

RADIO AND  
TELEVISION  
SERVICING

J. HARRIS

1968-1969  
MODELS



# RADIO AND TELEVISION SERVICING

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RADIO AND TELEVISION SERVICING  
1968-69 MODELS

INTERNATIONAL LEARNING SYSTEMS CORPORATION  
LIMITED

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# CONTENTS

	PAGE
PREFACE . . . . .	5

## RECENT DEVELOPMENTS

ELECTRONIC VIDEO RECORDING . . . . .	7
RADIO RECEIVERS . . . . .	9
COLOUR TELEVISION . . . . .	11

## COLOUR TELEVISION SERVICING DATA (1968-69 MODELS)

	PAGE		PAGE
BAIRD . . . . .	14	MURPHY . . . . .	102
B.R.C. . . . .	18	PHILIPS . . . . .	103
BUSH . . . . .	66	STELLA . . . . .	104

## RADIO SERVICING DATA (1968-69 MODELS)

	PAGE		PAGE
ALBA . . . . .	106	MONOGRAM . . . . .	286
BEOLIT . . . . .	114	NATIONAL . . . . .	288
BLAUPUNKT . . . . .	116	PERDIO . . . . .	296
BUSH . . . . .	123	PHILCO . . . . .	307
DANSETTE . . . . .	128	PHILIPS . . . . .	314
DECCA . . . . .	136	PORTADYNE . . . . .	338
DEFIANT . . . . .	146	PYE . . . . .	340
DYNATRON . . . . .	151	RADIOMOBILE . . . . .	352
EDDYSTONE . . . . .	162	R.G.D. . . . .	355
EKCO . . . . .	170	ROBERTS . . . . .	356
ELIZABETHAN . . . . .	175	SANYO . . . . .	360
FERGUSON . . . . .	183	SHARP . . . . .	365
FERRANTI . . . . .	203	SOBELL . . . . .	366
FIDELITY . . . . .	203	SONY . . . . .	373
G.E.C. . . . .	208	S.T.C. . . . .	377
HACKER . . . . .	221	STANDARD . . . . .	390
H.M.V. . . . .	239	STELLA . . . . .	394
K.B. . . . .	254	STEREOSOUND . . . . .	401
KLINGER . . . . .	262	ULTRA . . . . .	406
MARCONIPHONE . . . . .	270	UNITRA . . . . .	424
MASTERADIO . . . . .	281	WORLD RADIO . . . . .	426



# CONTENTS

## TAPE RECORDER SERVICING DATA (1968-69 MODELS)

	PAGE		PAGE
AIWA . . . . .	428	RADIONETTE . . . . .	477
ALBA . . . . .	440	ROBUK . . . . .	480
DYNATRON . . . . .	443	SANYO . . . . .	484
FERGUSON . . . . .	448	SHARP . . . . .	487
GRUNDIG . . . . .	454	STANDARD . . . . .	493
LOEWE OPTA . . . . .	459	STELLA . . . . .	496
MARCONIPHONE . . . . .	462	TELEFUNKEN . . . . .	500
MONOGRAM . . . . .	466	ULTRA . . . . .	502
NATIONAL . . . . .	468	VAN DER MOLEN . . . . .	503
RADIOMOBILE . . . . .	477	WORLD RADIO . . . . .	505

## TELEVISION SERVICING DATA (1968-69 MODELS)

	PAGE		PAGE
B.R.C. . . . .	508	MARCONIPHONE . . . . .	563
DECCA . . . . .	538	PHILIPS . . . . .	564
DYNATRON . . . . .	547	PYE . . . . .	574
EKCO . . . . .	560	R.G.D. . . . .	585
FERGUSON . . . . .	560	S.T.C. . . . .	585
FERRANTI . . . . .	560	STELLA . . . . .	602
H.M.V. . . . .	561	ULTRA . . . . .	602
K.B. . . . .	562		

INDEX TO MODELS . . . . .	605
---------------------------	-----

## PREFACE

THE Introduction to last year's volume (1967-68 Models) was included to explain why that volume, and the previous one (1966-67 Models), had departed slightly from the traditional style of the series. In a similar manner here, space has been provided to describe the additional changes that have been made in this volume.

There are now five main sections, one dealing with Recent Developments and the other four containing servicing data. Each of the data sections is preceded by a sub-title page which shows the nature of its content, and acknowledgement to the manufacturers concerned in that section.

Included in the Recent Developments section is an article on Colour Television Test Equipment, and a general description of an EVR System, which may have a great impact in fields of mass communication.

Colour Television has continued to grow, and the section devoted to it has been expanded, both to embrace new receivers and follow-up material for the receivers featured last year. Again it has been found necessary to "split" many colour television receiver diagrams across a number of pages. Consideration was given to a larger page size, but this would have caused an abrupt departure from the "handy size" and destroyed the recognisable continuity of the series. A study of the different receivers reveals that colour television receiver circuitry still varies considerably among models, though most manufacturers are following specific design lines. Hybrid receivers, it seems, are the most favoured, only one manufacturer having a fully transistorised model available.

The section headed "Radio Servicing" contains information covering Radiograms, Record Players, etc., as previously, subject to one change outlined in the paragraph following. The former is obviously the larger section and, although it is impossible (without extensive enlargement and price increase) to cover all models produced by all manufacturers, many new makes have been included. It is intended to maintain continuity as far as possible and models not included (provided adequate information is available) will be featured, together with the later models, in next year's volume.

Tape Recorders have now been given their own section and sub-title page. With the aid of the Contents List and Index, the user should be able to find information on tape recorders much more quickly than hitherto.

Monochrome Television Receiver data is contained in the last section, as previously, away from the data on colour television receivers to prevent confusion between them.

In general, the changes in this and the last two volumes have been made to cope with the situation in the Radio Trade, which has been much altered by the advent of colour television. Overall, the format and policy of these books remains unchanged.

## PREFACE

We express our gratitude to all the manufacturers and agents who have co-operated with us in the preparation of this volume. Their co-operation, together with the assistance received from S.E.R.T., R.T.E.B. and R.T.R.A., has proved invaluable.

It is gratifying to record that, in order to deal with an increasing demand for their many services, the S.E.R.T. and R.T.E.B. have moved into larger accommodation at Faraday House, 8-10 Charing Cross Road, London, W.C.2. Increased interest, further requirements for adequate training and examination of servicing personnel, together with the necessity for improved courses of instruction have been main factors responsible for their expansion.

It is hoped that regular users of these volumes will find that the quality of the series has been maintained, irrespective of the alterations. Improved methods of production have resulted in a further increase in the number of pages without materially affecting the costs and subsequently the consumer.

J.H.

## DEVELOPMENTS IN ELECTRONIC VIDEO RECORDING AND REPRODUCTION

Reports in the Press have given some prominence to a radically new audio-visual system called EVR—Electronic Video Recording, which represents a technological development expected to have a substantial impact in the field of home entertainment and in education.

The EVR system makes it possible for the first time to show on a conventional television receiver, in the home or classroom, pre-recorded programming from ciné film and video tape. It combines optics and electron-physics technology to produce, inexpensively and in large quantities, cartridges containing video and audio information. The system is the result of many years of intensive research and development by the American CBS laboratories. Demonstrations there have shown that a great deal more pictorial and sound information can be stored on the EVR cartridge than is possible on a reel of magnetic tape of the same diameter, and at a much lower cost than with conventional ciné or magnetic-tape techniques. EVR cartridges are capable of carrying up to one hour of black-and-white programming or one half-hour of colour.

There are three main stages in the system:

*Pre-recording:* An electronic process transfers any film or video taped programme to a special 8.75-mm unperforated thin photographic film.

*Cartridge:* The film is contained in a cartridge 7 inches in diameter by  $\frac{1}{2}$  inch thick.

*Reproduction:* The cartridge is inserted into the player where it is automatically threaded, played, rewound and ejected. The player, which is roughly the size of a domestic tape recorder, is attached to the aerial socket of

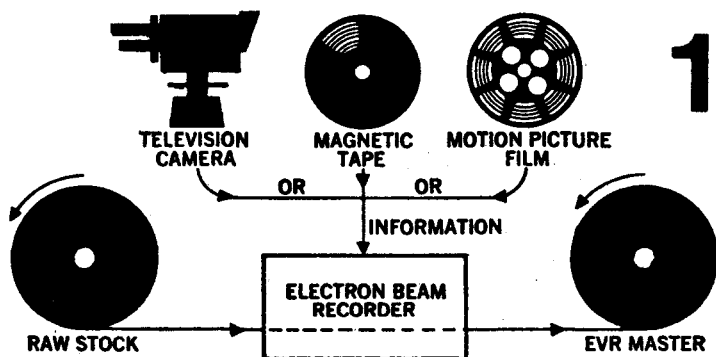


FIG. 1. EVR ELECTRON BEAM RECORDER TAKES PROGRAMME MATERIAL FROM TV CAMERA, MAGNETIC TAPE OR CINÉ FILM TO GENERATE AN EVR MASTER, IN COLOUR OR BLACK-AND-WHITE.



## RADIO AND TELEVISION SERVICING

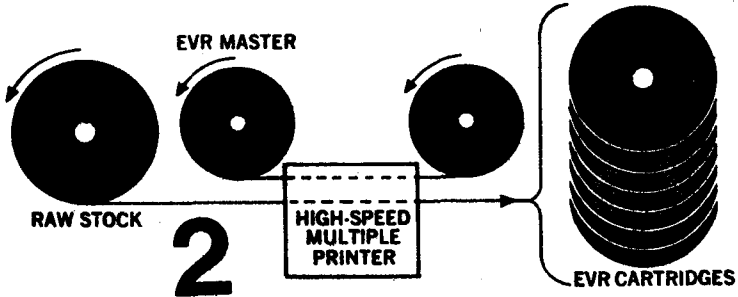


FIG. 2. ONE 20-MINUTE PROGRAMME CAN BE PRINTED IN APPROXIMATELY 30 SECONDS BY EVR HIGH SPEED MULTIPLE PRINTER, WHICH GENERATES MULTIPLE EVR FILM CARTRIDGES FROM THE EVR MASTER.

the television set. The EVR film moves at a speed of 5 inches a second, and one of its great advantages is that it can be stopped at will and a single frame shown. It also makes possible the display of film strips or ciné films on one and the same machine.

It is emphasised that the player is not a video tape recorder and that the film cartridges it plays will be made only in processing laboratories designed for the purpose. As yet there is no indication that there is any possibility for the recording process becoming available to the general public for use in a similar manner to that of magnetic recording. Demonstration of EVR equipment in this country is to be expected shortly and preliminary reports suggest that cartridges and players will be available in the spring of 1969.

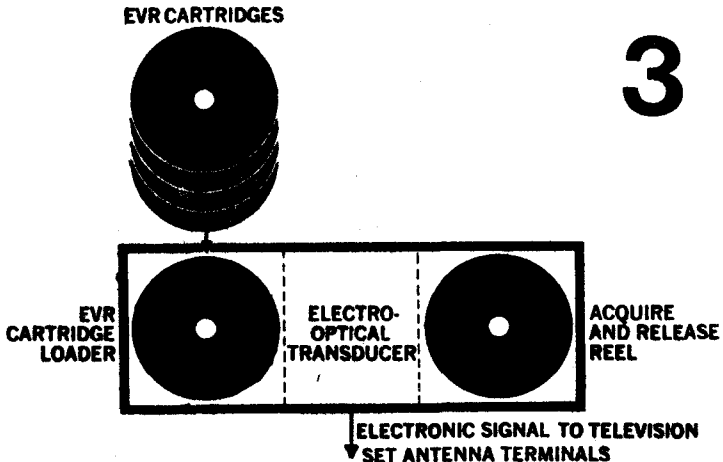


FIG. 3. ELECTRO-OPTICAL TRANSDUCER IN EVR PLAYER "READS" THE EVR CARTRIDGE, WHICH IS REPRODUCED ON A TV RECEIVER. THE RF SIGNAL IS CARRIED THROUGH THE AERIAL TERMINALS.

## **DEVELOPMENTS IN RADIO RECEIVERS 1968-69**

Radio design continues to follow conventional patterns during the period covered by this book, but a significant modification is the replacement of dry-battery supplies in low-power models by mains-derived H.T. through transformer and full-wave contact-cooled rectifier. An increase in the number of designs incorporating AF and IF modules will be encountered by the service engineer, the only external circuitry under the control of the designer being the RF and oscillator tuned circuits and power supplies. It is emphasised that due to the advent of micro-techniques and thin-film resistor modules within these units, the possibility of servicing faulty items becomes remote and the repair of receivers of this type will necessitate a complete replacement.

### **Car Radios**

The versatility of many portable receivers has been improved to make them more suitable for operation as a car radio. When operating on an external aerial, an external/internal switch disconnects the ferrite rod aerial windings and replaces them with well-screened aerial tuned circuits within the receiver fed by a screened down lead. This results in improved immunity from ignition interference and overcomes the directional properties of the ferrite rod which gives poor sensitivity when screened by the car body.

### **Stereo Multiplex Reception**

Stereo multiplex decoders are featured as standard design in a number of current models, and a beacon light, operated from the 19 kc/s. pilot tone, is incorporated. In the Dynatron circuit the sensitivity of the beacon is adjusted so that it will only operate when an adequate signal for channel separation is present at the input to the receiver.

### **Capacitance Diode Tuning**

A number of receivers incorporate bandspread tuning. Control is effected by means of a potentiometer connected to a reverse-biased diode in the local oscillator circuit. The small capacitance swing introduced by the diode limits the range of the oscillator fine tuning and only becomes effective at the high frequency end of the Medium Waveband. Such a circuit is featured in Philips models and is termed "Fine Focus" tuning. In this the diode rectifies the oscillator voltage appearing across the tuned circuit and the inverse voltage at the anode is set by the potentiometer tuning control (See Philips model 13RL360 in this volume).

The application of this method of tuning would appear attractive at

## RADIO AND TELEVISION SERVICING

V.H.F./F.M. frequencies and is frequently to be found in A.F.C. circuits of such receivers. The disadvantage is that large swings of frequency at the oscillator would result in changes of gain across the band due to the R.F. stages remaining fixed tuned. A novel method of overcoming this is introduced in the Bang and Olufsen "Beolit 500" F.M. receiver. The conventional two-gang capacitor has been replaced by two BA 110 vari-cap diodes and five separate tuning potentiometers, all of which cover the entire F.M. band from 87.5 to 108 Mc/s. The control voltage is obtained from a separate battery in order to avoid interaction with the other stages of the receiver. Both the oscillator and R.F. collector circuits are tuned, and the same diodes receive A.F.C. bias from the discriminator. See Beolit 500 in this volume.

## DEVELOPMENTS IN COLOUR TELEVISION TEST EQUIPMENT

The test equipment described in this article, together with the normal range of equipment to be found in a service department, should enable the technician to install and service colour television receivers.

### Crosshatch Generator

The crosshatch generator should have the following facilities: dual-standard preferably covering Bands 3, 4 and 5 to avoid re-tuning of the receiver; crosshatch for dynamic convergence; dot pattern for static convergence; grey scale for checking and adjusting grey scale tracking and a blank white synchronised raster to facilitate purity adjustments. The static convergence magnets can be adjusted on a crosshatch pattern, but because of the radial movement of the electron beams, a dot pattern makes adjustment easier. Grey scale tracking can be carried out by de-tuning the receiver to remove the colour burst or by switching to a monochrome picture. Purity can be adjusted by removing the input signal and advancing the brightness control, but, due to noise and difficulty on some receivers of obtaining sufficient brightness, this method is not satisfactory.

### Degaussing Coil

Although colour receivers incorporate an automatic degaussing circuit for the shadow mask and cathode ray tube mountings, an external degaussing coil is required to demagnetise the chassis and surrounding metal-work.

A suitable coil may be made by winding 800-1200 turns of 31 s.w.g. enamelled copper wire on a 15-inch diameter former. When the coil has been wound, the ends can be terminated in flexible insulated wires about 1 ft long; the coil should then be insulated by wrapping it in PVC insulating tape. The "half lap" method should be used so that all parts of the coil are covered by two layers of tape. For greater safety, another layer of tape should be added.

A wooden handle should then be fitted across the diameter of the coil former. A switch of the push-button type (double-pole) and rated at 3 amps 240 volts a.c., should be mounted on the coil former. The switch must be of the biased-off type so that the coil is energised only when the switch is being pressed.

The coil should be connected to a convenient length of good quality twin mains lead and the lead should be fixed to the wooden handle so that rough usage will not make the coil dangerous.

This degaussing coil is not intended for long periods of continuous use and it will become very warm if energised for more than a minute or two at a time.

4/15  
wire?



### **E.H.T. Meter**

An e.h.t. meter with a minimum 30 kV. f.s.d. is essential during installation and maintenance. To obtain equal standards of grey scale, focus and convergence on 625-line and 405-line systems, the e.h.t. voltage must remain constant between the two systems.

A separate e.h.t. meter is more accurate, convenient and safer to use than an e.h.t. adaptor for use with the normal multirange meters. An important requirement of any instrument used is that it does not draw an excessive current from the e.h.t. circuits.

The source impedance of colour receiver e.h.t. circuits is much lower than the black-and-white e.h.t. circuits. The current consumed is about 1.25 mA at 24 kV representing 30 watts of power. For this reason no chances or risks should be taken. It is most important that no attempts be made to draw sparks from any part of the e.h.t. supply, either to an insulated screw-driver or to the chassis.

As in monochrome receivers the cathode ray tube inside and outside surfaces are coated to form a capacitor for e.h.t. smoothing and it is essential to discharge the tube before beginning service work. A lead may be made up consisting of 2 ft. of e.h.t. cable terminated at one end in a standard e.h.t. cavity connector fitted with a plastic insulating cap and the other in a crocodile clip. To discharge the tube, connect the crocodile clip to the tube magnetic shield, remove the e.h.t. connector from the tube cavity and replace it with the e.h.t. connector on the prepared lead. The shorting lead should be left in position until the receiver is ready for operation. The rapid discharge of the tube may cause the shadow mask to become magnetised.

**Warning:** The e.h.t. is stabilised by a shunt regulating circuit usually using a PD500 valve (or equivalent). This valve emits X-radiation when operating and for that reason it is housed in a compartment of heavy-gauge steel. With these metal screens in place, it is safe to work in the vicinity of the valve, but under no circumstances must the receivers be operated with any of the metal screens removed.

### **Colour Bar Generator**

This instrument, though not essential, is useful when no colour transmissions are available. Its facilities enable adjustments to be made to the delay line, circuitry, demodulator and checks on the performance of the reference oscillator.

### **Cathode Ray Oscilloscope**

The oscilloscope, preferably a double-beam, is essential for fault-finding and setting up, especially in the decoder section. The "Y" amplifier response must be level from d.c. to 6 Mc/s. and the timebase should be of the triggered type with a sweep speed of up to 1 microsecond/centimeter. The scope should be used with a high-impedance probe, which can be adjusted to compensate for the inductance and capacitance of the test leads, otherwise distortion of waveforms or, in some cases, damping of the circuit under test is likely to occur.

# COLOUR TELEVISION SERVICING

## ACKNOWLEDGEMENTS

British Radio Corporation Ltd.  
Combined Electronic Services Ltd  
Rank Bush Murphy Ltd.  
Radio Rentals Ltd.

**BAIRD****700 Series**

**General Description:** This series of dual-standard colour television receivers is described in the 1967-68 volume, pages 30 to 55. This volume contains a short history of modifications and some other additional information. The models in the series are: 701/T, 701/W, 701/WP, 702/T 702/WP, 703, 704 and 707.

**History of Modifications:**

1. The U.H.F. tuners originally employed Fairchild transistors Tr1 (BF161UA) and Tr2 (BF161UB). Later production tuners employ Mullard transistors Tr1 (BF180) and Tr2 (BF181). Tuners with Mullard transistors operate from a supply of +14 volts, and a dropper R9 is included in series with the feed from the +25-volt line. R9 (1.5k) is mounted on top of the tuner.
2. Test-point 11 (see I.F. panel) used to be TP6. When this change was made, TP6 was moved to the previously unnumbered pin close to the original TP6 pin.
3. The original A.G.C. circuit did not have a weak/strong system of taps, as it has now that a resistor R103 (100k) and a flying lead have been added to the circuit.
4. R80 was originally 560 ohms but was increased to 680 ohms to prevent over-running of the pentode section of V13. R80 was later restored to its original value of 560 ohms, see 5.
5. R607 (2.2k) was originally 1.6k, and a resistor R104 (10k) was added across C609. These changes were made to reduce the H.T. at the V.H.F. tuner to about 180 volts, on 405, and 210 volts on 625. The modification also reduced the screen potential of V13 so that R80 was returned to its original value. R607, R104 and C608 are mounted on a tag strip on the right-hand side of the I.F. panel cradle. C139 (2200 pF.) was added to decouple the H.T. of the V.H.F. tuner at R.F. This capacitor is not shown on the circuit diagram, but it exists on the I.F. panel, just above the slider switch and to one side of the link.
6. R79 (on which L42 is wound) was originally 27k, but was changed to 5.6k to reduce the 6 Mc/s. output from the vision detector to Tr8. This reduces patterning during colour reception which is caused by a beat frequency of about 1.5 Mc/s. between 6 Mc/s. sound carrier and 4.43 Mc/s. chrominance sub-carrier.
7. R357 (8.2k) in the top connection of the brightness control was originally 10k. Due to the need to compensate for production spreads, R357 may be 8.2k or 10k.
8. C309 (4700 pF.) and R348 (180 ohms) were not present in the luminance circuit of early receivers. They constitute an anti-smear circuit and improve results, particularly on 625 reception. Full D.C. restoration was used in the grid circuit of V5b but the present D.C. restorer is tapped down the grid leak. The modification reduces changes in brightness when

## BAIRD

switching between line standards, and between V.H.F. signals of differing strengths.

9. In early receivers, the D.C. component of the chrominance signals was re-inserted by clamping on the grids of the amplifiers V7a, V7b and V8a. The level of blanking pulse at the outputs was adjusted by means of a potentiometer between H.T. line and chassis. The 1M grid leaks were returned to a potentiometer across the H.T. line. Variation of the potentiometer varied the amplitudes of the blanking pulses at the outputs, but because of the matrixing for (G-Y) all outputs were not equally affected. The background colour was therefore changed. In the latest circuit, clamping is removed from the grids, and variation of the amplitude of the pulses at the output is achieved by altering the amplitude of the pulses fed into the grid circuits. R331 is provided to set the pulses at the (G-Y) output to the same amplitude as those at the (R-Y) and (B-Y) outputs when the (G-Y) matrixing has been set correctly. The grey-scale tracking can therefore be set more accurately than in the original circuit. The D.C. clamping is maintained by D.C. restorer diodes at the colour difference outputs, but for correct biasing of the output amplifiers, the grid leaks are now returned to the +20-volt line.

10. Tr31 (OC75) in the colour killer circuit was originally an OC81.

11. C232 (640  $\mu$ F.) was originally 500  $\mu$ F., and C312 (32  $\mu$ F.) was added across C310. The modification overcame a tendency towards magenta-to-green shading on the picture, from left to right, during colour reception. The effect was particularly noticeable on Test Card F.

12. Sub-carrier radiation proved to be too high for good performance on Channel 1. A diagonal beat pattern was produced on the screen. R230 was 6.8k and is now 5.6k. R231 (15k) was originally connected to the +20-volt line, but is now connected to collector of Tr23 to apply some negative feedback. R237 was 8.2k and is now 10k. C265 and C315 were added and C227 (0.1  $\mu$ F.) was removed from its position across R239.

13. The addition of D25, R314 and C307 made the saturation control work more smoothly.

14. C230 was a ceramic type but was changed to a polystyrene type to reduce the effect of temperature on background.

15. C304 (5  $\mu$ F.) was 4  $\mu$ F. C236 (5  $\mu$ F.) was 1.6  $\mu$ F. C237 (5  $\mu$ F.) was 1.6  $\mu$ F.

16. The original circuit did not include taps X, Y and Z for the anodes of the D.C. restorers V9a, V9b and V10a. These taps were provided to cater for the variations in C.R.T. grid bases. C311 was added to prevent a radiation which showed up as patterning on Channel 5.

17. C310 was added to provide additional decoupling of the +20-volt line.

18. The input circuit of Tr27 was altered to increase the 6 Mc/s. rejection and to reduce the response at higher video frequencies. L212 (27 + 30 s.w.g.) was (20 + 26 s.w.g.). C246 (180 pF.) was 390 pF. L211 (35 + Litz) was (50 + Litz). R269 (1k) was 1.5k. C260 added across L211 (680 pF. inside can).



## COLOUR TELEVISION SERVICING

19. L418 and L419 were employed in the horizontal convergence circuits to apply both positive and negative tilts.

20. Tr34 replaced two OA10 diodes. This modification also caused a change in the wiring of the red and green line convergence coils. Convergence coils made for use with early chassis will not work with late chassis unless the red and two brown leads on the red line convergence coils are transposed.

21. D33 and D34 have been replaced by Tr35, (AD162). This is a similar connection to Tr34. R526 (8.2 ohms) was 6.8 ohms.

22. R346 (47k) and C308 (10 pF.) have been added in series across P16 and P20. R150 and C615 have been removed.

23. R370, R371, R372, R373, R374, R375, R376, R377, R378 and R379 were added to reduce the effects of flash-over in the C.R.T.

24. D31 and D32, were changed from type OA81 to type BA144.

25. To prevent lock-out on 405, R463 was changed, and a capacitor (C440) and a resistor (R461) was added. This modification was later found to give rise to bent verticals. Therefore, C440 and R461 were removed, and R463 was restored to its old value. To overcome lock-out on 405, R473 was made 820 ohms and not 1000 ohms.

26. In some receivers, C477 and C478 are replaced by a single 82-pF. capacitor.

27. R432 (33k) has been added in series with the lead from C414/R434 to the background controls. This resistor removes the third harmonic of the line pulse.

28. For H.T. rectification, some receivers use two BY100 diodes, and others employ a single 1N5054 diode.

29. The present pin-cushion transducer is Mullard AT4041/05. The earlier version was AT4041/03. A resistor R442 (22k) is used to damp the unused winding of the AT4041/05. It reduces distortion in the corners of the picture.

30. In present receivers, thermistor N600 is soldered to tags on R601 so that it remains at the correct distance of 0.25 in. from R601. In early receivers, N600 was soldered to a tag-strip and the wires bent so that N600 was in the correct position relative to R601. If N600 is wrongly positioned, variations in purity occur in sympathy with the beat frequency between the mains supply and the frame timebase.

31. The diameter of the system switch armature has been reduced from 0.375 in. to 0.345 in. to prevent the armature from jamming in the solenoid.

32. An 820k resistor has been added to the C.R.T. base panel between pin 14 (heater) and the end of R374 on the back plate (the end remote from pin 2 on C.R.T.).

33. F1 is now 2A anti-surge and not 3A.

**Cathode Ray Tube:** All models are fitted with a 25-in. C.R.T. A63-11X Mullard, or A63-13X R.C.A., or A63-16X R.C.A.

**Colour Faults:** See table on facing page.

# BAIRD

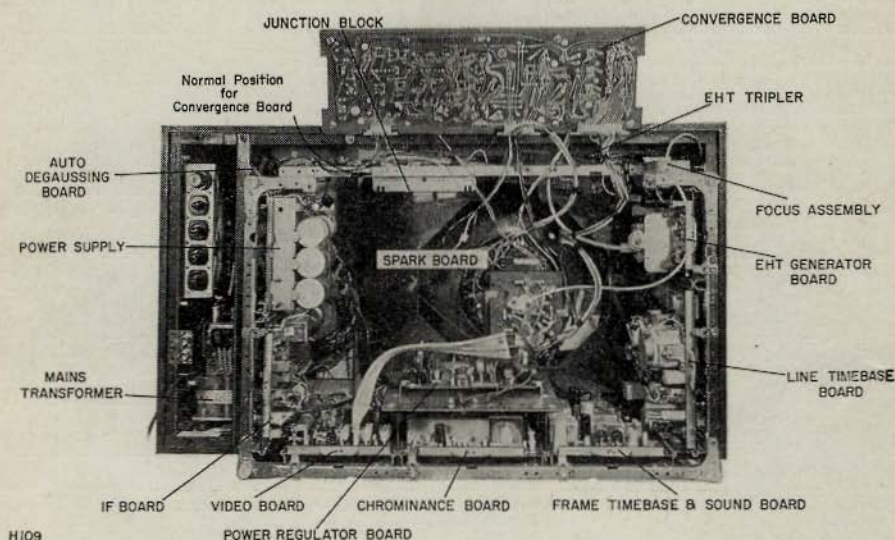
<i>Symptom</i>	<i>Cause</i>	<i>Cure</i>
Background suddenly becomes coloured	EB91 D.C. restoration diodes V9 or V10 damaged by flashover in C.R.T.	Replace faulty EB91 and introduce flash-over protection, if not already present
Background goes green, and receiver does not produce colour	Reference oscillator (Tr23) stopped. Intermittent faults often caused by diode D23 (BA102), or polystyrene capacitors C221, C222, C223, C219	Replace faulty diode or capacitor
Colour bars appear to be desaturated at the left-hand side of the screen, and over-saturated at the right-hand side. Background is magenta on left and green on right	C273, 50 $\mu$ F. electrolytic, is disconnected or O.C.	Repair connection or replace capacitor
Hanover bars in red, orange and magenta colours	OA90 diodes D26, D27 out of balance	Replace both diodes (with a matched pair)
Very weak colour	Leads from inverter L214/L215 S.C.	Sleeve as appropriate
Weak (B-Y) signal; no (R-Y) signal	Leads from inverter transformer L216/L217 S.C.	Sleeve as appropriate
Vertical band of incorrect colour on right or left side of picture—showing on red and cyan areas	PAL switching operation taking place during the active line period	Check that burst gating control R249 is sufficiently far advanced, and, if necessary, re-set L216A and L216B
Reference oscillator will not lock—impossible to obtain +6 volts on TP18	BA115 diodes D21, D22 out of balance	Replace faulty diode and re-set A.P.C. loop
Erratic locking of reference oscillator, and erratic operation of 7.8 kc/s. switch circuit—both affected by operation of contrast control	OA90, D20, burst gating pulse limiter S.C.	Replace D20
No colour—poor luminance performance. +20-volt line reads about +5 volts	Case of Tr33 touching emitter resistor R221	Move Tr33 so that its case cannot touch R221

## Convergence Faults:

<i>Symptom</i>	<i>Cause</i>	<i>Cure</i>
Insufficient range on horizontal R/G controls	OA10 diodes D35, D36 (early models) or AC128 transistor Tr34 (late models) S.C.	Replace faulty diodes or transistor
R/G out of convergence at edges of picture	1. OA10 diodes D35, D36 (early models) or AC128 transistor Tr34 (late models) O.C. 2. R517 or R524 5 ohms R/G amp. control O.C.	Replace faulty diodes or transistor Replace faulty control
Blue horizontal lines displaced from R, G, by about $\frac{1}{8}$ in.	OA10 diodes D33, D34 (early models) or transistor Tr35, AD162 (late models) S.C.	Replace faulty diodes or transistor
Intermittent variation in horizontal convergence	System switch on convergence panel out of adjustment. This may be due to a weak toggle action in S4	Re-set switch, or replace S4, as appropriate
Range of blue width control insufficient to achieve convergence at edges	Blue lateral magnet not correctly positioned over focus electrodes in C.R.T.; or connections of blue lateral magnet reversed; or magnet fitted back-to-front	Correct position of magnet; reverse connections; or remove and replace magnet correctly
R/G amp. does not move R relative to G, but moves both R and G sideways	Incorrectly wired convergence coils—coils wired to suit early convergence circuits having R/G tilt potentiometers	Transpose the RED and two BROWN leads on the line tags of the RED convergence coil
R/G amp. and R/G tilt pots. do not move R relative to G	Incorrectly wired convergence coils—coils wired to suit later convergence circuit having R/G tilt inductors	Transpose the RED and two BROWN leads on the line tags of the RED convergence coil

**BRC****2000 Series**

**General Description:** The 2000 Series is designed for the reception of colour and monochrome pictures on 625-lines and monochrome pictures on 405-lines. Modular construction has been used to simplify the technique of servicing. All the major circuits are mounted on printed board sub-assemblies which slide into the main chassis frame, automatically making most of their connections as they are pushed home. The integrated tuner is also connected by plugs and sockets.



(H109) 19-INCH SCREEN MODEL

**Warning:** The receiver must not be connected to D.C. mains supplies.

**Note:** All general pre-set adjustments should be made with the receiver set to a V.H.F. channel unless otherwise stated.

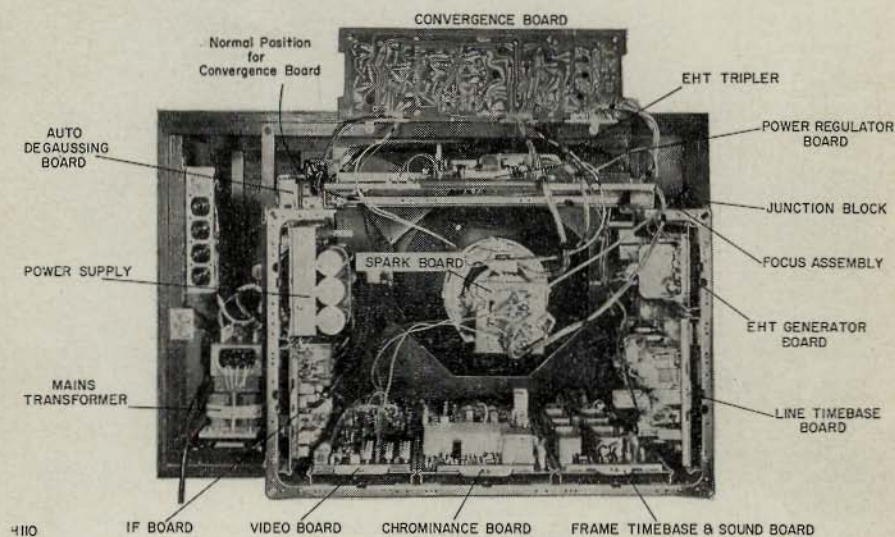
**A.C. Mains Connection:** The receiver is fitted with a 3-core mains lead which should be connected to a suitable 3-pin plug. Before connecting to the mains supply ensure that the plug-in links on the mains transformer are connected to the appropriate taps. In addition to the 200-volt, 220-volt, 240-volt taps a 0-10-volt tap is provided. Used in combination these taps cover 200-250 volts in 10-volt steps. It is important that the mains voltage taps are adjusted correctly for correct operation of the H.T. regulator and colour tube.

**Aerials:** Separate aerials are recommended for V.H.F. and U.H.F. The V.H.F. aerial should be a combined Bands I and III type. A wide bandwidth U.H.F. aerial should be selected to ensure satisfactory reception of the colour sub-carrier. It should be carefully sited for best signal-



strength with freedom from ghosting. If combined V.H.F.-U.H.F. aerials are used, priority of positioning should be given to the U.H.F. array. The U.H.F. and V.H.F. aerials should be fed to the receiver with separate 75-ohm coaxial cables, and in accordance with R.T.R.A. recommendations the outer braiding of the feeders should be properly earthed. It should be noted that the aerial sockets on the colour receiver are wired to connect the outer of the cable direct to chassis which, when using a three-pin mains plug, is at mains earth potential.

**Fuses:** A 2-amp delay type fuse is incorporated in the mains input circuit. Fusible resistors are incorporated in the solenoid circuits and in the various H.T. lines—see Fusible Resistors.



(H110) 25-INCH SCREEN MODEL

**Electronic Trip:** An electronic trip circuit is incorporated in the 52-55-volt supply to the Line Timebase board and automatically cuts off this supply in the presence of voltage surges which might otherwise cause damage. The supply is normally restored by switching off the receiver for about 30 sec. If the picture fails to appear after switching on again, check for a fault condition.

**Contrast:** Independent 405 and 625 controls are provided for V.H.F. and U.H.F. reception. 625 Contrast adjustments should be made with the Colour control at minimum.

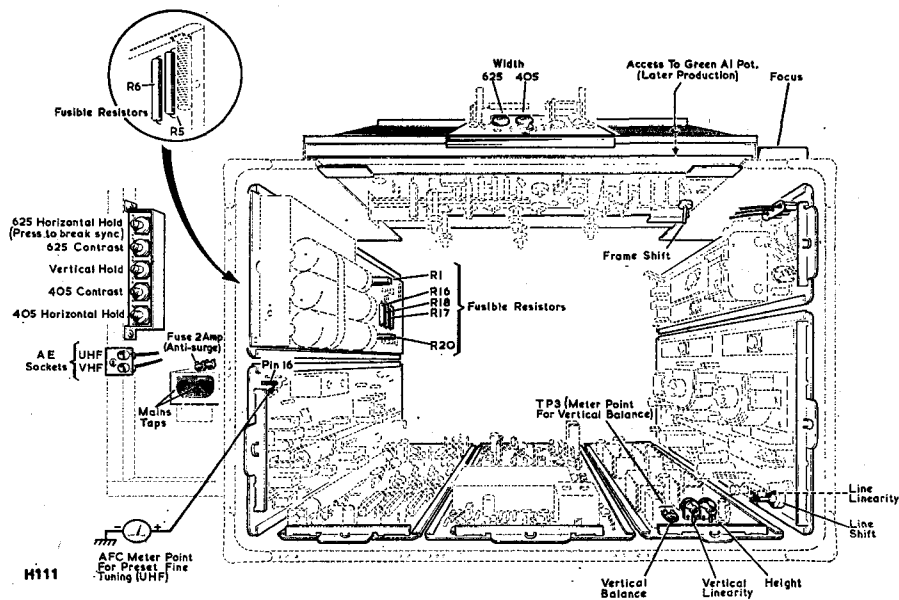
**625 Horizontal Hold:** Push in the spring-loaded control to break sync. and rotate to obtain a floating but resolved picture. Release the control and the picture should lock.

**405 Horizontal Hold:** The sync. breaking facility of the 625-Horizontal Hold should be used when adjusting the 405-Horizontal Hold.



## COLOUR TELEVISION SERVICING

**Fusible Resistors:** R<sub>1</sub> in the main H.T. supply to the E.H.T. Generator. R<sub>5</sub> in the general 30-volt supply to Tuner, I.F. and Video boards, etc. R<sub>6</sub> in the H.T. supply to the Chrominance circuits. R<sub>16</sub> in series with I.F. system switch solenoid, R<sub>17</sub> in series with Convergence board system switch solenoid, and R<sub>18</sub> in series with the Line Timebase system switch solenoid. The solenoids are fed from the 240-volt winding on the mains transformer. R<sub>20</sub> in the 270-volt smoothing circuit feeds the Video output collectors, partially supplies the E.H.T. Generator, and supplies the 68-volt reference for the Regulator. The fusible links may be resoldered to make contact after eliminating any overload condition.

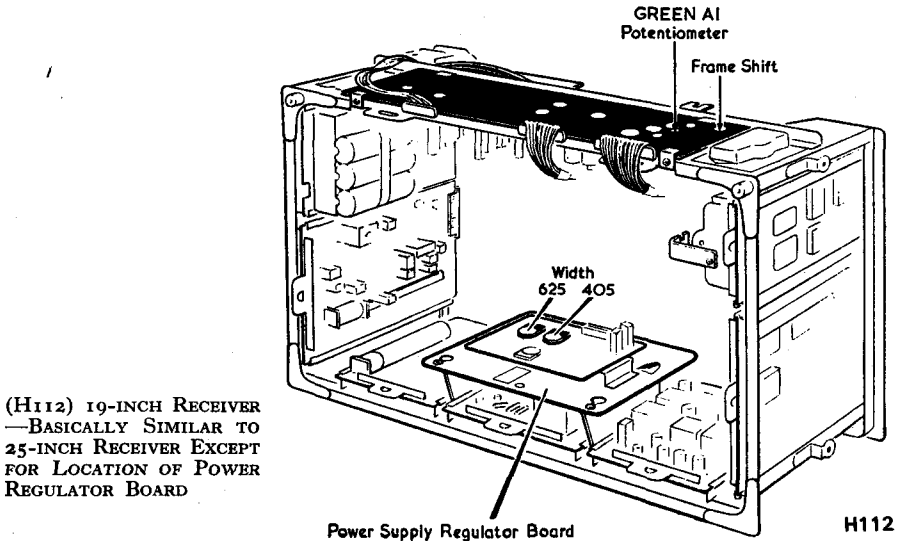


(H111) INSTALLATION ADJUSTMENTS—25-INCH RECEIVER

**Pre-set Push-Button Fine Tuning:** With the selector button depressed pull the button outwards against the spring pressure while rotating to tune in the required channel. Clockwise rotation increases the frequency.

**V.H.F. Channels:** Tuning adjustment should be made as soon as possible after switch-on from cold. The button should be adjusted to a point which is mid-way between the position where sound on vision occurs and the position where degradation of picture quality sets in. If the adjustment must be made when the receiver has been switched on for a considerable time, then select a tuning point which is closer to the onset of picture degradation. When all available V.H.F. channels have been adjusted, as described, select each channel in turn to check that button latching has been correct during the initial adjustment.

## BRC



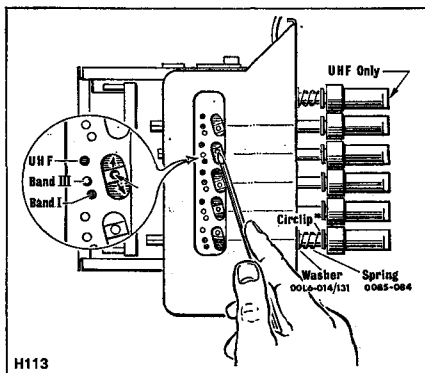
(H112) 19-INCH RECEIVER  
—BASICALLY SIMILAR TO  
25-INCH RECEIVER EXCEPT  
FOR LOCATION OF POWER  
REGULATOR BOARD

**U.H.F. Channels:** Because of the critical nature of tuning-in a colour transmission, automatic frequency control (A.F.C.) is employed on U.H.F channels. In order to fully utilise the benefit of the A.F.C. system it is essential that the U.H.F. buttons are tuned to the middle of the “pull-in” range.

The following simple procedure for tuning to the centre of the “pull-in” range must be made within 20 minutes of switch-on from cold. A D.C volt-meter, such as an Avometer Model 8 on 100-volt range, should be connected positive to pin 16 (top rear corner of I.F. board) and negative to chassis. (i) Adjust button for picture and sound. (ii) Turn the button slowly clockwise until the picture shows patterning but does not break-up. (iii) Turn button slowly anti-clockwise until meter indicates 13 volts approximately.

After all available U.H.F. channels have been adjusted, re-select each channel in turn to check that button latching has been correct during initial adjustments.

**Push-Button Band Changing:** With the exception of the top button which tunes the U.H.F. band only, all other buttons can be adjusted to tune over any band. When changing the position of one of the selectors, ensure that the associated button is not depressed and that the locating pip locks securely in the correct hole. The 405/625 switching is operated by a coil spring and washer fitted over each U.H.F. push-button spindle. If it is required to change a push-button from 405 to 625 operation, a spring and washer must be fitted to the associated push-button spindle. Conversely, if it is required to change a button from 625 to 405 operation, then the spring and washer must be removed from the associated spindle. To remove or fit



(H113) PUSH-BUTTON BAND CHANGING

a spring washer, pull off the push-button while gripping the spindle with pliers to avoid damage to the nylon spindle stop and remove the spring retaining circlip. When re-fitting the circlip ensure that it fits into the slot nearest the push-button end, and grip spindle when replacing button.

**V.H.F. Wired Distribution Systems:** With the exception of the top button which tunes the U.H.F. bands only, all other push-buttons can be adjusted to tune over V.H.F. Band I or Band III. For 625-line operation at V.H.F., simply adjust the band selector of the bottom U.H.F. button. This can be done without removing the tuner from the cabinet. It is important that the button is not depressed while this adjustment is made. If existing V.H.F. buttons are required to operate on 625-lines, additional springs and washers are necessary and are obtainable from Service depots.

**Picture Size Adjustments:** The height control should be adjusted so that the castellations at top and bottom of Test Card D are partially excluded and the width control set up for the best formation of the circle in the centre. The width control must not be set up for excessive overscan otherwise the line H.T. regulator may be overrun causing hum bars.

**Line Linearity:** The adjustable core has a square hole which accepts a non-magnetic trimming tool one-tenth of an inch wide. Adjust in conjunction with the width control while observing a test card to correctly proportion the picture.

**Frame Linearity:** Adjust in conjunction with the height control for a correctly proportioned picture.

**Note:** If a large change in the height adjustment is made it will be necessary to check the vertical balance adjustment as follows: (1) Adjust height and frame linearity. (2) Readjust height. (3) Adjust vertical balance for 24-volt D.C. at Test Point 3 on frame and sound board. (4) Readjust height.

**Picture Squaring:** To square up the picture with the mask slacken off the clamp screw securing the deflection coils housing and rotate the complete assembly as necessary. Before retightening the screw ensure that the housing is hard up against the flare of the tube neck. Finally check the purity adjustments.

**Picture Centering:** First check the line-hold adjustments and then, if necessary, adjust the line-shift and frame-shift pre-sets to centre the picture.

**Magnetic Field Effects:** The receivers leave the factory with all the colour tube adjustments set-up in a normal magnetic environment in such a

way that the receivers do not favour any particular orientation. Receivers set-up under these conditions should provide satisfactory pictures on installation without further adjustments for purity. It must be stressed however, that colour receivers are nevertheless susceptible to magnetic fields caused by large ferrous objects such as boilers, radiators, pre-stressed concrete beams and steel-framed buildings which could alter the normal field pattern to a degree that would make purity and static convergence adjustments necessary during installation. Generally, the vast majority of dwellings are of traditional construction and will normally be free of these effects.

**Automatic Degaussing:** A built-in degaussing coil effectively neutralises all but the most severe magnetism in the colour tube and surrounding shield due to changes in working position, or magnetism induced into the colour tube caused by a magnetic device being brought near to the faceplate. The automatic degaussing circuit operates whenever the set is switched on or when a change in line-system is made during push-button selection. Should the receiver become magnetised during a transmission, all that is necessary is to select another channel which involves a line-system change and allow approximately ten seconds for the degaussing process to take place before re-selecting the original channel.

**Manual Degaussing:** In an isolated case of severe magnetisation such as might be induced during transit by a large electric motor, e.g. a fork-lift truck or an electric train, a stronger degaussing field will be required and an external coil connected to the mains supply will be necessary.

**Coil Details:** A suitable 1900 ampere-turn degaussing coil for intermittent use may be made up of 800 turns of 24 S.W.G. enamelled copper wire, wound on a 12-inch diameter mandrel. This should be double-wrapped with Empire or PVC tape for insulation and connected to approximately five yards of suitable cable. Such a coil will provide a localised field of 75 gauss measured half-inch from the exterior of the winding.

**Procedure:** Connect coil to the A.C. mains supply—the receiver need not be switched off. Move the coil slowly about the faceplate of the C.R.T. and over the top, bottom and sides of the cabinet—*never over the back*. One minute is quite long enough to cure any isolated case of induced magnetism. Finish with the coil over the centre of the screen and withdraw it slowly to a distance of at least eight feet before disconnecting it from the mains supply. In a service department or showroom, this also means eight feet from any other colour receiver whether operating or not.

The external degaussing coil may also be used to neutralise the field disturbance produced by ferrous objects such as radiators located near the receiver, although good installation practice should ensure that, whenever possible, the receiver is positioned well away from such objects.

**Static Convergence and Purity:** A preliminary adjustment, for static convergence will be necessary before purity is adjusted due to both adjustments being to some extent interdependent. Withdraw the convergence board from its mounting and fit into chassis lugs in vertical position with controls facing towards front of receiver. Manually degauss the receiver

and set-up all normal black-and-white adjustments affecting picture size, shape, position, linearity, etc. Allow the receiver to warm up with brightness control advanced to a high brilliance level for approximately 20 minutes before commencing adjustments. Select a 625-line channel. Connect a 405-625-line cross-hatch dot generator to receiver aerial sockets.

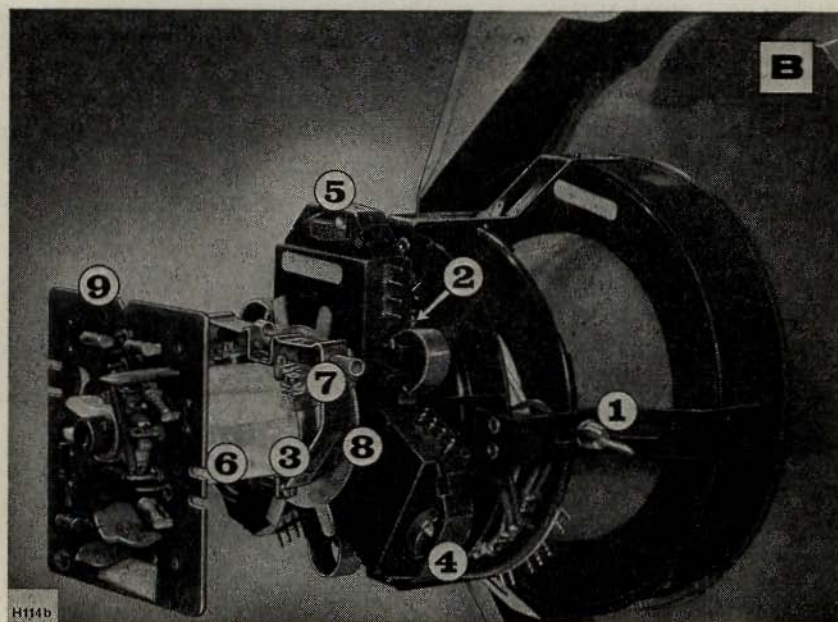
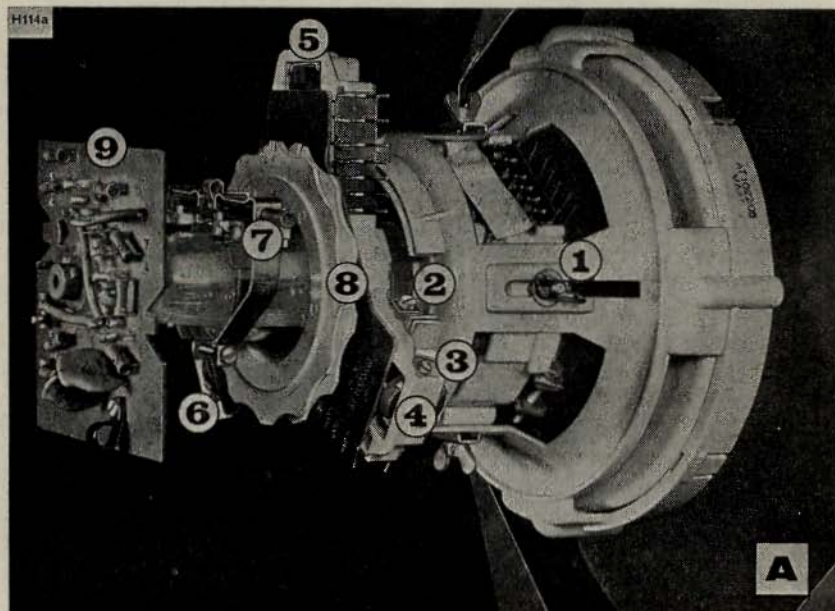
*Note:* When possible use a widely-spaced dot or cross-hatch pattern to avoid error of converging with the wrong dot. If a closely-spaced dot pattern must be used, make preliminary coarse convergence adjustments on broadcast picture before using pattern generator.

**Static Convergence Adjustment:** Red, green, and blue beam switches and 405 blue and R.G. clamp adjustments are located on the convergence board as shown below. All other adjustments are located on the tube neck assembly. Switch off the blue beam and rotate the red and green magnets on the convergence yoke to obtain convergence where the centre vertical and centre horizontal lines of the cross-hatch intersect at the centre of the screen. Switch on the blue beam, rotate the blue magnet on the convergence yoke and rotate the tube containing the blue lateral magnets on the neck to converge blue with red and green at the centre of the screen. Switch to a 405-line channel and if necessary adjust the clamps for blue and R.G. reconvergence.

**Purity Adjustment:** Switch off the green and blue beams leaving a *red* screen. Slacken the locking nuts securing the deflection yoke and slide the yoke backwards in its housing to the limit of its travel. Rotate both purity ring magnets relative to each other to obtain a uniform red patch at the screen centre. Slide the deflection yoke forward while observing the entire screen area until a position is found which gives an optimum overall red screen. Secure the yoke in this position. Check the blue and green fields for overall purity. *Repeat the static convergence and purity adjustments until three clear fields are obtained.*

**Grey Scale Tracking (Set White):** The ability of the colour receiver to produce a true white picture is dependent upon the grey-scale tracking adjustments. The complete adjustment procedure should only become necessary after replacing the C.R.T., frame timebase and sound board, video board or convergence board; or if it is suspected that the tracking adjustments have been disturbed. Generally, any slight coloration which cannot be removed by adjustment of the tint control (overall red or blue) or the green A1 potentiometer (overall purple or green) may be satisfactorily cleared by trimming the video gain pre-sets and/or the video bias pre-sets as described in the complete procedure.

**Dynamic Convergence Adjustments:** Dynamic convergence adjustments should only be attempted after purity, static convergence and grey-scale tracking adjustments have been made. It will be necessary to recheck and, if necessary, readjust static convergence after each adjustment during the dynamic convergence procedure which is shown for simplicity in illustrative form. The illustration shows the location of the controls, the area of the screen affected by each control and the necessary sequence of adjustments.



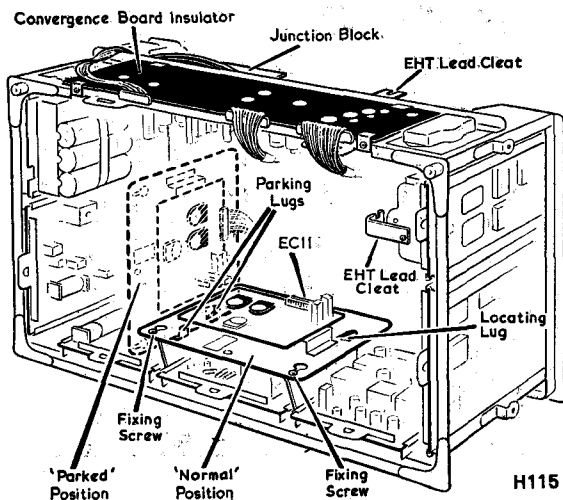
(H114) C.R.T. NECK ASSEMBLY

When following the sequence it should be noted that some controls—particularly those affecting the same axis—are to some extent interdependent and should therefore be adjusted in a complementary manner.

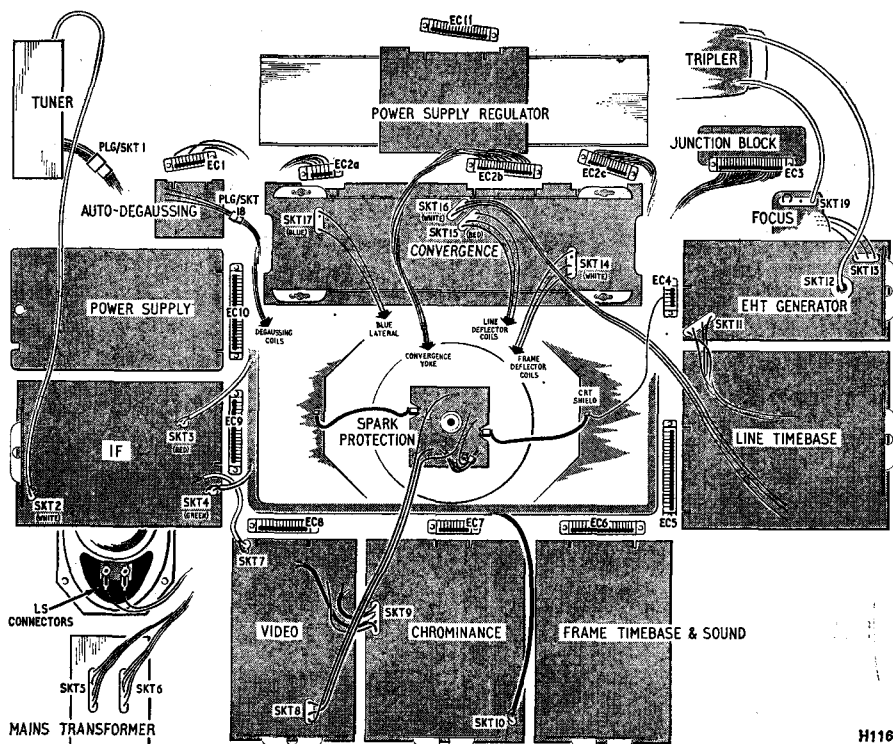
The following points should be noted if difficulty is experienced in obtaining dynamic blue lateral convergence. 1. For the adjustments to have maximum effect the blue lateral assembly should be as close as possible to the convergence yoke. 2. If convergence cannot be obtained within the limits of the adjustments, reverse SKT17 (on convergence board) and repeat the adjustments. 3. Where the left- and right-hand blue verticals are horizontally displaced by unequal amounts, unplug the socket and rotate the convergence yoke slightly to achieve equal separations and then replace SKT17. 4. In some receivers dynamic blue lateral correction is unnecessary and the blue lateral may then be left disconnected (in later production a "parking" pin is provided on the board for this purpose).

**C.R.T. Neck Assembly:** See diagram H114 A and B. 1. Positioning locking nut for deflection yoke. 2. Clamp screw for deflection housing. 3. Type A—Securing screw for convergence yoke. Type B—Securing screw for convergence yoke and blue lateral. 4. Red static convergence magnet. 5. Blue static convergence magnet. 6. Green static convergence magnet. 7. Tube containing the blue lateral convergence magnets. 8. Purity ring magnets. 9. Spark protection board including tube base connector.

**Main Chassis:** The main chassis frame is mounted on four cabinet brackets. With the convergence board in its normal position, the four mounting nuts may be slackened to enable the chassis to be drawn back out of the cabinet along the brackets until the mounting studs engage with the slots at the ends. The mounting nuts should then be tightened. With the chassis in this servicing position, access to the interior of the receiver is improved and the copper sides of most printed boards exposed. The cabinet



(H115) 19-INCH CHASSIS  
SHOWING PARKING POSITION  
OF POWER REGULATOR BOARD



H116

(H116) PRINTED BOARD LOCATIONS, ETC. ON 19-INCH CHASSIS POWER SUPPLY REGULATOR BOARD IS MOUNTED ON TWO BRACKETS ABOVE THE CHROMINANCE BOARD

may be turned on to its side for access to bottom boards. In 19-inch receivers a "parking" position for the power regulator board is provided to allow access to the component side of the chrominance board.

**Printed Board Removal:** Similar type connectors are colour-coded for easy identification. Before separating plug and socket connectors or floating edge-connectors, note the orientation of the associated cableforms so that similar routing may be employed when replacing. The 8KV pulse lead to the tripler must always be dressed carefully to avoid direct contact with any metalwork. When removing printed boards ensure that the board retainers do not interfere with the copper sides during withdrawal—the retainers are slotted to provide sufficient clearance without completely removing the screw. However, it is advisable to completely remove the retainers securing the vertically mounted boards to avoid accidental damage. Ensure that the insulator fitted over the copper side of the convergence board in 19-inch receivers is refitted when replacing the board.

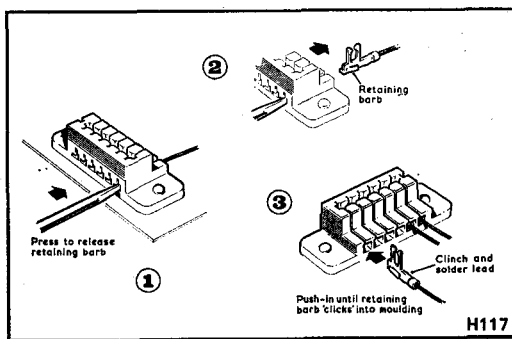
**Note:** Ensure that the receiver is switched off before removing or inserting printed boards or disconnecting plugs and sockets.



**Plug and Socket Connectors:** When removing a socket from the printed board plug pins, the socket may be rocked longways to ease removal. Do not rock sideways and see the information given for edge-connectors.

**Floating Edge-Connectors:** A similar technique to that described for plug and socket connectors is recommended when freeing floating edge-connectors. If the connector is very tight, insert a wide bladed screwdriver between the end lug of the connector and the board, and turn the blade. The following boards employ *floating* edge-connectors, and the removal procedure is as follows:

**Automatic Degaussing:** Remove edge-connector EC1, separate plug and socket connector PLG18-SKT18 in the leads to the degauss coils and release board from four spring-clips.



(H117) EDGE-CONNECTOR CONTACT REPLACEMENT

The clinching lugs should be neatly folded and a minimum of solder applied.

**Power Supply Regulator (including Heat-Sink): 25-inch Receivers:** Pull off edge-connector EC11 and release the complete assembly by removing four screws securing the heat-sink in the chassis. **19-inch Receivers:** Pull off the edge-connector EC11, slacken two fixing screws in keyhole slots and withdraw the assembly by disengaging the heat-sink locating lugs from slots in the mounting brackets.

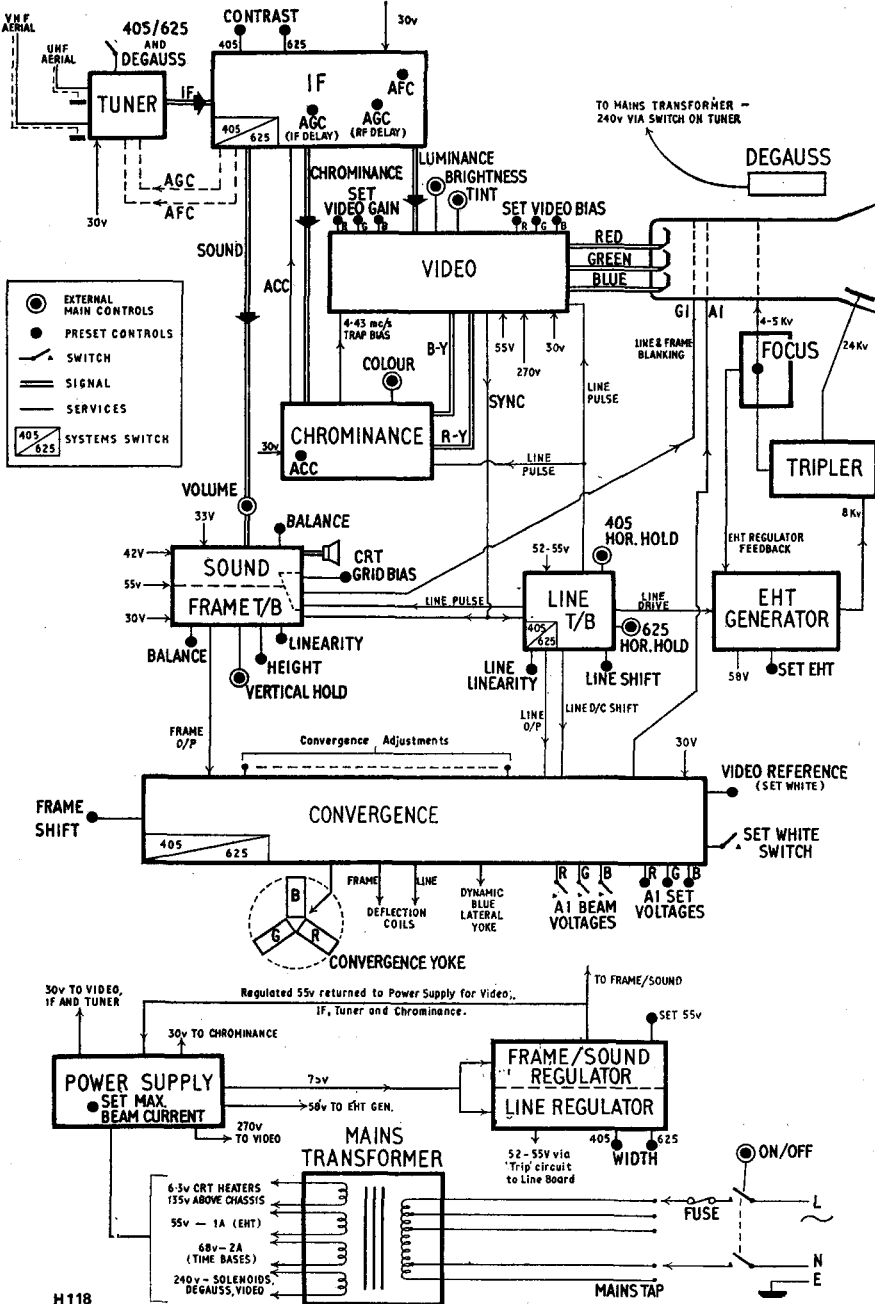
**Convergence:** Remove three edge-connectors EC2A-B-C and disconnect SKT14, SKT15, SKT16 and SKT17. Remove two board retainers and withdraw board from two edge clips.

**Fixed Edge-Connectors:** An extractor tab is fitted at the outer end of each board employing a fixed edge-connector to facilitate removal and replacement. A screwdriver inserted through the hole in the tab should be used against the chassis to lever a board out of its edge-connector. A similar technique should be employed by inserting the blade through the hole in the chassis rail when inserting this type of board to ensure that board and edge-connector are fully engaged. All the following boards employ *fixed* edge-connectors and the removal procedure is as follows:

**Power Supply:** Release sub-chassis retainer and withdraw.

**I.F.:** Disconnect SKT2, SKT3 and SKT4, also SKT7 on the video board. Release I.F. board retainer and withdraw.

# BRC



(H118) BLOCK DIAGRAM—2000 SERIES

## COLOUR TELEVISION SERVICING

**Video:** Disconnect SKT7 and SKT8, also SKT9 on the chrominance board. Release the video board retainer and withdraw. See Note 1.

**Chrominance:** Disconnect SKT9 and SKT10. Release board retainer and withdraw. See Note 1.

**Note 1.** On 19-inch receivers the power supply regulator must be removed first.

**Frame Timebase and Sound:** Release board retainer and withdraw.

**Line Timebase:** Disconnect SKT11 on E.H.T. generator board, and SKT16 on convergence board. Release the line timebase board retainer and withdraw.

**E.H.T. Generator:** Disconnect SKT11, SKT12 and SKT13. Release the board retainer and withdraw.

### Removal of Additional Assemblies

**Loudspeaker:** Unplug two connectors from the speech coil tags and remove four PVC end caps to release the loudspeaker.

**Mains Transformer:** Disconnect SKT5 and SKT6 from the transformer. Remove four 2BA nuts and washers and withdraw the complete assembly from the mounting studs.

**Convergence Yoke:** *Type A:* The yoke engages with the circular channel at the rear of the deflector coils housing. Pull off the spark protection board assembly. Slacken the blue lateral assembly clamp and withdraw from the neck. Slacken the convergence yoke retaining screw. Turn the convergence yoke in an anti-clockwise direction and withdraw. *Type B:* Pull off the spark protection board assembly. Slacken the blue lateral assembly clamp and withdraw the blue lateral assembly and convergence yoke. When refitting ensure that the yoke is close up against the deflector coils and that no leads are trapped between assemblies.

**Tripler Assembly:** Unplug SKT12 from E.H.T. Generator board and SKT19 from focus assembly. Slacken locking nut to release tripler assembly from tube shield and unplug the assembly from E.H.T. cavity socket.

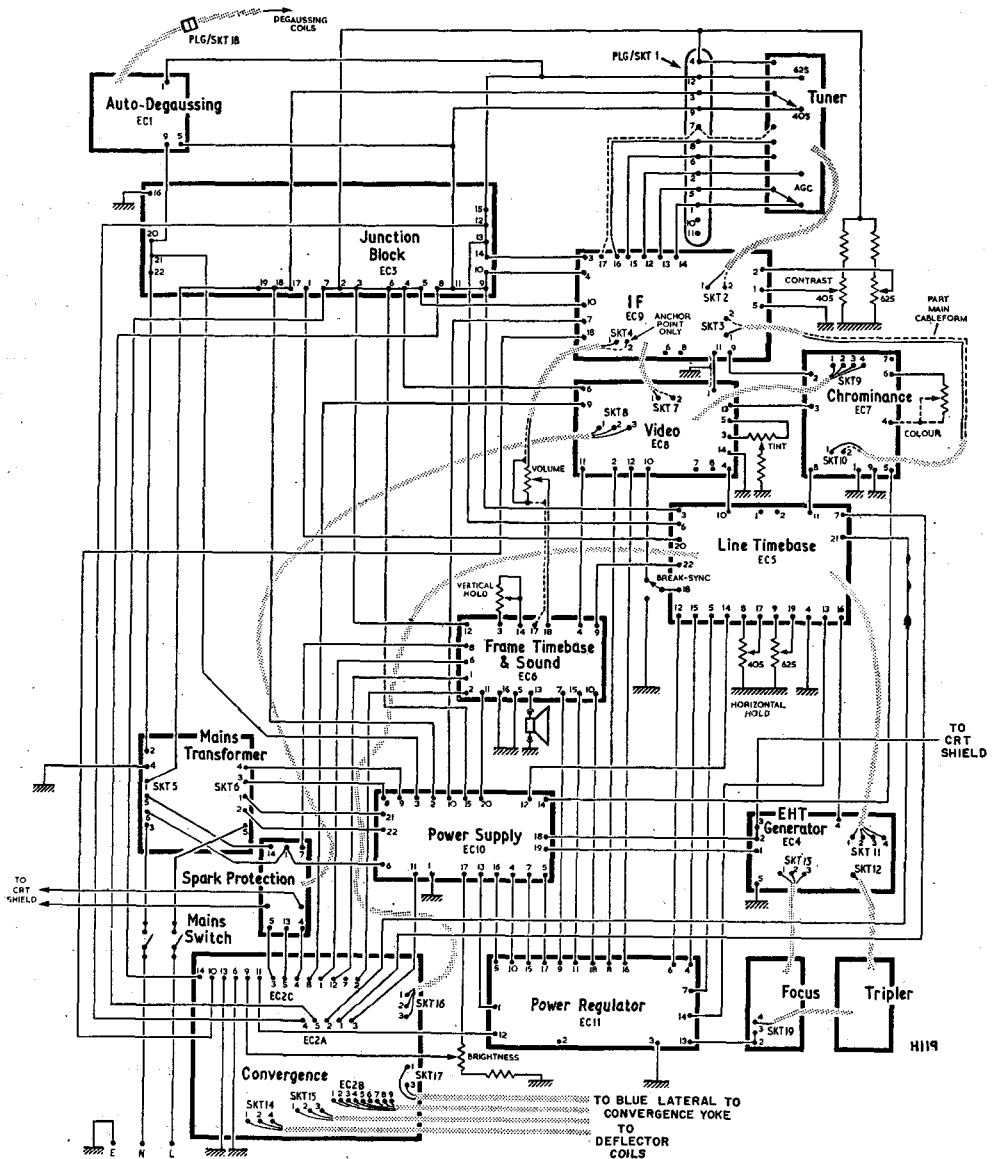
**Integrated Tuner Unit:** Remove screw to release aerial socket panel from cabinet. Disconnect SKT2 from I.F. board and disconnect PLG1/SKT1 in tuner cableform. Remove two brass nuts to release tuner from cabinet.

**Chassis Removal:** Withdraw chassis to servicing position. Pull off front control knobs and release front controls mounting panels, also release auxiliary controls panel from rear of cabinet. Unplug the following:

1. Floating connectors PLG1/SKT1 in tuner cableform and PLG18/SKT18 in degaussing coil leads.
2. Two mains transformer connectors SKT5 and SKT6 on transformer.
3. Loudspeaker amp.-connectors on loudspeaker.
4. Tuner I.F. coaxial lead SKT2 on I.F. board.
5. E.H.T. lead SKT19 on focus control assembly and E.H.T. lead SKT12 on E.H.T. transformer.
6. Cathode feed connector SKT8 on video board.
7. Four connectors SKT14-17 and edge-connector EC2B on convergence board to free tube neck assembly.
8. Two earthing leads on C.R.T. shield to spark

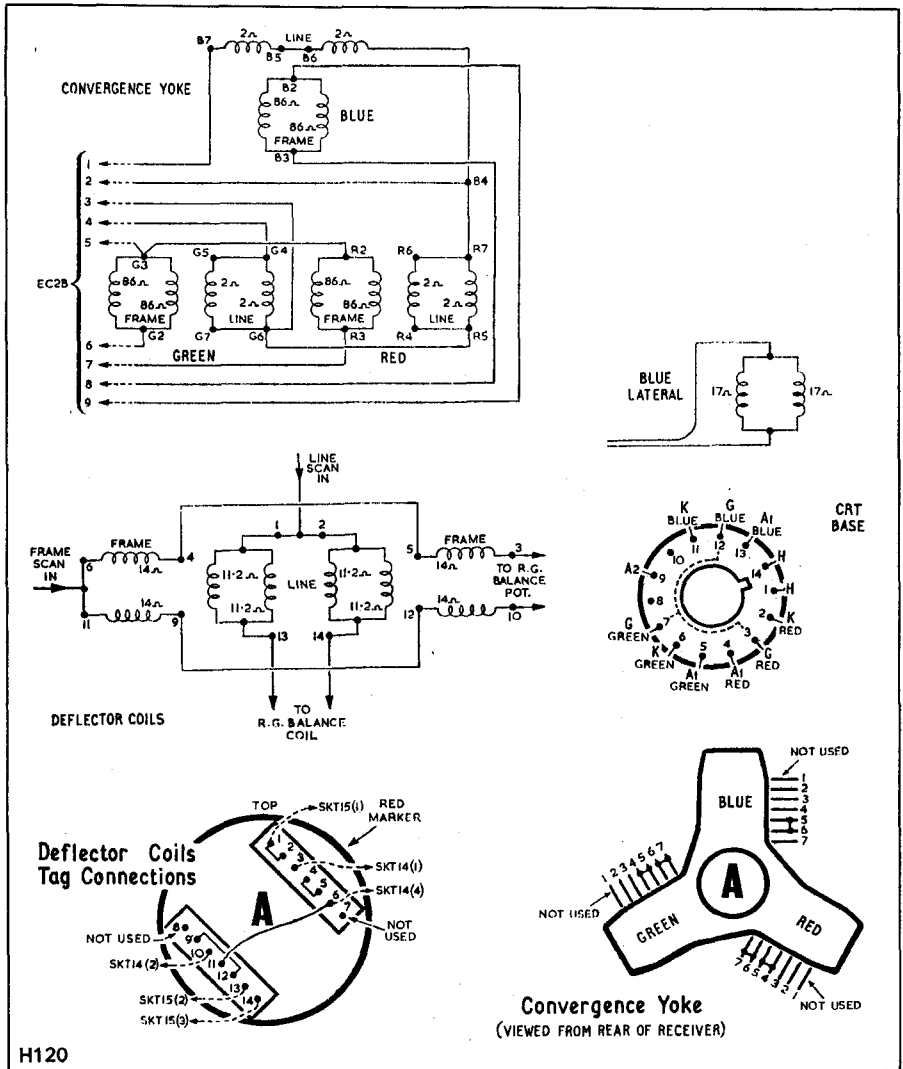
**BRC**

protection board and one earthing lead on C.R.T. shield to E.H.T. board. One earthing lead on deflector coils housing (Type B C.R.T. neck assembly only). 9. Spark protection board assembly from C.R.T.



## (H119) INTERCONNECTIONS WIRING—2000 SERIES

# COLOUR TELEVISION SERVICING



H120

## (H120) COMPONENT DETAILS

Slacken the chassis mounting nuts. The chassis may now be lifted free of the cabinet.

**C.R.T. Replacement:** *Colour Tube Types:* 25-inch CTA2550/A63-11X; 19-inch CTA1950/A49-11X.

Remove the chassis assembly. Release the locking nut securing the E.H.T. tripler assembly and detach the assembly from the E.H.T. cavity socket. Slacken the blue lateral clamp and withdraw the assembly from the

tube neck. Slacken the deflection unit housing clamp and withdraw the complete assembly, including the convergence yoke and purity magnets, from the tube neck.

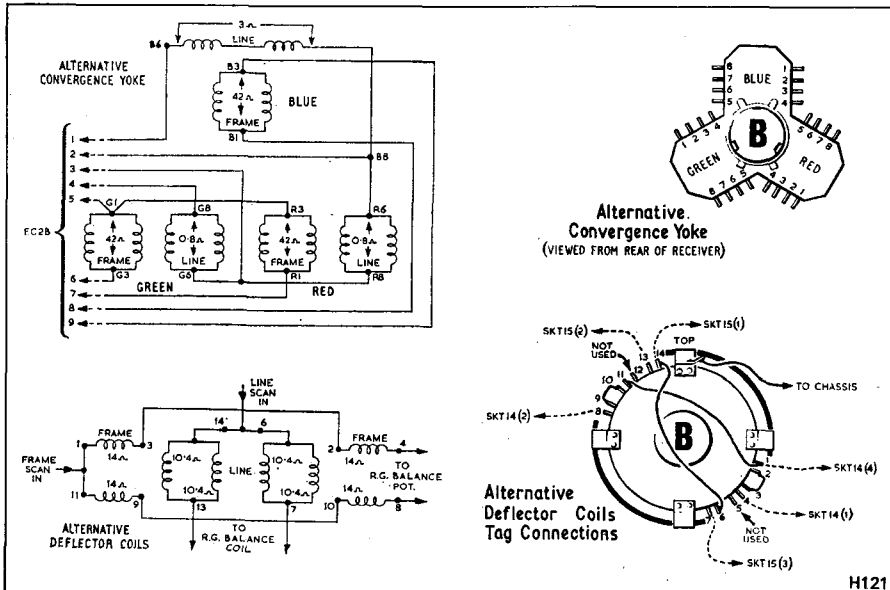
Place the cabinet face downwards on a clean padded surface—if possible rest the cabinet on two edge supports so that it is possible to visually check the new tube during fitting for registration within the mask.

Remove the four corner nuts securing the tube magnetic shield and withdraw the shield. With the shield withdrawn remove four nuts and washers securing the tube mounting brackets. Carefully remove the tube—do not lift by the neck.

Spin down the four knurled nuts on the tube mounting studs and insert the new tube so that it sits on the mask with the E.H.T. cavity socket towards the top of the cabinet. Adjust the tube until it appears central in the mask opening. Retract the knurled nuts under the tube brackets until they touch the brackets and just take the weight of the tube off the mask.

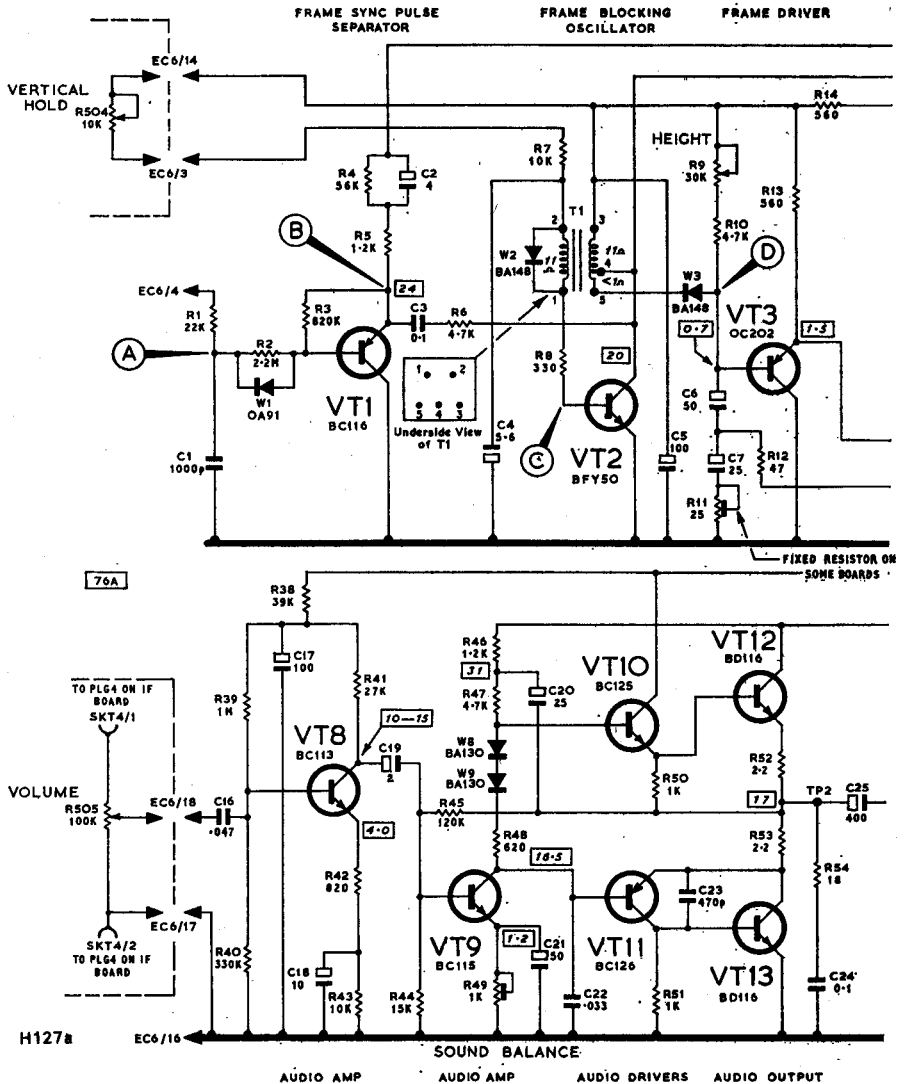
Refit the tube fixing washers (one elongated and one plain washer over each stud) and nuts followed by the tube shield and the tube shield fixing nuts. Refit the tube neck assembly with the red coding mark on the Type A deflection housing towards the top of the cabinet (the word TOP is printed on Type B assemblies). Replace the E.H.T. tripler assembly. Refit the chassis ensuring that all connections are correctly made.

Check and adjust where necessary in the following order: static convergence, picture squaring, purity, picture size, picture shift, grey-scale tracking and dynamic convergence.



(H121) ALTERNATIVE COMPONENT DETAILS

## COLOUR TELEVISION SERVICING

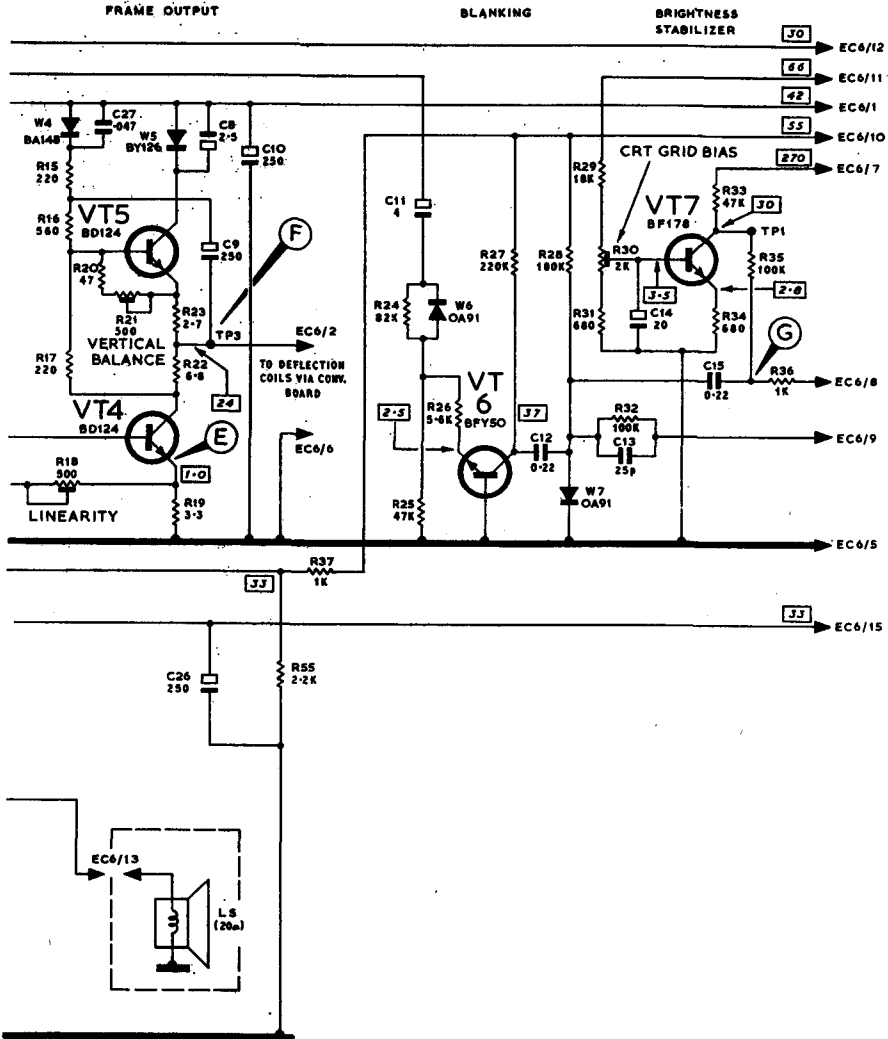


### Interconnection Details (Frame Timebase and Sound):

#### EC6

1. 42 volts H.T. from convergence EC2C/12
2. To convergence EC2C/2
3. To vertical hold
4. Sync. in from video EC8/11
5. Frame earth to chassis
6. Frame scan earth return from convergence EC2C/1
7. 270 volts from power regulator EC11/9
8. D.C. bias to C.R.T. grids (30 volts approx.)

# BRC



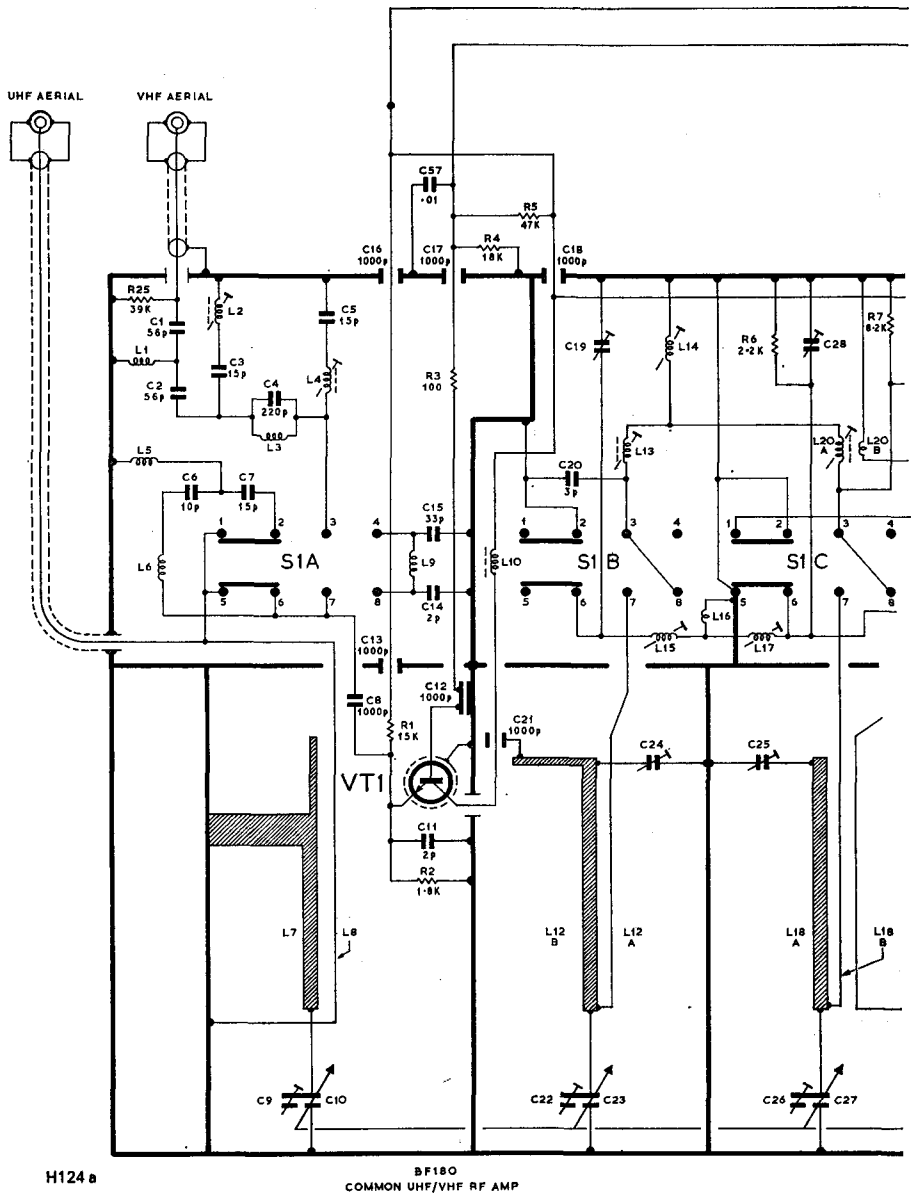
H127 b

(H127b) FRAME TIMEBASE AND SOUND (CONTINUED)

- |                                                  |                                           |
|--------------------------------------------------|-------------------------------------------|
| 9. 220-volt line pulse from line timebase EC5/22 | 13. To loudspeaker live side              |
| 10. 55 volts from power regulator EC11/18        | 14. To vertical hold                      |
| 11. 66 volts from power supply EC10/20           | 15. 33 volts from power regulator EC11/11 |
| 12. 30 volts from junction block EC3/3           | 16. Audio earth return to chassis         |
|                                                  | 17. Earth for volume control feed         |
|                                                  | 18. Audio input from volume control       |



# COLOUR TELEVISION SERVICING

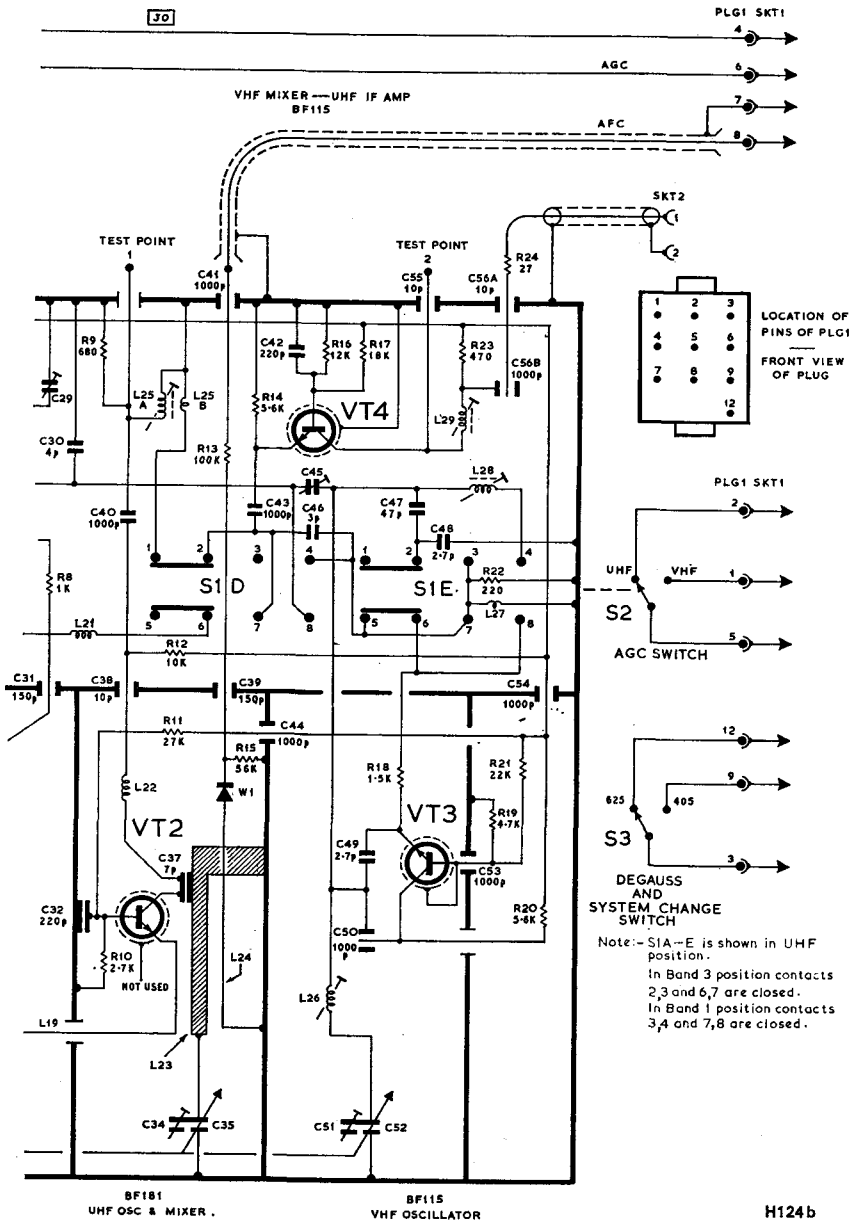


H124a

BF180  
COMMON UHF/VHF RF AMP

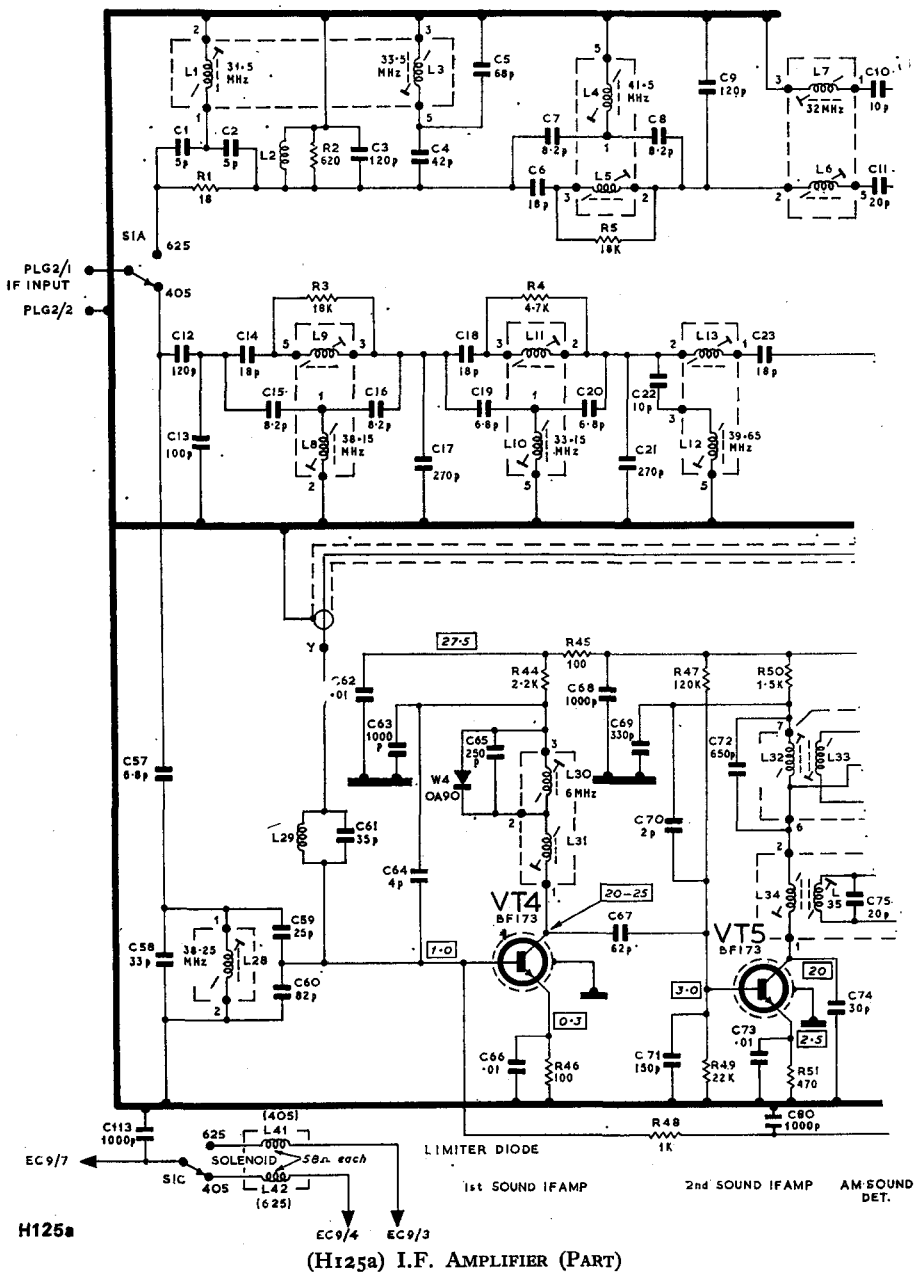
(H124a) INTEGRATED TUNER (PART)

# BRC



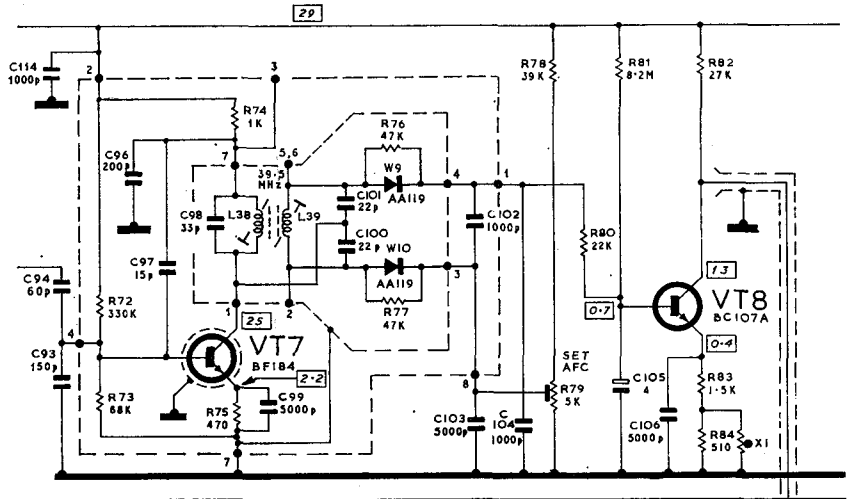
(H124b) INTEGRATED TUNER (CONTINUED)

# COLOUR TELEVISION SERVICING



### 3rd VISION IF AMP

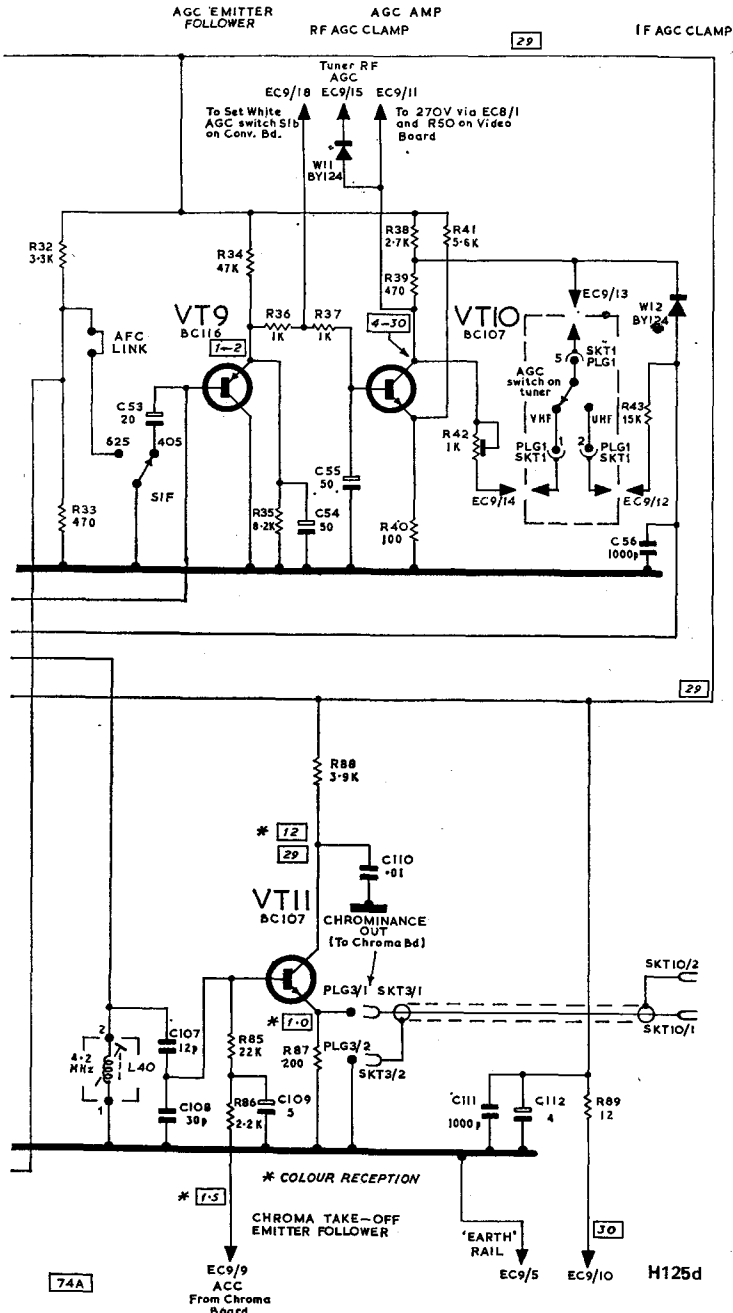
VISION DET



EC9/17    EC9/16  
AFC OUT  
(To Tuner)

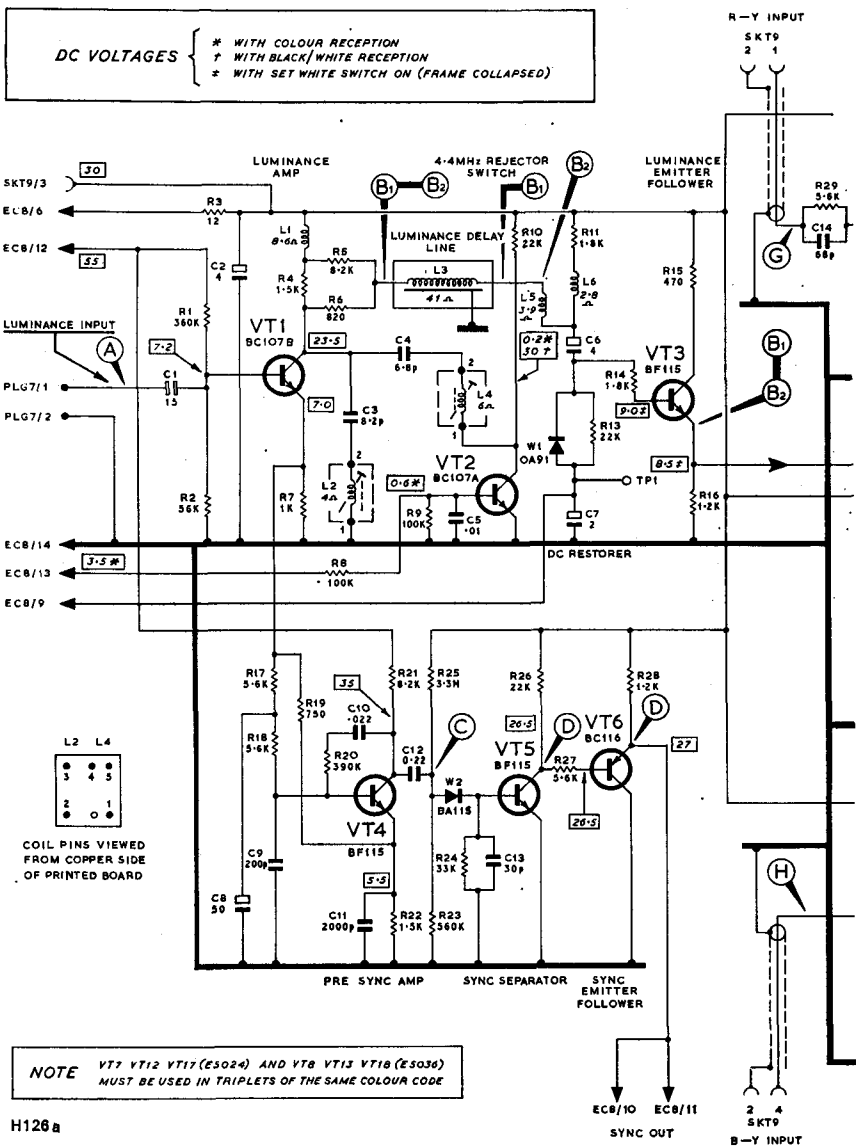
40

# BRC

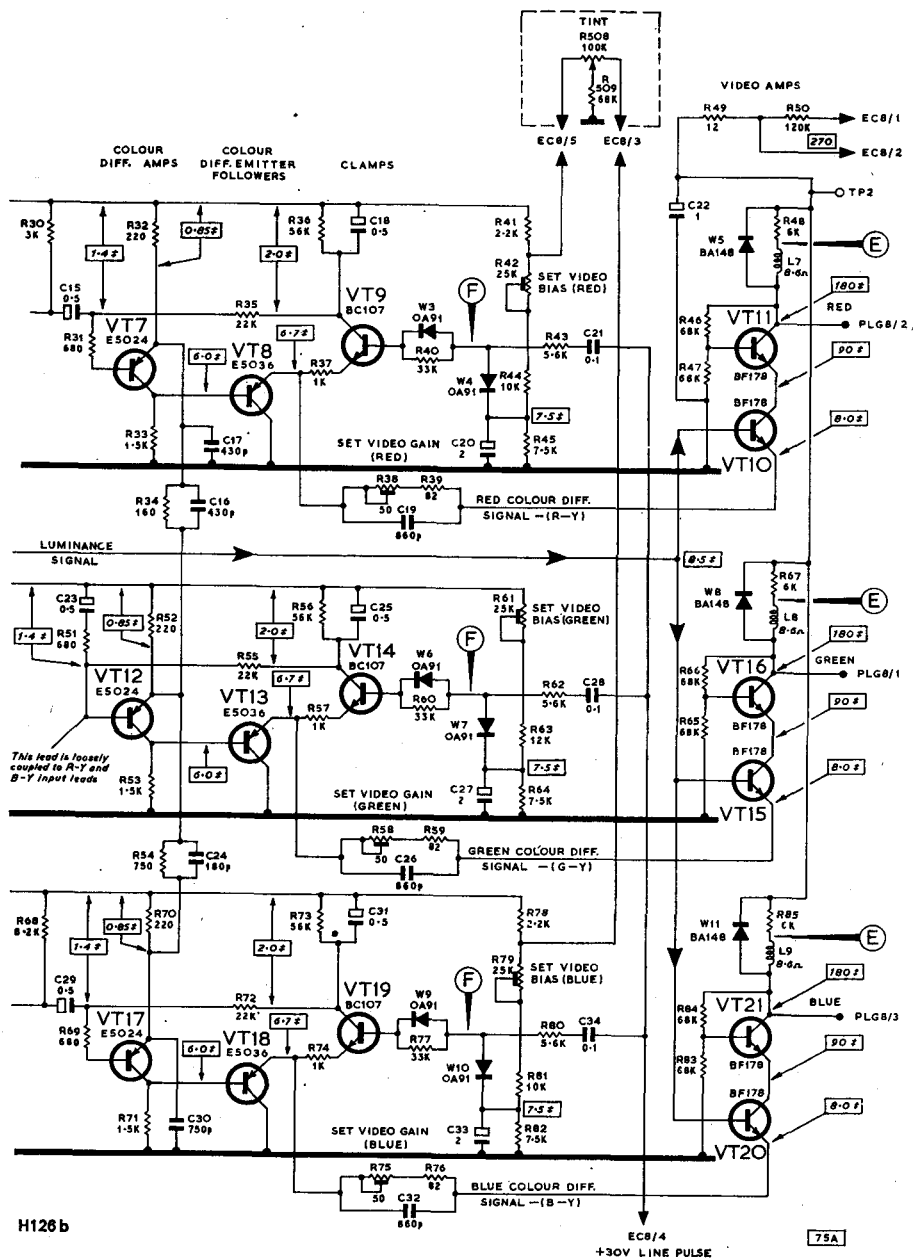


(H125d) I.F. AMPLIFIER (CONTINUED)

# COLOUR TELEVISION SERVICING



(H126a) VIDEO TYPE 135 (PART)



(H126b) VIDEO TYPE 135 (CONTINUED)



## COLOUR TELEVISION SERVICING

### Interconnection Details (Integrated Tuner):

#### PLG1/SKT1—on flying leads

1. I.F. board EC9/14
2. I.F. board EC9/12
3. Junction block EC3/17
4. Junction block EC3/2 and top end of contrast network
5. I.F. board EC9/13
6. I.F. board EC9/15
7. I.F. board EC9/17
8. I.F. board EC9/16

9. Junction block EC3/11 and auto-degauss EC1/5
- 10 and 11. Not used
12. Junction block EC3/15 and Auto-degauss EC1/1

#### SKT2—on flying co-axial lead

1. Inner } I.F. out to I.F. board
2. Screen }

### Interconnection Details (I.F. Amplifier):

#### EC9

1. Slider of 405 contrast control
2. Slider of 625 contrast control
3. Junction block EC3/14
4. Junction block EC3/10
5. Chassis earth
6. Not used
7. Power supply EC10/10
8. Not used
9. Chrominance EC7/2
10. Junction block EC3/5
11. Video EC8/1
12. SKT1/2 } Tuner connector
13. SKT1/5 }
14. SKT1/1 }
15. To tuner via SKT1/6
16. To tuner via SKT1/8
17. To tuner via SKT1/7
18. Convergence EC2C/10

#### PLG3—pins on board

1. Inner } Via main cableform and SKT10 to chrominance
2. Screen } PLG10

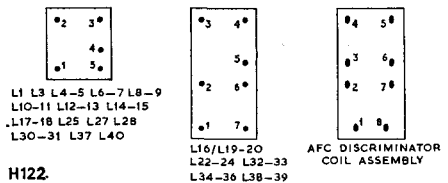
#### PLG4—pins on board

1. Inner } Via volume control to frame timebase and sound EC6/17 and EC6/18
2. Screen }

#### SKT7—on flying co-axial lead

1. Inner } Video PLG7
2. Screen }

ALL COIL BASES VIEWED FROM UNDERSIDE



#### PLG2—pins on board

1. Inner } I.F. in from tuner
2. Screen }

### Interconnection Details (Video Type 135):

#### EC8

1. I.F. board EC9/11
2. Power regulator EC11/8
3. Tint control
4. Line timebase EC5/10
5. Tint control
6. Junction block EC3/4
- 7 and 8. Not used
9. Brightness potential from convergence EC2C/8 (Video reference line with set white switch operated)
10. Line timebase EC5/18 via sync. switch on 625 horizontal hold control
11. Frame timebase and sound EC6/4
12. Power regulator EC11/16
13. Chrominance EC7/3—Bias in 4.4 MHz rejector switch
14. Chassis earth

#### PLG7—pins on board

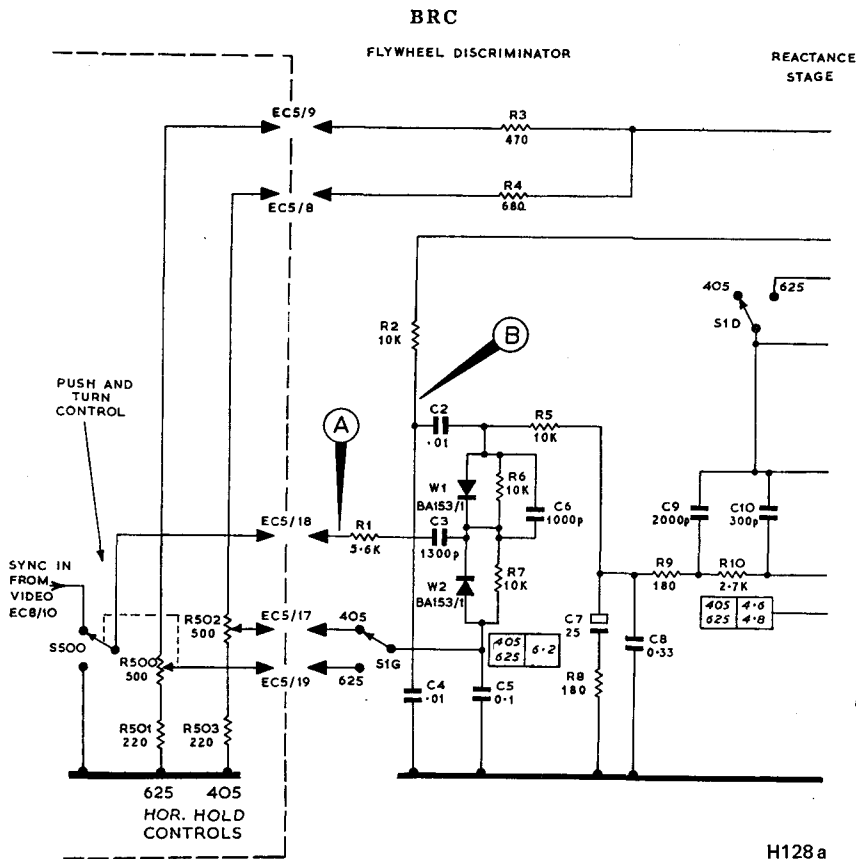
1. } Luminance in from I.F. board
2. SKT7

#### PLG8—pins on board

1. Green } Composite signals to C.R.T.
2. Red } cathodes via SKT8 and
3. Blue } spark protection board

#### SKT9—on flying leads

1. R-Y in from chrominance
2. Earth for R-Y and B-Y inputs
3. A.C. return for colour difference inputs
4. B-Y from chrominance



(HI28a) LINE TIMEBASE (PART)

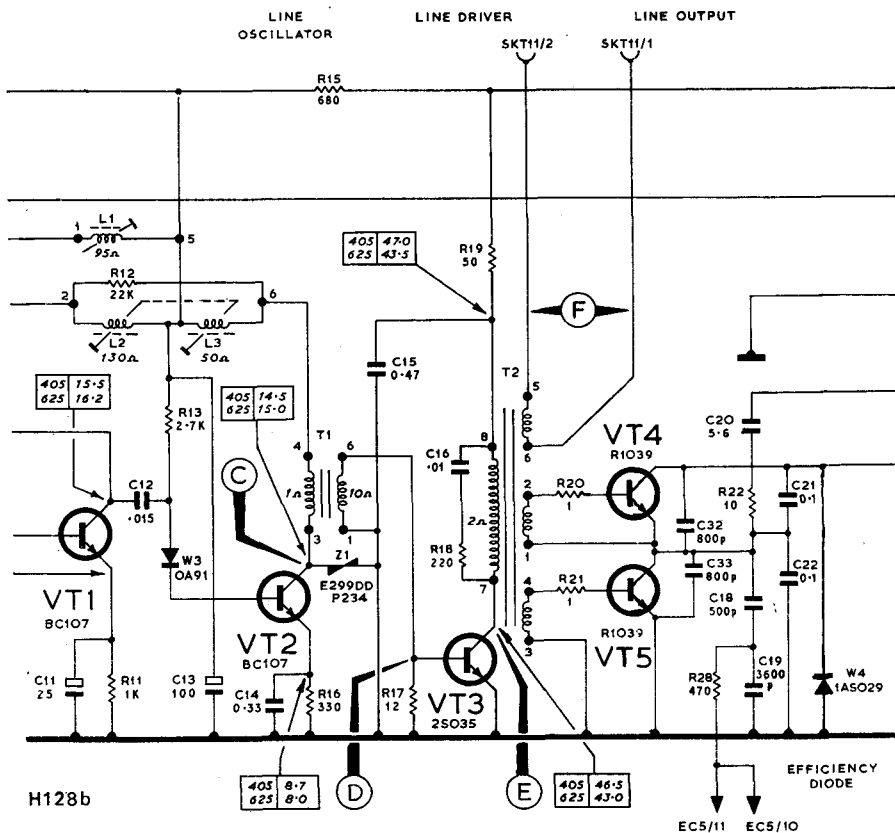
### Interconnection Details (Line Timebase):

**EC<sub>5</sub>**

- 1 and 2. Not used
3. Junction block EC<sub>3/9</sub> (A.C. circuit)
4. Chassis earth
5. Power regulator EC<sub>11/7</sub>
6. Junction block EC<sub>3/13</sub> (A.C. circuit)
7. Boost H.T. to A<sub>1</sub> potentiometers, convergence EC<sub>2A/1</sub>
8. Top of 405 horizontal hold control
9. Top of 625 horizontal hold
10. 30-volt line pulse out to video EC<sub>8/4</sub>
11. 30-volt line pulse out to chrominance EC<sub>7/8</sub>
12. Switched supply to 405 width pot. divider, power regulator EC<sub>11/6</sub>

13. Width switch supply in from power regulator EC11/14
14. Power supply EC10/12 (A.C. circuit)
15. Switched supply to 625 width pot. divider, power regulator EC11/4
16. Switched supply to E.H.T. generator EC4/4
17. Slider of 405 horizontal hold
18. Sync. input from video EC8/10 (via switch)
19. Slider of 625 horizontal hold
20. 52-55 volts to junction block EC3/1
21. 220-volt line pulse to convergence EC2A/2
22. 220-volt line pulse to frame time-base and sound board EC6/9

# COLOUR TELEVISION SERVICING



(H128b) LINE TIMEBASE (PART)

## SKT11—on flying leads

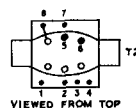
1. Line drive to E.H.T. generator
2. Switched supply to E.H.T. generator
3. Voltage in from E.H.T. generator

## SKT16—on flying leads

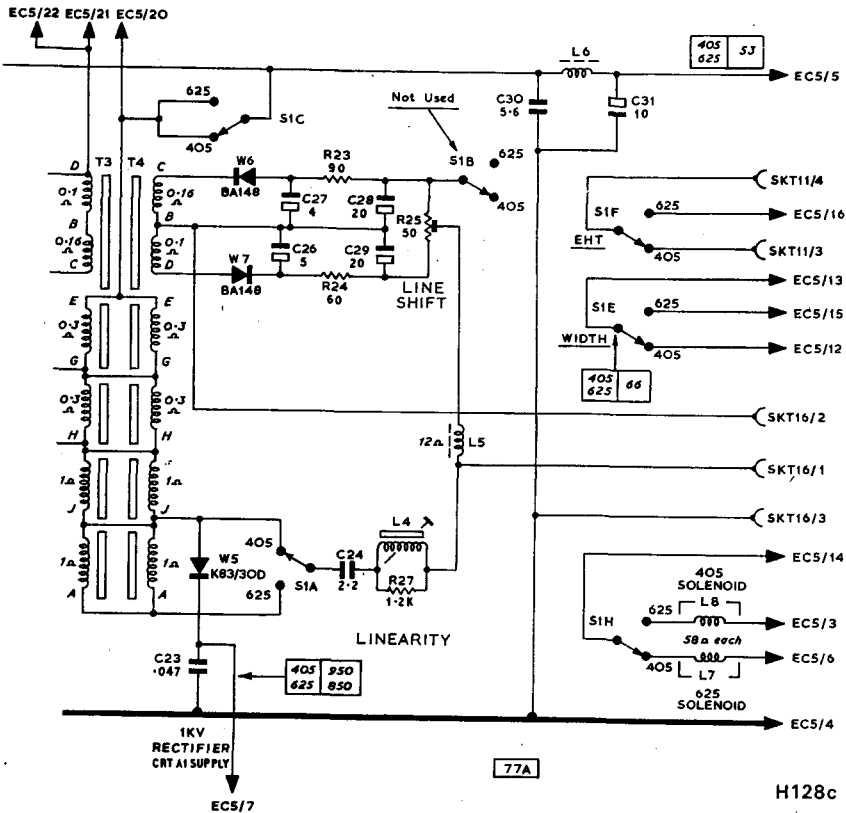
1. Line scan out via convergence
2. Line D.C. shift return from convergence
3. Line scan coils earth to convergence



VIEWED FROM UNDERSIDE



H123



(H128c) LINE TIMEBASE (CONTINUED)

**Interconnection Details (E.H.T. Generator):****EC4**

1. Power supply EC10/19
2. Power supply EC10/18—earth return via R<sub>3</sub> (2 ohms) on power supply
3. To C.R.T. shield—earth return for spark protection board, C.R.T. aquadag and C.R.T. shield
4. Line timebase EC5/16
5. Chassis earth

**PLG11—pins on board**

1. Line drive from E.H.T. board
2. To E.H.T. switch line timebase
3. To E.H.T. switch line timebase
4. (S1F)

**PLG12—SKT12—press-stud on transformer**

E.H.T. feed to tripler

**PLG13—pins on board**

1. 66 volts from focus panel
2. E.H.T. earth to focus panel
3. Feedback reference in from focus panel

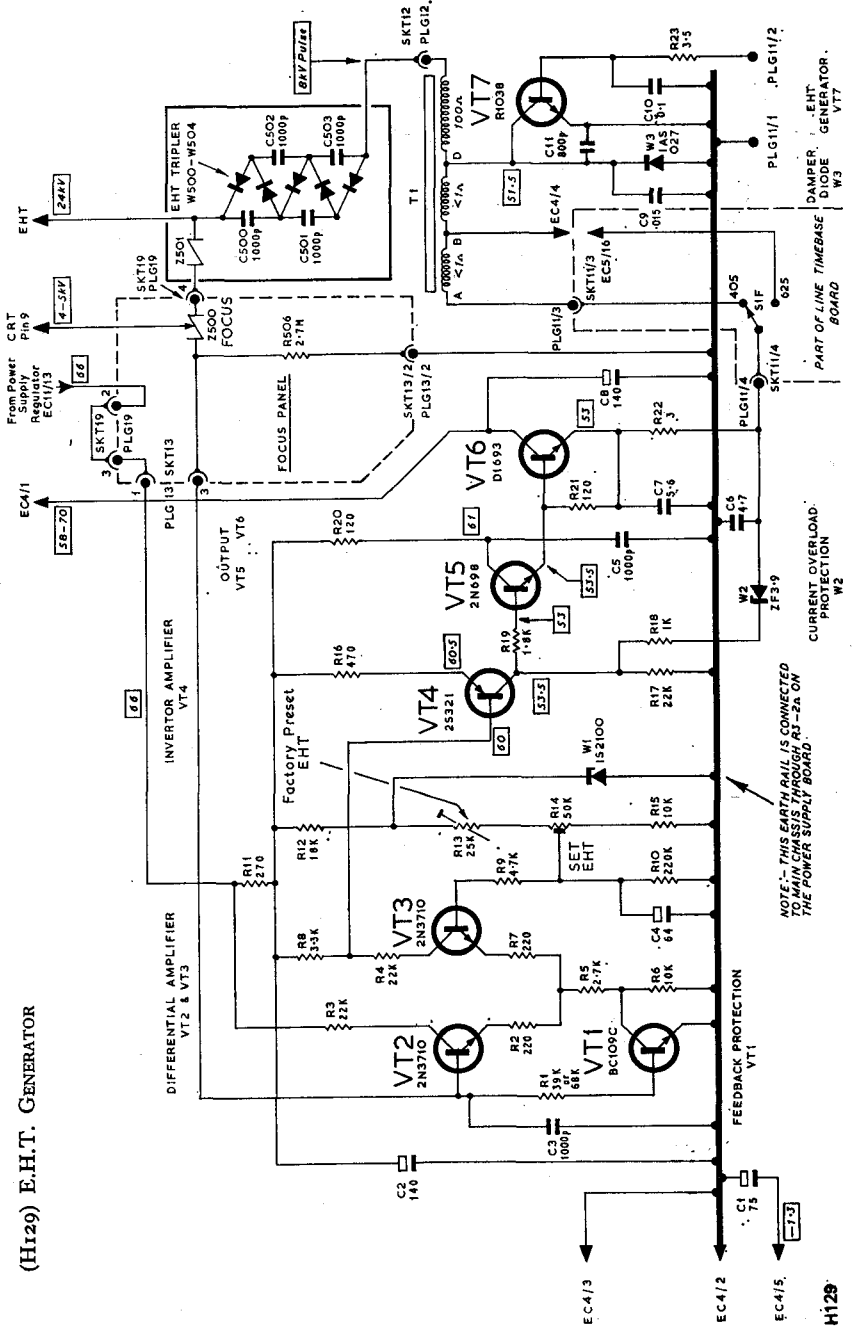
**PLG19—pins on panel (numbers moulded on Focus cover)**

2. Power regulator EC11/13
3. Linked to (2) in socket
4. Focus potentiometer feed from tripler

See diagram on next page.

# COLOUR TELEVISION SERVICING

## (H129) E.H.T. GENERATOR





## COLOUR TELEVISION SERVICING

### Interconnection Details (Power Supply):

#### EC10

1. Chassis earth
2. Junction block EC3/18
3. Junction block EC3/21
4. Power regulator EC10/10
5. Power regulator EC11/17
6. C.R.T. pin 1 via spark protection board
7. Power regulator EC11/15
8. Mains transformer via SKT6/3
9. Mains transformer via SKT6/4
10. I.F. board EC9/7
11. Convergence EC2A/3
12. Line timebase EC5/14
13. Power regulator EC11/1
14. Chrominance EC7/5
15. Junction block EC3/6
16. Power regulator EC11/5
17. Brightness control
18. E.H.T. generator EC4/2
19. E.H.T. generator EC4/1
20. Frame timebase and sound EC6/11
21. Mains transformer via SKT6/1
22. Mains transformer via SKT6/2

#### MAINS TRANSFORMER

##### PLG5—pins on transformer

1. Junction block EC3/19
2. Junction block EC3/22
3. Neutral mains in via On/Off switch
4. Chassis earth
5. C.R.T. pin 14
6. C.R.T. pin 1

##### PLG6—pins on transformer

1. Power supply EC10/21
2. Power supply EC10/22
3. Power supply EC10/8
4. Power supply EC10/9
5. Live mains in via On/Off switch
6. Not used

#### JUNCTION BLOCK

EC3—the following contacts are linked on the copper pattern: 2-7, 8-11, 12-15, 17-19 and 20-22

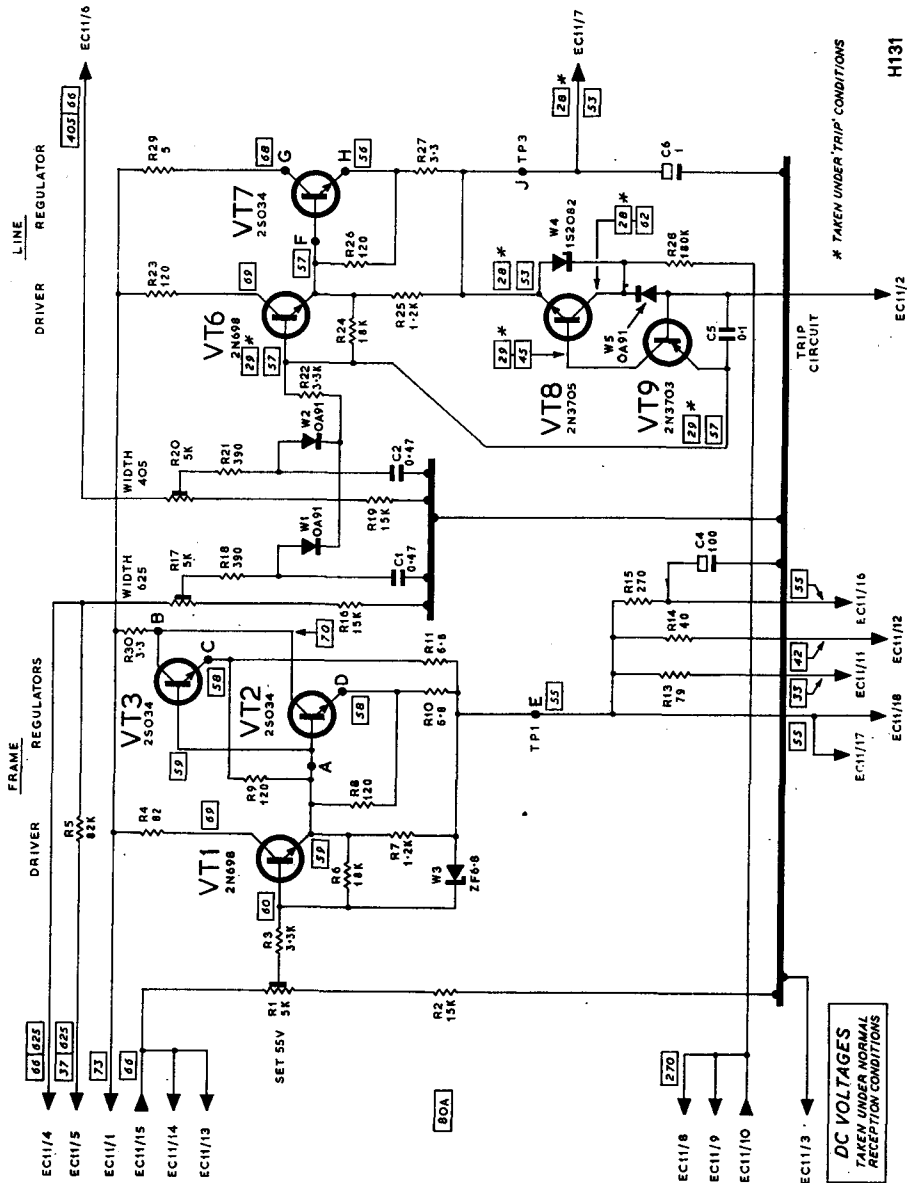
1. Line timebase EC5/20
2. To top ends of contrast controls and to tuner via SKT1/4
3. Frame timebase and sound EC6/12
4. Video EC8/6
5. I.F. board EC9/10
6. Power supply EC10/15
7. Convergence EC2C/14
8. Convergence EC2A/5
9. Line timebase EC5/3
10. I.F. board EC9/4
11. Auto-degauss board EC1/5 and to tuner via SKT1/9
12. Convergence EC2A/4
13. Line timebase EC5/6
14. I.F. board EC9/3
15. Auto-degauss board EC1/1 and to tuner via SKT1/12
16. Chassis earth
17. Tuner via SKT1/3
18. Power supply EC10/2
19. Mains transformer via SKT5/1
20. Auto-degauss board EC1/9
21. Power supply EC10/3
22. Mains transformer via SKT5/2

### Interconnection Details (Power Supply Regulator):

#### EC11—on flying leads

1. Power supply EC10/13
2. Not used
3. Chassis earth
4. Line timebase EC5/15
5. Power supply EC10/16
6. Line timebase EC5/12
7. Line timebase EC5/5
8. Video EC8/2
9. Frame and sound EC6/7
10. Power supply EC10/4

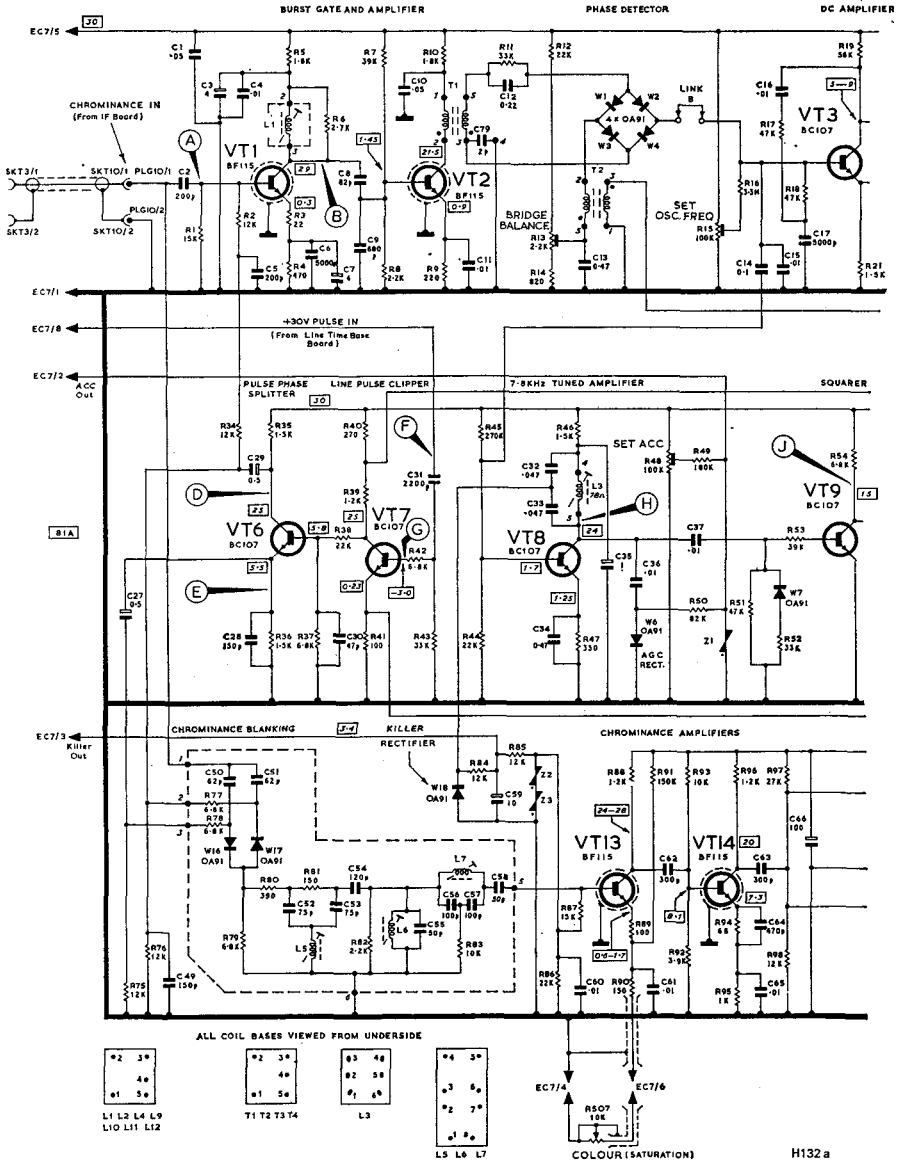
11. Frame timebase and sound EC6/15
12. Convergence EC2C/11, then via switch to frame timebase and sound EC6/1
13. PLG19 on focus panel, then to E.H.T. generator PLG13/1
14. Line timebase EC5/13
15. Power supply EC10/7
16. Video EC8/12
17. Power supply EC10/5
18. Frame timebase and sound EC6/10



(H131) POWER SUPPLY REGULATOR



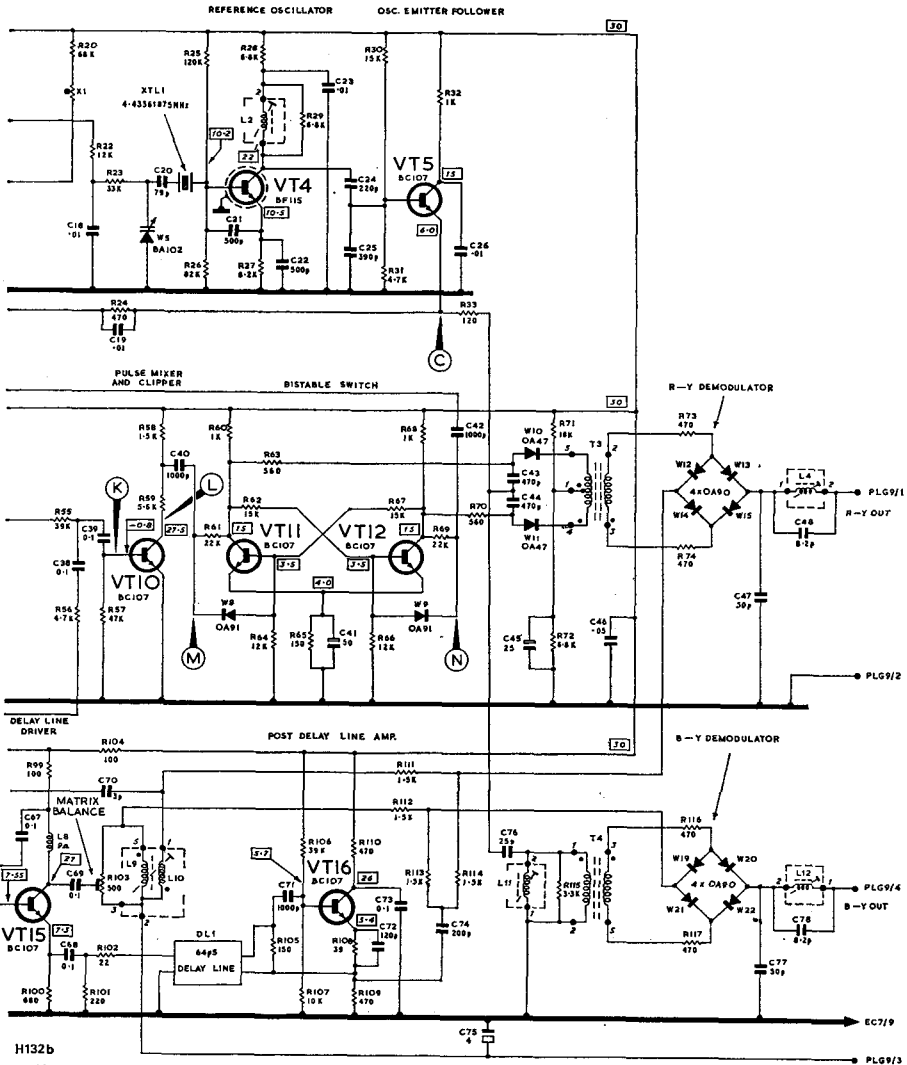
# COLOUR TELEVISION SERVICING



Above: (H132a) CHROMINANCE TYPE 131 (PART)

Right: (H132b) CHROMINANCE TYPE 131 (CONTINUED)

# BRC



## Interconnection Details (Chrominance Type 131):

EC7

1. To chassis
2. A.C.C. to I.F. board EC9/9
3. Bias to video EC8/13
4. Earth return for colour control
5. 30 volts from power supply EC10/14
6. To colour control, live end
7. Not used
8. 30-volt pulse in from line timebase EC5/11
9. To chassis

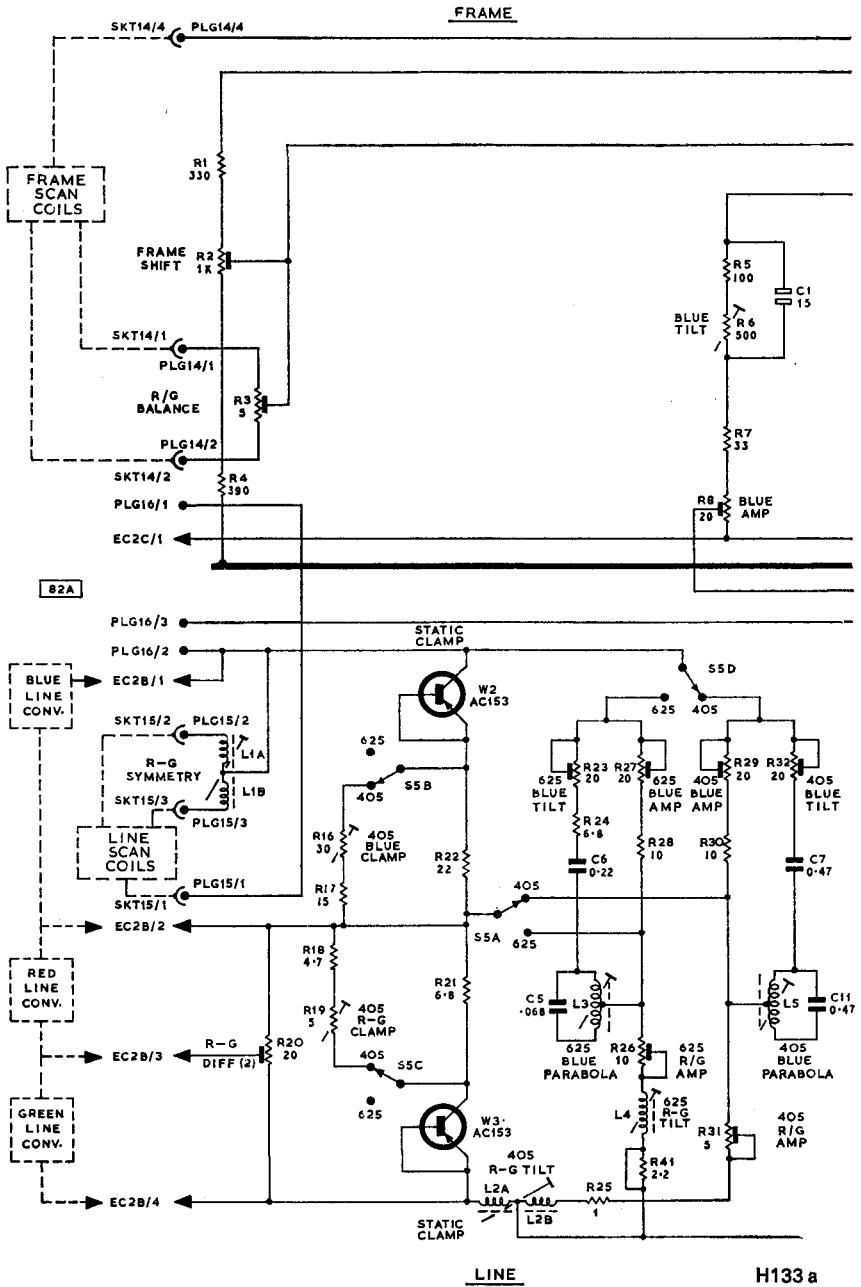
PLG9—pins on board

1. R-Y to video
2. Screens joined for R-Y and B-Y to video
3. A.C. return for colour difference outputs
4. B-Y to Video

PLG10—pins on board

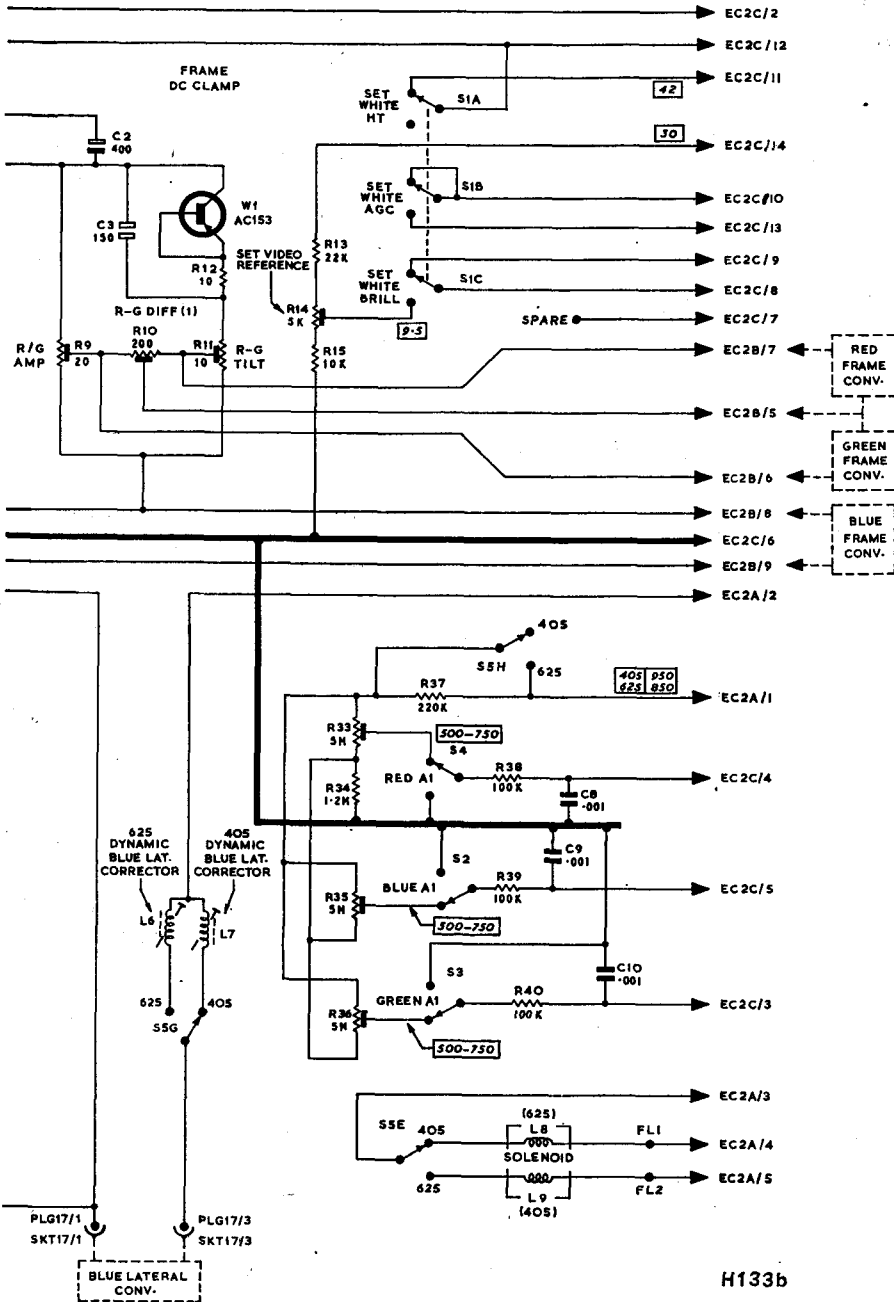
1. Inner } Chrominance in on SKT10
2. Screen } through main cableform and SKT3 on I.F. board

# COLOUR TELEVISION SERVICING



(H133a) CONVERGENCE TYPE 132 (PART)

# BRC



H133b

(H133b) CONVERGENCE TYPE 132 (CONTINUED)

## COLOUR TELEVISION SERVICING

### Interconnection Details (Convergence Type 132):

#### EC2A—on flying leads

1. Line timebase EC5/7
2. 220-volt line pulse in from line timebase EC5/21
3. Power supply EC10/11 (240-volt A.C. circuit)
4. Junction block EC3/12 (240-volt A.C. circuit)
5. Junction block EC3/8 (240-volt A.C. circuit)
6. Not used

#### EC2B—on flying leads

- 1-9. Waveforms out to convergence yoke

#### EC2C—on flying leads

1. Frame timebase and sound EC6/6 (frame earth)
2. Frame timebase and sound EC6/2 (frame scan)
3. C.R.T. pin 5
4. C.R.T. pin 4
5. C.R.T. pin 13
6. Chassis earth
7. Not used
8. Video EC8/9
9. Brightness control slider
10. I.F. board EC9/18 (A.G.C. circuit)

11. Power regulator EC11/12
12. Frame timebase and sound EC6/1
13. Chassis earth
14. Junction block EC3/7

#### PLG14—pins on board

1. } Frame deflector coils earthy ends
2. }
3. Not used
4. Frame scan out to frame deflector coils

#### PLG15—pins on board

1. Line scan out to line deflector coils
2. }
3. } Line deflector coils earthy ends

#### PLG16—pins on board

1. Line scan in from line timebase
2. Line D.C. shift return for shift circuit on line timebase board
3. Line earth—line timebase board

#### PLG17—pins on board (socket is reversible)

1. Line earth out to blue lateral yoke coils
2. Not used
3. Correction waveform out to blue lateral yoke coils

### Interconnection Details (Spark Protection Board):

#### SKT8—on flying leads

1. Green
  2. Red
  3. Blue
- } Cathode feeds in from video

*Note:* All other spark protection board connections are fed via the main cableform to the terminals indicated on the circuit diagram.

### Interconnection Details (Auto-Degauss):

#### EC1—on flying leads

1. }
2. } Joined on copper pattern with contact 1 out to tuner via SKT12/12
3. } and also to junction block EC3/15
4. }
5. }
6. } Joined on copper pattern with contact 5 out to tuner via SKT1/9 and
7. } also to junction block EC3/11
8. }
9. Junction block EC3/20

#### PLG18/SKT18—Flying connector to degauss coils

1. } Linked on plug side, out to degauss
2. } coil
3. A.C. return from degauss coil

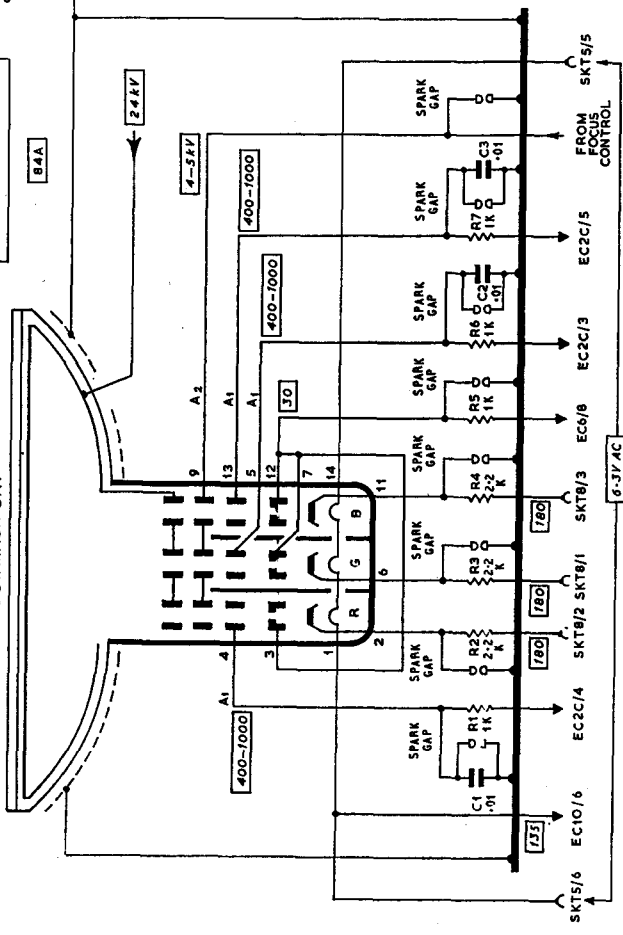
# NOTE

Aquadag and earth of Spark Protection Board is returned to main circuit earth via EC10/18 and R3-2A on Power Board.

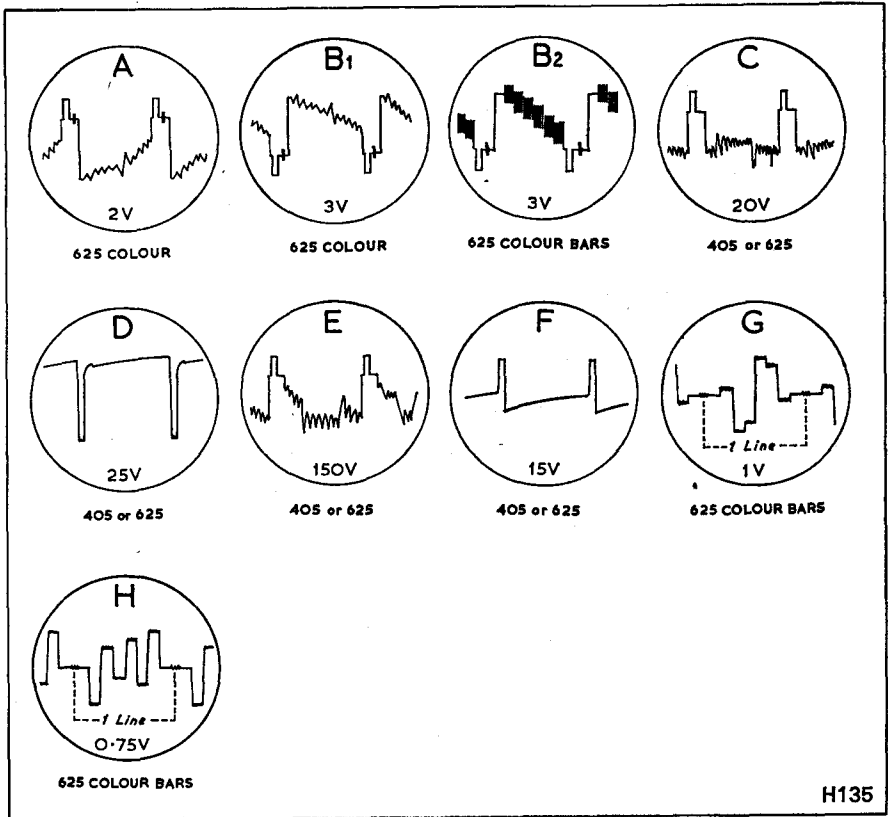
## DC VOLTAGES

TAKEN UNDER NORMAL RECEPTION CONDITIONS

SHADOWMASK CRT



(H134) SPARK PROTECTION AND AUTO-DEGAUSS



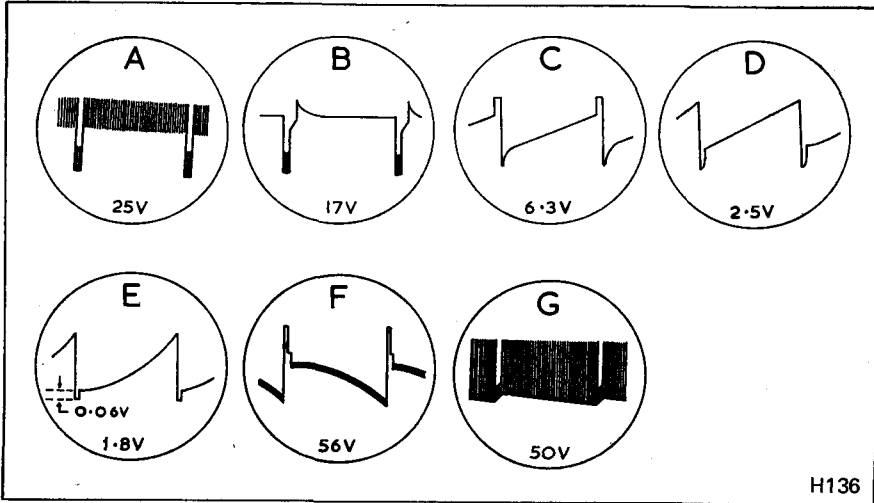
H135

(H135) VIDEO WAVEFORMS

**Circuit Diagram Notes**

**D.C. Voltages:** Figures in rectangles are D.C. voltages which were taken on a nominal 240-volt input using the 240-volt tap. E.H.T. was measured with an electrostatic meter at minimum brightness; all other voltages with an Avometer Model 8. In general the receiver was set up for normal reception with a locked picture. The figures for the chrominance circuit were taken during colour reception and those for the E.H.T. generator were taken with respect to E.H.T. earth which is 2 ohms above chassis. Note also the following conditions when measuring E.H.T. generator voltages: Receiver set to a 625-line channel during test-card transmission. E.H.T. and beam current limiter checked for correct setting. Red and blue guns switched off and brightness control adjusted for average current of 600  $\mu$ A. measured by inserting meter in series with green cathode lead—the lead may be unplugged at the C.R.T. base connector.

Before taking any voltage readings check that the two main taps are ad-

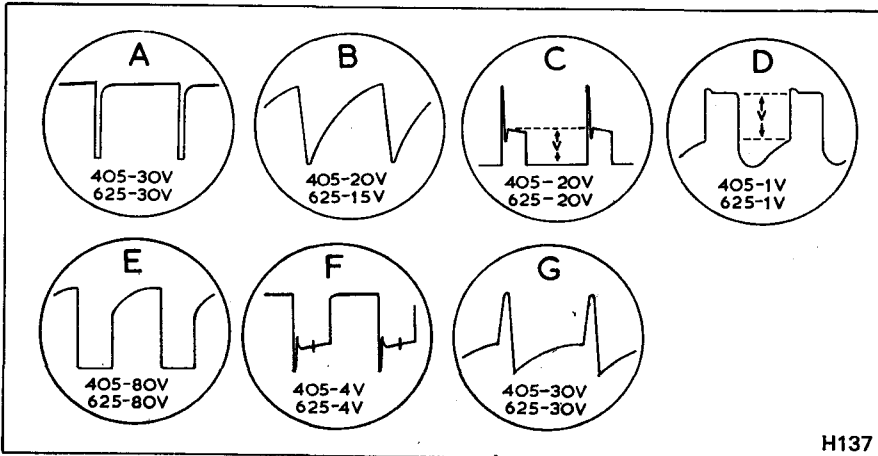


H136

(H136) FRAME TIMEBASE AND SOUND WAVEFORMS

justed for the local supplies. Check and if necessary adjust SET 55 volts for this figure at TP1 on the power regulator board. A tolerance of  $\pm 5$  per cent. should be allowed for the 30-volt stabilised and 66-volt stabilised lines. Variations of up to 20 per cent. on the other supplies do not necessarily indicate fault conditions.

**Oscillograms:** Each set of oscillograms is lettered to correspond with the appropriate circuit diagram. Those for the frame timebase and sound board were taken at frame frequency all others at line frequency. Voltage



H137

(H137) LINE TIMEBASE WAVEFORMS

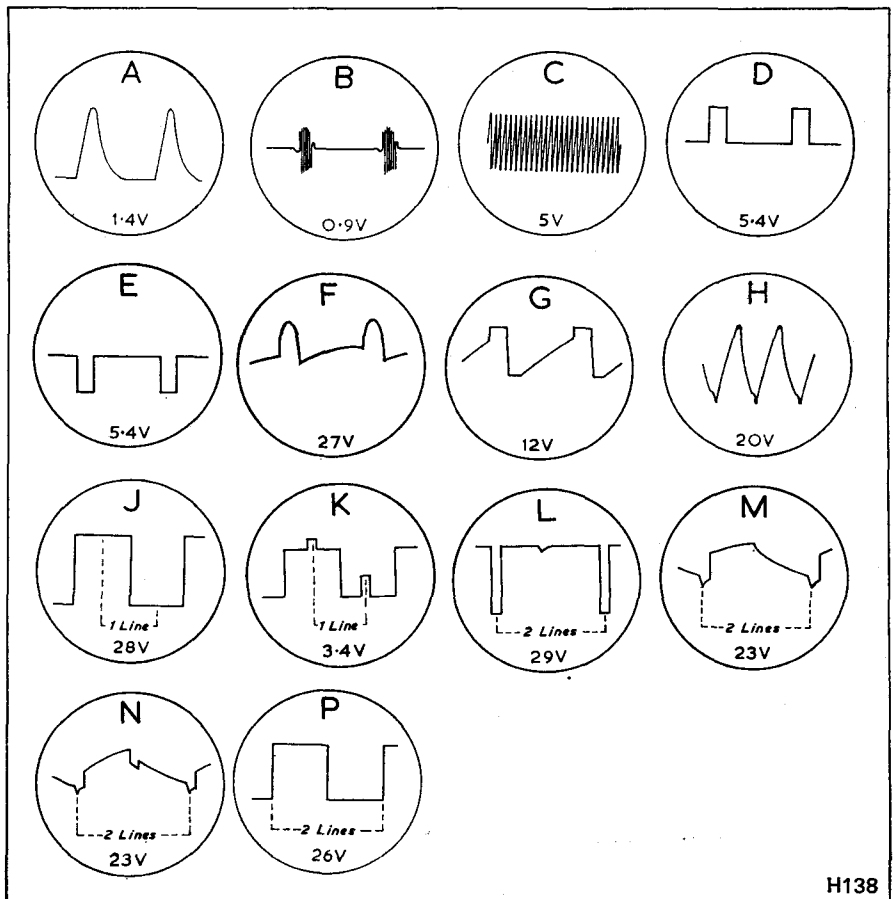


## COLOUR TELEVISION SERVICING

figures given with the oscillograms represent peak-to-peak values measured via a probe having an input capacitance of 8 pF. in parallel with 10 M $\Omega$ .

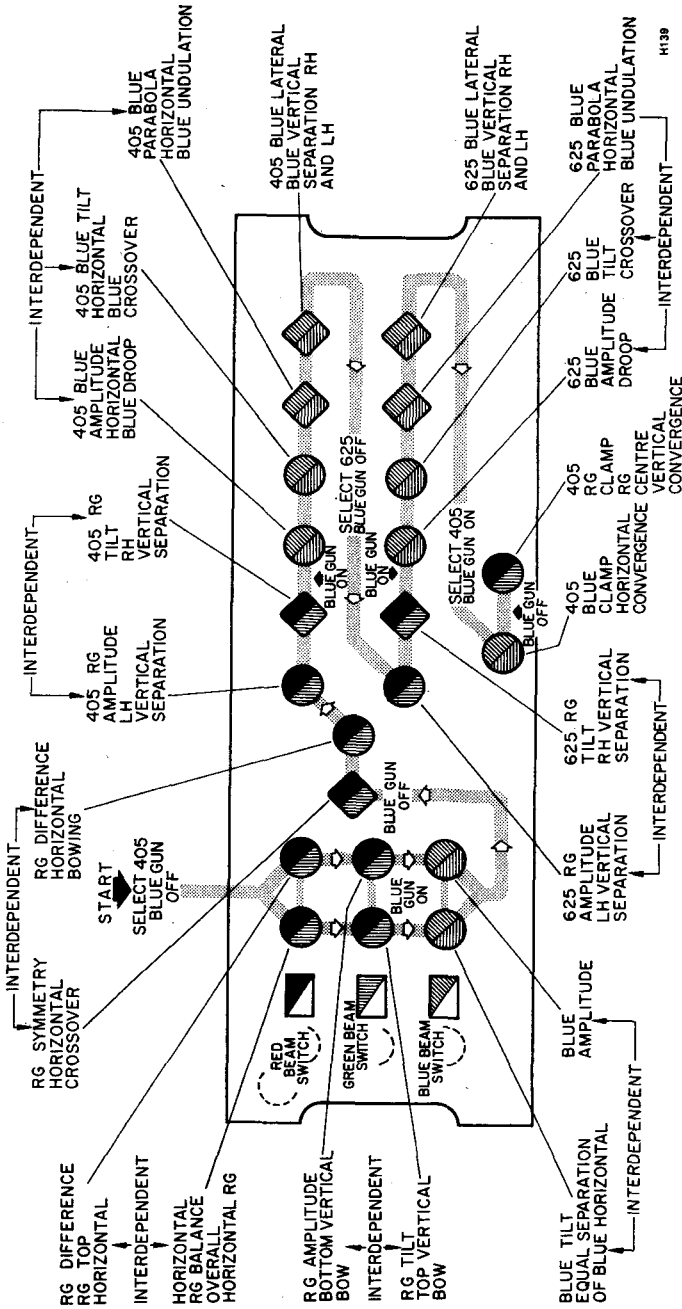
**Board Identification:** The type number is normally printed on the component side adjacent to the extractor tab and also etched on the copper side; prefix or suffix letters can be ignored.

**Complete Dynamic Convergence:** 1. Before attempting the complete procedure given in the dynamic convergence diagram, see the information given in dynamic convergence adjustments. 2. Static convergence should be checked after each adjustment given in the dynamic convergence diagram. 3. The 405 and 625 blue lateral dynamic adjustments will have no effect when SKT17 is in the parked position. 4. After completing the complete procedure, check convergence overall and adjust where necessary.



H138

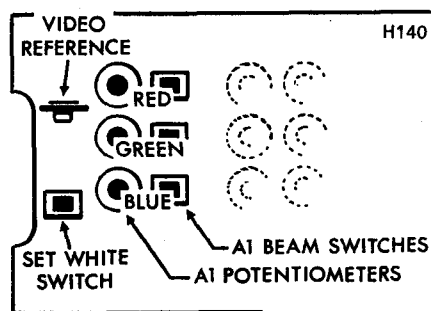
(H138) CHROMINANCE WAVEFORMS



(H139) DYNAMIC CONVERGENCE DIAGRAM

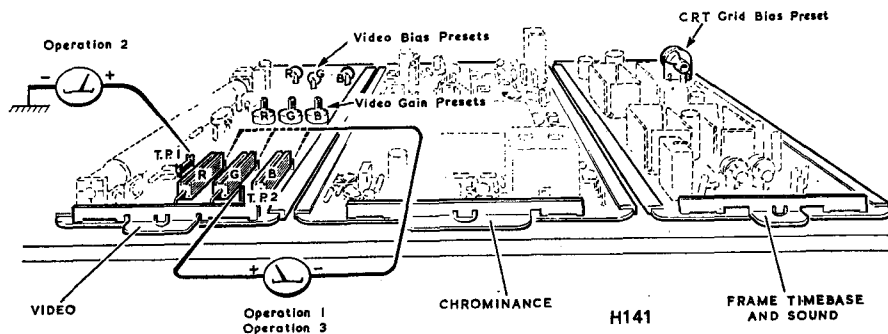
**Complete Grey-scale Tracking:** Before attempting the following adjustments, *see* Grey-scale tracking (set white).

The following sequence of adjustments ensures a black and white picture free from coloration. An Avometer 8 (or equivalent) is required for D.C. voltage measurements. Locations of meter test connections are shown in the grey-scale diagram. The convergence board should be withdrawn and mounted in the cabinet clips. The setting-up procedure should be carried out with the receiver switched to a 625-line channel, preferably with a black and white transmission.



(H140) PART OF CONVERGENCE BOARD  
VIEWED FROM FRONT OF RECEIVER

1. Set tint control to centre of range and turn A1 potentiometers to minimum. Connect meter (250 volt D.C. range) with positive to TP2 and negative to the red, green and blue video output loads in turn, adjusting each video bias pre-set for minimum reading. Set the three video gain pre-sets to mid positions.
2. Operate set white switch to collapse frame. Connect meter positive to TP1 and negative to chassis. Adjust video reference pre-set for +9.5 volts.
3. Connect meter as in operation 1, and adjust each video bias pre-set for +90 volts.
4. Connect meter positive to pin 12 on the tube base connector with negative to chassis and adjust C.R.T. grid bias potentiometer for +30 volts.
5. Slowly advance each A1 potentiometer until the three colours are just visible on the screen (*see note below*), the three A1 beam switches may be operated to turn the beams on and off for comparisons.
6. With all beams switched on, operate the set white switch to restore the frame. Adjust contrast and brilliance controls for a



(H141) GREY-SCALE DIAGRAM

typical black and white picture (ideally a test card). If necessary, readjust video gain pre-sets to improve highlights and trim the A1 potentiometers to remove any tinting in the shadows.

**Note:** Re 5. above, if any of the horizontal lines fail to appear with the A1 potentiometers at maximum: (a) Leave A1 potentiometers corresponding to absent colours at maximum. (b) Set A1 potentiometers controlling visible lines to minimum. (c) Advance C.R.T. grid bias potentiometer until the previously absent colours are just visible. (d) Set all A1 potentiometers to minimum and repeat 5.

**Replacement Modules:** All replacement modules are pre-aligned and adjusted before despatch, but the setting-up and checking adjustments should be made after fitting to the receiver.

1. Adjust pre-set fine tuning.
2. Set 55 volts. With the receiver adjusted for normal reception connect an Avometer, on the 100-volt D.C. range, to TP1 on the power supply regulator board and adjust set 55 volts on the same board.
3. Check width. Independent 405 and 625 width pre-sets are located on the power supply regulator board.
4. Check E.H.T. Without removing the tube anode cap, connect an E.H.T. meter to the C.R.T. anode by means of a probe which permits contact to be made underneath the cap. Switch on the receiver and with a locked picture turn the brightness to minimum. Adjust, if necessary, set E.H.T. (E.H.T. generator board) for 24 kV.
5. Beam current limiter. With the picture adjusted for normal contrast unplug the green cathode lead at the C.R.T. base and connect a meter (1 mA. range) in series with the cathode with the meter positive to the C.R.T. base. Switch off the red and blue beams (beam switches on convergence board).

Select a U.H.F. channel and turn the brightness control to maximum. Adjust the beam current limiter (power supply board) for a reading of 800  $\mu$ A.

6. Check video reference. With a U.H.F. channel selected connect an Avometer to TP1 on the video board. Operate the set white switch (convergence board) to collapse the frame. The meter should read 9.5 volts, otherwise adjust video reference pre-set (convergence board) for this figure.

7. Check C.R.T. grid bias. This pre-set is located on the frame timebase and sound board and should be adjusted for a reading of 30 volts D.C. at TP1 (frame and sound board). However, if grey-scale performance is unsatisfactory, a slightly different setting may be necessary.

8. Check contrast. Independent controls are provided for V.H.F. and U.H.F. operation.

9. Check line linearity.

10. Check line shift. Adjust to centre picture horizontally.

11. Check frame shift. Adjust to centre picture vertically.

12. Check height. See Picture Size Adjustments.

13. Check frame linearity.

# COLOUR TELEVISION SERVICING

	TUNER	DEGAUSS	IF AMPLIFIER	VIDEO	FRAME AND SOUND	LINE TIMEBASE	DEFLECTOR COILS	CONVERGENCE Yoke	EHT GENERATOR	EHT TRIPLER	POWER SUPPLY	SUPPLY REGULATOR	MAINS TRANSFORMER	CHROMINANCE	CONVERGENCE
1	●														
2										●	●	●			
3					●	●				●	●	●			
4							●	●	●		●				
5								●		●		●			
6										●		●		●	
7				●						●		●			
8		●													
9					●	●									
10					●										
11				●										●	
12				●		●									
13				●		●									
14				●											
15				●	●	●	●							●	
16		●											●		
17			●							●		●		●	
18	●														

H142

(H142) REPLACE MODULES DIAGRAM

14. Check vertical balance. *See* Frame Linearity.
15. Check purity and convergence.
16. Check automatic chrominance (A.C.C.). Select a colour transmission, turn colour control to minimum (no colour) and adjust the brightness and contrast controls for a satisfactory black and white picture.

Connect an Avometer Model 8, on 10 volt D.C. range, to the luminance out terminal on the I.F. board and readjust the contrast control for a reading of 6.5 volts. Then transfer the Avometer (10 volt D.C. range) to the

# BRC

A.C.C. checkpoint on the chrominance board, and adjust A.C.C. pre-set (R48) for a reading of 3.4 volts.

17. Check grey-scale tracking.

18. Check auto-degauss. No adjustments are necessary when replacing the board. The degaussing action can be observed as a momentary period of coloration accompanied by raster distortion immediately following a channel change between systems. A recycling time of 3 to 5 minutes must be allowed before re-selecting the original system in order to observe the second degaussing effect in the opposite direction.

**BUSH****Models CTV25 and CTV167**

**General Description:** Dual-standard hybrid colour television receivers. Valves are used in line timebase, field timebase, colour difference amplifiers and luminance output stage. Transistors are used in all other stages.

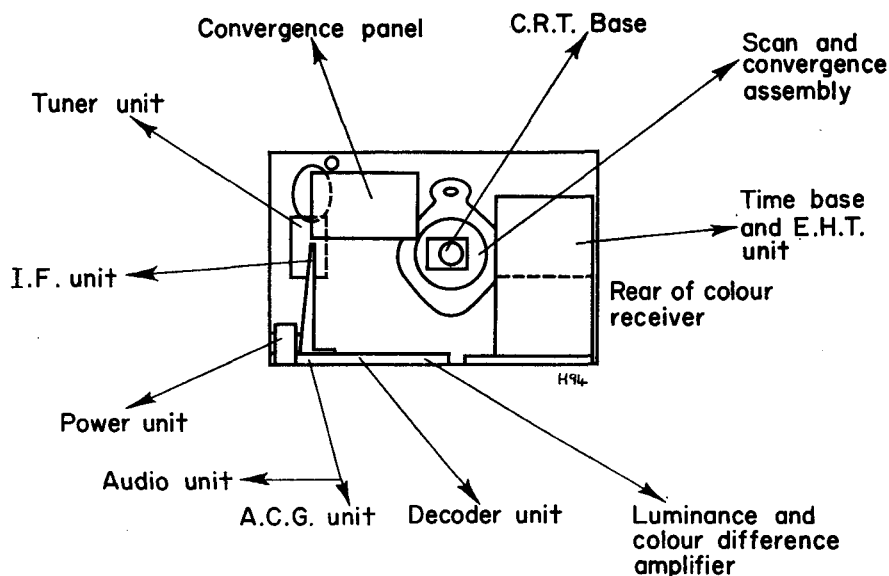
**Installation:** The following check list should be used for guidance when installing the receiver. It is assumed that the receiver has already been carefully checked in accordance with the setting-up procedure on pages 98-102.

**Warning:** Any mains adjustment should be carried out before the receiver is installed as adjustment entails the removal of the Power Unit.

1. Select a suitable position for the receiver in the customer's room so that the screen is shielded from direct light from lamps or windows. If possible do not position the receiver close to any large metal object such as a hot water radiator, etc., since stray magnetic fields may disturb the purity and convergence.

2. Remove the cabinet back and connect the receiver to the mains supply. **Observe the usual live chassis precautions.** Switch on the receiver, allow a warm up period not less than 10 minutes before making any adjustments.

3. Check purity by looking at the R.G. and B. fields in turn and carry out the following degaussing procedure if required. Connect a degaussing coil



(H94) POSITIONS OF UNITS





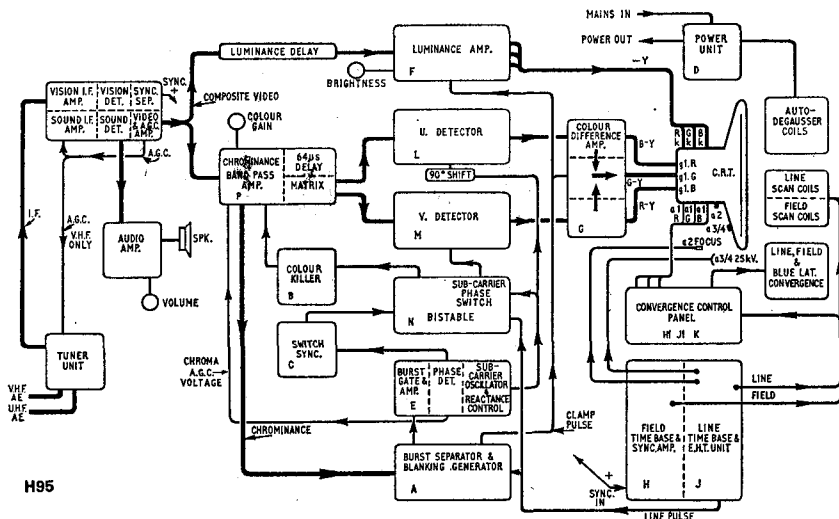
## COLOUR TELEVISION SERVICING

to the mains supply, and degauss the complete receiver including the shadow mask and chassis. Remove the degaussing coil at least 10 feet from the vicinity of the receiver before switching the coil off. If the purity is still unsatisfactory adjust the purity ring magnets for a pure red field, then check the purity of the green and blue fields.

4. Connect both aerials and check that all the local stations are received satisfactorily and all buttons are tuned correctly. Adjust the brightness control 9RV25, and the 405 and 625 pre-set contrast controls for a correct picture. The local/distant control 2RV2 may need adjustment if a noisy picture or cross modulation is observed. *Note:* An aerial satisfactory for monochrome reception may not be entirely suitable for the reception of colour transmissions due to multipath reception, ghosting, insufficient bandwidth, etc. This may have little effect on monochrome reception but may produce any of the following symptoms on a colour transmission—colour distortion, grain on colour, weak colour irrespective of the setting of the colour control. Under these conditions adjustment to or resiting of the aerial system may be needed.

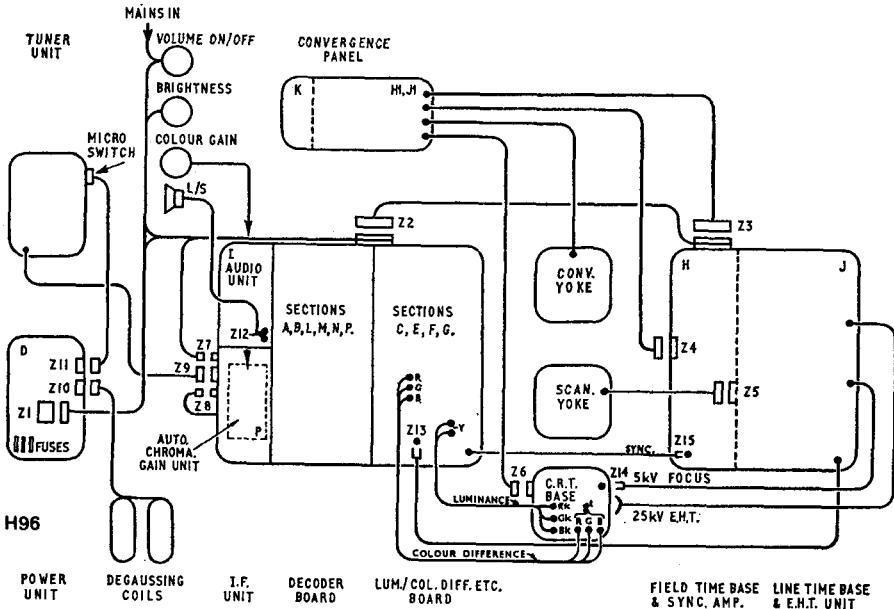
5. Switch the receiver to a 625 colour transmission and set the colour control to the centre of its travel then adjust the pre-set Auto Chroma gain Control  $\text{5RV}_4$  for a correctly saturated colour picture.

6. Connect a signal generator (to the aerial input) modulated with a suitable cross hatch convergence grid pattern, set to the 625-line standard. Set the brightness control so that the raster is visible. Adjust radial and lateral static convergence magnets required. Check dynamic convergence. Repeat purity adjustments if a large static convergence error is corrected.



### (H95) BLOCK DIAGRAM

**BUSH**



### (H96) INTERCONNECTION DIAGRAM

7. Switch signal generator (modulated with a suitable cross hatch grid pattern), and receiver to the alternative standard and check purity, static and dynamic convergence.

8. Replace receiver back, re-connect aerials and instruct the customer in the operation of the receiver, particularly the slight tuning adjustment that may be required for the best results on colour transmissions.

**Control Adjustments:** The following equipment will be required if all the adjustments outlined below are carried out:

(a) Pattern Generator—(Monochrome)—R.F. output on 405 and 625, with a suitable sync. and blanking. Alternatively a test transmission may be employed.

(b) Cross Hatch Pattern Generator—R.F. output on 405 and 625.

(c) Colour Bar Generator—R.F. output on 625, or test transmission.

(d) Isolation Transformer—500 watt rating (suitable for high peak currents).

(e) E.H.T. Meter—30 kV.

(f) A.V.O. Meter Model 8.

(g) Oscilloscope—wideband 0 to 6 MHz.

(h) Degaussing Coil—separate coil for external use.

Reference to the controls and their functions are listed in the following table.

# COLOUR TELEVISION SERVICING

Control and/or Function	System	Circuit Reference and/or Unit
Mains adjustment	—	Mains transformer
De-gaussing	—	Using external degaussing coil
Channel selection and tuning	405/625	Tuner Unit V.H.F. and U.H.F.
Pre-set contrast	405/625	2RV5/2RV4
Local/Distant control	—	2RV2
Brightness control	—	9RV25
Line frequency	625/405	3L1/3TC1
Field frequency	—	3RV7
Width	625/405	3L13/3L14
Line drive	625/405	3RV2/3RV1
Line linearity	625	3L15
Line shift	625	3RV3
3rd harmonic tuning	625/405	3L11/3L12
Height	—	9RV13
Field linearity gen	—	9RV7
Field linearity top	—	9RV2
Field shift	—	3RV8
E.H.T. regulator	625	3RV6
Focus	405/625	3RV4/3RV5
Picture squaring	—	Scan coil assembly
Pin-cushion correction	—	3L19
Purity adjustment	—	Purity ring magnets
Static convergence	—	R.G. and B. static magnets
Vertical dynamic convergence	625/405	{ 9RV6, 9RV16 9RV1, 9RV11 9RV12, 9RV27 9RV18, 9RV19 9RV20, 9RV21 9RV22, 9L9 9L21, 9L5/6 9RV3, 9RV8 9RV9, 9RV10 9RV15, 9L7 9L3/4
R.G. and B.	625	
Horizontal dynamic convergence	405	
R.G. and B.	—	
Subcarrier reference	625	
Generator	—	{ 6RV1, 6TC1 6L8/9, 6L10/11 5RV3, 6L12
V. channel sync.	625	
Grey scale adjustment	405/625	{ 9RV23, 9RV24, 9RV5, 9RV14, 9RV17

## BUSH

**Mains Adjustment:** The receiver as supplied is suitable for a 240-volt A.C. supply. To operate the receiver on a mains supply other than 240 volt A.C., remove the power unit from the cabinet and adjust it for the required voltage in accordance with accompanying diagram.

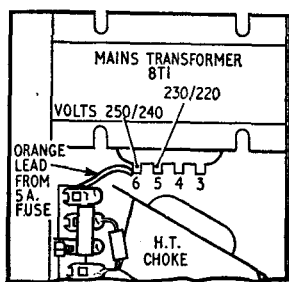
1. Remove the two screws securing the colour chassis (I.F. unit decoder audio unit, A.C.C. unit and Luminance colour diff. unit) to the cabinet (rear rail of colour chassis).

2. Unclip the system switch operating cable from the I.F. unit switch.

3. Disconnect the tuner unit power input and signal connection Z<sub>9</sub> from the I.F. unit.

4. Withdraw the colour chassis as far as possible.

5. Disconnect the three connectors Z<sub>1</sub>, Z<sub>10</sub> and Z<sub>11</sub> from the power unit and remove the three screws securing it to the cabinet.



H76

(H76) MAINS ADJUSTMENT  
Part under view of power unit.

**Degaussing:** The receiver will only need degaussing using a separate degaussing coil if the purity has been disturbed due to external magnetic fields magnetising the screen or adjacent chassis. The automatic degaussing circuits incorporated in the receiver will normally take care of any magnetic effects induced into the screen but occasionally degaussing using an external coil may be required. To ascertain if the purity has been disturbed and degaussing using a separate degaussing coil is required, carry out the following procedure:

1. Turn the brightness control up until the raster is visible.

2. Switch off the green and blue guns and observe the red field, this should be pure (not showing any other colour) over the entire screen—use a low power magnifier to check that only the red phosphor dots are illuminated.

3. If the red field is found impure (i.e. showing other colours with red) and the automatic degaussing does not improve the conditions, carry out the following degaussing procedure using a separate degaussing coil.

4. Connect the degaussing coil to the mains supply, switch off the receiver and pass the coil over the screen and metal work several times, then withdraw the coil some (10 feet) distance from the receiver before switching it off.

5. Check the purity of the green and blue fields in turn by switching the

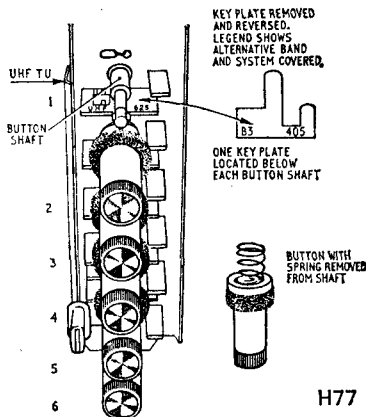
appropriate guns and check that each field is not contaminated by other colours.

*Note 1:* If impurity still persists carry out the purity adjustment procedure.

*Note 2:* So that the automatic degaussing circuit may work, the receiver must be switched on from cold, i.e. the control P.T.C. Thermistor 8TH2 should be at room temperature.

**Push-Button, Band, System and Channel Selection:** To alter the band or transmission system to which any particular button is set, proceed as follows:

1. Remove the tuner unit from the cabinet by withdrawing plug Z<sub>9</sub>, (power and I.F. signal) from the I.F. unit, the plug Z<sub>10</sub> (Micro-switch to P.U.) from the power unit, then disconnect the braided chassis lead between the T.U. and the I.F. unit and withdraw the T.U. from the cabinet.
2. The information stamped on the Key Plate (illustrated), will indicate the band covered and the transmission system set for that button.
3. Withdraw the Key Plate from the slot under the push-button spindle that it is required to reset.



(H77) KEY PLATE

4. Insert the new Key Plate into the slot, correct side up. The button can be tuned over the band and will operate on the transmission system indicated on the upper face of the Key Plate.

5. Replace the T.U. in the cabinet and tune the button to the channel required.

*Note:* The T.U. is normally supplied with the following Key Plates:

*Side 1:* U.H.F. Bands 4/5 system 625; V.H.F. Band 1 system 405; V.H.F. Band 3 system 625.

*Side 2:* V.H.F. Band 3 system 405 (Four fitted to the unit); V.H.F. Band 1 system 625 (Two fitted to the unit); U.H.F. Band 4/5 system 405 (One supplied as spare).

**Tuning Range** (as despatched from the factory): Push-buttons 1 and 2, Bands 4 and 5, Channels 21 to 68, 625 system; Push-buttons 3 and 4, Band 3,

Channels 6 to 13, 405 system; Push-buttons 5 and 6, Band 1, Channels 1 to 5, 405 system.

### **Tuning Procedure:**

1. Press in the button that requires tuning then allow it to return to its normal position.

2. Withdraw the button slightly, then turn the button until the receiver is tuned correctly for satisfactory picture and sound.

3. On colour programmes a slight readjustment to the tuning may be necessary so that the colour picture is received free from any interference pattern and with the maximum colour saturation. The correct tuning point is where the sound interference pattern just disappears from the colour picture.

**A.C.G. and Local/Distant Controls:** All these controls are located on the I.F. Unit. They are 2RV<sub>4</sub>, 2RV<sub>5</sub> and 2RV<sub>2</sub>.

1. Set the brightness control so that the raster is just below visibility.

2. Select a 405 channel and adjust the 405 pre-set A.G.C. control 2RV<sub>5</sub>, for a correctly contrasted picture, making any slight adjustment to the brightness, control 9RV<sub>25</sub>, that may be necessary.

3. Select a 625 channel and adjust the 625 pre-set A.G.C. control 2RV<sub>4</sub>, as for item 2.

4. If cross modulation or a noisy picture is obtained on either channel adjust the local/distant control 2RV<sub>2</sub> for freedom from cross-mod and the best signal to noise result.

**Line Controls (3L<sub>1</sub> and 3TC<sub>1</sub>):** Both line frequency controls 3L<sub>1</sub>, 625 and 3TC<sub>1</sub>, 405 are located on the scan generator chassis at the rear. Adjust as follows:

1. Select a 625 channel, and remove the sync. input socket Z<sub>15</sub> from the plug on the scan unit chassis. Set the brightness control 9RV<sub>25</sub> for a visible picture.

2. Adjust the core of 3L<sub>1</sub> to approximately the correct frequency (picture just sliding horizontally).

3. Select a 405 channel and adjust 3TC<sub>1</sub> for the correct frequency as in item 2, then replace sync. input socket Z<sub>15</sub>.

**Field Control (3RV<sub>7</sub>):** The field frequency control 3RV<sub>7</sub> is located on the rear of the scan generator chassis.

**Line Drive and E.H.T. Controls:** The line drive controls 3RV<sub>1</sub> (405), 3RV<sub>2</sub> (625) and the E.H.T. control 3RV<sub>6</sub>, are located on the right-hand side (rear view) of the scan generator chassis. Before making any adjustments that affect the line output stage it is advisable to check that the maximum cathode current in 3V<sub>3</sub> (PL505) is not exceeded. Details of this check appear in the appropriate section under **Convergence Procedure**.

1. Connect an E.H.T. meter (30 kV. range) between the chassis and the picture tube E.H.T. connection, and an A.V.O. Meter Model 8 (2.5 volts D.C. range) between the chassis and pin 1 of 3V<sub>6</sub> PD 500, i.e. across the cathode resistor 3R<sub>29</sub>.

## COLOUR TELEVISION SERVICING

2. Select a 625 channel. Set the E.H.T. control 3RV6 and the 625 line drive control 3RV2 to approximately 75 per cent. of maximum. Adjust the 625 line width control 3L13 (located on side of timebase chassis) for a nominal scan then turn the brightness control 9RV25 to minimum.

3. Adjust the E.H.T. control 3RV6 and the 625 line drive control 3RV2 to give an E.H.T. voltage of approximately 24 kV. and a cathode current of 1.2 mA. (1.2 volts D.C. on A.V.O.) in the cathode resistor 3R29 of 3V6 PD500, E.H.T. regulator valve.

4. Connect A.V.O. Meter Model 8 (2500 volts D.C. range) between chassis and the boosted boost line (i.e. the junction of the capacitor 0.01, 3C38 and the rectifier BY100 3D4), and *record the voltage obtained* which should be approximately 1.25 kV.

5. Select a 405 channel. Set the 405 line drive control 3RV1 to approximately 75 per cent. of maximum and the 405 line width control 3L14 (located on the side of the timebase chassis), for a nominal scan. Turn the brightness control 9RV25 to minimum. Then adjust the 405 line drive control 3RV1 so that the boosted boost and E.H.T. voltages are similar to that obtained on the 625 channel. *Note:* The final setting of the 405 line drive control 3RV1 is governed by the requirement of equalising the boosted boost voltage and the E.H.T. voltage on the 405 and 625 systems.

**Line Width Controls (3L13 and 3L14):** The scan amplitude adjustment forms part of the line drive and E.H.T. adjustments. 3L13 (625) and 3L14 (405) are located on the right-hand side (rear view) of the timebase chassis.

**Field Height (9RV13):** The field height control 9RV13 is located on the convergence panel.

1. With a 405 or 625 channel selected, set the brightness control 9RV25 for a satisfactory brightness level, and check that the picture displayed on the screen is correctly locked, then adjust the field height control for a nominal scan amplitude.

**Line and Field Linearity (3L15, 9RV7 and 9RV2):** The line linearity control 3L15 is located on the scan coil connector panel (left-hand side of timebase chassis) and the field linearity controls 9RV7 and 9RV2 on the convergence panel.

1. Select a 405 or 625 channel. Adjust the brightness control 9RV25 for a satisfactory brightness level, and check that the picture displayed on the screen is correctly locked, then adjust the line and field linearity controls for optimum linearity. Finally re-check, line width, drive and E.H.T.

**Focus Controls (3RV5 and 3RV4):** The focus controls 3RV5, 625; and 3RV4, 405; are located on the right-hand side (rear view) of the timebase chassis.

1. Select a 625 channel (viewing a high brightness picture, e.g. test card). Set the brightness control 9RV25 for the correct level and check that the display is correctly locked.

2. Adjust the 625 focus control 3RV5 for a correctly focused picture.

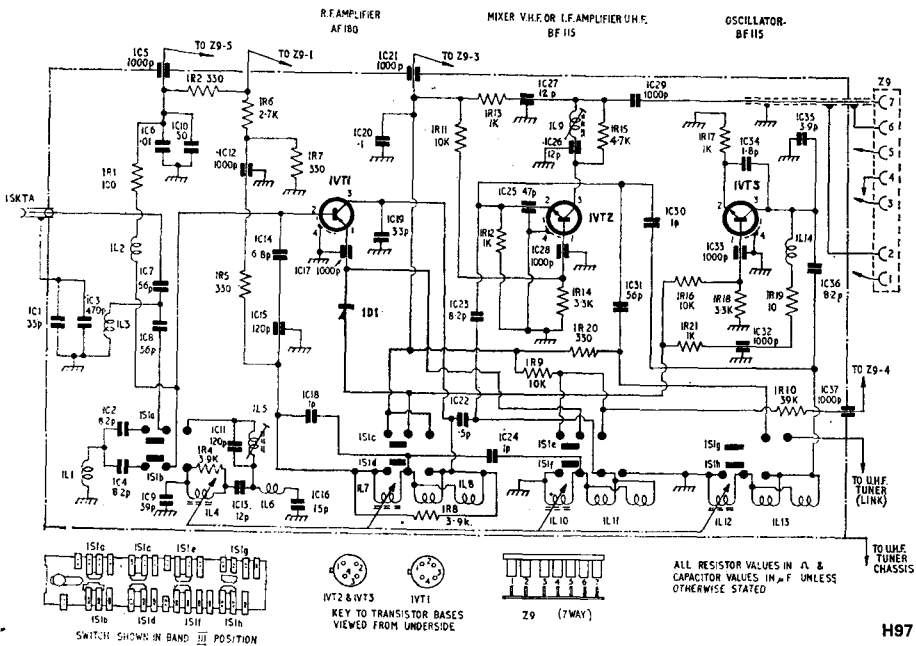
3. Switch to a 405 channel and under similar conditions to that for the 625 channel, adjust the 405 focus control 3RV4 for a correctly focused picture.

**BUSH**

**Picture Squaring:** The picture squaring (scan yoke) adjustment is located on the C.R.T. neck.

1. Select a 405 or 625 channel. Set the brightness control for a satisfactory brightness level. Check that the display is correctly locked.
2. Slacken the scan yoke assembly clamp screw (one screw) and rotate the complete scan assembly until the vertical and horizontal lines in the test pattern are correct. It is important to maintain the scan yoke assembly in contact with the flare of the C.R.T.

As the convergence yoke is secured to the rear of the scan yoke assembly (a lockable bayonet fitting is used) adjustment to the scan yoke assembly will also effect the position of the convergence yoke, thus making some adjustments to the convergence necessary. A following section describes such adjustments.



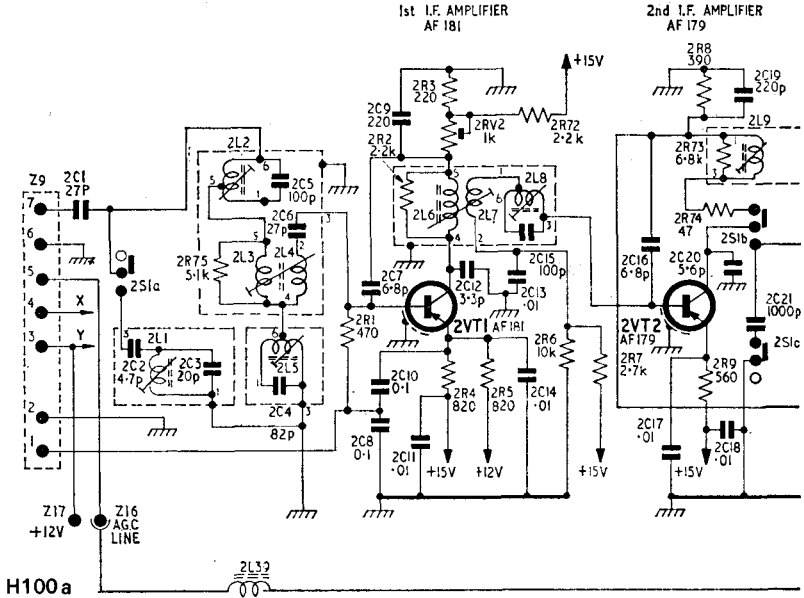
### (H97) CIRCUIT DIAGRAM—V.H.F. TUNER

**Picture Shift:** The picture shift controls 3RV3, (horizontal shift) and 3RV8 (vertical shift) are located on the right-hand side of the timebase chassis. Adjust the horizontal shift 3RV3 and vertical shift 3RV8 controls to centre the picture in the display area. Check horizontal shift on alternative system and make a compromise adjustment if required.

**Pin-Cushion Corrector (3L19):** The pin-cushion corrector 3L19 is located on the left-hand side of the timebase chassis. See further procedure on page 79.



## COLOUR TELEVISION SERVICING

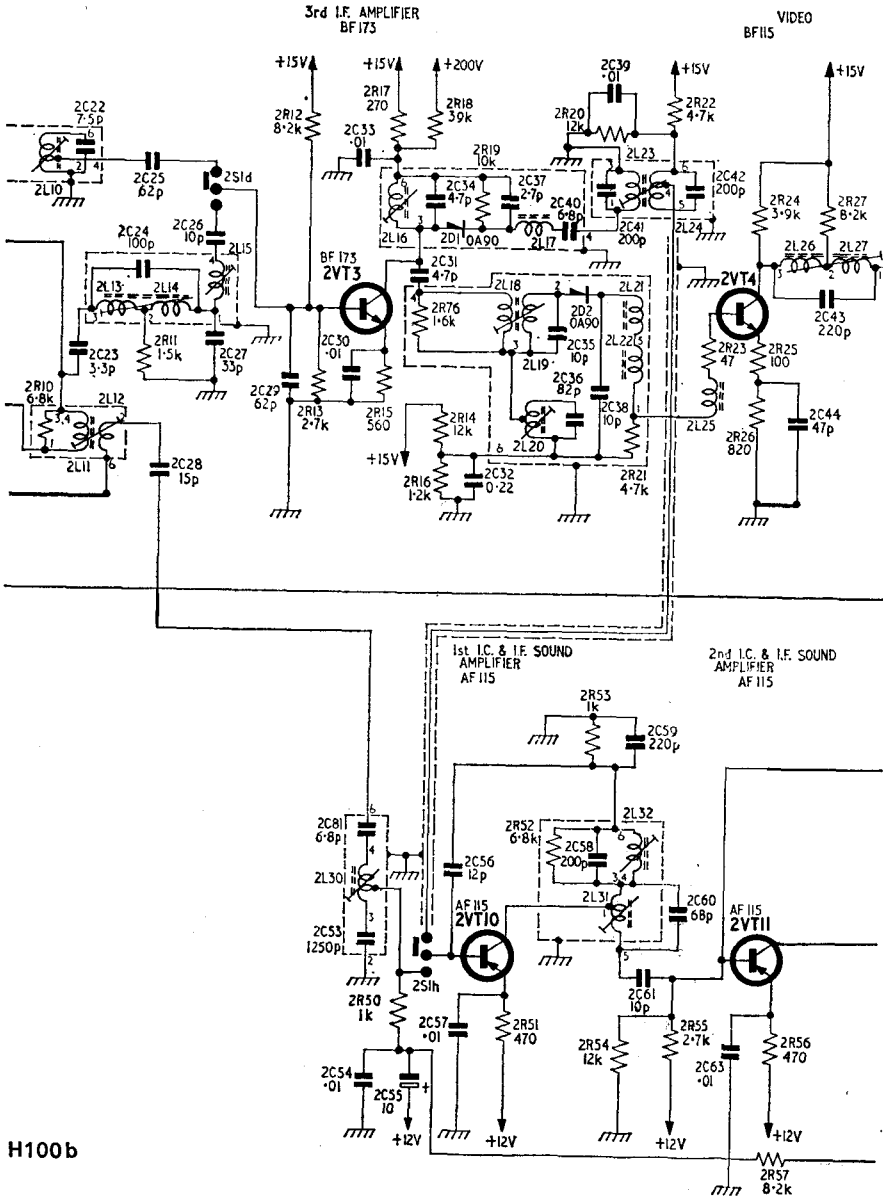


(H100a) CIRCUIT DIAGRAM—I.F. STAGES, ETC. (PART)

### Circuit Diagram Modifications:

1. Resistor 5R29 is changed to 680 ohms (Section M. V Detector).
2. A 33pF capacitor is added between the junction of 2L32, 2L31, 2C60 and 2C61, 2C62, 2R50, etc., in the sound I.F. amplifier.
3. On some models the Thermistor 9TH1, and shunt resistor 9R21 is located in a different position to that shown in the circuit diagram. They are connected between the tag 7 of coil 9L28, and the bottom of resistor 9R23, also tag 3, of coil 9L27, and tag 4 of coil 9L28, are joined, and the junction taken to the slider of 9RV27. See also Circuit Diagram Notes with diagram on page 94.

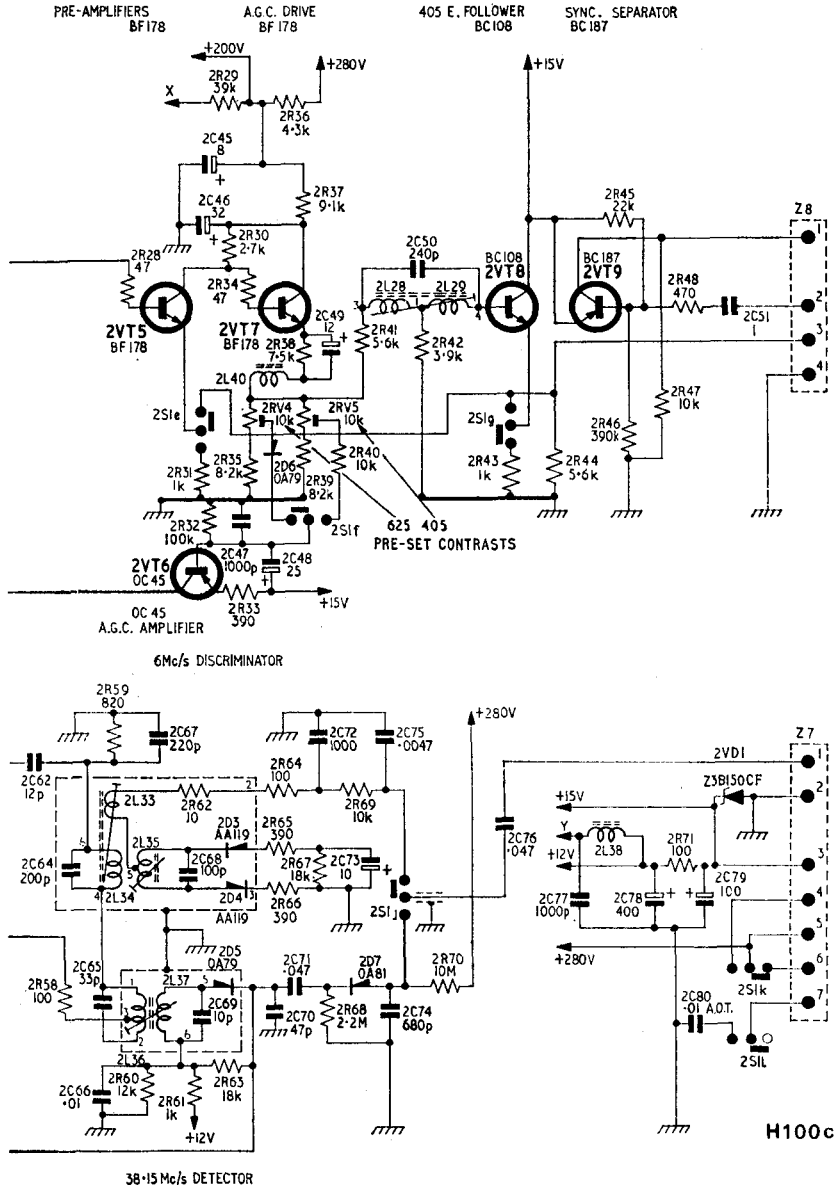
# BUSH



H100b

(H100b) CIRCUIT DIAGRAM—I.F. STAGES, ETC. (PART)

# COLOUR TELEVISION SERVICING



(H100c) CIRCUIT DIAGRAM—I.F. STAGES, ETC. (CONTINUED)

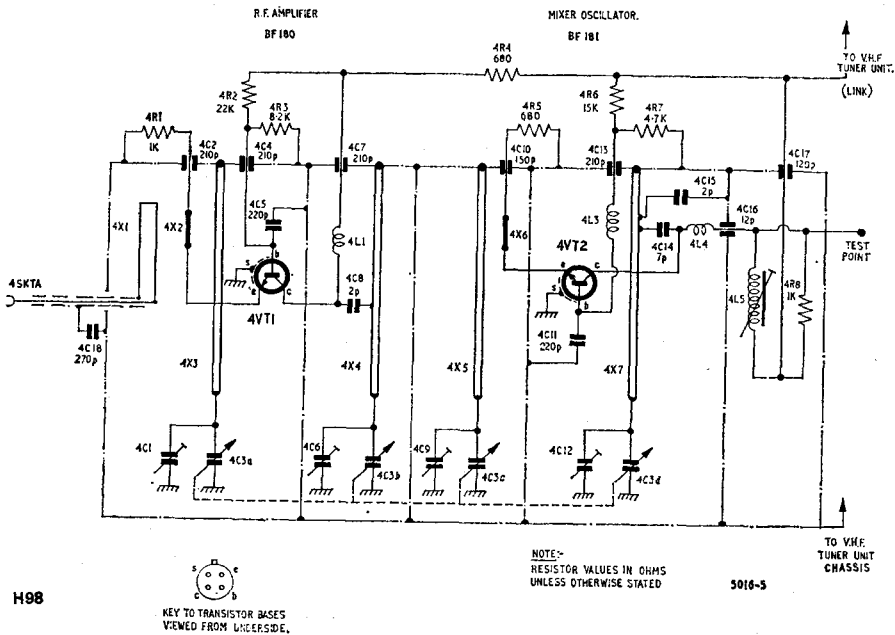
# BUSH

1. Select a 625 channel. Set the brightness control for a satisfactory brightness level. Check that the display is correctly locked. Adjust the core of the pin-cushion correction coil 3L19 so that any bowing at the top border of the picture is symmetrical.

2. Switch to a 405 channel and make a compromise adjustment to 3L19 if necessary.

**3rd Harmonic Tuning (3L12 and 3L11):** The 3rd harmonic tuning coils 3L12 on 405 and 3L11 on 625 are located inside the screened compartment of the timebase chassis. They are adjusted when the line-transformer is assembled and normally should not need adjustment. If, however, readjustment is required, carry out the following procedure:

1. Select a 625 channel, and set the brightness control 9RV25 for a visible picture. Check the line and field frequency then black out the C.R.T. with the brightness control or the A1 C.R.T. gun switches.



(H98) CIRCUIT DIAGRAM—U.H.F. TUNER

2. Connect a 30 kV. E.H.T. meter between the chassis and the 25 kV. C.R.T. supply, and an A.V.O. Meter Model 8 (2.5 volt D.C. range) between the chassis and pin 1 of 3V6 PD500, i.e. across the cathode resistor 3R29.

3. Adjust the core of 3L11, 625 harmonic tuning for maximum E.H.T. volts and maximum current in the cathode resistor 3R29.

4. Switch to a 405 channel, and repeat settings as in item 1, then adjust the core of 3L12 405 harmonic tuning for maximum E.H.T. volts and

maximum current in the cathode resistor 3R29. *Note:* It will be necessary to carry out operation 7 line drive and E.H.T. adjustment after readjusting the 3rd harmonic tuning.

**Sub-Carrier Reference Generator:** The sub-carrier generator controls 6RV1, 6TC1 and tuning adjustments 6L10/11 and 6L8/9 are located on the luminance/colour difference panel.

1. Select a 625 channel (colour signal). Set the brightness control 9RV25 for a satisfactory brightness level. Check that the line and field frequencies are correct. Then position the Colour control 9RV28 halfway. Override the colour killer circuit by connecting an 18 k $\Omega$  resistor between TP.P2, and TP.P3, and turn 6TC1 halfway. Connect TP.E3 to TP.E2.

2. Connect the C.R.O. to TP.E4. Adjust the sub-carrier oscillator output coil 6L10/11 for maximum output.

3. Transfer the C.R.O. to TP.G1, (any one of the colour difference amplifier outputs) and adjust 6TC1 the sub-carrier oscillator trimmer for zero beat on the C.R.O., i.e. colours just running through on the screen of the C.R.T. **Use a non metallic tool.** Remove connection between TP.E3 and TP.E2.

4. Connect the C.R.O. (switched to D.C.) to TP.E3. Stop sub-carrier oscillator by connecting TP.E4, to TP.E5. Adjust balance potentiometer 6RV1 for zero D.C. volts. Remove connecting link between TP.E4 and TP.E5.

**V. Channel Synchronism:** The V. channel sync. control 5RV3 is located on the decoder panel and the tuned coil 6L12 on the luminance colour difference panel.

1. Select a 625 channel (colour signal). Set the brightness control 9RV25, for the correct level. Override the colour killer circuit by connecting an 18 k $\Omega$  resistor between TP.P2, and TP.P3.

2. Turn the V. channel sync. control 5RV3, fully clockwise (view from rear of receiver). If the picture has incorrect colours, interrupt the signal until the picture has the correct colours. Disconnect the 18 k $\Omega$  resistor TP.P2, and TP.P3.

3. Connect the C.R.O. (switched to D.C.) between chassis and TP.P3 and adjust coil 6L12 for maximum D.C. volts output on the C.R.O. Remove C.R.O. from the test points.

4. Interrupt the signal until the picture has incorrect colours, i.e. wrong V. channel sync., then turn the V. channel sync. control 5RV3, slowly back (counter-clockwise) until the correct synchronism is obtained, i.e. correct colours in the picture. **Do not turn the control beyond the point at which correct V. channel sync. is satisfactory, with either a weak or interrupted signal.**

**Purity Adjustment:** The controls associated with the purity adjustments consist of the purity ring magnet, scan coil yoke and the static convergence magnets, and are all located on the C.R.T. neck. The red, green and blue A1 gun switches 9S1a, b and c, are mounted on the convergence panel.

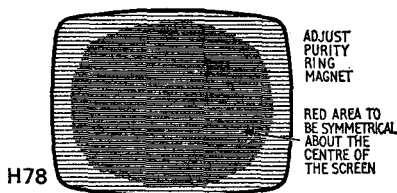
## BUSH

**Note:** The term purity as applied to the shadow mask tube means the correct position of each of the electron beams as they approach the holes in the shadow mask when each beam should fall on the appropriate phosphor dot. The correction is made by means of the purity ring magnet, prior to the process of scan deflection.

1. Carry out the complete degaussing procedure.
2. Switch on the receiver and allow it ten minutes to warm up. Switch to a 625 channel and apply R.F. signal generator modulated with a cross hatch pattern to the aerial input. Adjust the input level and the brightness control 9RV25 so that the cross hatch pattern is visible.
3. Adjust the red, green and blue radial static magnets to minimum field, i.e. yellow dot on magnet to rear, Switch off blue gun by means of switch 9S1a, and viewing centre of screen only, adjust red and green radial static magnet to overlay—red and green line (produce yellow) then switch on blue gun and adjust blue radial and lateral static magnets to overlay (view centre of screen only) blue line on yellow (produces white). Only a rough adjustment is required at this stage.

If possible, switch off the cross hatch pattern leaving only a synchronised raster.

(H78) PURITY DIAGRAM



4. Loosen the four wing nuts securing the scan coils in the scan assembly cradle.

5. Switch off the green and blue guns using the A1 gun switch 9S1a and b. Turn the purity ring magnet to a minimum field, i.e. align the slots in the plastic rings for minimum field.

6. Adjust the purity ring magnets, by increasing the field strength a small amount at a time then rotating the complete purity magnet assembly around the neck of the C.R.T., repeating the field adjustments and rotating the assembly until the red area is central on the C.R.T. screen. See accompanying diagram.

7. Move the scan coils forward or backwards on the C.R.T. neck until a full pure red field is obtained over the entire screen, then tighten the four scan coil clamp screws.

8. Switch off the red gun and switch on the green and blue guns in turn and check that the green and blue fields are satisfactorily pure. **Note:** If the red, green and blue fields are not satisfactorily pure repeat the procedure carefully.

**Convergence:** The controls associated with the convergence adjustments are located on the convergence panel and the scan assembly cradle fitted to the C.R.T. neck.

### 1. Static Convergence

Red	}	{	Radial convergence static magnets (one for each gun) located on the convergence coil yoke mounted on the rear of the scan yoke assembly.
Green			
Blue			
Blue			
			Lateral convergence static magnet assembly located on the C.R.T. neck to the rear of the scan coil assembly.

### 2. Dynamic Convergence

Employing the following controls:

Field Derived

9RV6	Amp.	}	Vertical Red/Green	}	Located on the convergence panel	
9RV1	Tilt					
9RV16	Diff.					
9RV12	Amp.	}	Vertical Blue			
9RV11	Tilt					
Line Derived 625						
9RV19	Amp.	}	Horizontal Red/Green			
9RV20	Tilt					
9RV21	Diff.					
9RV22	Amp.	}	Horizontal Blue			
9RV18	Tilt					
9L9	Shape					
9L5/6	Width					
Line Derived 405						
9RV3	Amp.	}	Horizontal Red/Green			
9RV8	Tilt					
9RV9	Diff.					
9RV15	Amp.	}	Horizontal Blue			
9RV10	Tilt					
9L7	Shape					
9L3/4	Width					

### 3. Scan Coil Balance Controls

9RV27	Vertical Scan Coil Balance	}	Located on the scan assy. cradle
9L21	Horizontal Scan Coil Balance		

4. **Warning:** Carefully read the following comments before making any convergence adjustments.

(a) Check that the picture width, height, linearity, focus centering, squaring, are correct.

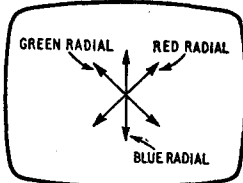
(b) Check that the receiver purity is satisfactory looking at the red, green and blue field in turn. *Note:* If large convergence errors are present it may not be possible to obtain a satisfactory purity on all fields. The remedy is to make a rough static and dynamic convergence adjustment followed by the purity adjustment.

## BUSH

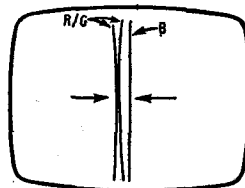
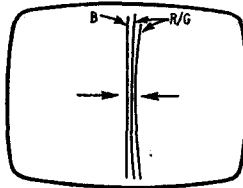
- (c) Carry out degaussing if any impurity exists.
- (d) If significant errors are present it is preferable to make two sets of purity and convergence adjustments, a rough and a final adjustment. This is to reduce the effects of interaction between convergence and purity.
- (e) Check that the E.H.T. and boosted boost voltages are similar between the 405 and 625 line standards.
- (f) In the following convergence information, adjustments are only made looking along the centre horizontal line and down the centre vertical line and at intersections with them. No adjustments can be made observing the corners of the picture.
- (g) Since dynamic convergence adjustments will cause changes in static convergence, it will be found necessary to readjust the static convergence from time to time during the setting-up procedure.
- (h) If there is a static error of the red, green or blue lines (centre screen area) the correct dynamic convergence adjustment requires that the red, green or blue should be parallel so that correcting the static error will then overlay the red, green or blue lines to give correct convergence.

### Convergence Procedure:

1. Select a 625 channel. Connect an R.F. generator (modulated with a cross hatch pattern) to the aerial input of the receiver. Tune for a satisfactory pattern and adjust the brightness control 9RV25 for a raster with cross hatch lines.



DIRECTION OF RADIAL STATIC SHIFT  
FOR RED GREEN AND BLUE GUNS



DIRECTION OF LATERAL STATIC SHIFT FOR BLUE GUN H79

(H79) STATIC CONVERGENCE DIAGRAMS

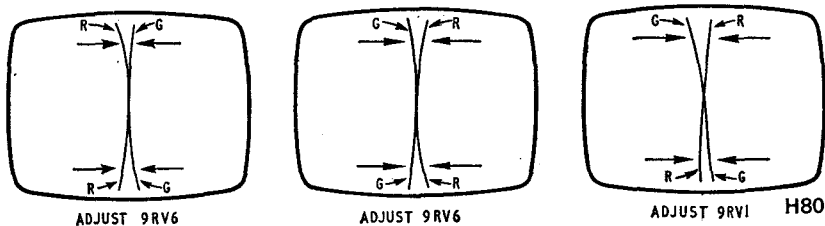
2. Adjust the red, green and blue radial static magnets so that the yellow dot marked on the magnets is turned to the rear, i.e. minimum field.
3. Adjust the red and green radial static magnets to overlay the red and green lines, then adjust the blue radial and lateral static magnets to overlay the blue line on the yellow.
4. Pre-set the controls as follows:

9RV6	Red/green amp.	}	Adjust to maximum counter-clockwise
9RV1	Red/green tilt		Adjust to centre of travel
9RV16	Red/green diff.		
9RV12	Blue amp.		Adjust to maximum counter-clockwise
9RV11	Blue tilt		Adjust to centre of travel
9RV27	Balance		No pre-set position given



## COLOUR TELEVISION SERVICING

5. Switch the blue gun A1, switch 9S1A to "Off".
6. Adjust the red/green vertical amp. control 9RV6—to straighten the centre vertical red and green lines.
7. Adjust the red/green vertical tilt control 9RV1—to prevent the centre vertical red, green lines from crossing over each other.
8. Repeat items 6 and 7 as often as required.



(H80) DYNAMIC CONVERGENCE DIAGRAMS—1

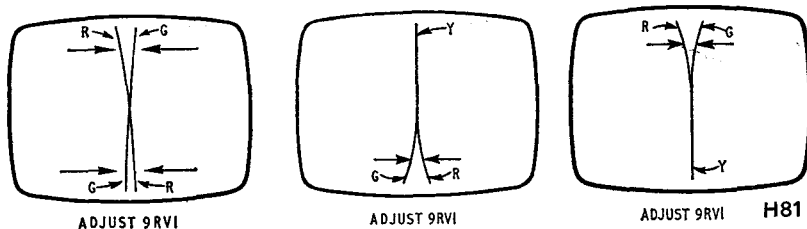
9. Adjust the red/green vertical diff. control 9RV16—to make the red, green horizontal lines intersecting the vertical red, green lines equally spaced or coincident from top to bottom. *Note:* If unable to equalise the spacing at top and bottom adjust the vertical scan coil balance control 9RV27, then readjust 9RV16.

10. Adjust red and green radial static magnets—to overlay the red and green lines (yellow line resulting), view centre of screen only.

11. Switch blue A1 gun switch 9S1a—to On. View red, green and blue rasters. Adjust blue vertical amp. control 9RV12 and blue vert. tilt control 9RV11—so that the blue horizontal intersections with the centre vertical line are equally spaced with respect to the horizontal yellow line.

*Note:* Make a rough adjustment first, then switch the blue gun A1 switch 9S1a,—to Off. Check that the red and green static convergence is correct and adjust if necessary, then switch the blue gun A1 switch—to On, and adjust the blue radial and lateral static magnets to overlay the blue line on the yellow line (view centre of screen). Then repeat adjustments to 9RV12 and 9RV11 as above.

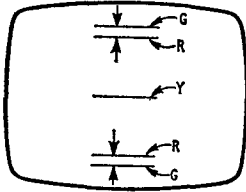
12. Repeat items 5 to 11 if required.



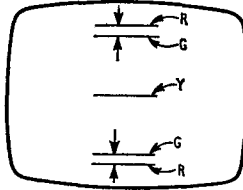
(H81) DYNAMIC CONVERGENCE DIAGRAMS—2

# BUSH

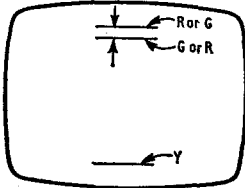
13. Pre-set controls as follows: 9RV19 Amp.—Adjust to fully counter-clockwise. 9RV20 Tilt. and 9RV21 Diff.—Adjust to centre of travel.



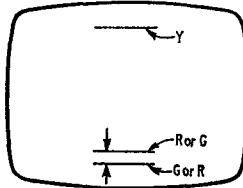
ADJUST 9RV16



ADJUST 9RV16



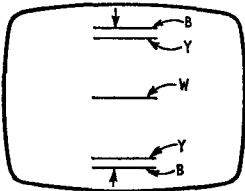
ADJUST 9RV27



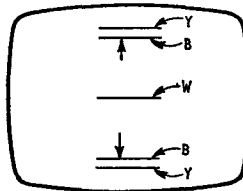
ADJUST 9RV27 H82

## (H82) DYNAMIC CONVERGENCE DIAGRAMS—3

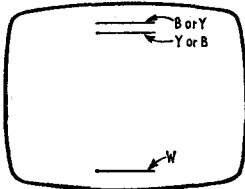
14. Switch the blue gun A1, switch 9S1a—to Off. Adjust the red/green horizontal amp. control 9RV19 for most equal spacing of the vertical red/green lines at the intersections with the horizontal red/green lines.



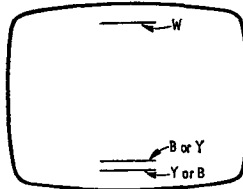
ADJUST 9RV12



ADJUST 9RV12



ADJUST 9RV11



ADJUST 9RV11 H83

## (H83) DYNAMIC CONVERGENCE DIAGRAMS—4

15. View as in item 14, if the spacing of the red/green lines is unequal right across the screen—Adjust red/green horizontal tilt control 9RV20.

## COLOUR TELEVISION SERVICING

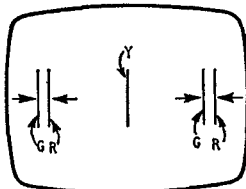
16. View along the centre horizontal red/green lines. Adjust the red/green horizontal diff. control 9RV21—to make the red/green horizontal lines parallel.

*Note 16/1:* If after optimum adjustment 16 the red and green horizontal lines cross over—Adjust the horizontal scan coil balance control 9L21—to correct skewing of the red versus green horizontal lines.

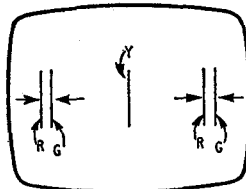
17. Repeat operations 14, 15 and 16 as necessary.

18. Adjust the red/green radial static convergence magnets—to overlay the red horizontal line on the green horizontal line (produce yellow).

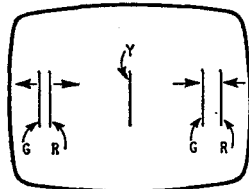
19. Pre-set controls as follows: 9RV22 Amp.—Adjust to fully clockwise; 9RV18 Tilt—Adjust to centre of travel; 9L9 Shape—No pre-set position given; 9L5/6 Width—No pre-set position given.



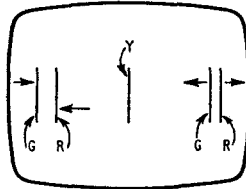
ADJUST 9RV19 (625)  
9RV3 (405)



ADJUST 9RV19 (625)  
9RV3 (405)



ADJUST 9RV20 (625)  
9RV8 (405)



ADJUST 9RV20 (625)  
9RV8 (405) H84

### (H84) DYNAMIC CONVERGENCE DIAGRAMS—5

20. Switch the blue gun A1, switch 9S1a—to On. Adjust the blue horizontal amp. control 9RV22—to make the blue horizontal line as near as possible parallel with the yellow line.

21. If the blue horizontal line cannot be made parallel with the yellow horizontal line both left and right of centre—Adjust the blue horizontal tilt control 9RV18.

*Note 21/1:* If a wave either side of centre of the blue horizontal line is seen or if there is a blue droop at the extreme left or right—Adjust the blue shape control 9L9.

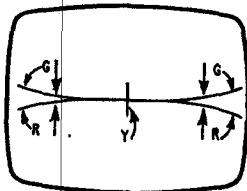
*Note 21/2:* If 9L9 is adjusted too far it will be found that there will be insufficient range of adjustment on 9RV22.

22. Check red, green and blue radial and blue lateral static convergence (centre of screen) and adjust if necessary.

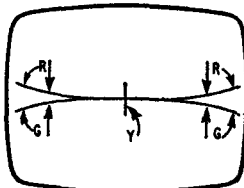
23. View red, green and blue rasters. View along horizontal centre line

## BUSH

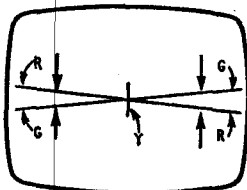
at the intersections with it. If the blue vertical lines overlay the yellow lines (white produced) no adjustment is required. If the blue vertical lines are either inside (blue narrow) or outside (blue wide) the vertical yellow lines proceed as follows: Adjust blue width coil 9L5/6—to overlay the blue



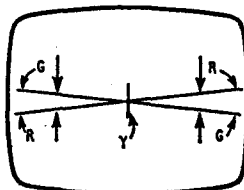
ADJUST 9RV21 (625)  
9RV9 (405)



ADJUST 9RV21 (625)  
9RV9 (405)



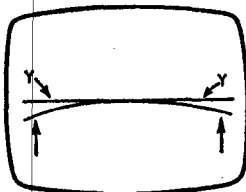
ADJUST 9L21 (625)



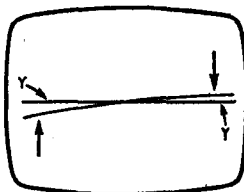
ADJUST 9L21 (625) H85

### (H85) DYNAMIC CONVERGENCE DIAGRAMS—6

vertical line on the yellow vertical line, withdraw core to increase width, screw in core to decrease width. (Do not withdraw the core further than the outermost coil.) If with the core in the outermost position blue width is still insufficient disconnect one of the supply leads to the blue width coil on blue lateral assembly and insulate the end of the lead.



ADJUST 9RV22 (625)  
9RV15 (405)



ADJUST 9RV18 (623)  
9RV10 (405) H86

### (H86) DYNAMIC CONVERGENCE DIAGRAMS—7

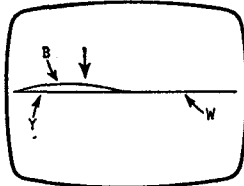
*Note 23/1:* View centre horizontal line. If there is a linearity difference between the vertical blue lines with respect to the vertical yellow lines, slacken the clamp screw securing the convergence yoke to the scan assembly cradle and rotate very slightly to correct this error, then re-tighten the clamp screw. The adjustment will have some effect on all other convergence adjustments.

## COLOUR TELEVISION SERVICING

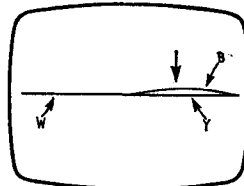
24. Check red, green and blue radial and blue lateral static convergence (centre of screen) and reset if necessary.

25. Pre-set controls as follows: 9RV3 Amp.—Adjust control to fully counter-clockwise. 9RV8 Tilt and 9RV9 Diff.—Adjust controls to centre of travel.

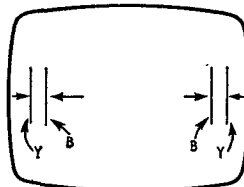
26. Select a 405 channel. Switch the cross hatch generator to 405. Tune the receiver for a satisfactory pattern and adjust the brightness control 9RV25 for a raster with the cross hatch lines visible.



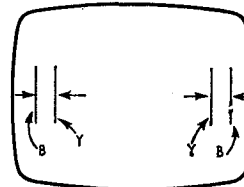
ADJUST 9L9 (625)  
9L7 (405)



ADJUST 9L9 (625)  
9L7 (405)



ADJUST 9L5/6 (625)  
9L3/4 (405)



ADJUST 9L5/6 (625)  
9L3/4 (405) H87

(H87) DYNAMIC CONVERGENCE DIAGRAMS—8

27. Carry out operations 14, 15 and 16 but using the 405 red/green horizontal controls instead of the 625 red/green horizontal controls, as follows: Use the red/green horizontal amp. 9RV3 in place of 9RV19. Use the red/green horizontal tilt 9RV8 in place of 9RV20. Use the red/green horizontal diff. 9RV9 in place of 9RV21.

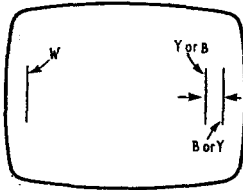
*Note 16/1: does not apply.*

*Note 27/1:* The correct dynamic convergence on 405 should give the appropriate static convergence provided the 625 convergence adjustments have been correctly carried out. However, slight compromise adjustments may be required in dynamic convergence but should never be permitted with static convergence.

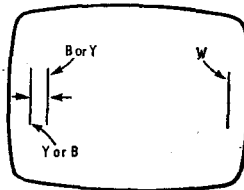
*Note 27/2:* Two focus controls are provided 3RV5, 625; and 3RV4, 405; and adjustments to these may give rise to static convergence errors before a serious change in focus occurs. Therefore if there is a difference in static convergence between the 405 and 625 line standards the setting of the focus controls should be checked.

# BUSH

28. Pre-set controls as follows: 9RV<sub>15</sub> Amp.—Adjust to fully counter-clockwise; 9RV<sub>10</sub> Tilt—Adjust to centre of travel; 9L<sub>7</sub> Shape and 9L<sub>3/4</sub> Width—No pre-set position given.



ROTATE CONV. YOKE



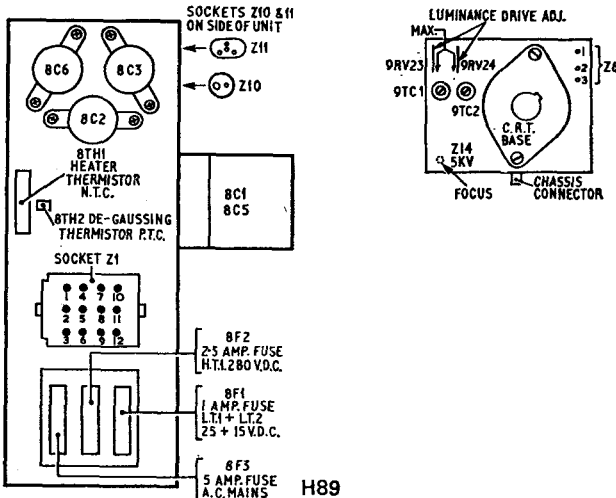
ROTATE CONV. YOKE H88

(H88) DYNAMIC CONVERGENCE DIAGRAMS—9

29. Carry out operations 20, 21 and 23, including Notes 21/1, 21/2 but using the 405 blue horizontal convergence controls as follows: Use blue horizontal amp. control 9RV<sub>15</sub> in place of 9RV<sub>22</sub>. Use blue horizontal tilt control 9RV<sub>10</sub> in place of 9RV<sub>18</sub>. Use blue horizontal shape control 9L<sub>7</sub> in place of 9L<sub>9</sub>. Use blue horizontal width control 9L<sub>3/4</sub> in place of 9L<sub>5/6</sub>.

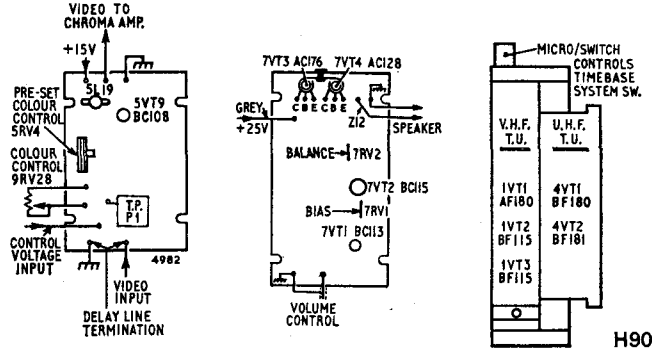
**Important: Line Output Stage 3V<sub>3</sub>, PL505. Cathode Current.** On completion of operation 7 or any adjustment affecting the line output stage conditions, it is advisable to ascertain that the maximum recommended cathode current in 3V<sub>3</sub> PL505 is not exceeded. Check as follows:

1. Connect an A.V.O. Model 8. (10-volt D.C. range) across 3RV<sub>3</sub> (horizontal shift control).
2. Set control 3RV<sub>3</sub> to the centre of its travel.



(H89) LAY-OUT OF POWER UNIT AND C.R.T. BASE

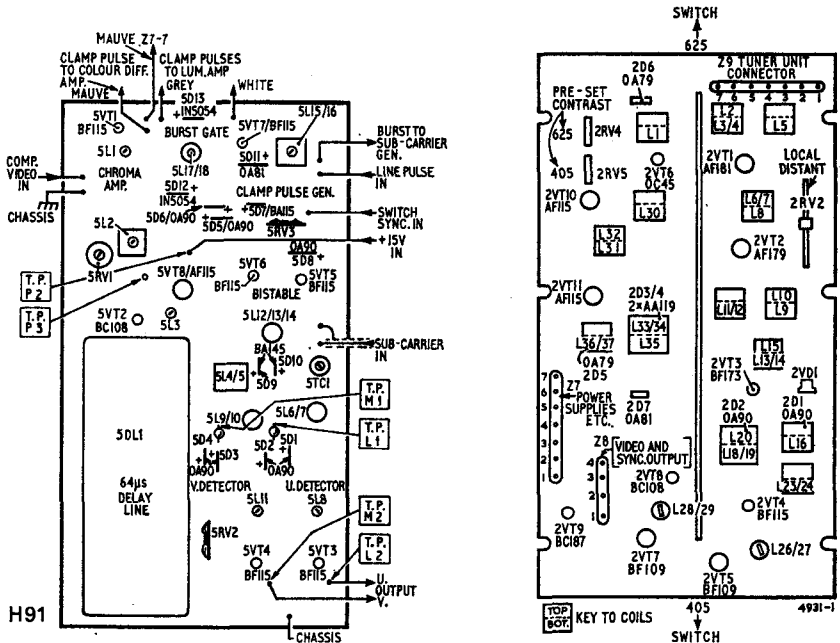
# COLOUR TELEVISION SERVICING



(H90) LAY-OUT OF A.C.G. UNIT, AUDIO UNIT AND TUNER UNIT

3. Note the voltage across 3RV3, which should be as follows: 405 system, 4 volt maximum; 625 system, 4.3 volt maximum.

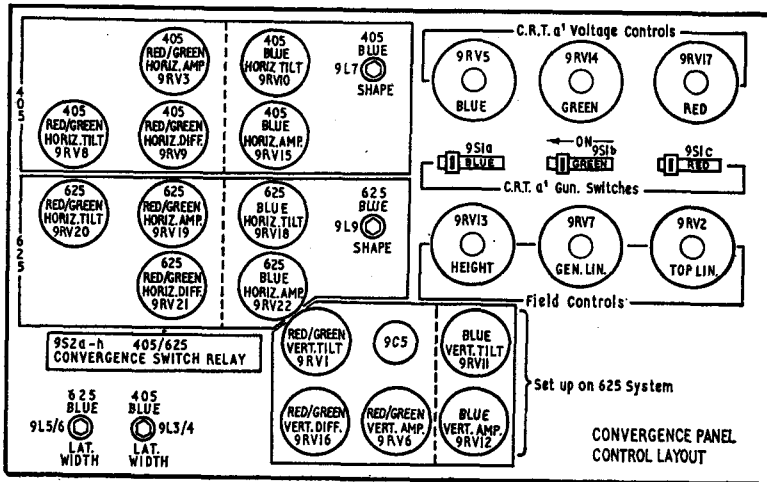
**Grey Scale Adjustment:** To produce a satisfactory grey scale two sets of adjustments must be made. First, the cut-off potentials of each of the three guns must be set to the required value. This is carried out by varying the C.R.T. A1 voltages, the controls being A1 voltage controls 9RV5,



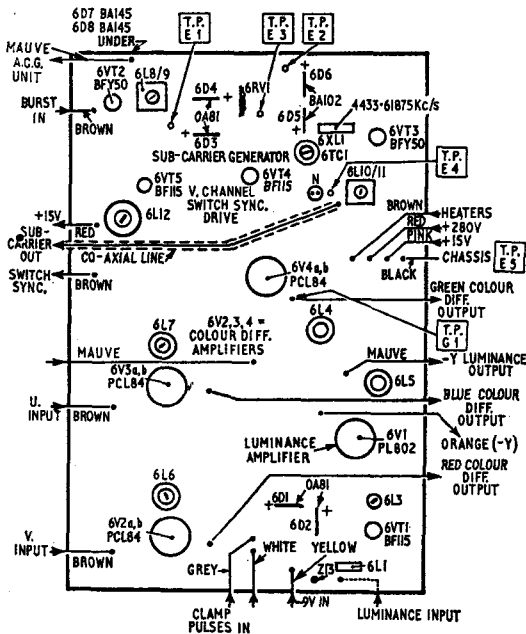
(H91) LAY-OUT OF DECODER UNIT AND I.F. UNIT

# BUSH

9RV14 and 9RV17 (low lights only) and the luminance drive controls 9RV23 and 9RV24 (high lights only). The controls are situated on the convergence panel and C.R.T. base panel respectively. Second, the drives to the guns must be set to the required ratio by means of the drive controls on the



H92

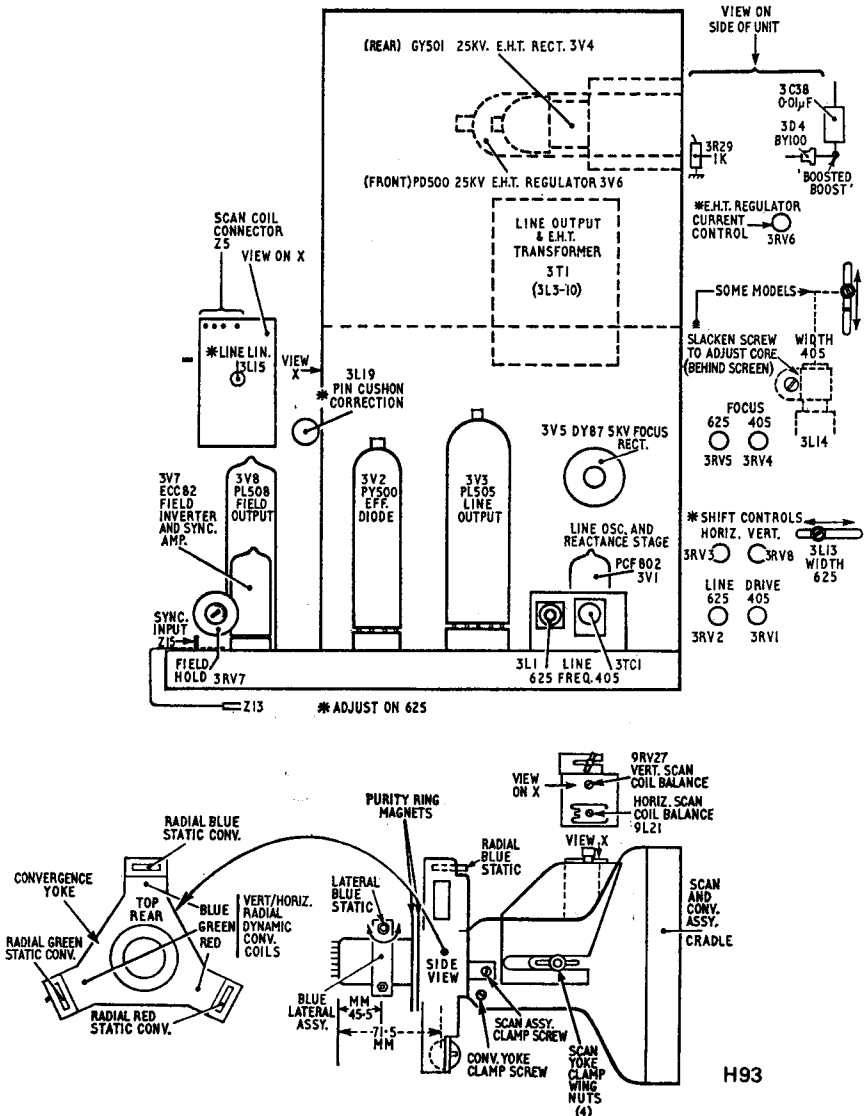


(H92) LAY-OUT OF CONVERGENCE PANEL AND LUMINANCE AND COLOUR DIFFERENCE AMPLIFIER



## COLOUR TELEVISION SERVICING

tube base. Normally the red gun has fixed drive at maximum level, the other two being adjustable. If necessary the connections can be changed to permit the red drive to be varied.



(H93) LAY-OUT OF TIMEBASE AND E.H.T. UNIT AND SCAN AND CONVERGENCE ASSEMBLY

Note: Width controls (405/625) repositioned at side of timebase unit.

# BUSH

**Method:** Carry out the procedure in subdued lighting conditions.

1. Select a 625 channel, apply no signal input.
2. Set the Luminance Drive controls 9RV23 and 9RV24, to maximum (slider to anode of luminance output valve 6V1 anode).
3. Connect an A.V.O. Meter Model 8 across 9RV23, use on 10 volt D.C. range.
4. Adjust the brightness control for zero volts D.C. on the A.V.O.
5. Adjust the C.R.T. A1 voltage controls 9RV17, 9RV14 and 9RV5 to black out the rasters, then readjust each control in turn to just illuminate each raster—taking care that the *dim raster (low lights) is neutral grey*. See Note 5/1.
6. Apply a 625 monochrome signal (test pattern if possible) and adjust the luminance drive controls 9RV23 and 9RV24 for a correct neutral raster in the high lights.

If any colour tint shows in the low lights a slight adjustment to the red and/or blue A1 voltage controls 9RV17 or 9RV5 may be made to correct it. Do not readjust the green A1 voltage control 9RV14. See Note 6/1.

7. Select a 405 channel, and apply a monochrome signal (test pattern if possible). Check that the grey scale is satisfactory. If there should be a significant change, check that the boost voltage does not differ between standards.

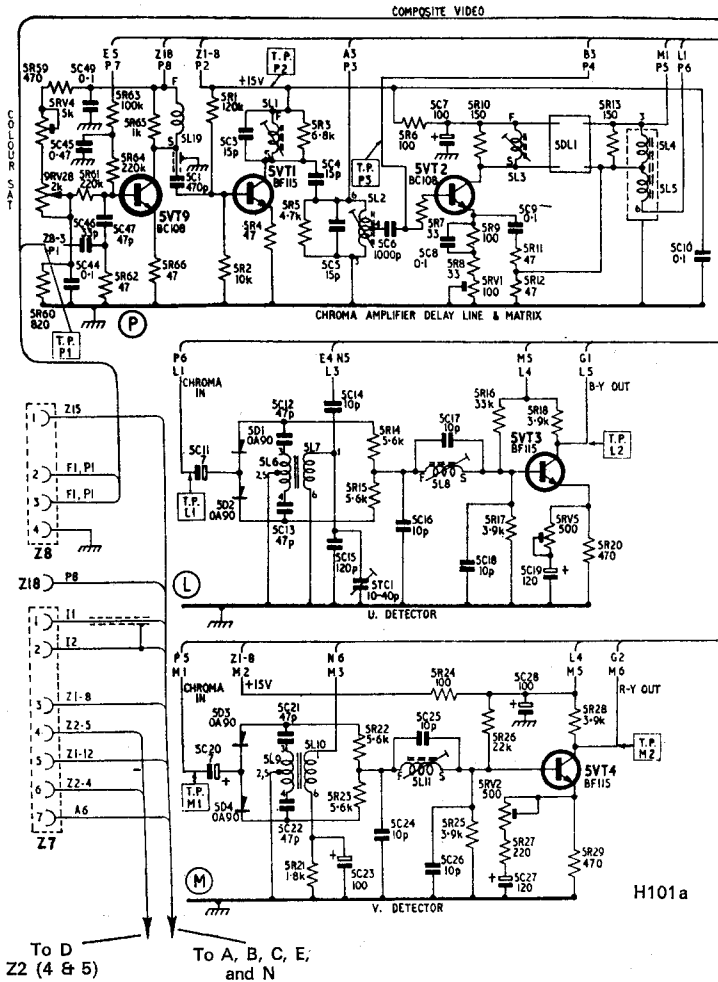
**Note 5/1:** If it is not possible to raise all three rasters, cut the link across 6R40, should it be impossible to black out any of the rasters replace the link across 6R40. Resistor 6R40 is located to the left of 6V4.

**Note 6/1:** If with the best adjustments of the luminance drive controls the high lights still show a red tint, change the red gun cathode leads with the (green or blue gun cathode) which ever is set to maximum.

Tint	Low lights—A1 adjustment
Red . . . . .	Decrease red
Green . . . . .	Increase red and blue
Blue . . . . .	Decrease blue
Cyan (blue/green) . . . . .	Increase red
Magenta (red/blue) . . . . .	Decrease red and blue
Yellow . . . . .	Increase blue

Tint	High lights—Luminance drive adjustment
Red . . . . .	Increase green and blue drive or if one is at max., interchange red cathode lead with one set at maximum
Green . . . . .	Decrease green drive
Blue . . . . .	Decrease blue drive
Cyan . . . . .	Decrease green and blue drive
Magenta . . . . .	Increase green drive or if at max., interchange green and red gun cathode leads and readjust
Yellow . . . . .	Increase blue drive or if at max. interchange blue and red gun cathode leads and readjust

# COLOUR TELEVISION SERVICING

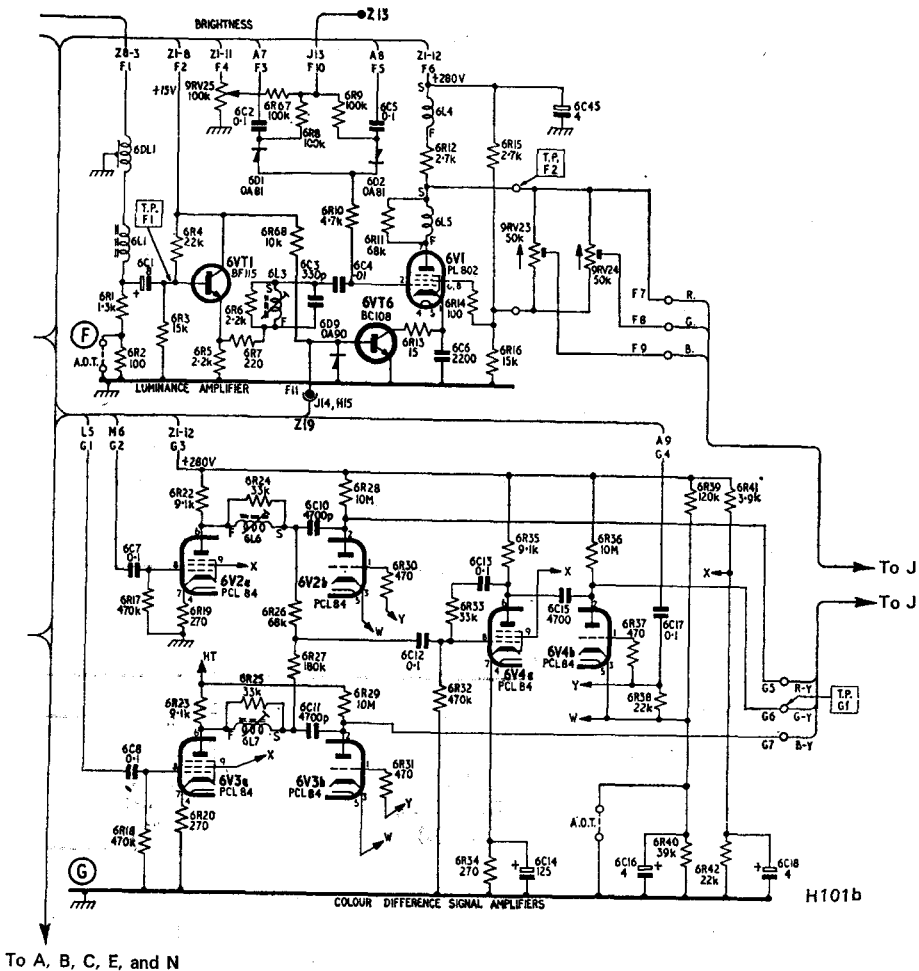


(H101a) CIRCUIT DIAGRAM—U AND V DETECTORS, ETC. (PART)

## Circuit Diagram Notes:

1. Sections of the circuit diagram are identified with letters, e.g. "P" chroma amplifier, delay line and matrix.
2. The double reference associated with each circuit section is intended as tracking guidance for that section, e.g. section "P" chroma amplifier

# BUSH



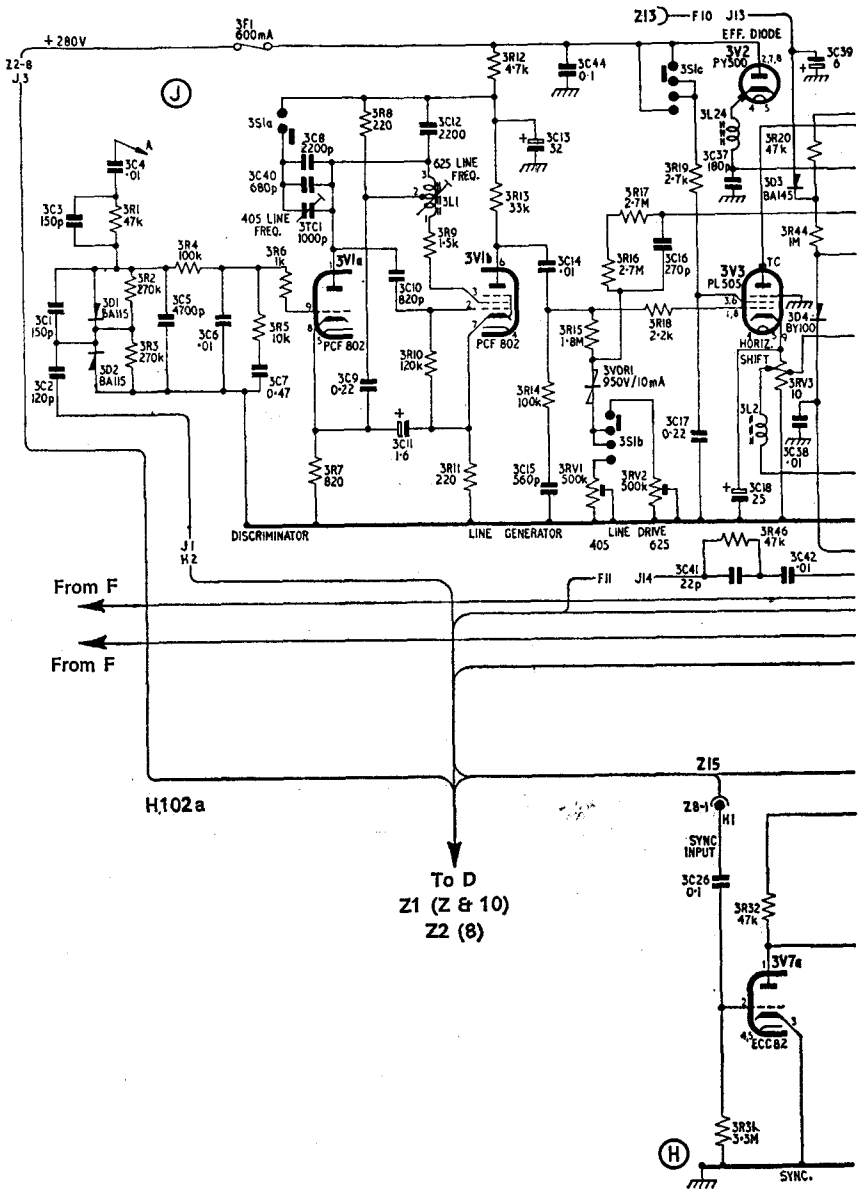
(H101b) CIRCUIT DIAGRAM—U AND V DETECTORS, ETC. (CONTINUED)

delay line, etc., letters "P<sub>4</sub>", "B<sub>3</sub>" signify, that the base of Transistor 5VT<sub>2</sub>, "P<sub>4</sub>", is connected to "B<sub>3</sub>", of section "B", the colour killer amplifier.

3. The reference "Z" is used to identify the plugs and sockets.

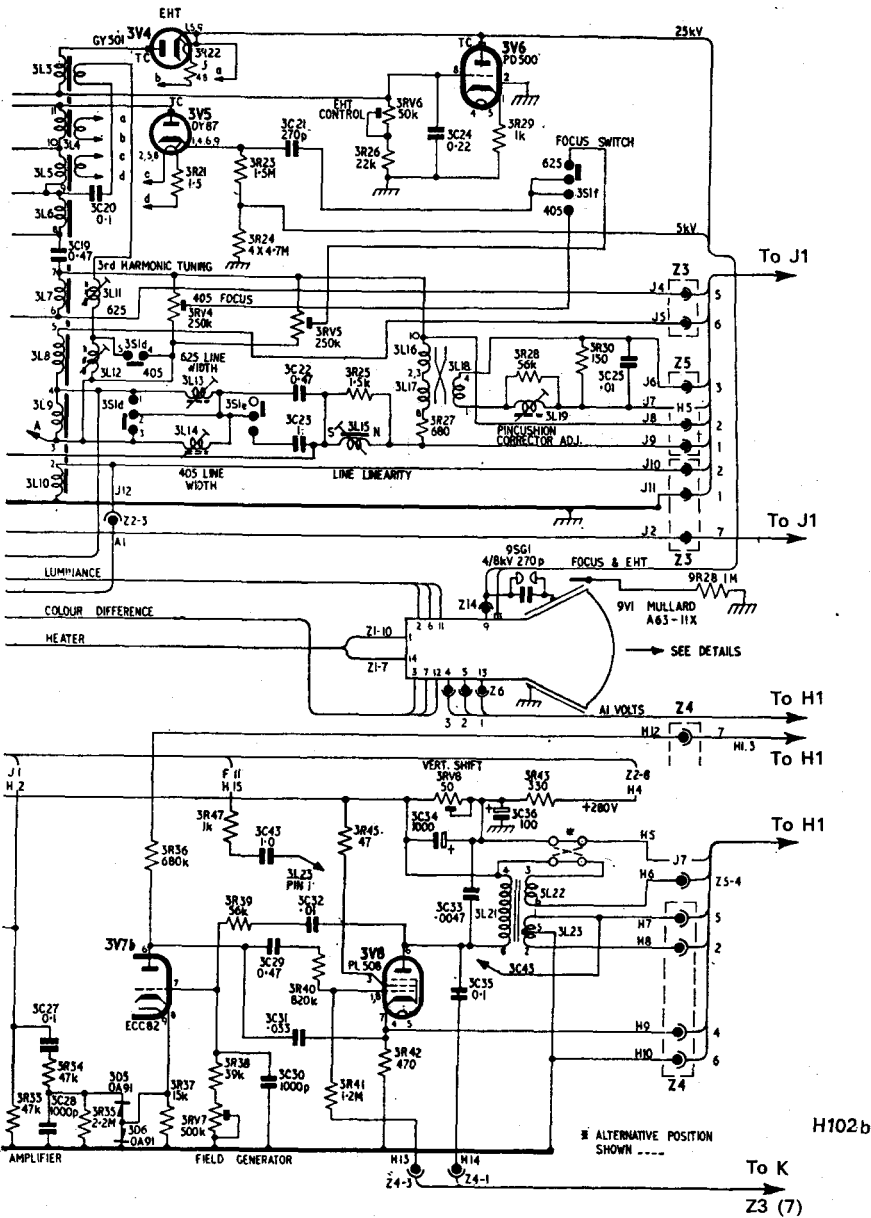
*Note:* Attention is drawn to Circuit Modifications, listed on page 76.

# COLOUR TELEVISION SERVICING



(H102a) CIRCUIT DIAGRAM—LINE TIMEBASE, ETC. (PART)

# BUSH



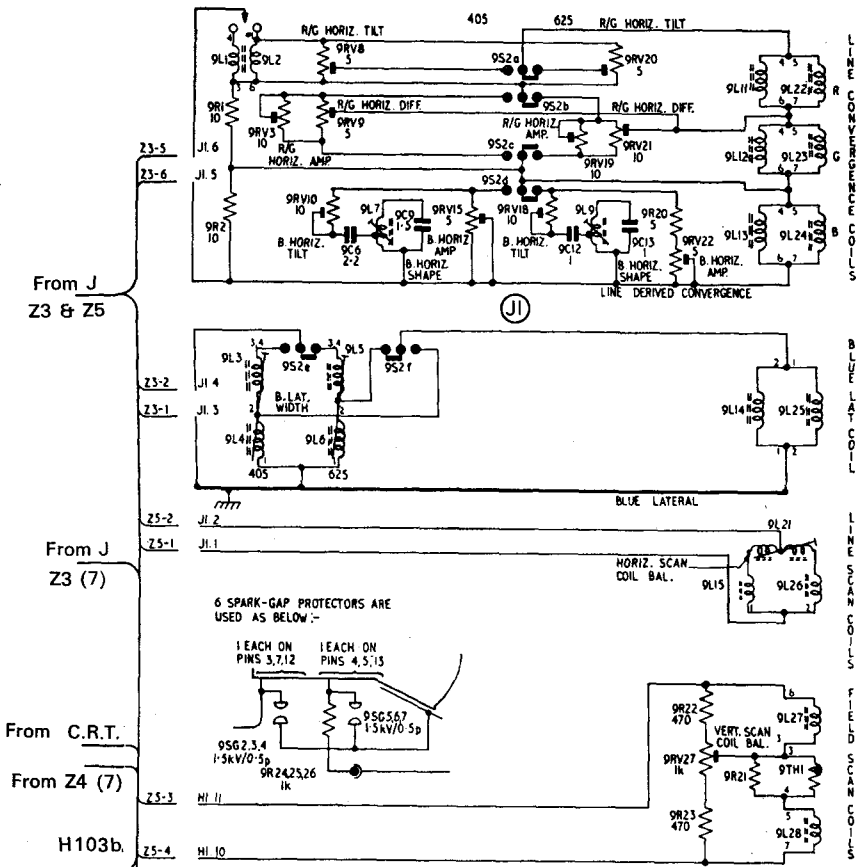
(H102b) CIRCUIT DIAGRAM—LINE TIMEBASE, ETC. (CONTINUED)

## FIELD CONVEYANCE COILS



1. Remove the receiver back. Check that all the valves and plugs are

# BUSH



(H103b) CIRCUIT DIAGRAM—CONVERGENCE COILS, ETC. (CONTINUED)

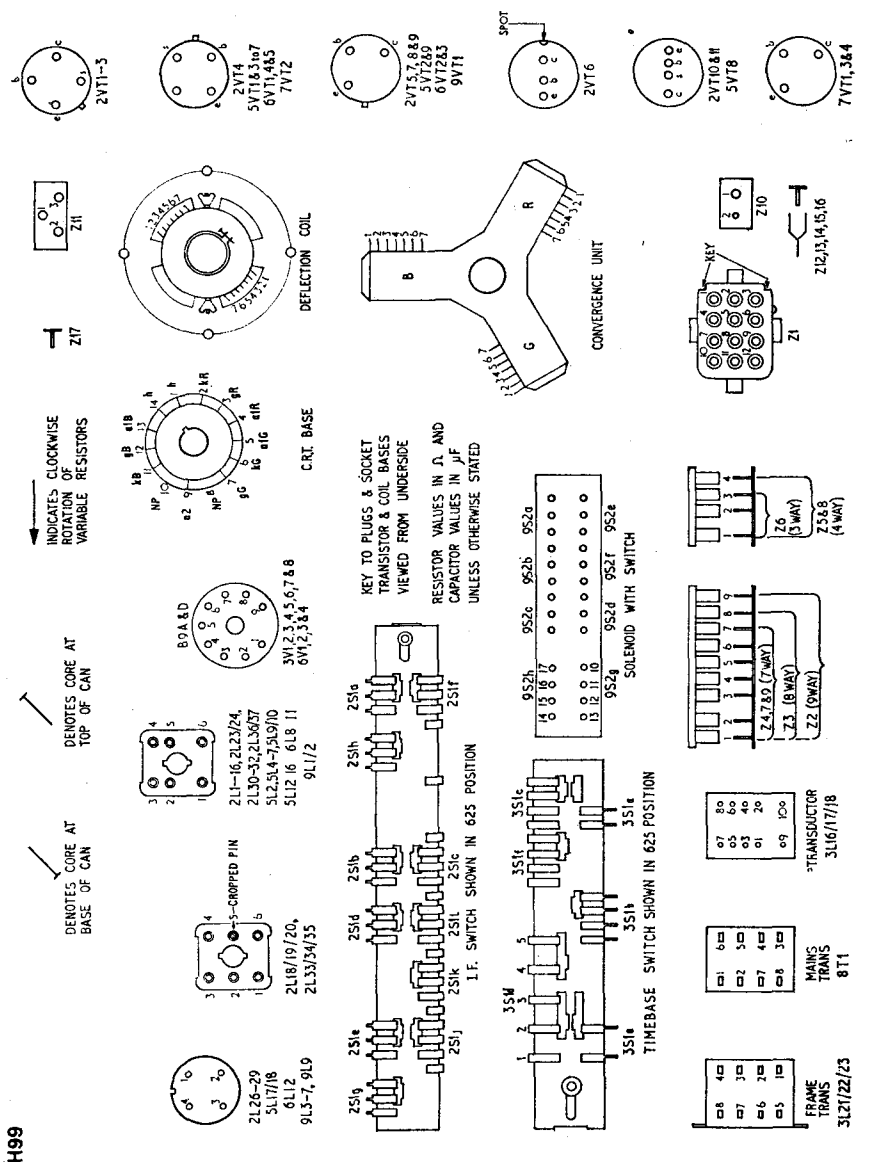
firmly seated in their holders. Adjust the mains input tappings on the power unit to agree with the customer's mains supply. *Note:* The receiver as supplied is suitable for a 240 volts A.C. supply only. If the receiver is modified for operation on voltages other than 240 volt A.C. this should be noted on the rear of the cabinet back.

2. Connect the receiver to the mains supply, chassis to neutral. If an isolating transformer is used it should rate at 500 watts. Check that with the receiver connected to the isolating transformer the voltage waveform is not effected by the high peak current demand of the receiver.

3. Select a channel, set the brightness and volume controls, check push-button tuning horizontal hold, (line freq.) and vertical hold, (field freq.).

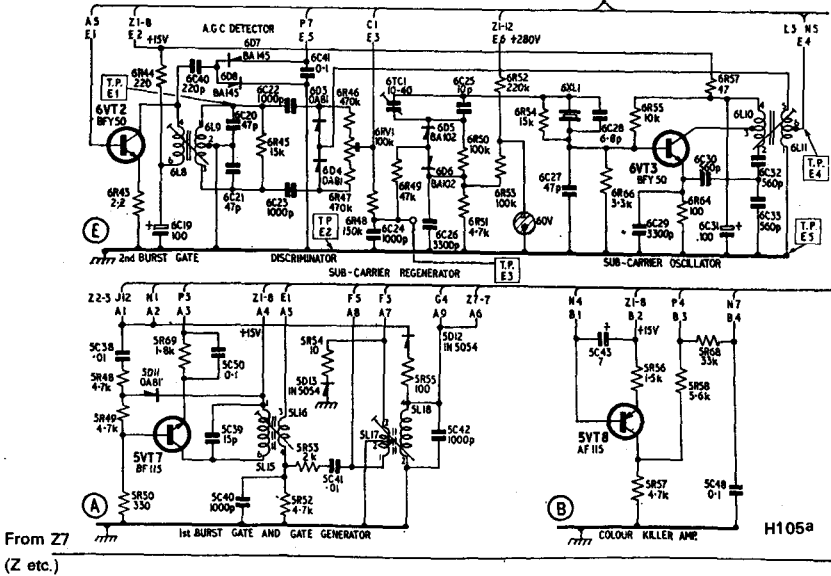


## 66H



# BUSH

From P. L. M. F & G



(H105a) CIRCUIT DIAGRAM—SUB-CARRIER REGENERATOR, ETC. (PART)

Set 405 and 625 pre-set contrast controls, and local/distant control, finally checking all channel buttons and tuning.

**Warning:** Do not make unnecessary adjustments to the following controls as they will have some effect on the convergence and purity which would then have to be corrected.

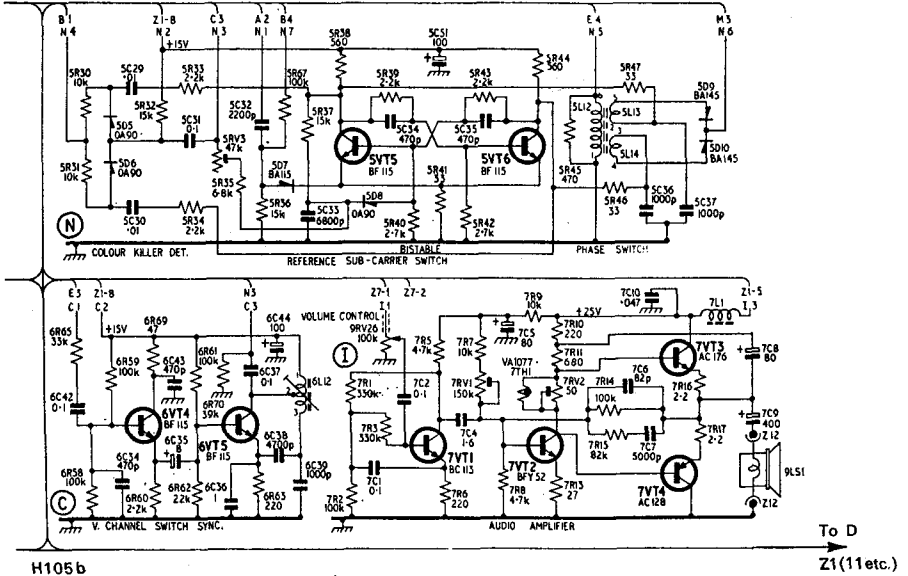
4. Check the width, height, linearity, vertical and horizontal centering, squaring of the picture in the mask aperture and focus on both 405 and 625 system.

5. With no signal input applied. Check the purity on 625 and 405 by looking at red, green and blue fields in turn and carry out the normal de-gaussing procedure if required.

6. With input signal from cross hatch pattern generator (405 and 625). Check the static convergence at the centre of tube screen on 625 and adjust red, green and blue static magnets if required. Switch to 405 and check that static convergence is satisfactory.

7. Check the vertical and horizontal convergence on 625 then switch to 405 and repeat check. The vertical convergence is checked on the centre vertical line on the screen and at the horizontal intersections with it. The

## COLOUR TELEVISION SERVICING



(H105b) CIRCUIT DIAGRAM—SUB-CARRIER REGENERATOR, ETC. (CONTINUED)

horizontal convergence is checked on the horizontal centre line across the screen and at vertical intersections with it.

8. Apply a monochrome test pattern on 405. Adjust brightness control for a correct picture. Check that a neutral grey is obtained in the low and high light areas, switch to 625 and check for a similar grey scale balance.

## MURPHY

## Models CV2510 and CV2511

**General Description:** These two models are similar to the CTV<sub>25</sub> and CTV<sub>167</sub> Bush models, already described in this volume.

## PHILIPS

Models "G6 Chassis"  
and Type G25K500

**General Description:** Service data given in the 1967-68 volume was provisional. Various production changes have taken place and the following list of modifications should be used in conjunction with this information, to bring it up-to-date.

1. R5053 changed in value from 47 k $\Omega$  to 100 k $\Omega$ .
2. R1078 changed in value from 47 k $\Omega$  to 100 k $\Omega$ .
3. R1059 changed in value from 15 ohms to 22 ohms. (On some receivers,  $2 \times 47$  ohms resistors are fitted.)
4. C5021 changed in value from 1K5 pF. to 330K pF.
5. C2040 changed in value from 16  $\mu$ F. to 40  $\mu$ F.
6. R7221 changed in value from 100 k $\Omega$  to 220 k $\Omega$ .
7. L2635 is added in lead to the base of T2144.
8. C2610 (330 pF.) is added from L2620/T2615 to chassis inside can assy.
9. R1166 (1 M $\Omega$ -pre-set contrast adj.) added in parallel with R1068.
10. C1009 changed in value from 0.1  $\mu$ F. to 330K pF.
11. R1085 changed in value from 6K8 ohms to 1K2 ohms.
12. R4132 changed in value from 4K7 ohms to 2K2 ohms.
13. C4059 changed in value from  $2 \times 470$  pF. to 1K pF.
14. R2646 (220 ohms) added in lead to L2643/2644, mounted inside can assy.
15. FS1106 changed to *Bulgin* or *Belling-Lee* type 1-amp. fuse.
16. C1038 (2.5  $\mu$ F.) connected from R1073 line circuit side, to chassis. (On some receivers a 12.5  $\mu$ F. capacitor is fitted.)
17. Models G25K501, G25K502 and ST2500 have a different loudspeaker fitted.
18. R1734-47 k $\Omega$  added from L1731/R1259 to L1731 centre tap. R1735-47 k $\Omega$  added from L1732/R1264 to L1732 centre tap. R1736-47 k $\Omega$  added from L1733 centre tap to unused end.
19. R1242 changed in value from 82 ohms to 47 ohms.
20. C1206 changed in value from 560K pF. to 390K pF.
21. R1275 deleted from the convergence box and the junction of L1637/L1638 connected direct to the chassis line. Two resistors R1097 and R1098-33 ohms are fitted in each lead joining the main chassis solenoid switch to the convergence solenoid switch. They are mounted across the tag strip behind the fuse panel on the main chassis.
22. R5040 and R5041 changed in value from 470 k $\Omega$  to 220 k $\Omega$ .
23. R2081 should be joined to the centre contact of the switch and not to the end contact as shown on the main circuit diagram.
24. X1295, X1296 and X1297 changed from OA9 to BA148.
25. FS1106 changed to 1.25 amp.
26. C1038 (2.5  $\mu$ F.) connected from R1073 line circuit side to chassis. (On some chassis a 12.5  $\mu$ F. is fitted.)

## COLOUR TELEVISION SERVICING

27. R1734-47 k $\Omega$  added from L1731/R1259 to L1731 centre tap. R1735-47 k $\Omega$  added from L1732/R1264 to L1732 centre tap. R1736-47 k $\Omega$  added from L1733 centre tap to unused end.
  28. R1275 deleted from the convergence box and the junction of L1637/L1638 connected direct to the chassis line. Two resistors R1097 and R1098-33 ohms are fitted in each lead joining the main chassis solenoid switch to the convergence solenoid switch. They are mounted across the tag strip behind the fuse panel on the main chassis.
  29. R5040 and R5041 changed in value from 470 k $\Omega$  to 220 k $\Omega$ .
  30. R2081 should be joined to the centre contact (2) of the switch and not to the end contact (3) as shown in the main circuit diagram.
  31. X1295, X1296 and X1297 changed from OA9 to BA148.
  32. R1282 changed in value from 390 k $\Omega$  to 220 k $\Omega$ .
  33. On some receivers, C2053 may be fitted on the print side of the I.F. panel.
  34. On the I.F. panel drawing, the lead from L2711/2712 should read C4007—not C4077.
  35. R2122 changed in value from 33 k $\Omega$  to 220 k $\Omega$ . R2123 deleted and C2060 fitted in its place—220K pF. capacitor.
  36. C2051 removed and reconnected across R2134; changed in value from 82 pF. to 5.6 pF.
  37. On some chassis the following changes occur together: C7074, R7230, R7247 and R1091 (tint control) are deleted. R7229 changed in value from 56 ohms to 82 ohms. R7246 changed in value from 47 ohms to 82 ohms.
  38. C5014 may be either 35 pF. or 42 pF. C5015 may be either 1.5  $\mu$ F. or 2.2  $\mu$ F.
- Important.** The boost voltage setting for a line output transformer incorporating the above values of C5014 should be 600 volts (625-line) and 570 volts (405-line).
39. R4075 changed in value from 150 k $\Omega$  to 130 k $\Omega$ .

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## STELLA

## Model ST2500

**General Description:** This model is electrically similar to Philips G6 Chassis, information for which is given on the previous page of this volume.

# RADIO SERVICING

## ACKNOWLEDGEMENTS

Alba (Radio and Television) Ltd.  
Bosch Ltd.  
British Radio Corporation Ltd.  
Combined Electronic Services Limited  
C.R.T.S. Ltd.  
Dansette Products Ltd.  
Debenhams Electrical Co. Ltd.  
Denham & Morley Ltd.  
Decca Radio & Television  
Dynaport Radio & T.V. Ltd.  
Dynatron Radio Ltd.  
Eddystone Radio Ltd.  
Elizabethan Electronics Ltd.  
Fidelity Radio Ltd.

Hacker Radio Ltd.  
Highgate Acoustics  
Klinger Controls Ltd.  
Monogram Electrical Company  
Perdio Products Ltd.  
Philco International Ltd.  
Radio & Allied (Holdings) Ltd.  
Radiomobile Ltd.  
Rank Bush Murphy Ltd.  
Roberts Radio Co. Ltd.  
R.T.S. Ltd.  
Sanyo Service & Sales  
Sharp Sales & Service  
Transervice Ltd.

# ALBA

# Model 339

**General Description:** Six-transistor-per-channel, mains-operated, stereophonic record player.

**Dismantling:** Pull off four control knobs. Remove bottom cover. Remove two, 4BA nuts fixing bottom of chassis to partition. Lift out chassis. When replacing chassis make sure location studs enter holes in control panel.

**Access to Panel Copper Side:** Remove four screws holding base plate to control bracket. Remove two screws holding panel to base plate. The panel together with control bracket may then be hinged open revealing copper side but leaving the power transistors screwed to base plate.

**Power Transistors:** When replacing TR<sub>5</sub>/TR<sub>6</sub> or TR<sub>11</sub>/12 a matched pair must be used. The transistor case is insulated from the chassis by a mica washer and two plastic bushes. When replacing a transistor make sure the mica washer is not damaged. Apply heat sink compound to both sides of washer and screw down transistor evenly to make good thermal contact. Check that case is insulated from chassis.

**Adjustments:** Adjust VR<sub>4</sub>/VR<sub>9</sub> to eliminate crossover distortion checking that TR<sub>5</sub>/TR<sub>11</sub> collector current is not greater than 15 mA. If this current is greater than 15 mA. modify to latest circuit.

**Gain Measurements:** All the following taken with balance set for equal outputs per channel at 10 kHz. and  $\frac{1}{4}$  volume 5 ohms resistance load. With volume at max. and tone controls at mid position. For 2 volts r.m.s. output at 1 kHz. either channel. With P.U. disc and generator applied to P.U. lead 22 mV. r.m.s.

With generator applied via 12 k $\Omega$  in series with 0.1  $\mu$ F. to: TR<sub>3</sub>/TR<sub>9</sub> collector—3 volts r.m.s.; TR<sub>3</sub>/TR<sub>9</sub> base (neg. side C10/C32)—140 mV./r.m.s.; TR<sub>2</sub>/TR<sub>8</sub> collector (transistor case)—4.2 volts r.m.s.; TR<sub>1</sub>/TR<sub>7</sub> collector (transistor case)—70 mV. r.m.s.

**Response:** With generator applied to P.U. lead.

**Half Volume Response:** Set base and treble for level response at max. volume then reduce volume control so that 260 mV. r.m.s. input gives 2 volts r.m.s. output at 1 kHz. The relative output at 100 Hz. should be +8 dB., and at 10 kHz. +3.5 dB.

**Tone Control Variation:** Set tone controls in mid position and volume at max. Relative to an input to give 2 volts r.m.s. output at 1 kHz. At 100 Hz. the range of bass control should be dB. At 10 kHz. the range of treble control should be 20 dB.

## Spare Parts

Item	Part No.	Item	Part No.	Item	Part No.
Bottom cover	14224	T <sub>1</sub>	14130	VR <sub>2</sub> , 7	14320
Control knob	13860/P	Rectifier	14135	VR <sub>3</sub> , 8	14318
Escutcheon	14277	SI, 2	14322	VR <sub>5</sub>	11615
Speaker	14281	S <sub>3</sub>	14323	VR <sub>4</sub> /9	14118
Tweeter	14282	VR <sub>1</sub> , 6	14320		

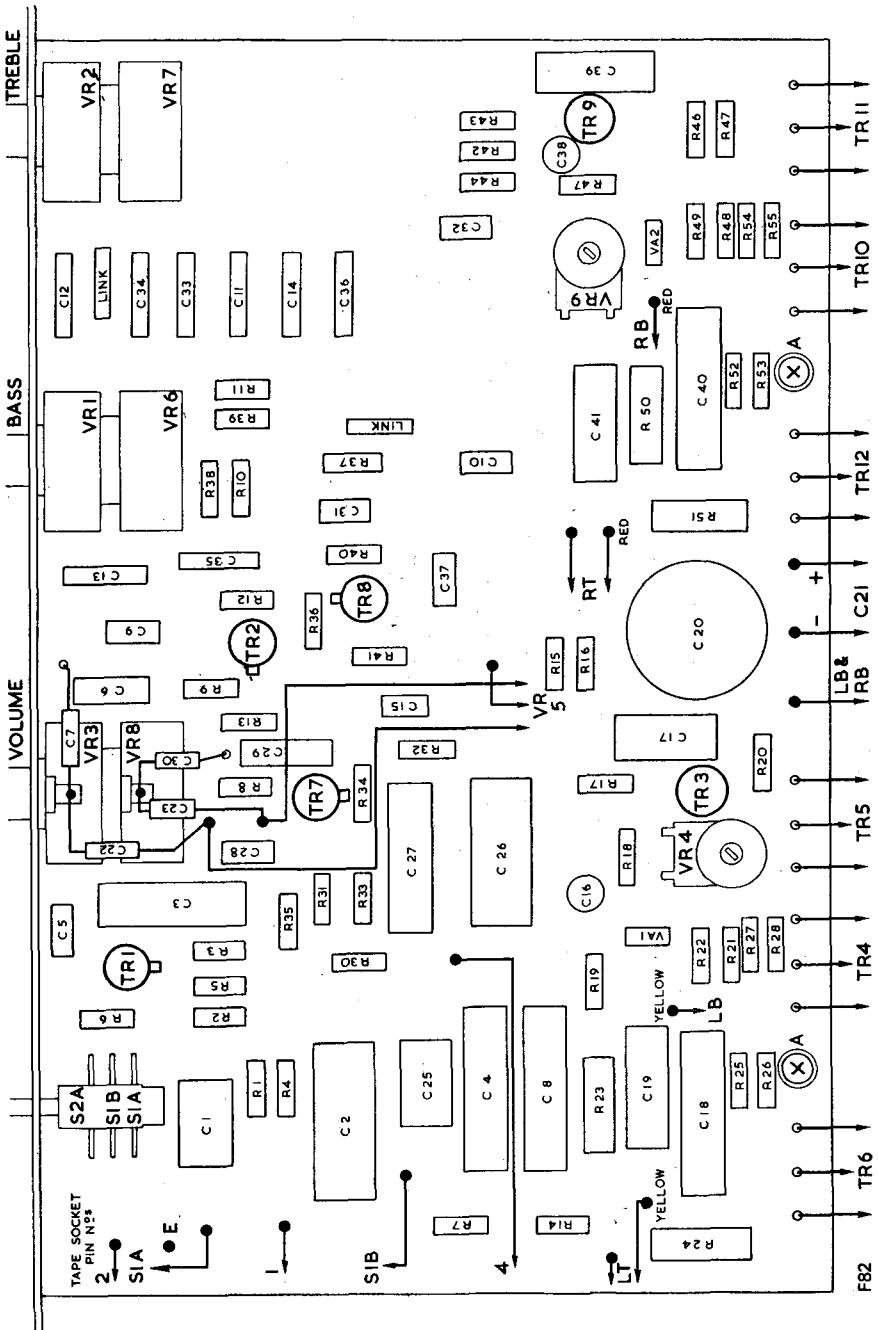


NOTE - ALL CONTROLS ARE LINEAR.  
RESISTORS  $\pm 10\%$  EXCEPT  
R15, 16, 42, & 43.  $\pm 5\%$   
R3, 7, 14, 25 to 28  $\pm 20\%$   
32, 52 to 55.

On later models LB and RB are returned to chassis by separate 3000 $\mu$ F capacitors.



# RADIO SERVICING



(F82) COMPONENT LAY-OUT—MODEL 339

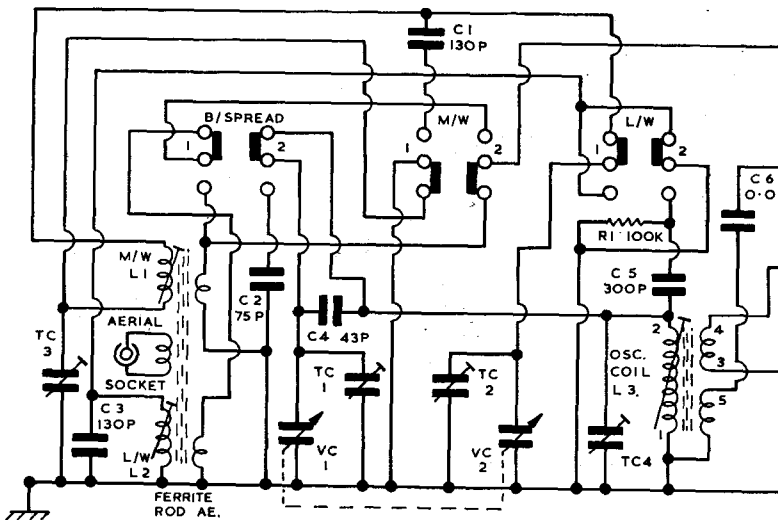
## ALBA

## Model 535

**General Description:** Seven-transistor, long- and medium-wave portable receiver. The receiver uses two modules that require specialised servicing facilities. In the event of a fault unsolder the leads and return the module to the manufacturer.

**Dismantling:** Pull off knobs. Pull cord off pointer. Remove three 4BA nuts holding chassis. Lift out chassis. When replacing, push cord on to pointer set at 2000 m. with gang closed.

**Alignment:** For alignment out of cabinet—attach paper clip to cord, line up to start with gang closed and use holes in top edge of chassis as shown. 470 kHz., adjust 4 cores on I.F. module for max. O/P; M.W. 600 kHz., 500 m. adjust  $L_3$  and  $L_1$ ; B/S. 1500 kHz., 200 m. adjust  $TC_4$  and  $TC_3$ ; M.W. 1500 kHz., 200 m. adjust  $TC_2$  and  $TC_1$ ; L.W. 200 kHz., 1500 m. adjust  $L_2$ .

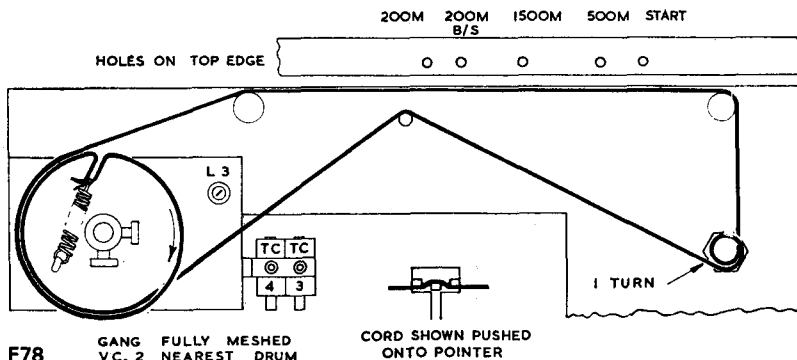


(F77a) CIRCUIT DIAGRAM—MODEL 535 (PART)

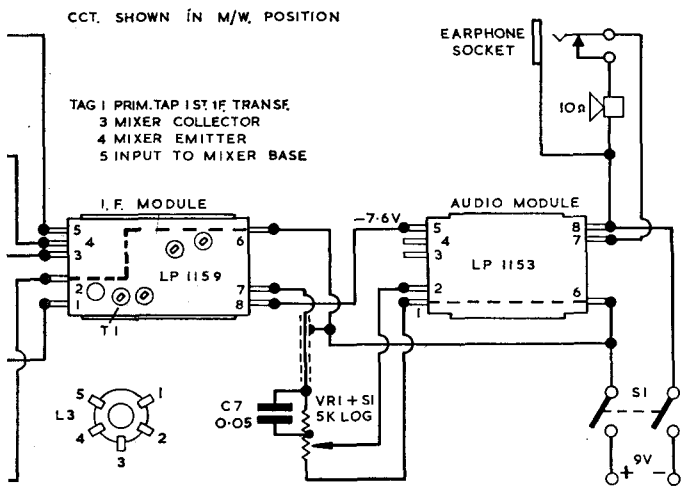
It should be noted that earlier models had twisted wire C in place of  $TC_4$  and 50 pF. across  $TC_3$ .

**Sensitivity:** With signal applied via 0.1  $\mu$ F. to I.F. module pin 5. 470 kHz. 4  $\mu$ V., 1 MHz. 1.5  $\mu$ V. for 50-mW. output.

## RADIO SERVICING



(F78) DRIVE CORD



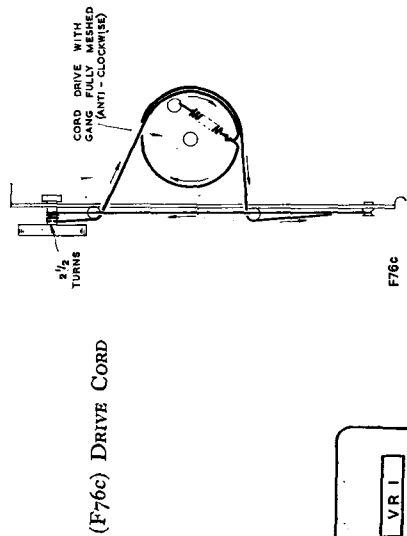
(F77b) CIRCUIT DIAGRAM—MODEL 535 (CONTINUED)

# ALBA

## Model 838

**General Description:** Eight-transistor, three-waveband portable receiver. Maximum power output 650 mW. Wavebands: L.W. 857-2000 m.; M.W. 187-566 m. and S.W. 5.95-18 Mc/s. Sockets: External Aerial, Earphone 1 (disconnects internal speaker in operation), Earphone 2 (provides for earphones and internal speaker together).

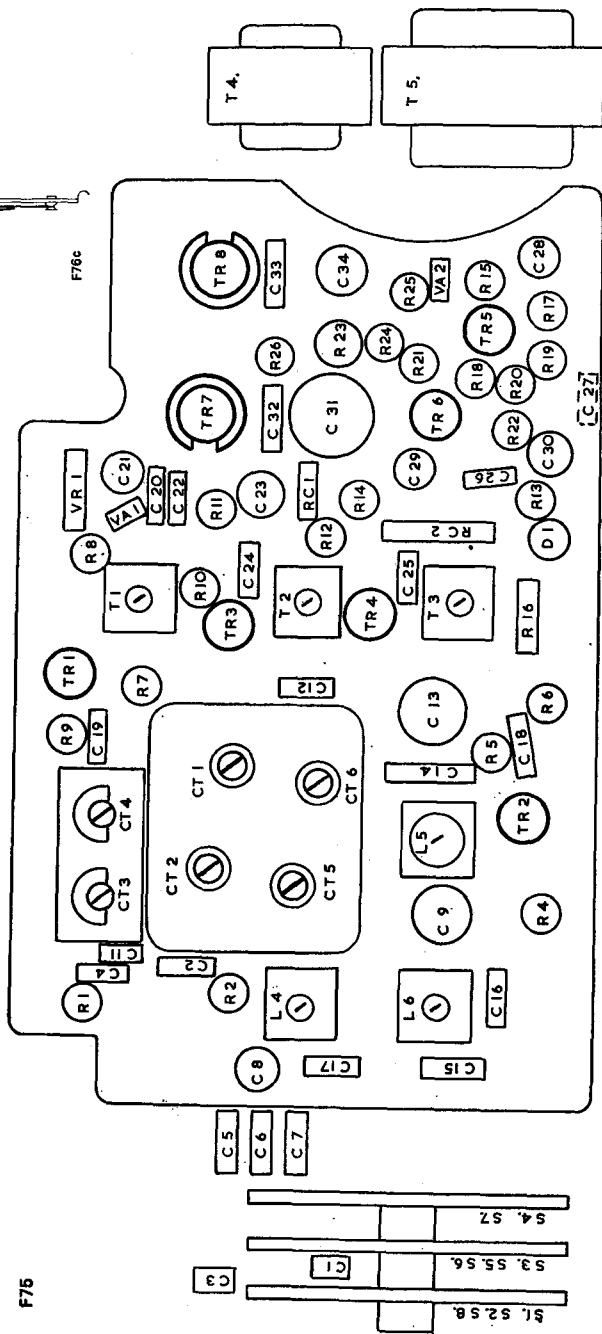
(F75) COMPONENT LAY-OUT—MODEL 838



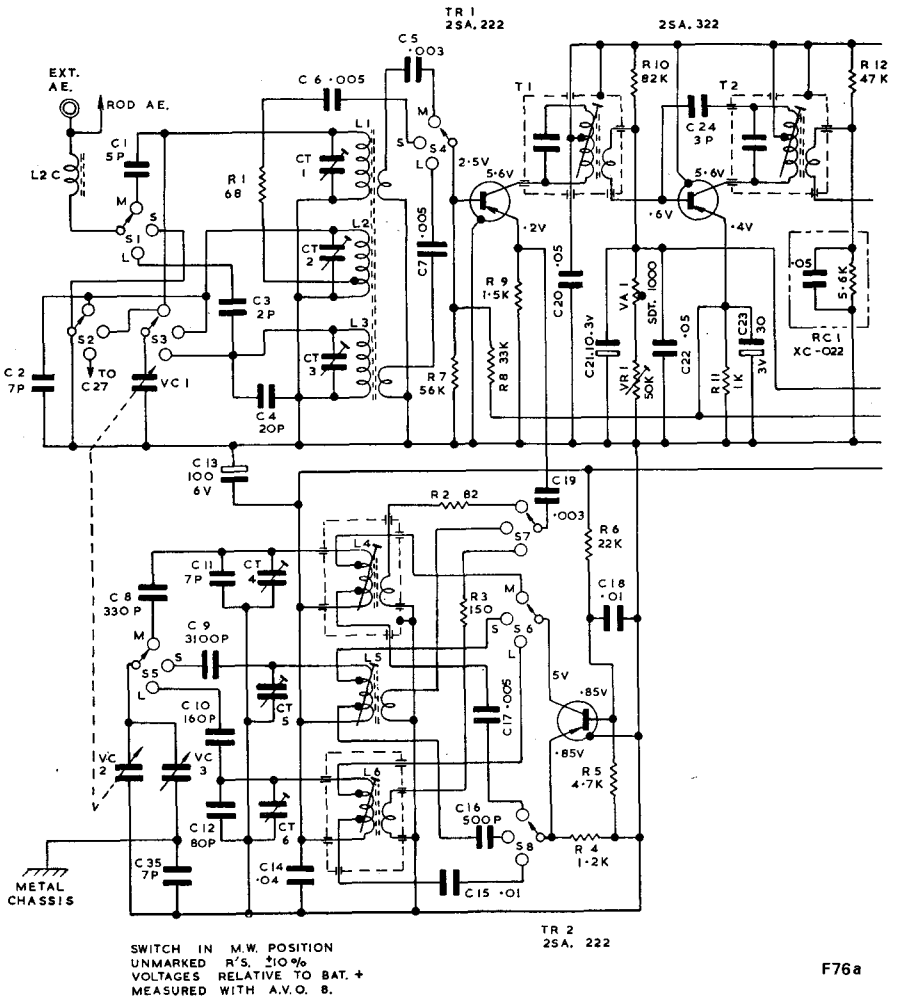
F75

III

ALBA



# RADIO SERVICING



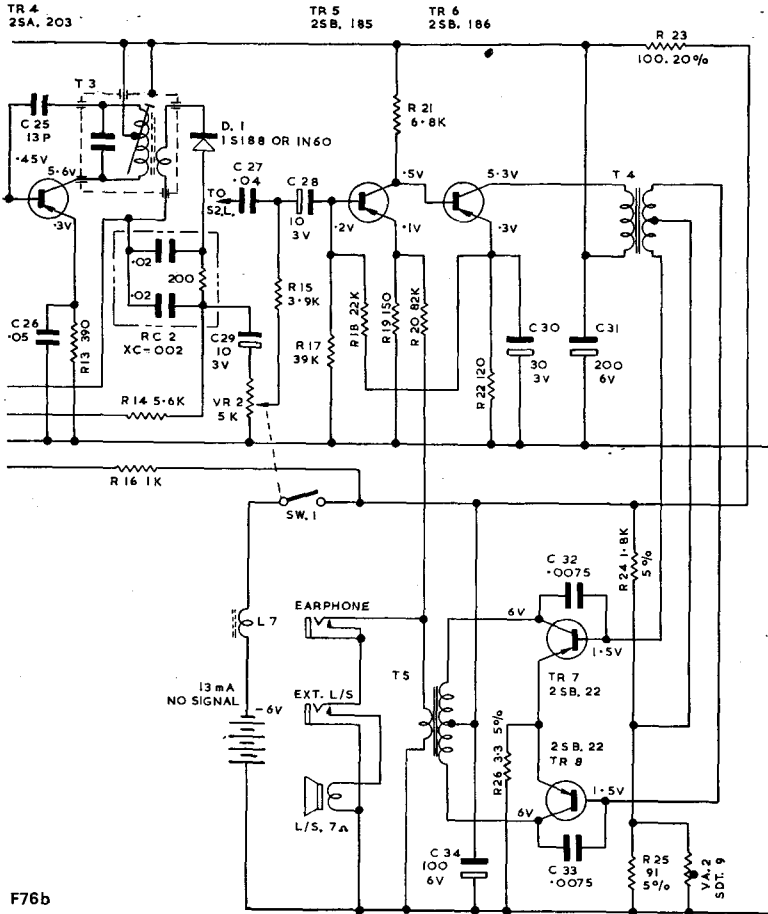
Above: (F76a) CIRCUIT DIAGRAM—MODEL 838 (PART)

Right: (F76b) CIRCUIT DIAGRAM—MODEL 838 (CONTINUED)

**Alignment:** Connect output meter across speaker. Adjust volume control for maximum. Adjust generator connected as below to restrict O/P to 5 mW.

Repeat each operation for optimum results. Oscillator is tuned at extreme end of each band.

# ALBA



Stage	Generator	Frequency	Adjust for max. O/P
I.F.T.S.	Across VC 1 via 0.1 $\mu$ F.	470 kc/s.	T3, T2, T1
M.W.	Connect to radiation loop	520 kc/s. 1650 kc/s.	L4 CT4
L.W.	Connect to radiation loop	600 kc/s. 1400 kc/s.	L1 CT1
S.W.	Connect to radiation loop	145 kc/s. 355 kc/s. 160 kc/s. 340 kc/s. 5.8 Mc/s. 18.5 Mc/s. 6.5 Mc/s. 17 Mc/s.	L6 CT6 L3 CT3 L5 CT5 L2 CT2

# BEOLIT

# Model 500 (Type 1101)

**General Description:** An eleven-transistor radio for F.M. reception with station selection effected by push-button. Fitted with telescopic aerial and sockets for extension speaker and gramophone/tape recorder.

**Batteries:** 9 volts ( $6 \times 1\frac{1}{2}$  volts). Quiescent current 26 mA. 22.5 volts. 15 amps.

## Sensitivity Measurements and Alignment Procedure:

Range	Potentiometer setting	R.F. Connection	Oscilloscope connection	Frequency	Remarks	Sensitivity	Output	Adjustments
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### I.F. Circuits

Button 1		Point A through 0.1 $\mu$ F.	A.F. 121 collector (14)* (see lay-out drawing)	10.7 Mc/s.	A.F.C. out; max. treble *Through diode probe			Turn cores 4 and 11 out; remove core 5 from coil Cores 10, 9, 8, 7, 6 for max. gain and symmetrical curve
Button 1		Aerial connector socket	As above	10.7 Mc/s.	As above			Cores 4, 5 for max. gain and symmetrical curve. Bandwidth 250 kc/s. $\pm$ 30 kc/s. at 6 dB

### Oscillator

Button 1	108 Mc/s.	As above	As above	108 Mc/s.	As above			Core 3
Button 1	87.5 Mc/s.	As above	As above	87.5 Mc/s.	As above			Potentiometer 13

### R.F. Circuits

Button 1	89 Mc/s.	As above	As above	89 Mc/s.	As above Do <b>not</b> adjust core 1			Core 2 for max. gain
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### Detector

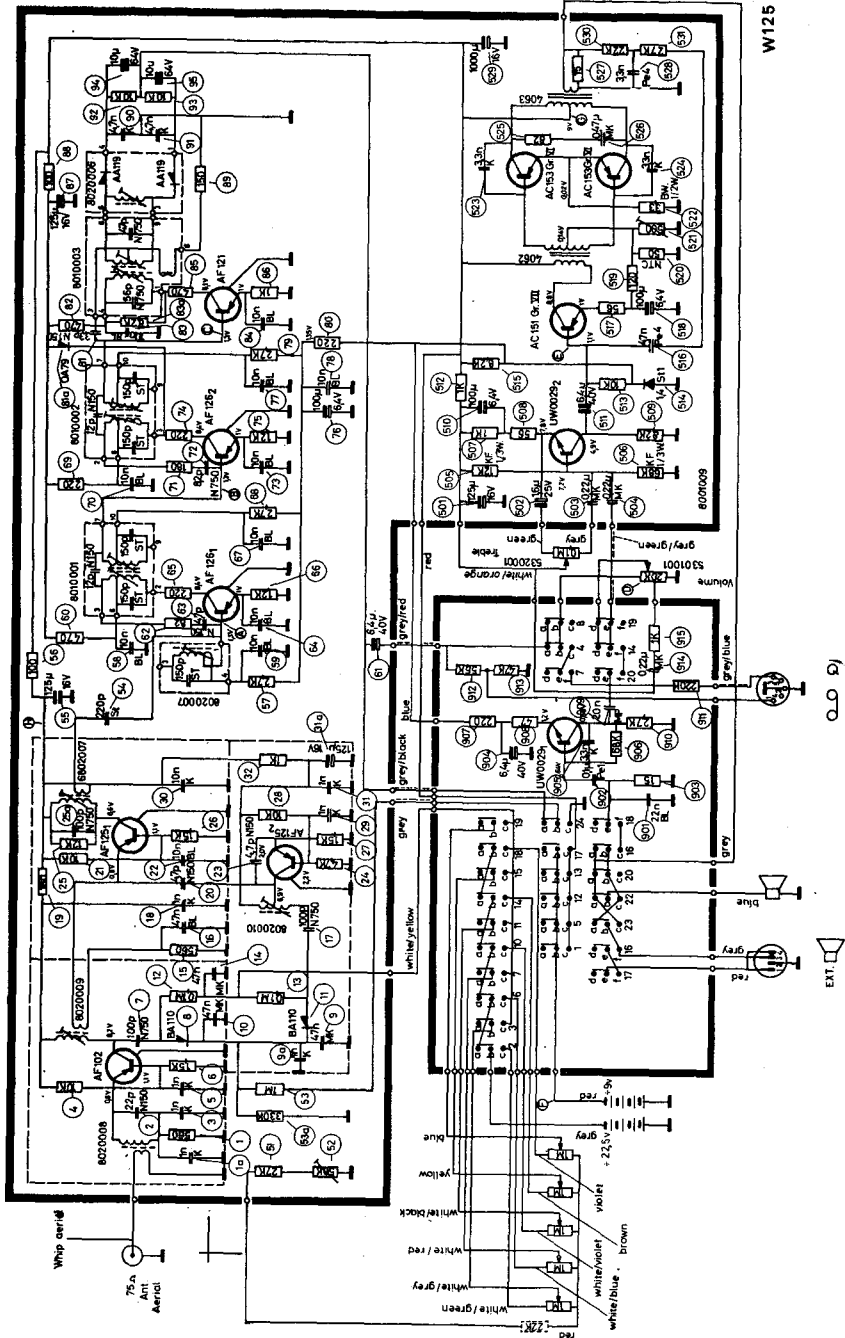
Button 1		As above	Point 15 (see lay-out drawing)	10.7 Mc/s.†	Without diode †With noise impulses			Cores 11, 12 for max. gain and symmetrical curve, and best noise suppression
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### Sensitivities

Button 1		Point A through 0.1 $\mu$ F.		10.7 Mc/s.	Unsold tuner (220 pF. No. 54 in diagram)	15 $\mu$ V.	50 mW.	
Button 1		Point B through 0.1 $\mu$ F.		10.7 Mc/s.		100 $\mu$ V.	50 mW.	
Button 1		Point C through 0.1 $\mu$ F.		10.7 Mc/s.		1.3 mV.	50 mW.	
Button 1	91 Mc/s.	Aerial connector socket		91 Mc/s.		2.24 $\mu$ V.	500 mW.	
Button 1	91 Mc/s.	Aerial connector socket		91 Mc/s.		3.55 $\mu$ V.	20 dB signal/noise ratio	

I.F. Alignment: Sweep Generator: Frequency Swing approx. 1 Mc/s.

Sensitivity Measurements: Sweep Generator: Frequency Swing: 22.5 kc/s.-400 c/s.



(W125) CIRCUIT DIAGRAM—MODEL 500 (TYPE 1101)

W125

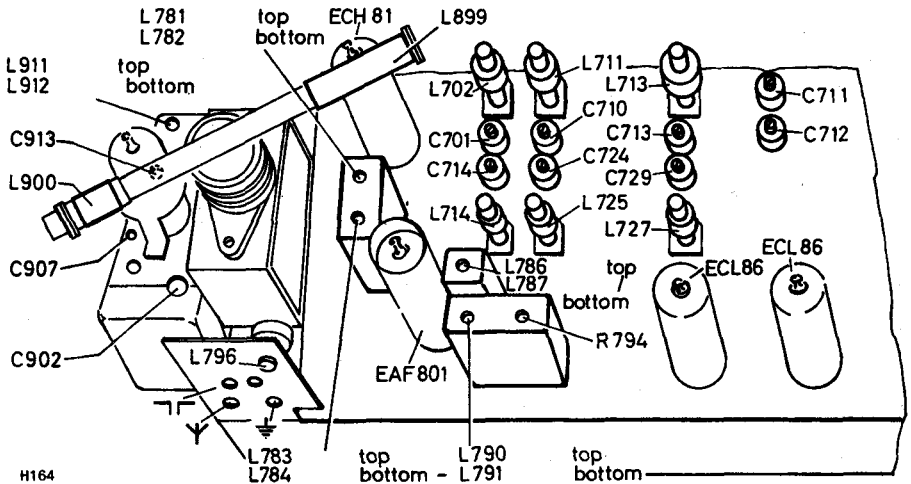


# BLAUPUNKT

# Model 13922

**General Description:** Stereo console radiogram for A.C. mains 110 volts and 220-250 volts 50 c/s.

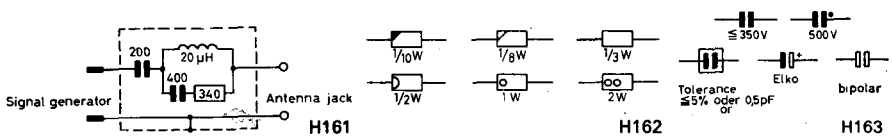
**Wavebands:** L.W. 148-400 kc/s. M.W. 515-1620 kc/s. S.W. 5.95-18.2 Mc/s. V.H.F. 87.4-104 Mc/s.



(H164) ALIGNMENT DIAGRAM—MODEL 13922

**Alignment (Preparation):** Turn in tuning capacitor and set dial pointer to calibration mark on A.M. dial. Set tone controls to treble and bass, tone button to HI-FI, S.W. bandspread to 0 and volume control to maximum. Connect multimeter to output transformer secondary channel 2, and work at 0.38 volts (25 mW.).

**Alignment (A.M. I.F.):** Connect signal generator via 0.01  $\mu$ F. to control grid of V872. Align according to alignment table. Connect signal generator via dummy aerial (see diagram) to aerial jack to align I.F. wave trap, tune to minimum. In order to measure sensitivities, connect signal generator via 0.01  $\mu$ F. to control grids of V872 and V873 respectively.



(H161) DUMMY AERIAL (Left); (H162) RESISTOR DETAILS (Centre); (H163) CAPACITOR DETAILS (Right)

Alignment Table

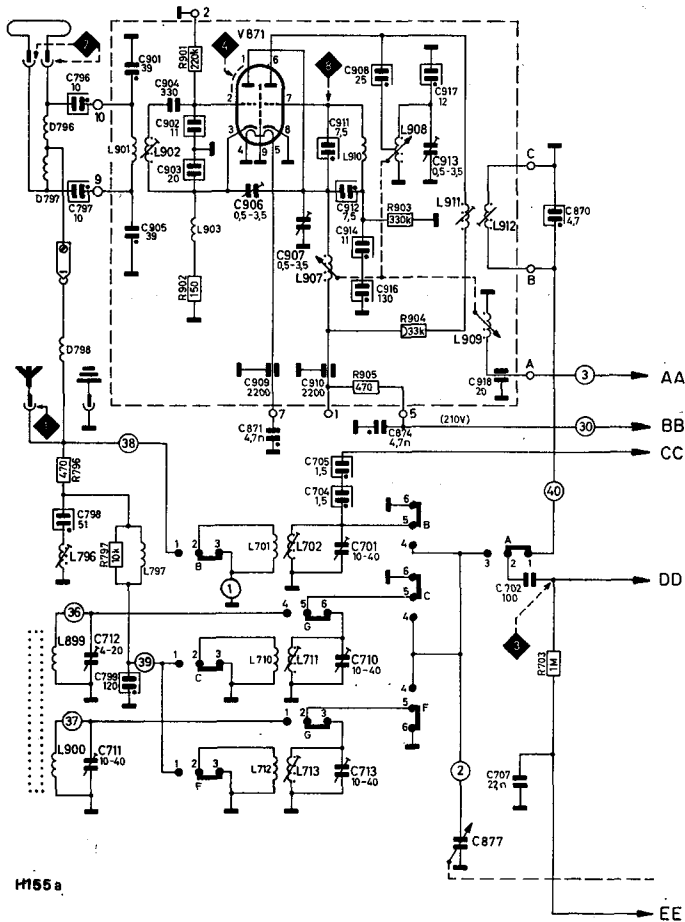
Band	Signal generator		Set		Adjustments	A.M. and A.F. sensitivity for 25 mW output; F.M. 4 volt ratio detector voltage	
	to:	Frequency	Band	Pointer to:		from	from
Z.F./I.F. (A.M.)	G 1 ECH 81 (3) (1)	460 kHz/kc.	M.W.	appr. 1600 kc. appr. 600 kc.	L787, L786, L784, L783 max. L796 min.	G 1-EAF 801 1.2 mV.	G 1-ECH 81: approx. 15 $\mu$ V.
S.W.	(1)	6.25 MHz/Mc. 18 MHz/Mc.	S.W.	48 m. 16.6 m.	Oscillator L714 L712 C701 L711 C710 C724 L727 C729	from G 1 ECH 81 20 $\mu$ V.	from ant. 20 $\mu$ V. 15 $\mu$ V.
M.W.	(1)	546 kHz/kc.	M.W.	546 kHz/kc.		20 $\mu$ V.	15 $\mu$ V.
L.W.	(1)	1500 kHz/kc. 160 kHz/kc. 350 kHz/kc.	L.W.	1500 kHz/kc. 160 kHz/kc. 350 kHz/kc.		20 $\mu$ V.	15 $\mu$ V. 10 $\mu$ V. 15 $\mu$ V.
M.W.	Coupling coil	546 kHz/kc.	M.W. and F-ANT.	546 kHz/kc.	<i>Ferrite antenna</i> L899 adjust for maximum		
L.W.	Coupling coil	1500 kHz/kc. 160 kHz/kc.	L.W. and F-ANT.	1500 kHz/kc. 160 kHz/kc.	C712 max. L900 adjust for maximum		
Z.F./I.F. (F.M.)	(4)	350 kHz/kc. 10.7 MHz/Mc.	V.H.F.	350 kHz/kc. 104 MHz/Mc.	C711 max. L790, L782, L781, L912, L911 max. L791 max. or S-curve, resp.	from G 1 EAF 801: appr. 80 mV.	from G 1 ECH 81: appr. 1.7 mV.
F.M. N.F./A.F.	(2) A.F. generator	94.5 MHz/Mc. 1000 Hz/c.	V.H.F. + Stereo	94.5 MHz/Mc.	Oscillator Interned. C913 C907 max. Channel 2  Channel 1	from ant.  from G 1 E(C)L 86: 390 mV. from G 1-E(C)L 86: 390 mV.	from PU jack via 200 k $\Omega$ : 42 mV.

# RADIO SERVICING

**Alignment (A.M. R.F.):** Connect signal generator via dummy aerial to aerial jack and proceed according to alignment table.

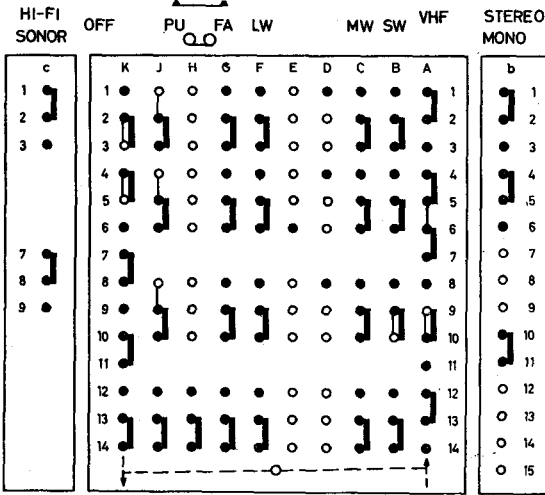
**Alignment (A.M. R.F. Ferrite Aerial):** Connect signal generator to a coupling coil (20 turns, 2.36 inches dia.) and put coil close to ferrite rod. Increase signal generator output to obtain a useful reading on output meter and proceed according to alignment table.

**Alignment (F.M. I.F.):** The ratio detector voltage should be nearly 4 volts, measured between point 5 and ground (see circuit diagram). Connect F.M. signal generator (modulated) to slotted metal cylinder which is slid on V871, up to the upper edges of the plates. Turn out core of L791. Adjust L790-L911 for maximum on output meter. Increase ratio detector reading to 10 volts and adjust L791 for maximum reading at ratio detector.



(H155a) CIRCUIT DIAGRAM—MODEL 13922 (PART)

# BLAUPUNKT

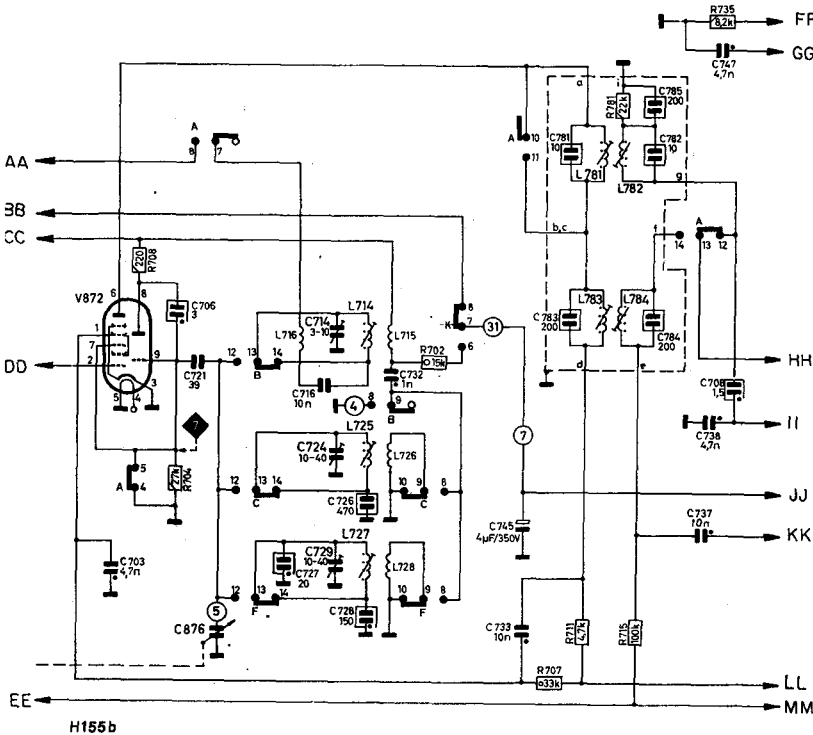


(H159) SWITCH DIAGRAM—  
MODEL 13922

Shown in position: VHF

• Switch contact

H159



(H155b) CIRCUIT DIAGRAM—MODEL 13922 (PART)

# RADIO SERVICING

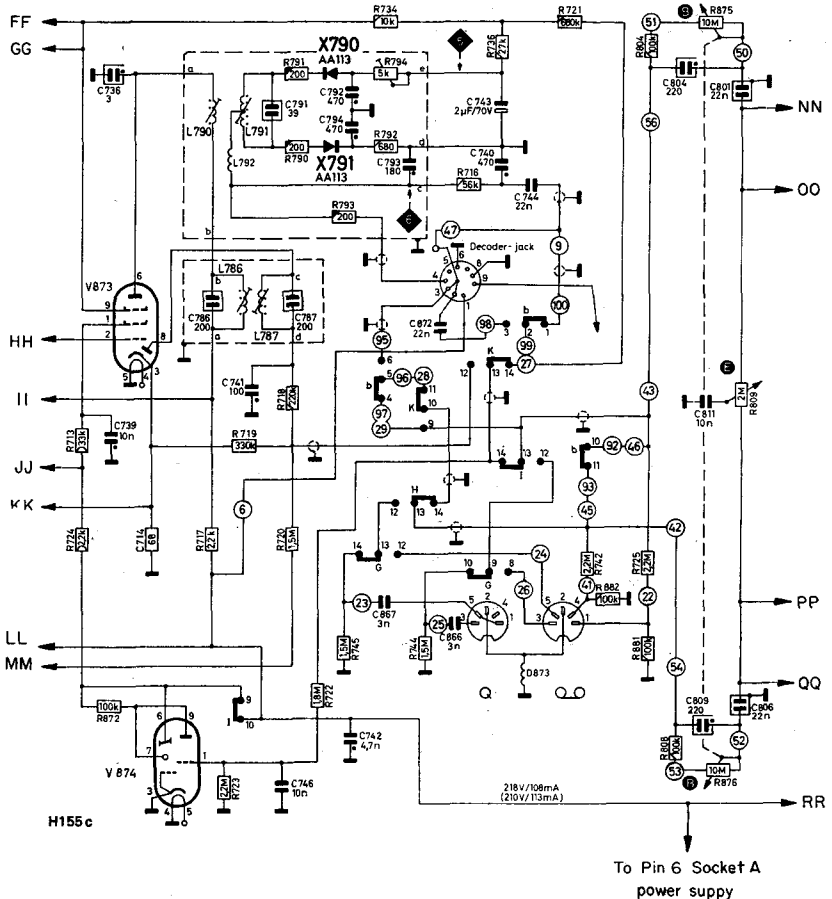
**Alignment (F.M. R.F.):** Set signal generator to 94.5 Mc/s. Tune in signal and set pointer to 94.5 Mc/s. on dial. Adjust C907 to maximum. Align C913 only if the frequency band is displaced.

**Audio:** The A.F. sensitivities from TA jack depend on the position of the balance control.

**Oscillator Voltages:** S.W. 4.5 to 10 volts. M.W. 5-12 volts. L.W. 5-13 volts. All voltages measured with V.T.V.M. at point 7. V.H.F. 1.5-3 volts measured with V.T.V.M. at point 8 (see circuit diagram).

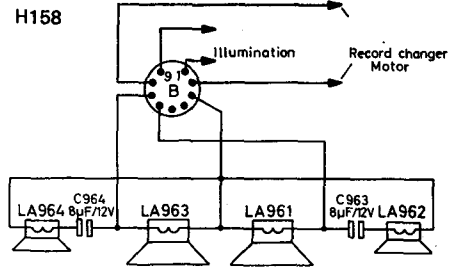
**Controls:** B is bass control, E is balance control, L is volume control and S is treble control (see circuit diagram).

**Component Positions:** 701-780 on R.F.-I.F.-A.F. board. Tie points 1-49. 781-795 on I.F. transformer. 801-816 on potentiometer-board. Tie points 50-64. 817-854 on negative feedback-board. Tie points 65-75. 855-870 on stereo-board. Tie points 80-105. 901-940 on V.H.F. unit.

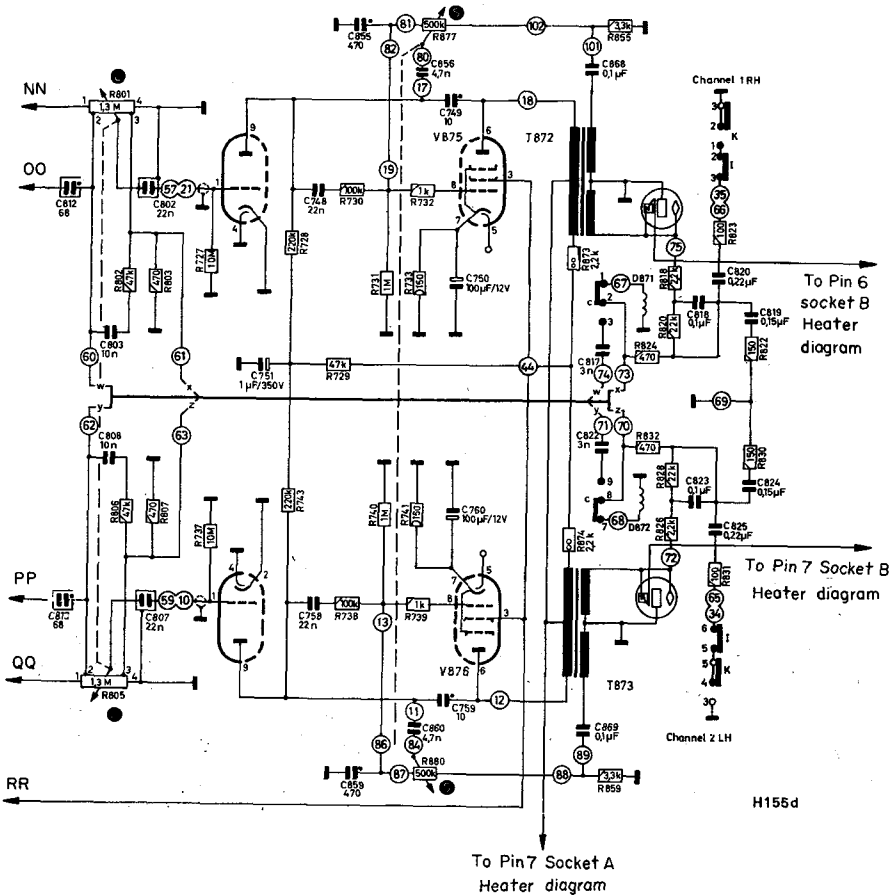


(H155c) CIRCUIT DIAGRAM—MODEL 13922 (PART)

## H158

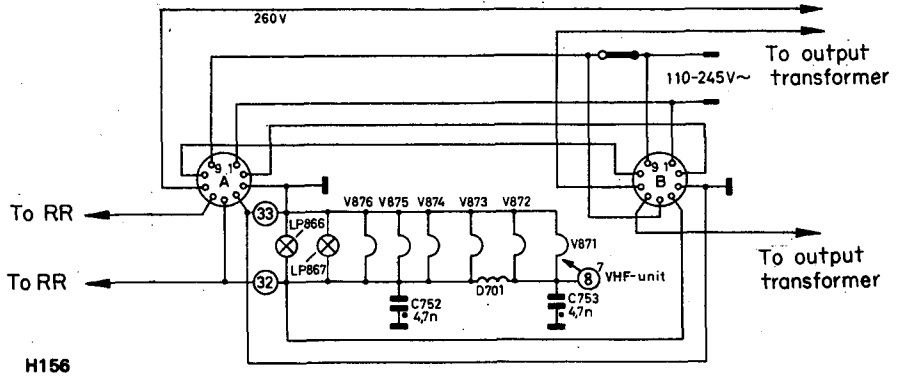


(H158) LOUDSPEAKER DIAGRAM (*Right*)

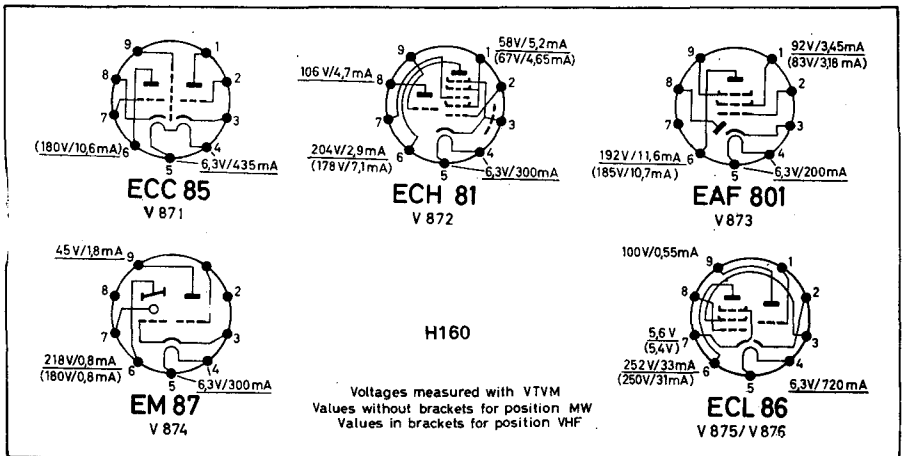


(HI55d) CIRCUIT DIAGRAM—MODEL 13922 (CONTINUED)

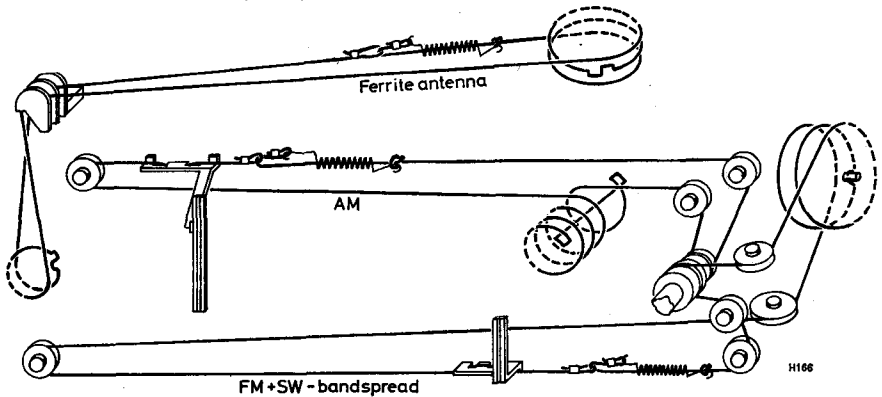
To output transformers



**H156**



(H160) VALVE VOLTAGES—MODEL 13922



(HI66) DRIVE CORD—MODEL 13922

## BUSH

## Model TRI46A and B

**General Description:** Battery-operated portable receivers incorporating seven transistors and one crystal diode. The receivers have coverage of the long and medium wavebands, while an additional range provides electrical bandspread of the high frequency end of the medium waveband. At the top of the cabinet are the tuning scale and receiver controls, comprising three push-buttons and two edge-operated control knobs. Cabinet back detachable for battery replacement.

**Controls:** Top L to R: Three push-buttons selecting L.W., M.W., B.S., Volume On/Off, Tuning.

**Wavebands:** L.W. band: 1070–1900 m. (280 to 158 kc/s.) M.W. band: 187–570 m. (1605 to 525 kc/s.) B.S. band: 187–210 m. (1605 to 1430 kc/s.).

**Intermediate Frequency:** 470 kc/s., oscillator high with respect to signal frequency.

**Aerial:** An internal ferrite rod aerial is fitted serving the three ranges, and a socket is provided at the side of the receiver for use with a car aerial.

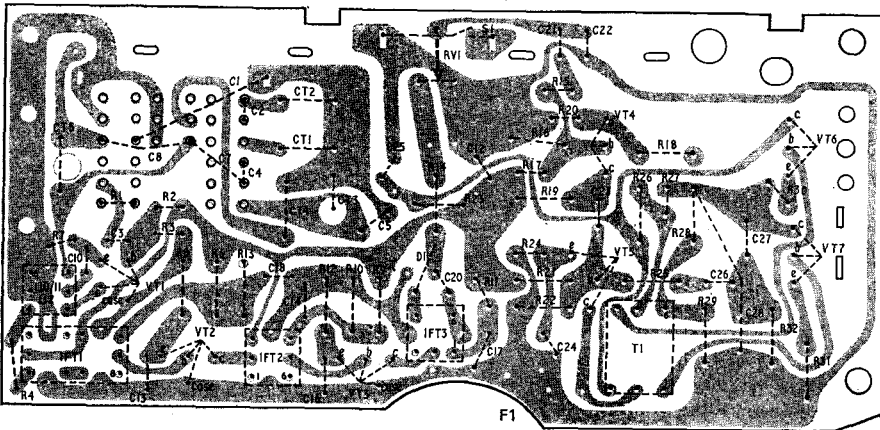
**Automatic Gain Control:** One controlled stage.

**Battery and Consumption:** One 9-volt PP7 or U.K. equivalent. Consumption is 14 mA. quiescent (at 18°C) and 18 mA. at average listening level.

**Audio Output:** 500 mW.

**Loudspeaker:**  $5\frac{3}{8}$  in.  $\times$   $2\frac{3}{4}$  in. elliptical. Impedance 15 ohms. Flux density 9500 lines per square centimetre.

**Transistors:** Mullard Type, VT<sub>1</sub> AF117 mixer/oscillator; VT<sub>2</sub> AF117 I.F. amplifier; VT<sub>3</sub> AF117 I.F. amplifier; VT<sub>4</sub> OC71 audio amplifier; VT<sub>5</sub> OC81D or AC128 driver stage; VT<sub>6</sub> and VT<sub>7</sub> OC81 (or AC128) push-pull output matched pair.



(F1) PRINTED BOARD—COPPER SIDE



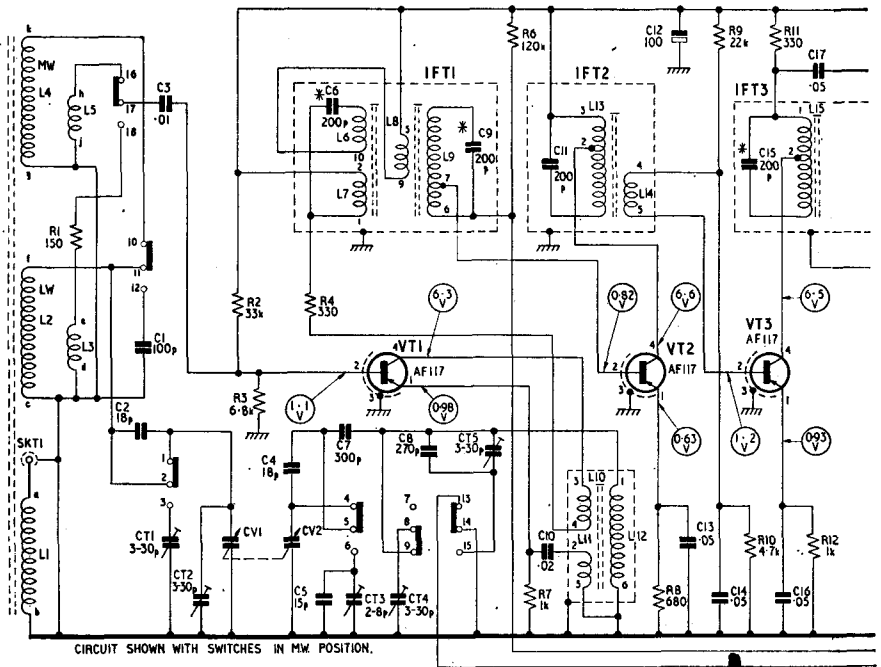
## RADIO SERVICING

**Crystal Diode:** DI OAgo detector.

**Earpiece Socket:** A socket is provided at the side of the receiver into which may be plugged an earpiece of 20–1000 ohms impedance. Alternatively, this socket may be used with an external loudspeaker of 15 ohms, or for tape recording provided that the recorder has an input impedance of not less than 15 ohms.

**Removing the Chassis:** Place the cabinet face downwards, remove the detachable back, then remove the battery. Unscrew the four 4BA cheese-head screws securing the chassis to the cabinet (one screw to each corner of the chassis). Lift out the chassis to the extent of the aerial and loudspeaker leads. Unsolder the leads if total removal of the chassis is required.

**Replacement:** Replace by reversing the above procedure.

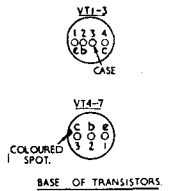
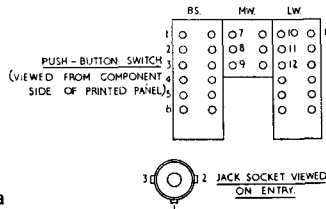


### NOTES:

1. VOLTAGES SHOWN ARE NEGATIVE WITH RESPECT TO CHASSIS AND MEASURED WITH AVO N° 8 UNDER NO SIGNAL CONDITIONS AND WITH VOLUME CONTROL SET TO ZERO.
2. ALL VALUES OF RESISTANCE IN OHMS AND ALL VALUES OF CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE STATED.

\* WHEN ALTERNATIVE TRANSFORMERS ARE USED VALUES OF CAPACITORS MARKED THUS \* BECOME 250 $\mu$ F

F3a

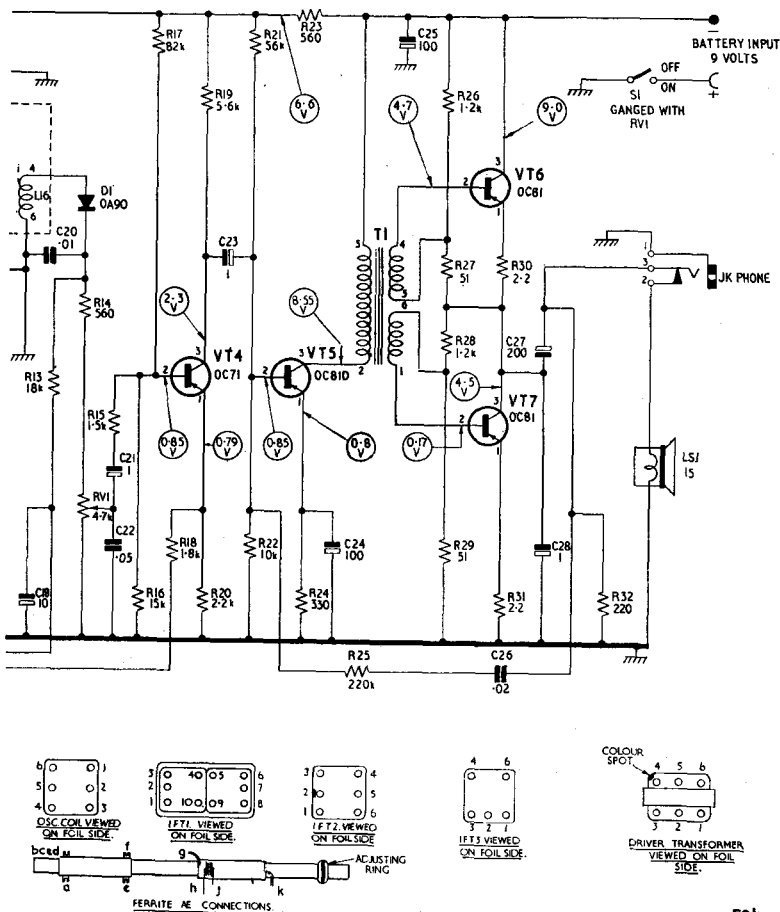


(F3a) CIRCUIT DIAGRAM—MODEL TR146 (PART)

# BUSH

**Alignment Procedure:** *Preliminary Notes:* Equipment required: (a) An A.M. signal generator to cover 158 kc/s.-1605 kc/s. (b) An output wattmeter with a range 0-500 mW. to match 15 ohms impedance. (c) A non-metallic trimming tool for adjusting the iron dust cores and R.F. trimmers. (d) A 0.1  $\mu$ F. capacitor for I.F. injection purposes, a 10 pF. capacitor for injecting R.F. calibration signals into the aerial socket, and an 8.2k resistor for temporarily desensitising the receiver under conditions of interference. The I.F. and R.F. alignment may be carried out after removing the back of the cabinet. Connect the output meter to the receiver by means of the earpiece socket and a suitable plug.

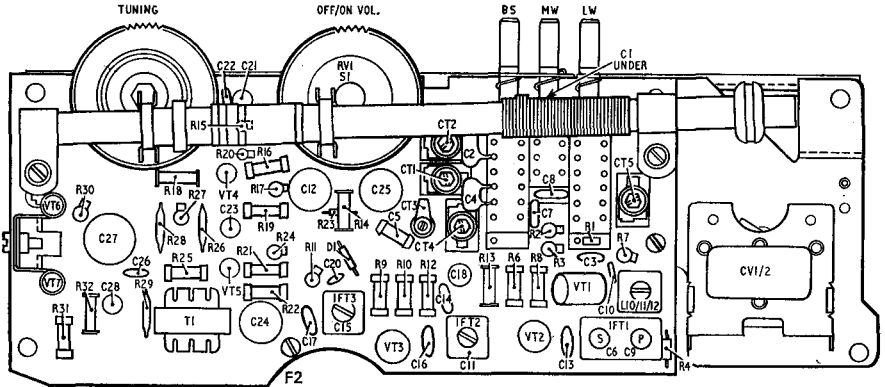
**Warning:** If the output meter is connected in parallel with the loud-speaker care must be exercised to ensure that the power output is not allowed



(F3b) CIRCUIT DIAGRAM—MODEL TRI46 (CONTINUED)

# RADIO SERVICING

R	*30 31	18 28	15 25	20 27	16 17 26 21	23 14 11	9	10	12	13	6	2 8	3	1	7	4
C	27 26 28	22 21 23	24	12 17 20 15	25	16	14 18 4	7 8	13	3	10 6	9				
M S C	VT6 VT7		VT4 VT5	RV1/S1 D1	IFT3 VT3	CT1 CT2 CT3 CT4	IFT2	VT2 VT1	IFT1	CT5 L10/11/12	CV1/2					

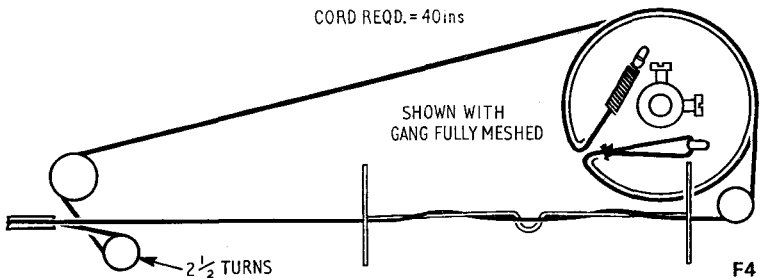


(F2) RECEIVER CHASSIS LAY-OUT

to rise to a level high enough to damage the output transistors (not greater than 75 mW.).

The signal generator should be switched on about 15 minutes before commencing the alignment. Set the volume control to maximum, and maintain the output at 50 mW. by adjusting the input signal each time a trimming adjustment is made (20 mW. if the loudspeaker is left in circuit).

**I.F. Alignment:** Switch the receiver to the medium waveband and set the tuning pointer to about 300 m. Set the signal generator to 470 kc/s., modulated 30 per cent. at 400 c/s. Connect the output via a 0.1  $\mu$ F. isolating capacitor to the base of VT1 (junction of R2 and R3), the chassis connection being the return point for the signal. Align IFT3, IFT2 and IFT1, in that order, for maximum audio output. Align each transformer once only.



(F4) DRIVE CORD

# BUSH

**R.F. Alignment:** *Note:* Ensure that the tuning pointer is in line with the datum dot at the low frequency end of the tuning scale when the tuning gang is fully meshed.

**Oscillator Circuits:** The signal generator should be connected to the aerial socket via a 10-pF. capacitor. Under conditions of interference, the receiver may be temporarily desensitised by connecting an 8.2k resistor between the junction of R6 and R13, and chassis.

Operation	Waveband	Sig. gen. frequency (mod. 30% 400 c./s.)	Tuning pointer setting	Adjust for maximum output
1	M.W.	600 kc/s.	500 m.	L10/11/12
2	M.W.	1500 kc/s.	200 m.	CT4
Repeat operations 1 and 2 and check calibration.				
3	L.W.	214 kc/s.	1400 m.	CT5
4	B.S.	1439 kc/s.	208 m.	CT3

**Aerial Circuits:** The signal generator should be coupled to the receiver by a loop of insulated wire placed about 3 ft. from the cabinet and with its plane at right-angles to the ferrite rod aerial.

Operation	Waveband	Sig. gen. frequency (mod. 30% 400 c/s.)	Tuning pointer setting	Adjust for maximum output
1	M.W.	600 kc/s.	500 m.	Adjusting ring*
2	M.W.	1500 kc/s.	200 m.	CT2
Repeat operations 1 and 2 for optimum gain at both points.				
3	L.W.	214 kc/s.	1400 m.	No adjustment
4	B.S.	1500 kc/s.	200 m.	CT1

\* See ferrite aerial connections.

**Replacement of Drive Cord:** To replace the drive cord, first remove the chassis from the cabinet as described in the dismantling procedure. Set the tuning capacitor to maximum, then remove the two Philips head screws securing the scale backing plate and lift clear. Remove the twin scale pointer assembly and fit the replacement drive cord in accordance with the diagram. Replace the scale pointer assembly and backing plate ensuring that the left hand pointer is in line with the datum dot at the low frequency end of the scale with the tuning gang fully-meshed.

**Modifications:** On some models VT5-7 are type AC 128, and R8 on later models is 820 ohms,  $\pm 10$  per cent. 0.2 W.

## DANSETTE

## “Dorchester”

**General Description:** Six-transistor portable radio. Power output 600 mW. Wavebands: L.W. 1200–2000 m.; M.W. 180–500 m. The internal aerial is of the ferrite rod type. A socket is provided for an external aerial on the right side of the instrument and on the left side are two sockets; the lower is the earphone socket and directly above is the tape output socket. Signals are fed from the aerial to the base of the frequency changer stage (AF117), which produces its own oscillation by means of feedback from collector to emitter. Tracking of the aerial and oscillator is obtained by using a tuning capacitor with shaped oscillator vanes.

The intermediate frequency is extracted from the collector of the first AF117 transistor by the first I.F. transformer. The I.F. amplifier uses two AF117 transistors operating in grounded emitter circuits. The third I.F. transformer is connected to an OA70 detector diode which provides an audio output and a D.C. output. The D.C. is fed back to control the operating current of the first I.F. transistor, so providing A.G.C.

The selected signal is fed via the volume control to the base of the L.F. amplifying transistor (OC81D) and the amplified audio signals are transformer coupled to matched pair of OC81 transistors, which form the output stage.

The output transistors are connected in a common emitter, class “B”, push-pull circuit. A push-pull output transformer terminates the output with a 3-ohm loudspeaker wired to the secondary.

**Alignment Instructions—Apparatus Required:** (1) A signal generator covering long and medium waves. (2) A sensitive D.C. volt-meter measuring 0–2.5 volts (to be connected across the volume control). (3) A radiator loop (a suitable loop consists of 0.25 m. with a series resistor of 430 ohms, situated about 0.6 m. from ferrite aerial). For all I.F. measurements connect a 0.5  $\mu$ F. capacitor and an 820-ohm resistor in series with the generator direct.

**I.F. Alignment:** (1) Connect the signal generator to the base of the second I.F. transistor (TR<sub>3</sub>), set the generator to 470 kc/s. and adjust T<sub>3</sub> for maximum output. (2) Transfer the signal generator to the base of the first I.F. transistor (TR<sub>2</sub>) and adjust T<sub>2</sub> for maximum output. (3) Connect the generator to the base of the oscillator transistor (TR<sub>1</sub>) and adjust T<sub>1</sub> for maximum output. (4) With the generator connected as in (3), the receiver switched to M.W. and the tuning capacitor set to maximum capacity, set the generator to 540 kc/s. Adjust the oscillator coil for maximum output. (5) Set the tuning capacitor to minimum capacity, reset the generator to 1640 kc/s. and adjust TC<sub>2</sub> for maximum output. (6) Repeat (4) and (5) till no further improvement can be achieved.

**Aerial Alignment:** (1) Connect the loop to the generator termination, and set the generator to 600 kc/s. Tune the receiver to 500 m. on the scale

# DANSETTE



**\* - SUBJECT TO ADJUSTMENT.**

(F71) CIRCUIT DIAGRAM—DANSETTE “DORCHESTER”

and adjust the M.W. aerial coil for maximum output. (2) Set the generator to 1300 kc/s., tune the receiver to 230 m. and adjust TC1 for maximum output. (3) Switch to L.W. Set the generator to 220 kc/s. Tune the receiver to 1360 m. and adjust the L.W. aerial coil for maximum output.

## DANSETTE

## "Stereophon"

**General Description:** Five-transistors-per-channel stereophonic record player. Power output 2.4 watts per channel. Frequency response level from 40 c/s. to 10 kc/s. B.S.R. Monarch record unit fitted with a Ronette "105" pickup cartridge. Supply 210-250 volts A.C. only.

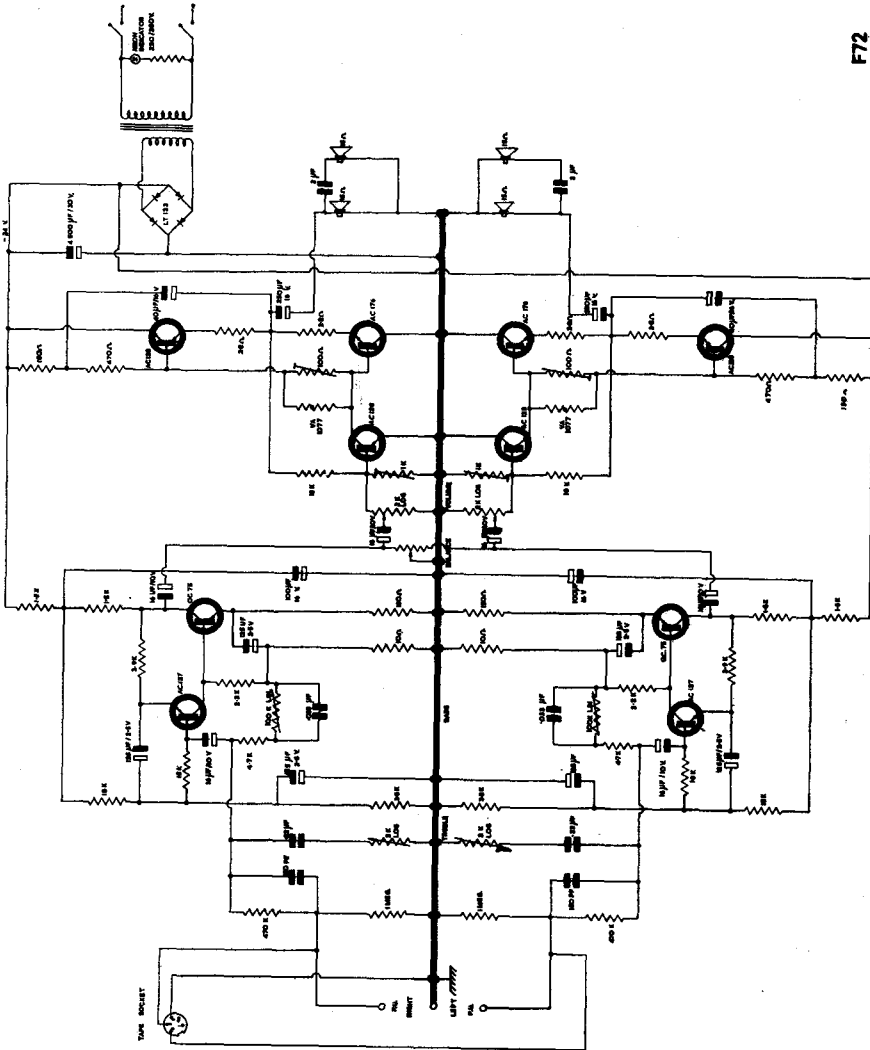
**Circuit Description:** Audio signals obtained from the pickup are fed to two preamplifiers. The output stages are class B push-pull circuits, designed to provide a common-emitter drive for the output transistors. The collector loads of the driver transistors are tapped, the tapping points being capacitively coupled to the mid-points of the output stages. The mid-point voltages are stabilised by providing D.C. feedback to the bases of the driver transistors, 1000 ohm. pre-set resistors being used to accommodate component tolerances and transistor spreads. These pre-set resistors also provide A.C. feedback, thus reducing any distortion originating in the output stages.

An *n-p-n* transistor and a *p-n-p* transistor in each channel are directly coupled to form the preamplifiers. Negative feedback is applied from the emitters of the OC75 transistors to the bases of the AC127 transistors.

The ganged bass boost controls operate by reducing this feedback at low frequencies. Ganged passive treble cut controls are also provided at the inputs.

The thermistors stabilise the quiescent current of the output stages, the 100-ohm pre-set resistors being used to set up the initial currents.

**Audio Adjustment Procedure:** *Note:* Normally no audio adjustment will be necessary. The following instructions apply only when driver or output transistors have been changed. (1) Switch the record player on. (2) Set the balance control fully to the channel being adjusted. (3) Disconnect the lead connecting the collector of the AC128 output transistor concerned from the junction of the negative supply line. Connect an ammeter in series and adjust the 100-ohm pre-set resistor on that channel to 18 mA. (no-signal). (4) Connect a power output meter to the respective L.S. (right or left hand) (15 ohms input impedance). Connect an Oscilloscope between the 250  $\mu$ F. capacitor (positive side) and earth. Connect the



(F72) CIRCUIT DIAGRAM—DANSETTE "STEREOPHON"

audio signal to the tape socket. (For pin connections see under Tape Recording.) (5) Set an audio signal to 1 kc/s. approximately. (6) With 460 mV. input, the power out should be 2.3 watts approximately. (7) Adjust the 1000 ohm. pre-set resistor concerned for a symmetrical sinewave at 2.3 watts output.



**DANSETTE****“Hendon”**

**General Description:** This model is electrically similar to the Dorchester, information for which is given elsewhere in this volume.

**DANSETTE****“Supreme”**

**General Description:** Five-transistor mains-operated record player. Power output  $3\frac{1}{2}$  watts undistorted. Frequency response level from 40 c/s. to 10 kc/s. B.S.R. record player unit with “Ful-Fi” TC8 M cartridge.

**Circuit Description:** Audio signals obtained from the pickup are fed to a preamplifier. The output stage is a class B push-pull circuit, designed to provide a common-emitter drive for the output transistors. The collector load of the driver transistor is tapped, the tapping point being capacitively coupled to the mid-point of the output stage. The mid-point voltage is stabilised by providing D.C. feedback to the base of the driver transistor, a 1000-ohm pre-set resistor being used to accommodate component tolerances and transistor spreads. The pre-set resistor also provides A.C. feedback, thus reducing any distortion originating in the output stage.

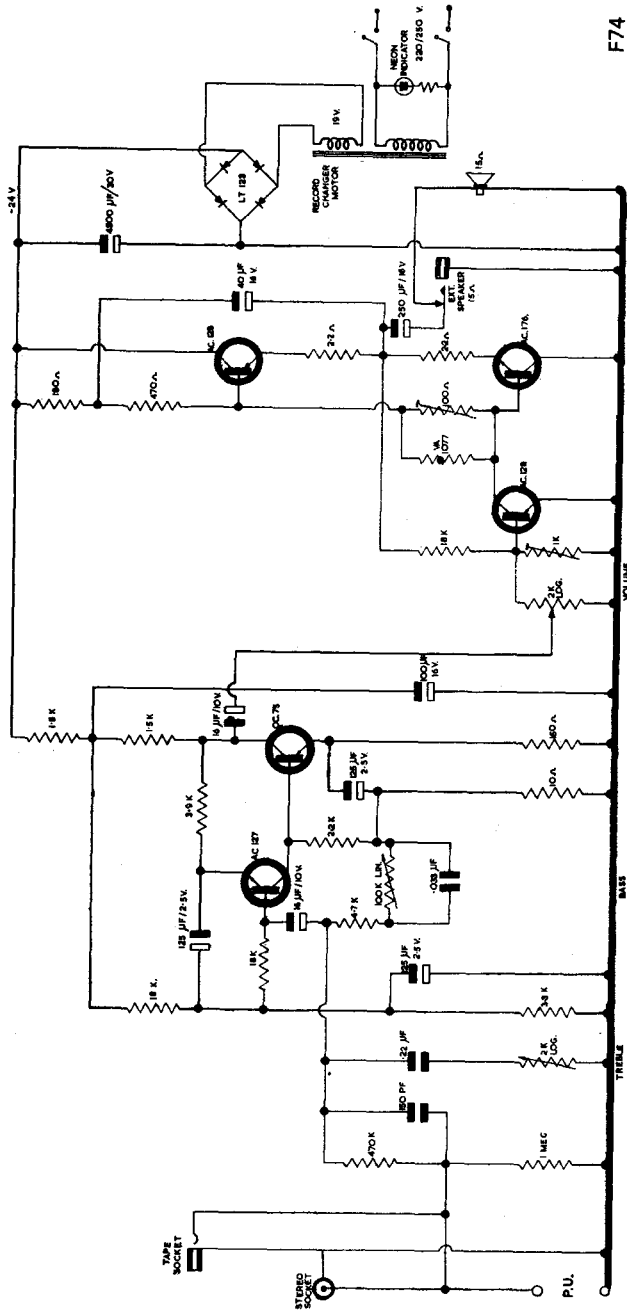
An *n-p-n* transistor and a *p-n-p* transistor are directly coupled to form the preamplifier. Negative feedback is applied from the emitter of TR2 to the base of TR1.

The bass boost control operates by reducing this feedback at low frequencies. A passive treble cut control is also provided at the input.

The thermistor stabilises the quiescent current of the output stage, the 100-ohms pre-set resistor being used to set up the initial current.

**Audio Adjustment Procedure:** *Note:* Normally no audio adjustment will be necessary. The following instructions apply only when the driver or output transistors have been changed. (1) Switch the record player on. (2) Disconnect the lead connecting the  $40\ \mu\text{F}$ . capacitor to the junction of the two 2.2-ohm resistors. Connect an ammeter in series (test point H.T.) adjust the 100-ohm pre-set resistor to 18 mA. maximum current (no-signal). (3) Connect the power output meter to the “L.S.” socket (15 ohms input impedance). Connect an Oscilloscope between the  $250\ \mu\text{F}$ . capacitor (negative side) and earth. Connect the audio signal to the tape socket. (4) Set the audio signal to 1 kc/s. approximately. (5) With 460 mV. input, the power out should be 2.3 watts approximately. (6) Adjust the 100-ohm pre-set resistor for a symmetrical sinewave at 2.3 watts output.

# DANSETTE



F74

(F74) CIRCUIT DIAGRAM—DANSETTE "SUPREME"

## DANSETTE

## "Herald"

**General Description:** The Dansette "Herald" Portable Transistor Radio uses a superheterodyne circuit. The internal aerial is of the ferrite rod type. A socket is provided for an external aerial on the right-hand side of the instrument and on the left-hand side are two sockets; the lower is the earphone socket and directly above is the tape output socket. Signals are fed from the aerial to the input of the R.F./I.F. module. Tracking of the aerial and the oscillator within the module is obtained by using a tuning capacitor with shaped oscillator vanes.

The audio output from the module is fed via the volume control to the base of the A.F. amplifier transistor (OC81D) and the amplified audio signals are transformer coupled to matched pair of OC81 transistors, which form the output stage.

The output transistors are connected in a common emitter, class "B", push-pull circuit. A push-pull output transformer terminates the output with a 3-ohm loudspeaker wired to the secondary.

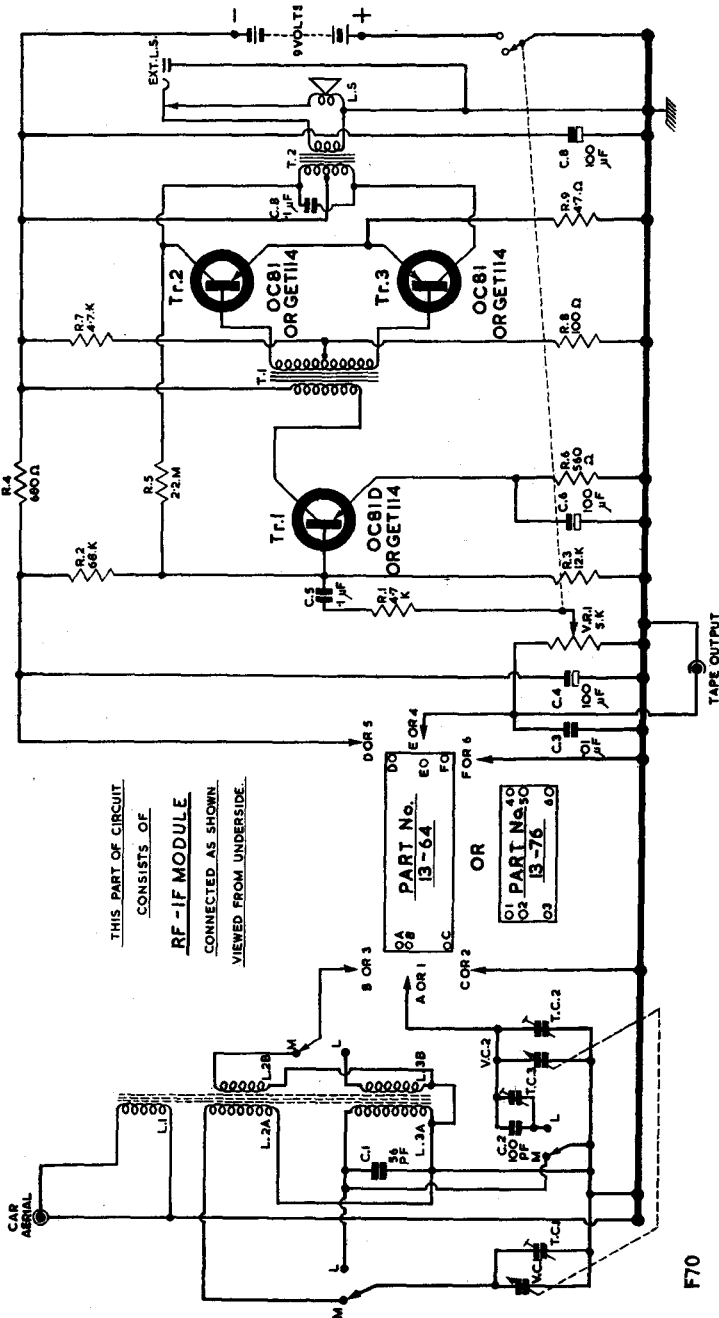
**Alignment Instructions—Apparatus Required:** (1) A signal generator covering the long and medium wavebands. (2) A sensitive D.C. volt-meter measuring 0-2.5 volts (to be connected across the volume control). (3) A radiator loop (a suitable loop consists of 3 turns of copper wire wound on a diameter of 0.25 m. with a series resistor of 430 ohms, situated about 0.6 m. from ferrite aerial).

**R.F. Alignment:** (1) Connect the signal generator to the common tag of the coupling winding of the M.W. aerial coil (normally wired with a WHITE coloured lead to the wave change switch) via a 0.5  $\mu$ F. capacitor in series with an 820-ohm resistor. (2) With the receiver switched to M.W. and the tuning capacitor set to 550 m., set the signal generator to 546 kc/s. Adjust the UNSEALED adjustable core in the module for maximum output. (3) Set the tuning capacitor to 200 m., reset the generator to 1500 kc/s. and adjust T.C.2 for maximum output. (4) Repeat (2) and (3) till no further improvement can be achieved.

**Aerial Alignment:** (1) Connect the loop to the generator termination and set the generator to 600 k/cs. Tune the receiver till the maximum signal is received from the generator (500 m. on the tuning scale), and adjust the M.W. aerial coil for maximum output. (2) Set the generator to 1420 kc/s., tune the receiver till the maximum signal is received from the generator (approximately 210 m. on the tuning scale), and adjust T.C.1. for maximum output. (3) Repeat (1) and (2) till no further improvement can be achieved. (4) Switch the receiver to L.W.. Set the generator to 200 kc/s. Tune the receiver to 1500 m. and adjust the L.W. aerial coil for maximum output.

**N.B. No I.F. alignment is required.**

# DANSETTE



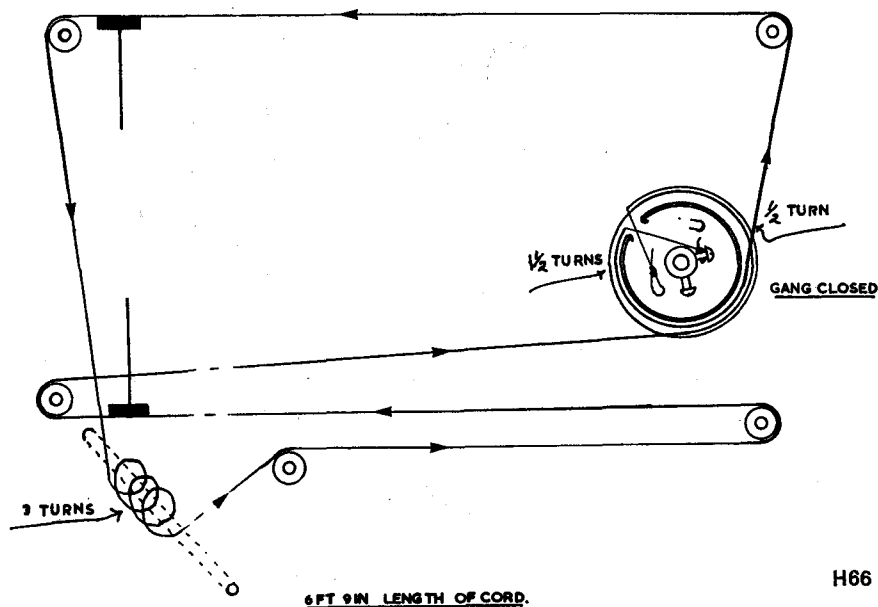
(F70) CIRCUIT DIAGRAM—DANSETTE "HERALD"

**DECCA****"STEREOGRAM"****Model 727**

**General Description:** Stereo radiogram with four wavebands. Auto-changer, AT6 Mk. II Garrard automatic turntable with manual control. Pickup, Deram stereo transcription cartridge with high-compliance diamond stylus for both stereo and microgroove records. A 78 r.p.m. head available as extra. Stylus, Deram Diamond/s coding blue. 200-250 volts A.C. mains.

**Wavebands:** L.W. 1112-2069 m. M.W. 182-586 m. S.W. 16-8-51 m. V.H.F. 87-5-101 Mc/s.

**Alignment (Equipment):** Either power meter or A.C. volt-meter. A.M. signal generator (140 kc/s.-18.5 Mc/s.). F.M. signal generator (10.7 Mc/s. and 87-101 Mc/s.).

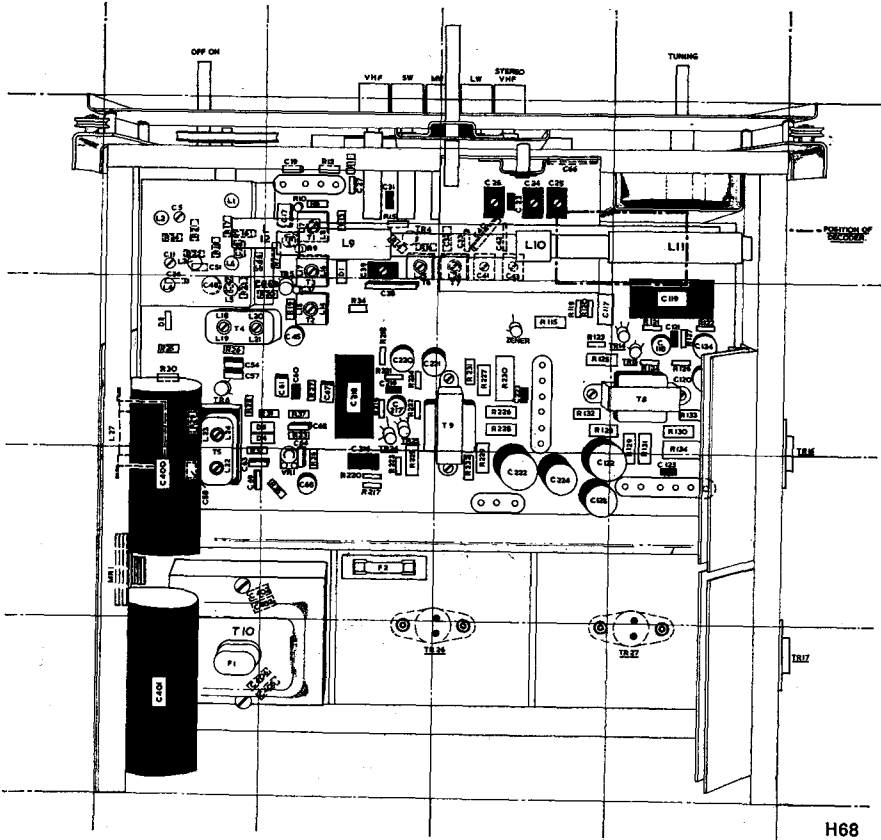


H66

**Alignment (Notes):** During all tests a load of 15 ohms must be across each output (speaker or dummy). The power meter (or A.C. volt-meter) should be connected to the output of one audio amplifier. The volume control should be set to max. and the tone controls to min. The sig. gen. output should be adjusted to maintain 1 watt output. The sig. gen. earthy lead must be taken to an earth point as close as possible to the signal injection point.

# DECCA

**Alignment (A.M. I.F.):** Depress M.W. button and fully close tuning gang. Disconnect wire from tap on M.W. aerial coil and inject 472 kc/s. signal into free end of wire via 0.01  $\mu$ F. capacitor. Adjust cores of L14/15; L18/19 and L22 in this sequence for maximum output, keeping generator output as low as possible. Check and readjust if necessary. Replace wire to M.W. coil.

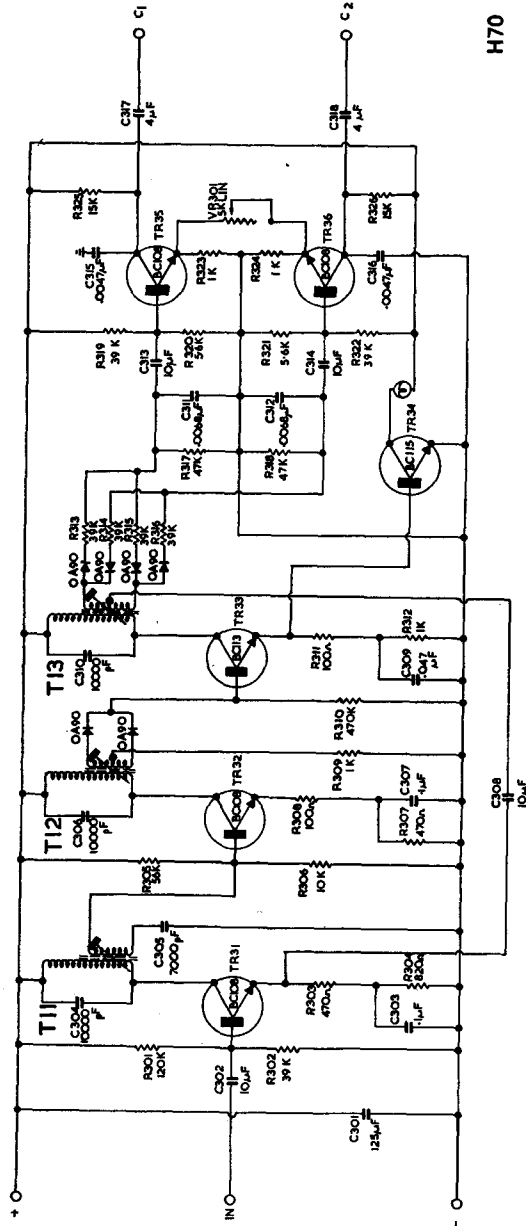


(H68) COMPONENT LOCATIONS—MAIN CHASSIS

**Alignment (F.M. I.F.):** Depress F.M. button and with gang fully closed inject a 10.7 mc/s. at 25 kc/s. deviation into base of TR2 via 0.01  $\mu$ F. capacitor. Adjust cores of L5/6; L7/8; L16/17; L20/21; L23/24 in this sequence for maximum output, keeping generator output as low as possible. Check and readjust if necessary. Switch generator to A.M. position. Adjust VR1 for minimum output.



C	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318
R	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318

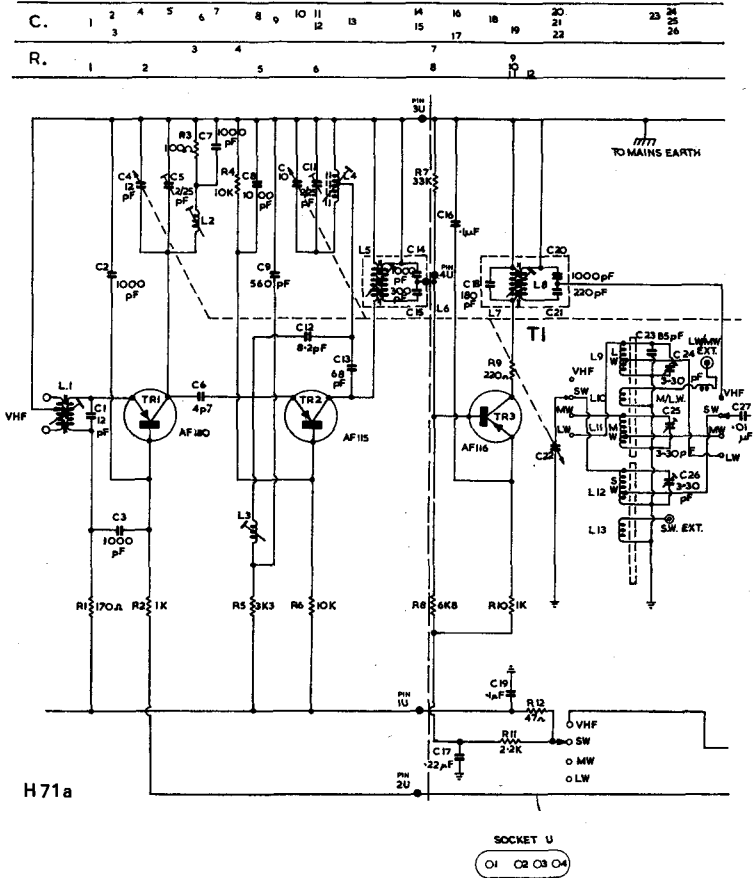


H70

(H70) Circuit Diagram—Decoder Unit



# RADIO SERVICING



(H71a) CIRCUIT DIAGRAM—727 (PART)

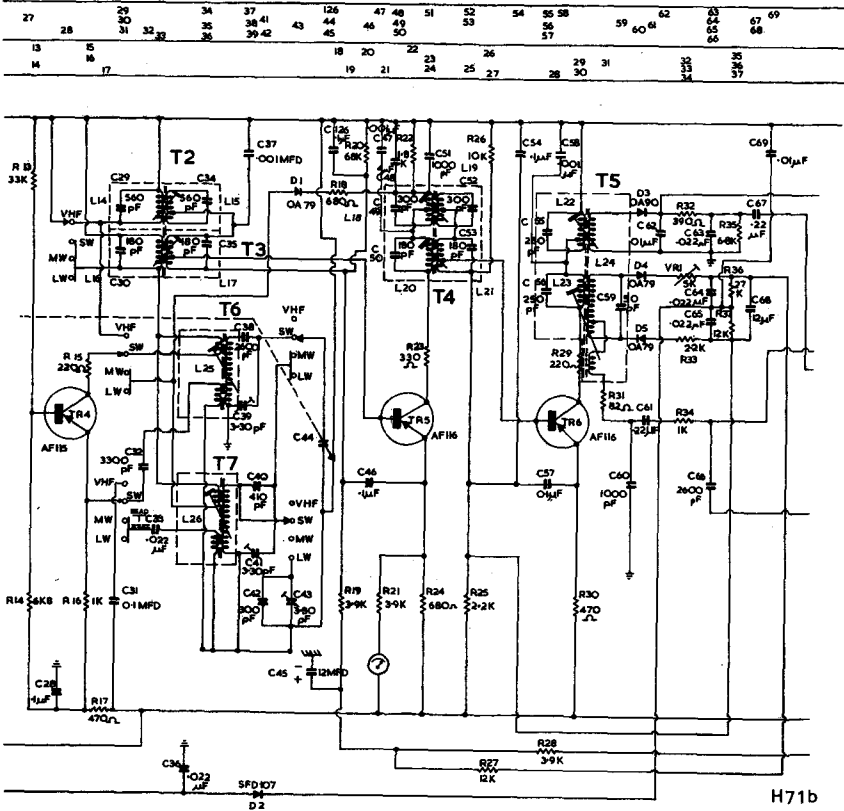
**Alignment (M.W.):** Inject signal via M.W. aerial lead (in series with 4700 ohms). Depress M.W. button. Set generator to 525 kc/s. and with gang fully closed, adjust L26 for maximum output. Set generator to 1620 kc/s. and with gang fully open, adjust C41 for maximum output. Repeat two above operations until no improvement can be made.

Set generator to 600 kc/s. and with receiver tuned to this (500 m.) adjust L.9 for maximum output. Set generator to 1500 kc/s. and with receiver tuned to this (200 m.) adjust C24 for maximum output.

Repeat two above operations until no improvement can be made.

**Alignment (L.W.):** Inject signal as for M.W. Depress L.W. button. Set generator to 145 kc/s. and with gang fully closed adjust C43 for maximum output. Set generator to 170 kc/s. and with receiver tuned to 1275 m. adjust L9 for maximum output. Set generator to 240 kc/s. and with re-

# DECCA



(H71b) CIRCUIT DIAGRAM—727 (PART)

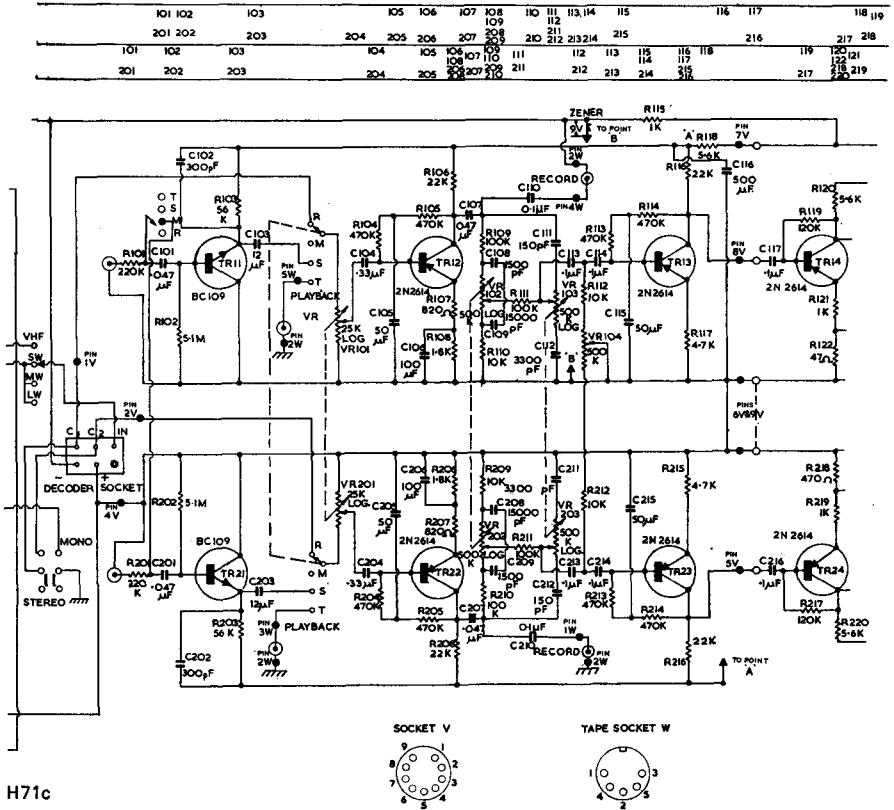
ceiver tuned to 1800 m. adjust C24 for maximum output. Repeat the last two operations until no improvement can be made. *Note:* It will be necessary to re-check M.W. aerial alignment if L.W. aerial has been re-set.

**Alignment (S.W.):** Depress S.W. button. Inject signal into S.W. external aerial wire via 4.7 kΩ resistor.

Set generator to 5.85 Mc/s. and with gang fully closed adjust L25 for maximum output. Set generator to 18.3 Mc/s. and with gang fully closed adjust C39 for maximum output. Repeat two above operations until no improvement can be made. Set generator to 6.4 Mc/s. with receiver tuned to this and adjust L12 for maximum output. Set generator to 14 Mc/s. and with receiver tuned to this adjust C26 for maximum output. Repeat two above operations until no improvement can be made.

**Alignment (F.M. R.F.):** Depress F.M. button, but before commencing

# RADIO SERVICING



H71c

(H71c) CIRCUIT DIAGRAM—727 (PART)

alignment check that the F.M. tuner cover is fitted correctly. Set the generator to 87.5 Mc/s. Inject signal into external F.M. aerial lead and with gang fully closed, adjust  $L_4$  for maximum output. With gang open set generator to 101 Mc/s. and adjust  $C_{11}$  for maximum output. Repeat two above operations until no improvement can be made. Set generator to 90 Mc/s. and with receiver tuned to this, adjust  $L_2$  for maximum output. Set generator to 99 Mc/s. and with receiver tuned to this, adjust  $C_5$  for maximum output. Repeat two above operations until no improvement can be made. Set generator to 95 Mc/s. and with receiver tuned to this, adjust  $L_1$  for maximum output.

**Decoder Alignment (Equipment):** Double-beam oscilloscope and signal generator capable of composite signal on A.F. and R.F.

## Decoder Alignment (Procedure):

1. Connect oscilloscope through  $0.01 \mu F.$  to collector of TR27. With

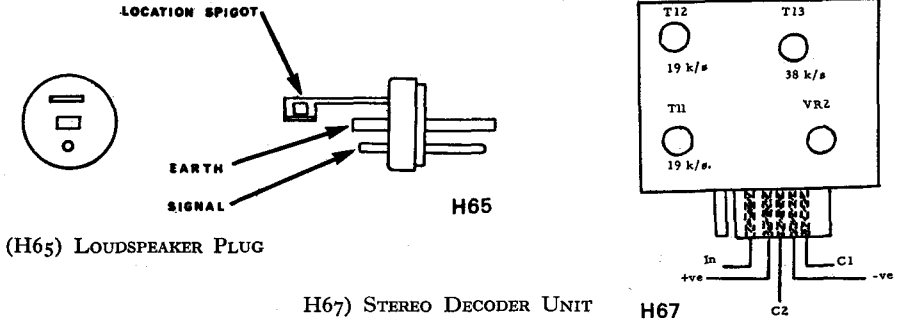
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stereo generator adjusted for 50 mV. output and 19 kc/s. pilot tone, the generator is connected via C302. Tune T11 for maximum output approx. 2 mV. RMS.

- 143

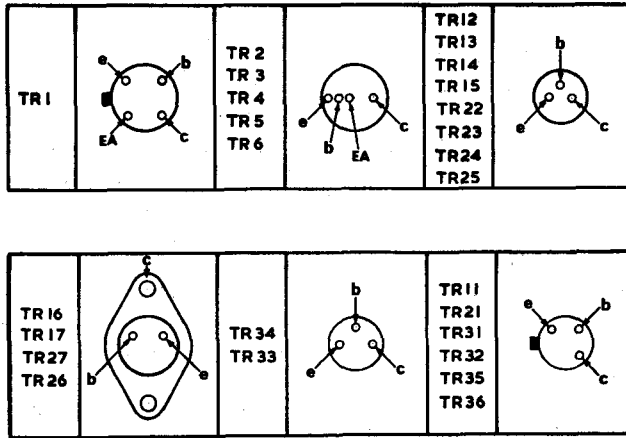
## RADIO SERVICING

**Loudspeakers:** Each channel has one 8-in. (15 ohms) and one 3-in. (15 ohms). Crossover point is 2500 c/s. External loudspeakers can be connected and these should have an impedance of 15 ohms. The following plugs are recommended—Hirschmann LS7 or LS8. Lumberg S34, S304 or S304N. The former can be obtained from Neoflex Ltd. and the latter from Super Electronics Ltd. The plug wiring is shown in the appropriate diagram. In one position the internal speakers are left on and in the other position (180° reversal) the internal speakers are muted.



**Stereo Earphones:** The impedance should not be below 150 ohms. The plug is a standard Aerial Pressings RA 1826. If required, the plugs mentioned in the paragraph on loudspeakers, may also be used.

**Aerials:** Internal ferrite rod aerials are provided for M.W., L.W. and S.W. reception. In areas of weak signal strength an external aerial can be plugged into the M.W. aerial socket. Similarly an internal aerial is provided for V.H.F. reception, but an external aerial can be used. When an external V.H.F. aerial is used the internal aerial plug must be disconnected.



# DECCA

## Voltage Readings:

### Pre-amplifier—Readings with respect to chassis

	<i>Collector</i>	<i>Base</i>	<i>Emitter</i>
TR11/21 . . .		0·3	3·4
TR12/22 . . .	6·1	1·3	2·3
TR13/23 . . .	7·7	1·8	3·4

### Power Amplifier—Readings with respect to positive tag . . . C401

	<i>Collector</i>	<i>Base</i>	<i>Emitter</i>
TR14/24 . . .	5·7	3·0	3·3
TR15/25 . . .	18·0	1·4	1·3
TR17/27 . . .	22·5	1·1	0·8
TR16/26 . . .	44·5	23·0	22·5

### Radio Unit—Readings with respect to chassis

	<i>Collector</i>	<i>Base</i>	<i>Emitter</i>	
TR1 . . . . .	0·2	8·7	8·8	F.M. only
TR2 . . . . .	—	4·6	5·0	F.M. only
TR3 . . . . .	0·2	5·3	5·9	F.M. only
TR4 . . . . .	0·2	6·7	7·0	A.M.
TR4 . . . . .	0·2	6·7	7·3	F.M.
TR5 . . . . .	3·0	7·6	8·2	A.M.
TR5 . . . . .	2·7	7·5	8·1	F.M.
TR6 . . . . .	0·6	7·5	7·8	A.M. F.M.

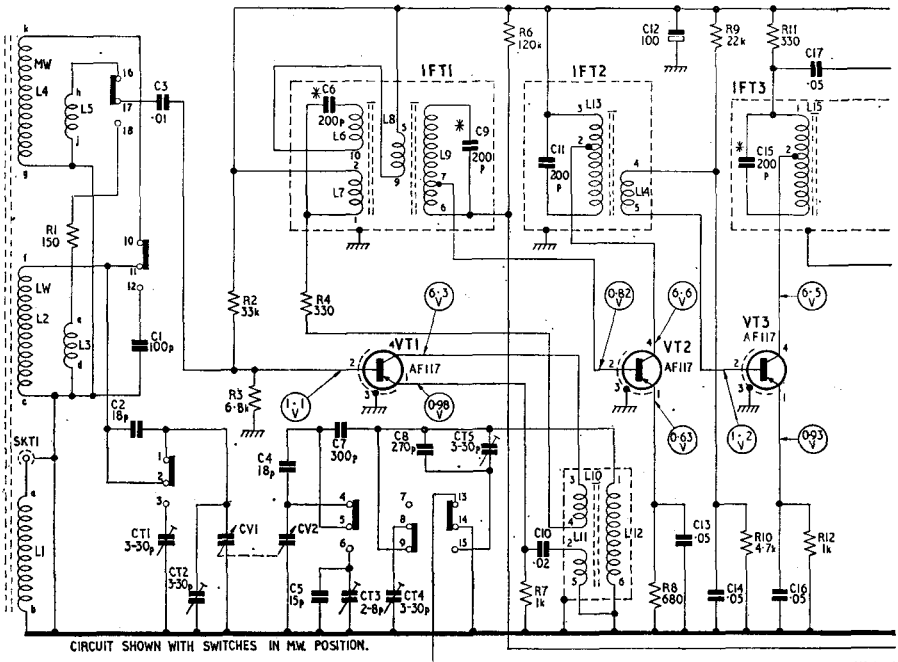
**Transistor Replacement:** When soldering transistor connections, it is essential to use a heat sink (preferably reasonably sized pliers). If excessive heat is transmitted to the transistors, it could easily cause serious damage and transistors should not be subjected to a temperature above 60°F. It is also important to realise that the electric soldering iron should be earthed, irons often have a very slight leak and the resultant current can often damage a new transistor.

# DEFIANT

# Model A503

**General Description:** Battery-operated portable receiver incorporating seven transistors and one crystal diode. The receiver has coverage of the long and medium wavebands, while an additional range provides electrical bandspread of the high frequency end of the medium waveband. At the top of the cabinet is the four part tuning scale which is also integral with the control panel. Controls comprise three push-buttons for waveband selection and two edge-operated control knobs, one for Volume and On/Off, the other for tuning. Cabinet back detachable for battery replacement.

**Wavebands:** L.W. band: 1070-1900 m. (280 to 158 kc/s.); M.W. band: 187-570 m. (1605-525 kc/s.); B.S. band: 187-210 m. (1605 to 1430 kc/s.).



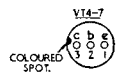
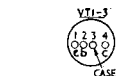
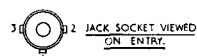
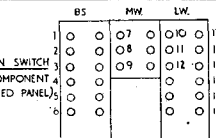
## NOTES.

1. VOLTAGES SHOWN ARE NEGATIVE WITH RESPECT TO CHASSIS AND MEASURED WITH AVO N° 8 UNDER NO SIGNAL CONDITIONS AND WITH VOLUME CONTROL SET TO ZERO.
2. ALL VALUES OF RESISTANCE IN OHMS AND ALL VALUES OF CAPACITANCE IN  $\mu$ F UNLESS OTHERWISE STATED.

\* WHEN ALTERNATIVE DROWFIELD MANUFACTURED I.F. TRANSFORMERS ARE USED VALUES OF CAPACITORS MARKED THUS \* BECOME 250p

F6 a

PUSH-BUTTON SWITCH  
(VIEWED FROM COMPONENT  
SIDE OF PRINTED PANEL)



BASE OF TRANSISTORS

(F6a) CIRCUIT DIAGRAM—MODEL A503 (PART)

# DEFIANT

**Intermediate Frequency:** 470 kc/s., oscillator high with respect to signal frequency.

**Aerial:** An internal ferrite rod aerial is fitted serving the three ranges, and a socket is provided at the side of the receiver for use with a car aerial.

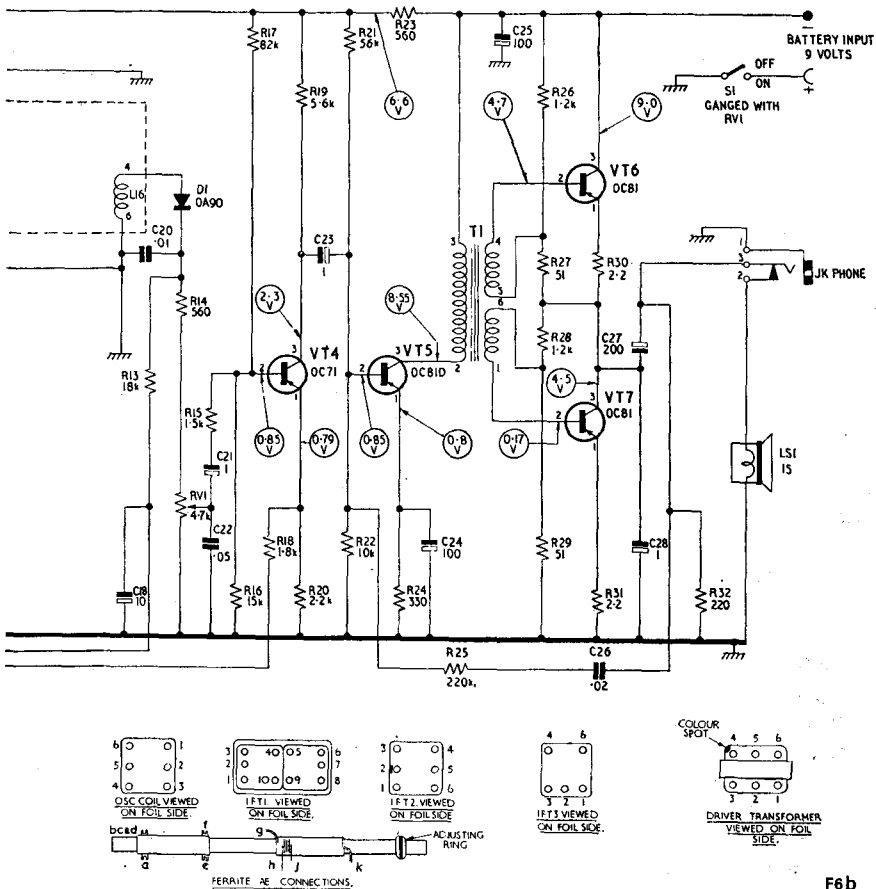
**Automatic Gain Control:** One controlled stage.

**Battery and Consumption:** One 9-volt PP7 or U.K. equivalent. Consumption is 12 mA. quiescent and 17 mA. at average listening level.

**Audio Output:** 500 mW.

**Loudspeaker:**  $5\frac{3}{8}$  in.  $\times$   $3\frac{3}{8}$  in. elliptical. Impedance 15 ohms. Flux density 9500 lines per square centimetre.

**Transistors:** Mullard Type: VT1 AF117 mixer/oscillator; VT2 AF117 I.F. amplifier; VT3 AF117 I.F. amplifier; VT4 OC71 audio amplifier;



(F6b) CIRCUIT DIAGRAM—MODEL A503 (CONTINUED)



VT<sub>5</sub> OC81D or AC128 driver stage; VT<sub>6</sub> and VT<sub>7</sub>, OC81 (or AC128). Push-pull output matched pair.

**Crystal Diode:** D<sub>1</sub> OA90 detector.

**Earpiece Socket:** A socket is provided at the side of the receiver into which may be plugged an earpiece of 200–1000 ohms impedance. Alternatively, this socket may be used with an external loudspeaker of 15 ohms, or for tape recording provided that the recorder has an input impedance of not less than 15 ohms.

**Removing the Chassis:** Place the cabinet face downwards, remove the detachable back, then remove the battery. Unscrew the four 4BA cheese-head screws securing the chassis to the cabinet (one screw to each corner of the chassis). Lift out the chassis to the extent of the aerial and loudspeaker leads. Unsolder the leads if total removal of the chassis required.

**Replacement:** Replace by reversing the above procedure.

**Alignment Procedure:** *Preliminary Notes:* Equipment required: (a) An A.M. signal generator to cover 158 kc/s.–1605 kc/s. (b) An output wattmeter with a range 0–500 mW. to match 15 ohms impedance. (c) A non-metallic trimming tool for adjusting the iron dust cores and R.F. trimmers. (d) A 0.1  $\mu$ F. capacitor for I.F. injection purposes, a 10 pF. capacitor for injecting R.F. calibration signals into the aerial socket and an 8.2k resistor for temporarily desensitising the receiver under conditions of interference. The I.F. and R.F. alignment may be carried out after removing the back of the cabinet. Connect the output meter to the receiver by means of the earpiece socket and a suitable plug.

**Warning:** If the output meter is connected in parallel with the loudspeaker care must be exercised to ensure that the power output is not allowed to rise to a level high enough to damage the output transistors (not greater than 75 mW.).

The signal generator should be switched on about 15 minutes before commencing the alignment. Set the volume control to maximum, and maintain the output at 50 mW. by adjusting the input signal each time a trimming adjustment is made (20 mW. if the loudspeaker is left in circuit).

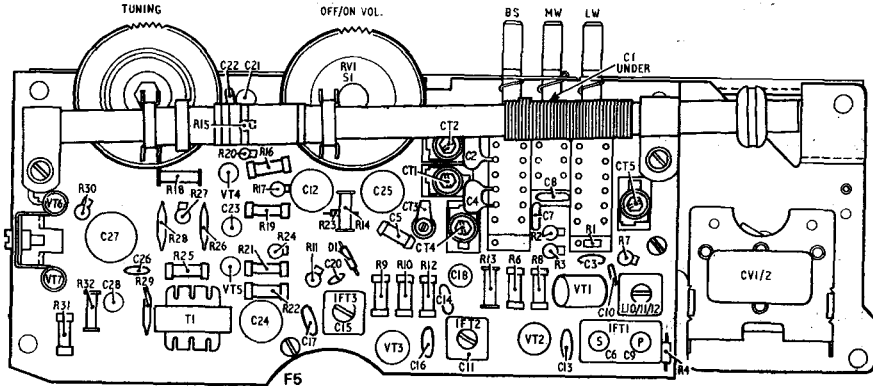
**I.F. Alignment:** Switch the receiver to the medium waveband and set the tuning pointer to about 300 m. Set the signal generator to 470 kc/s., modulated 30 per cent. at 400 c/s. Connect the output via a 0.1  $\mu$ F. isolating capacitor to the base of VT<sub>1</sub> (junction of R<sub>2</sub> and R<sub>3</sub>), the chassis connection being the return point for the signal. Align IFT<sub>3</sub>, IFT<sub>2</sub> and IFT<sub>1</sub>, in that order, for maximum audio output. Align each transformer once only.

**R.F. Alignment:** *Note:* Ensure that the tuning pointer is in line with the datum dot at the low frequency end of the tuning scale when the tuning gang is fully meshed.

**Oscillator Circuits:** The signal generator should be connected to the aerial socket via a 10-pF. capacitor. Under conditions of interference, the receiver may be temporarily desensitised by connecting an 8.2k resistor between the junction of R<sub>6</sub> and R<sub>13</sub>, and chassis.

# DEFIANT

R	30 31 32	18 28 29	15 26 25	16 20 19	17 24 21	11 22	23 14	9 10	12	13	6	2 8	3 5	1	7	4
C		27 28	26	22 23	21 24	12 17	20 15	25 5	14 16	18 11	4	7 13	8	3 10	1 6	9
M S C	VT6 VT7		VT4 VT5		RV1/S1 D1	IFT3	VT3	CT1 CT2 CT3 CT4	IFT2	VT2	VT1	IFT1	CT5 L10/11/12		CV1/2	



(F5) RECEIVER CHASSIS LAY-OUT

Operation	Waveband	Sig. gen. frequency (mod. 30% 400 c/s.)	Tuning pointer setting	Adjust for maximum output
1	M.W.	600 kc/s.	500 m.	L10/11/12
2	M.W.	1500 kc/s.	200 m.	CT4
Repeat operations 1 and 2 and check calibration.				
3	L.W.	214 kc/s.	1400 m.	CT5
4	B.S.	1439 kc/s.	208 m.	CT3

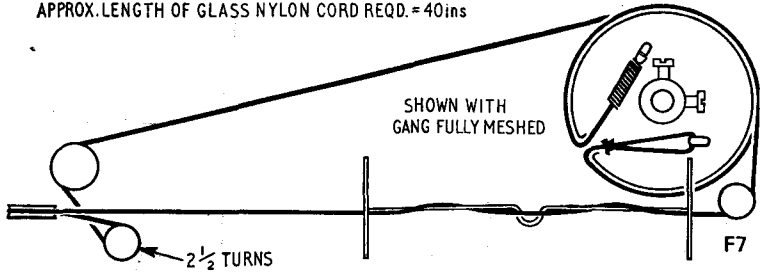
**Aerial Circuits:** The signal generator should be coupled to the receiver by a loop of insulated wire placed about 3 ft. from the cabinet and with its plane at right-angles to the ferrite rod aerial.

Operation	Waveband	Sig. gen. frequency (mod. 30% 400 c/s.)	Tuning pointer setting	Adjust for maximum output
1	M.W.	600 kc/s.	500 m.	Adjusting ring*
2	M.W.	1500 kc/s.	200 m.	CT2
Repeat operations 1 and 2 for optimum gain at both points.				
3	L.W.	214 kc/s.	1400 m.	No adjustment
4	B.S.	1500 kc/s.	200 m.	CT1

\* See ferrite aerial connections.

## RADIO SERVICING

APPROX. LENGTH OF GLASS NYLON CORD REQD. = 40ins



(F7) DRIVE CORD

**Replacement of Drive Cord:** To replace the drive cord, first remove the chassis from the cabinet as described in the dismantling procedure. Set the tuning capacitor to maximum, then remove the two Phillips head screws securing the scale backing plate and lift clear. Remove the twin scale pointer assembly and fit the replacement drive cord in accordance with the diagram.

Replace the scale pointer assembly and backing plate ensuring that the left-hand pointer is in line with the datum dot at the low frequency end of the scale with the tuning gang fully-meshed.

**Modifications:** On some models VT5-7 are type AC 128 and R8 on later models is 82 ohms  $\pm 10$  per cent. 0.2W.

# DYNATRON Models SRX24, SRX24A, SRX24B, RG46-57, HFC4, HFC3A, HFC3M, TRV16, TRV17, TRG12

**General Description:** This SRX24 series of tuner amplifiers is used in the following Dynatron models: SRX24-TRV16, TRV17, HFC3A and HFC3M: SRX24A-RG46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56 and 57; SRX24B-HFC4.

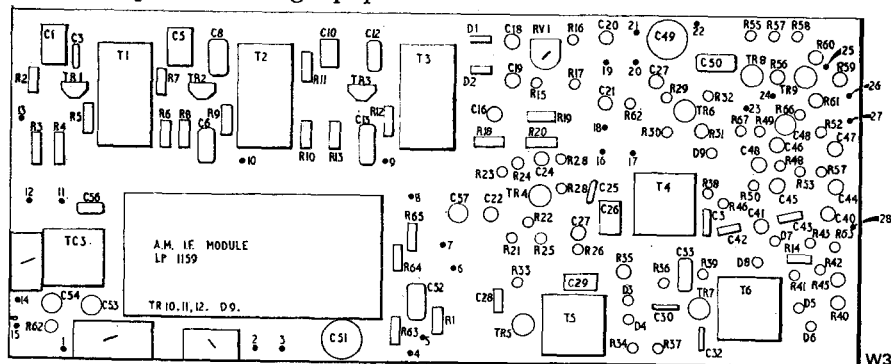
All chassis are electrically similar but differ mechanically as follows: SRX24 has a horizontal scale and fixed A.M. bands "Ferrite" aerial. SRX24A has a horizontal scale and a rotatable A.M. bands "Ferrite" aerial, SRX24B a vertical scale and a fixed A.M. bands "Ferrite" aerial.

The chassis are further subdivided into "20" series and "25" series by the use of alternative mains transformers. "20" series: RG46, 47, 51 and 56, HFC4, TRV16; "25" series: RG48, 49, 50, 52, 53, 54, 55 and 57, HFC3A, HFC3M, TRV17.

With the exception of RG55, all models fitted with record player units use the Sonotone 9TAHC cartridge with diamond L.P. stylus. Model RG55 is fitted with a Pickering V15/AC-1 magnetic cartridge with diamond stylus. TRV16 and TRV17 have a pickup socket provided on the rear socket panel to accept either a Piezo or Magnetic cartridge. Frequency compensation is to R.I.A.A. curve and is automatically applied for each type of cartridge depending on the manner in which the plug is wired.

**Audio Amplifier Section:** The circuit diagram shows the L.H. channel only since the R.H. channel is identical. VT1 is an equalised P.U. pre-amp. stage with sensitivity suitable for magnetic cartridges of medium output (5 mV. will fully drive the amplifier). Piezo cartridges must have a series resistor of the order of 100 k $\Omega$  to give cartridge constant velocity output.

**Note:** Realignment of the decoder circuits should NOT be attempted unless complete encoding equipment is available.

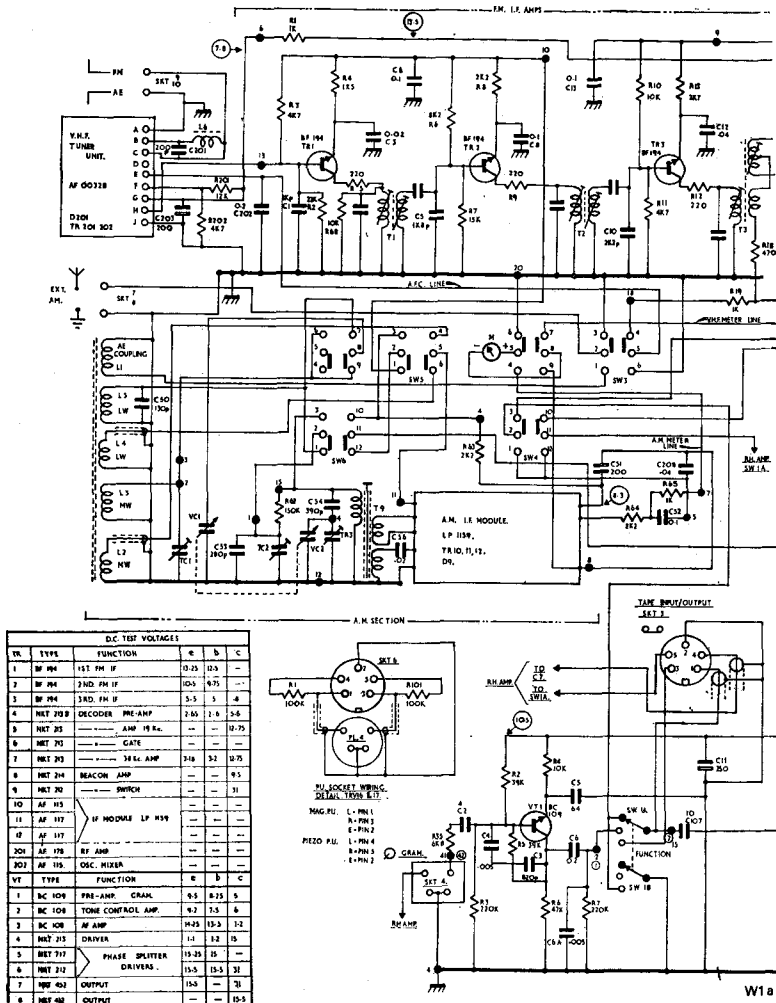


(W3) PRINTED PANEL—R.F., I.F. DECODER STAGES

# RADIO SERVICING

## Removal of SRX24 Series Chassis From Cabinets

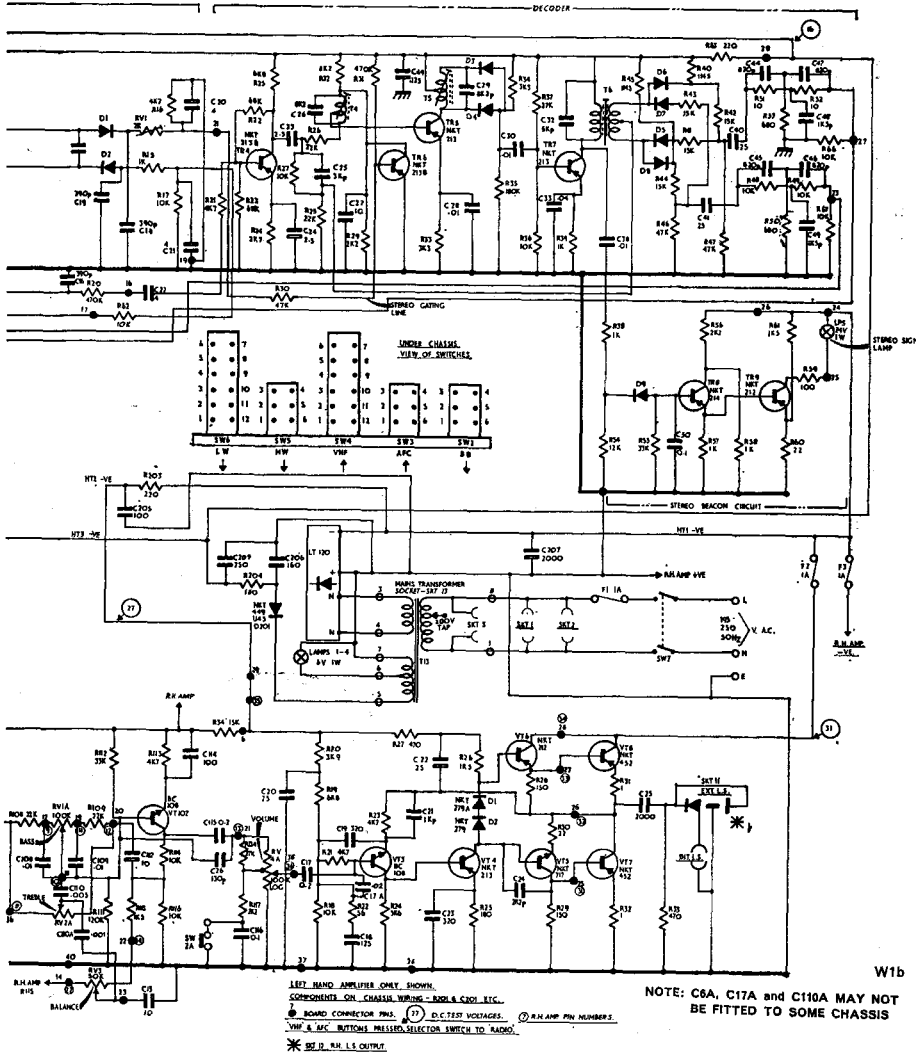
**RG46, 47, 48, 49, 50, 53, 54 and 56:** 1. Remove cross-head screws from front edge and rear of control panel facia. 2. Remove external plugs from sockets panel. Lift up front edge of facia to expose chassis and remove leads to gram motor, interior lamp, pickup, loudspeaker and mains transformer. 3. Feed mains lead through aperture at rear of cabinet and withdraw facia and chassis together.



(W1a) CIRCUIT DIAGRAM TUNER AMPLIFIER—MODEL SRX24 (PART)

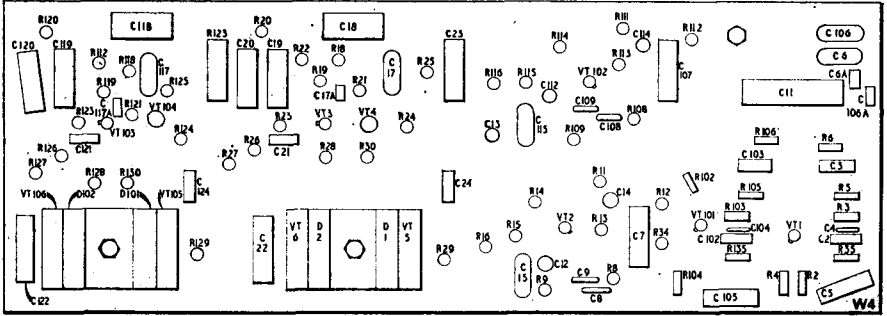
# DYNATRON

**RG51, 55 and 57:** 1. Remove sockets section panel from rear of cabinet after removing external plugs. 2. Remove mains transformer plug lead and disconnect loudspeaker leads. Release sockets panel from its mounting studs. Remove cross-head screws from top of fascia and smaller screws from rear of fascia edge. Lift up fascia and chassis complete and remove leads to gram motor, interior light and pickup. Withdraw fascia and chassis with sockets panel up through cabinet.



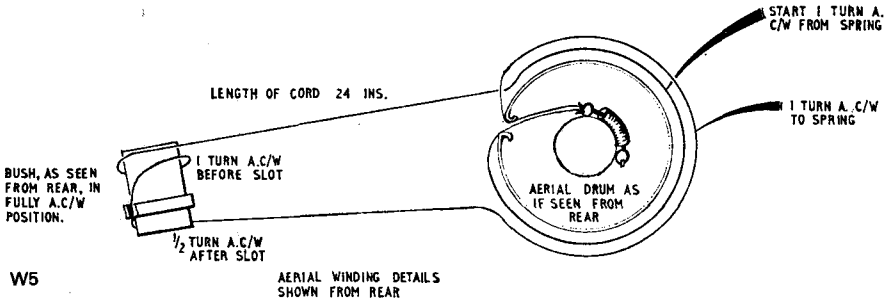
(W1b) CIRCUIT DIAGRAM TUNER AMPLIFIER—MODEL SRX24 (CONTINUED)

# RADIO SERVICING

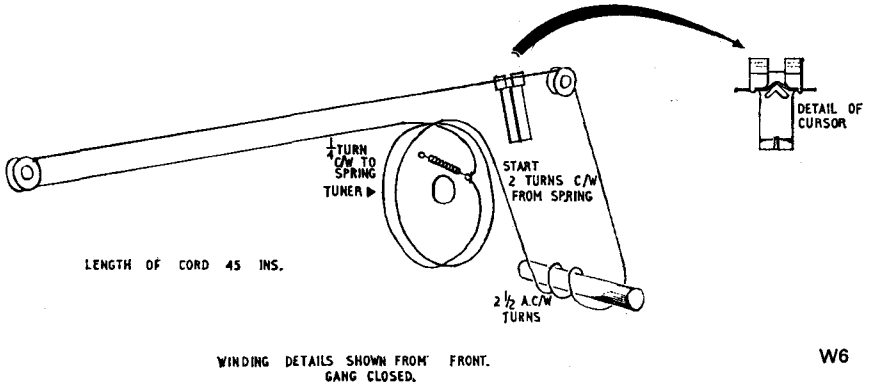


(W4) PRINTED PANEL—A.F. STAGES

**HFC3A and M, TRV16, TRV17:** 1. Remove base of cabinet and release four nuts holding main chassis to front of cabinet, also two nuts holding sockets panel. 2. (a) HFC3. Release plugs connecting gram motor, pickup and mains transformer. (b) TRV16. Release loudspeaker leads and mains transformer plug lead. (c) TRV17 Release mains transformer plug lead.



(W5) DRIVE CORD 1



(W6) DRIVE CORD 2

## DYNATRON

**HFC4:** 1. Remove base of cabinet and release plug leads for gram motor, interior lamp, loudspeakers and mains transformer. 2. Remove two nuts holding sockets panel to cabinet. 3. Remove screws holding facia panel in position, lift up facia and withdraw complete assembly through top of cabinet.

**Main Chassis:** To work on underside of audio print panel, release the three special studs securing board and lift up panel by hinging on the cable form immediately behind the control potentiometers (front of chassis).

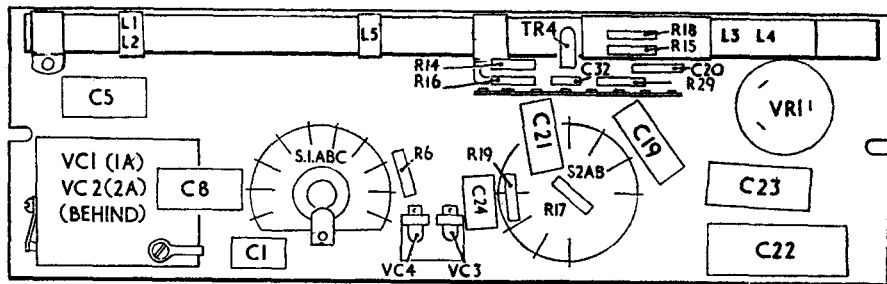
To work on underside of receiver print panel, release four special studs securing board and unsolder leads to ferrite aerial and tuning gang so that the board may be lifted and hinged on the cable form at front of chassis.

## DYNATRON

## Models TP30, TP31 and TP32

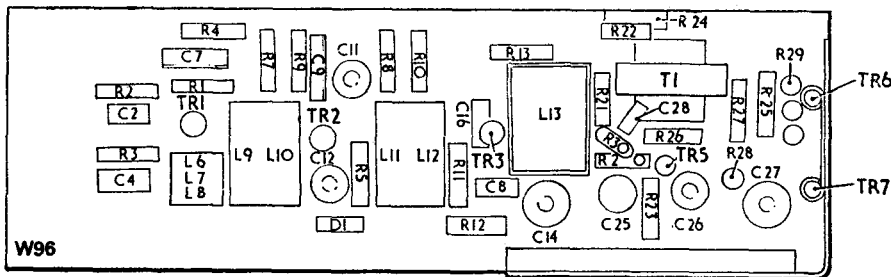
**General Description:** The "Jewel" model TP30 is a seven-transistor battery-operated portable radio receiver covering the long and medium wavebands. Sockets for car aerial and earphone are incorporated. The "Sapphire" models TP31 and TP32 incorporate the additional features of a short waveband with a telescopic aerial, and a tape-recording socket.

**Batteries:** 2 × 9 volts (PP7 or equivalent). Loudspeaker 25 ohms.



(W95) UPPER CHASSIS—MODEL TP30

W95



(W96) LOWER CHASSIS—MODEL TP30

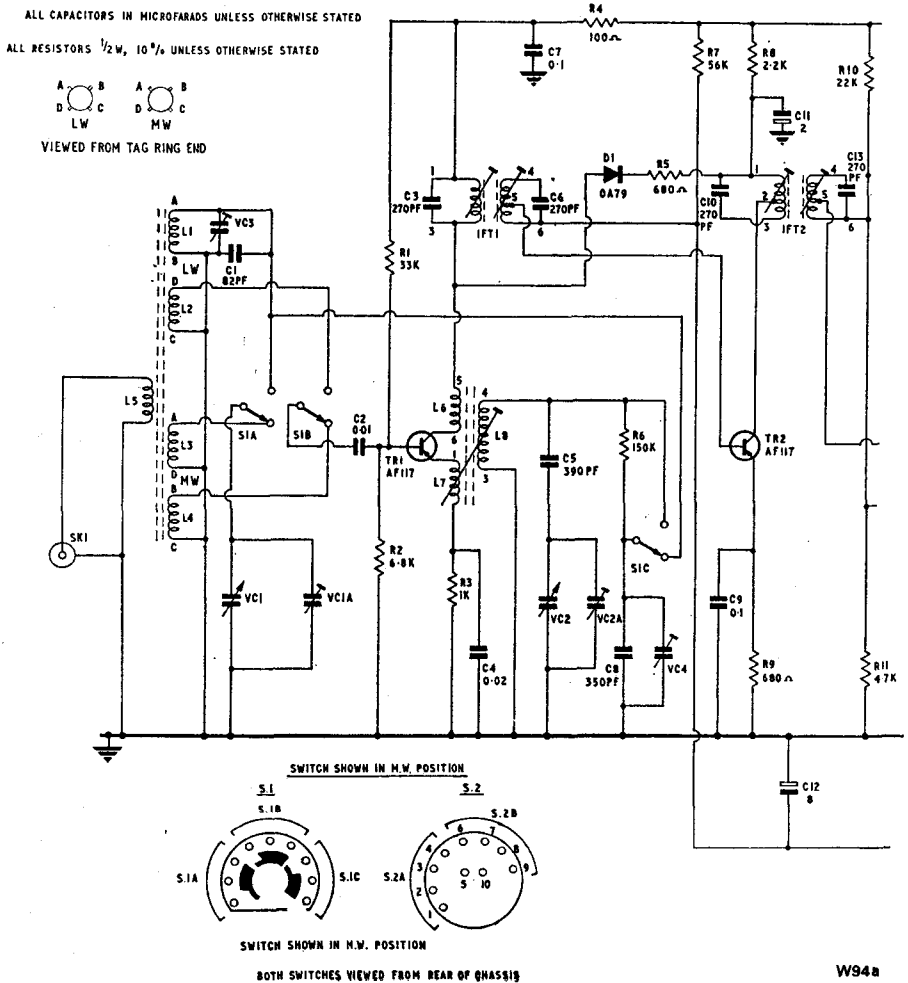


## RADIO SERVICING

### Chassis Removal

**Model TP30:** Remove rear cover. Disconnect battery and speaker leads. Remove all control knobs to free dial scale and expose the two 4BA nuts holding top chassis. Remove nuts to free chassis. Remove wood-screw holding bottom printed panel chassis to floor of cabinet, and slide out panel to rear.

**Models TP31, TP32:** Remove rear cover. Disconnect the battery and

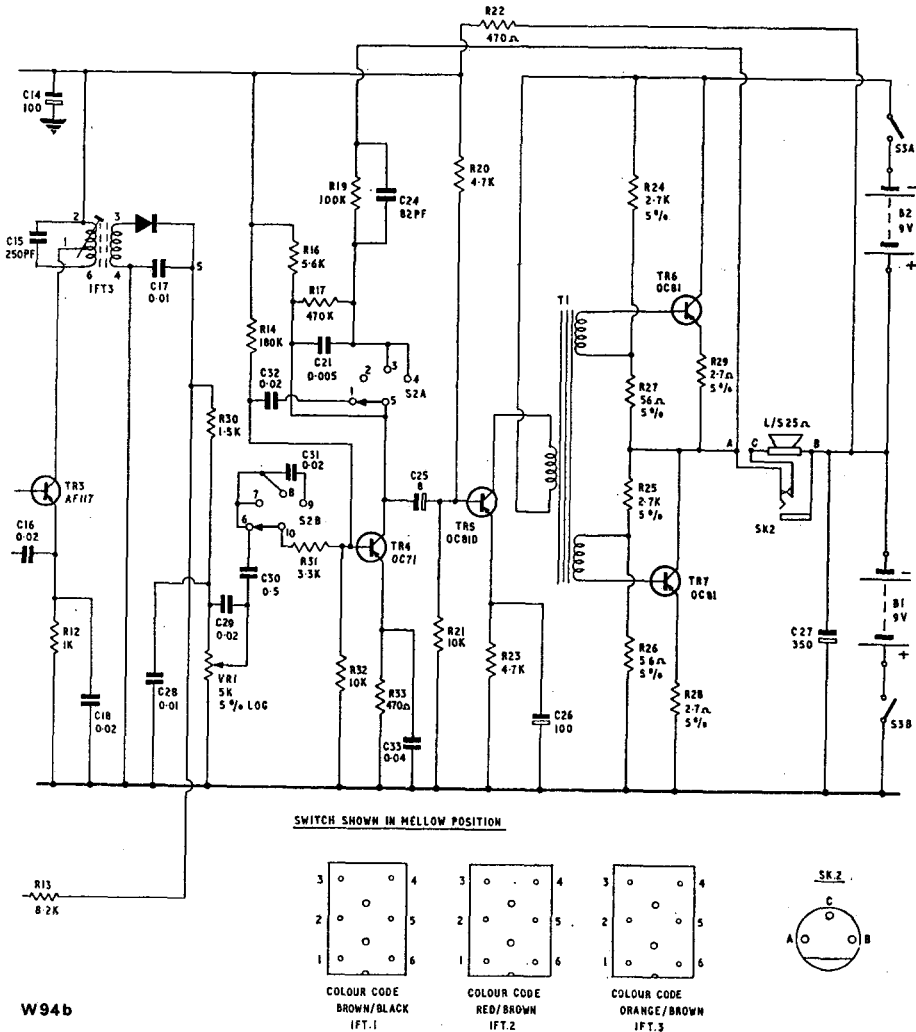


(W94a) CIRCUIT DIAGRAM—MODEL TP30 (PART)

# DYNATRON

speaker leads, also the leads to earphone, tape and car aerial sockets, and telescopic aerial. Remove all control knobs to free dial scale and expose the two 4BA nuts holding top chassis. Remove nuts to free chassis. Remove left-hand battery bracket, and woodscrew holding bottom printed panel chassis to floor of cabinet, and slide out panel to rear.

**Alignment: I.F.:** Inject 470 kc/s. across L4. Adjust L13, 12, 11, 10 and 9 for maximum output.

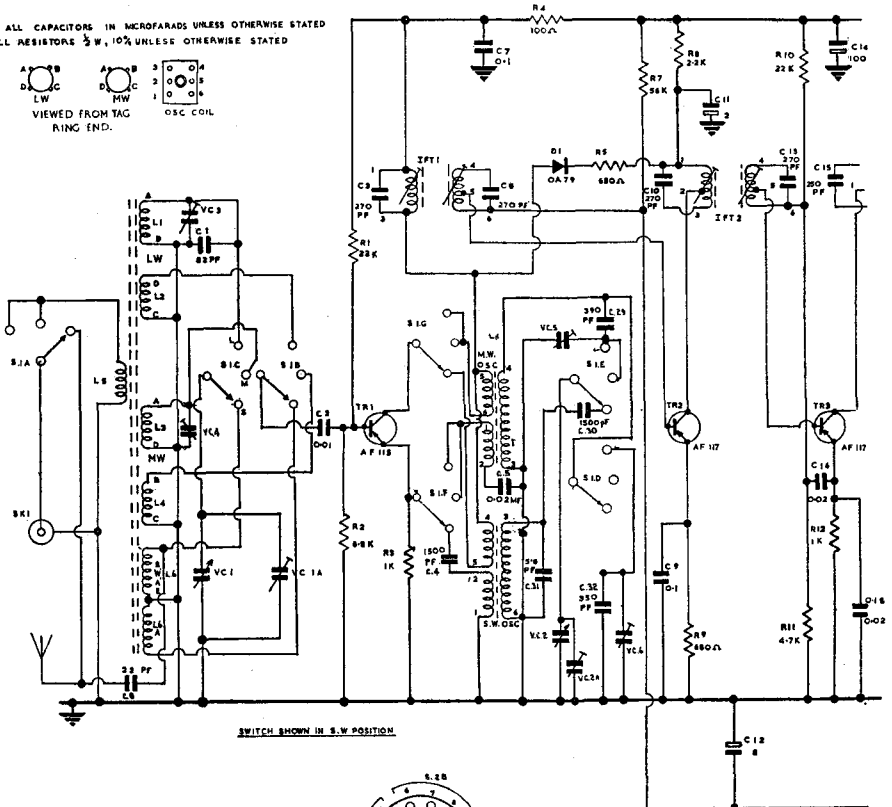
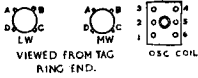


(W94b) CIRCUIT DIAGRAM—MODEL TP30 (CONTINUED)

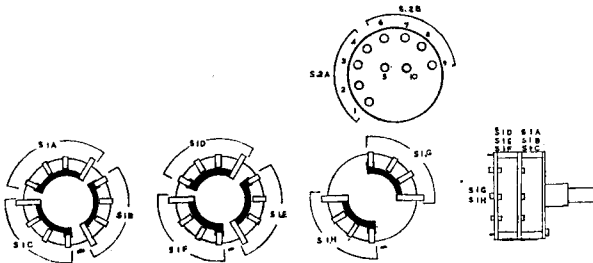
# RADIO SERVICING

## (W98a) CIRCUIT DIAGRAM—MODELS TP31 AND TP32 (PART)

ALL CAPACITORS IN MICROFARADS UNLESS OTHERWISE STATED  
ALL RESISTORS  $\frac{1}{2}$  W., 10% UNLESS OTHERWISE STATED



SWITCH SHOWN IN S.W. POSITION

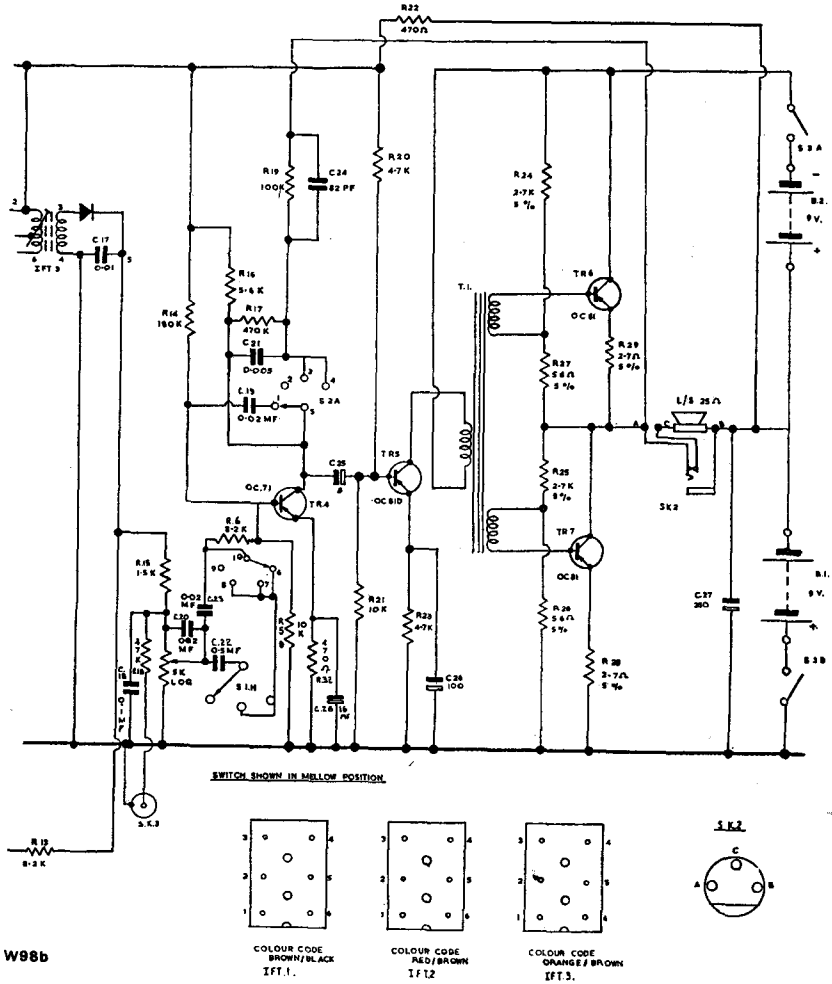


W98a

**R.F.:** Check that the pointer travels symmetrically within the scale aperture between the limits of the gang travel. Set up a standard loop aerial with its axis parallel to the receiver aerial and about 2 ft. away for M.W. and L.W. For S.W. feed signal through dummy aerial to aerial socket.

**Models TP31, TP32 only:** Switch to S.W. and feed in a signal at 6 Mc/s. Adjust S.W. oscillator coil and aerial coil turns for maximum output. Close aerial trimmer VC1A and feed in a signal at 15 Mc/s., adjust oscillator

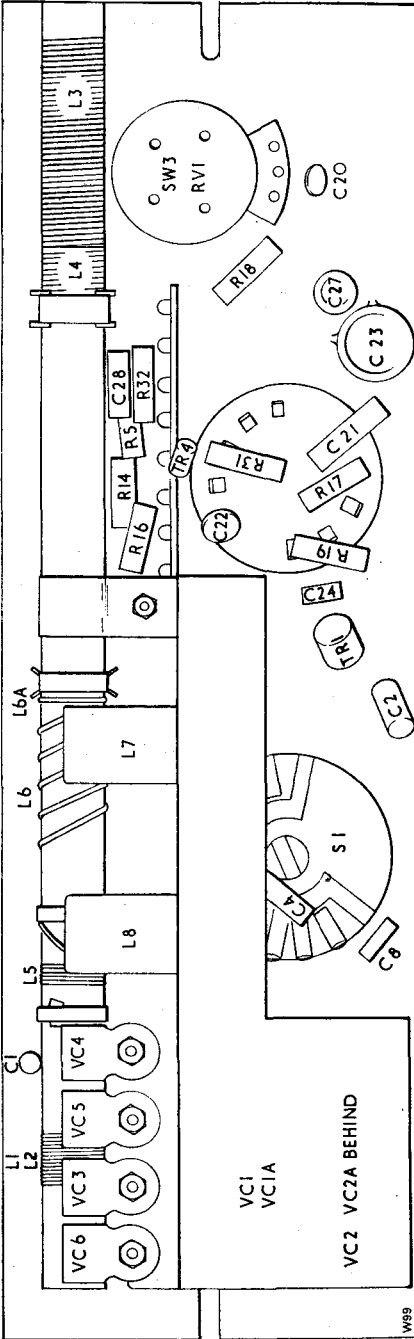
# DYNATRON



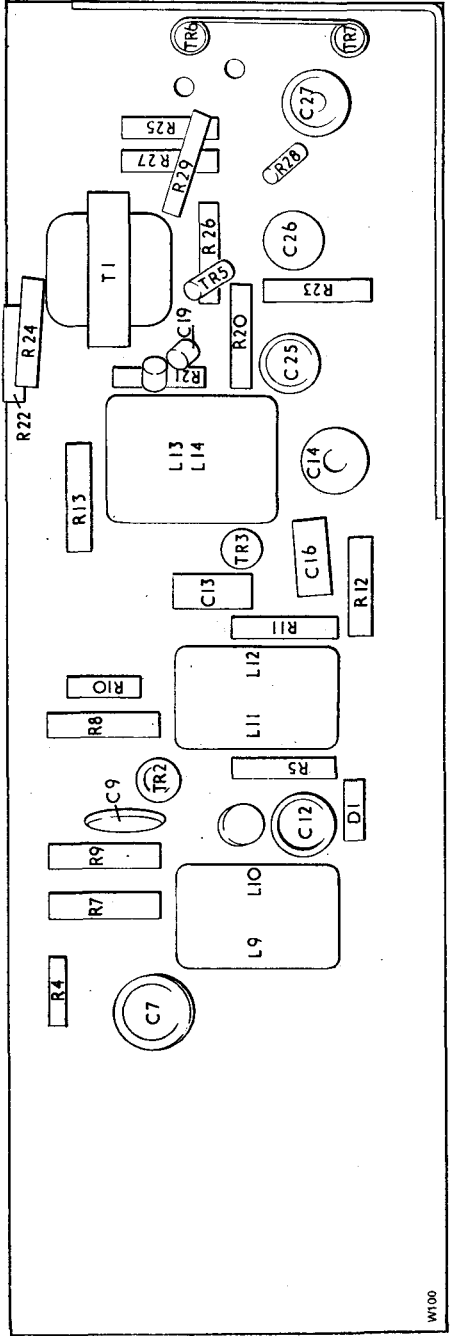
(W98b) CIRCUIT DIAGRAM—MODELS TP31 AND TP32 (CONTINUED)

trimmer VC2A for second peak. Adjust aerial trimmer VC1A for maximum output, reducing capacity until oscillator goes off tune then increase capacity to a point where it comes back to tune.

**All Models:** 1. Switch to M.W. and tune receiver to I.F. end of scale. Feed in a signal at 540 kc/s. Adjust L8 core for maximum output. 2. Tune receiver to H.F. end of scale. Feed in a signal at 1640 kc/s. Adjust VC2A for maximum output model TP30, VC5 for maximum output TP31, TP32.

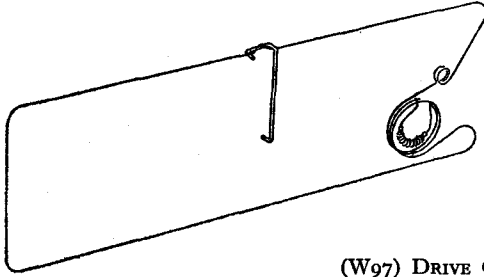


TOP: (W99) UPPER CHASSIS—MODELS TP<sub>31</sub> AND TP<sub>32</sub>



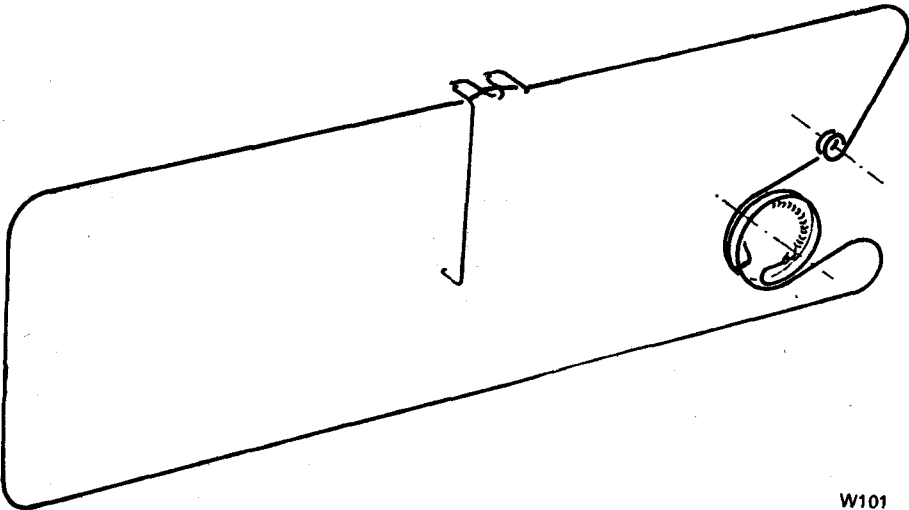
BOTTOM: (W100) LOWER CHASSIS—MODELS TP31 AND TP32

# DYNATRON



(W97) DRIVE CORD—MODEL TP30

3. Repeat 1 and 2 until no further improvement can be made. 4. Switch to L.W. and tune to Radio 2 programme. Feed in a signal at 200 kc/s. and adjust VC4 for maximum output. 5. Switch to M.W., feed in a signal at 600 kc/s., tune in on receiver. Adjust L3 for maximum, and peak with VC6. 6. Feed in a signal at 1300 kc/s., tune in on receiver. Adjust VC1A for maximum output. 7. Repeat 5 and 6 until no further improvement can be made. 8. Switch to L.W. Feed in a signal at 160 kc/s., tune in on receiver. Adjust L1 on rod for maximum output. 9. Feed in a signal at 260 kc/s., tune in on receiver. Adjust VC3 for maximum output. 10. Repeat 8 and 9 until no further improvement can be made. 11. Check the calibration on M.W. adjusting position of pointer on drive cord to minimise residual errors.



W101

(W101) TUNING DRIVE CORD

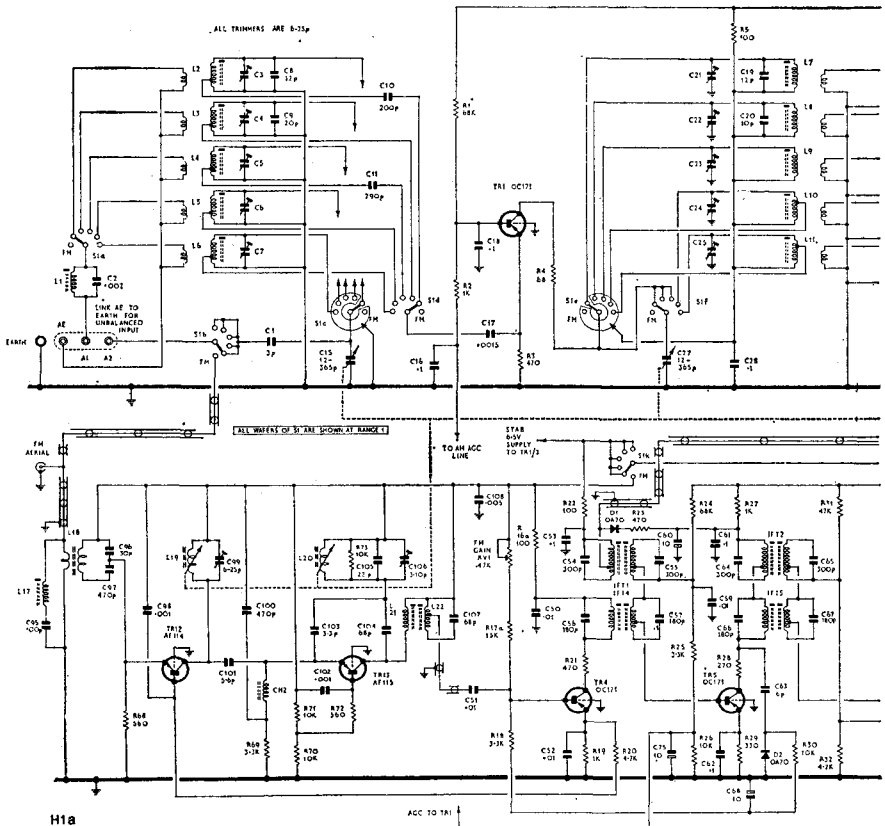
## EDDYSTONE

## Model EB35

**General Description:** Fully transistorised A.M./F.M. receiver with power derived from battery or mains. Facilities for tape recorder, record player and private listening. Battery six 1.5 volts dry cells (type U2). Speaker 8 ohms.

**Frequency Coverage:** F.M., 88–108 Mc/s. Range 1, 8.5–22 Mc/s. Range 2, 3.5–8.5 Mc/s. Range 3, 1.5–3.5 Mc/s. Range 4, 550–1500 kc/s. Range 5, 150–350 kc/s.

**Alignment:** Figures quoted for sensitivity, etc., in the instructions that follow are based on the assumption that new batteries are in use. *Test equipment required:* Signal generator(s) covering the two intermediate frequencies (465 kc/s. and 10.7 Mc/s.), the A.M. range (150 kc/s.–22 Mc/s.) and the F.M. band 88–108 Mc/s. Output meter matched to 8 ohms with plug to mate with telephone socket.



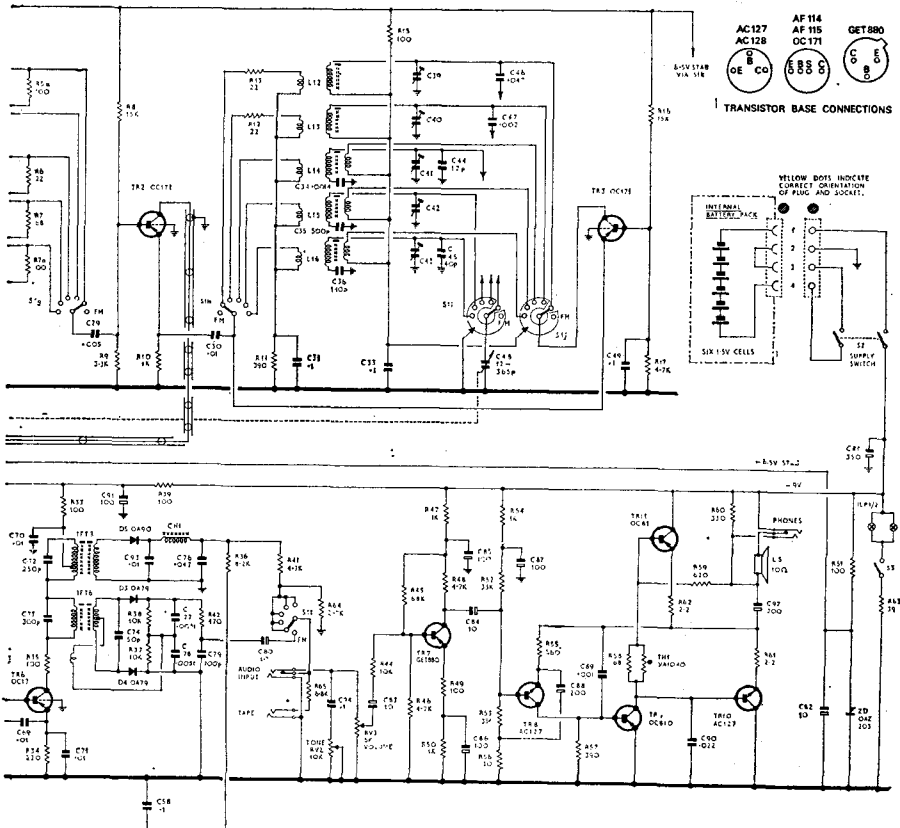
(H1a) CIRCUIT DIAGRAM—MODEL EB35 (PART)

# EDDYSTONE

**Trimming tools:** Miniature insulated screwdriver with  $\frac{1}{16}$ -in. blade (length 2 in. maximum), small metal-tipped insulated screwdriver and a Neosid HS1 hexagonal core adjuster.

When aligning either I.F. channel, the four screws which retain the two angle strips on which the I.F. board is mounted should be removed. The board can then be re-mounted at right-angles to its normal position using two screws only. All dust cores will then be accessible and there is no need to unsolder connections to the board.

**465 kc/s. Stages:** Stand the receiver on one end to allow connection of the generator output lead to the Range 5 mixer coil L11 (see underside view of receiver). The generator should be arranged to provide a 50-ohm source and the earth lead can be clipped to the screen adjacent to the coil. Disable the local oscillator by shorting out the forward section of the tuning gang (C48) and then plug the output meter into the telephone socket. The speaker is automatically disconnected on insertion of the plug and the meter if matched to 8 ohms will read the true output power. Switch on the



(H1b) CIRCUIT DIAGRAM—MODEL EB35 (CONTINUED)

H1b



## RADIO SERVICING

generator, allow it adequate time to stabilise against drift and then set the receiver controls as follows: Range Switch, Range 5; Volume, Maximum; Tuning, 350 kc/s.; Tone, Fully clockwise. Tune the generator to 465 kc/s. (with modulation 30 per cent. at 400 c/s.) and then set the attenuator to give a reading of approximately 50 mW. on the output meter. Peak the cores in IFT<sub>1</sub>, IFT<sub>2</sub> and IFT<sub>3</sub> for maximum output, setting all cores to the "outer" peak. Re-check each adjustment several times to ensure accurate alignment and then set the attenuator for an output reading of 50 mW. Input should be of the order 4  $\mu$ V. If the I.F. sensitivity is lower than this figure, check the A.F. sensitivity by introducing an audio generator across RV<sub>3</sub>. At 1000 c/s. an input of 5 mV. should give an output of 50 mW. Disconnect the generator(s) and remove the shorting link from C<sub>48</sub> on completion of the alignment.

**10.7 Mc/s. Stages:** *N.B.:* The 10.7 Mc/s. I.F. Transformer L<sub>21</sub>/L<sub>22</sub> is not aligned with the other 10.7 Mc/s. circuits. It forms part of the F.M. tuner unit and is adjusted when aligning this unit later in the alignment procedure.

Switch on the generator, allow adequate time to stabilise against drift and set all receiver controls as for 465 kc/s. alignment except the range switch which should be at F.M. Short out the one discriminator diode D<sub>4</sub> and connect the output meter to the telephone socket as before. Tune the generator to 10.7 Mc/s., adjust for 30 per cent. modulation at 400 c/s. and then connect its output lead to tag 16 at the right-hand end of the I.F. board. The adjacent tag 17 can be used as an earthing point.

Peak the cores in the 10.7 Mc/s. transformers IFT<sub>4</sub>, IFT<sub>5</sub> and IFT<sub>6</sub> on their "outer" peak for maximum reading on the output meter. Remove the short from D<sub>4</sub> and adjust the secondary (top) core of IFT<sub>6</sub> for minimum signal.

I.F. sensitivity using an A.M. signal and with D<sub>4</sub> shorted should be of the order 30  $\mu$ V. for 50 mW. output. RV<sub>1</sub> can be adjusted if necessary to achieve this figure.

**R.F. Alignment:** (*Ranges 1-5*): The first step in this part of the procedure is a check on the overall calibration accuracy. Proceed as follows: Standardise the generator calibration against a reliable frequency standard and connect its output lead to the "A<sub>1</sub>" socket and "earth." The shorting plug should be in position between "AE" and "earth." Select Range 1 and tune the generator and receiver to each megacycle point in turn noting the degree of error present. Errors should not exceed 1 per cent. (i.e. 180 kc/s. at 18 Mc/s., 90 kc/s. at 9 Mc/s., etc.). Repeat on Range 2 and then select Range 3. Checks should be made at 500 kc/s. intervals on this range followed by checks at 100 kc/s. intervals on Ranges 4 and 5.

Oscillator adjustments should not be touched unless errors of greater than 1 per cent. are detected. If realignment is found to be necessary, carry out normal tracking procedure using trimmers at the high frequency end of the band and cores at the low frequency end. Each adjustment must be

# EDDYSTONE

repeated several times to ensure accurate alignment. Alignment frequencies and adjustments are listed in the table which follows:

Range	Frequency	Trimmer	Frequency	Core
1	20.0 Mc/s.	C39	8.6 Mc/s.	L12
2	8.0 Mc/s.	C40	3.6 Mc/s.	L13
3	3.5 Mc/s.	C41	1.5 Mc/s.	L14
4	1400 kc/s.	C42	550 kc/s.	L15
5	330 kc/s.	C43	160 kc/s.	L16

Alignment of the R.F. (Aerial) and Mixer circuits can now be commenced. The generator is connected to "A 1" and "earth" as before but must now be adjusted to match the receiver input impedance (75 ohms) for Ranges 1/3 and 400 ohms for Ranges 4/5. The output meter is connected as for I.F. alignment. Adjustments are made at the same frequencies used for oscillator alignment but using the adjustments listed in the following table. Care should be taken to ensure that the aerial circuits are set for best s/n ratio.

Range	Trimmer			Core		
	Frequency	Aerial	Mixer	Frequency	Aerial	Mixer
1	20.0 Mc/s.	C3	C21	8.6 Mc/s.	L2	L7
2	8.0 Mc/s.	C4	C22	3.6 Mc/s.	L3	L8
3	3.5 Mc/s.	C5	C23	1.5 Mc/s.	L4	L9
4	1400 kc/s.	C6	C24	550 kc/s.	L5	L10
5	330 kc/s.	C7	C25	160 kc/s.	L6	L11

On completion of these adjustments, select 550 kc/s. on Range 4, tune the generator to 465 kc/s. and increase its level until an indication is obtained on the output meter. Adjust the I.F. rejector coil L1 for *minimum* signal.

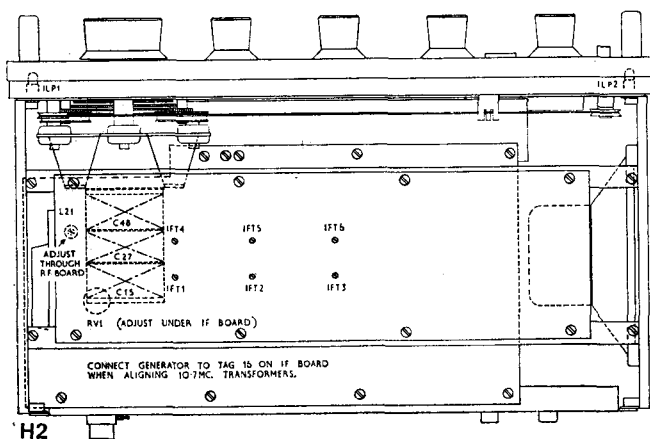
**F.M. Alignment:** Alignment of the F.M. tuner unit is most conveniently carried out by using an A.M. signal and with D4 shorted out as in alignment of the 10.7 Mc/s. stages. The generator is required only to establish the accuracy of the dial calibration, all other adjustments being made on noise to avoid the need for continual re-tuning of the generator to cope with pulling of the receiver oscillator which occurs when either the input or output circuits of the mixer transistor are re-tuned.

The calibration check should be carried out at 100 Mc/s. with the generator connected either to the F.M. coaxial socket or to "A2" and "earth". Oscillator trimmer C106 should be adjusted to nullify any error which may be present. Now switch off the generator and adjust C99, L21 and L22 for maximum noise output. Re-check C106 setting at 100 Mc/s. and then carry out a sensitivity check at this frequency. A figure of the order 10  $\mu$ V. should be obtained for 50 mW. output. Finally, tune the generator to 10.7 Mc/s. and adjust the I.F. rejector L17 for minimum signal output. Disconnect the short across D4 before putting the set back into its case.

## RADIO SERVICING

**Drive Cord:** In the instructions that follow, right-hand and left-hand are as viewed from rear of set.

1. Remove the existing cord and set the tuning gang to full mesh.
2. Tie a double knot in one end of the replacement cord and feed the cord through the hole provided in the left-hand drive pulley with the knot on the inside of the rim. The hole should lie at approximately "4 o'clock".
3. Wind approximately one and a half turns anti-clockwise round the drive pulley and then pass the cord under and over the left-hand guide pulley.
4. Pass the cord across the dial from left to right and then, while holding the free end of the cord in tension, rotate the tuning control to fully unmesh the tuning gang. This operation will wind just over three complete turns of cord on to the left-hand drive pulley and tension must now be maintained to prevent the cord from slipping out of the pulley groove.
5. Pass the cord clockwise round the jockey pulley (right-hand side of the receiver) and then back across to the right-hand drive pulley. Feed the cord into the pulley groove and then through the hole in the rim (hole lies at about "10 o'clock"). Increase the tension on the cord until the outer rim of the jockey pulley takes up a position level with the nearest edge of the panel handle retaining screw. Mark the cord with a pencil at the point where the retaining knot must be tied.
6. Free the cord from the jockey pulley and while maintaining tension, draw the cord through the hole in the right-hand drive pulley until it tightens on the left-hand guide pulley.
7. Tie a double knot at the position marked in (5) above and then cut off the surplus cord. Feed the cord back through the hole and replace in position round the jockey pulley.
8. Set the tuning gang to full mesh and slide the pointer to "0" on the logging scale. Attach the pointer to the cord (when viewed from above the



(H2) PLAN VIEW—MODEL EB35

cord should pass under the two outer prongs at the rear of the pointer carrier) and then check the drive for free normal operation.

**Aerials for Use on Ranges 1-5:** The type of aerial used with the EB35 receiver will depend to a large extent on the permanency of the installation. Reasonable results may be obtained in a temporary installation with a relatively short length of wire located indoors. Some 15-20 ft. of insulated wire run round the picture rail will provide reception from all long and medium wave stations serving the area; many of the high-powered short-wave stations should also be audible at good strength. Such an aerial is of course relatively inefficient and it should be realised that signals are received only because of the high receiver sensitivity.

An outside aerial is strongly recommended for a permanent installation, permitting reception from a greater number of stations with a lower level of background noise. A suitable aerial could take the form of some 30-60 ft. of insulated wire strung between two insulators and located as high as conveniently possible. It should be kept well away from local obstructions (especially those of metallic construction). The down-lead can be taken from either end or from any point along the length of the horizontal top and should be run well clear of house guttering, etc., to avoid any loss in the available signal voltage. Soldered joints should be used where connections are needed.

Aerials of the types so far described are known broadly as "single-wire" or unbalanced aerials and are connected to socket "A<sub>1</sub>". The socket marked "AE" should be linked to the "earth" terminal using the special shorting plug supplied. Improved results may be obtained when the wire length is less than 15 feet if the "A<sub>2</sub>" socket is used for the aerial connection. "A<sub>2</sub>" should also be used for connecting short rod aerials when a longer aerial is not available as for example when using the receiver in a vehicle.

For serious short-wave reception a further improvement can be obtained if a balanced aerial is employed. One type which falls in this category and involves no difficult constructional problems is the dipole aerial. This takes the form of a letter "T" in appearance, the horizontal portion being the aerial proper and the vertical section the downlead or feeder. Any wire of adequate strength (either insulated or bare) can be used for the top while the feeder can be any good quality twisted flex suitable for outside use (e.g. plastic covered). Special feeder cables are manufactured for this specific application but these are more expensive and offer little in the way of advantage for a normal domestic installation. They can of course be employed if the user so wishes.

For general short-wave reception the overall length of the horizontal portion should be of the order 50-60 ft., the wire being broken at the centre with each lead connected separately to the feeder cable. An insulator is used at this point to facilitate connection and provide mechanical support for the feeder. The length of the feeder is of minor importance and little attention need be paid to its actual positioning. The aerial proper should be erected

as high as conveniently possible using insulators for supporting the two ends of the wire.

If attention is centred in one specific short-wave broadcast band, performance can be optimised at this frequency by cutting the aerial to a predetermined length. Overall lengths for the main broadcast bands are as follows: 49 m. : 76 ft., 31 m. : 48 ft., 25 m. : 39 ft., 19 m. : 30 ft., 16 m. : 26 ft., 13 m. : 21 ft. Overall lengths (in feet) for other bands can be calculated by dividing 468 by the frequency in megacycles.

When using a twisted flex feeder of the type described above one feeder wire is connected to the "A<sub>1</sub>" socket and the other to the "AE" socket. The special shorting plug is removed and can be stored in the "A<sub>2</sub>" socket to avoid loss. The same connections are employed when using a standard flat twin transmission line. Coaxial feeders are unbalanced and are connected as follows. Braid to "earth" terminal, inner wire to "A<sub>1</sub>", shorting plug in position between "AE" and "earth" terminal. On the lower frequencies the dipole can be operated as a single-wire aerial by strapping together both the feeder wires and connecting to the "A<sub>1</sub>" socket. This will give greater signal pick-up and increase the versatility of the aerial.

In some cases it will be found that reception can be improved if an earth connection is made to the "earth" terminal. One benefit is a reduction of locally generated electrical interference especially when listening on the lower frequencies in the tuning range. The earth lead should be as short and direct as possible connected to a water pipe or an external earth rod.

**Aerials for F.M. Reception:** In the case of a permanent installation it will usually be found best to employ an outside aerial except when the receiver is situated very close to the transmitting station. A wide variety of commercial designs are available, but one should be selected of a type which is most suited to local conditions. Such an aerial will have a coaxial feeder which should be terminated with the plug supplied and connected to the "F.M." aerial socket.

For F.M. reception in regions of high signal strength an indoor aerial will usually suffice. The simplest type of indoor aerial takes the form of a short piece of insulated wire some 4-6 ft. in length connected to the "A<sub>2</sub>" socket. Its position will have quite a marked effect on reception and some experimentation is called for if optimum results are to be achieved.

Greater signal pick-up and reduced background noise are features of the dipole aerial already referred to in connection with A.M. reception on the short-wave bands. A dipole suitable for receiving F.M. signals in the V.H.F. band is relatively small and can be conveniently made from a length of ordinary twisted flex. Unravel some 30 in. at one end and straighten the two wires to form a horizontal top with an overall length of approximately 60 in. Tape the flex to prevent further unravelling. The remainder of the lead will serve as the feeder; one wire being connected to the "A<sub>2</sub>" socket and the other to the "earth" terminal.

As with the single-wire aerial, various positions should be tried for best

## EDDYSTONE

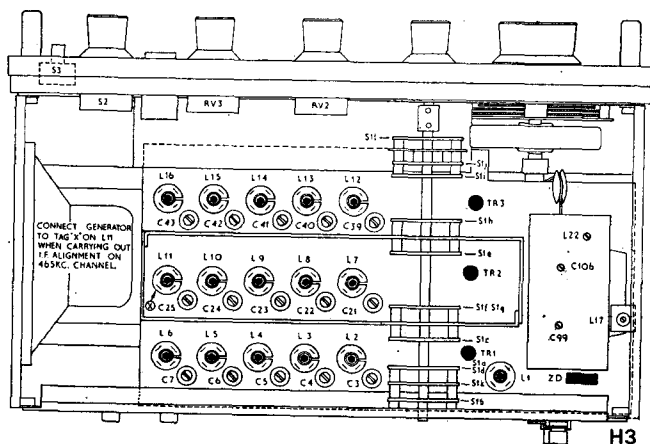
results and it may be found convenient to tape the aerial proper to a short length of bamboo cane to facilitate handling the wire which should be kept in a horizontal plane. Once the best position has been determined, the wire can be removed from the cane and tacked to a picture rail or otherwise retained in an unobtrusive location.

**Use of the F.M. Attenuator:** In some installations it may be found that too strong a signal is picked up by the aerial, especially when this is an outdoor type located only a few miles from the broadcast station. Excessive signal input to the receiver will be indicated by distorted output and a tendency for the station to remain in tune when the tuning is off-set from the correct tuning point. If this effect is noticed, it can be eliminated by removing the aerial plug from the set, plugging it instead into the attenuator and connecting this to the "F.M." aerial socket.

**Batteries:** To fit the batteries, first unscrew the two knurled screws which retain the battery box at the rear of the receiver. Carefully remove the box and free it from the receiver proper by disengaging the battery connector. Lay the box on a flat surface and take off the inner cover. Arrange the batteries in two groups of three and then slide them into the battery troughs.

**Dial Bulbs:** Faulty bulbs can be changed by levering the holders free from the rubber mounting grommets at the extreme ends of the dial. Replacements should be of the L.E.S. type with a rating of 6 volts at 50 mA.

**Mains Operation:** The receiver can be operated directly from all standard A.C. mains supplies by fitting a Power Unit Type 924 in place of the battery container. The P.U. gives an output of 9 volts and has the same physical size and fixing arrangements as the normal battery box.



(H3) UNDERSIDE VIEW—MODEL EB35

## *Removing the Cabinet*

1. Remove the battery container by unscrewing the two knurled retaining screws and disengaging the battery connector.
2. Remove the four cabinet retaining screws located at the rear.
3. Free the cabinet from the panel by applying pressure with the fingers between the rear inner edge of the cabinet and the ends of the strip which supports the I.F. printed board near the top of the cabinet.
4. Slide the cabinet away from the panel.

## **Circuit Modifications:**

1. Two reverse-connected diodes (DD006) have been added to the aerial input. The two diodes should be referred to as D6 and D7—they are connected directly across the A1 and AE sockets. See circuit diagram model EB36 in this volume.
2. C68 is 1  $\mu$ F.
3. R27 is 1500 ohms.
4. Loudspeaker is 8 ohms.
5. IFT3 secondary winding is not tuned by dust core.
6. TR9 and TR11 are Mullard AC128.

## **EKCO**

## **Model PT302**

**General Description:** This receiver is electrically similar to the Pye Model 1369 described elsewhere in this volume.

## **EKCO**

## **Model PT304**

**General Description:** This receiver is electrically similar to the Pye Model 1372 described elsewhere in this volume.

## **EKCO**

## **Model PT305**

**General Description:** This receiver is electrically similar to the Pye Model 1373 described elsewhere in this volume.

## **EKCO**

## **Models PT300, PT447**

**General Description:** These models are electrically similar to the Pye Model 1370 described in the 1966-67 volume.

**EKCO****Model PTP301**

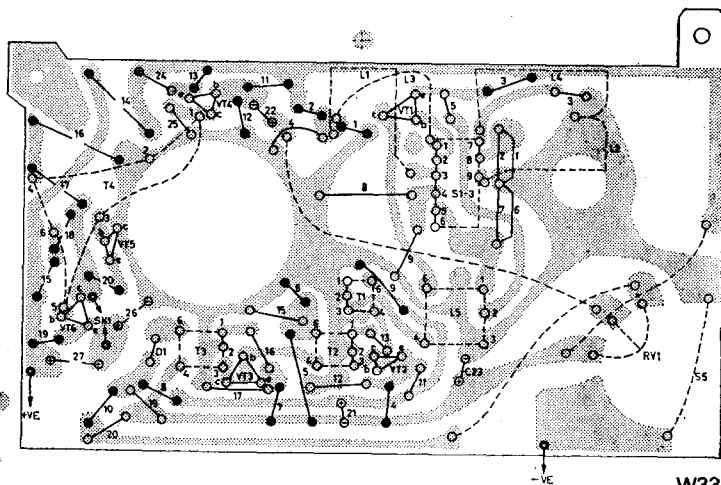
**General Description:** A six-transistor, M.W./L.W. pocket radio, with outlet socket for earphone (40 ohms).

**Battery:** 9 volts. PP3 or equivalent. Quiescent current 6–8 mA.

**To Remove Chassis:** The back cover is a close tolerance fit and is simply prised from the case, a thumb nail slot at the base of the cabinet being provided to facilitate removal. Remove battery. To release the interior panel, undo the three chassis fixing screws. Unsolder loudspeaker and earphone leads. To remove loudspeaker, undo the two screws clamping it in.

**Trimming Procedure**

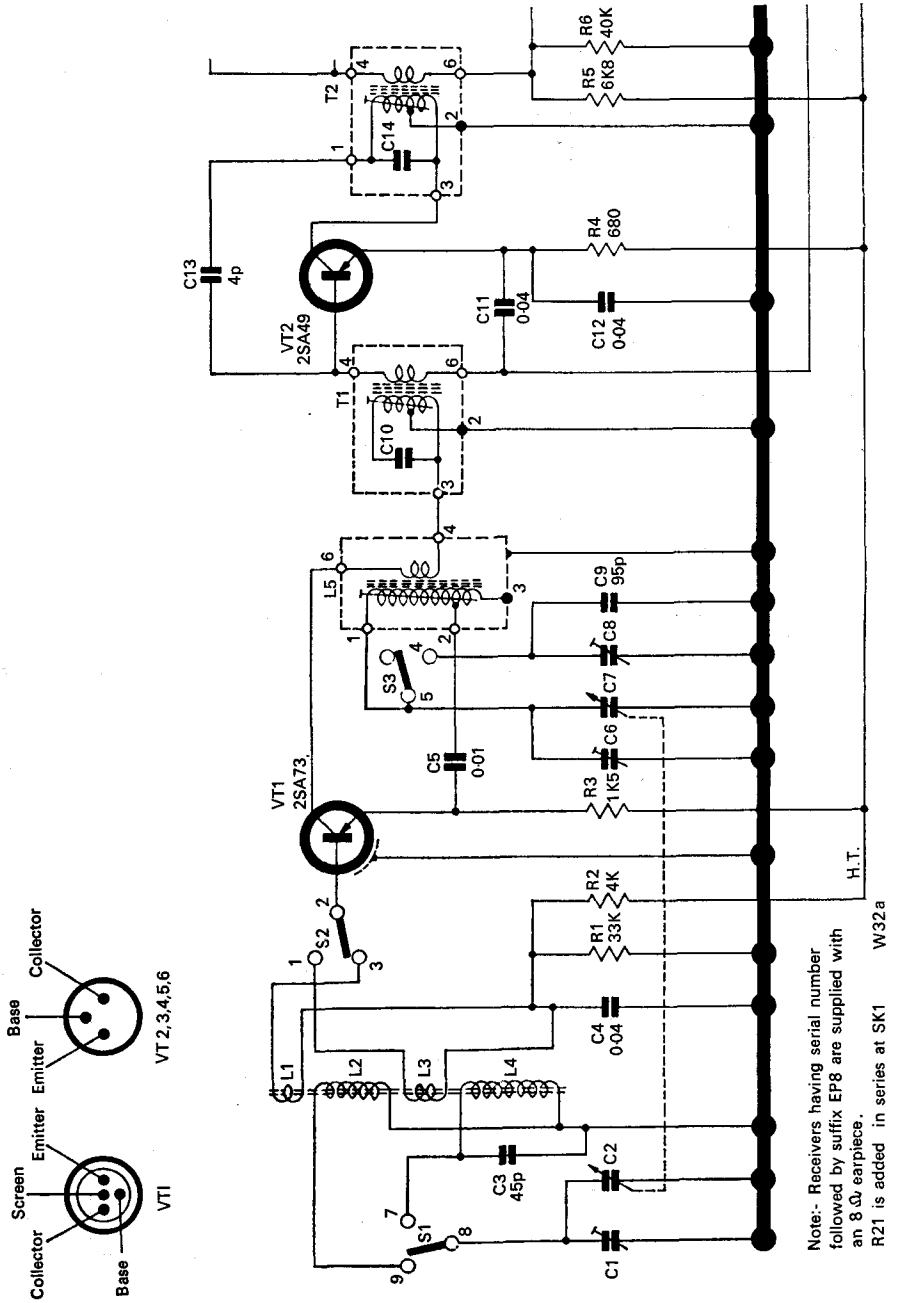
<i>Apply signal as below:</i>	<i>Set receiver controls to:</i>	<i>Adjustment in order for maximum output:</i>
1. 470 kc/s. across L1 with 0.1 $\mu$ F. capacitor in each lead	M.W. Low frequency end	Cores of T3, T2 and T1
2. 600 kc/s. to rod aerial via search coil at 11 in. from centre of rod	M.W. 500 metres	Core of L5 and position of L2 on rod
3. As 2, but 1500 kc/s.	M.W. 200 metres	Trimmers C6 and C1
4. Repeat 2 and 3 until calibration is correct	Seal L2 with polystyrene dope	
5. As 2, but 214 kc/s.	L.W. 1400 metres	Trimmer C8 and position of L4 on rod
6. Seal L4 with polystyrene dope		



(W33) PRINTED PANEL—MODEL PTP301

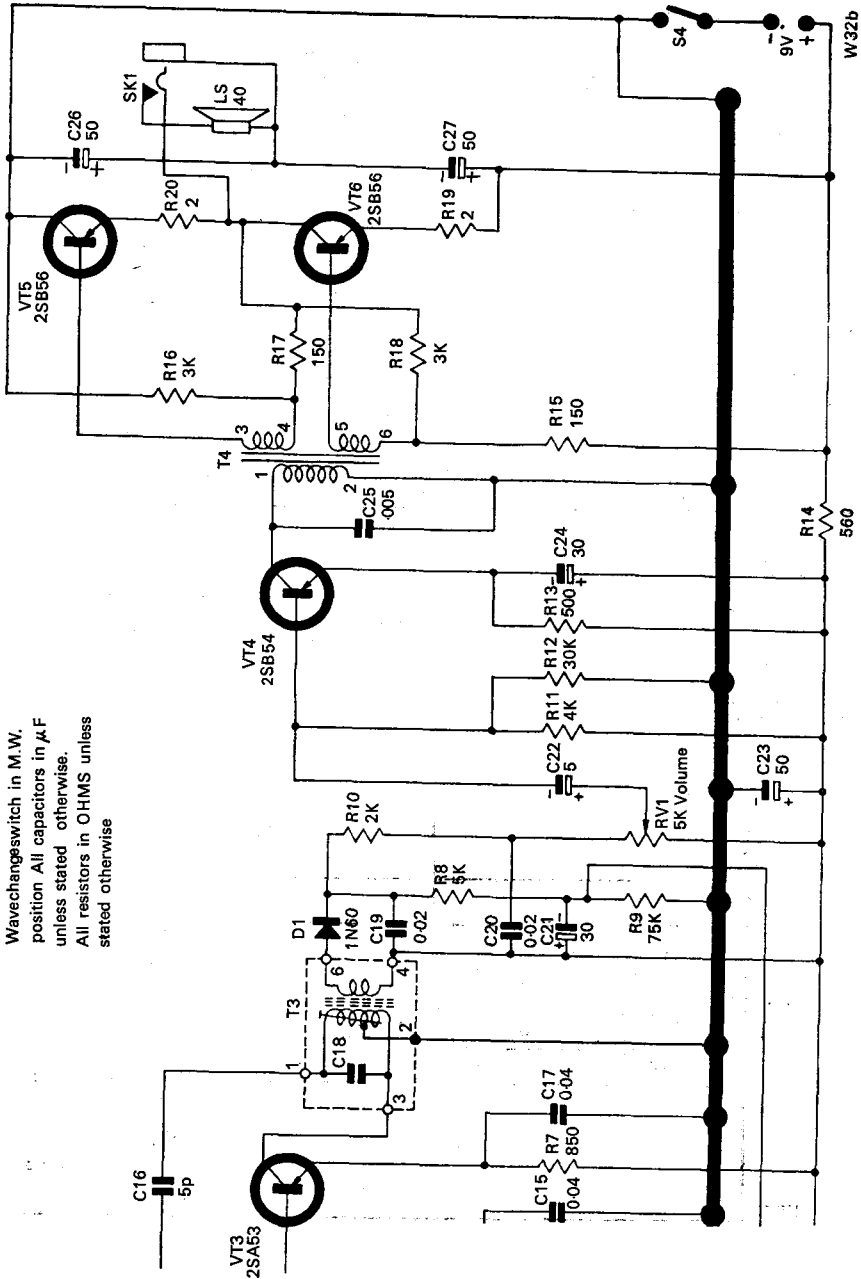


# RADIO SERVICING



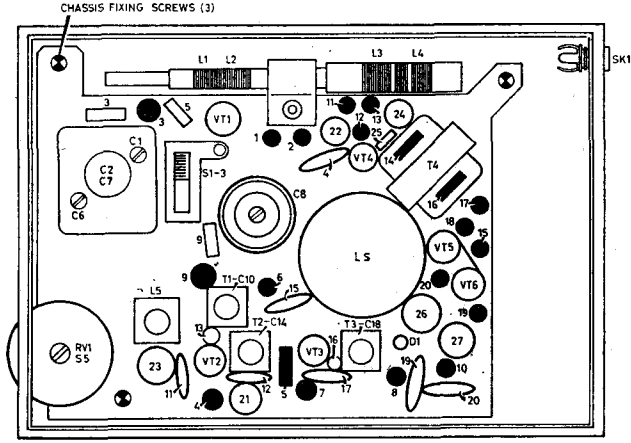
Note:- Receivers having serial number followed by suffix EP8 are supplied with an 8Ω earpiece.  
R21 is added in series at SK1 W32a

(W32a) CIRCUIT DIAGRAM—MODEL PTP301 (PART)



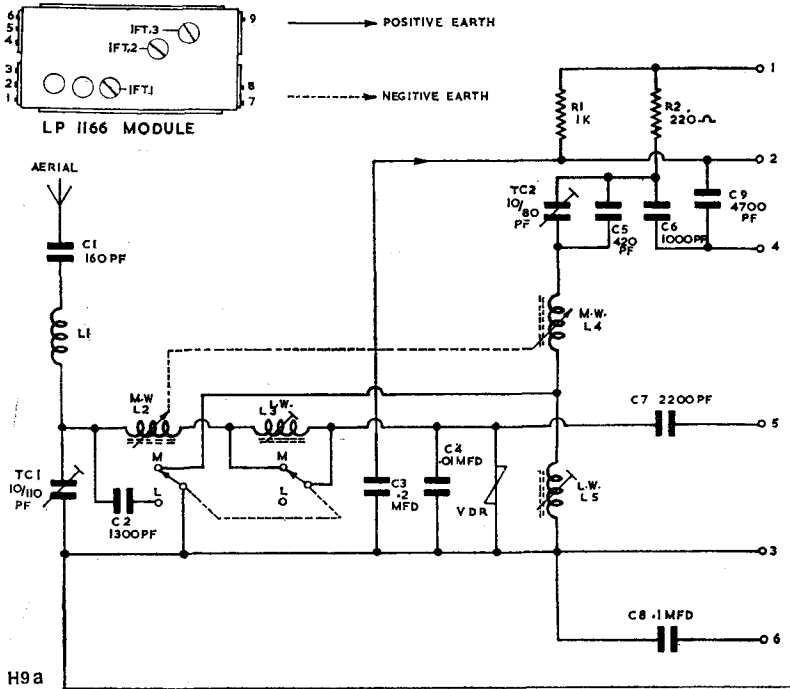
(W32b) CIRCUIT DIAGRAM—MODEL PTP301 (CONTINUED)

## RADIO SERVICING



W34

(W34) COMPONENT LAY-OUT—EKCO MODEL PTP301

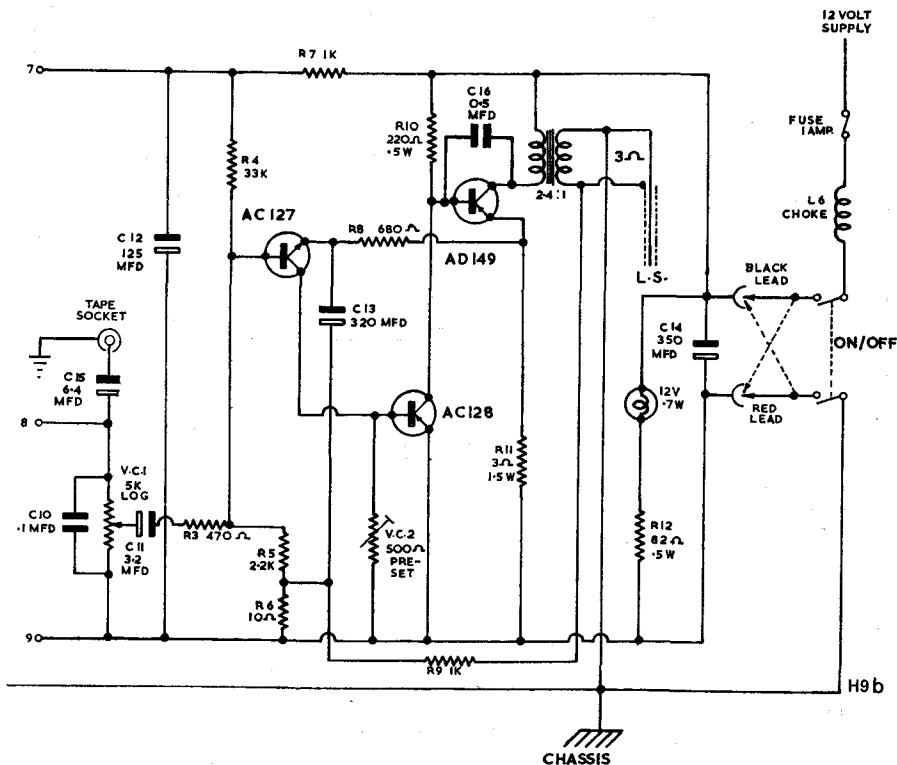


(H9a) CIRCUIT DIAGRAM—ELIZABETHAN MODEL LZ<sub>3</sub> (PART)

**General Description:** Car radio incorporating Mullard R.F./I.F. amplifier module type LP.1166.

**Permeability Tuner:** This unit is also accurately pre-aligned and the only operations required are specified in the paragraphs dealing with alignment.

**L.W. Alignment:** Select L.W. and connect signal generator to receiver as for M.W. 187 kc/s. Adjust L<sub>5</sub> for signal and L<sub>3</sub> for max.



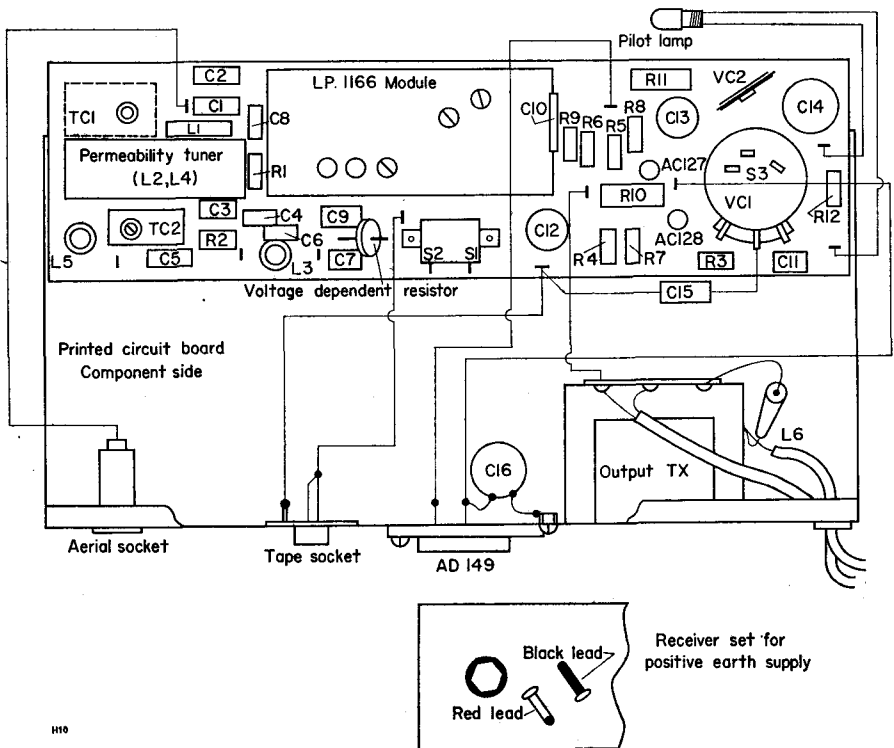
(H9b) CIRCUIT DIAGRAM—MODEL LZ<sub>3</sub> (CONTINUED)

## RADIO SERVICING

**A.F. Stages:** The audio signal appears across the volume control VC1. A tape recorder socket is connected to the slider (on later models to the junction with Module pin 8). Increase the level of the injected signal until the output waveform (when viewed on a scope) just distorts, then adjust VC2 for symmetrical clipping.

**Dismantling:** Remove the control knobs, decorative nuts, tuning scale and silver bezel. Remove the Phillips-head screws from the top, bottom and sides of the case. Access to the component side of the printed circuit board and to the components on the rear panel can now be gained. Should it be necessary to work on the print side of the board carefully bend the metal tabs which secure the top and bottom edges of the board to the front panel.

**Circuit Modifications:** C9 is connected to module pins 3 and 4 on some models. C16 is sometimes omitted. C15 is taken to slider of VC1 on some models.



(H10) COMPONENT LOCATIONS—MODEL LZ3

## ELIZABETHAN

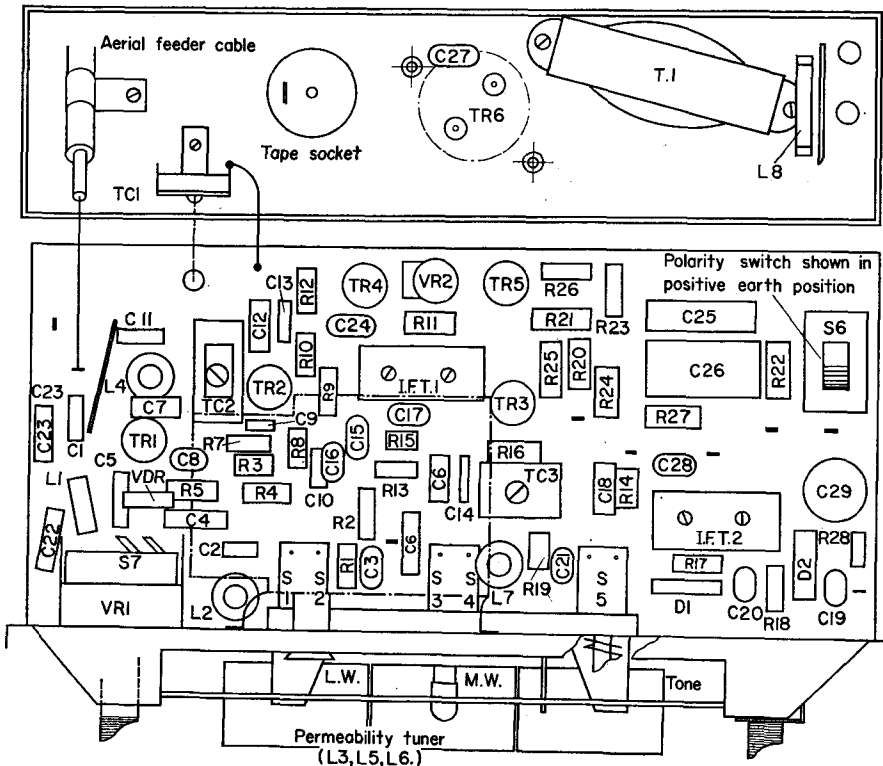
## Model LZ7

**General Description:** Car radio, employing six transistors and two diodes, for operation on a 12-volt positive or negative ground supply. The polarity is selected by a two pole changeover switch.

**I.F. Alignment:** Connect signal generator across R18—use blocking capacitor. Set generator frequency to 472 kc/s. and adjust I.F. T2 and I.F. T1 for max.

**M.W. Alignment:** Connect signal generator, via 80 pF. capacitor, to aerial socket. Tune receiver to high frequency end of band and select M.W. Set generator to 1260 kc/s. and adjust TC2 and TC1 for max. Check sensitivity at 1260 kc/s., 1500 kc/s. and 600 kc/s.

**L.W. Alignment:** Connect signal generator as for M.W. Select L.W. and tune receiver to 1500 m. Inject 200 kc/s. and adjust L7 for signal. Inject 230 kc/s., tune in receiver and adjust L4 and L2 for max. Check sensitivity at 230 kc/s.



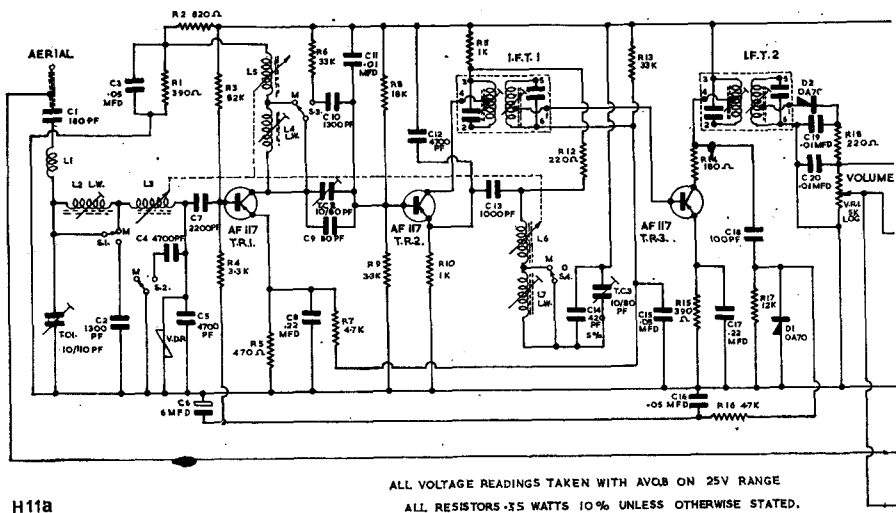
(H12) COMPONENT LOCATIONS—MODEL LZ7

## RADIO SERVICING

**Alignment Notes:** The output of the receiver must be kept below 800 mV. during alignment, to prevent A.G.C. action.

**Sensitivity:** M.W. and L.W.  $6.5 \mu\text{V}$ . average,  $12 \mu\text{V}$ . max. I.F.  $30 \mu\text{V}$ . All sensitivities given for 50 mW. into 3 ohms.

**TR5:** Inject a signal as for L.W. alignment (230 kc/s.), and with a C.R.O. (continued opposite)



(H11a) CIRCUIT DIAGRAM—MODEL LZ7 (PART)

## ELIZABETHAN

## Model LZ15

**General Description:** Car radio, employing six transistors and two diodes, for operation on a 12-volt positive or negative ground supply.

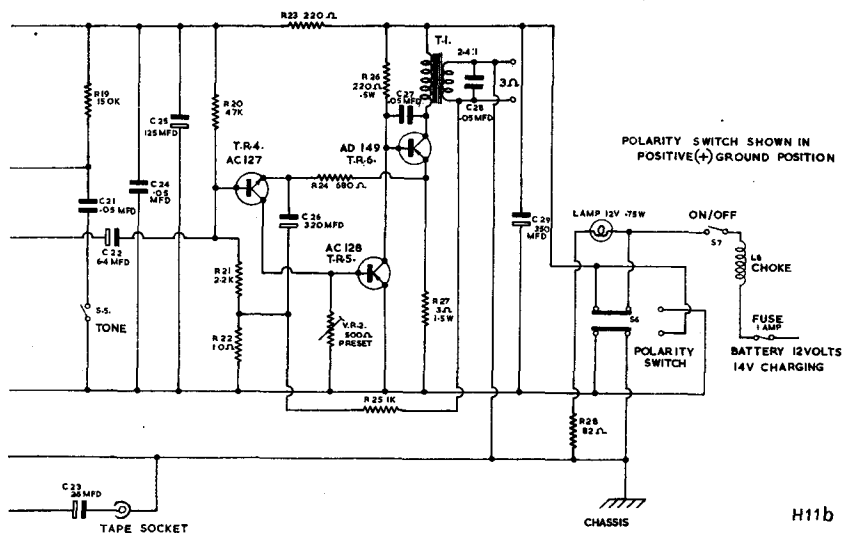
**I.F. Alignment:** Connect signal generator, via  $0.1 \mu\text{F}$ . capacitor, across R7. Inject 472 kc/s., select M.W., and adjust I.F. T2 and I.F. T1 for max.

**M.W. Alignment:** Pull out the button of a M.W. selector. Tune to high frequency end of band and fully depress the button. Connect signal generator, via 80 pF. capacitor, to aerial socket. Inject 1625 kc/s. Adjust TC3 for signal and TC1 and TC2 for max. Check sensitivity at 1625 kc/s., 1260 kc/s., 1500 kc/s. and 600 kc/s.

# ELIZABETHAN

across output, adjust VR<sub>2</sub> for symmetrical waveform clipping (signal input must be increased until waveform just clips).

**Dismantling:** Remove control knobs, decorative nuts, tuning scale and silver bezel. Remove the Phillips-head screws from top, bottom and sides of case. Access to both sides of the printed board can now be obtained.



(H11b) CIRCUIT DIAGRAM—MODEL LZ7 (CONTINUED)

**L.W. Alignment:** Select L.W. (button) and tune receiver to 1500 m. Connect signal generator as for M.W. Inject 200 kc/s. and adjust L<sub>7</sub> for signal. Inject 230 kc/s. and adjust L<sub>4</sub> and L<sub>2</sub> for max. Check sensitivity at 200 kc/s. and 230 kc/s.

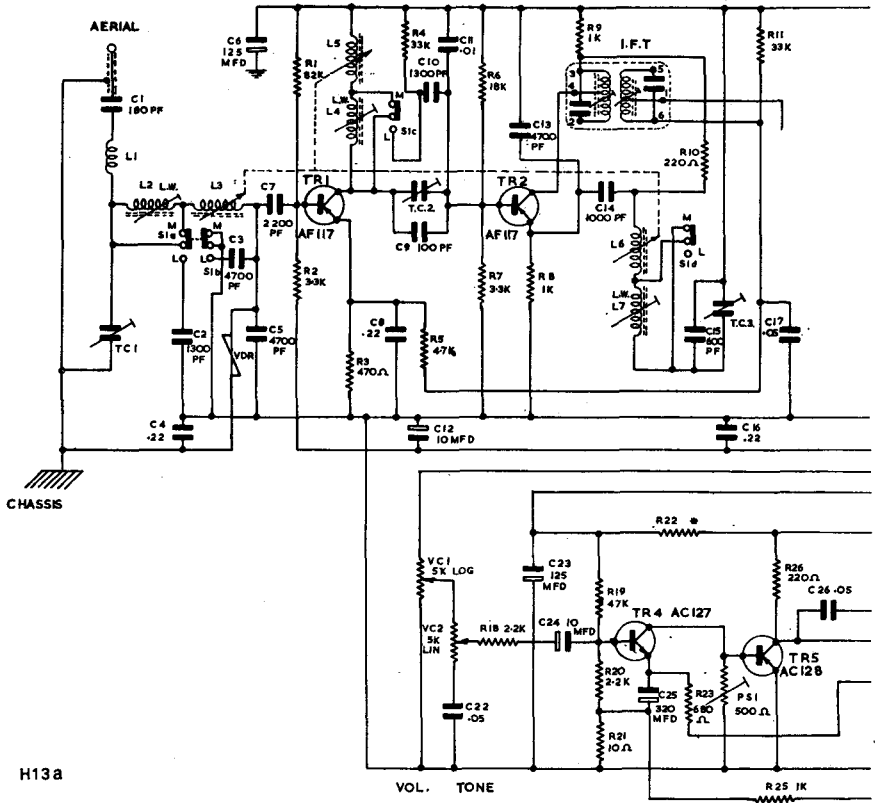
**Alignment Notes:** The output of the receiver must not be allowed to exceed 800 mV., to prevent A.G.C. action.

**Sensitivity:** M.W. and L.W. 2 to 6  $\mu$ V. I.F. 30  $\mu$ V. A.F., 50 mV. (input to volume control). All sensitivities given for 50 mW. output except A.F. sensitivity which is given for 1.5 watts output.

**Dismantling:** Remove control knobs, decorative nuts, plastic trims and silver bezels. Remove Phillips-head screws from top and sides of case. Access to the printed side of the circuit boards can now be obtained. For



# RADIO SERVICING

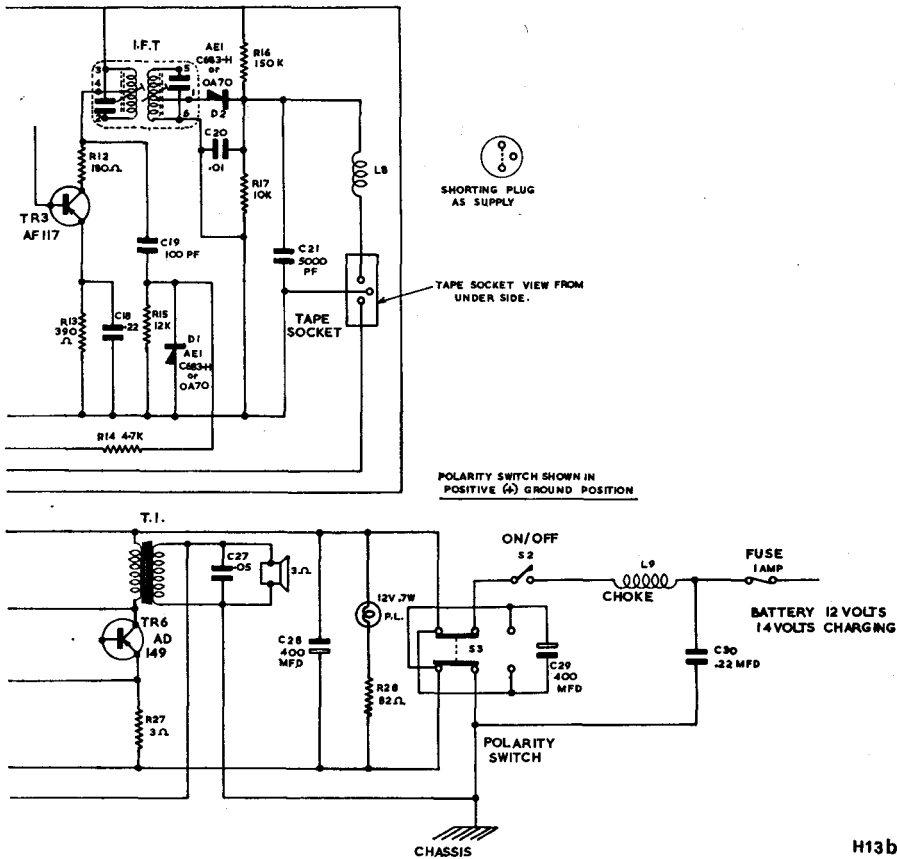


(H13a) CIRCUIT DIAGRAM—MODEL LZ15 (PART)

access to components on audio board, unsolder link wires, slacken volume control lock-nut and pivot small board on volume control shaft. For access to components on R.F. board. Unsolder connections on TC<sub>1</sub> and aerial feeder. Unsolder lead from C<sub>4</sub> at the earth tag. Remove three screws holding push-button unit to case bottom plate. The complete chassis may now be lifted and turned over. TC<sub>1</sub>, C<sub>4</sub> and aerial feeder may now be re-connected with jumper leads for functional testing.

**Pre-Selector Unit:** There are five push-buttons, four for medium waves and one for long wave. To obtain a M.W. station, select any button except the right-hand one and pull it out to its full extent. Tune in the

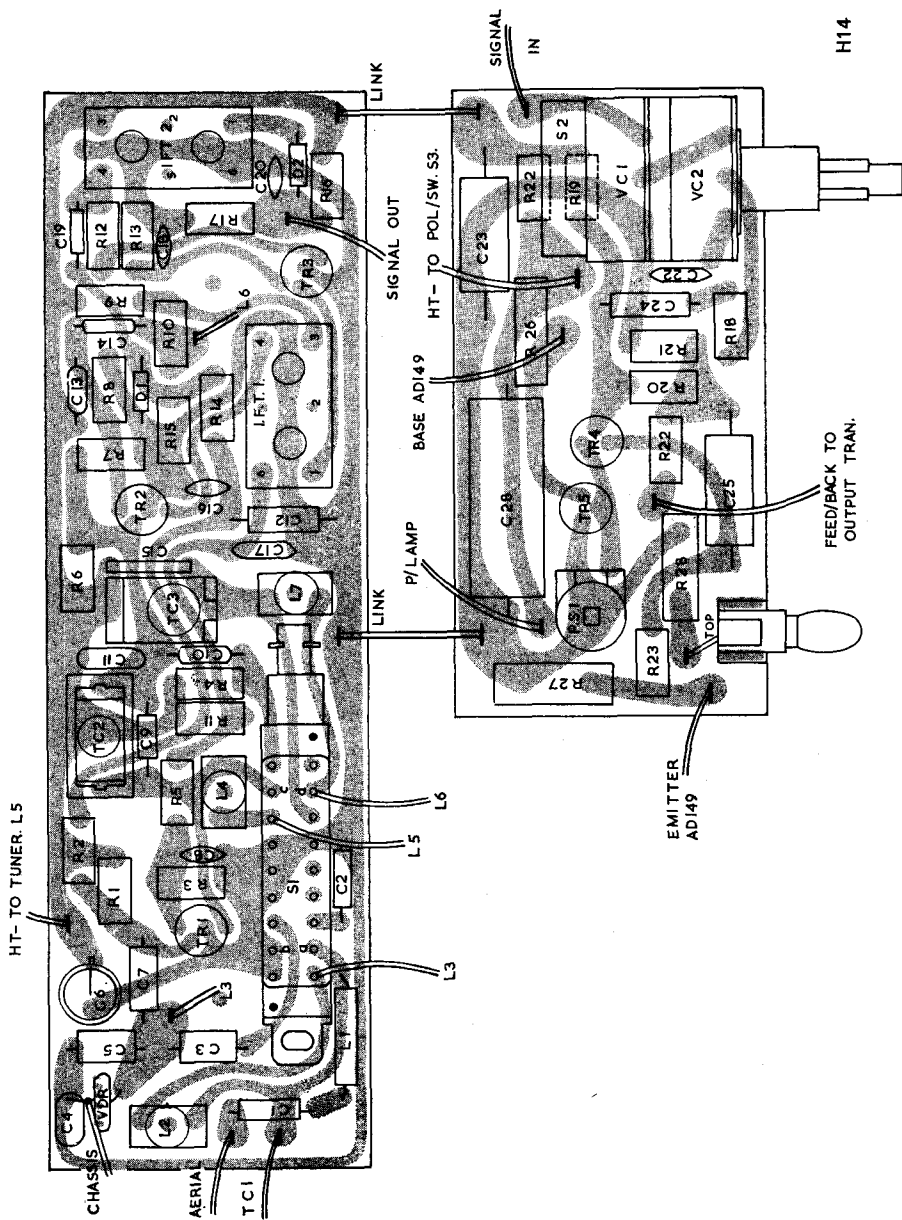
# ELIZABETHAN



(H13b) CIRCUIT DIAGRAM—MODEL LZ15 (CONTINUED)

required station with the right-hand control knob. When the station is tuned in, push in the button as far as it will go and then allow it to return to its normal position. Repeat this procedure with the other three M.W. buttons. Setting up the L.W. station is done in a similar manner. Once set up, pressing each button will tune in the selected station. Manual tuning can be carried out normally on M.W., but when manual tuning is required on L.W. the L.W. button must be depressed.

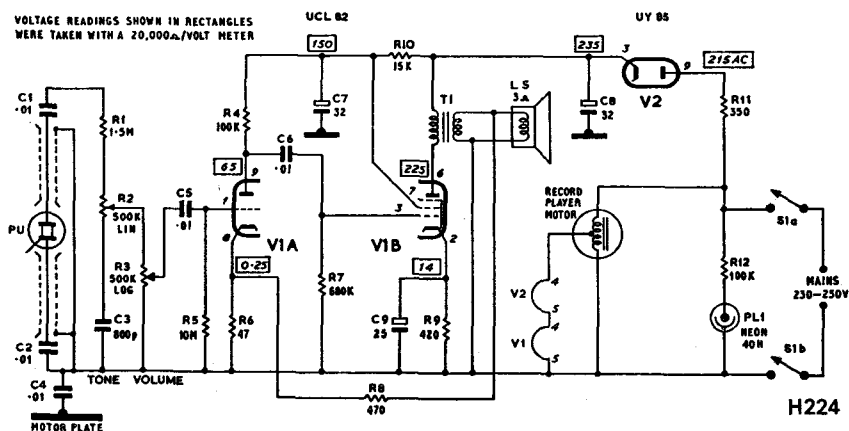
**Warning:** The unit must not be dismantled and the setting of the coil tuning slugs must not be altered.



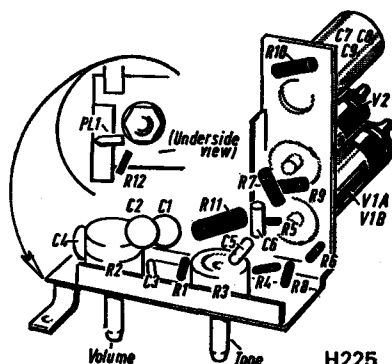
(H14) COMPONENT LOCATIONS—MODEL LZ15

H14

**Push-Button Catch Adjustment:** To prevent “buzz” occurring at the push-button catch, the latch pin should fit firmly into the latch plate when the lid is closed. Adjustment of the pin can be made by screwing it slightly



(H224) CIRCUIT DIAGRAM—MODEL 3010



(H225) COMPONENT LOCATIONS—MODEL 3010

in or out of the lid assembly. It is important that the pin is not shortened too much, otherwise difficulty will be found in engaging with the latch plate when the lid is closed.

**Styli Replacement:** The styli assembly may be pulled free with the indicator in the 78 position. The indicator of the replacement assembly must be similarly positioned before pressing into its locations. Always ensure that the styli arm is fitted correctly in the V-shaped slot.

## FERGUSON

## Model 3020

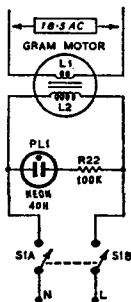
**General Description:** This model is similar to the Ultra Model 6018 described in this volume.

**Record Changer:** Garrard 3000 L.M. with Acos GP94-1 cartridge and turnover styli.

**Speaker:** Elliptical 8 ohms with 2.5 in. tweeter.

**Cartridge Replacement:** Ease forward the small plastic block at front of head to release cartridge. Then detach plugs from pins at rear of cartridge noting colour coding.

**Stylus Replacement:** Select L.P. stylus and prise out of selector lever assembly. Position replacement assembly with the tongue on top and press to engage with selector lever assembly. Ensure that the stylus arm is engaged within the V-shaped fork of the cartridge.

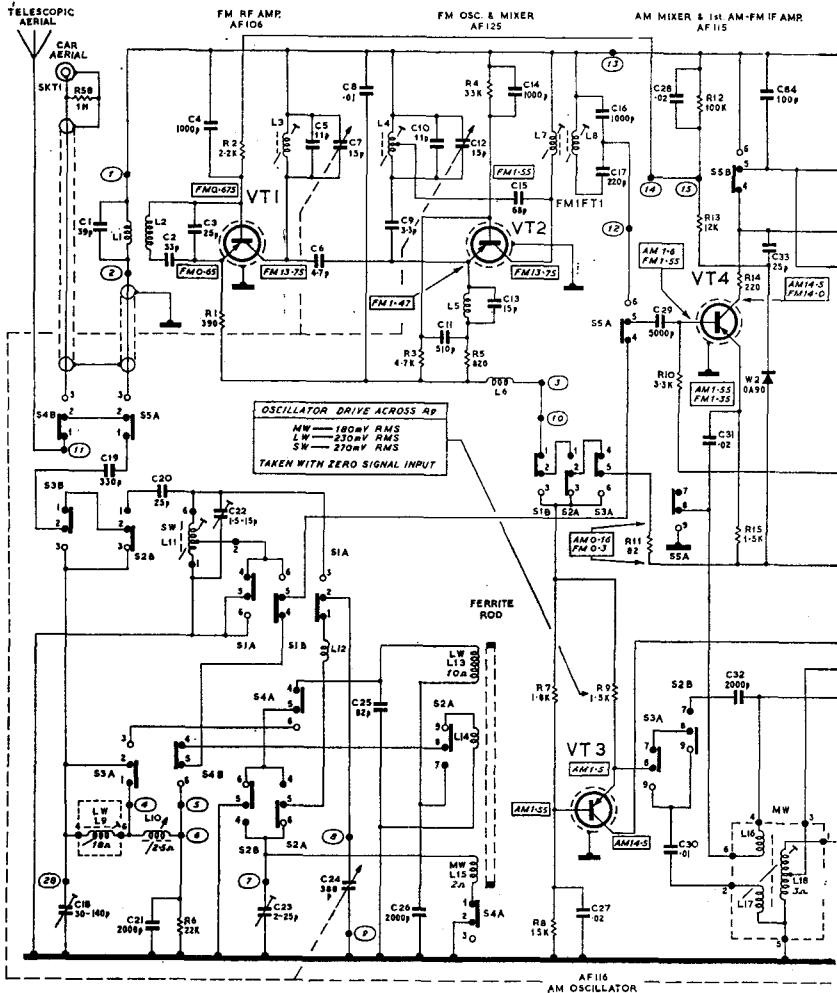

(H230) CIRCUIT CHANGE  
FOR GRAM MOTOR

**Note:** T1 is replaced by motor winding L1 in this model—see Component Locations Diagram Ultra Model 6018. The layout of the controls is also illustrated in that diagram.

# FERGUSON

## Model 3152

**Wavebands:** L.W. 270-148 KHz. M.W. 1640-530 KHz. S.W.  
18-6 MHz. V.H.F. 108-87 MHz.

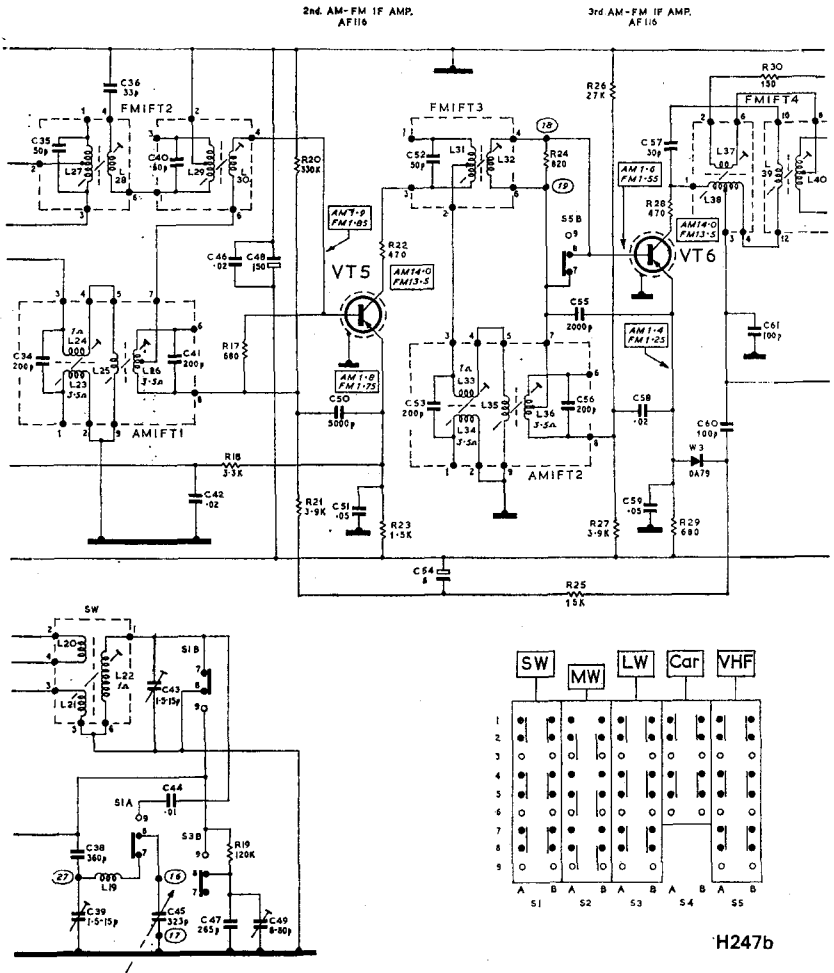


**(H247a) CIRCUIT DIAGRAM—MODEL 3152 (PART)**

## RADIO SERVICING

**Alignment (General):** A signal from a suitable generator 30 per cent. amplitude modulated by an A.F. signal is required for circuit alignment. Tuning indication is best obtained either with an output meter having an impedance of 25 ohms connected across the L.S. speech coil tags (with the loudspeaker disconnected)—printed board tags 22 and 24 are convenient connections—or a Model 8 Avometer, set to the 2.5-volt A.C. range, connected in parallel with the loudspeaker.

Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW. with the bass, treble and volume controls set at maximum to avoid alignment error due to A.G.C. action.

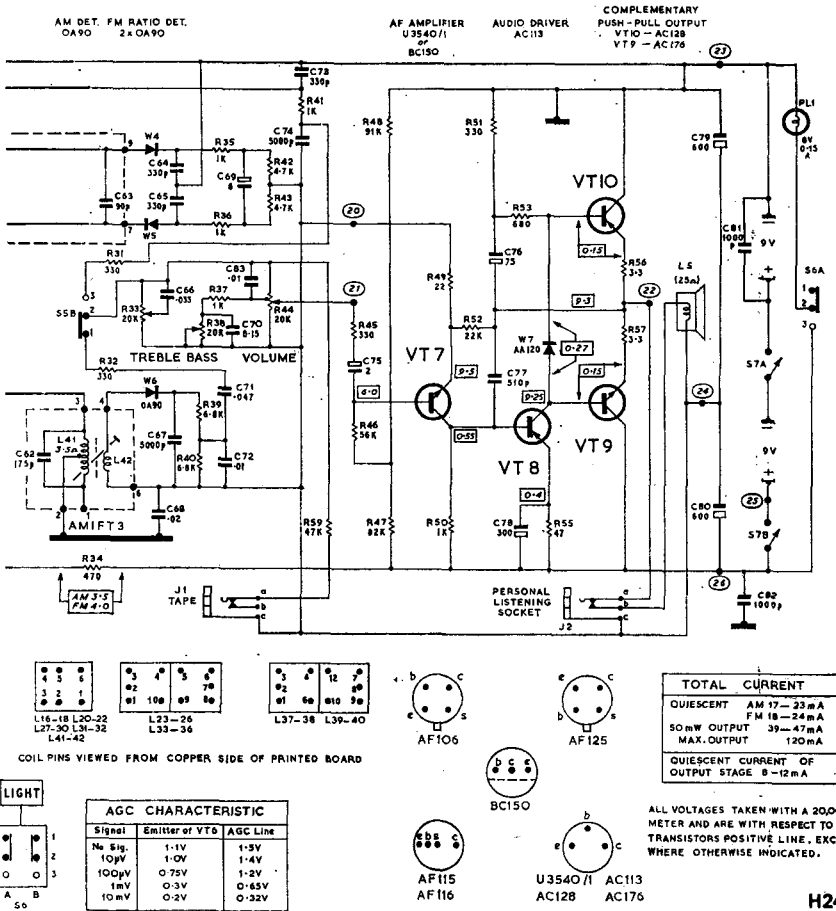


(H247b) CIRCUIT DIAGRAM—MODEL 3152 (PART)

# FERGUSON

**Alignment (A.M. I.F.):** Depress M.W. button and turn gang to maximum capacitance. Apply a 475 kHz modulated signal through a 0.1  $\mu$ F. capacitor across C24 (tags 8 and 9) aerial section of tuning gang. Adjust L41/42, L35/36, L33/34, L25/26, and L23/24 in that order for maximum output. Repeat in the same order until no further improvement is obtainable.

**Alignment (A.M. R.F.):** With gang at maximum capacitance, check that cursor coincides with set zero pip at left-hand end of scale window. Slide cursor along drive cord to correct any error in calibration. **M.W. must be aligned first.** Signals should be injected via a loop loosely coupled to the ferrite rod aerial with the CAR button in the "off" position. For S.W.

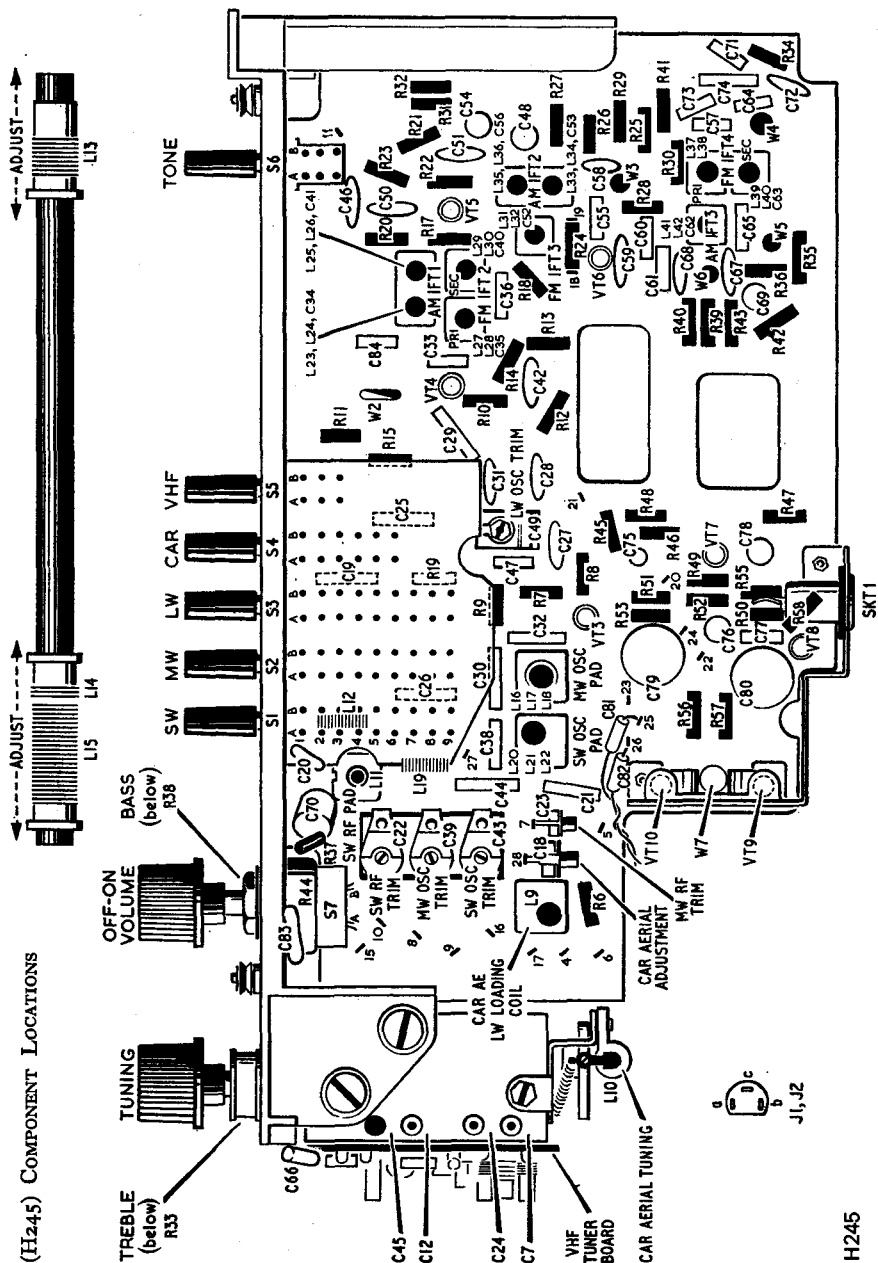


(H247c) CIRCUIT DIAGRAM—MODEL 3152 (CONTINUED)



# RADIO SERVICING

(H245) COMPONENT LOCATIONS



H245

# FERGUSON

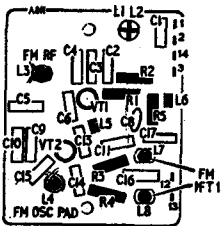
alignment the telescopic aerial lead should be disconnected and signals injected to the lead via a 7-10 pF. capacitor.

Range	Inject	Cursor position	Adjust
M.W.	600 kHz	500 metres	L18, L15
M.W.	1500 kHz	200 metres	C39, C23
L.W.	220 kHz	Cal. marker	C49, L13
S.W.	6.7 MHz	Pad marker	L22, L11
S.W.	15.8 MHz	Trim marker	C43, C22

**Notes:** Adjust L15 and L13 by sliding coil along ferrite rod. Pulling should be countered by rocking the gang when tuning C22.

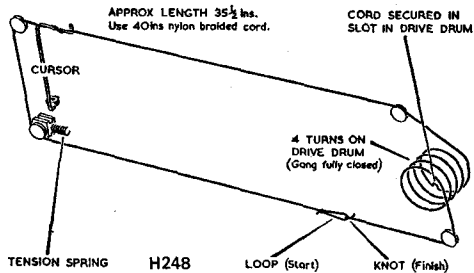
**Alignment (Car Aerial Tuner):** M.W.: Depress M.W. and CAR buttons and set M.W. car aerial trim (L10) adjusting screw (cam follower) so that an equal amount of thread appears at each end of its moulded support. With gang fully closed, check that slot in rear face of drive cam is in line with cam follower. Set receiver to 500 metre mark on scale and inject 600 kHz signal into car aerial socket via dummy load comprising an 18-pF. capacitor in series with signal generator output, followed by a 60-pF. shunt capacitor. Adjust C18 for maximum output.

**L.W.:** Depress L.W. and CAR buttons and set receiver to calibration marker on L.W. scale. Inject 220 kHz and adjust L9 for maximum output.



H246

(H246) F.M. TUNER BOARD



(H248) DRIVE CORD

**Alignment (F.M./I.F.):** Depress F.M. button and inject 10.7 MHz (25 kHz deviation) signal, via a blocking capacitor to tag 12 and chassis line (tag 13) on F.M. board. Peak L39/40, L37/38, L31/32, L29/30 and L27/28 for maximum output. Switch signal generator to A.M. (30 per cent. modulation) and adjust L39/40 for minimum output. (A.M. rejection.) Repeat adjustments as necessary for maximum F.M. output and minimum A.M. output.

**Alignment (F.M./R.F.):** Ensure that, when tuning capacitor is set to maximum capacitance, cursor coincides with the marker at left-hand side of

## RADIO SERVICING

V.H.F. scale. Slide cursor along drive cord to correct any error in calibration. Depress F.M. and CAR buttons and connect F.M. signal generator across car aerial socket.

<i>Inject</i>	<i>Cursor position</i>	<i>Adjust</i>
94 MHz 96 MHz	94 MHz 96 MHz	L4, L3 L7, L8

**Installation (C18):** This adjustment is accessible after withdrawing the battery from the battery compartment adjacent to the aerial socket, within the limits of the connecting leads. Plug in car aerial feeder, select M.W. and depress CAR button. Tune receiver to any weak station at the middle of wave range and peak C18. Check that peak occurs within four turns of maximum capacitance.

**Dismantling:** Take off battery covers, disconnect and remove batteries. Pull off tuning and volume control knobs. Remove six self-tapping screws from centre panel in base of cabinet, then take out two threaded bolts from speaker baffle securing complete assembly to front grille. Unsolder six leads from tag panel fitted to cabinet moulding (note colour code for re-assembly), then unsolder speaker grille earthing lead from car aerial socket panel. The complete assembly can now be eased from the cabinet.

To expose component side of printed board take out four screws (two large and two small) securing speaker baffle to metal brackets on printed board assembly. The loudspeaker baffle can now be lifted clear within the limit of the connecting leads.

When refitting receiver assembly into the cabinet ensure that two studs on the scale backing plate locate with two stand-off pillars on the scale frame assembly.

**Note (W7):** The diode (W7) is biased by VT8 collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The voltage developed across W7 equals the sum of the nominal output transistor (VT9 and VT10) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W7 increases thus compensating for the falling current of the output transistors. This effect also takes place in the event of a falling battery voltage. The diode W7 also assists thermal stability at high temperatures and opposes high current drain from the battery.

**Note (VT9 and VT10):** Components VT9 and VT10 are fitted into a "heat sink" and a coating of silicone grease has been given to each to assist thermal conductivity. It is important that when replacing these transistors a coating of similar grease is applied in order to maintain the cooling action. Heat Sink Compound DP2633, or Anti-Tracking Grease MS4, is suitable.

## FERGUSON

## Model 3156

**General Description:** This model is similar to the Ferguson 3156T.

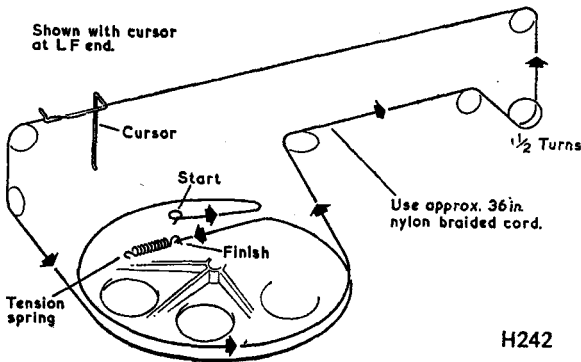
**Notes:** The push-button tone control is not used. S6A/B is used to switch in a scale lamp and is connected between tags 34 and 35. C81 is 100 pF. and C87 is omitted.

## FERGUSON

## Model 3156T

**General Description:** V.H.F./F.M. and A.M. radio receiver with over 1 watt output. Aerials, ferrite rod (A.M.) and telescopic rod (F.M.). Speaker, elliptical 25 ohms. Sockets, Car aerial, Tape (20k) and Private listening (15-100 ohms). Battery, 9 volt PP9.

**Wavebands:** L.W. 268-148 kHz. M.W. 1579-530 kHz. S.W. 18.8-6 MHz. V.H.F. 101-87 MHz.



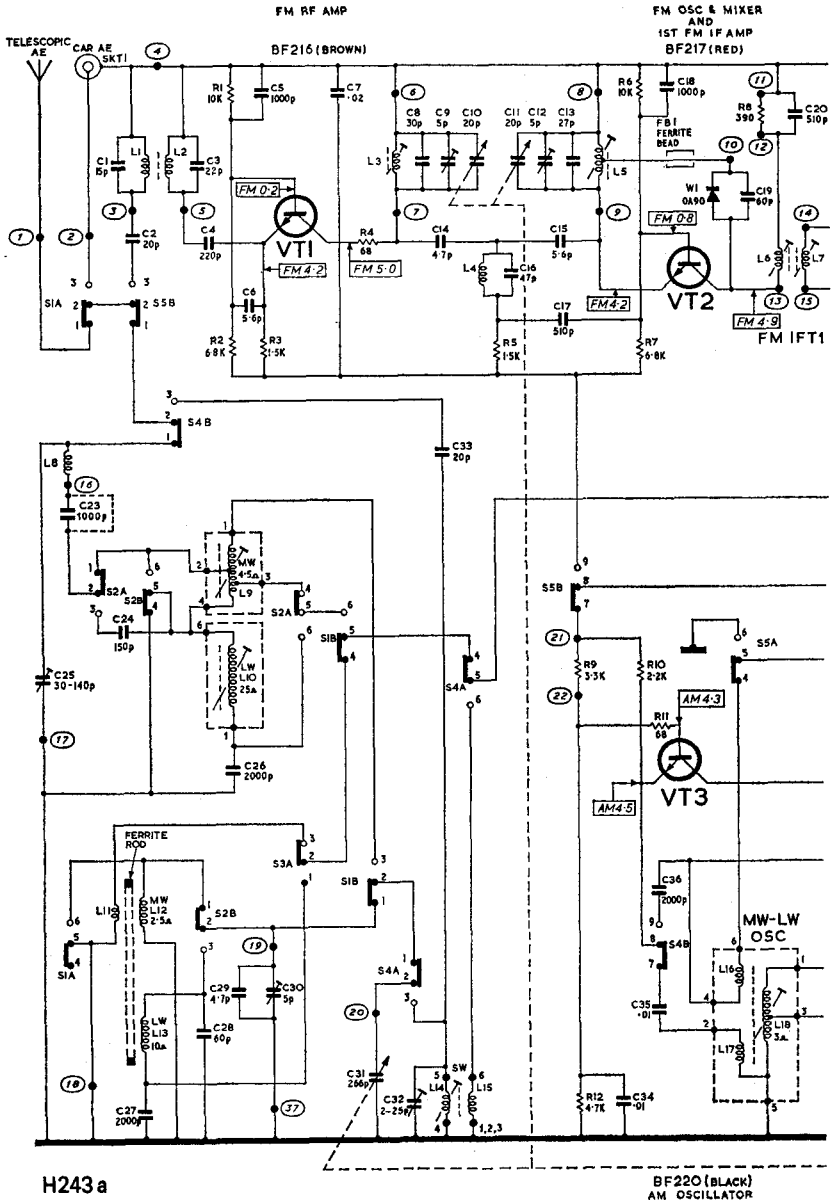
(H242) DRIVE CORD

**Alignment (General):** A signal from a suitable generator, 30 per cent. amplitude modulated by an A.F. signal is required for circuit alignment. Tuning indication is best obtained either with an output meter having an impedance of 25 ohms and connected in place of the loudspeaker or a Model 8 Avometer, set to the 2.5 volt A.C. range, connected in parallel with the loudspeaker.

Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW. with the volume control set at maximum in order to avoid alignment error due to A.G.C. action.

# RADIO SERVICING

**Alignment (A.M. I.F.):** Depress M.W. button and turn gang to maximum. Apply a 475 kHz modulated signal through a 0.1  $\mu$ F. capacitor into S5A contact 2. Adjust L40/41, L31, L28/29, L25 and L22/23 in that order for maximum output.

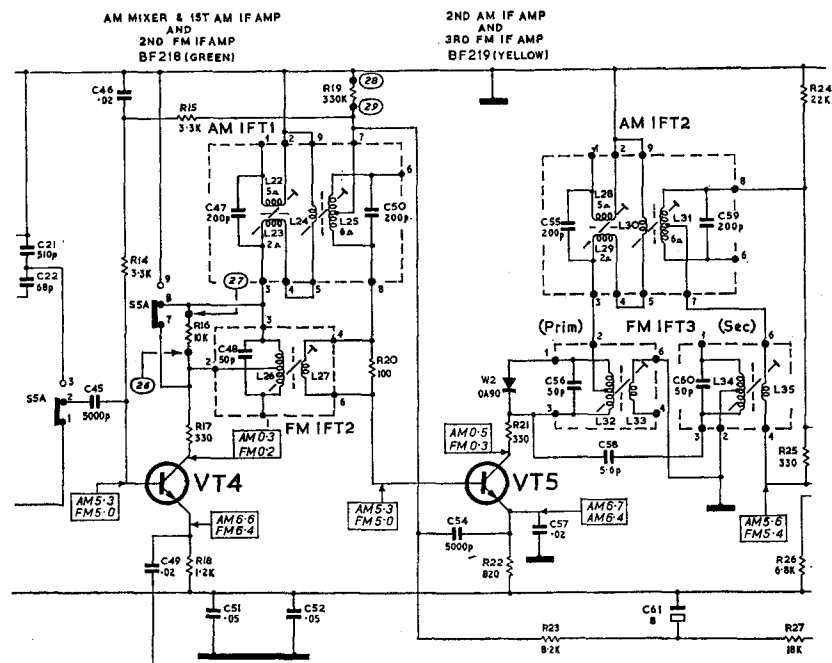


(H243a) CIRCUIT DIAGRAM—MODEL 3156T (PART)

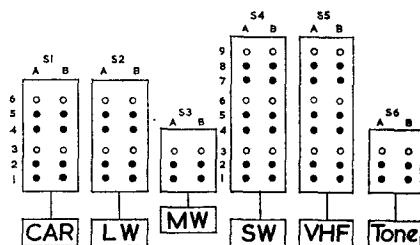
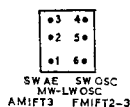
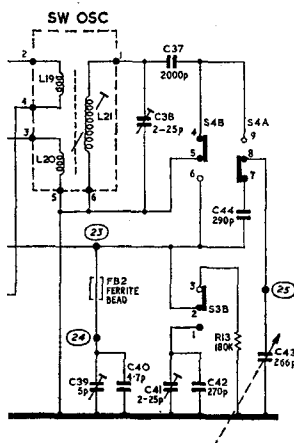
# FERGUSON

Repeat in the same order until no further improvement is obtainable.

**Alignment (A.M. R.F.):** With gang at maximum, check that cursor coincides with the "zero" pips at right-hand end of scale. Slide cursor along drive cord to correct any error in calibration. M.W. must be aligned



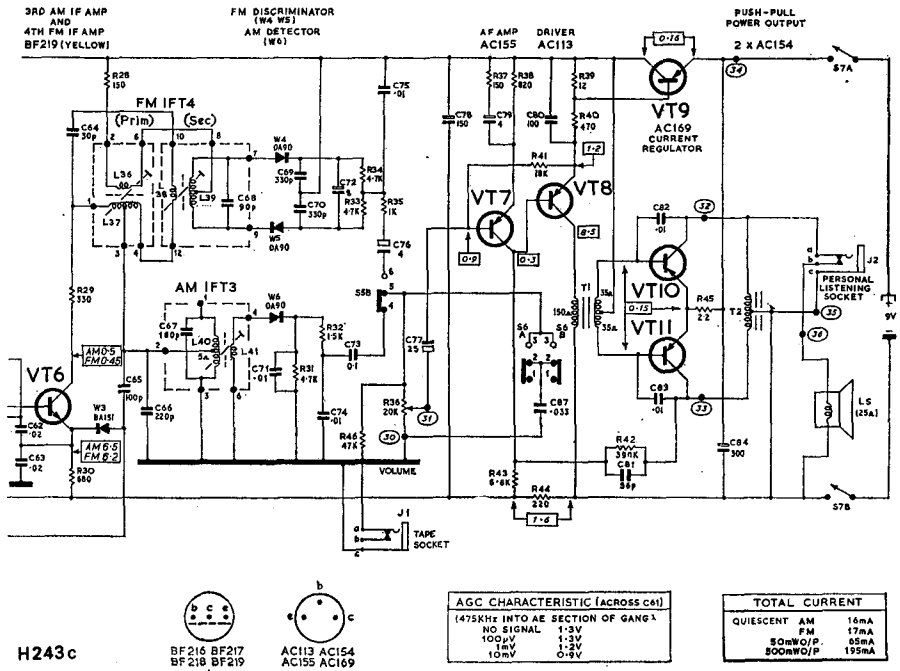
H243b



(H243b) CIRCUIT DIAGRAM—MODEL 3156T (PART)

## RADIO SERVICING

first. Medium- and long-wave signals should be injected via a loop loosely coupled to the ferrite rod aerial. For S.W. alignment, unclip lead from telescopic aerial and inject signals into the lead via a 20 pF. capacitor.



(H243c) CIRCUIT DIAGRAM—MODEL 3156T (CONTINUED)

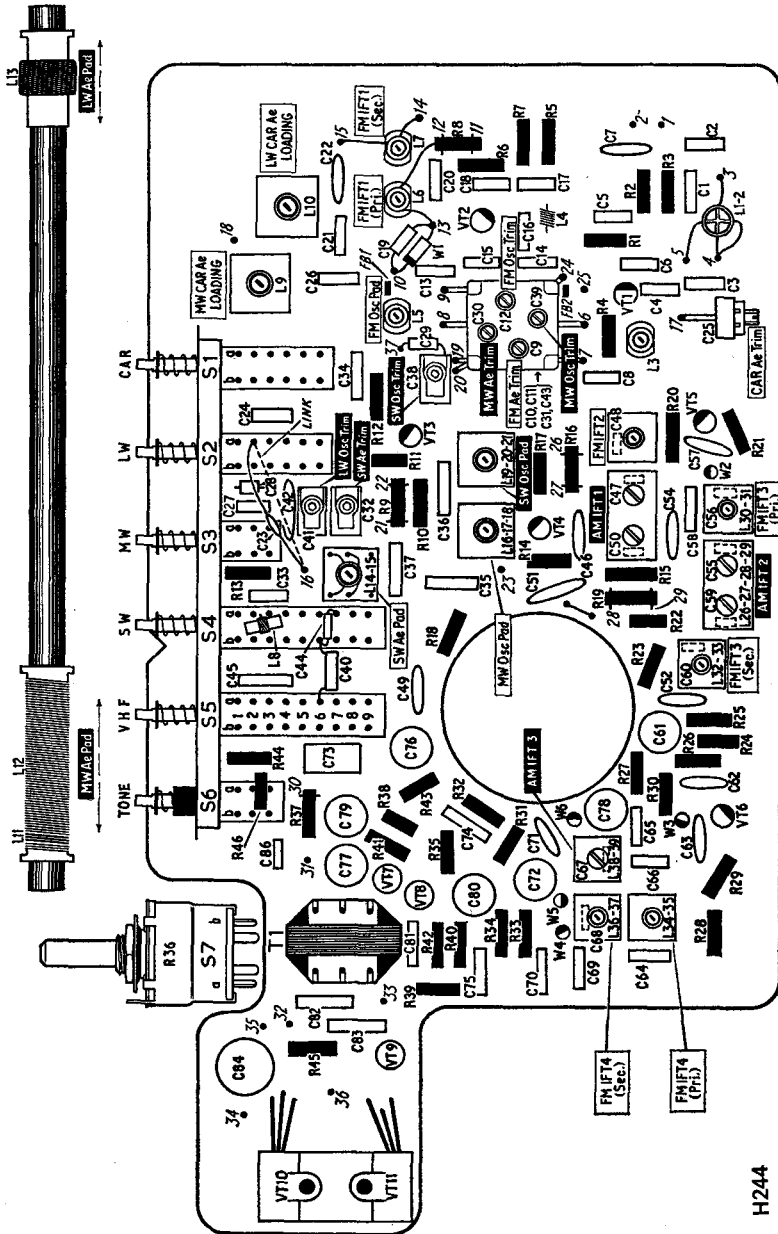
*Note:* The Sections (a) and (b) have been enlarged in proportion to (c) to illustrate the finer detail areas.

Range	Inject	Cursor position	Adjust
M.W.	600 kHz	500 m. calibration	L18, L12
	1500 kHz	200 m. calibration	C39, C30
L.W.	220 kHz	L.W. calibration	C41, L13
S.W.	6.77 MHz	6.77 MHz calibration	L21, L14
	15.45 MHz	15.45 MHz calibration	C38, C32

*Notes:* 1. Adjust L12 by sliding ring along ferrite rod. 2. Adjust L13 by sliding former along ferrite rod.

**Alignment (F.M. I.F.):** Depress F.M. button. Inject 10.7 MHz (25 kHz deviation) signal, via a 0.1 μF. blocking capacitor, to S5A contact 2 and peak L36/37, L34/35, L32/33 and L26/27 for maximum output. Switch signal generator to A.M. (30 per cent. modulation) and adjust L38/39 for minimum output (A.M. rejection).

**Alignment (F.M. R.F.):** Inject signals into telescopic rod.



(H244) COMPONENT LOCATIONS

H244



# RADIO SERVICING

Range	Inject	Tune to	Adjust
F.M.	88 MHz 96 MHz 91 MHz	88 MHz calibration 96 MHz calibration 91 MHz	L5, L3 C12, C9 L6, L7

**Alignment (Car Aerial):** The Car Aerial Circuits are aligned with A.M. signals, 30 per cent. modulated injected to the Car Aerial Socket via a dummy load comprising an 18-pF. capacitor in series with signal generator output, followed by a 60-pF. shunt capacitor. The "Car" button must be depressed in conjunction with the appropriate waveband button, make settings and adjustments as shown in the table.

Range	Inject	Tune to	Adjust
Medium	600 kHz 1500 kHz	500M Marker 200M Marker	L9 C25
Long	220 kHz	1400M Marker	L10

**Circuit Description (F.M.):** The signal is applied via tuned input transformer circuit L1, C1; L2, C3 and C4 to the emitter of VT1. The collector circuit of VT1 is tuned by L3, C8, C9 and C10. This stage operates as a grounded base R.F. amplifier feeding via C14 into the emitter of grounded base oscillator and mixer transistor VT2. The collector of VT2 is loaded by L6, L7 and tuned by series capacitors C21, C22. C19 provides coupling into the oscillator circuit (L5, C11, C12 and C13). L4 and C17 form a 10.7 MHz F.M. I.F. rejector with C16 acting as an input phase corrector at oscillator frequencies.

The 10.7 MHz I.F. output developed across L7 is fed via the potential divider C21/C22, switch S5A contacts 2 and 3 and C45, to the base of VT4 which operates as an I.F. amplifier.

**Circuit Description (A.M.):** Medium- and long-wave windings and coupling coil L11 on the ferrite rod are selected by switches S2B contacts 1, 2 and 3 while short-wave signals are received by the telescopic aerial and coupled by S4B, contacts 2 and 3 and C33 to the tuned input transformer L14/15. C31, the aerial section of the tuning gang, is switched for S.W. tuning by S4A contacts 2 and 3. A.M. signals are fed via S5A, contacts 1 and 2 and C45 into the base of A.M. mixer transistor VT4. VT1 and VT2 are rendered inoperative when contacts 8 and 9 of switch S5B open to disconnect their emitter and bias voltages from the negative rail.

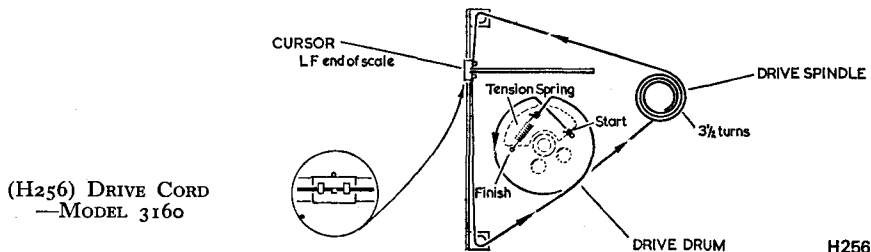
**Circuit Diagram Notes:** All voltages were measured with an Avometer 8 and are with respect to the positive supply line of each transistor except where otherwise shown. Ringed figures indicate printed board tag connections. D.C. resistance readings are shown against inductors where these are greater than 1 ohm. The circuit diagram shown covers Model 3156T Sch. B receivers. On Sch. A receivers, C87 is 390 pF. and is connected between S6A/B contacts 2 and junction of R42, C81 and C83. Contacts 3 of S6A/B are connected to collector of VT7.

## FERGUSON

## Model 3160

**General Description:** F.M./A.M. radio receiver with 200 mW. output. Aerials; ferrite rod and telescopic rod. Sockets, two for private listening. Speaker, round 8 ohms. Batteries, four 1.5 volt HP7. Accessories; earpiece in leather purse and carrying strap extension.

**Wavebands:** M.W. 1605-535 kHz. L.W. 300-150 kHz. V.H.F. 108-87 MHz.



**Alignment (General):** A signal from a suitable generator, 30 per cent. amplitude modulated by an A.F. signal is required for circuit alignment. Tuning indication is best obtained either with an output meter having an impedance of 8 ohms and connected in place of the loudspeaker or a Model 8 Avometer, set to the 10 volt A.C. range, connected in parallel with the loudspeaker.

Throughout alignment the signal level to the receiver should be adjusted to maintain an audio output at approximately 50 mW., with the volume control set at maximum, to avoid alignment error due to A.G.C. action.

**Alignment (A.M. I.F.):** Switch to M.W. and turn gang to maximum capacitance. Apply a 455 kHz modulated signal via a 0.1  $\mu$ F. capacitor across C19, aerial section of gang. Adjust L28/29, L22/23 and L16/17 in that order for maximum output. Repeat in same order until no further improvement results.

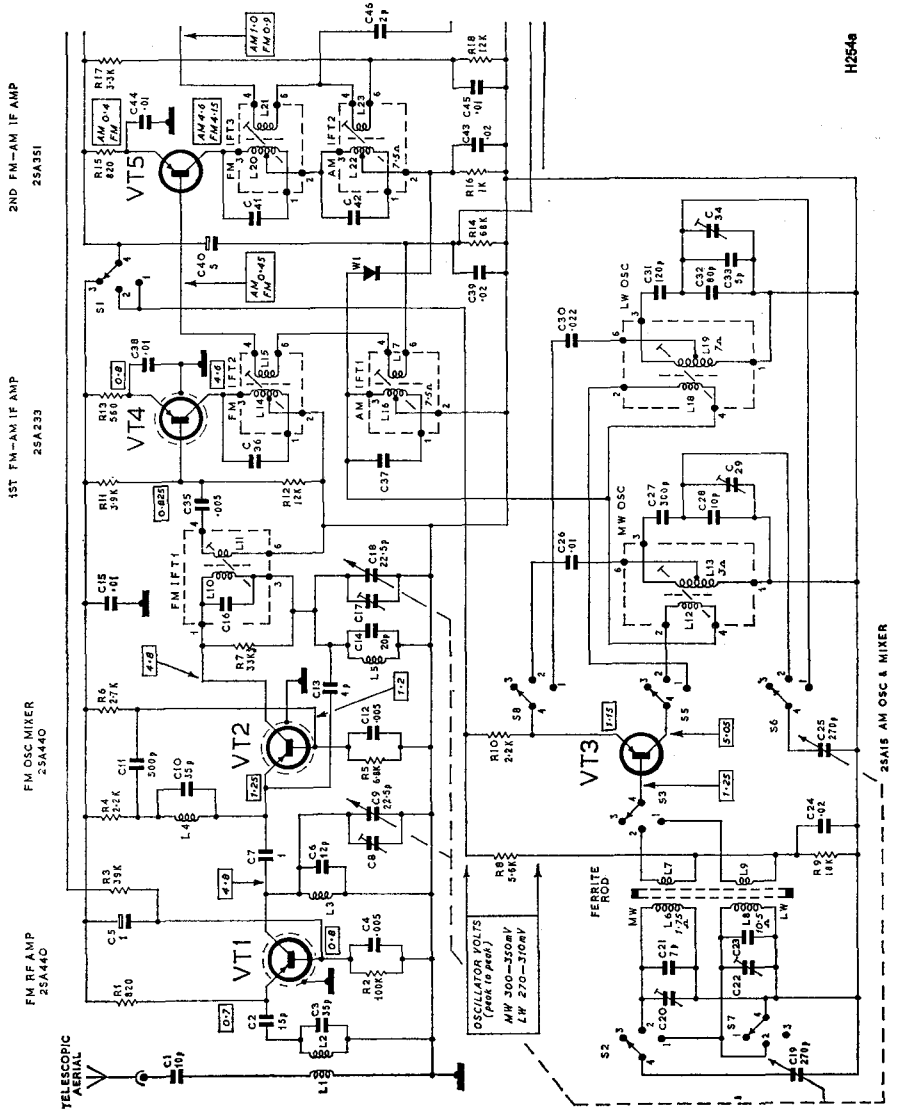
**Alignment (A.M. R.F.):** With gang at maximum capacitance check that cursor is aligned across the top of the vertical lines on scale. M.W. must be aligned first. Medium- and long-wave signals should be injected via a loop loosely coupled to the ferrite rod aerial.

Range	Inject	Cursor position	Adjust
M.W.	600 kHz 1500 kHz	6 Midway between 14 and 16	L13, L6/7 C29, C20
L.W.	190 kHz 280 kHz	19 28	L19, L8/9 C34, C22

*Note:* Adjust L6/7 and L8/9 by sliding former along ferrite rod.

# RADIO SERVICING

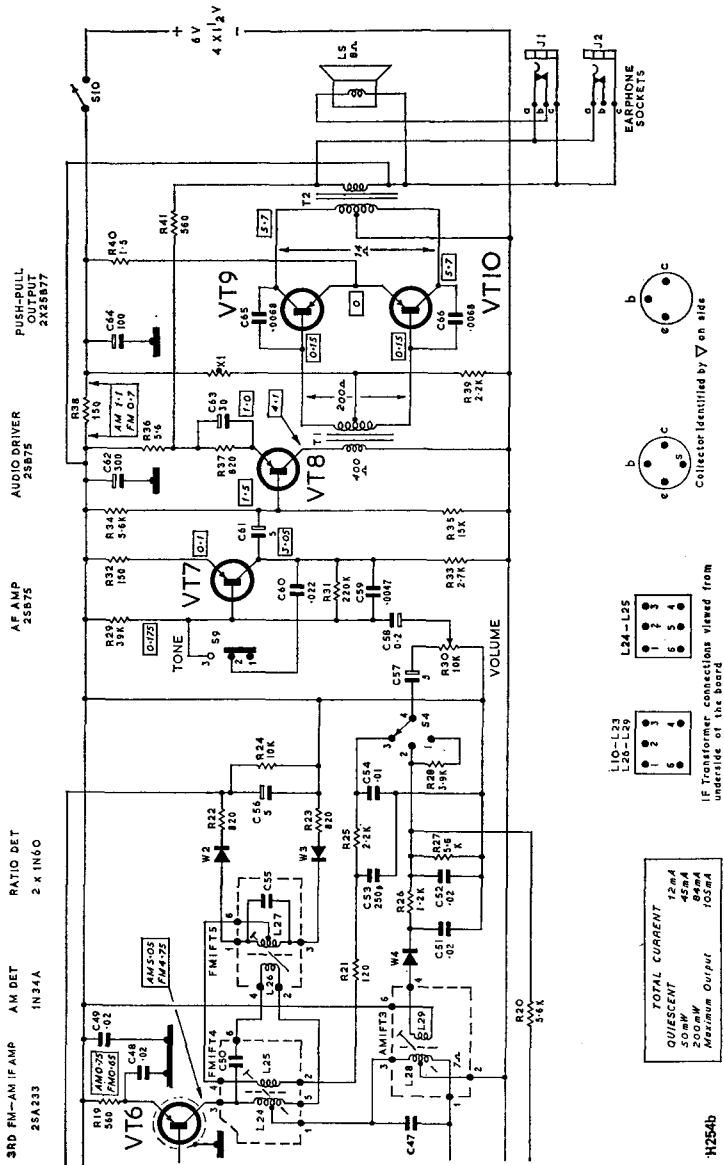
**Alignment (F.M. I.F.):** Switch to F.M. Inject 10.7 MHz signal 25 kHz deviation via 0.1  $\mu$ F. capacitor to the junction of R<sub>4</sub>/L<sub>4</sub> (clip signal input lead to the top of R<sub>4</sub>). Adjust L<sub>24</sub>/25, L<sub>20</sub>/21, L<sub>14</sub>/15 and L<sub>10</sub>/11 for maximum output. Switch signal generator to A.M.; 10.7 MHz, 30 per cent. modulated and adjust L<sub>26</sub>/27 for minimum output (A.M. rejection). Repeat adjustments as necessary to obtain maximum output and accurate calibration.



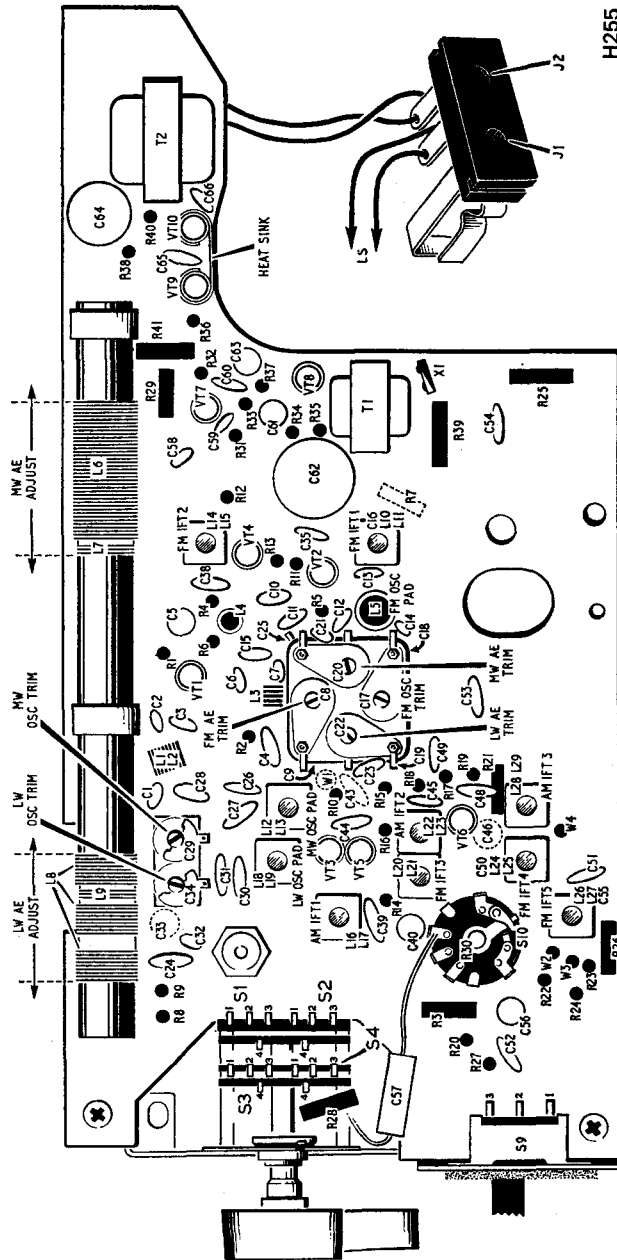
# FERGUSON

**Circuit Diagram Notes:** Figures in rectangles indicate voltages measured with an Avometer 8, with respect to positive chassis. D.C. resistance readings are shown against inductors where these are 0.5 ohms or greater. Ringed figures indicate printed board tag connections.

Above: (H254a) CIRCUIT DIAGRAM—MODEL 3160 (PART)  
Below: (H254b) CIRCUIT DIAGRAM—MODEL 3160 (CONTINUED)



# RADIO SERVICING



(H255) COMPONENT LAY-OUT—MODEL 3160

# FERGUSON

**Alignment (F.M. R.F.):** Inject F.M. R.F. signals into telescopic aerial.

<i>Range</i>	<i>Inject</i>	<i>Cursor position</i>	<i>Adjust</i>
F.M.	94 MHz	94	Cr7, C8

**Circuit Description (F.M.):** The signal is applied via the coupling capacitor C2 from the V.H.F./F.M. tuned circuit L2/C3. The collector of VT2 is loaded by L10 and tuned by Cr6. Cr3 provides the feedback into the emitter of VT2, L4 and Cr11 forming a 10.7 MHz rector with Cr10 acting as an input phase corrector at oscillator frequencies. The 10.7 MHz oscillator output is fed via C35 to VT4 base which operates as the 1st F.M. I.F. amplifier.

**Circuit Description (A.M.):** Medium- and long-wave windings are selected by switch S2 and S7 respectively and fed via L7 or L9 via S3 to VT3 the A.M. oscillator-mixer. M.W. and L.W. oscillators are selected by S5 and S8; the selected oscillator output being fed direct to A.M. IFT1 and coupled to VT5 base by L17. VT1 and VT2 are rendered inoperative when S1 disconnects their emitter and bias voltages from the battery positive line.

**Circuit Description (A.F.):** Audio signals from the V.H.F./F.M. and A.M. channels are selected by S4 and fed to VT7 base via C57 and R30. The amplified signals are then passed to VT8 the audio driver stage and then transformer coupled into bases of VT9 and VT10 the push-pull output stage. S9 switches C60, the fixed tone correction into circuit from VT7 collector. Negative feedback operates between VT7 collector and base through R31 and C59. X1 with R39 form the base bias potentiometer network for VT9 and VT10. During low ambient temperature conditions the resistance of X1 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. Thermistor X1 also assists thermal stability at high temperature and opposes high current drain from the battery.

**Dismantling:** To obtain access to the printed circuit board, remove two screws in the cabinet back. Insert thumb nail in the slot in the cabinet base and gently hinge open within the limit of the battery connecting leads. To release the cabinet back, unsolder the battery leads, noting connections for reassembly. To release the printed circuit board assembly, pull off tuning and volume control knobs, then pull out plug connection to telescopic aerial. Take out four self-tapping screws, one of which is located in the lower limb of the wavechange switch bracket assembly, then remove the hexagonal brass pillar located near the switch assembly and take out threaded screw and washers at extreme right-hand corner of printed board. The printed circuit board can now be lifted clear within the limit of the loud-speaker connecting leads. Unsolder these leads to completely free the printed circuit board, noting colour coding for correct reassembly.

**Drive Cord Replacement:** Remove printed circuit board, then take out three screws securing scale to its mounting assemblies. Lift off scale to expose drive cord assembly. Approximately 14 in. of Nylon braided cord will be required.

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## FERGUSON

## Model 3338

**General Description:** This model is similar to the Ultra Model 6322 described in this volume. Changer, BSR UA15 with BSR C1 cartridge.

**Note:** The component locations diagram does not show pickup matching components R83, R84, R85 and C87, C88. These components are mounted on a tag strip fitted to the underside of the record changer.

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## FERGUSON

## Model 3340

**General Description:** This model is similar to the Ferguson Model 3348 see below, but it employs a Garrard 3000 L.M. record changer with a Sonotone 9TAHC cartridge and a L.P. stylus type 9T1.

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## FERGUSON

## Model 3348

**General Description:** This model is similar to the Marconiphone Model 4322 described in this volume.

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## FERGUSON

## Model 3334

**General Description:** This model is similar to the Ultra Model 6324 described later in this volume, apart from presentation and the number of wavebands covered.

**Wavebands:** M.W. 1620-530 kc/s. L.W. 268-148 kc/s. V.H.F. 101-87.5 Mc/s.

**FERRANTI****Model 1141**

**General Description:** This model is electrically similar to the Pye Model 1370 described in the 1966-67 volume.

**FERRANTI****Model 5501**

**General Description:** This receiver is electrically similar to the Pye Model 1372 described elsewhere in this volume.

**FERRANTI****Model 5503**

**General Description:** This receiver is electrically similar to the Pye Model 1373 described elsewhere in this volume.

**FIDELITY****Comet**

**General Description:** Portable receiver with 500 mV. output. Speaker, round 10 ohms. Battery, 9 volts.

**Wavebands:** S.W. 6-14.5 Mc/s. M.W. 188-555 m. B.S. 188-211 m. L.W. 1200-2000 m.

**Alignment (General):** To obtain access to the cores and trimmers, it is necessary to remove the front panel assembly, see Dismantling. The template (see appropriate diagram) may be used to mark the alignment points on the pointer rail noting that the diagram is half-size. The L.H. pointer is used for M.W. and B.S. and the R.H. pointer for L.W. and S.W. Before alignment check that the L.H. pointer lines up with mark 1 when the gang is fully in. Use a coupling loop when the R.F. adjustments are made.

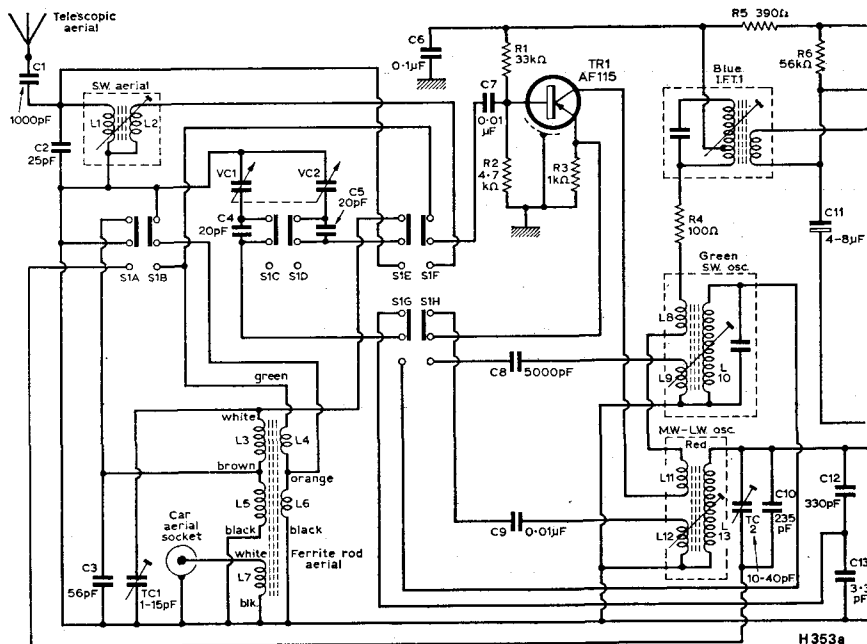
**Alignment (I.F.):** Connect a suitable output meter across the speaker tags via an isolating capacitor. Connect signal generator across the aerial section of the tuning gang (mauve and black leads). Turn the volume control to maximum clockwise. It is preferable, though not essential, to short out



(H356) TEMPLATE FOR ALIGNMENT MARKER POSITIONS (SHOWN EXACTLY HALF SIZE)



# RADIO SERVICING



(H353a) CIRCUIT DIAGRAM—MODEL FIDELITY COMET (PART)

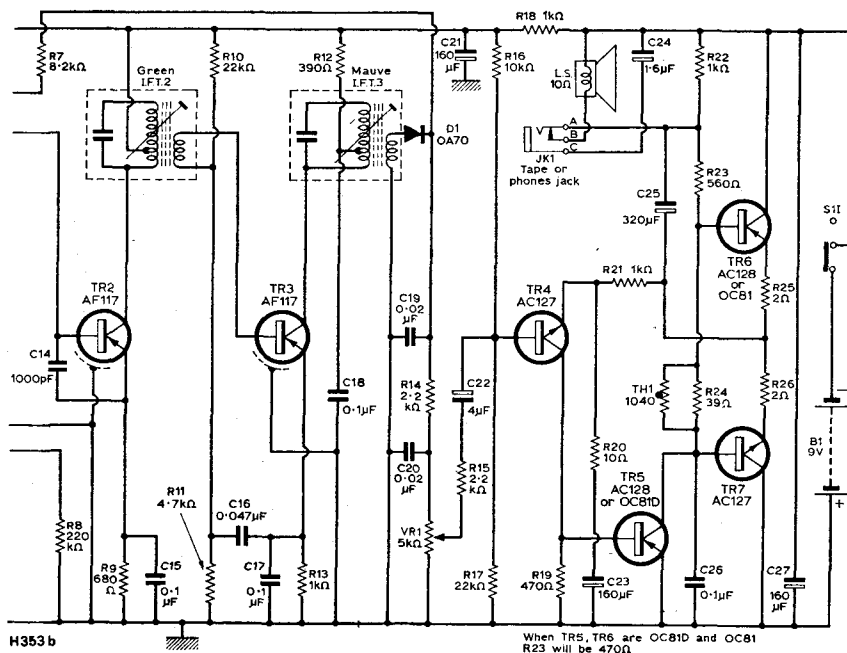
the tuned winding  $L_{13}$  (this may be achieved without further dismantling by bridging  $R_8$ ). Press the M.W. button and with tuning gang at maximum capacitance inject a modulated signal of 470 kc/s. and trim the cores of IFT<sub>3</sub>, IFT<sub>2</sub> and IFT<sub>1</sub>, in that order, for maximum output. Repeat these adjustments with reduced signal input. Remove s/c from oscillator circuit.

**Alignment (B.S.):** Press B.S. button. Tune receiver to B.S. Luxembourg (L.H. pointer to calibration mark 3) and inject into loop a signal of 1440 kc/s. Trim the core of oscillator coil  $L_{13}$  for maximum output.

**Alignment (M.W.):** Press the M.W. button. Tune the receiver to 500 m. (L.H. pointer to calibration mark 2) and inject signal of 600 kc/s. Adjust aerial coil  $L_3/4$ , by sliding it along the ferrite rod, for maximum output. Retune receiver to M.W. Luxembourg (L.H. pointer to calibration mark 4), inject signal of 1440 kc/s. and adjust aerial trimmer  $TC_1$  for maximum output. Repeat for optimum results.

**Alignment (L.W.):** Press the L.W. button. Tune the receiver to long wave 1500 m. position (R.H. pointer to calibration mark 7) and adjust oscillator trimmer  $TC_2$  for maximum output of the B.B.C. broadcast signal. Retune receiver to Allouis (R.H. pointer to calibration mark 5) and adjust aerial coil  $L_5/6$ , by sliding it along the ferrite rod, for maximum output of Allouis broadcast signal.

# FIDELITY



(H353b) CIRCUIT DIAGRAM—MODEL FIDELITY COMET (CONTINUED)

Note: The wavechange switch is shown in the M.W. position.

**Alignment (S.W.):** Transfer signal generator output from transmitting loop to the S.W. telescopic aerial. Press the S.W. button and tune receiver to 9 Mc/s. (R.H. pointer to calibration mark 6). Inject signal of 9 Mc/s. and trim the core of oscillator coil  $L_{10}$ , then the aerial coil  $L_{1/2}$ , for maximum output.

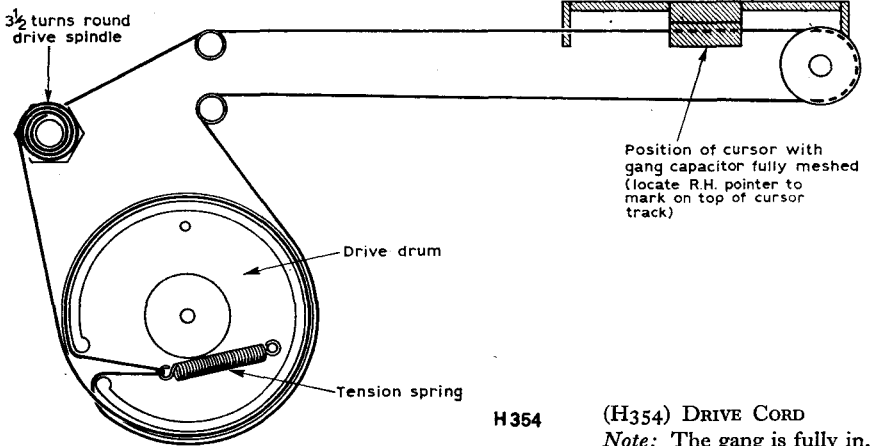
**Voltage Table:** The voltage readings given in the table are negative with respect to chassis. They were taken with a 20,000 ohms/volt-meter under no signal conditions.

*Voltages*

Reference	Base	Emitter	Collector
TR1	0.75	0.6	5.7
TR2	0.9	0.7	6.0
TR3	1.0	0.7	5.75
TR4	4.0	4.2	0.15
TR5	0.15	—	4.5
TR6	4.7	4.6	9.0
TR7	4.5	4.6	—

**Dismantling:** Pull off the two front control knobs. Take off battery compartment cover and remove battery. Remove the Phillips-head screw

## RADIO SERVICING

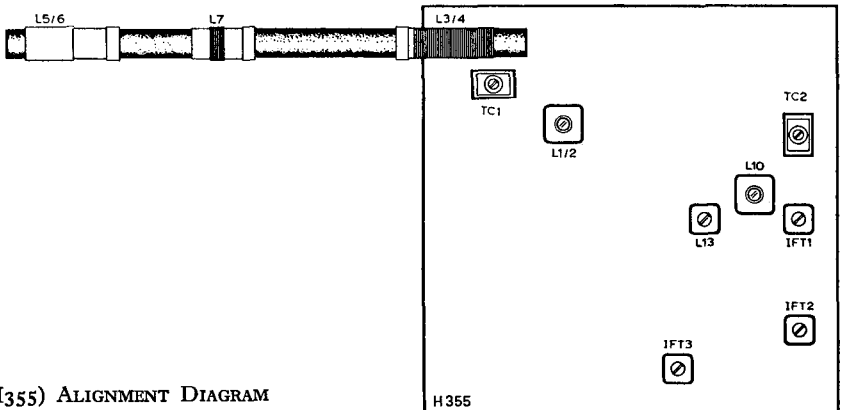


from top right-hand corner of battery compartment and remove the two long Phillips-head screws from back of cabinet.

The front panel assembly may then be removed by hinging it forward from the top, to the extent of the speaker leads (which may be unplugged), providing access to the component side of the printed circuit board.

For further dismantling, remove the five Phillips screws securing the circuit board and pointer rail moulding to the cabinet. Pull through the battery leads and connector. The complete assembly may then be removed by easing it out from the base of the circuit board, unplugging the lead to the telescopic aerial when board is raised.

When, reassembling, insert the chassis into the case top-first, easing the push-buttons into their slots from the top corner first. When replacing the front panel, first locate the three lugs into the slots provided in the case bottom.



**(H355) ALIGNMENT DIAGRAM**

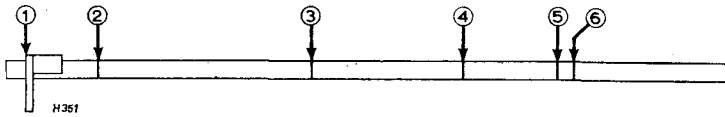
## FIDELITY

## Model RAD II

**General Description:** Portable receiver with 500 mW. power output. Speaker, elliptical 10 ohms. Battery, 9 volts.

**Wavebands:** L.W. 1200-2000 m. M.W. 187-555 m. B.S. 188-211 m.

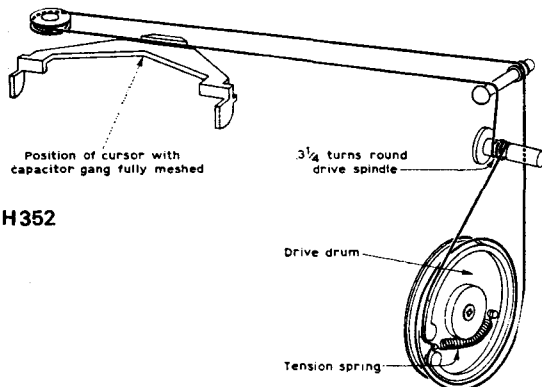
**Alignment (General):** To obtain access to coils and trimmers, remove chassis as described under Dismantling. Use the template (see appropriate diagram) to mark off calibration points on pointer rail, noting that the diagram is exactly half-size. The L.H. pointer is used for M.W. and the R.H. pointer for L.W. and B.S. Check that the L.H. pointer lines up with mark 1 when the gang is fully in.



(H351) TEMPLATE FOR ALIGNMENT MARKER POSITIONS (SHOWN EXACTLY HALF SIZE)

**Alignment (I.F.):** Connect output meter across speaker tags via an isolating capacitor. Connect signal generator across aerial section of tuning gang. Turn volume control to maximum and render oscillator inoperative by shorting L8. Switch to M.W. and with gang fully in inject 470 kc/s. Trim IFT<sub>3</sub>, IFT<sub>2</sub> and IFT<sub>1</sub> (in that order) for maximum output. Remove short from L8.

**Alignment (R.F.):** Inject signal via a loop placed near to, and coaxial with, the ferrite rod. B.S. Press B.S. button. Tune to Luxembourg (R.H. pointer to mark 5). Inject 1440 kc/s. and trim L8 (red core) for maximum output. M.W. Press M.W. button. Tune to 500 m. (L.H. pointer to mark 2). Inject 600 kc/s. and adjust L<sub>2/3</sub> (by sliding along rod) for maximum output. Retune to mark 3 (M.W. Luxembourg). Inject



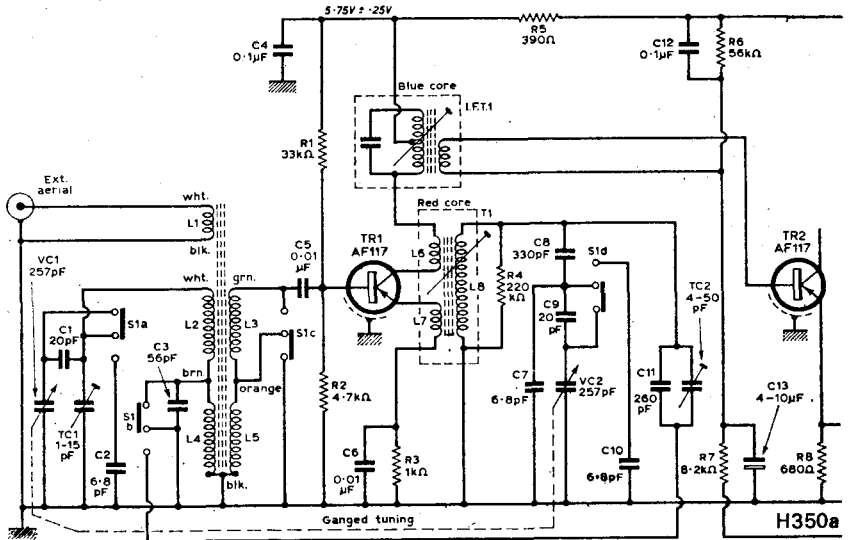
(H352) DRIVE CORD—  
MODEL RAD II

*Note:* Gang is fully in.

## RADIO SERVICING

1440 kc/s. and adjust TC1 for maximum output. L.W. Press L.W. button. Tune R.H. pointer to mark 6 and adjust TC2 for maximum output of B.B.C. Radio 2. Retune to mark 4 and adjust L4/5 (by sliding along rod) for maximum output of Allouis signal.

**Dismantling:** To remove cabinet back, take out the two slotted screws,  
(continued opposite)



(H350a) CIRCUIT DIAGRAM—MODEL RAD 11 (PART)

Note: The wavechange switch is shown in M.W. Position.

## G.E.C.

## Model G832

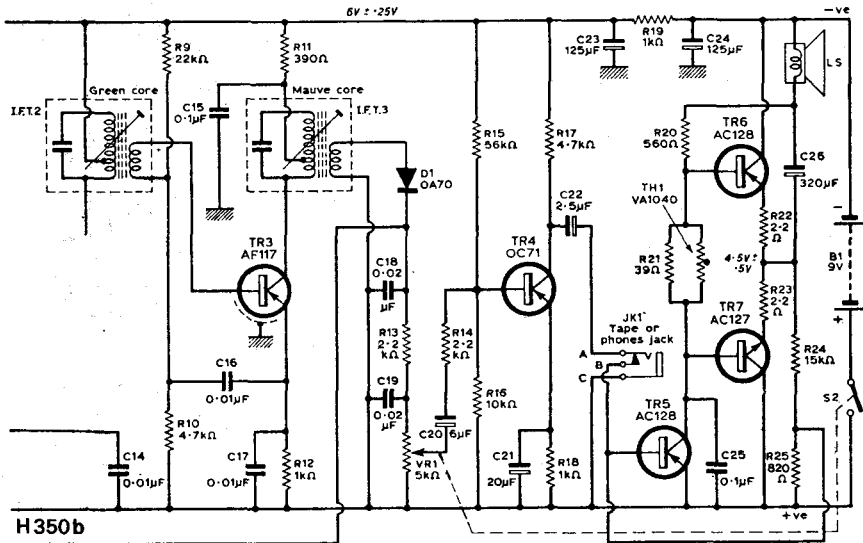
**General Description:** Three waveband mains/battery portable radio receiver covering long, medium and a bandsread portion of the medium waveband, incorporating eight transistors and a diode. Features include silicon transistors in R.F. and I.F. stages with a transformerless complementary push-pull output stage with temperature compensation, an output in excess of 1 watt, separate car aerial input circuits on all bands.

**Waveband Coverage:** Long Wave; 1200-2140 m. (250-140 kc/s.); Medium Wave; 190-550 m. (1580-540 kc/s.); Bandsread; 185-220 m. (1620-1365 kc/s.).

**Aerial:** Internal ferrite rod covering all bands. A socket is also provided to allow the connection of a car aerial.

**Output Sockets:** A socket is provided for feeding into an earphone or

then pull the fabric tab. This will give access to the tin dip side of the circuit board. For further dismantling, pull off tuning knob, unclip speaker tags, remove the two long-headed hexagon nuts (and their washers). The complete chassis may then be withdrawn from the case.



(H350b) CIRCUIT DIAGRAM—MODEL RAD 11 (CONTINUED)

external loudspeaker. A second socket is provided for feeding the input of a tape recorder.

**Loudspeaker:** High flux elliptical 8 in. × 5 in., 20 ohms impedance.

**Power Output:** 1.5 watts maximum.

**Battery Supply:** 18 volts provided by two PP9's or equivalent.

**Consumption:** 14 mA. quiescent.

**Intermediate Frequency:** 470 kc/s.

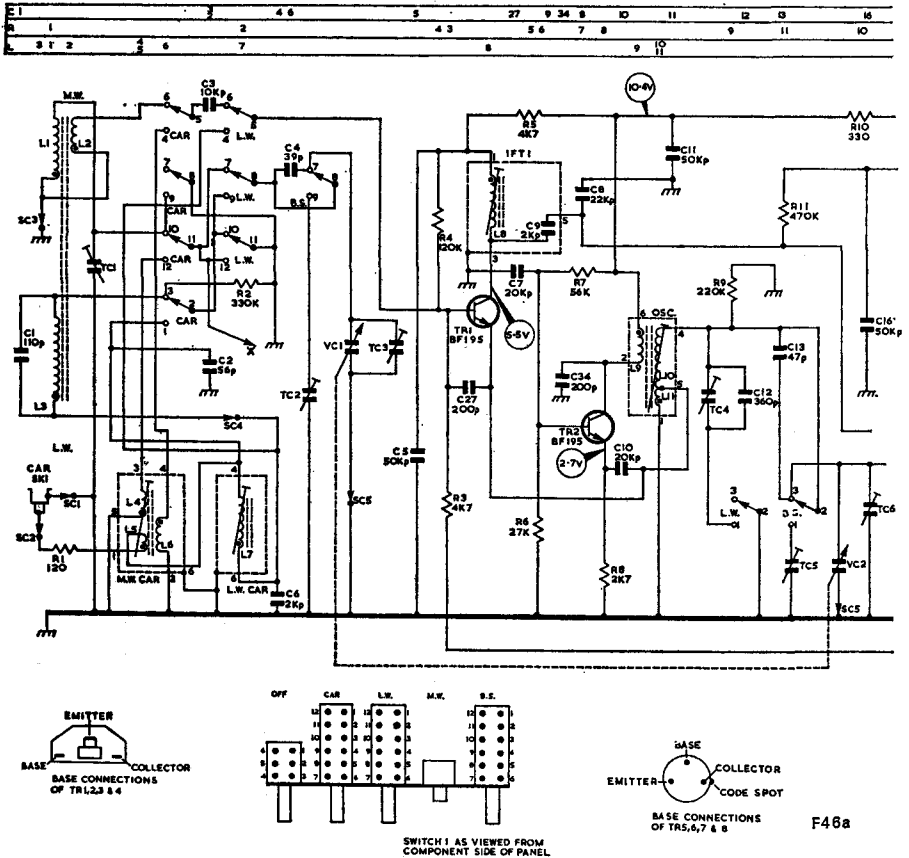
**Semiconductors:** TR1 BF195 Mixer/A.G.C.; TR2 BF195 Oscillator; TR3 BF194 1st I.F. amplifier; TR4 BF194 2nd I.F. amplifier; TR5 AC127 Audio Preamplifier; TR6 AC128 Audio driver; TR7 AC127 and TR8 AC128 Complementary p/p output; D1 OA90 Detector diode.

**Thermistor:** VA1040 Temperature stabilising.

**Mains Power Unit:** This assembly is in addition to batteries, and enables the receiver to be operated from a 200–250-volt A.C. mains supply.

**Dismantling:** For access to batteries, turn fastener on the end of the battery compartment cover in bottom of cabinet. This will release the cover.

# RADIO SERVICING



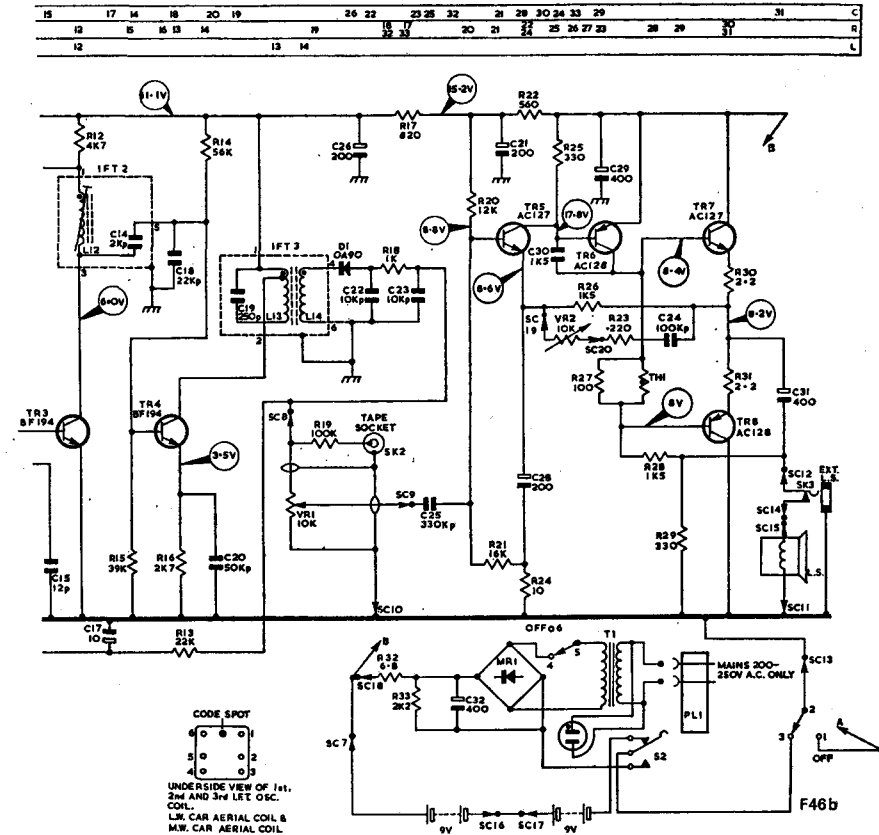
(F46a) CIRCUIT DIAGRAM—MODEL G832 (PART)

When replacing, ensure that correct polarity of batteries is observed, turn fastener until it locks, indicated by a click.

To remove back of cabinet, undo the three Phillips screws in bottom of the cabinet, draw back off at an angle of about 15°, thus providing access to the component side of the printed circuit board, and to all the cores and trimmers so that alignment may be carried out without further dismantling.

Secondary calibration markers in the form of solid triangles are provided on the scale. Primary calibration markers are provided on the scale back moulding.

To remove the circuit board, gang and scale back moulding from the cabinet, remove all control knobs, unsolder speaker leads and connecting leads to the power unit, undo the two cheese-headed screws holding the



(F46b) CIRCUIT DIAGRAM—MODEL G832 (CONTINUED)

Circuit diagram with the L.W. switch shown in the M.W. position and the car switch shown in the internal aerial position. The switch S2 is operated automatically when the mains plug is inserted into the receiver, thus switching out the internal batteries. The voltage and current measurements were obtained using a 20,000  $\Omega/V$  meter with the receiver switched to M.W., the gang capacitor fully meshed and no-signal input. The starts of windings are indicated with spots. *Note:* In later models a 2.2 k $\Omega$  10 per cent. R34 is fitted between the slider of VR1 and SC9.

power unit chassis to the cabinet front. These are situated between the chassis and the cabinet side.

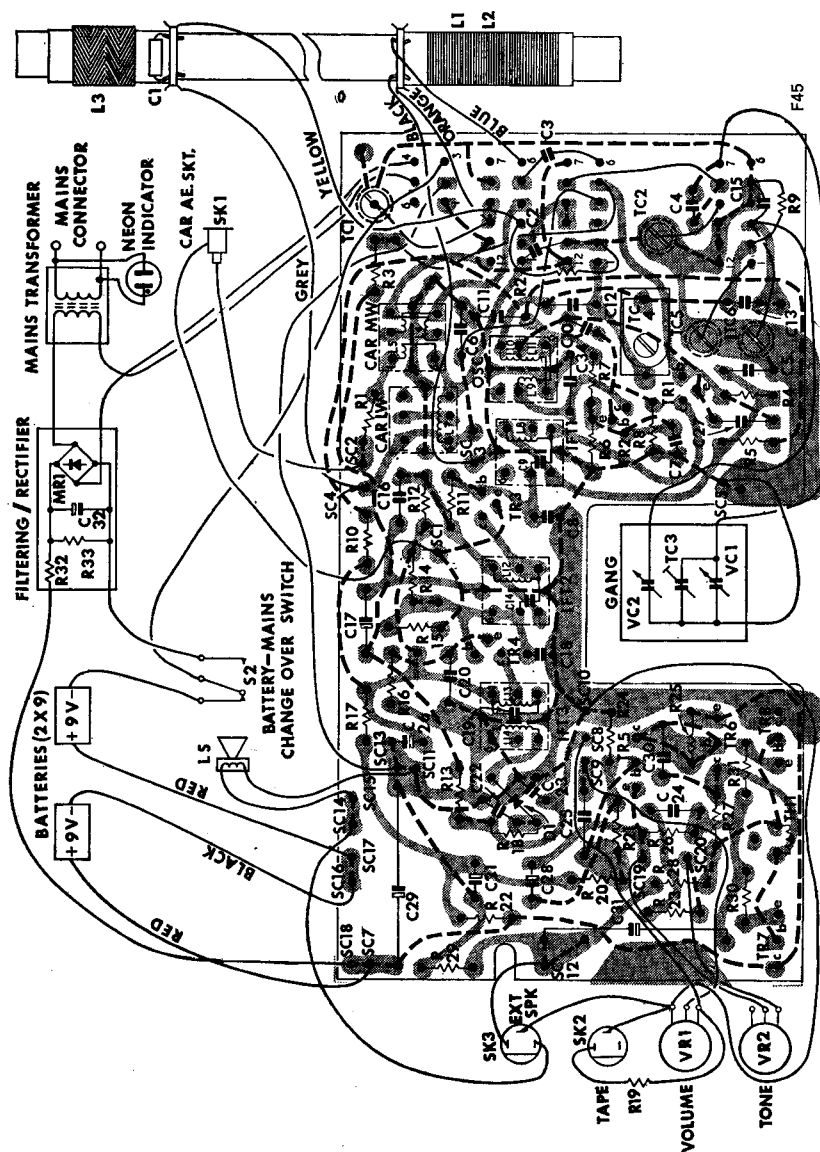
Withdraw the power unit. Remove the three cheese-head screws from the scale back moulding. Remove the hexagonal headed self tapping screw from the bottom of the circuit board. Carefully draw the assembly out away from the scale. It is then possible to examine or service the drive cord, gain access to the primary calibration markers or the sockets, etc.

### Alignment Procedure: Equipment Required:

1. An output meter (20 ohms impedance, 0–100 mW.). The output during alignment should not exceed 50 mW.



# RADIO SERVICING



(F45) THE CIRCUIT BOARD AND WIRING TAKEN FROM IT TO THE AERIAL COILS, POWER SUPPLIES AND SOCKETS. THE BOARD IS VIEWED FROM THE TIN DIPSIDE WITH COMPONENTS AS SEEN THROUGH THE BOARD. WIRING IN BROKEN LINE REPRESENTS PRINTED CONNECTIONS ON THE COMPONENT SIDE OF THE BOARD

# G.E.C.

2. A signal generator (low impedance output), amplitude modulated to 30 per cent. covering long, medium and bandsread bands.
3. Suitable insulated trimming tools.
4. Dummy aerial unit.

## Notes:

1. Before commencing alignment, check that the pointer lines up with calibration mark 1 with the tuning gang fully closed (i.e. max. capacity).
2. For I.F. alignment (operations 1 and 2 in the alignment table) the signal generator is connected to the base of TR<sub>1</sub> by a 0.1  $\mu$ F. capacitor.
3. For R.F. alignment (operations 3 to 8 in the alignment table) the signal generator is connected via a dummy aerial to the car aerial socket, and the CAR switch depressed.
4. For R.F. alignment (operations 9 to 12 in the alignment table) the output from the signal generator should be fed into a transmitting coil placed 6 in. from the ferrite rod and the car switch released. A suitable coil can be made with approximately 14 turns of 18 s.w.g. enamelled copper wire wound on a 1-in. former and spaced to a length of 1-1 $\frac{1}{4}$  in.

Op.	Set pointer to alignment mark	Waveband	Signal gen. frequency	Adjust for max. output
1 2	Gang closed	M.W. Repeat operation 1.	470 kc/s.	L13, L12, L8

## Car switch depressed

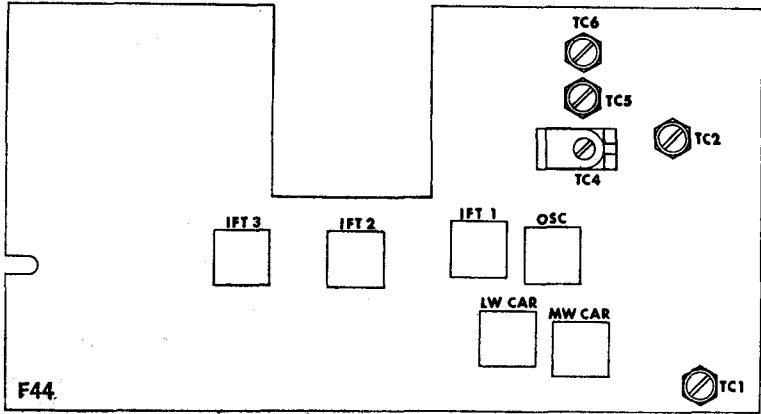
3	2	M.W.	600 kc/s.	L10 (oscillator coil) L4 (car aerial coil)
4	6	M.W.	1439 kc/s.	TC6 (oscillator trimmer) TC3 (car aerial trimmer)
5 6	5	Repeat operations 3 and 4.		
		L.W.	220 kc/s.	TC4 (oscillator trimmer) L7 (car aerial coil)
7	4 Approx. (tune to signal)	M.W.	908 kc/s.	Tuning knob
8	Leave as tuned in Operation 7	B.S.	1439 kc/s.	TC5 (oscillator trimmer)

## Car switch released

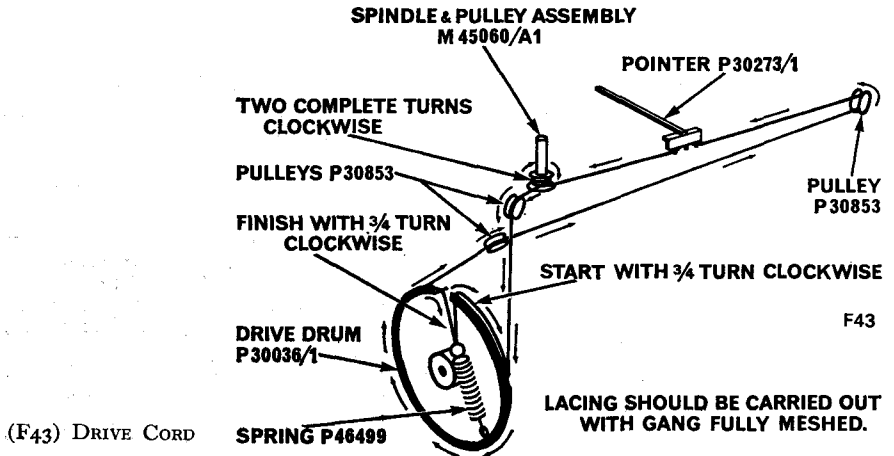
9	2 Approx. (tune to signal)	M.W.	600 kc/s.	L1 (rod aerial coil)
10	6 Approx. (tune to signal)	M.W.	1439 kc/s.	TC1 (rod aerial trimmer)
11	5 Approx. (tune to signal)	L.W.	220 kc/s.	L3 (rod aerial coil)
12	4 Approx. (tune to signal)	B.S.	1439 kc/s.	TC2 (rod aerial trimmer)

5. The alignment points referred to in the alignment table are raised pins on the lower edge of the front face of the scale back moulding.
6. All cores should be tuned to the outer position.
7. Adjustment of L<sub>1</sub> and L<sub>3</sub> where mentioned in the alignment procedure, is achieved by sliding the appropriate coil along the ferrite rod.
8. After alignment, the aerial coils should be resealed.

## RADIO SERVICING



(F44) ALIGNMENT COMPONENTS



(F43) DRIVE CORD

# G.E.C.

# Model G827

**General Description:** This receiver is similar to the model D527 described on page 188 in the 1966-67 volume.

## G.E.C.

## Model G983

**General Description:** Five-waveband A.M.-F.M. stereo radiogram, incorporating a four-speed automatic record player, five transistors, six diodes and five valves.

**Wavebands:** Long Wave: 158-270 kc/s. (1120-1900 m.). Medium Wave: 540-1500 kc/s. (200-555 m.). M.W./Bandspread: 1420-1700 kc/s. (180-211 m.). Short Wave: 5.7-16.5 Mc/s. (18-53 m.). V.H.F./F.M.: 87-108.5 Mc/s.

**Aerials:** A.M. (internal): Ferrite rod. A.M. (external): Conventional Long Wire. F.M. (internal): Dipole. F.M. (external): 75 ohm un-balanced dipole.

**Loudspeakers:** Two 8 in.  $\times$  5 in. wide-range high-flux loudspeakers, 3 ohms impedance. Provision is made for external speakers with internal/external switching.

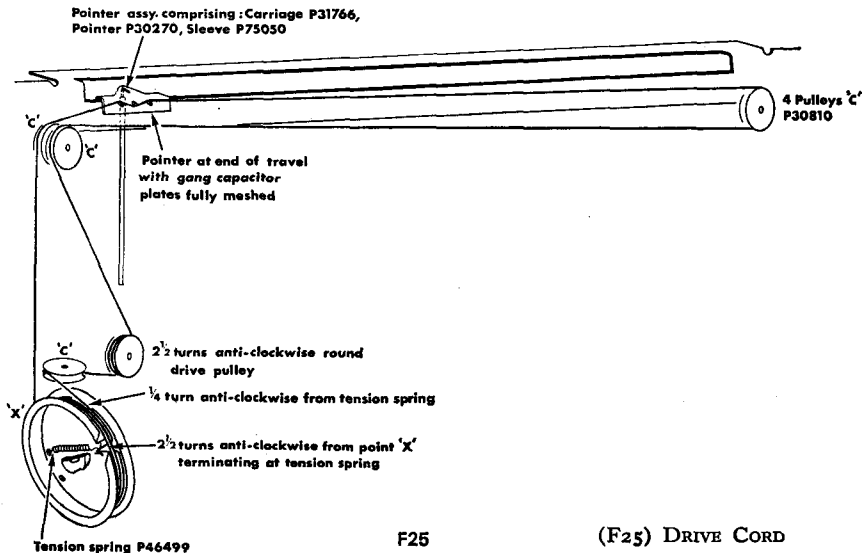
**Power Output:** Audio power output is 4 watts per channel; 8 watts total.

**Tape Output Socket:** Provision is made for the monitored recording of radio programmes and mono or stereo gramophone records; mono or stereo tape recordings may also be played back via the audio amplifiers. All connections are made by means of a 5-pin DIN plug.

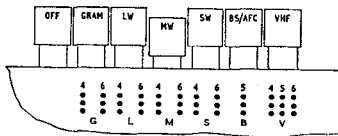
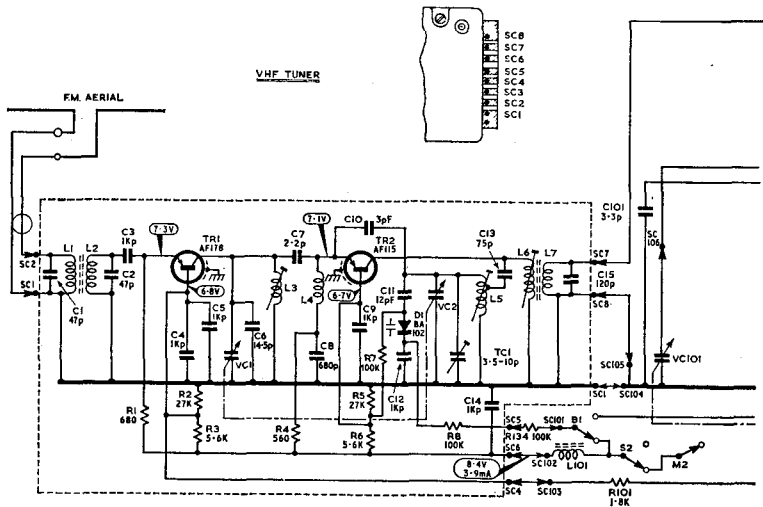
**Intermediate Frequencies:** A.M. 470 kc/s.; F.M. 10.7 Mc/s.

**Record Player Unit:** A Balfour four-speed auto-changer is fitted, with a Ronette 105S cartridge having a diamond stylus in the L.P. position.

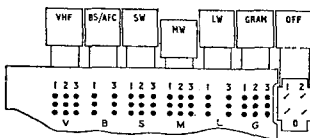
**Mains Input:** 200-250 volts, 50/60 c/s A.C. only.



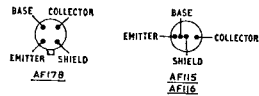
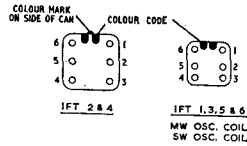
# RADIO SERVICING



SIOI VIEWED FROM BELOW



SIOI VIEWED FROM ABOVE



TRANSISTOR & COIL CONNECTIONS VIEWED FROM UNDERSIDE

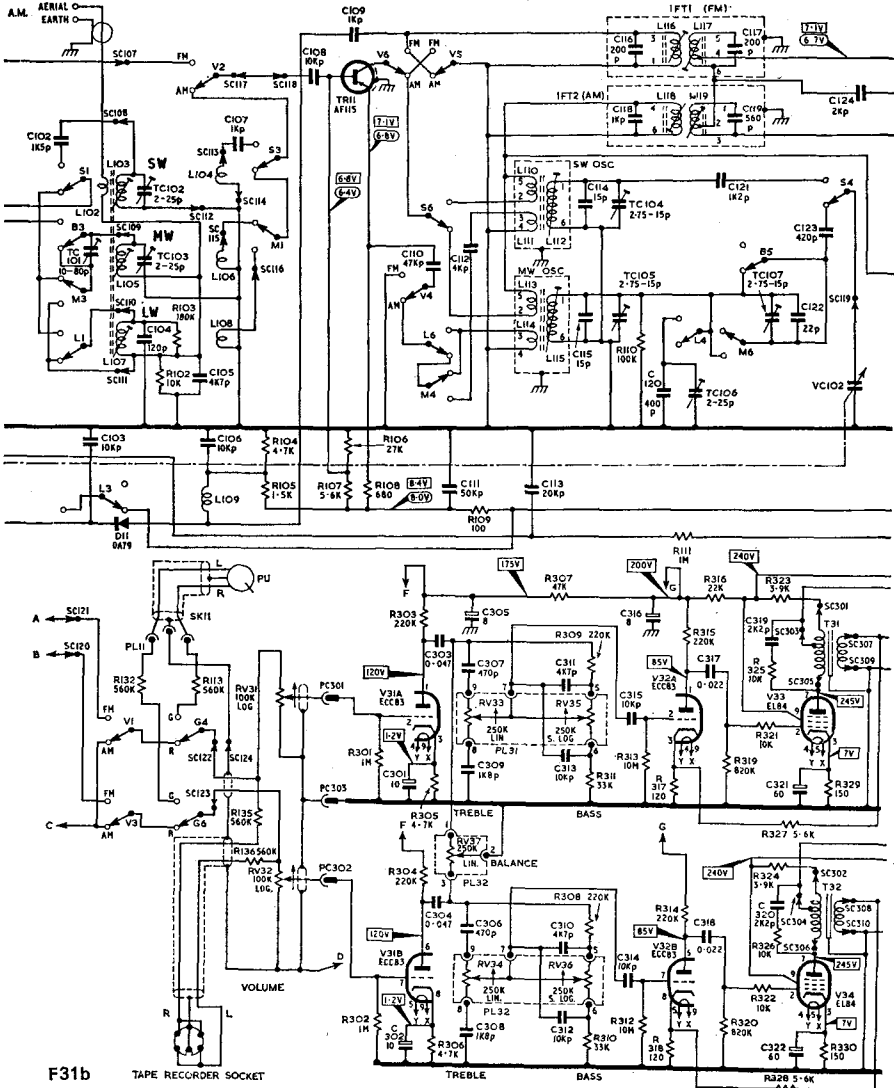
NOTES:-  
D.C. VOLTAGES MEASURED TO CHASSIS WITH 20,000Ω/VOLT METER. NO SIGNAL INPUT.  
MAINS INPUT 240V TO 240V/250V TAP  
[ ] MW [ ] VHF (WHERE DIFFERENT)  
SWITCHES SHOWN WITH MW BUTTON DEPRESSED & BS/AFC BUTTON OUT.

F31a

(F31a) CIRCUIT DIAGRAM—MODEL G983 (PART)

**Semiconductors:** TR<sub>1</sub>, AF178; Low noise R.F. amplifier (F.M. only). TR<sub>2</sub>, AF115; Oscillator/Mixer (F.M. only). TR<sub>11</sub>, AF115; Oscillator/Mixer (A.M.) 1st I.F. amp. (F.M.). TR<sub>12</sub>, AF116; 1st I.F. amp. (A.M.) 2nd I.F. (F.M.). TR<sub>13</sub>, AF116; 2nd I.F. amp (A.M.) 3rd I.F. amp. (F.M.). D<sub>1</sub>, BA102; Tuner A.F.C. diode (F.M. only). D<sub>12</sub>, OA79; A.G.C. clamping diode (A.M. only). D<sub>14/15</sub>, 2 × AA119; Ratio

# G.E.C.



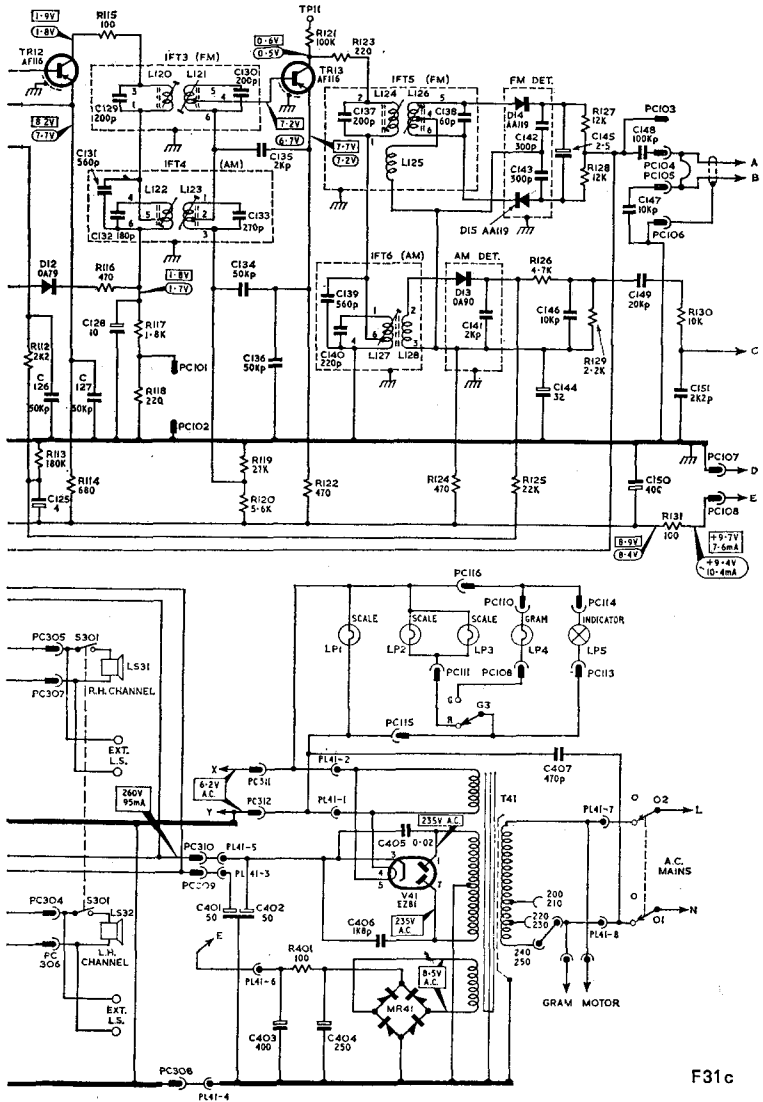
(F31b) CIRCUIT DIAGRAM—MODEL G983 (PART)

detector diodes (F.M. only). D13, OA90; Detector (A.M. only). D11, OA79; A.G.C. (F.M. only).

**Valves:** V31, ECC83; Audio pre-amplifier. V32, ECC83; Audio amplifier and driver. V33, EL84; Audio power output. V34, EL84; Audio power output. V41, EZ81; Power rectifier.

**Dismantling:** Access to all components is obtained by removal of the

# RADIO SERVICING



(F31c) CIRCUIT DIAGRAM—MODEL G983 (CONTINUED)

power pack and/or the main chassis. Remove the back panel. The power pack can then be removed after unplugging the octal plug from the main chassis and unscrewing the fixing screws. Removal of the rear fixing screws will enable the main chassis to be moved to the rear, free of its front fixing lugs. Before lifting out the chassis disconnect pickup lead by unplugging the 3-pin connector from the I.F. panel, and disconnect mains indicator

lamp leads and gram compartment lamp leads by unplugging the A.M.P. connectors from the push-button switch panel.

**Alignment Procedure:** Check that with the gang capacitor fully closed, the scale pointer coincides with the extreme low frequency end of the scale (logging scale at 100). A 3-ohm loudspeaker or dummy load must at all times be connected across each pair of output terminals. Damage to the output valves may result if the output terminals are left open-circuited. It is important that all cores are tuned to the first peak from the outer ends of the coils.

**A.M. Alignment:** Connect an A.C. volt-meter across one loudspeaker or dummy load. Reference level is 0.8 volts (200 mW.). As the circuits are brought into alignment, the signal input should be reduced so that the output does not exceed the reference level. Set the volume control at maximum, the treble control at minimum and the bass and balance controls in the mid-position. Switch receiver to M.W. and set gang capacitor at maximum. Feed a 470 kc/s. signal to TR<sub>11</sub> base via a 0.01  $\mu$ F. capacitor. Adjust L<sub>127</sub>, L<sub>123</sub>, L<sub>122</sub>, L<sub>119</sub>, L<sub>118</sub> in that order, for maximum output. Connect the signal generator via a dummy aerial to the A.M. aerial and earth socket.

**A.M. Alignment Table:**

Receiver setting				Signal generator		
Operation	Waveband	Tuning scale	Logging scale	Frequency	Signal level	Adjust for max. output
1	M.W.	500 m.	77	600 kc/s.	6 $\mu$ V.	L <sub>115</sub> and L <sub>105</sub>
2	M.W.	H.F. end	0	1500 kc/s.	6 $\mu$ V.	TC <sub>105</sub> and TC <sub>103</sub>
3	M.W.			Repeat 1 and 2.		
4	M.W.B.S.	"300" on M.W. scale	25	1500 kc/s.	3 $\mu$ V.	TC <sub>107</sub> and TC <sub>101</sub>
5	L.W.	1360 m.	31	220 kc/s.	25 $\mu$ V.	TC <sub>106</sub> and L <sub>107</sub>
6	S.W.	6.5 Mc/s.	72	6.5 Mc/s.	25 $\mu$ V.	L <sub>112</sub> and L <sub>103</sub>
7	S.W.	15 Mc/s.	6	15 Mc/s.	25 $\mu$ V.	TC <sub>104</sub> and TC <sub>102</sub>
8	S.W.			Repeat 6 and 7.		

**Notes:** A trimming tool made of insulating material must be used for the adjustment of all aerial trimmers and the B.S. oscillator trimmer. L<sub>105</sub> and L<sub>107</sub>, on the ferrite rod, should be adjusted by sliding the coils along the rod. L<sub>103</sub>, on the ferrite rod, should be adjusted by altering the spacing of the turns. Care must be taken to avoid hand capacitance effects. TC<sub>102</sub> must be adjusted to the peak which occurs with the trimmer furthest in.

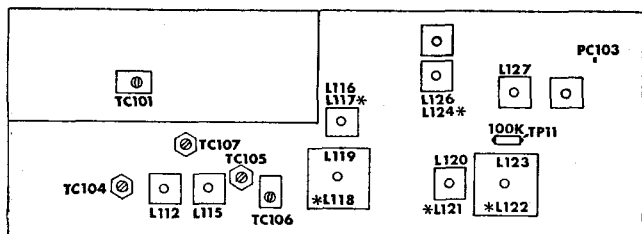
**F.M. Alignment:** The A.F.C. button must be *out* during F.M. alignment.

**Sweep Frequency Method:** It is strongly recommended that the F.M./I.F. tuned circuits are aligned using a wobulator set to a deviation of approx.  $\pm 300$  kc/s. about a centre frequency of 10.7 Mc/s. displaying the I.F. response and ratio detector curves on an oscilloscope.

Connect the wobulator signal output to the base of TR<sub>11</sub> via a 0.01  $\mu$ F. capacitor. Connect the oscilloscope diode probe to test point TP<sub>11</sub> (i.e. free end of R<sub>121</sub>, 100 k $\Omega$  resistor). Detune the secondary of IFT<sub>5</sub> (L<sub>126</sub>)



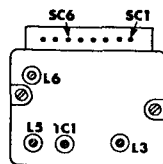
## RADIO SERVICING



\*THESE COILS ARE ADJUSTED FROM UNDERNEATH.

(F27) ALIGNMENT COMPONENTS

F27



by unscrewing the dust core so that it protrudes approx.  $\frac{1}{8}$  in. from the top of the coil former.

Adjust L124, L121, L120, L117 and L116 in that order for maximum amplitude and symmetry about 10.7 Mc/s.

Transfer wobblator signal output to SC6 (positive supply point) on tuner, via a  $0.01 \mu\text{F}$ . capacitor, earthy lead to SC1. Adjust L6 for maximum amplitude and symmetry about 10.7 Mc/s.

Connect oscilloscope direct input (i.e. without diode probe) to PC103. Screw in core of L126 and adjust for most symmetrical "S" curve about 10.7 Mc/s.

**Spot Frequency Method:** This method should be used if a wobblator and display equipment are not available. Connect a volt-meter of not less than  $50 \text{ k}\Omega$  resistance across C145. Feed a 10.7 Mc/s. unmodulated signal to the base of TR11 via a  $0.01 \mu\text{F}$ . capacitor. Detune the secondary of IFT5 (L126) by unscrewing the dust core so that it protrudes approx.  $\frac{1}{8}$  in. from the top of the coil former. Detune L6 by unscrewing its core.

Adjust L124, L121, L120, L117 and L116 in that order, for maximum reading, adjusting the input signal to keep the output voltage at approx. 0.5 volt.

Feed a 10.7 Mc/s. signal to SC6 (positive supply point) on tuner, via a  $0.01 \mu\text{F}$ . capacitor, earthy lead to SC1. Adjust L6 for maximum output.

Connect a  $100 \mu\text{A}$ . meter between the junction of R127/R128 (PC103) and the junction of R131/C150, the negative to PC103. Adjust L126 by screwing in the dust core. As the core is screwed in, the current will first increase, then decrease to zero, and reverse. The correct setting is for zero meter reading.

**R.F. Alignment:** Connect an F.M. signal generator to the F.M. aerial socket. Set scale pointer to 88. Inject an 88 Mc/s. signal and adjust the core of L5 to tune in the signal, then adjust the core of L3 for maximum output.

Set pointer on 108. Inject a 108 Mc/s. signal and adjust TC1 to tune in the signal. Repeat the oscillator adjustment at 88 Mc/s. and then again at 108 Mc/s. This procedure may have to be repeated a number of times until correct calibration is obtained.

Input level should be  $2.5 \mu\text{V}$ . for a reading of 0.8 volts.

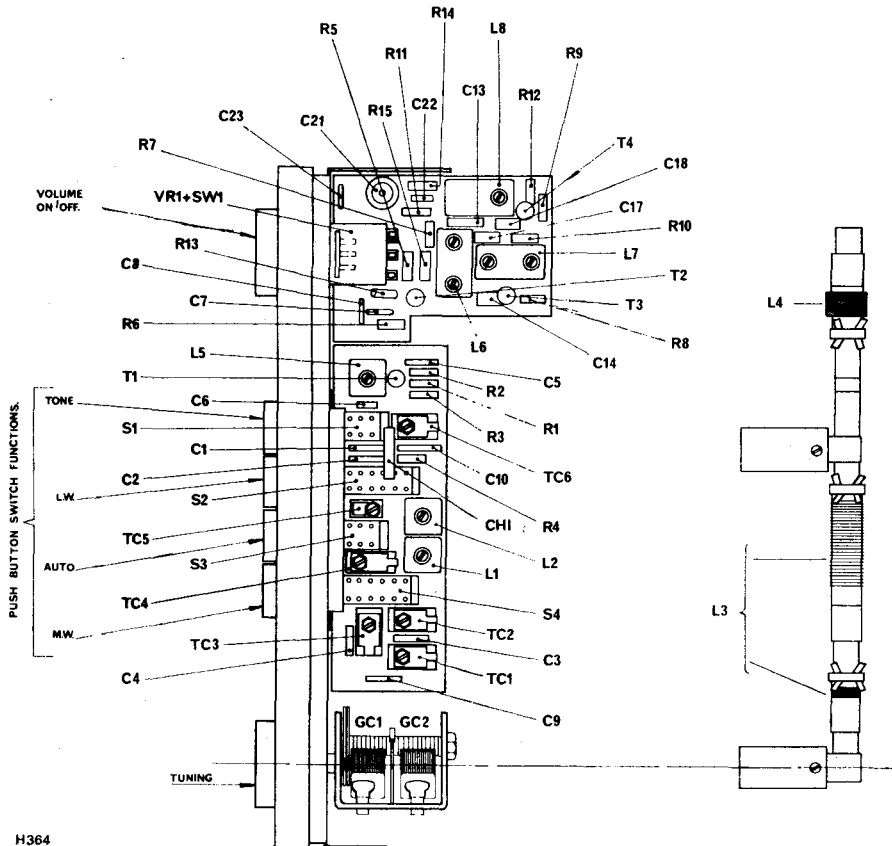
## HACKER

## AUTOCRAT

## Model RP33

**General Description:** This receiver is a battery-operated transistor portable covering M.W. and L.W. broadcast bands. Provision for car operation has been made including extra screened aerial coils and S.W. filters on the car aerial input sockets. The ferrite rod aerial can be switched out of circuit. Cabinet dimensions are designed to suit most glove compartments and dashboard tray configurations.

**Features:** 1. Auxiliary tape recorder or personal earphone socket. 2. Car aerial socket with screened aerial coils and S.W. filter. 3. Temperature and voltage compensation in amplifier circuit. 4. Push-button, wave change, tone control and car operation switches. 5. Elliptical speaker 25 ohms. 6. Two PP9 batteries, quiescent current 19 mA. approx. 7. Ferrite rod for portable use with two screened coils for car operation.



(H364) TUNER COMPONENT LOCATIONS—MODEL RP33

## RADIO SERVICING

**Wavebands:** L.W. 1070-2000 m. M.W. 170-590 m.

**Removal from Case:** With front facing forward, open the back by placing hands on the sides and easing the back by pressing the top of the back away with the thumbs. Disconnect batteries and remove. Remove 5-pin plug from amplifier and remove green/black connections to aerial socket. Remove clamps fixing chassis to cabinet interior. Remove domes covering handle securing screws by gently levering off. Take out handle fixing screws and remove handle. Remove amplifier which is secured by 4BA nuts. Unplug blue/black wire from earphone socket. To remove speaker, unplug speaker leads. The speaker is fixed with  $4 \times 4$ BA nuts. (Take care in replacing—not to over-tighten.) Remove grille and baffle (fixed by  $4 \times 4$ BA nuts).

**Push-Button Switch:** This component is of rigid design and should give little trouble. In the event of replacement being necessary, considerable care must be taken in removing the switch to avoid damage to the printed circuit board. It is necessary to remove all the solder from the connecting pins before attempting to take the switch out. This operation is facilitated by the use of a solder "sucker".

It is very important to position the new switch correctly on the printed board and a spacing jig consisting of a small piece of 16-gauge aluminium or brass giving a clearance of  $\frac{1}{16}$  in. will ensure that sufficient spacing is left between the body of the switch and the circuit board.

**Ferrite Rod:** Replacement must always be followed by R.F. realignment, an important feature of which is correct positioning of the coils on the ferrite rod. The correct position of the M.W. coil is such that the tags of the coil are in the physical centre of the rod, i.e. 4 in. from the end.

**I.F. Transformers:** When any I.F. transformer is replaced, I.F. realignment will be necessary. The I.F. transformers are aligned visually in the factory and therefore should not just simply be peaked for maximum output. Instability is likely to result if the circuits are peak tuned.

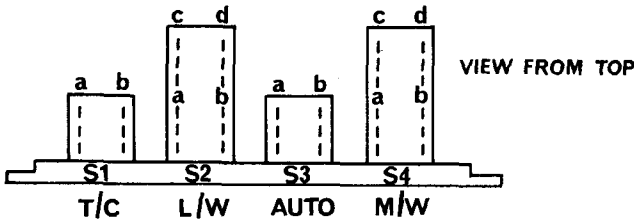
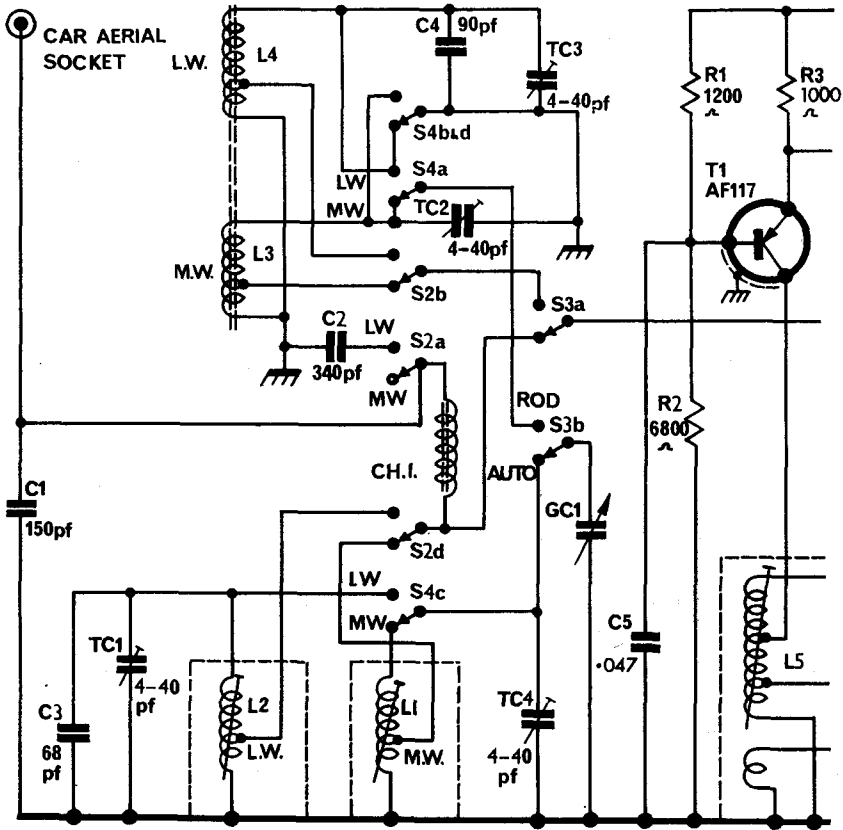
**Speaker:** Extreme care must be observed when replacing the speaker to avoid damaging the cone.

**Static Voltages:** All voltages measured with Avometer 8—with respect to H.T. negative rail. Supply 18 volts H.T. rail 7.7 volts.

<i>Tuner</i>	<i>T1 volts</i>	<i>T2 volts</i>	<i>T3 volts</i>	<i>T4 volts</i>
C	7.7	7.7	7.7	7.7
B	1.05	1.0	1.0	1.85
E	0.9	0.9	0.9	1.55

<i>Amplifier</i>	<i>TR1</i>	<i>TR2</i>	<i>TR3</i>	<i>TR4</i>	<i>TR5</i>
Vce	7.1	9.0	0.3	9.1	8.9
Vcb	4.7	8.75	0.125	9.0	8.72
Vbe	0.625	0.175	0.175	0.1	0.15
Ic	0.58 mA.	7.1 mA.	—	4 mA.	4.25 mA.

# HACKER

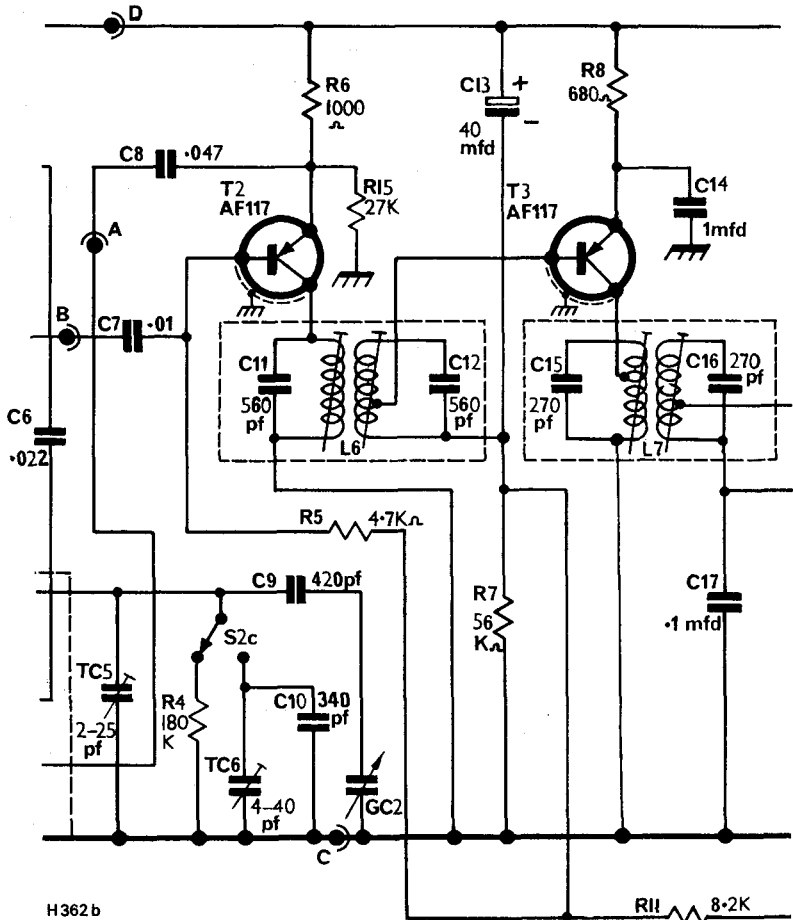


H362a

(H362a) TUNER CIRCUIT DIAGRAM—MODEL RP33 (PART)

**Quiescent Current and Mid-Point Voltage:** 1. Connect a 25-30-ohm output meter to the output of the amplifier, having first disconnected the speaker. 2. Short-circuit the input of the amplifier to Earth. 3. Connect a 0-10 Ma. D.C. meter between points of test link, having first cut link.

# RADIO SERVICING



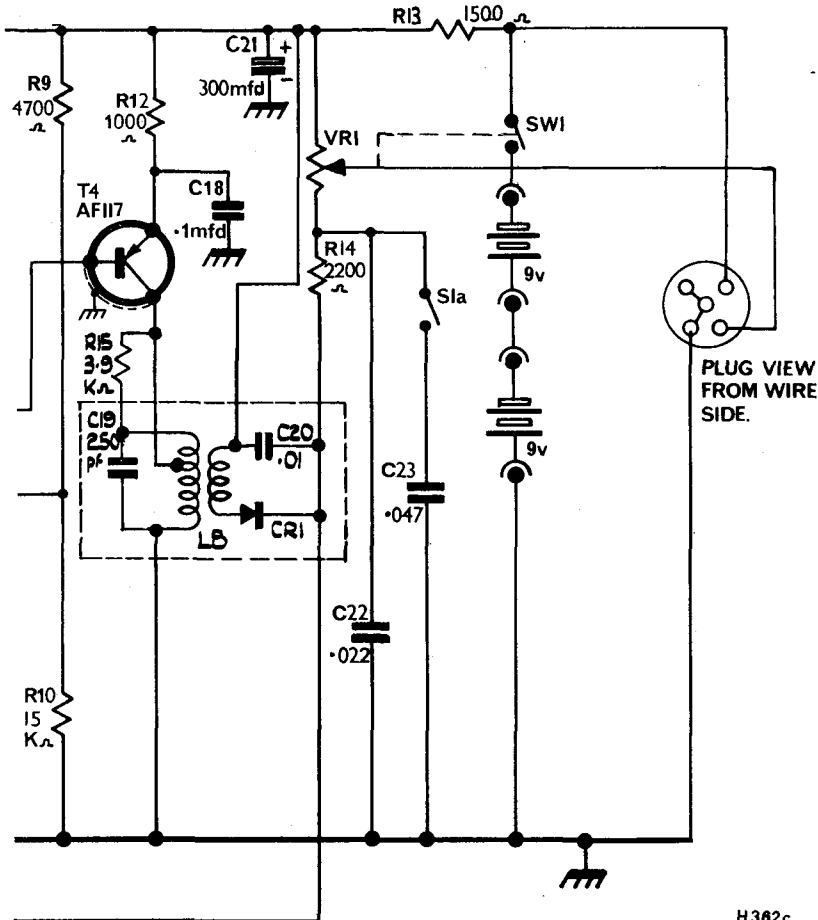
(H362b) TUNER CIRCUIT DIAGRAM—MODEL RP33 (PART)

4. Connect 0-10-volt D.C. volt-meter between the junction of  $R_{14}/R_{15}$  and Earth (—ve to Earth). 5. Connect 18 volt supply. 6. Adjust  $RV_2$  to give a quiescent current reading of 4 Ma. Also adjust  $RV_1$  to give a mid-point voltage reading of 8.85 volts. Readjust  $RV_2$  and  $RV_1$  to give a balanced reading of 4 Ma. and 8.85 volts respectively as necessary.

**Stabilisation:** With conditions as for Quiescent Current and Mid-point Voltage: 1. Reduce supply volts to 12 volts. 2. Read fall in quiescent current reading—this should be 2.4 minimum. 3. *Switch off supply* and resolder test link. Seal  $RV_2$ .

**Sensitivity:** 1. Connect output meter and C.R.O. across speaker ter-

# HACKER



H362c

(H362c) TUNER CIRCUIT DIAGRAM—MODEL RP33 (CONTINUED)

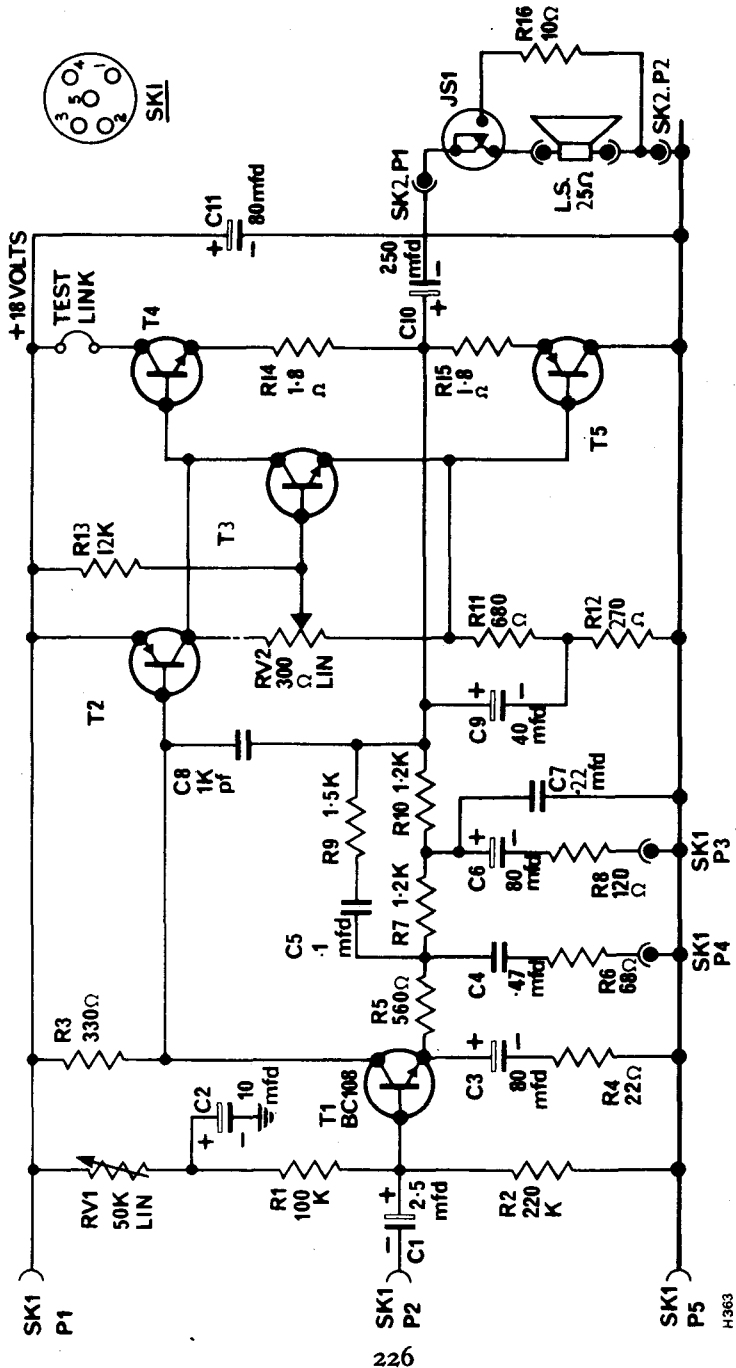
minals. 2. Inject a signal at 1000 c/s. from audio generator to input of amplifier to produce 1 watt undistorted output. The input signal required to produce this output should be 30 millivolts  $\pm 1$  dB.

**Note:** Some uneven clipping of the waveform near the rated power output may be noticed, if so, adjust RV1 slightly to produce even clipping.

**Frequency Response:** With conditions as for Sensitivity, reduce input to produce an output of 100 mV. Then keeping input voltage constant: 100 c/s. (plus 5 dB), 1000 c/s. (0 dB) and 6000 c/s. (plus 4 dB). Limits plus or minus 2 dB.

**Stability:** Remove input and speaker load (30 ohms). With C.R.O.

# RADIO SERVICING



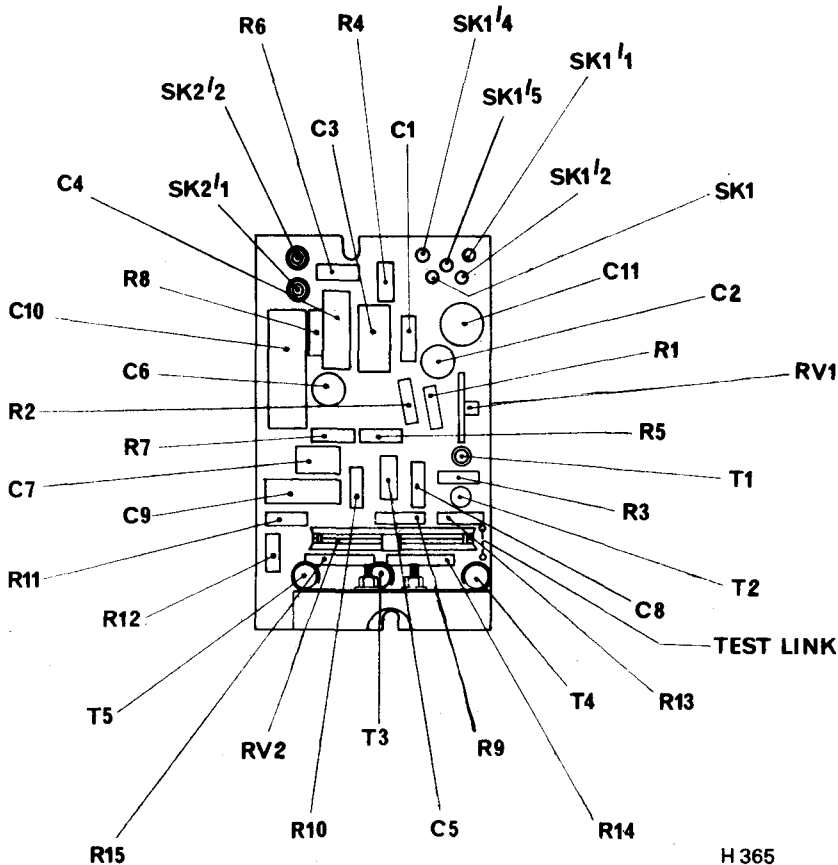
(H363) CIRCUIT DIAGRAM OF A.F. STAGES—MODEL RP33

# HACKER

connected across speaker terminals there should be no oscillation visible on trace.

**Noise:** With output meter (25–30 ohms) connected in place of speaker, load input with 47k ohm resistor. Noise level should be greater than –60 dB on 1 watt. Quiescent current 14 mA. maximum.

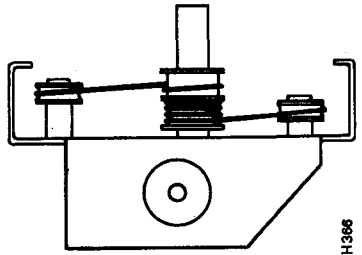
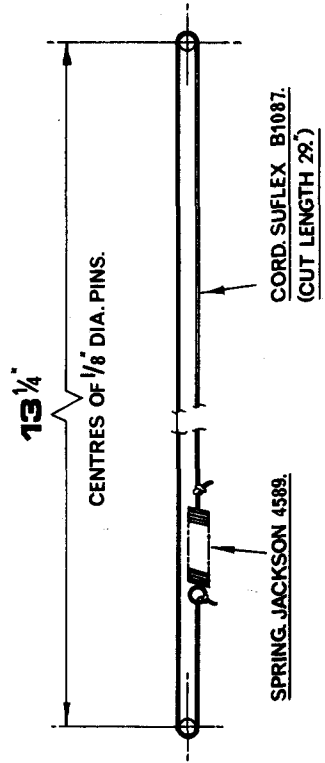
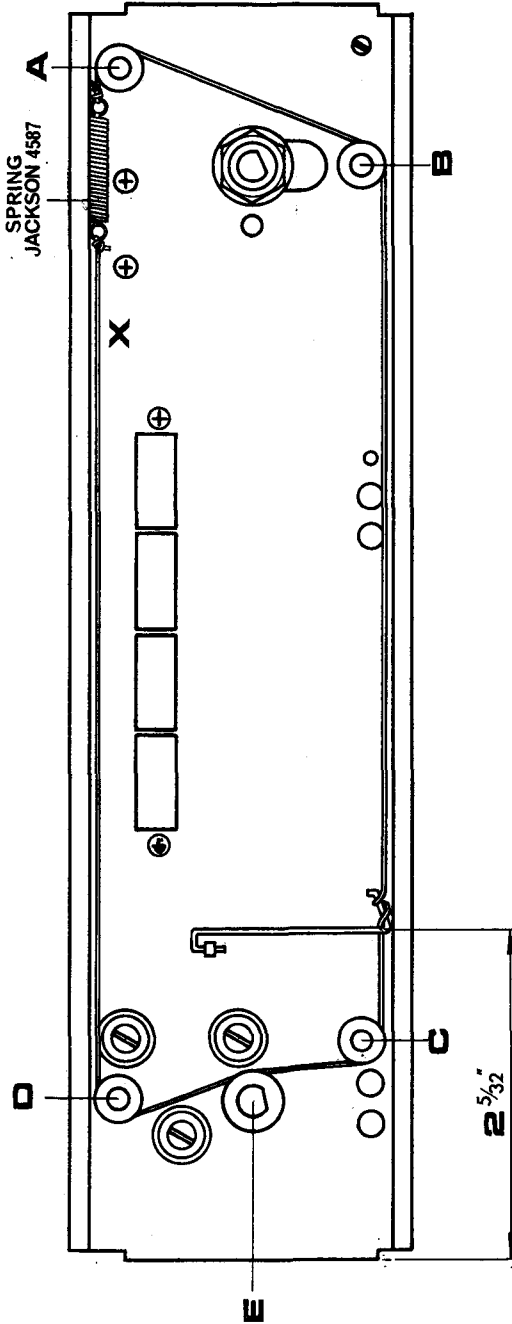
**Alignment (I.F.):** Switch to M.W. with Auto button up. Connect C.R.O. and millivoltmeter across volume control (VR1). Connect sweep generator (via 0.1  $\mu$ F.) across gang (GC1). Keep input signal low to avoid A.G.C. action. Adjust L6, L7 and L8 for a symmetrical shape having a bandwidth of 6 kc/s. at 3 dB down. Remove sweep generator and replace by R.F. generator. The sensitivity should be 25  $\mu$ V. for an output of 25 mV.



(H365) AMPLIFIER COMPONENT LOCATIONS—MODEL RP33



# RADIO SERVICING



(H366) DRIVE CORD—MODEL RP33

**Alignment (R.F.):** Connect R.F. generator via dummy aerial (400 ohms) to car aerial socket. Switch to M.W. Auto. Connect millivoltmeter across  $VR_1$ .

1. Inject a signal of 660 kc/s. and with the pointer set to 500 m., adjust  $L_5$  and  $L_1$  in turn for maximum output. 2. Inject a signal of 1500 kc/s. and with the pointer set to 200 m. adjust  $TC_5$  and  $TC_4$  for maximum output. 3. Repeat 1 and 2 until no further improvement can be made. 4. Switch receiver to L.W. Auto. 5. Inject a signal of 200 kc/s. and with the pointer set to 1500 m., adjust  $TC_6$  for maximum output. 6. Inject a signal of 174 kc/s. and tune in receiver, adjust  $L_2$  for maximum output. 7. Inject a signal of 260 kc/s. and tune in receiver, adjust  $TC_1$  for maximum output. 8. Check sensitivity. The following inputs should be sufficient to produce 25 mV. across  $RV_1$ . 600 kc/s. (10  $\mu V$ .), 1500 kc/s. (20  $\mu V$ .), 174 kc/s. (20  $\mu V$ .) and 260 kc/s. (15  $\mu V$ .). 9. Disconnect dummy aerial and feed R.F. signals via loop. Switch to M.W. with Auto button in up position. 10. Inject a signal of 600 kc/s. via the loop and adjust the small winding of  $L_3$  on the rod for maximum output.

*Note:* The tags on the major winding of  $L_3$  must be in the centre of the 8-in. aerial rod.

11. Inject a signal of 1500 kc/s. via loop, tune in receiver and adjust  $TC_2$  for maximum output. 12. Repeat until no further improvements can be made. 13. Switch receiver to L.W. Inject via loop, a signal of 174 kc/s., tune in receiver and adjust  $L_4$  on the rod for maximum. 14. Inject, via the loop, a signal of 260 kc/s., tune in receiver and adjust  $TC_3$  for maximum output. 15. Check sensitivity. With loop at 24 ins. the following inputs should be sufficient to produce 25 mV. across  $RV_1$ . 600 kc/s. (1.5 mV.), 1500 kc/s. (1.5 mV.), 174 kc/s. (10 mV.) and 260 kc/s. (8 mV.).

**Drive Cord:** Tape cord temporarily to chassis in position X with spring in position drawn. Proceed round pulley A to pulleys B and C and wind 4 turns on to drum E in anti-clockwise direction on end of drum nearest to chassis. Carry cord through slot in drum centre flange and wind on 1 turn. Then proceed to pulley D releasing taped cord. Pointer should then be positioned as shown before checking calibration.

**Modifications:** 1. The first few receivers used the old LFK4 package of transistors in the amplifier.  $TR_1$  (BC108),  $TR_2$  (OC81),  $TR_3$  (AC127),  $TR_4$  (AC127) and  $TR_5$  (OC81). *Note:*  $TR_1$  not in package.

Later receivers use the new LFK4 package,  $TR_1$  (BC108),  $TR_2$  (AC128),  $TR_3$  (AC127),  $TR_4$  (AC127) and  $TR_5$  (AC128). *Note:*  $TR_1$  not in package.

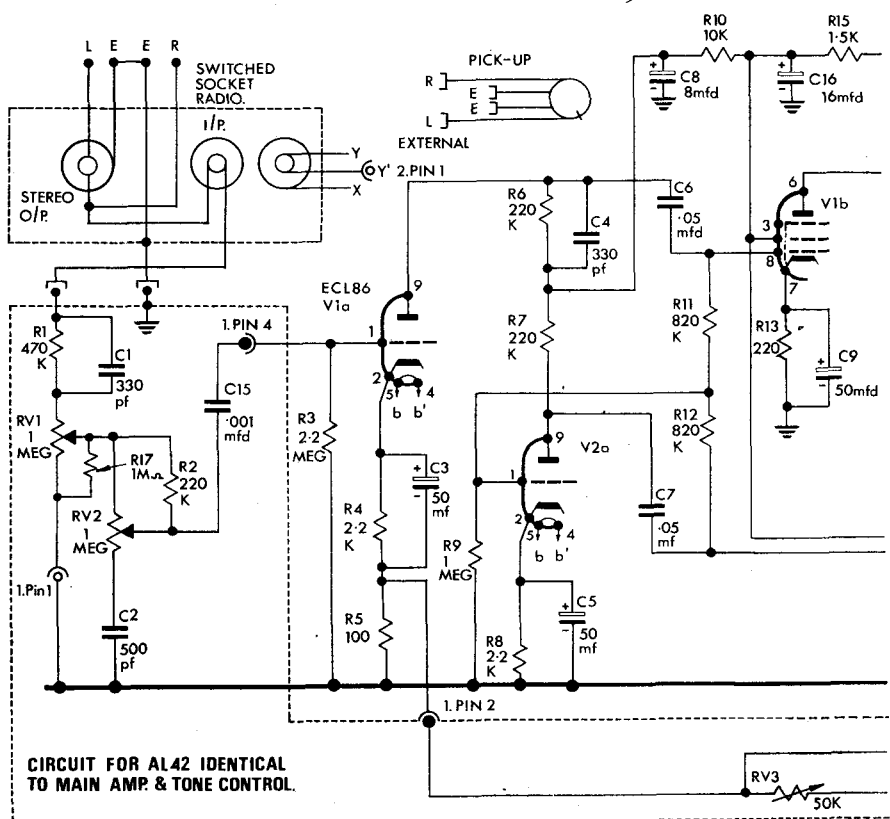
2.  $L_8$  (3rd I.F.T.) was changed to include screen plate in order to reduce tendency to instability at L.F. end of M.W. band with new batteries.

3. A resistor (3.9k) has been added between primary collector top of  $L_8$  (3rd. I.F.T.) and E, on some models only.

**HACKER****GONDOLIER****Model GP42**

**General Description:** The "Gondolier" model GP42 is an A.C. mains-operated transportable record reproducer with 7 watts push-pull output and the Garrard 3000 record changer. The record reproducer is stereo adaptable and a speaker amplifier unit, AL42 of similar construction is available. The following service information is equally correct for both equipments.

**Features:** 1. Wide range elliptical loudspeaker with 15 ohms voice coil. 2. Ample power reserve. 7 watts. 3. Independent bass and treble controls. 4. Either Garrard model 3000 or SP25 (single player). 5. Illuminated controls externally situated. 6. Socket for radio and tape play back utilising internal amplifier and speaker. 7. Switched socket for external hi-fi speaker (15 ohms) or tape recorder. 8. Quick action securing device for transit of free floating record changer. 9. Transformer isolated from the



H367a

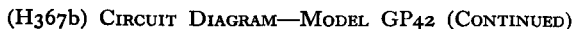
(H367a) CIRCUIT DIAGRAM—MODEL GP42 (PART)

mains, completely safe. External equipment such as tape recorder, etc., may be added without fear of shock.

**Pickup:** Acos GP96/1 turnover stylus. LP/Stereo frequency response 30 c/s. to 15 kc/s. separation better than minus 15 dBs at 1000 c/s.

**Installation:** Ensure that the mains voltage adjustment is correct for the supply from which it is to be used. Access to the voltage adjustment panel is obtained by removing the plate at the rear of the case. Wherever possible a 3-pin mains plug should be used with the green lead connected to the earth pin. If a 2-pin plug must be used, reverse the plug connections for minimum hum with the volume control advanced towards maximum. Loosen transit screws fully before use. Check stylus pressure and adjust if necessary to 5-6 grammes, measured with a pressure gauge.

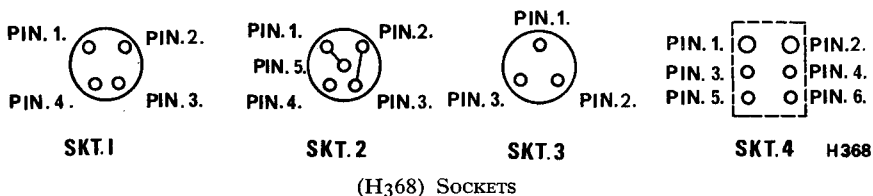
**Stereophonic Reproduction:** Setting up for stereophonic reproduction is very simple. Couple the two units by the co-axial lead supplied, i.e. from



## RADIO SERVICING

the stereo output of the GP42 to the input socket of the AL42. Each unit has independent volume controls. These must be set to approximately the same level on each unit. The calibrated tone control panel will help the operator to determine the positions of the volume, treble and bass controls. If, however, the treble or bass controls are adjusted on one unit to suit various makes of records, the corresponding changes must be made on the other unit. To help obtain a balance between the two units, it is advisable to play an ordinary monophonic record and to adjust the volume controls on each unit so that the apparent sound is "moved" to the centre of the two units. This system enables the operator to adjust the two units for optimum reproduction in stereophonic sound.

**Colour Coding (L.H. and R.H. Channels):** Red for Live R.H. channel. Green for Earth GP42. White for Live L.H. channel. Blue for Earth AL42.



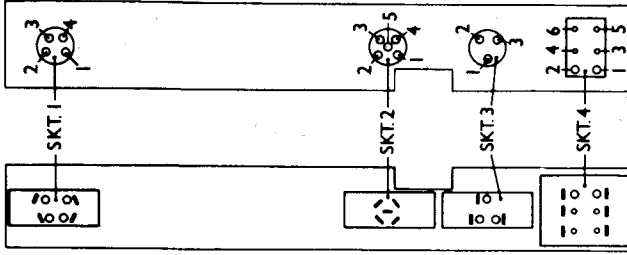
**Removal (Motor Board and Changer):** Remove four fixing screws located on the motor board. Lift motor board and unplug motor supply (a 3-pin plug located on the amplifier chassis) and the four pickup slip-on tags. The motor board can now be completely withdrawn. To remove auto changer from motor board, it is necessary to depress auto changer to the motor board, to release the pressure on the two locking clips situated on the underside of the board. Twist clips to an upright position and withdraw auto changer. For assembly reverse procedure.

*Note:* Pickup connecting leads must be reconnected in the same order as when they were removed and in the same position. Incorrect positioning of the leads could result in excessive hum and if they are pulled too tight they can cause acoustic feedback.

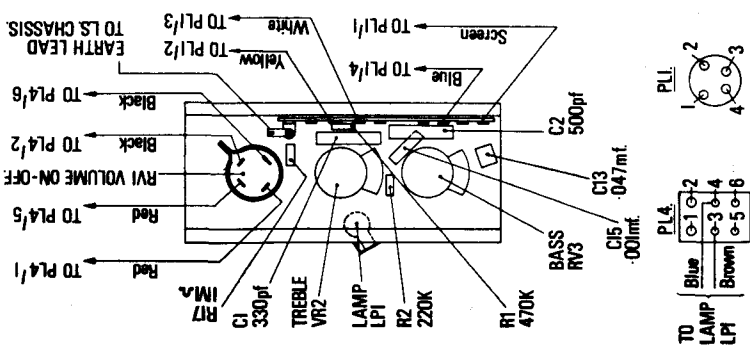
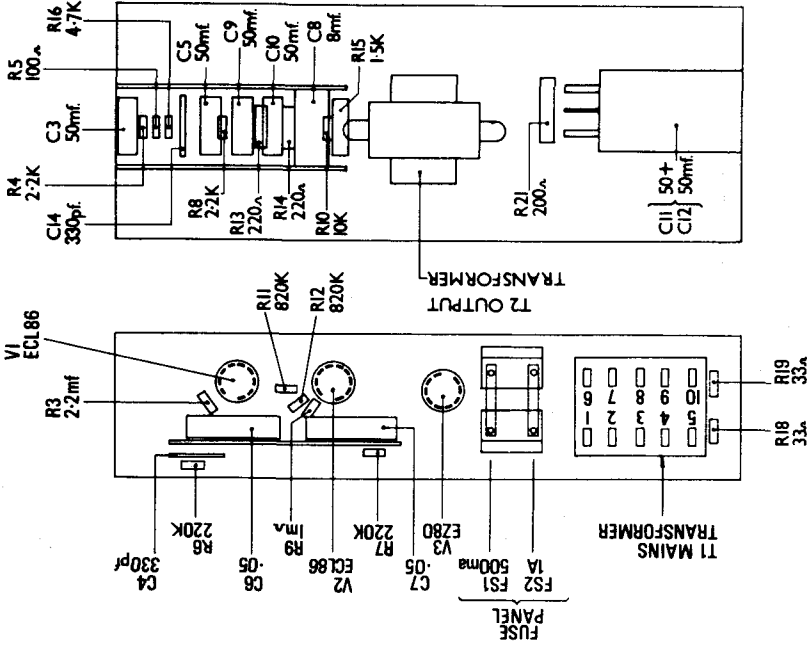
**Removal (Amplifier):** Unplug all existing plugs on the amplifier. These plugs cannot be interchanged hence there is no danger of a wrong connection being made when re-assembling. Remove the fixing clamp situated on the right-hand side of the chassis, two 4BA nuts located at the top and a fixing screw near the mains transformer. Unfasten insuloid clip to free mains lead. Withdraw amplifier. For assembly reverse procedure.

**Removal (Tone Control Unit):** Remove top panel by undoing five fixing screws. Disconnect slip-on leads from switched socket panel and earth to speaker chassis. Undo fixing clamp. Unfasten plastic strap to free mains cable. Withdraw tone control unit. For assembly reverse procedure.

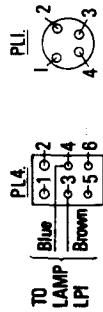
# HACKER



H369



PLUGS VIEWED FROM BASE (WIRE) END



## RADIO SERVICING

**Removal (Speaker):** Remove slip-on tags. Note connections. Undo four nuts securing speaker and withdraw speaker.

**Removal (Switched Socket Assembly):** Undo four woodscrews, plastic strap and withdraw. For assembly reverse procedure.

**Removal (Amplifier Unit AL42):** Take back cover off and undo 2 × amplifier fixing bolts located on the crossbar and the dog clamp on both sides of the chassis. Unplug mains switching connecting plug and T/C input plugs. Remove slip-on tags to L/S and lift amplifier out over the bar. Speaker and T/C removal as on GP42. For assembly reverse procedure.

**Sensitivity:** Remove the tone control and short out the feedback lines on the 4-pin socket, pins 2 and 3. Connect a wattmeter (15 ohms impedance) and C.R.O. to the secondary of output transformer, having disconnected L.S. Inject 1000 c/s. into grid of V1a, 250 mV. for 6 watts output.

**Frequency Response:** With conditions as for Sensitivity, reduce input signal to give an output of 1 watt at 1000 c/s. 30 c/s. (0 dB), 1000 c/s. (0 dB) and 20 kc/s. (0 dB). Limits plus or minus 1 dB.

**Hum and Noise:** With conditions as for Frequency Response, remove input source and with grid open the hum and noise should be approximately minus 60 dB.

**Sensitivity through Tone Control Unit:** With conditions as for Sensitivity. Plug in the tone control unit and remove the shorting link from the feedback line. Turn volume, treble controls to maximum, bass minimum and connect the switched socket panel to amplifier tone control. Connect wattmeter and oscilloscope to secondary of output transformer. Inject a 1000 c/s. signal source from A.F.G. into the radio socket. Adjust the input to give 6 watts output. Input required 400 mV.

**Frequency Response of Tone Controls:** With conditions as for Frequency Response, reduce the input at 1000 c/s. to give an output of 100 mW. 70 c/s. (bass max. plus 9 dB, bass min. 0 dB). 1000 c/s. (Level 0 dB). 10,000 c/s. (Treble max. plus 3 dB, Treble min. minus 16 dB).

<i>Static voltage</i>	<i>Avo 8 volts</i>	<i>Range volts</i>
Mains in	245	1000 A.C.
Secondary	250-0-250	1000 A.C.
Heater 2 to V3	6.3	10 A.C.
Heater 2 to V1 and lamp	6.3	10 A.C.
H.T.1 C12	260	1000 D.C.
H.T.2 C11	250	1000 D.C.
H.T.3 C8	240	1000 D.C.
V1a pin 9 anode	145	1000 D.C.
V2a pin 9 anode	145	1000 D.C.
V1b pin 6 anode	260	1000 D.C.
V2b pin 6 anode	260	1000 D.C.
V1a pin 2 cathode	1.3	10 D.C.
V2a pin 2 cathode	1.2	10 D.C.
V1b pin 7 cathode	7.8	10 D.C.
V2b pin 7 cathode	7.8	10 D.C.

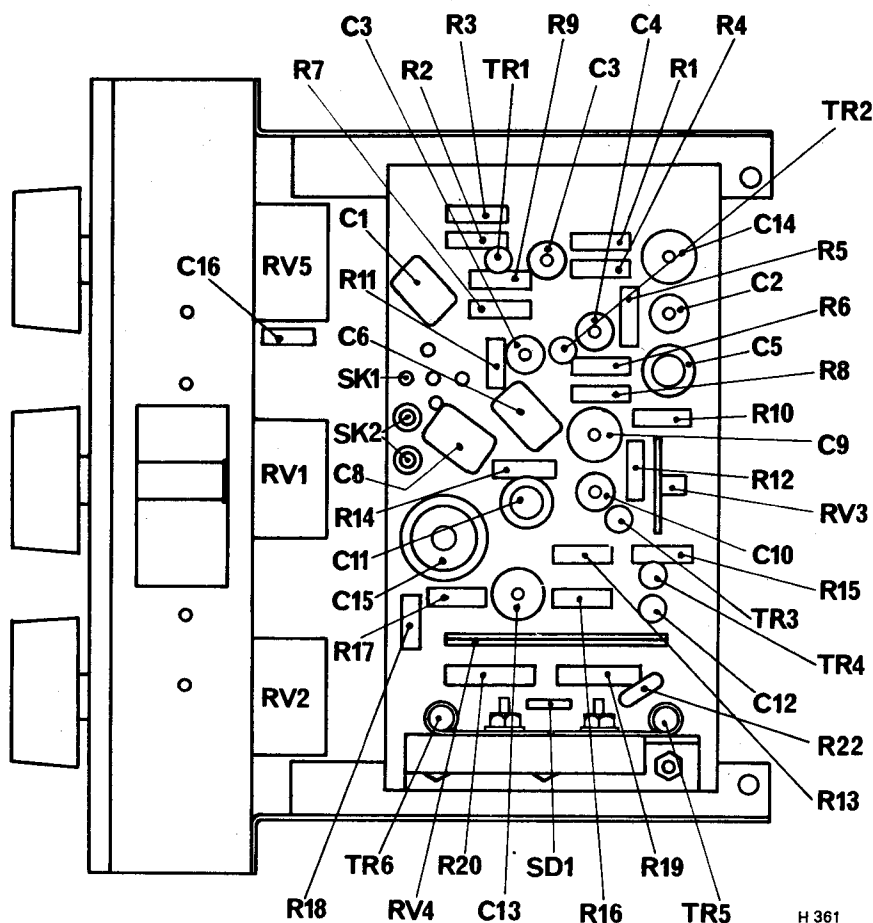
## HACKER

## RAMBLER

## Model GP19

**General Description:** Battery-operated, portable transistorised record reproducer with an output power of 1.2 watts. Garrard record player unit SRP12. Pickup, ERC Compact D-HC. Speaker, elliptical 25 ohms. Batteries,  $3 \times \text{PP9}$ , or  $18 \times \text{U2}$  (if fitted with alternative battery containers and retaining panel).

**Access for Servicing Amplifier and Motor:** 1. Access to the batteries is obtained by removing the back which is held in place by two turn buckle screws (turn clockwise). One PP9 battery drives the motor and the remaining two batteries (in series) feed the amplifier.



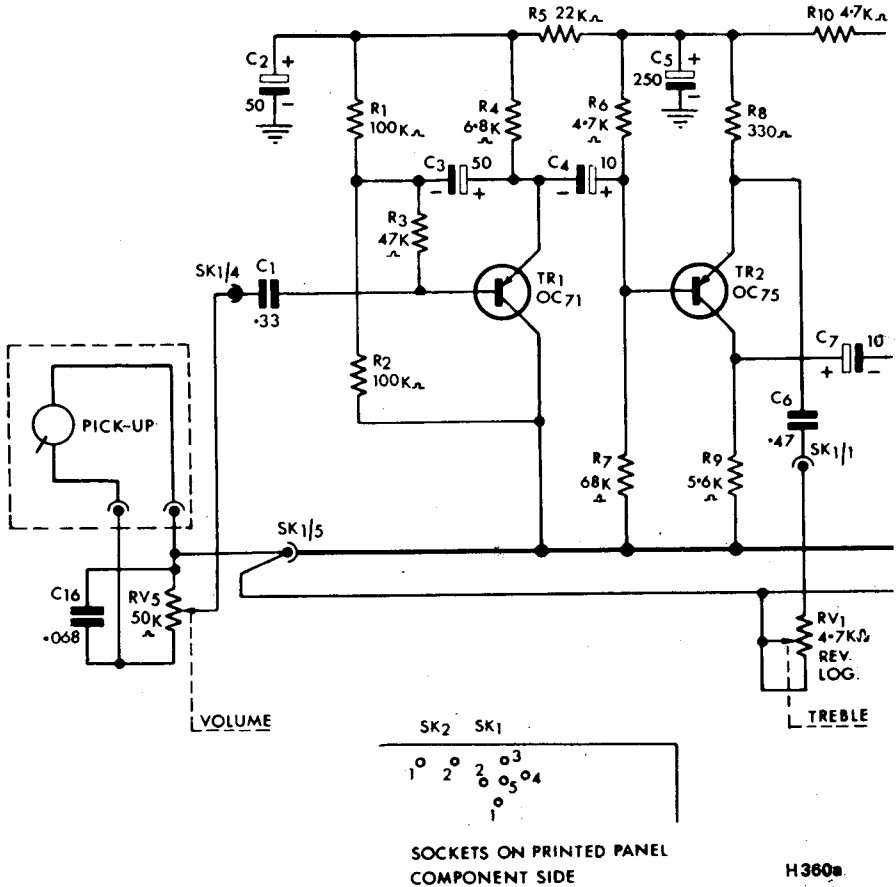
(H361) COMPONENT LOCATIONS—MODEL GP19



# RADIO SERVICING

2. To obtain access to the amplifier or motor, it is necessary to remove the screws securing the motor board to the cabinet, taking care not to lose the cup washers, the motor board may now be lifted up. To remove the amplifier chassis, remove batteries and battery shelf from rear of case. Unplug the On/Off switch leads from the motor board and pickup leads, making note of the pickup connections so that they may be replaced in the same order. The motor board can now be removed entirely. Remove the sloping wooden panel which conceals the speaker, by taking out the securing screws at each side. Disconnect the speaker. Remove the three wood screws holding the amplifier in position. Remove leads from cleat. It is now possible to remove the amplifier.

3. If the speaker is removed for any reason, make sure when replacing, to tighten nuts alternatively a little at a time and avoid over-tightening which could distort the cone.



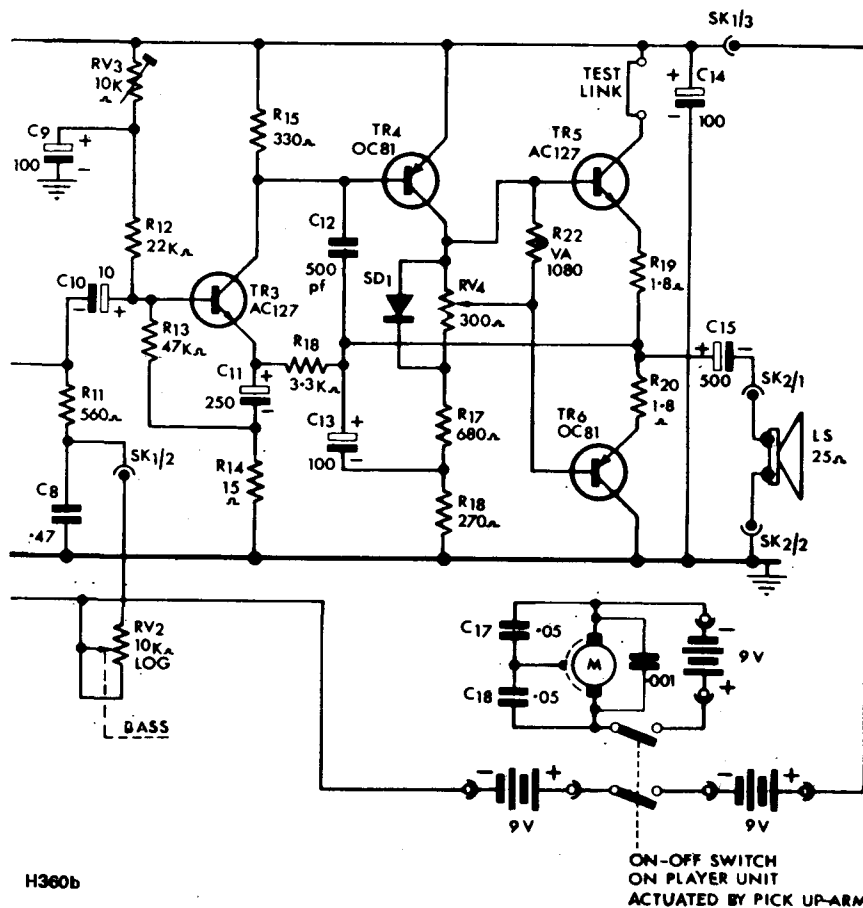
(H360a) CIRCUIT DIAGRAM—MODEL GP19 (PART)

# HACKER

**Static Voltages:** The voltages given below were measured with a voltmeter of 20,000 ohms per volt:

	Collector volts	Base volts	Emitter volts
TR1 +ve terminal to junction of R5/R4	4.0	1.5	1.6
TR2 +ve terminal to junction of R10/R8	3.2	0.625	0.64
TR3 +ve terminal to HT+	0.15	6.4	6.7
TR4 +ve terminal to HT+	9.1	0.15	nil
TR5 -ve terminal to Earth	18	9.4	9.2
TR6 +ve terminal to HT+	18.0	9.1	9.2

**Quiescent Current and Mid-Point Voltage Setting:** With speaker or output meter connected: 1. Short-circuit amplifier input by a link between Pin No. 4 and 5 of SK1, or set volume control to minimum. 2. Connect



(H360b) CIRCUIT DIAGRAM—MODEL GP19 (CONTINUED)

## RADIO SERVICING

a 0.10 mA. meter between the test link terminals (having first cut the wire link). 3. Connect a 1-10-volt meter between the mid-point voltage test point, which is the junction of R19, R20 and Earth (negative to Earth). 4. Connect batteries. 5. Adjust RV4 to give a quiescent current of 4 mA. Also adjust RV3 to give a mid-point voltage reading of 8.85 volts. Readjust as necessary, seal RV4. Switch off supply. Remove meters. Replace link and remove short-circuit from input.

**Warning:** It is important at all times to avoid short-circuiting the speaker leads as this will result in damage to the output transistors.

**Amplifier Sensitivity:** With bass and treble controls set to minimum: 1. Connect oscilloscope and output meter (22-30 ohms impedance) to the output transistors of the amplifier. 2. Inject a signal at 1000 c.p.s. from the audio generator to the top of the volume control, to produce 1.2 watts undistorted output as indicated on the oscilloscope. Sensitivity for 1.2 watts output—25 mV. (22-ohm load); Sensitivity for 1.1 watts output—20 mV. (30-ohm load). 3. If uneven clipping of the waveform occurs near the rated power output, adjust RV3 slightly to produce even clipping. 4. Limits of sensitivity tests plus or minus 1 dB. 5. Audio generator 600 ohms output.

**Frequency Response:** With conditions the same as for Amplifier Sensitivity, reduce audio generator output to produce an output of 100 mW. Then the following results should be obtained: 1000 c/s. (0 dB), 100 c/s. (-1 dB) and 10 kc/s. (-4 dB). Limits plus or minus 2 dB.

**Tone Control:** With conditions the same as for Frequency Response keep the reference frequency of 1000 c/s., and reduce input to produce an output of 10 mW.: 1. Change the generator frequency to 50 c/s. and rotate the bass control to maximum. The change from minimum to maximum should produce a change in output of 13 dB. Return bass control to minimum. 2. Change the generator frequency to 10 kc/s. and rotate the treble control to maximum. The change from minimum to maximum should produce a change in output of +14 dB. 3. Limits in both tests plus or minus 3 dB.

**Stability:** With no input to the amplifier but with the output meter or speaker connected, connect oscilloscope to output terminals and note that no oscillations are visible in the trace.

**Noise:** With output meter connected, turn treble, bass and volume controls to maximum and noise level should only just be noticeable on 5 mW. range, i.e. -50 dB on 1 watt.

**Battery Consumption:** Amplifier quiescent current is 15 mA. approx. Motor current at 33 r.p.m. is 40 mA. approx. Motor current at 78 r.p.m. is 60 mA. approx. Note that any extra load on motor will increase motor current.

**Pickup Stylus Pressure:** Use pressure gauge when adjusting screw at base of pickup pivot. Pressure 6.5-7 gm.

**H.M.V.****Model 2026**

**General Description:** This model is similar to the H.M.V. Model 2328 described in this volume.

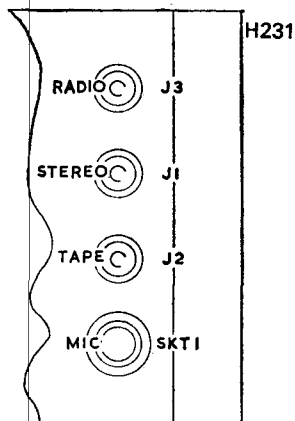
**Notes:** Model 2026 is not fitted with V.H.F./F.M. radio. Regarding the component locations diagrams for Model 2328, the F.M. printed board and SKT<sub>2</sub>/P<sub>2</sub> do not exist in Model 2026.

**H.M.V.****Model 2030**

**General Description:** This model is similar to the Ultra Model 6018 described in this volume.

**Chassis Removal:** Remove ventilation panel (two screws) from record changer compartment and take out screw from each end of escutcheon plate. Slip a thin card between escutcheon plate and cabinet sides to protect the leathercloth when removing or replacing chassis. To free escutcheon plate ease up at front to free it from slot in cabinet and slide it back to clear control knobs. From top of chassis, unplug socket leads, taking careful note for correct reconnection.

(H231) CONTROLS—MODEL 2030



**Changer Removal:** Unfasten ventilation panel and remove four screws and cup washers to release motor board. Withdraw and lift motor board on to its side. Unfasten mains lead cleat, disconnect plug connections from tag strip on underside of record changer (note colour coding to ensure correct reconnection) and also unplug lead connections to socket panel after taking note of appropriate connections. Unsolder motor leads from On/Off switch on amplifier chassis. The record changer assembly may now be lifted clear of the cabinet.

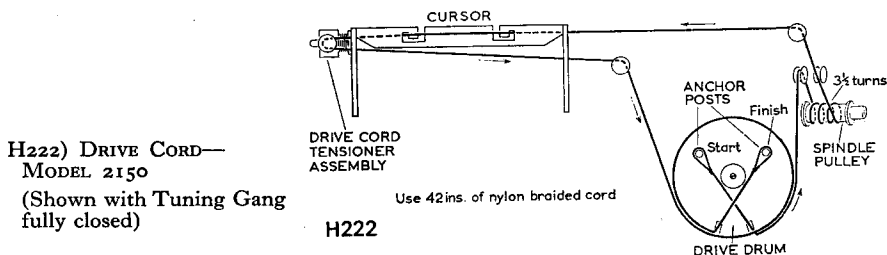
# H.M.V.

# Model 2150

**General Description:** Radio receiver with 500 mW. output. Aerials, ferrite rod for A.M. and telescopic rod for F.M. Speaker, round 35 ohms. Sockets, car aerial and personal listening which may also be used for feeding a tape recorder. Battery, two 9 volt DT6.

**Wavebands:** L.W. 270-148 kc/s. M.W. 1620-525 kc/s. V.H.F. 87.5-108 Mc/s.

**Alignment (General):** A signal from a suitable generator, 30 per cent. amplitude modulated by an A.F. signal is required for circuit alignment. Tuning indication is best obtained either with an output meter having an impedance of 35 ohms and connected in place of the loudspeaker or a Model 8 Avometer, set to the 2.5-volt A.C. range, connected in parallel with the loudspeaker. Throughout alignment the signal input level to the receiver should be adjusted to maintain the audio output at approximately 50 mW. with the volume control set at maximum in order to avoid alignment error due to A.G.C. action.



**Alignment (A.M. I.F.):** Select M.W. and turn gang to maximum capacitance. Apply a 475 kc/s. modulated signal through a 0.1  $\mu$ F. capacitor between tags 18 and chassis line tag 16. Adjust L26/27, L24/25, L20/21 and L18/19 in that order for maximum output.

**Alignment (A.M. R.F.):** With gang at maximum, check that cursor coincides with the "zero" pip at left-hand end of each scale. Slide cursor along drive cord to correct any error in calibration. M.W. must be aligned first. Medium and Long wave signals should be injected via a loop loosely coupled to the ferrite rod aerial.

Range	Inject	Cursor position	Adjust
M.W.	600 kc/s.	Centre of 500 m.	L13, L5
	1500 kc/s.	Centre of 200 m.	C25, C8
L.W.	220 kc/s.	L.W. calibration marker	C29, L6

**Note:** Adjust L5 by sliding ring along ferrite rod. Adjust L6 by sliding coil former along ferrite rod. Repeat adjustments as necessary to obtain accurate calibration.

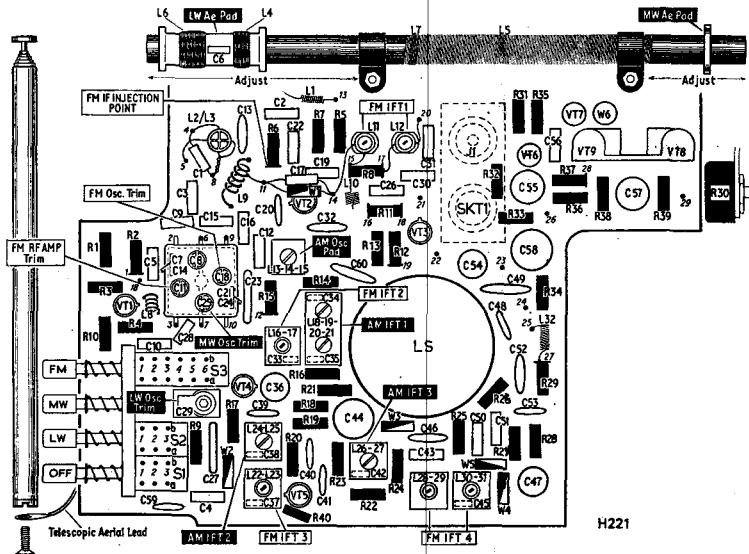
**Alignment (F.M. I.F.):** Select F.M. Inject 10.7 Mc/s. (25 kc/s. devia-

tion) signal, via a 0.1  $\mu$ F. blocking capacitor, between F.M. I.F. injection point (lower tag on R6) and chassis line (tag 16) and peak L30/31, L28/29, L22/23, L16/17 and L11/12 for maximum output. Switch signal generator to A.M. (30 per cent. modulation) and adjust L30/31 for minimum output (A.M. rejection).

**Alignment (F.M. R.F.):** Inject F.M. R.F. signals into telescopic aerial lead with aerial disconnected.

Range	Inject	Tune to centre of	Adjust
F.M.	88 Mc/s. 96 Mc/s. 92 Mc/s.	88 Mc/s. calibration 96 Mc/s. calibration 92 Mc/s. calibration	L9, L8 C18, C11 L12

*Note:* Adjust L9 by slightly opening or closing coil turns.

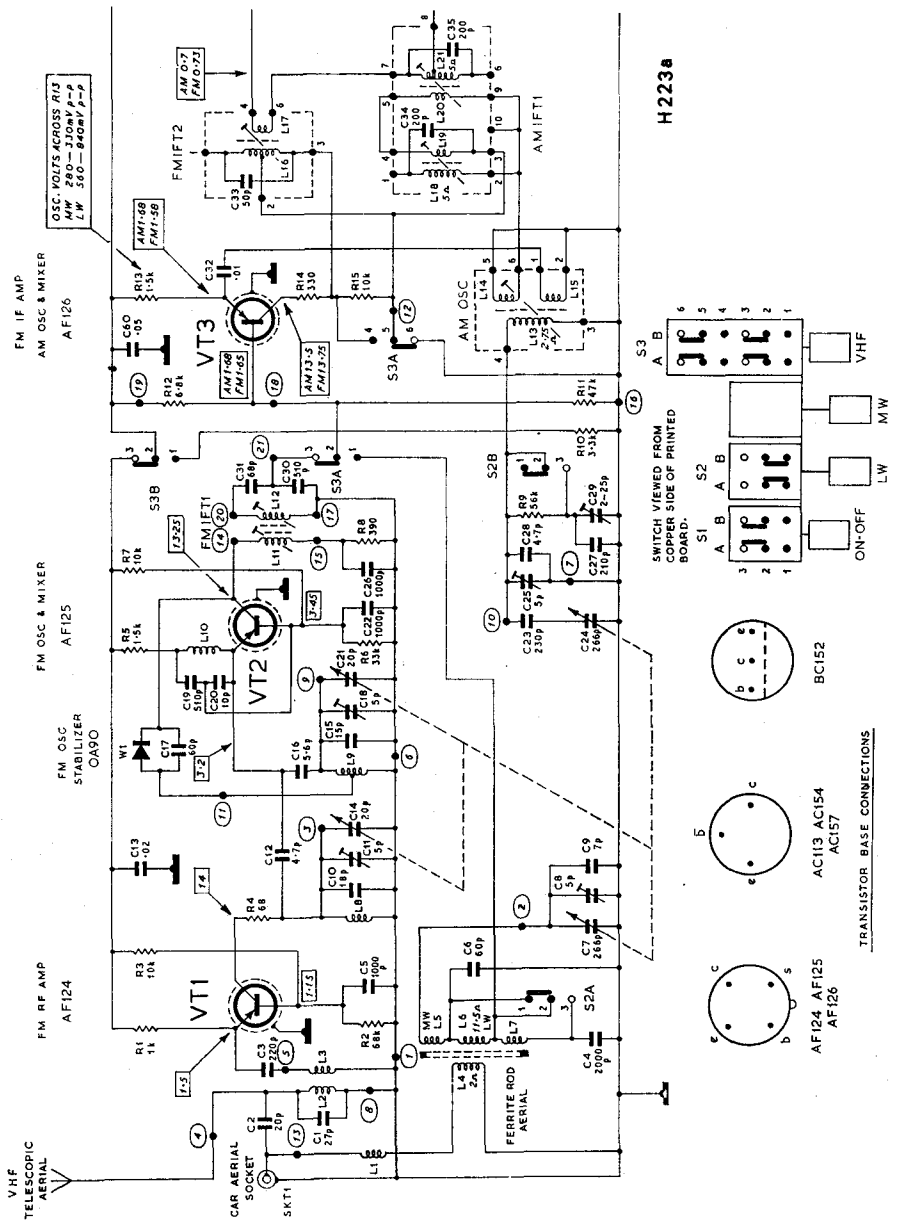


(H221) COMPONENT LOCATIONS

**Circuit Diagram Notes:** All voltages were measured with a 20,000-ohm volt-meter and are with respect to the positive supply line of each transistor except where otherwise shown. Ringed figures indicate printed board tag connection points. D.C. resistance readings are shown against inductors where these are 1 ohm or greater.

**Circuit Description (F.M.):** The telescopic aerial applies F.M. signals via tuned input transformer circuit L2, C1, and L3, C3 to the emitter of VT1. The collector circuit of VT1 is tuned by L8, C10, C11 and C14. This stage operates as a grounded base R.F. amplifier feeding via R4, C12 into the emitter of grounded base oscillator and mixer transistor VT2. The collector of VT2 is loaded by L11-L12 and tuned by series capacitors C30,

# RADIO SERVICING



(H223a) CIRCUIT DIAGRAM—MODEL 2150 (PART)



COIL BASE CONNECTIONS ARE VIEWED FROM COPPER SIDE OF PRINTED BOARD



C<sub>31</sub>. C<sub>17</sub> provides coupling into the oscillator circuit L<sub>9</sub>, C<sub>15</sub>, C<sub>18</sub> and C<sub>21</sub> with C<sub>16</sub> providing feedback into the emitter of VT<sub>2</sub>. L<sub>10</sub> and C<sub>19</sub> form a 10.7 MHz F.M. I.F. rejector with C<sub>20</sub> acting as an input phase corrector at oscillator frequencies.

A portion of the 10.7 MHz I.F. output developed across L<sub>12</sub> is tapped by means of the potential divider C<sub>30</sub>/C<sub>31</sub> and fed via switch S<sub>3A</sub>, contacts 2 and 3, to the base of VT<sub>3</sub> which operates as an I.F. amplifier when the receiver is switched to F.M.

**Circuit Description (A.M.):** Medium- or long-wave windings and base coupling coil L<sub>7</sub> on the ferrite rod are selected by switch S<sub>2A</sub> and coupled by switch S<sub>3A</sub>, contacts 1 and 2, to the base of A.M. mixer transistor VT<sub>3</sub>. VT<sub>1</sub> and VT<sub>2</sub> are rendered inoperative when contacts 2 and 3 of switch S<sub>3B</sub> open to disconnect their emitter and bias voltages from the positive rail.

The load presented by F.M. transistors VT<sub>1</sub> and VT<sub>2</sub> is replaced by R<sub>10</sub> in order to maintain an unchanged supply voltage to the I.F. and audio stages when the receiver is switched for A.M. operation.

**Circuit Description (W6):** The diode (W6) is biased by VT<sub>7</sub> collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The voltage developed across W6 equals the sum of the nominal output transistor (VT<sub>8</sub> and VT<sub>9</sub>) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W6 increases thus compensating for the falling current of the output transistors. This effect also takes place in the event of a falling battery voltage. The diode W6 also assists thermal stability at high temperatures and opposes high current drain from the battery.

**Access For Service:** 1. Insert and twist coin in slots in cabinet base to release cabinet back cover. 2. Take out battery, pull off volume and tuning control knobs (note felt washers and plastic inserts) then remove counter-sunk screw securing telescopic aerial and connecting lead to cabinet base. 3. Withdraw telescopic aerial from insulating tube, release battery and loudspeaker leads from cable clip, unsolder cabinet top trim earthings lead from right-hand side of L.W. aerial coil former, then take out two screws at lower edge of printed board. Note positions of insulating washers. 4. The printed board assembly may now be lifted out within limit of loudspeaker leads and turned over for access to drive cord and copper side of printed board. 5. When reassembling, ensure that insulator is correctly located over loudspeaker tag panel and do not omit to refit telescopic aerial rod insulator tube.

## H.M.V.

## Model 2322

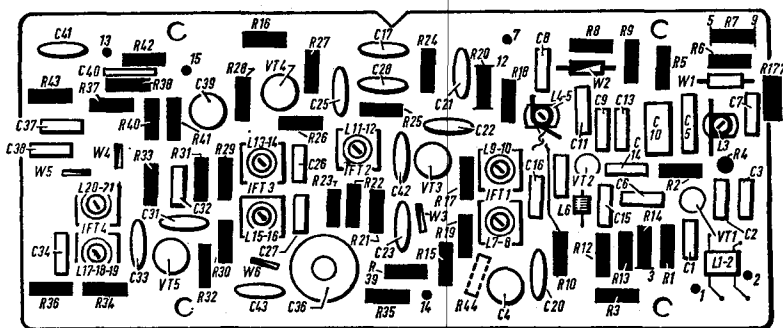
**General Description:** This model is similar to the Ferguson Model 3334 described in this volume.

**H.M.V.****Model 2328**

**General Description:** Stereomaster radiogram with 14 watts output (7 watts per channel). Turntable; Garrard Autochanger 3000 with low mass Cartridge; Sonotone 9TAHC with diamond L.P. stylus, stereo balanced by pre-set control. Speakers; two round (10 ohms) and two tweeters (10 ohms). Sockets; Record and playback (100k), Radio or tuner (20k). 200-250 volts A.C. 50 c/s.

**Amplifier Controls:** Calibrated Volume (Mains On/Off); Calibrated Bass; Calibrated Treble; Stereo/Mono Selector; Gram-Tape-Radio Selector.

**Integral Tuner Unit:** Push-button tuning for three F.M. programmes. A.F.C.; Internal dipole with provision for external aerial connection (75 ohms); A.F.C. On/Off control; Home, Light and Third push-buttons (each button tuneable over range 87.5-101 Mc/s.).



H262

(H262) F.M. PRINTED BOARD

**Chassis Removal:** Unscrew transit screws fully anti-clockwise to lock auto-mechanism then turn cabinet on its side taking precautions to protect the surface.

Remove cabinet base cover (16 screws) then unplug F.M. aerial lead. Detach ventilation panel (three screws) from turntable compartment and pull off stereogram control knobs. Turn cabinet on its front, take out chassis board fixing screws (two short ones from the control panel end and two longer ones from the lower rail) then slide out chassis board assembly within limit of leads taking care not to lose rubber bush located between indicator lamp recess and chassis board.

For complete separation from cabinet, unsolder pickup and loudspeaker leads (note for reassembly the lead colour to each tag), disconnect motor leads from mains transformer and detach mains lead clamp from cabinet back.

## RADIO SERVICING

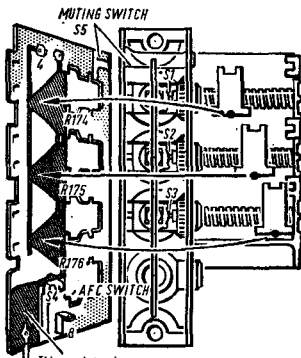
**Record Changer Removal:** Detach ventilation panel from turntable compartment. Take off cabinet base cover. Disconnect motor leads from mains transformer and, taking note of connections, unsolder pickup cable-form from tag strip mounted on automechanism baseplate. With transit screws turned fully in, pivot clips on transit screws to enable them to pass through motor board, then lift changer out of cabinet.

**Note:** If the gramophone is to be operated with the cabinet base cover removed, it is essential to keep the volume level well attenuated otherwise damage to the high compliance speaker cones may result.

**Stylus Replacement:** A special diamond L.P. stylus is fitted to the pickup cartridge for minimum record wear at a stylus pressure of 2 to 3 g.

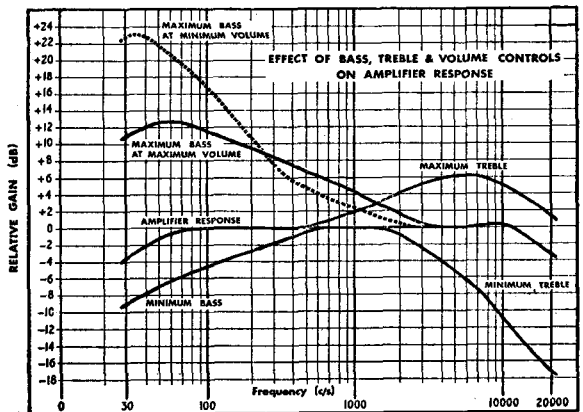
On some turntable units, to examine the stylus, it is necessary to turn aside a flexible pickup lift restrictor at the rear of the pickup arm. To remove the styli, turn the indicator flag to its mid position, and then by pulling the indicator gently outwards, the complete styli assembly may be withdrawn. The indicator of the replacement assembly must be similarly placed in the mid position before attempting to press the assembly into its location.

**Stylus Pressure:** To adjust stylus pressure (pickup weight), turn the knurled nut on the underside of the pickup arm clockwise to decrease or counter-clockwise to increase pressure.



H263

H263) EXPLODED VIEW  
OF PUSH-BUTTON UNIT



H264

(H264) RESPONSE DIAGRAM

**Audio Check:** The following tests should be made via the pickup leads for each channel. Connect output lead from audio generator (switched to 800 c/s.) to pickup leads, and output leads to output meter; plug in, switch on.

1. Set volume, bass and treble controls to maximum; switch to stereo.
2. Sensitivity for 5 watts per channel undistorted is 57 mV. approximately.
3. Turn bass and treble controls to minimum. Sensitivity for 5 watts per

channel undistorted is 120 mV. 4. Sensitivity for 500 mW. per channel is 37 mV. 5. Balance between channels should be within 2dB's. 6. Switch generator to 100 c/s. and check operation of Bass control, i.e. boost and cut, note that outputs at any setting of the control should be within 2dB of each other. 7. Switch generator to 10 kc/s. and check operation of treble control, i.e. boost and cut: note that output at any setting of the control should be within 2dB of each other.

**Audio Check:** The following tests should be made via the tape socket for each channel. Connect generator (switched to 800 c/s.) to Tape socket. Sensitivity from this socket for 500 mW. output is 10 mV.

1. Check that outputs are within 2dB of each other. 2. Switch to mono, check that outputs are similar.

*Note:* A pre-set balance control is incorporated for P.U. balance only and is set during manufacture. It will not require readjustment unless a replacement cartridge is fitted. The two audio boards are also matched at the factory to within 2dB.

**Alignment (General):** Remove chassis as described. Connect an output meter adjusted for 10 ohms impedance in place of L.H. or R.H. loudspeakers, or a 20,000-ohm volt-meter set to a suitable A.C. voltage range between tags 109 and 111.

To ensure satisfactory operation of A.F.C. it is essential to ensure that the discriminator is adjusted to a balanced condition. This is achieved by measuring voltage between junction of R<sub>40</sub>-R<sub>41</sub> and chassis line (tag 15). As this voltage will swing alternately positive and negative, a centre-zero meter (25-0-25  $\mu$ A.) with a series 22 k $\Omega$  resistor produces a satisfactory movement. The meter should read 0 volts on completion of alignment. An Avo Model 8 on the 50  $\mu$ A. D.C. range with series 22 k $\Omega$  resistor will also suffice but is not so convenient for following the voltage swing and zero reading.

#### **Alignment (I.F.): I.F. Circuits:**

Inject a 10.7 Mc/s. signal (25 kc/s. deviation) via 30 pF. capacitor to junction of R<sub>12</sub>-C<sub>15</sub>, with generator earth lead connected to "earthly" end of R<sub>10</sub>. Switch off A.F.C. Detune L<sub>3</sub> by unscrewing core 2-3 turns. Peak L<sub>21</sub> and L<sub>17/18</sub> for maximum audio output.

*If D.C. meter does not read zero, a slight adjustment of L<sub>21</sub> should be made to produce this condition.*

If L<sub>21</sub> was readjusted, re-peak L<sub>17/18</sub> and then L<sub>15</sub>, L<sub>13</sub>, L<sub>11</sub>, L<sub>9</sub> and L<sub>7</sub> for maximum output.

*If D.C. meter has moved off zero, correct with L<sub>21</sub> and repeat this operation.*

Complete I.F. alignment with input of approximately 100  $\mu$ V. reducing volume control setting to retain output at approximately 500 mW. Maximum output should now occur with D.C. = 0 and coincide with minimum noise or A.M. modulation. A check of balanced alignment may be made by swinging generator frequency either side of 10.7 Mc/s. when D.C. meter should show a similar deflection to positive and negative.

### (H26r) COMPONENT LOCATIONS



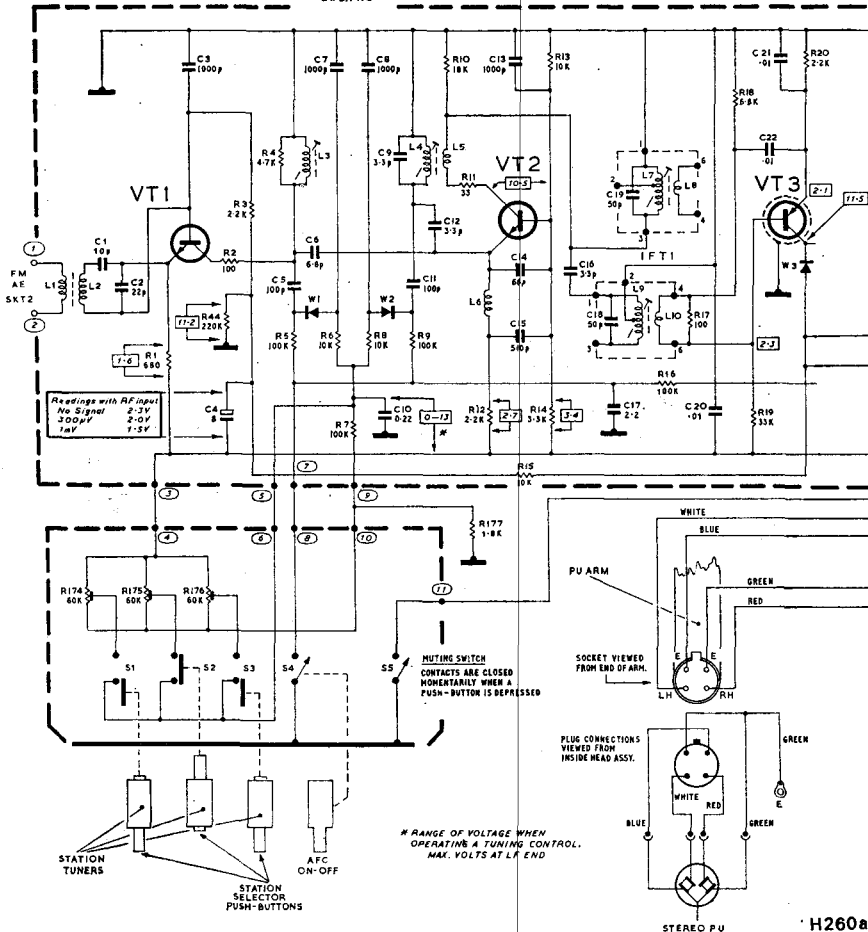
# H.M.V.

FM RF AMPLIFIER  
BF210 or BF160

VARI-CAPACITANCE  
DIODES  
2 x BA 110

FM OSC. & MIXER  
BF217 or BF160

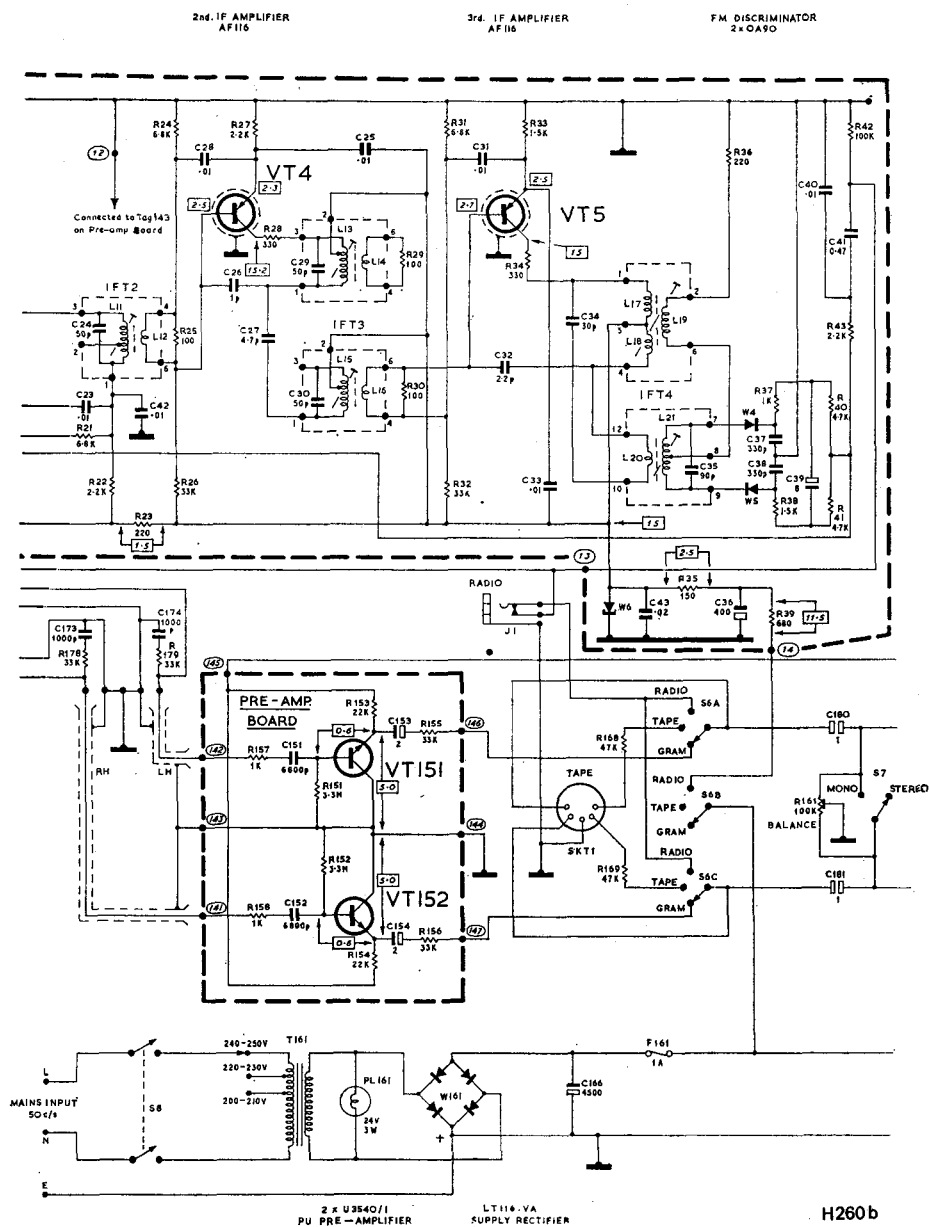
Int. IF AMPLIFIER  
AF16



(H260a) CIRCUIT DIAGRAM—MODEL 2328 (PART)

**Circuit Diagram Notes:** All voltages were measured with an Avometer 8, and are with respect to the positive line appropriate to each transistor except where otherwise stated. Ringed figures denote printed board connecting points.

## RADIO SERVICING



(H260b) CIRCUIT DIAGRAM—MODEL 2328 (PART)

# H.M.V.

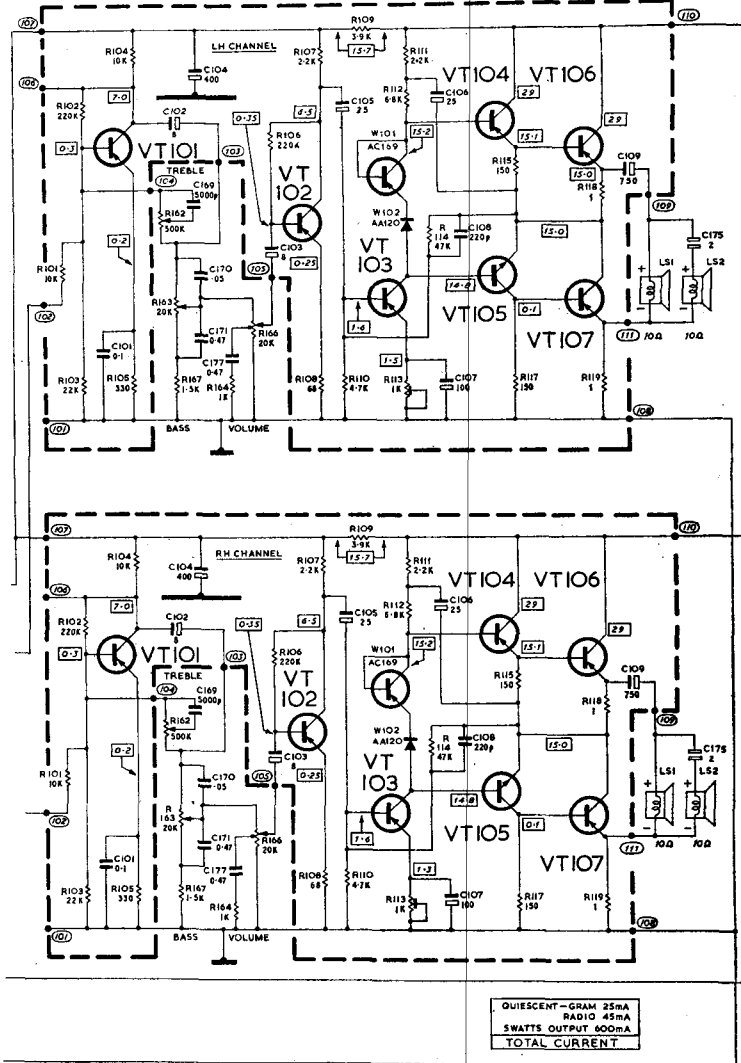
AF AMPLIFIER  
AC156

AF AMPLIFIER  
AC156

AUDIO DRIVER  
AC165

COMPLEMENTARY PUSH-PULL  
DRIVER STAGE  
VT104 AC166  
VT105 AC168

PUSH-PULL POWER  
OUTPUT STAGE  
2 x AD149



AC156  
AF AMPLIFIER

AC156  
AF AMPLIFIER

AC165  
AUDIO DRIVER

VT104 AC166  
VT105 AC168  
COMPLEMENTARY PUSH PULL  
DRIVER STAGE

2xAD149  
PUSH-PULL POWER  
OUTPUT STAGE

H260C

(H260c) CIRCUIT DIAGRAM—MODEL 2328 (CONTINUED)



**Alignment (R.F.): R.F. Circuits:**

Retain D.C. meter connection as for I.F. alignment. Apply 87.5 Mc/s. signal (25 kc/s. deviation) to aerial terminals. Select a tuning push-button and turn to L.F. end of band (i.e. bottom of scale).

Tune oscillator coil L<sub>4</sub> for maximum output: zero reading on the D.C. meter will indicate correct tuning point. Change input frequency to 94 Mc/s. or any suitable frequency avoiding an interfering station. Tune push-button tuning control to this frequency for maximum output and peak R.F. coil L<sub>3</sub> for maximum output. During this peaking operation a slight "pulling" of the oscillator may occur shown by the D.C. meter moving off zero; this should be corrected by the push-button tuning control and L<sub>3</sub> then peaked for maximum output. During final alignment, input level should be approximately 10  $\mu$ V. and the volume control adjusted for a convenient output level.

**Circuit Description:** The R.F. and oscillator sections follow conventional transistor tuner circuitry except that in both the R.F. and oscillator tuned circuits a variable capacitance diode provides the variable capacity tuning element. The voltage across these diodes, and thereby the capacitance, is varied by means of one of the tuner potentiometers R<sub>174</sub>, R<sub>175</sub> or R<sub>716</sub> which together with R<sub>177</sub> and R<sub>7</sub> form a potentiometer network across the D.C. supply lines. This variable voltage is applied to each diode tuned circuit via R<sub>6</sub> and R<sub>8</sub>. This facility of tuning by voltage variation is further utilized for the application of A.F.C. (Automatic Frequency Control). Any out of balance voltage due to mis-tuning is fed via R<sub>16</sub> and then to each circuit via R<sub>5</sub> and R<sub>9</sub> of such polarity as to correct tuning. This correction voltage is shorted out by S<sub>4</sub> in the A.F.C. OFF position.

A.G.C. is applied to the R.F. amplifier via R<sub>15</sub> and is derived from W<sub>3</sub> in VT<sub>3</sub> collector circuit. R<sub>44</sub> is required to provide a base voltage suitable for the operation of transistors of varying parameters.

W<sub>6</sub> is a Zener diode providing a stabilised supply voltage.

The output from the pickup is preamplified by low-noise silicon planar transistors VT<sub>151</sub> and VT<sub>152</sub>. The amplified output is fed via the Radio-Tape-Gram Selector switch to audio amplifier VT<sub>101</sub> of left- and right-hand channels. R<sub>161</sub> across the audio amplifier input is adjusted for optimum pickup stereo balance, and the stereo-mono switch across R<sub>161</sub> effectively parallels the left- and right-hand audio channel inputs for mono reproduction.

Separate Bass and Treble tone controls and a loudness-type Volume control are incorporated in the interstage coupling of audio amplifiers VT<sub>101</sub> and VT<sub>102</sub>. C<sub>177</sub>-R<sub>164</sub> are connected to a tapped volume control R<sub>166</sub> so that additional bass boost is applied as volume is reduced. The output of VT<sub>102</sub> is applied to the audio driver stage VT<sub>103</sub>. Stabilising diodes W<sub>101</sub> and W<sub>102</sub> are series connected in the collector circuit and feed into the complementary push-pull driver comprising *n-p-n* and *p-n-p* transistors VT<sub>104</sub> and VT<sub>105</sub>.

D.C. coupling is used to the *p-n-p* output transistors VT<sub>106</sub> and VT<sub>107</sub>

## H.M.V.

operating in push-pull and balanced by variable resistor  $R_{113}$  in  $VT_{103}$  emitter circuit. The output transistors are mounted in a large heat sink together with the two stabilising diodes. The diodes are included in the heat sink so that any temperature changes are immediately transferred to the diodes to ensure effective compensation. Overall negative feedback is applied to the base of audio driver  $VT_{103}$  from the push-pull power output stage via  $R_{114}$ .  $C_{108}$ , in parallel with  $R_{114}$ , is incorporated in the loop for phase correction.

The audio outputs are fed to the loudspeaker system of each channel which consists of a sealed enclosure containing a specially developed side-mounted bass speaker featuring a large ceramic magnet and a rolled cone surround. The enclosure permits the maximum movement of the cone while avoiding "doubling" or "trebling" at low frequencies. A capacitive cross-over to a  $3\frac{1}{2}$ -in. forward facing tweeter unit completes the system on each channel and combined with the bass speaker provides an even response over the whole range of audible frequencies.

A fully isolated mains transformer and full-wave rectifier provides a 30-volt line voltage supply to the amplifier circuits and includes a protective fuse incorporated in the negative rail.

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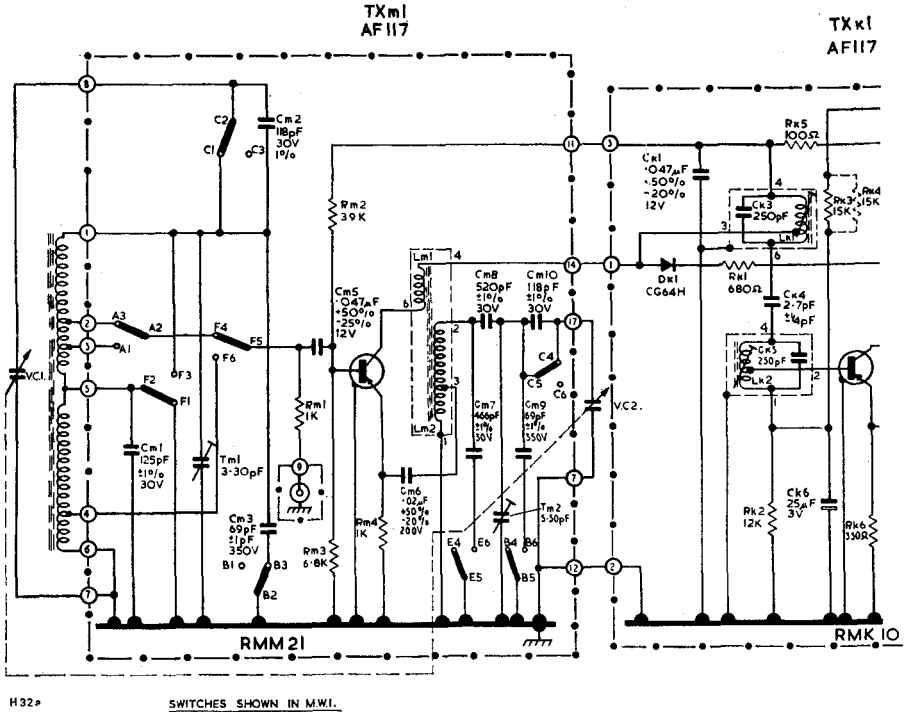
## H.M.V.

## Model 2338

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**General Description:** This model is similar to the Marconiphone Model 4322 described in this volume.

# RADIO SERVICING



(H32a) CIRCUIT DIAGRAM—MODEL KR023 (PART)

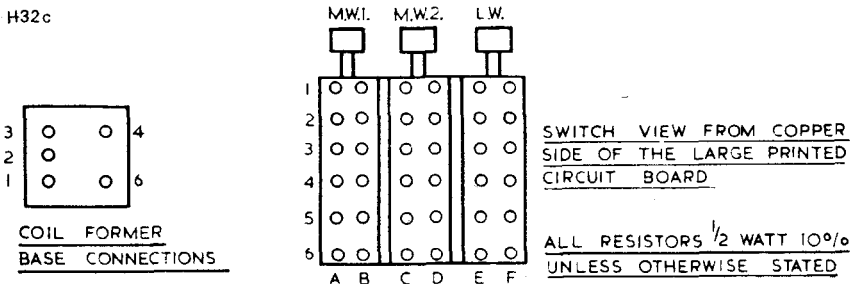
**K.B.**

**“CHIEFTAIN”**

**Model KR023**

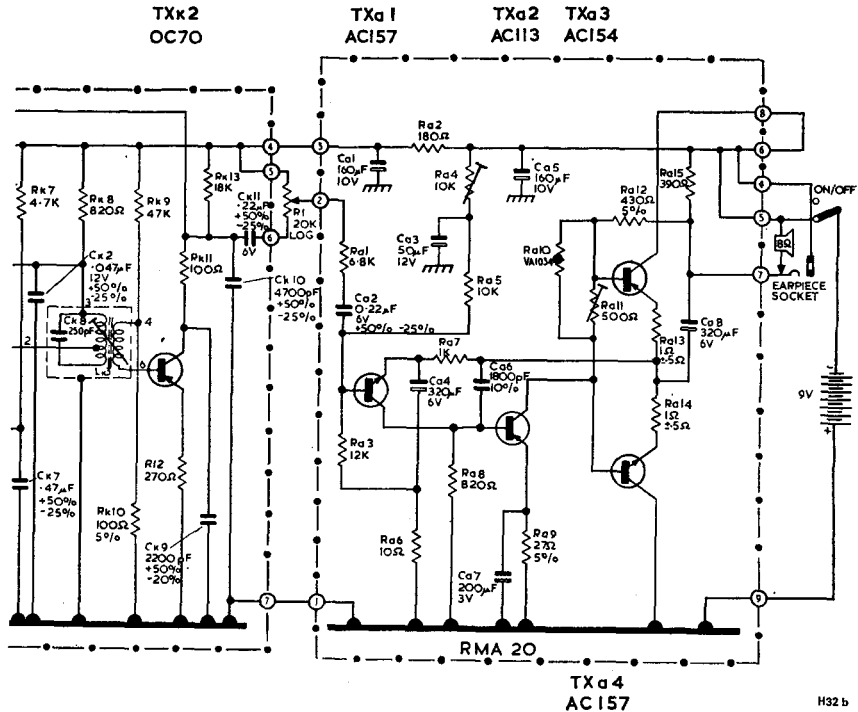
**General Description:** This receiver is similar to the K.B. model KRO22 (Commodore), see facing page, apart from the R.F. Module RMM21 which does not incorporate separate coils, or push-button switching for car operation.

H32c



(H32c) COMPONENT DETAILS—MODEL KR023

K.B.



(H32b) CIRCUIT DIAGRAM—MODEL KR023 (CONTINUED)

# K.B. "COMMODORE" Model KR022

**General Description:** This receiver is similar to the R.G.D. model RR222 (Rambler), described in the 1967-68 volume.

# K.B. Models KG041 and KG042

**General Description:** These models employ the S.T.C. Chassis GC10 and GC11 described in this volume.

**Dismantling (Chassis):** 1. Ensure that the radiogram mains lead is disconnected from the mains supply. 2. Remove the circular knobs from the horizontal controls. 3. Unclip the control panel fascia; the hole sur-

rounding the tuning control spindle is elongated to facilitate this action. The small light bulbs may now be replaced easily if necessary. 4. Remove the longer of the two back panels. 5. Disconnect all plugs from the back of the chassis and also the A.M.P. connectors on the indicator bulb socket. Ensure the A.M.P. plugs do not short together. 6. Unplug the cartridge lead from the changer tag strip. 7. Unfasten the mains lead at the P-clip on the cabinet base by the mains lead slot in the cabinet back. 8. Remove the screw from the counterbored hole at the back of the cabinet. 9. Remove the screw from the right-hand side of the changer compartment. 10. Remove the two Phillips screws to the right of the card mask that fits over the control spindles. If the mains lead is unhindered, the chassis should now be free to be lifted vertically out of the cabinet.

**Dismantling (Changer):** 1. Remove the radiogram mains plug from the mains supply. 2. Remove the longer of the two cabinet backs. 3. Pull out the changer mains plug from the chassis. 4. Unplug the changer cartridge lead from the changer tag strip. 5. Set the transit screw clips on the changer vertical and, ensuring the mains lead is free to move, lift the changer vertically from the cabinet.

*Note:* When re-connecting the cartridge lead ensure the A.M.P. "Faston" lugs are terminated with the red lead to the tag with the red wire, the black lead to the tag with the white wire, and the screen to the centre tag.

**Dismantling (Loudspeaker):** 1. Disconnect the radiogram from the mains supply. 2. Remove the appropriate back panel of the cabinet. 3. Unplug the A.M.P. lugs from the speaker terminals. Ensure the lugs do not present a short-circuit to the output stages of the audio module. 4. Unscrew the nuts on the built-in speaker fixing bolts and pull the speaker off from these bolts.

*Note 1:* The lead with the red stripe should be reconnected to the lug marked with a red dot or +ve sign and the all black lead to the lug marked with a black dot or -ve sign.

*Note 2:* When refitting the speaker be careful not to puncture the cone with the built-in bolts.

## K.B.

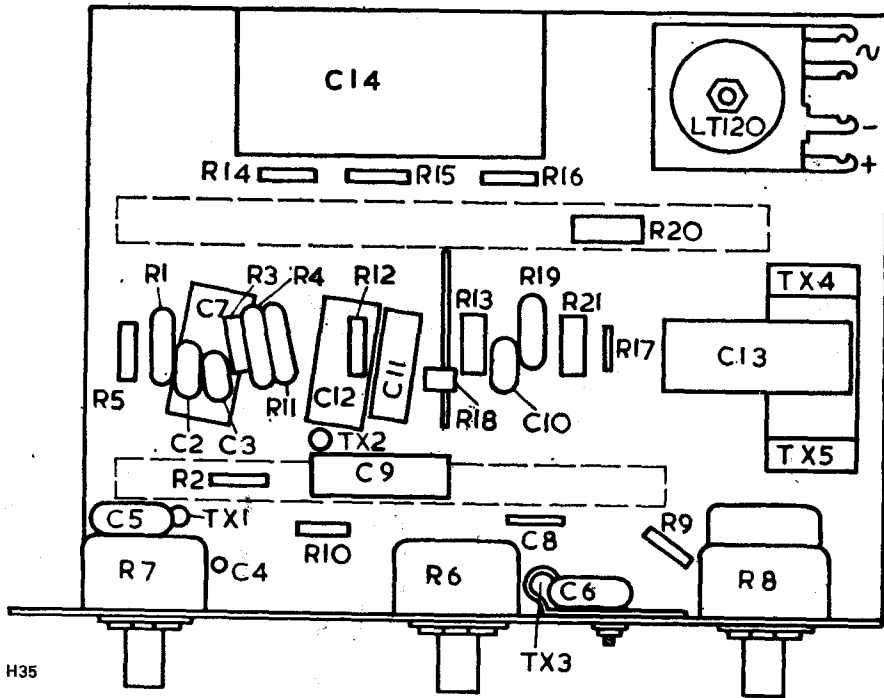
## Model KP036

**General Description:** Record player with 3 watts output (Mk. 1 chassis) or 3.5 Watts output (Mk. 2 chassis). The chassis can be easily distinguished as the Mk. 1 has two tag strips, whereas the Mk. 2 has only one tag strip.

**Circuit Description (Mk. 1):** The transistor amplifier uses a low noise pre-amplifier stage TX1, incorporating feedback R3 C3 to provide capacitive loading for the cartridge. The output voltage developed across R4 is fed

K.B.

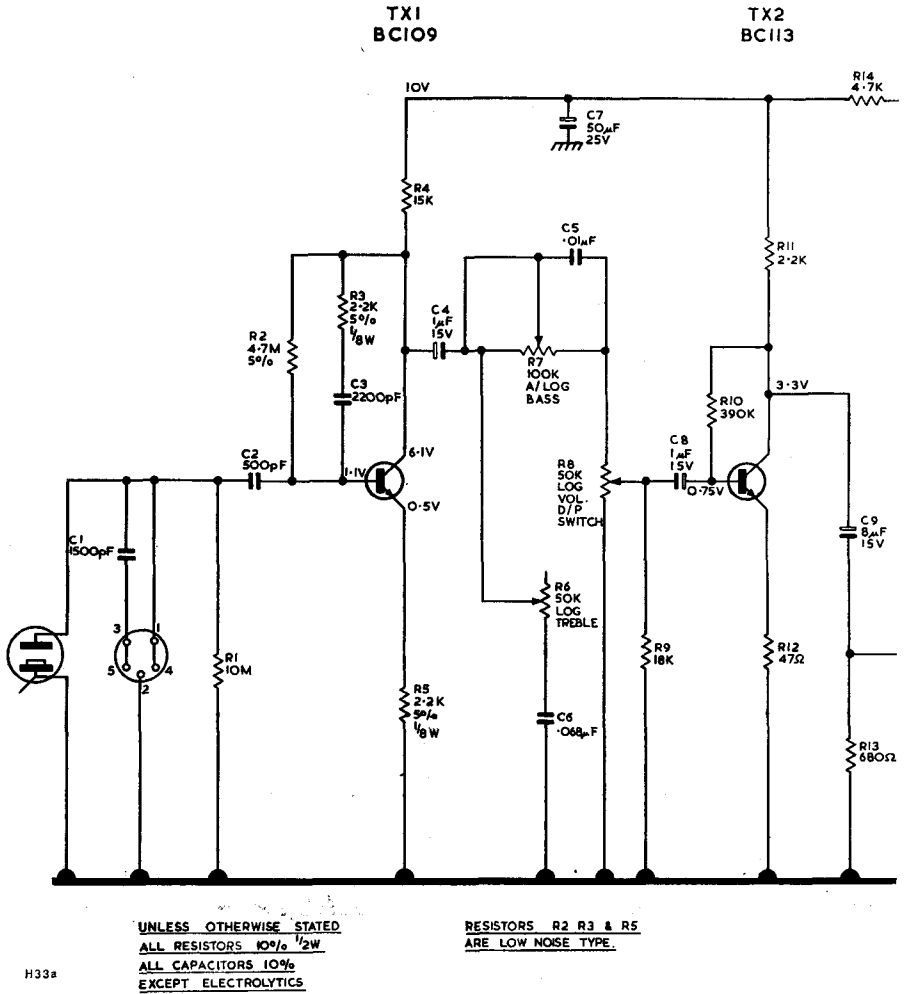
via the volume and tone control network to the pre-driver TX2 and then on to the driver TX3. TX3 has D.C. feedback applied through R19 enabling the biasing condition of the driver to be adjusted by R18 for optimum performance. The output stage consists of two transistors TX4 and TX5 operating in complementary symmetry. They function in the common emitter mode due to the A.C. referencing action of C12. The changer motor has an 18.6 volt secondary which is used to supply the indicator lamp and to drive the 24 volt D.C. rail by bridge rectification.



(H35) COMPONENT LOCATIONS—CHASSIS MK. 1

**Circuit Description (Mk. 2):** The signal from the cartridge passes first to the bass control which functions by resistively loading the capacitive source. The treble control cuts high frequencies when the slider is towards the end of the control connected to R4. The signal then passes via the volume control R5 to the input of TX1 which has a high impedance. The amplified signal then passes to TX2 and thence to the complementary symmetry output. D.C. and A.C. feedback is applied via R13 and R11 from the output to the emitter of TX1. A large amount of feedback is applied to

# RADIO SERVICING



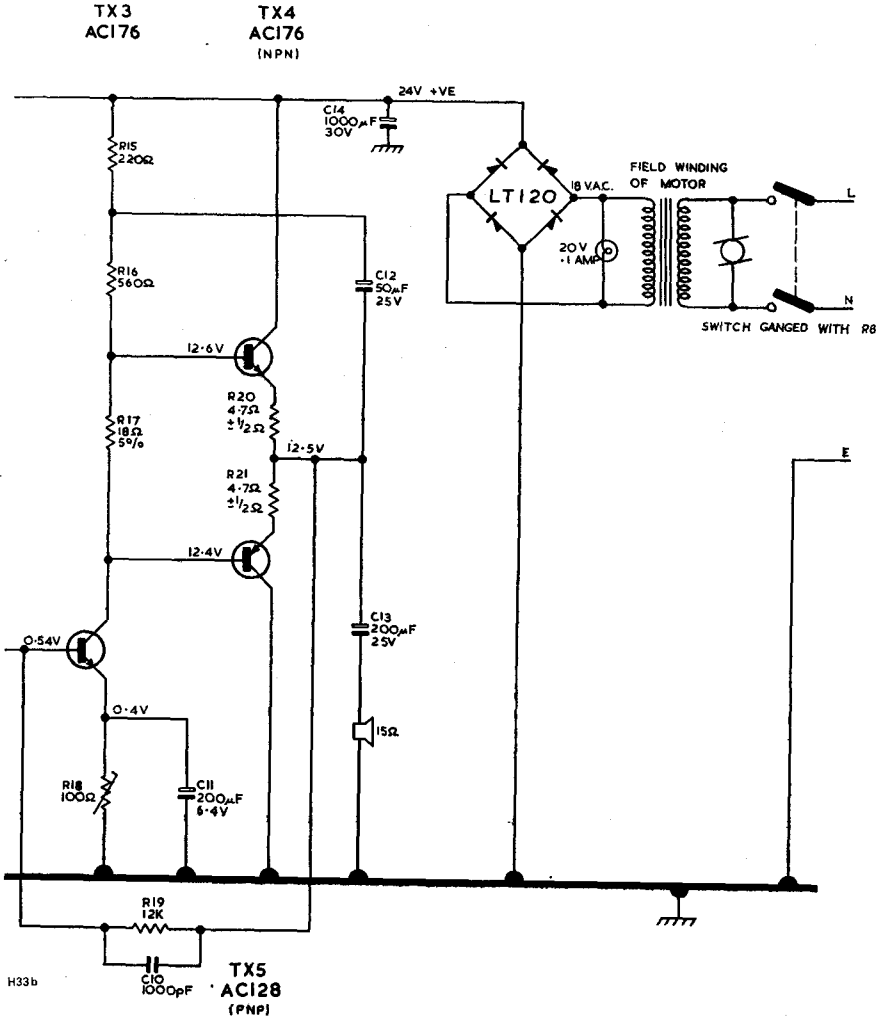
(H33a) CIRCUIT DIAGRAM—CHASSIS MK. I (PART)

eliminate the need for any adjustment for correct working conditions. The A.C. feedback is controlled by the networks C6, R12 and C5, R10.

The output stage consists of two transistors TX3 and TX4 operating in complementary symmetry. They function in common emitter mode due to the fact that R15 is connected to the live terminal of the load. The changer motor has an 18.6 volt secondary which is used to supply the indicator lamp and drive the 24 volt D.C. rail by half wave rectification.

*Note:* This amplifier has a negative H.T. rail.

K.B.

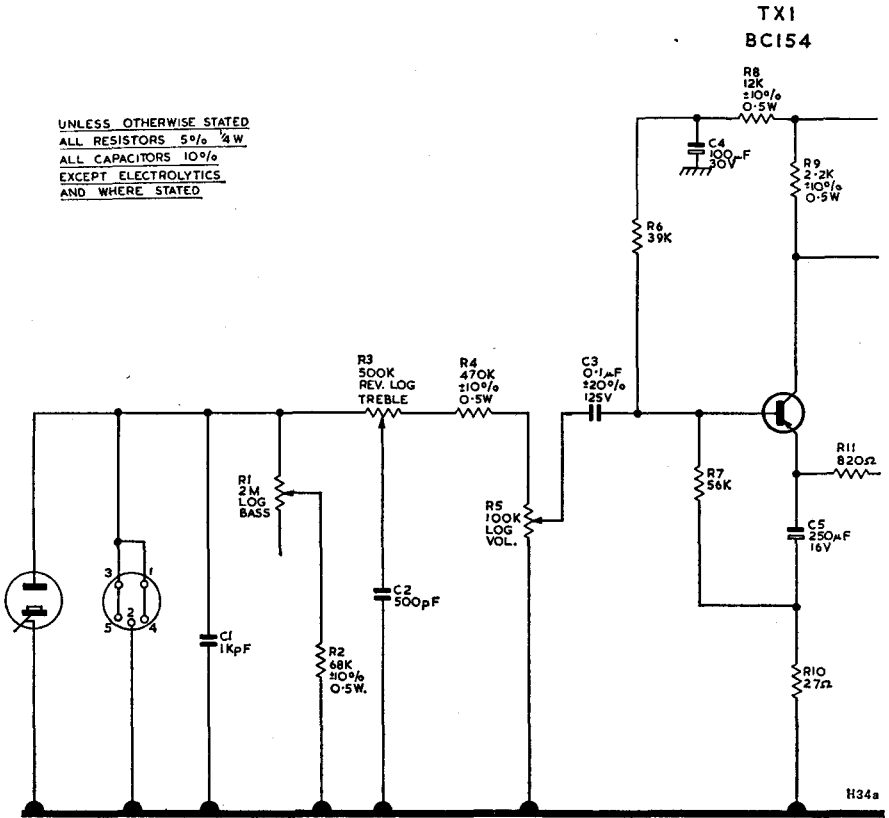


(H33b) CIRCUIT DIAGRAM—CHASSIS MK. I (CONTINUED)

**Bias Adjustment (Mk. I):** Disconnect the cartridge from the input and with volume, bass and treble set at maximum, use the following procedure: Set the present resistor R18 to the centre of its travel. Apply a 1 kc/s. sine wave signal to pin 5 of tape socket. Replace the loudspeaker by a 15-ohm 3-watt resistor, and connect an oscilloscope across it. Increase the input signal until clipping of the output waveform occurs and then adjust R18 for symmetrical clipping.



## RADIO SERVICING



(H34a) CIRCUIT DIAGRAM—CHASSIS MK. 2 (PART)

**Dismantling:** Unscrew the three plastic screws on the back cover and remove. The two chrome screws on the control panel should then be removed and the control panel lifted clear of the cabinet, and placed upside-down over the position from which it was withdrawn, to enable servicing.

**Stylus Replacement:** Turn the stylus flag to the L.P. position, that is turnover flag pointing towards the centre of turntable when looking downwards on to the pickup arm. Then pivot pickup arm upwards so it is at 90° to turntable. If the pickup cartridge is viewed from the underside a plastic tube coded with a blue strip will be observed. The fingernail should be inserted under the lip on the front of this tube and gently ease the tube complete with metal stylus arm away from the flag moulding until it is an angle of approximately 45°. The stylus may then be removed with fore-

K.B.



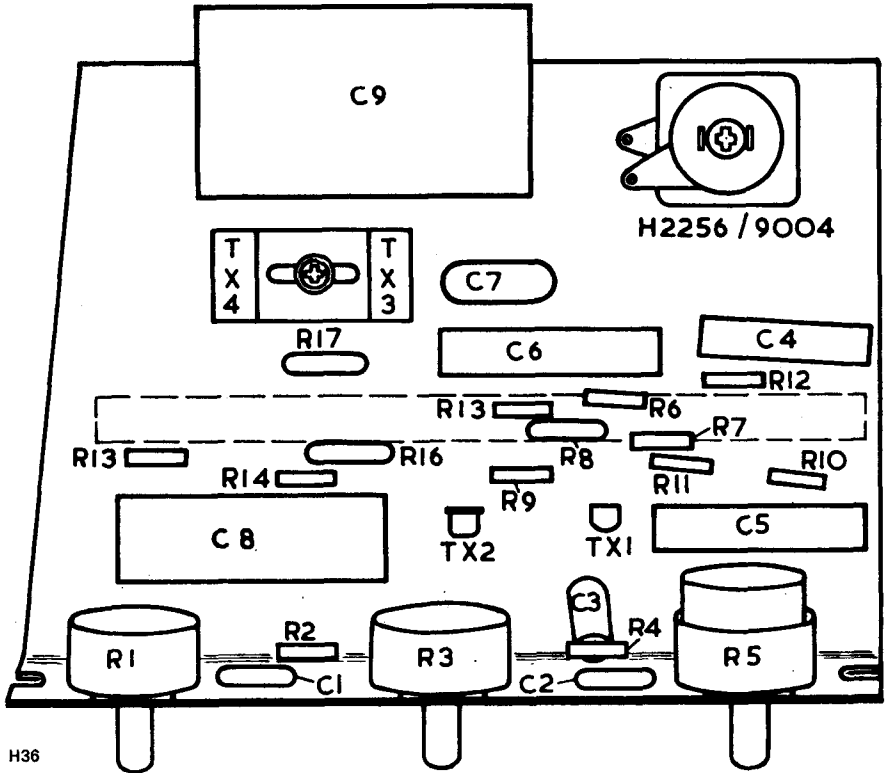
(H34b) CIRCUIT DIAGRAM—CHASSIS MK. 2 (CONTINUED)

finger and thumb. To replace, reverse this procedure ensuring that the coded plastic tube is fitted securely, and the rear end is in contact with the turnover flag proper. Make certain that the metal stylus is firmly located in the V-shaped groove of the drive pocket.

### Semiconductor Complement:

Mk. 1	Mk. 2
BC109	Pre-amplifier
BC113	BC154 Pre-driver
AC176	BC107 Driver
AC176 NPN	AC176} Push-Pull Output
AC128 PNP	AC128}
LT120 (bridge)	H225L/9004—Rectifier.
	261

# RADIO SERVICING



(H36) COMPONENT LOCATIONS—K.B. CHASSIS Mk. 2

## KLINGER

## Model KC24M

**General Description:** This model is similar to the Klinger Model KC24 described in this volume. The letter M indicates that a dynamic pickup is used.

## KLINGER

## Model KC23

**General Description:** Compact stereo HI-FI system consisting of a player unit and two identical loudspeakers. Power output 5 watts per channel. Power supply 200–250 volts A.C. 50 c/s.

**Record Changer:** Garrard model 3000 equipped with lightweight arm, ceramic cartridge and diamond stylus.

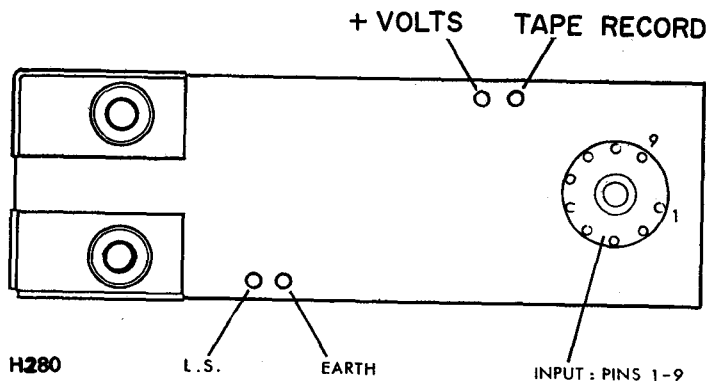
**Loudspeakers:** Bookshelf size acoustically designed speaker system enclosures contain separate bass and tweeter speakers with a crossover network. Impedance 8–16 ohms.

**Amplifiers:** Two closely matched, 5 watt, 7-transistor amplifiers independently constructed on modular circuit boards.

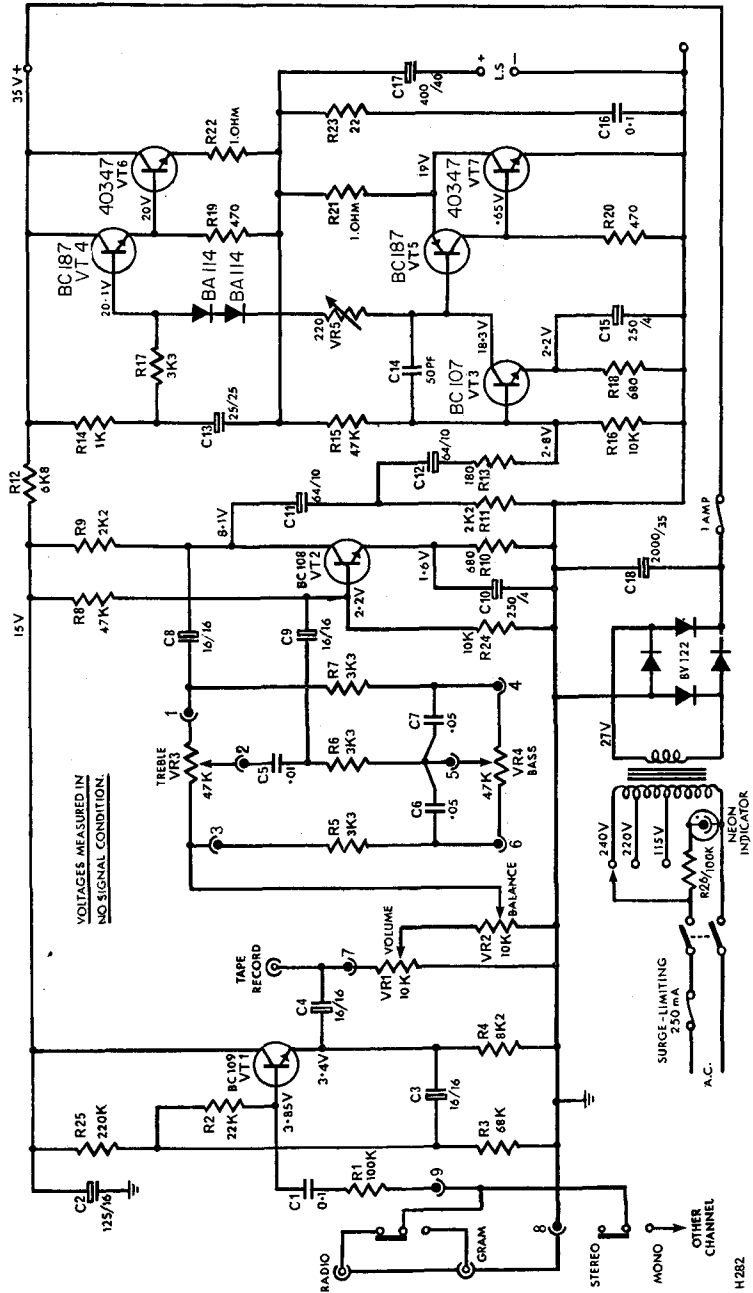
**Dismantling:** Place player unit upside down and remove base board. Disconnect motor and pickup, remove nut on one side and long nut on other side to withdraw entire front assembly from the two bolts anchored in front of cabinet. The two amplifiers are constructed on plug-in boards. Each amplifier board has nine pins which plug into a valveholder near centre of chassis. A retaining strip on a spring ensures that the boards remain in the valveholders. On the outer ends each board has a bracket fixed to chassis with a selfthreading screw.

To remove a board, release tension on the retaining strip and swing board out sufficiently to unplug. The valveholders pivot on their fixing points. The four soldered connections on each board are shown in the diagram. Note that the heat sinks on outer ends of each board are at collector potential of power transistors. Care must be taken to avoid contact with chassis when power is on, as this could destroy the transistors.

**Notes:** The loudspeakers are sealed units. In the event of failure they should be returned to the makers. In case of a fault involving semiconductors on the boards, contact the makers for a replacement board in exchange for faulty one.



(H280) AMPLIFIER BOARD—SOLDERED CONNECTIONS

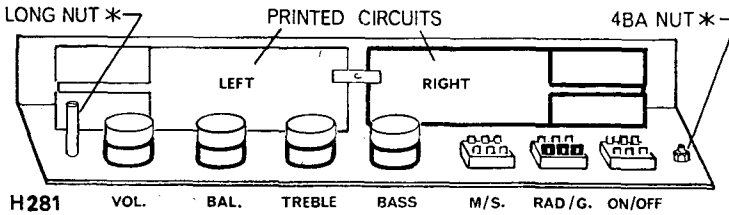
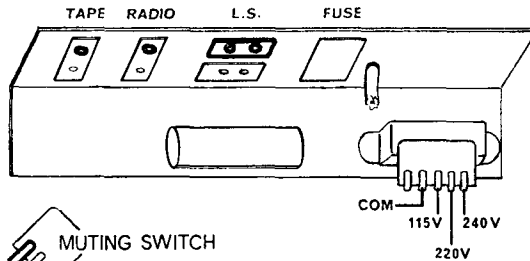


# KLINGER

**Controls:** 1. On/Off. 2. Radio/Gram. 3. Stereo/Mono. 4. Volume. 5. Balance. In its central position the volume from each speaker is the same. The control varies the relative volume from the two speakers. In the extreme positions one speaker or the other is silenced. 6. Bass. 7. Treble.

RIGHT channel is indicated by heavy outlines.

\*chassis fixings



(H281) OVERALL LAY-OUT—MODEL KC23

## KLINGER

## Model KC24

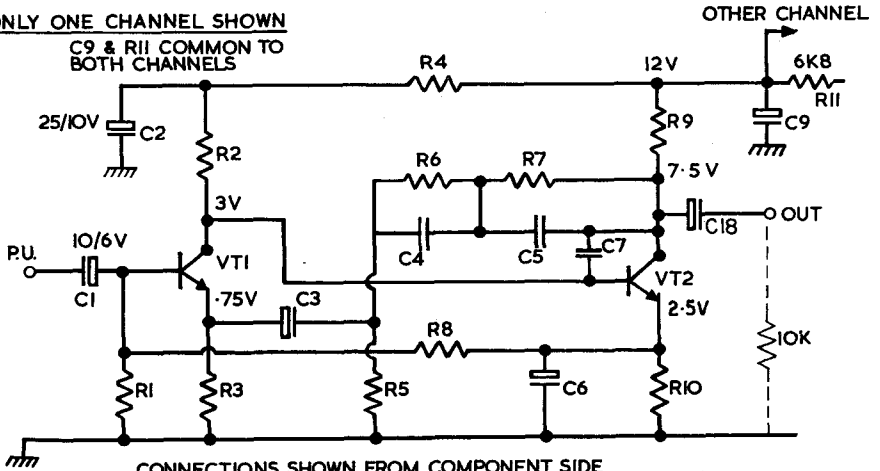
**General Description:** This model is similar to the Klinger Model KC23 previously described in this volume. However, this model employs the Garrard SP25 playing deck and a separate compensated preamplifier.

### Table of Components:

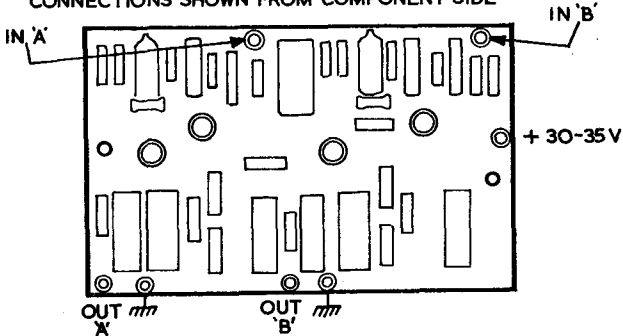
C1	10 mF.	6 volts	R3	2K7
C2	25 mF.	10 volts	R4	10k
C3	64 mF.	4 volts	R5	220 ohms
C4	0.015 mF.		R6	4K7
C5	0.047 mF.		R7	100k
C6	250 mF.	4 volts	R8	150k
C7	220 pF.		R9	4K7
C8	16 mF.	16 volts	R10	2K7
C9	125 mF.	16 volts	R11	6K8
R1	150k		VT1	BC109
R2	22k		VT2	BC108

## RADIO SERVICING

**ONLY ONE CHANNEL SHOWN**  
C9 & R11 COMMON TO BOTH CHANNELS



CONNECTIONS SHOWN FROM COMPONENT SIDE



H283

(H283) PICKUP PREAMPLIFIER—KC24

## KLINGER

## Model KC26

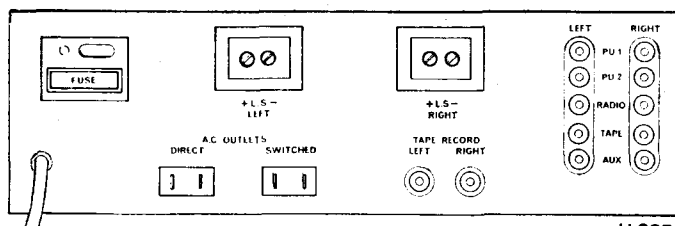
**General Description:** Hi-fi stereo amplifier with power output of 13 watts per channel. Speaker Matching, 8-16 ohms from transformerless output stages. Power supply, 200-250 volts A.C. 50-60 c/s.

**Input Selector Control:** Push-button interlocked. 1. P.U.1. For magnetic (dynamic) pickups. Stereo or mono. 2. P.U.2. For crystal or ceramic pickups. Stereo or mono. 3. Radio. For stereo or mono tuners. 4. Tape. For replay from monitor or speaker outlet on tape recorder, or tape preamplifier. 5. Auxiliary. For high output crystal pickups or other signal source.

# KLINGER

**Bass Control:** Precision ganged—continuously variable. Boost 14 db at 40 Hz. Cut 15 db at 40 Hz. Indicated centre position for level response.

**Treble Control:** Precision ganged—continuously variable. Boost 12 db at 14 kHz. Cut 18 db at 14 kHz. Indicated centre position for level response.



H 285

(H285) REAR CONNECTIONS

**Balance Control:** Single knob adjustable for correct balance between channels from zero to maximum power. Calibrated centre zero setting.

**Volume Control:** Precision ganged for both channels—continuously variable.

**High Filter Control:** Rotary three position, cutting 10 db at 7 kHz, 10 db at 10 kHz, and "OUT". Used to reduce or eliminate scratch from records, or whistles and interference on radio.

**Low Filter Control:** Push-button 18 db cut at 50 Hz. Used to reduce or eliminate turntable rumble, or other low frequency interference.

**Mode Switch Control:** Four position: 1. Power off. 2. Stereo. 3. Stereo reverse (reversing left and right channels). 4. Mono. Left channel input feeding both outputs.

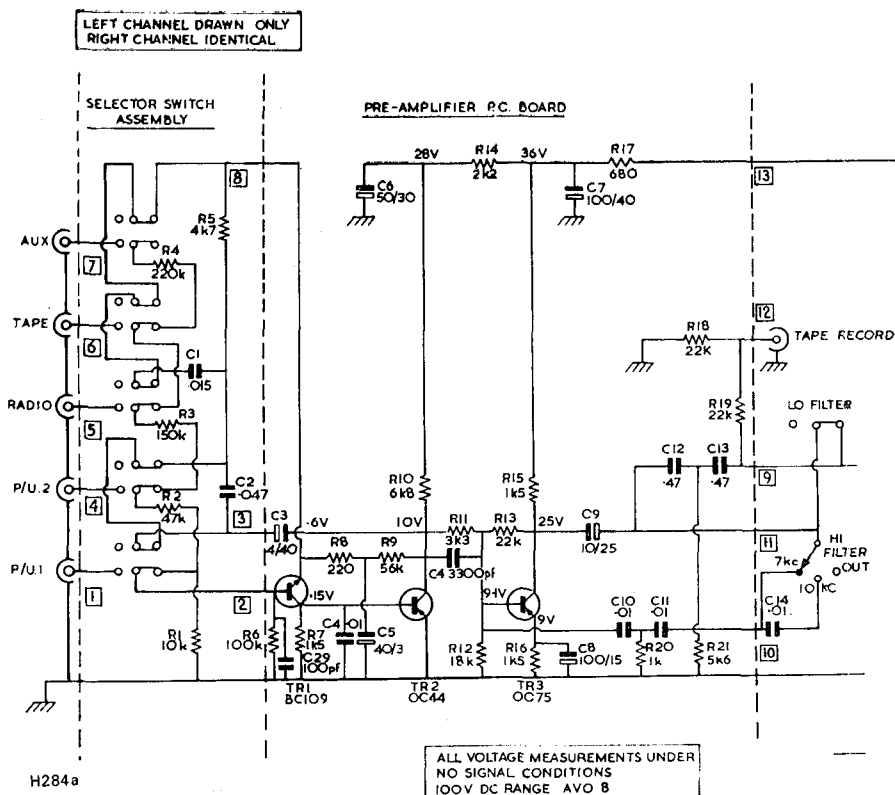
## Input Sensitivities:

	<i>Sensitivity</i>	<i>Matching</i>	<i>Characteristic</i>
Pickup 1	3.5 mV.	47 kΩ	R.I.A.A. compensated for magnetic (dynamic) pickups
Pickup 2	2 mV.	47 kΩ	R.I.A.A. compensated for ceramic pickups
Radio	100 mV.	220 kΩ	Flat
Tape	100 mV.	220 kΩ	Flat
Auxiliary	250 mV.	430 kΩ	Flat (for high-output crystal pickups or other high level programme sources)

**Circuit Diagram Notes:** C<sub>3</sub> may be 0.47 μF. An extra capacitor 680 pF. is connected between base of TR<sub>3</sub> and junction C<sub>11</sub>/C<sub>14</sub>. Set RV<sub>5</sub> for symmetrical clipping on full drive. Voltage on emitter of TR<sub>5</sub> should read 1.4 volts. Figures set in squares denote numbering of connections on printed circuit board. The manufacturer reserves the right to alter circuit diagram without notice.



# RADIO SERVICING



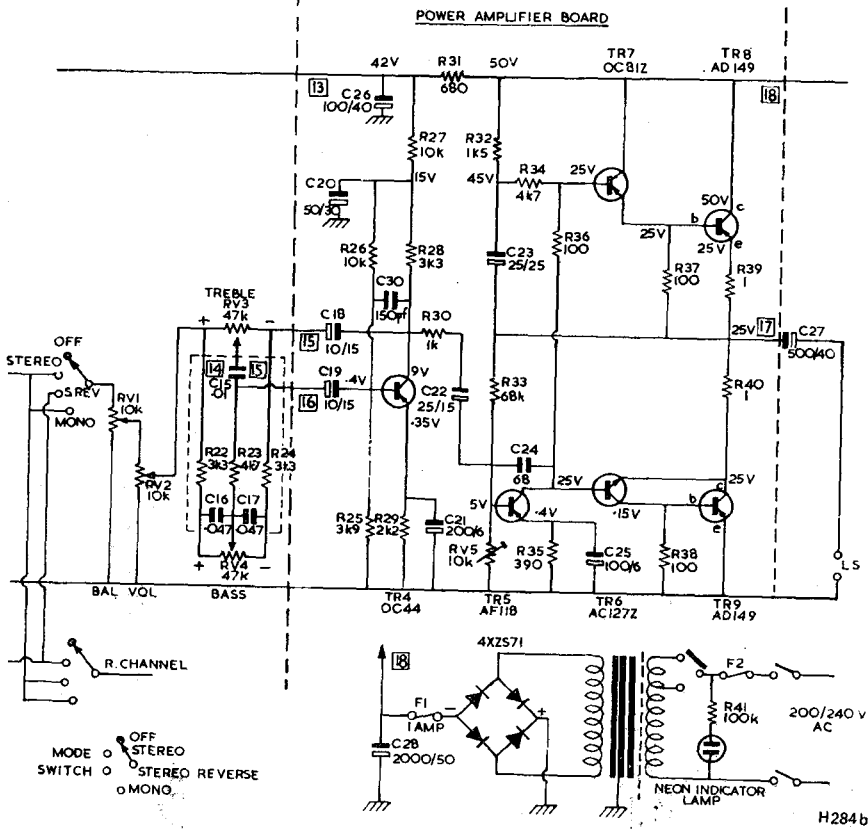
(H284a) CIRCUIT DIAGRAM—KC26 (PART)

**Service:** To simplify service, the modular sub-units are available separately or as replacements. The three principal units are: (a) Input Selector Switch with PC boards and wire to tails complete with diagram of connections and colour code. (b) Preamplifier circuit boards Ref. 1010/25. (c) Complete Power amplifier module with power transistors and speaker terminals. Detach faulty unit by removal of two screws at rear of amplifier and four connections.

**A.C. Outlets:** Two 2-pin sockets (U.S.A. standard) are provided at the rear of the amplifier. These are convenient power sources for gramophone motor, tuner or tape unit. The power from these sockets is not fused. One of the sockets is controlled by the ON/OFF switch of the amplifier.

**Input Connections:** The inputs are standard international co-axial (phono) sockets. Screened cables must be used, whereby the screening forms the only "earth" connection between the amplifier and other equipment. Multiple earthing may introduce hum and instability.

# KLINGER



## KLINGER

## Model KC25

**General Description:** This model is similar to the Klinger Model KC23 described in this volume. However, this model employs the Garrard AT60 playing deck and a separate compensated preamplifier (see Klinger Model KC24 in this volume).



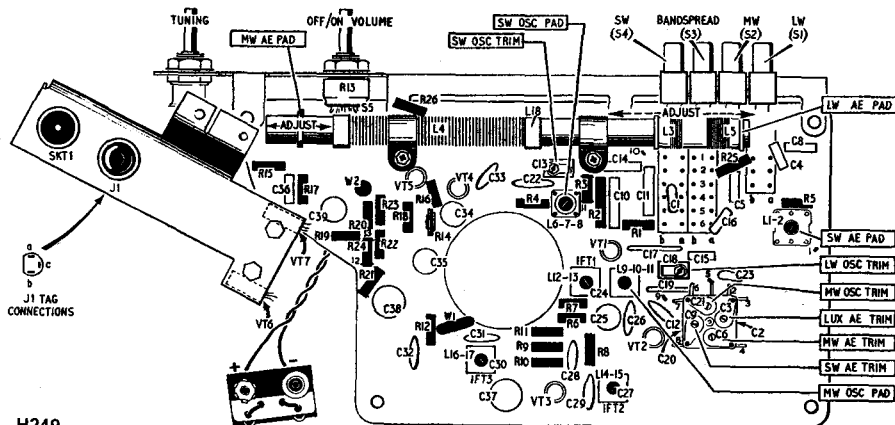
## MARCONIPHONE

## Model 4140

**General Description:** A.M. radio receiver with 600 mW. output. Aerials; ferrite rod and telescopic rod. Sockets; car aerial and earphone (15 ohms). Speaker, round 35 ohms. Batteries, two 9 volt PP7.

**Wavebands:** M.W. 1579-530 kc/s. Bandsread 1621-1389 kc/s. L.W. 268-148 kc/s. S.W. 17.5-9 Mc/s.

**Alignment (General):** Remove cabinet back cover only, then connect an output meter, set to 35 ohms impedance, in place of loudspeaker via jack plug connection to J1. Alternatively, connect a Model 8 Avometer (10 volt A.C. range) across speech coil via tags 12 and 13 on printed board.

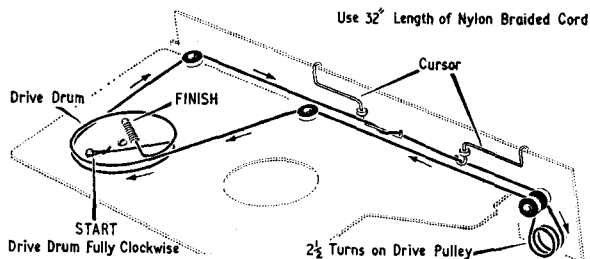


H249

(H249) COMPONENT LOCATIONS—MODEL 4140

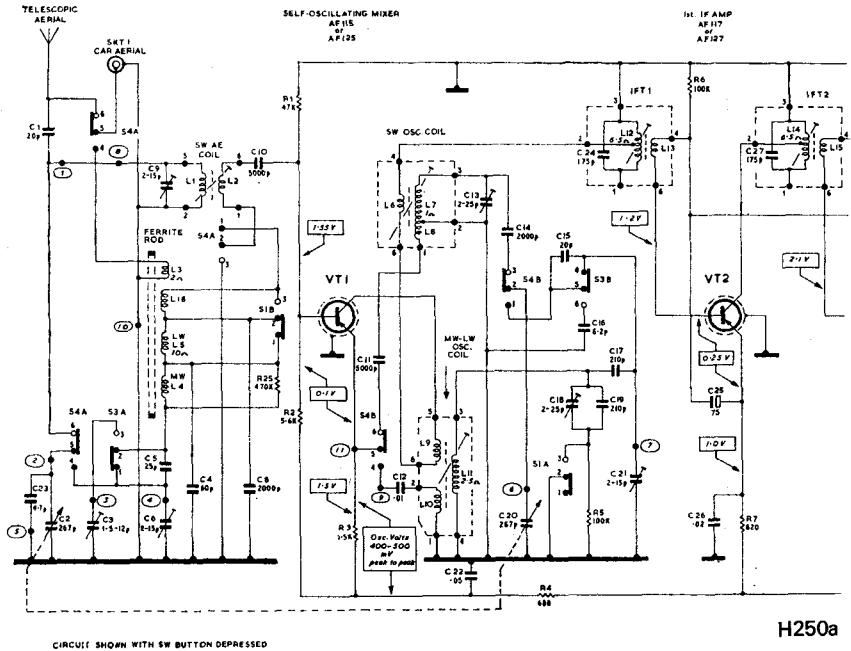
Set volume control to maximum but, during alignment, adjust signal generator output level to maintain receiver output at 50 mW.

**Alignment (I.F.):** Switch receiver to medium waveband and turn gang to maximum capacitance. Apply a 475 kc/s. (30 per cent. modulated) signal, via a 0.1-μF. blocking capacitor, across C2 (aerial section of gang)

(H251) DRIVE CORD—  
MODEL 4140

H251

# RADIO SERVICING



(H250a) CIRCUIT DIAGRAM—MODEL 4140 (PART)

then adjust IFT<sub>3</sub>, IFT<sub>2</sub> and IFT<sub>1</sub> (in that order) for maximum output. Repeat until no further improvement results.

**Alignment (R.F.):** Inject M.W. and L.W. signals, via a loop loosely coupled to the ferrite rod aerial. On S.W. extend telescopic aerial and place signal generator lead nearby to provide a loose coupling. Check that cursor travel is central in scale window, i.e. the gap between cursor and edge of window is equal at both ends.

Wave range	Signal generator	Tune to	Adjust
Medium	600 kc/s.	500 m.	L11, L4
Bandspread	1500 kc/s.	200 m.	C21
Medium	1500 kc/s.	Max. output at 200 m.	C6
Bandspread	1500 kc/s.	200 m.	C3
Repeat as necessary for accurate calibration and maximum output.			
Long	200 kc/s.	1500 m.	C18, L5
Short	7 Mc/s.	7 Mc/s.	L7, L1
Short	16 Mc/s.	16 Mc/s.	C13, C9
Repeat as necessary for accurate calibration and maximum output.			

# MARCONIPHONE



(H250b) CIRCUIT DIAGRAM—MODEL 4140 (CONTINUED)

*Notes:* Adjust L4 by sliding ring along ferrite rod. Adjust L5 by sliding former along ferrite rod. Pulling should be countered by rocking the gang when tuning C9.

**Balance Adjustment (R<sub>14</sub>):** VT<sub>6</sub> and VT<sub>7</sub> are balanced by R<sub>14</sub>. The output waveform should be viewed on an oscilloscope at maximum output, and R<sub>14</sub> adjusted for symmetrical clipping.

**Heat Sink Components:** Whenever transistors (sleeved or unsleeved types) are used in heat sinks it is essential for the preservation of a low thermal resistance that there should be no air-space between the outside surface of the transistor and the inside of the heat sink. In the case of small transistors in cylindrical encapsulation, this air-space must be filled by the application of a suitable heat conducting grease and the transistor pushed fully into its sink. Although the heat sink grease is applied during production it must always be reapplied by the engineer when replacing a transistor during servicing.

Heat Sink Compound DP2623, or Anti-Tracking Grease MS4, is suitable.

**Circuit Diagram Notes:** Figures in rectangles indicate voltages measured with an Avometer 8, between positive line of each transistor and point shown. D.C. resistance readings are shown against inductors where these are 1 ohm or greater. Ringed figures show printed board tag connections.

**Dismantling:** Slide open battery cover, then disconnect and take out batteries. Complete access to the printed board may be gained by removing the cabinet back cover which is retained by three countersunk screws in the cabinet base. For access to the drive cord and the copper side of the printed board, pull off control knobs and unsolder lead on telescopic aerial. Take out five screws and washers securing printed board, then unsolder leads on loudspeaker tag panel. The printed board may then be lifted out without further disconnection.

## MARCONIPHONE

## Model 4142

**General Description:** This receiver is similar to the Ultra Model 6146 described in this volume.

## MARCONIPHONE

## Model 4322

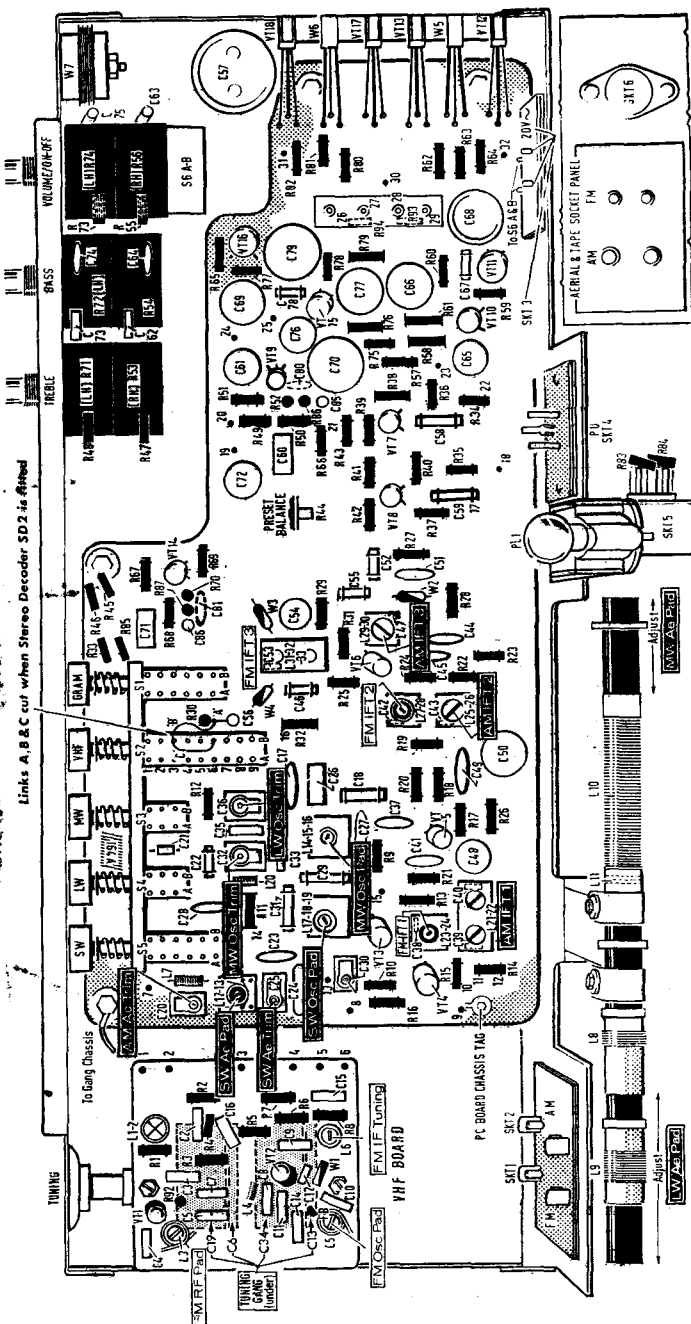
**General Description:** Stereogram with an output of 2 watts continuous tone per channel. Record changer; B.S.R. Superslim UA15 with B.S.R. C1 cartridge and stylus type ST3. Aerials; ferrite rod for A.M. and internal dipole for F.M. Sockets; A.M. aerial, F.M. dipole and tape input and output. 200-250 volts A.C. 50 c/s.

**Wavebands:** S.W. 18.2-5.8 Mc/s. M.W. 1620-530 kc/s. L.W. 268-148 kc/s. V.H.F. 101-87.5 Mc/s.

**Alignment (General):** Remove chassis. Connect an output meter adjusted for 15-ohm impedance in place of L.H. or R.H. loudspeaker or a 20,000-ohm volt-meter set to a suitable A.C. voltage range across the L.H. or R.H. loudspeaker sockets. Zero, trim and pad markers are provided on the scale diffuser.

**Circuit Diagram Notes:** Voltage measurements shown in rectangles were taken relative to the positive rail of each transistor (except where otherwise indicated) with a 20,000-ohm volt-meter, and with a mains input of 245 volts. D.C. resistance readings are shown against inductors where these are 1 ohm or greater. When a stereo decoder unit Type SD2 is plugged into socket SKT5, the wire links A, B and C are cut where shown.

# MARCONIPHONE



H273

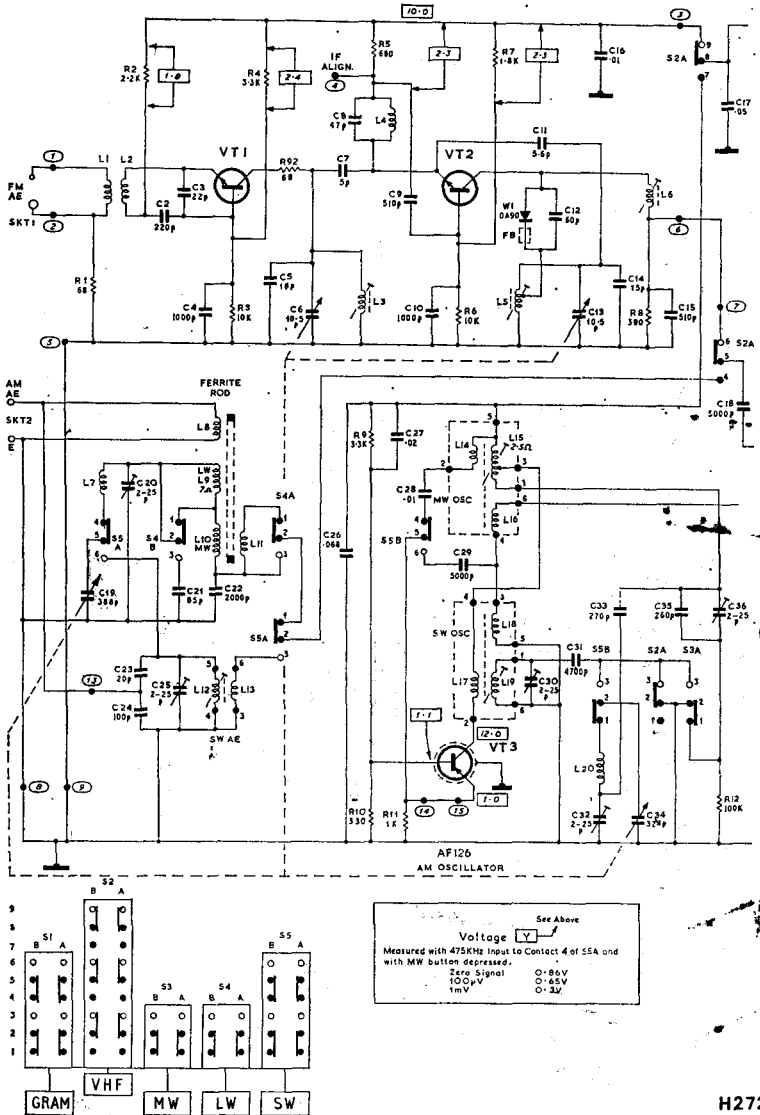
(H273) COMPONENT LOCATIONS—MODEL 4322



# RADIO SERVICING

FM RF AMP,  
BF216

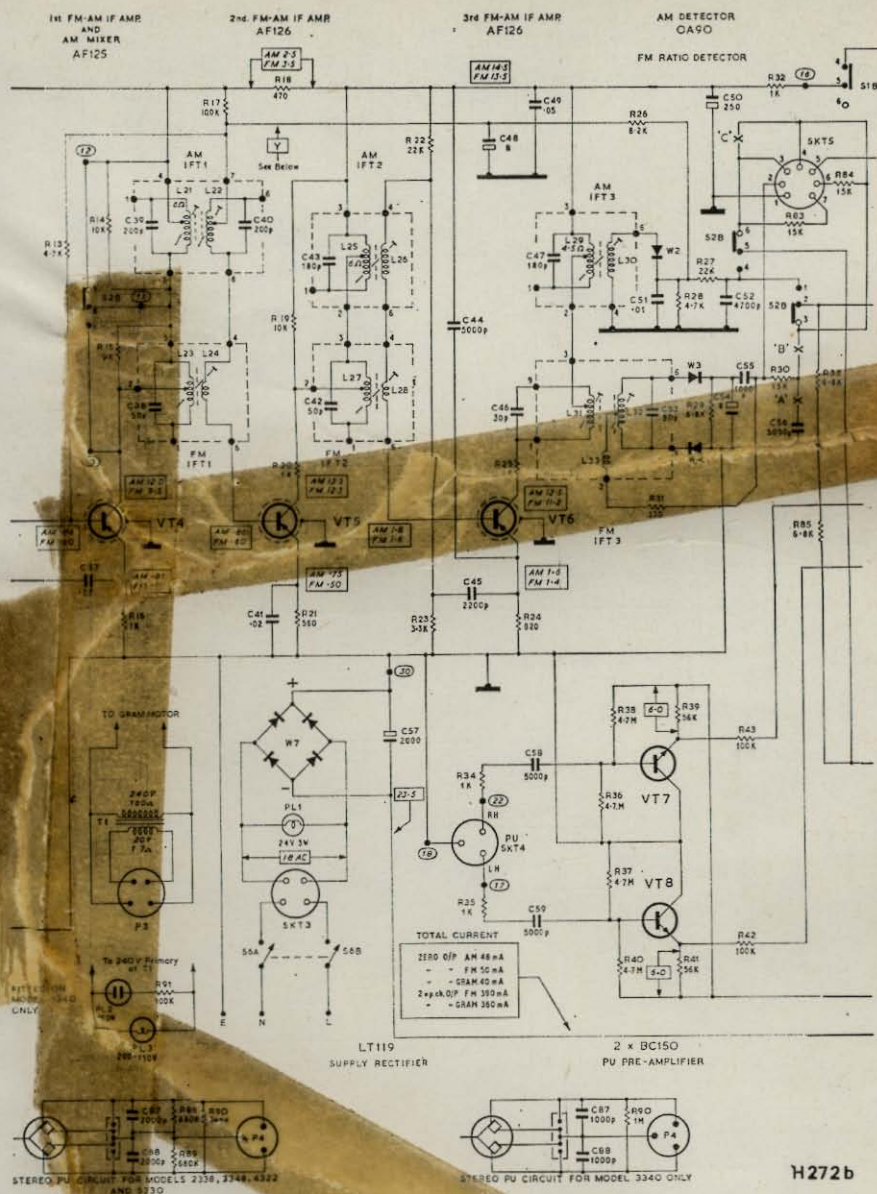
FM OSC & MIXER  
BF217



(H272a) CIRCUIT DIAGRAM—MODEL 4322 (PART)

**Alignment (A.M. I.F.):** Switch receiver to M.W.: turn gang to maximum capacitance position and volume control fully clockwise. Inject a 475 kc/s., 30 per cent. modulated, signal via a 0.1-µF. capacitor between contact 5 of

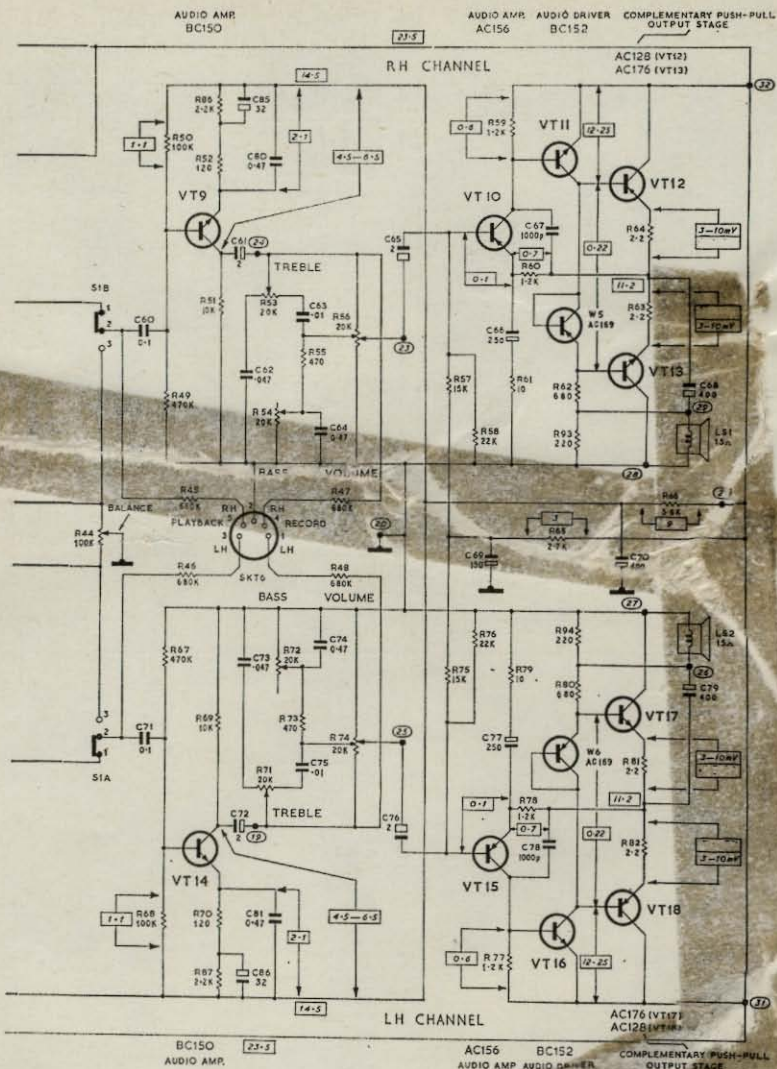
# MARCONIPHONE



(H272b) Circuit Diagram—Model 4322 (PART)

switch S5A and chassis, then peak L29, L25, L22 and L21 for maximum output, adjusting signal input level as required to maintain an output level of 200 mW.

# RADIO SERVICING



L21-22 L31-32-33

•3	4•	•5	5•
•2			7•
•1	10•	•9	8•

L12-13

03	40
02	50
01	60

L14-15-16  
L17-18-19

●	●	●
4	3	6
3	2	1
●	●	●

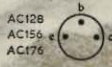
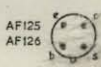
L23-24

•3	4•
•2	
•1	

AC156 BC152  
AUDIO AMP AUDIO DRIVER

COMPLEMENTARY PUSH-PULL  
OUTPUT STAGE

THESE CONNECTIONS MUST BE CUT WHEN  
A STEREO DECODER UNIT IS FITTED



H272 c

(H272c) CIRCUIT DIAGRAM—MODEL 4322 (CONTINUED)

## MARCONIPHONE

**Alignment (A.M. R.F.):** Align M.W. first. 30 per cent. modulated signal should be injected at A.M. aerial/earth socket (SKT<sub>2</sub>) via a 30-pF. series capacitor. With the tuning gang at maximum, check that the cursor coincides with the zero marker on the scale diffuser.

Range	Frequency	Cursor position	Adjust
M.W.	600 kc/s.	M.W. pad marker	L <sub>15</sub> , L <sub>10</sub>
	1400 kc/s.	M.W. trim marker	C <sub>32</sub> , C <sub>20</sub>
L.W.	220 kc/s.	L.W. 220 kc/s. marker	C <sub>36</sub> , L <sub>9</sub>
S.W.	6.7 Mc/s.	M.W. pad marker	L <sub>19</sub> , L <sub>12</sub>
	15.8 Mc/s.	M.W. trim marker	C <sub>30</sub> , C <sub>25</sub>

*Notes:* Adjust L<sub>10</sub> by sliding ring along ferrite rod. Adjust L<sub>9</sub> by sliding former along ferrite rod.

**Alignment (F.M. I.F.):** Use a signal generator providing Band II coverage, also 10.7 Mc/s. A.M. (30 per cent. modulated) and 10.7 Mc/s. F.M. signals (25 kc/s. deviation) at an impedance of 75 ohms.

Switch to V.H.F., and allow the receiver and test equipment to warm up for about 10 min.; set volume control 90 deg. back from maximum with treble and bass controls set to the midway position. Inject 10.7 Mc/s. F.M. signal between tag 7 and chassis, then adjust L<sub>31</sub>, L<sub>32</sub>, L<sub>27</sub> and L<sub>23</sub> for maximum output.

*Notes:* Tune L<sub>31</sub> and L<sub>32</sub> to outer peak with cores protruding from top of coil can.

**Alignment (A.M. Rejection):** Switch signal generator to 10.7 Mc/s. A.M. and tune L<sub>32</sub> for minimum output (this should be a sharply defined dip in output). Switch signal generator to 10.7 Mc/s. F.M. and check that F.M. output has been retained. If maximum A.M. rejection does not coincide with maximum F.M. output, L<sub>32</sub> should be tuned for maximum rejection at the expense of a slight reduction in F.M. output. Reset signal generator to 100  $\mu$ V. F.M. output and recheck operations 1, 2 and 3 using volume control to maintain the output level at 500 mW.

**Alignment (F.M. R.F.):** Check that the cursor coincides with the "zero" marker on the scale diffuser when the gang is fully closed. Tune receiver to F.M. 94 Mc/s. marker on scale diffuser. Inject 94 Mc/s. F.M. signal into F.M. aerial socket (SKT<sub>1</sub>) and adjust L<sub>5</sub>, L<sub>3</sub> and L<sub>6</sub> for maximum output. Repeat as necessary for correct calibration.

**Pickup Balance:** R<sub>44</sub> is a pre-set control which balances the left-hand and right-hand outputs from the pre-amplifier and, normally, will require adjustment only if the pickup cartridge is replaced.

**Audio Check:** Connect a 15-ohm impedance output meter in place of each loudspeaker. Alternatively, examine output waveform on an oscilloscope connected between tag 29 (or tag 26 for LH channel) and chassis. Switch to gram and turn both treble and bass controls fully clockwise, then connect audio oscillator between tags 22 and 18. Inject a 15-20 mV. 800 c/s. signal and note output: for a correctly functioning amplifier this

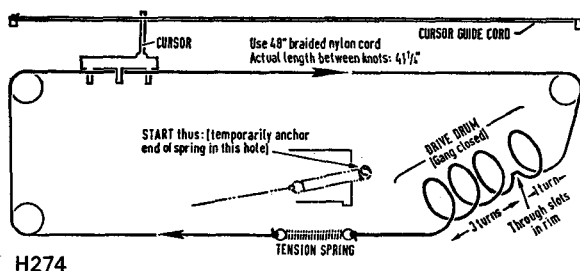
## RADIO SERVICING

should be clean, unclipped and approximately 2 watts. Transfer input to tags 17 and 18 and similarly check other amplifier.

**Tone Control Check:** With test conditions as for the audio amplifier check, volume control at maximum and tone controls set to the midway position, reduce input of 800 c/s. signal to produce 200 mW. output: this will require an input of approximately 5 mV. Back off volume control 20 db, i.e. increase input 20 db and adjust volume control to reduce output to original level. Inject an 80 c/s. audio signal and turn bass control from minimum to maximum: this should produce a variation of 12 db in output level. Inject an 8 kc/s. audio signal and turn treble control from minimum to maximum: this should produce a variation of 18 db. in output level.

**Chassis Removal:** Pull off rotary control knobs, best done by using a length of stout cord as a "puller". Disconnect F.M. aerial plug and remove back cover. Pull out A.M. aerial and F.M. aerial plugs from chassis then release tape recorder and aerial sockets panel from cabinet. Release mains lead clamp, then detach connections from chassis (mains transformer, pickup and loudspeaker). When removing loudspeaker socket connection from printed board, pull outward only to avoid breaking soldered connections on copper side of board. Remove 2BA nut and washers or 2BA bolt from chassis fixing lug located centrally at rear of chassis. The chassis assembly may now be pulled clear of front locating studs and manoeuvred clear of cabinet.

**Record Changer Removal:** Take out screws, swivel turnclips, and unplug F.M. and A.M. leads to release back covers. Unplug pickup and mains transformer connections from radio chassis, remove two 4BA nuts and shake-proof washers securing mains transformer to cabinet floor, and (in Models 2338, 3348 and 4322 only) take out sliding shelf beneath record changer. With record changer transit screws turned fully clockwise, pivot clips on lower end of transit screws to enable them to pass through motor board, then lift record changer and mains transformer clear of cabinet.



(H274) DRIVE CORD—MODEL 4322

## MASTERADIO

## Model D530

**General Description:** A three-band push-button portable radio receiver covering long, medium and short wavebands and incorporating a bandspread section of the medium waveband centred on Radio Luxembourg. Circuit features include seven transistors, one diode and a complementary transformerless push-pull audio circuit, with negative feedback and temperature stabilisation.

**Waveband Coverage:** Long Wave: 150-260 kc/s. (2000-1155 m.). Medium Wave: 540-1500 kc/s. (555-200 m.). Bandspread: 1425-1640 kc/s. (211-183 m.). Short Wave: 5.7-10.3 Mc/s. (49, 41 and 31 mb).

**Aerial:** Internal ferrite rod covering all bands. A seven section telescopic aerial is incorporated to improve short-wave performance. Socket also provided to allow connection to car aerial.

**Output Socket:** A socket is provided for feeding into an earphone, extension speaker or tape recorder. Insertion of a jack plug automatically mutes the internal loudspeaker.

**Loudspeaker:** High flux  $4\frac{1}{8}$  in. diameter, 25 ohms impedance.

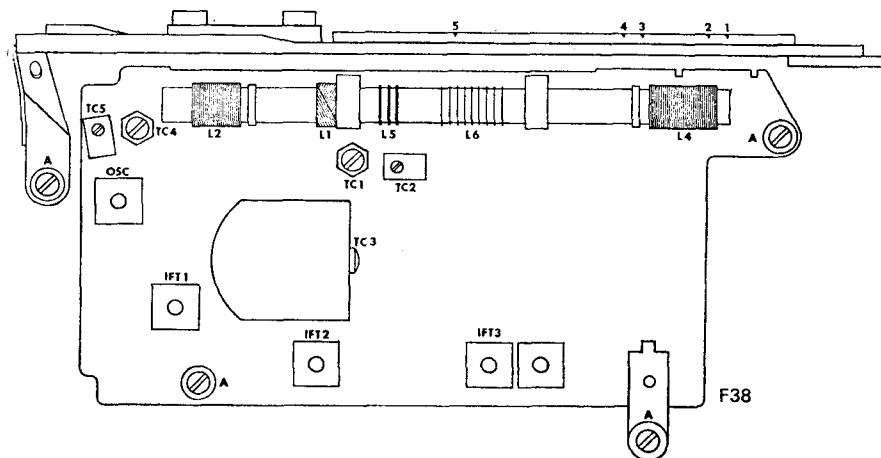
**Power Output:** 250 mW. maximum.

**Battery Supply:** 9 volts: Ever Ready PP7, Vidor VT7 or equivalent.

**Consumption:** 11 mA. quiescent.

**Intermediate Frequency:** 470 kc/s.

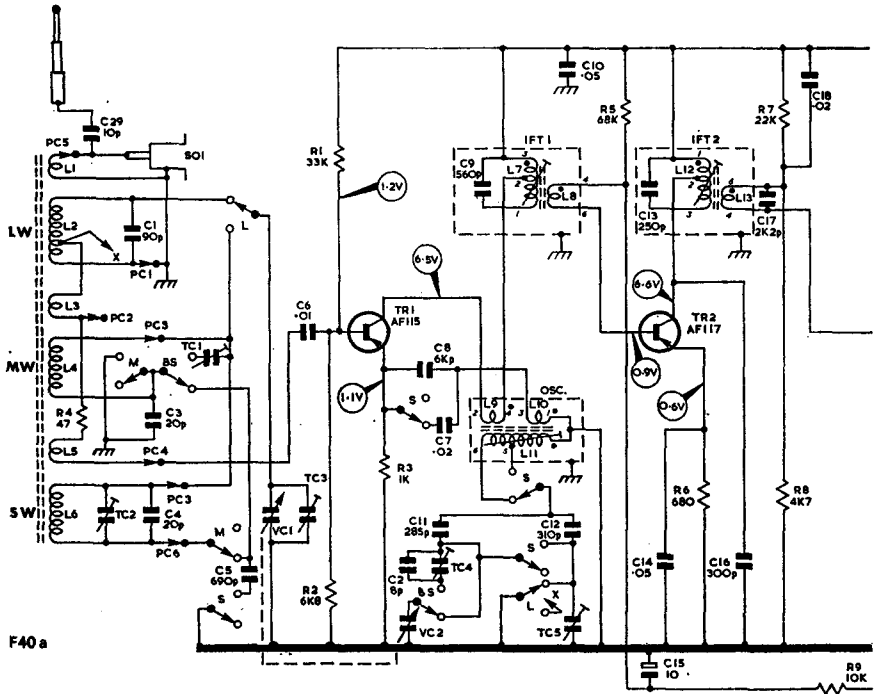
**Semiconductors:** AF115 Self-oscillating mixer. AF117 1st I.F. amplifier. AF117 2nd I.F. amplifier. AC127 Audio pre-amplifier. AC128 Audio driver. AC128 and AC127 Complementary push-pull output. OA90 Detector diode.



(F38) LOCATION OF ALIGNMENT COMPONENTS

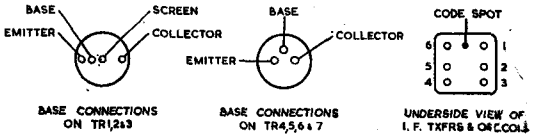


# RADIO SERVICING



## NOTES:-

1. SW1 SHOWN IN LW POSITION.
2. START OF WINDINGS INDICATED BY SPOTS.
3. VOLTAGE & CURRENT MEASUREMENTS TAKEN WITH A 20000A/VOLT INSTRUMENT WITH THE SET SWITCHED TO MW, GANG FULLY MESHEO. NO SIGNAL INPUT.
4. PC Nos. 1 to 10 DENOTE CONNECTION POINTS ON PC. PANEL PC270.



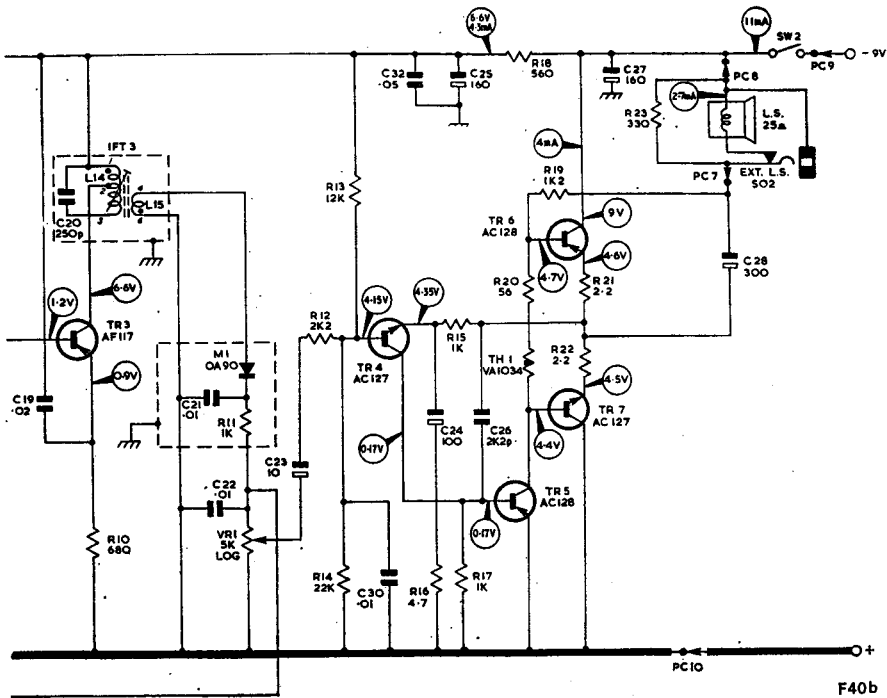
(F40a) CIRCUIT DIAGRAM—MODEL D530 (PART)

**Thermistor:** VA1034 Temperature stabilising.

**Dismantling:** Remove back cover (two Phillips-head screws). Disconnect the lead to telescopic aerial. The chassis is held in position by four screws. To release chassis, slide the car aerial and output sockets out of their slots, remove tuning and volume control knob; (pull off) and remove chassis fixing screws.

Should it be necessary to replace the wave-change switch, it should be noted that the position of this switch is critical and, if misplaced, push-buttons will not centre in the escutcheon. When fitting the new switch, the free end of the pins protruding through the printed circuit board must measure  $\frac{7}{64}$  in. from the top of the pins to the face of the board.

# MASTERADIO



(F40b) CIRCUIT DIAGRAM—MODEL D530 (CONTINUED)

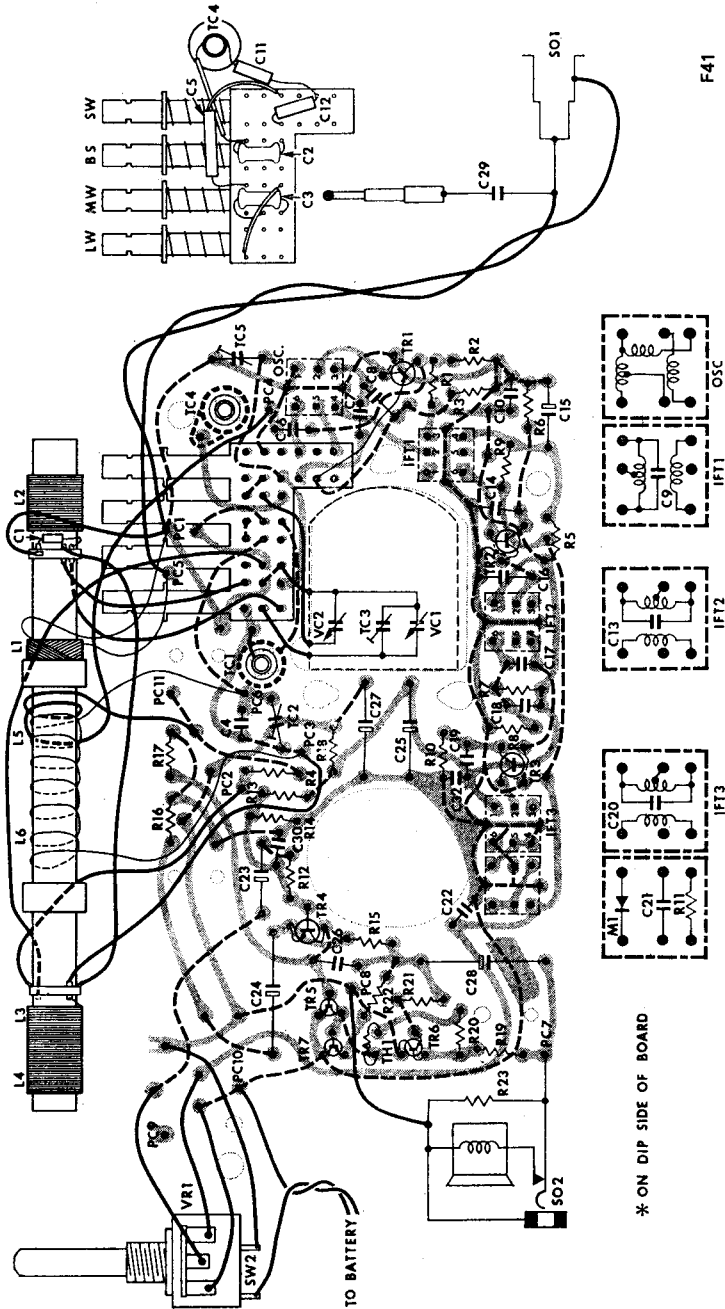
## Alignment Procedure: Equipment Required:

1. An output meter (25-ohm impedance, 0-100 mW.). The output during alignment should not exceed 50 mW.
2. A signal generator (low impedance output), amplitude modulated to 30 per cent. covering long, medium and short wave bands.
3. Suitable insulated trimming tools.

## Notes:

1. Before commencing alignment, check that the pointer coincides with the alignment mark 1 when the gang is fully open.
2. For I.F. alignment (operations 1 and 2 in the alignment table) the signal generator is connected to the base of Tr1 via a 0.01  $\mu$ F. capacitor.
3. For R.F. alignment (operations 3-11 in the alignment table) the output from the signal generator should be fed into a transmitting coil placed 6 in. from the ferrite rod. A suitable coil can be made with approximately 14 turns of 18 s.w.g. enamelled copper wire wound on a 1-in. former and spaced to a length of 1 to 1  $\frac{1}{4}$  in.



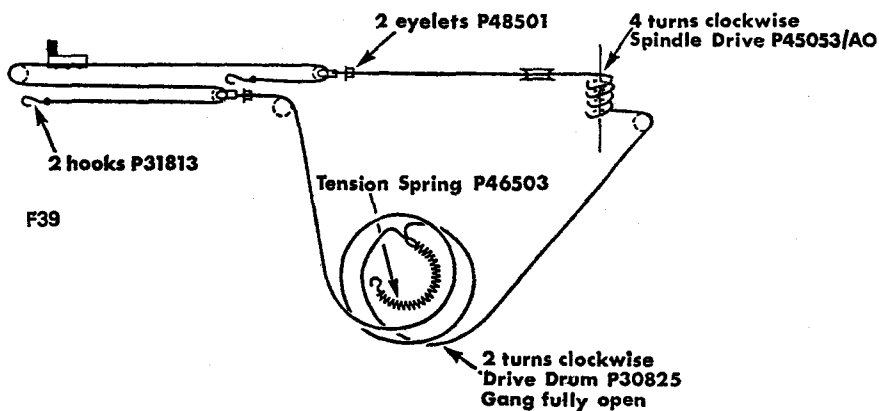


(F41) THE CIRCUIT BOARD EMPLOYS PLAYED CIRCUIT TECHNIQUE WITH PRINTED WIRING ON BOTH SIDES. THE DIAGRAM ABOVE SHOWS THE BOARD AS VIEWED FROM THE TIN DIP SIDE, WITH COMPONENTS AS SEEN THROUGH THE BOARD. WIRING SHOWN IN BROKEN LINE REPRESENTS PRINTED CONNECTIONS ON THE COMPONENT SIDE OF THE BOARD. THE PRINTED CIRCUIT (PC) CONNECTIONS ARE ALSO IDENTIFIED ON THE CIRCUIT DIAGRAM

## MASTERADIO

4. The alignment points referred to in the alignment table are marked on the scale back plate.
5. All cores should be turned to the outer position.
6. Adjustment of L<sub>2</sub> and L<sub>3</sub>/L<sub>4</sub>, where mentioned in the alignment procedure, is achieved by sliding the appropriate coil along the ferrite rod.
7. Adjustment of L<sub>6</sub> is achieved by altering the spacing of the turns.
8. After alignment, the aerial coils should be resealed.

**N.B.:** The short-wave section of this receiver is restricted and covers the 31, 41 and 49 meter bands only. No oscillator tuning adjustment is provided, and in steps 9 and 10 the appropriate signal should be injected and the signal tuned in before the aerial adjustments are made.



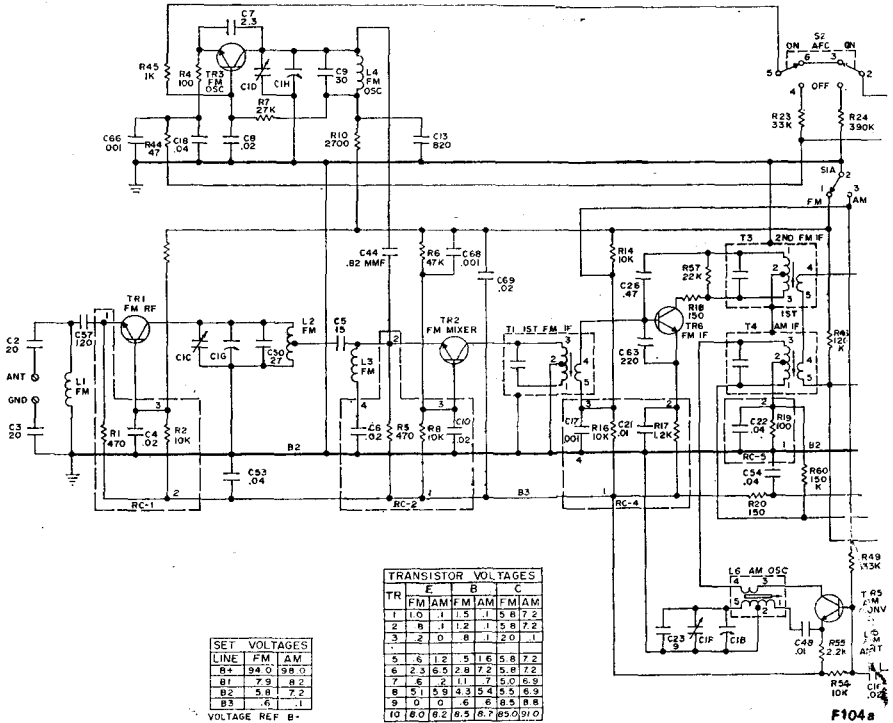
**Alignment Table:**

Operation	Set pointer to alignment mark	Waveband	Signal gen. frequency	Adjust for maximum output
1	Gang fully closed	M.W.	470 kc/s.	L <sub>14</sub> , L <sub>12</sub> , L <sub>7</sub>
2		Repeat operation 1.		
3	4	L.W.	220 kc/s.	L <sub>11</sub>
4	5	M.W.	600 kc/s.	L <sub>3</sub> /L <sub>4</sub>
5	2	M.W.	1440 kc/s.	TC <sub>3</sub> and TC <sub>5</sub>
6		Repeat operations 3, 4 and 5.		
7	4	L.W.	220 kc/s.	L <sub>2</sub>
8	3	B.S.	1500 kc/s.	TC <sub>4</sub> and TC <sub>1</sub>
9	49 m. band	S.W.	6.0 Mc/s.	L <sub>6</sub>
10	31 m. band	S.W.	9.5 Mc/s.	TC <sub>2</sub>
11		Repeat operations 9 and 10.		

# MONOGRAM

# Model UKC 1570

**General Description:** Nine-transistor A.M./F.M. mains-operated clock-radio receiver. Power output: 1 watt undistorted, 1.5 watt maximum. Mains supply 220-250 V.A.C. Wavebands: A.M. 540-1600 kc/s.; F.M. 88-108 Mc/s.

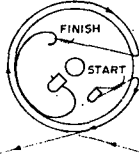


(F104a) CIRCUIT DIAGRAM—MODEL UKC 1570 (PART)

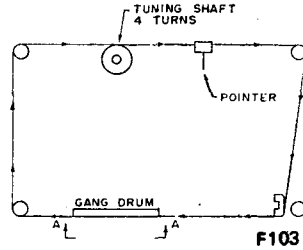
**Circuit Diagram Notes:** 1. S<sub>3</sub> used with clock on clock sets. 2. S<sub>3</sub> used with R<sub>36</sub> on non-clock sets. 3. Unless otherwise noted. Capacitors more than 1 =  $\mu$ F. Capacitors less than 1 = mF. Resistors  $\frac{1}{2}$  watt K = 1000. 4. Voltages are positive with respect to B— under no signal conditions and volume control min. 5. Replace transistors with type shown. 6. Switch S<sub>1</sub> shown in F.M. position.

# MONOGRAM

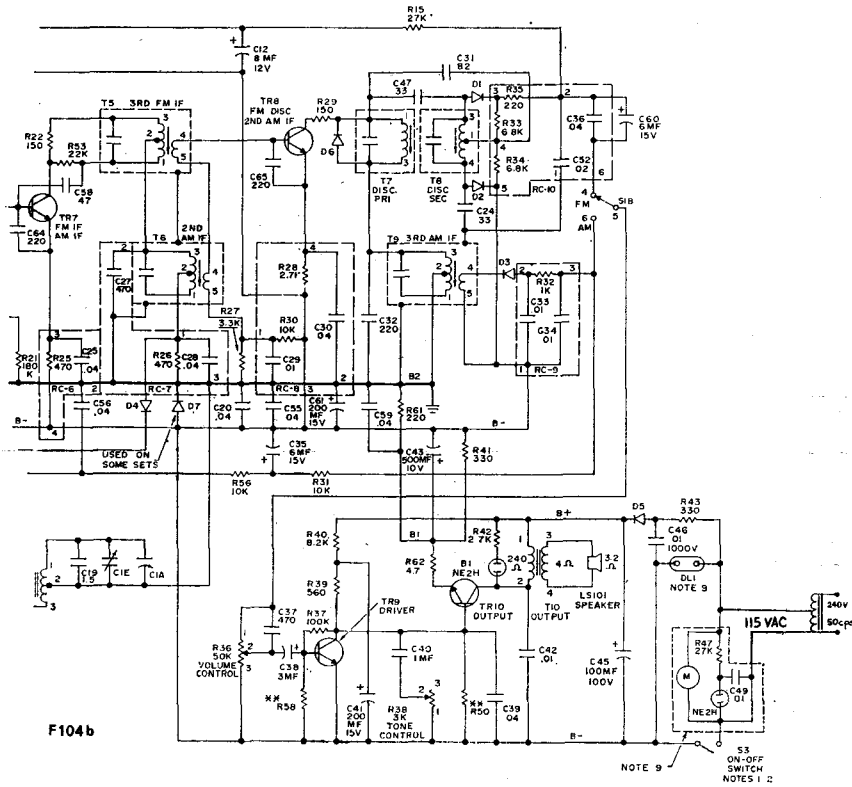
START STRINGING WITH  
GANG FULLY OPEN



VIEW - A-A  
GANG DRUM



(F103) DRIVE CORD—  
MODEL UKC 1570



(F104b) CIRCUIT DIAGRAM—MODEL UKC 1570 (CONTINUED)

**Alignment:** See tables overleaf.

## RADIO SERVICING

### Alignment:

#### *F.M. Alignment*

Step	Signal Generator	Generator setting	Tuning gang	V.T.V.M. connection	Adjustment	Notes
1	Couple output to emitter of TR <sub>2</sub> through a 3 M.M.F. ceramic capacitor. Couple gnd. to tuning gang	10.7 Mc. A.M. modulated 80 per cent. or less	Set gang at highest frequency	TR <sub>8</sub> emitter and gnd. in series with a 22k resistor and a 0.05 M.F. series capacitor	T <sub>5</sub> , T <sub>3</sub> , T <sub>2</sub> , T <sub>1</sub> for maximum gain	Keep generator output level as low as possible. S <sub>1</sub> in F.M. and A.F.C. switch in F.M. position
2	Same	Same	Same	Top side of volume control	T <sub>8</sub> , T <sub>7</sub> for sharp null	Same
3	Couple output and gnd. to F.M. antenna term	108.5 Mc. Unmodulated	Same	Same	Adjust CrB and CrC for best null in noise level	If F.M. modulation is available, make all adjustments for maximum gain
4	Same	87.75 Mc. Unmodulated	Set gang at lowest frequency	Same	Adjust L <sub>2</sub> and L <sub>4</sub> for best null in noise level	Use weakest possible signal
5	Recheck Steps 3 and 4					

#### *A.M. Alignment*

Step	Signal generator	Generator setting	Tuning gang	Connect scope or output meter	Adjustments
1	Radiate output to L <sub>5</sub>	455 kc. modulated 400 cycles at 30 per cent.	Set gang to highest frequency	Voice coil	T <sub>4</sub> , T <sub>6</sub> , T <sub>9</sub> for maximum
2	Repeat Step 1				
3	Radiate output to L <sub>5</sub>	1630 kc.	Same	Voice coil	Oscillator trimmer CrF for maximum
4	Same	580 kc.	580 kc.	Voice coil	A.M. Oscillator L <sub>6</sub> while rocking gang
5	Same	1400 kc.	1400 kc.	Voice coil	Peak antenna trimmer CrE while rocking gang
6	Repeat Steps 1 through 5 as necessary				

## NATIONAL PANASONIC

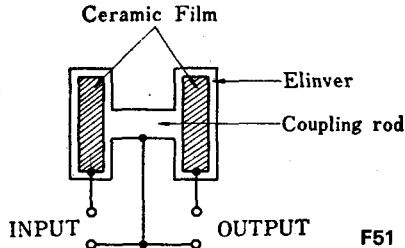
## Model R-470

**General Description:** Ten-transistor, four-waveband portable receiver. Wavebands M.W. 525-1605 kc/s.; S.W.1 1.6-4.5 Mc/s.; S.W.2 4.5-11 Mc/s.; S.W.3 12-26.1 Mc/s. Power output 0.52 watts undistorted up to watt maximum. Intermediate frequency 455 kc/s.

**The Mechanical I.F. Filter:** The mechanical filter employed as the 1st I.F. transformer of this superheterodyne receiver is the H-type electro-mechanical I.F. filter. The filter consists of an input transducer, a resonant mechanical section (comprised of elinvers and coupling rod). Two ceramic films, as a function of the input and output transducer, are mounted by silver solder on both sides of the elinvers shown. The input and output transducers serve only as electro to mechanical coupling and do not affect the selectivity characteristics, which are determined by the dimensions of the elinvers and the coupling rod. An electrical signal applied to the input terminal is converted into a mechanical vibration at the input transducer

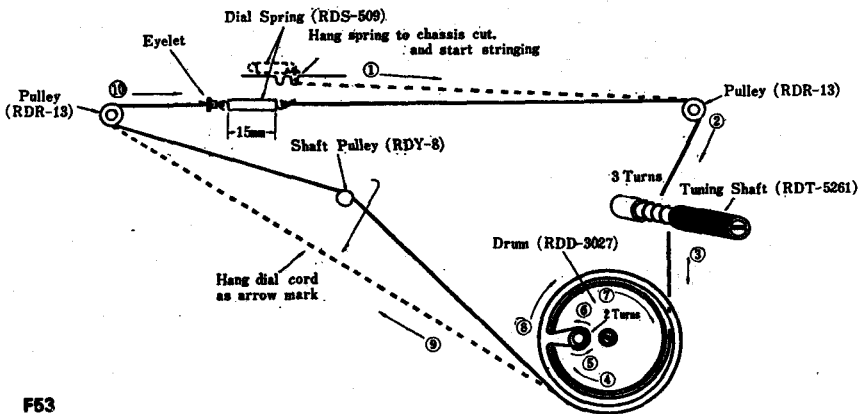
# NATIONAL PANASONIC

(F51) MECHANICAL I.F. FILTER



F51

by means of piezoelectric effect of the ceramic film. This mechanical vibration travels through the resonant mechanical section to the output transducer where it is converted by means of piezoelectric effect to an electrical signal which appears at the output terminal. By employing the mechanical filter the selectivity is improved more than 10 times and the bandwidth more than twice compared with the usual I.F. transformer. The frequency characteristic of the mechanical filter is permanent and no adjustment is possible. The filter is enclosed in a hermetically sealed case.



F53

(F53) DRIVE CORD—MODEL R-470

**Circuit Diagram Notes:** 1.  $S_1$   $S_4$ : Band selector switch in "M.W." position. 2.  $S_5$ : Dial light switch in "OFF" position. 3.  $S_6$ : Power source switch in "OFF" position. 4. Measured voltages for  $TR_1 \sim TR_{10}$  are from transistor terminal to bias line. 5. The value of resistance marked with \* is standard and it may be changed by the characteristics of transistors. \* $R_{21} = 330 \text{ k}\Omega$ ,  $220 \text{ k}\Omega$  or  $150 \text{ k}\Omega$ . 6. D.C. voltage measurements are taken with circuit tester ( $10 \text{ k}\Omega/\text{V}$ ). 7. Capital letters (M, K, J, P) in the circuit diagram show allowable tolerance of capacitors as follows: M =  $\pm 20\%$ ; K =  $\pm 10\%$ ; J =  $\pm 5\%$ ; P =  $+100\%$ ,  $-0\%$ . 8. Tolerance of all resistors is  $\pm 10\%$ . 9. Battery current; No signal  $12 \sim 20 \text{ mA}$ . Maximum output  $150 \sim 190 \text{ mA}$ .

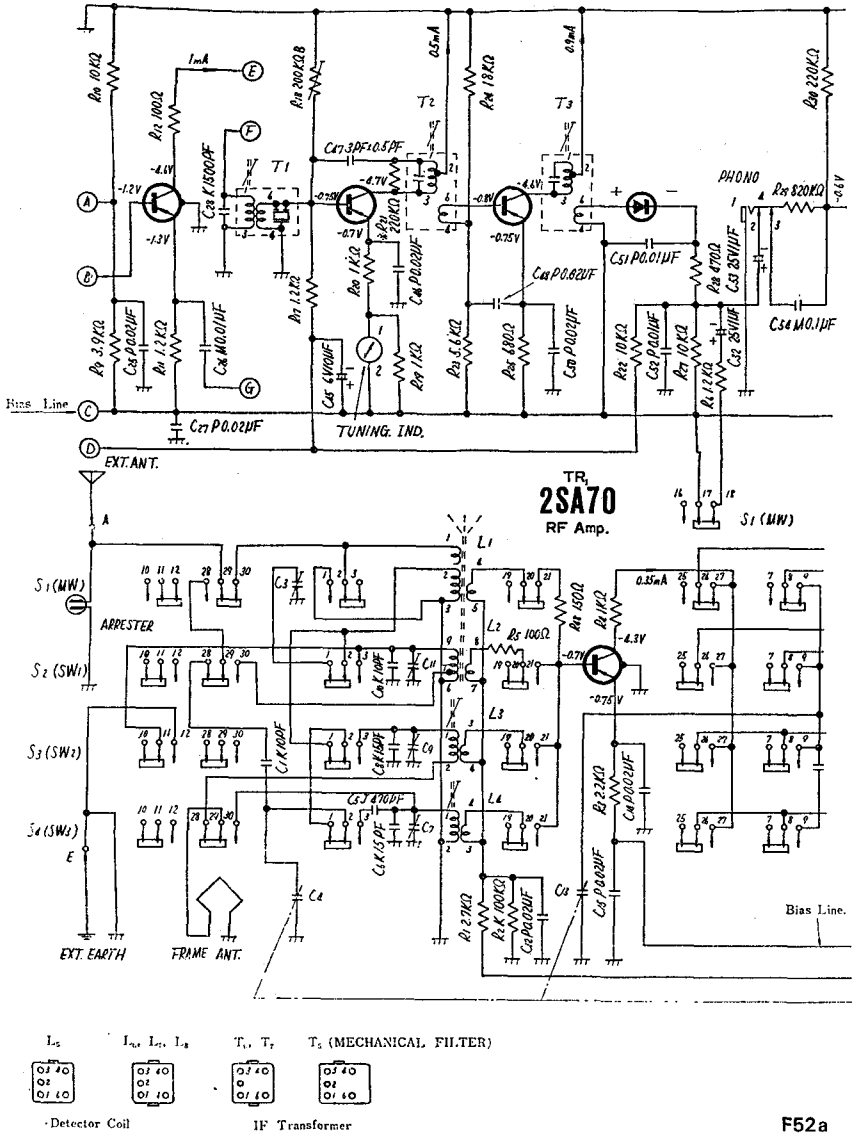
# RADIO SERVICING

TR<sub>1</sub>  
**2SA70**  
Conv.

TR<sub>1</sub>  
**2SA101**  
1st IF Amp.

TR<sub>1</sub>  
**2SA101**  
2nd IF Amp.

D<sub>1</sub>  
**0A70**  
Det & AGC



F52a

(F52a) CIRCUIT DIAGRAM—MODEL R-470 (PART)

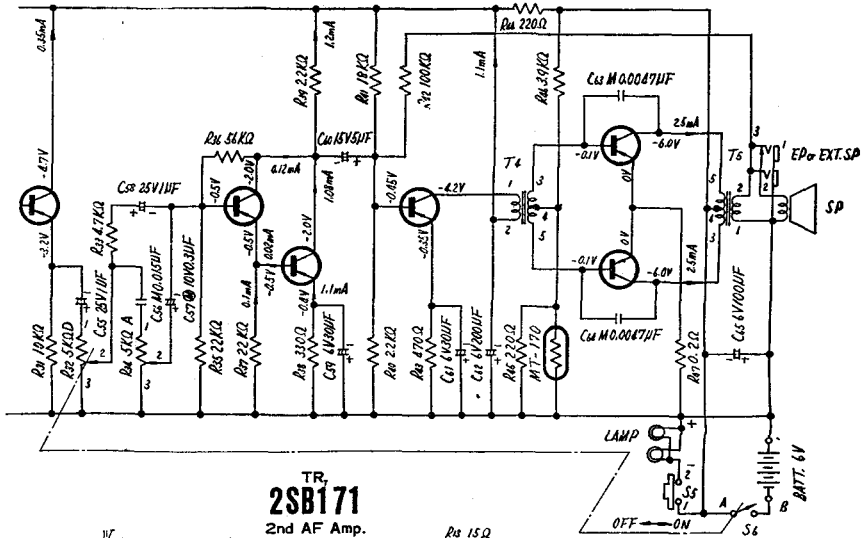
# NATIONAL PANASONIC

TR<sub>2</sub>  
**2SB173**  
PRE Amp.

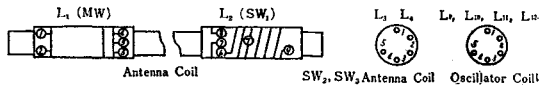
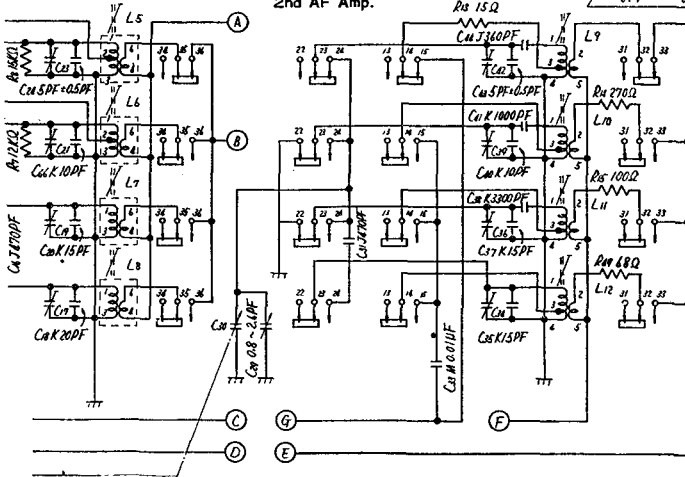
TR<sub>4</sub>  
**2SB173**  
1st AF Amp.

TR<sub>5</sub>  
**2SB171**  
3rd AF Amp.

TR<sub>9</sub> & TR<sub>10</sub>  
**2SB178×2**  
Power Amp.



TR<sub>3</sub>  
**2SB171**  
2nd AF Amp.



F52b

(F52b) CIRCUIT DIAGRAM—MODEL R-470 (CONTINUED)



# RADIO SERVICING

S <sub>4</sub> (SW <sub>3</sub> )	S <sub>3</sub> (SW <sub>2</sub> )	S <sub>2</sub> (SW <sub>1</sub> )	S <sub>1</sub> (MW)
1 10 19 28 2 11 20 29 3 12 21 30 4 13 22 31 5 14 23 32 6 15 24 33 7 16 25 34 8 17 26 35 9 18 27 36	1 10 19 28 2 11 20 29 3 12 21 30 4 13 22 31 5 14 23 32 6 15 24 33 7 16 25 34 8 17 26 35 9 18 27 36	1 10 19 28 2 11 20 29 3 12 21 30 4 13 22 31 5 14 23 32 6 15 24 33 7 16 25 34 8 17 26 35 9 18 27 36	1 10 19 28 2 11 20 29 3 12 21 30 4 13 22 31 5 14 23 32 6 15 24 33 7 16 25 34 8 17 26 35 9 18 27 36

F62c

(F52c) BAND SELECTOR SWITCH—MODEL R-470

## NATIONAL PANASONIC

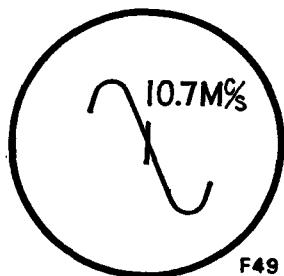
## Model RF-621L

**General Description:** Nine-transistor, three-waveband A.M./F.M. portable radio. Power output 500 mW. maximum. Batteries: four penlight (6 volts). Wavebands: F.M. 87-108 Mc/s.; M.W. 577-186 m.; L.W. 2000-1000 m. External loudspeaker impedance 8 ohms. A whip aerial is used for F.M. and a ferrite aerial for the A.M. bands.

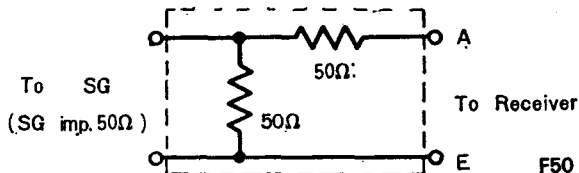
**Dismantling:** Remove the back cover, four red chassis mounting screws and the heat sink mounting screw. To remove the chassis, unsolder the loudspeaker leads.

### Alignment

**A.M.:** Connect several turns of wire across the signal generator output. I.F. 470 kc/s. Adjust T8, T5 and T3 for maximum output. L.W. 150 kc/s.—L9 (osc. coil), L8 (aerial coil); 300 kc/s.—C31 (osc. trimmer), C23 (aerial trimmer). M.W. 550 kc/s.—L10 (osc. coil), L7 (aerial coil); 1500 kc/s.—C35 (osc. trimmer), C22 (aerial trimmer).



F49 (F49) WAVEFORM DIAGRAM



(F50) F.M. DUMMY AERIAL

## F.M. I.F. and Detector Alignment with Oscilloscope

**Oscilloscope:** Set sweep selector of oscilloscope to "External Sweep". Apply 60-c/s. sweep signal from sweep generator to horizontal input terminals of oscilloscope.

**Equipment Required:** Signal generator that provides 10.7 Mc/s. marker. Sweep generator that provides 10.7 Mc/s. centre frequency and 400 kc/s. sweep width. Set band selector switch to F.M. Set volume control to minimum.

**Note:** Unsolder lead between test point PT3 and point (A) before alignment and resolder it after alignment.

Sweep generator coupling	Signal generator coupling	Radio dial setting	Indicator	Adjust	Remarks
0.001 $\mu$ F. to point TP2. Common to Chassis	0.001 $\mu$ F. to point TP2. Common to Chassis	100 Mc/s.	Connect vert. Amp. of scope to point TP3. Common to chassis	T4 (3rd I.F.T.) T2 (2nd I.F.T.) T1 (1st I.F.T.)	Adjust for maximum amplitude and symmetrical curve
0.001 $\mu$ F. to point TP2. Common to Chassis	0.001 $\mu$ F. to point TP2. Common to Chassis	100 Mc/s.	Connect vert. Amp. of scope to point TP4. Common to chassis	T6 (4th I.F.T.) (Primary) T7 (4th I.F.T.) (Secondary)	Adjust T6 for maximum amplitude and proper linearity between $\pm 100$ kc/s. markers. Adjust T7 so that 10.7 Mc/s. marker appears at the centre. (Refer to illustration F49)

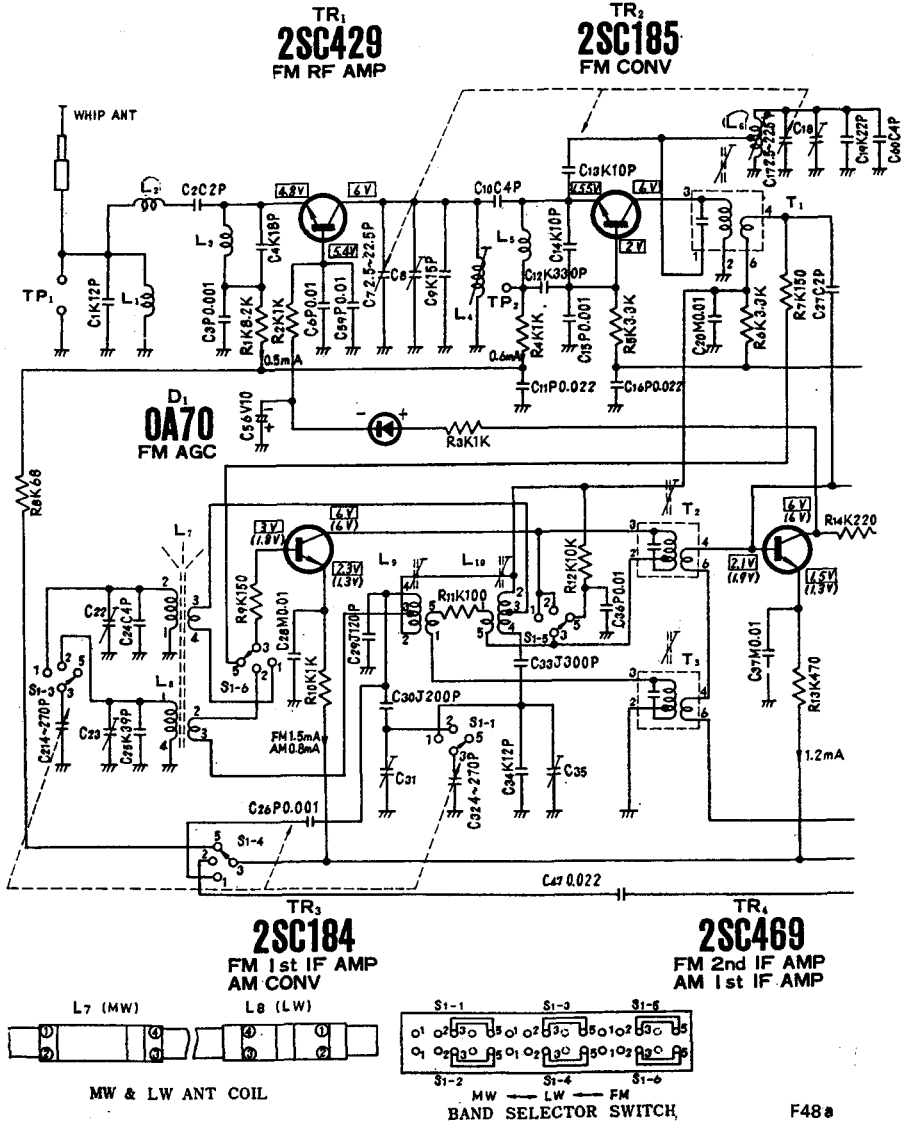
**Note:** When aligning the Ratio Detector circuit, (Fig. F49) waveform may be inverted.

**F.M. R.F. Alignment:** Output of signal generator should be no higher than necessary to obtain an output reading. Set volume control to maximum. Set band selector switch to F.M.

Signal generator coupling	Signal generator frequency	Radio dial setting	Indicator	Adjust	Remarks
(1) Connect to Point TP1 through F.M. Dummy antenna. Common to chassis	90 Mc/s. (400 c/s. Mod.)	90 Mc/s.	Output meter across earphone jack	L6 (F.M. Osc. coil) L4 (F.M. Ant. coil)	Adjust for maximum output
(2) Connect to Point TP1 through F.M. Dummy antenna. Common to chassis	106 Mc/s. (400 c/s. Mod.)	106 Mc/s.	Output meter across earphone jack	C18 (F.M. Osc. trimmer) C8 (F.M. Ant. trimmer)	Adjust for maximum output. Repeat steps (1) and (2)

**Note:** As three output responses will be present, proper tuning is the centre frequency.

# RADIO SERVICING



(F48a) CIRCUIT DIAGRAM—MODEL RF-621L (PART)

**Circuit Diagram Notes:** 1. S1-1 ~ S1-6: Band selector switch in "F.M." position. 2. S2: Power source switch in "OFF" position. 3. D.C. voltage measurements are taken with circuit tester (10 kΩ/V) from negative terminal of battery.

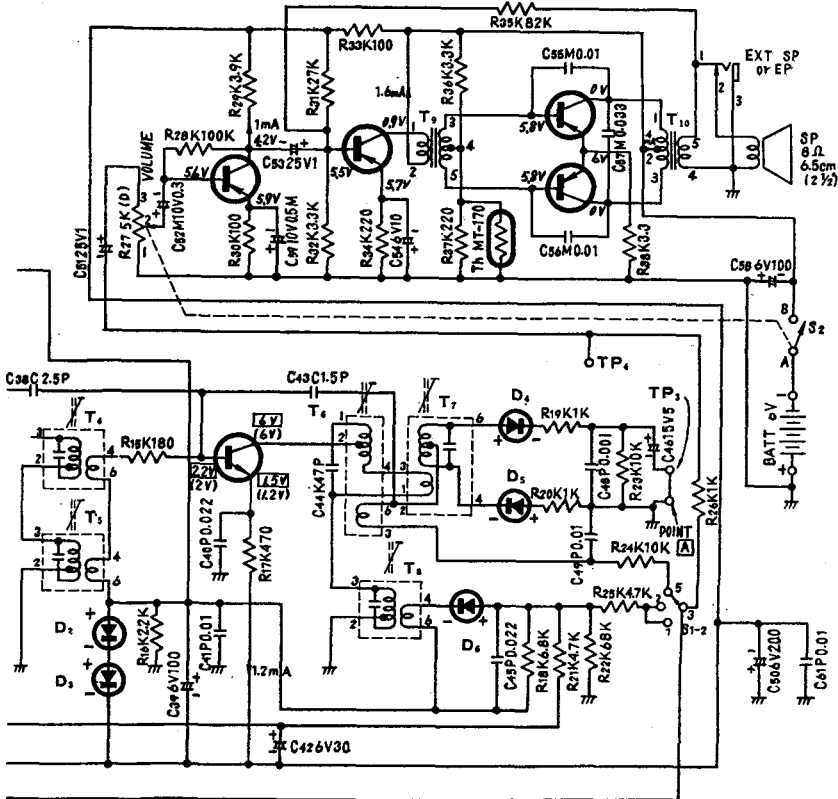
□ . . . F.M. position ( ) . . . M.W. position. 4. Capital letters

NATIONAL PANASONIC

TR<sub>6</sub>  
**2SB171**  
1st AF AMP

TR<sub>7</sub>  
**2SB175**  
2nd AF AMP

TR<sub>8</sub> & TR<sub>9</sub>  
**2SB176×2**  
POWER AMP



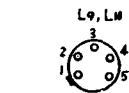
D<sub>2</sub> & D<sub>3</sub>  
**1S1211×2**  
AOC

TR<sub>5</sub>  
**2SC469**  
FM 3rd IF AMP AM DET & AGC  
AM 2nd IF AMP

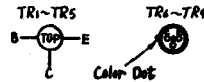
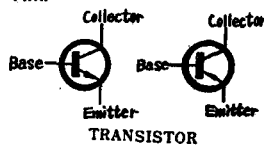
D<sub>4</sub>  
**0A90**

D<sub>1</sub> & D<sub>5</sub>  
**0A70×2**  
FM DET

F48



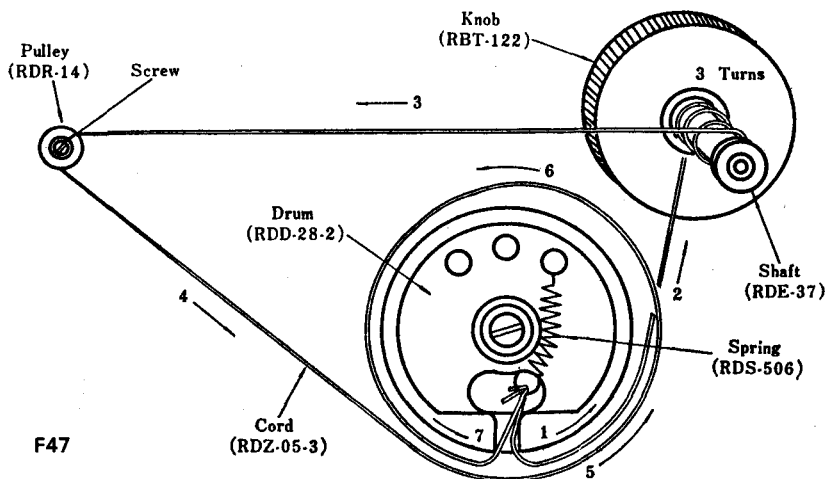
BOTTOM VIEW  
MW & LW OSC COIL IFT



(F48b) CIRCUIT DIAGRAM—MODEL RF-621L (CONTINUED)

(J, K, M, P, C) in the circuit diagram shows allowable tolerances of resistors and capacitors as follows: J =  $\pm 5\%$ , K =  $\pm 10\%$ , M =  $\pm 20\%$ , P =  $\pm 100\%$ , C =  $\pm 0.25$  pF. 5. Battery current: No signal F.M. M.W. 17 mA. Maximum output F.M. M.W. 130 mA. 7. All resistor values in ohms (K = 1000 ohms). 8. All capacitor values in micro-farads.

## RADIO SERVICING



(F47) DRIVE CORD—MODEL RF-62iL

**Drive Cord Notes:** 1. Take the dial back plate off by removing the screw. Then reinsert the screws to hold the dial cord (see figure) 2. Dial cord length is 55 cm. ( $21\frac{3}{8}$  in.). 3. Tuning gang is positioned at maximum capacity. 4. Arrow marks (1 ~ 7) indicate correct order and direction of stringing dial cord. 5. Cement dial cord ends.

### To Mount Dial Pointer:

1. Set tuning gang to fully closed position. 2. Set dial pointer to start point of pointer guide. 3. Attach dial cord to dial pointer.

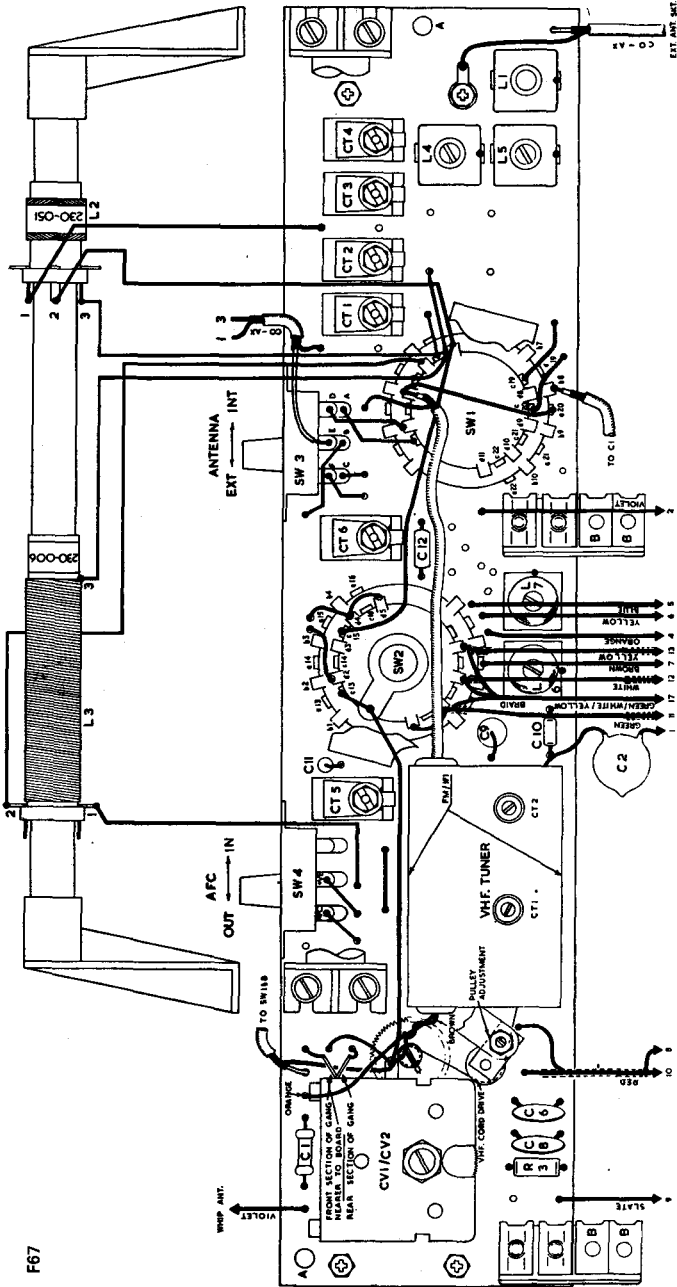
## PERDIO

## Model PR.40 (Knightsbridge FM)

**General Description:** The Knightsbridge F.M. is a nine-transistor, eight-diode portable radio receiver. This version (PR.40) covers extended L.W., M.W. and V.H.F./F.M. bands. All versions are fitted with a tone control, record socket, and external antenna socket. The S.W. versions (PR.47 and PR.48) have a bandsread control for use on A.M. reception.

**A.M.:** The self oscillating mixer transistor is fed from a ferrite rod antenna or from an external antenna via separate screened input coils. A separate oscillator tuned circuit is used for each waveband.

# PERDIO



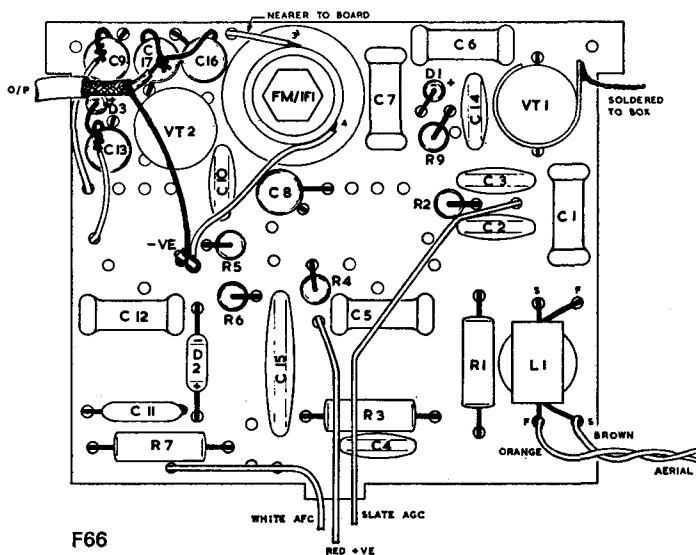
(F67) R.F. PANEL—MODEL P.R.40

F67

## RADIO SERVICING

Three single tuned I.F. transformers couple the two grounded emitter I.F. amplifiers, and the crystal detector. The first I.F. amplifier is A.G.C. controlled by bias derived from the detector output.

The demodulated signal is fed via the volume control to the first A.F. amplifier which is directly coupled to the second A.F. transistor the output of which is used to drive a pair of output transistors in push-pull. This circuit is stabilised against falling battery voltage, and is temperature compensated.



(F66) V.H.F. TUNER

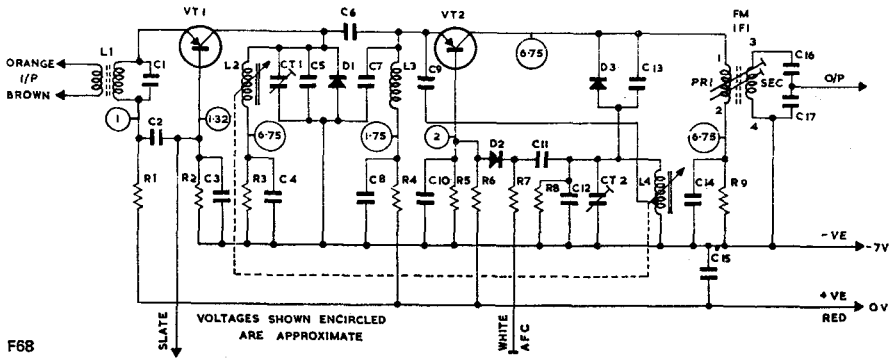
**F.M.:** The self-oscillating mixer transistor is fed from a V.H.F. R.F. amplifier, which is coupled to the antenna system via a matching transformer.

Three double tuned I.F. transformers, and a ratio detector couple the three grounded emitter I.F. amplifiers. The R.F. amplifier is A.G.C. controlled by bias derived from the secondary of the third I.F. transformer. The ratio detector output is then fed to the A.F. amplifier as for A.M. A D.C. output from the ratio detector is fed back to the oscillator, for the automatic frequency control.

**Controls:** Volume with on-off switch, edge control at lower right-hand side of cabinet. Tone, edge control at lower right side of cabinet. Tuning, edge control at top of cabinet, right-hand side. Wavechange, edge control at top of cabinet, central. Antenna switch, slide action at top of cabinet left-hand side, selecting internal or external antenna circuits. A.F.C. switch, slide action at top of cabinet right-hand side, switching A.F.C. in or out.

**Wavebands:** Band 1 L.W. 150 kc/s.-385 kc/s. (2000 m.-780 m.). Band

# PERDIO

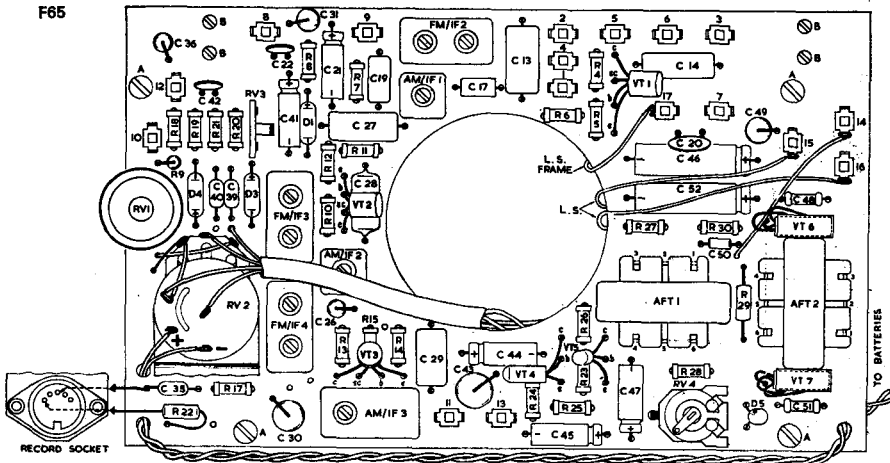


(F68) TUNER CIRCUIT DIAGRAM—V.H.F.

2 M.W. 525 kc/s.—1620 kc/s. (570 m.—185 m.). Band 3 V.H.F./F.M. 87.5 Mc/s.—108 Mc/s. (3.43 m.—2.78 m.).

In addition to individual scales for each band a logging scale is provided, and the V.H.F. scale is marked in channels. The moulded pointer has a travel of approx.  $8\frac{1}{4}$  in., and a cord-drive system is used, with a 7.6:1 reduction on the tuning gang.

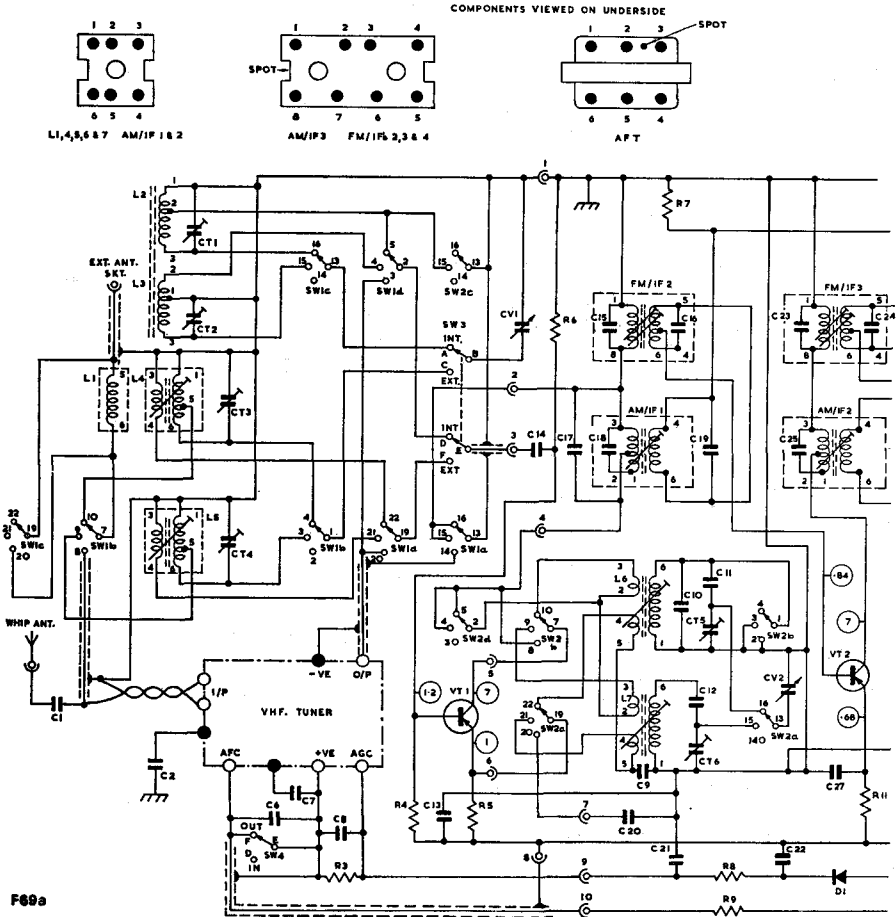
**Aerial:** The receiver has an 8-in. ferrite rod antenna for use on band 1 and band 2, and a 35-in. whip antenna (flexible joint) for band 3 reception. An external antenna socket is provided, and is intended for use with a screened car antenna. On bands 1 and 2, this socket feeds the signal to a screened filter, and screened tuned coils, thus greatly reducing ignition interference, and obviating the directional properties of the ferrite rod which is switched out of circuit. On band 3 the socket feeds direct to the matching transformer in the V.H.F. tuner, and has an input impedance of 75 ohms.



(F65) I.F./A.F. PANEL



# RADIO SERVICING



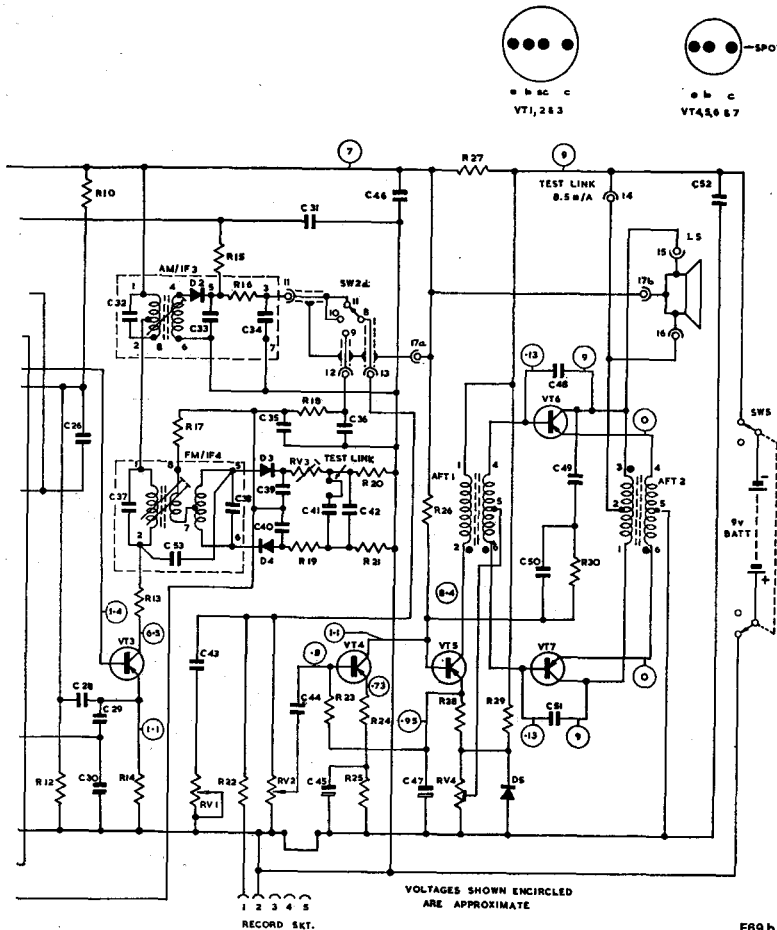
(F69a) CIRCUIT DIAGRAM—MODEL PR.40 (PART)

**Intermediate Frequency:** A.M. 468 kc/s. F.M. 10.7 Mc/s.

**Transistors:** AF102—V.H.F./R.F. amplifier; AF115—F.M. mixer/oscillator; AF116—A.M. mixer/oscillator 10.7 Mc/s. I.F. amplifier; AF116—10.7 Mc/s.—468 kc/s. I.F. amplifier; AF116—10.7 Mc/s.—468 kc/s. I.F. amplifier; OC71—A.F. amplifier; OC81D—Driver; OC81, OC81, Push-pull output.

**Diodes:** OA91—V.H.F. damping; OA91—V.H.F./I.F. damping; BA102—V.H.F. automatic frequency control; OA79—V.H.F. A.G.C.; OA70, OA70, F.M. ratio detectors; OA91—A.M. detector; AA129—OC81 bias stabiliser.

# PERDIO



(F69b) CIRCUIT DIAGRAM—MODEL PR.40 (CONTINUED)

F69b

**Sound Output:** Power output is 1 watt. A low-level high-impedance A.F. output via a five pin DIN socket derived from the detector load, and independent of the volume control setting, is provided for feeding into a tape recorder.

**Loudspeaker:** 8 in. × 5 in. elliptical. Impedance 15 ohms. Flux density 8000 lines.

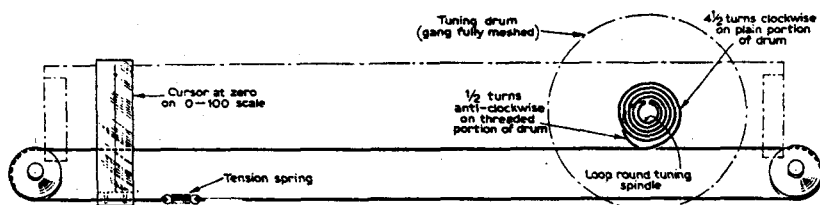
**Batteries:** 9 volts.

**Consumption:** Approx. 30 mA. at a reasonable listening level.

**Dismantling:** Remove cabinet back by taking out the two fixing screws. This will expose the component sides of the circuit boards and provide access

## RADIO SERVICING

to all coil cores and trimmers required for alignment purposes. The receiver consists of two sub-assemblies, an R.F. panel and an I.F.-A.F. panel. To remove both assemblies complete, disconnect both battery plugs, unplug the two speaker leads and speaker frame lead on the I.F.-A.F. panel, and antenna lead on the R.F. panel, pull out last section of whip antenna. Remove the four PK screws in the corners of the I.F.-A.F. panel and the two on the R.F. panel, lift the whole assembly towards the top of the cabinet and withdraw from the bottom, taking care not to damage the volume control knob, finally unplug the external antenna leads. To separate the I.F.-A.F. panel from the R.F. panel, unplug the thirteen coloured flying leads from the I.F.-A.F. panel unsolder C2 at one end and remove the four PK screws marked "B".



(F64) DRIVE CORD

**Drive Cord:** To replace a drive cord, a length of 3 in. of 245-001 drive cord is required. First remove the tuning scale by taking out the four fixing screws. Then pull off the tuning control knob. Form a tight loop in the replacement drive cord and push it through the slot in the drum and locate around the centre boss, moistening the cord slightly if necessary to facilitate the operation. Replace the tuning knob and proceed to route the cord as shown in the diagram noting the relative positions of the tuning gang, scale pointer and tension spring. The V.H.F. cord drive is best fitted when the gang is in the fully opened position, fit cord over pulley assembly, wrap one turn around drive in an anti-clockwise direction, then pass through slot so that eyelet engages firmly.

**Alignment Procedure:** *Equipment Required:* (1) Signal generator with a frequency coverage of 150 kc/s. to 1620 kc/s., 10 Mc/s. to 11 Mc/s. and 87 Mc/s. to 110 Mc/s., with suitable modulation for both A.M. and F.M., a "sweeping" circuit should also be available for F.M. alignment. (2) Display equipment suitable for use with the signal generator for F.M. alignment. (3) An output meter of 15 ohms impedance, or a suitable A.C. volt-meter. (4) Antenna pad for aligning the external antenna circuit. (5) Suitable non-ferrous trimming tools for adjusting oscillator, R.F., and I.F. circuits.

**Audio Bias Adjustment:** To set the audio bias potentiometer RV4, proceed as follows. With no signal applied and the volume control at minimum, insert current meter at test link, tag (14) on I.F.-A.F. board, that is, between the H.T. line and pin 2 of AFT2. Adjust RV4 so that a steady

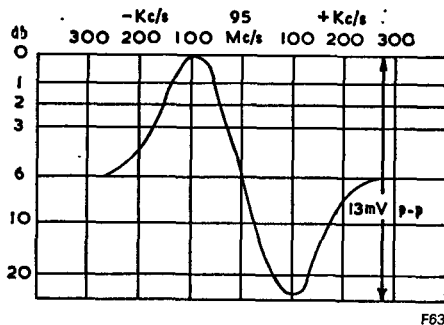
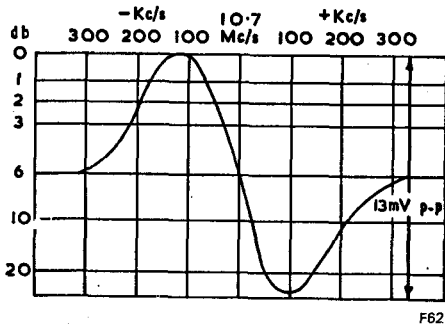
## PERDIO

current of 8.5 mA. flows through the meter. Remove meter, and replace test link.

**Note:** Before further alignment, set volume control to maximum, tone control to minimum treble cut, and use lowest signal from generator consistent with reasonable output, say 50 mW, this avoids A.G.C. action.

**I.F. Alignment (A.M.) Spot Frequency Method:** Switch receiver to band 2, and turn gang to its fully meshed position; check that pointer coincides with the zero mark on logging scale. Set signal generator to 468 kc/s., modulated to 30 per cent. and connect signal between chassis and the I.F. input tag (3) on I.F.-A.F. board after removing lead from R.F. board. Connect output meter across the loudspeaker tags 15 and 16. Adjust cores of A.M./I.F. 1, 2 and 3 for maximum output, reducing the level of input signal as the circuits come into alignment.

**I.F. Alignment (F.M.) Sweep Method:** Switch receiver to band 3. Set the signal generator to 10.7 Mc/s. and switch on sweeping circuit, connect signal between chassis, and I.F. input tag (3) on I.F.-A.F. board after removing lead from R.F. board. Connect display equipment between chassis, and output of ratio detector tag (12). Adjust cores of F.M./I.F. 2, 3 and 4 for maximum output together with a response curve reducing the level of input signal as the circuits come into alignment.



(F62) and (F63) DISCRIMINATOR WAVEFORMS

**Adjustment of A.M. Rejection on F.M.:** Proceed as for F.M. I.F. alignment, after this alignment has been concluded, increase input level by approx. 20 dB, reducing display equipment sensitivity accordingly. Switch 30 per cent. of A.M. on to swept I.F. signal and adjust RV<sub>3</sub> for minimum A.M. output at centre point of response curve.

**R.F. Alignment (A.M.):** The signal generator should be loosely coupled to the receiver by means of a transmitting loop, placed adjacent to, and co-axially with the ferrite rod antenna assembly. The screened external antenna coils are aligned with the signal generator coupled to the external antenna socket.

**Band 1 (Long Wave):** (1) Switch receiver to band 1 and antenna switch to INT. (2) Set generator and receiver to 165 kc/s. (3) Adjust L.W.

## RADIO SERVICING

oscillator coil L6 and L.W. antenna coil L2 for maximum output. (4) Switch to EXT. and adjust L.W. external antenna L4 for maximum output. (5) Switch to INT. and reset generator and receiver to 370 kc/s., adjust L.W. oscillator trimmer C15 and L.W. antenna trimmer CT1 for maximum output. (6) Switch to EXT and adjust L.W. external antenna trimmer CT3 for maximum output. (7) Repeat above procedure until no further improvement can be obtained, finishing at the higher frequency 370 kc/s.

## PERDIO

## Model PR.43 "Mini 77"

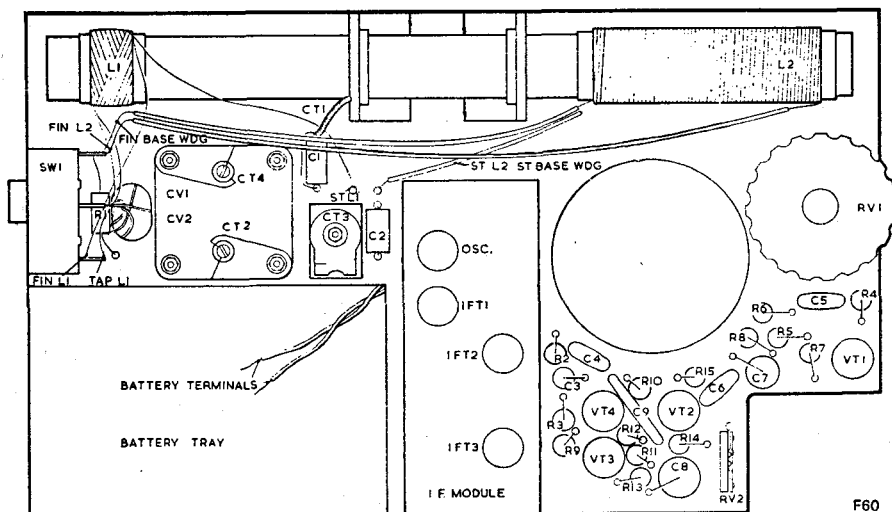
**General Description:** Battery-operated seven-transistor radio receiver covering medium and long wavebands. The set contains an I.F. module comprising all that is normally in the I.F. strip of a M.W./L.W. transistor receiver from the base of the mixer to the output of the diode.

**Controls:** Wavechange switch is on the right-hand side of cabinet. The tuning knob is at the top of the cabinet and the volume control is on the left-hand side.

**Wavebands:** M.W. 184-570 m. (1635-525 kc/s.); L.W. 1090-1940 m. (275-155 kc/s).

**Aerial:** Internal ferrite rod aerial is used on both wavebands.

**Intermediate Frequency:** 470 kc/s.



(F60) COMPONENT LAY-OUT—MODEL PR. 43

## PERDIO

**Battery:** Two 9-volt batteries are used in parallel. Suitable types include: PP<sub>3</sub>; T6003; DT<sub>3</sub>.

**Consumption:** Approximately 20 mA. at a reasonable listening level.

**Sound Output:** 100 mW. at 5 per cent. total distortion.

**Loudspeaker:** Flux density 7000 lines per sq. cm. Impedance 60 ohms.

**Transistors:** AF127 mixer; AF127 1st I.F. amplifier; AF127 2nd I.F. amplifier; OC71 1st A.F. amplifier; OC81D Driver; OC81 and OC127 Complementary push-pull output Crystal diode oAg<sub>1</sub> detector.

**Chassis Removal:** The back is secured with a coin slot screw, when this is undone the back may be removed by turning a small coin in the slot on the underside of the cabinet. Disconnect battery, remove the 6BA hexagonal spacer and the board fixing screw, the board may then be taken out of the cabinet by lifting the left-hand side first, allowing the volume control knob to clear its aperture.

**Alignment Procedure: Equipment Required—**(1) A signal generator with a frequency coverage of at least 155–1670 kc/s. with suitable modulation. (2) Output power meter 60-ohm impedance or volt-meter to read 0–2 volts A.C. across speech coil. (3) Trimming tool suitable for adjusting I.F. and oscillator coils, 10BA trimming tool for L.W. oscillator trimmer. (4) Volt-meter to read 0–10 volts D.C.

Before alignment set the volume control to maximum and use the lowest signal from the generator consistent with reasonable output from the set, say 50 mW. or 1.7 volts A.C. across the speech coil. This avoids A.G.C. action.

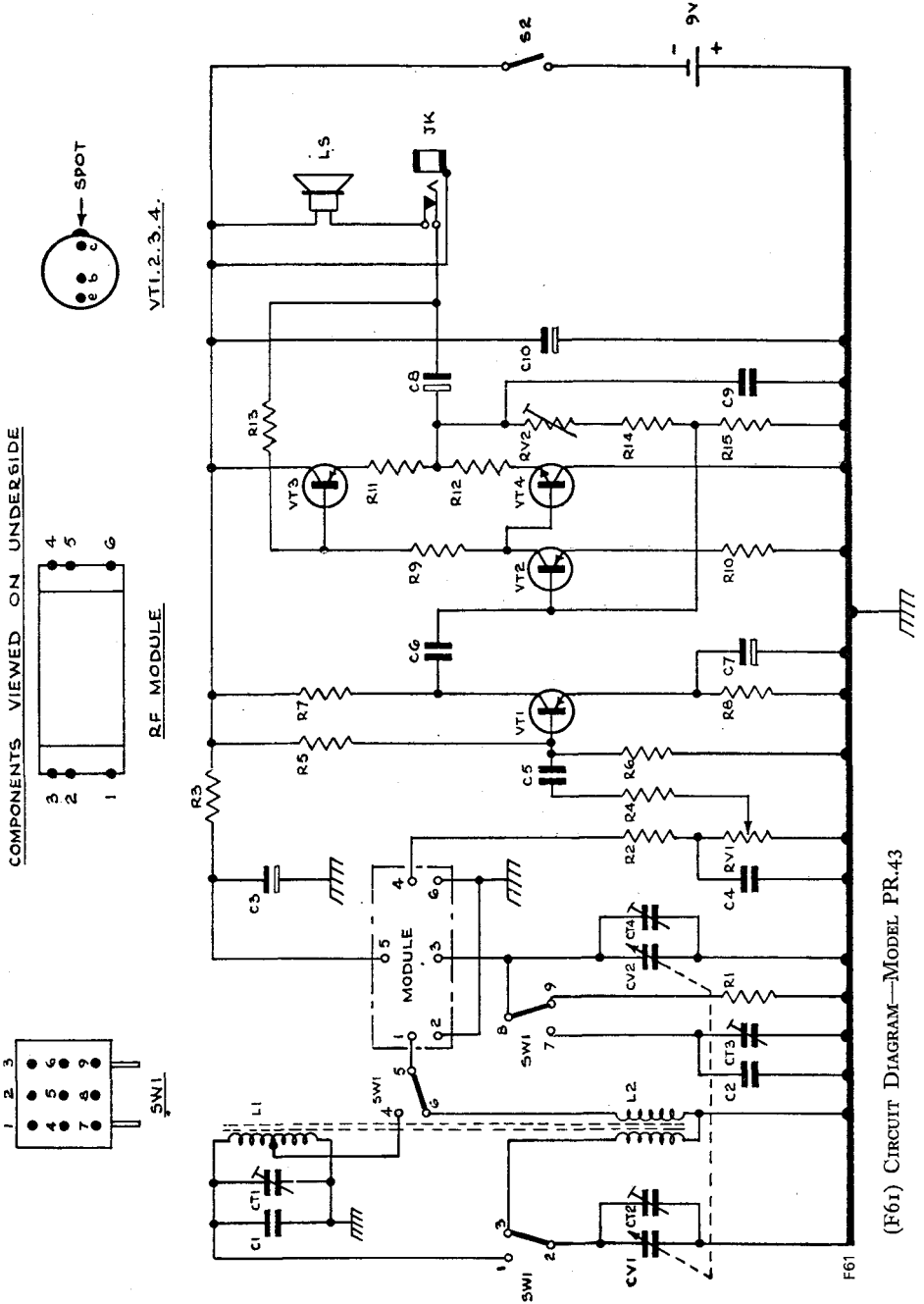
**I.F. Alignment:** Switch the receiver to M.W. Set the gang to approximately 1 Mc/s. Set the signal generator to 470 kc/s. and connect to pin 1 of the I.F. module. Align each I.F.T. for maximum output with either the output meter connected in place of the speaker or with the volt-meter connected across the speaker.

**R.F. Alignment:** For R.F. alignment the signal generator should be loosely coupled to the set by a loop of insulated wire placed at a convenient distance from the set. The loop should be orientated for maximum pickup.

Operation	Waveband	Generator	Receiver	Adjust for max. output
1	M.W.	525 kc/s.	Gang closed	Osc. coil
2	M.W.	1670 kc/s.	Gang open	CT4 ("O" on gang)
Repeat operations 1 and 2.				
3	M.W.	600 kc/s.	600 kc/s.	M.W. aerial coil
4	M.W.	1450 kc/s.	1450 kc/s.	CT2 ("A" on gang)
Repeat operations 3 and 4.				
5	L.W.	155 kc/s.	Gang closed	CT3
6	L.W.	175 kc/s.	175 kc/s.	L.W. aerial coil
7	L.W.	260 kc/s.	260 kc/s.	CT1
Repeat operations 6 and 7 and check operations 3 and 4.				

When the oscillator is set up on L.W. the aerial should be detuned by

# RADIO SERVICING



(F61) CIRCUIT DIAGRAM—MODEL PR-43

## PHILCO

placing a ferrite rod next to the L.W. aerial coil. This stops the aerial circuit pulling the oscillator off tune.

**Circuit Voltages:** Circuit voltages are measured with respect to common positive line under "no-signal" conditions.

	VT1 volts	VT2 volts	VT3 volts	VT4 volts
Emitter	0.94	0.56	4.9	4.9
Base	1.1	0.74	5.0	4.7
Collector	3.6	4.7	9.0	0

Voltage on pin 5 of I.F. module is -7 volts.

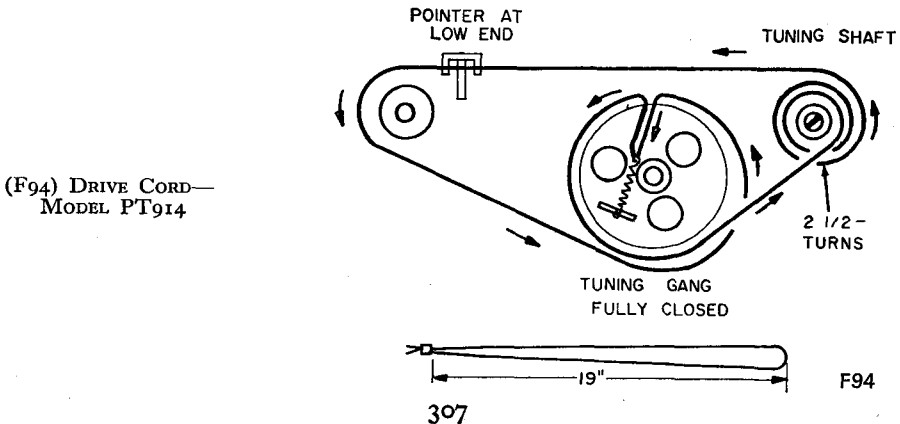
Quiescent current = 10 mA.  $\pm$  2 mA.

## PHILCO

## Model PT914

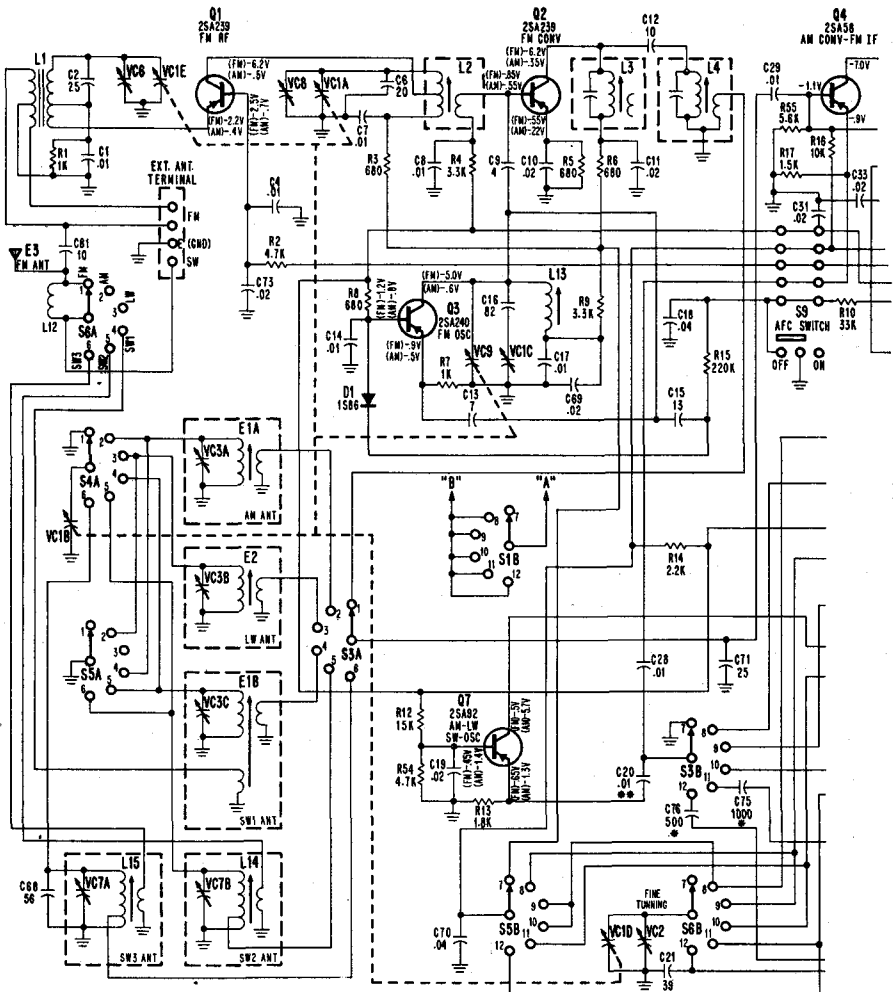
**General Description:** Thirteen transistors, five diodes and one thermistor in a superhet F.M./A.M. receiver. Wavebands: F.M. 88 Mc/s.-108 Mc/s.; M.W. 528-1630 kc/s.; L.W. 145-410 kc/s.; S.W.1 1650 kc/s.-4.3 Mc/s.; S.W.2. 3.7-10.3 Mc/s.; S.W.3. 9.7-18.4 Mc/s. Loudspeaker 4 x 6 inches, 8 ohms impedance.

**Dismantling:** Open battery cover and remove batteries. Remove two nuts and screws holding aerial terminal panel to cabinet. Remove two screws holding chassis to angle brackets located inside bottom of cabinet (angle brackets are attached between chassis and bottom of cabinet). Remove two handle mounting screws at top of cabinet. Slide chassis part way out of cabinet and remove two nuts holding earphone and external power jack to cabinet. Unsolder lead to aerial then slide chassis completely from cabinet.





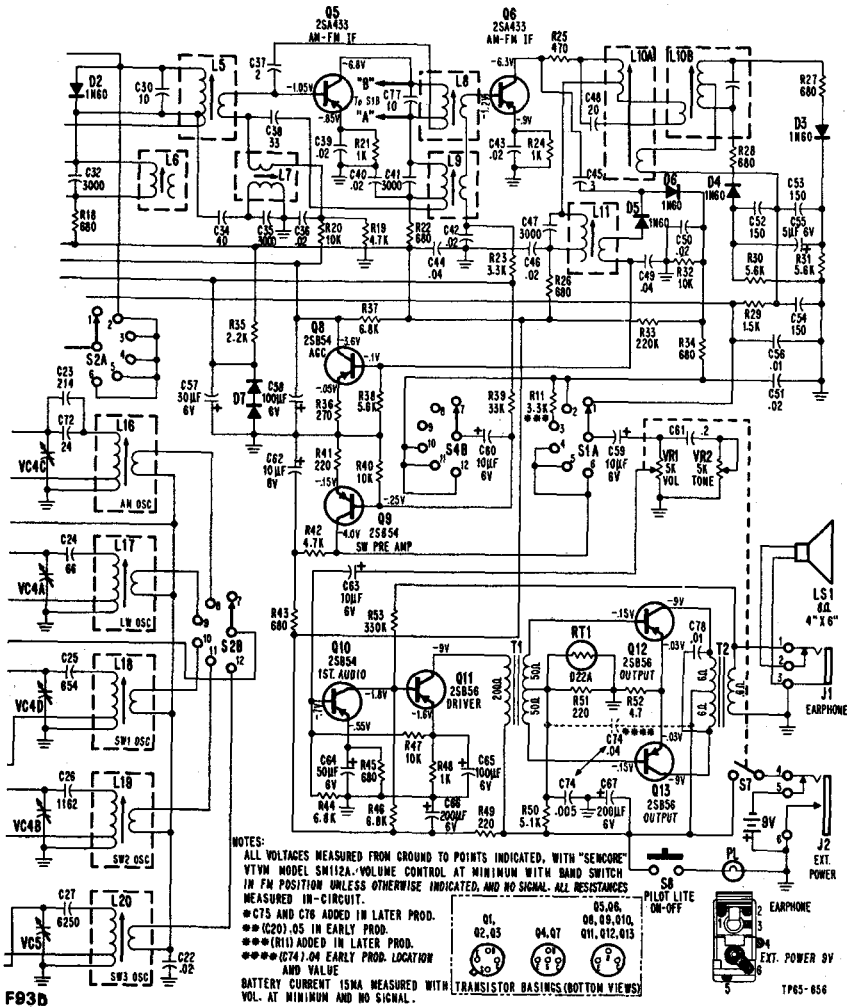
# RADIO SERVICING



(F93a) CIRCUIT DIAGRAM—MODEL PT914 (PART)

**A.M. Alignment:** Allow test equipment 15 minutes to warm up and stabilise. Set band switch of receiver as indicated on chart. Set volume control to maximum. Connect an 8-ohm resistor across an earphone plug and insert plug into earphone jack (J1). Connect V.T.V.M. or Oscilloscope across the 8-ohm resistor for an output indicator. Connect A.M. Signal Generator (30 per cent. modulation) as indicated on chart; keep generator output as low as possible to avoid A.G.C. action.

# PHILCO



(F93b) CIRCUIT DIAGRAM—MODEL PT914 (CONTINUED)

**Note: Alignment Charts** (For both A.M. and F.M.) are given on the following page.

**F.M. Alignment:** Set band switch of receiver to F.M. position. Connect F.M. ( $\pm 75$  kc. deviation) signal generator as indicated on chart. Connect A.M. (30 per cent. modulation) signal generator as indicated in Step 3 only. Keep signal generator output as low as possible to avoid overload.

## RADIO SERVICING

### Alignment (A.M.)

Signal generator			Radio		
Step	Connection to radio	Dial setting	Dial setting	Special instructions	Adjust
1	Use radiating loop (see Note 1)	455 kc.	Tuning gang fully open	Set band switch to "A.M.". Adjust coils for max. output	L11, L9, L7 and L6
2	Repeat Step 1 until no further improvement is obtained	528 kc.	Tuning gang fully closed	Adjust coils and trimmers indicated for max. output	L16
3	Same as Step 1	1630 kc.	Tuning gang fully open		VC4-C
4		1400 kc.	1400 kc.	Adjust coils and trimmers indicated for max. output	VC3-A
5	Same as Step 1	600 kc.	600 kc.		Br-A
6	Repeat Step 3 through step 6 until no further improvement is obtained	145 kc.	Tuning gang fully closed	Set band switch to "L.W.". Adjust coils and trimmers indicated for max. output	L17
7	Same as Step 1	410 kc.	Tuning gang fully open		VC4-A
8		350 kc.	350 kc.		VC3-B
9		170 kc.	170 kc.		E2
10	Repeat Step 8 through step 11 until no further improvement is obtained	1650 kc.	Tuning gang fully closed	Set band switch to "S.W.1". Adjust coils and trimmers indicated for max. output	L18
11	ant. panel	4.3 Mc.	Tuning gang fully open		VC4-D
12		4.0 Mc.	4.0 Mc.		VC3-C
13		2.0 Mc.	2.0 Mc.		Br-B
14	Repeat Step 13 through Step 16 until no further improvement is obtained	3.7 Mc.	Tuning gang fully closed	Set band switch to "S.W.2". Adjust coils and trimmers indicated for max. output	L19
15	Same as Step 13	10.3 Mc.	Tuning gang fully open		VC4-B
16		10 Mc.	10 Mc.		VC7-B
17		4.0 Mc.	4.0 Mc.		L14
18	Repeat Step 18 through Step 21 until no further improvement is obtained	9.7 Mc.	Tuning gang fully closed	Set band switch to "S.W.3". Adjust coils and trimmers indicated for max. output	L20
19	Same as Step 13	18.4 Mc.	Tuning gang fully open		VC5
20		16 Mc.	16 Mc.		VC7-A
21		10 Mc.	10 Mc.		L15
22	Repeat Step 23 through Step 26 until no further improvement is obtained				
23					
24					
25					
26					
27					

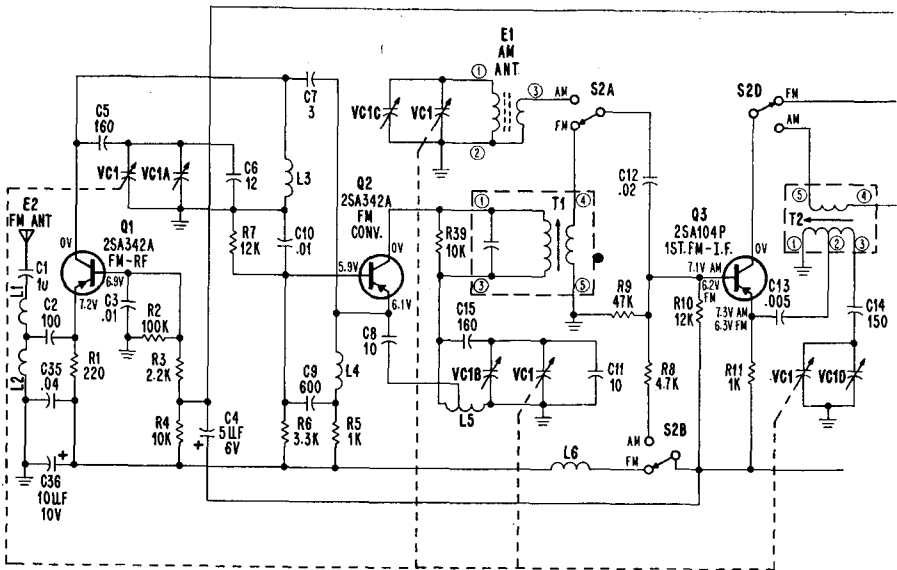
Note: 1 Radiating loop is made of 6 to 8 turns of insulated wire in a 6-inch diameter. Connect to generator terminals and place about 12 inches from radio.

### Alignment (F.M.)

Signal generator			Radio		
Step	Connection to radio	Dial setting	Dial setting	Special Instructions	Adjust
1	To F.M. terminals on external ant. panel	10.7 Mc.	Tuning gang fully open	Adjust coils for max. output in order given	L8, L3, L3, L4, and L10A
2	Repeat Step 1 until no further improvement is obtained	10.7 Mc.	Tuning gang fully open	Adjustment for minimum output	L10-B
3	Same as Step 1	A.M.	88 Mc.	Adjust coils and trimmers indicated for max. output	L13
4	Same as Step 1	88 Mc.	108 Mc.		VC9
5		108 Mc.	106 Mc.		VC6 and VC8
6		90 Mc.	90 Mc.		L1 and L2
7	Repeat Step 4 through Step 7 until no further improvement is obtained				
8					

**Dismantling:** Remove cross-recess screw from bottom of rod aerial and slide rod up out of cabinet to clear chassis. Remove four cross-recess screws holding panel to cabinet. Carefully remove chassis by lifting right side first to clear recessed control knobs. Speaker and earphone jack may remain in cabinet while servicing.

**A.M. Alignment:** Allow test equipment 15 minutes to warm up and



• BATTERY CURRENT 12MA (FM)  
9MA (AM)

Q1 & Q2      Q3 THRU Q9  
BOTTOM VIEW

Diagram showing the bottom view of the part. It is a rectangle with dimensions 4 (width) and 5 (depth). There are five holes: one at the top-left corner, one at the bottom-left corner, and three in a vertical row on the right side. The holes on the right are dimensioned 1 (top), 2 (middle), and 3 (bottom).

①  
YEL

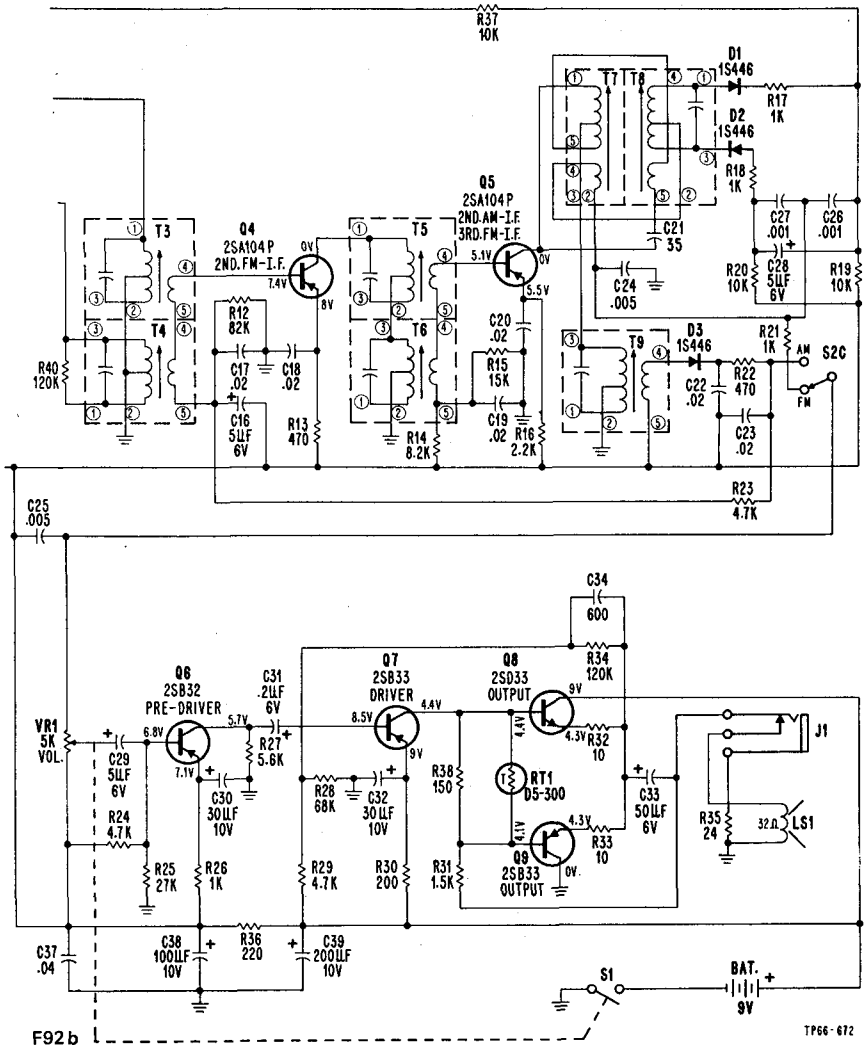
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BLK BLU

(F92a) CIRCUIT DIAGRAM—MODEL QT9I (PART)

# RADIO SERVICING

stabilise. Set slide-switch to A.M. position. Insert earphone plug paralleled with a 32-ohm resistor into the earphone jack, J1. Connect V.T.V.M. across the 32-ohm resistor. Connect generator leads as indicated in chart. Keep generator output as low as possible to avoid A.G.C. action. Set volume control to maximum. See alignment chart at top of next page.

**F.M. Alignment:** Refer to A.M. alignment preliminary instructions. Set slide-switch to F.M. position. See lower alignment chart on facing page.



(F92b) CIRCUIT DIAGRAM—MODEL QT91 (CONTINUED)

# PHILCO

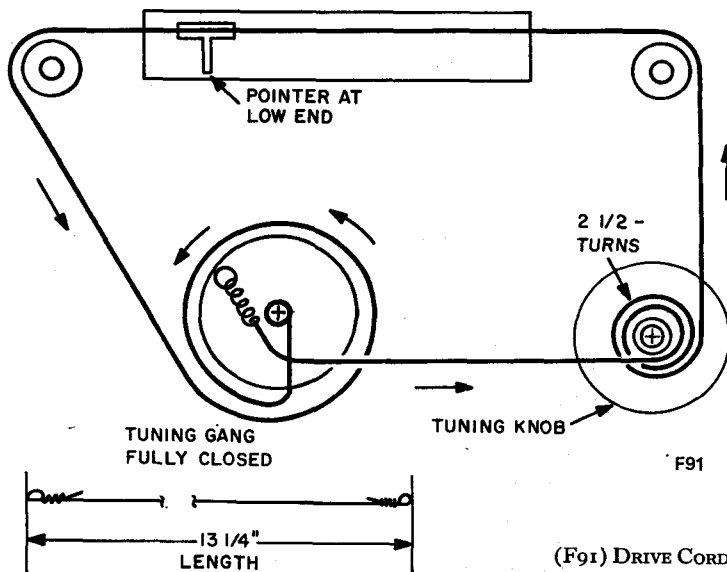
## Alignment Charts: (Top) A.M. and (Lower) F.M.

Signal generator			Radio		
Step	Connection to radio	Dial setting	Dial setting	Special instructions	Adjust
1	Radiating loop	455 kc.	Tuning gang fully open	Adjust for max. output in order given	T <sub>9</sub> , T <sub>6</sub> , T <sub>4</sub>
2	Same as Step 1	510 kc.	Tuning gang fully closed	Adjust for max. output	T <sub>2</sub>
3	Same as Step 1	1650 kc.	Tuning gang fully open	Adjust for max. output	VC1D
4	Repeat Steps 2 and 3 until no further improvement is obtained				
5	Same as Step 1	600 kc.	600 kc.	Adjust for max. output by sliding ant. coil on core	E <sub>1</sub>
6	Same as Step 1	1400 kc.	1400 kc.	Adjust for max. output	VC1C
7	Repeat Steps 5 and 6 until no further improvement is obtained				

Step	Connection to radio	Dial setting	Dial setting	Special instructions	Adjust
1	Emitter of Q <sub>2</sub>	10.7 Mc. ± 500 kc. sweep	Tuning gang fully open	Adjust for maximum output in order given	T <sub>7</sub> , T <sub>5</sub> , T <sub>3</sub> and T <sub>1</sub>
2	Same as Step 1	10.7 Mc. 30% A.M.	Tuning gang fully open	Set V.T.V.M. to 3 volts range. Centre meter needle. Adjust for 0 volts	T <sub>8</sub>
3	Repeat Steps 1 and 2 until no further improvement is obtained				
4	Use radiating loop	86.2 Mc. F.M.	Tuning gang fully closed	Adjust for max. output	L <sub>5</sub>
5	Same as Step 4	108.8 Mc. F.M.	Tuning gang fully open	Adjust for max. output	VC1B
6	Repeat Steps 4 and 5 until no further improvement is obtained				
7	Same as Step 4	87 Mc. F.M.	87 Mc.	Adjust for max. output	L <sub>3</sub> (see note below)
8	Same as Step 4	108 Mc. F.M.	108 Mc.	Adjust for max. output	VC1 (see note below)
9	Repeat Steps 7 and 8 until no further improvement is obtained				

Note: When tracking is off, adjust L<sub>3</sub> and VC1A and keep the tuning correct by adjusting VC1B. Osc. frequency varies slightly if L<sub>3</sub> and VC1A are adjusted.

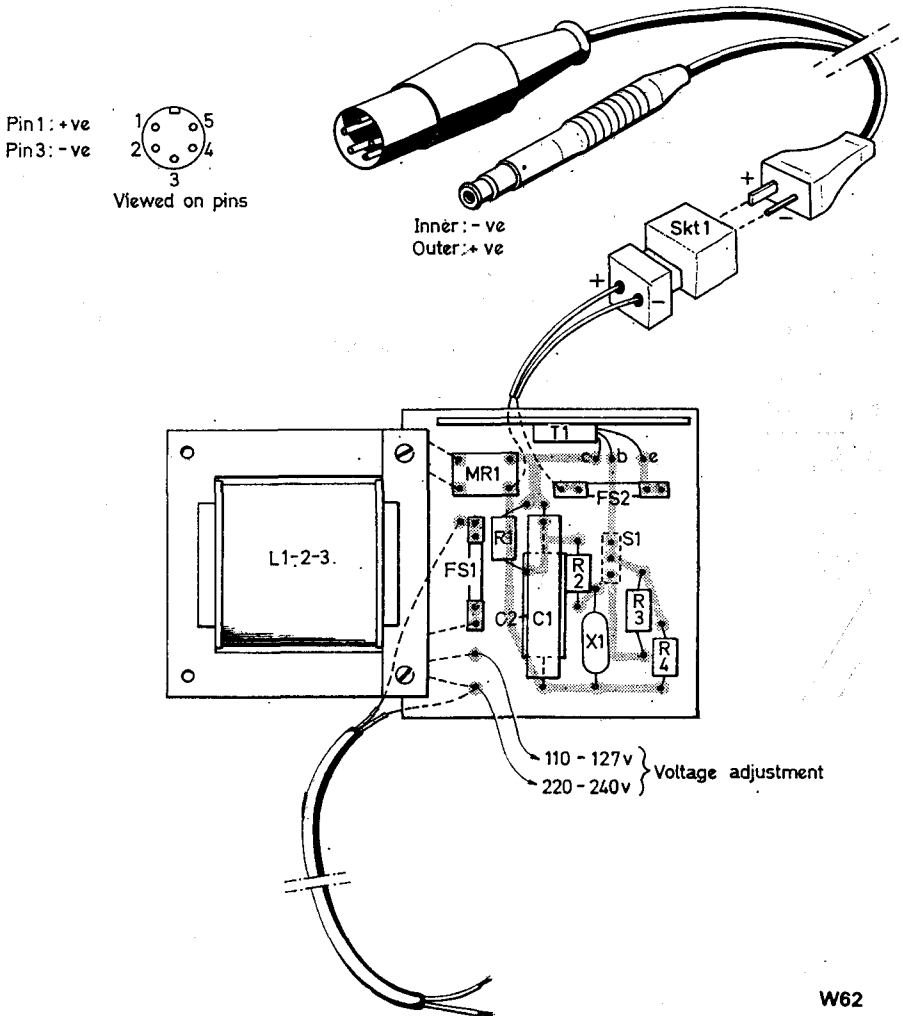


(F91) DRIVE CORD—MODEL QT91

# PHILIPS

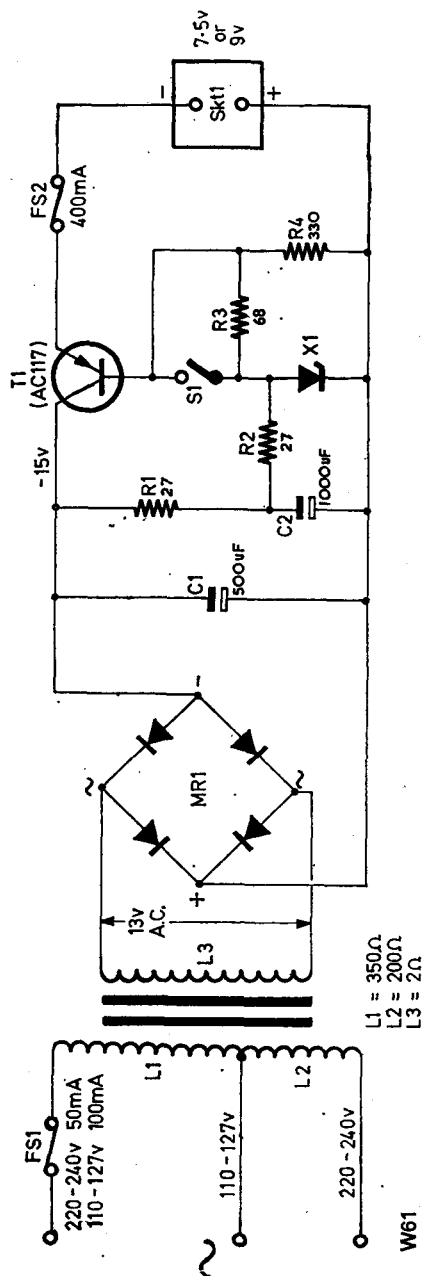
## Mains Supply Unit EL1998

**General Description:** The EL1998 mains supply unit enables battery-operated equipment to be used from an A.C. mains supply. It is designed to operate with a mains input of 220–240 volts A.C. 50–60 c/s. and can be adjusted for use with 110–127 volts A.C. by changing one connection of the mains lead and replacing the 50 mA. fuse FS1 with the 100 mA. fuse supplied.



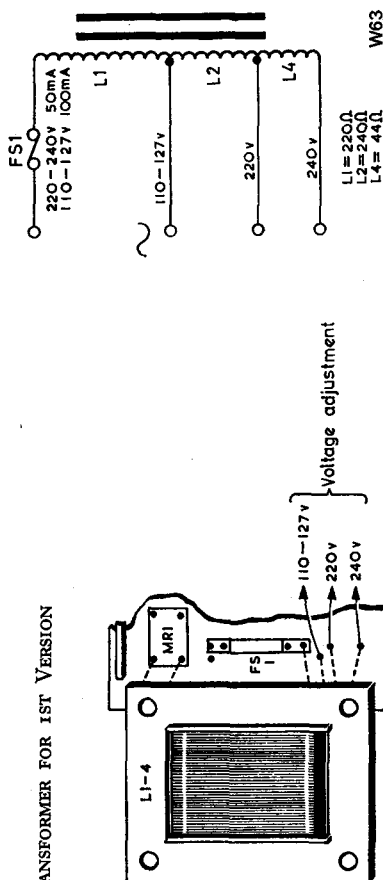
W62

(W62) COMPONENT LAY-OUT (1ST VERSION)—MODEL EL1998

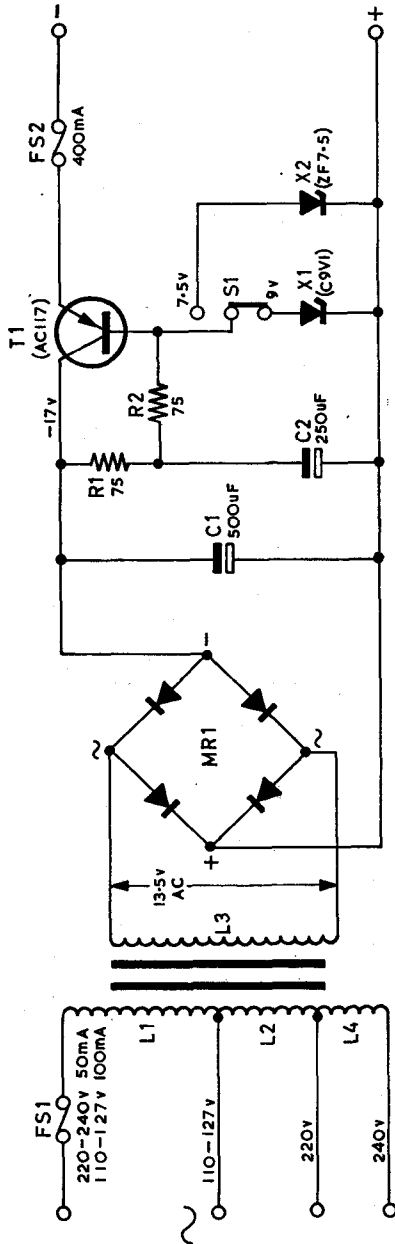


Above: (W61) CIRCUIT DIAGRAM—MODEL EL1998 (1ST VERSION)

Right: (W63) ALTERNATIVE MAINS TRANSFORMER FOR 1ST VERSION



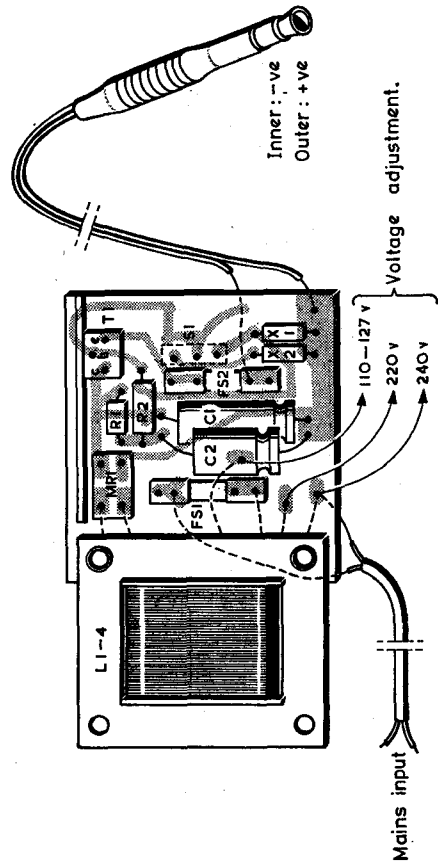




L1 = 220Ω  
L2 = 240Ω  
L3 = 2Ω  
L4 = 44Ω

W64

Top: (W64) CIRCUIT DIAGRAM—MODEL EL1998 (2ND VERSION)



Left: (W65) COMPONENT LAY-OUT (2ND VERSION)

Note: In some versions, the output lead is wired direct to the unit, Skt. 1 being omitted. In these cases, an adaptor is supplied instead of the second output lead, enabling the output to be applied to either a ROKA or 5-pin DIN socket.

## PHILIPS

The unit has a stabilised output, which can be switched to 7.4 volts or 9 volts D.C. as required. It may be used in conjunction with various recorders, record players, etc., as listed below: Philips—EL3300, EL3301, EL3301T, EL3302, EL3583, EL3586, N4200, AG4100, AG4127, 22GF227, L6X38T; Cossor—CR1621; Stella—ST471, ST472, ST474.

In addition to the version of the EL1998 mains supply unit described, there are two other versions, (a) and (b), each with mains transformers with separate 220-volt and 240-volt tappings.

Details of these variations are as follows: (a) Employs the printed panel as given, but with an additional connection point included for 220 volts. A different mains transformer, with a 220-volt tapping, is used. (b) Employs a different printed panel and mains transformer.

## PHILIPS

## Model EL3787A

**General Description:** Three-stage transistor preamplifier which can be used with any of the mono tape recorders listed below to provide the following facilities: 1. Playback of pre-recorded stereo tapes at 3 inches and 7½ inches per second (an external main mono/stereo amplifier and L.S. are required). 2. Synchronous recording/Duoplay, i.e. monitoring the playback of one track while recording a synchronised programme on another (headphones required). Both recordings may be subsequently played back together by the recorder in the "PAR" track selector position. 3. Multi-play, i.e. copying (with attenuation) from one track to another and simultaneously mixing an additional microphone input with headphones and lead.

The following recorders are suitable for use with this equipment: Philips: EL3553A, EL3556A, EL3558A, EL3573A, EL3576A, EL3578A. Stella: ST462, ST463.

Operating voltage 22 volts. D.C. at 8 mA. Sensitivity 260  $\mu$ V. into 3 k $\Omega$  for 1 volt output across 20 k $\Omega$ .

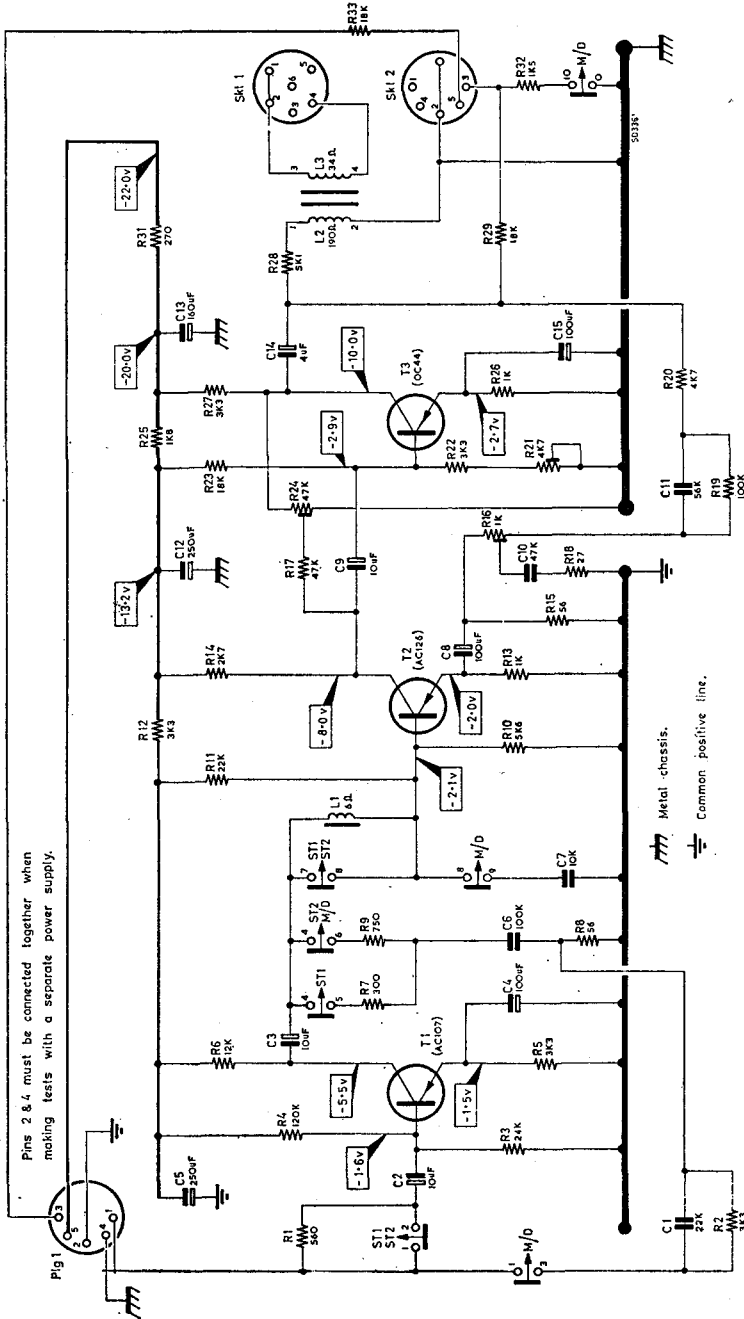
**Electrical Adjustments:** If the preamplifier is to be operated without a recorder, a 22-volt D.C. supply is required, connected to PLG1 as follows: Positive—pin 2; Negative—pin 5; Join pins 2 and 4 together.

**R16:** Switch to "Stereo 3½ in. per second" and connect a 100-ohm resistor between pins 1 and 2 on PLG1. Connect an A.C. millivolt-meter (1-volt range) between pins 3 and 2, SKT2 and apply a 1 kHz. signal via 100 k $\Omega$  resistor to pin 1 of PLG1. Adjust generator output for a meter reading of exactly 650 mV. then, without changing the generator output, reset the frequency to 14 kHz. and adjust R16 for a meter reading of 650 mV.

**R24:** With the generator, input divider and A.C. millivolt-meter connected as given above for R16, apply a 60 Hz. signal at 22 mV. and adjust R24 for a meter reading of 400 mV.

**R21:** Connect a D.C. volt-meter (10-volt range) between the collector and emitter of T3 then adjust R21 for a meter reading of 7.3 volts.

# RADIO SERVICING



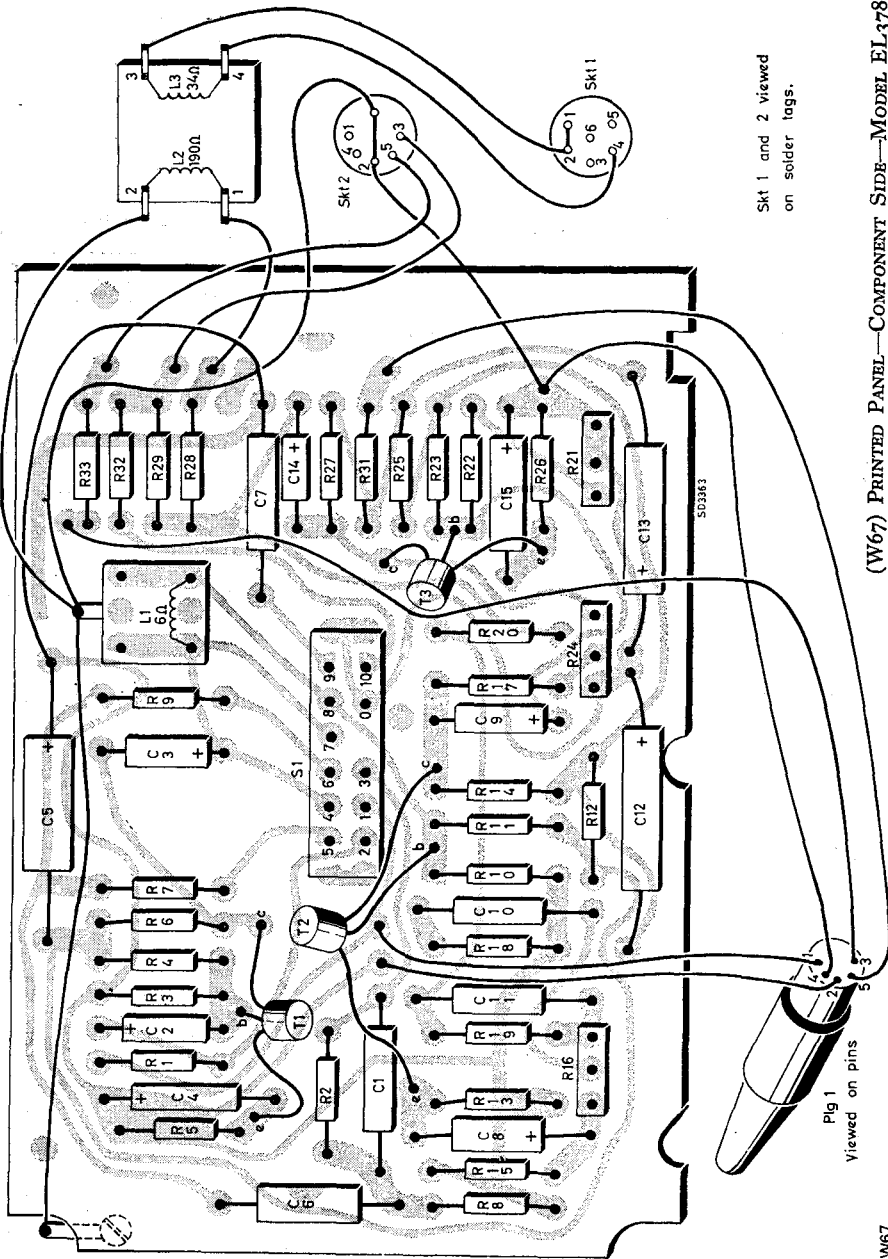
Plug and sockets viewed on solder logs.

All voltages taken with respect to chassis, using a 100 kΩ/voltmeter. No audio input.

Switches close only for functions indicated.

W66

(W66) CIRCUIT DIAGRAM—MODEL EL3787A



Sk11 and 2 viewed  
on solder tags.

(W67) PRINTED PANEL—COMPONENT SIDE—MODEL EL3787A

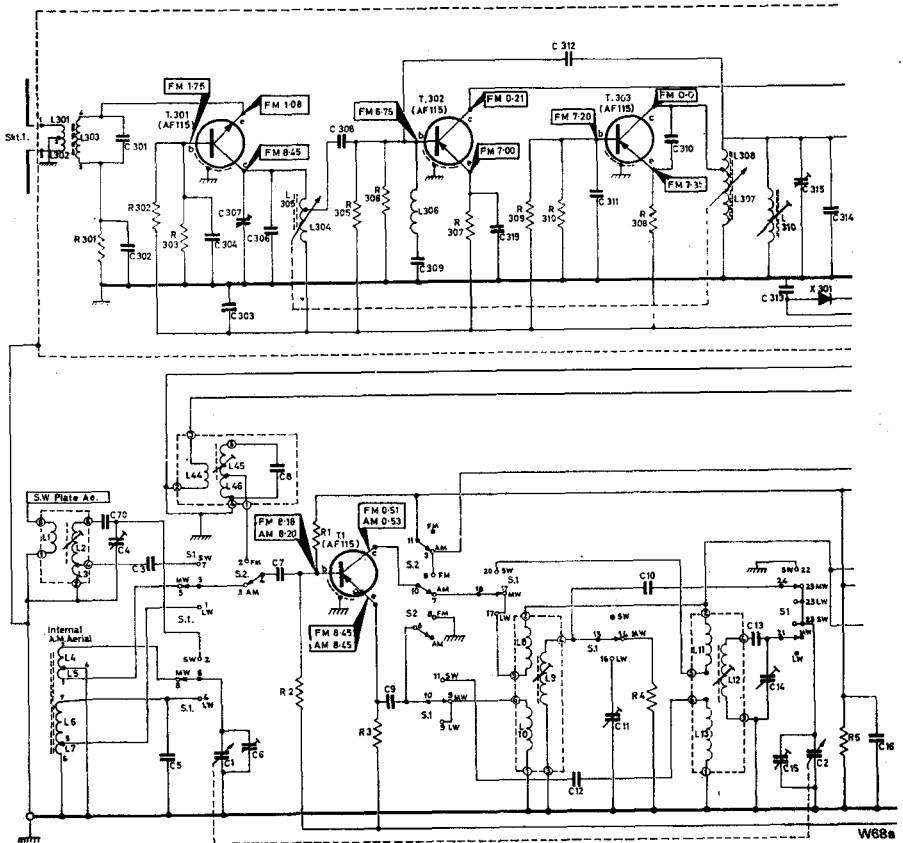
W67

# PHILIPS

## Model F5G53AT "Studio Ten"

**General Description:** Mains operated, all transistor, A.M./F.M. radiogram, incorporating two audio channels for reproduction of stereophonic disc and tape recordings and an automatic record changer. Provision also for connection of an F.M. stereo decoder for reception of F.M. stereo broadcasts.

A 5 pin DIN socket is fitted for the connection of a tape recorder to playback mono/stereo tape recordings through the audio amplifier. The same socket (different plug connections) is used for the tape recording of mono/stereo disc records or a mono radio programme. Stereo radio programmes may also be tape recorded when the F.M. stereo decoder is fitted and stereo transmissions are available. Extension loudspeaker sockets are



(W68a) CIRCUIT DIAGRAM R.F./I.F. STAGES—MODEL F5G53AT (PART)

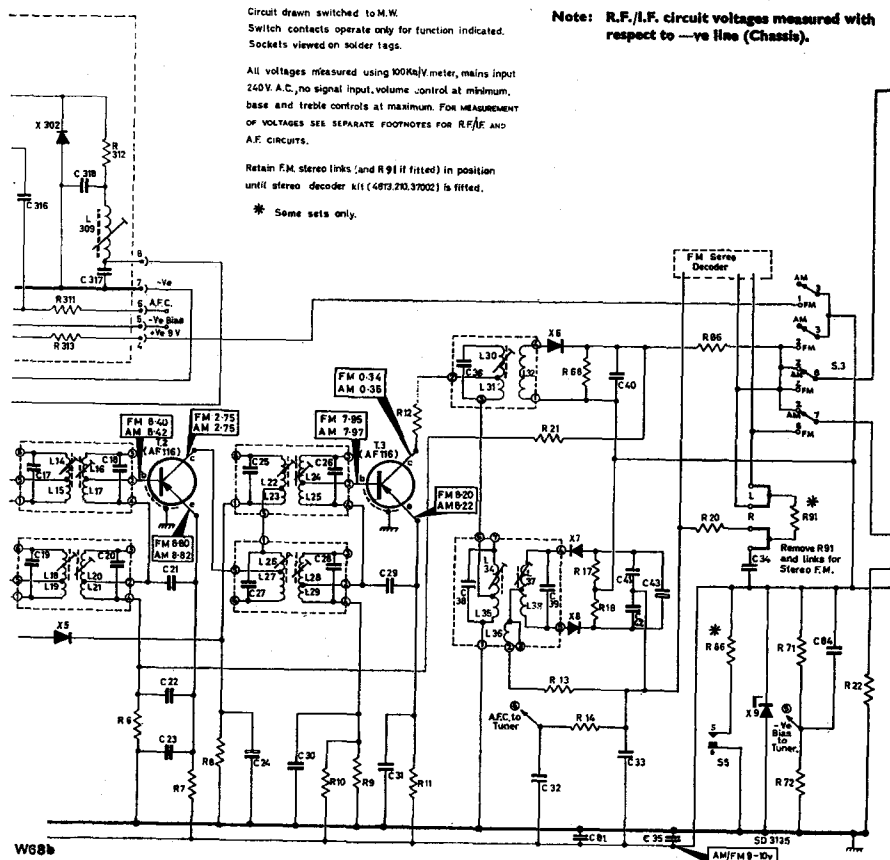
# PHILIPS

provided for the connection of external speakers of 15 ohms impedance. The record changer is a 4-speed, mono/stereo, type GC150 autochanger.

**Warning:** Care must be taken not to short-circuit the loudspeakers as this may damage the output transistors. Damage may also result if the impedance of the external speakers is less than the recommended value.

## A.F. Adjustments

**Setting Up Procedure:** Switch to "Gram." and turn volume controls (inner and outer knobs) to minimum. Connect a D.C. volt-meter between the junction of R41/R42/R43 and the +ve tag of C69 and adjust R37 (R.H. channel) to obtain a meter reading equal to half the voltage measured across C69. Transfer the meter —ve connection to the junction of R57/R58/R59 and adjust R53 (L.H. channel) to obtain the same meter reading. A convenient point for the connection of the meter to the junction of R41/R42/R43



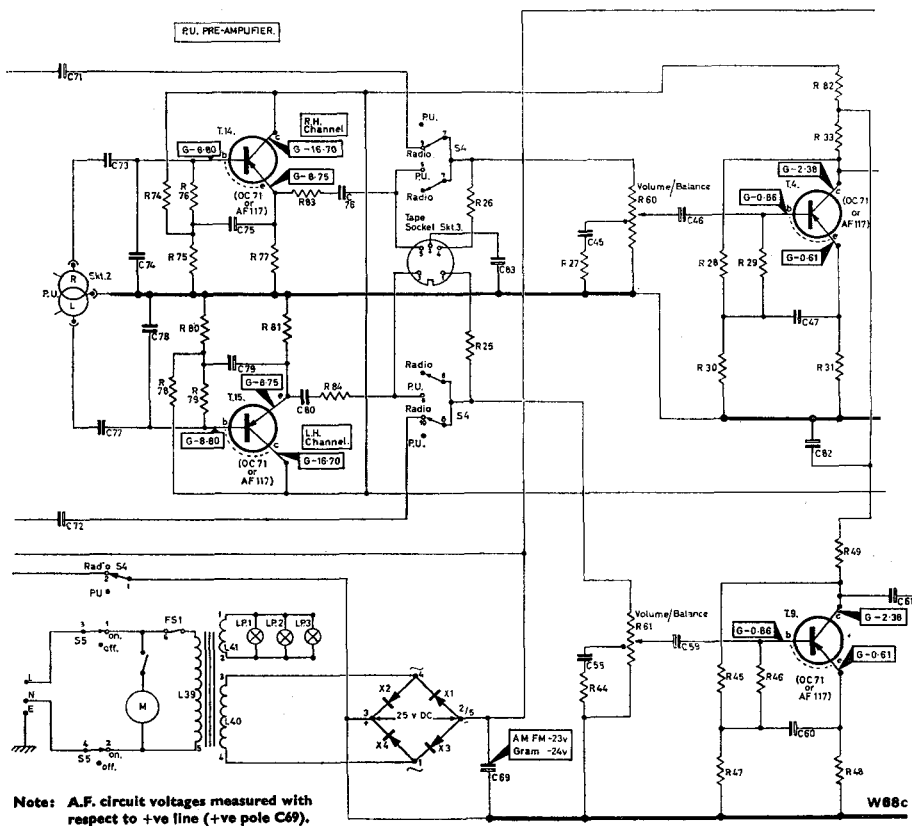
(W68b) CIRCUIT DIAGRAM R.F./I.F. STAGES—MODEL F5G53AT (CONTINUED)

## RADIO SERVICING

is the -ve (top) connection of C56, and for the junction of R57/R58/R59, the -ve (top) connection of C68.

**Collector Current Setting:** Switch to "Gram." and turn volume controls (inner and outer knobs) to minimum. Connect a D.C. milliammeter in series with the collectors of each pair of output transistors in turn. Test points "B" and "C" are provided for this purpose in the form of soldered tags—"B" adjacent to R39 for T7/T8 and "C" adjacent to R55 for T12/T13. Adjust R38 (R.H. channel) and R54 (L.H. channel) to obtain a quiescent current of 6 mA. on each channel.

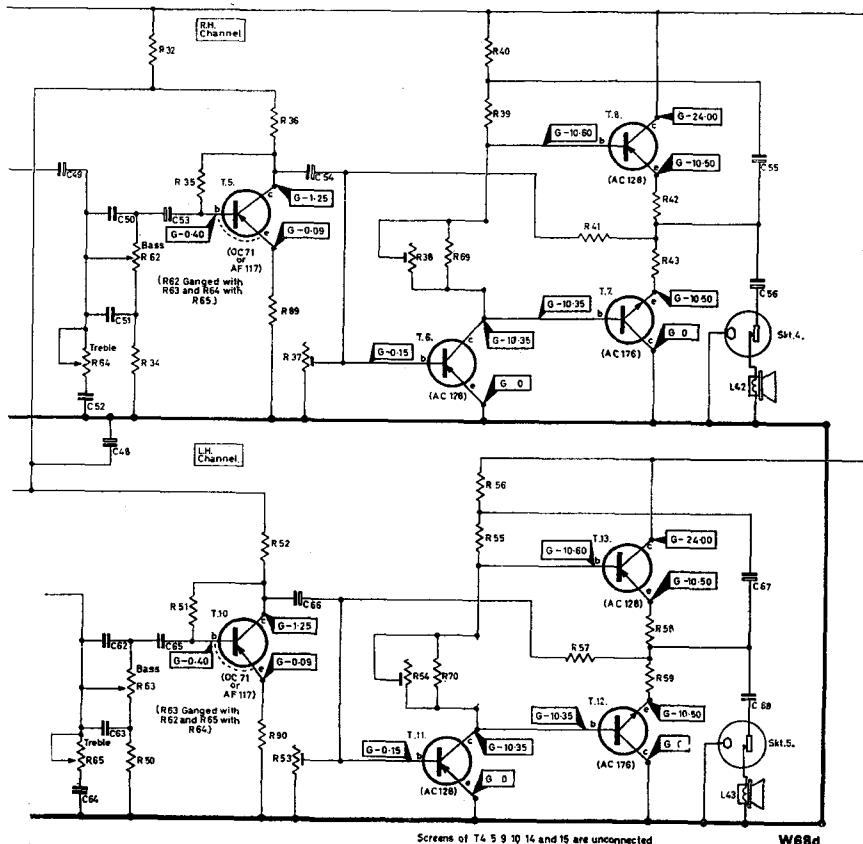
<i>Capacitors pF.</i>		C9	22,000	C17	91
C1/2		C10	300	C18	91
C3	1,000	C11	275	C19	100
C4	40	C12	2,200	C20	100
C5	82	C13	240	C21	2,200
C7	10,000	C14	40	C22	32 $\mu$ F.
C8	150	C16	0.1 $\mu$ F.	C23	47,000



(W68c) CIRCUIT DIAGRAM A.F. STAGES—MODEL F5G53AT (PART)

## Capacitors pF. (Continued)

C24	32 $\mu$ F.	C45	12,000	C65	4 $\mu$ F.
C25	91	C46	4 $\mu$ F.	C66	16 $\mu$ F.
C26	91	C47	64 $\mu$ F.	C67	40 $\mu$ F.
C27	200	C48	250 $\mu$ F.	C68	250 $\mu$ F.
C28	200	C49	4 $\mu$ F.	C69	2,500 $\mu$ F.
C29	2,200	C50	0.33 $\mu$ F.	C70	300
C30	47,000	C51	0.47 $\mu$ F.	C71	4 $\mu$ F.
C31	47,000	C52	0.33 $\mu$ F.	C72	4 $\mu$ F.
C32	0.1 $\mu$ F.	C53	4 $\mu$ F.	C73	10,000
C33	47	C54	16 $\mu$ F.	C74	2,200
C34	4,700	C55	40 $\mu$ F.	C75	25 $\mu$ F.
C35	160 $\mu$ F.	C56	250 $\mu$ F.	C76	4,700
C36	200	C58	12,000	C77	10,000
C38	82	C59	4 $\mu$ F.	C78	2,200
C39	82	C60	64 $\mu$ F.	C79	25 $\mu$ F.
C40	20,000	C61	4 $\mu$ F.	C80	4,700
C41	470	C62	0.33 $\mu$ F.	C81	0.1 $\mu$ F.
C42	470	C63	0.47 $\mu$ F.	C82	6.4 $\mu$ F.
C43	10 $\mu$ F.	C64	0.33 $\mu$ F.	C83	125 $\mu$ F.



(W68d) CIRCUIT DIAGRAM A.F. STAGES—MODEL F5G53AT (CONTINUED)



# RADIO SERVICING

## Capacitors pF. (Continued)

C84	80 $\mu$ F.	C308	4	C314	15
C301	47	C309	470	C315	6
C302	1,500	C310	10	C316	12
C303	10,000	C311	5,000	C317	100
C304	1,500	C312	1.5	C318	82
C306	8.2	C313	1,500	C319	5,000
C307	6				

## List of Resistors $\Omega$

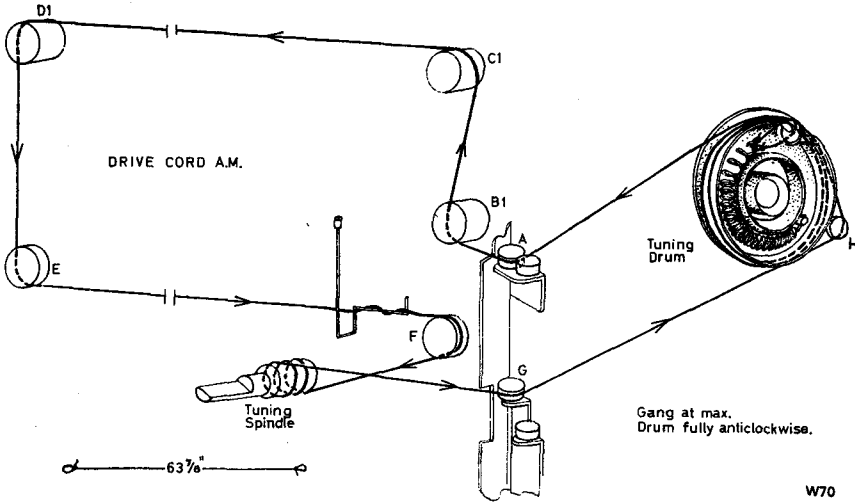
R1	47,000	R53	1,000
R2	6,800	R54	220
R3	1,000	R55	470
R4	0.15M	R56	180
R5	470	R57	18,000
R6	0.12M	R58	2.2
R7	470	R59	2.2
R8	2,200	R60	0.12M + 80,000
R9	22,000	R61	0.12M + 80,000
R10	3,900	R62	20,000
R11	820	R63	20,000
R12	220	R64	20,000
R13	180	R65	20,000
R14	0.22M	R68	4,700
R17	4,700	R69	Thermistor
R18	4,700	R70	Thermistor
R20	2,200	R71	560E
R21	10,000	R72	4,700
R22	470	R74	56,000
R25	47,000	R75	68,000
R26	47,000	R76	1,200
R27	10,000	R77	15,000
R28	47,000	R78	56,000
R29	5,600	R79	1,200
R30	33,000	R80	68,000
R31	1,000	R81	15,000
R32	1,200	R82	3,300
R33	15,000	R83	27,000
R34	820	R84	27,000
R35	56,000	R85†	0.12M
R36	8,200	R86*	100
R37	1,000	R89†	47
R38	220	R90†	47
R39	470	R91*	1,000
R40	180	R301	680
R41	18,000	R302	27,000
R42	2.2	R303	8,200
R43	2.2	R305	5,600
R44	10,000	R306	22,000
R45	47,000	R307	1,500
R46	5,600	R308	680
R47	33,000	R309	4,700
R48	1,000	R310	27,000
R49	15,000	R311	0.47M
R50	820	R312	220
R51	56,000	R313	180
R52	8,200		

\*Fitted some sets only.

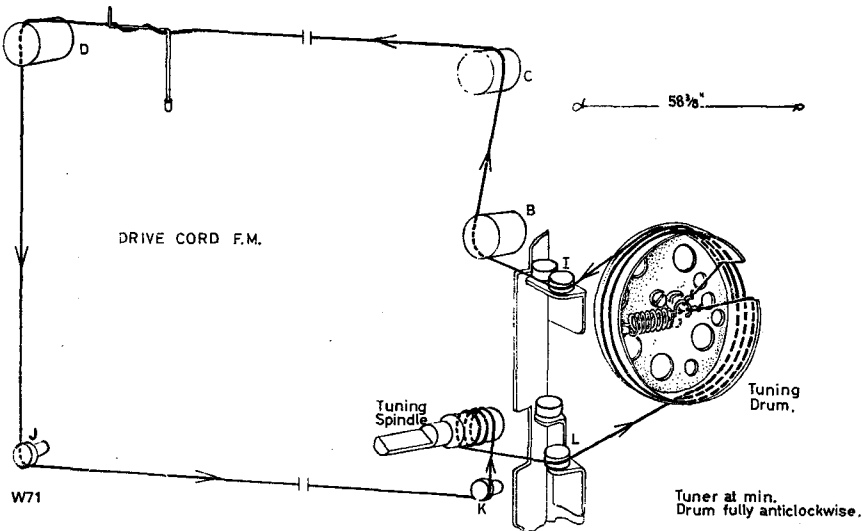
† Some sets 47,000/ 82,000.

‡ Some sets 22.

PHILIPS



(W70) A.M. DRIVE CORD—MODEL F5G53AT



(W71) F.M. DRIVE CORD—MODEL F5G53AT

PHILIPS

Model 13GF810

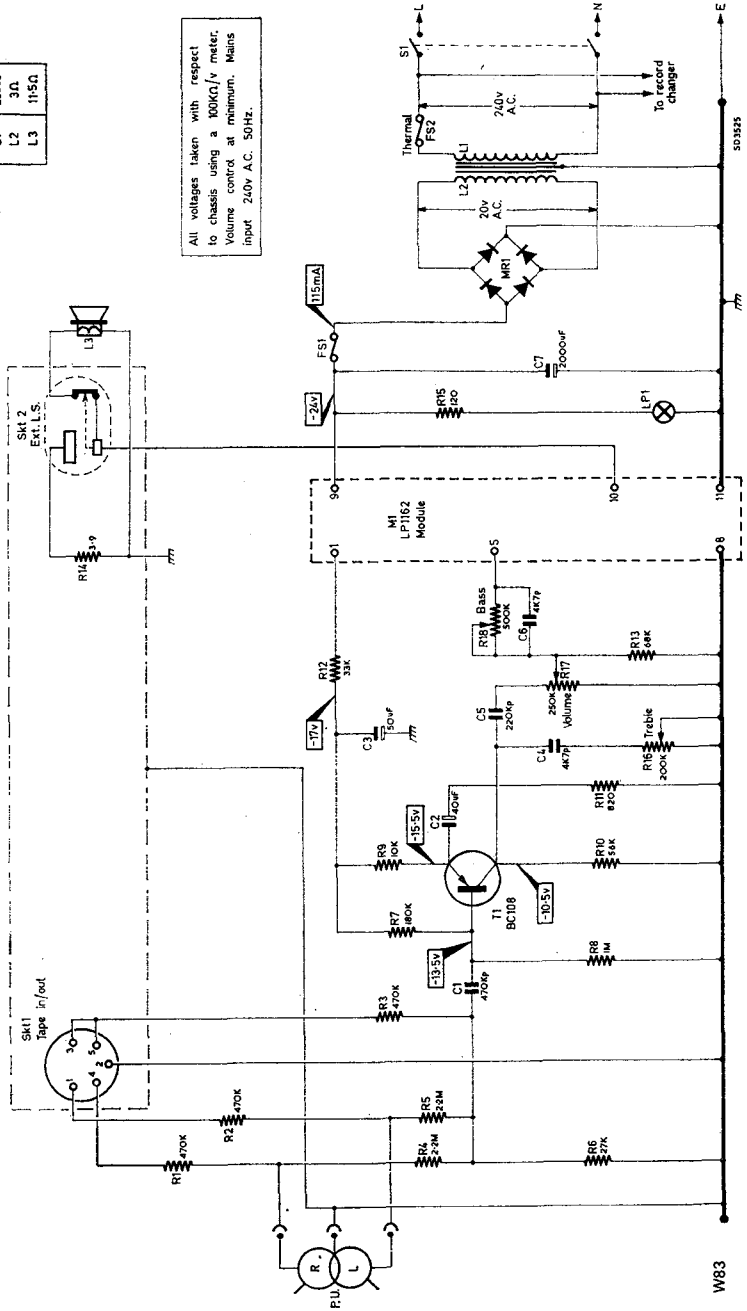
**General Description:** A mains-powered transistor record-player, comprising a single transistor (BC108) preamplifier and 4 watt power amplifier module. A 5 pin DIN socket is provided for making tape recordings or for

# RADIO SERVICING

D.C. Resistance of coils	
L1	260Ω
L2	3Ω
L3	11.5Ω

Sockets viewed on solder tags

All voltages taken with respect to chassis using a 100K $\Omega$ /v meter. Volume control at minimum. Mains input 240v A.C. 50Hz.



(W83) CIRCUIT DIAGRAM—MODEL 13GF810

## PHILIPS

feeding in an audio signal for amplification. An extension speaker socket allows for the connection of an external speaker of 12 ohms impedance.

**Warning:** The output transistors will be damaged if the speaker is short-circuited or an external speaker of lower impedance than that recommended is connected.

**Uncasing:** Disconnect from supply. Remove two screws and the fibre-board panel at the side of the autochanger. Undo one screw under the cabinet at the control panel end and five screws securing the motorboard. Slide the motorboard together with the amplifier compartment out from the cabinet.

**Amplifier:** The module LP1162 is a factory tested unit. For servicing this should be returned intact to the manufacturer.

### Resistors:

	Value $\Omega$	Wattage	Tolerance %		Value $\Omega$	Wattage	Tolerance %
R1	470k	$\frac{1}{2}$	10	R10	56k	$\frac{1}{2}$	5
R2	470k	$\frac{1}{2}$	10	R11	820	$\frac{1}{2}$	10
R3	470k	$\frac{1}{2}$	10	R12	33k	$\frac{1}{2}$	10
R4	2.2M	$\frac{1}{2}$	10	R13	68k	$\frac{1}{2}$	10
R5	2.2M	$\frac{1}{2}$	10	R14 Wire wound	3.9	1	
R6	27k	$\frac{1}{2}$	10	R15	120	1	10
R7 High stability	180k	$\frac{1}{2}$	10	R16 Treble	200k log law		
R8	1M	$\frac{1}{2}$	10	R17 Volume	250 log law		
R9 High stability	10k	$\frac{1}{2}$	5	R18 Bass	500k log law		

## PHILIPS

## Model 22GF100

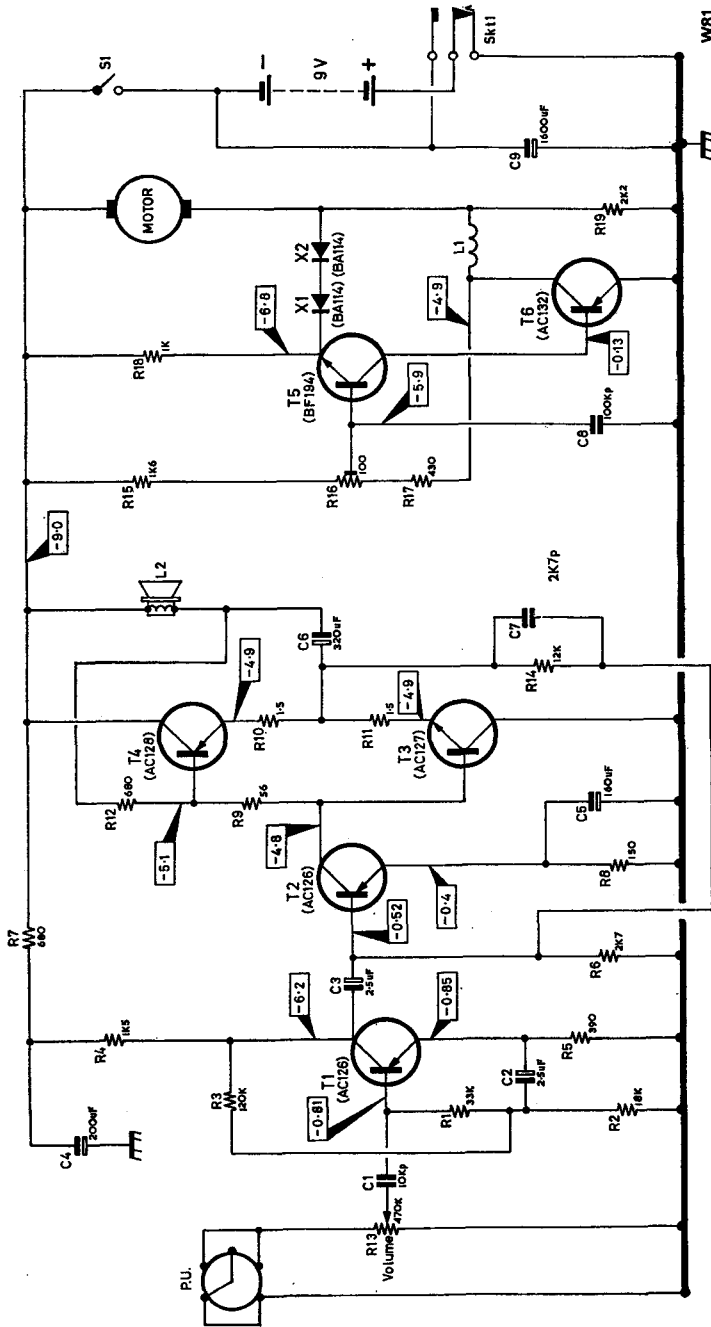
**General Description:** Battery-operated, three-speed, portable record player with the loudspeaker housed in the detachable lid. Provision is made for operation from a mains supply unit. Transistors T5 and T6 provide motor speed stabilisation. Speed adjustment is effected by R16. Stylus pressure 4–6 gms.

**Batteries:** 9 volts ( $6 \times 1\frac{1}{2}$  volts). U2 or equivalent.

**Uncasing:** Release cabinet lid by sliding the two side catches forward towards the carrying handle. Lift off turntable mat, release spring and remove turntable. Remove battery cover and the batteries, then withdraw the three screws and raise top plate, captive only by battery and loudspeaker connecting leads. Both the printed circuit and the motor assembly (located on underside of top plate) are now accessible.

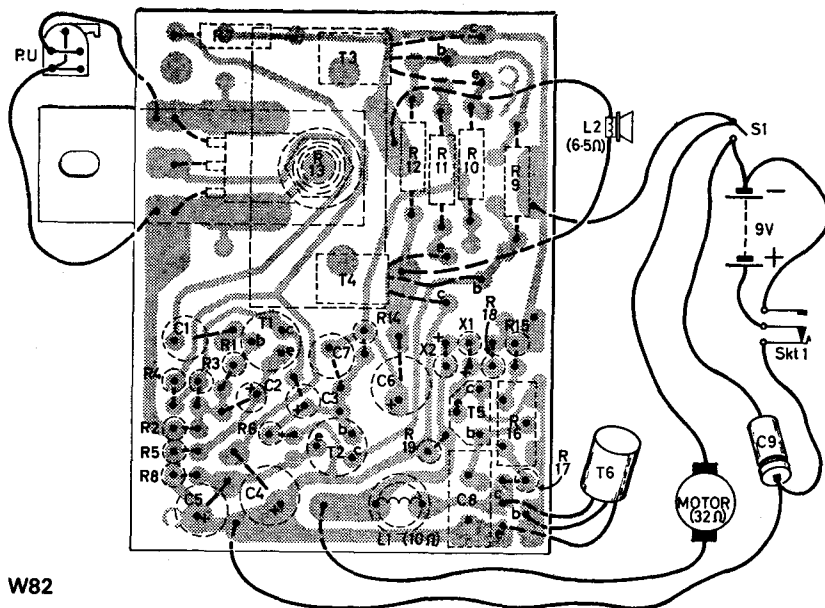
To obtain access to loudspeaker, remove grille (held by four screws inside lid) then release the four screws and clips securing the rim of the loudspeaker assembly. The assembly may now be lifted from the top of the lid.

# RADIO SERVICING



(W81) CIRCUIT DIAGRAM—MODEL 22GF100

# PHILIPS



(W82) PRINTED PANEL—MODEL 22GF100

## PHILIPS

## Model 13RB561

**General Description:** This receiver/amplifier chassis is basically similar to that fitted to Philips Model F5G53, information for which is given elsewhere in this volume. Additional facilities incorporated in the 13RB561 include a built-in stereo decoder, a meter type tuning indicator and four loudspeakers arranged in two pairs of speaker and tweeter.

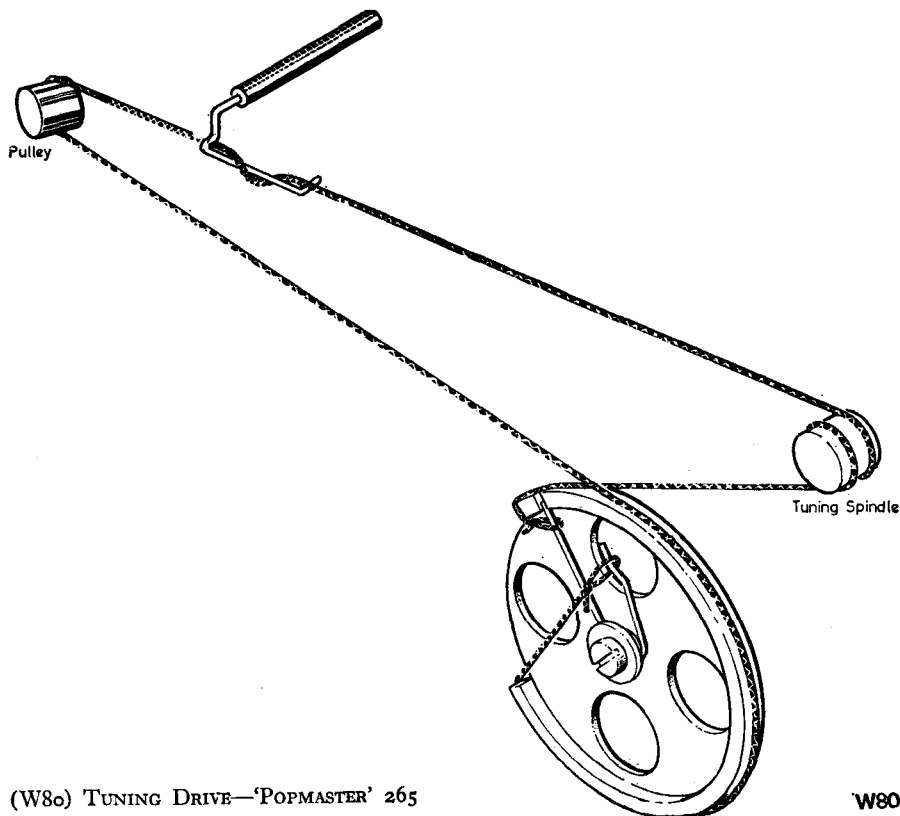
## PHILIPS Model 13RL161 "Popmaster 161"

**General Description:** This portable receiver is electrically similar to Philips Model L1G41T, for which information was given in the 1964-65 volume.

## PHILIPS Model 13RL265 "Popmaster 265"

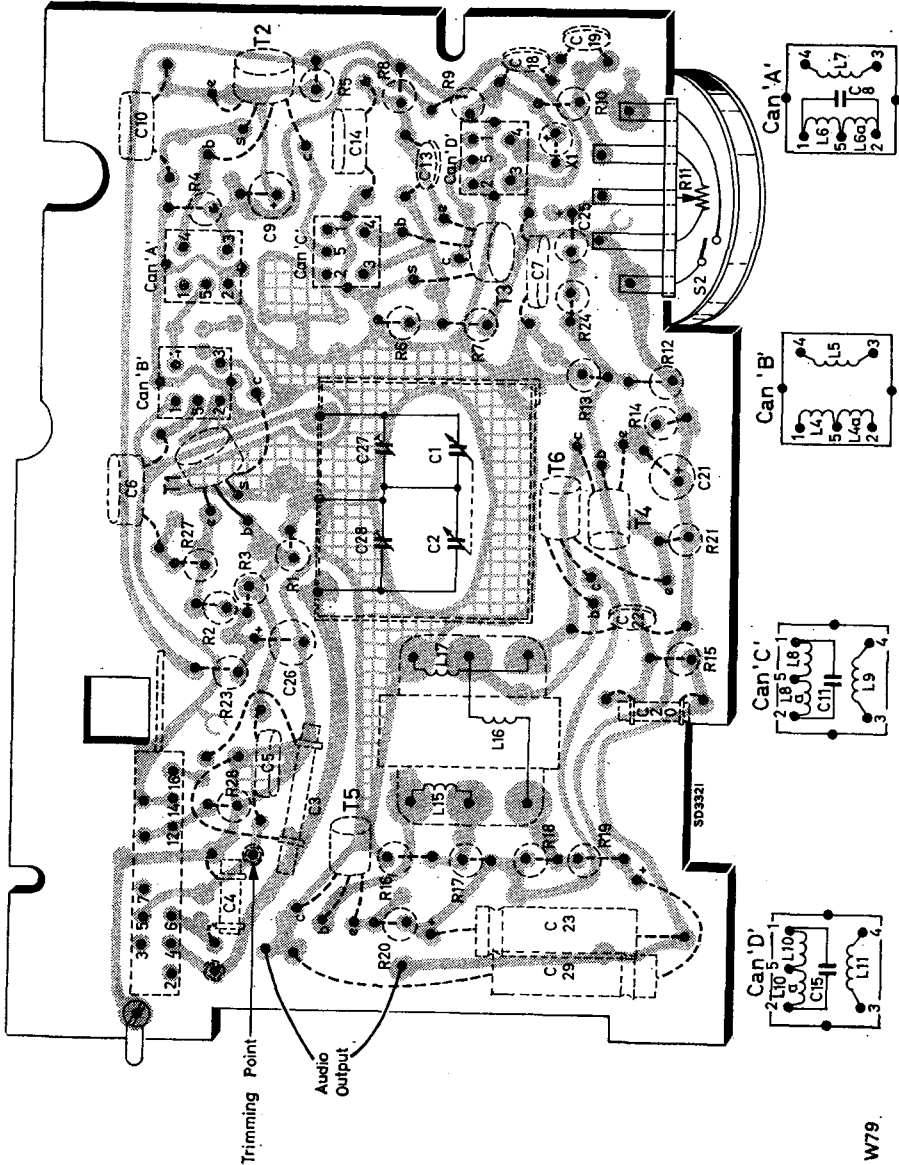
**General Description:** A M.W. and L.W. battery-operated portable radio receiver employing micro-technique and special thin film resistor modules. The extremely economical circuit, using 6 transistors and one crystal diode, is powered by four penlight batteries which are housed in a separate compartment accessible through the sliding panel in the base. An earphone socket is provided, the internal loudspeaker being automatically silenced when the earphone plug is inserted.

*Note:* Later production models use an alternative printed circuit panel utilising conventional carbon resistors; these models are suffixed as follows, /05X with blue case and /05B with grey case. Both versions are electrically identical. The circuit used in this receiver is identical to that used in Philips Model 13RS261, featured in this volume, less mains power supply unit, and reference should be made to that diagram. The two versions of construction are given: Type /00—Module; Type /05 Conventional.



# PHILIPS

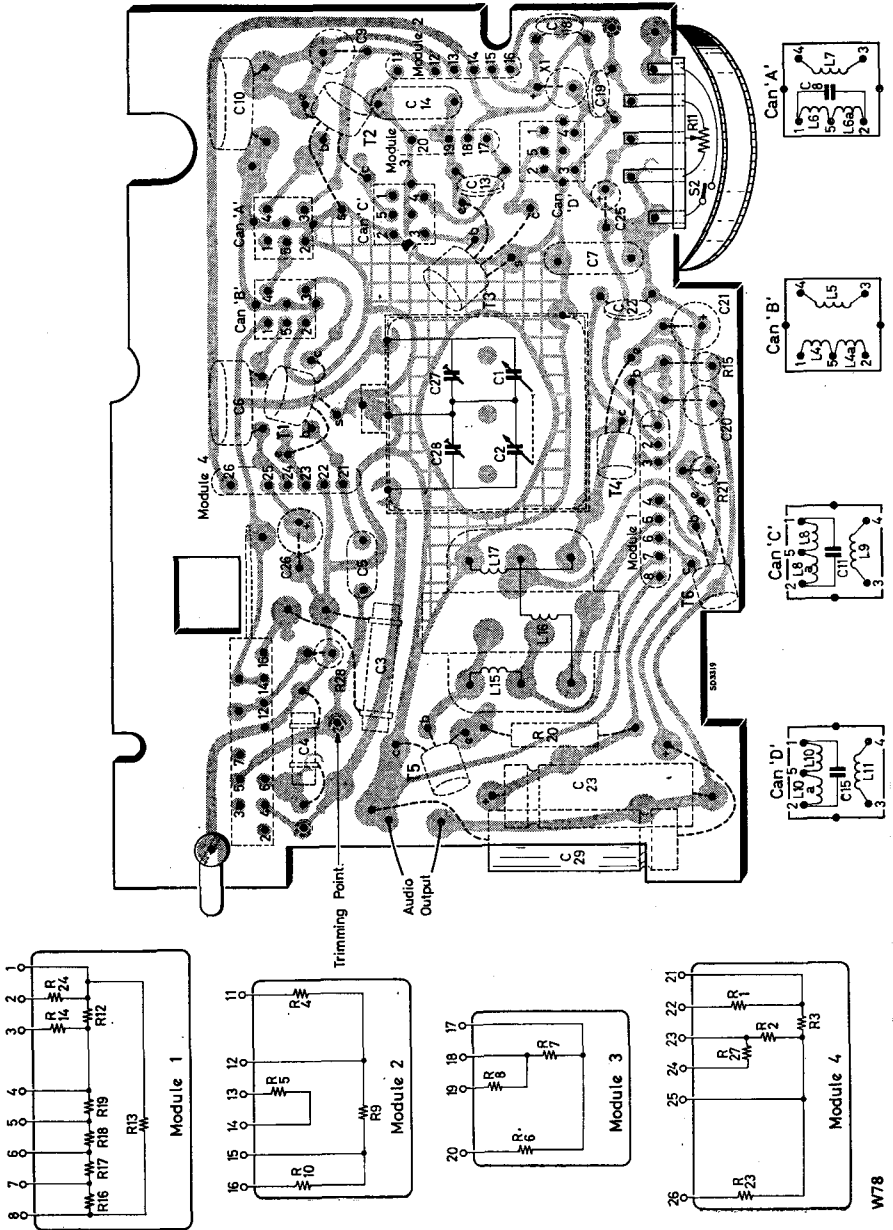
**Note:** A low impedance meter should not be used when measuring voltages and resistances, since excessive current flowing through the delicate resistor modules will damage them.



(W79) PRINTED PANEL /05 VERSION—PRINT SIDE—'POPMASTER' 265



# RADIO SERVICING



(W78) PRINTED PANEL /00 VERSION—PRINT SIDE—'POPMASTER' 265

**Dismantling:** Remove the sliding battery cover and take out batteries and foam pad. Release the screw located at each end of the battery compartment, and gently separate the two halves of the case. Ease the station scale from its locating lugs on the front case and remove for safe keeping the carrying strap fixing studs, case clamping brackets and the battery link. The component side of the printed panel is now accessible. To gain access to the print side of the panel and the tuning drive assembly, remove the two screws securing the bracket and pulley assembly to the front case, then release the two screws and fibre washers securing the printed panel. The printed panel complete with ferroceptor aerial and tuning drive assembly can now be lifted from the case, captive only by the earphone and loudspeaker connecting leads which may now be unsoldered.

**Alignment:** Use alignment procedure given for Philips Model 13RS261.

## PHILIPS

## Model 13RL360

**General Description:** A six-transistor, M.W./L.W. portable receiver. Sockets are provided for the connection of a car aerial socket, earphone and tape recorder. A feature of the circuit is a fine tuning control employing a capacitance diode operated by a potentiometer.

### Dismantling

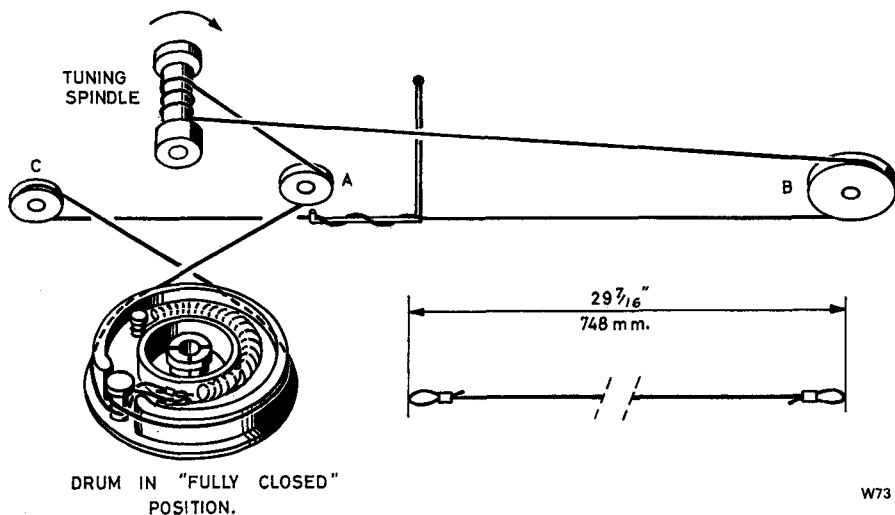
**Removing the Cabinet:** Place receiver face downwards on a soft cloth, release the two captive retaining screws in the cabinet backplate, then lift off backplate. Remove the battery; the wooden cabinet is now held only by the four corner screws.

**Removing the Chassis:** To detach the chassis from the front moulding, remove the two large screws securing the socket plate assembly, also the two chassis screws, one of which is situated next to the tuning gang and the other near the Station Focus control mounting plate. Pull off the four control knobs, unsolder the speaker leads and withdraw the chassis.

**Releasing the Panel:** To gain access to the underside of the panel, release the two fixing screws and withdraw the panel from the slots in the rod aerial rubber mounting brackets. To release the panel further, unsolder C32 from the underside and R31 from its tag near the Station Focus control. The panel can now be removed.

**R23 Adjustment:** This resistor controls the amount of current drawn by T5/T6 under quiescent conditions. Normally, adjustment will only be required if T5/T6 or any associated components are replaced. To measure the combined collector current, remove the shorting link on the panel near the output transformer. Connect a 0-10 mA. meter between the link tags, turn volume control to minimum, switch receiver on and ensure that the

# RADIO SERVICING



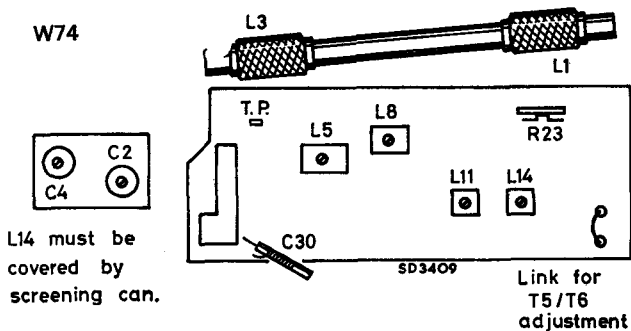
W73

(W73) DRIVE CORD—MODEL 13RL360

battery voltage is at least 8.5 volts. Observe the ambient temperature near the panel and adjust R23 to give a meter reading according to the table given below.

Temperature	Collector current setting
18°C (64.4°F)	4.5 mA.
22°C (71.3°F)	5 mA.
26°C (78.4°F)	5.5 mA.

W74



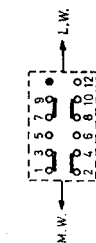
(W74) TRIM PLAN—MODEL 13RL360

**Alignment:** I.F. L14 (470 kc/s.), L8 (473 kc/s.); M.W. L5 (553 kc/s.), C4 (1638 kc/s. L.H. Marker), L1 (650 kc/s.), C2 (1300 kc/s.); L.W. C30 (148 kc/s.), L3 (185 kc/s.).

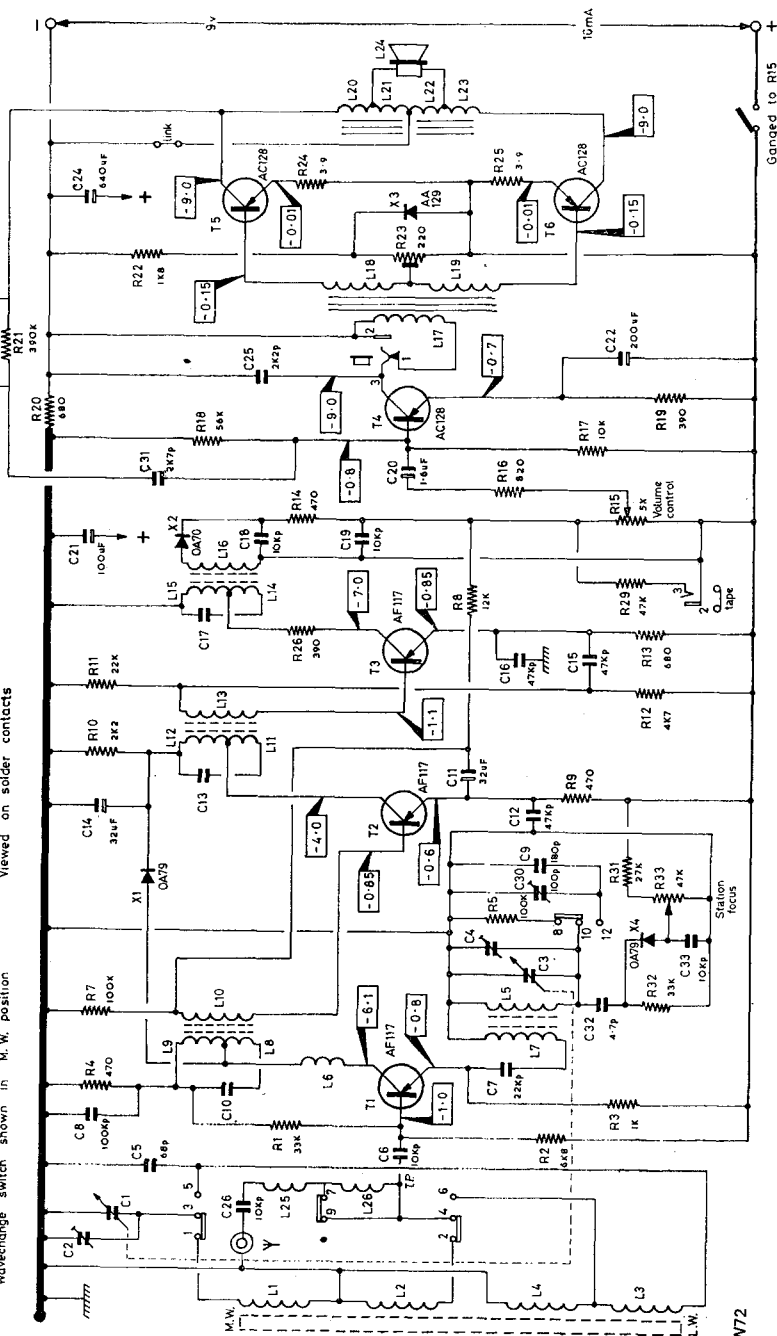
All voltages taken with respect to battery positive, using a 100K $\Omega$ /volt meter. No signal input. Negative earth. Battery voltage 9volts.

Wavechange switch shown in M.W. position

Viewed on solder contacts



(W72) CIRCUIT DIAGRAM—MODEL 13RL360



## PHILIPS

## Model 13RS261

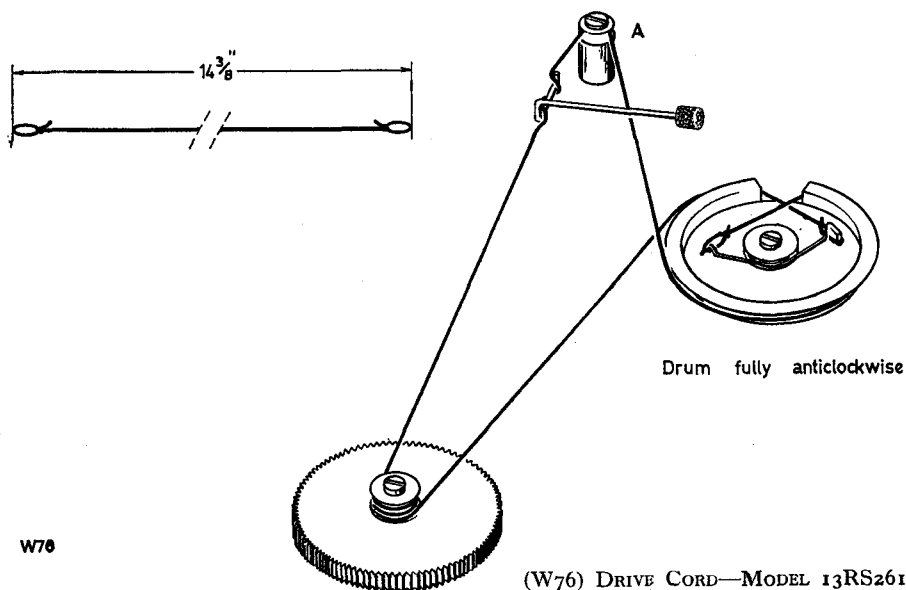
**General Description:** Mains-operated clock radio featuring a radio/buzzer alarm, the radio being switched on first, the buzzer sounding approximately 10 minutes later. Also featured is an automatic "sleep control" which can be set to switch off the radio at a predetermined time of up to 60 minutes. The radio consists of a micro-technique chassis employing six transistors, two diodes and a rectifier, to provide reception on the long and medium wavebands. Mains supply 200–240 volts, 50 c/s.

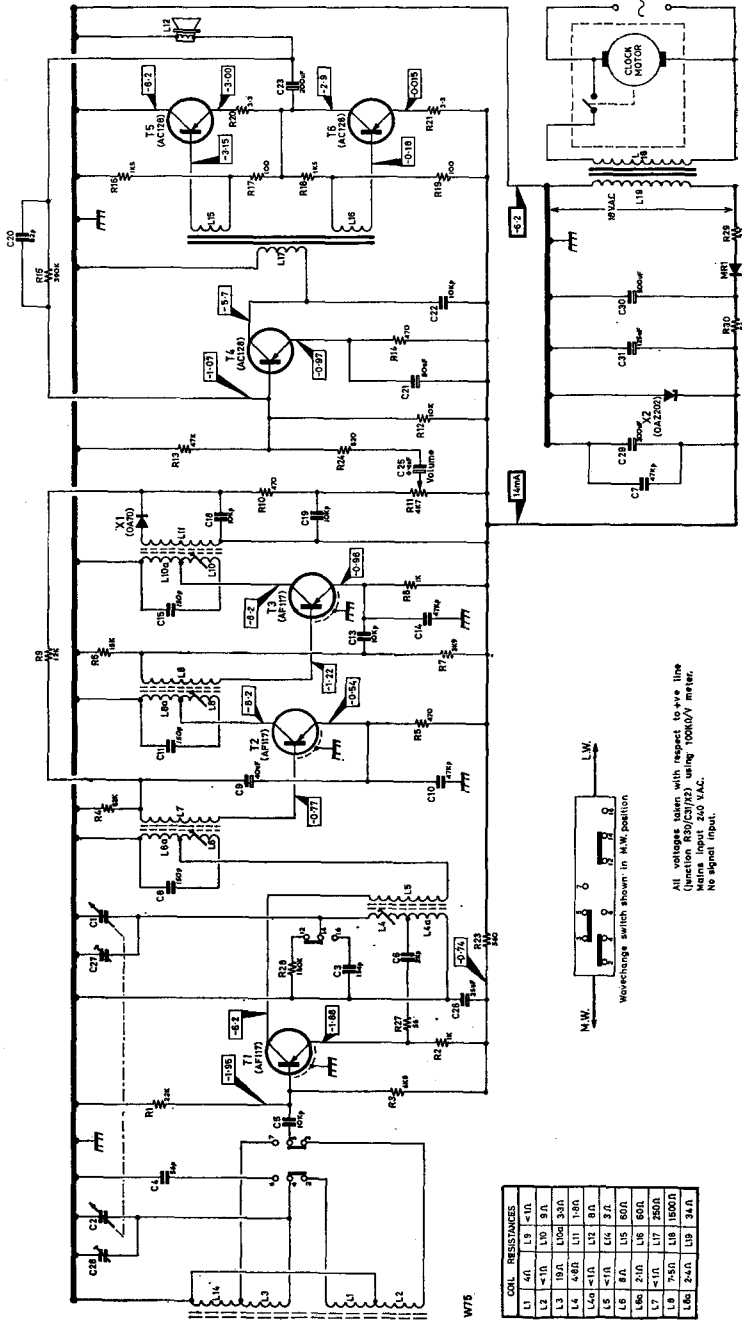
*Note:* MR1 is a S.T.C. Type S7 Rectifier. For similar component lay-out see Model 13RL265/05.

**Dismantling**

**Removing the Cabinet Rear:** Place receiver face downwards on a soft cloth, remove the two retaining screws from the rear of the cabinet, which can then be carefully lifted away to the extent of the loudspeaker connecting leads. To detach rear section completely, the loudspeaker leads must be disconnected. The component side of the printed panel, the power supply and the clock assembly are then readily accessible.

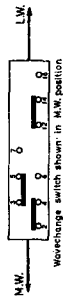
**Releasing the Printed Panel:** Release the three panel securing screws, two at the top adjacent to the ferrite rod and one at the bottom on the paxolin panel. The panel and ferrite rod assembly can now be lifted from the front moulding, giving access to print side of the panel and drive cord assembly.





W75

COIL RESISTANCES		
L1	4Ω	1.9
L2	<1Ω	1.0
L3	19Ω	1.0
L4	4.8Ω	1.1
L5	<1Ω	1.2
L6	8Ω	1.5
L7	<1Ω	1.7
L8	2.0Ω	1.8
L9	7.5Ω	1.8
L10	2.4Ω	1.9



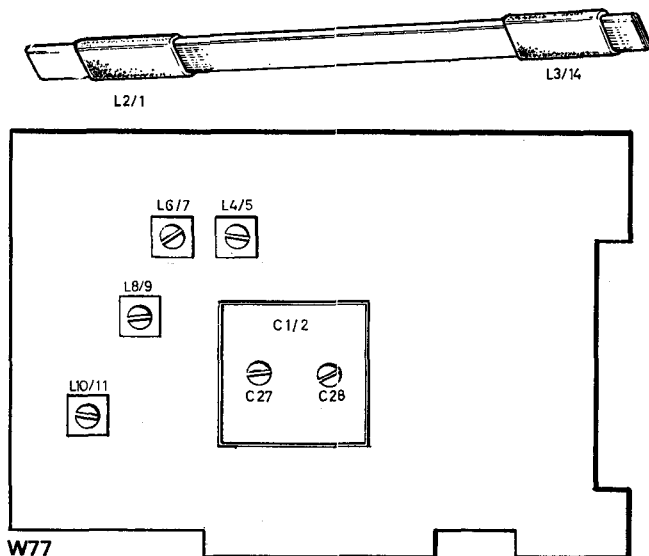
All voltages taken with respect to +ve line  
(function R30/C21/R2) using 1000Ω/V meter.  
Main input 240 V.A.C.  
No signal input.

(W75) CIRCUIT DIAGRAM—MODEL 13RS261

## RADIO SERVICING

**Releasing the Power Supply Panel:** Remove the three retaining screws, one at the top adjacent to the volume control and two at the bottom near the mains transformer. The metal panel now can be lifted from the front panel.

**Alignment:** I.F. L10, L8, L6 (470 kc/s.); Osc. L.W. L4 (148 kc/s. Gang Max.); Osc. M.W. C27 (1630 kc/s. Gang Min.); A.e. L.W. L3/14 (190 kc/s.); M.W. L1/2 (515 kc/s.); C28 (1300 kc/s.).



(W77). TRIM PLAN—MODEL 13RS261

## PORTADYNE

## Models RG400, RG1000

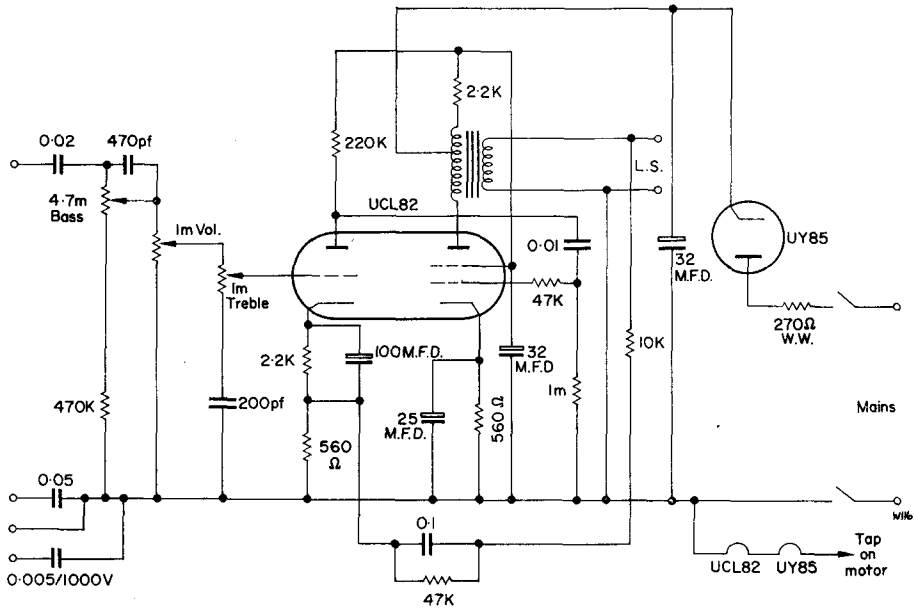
**General Description:** These A.M. Radio/Stereograms incorporate a five-valve chassis, electrically similar to that used in Model SRG 26, which information was given in the 1963-64 volume.

## PORTADYNE

## Models RP17, RP20

**General Description:** Record players incorporating a two-valve (UCL 82, UY 85) amplifier for use on A.C. mains. *Caution:* Live chassis.

# PORTADYNE

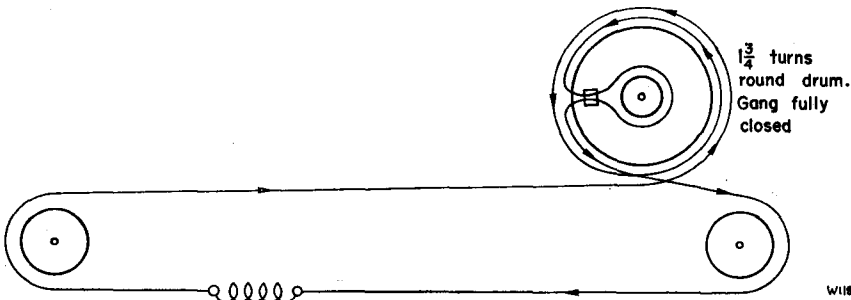


(W116) CIRCUIT DIAGRAM—MODELS RP17 AND RP20

## PORTADYNE

## Model 3B2

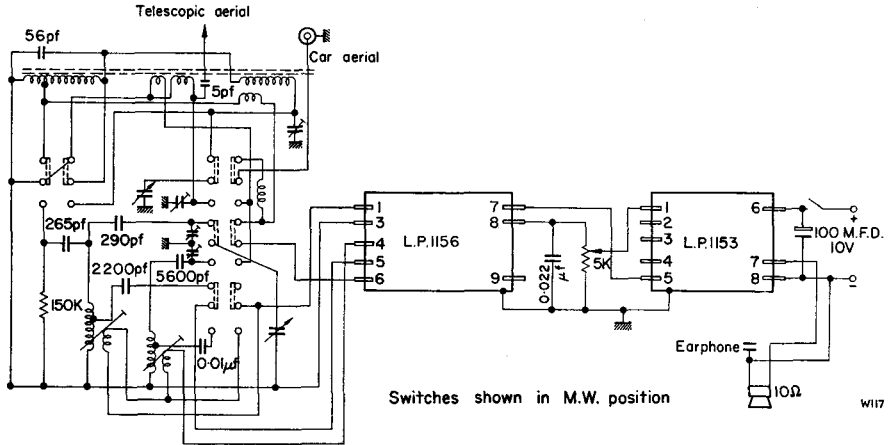
**General Description:** Three-waveband transistor portable receiver, incorporating I.F. and A.F. modules. Provided with telescopic aerial, car aerial socket and earphone socket.



(W118) DRIVE CORD—MODEL 3B2



## RADIO SERVICING

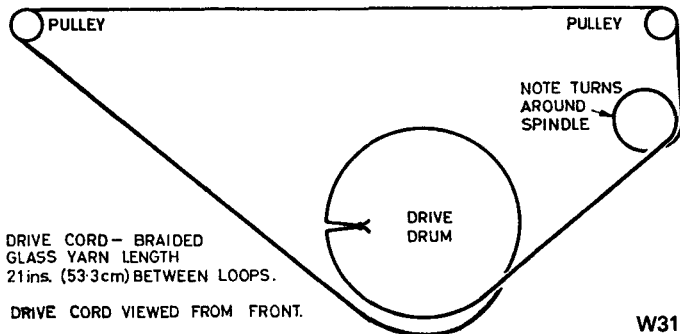


(W117) CIRCUIT DIAGRAM—PORTADYNE MODEL 3B2

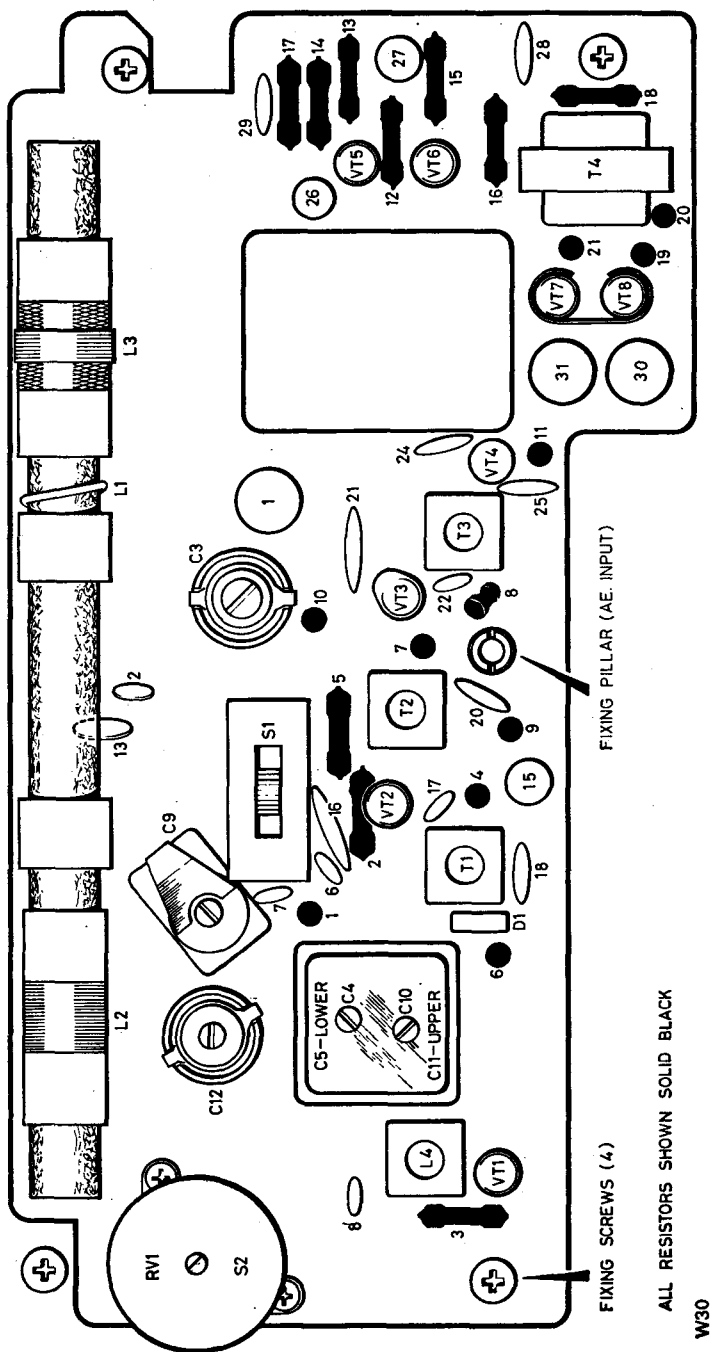
## PYE

## Models 1369 and 1371

**General Description:** An eight-transistor portable radio for reception of L.W. and M.W., with bandsread at the high frequency end of the M.W. fitted with telescopic aerial and earphone socket. Early versions of Model 1369 contain a 5-pF. capacitor in position C32 and the bandsread range covers from 185–225 metres. Later models use a 12-pF. capacitor and cover 185–255 metres on the bandsread range. All 1371 receivers have a 5-pF. capacitor.



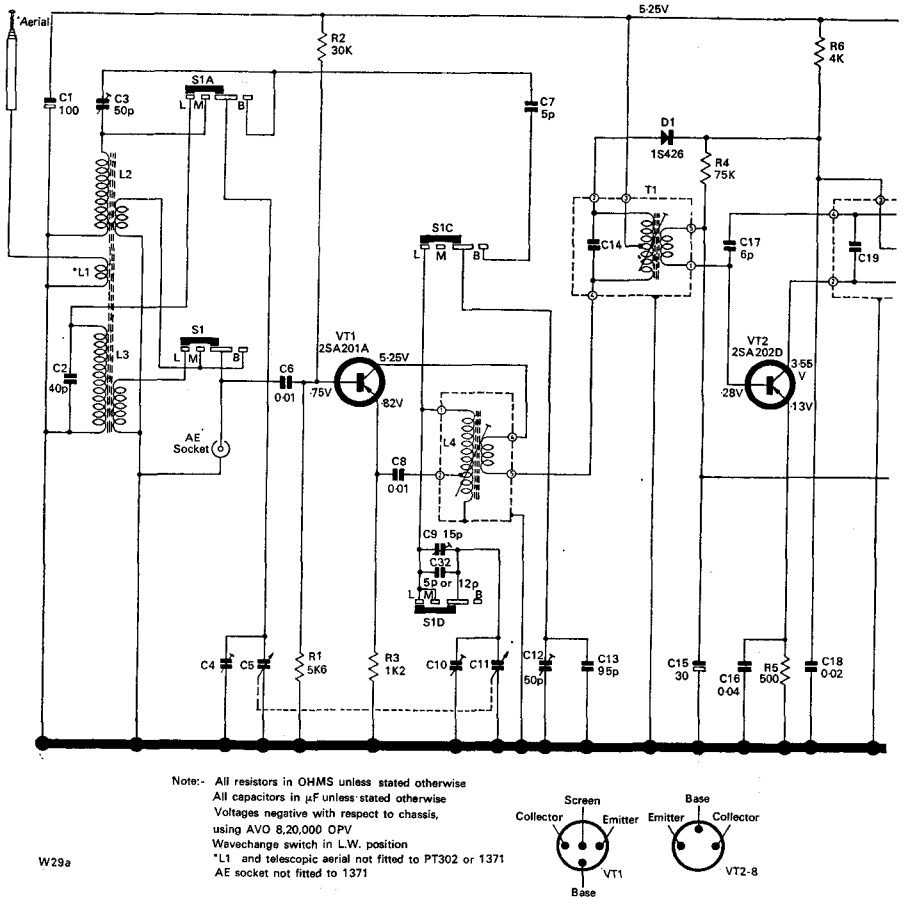
(W31) DRIVE CORD—MODELS 1369 AND 1371



(W30) COMPONENT LAY-OUT—MODELS 1369 AND 1371

W30

# RADIO SERVICING



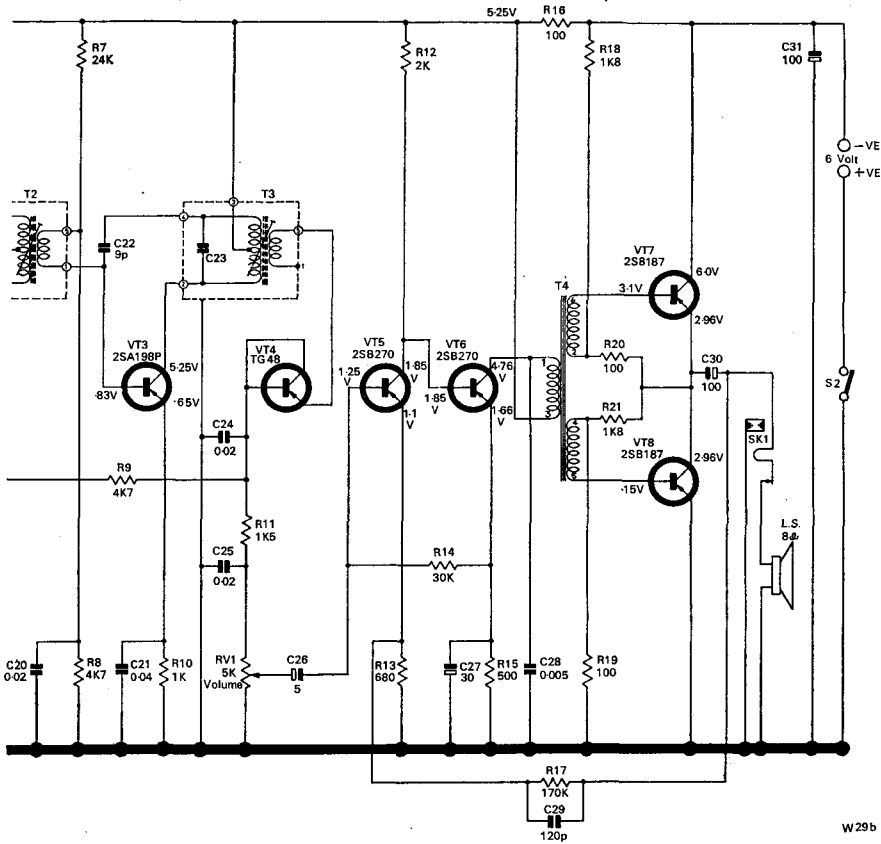
(W29a) CIRCUIT DIAGRAM—MODELS 1369 AND 1371 (PART)

**Batteries:** U7 or equivalent ( $4 \times 1\frac{1}{2}$  volts). Quiescent current: 8 mA.

**To Remove Chassis:** Release screw, insert coin into slot at base of cabinet and twist to remove back cover. Unclip the battery leads from container. Unsolder the leads to aerial and earpiece sockets. Remove the four chassis fixing screws and aerial input pillar.

## Trimming Procedure (Table continued on next page)

Apply signal as below:	Set receiver controls to:	Adjust in order for maximum output:
1. 470 kc/s. to junction S1B/C6 with 0.1- $\mu\text{F}$ . capacitor in each lead	Low frequency end of M.W. Volume control at maximum	Cores of T3, T2 and T1



(W29b) CIRCUIT DIAGRAM—MODELS 1369 AND 1371 (CONTINUED)

2. 600 kc/s. mod. 30 per cent. at 1000 c/s. to rod aerial via standard loop at 15 in. from centre of rod	M.W. 500 metres	Core of L4 and position of L2 on rod
3. As 2, but 1500 kc/s.	M.W. 200 metres	Trimmers C10 and C4
4. Repeat 2 and 3 until calibration is correct. Seal position of L2 with polystyrene dope		
5. As 3, but 200 kc/s.	L.W. 1500 metres	Trimmer C12 and position of L3 on rod
6. Seal with polystyrene dope		
† 7. As 2, but 1389 (or 1215) kc/s.	M.B. 216 (or 247) metres	Trimmers C9 and C3

Note: In the event of any adjustment being made to the M.W. circuits, the L.W. and M.B. circuits must also be realigned.

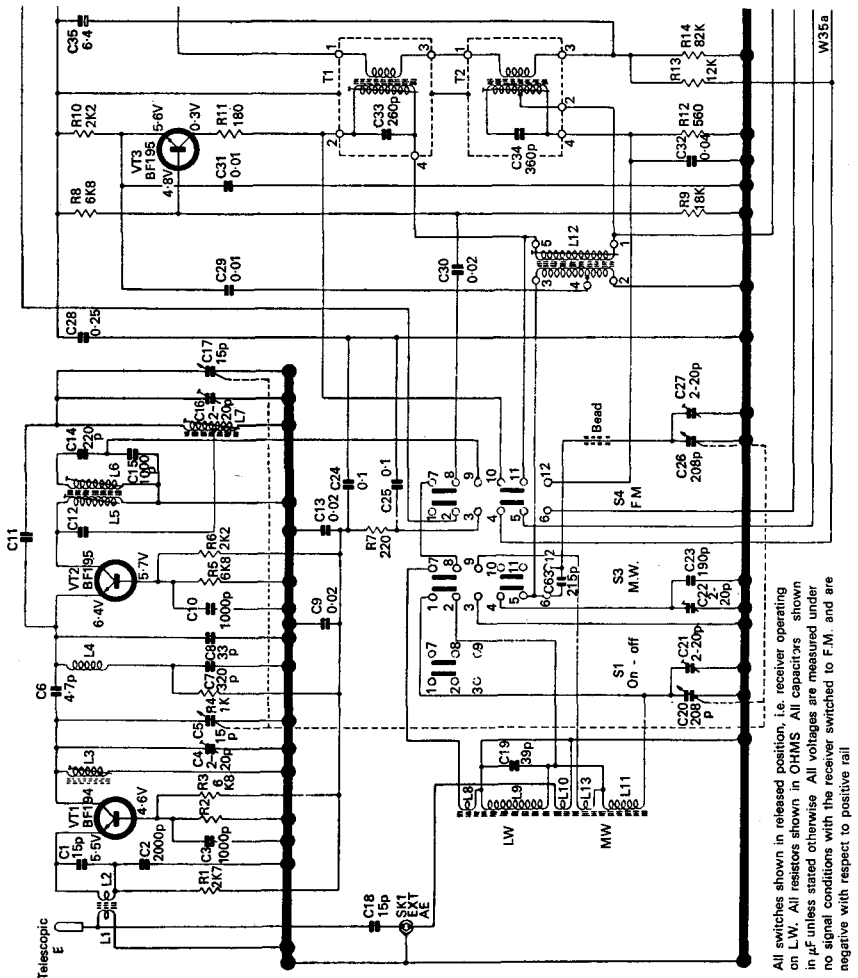
† Dependent upon coverage of bandspread.

PYE

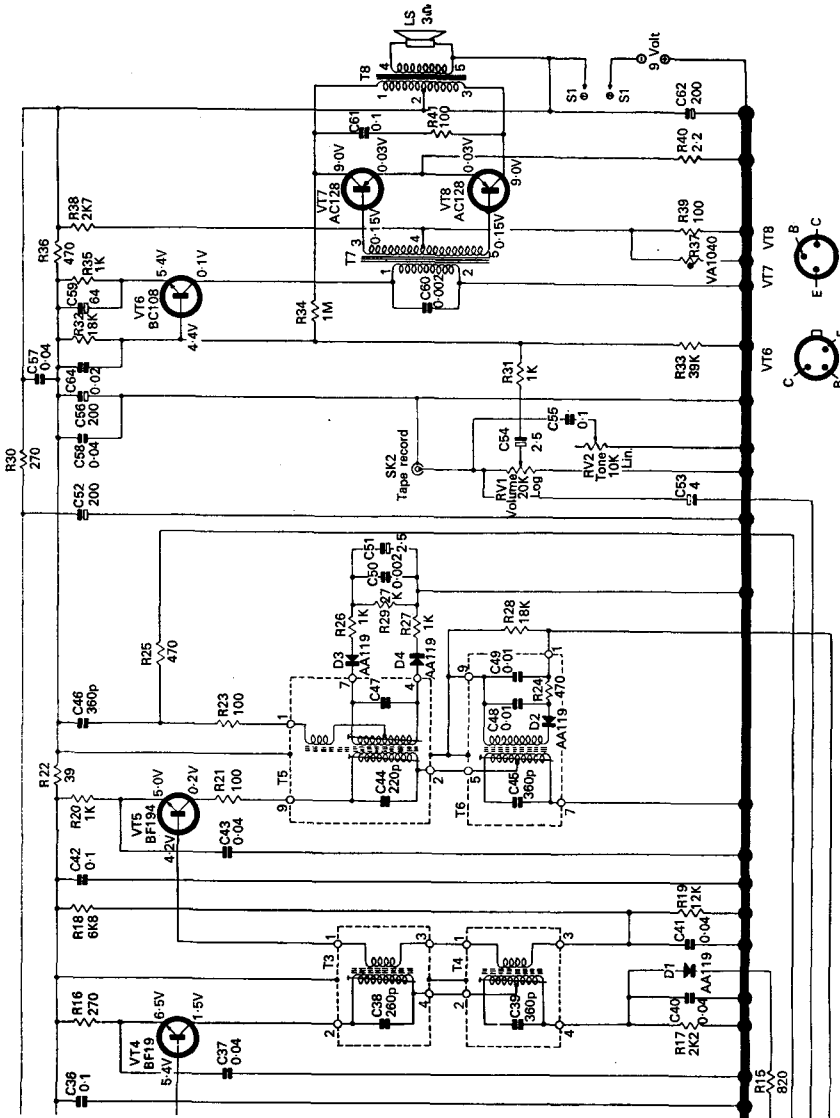
Model 1372

**General Description:** An eight-transistor portable radio for reception of M.W., L.W. and F.M. transmissions. Fitted with telescopic aerial and car aerial socket, with provision for connection to a tape recorder.

**Batteries:** U11 or equivalent ( $6 \times 1\frac{1}{2}$  volts). Consumption A.M. 18 mA., F.M. 22 mA.



(W35a) CIRCUIT DIAGRAM—MODEL 1372 (PART)



Note: Collector connected to can

Transistor connections viewed from underside

W35b

(W35b) CIRCUIT DIAGRAM—MODEL 1372 (CONTINUED)

# RADIO SERVICING

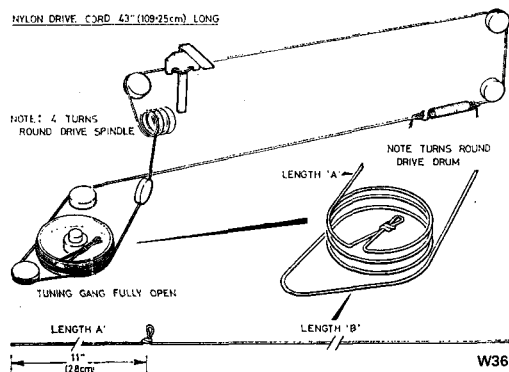
## Trimming Procedure (A.M.)

<i>Apply a 30% modulated signal as below:</i>	<i>Set receiver controls as follows:</i>	<i>Adjust in order for maximum output:</i>
1. 470 kHz via dummy aerial to S <sub>3</sub> (pin 8)	M.W. button depressed. Low frequency end of band. Volume and tone controls at maximum Check that pointer is aligned with datum marks at low frequency end of scale	Cores of T <sub>2</sub> , T <sub>4</sub> and T <sub>6</sub>
2. 600 kHz via dummy aerial to external aerial socket	M.W. button depressed. 500 metres	Core of L <sub>12</sub> and position of L <sub>11</sub> on ferrite rod
3. As (2), but 1500 kHz	M.W. button depressed. 200 metres	Trimmers C <sub>27</sub> and C <sub>21</sub>
4. Repeat (2) and (3) until calibration and tracking is correct.		Seal position of L <sub>11</sub> on rod,
5. As (2), but 214 kHz	L.W. button depressed. 1400 metres	Trimmer C <sub>22</sub> and position of L <sub>9</sub> on rod. Seal L <sub>9</sub>

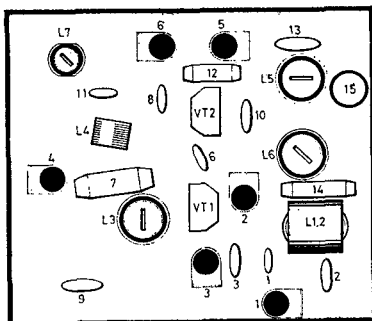
## Trimming Procedure (F.M.)

<i>Apply signal, input terminated 75 ohms as follows:</i>	<i>Set receiver controls as below:</i>	<i>Adjust in order for maximum output: (unless otherwise stated)</i>
1. 10.7 MHz $\pm$ 22½ kHz deviation, to external aerial socket	F.M. button depressed. Approx. 92 MHz. Volume and tone controls at maximum	Cores of T <sub>1</sub> , T <sub>3</sub> , T <sub>5</sub> , L <sub>5</sub> and L <sub>6</sub> Repeat until no improvement can be obtained
2. As (1), but switch to A.M. modulation	As (1)	Core of T <sub>5</sub> secondary for minimum output
3. As (1)	As (1)	Cores of T <sub>1</sub> , T <sub>3</sub> and T <sub>5</sub> primary
4. As (1), but 92 MHz $\pm$ 22½ kHz deviation	As (1)	Cores of L <sub>3</sub> and L <sub>7</sub>
5. As (1), but 102 MHz	As (1), but 102 MHz	Trimmers C <sub>4</sub> and C <sub>16</sub>
6. Repeat (4) and (5) until calibration and tracking is correct.		

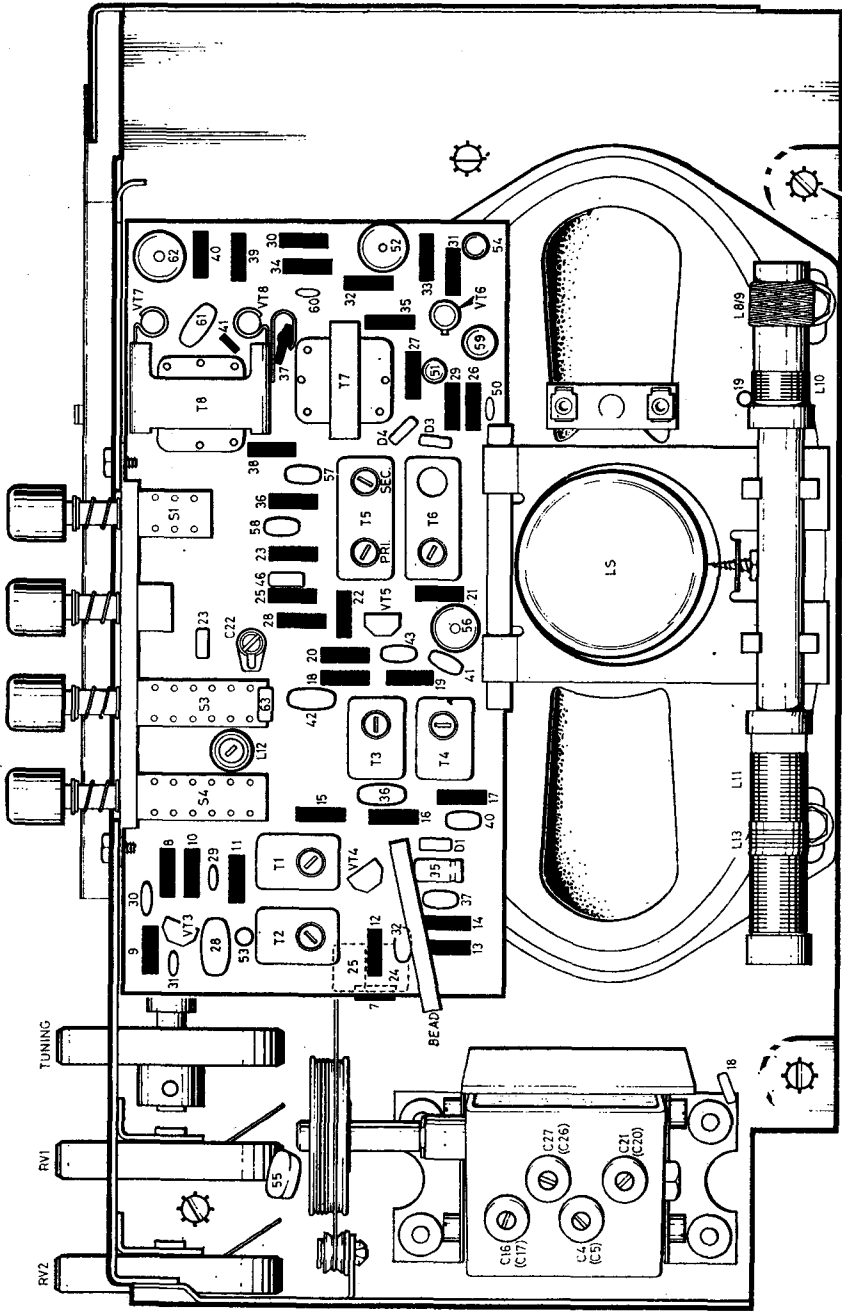
NYLON DRIVE CORD 43" (109.25cm) LONG



(W36) DRIVE CORD—MODEL 1372



(W37) V.H.F. TUNER PANEL—MODEL 1372



NOTE - ALL RESISTORS SHOWN SOLID BLACK

(W38) COMPONENT LAY-OUT—MODEL 1372

CHASSIS FIXING SCREW (4) W38



PYE

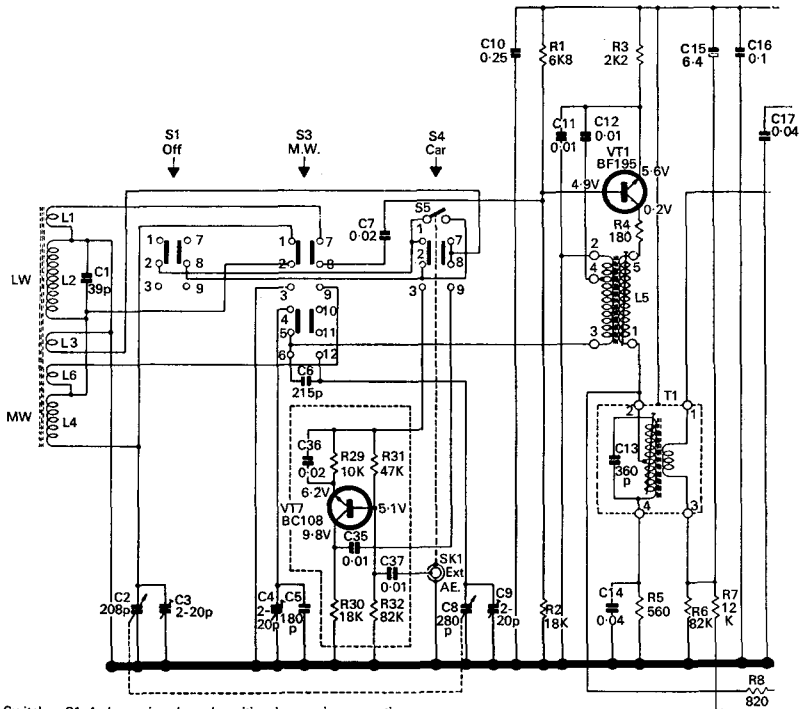
Model 1373

**General Description:** A seven-transistor M.W./L.W. portable receiver. A special feature of this model is the inclusion of a screened R.F. amplifier stage for use when the receiver is operated from a car aerial. When S4 button is pressed, R.F. signals are amplified by VT7 which is connected as an emitter follower and matched into the first tuned stage via L2.

**Batteries:** U11 or equivalent ( $6 \times 1\frac{1}{2}$  volts). Consumption 18 mA.

*Below: (W39a) CIRCUIT DIAGRAM—MODEL 1373 (PART)*

*Right: (W39b) CIRCUIT DIAGRAM—MODEL 1373 (CONTINUED)*

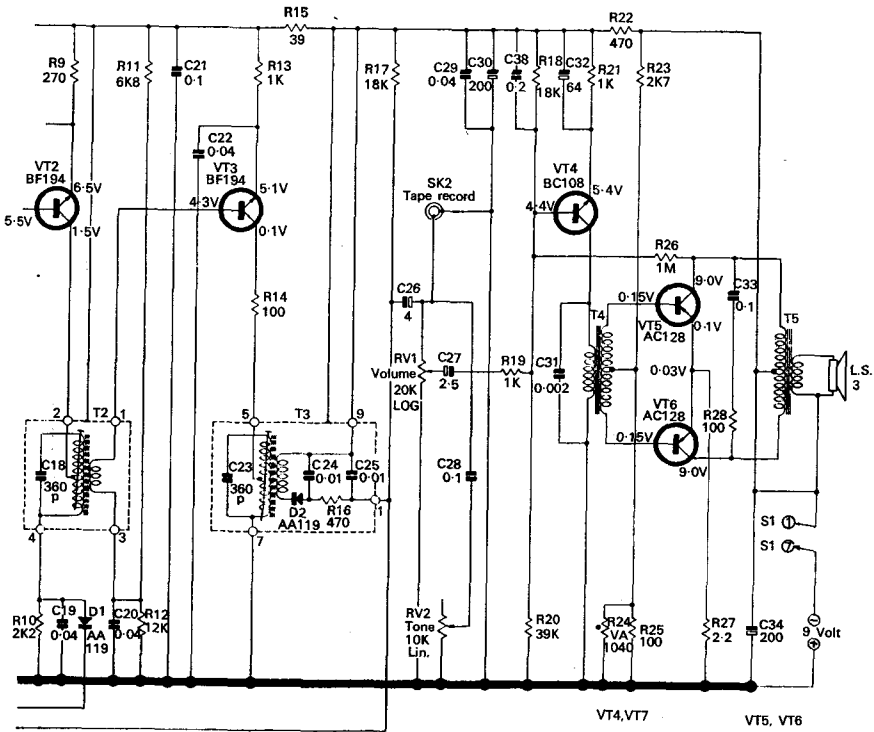


Switches S1-4 shown in released position i.e. receiver operating on L.W. switch S5, ganged to aerial socket SK1, closes on insertion of aerial plug. All resistors shown in OHMS unless stated otherwise. All capacitors shown in  $\mu$ F unless stated otherwise. All voltages measured under no signal conditions with receiver switched to M.W. with S3 and S4 depressed, are negative with respect to the positive rail.

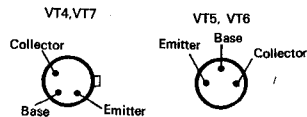
W39a

# Trimming Procedure

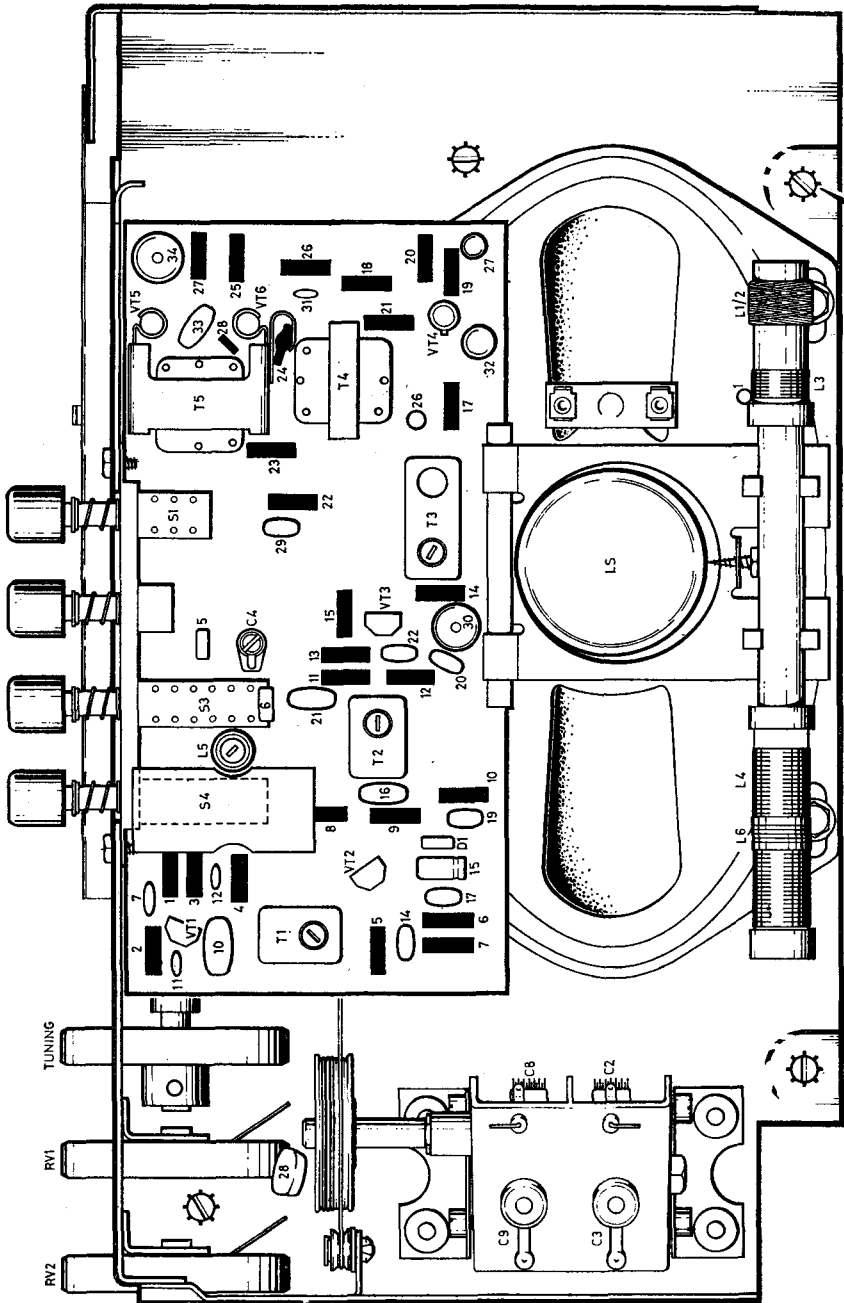
Apply a 30% modulated signal as below:	Set receiver controls as follows:	Adjust in order for maximum output:
1. 470 kHz via dummy aerial to S <sub>3</sub> (pin 8)	M.W. button depressed. Low frequency end of band Volume and tone controls at maximum Check that pointer is aligned with datum marks at low frequency end of scale	Cores of T <sub>1</sub> , T <sub>2</sub> and T <sub>3</sub>
2. 600 kHz via dummy aerial to external aerial socket	M.W. button depressed. 500 metres	Core of L <sub>5</sub> and position of L <sub>4</sub> on ferrite rod
3. As (2), but 1500 kHz	M.W. button depressed. 200 metres	Trimmers C <sub>9</sub> and C <sub>3</sub>
4. Repeat (2) and (3) until calibration and tracking is correct.		Seal position of L <sub>2</sub> on rod,
5. As (2), but 214 kHz	L.W. button depressed. 1400 metres	Trimmer C <sub>4</sub> and position of L <sub>2</sub> on rod. Seal L <sub>2</sub>



In later models -  
R21 is connected between VT4 emitter and junction R22 R23.  
R26 is deleted.



Note - Collector connected to can



NOTE - ALL RESISTORS SHOWN SOLID BLACK

(W40) COMPONENT LAY-OUT—MODEL 1373

CHASSIS FIXING SCREW (4)

W40

# PYE

NYLON DRIVE CORD 43" (109.25cm) LONG

NOTE: 4 TURNS  
ROUND DRIVE SPINDLE

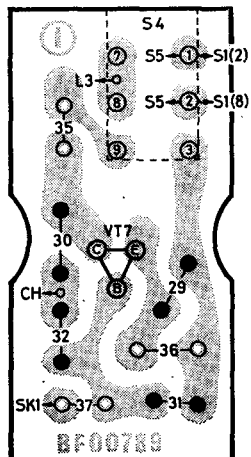
NOTE TURNS ROUND  
DRIVE DRUM

TUNING GANG FULLY OPEN

LENGTH 'A'

LENGTH 'B'

W41



W42

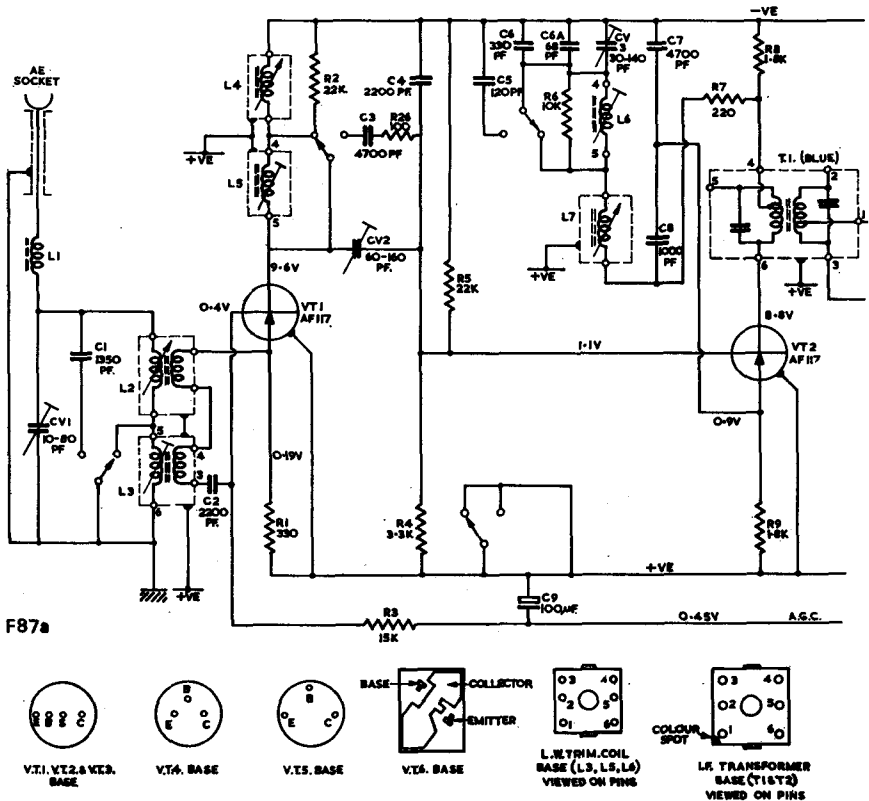
Above: (W41) DRIVE CORD—MODEL 1373

Right: (W42) PRINTED PANEL R.F. STAGE

# RADIOMOBILE

# Model 70X

**General Description:** Six-transistor, two-waveband A.M. car radio. Earth polarity change-over switch. Loudspeaker output impedance 3.5 ohms.



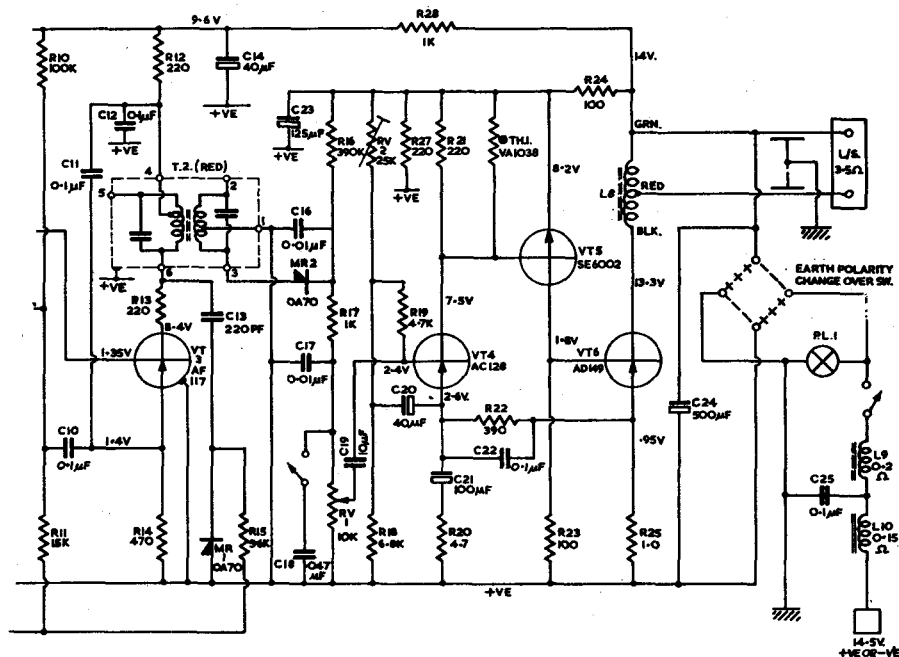
(F87a) CIRCUIT DIAGRAM—MODEL 70X (PART)

## Circuit Alignment Data

**Output Transistor Current Adjustment:** (This adjustment must be made after transistor replacement.) Disconnect battery lead and insert an ammeter (1 amp range) into circuit, ensure pilot lamp is illuminated. Adjust slider resistor RV2 for 900 mA. at 14.5 volts input. Check current after 15 minutes' operation.

# RADIOMOBILE

**I.F. Alignment:** M.W. and L.W. models—470 kc/s. M.W. only models—456 kc/s. Apply the appropriate I.F. signal modulated 30 per cent. at 400 c/s. to the aerial input socket via the standard dummy load. Switch to M.W. and set pointer to 350 m. Tune to maximum output: Secondary I.F.T. 2 (top tuning core); Primary I.F.T. 2 (bottom tuning core); Secondary I.F.T. 1 (top tuning core); Primary I.F.T. 1 (bottom tuning core). Repeat until no further improvement in gain can be made.



**LET.1**  
PINS 1-3. 0-5Ω.  
PINS 4-6. 2-5Ω.

**LET.2**  
PINS 1-3. 1Ω.  
PINS 4-6. 2Ω.

D.C. VOLTAGES MEASURED RELATIVE TO THE POSITIVE LINE, USING AN AVO. I. NO SIGNAL INPUT, VOL. AT MIN. M.W.

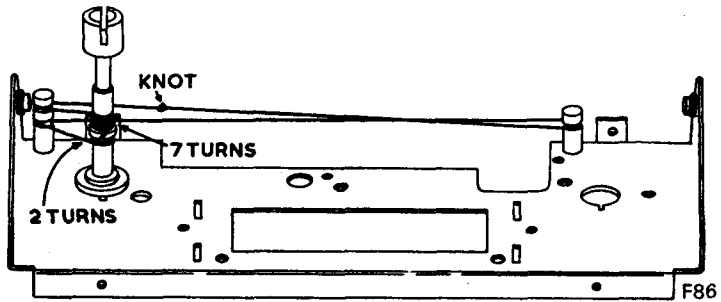
F87h

(F87b) CIRCUIT DIAGRAM—MODEL 70X (CONTINUED)

**M.W. Alignment:** Switch the M.W. pointer to the calibration mark at left of scale. Inject signal 1620 kc/s. (185 m.) and peak CV3, CV2, CV1. Check alignment at 1100 kc/s. (272.7 m.) and 600 kc/s. (550 m.). Gain figure should be better or equal to that obtained in previous operation.

**Note:** The tuner unit is factory pre-aligned, coils L2, L4, L7, should not be disturbed during alignment procedure.

## RADIO SERVICING



(F86) DRIVE CORD

**L.W. Alignment:** Pointer to extreme right. Inject signal 150 kc/s. (2000 m.) and peak L6. Inject signal 180 kc/s. and tune in receiver. Peak L<sub>3</sub> and L<sub>5</sub>.

**To Replace Drive Cord:** With tuning spindle fully anti-clockwise, i.e. tuning cores fully withdrawn, restring drive cord as shown in illustration, passing the loose end through loop and knotting the cord. Check pointer calibration.

## R.G.D.

## Models RG241 and RG242

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**General Description:** These models employ the S.T.C. Chassis GC10 and GC11 which are suitably described later in this volume on page 377 to 390.

**Dismantling:** This procedure is similar to that given for K.B. models KGo41 and KGo42 previously described on pages 255 and 256 of this volume.

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## R.G.D.

## Model RP236

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**General Description:** This model employs the S.T.C. Chassis PC10 and PC11, and is similar to the K.B. model KP036 described on page 256 of this volume.

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## R.G.D.

## “ROVER”

## Model RR221

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**General Description:** This model, apart from presentation, is similar to the “Cobra” radio receiver (KR021) described on page 239 of the 1967-68 volume.

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## R.G.D.

## “RAPIER”

## Model RR223

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**General Description:** This model is similar in most respects to the model RR222 (Rambler) described on pages 326 to 331 of the 1967-68 volume.

The R.F. Module RMM21 employed in this receiver is similar to that employed in the K.B. model KR023 (Chieftain) described previously, on pages 254 and 255 of this volume.

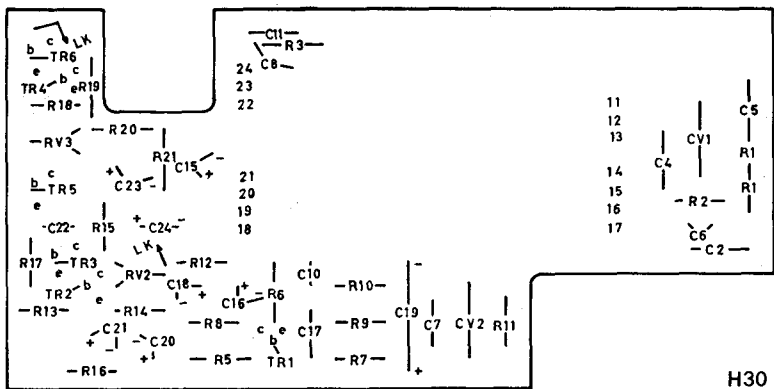


**ROBERTS****Model R600**

**General Description:** F.M./A.M. portable receiver employing eleven transistors and five diodes. Miniature jack socket for earpiece and car-type aerial socket for external aerials. Speaker, elliptical 5 ohms. Battery, 9 volts.

**Wavebands:** L.W. 150–265 kHz. M.W. 530–1620 kHz. V.H.F. 87.5–108 MHz.

**Adjustments:** The following adjustments are carried out with 9 volts measured across C24. (1) Connect a volt-meter between junction of TR5 and TR6 emitters and positive supply, and with volume at minimum, adjust RV2 to give 4.7 volts. (2) Connect a milliammeter in black flex link (LK) under printed circuit board, and adjust RV3 to give an output stage quiescent current of 3.5 mA. at 20°C. Allow one minute and recheck the figure. (3) Observing a sine-wave output on an oscilloscope, adjust RV2 for symmetry at onset of clipping.

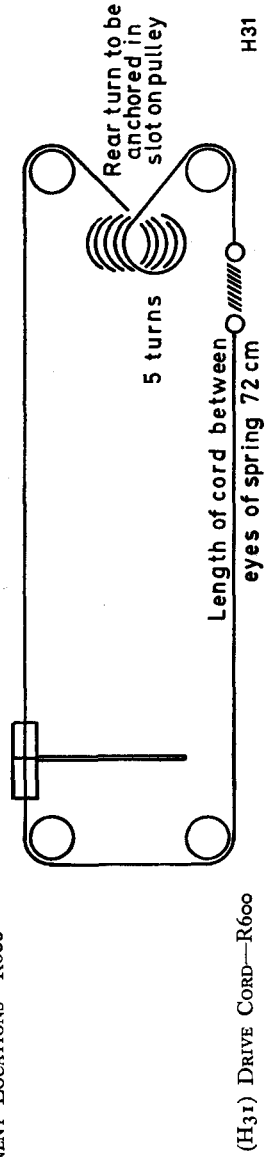
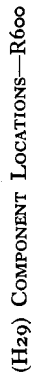


(H30) BOARD LAY-OUT—R600

**Alignment:** The I.F. transformers have been accurately aligned by the manufacturers and no attempt should be made to realign them. If a fault develops in the I.F. amplifier or the F.M. tuner, the complete unit should be removed and returned to the Roberts' Radio Co. Ltd. for replacement. R.F.A.M. Rotate tuning control fully anti-clockwise and check that pointer coincides with the high wavelength end of the tuning scale. Inject signal via a coupling coil. Output should be kept low to avoid A.G.C. action. M.W. 1500 KHz. Adjust A.M. osc. and Aerial for max. 560 KHz. Adjust A.M. osc. coil and L2 for max. L.W. 263 KHz. Adjust CV1 and CV2 for max. 158 KHz. Adjust L3 for max. F.M. Switch off A.F.C. (button

C1	R1	R2	C4	C5	C6	C7	CV2	L4	L5	L6	L7	L8	L9	L10	L11	L12	L13	R3	C8	R4	RV1	C14	C16	RV2	C17	RV3	C19	RV4	C20	RV5	C21	RV6	C22	RV7	C23	RV8	C24	RV9	C25	RV10	C26	RV11	C27	RV12	C28	RV13	C29	RV14	C30	RV15	C31	RV16	C32	RV17	C33	RV18	C34	RV19	C35	RV20	C36	RV21	C37	RV22	C38	RV23	C39	RV24	C40	RV25	C41	RV26	C42	RV27	C43	RV28	C44	RV29	C45	RV30	C46	RV31	C47	RV32	C48	RV33	C49	RV34	C50	RV35	C51	RV36	C52	RV37	C53	RV38	C54	RV39	C55	RV40	C56	RV41	C57	RV42	C58	RV43	C59	RV44	C60	RV45	C61	RV46	C62	RV47	C63	RV48	C64	RV49	C65	RV50	C66	RV51	C67	RV52	C68	RV53	C69	RV54	C70	RV55	C71	RV56	C72	RV57	C73	RV58	C74	RV59	C75	RV60	C76	RV61	C77	RV62	C78	RV63	C79	RV64	C80	RV65	C81	RV66	C82	RV67	C83	RV68	C84	RV69	C85	RV70	C86	RV71	C87	RV72	C88	RV73	C89	RV74	C90	RV75	C91	RV76	C92	RV77	C93	RV78	C94	RV79	C95	RV80	C96	RV81	C97	RV82	C98	RV83	C99	RV84	C100	RV85	C101	RV86	C102	RV87	C103	RV88	C104	RV89	C105	RV90	C106	RV91	C107	RV92	C108	RV93	C109	RV94	C110	RV95	C111	RV96	C112	RV97	C113	RV98	C114	RV99	C115	RV100	C116	RV101	C117	RV102	C118	RV103	C119	RV104	C120	RV105	C121	RV106	C122	RV107	C123	RV108	C124	RV109	C125	RV110	C126	RV111	C127	RV112	C128	RV113	C129	RV114	C130	RV115	C131	RV116	C132	RV117	C133	RV118	C134	RV119	C135	RV120	C136	RV121	C137	RV122	C138	RV123	C139	RV124	C140	RV125	C141	RV126	C142	RV127	C143	RV128	C144	RV129	C145	RV130	C146	RV131	C147	RV132	C148	RV133	C149	RV134	C150	RV135	C151	RV136	C152	RV137	C153	RV138	C154	RV139	C155	RV140	C156	RV141	C157	RV142	C158	RV143	C159	RV144	C160	RV145	C161	RV146	C162	RV147	C163	RV148	C164	RV149	C165	RV150	C166	RV151	C167	RV152	C168	RV153	C169	RV154	C170	RV155	C171	RV156	C172	RV157	C173	RV158	C174	RV159	C175	RV160	C176	RV161	C177	RV162	C178	RV163	C179	RV164	C180	RV165	C181	RV166	C182	RV167	C183	RV168	C184	RV169	C185	RV170	C186	RV171	C187	RV172	C188	RV173	C189	RV174	C190	RV175	C191	RV176	C192	RV177	C193	RV178	C194	RV179	C195	RV180	C196	RV181	C197	RV182	C198	RV183	C199	RV184	C200	RV185	C201	RV186	C202	RV187	C203	RV188	C204	RV189	C205	RV190	C206	RV191	C207	RV192	C208	RV193	C209	RV194	C210	RV195	C211	RV196	C212	RV197	C213	RV198	C214	RV199	C215	RV200	C216	RV201	C217	RV202	C218	RV203	C219	RV204	C220	RV205	C221	RV206	C222	RV207	C223	RV208	C224	RV209	C225	RV210	C226	RV211	C227	RV212	C228	RV213	C229	RV214	C230	RV215	C231	RV216	C232	RV217	C233	RV218	C234	RV219	C235	RV220	C236	RV221	C237	RV222	C238	RV223	C239	RV224	C240	RV225	C241	RV226	C242	RV227	C243	RV228	C244	RV229	C245	RV230	C246	RV231	C247	RV232	C248	RV233	C249	RV234	C250	RV235	C251	RV236	C252	RV237	C253	RV238	C254	RV239	C255	RV240	C256	RV241	C257	RV242	C258	RV243	C259	RV244	C260	RV245	C261	RV246	C262	RV247	C263	RV248	C264	RV249	C265	RV250	C266	RV251	C267	RV252	C268	RV253	C269	RV254	C270	RV255	C271	RV256	C272	RV257	C273	RV258	C274	RV259	C275	RV260	C276	RV261	C277	RV262	C278	RV263	C279	RV264	C280	RV265	C281	RV266	C282	RV267	C283	RV268	C284	RV269	C285	RV270	C286	RV271	C287	RV272	C288	RV273	C289	RV274	C290	RV275	C291	RV276	C292	RV277	C293	RV278	C294	RV279	C295	RV280	C296	RV281	C297	RV282	C298	RV283	C299	RV284	C300	RV285	C301	RV286	C302	RV287	C303	RV288	C304	RV289	C305	RV290	C306	RV291	C307	RV292	C308	RV293	C309	RV294	C310	RV295	C311	RV296	C312	RV297	C313	RV298	C314	RV299	C315	RV300	C316	RV301	C317	RV302	C318	RV303	C319	RV304	C320	RV305	C321	RV306	C322	RV307	C323	RV308	C324	RV309	C325	RV310	C326	RV311	C327	RV312	C328	RV313	C329	RV314	C330	RV315	C331	RV316	C332	RV317	C333	RV318	C334	RV319	C335	RV320	C336	RV321	C337	RV322	C338	RV323	C339	RV324	C340	RV325	C341	RV326	C342	RV327	C343	RV328	C344	RV329	C345	RV330	C346	RV331	C347	RV332	C348	RV333	C349	RV334	C350	RV335	C351	RV336	C352	RV337	C353	RV338	C354	RV339	C355	RV340	C356	RV341	C357	RV342	C358	RV343	C359	RV344	C360	RV345	C361	RV346	C362	RV347	C363	RV348	C364	RV349	C365	RV350	C366	RV351	C367	RV352	C368	RV353	C369	RV354	C370	RV355	C371	RV356	C372	RV357	C373	RV358	C374	RV359	C375	RV360	C376	RV361	C377	RV362	C378	RV363	C379	RV364	C380	RV365	C381	RV366	C382	RV367	C383	RV368	C384	RV369	C385	RV370	C386	RV371	C387	RV372	C388	RV373	C389	RV374	C390	RV375	C391	RV376	C392	RV377	C393	RV378	C394	RV379	C395	RV380	C396	RV381	C397	RV382	C398	RV383	C399	RV384	C400	RV385	C401	RV386	C402	RV387	C403	RV388	C404	RV389	C405	RV390	C406	RV391	C407	RV392	C408	RV393	C409	RV394	C410	RV395	C411	RV396	C412	RV397	C413	RV398	C414	RV399	C415	RV400	C416	RV401	C417	RV402	C418	RV403	C419	RV404	C420	RV405	C421	RV406	C422	RV407	C423	RV408	C424	RV409	C425	RV410	C426	RV411	C427	RV412	C428	RV413	C429	RV414	C430	RV415	C431	RV416	C432	RV417	C433	RV418	C434	RV419	C435	RV420	C436	RV421	C437	RV422	C438	RV423	C439	RV424	C440	RV425	C441	RV426	C442	RV427	C443	RV428	C444	RV429	C445	RV430	C446	RV431	C447	RV432	C448	RV433	C449	RV434	C450	RV435	C451	RV436	C452	RV437	C453	RV438	C454	RV439	C455	RV440	C456	RV441	C457	RV442	C458	RV443	C459	RV444	C460	RV445	C461	RV446	C462	RV447	C463	RV448	C464	RV449	C465	RV450	C466	RV451	C467	RV452	C468	RV453	C469	RV454	C470	RV455	C471	RV456	C472	RV457	C473	RV458	C474	RV459	C475	RV460	C476	RV461	C477	RV462	C478	RV463	C479	RV464	C480	RV465	C481	RV466	C482	RV467	C483	RV468	C484	RV469	C485	RV470	C486	RV471	C487	RV472	C488	RV473	C489	RV474	C490	RV475	C491	RV476	C492	RV477	C493	RV478	C494	RV479	C495	RV480	C496	RV481	C497	RV482	C498	RV483	C499	RV484	C500	RV485	C501	RV486	C502	RV487	C503	RV488	C504	RV489	C505	RV490	C506	RV491	C507	RV492	C508	RV493	C509	RV494	C510	RV495	C511	RV496	C512	RV497	C513	RV498	C514	RV499	C515	RV500	C516	RV501	C517	RV502	C518	RV503	C519	RV504	C520	RV505	C521	RV506	C522	RV507	C523	RV508	C524	RV509	C525	RV510	C526	RV511	C527	RV512	C528	RV513	C529	RV514	C530	RV515	C531	RV516	C532	RV517	C533	RV518	C534	RV519	C535	RV520	C536	RV521	C537	RV522	C538	RV523	C539	RV524	C540	RV525	C541	RV526	C542	RV527	C543	RV528	C544	RV529	C545	RV530	C546	RV531	C547	RV532	C548	RV533	C549	RV534	C550	RV535	C551	RV536	C552	RV537	C553	RV538	C554	RV539	C555	RV540	C556	RV541	C557	RV542	C558	RV543	C559	RV544	C560	RV545	C561	RV546	C562	RV547	C563	RV548	C564	RV549	C565	RV550	C566	RV551	C567	RV552	C568	RV553	C569	RV554	C570	RV555	C571	RV556	C572	RV557	C573	RV558	C574	RV559	C575	RV560	C576	RV561	C577	RV562	C578	RV563	C579	RV564	C580	RV565	C581	RV566	C582	RV567	C583	RV568	C584	RV569	C585	RV570	C586	RV571	C587	RV572	C588	RV573	C589	RV574	C590	RV575	C591	RV576	C592	RV577	C593	RV578	C594	RV579	C595	RV580	C596	RV581	C597	RV582	C598	RV583	C599	RV584	C600	RV585	C601	RV586	C602	RV587	C603	RV588	C604	RV589	C605	RV590	C606	RV591	C607	RV592	C608	RV593	C609	RV594	C610	RV595	C611	RV596	C612	RV597	C613	RV598	C614	RV599	C615	RV600	C616	RV601	C617	RV602	C618	RV603	C619	RV604	C620	RV605	C621	RV606	C622	RV607	C623	RV608	C624	RV609	C625	RV610	C626	RV611	C627	RV612	C628	RV613	C629	RV614	C630	RV615	C631	RV616	C632	RV617	C633	RV618	C634	RV619	C635	RV620	C636	RV621	C637	RV622	C638	RV623	C639	RV624	C640	RV625	C641	RV626	C642	RV627	C643	RV628	C644	RV629	C645	RV630	C646	RV631	C647	RV632	C648	RV633	C649	RV634	C650	RV635	C651	RV636	C652	RV637	C653	RV638	C654	RV639	C655	RV640	C656	RV641	C657	RV642	C658	RV643	C659	RV644	C660	RV645	C661	RV646	C662	RV647	C663	RV648	C664	RV649	C665	RV650	C666	RV651	C667	RV652	C668	RV653	C669	RV654	C670	RV655	C671	RV656	C672	RV657	C673	RV658	C674	RV659	C675	RV660	C676	RV661	C677	RV662	C678	RV663	C679	RV664	C680	RV665	C681	RV666	C682	RV667	C683	RV668	C684	RV669	C685	RV670	C686	RV671	C687	RV672	C688	RV673	C689	RV674	C690	RV675	C691	RV676	C692	RV677	C693	RV678	C694	RV679	C695	RV680	C696	RV681	C697	RV682	C698	RV683	C699	RV684	C700	RV685	C701	RV686	C702	RV687	C703	RV688	C704	RV689	C705	RV690	C706	RV691	C707	RV692	C708	RV693	C709	RV694	C710	RV695	C711	RV696	C712	RV697	C713	RV698	C714	RV699	C715	RV700	C716	RV701	C717	RV702	C718	RV703	C719	RV704	C720	RV705	C721	RV706	C722	RV707	C723	RV708	C724	RV709	C725	RV710	C726	RV711	C727	RV712	C728	RV713	C729	RV714	C730	RV715	C731	RV716	C732	RV717	C733	RV718	C734	RV719	C735	RV720	C736	RV721	C737	RV722	C738	RV723	C739	RV724	C740	RV725	C741	RV726	C742	RV727	C743	RV728
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## 358



## ROBERTS

depressed). Set tuning control fully clockwise. 108 MHz. Adjust F.M. osc. and F.M.R.F. for max.

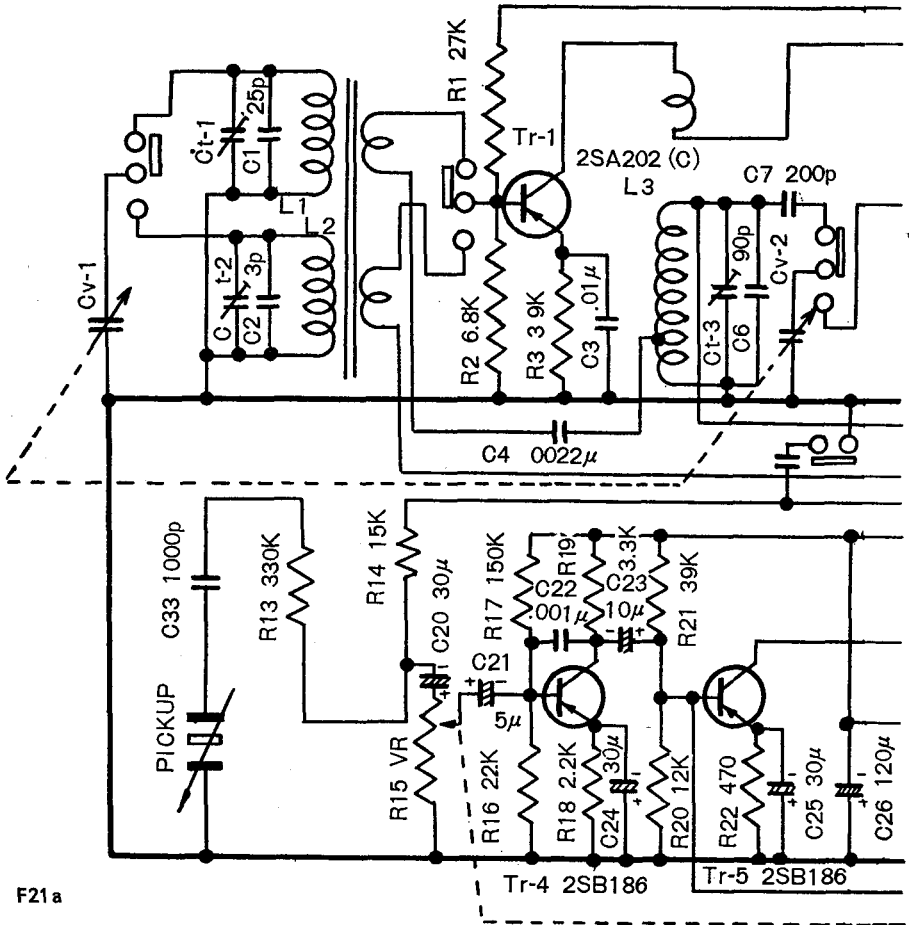
**Dismantling:** Remove battery. Remove two screws securing chassis to case and one screw retaining telescopic aerial. Disconnect speaker leads. Remove complete chassis from the top of the case.

**SANYO**

**Model G-1120E**

**General Description:** Two-waveband seven-transistor portable radio-gram. Wavebands M.W. 187-550 m., L.W. 850-2,000 m. Maximum output power 700 mW. Current consumption, maximum 170 mA. (radio), 210 mA. (gram.).

**Alignment:** Apply volt-meter across the L.S. Volume control at maxi-



(F21a) CIRCUIT DIAGRAM—MODEL G-1120E (PART)

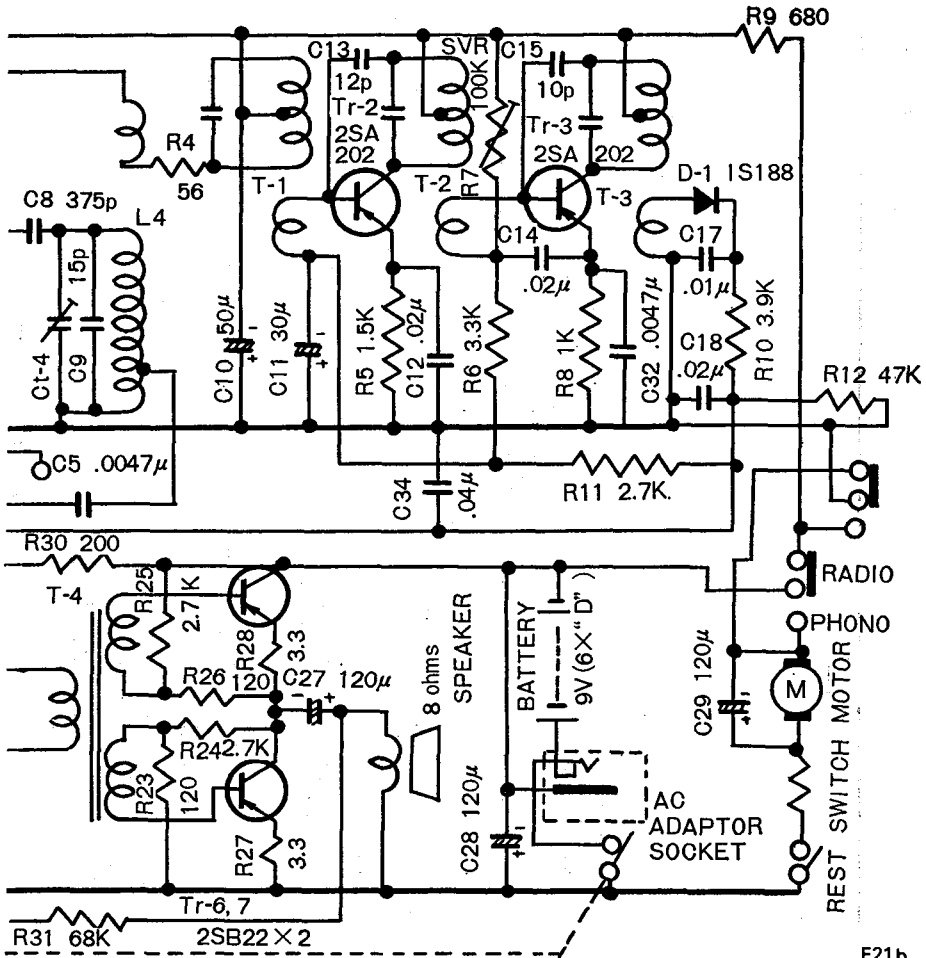
SANYO

mum. Output of signal generator should be no higher than necessary to obtain output reading in order to avoid the effects of A.G.C.

**I.F. Alignment:** 470 kc/s.—T<sub>3</sub>, T<sub>2</sub> and T<sub>1</sub>.

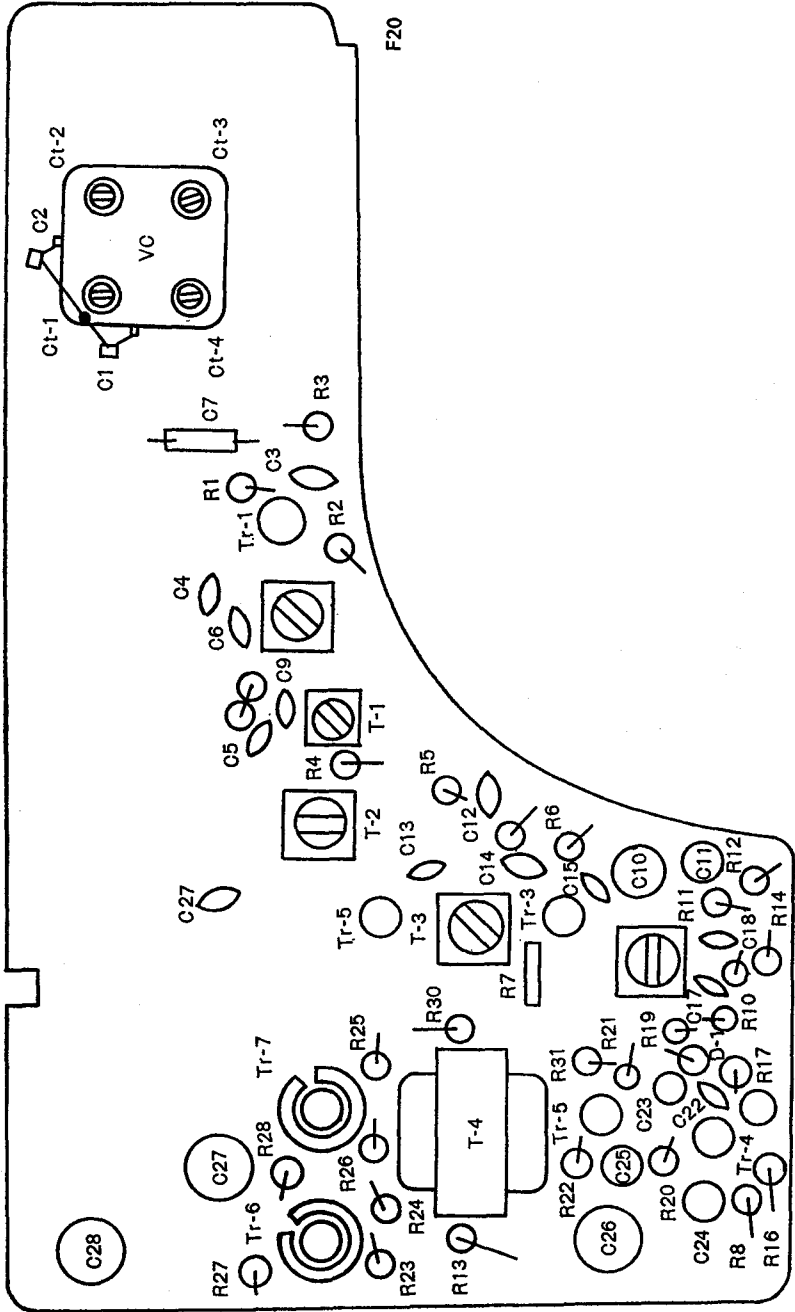
**L.W./R.F. Alignment:** 145 kc/s.—L<sub>4</sub>; 360 kc/s.—L.W. osc. Ct 3. Repeat. 150 kc/s.—L<sub>1</sub>; 350 kc/s.—L.W. aerial Ct 1. Repeat.

**M.W./R.F. Alignment:** 520 kc/s.—L<sub>4</sub>; 1650 kc/s.—M.W. osc. Ct 4. Repeat. 600 kc/s.—L<sub>2</sub>; 1400 kc/s.—M.W. aerial Ct 2. Repeat.



F21b

(F21b) CIRCUIT DIAGRAM—MODEL G-1120E (CONTINUED)



(F20) COMPONENT LAY-OUT—MODEL G-1120E

## SANYO

## Model 6L-714E

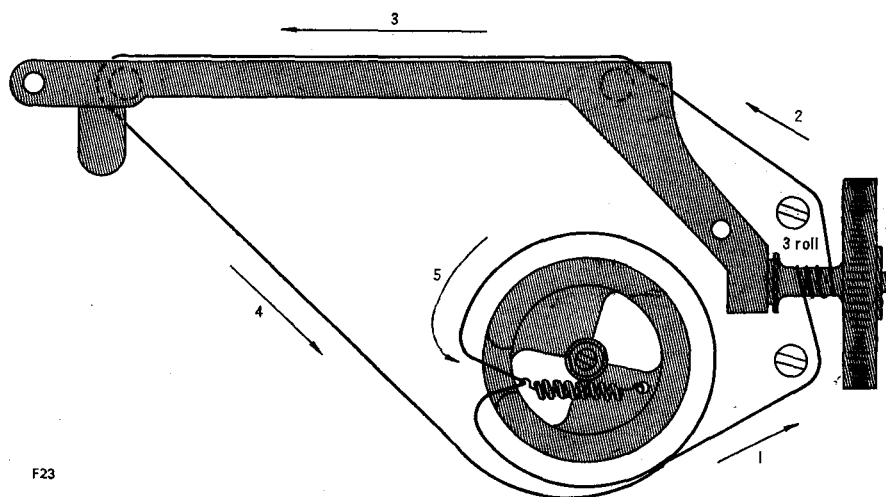
**General Description:** Two-waveband, six-transistor portable radio. Wavebands: M.W. 187-565 m.; L.W. 1200-2000 m. Maximum current consumption 130 mA. (no-signal 17 mA.) Maximum output power 300 mW.

**Alignment:** Apply volt-meter across the loudspeaker. Volume control at maximum. Output of signal generator should be not higher than necessary to obtain proper output reading in order to avoid the effects of A.G.C.

**I.F. Alignment:** 470 kc/s.—T<sub>3</sub>, T<sub>2</sub> and T<sub>1</sub>.

**M.W./R.F. Alignment:** 577 m.—L<sub>3</sub>; 182 m.—M.W. osc. trim Ct 2. Repeat. 500 m.—L<sub>1</sub>; 214 m.—M.W. aerial trim Ct 1. Repeat.

**L.W./R.F. Alignment:** 1141 m.—L.W. osc. trim Ct 3; 1875 m.—L<sub>2</sub>. Repeat.



F23

(F23) DRIVE CORD—MODEL 6L-714E

**Transistors:**

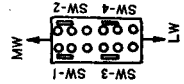
TR-1 . . .	2SA 321
TR-2 . . .	2SA 203
TR-3 . . .	2SA 202
TR-4 . . .	2SB 186
TR-5 . . .	2SB 187
TR-6 . . .	2SB 187

**Diode:**

D-1 . . .	1S 188
-----------	--------



## RADIO SERVICING



	2SA321	2SA203	2SA202	2SB186	2SB187	2SB187
V coll.	5.6	5.6	5.6	5.4	6	3
V base	1.15	0.51	0.51	1.25	3.1	0.185
V emitt.	1.04	0.36	0.35	1.1	3	0.008
I coll.	220 $\mu$ A	450 $\mu$ A	800 $\mu$ A	2.7 mA	3.8 mA	3.8 mA

(F24) CIRCUIT DIAGRAM—SANYO MODEL 6L-714E

SHARP

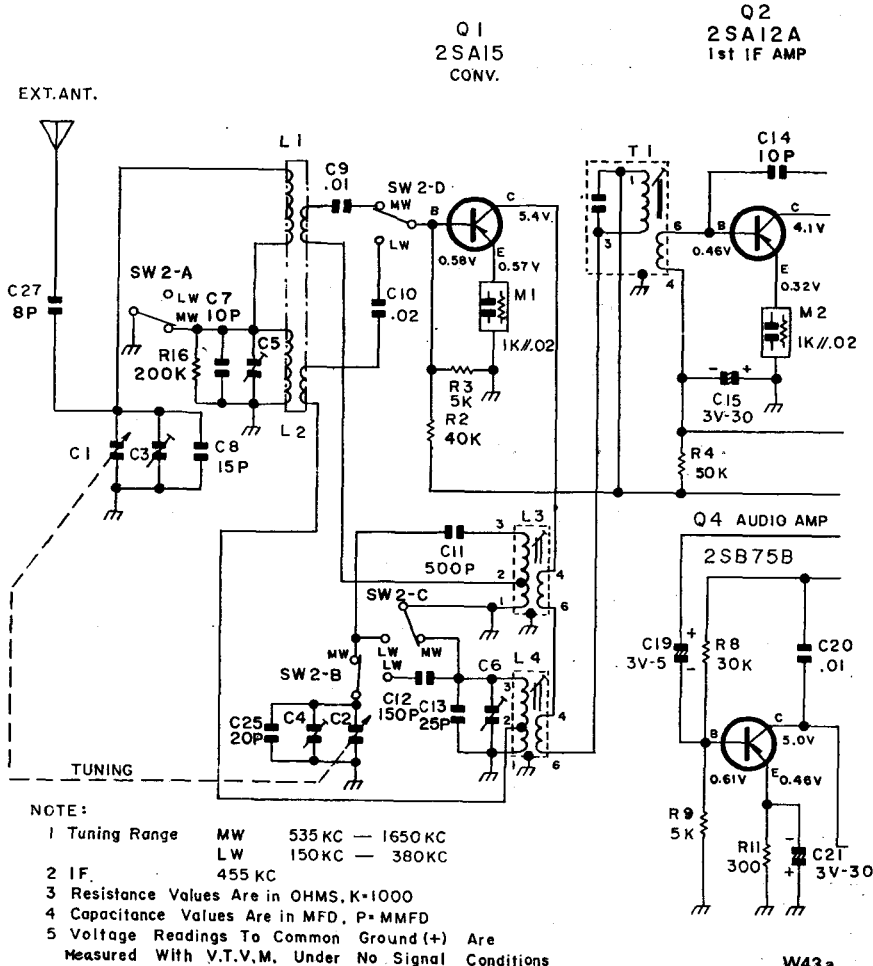
## Model BXH-16L

**General Description:** An eight-transistor portable radio for reception of L.W. and M.W. An external aerial is used for L.W.

**Batteries:** 6 volts ( $4 \times 1\frac{1}{2}$ -volt cells). Quiescent current 13 mA.

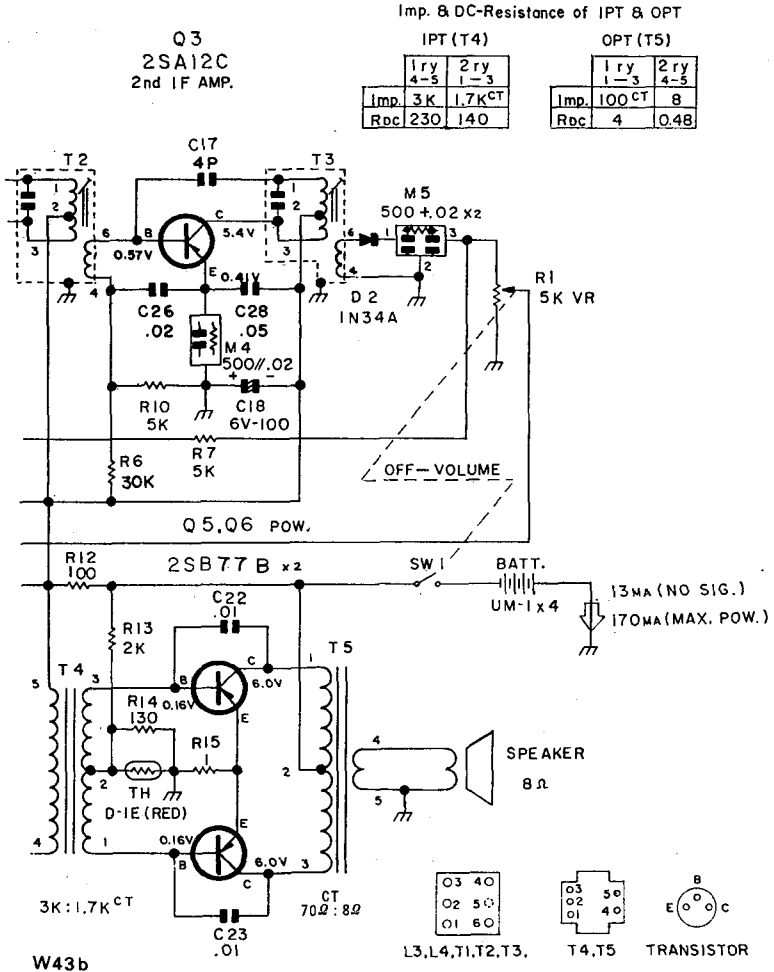
**Dismantling:** Remove back and batteries. Remove three screws located on the printed circuit board.

**Alignment:** I.F. 455 kc/s. (I.F.T. 3, 2, 1); M.W. 520 kc/s. (L<sub>3</sub>), 1680 kc/s. (C<sub>4</sub>), 600 kc/s. (L<sub>1</sub>), 1400 kc/s. (C<sub>3</sub>); L.W. 145 kc/s. (L<sub>4</sub>), 385 kc/s. (C<sub>6</sub>), 180 kc/s. (L<sub>2</sub>), 350 kc/s. (C<sub>5</sub>).



(W43a) CIRCUIT DIAGRAM—MODEL BXH-16L (PART)

# RADIO SERVICING



(W43b) CIRCUIT DIAGRAM—MODEL BXH-16L (CONTINUED)

## SOBELL

## Model S327

**General Description:** This receiver is similar to the model D527 described on page 188 in the 1966-67 volume.

## SOBELL

## Model S334

**General Description:** Ten-transistor A.M./F.M. Portable receiver covering L.W., M.W. and V.H.F. Bands and incorporating a separate switched car aerial input circuit for the A.M. Bands. Silicon Planar transistors are used in the permeability V.H.F. tuner, throughout the R.F./I.F. circuits and in the audio pre-amplifier, resulting in high uniform sensitivity and good signal-to-noise figures. A ferrite rod internal aerial is used for signal pickup on A.M. and a 30-in. multi-position telescopic aerial is provided for F.M. reception.

Detected signals are fed into a four-stage audio amplifier which includes a temperature stabilised complementary push-pull output circuit and negative feed-back over three stages.

**Waveband Coverage:** Long Wave: 145–255 kc/s. (1180–2060 m.). Medium Wave: 540–1600 kc/s. (188–560 m.). V.H.F./F.M.: 87–108.5 Mc/s.

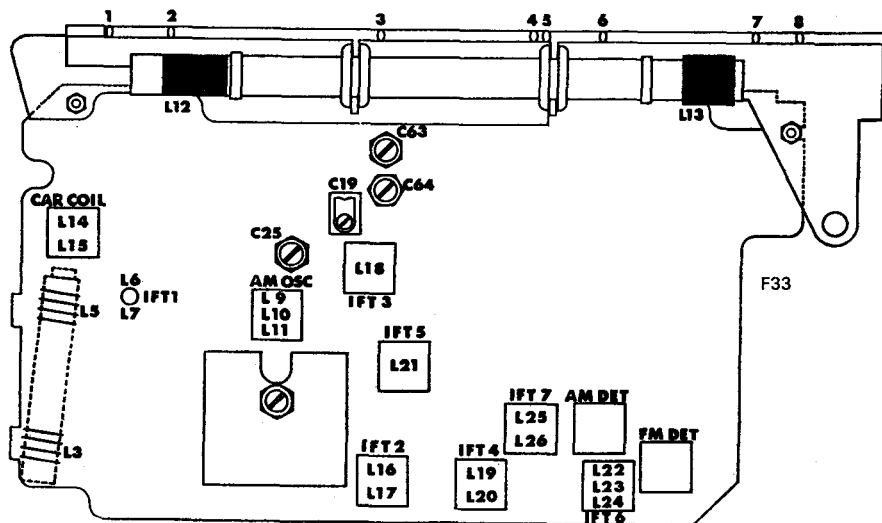
**Aerials:** Internal ferrite rod covering L.W., M.W. (An aerial socket provides for the connection of a car aerial.) Telescopic aerial for V.H.F./F.M. reception.

**Tape Output Socket:** A socket provides a signal source of 30 k $\Omega$  impedance for making tape recordings, which is unaffected by the setting of the volume control.

**Loudspeaker:** 4-in. round, 10-ohm impedance.

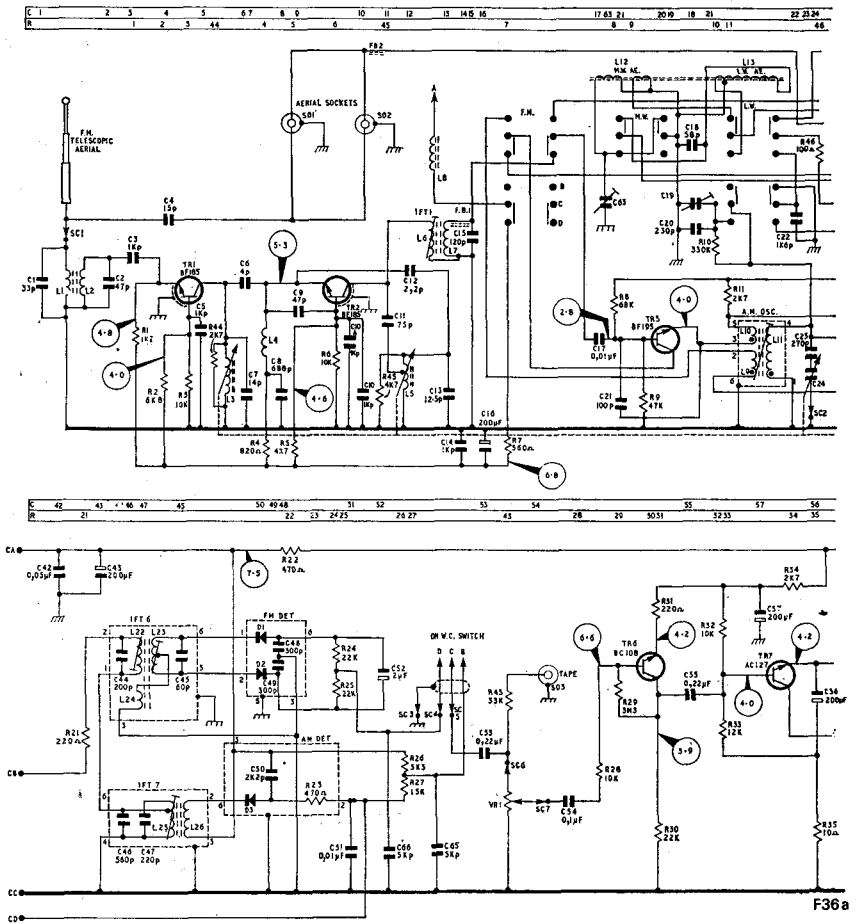
**Intermediate Frequencies:** 470 kc/s. and 10.7 Mc/s.

**Power Output:** 600 mW. undistorted.



(F33) ALIGNMENT COMPONENTS

# RADIO SERVICING



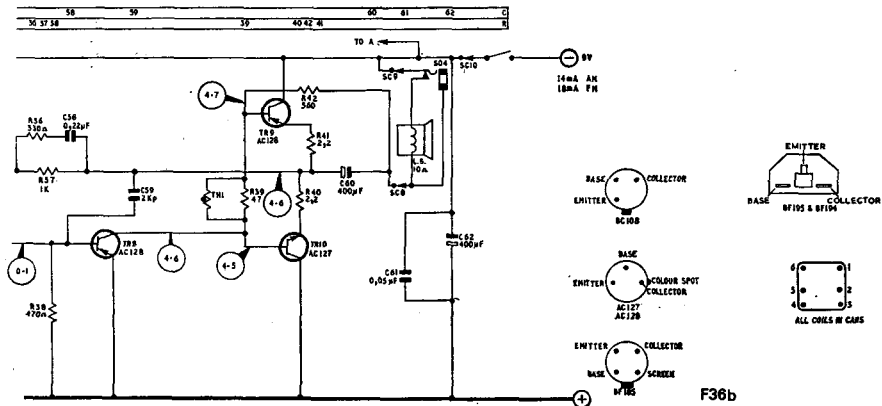
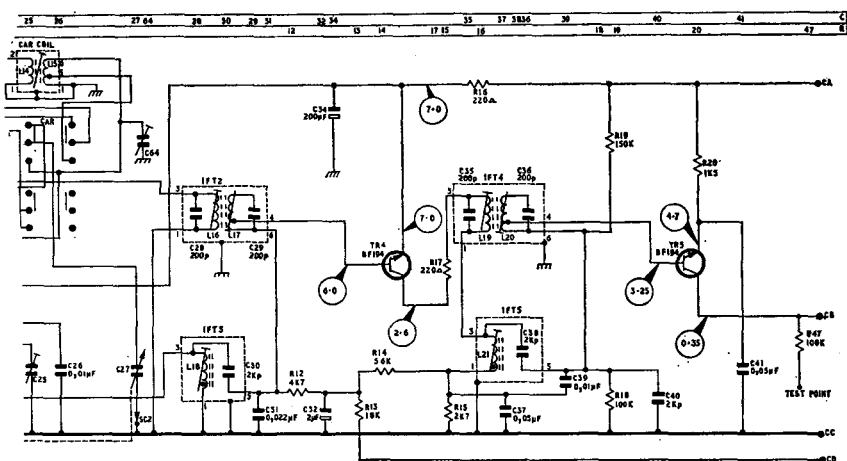
(F36a) CIRCUIT DIAGRAM—MODEL S334 (PART)

**Battery Supply:** 9 volts. PP7 or equivalent.

**Battery Consumption:** 14 mA. quiescent (A.M.); 18 mA. quiescent (F.M.).

**Semiconductors:** BF185 R.F. amplifier (F.M.). BF185 Osc./mixer (F.M.). BF195, Osc./mixer (A.M.) and 1st I.F. amplifier (F.M.). BF194, 1st I.F. amplifier (A.M.) and 2nd I.F. amplifier (F.M.). BF194, 2nd I.F. amplifier (A.M.) and 3rd I.F. amplifier (F.M.). BC108 Audio pre-amplifier.

**SOBELL**



(F36b) CIRCUIT DIAGRAM—MODEL S334 (CONTINUED)

Wavechange switching shown in the F.M. position. All voltages were measured with respect to positive ground with a 20,000  $\Omega/V$ . testmeter on the 10-volt range. Starts of coils are indicated with a dot.

AC127 Audio amplifier. AC128 Audio driver. AC128 and AC127 Complementary push-pull output. AA119 Ratio detector (F.M. only). OAg0 A.M. detector. VA1040 Temperature stabilising.

**Dismantling:** Slide off battery cover to obtain access to battery. In replacing battery, ensure that correct polarity is observed.

To remove back of cabinet, undo the two 4BA Phillips-head screws at bottom edge, tilt open at approximately 15 deg., and slide downwards to

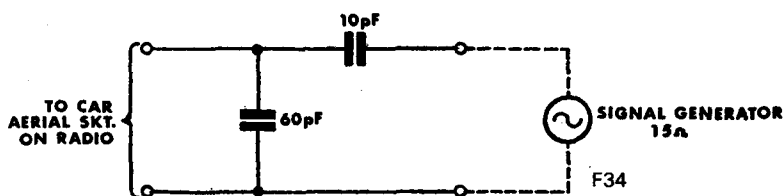
## RADIO SERVICING

release the telescopic aerial from aperture in scale. Slide out the tape output socket to fully open the back cover. This provides access to the component side of the printed-circuit board.

To dismantle the printed-circuit board from the cabinet, pull off control knobs, slide out ear-phone and tape recording sockets, remove the two 4BA screws securing the chassis, tilt out the bottom edge and remove in a downward direction.

### **Alignment Procedure: A.M. Alignment—Equipment Required:**

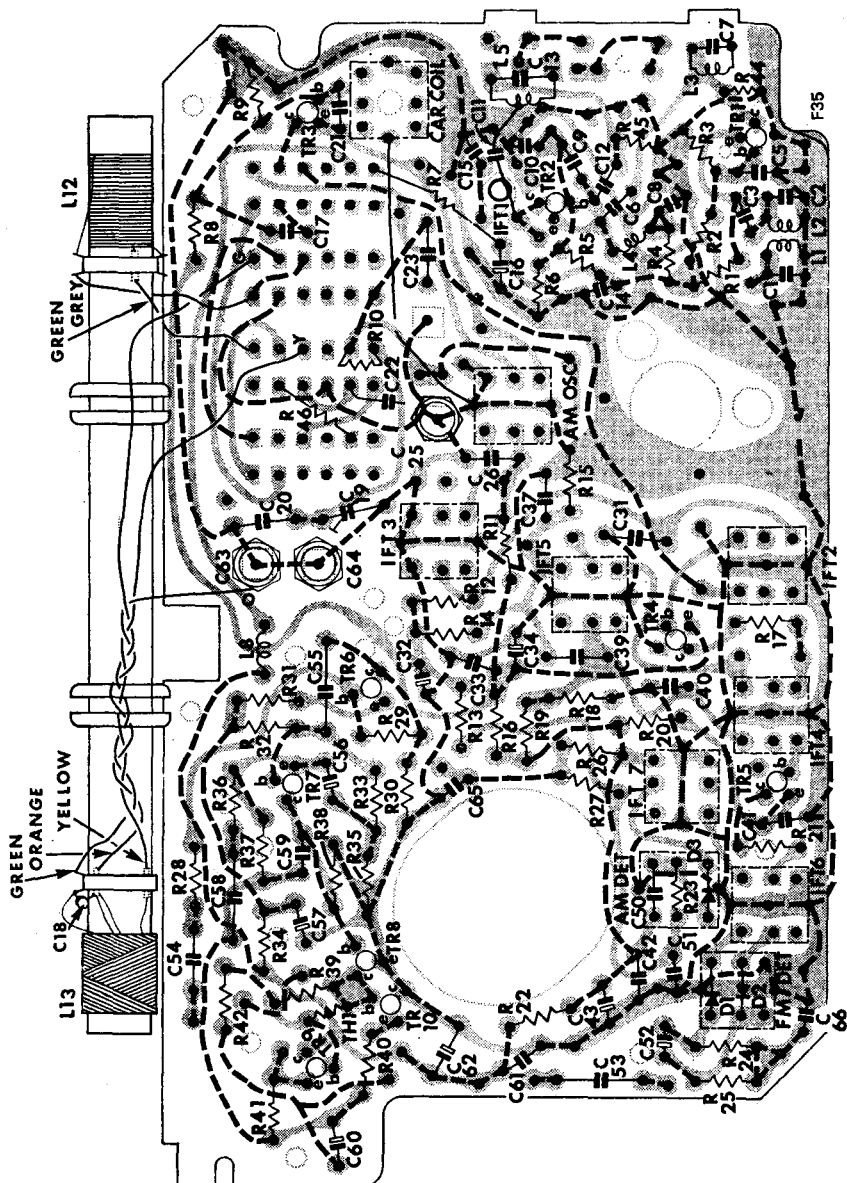
1. An output meter (10 ohms impedance, 0–100 mW.). The output during alignment should not exceed 50 mW.
2. A signal generator (Low impedance output), amplitude modulated to 30 per cent. covering long and medium wavebands.
3. Suitable non magnetic trimming tools.
4. Dummy aerial unit.



(F34) DUMMY CAR AERIAL

### **Notes:**

1. Before commencing alignment, check that the pointers line up with calibration marks 1 and 4 with the tuning gang fully closed (i.e. maximum capacitance).
2. For I.F. alignment (operations 1 and 2 in the alignment table) the signal generator is connected to the base of TR<sub>3</sub> by a 0.01  $\mu$ F. capacitor.
3. For R.F. alignment (operations 3 to 5 in the alignment table) the signal generator is connected via a dummy aerial to the car aerial socket, and the CAR switch depressed.
4. For R.F. alignment (operations 6 and 9 in the alignment table) the output from the signal generator should be fed into a transmitting coil placed 6 in. from the ferrite rod, and the car switch released. A suitable coil can be made with approximately 14 turns of 18 s.w.g. enamelled copper wire wound on a 1-in. former and spaced to a length of 1–1½ in.
5. The alignment points referred to in the alignment table are raised marks on the scale back moulding.
6. All cores should be tuned to the outer position.
7. Adjustment of L<sub>12</sub> and L<sub>13</sub> where mentioned in the alignment procedure, is achieved by sliding the appropriate coil along the ferrite rod.
8. After alignment, the aerial coils should be resealed.



(F35) THE CIRCUIT BOARD AND WIRING TAKEN FROM IT TO THE AERIAL COILS

The board is viewed from the tin dip side with components as seen through the board. Wiring in broken line represents printed connections on the component side of the board.



# RADIO SERVICING

## Alignment Table:

Operation	Set pointer to alignment mark	Waveband	Signal gen. frequency	Adjust for max. output
Car switch depressed				
1	Gang closed	M.W.	470 kc/s.	L18, L21, L25/26
2		Repeat Operation 1.		
3	2	M.W.	600 kc/s.	L9/10/11 (Oscillator coil) L14/15 (Car aerial coil)
4	3	M.W.	1439 kc/s.	C25 (Oscillator trimmer) C46 (Car aerial trimmer)
5		Repeat Operations 3 and 4.		
Car switch released				
6	2 Approx.*	M.W.	600 kc/s.	L12 (Rod aerial coil)
7	3 Approx.*	M.W.	1439 kc/s.	C63 (Rod aerial trimmer)
8		Repeat Operations 6 and 7.		
9	7	L.W.	220 kc/s.	C19 (Oscillator trimmer) L13 (Rod aerial coil)

\* Tune to signal.

**F.M. Alignment—I.F. Circuits:** It is strongly recommended that the F.M. I.F. tuned circuits are aligned using a wobblulator set to a deviation of  $\pm 300$  kc/s. about a carrier frequency of  $10\cdot7$  Mc/s., displaying the I.F. curve and ratio detector curve on an oscilloscope.

Inject the signal from the wobblulator to the base of TR<sub>3</sub> via a  $0\cdot01$   $\mu$ F. capacitor. Detune the secondary, L<sub>23</sub>, of the ratio detector transformer by unscrewing the dust core so that it protrudes approximately  $\frac{1}{16}$  in. from the top of the coil former. Connect the oscilloscope "diode input" to the free end of R<sub>47</sub>, a 100 k $\Omega$  resistor. Adjust I.F.T.'s L<sub>22</sub>, L<sub>19</sub>, L<sub>20</sub>, and L<sub>16</sub>, L<sub>17</sub>, in that order, for maximum amplitude and symmetry about  $10\cdot7$  Mc/s.

Transfer the signal input across L<sub>3</sub>. Adjust L<sub>6</sub> and L<sub>7</sub> for maximum amplitude and symmetry about  $10\cdot7$  Mc/s. Connect oscilloscope "direct input" to the junction of R<sub>24</sub> and R<sub>25</sub>. Screw in the core of L<sub>23</sub> and adjust for "S" curve with linear portion symmetrical about  $10\cdot7$  Mc/s.

## R.F. Circuits:

Connect F.M. signal generator to F.M. aerial input (SC<sub>1</sub>) and tuner cover. Set pointer to Mark 5 (88 Mc/s.) mark. Adjust oscillator coil L<sub>5</sub> and R.F. coil L<sub>3</sub> with 88 Mc/s. signal input. Further calibration marks are provided at 6 (93 Mc/s.) and 8 (108 Mc/s.). These are for checking purpose only.

**N.B.:** A trimming tool made of non-magnetic material must be used for these adjustments. **Final adjustment of ratio detector transformer:** Feed in signal of 93 Mc/s. at  $2\cdot5$   $\mu$ V. level. Tune receiver for maximum output. Switch signal generator to A.M. and readjust L<sub>23</sub> for minimum output (not more than  $\frac{1}{4}$  turn of core).

**SONY****Model 4F-53L**

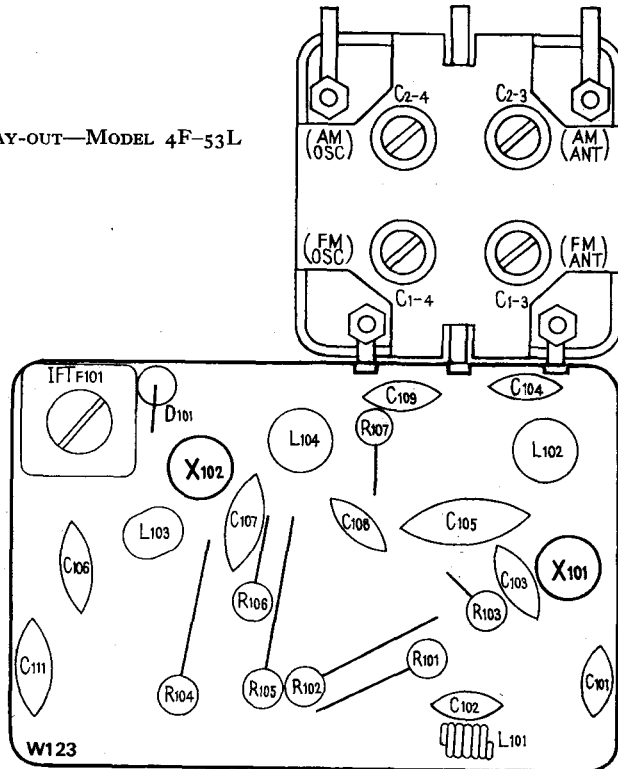
**General Description:** An eight-transistor A.M./F.M. portable radio, with telescopic aerial for F.M. reception and jack sockets for the connection of a multiplex stereo adaptor, tape recorder and earphone. Batteries: 9 volts ( $6 \times 1\frac{1}{2}$  volts). Quiescent current, 10 mA. approx.

**R.F. Alignment Details:** See page 375 for table, under the second section of the circuit diagram.

**Transistors:**

X101.	.	.	2SA455	X203.	.	.	2SC403
X102.	.	.	2SA455	X204.	.	.	2SC401
X201.	.	.	2SC403	X205.	.	.	2SB136
X202.	.	.	2SC403	X206.	.	.	2SB136

(W123) F.M. TUNER LAY-OUT—MODEL 4F-53L



# RADIO SERVICING

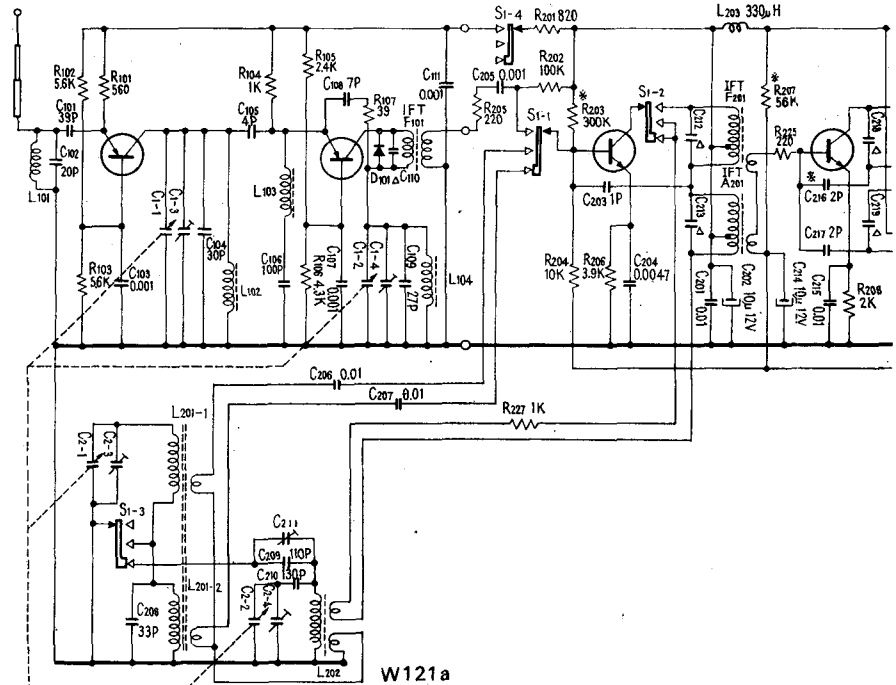
X101 2SA455

X102 2SA455  
D101 1T262

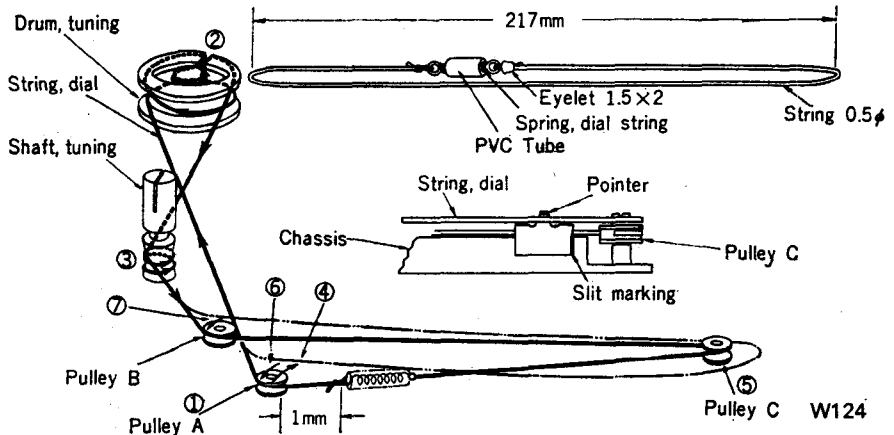
X201 2SC403

X202 2SC403

Tel. ANT



(W121a) CIRCUIT DIAGRAM—MODEL 4F-53L (PART)



(W124) DRIVE CORD—MODEL 4F-53L

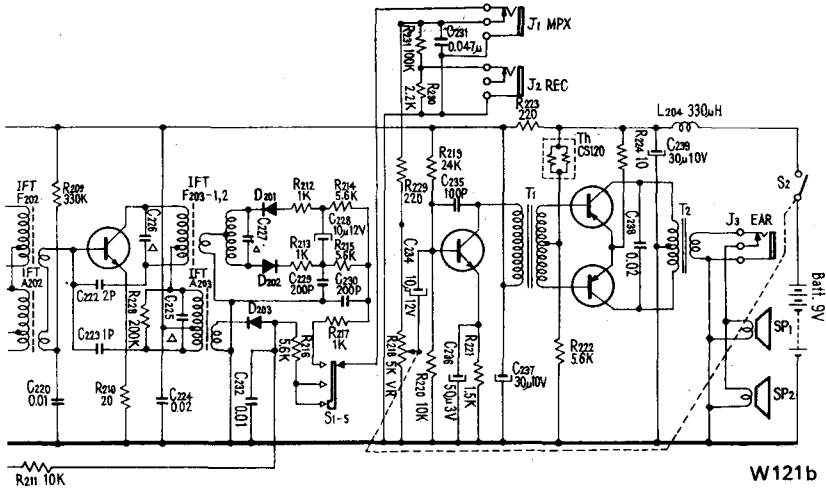
# SONY

X203 2SC403

D201, 202 1T262×2  
D203 1T23

X204 2SC401

X205, 206 2SB136×2



(W121b) CIRCUIT DIAGRAM—MODEL 4F-53L (CONTINUED)

## R.F. Alignment:

Adj. item	SSG freq.	Receiver dial setting	Adjust
F.M. Frequency coverage	86 Mc.* 105.5 Mc.*	Fully left Fully left Fully right	F.M. osc. Coil (L104) F.M. osc. Trimmer (C1-4)
F.M. Tracking	86 Mc.* 105.5 Mc.*	Tune to 86 Mc. signal Tune to 105.5 Mc. signal Fully left	F.M. R.F. Coil (L102) F.M. R.F. Trimmer (C1-3)
M.W. Frequency coverage	520 kc.† 1680 kc.†	Fully left Fully right	M.W. osc. Coil (L202) M.W. osc. Trimmer (C2-4)
M.W. Tracking	620 kc.† 1400 kc.†	Tune to 620 kc. signal Tune to 1400 kc. signal Fully right	M.W. ant. Coil (L201-1) M.W. ant. Trimmer (C2-3)
L.W. Frequency coverage	260 kc.† 200 kc.†	Fully right Tune to 200 kc. signal	L.W. osc. Trimmer (C211) L.W. ant. Coil (L201-2)

\* 400 c/s. ± 22.5 kc. F.M.

† 1000 c/s. 30 per cent. A.M.

W122

## Chassis GC10 and GC11

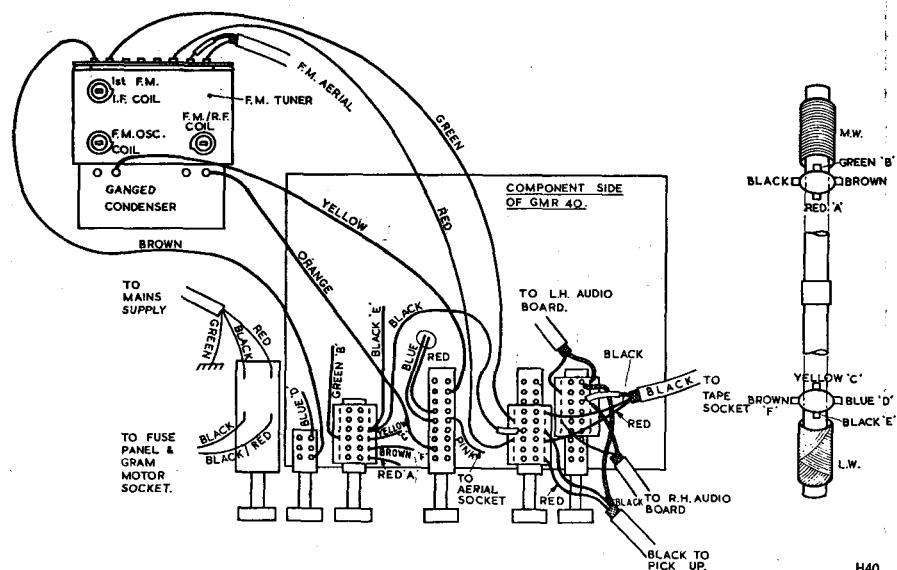
**General Description:** These chassis differ only in their power output. The GC10 gives 3 watts per channel and the GC11 gives 7 watts per channel. Radiograms fitted with these chassis are suitable for the reproduction of stereophonic records, and the reception of L.W., M.W., S.W. and V.H.F./F.M. signals. A stereo decoder plug-in unit type GDK1 is available as an optional extra for the reception of stereo radio transmissions.

**Wavebands:** L.W. 150-263 KHz. M.W. 540-1610 KHz. S.W. 5.8-16 MHz. V.H.F. 86-101 MHz.

**Circuit Description (A.M.):** The long-wave and medium-wave aerial coils are wound on the ferrite rod, the short-wave aerial being wound on a dust cored former and connected to the internal antennae on switching. The medium wave coil is tuned by Cr<sub>3</sub> and Cr<sub>4</sub>. On long wave the medium wave primary is shorted out and the long-wave aerial coil tuned by Cr<sub>3</sub>, Cr<sub>4</sub> and Cr<sub>5</sub>. On short wave the aerial coil L<sub>11</sub> is series fed via Cr<sub>1</sub> and tuned by Cr<sub>2</sub> and Cr<sub>3</sub>. On medium and long wave the aerial is bottom capacity coupled via Cr<sub>6</sub>.

The tuned signal selected is fed via Cr7 to the base of TXr1 which is operated as a mixer. The heterodyne voltage is derived from TXr2.

The short-wave oscillator coils  $L_{R12}$  and  $L_{R14}$  are tuned by  $Cr_{24}$  and  $Cr_{27}$ . On medium wave the oscillator coils  $L_{R11}$  and  $L_{R13}$  are tuned by  $Cr_{25}$ ,  $Cr_{26}$  and  $Cr_{27}$ , while the long wave is tuned by adding  $Cr_{49}$  and  $Cr_{21}$  in shunt.



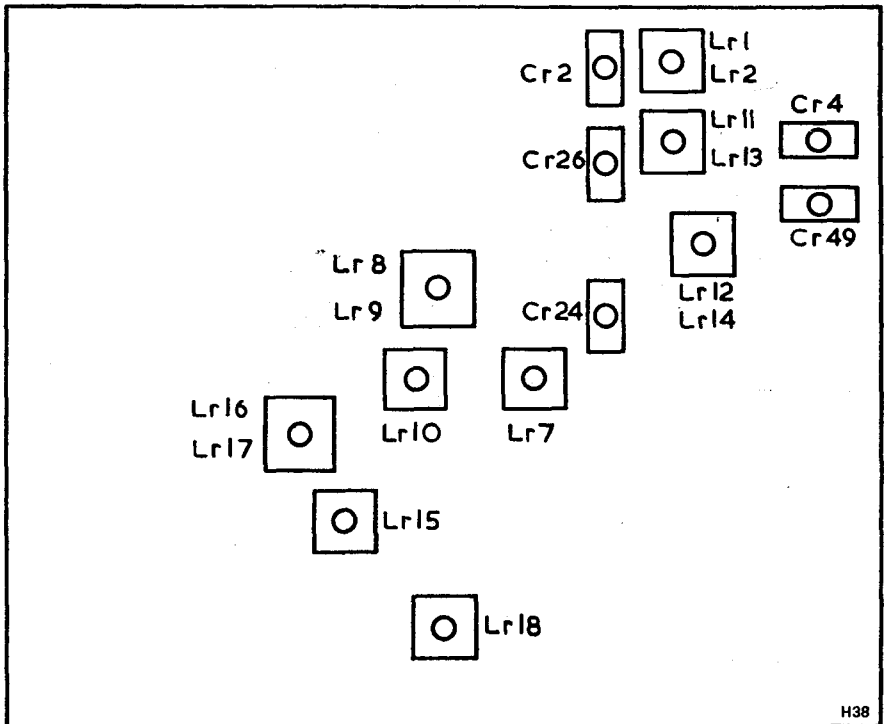
(H40) WIRING DIAGRAM OF GC10 AND GC11

## RADIO SERVICING

The I.F. signal is selected by Lr7, and Lr10 and further amplification occurs at TXr3 which has the 2nd A.M. I.F. transformer in its collector circuit comprised of Lr15 and Lr18. Lr18 feeds the A.M. detector TXr4 which is connected via the filter Cr44, Rr28 and Cr47, and switching circuitry to the audio amplifiers.

**Circuit Description (F.M.):** TXt1 and TXt2 comprise a transistor tuner operating over the frequency range 86–101 MHz.

Signals are coupled to the emitter of TXt1 by the aerial input transformer Lt1 and Lt2. The tuned circuit, Lt3, Ct6, Ct8 and the ganged capacitor Ct9, selects the required frequency, and the signal is coupled via Ct7 to the emitter of the F.M. mixer TXt2. The oscillator tuning inductance is Lt5. Lt6 and Lt7 form the first F.M./I.F. transformer and are tuned to 10.7 MHz. The output coil Lt7 is coupled to the input of TXr1, via the capacity tap Ct19 and Ct20. Signals at 10.7 MHz are selected by Lr8 and Lr9 (2nd F.M./I.F. transformer) before being passed to TXr3 and the ratio detector Lr16–Lr17. The balanced detector (two 1N 542's) feeds the signal to the audio amplifiers.



(H38) ALIGNMENT LAY-OUT—GC10 AND GC11

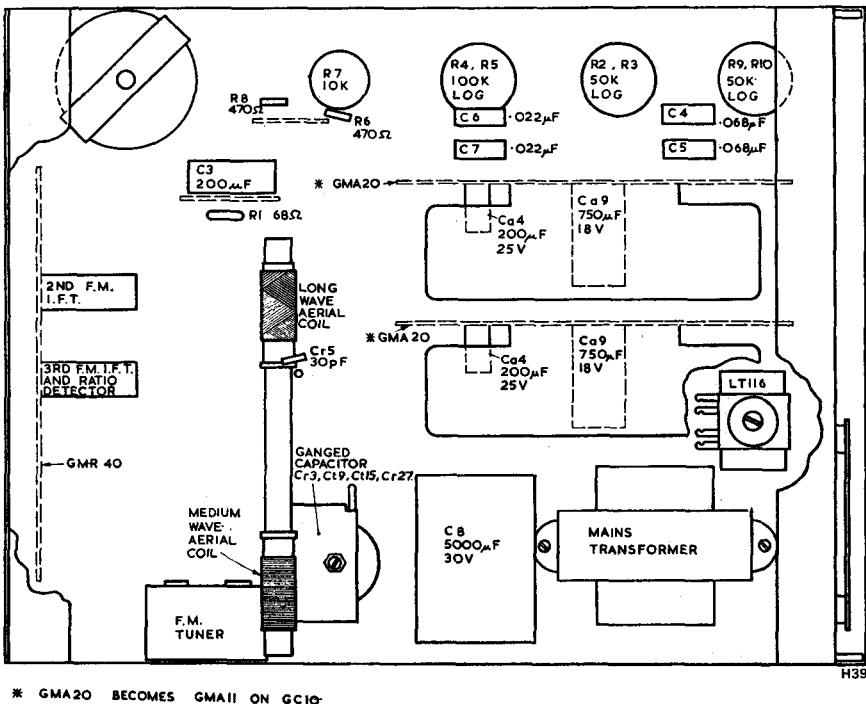
**Circuit Description (Gram.):** In the Gram position the outputs from the cartridge are directly coupled to the base of TXa1 on each channel which has a stage gain of less than unity, due to the capacitive feedback provided by Ra2 and Ca1, which capacitively loads the cartridge. This allows the high cartridge impedance to be matched to the input impedance of the transistor.

The output from TXa1 is fed via the volume control and tone control network to the pre-driver TXa2, and after amplification is fed to TXa3 which is used to drive the output stage.

The output stage comprises two transistors TXa4 and TXa5 operating in complementary symmetry, the output voltage being developed at the junction of Ra17 and Ra18, and applied to the loudspeaker via Ca9. Ra15 forms a feedback loop to the base of TXa3 providing adjustable biasing of the output and driver stages by means of Ra14. On the GC11, Ra13 provides an adjustment of the output stage quiescent current.

**Alignment (Equipment):** Realignment should not be necessary unless a coil or the tuner is replaced. It should not be attempted without all the necessary equipment. The following equipment will be required:

1. Output power meter covering the range 50 mW.-10 watts at impedances of 6 and 15 ohms or an A.C. valve volt-meter to read 1 mV. and 50 mV.



(H39) CHASSIS VIEW OF GC11



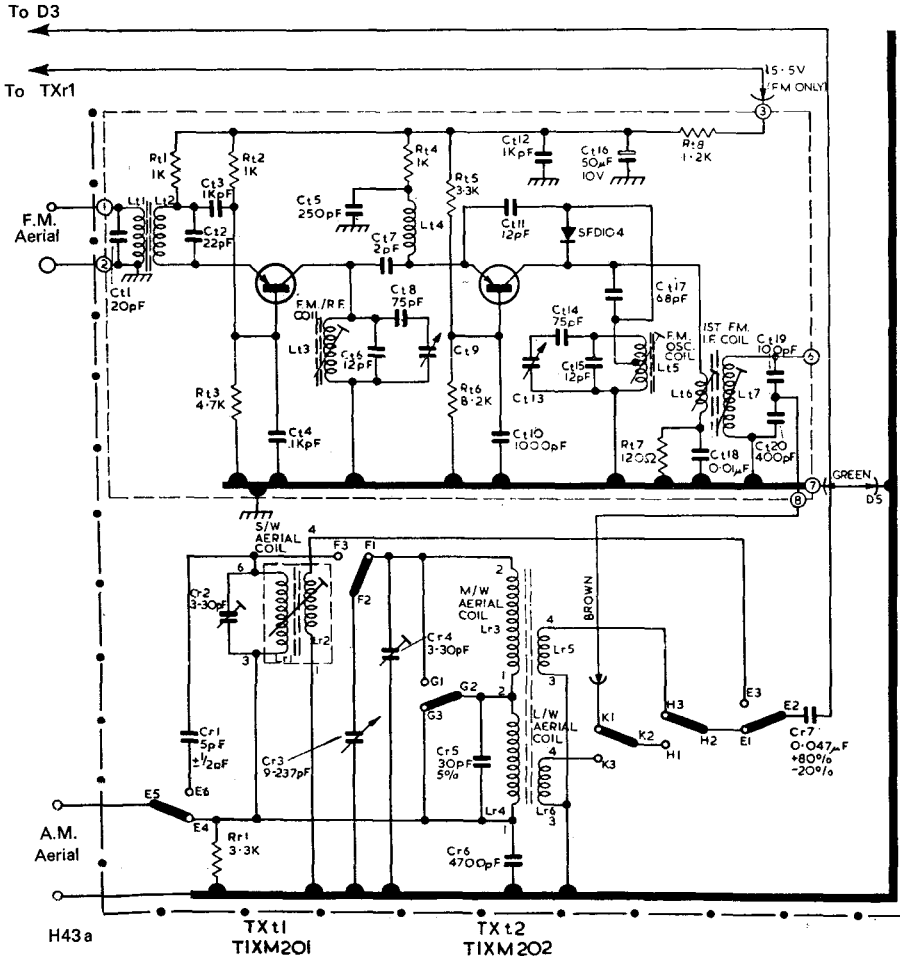
## RADIO SERVICING

2. A.M. signal generator covering the frequency range 175 KHz to 15 MHz, modulated to a depth of 30 per cent. at 400 Hz.
3. F.M. signal generator covering the frequency range 10 MHz–100 MHz, with variable deviation and A.M. facility, modulation frequency 1 KHz.
4. Sweep generator 10·7 MHz and 94 MHz.
5. Oscilloscope.

### Alignment (A.M.):

1. Set tuning pointer to datum (gang closed).
  2. Rotate tone controls fully clockwise and balance control to its central position.
  3. Adjust the volume control to position 5 if an output power meter is to be used to measure the output signal, or to position 0, if a valve volt-meter is to be used.
  4. Connect the output power meter in place of the L.H. loudspeaker and disconnect the R.H. loudspeaker.
  5. Do not apply a dummy load to the R.H. channel output. **Do not short-circuit either output under any circumstances.**
  6. If a valve volt-meter is employed, connect its input to the junction of Rr28 (10 k $\Omega$ ) and Cr48 (3900 pF.).
  7. During alignment adjust the input signal level to keep the output at approximately 50 mV. or 50 mW.
  8. Apply a 470 KHz signal (modulated to a depth of 30 per cent. at 400 Hz) to pin E2 on the band switch.
  9. Unscrew all A.M./I.F.T. cores.
  10. Align the A.M./I.F. transformers in the following order Lr18, Lr15, Lr10, Lr7.
  11. After alignment the  $-3$ dB bandwidth should be 7 KHz  $\pm 0\cdot5$  KHz and the response at  $\pm 9$  KHz off tune should be  $-20$  dB  $\pm 3$  dB.
- Apply a signal to aerial input socket via a standard dummy aerial.

Operation	Input frequency	Waveband	Gang or pointer position	Adjustments
1	600 KHz	M.W.	1 $\frac{1}{8}$ in. from datum	M.W. Osc. coil Lr13 M.W. Aerial coil Lr3
2	1500 KHz	M.W.	8 $\frac{1}{2}$ in. from datum	M.W. Osc. trimmer Cr26
3	1500 KHz	M.W.	8 $\frac{1}{2}$ in. from datum	M.W. Aerial trimmer Cr4
4		Repeat operations 1, 2, 3, as necessary.		
5	175 KHz	L.W.	3 $\frac{1}{2}$ in. from datum	L.W. Osc. trimmer Cr49
6	175 KHz	L.W.	3 $\frac{1}{2}$ in. from datum	L.W. aerial coil Lr4
7		Repeat operations 5, 6, as necessary.		
8	6 MHz	S.W.	$\frac{1}{2}$ in. from datum	S.W. Osc. coil Lr14 S.W. Aerial coil Lr1
9	15 HMz	S.W.	8 $\frac{3}{8}$ in. from datum	S.W. Osc. trimmer Cr24 S.W. Aerial trimmer Cr2
10		Repeat operations 8, 9, as necessary.		

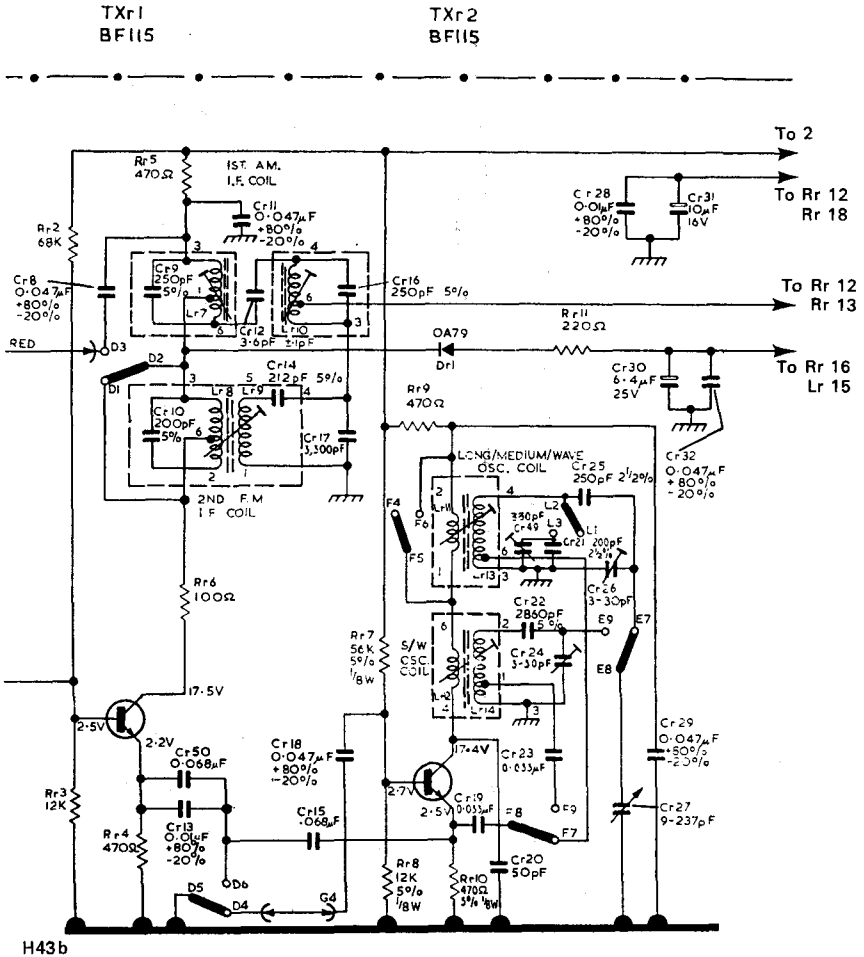


(H43a) CIRCUIT DIAGRAM GC10 (PART)

**Alignment (F.M./I.F.):**

1. Press F.M. button and tune to 94 MHz unless interference is present on this frequency, in which case employ 92.5 MHz wherever 94 MHz is mentioned below. If a valve volt-meter is used, transfer its input to pin D8 of bandswitch.
2. During alignment adjust the input signal to keep the output at approximately 50 mW. or 20 mV.
3. Apply input signal at 10.7 MHz deviated 22.5 kHz to pin E2 on the bandswitch.
4. Partially unscrew all F.M./I.F. cores.

# RADIO SERVICING



(H43b) CIRCUIT DIAGRAM GC10 (PART)

5. Align the F.M./I.F. transformers in the following order: Lr16, Lr17, Lr9, Lr8, when aligning Lr17, choose the tuning point giving greater inductance (core further in).

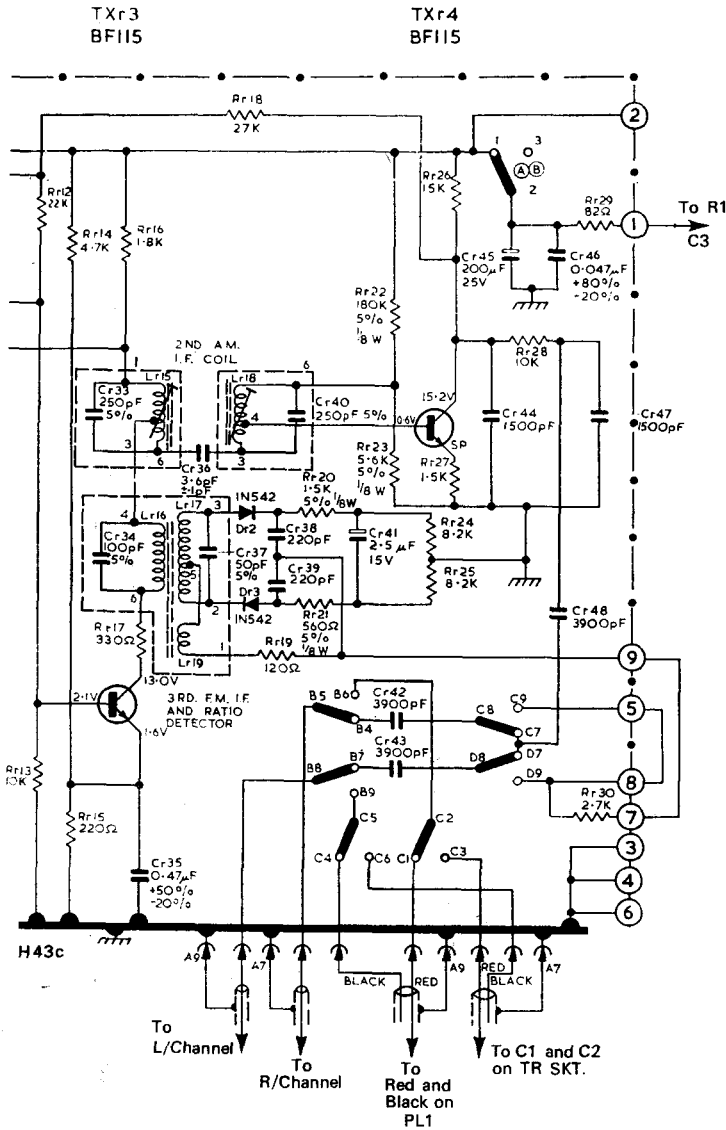
6. Repeat alignment in the following (*different*) order Lr17, Lr16, Lr9, Lr8.

7. Using the sweep generator, display the S-curve and check for linearity and symmetry.

## Alignment (A.M. Rejection):

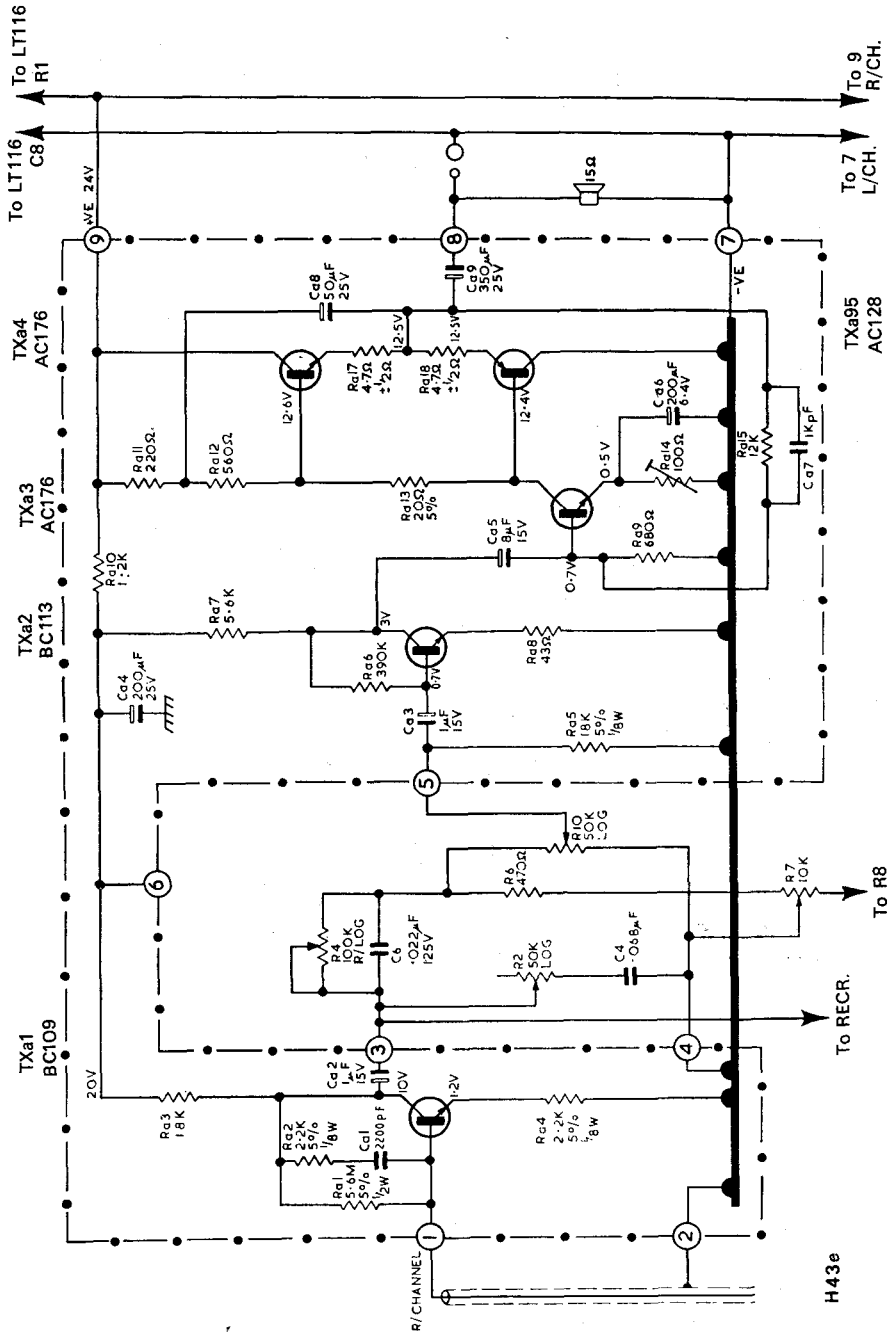
1. Return to the signal-generator input signal set to give 50 mW. (or 20 mV.) output and change modulation to 30 per cent. A.M.

# S.T.C.

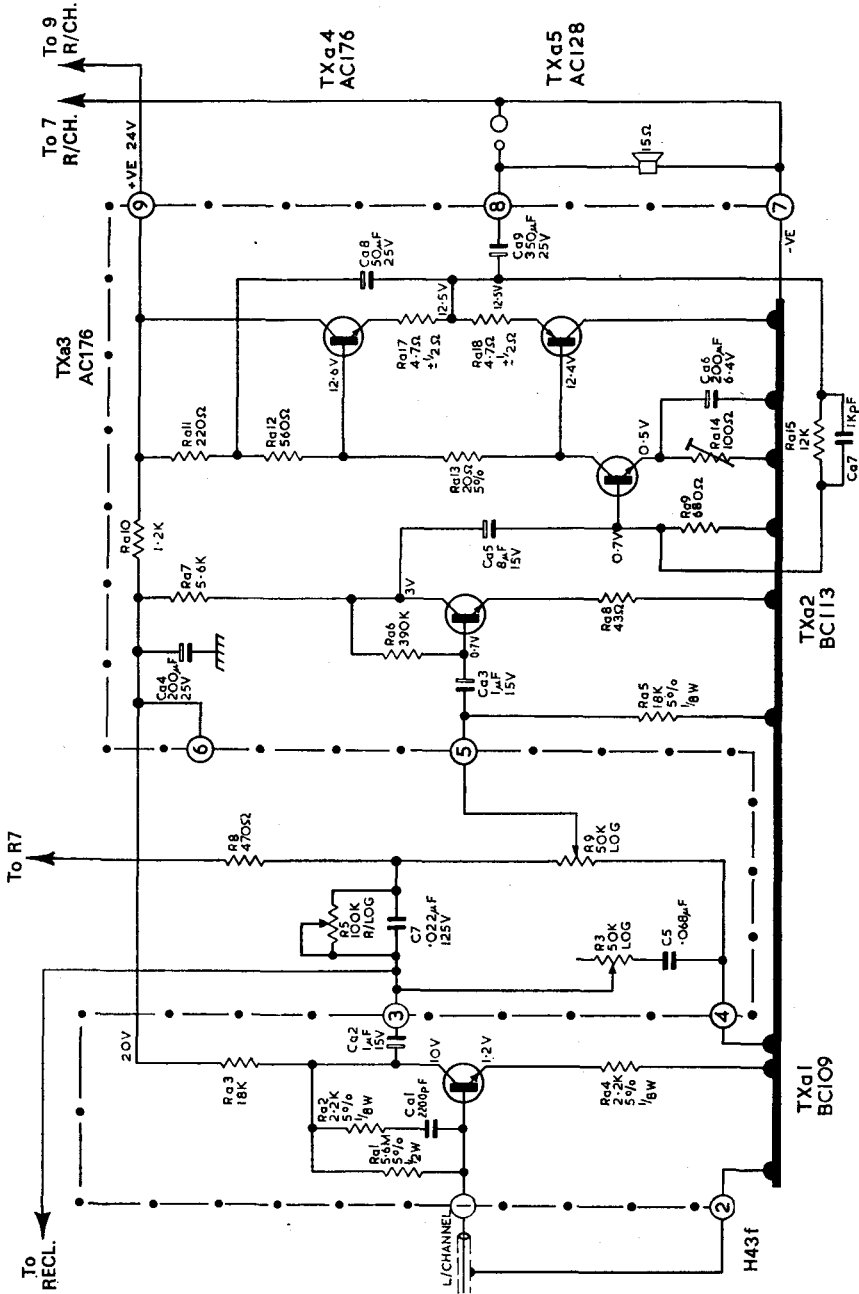


(H43c) CIRCUIT DIAGRAM GC10 (PART)

2. Retune generator slightly for minimum response (the adjustment required should not exceed 20 KHz).
3. The output should fall by more than 30 dB.

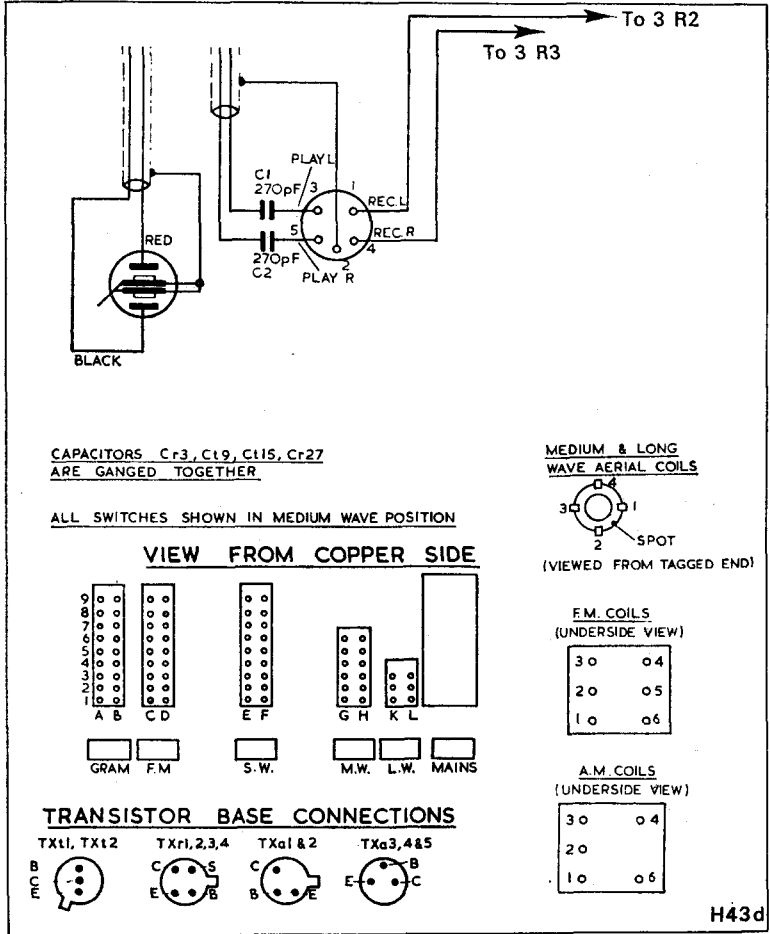


(H43e) CIRCUIT DIAGRAM GC10 (PART) R/CHANNEL

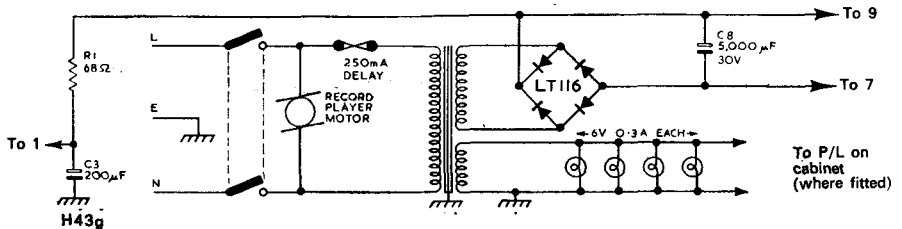


(H43f) CIRCUIT DIAGRAM GC10 (PART) L/CHANNEL

# RADIO SERVICING



(H43d) CIRCUIT DIAGRAM GC10 (PART)



(H43g) CIRCUIT DIAGRAM GC10 (CONTINUED)



(H44a) GCII CIRCUIT DIAGRAM—SHOWING DIVERGENCIES FROM GC10. RIGHT-HAND CHANNEL

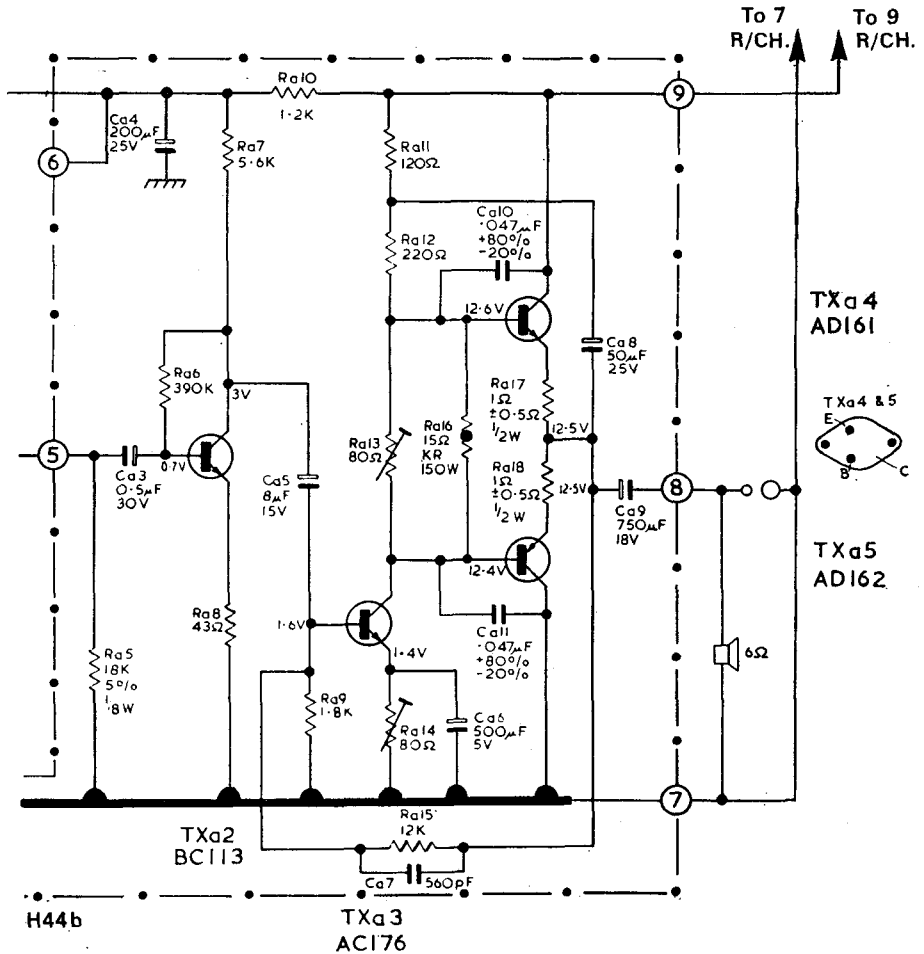
### Alignment (F.M. Tuner):

1. Apply 94 MHz signal at 22.5 KHz deviation to F.M. aerial terminals.
2. Align in the following order: Lt5, Lt7, Lt6, Lt3.
3. Do not repeat, if alignment is not satisfactory unscrew the cores of Lt7 and Lt6 and repeat alignment.

**Audio Adjustments:** Adjustment is provided for symmetry by Ra14. Quiescent current adjustment is provided by Ra13 on GC11 only. No



# RADIO SERVICING



(H44b) GC11 CIRCUIT DIAGRAM—SHOWING DIVERGENCIES FROM GC10. LEFT-HAND CHANNEL

1. Voltages with M.W. button pressed except where stated.
2. Unless otherwise stated all resistors 10 per cent.  $\frac{1}{4}$ W and all capacitors 10 per cent.

adjustment for Quiescent current is provided on GC10 chassis audio modules. An output power meter is essential, full scale readings of 5 watts at 15 ohms for GC10 chassis and 10 watts at 6 ohms for GC11 chassis.

Apply an input signal either to tape socket, or receiver circuit and connect the required power meter (5 watts f.s.d. or 10 watts f.s.d.) and an oscilloscope to the output of the module required.

Adjust the input to obtain: 2.6 watts for GMA20 (i.e. GC11 chassis);

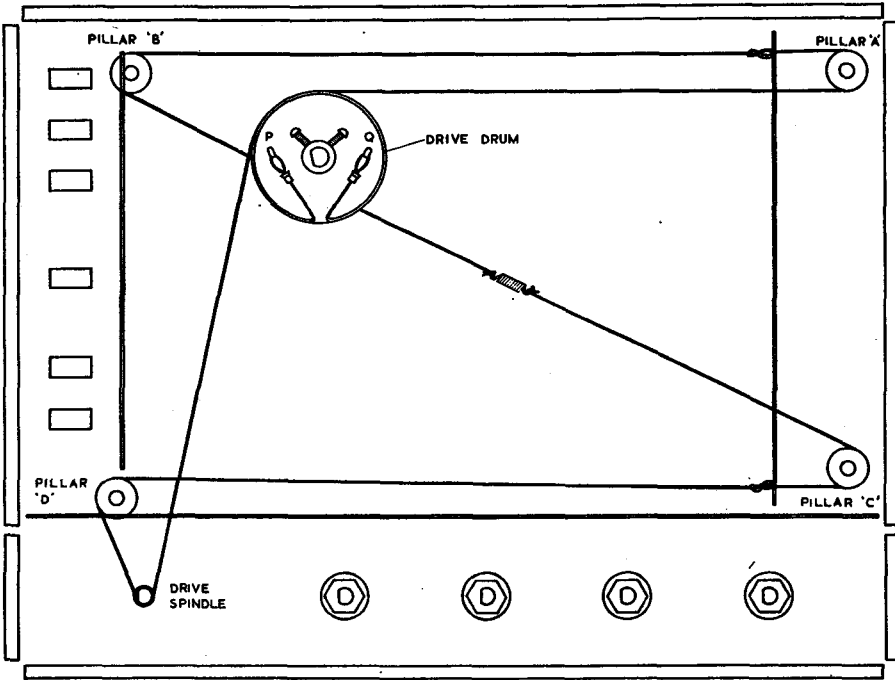
# S.T.C.

1.0 watts for GMA11 (GC10 chassis) and allow 10 min. to reach thermal equilibrium.

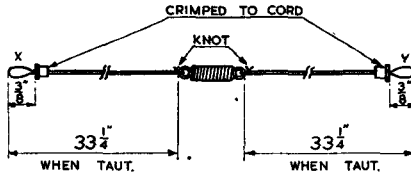
Increase input until output is just clipped and adjust RA14 (in both cases) for symmetrical clipping. Remove input signal and allow 10 min. for cooling. On GMA20 (GC11 chassis) remove link adjacent to contact 10 on this audio module and insert a millimeter. Adjust current to 10 mA. by means of RA13. Replace link and seal both RA13 and RA14.

When drive drum turned fully clockwise and in position shown proceed as follows:

1. Connect end "X" of cord to hook P and pass cord clockwise round drive drum.
2. Pass cord round pillars "A", "B", "C" and "D", put two turns anti-clockwise round drive spindle.



H37



(H37) DRIVE CORD

3. Put two turns clockwise on drive drum and connect end "Y" to hook Q.
4. Connect pointer as shown and line up with asterisk adjacent to F.M. on scale plate when gang is fully closed.

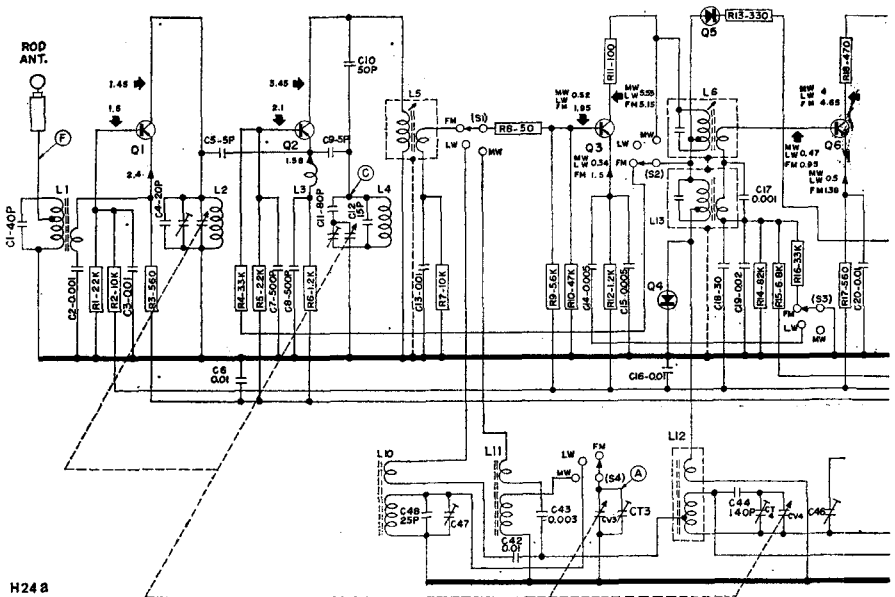
## STANDARD

## Model SR-Q771FL

**General Description:** A.M./F.M. radio receiver employing nine transistors, five diodes and one thermistor. Battery 6 volts. Speaker 8 ohms. Power output 250 mW. undistorted.

**Wavebands:** F.M. 88-108 Mc/s. M.W. 530-1600 kc/s. L.W. 150-255 kc/s.

**Alignment:** A.M. I.F., 455 kc/s. Inject signal at point A and adjust L13, L14 and L15 for max. M.W., inject signal via a loop. 515 kc/s. L12 for max. 1650 kc/s. CT4 for max. 600 kc/s. L11 for max. 1400 kc/s. CT3 for max. L.W., inject signal via a loop. 145 kc/s. C46 for max. 170 kc/s. L10 for max. 250 kc/s. C47 for max. F.M. I.F. 10-7 Mc/s. Inject signal at point C and adjust L5, L6, L7 and L8 for max. (Adjust L9 for crossover.) F.M. R.F., inject signal at point F. 87 Mc/s. L4 for max. 109 Mc/s. CT2 for max. 90 Mc/s. L2 for max. 105 Mc/s. CT1 for max. 98 Mc/s. L1 for max.



(H24a) CIRCUIT DIAGRAM—SR-Q771FL (PART)

# STANDARD

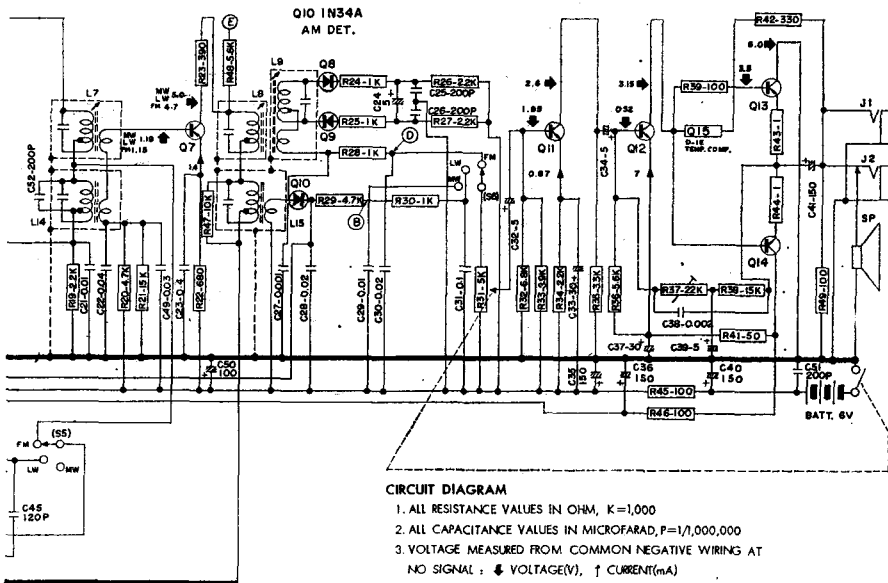
Transistor	Type	Function
Q1	2SA235	F.M. R.F. Amplifier
Q2	2SA235	F.M. Converter
Q3	2SA234	F.M. I.F. Amplifier
Q6	2SA234	A.M. Converter
Q7	2SA234	F.M. I.F. Amplifier
Q11	2SB75	A.M. I.F. Amplifier
Q12	2SB77	F.M. I.F. Amplifier
Q13	2SB77	A.M. I.F. Amplifier
Q14	2SD77	A.F. Amplifier
		A.F. Amplifier
		Power Amplifier
		Power Amplifier

Diode	Type	Function
Q4	IN34A	Osc. Compensator
Q5	IN34A	A.G.C. Compensator
Q8	IN34A	F.M. Detector
Q9	IN34A	F.M. Detector
Q10	IN34A	A.M. Detector

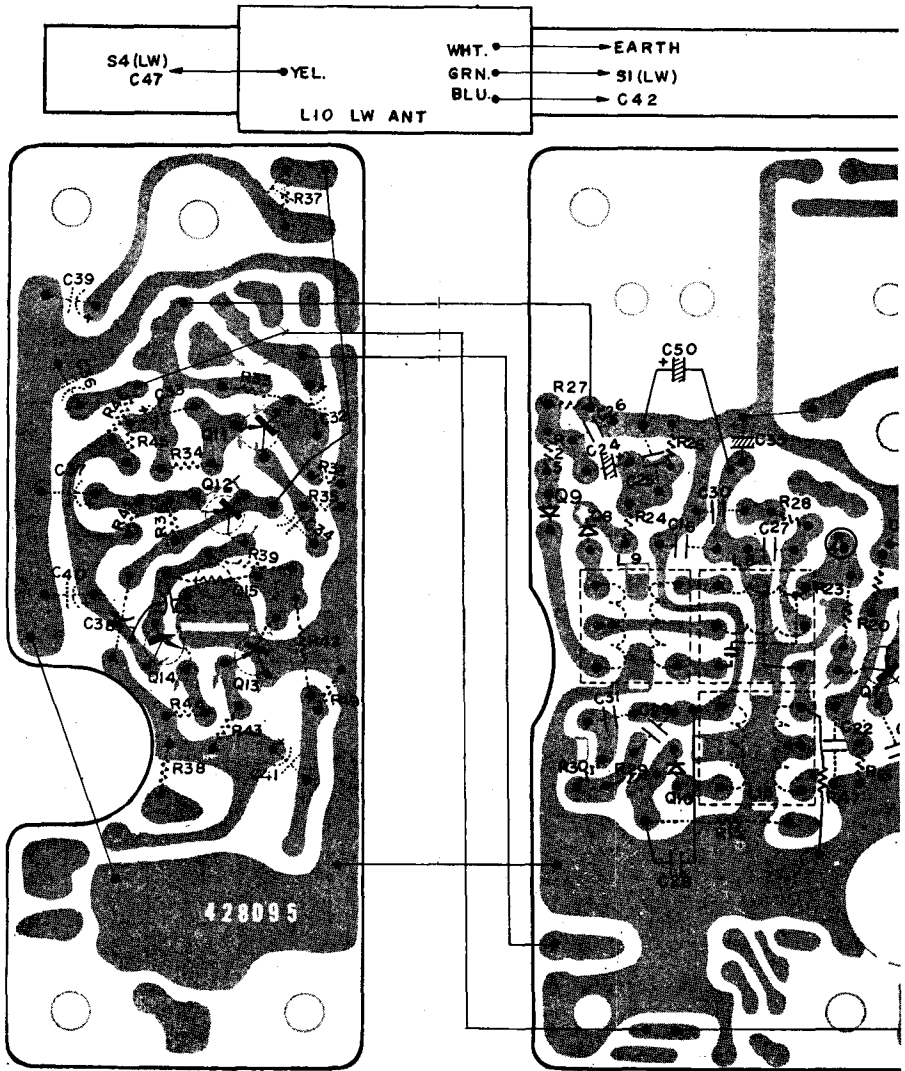
Thermistor	Type	Function
Q15	D-1E	Temp. Compensator



H24b

(H24b) CIRCUIT DIAGRAM—SR-Q771FL (CONTINUED)

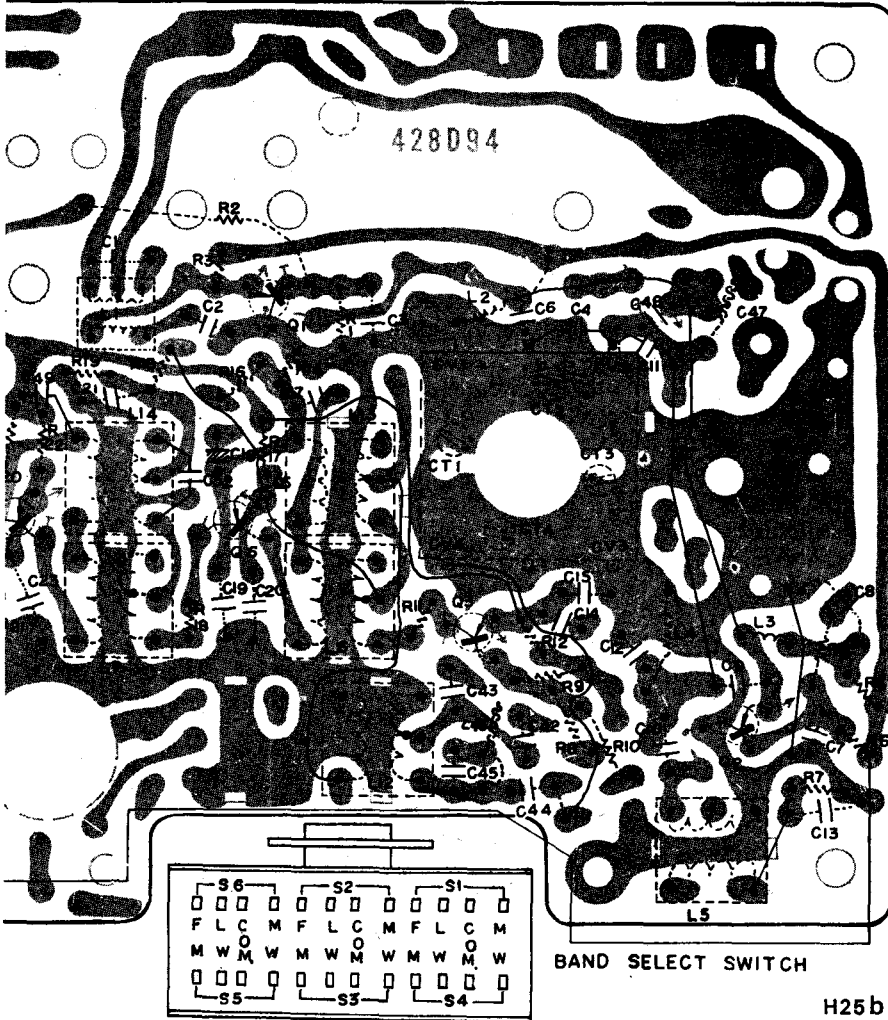
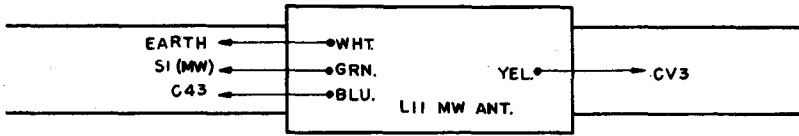
# RADIO SERVICING



H25a

(H25a) COMPONENT LOCATIONS—SR-Q771FL (PART)

# STANDARD



H25b

(H25b) COMPONENT LOCATIONS—SR-Q77iFL (CONTINUED)

**STELLA****Model ST335AT**

**General Description:** This radiogram is electrically similar to the Philips Model FG53AT "Studio Ten" information for which is given elsewhere in this volume.

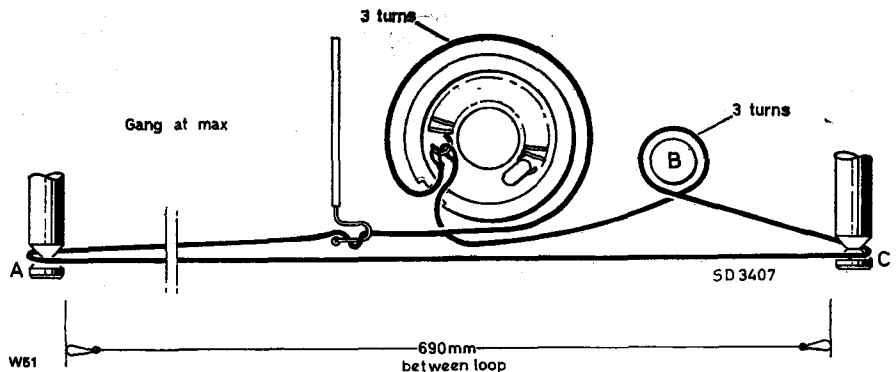
**STELLA****Model ST438T**

**General Description:** A seven-transistor portable receiver which incorporates a bandsread waveband in addition to Long and Medium Wavebands. Sockets are provided for a car aerial and earphone (8 ohms).

Batteries:  $4 \times 1\frac{1}{2}$  volts (U11 or equivalent). Consumption 11–15 mA.

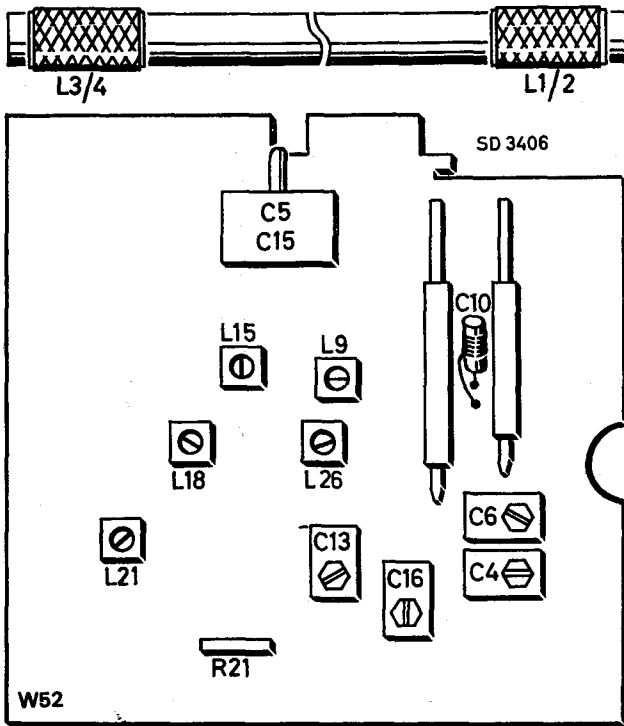
**Dismantling:** Remove the spring loaded battery compartment and lay the receiver, face downwards, on a soft protective surface. Release the two retaining screws and lift off the cabinet rear. Remove the screw situated in the volume control compartment and the screw adjacent to the wavechange switch assembly. The chassis can now be lifted from the cabinet front, captive only by the loudspeaker and earphone/aerial connecting leads which may now be unsoldered.

**Adjustment of R21:** This resistor controls the quiescent current drawn by T6/T7, and since the A.F. amplifier stages of the receiver are D.C. coupled it is advisable to check, and if necessary adjust, this current value after any servicing has been carried out on the A.F. amplifier stages. To measure the current, remove the link from T5 collector to T7 base, and insert a 0–10 mA. meter. Turn the volume control to minimum and adjust R21 for a meter reading of 3 mA. Disconnect the meter and replace the shorting link.



(W51) DRIVE CORD—MODEL ST438T

# STELLA



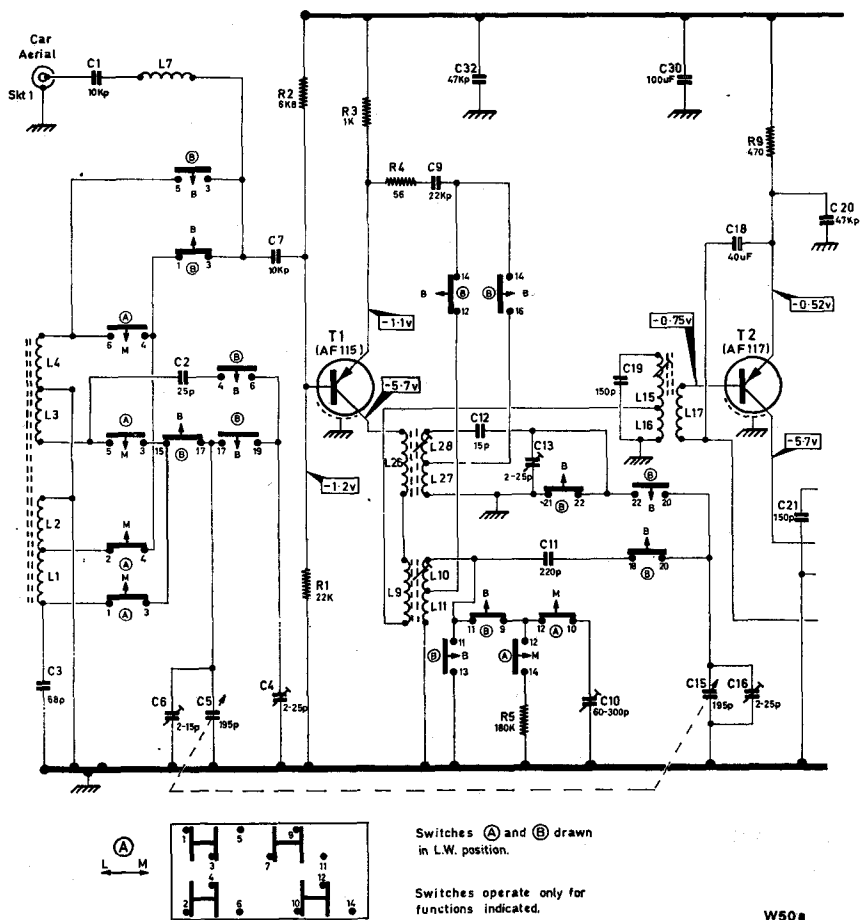
(W52) TRIM PLAN—MODEL ST438T

## Alignment Table

Switch to:	Set gang to:	Injection point	Sig. gen. frequency	Adjust
<i>I.F. Alignment</i>				
M.W.	Minimum	Aerial side of C7 via a 470 kpF. cap.	470 kHz.	L21 max. output
M.W.	Minimum	Aerial side of C7	472 kHz.	L18 max. output
M.W.	Minimum	Aerial side of C7 via a 470 kpF. cap.	468 kHz.	L15 max. output
<i>M.W. Oscillator</i>				
M.W.	Maximum	Aerial side of C7	540 kHz.	L9 max. output
M.W.	Minimum	Aerial side of C7 via a 470 kpF. cap.	1545 kHz.	C16 max. output
<i>L.W. Oscillator</i>				
L.W.	Maximum	Aerial side of C7 via a 470 kpF. cap.	148 kHz.	C10 max. output



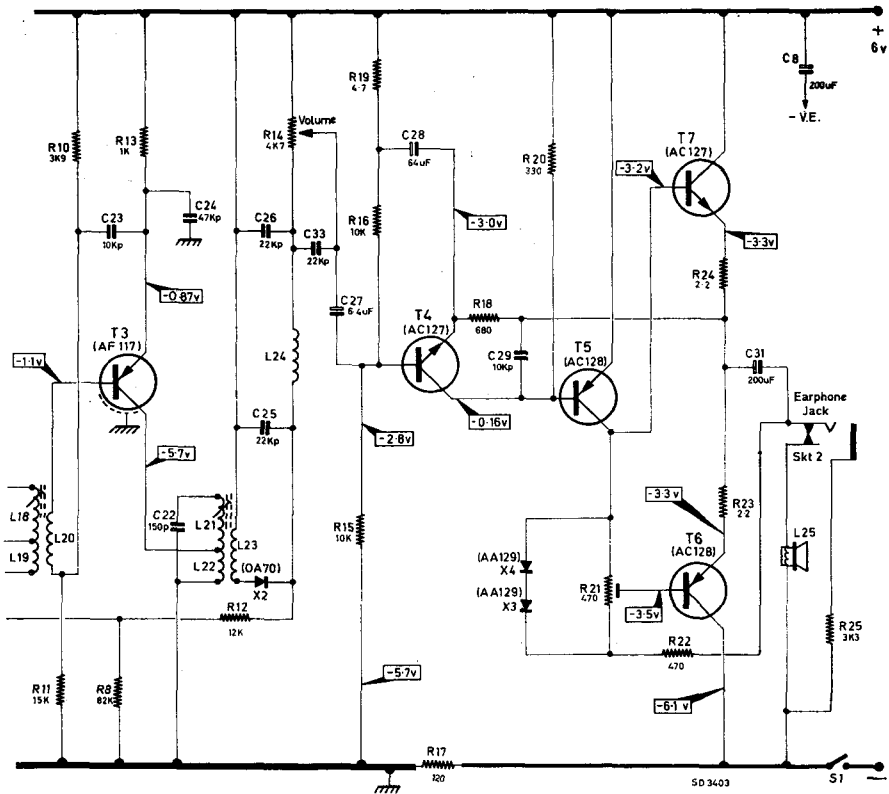
## RADIO SERVICING



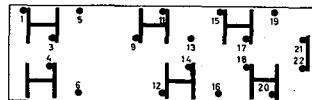
(W50a) CIRCUIT DIAGRAM—MODEL ST438T (PART)

<i>Switch to:</i>	<i>Set gang to:</i>	<i>Injection point</i>	<i>Sig. gen. frequency</i>	<i>Adjust</i>
<i>B.W. Oscillator</i>				
B.W.	Maximum	Aerial side of C7	1395 kHz.	L26 max. output
B.W.	Minimum	via a 470 kpF. cap.	1645 kHz.	C13 max. output
Repeat as necessary				
<i>M.W. Aerial</i>				
M.W.	600 kHz.	Via coupling loop	600 kHz.	L3/4 max. output
M.W.	1500 kHz.	Via coupling loop	1500 kHz.	C6 max. output
Repeat as necessary				

# STELLA



All voltages taken with respect to +ve line on 100 K $\Omega$ /VOLT METER. No signal input.



(B)  
L B

(W50b) CIRCUIT DIAGRAM—MODEL ST438T (CONTINUED)

Switch to:	Set gang to:	Injection point	Sig. gen. frequency	Adjust
<i>L.W. Aerial</i>				
L.W.	190 kHz.	Via coupling loop	190 kHz.	L1/2 max. output
<i>B.W. Aerial</i>				
B.W.	1645 kHz.	Via coupling loop	1654 kHz.	C4 max. output

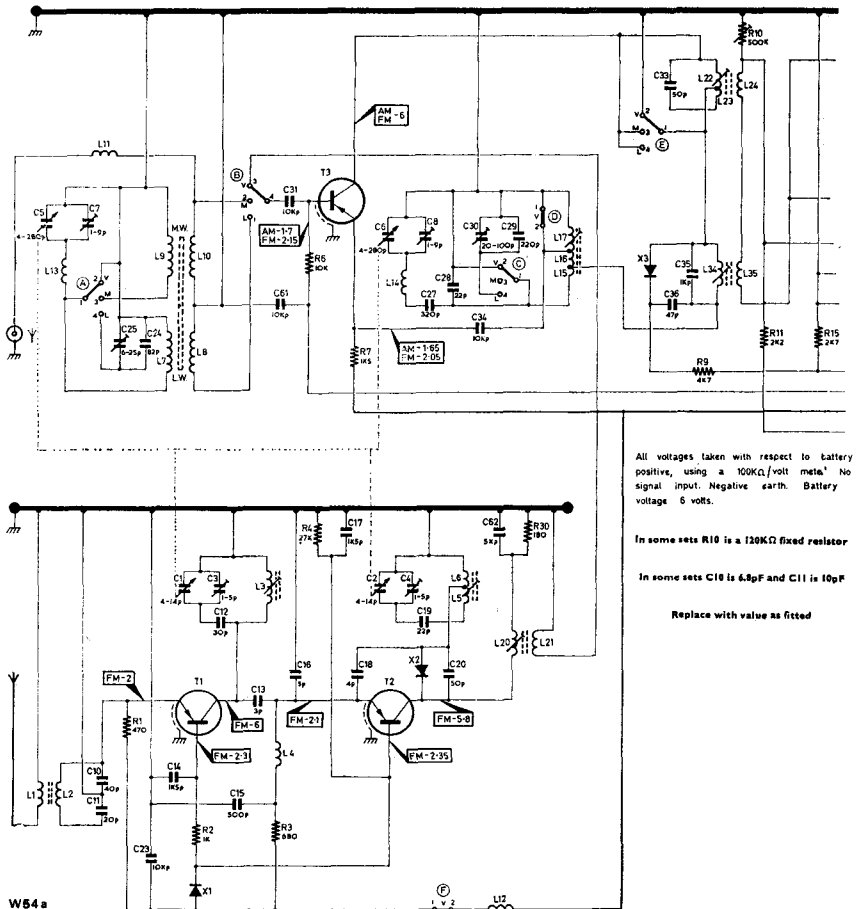
## STELLA

## Model ST6143

**General Description:** A nine-transistor, three-waveband A.M./F.M. portable radio. A telescopic aerial is used for F.M. and switchable tone control is provided at the rear of the receiver. Sockets are provided for connection of a car aerial, earphone and extension loudspeaker (3 ohms).

**Dismantling:** Place receiver face down on a protected surface, release the "clip-in" battery cover and withdraw batteries. Undo two screws at bottom of receiver, also unscrew two ornamental screws at each side of case. The rear cover can now be removed.

**Note:** When re-assembling, ensure that the metal lip on the rear half of the case engages under the metal scale trim, to obtain a proper fit at the top.

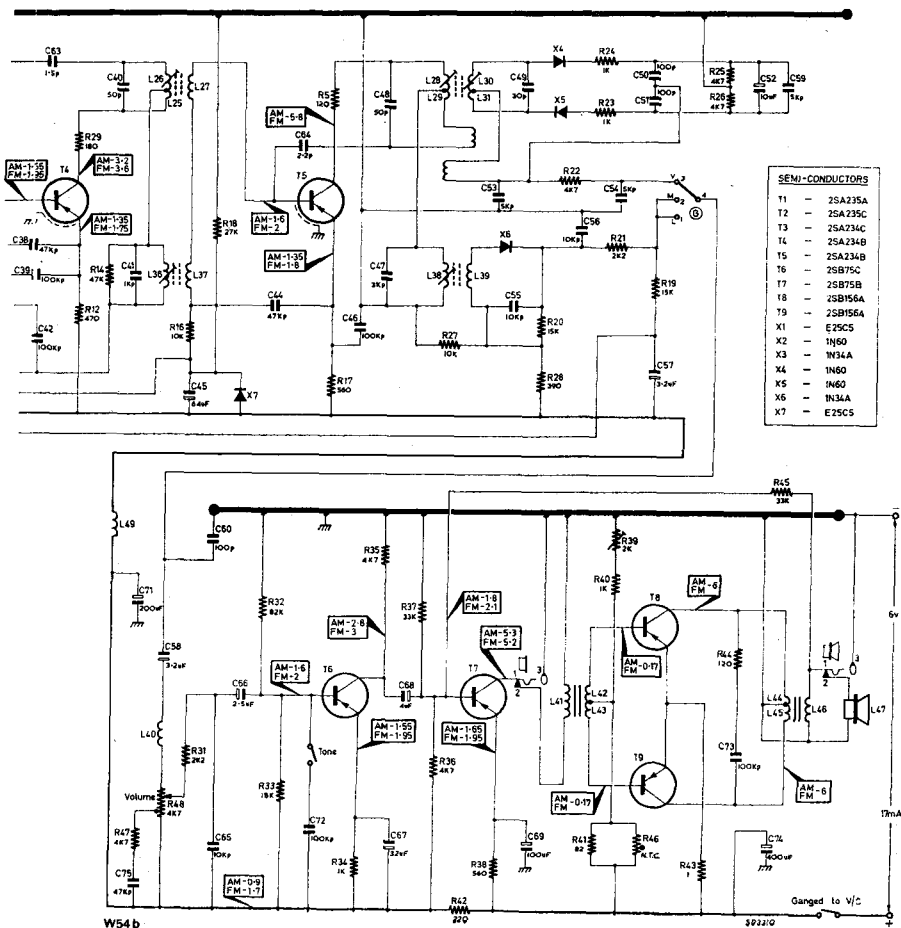


(W54a) CIRCUIT DIAGRAM—MODEL ST6143 (PART)

# STELLA

**Removing the Battery Holder:** To remove battery holder from chassis, unscrew the two countersunk screws at each end of holder. Unsolder the red and black wires from their tags, also the lead to the telescopic aerial connecting plate. Withdraw battery holder from chassis.

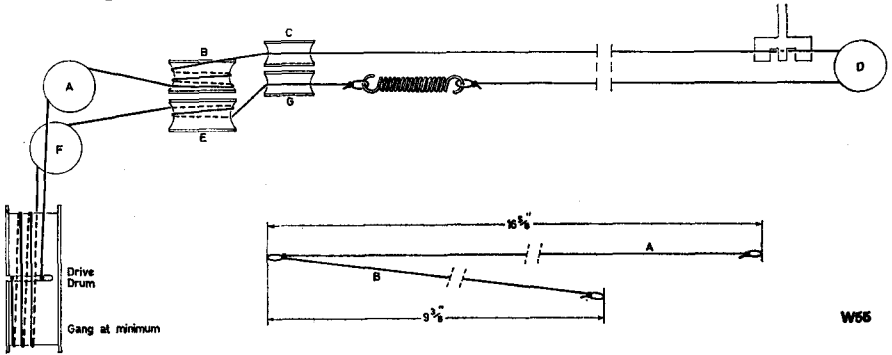
**Releasing the R.F.-I.F. Panel:** After removing battery holder and turning the gang to max. capacity (pointer to 550 m.), remove the six cheesehead screws securing panel to chassis, but before removing, attach a piece of adhesive tape to the tuning drum to hold the drive cord in place. Then ease drum assembly off the gang spindle and stick it to the case side with adhesive tape. As the panel is removed, gently lever the wavechange knob off its spindle. To detach the panel completely from the chassis, it is necessary to unsolder the leads from the tag strip on top of the detector screening can and the Ext. aerial socket lead from L11.



(W54b) CIRCUIT DIAGRAM—MODEL ST6143 (CONTINUED)

## RADIO SERVICING

**Releasing the A.F. Panel:** Unsolder the three leads from the left-hand edge of the A.F. panel, unscrew the two screws retaining the panel, one by the output sockets and the other in the bottom right hand corner, after which the panel can be removed. To detach the panel completely from the chassis, unsolder the grey L.S. lead from its tag and the two leads at the top edge of the A.F. panel.



(W55) DRIVE CORD—MODEL ST6143

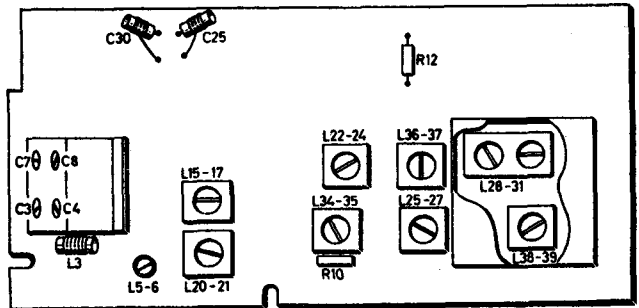
**R10 Adjustment:** Connect a valve volt-meter across R12, and with no signal input, adjust R10 to give a reading of 0.4 volt.

*Note:* This adjustment only applies where R10 is a pre-set pot. In some sets it is a 120 kΩ fixed resistor.

**R39 Adjustment:** This resistor controls the amount of current drawn by T8/T9 under quiescent conditions. Normally, adjustment will only be required if T8/T9 are replaced. To measure the combined collector current, remove the shorting link on the print adjacent to C71. Connect a 0-10 mA. meter between the print lands, turn volume control to minimum, switch receiver on and ensure that the battery voltage is at least 5.5 volts. Adjust R39 for a reading of 3 mA., disconnect meter and replace shorting link.



W56) TRIM PLAN—  
MODEL ST6143



W56

## STEREOSOUND

### Alignment Table

<i>Switch to:</i>	<i>Gang to:</i>	<i>Gen. freq. 30% mod.</i>	<i>Apply to:</i>	<i>Adjust</i>
M.W.	Max.	470 kHz.	T3 base via 39 kpF.	L38/39 L36/37 L35/34 L15-17 C8 C30 Adj. position L9/L10 C7 Adj. position L7/L8 C25 L25/27 L28/29 L30/31 L22/24 L20/21 L5/6
M.W.	Pointer to 530 m.	570 kHz.	T3 base via 39 kpF.	
M.W.	Pointer to 194 m.	1550 kHz.	T3 base via 39 kpF.	
L.W.	Pointer to 1200 m.	250 kHz.	T3 base via 39 kpF.	
M.W.	Pointer to 530 m.	570 kHz.	Via loop	
M.W.	Pointer to 194 m.	1550 kHz.	Via loop	
L.W.	Pointer to 1760 m.	170 kHz.	Via loop	
L.W.	Pointer to 1200 m.	250 kHz.	Via loop	
F.M.	Max.	10.7 MHz.	T4 base via 47 kpF.	
F.M.	Max.	10.7 MHz.	T4 base via 47 kpF.	
F.M.	Max.	10.7 MHz.	T1 coll. via 47 kpF.	
F.M.	Pointer to 90 MHz.	90 MHz.	Tele. aerial via 1500 pF.	
F.M.	Pointer to 100 MHz.	100 MHz.	Tele. aerial via 1500 pF.	C4
F.M.	Pointer to 90 MHz.	90 MHz.	Tele. aerial via 1500 pF.	L3
F.M.	Pointer to 100 MHz.	100 MHz.	Tele. aerial via 1500 pF.	C3

## STELLA

## Model ST7005

**General Description:** This portable transistor radio is electrically similar to the Philips Model 13RL360 described on pages 333 to 335 of this volume.

## STEREOSOUND

## Models SS.16 and TA.2

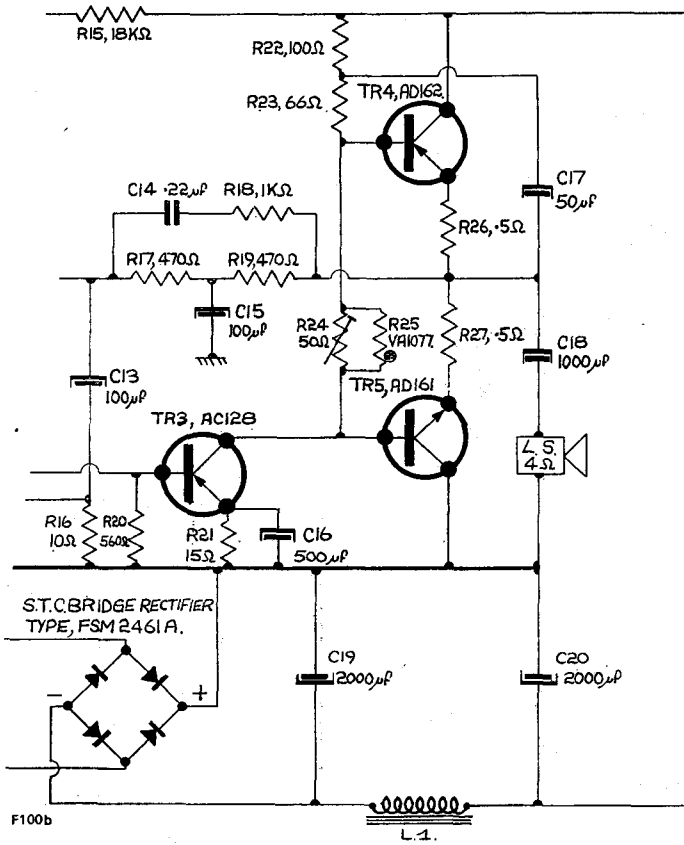
**General Description:** Five-transistor, eight-watt complementary push-pull amplifier. Circuit features include direct coupling, negative feedback and low impedance loudspeaker. On TA.2, R.21, C.16 are omitted and TR3 emitter is earthed. On certain models a 6.8 kΩ resistor may be connected across C.14 to reduce the bass response.

### TR Voltages

	<i>SS.16 8 watt</i>			<i>TA.2 3 watt</i>		
	<i>Collector volts</i>	<i>Base volts</i>	<i>Emitter volts</i>	<i>Collector volts</i>	<i>Base volts</i>	<i>Emitter volts</i>
TR <sub>1</sub>	10.3	16	19	13	18	20
TR <sub>2</sub>	1.3	7.5	9.5	0.17	9	12.7
TR <sub>3</sub>	12	1.35	1.2	13	0.17	0
TR <sub>4</sub>	26	12	12	28	13	13.2
TR <sub>5</sub>	0	12	12	0	13	13.2

402

# STEREOSOUND



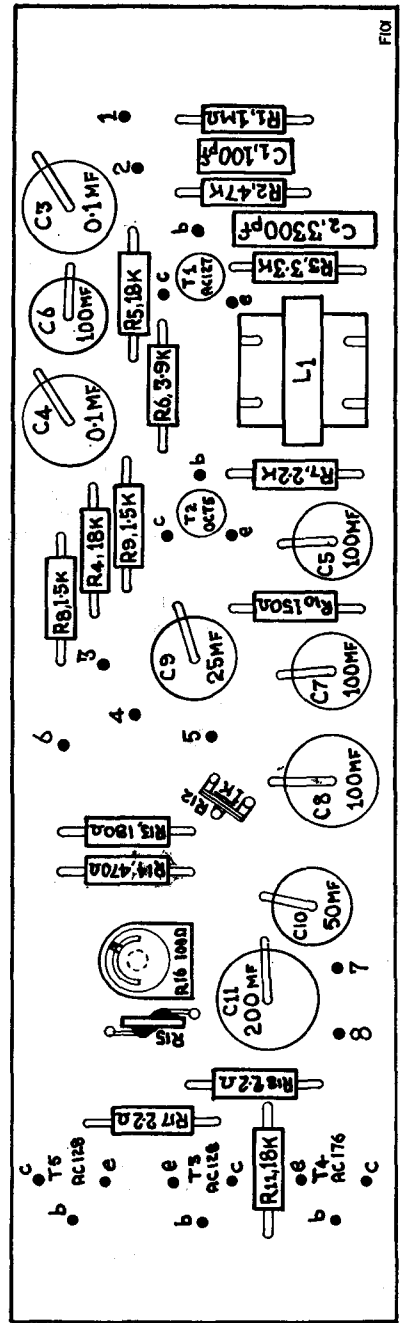
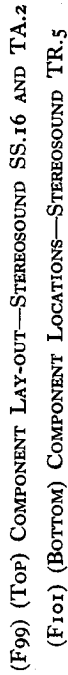
(F100b) CIRCUIT DIAGRAM—STEREOSOUND SS.16 AND TA.2 (CONTINUED)

## STEREOSOUND

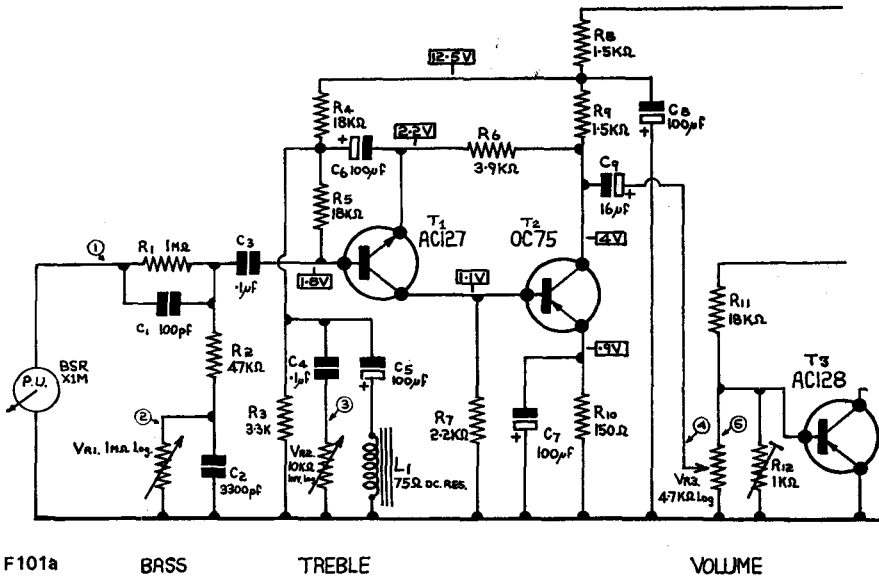
## Model TR.5

**General Description:** Five-transistor complementary Class B push-pull record-player amplifier. Circuit features include direct coupling, negative feedback, treble and bass controls.



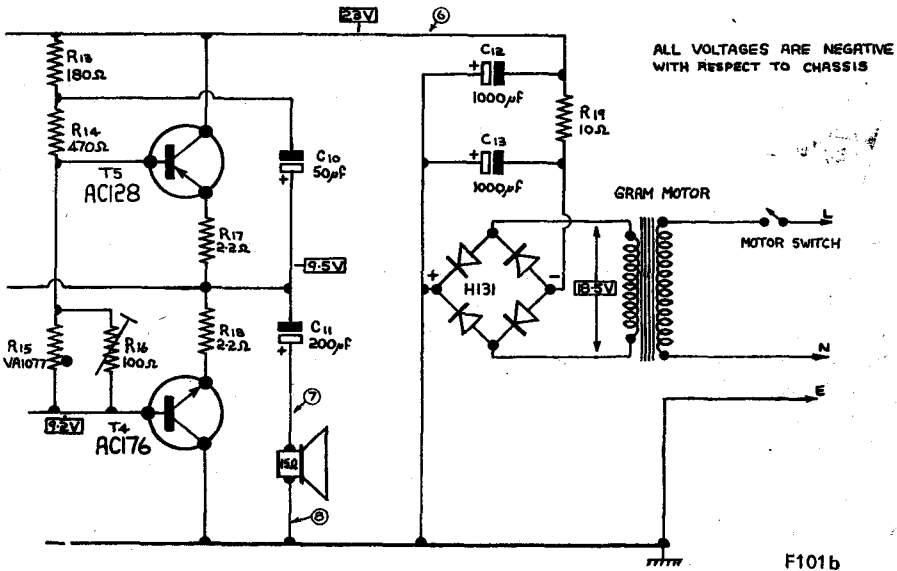


# STEREOSOUND TRANSISTOR AMPLIFIER TYPE TR.5



Above: (F101a) CIRCUIT DIAGRAM—STEREOSOUND TR.5 (PART)

Below: (F101b) CIRCUIT DIAGRAM—STEREOSOUND TR.5 (CONTINUED)



## ULTRA

## Model 6008

**General Description:** This model is similar to the Marconiphone Model 4020 described in this volume.

## ULTRA

## Model 6016

**General Description:** This model is similar to the Ultra Model 6008 described above.

**Note:** The positions of R<sub>1</sub> and R<sub>5</sub> are reversed—see Component Locations Diagram on page 270, as for Model 6008.

## ULTRA

## Model 6018

**General Description:** Record player with 5 watts output. Changer, B.S.R. UA15 Superslim. Cartridge, B.S.R. C1 with turnover stylus ST3. Speaker, elliptical 8 ohms. A.C. mains 200–250 volts 50 c/s. Sockets, microphone and radio inputs, stereo output (L.H. channel) and tape recording output.

**Circuit Diagram Notes:** Figures in rectangles are voltage readings taken with an Avometer 8, and are with respect to the positive line unless otherwise indicated. Ringed figures indicate printed board tag connections. J<sub>1</sub> is shown in the monophonic position.

**Stylus Replacement:** Turn indicator flag to L.P. position. Press down and forward (gently) to release styli assembly. After replacement, ensure that stylus arm is engaged within the V-shaped fork of cartridge.

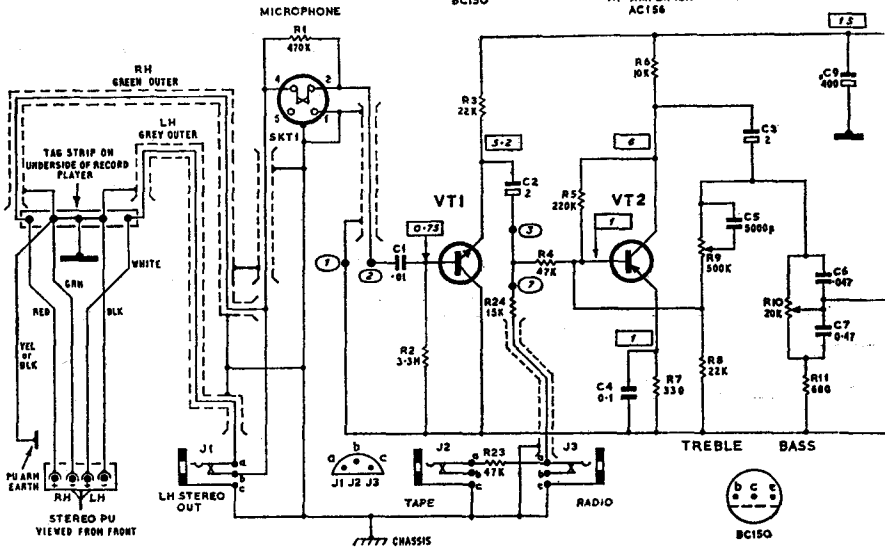
**Cartridge Replacement:** Ease forward the spring clip at front of head to release cartridge. Then detach plugs from pins at rear of cartridge, noting colour coding.

**Chassis Removal:** Fully unscrew transit screws to lock record changer to motor board then turn cabinet on to its left-hand side taking precautions to protect the surface. Take out six plastic screws to release cabinet base cover: these screws can be refitted by pushing them in.

# ULTRA

AF AMPLIFIER  
U3540-1  
or  
BC150

AF AMPLIFIER  
AC156

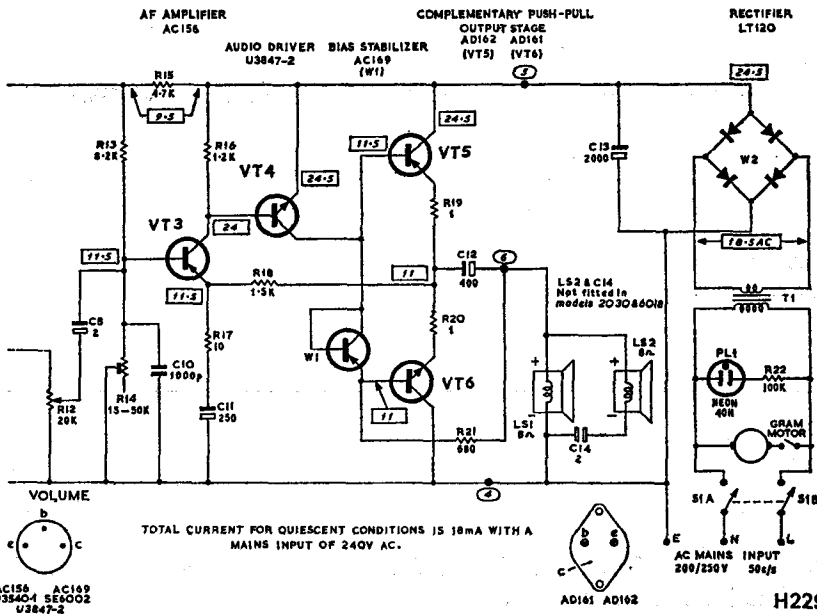


Note: In some models R24 is 22K and C4 is .047 $\mu$ F

H229a

Above: (H229a) Circuit Diagram—MODEL 6018 (PART)

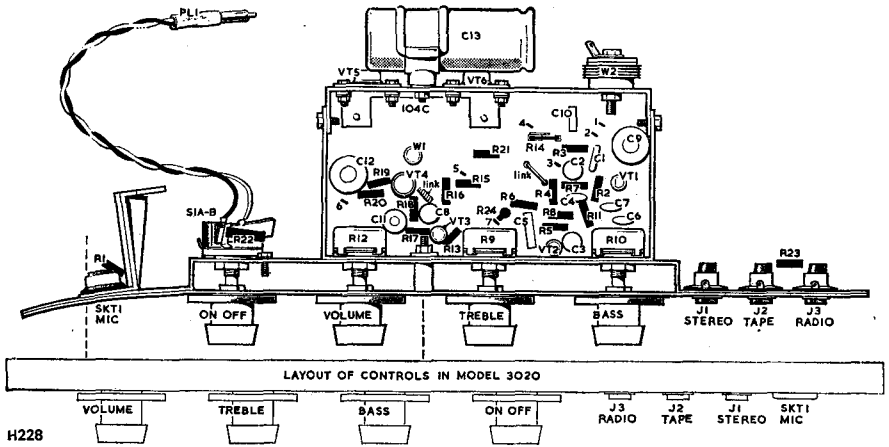
Below: (H229b) Circuit Diagram—MODEL 6018 (CONTINUED)



TOTAL CURRENT FOR QUIESCENT CONDITIONS IS 18mA WITH A MAINS INPUT OF 240V AC.

H229b

## RADIO SERVICING



### (H228) COMPONENT LOCATIONS

Note that T<sub>1</sub> is mounted on underside of motor board.

Unplug pickup connections from tag strip on underside of record changer (taking note of colour coding to ensure correct reconnection) and unfasten cleats securing pickup and mains leads. Also, unclip neon indicator lamp and unplug leads from loudspeaker tags. Restore cabinet to its normal position then take out screw from each end of amplifier control panel. The control panel and chassis assembly may now be lifted out within limit of mains transformer leads. Unsolder these leads for complete removal of the control panel and chassis assembly.

**Changer Removal:** Remove cabinet base cover and unplug pickup leads (see Chassis Removal) then unsolder motor leads from mains transformer. Turn transit screws fully clockwise then prise up locking tongue of each transit clip and slide the latter off the bottom end of the transit screw. Remove flat washers from transit screws and lift record changer out of the cabinet.

## ULTRA

## Model 6144

**General Description:** This model is similar to the Marconiphone Model 4140 described in this volume.

## ULTRA

## Model 6146

**General Description:** A.M. radio receiver with 300 mW. output. Aerials; ferrite rod and telescopic rod. Sockets; car aerial and earphone (or tape recorder). Speaker, round 15 ohms. Battery, 9 volts PP6.

**Wavebands:** M.W. 1620–530 kc/s. L.W. 268–148 kc/s. S.W. 17–5.9 Mc/s.

**Alignment (General):** Connect an output meter, set to 15 ohms impedance, in place of loudspeaker. Alternatively, connect a Model 8 Avometer (on 10-volt A.C. range) across speech coil. Set volume control to maximum but, during alignment, adjust signal generator output level to maintain receiver output at 50 mW.

**Alignment (I.F.):** Switch receiver to M.W. and turn gang to maximum capacitance. Apply a 475 kc/s. (30 per cent. modulated) signal, via a 0.1  $\mu$ F. blocking capacitor, across C<sub>3</sub> (aerial section of gang) then adjust IFT<sub>3</sub>, IFT<sub>2</sub> and IFT<sub>1</sub> (in that order) for maximum output.

**Alignment (R.F.):** Inject M.W. and L.W. signals via a loop loosely coupled to ferrite rod aerial. Align in following order.

Range	Sig. gen.	Tune to	Adjust (max.)
M.W.	525 kc/s.	Gang closed	L8 (M.W. osc. pad)
M.W.	600 kc/s.	Signal	L2 (M.W. aer. pad)
M.W.	1500 kc/s.	Signal	C2 (M.W. aer. trim)
L.W.	148 kc/s.	Gang closed	C15 (L.W. osc. trim)
L.W.	220 kc/s.	Signal	L3 (L.W. aer. pad)

**Note:** Adjust L<sub>2</sub> and L<sub>3</sub> by sliding coil former along ferrite rod.

**Alignment (S.W.):** Extend telescopic aerial and place signal generator lead nearby to provide a loose coupling.

Range	Sig. gen.	Tune to	Adjust (max.)
S.W.	5.9 Mc/s.	Gang closed	L11 (S.W. osc. pad)
S.W.	17 Mc/s.	Gang open	C9 (S.W. osc. trim)
S.W.	6.77 Mc/s.	Signal	L4 (S.W. aer. pad)
S.W.	15.45 Mc/s.	Signal	C5 (S.W. aer. trim)

**Circuit Diagram Notes:** Figures in rectangles indicate voltages measured with an Avometer 8, between positive line and point shown except where otherwise indicated. D.C. resistances are shown against inductors where these are greater than one ohm. Ringed figures show printed board tag connections.

**Balance Adjustment:** Output transistors VT<sub>6</sub> and VT<sub>7</sub> are series connected across the 9-volt battery supply and to ensure a balanced supply voltage to each, an adjustment R<sub>13</sub> is incorporated in emitter circuit of VT<sub>4</sub>.

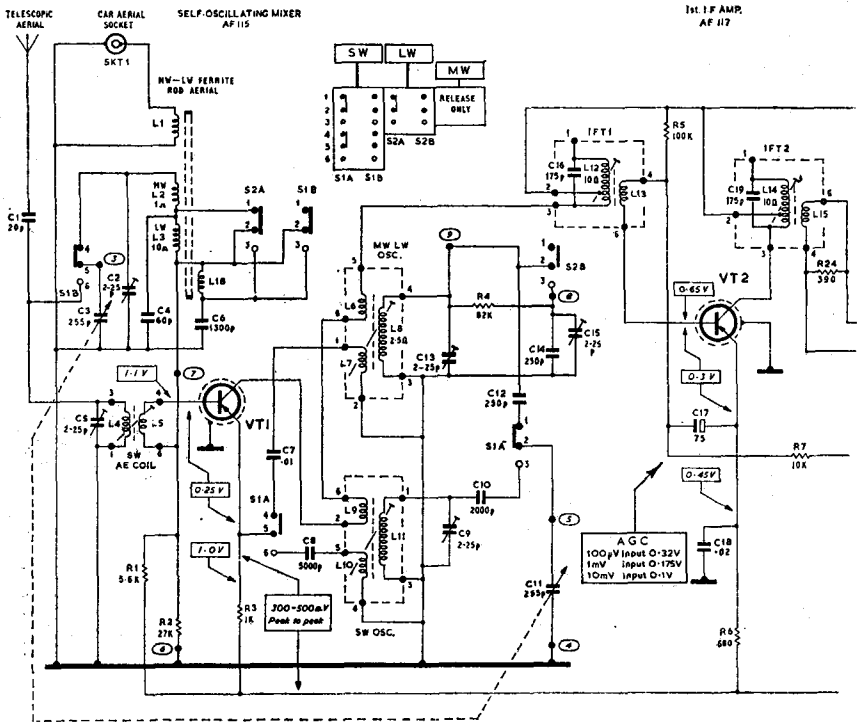
## RADIO SERVICING

Adjustment of this resistor sets emitter potential and hence collector potential of VT4. It will, therefore, determine the base potential of driver VT5 which is directly coupled to VT4. This bias decides collector potential of VT5 which in turn controls base voltages of VT6 and VT7.

Correct balance is obtained when potential of VT6/VT7 emitter junction is 5 volts with respect to positive line. The discrepancy from half-battery voltage is due to the emitter bias voltage developed across R17 which determines limit of negative signal excursion before bottoming of VT5 takes place.

An alternative method of balancing operating voltages of VT6 and VT7 is by visual observation, on an oscilloscope, of output waveform at maximum output when adjustment should be made for symmetry of both waveform and clipping at high outputs.

**Complementary Power Output Stage:** *p-n-p* and *n-p-n* type transistors are used in conjunction with a stabilising diode to provide a transformerless power stage giving an audio output of 300 mW.



Circuit shown with medium wave button depressed

H253a

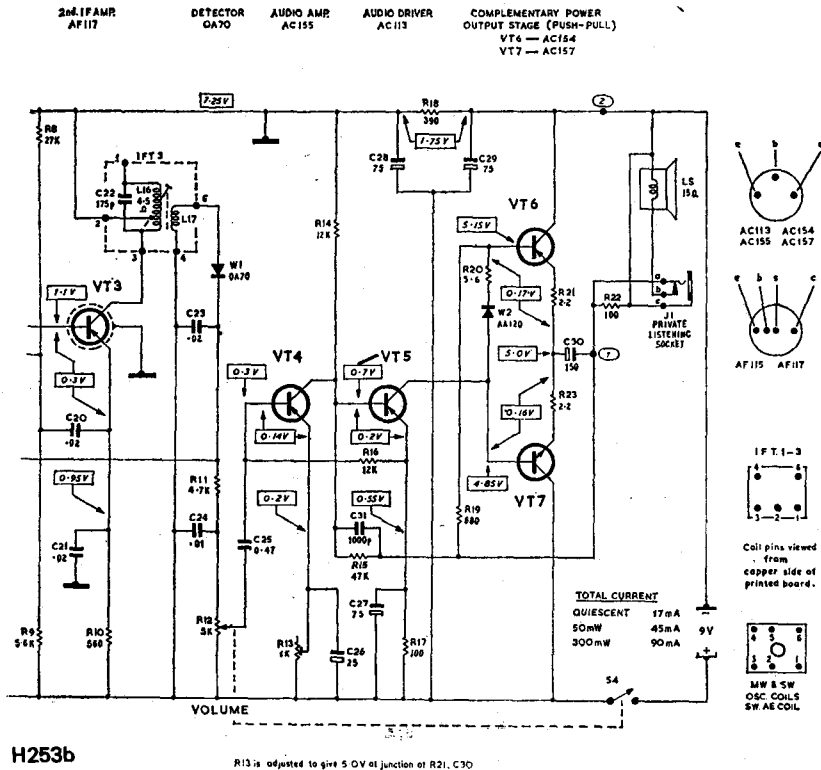
(H253a) CIRCUIT DIAGRAM—MODEL 6146 (PART)

# ULTRA

The audio signal developed across volume control R<sub>12</sub> is applied via coupling capacitor C<sub>25</sub> to the base of audio amplifier transistor VT<sub>4</sub>. The amplified signal appearing at the collector of VT<sub>4</sub> is directly coupled to the base of driver transistor VT<sub>5</sub>. The output from VT<sub>5</sub> simultaneously drives the bases of both output transistors VT<sub>6</sub> and VT<sub>7</sub>. During positive half-cycles of the signal, *n-p-n* transistor (VT<sub>7</sub>) conducts, resulting in a fall in collector/emitter voltage of VT<sub>7</sub>. During negative half-cycles of the signal *p-n-p* transistor (VT<sub>6</sub>) conducts, resulting in an increase in collector/emitter voltage of VT<sub>7</sub>. The loudspeaker is fed via C<sub>30</sub> and J<sub>1</sub>.

VT5 collector load R19 is returned to the "live" side of the loudspeaker and, as this point is coupled to the emitters of VT6 and VT7 through C30, the input signal to the output stage is virtually applied between base and emitter of both VT6 and VT7.

The diode is biased by  $V_{T5}$  collector current and acts as a variable resistance which is sensitive to voltage and temperature variations. The resistance value of  $W_2$  is small compared with  $R_{10}$  and the voltage developed



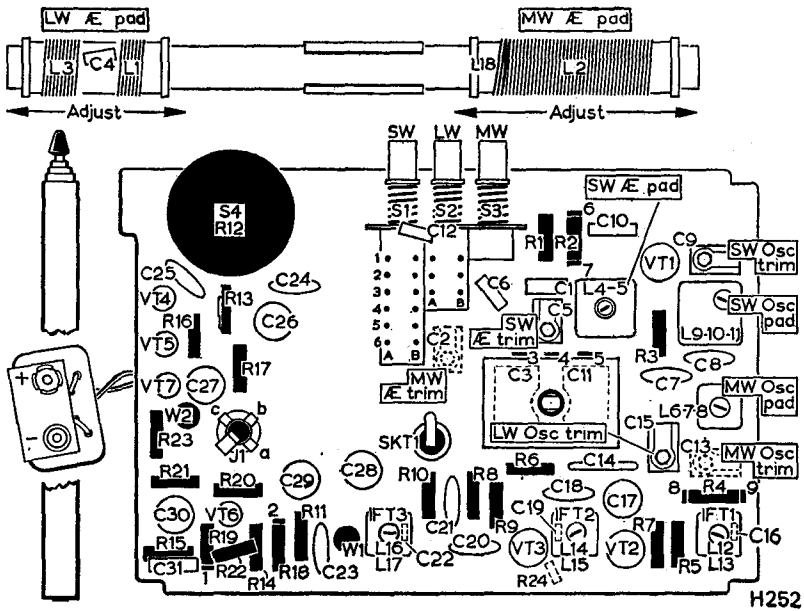
(H253b) CIRCUIT DIAGRAM—MODEL 6146 (CONTINUED)



## RADIO SERVICING

across W2 equals the sum of the nominal output transistor (VT6 and VT7) base/emitter voltages and so determines the correct quiescent operating conditions. During low ambient temperature conditions the resistance of W2 increases thus compensating for falling current of the output transistors. This effect also takes place in the event of falling battery voltage. The diode W2 also assists thermal stability at high temperatures and opposes high current drain from the battery.

**Dismantling:** Slide the battery cover downwards to release it and remove the battery. Unscrew the handle fixing studs to free the back cover. For access to the copper side of the printed board, pull off the tuning knob then gently prise up the lower end of the board which is clipped into moulded lugs on the case.



(H252) COMPONENT LOCATIONS—MODEL 6146

## ULTRA

## Model 6158T

**General Description:** This model is similar to the model Ferguson 3156T described in this volume.

## ULTRA

## Model 6322

**General Description:** Stereogram featuring twenty transistors and four diodes, in a mains powered cool chassis. Power output, 2 watts continuous tone per channel. Aerials; rotatable ferrite rod and internal dipole. Speakers, two elliptical 15 ohms. Sockets; A.M. aerial, F.M. dipole and tape input and output. 200–250 volts A.C. 50 c/s. Power consumption; radio 20 watts and gram 35 watts.

**Wavebands:** L.W. 268–148 kc/s. M.W. 1620–530 kc/s. S.W. 18.2–5.8 Mc/s. V.H.F. 101–87.5 Mc/s.

**Alignment (General):** Remove chassis as described. Connect an output meter adjusted for 15 ohm impedance in place of L.H. or R.H. loudspeaker or a 20,000-ohm volt-meter set to a suitable A.C. voltage range across the L.H. or R.H. loudspeaker sockets. Zero, trim and pad markers are provided on the scale diffuser.

**Alignment (A.M. I.F.):** Switch receiver to M.W.: turn gang to maximum capacitance position and volume control fully clockwise. Inject a 475 kc/s., 30 per cent. modulated, signal via a 0.1  $\mu$ F. capacitor between contact 5 of switch S5B and chassis, then peak L29, L25, L22 and L21 for maximum output, adjusting signal input level as required to maintain an output level of 200 mW.

**Alignment (A.M. R.F.):** Align M.W. first. 30 per cent. modulated signals should be injected in A.M. aerial/earth socket (SKT2) via a 30 pF. series capacitor. With the tuning gang at maximum, check that the cursor coincides with the zero marker on the scale diffuser.

Range	Frequency	Cursor position	Adjust
M.W.	600 kc/s. 1400 kc/s.	M.W. pad marker M.W. trim marker	L15, L10 C32, C20
L.W.	220 kc/s.	L.W. 220 kc/s. marker	C36, L9
S.W.	6.7 Mc/s. 15.8 Mc/s.	M.W. pad marker M.W. trim marker	L19, L12 C30, C25

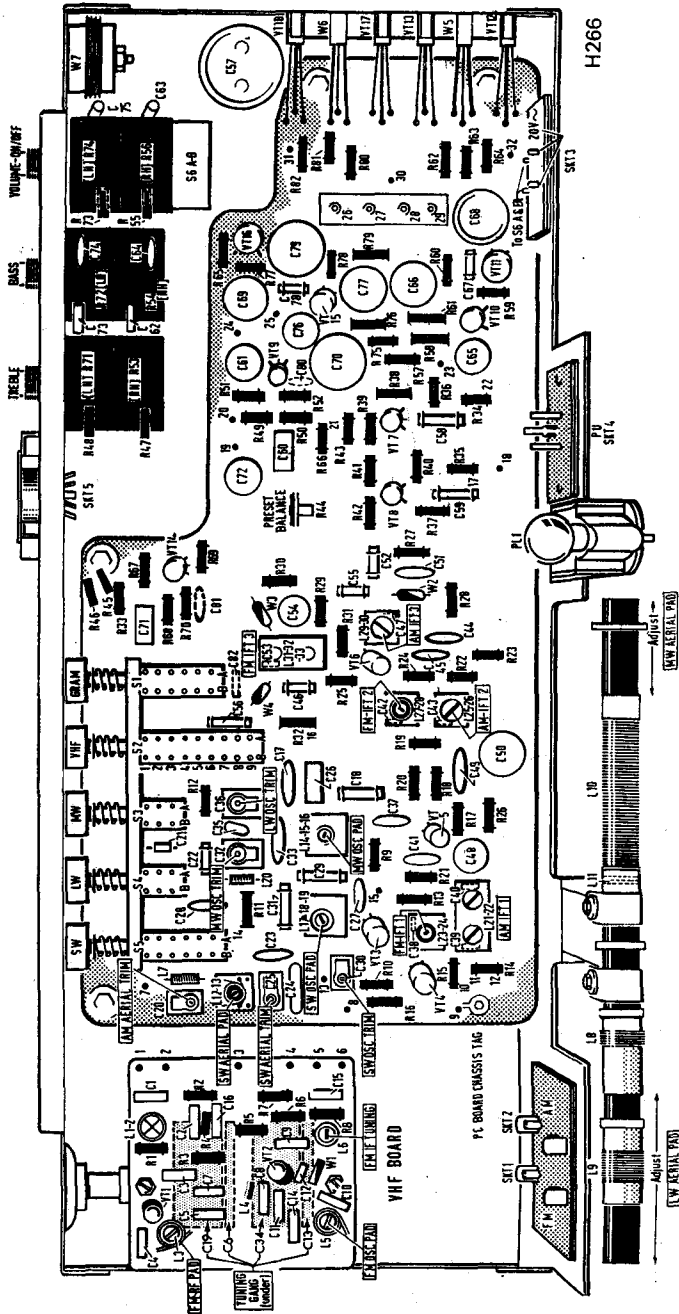
**Notes:** Adjust L10 by sliding ring along ferrite rod. Adjust L9 by sliding former along ferrite rod.

**Alignment (F.M. I.F.):** Use a signal generator providing Band II coverage, also 10.7 Mc/s. A.M. (30 per cent. modulated) and 10.7 Mc/s. F.M. signals (25 kc/s. deviation) at an impedance of 75 ohms. Switch to V.H.F., and allow the receiver and test equipment to warm up for about 10 min.; set volume control 90 deg. back from maximum with treble and bass controls set to the midway position. Inject 10.7 Mc/s. F.M. signal between tag 7 and chassis, then adjust L31, L32, L27 and L23 for maximum output.

**Note:** Tune L31 and L32 to outer peak, the cores should be protruding from top of coil can.

**Alignment (A.M. Rejection):** (a) Switch signal generator to 10.7

# RADIO SERVICING



(H266) COMPONENT LOCATIONS—Model 6322

Mc/s. A.M. and tune L32 for minimum output (this should be a sharply defined dip in output). (b) Switch signal generator to 10.7 Mc/s. F.M. and check that F.M. output has been retained. If maximum A.M. rejection does not coincide with maximum F.M. output, L32 should be tuned for maximum rejection at the expense of a slight reduction in F.M. output.

Reset signal generator to 100  $\mu$ V. F.M. output and recheck operations 1, 2 and 3 using volume control to maintain the output level at 500 mW.

**Alignment (F.M. R.F.):** Check that the cursor coincides with the "zero" marker on the scale diffuser when the gang is fully closed. Tune receiver to F.M. 94 Mc/s. marker on scale diffuser. Inject 94 Mc/s. F.M. signal into F.M. aerial socket (SKT1) and adjust L5, L3 and L6 for maximum output. Repeat as necessary for correct calibration.

**A.F. Circuit Description:** VT9 and VT10 form conventional audio amplifying stages incorporating treble and bass control circuits. VT11 is an audio driver stage with a transistor (connected as a stabilising diode) series connected, in its collector lead and feeding into the complementary output stage which uses *p-n-p* and *n-p-n* transistors (VT12 and VT13) respectively. The left-hand channel, comprising VT14-18 and stabilising diode W6, operates in a similar manner.

R44 is a pre-set control which balances the left-hand and right-hand outputs from the preamplifier and, normally, will require adjustment only if the pickup cartridge is replaced.

VT7-10, VT14 and VT15 are silicon planar transistors. Replacements should be obtained direct from the usual suppliers.

**A.F. Check:** Connect a 15-ohm impedance output meter in place of each loudspeaker. Alternatively, examine output waveform on an oscilloscope connected between tag 29 (or tag 26 for L.H. channel) and chassis. Switch to gram and turn both treble and bass controls fully clockwise, then connect audio oscillator between tags 22 and 18. Inject a 15-20 mV. 800 c/s. signal and note output: for a correctly functioning amplifier this should be clean, unclipped and approximately 2 watts. Transfer input to tags 17 and 18 and similarly check other amplifier.

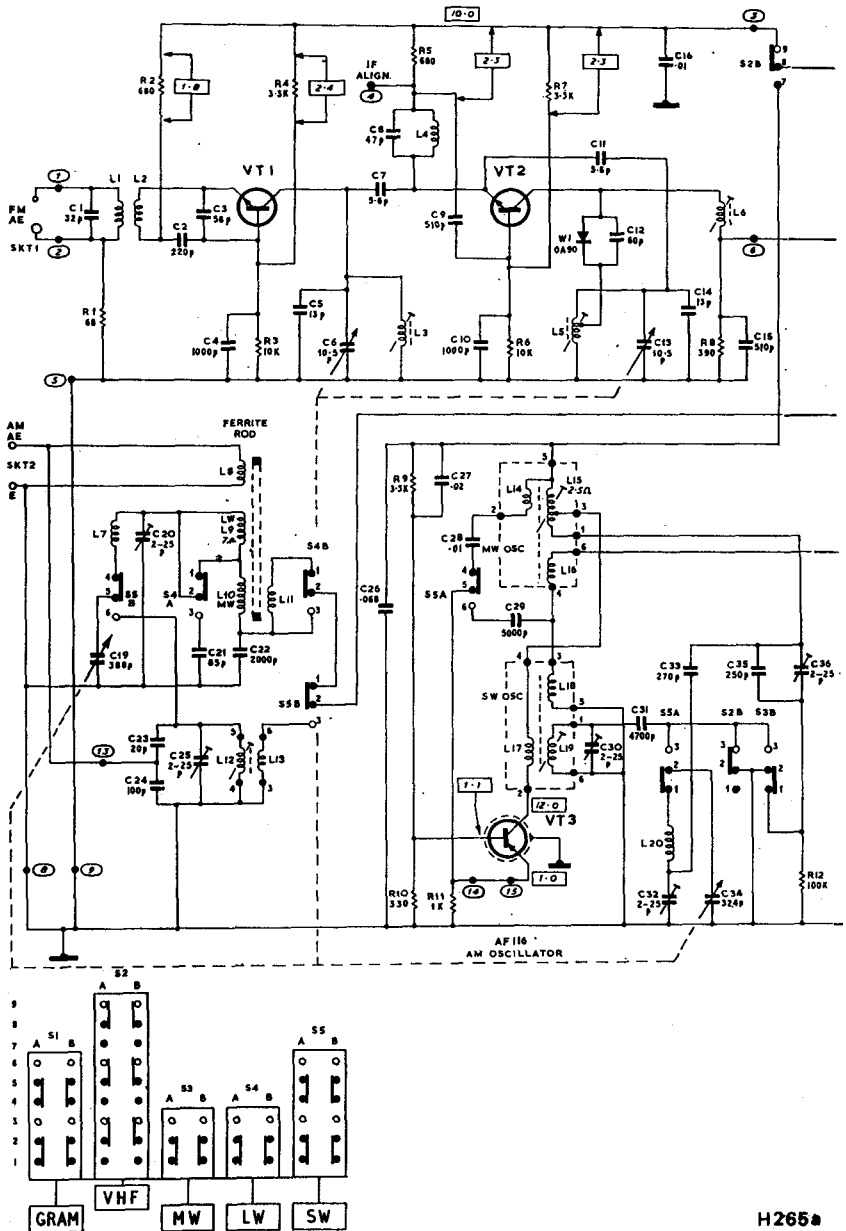
**Tone Control Check:** With test conditions as for the audio amplifier check, volume control at maximum and tone controls set to the midway position, reduce input of 800 c/s. signal to produce 200 mW. output: this will require an input of approximately 5 mV. Back off volume control 20 dB, i.e. increase input 20 dB and adjust volume control to reduce output to original level. Inject an 80 c/s. audio signal and turn bass control from minimum to maximum: this should produce a variation of 12 dB in output level. Inject an 8 kc/s. audio signal and turn treble control from minimum to maximum: this should produce a variation of 18 dB in output level.

**Chassis Removal:** Pull off rotary control knobs. Remove back cover. Release mains lead clamp. Detach mains transformer, pickup and speaker connections from chassis. Pull outward only when removing speaker socket connection from printed board. Remove 4BA nut, washer and SP washer from stud passing through chassis fixing lug located centrally at rear of

# RADIO SERVICING

FM RF AMP.  
5E1002

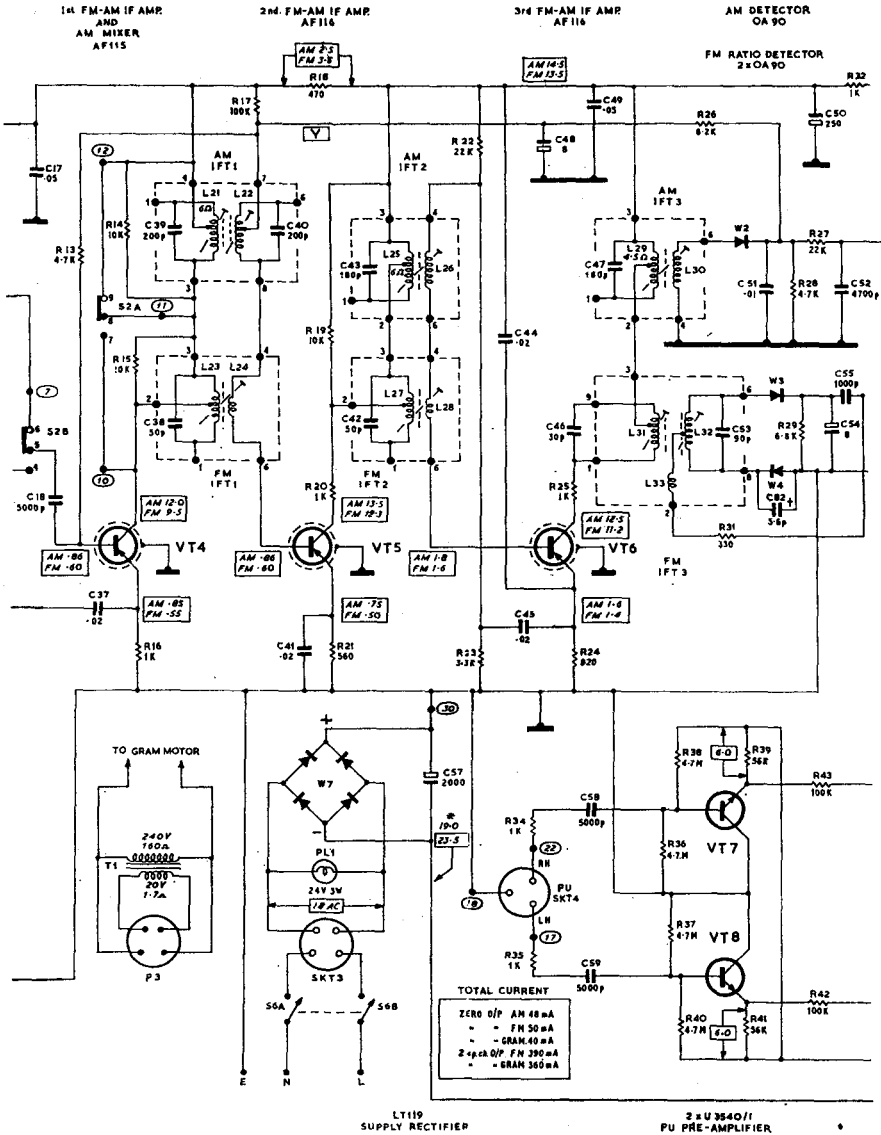
FM OSC. & MIXER  
5E1002



H265a

(H265a) CIRCUIT DIAGRAM—MODEL 6322 (PART)

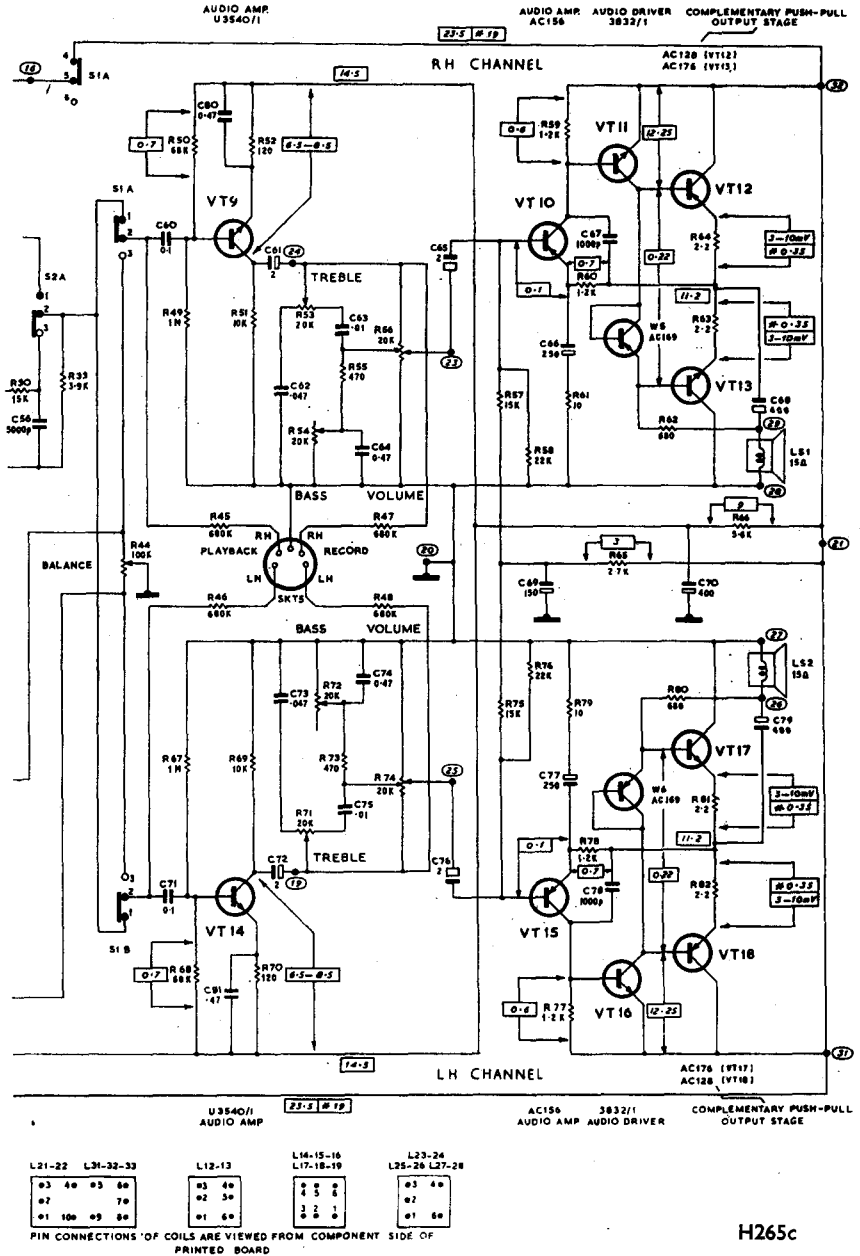
# ULTRA



(H265b) CIRCUIT DIAGRAM—MODEL 6322 (PART)

H265 b

# RADIO SERVICING



(H265c) CIRCUIT DIAGRAM—MODEL 6322 (CONTINUED)

## ULTRA

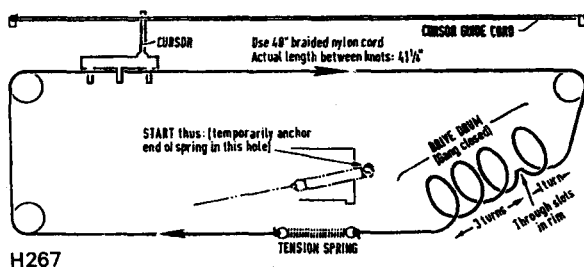
chassis. Now pull chassis clear of front locating studs and take it out through rear of cabinet. Take care to avoid scraping scale with control spindles.

**Record Changer Removal:** Take out five screws and unplug F.M. and A.M. leads to release back cover. Unplug pickup and mains transformer connections from radio chassis, then remove two 4BA nuts and washers securing mains transformer to cabinet shelf. With changer transit screws fully clockwise, pivot clips on lower end of transit screws, then lift changer and mains transformer clear.

**Record Changer:** Garrard 3000 L.M. with Sonotone 9TAHC cartridge and diamond L.P. stylus.

**Circuit Diagram Notes:** Voltages shown in rectangles were taken relative to positive chassis line (except where otherwise indicated), with an Avometer 8, and a mains input of 245 volts. D.C. resistances are shown against inductors where these are 1 ohm or greater. Ringed figures indicate printed board tag connections.

**Note (Component Locations):** In a few receivers contacts 4, 5 and 6 of switch S2A are used instead of contacts 1, 2 and 3 of switch S2B. Also, in these receivers the value of C5 and C14 is 15 pF.



(H267) DRIVE CORD—MODEL 6322

## ULTRA

## Model 6324

**General Description:** Stereogram similar in most respects to the Ultra Model 6322 also described in this volume. This model features eighteen transistors and four diodes in a mains powered cool chassis. The power output, loudspeakers, aerials, sockets, drive cord, wavebands and mains voltage range identical to Model 6322.

**Record Changer:** Balfour Princess with Sonotone 19-T1 cartridge, or, B.S.R. UA15SS with Sonotone 20-T1 cartridge.

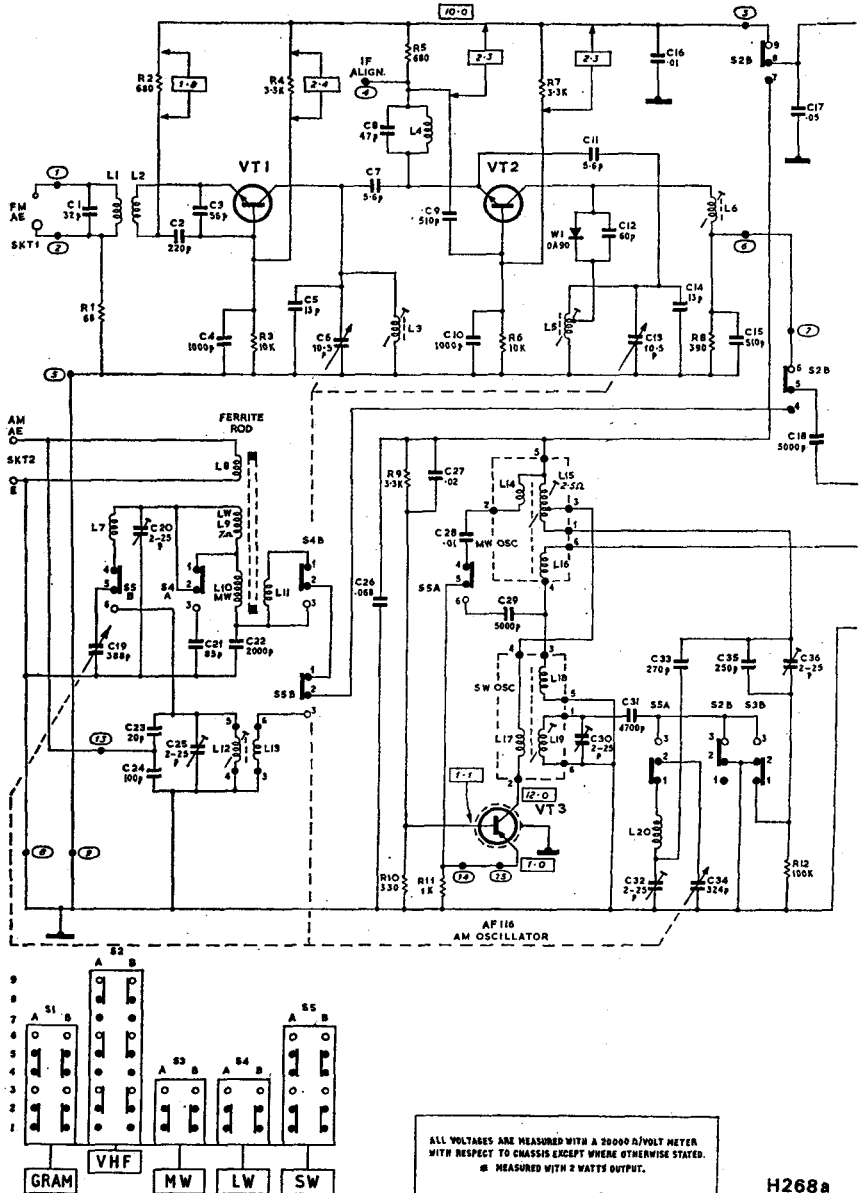
**Servicing:** Alignment, A.F. circuit description and check, tone control check, circuit diagram notes and component locations are as Model 6322.



# RADIO SERVICING

FM RF AMP.  
SE 1002

FM OSC. & MIXER  
SE 1002



H268a

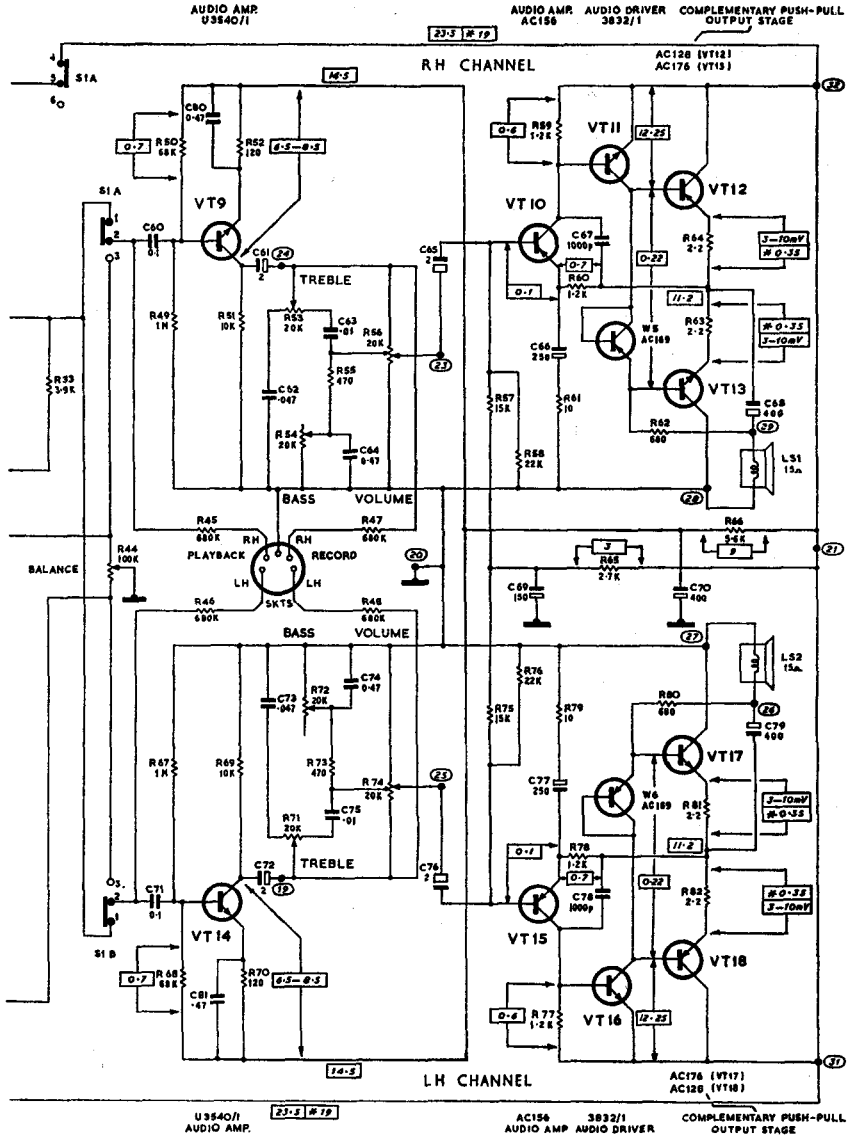
(H268a) CIRCUIT DIAGRAM—MODEL 6324 (PART)

## 42I



(H268b) CIRCUIT DIAGRAM—MODEL 6324 (PART)

# RADIO SERVICING



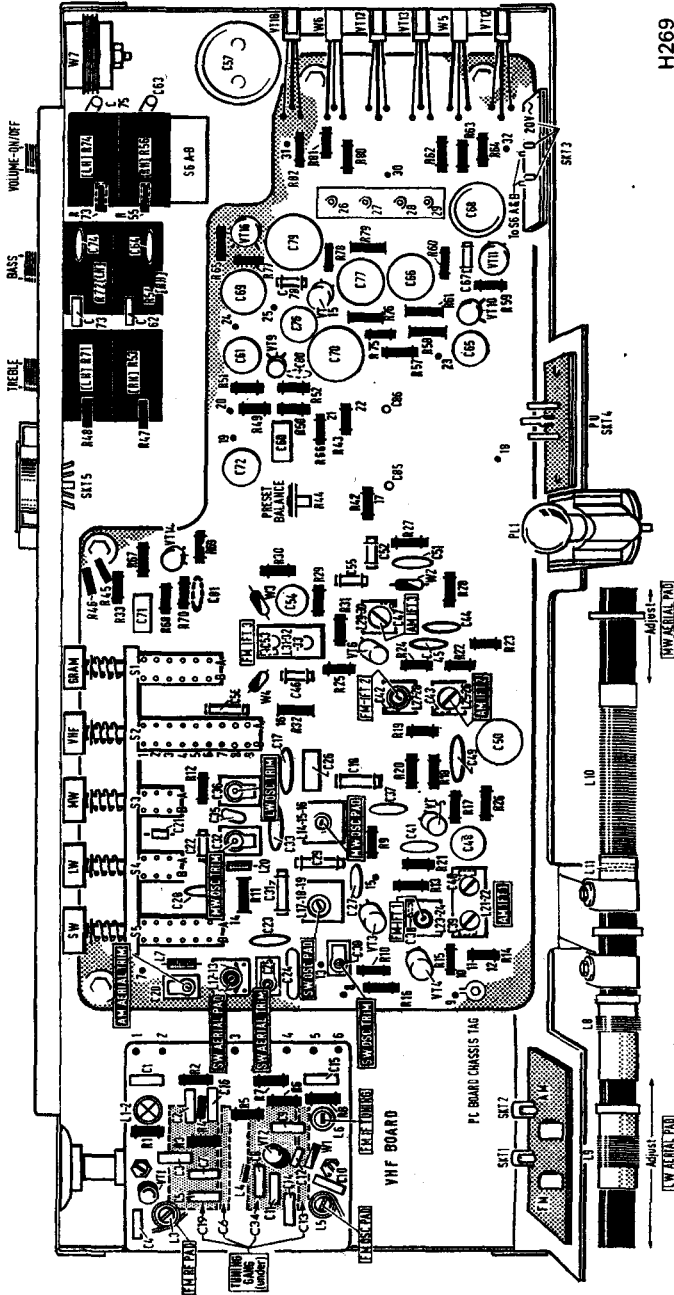
L21-22	L31-32-33	L12-15	L14-15-16 L17-18-19	L23-24 L25-26 L27-28
03 40 05 50	03 40 05 50	03 40 05 50	03 40 05 50	03 40 05 50
07 100 05 50	07 100 05 50	07 100 05 50	07 100 05 50	07 100 05 50
01 100 05 50	01 100 05 50	01 100 05 50	01 100 05 50	01 100 05 50

PIN CONNECTIONS OF COILS ARE VIEWED FROM COMPONENT SIDE OF PRINTED BOARD

H268c

(H268c) CIRCUIT DIAGRAM—MODEL 6324 (CONTINUED)

# ULTRA



H269

(H269) COMPONENT LOCATIONS—MODEL 6324

# ULTRA

# Model 6330

**General Description:** This model is similar to the Marconiphone Model 4322 described in this volume.

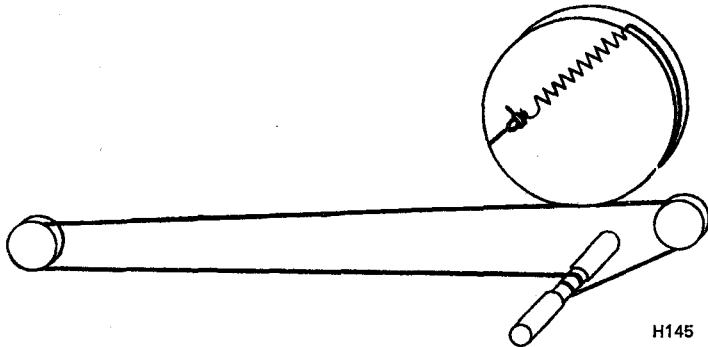
## UNITRA

## Figaro Special

**General Description:** A.M. radio receiver with an apparent output power of 1 VA. A.C. mains 220/240 volts 50 c/s.

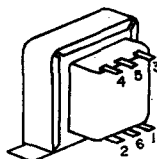
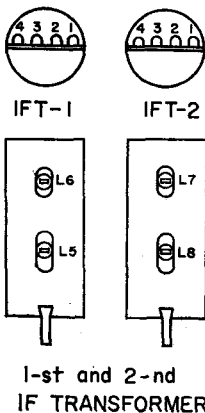
**Wavebands:** L.W. 165-280 kc/s. M.W. 535-1605 kc/s. S.W. 6-12 Mc/s.

**Alignment:** Always begin with medium wave.



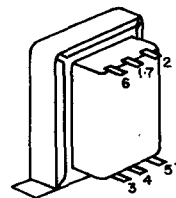
H145

(H145) DRIVE CORD—FIGARO SPECIAL



Tr2

LOUDSPEAKER TRANSFORMER

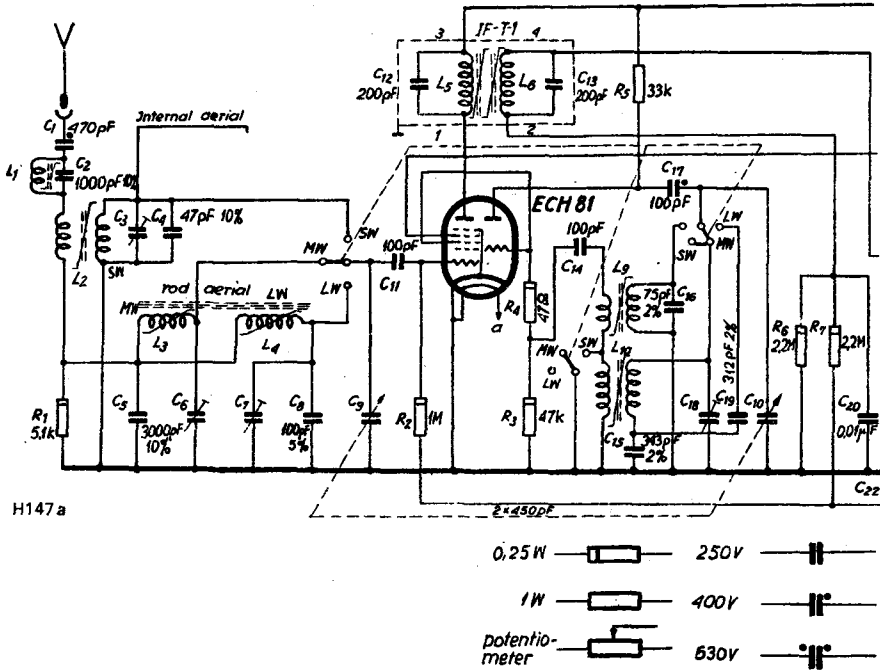


Tr1

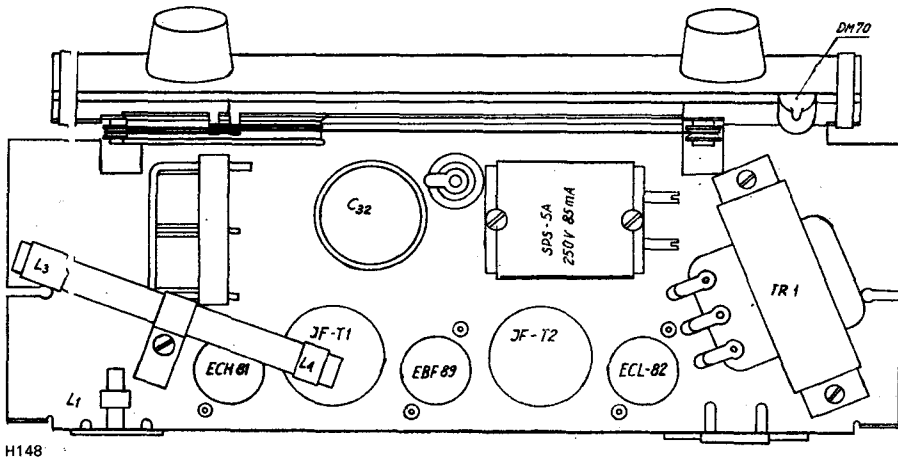
AUTOTRANSFORMER

H146

# UNITRA



(H147a) CIRCUIT DIAGRAM—FIGARO SPECIAL (PART)



(H148) COMPONENT LOCATIONS—FIGARO SPECIAL

<i>Tuning of :</i>	<i>Wave switch</i>	<i>Dial indicator</i>		<i>H.F. signal on aerial jack by 100 pF.</i>	<i>Measuring frequency</i>		<i>Tune</i>
I.F.-transformers I.F.-eliminator	M.W.	550 m.			465 kc/s.		L8 L7 L6 L5 (max. output) L1 (minimum output)
Long waves	L.W.	175 kc/s.	ca. 270 kc/s.		175 kc/s.	270 kc/s.	L4 C7
Medium waves	M.W.	600 kc/s.	1400 kc/s.		600 kc/s.	1400 kc/s.	L10 C18
Short waves	S.W.	6 Mc/s.	ca. 11·8 Mc/s.		6 Mc/s.	11·8 Mc/s.	L3 C6 L9 L2 Maximum output C3

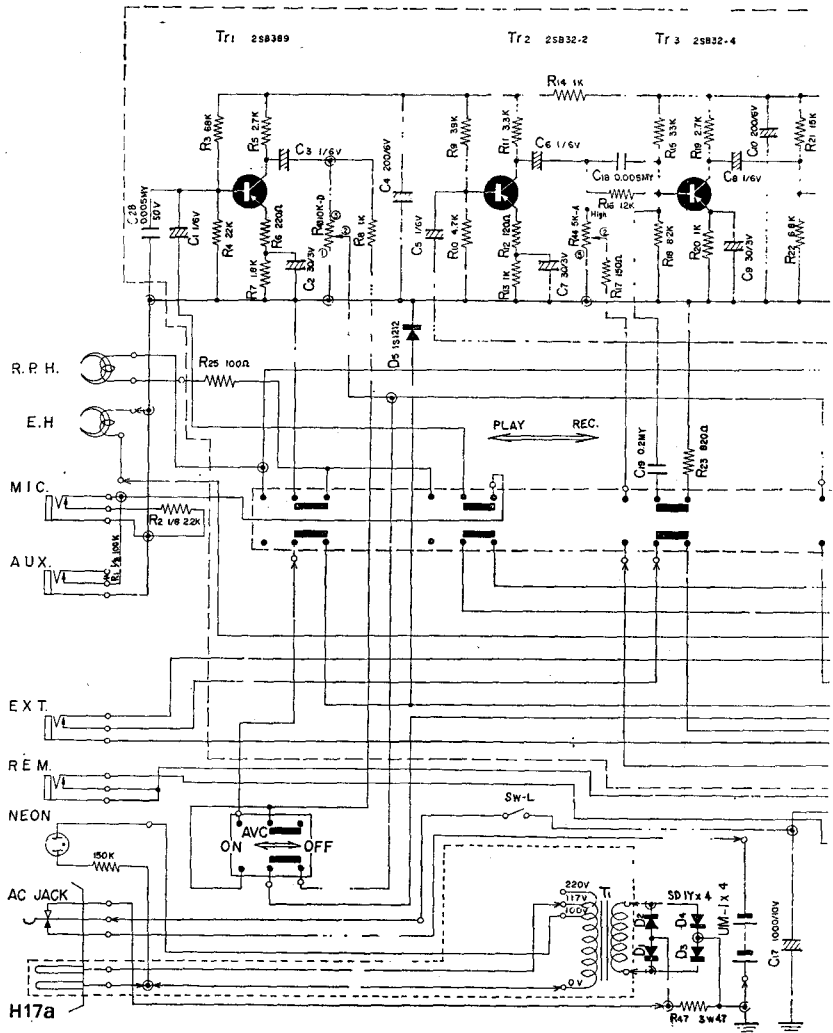
# TAPE RECORDER SERVICING

## ACKNOWLEDGEMENTS

A.E.G. (Great Britain) Ltd.  
Alba (Radio and Television) Ltd.  
B. Adler and Sons (Radio) Ltd.  
British Radio Corporation Ltd.  
Combined Electronic Services Ltd.  
Denham and Morley Ltd.  
Dynatron Radio Ltd.  
Grundig (Great Britain) Ltd.  
Highgate Acoustics.  
Monogram Electric Company.  
Radiomobile Ltd.  
Robuk Electrical Industries Ltd.  
Sanyo Service and Sales.  
Sharp Sales and Service.  
Transervice Ltd.  
Van Der Molen Ltd.



**General Description:** Transistorised tape recorder, capstan drive, two-speed, dual track. Power source, 6 volt battery or 117 volt 50/60 c/s. A.C. mains. Speaker, elliptical 8 ohms. Power output 800 mW. max.

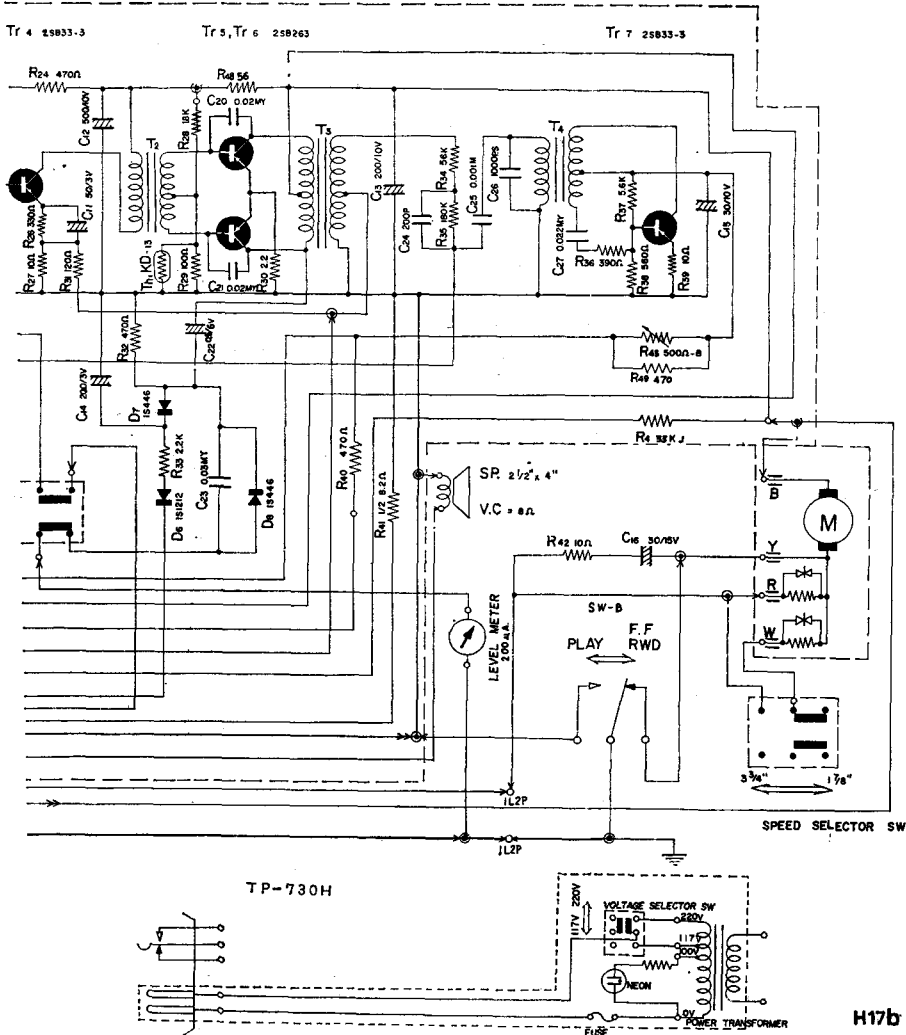


(HI7a) CIRCUIT DIAGRAM—TP-730, TP-730S AND TP-730H (PART)

# AIWA

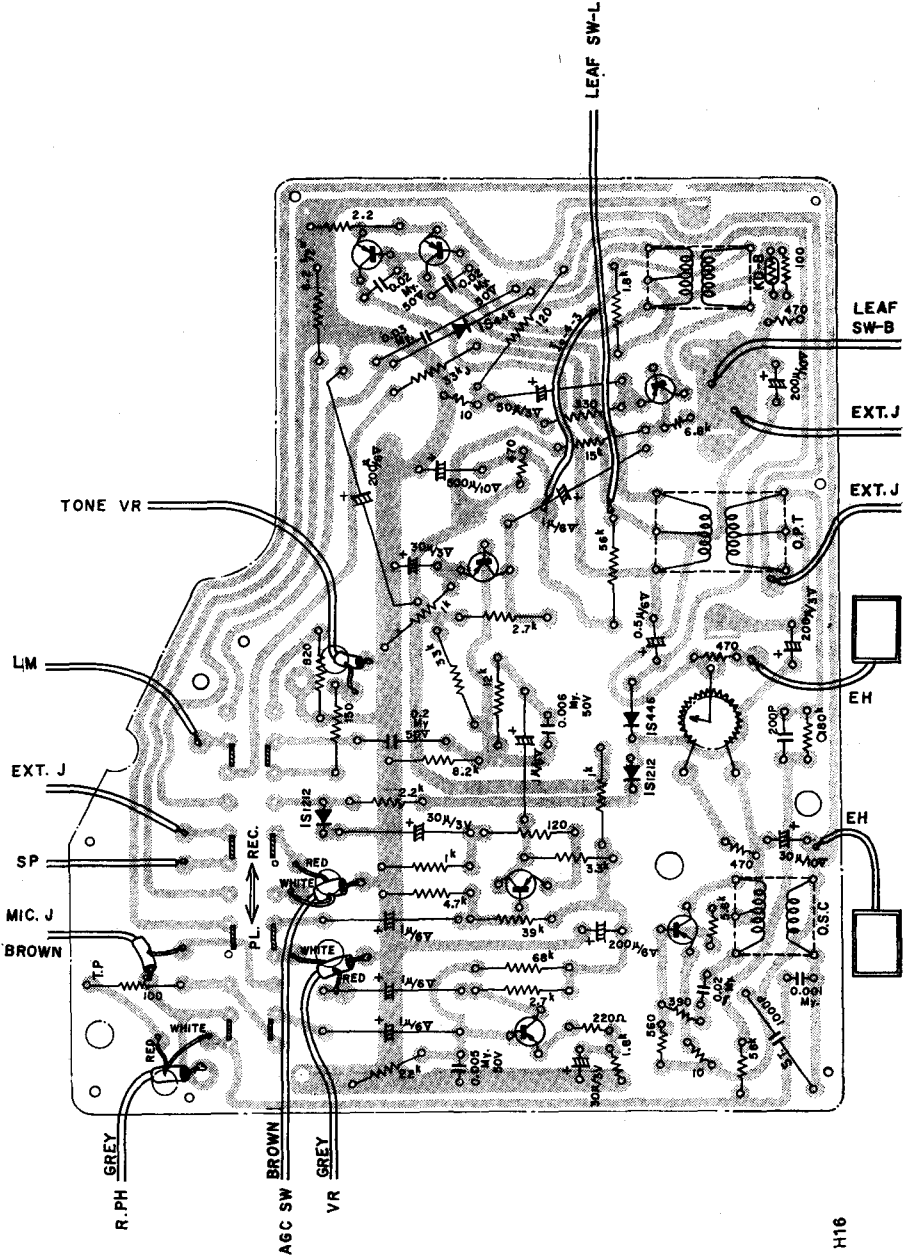
Power source for TP-730H, 110-125 volt 50/60 c/s. and 220-240 volt 50/60 c/s.

**Dismantling:** To remove back lid: Take out four setscrews and pull A.C. input jack down and out. Remove two setscrews securing selector switch—TP-730H only. To remove chassis assembly: Remove five setscrews and one bind screw. Remove two setscrews from switch holder,



(H17b) CIRCUIT DIAGRAM—TP-730, TP-730S AND TP-730H (CONTINUED)

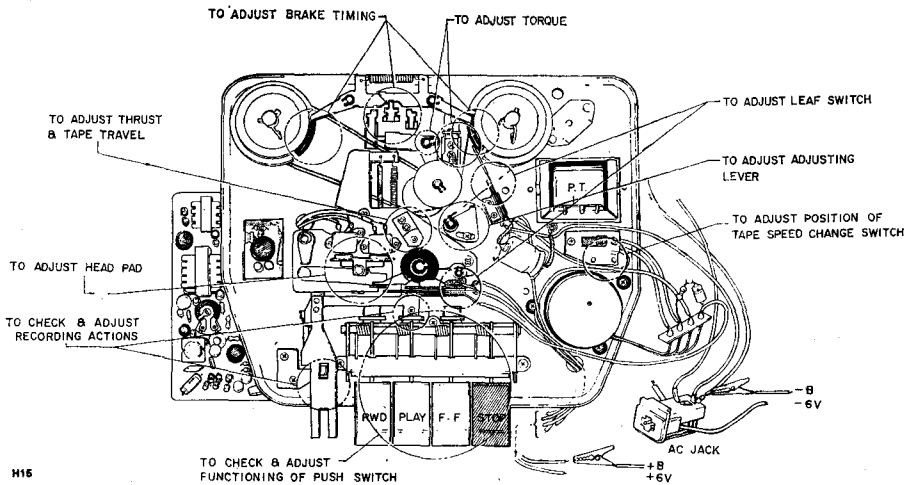
## TAPE RECORDER SERVICING



(H16) COMPONENT LOCATIONS—TP-730, TP-730S AND TP-730H

## AIWA

and one setscrew from volume holder. Unsolder lead wires from battery terminal plate. Turn over case and remove four jacks AUX. EXT. MIC. and REMOTE.



(H15) ADJUSTABLE PARTS—TP-730, TP-730S AND TP-730H

## AIWA

## Model TP-1004

**General Description:** Portable stereo cassette tape recorder, capstan drive, four track. Power source, 6-volt battery, interchangeable A.C. 110-220 volts 50 c/s.

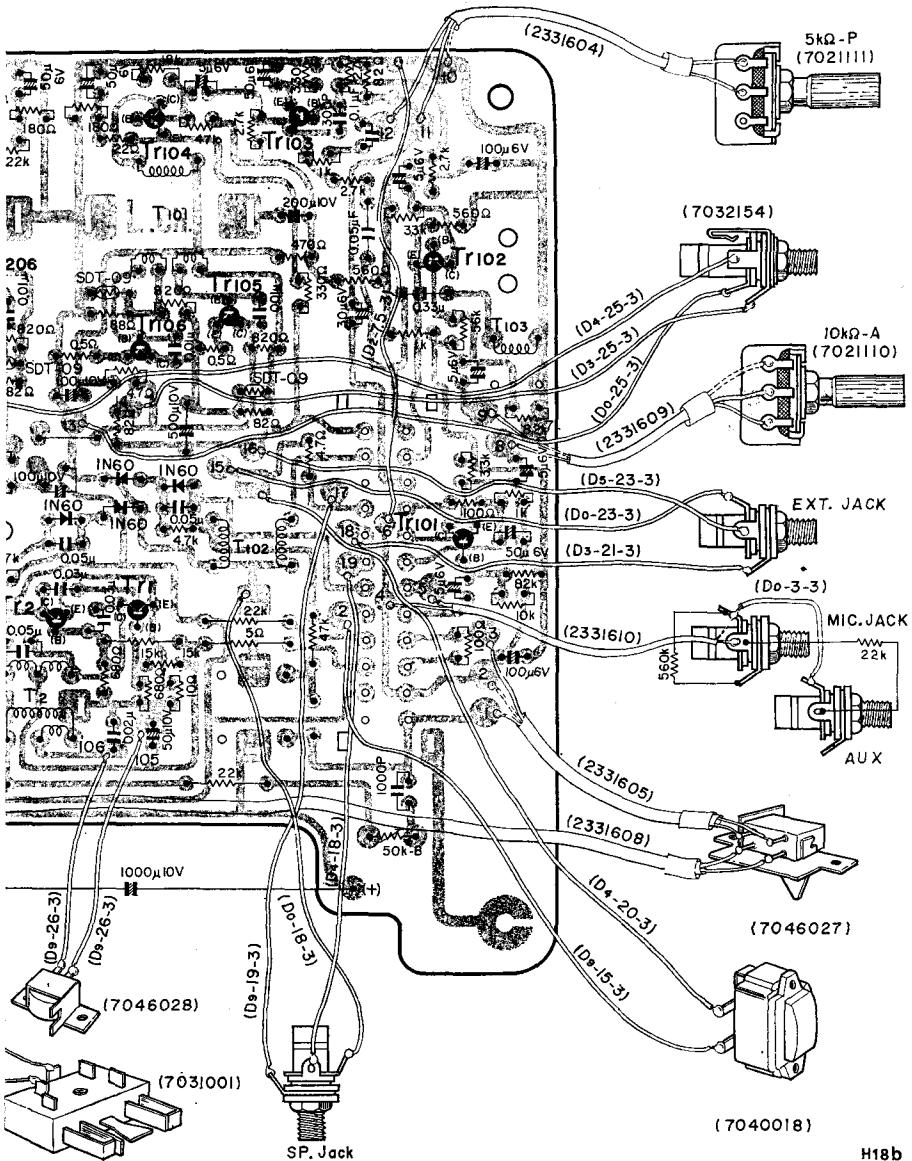
**Dismantling:** To remove back lid: Take out five setscrews and move A.C. jack out of groove. To take out chassis assembly: Remove five screws securing chassis assembly and stud securing back lid. Remove one set-screw in side of case. Pull off four control knobs. Remove nuts on head-phone and speaker jacks.

**Cleaning:** When surface of Recording/Playback head slit is dirty, contact between tape and the head slit becomes improper, resulting in insufficient output. Failure to erase may also occur.

Wipe the slit surface clean, using a soft piece of cloth moistened with alcohol or carbon tetrachloride. The slit is so narrow that ample care should be taken in cleaning.

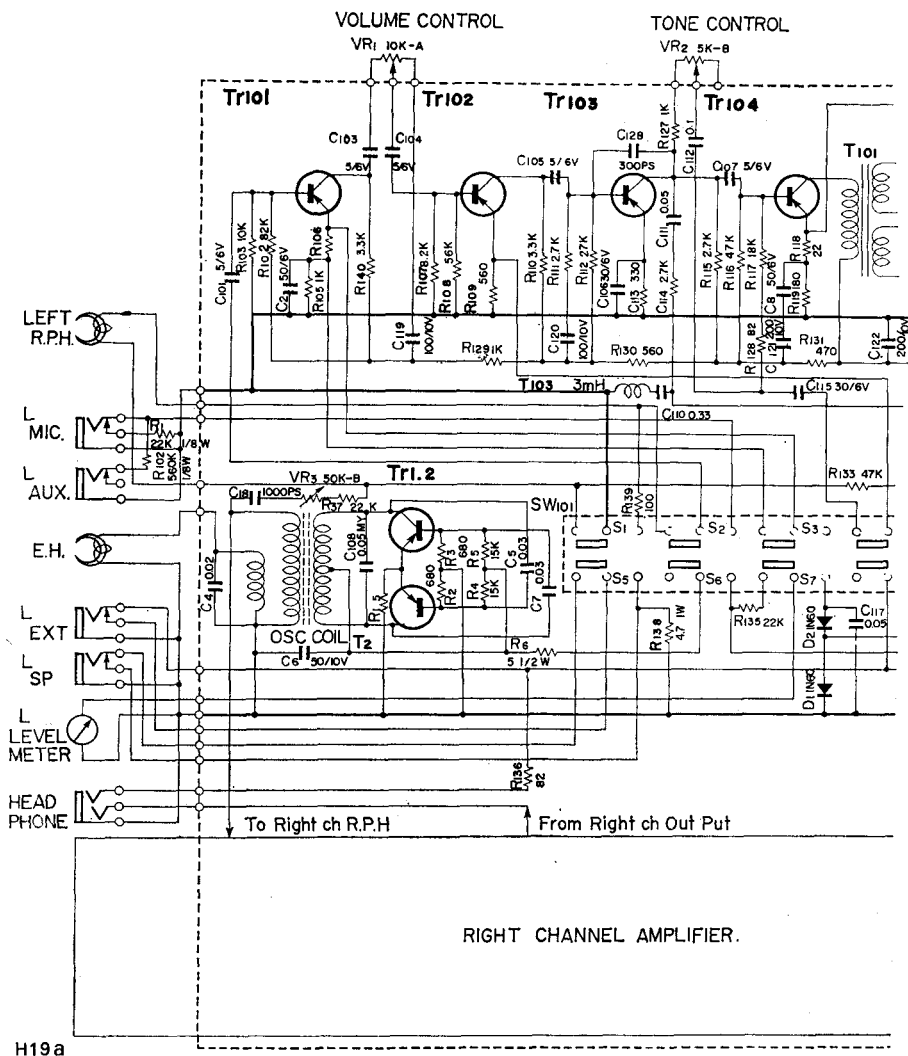
## (HI8a) COMPONENT LOCATIONS--TP-1004 (PART)





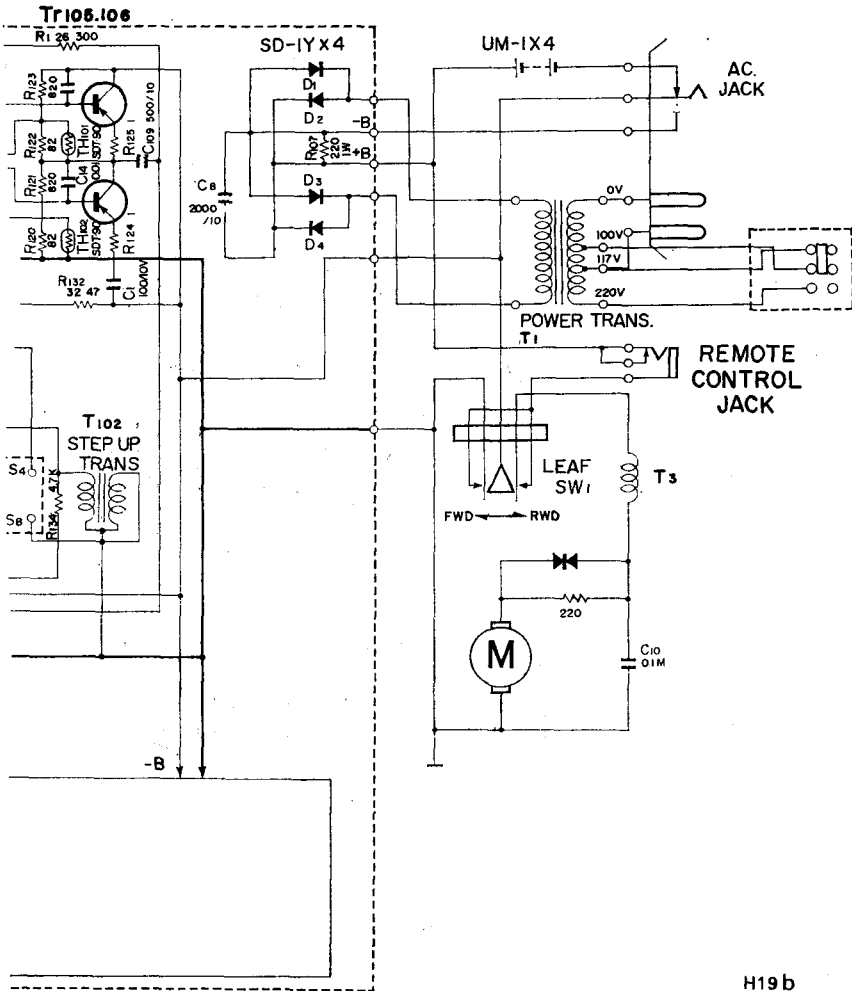
(H18b) COMPONENT LOCATIONS—TP-1004 (CONTINUED)

# TAPE RECORDER SERVICING



H19a

(H19a) CIRCUIT DIAGRAM—TP-1004 (PART)



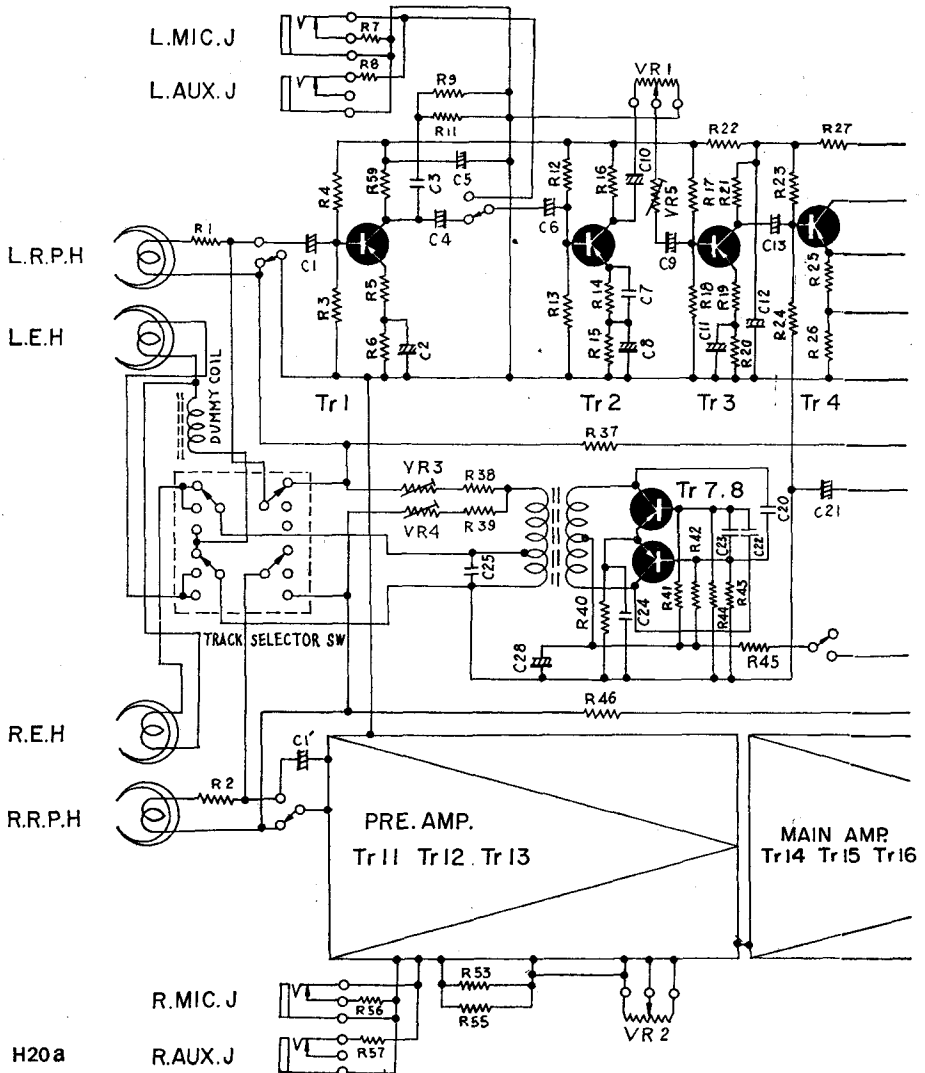
H19b

(H19b) CIRCUIT DIAGRAM—TP-1004 (CONTINUED)



**AIWA****Model TP-1014**

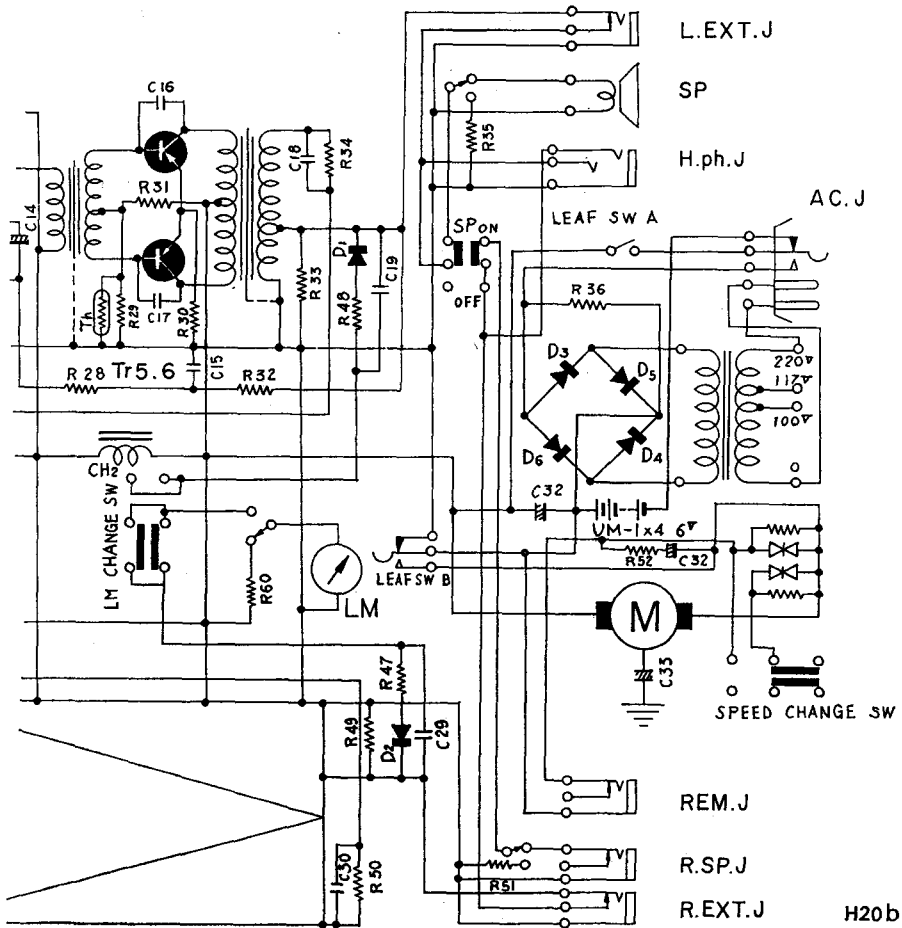
**General Description:** Four-track stereo (transistorised) tape recorder.  
 Power source (1) 6 volt battery (2) A.C. plug-in 110-125 volts 50/60 c/s.  
 (3) A.C. plug-in 220-240 volts 50/60 c/s.



(H20a) CIRCUIT DIAGRAM—TP-1014EH (PART)

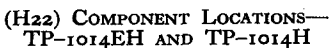
**Dismantling:** Similar to that given for model TP-730 described in this volume, but, in removing back lid note that the nut securing the RIGHT speaker must be removed.

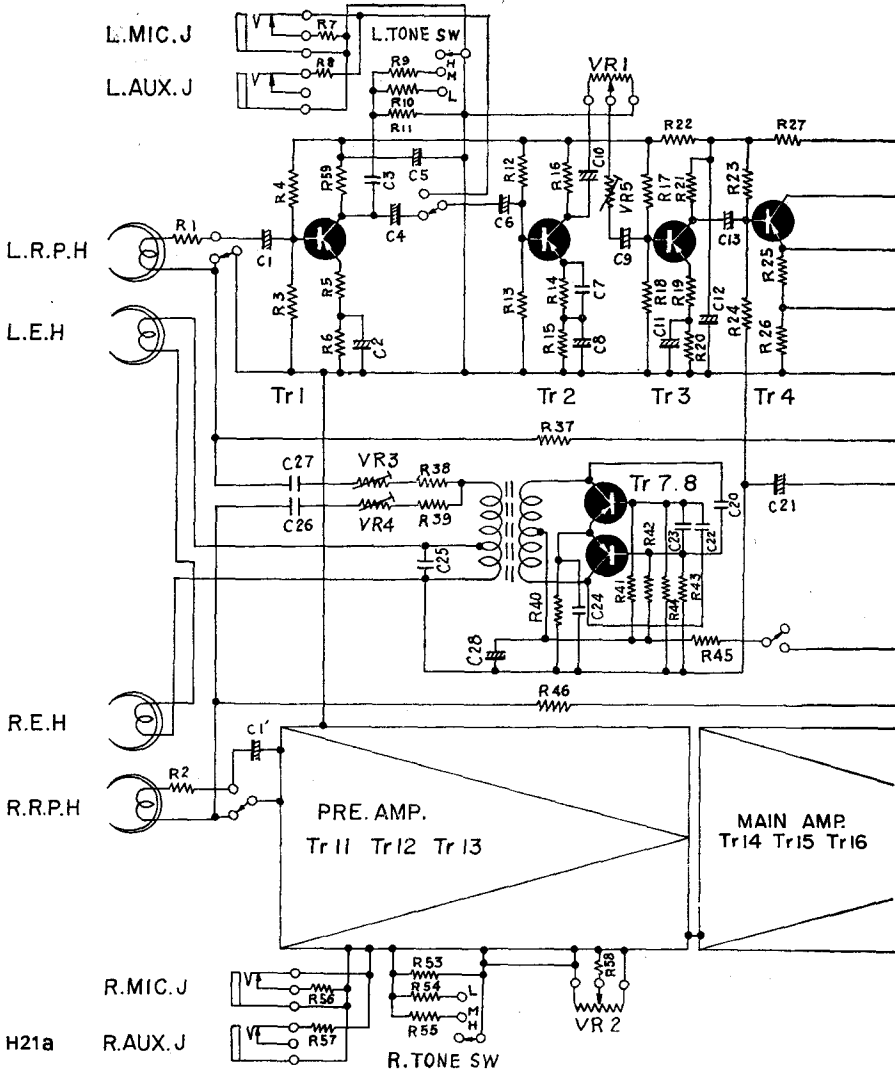
**Note:** The "adjustable parts" diagram given for the TP-730, also applies to the TP-1014.



(H2ob) CIRCUIT DIAGRAM—TP-1014EH (CONTINUED)

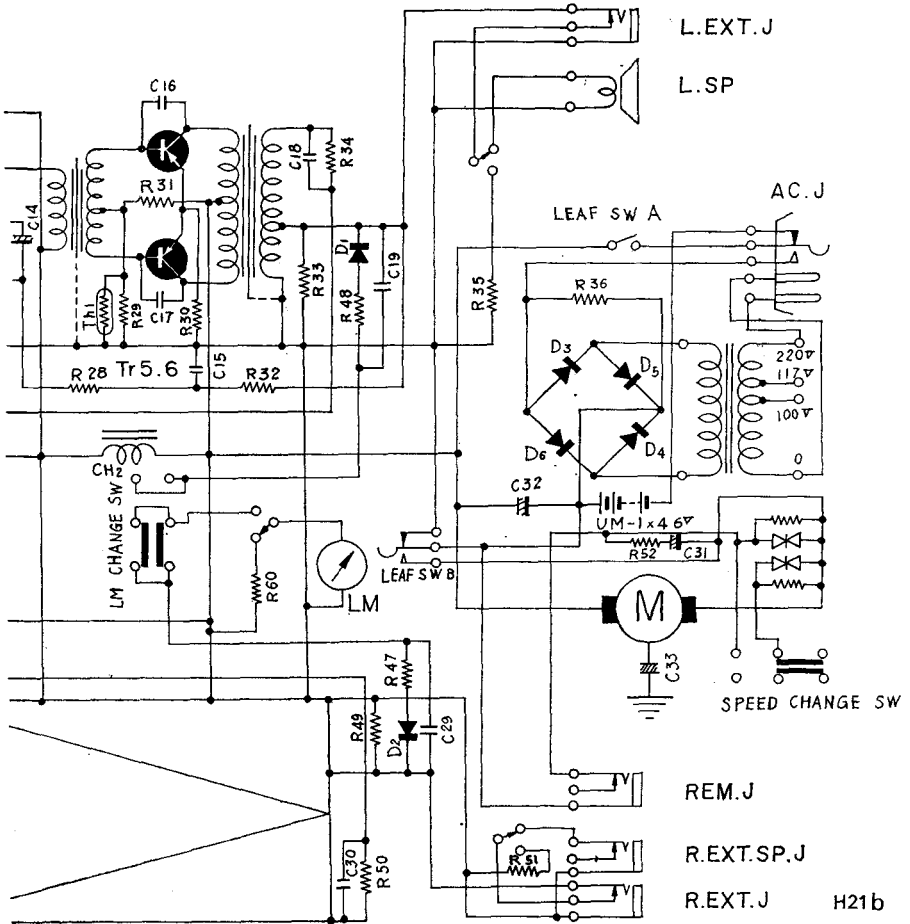
## TAPE RECORDER SERVICING





(H21a) CIRCUIT DIAGRAM—TP-1014H (PART)

## TAPE RECORDER SERVICING



(H21b) CIRCUIT DIAGRAM—TP-1014H (CONTINUED)

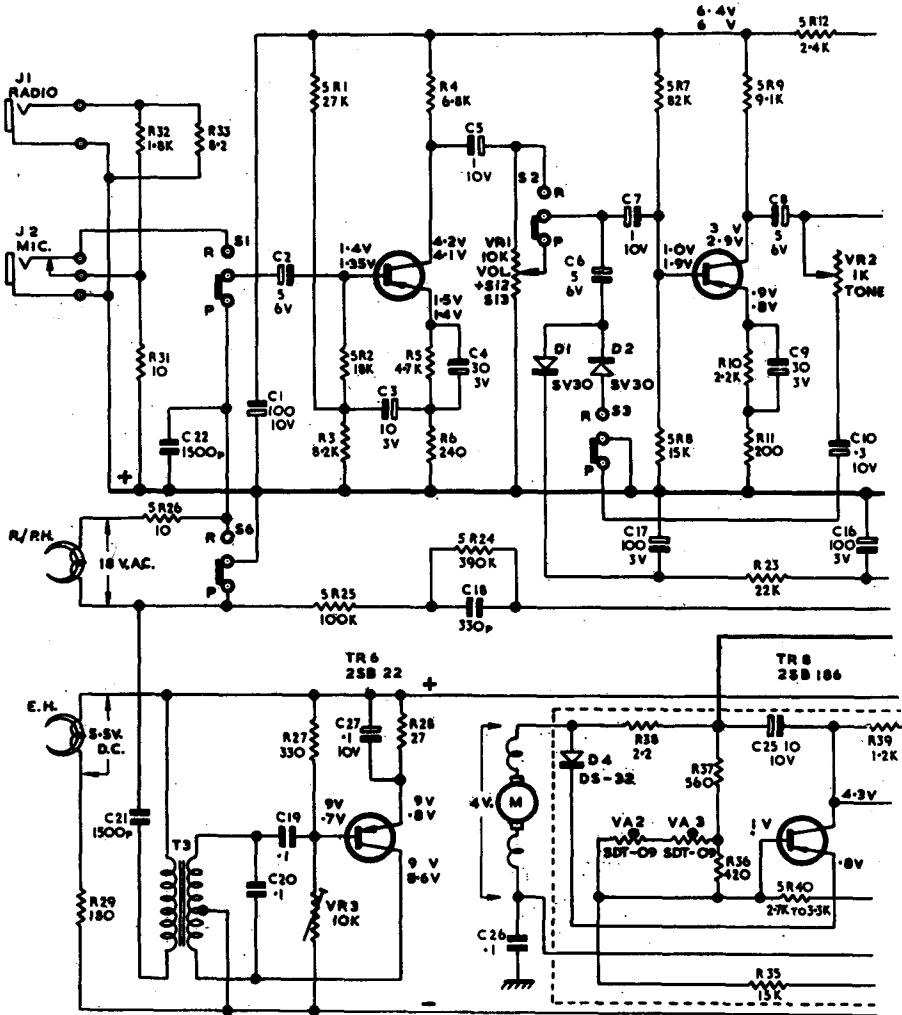
# ALBA

## Model R19

**General Description:** Eight-transistor portable tape recorder. Power output 450 mW. undistorted, 800 mW. maximum. A.C. record bias and D.C. erase bias. Frequency response 100-6000 c/s. at  $3\frac{3}{4}$  in./sec. and 100-3000 c/s. at  $1\frac{7}{8}$  in./sec.

**Warning:** When installing or adjusting Head angle all tools used must be non magnetic, otherwise parts located near the tape may become magnetised, causing static.

# ALBA



NOTE: -CCT. SHOWN IN PLAY POSITION.

S1 - S6 RECORDING SWITCH

S7 SWITCH ON AT RECORD AND PLAY

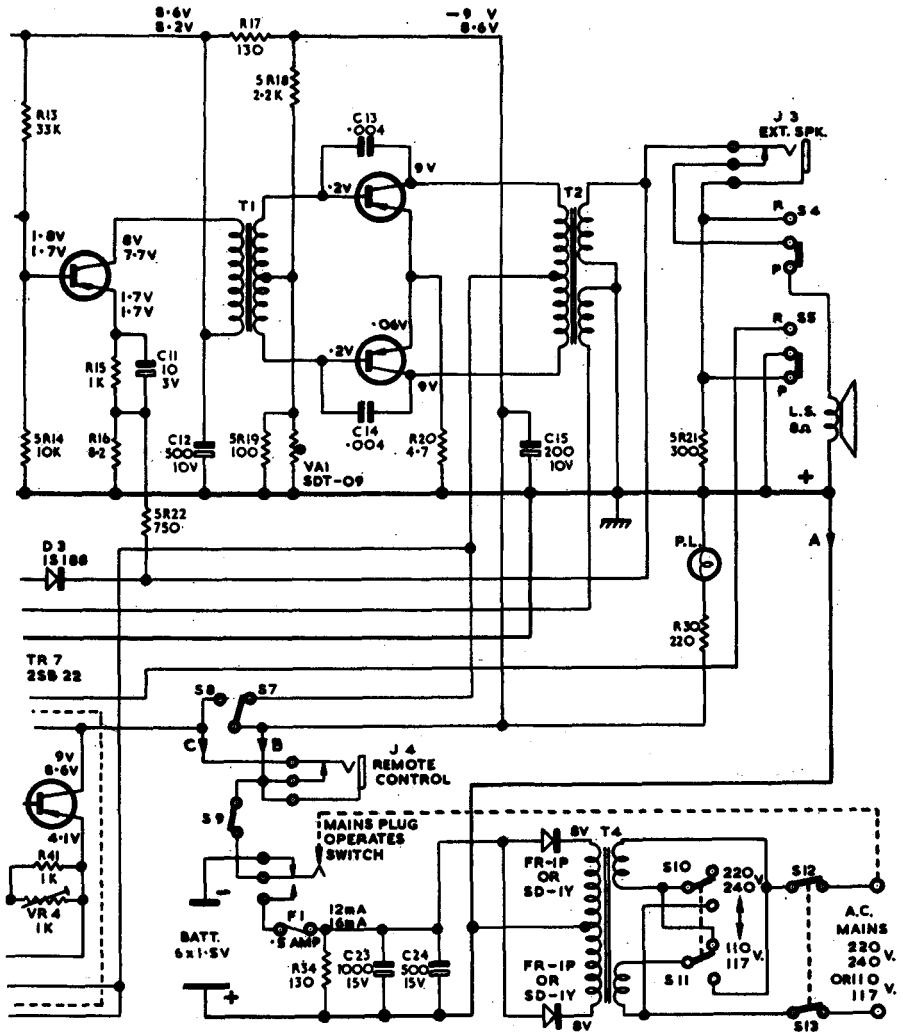
S8 SWITCH ON AT REWIND AND FAST FORWARD

S9 POWER SWITCH "SWITCH OFF AT STOP"

F85a

(F85a) CIRCUIT DIAGRAM—MODEL R19 (PART)

# TAPE RECORDER SERVICING



PREFIX 5 ON R's IS  $\pm 5\%$ .  
 UNMARKED R's  $\pm 10\%$ .  
 VOLTAGES TAKEN WITH A.V.O. 8, RELATIVE TO BATT. +  
 NO SIGNAL INPUT. 240V MAINS.  
 ON DUAL VOLTAGE FIGURES  
 UPPER IS PLAYBACK, LOWER IS RECORD.  
 ADJUST VR3 FOR 98mV. ACROSS R26.  
 ADJUST VR4 FOR 4V. ACROSS MOTOR.

F85b

(F85b) CIRCUIT DIAGRAM—MODEL R19 (CONTINUED)

## DYNATRON

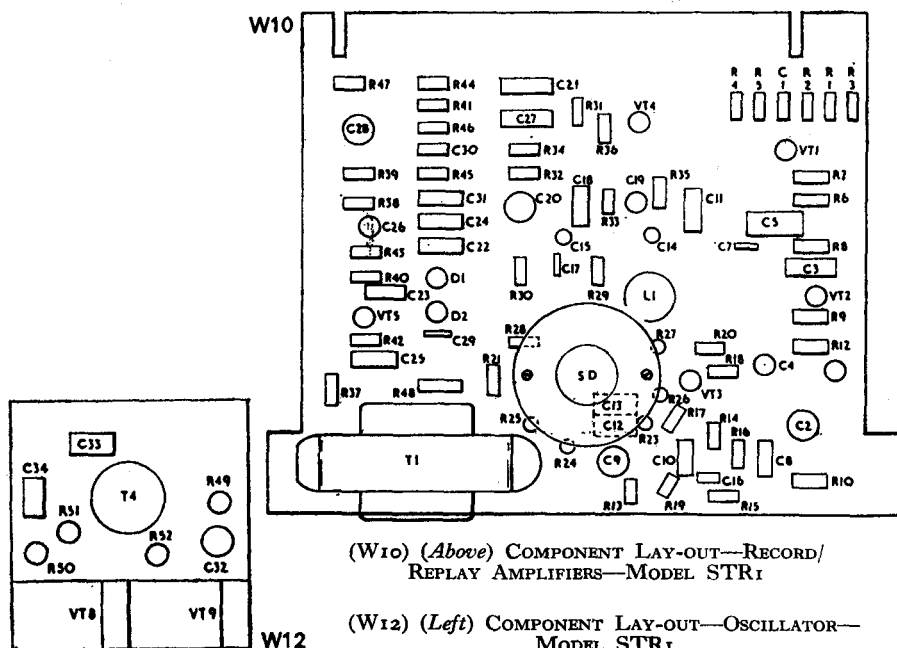
## Model STRI

**General Description:** A fully transistorised, three speed ( $7\frac{1}{2}$ ,  $3\frac{3}{4}$ , 1 in./sec.), four-track, stereo tape recorder with facilities for transferring recordings between tracks 1 and 3. Only the right-hand channel is shown. The left-hand channel uses an identical circuit. For use on 200-240-volt A.C. mains. The Modified Output Stage and Voltage Data is shown on the section of the Circuit Diagram 7c.

## Dismantling

**To Remove Head Cover:** 1. Slide off the speed selector knob (remove lock screw if fitted in end of knob). 2. Remove the two fixing screws at the top of the head cover. 3. Take off the cover. Follow reverse sequence when assembling.

**To Remove Main Cover:** 1. Remove head cover as above. 2. Remove the volume and selector knobs. 3. Remove five counter-sunk screws in the cover. 4. Remove the two smaller cheese-head screws in the cover. 5. Take off the main cover. Follow reverse sequence when assembling taking care that the main cover is not held off by displaced wires etc., or tape reels may foul cover.



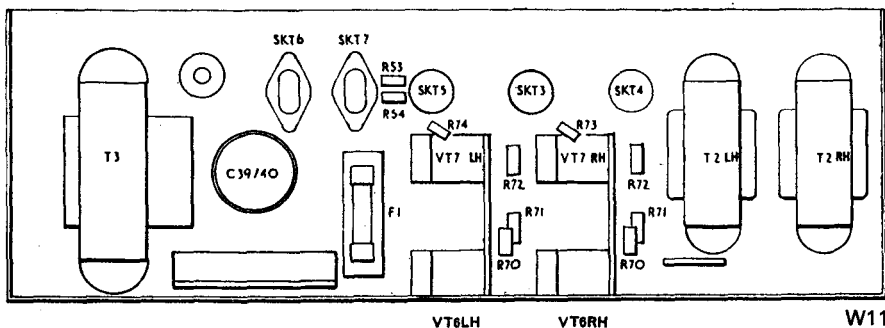


## TAPE RECORDER SERVICING

**To Remove Complete Machine from Case:** 1. Remove covers as above. 2. Locate and remove four cheese-head 4BA screws securing deck plate to case. One will be found at each rear corner of deck plate, another adjacent to the counter and the fourth is reached through an aperture in the meter mounting plate. 3. Lift complete machine from case and, if necessary, disconnect loudspeaker leads. When reassembling take care not to trap any wiring associated with selector switch.

**To Remove Amplifier Print Panels:** 1. Remove instrument from case. 2. Temporarily remove counter drive belt. 3. Loosen socket head set screw securing speed change lever to equalisation switch shaft and lift off bush from shaft. 4. Carefully withdraw completely the equalisation switch shaft. 5. Unsolder two link wires from top print panel and connector strip. 6. Remove tie strap from amplifier panel support plates. 7. Carefully ease off the connector strip from the top print panel and then withdraw the panel from the support plate guides in a direction parallel to the main deck plate. 8. Unsolder link wires on lower print panel as detailed above and withdraw in similar fashion. It is important that the rotors of the equalisation switch wafers are not moved or alignment difficulty will appear on reassembly. Also preserve and replace any insulating material fitted to prevent frame of T1 contacting support plate.

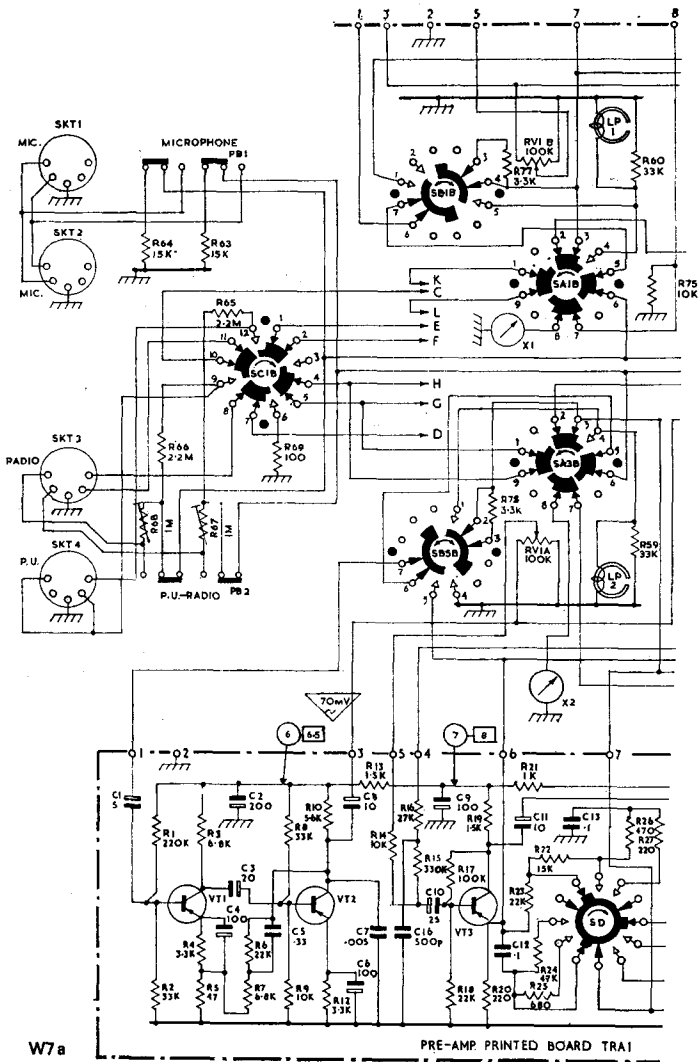
**Lubrication:** All main bearings are of the oil retaining type and rarely need lubricating. If it does become necessary a SPOT of oil can be applied to bearings of motor, capstan, pressure roller, intermediate drive wheel, reel hubs and drive belt pulley bearings. Use only a fine grade oil and at all costs avoid excessive use of the oil can. Any surplus oil should be removed with a clean rag. As a general rule, do not oil unless really necessary.



(W11) COMPONENT LAY-OUT—POWER AND O/P STAGES—MODEL STR1

# DYNATRON

L.H. CHANNEL AS R.H.

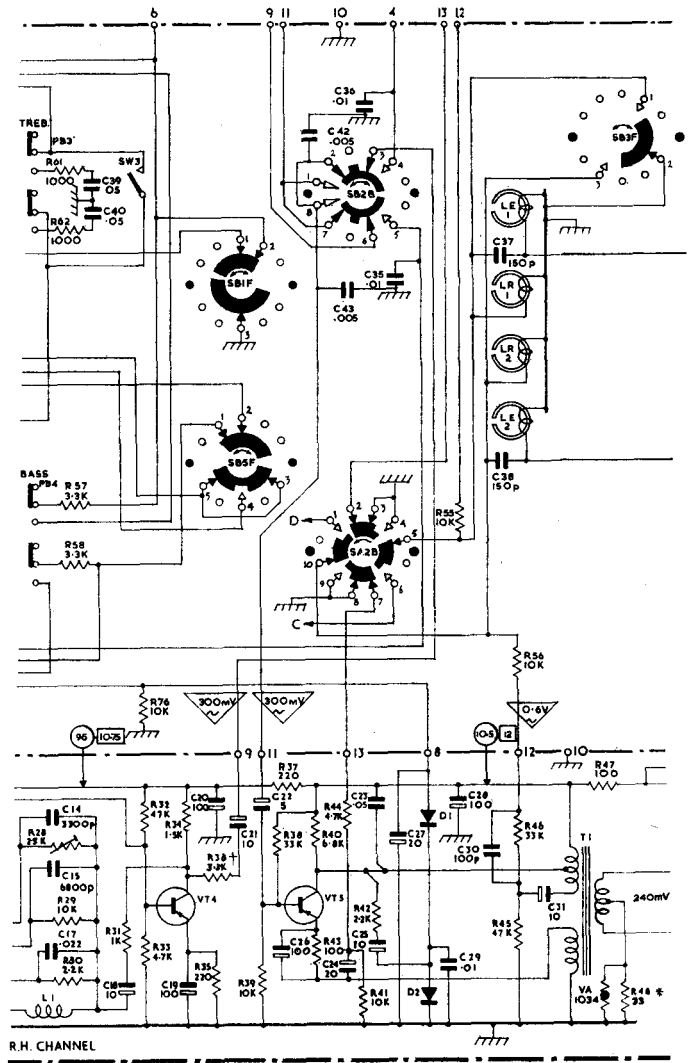


(W7a) Circuit Diagram—MODEL STR1 (PART)

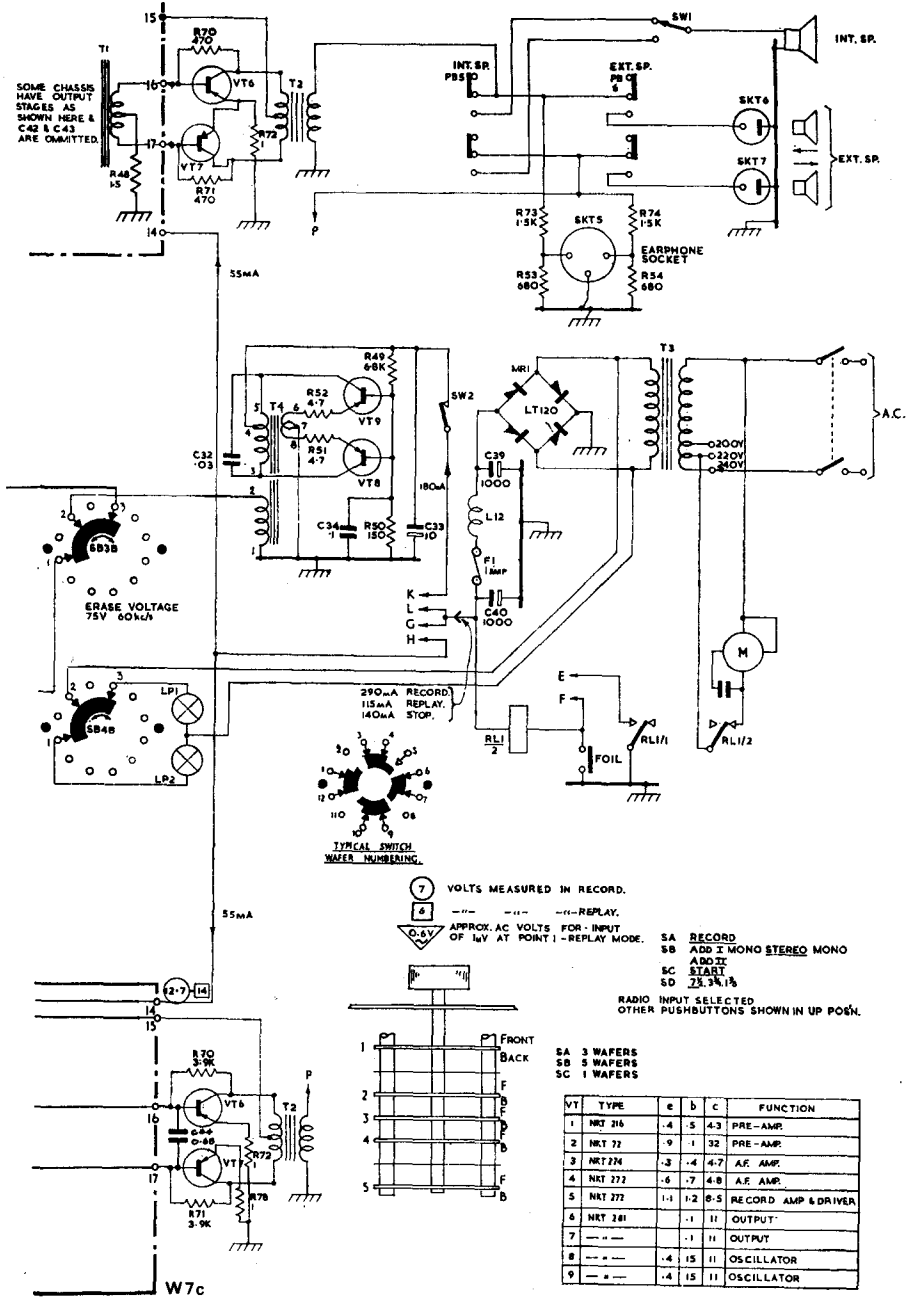
# TAPE RECORDER SERVICING

(W7b) (Below) CIRCUIT DIAGRAM—MODEL STR<sub>I</sub> (PART)

(W7c) (Right) CIRCUIT DIAGRAM—MODEL STR<sub>I</sub> (CONTINUED)



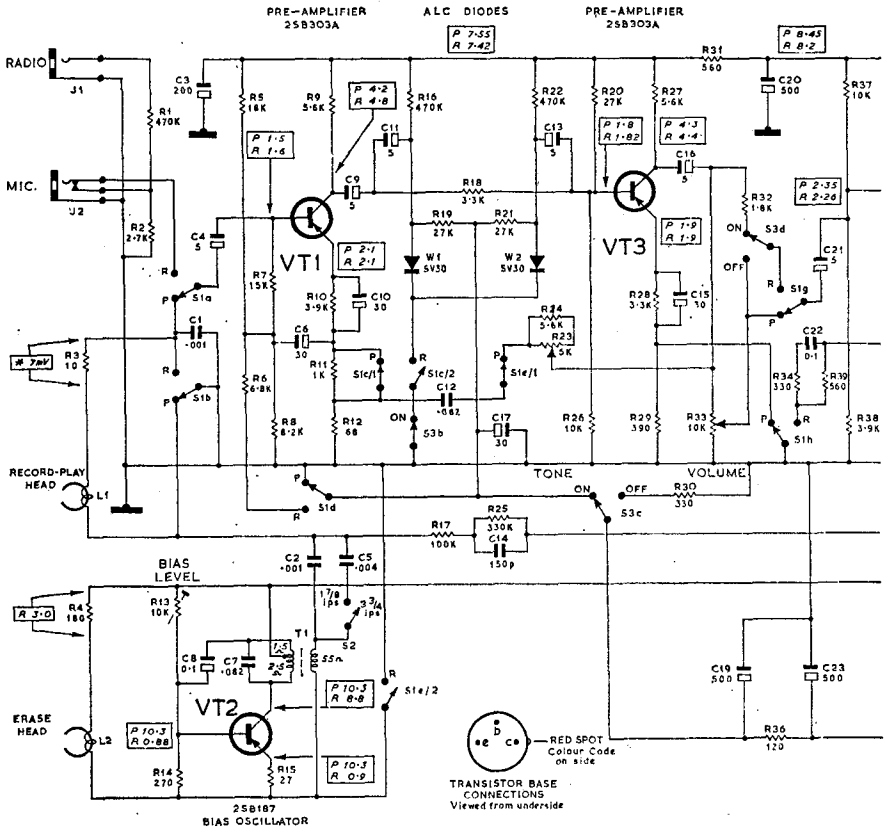
# DYNATRON



## FERGUSON

## Model 3234

**General Description:** Two-speed, two-track battery/mains tape recorder with 800 mW. output. Heads; standard half-track, one erase and one record/play. Speeds; 3.75 in./sec. and 1.875 in./sec. Counter, three digits press-button reset. Moving coil meter for record level and battery



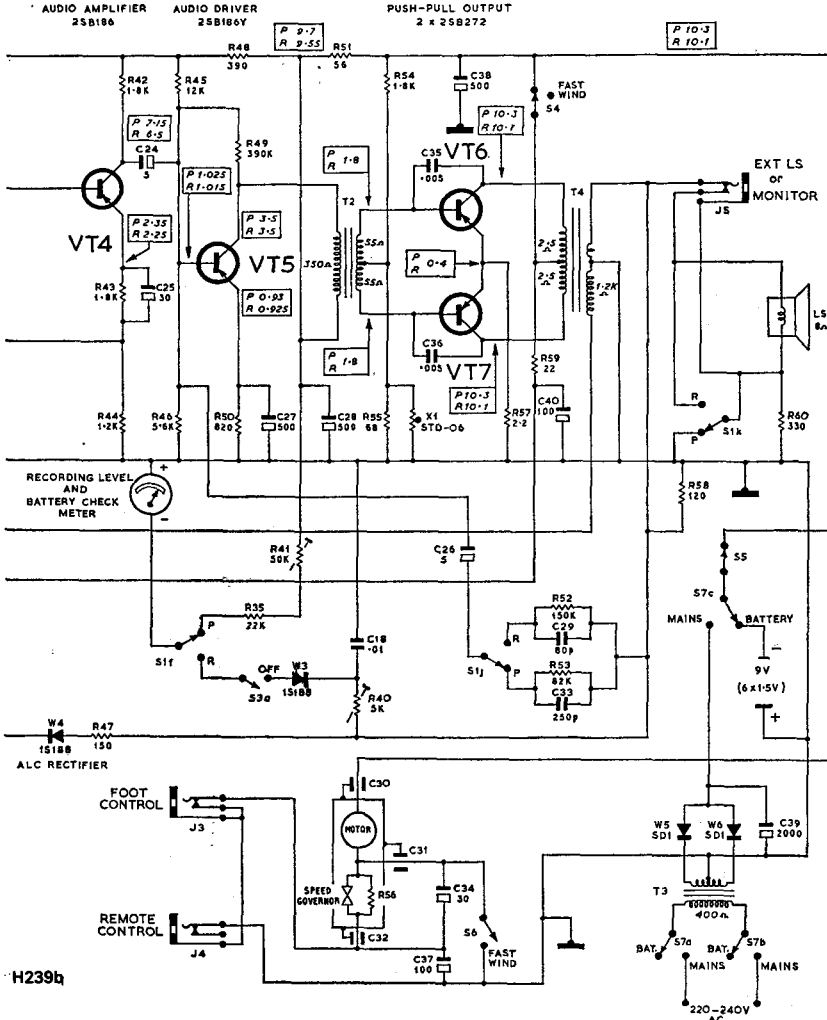
H239a

(H239a) CIRCUIT DIAGRAM—MODEL 3234 (PART)

# FERGUSON

indicator. Input Sockets; Microphone (low-level) and Radio (high-level). High-level monitor output socket (8 ohms). Battery, six 1.5-volt cells (HP2 or equivalent). A.C. mains 220-240-volt 50 Hz.

**Battery Check:** The condition of the batteries may be checked when the Battery/Mains switch is set to Battery. Depress the PLAY, FWD or REW key. If the batteries are good the needle of the Indicator will move into the



(H239b) CIRCUIT DIAGRAM—MODEL 3234 (CONTINUED)

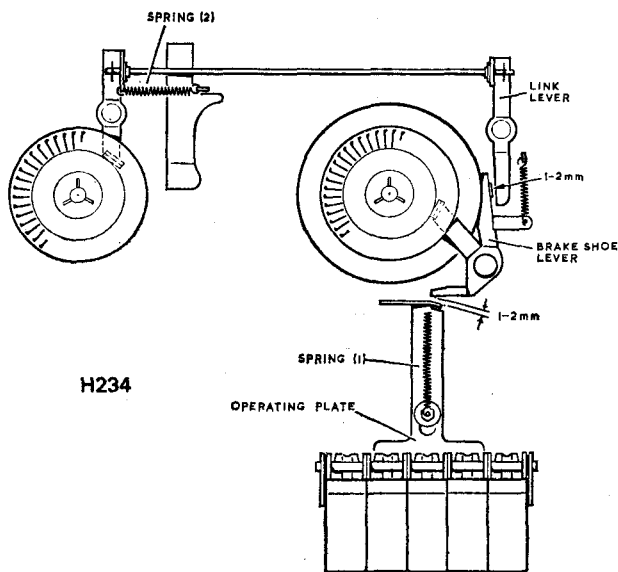
## TAPE RECORDER SERVICING

blue area, but the needle will remain in the red area if the batteries are weak.

**Automatic Level Control (ALC):** This facility is suitable for speech only. With the ALC switch ON, the Record Level (Volume) control and meter are inoperative.

**Speed Changing:** Pull off head housing. Rotate knurled cap (on top of capstan spindle) clockwise to remove sleeve. Fit sleeve on to speed compensation switch spindle adjacent to left-hand tape guide. Turn cap anti-clockwise to secure. This retains sleeve and operates speed compensation circuit.

**Dismantling (Tape Deck and Printed Board):** Remove battery compartment cover and extract batteries. Remove four screws (from underside of case) and withdraw deck and amplifier assembly. Slacken screw to release printed board retaining bracket, and hinge out printed



(H234) BRAKE MECHANISM

board. When returning printed board to normal position, ensure that the slide switch linkage is re-engaged.

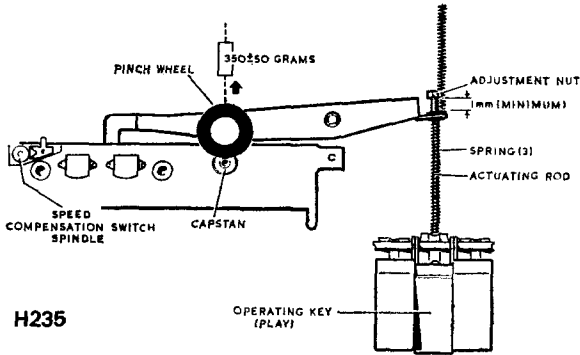
**Dismantling (Top Cover):** Unscrew (clockwise) knurled screw and remove pinch wheel. Remove six screws from underside of deck to release complete top cover assembly—the screws are colour stained for easy identification.

**Cleaning and Lubrication:** Petrol or carbon-tetrachloride should be avoided. A soft cloth (dampened with methylated spirits) should be used to clean the drive surfaces and head faces. Pressure pad and clutch pad

## FERGUSON

surfaces should be kept clean and fluffy. Only the slightest amount of oil should be applied to the bearing surfaces, and care must be taken to ensure that the oil does not reach the drive surfaces.

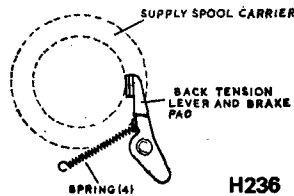
**Brake Mechanism:** See diagram H234. Adjust tension of spring (1) so that the Operating Plate is in close contact with the key levers. Check for 1-2 mm. clearance between operating plate and brake shoe lever also between brake shoe lever and link lever. Check condition of take-up spool brake shoe material and renew if necessary. Increase tension of spring (2) if braking is insufficient on supply spool.



H235

Left:  
(H235) PINCH WHEEL

Below:  
(H236) BACK TENSION

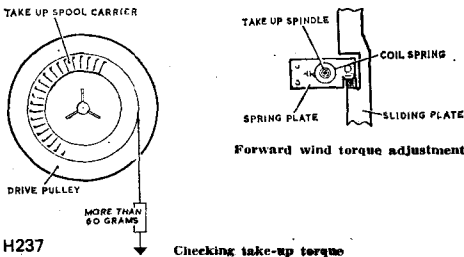


H236

**Pinch Wheel:** See diagram H235. Adjust effective length of actuating rod for minimum clearance of 1 mm. at point shown with recorder in the  $1\frac{1}{8}$  in./sec. mode (i.e. capstan sleeve removed and Play key depressed). Pressure of pinch wheel against capstan set by spring (3) with capstan sleeve removed should be  $350 \pm 50$  grams.

**Back Tension:** See diagram H236. A lightly loaded brake pad provides the necessary back tension by retarding the supply spool carrier during record, play or forward wind. The correct pressure set by spring (4) of the brake shoe against the spool carrier base is 5-7 grams.

**Take-Up and Forward Wind:** See diagram H237. The drive to the take-up spool carrier is transmitted from the spool carrier drive pulley through a felt clutch ring fitted under the spool carrier. A spring plate and coil

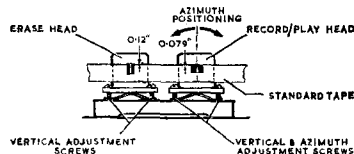


H237

Checking take-up torque

(H237) TAKE-UP AND FORWARD WIND

(H238) HEAD ADJUSTMENT



H238



## TAPE RECORDER SERVICING

spring mounted under the drive pulley presses the pulley upwards to maintain sufficient drive contact with the spool carrier. This pressure is increased to provide extra torque on forward wind by a sliding plate which raises the spring plate.

In the event of poor take-up or insufficient torque on forward wind, check for oil-stained clutch washer, weak pressure of idler against drive pulley, or insufficient upwards thrust under drive pulley. If the upwards thrust is insufficient, bend the sliding plate slightly to raise the spring plate.

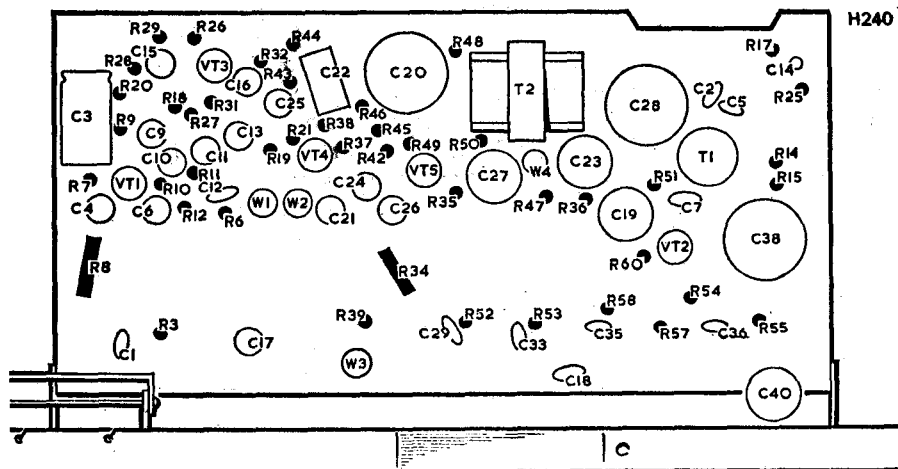
**Head Adjustment:** See diagram H238. Provision is made on the head mountings for both vertical (height) and horizontal (azimuth) adjustment. For optimum results use a pre-recorded standard tape with 5 KHz signal and adjust the play/record head for maximum reading on an audio output meter. Adjust the erase head for optimum erasure of a high-level recording.

**Record Level Meter Calibration:** With the record and play keys depressed and the ALC switch at OFF set the volume control to maximum. Connect a 1 KHz signal from an audio generator via an attenuator to the microphone terminals. Set the audio generator for 1 volt output and adjust the attenuator for -71 db signal at microphone terminals (approximately 300  $\mu$ V.). Adjust R40 so that the meter needle registers at the junction of the blue and red sections of the scale.

**Bias Level Adjustment:** Connect a valve millivolt-meter across R4 and with the machine in the Record mode adjust R13 for a reading of 7 mV.

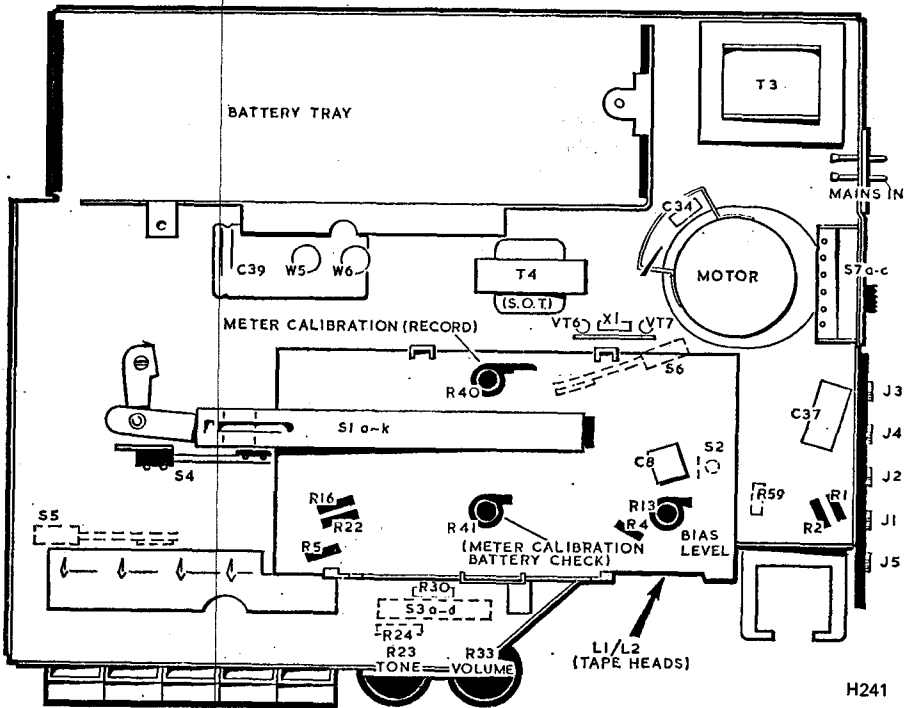
**Demagnetisation:** The normal precautions and procedure apply.

**Circuit Diagram Notes:** Figures in rectangles represent D.C. voltages measured with respect to positive chassis line. They were taken with an Avometer 8 during A.C. mains operation. Inductors have the D.C. resistance of their windings given where they exceed 1 ohm.



(H240) COMPONENT LOCATIONS—PRINTED BOARD

## FERGUSON



(H241) UNDERSIDE VIEW OF TAPE DECK ASSEMBLY AND AMPLIFIER ASSEMBLY

## FERGUSON

## Model 3216

**General Description:** This tape recorder is similar to the Ferguson Model 3214 described in the 1967-68 volume.

## FERGUSON

## Model 3230

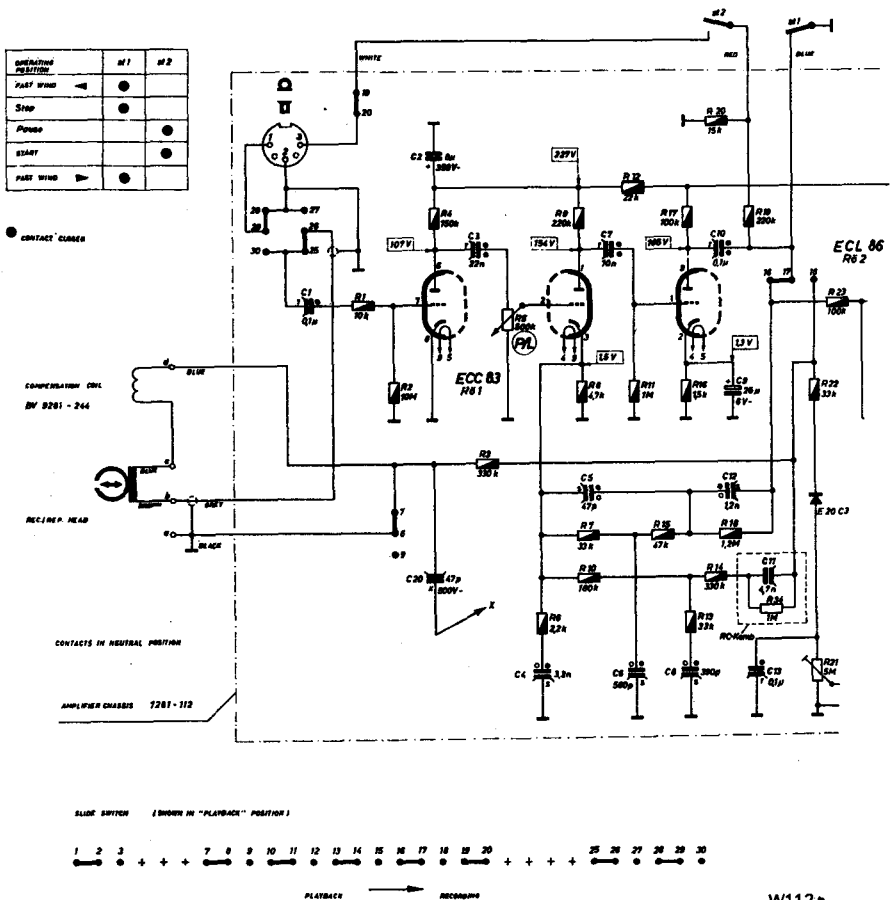
**General Description:** This tape recorder is similar to the Ferguson Model 3214 described in the 1967-68 volume.

# GRUNDIG

## Models TKI20, TKI25, TKI40, TKI45

**General Description:** The mechanical construction of this series of mains-operated tape recorders is almost identical. Model TK120 is a twin-track machine. Model TK140 is a four-track version of the TK120. Model TK125 is a twin-track machine. Model TK145 is a four-track version of the TK125.

Models TK125, TK140 and TK145 incorporate a digital position indicator and "end-of-tape" stop mechanism.



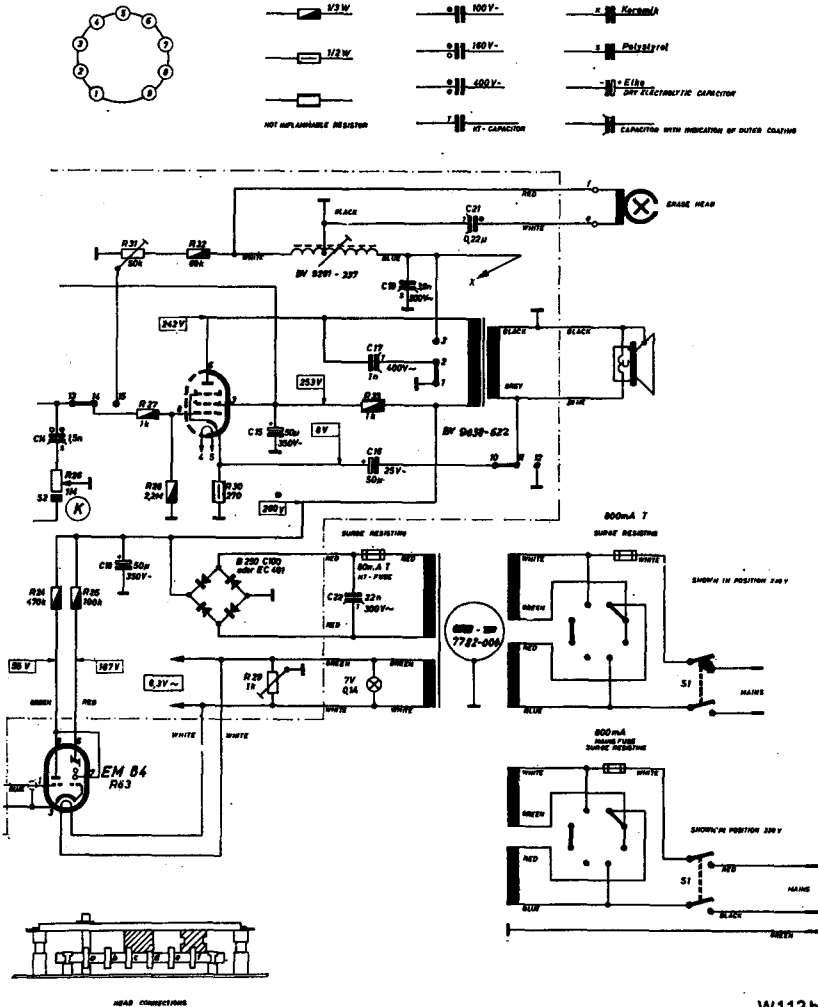
(W112a) CIRCUIT DIAGRAM—MODEL TK120 (PART)

**GRUNDIG**

**Dismantling:** Most components are accessible after removal of the top deck and the base. The top deck is held by five screws. Before this can be finally removed the selector switch knob must be pulled off. The magic eye is clipped to the top deck.

**Note:** Never remove the four sealed screws holding the sound channel assembly mounting plate.

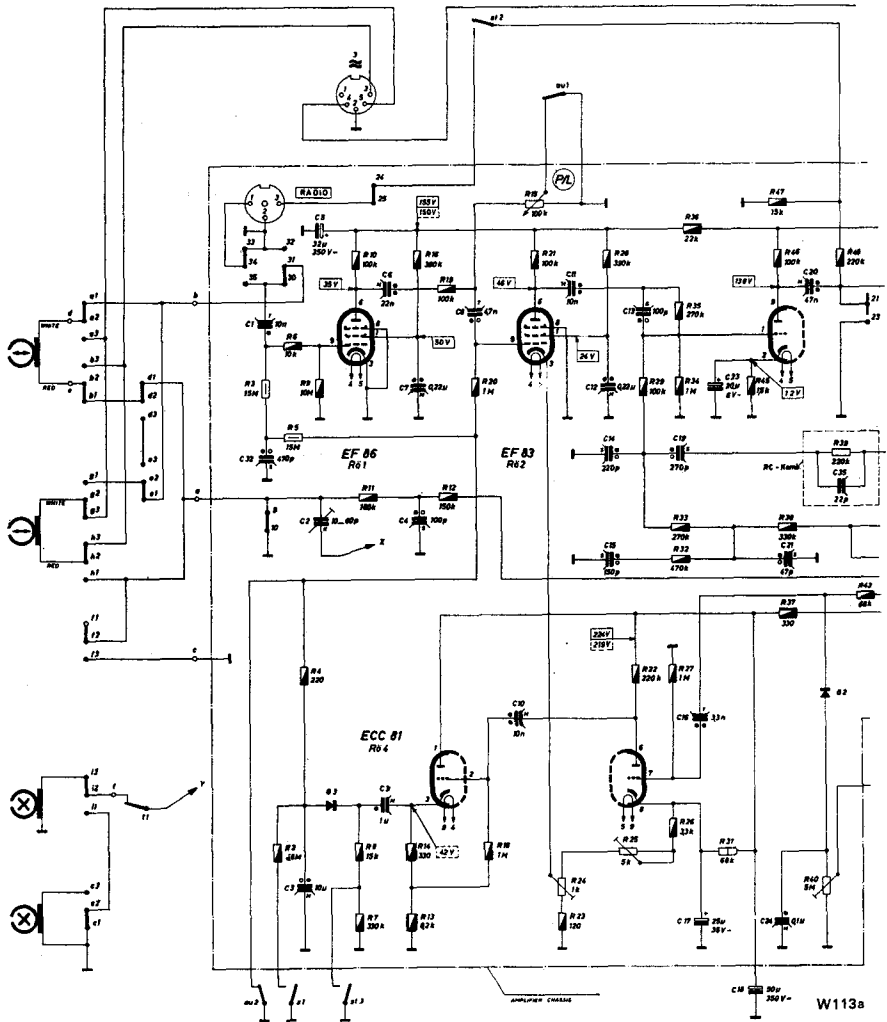
The base is held by four screws and the mains lead is taken through an opening in the storage compartment. To obtain access to the printed circuit,



(W112b) CIRCUIT DIAGRAM—MODEL TK120 (CONTINUED)

# TAPE RECORDER SERVICING

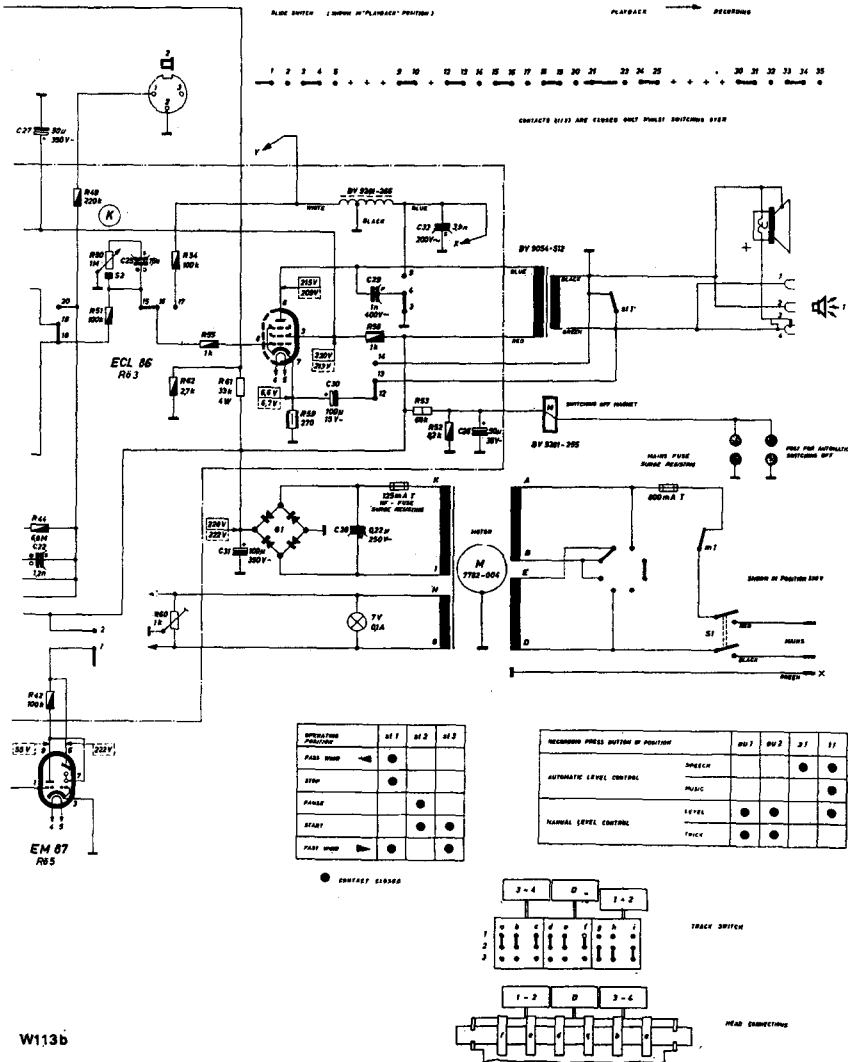
first remove the top deck and base. Remove the lever bracket by tilting towards the centre of the machine until one lug is free. Now move the bracket towards the printed circuit panel to free the second lug and then unhook the return spring. Free both sides of the printed circuit from its mounting studs and lift out. Reassemble in reverse order.



(W113a) CIRCUIT DIAGRAM—MODEL TK145 (PART)

# GRUNDIG

To change the two drive belts, remove the lower flywheel bearing, clean the lower flywheel spindle and pulley with a lint-free cloth and lift both drive belts through the chassis cut-out over the spindle. Remove the belts through the top of the machine. Engage the flywheel bearing in the chassis guide holes when reassembling.



(W113b) CIRCUIT DIAGRAM—MODEL TK145 (CONTINUED)

## TAPE RECORDER SERVICING

Before completing the reassembly, switch on the recorder briefly to re-position the magic eye. The recording button, control knobs and connecting socket are re-positioned automatically by the refitting of the top deck.

**H.F. Bias Setting:** To measure H.F. signals, use a capacitive potential divider, having a ratio of 1000:1, so that the voltage levels are read on the millivolt range of the meter (Grundig type VST24). Variable controls and trimmers should be set to their mid-position before adjustment. The H.F. bias frequency is 52–58 kHz. Next check the erase and record current as follows:

**TK120:** Adjust R31 for 41 volts measured across erase head and C20 to provide 82 volts across record head.

**TK125:** Adjust C2 for 82 volts across record head. The reading across the erase head should then be 33–36 volts.

**TK140:** Adjust R31 for not less than 9 volts across either erase head system. Then adjust C20 for a mean voltage level depending upon the colour code of the record head: Red-red = 53 volts; White-white = 63 volts; Black-black = 73 volts; Red-white = 58 volts; White-black = 68 volts.

**TK145:** Adjust C2 for a mean reading depending upon the colour code of the record head: Red-red = 53 volts; White-white = 63 volts; Black-black = 73 volts; Red-white = 58 volts; Red-black = 68 volts. The reading across the erase heads must then be between 10–12 volts.

Trick recording must not change the H.F. bias reading by more than +15 per cent. (TK125–TK145 only).

Where a valve volt-meter is not available approximate readings can be obtained across the heads with an Avo. 8.

<i>Model</i>	<i>A.C. range volts</i>	<i>Record bias volts</i>	<i>Erase volts</i>
TK120	100	60	55
TK125	100	45	40
TK140	25	20	6
TK145	25	20	6

## LOEWE OPTA

## Model Optacord 450

**General Description:** Ten-transistor, two-track, magazine-loading tape recorder. Frequency response 50–8000 c/s. at –6 dB. Power output 1.8 watts. Input socket for radio and microphone about 0.3 mV., 10 k $\Omega$  impedance. Output jack for radio 700 mV., 700 ohms, external loudspeaker 5 ohms or an earphone 5 ohms. Power supply 110 volts or 220 volts, 50 or 60 c/s., consumption 6 volts/amp. Battery supply 5 mono cells of 1.5 volts.

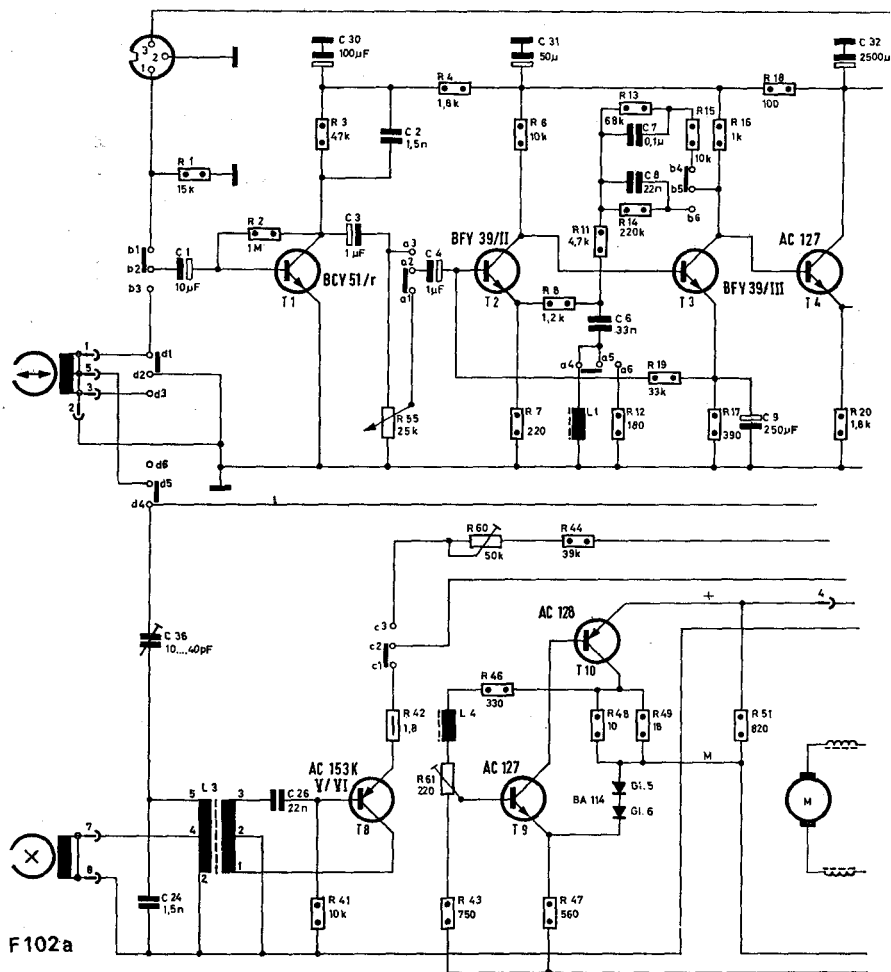
**The Quiescent D.C. Current of the Output Stage:** Adjust the D.C. current of the output stage with the potentiometer R59 to be 8 mA. This is equivalent to 8 mV. over R38/1 ohm. Hereupon, the output stage will be loaded at the output transformer with 4.7 ohms and then be checked with an oscilloscope at full load equivalent to 2.9 volts on 4.7 ohms at 1 kc/s. An overlapping fault in the output sine wave of the output transistors can be corrected by readjusting the D.C. initial current. The quiescent current for correctly paired output transistors may be 6 mA. min. and 10 mA. max.

<i>Measuring point</i> B = Base E = Emitter C = Collector	<i>D.C. voltage to earth × to + ive pole, E<sub>b</sub> = 7.5 volts</i>	<i>Playback level at 1 kc/s. applied on 1 ohm in the cold wire of the head</i>	<i>Record level at 1 kc/s. applied on 5 k<math>\Omega</math> series resistance in the microphone jack, R55 opened</i>
B1	560 mV.	0.3 mV.	0.2 mV.
C1	1.6 volts	12 mV.	8 mV.
B2	765 mV.	12 mV.	8 mV.
E2	113 mV.	—	—
C2	1.7 volts	7.5 mV.	8.1 mV.
C3	4.2 volts	520 mV.	530 mV.
E3	—	—	—
C4	7.3 volts	—	—
E4	1.1 volts	520 mV.	530 mV.
B5	1.5 volts	57 mV.	57 mV. adjusted
E5	1.3 volts	—	—
C5	6 volts	460 mV.	460 mV.
B6	× 150 mV.	190 mV.	190 mV.
B7	× 150 mV.	190 mV.	100 mV.
C6	× 7.5 volts	5.2 volts	5.2 mV.
C7	× 7.5 volts	5.2 volts	5.2 mV.
E6/7	× 10 mV. adjusted with R59	—	—
V <sub>imp</sub> at 4.7 ohms	—	3.2 volts	3.2 volts

**Motor Noise:** The distortion of the motor is to be measured at the radio output socket after laying on an empty magazine. Use a valve volt-meter able to measure dB and peak values with electric ear characteristic. Set



# TAPE RECORDER SERVICING

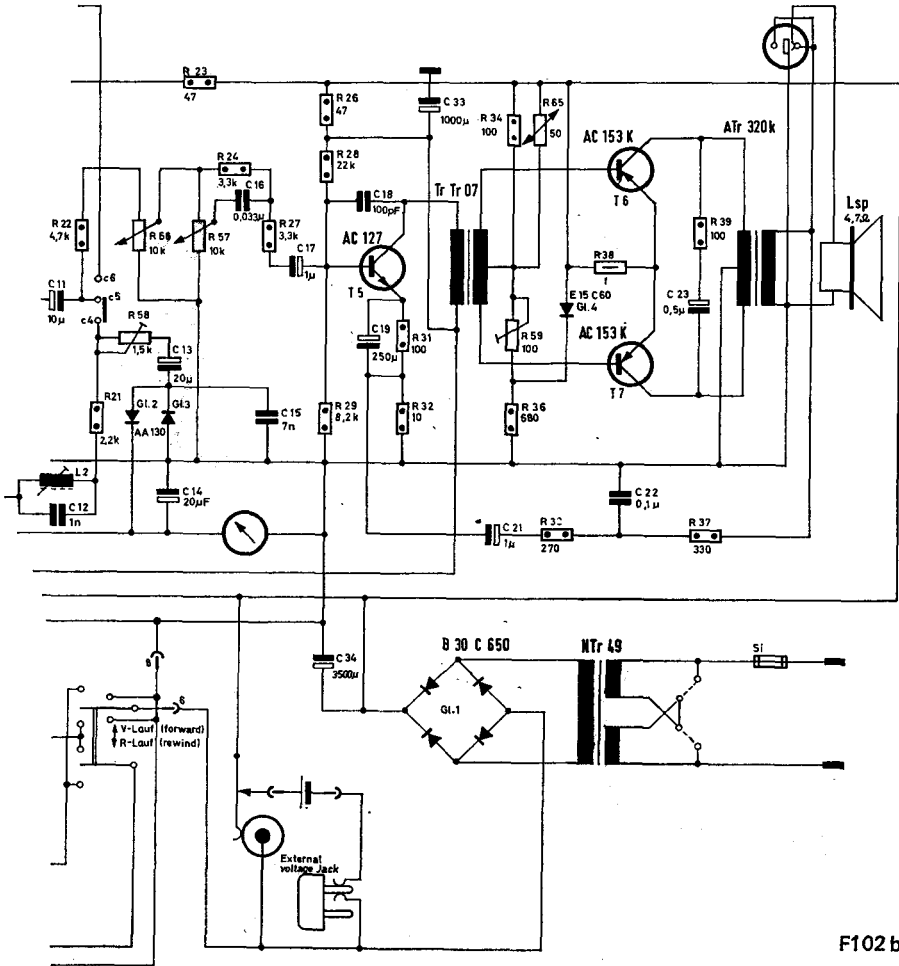


(F102a) CIRCUIT DIAGRAM—MODEL OPTACORD 450 (PART)

the valve volt-meter for measuring peak values and in the slow acting position. The noise level of the motor with this measurement may not exceed 10 mV.

**Drive Noise:** At normal playback operation, the drive noise of the set, measured when driven from a battery, is  $\leq 40$  phons. The measurement is taken at 10 cm. over the record/play head.

# LOEWE OPTA



(F102b) CIRCUIT DIAGRAM—MODEL OPTACORD 450 (CONTINUED)

## MARCONIPHONE

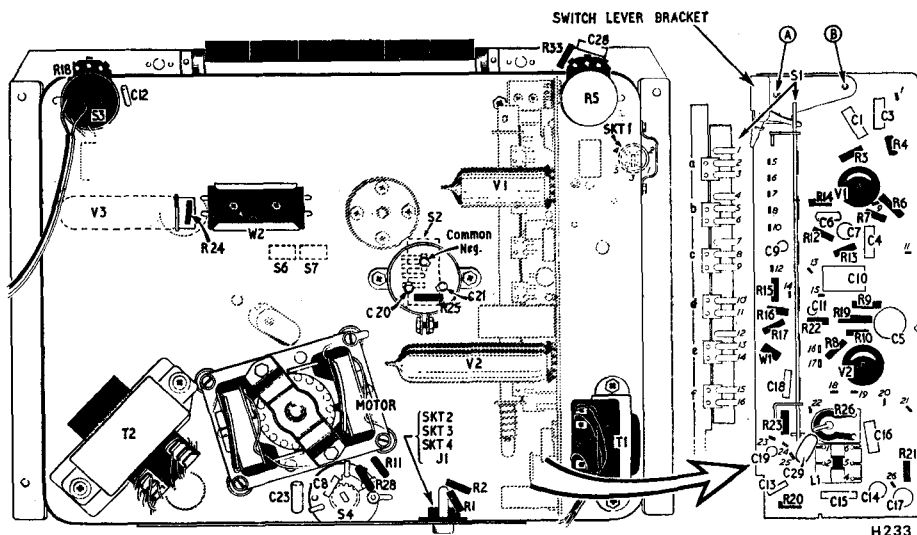
## Model 4216

**General Description:** Tape recorder employing Tape Deck Thorn type DB42. Output power 3 watts. Digital type position indicator. Input Sockets; Microphone (1.5 mV. into 10M), Radio (1.5 volts into 68k), and Pickup (75 mV. into 3.3M). Output Sockets; Radio (500 mV. at 22k), and External speaker (3 watts at 3 ohms). Power supply 200–250 volts, A.C. 50 c/s.

**Note:** 1. When the output socket for the external speaker is used, the internal speaker is automatically muted. 2. See page 383 of 1967–68 volume for Thorn type DB42 tape deck.

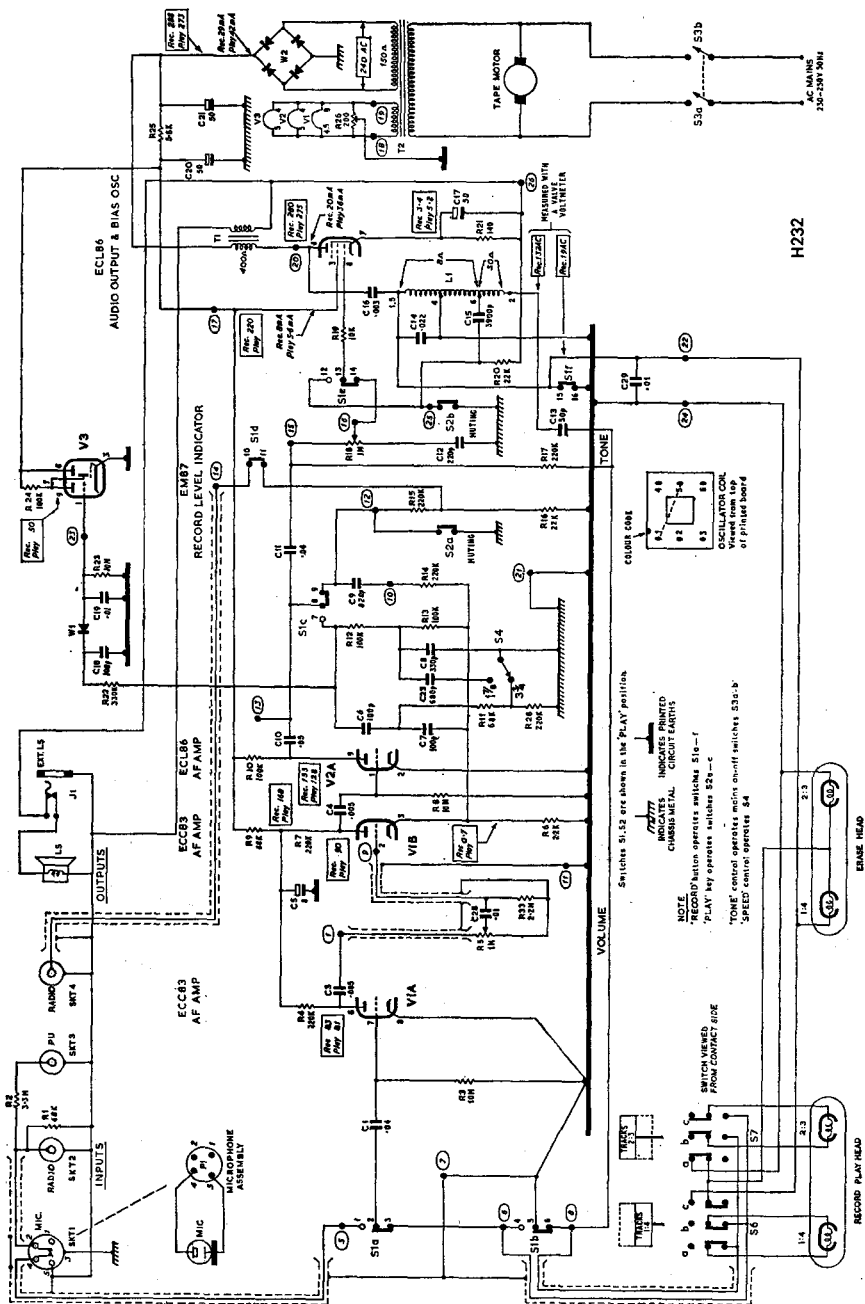
**Heater Balance:** The humdinger (R26) has been set during manufacture and should not be altered unless a valve change is made. If readjustment becomes necessary the procedure given below must be carefully followed. While setting the adjustment, the chassis must be electrostatically screened particularly around V1.

Take off the tape spools and set the instrument to "Record" with the tone control set to minimum and record level control at maximum. Connect a sensitive valve volt-meter between the junction of C10/C11 and chassis. Place a shorting lead across R20 to prevent the oscillator functioning and plug in a screened dummy microphone connector with a 1000-pF. capacitor strapped across pins 4 and 5. Allow the machine to warm up for 10 minutes, then adjust R26 for minimum reading on the valve volt-meter (approximately 50 mV.).



(H233) COMPONENT LOCATIONS

**MARCONIPHONE**



(H232) CIRCUIT DIAGRAM—MODEL 4216

## TAPE RECORDER SERVICING

**Demagnetisation:** It is important that there is no residual magnetism in the heads or the capstan spindle. This condition, which may arise if magnetised objects are brought near these components or if an ohmmeter is connected to the head windings, leads to an increase in background noise on PLAY. Suitable instruments for providing a demagnetising field are available from a number of manufacturers.

**Head Adjustment:** Provision is made on the head mounting for horizontal adjustment (azimuth) of the RECORD/PLAY head. Adjustment becomes necessary only when the manufacturer's setting has been disturbed. The head can be "rocked" on its mounting by making adjustments to the two mounting screws, one of which is fitted with a compression spring. To readjust, play back a standard azimuth tape with an output meter connected. Adjust the RECORD/PLAY head for maximum output using the volume control to keep the output level as low as possible. Avoid over-tightening the mounting screws as this may cause distortion of the head mounting.

**Dismantling (Top Cover):** To gain access to the tape deck for routine cleaning, pull off the control knobs and moulded head cover, then remove seven screws securing the moulded top cover.

**Dismantling (Chassis):** Having removed control knobs and covers, remove two screws from each side of the mechanism top plate. Remove pocket cover and then two screws securing storage compartment backing to the main chassis. The complete assembly (less loudspeaker) can now be lifted from cabinet. To disconnect loudspeaker pull the connecting leads from the speaker tags.

**Dismantling (Printed Circuit Board):** To obtain access to components located behind S1a-f, the printed board can be released from its mounting. Take out two small self-tapping screws securing the switch lever bracket to the main chassis and release a spring clip fitting into a slot at the other end of the printed board. The assembly can now be eased away from the main chassis.

**Component Locations:** V<sub>3</sub>, R<sub>24</sub> SKT<sub>1</sub>, S<sub>2</sub> and S<sub>6/7</sub> are located on the tape deck top plate. Accurate positioning of the switch lever bracket on the printed board is necessary for correct switch operation. Where the bracket has been removed, the following procedure should be followed for refitting. With printed board in position on the base plate and screws "A" and "B" slackened, adjust the printed board relative to the switch lever so that the switch lever arm just touches the baseplate; the screw holes in the printed board are oversize to allow for adjustment. Finally, tighten screws "A" and "B".

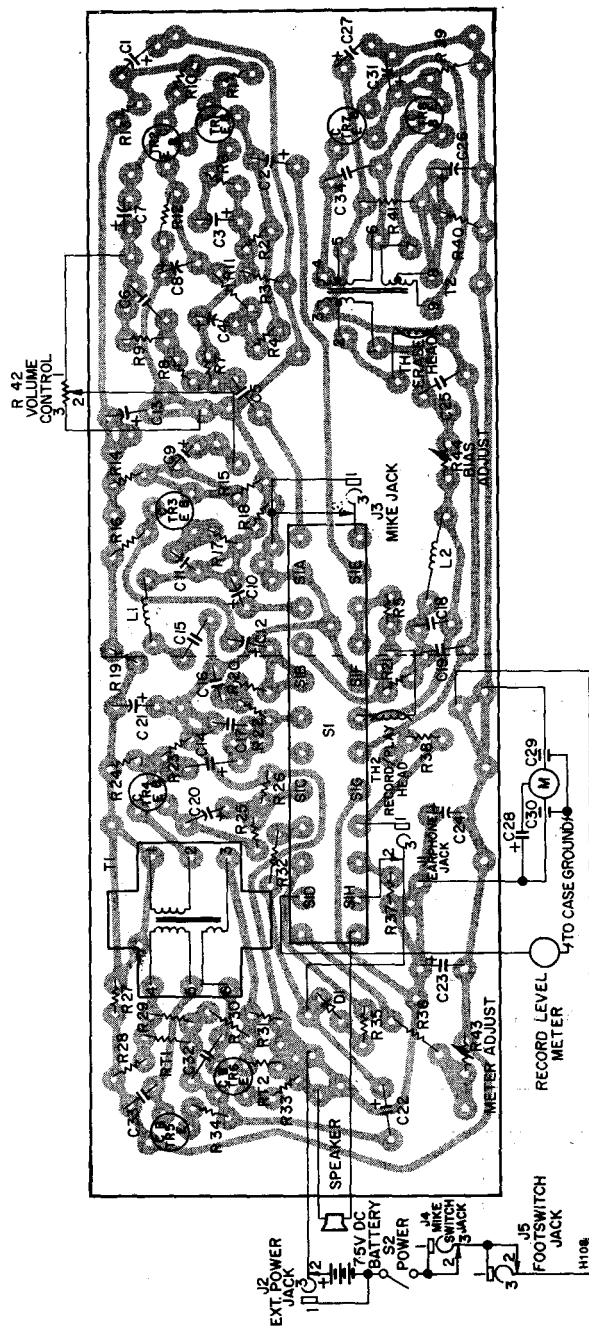
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## MARCONIPHONE

## Model 4212

**General Description:** This tape recorder is similar to the Marconiphone Model 4210 described in the 1967-68 volume.

# MONOGRAM



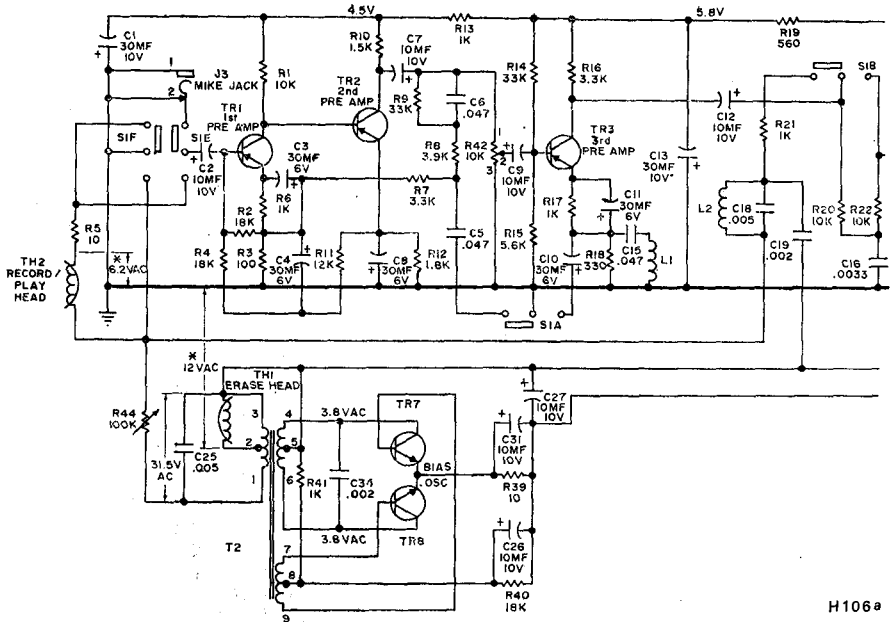
(H108) COMPONENT LOCATIONS—UOM8300 Monogram  
(Described overleaf)

**MONOGRAM****Model UOM 8300**

**General Description:** Capstan cartridge tape recorder for portable operation. VU meter for record level set, and remote control jack for an external footswitch. Power supply, five 1.5-volt cells.

**Circuit Diagram Notes:** S1 shown in record position. Unless otherwise noted, capacitors more than 1 are in pF. and capacitors less than 1 are in  $\mu$ F. All resistors are  $\frac{1}{8}$  watt.

**Voltages:** All voltages (given with respect to ground) measured with 20k/V. meter. Voltages marked with an asterisk taken in Record position. Voltages not marked with an asterisk taken in Play position.



H106a

(H106a) CIRCUIT DIAGRAM—MODEL UOM8300 (PART)

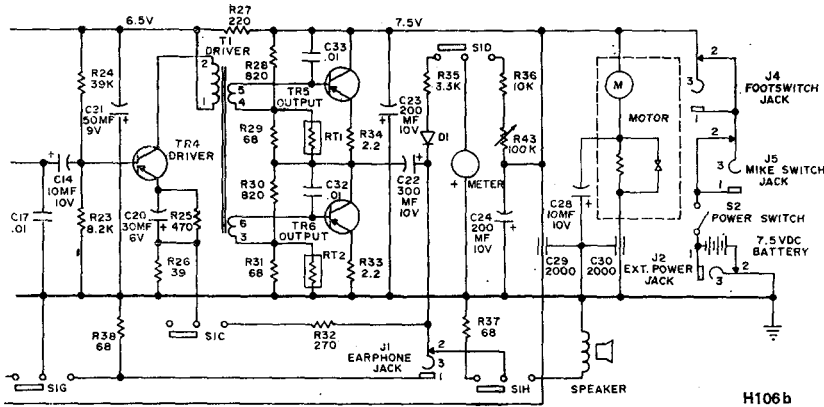
Transistor voltages

Tr	E	B	C
1	0.3	0.4	1.2
2	1.2	1.2	2.8
3	0.75	0.7	3.75
4	0.7	1.0	6.0
5	3.7	3.5	7.5
6	0	0.15	3.5
7	7.0	6.0	6.1
8	7.0	6.0	6.1

# MONOGRAM

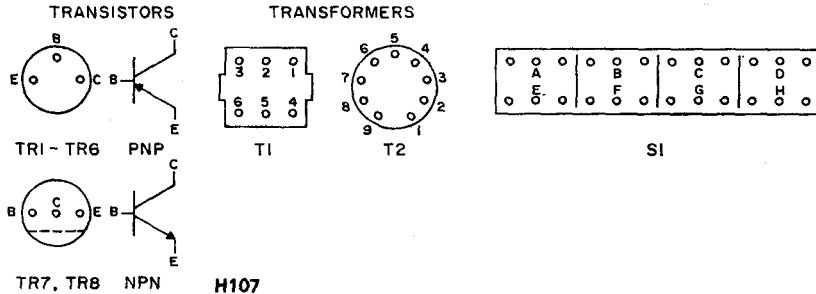
**Lubrication:** The mechanical parts are factory coated with a thin coat of light grease and should not necessarily require further lubrication. If a light grease is applied, use caution not to get any grease on the record and erase heads, other head unit components, tape reel compartments or selector switch.

**Dismantling:** To open the cabinet, remove screws from the cabinet back. To remove the component circuit board, remove the two screws holding it to the transport. To remove cabinet front, remove two side screws and two screws inside located at speaker end of transport.



(H106b) CIRCUIT DIAGRAM—MODEL UOM8300 (CONTINUED)

## BOTTOM VIEW OF COMPONENTS

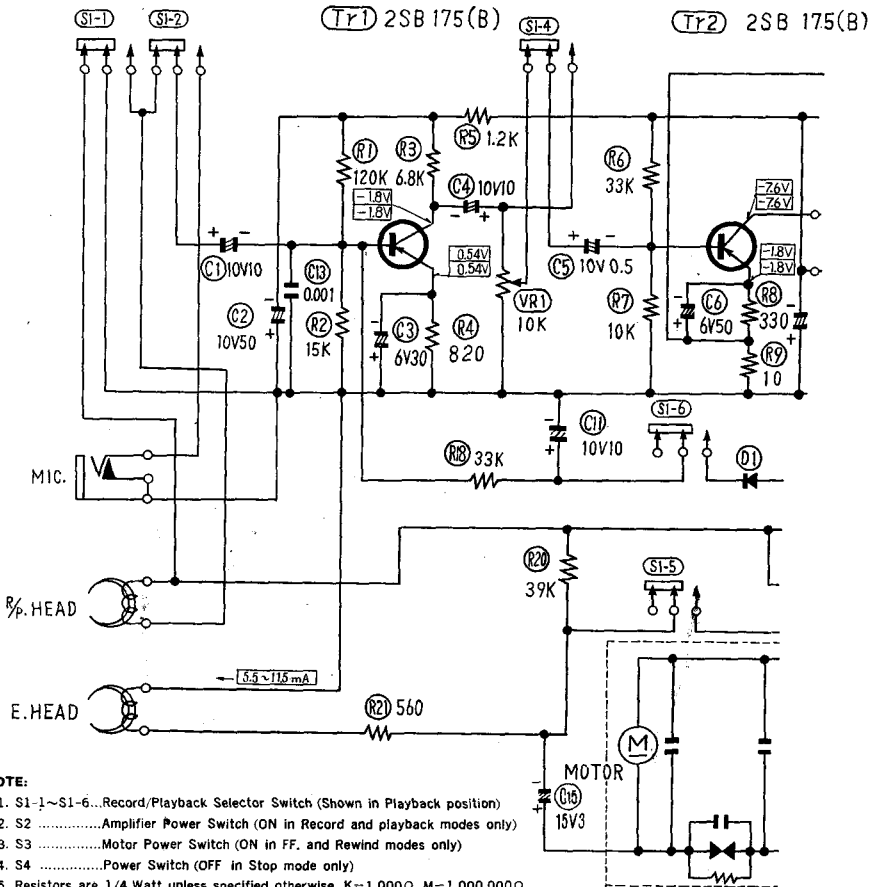


(H107) COMPONENTS—MODEL UOM8300



**NATIONAL****Model RQ-113S**

**General Description:** Solid state four transistor battery portable tape recorder. Power output 700 mW., D.C. bias and erase. Frequency response 150–6000 c/s. at  $3\frac{3}{4}$  in./sec. and 150–4000 c/s. at  $1\frac{7}{8}$  in./sec. Monitor output impedance 8 ohms. Erase current should be within the range 5.5–11.5 mA.

**NOTE:**

1. SI-1~SI-6...Record/Playback Selector Switch (Shown in Playback position)
2. S2 .....Amplifier Power Switch (ON in Record and playback modes only)
3. S3 .....Motor Power Switch (ON in FF. and Rewind modes only)
4. S4 .....Power Switch (OFF in Stop mode only)
5. Resistors are 1/4 Watt unless specified otherwise. K=1,000Ω, M=1,000,000Ω.
6. Capacitors are microfarad (μF) unless specified otherwise. PF=Micro-microfarads.
7. Values indicated in   are DC to chassis ground with no signal applied.
8. The upper values should be measured during playback and the lower values during recording.

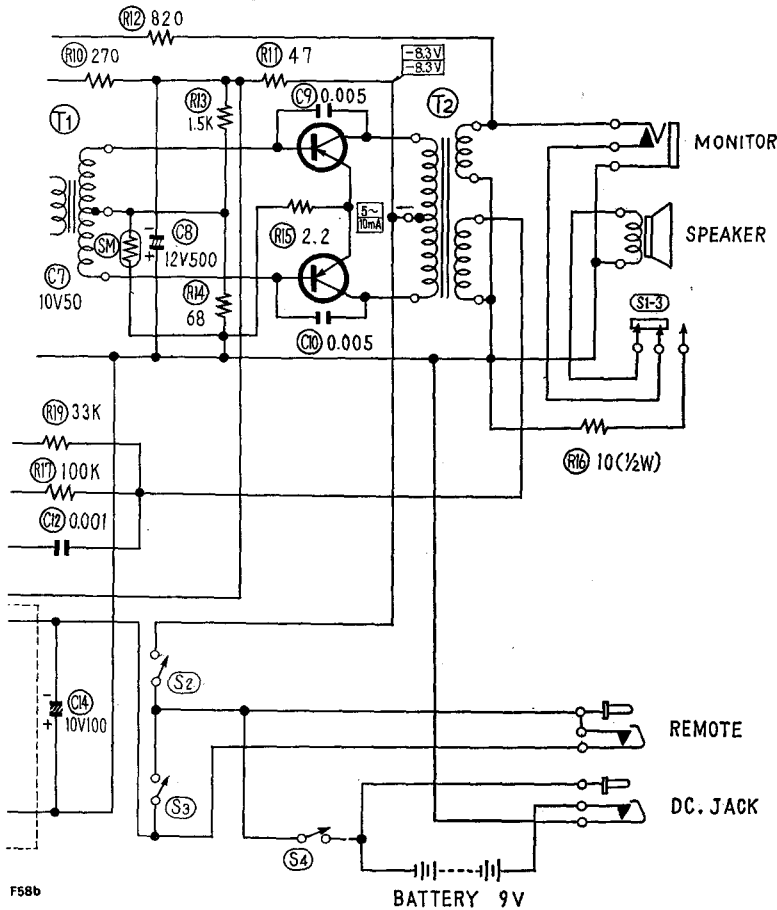
F58a

(F58a) CIRCUIT DIAGRAM—MODEL RQ-113S (PART)

# NATIONAL

**Maintenance:** The tape recorder does not generally require oiling, but on repair just one or two drops of oil may be applied to the capstan, pressure roller and rewind pulley bearings, and also the reel table spindles and the guide pulleys. All traces of oil should be removed afterwards from surfaces of capstan and pressure roller, or the tape may slip and cause damage. The motor bearings require no oiling during the lifetime of the motor and should bearings or armature shaft show excessive wear, replace motor.

(Tr3), (Tr4) 2-2 SB 178 (D)



(F58b) CIRCUIT DIAGRAM—MODEL RQ-113S (CONTINUED)

## TAPE RECORDER SERVICING

**Cleaning:** A soft cloth moistened with alcohol may be used to wipe dirt from the record/playback and erase heads, the surface of the pressure roller and the surface coming into contact with the belt.

**Continuity:** Magnetisation of the heads may result if continuity of heads is measured with an ohmmeter, and if such check is necessary, heads should be demagnetised afterwards. The magnetised head can be neutralised by use of a standard demagnetisation tool, the tip of which should not be used through the pad, but should be thin enough to fit between pressure pad and head. A piece of cellulose tape on the tip prevents metal to metal contact. After demagnetisation, slowly remove tool from vicinity before turning off current.

**Pressure Roller Tension:** 1. Load the tape as in the case of playback, and set the tape recorder in record or playback mode.

2. Hang a loop of twine on the pressure roller shaft and hook the spring scale on the other end of the loop.

3. Pull the spring scale in the direction of a line connecting the centres of the capstan and pressure roller shaft. Slowly increase the pull and read the scale at a point where the tape stops moving.

4. The standard pressure of the Pressure Roller Shaft should be:

$1\frac{7}{8}$ in./sec.	.	.	.	between 7.8 and 12.0 ozs. (220 and 340 g.)
$3\frac{3}{4}$ in./sec.	.	.	.	between 11.2 and 15.6 ozs. (320 and 440 g.)

**Adjustment:** Adjust the pressure roller spring to the standard pressure.

**Winding Torque for Playback:** 1. Make a loop at the end of a fully loaded 3-inch reel of tape, fasten the looped end with splicing tape, and put the reel on the takeup reel table.

2. Hook the tension gauge in the loop and pull out about 6 inches of the tape end.

3. Set the recorder in playback mode, and pull tension gauge in direction of winding, keeping pace with the moving tape until the reading of the tension gauge remains constant, then take the reading. Repeat this several times and take the average to determine the correct torque.

4. The above test should be made with 3-inch tape reel fully loaded.

5. The standard torque should be:

between 0.63 and 1.08 ozs. (between 18 and 30 g.).

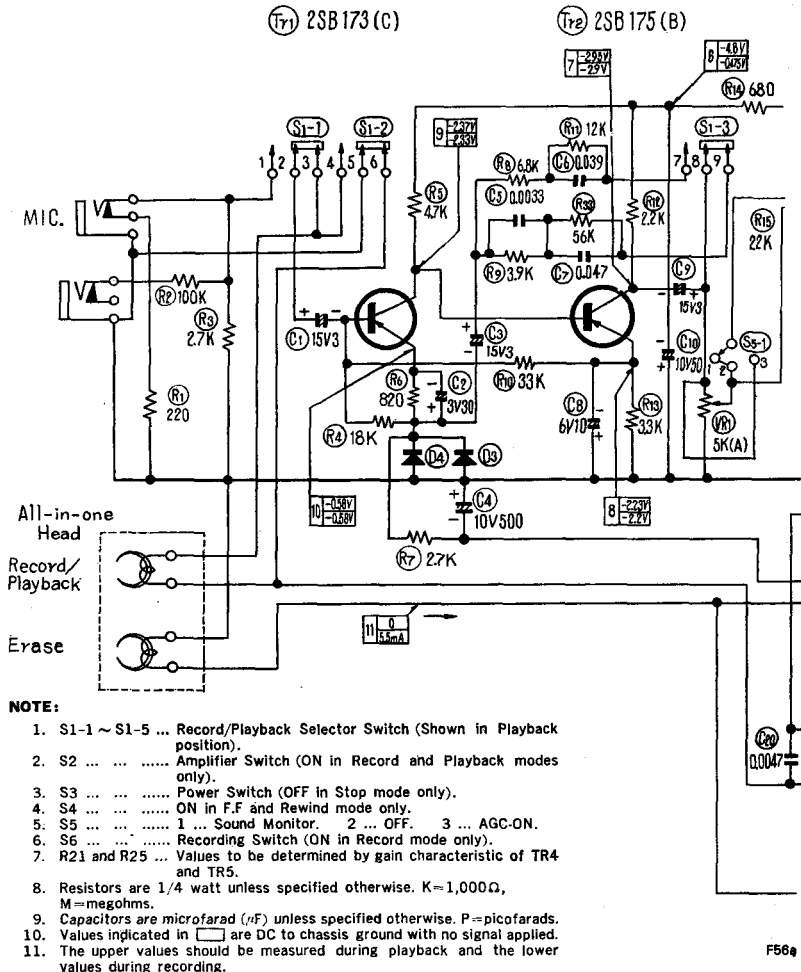
**Adjustment:** Adjust torque with the friction spring on the takeup reel table. If torque is too strong, loosen friction spring, if too weak tighten it. If the friction washer gets oily clean it immediately to prevent slip. If tension of takeup belt is weakened, winding torque drops.

## NATIONAL

## Model RQ-153S

**General Description:** Six transistor battery portable tape recorder. Power output 500 mW. (700 mW. maximum). 30 kc/s. A.C. bias with D.C. erase. Frequency response 120-7000 c/s. at  $3\frac{3}{4}$  in./sec. and 120-4000 c/s. at  $1\frac{7}{8}$  in./sec. Input impedance: microphone 2.7 k $\Omega$ ; auxiliary 100 k $\Omega$ . Extension loudspeaker impedance 8 ohms.

**Adjustments:** Pressure Roller Shaft tension should be 5.6-7.8 ozs. at  $1\frac{7}{8}$  in./sec. and 5.3-7.4 ozs. at  $3\frac{3}{4}$  in./sec. Winding torque 0.28-0.42 ozs.



(F56a) CIRCUIT DIAGRAM—MODEL RQ-153S (PART)

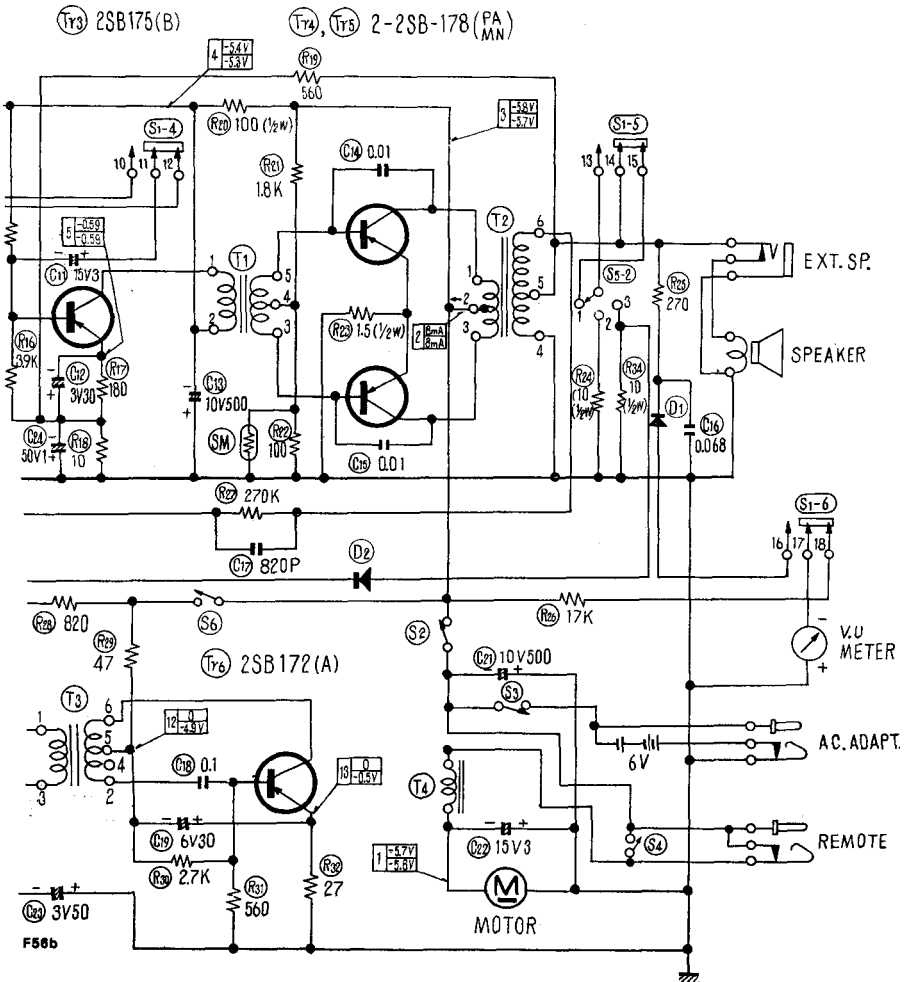
## TAPE RECORDER SERVICING

Tape pad pressure 0.53–1.1 ozs.

**Record Bias Current:** Place a 100-ohm resistor in the earthy lead of the record/playback head. Using a valve volt-meter check that the voltage across the 100-ohm resistor is 0.065–0.11 volts. If the voltage is not within the above range, correct by adjusting T3. The frequency must be in the range of 25–35 kc/s.

**Erase Current:** Connect a D.C. milliammeter in the earthy lead of the erase head. Erase current should be 5.35–7.5 mA.

**Maintenance and Cleaning:** The procedures for Model RQ-113S (in this volume) apply.



(F56b) CIRCUIT DIAGRAM—MODEL RQ-153S (CONTINUED)

## NATIONAL

## Model RQ-300IS

**General Description:** Seven-transistor battery portable tape recorder. Power output 700 mV. Tape speed  $1\frac{7}{8}$  in./sec. Frequency response 120–6000c/s. Bias and erase frequencies 35 kc/s. Microphone input impedance 2 k $\Omega$ . Line output 20 k $\Omega$ .

**Adjustments:** *Pressure roller:* Set the recorder in the Playback position and attach a short length of string on to the frame of the pressure roller assembly. Suspend a spring scale on the other end of the string and pull the spring scale at right angles to the frame. When the pressure roller comes off the capstan the spring scale should be indicating 5.45–6.5 oz. (155–185 g.). To adjust the roller pressure change the position of the roller spring. *Record Bias Current:* Connect a valve volt-meter between chassis and the earthy side of the record head. Set the recorder in the record mode keeping the record level at zero. The bias voltage indicated by the VVM should be 23–28 mV. This voltage can be obtained by adjusting the variable inductor T<sub>3</sub>.

## Resistors

Ref. No.	Description
R1, 10, 13 . . . . .	Carbon resistor 3.9 k $\Omega$ $\frac{1}{4}$ W.
R2, 8 . . . . .	Carbon resistor 56 k $\Omega$ $\frac{1}{4}$ W.
R3, 28 . . . . .	Carbon resistor 10 k $\Omega$ $\frac{1}{4}$ W.
R4 . . . . .	Carbon resistor 4.7 k $\Omega$ $\frac{1}{4}$ W.
R5 . . . . .	Carbon resistor 2.2 k $\Omega$ $\frac{1}{4}$ W.
R6 . . . . .	Carbon resistor 22 $\Omega$ $\frac{1}{4}$ W.
R7 . . . . .	—
R9, 27 . . . . .	Carbon resistor 15 k $\Omega$ $\frac{1}{4}$ W.
R11, 32 . . . . .	Carbon resistor 1.8 k $\Omega$ $\frac{1}{4}$ W.
R12 . . . . .	Carbon resistor 1 k $\Omega$ $\frac{1}{4}$ W.
R14 . . . . .	Carbon resistor 5.6 k $\Omega$ $\frac{1}{4}$ W.
R15, 35 . . . . .	Carbon resistor 33 k $\Omega$ $\frac{1}{4}$ W.
R16 . . . . .	Carbon resistor 8.2 k $\Omega$ $\frac{1}{4}$ W.
R17, 25 . . . . .	Carbon resistor 2.7 k $\Omega$ $\frac{1}{4}$ W.
R18 . . . . .	Carbon resistor 68 $\Omega$ $\frac{1}{4}$ W.
R19 . . . . .	Carbon resistor 820 $\Omega$ $\frac{1}{4}$ W.
R20 . . . . .	Carbon resistor 470 $\Omega$ $\frac{1}{4}$ W.
R21 . . . . .	—
R22 . . . . .	Carbon resistor 18 k $\Omega$ $\frac{1}{4}$ W.
R23 . . . . .	—
R24 . . . . .	Carbon resistor 2.2 k $\Omega$ $\frac{1}{4}$ W.
R26 . . . . .	Carbon resistor 330 $\Omega$ $\frac{1}{4}$ W.
R29 . . . . .	Carbon resistor 680 $\Omega$ $\frac{1}{4}$ W.
R30 . . . . .	Carbon resistor 1.5 k $\Omega$ $\frac{1}{4}$ W.
R31 . . . . .	Carbon resistor 150 $\Omega$ $\frac{1}{4}$ W.
R33 . . . . .	Carbon resistor 47 $\Omega$ $\frac{1}{4}$ W.
R34 . . . . .	Carbon resistor 10 $\Omega$ $\frac{1}{4}$ W.
R36 . . . . .	Carbon resistor 21 k $\Omega$ $\frac{1}{4}$ W.
R37 . . . . .	Carbon resistor 4.7 $\Omega$ $\frac{1}{4}$ W.
R38 . . . . .	Carbon resistor 270 $\Omega$ $\frac{1}{4}$ W.

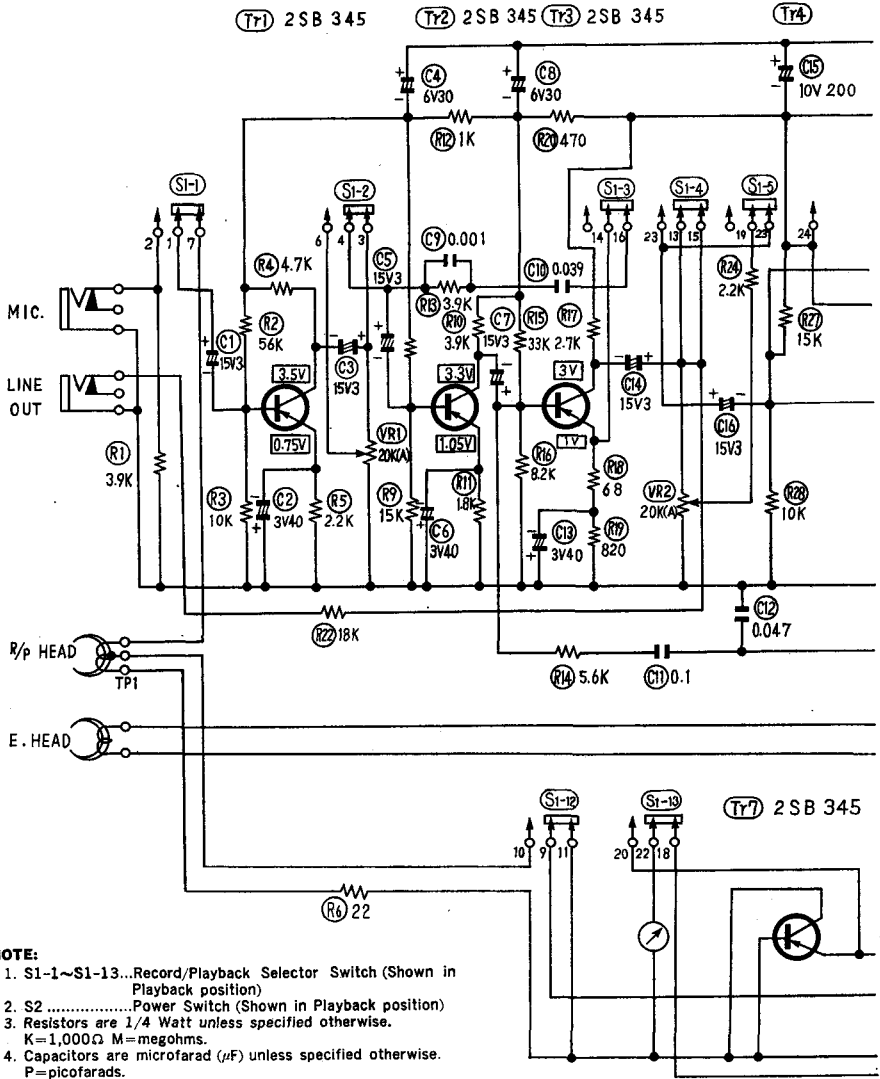
## Variable Resistors

VR1, VR2 . . . . .	Volume control	20 k $\Omega$ -A
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# TAPE RECORDER SERVICING

## Capacitors

Ref. No.	Description	
C1, 3, 5, 7, 14, 16, 24	Electrolytic capacitor	3 $\mu$ F.
C2, 6, 13, 18	Electrolytic capacitor	40 $\mu$ F.
C4, 8, 17	Electrolytic capacitor	30 $\mu$ F.
C9	Polystyrene capacitor	0.001 $\mu$ F.
C10	Mylar capacitor	0.039 $\mu$ F.
C11, 25	Mylar capacitor	0.1 $\mu$ F.



### NOTE:

- S1-1~S1-13...Record/Playback Selector Switch (Shown in Playback position)
- S2 .....Power Switch (Shown in Playback position)
- Resistors are 1/4 Watt unless specified otherwise.  
K=1,000 $\Omega$  M=megohms.
- Capacitors are microfarad ( $\mu$ F) unless specified otherwise.  
P=picofarads.
- Values indicated in   are DC to chassis ground with no signal applied.

(F54a) CIRCUIT DIAGRAM—MODEL RQ-3001S (PART)

# NATIONAL

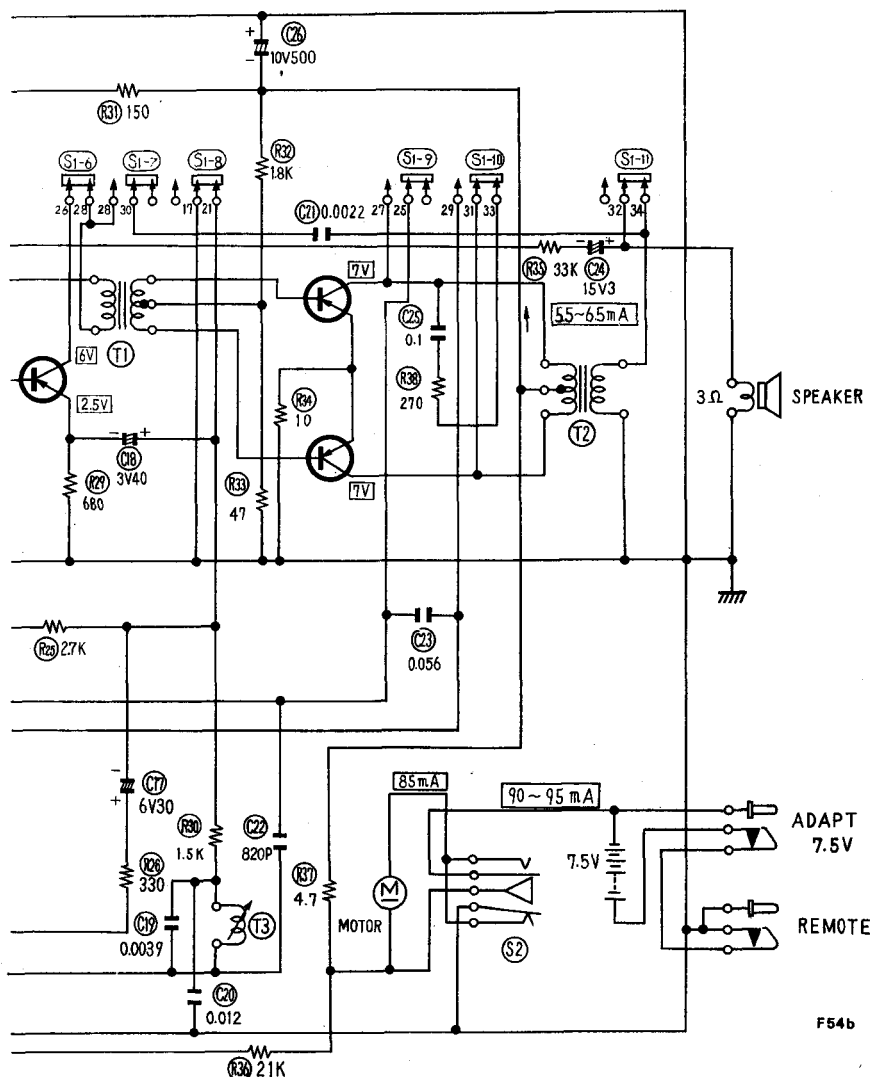
## Ref.No.

## Description

C12	.	.	.	Mylar capacitor	0.047 $\mu$ F.
C15	.	.	.	Electrolytic capacitor	200 $\mu$ F.
C19	.	.	.	Polystyrene capacitor	0.0039 $\mu$ F.
C20	.	.	.	Mylar capacitor	0.012 $\mu$ F.
C21	.	.	.	Polystyrene capacitor	0.0022 $\mu$ F.
C22	.	.	.	Polystyrene capacitor	820 pF.
C23	.	.	.	Mylar capacitor	0.056 $\mu$ F.
C26	.	.	.	Electrolytic capacitor	500 $\mu$ F.

2SB345

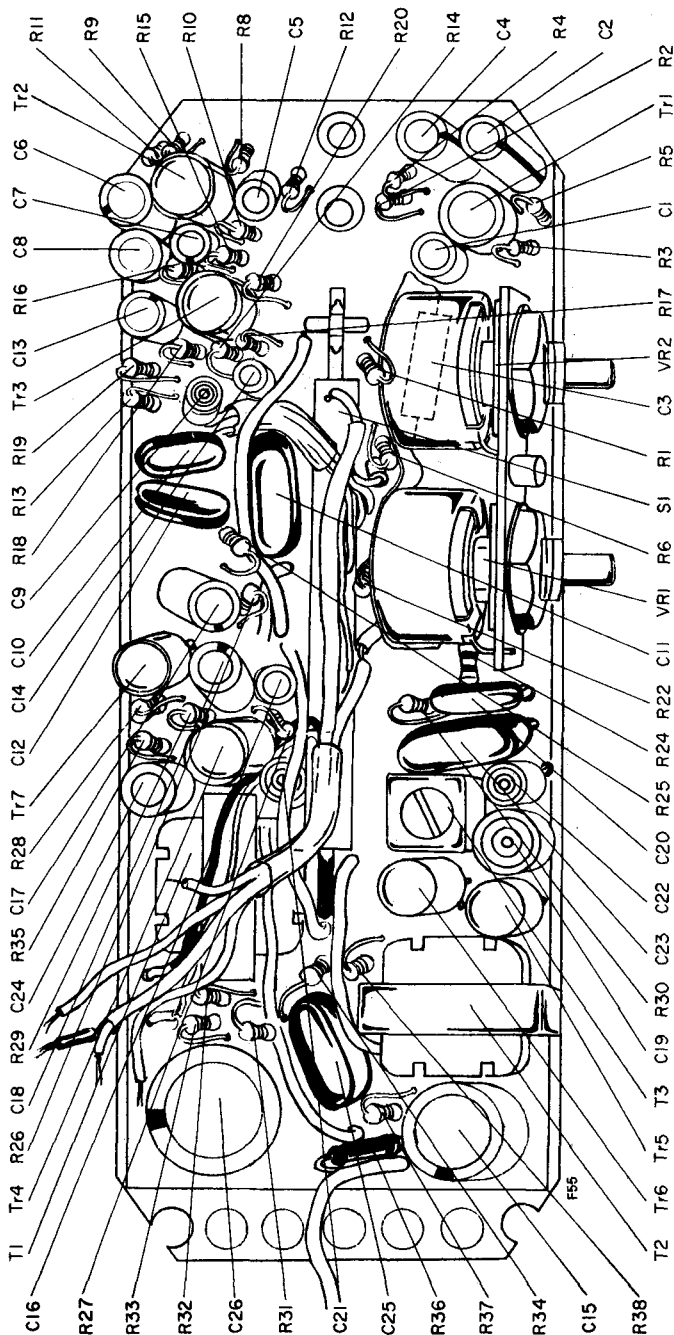
(T75, T76) 2-2SB324



(F54b) CIRCUIT DIAGRAM—MODEL RQ-3001S (CONTINUED)



# TAPE RECORDER SERVICING



(F55) COMPONENT LAY-OUT

# RADIOMOBILE

# Model CTR 101

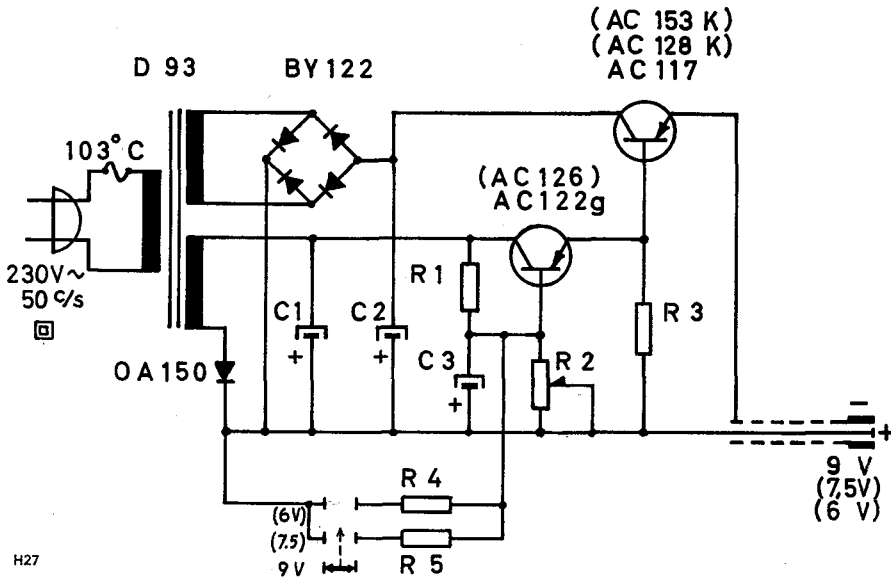
**General Description:** This model is electrically similar to World Radio Model TRC<sub>1</sub>, information for which is given elsewhere in this volume.

## RADIONETTE

## Battery Eliminator Type E2

**General Description:** Stabilised battery eliminator with an internal resistance of 0.9 ohms (9 volts at 400 mA.).

*Note:* see also MULTICORDER (following).



(H27) CIRCUIT DIAGRAM—TYPE E2

**Components:** R<sub>1</sub> (2.2k), R<sub>2</sub> (25k), R<sub>3</sub> (3.3k), R<sub>4</sub> (3.9k), R<sub>5</sub> (10k), C<sub>1</sub> (200  $\mu$ F./10 volts), C<sub>2</sub> (1000  $\mu$ F./12 volts) and C<sub>3</sub> (125  $\mu$ F./16 volts).

**Output:** Maximum current 400 mA. Voltage 6, 7.5 or 9 volts D.C. Note that R<sub>2</sub> is adjusted for an output of 9.8 volts at 20 mA.

## RADIONETTE

## Multicorder

**General Description:** Tape recorder employing seven transistors and two diodes. Tape speeds, 1.875 in./sec. and 3.75 in./sec. Total playing time, 12.8 hours, using all four tracks at the lower speed. Speaker 4 ohms.

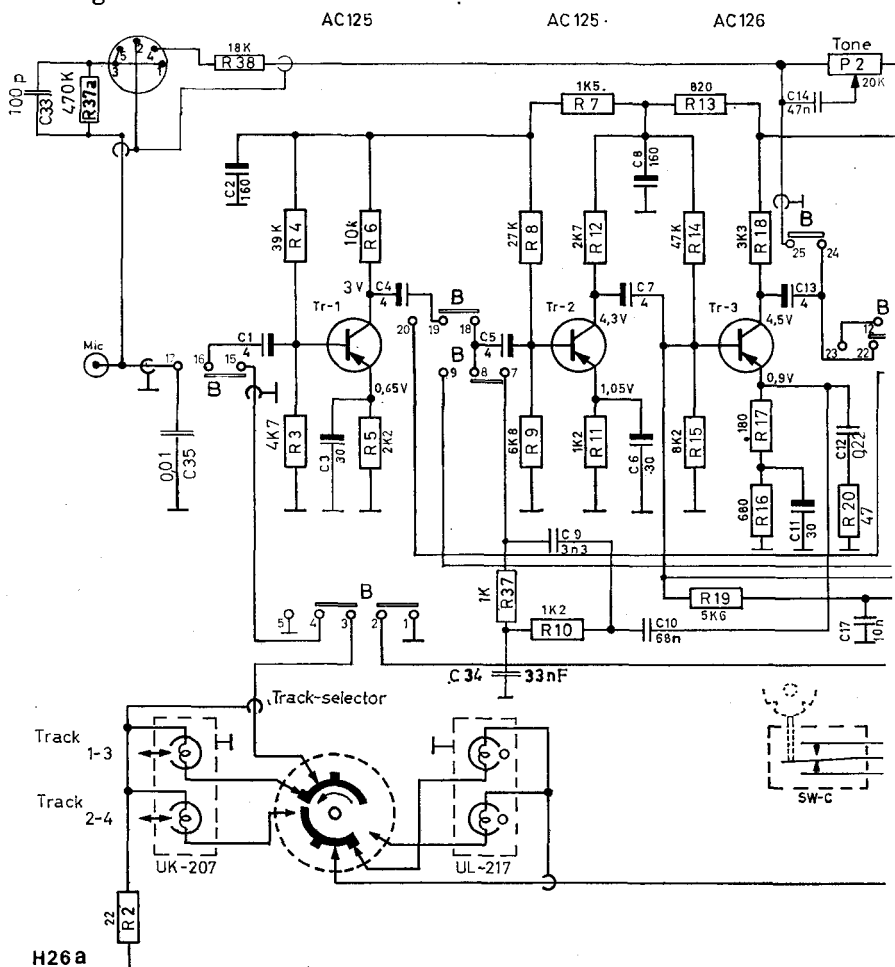
# TAPE RECORDER SERVICING

Power supply, 9-volt battery or mains adaptor. Digital type tape indicator. Bias oscillator, 66.6 kHz (kc/s.).

**Note:** See previous page for battery eliminator type E2.

**Recording Indicator:** During recording the instrument indicates between 2 and 3 with peaks reaching 6. During playback and fast rewind the total current consumption is shown on the instrument's lower dial. During fast forward wind the battery voltage is indicated on the instrument's upper dial.

**Circuit Notes:** The circuit diagram applies to models with serial numbers of 5000 and above. Components marked with an asterisk have been subject to changes.

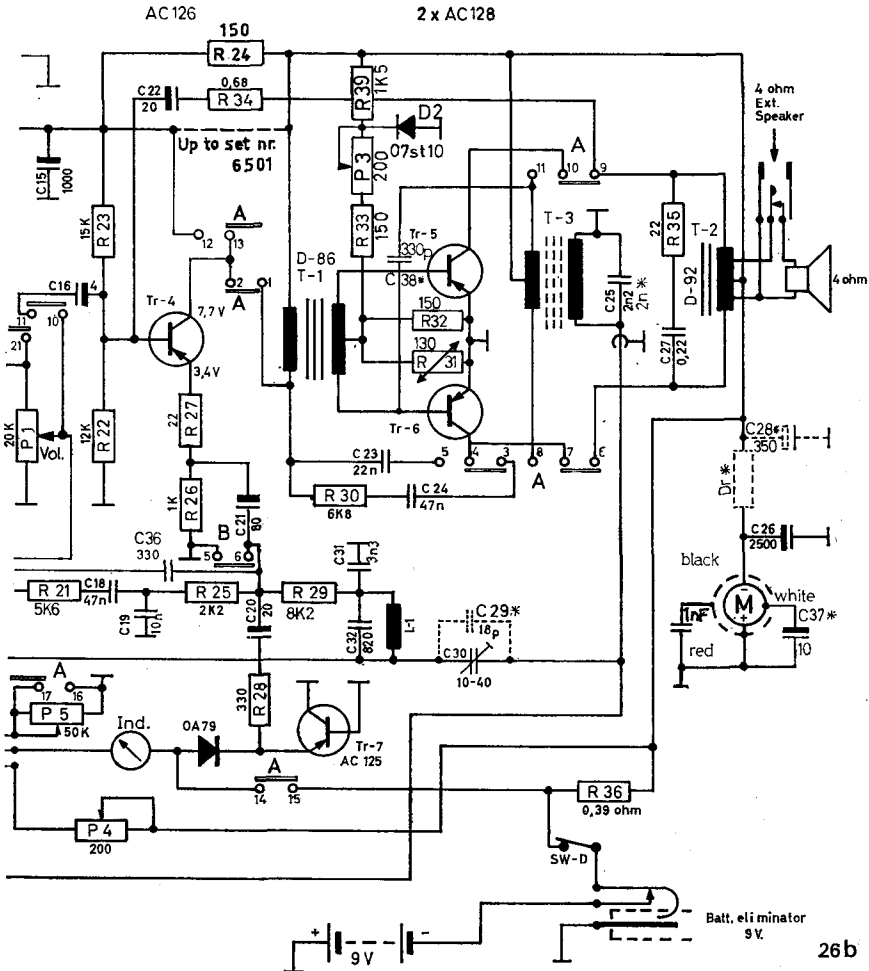


(H26a) CIRCUIT DIAGRAM—MULTICORDER (PART)

# RADIONETTE

**Electrical Adjustments:** The oscillator trap  $L_1$  should be tuned for a minimum A.C. voltage across  $C_{31}$ , track 1. The bias current to the playing head is adjusted by means of  $C_{30}$ , it is read as an A.C. voltage (of 10 mV.) across  $R_2$ . The recording indicator reading is adjusted by means of  $P_5$  on fast forward wind, and by means of  $P_4$  on fast rewind.

**Dismantling:** Remove control knobs (setscrews), lift off track lever and pull out top cover. Take out four screws in bottom, remove batteries, unsolder loudspeaker wires and lift out chassis. Loosen screw on motor clip and remove motor. To lift printed board out of locking slots, remove the locking key and then ease the side brackets to free the printed board.



(H26b) CIRCUIT DIAGRAM—MULTICORDER (CONTINUED)

**ROBUK****Model 4/44**

**General Description:** Five-valve, mains-operated tape recorder.

**Sockets:** Extension Loudspeaker, Monitor, Output Microphone and Gram inputs.

**Valves:** V<sub>1</sub> (ECC83), V<sub>2</sub> (ECL82), V<sub>3</sub> (EZ80), V<sub>4</sub> (EL84) and V<sub>5</sub> (EM84). Note: WX6 is a germanium diode.

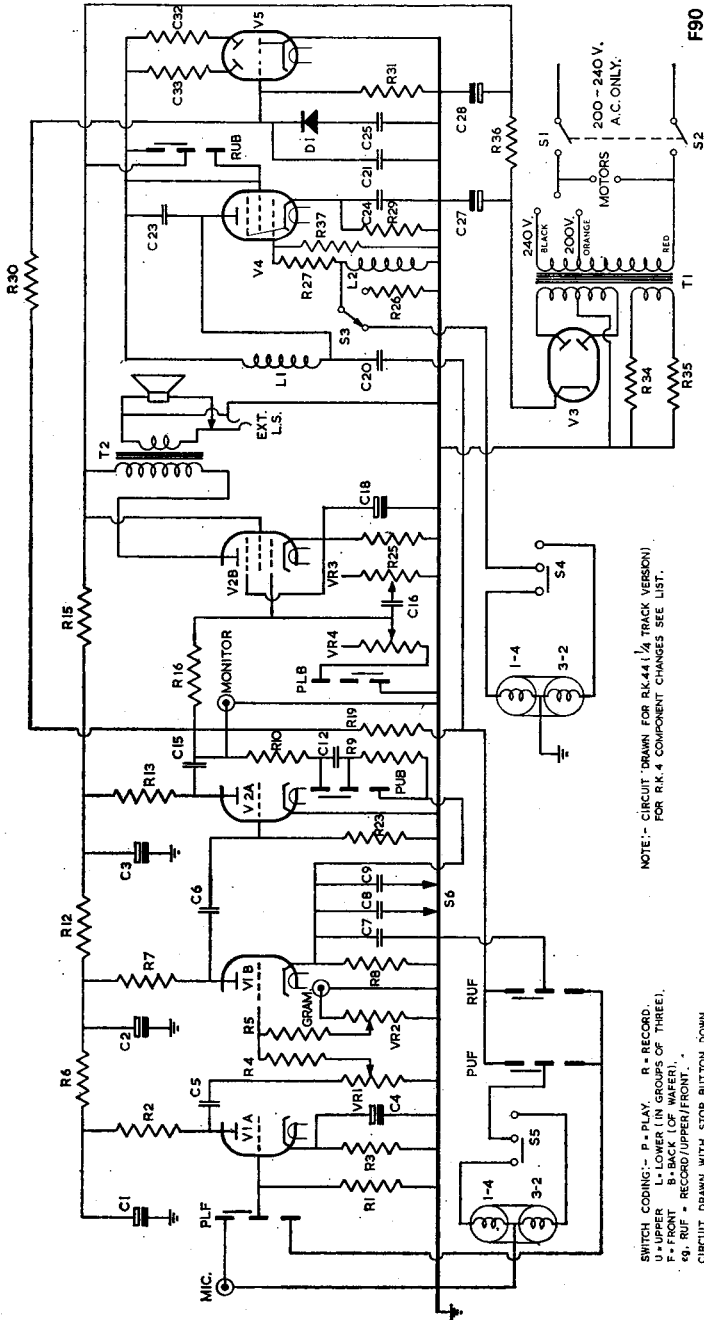
**Components:**

R <sub>1</sub>	470k	R <sub>19</sub>	150k
R <sub>2</sub>	180k Hi Stab.	R <sub>20</sub>	10k
R <sub>3</sub>	4.7k	R <sub>21</sub>	150k
R <sub>4</sub>	220k	R <sub>23</sub>	1 Meg
R <sub>5</sub>	220k	R <sub>24</sub>	820k
R <sub>6</sub>	47k	R <sub>25</sub>	680 ohm 1 Watt
R <sub>7</sub>	180k	R <sub>26</sub>	250 ohm 2 Watt
R <sub>8</sub>	3.3k	R <sub>27</sub>	10k
R <sub>9</sub>	100k	R <sub>28</sub>	100k
R <sub>10</sub>	47k	R <sub>29</sub>	1.5k 1 Watt
R <sub>11</sub>	47k	R <sub>30</sub>	39k
R <sub>12</sub>	39k	R <sub>31</sub>	2.3 Meg
R <sub>13</sub>	100k	R <sub>32</sub>	470k
R <sub>14</sub>	1.5k	R <sub>33</sub>	100k
R <sub>15</sub>	4.7k	R <sub>34</sub>	100 ohm
R <sub>16</sub>	100k	R <sub>35</sub>	100 ohm
R <sub>17</sub>	47k	R <sub>36</sub>	1.0k W/W
R <sub>18</sub>	47k		

**Note:** All fixed resistors have a tolerance of 20 per cent. except R<sub>2</sub> which is 5 per cent.

C <sub>1</sub>	8 + 8 + 8 mF. Electrolytic	C <sub>16</sub>	5,000 pF.
C <sub>2</sub>		C <sub>17</sub>	25 mF. + 25 + Electrolytic
C <sub>3</sub>		C <sub>18</sub>	25 mF. + 25 + Electrolytic
C <sub>4</sub>	25 mF. 25 V Electrolytic	C <sub>19</sub>	1,000 pF.
C <sub>5</sub>	0.05 mF. + Earthing tag	C <sub>20</sub>	33 pF.
C <sub>6</sub>	0.05 mF.	C <sub>21</sub>	1,800 pF. 5% Silver Mica
C <sub>7</sub>	10,000 pF.	C <sub>22</sub>	5,000 pF.
C <sub>8</sub>	5,000 pF.	C <sub>23</sub>	1,800 pF. 5% Silver Mica
C <sub>9</sub>	500 pF.	C <sub>24</sub>	10,000 pF.
C <sub>10</sub>	200 pF.	C <sub>25</sub>	0.04 mF.
C <sub>11</sub>	100 pF.	C <sub>26</sub>	0.1 mF.
C <sub>12</sub>	1,000 pF. or 500 pF.	C <sub>27</sub>	50 + 50 mF. 375 V Electrolytic
C <sub>13</sub>	500 pF.	C <sub>28</sub>	
C <sub>14</sub>	5,000 pF.	C <sub>30</sub>	2,500 pF.
C <sub>15</sub>	0.05 mF. + Earthing tag	C <sub>31</sub>	250 pF.

VR <sub>1</sub>	500k Log + Earth mic.	T <sub>1</sub>	Mains trans.
VR <sub>2</sub>	500k + Earth gram.	T <sub>2</sub>	Output 50:1 3-4 ohms
VR <sub>3</sub>	1 Meg tone	L <sub>1</sub>	Oscillator coil
VR <sub>4</sub>	500k Monitor	L <sub>2</sub>	Compensation coil
S <sub>1</sub> /S <sub>2</sub>	Double pole switch		



NOTE:—CIRCUIT DRAWN FOR RK44 (1/4 TRACK VERSION)  
FOR R.K. 4 COMPONENT CHANGES SEE LIST.

SWITCH CODING:—P = PLAY, R = RECORD.  
U = UPPER, L = LOWER (IN GROUPS OF THREE).  
F = FRONT, B = BACK (OF WAKER).  
Sg. RUF = RECORD/UPPER/FRONT. —  
CIRCUIT DRAWN WITH STOP BUTTON DOWN  
THIS EQUALS AMPLIFIER POSITION.

(F90) CIRCUIT DIAGRAM—MODEL 4/44

**ROBUK****Model 5/54**

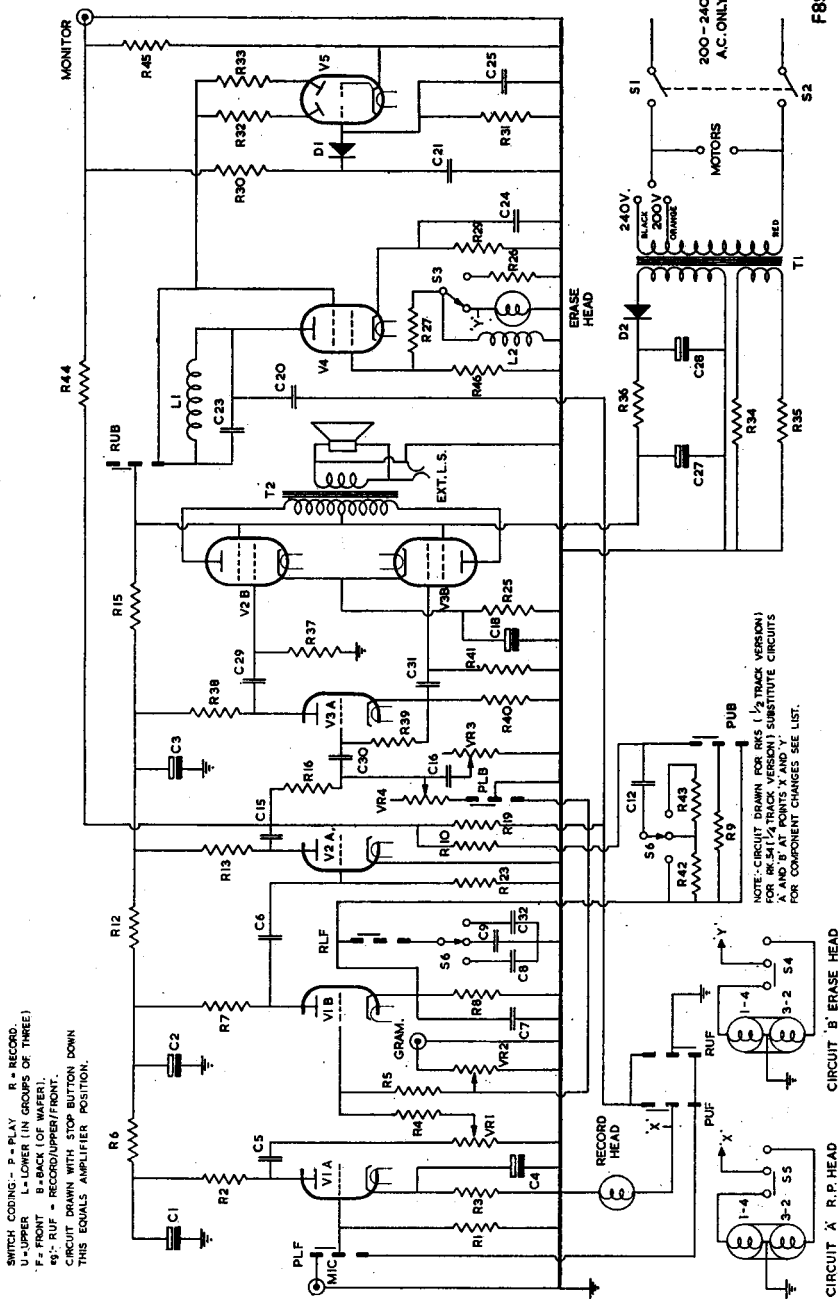
**General Description:** Three-speed, two- or four-track tape recorder. Five valve push-pull amplifier gives 5-watt output. Equalisation to C.C.I.R. specification. Wow and flutter less than 0.2 per cent. at  $7\frac{1}{2}$  in./sec. and 0.3 per cent. at  $3\frac{3}{4}$  in./sec. Frequency response 40-15,000 c/s.  $\pm 3$  dB at  $7\frac{1}{2}$  in./sec.

**Valves:** V<sub>1</sub> (ECC83), V<sub>2</sub> (ECL82), V<sub>3</sub> (ECL82), V<sub>4</sub> (EL84) and V<sub>5</sub> (EM84).

**Diodes:** D<sub>1</sub> (OA81) and D<sub>2</sub> (BY105).

**Components:**

R1	680k	R26	560 ohm
R2	180k H.S.	R26	390 ohm
R3	4.7k	R27	100k
R4	220k	R29	1.5k
R4	100k	R30	39k
R5	220k	R31	3.3M ohm
R5	390k	R32	470k
R6	4.7k	R33	100k
R7	270k	R34	100 ohm
R8	47k	R35	100 ohm
R8	3.3k	R36	1k W.W.
R9	470k	R37	180k
R10	270k	R38	33k
R10	220k	R39	10M ohm
R12	39k	R40	33k
R13	100k	R41	180k
R15	4.7k	R42	220k
R16	270k	R43	470k
R19	150k	R44	180k
R23	12 Meg.	R45	22k
R25	250 ohm	R46	100k
C1	8 mF. 275V Wkg.	C18	25 mF. 25 V Wkg.
C2	8 mF. 275V Wkg.	C20	33 pF.
C3	8 mF. 275V Wkg.	C20	82 pF.
C4	25 mF. 25V Wkg.	C21	200 pF.
C5	0.05 350V Wkg.	C23	1,800 pF.
C6	0.05 350V Wkg.	C24	5,000 pF.
C7	5,000 pF.	C25	0.04
C8	6,800 pF.	C27	50 mF. 350 V Wkg.
C9	15,000 pF.	C28	50 mF. 350 V Wkg.
C8	5,000 pF.	C29	0.05
C9	10,000 pF.	C30	0.01
C12	500 pF.	C31	0.05
C15	0.05	C32	3,300 pF.
C16	1,000 pF.	C32	2,000 pF.
VR1	250k ohm Log	T1	Mains Tran.
VR2	250k ohm Log	T2	O.P.T.
VR3	1M ohm Log	L1}	osc. coil
VR4	500k ohm Log (D.P. Switch)	L2}	

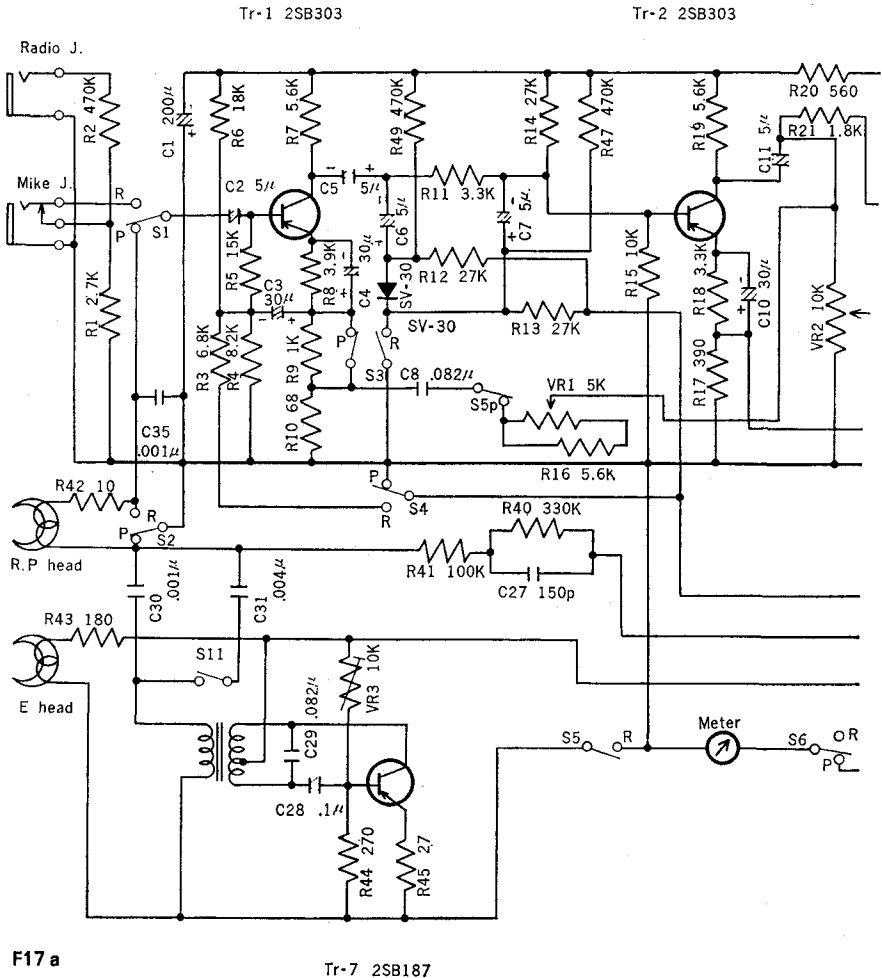


(F89) CIRCUIT DIAGRAM—MODEL 5/54



**SANYO****Model MR-130**

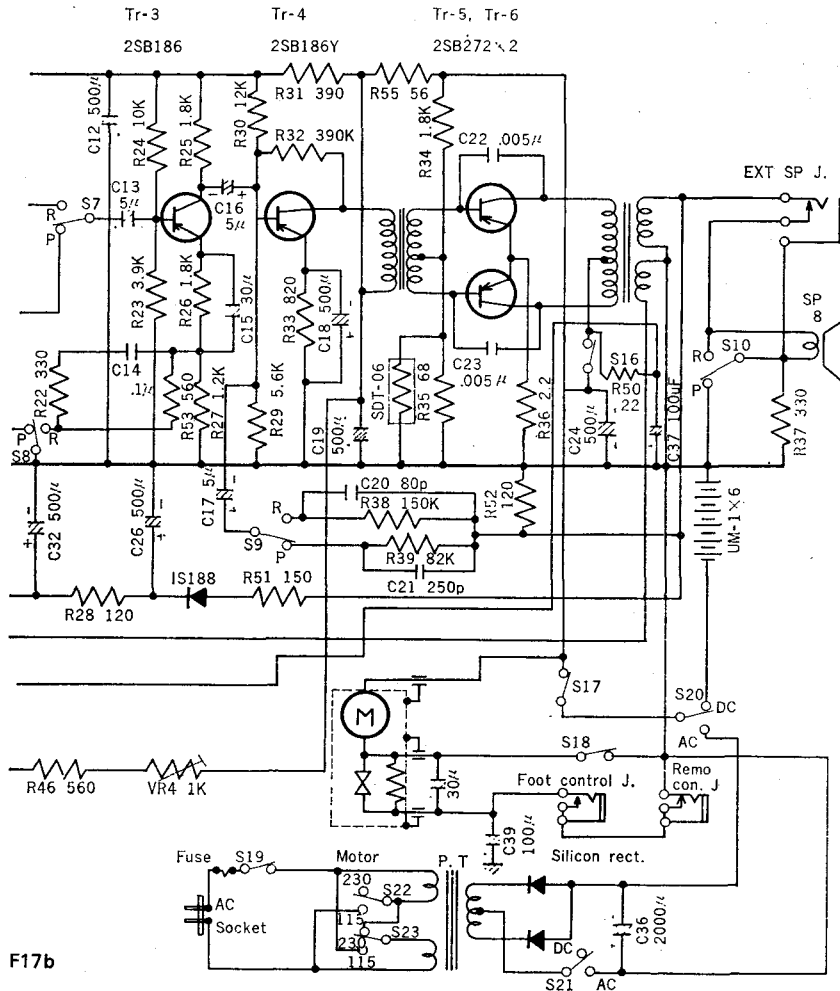
**General Description:** Two track portable A.C./D.C. tape recorder. Power supply 115/230 volts 50-60 c/s. A.C. or six 1½-volt batteries. Power consumption 8 watts. Tape speeds: 3½ in./sec. or 1½ in./sec. Output power 1 watt (undistorted 800 mW.). Frequency response 100-7000 c/s. at 3½ in./sec. and 100-4000 c/s. at 1½ in./sec. Microphone input 20 kΩ. Radio input 470 kΩ. Extension loudspeaker impedance 8 ohms.



(F17a) CIRCUIT DIAGRAM—MODEL MR-130 (PART)

**Dismantling:** To remove the amplifier and mechanism from the cabinet. Unscrew the pinch roller mounting screw in a counter-clockwise direction and remove. Pull the pinch roller upwards and remove. Pull the head-cover and take it out. Place tape recorder upside down and remove four (+) screws by rotating counter-clockwise. Remove the back lid. Remove all 6 (+) screws coated with red paint by turning them counter-clockwise. The amplifier and mechanism can now be taken out of the cabinet.

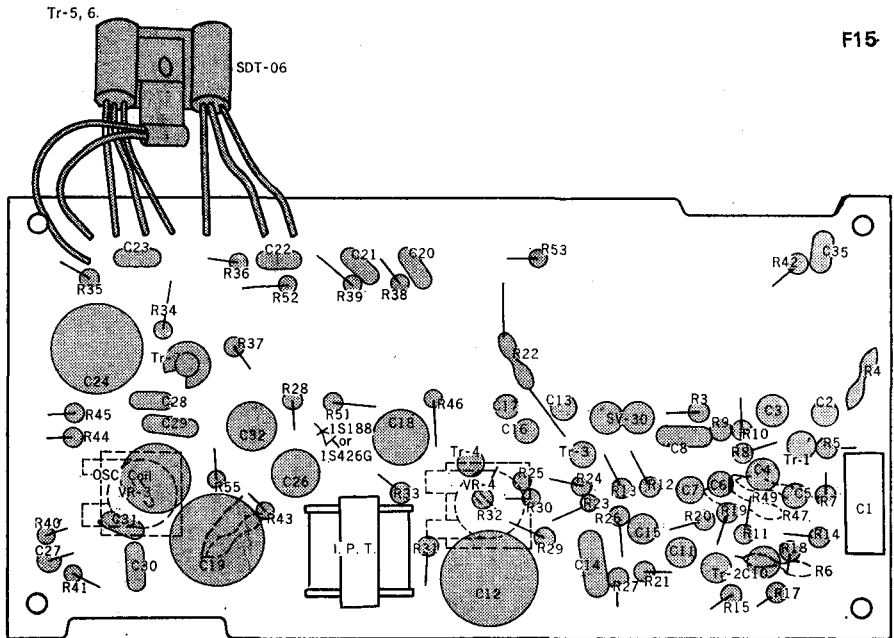
**Bias Current Adjustment:** Adjust VR3 so that 7 mV. is measured by a valve volt-meter across R42.



(F17b) CIRCUIT DIAGRAM—MODEL MR-130 (CONTINUED)

## TAPE RECORDER SERVICING

**Record/Play Head Azimuth Adjustment:** Use a pre-recorded tape (5000 c/s.) and adjust the record/play head for maximum output. Erase head current 14 mA. (5 volts across erase head).



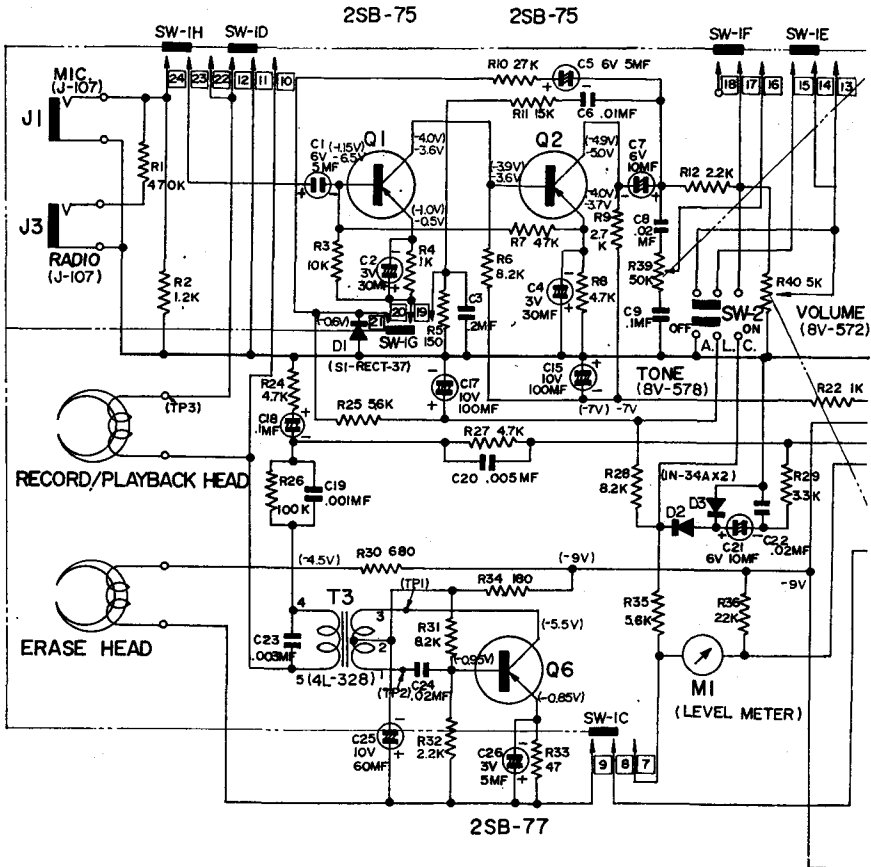
(F15) COMPONENT LAY-OUT

### Voltage and Current Chart

Point	Playback	Recording	Tester range
Tr-7 C	(V)	8.0 (V)	25 (V)
Tr-4 C	7.0 (V)	6.8 (V)	25 (V)
Tr-3 C	5.4 (V)	5.0 (V)	25 (V)
Tr-2 C	2.3 (V)	2.4 (V)	10 (V)
Tr-1 C	2.1 (V)	2.3 (V)	10 (V)
Tr-7 E		1.0 (V)	10 (V)
Tr-4 E	2.0 (V)	1.9 (V)	10 (V)
Tr-3 E	1.8 (V)	1.7 (V)	10 (V)
Tr-2 E	1.5 (V)	1.5 (V)	10 (V)
Tr-1 E	2.0 (V)	2.0 (V)	10 (V)
Tr-1 E	460 (μA.)	380 (μA.)	1 (mA.)
Tr-2 E	410 (μA.)	370 (μA.)	1 (mA.)
Tr-3 E	560 (μA.)	740 (μA.)	1 (mA.)
Tr-4 E	2.2 (mA.)	2.1 (mA.)	10 (mA.)
Tr-7 E	42.5 (mA.)	42.5 (mA.)	100 (mA.)

**SHARP****Model RD505**

**General Description:** Model RD-505 is a two speed, two-track mon-aural tape recorder designed to operate as a portable. It incorporates solid



- SW-1(A-H): RECORD PLAYBACK SWITCH, RECORD POSITION  
 SW-2: AUTOMATIC LEVEL CONTROL SWITCH, ON POSITION  
 SW-3: SOUND MONITOR SWITCH, COUPLED WITH TONE R39, ON POSITION  
 SW-4: MUTING SWITCH, OFF POSITION, FORWARD ON  
 SW-5: D.C. POWER SWITCH, OFF POSITION  
 SW-6: AC/DC SWITCH, D.C. POSITION  
 SW-7: AC POWER SWITCH, COUPLED WITH VOLUME R40

VOLTAGE : AT PLAYBACK, NO SIGNAL  
 (VOLTAGE) : AT RECORDING, NO SIGNAL INPUT } AT D.C. 9V POWER

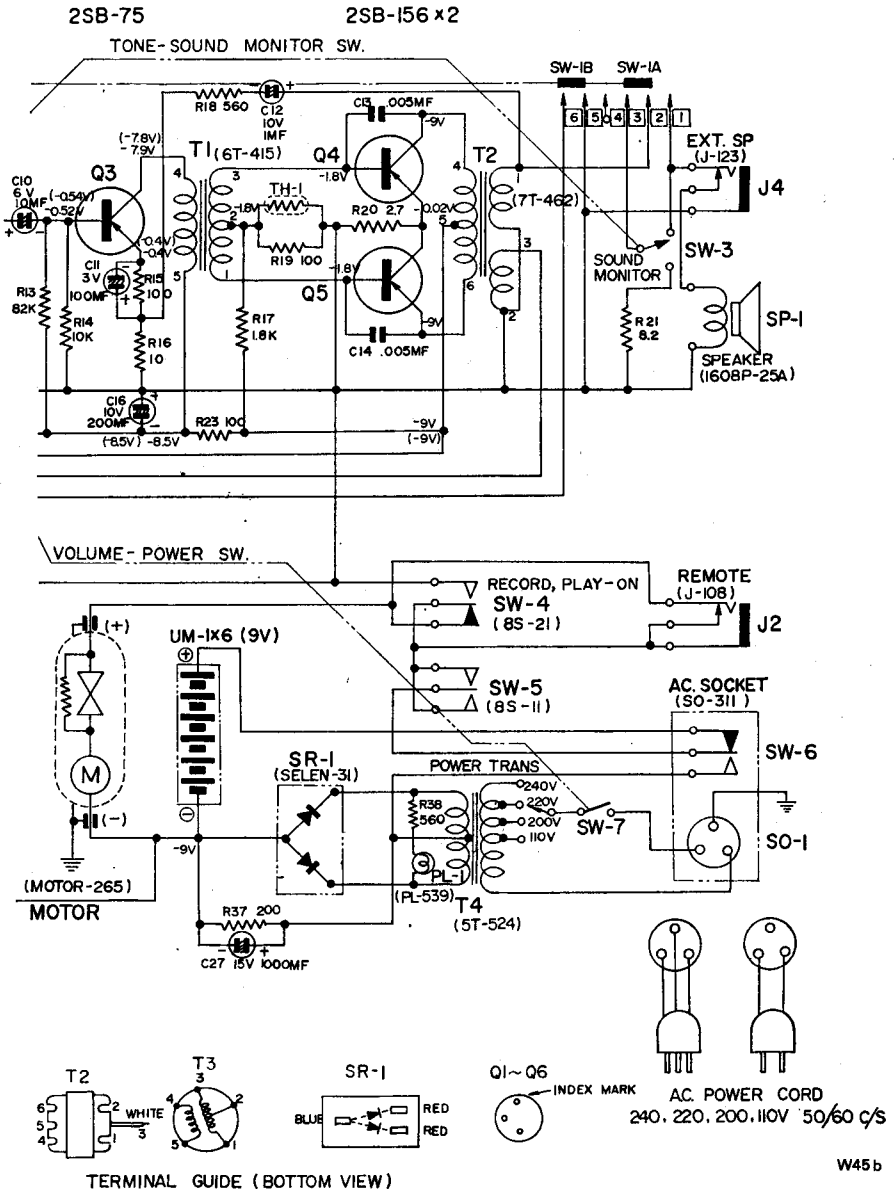
W45a



(W45a) CIRCUIT DIAGRAM—MODEL RD505 (PART)

# TAPE RECORDER SERVICING

state electronic circuitry and will operate using either an internal 9-volt battery supply or connected to a conventional 240, 220, 200, 110 volts, 50/60 cycle power outlet. Automatic level control switch is provided for



## SHARP

an automatic recording level control. Jacks are provided for connecting an external speaker or earphone and for recording directly from an external source, such as a radio or pickup. The microphone supplied with this recorder is equipped with a remote control switch.

**Record Bias:** Connect a 100-ohm resistor in series with the earthy end of the Record/Playback head. Connect a valve volt-meter across the resistor and adjust T<sub>3</sub> for 100 mV.

**Erase Current:** Connect a D.C. ammeter in series with the earthy end of the erase head. The current should exceed 7 mA.

**Cabinet Removal:** Remove the tape reel cover, the tape reels and the head cover.

*Note:* At this point the tape heads are accessible for cleaning. Remove the volume control and tone control knobs, then fast forward and function selector knobs from the cabinet top. Remove the cabinet top retaining screw that is located under the function selector knob. The battery compartment and batteries should now be removed. Next take out the accessory compartment cover and the six bottom retaining screws. Remove cabinet bottom. Separate the jack mounting plate from the cabinet top and remove the four chassis retaining screws. Remove the battery terminal leadwire from the cabinet top. Remove speaker holder and take speaker out of cabinet top, which now separates from the chassis and associated circuitry.

*Note:* At this point, the printed circuit board assembly and mechanism are accessible for servicing.

---

## SHARP

## Model RD706

**General Description:** The Model RD-706 is a two-track three-speed monaural tape recorder that operates in a vertical and horizontal position. It incorporates solid state electronic circuitry and will operate on a conventional (120 volt, 60 c/s.) (240, 220, 200, 110 volt, 50/60 cycles) power outlet. Jacks are provided for connecting an external speaker, and for recording directly from an external source, such as radio or pickup. The unit includes a sound monitor switch with built-in speaker.

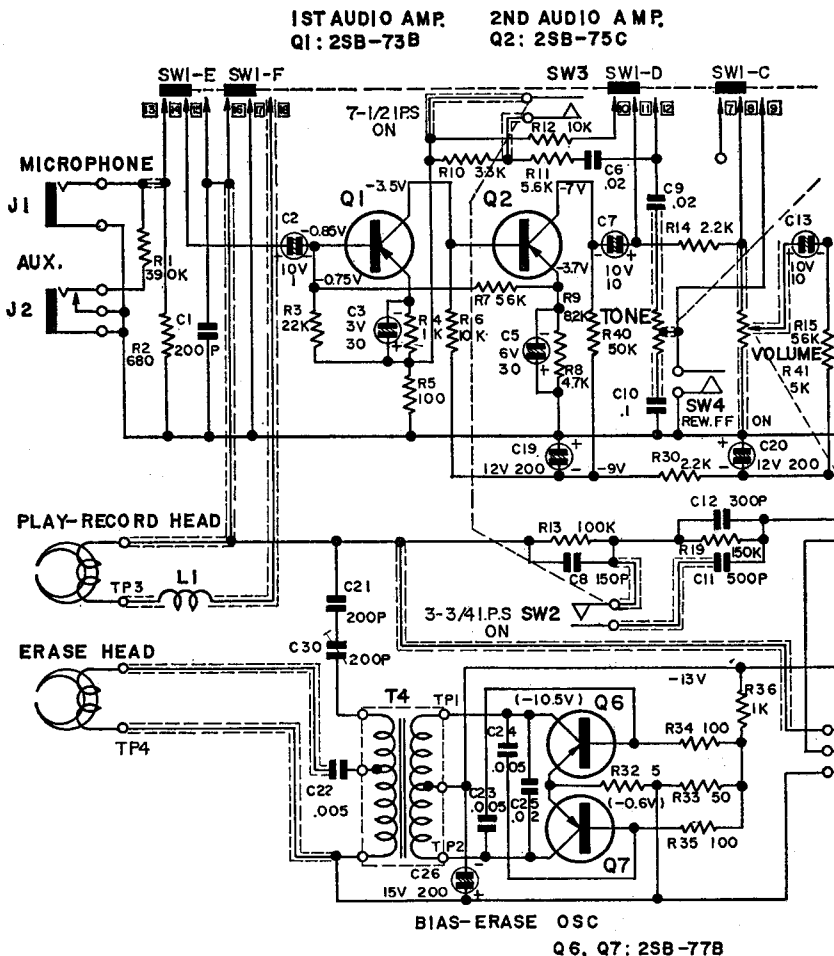
**Record Bias:** Connect a 100-ohm resistor in series with the earthy end of the Record/Playback head. Connect a valve volt-meter across the resistor and adjust C<sub>30</sub> for 100 mV.

**Erase Voltage:** Connect a 1-ohm resistor in series with the earthy end of the erase head. Connect a valve volt-meter across the resistor. The reading should be approx. 25 mV.

**Mechanism Assembly Removal:** Remove all control and selector knobs and head cover. Remove the five screws retaining the reel panel and the two screws retaining the deck cover. Take off the reel panel and the

# TAPE RECORDER SERVICING

deck cover. **Caution:** The counter belt of the tape counter at the back of the reel panel should be removed when taking out the reel panel and deck cover. Next unplug the speaker lead tip. Remove the two screws retaining



SW1 : SW-1A...SW1-F, PLAY-RECORD SWITCH (SHOWN IN RECORDING)

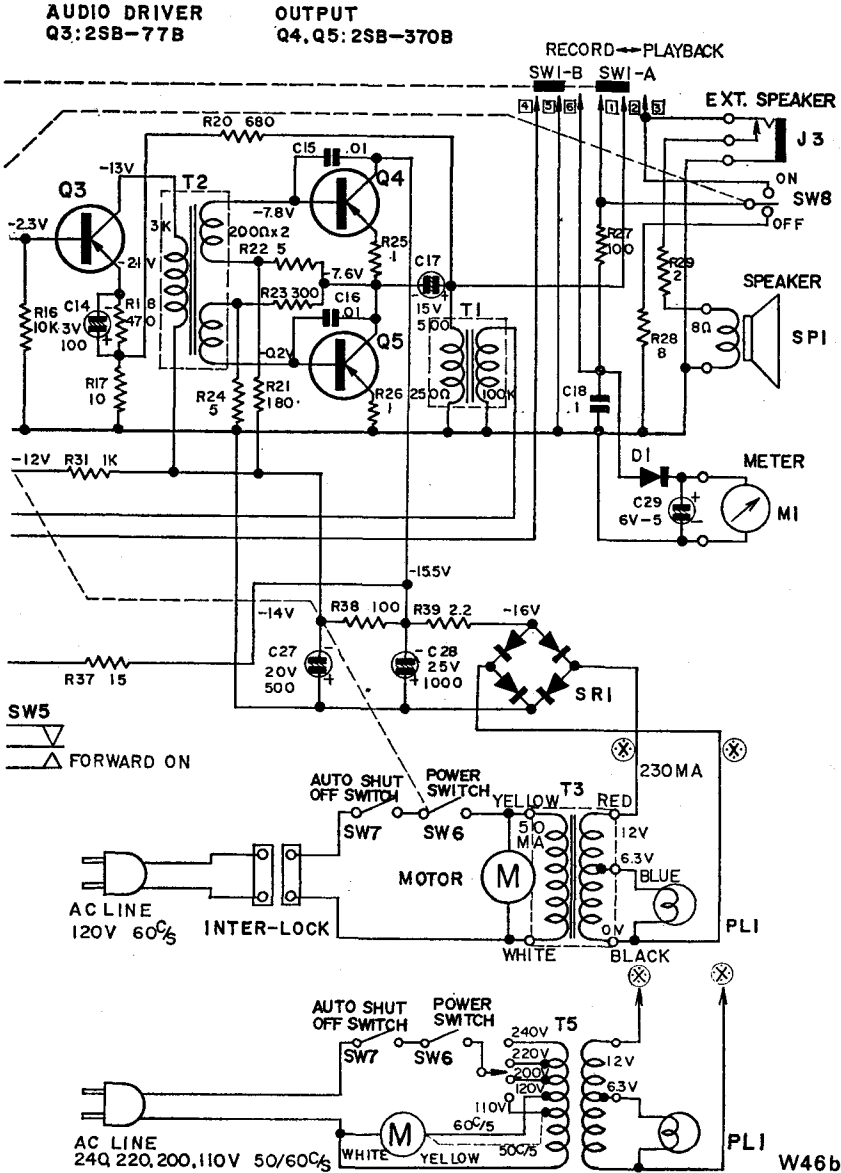
VOLTAGE: AT PLAYBACK, NO SIGNAL  
(VOLTAGE): AT RECORDING, NO SIGNAL

W46a

(W46a) CIRCUIT DIAGRAM—MODEL RD706 (PART)

# SHARP

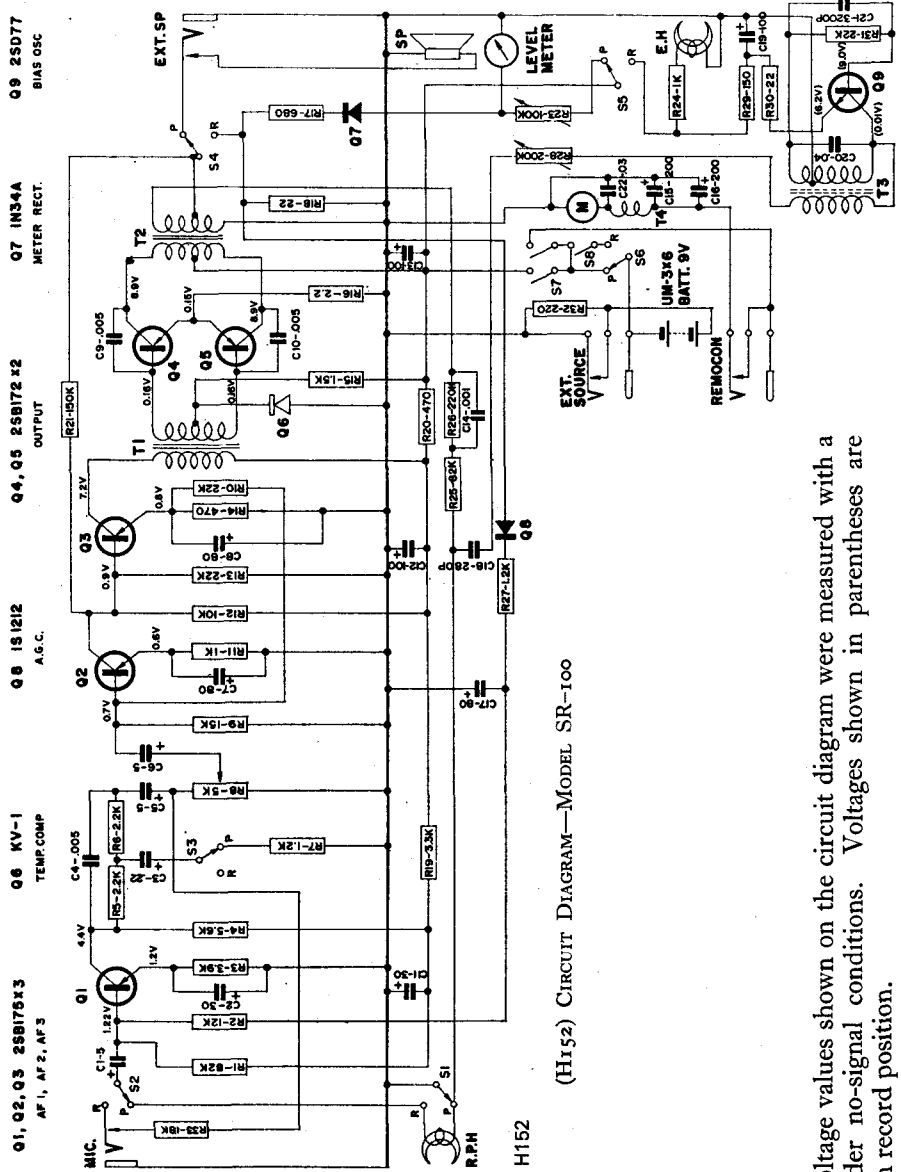
the handle, and the four screws retaining the bottom legs and cabinet to the mechanism chassis. Remove the two screws retaining the back legs and cabinet mechanism chassis at the rear.



(W46b) CIRCUIT DIAGRAM—MODEL RD706 (CONTINUED)



# TAPE RECORDER SERVICING



(H152) CIRCUIT DIAGRAM—MODEL SR-100

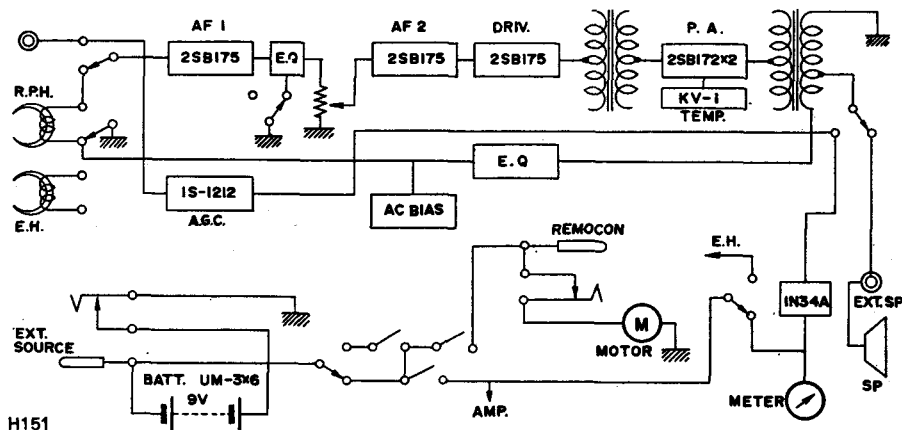
*Note:* Voltage values shown on the circuit diagram were measured with a VTVM under no-signal conditions. Voltages shown in parentheses are for switch in record position.

## STANDARD

## Model SR-100

**General Description:** Portable cassette tape recorder with 400-mW. power output. Tape speed 4.75 cm./sec. Battery 9 volts.

**Current Consumption:** See table below.



(H151) BLOCK DIAGRAM—MODEL SR-100

		Amplifier	Motor	Actual value (AMP + motor)
Playing	No-signal	15 ~ 25 mA.	80 ~ 130 mA.	95 ~ 155 mA.
	Max. output	130 mA.	80 ~ 130 mA.	210 ~ 250 mA.
Recording		50 mA.	80 ~ 130 mA.	160 ~ 180 mA.
Fast winding		—	70 ~ 130 mA.	—

## STANDARD

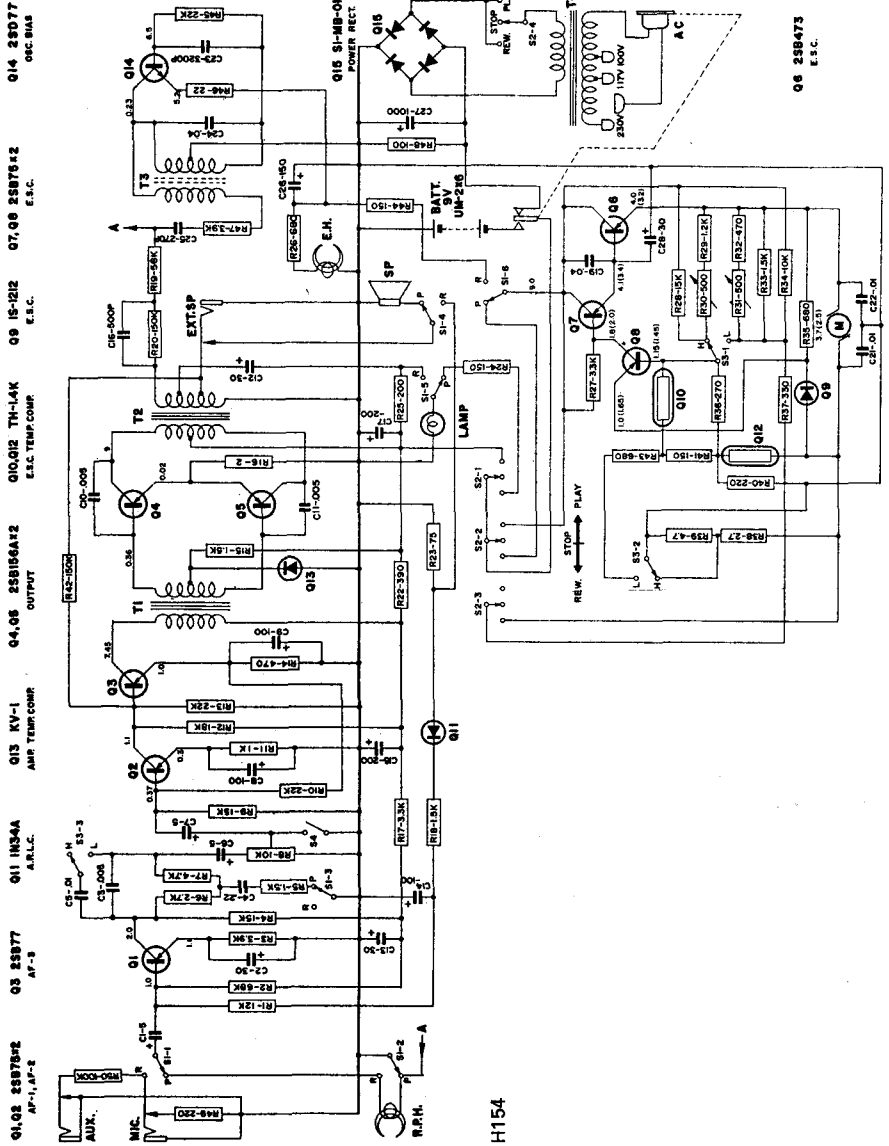
## Model SR-300

**General Description:** Transistorised tape recorder with 800-mW. power output. Tape speeds 9.5 and 4.75 cm./sec. Battery 9 volts.

**Recording Level:** The best recording is made when the level lamp goes on and off continuously.

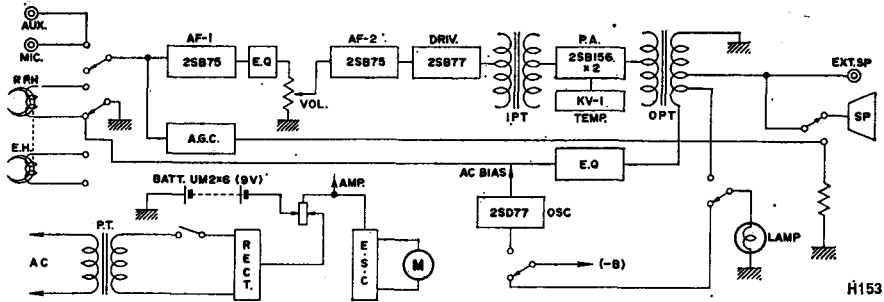
**Batteries:** The level lamp acts as an indicator of battery voltage. When the lamp goes almost out, the batteries should be changed.

# TAPE RECORDER SERVICING



(H154) CIRCUIT DIAGRAM—MODEL SR-300

# STANDARD

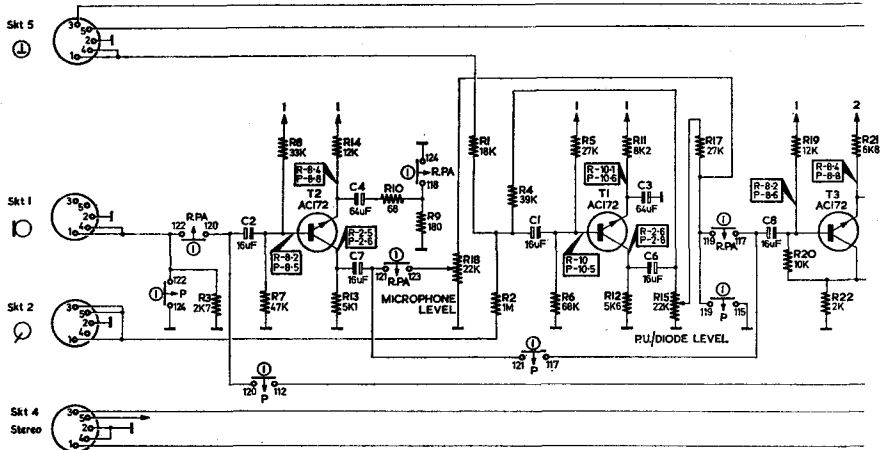


(H153) BLOCK DIAGRAM—MODEL SR-300

## STELLA

## Model ST462

**General Description:** A four-track, four-speed, mains-operated monophonic tape recorder employing both semiconductors and valves in a printed circuit amplifier. Low noise, high input impedance *n-p-n* type transistors are used in all low-level stages of the pre-amplifier which feeds an all-valve



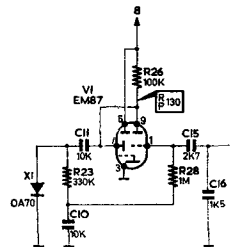
## SWITCH CODING and FUNCTIONS

R = RECORD	$7\frac{1}{2} = 7\frac{1}{2}$ l.p.s.	① = S1
P = PLAYBACK	$3\frac{3}{4} = 3\frac{3}{4}$ l.p.s.	② = S2
PA = PUBLIC ADDRESS	$1\frac{1}{8} = 1\frac{1}{8}$ l.p.s.	③ = S3
PAR = PARALLEL	$15\frac{1}{16} = 15\frac{1}{16}$ l.p.s.	④ = S4
STOP = PLAY KEY UP		
1-4 = TRACKS 1 OR 4		
2-3 = TRACKS 2 OR 3		

SWITCHES CLOSE ONLY FOR FUNCTIONS INDICATED

W53a

ALL VOLTAGES TAKEN WITH RESPECT TO CHASSIS USING A 100KΩ/V. METER.  
240V. A.C. INPUT TO 245V. TAP.

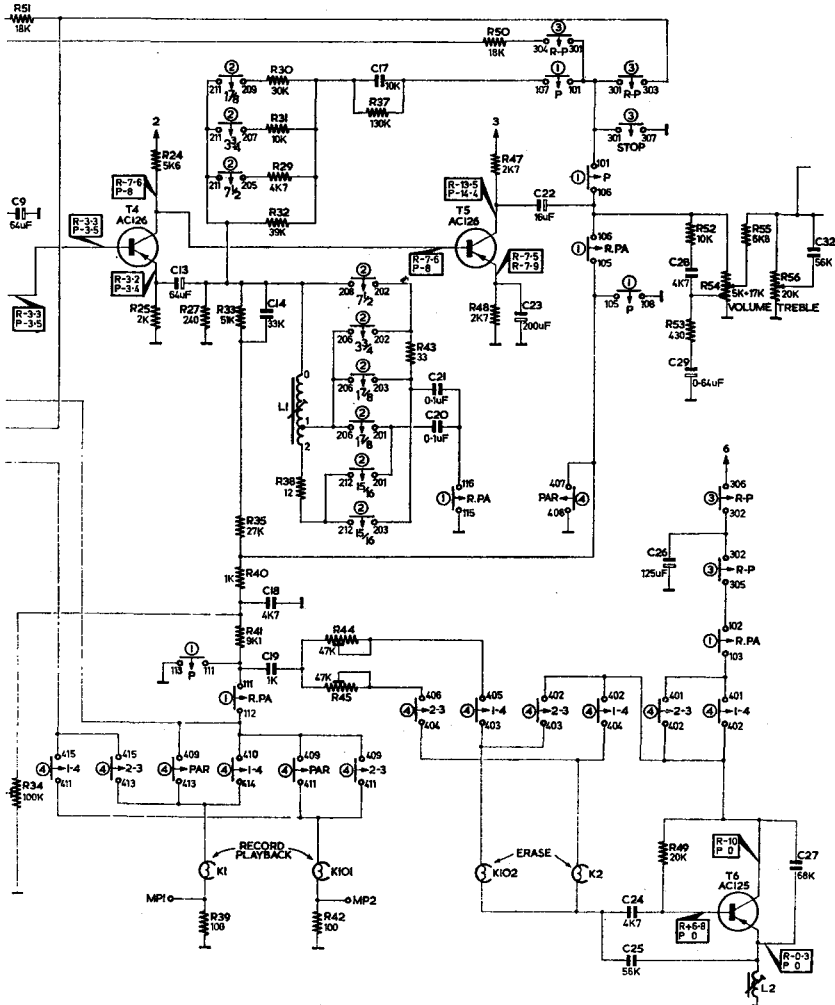


(W53a) CIRCUIT DIAGRAM—MODEL ST462 (PART)

# STELLA

main amplifier having separate bass and treble tone controls and a push-pull output stage. Provision is made for operation as a microphone or P.U./radio amplifier and, when used in conjunction with the Philips EL3787/00A pre-amplifier, etc., stereo playback, multiplay or duoplay is also possible.

**Adjustments: R34 Adjustment, Recording Indicator Sensitivity—** Switch recorder on (any speed), depress the record (red) key only and place



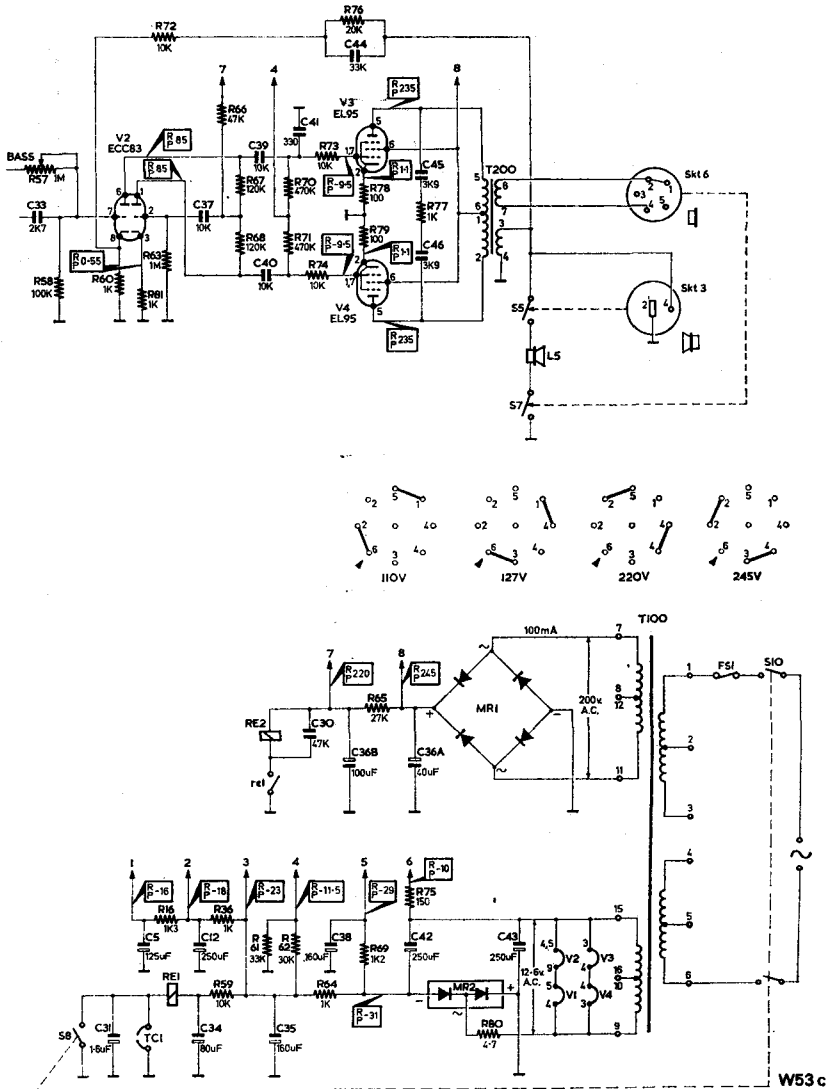
ALL SOCKETS IN CIRCUIT VIEWED ON SOLDER TAGS

W53b

(W53b) CIRCUIT DIAGRAM—MODEL ST462 (PART)

# TAPE RECORDER SERVICING

the track selector in the "1-4" position. Connect an A.C. millivolt-meter to MP1 and apply a generator source of 1 kc/s. to tag 1 on Skt1. Adjust generator level and/or microphone level (R18) for a meter reading of exactly 15 mV. Set R34 so that the fluorescent segments just meet the red band.



(W53c) CIRCUIT DIAGRAM—MODEL ST462 (CONTINUED)

## STELLA

**R44 and R45 Adjustment, Recording Bias Level:** Switch to Record at  $3\frac{3}{4}$  in./sec. and connect an A.C. millivolt-meter to MP1. Place the track selector in the "1-4" position and adjust R44 for a meter reading of 58 mV. Transfer the meter to MP2, switch to the "2-3" track position and adjust R45 for the same reading.

**L2 Adjustment, Oscillator Frequency Control:** The bias/erase oscillator frequency should be 52 kc/s.  $\pm 10$  per cent. This may be determined by measuring the voltage developed between the junction K2-K102 and chassis with a valve volt-meter. Adjust the core of L2 for a reading of 14.5 volts A.C. which should occur when the core is almost fully in.



## TELEFUNKEN

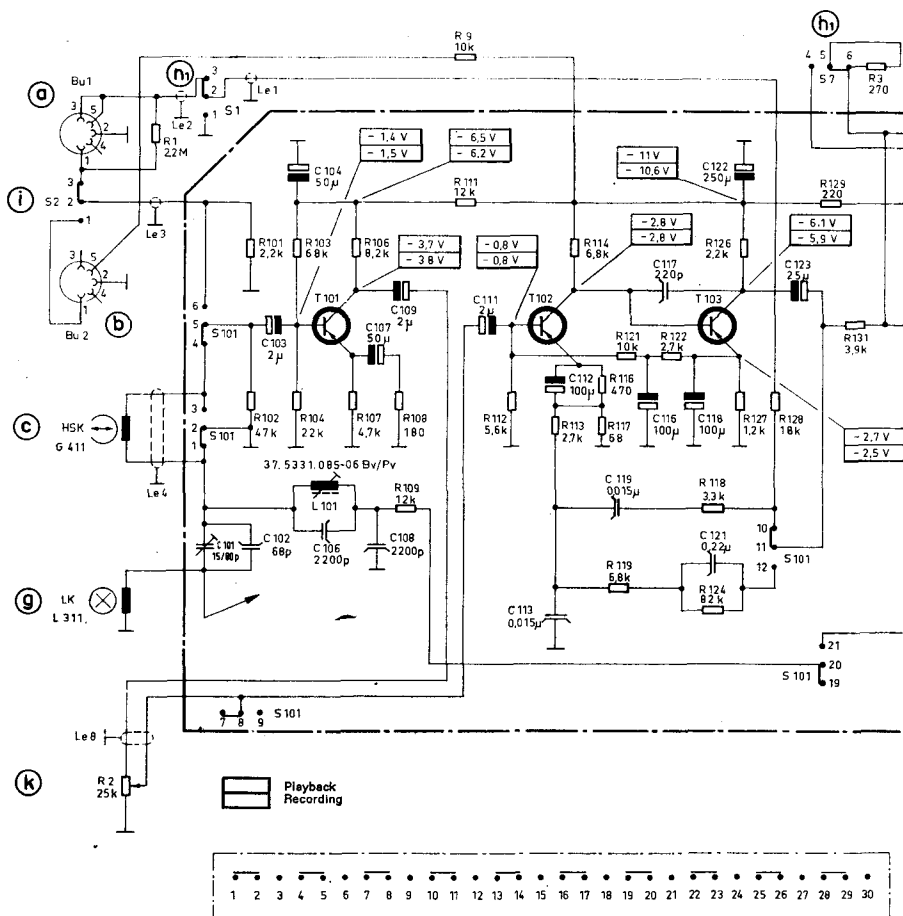
## Models M200, M201

**General Description:** Model M200: A two-track mains-operated tape recorder employing six transistors. Model M201: Employs a similar chassis with switching for four-track operation.

AC 150 green

AC 122 violet

AC 122 violet



a Radio and Phono socket

b Microphone socket

c Record / playback head

d Earphone socket

e Battery power and level meter

f On / off-switch S 8

g Erase head

h External loudspeaker socket 3.5 ... 5Ω

h<sub>1</sub> Loudspeaker-switch S 7

Marked switch position: Loudspeaker ON

i Radio-microphone-switch S 2

k Volume control

(n)

S 101

l Voltage selector S 9

m Tone control

n Recording / playback switch S 1, S 101

Switch position shown: playback

n<sub>1</sub> Playback switch S 1

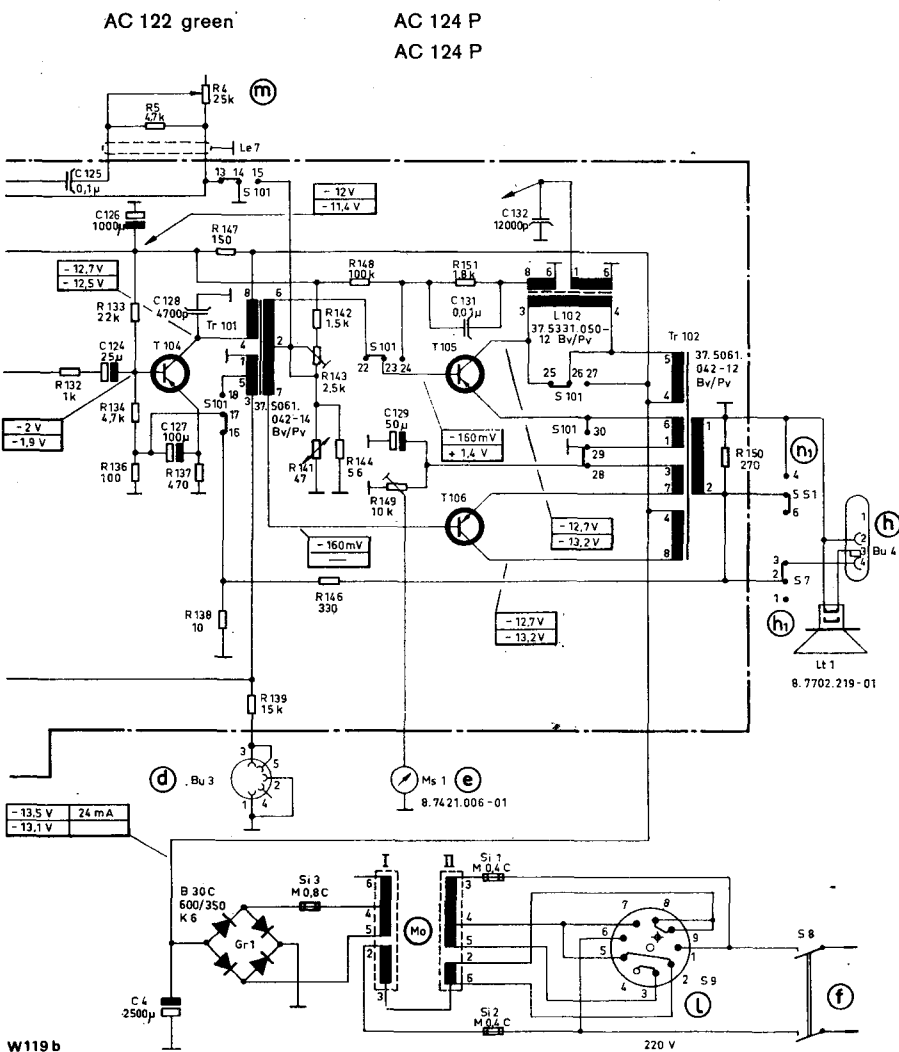
Switch position shown: playback

W119 a

(W119a) CIRCUIT DIAGRAM—MODEL MAGNETOPHON 200 (PART)

# TELEFUNKEN

**Bias and Erase Oscillator:** T105 operates as oscillator transistor in the recording setting. The oscillator circuit is single-ended with inductive feedback. The capacitor C132 in conjunction with one winding of the oscillator coil L102 constitutes the frequency-determining resonant circuit which is tuned to 85 kc/s. with the help of the screw core of the coil. If it is



(W119b) CIRCUIT DIAGRAM—MODEL MAGNETOPHON 200 (CONTINUED)

## TAPE RECORDER SERVICING

necessary to retune the oscillator frequency, make sure that the erase head is connected. The R.F. bias required for the recording process is fed to the record/playback head via C11/12 or C21/22 respectively.

**Adjusting the Parallel-tuned Trap, Coil L101:** This trap serves for suppressing R.F. bias injection into the amplifier circuit. Readjustment of the trap is necessary when oscillator circuit components or the erase head have been replaced. For such readjustments, connect the VTVM in parallel with capacitor C108 and switch the tape recorder to "recording". Then adjust the iron core of coil L101 for minimum voltage across C108.

**Setting the Resting Current of the Output Stage:** The resting current of the driver and output stage is set to 24 mA. in the absence of an A.F. signal. After any repairs to this stage have been carried out, first of all reset to this current value before applying an A.F. signal to the stage. For this purpose it is necessary to break the negative line running to the amplifier plate and to interpose the current meter. Switch the tape recorder to playback with the volume control turned right back to zero. Then adjust the resting current with the potentiometer R143.

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## ULTRA

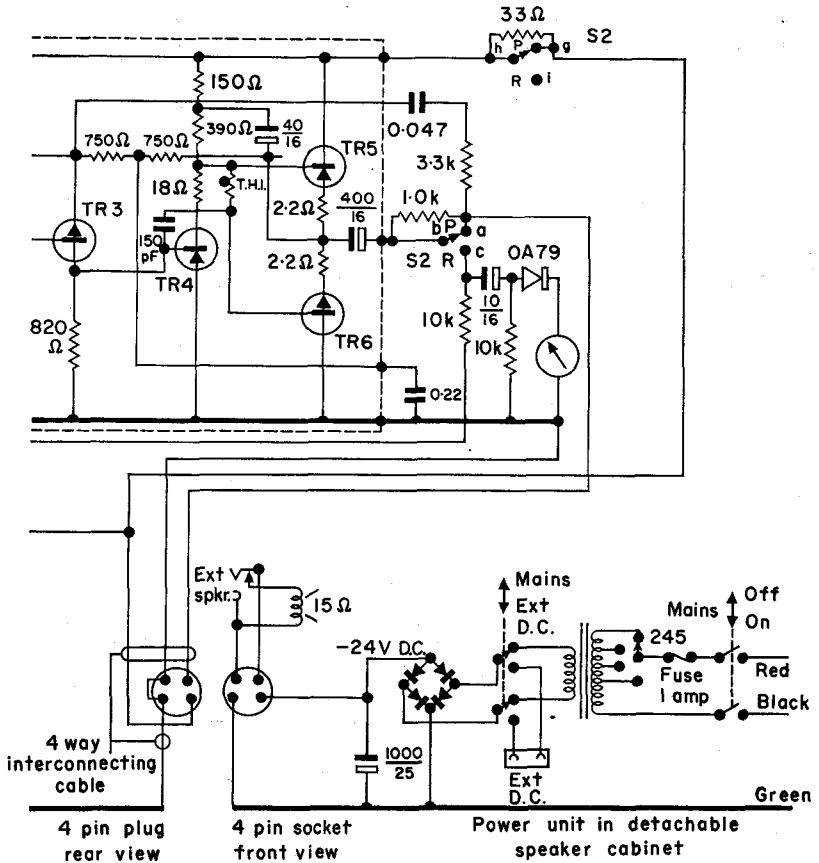
## Model 6212

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**General Description:** This tape recorder is similar to the Ultra Model 6206 described in the 1967-68 volume.



# TAPE RECORDER SERVICING

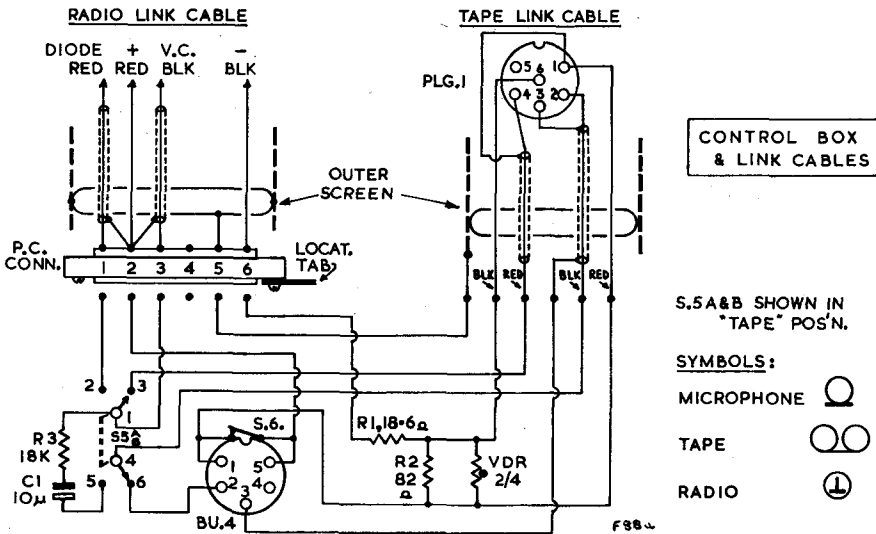


(H23b) CIRCUIT DIAGRAM—MODEL SONIC EIGHT (CONTINUED)

## WORLD RADIO

## Model TRC1

**General Description:** Ten-transistor tape recorder. Loudspeaker output impedance 8 ohms. Battery supply 7.5 volts.

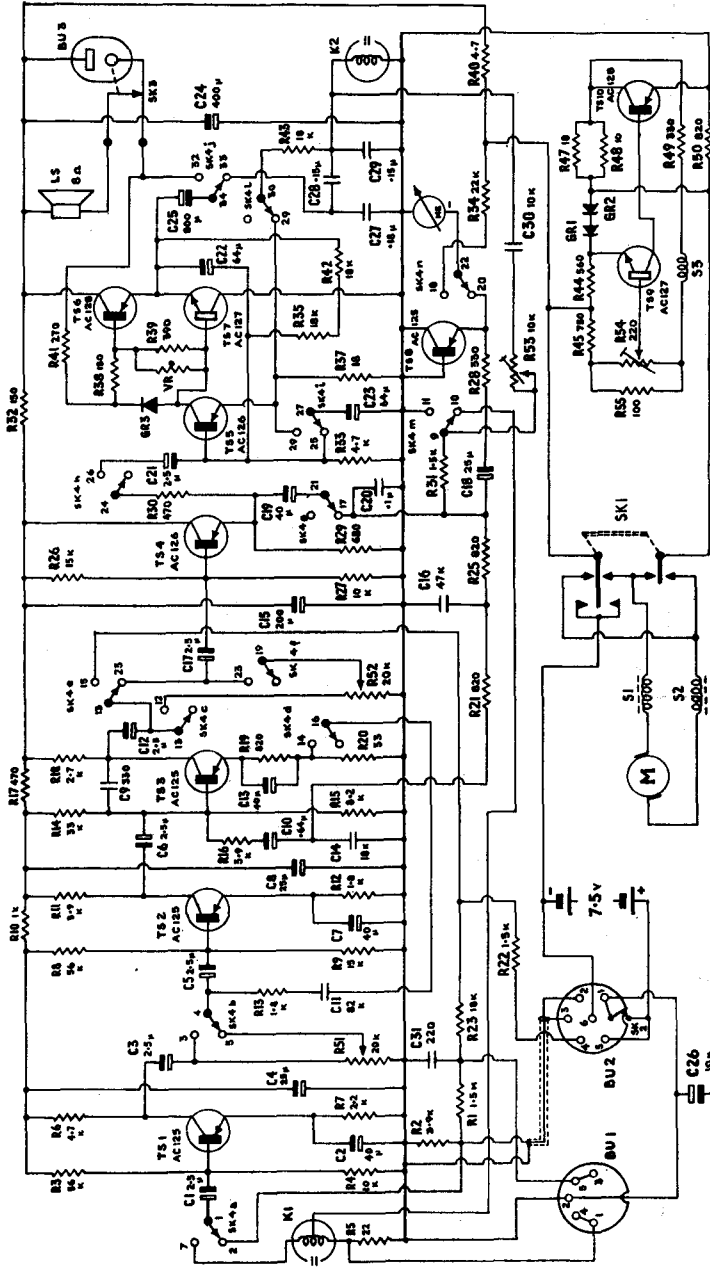


(F88a) CIRCUIT DIAGRAM—LINK CABLES/CONTROL BOX—MODEL TRC1

Variable resistor	Value
R51 . . . . .	20k
R53 . . . . .	10k
R54 . . . . .	220 Ω

Transistor	Type
TS1 . . . . .	AC125
TS2 . . . . .	AC125
TS3 . . . . .	AC125
TS4 . . . . .	AC126
TS5 . . . . .	AC126
TS6 . . . . .	AC128
TS7 . . . . .	AC127
TS8 . . . . .	AC125
TS9 . . . . .	AC127
TS10 . . . . .	AC128

# TAPE RECORDER SERVICING



F88

Switch SK4 shown in 'Record' position

(F88) CIRCUIT DIAGRAM—MODEL TRC1

# TELEVISION SERVICING

## ACKNOWLEDGEMENTS

British Radio Corporation Ltd.  
Combined Electronic Services Ltd.  
C.R.T.S. Ltd.  
Decca Ltd.  
Dynatron Radio Ltd.  
R.T.S. Ltd.

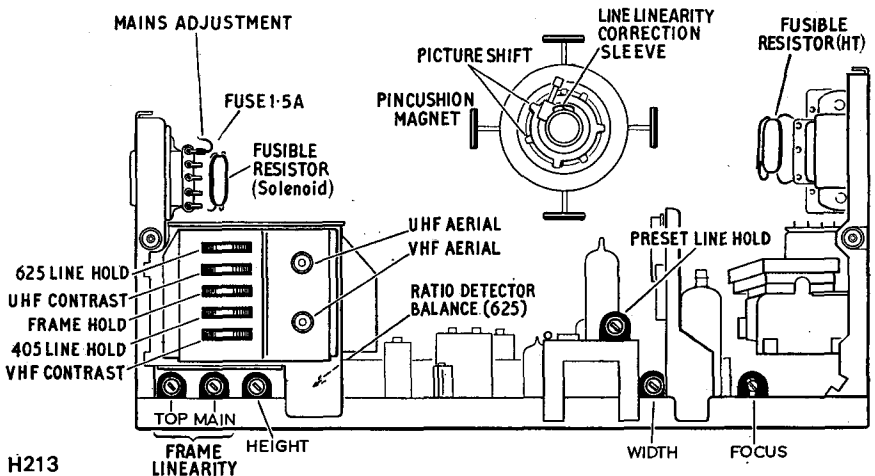


**B.R.C.****970 Series Chassis**

**General Description:** Dual-standard television chassis similar (in some respects) to the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**A.C. Mains Connection:** Before connecting to the mains supply ensure that the flylead to the mains transformer is connected to the appropriate voltage tag as shown on the indicator flap. The flylead is provided with a "push-on" tag connector. The black wire in the mains lead is connected to chassis when the receiver is switched on. Connect to mains so that the chassis is at neutral; the use of a non-reversible mains plug is recommended. The receiver may be operated on non-synchronous supplies.

**Fuses:** A 1.5 amp cartridge type is fitted in the supply to the mains transformer. If replacement becomes necessary, a fuse of the same type and rating should be used. Additional protection is provided by a fusible resistor link in the receiver H.T. line. A second fusible resistor link separately protects the switch operating solenoid. It should be noted that if this link is fused the supply to the transformer is also disconnected. The fusible links may be resoldered to make contact after eliminating any overload condition.



**Line-Hold Controls:** Independent controls are provided for each line standard. Pictures may be displaced to one side of the screen or split into two after locking-in. Careful readjustment of the appropriate line-hold control should centre the picture within the screen area. The correct adjustment is obtained when the picture is centred and free from any foldover effect.

**R413:** This is a factory adjustment and should not normally require attention. To readjust, select a V.H.F. transmission, short-circuit the top end of R44 (sync. separator grid-leak) to chassis, and adjust the 405 line-hold control for an almost stationary picture. Remove the short-circuit and check that the picture breaks up when the control is rotated in either direction from the stationary position. If necessary adjust the pre-set line-hold control (on flywheel unit) to achieve this condition. Renew the short-circuit and select a U.H.F. band. Tune to signal and adjust the 625 line-hold control in the same manner, but do not disturb the setting of the pre-set line-hold control. Remove short-circuit.

**Picture Squaring:** To square-up the picture with the mask, slacken off the clamp securing the deflector coils assembly on the neck of the tube. Then, keeping the coils as far forward as possible while at the same time ensuring that the position of the linearity sleeve relative to the deflector coils remains unaltered, carefully rotate the complete assembly as required.

**Pin-Cushion Correction Magnets:** These magnets are mounted on flexible brass strips attached to the deflection unit. To remove curvature from the edges of the picture, the positions of the magnets should be adjusted by bending the mounting strips.

**Picture Size:** The height control should be adjusted so that the castellations at top and bottom of Test Card C are partially excluded and the width control set up for the best formation of the circle in the centre. The adjustments should be made on a low brilliance setting. The width control must not be set up for excessive over-scan, otherwise the E.H.T. may rise beyond the maximum permissible voltage.

The line linearity correction sleeve must be positioned so that the locating lug is directly opposite the tube anode connector with the moulded ring 3 mm. from the edge of the deflector coils moulding. Where over- or under-scan cannot be corrected by the width control with the linearity sleeve set to its correct distance, then the sleeve may be readjusted within the tolerance limits 0-4 mm. The deflector coils clamp should be slackened before adjusting.

**Frame Linearity:** Two frame linearity adjustments are provided; one controlling the overall linearity and the other affecting only the top of the picture. The latter should not be disturbed unless non-linearity is apparent at the top of the frame, in which event it should be set to the middle of its range while overall linearity is adjusted by means of the main control. The "top" adjustment may then be varied, if necessary, to correct the top of the picture.

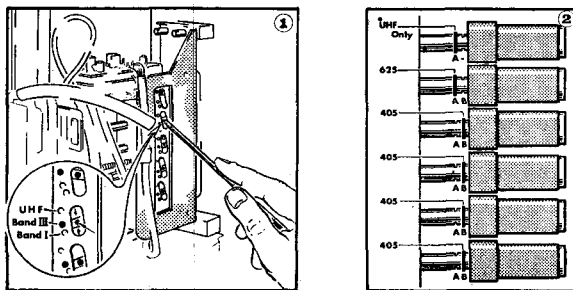
**Picture Position:** The shift control is mounted at the rear of the deflector coils assembly. The picture can be moved in any direction by rotating both control rings together around the neck of the tube. The position of the rings relative to one another alters the extent of the picture movement. (*See also Line-Hold Controls.*)

**Ratio Detector Balance (625):** This is a factory adjustment and should not normally require attention. To readjust, set control for minimum

"buzz" from the loudspeaker with the receiver correctly tuned to a 625-line U.H.F. transmission.

**Push-Button Fine Tuning:** With the selector button depressed, the spring-loaded outer sleeve can be further depressed to allow the inner shaft to be rotated. Avoid pressing in on the button when tuning as this will alter the effect of the adjustment.

**Push-Button Band Changing:** With the exception of the top button which tunes the U.H.F. band only, all the other buttons can be adjusted to tune over any band. The band selectors are shown in Diagram 1. When changing the position of one of the selectors, ensure that the associated button is not depressed and that the locating pip locks securely in the correct hole. The 405/625 switching is determined by the positions of circlips on the push-button spindles, see Diagram 2. Two locating slots are provided on each push-button spindle, the one nearest the tuner metalwork for 625 and the one nearest the push-button knob for 405. Fit the circlip into the appropriate slot.



H214

(H214) DIAGRAMS 1 AND 2. PUSH-BUTTON BAND CHANGING

**V.H.F. Wired Distribution Working:** If it is required to operate the receiver on 625 lines at V.H.F., all that is necessary is to move the circlip on the appropriate V.H.F. button to the 625 position, and if necessary set the associated band selector to the required V.H.F. Band. (*See Push-Button Band Changing.*)

**Harmonic Suppression Filter:** 1. This filter is normally tuned to 194 Mc/s. to suppress the 5th harmonic of the 625-line vision I.F., which might cause interference on receivers which are in close proximity and operating on Channel 9. Alternatively the filter may be readjusted to 209 Mc/s. to suppress self-generated I.F. harmonic interference received on Channel 12. The adjustment (L<sub>14</sub>) is located in the vision detector coil assembly. Set the fine tuning control for maximum interference and adjust L<sub>14</sub> for maximum suppression.

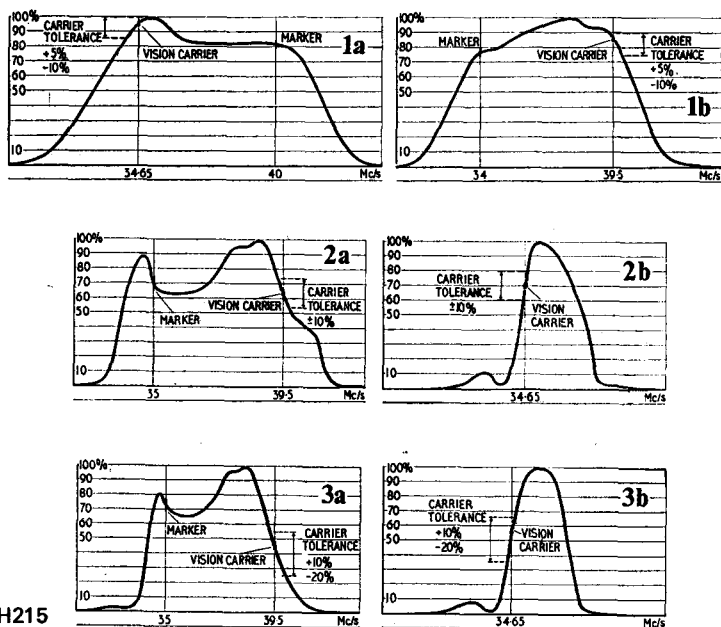
**Wire-Wrap Tags:** If these connections are replaced during service, do not attempt to wrap the wires but use normal soldered joints.

**Alignment (Equipment):** 1. An A.M. signal generator 75 ohms output impedance capable of being modulated at audio frequencies. 2. A wob-

bulator providing a 30-45 Mc/s. sweep and preferably incorporating a display unit or alternatively a separate oscilloscope may be used for display purposes. 3. A video output meter. This may be a Model 8 Avometer, used on its 100-volt D.C. range. 4. An output meter for the 6 Mc/s. F.M. I.F. amplifier. This may be a Model 8 Avometer, used on its 10-volt D.C. range. 5. A suitably calibrated, audio output meter. 6. Resistors and capacitors to provide suitable terminations for test equipment.

**Alignment (Procedure):** Suitable connecting points for test equipment are shown in the alignment diagrams. When two tuning cores are located in same former, tune to the outer peak in each case; select the peak nearest chassis or printed board for single core formers. The input signal level should be adjusted during alignment to maintain the video output meter reading at about 70 volts on V.H.F., and 50 volts on U.H.F. The audio output should not be allowed to exceed 50 mW. *Note:* L<sub>17</sub> and L<sub>18</sub> are adjusted during factory alignment on special test gear to ensure optimum transient response and therefore it is advisable not to disturb these adjustments. Harmonic suppression coil L<sub>14</sub> is normally tuned to 194 Mc/s. to suppress 625 vision I.F. fifth harmonics.

**Alignment (Rejector and 405 Sound I.F.):** Connect shorting links as shown in the Alignment Diagram. Connect equipment to the points shown in Alignment Diagram.



H215

(H215) WOBULATOR DIAGRAMS. KEY NUMBERS ON DIAGRAMS ARE INCLUDED FOR EASY REFERENCE TO TEXT

## TELEVISION SERVICING

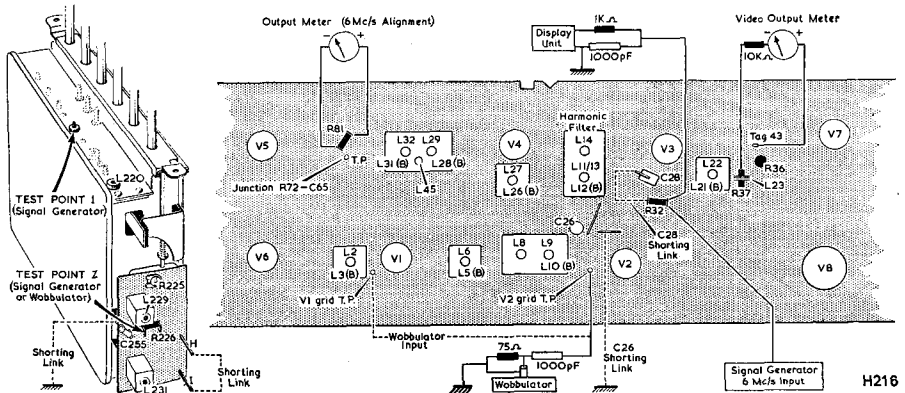
### Unmodulated Input Signals

<i>Adjust</i>	<i>Mc/s.</i>	<i>Video output</i>
L9 . . .	38.15	Minimum
L8 . . .	41.5	Minimum
L6 . . .	33.15	Minimum
L2 . . .	39.65	Minimum

### Modulated Input Signals

<i>Adjust</i>	<i>Mc/s.</i>	<i>Audio output</i>
L45 . . .	34.65	Minimum
L26 . . .	38.25	Maximum
L29 . . .	38.25	Maximum
L28 . . .	38.25	Maximum

**Alignment (Tuner To Link Unit Coils):** With the test equipment set up as for Rejector and 405 Sound I.F., remove the shorting link from junction L229-C255 and transfer sig. gen. to Tuner Test Point 1. Return all push-buttons to the out position. (1) Signal generator to 39.7 Mc/s. and adjust L220 for maximum. (2) Signal generator to 33.2 Mc/s. and adjust L229 for maximum. Disconnect test equipment and links.



(H216) ALIGNMENT DIAGRAM

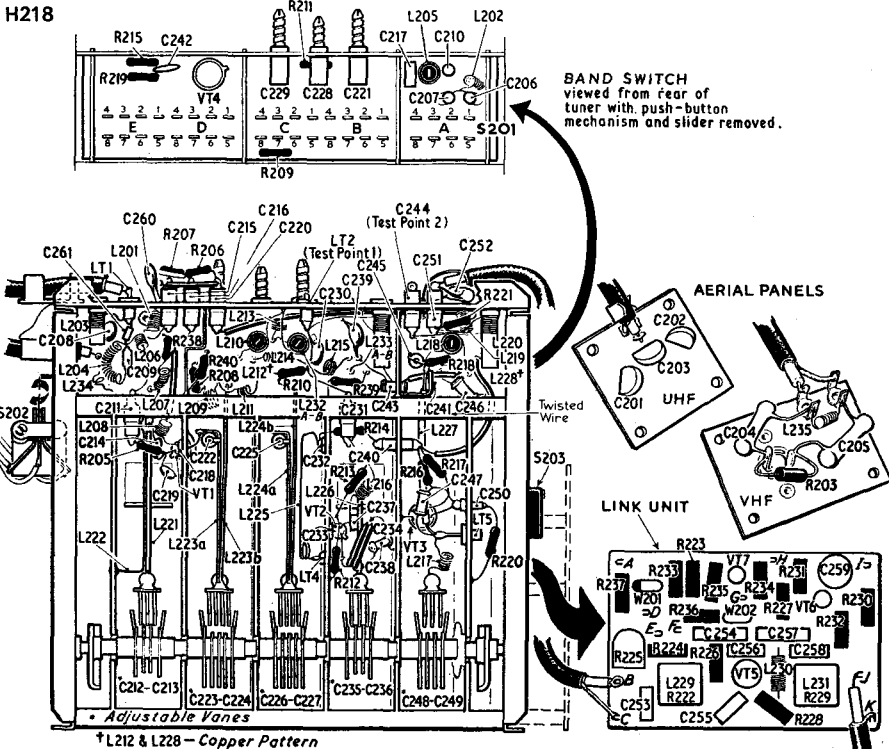
### Alignment (Vision I.F.): Wobbulator Method.

**1(a)** Terminate the wobbulator output with a 75-ohm resistor and connect via a 1000-pF. capacitor to V2 grid T.P. (see alignment diagram). Connect the input of the display unit to pin 8 of V3 (R32 end cap provides a convenient connection) via a 1 kΩ resistor decoupled by a 1000-pF. capacitor. Switch wobbulator range to cover 30-45 Mc/s. If the wobbulator does not incorporate a marker generator, the A.M. signal generator may be used for this purpose provided that the calibration is known to be accurate.

Adjust  $L_{11}/L_{13}$  and  $L_{12}$  for response shape as shown in 1a on accompanying diagram. (b) Switch to U.H.F. and check that response shape is as shown in 1b. If the vision carrier is not within the tolerance limits,  $L_{11}/L_{13}$  and  $L_{12}$  should be slightly readjusted to obtain the best compromise between the 405 and 625 response shapes. Finally, check that vision carrier remains within the specified limits on both line systems.

2(a) Transfer the wobulator output to pin 2 of  $V_1$  ( $V_1$  grid T.P.) and reduce the R.F. output of the wobulator to maintain a similar size trace as before. Switch to U.H.F. Adjust  $L_5$  and  $L_{10}$  for a response shape as shown in 2a on accompanying diagram. (b) Switch to Channel 2. Check that response shape is as shown in 2b. If the vision carrier is not within the tolerance limits, readjust  $L_5$  and  $L_{10}$  for best compromise ensuring that the vision carrier remains within the specified limits on both line systems.

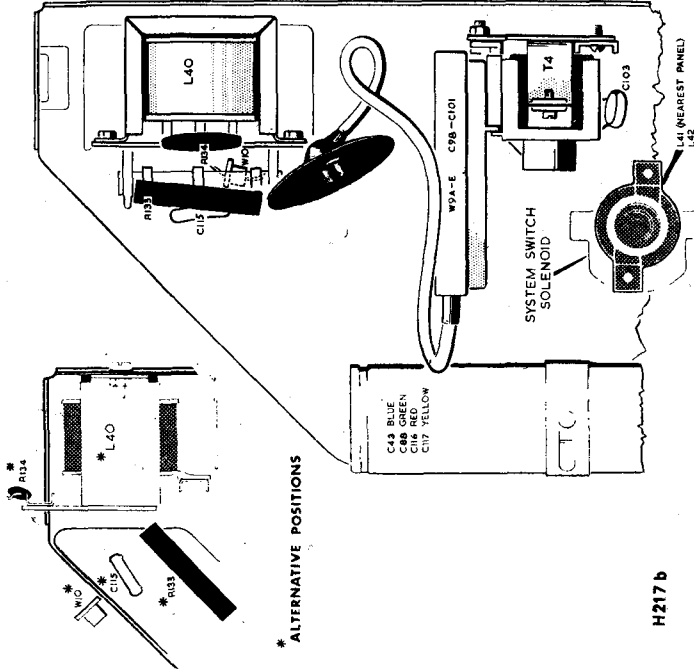
3(a) Transfer wobulator to Test Point Z. Place shorting link between junction  $L_{229}-C_{255}$  and chassis. Select U.H.F. band and adjust  $L_3$  and  $L_{231}$  for shape shown in 3a on accompanying diagram. (b) Select a V.H.F. band and check that shape is as shown in 3b. If vision carrier is not within



(H218) COMPONENT LOCATIONS—INTEGRATED V.H.F./U.H.F. TUNER AND LINK UNIT

# TELEVISION SERVICING

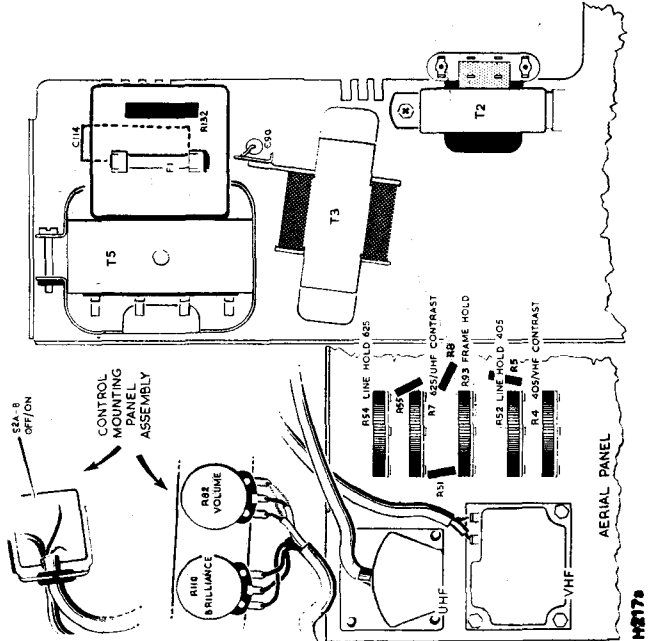
(H217a) CHASSIS LEFT-HAND SIDE PANEL



\* ALTERNATIVE POSITIONS

H217 b

(H217b) CHASSIS RIGHT-HAND SIDE PANEL

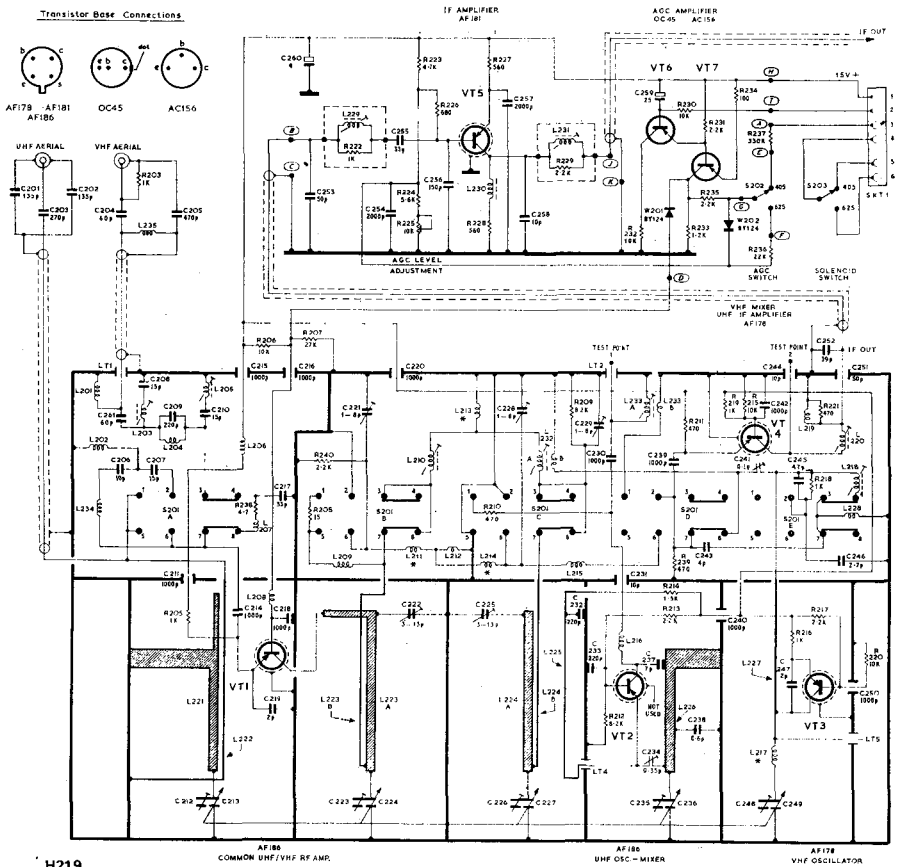


## TELEVISION SERVICING

tolerance limits readjust  $L_3$  and  $L_{231}$  for best compromise. Ensure that vision carrier remains within the specified limits on both line systems. Remove shorting link.

**Alignment (6 Mc/s. F.M. I.F.):** Select U.H.F. band. Connect output meter (on 10-volt D.C. range) across  $R_{81}$ . Inject 6 Mc/s. unmodulated signal at  $V_3A$  grid ( $R_{32}$  end cap provides a convenient connection).

During alignment adjust the signal generator input to maintain the meter reading at 5 volts approximately. Adjust the following for maximum output:  $L_{21}$ ,  $L_{22}$ ,  $L_{27}$  and  $L_{31}$ . Disconnect the output meter from across  $R_{81}$  and connect two equal resistors of about 100 k $\Omega$  each, in series across  $R_{81}$ . Switch the meter to its 50- $\mu A$ . range and connect it between the



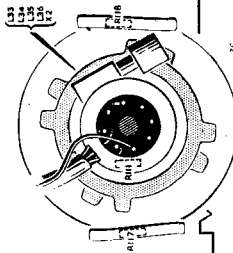
**NOTES:** SWITCH POSITIONS 5201A-E. CONTACTS 12385 CLOSED. UHF BAND 3.547.88 MHz. BAND 3.

TRANSISTORS VT1 & VT2 ARE LOCATED IN HEAT SINKS

\* THE INDUCTANCE OF THESE COILS IS FACTORY ADJUSTED BY EXPANDING OR COMPRESSING THE COIL TURNS.

**(H219) CIRCUIT DIAGRAM—INTEGRATED V.H.F./U.H.F. TUNER AND LINK UNIT**





(H217c) PRINTED CIRCUIT BOARD

junction of these resistors and the junction of R72-C65 (a suitable tag is provided on the printed board for the latter connection). Adjust L32 for zero meter reading between positive and negative swings. Disconnect the resistors and remove the meter.

**A.G.C. Level Adjustment (R225):** Under normal circumstances it should not be necessary to disturb the setting of R225. In the absence of suitable test gear tune the receiver to a strong V.H.F. signal and adjust R225 for minimum cross-modulation. This usually occurs at a position slightly clockwise of centre.

**Circuit Notes:** Apart from the integrated tuner and link unit, contrast and A.G.C. networks the circuits are basically similar to those in the Thorn 950 Mk. II Series.

**Flywheel Sync. Unit:** See Thorn 950 Mk. II Series.

**Pentode Type Flywheel Sync.:** See Thorn 950 Mk. II Series.

**Access For Service:** See Thorn 950 Mk. II Series.

**Cathode Ray Tube Notes:** See Thorn 950 Mk. II Series.

**Circuit Diagram Notes:** The following differences to the circuit diagram may be found in some receivers: C33-33 pF., C73-0.01  $\mu$ F., C107-20 pF., R41-5.6 k $\Omega$ , R44-680 k $\Omega$ . In some receivers the Flywheel Unit D.C. Amplifier is connected as a pentode with the following component differences: R51-68 k $\Omega$ ; R55-100 k $\Omega$ ; R406-180 k $\Omega$ ; R408-68 k $\Omega$ ; R409-39 k $\Omega$ ; R411-47 k $\Omega$ .

Figures in rectangles are D.C. voltage measurements. They were taken on a mains input of 240 volts A.C. with the controls set for normal operation. Timebase measurements were taken with the oscillators locked, all other measurements were taken under "no-signal" conditions. E.H.T. was measured with an electrostatic meter at minimum brilliance. These readings may be considered as typical but it is stressed that they are provided for guidance only and that variations of 10 to 20 per cent. do not necessarily indicate fault conditions.

Ringed figures indicate connecting points on the component side of the printed board.

The spark gaps shown in the main circuit diagram are formed in the copper-work of the printed board and provide a "low resistance" path to earth for any high voltage flashover which might occur in the C.R.T.

Whenever possible, D.C. resistances are given for inductors which have a resistance of 1 ohm or more.

The oscillograms show peak-to-peak voltage values. They were measured via a probe of 8 pF. in parallel with 10 M $\Omega$ . (A), (B), (D), (E), (F) and (M) were taken at 405-line frequency. (C), (G), (H), (J) and (K) were taken at field frequency. Note that (K) was taken with the field oscillator rendered inoperative by earthing grid of V6B.

**Printed Board Servicing Aids:** Printed wiring between components and general circuit information (including circuit references) is printed in white on the component side of the printed board.

VISION & SOUND  
IF AMP  
6F29 (EF183)



6F30 (EF84)  
SOUND IF AMP. &  
CAL LIMITED

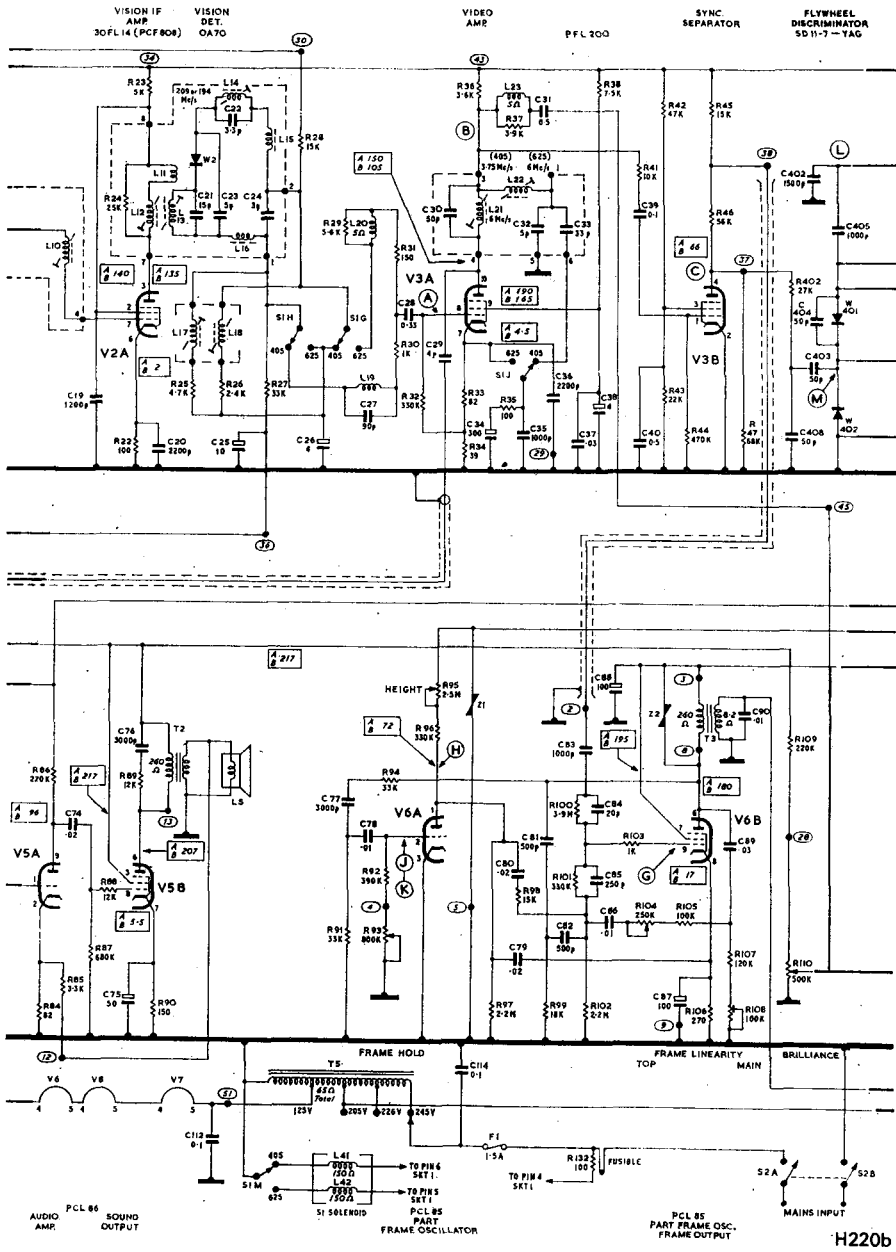
2G84  
AM SOUND  
DETECTOR

2xCG61  
FM RATIO  
DETECTOR

OABI  
SOUND NOISE LIMITER

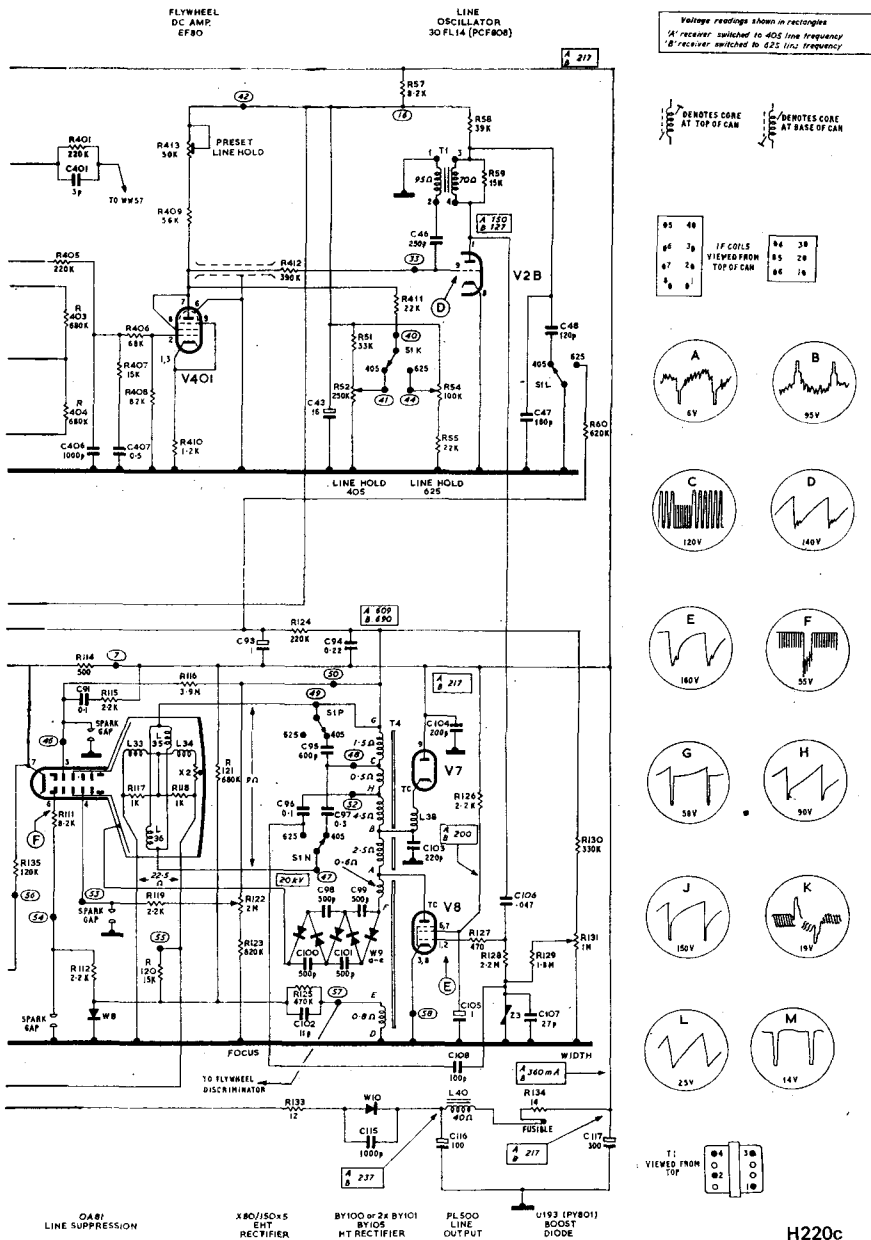
### (H220a) CIRCUIT DIAGRAM—MAIN CHASSIS—970 SERIES (PART)

# B. R. C.



(H220b) CIRCUIT DIAGRAM—MAIN CHASSIS—970 SERIES (PART)

## TELEVISION SERVICING



H220c

(H220c) CIRCUIT DIAGRAM—MAIN CHASSIS—970 SERIES (CONTINUED)

External connections to wire-wrap tags numbered to correspond with circuit diagram are also shown.

White lines on the copper side of the board, with circuit references, indicate soldering points for individual components. Lines which are marked with the letter J indicate wire jumpers. Solder connections to valve bases are numbered to facilitate pin identification.

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## B.R.C. 1400 Series Tuners and Chassis

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**General Description:** Dual-standard television receiver chassis used with V.H.F. tuner type 1516 and U.H.F. tuner types T4 and T8.

**A.C. Mains Connection:** The black wire in the mains lead is connected to chassis when the receiver is switched on. Connect to mains so that the chassis is at neutral; a non-reversible mains plug is recommended.

**Fuses:** A fusible resistor link protects the switch operating solenoid. It should be noted that if this link is fused the supply to the receiver is also disconnected.

**Local-Distant Control (V.H.F. only):** In strong signal areas the control should be used to remove cross modulation effects. These effects show up as bars on the picture changing in sympathy with the sound, or as a buzz from the loudspeaker varying with picture content. In weak signal areas the control should be adjusted for minimum noise on the picture.

**Contrast Controls:** Independent controls are provided for V.H.F. and U.H.F. reception.

**Picture Squaring:** Slacken off the clamp securing deflector coils, then rotate complete assembly as required. Note that the coils must be kept as far forward as possible and the linearity sleeve must retain its position with respect to the coils.

**Pin-Cushion Correction Magnets:** To remove curvature from the edges of the picture, the positions of the magnets should be adjusted by bending the mounting strips.

**Picture Size:** The height and width adjustments should be made on a low brilliance setting. The width must not be made excessive, in order to prevent the E.H.T. exceeding the maximum permissible voltage.

**Line Linearity:** The correction sleeve must be set with the moulded ring 3 mm. from the edge of the deflector coils moulding. Tolerance limits 0 to 4 mm. Note that the deflector coils clamp should be slackened before adjusting.

**Field Linearity:** Two frame linearity adjustments are provided; one controlling the overall linearity and the other affecting only the top of the picture. The latter should not be disturbed unless non-linearity is apparent at the top of the frame, in which event it should be set to the middle of its

## TELEVISION SERVICING

range while overall linearity is adjusted by means of the main control. The "top" adjustment may then be varied, if necessary, to correct the top of the picture.

**Picture Position:** The shift control is mounted at the rear of the deflector coils assembly. The picture can be moved in any direction by rotating both control rings together around the neck of the tube. The position of the rings relative to one another alters the extent of the picture movement.

**Ratio Detector Balance:** This is a factory adjustment and should not normally require attention. To readjust, set control for minimum "buzz" from the loudspeaker with the receiver correctly tuned to a 625-line U.H.F. transmission.

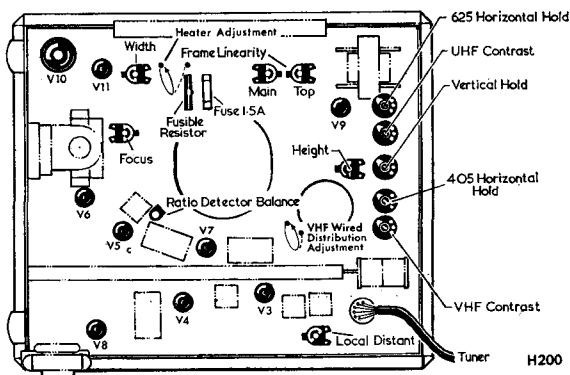
**U.H.F. Tuner:** The unit may be continuously tuned through Bands IV and V and is fitted with either push-button or rotary channel selection depending on individual receiver presentation. Where push-button selection is employed the buttons may each be pre-set to any channel.

**Warning (U.H.F. Tuner Unit):** No servicing adjustments of an electrical nature should be attempted on this unit. If the unit develops an electrical fault, the complete assembly should be sent to the nearest Service Depot.

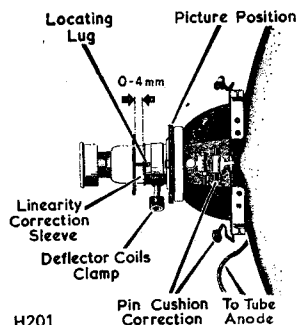
**V.H.F. Tuner:** Each Band 1 and Band 3 biscuit is numbered to indicate the channel to which it is tuned. The number is preceded by the letter C. An additional biscuit (marked U.H.F.) adapts the R.F. and Mixer stages to function as an I.F. pre-amp. during U.H.F. reception. A common biscuit (numbered C23) is employed for channels 12 and 13.

**Wire-Wrap Tags:** If these connections are replaced during service, do not attempt to wrap the wires but use normal soldered joints.

**Alignment Notes:** 1. All other possible causes of poor response or low gain should be checked before realigning the circuits. 2. Equipment required: (a) A.M. signal generator of 75 ohms output impedance. (b) Video output meter—or Model 8 Avo. (c) Output meter—or Model 8 Avo. (d) 4.5-volt grid bias battery. (e) Various small components



(H200) PRE-SET ADJUSTMENTS AND VALVE LOCATIONS



(H201) C.R.T. NECK UNITS

—see text. 3. When two cores are located in the same former, tune to outer peak in each case. 4. Select the peak nearest printed board for single core formers. 5. The signal input should be adjusted to maintain a video output reading of 120 volts on V.H.F. 6. On U.H.F. the signal input should be set to maintain a video output reading of 80 volts except for the 33.15 MHz rejector when the output reading should be 50 volts. 7. The audio output should never exceed 50 mW. 8. L18 should not be disturbed.

**Rejector and 405 Sound I.F.:** Turn the local/distant control fully anticlockwise, and contrast and volume controls fully clockwise. Connect apparatus as shown in alignment diagram. Use Table 1. Then connect 4.5-volt battery as in alignment diagram and use Table 2.

**Vision I.F.:** After the rejector and 405 sound I.F. circuits have been set up, the audio output meter should be removed. Then switch receiver to U.H.F. and short TP3 to TP4. The damping components (330 ohms and 1000 pF.) should be connected in series (with short leads) between the earth conductor and the damping points specified in Table 3.

**Table 1. Unmodulated Input Signals**

Select	Adjust	MHz	Video output
V.H.F. . . . .	L7	38.15	Minimum
Channel 2 . . . .	L2	41.5	Minimum
	L3	39.65	Minimum
	L6	33.15	Minimum
U.H.F. . . . .	L1	33.15	Maximum

**Table 2. Modulated Input Signals (A.M.)**

Select	Adjust	MHz	Video output
V.H.F. . . . .	L23	38.15	Minimum
Channel 2 . . . .	L25	38.15	Maximum
	L26	38.15	Maximum

**Table 3**

Adjust	MHz	Damping point	Video output
L10 . . . . .	36.5	V4A anode	Minimum
L9 . . . . .	38.3	—	Minimum
L8 . . . . .	37.3	V3 anode	Minimum
L5 . . . . .	38.2	TP2	Minimum
L209 . . . . .	37.4	V3 grid	Minimum
L4 . . . . .	35.1	Tag 1	Minimum

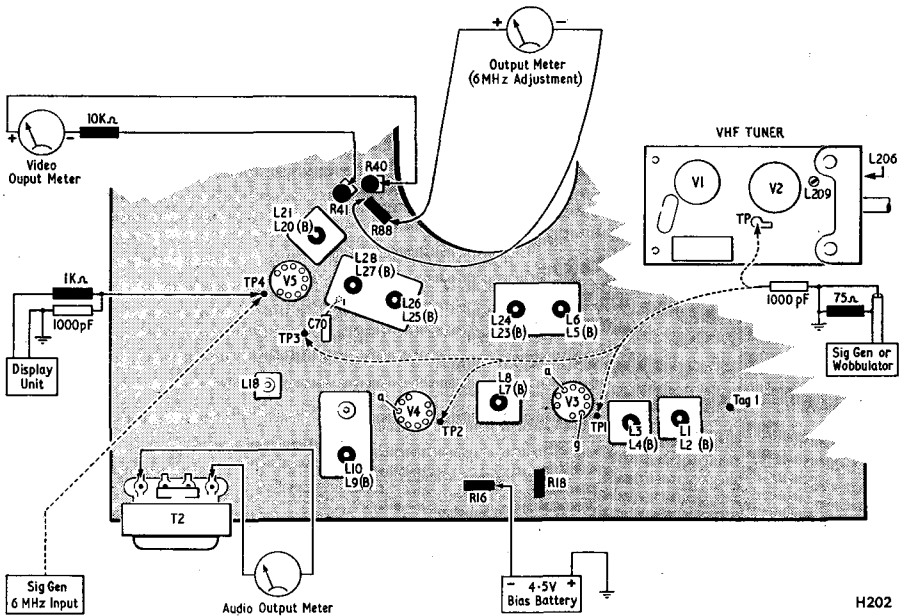
**6. MHz F.M. I.F.:** 1. Switch to U.H.F. on the V.H.F. turret tuner. Connect the output meter (on 10-volt D.C. range) across R88, observing the correct polarity. Inject a 6-Mc/s. unmodulated signal between T.P4



## TELEVISION SERVICING

and chassis. 2. During alignment adjust the signal generator input to maintain the meter reading at 5 volts approximately. Adjust the following for maximum output: L24, L27, L28, L20 and L21. 3. Disconnect the output meter from across R88 and connect two equal resistors of about 100 k $\Omega$  each in series across R88. Switch the meter to its 50  $\mu$ A. range and connect it between the junction of these resistors and the junction of R81-C70 (pin 1 of L28 coil base is suitable for the latter connection). Adjust L28 for zero meter reading between positive and negative swings. Disconnect the resistors and remove the meter.

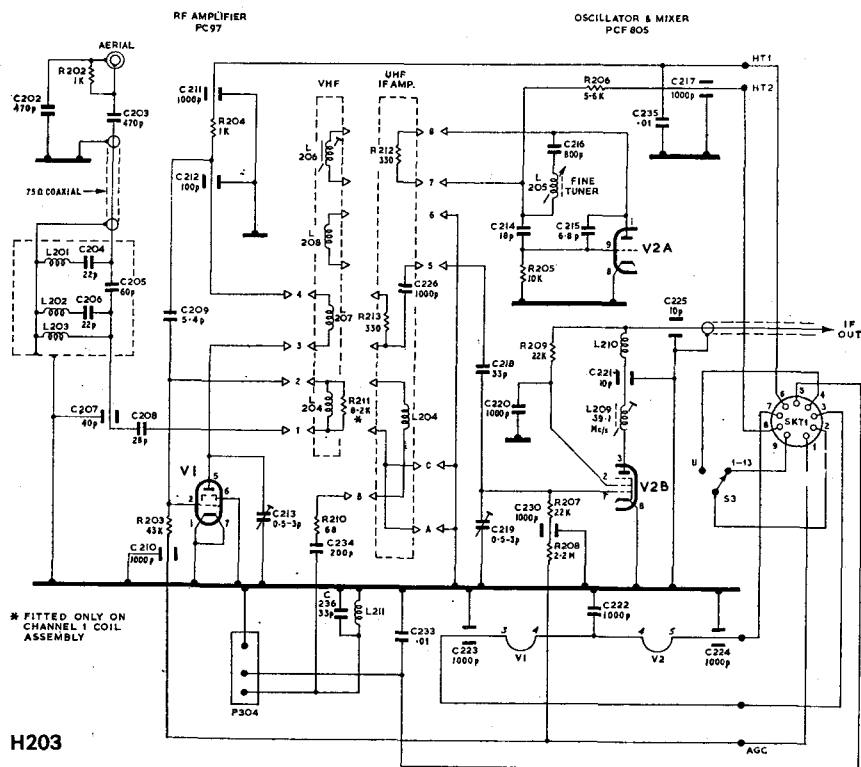
**V.H.F. Tuner Oscillator Adjustment:** Connect aerial, select appropriate channel and turn fine tuning to the middle of its range. Tune in transmission with L206.



(H202) ALIGNMENT DIAGRAM. CORE ADJUSTMENTS ARE SHOWN WITH B DENOTING CORE NEAREST BOARD

**Circuit Diagram Notes:** 1. The diagrams shown are of the Schedule B chassis. The Schedule A chassis differed in that R90, C128, T.P1-5 and Tags 43 and 44 (the latter incorrectly shown as Tag 42 in diagram) were not fitted. Also in some Schedule A chassis R69 was 360k, R102 was 1k and C89 was 0.1  $\mu$ F. 2. Later production chassis are designated Schedule C. They incorporate a fusible resistor in the HT2 positive rail. When this is fitted R137 becomes 126 ohms and the line-hold controls are taken directly to C123. 3. Figures in rectangles are D.C. voltages. All were taken on a mains input of 240 volts A.C. using the 240-250-volt tap. E.H.T.

was measured with an electrostatic meter and all other voltages with an Avometer Model 8. The readings are typical but variations of up to 20 per cent. do not necessarily indicate fault conditions. 4. If the D.C. resistance of an inductor is greater than 1 ohm, its value is given in the circuit diagram. 5. Ringed figures indicate connecting points on the component side of the printed board.



(H203) V.H.F. TUNER-TYPE 1516

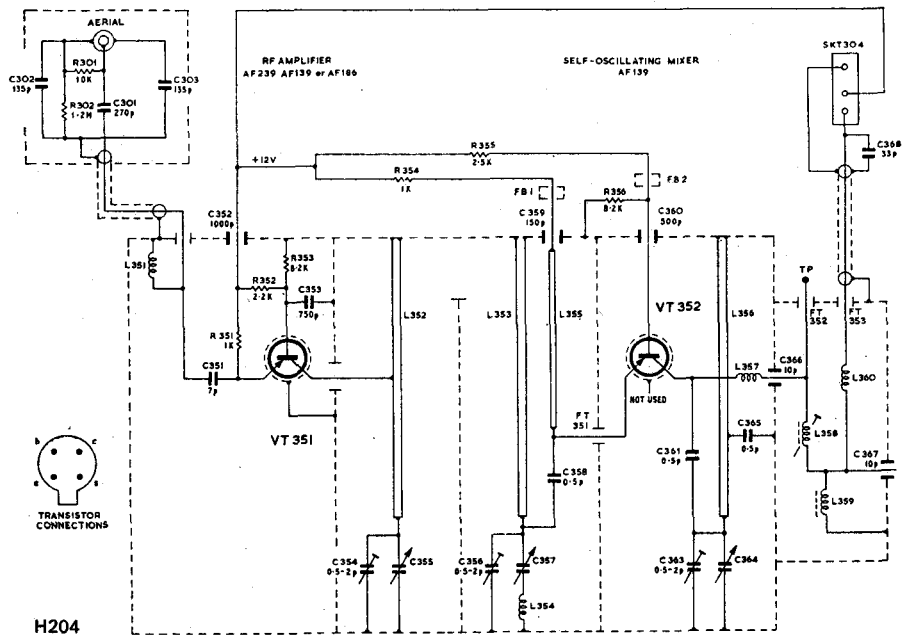
**Circuit Description (Tuners):** The V.H.F. tuner employs a frame-grid triode R.F. amplifier followed by a triode-pentode oscillator and mixer, the R.F. and mixer stages being A.G.C. controlled. The R.F. amplifier V1 and the pentode section of V2 also function as an I.F. amplifier during 625-line U.H.F. reception, the I.F. output from the U.H.F. tuner being applied to the grid circuit of V1. The switching circuit is contained on a special turret biscuit.

The U.H.F. tuner employs two high frequency transistors, AF139, AF186 or AF239 (R.F. amplifier) and AF139 (self-oscillating mixer) connected in grounded-base configuration. The  $\frac{1}{4}$ -wave lecher lines L352,

## TELEVISION SERVICING

L353 and L356 are end-capacity tuned by a three-gang capacitor providing complete coverage of Bands IV and V. A low voltage supply, derived from the receiver H.T. line, is fed to the emitter/base resistance networks while the chassis and collectors are maintained at relative negative potential.

**Circuit Description (Solenoid):** The main chassis circuit includes dual-standard I.F. and line timebase stages, the necessary changeover between systems being achieved by a solenoid actuated slide switch S2A-M.

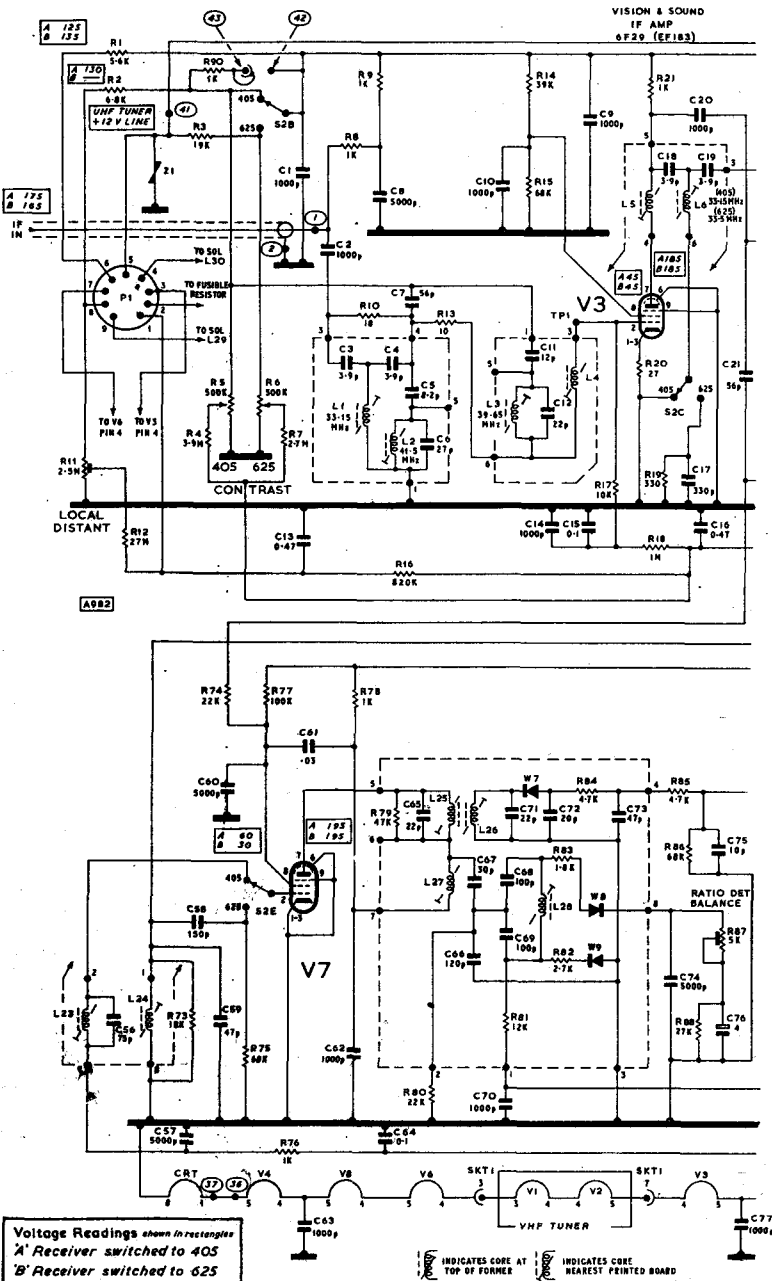


(H204) V.H.F. TUNERS—TYPES T<sub>4</sub> AND T<sub>8</sub>

When the "U" position is selected on the V.H.F. turret control the selector stud (at the rear of the tuner) moves S<sub>3</sub> to the "U" position to energise S<sub>2</sub> solenoid, winding L<sub>29</sub>, which in turn moves the slide switch S<sub>2A-M</sub> to the 625 position. The switching is arranged so that the solenoid is only energised momentarily—the movement of the slide switch automatically breaks the solenoid circuit at S<sub>2A</sub>. When the turret control is returned to a V.H.F. channel the operation is reversed, another solenoid winding (L<sub>30</sub>) being employed to return the slide switch to the 405 position. A fusible resistor link (R<sub>123</sub>) protects the solenoid against overload. If this link fuses, the supply to the receiver (via F<sub>1</sub>) will also be disconnected.

**Circuit Description (V.H.F. 405 Operation):** The vision-sound I.F. from the V.H.F. tuner is fed via adjacent channel sound rejector L<sub>1</sub> and Channel 1 rejector L<sub>2</sub> to vision-sound I.F. amplifier V<sub>3</sub> which is grid tuned by L<sub>4</sub>, with adjacent channel vision rejection provided by L<sub>3</sub>-C<sub>12</sub>.

B.R.C.



(H205a) CIRCUIT DIAGRAM, MAIN CHASSIS—MODEL 1400 SERIES (PART)

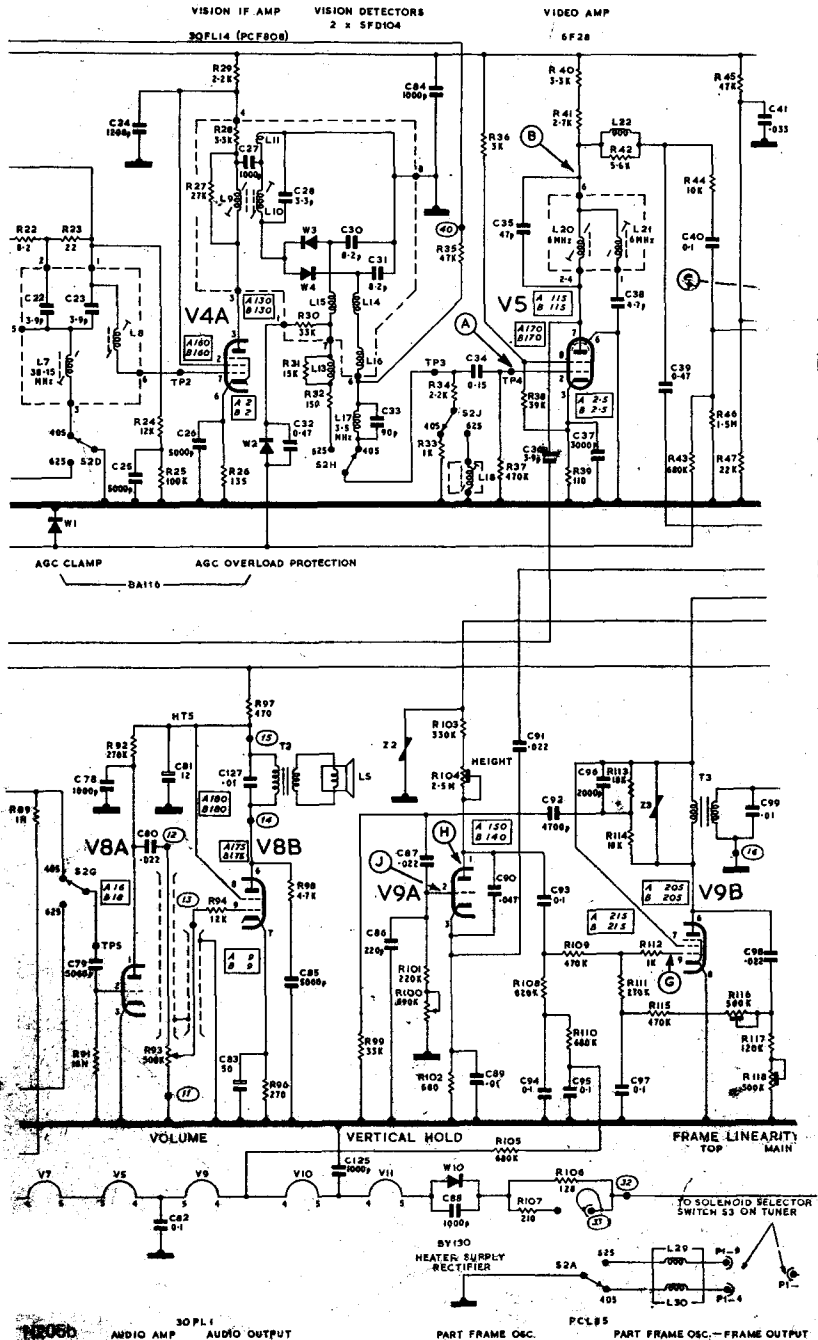
6F30 (EF184)  
SOUND IF AMP & FM LIMITER

CG64  
AM SOUND DET

2 x CG61  
FM RATIO DET.

H205a

# TELEVISION SERVICING



(H205b) CIRCUIT DIAGRAM, MAIN CHASSIS—MODEL 1400 SERIES (PART)

# B.R.C.

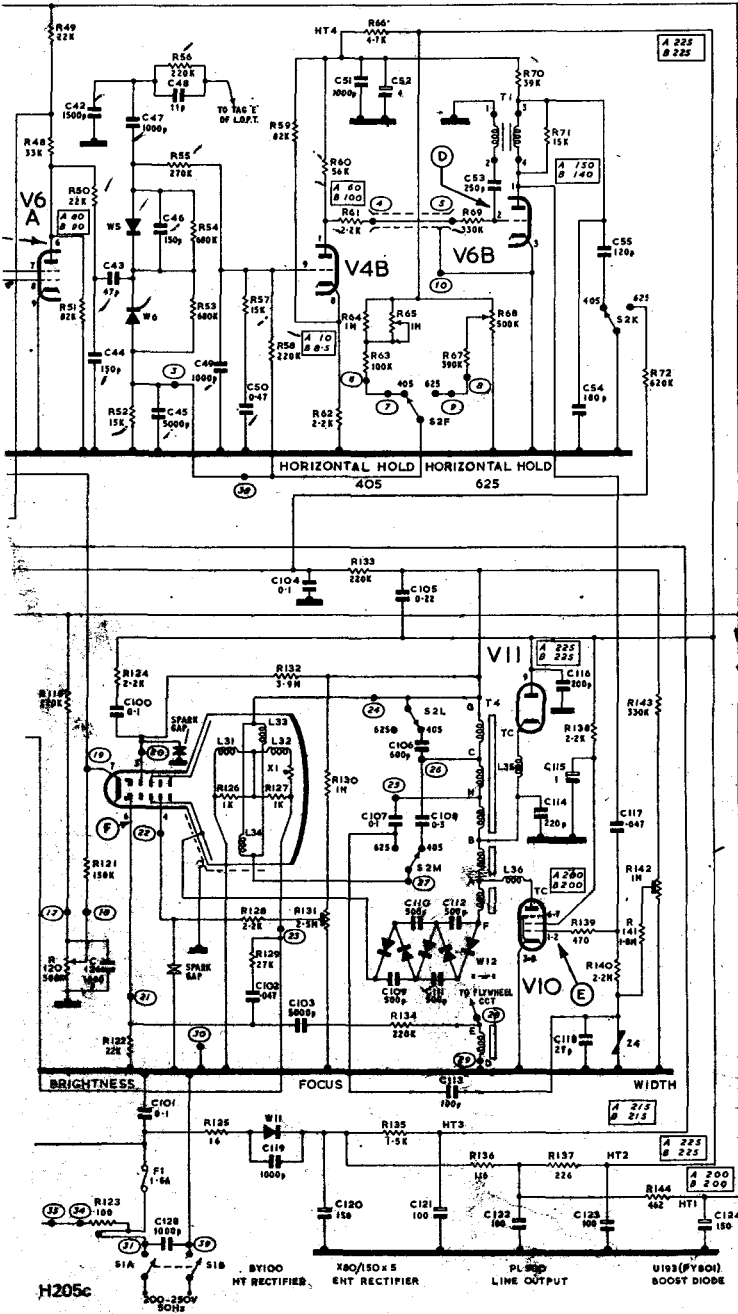
SYNC SEPARATOR  
30FL1

FLYWHEEL  
DISCRIMINATOR  
BA153/1

FLYWHEEL DC AMP  
30FL14 (PCF804)

LINE OSCILLATOR  
30FL1

A 225  
B 225

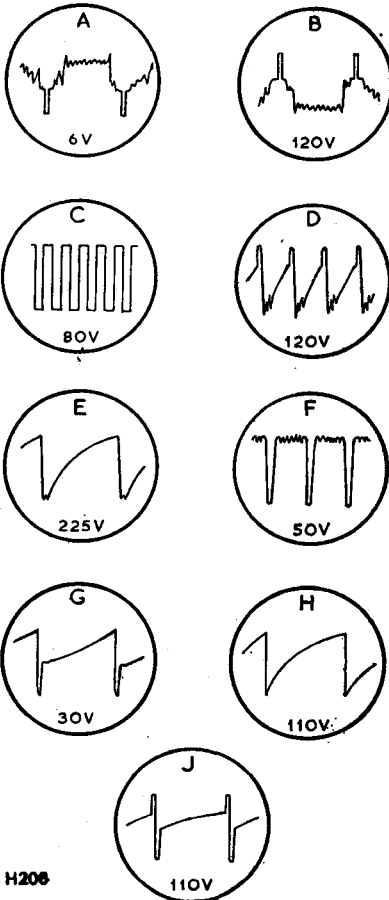


(H205c) CIRCUIT DIAGRAM, MAIN CHASSIS—MODEL 1400 SERIES (CONTINUED)

# TELEVISION SERVICING

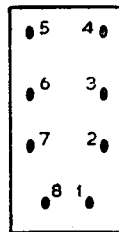
V<sub>3</sub> anode circuit is tuned by L<sub>5</sub>, and L<sub>23</sub> is the sound I.F. "take-off" coil. The anode-grid circuit between V<sub>3</sub> and V<sub>4A</sub> incorporates adjacent channel sound rejector L<sub>6</sub>-C<sub>19</sub>; and sound I.F. rejector L<sub>7</sub>, C<sub>22</sub> and C<sub>23</sub>. V<sub>4A</sub> grid is tuned by L<sub>8</sub>.

The vision I.F. is amplified by V<sub>4A</sub> and bottom inductively coupled to vision detector W<sub>4</sub>. The video signal is fed in the correct modulation sense by S<sub>2H</sub> and C<sub>34</sub> to V<sub>5</sub> grid. R<sub>30</sub>, W<sub>2</sub> and C<sub>32</sub> form the overload circuit. W<sub>2</sub> conducts when the D.C. component of the rectified signal exceeds the A.G.C. line voltage to supplement the A.G.C. bias on very strong signals. The amplified video signal is then fed to the C.R.T. cathode via L<sub>22</sub> and C<sub>39</sub>, the D.C. reference level being provided by potential divider R<sub>110</sub>-R<sub>120</sub>. V<sub>5</sub> output is also applied to sync. separator V<sub>6A</sub> via R<sub>44</sub> and C<sub>40</sub>. A mean-level A.G.C. voltage is derived from V<sub>6A</sub> grid circuit and applied to I.F. amplifier V<sub>3</sub> and to the V.H.F. tuner via a pre-set delay R<sub>11</sub>.



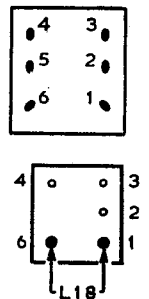
(H206) OSCILLOGRAMS. A, B, D, E AND F AT 405-LINE FREQUENCY. C, G, H AND J AT FIELD FREQUENCY. VOLTAGES GIVEN ARE PEAK-TO-PEAK VALUES MEASURED VIA A PROBE OF 8 P.F. IN PARALLEL WITH 10M

L5-6, 23-24  
L9-11, 14-16  
L25-28



H207

L1-2 L3-4  
L7-8 L20-21



(H207) I.F. COILS VIEWED FROM TOP OF CANS

H206

The 38.15 MHz sound I.F. at V<sub>3</sub> anode is inductively coupled by L<sub>23</sub> to sound I.F. amplifier V<sub>7</sub> and detected by W<sub>7</sub> in the secondary of the anode transformer (L<sub>25</sub>–L<sub>26</sub>). The rectified output, developed across potential divider R<sub>85</sub>–R<sub>86</sub>, is applied to V<sub>7</sub> as A.G.C. bias. The audio signal developed across R<sub>85</sub>–R<sub>86</sub> is fed via switch S<sub>2G</sub> and C<sub>79</sub> to the audio amplifier V<sub>8</sub>.

**Circuit Description (Audio Amplifier):** V<sub>8A</sub> audio amplifier provides limiting action to impulsive interference by the self-bias time constant C<sub>79</sub>–R<sub>91</sub> in the grid circuit; the delay time being determined by the time constant C<sub>78</sub>–R<sub>92</sub> in the anode circuit. To preserve the efficiency of this stage, limiting action must take place before the volume control circuit and for this reason the volume control R<sub>93</sub> is included in the coupling to the output stage V<sub>8B</sub>.

**Circuit Description (U.H.F. 625 Operation):** The I.F. output from the U.H.F. tuner is applied to grid of V<sub>1</sub> (in V.H.F. tuner) which, together with V<sub>2B</sub>, functions as an I.F. preamplifier. The output from V<sub>2B</sub> anode is applied to V<sub>3</sub> grid circuit, L<sub>4</sub> being the common I.F. grid coil. L<sub>6</sub>–C<sub>17</sub> in V<sub>3</sub> anode circuit form a sound rejector to reduce sound level.

The combined vision-sound I.F. is further amplified by V<sub>4A</sub> and detected by W<sub>3</sub>. The polarity of the diode circuit is switched by S<sub>2H</sub> to provide an output in the correct modulation sense. R<sub>30</sub>, W<sub>2</sub> and C<sub>32</sub> form an overload circuit. W<sub>2</sub> conducts when the D.C. component of the rectified signal exceeds the A.G.C. line voltage to supplement the A.G.C. bias on very strong signals. The rectified video signal containing the F.M. intercarrier beat frequency (6 MHz) is coupled by switch S<sub>2H</sub> to V<sub>5</sub> (video amplifier) grid via C<sub>34</sub>. S<sub>2J</sub> switches in L<sub>18</sub> the detector compensation coil.

A 6 MHz tuned circuit L<sub>20</sub>–C<sub>35</sub> in V<sub>5</sub> anode circuit selects the F.M. intercarrier which is taken off the sound I.F. amplifier through C<sub>36</sub>. Any residual 6 MHz signals are rejected by L<sub>21</sub>–C<sub>38</sub> ensuring that the intercarrier signals are isolated from the C.R.T. cathode.

The 6 MHz sound I.F. is amplified by V<sub>7</sub>. S<sub>2D</sub> modifies the screen circuit to reduce the screen voltage, the necessary limiter action being provided by V<sub>7</sub> grid current. The output from V<sub>7</sub> is transformer fed to W<sub>8</sub> and W<sub>9</sub> operating in a ratio detector circuit. The tertiary voltage is taken from the junction of C<sub>66</sub>–C<sub>67</sub> in series which shunt tune L<sub>27</sub> the primary of the transformer. The voltage is injected into the secondary L<sub>28</sub> at the centre-tap formed by tuning capacitors C<sub>68</sub>–C<sub>69</sub>. Ratio detector balance is adjusted for optimum A.M. rejection by pre-set R<sub>87</sub>. C<sub>76</sub> is the stabilising capacitor, with R<sub>88</sub> as the detector load. R<sub>81</sub> and C<sub>70</sub> provide deemphasis and the audio signal is switched to V<sub>8A</sub> grid by S<sub>2G</sub>.

**Circuit Description (Line Timebase):** Sync. pulses are taken from V<sub>6A</sub> anode to the flywheel discriminator via integrating network R<sub>50</sub>–C<sub>44</sub> and coupling capacitor C<sub>43</sub>.

A reference pulse, taken from winding ED on the L.O.T. (Tag 28), is fed to the discriminator via integrating network R<sub>56</sub>–C<sub>42</sub> and shaper C<sub>48</sub>. The discriminator formed by W<sub>5</sub>–W<sub>6</sub>, develops a negative or positive





voltage depending on whether the reference pulse lags or leads the sync. pulse. The resultant D.C. voltage is amplified by V4B and applied as a control voltage to grid of line oscillator V6B.

The discharge rate of oscillator grid components C53-R69 is influenced by a network which incorporates the horizontal hold controls. The settings of the horizontal hold controls affect the anode voltage of V4B.

The appropriate horizontal hold control is selected for 405- or 625-line operation by S2F. S2K selects the line charging capacitance for either system. Width stabilisation is provided by voltage dependent resistor Z4 in the grid of line output stage (V10), while the scan and linearity are equalised for 405-625 operation by S2L and M.

**Circuit Description (E.H.T. Trebler. 20 kV.):** A pulse derived from the anode circuit of the line valve V10 is applied to the rectifiers and voltage-treiber circuit formed by W12A-E and C109-C112. The basic principle is that of a Cockcroft Walton multiplier. To avoid earth connections in the circuit the aquadag coating of the C.R.T. is used as a reservoir capacitor which charges up through series capacitors C109 and C111.

**Circuit Description (Field Timebase):** V9A and V9B are connected in a multivibrator oscillator circuit, the pentode section also functioning as the output stage. V9A anode is fed from the boost H.T. supply. The increase in voltage from this supply on 625 is counteracted by S2K connecting R72 to earth from the boost H.T. line. Voltage dependent resistor Z2 across the boost H.T. line stabilises the height. The pulses from the sync. separator are fed via C91 to V9A cathode. C90 is the frame charging capacitor with pulse shaping performed by C94-C97-R109.

A linearising network including pre-set controls R116 and R118 is connected from the anode of V9B. Voltage dependent resistor Z3 across the primary of T3 limits the frame flyback peak voltage, and C99 across the secondary bypasses any line frequency high harmonics induced through the deflector coils. Frame amplitude is stabilised by temperature dependent resistor X1 in series with the frame scan coils, to maintain constant resistance despite temperature changes. Damping resistors R126-R127 reduce ringing induced by the line flyback. V9B grid bias is derived from a tapping on the heater chain.

**Circuit Description (Heater Chain):** The heater supply is fed with pulses due to series diode W10. It is connected so as to provide a pulsating D.C. supply negative with respect to chassis to enable a voltage to be tapped from the heater chain, smoothed and applied to V9B (frame output) as grid bias. Should W10 fail by going short-circuit, loss of V9B grid bias would provide a visual indication of the fault by the timebase not locking. Without this precautionary circuit, heater current could rise without noticeably affecting receiver performance.

Due to the presence of diode W10 in the heater chain, current or voltage measurements should be made with a moving-iron or hot-wire instrument for accurate results.

**Heater Chain Notes:** Voltage and current measurements of the valve-

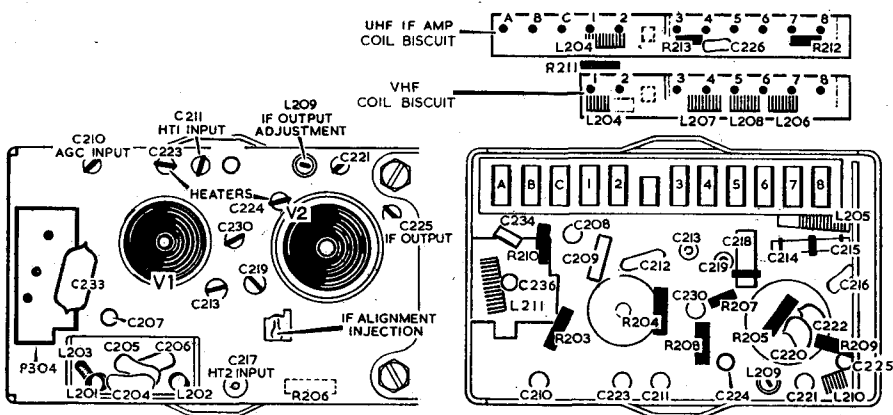
## TELEVISION SERVICING

heater chain must be made with a moving iron or hot-wire type of meter to obtain normal R.M.S. readings.

An average value reading instrument, such as an Avometer will not indicate correct value voltage or current due to the series rectifier in the heater chain. The indicated heater current would be approximately 0.19 amps on the D.C. range, and the voltage across a 6.3 volt heater would be indicated as approximately 4 volts.

**Heater Current Adjustment:** A shorting link (tags 32 and 33) is provided for use when operating the receiver on mains supplies consistently less than 220 volts.

**Cathode Ray Tube Notes:** The notes on this topic are similar to those given for the Thorn 950 Mk. II Series, which is described on page 509 in the 1967-68 volume.



(H209) COMPONENT LOCATIONS—V.H.F. TUNER

**Access for Service:** The printed circuit board has been designed with standardised mounting facilities for easy access and removal. To gain access to the component side of the printed circuit board, take out the two screws securing the printed board assembly to the two metal brackets at the right-hand side of the cabinet. The printed board can now be hinged open to expose the components or lifted off the hinge pivots, as shown, when opened out sufficiently to line up with the bracket to release the interlock.

The receiver can be operated with the board hinged open providing the usual safety precautions are exercised regarding high voltages.

The line output transformer assembly is secured to the heat-sink by two screws. Extreme care should be exercised when removing or resoldering the connecting leads to the tags on the transformer.

Use a small, low consumption iron and do not bear down on the tags heavily or apply the bit for longer than is necessary to produce sound joints.

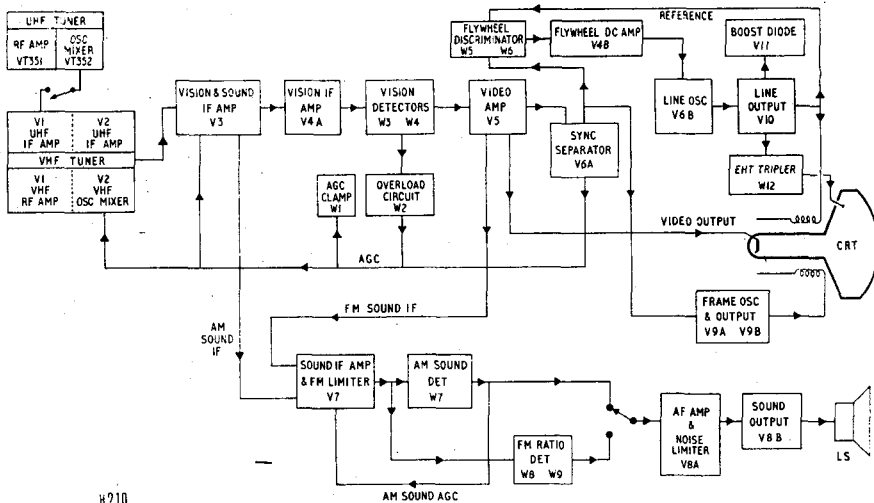
Short-circuiting the E.H.T. supply should be avoided. After a number of short-circuits the rectifiers are affected to some extent and their working

life may be shortened. These items carry a twelve-month guarantee and replacements are available as a complete sub-assembly (Part No. 6M3-034) from Service Depots.

The complete tray unclips from the transformer but in some cases it will be necessary to first release a PVC strap—which has been added for transit purposes.

**Splined Knob Fixing:** The V.H.F. and U.H.F. channel selector spindles are fitted with insulating sleeves to ensure that metal parts are not exposed when the knobs are removed. The knobs are a friction fit on the sleeve assembly; the splined portion of the sleeve accepts the fine tuning control (V.H.F. spindle) or the channel indicator ring (U.H.F. spindle).

To refit the U.H.F. indicator, first tune spindle to a known channel, then push on indicator ring in a position to indicate the appropriate number. The splined sleeve feature ensures precise calibration.



H210

(H210) BLOCK SCHEMATIC (SIMPLIFIED)—1400 SERIES

**V.H.F. Tuner Removal:** Remove the turret knob to reach the fixing screw. After removing the screw, unlatch the tuner from the nylon moulding. The mounting position of the tuner and nylon moulding varies with receiver presentation.

**V.H.F. Wired Distribution System Working:** In addition to being suitable for adjacent channel operation of officially allocated Bands I and III V.H.F. frequencies receivers incorporating the 1400 Series Chassis can also be quickly modified for 625-line operation at V.H.F. The removable turret coil biscuits can be moved in position or substituted if necessary. The U.H.F. tuner, when fitted, may be removed or left in position as required.

The following changes should be made: Remove push-on connector from Tag 43 located near main electrolytic and transfer fly-lead to link Tag

43 with Tag 44, this maintains H.T. to the V.H.F. oscillator through R90 (1 k $\Omega$ ) with the receiver switched to either system.

Replace the turret "U" biscuit with a suitable 625 V.H.F. segment.

When more than one 625-line channel is required, additional selector studs must be inserted in the appropriate holes in the moulded cam at the rear of the tuner. Selector studs may be obtained from the nearest Service Depot by quoting Part No. 56357. Information regarding special coil biscuits can also be obtained.

*Tags 43 and 44 (including R90) are not fitted to Schedule A chassis. With receivers fitted with these chassis it will be necessary to solder a 1 k $\Omega$ ,  $\frac{1}{4}$  watt, 10 per cent. resistor across switch S2B, see circuit diagram.*

## B.R.C.

## Models 2643 and 3649

**General Description:** These two 16-in. models employ a chassis assembly which is similar to the Thorn 980 Series Chassis, except that the contrast, brilliance, volume and on/off controls are separately mounted in the cabinet.

**Note:** The Thorn 980 Series Chassis is described on page 502 in the 1967-68 volume.

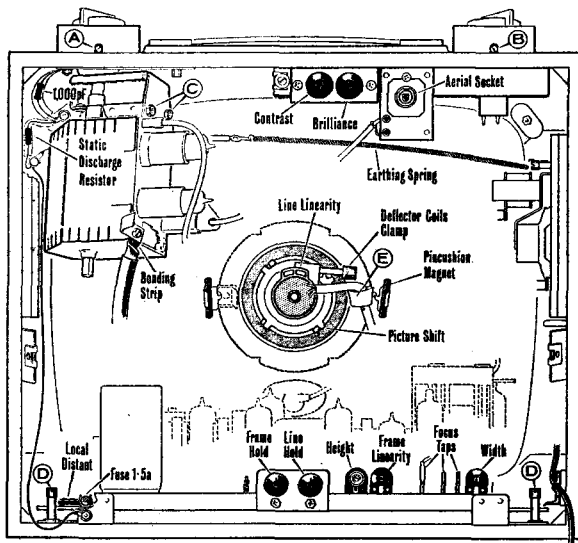
**Service Details:** 1. To remove the turret knob assembly, select channel 3, rotate fine tuner to expose grub screw in aperture (A). Slacken grub screw and pull off knob assembly. The grub screw which secures the OFF/ON volume knob is accessible through aperture (B) when the knob is in the OFF position. 2. To release the tuner unit remove two screws (C) and unlatch the tuner from the cabinet bracket. 3. The printed board assembly is mounted on a metal chassis which is secured to the cabinet base. Remove two nuts (D), release cableform from cleat (E) and withdraw the board assembly. The frame output earth lead is looped and sleeved for length adjustment and should be shortened again when refitting the board assembly.

**Note:** A brass strip is used to bond the tuner to the printed board assembly and a 1000 pF. (BS415) is connected between the tuner mounting and the adjacent tube mounting bracket. The aquadag coating on the tube is connected through the earthing spring and lead to chassis but the tube mounting assembly is isolated from general chassis by a 2.2 M $\Omega$  static discharge resistor. Ensure that these connections are correctly made when refitting.

**C.R.T. Details:** 1. The replacement tube must be a similar type (CME1602/A40-12W/S). This is supplied complete with safety band and mounting lugs. 2. To obtain removal clearance for the tube it is necessary to remove the printed board assembly, tuner unit, aerial panel and loud-speaker assembly. 3. To avoid any possibility of direct contact between the tube mounting and chassis metalwork, insulating strips are fitted over the two lower tube mounting lugs and an insulating patch is fitted to the tube

behind the tuner unit. Ensure that the insulators are refitted with the replacement tube. 4. The mask is secured by four nuts which are accessible with the tube removed.

**Modifications:** See circuit diagram Thorn 980 Series. The following differences to the circuit diagram may be found in later production receivers: R85—470 k $\Omega$ , (Part No. 8A32); 470 k $\Omega$  resistor (Part No. 8A32) added in series with R85 and the junction of these resistors connected to chassis via a 0.1  $\mu$ F. capacitor (Part No. 8M51); 100 k $\Omega$  (Part No. 1A68) added between junction C54/R71 and chassis.



H212

(H212) REAR VIEW  
OF RECEIVER  
—MODELS 2643/3649

## B.R.C.

## Model 4618

**General Description:** Apart from presentation items, Model 4618 is otherwise identical to the group of receivers using the Thorn 980 Series Tuners and Chassis, described on page 502 in the 1967-68 volume.

**C.R.T.:** Mazda Rimband CME 1201/A31-18 W. 12 in.

**Modifications:** 1. See circuit diagram Thorn 980 Series. The following differences to the circuit diagram may be found in later production receivers: R85—470 k $\Omega$ , (Part No. 8A32); 470 k $\Omega$  resistor (Part No. 8A32) added in series with R85 and the junction of these resistors connected to chassis via a 0.1  $\mu$ F. capacitor (Part No. 8M51); 100 k $\Omega$  (Part No. 1A68) added between junction C54/R71 and chassis. 2. In some early production 12-in. receivers R114, R115 and R116 may be mounted on a tag strip instead of being fixed to the printed board.

## DECCA

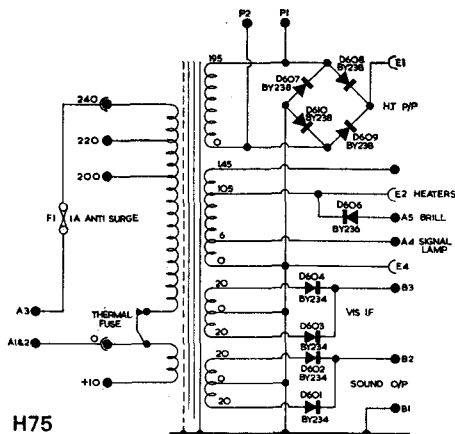
## Schools Receiver

**General Description:** Dual-standard television receiver incorporating the Professional Standard Chassis. Power consumption 100 watts.

**System Switching:** This is achieved by using a solenoid in conjunction with a micro-switch on the tuner and actuated by the appropriate channel selection button giving automatic changeover from 625 to 405. It is also possible to provide a V.H.F. channel operating on the 625 system.

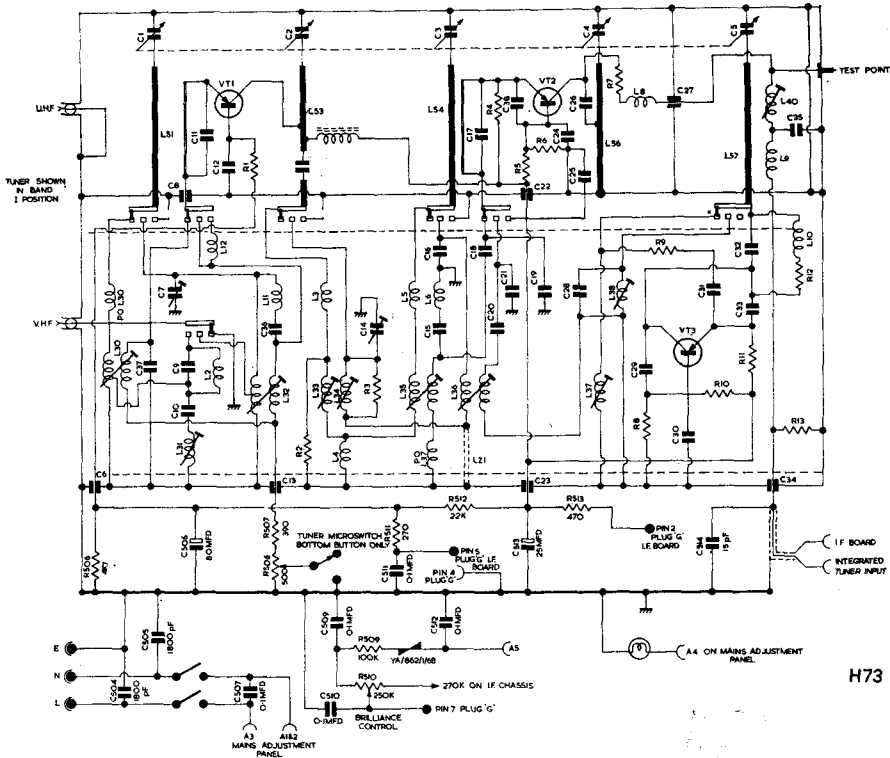
**Video Amplifier:** Will provide not less than 120-volt P-P of drive with an input of 1-volt P-P from the video detector. D.C. coupled to the tube cathode to eliminate caption "streaking" associated with the normal practice of partial D.C. coupling.

**Amplified A.G.C. System:** The gated A.G.C. system operates during the back porch (Black Level) following the line pulse and will therefore produce a voltage independent of the video information. Lock-out or blocking of the A.G.C. system is prevented by the use of D.C. coupling to the video detector so that the amplifier may respond to peak white video in the absence of gating pulses. Thus the system reverts to a form of mean level A.G.C. under abnormal operating conditions. The A.G.C. has a total compression of not less than 80dB with a dynamic range of not less than 40dB.



(H75) DP TV. TRANSFORMER AND MAINS ADJUSTMENT PANEL

**Sound Output:** The sound output is a class B push-pull amplifier using complementary output and driver stages with negative feed back giving a total harmonic distortion better than 5 per cent. and a maximum power output of 3 watts. A continuously variable tone control has been included in the specification.



H73

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100
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(H73) DP TV. INTEGRATED TUNER AND CONTROL PANEL CIRCUIT DIAGRAM

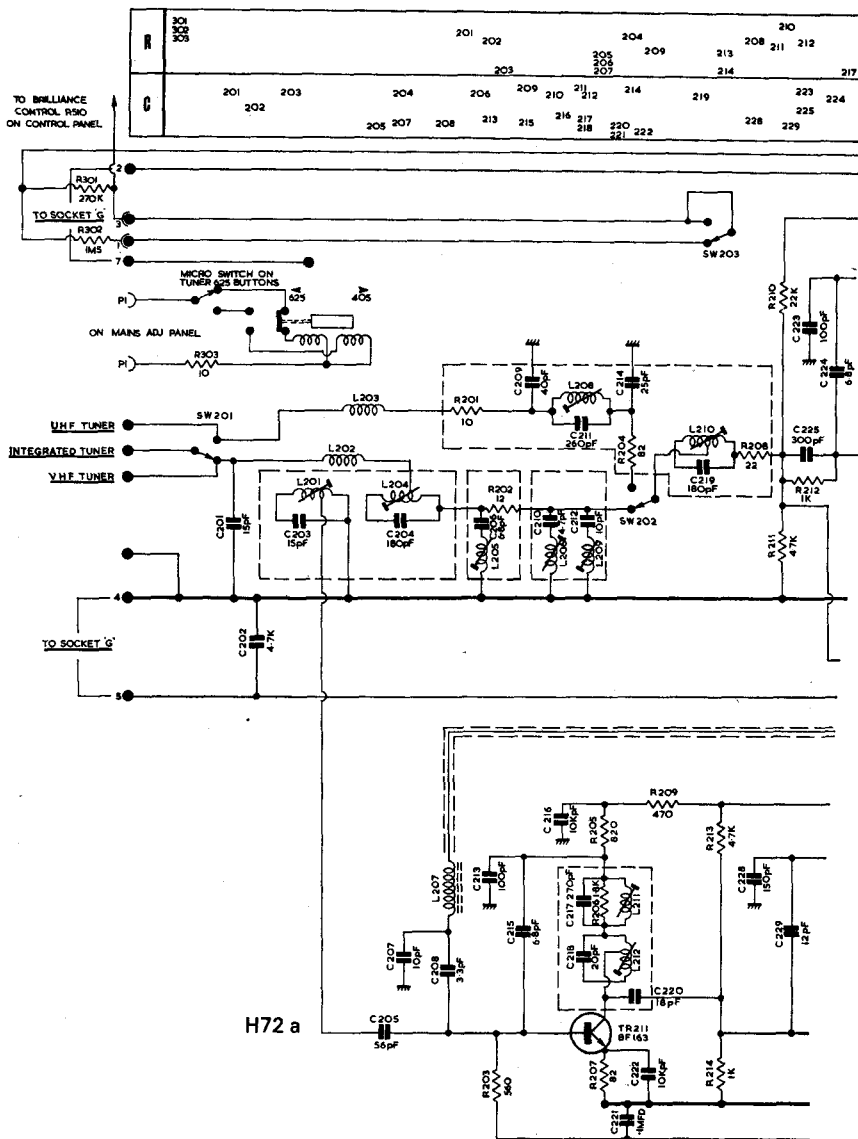
**Separate Mains Switch:** A separate on-off mains switch has been provided to enable the volume control to be pre-set at any level. As the sound stage is transistorised the sound appears immediately the receiver is switched on.

**Valves:** ECL80 (Line pulse discriminator); ECC82 (Line oscillator); PL504 (Line output); PY800 (Boost diode); DY87 (E.H.T. rectifier); 30PL14 (Frame oscillator/output); EF80 (Sync. separator).

**Transistors and Diodes:** BF163 (First vision I.F. amplifier A.G.C. controlled); BF163 (Second vision I.F. amplifier); BF159 (Final vision I.F. amplifier); BF154 (Video phase splitter); BC118 (Video driver); BD119 (Video amplifier); BC113 (Signal sampler); P346A (Gate); BC116 (Mean



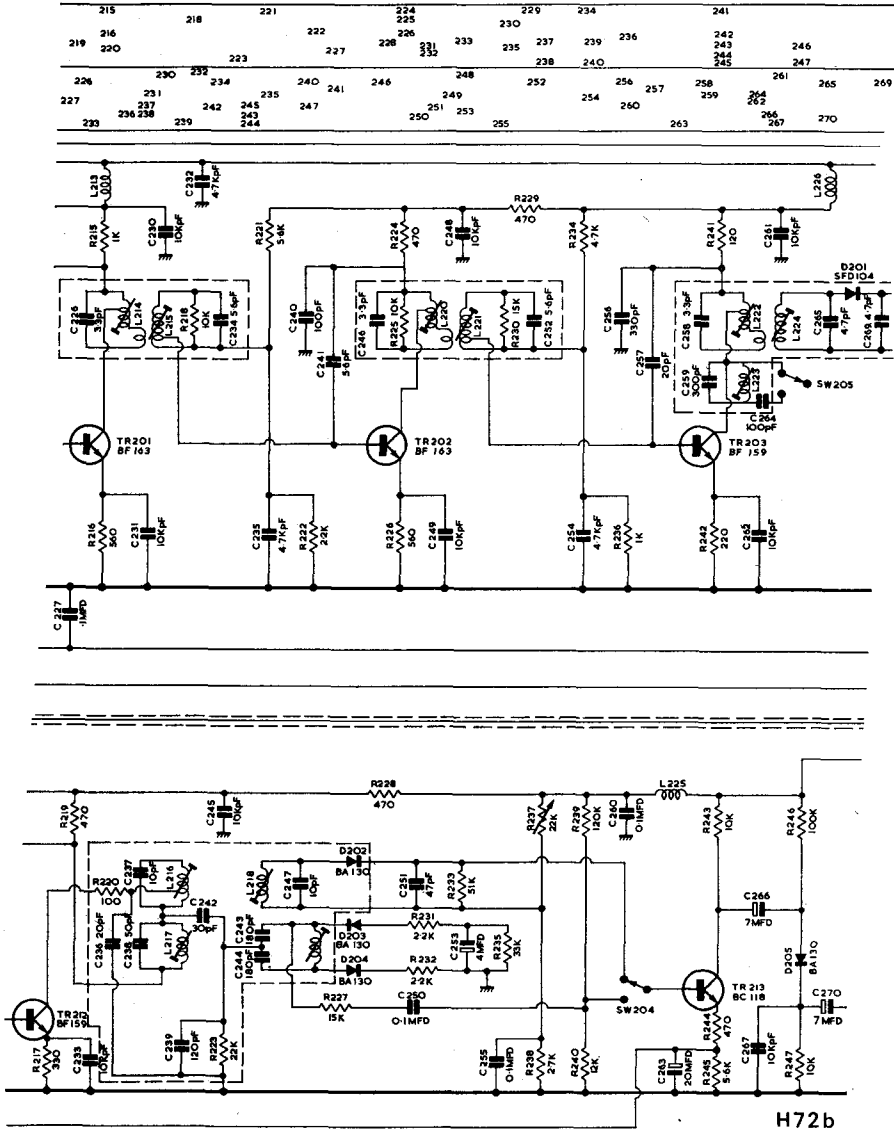
## TELEVISION SERVICING



(H72a) DP TV. I.F. CIRCUIT DIAGRAM (PART)

level override amplifier); BC116 (A.G.C. amplifier); BF163 (First sound I.F. amplifier A.G.C. controlled); BF159 (Final sound I.F. amplifier); BC118 (A.G.C. amplifier and audio amplifier); BC135 (Audio pre-driver);

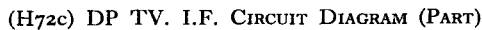
# DECCA



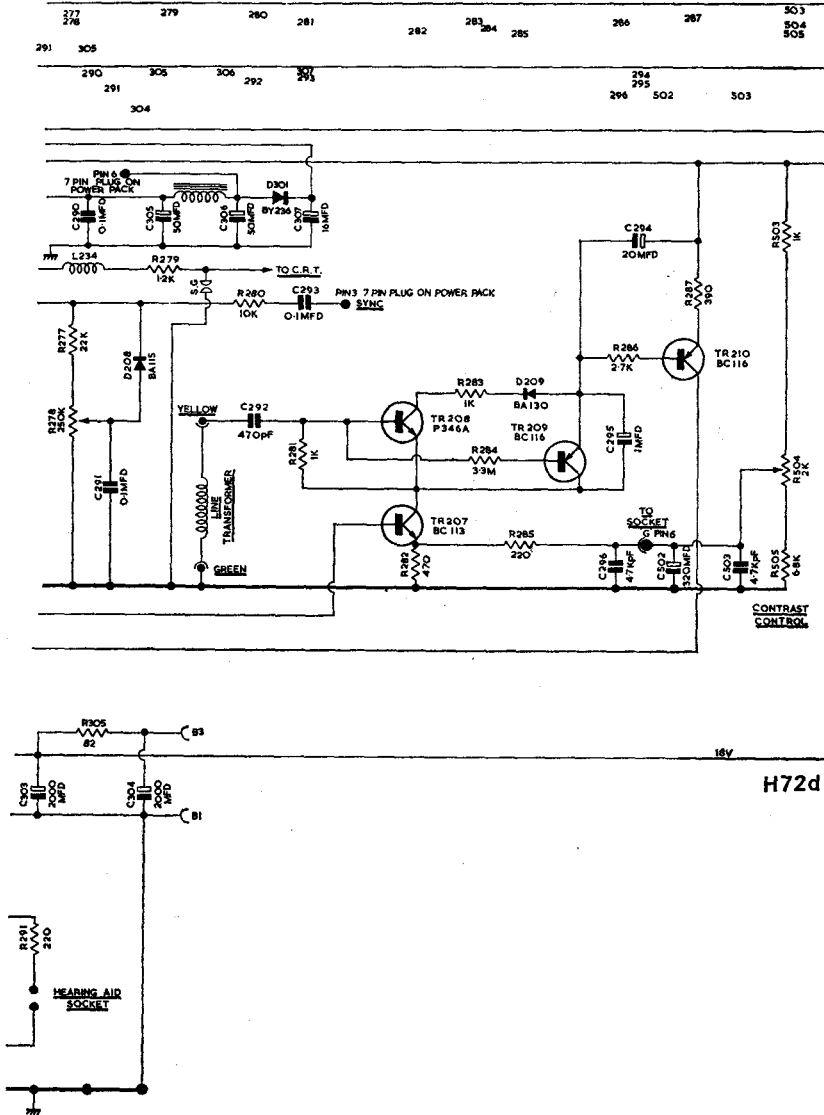
(H72b) DP TV. I.F. CIRCUIT DIAGRAM (PART)

BC136 and BC137 (Complementary drivers). 2 × BC138 (Push-pull output stage).

SFD104 (Video detector); BA130 (38.15 Mc/s. A.M. sound detector);

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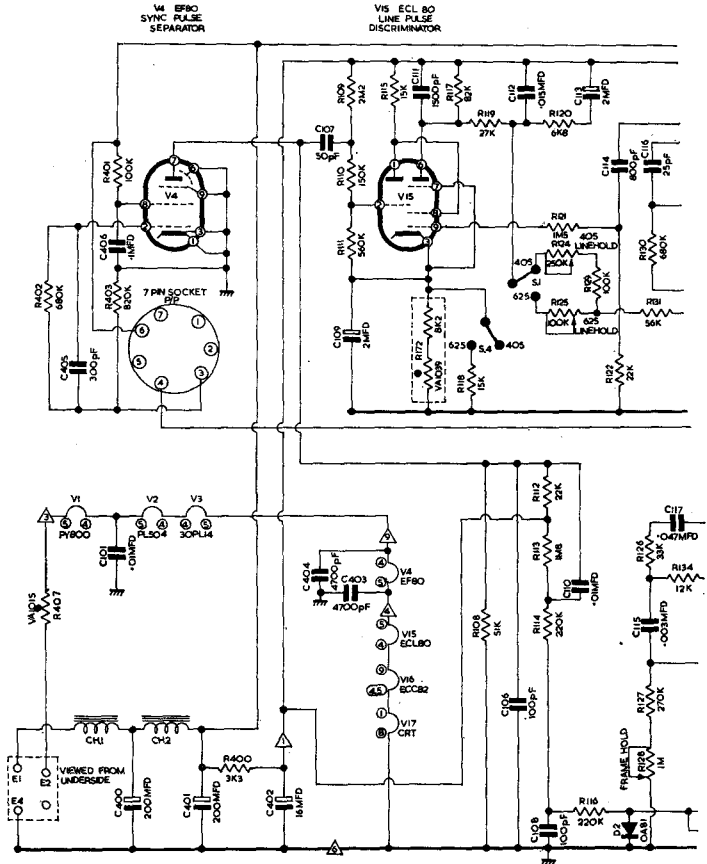
542



(H72d) DP TV. I.F. CIRCUIT DIAGRAM (CONTINUED)

discriminator).  $3 \times$  BA130 (Bias diodes for audio drivers). 12V7 (Video driver H.T. stabiliser).

## TELEVISION SERVICING



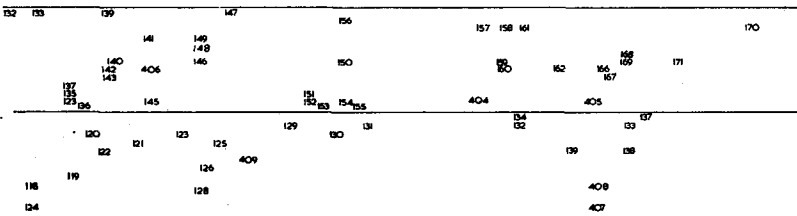
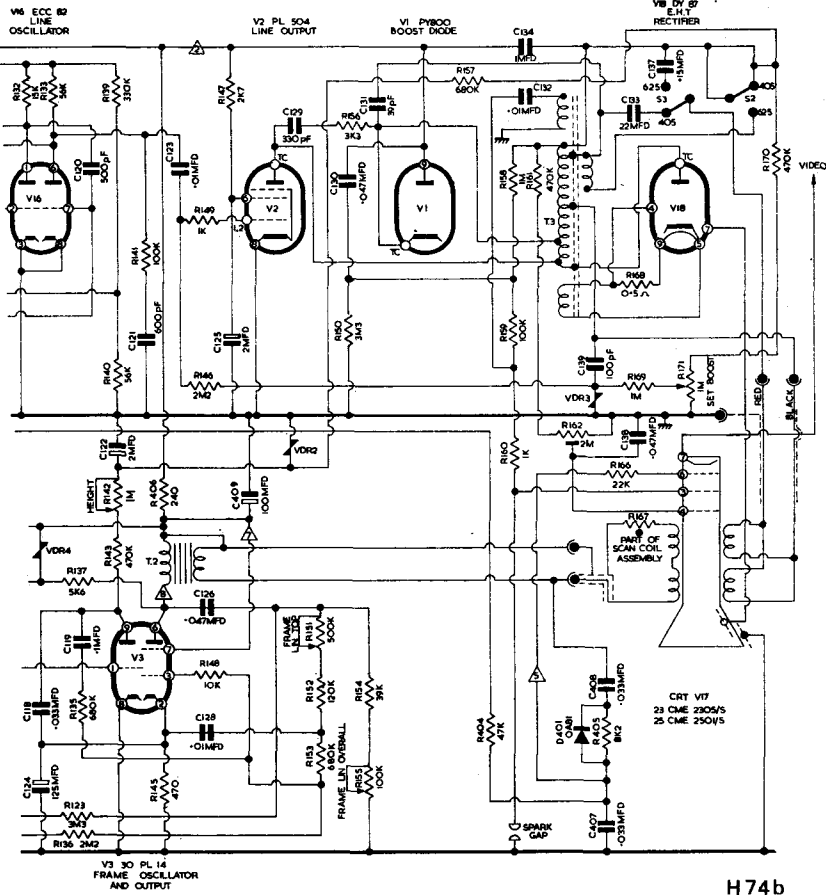
**H74 a**

R	402	40X		109 110 111	115	117 119	120 121 124 125	130 131 134 135	132	133	134
		403				172	118				
	407						108	112 113 114		126 127 128	134
			400								
C	405	406 101		107 109		111		112	113	114	116
				404	403					110	117
							106			115	
	400	401	402					108			

(H74a) DP TV. TIMEBASE CIRCUIT DIAGRAM (PART)

**Note:** In the Transistor Voltages Table all the readings are positive with respect to chassis. The readings were taken with Avo Model 8, 405 opera-

# DECCA



(H74b) DP TV. TIMEBASE CIRCUIT DIAGRAM (CONTINUED)

tion, contrast control at maximum with zero signal input. Voltages are nominal and may vary with transistor spreads. (See Table, next page.)

# TELEVISION SERVICING

## Transistor Voltages Table:

<i>Transistor</i>		<i>Voltages</i>		
		<i>Emitter</i>	<i>Base</i>	<i>Collector</i>
TR201	BF163	3	3.8	17
TR202	BF163	4	4.8	13
TR203	BF159	3	3.6	19
TR204	BF154	2	2.6	17
TR205	BC118	2	2.6	11.5
TR206	BD119	1.5	2	140
TR207	BC113	5.4	2.4	16.5
TR208	P346A	16.5	16.5	17
TR209	BC116	17.5	17	16.5
TR210	BC116	20	17.5	3
TR211	BF163	0.4	1.1	11
TR212	BF159	1.8	2.5	13
TR213	BC118	1.3	1.7	17.5
TR214	BC135	0.2	0.85	9.5
TR215	BC137	10	9.5	0.5
TR216	BC136	11	11.5	23.5
TR217	BC138	10.5	11	23.5
TR218	BC138	0	0.5	10

## DYNATRON

## TV95-TV100 and TV100CH

**General Description:** This series of television receivers incorporate a hybrid circuit using transistors in the R.F., I.F. and first A.F. stages and valves in the video, line, frame and sound output stages. Model TV95 uses manual station selection, the remainder being fitted with a motorised unit operated by push-button or remote control. This chassis is designed for use from an A.C. supply of 200/250 volts. Under no circumstances connect to a D.C. supply or serious damage will result.

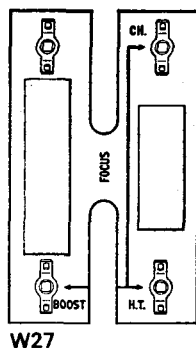
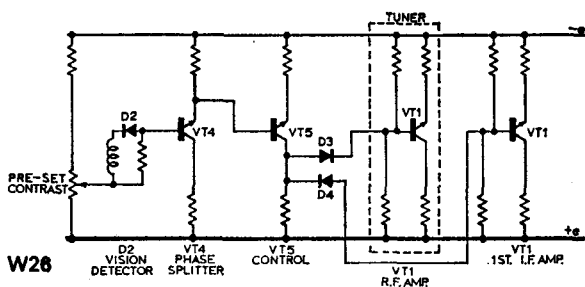
### Notes on Adjustment of Controls

\* **Set Width (625 and 405):** Ensure first that the horizontal linearity adjustment has been correctly carried out. Adjust appropriate line system slider control commencing from minimum scan and advancing to the point where scan ceases to increase. Move slider in reverse direction to the correct amplitude setting.

**Vertical Scan Equalising:** 1. Ascertain which line system has the highest boost voltage (SW4G-c). 2. Plug fly-lead (frame oscillator feed) on to the appropriate tag for the system with the highest boost voltage, i.e. tag 50 (625) or tag 49 (405). 3. Equalise frame scans with pre-set control R157.

**Focus:** Optimum focus is obtained by connecting the blue jumper lead from pin 4 of the C.R. tube to the appropriate tag on the spark protection card assembly.

† **Pre-set Contrast (625 and 405):** These controls should be set so that the D.C. volts developed across R20, with an input signal greater than 1 mV., are 1.8 volts (405) and 2.9 volts (625). Slight readjustment should then be made as necessary to give equal contrasts on both systems.



\* It is recommended that 30 minutes heating up on normal operation be allowed before making amplitude or linearity adjustments. If not, then the amplitude controls should be adjusted to give a small additional vertical and horizontal overscan to that for correct setting.

† This control is factory pre-set and will not normally require adjustment.

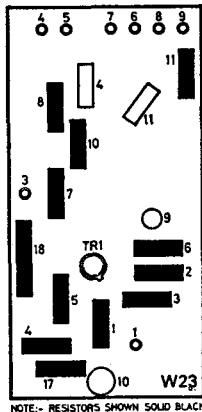


## TELEVISION SERVICING

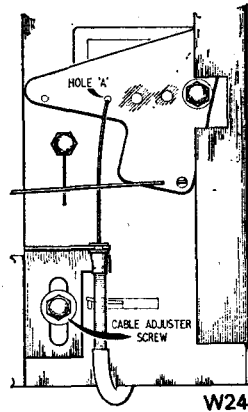
**Note:** Cross-modulation problems on strong signals may result if the control settings are too high.

**Bowden Cable:** When it becomes necessary to detach the tuner from the chassis, the cable should be disconnected at the tuner end, by prising the outer and inner from their retaining brackets. In either case, do NOT disturb the cable adjuster screw on the chassis. In the unlikely event of a replacement cable being required, however, proceed as follows: 1. Remove faulty cable and fit replacement to tuner. 2. With tuner and timebase system switch in "405" position (tuner cable retainer "open" and timebase switch plate "lowered", slacken off cable adjuster screw and hook inner cable into hole "A". 3. Fit outer cable to adjuster bracket and tighten screw.

**Note:** In the illustration, the switch plate is shown in the "raised" (625) position.



(W23) SOUND OUTPUT UNIT



(W24) BOWDEN CABLE

**Automatic Gain Control:** With the receiver set for maximum gain and a weak signal applied, the A.G.C. transistor (VT<sub>5</sub>) is operating in a fully bottomed state (i.e. conducting heavily), thus causing its collector to become negative with respect to chassis.

Under these conditions, D<sub>4</sub> is conducting and appears as a short-circuit transferring any change in VT<sub>5</sub> collector volts to the base of VT<sub>1</sub>, the first I.F. amplifier, while D<sub>3</sub> is cut off. As the signal strength is increased, or the setting of the pre-set contrast control is made more negative, the current passing through VT<sub>5</sub> will decrease, causing its collector and also the base of VT<sub>1</sub> to become less negative, thus reducing the stage gain.

When the collector of VT<sub>5</sub> reaches a predetermined voltage, D<sub>3</sub> will conduct and D<sub>4</sub> will become cut off. Under these conditions, the gain of the I.F. amplifier stage is fixed at some low value, while D<sub>3</sub> conducting is

[illegible]

Note: SK5 not fitted to model TV95.

(W21b) CHASSIS VIEW (LOWERED POSITION)

effectively a short-circuit and now transfers the A.G.C. voltage to the base of the R.F. transistor (VT<sub>1</sub> in the tuner).

The A.G.C. to the R.F. stage is therefore delayed in order to give optimum signal to noise performance.

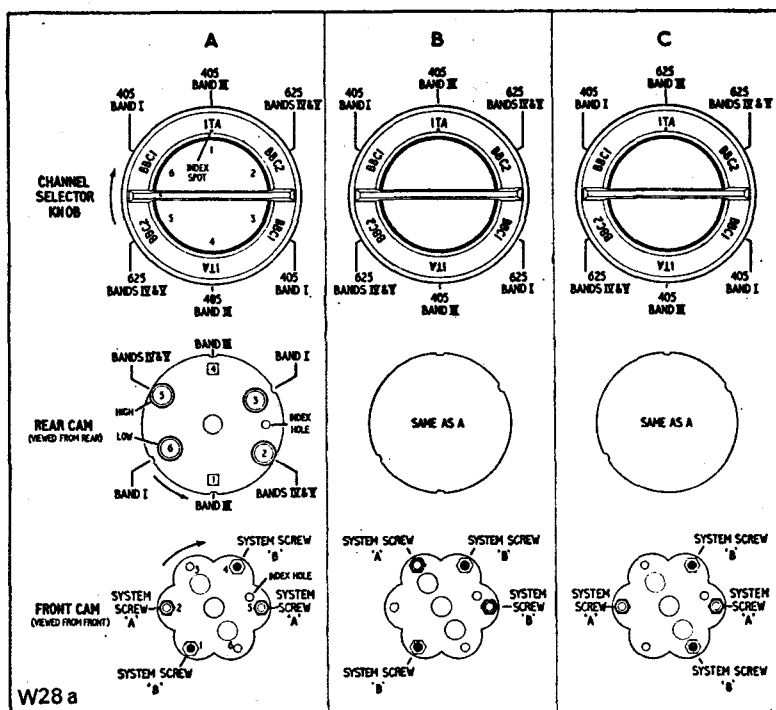
The pre-set contrast control provides a manually controlled voltage which determines the A.G.C. operating point, and the A.G.C. voltage is therefore the summation of the signal and manual control voltages.

### Tuner and Line System Adjustments

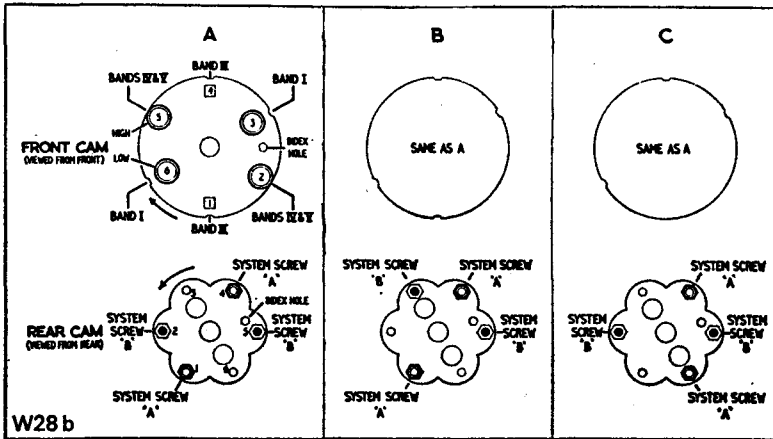
**Band and Line System Selection:** When despatched from the factory, the Dynatron Rotary and Motorised Tuners are "set" so that the two B.B.C.1 positions can only be tuned to channels 1-5 (405); the two I.T.A. positions to channels 6-13 (405); and the two B.B.C.2 positions to channels 21-68 (625).

In any instance where it is required to change the above combination, this is achieved quite simply by rearranging the position of the system screws (which determine the line system); and/or rotating through 180 deg. or removing one of the cam buttons (which determine the band coverage).

Three combinations are illustrated, these being: *A* As despatched from the factory, *B* B.B.C.1 converted to Band I (625), *C* I.T.A. converted to Band III (625).



# DYNATRON



In Fig. W28a the Rotary Tuner channel selector knob is viewed with the I.T.A. position having a small index spot below the "T" at top centre, and the two cams in the same relative position, viewed from rear and front respectively. In Fig. W28b the Motorised Tuner cams are in a corresponding position (as will be seen from the index holes), but the direction of rotation is reversed and they are viewed from the front and rear respectively. Thus, in order to change *A* to either *B* or *C*, one of the screws placed in *alternate order* behind the cam (system screw "A") or in front of the cam (system screw "B") must be removed and re-fitted as shown. The cam buttons remain unaltered in both cases. If it should be required to alter the band range, which is selected by the bottom centre cam button, this button should be: (a) in the low (inner) position for Band I, (b) removed for Band III, (c) in the high (outer) position for Bands IV and V.

This is shown by the following examples: (i) to convert a B.B.C.1 position to Band III, remove button 3 or 6 and "park" in square hole adjacent to fine tuner spindle; (ii) to convert an I.T.A. position to Band I, insert an additional button in either 1 or 4, in "low" position; (iii) to convert a B.B.C.2 position to Band I 625 (or Band III 625), pull-out button 2 or 5, rotate through 180 deg. and replace in "low" position (or pull-out button 2 or 5, and "park").

**Warning:** In any instance where the position of a system screw has been changed and either channel selector or system switch is removed with the Bowden cable disconnected, care must be taken to ensure that both selector and switch are returned to their original positions before re-connecting the cable. Otherwise, it is possible for the mechanism to become jammed.

**Fine Tuning:** After carrying out any of the above adjustments, the required programme can be obtained by rotating the fine tuner fully clockwise and then turning back approximately the number of turns indicated in the table following.

# TELEVISION SERVICING

Channel No.	No. of turns anti-clockwise from stop	Channel No.	No. of turns anti-clockwise from stop
1	2	21	1
2	6½	25	2½
3	9½	30	4
4	14	34	5½
5	18½	39	7
6	9½	40	7½
7	10½	45	9½
8	11½	50	11½
9	13	55	13½
10	14½	60	15½
11	15½	65	17½
12	16½	68	18½
13	18		

## Transistor Voltage Data

Code No.	Collector	Base	Emitter
VT1 . . . .	6.75 (8.7)	15.4 (12.7)	16.1 (13.4)
VT2 . . . .	0	13.9	14.7
VT3 . . . .	0	14.4	15.2
VT4 . . . .	9.0 (3.0)	9.3 (14.4)	10.4 (15.25)
VT5 . . . .	17.5 (3.15)	16.74 (17.3)	17.6 (17.75)
VT6 . . . .	0	14.25	15.5
VT7 . . . .	0.5	14.0	14.7
Pin "D" . . .		12.0 (3.4)	
Pin "E" . . .		12.9 (4.3)	
Pin "F" . . .		18.0	

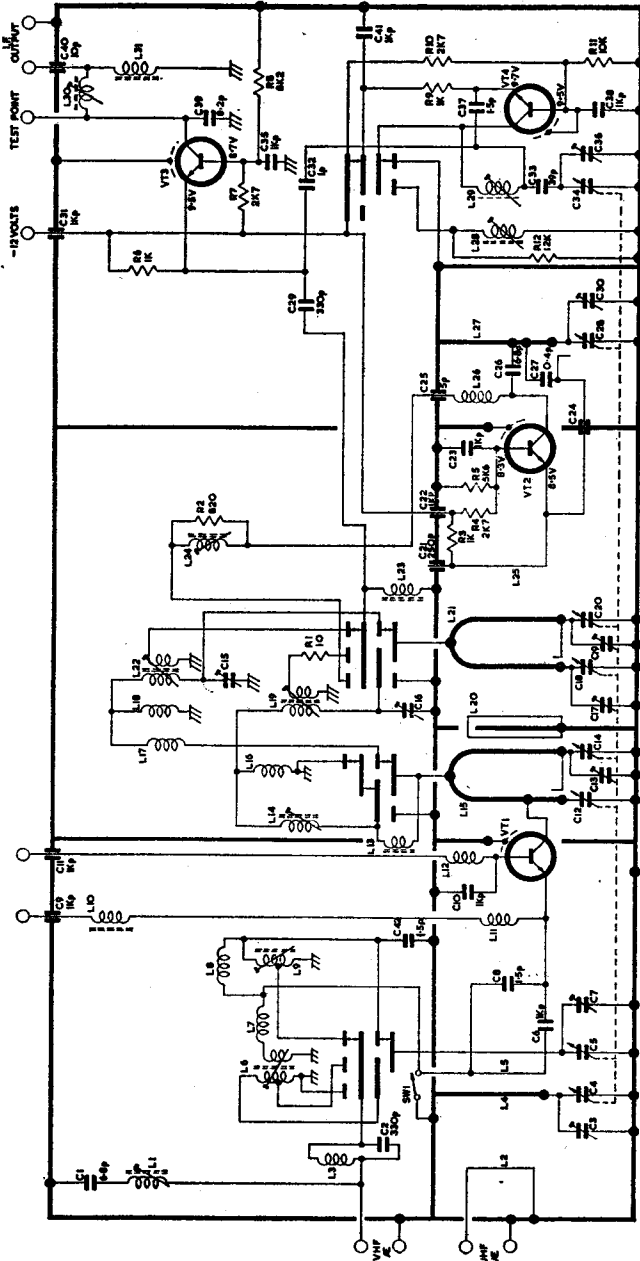
All the above voltage readings are negative with respect to chassis and taken with AVO model 8, no-signal input, SW2 in "405" position with pre-set contrast at maximum gain. Readings in brackets are those which differ when the pre-set contrast is set for minimum gain.

**Circuit Variations:** During the early stages of production a certain number of component values were changed. The current values only are shown on the circuits and the original values are listed below for information: R6—1K5; R112—47K; R113—50K; C110—270 pF.; R140—120K; R141—22K; R146—1K.

**Voltage and Waveform Analysis Conditions:** 1. With signal input, volume control at minimum all other controls set for normal operation. 2. Volt-meter sensitivity 20,000 Ω/v Avometer Model No. 8. Electrostatic volt-meter used for E.H.T. voltages. 3. Waveforms taken with Cossor 1035 Mk. 2 oscilloscope E.H.T. voltage at zero beam current. All voltage readings taken with receiver on 240 V.A.C. Voltages shown in brackets are for 405-line operation.

**Oscilloscope Frequencies of Waveforms:** V = Vertical timebase approx. osc. sweep freq. 25 c.p.s. H = Horizontal timebase approx. osc. sweep freq. 7812.5 c.p.s.

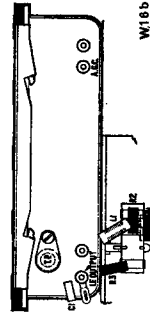
# DYNATRON



ALL CAPACITORS IN P.F. UNLESS OTHERWISE STATED.  
ALL RESISTORS IN OHMS UNLESS OTHERWISE STATED.

SW1 CLOSED ON LINE ONLY.

BAND SWITCH SHOWN IN BAND III POSITION.  
ALL VOLTAGES MEASURED WITH AVO 8 25V RANGE.  
V12 VOLTAGES MEASURED WITH SWITCH TO BAND I.  
V14 VOLTAGES MEASURED WITH SWITCH TO LINE.

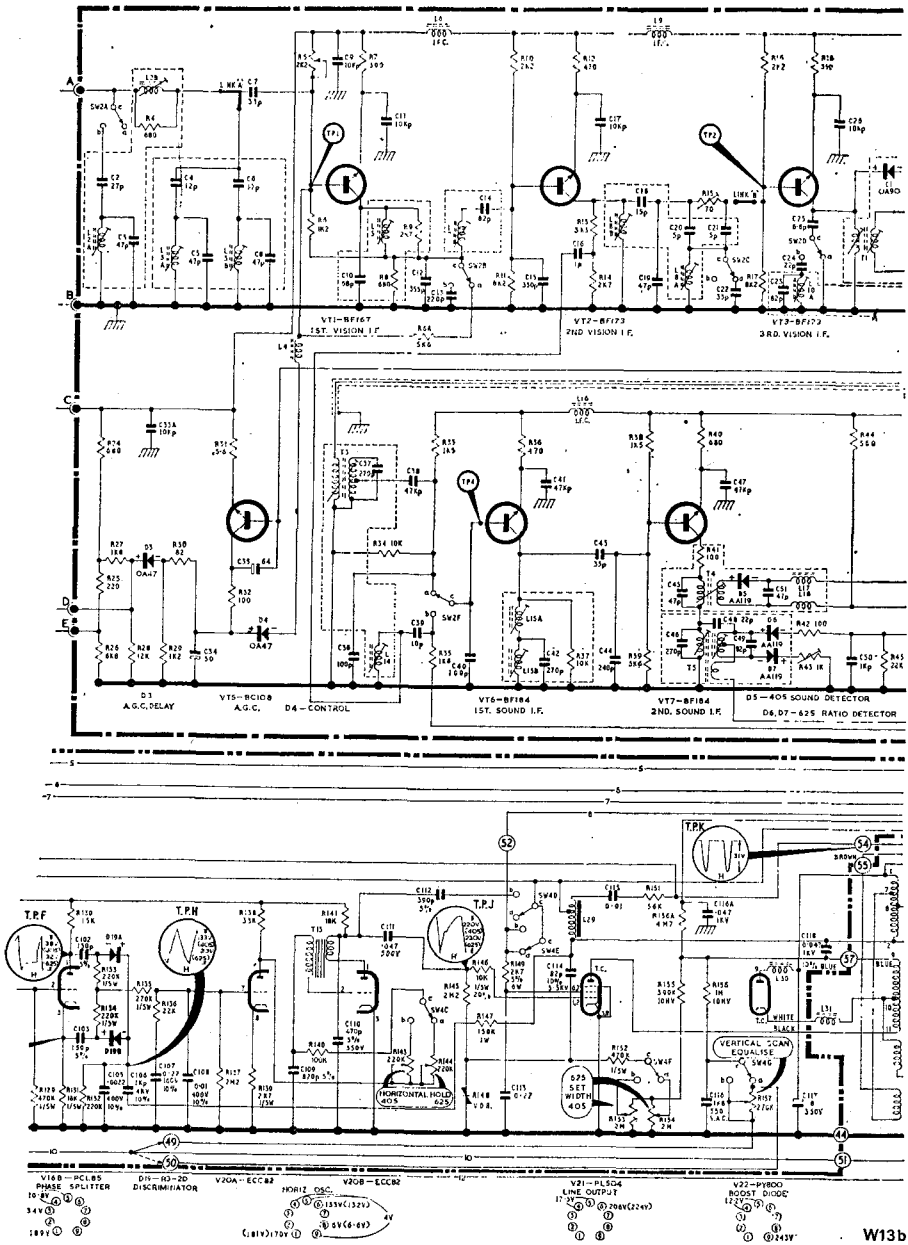


(W16a) "MULTI-BAND" TUNER CIRCUIT DIAGRAM

(W16b) TUNER END VIEW



# DYNATRON

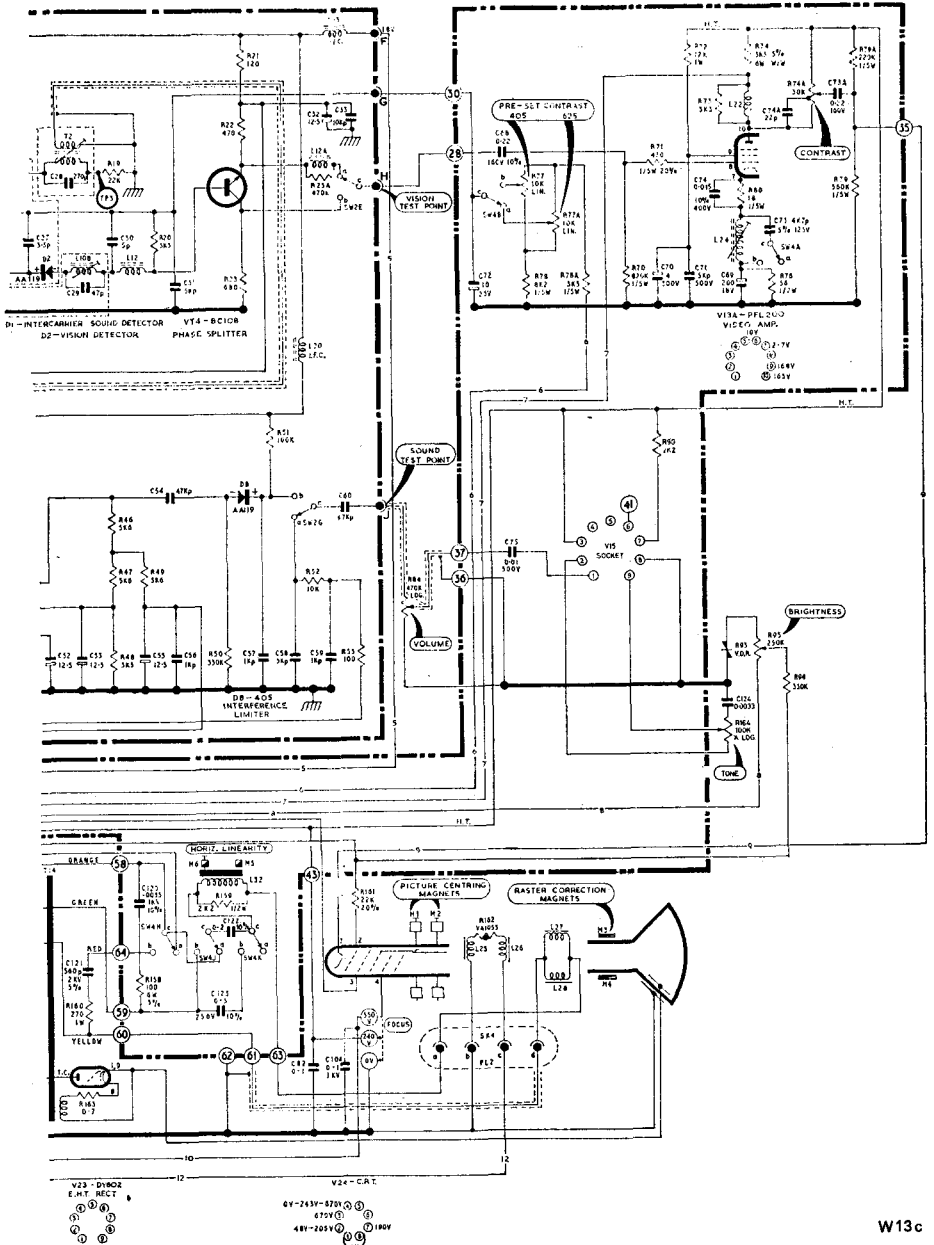


W13b

(W13b) CIRCUIT DIAGRAM WITH VOLTAGE AND WAVEFORM ANALYSIS—MODEL TV95 (PART)

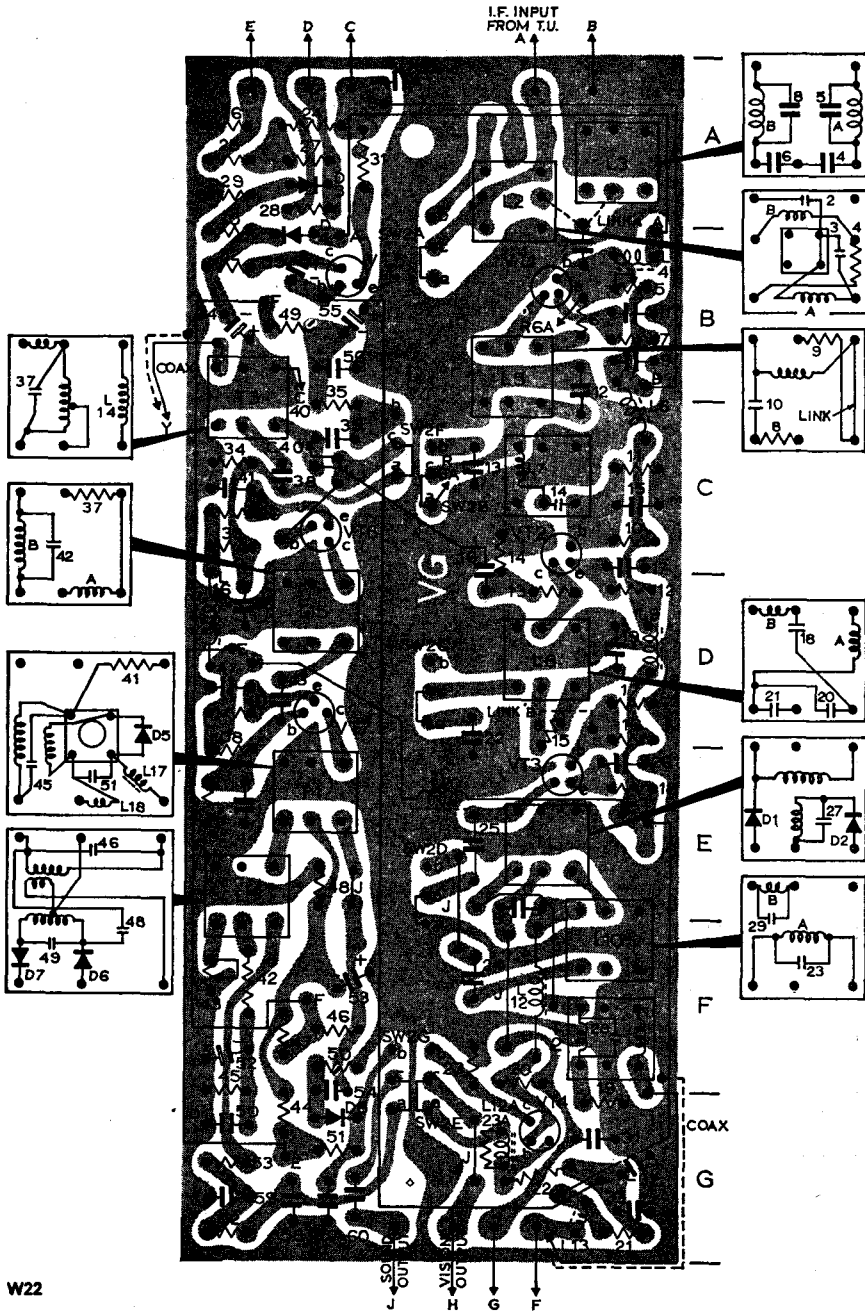


# TELEVISION SERVICING



(W13C) CIRCUIT DIAGRAM WITH VOLTAGE AND WAVEFORM ANALYSIS—MODEL TV95 (CONTINUED) In later models C75 is 0.1  $\mu$ F. R156 is 560k.

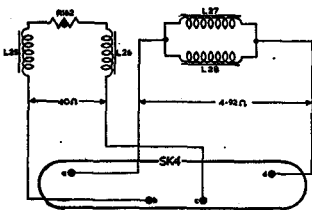
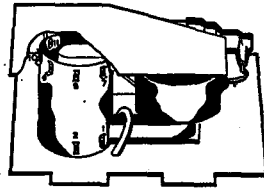
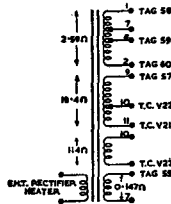
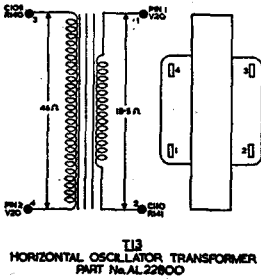
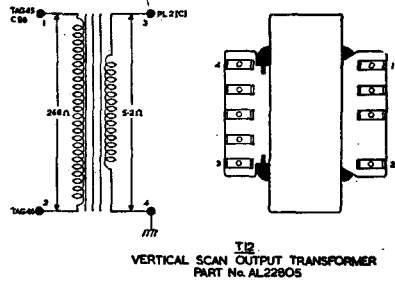
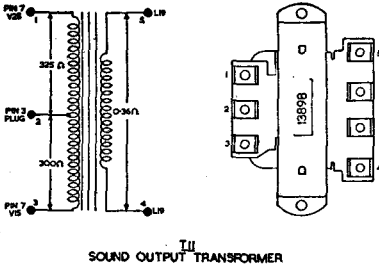
# DYNATRON



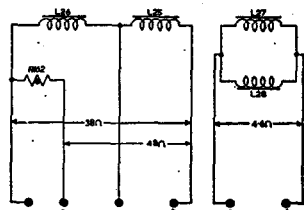
(W22) I.F. PANEL (COPPER SIDE)



# DYNATRON



L19 LOUDSPEAKER SPEECH  
COIL - 3 Ω NOMINAL.  
L29 INJECTION CHOKE - 7 Ω.  
L28 HT. CHOKE - 20 Ω.  
L32 LINEARITY CONTROL  
WINDING - 0.68 Ω.  
ALL RESISTANCE READINGS  
± 10% UNLESS OTHERWISE STATED.



(W19) D.C. RESISTANCE AND  
CONNECTIONS OF WINDINGS

**Circuit Notes:** All resistors  $\frac{1}{4}$  W 10 per cent. unless otherwise stated. All capacitors  $350 \geq 20$  per cent. unless otherwise stated. All potentiometers linear unless otherwise stated. SW<sub>2</sub> A—G ganged to SW<sub>4</sub> A—K and mechanically coupled to tuner channel selector. C66—C67—C86—C101 in one container. R66—R69 on same former. SW<sub>1</sub> ganged to R84.

## EKCO

### Models T500, T510, T511, T512, T513, TC501 and TC502

**General Description:** These models are electrically similar to the Pye '67 Chassis. Reference should be made to this information which is given elsewhere in this volume.

#### Cathode Ray Tube Type Variations

**T500, TC501 and TC502:** 19 in. A47-14W; 23 in. A59-15W; 25 in. A65-11W.

**T510, T511:** 19 in. A47-14W; 23 in. A59-15W.

**T512, T513:** 19 in. A47/26W or C47/10R; 23 in. A59/23W or C59/10R.

## FERGUSON

### Model 3646

**General Description:** This model employs tuners and chassis adapted from the B.R.C. 1400 Series described in this volume.

**V.H.F. Tuner:** Type 1516.

**U.H.F. Tuner:** Type T8.

**C.R.T.:** 19 in. Rimguard. CME 1907/A47-25W/S.

**Dismantling:** Remove cabinet back (5 screws). Release chassis from right-hand mounting brackets (2 screws). The chassis can be hinged open or lifted off its hinges for complete accessibility as described in the 1400 Series.

## FERRANTI

### Models T1164, T1165, TC1157, TC1159, TC1160 and TC1163

**General Description:** These models are electronically similar to the Pye '67 Chassis. Reference should be made to this information which is given elsewhere in this volume.

**Cathode Ray Tube Variations:** 19 in. A47-14W; 23 in. A59-15W; 25 in. A65-11W.

**H.M.V.****Model 2631**

**General Description:** 1. Model 2631 employs a special 20 kV. version of the 950 Series "TV only" chassis. 2. A modified jellypot line output transformer is fitted, together with a rectifier assembly which functions as a voltage trebler to provide 20 kV. of E.H.T. 3. A pulse derived from the anode circuit of the line output valve V11 is applied to the rectifier and voltage trebler circuit formed by W11A-e and C127-C130. The basic principle is that of a Cockcroft Walton multiplier. To avoid earth connections in the circuit the aquadag coating of the C.R.T. is used as a reservoir capacitor which charges up through series capacitors C129 and C127. 4. The frame output transformer is especially wound to provide the extra scanning power required. Component differences are detailed below.

**Note:** The Thorn 950 Series is described on page 482 in the 1966-67 volume.

**Component Differences:** The following differences should be observed when reading the 950 Series data: 1. C95 from 25 pF. to 11 pF., 350 volts, Part No. 5M92. 2. C97 from 300 pF. to 450 pF., Part No. 1M19. 3. C115 and L39 deleted, also the C.R.T. grid screen is not fitted. 4. C127-C130, 500 pF., 8 kV., added, part of E.H.T. trebler circuit. 5. C131, 220 pF., 5 per cent., 8 kV., shunt capacitor added, Part No. 6M24. 6. R112 from 360 ohm to 270 ohm, Part No. 9A49. 7. R126 from 220 kΩ to 470 kΩ, Part No. 9A50. 8. T3, Frame output transformer, Part No. oD3-o12. 9. T4, Line output transformer, Part No. oD4-o43. 10. W11A-E, Selenium E.H.T. rectifier assembly and part of E.H.T. trebler circuit. 11. Main printed board assembly, Part No. oV6-o45/12. 12. Flywheel printed board assembly, Part No. oV6-o831/1.

Items 4 and 10 have regard to the Complete tray assembly, Part No. oM3-700.

**V.H.F. Tuner:** Type 1700.

**U.H.F. Tuner:** Type UHFT4.

**C.R.T. Assembly:** 23 in. C.R.T. CME-2306. Integral implosion guard.

**H.M.V.****Model 2636**

**General Description:** This model employs tuners and chassis adapted from the B.R.C. 970 Series which is described in this volume.

**H.M.V.****Model 2637**

**General Description:** This model employs tuners and chassis adapted from the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 23 in. C.R.T. CME2303/AW59-91. PVC implosion guard (pre-stretched).

**Dismantling:** Remove cabinet back (two screws). Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.

**H.M.V.****Model 2639**

**General Description:** This receiver employs tuners and chassis adapted from the B.R.C. 1400 Series described in this volume.

**V.H.F. Tuner:** Type 1516.

**U.H.F. Tuner:** Type T8.

**C.R.T.:** 19 in. Rimguard CME 1907/A47-25W/S.

**Dismantling:** Remove cabinet back (6 screws). Release chassis from right-hand mounting brackets (2 screws). The chassis can be hinged open or lifted off its hinges for complete accessibility as described in the 1400 Series.

**K.B.****Models KV013, KV113,  
KV014 and KV114**

**General Description:** All these models employ the S.T.C. Chassis type VC4 described in the 1967-68 volume.

**K.B.****Models KV024, KV025,  
KV124 and KV125**

**General Description:** All these models employ the S.T.C. Chassis VC51 and VC51/1 described in this volume.

**MARCONIPHONE****Model 4615**

**General Description:** This receiver employs tuners and chassis adapted from the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 19 in. C.R.T. CME 1903/AW47-91. PVC implosion guard (pre-stretched).

**Dismantling:** Remove cabinet back (two screws). Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.

**MARCONIPHONE****Model 4619**

**General Description:** This model is fitted with a chassis basically similar to the 950 Mk. II Series except for the following modifications (see note below): Mechanically operated system switch, mains dropper power supply circuit with series diode rectifier in the heater supply. Also in later production chassis the frame output (V8B) is negatively biased from the heater line at the junction on the C.R.T. and V7 heaters. Under this arrangement, failure of the heater diode will be indicated by loss of vertical hold. A shorting link is provided for the outer section of the mains dropper (R150) for operation on A.C. mains supplies below 220 volts.

*Note:* To identify later production chassis, check for absence of C89 and R112, the bias components for V8B—see 1967-68 volume page 509.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 19 in. C.R.T. Rimguard Mk. II. CME-1907/A47-25W/S.

**Dismantling:** Remove cabinet back (two screws). Disengage system switch link by lifting off spring. Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.



**PHILIPS****Models GI9T210A, GI9T211A,  
G23T210A and G23T211A**

**General Description:** These receivers are dual standard 405/625-line, printed circuit hybrid models employing eleven transistors and seven semiconductor diodes in the tuner and I.F. amplifiers and nine valves and two semiconductor rectifiers in the time bases, output stages and power supplies. The integrated V.H.F./U.H.F. tuner is operated by six push-buttons which can be set to select any channel on 405- or 625-lines. The system switch is solenoid operated and is actuated by a micro-switch on the tuner. To facilitate servicing the chassis is located on two spigots in the base of the cabinet and is secured by a single fixing screw at the top. The connecting leads are sufficiently long to enable the receiver to be operated with the chassis withdrawn from the cabinet and socket connectors are fitted to the tuner and deflection coils.

**Circuit Protectors:**

<i>Fuses</i>	<i>Type</i>	<i>Location</i>
FS1551 FS1571 FS1572	Thermal 1.5A 1.0A	Main H.T. supply Mains supply Solenoid switching
<i>Drop-off resistors</i>	<i>Value</i>	<i>Location</i>
R4036 R4037 R4050 R4051 R4052	560 ohms 560 ohms 1800 ohms 1800 ohms 100 ohms	Field output stage  Video output stage Audio output stage
<i>Safety resistors</i>	<i>Value</i>	<i>Location</i>
R1547 R2145	1000 ohms 2200 ohms	Audio amplifier H.T. supply Line oscillator H.T. supply
<i>Spark gap</i>		<i>Location</i>
SG1560 E.H.T.		C.R.T. base connector 18 kV. stabilised

**Specially Mounted Components:** The following information relates to the replacement of certain components; it is very important that the methods described below are followed.

**Safety Resistors R1547 and R2145:** Safety resistors R1547 and R2145 are designed to act as fuses when their rated dissipation is exceeded. In the event of a fault causing either of these resistors to become open circuit it must be replaced with the correct type and in the case of R2145 spaced approximately  $\frac{1}{4}$  in. away from the panel by crimping the connecting wires.

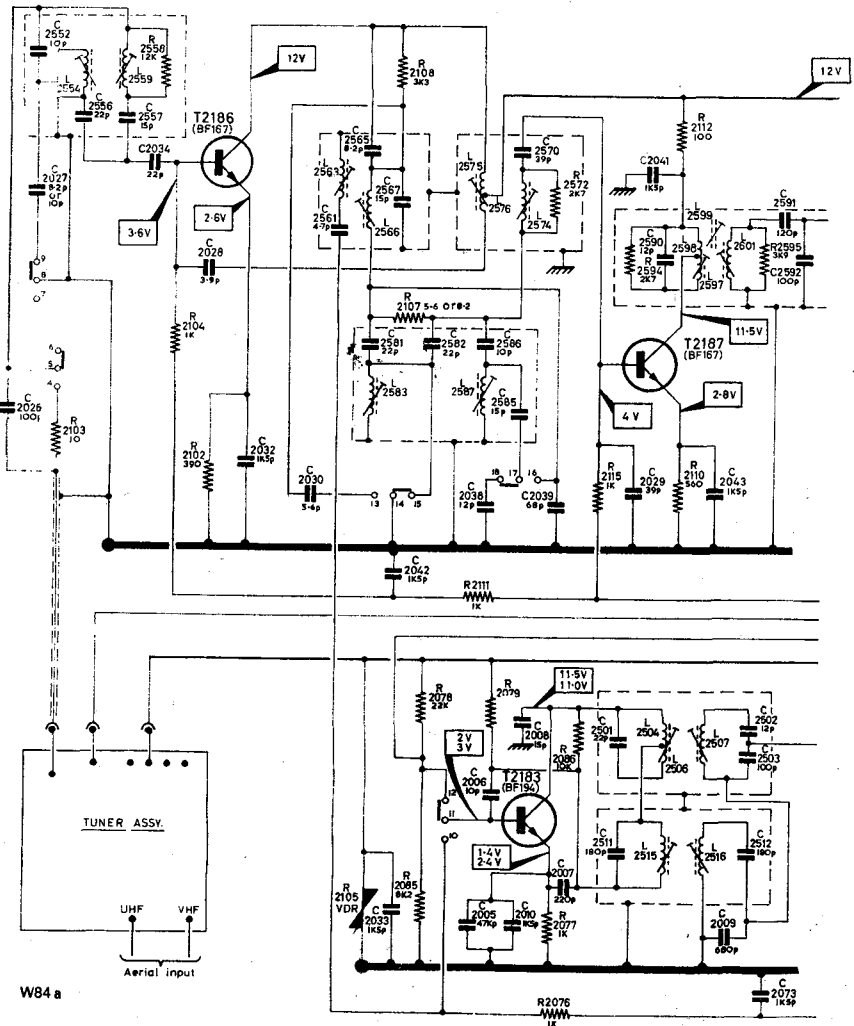


**(W91) WIRING DIAGRAM**

# TELEVISION SERVICING

**Ballast Resistors:** During manufacture, a high melting point solder is employed on all connections to the power supply ballast resistors R1542/R1543 and R1541/R1544/R1545. It is most important that this grade of solder (e.g. Ersin Cosmol Alloy) is used with a high temperature iron if these components are replaced, and that the component connection tags are positioned horizontally and point towards the rear of the receiver.

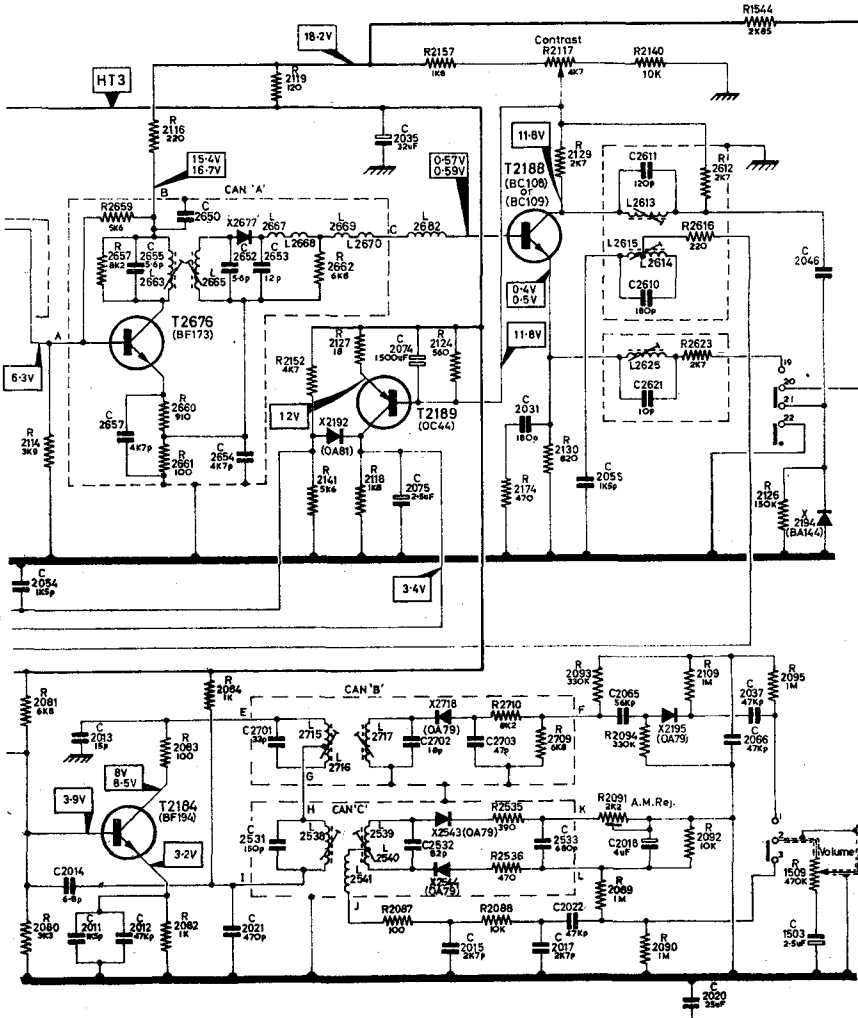
NOTE:- In sets fitted with vision detector unit code no.3113 108 21960, L2682 is omitted and R2682 and C2680 are replaced by R2125 and C2040. For circuit and print details see provisional service manual AES 641.



(W84a) CIRCUIT DIAGRAM—MODELS G19T210A, G19T211A, G23T210A, G23T211A (PART)

**Thermal Fuse:** A thermal fuse (FS1551) in the form of a wire spring is soldered adjacent to R1542 on the H.T. supply ballast resistor. Excessive heat dissipation will cause the solder to melt and the fuse will spring free. The spring must be refitted using "60/40" solder.

**Drop-off Resistors:** R4036, R4037, R4050, R4051 and R4052 are spaced from the printed panel on stand-off solder tags. Should one of these resistors

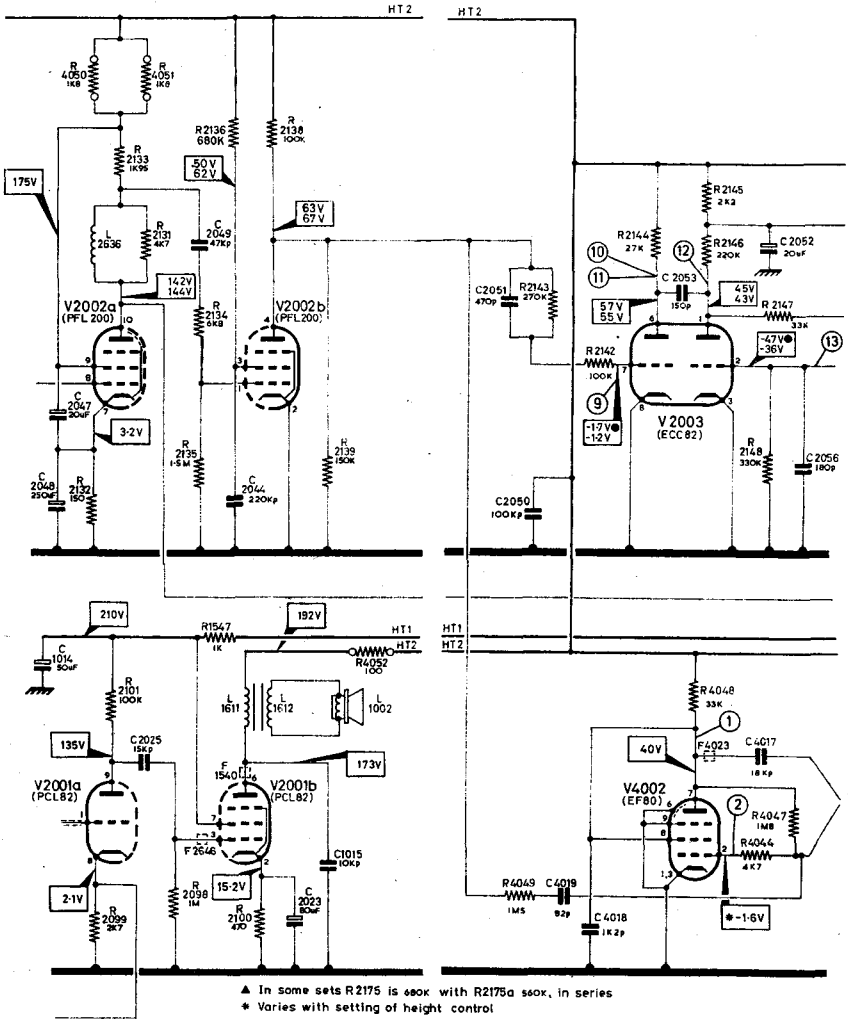


W84b

(W84b) CIRCUIT DIAGRAM (PART)

# TELEVISION SERVICING

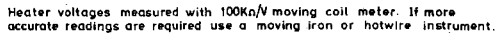
overheat for any reason, such as an inter-electrode short-circuit occurring in a valve, the solder on the tags will melt, allowing the component to fall away. This provides a degree of protection to the printed panels and other circuitry. Replacements should be made with Dubilier type BTA 1W resistors, using ordinary "60/40" resin cored solder. The resistors must be mounted on the underside of the solder tags, with the connecting wires placed straight under the tags and not wrapped around them.



W84c

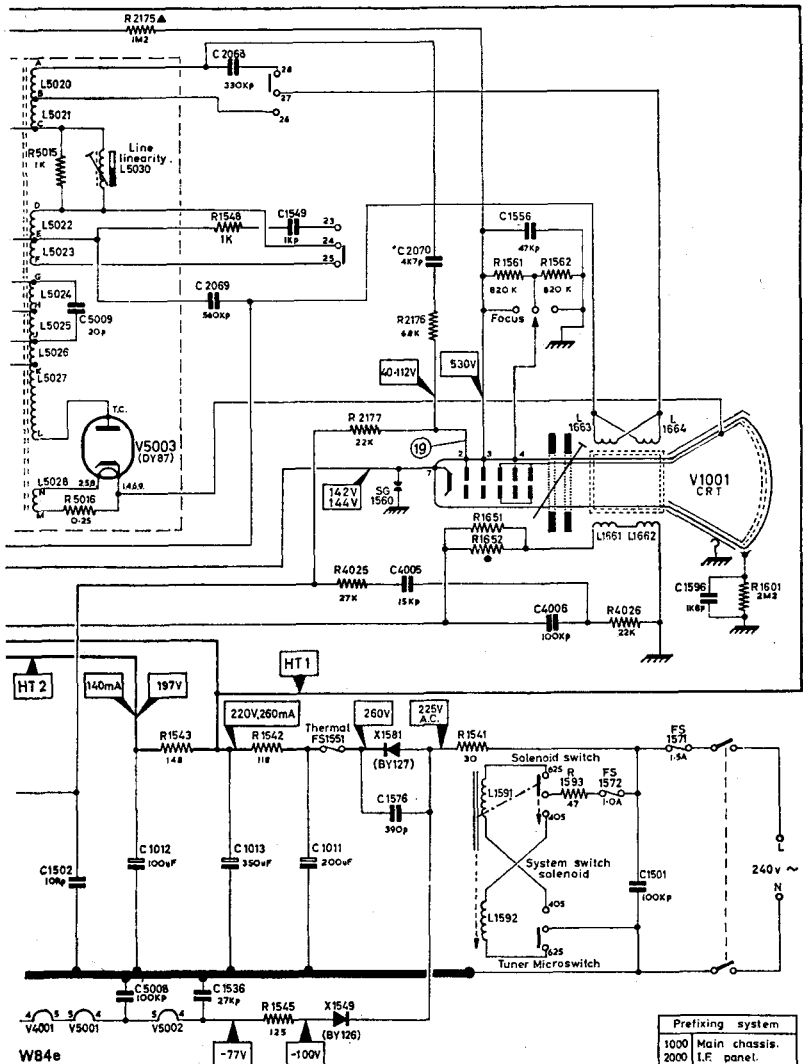
(W84c) CIRCUIT DIAGRAM (PART)

**Special Trimming Tool:** A special star-shaped trimming tool is necessary for the alignment of the tuner I.F. coil. This tool is available as part of



(W84d) CIRCUIT DIAGRAM (PART)

# TELEVISION SERVICING



All voltages, unless otherwise indicated, measured with respect to chassis, using a 100k $\Omega$ /V meter. Contrast, brightness and volume controls to minimum, no signal input, mains input 240V AC.

## NOTES:-

1.  $\text{V}_{\text{H}}$  indicates voltage taken with the line hold control reset to synchronize the time base with a transmission.
2.  $\text{C}$  = C.R.T. protection link on line deflection coil connection socket.
3. System switch drawn in 625-line position.

4.  $\text{V}_{\text{W}}$  denotes waveform taken.

5.  $\text{D}$  = drop off resistor.

6. Voltages shown: 405-lines 45V, 625-lines 43V

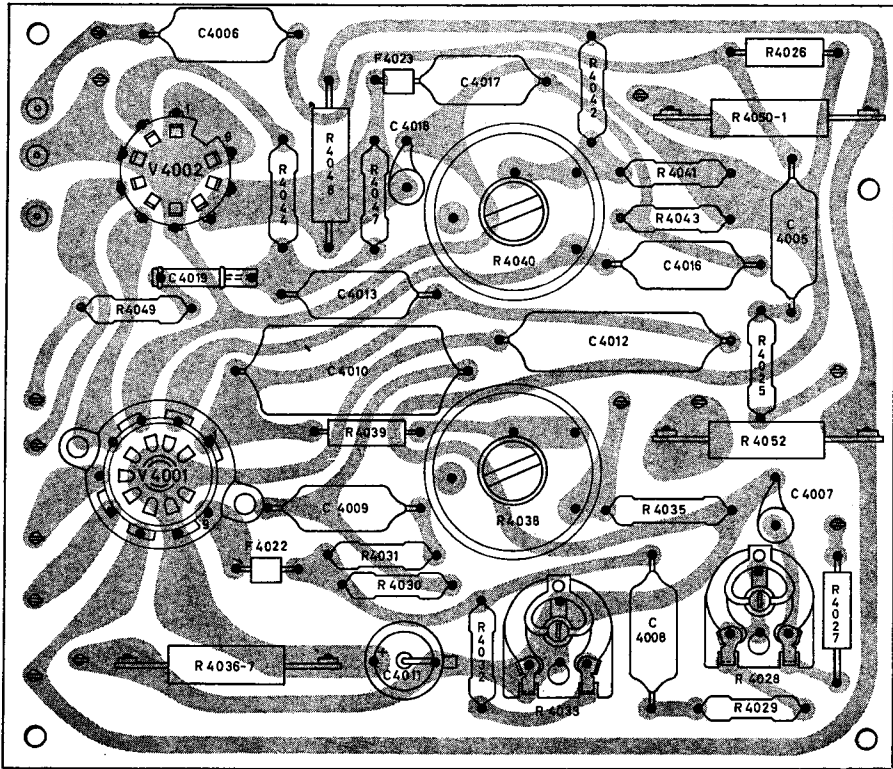
(W84e) CIRCUIT DIAGRAM—MODELS G19T210A, G19T211A, G23T210A, G23T211A (CONTINUED)

## PHILIPS

the trimming tool kit 800/TX and engineers are advised that attempts to adjust this core with non-standard tools may result in damage to the core.

### Adjustments

**Tuner Push-Buttons:** Depress the appropriate push-button for the band and system being used until it locks in, then without further pressure, slowly rotate to tune in the desired channel. The tuner switching can be set for any combination of band and system in the following way. With all



(W89) FIELD TIMEBASE PANEL

W89

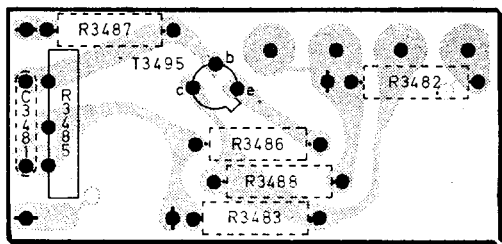
the push-buttons in the unlatched position, depress the appropriate plastic knob at the rear of the tuner and rotate until the arrow on the rear of the knob lines up with the required band and system. A label which is attached to the rear of the tuner will assist in this setting-up procedure.

**Release of Tuner Push-Buttons:** In the event that the six push-buttons have been accidentally pressed in simultaneously, they may be released by pressing in the third button from the top (B.B.C.2) still further.

**Line-Hold Pre-set (R2155):** A pre-set line-hold control is provided to balance the setting of the main line-hold control for both systems. To



# TELEVISION SERVICING



W90

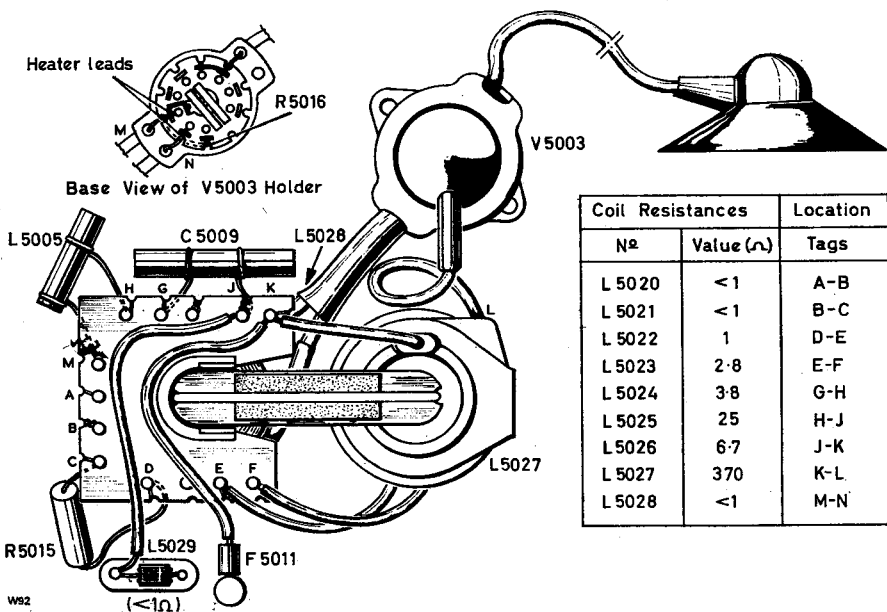
(W90) TUNER A.G.C. PANEL (PRINTSIDE)

adjust, switch to 625-lines and lock the picture using the main hold control, then switch to 405 lines and lock the picture by adjusting R2155.

**Line Stabilisation/Width (R2170, R2171):** *Great care must be taken when making this adjustment as high voltages exist at this point.*

Correct adjustment of the 405- and 625-line stabilising controls automatically sets the picture width. Lock the raster and turn the brightness control to minimum. Connect a high impedance D.C. volt-meter between the boost test point (junction of R2165/R2175, indicated by a red disc) and chassis. Adjust R2170 and R2171 accurately to give a meter reading of 930 volts on 625 and 405 line respectively.

**Tuner A.G.C. Control (R3485):** R3485 is adjusted in the factory and its setting should not be altered. If, however, it has been disturbed, proceed



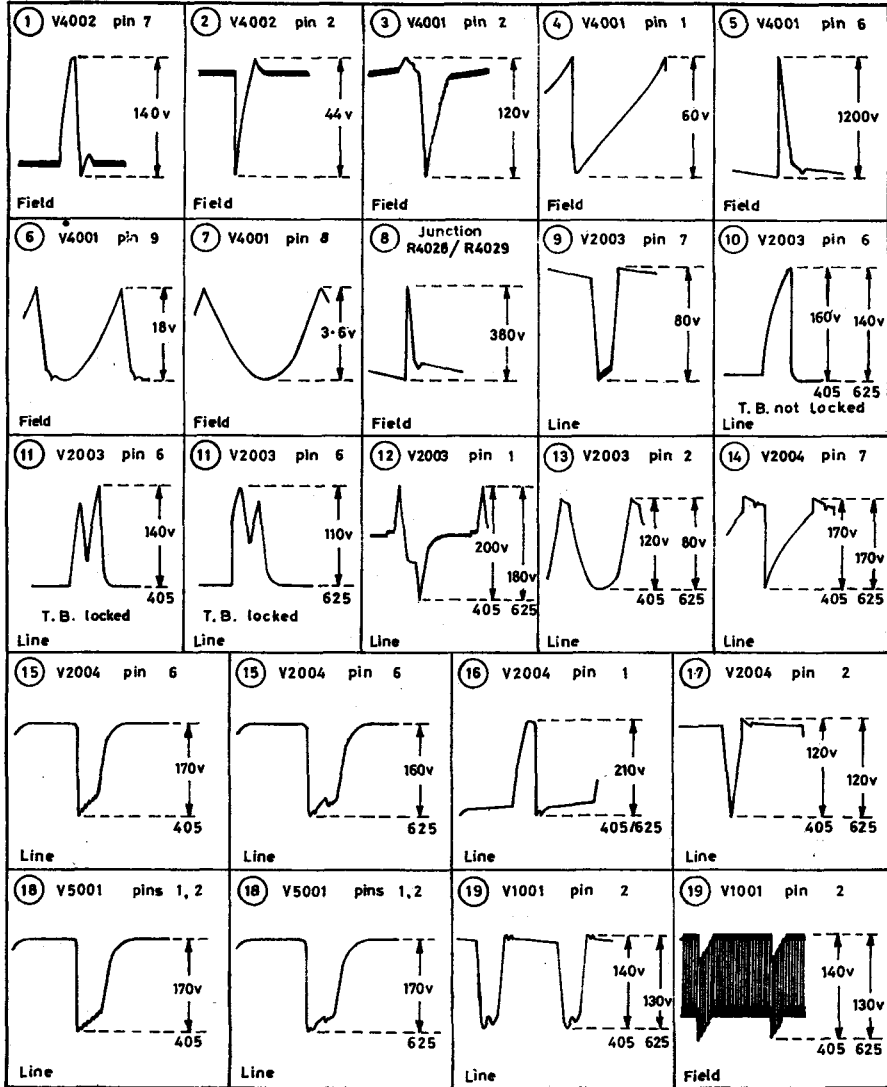
Coil Resistances		Location
No	Value (Ω)	Tags
L 5020	<1	A-B
L 5021	<1	B-C
L 5022	1	D-E
L 5023	2.8	E-F
L 5024	3.8	G-H
L 5025	25	H-J
L 5026	6.7	J-K
L 5027	370	K-L
L 5028	<1	M-N

(W92) LINE OUTPUT TRANSFORMER

# PHILIPS

as follows: Switch the tuner to any blank channel. Connect a variable D.C. supply to the junction of X2192 and R2118 and adjust its output to 3.8 volts. Connect a high impedance volt-meter across R3482 and adjust R3485 to give a reading of 3.5 volts.

Voltage waveforms peak to peak taken on Philips PM3230 oscilloscope using high impedance probe.



W93

(W93) VOLTAGE WAVEFORMS

**PYE****Models 48, 49, 53, 60 and 61  
(’67 Chassis)**

**General Description:** These models incorporate the Pye “Group ’67 Chassis”, which employs the “Multi-band” silicon tuner and separate I.F. panel. The circuit is designed for use on an A.C. supply of 200/250 volts. *Note:* Some early models are suitable for 210/250-volt operation only (see inset at left-hand side of circuit diagram). Under no circumstances connect to a D.C. supply or serious damage will result.

**Circuit Notes and Component Variations**

**Cathode Ray Tube Types, Models 48, 49 and 55:** 19 in. A47-14W; 23 in. A59-15W; 25 in. A65-11W.

**Models 60 and 61:** 19 in. A47/26W or C47/10R; 23 in. A59/23W or C59/10R.

During the early stages of production a certain number of component values were changed. The current values only are shown on the circuit, and the original values are listed for information: R5-2K2 (fixed); R13-4K7; R14-1K; R24-560Ω; R36-1K; R44-820Ω; C40-47 pF.; C74-0.01 μF.; R6A- not fitted.

In addition, Link “A” in the base of the 1st. Vision I.F. (VT1) has now been moved to the opposite side of C7. It is in fact a double link, connecting C7 separately to the junctions C4/C6 and L2B/R4.

Three further changes which do not appear on the circuit are being made, as follows: R103 (470Ω) rating raised to 3W. R112 and R113 (Vertical hold control) increased to 100k. In later models the following component values apply: R6 1k 2; R140 100k; R141 18k; R146 10k; R156 560k 1W; C110 470 pF. Mica. In some chassis VT7 may be type BF 185.

**Adjustments:** The Horizontal Linearity control (L32) is located on the front of the timebase panel. Adjust the round magnet up or down the former until the first 30 per cent. of scan is equal to the last 30 per cent. of scan.

\* **Set Width (625 and 405):** Ensure first that the horizontal linearity adjustment has been correctly carried out. Adjust appropriate line system slider control commencing from minimum scan and advancing to the point where scan ceases to increase. Move slider in reverse direction to the correct amplitude setting.

**Vertical Scan Equalising:** 1. Ascertain which line system has the highest boost voltage (SW4G-c). 2. Plug fly-lead (frame oscillator feed) on to the appropriate tag for the system with the highest boost voltage, i.e. tag 50 (625) or tag 49 (405). 3. Equalise frame scans with pre-set control R157.

\* It is recommended that 30 minutes heating up on normal operation be allowed before making amplitude or linearity adjustments. If not, then the amplitude controls should be adjusted to give a small additional vertical and horizontal overscan to that for correct setting.

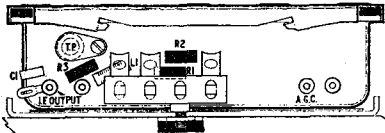
**Picture Centring:** Picture centring is effected by the two magnets (M1, M2) situated on the rear of the deflector coils. Rotate the magnets independently until the picture is correctly positioned on the screen.

**Focus:** Optimum focus is obtained by connecting the blue jumper lead from pin 4 of the C.R. tube to the appropriate tag on the Spark Protection Card Assy.

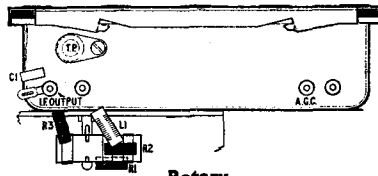
**\* Pre-set Contrast (625 and 405):** These controls should be set so that the D.C. volts developed across R20, with an input signal greater than 1 mV., are 1.8 volts (405) and 2.9 volts (625). Slight readjustment should then be made as necessary to give equal contrasts on both systems.

**Note:** Cross-modulation problems on strong signals may result if the control settings are too high.

**Mechanical Data:** After switching the receiver off, the final anode connected on the glass bulb of the C.R. tube should be short-circuited to chassis before any work is carried out.



Push-Button



Rotary

W106

Note that the coding above relates to the Receiver Circuit Diagram

(W106) TUNER END VIEWS

**To Lower Chassis:** Remove back cover. Remove the two top chassis fixing screws. The chassis may now be lowered to the horizontal position to enable normal service to be carried out.

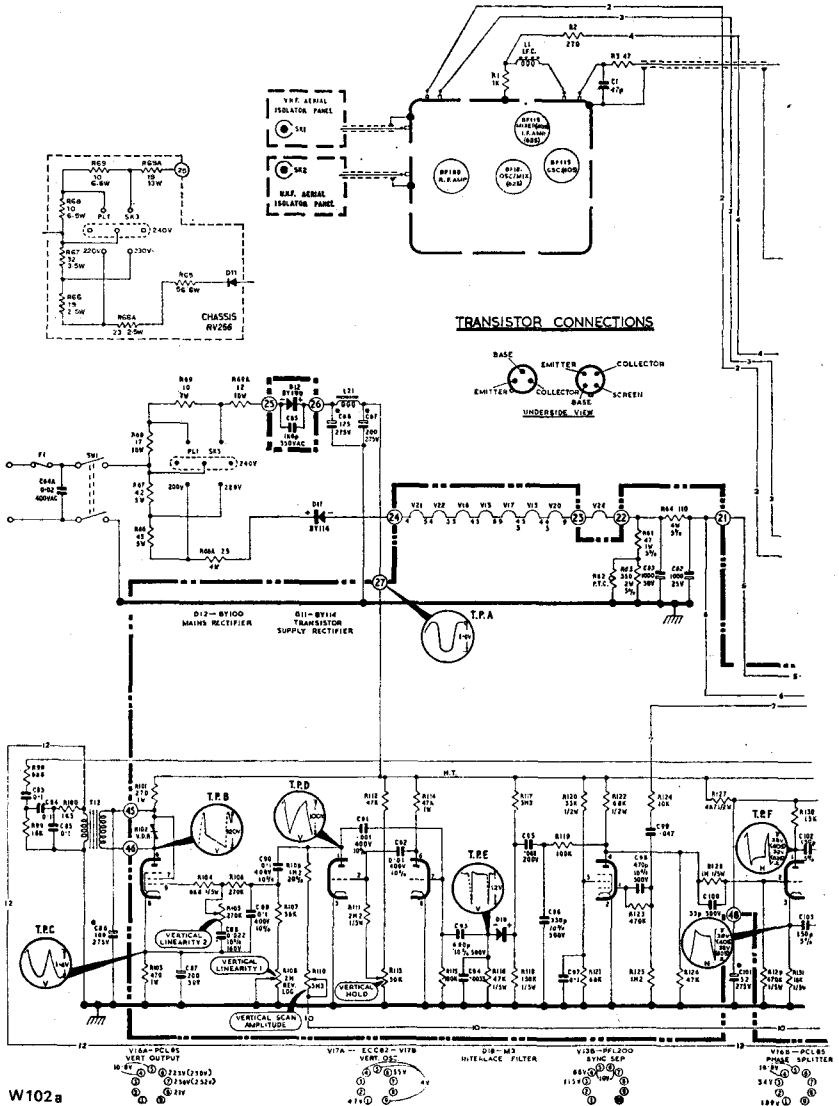
**Chassis Removal:** Raise the chassis (approximately to the halfway position) until the slots in the cabinet hinge brackets permit the chassis to be withdrawn. If it should be desired to completely detach the chassis, e.g. for cabinet replacement, it will be necessary to remove the front control panel, unplug or unsolder deflector coils, disconnect the tuner 3-pin plug sockets and the C.R. tube; also the blue and red leads on the sound output transformer.

**L.O.P.T. Assembly Removal:** Lower chassis. Unplug E.H.T. cavity connector, the two valve top cap connectors and fly-leads from L.O.P.T. to terminating posts on timebase panel. Remove the self-tapping screw and washer and carefully withdraw L.O.P.T., at the same time releasing the E.H.T. lead retaining grommet.

**L.O.P.T. Assembly Replacement:** Reverse above procedures, ensuring that the coloured leads to the timebase panel are replaced as follows: White—V22T.C., Black—V21T.C., Brown—Pin 55, Blue—Pin 57, Orange—Pin 58, Green—Pin 59, Yellow—Pin 60, Red (inc. C121)—Pin 64.

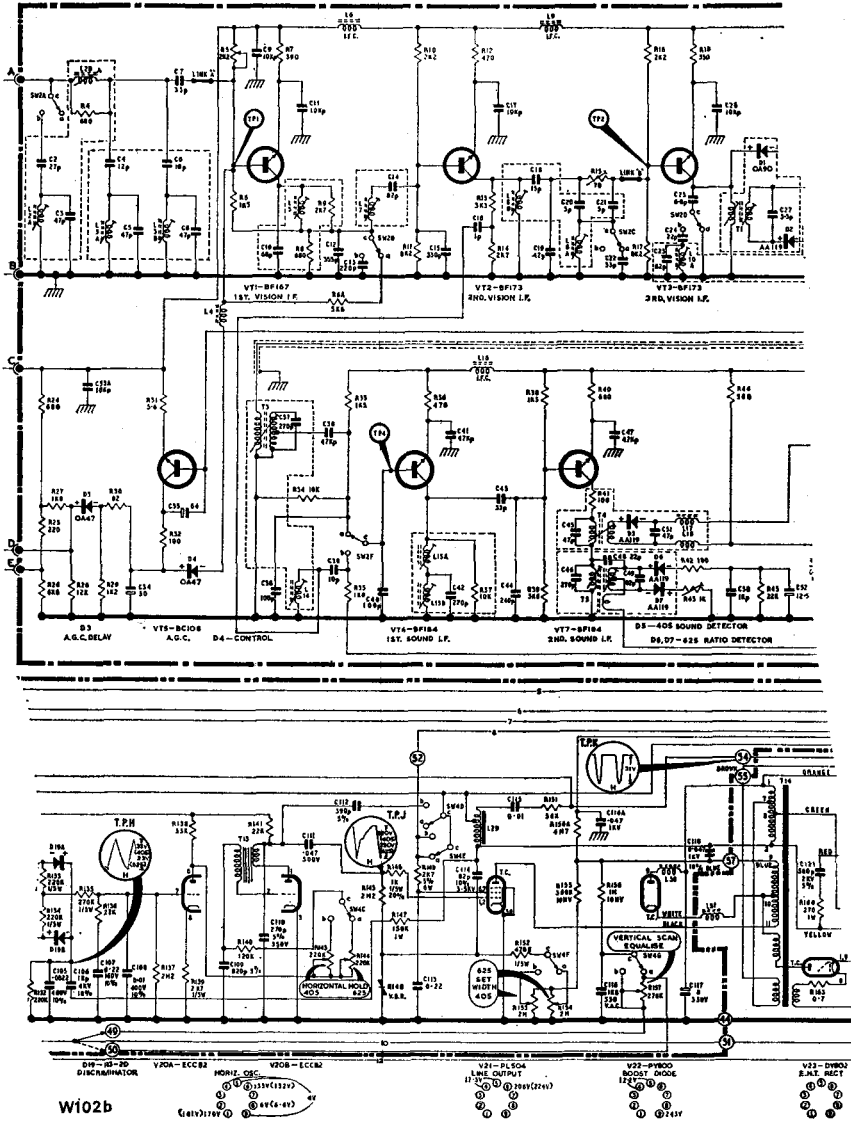
\* This control is factory pre-set and will not normally require adjustment.

# TELEVISION SERVICING



(W102a) CIRCUIT DIAGRAM—MODELS 48, 49, 55, 60 AND 61 (PART)

**To Disconnect C.R. Tube:** Lower chassis. Release aquadag earthing strap and disconnect spark protection card assembly. Pull off E.H.T. cavity connector and C.R.T. base connector; also unplug or unsolder deflector coils.

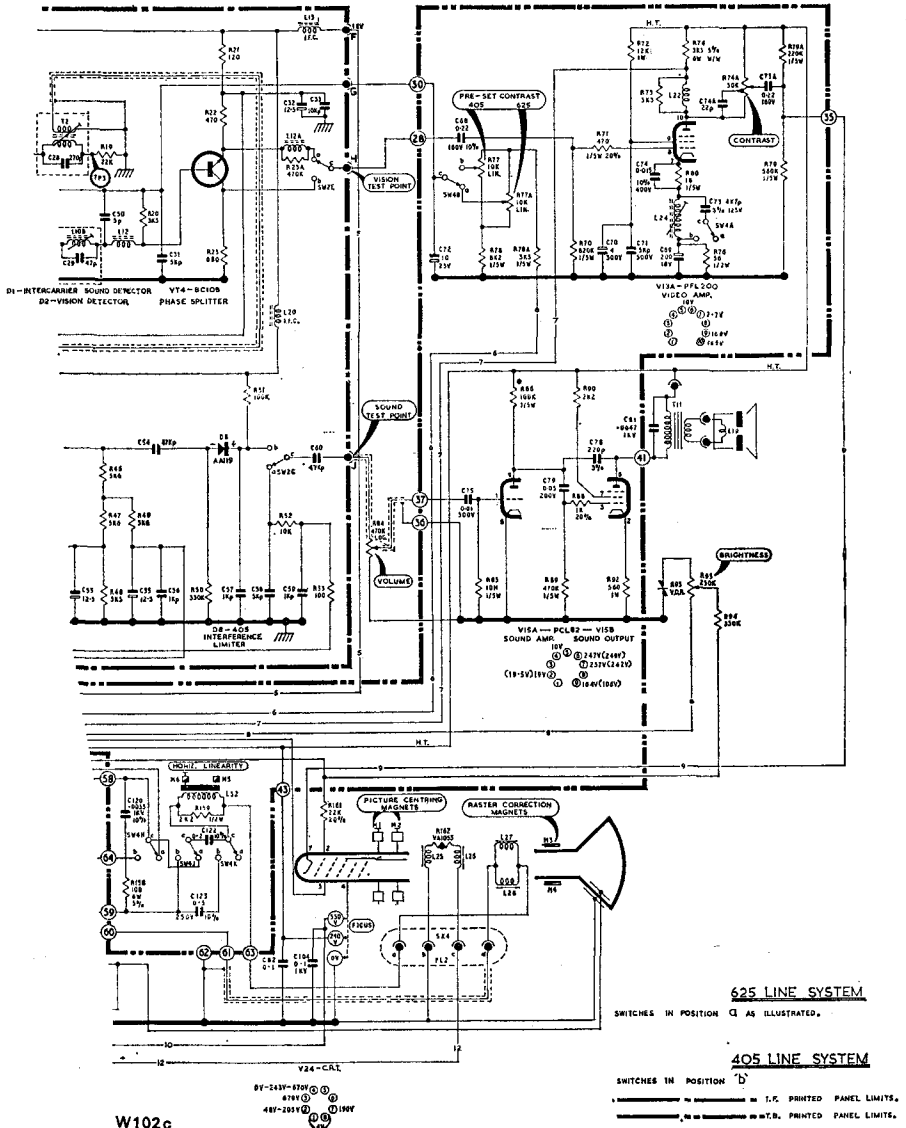


(W102b) CIRCUIT DIAGRAM—MODELS 48, 49, 55, 60 AND 61 (PART)

**To Detach I.F. Panel:** Remove 4-pin and two 3-pin plug sockets. Slacken the two Philips self-tapping screws on the right-hand side and carefully disengage system switch link.

**Bowden Cable:** When it becomes necessary to detach the tuner from the

# TELEVISION SERVICING



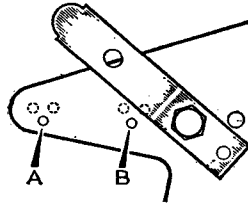
chassis, the method used will depend on whether the cable outer is (a) clamped to the cable adjuster bracket on the chassis, or (b) simply held in position by a spring clip.

In the case of (a) the cable should be detached at the tuner end, by prising

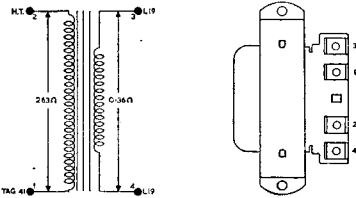
# PYE

the outer from its retaining bracket (or removing two s/t. screws on retainer bracket). For (b) the cable should be detached at the chassis end, by releasing the spring clip, slackening the s/t. screw holding the cable inner retainer, pushing it aside and then unhooking the inner cable from the switch plate.

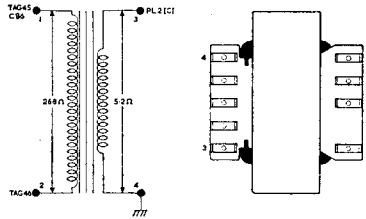
(W111) BOWDEN CABLE



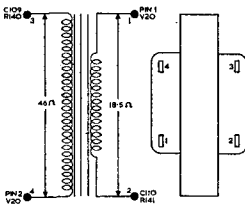
W 111



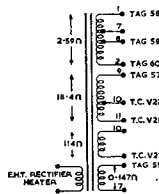
T11  
SOUND OUTPUT TRANSFORMER  
PART No. EBO217



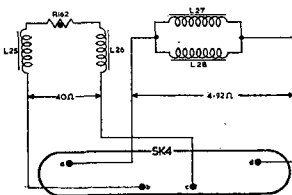
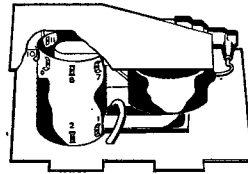
T12  
VERTICAL SCAN OUTPUT TRANSFORMER  
PART No. AL22805



T13  
HORIZONTAL OSCILLATOR TRANSFORMER  
PART No. AL22800

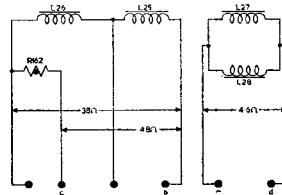


T14  
HORIZONTAL SCAN OUTPUT TRANSFORMER  
PART No. AL21029



L25-L28  
DEFLECTOR COILS  
PART No. AFOO050

L19 LOUDSPEAKER SPEECH  
COIL - 3  $\Omega$  NOMINAL  
L29 INJECTION CHOKE - 17  $\Omega$   
L21 H.T. CHOKE - 26  $\Omega$   
L32 LINEARITY CONTROL  
WINDING - 0.68  $\Omega$   
ALL RESISTANCE READINGS  
 $\pm 10\%$  UNLESS OTHERWISE STATED



L25-L28  
DEFLECTOR COILS  
PART No. FTO6064

W110

## (W110) D.C. RESISTANCE AND CONNECTIONS OF WINDINGS



## TELEVISION SERVICING

In either case, do NOT disturb the cable adjuster bracket screw on the chassis, which is sealed with a blob of red paint.

In the unlikely event of a replacement cable being required, however, proceed as follows: 1. Remove faulty cable and fit replacement to tuner. 2. With tuner and timebase system switch in "405" position, slacken off cable adjuster bracket screw and hook inner cable into hole "A" (push-button tuners) or into hole "B" (rotary tuners). 3. Fit outer cable to cable adjuster bracket and tighten screw; then replace cable inner retainer.

### Circuit Diagram Notes

**Voltage and Waveform Analysis Conditions:** With signal input, volume control at minimum all other controls set for normal operation. Volt-meter sensitivity 20,000  $\Omega/v$  Avometer model No. 8. Electrostatic volt-meter used for E.H.T. voltages. Waveforms taken with Cossor 1035 Mk. 2. Oscilloscope E.H.T. voltage at zero beam current. All voltage readings taken with receiver on 240 v.a.c. Voltages shown in brackets are for 405-line operation.

**Oscilloscope Frequencies of Waveforms:** V = vertical timebase approx. osc. sweep freq. 25 c.p.s. H = horizontal timebase approx. osc. sweep freq. 7812.5 c.p.s.

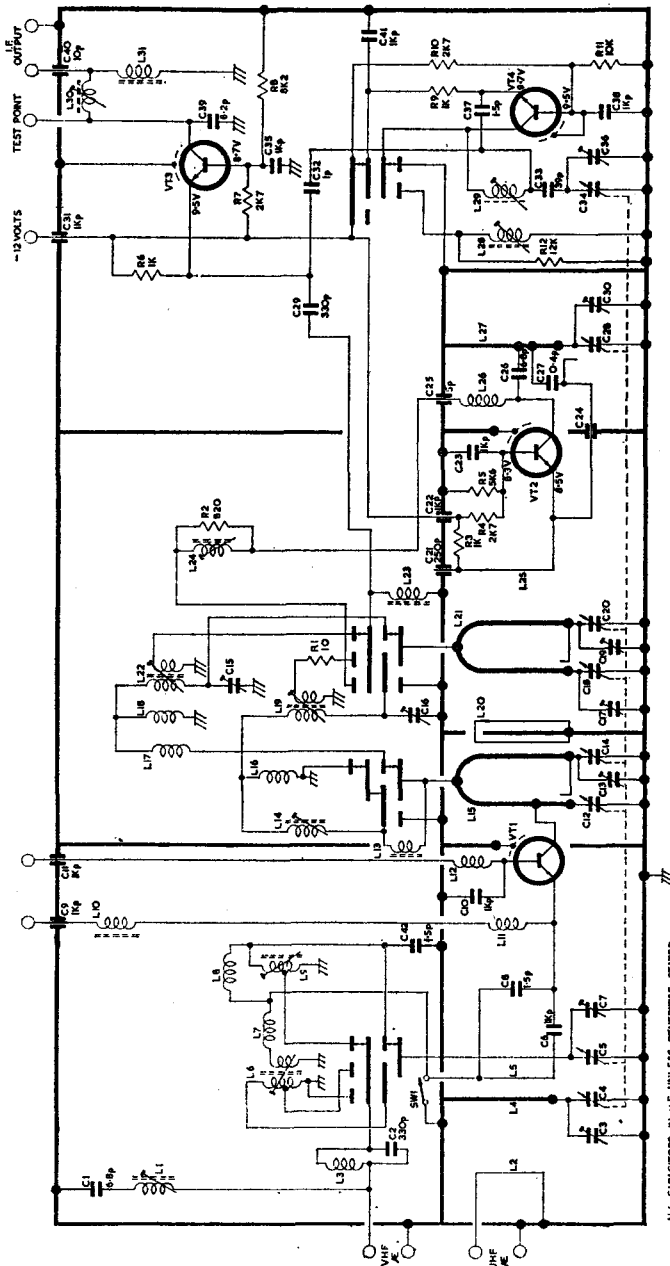
**Circuit Notes:** All resistors  $\frac{1}{4}$  W. 10 per cent. unless otherwise stated. All capacitors 350 volts  $\geq$  20 per cent. unless otherwise stated. All potentiometers linear unless otherwise stated. SW<sub>2</sub> A-G ganged to SW<sub>4</sub> A-K and mechanically coupled to tuner channel selector. C66-C67-C86-C101 in one container. R66-R69 on same former. SW<sub>1</sub> ganged to R84.

**Frame Equalisation:** Ascertain the system with the highest boost voltage (SW<sub>4</sub>Gc) plug ply-lead (frame osc. feed) on to the appropriate tag for the system with the highest boost voltage i.e. tag 50 (625), tag 49 (405). Equalise frame scans with pre-set control R157.

### Transistor Voltage Data

Code No.	Collector	Base	Emitter
VT <sub>1</sub> . . . .	6.75 (8.7)	15.4 (12.7)	16.1 (13.4)
VT <sub>2</sub> . . . .	0	13.9	14.7
VT <sub>3</sub> . . . .	0	14.4	15.2
VT <sub>4</sub> . . . .	9.0 (3.0)	9.3 (14.4)	10.4 (15.25)
VT <sub>5</sub> . . . .	17.5 (3.15)	16.74 (17.3)	17.6 (17.75)
VT <sub>6</sub> . . . .	0	14.25	15.5
VT <sub>7</sub> . . . .	0.5	14.0	14.7
Pin "D" . . .		12.0 (3.4)	
Pin "E" . . .		12.9 (4.3)	
Pin "F" . . .		18.0	

All the above voltage readings are negative with respect to chassis and taken with AVO model 8, no signal input, SW<sub>2</sub> in "405" position with pre-set contrast at maximum gain. Readings in brackets are those which differ when the pre-set contrast is set for minimum gain.



ALL CAPACITORS IN P.F. UNLESS OTHERWISE STATED.  
ALL RESISTORS IN OHMS UNLESS OTHERWISE STATED.

W105

SW1 CLOSED ON LINE ONLY.

BAND SWITCH SHOWN IN BAND II POSITION.

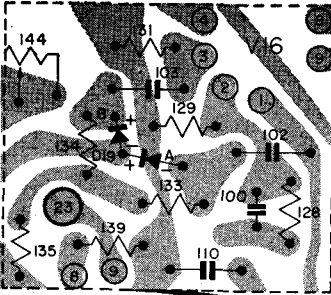
ALL VOLTAGES MEASURED WITH AVO 8 25V RANGE.

VT1-VT4 VOLTAGES MEASURED WITH SWITCH TO BAND I.

VT2 VOLTAGES MEASURED WITH SWITCH TO U.H.F.

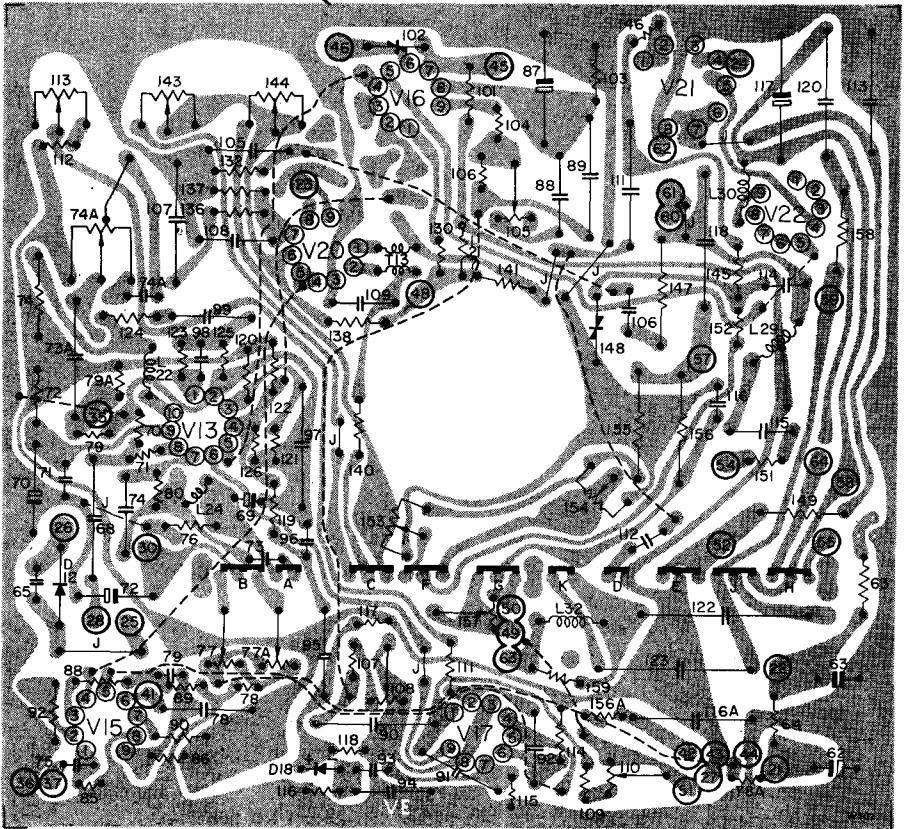
(W105) "MULTI-BAND" TUNER CIRCUIT DIAGRAM

## TELEVISION SERVICING



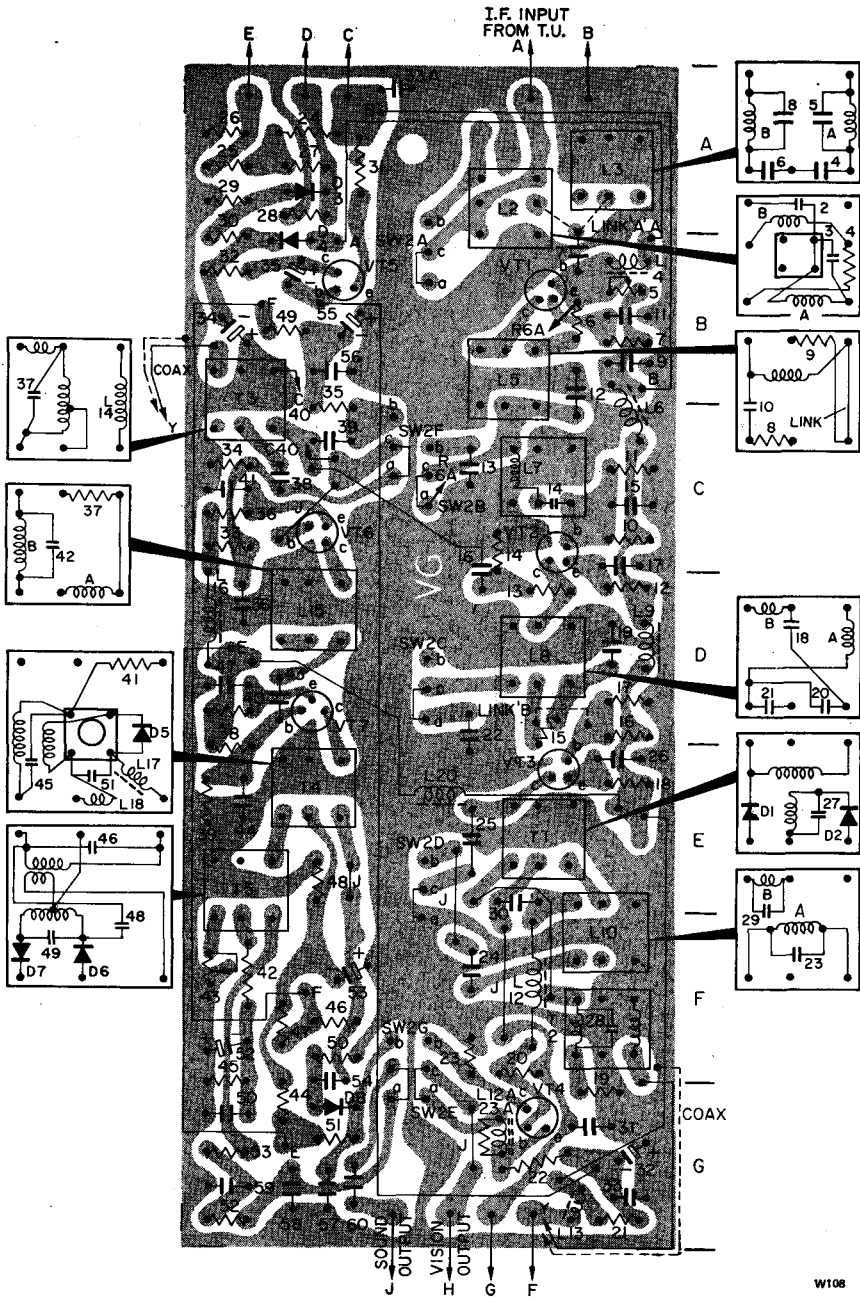
In early panels coded 'V', 'VA', 'VB' & 'VC' certain variations applied; these included—

- C78 fitted to copper side
- C81 mounted on panel
- C116A and R156A mounted on chassis side member



(W107) TIMEBASE PANEL

PYE



(W108) I.F. PANEL DETAILS

The image contains two detailed electronic circuit diagrams, labeled 'a' and 'b', showing the internal layout of a television set. Diagram 'a' is the top half, showing the main chassis with components like the frame hold, line hold, contrast, and vertical line 1 and 2. Diagram 'b' is the bottom half, showing the lower chassis with components like the sound amp, video amp, horizontal scan output transformer, and various other electronic components. Both diagrams include component values, part numbers, and labels for various sections of the circuit.

**Diagram a (Top Chassis):**

- Components: FRAME HOLD 405, 625, LINE HOLD, LINE HOLD, CONTRAST, VERT. LIN. 2, 405, 625 SET WIDTH, VERT. SCAN & EQUALISE, VERT. LIN. 1, VERT. SCAN AMP, PRE-SET CONTRAST, 405, 625, V15, V16, V17, V18, V19, V20, V21, V22, V23, V24, V25, V26, V27, V28, V29, V30, V31, V32, V33, V34, V35, V36, V37, V38, V39, V40, V41, V42, V43, V44, V45, V46, V47, V48, V49, V50, V51, V52, V53, V54, V55, V56, V57, V58, V59, V60, V61, V62, V63, V64, V65, V66, V67, V68, V69, V70, V71, V72, V73, V74, V75, V76, V77, V78, V79, V80, V81, V82, V83, V84, V85, V86, V87, V88, V89, V90, V91, V92, V93, V94, V95, V96, V97, V98, V99, V100.
- Labels: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T27, T28, T29, T30, T31, T32, T33, T34, T35, T36, T37, T38, T39, T40, T41, T42, T43, T44, T45, T46, T47, T48, T49, T50, T51, T52, T53, T54, T55, T56, T57, T58, T59, T60, T61, T62, T63, T64, T65, T66, T67, T68, T69, T70, T71, T72, T73, T74, T75, T76, T77, T78, T79, T80, T81, T82, T83, T84, T85, T86, T87, T88, T89, T90, T91, T92, T93, T94, T95, T96, T97, T98, T99, T100.

**Diagram b (Bottom Chassis):**

- Components: SOUND AMP/OUTPUT, V15, V16, V17, V18, V19, V20, V21, V22, V23, V24, V25, V26, V27, V28, V29, V30, V31, V32, V33, V34, V35, V36, V37, V38, V39, V40, V41, V42, V43, V44, V45, V46, V47, V48, V49, V50, V51, V52, V53, V54, V55, V56, V57, V58, V59, V60, V61, V62, V63, V64, V65, V66, V67, V68, V69, V70, V71, V72, V73, V74, V75, V76, V77, V78, V79, V80, V81, V82, V83, V84, V85, V86, V87, V88, V89, V90, V91, V92, V93, V94, V95, V96, V97, V98, V99, V100.
- Labels: T1, T2, T3, T4, T5, T6, T7, T8, T9, T10, T11, T12, T13, T14, T15, T16, T17, T18, T19, T20, T21, T22, T23, T24, T25, T26, T27, T28, T29, T30, T31, T32, T33, T34, T35, T36, T37, T38, T39, T40, T41, T42, T43, T44, T45, T46, T47, T48, T49, T50, T51, T52, T53, T54, T55, T56, T57, T58, T59, T60, T61, T62, T63, T64, T65, T66, T67, T68, T69, T70, T71, T72, T73, T74, T75, T76, T77, T78, T79, T80, T81, T82, T83, T84, T85, T86, T87, T88, T89, T90, T91, T92, T93, T94, T95, T96, T97, T98, T99, T100.

***Below: (W109b) CHASSIS VIEW (LOWERED POSITION)***

## R.G.D.

## Models RV213, RV313, RV214 and RV314

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**General Description:** All these models employ the S.T.C. Chassis type VC4 described in the 1967-68 volume.

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## R.G.D.

## Models RV224, RV225 and RV235

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**General Description:** All these models employ the S.T.C. Chassis VC51 and VC51/1 described in the following pages.

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## S.T.C.

## Television Chassis Type VC51

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**General Description:** Dual-standard chassis supplied with or without U.H.F. tuner. Similar to VC4 chassis described in the 1967-68 volume.

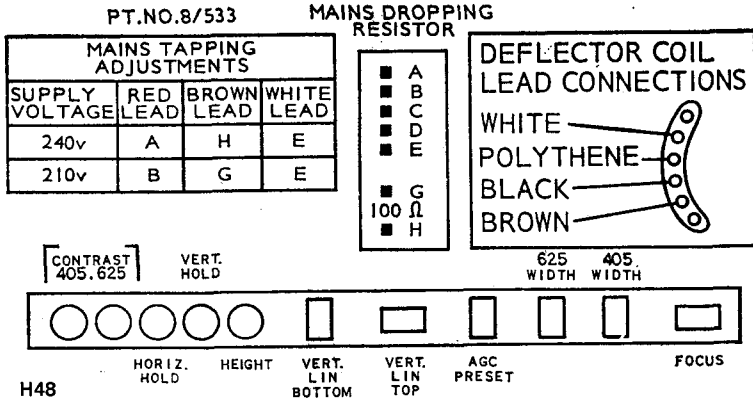
The V.H.F. tuner is a conventional type giving 13 positions. The coils are loaded in non-sequential order to give adjacent Band I and Band III positions in most areas. Each pair of aerial and oscillator coils in the V.H.F. tuner are mounted on a single biscuit, and are easily exchanged after first removing the tuner unit cover plate. The V.H.F. tuner valves are PC97 (Neutrode R.F. Amplifier) and PCF805 (Mixer Oscillator). H.T. supplies for the U.H.F. tuner are obtained from a plug and socket mounted on the side of the V.H.F. tuner.

The I.F. output from the U.H.F. unit is also connected to this plug and socket and applies the signal to the grid of the mixer section of the PCF805 (V.H.F. Tuner) via a balanced bridge which prevents interaction between the two circuits. This arrangement gives satisfactory U.H.F. operation irrespective of the position of the V.H.F. Channel Selector, and provides an additional stage of I.F. amplification on U.H.F. and enables selection of U.H.F. signals to be combined with the system switch.

When the system switch is in the 405-line position the H.T. supply to the U.H.F. tuner is disconnected, and when the switch is in the 625 position, H.T. supply is connected to the U.H.F. tuner and disconnected from the neutrode amplifier and oscillator section of PCF805 in the V.H.F. tuner leaving the pentode section of this valve in operation as on I.F. amplifier.

**A.G.C. Pre-set:** R77 should be adjusted for an optimum position where all obtainable channels are received at the lowest noise level attainable without introducing intermodulation.

# TELEVISION SERVICING



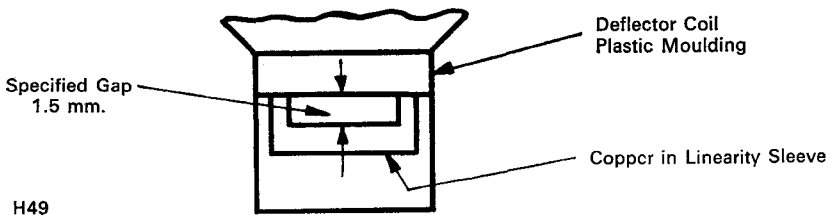
(H48) LAY-OUT OF CONTROLS

**Width:** Separate width adjustment is provided for 405 and 625 systems by means of their respective pre-sets R154 and R153.

**Linearity:** Vertical linearity is achieved by two pre-sets, R96 controlling the top of the raster, and R93 the bottom. Horizontal linearity is achieved by sliding the paper sleeve, incorporating a shorted turn along the tube neck, and then readjusting the width controls.

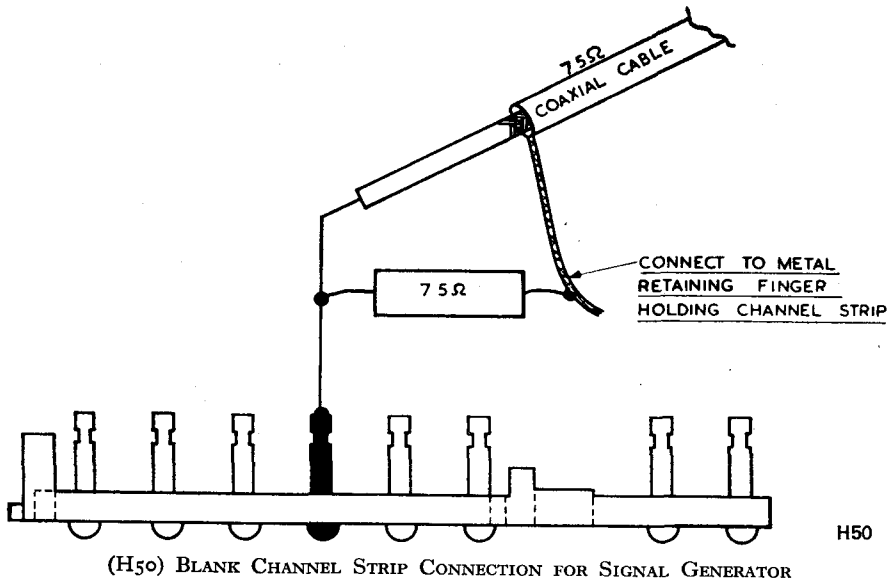
**Focus:** Focus is obtained by varying the voltage applied to the third anode of the tube by means of R157.

**U.H.F. To V.H.F. Translation:** To modify this chassis to operate in the V.H.F. bands when switched to 625-line standards it is necessary to ensure that the H.T. supply remains connected to the neutrode amplifier and oscillator section of the V.H.F. tuner. This can easily be carried out by linking section S.9 of the system switch. It may also be necessary to fit a wide band biscuit to cover the appropriate V.H.F. band, and these are available from the spares department. When ordering it is essential to quote the vision and sound frequencies of the translated signal. The U.H.F. tuner should be rendered inoperative by disconnecting the socket from the side of the V.H.F. tuner.



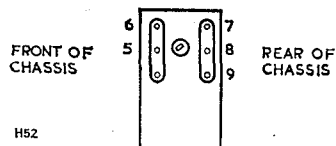
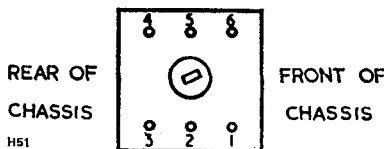
H49

(H49) LINE LINEARITY DIAGRAM



**Circuit Description (Common I.F. Amp.):** Coupling between the tuner unit and the common I.F. amplifier stage is achieved by means of a band pass filter consisting of a coil in the anode of V<sub>2</sub> and L<sub>32</sub> in the grid circuit of V<sub>5</sub>, the degree of coupling being determined by the capacity to chassis of the screened lead connecting the tuner to the amplifier together with C<sub>33</sub>. Also between the tuner unit and V<sub>5</sub> is located an adjacent channel trap (C<sub>31</sub>, C<sub>32</sub>, L<sub>31</sub>) tuned to reject 41.5 Mc/s. which is the adjacent sound carrier for the 625 system. The basic interstage coupling between V<sub>5</sub> and V<sub>6</sub> is achieved by a double tuned circuit L<sub>34</sub> and L<sub>39</sub>. Band defining filters are then selected by the system switch as follows:

**405 System:** 1. Rejector circuit 38.15 Mc/s., the accompanying sound frequency L<sub>36</sub>, C<sub>43</sub>, C<sub>47</sub>. 2. Rejector circuit 39.65 Mc/s., the adjacent vision carrier L<sub>37</sub>, C<sub>48</sub>. 3. Rejector circuit 33.15 Mc/s., the adjacent sound carrier L<sub>40</sub>, C<sub>50</sub>, C<sub>51</sub>. These three circuits limit the response of the I.F. signal on 405-line system to a bandwidth of 3 Mc/s. before passing to the grid of V<sub>6</sub>.



Left: (H51) I.F. COIL ASSEMBLY VIEWED FROM UNDERSIDE OF CHASSIS

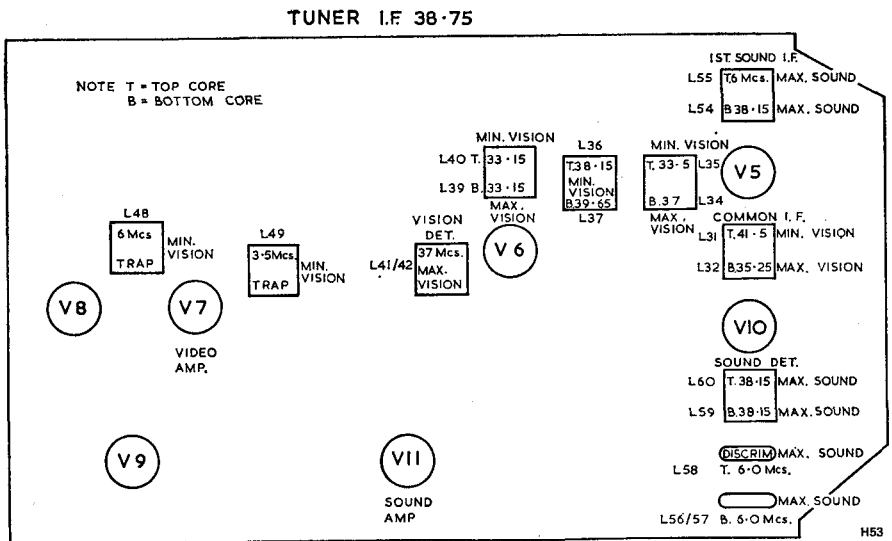
Right: (H52) DISCRIMINATOR TRANSFORMER VIEWED FROM UNDERSIDE OF CHASSIS



## TELEVISION SERVICING

**625 System:** Trap circuit 33.5 Mc/s., the accompanying sound frequency L35, C42, C45. All these defining filters are switched into circuit by contacts S2 and S3 of the system switch. The remaining tuned circuit in the I.F. amplifier is the single tuned circuit in the anode of V6 (L41, L42) which feeds direct to the detector diode.

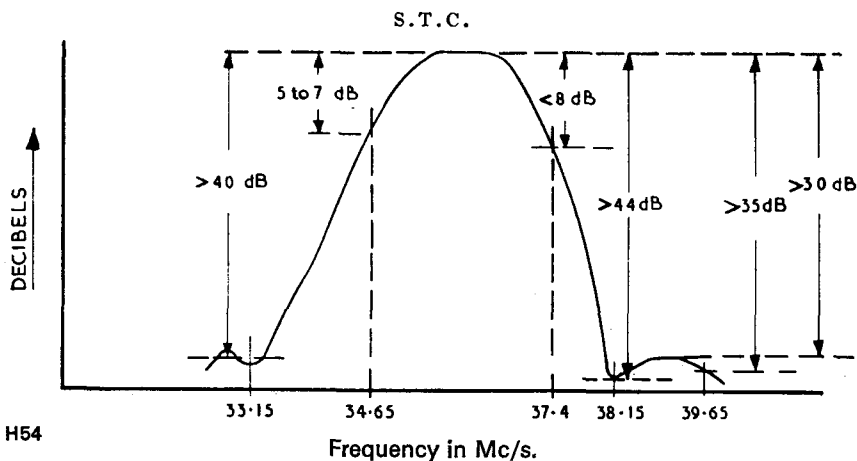
**Circuit Description (Detector and Video Amp.):** The detector circuit is of conventional design using a CG64H germanium diode, but as on the 625-line system, negative modulation is used as opposed to positive modulation for 405-lines, it is necessary to switch the polarity of the detector, this is achieved by contacts S5 and S6 on the system switch. On 625-lines the grid of the video amplifier V7 is A.C. coupled, but on 405-lines is directly coupled to the vision detector, from which it derives the positive drive.



### (H53) ALIGNMENT DIAGRAM

This necessitates increasing the cathode bias on 405-lines and is achieved by switch S11 and R55, additional to the normal bias from R54. Trap circuits are also employed in the video amplifier anode and cathode circuits to reject the difference frequency beat that occurs on the detector. L49 and C65 for 405-lines rejecting at 3.5 Mc/s., and L48 and C67 on 625-lines rejecting at 6.0 Mc/s. The video signal is A.C. coupled from the video amplifier anode to the cathode of the cathode-ray tube.

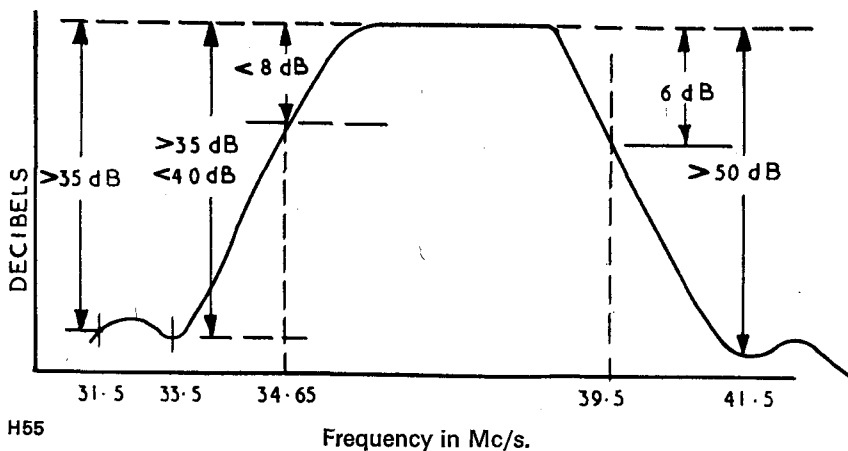
**Circuit Description (405-Line Sound):** The signal is fed through a common I.F. amplifier and the output is taken via C38 at 38.15 Mc/s., the voltage being developed across the tuned circuit L54, C86, and applied to the grid of V10. The grid of this valve is supplied with A.G.C. the negative



(H54) 405-LINE RESPONSE CURVE

voltage being derived from the detector diode and fed via R109. In the anode circuit of V10 is the double tuned circuit L59, L60, together with the OA81 germanium diode detector. The detector signal is fed via a noise limiter diode and C102, back through the F.M. discriminator and then on to the volume control and is then applied to the conventional two stage L.F. amplifier (V11 PCL86) with fixed tone correction (C106) applied to the grid of the pentode.

**Circuit Description (625-Line Sound):** On the 625-line transmission the sound carrier is frequency modulated (F.M.) and the method used to derive the sound I.F. is known as the intercarrier system. This is achieved by permitting a small proportion of the sound carrier at I.F. frequency (33.5 Mc/s.) to pass through the vision I.F. amplifier, on reaching the vision

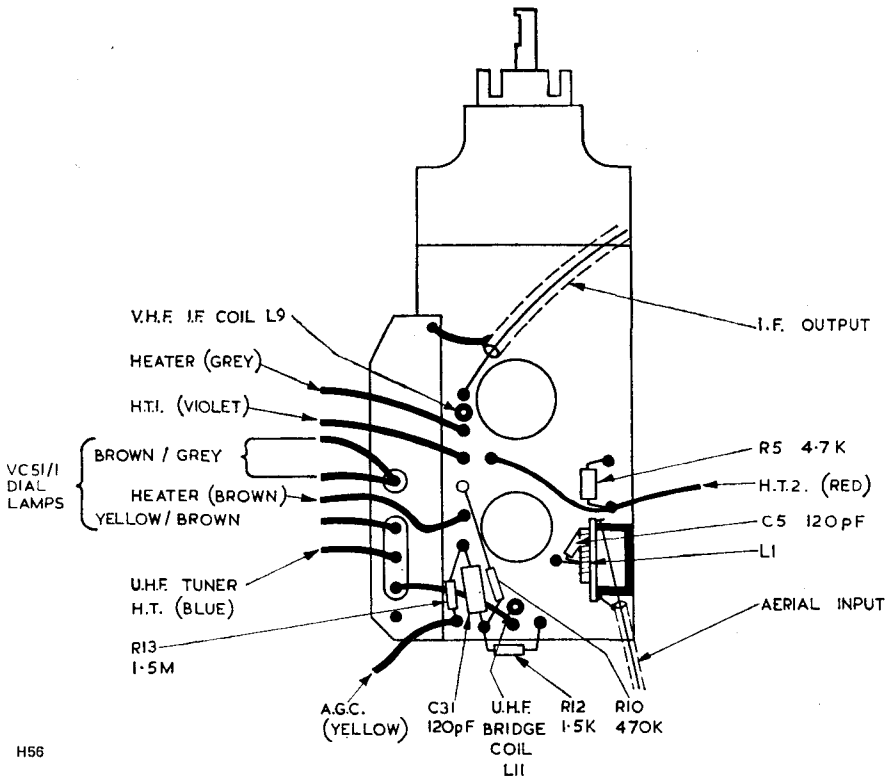


(H55) 625-LINE RESPONSE CURVE

## TELEVISION SERVICING

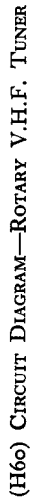
detector stage the diode acting as a form of mixer produces through the mixing of the vision and sound carriers, a difference frequency of 6 Mc/s. which carries the F.M. sound modulation and the A.M. vision modulation. These signals are then fed to the video stage and the 6 Mc/s. F.M./I.F. signal is developed across L48 and C67 and fed via C63 to the tuned circuit L55 together with the capacity of the screened cable and the valve input capacity. The voltage developed across the tuned circuit is passed to the grid of V10 via C88 and S1. In the anode circuit of V10 is the discriminator tuned circuit L56 incorporating a ratio detector. The amplitude modulation is removed in the F.M. detector circuit by means of the normal limiting action of the ratio detector. The audio signal is fed via R113 to the volume control, the return path being via the A.M. noise limiter D4 and the A.M. detector load R108, the audio then continues on to the L.F. amplifier.

**Circuit Description (Sync. Separator):** The sync. separator uses the pentode section of a PCF80 (V8) in a conventional sync. limiter circuit. The vertical sync. pulse is fed via a cathode driven vertical sync. amplifier PCL84 (V7) to the grid of the vertical scan oscillator. The line synchronising



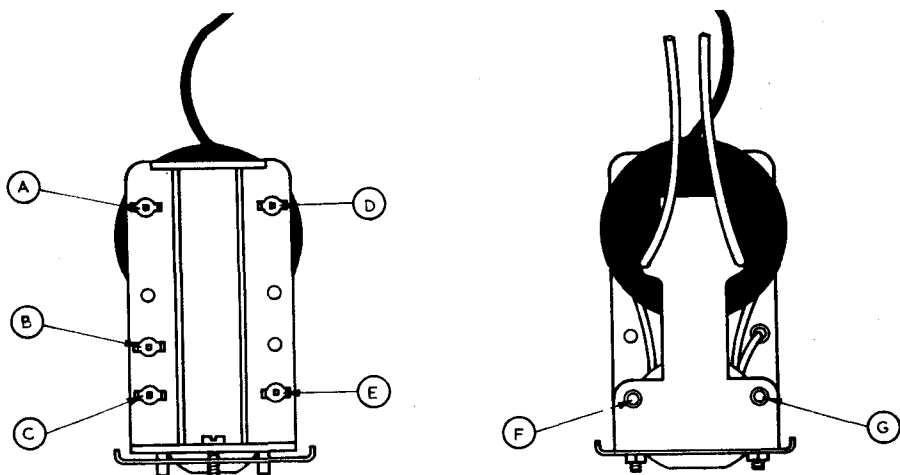
H56

(H56) V.H.F. TUNER—TOP VIEW

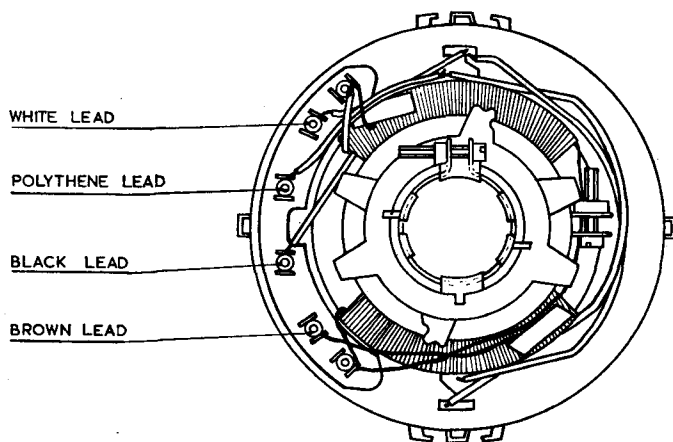


## TELEVISION SERVICING

- A — TOP CAP OF V13
- B — C131 (VIOLET)
- C — JUNCTION OF C135 AND R139 (WHITE)
- D — TOP CAP OF V14
- E — HORIZONTAL DEFLECTOR COILS (POLYTHENE)
- F — C133 (POLYTHENE)
- G — JUNCTION OF C134 AND R156 (ORANGE)

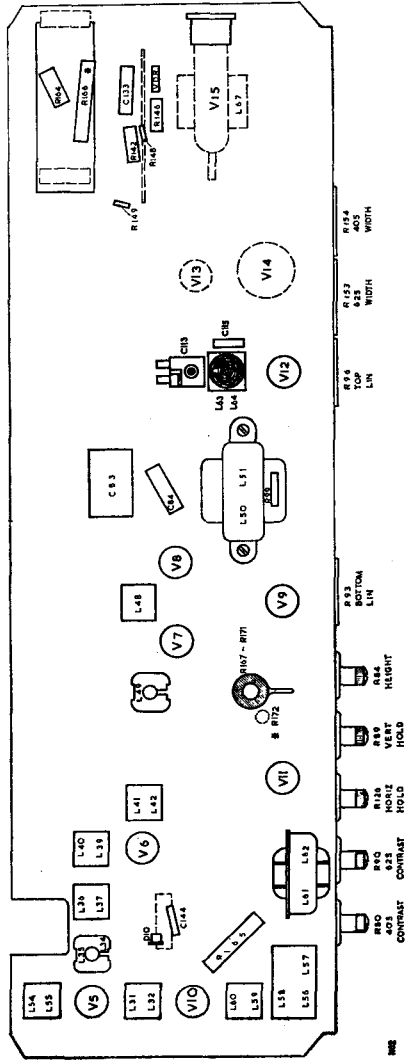


*Connections to Line Output Transformer*



H58

*Deflector Coil Connections*



*Left*  
(H62) TOP VIEW OF  
CHASSIS.  
SEE NOTE UNDER BOTTOM  
VIEW OF CHASSIS

## TELEVISION SERVICING

pulses are fed via C71 to the "two-diode" A.F.C. circuit comprising  $2 \times \text{OA81}$ .

**Circuit Description (A.F.C. Circuit):** The line sync. pulses are clamped by the diode OA81 (D7) to a variable potential which serves as the common line hold control. Reference pulses from the line output transformer, suitably attenuated, are D.C. restored by diode OA81 (D8) to produce the controlling potential which is filtered and fed to the control grid of the horizontal oscillator. The degree of D.C. restoration of the reference pulse is determined by the gating action of the respective pulses applied to the anode and cathode of D8.

**Circuit Description (Line Oscillator):** The horizontal oscillator is a sine wave generator oscillating between the control grid and screen grid of the pentode section of the PCF802. The nominal frequency is determined by the tuned circuit of L63, the required capacity being selected by switch S14. Small changes of the frequency are determined by the degree of conduction of the triode section of the PCF802 which is connected as a capacitive reactance valve in parallel with the coil L63. The grid of this triode has the filtered control voltage from the A.F.C. circuit connected to it. The anode circuit of the pentode section has a switched pulse shaping circuit and is A.C. coupled by C126 to the grid of the horizontal output valve (V14, PL36).

**Circuit Description (Line Deflection Circuit):** In a stabilised line deflection circuit the performance is practically unaffected by mains variations and spread or deviation of the line output valve. In the circuit, advantage is taken of the rectifying action resulting from the curvature of the characteristic of a V.D.R. in order to derive a negative bias for the line output valve (PL36) from the amplitude of the flyback pulse. From the slider of the appropriate width pre-set, via R148 and R149, a direct current flows through the V.D.R. which fixes the working point of the latter. On this direct current is superimposed a pulsating current which is derived from the flyback pulse via C133. Due to the presence of R142 and the coupling capacitor C126, the resulting pulsating voltage across the V.D.R. is converted into a direct voltage which controls the bias of the line output valve. The direct voltage is determined by the mean value of the voltage across the V.D.R. which is highly dependent on the amplitude of the flyback pulse.

**Circuit Description (Vertical Scanning):** A cathode coupled multi-vibrator is used as a vertical oscillator and employs the triode sections of V8 and V9. The pentode section of V9 is used as the frame output amplifier and correct linearity is ensured by R93 and R96 in the coupling circuit. The vertical deflector coils are connected in series and a thermistor is placed in series with the deflectors to ensure the stability of height and linearity with temperature changes.

**Circuit Description (Power Supply):** A silicon diode is used to supply the H.T. line and a capacitor (C144) is wired in parallel with the diode to prevent build up of any high reverse voltage across the diode due to high

# S.T.C.

voltage pulses on the H.T. line or mains supply. On the VC51/1 chassis, two thermistors (VA1015 R164) and (VA1015 R172) are connected in series with the heater chain to protect the dial lamps from current surge when the set is switched on. A mains dropping resistance provides facilities for operating between 210 and 240 volts.

**Coil and Transformer Data:** All the coils and transformers not included in the following table, have a resistance less than 1 ohm.

<i>Circuit Ref. No.</i>	<i>Function</i>	<i>Approximate ohms</i>
L42	Vision detector secondary +ve lead to pin 6 -ve lead to pin 5	450
L60	Sound detector secondary +ve lead to pin 6 -ve lead to pin 4	8k
L46	Video anode peaking inductance	5.5
L47	Video anode peaking inductance	4
L48	6 Mc/s. sound take-off (625)	1.8
L63	Line oscillator transformer Primary	280
L64	Secondary	55
L66	Line output transformer Primary	15
L67	E.H.T. overwind	65
J69, 70	Line deflector coils (in parallel)	7.5
L50	Frame output transformer Primary	300
L51	Secondary	3.5
L52, 53	Frame deflector coils (in series)	7.5
	Frame deflector coils (in series) + thermistor	11
	Audio output transformer primary	450

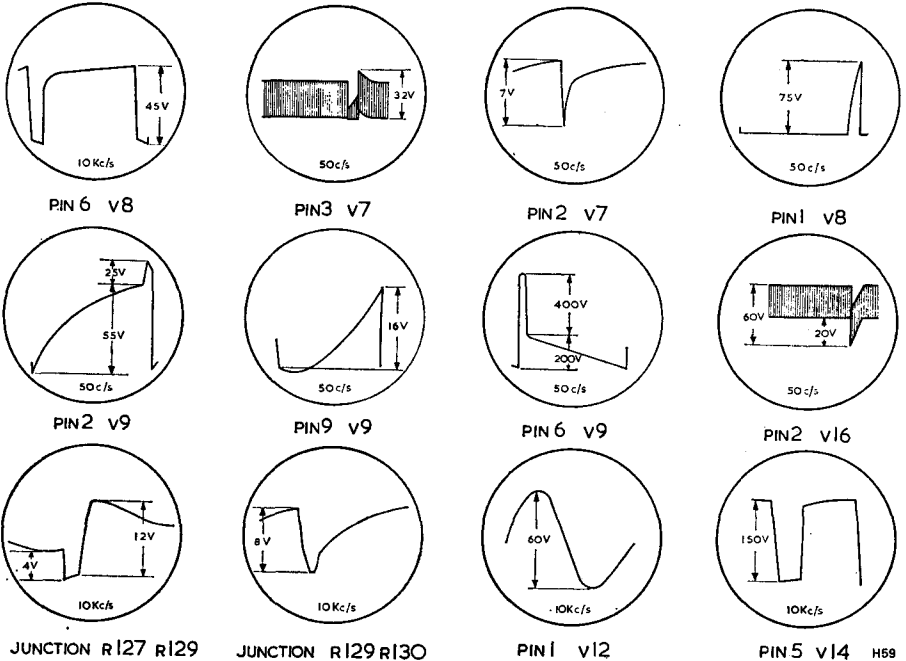
**Alignment (Notes):** Under normal working conditions the I.F. circuits of this instrument are unlikely to need realignment. With the exception of cases where the I.F. stages are known to have been tampered with or a new I.F. coil fitted, realignment of I.F. stages should not be attempted until a thorough investigation has been carried out covering other possible causes for low gain or poor picture quality, such as: (a) inefficient aerial systems; (b) low gain tuner units; (c) A.G.C. faults; (d) faulty diode filter coil or diode detector; (e) defective video stage.

**Alignment (Equipment Required):** (a) Signal generator covering the frequency range 32 to 42 Mc/s. (b) A valve volt-meter capable of operating up to 6 Mc/s. (c) Wattmeter for audio measurements with an impedance of 3 ohms. (d) High impedance volt-meter for sound A.G.C. voltage measurements. (e) A.M./F.M. signal generator covering the frequency range 5 to 7 Mc/s. (f) A sweep generator covering the range 32 to 42 Mc/s., together with display equipment. (g) A biasing potential of 3 volts.

Item (f) is not essential, but is desirable if optimum results are to be obtained. Connect the volt-meter (d) across the vision diode load resistor R47



## TELEVISION SERVICING



(H59) WAVEFORMS—TAKEN ON A 543A TEKTRONIX OSCILLOSCOPE

(2.7 k $\Omega$ ) operate at about 1 volt during alignment. The wattmeter should be connected in place of the loudspeaker and the signal generator should be connected to the valve (V2) as illustrated in the appropriate diagram.

**Dust Cores:** The dust cores of the I.F. coils on the receiver chassis should be unscrewed until just protruding from the base of the cans. In the case of cans containing two cores, the top one should be unscrewed until just protruding from the top of the can. The cores of the I.F. coils on the tuner should not be detuned.

**Alignment (Procedure):** Before commencing alignment the receiver should have been switched on for at least five minutes. 3 volts negative bias should be applied to the vision A.G.C. line at the junction of R35 and C39 (1000 pF.).

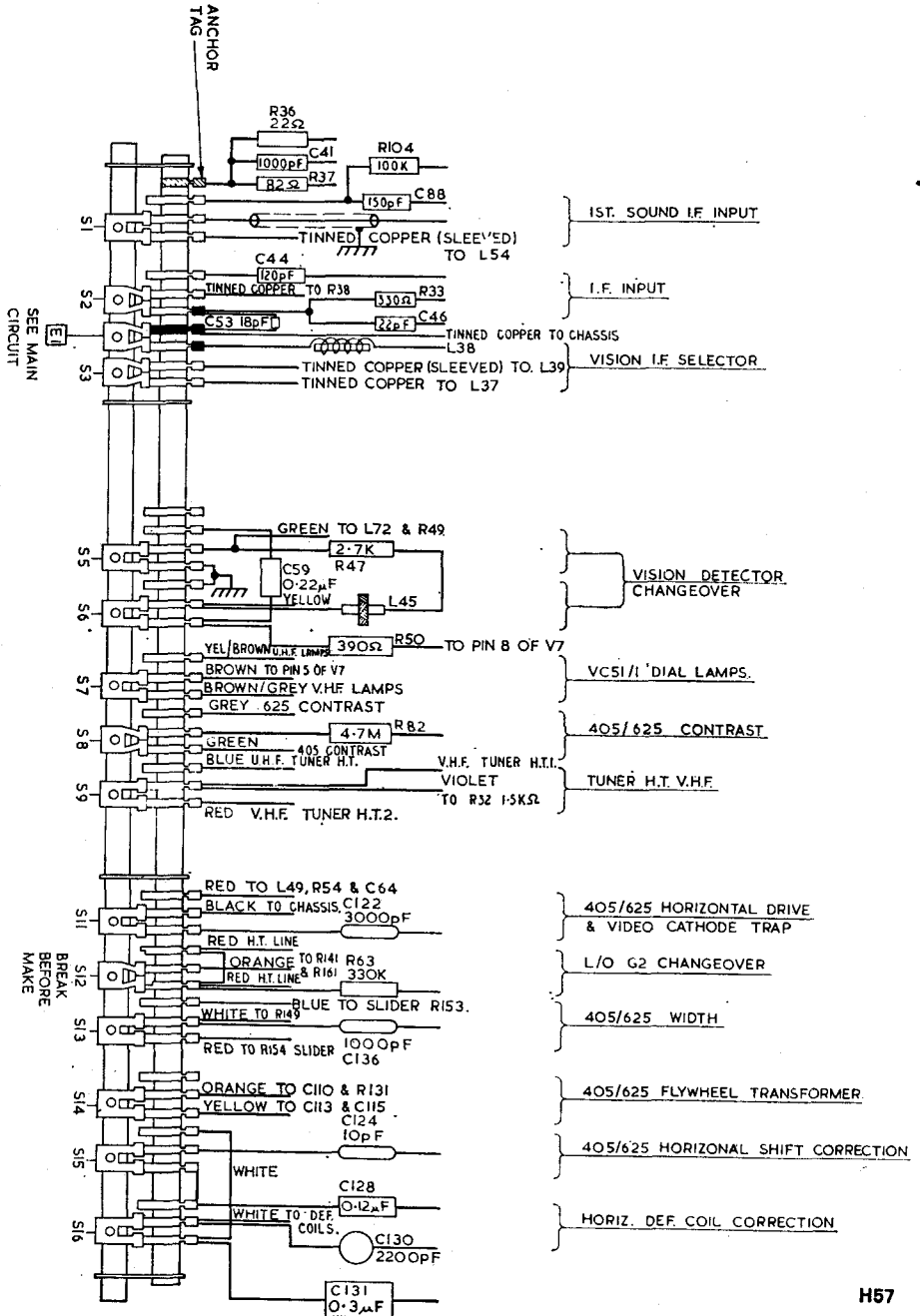
	405-line system	625-line system
Vision I.F. carrier . . .	34.65 Mc/s.	39.5 Mc/s.
Sound I.F. carrier . . .	38.15 Mc/s.	33.5 Mc/s.
Intercarrier sound . . .		6.0 Mc/s.

# S. T. C.

<i>Operation</i>	<i>Frequency Mc/s.</i>	<i>Coil</i>	<i>Adjust</i>	<i>Remarks</i>	<i>System switch position</i>
1	41.5	L31 Adjacent sound channel trap (625)	Top core for minimum vision	Remove bias and connect vision A.G.C. line to chassis during operations 1 and 2	625
2	33.5	L35 625 sound trap	Top core for minimum vision		625
3	35.25	L32 Band pass Coupling coil	Lower core for maximum vision		405
4	38.75	V.H.F. Tuner I.F.	Maximum vision	Remove bias and connect vision A.G.C. line to chassis during opera- tions 7, 8, 9, 10, 11, 12 and 13 Operations 8, 9 and 10 should be done at a level of 50 mW. with volume control at maximum. The carrier should be A.M. modulated to a depth of 30 per cent. at a frequency of 400 c/s.	405
5	35.25	L32 Band pass Coupling coil	Lower core for maximum vision		405
6	38.75	V.H.F. Tuner I.F.	Maximum vision		405
7	38.15	L36 Sound trap (405)	Top core for minimum vision		405
8	38.15	L60 A.M. sound detector	Top core for maximum sound		405
9	38.15	L59 A.M. Sound detector	Lower core for maximum sound		405
10	38.15	L54 1st sound I.F.	Lower core for maximum sound		405
11	39.65	L37 Adjacent vision trap (405)	Lower core for minimum vision		405
12	33.15	L40 Adjacent sound channel trap (405)	Top core for minimum vision		405
13	33.15	L39 Interstage coupling coil	Lower core for maximum vision		405
14	37	L34 Interstage coupling coil	Lower core for maximum vision		405
15	37	L41/L42 Vision detector	Maximum vision		405
16	34.5	I.F. Bridge I/P Coil	Maximum vision		625

**Alignment (Response Curves):** Connect a sweep generator (*f*) in place of the signal generator. Connect the display unit between the video ampli-

# TELEVISION SERVICING



(H57) SYSTEM SWITCH—SHOWN IN 405-LINE POSITION

fier grid (Pin 8 of V7) and chassis. Apply a battery bias potential of  $-3$  volts to the vision I.F. A.G.C. line. The system switch should be in the 405-line position. Check that the response of the vision I.F. agrees with the requirements of the curve shown in the appropriate diagram. Slight adjustment of L41, L42 and L32 may be necessary to achieve this response. The system switch should next be changed to the 625-line position and the response curve checked against that shown in the appropriate diagram. Slight adjustment of L38 and V.H.F. tuner I.F. may be necessary to achieve this response.

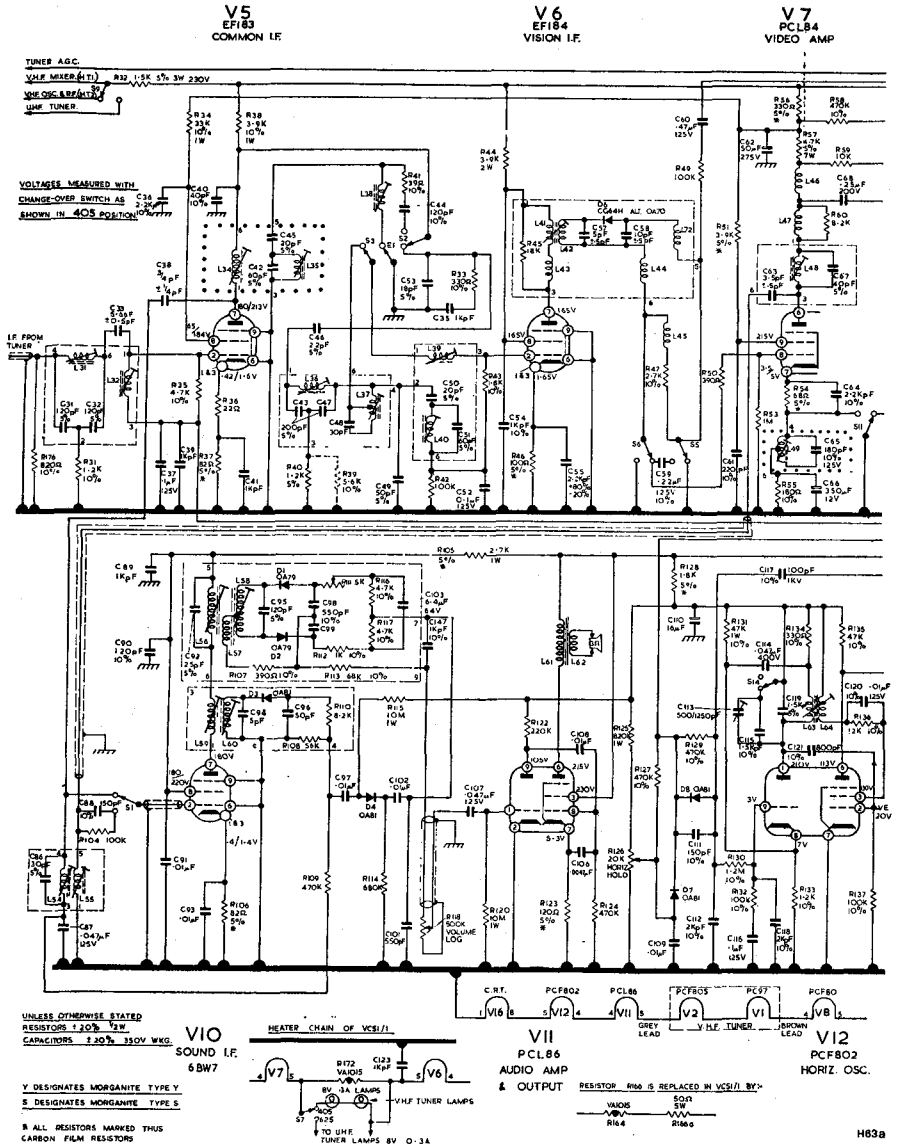
**Alignment (F.M. Sound):** Connect the volt-meter (*d*) between the wiper of the A.M. balance control (R111) and chassis. This point can be obtained by inserting a probe through hole in top of discriminator can that is available for A.M. balance control adjustment. The signal generator (*e*) output lead should be connected between the video amplifier grid (pin 8 of V7) and chassis. The generator must have the correct terminating resistance connected across the end of its output lead. 1. Inject an unmodulated signal of 6 Mc/s. and adjust L48 (Sound take-off coil—625) L55 (1st Sound I.F., top core) L56 (Discriminator transformer, bottom core) in that order for maximum meter deflection.

*Note:* L48 must be reset when receiver is operating on picture.

2. Remove meter, connect wattmeter (*c*) to sound output transformer secondary, and apply  $\pm 16$  kc/s. deviation F.M. to signal generator. Adjust L57/L58 (Discriminator transformer, top core) for maximum audio output, setting signal input to provide a maximum output of 500 mW., volume control set at maximum. An alternative method of aligning L57/L58 is as follows: Remove meter and connect wattmeter as above. Connect high impedance Volt-meter (*d*) (Avometer Model 8, 2.5 volts range) to audio output point of discriminator transformer (R113). Adjust L57/L58 for zero voltage output. Remove volt-meter, apply  $\pm 16$  kc/s. deviation and adjust signal input to provide an output of 500 mW., volume control set at maximum. 3. Change modulation of signal generator to 30 per cent. A.M. and adjust balance control R111 (Discriminator transformer top) for minimum audio output.

**Alignment (Final):** The receiver should have been switched on for at least five minutes before this alignment is started. The system switch should be in the 405-line position. A sweep generator should be connected to the aerial socket of the receiver. The display unit should be connected to the grid of the video amplifier (Pin 8 of V7). On each V.H.F. channel used the local oscillator should be adjusted so that the sound carrier marker pip appears in the bottom of the sound trap. The vision carrier should be between 5 and 7 dB down on the overall response. If a sweep generator is not available one generator tuned to the sound frequency of the channel under test should be connected to the aerial terminals and a 38.15 Mc/s. signal injected into the sound I.F. from another generator. The oscillator should be adjusted for an audible beat in a loudspeaker connected to the output.

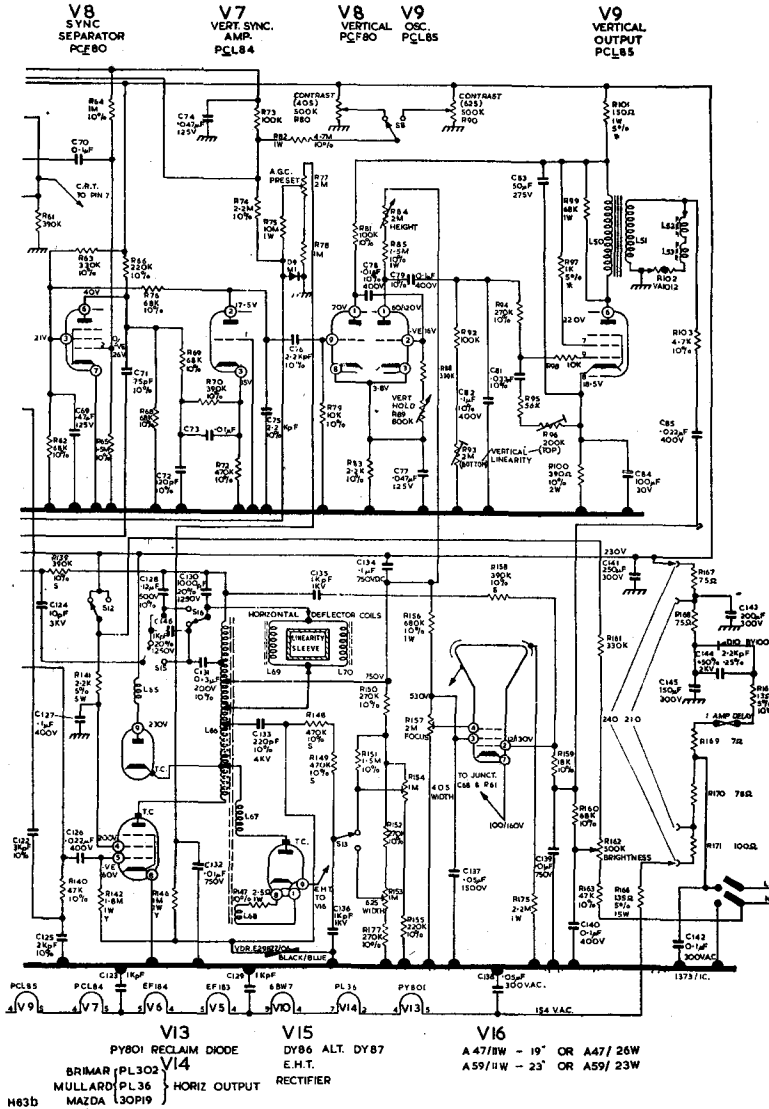
# TELEVISION SERVICING



(H63a) CIRCUIT DIAGRAM—MODELS VC51 AND VC51/I (PART)

The response and sensitivity of the receiver should be checked on all tuner positions and should appear as the I.F. response shown in the appropriate diagram, except that the vision and sound carriers will bear the frequency of the channel under test. Slight I.F. coil adjustment is permitted to

# S.T.C.



(H63b) CIRCUIT DIAGRAM—MODELS VC51 AND VC51/I (CONTINUED)

achieve optimum results in all channels. The response may be slightly double humped, a maximum peak to valley ratio of 1 dB being permissible.

**Cathode Trap (Video):** 1. Connect valve volt-meter (*b*) to the junction of L46 and L47 in the video stage. 2. Inject a 3.5 Mc/s. signal into the grid

## TELEVISION SERVICING

of the video stage (Pin 8, V7). System Switch on 405. 3. Adjust L49 for minimum reading on the volt-meter.

**Anode Trap (Video):** The 3.5 Mc/s. trap can be satisfactorily aligned on 405-line picture transmission, by detuning the receiver by means of the fine tuner control, and then adjusting L49 until the 3.5 Mc/s. beat pattern (the fine dot structure) disappears. Similarly L48 may be adjusted on a 625-line picture transmission.

**Line Oscillator (Setting Up Procedure):** A biasing potential of 3 volts positive is required and stationary test cards of both 405 and 625 systems are necessary. 1. Switch to the 625 position. 2. Short circuit the A.F.C. circuit by connecting the junction of D7 and C109 (0.01  $\mu$ F.) to pin 9 of V12 (PCF802). Connect volt-meter (*d*) between pin 9 of V12 and chassis. Set line-hold control so that 3 volts is indicated on meter. 3. Adjust the dust core of L63/L64 (line oscillator transformer) until a stationary picture is obtained. 4. Switch to the 405 position and check the 3-volt bias voltage. Adjust the trimming condenser C113 until a stationary picture is obtained. 5. Remove short-circuit across the A.F.C. circuit. 6. Seal the head of the screw and the washer to the trimmer blade by a neat blob of distrene or other suitable material to prevent movement after setting. 7. Adjust the common line-hold control R126 to place the movement of the picture in the centre of the PULL-IN range. When R126 is rotated either fully clockwise or fully anti-clockwise it may be necessary to switch the systems switch to 625 then back to 405 to disturb synchronism.

**Warning:** Under no circumstances should adjustment or repairs be attempted on the U.H.F. tuners, neither should the cover plate be removed for inspection.

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## STELLA

## Model ST1100

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**General Description:** This all-transistor portable television receiver is electrically similar to the Philips Model 11TG190AT, information for which is given in the 1967-68 volume.

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## ULTRA

## Model 6645

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**General Description:** This model employs tuners and chassis adapted from the B.R.C. 970 Series which is described in this volume.

**ULTRA****Model 6642**

**General Description:** This model employs tuners and chassis adapted from the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 19 in. C.R.T. CME 1908. PVC implosion guard (pre-stretched).

**Dismantling:** Remove cabinet back (two screws). Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.

**ULTRA****Model 6643**

**General Description:** This model employs tuners and chassis adapted from the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 23 in. C.R.T. CME2303/AW59-91. PVC implosion guard (pre-stretched).

**Dismantling:** Remove cabinet back (three screws). Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.

**ULTRA****Model 6647**

**General Description:** This model employs tuners and chassis adapted from the Thorn 950 Mk. II Series described on page 509 in the 1967-68 volume.

**V.H.F. Tuner:** Type 1500.

**U.H.F. Tuner:** Type 050.

**C.R.T. Assembly:** 25 in. C.R.T. CME2501/A65-11W. Integral implosion guard and mounting lugs.

**Dismantling:** Remove cabinet back (four screws). Remove two brass nuts securing the chassis to the slotted mounting brackets. Disengage the chassis mounting studs from the slots and withdraw the chassis from the cabinet within the limits of the interconnecting leads.

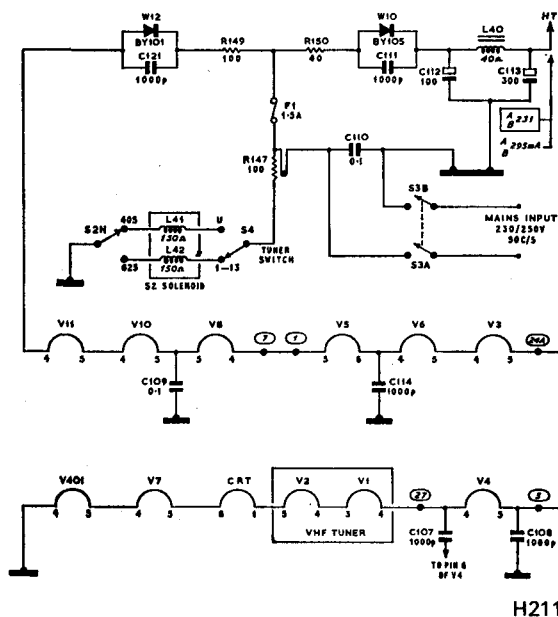


## ULTRA

## Model 6646

**General Description:** This 16-in. model employs tuners and chassis adapted from the Thorn 950 Series and the Thorn 16-in. Portable, both described in the 1966-67 volume.

**Note:** Chassis fitted to Model 6646 incorporates a modified power supply circuit and may be identified by the presence of a tubular dropper resistor mounted to the chassis top member.



(H211) MODIFIED HEATER CHAIN, ETC. THE COMPLETE HEATER CHAIN IS FED FROM THE MAINS THROUGH A BALLAST RESISTOR AND DIODE DROPPER. THE H.T. SUPPLY IS CHOKE-CAPACITY SMOOTHED

**C.R.T. Assembly:** CME 1601/A40-11W. PVC guard (pre-stretched).

**Access For Service:** 1. The cabinet back cover is secured by five screws; three at the top and two at the base of the cover. When the screws are removed, the back cover may be detached and swung to one side with the aerial panel leads still connected. To disconnect the back cover completely, remove two screws securing the aerial panel to the back cover. 2. Access to the line output stage is facilitated by removing the metal screen. Remove two screws and detach the screen from its rear clip fixing. 3. The pre-set controls mounting panel (Frame Lin. and Height) can easily be detached from the chassis (one screw fixing). 4. The heat deflector (fitted under the sound output stage) can also be removed for access (one screw).

# INDEX TO MODELS

## AIWA

Tape recorders:  
 TP-730, 428  
 TP-1004, 431  
 TP-1014, 436

## ALBA

Radio receivers, etc.:  
 339, 106  
 535, 109  
 838, 110  
 Tape recorders:  
 R19, 440

## BAIRD

Colour television receivers:  
 700 Series, 14

## BEOLIT

Radio receivers, etc.:  
 500/1101, 114

## BLAUPUNKT

Radio receivers, etc.:  
 13922, 116

## B.R.C.

Colour television receivers:  
 2000 Series, 18  
 Television receivers:  
 970 Series Chassis, 508  
 1400 Series, 521  
 2643, 536  
 3649, 536  
 4618, 537

## BUSH

Colour television receivers:  
 CTV25, 66  
 CTV167, 66  
 Radio receivers, etc.:  
 TR146A, 123  
 TR146B, 123

## DANSETTE

Radio receivers, etc.:  
 "Dorchester", 128

## DANSETTE (contd.)

"Hendon", 132  
 "Herald", 134  
 "Stereophon", 130  
 "Supreme", 132

## DECCA

Radio receivers, etc.:  
 727, 136  
 "Stereogram", 136  
 Television receivers:  
 Schools receiver, 538

## DEFIANT

Radio receivers, etc.:  
 A503, 146

## DYNATRON

Radio receivers, etc.:  
 HFC3A, 151  
 HFC3M, 151  
 HFC4, 151  
 "Jewel", 155  
 RG46 to 57, 151  
 SRX24, 151  
 SRX24A, 151  
 SRX24B, 151  
 TP30, 155  
 TP31, 155  
 TP32, 155  
 TRG12, 151  
 TRV16, 151  
 TRV17, 151  
 Tape recorders:  
 STR1, 443  
 Television receivers:  
 TV95, 547  
 TV96, 547  
 TV97, 547  
 TV98, 547  
 TV99, 547  
 TV100, 547  
 TV100CH, 547

## EDDYSTONE

Radio receivers, etc.:  
 EB35, 162

## EKCO

Radio receivers, etc.:  
 PT300, 170  
 PT302, 170  
 PT304, 170  
 PT305, 170  
 PT447, 170  
 PTP301, 171  
 Television receivers:  
 T500, 560  
 T510, 560  
 T511, 560  
 T512, 560  
 T513, 560  
 TC501, 560  
 TC502, 560

## ELIZABETHAN

Radio receivers, etc.:  
 LZ3, 175  
 LZ7, 177  
 LZ15, 178

## FERGUSON

Radio receivers, etc.:  
 3010, 183  
 3020, 184  
 3152, 185  
 3156, 191  
 3156T, 191  
 3160, 197  
 3334, 202  
 3338, 202  
 3340, 202  
 3348, 202  
 Tape recorders:  
 3216, 453  
 3230, 453  
 3234, 448  
 Television receivers:  
 3646, 560

## FERRANTI

Radio receivers, etc.:  
 1141, 203  
 5501, 203  
 5503, 203  
 Television receivers:  
 T1164, 560  
 T1165, 560

## INDEX TO MODELS

### FERRANTI (contd.)

TC1157, 560  
TC1159, 560  
TC1160, 560  
TC1163, 560

### FIDELITY

Radio receivers, etc.:  
"Comet", 203  
Rad 11, 207

### G.E.C.

Radio receivers, etc.:  
G827, 214  
G832, 208  
G983, 215

### GRUNDIG

Tape recorders:  
TK120, 454  
TK125, 454  
TK140, 454  
TK145, 454

### HACKER

Radio receivers, etc.:  
GP19, 235  
GP42, 230  
RP33, 221  
"Autocrat", 221  
"Gondolier", 230  
"Rambler", 235

### H.M.V.

Radio receivers, etc.:  
2026, 239  
2030, 239  
2150, 240  
2322, 244  
2328, 245  
2338, 253  
Television receivers:  
2631, 561  
2636, 561  
2637, 562  
2639, 562

### K.B.

Radio receivers, etc.:  
KG041, 255  
KG042, 255  
KP036, 256  
KR022, 255  
KR023, 254  
"Chieftain", 254  
"Commodore", 255

### K.B. (contd.)

Television receivers:  
KV013, 562  
KV014, 562  
KV024, 562  
KV025, 562  
KV113, 562  
KV114, 562  
KV124, 562  
KV125, 562

### KLINGER

Radio receivers, etc.:  
KC23, 263  
KC24M, 262  
KC24, 265  
KC25, 269  
KC26, 266

### LOEWE OPTA

Tape recorders:  
Optacord 450, 459

### MARCONIPHONE

Radio receivers, etc.:  
4020, 270  
4140, 271  
4142, 274  
4322, 274  
Tape recorders:  
4212, 464  
4216, 462  
Television receivers:  
4615, 563  
4619, 563

### MASTERADIO

Radio receivers, etc.:  
D530, 281

### MONOGRAM

Radio receivers, etc.:  
UKC1570, 286  
Tape recorders:  
UOM8300, 466

### MURPHY

Colour television receivers:  
CV2510, 102  
CV2511, 102

### NATIONAL

Radio receivers, etc.:  
R-470, 288  
RF-621L, 292  
Tape recorders:  
RQ-113S, 468  
RQ-153S, 471  
RQ-3001S, 473

### PERDIO

Radio receivers, etc.:  
PR40, 296  
PR43, 304  
"Knightsbridge", 296  
"Mini 77", 304

### PHILCO

Radio receivers, etc.:  
PT014, 307  
QT91, 311

### PHILIPS

Colour television receivers:  
G6 Chassis, 103  
G25K500, 103  
Radio receivers, etc.:  
Unit EL1998, 314  
EL3787A, 317  
F5G53AT, 320  
13GF810, 325  
22GF100, 327  
13RB561, 329  
13RL161, 329  
13RL265, 330  
13RL360, 333  
13RS261, 336  
"Popmaster 161", 330  
"Popmaster 265", 329  
"Studio Ten", 320

Television receivers:  
G19T210A, 564  
G19T211A, 564  
G23T210A, 564  
G23T211A, 564

### PORTADYNE

Radio receivers, etc.:  
RG400, 338  
RG1000, 338  
RP17, 338  
RP20, 338  
3B2, 339

### PYE

Radio receivers, etc.:  
1369, 340  
1371, 340

## INDEX TO MODELS

### PYE (contd.)

1372, 344  
1373, 348  
Television receivers:  
48, 574  
49, 574  
53, 574  
60, 574  
61, 574  
'67 Chassis, 574

### RADIOMOBILE

Radio receivers, etc.:  
70X, 352  
Tape recorders:  
CTR101, 477

### RADIONETTE

Tape recorders:  
E2, 477  
Multicorder, 477

### R.G.D.

Radio receivers, etc.:  
RG241, 355  
RG242, 355  
RP236, 355  
RR221, 355  
RR223, 355  
"Rapiet", 355  
"Rover", 355  
Television receivers:  
RV213, 585  
RV214, 585  
RV224, 585  
RV225, 585  
RV235, 585  
RV313, 585  
RV314, 585

### ROBERTS

Radio receivers, etc.:  
R600, 356

### ROBUCK

Tape recorders:  
4/44, 480  
5/54, 482

### SANYO

Radio receivers, etc.:  
G-1120E, 360  
6L-714E, 363

Tape recorders:  
MR-130, 484

### SHARP

Radio receivers, etc.:  
BXH16L, 365

Tape recorders:  
RD505, 487  
RD706, 489

### SOBELL

Radio receivers, etc.:  
S327, 366  
S334, 367

### SONY

Radio receivers, etc.:  
4F53L, 373

### STANDARD

Radio receivers, etc.:  
SR-Q771FL, 390  
Tape recorders:  
SR-100, 493  
SR-300, 493

### S.T.C.

Radio receivers, etc.:  
Chassis GC10, 377  
Chassis GC11, 377

Television receivers:  
Chassis V.C. 51, 585

### STELLA

Colour television receivers:  
ST2500, 104

Radio receivers, etc.:  
ST335AT, 394  
ST438T, 394  
ST6143, 398  
ST7005, 401

Tape recorders:  
ST462, 496

### STELLA (contd.)

Television receivers:  
ST1100, 602

### STEREOSOUND

Radio receivers, etc.:  
SS.16, 401  
TA.2, 401  
TR.5, 403

### TELEFUNKEN

Tape recorders:  
M200, 500  
M201, 500

### ULTRA

Radio receivers, etc.:  
6008, 406  
6016, 406  
6018, 406  
6144, 408  
6146, 409  
6158T, 412  
6322, 413  
6324, 419  
6330, 424

Tape recorders:  
6212, 502

Television receivers:  
6642, 603  
6643, 603  
6645, 602  
6646, 604  
6647, 603

### UNITRA

Radio receivers, etc.:  
Figaro-Special, 424

### VAN DER MOLEN

Tape recorders:  
Sonic Eight, 503

### WORLD RADIO

Radio receivers, etc.:  
125X, 426

Tape recorders:  
TRC1, 505

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