Supplement to Electrical and Electronic Trader
17 July 1970

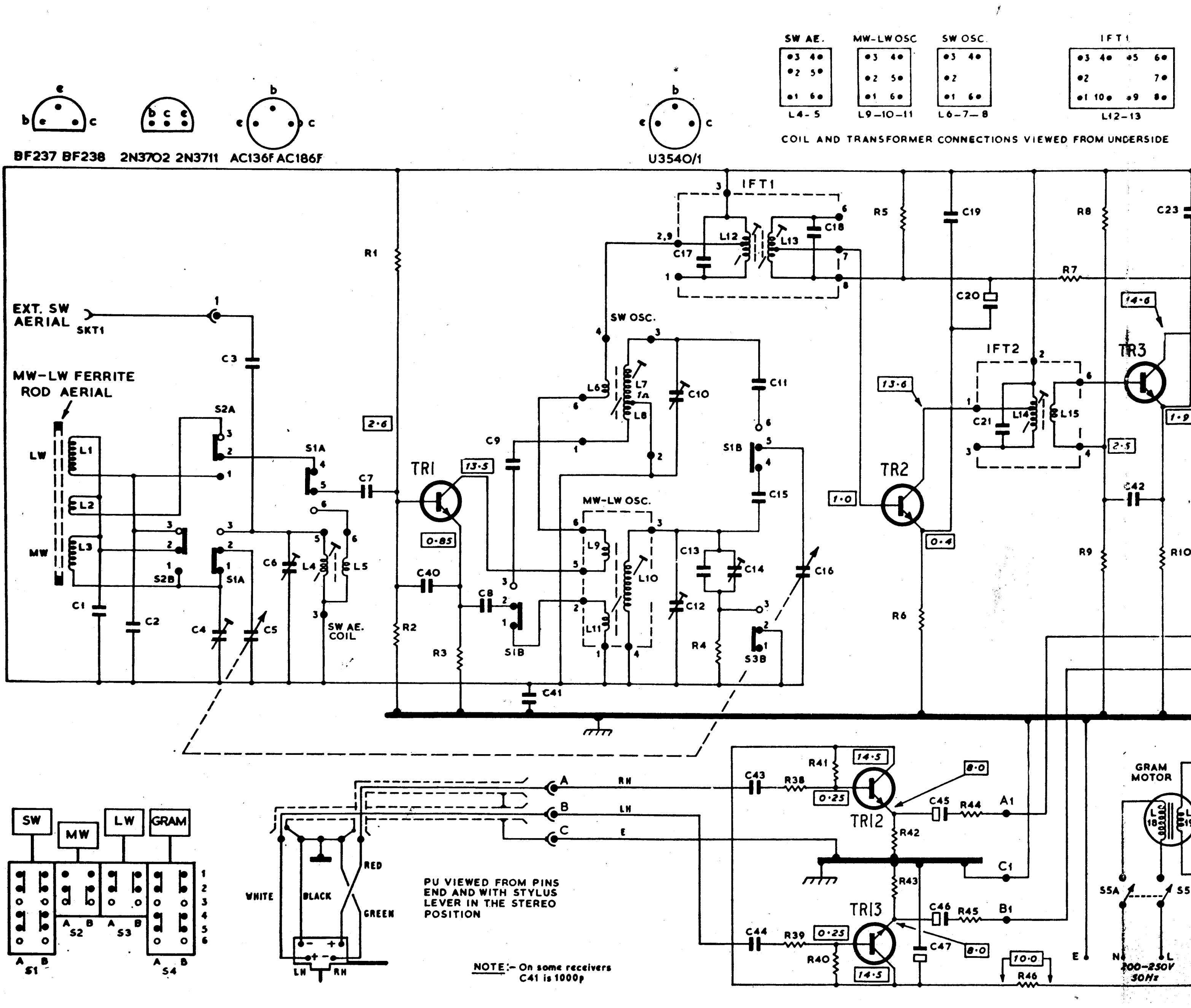
BRC 5399 sch A & B 1943

Above :
transistor

Transistored radiogram.

Below :

C	3 7 9 10 17 11 15 18 19 20 21 42 23 1 2 4 5 6 40 8 41 12 13 14 43 44 16 47 45 46
R	1 5 7 8 2 3 4 38 39 40 41 42 43 6 44 45 46 9 10
L	1 2 6 7 8 12 13 14 15 3 4 5 9 11 10 18 19



Trader Service Sheet

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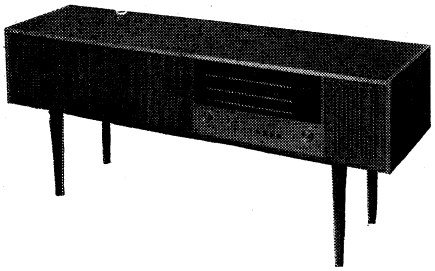


Above: Three-quarter view of the BRC 5399 transistored radiogram:

Below: Circuit diagram of the BRC 5399 sch B

Resistors

R1	22kΩ	A1	R19	39kΩ	B1	R39†	1kΩ	C2	C10	25pF	A1
R2	5·6kΩ	A1	R20	33kΩ	B1	R40†	3·3MΩ	C2	C11	4,700pF	A1
R3	2·2kΩ	A1	R21	1·2kΩ	B1	R41†	3·3MΩ	C2	C12	25pF	A1
R4	150kΩ	A1	R22	10Ω	B1	R42†	22kΩ	C2	C13	270pF	A1
R5	150kΩ	A1	R23	3·9kΩ	B1	R43†	22kΩ	C2	C14	25pF	A1
R6	470Ω	A1	R24	10Ω	B1	R44†	100kΩ	C2	C15	270pF	A1
R7	12kΩ	A1	R25	1kΩ	B1	R45†	100kΩ	C2	C16	324pF	A1
R8	22kΩ	A1	R26	5·6Ω	B1	R46†	10kΩ	C2	C17	200pF	A1
R9	5·6kΩ	A1	R27	5·6Ω	B1				C18	200pF	A1
R10	1kΩ	A1	R28	50kΩ	B1	**Capacitors**			C19	0·02μF	A1
R11	5·6kΩ	B1	R29	5kΩ	B1				C20	75μF	A1
R12	2·2kΩ	A1	R30	33kΩ	B1	C1	85pF	A1	C21	180pF	A1
R13	12kΩ	B1	R31	1·2kΩ	B1	C2	2000pF	A1	C22	2,000μF	B1
R14*	470kΩ	B1	R32	10Ω	B1	C3	20pF	A1	C23	0·02μF	A1
R15*	470kΩ	B1	R33	3·9kΩ	B1	C4	25pF	A1	C24	180pF	A1
R16	50kΩ	B1	R34	10Ω	B1	C5	388pF	A1	C25	150pF	A1
R17	50kΩ	B1	R35	1kΩ	B1	C6	25pF	A1	C26	0·01μF	B1
R18	68kΩ	B1	R36	5·6Ω	B1	C7	0·01μF	A1	C27	0·01μF	B1
			R37	5·6Ω	B1	C8	0·01μF	A1	C28	0·05μF	B1
			R38†	1kΩ	C2	C9	4,700pF	A1	C29	0·05μF	B1
									C30	25μF	B1
									C31	0·1μF	B1
									C32	150μF	B1
									C33	220pF	B1
									C34	400μF	B1
									C35	0·05μF	B1
									C36	0·1μF	B1
									C37	150μF	B1
									C38	220pF	B1
									C39	400μF	B1
									C40	68pF	A1
									C41	2,000pF	A1
									C42	0·02μF	A1
									C43†	6,800pF	C2
									C44†	6,800pF	C2
									C45†	2μF	C2
									C46†	2μF	C2
									C47†	10μF	C2

Inductors

L1	8Ω	B1
L2	—	A1
L3	—	A1
L4	—	A1
L5	—	A1
L6	—	A1
L7	1Ω	A1
L8	—	A1
L9	—	A1
L10	2·5Ω	A1
L11	—	A1
L12	7Ω	A1
L13	6·5Ω	A1
L14	7Ω	A1
L15	—	A1
L16	4·5Ω	A1
L17	—	A1
L18	—	—
L19	—	—
LS1	30Ω	—
LS2	30Ω	—

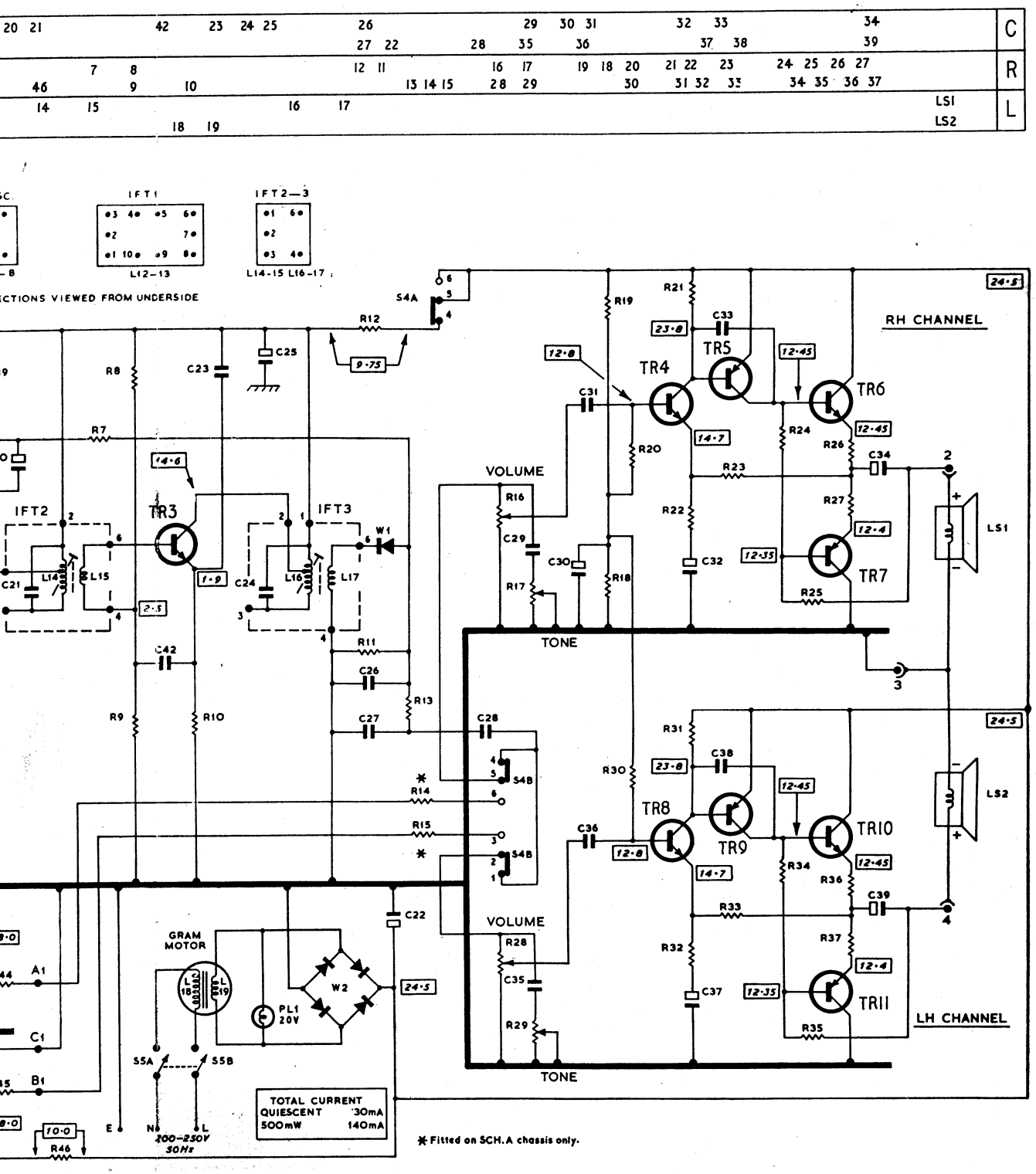
Semiconductors

TR1	BF237	A1
TR2	BF238	A1
TR3	BF237	A1
TR4	2N3711	B1
TR5	2N3702	B1
TR6	AC186F	B1
TR7	AC131F	B1
TR8	2N3711	B1
TR9	2N3702	B1
TR10	AC186F	B1
TR11	AC131F	B1
TR12†	U3540/1	C2
TR13†	U3540/1	C2
W1	OA90	B1
W2	G63D/1B	B1

Miscellaneous

PL1	20V 0·1A	A1
S1-S4	—	A1
S5A-B	—	B1

**Fitted in Sch A models only.*
† Fitted in Sch B models only.



1943
BRC 5399 sch A & B

Introduction

BRC 5399 is a three waveband transistored stereogram designed to operate from 200-250V 50Hz mains power supplies, at a power consumption of approximately 24 watts. There are two versions, namely schedules A and B.

The schedule A version employs eleven transistors and one diode, a semi-conductor bridge rectifier being used in the power supply. In the schedule B version a pick-up pre-amplifier is incorporated in each of the audio channels. This entails an additional transistor and its associated components per channel, and is the only difference between schedules.

Waveband selection is by press button operated switches, and the ranges covered are: l.w. 1120-2027m (267-148kHz), m.w. 185-566m (1620-530kHz) and s.w. 16·7-51·5m (18-5·8MHz), a fourth press button selects 'gram'.

Reception for m.w. and l.w. is via an internal ferrite rod aerial assembly, an external aerial being required for s.w., and an isolated aerial socket is fitted for its connection.

A power output of 1·8W (speech and music rating) per channel is handled with two 8 x 5in elliptical loudspeakers of 30Ω impedance.

When operating on radio, the audio stages are paralleled. There is no provision for external loudspeakers. It is inadvisable to fit them if requested to do so.

Both schedules are fitted with BSR UA25 autochangers, schedule A has either a BSR SX1H or SX5H cartridge and the 'B' a BSR SX1M. The stylus in both cases is a type ST8.

Transistor analysis

Voltages given on the circuit diagram were derived from information supplied by the manufacturer. They are negative with respect to each transistor's positive line. They were measured with a 20,000Ω/V meter under quiescent conditions and the mains input was 245V.

Circuit operation

When switched to m.w. signal voltages induced in **L3,** mounted on the ferrite rod aerial assembly, are tuned by **C5** and coupled by **L2, S2A, S1A** and **C7** to the base of transistor **TR1** mixer/oscillator. **R1, R2** form a base bias potential divider and emitter stabilizing is provided by **R3** decoupled by **C40.** The oscillator circuit comprises **L9, L10, L11,** for long and medium wave and **L6, L7, L8** for short wave. Tuned by associated padders and trimmers and oscillator tuning capacitor **C16,** circuit selection being via **S1B** and **S3B** contacts.

Signals at i.f. are selected by collector load circuit **L12** tuned by **C17** and coupled by **L13** tuned by **C18** to the base of first i.f. amplifier **TR2** an automatic gain controlled stage.

Base bias voltage is derived across **R5** and emitter stabilizing is provided with **R6** de-coupled by **C19.** Tuned collector load **L14, C21** inductively couples the signal to the base of the second i.f. amplifier **TR3. R8, R9** form a potential divider for base bias, decoupled by **C42, R10, C23** forming emitter voltage stability components.

Collector load circuit **C24, L16** couples the i.f. signal to **L17,** the demodulator coupling coil.

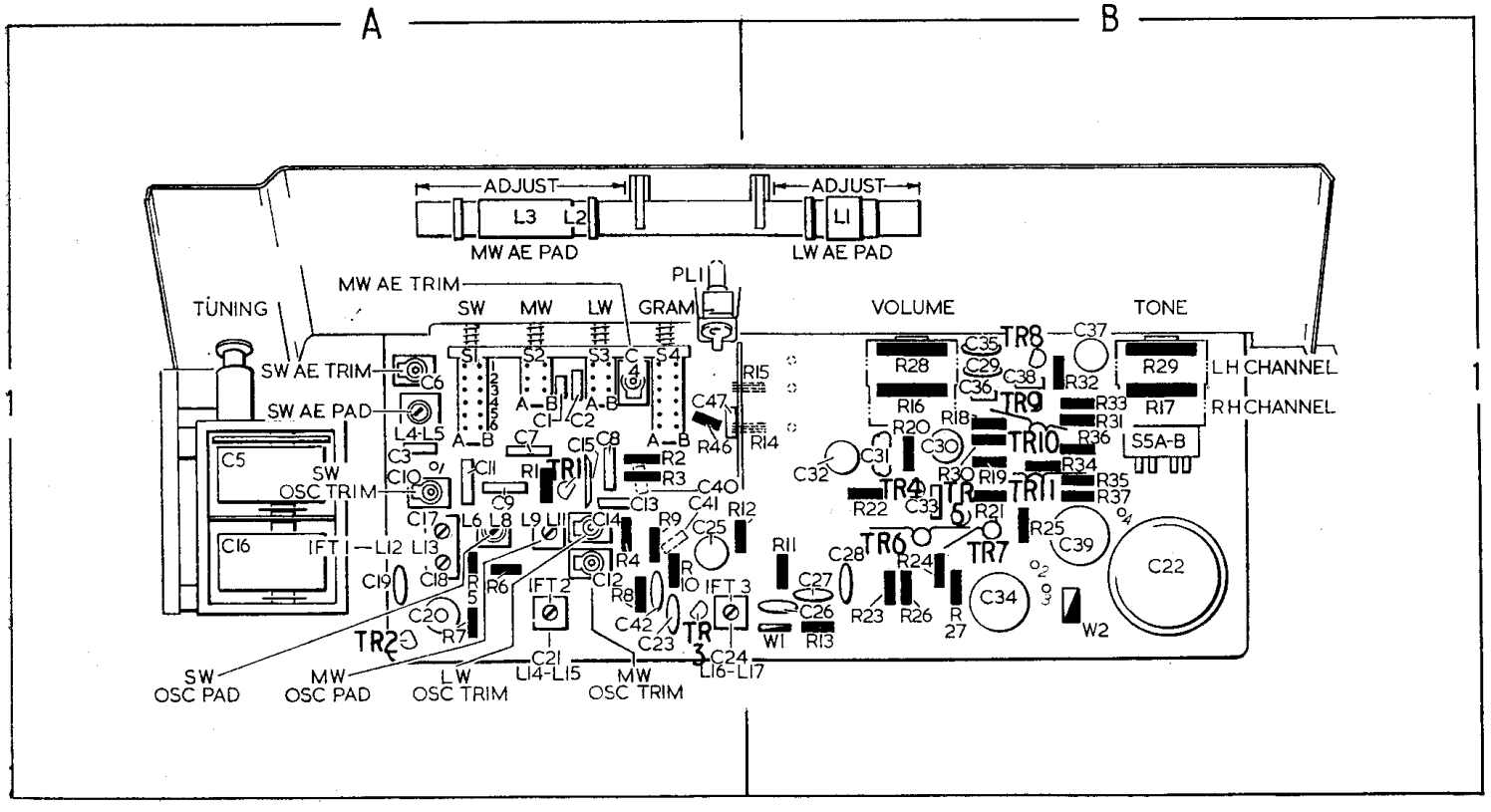
After demodulation, i.f. filtering is effected by **R13, C26** and **C27.** The d.c. component developed across **R11** demodulator load is fed to **TR2** base as a.g.c. voltage, **R7** and **C20** providing filtering. Audio signals across **R11** are coupled via **C28** and **S4B** to the tops of volume controls **R28** and **R16.**

The audio section comprises two identical a.f. amplifiers and the following note, although dealing with the right-hand channel, is applicable to both.

Signals at a.f. developed across the volume control **R16** are fed to a d.c. coupled circuit comprising a complementary push-pull output stage **TR6** and **TR7,** a p.n.p. driver **TR5** and an n.p.n. pre-amplifier **TR4.**

Transistor **TR4** has the dual role of pre-amplifier for a.c. and the difference-amplifier for d.c. It compares the d.c. potential (Vb) at its base with the emitter voltage (Ve) of **TR6** and **TR7.** The high loop gain of the circuit keeps the small difference between Ve and Vb constant, so that Ve is defined with respect to Vb irrespective of spreads in the characteristics of the transistors **TR4** and **TR5.** Negative feed back is via **R23** from the output to the emitter of **TR4.** Decoupling by **C32** removes the a.c. component but a small known amount of a.c. feedback is reintroduced by **R22.** The collector load **(R25)** of **TR5** is connected to the live end of the loudspeaker to enable the output transistors to operate in the common emitter mode, thus giving maximum gain.

The small quiescent bias voltage required for transistors operating in class B push-pull is developed by the



collector current of **TR5** flowing through **R24.** Finally the audio output is a.c. coupled by **C34** to the loudspeaker load **LS1.**

Circuit Alignment

Equipment required.—An r.f. signal generator covering the range of frequencies 100kHz to 20MHz amplitude modulated 30 per cent at 400Hz; an output meter of 30Ω impedance or a 20,000Ω/V meter set to a suitable a.c. voltage range; an r.f. coupling loop; a 0·1μF capacitor, and a 20pF capacitor.

Alignment note.— Two methods of alignment are possible. With the chassis removed from cabinet, and the chassis in situ. This brings two cursor reference points into use and this necessitates two alignment procedures being described. To make i.f. alignment easier the chassis is removed for this operation.

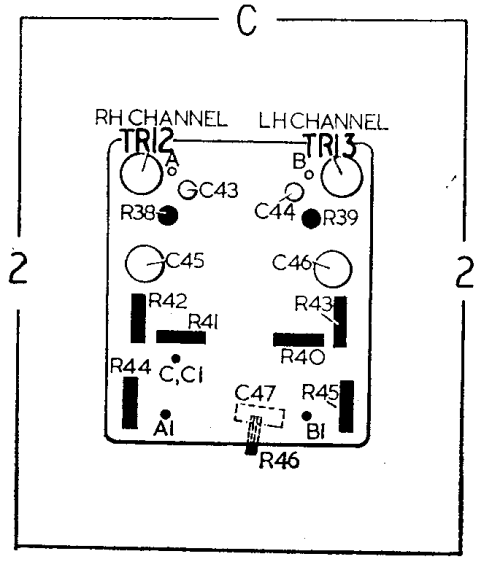
Alignment procedure with chassis removed from cabinet.

1. – Connect output meter in place of the left- or right-hand loudspeaker, or a.c. voltmeter across either loudspeaker. Switch to m.w., set volume and tone controls to maximum and tune to maximum capacitance.

2. – Feed in a 475kHz a.m. signal via a 0·1μF capacitor to the aerial section of the tuning capacitor **C5.** Adjust **L16, L14, L13** and **L12** in that order for maximum output. Attenuate the input signal so that an output of 50mW is not exceeded. On completion of i.f. alignment the signal generator output should be approximately 15μV.

3. – Switch to m.w. and check that cursor aligns with the zero mark on the calibration strip located on the scale diffuser, tuning capacitor fully closed. Medium waveband must be aligned first.

4. – Tune receiver to m.w. pad calibration mark and feed in a 600kHz a.m. signal to the ferrite rod aerial via a loosely coupled r.f. loop. Adjust **L10** and the position of **L3** on ferrite rod for maximum output.



Component side of pre-amplifier panel, sch B only.

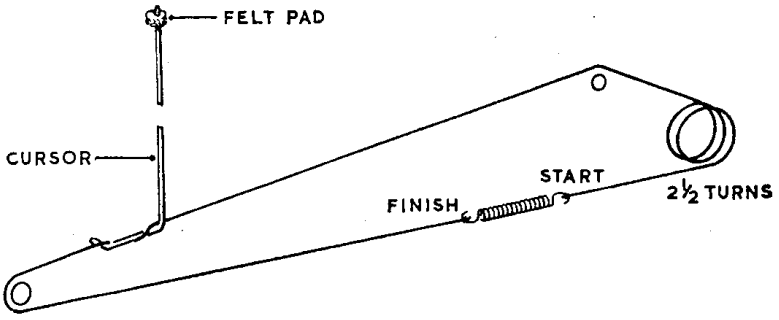


Illustration of the drive cord assembly, shown with gang fully closed

5. – Tune receiver to m.w. trim position on calibration scale and feed in a 1400kHz a.m. signal. Adjust **C12** and **C4** for maximum output.

6. – Repeat operations 4 and 5 until no further improvement can be obtained.

7. – Switch receiver to l.w., tune to 220kHz position on calibration scale and feed in a 220kHz a.m. signal. Adjust **C14** and the position of **L1** on ferrite rod for maximum output.

8. – Switch receiver to s.w., tune to the m.w. pad position on calibration scale and feed in a 6·7MHz a.m. signal via a 20pF capacitor to the s.w. aerial socket. Adjust **L7** and **L4** for maximum output.

9. – Tune receiver to m.w. trim marker on the calibration scale and feed in a 15·8MHz a.m. signal. Adjust **C10** and **C6** for maximum output.

Alignment procedure with chassis in situ.

Carry out operation 1 of previous procedure.

1. – Switch receiver to m.w., tune to 500m and feed in a 600kHz a.m. signal. Adjust **L10** and position of **L3** on ferrite rod for maximum output.

2. – Tune receiver to 200m, feed in a 1500kHz a.m. signal and adjust **C12** and **C4** for maximum output.

3. – Switch receiver to l.w., tune to centre of BBC2 on scale and feed in a 200kHz a.m. signal. Adjust **C14** and the position of **L1** on ferrite rod for maximum output.

4. – Switch receiver to s.w., tune to 7MHz and feed in a 7MHz a.m. signal via a 20pF capacitor to the s.w. aerial socket. Adjust **L7** and **L4** for maximum output.

5. – Tune receiver to 16MHz and feed in a 16MHz a.m. signal. Adjust **C10** and **C6** for maximum output.

Audio output check

Connect a 30Ω impedance output meter in place of each loudspeaker, alternatively connect an oscilloscope across each loudspeaker and observe output waveform.

Switch to 'GRAM' and turn volume and tone controls to maximum.

Feed in a 2·4V (2·0V SchA), 800Hz signal from an audio oscillator to the right-hand pickup input pins and note output, this should be 1·5 watts clean and unclipped. Transfer audio signal to left-hand pickup pin and note output from this channel. This should also be 1·5 watts. The outputs should be within 2dB of each other.
Tone control check: With test conditions as previously inject an 8,000Hz signal to right-hand and left-hand channels respectively. Turn tone control to minimum and note change in output level, this should drop by 20dB.

Dismantling

Pull off control knobs, remove chassis compartment back cover and disconnect s.w. aerial lead from printed panel.

Remove both chassis securing screws located under the front edge of cabinet, then remove the screw and washer securing the scale backing plate. The chassis may now be removed to the extent of the interconnecting leads.

Should complete removal be necessary pull off loudspeaker and pick-up leads. Disconnect leads to printed panel from the terminal block inside the chassis compartment. Note colour coding of leads for ease of re-assembly.

Record changer removal; screw down transit screws to fullest extent to ensure freedom of the record changer. Unscrew two screws securing a wood strip over one of the access holes to the underside of the transit screws. Push and turn the clips on the ends of the transit screws to enable them to pass through the motor board. Remove motor leads from terminal block. Pull off pick-up leads from printed panel then lift record changer clear of cabinet.

Stylus replacement; Place indicator flag in LP position and prise out stylus using the flag as a lever. Prise open locating clip with thumbnail and slide end stock of stylus into position ensuring that the stylus arm is engaged within the V-shaped fork of the cartridge.

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