. L. W. Clement	50	1320	227.1			
KGEW	Fort Morgan, Colo. City of Fort Morgan	10	1370	218.8			
KGEY	Denver, Colo. J. W. Dietz	15	1490	201.2			
KGEZ	Kalispell, Mont. Flathead Brdcstg. Assn.	100	1460	205.4			
KGFB	Iowa City, Ia. Albert C. Dunkel	10	1340	223.7			
KGFF	Alva, Okla. Earl E. Hampshire	25	1460	205.4			
KGFG	Oklahoma City, Okla. Full Gospel Church (KGCB)	50	1390	215.7			
KGFH	La Crescenta, Calif. Frederick Robinson (KMIC)	250	1340	223.7			
KGFI	Ft. Stockton, Tex. M. L. Eaves	15	1360	220.4			
KGFJ	Los Angeles, Calif. Ben S. McGlashan (KFVD)	100	1440	208.2			
KGFK	Hallock, Minn. Kittson County Enterprise	50	1340	223.7			
KGFL	Trinidad, Colo. N. L. Cotter	50	1350	222.1			
KGFM	Yuba City, Calif. George W. Johnson	15	1420	211.1			
KGFN	Aneta, N. D. H. Haraldson & C. Tbingstad	15	1500	199.9			
KGFO	Portable Brant Radio Power Co.	100	1470	204.0			
KGFP	Mitchell, S. D. Mitchell Broadcast. Co.	10	1410	212.6			
KGFW	Ravenna, Nebr. Otto F. Sothman	10	1000	299.8			
KGFX	Pierre, S. D. Dana McNeil (6 to 6 only)	200	1180	254.1			
KGGF	Picher, Okla. Dr. D. L. Connel	100	1450	206.8			
KGGF	Cedar Grove, La. Bates Radio & El. Co.(KGOX)	50	1410	212.6			
KGO	Oakland, Calif. General Electric Co.	5000	780	384.4			
KGRC	San Antonio, Tex. Gene Roth & Co. (KGCI)	50	1360	220.4			
KGRS	Amarillo, Tex. Gish Radio Service	150	1230	243.8			
KGTT	San Francisco, Calif. Glad Tidings T. & Bible Inst.	50	1450	206.8			
KGU	Honolulu, Hawaii Marion A. Mulrony	600	1110	270.1			
KGW	Portland, Ore. Oregonian Pub. Co.	1000	610	491.5			
KGY	Lacey, Wash. St. Martins College	50	1230	243.8			
KHJ	Los Angeles, Calif. Times Mirror Co.	500	740	405.2			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	Dials 2	Dials 3
KHQ	Spokane, Wash. Louis Wasmer, Inc.	1000	810	370.2			
KICK	Atlantic, Ia. Atlantic Automobile Co.	100	650	461.3			
KJBS	San Francisco, Calif. Julius Brunton & Sons Co.	50	1360	220.4			
KJR	Seattle, Wash. Northwest Radio Service Co.	2500	860	348.6			
KKP	Seattle, Wash. City of Seattle, Harbor Dept.	15	1130	265.3			
KLDS	Independence, Mo. Reor. Ch. of Jesus Christ of Latter Day Saints	1500	1260	238.0			
KLIT	Portland, Ore. Lewis Irvine Thompson	10	1450	206.8			
KLS	Oakland, Calif. Warner Bros. (KZM)	250	1220	245.8			
KLX	Oakland, Calif. Tribune Pub. Co.	500	590	508.2			
KLZ	Denver, Colo. Reynolds Radio Co., Inc.	250	1120	267.7			
KMA	Shenandoah, Ia. May Seed and Nursery	500	1110	270.1			
KMED	Medford, Ore. W. J. Virgin (KFJI)	50	1200	249.9			
KMIC	Inglewood, Calif. James R. Fouch (KGFH)	250	1340	223.7			
KMJ	Fresno, Calif. The Fresno Bee	50	820	365.6			
KMMJ	Clay Center, Neb. The M. M. Johnson Co. (WCAJ)	500	790	379.5			
KMO	Tacoma, Wash. K M O, Inc.	250	1180	254.1			
KMOX	St. Louis, Mo. Voice of St. Louis	5000	1000	299.8			
KMTR	Hollywood, Calif. KMTR Radio Corp.	500	570	526.0			
KNRC	Santa Monica, Calif. Clarence B. Juneau	500	800	374.8			
KNX	Los Angeles, Calif. L. A. Express Pub. Co.	500	890	336.9			
KOA	Denver, Colo. General Electric Co.	5000 10000—6 to 7	920	325.9			
KOAC	Corvallis, Ore. Oregon State Agric. College	500	1110	270.1			
KOB	State College, N. M. N. M. College (KWSC-KTW)	5000	760	394.5			
KOCH	Omaha, Nebr. Cent. Rad. Sch. (WNAL-KFOX)	250	1160	258.5			
KOCW	Chickasha, Okla. Okla. Col. for Women	250	1190	252.0			
KOIL	Council Bluffs, Ia. Mona Motor Oil Co.	2000 4000—7 to 7	1080	277.6			
KOIN	Portland, Ore. K O I N, Inc.	1000	940	319.0			
KOLO	Durango, Colo. Gerald K. Hunter	5	1500	199.9			
KOMO	Seattle, Wash. Fisher's Blend Station, Inc.	1000	980	305.9			
KOW	Denver, Colo. Olinger Broadcasting Corp.	250	630	475.9			
KOWW	Walla Walla, Wash. Frank A. Moore, Inc.	500	1000	299.8			
KPCB	Seattle, Wash. Pac. Coast Biscuit Co. (KGCL)	50	1300	230.6			
KPJM	Prescott, Ariz. Frank Wilburn	15	1400	214.2			
KPLA	Los Angeles, Calif. Pacific Develop. Radio Co.	500	1190	252.0			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
KPNP	Muscatine, Ia. Central Radio Co.	100	1420	211.1			
KPO	San Francisco, Calif. Hales Bros. & The Chronicle	1000	710	422.3			
KPPC	Pasadena, Calif. Pasadena Pres. Ch. (KELW)	50	1310	228.9			
KPRC	Houston, Tex. Houston Printing Co.	500	1020	293.9			
KPSN	Pasadena, Calif. Pasadena Star-News Pub. Co.	1000	950	315.6			
KQV	Pittsburgh, Pa. Doubleday-Hill El. (WJAS) Co.	500	1110	270.1			
KQW	San Jose, Calif. First Baptist Church	500	1010	296.9			
KRAC	Shreveport, La. Caddo Radio Club	50	1360	220.4			
KRE	Berkeley, Calif. First Cong. Church (KFUS)	100	1170	256.3			
KRLD	Dallas, Tex. K R L D, Inc.	500	650	461.3			
KRLO	Los Angeles, Calif. F. Lang & A. B. Scott (KGER)	250	1390	215.7			
KRSC	Seattle, Wash. Radio Sales Corp.	50	1420	211.1			
KSAC	Manhattan, Kan. Kansas State Agri. College	500	900	333.1			
KSBA	Shreveport, La. W. G. Paterson	1000	1120	267.7			
KSCJ	Sioux City, Ia. Perkins P[illegible] o (KWUC)	500	1230	243.8			
KSD	St. Louis, Mo. Pulitzer Pub. Co. (KFUO)	500	550	545.1			
KSEI	Pocatello, Idaho KSEI Brdcstg. Assn.	250	900	333.1			
KSL	Salt Lake City, Utah Radio Service Corp. of Utah	1000	990	302.8			
KSMR	Santa Maria, Calif. Santa Maria Valley R. R. Co.	100	1100	272.6			
KSO	Clarinda, Ia. Berry Seed Co.	500	1320	227.1			
KSOO	Sioux Falls, S. D. Sioux Falls Broadcast Assn.	250	1430	209.7			
KTAB	Oakland, Calif. Associated Broadcasters	500	1070	280.2			
KTAP	San Antonio, Tex. Robert B. Bridge	20	1310	228.9			
KTBI	Los Angeles, Calif. Bible Inst. of Los Angeles, Inc.	500	1040	288.3			
KTBR	Portland, Ore. M. E. Brown (KFJR)	50	1060	282.8			
KTCL	Seattle, Wash. American Radio Tel. Co.	500	1080	277.6			
KTHS	Hot Springs, Ark. Arlington Hotel Co.	1000	780	384.4			
KTNT	Muscatine, Ia. Norman Baker	3500 5000–6 to 6	1170	256.3			
KTSA	San Antonio, Tex. Alamo Broadcast Co.	2000	1130	265.3			
KTUE	Houston, Tex. Uhalt Electric	5	1410	212.6			
KTW	Seattle, Wash. First Pres. Ch. (KWSC-KOB)	1000	760	394.5			
KUJ	Seattle, Wash. Puget Sd. Rad. Brdcstg. Co., Inc.	10	1500	199.9			
KUOA	Fayetteville, Ark. University of Arkansas	500	1010	296.9			
KUOM	Missoula, Mont. State Univ. of Montana	500	800	374.8			
KUSD	Vermillion, S. D. Univ. of S. Dakota	250	620	483.6			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
KUT	Austin, Texas University of Texas	500	1290	232.4			
KVI	Tacoma, Wash. Puget Sd. Rad. B'dc'g Co.	50	1280	234.2			
KVOO	Bristow, Okla. Southwestern Sales Corp.	1000	860	348.6			
KVOS	Seattle, Wash. L. Kessler	50	1430	209.7			
KWBS	Portland, Ore. Schaeffer Radio Co.	15	1500	199.9			
KWCR	Cedar Rapids, Ia. H. F. Paar (WJAM)	250	780	384.4			
KWG	Stockton, Calif. Portable Wireless Tel. Co.	50	870	344.6			
KWJJ	Portland, Ore. Wilbur Jerman	50	1310	228.9			
KWKC	Kansas City, Mo. Wilson Duncan Brdcstg. Co.	100	1350	222.1			
KWKH	Shreveport, La. W. K. Henderson	1000	760	394.5			
KWLC	Decorah, Ia. Luther College (KGCA)	50	1210	247.8			
KWSC	Pullman, Wash. St. Col. of Wash. (KTW–KOB)	500	760	394.5			
KWTC	Santa Ana, Calif. Dr. John Wesley Hancock	5	850	352.7			
KWUC	Le Mars, Ia. Western Union Col. (KSCJ)	1500	1230	243.8			
KWWG	Brownsville, Tex. Chamber of Commerce	500	1080	277.6			
KXL	Portland, Ore. KXL Broadcasters	50	1360	220.4			
KXRO	Aberdeen, Wash. KXRO, Inc.	50	1320	227.1			
KYA	San Francisco, Calif. Pacific Broadcasting Corp.	500	970	309.1			
KYW	Chicago, Ill. Westingh'se E&M Co.(KFKX)	2500	570	526.0			
KZM	Oakland, Calif. Preston D. Allen (KLS)	100	1220	245.8			
WAAD	Cincinnati, O. Ohio Mechanics Inst.	25	1120	267.7			
WAAF	Chicago, Ill. Drovers Jr. Pub. Co.(WBBM-WJBT)	500	770	389.4			
WAAM	Newark, N. J. WAAM, Inc. (WGBS)	500	860	348.6			
WAAT	Jersey City, N. J. Bremer Bdcg. Corp. (WGBB-WSOM)	300	1220	245.8			
WAAW	Omaha, Neb. Omaha Gr. Ex. (6 to 7 only)	500	860	348.6			
WABC	Richmond Hill, N. Y. Atlantic Brd'tg. Corp.(WBOQ)	2500	920	325.9			
WABF	Kingston, Pa. Markle Brdcstg. Corp.	250	1460	205.4			
WABI	Bangor, Maine First Universalist Church	100	770	389.4			
WABO	Rochester, N. Y. Lake Ave. Memorial Baptist Church & Soc. (WHEC)	100	1290	232.4			
WABQ	Philadelphia, Pa. Keystone Brdcstg. Co., Inc.	500	1150	260.7			
WABR	Toledo, O. Scott High School (WTAL)	50	1070	280.2			
WABW	Wooster, O. College of Wooster	50	1210	247.8			
WABY	Philadelphia, Pa. John Magaldi, Jr. (WFKD)	50	1210	247.8			
WABZ	New Orleans, La. Coliseum Place Baptist Church	50	1210	247.8			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WADC	Akron, O. Allen T. Simmons	500	1010	296.9			
WAFD	Detroit, Mich. Albert B. Parfet Co. (WRAV)	100	880	340.7			
WAGM	Royal Oak, Mich. Robert L. Miller	50	1330	225.4			
WAGS	Lexington, Mass. J. Smith Dodge	5	1390	215.7			
WAIT	Taunton, Mass. A. H. Waite & Co., Inc.	10	1400	214.2			
WAIU	Columbus, O. American Ins. Union (WEAO)	5000	1060	282.8			
WALK	Willow Grove, Pa. Albert A. Walker	50	1490	201.2			
WAMD	Minneapolis, Minn. Radisson Radio Corp. & Stanley E. Hubbard	500	1330	225.4			
WAPI	Auburn, Ala. Alabama Polytechnic Inst.	1000	920	325.9			
WARS	Brooklyn, N. Y. Amateur Radio Specialty Co. (WSDA–WBBC)	500	1320	227.1			
WASH	Grand Rapids, Mich. Baxter Launderers, Inc.	250	1170	256.3			
WATT	Portable Edison El. Illum. Co.	100	1490	201.2			
WBAA	Lafayette, Ind. Purdue Univ. (WRM)	500	1100	272.6			
WBAK	Harrisburg, Pa. Penna. State Police (WPSC)	500	1000	299.8			
WBAL	Baltimore, Md. Cons. Gas, El. Lt. & Pr. Co.	5000	1050	285.5			
WBAO	Decatur, Ill. James Millikin Univ.	100	1120	267.7			
WBAP	Fort Worth, Tex. Carter Publications, Inc.(WFAA)	1500	600	499.7			
WBAW	Nashville, Tenn. Waldrum Drug Co.	100	1210	247.8			
WBAX	Wilkes-Barre, Pa. John H. Stenger, Jr. (WBRE)	100	1200	249.9			
WBBC	Brooklyn, N. Y. Brooklyn Brdcstg. Corp. (WARS-WSDA)	500	1320	227.1			
WBBL	Richmond, Va. Grace Covenant Pres. Church	100	1210	247.8			
WBBM	Chicago, Ill. Atlass Inv. Co. (WJBT-WAAF)	1000	770	389.4			
WBBP	Petoskey, Mich. Petoskey High School	100	1250	239.9			
WBBR	Rossville, N. Y. People's Pulpit Assn (WEBJ–WLTH)	1000	1170	256.3			
WBBW	Norfolk, Va. Ruffner Junior High School	50	1270	236.1			
WBBY	Charleston, S. C. Washington Light Infantry	75	600	499.7			
WBBZ	Portable C. L. Carrell	100	1470	204.0			
WBCN	Chicago, Ill. Great Lakes Radio Broadcasting Corp. (WENR)	250	1040	288.3			
WBES	Takoma Park, Md. Bliss Electrical School	100	1010	296.9			
WBET	Boston, Mass. Boston Transcript Co. (WSSH)	500	1040	288.3			
WBIS	Boston, Mass. The Shepard Stores (6 to 6 only)	100	990	302.8			
WBKN	Brooklyn, N. Y. Arthur Faske (WBMS–WIBI–WWRL)	100	1120	267.7			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
WBMH	Detroit, Mich. Braun's Music House	100	1420	211.1			
WBMS	Union City, N. J. Geo. J. Schowerer (WBKN-WIBI-WWRL)	100	1120	267.7			
WBNY	New York, N. Y. Baruchrome Corp. (WHAP-WMSG)	500	1270	236.1			
WBOQ	Richmond Hill, N. Y. Atlantic Brdcstg. Cor. (WABC)	500	920	325.9			
WBRC	Birmingham, Ala. Birmingham Brdcstg. Co.	250	1230	243.8			
WBRE	Wilkes-Barre, Pa. Louis G. Baltimore (WBAX)	100	1200	249.9			
WBRL	Tilton, N. H. Booth Radio Laboratories	500	1290	232.4			
WBRS	Brooklyn, N. Y. N. A. Brdcstg. Corp. (WCDA-WRST)	100	1420	211.1			
WBSO	Wellesley Hills, Mass. Babson's Statistical Or., Inc.	100	780	384.4			
WBT	Charlotte, N. C. C. C. Coddington	500 1000–7 to 7	1160	258.5			
WBZ	E. Springfield, Mass. Westinghouse E. & M. Co.	15000	900	333.1			
WBZA	Boston, Mass. Westinghouse E. & M. Co.	500	900	333.1			
WCAC	Mansfield, Conn. Conn. Agric. College	500	1090	275.1			
WCAD	Canton, N. Y. St. Lawrence University	500 1000–6 to 6	820	365.6			
WCAE	Pittsburgh, Pa. Kaufman & Baer Co.	500	580	516.9			
WCAH	Columbus, O. C. A. Entrekin	250	560	535.4			
WCAJ	Lincoln, Neb. Neb. Wes. Univ. (KMMJ)	500	790	379.5			
WCAL	Northfield, Minn. St. Olaf College (KFMX)	500	1270	236.1			
WCAM	Camden, N. J. City of Camden	500	1340	223.7			
WCAO	Baltimore, Md. Monumental Radio, Inc. (WCBM)	250	780	384.4			
WCAT	Rapid City, S. D. S. Dak. State Sch. of Mines	100	1210	247.8			
WCAU	Philadelphia, Pa. Universal Brdcstg. Co.	500	1080	277.6			
WCAX	Burlington, Vt. University of Vermont	100	1180	254.1			
WCAZ	Carthage, Ill. Carthage College	50	880	340.7			
WCBA	Allentown, Pa. C. W. Heimbach & B. Bryan Musselman (WSAN)	100	1350	222.1			
WCBD	Zion, Ill. Wilbur Glenn Voliva (WLS)	5000	870	344.6			
WCBE	New Orleans, La. Uhalt Radio	5	1320	227.1			
WCBH	Oxford, Miss. University of Mississippi	100	1240	241.6			
WCBM	Baltimore, Md. Hotel Chateau (WCAO)	100	780	384.4			
WCBR	Portable Charles H. Messter	100	1490	201.2			
WCBS	Springfield, Ill. H. L. Dewing & C. Messter	250	1430	209.7			
WCCO	Minneapolis, Minn. Washburn-Crosby Co.	5000 7500–6 to 6	740	405.2			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
WCDA	Cliffside, N. J. Ital. Ed. Brdcstg. Co.(WBRS-WRST)	250	1420	211.1			
WCFL	Chicago, Ill. Chicago Fed. of Labor (WEMC-WLTS)	1500	620	483.6			
WCGU	Coney Island, N. Y. C. G. Unger (WKBQ-WKBO)	500	1370	218.8			
WCLO	Camp Lake, Wis. C. E. Whitmore (WWAE-WJBC)	100	1320	227.1			
WCLS	Joliet, Ill. M. A. Felman (WKBB)	150	1390	215.7			
WCMA	Culver, Ind. Culver Military Academy	250	1160	258.5			
WCOA	Pensacola, Fla. City of Pensacola	500	1200	249.9			
WCOC	Columbus, Miss. Crystal Oil Co.	100	1300	230.6			
WCOM	Manchester, N. H. City of Manchester	100	1260	238.0			
WCOT	Providence, R. I. Jacob Conn (WFCI)	50	1330	225.4			
WCRW	Chicago, Ill. C. R. White (WFKB-WPCC)	500	1340	223.7			
WCSH	Portland, Me. Congress Square Hotel Co.	500	830	361.2			
WCSO	Springfield, O. Wittenberg College	500	1170	256.3			
WCWK	Ft. Wayne, Ind. Chester W. Keen (WOWO)	500	1310	228.9			
WCWS	Danbury, Conn. Danbury B'dc'g Sta. (WICC)	100	1400	214.2			
WCX-WJR	See WJR-WCX						
WDAD-WLAC	Nashville, Tenn. Dad's Auto Accessories, Inc. & Life & Casualty	500 / 1000	1330 7 to 7	225.4			
WDAE	Tampa, Fla. Tampa Pub. Co.	500	1120	267.7			
WDAF	Kansas City, Mo. Kansas City Star Co.	1000	810	370.2			
WDAG	Amarillo, Texas J. Laurance Martin	250	1140	263.0			
WDAH	El Paso, Tex. Trinity Methodist Church	100	1280	234.2			
WDAY	Fargo, N. D. Radio Equipment Corp.	250	830	361.2			
WDBJ	Roanoke, Va. Richardson-Wayland El. Corp.	250	1300	230.6			
WDBK	Cleveland, O. WDBK B'd'g Sta. (WJAY)	250	1320	227.1			
WDBO	Orlando, Fla. Rollins College, Inc.	500 / 1000	1040 6 to 6	288.3			
WDEL	Wilmington, Del. Wilmington Elec. Spec. Co., Inc.	100	1130	265.3			
WDGY	Minneapolis, Minn. Dr. Geo. W. Young (WRHM)	500	1150	260.7			
WDOD	Chattanooga, Tenn. Chattanooga Radio Co., Inc.	500	1220	245.8			
WDRC	New Haven, Conn. Doolittle Radio Corp.	500	1060	282.8			
WDWF-WLSI	Cranston, R. I. D. W. Flint and The Lincoln Studios, Inc.	500	800	374.8			
WDWM	Asbury Park, N. J. Radio Indus. Broadcast Co.	500	830	361.2			
WDZ	Tuscola, Ill. James L. Bush (6 to 6 only)	100	1080	277.6			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WEAF	New York, N. Y. National Brdcstg. Co., Inc.	5000	610	491.5			
WEAI	Ithaca, N. Y. Cornell University	250	620	483.6			
WEAM	N. Plainfield, N. J. Bor. of N. Plainfield (WOAX)	250	1250	239.9			
WEAN	Providence, R. I. The Shepard Co.	500	940	319.0			
WEAO	Columbus, O. State University (WAIU)	750	1060	282.8			
WEAR	Cleveland, O. Willard Stor. Bat. Co.(WTAM)	1000	750	399.8			
WEBC	Superior, Wis. Head of the Lakes B'dc'g Co.	250	1240	241.8			
WEBE	Cambridge, O. Roy W. Waller	10	1210	247.8			
WEBH	Chicago, Ill. Edgewater Bch Hotel Co.(WJJD)	2000	820	365.6			
WEBJ	New York, N. Y. Third Ave. Ry. Co. (WBBR-WLTH)	500	1170	256.3			
WEBQ	Harrisburg, Ill. Tate Radio Company	15	1340	223.7			
WEBR	Buffalo, N. Y. H. H. Howell	200	1240	241.8			
WEBW	Beloit, Wis. Beloit College	500	1160	258.5			
WEDC	Chicago, Ill. Emil Denemark (WGES)	500	1240	241.8			
WEEI	Boston, Mass. Edison Elec. Illuminating	500	670	447.5			
WEHS	Evanston, Ill. Victor C. Carlson	100	1390	215.7			
WEMC	Berrien Springs, Mich. Emman. Miss. Col. (WCFL-WLTS)	1000	620	483.6			
WENR	Chicago, Ill. Gr. Lakes B'dc'g Co. (WBCN)	500	1040	288.3			
WEPS	Gloucester, Mass. Matheson Radio Co., Inc.	100	1010	296.9			
WEW	St. Louis, Mo. St. Louis Univ. (6 to 8 only)	1000	850	352.7			
WFAA	Dallas, Tex. Dallas Morning News (WBAP)	500	600	499.7			
WFAM	St. Cloud, Minn. Times Pub. Co., Inc.	10	1190	252.0			
WFBC	Knoxville, Tenn. First Baptist Church	50	1280	234.2			
WFBE	Cincinnati, O. Garfield Place Hotel Co.	250	1220	245.8			
WFBG	Altoona, Pa. Wm. F. Gable Company	100	1070	280.2			
WFBJ	Collegeville, Minn. St. John's University	100	1100	272.6			
WFBL	Syracuse, N. Y. The Onondaga Co., Inc.	750	1160	258.5			
WFBM	Indianapolis, Ind. Indianapolis Pr. & Lt. Co.	250	1330	225.4			
WFBR	Baltimore, Md. Fifth Inf. Md. Natl. Guard	100	1330	225.4			
WFBZ	Galesburg, Ill. Knox College (WRAM)	50	1210	247.8			
WFCI	Pawtucket, R. I. Frank Crook, Inc. (WCOT)	50	1330	225.4			
WFDF	Flint, Mich. Frank D. Fallain	100	860	348.6			
WFHH	Clearwater, Fla. Clearwater Ch. of Commerce	500	820	365.6			
WFI	Call letters changed to (WFLA) Philadelphia, Pa. Strawbridge & Clothier (WLIT)	500	740	405.2			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WFIW	Hopkinsville, Ky. The Acme Mills, Inc.	500 / 1000–6 to 6	1070	280.2			
WFKB	Chicago, Ill. F. K. Bridgman, Inc. (WCRW–WPCC)	500	1340	223.7			
WFKD	Frankford, Pa. Foulkrod Rad. En. Co. (WABY)	50	1210	247.8			
WGAL	Lancaster, Pa. Lancaster E. Sup. & Constr. Co. (WKJC)	15	1190	252.0			
WGBB	Freeport, N. Y. H. H. Carman (WAAT–WSOM)	400	1220	245.8			
WGBC	Memphis, Tenn. First Baptist Church	15	1080	277.6			
WGBF	Evansville, Ind. Finke Furniture Co.	250	1270	236.1			
WGBI	Scranton, Pa. Scranton Broadcasters, Inc. (WQAN)	250	1300	230.6			
WGBS	Astoria (L. I.) N. Y. Gimbel Bros. Inc. (WAAM)	500	860	348.6			
WGCP	Newark, N. J. May Radio Brdcstg. Corp. (WNJ)	500	1070	280.2			
WGES	Chicago, Ill. Oak Leaves B'dc'g Corp. (WEDC)	500	1240	241.8			
WGHP	Mt. Clemens, Mich. Geo. Harrison Phelps, Inc.	750	940	319.0			
WGL	New York, N. Y. Intern'l B'dc'g Corp. (WODA)	500 / 1000–7 to 1	1020	293.9			
WGM	Jeannette, Pa. Verne & Elton Spencer	50	1440	208.2			
WGMU	Portable Atlantic B'dc'g Corp. (WRMU)	100	1490	201.2			
WGN–WLIB	Chicago, Ill. Tribune Co. & Lib. Wkly, Inc.	500	980	305.9			
WGR	Buffalo, N. Y. Federal Radio Corp.	750	990	302.8			
WGST	Atlanta, Ga. Georgia Sch. of Techn. (WMAZ)	500	1110	270.1			
WGWB	Milwaukee, Wis. Rediocast Corp. of Wis.	500	1370	218.8			
WGY	S. Schnectady, N. Y. General Elec. Co. (WHAZ)	30KW	790	379.5			
WHA	Madison, Wis. Univ. of Wisconsin (WLBL)	750	940	319.0			
WHAD	Milwaukee, Wis. Marquette University (WTMJ)	500	1020	293.9			
WHAM	Rochester, N. Y. Stromberg-Carlson Tel. Mfg. Co.	500	1080	277.6			
WHAP	New York, N. Y. Wm. H. Taylor Finance Corp. (WMSG–WBNY)	1000	1270	236.1			
WHAR	Atlantic City, N. J. Cook's Sons, Inc. (WPG)	1000	1100	272.6			
WHAS	Louisville, Ky. The Courier Journal Co. & The Louisville Times Co.	500	650	461.3			
WHAZ	Troy, N. Y. Rensselaer Poly. Inst. (WGY)	500	790	379.5			
WHB	Kansas City, Mo. Sweeney Auto Sch. Co. (WOQ)	500	890	336.9			
WHBA	Oil City, Pa. C. C. Shaffer.	10	1150	260.7			
WHBC	Canton, O. St. John's Catholic Church	10	1270	236.1			
WHBD	Bellefontaine, O. Chamber of Commerce	100	1350	222.1			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
WHBF	Rock Island, Ill. Beardsley Specialty Co.	100	1350	222.1			
WHBL	Portable C. L. Carrell	100	1470	204.0			
WHBM	Portable C. L. Carrell	100	1490	201.2			
WHBN	Gainsville, Fla. Univ. of Florida	10	1010	296.9			
WHBP	Johnston, Pa. Johnston Automobile Co.	250 (500–6 to 6)	1310	228.9			
WHBQ	Memphis, Tenn. Brdcstg. Sta. WHBQ, Inc.	100	1290	232.4			
WHBU	Anderson, Ind. Citizens Bank	15	1360	220.4			
WHBW	Philadelphia, Pa. D. R. Kienzle (WIAD)	50	1360	220.4			
WHBY	West De Pere, Wis. St. Norbert's College	50	1200	249.9			
WHDI	Minneapolis, Minn. William Hood Dunwoody Industrial Ins. (WLB)	500	1220	245.8			
WHEC	Rochester, N. Y. Hickson Elec. Co., Inc. (WABO)	100	1290	232.4			
WHFC	Chicago, Ill. Woodson & Wilson, Inc.	200	1390	215.7			
WHK	Cleveland, O. Radio Air Service Corp.	500 / 1000 6 to 6	1130	265 3			
WHN	New York, N. Y. Geo. Schubel (WQAO)(WPAP)	500	760	394.5			
WHO	Des Moines, Ia. Bankers Life Co.	5000	560	535.4			
WHPP	New York, N. Y. Bronx Brdcstg Co. (WMRJ–WTRL)	10	1450	206.8			
WHT	Chicago, Ill. Radiophone B'dc'g Corp.(WIBO)	5000	720	416.4			
WIAD	Philadelphia, Pa. Howard R. Miller (WHBW)	100	1360	220.4			
WIAS	Burlington, Ia. Home Electric Co.	100	630	475.9			
WIBA	Madison, Wis. Capital Times Strand Theater	100	1250	239.9			
WIBG	Elkins Park, Pa. St. Pauls P. E. Ch. (6 to 6 Sun.)	50	680	440.9			
WIBI	Flushing, N. Y. Fred. B. Zittell, Jr. (WBKN–WBMS–WWRL)	100	1120	267.7			
WIBJ	Portable C. L. Carrell	100	1490	201.2			
WIBM	Portable C. L. Carrell	100	1490	201.2			
WIBO	Chicago, Ill. WIBO Broadcasters, Inc.(WHT)	500	720	416.4			
WIBR	Steubenville, O. Thurman A. Owings	50	1200	249.9			
WIBS	Elizabeth, N. J. Lt. Thos. F. Hunter (WLBX–WMBQ)	150	1470	204.0			
WIBU	Poynette, Wis. Wis. State Journal Co.	20	1380	217.3			
WIBW	Portable C. L. Carrell	100	1470	204.0			
WIBX	Utica, N. Y. WIBX, Inc.	150	1260	238.0			
WIBZ	Montgomery, Ala. Alexander D. Trum	15	1300	230.6			
WICC	Bridgeport, Conn., Sport Hill Bridgeport Brdcstg. Sta., Inc. (WCWS)	500	1400	214.2			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WIL	St. Louis, Mo. Benson Radio Brdcstg. Co.	250	1160	258.5			
WIOD	Miami Beach, Fla. Carl G. Fisher Co.	1000	1210	247.8			
WIP	Philadelphia, Pa. Gimbel Bros., Inc. (WOO)	500	590	508.2			
WJAD	Waco, Tex. Frank P. Jackson	500	670	447.5			
WJAG	Norfolk, Neb. Norfolk Daily News	250 500–7 to 7	1050	285.5			
WJAK	Kokomo, Ind. J. A. Kautz	50	1280	234.2			
WJAM	Cedar Rapids, Ia. D. M. Perham (KWCR)	100	780	384.4			
WJAR	Providence, R. I. The Outlet Company	500	620	483.6			
WJAS	Pittsburgh, Pa. Pittsburgh Radio Sup. Hse (KQV)	500	1110	270.1			
WJAX	Jacksonville, Fla. City of Jacksonville	1000	890	336.9			
WJAY	Cleveland, O. Cleveland Rad. B'dc'g Corp. (WDBK)	500	1320	227.1			
WJAZ	Mt. Prospect, Ill. Zenith Radio Corp. (WMBI)	5000	1140	263.0			
WJBA	Joliet, Ill. D. H. Lentz, Jr.	50	930	322.4			
WJBB	Tampa, Fla. Financial Journal, Inc.	250	870	344.6			
WJBC	La Salle, Ill. Hummer Furn. Co. (WWAE–WCLO)	100	1320	227.1			
WJBI	Red Bank, N. J. Robert S. Johnson	150	1140	263.0			
WJBK	Ypsilanti, Mich. Ernest F. Goodwin	15	1360	220.4			
WJBL	Decatur, Ill. Wm. Gushard D. G. Co.	250	1410	212.6			
WJBO	New Orleans, La. Valdemar Jensen	100	1140	263.0			
WJBR	Omro, Wis. Gensch & Stearns	100	1320	227.1			
WJBT	Chicago, Ill. J. S. Boyd, Inc. (WBBM-WAAF)	500	770	389.4			
WJBU	Lewisburg, Pa. Bucknell University	100	1400	214.2			
WJBW	New Orleans, La. Charles C. Carlson, Jr.	30	1260	238.0			
WJBY	Gadsden, Ala. Electric Const. Co.	50	1280	234.2			
WJBZ	Chicago Heights, Ill. R. G. Palmer & A. Coppotelli	100	1440	208.2			
WJJD	Mooseheart, Ill. Sup. Lodge of the World, Loyal Order of Moose (WEBH)	1000	820	365.6			
WJPW	Ashtabula, O. J. P. Wilson	30	1440	208.2			
WJR–WCX	Pontiac, Mich. WJR Inc. & Detroit Free Press	5000	680	440.9			
WJZ	Bound Brook, N. J. Radio Corp. of America	30KW	660	454.3			
WKAQ	San Juan, P. R. Radio Corp. of Porto Rico	500	880	340.7			
WKAR	E. Lansing, Mich. Michigan State College	500 1000–7 to 7	1050	285.5			
WKAV	Laconia, N. H. Laconia Radio Club	50	1340	223.7			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WKBB	Joliet, Ill. Sanders Bros. (WCLS)	150	1390	215.7			
WKBC	Birmingham, Ala. H. L. Ansley	10	1370	218.8			
WKBE	Webster, Mass. K. & B. Electric Co.	100	1310	228.9			
WKBF	Indianapolis, Ind. Noble Butler Watson	250	1190	252.0			
WKBG	Portable C. L. Carrell	100	1490	201.2			
WKBH	La Crosse, Wis. Callaway Music Co.	500	1360	220.4			
WKBI	Chicago, Ill. Fred L. Schoenwolf	50	930	322.4			
WKBL	Monroe, Mich. Monrona Radio Mfg. Co.	15	1460	205.4			
WKBM	Newburgh, N. Y. John Wilbur Jones	100	1440	208.2			
WKBN	Youngstown, O. W. P. Williamson, Jr. (WMBW)	50	1400	214.2			
WKBO	Jersey City, N. J. Camith Corp.(WKBQ-WCGU)	500	1370	218.8			
WKBP	Battle Creek, Mich. Enquirer-News Co.	50	1410	212.6			
WKBQ	New York, N. Y. Starlight Amusement Park (WKBO)(WCGU)	500	1370	218.8			
WKBS	Galesburg, Ill. Permil N. Nelson (WLBO)	100	1380	217.3			
WKBT	New Orleans, La. First Baptist Church	50	1190	252.0			
WKBU	Portable Harry K. Armstrong	50	1470	204.0			
WKBV	Brookville, Ind. Knox Bat. & Elec. Co.	100	1380	217.3			
WKBW	Buffalo, N. Y. Churchill Evan. Assn., Inc.	500	1380	217.3			
WKBZ	Ludington, Mich. K. L. Ashbacker	15	1500	199.9			
WKDR	S. Kenosha, Wis. Edward A. Dato	15	930	322.4			
WKEN	Kenmore, N. Y. Radio Station WKEN, Inc.	250	1470	204.0			
WKJC	Lancaster, Pa. Kirk Johnson & Co. (WGAL)	50	1190	252.0			
WKRC	Cincinnati, O. Kodel Radio Corp.	500	900	333.1			
WKY	Oklahoma City, Okla. WKY Radiophone Co.	150	1040	288.3			
WLAC-WDAD—See WDAD-WLAC							
WLAP	Louisville, Ky. L. W. Benedict	30 / 100–6 to 6	1120	267.7			
WLB	Minneapolis, Minn. Univ. of Minnesota (WHDI)	500	1220	245.8			
WLBC	Muncie, Ind. Donald A. Burton	50	1430	209.7			
WLBF	Kansas City, Mo. Everett L. Dillard	50	1430	209.7			
WLBG	Petersburg, Va. Robert Allen Gamble	100	1400	214.2			
WLBH	Farmingdale, N. Y. Joseph J. Lombardi	30	1290	232.4			
WLBI	Wenona, Ill. Wenona Leg. B'casters, Inc.	250	1260	238.0			
WLBL	Stevens Point, Wis. Wis. Dept. of Markets (WHA)	1000	940	319.0			
WLBM	Boston, Mass. Browning-Drake Corp.	50	1300	230.6			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WLBN	**Portable** William E. Hiser	50	1470	204.0			
WLBO	**Galesburg, Ill.** Fred A. Trebbe, Jr. (WKBS)	100	1380	217.3			
WLBP	**Ashland, O.** Robert A. Fox	15	1480	202.6			
WLBQ	**Atwood, Ill.** E. Dale Trout	25	1480	202.6			
WLBR	**Belvidere, Ill.** Alford Radio Co.	15	930	322.4			
WLBT	**Crown Point, Ind.** Harold Wendell	50	930	322.4			
WLBV	**Mansfield, O.** Mansfield Brdcstg. Assn.	50	1450	206.8			
WLBW	**Oil City, Pa.** Petroleum Telephone Co.	500	1020	293.9			
WLBX	**L. I. City, N. Y.** John N. Brahy (WIBS-WMBQ)	250	1470	204.0			
WLBY	**Iron Mountain, Mich.** Aimone Electric	50	1430	209.7			
WLBZ	**Dover-Foxc't, Me.** Thompson L. Guernsey	250	1440	208.2			
WLCI	**Ithaca, N. Y.** Lutheran Assn. of Ithaca	50	1210	247.8			
WLIB-WGN	**Elgin, Ill.** Liberty Weekly, Inc. & The Tribune Co.	15KW	980	305.9			
WLIT	**Philadelphia, Pa.** Lit Brothers (WFI)	500	740	405.2			
WLS	**Chicago, Ill.** Sears, Roebuck & Co. (WCBD)	5000	870	344.6			
WLSI-WDWF—See WDWF-WLSI							
WLTH	**Brooklyn, N. Y.** Flatbush Radio (WBBR-WEBJ)	250	1170	256.3			
WLTS	**Chicago, Ill.** Lane Technical H. S. (WEMC-WCFL)	100	620	483.6			
WLW	**Harrison, O.** Crosley Radio Corp.	5000	700	428.3			
WLW	**Cincinnati, O.** Crosley Radio Corp.	500	700	428.3			
WLWL	**New York, N. Y.** Missionary Soc. of St. Paul the Apostle (WMCA)	1000	810	370.2			
WMAC	**Casenovia, N. Y.** Clive B. Meredith (WSYR)	500	1330	225.4			
WMAF	**S. Dartmouth, Mass.** Round Hills Radio Corp.	500	700	428.3			
WMAK	**Lockport, N. Y.** Norton Laboratories, Inc.	750	550	545.1			
WMAL	**Washington, D. C.** M. A. Leese Co.	100	990	302.8			
WMAN	**Columbus, O.** W. E. Heskitt	50	1280	234.2			
WMAQ	**Chicago, Ill.** Chicago Daily News, Inc. (WQJ)	1000	670	447.5			
WMAY	**St. Louis, Mo.** Kingshighway Pres. Church	100	1210	247.8			
WMAZ	**Macon, Ga.** Mercer University (WGST)	500	1110	270.1			
WMBA	**Portable** LeRoy Joseph Beebe	100	1470	204.0			
WMBB	**Chicago, Ill.** Am. Bd. & Mtg. Co. (WOK)	500	1190	252.0			
WMBC	**Detroit, Mich.** Michigan Brdcstg. Co., Inc.	100	1230	243.8			
WMBD	**Peoria Heights, Ill.** Peoria Heights Radio Lab.	250	1460	205.4			
WMBE	**St. Paul, Minn.** Dr. C. S. Stebens	10	1440	208.2			

Call	Station and Owner	Power	Keys.	Meters	Dials 1	2	3
WMBF	Miami Beach, Fla. Fleetwood Hotel Corp.	500	780	384.4			
WMBG	Richmond, Va. Havens & Martin	15	1360	220.4			
WMBH	Joplin, Mo. Edwin Dudley Aber	100	1470	204.0			
WMBI	Chicago, Ill. Moody Bible Inst. (WJAZ)	500	1140	263.0			
WMBJ	Monessen, Pa. Star Theater	50	1290	232.4			
WMBL	Lakeland, Fla. Benford's Radio Studios	50	1310	228.9			
WMBM	Memphis, Tenn. Seventh Day Adv. Church	10	1430	209.7			
WMBO	Auburn, N. Y. Radio Service Laboratories	100	1360	220.4			
WMBQ	Brooklyn, N. Y. Paul J. Gollhofer (WIBS-WLBX)	100	1470	204.0			
WMBR	Tampa, Fla. F. J. Reynolds	100	1190	252.0			
WMBS	Harrisburg, Pa. Mack's Battery Co.	250	1280	234.2			
WMBU	Pittsburgh, Pa. Paul J. Miller	50	1380	217.3			
WMBW	Youngstown, O. Youngstown Brdcstg. Co. Inc. (WKBN)	50	1400	214.2			
WMBY	Bloomington, Ill. Robert A. Isaacs (WNBL)	15	1500	199.9			
WMC	Memphis, Tenn. Memphis Com. Appeal, Inc.	500	580	516.9			
WMCA	Hoboken, N. J. Greeley Sq. Hotel Co. (WLWL)	500	810	370.2			
WMES	Boston, Mass. Massachusetts Educ. Soc.	100	1420	211.1			
WMPC	Lapeer, Mich. First Methodist Prot. Church	30	1280	234.2			
WMRJ	Jamaica, N. Y. Peter J. Prinz (WHPP-WTRL)	10	1450	206.8			
WMSG	New York, N. Y. Madison Sq. Garden Brdcstg. Corp. (WBNY-WHAP)	500	1270	236.1			
WNAC	Boston, Mass. The Shepard Stores	500	850	352.7			
WNAD	Norman, Okla. Univ. of Oklahoma	500	1250	239.9			
WNAL	Omaha, Neb. R. J. Rockwell (KFOX-KOCH)	250	1160	258.5			
WNAT	Philadelphia, Pa. Lennig Bros. Co.	100	1040	288.3			
WNAX	Yankton, S. D. Gurney Seed & Nursery Co. & Dakota Radio App. Co.	250	990	302.8			
WNBA	Forest Park, Ill. Michael T. Rafferty	200	1440	208.2			
WNBF	Endicott, N. Y. Howitt-Wood Radio Co.	50	1450	206.8			
WNBH	New Bedford, Mass. New Bedford Broadcasting Co.	250	1150	260.7			
WNBJ	Knoxville, Tenn. Lonsdale Baptist Church	50	1450	206.8			
WNBL	Bloomington, Ill. Harvey R. Storm (WMBY)	15	1500	199.9			
WNBO	Washington, Pa. John Brownlee Spriggs	15	1420	211.1			
WNBQ	Rochester, N. Y. Gordon P. Brown	15	1480	202.6			
WNBR	Memphis, Tenn. John Ulrich	20	1310	228.9			
WNBX	Springfield, Vt. First Cong. Church Corp.	10	1240	241.8			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	Dials 2	Dials 3
WNJ	Newark, N. J. Herman Lubinsky (WGCP)	500	1070	280.2			
WNOX	Knoxville, Tenn. Peoples Tel. & Telg. Co.	1000	1130	265.3			
WNRC	Greensboro, N. C. Wayne M. Nelson	500	1340	223.7			
WNYC	New York, N. Y. Dept. of Plant & Structures	500	560	535.4			
WOAI	San Antonio, Tex. Southern Equipment Co.	5000	990	302.8			
WOAN	Lawrenceburg, Tenn. Church of the Nazarene & Vaughan School of Music	250	1050	285.5			
WOAX	Trenton, N. J. Franklin J. Wolff (WEAM)	500	1250	239.9			
WOBR	Portable Harl Smith	10	1470	204.0			
WOBU	Charleston, W. Va. Charleston Radio Brdcstg. Co.	50	1120	267.7			
WOC	Davenport, Ia. Palmer Sch. of Chiropractic	5000	850	352.7			
WOCL	Jamestown, N. Y. A. E. Newton	25	1340	223.7			
WODA	Paterson, N. J. Richard E. O'Dea (WGL)	1000	1020	293.9			
WOI	Ames, Ia. Iowa State College	2500 5000 6 to 6	1130	265.3			
WOK	Homewood, Ill. Trianon, Inc. (WMBB)	5000	1190	252.0			
WOKO	Peekskill, N. Y. Harold E. Smith	250	1390	215.7			
WOKT	Rochester, N. Y. Titus-Ets Corporation	500	1430	209.7			
WOMT	Manitowoc, Wis. Mikadow Theater	50	1350	222.1			
WOO	Philadelphia, Pa. John Wanamaker (WIP)	500	590	508.2			
WOOD	Grand Rapids, Mich. Walter B. Stiles, Inc.	500	1150	260.7			
WOQ	Kansas City, Mo. Unity Sch. of Christianity(WHB)	250 500 6 to 6	890	336.9			
WOR	Newark, N. J. L. Bamberger & Co.	500	710	422.3			
WORD	Batavia, Ill. Peoples Pulpit Assn. (WTAS)	5000	1090	275.1			
WOS	Jefferson City, Mo. State Marketing Bureau	500	640	468.5			
WOW	Omaha, Neb. Woodmen of the World Life Ins. Assn.	1000	590	508.2			
WOWO	Ft. Wayne, Ind. Main Auto Sup. Co. (WCWK)	1000	1310	228.9			
WPAP–WQAO—See WQAO–WPAP							
WPCC	Chicago, Ill. North Shore Cong. Church (WCRW–WFKB)	500	1340	223.7			
WPCH	Brooklyn, N. Y. Concourse Radio Corp. (WRNY)	500	970	309.1			
WPEP	Waukegan, Ill. Maurice Mayer	250	1390	215.7			
WPG	Atlantic City, N. J. Munic. of Atlantic City(WHAR)	5000	1100	272.6			
WPRC	Harrisburg, Pa. Wilson Pt. & Radio Co.	100	1430	209.7			
WPSC	State College, Pa. Penna. St. Col. (WBAK)	500	1000	299.8			
WPSW	Philadelphia, Pa. Phila. Sch. of Wireless Teleg.	50	1480	202.6			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WQAA	Parkesburg, Pa. Horace A. Beale, Jr.	500	1390	215.7			
WQAM	Miami, Fla. Electrical Equipment Co.	750	930	322.4			
WQAN	Scranton, Pa. Scranton Times (WGBI)	250	1300	230.6			
WQAO-WPAP	Cliffside, N. J. Calvary Baptist Church (WHN)	500	760	394.5			
WQJ	Chicago, Ill. Calumet Brdcstg. Co. (WMAQ)	500	670	447.5			
WRAF	La Porte, Ind. The Radio Club, Inc.	100	1440	208.2			
WRAH	Providence, R. I. Stanley N. Read	250	1500	199.9			
WRAK	Escanaba, Mich. Economy Light Co.	50	1060	282.8			
WRAM	Galesburg, Ill. Lombard College (WFBZ)	50	1210	247.8			
WRAV	Yellow Springs, O. Antioch College (WAFD)	100	880	340.7			
WRAW	Reading, Pa. Ave. Rad. & Elec. Shop	100	1260	238.0			
WRAX	Philadelphia, Pa. Berachah Church, Inc.	250	1410	212.6			
WRBC	Valparaiso, Ind. Immanuel Lutheran Church	250	1260	238.0			
WRC	Washington, D. C. Radio Corp. of America	500	640	468.5			
WRCO	Raleigh, N. C. Wynne Radio Co.	250	1380	217.3			
WRCV	Norfolk, Va. Radio Corp. of Virginia	100	1430	209.7			
WREC	Memphis, Tenn. WREC, Incorporated	50	1180	254.1			
WREN	Lawrence, Kan. Jenny Wren Co.	750	1180	254.1			
WREO	Lansing, Mich. Reo Motor Car Co. (KFKO)	500	1300	230.6			
WRES	Quincy, Mass. Harry Leonard Sawyer	50	1380	217.3			
WRHF	Washington, D. C. Washington Radio Hospital Fund (6 to 6 only)	150	940	319.0			
WRHM	Fridley, Minn. Rosedale Hospital Co. Inc. (WDGY)	1000	1150	260.7			
WRK	Hamilton, O. S. W. Doron & J. C. Slade	100	1460	205.4			
WRM	Urbana, Ill. Univ. of Illinois (WBAA)	500 1000–6 to 6	1100	272.6			
WRMU	Portable Atlantic Brdcstg. Corp.(WGMU)	100	1490	201.2			
WRNY	Coytesville, N. J. Experimenter Pub. Co.(WPCH)	500	970	309.1			
WRPI	Terre Haute, Ind. Rose Poly. Inst. & B'dc'g. Assn.	100	1440	208.2			
WRR	Dallas, Tex. City of Dallas	500	850	352.7			
WRRS	Racine, Wis. Racine Broadcasting Corp.	50	930	322.4			
WRSC	Chelsea, Mass. William S. Pote	15	1460	205.4			
WRST	Bay Shore, N. Y. Radiotel Mfg. Co., Inc.(WBRS WCDA)	250	1420	211.1			
WRVA	Richmond, Va. Larus Bros. & Co., Inc.	1000	1180	254.1			
WSAI	Cincinnati, O. U. S. Playing Card Co.	5000	830	361.2			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WSAJ	Grove City, Pa. Grove City College	250	1340	223.7			
WSAN	Allentown, Pa. Allentown Call Pub. Co., Inc. (WCBA)	100	1350	222.1			
WSAR	Portsmouth, R. I. Doughty & Welch El. Co., Inc.	100	1190	252.0			
WSAX	Chicago, Ill. Zenith Radio Corp.	100	1470	204.0			
WSAZ	Huntington, W. Va. McKellar Electric Co.	100	1240	241.8			
WSB	Atlanta, Ga. Atlanta Journal Co.	1000	630	475.9			
WSBC	Chicago, Ill. World Battery Co. Inc. (WJKS)	500	1290	232.4			
WSBF	St. Louis, Mo. Miss. Valley Brdcstg. Co.	250	680	440.9			
WSBT	South Bend, Ind. South Bend Tribune	500	1260	238.0			
WSDA	New York, N. Y. The City Temple (WARS–WBBC)	250	1320	227.1			
WSEA	Virginia Beach, Va. Virginia Beach Brdcstg. Co., Inc. (WTAR)	500	1140	263.0			
WSIX	Springfield, Tenn. 638 Tire & Vulcanizing Co.	150	1410	212.6			
WSKC	Bay City, Mich. World's Star Knitting Co.	250	610	491.5			
WSM	Nashville, Tenn. Nat'l Life & Acc. Ins. Co. Inc.	5000	880	340.7			
WSMB	New Orleans, La. Saenger Theatres, Inc. & Maison Blanche Co.	500	930	322.4			
WSMK	Dayton, O. Stanley M. Krohn, Jr.	200	1010	296.9			
WSOE	Milwaukee, Wis. Sch. of Eng. of Milwaukee	500	1110	270.1			
WSOM	New York, N. Y. G. J. Cook (WAAT–WGBB)	500	1220	245.8			
WSRO	Middletown, O. Harry W. Fahrlander	100	780	384.4			
WSSH	Boston, Mass. Tremont Temple Baptist Ch. (WBET)	100	1040	288.3			
WSUI	Iowa City, Ia. State University of Iowa	500	710	422.3			
WSVS	Buffalo, N. Y. Seneca Vocational School	50	1460	205.4			
WSYR	Syracuse, N. Y. Clive B. Meredith (WMAC)	500	1330	225.4			
WTAD	Quincy, Ill. Illinois Stk. Med. B'dc'g Corp.	250 500–6 a.m. to 7 p.m.	1270	236.1			
WTAG	Worcester, Mass. Worcester Telegram Pub. Co.	500	580	516.9			
WTAL	Toledo, O. Toledo Brdcstg. Co.(WABR)	100	1070	280.2			
WTAM	Cleveland, O. Willard Stor. Bat. Co. (WEAR)	3500 5000–6 to 6	750	399.8			
WTAQ	Eau Claire, Wis. C. S. Van Gorden	500	1180	254.1			
WTAR	Norfolk, Va. Reliance Electric Co., Inc.	500	1140	263.0			
WTAS	Elgin, Ill. Illinois Brdcstg. Corp. (WORD)	3500	1090	275.1			
WTAW	College Sta., Tex. Agri. & Mech. Col. of Texas	500	970	309.1			
WTAX	Streator, Ill. Williams Hardware Co.	50	930	322.4			

Call	Station and Owner	Power	Kcys.	Meters	Dials 1	2	3
WTAZ	Lambertville, N. J. Thomas J. McGuire	15	1360	220.4			
WTIO	Detroit, Mich. W. J. Thomas Brdcstg. Co.	250	1370	218.8			
WTIC	Hartford, Conn. Travelers Ins. Co.	500	630	475.9			
WTMJ	Brookfield, Wis. Milwaukee Journal (WHAD)	1000	1020	293.9			
WTFF	Mt. Vernon Hills, Va. Independent Pub. Co.	50	1470	204.0			
WTRL	Midland Park, N. J. Tech. Rad. Lab. (WMRJ-WHPP)	15	1450	206.8			
WWAE	Chicago, Ill. Dr. G. F. Currier (WCLO-WJBC)	500	1320	227.1			
WWJ	Detroit, Mich. The Detroit News	1000	800	374.8			
WWL	New Orleans, La. Loyola University	100	1090	275.1			
WWNC	Asheville, N. C. Chamber of Commerce	1000	1010	296.9			
WWRL	Woodside, N. Y. Wm. H. Reuman (WBKN-WBMS-WIBI)	100	1120	267.7			
WWVA	Wheeling, W. Va. John C. Stroebel, Jr.	100	770	389.4			

Radio
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Principal Foreign Radio Broadcasting Stations

EUROPE

AUSTRIA

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
ORV	Vienna Broadcasting monopoly, national	577	1500			

BELGIUM

BAV	Brussels Radio organization	508.5	1500			

CZECHOSLOVAKIA

OKP	Prague Broadcasting monopoly, national	381.9	5000			

FRANCE

2BD	Agen Department Government	297	250			
YN	Lyon Government	480	1000			
FPTT	Paris Government	458	1000			
FL	Paris Government	2650	4000			
MRD	Toulouse Government	260	1000			

GERMANY

AFT	Berlin Broadcasting monopoly, local	1250	4000			

HUNGARY

MTI	Budapest Radio organization	555.6	2000			

IRISH FREE STATES

6CK	Cork Government	400	1000			
2RN	Dublin Government	319.1	1500			

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
	ITALY					
IM1	Milan Broadcasting monopoly, national	322.6	1500			
INA	Naples Broadcasting monopoly, national	333.3	1500			
IRO	Rome Broadcasting monopoly, national	449	3000			
	LATVIA					
KCX	Riga Government	526.3	2000			
	NETHERLANDS					
HDO	Hilversum Radio manufacturers	1060	1000			
	NORWAY					
----	Oslo Broadcasting company	370.4	1500			
	PORTUGAL					
PIAA	Lisbon Department store	267.8	500			
	RUSSIA					
RA30	Dneprovsk Local soviet	525	1000			
RA43	Kharkov Local soviet	475	4000			
RA38	Krasnodar Local soviet	513	1000			
RA60	Krementchug Radio organization	400	50			
RA2	Moscow Labor unions	450	500			
RA4	Moscow Trade unions	450	300			
RA64	Petropavlovsk Radio organization	350	45			
RA32	Saratov Radio organization	420	200			
RA21	Tomsk University	300	150			
RA17	Vladivostok Radio organization	456	1500			

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
	SPAIN					
EAJ1	Barcelona Radio organization	344	1000			
EAJ13	Barcelona Private citizen	277.8	1000			
EAJ9	Bilbao Private citizen	438	500			
EAJ11	Bilbao Private citizen	294.1	500			
EAJ3	Cadiz Private citizen	344	500			
EAJ16	Cartagena Private citizen	294.1	500			
EAJ2	Madrid Not reported	400	500			
EAJ7	Madrid Broadcasting Company	375	1000			
EAJ25	Malaga Radio organization	50–250	100			
EAJ19	Oviedo Private citizen	201.3	100			
EAJ22	Salamanca Broadcasting company	405	500			
EAJ8	San Sebastian Private citizen	272.7	500			
EAJ5	Seville Private citizen	400	1000			
EAJ17	Seville Radio organization	344	500			
EAJ23	Zaragoza Not reported	566				
	SWEDEN					
SASE	Boden Broadcasting company, national	454.5	1000			
SMYB	Boras Radio organization	230	250			
SMUC	Eskilstuna Radio organization	275.2	250			
SMZK	Falun Radio organization	400	750			
SMXF	Gavle Radio organization	204.1	250			
SASB	Goteborg Broadcasting company, national	416.7	1000			
SMSB	Halmstad Radio organization	215.8	250			
SMYE	Helsingborg Radio organization	235	250			
SMSL	Hudiksvall Radio organization	248	250			
SMZD	Jonkopings Radio organization	201.3	250			
SMSW	Kalmar Radio organization	253	250			
SMSM	Karlskrona Radio organization	201.3	250			
SMXG	Karlstad Radio organization	220 6	250			
SMTJ	Kristinehamn Radio organization	202.7	100			
SASC	Malmo Broadcasting company, national	229	1000			
	Motala Broadcasting company, national	1304.5	40000			

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
	SWEDEN (Continued)					
SMVV	Norrkoping Radio organization	272.7	250			
SMTI	Orebro Radio organization	566	250			
SMTS	Saffle Radio organization	252.1	500			
SASA	Stockholm Broadcasting company, national	416.7	1500			
SASD	Sundsvall Broadcasting company, national	545.6	1000			
SMXQ	Trollhattan Radio organization	277.8	1000			
SMZP	Uddevalla Radio organization	294.1	100			
SMSN	Umea Radio organization	252.1	250			
SMSO	Varberg Radio organization	297	100			
	UNITED KINGDOM					
2BD	Aberdeen Government	500	1500			
2BE	Belfast Government	306.1	1500			
5IT	Birmingham Government	326.1	1500			
6BM	Bournemouth Government	491.8	1500			
5WA	Cardiff Government	353	1500			
2DE	Dundee Government	294	200			
2EH	Edinburgh Government	288.5	500			
5SC	Glasgow Government	405.4	1500			
6KH	Hull Government	294	200			
2LS	Leeds, Bradford Government	277.8 252.1	500			
6LV	Liverpool Government	297	200			
2LO	London Government	361.4	3000			
2ZY	Manchester Government	384.6	1500			
5NO	Newcastle Government	312.5	1500			
5NG	Nottingham Government	275.2	200			
5PY	Plymouth Government	400	200			
6FL	Sheffield Government	272.7	200			
6ST	Stoke-on-Trent Government	294	200			
5SX	Swansea Government	294	200			

NORTH AMERICA

CANADA

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
CFGC	Brantford, Ont. Radio dealers	296.9	50			
CFYC	Burnaby, B. C. Church organizations	410.7	500			
CFAC	Calgary, Alta. Newspaper	434.5	500			
CFCN	Calgary, Alta. Radio dealers	434.5	1800			
CJCJ	Calgary, Alta. Radio dealers	434.5	250			
CNRC	Calgary, Alta. Railway (uses above stations)					
CFCY	Charlottetown, P. E. I. Radio dealers	312.3	100			
CKMC	Cobalt, Ont. Not reported	247.8	5			
CHCY	Edmonton, Alta. Church organization	516.9	250			
CHMA	Edmonton, Alta. Church organization	516.9	250			
CJCA	Edmonton, Alta. Newspaper	516.9	500			
CKUA	Edmonton, Alta. University	516.9	500			
CNRE	Edmonton, Alta. Railway (uses above stations)					
CFNB	Fredericton, N. B. Radio dealers	247.8	25			
CHNS	Halifax, N. S. Electrical dealers	322.4	100			
CHCS	Hamilton, O. Newspapers	340.7	10			
CKOC	Hamilton, O. Radio dealers	340.7	50			
CFCH	Iroquois Falls, Ont. Power company	499.7	250			
CFJC	Kamloops, B. C. Merchants	267.7	15			
CFRB	King, York Co., Ont. Radio manufacturers	291.1	1000			
CFMC	Kingston, Ont. Battery manufacturers	267.7	20			
CFRC	Kingston, Ont. University	267.7	500			
CJGC	London, Ont. Newspaper	329.5	500			
CKPR	Midland, Ont. Not reported	267.7	50			
CJCU	Mission City, B. C. Private citizen	247.8	5			
CNRA	Moncton, N. B. Railway	322.4	500			
CFCF	Montreal, P. Q. Hotel	410.7	1650			
CHYC	Montreal, P. Q. Electrical dealers	410.7	750			
CKAC	Montreal, P. Q. Newspaper	410.7	1200			
CNRM	Montreal, P. Q. Railway (uses above stations)					
CJRM	Moose Jaw, Sask. Merchants	296.9	50			

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
	CANADA (Continued)					
CKCO	**Ottawa, Ont.** Radio organization	434.5	100			
CNRO	**Ottawa, Ont.** Railway	434.5	500			
CFLC	**Prescott, Ont.** Radio organizations	296.9	50			
CKPC	**Preston** Private citizen	247.8	7½			
CHRC	**Quebec, P. Q.** Private citizen	340.7	5			
CKCI	**Quebec, P. Q.** Not reported	340.7	22½			
CKCV	**Quebec, P. Q.** Not reported	340.7	50			
CKLC	**Red Deer, Alta.** Grain dealers	356.9	1000			
CHWC	**Regina, Sask.** Not reported	312.3	15			
CJBR	**Regina, Sask.** Farmers' coop. organization	312.3	500			
CKCK	**Regina, Sask.** Newspaper	312.3	500			
CKSH	**St. Hyacinthe, P. Q.** Municipality	312.3	50			
CFQC	**Saskatoon, Sask.** Electrical dealers	329.5	500			
CHUC	**Saskatoon, Sask.** Church organization	329.5	500			
CJWC	**Saskatoon, Sask.** Electrical dealers	329.5	250			
CJYC	**Scarboro, Ont.** Radio dealers	291.1	500			
CJOR	**Sea Island, B. C.** Private citizen	291.1	50			
CHLC	**Summerside, P. E. I.** Merchants	267.7	25			
CFCA	**Toronto, Ont.** Newspaper	356.9	500			
CHIC	**Toronto, Ont.** Electrical dealers	356.9	500			
CKCL	**Toronto, Ont.** Battery manufacturers	356.9	500			
CKNC	**Toronto, Ont.** Battery manufacturers	356.9	500			
CHSC	**Unity, Sask.** Radio dealers	267.7	50			
CFCQ	**Vancouver, B. C.** Radio dealers	410.7	10			
CFCT	**Vancouver, B. C.** Private citizen	329.5	500			
CKCD	**Vancouver, B. C.** Newspaper	410.7	1000			
CKFC	**Vancouver, B. C.** Church	410.7	50			
CKWX	**Vancouver, B. C.** Private citizens	410.7	10			
CNRV	**Vancouver, B. C.** Railway	291.1	500			
CKY	**Winnipeg, Man.** Provincial government	384.4	500			
CJGX	**Yorkton, Sask.** Grain dealers	475.9	500			
	CUBA					
PWX	**Havana** Telephone company	400	500			

Call	City, Owners and Operators	Wave-length Meters	Power antenna Watts	Dials 1	2	3
	MEXICO					
CZF	Chihuahua State government	310	250			
CYR	Mazatlan Private citizen	475	250			
CYY	Merida Political organization	548	100			
CYA	Mexico City Private citizen	300	500			
CYB	Mexico City Industrial corporation	275	500			
CYH	Mexico City Publishers	375	100			
CYJ	Mexico City Not reported	400	2000			
CYL	Mexico City Radio dealers	400	500			
CYO	Mexico City Private citizen	425	100			
CYX	Mexico City Newspaper	325	500			
CZE	Mexico City Government	350	500			
----------	Monterey Private citizen	311	250			
CYF	Oaxaca Private citizen	265	100			
CYU	Pueblo Private citizen	312	100			
CYQ	Tampico Merchants	322	100			
CYC	Vera Cruz Sales agent	337	50			

SOUTH AMERICA

ARGENTINA

LOL	Buenos Aires Broadcasting company	236	2000			
LON	Buenos Aires Broadcasting company	210	5000			
LOO	Buenos Aires Broadcasting company	252	1000			
LOQ	Buenos Aires Private citizen	261	500			
LOR	Buenos Aires Radio organization	344.8	1000			

BRAZIL

SQIA	Rio de Janeiro Radio organization	400	1000			
SQIB	Rio de Janeiro Radio organization	320	500			
SQIC	Rio de Janeiro Merchants	260	100			
SQIG	Sao Paulo Radio organization	350	1000			
RSR	Porto Alegre Radio organization	380	80			

VENEZUELA

AYRE	Caracas Broadcasting monopoly, national	375	1000			

UNITED STATES STATIONS BY STATES

ALABAMA

Auburn	WAPI
Birmingham	WBRC
Birmingham	WKBC
Gadsden	WJBY
Montgomery	WIBZ

ARIZONA

Flagstaff	KFXY
Phoenix	KFAD
Phoenix	KKCB
Prescot	KPJM
Tuscon	KGAR

ARKANSAS

Fayetteville	KUOA
Hot Springs	KTHS
Newark	KGCG

CALIFORNIA

Avalon	KFWO
Berkeley	KRE
Burbank	KELW
El Centro	KGEN
Eureka	KFWH
Fresno	KMJ
Hollywood	KMTR
Hollywood	KFQZ
Holy City	KFQU
Inglewood	KMIC
La Criscenta	KGFH
Long Beach	KFOM
Long Beach	KGER
Los Angeles	KFPR
Los Angeles	KFI
Los Angeles	KFSG
Los Angeles	KFWB
Los Angeles	KGEF
Los Angeles	KGFJ
Los Angeles	KHJ
Los Angeles	KNZ
Los Angeles	KPLA
Los Angeles	KRLO
Los Angeles	KTBI
Lower Lake	KGEU
Oakland	KFUS
Oakland	KZM
Oakland	KFWM
Oakland	KLX
Oakland	KGO
Oakland	KLS
Oakland	KTAB
Oxnard	KFYF
Pasadena	KPPC
Santa Monica	KNRC
Sacramento	KFBK
San Bernardo	KFWC
San Diego	KFBC
San Diego	KFSD
San Francisco	KFRC
San Francisco	KFWI
San Francisco	KGTT
San Francisco	KJBS
San Francisco	KPO
San Francisco	KYA
San Jose	KQW
Santa Barbara	KFCR
Santa Maria	KSMR
Santa Anna	KWTC
Stockton	KGPM
Stockton	KWG
Uba City	KGFM
Venice	KFVD

COLORADO

Colorado Springs	KFUM
Denver	KFEL
Denver	KFUP
Denver	KFXF
Denver	KGEY
Denver	KLZ
Denver	KOA
Denver	KOW
Durango	KOLO
Edgewater	KFXZ
Fort Morgan	KGEW
Greeley	KFKA
Gunnison	KFHA
Pueblo	KGDP
Trinidad	KGFL
Yuma	KGEK

CONNECTICUT

Bridgeport	WICC
Danbury	WCWS
Hartford	WTIC
Mansfield	WCAC
New Haven	WDRC

DELAWARE

Wilmington	WDEL

DISTRICT OF COLUMBIA

Washington	WMAL
Washington	WRC
Washington	WRHF

FLORIDA

Clearwater	WFLA
Gainesville	WHBN

Jacksonville	WJAX
Lakeland	WMBL
Miami	WQAM
Miami Beach	WIOD
Miami Beach	WMBF
Orlando	WDBO
Pensacola	WCOA
Tampa	WDAE
Tampa	WJBB
Tampa	WMBR

GEORGIA

Atlanta	WGSF
Atlanta	WSB
Macon	WMAZ

IDAHO

Boise	KFAU
Jerome	KFXD
Kellogg	KFEY
Pocatello	KSEI

ILLINOIS

Atwood	WLBQ
Batavia	WORD
Belvidere	WLBR
Bloomington	WMBY
Bloomington	WNBL
Carthage	WCAZ
Chicago	KYW
Chicago	WAAF
Chicago	WBBM
Chicago	WBCM
Chicago	WEFL
Chicago	WCRW
Chicago	WEBH
Chicago	WEDC
Chicago	WENR
Chicago	WFKB
Chicago	WGES
Chicago	WGN-WLIB
Chicago	WHFC
Chicago	WHT
Chicago	WIBO
Chicago	WJBT
Chicago	WKBI
Chicago	WLS
Chicago	WLTS
Chicago	WMAQ
Chicago	WMBB
Chicago	WMBI
Chicago	WPCC
Chicago	WQJ
Chicago	WSAX
Chicago	WSBC
Chicago	WWAE
Chicago Heights	WJBG
Decatur	WBAO
Decatur	WJBL
Elgin	WGN-WLIB
Elgin	WTAS
Evanston	WEHS
Forest Park	WNBA
Galesburg	WKBS
Galesburg	WLBO
Galesburg	WFBZ
Galesburg	WRAM
Harrisburg	WEBQ
Homewood	WOK
Joliet	WJBA
Joliet	WKBB
Joliet	WELS
La Salle	WJBE
Mooseheart	WJJD
Mt. Prospect	WJAZ
Peoria Heights	WMBD
Quincy	WTAD
Rockford	KTLV
Rock Island	WHBF
Springfield	WCBS
Streator	WWAE
Tuscola	WDZ
Urbana	WRM
Waukegan	WPEP
Winona	WLBI
Zion	WCBD

INDIANA

Anderson	WHBU
Brookville	WKBV
Crown Point	WLBT
Culver	WCMA
Evansville	WGBF
Ft. Wayne	WCWK
Ft. Wayne	WOWO
Indianapolis	WFBM
Indianapolis	WKBF
Kokomo	WJAK
Lafayette	WBBA
La Porte	WRAF
Muncie	WLBC
South Bend	WSBT
Terre Haute	WRPI
Valparaiso	WBBC

IOWA

Ames	WOI
Atlantic	KIEK
Boone	KFGQ
Burlington	WIAS

Cedar Rapids	KWCR
Cedar Rapids	WJAM
Clarinda	KSO
Council Bluffs	KOIL
Cresco	KGDA
Davenport	WOC
Decorah	KGCA
Decorah	KWLC
Des Moines	WHO
Fort Dodge	KFJY
Iowa City	KGFB
Iowa City	WSUI
La Mars	KWUC
Marshaltown	KFJB
Muscatine	KPNP
Muscatine	KTNT
Oskaloosa	KFHL
Shenandoah	KFNF
Shenandoah	KMA
Sioux City	KFMR
Sioux City	KSCJ

KANSAS

Concordia	KGCM
Independence	KFVG
Lawrence	KFKU
Lawrence	WREN
Manhattan	KSAC
Milford	KFKB
Wichita	KFH

KENTUCKY

Hopkinsville	WFIW
Louisville	WHAS
Louisville	WLAP

LOUISIANA

New Orleans	WABZ
New Orleans	WCBE
New Orleans	WJBO
New Orleans	WJBW
New Orleans	WKBT
New Orleans	WSMB
New Orleans	WWL
Shreveport	KFDX
Shreveport	KGDX
Shreveport	KRAC
Shreveport	KSBA
Shreveport	KWKH

MAINE

Bangor	WABI
Dover-Foxcraft	WLBZ
Portland	WCSH

MARYLAND

Baltimore	WBAL
Baltimore	WCAO
Baltimore	WCBM
Baltimore	WFBR
Tacoma Park	WBES

MASSACHUSETTS

Boston	WBET
Boston	WBIS
Boston	WBZA
Boston	WEEI
Boston	WLBM
Boston	WMES
Boston	WNAC
Boston	WSSH
Chelsea	WRSC
East Springfield	WBZ
Gloucester	WEPS
Lexington	WAJS
New Bedford	WNBH
Quincy	WRES
South Dartmouth	WMAF
Taunton	WAIT
Webster	WKBE
Wellesley Hills	WBSO
Worcester	WTAG

MICHIGAN

Battle Creek	WKBP
Bay City	WSKC
Berrien Springs	WEMC
Budington	WKBZ
Detroit	WAFD
Detroit	WBMH
Detroit	WMBC
Detroit	WTHO
Detroit	WWJ
East Lansing	WKAR
Escanaba	WRAK
Flint	WFDF
Grand Rapids	WASH
Grand Rapids	WOOD
Iron Mountain	WLBY
Lansing	WREO
Lapeer	WMPC
Monroe	WKBL
Mt. Clemens	WGHP
Petoskey	WBBP
Pontiac	WJR & WCX
Royal Oak	WAGM
Ypsilanti	WJBK

MINNESOTA

Barrett	KGDE
Collegeville	WFBJ

Farmont	KFVM
Fridley	WRHM
Hallock	KGFK
Minneapolis	KFDZ
Minneapolis	KFEQ
Minneapolis	WAMD
Minneapolis	WCCO
Minneapolis	WDGY
Minneapolis	WHDI
Minneapolis	WLB
Northfield	KFMX
Northfield	WCAL
Saint Cloud	WFAM
Saint Paul	KFOY
Saint Paul	WMBE

MISSISSIPPI

Columbus	WCOC
Oxford	WCBH

MISSOURI

Cape Girardeau	KFVS
Cartersville	KFPW
Columbia	KFRU
Independence	KLDS
Jefferson City	WOS
Joplin	WMBH
Kansas City	KWKC
Kansas City	WDAF
Kansas City	WHB
Kansas City	WLBF
Kansas City	WOQ
Kirksville	KFKZ
Saint Joseph	KFEQ
Saint Joseph	KGBX
St. Louis	KFQA
St. Louis	KFUO
St. Louis	KFVE
St. Louis	KFWF
St. Louis	KMOX
St. Louis	KSV
St. Louis	WEW
St. Louis	WIL
St. Louis	WMAY
St. Louis	WSBF

MONTANA

Havre	KFBB
Kalispell	KGEZ
Missoula	KUOM
Vermillion	KUSD
Vida	KGCY

NEBRASKA

Central City	KGES
Clay Center	KMMJ
Grand Island	KGEO
Hastings	KFKX
Humboldt	KGDW
Lincoln	KFAB
Lincoln	KFOR
Lincoln	WCAJ
Norfolk	WJAG
Omaha	KFOX
Omaha	KOCH
Omaha	WAAW
Omaha	WNAL
Omaha	WOW
Ravenna	KGFW
Shelby	KGBY
Wayne	KGCH
York	KGBZ

NEW HAMPSHIRE

Laconia	WKAV
Manchester	WCOM
Tilton	WBRL

NEW JERSEY

Asbury Park	WDWM
Atlantic City	WHAR
Atlantic City	WPG
Bound Brook	WJZ
Camden	WCAM
Cliffside	WCDA
Cliffside	WQAO-WPAP
Coytesville	WRNY
Elizabeth	WIBS
Hoboken	WMCA
Jersey City	WAAT
Jersey City	WKBO
Lambertville	WTAZ
Midland Park	WTRL
Newark	WAAM
Newark	WGCP
Newark	WNJ
Newark	WOR
New York	WSBA
North Plainfield	WEAM
Patterson	WODA
Red Bank	WJBI
Trenton	WOAX
Union City	WBMS

NEW MEXICO

State College	KOB

NEW YORK

Astoria	WGBS
Auburn	WMBO
Bay Shore	WRST
Brooklyn	WARS
Brooklyn	WBBC
Brooklyn	WBKN
Brooklyn	WBRS
Brooklyn	WLTH
Brooklyn	WMBQ
Brooklyn	WPCH
Buffalo	WEBR
Buffalo	WGR
Buffalo	WKBW
Buffalo	WSVS
Canton	WCAD
Casenovia	WMAC
Coney Island	WCGU
Endicott	WNBF
Farmingdale	WLBH
Flushing	WIBI
Freeport	WGBB
Ithaca	WEAI
Ithaca	WLCI
Jamaica	WMRJ
Jamestown	WOCL
Kenmore	WKEN
Lockport	WMAK
Long Island City	WLBX
Newburgh	WKBM
New York	WBNY
New York	WEAF
New York	WEBJ
New York	WGL
New York	WHAP
New York	WHM
New York	WHPP
New York	WKBQ
New York	WLWL
New York	WMSG
New York	WNYC
New York	WSON
Peeksville	WOKO
Richmond Hill	WABC
Richmond Hill	WBOQ
Rochester	WABO
Rochester	WHAM
Rochester	WHEC
Rochester	WNBQ
Rochester	WOKT
Rossville	WBBR
S. Schenectady	WGY
Syracuse	WFBL
Syracuse	WSYR
Troy	WHAZ
Utica	WIBX
Woodside	WWR

NORTH CAROLINA

Asheville	WWNC
Charlotte	WBT
Greensboro	WNRC
Raleigh	WRCO

NORTH DAKOTA

Aneta	KGFN
Bismarck	KFYR
Devils Lake	KDLR
Fargo	WDAY
Grand Forks	KFJM
Mandan	KGCU

OHIO

Akron	WADE
Ashland	WLBP
Ashtabula	WJPW
Bellefontaine	WHBD
Cambridge	WEBE
Canton	WHBC
Cincinnati	WAAD
Cincinnati	WFBE
Cincinnati	WKRC
Cincinnati	WLW
Cincinnati	WSAI
Cleveland	WDBK
Cleveland	WEAR
Cleveland	WFK
Cleveland	WJAY
Cleveland	WTAM
Columbus	WAIU
Columbus	WCAH
Columbus	WEAO
Columbus	WMAN
Dayton	WSMK
Hamilton	WRK
Harrison	WLW
Mansfield	WLBV
Middletown	WSRO
Springfield	WCSO
Stubenville	WIBR
Toledo	WABR
Toledo	WTAL
Wooster	WABW
Yellow Springs	WRAB
Youngstown	WKBN
Youngstown	WMBW

OKLAHOMA

Alva	KGFF
Bristow	KVOO
Chickasha	KOCW
Norman	WNAD
Oklahoma City	KFJF

Oklahoma City	KFYR
Oklahoma City	KGCB
Oklahoma City	KGFG
Oklahoma City	WKY

OREGON

Astoria	KFJI
Corvallis	KOAC
Eugene	KGEF
Medford	KMED
Portland	KEX
Portland	KFEC
Portland	KFIF
Portland	KFJR
Portland	KGW
Portland	KLIT
Portland	KOIN
Portland	KTBR
Portland	KWJJ
Portland	KXL
Portland	KWBS

PENNSYLVANIA

Allentown	WCBA
Allentown	WSAM
Altoona	WFBG
East Pittsburgh	KDKA
Elkins Park	WIBJ
Frankford	WFKD
Grove City	WSAJ
Harrisburg	WBAK
Harrisburg	WMBS
Harrisburg	WPRC
Jeannette	WGM
Johnson	WHBP
Kingston	WABF
Lancaster	WGAL
Lancaster	WKJC
Louisburg	WJBU
Monessen	WMBJ
Oil City	WHBA
Oil City	WLBW
Parksburg	WQAA
Philadelphia	WABQ
Philadelphia	WABY
Philadelphia	WCAU
Philadelphia	WFI
Philadelphia	WHBW
Philadelphia	WIAD
Philadelphia	WIP
Philadelphia	WLIT
Philadelphia	WNAT
Philadelphia	WOO
Philadelphia	WPSW
Philadelphia	WRAX
Pittsburgh	KQV
Pittsburgh	WCAE
Pittsburgh	WJAS
Pittsburgh	WMBU
Reading	WRAW
Scranton	WGBI
Scranton	WQAM
State College	WPSC
Washington	WNBO
Wilkes-Barre	WBAX
Wilkes-Barre	WBRE
Willow Grove	WALK

PORTO RICO

San Juan	WKAQ

RHODE ISLAND

Cranston	WDWF and WLSI
Pawtucket	WFCI
Portsmouth	WSAR
Providence	WCOT
Providence	WEAN
Providence	WJAR
Providence	WRAH

SOUTH CAROLINA

Charleston	WBBY

SOUTH DAKOTA

Brookings	KFDY
Brookings	KGCR
Del Rapids	KGDA
Mitchell	KGFP
Oldham	KGDY
Pierre	KGFX
Rapid City	WCAT
Sioux Falls	KSOO
Yankton	WNAX

TENNESSEE

Chattanooga	WDOD
Knoxville	WFBC
Knoxville	WNBJ
Knoxville	WNOX
Lawrenceburg	WOAN
Memphis	WGBC
Memphis	WHBQ
Memphis	WMBM
Memphis	WMC
Memphis	WNBR
Memphis	WREC
Nashville	WBAW
Nashville	WDAD & WLAC
Nashville	WSM

TEXAS

Amarillo	KGRS
Amarillo	WDAG
Austin	KUT
Beaumont	KFDM
Brownsville	KWWG
College Station	WTAW
Dallas	KRLD
Dallas	WFAA
Dallas	WRR
Dublin	KFPL
El Paso	KFXH
El Paso	WDAH
Fort Stockton	KGFI
Fort Worth	KFJZ
Fort Worth	KFQB
Fort Worth	WBAP
Galveston	KFLX
Galveston	KFUL
Greenville	KFPM
Houston	KFVI
Houston	KPRC
Houston	KTUE
San Antonio	KGCI
San Antonio	KGDR
San Antonio	KGRC
San Antonio	KTAP
San Antonio	KTSA
San Antonio	WOAI
Waco	WJAD

UTAH

Ogden	KFUR
Salt Lake City	KDYL
Salt Lake City	KFUT
Salt Lake City	KSL

VIRGINIA

Mt. Vernon Hills	WFEF
Norfolk	WBBW
Norfolk	WRCV
Norfolk	WTAR
Petersburg	WLBG
Richmond	WBBL
Richmond	WMBG
Richmond	WRVA
Roanoke	WBDJ
Virginia Beach	WSEA

VERMONT

Burlington	WCAX
Springfield	WNBX

WASHINGTON

Aberdeen	KXRO
Everett	KFBL
Lacey	KGY
Pullman	KWSC
Seattle	KFOA
Seattle	KFQW
Seattle	KGBS
Seattle	KGCL
Seattle	KJR
Seattle	KKP
Seattle	KOMO
Seattle	KPCB
Seattle	KRSC
Seattle	KTCL
Seattle	KTW
Seattle	KUJ
Seattle	KVOS
Spokane	KFIO
Spokane	KGA
Spokane	KHQ
Tacoma	KMO
Tacoma	KVI
Walla Walla	KOWW
Yakima	KFIQ

WEST VIRGINIA

Huntington	WSAZ
Wheeling	WWVA

WISCONSIN

Beloit	WEBW
Brookfield	WTMJ
Camp Lake	WCLA
Eau Claire	WTAQ
Fond du Lac	KFIZ
La Crosse	WKBH
Madison	WHA
Madison	WIBA
Manitowoc	WOMT
Milwaukee	WHAD
Milwaukee	WGWB
Milwaukee	WSOE
Omro	WJBR
Poynette	WIBU
Racine	WRRS
South Kenosha	WKDR
Stevens Point	WLBL
Superior	WEVC
West De Pere	WHBY

WYOMING

Laramie	KFVU

ALASKA

Anchorage	KFQD
Juneau	KFIU
Ketchikan	KGBU

HAWAII

Honolulu	KGU

PORTABLE

KGFO	WGMU	WIBM	WLBN
WATT	WHBL	WIBW	WMBA
WDBZ	WHBM	WKBG	WOBR
WCBR	WIBJ	WKBU	WRMU

RAY-O-VAC

RADIO BATTERIES

Classified According to Demand

Class I — Radio batteries No. 9303, No. 2303, No. 5151, No. 231R and No. 1211 meet 90 per cent of radio requirements and are carried in all branch and warehouse stocks.

Master Ray-O-Vac No. 9303—45 Volt "B" Battery

Recommended for economical "B" battery operation on all radio sets of four or more tubes. New construction gives it practically twice the life of medium size 45 volt types. Has 30 extra large cells. Size, including terminals: 8" x 4⅜" x 7⅛".

List price, each $4.75

Ray-O-Vac No. 2303—45 Volt "B" Battery

Especially recommended for receiving sets requiring a large battery in a limited space. Built from thirty cells with one intermediate tap at 22½ volts. Size, including terminals: 8" x 3 3/16" x 7⅛".

List price, each $3.75

Ray-O-Vac No. 5151 Combined "B" "C" Battery

Recommended as a "B" battery for portable radio sets or where only a limited space is available. As a "C" battery, its four terminals furnish the following voltages: —22½C; —16½C; —4½C; +C. Size, including terminals: 4⅛" x 2½" x 3 3/16".

List price, each $1.75

Ray-O-Vac No. 231R—4½ Volt "C" Battery

Designed to give dual service as an "A" battery for 4½ volt tubes or as a "C" battery. Terminals give a voltage adjustment of +C and —4½ volts. Size, including terminals: 4" x 1 7/16" x 3½".

List price, each ..... $ .60

Ray-O-Vac No. 1211 For Radio "A" Circuits

Will keep its voltage above 0.9—the radio "end point" for "A" batteries—longer than any type of ignition cell. Due to special construction, it will build up voltage rapidly during rest periods. Maximum service can be obtained by using two No. 1211 in parallel on types of 1½ volt tubes, or three No. 1211 in series on types of 4½ volt tubes.

Class II Radio Batteries No. 2153 and No. 4151 meet an occasional demand. They are carried in stock only at factory shipping points.

Ray-O-Vac No. 2153—22½ Volt "B" Battery

A vertical type 15 cell "B" battery, which will give long dependable service on any set requiring not more than 15 milliamperes of current. Has two screw post terminals. Size, including terminals: 4 3/16" x 3 3/16" x 7⅛".

List price, each $2.00

Ray-O-Vac No. 4151—22½ Volt "B" Battery

A 15 cell "B" battery for use in portable or cabinet sets where very small current is required and where space is limited. Has two screw post terminals. Size, including terminals: 3½" x 2 3/16" x 2⅞".

List price, each $1.50

FRENCH BATTERY CO.

Madison, Wisconsin

RAY-O-VAC
Batteries
for all other purposes

THE Ray-O-Vac line of batteries includes dry cells for every type of service, each especially built for a special purpose and to serve that purpose for a long time.

Wherever a hot, powerful spark is needed, as on power machinery, Ray-O-Vac ignition batteries will deliver it. They come in single, four-, five- and six-cell units. No. 6 Telephone Cells deliver smooth level voltage to the end.

Even in the Ray-O-Vac Flashlight Battery the same staying power is noted. It gives a full-powered light to the very end-point.

All these batteries bear the Ray-O-Vac label. Ask for them by name.

The New RAY-O-VAC Flashlight

With the Oscillating Switch

"BUILT TO LAST A LIFETIME"

LOOK for this flashlight display on your dealer's counter. Ask to examine these new flashlights. You'll be delighted with the new service features they offer. You'll find them beautiful, sturdy—built to last a lifetime. And you'll also find a flashlight for every possible need.

Made By The

FRENCH BATTERY COMPANY

MADISON - - - WISCONSIN

Radio is Better With Battery Power

Radio Owner's Diary

Name of Set_____

Bought From _____Date_____

Batteries Used _____

Date Bought _____

_____

_____

Average Daily Use of Radio_____Hours_____

First Station Received on Our Set_____

Favorite Stations _____

Favorite Announcers _____

Favorite Stars_____

TABLE OF CONTENTS

RAY-O-VAC

RADIO BATTERIES

Better Reception
at Less Expense

Manufactured By

FRENCH BATTERY COMPANY

Madison . . . Wisconsin

Also Makers of Ray-O-Vac Ignition and Multiple Batteries,
Ray-O-Vac Flashlights and Flashlight Batteries