PYE CAMBRIDGE
V.H.F. A.M.
MOBILE RADIOTELEPHONE

Type AM 10 D

This service manual is for the maintenance of Pye Telecommunications equipment. The performance figures quoted are typical and are subject to normal manufacturing and service tolerances.

The right is reserved to alter the equipment described in this manual in the light of future technical development.

SERVICE MANUAL

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PYE TELECOMMUNICATIONS LIMITED · CAMBRIDGE · ENGLAND

CONTENTS

ILLUSTRATIONS

AMENDMENTS This manual incorporates Amendments 1-4.

Fig. 12 Receiver Circuit Diagram

Delete R202 2.2k

Replace with R202 1.5k

Fig. 14 Transmitter Circuit Diagram (25-68 Mc/s)

Add C636 1n from junction R619/R621 to ground.

Fig. 16 Transmitter Circuit Diagram (68-174 Mc/s)

Add C636 1n from junction R619/R621 to ground.

CHAPTER I

GENERAL DESCRIPTION AND SUMMARY OF DATA

The Pye AM 10 D Cambridge is a compact, amplitude modulated, mobile radiotelephone which provides two way speech communication between units of a mobile fleet and a base station. Its small size enables it to be fitted under the dashboard of most road vehicles which can provide the necessary 12 volts d.c. supply.

The equipment operates on fixed frequencies between 25 and 174 Mc/s with a channel spacing of 25 or 50 kc/s; it can be either single channel or have up to six switch-selected channels.

The double superheterodyne receiver is fully transistorised and incorporates a squelch circuit to eliminate background noise in the absence of a signal. Channel spacing is determined by an interchangeable band pass block filter.

The transmitter provides a power output of at least five watts and employs valves only in the r.f. stages. The transmitter power supply and modulator are fully transistorised, the modulator incorporating the receiver audio stages.

All the operator's controls and the loudspeaker are mounted on the front panel. In the RX position of the POWER switch the current consumption is only 0.25A, so that the receiver may be left switched on for lengthy periods without risk of discharging the battery.

The equipment is completely enclosed and is dust and splash proof. The case and chassis are made of heavy gauge aluminium which forms an efficient heat sink. The equipment can be removed from the vehicle by loosening a knurled screw on each side of the case and pulling the set out of its mounting cradle. Complete access to the chassis can then be obtained by removing the top and bottom covers, each secured by two quick release fasteners. A fist microphone is supplied complete with mounting bracket.

The Cambridge is suitable for operation in all climates and is designed to meet all relevant specifications.

SUMMARY OF DATA

GENERAL

Service	A3 telephony. Single or two frequency simplex.
Frequency	25 - 174 Mc/s.

Frequency bands	Band J 25-32.5 Mc/s Band H 32.5-42 Mc/s Band G 42 - 54 Mc/s Band F 54 - 68 Mc/s Band E 68 - 88 Mc/s Band D 88 -108 Mc/s Band C 108-132 Mc/s Band B 132-156 Mc/s Band A 148-174 Mc/s
Channel spacing	25 or 50 kc/s
Power supply	12 volts d.c. nominal; positive ground, negative ground or floating supply. Polarity The red supply lead must be connected to the positive battery terminal and the black supply lead to the negative battery terminal. If these connections are reversed one or both of the fuses will blow.
Power consumption	Receive 0.25A Standby 1.4A Transmit 4.5A
Controls	POWER OFF-RX-S'BY switch VOLUME control SQUELCH control CHANNEL selector switch (switched channel equipment only) Transmit button (on microphone)
Dimensions	$12\frac{1}{4}$" wide x 9" deep x $4\frac{1}{4}$" high (31.1 cm x 22.9 cm x 10.8 cm)
Weight	10.5 lb (4.8 kg)
Metering	Internal test points are provided for alignment purposes (a standard 20,000Ω/volt meter is recommended).
Antenna	Quarter-wave vertical whip with 50Ω co-axial feeder cable.
Optional features	Switched channel operation with up to six switch selected channels. (If all channels are within ±0.2% of the mean carrier frequency, the performance of the equipment will be maintained within specification).

Telephone handset in place of fist microphone.

Shock absorbing mountings for the cradle.

Temperature controlled crystal ovens.

RECEIVER

Sensitivity

Approximately 1μV p.d. input for 500mW audio output with signal-to-noise ratios of 12db (25-108 Mc/s equipment) and 10db (108-174 Mc/s equipment).

Audio output

Approximately 1 watt with less than 10% distortion.

Intermediate frequencies

First i.f.	6 Mc/s (25-68 Mc/s equipment) 10.7 Mc/s (68-174 Mc/s equipment)
Second i.f.	455 kc/s with band pass block filter

Squelch

The electronic squelch circuit, which cuts background noise in the absence of a signal, can be adjusted to operate with signal inputs between 0.5μV and 2μV e.m.f.

Semiconductors

VT1	First r.f. amplifier	
VT2	Second r.f. amplifier	
VT3	First local oscillator	
MR1	First mixer	
VT101	First 6 Mc/s amplifier First 10.7 Mc/s amplifier	(25- 68 Mc/s) (68-174 Mc/s)
VT102	Second 6 Mc/s amplifier Second 10.7 Mc/s amplifier	(25- 68 Mc/s) (68-174 Mc/s)
VT103	Third 6 Mc/s amplifier Third 10.7 Mc/s amplifier	(25- 68 Mc/s) (68-174 Mc/s)
VT202	Second local oscillator	
MR201	Second mixer	
VT201	First 455 kc/s amplifier	
VT301	Emitter follower	
VT302	Second 455 kc/s amplifier	
MR301	Overload protector	
VT303	Third 455 kc/s amplifier	
VT304	Emitter follower	
VT305	Fourth 455 kc/s amplifier	
MR302	Signal detector	
MR303	A.G.C. detector	
VT306	Emitter follower	
MR304	Noise limiter	

Semiconductors (cont.)	VT307	Emitter follower
	MR305	Squelch control diode
	VT401	Squelch switching
	* VT503	Audio amplifier
	* VT504	Emitter follower
	* VT505	Audio output driver
	* VT506	Audio output
	* VT507	Audio output

* Also used in transmitter as modulator

TRANSMITTER

Power output	5 to 7 watts nominal depending on operating frequency.
Rating	Intermittent (E.I.A.) up to 60°C ambient temperature.
Modulation	High level amplitude modulation is employed.

Valves & semiconductors	V601	Crystal oscillator
	V602	Frequency multiplier (68-174 Mc/s only)
	V603	Frequency multiplier/driver
	V604	Power amplifier
	VT501	Modulator compressor
	VT502	Emitter follower
	* VT503	Modulator amplifier
	* VT504	Emitter follower
	* VT505	Modulator driver
	* VT506	Modulator output
	* VT507	Modulator output
	MR501	Modulator compressor rectifier

* Also used in receiver as audio stages.

POWER SUPPLY

Semiconductors	VT701	Oscillator
	VT702	Oscillator
	MR701a to MR701d	Bridge rectifier
	MR702	Reverse polarity protector

NOTE: Suitable equivalents of the valves and semiconductors detailed in this manual may be used at the manufacturer's discretion.

COMPONENT CODING

Components in each sub-section may be identified from the block reference numbers, as follows:-

Receiver R.F. Unit Section	1-100
Receiver First I.F. Unit Section	101-200
Receiver Second Mixer Unit Section	201-300
Receiver Second I.F. Unit Section	301-400
Receiver Squelch Unit Section	401-500
Transmitter/Receiver A.F. Section	501-600
Transmitter R.F. Section	601-700
Power Supply Section	701-800
Crystal Assembly and Front Panel Controls	801-900

For example: VT1 is located on the Receiver R.F. Unit Section,
VT701 is located on the Power Supply Section.

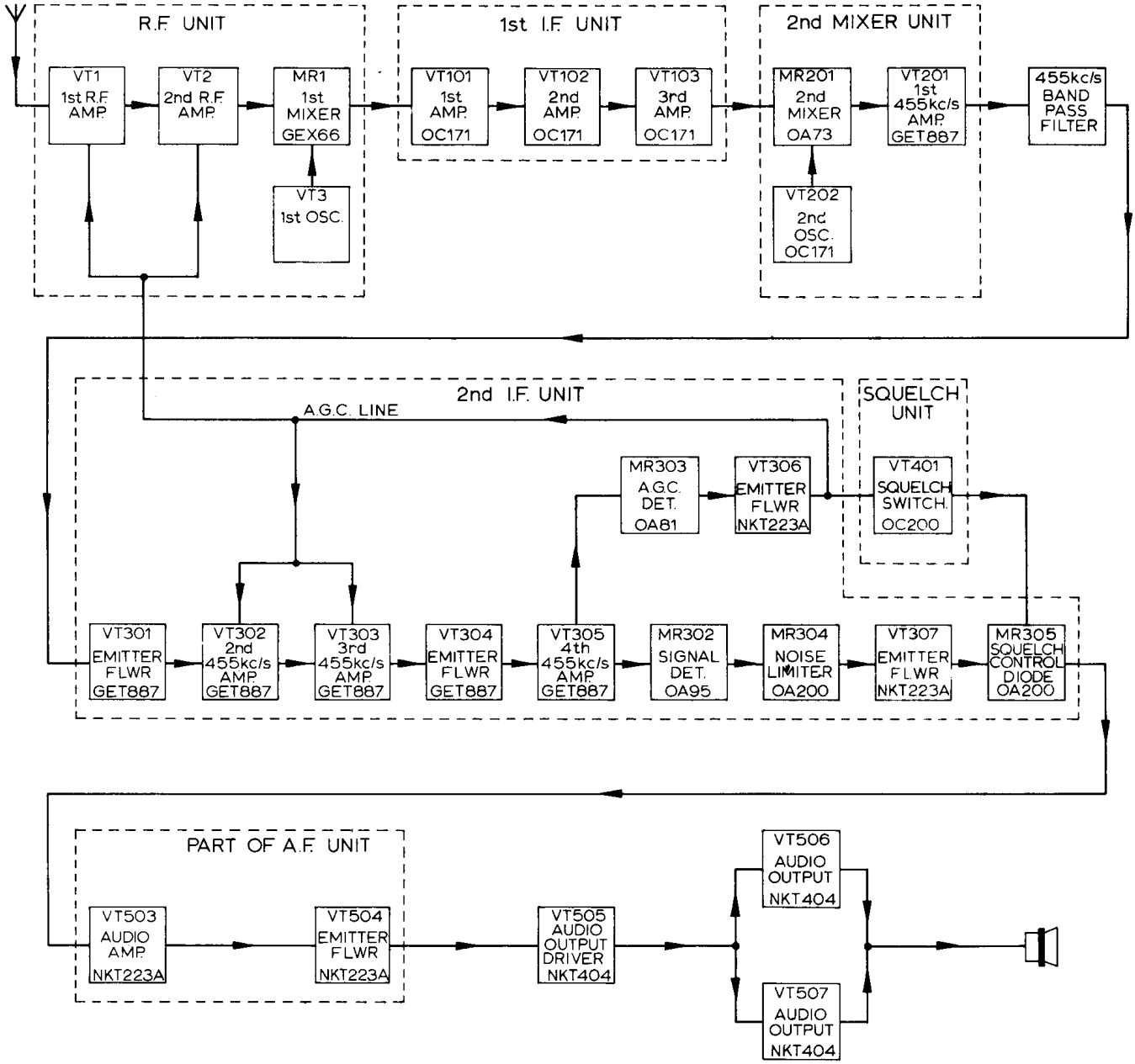


Fig. 1 Receiver Block Diagram

CHAPTER II

CIRCUIT DESCRIPTION

RECEIVER

CIRCUIT FEATURES

Fig. 1

The receiver uses 21 transistors in a double superheterodyne circuit. Two r.f. amplifiers are followed by a local oscillator and mixer, giving a first i.f. of 6 Mc/s on 25-68 Mc/s equipment and 10.7 Mc/s on 68-174 Mc/s equipment. The first i.f. is passed through a three stage amplifier to the second local oscillator and mixer to produce a second i.f. of 455 kc/s. This is amplified by a single stage and fed to a band pass block filter and a five stage amplifier. The detector is followed by a three stage audio amplifier which is transformer coupled to the push-pull output stage.

The circuit includes a noise limiter, designed to suppress pulse type interference such as that caused by vehicle ignition systems, and a squelch circuit which silences the receiver in the absence of a signal.

DETAILED DESCRIPTION

Figs. 10 & 12

R.F. Unit

VT1 and VT2 are r.f. amplifiers. Signals from the antenna are fed to VT1 via the contacts of the antenna changeover relay RLA and the antenna tuned circuit L1, C1, C2; the two capacitors form an impedance matching network. Interstage coupling between VT1 and VT2 is provided by the tuned circuit associated with L2, T1. VT2 is coupled to the first mixer diode MR1 by the circuit comprising L4, T3.

Local oscillator injection for the diode mixer MR1 is normally at a frequency of 6 Mc/s (25-68 Mc/s equipment) or 10.7 Mc/s (68-174 Mc/s equipment) below (in some cases 6 Mc/s or 10.7 Mc/s above) the signal frequency and is derived from VT3. This is an overtone crystal controlled oscillator provided with inductive crystal trimming. Each channel of a switched channel equipment has a separate crystal and trimming inductor. The selected channel is switched into circuit by operation of the CHANNEL selector switch SB2.

On 25-54 Mc/s equipment the output of VT3, at the oscillator crystal frequency, is mixed with the signal frequency by MR1 to produce the first i.f. of 6 Mc/s. On 54-174 Mc/s equipment a harmonic (see Appendix) of the oscillator crystal frequency is selected by T2 in the collector circuit of VT3 and mixed with the signal frequency to produce the first i.f. of 6 Mc/s (54-68 Mc/s equipment) or 10.7 Mc/s (68-174 Mc/s equipment). The first i.f. is connected to the input stage of the First I.F. Unit via L5.

First I.F. Unit

VT101, VT102 and VT103 are connected in a transformer coupled cascade amplifier with each stage neutralised. The amplified output from the unit is coupled by T104 in the collector circuit of VT103 to the second mixer MR201.

Second Mixer Unit

The incoming 6 Mc/s or 10.7 Mc/s signal is mixed by MR201 with the output from the crystal controlled oscillator VT202 to produce a frequency of 455 kc/s. This second i.f. signal is amplified by VT201 and fed to the 455 kc/s band pass filter. VT202 normally operates at a frequency of 455 kc/s above the first i.f. but under certain circumstances may operate at 455 kc/s below the first i.f. (see Appendix).

455 kc/s Band Pass Filter

This filter is connected between the Second Mixer Unit and Second I.F. Unit. It is sealed and determines the selectivity of the receiver for the required channel spacing. If it is required to alter the channel spacing it is only necessary to change the filter:-

Second I.F. Unit

The 455 kc/s input is fed to the base of VT301, an emitter follower which provides an impedance match for the band pass filter to the following amplifying stages VT302-VT305. MR301, in the base circuit of VT303, prevents overloading of the stage under high signal level conditions.

The amplified output from VT305 is coupled by T302 to the signal detector MR302 and the a.g.c. detector MR303. This operates in conjunction with the emitter follower VT306 to provide a.g.c. bias for VT1, VT2, VT302 and VT303. With no incoming signal the a.g.c. line is held at about -1.5 volts, becoming less negative with increasing signal level.

The audio output from MR302 is fed via the noise limiter MR304 to the emitter follower VT307, which provides an impedance match for the detector and noise limiter to the following stages. A test point is connected in the cathode circuits of MR302 and MR304 to enable the demodulated signal current to be monitored during alignment.

The audio signal is fed via MR305, the squelch diode in the emitter circuit of VT307, to the VOLUME control RV801 on the front panel.

Squelch Unit

VT401 is controlled by the a.g.c. bias level and operates as a switching stage, which, with no incoming signal, maintains the cathode voltage of MR305 at a level less negative than that applied to its anode by the emitter of VT307. Under these conditions MR305 is non conducting and prevents noise voltage from being passed to the succeeding stages. Thus the receiver is silenced.

When a signal is received the a.g.c. bias becomes less negative and VT401 applies a negative going voltage to the cathode of MR305, which conducts and allows the audio signal to pass to the succeeding stages. The setting of the SQUELCH control RV802 on the front panel determines the voltage applied to the emitter of VT401 and thus the signal level at which it will operate.

A.F. Section Figs. 14 & 16

The audio signal from the VOLUME control is fed via relay contacts RLB2 to the audio amplifier VT503, the output from which is coupled via the low pass filter C509, L502, C513 to VT504. The latter is an emitter follower which provides an impedance match for the filter to the audio output driver VT505. The output from VT505 is coupled by the phase splitting transformer T501 to the class B push-pull output stages VT506 and VT507, which feed the loudspeaker via relay contacts RLB3 and RLB4 and the output transformer T502.

TRANSMITTER

CIRCUIT FEATURES Fig. 2

The transmitter r.f. stages use three valves on equipment operating within the range 25-68 Mc/s and four valves on equipment operating within the range 68-174 Mc/s. The a.f. stages use seven transistors. The output from a crystal controlled oscillator is multiplied in the following stages before being coupled to the push-pull output stage.

The output from the microphone is amplified in four stages before application to the push-pull output stage, which provides anode and screen modulation of the power amplifier.

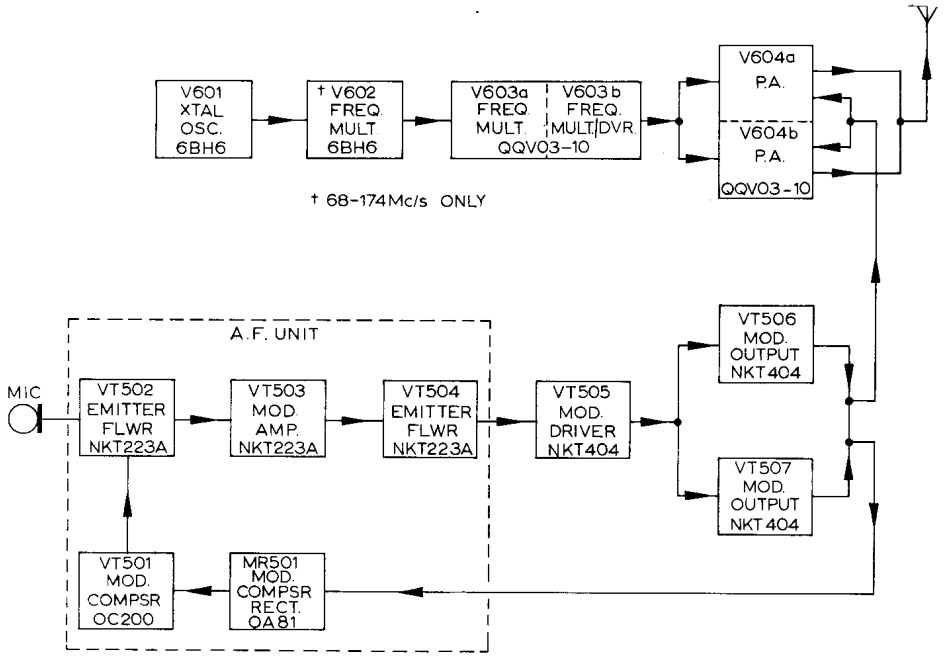


Fig. 2 Transmitter Block Diagram

DETAILED DESCRIPTION Figs. 14 & 16

R.F. Section

V601 operates in a crystal controlled oscillator circuit provided with capacitive crystal trimming (see Appendix). Each channel of a switched channel equipment has a separate crystal and trimming capacitor. The selected channel is switched into circuit by operation of the CHANNEL selector switch SB1.

The output from V601 is coupled by C607 to the first frequency multiplier (V603a on 25-68 Mc/s equipment and V602 on 68-174 Mc/s equipment). The output of V602 (not used on 25-68 Mc/s equipment) is coupled by C612 to the following frequency multiplier V603a, which is one section of a twin tetrode. A double tuned transformer T601 couples the output of V603a to V603b, which operates as the final frequency multiplier and also provides a balanced input to the power amplifier V604.

The power amplifier is a twin tetrode operating in push-pull, its output being developed in the tank circuit L607, C626. The output of this circuit is fed to the antenna via the coupling coil L608 (series tuned by C628), a low pass filter comprising L609, C629, L610, C630, the contacts RLA1 of the antenna changeover relay and the antenna socket SKTF.

The crystal frequency multiplication of the various stages is as follows:-

	25-42 Mc/s	42-68 Mc/s	68-88 Mc/s	88-132 Mc/s	132-174 Mc/s
V601	x1	x1	x1	x1	x1
V602	-	-	x2	x2	x3
V603a	x2	x3	x2	x3	x3
V603b	x2	x2	x2	x2	x2
V604	x1	x1	x1	x1	x1
Total multiplication	x4	x6	x8	x12	x18

A.F. Section

This section also includes the receiver a.f. stages. The microphone output is fed via R501, the emitter follower VT502 and relay contacts RLB2 to the audio amplifier VT503, the output from which is coupled via the low pass filter C509, L502, C513 to VT504. The latter is an emitter follower which provides an impedance match for the filter to the audio output driver VT505. The output from VT505 is coupled by the phase splitting transformer T501 to the class B push-pull output stages VT506 and VT507, which feed into the modulation transformer T503 via relay contacts RLB3 and RLB4.

T503 has two secondary windings, one of which modulates the anodes and screen of the transmitter power amplifier. The output from the other secondary winding is rectified by MR501 and fed to the base of the compressor VT501 as a negative potential. When the modulation reaches a sufficiently high level this negative potential controls the effective shunt resistance of the potential divider formed by R501 and VT501 and consequently prevents any further increase in modulation level.

The microphone sensitivity is controlled by selection of R514, which determines the amount of negative feedback on VT503. This resistor is selected at the factory for optimum sensitivity level with reference to normal vehicle noise.

POWER SUPPLIES

DETAILED DESCRIPTION

Figs. 14 & 16

Power Supply Section

The vehicle battery is connected to the equipment via the 10A fuses FS701 and FS702 and the two pole POWER switch SA on the front panel. When the equipment is switched to receive (RX) the positive and negative sides of the supply are connected to the receiver and the green SUPPLY lamp ILP801. The positive side of the supply is connected to the d.c. converter.

The d.c. converter comprises VT701 and VT702 which operate in a push-pull blocking oscillator circuit. The a.c. developed by the secondary winding of T701 is rectified by a full wave bridge rectifier comprising four silicon rectifiers MR701 (a-d). The output of the rectifier is smoothed by L701, R701, C702a and C702b.

When the equipment is switched to standby (S'BY) the receiver, SUPPLY lamp and transmitter power supply remain connected to the supply and the heaters of the transmitter valves are also connected. When the transmit button on the microphone is pressed the transmit relay RLB is energised, RLB1 changes over to connect the negative side of the supply to the converter and h.t. is applied to the transmitter. The red TX ON lamp ILP802 is connected in parallel with the energising coils of RLA and RLB and lights when the transmit button is pressed.

Transistor Reversed Polarity Protection

A selenium rectifier MR702 is mounted at the rear of the front panel and is connected across the d.c. supply when the POWER switch is in either the RX or S'BY positions. The cathode of MR702 is connected to the positive side of the supply and the anode to the negative side so that the rectifier is normally non-conducting. If the input polarity is accidentally reversed, MR702 will conduct and blow one or both of the supply fuses, thus preventing damage to the equipment.

RELAY OPERATION

Figs. 14 & 16

The energising coils of the relays RLA and RLB are connected in parallel to the negative side of the supply via the S'BY position of the POWER switch and to the positive side of the supply via the microphone transmit button in the transmit position. The relays are only energised when the equipment is switched to transmit and their contacts carry out the following functions:-

RLA1 transfers the antenna connection from the receiver input circuit to the transmitter output circuit.

RLB1 transfers the negative side of the supply from the receiver to the transmitter power supply, thus switching off the receiver and switching on the transmitter.

RLB2 transfers VT503, and the following stages in the a.f. section from the receiver output to the microphone.

RLB3 and RLB4 transfers the audio output of VT506 and VT507 in the a.f. section from the receiver output transformer T502 to the transmitter modulation transformer T503.

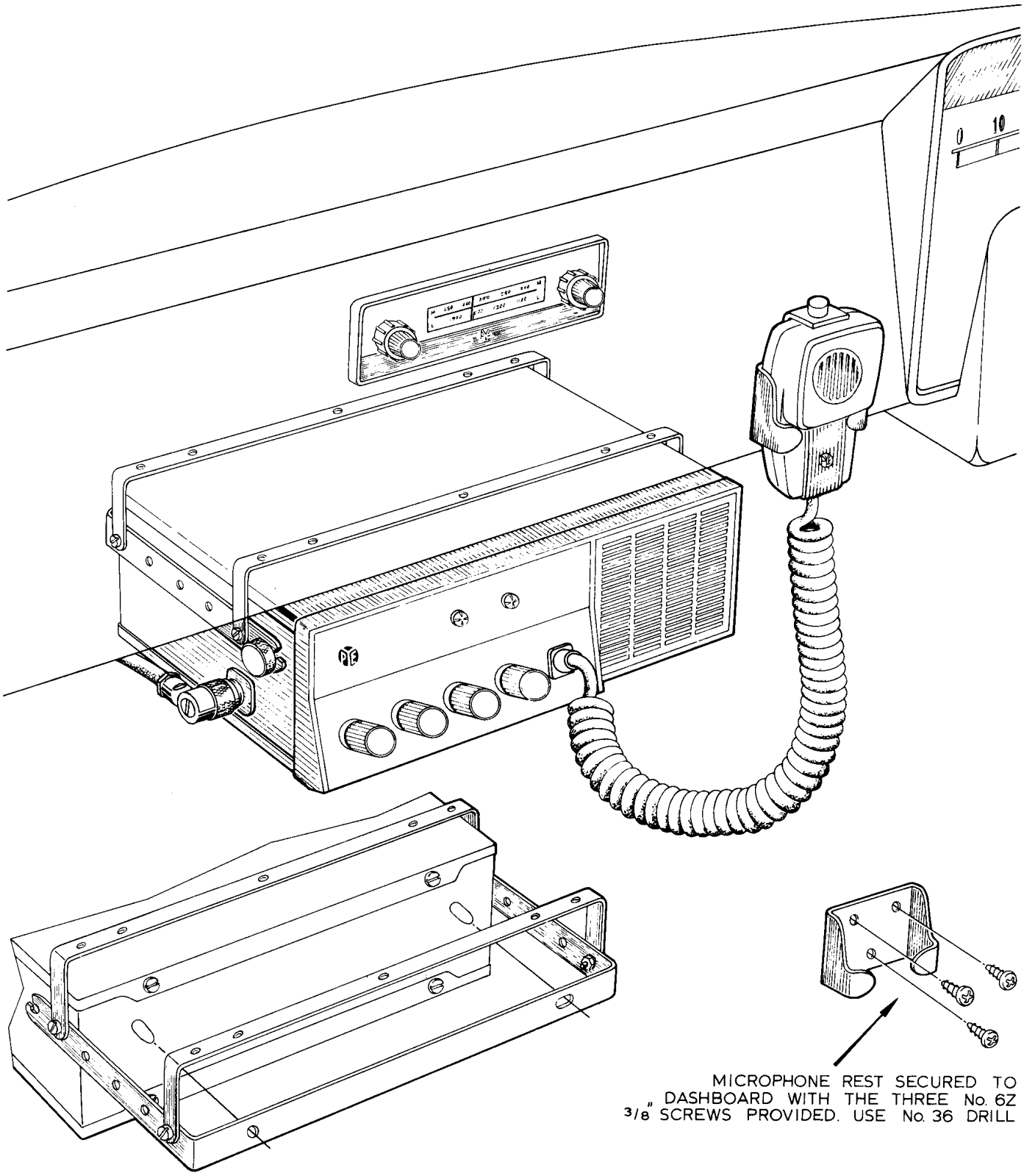


Fig. 3 Typical Installation

CHAPTER III

INSTALLATION AND OPERATION

INSTALLATION

Fig.3

Before the equipment is installed, remove the top and bottom covers by giving the four quick-release fasteners at the rear a quarter turn in an anti-clockwise direction and pulling the covers rearwards from under the flange on the front panel. Check that all valves, crystals, lamp holders and hinged printed circuit boards are firmly seated in position and that no obvious damage has occurred during transit. Replace the covers.

The cradle is normally secured to the underside of the dashboard, the series of holes in each cradle member enabling the set to be mounted in any required position. The method of assembling and mounting the cradle is shown in Fig.3. Check that the set can be easily removed from the cradle and that the antenna socket is readily accessible. The two additional cradle members supplied may be used, if required, to provide more support for the cradle. The microphone bracket is mounted as shown in Fig.3 in any suitable position.

POLARITY WARNING

The red supply lead must be connected to the positive battery terminal and the black supply lead to the negative battery terminal.

If these connections are reversed no damage will be caused to the set, but one or both of the fuses will blow. When fuses are replaced it is important to ensure that the rating of 10A is not exceeded and that the correct type of fuses are used. Slow blow fuses must not be used.

Power Supply

A fuse is included in each of the power supply leads and Fig.4 shows the method of assembling the fuse holders.

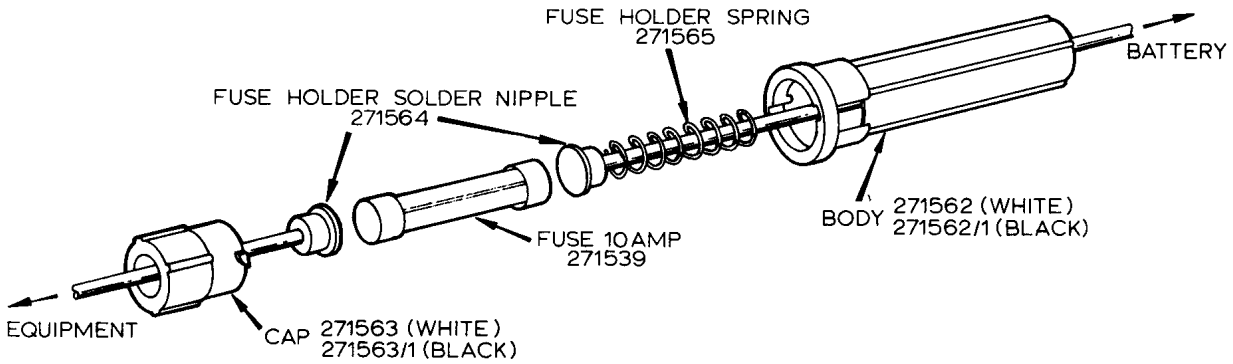


Fig.4 Fuse Holder Assembly

It is important that the power supply leads are of sufficiently heavy gauge to limit the voltage drop to the set. 70/0.0076 cable is satisfactory for loop lengths of up to 10 yards, i.e. with the set not more than 5 yards from the battery.

Standard Test Voltage

The standard test voltage for test and alignment purposes is 13.2 volts d.c. measured at the input to the equipment.

Vehicle Interference Suppression

Information on the location and suppression of vehicle interference is available as a supplement to this manual.

Erection of Antenna

Detailed installation instructions for the whip antenna are available in a supplement to this manual.

After fitting the antenna, connect the antenna plug to the antenna feeder cable as follows:-

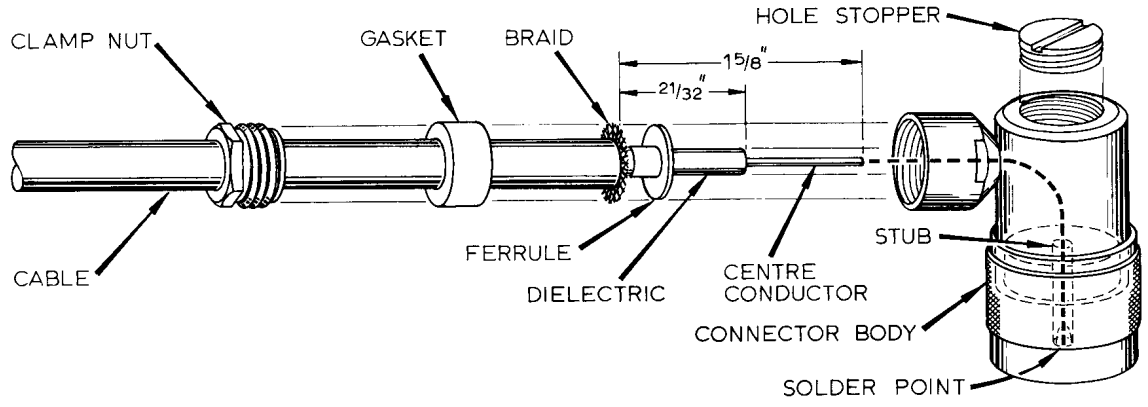


Fig.5 Antenna Plug Assembly

1. Unscrew and remove the clamp nut and hole stopper and remove the gasket and ferrule from the connector body.

2. Cut the end of the cable squarely, cut off $1\frac{5}{8}$" of the cable sheath and slide the clamp nut (head leading) and gasket onto the cable.

3. Cut the braid to $\frac{1}{4}$", comb out the braid wires and fold them back over the sheath.

4. Slide the ferrule over the exposed dielectric and push the ferrule fully home between the braid and dielectric. Trim the braid between the ferrule and sheath edge.

5. Cut off the dielectric 21/32" from the face of the ferrule and tin the exposed centre conductor. Bend it into an arc and feed it through the stub in the connector body.

6. Insert the gasket and clamp nut into the connector body and tighten the clamp nut.

7. Trim off the excess centre conductor, solder securely and replace the hole stopper.

The installation should be completed by inserting the antenna plug into the antenna socket on the left hand side of the case.

INITIAL ADJUSTMENTS

Turn the POWER switch to the S'BY position and check that the green lamp lights on the front panel. After 30 seconds, press the transmit button on the microphone and check that the red lamp lights on the front panel.

Transmitter

Note: The transmitter should never be operated without either the antenna or a suitable dummy load being connected to the antenna socket.

1. Connect the positive lead of a 0-2.5 volts d.c. voltmeter (the Avo Model 8 set to the 2.5 volts d.c. range is suitable) to the external test point on the left hand side of the set and the negative lead to the case.

2. Connect the antenna feeder to the antenna socket via a reflectometer (the Pye TCL201F is suitable). If a reflectometer is not available, the antenna feeder should be connected directly to the equipment and a suitable radiation indicator placed adjacent to the whip antenna.

3. Press the microphone transmit button and adjust the preset antenna tuning capacitor, accessible under the hinged cover plate on the left hand side of the case, for maximum reading on the reflectometer (or maximum radiation from the antenna). Check that the voltmeter reading is within the range 0.55-0.7 volts. If it is not, the antenna coupling coil must be adjusted to obtain a reading within these limits, as shown in Fig. 18.

4. Remove the reflectometer and reconnect the antenna feeder to the antenna socket.

Receiver

With no incoming signal turn the VOLUME and SQUELCH controls clockwise until receiver noise is heard and then turn back the SQUELCH control until the receiver is just silenced. If required, a less sensitive setting of the SQUELCH control may be obtained by turning the control further anticlockwise.

OPERATION

Upon completion of the installation and initial adjustments, the equipment should be given an operational test run and test results from various locations noted.

FIELD TESTING PROCEDURE

The crystal trimmers are adjusted against a high accuracy frequency substandard before despatch from the factory and it will not normally be necessary to alter their settings unless a component in a crystal oscillator circuit is changed.

> Under no circumstances should the settings of the transmitter or receiver crystal trimmers be altered without reference to a frequency substandard or to the base station equipment as described below.

Receiver

The Pye 455 kc/s marker oscillator PT 503 is suitable for checking the operating frequency against that of the base station.

1. Arrange for the base station to radiate a carrier.

2. Switch on the 455 kc/s oscillator and hold it close to the mobile receiver Second I.F. Unit.

3. If a high audio beat note is produced, i.e. in excess of 1000 c/s for 25 kc/s channel spacing and 2000 c/s for 50 kc/s channel spacing, the mobile receiver cyrstal trimmer L806 should be adjusted for zero beat.

4. This procedure should be repeated for each channel of a switched channel equipment.

Transmitter

The following procedure should be used in conjunction with a crystal controlled marker oscillator having exactly the same frequency as that of the base station receiver first or second i.f. If the base station in use is the Pye AM 27F the marker oscillator type PT 503 can be used.

1. Arrange for the mobile transmitter to radiate a carrier.

2. Switch on the marker oscillator and hold it close to the appropriate mixer in the base station receiver.

3. If a high audio beat note is produced, i.e. in excess of 1000 c/s for 25 kc/s channel spacing and 2000 c/s for 50 kc/s channel spacing, the mobile transmitter crystal trimmer C808 should be adjusted for zero beat as reported by the base station engineer. Adjustment must not be made to the base station receiver crystal trimmer without reference to a frequency substandard.

4. This procedure should be repeated for each channel of a switched channel equipment.

This field testing procedure becomes increasingly important as the carrier frequency increases and the channel spacing decreases.

MICROPHONE TECHNIQUE

Correct use of the microphone is essential in order to obtain the best results from the transmitter.

The operator should hold the microphone two or three inches from the lips and speak across its face at a normal level of speech. This helps to reduce background noise and give a clear signal at the base station.

CHAPTER IV

SERVICING

The performance figures given in the Alignment Charts (Figs. 17 & 18) are for new equipment and equipment regularly maintained in accordance with the Routine Maintenance Procedure on page 22.

It is recommended that this procedure should be carried out at four monthly intervals, or, if the equipment is operating under adverse conditions, at two monthly intervals. If it is necessary to dismantle the equipment proceed as indicated below.

DISMANTLING PROCEDURE

Fig.6

1. To remove the set from the cradle, loosen the knurled screw on each side of the case, lift the front of the set and pull forward until the two locating pins at the rear are clear of the holes in the cradle rear member (see Fig.3 on page 12).

2. To remove the top and bottom covers, give the quick release fasteners (A) on each side a quarter turn in an anti-clockwise direction and pull the covers rearwards from under the flange on the front panel.

3. To remove the front panel, unsolder from the front panel components all leads except those connected to the POWER and CHANNEL switches. Take off the POWER and CHANNEL switch knobs and the POWER switch retaining nut (C). Remove the screws and nuts (B) at each side of the case and pull off the front panel.

4. To remove the Second I.F. Unit and A.F. Unit printed circuit boards, unlock the quick release fasteners (D) and remove the screws (E). The remaining printed circuit boards are secured by pillar nuts, but before removing any boards the associated interconnecting leads should be unsoldered from their terminals.

5. To remove the band pass filter, unsolder the leads from its terminals and remove the securing screws (F).

6. To remove an indicator lamp, squeeze the securing arms of the lampholder with forefinger and thumb and draw the lampholder away from the rear of the front panel.

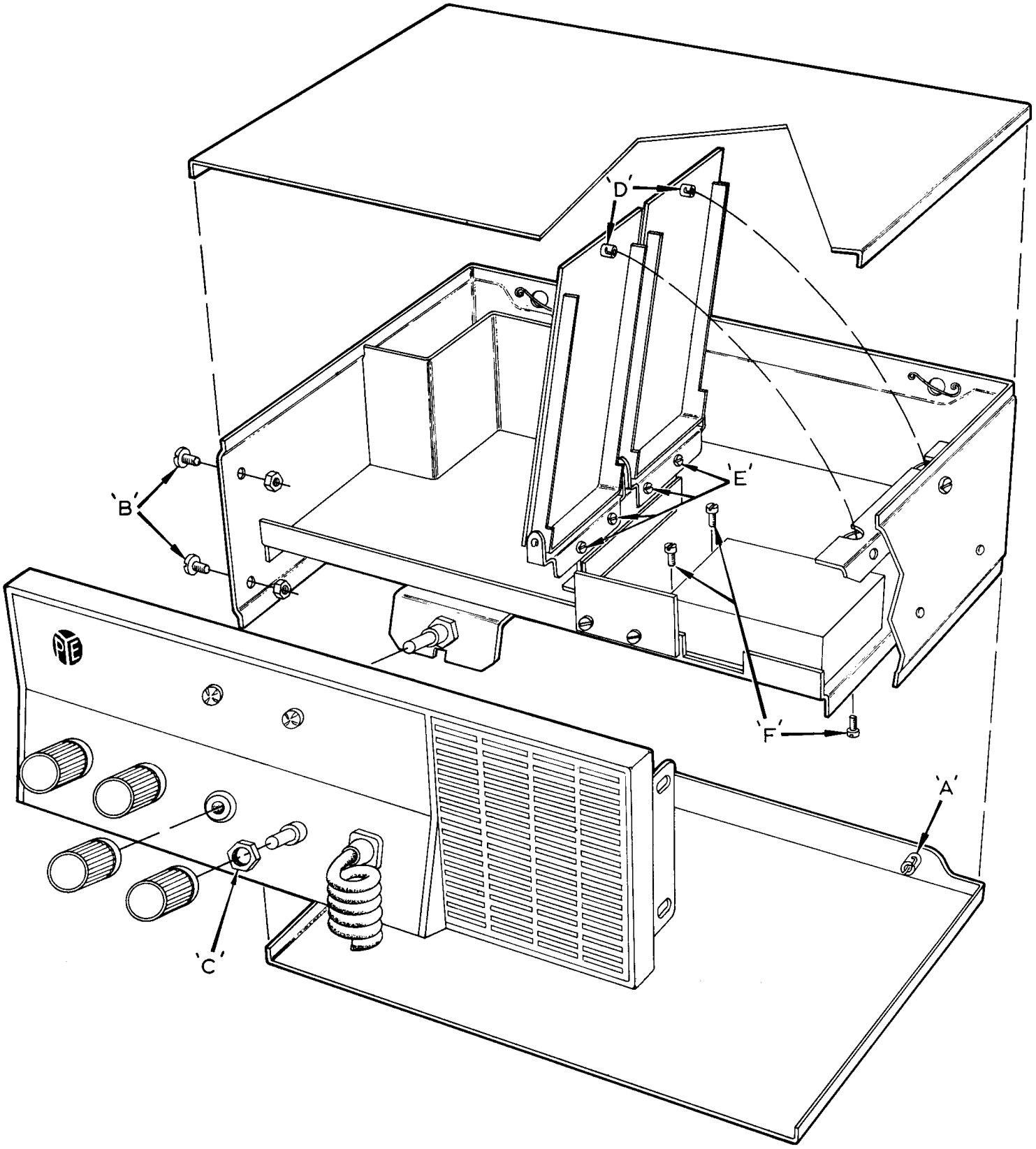


Fig. 6 Dismantling Diagram

TRANSISTOR CIRCUITS

INTRODUCTION

Transistors are susceptible to damage by current overload or reversed supply polarity and this calls for special care during servicing. Small test meter prods and crocodile clips, suitably insulated, should be used to reduce the risk of damage by accidental short circuits.

Before removing transistors make absolutely certain that all d.c. measurements and other checks confirm that the transistor is faulty. It may be easily damaged by unnecessary removal.

It is advisable, on completion of a repair, to recheck the transistor, diode and electrolytic capacitor connections before switching on.

GENERAL INSTRUCTIONS

1. Do not apply a soldering iron to the connecting lead for any length of time, and use a heat shunt on the lead, e.g. grip the wire between the transistor and the joint with a pair of pliers.

2. Always check for correct polarity before connecting up transistor circuits.

3. Transistors have a very low resistance and can be destroyed by the quite low potentials which may exist between the terminals of test equipment, or between a soldering iron and ground. The iron should be removed from the a.c. supply when soldering unless it is certain that the equipment is not grounded. The use of low voltage soldering irons is recommended.

4. The metal cases of the power transistors (which are at collector potential) are insulated from the chassis by mica washers which are coated with silicon compound to ensure efficient thermal contact. This thermal contact and electrical insulation must be maintained.

5. Do not remove or replace components (or valves) with the power supply on. Surges may occur which could result in excessive voltage being applied to transistors.

6. When using a volt meter on low ranges for measuring transistor voltages ensure that the leads do not touch any h.t. lines used for valve supplies.

7. If damage to power transistors is suspected, continuity checks should be carried out as shown in Fig. 7. The ohmmeter should have an internal or external resistance of approximately 1kΩ in circuit. If these results are not obtained a replacement transistor should be fitted but the power should not be applied to the equipment until the cause of the transistor failure has been ascertained and remedied.

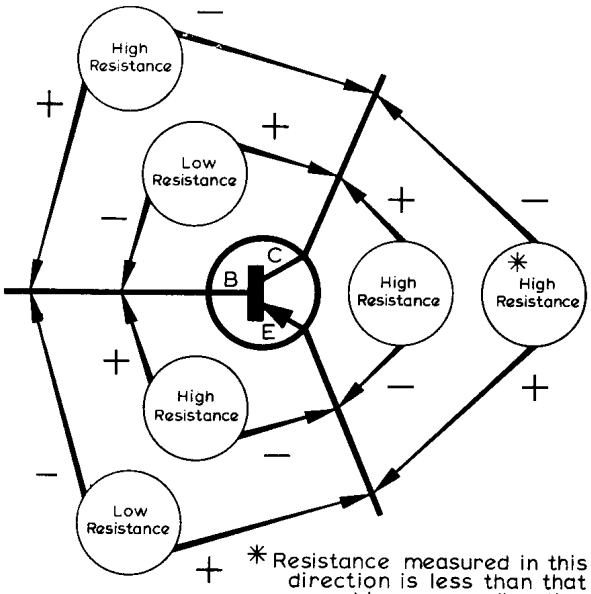


Fig. 7 Power Transistor Servicing Diagram

PRINTED CIRCUITS

The methods used in servicing printed circuits are similar to those used with wired circuits. However, the following points should be noted:-

1. Printed circuits are generally solder plated, but some may be protected by a layer of polystyrene (easily recognised by the copper colour of the circuits) To avoid damage to either coating it is preferable to take meter readings from the end wires of the components on the upper side of the board.

2. When it is necessary to take readings on the printed circuits, needle point test probes should be used.

3. Care should be taken to avoid softening of the thermoplastic adhesive under the copper foil by excessive heat. Use a hot iron for soldering and apply it for the minimum time.

4. It is advisable to use as little force as possible in order to remove faulty components. A recommended method is to cut the component leads and hold the board upside down, when the application of a hot iron to the soldered joints should cause the remaining wires to drop out.

5. The leads of replacement components should be carefully cleaned before they are inserted through the holes in the board. They should then be cut to length, bent over against the copper foil sufficiently to hold them in position and soldered as rapidly as possible. 60/40 resin-cored solder is recommended.

6. Excess deposits of solder should be avoided, particularly in the more congested areas of the printed circuit.

7. It will not normally be necessary to clean the printed circuit before soldering, but, should the necessity arise, a small glass-fibre brush should be used. After soldering, any exposed copper foil should be recoated with a preservative to keep out moisture. Durofix or polystyrene dope is recommended. Any particles of solder should be removed from the protective surface. Printed circuits which are already solder plated need no further protection.

8. Damaged circuits can be bridged with tinned copper wire, or, in the case of microscopic cracks, a solder bridge is often satisfactory.

ROUTINE MAINTENANCE PROCEDURE

The nominal figures quoted in brackets are provided for guidance when checking the equipment.

TEST EQUIPMENT REQUIRED

The following test equipment is recommended.

1. Hum-free l.t. supply of 13.2V d.c.

2. H.F. valve voltmeter or diode probe (a suitable circuit is shown in Fig. 8 on page 24) used in conjunction with a 0-50μA meter (Avo Model 8 is suitable).

3. Audio output meter with a scale reading up to two watts (most standard multi-range instruments are suitable).

4. Signal generator (see V.H.F. Signal Generators on page 23).

5. Crystal controlled 455 kc/s marker oscillator (the Pye PT503 is suitable).

6. Multi-range d.c. voltmeter of 20,000Ω/volt sensitivity (Avo Model 8 is suitable).

7. 0-50μA meter with a resistance of 2.5kΩ (Avo Model 8 is suitable).

8. A.F. oscillator.

9. Reflectometer (the Pye TCL201F is suitable).

10. R.F. power output meter (the Bird Termaline Model 612 is suitable).

V.H.F. SIGNAL GENERATORS

Measurements of sensitivity, signal-to-noise ratio, a.g.c., etc., require suitable test gear. The following signal generators are recommended.

1.	Boonton Radio Corporation, Boonton, New Jersey	Type 202C
2.	Marconi Instruments Ltd.	TF995A/1-5
3.	Hewlett Packard	Type 608A

Other signal generators may be suitable for comparative tests.

GENERAL CHECKS

1. Disconnect the battery supply leads and antenna and remove the set from the cradle.

2. Remove the top and bottom covers and carry out a physical inspection for obvious defects, taking care not to disturb any components.

3. Check over the antenna installation.

4. Check the battery leads for wear and replace if necessary. Ensure that all connections are firm.

5. Check the battery voltage (see Standard Test Voltage on page 14).

6. Reconnect the antenna and battery supply leads and check the operation of the POWER switch. Operate it several times.

7. Check that the indicator lamps are functioning and firmly secured in their holders (the transmitter must be switched on to check the red TX ON lamp). When replacing a lamp it should be secured in its holder by applying a touch of paint or varnish to the threads of the lamp and holder.

8. Check that all valves and crystals are firmly seated and that there is no noise from intermittent contacts.

9. Check the operation of both relays.

10. Check the operation of the CHANNEL selector switch on switched channel equipment.

11. Check the transmitter h.t. voltage (260 volts).

RECEIVER PERFORMANCE CHECKS

Typical voltages at relevant points of the circuit are shown on the circuit diagrams (Figs.10 and 12). Nominal sensitivity figures and a check of the 455 kc/s band pass filter are given in the Appendix. The complete alignment procedure for the receiver is given in Fig.17.

1. Check the second local oscillator.

   Using the valve voltmeter (or diode probe in conjunction with the 0-50μA meter) check that the oscillator injection voltage at the junction of MR201 and L201 on the Second Mixer Unit (see Fig.17) is at least 0.5 volts.

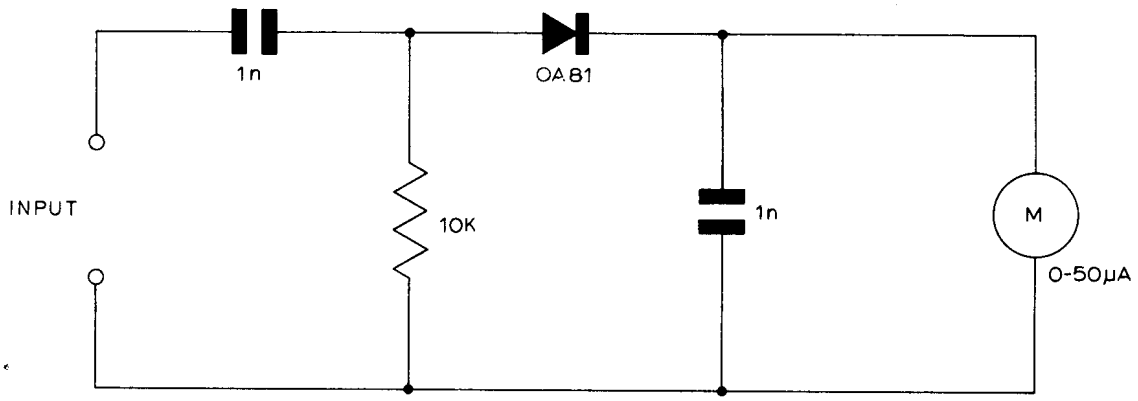


Fig.8 Diode Probe

2. Check the first local oscillator.

   Transfer the valve voltmeter (or diode probe) to the junction of MR1 and L5 on the R.F. Unit (see Fig.17) and check that the oscillator injection voltage is approximately 0.5 volts. Disconnect the valve voltmeter (or diode probe)

3. Turn the VOLUME and SQUELCH controls fully clockwise.

4. Check the overall sensitivity.

   Check the audio output meter, set to 30Ω impedance, in parallel with the loudspeaker, i.e. between terminals 4 and 5 of the receiver output transformer T502. The meter will then read approximately 50mW when the

receiver output is 500mW. Connect the signal generator to the antenna socket, hold the 455 kc/s marker oscillator close to the Second I.F. Unit and adjust the signal generator frequency for zero beat. Inject an r.f. signal of 0.5μV e.m.f. modulated 30% at 1000 c/s. Check the audio output (500mW).

5. Check the signal-to-noise ratio.

With the signal generator and output meter connected as in 4 above and an r.f. input of 2μV e.m.f., adjust the VOLUME control to obtain an audio output of 100mW (10mW on meter) and note the reading on the db scale. Switch off the modulation and again note the reading on the db scale. Subtracting the latter reading from the former reading will give the approximate signal-to-noise ratio at this level (12db on 25-108 Mc/s equipment; 10db on 108-174 Mc/s equipment).

6. Check the a.g.c. performance.

With the signal generator and output meter connected as in 4 above an an r.f. input of 100mV e.m.f., adjust the VOLUME control to obtain an audio output of 500mW (50mW on meter). Check that when the r.f. input is reduced to 2μV e.m.f. the fall in audio output does not exceed 8db (25-108 Mc/s equipment) or 10db (108-174 Mc/s equipment).

7. Check the squelch.

With the signal generator connected to the antenna socket, inject an r.f. signal of 2μV e.m.f. Turn the SQUELCH control fully anticlockwise and check that the squelch remains closed (receiver silenced). Check the maximum sensitivity of the squelch, at the threshold setting, which should operate satisfactorily with a signal input of 0.5μV e.m.f.

TRANSMITTER PERFORMANCE CHECKS

Typical voltages at relevant points of the circuit are shown on the circuit diagram (Figs. 14 & 16). Nominal sensitivity figures for the modulator are given in the Appendix. The complete alignment procedure for the transmitter is given in Fig. 18.

1. Check each r.f. stage.

Check the d.c. voltage between the chassis and each of the following test points, the positions of which are shown in Fig. 18.

Test Point		
TP601	(V601 grid voltage)	*-0.24V
TP602	(V602 grid voltage - 68 to 174 Mc/s only)	*-0.8 V
TP603	(V603a grid voltage)	*-0.5 V
TP604	(V603b grid voltage)	*-0.65V (25 - 68 Mc/s)
		*-1.05V (68 -174 Mc/s)
TP605	(V604 grid voltage)	-2.8 V (25 -132 Mc/s)
		-1.5 V (132-174 Mc/s)
TP606	(V604 cathode voltage)	+0.55V to +0.65V

* Typical voltages

The power amplifier grid (TP605) and cathode (TP606 voltages should be as shown).

2. Check the modulator.

Connect the audio output meter to terminals 4 and 5 of the modulator output transformer T503 and connect the a.f. socillator in place of the microphone, ensuring that a d.c. path exists between oscillator and modulator (i.e. a blocking capacitor must not be used). Remove the power amplifier (V604). With an audio input of 12mV at 1000 c/s, check the audio output (2W). Remove all test gear and replace the power amplifier.

3. Check the carrier for hum and noise.

Connect the antenna feeder to the antenna socket via the reflectometer and connect a pair of earphones to the jack socket. Switch on the transmitter and check that there is no hum or noise on the carrier.

4. Check the modulation.

With the same arrangements as in 3 above, speak into the microphone and ensure that the modulator is working satisfactorily.

5. Check the power output, which should be at least five watts.

6. Adjust the antenna trimmer C628 for maximum power output as indicated on the reflectometer or a radiation meter.

Remove all test gear and re-install the equipment, ensuring that all fastenings are tight and that all external connections are properly made.

Call up the base station for a final operational check, carrying out the Field Testing Procedure described on page 16.

D.C. RESISTANCE OF INDUCTORS

SECOND MIXER UNIT

		Winding	Tag Nos.	Resistance
T201	2nd i.f. transformer	Primary		3.7Ω
		Secondary		9.6Ω

SECOND I.F. UNIT

T301	2nd i.f. transformer	Primary		9.6Ω
		Secondary		3.7Ω
T302	2nd i.f. transformer	Primary		5.1Ω
		A.G.C. secondary		5.5Ω
		Detector secondary		9.1Ω

A.F. UNIT

L501	Audio choke			4.3Ω
L502	Filter choke			19Ω
L503	Filter choke			1Ω
T501	Audio driver transformer	Primary	1 - 3	63Ω
		Secondary	4 - 6	4.1Ω
T502	Audio output transformer	Primary	1 - 3	16Ω
		Secondary	4 - 5	0.35Ω
T503	Modulation output transformer	Primary	1 - 3	0.75Ω
		Modulation secondary	4 - 5	67Ω
		Feedback secondary	6 - 7	0.8Ω

TRANSMITTER

L602	Cathode choke			7.6Ω

POWER SUPPLY

L701	Smoothing choke			7.6Ω
T701	Converter transformer	Oscillator primary	10 - 12	0.14Ω
		Feedback primary	2 - 5	0.06Ω
		Secondary	7 - 9	16.5Ω

RELAYS

RLA	Antenna changeover	330Ω
RLB	Transmit	170Ω

APPENDIX

OSCILLATOR ALIGNMENT

Alignment of the transmitter oscillator and receiver first local oscillator does not form part of the normal alignment procedure. The Field Testing Procedure on page 16 is normally adequate for netting the equipment to the base station or re-aligning the oscillators if a component is changed in an oscillator circuit.

Oscillator alignment should only be carried out with test equipment of a high standard, the following instruments being typical of those found to be satisfactory.

1. Berkeley Counter Frequency Meter Model 5570 or 7370 (direct frequency indicating meters).

2. Schomandl Frequency Meter Type FD1 (zero beat indicating meter).

Detailed information on the operation of these instruments is supplied by the manufacturers, but the following points should be noted:-

(a) Measurements can be made of either the carrier frequency (transmitter only) or the crystal frequency.

(b) If the carrier frequency is measured the coupling between transmitter and frequency meter should be the minimum required to obtain a reading. In general, to avoid overloading the meter there should be no direct coupling and it may be necessary to separate the transmitter and meter by a few feet.

(c) If the transmitter crystal frequency is measured, connection to the meter should be by co-axial cable from the anode of V601 via a 0.75pF capacitor.

(d) To measure the receiver first local oscillator injection frequency the meter should be connected to the junction of MR1 and L5 via a 2nF capacitor. In this case the crystal frequency should be calculated from the receiver first local oscillator crystal formula given in Crystal Information following.

(e) If crystal ovens are fitted the effect of the oven heat cycling should be observed and the crystal trimmers adjusted as near as possible to the centre of the total excursion of the oven cycle.

CRYSTAL INFORMATION

RECEIVER

MULTIPLICATION FACTORS

	Carrier Frequency	VT3 Multiplication
Band J	25-32.5 Mc/s	x1
Band H	32.5-42 Mc/s	x1
Band G	42 - 54 Mc/s	x1
Band F	54 - 68 Mc/s	x2
Band E	68 - 88 Mc/s	x2
Band D	88 -108 Mc/s	x3
Band C	108-132 Mc/s	x3
Band B	132-156 Mc/s	x3
Band A	148-174 Mc/s	x3

CRYSTAL FORMULAE (U.K. EQUIPMENT ONLY)

	First Local Oscillator	Crystal Specification No.	
Carrier Frequency (fc)	Crystal Frequency (fx)	50 kc/s	25 kc/s
25-32.5 Mc/s	$fx = fc + 6$	P28/C	P28/C
32.5-42 Mc/s	$fx = fc - 6$	P28/C	P28/C
42 - 54 Mc/s	$fx = fc - 6$	P28/C	P28/C
54 - 68 Mc/s	$fx = \frac{fc - 6}{2}$	P28/C	P28/C
68 - 88 Mc/s	$fx = \frac{fc - 10.7}{2}$	P28/C	P28/C
88 -108 Mc/s	$fx = \frac{fc - 10.7}{3}$	P28/C	P29/C
108-132 Mc/s	$fx = \frac{fc - 10.7}{3}$	P28/C	P29/C
132-156 Mc/s	$fx = \frac{fc - 10.7}{3}$	P28/C	P29/C
148-174 Mc/s	$fx = \frac{fc - 10.7}{3}$	P28/C	P29/C

Second Local Oscillator

Crystal Specification No. P53J.

On 25-68 Mc/s equipment the crystal frequency is 6.455 Mc/s, except when the assigned frequency is within 100 kc/s of the following frequencies, in which case the crystal frequency is 5.545 Mc/s.

25.82 Mc/s	32.275 Mc/s	38.73 Mc/s	45.185 Mc/s
51.64 Mc/s	58.095 Mc/s	64.55 Mc/s	

On 68-174 Mc/s equipment the crystal frequency is 11.155 Mc/s, except when the assigned frequency is within 100 kc/s of the following frequencies, in which case the crystal frequency is 10.245 Mc/s.

78.085 Mc/s	89.24 Mc/s	100.395 Mc/s	111.55 Mc/s	122.705
133.86 Mc/s	145.015 Mc/s	156.17 Mc/s	167.325 Mc/s	Mc/s

Switched Channel Receivers

To avoid heterodynes on some switched channel receivers, the frequency of the second local oscillator may lie within the following limits:-

6.455 Mc/s ±3 kc/s 5.545 Mc/s ±3 kc/s	25-68 Mc/s equipment	11.155 Mc/s ±3 kc/s 10.245 Mc/s ±3 kc/s	68-174 Mc/s equipment

Should it be necessary to order a replacement crystal it is essential to quote the exact frequency of the original crystal. Use of a crystal of any other frequency may result in heterodynes on one or more channels.

TRANSMITTER

MULTIPLICATION FACTORS

Carrier Frequency		V601	V602	V603a	V603b	V604	Total Multiplication
Band J	25-32.5 Mc/s	x1	-	x2	x2	x1	x4
Band H	32.5-42 Mc/s	x1	-	x2	x2	x1	x4
Band G	42 - 54 Mc/s	x1	-	x3	x2	x1	x6
Band F	54 - 68 Mc/s	x1	-	x3	x2	x1	x6
Band E	68 - 88 Mc/s	x1	x2	x2	x2	x1	x8
Band D	88 -108 Mc/s	x1	x2	x3	x2	x1	x12
Band C	108-132 Mc/s	x1	x2	x3	x2	x1	x12
Band B	132-156 Mc/s	x1	x3	x3	x2	x1	x18
Band A	148-174 Mc/s	x1	x3	x3	x2	x1	x18

CRYSTAL FORMULAE (U.K. EQUIPMENT ONLY)

Carrier Frequency (fc)	Crystal Frequency (fx)	Crystal Specification No. 50 kc/s	Crystal Specification No. 25 kc/s
25-32.5 Mc/s	$fx = \frac{fc}{4}$	P19	P19
32.5-42 Mc/s	$fx = \frac{fc}{4}$	P19	P19
42 - 54 Mc/s	$fx = \frac{fc}{6}$	P19	P19
54 - 68 Mc/s	$fx = \frac{fc}{6}$	P19	P19
68 - 88 Mc/s	$fx = \frac{fc}{8}$	P19	P19
88 -108 Mc/s	$fx = \frac{fc}{12}$	P19	P18
108-132 Mc/s	$fx = \frac{fc}{12}$	P19	P18
132-156 Mc/s	$fx = \frac{fc}{18}$	P19	P18
148-174 Mc/s	$fx = \frac{fc}{18}$	P19	P18

PARTS LISTS

AND

DIAGRAMS

ORDERING OF SPARE PARTS

To avoid delays and possible errors in the supply of spare parts the reference numbers shown in these parts lists should be quoted in all orders.

R.F. UNIT

Code		CAPACITORS			Part No.
†C1	33pF	Silver mica	(25-32.5 Mc/s)	±1pF	660847
	39pF	Silver mica	(32.5-42 Mc/s) 350V	±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
†C2	150pF	Silver mica	(25-32.5 Mc/s) 350V	± 2%	PP09405
	390pF	Silver mica	(32.5-42 Mc/s) 350V	± 2%	664587
	220pF	Silver mica	(42 - 54 Mc/s) 350V	± 2%	660865
	150pF	Silver mica	(54 - 68 Mc/s) 350V	± 2%	PP09405
	100pF	Silver mica	(68 -108 Mc/s) 350V	± 2%	660857
	68pF	Silver mica	(108-132 Mc/s) 350V	± 2%	660849
	82pF	Silver mica	(132-156 Mc/s) 350V	± 2%	660861
	68pF	Silver mica	(148-174 Mc/s) 350V	± 2%	660849
C3	2nF	Disc ceramic		+40% -20%	660461
C4	2nF	Disc ceramic		+40% -20%	660461
†C5	27pF	Silver mica	(25-32.5 Mc/s) 350V	±1pF	660846
	39pF	Silver mica	(32.5-42 Mc/s) 350V	±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
†C6	2nF	Disc ceramic		+40% -20%	660461
C7	1.8pF	Ceramic	(25-32.5 Mc/s)	±0.1pF	PN00176
	1.2pF	Ceramic	(32.5-42 Mc/s)	±0.1pF	PN00060
	0.7pF	Ceramic	(42 - 54 Mc/s)	±0.1pF	266547
	0.3pF	Ceramic	(54 -108 Mc/s)	±0.1pF	266297
	0.4pF	Ceramic	(108-174 Mc/s)	±0.1pF	PN00010
C8	0.1µF	Foil			653632
†C9	27pF	Silver mica	(25-32.5 Mc/s) 350V	±1pF	660846
	47pF	Silver mica	(32.5-42 Mc/s) 350V	±1pF	660848
	27pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660846
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
†C10	2nF	Disc ceramic		+40% -20%	660461
C11	2nF	Disc ceramic		+40% -20%	660461
C12	56pF	Silver mica	(25 - 42 Mc/s) 350V	± 2%	660870
	15pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660844
	56pF	Silver mica	(54 -132 Mc/s) 350V	± 2%	660870
	33pF	Silver mica	(132-156 Mc/s)	±1pF	660847
	27pF	Silver mica	(148-161 Mc/s)	±1pF	660846
	27pF	Silver mica	(161-174 Mc/s)	±1pF	660846
C13	4.7pF	Silver mica	(25 -108 Mc/s) 350V	±0.5pF	660868
	12pF	Silver mica	(108-132 Mc/s) 350V	± 5%	PN09111
	4.7pF	Silver mica	(132-174 Mc/s) 350V	±0.5pF	660868
C14	2nF	Disc ceramic		+40% -20%	660461
C15	0.1µF	Foil			653632
†C16		Not used	(25 - 54 Mc/s)		
	18pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10118
	12pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN09111
	12pF	Ceramic	(88 -108 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(108-132 Mc/s)	± 5%	PN09031
	12pF	Ceramic	(132-156 Mc/s)	± 5%	PN09111
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
†C17	27pF	Silver mica	(25-32.5 Mc/s) 350V	±1pF	660846
	39pF	Silver mica	(32.5-42 Mc/s) 350V	±1pF	660864
	22pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660845
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	15pF	Ceramic	(132-156 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(148-174 Mc/s)	± 5%	PN09031
†C18	2nF	Disc ceramic		+40% -20%	660461
†C19		Not used	(25 - 54 Mc/s)		
	2nF	Disc ceramic		+40% -20%	660461
			(54 -174 Mc/s)		
C20	1.8pF	Ceramic	(25-32.5 Mc/s)	±0.1pF	PN00176
	1.2pF	Ceramic	(32.5-42 Mc/s)	±0.1pF	PN00060
	0.7pF	Ceramic	(42 - 54 Mc/s)	±0.1pF	266547
	0.3pF	Ceramic	(54 -108 Mc/s)	±0.1pF	266297
	0.4pF	Ceramic	(108-174 Mc/s)	±0.1pF	PN00010
†C21	27pF	Silver mica	(25-32.5 Mc/s) 350V	±1pF	660846
	47pF	Silver mica	(32.5-42 Mc/s) 350V	±1pF	660848
	27pF	Silver mica	(42 - 54 Mc/s) 350V	±1pF	660846
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	PN10037
	10pF	Ceramic	(68 -132 Mc/s)	± 5%	PN09031
	15pF	Ceramic	(132-156 Mc/s)	± 5%	PN10037
	12pF	Ceramic	(148-174 Mc/s)	± 5%	PN09111

Code		CAPACITORS (Cont.)			Part No.
C22	0.1µF	Foil			653632
C23	0.1µF	Foil			653632
C24	39pF	Silver mica	(25 - 54 Mc/s) 350V	±1pF	660864
	15pF	Silver mica	(54 -174 Mc/s) 350V	±1pF	660844
C25	10nF	Disc ceramic			660006
C26	2nF	Disc ceramic		+40% -20%	660461
C27	10µF	Electrolytic	25V		PS23027
C28	2nF	Disc ceramic		+40% -20%	660461
C29		Not used			
C30		Not used			
C31		Not used			
C32		Not used			
C33	2nF	Disc ceramic		+40% -20%	660461

RESISTORS

R1	470Ω	Composition		0.1W ±10%	267450
R2	270Ω	Composition		0.1W ±10%	267447
R3	560Ω	Composition		0.1W ±10%	267451
†R4	470Ω	Composition		0.1W ±10%	267450
R5	5.6kΩ	Composition		0.1W ±10%	267463
R6	680Ω	Composition		0.1W ±10%	267452
R7	68Ω	Composition		0.1W ±10%	267440
R8	470Ω	Composition		0.1W ±10%	267450
R9	560Ω	Composition		0.1W ±10%	267451
†R10	470Ω	Composition		0.1W ±10%	267450
R11	270Ω	Composition		0.1W ±10%	267447
R12	470Ω	Composition		0.1W ±10%	267450
R13	470Ω	Composition		0.1W ±10%	267450
R14	1kΩ	Composition		0.1W ±10%	267454
R15		Not used			
R16		Not used			
R17	470Ω	Composition	(25 - 54 Mc/s)	0.1W ±10%	267450
		Not used	(54 -174 Mc/s)		

SEMICONDUCTORS

VT1		Transistor	OC171	(25-32.5 Mc/s)	865344
		Transistor	AFZ11	(32.5-68 Mc/s)	865381
		**Transistor	AFZ12	(68 -156 Mc/s)	865382
		Transistor	AFZ12A	(148-174 Mc/s)	FV05090
VT2		Transistor	OC171	(25-32.5 Mc/s)	865344
		Transistor	AFZ11	(32.5-68 Mc/s)	865381
		**Transistor	AFZ12	(68 -156 Mc/s)	865382
		Transistor	AFZ12A	(148-174 Mc/s)	FV05090
VT3		Transistor	OC171	(25 - 42 Mc/s)	865344
		Transistor	AFZ11	(42 - 54 Mc/s)	865381
		Transistor	OC171	(54 -108 Mc/s)	865344
		Transistor	AFZ11	(108-156 Mc/s)	865381
		Transistor	AFZ12B	(148-174 Mc/s)	FV05091
MR1		Diode	GEX66		705654

** AFZ12A or AFZ12B may also be used at the manufacturer's discretion.

TRANSFORMERS

†T1	R.F.	(25-32.5 Mc/s)	278686/2
	R.F.	(32.5-88 Mc/s)	278584
	R.F.	(88 -108 Mc/s)	278584/9
	R.F.	(108-132 Mc/s)	278674/2
	R.F.	(132-174 Mc/s)	278665/2
	Iron dust core assembly		272757
†T2	Not used	(25 - 54 Mc/s)	
	Multiplier	(54 - 88 Mc/s)	278584/13
	Multiplier	(88 -108 Mc/s)	278584/14
	Multiplier	(108-132 Mc/s)	278674/6
	Multiplier	(132-174 Mc/s)	278665/6
	Iron dust core assembly		272757
†T3	R.F.	(25-32.5 Mc/s)	278686/4
	R.F.	(32.5-88 Mc/s)	278584/3
	R.F.	(88 -108 Mc/s)	278584/11
	R.F.	(108-132 Mc/s)	278674/4
	R.F.	(132-174 Mc/s)	278665/4
	Iron dust core assembly		272757

R.F. UNIT

Code	INDUCTORS	Part No.
†L1	Antenna matching coil (25-32.5 Mc/s)	278686
	Antenna matching coil (32.5-88 Mc/s)	278584/1
	Antenna matching coil (88 -108 Mc/s)	278584/6
	Antenna matching coil (108-132 Mc/s)	278674
	Antenna matching coil (132-174 Mc/s)	278665
	Iron dust core assembly	272757
†L2	1st r.f. amplifier coil (25-32.5 Mc/s)	278686/1
	1st r.f. amplifier coil (32.5-54 Mc/s)	278584/12
	1st r.f. amplifier coil (54 - 88 Mc/s)	278584/2
	1st r.f. amplifier coil (88 -108 Mc/s)	278584/7
	1st r.f. amplifier coil (108-132 Mc/s)	278674/1
	1st r.f. amplifier coil (132-174 Mc/s)	278665/1
	Iron dust core assembly	272757

Code	INDUCTORS (Cont.)	Part No.
L3	R.F. choke	279052
†L4	2nd r.f. amplifier coil (25-32.5 Mc/s)	278686/3
	2nd r.f. amplifier coil (32.5-68 Mc/s)	278584/5
	2nd r.f. amplifier coil (68 - 88 Mc/s)	278584/19
	2nd r.f. amplifier coil (88 -108 Mc/s)	278584/8
	2nd r.f. amplifier coil (108-132 Mc/s)	278674/3
	2nd r.f. amplifier coil (132-174 Mc/s)	278665/3
	Iron dust core assembly	272757
L5 3μH	R.F. choke	278582

†Components mounted in cans

PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (25-32.5 Mc/s) PART NO. 276250/9
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (32.5-42 Mc/s) PART NO. 276250/4
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (42 - 54 Mc/s) PART NO. 276250/3
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (54 - 68 Mc/s) PART NO. 276250/8
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (68 - 88 Mc/s) PART NO. 276250
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (88 -108 Mc/s) PART NO. 276250/2
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (108-132 Mc/s) PART NO. 276250/6
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (132-156 Mc/s) PART NO. 276250/7
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (148-174 Mc/s) PART NO. 276250/1

FIRST I.F. UNIT

Code		CAPACITORS			Part No.
C101	0.1μF	Foil			653632
C102	0.1μF	Foil			653632
C103	334pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10720
	*75pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ08352
or	80pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ08380
C104	0.1μF	Foil			653632
C105	18pF	Silver mica	350V	±1pF	660835
C106	204pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10020
	*57pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07320
or	60pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07600
C107	0.1μF	Foil			653632
C108	204pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10020
	*57pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07320
or	60pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07600
C109	18pF	Silver mica	350V	±1pF	660835
C110	204pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10020
	*57pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07320
or	60pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07600
C111	0.1μF	Foil			653632
C112	204pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10020
	*57pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07320
or	60pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ07600
C113	12pF	Silver mica	350V	±1pF	660856
C114	370pF	Polystyrene (25 - 68 Mc/s)	125V	± 1%	PQ10868
	*110pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ08655
or	106pF	Polystyrene (68 -174 Mc/s)		± 1%	PQ08530
C115	0.1μF	Foil			653632
C116	30μF	Electrolytic	15V		266597
C117		Not used			
C118		Not used			
C119		Not used			
C120		Not used			
C121	0.1μF	Foil			653632
C122	0.1μF	Foil			653632

RESISTORS

R101	33kΩ	Composition	0.1W	±10%	267472
R102	4.7kΩ	Composition	0.1W	±10%	267462
R103	1.8kΩ	Composition	0.1W	±10%	267457
R104	1kΩ	Composition (25 - 68 Mc/s)	0.1W	±10%	267454
	820Ω	Composition (68 - 174 Mc/s)	0.1W	± 5%	NE82103

Code		RESISTORS (Cont.)			Part No.
R105	33kΩ	Composition	0.1W	±10%	267472
R106	4.7kΩ	Composition	0.1W	±10%	267462
R107	270Ω	Composition	0.1W	±10%	267447
R108	2.2kΩ	Composition	0.1W	±10%	267458
R109	1kΩ	Composition (25 - 68 Mc/s)	0.1W	±10%	267454
	820Ω	Composition (68 -174 Mc/s)	0.1W	± 5%	NE82103
R110	33kΩ	Composition	0.1W	±10%	267472
R111	4.7kΩ	Composition	0.1W	±10%	267462
R112	2.7kΩ	Composition	0.1W	±10%	267459
R113	1kΩ	Composition (25 - 68 Mc/s)	0.1W	±10%	267454
	820Ω	Composition (68 -174 Mc/s)	0.1W	± 5%	NE82103
R114	220Ω	Composition	0.1W	±10%	267446

SEMICONDUCTORS

VT101	Transistor OC171	865344
VT102	Transistor OC171	865344
VT103	Transistor OC171	865344

TRANSFORMERS

T101	1st i.f.	278583
	Iron dust core assembly	272802
T102	1st i.f.	278583/1
	Iron dust core assembly	272802
T103	1st i.f.	278583/1
	Iron dust core assembly	272802
T104	1st i.f.	278583/3
	Iron dust core assembly	272802

INDUCTORS

L101	Coupling coil	278583/2
	Iron dust core assembly	272802
L102	Coupling coil	278583/2
	Iron dust core assembly	272802

* Selected on manufacture

PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (25 - 68 Mc/s) PART NO.276251/1
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (68 -174 Mc/s) PART NO.276251

SECOND MIXER UNIT

Code	CAPACITORS			Part No.
C201	33pF	Silver mica	350V ±1pF	660847
C202	0.1μF	Foil		653632
C203	220pF	Silver mica	200V ± 2%	660865
C204	100pF	Silver mica	350V ± 2%	660857
C205	390pF	Silver mica	350V ± 2%	664587
C206	0.1μF	Foil		653632
C207	39pF	Silver mica	350V ±1pF	660864
C208	30μF	Electrolytic	15V	266597
C209	10nF	Foil	150V	PQ25000
C210	0.1μF	Foil		653632

	RESISTORS			
R201	470Ω	Composition	0.1W ±10%	267450
R202	1.5kΩ	Composition	0.1W ±10%	NG15203
R203	1kΩ	Composition	0.1W ±10%	267454
R204	27kΩ	Composition	0.1W ±10%	267471
R205	27kΩ	Composition	0.1W ±10%	267471
R206	470Ω	Composition	0.1W ±10%	267450
R207	15kΩ	Composition	0.1W ±10%	267468
R208	1.2kΩ	Composition	0.1W ±10%	267455
R209	2.2kΩ	Composition	0.1W ±10%	267458
R210	470Ω	Composition	0.1W ±10%	267450

Code	SEMICONDUCTORS		Part No.
VT201	Transistor	GET887	865376
VT202	Transistor	OC171	865344
MR201	Diode	OA73	707804

	MISCELLANEOUS	
†T201	2nd i.f. transformer	278578
	Iron dust core assembly	272772
L201	Choke	279052
XL201	Crystal	

When ordering crystals, please state exact frequency and type required (see Appendix)

†Components mounted in cans

PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (25 - 68 Mc/s) PART NO.276252/1
PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE (68 -174 Mc/s) PART NO.276252
BAND PASS FILTER (25 kc/s) PART NO.260008
BAND PASS FILTER (50 kc/s) PART NO.260040

SECOND I.F. UNIT

Code	CAPACITORS			Part No.
C301	10nF	Foil	150V	PQ25000
C302	0.1μF	Foil		653632
C303	10nF	Foil	150V	PQ25000
C304	0.1μF	Foil		653632
C305	39pF	Ceramic	±10%	266284
C306	180pF	Silver mica	± 2%	PP09651
C307	0.1μF	Foil		653632
C308	0.1μF	Foil		653632
C309	0.1μF	Foil		653632
C310	0.1μF	Foil		653632
C311	0.1μF	Foil		653632
C312	10nF	Foil	150V	PQ25000
C313	1.5nF	Polystyrene	125V ± 5%	653724
C314	0.1μF	Foil		653632
C315		Not used		
C316	470pF	Disc ceramic	±20%	266126
C317	2nF	Disc ceramic	+40% -20%	660461
C318	0.1μF	Foil		653632
C319	25μF	Electrolytic	12V	PS28005
C320	2nF	Disc ceramic	+40% -20%	660461
C321	0.22μF	Polyester	125V	653608
C322	10nF	Foil	150V	PQ25000
C323	0.47μF	Polyester	125V	653610
C324	30μF	Electrolytic	15V	266597
C325	0.1μF	Foil		653632
C326	30μF	Electrolytic	15V	266597
C327	0.22μF	Polyester	125V	653608
C328	220pF	Ceramic	±10%	PN20028

	RESISTORS			
R301	10kΩ	Composition	0.1W ±10%	267466
R302	1.5kΩ	Composition	0.1W ±10%	267456
R303	1kΩ	Composition	0.1W ±10%	267454
R304	1.8kΩ	Composition	0.1W ±10%	267457
R305	1kΩ	Composition	0.1W ±10%	267454
R306	3.3kΩ	Composition	0.1W ±10%	267460
R307	3.3kΩ	Composition	0.1W ±10%	267460
R308	2.2kΩ	Composition	0.1W ±10%	267458
R309	270Ω	Composition	0.1W ±10%	267447
R310	2.2kΩ	Composition	0.1W ±10%	267458
R311	22Ω	Composition	0.1W ±10%	267434
R312	1kΩ	Composition	0.1W ±10%	267454
R313		Not used		
R314	10kΩ	Composition	0.1W ±10%	267466

Code	RESISTORS (Cont.)			Part No.
R315	2.2kΩ	Composition	0.1W ±10%	267458
R316	1kΩ	Composition	0.1W ±10%	267454
R317	220Ω	Composition	0.1W ±10%	267446
R318	22Ω	Composition	0.1W ±10%	267434
R319	330Ω	Composition	0.1W ±10%	267448
R320	820Ω	Composition	0.1W ±10%	267453
R321	10kΩ	Composition	0.1W ±10%	267466
R322	470Ω	Composition	0.1W ±10%	267450
R323	68kΩ	Composition	0.1W ±10%	267476
R324	270Ω	Composition	0.1W ±10%	267447
R325	1kΩ	Composition	0.1W ±10%	267454
R326	22kΩ	Composition	0.1W ±10%	267470
R327	22kΩ	Composition	0.1W ±10%	267470
R328	1kΩ	Composition	0.1W ±10%	267454
R329	47kΩ	Composition	0.1W ±10%	267474
R330	47kΩ	Composition	0.1W ±10%	267474
R331	47kΩ	Composition	0.1W ±10%	267474
R332	47kΩ	Composition	0.1W ±10%	267474
R333	1kΩ	Composition	0.1W ±10%	267454
R334	47kΩ	Composition	0.1W ±10%	267474
R335	270Ω	Composition	0.1W ±10%	267447
R336	4.7kΩ	Composition	0.1W ±10%	267462
R337	10kΩ	Composition	0.1W ±10%	267466
R338	22Ω	Composition	0.1W ±10%	267434
R339	270Ω	Composition	0.1W ±10%	267447

	SEMICONDUCTORS		
VT301	Transistor	GET887	865376
VT302	Transistor	GET887	865376
VT303	Transistor	GET887	865376
VT304	Transistor	GET887	865376
VT305	Transistor	GET887	865376
VT306	Transistor	NKT223A	865496
VT307	Transistor	NKT223A	865496
MR301	Diode	OA81	707302
MR302	Diode	OA95	707842
MR303	Diode	OA81	707302
MR304	Diode	OA200	721601
MR305	Diode	OA200	721601

	TRANSFORMERS	
†T301	2nd i.f.	278578
	Iron dust core assembly	272772
†T302	2nd i.f.	278578/2
	Iron dust core assembly	272772

† Components mounted in cans

PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE PART NO. 276253/3

SQUELCH UNIT

Code		RESISTORS		Part No.
R401	22kΩ	Composition	0.25W ±10%	671522
R402	270Ω	Composition	0.25W ±10%	671499
R403	4.7kΩ	Composition	0.25W ±10%	671514
R404	10kΩ	Composition	0.25W ±10%	671518

Code		MISCELLANEOUS		Part No.
C401	2μF	Electrolytic capacitor	150V	680460
VT401		Transistor OC200		286070

PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE PART NO.276255

A.F. SECTION

Code		CAPACITORS		Part No.
C501	10nF	Disc ceramic		660006
C502	1nF	Disc ceramic		660433
C503	0.47μF	Polyester	125V	653610
C504	100μF	Electrolytic	25V	266395
C505	0.47μF	Polyester	125V	653610
C506	100μF	Electrolytic	25V	266395
C507	8μF	Electrolytic	100V	PS22061
C508	25μF	Electrolytic	12V	PS28005
C509	10nF	Tubular	200V	PR14000
C510	1nF	Disc ceramic		660433
C511	1nF	Disc ceramic		660433
C512	2μF	Electrolytic	6V	680426
C513	10nF	Tubular	200V	PR14000
C514	8μF	Electrolytic	12V	PS22080
C515	100μF	Electrolytic	6V	PS38011
C516a	1000μF	Electrolytic	15V	266600
C516b	1000μF			
C517	10μF	Electrolytic	50V	PS23009
C518	10nF	Disc ceramic	1400V	660040
C519	0.1μF	Foil		653632

RESISTORS

R501	10kΩ	Composition	0.1W ±10%	267466
R502	680Ω	Composition	0.1W ±10%	267452
R503	1.2kΩ	Composition	0.1W ±10%	267455
R504	470kΩ	Composition	0.1W ±10%	267486
R505	220Ω	Composition	0.1W ±10%	267446
R506	47kΩ	Composition	0.1W ±10%	267474
R507	47kΩ	Composition	0.1W ±10%	267474
R508	4.7kΩ	Composition	0.1W ±10%	267462
R509	10kΩ	Composition	0.1W ±10%	267466
R510	10kΩ	Composition	0.1W ±10%	267466
R511	1kΩ	Composition	0.1W ±10%	267454
R512	5.6kΩ	Composition	0.1W ±10%	267463
R513	820Ω	Composition	0.1W ±10%	267453
*R514	22Ω	Composition	0.1W ±10%	267434
	or 27Ω	Composition	0.1W ±10%	267435
	or 33Ω	Composition	0.1W ±10%	267436
	or 39Ω	Composition	0.1W ±10%	267437
	or 47Ω	Composition	0.1W ±10%	267438
	or 56Ω	Composition	0.1W ±10%	267439
	or 68Ω	Composition	0.1W ±10%	267440
	or 82Ω	Composition	0.1W ±10%	267441
	or100Ω	Composition	0.1W ±10%	267442
	or120Ω	Composition	0.1W ±10%	267443
	or150Ω	Composition	0.1W ±10%	267444
	or180Ω	Composition	0.1W ±10%	267445
	or220Ω	Composition	0.1W ±10%	267446

Code		RESISTORS (Cont.)		Part No.
R515	18kΩ	Composition	0.1W ±10%	267469
R516	5.6kΩ	Composition	0.1W ±10%	267463
R517	1.5kΩ	Composition	0.1W ±10%	267456
R518	100Ω	Composition	0.25W ±10%	671494
R519	3.3kΩ	Composition	0.25W ±10%	671512
R520	680Ω	Composition	0.25W ±10%	671504
R521	22Ω	Composition	0.1W ±10%	267434
R522	12Ω	Composition	0.25W ±10%	671483
R523	100Ω	Composition	0.25W ±10%	671494
R524	100Ω	Composition	0.25W ±10%	671494
R525	680Ω	Composition	0.25W ±10%	671504
R526	0.25Ω	Wirewound	0.75W ±10%	267394
R527	0.25Ω	Wirewound	0.75W ±10%	267394
R528	680Ω	Composition	0.25W ±10%	671504
R529	100Ω	Composition	0.25W ±10%	671494
R530	2.2Ω	Wirewound	0.5W ±10%	PG02240

*Selected on manufacture

TH501	Thermistor VA1063		PL23022

SEMICONDUCTORS

VT501	Transistor OC200		286070
VT502	Transistor NKT223A		865496
VT503	Transistor NKT223A		865496
VT504	Transistor NKT223A		865496
VT505	Transistor NKT404		865460
VT506	Transistor NKT404	Matched pair	286071
VT507	Transistor NKT404		286071
MR501	Diode OA81		707302

INDUCTORS

L501	100mH	Audio choke	279836/1
L502	0.5H	Filter choke	279840
L503		Filter choke	279052

TRANSFORMERS

T501	Audio driver	277895
T502	Audio output	277892
T503	Modulation output	277894/1

MISCELLANEOUS

LS	3Ω	Loudspeaker	285029

A.F. UNIT PRINTED CIRCUIT BOARD ASSEMBLY COMPLETE PART NO.276257

TRANSMITTER

CAPACITORS

Code					Part No.
C601	1nF	Disc ceramic			660433
C602	1nF	Disc ceramic			660433
C603	1nF	Disc ceramic			660433
C604	47pF	Ceramic	(25-32.5 Mc/s)	± 5%	PN13105
	15pF	Ceramic	(32.5-42 Mc/s)	± 5%	266494
	33pF	Ceramic	(42 - 54 Mc/s)	± 5%	PN12075
	15pF	Ceramic	(54 - 68 Mc/s)	± 5%	266494
	18pF	Ceramic	(68 - 88 Mc/s)	± 5%	266485
	27pF	Ceramic	(88 -108 Mc/s)	± 5%	266487
	22pF	Ceramic	(108-132 Mc/s)	± 5%	266486
	39pF	Ceramic	(132-156 Mc/s)	± 5%	266488
	27pF	Ceramic	(148-174 Mc/s)	± 5%	266487
C605	10pF	Ceramic		±1pF	266279
C606	47pF	Ceramic		±10%	266285
C607	100pF	Ceramic		±10%	266287
C608		Not used	(25 - 68 Mc/s)		
	1nF	Disc ceramic	(68 -174 Mc/s)		660433
C609		Not used	(25 - 68 Mc/s)		
	1nF	Disc ceramic	(68 -174 Mc/s)		660433
C610		Not used	(25 - 68 Mc/s)		
	56pF	Ceramic	(68 - 88 Mc/s)	± 5%	PN14110
	10pF	Ceramic	(88 -108 Mc/s)	±0.5pF	266308
	47pF	Ceramic	(108-132 Mc/s)	± 5%	266578
	27pF	Ceramic	(132-156 Mc/s)	± 5%	266577
	18pF	Ceramic	(148-174 Mc/s)	± 5%	266505
C611		Not used	(25 - 68 Mc/s)		
	1nF	Disc ceramic	(68 -174 Mc/s)		660433
C612		Not used	(25 - 68 Mc/s)		
	100pF	Ceramic	(68 -174 Mc/s)	±10%	266287
C613	1nF	Disc ceramic			660433
C614	10nF	Disc ceramic			660006
C615	22pF	Ceramic	(25-32.5 Mc/s)	± 5%	266506
	39pF	Ceramic	(32.5-42 Mc/s)	± 5%	PN12152
	22pF	Ceramic	(42 - 54 Mc/s)	± 5%	266506
	8.2pF	Ceramic	(54 - 68 Mc/s)	±0.25pF	PN07040
	10pF	Ceramic	(68 - 88 Mc/s)	±0.5pF	266308
	2pF	Ceramic	(88 -108 Mc/s)	±0.25pF	266576
	12pF	Ceramic	(108-132 Mc/s)	± 5%	266503
	6.8pF	Ceramic	(132-156 Mc/s)	±0.5pF	266277
	2pF	Ceramic	(148-174 Mc/s)	±0.25pF	266576
C616	1nF	Disc ceramic			660433
C617	22pF	Ceramic	(25-32.5 Mc/s)	± 5%	266506
	39pF	Ceramic	(32.5-42 Mc/s)	± 5%	PN12152
	18pF	Ceramic	(42 - 54 Mc/s)	± 5%	266505
	8.2pF	Ceramic	(54 - 68 Mc/s)	±0.25pF	PN07040
	12pF		(68 - 88 Mc/s)	± 5%	266503
	3.3pF	Ceramic	(88 -108 Mc/s)	±0.25pF	266575
	22pF	Ceramic	(108-132 Mc/s)	± 5%	266506
	10pF	Ceramic	(132-156 Mc/s)	±0.5pF	266308
	5.6pF	Ceramic	(148-174 Mc/s)	±0.25pF	PN04132
C618	1nF	Disc ceramic			660433
C619	10nF	Disc ceramic			660006
C620	10nF	Disc ceramic	(25 -108 Mc/s)		660006
	1-12pF	Trimmer	(108-174 Mc/s)		280057
C621	2.4-30pF	Variable	(25 - 68 Mc/s)		280059
		Variable	(68 -108 Mc/s)		280063
		Variable	(108-174 Mc/s)		800444
C622	1nF	Disc ceramic			660433
C623		Variable			800444
C624	1nF	Disc ceramic			660433
C625	1nF	Disc ceramic			660433
C626		Variable	(25 - 68 Mc/s)		800445
		Variable	(68 -174 Mc/s)		800070
C627	1nF	Disc ceramic			660433
C628	2.4-30pF	Variable			280059
C629	100pF	Ceramic	(25-32.5 Mc/s)	± 2%	266573
	82pF	Ceramic	(32.5-42 Mc/s)	± 2%	266500
	100pF	Ceramic	(42 - 54 Mc/s)	± 2%	266573
	68pF	Ceramic	(54 - 68 Mc/s)	± 2%	266502
	39pF	Ceramic	(68 - 88 Mc/s)	± 2%	266484
	33pF	Ceramic	(88 -108 Mc/s)	± 2%	266479
	27pF	Ceramic	(108-132 Mc/s)	± 2%	266490
	15pF	Ceramic	(132-174 Mc/s)	±2.5%	266482
C630	100pF	Ceramic	(25-32.5 Mc/s)	± 2%	266573
	82pF	Ceramic	(32.5-42 Mc/s)	± 2%	266500
	100pF	Ceramic	(42 - 54 Mc/s)	± 2%	266573
	68pF	Ceramic	(54 - 68 Mc/s)	± 2%	266502
	39pF	Ceramic	(68 - 88 Mc/s)	± 2%	266484
	33pF	Ceramic	(88 -108 Mc/s)	± 2%	266479
	27pF	Ceramic	(108-132 Mc/s)	± 2%	266490
	15pF	Ceramic	(132-174 Mc/s)	±2.5%	266482
C631		Not used	(25 - 88 Mc/s)		
	3.3pF	Ceramic	(88 - 98 Mc/s)	±0.25pF	266575
		Not used	(98 -174 Mc/s)		

CAPACITORS (Cont.)

Code					Part No.
C632		Not used	(25 - 88 Mc/s)		
	3.3pF	Ceramic	(88 - 98 Mc/s)	±0.25pF	266575
		Not used	(98 -174 Mc/s)		
C633	2pF	Ceramic	(25 - 68 Mc/s)	±0.25pF	266576
		Not used	(68 -174 Mc/s)		
C634	27pF	Silver mica	(25-32.5 Mc/s)	±1pF	660846
	18pF	Silver mica	(32.5-42 Mc/s)	±1pF	660835
		Not used	(42 -174 Mc/s)		
C635	1µF	Polyester	250V (single frequency equipment only)		PQ37503
C636	1nF	Disc ceramic			660433

RESISTORS

R601	27kΩ	Composition		0.25W ±10%	671523
R602	1kΩ	Composition		0.25W ±10%	671506
R603	150kΩ	Composition		0.25W ±10%	671532
R604	1kΩ	Composition		0.25W ±10%	671506
R605		Not used	(25 - 68 Mc/s)		
	120kΩ	Composition	(68 -174 Mc/s)	0.25W ±10%	671531
R606		Not used	(25 - 68 Mc/s)		
	100kΩ	Composition	(68 -174 Mc/s)	0.25W ±10%	671530
R607		Not used	(25 - 68 Mc/s)		
	1kΩ	Composition	(68 -174 Mc/s)	0.25W ±10%	671506
R608		Not used	(25 - 68 Mc/s)		
	1kΩ	Composition	(68 -174 Mc/s)	0.25W ±10%	671506
R609	220kΩ	Composition	(25 - 68 Mc/s)	0.25W ±10%	671534
	82kΩ	Composition	(68 -174 Mc/s)	0.25W ±10%	671529
R610	100kΩ	Composition		0.25W ±10%	671530
R611	1kΩ	Composition		0.25W ±10%	671506
R612	1kΩ	Composition		0.25W ±10%	671506
R613	82kΩ	Composition		0.25W ±10%	671529
R614	1kΩ	Composition		0.25W ±10%	671506
R615	330Ω	Composition		0.25W ±10%	671500
R616	33kΩ	Composition		0.25W ±10%	671524
R617	1kΩ	Wirewound		± 5%	679135
R618	10Ω	Wirewound		± 5%	679134
R619	47Ω	Composition		0.25W ±10%	671490
R620	39kΩ	Composition		0.25W ±10%	671525
R621	15kΩ	Composition		0.25W ±10%	671520
R622	47Ω	Composition		0.25W ±10%	671490

VALVES

V601	6BH6		860099
V602	Not used	(25 - 68 Mc/s)	
	6BH6	(68 -174 Mc/s)	860099
V603	QQV03-10		860395
V604	QQV03-10		860395

INDUCTORS

†L601	Oscillator anode coil		278576/11
	Iron dust core assembly		272770
L602	Cathode choke		279051
†L603	Not used	(25 - 68 Mc/s)	
	Multiplier anode coil	(68 - 88 Mc/s)	278576/9
	Multiplier anode coil	(88 -108 Mc/s)	278576/10
	Multiplier anode coil	(108-174 Mc/s)	278576/9
	Iron dust core assembly		272769
L604	Driver anode coil	(25-32.5 Mc/s)	278668
	Driver anode coil	(32.5-42 Mc/s)	278670/3
	Driver anode coil	(42 - 54 Mc/s)	278667
	Driver anode coil	(54 - 68 Mc/s)	278667/1
	Driver anode coil	(68 - 88 Mc/s)	278663
	Driver anode coil	(88 -108 Mc/s)	278600/4
	Driver anode coil	(108-132 Mc/s)	278600/9
	Driver anode coil	(132-156 Mc/s)	AT31250/2
	Driver anode coil	(148-174 Mc/s)	278595/18
L605	P.A. grid coil	(25-32.5 Mc/s)	278669
	P.A. grid coil	(32.5-42 Mc/s)	278670/2
	P.A. grid coil	(42 - 54 Mc/s)	AT31629/1
	P.A. grid coil	(54 - 68 Mc/s)	278670/1
	P.A. grid coil	(68 - 88 Mc/s)	278664
	P.A. grid coil	(88 -108 Mc/s)	278600/5
	P.A. grid coil	(108-132 Mc/s)	278600/3
	P.A. grid coil	(132-156 Mc/s)	AT31250/3
	P.A. grid coil	(148-174 Mc/s)	278600/8
L606	Not used		
L607	P.A. anode coil	(25-32.5 Mc/s)	278402/J
	P.A. anode coil	(32.5-42 Mc/s)	278402/H
	P.A. anode coil	(42 - 54 Mc/s)	278402/G
	P.A. anode coil	(54 - 68 Mc/s)	278402/F
	P.A. anode coil	(68 - 88 Mc/s)	278386/1
	P.A. anode coil	(88 -108 Mc/s)	278593/5
	P.A. anode coil	(108-132 Mc/s)	278593/3
	P.A. anode coil	(132-174 Mc/s)	278593/2

TRANSMITTER (Cont.)

Code	INDUCTORS (Cont.)		Part No.
L608	Antenna coupling coil	(25 - 68 Mc/s)	278443
	Antenna coupling coil	(68 - 88 Mc/s)	278592/2
	Antenna coupling coil	(88 -174 Mc/s)	278592/3
L609	Antenna filter coil	(25-32.5 Mc/s)	278600/7
	Antenna filter coil	(32.5-42 Mc/s)	278595/12
	Antenna filter coil	(42 - 54 Mc/s)	278595/13
	Antenna filter coil	(54 - 68 Mc/s)	278595/14
	Antenna filter coil	(68 -132 Mc/s)	278595/8
	Antenna filter coil	(132-174 Mc/s)	278595/9
L610	Antenna filter coil	(25-32.5 Mc/s)	278600/7
	Antenna filter coil	(32.5-42 Mc/s)	278595/12
	Antenna filter coil	(42 - 54 Mc/s)	278595/13
	Antenna filter coil	(54 - 68 Mc/s)	278595/14
	Antenna filter coil	(68 -132 Mc/s)	278595/8
	Antenna filter coil	(132-174 Mc/s)	278595/9

TRANSFORMERS

†T601	Multiplier	(25-32.5 Mc/s)	277156/21
	Multiplier	(32.5-68 Mc/s)	277156/28
	Multiplier	(68 -108 Mc/s)	277156/6
	Multiplier	(108-174 Mc/s)	277156/7
	Iron dust core assembly		272769

Code	TEST POINTS		Part No.
TP601	Test point pin		270842
	Brown insulator		712622/2
TP602	Not used	(25 - 68 Mc/s)	
	Test point pin	(68 -174 Mc/s)	270842
	Yellow insulator	(68 -174 Mc/s)	712622/4
TP603	Test point pin		270842
	Blue insulator		712622/5
TP604	Test point pin		270842
	White insulator		712622/6
TP605	Test point pin		270842
	Orange insulator		712622/3
TP606	Test point pin		270842
	Red insulator		712622/7

RELAYS

†RLA	330Ω	Antenna changeover	283071
†RLB	170Ω	Transmit	FR02691

MISCELLANEOUS

SKTF	Antenna socket	272332
MIC	Microphone and lead assembly	274671/3

†Components mounted in cans

POWER SUPPLY

Code	CAPACITORS			Part No.
C701	500μF	Electrolytic	25V	PS46005
C702a	16μF	Electrolytic	450V	680431
C702b	2μF			
C703	1nF	Disc ceramic		660433
C704	250μF	Electrolytic	25V	PS41001
C705		Not used		
C706	1nF	Disc ceramic		660433
C707	1nF	Disc ceramic		660433
C708	1nF	Disc ceramic		660433
C709	1nF	Disc ceramic		660433
C710	1nF	Disc ceramic		660433
C711	1nF	Disc ceramic		660433
C712	1nF	Disc ceramic		660433
C713	1nF	Disc ceramic		660433
C714	1nF	Disc ceramic		660433
C715	1nF	Disc ceramic		660433
C716	1nF	Disc ceramic		660433
C717	1nF	Disc ceramic		660433
C718	2nF	Disc ceramic	+40% -20%	660461
C719	2nF	Disc ceramic	+40% -20%	660461

RESISTORS

R701	100Ω	Wirewound	5W ± 5%	267054
R702	1.2kΩ	Composition	0.25W ±10%	671507
R703	6.2Ω	Wirewound	0.5W ± 5%	679136
R704	47Ω	Wirewound (25 - 68 Mc/s)	3W ± 5%	PE47071
		Not used (68 -174 Mc/s)		

Code	INDUCTORS	Part No.
L701	Smoothing choke	279051
L702	Choke	279059
L703	Filter choke	279053
L704	Filter choke	279059
L705	Filter choke	279059

SEMICONDUCTORS

VT701	Transistor NKT404	matched pair	286071
VT702	Transistor NKT404		286071
MR701a	Diode SX634		724454
MR701b	Diode SX634		724454
MR701c	Diode SX634		724454
MR701d	Diode SX634		724454
MR702	Diode FSD2197C		724460

FUSES

FS701	10A	271539
FS702	10A	271539

MISCELLANEOUS

T701	Converter transformer	277893

CRYSTAL ASSEMBLY AND FRONT PANEL CONTROLS

Code		CAPACITORS			Part No.
C801	2nF	Disc ceramic (switched channel only)		+40% -20%	660461
C802	0.1μF	Polyester	125V		653606
C803	1-12pF	Trimmer (switched channel only)			280057
C804	1-12pF	Trimmer (switched channel only)			280057
C805	1-12pF	Trimmer (switched channel only)			280057
C806	1-12pF	Trimmer (switched channel only)			280057
C807	1-12pF	Trimmer (switched channel only)			280057
C808	1-12pF	Trimmer			280057
C809	10pF	Ceramic (single channel only)(25 -148 Mc/s)			266308
	6.8pF	Ceramic (single channel only)(148-174 Mc/s)		±0.5pF	652653
C810	1nF	Disc ceramic			660433
C811		Not used			
C812	2nF	Disc ceramic		+40% -20%	660461
		RESISTORS			
R801	680Ω	Composition (switched channel only)	0.25W	±10%	671504
R802	680Ω	Composition (switched channel only)	0.25W	±10%	671504
R803	680Ω	Composition (switched channel only)	0.25W	±10%	671504
R804	680Ω	Composition (switched channel only)	0.25W	±10%	671504
R805	680Ω	Composition (switched channel only)	0.25W	±10%	671504
R806	680Ω	Composition	0.25W	±10%	671504
R807	2.2kΩ	Composition	0.25W	±10%	671510
R808	680kΩ	Composition	0.25W	±10%	671540
RV801	5kΩ	Potentiometer (VOLUME control)			281147
RV802	1kΩ	Potentiometer (SQUELCH control)			281137

INDUCTORS

L801	Crystal trimming coil (switched channel only) (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (switched channel only) (88 -108 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (108-132 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (132-156 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1
L802	Crystal trimming coil (switched channel only) (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (switched channel only) (88 -108 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (108-132 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (132-156 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1
L803	Crystal trimming coil (switched channel only) (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (switched channel only) (88 -108 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (108-132 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (132-156 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1
L804	Crystal trimming coil (switched channel only) (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (switched channel only) (88 -108 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (108-132 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (132-156 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1
L805	Crystal trimming coil (switched channel only) (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (switched channel only) (88 -108 Mc/s)	278666/2
	Crystal trimming coil (switched channel only) (108-132 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (132-156 Mc/s)	278666/1
	Crystal trimming coil (switched channel only) (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1
L806	Crystal trimming coil (25-32.5 Mc/s)	278666/1
	Crystal trimming coil (32.5-42 Mc/s)	278666/2
	Crystal trimming coil (42 - 54 Mc/s)	278666/1
	Crystal trimming coil (54 - 68 Mc/s)	278666/2
	Crystal trimming coil (68 - 88 Mc/s)	278666/4
	Crystal trimming coil (88 -108 Mc/s)	278666/2
	Crystal trimming coil (108-132 Mc/s)	278666/1
	Crystal trimming coil (132-156 Mc/s)	278666/1
	Crystal trimming coil (148-174 Mc/s)	278666/6
	Iron dust core assembly	274823/1

SWITCHES

SA	POWER	283539
SB	CHANNEL (switched channel only)	283540

INDICATOR LAMPS

ILP801	12/14V	Supply (green)	0.75W	272232
ILP802	12/14V	Tx. on (red)	0.75W	272232

MISCELLANEOUS

TS801	4-way tag strip assembly	274269
XL801-XL805	Crystals (switched channel only)	
XL806	Crystal	
XL807-XL811	Crystals (switched channel only)	
XL812	Crystal	

When ordering crystals, please state exact frequency and type required (see Appendix)

MECHANICAL ITEMS

DESCRIPTION	Part No.
Cradle frame	244236
Cradle bracket	244237
Cradle support	244238
Microphone bracket	242367
Fuse holder body (white)	271562
Fuse holder body (black)	271562/1
Fuse holder cap (white)	271563
Fuse holder cap (black)	271563/1
Fuse holder solder nipple	271564
Fuse holder spring	271565
Battery connector block	248262
Hexagonal trimming tool	716964
Screwdriver trimming tool	716965
Double ended trimming tool	732669
Hexagon wrench	271947
Clip for above	271759/E
Case assembly	276304
Locating pin for above	230175
Case cover	276305
Cover fastener spring	711839
Front panel	248389/A
Escutcheon (single channel)	201635
Escutcheon (switched channel)	201634
Antenna trimmer cover plate	244239
Spigot for above	231232
Clip for above	200954
Washer for above	243624
Interconnection tag board (22-way)	274270
Bracket for above	276298
Bakelite spacer for above	410180
Printed circuit board spacer (6BA x $\frac{3}{8}$")	310309
Hexagonal pillar with screwdriver slot	231251
Hexagonal pillar with tapped hole	231286
Hinged printed circuit board bracket	244230
Hinged printed circuit board fastener spring	716904
Transistor mounting bracket	276297
Transistor insulating washer	243376
Transistor insulating bush	270682
Transistor heat sink	276300
B7G valveholder	708995
B7G valveholder with skirt	704735
B9A valveholder (under chassis mounting)	205354
B9A valveholder (above chassis mounting)	271519
B9A valveholder with skirt	705979

DESCRIPTION	Part No.
B7G valve screening can	706312
B9A valve screening can	706315
Valve retainer	271911
Valve mounting bracket	276303
Antenna filter bracket	276299
Band pass filter bracket	244229
Power amplifier screen	276366
Bracket for above	276368
Miniature feedthrough insulator	202637
Driver screen	244365
Second mixer screen	244240
First oscillator crystal chassis	244235
Crystal holder (single channel)	271498
Crystal holder (2 and 3 channels)	274676/A
Crystal holders (4, 5 and 6 channels)	274676/A & B
Crystal retainer (single channel)	271357
Crystal retainer (switched channel)	271885
Insulating washer for crystal trimming capacitor	243625
Control knob assembly	275902/6
Potentiometer locating plate	244234
Switch locating plate	244233
Channel switch stop	244241
Front panel plate assembly	276307
Loudspeaker plate assembly	276312
Loudspeaker bracket	244231
Loudspeaker grille	201636
Microphone lead grommet	FG02200
Lamp holder	272249
Lamp holder lens (red)	203378
Lamp holder lens (green)	203379
Clip for above	200953
Clip for $\frac{3}{8}$" diameter capacitor	700651
Clip for $\frac{5}{8}$" diameter capacitor	700653
Clip for $\frac{3}{4}$" diameter capacitor	700654
Clip for 1" diameter capacitor	700655
Cleat for 3/16" diameter cable	704790
Cleat for $\frac{1}{4}$" diameter cable	704791
Grommet for $\frac{1}{4}$" diameter hole	271702
Grommet for 5/16" diameter hole	271199
Grommet for $\frac{3}{8}$" diameter hole	271200
Antenna (25 - 60 Mc/s)	274090
Antenna (60 -140 Mc/s)	200023/3
Antenna (140-174 Mc/s)	200023/1
Telephone handset and lead	203628

INTRODUCTION

It is recommended that a dummy run through the procedure be carried out prior to aligning the receiver.

EQUIPMENT REQUIRED

1. Hum-free l.t. supply of 13.2V d.c.
2. Signal generator (see V.H.F. Signal Generators in Chapter IV).
3. Crystal controlled 455 kc/s marker oscillator (the Pye PT 503 is suitable).
4. 0-50μA meter with a resistance of 2.5kΩ (Avo Model 8 is suitable).
5. H.F. valve voltmeter or diode probe (see Fig. 8 on page 24) used in conjunction with a 0-50μA meter (Avo Model 8 is suitable).
6. Audio output meter reading up to 2W (most standard multi-range instruments are suitable).

FIRST LOCAL OSCILLATOR

Crystal trimmers L801-L806 must not be adjusted. except as described in Field Testing Procedure in Chapter III or against a frequency substandard (see Appendix).

ALIGNMENT PROCEDURE

Switched channel equipment should be aligned on the channel nearest to the centre frequency and the performance on the remaining channels checked after alignment. On equipment using two widely-spaced channels compromise tuning of the R.F. Unit must be used to equalise the performance on both channels. Performance figures quoted relate to channels within ±0.2% of the mean carrier frequency.

Any test of the R.F. Unit must be carried out with the SQUELCH control fully clockwise.

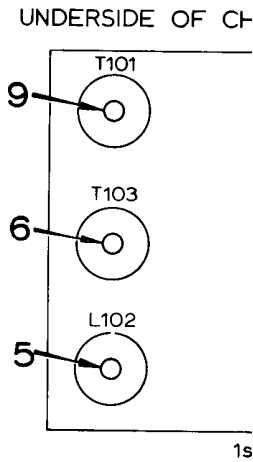
This procedure is for complete receiver re-alignment. When a component affecting alignment is replaced, only the associated printed circuit board need be re-aligned.

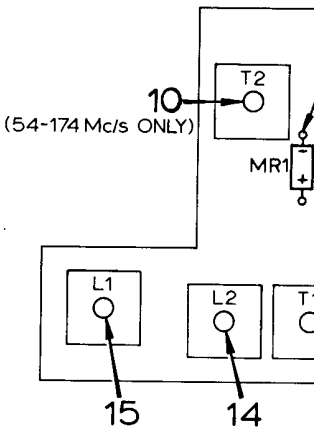
PRELIMINARY PROCEDURE

1. Connect the signal generator to the antenna socket and turn the SQUELCH control fully clockwise.
2. Hold the 455 kc/s oscillator close to the 2nd I.F. Unit and adjust the signal generator frequency for zero beat.
3. Connect the 0-50μA meter between the diode current test point (+ve) and the positive supply line (-ve) and adjust the signal generator output to obtain a meter reading of approximately 10μA.
4. Carry out the alignment procedure shown in the chart opposite, reducing the signal generator output as necessary to keep the meter reading from exceeding 16μA.

PERFORMANCE CHECK

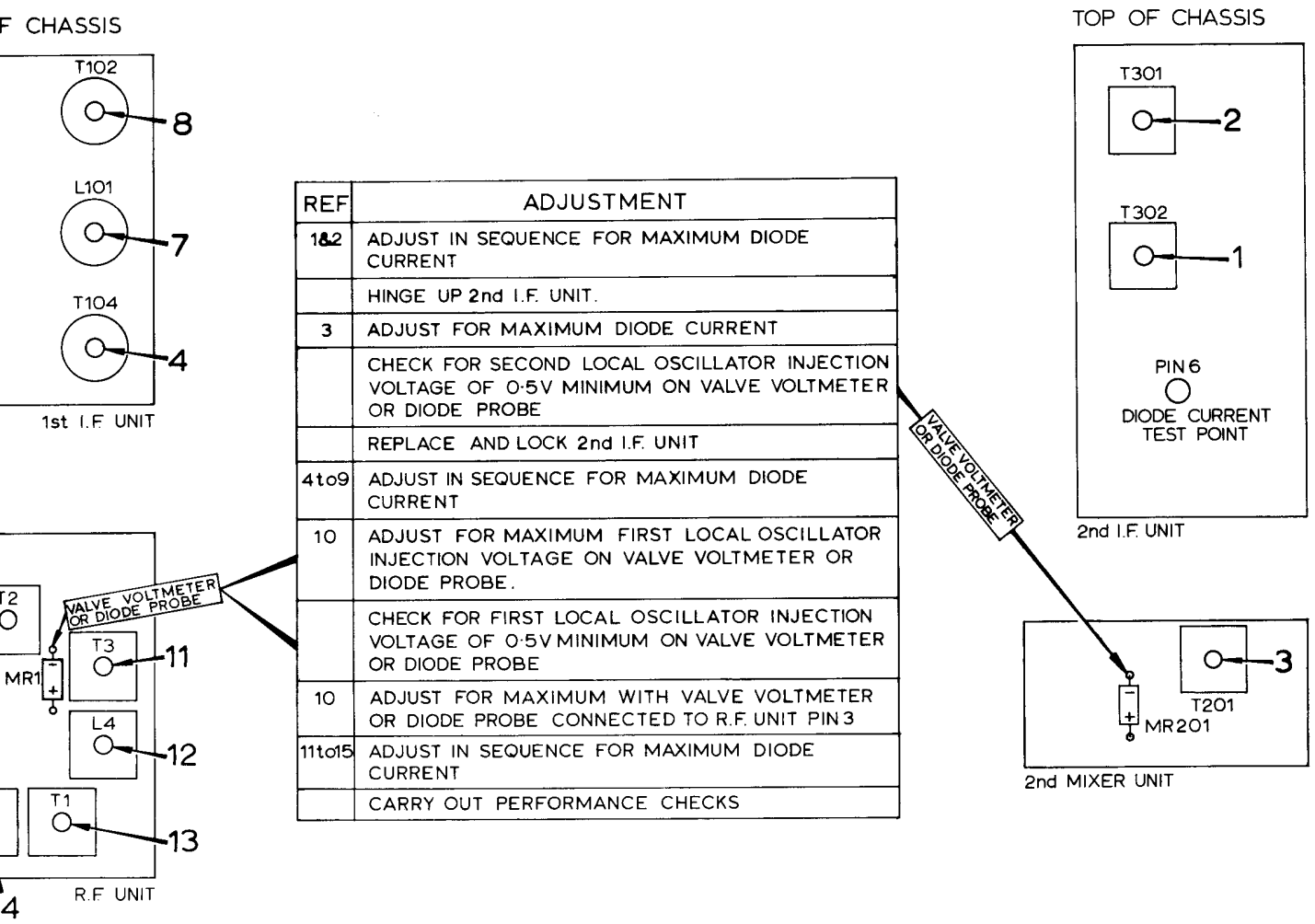
1. Remove the meter and connect the audio output meter, set to 30Ω impedance, in parallel with the loudspeaker.
2. With a signal generator output of 2μV e.m.f., adjust the VOLUME control to obtain an audio output of 100mW (10mW on meter) and check that the signal-to-noise ratio is not less than 12db (25-108 Mc/s) or 10db (108-174 Mc/s).
3. With a signal generator output of 0.5μV e.m.f. check that the audio output is not less than 500mW (50mW on meter).





NOTES:-

1. T2, T3, L4, T1, L1, L2 AR
AT BASE OF COIL (e.g.
2. A DOUBLE PEAK MAY BE
TUNE TO LARGER PEAI



REF	ADJUSTMENT
1&2	ADJUST IN SEQUENCE FOR MAXIMUM DIODE CURRENT
	HINGE UP 2nd I.F. UNIT.
3	ADJUST FOR MAXIMUM DIODE CURRENT
	CHECK FOR SECOND LOCAL OSCILLATOR INJECTION VOLTAGE OF 0·5V MINIMUM ON VALVE VOLTMETER OR DIODE PROBE
	REPLACE AND LOCK 2nd I.F. UNIT
4to9	ADJUST IN SEQUENCE FOR MAXIMUM DIODE CURRENT
10	ADJUST FOR MAXIMUM FIRST LOCAL OSCILLATOR INJECTION VOLTAGE ON VALVE VOLTMETER OR DIODE PROBE.
	CHECK FOR FIRST LOCAL OSCILLATOR INJECTION VOLTAGE OF 0·5V MINIMUM ON VALVE VOLTMETER OR DIODE PROBE
10	ADJUST FOR MAXIMUM WITH VALVE VOLTMETER OR DIODE PROBE CONNECTED TO R.F. UNIT PIN 3
11to15	ADJUST IN SEQUENCE FOR MAXIMUM DIODE CURRENT
	CARRY OUT PERFORMANCE CHECKS

L1, L2 ARE NORMALLY TUNED WITH CORE
OIL (e.g. THROUGH THE FORMER)
K MAY BE OBTAINED WHEN TUNING T3.
GER PEAK

Fig. 17 RECEIVER ALIGNMENT CHART
(AM 10 D Cambridge)

RECEIVER SENSITIVITY

The sensitivity at various points of the circuit may be checked as follows:-

Connect the 0-50μA meter between the diode current test point (+ve) and the positive supply line (-ve). Connect the signal generator, modulated 30% at 1000 c/s, to each of the points shown and check that the signal generator outputs required to give a diode current of 13μA approximate to the figures given below.

Test Point	Nominal Signal Level
Antenna socket	1.2μV e.m.f.
VT2 (2nd r.f. amplifier) base	3.1μV e.m.f.
MR1 (1st mixer) cathode	16μV e.m.f.
T101 (1st i.f. transformer)	3.6μV e.m.f.
VT101 (1st i.f. amplifier) base	7.6μV e.m.f.
VT102 (1st i.f. amplifier) base	8.6μV e.m.f.
VT103 (1st i.f. amplifier) base	13μV e.m.f.
MR201 (2nd mixer) cathode	26μV e.m.f.
T201 (2nd i.f. transformer)	10μV e.m.f.
VT201 (2nd i.f. amplifier) base	34μV e.m.f.
455 kc/s band pass filter input	24μV e.m.f.
455 kc/s band pass filter output	15μV e.m.f.
VT302 (2nd i.f. amplifier) base	24μV e.m.f.
VT303 (2nd i.f. amplifier) base	300μV e.m.f.
VT304 (emitter follower) base	11mV e.m.f.
VT305 (2nd i.f. amplifier) base	11mV e.m.f.

Connect the signal generator, modulated 30% at 1000 c/s, to the antenna socket and adjust the signal generator output to obtain a diode current of 13μA. Use the h.f. valve voltmeter to check the signal level at the points shown below.

MR302 (signal detector) cathode	600mV
MR304 (noise limiter) anode	150mV
VT307 (emitter follower) base	30mV
VT307 (emitter follower) emitter	30mV

With an r.f. signal input of 1mV, adjust the VOLUME control to obtain an audio output of 500mW and, using the valve voltmeter, check the signal level at the points shown below.

VT503 (audio amplifier) base	2.4mV
VT503 (audio amplifier) collector	82mV
VT504 (emitter follower) base	68mV
VT504 (emitter follower) emitter	65mV
VT505 (audio output driver) collector	1.34V
VT506, VT507 (audio output) base	104mV
VT506, VT507 (audio output) collector	6.7V

Band Pass Filter Check

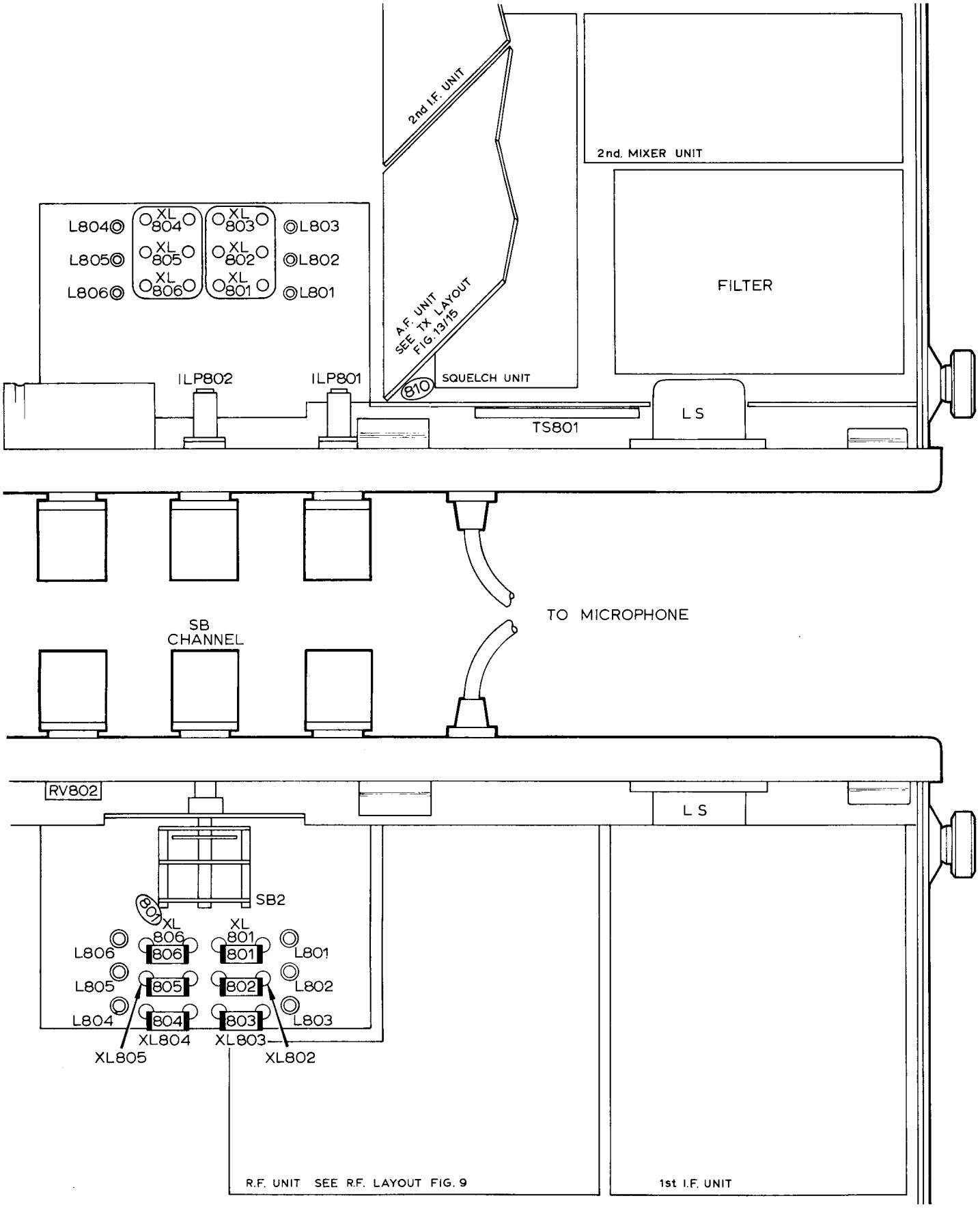
Check the insertion loss.

With an r.f. input to produce a diode current of 13μA, check that the signal level at the input of the filter is not more than 6db above that at its output.

TRANSMITTER MODULATOR SENSITIVITY

Connect the audio output meter to terminals 4 and 5 of the modulator output transformer T503 and connect the a.f. oscillator in place of the microphone, ensuring that a d.c. path exists between oscillator and modulator (i.e. a blocking capacitor must not be used). Remove the power amplifier (V604). With an audio input of 12mV at 1000 c/s, use the valve voltmeter to check the signal level at the points shown below.

Test Point	Nominal Signal Level
Oscillator output	12mV
VT502 (emitter follower) emitter	3.6mV
VT503 (modulator amplifier) collector	135mV
VT504 (emitter follower) emitter	100mV
VT505 (modulator driver) collector	4.8V
VT506, VT507 (modulator output) base	450mV
VT506, VT507 (modulator output) collector	4.8V


2nd I.F. UNIT
2nd. MIXER UNIT
FILTER
L804
L805
L806
XL 804
XL 805
XL 806
XL 803
XL 802
XL 801
L803
L802
L801
A.F. UNIT SEE TX LAYOUT FIG. 13/15
ILP802
ILP801
810
SQUELCH UNIT
TS801
L S
TO MICROPHONE
SB CHANNEL
RV802
L S
801
SB2
XL 806
XL 801
L806
806
801
L801
L805
805
802
L802
L804
804
803
L803
XL804
XL803
XL805
XL802
R.F. UNIT SEE R.F. LAYOUT FIG. 9
1st I.F. UNIT

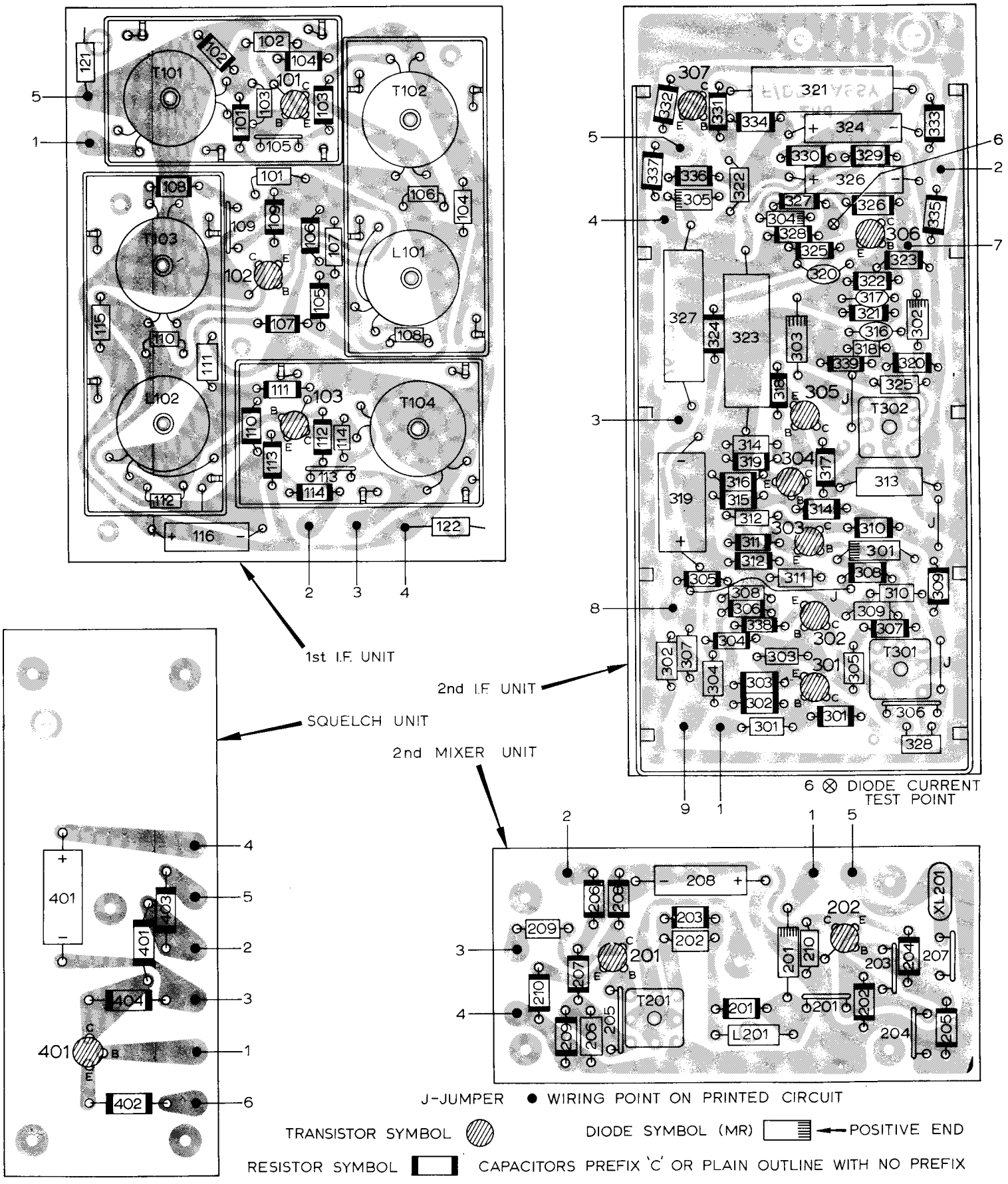
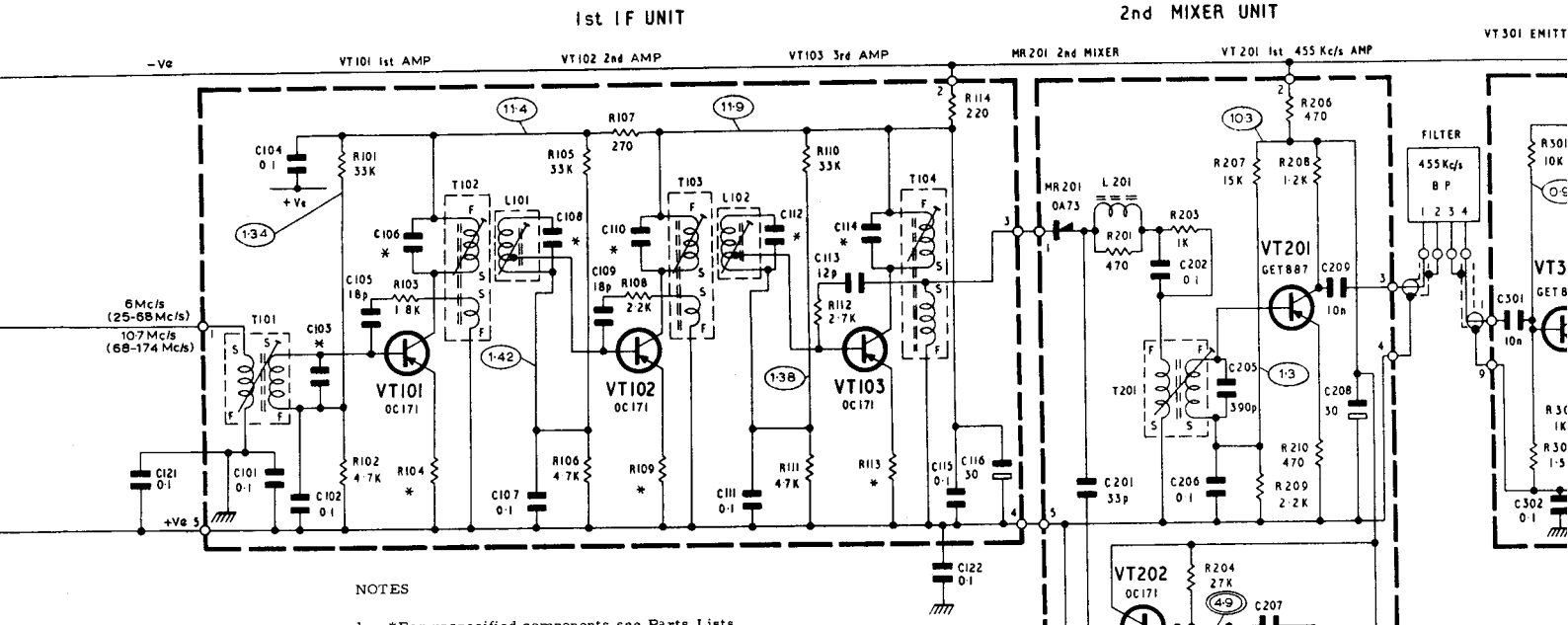


Fig. 11 RECEIVER I. F. COMPONENT LAYOUT DIAGRAM
(AM 10 D Cambridge)



NOTES

1. *For unspecified components see Parts Lists.
2. Resistors R311, R318 and R338 may be shorted out on some equipments.
3. (1.34) Typical voltages (negative with respect to positive line measured, with SQUELCH control fully anticlockwise and with no incoming signal, on Avo Model 8 (20,000Ω/volt) set to lowest appropriate d.c. voltage range.
4. (3.8) - Typical voltages with squelch open.
   (0.34) - Typical voltages with squelch closed.
5. (4.7) - Typical voltages with crystal (XL201) shorted.
6. All resistors quoted in Ω unless otherwise stated. All capacitors quoted in μF unless otherwise stated.

FIG.10

A.G.C.

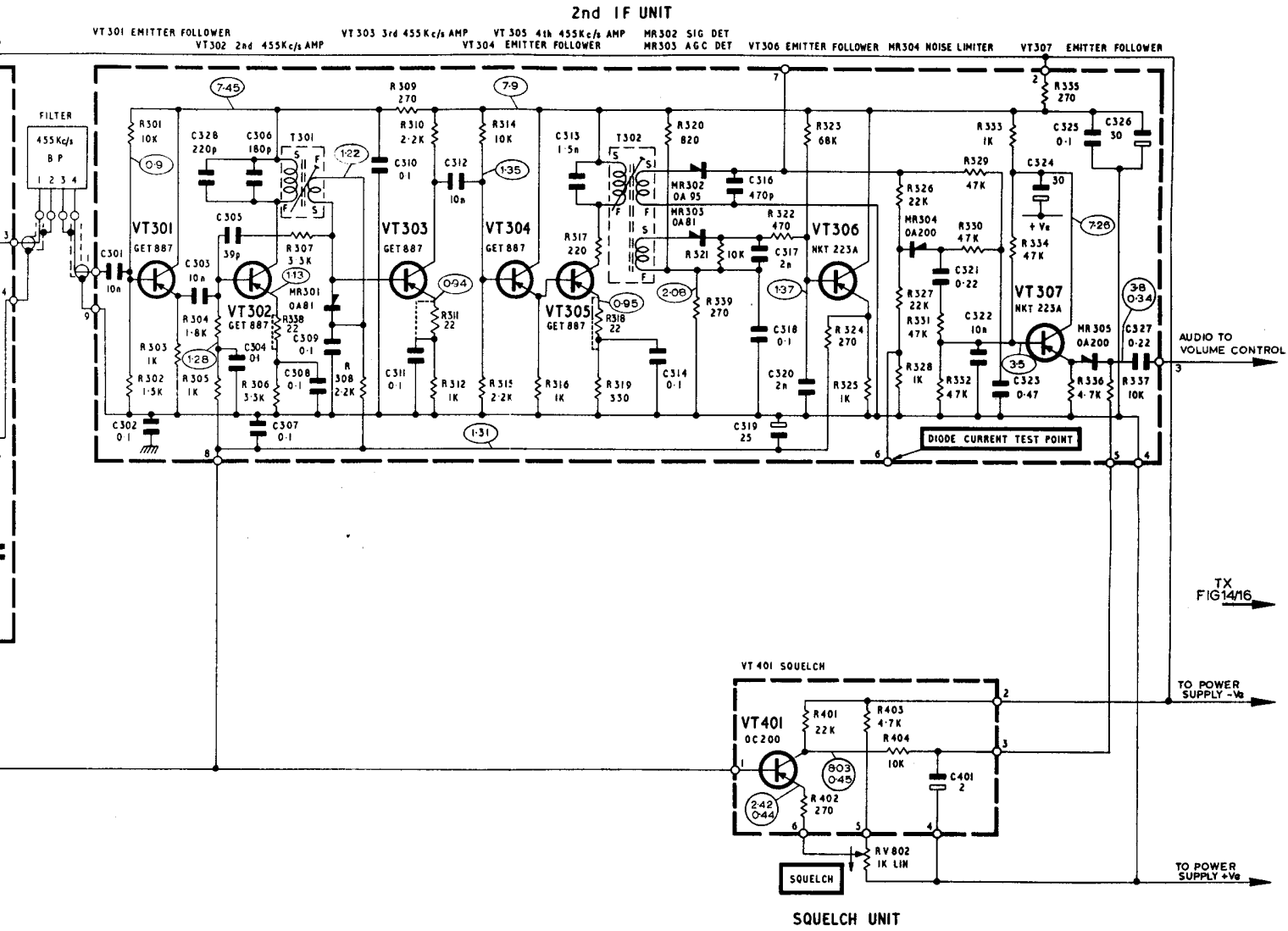


Fig. 12 RECEIVER I. F. CIRCUIT DIAGRAM
(AM 10 D Cambridge)

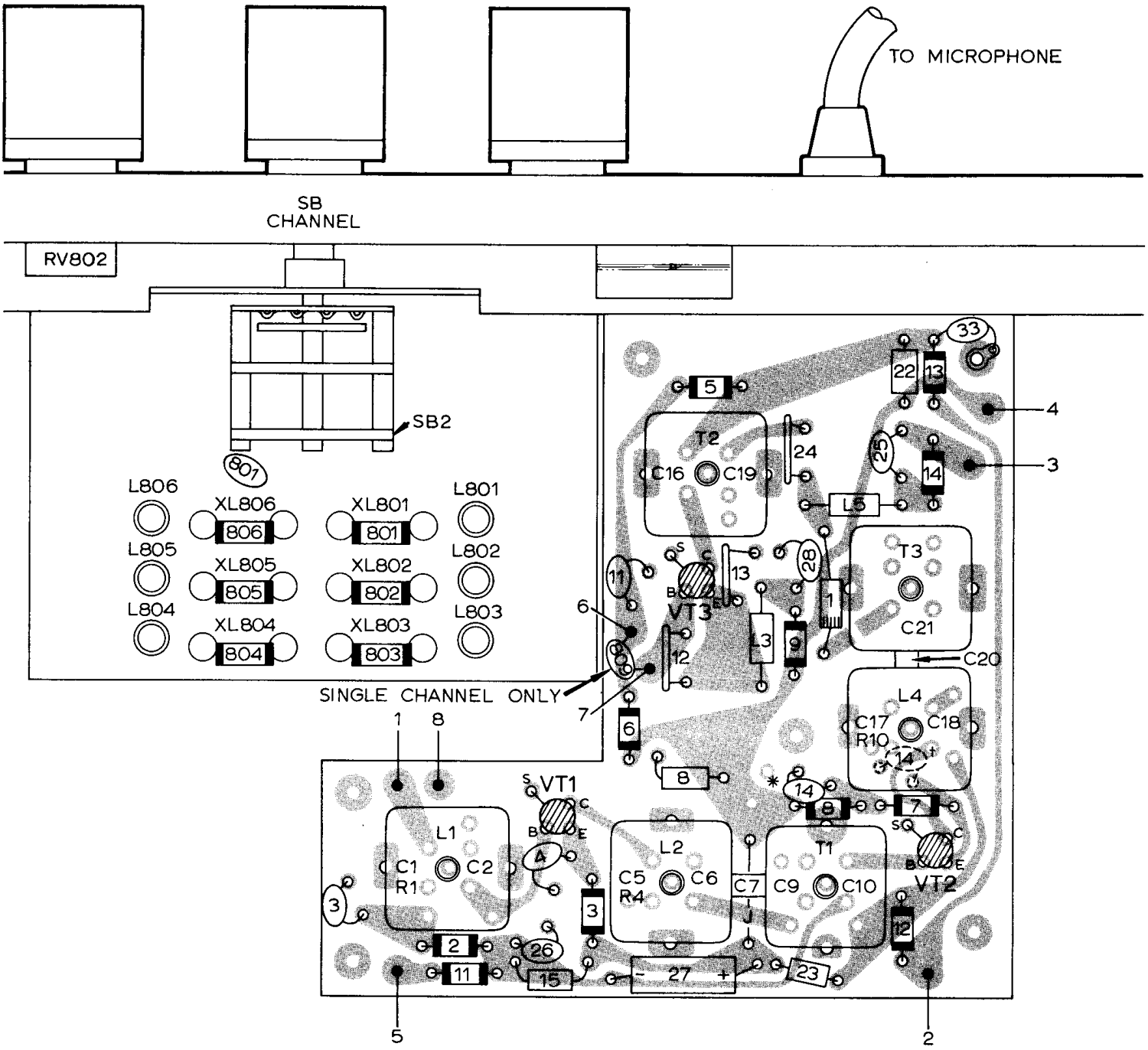


Fig. 9 RECEIVER R.F. COMPONENT LAYOUT DIAGRAM
(AM 10 D Cambridge)

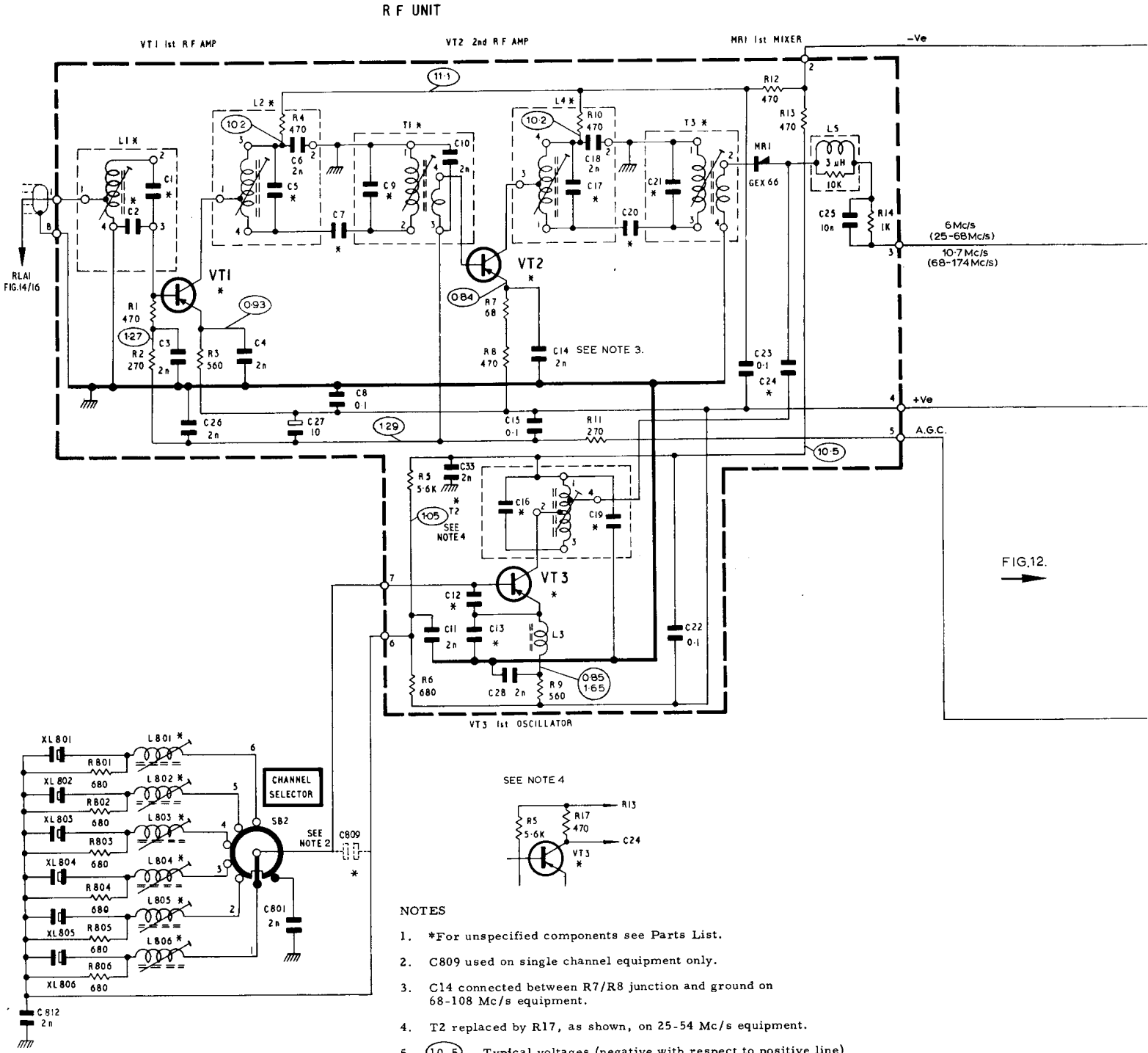


FIG.12.

NOTES

1. *For unspecified components see Parts List.
2. C809 used on single channel equipment only.
3. C14 connected between R7/R8 junction and ground on 68-108 Mc/s equipment.
4. T2 replaced by R17, as shown, on 25-54 Mc/s equipment.
5. (10.5) Typical voltages (negative with respect to positive line) measured, with SQUELCH control fully anticlockwise and with no incoming signal, on Avo Model 8 (20,000Ω/volt) set to lowest appropriate d.c. voltage range.
6. (0.85 / 1.65) - Typical voltage without crystals / - Typical voltage with crystals.
7. All resistors quoted in Ω unless otherwise stated. All capacitors quoted in µF unless otherwise stated.

Fig. 10 RECEIVER R. F. CIRCUIT DIAGRAM (AM 10 D Cambridge)

INTRODUCTION

It is recommended that a dummy run through the procedure be carried out prior to aligning the transmitter.

EQUIPMENT REQUIRED

1. L.T. supply of 13.2V d.c.
2. Multi-range d.c. voltmeter of 20,000Ω/volt sensitivity (Avo Model 8 is suitable).
3. R.F. power output meter (Bird Termaline Model 612 is suitable).
4. A.F. oscillator.
5. Audio output meter reading up to 10W.
6. Hexagonal trimming tool (Part No. 716964).

CRYSTAL OSCILLATOR

Crystal trimmers C803-C808 must not be adjusted, except as described in Field Testing Procedure in Chapter III or against a frequency substandard (see Appendix).

ALIGNMENT PROCEDURE

NOTES: (a) Check that C631 and C632 have been removed from equipments intended for operation within the frequency ranges 98-108 Mc/s

(b) The transmitter is designed for intermittent operation. Operate the transmit button only when making adjustments

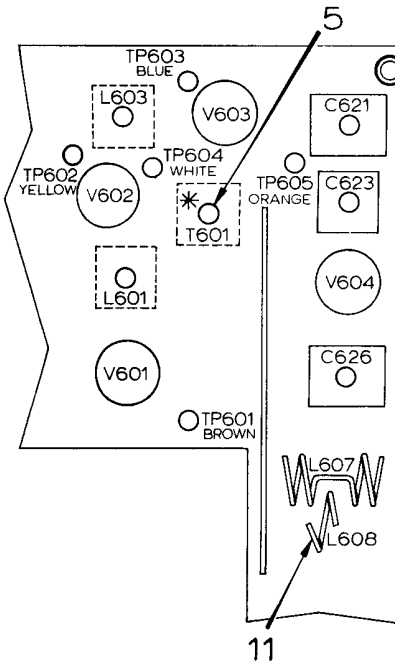
(c) C620 (108-174 Mc/s only) is factory preset and should not require adjustment with frequency change or V603 replacement.

With the voltmeter set to the appropriate range and connected between chassis and the test point indicated, carry out the alignment procedure shown in the charts opposite.

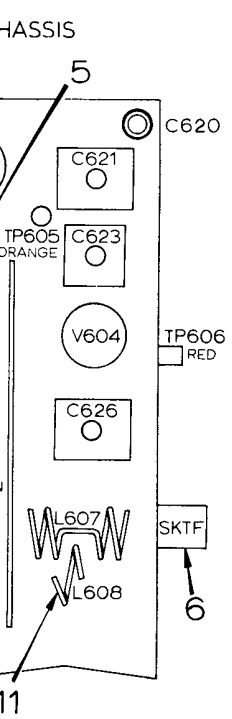
MODULATOR CHECK

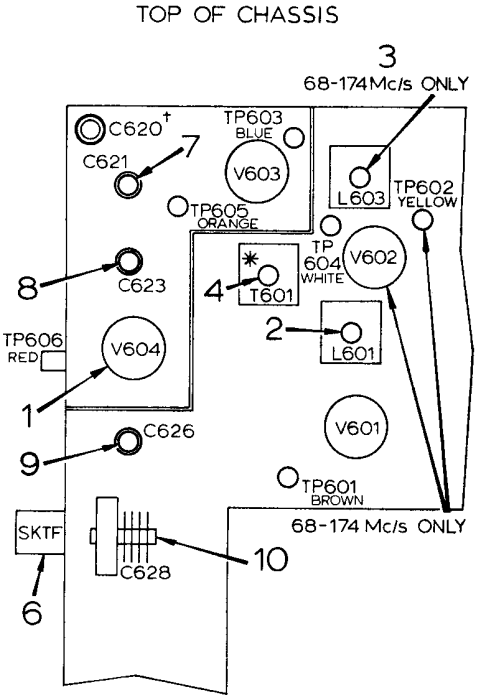
1. Remove V604, connect the a.f. oscillator in place of the microphone, ensuring that a d.c. path exists (i.e. no blocking capacitor should be used), and connect the audio output meter to T503, terminals 4 and 5.
2. With an audio input 12mV at 1 kc/s check that the audio output is 2W ± 2dB. If outside these limits, check the modulator sensitivity stage by stage as detailed in the Appendix.
3. Raise the audio input level by a further +10dB and check that the audio output is between 5.6W and 7W.
4. Raise the audio input level by a further +10dB and check that the audio output level remains within 0.5dB of that in 3 above.

UNDERSIDE OF CHASSIS



REF	TEST POINT	ADJUSTMENT	TYPICAL READING
1		REMOVE V604 (POWER AMPLIFIER)	
	TP601	CHECK CRYSTAL OSCILLATOR (V601)	-0·2V
		25-68 Mc/s EQUIPMENT	
2	TP603	ADJUST FOR MAXIMUM	-0·35V
		68-174 Mc/s EQUIPMENT	
2	TP602	ADJUST FOR MAXIMUM	-0·45 - 0·6V
3	TP603	ADJUST FOR MAXIMUM	-0·35V
		25-174 Mc/s EQUIPMENT	
4	TP604	ADJUST FOR INDICATION	-Ve
5	TP604	ADJUST FOR MAXIMUM	-Ve
4	TP604	ADJUST FOR MAXIMUM	-Ve
5	TP604	ADJUST FOR MAXIMUM	-0·65V (25-68 Mc/s) -1·05V (68-174 Mc/s)
1		REPLACE V604	
6		CONNECT POWER OUTPUT METER TO ANTENNA SOCKET	
7	TP605	ADJUST FOR MAXIMUM	-Ve
8	TP605	ADJUST FOR MAXIMUM	-1·8V TO -2·8V (25-108 Mc/s) -1·25V TO -1·8V (108-174 Mc/s)
9	TP606	ADJUST FOR MAXIMUM	
10		ADJUST FOR MINIMUM	
9	TP606	ADJUST FOR MINIMUM (DIP READING)	
10		ADJUST FOR MAXIMUM R.F. OUTPUT	
		25-148 Mc/s EQUIPMENT	
11	TP606	REMOVE BOTTOM COVER. ADJUST COUPLING TO OBTAIN R.F. OUTPUT OF 5W WITH A TEST POINT READING OF +0·55V TO +0·65V (WITH BOTTOM COVER IN POSITION)	
		148-174 Mc/s EQUIPMENT	
11	TP606	REMOVE BOTTOM COVER. ADJUST COUPLING TO OBTAIN R.F. OUTPUT OF 4·5W WITH A TEST POINT READING OF +0·55V TO +0·7V (WITH BOTTOM COVER IN POSITION)	

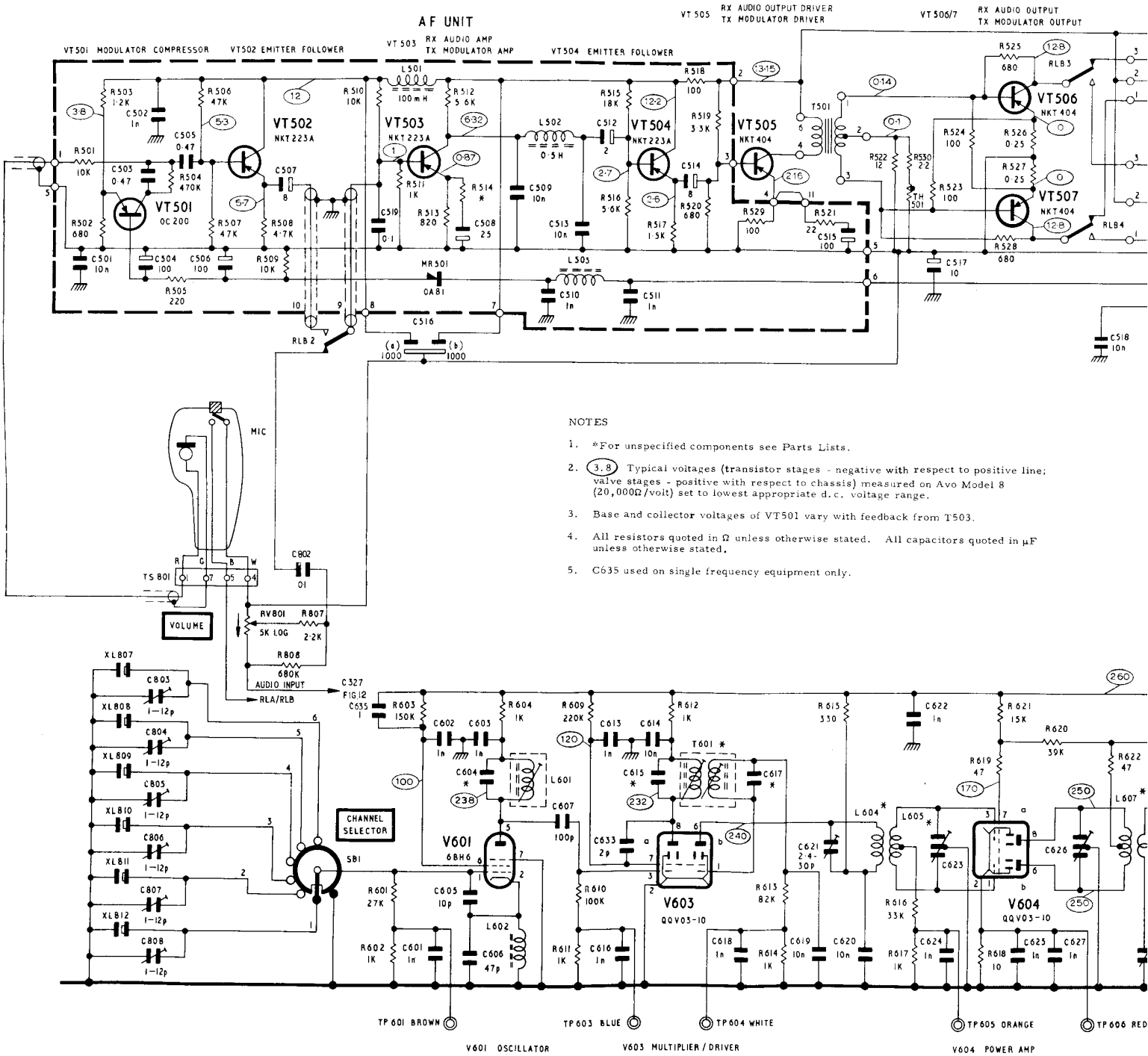




✳ BOTH CORES ADJUSTABLE FROM TOP OR UNDERSIDE OF CHASSIS

† C620 IS FACTORY PRE-SET

Fig. 18 TRANSMITTER ALIGNMENT CHART (AM 10 D Cambridge)



NOTES

1. *For unspecified components see Parts Lists.
2. (3.8) Typical voltages (transistor stages - negative with respect to positive line; valve stages - positive with respect to chassis) measured on Avo Model 8 (20,000Ω/volt) set to lowest appropriate d.c. voltage range.
3. Base and collector voltages of VT501 vary with feedback from T503.
4. All resistors quoted in Ω unless otherwise stated. All capacitors quoted in μF unless otherwise stated.
5. C635 used on single frequency equipment only.

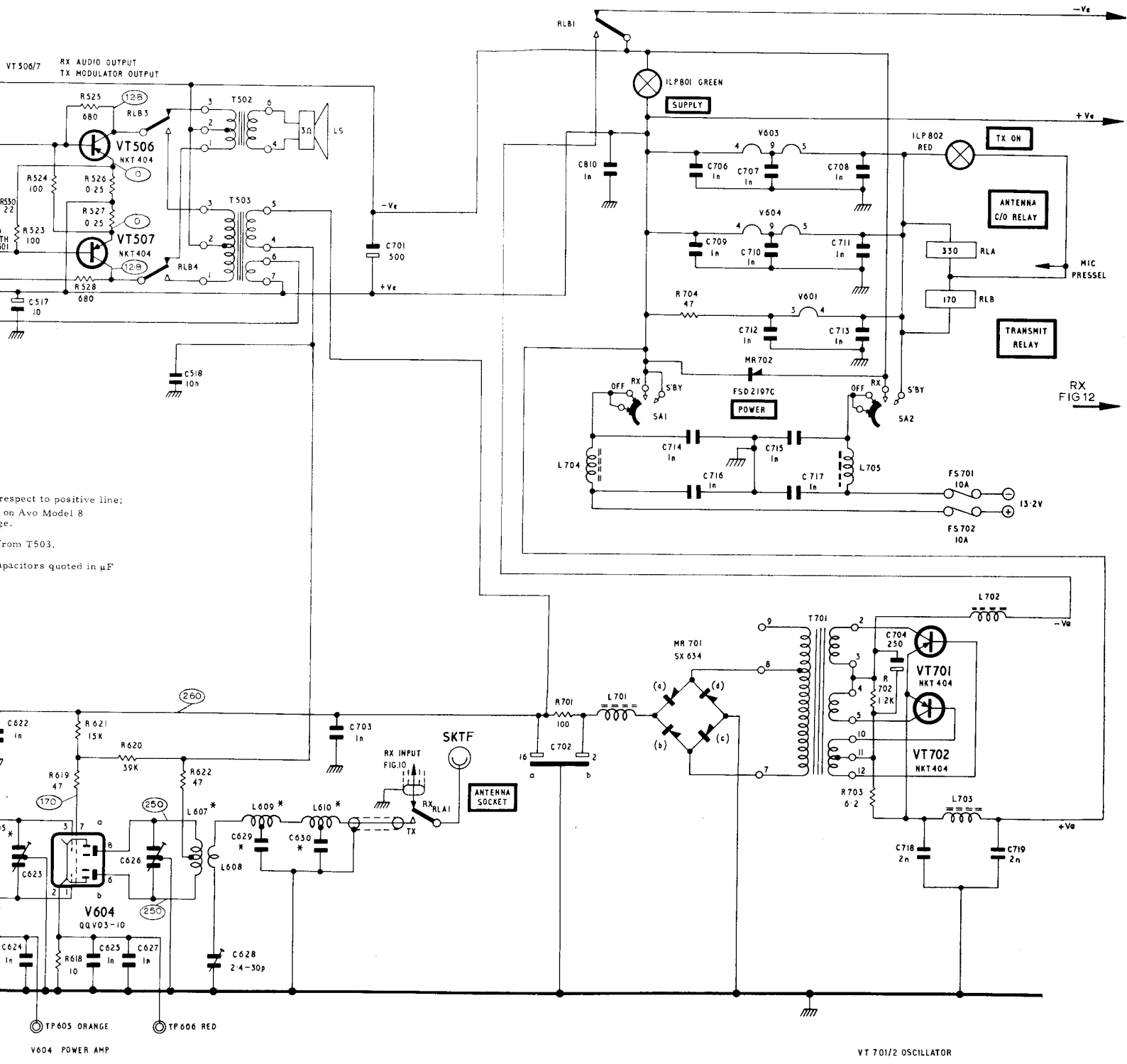
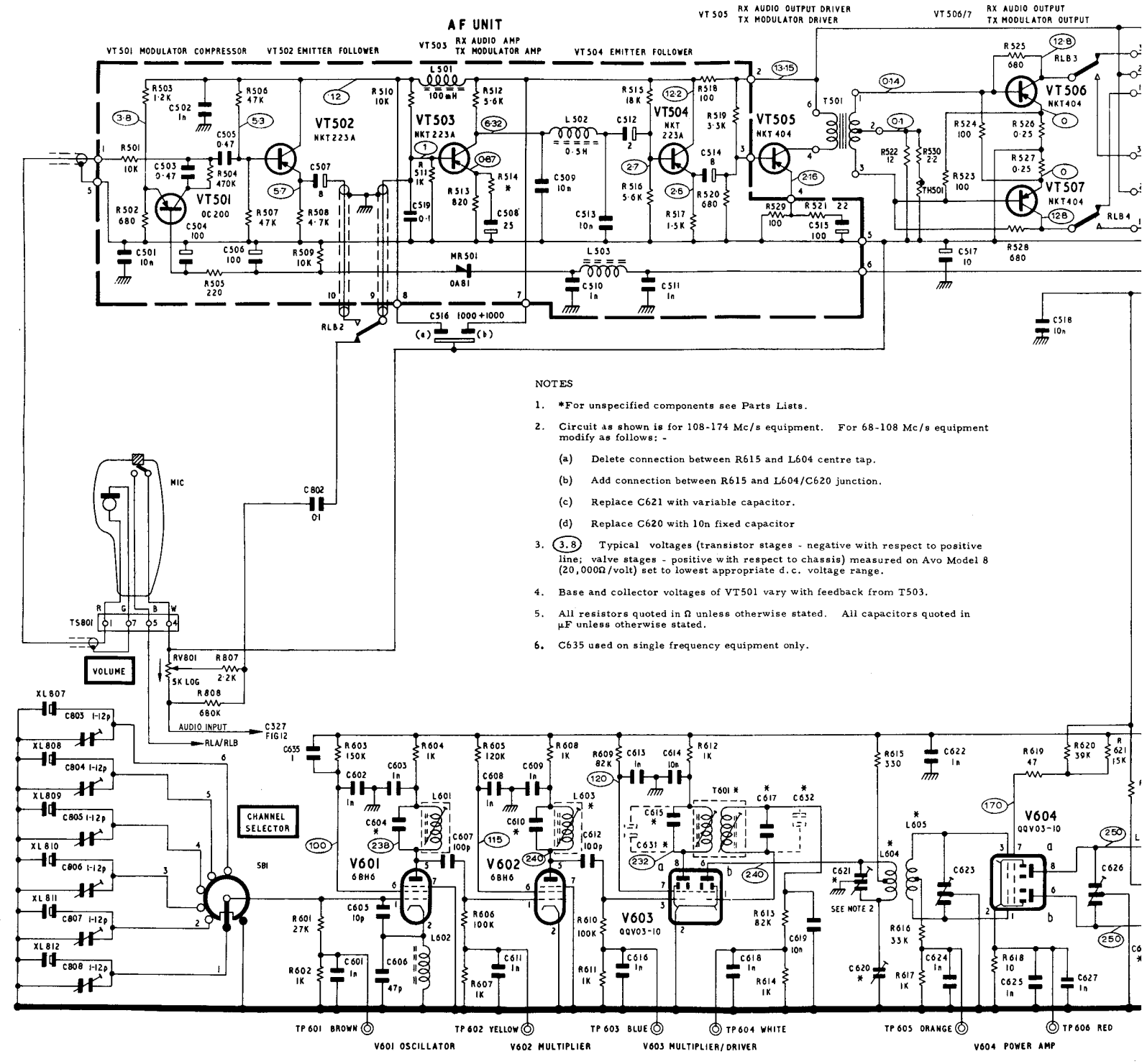


Fig. 14 TRANSMITTER CIRCUIT DIAGRAM - 25 to 68 Mc/s
(AM 10 D Cambridge)



NOTES

1. *For unspecified components see Parts Lists.
2. Circuit as shown is for 108-174 Mc/s equipment. For 68-108 Mc/s equipment modify as follows: -
   (a) Delete connection between R615 and L604 centre tap.
   (b) Add connection between R615 and L604/C620 junction.
   (c) Replace C621 with variable capacitor.
   (d) Replace C620 with 10n fixed capacitor
3. (3.8) Typical voltages (transistor stages - negative with respect to positive line; valve stages - positive with respect to chassis) measured on Avo Model 8 (20,000Ω/volt) set to lowest appropriate d.c. voltage range.
4. Base and collector voltages of VT501 vary with feedback from T503.
5. All resistors quoted in Ω unless otherwise stated. All capacitors quoted in μF unless otherwise stated.
6. C635 used on single frequency equipment only.

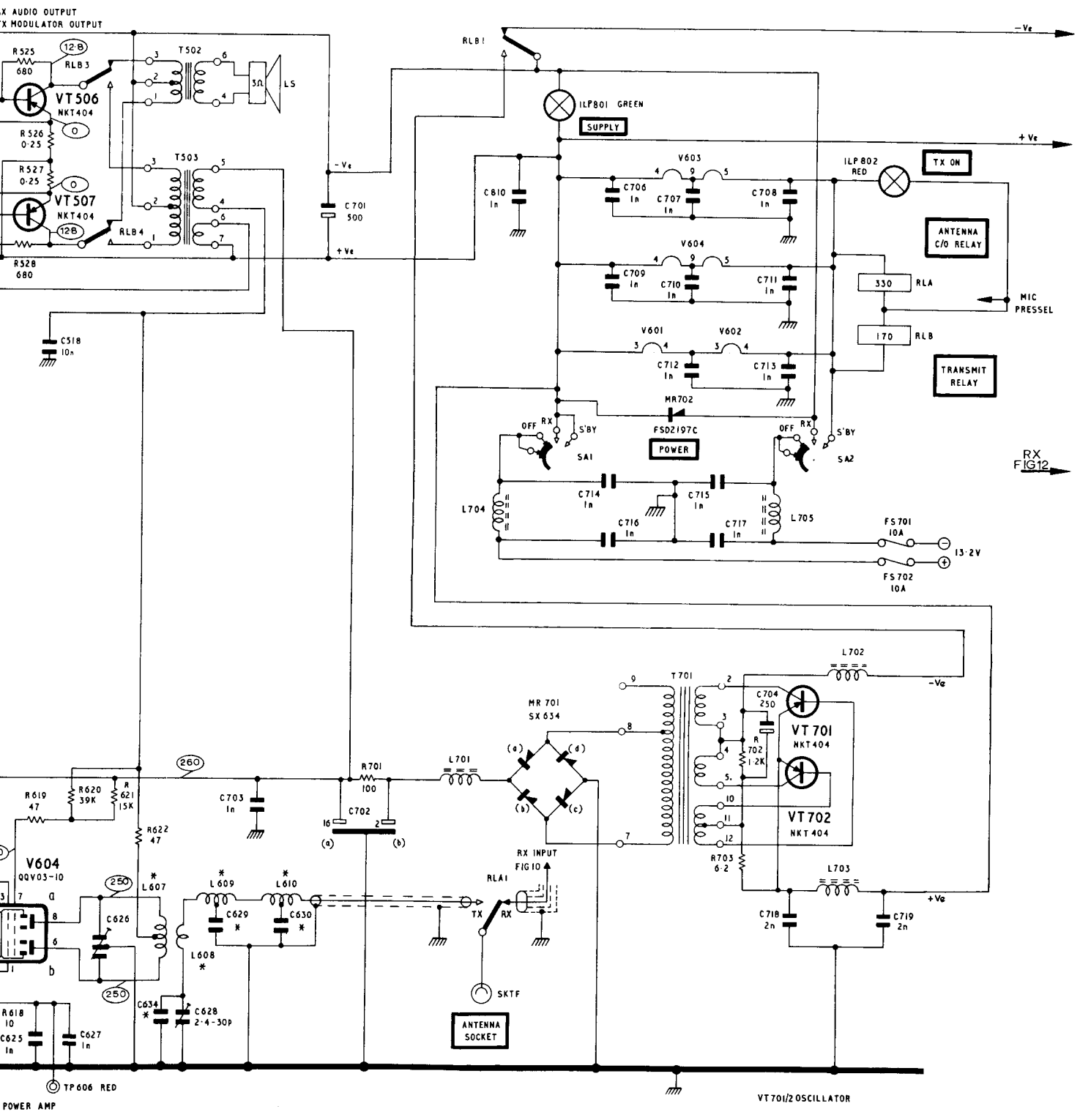
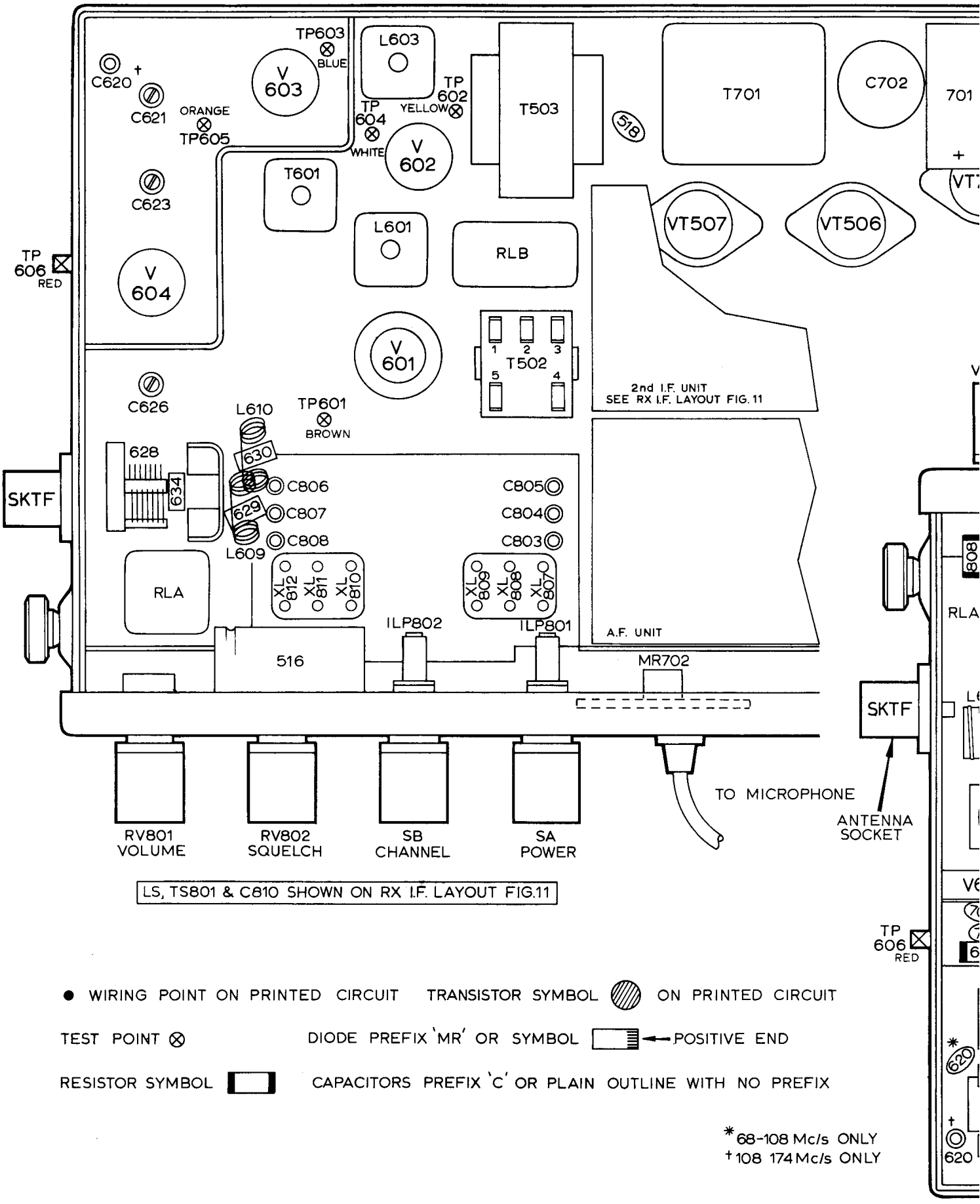


Fig. 16 TRANSMITTER CIRCUIT DIAGRAM - 68 to 174 Mc/s
(AM 10 D Cambridge)



LS, TS801 & C810 SHOWN ON RX I.F. LAYOUT FIG.11

● WIRING POINT ON PRINTED CIRCUIT TRANSISTOR SYMBOL ▨ ON PRINTED CIRCUIT

TEST POINT ⊗ DIODE PREFIX 'MR' OR SYMBOL ▭ ← POSITIVE END

RESISTOR SYMBOL ▭ CAPACITORS PREFIX 'C' OR PLAIN OUTLINE WITH NO PREFIX

* 68-108 Mc/s ONLY
† 108 174 Mc/s ONLY

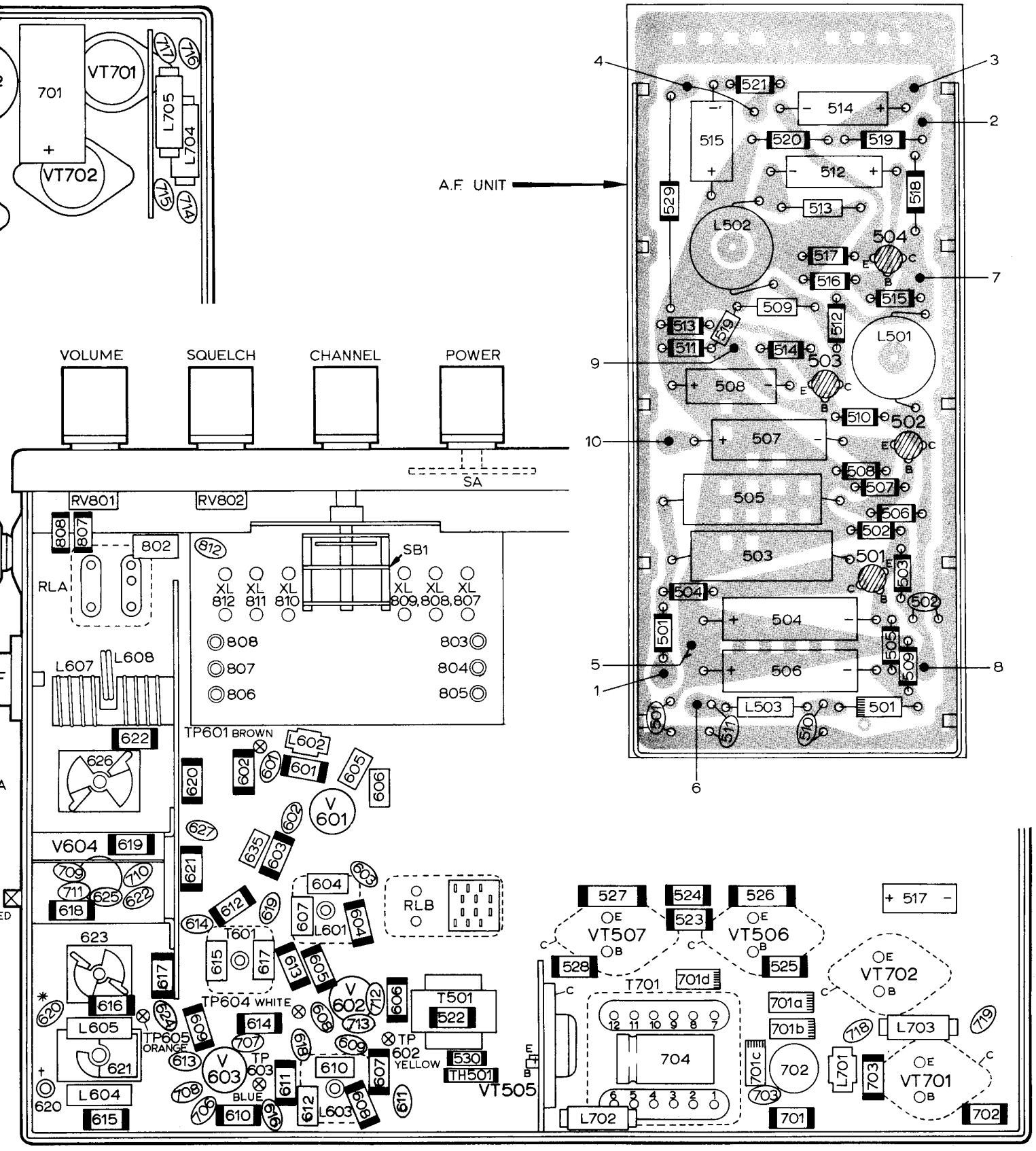


Fig. 15 TRANSMITTER COMPONENT LAYOUT DIAGRAM - 68 to 174 Mc/s
(AM 10 D Cambridge)