INSTALLATION AND OPERATING INSTRUCTIONS FOR STROMBERG-CARLSON No. 460 RECEIVERS

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INTRODUCTION

The Stromberg-Carlson No. 460 Radio Receivers are twelve tube, "Electric Tuning", adjustable high fidelity receivers with three tuning ranges. The electric tuning circuit combines a highly efficient motor and selector circuit in combination with an automatic frequency control circuit. The electric tuning circuit is arranged so that eight favorite stations located in the Standard Broadcast range may be set up for selection by means of the push buttons (local and other stations that give the best daytime and evening service should be selected). To properly set up the electric tuning arrangement for the eight favorite broadcast stations, read the section, "Instructions for Setting Up Electric Tuning Arrangement" appearing on page 3 of these instructions.

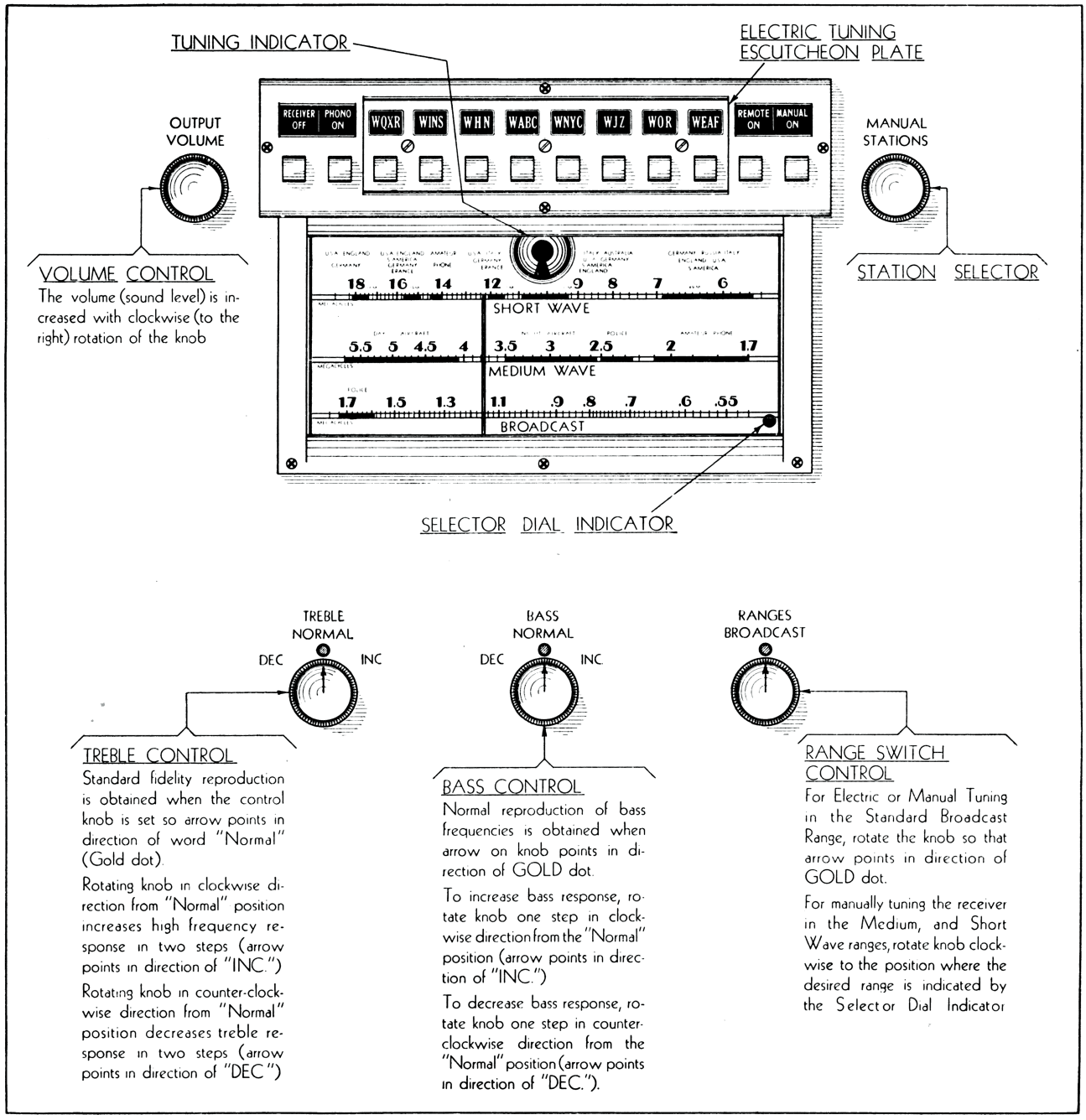

Fig. 1. Location and Operation of Controls.

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When manually tuning these receivers or when setting up the eight desired stations for electric tuning, resonance with a signal is indicated by means of the tuning indicator tube which operates on the cathode-ray principle. The strength of a received signal may be determined by observing the size of the aperture appearing on the target of the tube; the stronger a received signal the greater the reduction in the size of the aperture.

A remote control unit is also furnished with these receivers. This unit enables one to control the volume, and select any one of the eight favorite stations which have been set up in the electric tuning system, at a distance from the receiver (up to the length of the attachment cable).

These receivers are also provided with a low level bass frequency compensating circuit in conjunction with the volume control circuit so that balanced reproduction is obtained for any setting of the volume control. A separate "Bass" control is also provided to increase or decrease the response at the lower (bass) audio frequencies if this is desired.

These receivers are also equipped with a special arrangement of the Stromberg-Carlson, Selector dial indicator. This design of dial arrangement enables the operator to easily identify the service and frequency range to which the range switch control knob is set by means of the yellow disc (located at the right-hand edge of the dial), which moves in a vertical direction in conjunction with the rotation of the range switch control knob. The dial scales are calibrated in megacycles and the location of some of the short-wave services, the two police bands, and the 16, 19, 25, 31, and 49 meters short-wave broadcast bands are indicated by different colored lines and designations on the dial.

The function of each operating control is designated on the front panel of the receiver. The three tuning ranges are as follows:

Standard Broadcast Range, also referred to as "A" range, covers a frequency range of .53 to 1.7 megacycles (530 to 1700 kilocycles) (566 to 176.5 meters).

Medium Wave Range, also referred to as "B" range, covers a frequency range of 1.7 to 5.6 megacycles (1700 to 5600 kilocycles) (176.4 to 53.5 meters).

Short Wave Range, also referred to as "C" range, covers a frequency range of 5.6 to 18 megacycles (5600 to 18,000 kilocycles) (53.5 to 16.6 meters).

In addition to the above features, a Stromberg-Carlson Record Player may easily be connected to these receivers for obtaining reproduction from phonograph records. See the section, "Obtaining Reproduction from Phonograph Records", appearing on page 8 of these instructions.

INSTALLATION

Removing Packing Material

Remove all packing material from the inside of the cabinet, including the material used for holding the tubes in place during shipment. Retain all this special packing material along with the packing case if this receiver is to be reshipped at any future date.

Removing Chassis Bolts

Before operating this receiver it is imperative that the four copper-plated bolts which secure the chassis rigidly to the cabinet shelf be entirely removed. The receiver will not operate properly if these bolts are not removed. It is essential that the chassis be floating on its cushioned mountings, and that the control knobs and shafts be free from touching the wood panel when the receiver is placed in operation or demonstrated. Do not remove the remaining four bolts as these hold the chassis to the cabinet shelf through the cushioned mountings.

Before reshipping or delivering the radio, be sure that the four copper-plated chassis bolts are again placed in position and securely tightened.

Tubes

This receiver is equipped with the same tubes with which it was tested at the factory and is shipped with these tubes in their respective sockets. Before making connections to the power supply circuit, and the antenna and ground, it is desirable to examine the tubes to be sure that they are all securely in their sockets and that the grid clips are in place. In the event of any questions regarding the proper location of the tubes, consult the tube location diagram on the back of the chassis.

Location

The receiver should be placed so that it will be near the antenna and ground connections and to an electrical outlet.

Remote Tuning Control Unit

Plug the control box cable into the socket located on the back of the chassis.

Antenna and Ground

For best reception and "noise" reduction on all the ranges covered by the No. 460 Receivers, the Stromberg-Carlson, Code No. 5, Broadcast and Short-Wave Antenna Kit is recommended. For proper installation of this antenna system, see the instructions accompanying each kit. For good practical results a simple "L" type antenna about 75 feet in length can be used for all the tuning ranges. Good antenna materials such as insulators, wire, etc., must be used to secure best results. As the efficiency of an antenna varies greatly with the frequency of the received waves, a given length may be excellent at certain frequencies and relatively poor at others. Therefore, to secure uniform results with a receiver such as the No. 460, an antenna of adjustable length would be theoretically desirable. However, if it is desired, a long antenna for the two lower frequency ranges and a short antenna for the higher frequency range may be used. If this is done it will be necessary to use a good low capacity switch for switching these antennas.

Do not use the short-wave tuning range in conjunction with a shielded lead-in or with a transmission line system designed for the standard broadcast and medium ranges only.

Best results will be insured by grounding the receiver in the conventional manner to a water-pipe, radiator, or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead should be short, preferably not more than fifteen feet in length and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

Power Supply

The No. 460 Receivers are designed for operation on an alternating current power supply circuit. The correct operating voltage and frequency is specified for each receiver. Therefore, before connecting the receiver to the house lighting circuit, examine the marking label inside of the cabinet in order to be sure that the receiver is the correct one for use on the particular local power supply circuit. **The connection to the power supply circuit should be made after the antenna and ground leads are connected.**

Placing Tuning Indicator Unit in Operating Position

The tuning unit is wrapped in tissue paper and fastened to the chassis in order to prevent damage during shipment. After unfastening and unpacking the unit, it should be mounted in its proper location. Before placing this unit in its proper location make sure that the tuning indicator tube is fully inserted into its accompanying socket. Then, by means of the metal clamp and clamping screw, fasten this unit to the metal bracket which extends from the center of the dial frame (looking at the rear of the receiver) by inserting the screw into the slot of this bracket, at the same time placing the end of the tube at the rear of the hole in the tuning dial. See Figure 1. The clamping screw should then be securely tightened.

To adjust the tuning indicator tube's aperture to its proper operating position, first turn the radio receiver "On", and then rotate the tube, in its mounting clamp, so that the aperture appearing on the target of the tube is as shown in Figure 1.

INSTRUCTIONS FOR SETTING UP ELECTRIC TUNING SYSTEM

1. Before proceeding with setting up the eight favorite broadcast stations for electric tuning, it is preferable that the radio receiver be turned "on" for approximately twenty minutes. This is accomplished by simply pushing in the push button immediately below the designation, "Manual On" (indicated by illumination of the dial).
2. Check the position of the "Treble" control knob. When setting up or tuning in stations, this control knob should be set at the "Normal" position (pointer on knob pointing in direction of gold dot).
3. Set the Range switch control knob to the "Broadcast" position (pointer on knob pointing in direction of gold dot).
4. Remove the lists of station letters from the P-28781 package assemblies which are tacked inside of the cabinet.

   Two sets of station letters are included; one for the receiver and one for the remote control unit. The station letters for the remote control box should be inserted in the same order as the station letters on the receiver (highest frequency station at the left).
5. Remove the three screws which hold the electric tuning escutcheon plate (metal plate) to the electric tuning escutcheon; see Figure 1. Then, remove from the escutcheon, the strip of transparent material and the strip of paper on which the eight stars are printed.
6. From the lists of stations, remove the call letters of the eight stations which it is desired to set up for electric tuning. **These eight stations should preferably be selected and set up in the daytime so that the best service will be obtained at all times.**

CAUTION: When setting up these stations it is necessary to see that the separation of these stations on the dial is sufficient to allow adjacent "Adjustable Station Brushes" to be properly located in the adjusting slot.

It will be noted that the station letters are printed on partially cut squares to facilitate ease in removing the desired station letters. In setting up these eight favorite stations, the following order should be followed:

Looking at the front of the receiver, the station letters of the station having the highest frequency should be inserted into the farthest left-hand square of the escutcheon. Then, in successive order, according to the frequency, insert the station letters of the remaining seven stations into the other seven squares of the electric tuning escutcheon; the station letters of the station having the lowest frequency being inserted into the farthest right-hand square of the escutcheon.

After the eight station call letters have been inserted into the escutcheon, the transparent strip should be replaced over the station call letters, and the escutcheon plate then fastened into its position on the electric tuning escutcheon by means of the three screws.

This same procedure should be followed for inserting the station letters into the remote control box.

The tuning adjustments for the eight favorite stations can now be made, starting with the station having the highest frequency and proceeding as follows:

7. With the Range switch control knob set to the "Broadcast" position, and the "Manual On" button pushed in, tune the receiver in the conventional manner by means of the "Manual Stations" (Station Selector) control knob to that station having the highest frequency.

   IMPORTANT: When manually tuning in a station, or when setting up a station in the electric tuning system, exact resonance with the desired station should always be obtained by observing the tuning indicator.

8. Facing the rear of the receiver, it will be observed that the commutator assembly located on the rear of the gang tuning capacitor (see Figure 2) has a calibrated dial and dial pointer. After manually tuning in the favorite broadcast station as mentioned in paragraph 7 above,

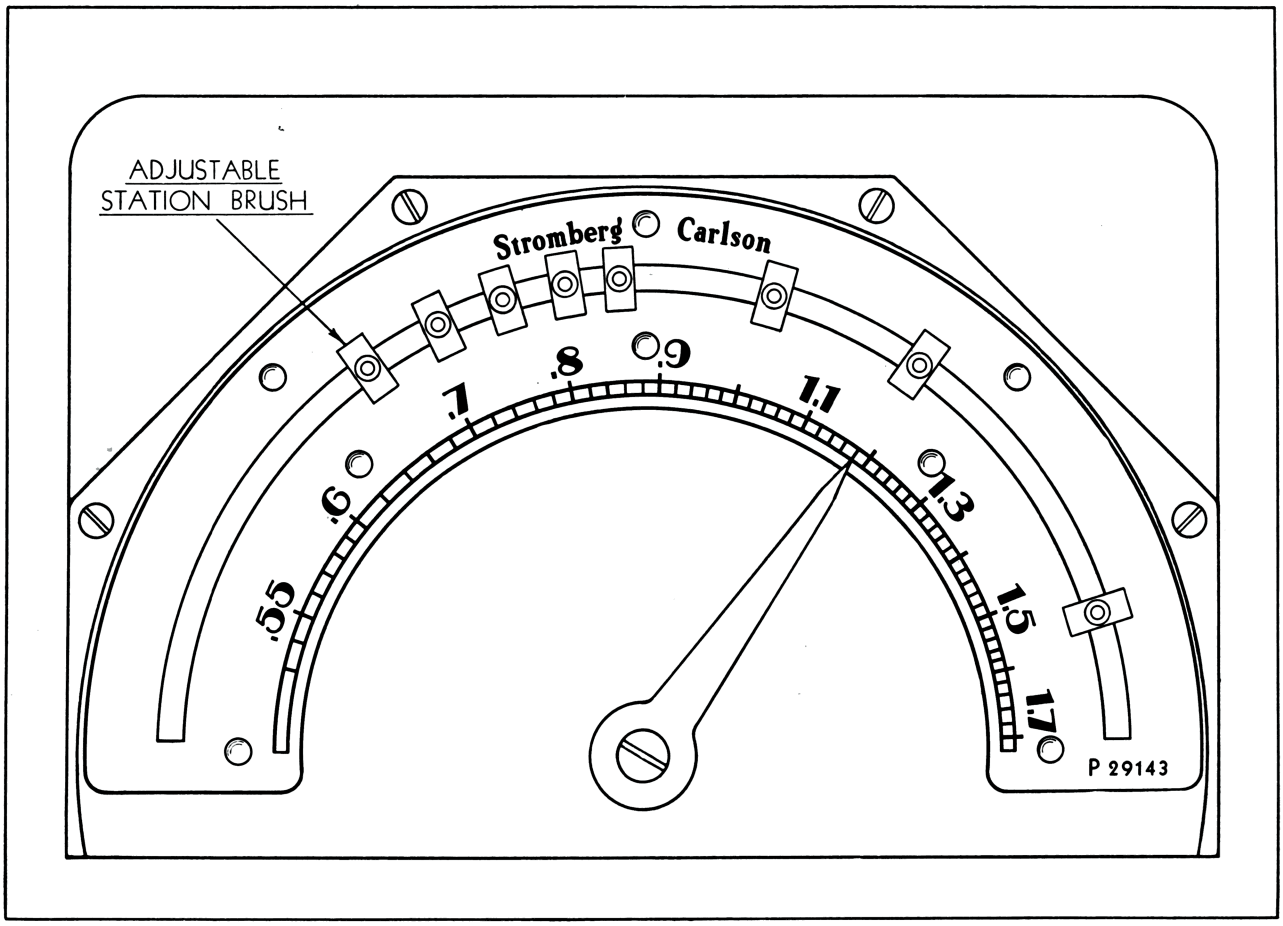

Figure 2.

it will be seen that the commutator dial's pointer also indicates the frequency of the station; now, slide the "Adjustable Station Brush" (which is nearest to the high frequency end of the commutator dial) in the slot until it is directly in line (and centered) with the end of the commutator's dial pointer.

9. Now, in successive order, according to frequency, proceed to set up the remaining seven favorite stations in the same manner as was mentioned in paragraphs 7 and 8 above for the favorite station having the highest frequency.

   When the eight adjustable station brushes have all been set up for the eight stations, the brush nearest to the low frequency end of the commutator's dial should be set at the frequency of the station having the lowest frequency.

10. After the eight favorite stations' brushes have all been positioned in the commutator's slot as mentioned in paragraphs 7, 8, and 9 above, loosen about one turn, the clamping screw of the tuning indicator. Remove the tuning indicator unit (with its clamp) from its metal bracket and allow the unit to rest on the chassis base with the end of the tuning indicator tube facing the rear of the receiver.

11. Repeat the operation mentioned in paragraph 7 above, for the favorite station having the highest frequency, being careful to obtain exact resonance with this station by means of the tuning indicator.

    When resonance with this station is obtained, watch the aperture appearing on the target of the tuning indicator tube and push in the button which is located under the station's letters (dial illumination ceases and station letters become illuminated). If the aperture of the tuning indicator changes, move the adjustable station brush slightly in either direction and recheck for resonance by switching back to manual tuning. Repeat this process until the condition is obtained where there is no change in the aperture of the tuning indicator tube when the station is switched from manual to electric tuning.

12. Proceed to check the settings of the adjustable station brushes for the remaining seven chosen stations according to frequency in exactly the same manner as mentioned in 11, above.

    When this has been accomplished, again mount the tuning indicator unit into its proper operating position as mentioned in the paragraph, "Placing Tuning Indicator Unit in Operating Position", given on page 3 of these instructions. This completes the operations necessary for setting up the eight favorite stations.

    IMPORTANT: With the electric tuning system in operation, the receiver will be automatically kept in tune with any one of the eight favorite stations as long as the station is operating or provided it has no unusual fading characteristics. If a distant station which is very weak is set up in the electric tuning unit, it will be found that the automatic frequency control circuit will not hold this station if a strong signal is present in either adjacent channel. This same phenomenon will occur if two stations in adjacent channels are almost of equal signal strength with the weakest signal fading slightly; with this condition the strong signal will have a tendency to "pull in" when the receiver is tuned to the station which is slightly weaker and fading.

OPERATION

Controls

The push buttons for electric tuning and the control knobs located on the front of the cabinet with their functions indicated are shown in Figure 1.

In order to simplify the marking on the dial and allow for comparatively large easily read figures, the tuning ranges are given in megacycles. One megacycle equals 1000 kilocycles so that by mentally placing the decimal point three positions to the right, any megacycle marking can be converted to kilocycles. For example, the .6 (megacycles) designation on the Standard Broadcast Scale of the dial becomes 600 kilocycles.

Procedure

These Receivers are so designed that simplicity and ease of operation are easily obtainable on all of the tuning ranges. The full possibilities of any receiver designed for the reception of short wave signals cannot be realized unless the user has a practical knowledge of short-wave transmission characteristics. Therefore, it is recommended that the notes on short wave reception in the

following section of these instructions be studied carefully, and that a good up-to-date transmitting schedule for the most important short-wave stations be obtained and consulted. As these transmitting schedules vary from season to season, they are not given in complete form in these instructions, but good tabulations can be found in newspapers and in current magazines on short-wave reception which your dealer can recommend. A condensed list of some of the most important short-wave stations is given on the last two pages of these instructions.

The following is a brief outline of the operating procedure for radio reception:

1. If the station desired is one of the eight set up in the electric tuning arrangement, or if it is desired to manually tune in stations located in the Standard Broadcast range, the Range Switch control knob should be set so that the arrow on the knob points in the direction of the gold dot.

   If it is desired to tune in stations located in the Medium Wave range, the Range Switch control knob should be rotated one step in a clockwise direction from the "BROADCAST" tuning position of this knob.

   If it is desired to tune in stations located in the Short Wave range, the Range Switch control knob should be rotated to its maximum clockwise position (two steps from the "BROADCAST" tuning position of this knob).

2. Check the position of the "TREBLE" control knob. When first selecting a station set up for electric tuning, or when manually tuning the receiver, this control should be set at the "NORMAL" position (arrow on knob pointing in direction of gold dot).

3. Rotate the Volume control knob in a clockwise direction for about three-quarters of its rotation.

4. **IMPORTANT:** To operate the remote control unit it is first necessary to push in the button located on the receiver under the designation, "Remote On".

   To select one of the eight stations set up in the electric tuning arrangement by means of the push buttons located on either the receiver or remote control unit, simply push the button located under the station letters of the desired station. When any station button is pushed in it should lock in the depressed position until another one is pressed. **Never press two buttons at the same time.**

   When a push button located under one of the station letters is pushed in, the station letters become illuminated. Wait a few seconds for the tubes to reach operating temperature.

5. If the receiver is to be tuned manually, simply push in the push button which is located under the designation "MANUAL ON" (dial becomes illuminated). Wait a few seconds for the tubes to reach operating temperature.

   Rotate the "MANUAL STATIONS" knob (Station Selector) to set the dial pointer to the position for the listed frequency of the desired station. Then, by means of this knob move the dial pointer **very slowly,** over a short range either side of the listed frequency of the desired station, noting at the same time whether the aperture appearing on the target of the tuning indicator tube changes. Resonance with the desired station will be indicated on the tuning indicator tube by the reduction in the size of the aperture appearing on the target of this tube. The reduction in the size of this aperture when resonance with any signal is obtained will be determined by the strength of the particular signal. If nothing is heard, rotate the Volume control knob in a further clockwise direction and repeat the above tuning process.

   IMPORTANT: This tuning procedure is extremely important particularly for short-wave reception. As the short wave tuning ranges cover a wide band of frequencies, tuning is very sharp and critical. Therefore, a signal of usable strength will often be imperceptible if "tuned through" rapidly or carelessly. A little practice in tuning the short wave stations will illustrate this point clearly. Start tuning in the short-wave ranges by selecting "local" stations or those with strong signals in your locality and note their assigned frequency. From these points as reference you can hunt for the weaker or more distant stations. Always sharpen the tuning by means of the Tuning Indicator.

   Fading of a signal will be indicated by the Tuning Indicator; with a fading condition, the reduction in size of the aperture of the Tuning Indicator will be varying with the signal response from the loud speaker. If the signals are too weak to operate the Tuning Indicator, it will be necessary to tune entirely by ear.

   In tuning a distant short wave station, select the time at which the station is scheduled to transmit and the band in which the station is located (16, 19, 25, 31, or 49 meters). Then, tune **slowly** over this band until a slight "hiss" is heard, and carefully retune on this hiss to bring up any modulation (speech or music) that may be present. A good distant station to practice selecting is GSB in England. This station has a frequency of 9510 kc. (9.51 mc.)

or a wavelength of 31.55 meters. It is, therefore, located in the 31 meter band (see dial scale for range "C"). The most desirable time to tune in this station is in the afternoon (in the Eastern Standard Time Zone). By following the above procedure you should be able to locate this station, assuming, of course, suitable antenna and favorable weather conditions. See Section, "Notes on Short Reception".

6. After receiving the signal, if the receiver has been tuned manually, rotate the Volume control knob in a counter-clockwise direction until the signal is reduced to a low level. Now, readjust the Station Selector knob accurately to a position midway between the points where the quality becomes poor or the signal disappears, or to a position where the maximum reduction of the aperture of the Tuning Indicator is obtained. **This setting reduces the amount of background noise and gives the fine quality of reproduction of which this receiver is capable.**

7. Due to the effect of heating up the apparatus, it may be necessary to occasionally retune short wave stations slightly for the first half hour of operation, in order to keep the audio quality satisfactory.

8. Adjust the Volume control for the desired volume level. When operating the remote control unit the volume is increased or decreased by the two buttons located under the designations, "VOL. INCR." and "VOL. DECR.". The automatic volume control circuit built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). All stations with good signal strength will, therefore, be received at approximately the same volume without readjustment of the Volume control.

   If decreased treble response is desired, rotate the "TREBLE" control knob in a counter-clockwise direction from the "NORMAL" position of this control. The treble response is decreased in two steps (arrow on knob pointing in direction of the designation "DEC.". This same procedure is followed to reduce excessive noise interference.

   IMPORTANT: When reception conditions warrant, the fidelity of this receiver can be increased by rotating the "TREBLE" control knob in a clockwise rotation from the "NORMAL" position of this control. High fidelity reproduction is obtained in two steps from the "NORMAL" position of this control (arrow on knob pointing in direction of the designation "INC."). For maximum high fidelity reproduction, this control should be rotated to the maximum clockwise position. However, as high fidelity transmission and reception require the use of more than present channel separations, you may hear "cross-talk" or interference when using the maximum fidelity position. If this condition is obtained, rotate the "TREBLE" control knob in a counter-clockwise rotation to the first "HIGH" fidelity position (first step in clockwise direction from the "NORMAL" position). When maximum selectivity is desired, the "TREBLE" control knob should be rotated to the "NORMAL" position.

9. If it is desired to increase the response at the lower (bass) audio frequencies, rotate the "BASS" control knob in a clockwise direction from the "NORMAL" position of this control. Increased bass response is obtained in one step from the "NORMAL" position of this control (arrow on knob pointing in direction of designation "INC.").

   If decreased bass response is desired, rotate the "BASS" control knob in a counter-clockwise direction from the "NORMAL" position of this control. The bass response is also decreased in one step from the "NORMAL" position of this control (arrow on knob pointing in direction of designation "DEC.").

10. To turn the receiver "off", simply push in the push button which is located under the designation, "Receiver Off" (dial and operating designations illumination ceases or illumination of station letters and operating designations ceases).

Dial Lamps

There are five dial lamp bulbs used in these receivers. Two are used to illuminate the operating designations, two are used to illuminate the station letters, and one is used to illuminate the tuning dial.

In case one of these lamps burns out replace it with a Stromberg-Carlson P-28025 Radio Dial Lamp. These lamps are visible and are easily reached from the rear of the cabinet. Each lamp is mounted in a removable type of socket, which can be slipped off its mounting lug for convenience in removing and replacing the lamp.

OBTAINING REPRODUCTION FROM PHONOGRAPH RECORDS

These receivers are equipped with a three-contact phonograph socket located in the center of the metal shield which covers the push button switches and is visible from the rear of the receiver. A three-prong plug is also furnished for connecting the pick-up cable to the phonograph socket.

To obtain the best quality of phonograph reproduction from these receivers, a Stromberg-Carlson Record Player is recommended. The Record Player is equipped with a correctly designed single record playing motor unit, and uses a crystal type pick-up in conjunction with a specially equalized circuit.

To switch the radio receiver's circuits from radio reproduction to phonograph reproduction, it is only necessary to push in the push button located under the designation, "Phono On". The Record Player's turntable switch should then be pushed to the "on" position. When the turntable has attained speed, raise the pick-up and lower it gently on to the record so that the needle point enters the outside groove. The volume and the bass response for phonograph reproduction can be controlled the same as for radio reception, i. e., by means of the "VOLUME" and "BASS" control knobs located on the front panel of the radio receiver. The treble response may also be varied by means of the control marked "TREBLE", which is located on the front panel of the radio receiver. However, when operating the phonograph unit this "TREBLE" control is effective only between the "NORMAL" position and its maximum counter-clockwise position; rotating this control knob in a clockwise direction from the normal position will not produce any change in the tone of the phonograph reproduction.

If the Stromberg-Carlson Record Player is not used and the electric pick-up to be used is of the high impedance type, it will be necessary to connect a shielded cable between the three-prong plug and the pick-up. For best reproduction, this shielded cable should be of the low capacity type. The length of this shielded cable should be kept as short as possible. To connect the shielded cable to the three-prong plug, remove the metal cover of the plug and solder the shield of the cable to that prong which is farthest away from the other two prongs; a short connecting wire must also be soldered from this prong to the upper right-hand prong when looking at the rear of the plug, that is, the side opposite to the prong side. The inside wire conductor of the shielded cable should then be soldered to the other terminal of the plug.

If a pick-up of the low impedance type is used, it will be necessary to connect a "matching transformer" between the three-prong plug and the pick-up. The transformer should be located as near to the receiver as possible, in which case it will not be necessary to use a shielded cable.

NOTES ON SHORT WAVE RECEPTION

The design of this receiver is such that no special skill or previous experience is needed for proper operation, but the full operating possibilities can be obtained only by those familiar with the general characteristics of short wave transmission. The following is a brief summary of data which has been collected mainly by experimental observations which should be helpful, particularly to beginners, in the operation of short wave receivers.

In the nineteen meter band and below, stations situated at a distance of 1,500 miles or greater will give the most satisfactory signals. These signals will usually be heard during daylight hours and seldom after sundown or when any appreciable portion of the transmission path is in darkness.

The reception from transmitters in the twenty-five meter band is most usual when the receiver is 1,000 miles or more away from the transmitter. Transmission in this band over distances less than 2,000 miles will be received best during the daytime. More distant stations may still be heard after dark under favorable conditions.

The greatest reliability of service from the stations in the thirty-one meter band is at distances exceeding 800 miles. Good reception in this band is possible both day and night from distant stations.

Transmissions in the forty-nine meter band are most reliable when received at a distance of 300 miles or more. However, good reception at distances greater than 1,500 miles can be expected only when a large portion of the signal path is in darkness.

Transmitted signals of any wavelength divide into two components, the "ground wave" and the "sky wave". The ground wave follows the earth's surface providing good service over short distances only. The sky wave travels into the higher layers of the atmosphere and is reflected back from the "Heaviside Layer" to the earth's surface at an appreciable distance from the transmitting station. With short wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a "dead spot" area in which reception is impossible or extremely

unsatisfactory. The length of the region in which such conditions are effective (called the skip-distance) varies greatly from day to night and from summer to winter. In general, the skip-distance increases in the transition from day to night and from summer to winter.

Although short wave reception is less affected by static or atmospherics and good results may be had even during electrical storms in the summer time, the same is not true of interference from man-made "static".

Electrical machinery such as street-cars, dial telephones, motors, fans, flashing signs, oil burners, electrical appliances, airplanes, and automobiles all cause much more interference on the shorter waves than in the regular broadcast band. Interference from automobiles, particularly at the shorter wave end of the short wave range, is quite noticeable and readily recognized. Cars with ignition suppression equipment put on when radio receivers are installed in them do not cause this interference.

While the above statements on short wave reception are valid, there are so many other factors which influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what may be reasonably expected at various times.

When operating a short-wave receiver and attempting to receive distant or foreign stations, the user must consider the time standards in use at various longitudes throughout the world. At 7:00 P. M. Eastern Standard Time in New York it is 6:00 P. M. in Chicago, 5:00 P. M. in Denver, and 4:00 P. M. in San Francisco. Going eastward it is 9:00 P. M. in Eastern Brazil, midnight in London, 1:00 A. M. the next day in most of Europe and 10:00 A. M. in Australia. Therefore, the regular evening broadcasts in Europe will be received in America in the late afternoon, while those from Australia will be received in America in the early morning.

SERVICES COVERED BY THE NO. 460 RECEIVERS

Following is a list of the types of services that can be received on these receivers, together with statements as to their value to the average listener.

(a) **Standard Broadcasts**—The standard broadcast band on the American Continents is between 530 kc. and 1600 kc. The broadcasts in this range give regularly scheduled, reliable service with valuable entertainment, educational material, news, etc.

(b) **Short-Wave Broadcasts**—Most of the short-wave broadcast stations operate in one or more of five bands known as the 16, 19, 25, 31, and 49 meter bands. Some operate at different frequencies in day and night, using the higher frequency in the daytime. There are a considerable number of foreign short-wave broadcast stations but the following are in general the most reliable to receive:

Daventry, England	Zeesen, Germany
Paris, France	Rome, Italy

In addition to these, there are a number of South American stations which are quite reliable.

Some of the American and Canadian programs of regular broadcast stations are sent out on short waves and in some locations and at certain hours it may be possible to receive the short waves better than the standard broadcasts. Most of these stations provide a regular scheduled service of programs similar to that of the standard broadcast bands.

(c) **Police Radio Stations**—The transmissions from these stations are located in two narrow bands, 1.6 to 1.7 and 2.3 to 2.5 megacycles. As these stations, therefore, are crowded together with several operating on the same frequency, more than one may be heard without retuning. This service is confidential in nature and is intended only for authorized police use. Steps are being considered by governing authorities to protect this service.

(d) **Amateur Phone Stations**—These transmissions are heard in three bands on this receiver, namely, 1.8 to 2 megacycles, 3.9 to 4 megacycles, and 14.15 to 14.25 megacycles. Amateur radio is a hobby for many thousands and naturally these bands are overcrowded. Therefore, there is considerable interference and no entertainment features or regular scheduled programs are heard on these bands.

(e) **Aircraft Radio**—This service is used to maintain contact between planes in flight and the airports. These transmissions are heard in several bands between 2.6 to 3.5 megacycles and 4.1 to 5.69 megacycles. This is an intermittent commercial service.

(f) **Commercial Phone Stations**—Regular short-wave radio telephone service is maintained between many of the larger countries of the world. One-half of a conversation often can be heard; however, it is customary to render the speech unintelligible by "garbling" electrically, for purposes of secrecy. Such garbled speech sounds high pitched, with no recognizable sounds.

(g) **Ship and Experimental Phone Stations**—A ship to shore radio telephone service is maintained on some of the larger passenger liners. These stations operate over a wide range of frequency assignments, dependent on conditions. Occasionally, one-half of a private conversation can be picked up on these channels.

(h) **Code Stations**—These dot-dash transmissions will be heard in many places in the tuning ranges of this receiver and will "come in" with different types of sounds. This type of transmission should not be confused with interference from electrical systems or automobiles. Code transmission can be tuned-in or out sharply while local electrical interference usually spreads over the entire dial. To those not acquainted with the telegraph code this type of signal has only one value, that of indicating that the short-wave receiver is operating correctly in the particular section of the tuning range.

(i) **Harmonics of Local Broadcast Stations**—In some cases the higher frequency harmonics (multiples of assigned frequency) of broadcast stations will be picked up and possibly mistaken for short-wave broadcast stations. However, this error will be rectified when the station signs off. In all such cases the spurious reception is the result of actual signals transmitted from broadcast stations, and is not due to defective operation of the short-wave receiver. By listening on the standard broadcast band for the same program material, the station transmitting the "Harmonics" can be ascertained and in the future reception of such programs (harmonics) on the particular divisions of the short-wave dial, will be recognized.

(j) **Short-Wave Log**—A partial list of Short-Wave Broadcast Stations is given in the following table, with a space left for logging the exact dial setting at which these stations are received on your particular receiver. A large number of short-wave stations are operating on an experimental basis and as a consequence often change the frequency (megacycles) and time of broadcast to improve transmitting conditions. Information on short-wave broadcasts and exact time of broadcasting can be found in local newspapers or in radio magazines.

PARTIAL LIST OF SHORT-WAVE BROADCAST STATIONS

Consult Newspapers and Radio Magazines for the latest Time Schedules for these Stations.

Location of Station		Call Letters	Meters	Mega-cycles	Dial
EUROPE					
England	Daventry	GSA	49.59	6.05	
	Daventry	GSB	31.55	9.51	
	Daventry	GSC	31.32	9.58	
	Daventry	GSD	25.53	11.75	
	Daventry	GSE	25.29	11.86	
	Daventry	GSF	19.82	15.14	
	Daventry	GSG	16.86	17.79	
France	Paris	TPA4	25.6	11.72	
	Paris	TPA3	25.23	11.88	
	Paris	TPA2	19.68	15.24	
Germany	Zeesen	DJA	31.38	9.56	
	Zeesen	DJB	19.74	15.20	
	Zeesen	DJC	49.83	6.02	
	Zeesen	DJD	25.49	11.77	
Holland	Huizen	PHI	25.57	11.73	
	Huizen	PHI	16.88	17.77	
Italy	Rome	2RO3	30.67	9.63	
	Rome	2RO4	25.40	11.81	
Portugal	Lisbon	CSW	27.17	11.04	
Switzerland	Geneva	HBP	38.48	7.79	
	Geneva	HBL	31.27	9.59	
U. S. S. R. (Russia)	Moscow	RAN	31.25	9.6	
	Moscow	RNE	25.00	12.00	
Vatican State	Vatican City	HVJ	19.84	15.12	
AFRICA					
Morocco	Rabat	CNR	37.33	8.03	
AUSTRALIA					
Australia	Sydney	VK2ME	31.28	9.59	
	Melbourne	VK3ME	31.55	9.51	
NORTH AMERICA					
Canada	Toronto, Ont.	CRCX	49.26	6.09	
	Winnipeg, Man.	CJRX	25.6	11.72	
United States	Boston,Mass.	W1XAL	49.67	6.04	
	Boston, Mass.	W1XK	31.36	9.57	
	Chicago, Ill.	W9XAA	49.34	6.08	
	Chicago, Ill.	W9XF	49.18	6.10	
	Cincinnati, Ohio	W8XAL	49.50	6.06	
	New York City	W3XAL	16.87	17.78	
	New York City	W3XAL	49.18	6.10	
	Philadelphia, Pa.	W3XAU	31.28	9.59	
	Philadelphia, Pa.	W3XAU	49.50	6.06	
	Pittsburgh, Pa.	W8XK	48.86	6.14	
	Pittsburgh, Pa.	W8XK	25.27	11.87	
	Pittsburgh, Pa.	W8XK	19.72	15.21	
	Schenectady, N. Y.	W2XAD	19.57	15.33	
	Schenectady, N. Y.	W2XAF	31.48	9.53	

Location of Station		Call Letters	Meters	Mega-cycles	Dial
		SOUTH AMERICA			
Argentina	Buenos Aires	LRX	31.06	9.66	
Brazil	Rio de Janeiro	PRF5	31.58	9.5	
	Pernambuco	PRA8	49.67	6.04	
Chili	Santiago	CB960	31.25	9.6	
	Santiago	CEC	28.12	10.67	
	Valdivia	CD1190	25.21	11.9	
Colombia	Bogota	HJ3ABH	49.92	6.01	
	Baranquilla	HJ1ABB	31.38	9.56	
	Cali	HJ5ABC	48.78	6.15	
	Medillin	HJ4ABA	25.64	11.7	
Ecuador	Guayaquil	HC2RA	31.78	9.44	
	Guayaquil	HC2CW	35.71	8.4	
	Quito	HC1EC	34.88	8.6	
Peru	Arequipa	OAX6A	48.96	6.13	
	Cuzco	OAX7A	48.96	6.13	
	Lima	OAX4T	31.32	9.56	
Venezuela	Caracas	YV5RD	48.73	6.15	
	Caracas	YV5RP	47.85	6.27	
	Maracaibo	YV1RH	47.1	6.36	
	Valencia	YV4RB	46.01	6.52	

Notes—When the above stations are broadcasting, the reception conditions will be approximately as follows:
Good Early Morning: Stations located between 15 and 18 megacycles (including the 16 and 19 meter bands).
Good Late A. M. till Evening: Stations located between 10 and 12 megacycles (including the 25 meter band).
Good Day and Night: Stations located between 8 and 10 megacycles (including the 31 meter band).
Good Late P. M. and Evening: Stations located between 3.7 and 8 megacycles (including the 49 meter band).