"TRADER" SERVICE SHEET

1464

EKCO CR903

2-band 12 Volt Car Radio

A SPECIAL series of valves and a transistor output stage enable the Ekco CR903 2-band car radio to operate directly from a 12V car battery without the need for a vibratory power supply. It is fitted with a polarity reversing plug that permits it to be fitted to cars having a positive or negative earth battery connection. Battery consumption is approximately 1.4A. The waveband ranges are 185-570m (M.W.) and 1,000-2,000m (L.W.).

The speaker is mounted as a separate unit, several types being available to suit a range of installation requirements. A list of cars, together with the type numbers of receivers, speaker units, and fixings recommended by the manufacturer is shown in col. 6 overleaf.

Release date and original price: October 1959, £16 10s 9d. Purchase tax extra.

MEASUREMENTS

Valve and transistor voltages and currents given in the tables in col. 2 are those derived from the manufacturers' information. Valve voltages were measured with a 20,000Ω/V meter, the negative meter terminal being connected to the cathode in each case. Transistor **TR1** voltages were measured with the negative meter terminal connected to the junction of **C26** and **R19.**

Valves

Valve	Anode		Screen	
	V	mA	V	mA
V1 ECH83 {a	4·4	—	—	—
V1 ECH83 {b	11·25	0·175	11·25	0·155
V2 ECH83 {a	11·25	0·28	—	—
V2 ECH83 {b	11·25	0·11	11·25	0·263
V3 EBF83	11·25	0·275	11·25	0·085
V4 EF98	9·75	4·3	11·25	1·83

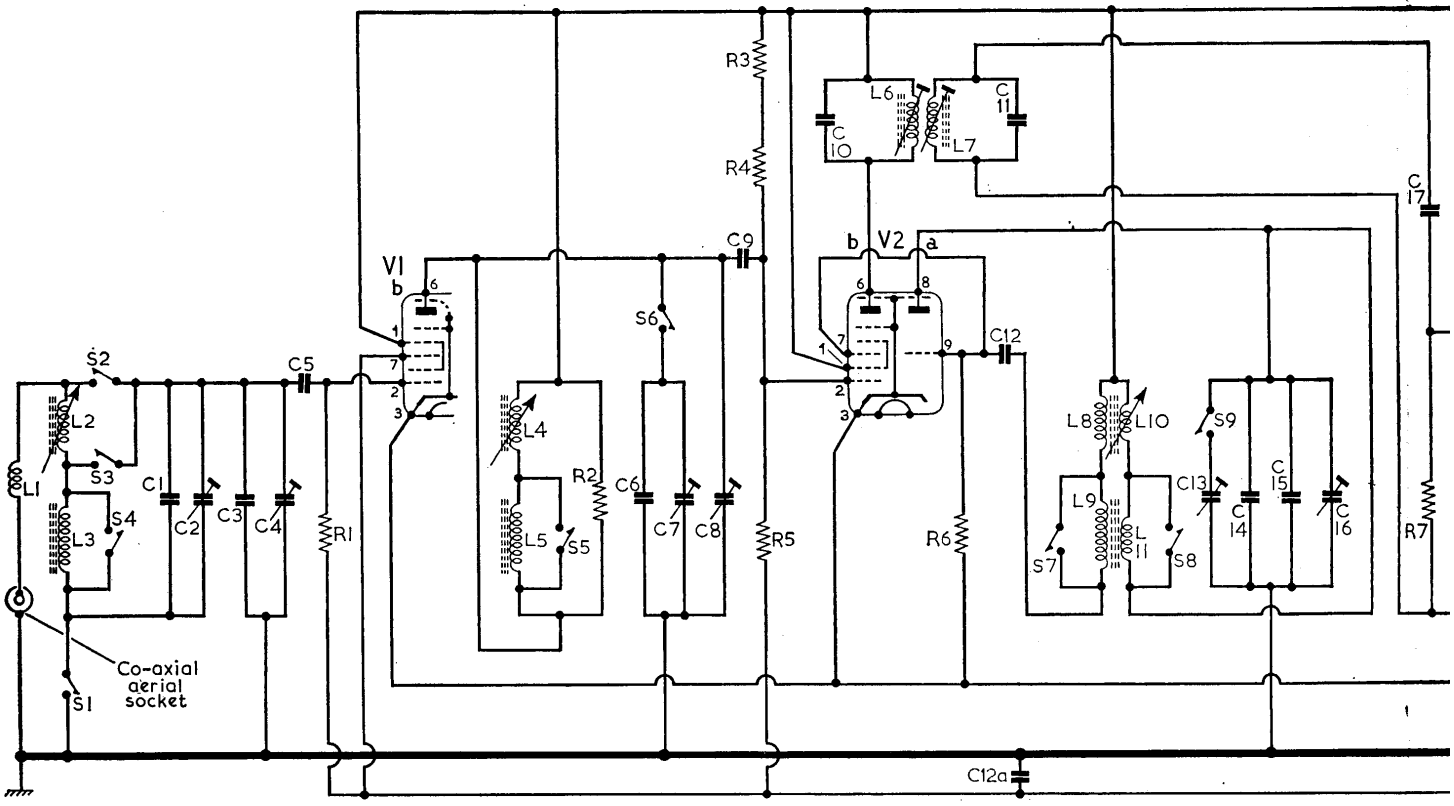
Transistor

Transistor	Collector		Base		Emitter	
	V	mA	V	mA	V	mA
TR1 OC19	1·15	450	9·85	6·53	10·2	393

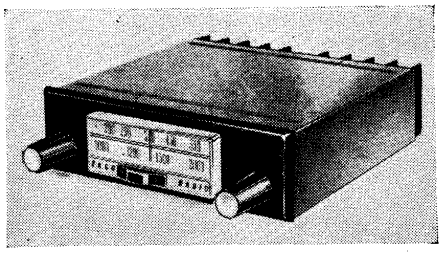
CIRCUIT DESCRIPTION

Aerial input is coupled via filter coil **L1** to permeability coils **L2** (M.W.) and **L3** (L.W.). On M.W. **L3** is short-circuited by **S4,** and **L2** is series-tuned by **C3, C4.** On L.W. **S1** and **S2** close, and **L2, L3** are connected in series and parallel-tuned by **C1-C4.** The R.F. amplifier anode circuit tuning is conventional, and its output is coupled to the pentode section of the frequency changer **V2.**

On M.W., the anode circuit of the triode oscillator valve, section **a,** is permeability tuned by **L10, C14, C15** and **C16,** with grid coupling by **L8.** For L.W. reception, an additional loading coil **L11** and trimmer capacitor **C13** are switched into the anode circuit, which is then coupled to the grid via **L8** and **L9** in series. The oscillator output is



Circuit diagram of the Ekco CR903. The main circuit is shown with the battery polarity plug **B** *connected to suit a car in which the of the battery is connected to chassis. The alternative plug connections for a negative chassis are shown in the dotted section of diagram b It is possible to damage the transistors if the plug is inserted the wrong way round, or if the set is switched on without the loud spea.*



Appearance of the Ekco CR903. The speaker is a separate unit.

directly connected to the injector grid of the heptode mixer, section **b.**

The pentode section of the double-diode-pentode valve **V3** is employed as an intermediate frequency amplifier with transformer couplings **L6, L7** and **L12, L13.**

Intermediate frequency 470kc/s.

One diode section (pin 8) of **V3** operates as a signal detector. The audio frequency signal in its rectified output is developed across the volume control **R13** and fed via **C23** to the grid current biased A.F. amplifier **V1a.** I.F. filtering by **R12, C22.**

The second diode section of **V3** is used as an A.G.C. rectifier. Its anode is fed with an I.F. signal from the anode of the pentode section via **C18,** and the resulting negative D.C. voltage developed across **R10** is fed to **V1a** and **V2b** as A.G.C. bias via decoupling components **R9, C12a.** In order to increase the signal handling capacity of these valves, the A.G.C. rectifier action is delayed by the positive bias voltage developed across the cathode resistor **R11.** Further delay is applied to the mixer valve **V2b** by connecting its control grid to the more positive potential at the junction of **R4** and **R5,** which form part of an H.T. potential divider.

The A.F. output from **V1a** is resistance-capacitance coupled by **R15, C24** to the tetrode-connected driver stage **V4.** This valve is biased by grid current flowing through **R16,** as was **V1a.** The out-

(*Continued overleaf col. 1.*)

COMPONENT VALUES AND LOCATIONS

Resistors

R1	1MΩ	C1
R2	100kΩ	B1
R3	10MΩ	B1
R4	10MΩ	B1
R5	1MΩ	C1
R6	47kΩ	C1
R7	3·3MΩ	C2
R8	820Ω	D2
R9	2·2MΩ	C1
R10	1MΩ	C2
R11	22Ω	C1
R12	100kΩ	D1
R13	1MΩ	A5
R14	10MΩ	B2
R15	150kΩ	B2
R16	10MΩ	B2
R17	100Ω	B3
R18	33Ω	C3
R19	150Ω	C3
R20	560Ω	C3
R21	1·6Ω	C3

Capacitors

C1	250pF	C5
C2	130pF	C5
C3	33pF	B4
C4	80pF	B3
C5	75pF	B1
C6	450pF	C4
C7	130pF	C4
C8	80pF	C4
C9	30pF	B1
C10	100pF	C4
C11	100pF	C4
C12	50pF	B4
C12a	0.03μF	C1
C13	130pF	C4
C14	47pF	C4
C15	75pF	C4
C16	80pF	C4
C17	0·001μF	C2
C18	75pF	C1
C19	100pF	D4
C20	100pF	D4
C21	75pF	D2
C22	75pF	D2
C23	0·005μF	A5
C24	0·005μF	B1
C25	500μF	C1
C26	500μF	C3
C27	1,000μF	C3
C28	0·001μF	B4
C29	0·001μF	B4
C30	0·001μF	D3

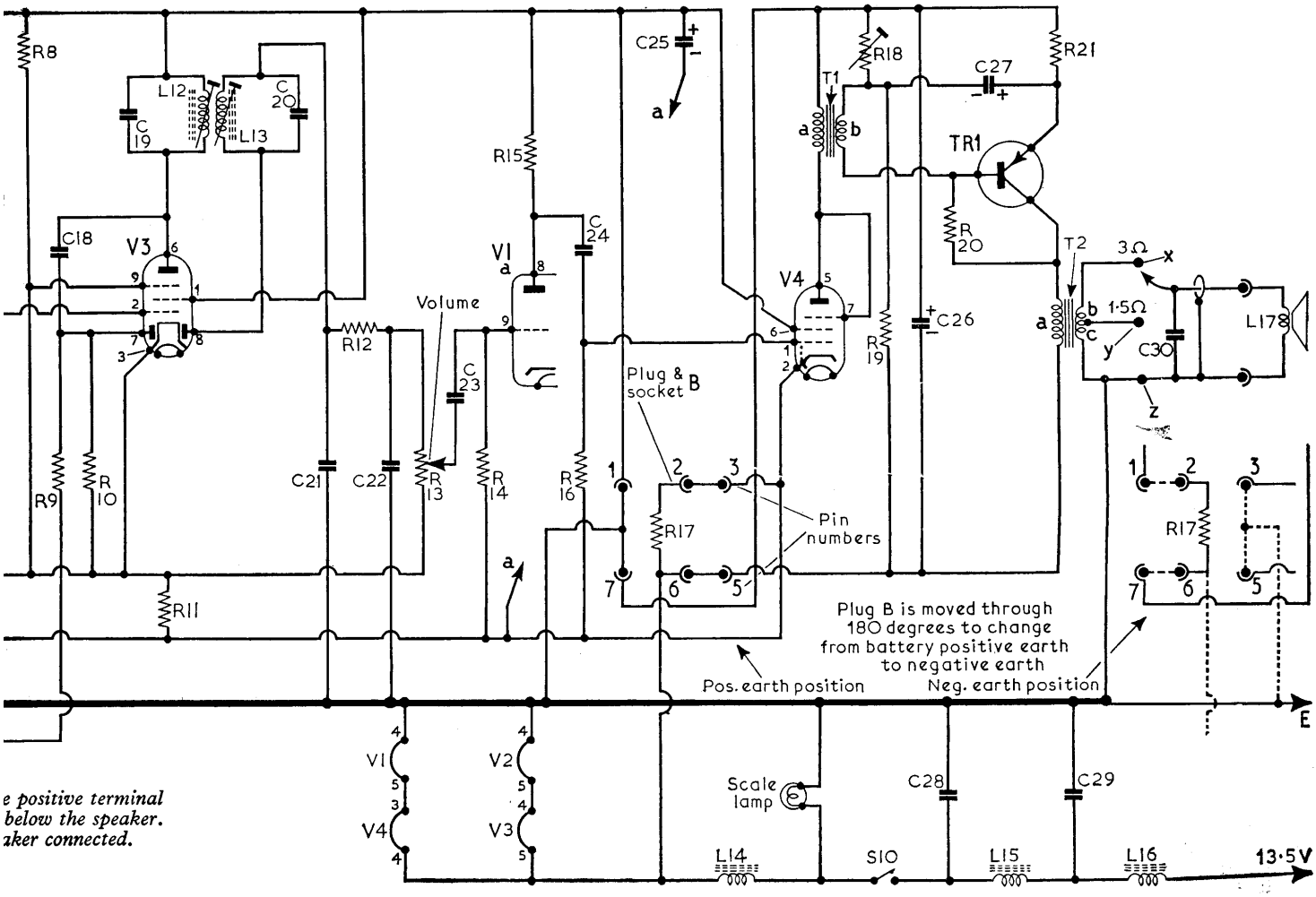
Coils*

L1	—	D4
L2	13·0	B1
L3	4·1	B4
L4	13·0	B2
L5	3·7	B3
L6	8·2	C4
L7	8·2	C4
L8	4·7	B1
L9	2·7	B5
L10	3·6	B1
L11	2·7	B5
L12	8·2	D4
L13	8·2	D4
L14	—	A4
L15	—	A4
L16	—	A3
L17	3·0	—

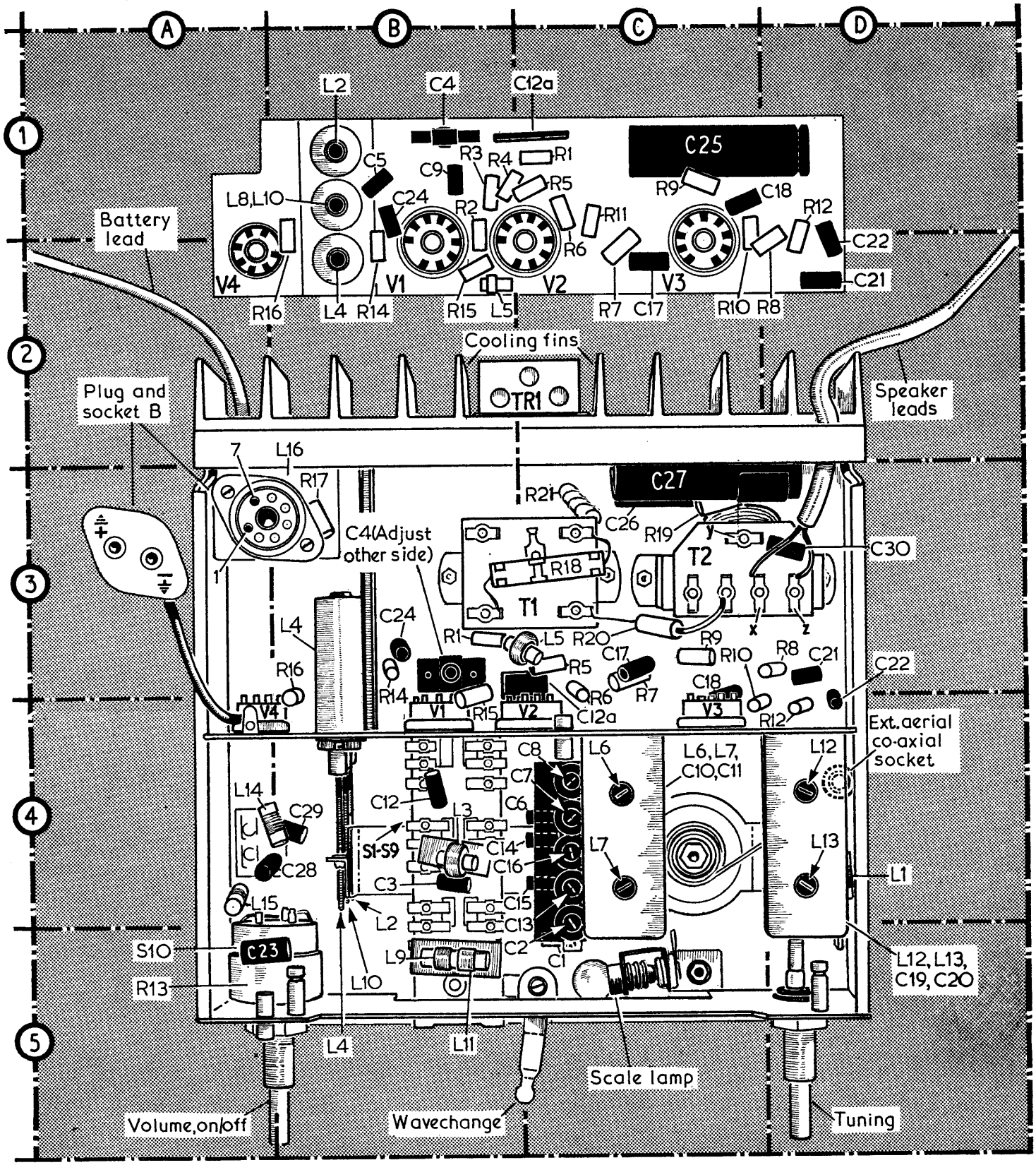
Miscellaneous*

T1	a	298·0	C3
	b	1·0	
T2	a	1·98	C3
	b	—	
	c	—	
S1–S9		—	B4
S10		—	A5

**Approximate D.C. resistance in ohms.*



e positive terminal below the speaker. aker connected.



Two views of the chassis. At the top is a view of the wired side of the chassis sub-assembly and below it is a plan view of the complete chassis. In early versions of this receiver the positions of the R.F. and oscillator coils, **L4** *and* **L8, L10,** *are transposed. The aerial trimmer* **C4** *(location reference B3) is adjusted through a hole in the base of the case.*

Circuit Description—*continued*

put from the driver stage is transformer coupled by **T1** to the base of power transistor **TR1,** and thence via output transformer **T2** to the low impedance speaker **L17.** Negative feedback is applied to the base of **TR1** through **R20.** Base bias is obtained from the potential divider **R18, R19.**

R18 is a pre-set variable bias resistor, which enables the collector current to be adjusted. In order to stabilize the junction temperature, the collector and case of the transistor are in thermal contact with the chassis, which is used as a heat sink. Electrical insulation between the transistor case and chassis is provided by a thin sheet of mica.

CIRCUIT ALIGNMENT

1.—Remove the chassis from the case as described under "General Notes" in col. 5. Connect an output meter (3Ω loading) across **T2** secondary winding in place of the speaker. Connect a signal generator to **V2b** control grid (pin 2) via a 0.1μF capacitor.

2.—Turn the volume and tuning controls

fully clockwise. Feed in a modulated 470kc/s signal and adjust the cores of **L12, L13** (location reference D4) and **L6, L7** (location reference C4) in that order for maximum output. Repeat these adjustments until no further improvement in output can be obtained.

3.—Connect the signal generator to the aerial socket via a dummy aerial comprising a 33pF capacitor connected across the aerial socket, and a 27pF capacitor in series with the generator output lead. Switch the receiver to M.W. and turn the tuning control fully anti-clockwise. Feed in a 1,620kc/s signal and adjust **C16** (C4), **C8** (C4) and **C4** (B3) for maximum output.

4.—Set the tuning control exactly 1¾ turns from its fully anti-clockwise position. Feed in a 1,200kc/s signal and adjust the cores of **L10, L4** and **L2** (location reference B5) for maximum output.

5.—Repeat operations 3 and 4.

6.—Feed in a 700kc/s signal and tune it in on the receiver. Re-adjust **L4** and **L2** for maximum output.

7.—Repeat operations 3, 4 and 6 until no further improvement in output can be obtained.

8.—Switch the receiver to L.W. and turn the tuning control fully anti-clockwise. Feed in a 300kc/s signal and adjust **C13** (C4) for maximum output.

9.—Feed in a 200kc/s signal and tune it in on the receiver. Adjust **C2** and **C7** (location reference C4) for maximum output.

Calibration.—The calibration error should not exceed 3/32in at 350m (857kc/s) M.W. or ⅛in at 1,200m (350kc/s) and 1,500m (200kc/s) L.W. If these limits are exceeded, the alignment process should be repeated.

Aerial Trimmer C4.—This should be finally adjusted after installation in the car as follows:

Tune the receiver to a weak station at the low frequency end of the M.W. band and adjust **C4** (B3) for maximum output. Access to **C4** is gained through a hole in the base of the case. On low capacity aerial systems the trimmer setting will be at maximum (fully clockwise).

GENERAL NOTES

Drive Cord Replacement.—Two separate lengths of nylon cord are required for a new tuning drive cord; one is 8in long, and the other 14in long. To fit a new cord, first turn the tuning control fully anti-clockwise. Then tie a knot in one end of the 8in length of cord, and thread the other end through the outer hole in the control spindle, pulling it through until the knot anchors. Wind 4½ turns anti-clockwise round the control spindle as shown in the sketch of the tuning drive system in col. 4. Holding the free end of the cord taut, turn the tuning control fully clockwise to allow 5 more turns to wind round the spindle. Pass the cord round the right-hand guide pin and secure the tension spring to its end so that the spring is not more than ⅛in from the guide pin. Temporarily anchor the free end of the spring to the chassis.

Tie a knot in one end of the 14in length of cord and pass the other end through the inner hole in the control spindle, pulling it through until it anchors. Wind 3½ turns clockwise round the control spindle and then lead the cord round the left-hand guide pin as shown in the sketch. Finally, remove the tension spring from its temporary anchorage and tie the free end of the cord to the spring so that the spring is under slight tension. Fit the cursor to the cord as shown in the sketch and adjust it so that with the tuning control fully clockwise the cursor is at the extreme right-hand end of the tuning scale.

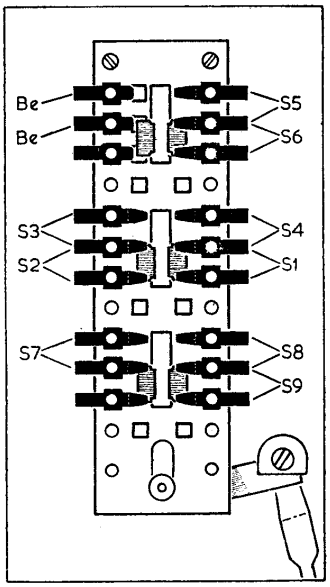
Removing Chassis.—Access to the valves and most of the components may be gained after removing the cover. This is fixed by ten self-tapping screws, six from the top and two from each side.

For circuit alignment, or to replace the scale lamp, it will be necessary to remove the front escutcheon. This may be done by first removing the control knobs (recessed grub screws), and then the two nuts which fix the escutcheon to the bushes on the control spindles. The tuning scale may be withdrawn by removing two fixing screws.

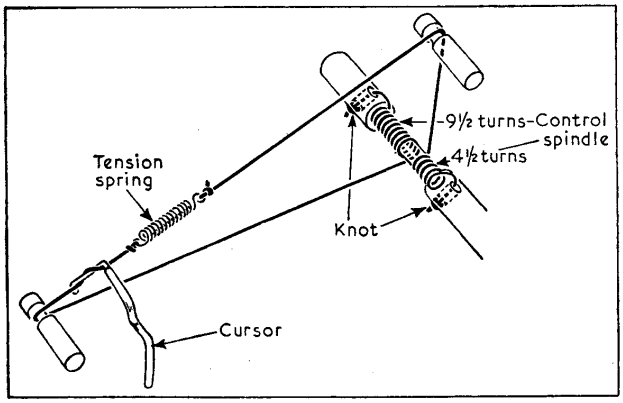
Scale Lamp.—This is a 14V, 0.2A lamp with a clear spherical bulb and an M.E.S. base. To gain access to the lamp, the front escutcheon and the tuning scale must be removed as described in "Removing Chassis" above.

Switches.—The waveband switches **S1-S9** are ganged in a 2-position slide-type unit and indicated in our chassis illustration in location reference B4. The switch contacts are identified in the diagram shown below. **S3, S4, S5, S7** and **S8** close on M.W.; **S1, S2, S6** and **S9** close on L.W.

R18 Adjustment.—This pre-set resistor is included in the base bias circuit of **TR1** to enable the collector current to be adjusted if a replacement transistor or an associated component is fitted. To adjust the collector current, connect a 1mA meter in series with the collector circuit; this is most easily done by unsoldering the green lead which connects the primary winding of output transformer **T2.** Then connect the meter between the now disconnected lead and the primary winding tag on **T2,** with the negative meter terminal to the transformer. The speaker load must be connected during this adjustment. Switch the receiver on and allow a few minutes for the collector current to stabilize. Then adjust **R18** (location reference C3) to obtain a reading of 450mA with a battery voltage of 14V. Disconnect the meter and reconnect the yellow lead.



Right: *Diagram of the waveband switch unit shown in the L.W. position.* Below: *Sketch of the tuning drive system drawn as seen with the tuning control turned fully anti-clockwise.*



INSTALLATION KITS

Code Numbers

Car	Receiver Type Number
ASTON MARTIN	
DB4	CR903/3
AUSTIN	
7	CR903/AB2
A40	CR903/AP
A55 Mk II	CR903/AC2
A99 and A105	CR903/AW2
Healey Sprite	CR903/AS
BRISTOL	
405	CR903/2
CITROEN	
ID.19	CR903/ID
DS.19	CR903/DS
COMMER	
Karrier	CR903/RK
FORD	
Popular	CR903/EXA
New Anglia	CR903/FL
New Prefect	CR903/EXB
Consul, Zephyr and Zodiac	CR903/ECX
HILLMAN	
Husky	CR903/RB
Estate Car	CR903/RC
Minx Series III and IIIA	CR903/RC
HUMBER	
Hawk	CR903/RL
Hawk Estate Car	CR903/RE
Super Snipe	CR903/RL
MERCEDES	
220S	CR903/M
MORRIS	
Mini Minor	CR903/AB2
Minor 1000	CR903/MM
Oxford Series V	CR903/MO
M.G. MAGNETTE	
Mk. III	CR903/MG2
M.G.A. 1600	CR903/MA
PANHARD	
Dyna	CR903/PD
PEUGEOT	
403	CR903/P
RENAULT	
Fregate	CR903/R
RILEY	
1500	CR903/OR
COMMER	
Minibus and Van	CR903/RV
SIMCA	
Aronde	CR903/SA
SINGER	
Gazelle IIIA	CR903/RG3
SKODA	
Octavia	CR903/KO
Felicia	CR903/KF
STANDARD	
Companion	CR903/SF
Vanguard	CR903/SV
SUNBEAM	
Alpine	CR903/RF
Rapier	CR903/RT3
STUDEBAKER	
Lark	CR903/SL
TRIUMPH	
Herald	CR903/TH
TR3	CR903/4
WOLSELEY	
6/99	CR903/WN
15/60	CR903/WW
1500	CR903/WO

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