ACCESSORIES

CAR RADIO

One of two models of car radio have been fitted to the " Consul " (1956 onwards), " Zephyr " and " Zodiac " cars.

Model CR.266/F (Domestic) or CR.266 (Export) is available as an accessory for fitting to cars produced from February 1956 to February 1959. The radio, Part No. 204E–18835–E, is available as an accessory for fitting to cars produced from February 1959 onwards.

The following section deals in turn with each radio :—

CAR RADIO Models CR.266/F and CR.266

(As fitted to " Consul," " Zephyr " and " Zodiac " cars 1956 to 1959.)

The car radio, model CR.266/F (Domestic) and CR.266 (Export) is available as an accessory, for fitting to " Consul," " Zephyr " and " Zodiac " models (1956 to 1959). The radio is a 12 volt, 5 valve superheterodyne unit designed to cover the medium and long wave bands. The receiver is mounted in place of the blanking panel in the centre of the facia panel and the speaker is mounted on the rear window shelf.

The radio incorporates manual tuning (small right-hand control) and an illuminated tuning scale provided with metre markings for station selection. To ensure that the maximum clarity of reproduction is obtained under all normal driving conditions, a variable tone control is incorporated, operated by the large left-hand control knob. Turning it to the right produces a " brilliant " tone and to the left a " mellow " tone.

The smaller left-hand control knob is the combined ON/OFF and volume control, and the larger right-hand control knob is the waveband or wavechange selector control.

The current consumption of the radio is 2.9 amps. at 12 volts.

Mullard valves of the following types are included in the various circuits and it is essential that similar valves only be used when making replacements, which may, from time to time, become necessary :

ECH	42	Frequency Changer
EF	41	IF Amplifier
EBC	41	AVC and Detector
EL	41	AF Output
EZ	41	FW Rectifier

A non-synchronous type vibrator is used and a similar type should be used for replacement purposes.

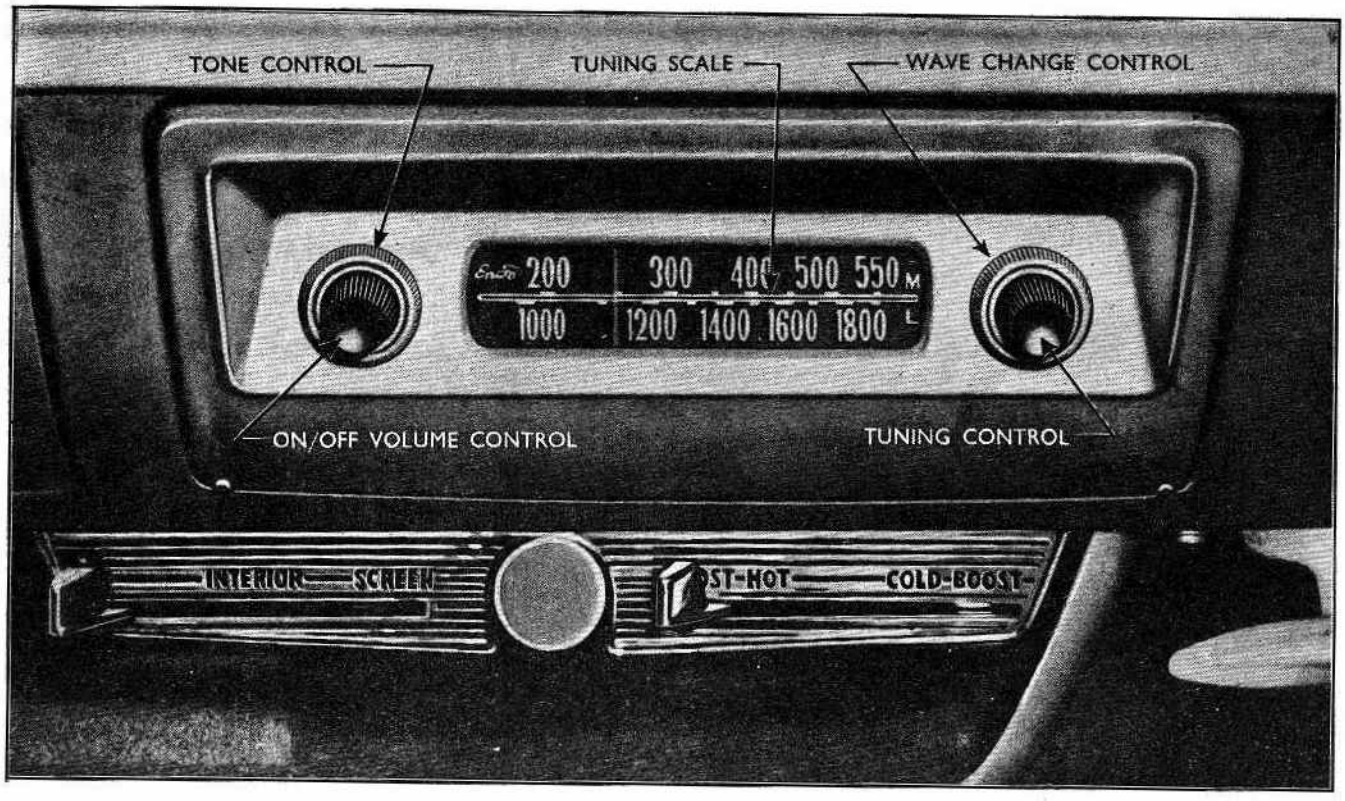


Fig. 582
Radio Controls
(Models CR.266/F and CR.266)

Receiver Serial Number

Each receiver bears a serial number stamped on the receiver chassis above the volume and tone control shaft. The serial number is also painted at the right-hand side of the fuse clip on top of the receiver case. Reference to Fig. 584 will clarify the locations of the serial number.

THE CONTROLS

Four main controls are provided, together with a tuning dial which is illuminated when the set is switched on.

Combined ON/OFF Switch and Volume Control

The smaller left-hand control operates the ON/OFF switch and varies the loudspeaker volume. The set is switched on by turning the knob clockwise and further movement in this direction progressively increases the volume. Anti-clockwise rotation will reduce the volume and the set may be switched off by turning the control fully in this direction.

Tone Control

The larger left-hand knob regulates loudspeaker tone, providing an infinitely variable degree of tonal balance to suit personal listening taste and changing vehicle and broadcasting conditions.

In general, it will be found that an anti-clockwise or " mellow " position of the control is suitable when receiving musical programmes, while a clockwise position provides greater clarity for speech.

Manual Tuning Control

Stations are tuned in on either the medium or long wave bands by means of the tuning control, which is the smaller right-hand knob, used in conjunction with the wave-change switch and illuminated tuning scale. Stations should always be tuned for maximum strength by means of this control and the volume reduced, if necessary, by using the volume control.

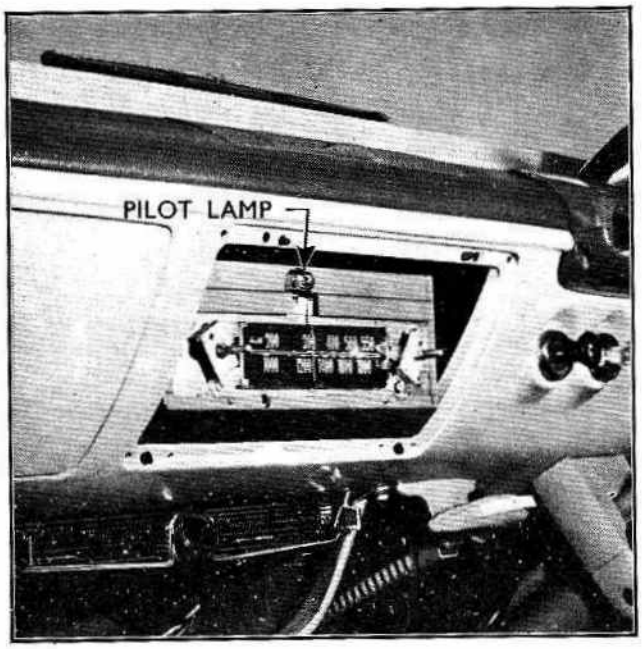


Fig. 583
The Pilot Lamp

Wave Change Switch

The two-position wave-change switch is the larger of the right-hand knobs. Movement to the right selects the medium wave band, and to the left the long wave band.

AERIAL TRIMMING

The aerial must be matched to the receiver on test when first installed and it should not be necessary to vary the adjustment in any way unless the aerial or lead-in are modified at a later date.

When the aerial is installed, or if for any reason the setting is suspected as being inaccurate, proceed as follows :—

1. Disconnect the car battery and lower the parcel tray and heater controls (if fitted). (See " The Receiver, To Remove," paragraphs 2 and 3.)
2. Reconnect the car battery and switch on the receiver, selecting a weak station on the medium wave band at approximately 340 metres. The aerial trimmer, which is a small screw recessed in the right-hand side of the receiver should then be rotated clockwise or anti-clockwise for maximum signal strength with the aerial fully extended and the set warmed up.
3. Select a suitable station (to suit local conditions) on each scale to check good reception before finalising the installation.
4. If the reception is acceptable, refit in position the heater control (if fitted) and the parcel shelf with the screws and spring washers originally used if in good condition.

THE PILOT LAMP

A pilot lamp is incorporated behind the tuning dial and also serves to illuminate the scale when the set is switched on (see Figs. 583 and 584).

To renew the bulb proceed as follows :—

1. Pull off the two smaller control knobs, which are friction held.
2. Remove the circlips in front of the two larger control knobs and pull these off.
3. Remove two fibre washers and one 4BA screw and washer from each shaft.
4. Unscrew and remove two self-tapping screws from the bottom corners of the escutcheon. (Some models may have two more screws located in the top corners of the escutcheon, these should also be removed).
5. Lift out the ash tray, and by means of a piece of ⅛ in. (3.175 mm.) diameter rod, ease back, a little at a time, the two pegs located in spire clips at the top corners of the escutcheon. (Models with two screws fitted at the top corners will probably not have spire clips).

6 Remove the escutcheon.

7 Unscrew and remove the bulb from above the centre of the tuning dial, and replace it with a suitable 14 volt 0.2 amp. bulb of the M.E.S. type.

8 Refit the escutcheon, ash tray, two 4BA screws, four fibre washers, large knobs, circlips and small knobs.

THE FUSE

The radio fuse is contained in the bayonet type connector incorporated in the main supply lead (see Fig. 585). A 5 amp. fuse is supplied with the installation and it is most important to ensure that a fuse of this rating only is used as a replacement, should the original burn out.

Access to the fuse, which is mounted in a clip on the top of the receiver, is gained through the ashtray aperture.

Fit the new fuse in the insulating sleeve before replacing, otherwise the fuse can be in contact with the connector casing causing a " short circuit." Insert the fuse and insulator in the connector casing and reconnect the supply lead. Replace the connector in the clip mounted on the receiver.

THE RECEIVER

To Remove

1 Disconnect the battery.

2 Remove the nuts, screws and washers (two screws at each end), securing the parcel tray and lower it to the floor.

3 Remove the two bolts and spring washers retaining the heater controls (where fitted) to the underside of the facia panel. Without disconnecting the cables lower the heater controls to the floor.

4 Disconnect the aerial, power lead, speaker lead (the speaker leads are thin and easily broken ; it is suggested that the leads be disconnected between the snap connectors and the car wiring loom cables), and earth strap from the receiver.

5 Unscrew and remove the two shouldered screws with flat washers which secure the rear of the receiver to its brackets.

6 Remove the two self-tapping screws positioned in the lower corners of the radio escutcheon. (Two more screws are fitted at the top on some models.)

7 Lift out the ashtray, and by means of a piece of $\frac{1}{8}$ in. (3.175 mm.) diameter rod passed through the ashtray aperture, ease back, a little at a time, the two pegs located at the top corners of the escutcheon. (Models with two screws fitted at the top corners will probably not have spire clips.)

8 Lift out the receiver and escutcheon as an assembly.

If it is necessary to remove the escutcheon from the set this should be done as described in " The Pilot Lamp," paragraphs 1 to 3.

To Replace

1 If previously removed, refit the escutcheon to the receiver.

2 Lift the receiver with the escutcheon carefully back into position and push the locating pegs on the escutcheon back into their spire clips (see Fig. 585).

3 Refit the self-tapping screws and the lower edge of the radio escutcheon.

4 Clip the fuse holder of the power lead into the spring clip fitted to the top of the receiver. Connect the receiver earth strap in its anchorage using a screw, spring and flat washer, and the aerial lead to the plug socket at the right-hand side of the receiver.

5 Connect the loudspeaker to the receiver, black lead to blue lead and red to blue with white tracer.

6 Replace the two shouldered screws and flat washers, passing them through rubber grommets in the receiver mounting bracket into the receiver and tighten securely.

7 Trim the aerial as described in "Aerial Trimming."

Note — When fitting a radio to a car equipped with a cigar lighter, care should be taken that the cigar lighter pilot light lead does not become trapped in the heater control mechanism. If this does occur, a chafed lead might cause a short circuit in the wiring system thus creating a serious fire risk.

THE LOUDSPEAKER

To Remove

1 Disconnect the car battery and loudspeaker connection at the loudspeaker (the speaker leads are thin and easily broken ; it is therefore suggested that the leads be disconnected between the snap connectors and the car wiring loom cables).

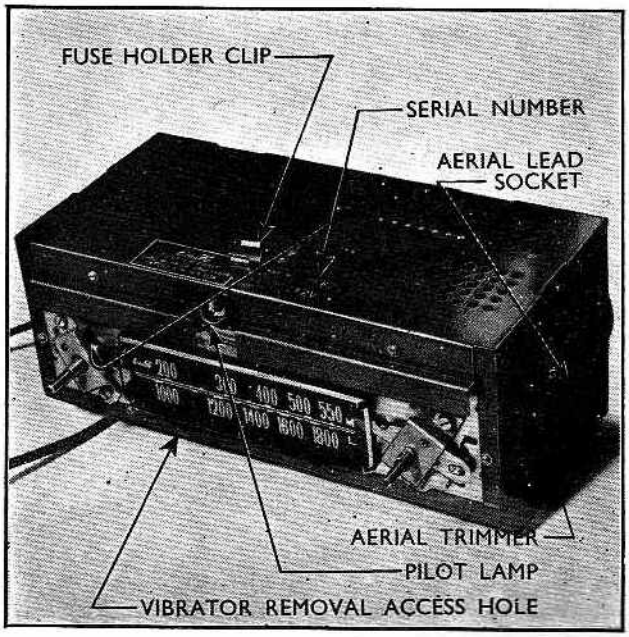


Fig. 584
The Receiver Case

2 From inside the luggage compartment, remove the four self-tapping screws securing the loudspeaker in position and remove it (see Fig. 586).

To Replace

1 Position the loudspeaker against the metal support under the rear window shelf with the connections towards the front of the vehicle.

2 Fit four self-tapping screws and tighten these securely.

3 Connect the loudspeaker leads, black to blue, red to blue with white tracer.

4 Check for satisfactory operation.

THE AERIAL

A " single draw " telescopic aerial is fitted on the left-hand windscreen skirting panel (see Fig. 587) on right-hand drive models, and the right-hand panel on left-hand drive models.

The aerial mast is chrome plated and is vertical.

To gain access to the aerial mounting it is necessary to remove the parcel tray and lower the heater controls as described in " The Receiver, To Remove," paragraphs 1 to 3.

To Remove

1 Disconnect the aerial lead from the receiver.

2 Engage a spanner in the hexagon at the base of the aerial mast and slacken this off, taking care not to damage the chrome.

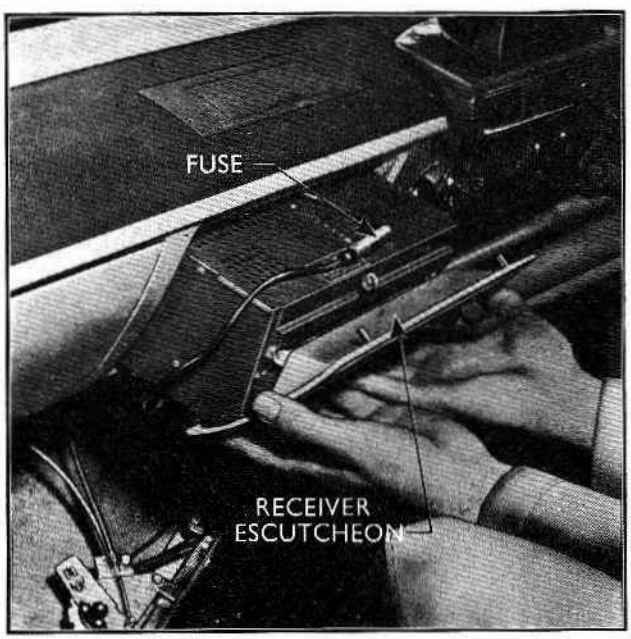


Fig. 585
Replacing the Receiver

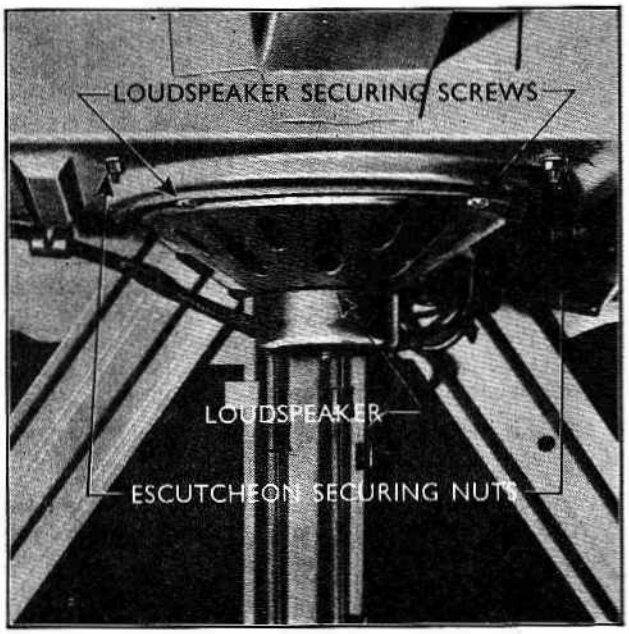


Fig. 586
The Loudspeaker

3 Remove the aerial mast, chrome spherical cup, insulating locator, and flat washer from the outside of the car.

4 From inside the car remove the aerial bollard and spherical cup.

To Replace

1 Fit the larger of the two spherical cups to the aerial bollard so that the spherical surfaces engage (convex surface down) and from within the car pass the threaded portion of the bollard through the mounting hole (ensure metal to metal surfaces are clean), and then fit the flat rubber washer, insulating locator (convex surface uppermost), chrome spherical cup and the aerial mast (see Fig. 587).

2 Locate the assembly in a vertical position, and using a spanner engaging the hexagon at the base of the aerial mast, fully tighten the assembly in this position, again taking care not to scratch the chrome.

3 Reconnect the aerial lead.

INSTALLATION INSTRUCTIONS

The following instructions describe the correct method of installing the car radio and aerial in " Consul," " Zephyr " and " Zodiac " models. This work should be done in the order given.

1 Open the bonnet and disconnect the battery.

2 Remove the nuts, screws and washers (two screws at each end) securing the front parcel tray and remove it.

3 Next, remove the two bolts and spring washers retaining the heater controls (where fitted) to the underside of the facia panel.

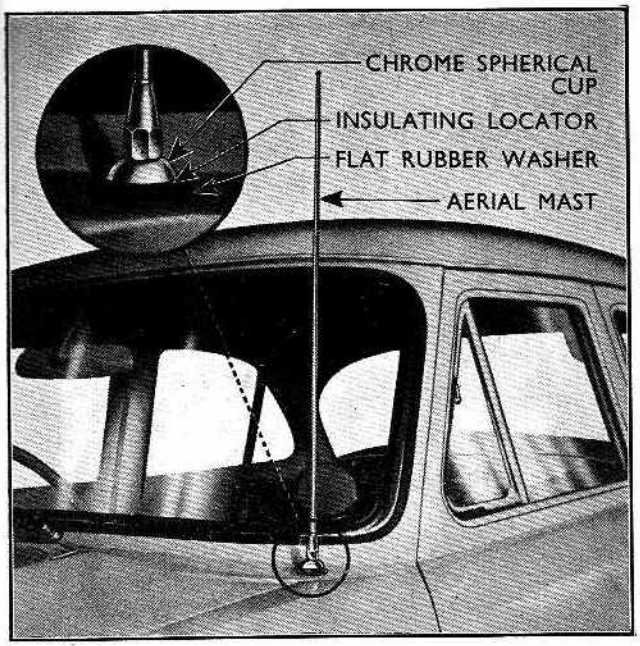


Fig. 587
The Aerial

Without disconnecting the cables, lower the heater controls to the floor.

4 Mark off one hole for the aerial mounting on the passenger side of the windscreen skirting panel (as in Fig. 588). Drill a pilot hole $\frac{1}{8}$ in. (3.175 mm.) dia. and then open out to $\frac{1}{2}$ in. (12.7 mm.) dia. Dress the hole, taking care not to damage the bodywork exterior finish and thoroughly clean the underside of the panel in this vicinity to approximately 2 in. (5.08 cm.) dia., so ensuring a good earth for the screened lead-in connection to the receiver fitted later.

5 Fit the aerial as described in the section " The Aerial, To Replace."

6 Route the aerial lead from the aerial bollard beneath the glove box and inside the lower edge of the facia panel to the receiver aperture at the centre (see Fig. 589).

7 Remove the generator end plate lower through bolt and clean away any paint, etc., at this location. Fit a flat washer in addition to the spring washer under the head of the through bolt and refit to the generator, inserting the metal lug of the condenser under the flat washer and tighten the bolt.

8 Connect the tag end of the condenser lead to the larger (" D ") generator terminal.

9 Lift out the ashtray, remove the two screws at the lower edge of the receiver aperture blanking panel. With a piece of $\frac{1}{8}$ in. (3.175 mm.) dia. rod passed through the ashtray aperture, ease back, a little at a time, the two pegs in the spire clips securing the top edge of the receiver aperture panel fitted in the surround.

On some models, screws are fitted in this location as well as at the lower edge. In this case remove any surplus paint that may be at these locations and fit spire clips in the largest two holes drilled in the top edge of the receiver aperture surround.

10 The receiver escutcheon which fits in the receiver aperture in the facia panel is supplied in primer and should be painted to match the body colour.

11 Clean the face of the clinch nut situated in the engine bulkhead panel, in line with the centre of the receiver aperture, and below the receiver bracket, for the earth strap anchorage.

12 Drill one hole $\frac{1}{4}$ in. (6.35 mm.) dia. for the power lead in the engine compartment panel as shown in Fig. 590, $1\frac{1}{8}$ in. (28.58 mm.) to the right of the fuse box right-hand securing screw and $\frac{3}{8}$ in. (9.525 mm.) above.

Note — On left-hand drive models this hole should be drilled $1\frac{1}{8}$ in. (28.58 mm.) to the left of the fuse box left-hand securing screw and $\frac{3}{8}$ in. (9.525 mm.) above.

13 Insert a rubber support strip in the holes provided in the receiver mounting bracket. Insert two special rubber receiver mounting grommets into the holes provided in the mounting bracket. Position the receiver on its mounting bracket.

On later models it is necessary to fit the mounting bracket, Part No. E271–T–2, to the car when installing radio as it is not fitted in later production models.

To fit the bracket, proceed as follows :—

(*a*) Thoroughly clean off the mounting holes in the rear of the bulkhead, dash panel, and mounting

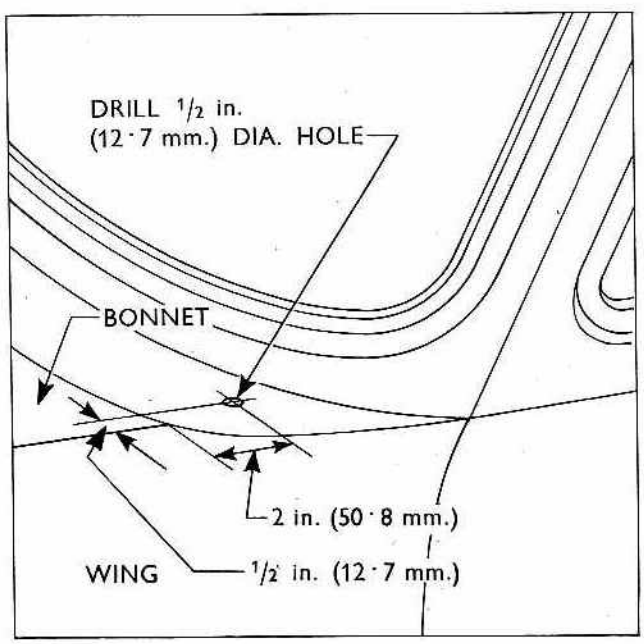


Fig. 588
Aerial Location

bracket to ensure that the bracket is adequately earthed to the body.

(*b*) Locate the bracket in the aperture, and fit two bolts, flat washers and lockwashers to secure the bracket to the dash panel through the two holes in the panel below the receiver aperture.

(*c*) Check the gap between the rear of the bracket and the clinch nuts in the rear of the bulkhead.

(*d*) Fit suitable washers to fill this gap and then enter two bolts with flat washers and spring washers, tightening these securely.

Under no circumstances must the bolts be tightened before first packing the gap between the bracket and the bulkhead as the action of pulling down the bolts could cause the dash panel to be buckled.

(*e*) Fit the two rubber grommets to the holes at the rear of the bracket and the rubber bumper strip to the front.

(*f*) When mounting the receiver, check that it rests on the rubber strip at the front and does not ride up on the aperture lip. If this is so, the lip should be dressed back until the receiver rests on the rubber mounting.

14 Clip the fuse holder of the power lead in the spring clip fitted to the top of the receiver and route the power lead through the hole drilled in the engine compartment bulkhead panel, fitting a grommet to prevent chafing. Connect the lead to the "A1" terminal of the voltage regulator.

15 Connect the receiver earth strap to its anchorage using a screw, spring and flat washer, and the aerial lead to the receiver, the plug connection being situated on the right-hand side of the receiver.

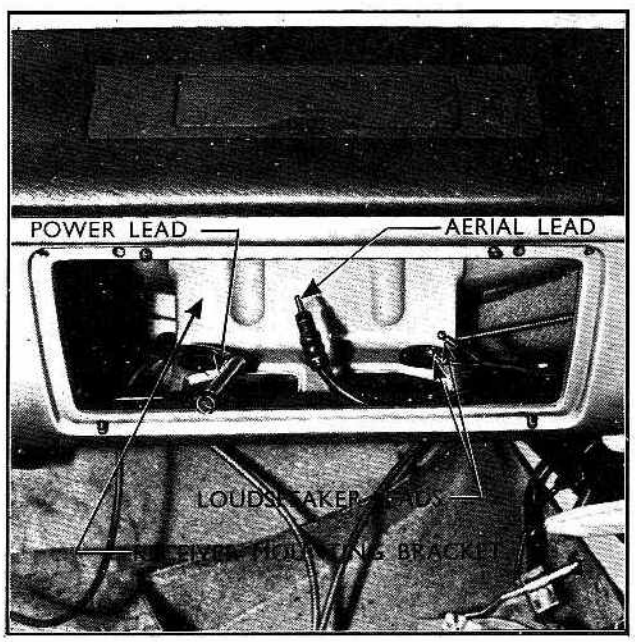


Fig. 589
Connections to Receiver

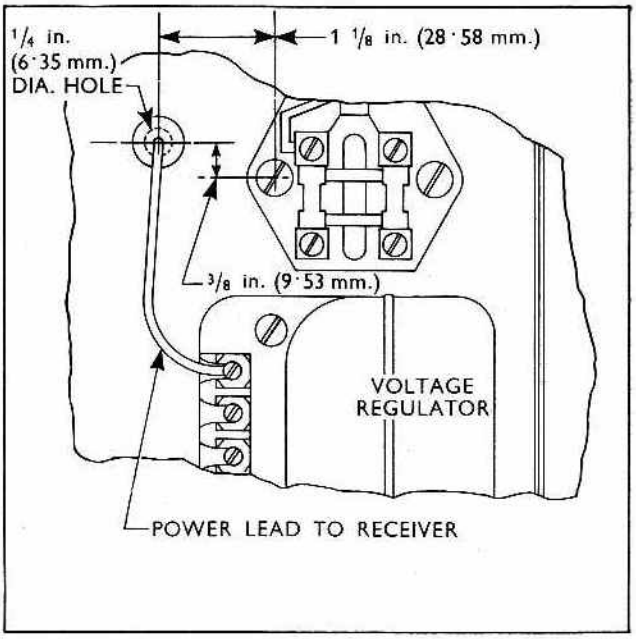


Fig. 590
Power Lead Location

16 Temporarily connect the loudspeaker to the receiver, black lead to black lead and red to red.

17 Trim the aerial as described in "Aerial Trimming."

18 If the performance of the receiver is acceptable disconnect the loudspeaker, taking care not to pull the soldered nipples off the ends of the loudspeaker leads, and connect the black and red receiver loudspeaker leads to the blue and blue with white tracer leads respectively, which form part of the car wiring loom and emerge from the loom at a point between the right-hand door and the mounting bracket. Retain the leads inside the lower edge of the facia panel with two small spring clips.

19 Pass the two shouldered receiver securing screws with flat washers under the heads through the rubber grommets in the receiver bracket and locate the receiver. Lightly enter the screws.

20 Assemble the receiver escutcheon to the receiver aperture locating the guide pegs in their respective spire clips. Push the panel into position and retain the lower edge with a self-tapping screw at each corner. The two screws are those originally used to secure the lower edge of the receiver aperture blanking panel.

21 Secure the receiver escutcheon to the receiver with two 4BA screws, with lockwashers under the heads, their locations being in the immediate proximity of the tuning and wavelength spindles.

22 Tighten the two receiver securing screws already loosely entered, using care not to overtighten.

23 Fit two fibre washers and an inner control knob to the tone control and wavelength switch spindles and retain in position with a circlip, located in the

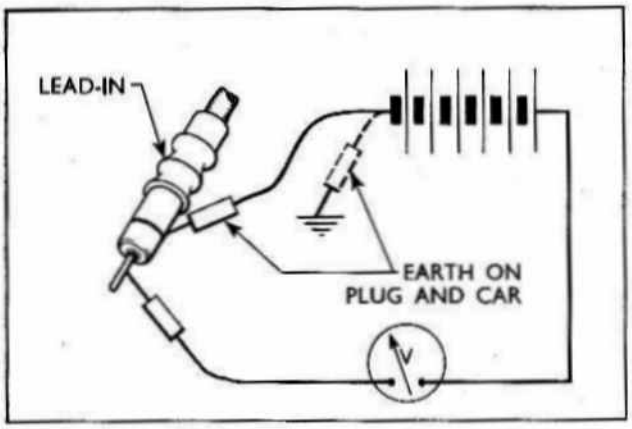


Fig. 591
Aerial Efficiency Test (*Short Circuit*)

machined groove of the spindle. Push on the outer control knob.

24 Refit the heater controls (where fitted) and the parcel shelf, using the screws and spring washers originally removed if in good condition.

25 The rear window shelf is perforated so that this aperture registers with a corresponding one in the metal support below it. The perforated area should be cut out concentric to the aperture in the metal support, using a sharp knife from above so that any ragged edges are below the surface. Mark off and spike from above, to register with the holes in the metal support, the four outer holes for the loudspeaker grille escutcheon studs.

26 Fit the four "U" shaped spire nuts to the four inner holes situated around the aperture in the luggage boot body member. From within the luggage boot fit the loudspeaker with the connections towards the front of the car and retain in position with four self-tapping screws, engaging the spire nuts.

27 Connect the black and red loudspeaker leads to the blue and blue with white tracer leads respectively, which emerge from the rear lamp wiring loom adjacent to the loudspeaker aperture.

28 From inside the car fit the loudspeaker escutcheon and grille. The grille is manufactured from expanded steel and should be fitted so that the interior of the loudspeaker cone is not visible from within the car. Secure the escutcheon in position by fitting four flat washers, shakeproof lockwashers and nuts, from within the luggage boot.

29 Test the radio for satisfactory operation with the engine running.

TROUBLE DIAGNOSIS

Aerial Efficiency Test

Physically check the condition of the aerial and lead-in, paying particular attention to the insulation of the lead-in from the car body and components.

Note — A duplicate aerial, consisting of a short length of suitably insulated wire connected to the receiver aerial socket and led out of the car, may be used for a quick test of aerial efficiency.

Short Circuit Tests

1 Connect a suitable voltmeter and test battery in series with two test prods, as shown in Fig. 591. Check the battery voltage by momentarily connecting the two test prods.

2 Remove the aerial lead-in plug from the socket in the right-hand side of the receiver, and touch one test prod on the plug centre contact and the other prod to the outer casing (see Fig. 591). Any reading shown on the voltmeter would indicate a short circuit between the aerial or lead-in, and earth. Check the aerial and lead-in independently.

3 Further checks can be made by removing the test prod from the outer screen casing and touching various good earthing points on the car body, or by testing between the aerial mast and earth.

Continuity Test

1 With the lead-in still disconnected from the receiver touch one test prod to the centre contact of the plug (see Fig. 592).

2 Use the other test prod to contact the aerial mast as previously described. The voltmeter should record full battery voltage, as the voltage drop throughout the circuit should be negligible.

To check for intermittent breaks in the aerial circuit, clip the prods in position and flex the lead-in throughout its length. The voltmeter readings should remain constant.

Main Supply Lead Tests

With the receiver switched on, and supply and battery leads properly connected, the pilot lamp will be illuminated and it should be possible to hear a hum from the vibrator, or to feel its action by placing a hand on the set chassis.

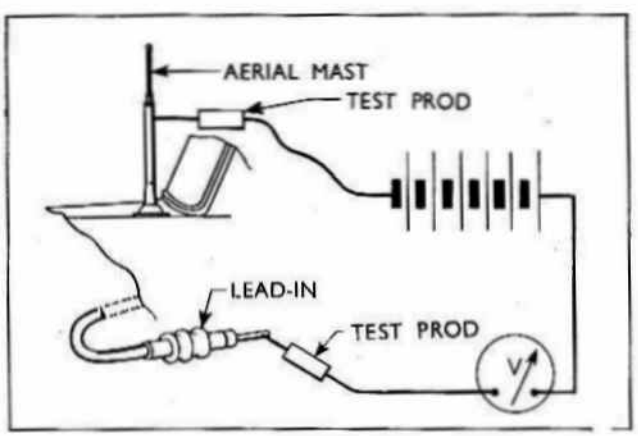


Fig. 592
Aerial Efficiency Test (*Continuity*)

If the vibrator does not appear to function first check the 5-amp. fuse in the connector, and if this is in order, proceed as follows :—

Continuity Tests

1 Connect a suitable voltmeter in series with two test prods as shown in Fig. 594.

2 Disconnect the supply lead at the connector and remove the fuse and insulating sleeve.

3 Slip the connector casing down the lead when a test prod may be used to touch the contact formed on the supply lead end.

4 Earth the other prod when the voltmeter should record full battery voltage, a drop through the leads being negligible.

5 Compare the reading obtained with the battery voltage. No reading on the voltmeter indicates a break in the supply circuit, while a drop in voltage indicates a poor connection resulting in a high resistance. Check back, stage by stage, at the points marked with an X in Fig. 594.

BENCH CHECKING THE RECEIVER

Before attempting to dismantle the radio unit carry out the aerial and supply leads checks described previously when investigating poor or " no reception." Make sure that the external connections to the set are correctly made.

Always use the " Trouble Diagnosis Chart " methodically when carrying out the checks detailed as follows :—

1 Remove the set from the car as described under the appropriate heading.

2 Unscrew the six screws retaining the top of the set in position, and remove the cover (see Fig. 593).

3 Plug in a test aerial to the appropriate socket.

4 Connect a suitable lead between the receiver chassis and the positive post of a test battery (12 volt) and using a suitable lead incorporating a 5-amp. fuse, connect the main supply lead to the negative post. Ensure that none of the valves are " soft." A " soft " valve can usually be detected by a white deposit on the inside of the glass envelope.

Switch on the radio, check the heater element of each valve and listen for the vibrator hum. If the heater of any valve does not appear to glow, switch off and replace it by one of the correct type. If the vibrator does not function replace with a new unit. (See paragraph " The Vibrator.")

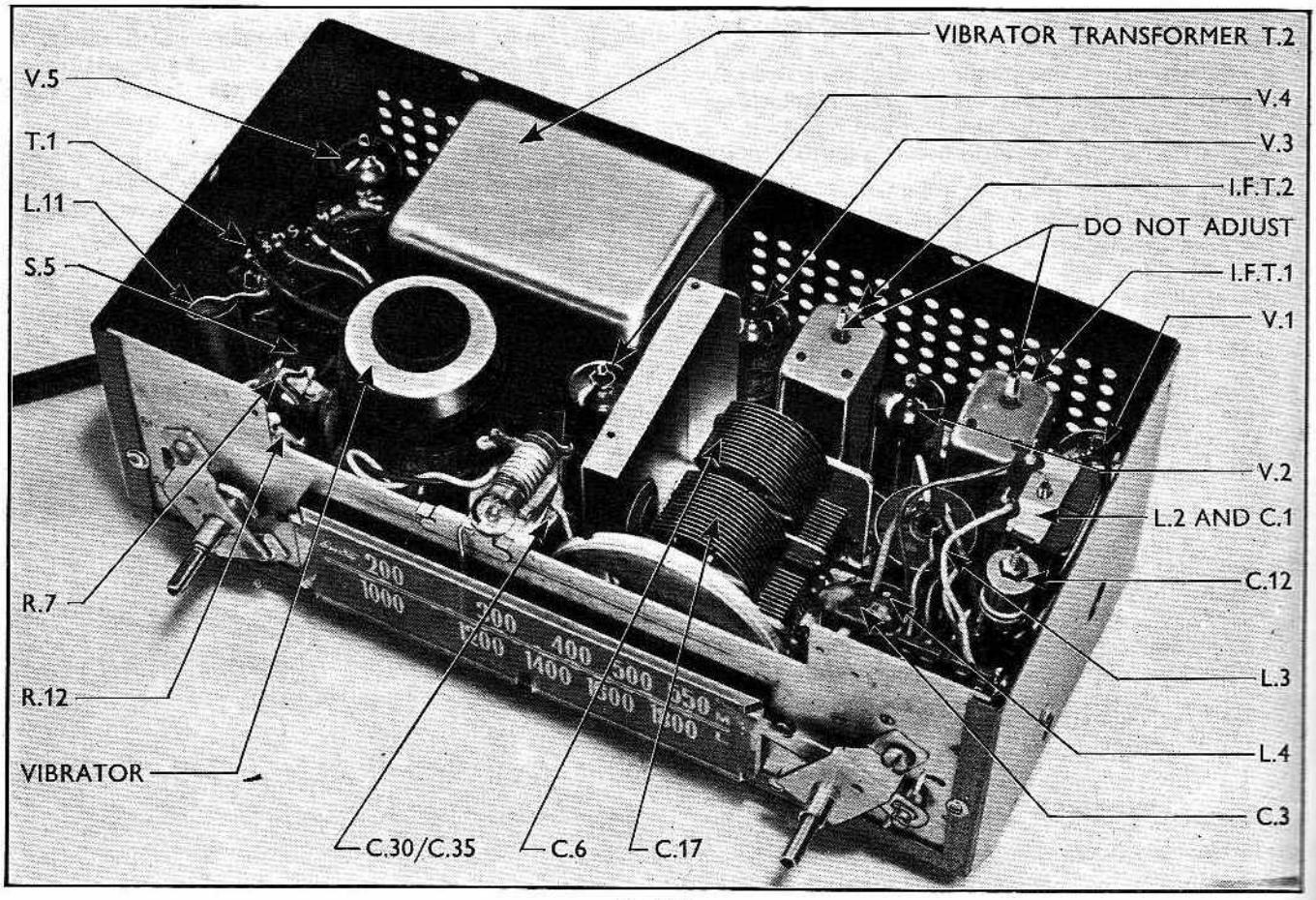


Fig. 593
Receiver Chassis

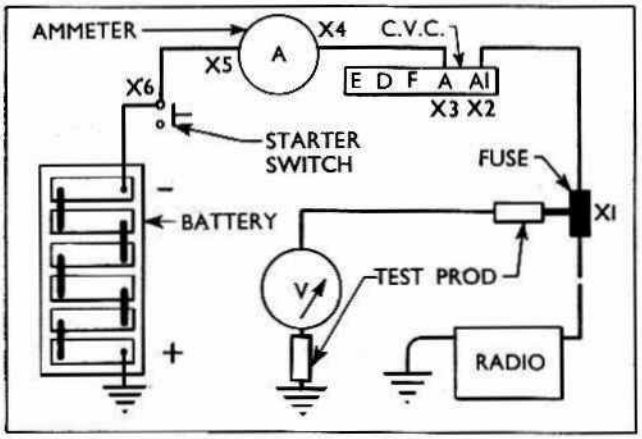


Fig. 594
Supply Lead Test (*Continuity*)

THE VALVES

The valve pins are so arranged that the valves will fit into their holders in one position only.

When removing valves, it will be found that access can be gained to them through four holes drilled in the bottom of the receiver casing, and through the loudspeaker connection hole (see Fig. 595). An electrician's small screwdriver, passed through these holes, can be used to push the valve out of its location. When replacing a valve, ensure that each pin enters its respective socket in the holder before pressing the valve " home."

Do not force a valve into its mountings.

If the valves appear to be in order and yet there is still " no reception " replace each in turn with a new valve in the following order, testing the set after each change :

EZ	41	Rectifier
EL	41	Output
EBC	41	Detector
EF	41	I.F. Amplifier
ECH	42	Frequency Changer

Ensure each valve is fully " home " in its mounting socket. If the receiver now functions but " crackle " is experienced with the aerial lead disconnected, gently tap each valve in turn to check for loose electrodes.

Replace any valves found to be defective.

THE VIBRATOR

The vibrator is a push fit in its socket. To remove, pass an electrician's small screwdriver through the elliptical hole in the front of the set below the tuning scale (see Fig. 584), and taking care not to damage any interior wiring, carefully lever up the vibrator from its socket, at the same time gently pulling it upwards. If care is not taken when carrying out this operation there is danger that the vibrator socket will become detached from the receiver chassis.

The vibrator will only fit into its socket in one position, and care should be taken on replacement to ensure that each prong engages its socket correctly.

CIRCUIT ALIGNMENT

The sequence for circuit alignment, as given below, must be adhered to.

Instruments required. A signal generator capable of covering the given test frequencies (amplitude modulated 30% at 400 c/s). An output meter, or low range A.C. voltmeter and trimming tools.

I.F. Alignment. Connect the output meter across the loudspeaker tags, set the tuning, volume and tone controls fully clockwise and the waveband switch to M.W.

Inject 465 Kc/s to the grid (Pin 6) of VI, via a 0.1 m.F. capacitor. Adjust L9, L10, L7 and L8 in that order for maximum output on the meter. Repeat until no further gain results.

M.W. Alignment. Switch to M.W. band, fully mesh the tuning capacitor and set the pointer to the datum line located between the M and L on the scale.

Inject 545 Kc/s to the aerial socket via an 82 p.F series dummy aerial and tune the receiver to 550 M., adjust L5 and L3 cores for maximum output.

Inject 1,500 Kc/s to the aerial socket via an 82 p.F series dummy aerial and tune the receiver to 200 M. mark on the scale, adjust C12 and C4 for maximum output.

Repeat until there is no further improvement in gain.

L.W. Alignment. Set the tuning capacitor to the datum line and switch to L.W. band.

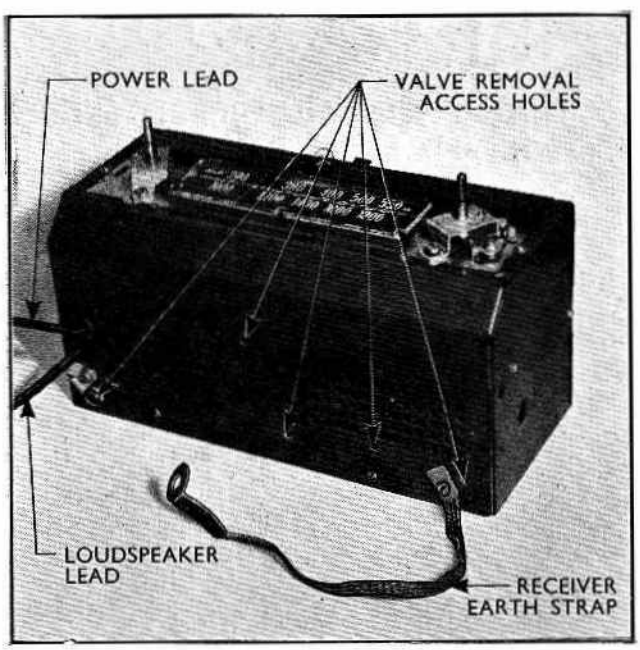


Fig. 595
Lower Face of Receiver

Inject 150 Kc/s to the aerial socket via an 82 p.F series dummy aerial and adjust L3 and L4 cores for maximum output.

Inject 250 Kc/s via an 82 p.F series dummy aerial to the aerial socket. Tune the receiver to 1,250 M, and adjust C15 and C2 for maximum output.

Repeat until there is no further improvement in gain.

I.F. Rejector Alignment. With the receiver switched to L.W. and the pointer set at the datum line, inject 465 Kc/s via an 82 p.F capacitor to the aerial socket.

Adjust L2 for minimum output on the meter.

Calibration Errors

M.W. 545 Kc/s and 1,500 Kc/s ± 0"
1,000 Kc/s ± $\frac{1}{16}$"

L.W. 150 Kc/s and 250 Kc/s ± 0"
200 Kc/s ± $\frac{1}{16}$"

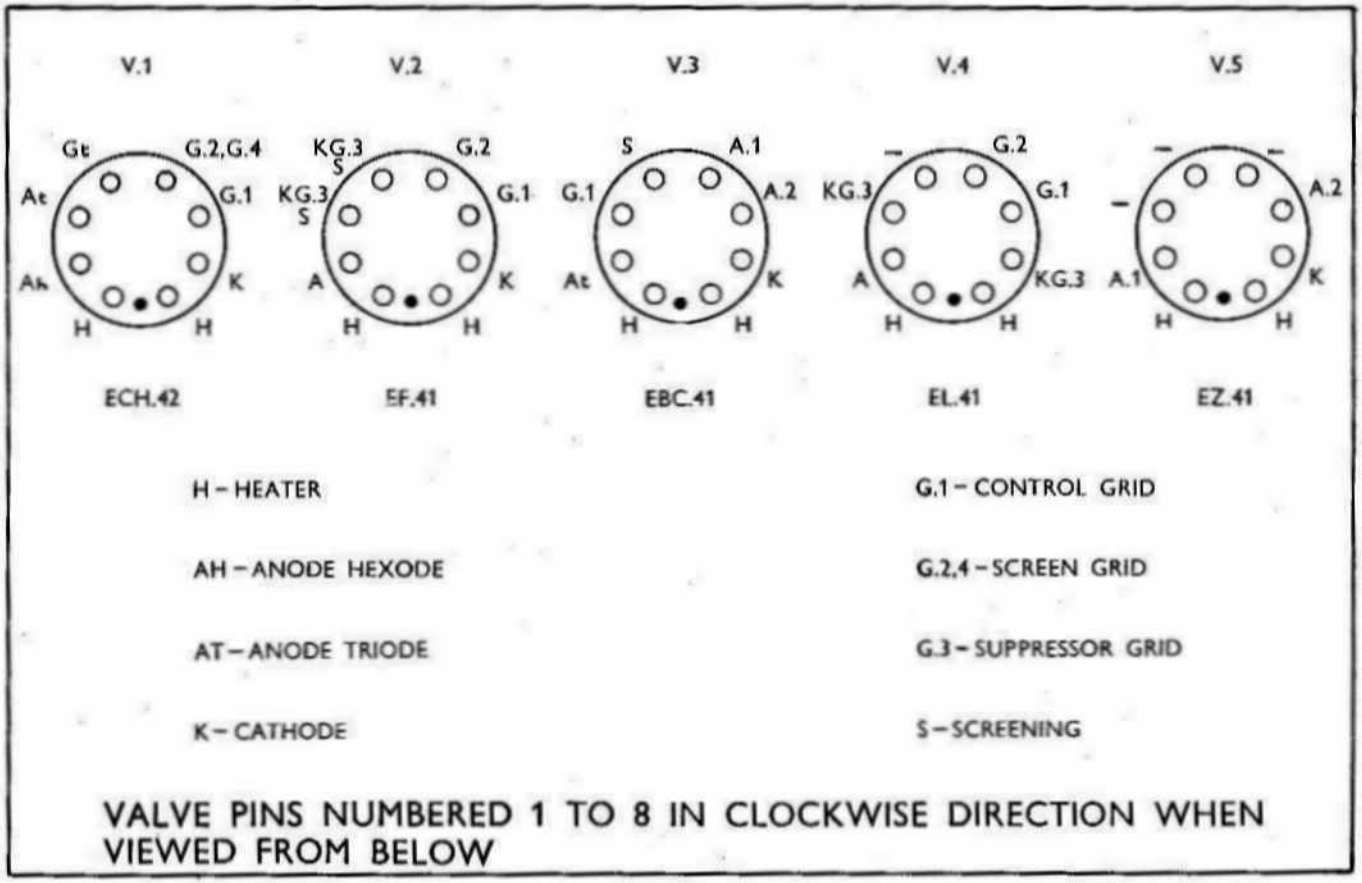
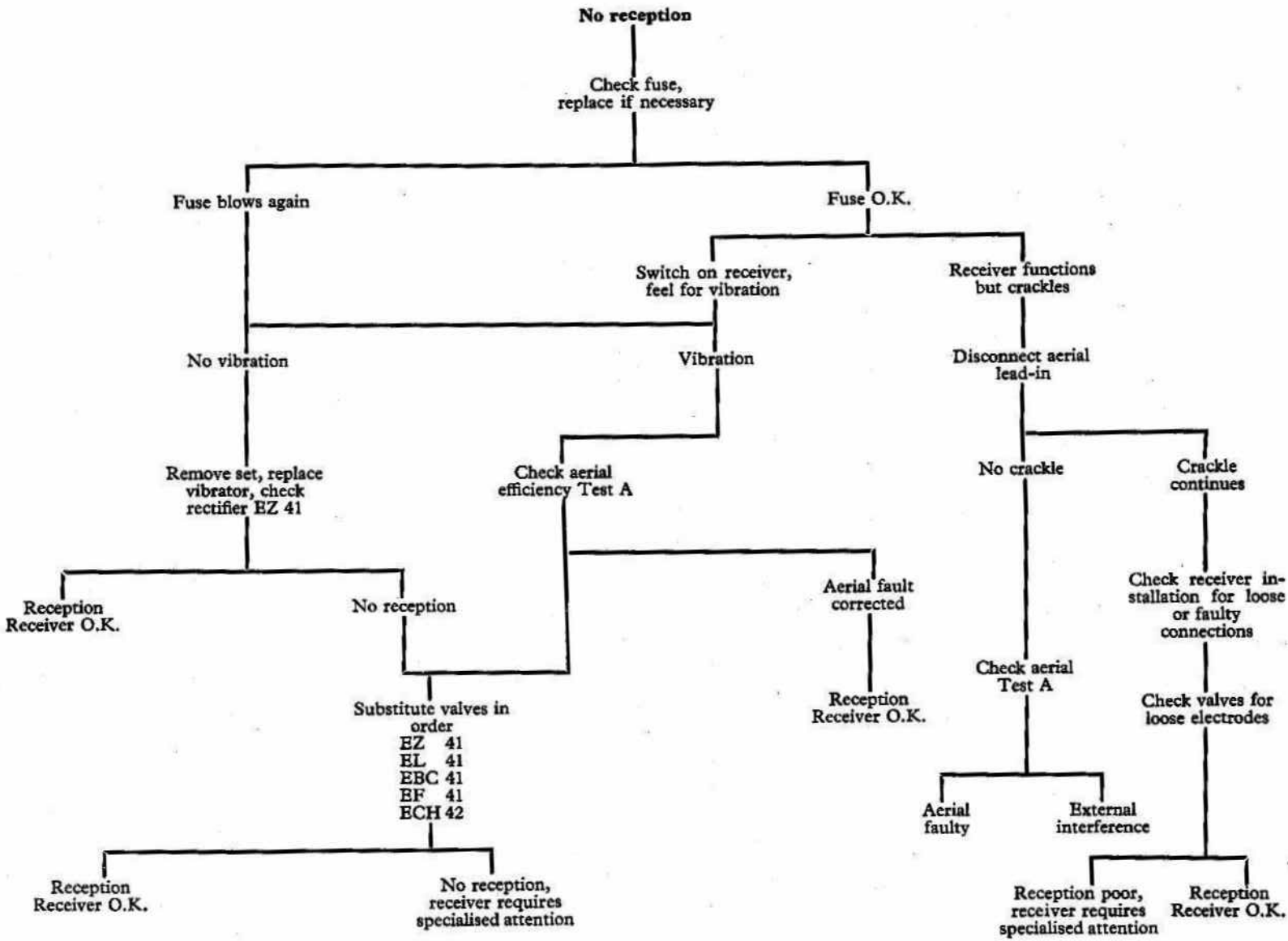


Fig. 596
Valve Base Layout



Trouble Diagnosis Chart

(*Models CR.266/F and CR.266*)

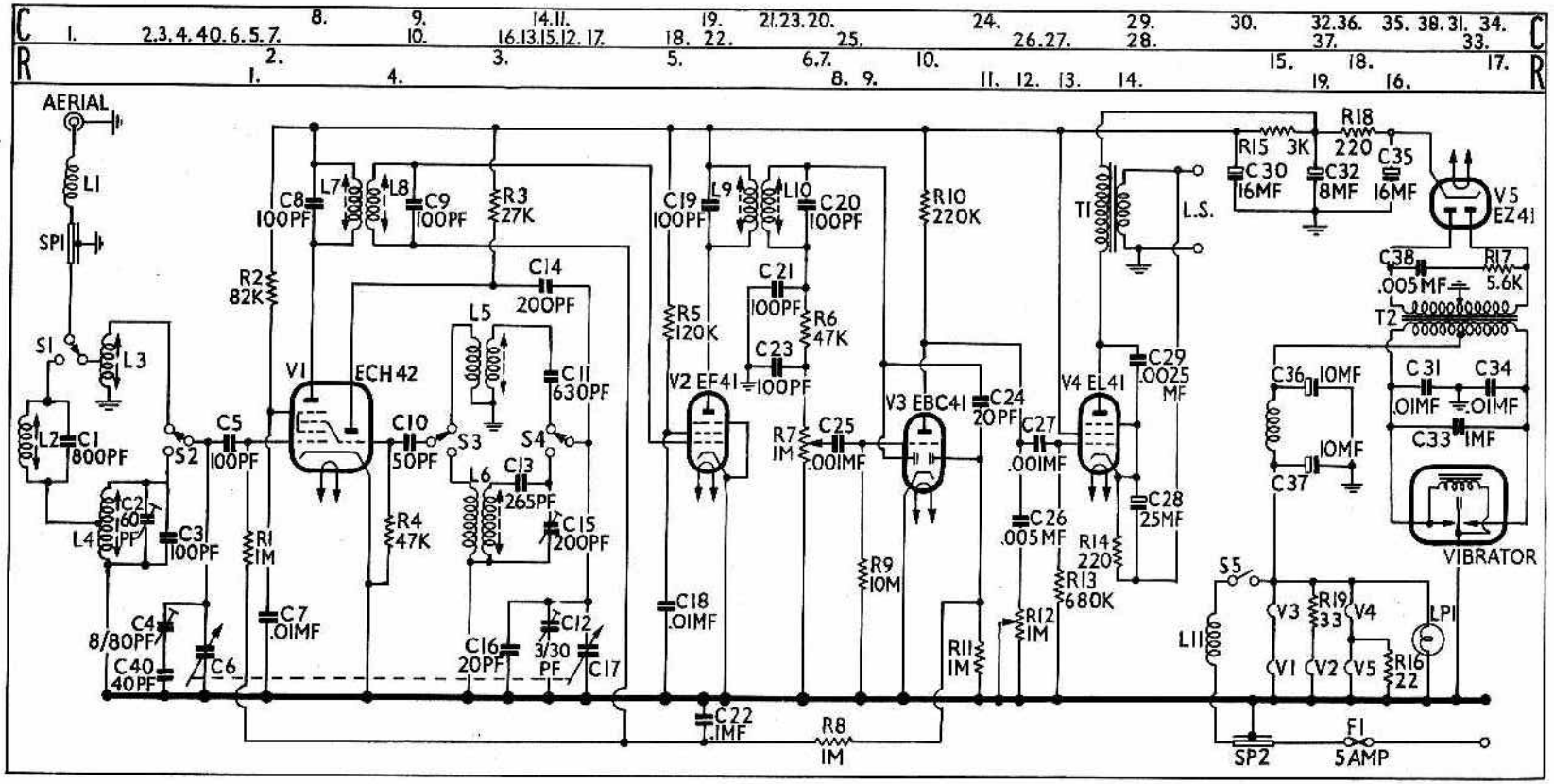


Fig. 597

Circuit Diagram

(Models CR.266/F and CR.266)

SPECIFICATIONS AND REPAIR DATA

For Models CR.266/F and CR.266 Radios

Type .. .. 5 Valve Superheterodyne

Frequency Coverage :

Medium wave	1,620—528 Kc/s	185— 568 Metres
Long wave	300—150 Kc/s	1,000—2,000 Metres

Intermediate Frequency (I.F.) .. .. 465 Kc/s

Tuning .. .. Manual Condenser

Valves—Mullard with B8A bases .. ..

V1	ECH 42	Frequency Changer
V2	EF 41	I.F. Amplifier
V3	EBC 41	Detector
V4	EL 41	Output
V5	EZ 41	Rectifier

Vibrator .. .. 12 v. Non-synchronous

Power Supply .. .. 12 v. 2.9 amps.

Fuse .. .. 5 amps.

Pilot Lamp .. .. 14 v. 200 m.a. M.E.S.

Speaker .. .. 6 in. dia.

Speaker Impedance .. .. 3 ohms at 400 C.P.S.

Note :—The stem located at the TOP of each I.F. transformer is a factory setting and **must not** be disturbed.

Voltage and Current Reading :

Unsmoothed H.T.	280—300 v. (v5 cathode, pin 7)	D.C.
Smoothed H.T.	210—230 v. (Junction R15—C30)	D.C.
Junction R15—C32	275—285 v.	D.C.

Valve	Anode Volts Ia	Screen Volts Es	Cathode Volts Ek
ECH 42	105 Tri 215 Hex	— 50	—
EF 41	215	55	—
EBC 41	90	—	—
EL 41	270	215	6.5
EZ 41	230—0—230		290

If further data is required, refer to a Valve Data Book.

CAR RADIO

As fitted to " Consul," " Zephyr " and " Zodiac " cars (1959 onwards).

Car Radio, Part No. 204E–18835–E, available as a Ford approved accessory for fitting to " Consul," " Zephyr " and " Zodiac " (1959 onwards) range models is a 13.5 volt, three-valve superheterodyne unit designed to cover the medium band, and one predetermined long wave station.

The receiver is mounted in place of the blanking panel in the centre of the lower facia panel, which also houses the hand brake, ashtray and cigar lighter (where fitted). The loudspeaker and baffle, Part No. 204E–18804–B, are mounted immediately above the receiver behind the louvred panel.

This radio incorporates manual tuning (right-hand control) and an illuminated tuning scale provided with metre markings for station selection.

The left-hand control knob is the combined ON/OFF and volume control.

The current consumption of the radio is 2.4 amps at 13.5 volts. Mullard valves of the following types are included in the various circuits and it is essential that similar valves only be used when making replacements, which may, from time to time, become necessary :—

ECH 81 Frequency Changer
EBF 89 I.F. Amplifier Audio and A.V.C. Detector
ECL 82 Audio Amplifier and Output

A non-synchronous type 1214 vibrator is used and only a similar type should be used for replacement purposes. The rectifier is a contact cooled pattern, Type No. 16RD2–2–6–1.

To complete the installation a receiver mounting kit, Part No. E2–WA–2 and an aerial kit, Part No. 204E–18894 are required and are available, complete with fitting instructions, which are also included in this chapter.

To simplify repair procedure the receiver has been designed on a unit basis consisting of :—

1 Base Plate Assembly
2 Front Plate Assembly (incorporating the cursor but not including the tuning scale)
3 R.F. and Tuning Unit
4 Power Pack

Each unit (see Fig. 608) is available as an exchange unit and detailed instructions covering the replacement of each is provided later in this section.

Receiver Serial Number

Each receiver bears a serial number stamped on the underside of the base plate. This same number is also rubber stamped on each unit (previously referred to) for identification purposes, and similarly, exchange units are also numbered as a separate series.

For ease of identification the receiver serial number also appears on the front plate, see Fig. 612, and is visible when the escutcheon, embellisher, etc. have been removed.

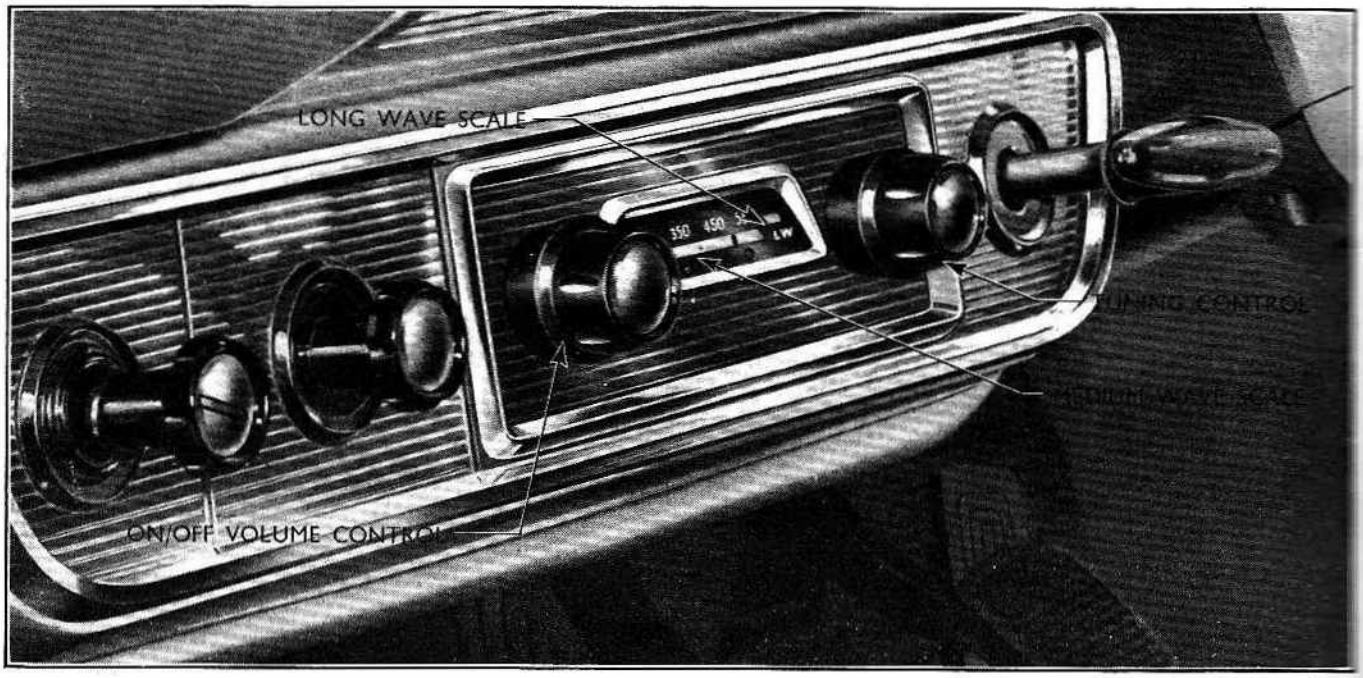


Fig. 598
The Radio Controls
Radio, Part No. 204E-18835-E)

THE FUSE

The radio fuse is contained in the bayonet-type connector, incorporated in the main supply lead. A 5 amp fuse is supplied with the installation and it is most important to ensure that a fuse of this rating only is used as a replacement, should the original burn out.

Bayonet connectors of two types may be encountered in service, one of metal construction and the other of bakelite. When using a metal connector, always ensure that an insulating sleeve is fitted around the fuse before inserting it in the connector, otherwise the casing will cause a " short circuit."

Location

A locating clip for tne bayonet connector is positioned on the rear of the receiver casing. Always locate the connector in this clip after checking or fitting the radio fuse.

AERIAL TRIMMING

The aerial must be matched to the receiver when first installed and it should not then be necessary to vary the adjustment in any way, unless the aerial or lead-in are modified at a later date.

When the aerial is installed, or if for any reason the setting is suspected as being inaccurate, proceed as follows :

Note — The aerial trimmer is located in the top of the set, as illustrated in Fig. 599.

1 Tune to a station received at the weakest strength at the low wavelength end of the medium wave range, preferably 200 metres or less and, with a small screwdriver, adjust the aerial trimmer, illustrated in Fig. 599, until the station is received at maximum strength. This setting should be adjusted with the aerial fully extended and the set at normal operating temperature.

2 Select a suitable station (to suit local conditions) on the scale to check for good reception.

THE CONTROLS

The Radio Receiver incorporates two manual controls and a tuning scale calibrated in metres, this being illuminated when the radio is switched on.

Combined ON/OFF Switch and Volume Control

The left-hand control operates the ON/OFF switch and varies the loudspeaker volume. The set is switched on by turning the knob clockwise and further movement in this direction progressively increases the volume. Anti-clockwise rotation will reduce the volume and the set may be switched off by turning the control fully in this direction.

Manual Tuning Control

Stations are tuned on the medium wave band by means of the tuning control, which is the right-hand knob, used in conjunction with the illuminated tuning scale. Stations should always be tuned for maximum strength by means of this control and the volume reduced, if necessary, by using the volume control. The long wave station is selected automatically when the indicator on the tuning scale reaches the division marked ' L.W.'

RADIO OPERATING INSTRUCTIONS

Fig. 598 illustrates the two controls.

Note — The radio will only operate with the ignition switched on in either the " auxiliary circuits " position or " ignition and auxiliary circuits " position. In order to obtain maximum clarity remember to fully extend the aerial when operating the receiver.

Medium Wave

Switch on the radio by turning the left-hand control knob clockwise when a click will be heard as the switch operates. Further clockwise rotation operates the volume control increasing the loudspeaker volume.

Allow approximately half-a-minute for the radio to warm up then select the required station by rotating the right-hand knob as required, carefully tuning for maximum volume and clarity of reception.

If necessary, use the volume control to reduce or increase the loudspeaker volume to suit operating circumstances.

Long Wave

Provision is made for the reception of one long-wave pre-set station. Normally, your radio is tuned to receive the B.B.C. Light Programme 1500 metres, but if required, you can vary this setting to suit individual requirements, see later in this section.

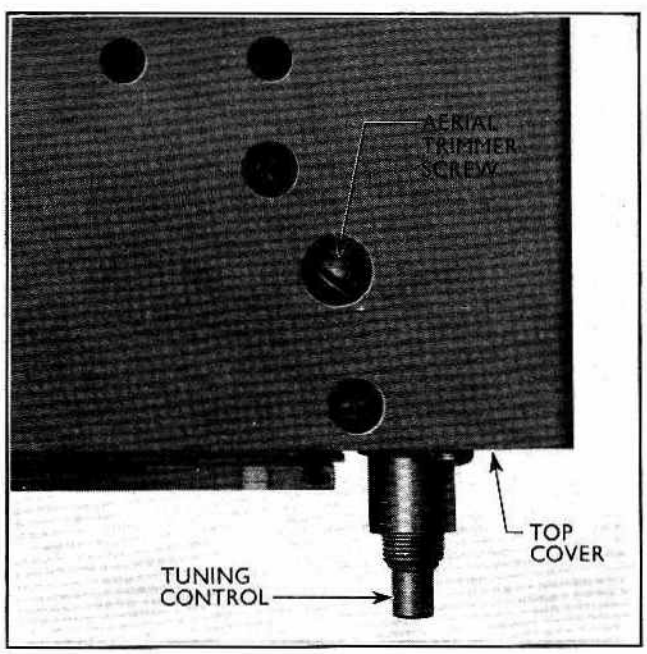


Fig. 599
Aerial Trimming Screw Location

Switch on the radio as explained previously and allow the radio to warm up.

Rotate the tuning control fully clockwise until the pointer enters the division marked L.W. so automatically selecting the pre-set long wave station.

Adjust the volume control as required.

INSTALLATION INSTRUCTIONS

The following instructions describe the correct method of installing the radio receiver, loudspeaker and aerial in the " Consul," " Zephyr " and " Zodiac " models.

The Aerial

1 Open the bonnet and disconnect the battery.

2 Mark off one hole for the aerial mounting on the passenger side of the windscreen skirting panel (see Fig. 600), drill a pilot hole $\frac{1}{8}$ in. (3.175 mm.) diameter and then open out to $\frac{7}{8}$ in. (22.23 mm.) diameter. Take care not to damage the bodywork exterior finish when completing this operation but do not dress the hole as the ragged edge will ensure a good earth connection between the body and base of the aerial mast.

3 Check that the hexagon plug retaining the lead-in is securely tightened in the base of the aerial mast. From within the car pass the threaded portion of the aerial base through the mounting hole and then fit the flat rubber washer and insulating locator (convex surface uppermost) over the threaded portion of the aerial base. Ensure that the small pips in the insulating locator enter the corresponding dimples in the flat rubber washer.

Place the spherical chrome cup over the insulating locator and screw on the aerial mast, see Fig. 601.

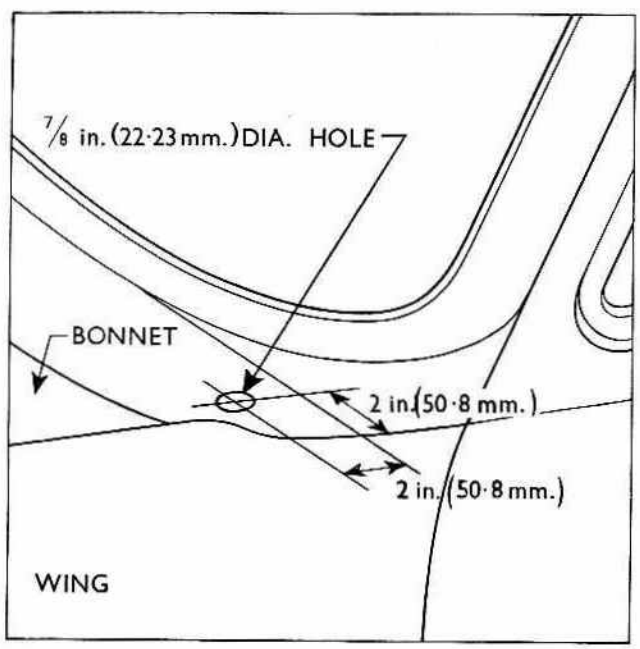


Fig. 600
Aerial Location on Skirting Panel

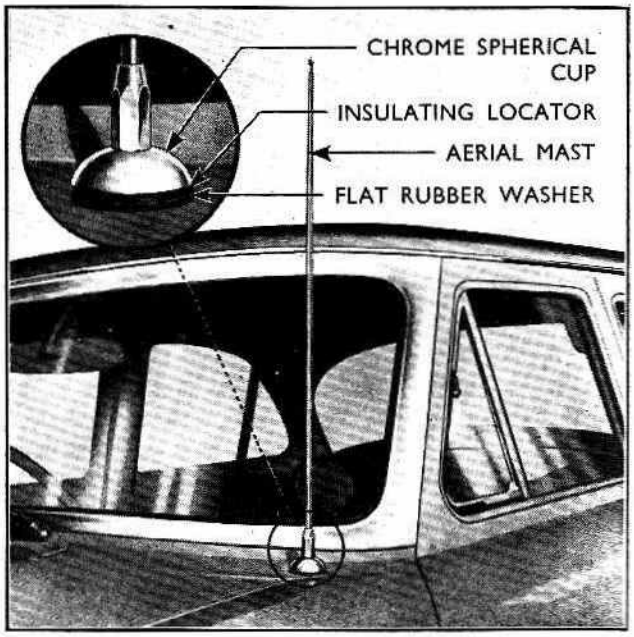


Fig. 601
The Aerial Assembly

4 Locate the assembly in a vertical position and carefully using a protected spanner, engage the hexagon at the base of the aerial mast and fully tighten the assembly in this position taking care not to damage the chrome.

5 Route the aerial lead from the aerial base beneath the glove box and inside the channel formed in the lower edge of the facia panel to the receiver aperture at the centre.

The Loudspeaker

1 Remove the screws retaining the heater and demister control knobs to the levers (or screw retaining the ventilator control knob, on cars not fitted with heater equipment) and slide the knob or knobs backwards off the levers.

2 Unscrew the four self-tapping screws retaining the louvred grille in the centre of the facia panel and remove the grille.

3 While it is accessible, clean the face of the clinch nut situated in the engine bulkhead, in line with the centre of the loudspeaker aperture and level with the lower edge, see Fig. 602.

4 Using screw, Part No. 31612–S7/8, with flat and spring washers, secure the radio receiver earth strap to the clinch nut ensuring that a clean and tight connection is made.

5 Locate the speaker and baffle assembly in position in the facia panel aperture behind the flanged edges, with the terminal panel downwards. Route the leads towards the receiver location, well clear of moving parts, i.e. heater controls, ashtray, etc. and then secure the baffle to the facia with four self-tapping screws, Part No. 52726–S7/8, as shown in Fig. 602.

6 Reposition the louvred grille in the facia and secure with the four self-tapping screws previously removed.

Reassemble the lever knob(s) and the lever(s), sliding each knob into position on its lever under the locating lug before fitting the screw. Check the operation of the heater or ventilator controls before proceeding with the installation.

The Radio Receiver

1 The receiver locates in a central position on the lower facia (see Figs. 598 and 602) which is at present obscured by a removable blanking panel.

From behind the panel, twist the two metal clips mounted on the rear of the panel, so releasing the panel from its position.

2 (*a*) Stand the receiver on the bench with the control spindles uppermost and remove the two hexagonal nuts.

(*b*) Place the tuning scale on the two raised brackets formed in the front panel of the receiver and secure the correct way up with two self-tapping screws (115633–ES2).

(*c*) Place the escutcheon (204E–18840) on the receiver front panel, over the control spindles (check that the small bush E8–WA–2 supplied with the receiver is in place on the on-off volume control spindle) and over this fit the embellisher (E5–WA–2).

(*d*) Position a cupped retainer washer over each spindle as shown in Fig. 603 and screw the hexagon nuts previously removed back on to the controls. Tighten each nut evenly and firmly.

(*e*) Line up each control knob with its " D "-shaped spindle and press each knob firmly into position.

3 Fit the two rubber mounting strips, one along the top rear and one along the bottom rear edges of the escutcheon to conform to the flange shape. Use a smear of adhesive to retain the strips in position on the escutcheon but do not allow adhesive to contact the car facia.

4 Remove the brace at present fitted between the centre of the lower facia panel and the engine bulkhead. This brace is of " U " section and the rearmost ends of the flanges must be tapered for a length of $1\frac{1}{2}$ in. to a depth of $\frac{1}{4}$ in. and both front and rear ends then suitably chamfered to prevent damage resulting from the exposed sharp corners (see Fig. 602).

5 (*a*) Depress the recessed pin in the windscreen wiper control knob and pull the knob from its spindle.

(*b*) Unscrew the escutcheon nut from the wiper control, also the similar nut from the ignition switch and lift away the small embellisher panel.

(*c*) Remove the two screws which are now exposed and which retain the instrument housing to the facia, also the one screw positioned inside the instrument panel hood.

(*d*) Displace the speedometer cable grommet from the engine bulkhead and ease the instrument panel upwards and out from the facia. Unscrew the knurled nut retaining the speedometer drive to the speedometer and lift out the instrument panel to the extent that the wiring will allow. It is not necessary to disconnect any leads.

(*e*) Connect the special radio feed lead (yellow with red tracer) provided to the accessory terminal of the ignition switch and route the lead to the receiver location.

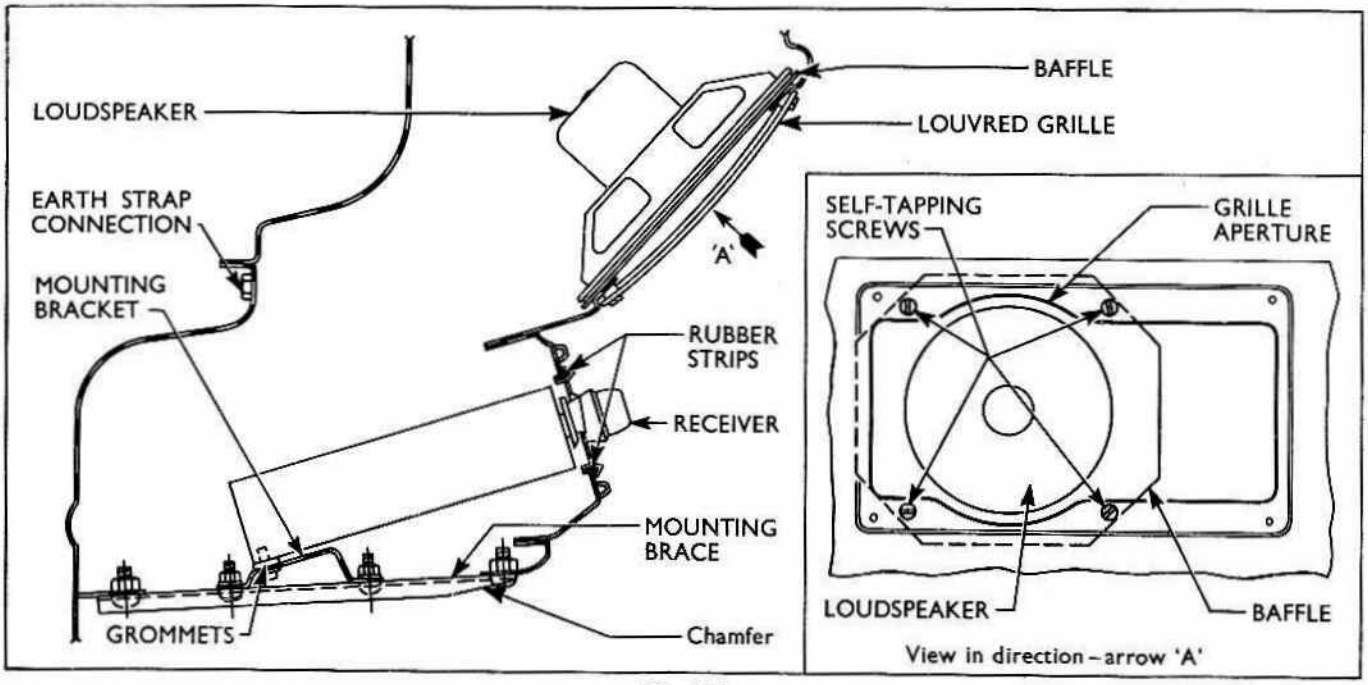


Fig. 602
Receiver and Loudspeaker Mounting Positions

(*f*) Reassemble the instrument cluster, etc. to the car, reversing the order of the previous instructions given. Ensure that the speedometer cable has a free, natural run and that the white tape round the outer conduit is directly under the clamp on the bulkhead, then replace the grommet.

6 Pass the receiver into position through the aperture in the lower facia and temporarily hold in its approximate position with a suitable support.

7 Connect the free end of the earth strap fitted in Operation 4 under the heading " Loudspeaker " to the welded nut in the right-hand side of the receiver casing. Ensure that the sides of the receiver and earth strap are both clean, and using a bolt (AB/602/5-A-S7/8) spring and flat washers make a tight connection on the receiver side.

Note — The earth strap supplied with early car radio mounting kits is of insufficient length to connect between the engine bulkhead and the right-hand side of the receiver.

It is in order for the strap to be secured to the similar location on the left-hand side of the receiver, provided a bolt no longer than ¼ in. (6.3 mm.) (e.g. Part No. 995952-ES7/8) is used. If a longer bolt is used then the possibility of fouling the volume control exists, so restricting loudspeaker output.

Where this procedure is adopted, it will also be necessary to install the receiver complete with earth strap, before fitting the loudspeaker.

A longer earth strap is supplied with later kits, in which case the original instructions can be followed.

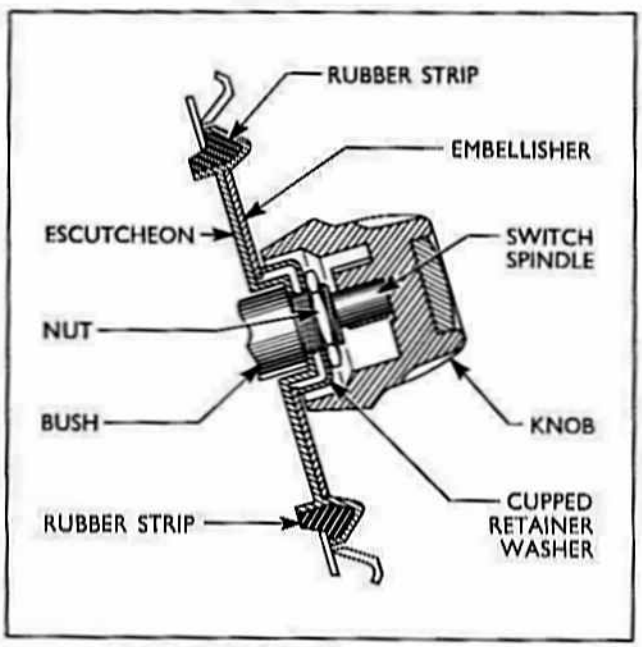


Fig. 603
Sectional View of the On/Off Volume Control Knob

8 Insert the aerial lead-in plug in the socket provided in the recess at the base of the receiver, see Fig. 607, and also connect the loudspeaker leads, fitting the three-pin plug in the socket in the receiver base. This plug will only fit in one position, do not attempt to force engagement.

9 Fit the 5 amp fuse supplied in its insulating sleeve (if the connector and fuse holder are of the metal type, see earlier in this section), and insert this assembly in the bayonet-type fuse holder. Connect the two parts of the fuse holder, reconnect the vehicle battery and check that the receiver operates.

10 Trim the car aerial.

(*a*) Allow approximately half-a-minute for the set to warm up and then select a weak station on the Medium Wave band at approximately 200 metres.

(*b*) Partially withdraw the receiver from its aperture, sufficient to gain access to the trimmer screw through the top cover of the receiver, see Fig. 599, and rotate the aerial trimmer screw clockwise or anti-clockwise, as necessary, for maximum signal strength, with the aerial fully extended.

(*c*) Select another suitable station (to suit local conditions) on the Medium Wave band and then select the pre-set Long Wave station to check for good reception before finalising the installation.

(*d*) Switch off the receiver and again disconnect the car battery.

11. Assemble the two grommets (E452-T-2) to the radio mounting bracket so that the larger shoulder of each grommet is above the bracket as shown in Fig. 602. Position the bracket on the underside of the radio and secure to the receiver base with two screws (AB-602/8-S7/8) and washers (44713-S7/8) using the threaded holes provided.

12 Refit the brace between the engine bulkhead and lower facia so that the flanges of the " U " section are downwards. Loosely secure each end of the brace with a bolt (50518-S7/8), spring washer (34805-S7/8) and nut (33796-S7/8) assembling the bolts with the heads downwards.

13 Bolt the receiver mounting bracket to the brace, using two bolts (50515-S7/8), flat washers (44713-S7/8), lockwashers (34803-S7/8) and nuts (34079-S7/8), again with bolt heads downwards.

14 Check that the receiver embellisher is seating correctly within the facia, aligning the receiver and embellisher as necessary, then evenly tighten the four bolts and nuts fitted in Operations 12 and 13.

15 Remove the generator end plate lower through bolt and clean away any paint etc., at this location. Fit a flat washer in addition to the spring washer under the head of the through bolt and refit to the generator, inserting the metal lug of the suppressor condenser (1 μF) under the flat washer. Tighten the through bolt securely.

Connect the tag end of the condenser lead to the larger (D) generator terminal.

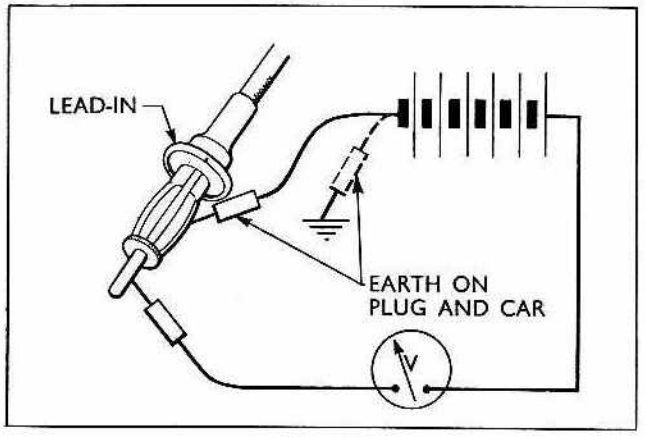


Fig. 604
Aerial Short Circuit Test

16 Reconnect the car battery and test the radio for satisfactory operation under operating conditions with the car engine running.

17 It may be found under certain operating conditions that further L.T. suppression is required.

If this is the case, slacken the bolt securing the coil mounting bracket, clean the bracket face and support, and locate the lug of a second suppressor condenser below the coil mounting bracket, tightening the bolt to secure the condenser in position.

Connect the free end of the condenser lead to the switch terminal (SW) of the ignition coil.

TROUBLE DIAGNOSIS

Efficient radio servicing requires the quick and accurate diagnosis of any fault which might develop in some section of the installation. This section details trouble shooting procedure which should be employed when investigating a complaint of poor or no reception.

The following aerial and main supply leads tests should be completed before removing the receiver or any other component from the car, but after having ascertained that all external connections are properly made. Use the Trouble Diagnosis Charts to ensure that the checks and tests are performed in the correct sequence.

Aerial Efficiency Tests

Physically check the condition of the aerial and lead-in, paying particular attention to the insulation of the lead-in from the car body and components.

Note — A duplicate aerial, consisting of a short length of suitably insulated wire connected to the receiver aerial socket and led out of the car, may be used for a quick test of aerial efficiency.

Short Circuit Tests

1 Connect a suitable voltmeter and test battery in series with two test prods, as shown in Fig. 604. Check the battery voltage by momentarily connecting the two test prods.

2 Remove the aerial lead-in plug from the socket in the underside of the receiver, see Fig. 607, and touch one test prod on the plug centre contact and the other prod on the outer diameter and rim of the plug. Any reading shown on the voltmeter would indicate a short circuit between the aerial lead-in and earth. Check the aerial and lead-in independently, after disconnecting the lead-in from the aerial mast.

3 Further checks can be made by removing the test prod from the outer rim of the plug and touching various good earthing points on the car body, or by testing between the aerial mast and earth.

Continuity Test

1 With the lead-in still disconnected from the receiver, touch one test prod on the centre contact of the plug (see Fig. 605).

2 Use the other test prod to contact the aerial mast as previously described. The voltmeter should record full battery voltage, as the voltage drop throughout the circuit should be negligible.

To check for intermittent breaks in the aerial circuit clip the prods in position and flex the lead-in throughout its length. The voltmeter reading should remain constant.

Radio Feed Lead Tests

With the receiver switched on, and supply and radio feed leads properly connected, the pilot lamp will be illuminated and it should be possible to hear a hum from the vibrator, or to feel its action by placing a hand on the set chassis.

Note — Due to the improved type holder for this vibrator, very little vibration will be felt in the receiver chassis. Care must therefore be exercised when checking for vibrator reaction.

If the vibrator does not appear to function, first check the 5 amp fuse in the connector and if this is in order, proceed as follows :—

Continuity Tests

1 Connect a suitable voltmeter in series with two test prods as shown in Fig. 606.

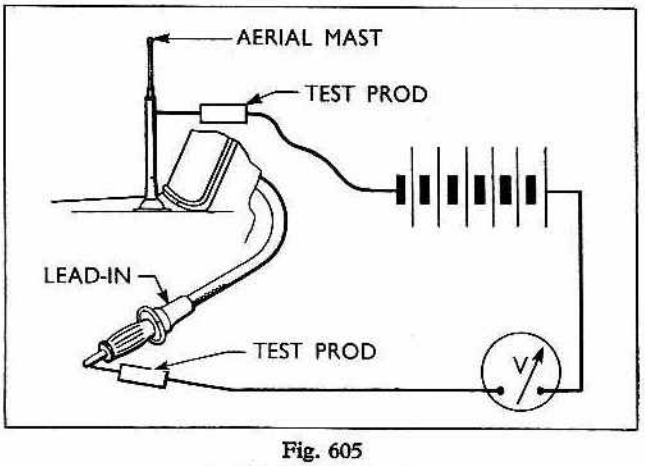
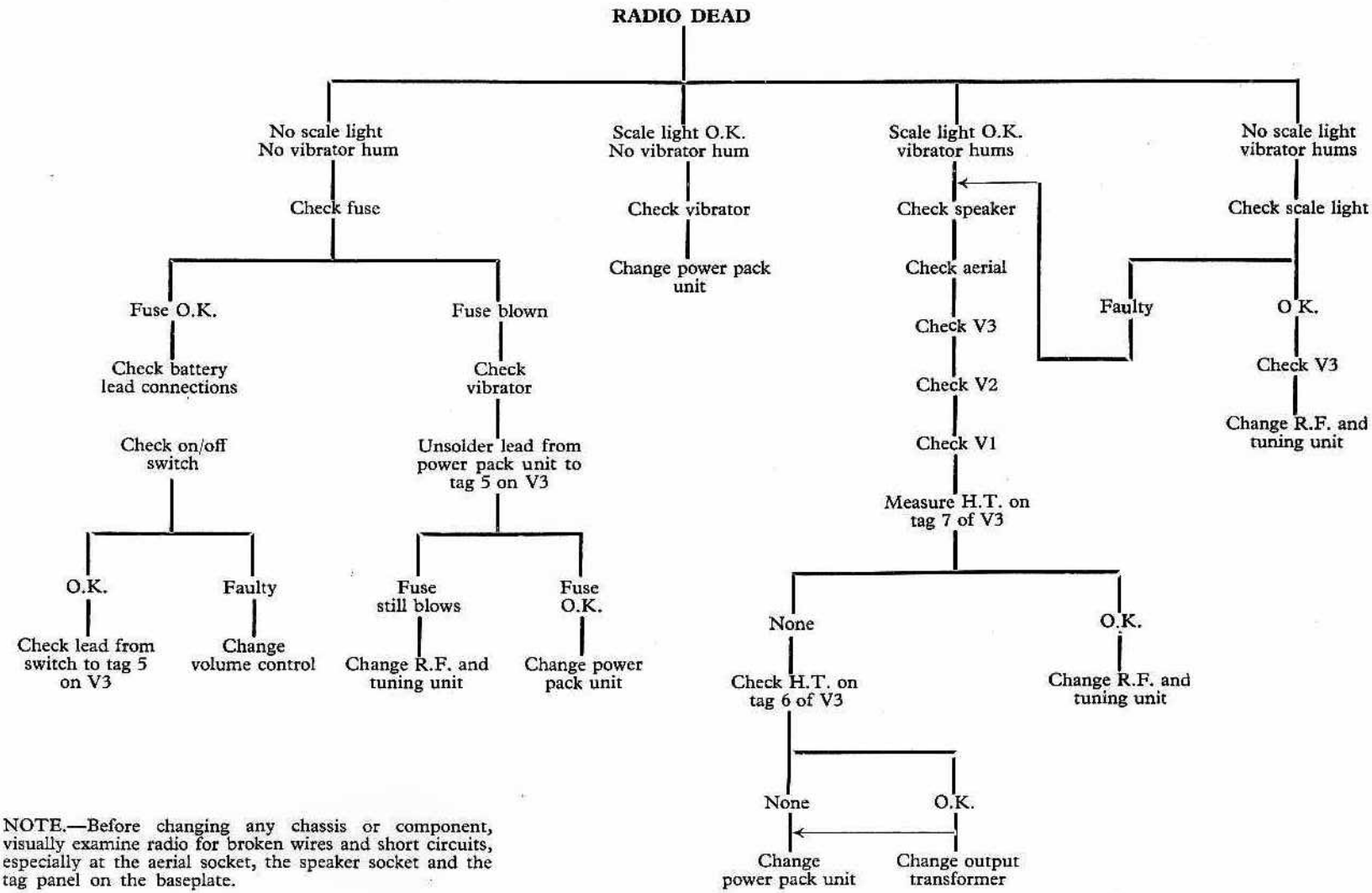


Fig. 605
Aerial Continuity Test



NOTE.—Before changing any chassis or component, visually examine radio for broken wires and short circuits, especially at the aerial socket, the speaker socket and the tag panel on the baseplate.

DIAGNOSIS CHART "A"

(*Radio, Part No. 204E-18835-E*)

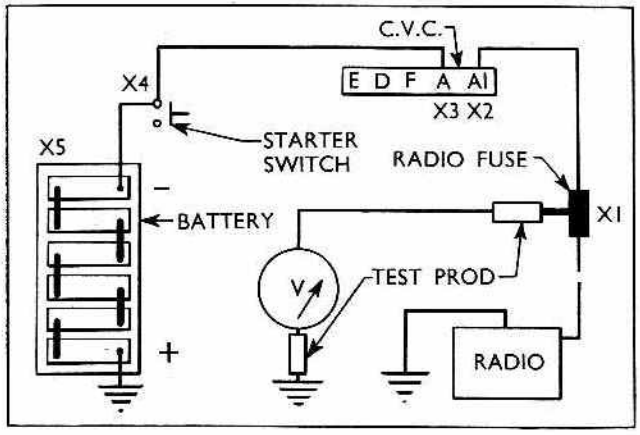


Fig. 606
Radio Feed Lead Tests

2 Disconnect the feed lead at the connector and remove the fuse and insulating sleeve.

3 Slip the connector casing down the lead when a test prod may be used to touch the contact formed on the supply lead end.

4 Earth the other prod when the voltmeter should record full battery voltage, a drop through the leads being negligible.

5 Compare the reading obtained with the battery voltage. No reading on the voltmeter indicates a break in the supply circuit, while a drop in voltage indicates a poor connection resulting in a high resistance. Check back stage by stage, at the points marked with an X in Fig. 606.

Receiver and Loudspeaker Tests

If after completing the aerial and supply lead tests it appears that an internal receiver or loudspeaker fault exists, then the unit concerned must be dismantled from the car and the appropriate diagnosis tests continued and concluded.

Unit removal and replacement instructions are given in the section " Repair Procedure." When required, a vibrator, valve or valves, should be renewed and, if necessary, use made of the exchange chassis units scheme. Fig. 608 illustrates the four exchange units available (base, power pack, R.F. tuning and front plate) in addition to other components which are normal service items.

THE AERIAL

A " double extension " telescopic aerial is fitted on the left-hand windscreen skirting panel (see Fig. 601) on right-hand drive models, and the right-hand panel on left-hand drive models.

The aerial mast is chrome plated and is vertical.

To Remove

1 Disconnect the aerial lead from the receiver, see Fig. 607.

2 Carefully, using a protected spanner, engage the hexagon at the base of the aerial mast and slacken this off, taking care not to damage the chrome.

3 Unscrew the aerial mast and remove the insulating locator and the flat rubber washer.

4 From within the car withdraw the threaded portion of the aerial base. If required the lead-in may be disconnected from the mast by removing the hexagon plug at the base of the aerial mast.

To Replace

1 Check that the hexagon plug retaining the lead-in is securely tightened in the base of the aerial mast.

From within the car pass the threaded portion of the aerial base through the mounting hole and then fit the flat rubber washer and insulating locator (convex surface uppermost) over the threaded portion of the aerial base. Ensure that the small pips in the insulator enter the corresponding dimples in the flat rubber washer.

2 Place the spherical chrome cup over the insulating locator and screw on the aerial mast, see Fig. 601.

3 Locate the assembly in a vertical position and carefully using a protected spanner, engage the hexagon at the base of the aerial mast and fully tighten the assembly in this position, taking care not to damage the chrome.

4 Route the aerial lead from the aerial base beneath the glove box and inside the channel formed in the lower edge of the facia panel to the receiver aperture at the centre. Insert the aerial plug in the socket in the base of the receiver, see Fig. 607.

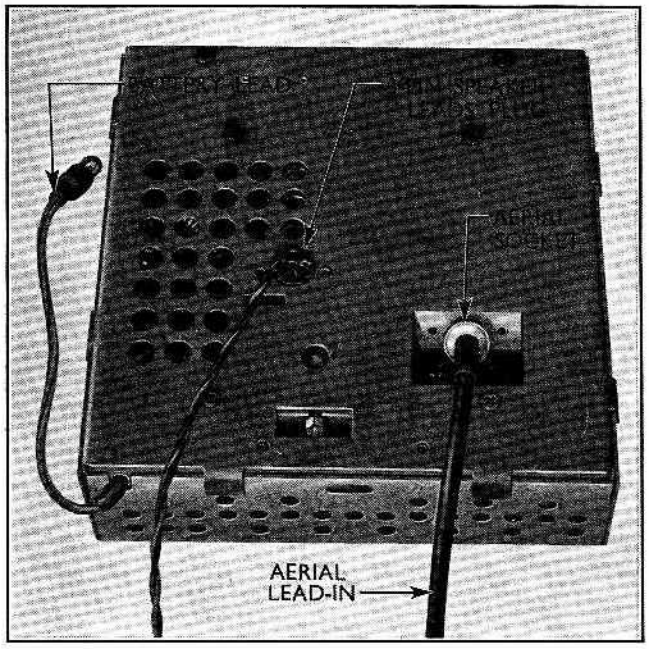
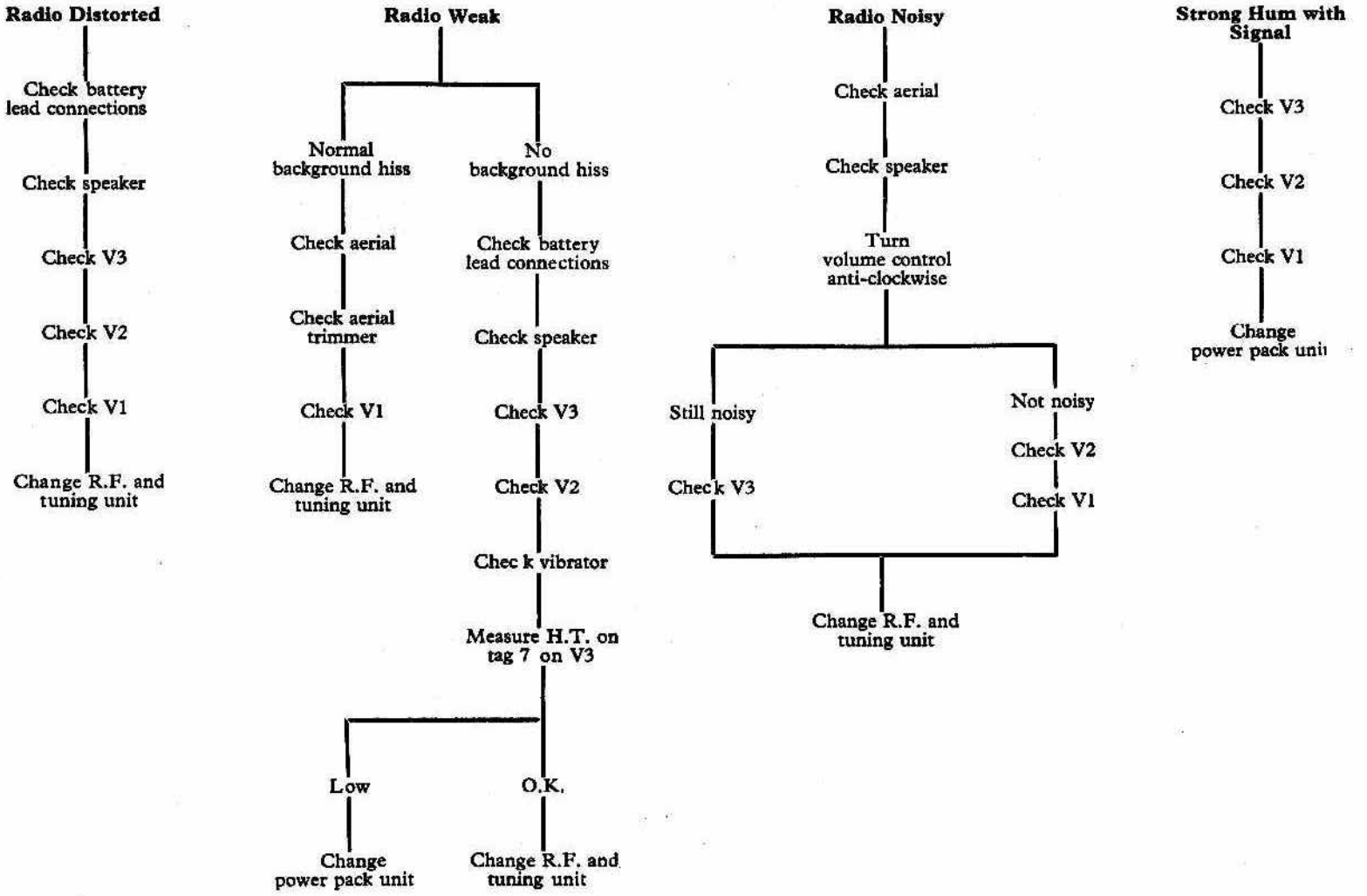


Fig. 607
External Connections to the Receiver Base



DIAGNOSIS CHARTS "B" to "E"

(Radio, Part No. 204E-18835-E)

THE RECEIVER

To Remove

1 Disconnect the battery.

2 Remove the two nuts, lockwashers, flat washers and bolts securing the receiver mounting bracket to the brace between the engine bulkhead and the lower facia, see Fig. 602.

3 Suitably support the receiver and remove the nut, spring washer and bolt at either end of the brace and remove the brace.

4 Unscrew the two screws securing the receiver mounting bracket to the receiver base.

5 Locate the radio feed lead, and disconnect the bayonet-type fuse holder, and remove the fuse and its insulating sleeve (if used).

6 Remove the loudspeaker leads plug and the aerial lead-in plug, by gently pulling from their respective sockets in the receiver base, see Fig. 607.

7 Unscrew the bolt, and remove the spring washer and the flat washer securing the earth strap to the right-hand side of the receiver.

8 Withdraw the receiver and the escutcheon as an assembly from its aperture in the facia panel.

To Replace

1 Ensure that the two rubber mounting strips, one along the top rear, and one along the bottom rear edges of the escutcheon conform to the flange shape, and lift the receiver back into position and provide a suitable support, see Fig. 602.

2 Connect the free end of the earth strap to the tapped hole provided in the right-hand side of the receiver casing, using a bolt, spring washer and a flat washer. Care should be taken to ensure that the side of the receiver and the earth strap are both clean, and that a tight connection is made on the receiver side.

3 Insert the aerial lead-in plug in the socket provided in the recess at the base of the receiver, and also connect the loudspeaker leads, fitting the three-pin plug in the socket in the receiver base. This plug will only fit in one position, do not attempt to force engagement.

4 Fit the 5 amp fuse in its insulating sleeve and insert this assembly in the bayonet-type fuse holder. Connect the two parts of the fuse holder.

5 Ensure that the two grommets are fitted to the receiver mounting bracket, so that the larger shoulder of each grommet is above the bracket as shown in Fig. 602. Position the bracket on the underside of the radio and secure to the receiver base with two screws and washers, using the threaded holes provided.

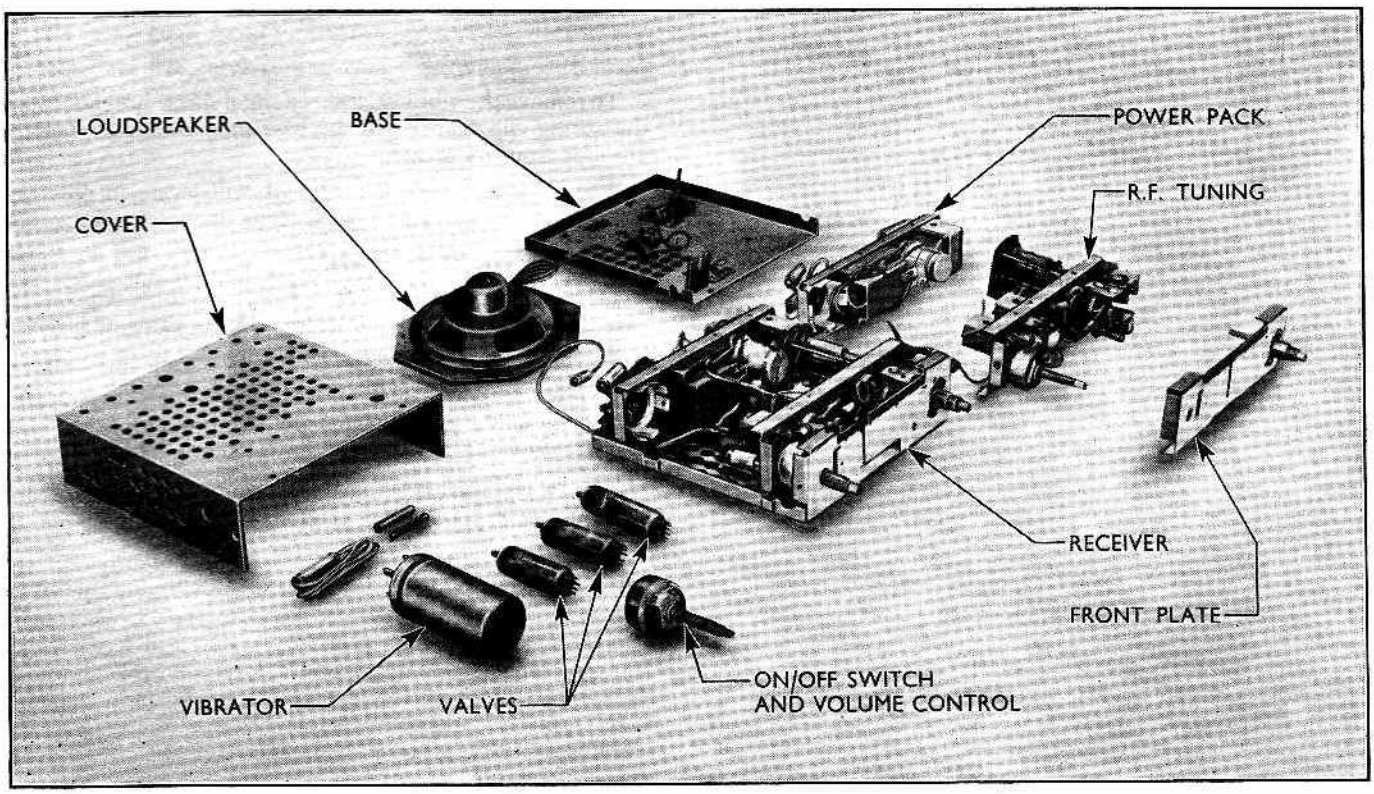


Fig. 608
Receiver Components and Assemblies Layout

6 Locate the brace between the engine bulkhead and lower facia so that the flanges of the " U " section are downwards. Loosely secure each end of the brace with a bolt, spring washer and nut, assembling the bolts with the heads downwards.

7 Bolt the receiver mounting bracket to the brace, using two bolts, flat washers, lockwashers and nuts, again with bolt heads downwards.

8 Check that the receiver embellisher is seating correctly within the facia, aligning the receiver and embellisher as necessary, then evenly tighten the four bolts and nuts fitted in operations 6 and 7.

9 Reconnect the lead to the battery, and test the radio for satisfactory operation under operating conditions with the car engine running.

BENCH CHECKING THE RECEIVER

Before commencing to dismantle the radio receiver carry out the aerial and supply leads checks described previously. Make sure that all external connections to the set are correctly made.

Always use the " Trouble Diagnosis Charts " methodically when carrying out the checks detailed hereunder :

1 Remove the set from the car as described under the appropriate heading.

2 Unscrew the nine screws retaining the cover of the set to the chassis, and remove the cover, Fig. 608.

3 Plug in a suitable test aerial to the appropriate socket.

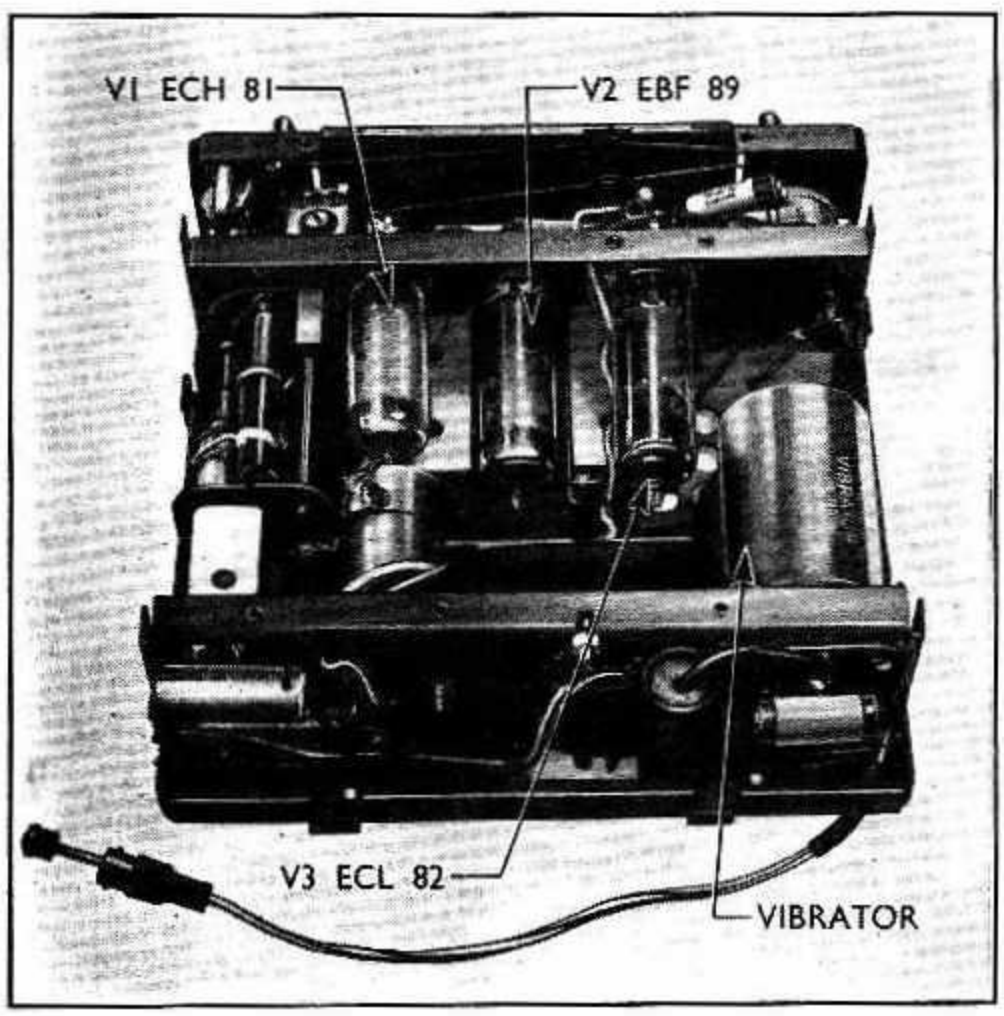


Fig. 609
Receiver Valve Positions

4 Connect a suitable lead between the receiver chassis and the positive post of the test battery (12 volt) and, using a suitable lead incorporating a 5 amp fuse, connect the main supply lead to the negative post.

Ensure that none of the valves are " soft." A " soft " valve can usually be detected by a white deposit on the inside of the glass envelope.

Switch on the radio, check the heater element of each valve and listen for the vibrator hum. If the heater of any valve does not appear to glow, switch off and replace it by one of the correct type. If the vibrator does not function replace with a new unit.

Note — The car radio was initially built with two self-tapping screws securing the rear of the top cover to the sides of the power pack chassis.

Should interference be encountered on one of these early receivers which is not caused by other electrical equipment on the vehicle, or resulting from some external source, remove the receiver and remove the two screws in question and re-locate them in the sides at the front end of the top cover, utilising existing holes in the top cover and front plate assembly.

Replace the receiver as described previously.

The initial top cover fixing was effective on receivers from approximate Serial No. 1004 to 3280 and all sets subsequent to this serial number have these fixing screws fitted to the front plate.

The Vibrator

Vibrator mounting sockets of two different types will be encountered in service.

Solid Mounting Type

To remove the vibrator, insert a small screwdriver between the spring clip holder and the base then carefully prise the vibrator from its socket.

When refitting note the vibrator will locate in only one position; all pins should engage correctly without force.

Rubber Mounting Type

To remove the vibrator, first detach the three tag connections from the base pins then remove as explained above.

To refit, insert the vibrator into its socket and refit the three tag connections with the large tag to pin 1.

The vibrator may be rotated slightly in either direction in order to find the position for lowest mechanical vibration.

Note — A vibrator which has not been in use for some time may not start due to a "bloom" formed on the points.

To rectify, switch on the receiver and lightly tap the vibrator casing. If this method fails, the vibrator should be removed and several attempts made to start it electrically on a suitable rig by connecting pins 1 and 2 in series with a 100 watt lamp on a 200/250 volt A.C. supply. Switch on for several periods of not more than twenty seconds, allowing at least ten seconds between tests, before condemning the vibrator as faulty.

The Valves

The valve pins are so arranged that the valves will fit into their holders in one position only.

From approximate chassis No. 32,750 the valve V3 (ECL.82) is mounted in an improved type holder. This incorporates a wire retaining clip which passes over the glass envelope thus preventing any possibility of the valve becoming loose in service.

When removing the valves, if the receiver cover and front plate assembly are removed, it will be found that access can be gained to them through holes in the bottom of the valve bases. A small screwdriver, passed through this hole, can be used to push the valve out of its location. When replacing a valve, ensure that each pin enters its respective socket in the holder before pressing the valve " home."

Do not force a valve into its mountings.

If the valves appear to be in order and yet there is still " no reception " replace each in turn with a new valve in the following order, testing the set after each change :

V3 ECL 82 Audio Amplifier and Output
V2 EBF 89 I.F. Amplifier, Audio and A.V.C. Detector
V1 ECH 81 Frequency Changer

If the receiver now functions but "crackle" is experienced with the aerial lead disconnected, gently tap each valve in turn to check for loose electrodes.

Renew any valves found to be defective.

Exchange Units

If the **reciever** still does not operate correctly after these checks have been carried out, a further examination should be made as detailed in the " Diagnosis Charts " which have been compiled to isolate any fault to one or more of the four assemblies :

(1) The front plate
(2) The R.F. and tuning unit
(3) The power pack
(4) The base plate

The instructions which follow detail the operations necessary when renewing one or more of these units. In addition, instructions are given for the removal and replacement of the Tuning Scale, Pilot Lamp Bulb, Combined ON/OFF and Volume Control Switch and the Feed Lead.

THE FRONT PLATE ASSEMBLY

Tuning Scale

To Remove

1 Pull the combined ON/OFF and volume control knob, and the tuning knob from their spindles.
2 Unscrew the two hexagonal nuts retaining the escutcheon and remove the cupped retainer washers.
3 Lift off the escutcheon with the embellisher.
4 Unscrew the two screws retaining the tuning scale and remove the scale.
5 Check to see that the small distance bush on the volume control spindle is not misplaced.

To Replace

1 Locate the tuning scale in its correct position.
2 Refit the two cross-head self-tapping screws and carefully tighten.
3 With the small bush in position, place the escutcheon and embellisher over the spindles.
4 Fit the cupped washers and nuts which retain the escutcheon and tighten securely, see Fig. 603.
5 Line up the volume control knob and tuning knob with the " D " shaped spindles and press each firmly into position.

Front Plate

To Remove

1 Dismantle the receiver cover, see previously, the tuning and ON/OFF knobs, the escutcheon, etc., as detailed in the " Tuning Scale, To Remove."
2 Loosen the two grub screws securing the tuning spindle to the permeability unit.
3 Remove the two cross-head screws from the base of the receiver chassis which secure the front plate assembly, and remove the assembly.
4 Remove the tuning scale.

To Replace

1 Refit the tuning scale to the front plate.
2 Fit the distance piece to the volume control spindle with the flange away from the volume control, then locate the front plate assembly on the receiver base plate and fit the two cross-head retaining screws. Tighten the screws securely.
3 Tighten the two grub screws which secure the tuning spindle to the permeability unit. Rotate the tuning control through the full range and check that the cursor tracks over the full range of the scale. Again release the two grub screws and adjust the tuning if this is necessary. Lock the grub screws with varnish or shellac.
4 Refit the top cover, insert and tighten the nine retaining screws.
5 Assemble the escutcheon, embellisher, retainer washers and nuts, tuning and ON/OFF knobs, as detailed under " Tuning Scale, To Replace."

Pilot Lamp Bulb

Should the receiver have the top cover removed for one of the previous operations, the pilot lamp holder can be easily removed from its retaining clip on the receiver base. Unscrew the bulb from its holder and renew the bulb.

However, if the pilot lamp bulb only has failed, and the receiver otherwise operates quite satisfactorily, it is possible to change the bulb with the receiver installed in the vehicle.

It is important that the correct pilot bulb, part No. 204E–18828 is used. If a bulb of the incorrect current rating is substituted, overloading of valve V3 with subsequent failure may result.

To Remove

1 Pull the combined ON/OFF and volume control knob, and the tuning knob from their spindles.

(*b*) Resistor connection at the volume control.

(*c*) Two black eads and one green lead from the ON/OFF switch.

3 Unscrew the nut retaining the switch to the receiver base plate, and remove the washer and switch.

To Replace

1 Locate the switch unit on its mounting bracket on the receiver base plate, refit the flat washer, and tighten the retaining nut securely.

2 Solder the following leads to their respective connections on the switch assembly :—

(*a*) Two black and one green lead to the ON/OFF switch.

(*b*) Resistor connection to the volume control.

(*c*) The three black leads to the volume control.

3 The embellisher and escutcheon, etc., the control knobs and the top cover should be reassembled as detailed under " The Front Panel Assembly."

POWER PACK ASSEMBLY

To Remove

1 Remove the top cover, the three valves and the vibrator as detailed previously.

2 Using a suitable soldering iron, unsolder the following leads from their respective connections :—

(*a*) Black, red and yellow leads to the valve ECL 82 (V3) holder at the valve holder.

(*b*) Black and white leads to the speaker tag at the tag.

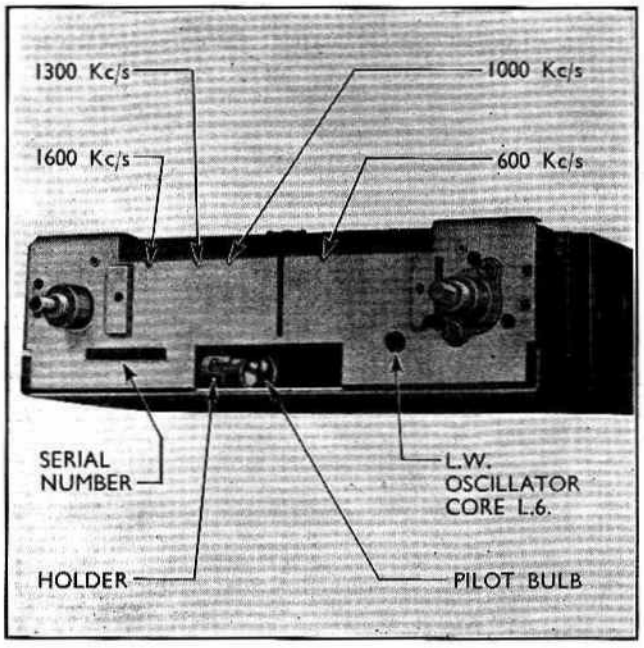


Fig. 612
Calibration Marks and Pilot Lamp

(*c*) Braided earth leads at the clip bond of the smoothing electrolytic condensers (C13 and C18).

3 Remove the two cross-head screws securing the power pack assembly to the receiver base plate and withdraw the unit.

To Replace

1 Locate the power pack assembly on the base plate.

2 Fit the two cross-head screws retaining the power pack to the receiver base plate and tighten securely.

3 Solder the following leads to their respective connections :—

(*a*) The two braided earth leads to the clip bond of the smoothing electrolytic condensers (C13 and C18).

(*b*) Black and white leads to the speaker tag at the tag.

(*c*) Black, red and yellow leads to the valve ECL 82 (V3) holder at the valve holder.

4 Refit the vibrator, the three valves and the top cover as detailed in the appropriate section of this chapter.

Radio Feed Lead

To Remove

1 Withdraw valve ECL 82 (V3) and the vibrator from their holders.

2 Unsolder the radio feed lead from its connection at the power input tag on the base plate.

3 Remove the feed lead from the base plate and withdraw the rubber sleeve from the lead.

To Replace

1 Refit the rubber sleeve to the new radio feed lead, and refit the lead to the base plate, ensuring that the rubber sleeve is so positioned that it prevents the lead from chafing on the edges of the hole provided in the base plate.

2 Solder the feed lead to its connection at the power input tag on the base plate.

3 Refit valve ECL 82 (V3) and the vibrator in their respective holders.

BASE PLATE

Should it prove necessary to fit an exchange base plate the existing assembly should be dismantled from the receiver by removing the Front Plate, the R.F. and Tuning Unit and the Power Pack as previously detailed. The exchange base plate can then be built into the receiver and the assemblies, previously removed, can be refitted in the following order :—

1 Power pack.

2 R.F. and tuning unit.

3 Front plate.

CIRCUIT DESCRIPTION

The aerial and oscillator circuits are inductively tuned. The aerial is bottom capacity coupled, by means of the aerial

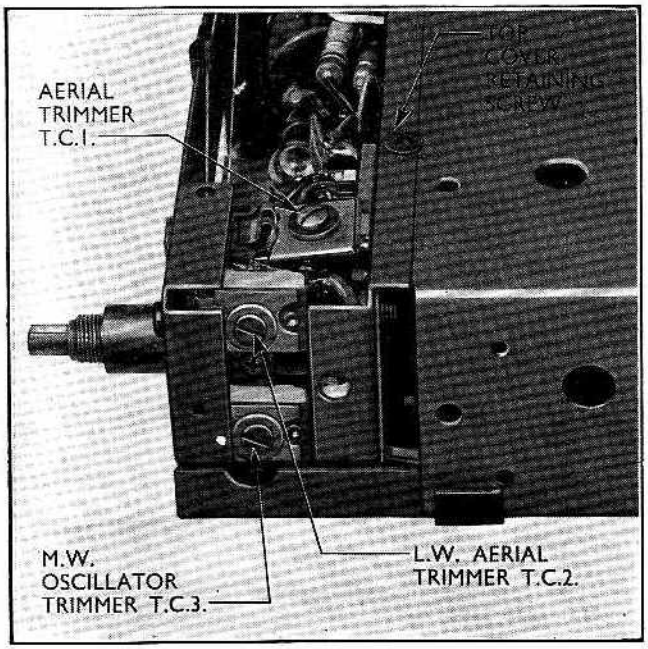


Fig. 613
Adjusting Trimmers TC3 and TC1

lead capacity, to the signal grid of the frequency changer V1 and the oscillator employs a series fed, tuned grid, circuit.

The I.F. signal appearing at the heptode anode of V1 is transformer coupled to the grid of V2, amplified by the pentode section and coupled by a further transformer to the detector diode.

The audio signal is passed via the volume control, to the grid of the triode section of V3, amplified and R.C. coupled to the pentode section which operates as a conventional power output valve, having as its anode load the primary of the output transformer whose secondary feeds the loudspeaker.

A.V.C. is obtained from the top of the volume control and applied to the grids of V1 and V2.

Negative feed-back is applied between the triode and pentode anodes of V3 via 47 pF and between the secondary winding of the output transformer and the bottom of the volume control via 680 ohms.

H.T. is supplied by a non-synchronous vibrator followed by a transformer and a metal rectifier giving full-wave rectification. Smoothing is achieved by means of a resistor of 2.2K ohms and two electrolytic condensers of 16 μF each. The H.T. supplies to V1 and the screen of V2 are separately decoupled.

Permeability Tuner

The receiver is continuously tunable over the complete medium wave range. Long wave coverage is restricted to one pre-set station within the range 1870–1225 metres. The tuner comprises two ganged coils directly coupled to the tuning control knob. The wave change switch is incorporated in the tuner and is automatically operated by setting the pointer to the " L.W." mark on the scale.

CIRCUIT ALIGNMENT

The sequence for circuit alignment, as given below, must be adhered to.

Instruments Required

An AM signal generator covering the given test frequencies and an AF output meter. Also a suitable screwdriver for use as a trimming tool and a doubled-ended insulated screwdriver suitably formed at one end to engage the M.W. cores.

Intermediate Frequency

470 Kc/s.

I.F. Alignment

The I.F. transformers, which are of a side trimming high stability type, are adjusted initially by means of a special visual adjustment gear. **DO NOT adjust the iron cores unless it is definitely known that the transformers are off tune.** Normal readjustment by peaking all circuits to 470 Kc/s gives good results. The radio should be tuned to the high frequency end of the medium wave band and the volume control turned fully clockwise.

For this adjustment, use a trimming screwdriver and keep the input signal from the generator to the lowest level, which will produce a satisfactory reading on the meter. Allow the radio and signal generator to warm up for a period of ten minutes and proceed as follows :—

1 Remove the top cover from the receiver.
2 Connect the A.F. output meter across the speaker.
3 Connect the signal generator live lead through a 0.1 μF condenser to pin 2 of V1.

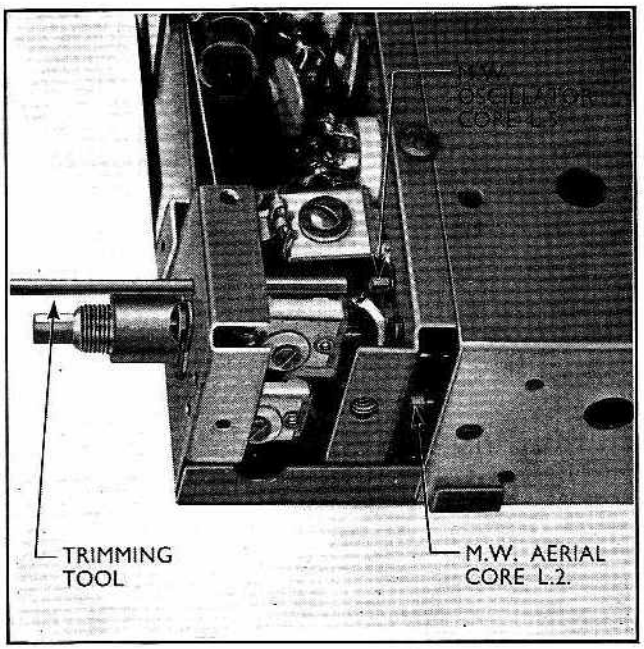


Fig. 614
Adjusting the M.W. Cores L5 and L2

4 Tune the primary and secondary cores of I.F.T.2 for maximum output, then in a similar manner, tune I.F.T.1. Fig. 611 identifies each adjustment.

R.F. Alignment

The following operations must be carried out with the radio unit screened, i.e. with the cover back on :—

1 To facilitate adjustment, with the cover securing screws removed, slide the top cover back to expose the trim screws.

2 Temporarily secure the top cover under the heads of the cover screws in the R.F. and Tuning unit, see Fig. 613.

3 Remove the tuning and volume control knobs by pulling them from their respective spindles. Remove the escutcheon securing nuts, retaining washers, embellisher, etc., and lift away the escutcheon to obtain access to the medium and long wave cores through the holes in the front panel.

Allow the radio and signal generator to warm up for a period of ten minutes before commencing alignment. It is of the utmost importance that the receiver volume control is in the **maximum** position, and that the signal generator input is maintained at the **minimum** level that will produce a satisfactory meter reading.

For all subsequent operations the signal generator must be connected to the aerial socket via a 15 pF condenser with a 60 pF condenser connected between the aerial socket and earth. Calibration marks are provided on the front plate and are identified on Fig. 612.

When making medium wave core adjustments use a piece of fibre rod with a slot cut in one end which will locate on the end of the core screws. The long wave core should be adjusted with an insulated trimming screwdriver. Care must be taken when adjusting the oscillator core to prevent damage to the pointer cord.

1 Tune the receiver to the 1600 Kc/s calibration mark on the medium waveband end of the scale. Inject 1600 Kc/s to the aerial socket and adjust trimmers TC3 and TC1 respectively for maximum output, see Fig. 613.

2 Tune the receiver to the 1300 Kc/s calibration mark on the medium waveband. Inject 1300 Kc/s to the aerial socket and adjust the cores of L5 and L2 for maximum output, see Fig. 614.

3 Repeat operations 1 and 2 until calibration and tracking are correct.

4 Tune the radio to the long waveband (right-hand end of the scale). Inject a signal of the frequency of the required station to the aerial socket and adjust the cores of L6 (Fig. 612) and the trimmer TC2 (Fig. 613) for maximum output.

The wavelengths and frequencies of stations in the long waveband are as follows :—

Station	*Wavelength*	*Frequency*
Light Programme ..	1500 metres	200 Kc/s
Luxembourg	1288 metres	233 Kc/s
Allouis (France) ..	1829 metres	164 Kc/s

THE LOUDSPEAKER

To Remove

1 Disconnect the car battery.

2 Remove the screws retaining the heater and demister control knobs to the levers (or screw retaining the ventilator control knob, on cars not fitted with heater equipment) and slide the knob or knobs backwards off the levers.

3 Unscrew the four self-tapping screws retaining the louvred grille in the centre of the facia panel and remove the grille.

4 Disconnect the loudspeaker lead from the base of the receiver, see Fig. 607.

5 Unscrew the four self-tapping screws securing the loudspeaker baffle to the facia.

6 Remove the loudspeaker and baffle from behind the flange of the aperture in the facia panel.

To Replace

1 Locate the speaker and baffle assembly in position in the facia panel aperture behind the flanged edges, with the terminal panel downwards. Route the leads towards the receiver location, well clear of movable parts, i.e. heater controls, ashtray, etc., and then secure the baffle to the facia with four self-tapping screws.

2 Reconnect the loudspeaker leads, fitting the three pin plug in the socket in the receiver base.

3 Reposition the louvred grille in the facia and secure with the four self-tapping screws previously removed.

4 Reassemble the lever knob(s) and the lever(s), sliding each knob into position under the locating lug on its lever before fitting the screw. Check operation of the heater or ventilator controls.

5 Reconnect the car battery.

SPECIFICATION AND REPAIR DATA

(Radio, Part No. 204E–18835–E)

Type	3 valve superheterodyne
Frequency Coverage :	
Medium wave	542–1600 Kc/s, 554–187 metres
Long wave	Pre-set station within the range 160–245 Kc/s, 1870–1225 metres
Tuning	Manual
Intermediate Frequency	470 Kc/s
Power Supply	12 volt, positive earth
Current Consumption	2.4 amps at 13.5 volts input
Fuse	5 amp cartridge type
Pilot Lamp	6.3 v. .115 amp M.B.C.
Sensitivity	Under 30 microvolts for 0.5 w. output on M.W. Under 200 microvolts for 0.5 w. output on L.W.
A.V.C.	For 40 dB input change, the output changes by 10 dB
Power Output	1.7 watts, undistorted at 1 Kc.—13 volts input
Valves—Mullard with B9A Bases	V1 ECH 81 Frequency Changer V2 EBF 89 I.F. Amplifier, Audio and A.V.C. Detector V3 ECL 82 Audio Amplifier and Output Rectifier
Rectifier	MR1 Westinghouse Contact—cooled Rectifier 16RD–2–2–6–1
Vibrator	12 v. non-synchronous—type 1214
Speaker	6 in. dia.
Impedance	3 ohms.

Resistance of Components (Ohms)

Medium wave aerial coil	L2	17
Medium wave oscillator coil	L5	6.5 + 3.25
Long wave oscillator coil	L6	2.75
1st and 2nd I.F. transformers :		
Primary	L3 and L4	11
Secondary	L7 and L8	11
Output transformer primary	T3	280
Output transformer secondary	T3	0.25
Vibrator transformer :		
Primary	T4	2.25
Secondary	T4	325
Speaker speech coil	—	3

Valve Base Data

Valve	Pins									Base
	1	2	3	4	5	6	7	8	9	
V1 ECH 81	G2 G4	G2	K.S G5	H	H	Ah	G3	At	Gt	B9A
V2 EBF 89	G2	G2	K.S	H	H	A	Ad1	Ad2	G3	B9A
V3 ECL 82	Gt	G3 Kp.S	G1	H	H	Ap	G2	Kt	At	B9A

Valve Voltage and Current Data

(Measured in Receiver at 12 volts Input)

Valve	Anode		Screen		Cathode	
	Volts	mA	Volts	mA	Volts	mA
V1 Heptode	63	1.0	63	4.1	0	7.0
Triode	61	1.9	—	—	—	
V2	138	1.05	26	.25	0	1.3
V3 Pentode	162	25	138	4.5	8	29.7
Triode	50	0.2	—	—	—	—

Resistors

Resistor	Value	Tol.	Type
R1	220K	20%	7AD
R2	47K	20%	7AD
R3	10K	10%	8
R4	470K	20%	7AD
R5	1M	20%	7AD
R6	82	10%	8
R7	47	10%	7AD
R8	47K	20%	7AD
R9	10M	20%	7AD
R10	330K	20%	7AD
R11	270	10%	7AD
R12	47K	20%	7AD
R13	2.2K	10%	8
R14	330K	20%	7AD
R15	680	10%	7AD
R16	220	20%	8
R17	220	20%	8

Capacitors

Capacitor	Capacity	Tol.	Type	Volts
C1	500 pF	2%	—	125
C2	.04 μF	—	W99	150
C3	.005 μF	—	CASCAP	500
C4 C5	Part of 1st I.F. Transformer			
C6	500 pF	2%	—	125
C7	73 pF	20%	N330 BD	—
C8	330 pF	5%	N750 CD	—
C9	.005 μF	—	CASCAP	500
C10 C11	Part of 2nd I.F. Transformer			
C12	220 pF	20%	K1200/AD	—
C13	16 μF	—	B.E.C.	275
C14	.005 μF	—	CASCAP	500
C15	25 μF	—	B.E.C.	25
C16	47 pF	20%	N750 AD	—
C17	.005 μF	—	CASCAP	500
C18	16 μF	—	B.E.C.	275
C19	500 pF	Suppressor Cond. Hunts.		
C20	.05 μF	20%	460B DUB	300 A.C.
C21	25 μF	—	B.E.C.	25
C22	25 μF	—	B.E.C.	25
C23	.22 μF	20%	PLESSEAL	150
C24	500 pF	Suppressor Cond. Hunts.		
TC1	6–65 pF	—	Trimmer	—
TC2	3–50 pF	—	Trimmer	—
TC3	3–50 pF	—	Trimmer	—

Operating Voltages

Supply Voltage	12
Supply current	2.0 amps.
Vibrator voltage	11.8
Heater voltage	6.0
H.T. voltage reservoir	170
H.T. voltage smoothing	138
H.T. current (smoothed) ..	13 mA

Tolerance 15%

Voltages under 10 *taken on* 10 *volts range—voltages over* 10 *but under* 50 *taken on* 100 *volts range of test meter. All H.T. voltages taken on* 400 *volts range of test meter. All readings taken with volume control fully clockwise, aerial disconnected and receiver off tune.*

Metal Rectifier, 16RD–2–2–6–1

Supply Voltage	12
Input voltage	190 A.C.
Output voltage	170 D.C.
Output current	38 mA