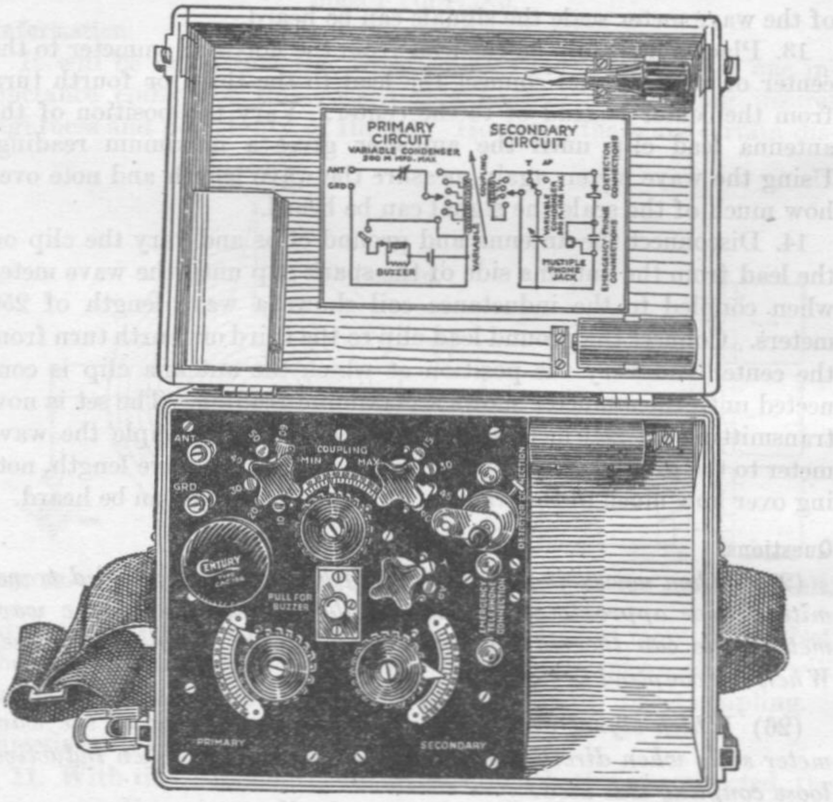
THE SCR–54–A RECEIVER.

Equipment.

1 SCR–61 wave meter.
1 SCR–54–A receiving set. (Set box BC–14–A only.)
1 antenna equipment, type A–2–A.
1 head set, type P–11.



RL-P-1935-C

Fig. 37.—Set box, BC–14–A with lid open.

Information.

The SCR–54–A (see Fig. 37) is one of the simplest types of radio receivers, designed for portable work in the field. It differs in construction from the SCR–61 wave meter, in that it has two tuning circuits instead of one. One circuit, called the *primary* circuit, includes the antenna, ground, and the primary tuning circuit; while the other circuit, called the *secondary* circuit, includes the secondary tuning circuit, the detector, and telephones. Both the primary and secondary tuning circuits consist of a tapped inductance coil and a variable condenser. The primary coil is stationary while the secondary coil is movable, the coupling between the two being changed by rotating the secondary.

The method of tuning the SCR–54–A differs slightly from that used in tuning the SCR–61 wave meter or the SCR–74–A transmitter. To tune the SCR–74–A transmitter the inductance is varied. In the SCR–54–A both the inductance and capacity of the primary and

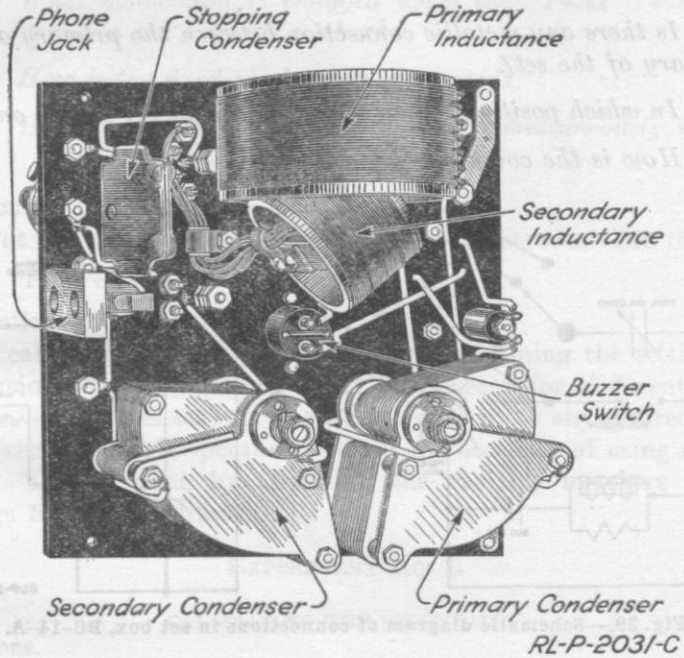


Fig. 38.—Rear of panel, set box, BC–14–A.

secondary circuits are varied when tuning the set to a certain wave length.

The *crystal detector* used in this set is similar to the one provided in the SCR–61 wave meter.

Directions.

1. Release the latches and raise the lid of the set box. Take out the four screws in the corners of the panel and remove the panel from the box. (See Fig. 38.) Place the panel in some convenient position, and trace the wiring of both the primary and secondary circuits. Compare with schematic circuit diagram shown in Fig. 39.

Questions.

(1) *How is the battery in the set box connected to the buzzer on the panel?*

(2) *How are the two head sets connected, when their plugs are inserted in the jacks, in parallel or series?*

(3) *Is the buzzer circuit connected to the primary or the secondary circuits?*

(4) *Why is the buzzer provided?*

(5) *Is there any metallic connection between the primary and the secondary of the set?*

(6) *In which position* (up or down) *is the buzzer swtich on?*

(7) *How is the coupling changed?*

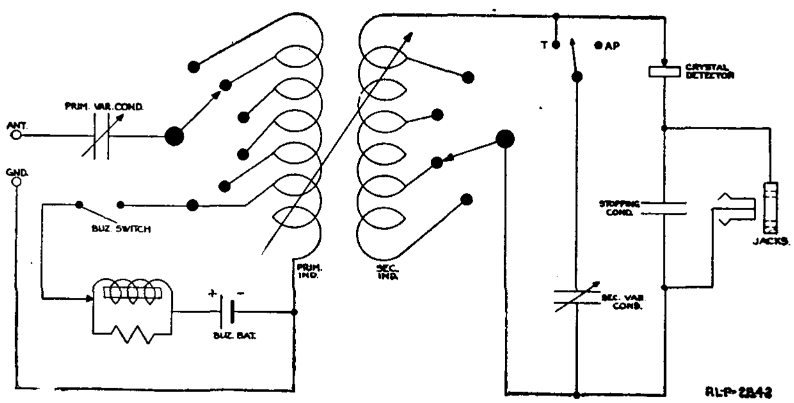


Fig. 39.—Schematic diagram of connections in set box, BC–14–A.

(8) *Why are leads brought out from the different points of the winding on the primary and the secondary coils?*

(9) *Why are the leads to the secondary inductance made flexible? Can the secondary be rotated or is it fixed in position?*

(10) *Count the number of turns on the primary inductance. See if the contact point numbers are the same as the number of turns connected in the circuit up to that point. What difference do you note?*

(11) *When the coupling scale on top of the panel indicates* "MAX" *what is the position of the secondary with respect to the primary? When it indicates* "MIN"*?*

(12) *Is the primary inductance parallel with the back edge of the box?*

(13) *Examine the two variable condensers. How do they differ? Why? Examine the fixed condenser. How is the connection made with the fixed plates of the variable condenser?*

(14) *How is the connection made with the movable plates?*

(15) *Are the movable plates insulated from the stationary plates?*

(16) *What connection is changed when the "T-AP" switch is moved from one contact to the other?*

(17) *How is the fixed condenser constructed?*

(18) *How many telephones can be used simultaneously in this set?*

Directions.

2. Put the panel in the box and replace the screws. See that the buzzer operates.

Information.

The calibration of the set consists in determining the settings of the various variable switches and condensers for different wave lengths, so that the set can be readily adjusted to any desired wave length each time it is operated, without the necessity of using a wave meter. This is done by adjusting the variable members to the settings found by calibration.

EXPERIMENT No. 1.

CALIBRATING THE SECONDARY.

Directions.

3. Put the wave meter with its coil as close to the back of the set box as possible. (See Figs. 40 and 41.) Set the "T-AP" switch to "T" (abbreviation for "tuned"). Adjust the detector of the set by means of the buzzer test. Turn the coupling knob until the indicator points to the 90° or maximum mark, and set the secondary inductance on tap 15. Adjust the wave meter to emit a 200-meter wave. Rotate the secondary variable condenser until the signal is heard. If the signal can not be picked up with the secondary inductance switch on tap 15, advance the switch to tap 30 or higher. If the signal comes in too loudly over a large part of the condenser scale, loosen the coupling between the wave meter and set box by moving the wave meter away from the set box. It should be moved

far enough away so that the signal can be heard over only a few degrees on the condenser scale.

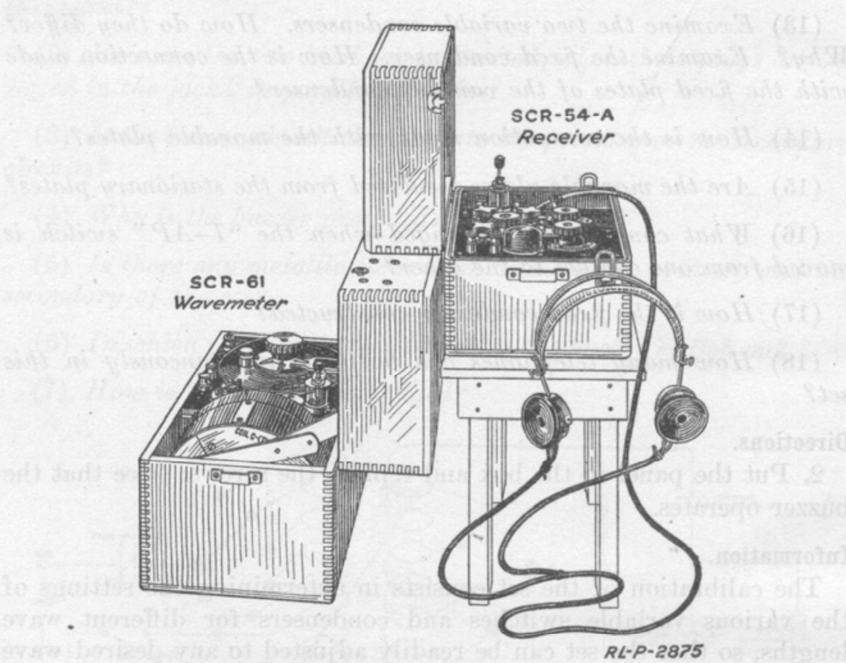


Fig. 40.—Method of coupling the SCR–61 wave meter to the secondary coil of the SCR–54–A receiver.

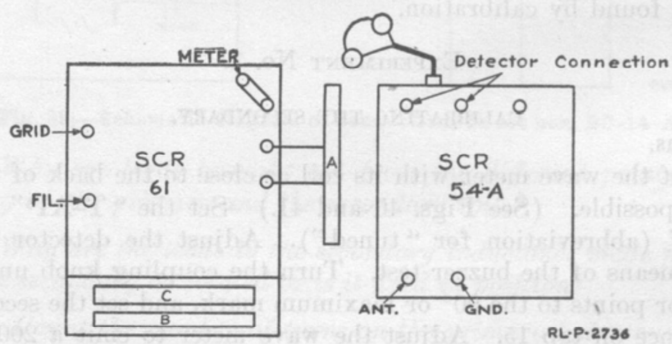


Fig. 41.—Schematic diagram showing relative positions of the SCR–61 wave meter and the SCR–54–A receiver when coupled as in Fig. 40.

4. Move the "T–AP" switch to "AP" (abbreviation for "aperiodic," meaning "untuned"), and endeavor to tune out the signal with the variable condenser. From the diagram of connections it will be seen that in the "AP" position the condenser is out of the

circuit. Therefore the secondary circuit can not be tuned to the primary circuit. When a circuit can not be tuned it will respond to all wave lengths. For the same reason that the SCR–74–A transmits over a number of wave lengths when connected directly to the antenna and ground, the secondary circuit of the SCR–54–A will respond to a number of wave lengths when the variable condenser is disconnected from the circuit. This is very useful when the set is used to pick up a signal on an unknown wave length.

5. Make up a calibration table for the secondary of the SCR–54–A similar to the No. 1 shown at the end of this Unit Operation. Part of the table will be used in the next experiment. Start at 200 meters and determine the settings of the inductance tap and condenser to tune the secondary to this wave length. Next set the wave meter at 225 meters and determine the settings for this wave length. Similarly determine the settings for 250 meters, 275 meters, etc., until all the wave lengths listed have been covered. Record the readings in the table prepared. Remember to change inductance coils in the wave meter when receiving.

Questions.

(19) *Why was the wave meter put back of the set box instead of to one side?* (*See answer to Question 12.*)

(20) *What is the wave length range of the secondary of this set?*

(21) *What is the wave length range of the set?*

(22) *With the switch thrown to "AP" why is it impossible to tune out the signal of the wave meter?*

(23) *What is the difference in the position of the secondary coil when turned to "*MAX*," with respect to the back edge of the box?*

EXPERIMENT No. 2.

CALIBRATING THE PRIMARY.

Directions.

6. As the wave meter is not to be used in this experiment it should be placed several feet away from the BC–14–A set box. Connect the antenna and ground leads to the proper terminals on the set box. The "T–AP" switch should be turned to the "T" position. Adjust the coupling control so that the indicator points to the 20° mark. Adjust the secondary inductance switch and the secondary condenser to the settings for 200 meters as recorded in Experiment No. 1. Start the buzzer operating and adjust the crystal detector until a sensitive spot is found. With the buzzer still in operation

vary the primary inductance switch and the primary condenser until the signal of the buzzer is heard in the headset with maximum intensity. Record the settings in Table No. 1. (See Direction 5.)

Questions.

(24) *In what way does the method used in calibrating the primary circuit differ from that used in calibrating the secondary circuit with the wave meter? Explain.*

(25) *Was the tuning of the primary circuit found to be fairly sharp?*

(26) *Why was the antenna and ground connected in calibrating the primary circuit?*

EXPERIMENT No. 3.

EFFECT OF CHANGE IN COUPLING.

Directions.

7. Wind a complete turn of the antenna lead around the cover of the wave meter as shown in Fig. 42. This provides coupling between the antenna circuit and the inductance coil of the wave meter as shown in Fig. 43.

8. Adjust the coupling of the BC–14–A set box so that the indicator points to the 90° or maximum mark.

9. Adjust the primary and secondary controls to the settings recorded for 300 meters.

10. Start the buzzer of the wave meter in operation and slowly vary the control knob of the wave meter condenser until the signal of the buzzer is heard with maximum intensity in the head set. Note the wave length indicated on the wave meter scale.

11. Reduce the coupling in the BC–14–A set box by turning the coupling knob until it points to the 40° mark. Again vary the wave meter condenser until the buzzer signal is heard with maximum intensity in the head set. Note the wave length indicated on the wave meter scale.

Questions.

(27) *Was the wave length indicated by the wave meter in the experiment under Direction 11, the same as recorded in Table No. 1 for the control settings used?*

(28) *Were any of the following three changes noticed when the coupling was reduced in the experiment under Direction 12?*

a. Was the wave length changed?
b. Was the sharpness of tuning changed?
c. Was the intensity of the signal changed?

(29) *When tuning an SCR–54–A receiver to a signal of known wave length using predetermined calibrations, what effect has a change in coupling upon the tuning of the primary and secondary circuits?*

(30) *Judging from the results of this experiment would you say, that the methods used in calibrating the primary and secondary circuits in Experiments 1 and 2 were accurate?*

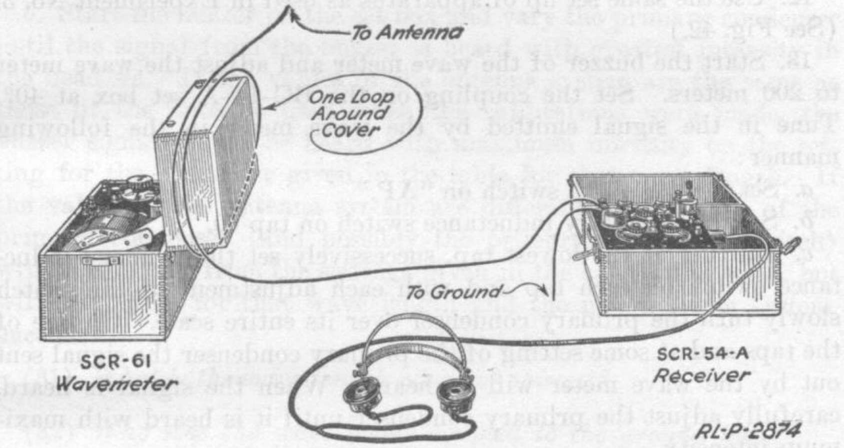


Fig. 42.—Method of coupling the SCR–61 wave meter to the primary circuit of the SCR–54–A receiver.

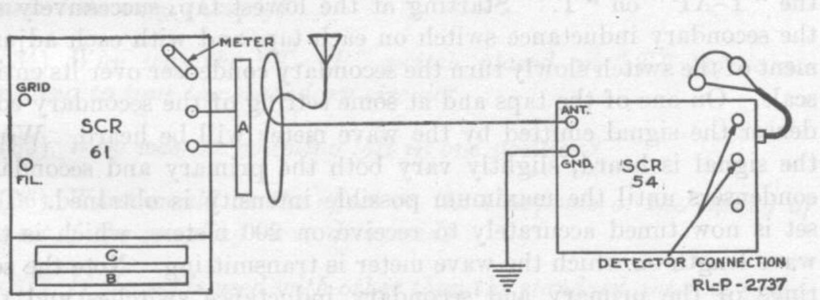


Fig. 43.—Schematic diagram of coupling arrangement as in Fig. 42.

Information.

The methods used in calibrating the primary and secondary of the SCR–74–A receiver in Experiments 1 and 2 produced only approximate results. In actually using any radio receiving set for the reception of messages or other information it is very important that the operator be able to set his adjustments, so that he knows that the set is accurately in tune on any given wave length. In order to accomplish this it is necessary to calibrate the set so that the calibration covers all of the adjustments of the set which have any influence on the wave length on which it receives.

EXPERIMENT No. 4.

CALIBRATING THE SCR–54–A SET FOR USE IN THE FIELD.

Directions.

12. Use the same set up of apparatus as used in Experiment No. 3. (See Fig. 42.)

13. Start the buzzer of the wave meter and adjust the wave meter to 200 meters. Set the coupling on the BC–14–A set box at 40°. Tune in the signal emitted by the wave meter in the following manner:

a. Set the " T–AP " switch on "AP."

b. Set the secondary inductance switch on tap 60.

c. Starting at the lowest tap, successively set the primary inductance switch on each tap and with each adjustment of the switch slowly turn the primary condenser over its entire scale. On one of the taps and at some setting of the primary condenser the signal sent out by the wave meter will be heard. When the signal is heard, carefully adjust the primary condenser until it is heard with maximum intensity.

d. Without changing the adjustments of the primary circuit, place the " T–AP " on " T." Starting at the lowest tap, successively set the secondary inductance switch on each tap, and with each adjustment of the switch slowly turn the secondary condenser over its entire scale. On one of the taps and at some setting of the secondary condenser the signal emitted by the wave meter will be heard. When the signal is heard, slightly vary both the primary and secondary condensers until the maximum possible intensity is obtained. The set is now tuned accurately to receive on 200 meters, which is the wave length on which the wave meter is transmitting. Note the settings of the primary and secondary inductance switches and the primary and secondary condensers. Prepare a table similar to Table No. 2 shown at the end of this Unit Operation and record in it the settings obtained.

14. Repeat the above directions for each of the remaining wave lengths in the table.

15. Due to slight changes which may occur each time the antenna system is erected or when a different antenna system is used the cali-

brations of the antenna circuit may vary somewhat. However, the calibrations obtained in this experiment will be nearly right for the standard antenna. Each time a different standard antenna is used the calibrations of the primary circuit may be readjusted in the following manner:

a. Using the settings recorded in Table No. 2, adjust the primary and secondary controls to any desired wave length. Set the coupling to the reading given in the table.

b. Start the buzzer on the set box and vary the primary condenser until the signal from the buzzer is heard with greatest intensity in the head set. If the values of the antenna system are the same as those of the antenna used when the calibrations were made, the buzzer signal should be heard with maximum intensity on the setting for the condenser given in the table for that wave length. If the values of the antenna system are different, the settings of the primary condenser (and possibly the primary inductance switch) will be different from the settings given in the calibration table, but will be correct for that wave length and the new antenna system.

Questions.

(31) *What is the wave-length range of this set?*

(32) *Why was the wave meter coupled to the ground lead?*

(33) *With the "T–AP" switch on "AP" did the primary condenser tune very sharply?*

(34) *Why was the "T–AP" switch placed on "T" before attempting to tune the secondary circuit?*

(35) *Why was the coupling left in one position?*

(36) *What would be the effect on the sharpness of the tuning of the set if the coupling were decreased?*

(37) *If the set is used with other than the standard antenna equipment, would the calibrations of the primary circuit be absolutely accurate?*

TABLE No. 1.

Settings for Experiment No. 1.			Settings for Experiment No. 2.			
Wave length.	Secondary inductance tap.	Secondary condenser.	Primary inductance tap.	Primary condenser.	Secondary inductance tap.	Secondary condenser.
200						
225						
250						
275						
300						
325						
350						
375						
400						
425						
450						
475						
500						
525						
550						
575						
600						

TABLE No. 2.

Settings for Experiment No. 4.					
Wave length.	Primary inductance tap.	Primary. condenser.	Coupling. (degrees).	Secondary inductance tap.	Secondary condenser.
200			40		
225			40		
250			40		
275			40		
300			40		
325			40		
350			40		
375			40		
400			40		
425			40		
450			40		
475			40		
500			40		
525			40		
550			40		
575			40		
600			40		