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.

PYE VANGUARD

V.H.F. A.M.

MOBILE RADIOTELEPHONE

AM25T

SERVICE MANUAL

ISSUE 1

PYE TELECOMMUNICATIONS LIMITED . CAMBRIDGE . ENGLAND

CONTENTS

LIST OF ILLUSTRATIONS

COMPONENT CODING

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

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Receiver Second Mixer Unit	201-300
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Transmitter/Receiver A.F. Section	501-600
Transmitter R.F. Section	601-700
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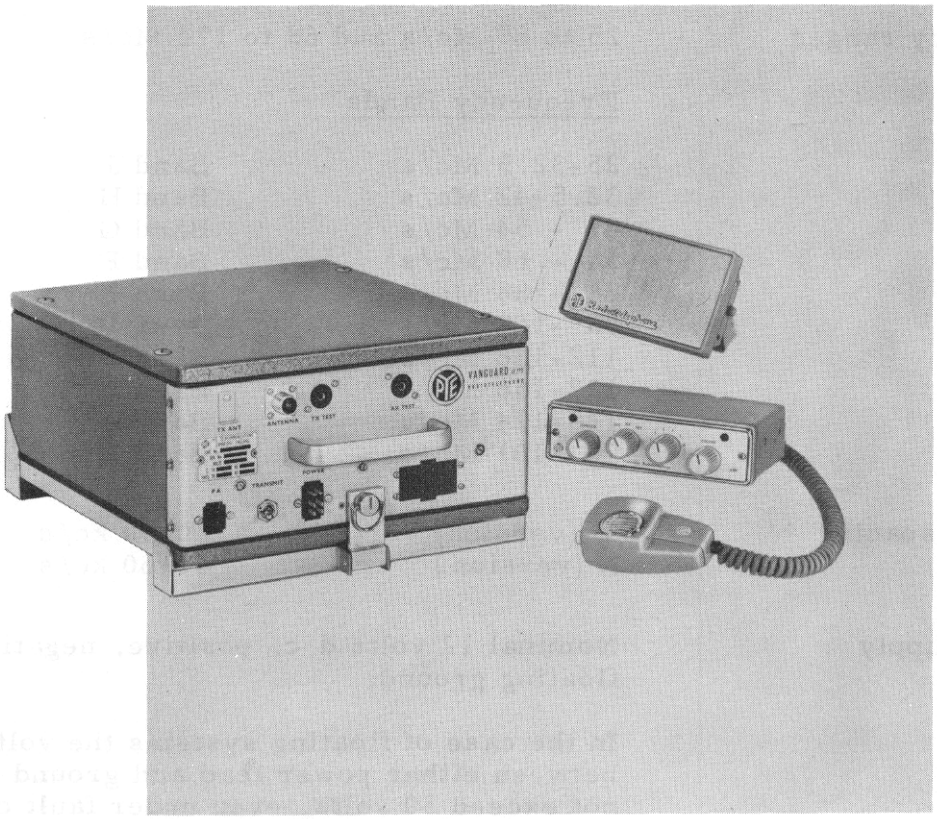
Crystal Assembly	801-900
Control Unit	901-1000

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

CHAPTER I

GENERAL DESCRIPTION



The Pye Vanguard type AM25 T is an amplitude-modulated radiotelephone providing two-way speech communication between vehicles and a base station.

The equipment operates on fixed frequencies in the range 25 to 174 Mc/s using either single or two frequency simplex working. Single or switched channel versions are available.

The boot-mounted main unit is remotely operated by the control unit which may be fitted in the normal radio slot or underneath the dashboard.

The double superheterodyne receiver is fully transistorised. The channel spacing can be either 40/60 kc/s (N version) or 20/30 kc/s (V version). This is determined by the type of sealed bandpass filter fitted. A squelch system is incorporated.

The transmitter delivers 17 to 25 watts r.f. output. A public address facility with an output of 10 watts is available as an optional item.

The Vanguard AM25 T operates from a 12V vehicle supply and is suitable for operation in all climates. It is designed to meet all relevant specifications.

SUMMARY OF DATA

Operation

Single or two frequency simplex

Frequency ranges

25 to 68 Mc/s and 68 to 174 Mc/s

Frequency Bands

25-32.5 Mc/s	Band J
32.5-42 Mc/s	Band H
42 - 54 Mc/s	Band G
54 - 68 Mc/s	Band F
68 - 88 Mc/s	Band E
88 -108 Mc/s	Band D
112-136 Mc/s	Band C
132-156 Mc/s	Band B
148-174 Mc/s	Band A
79 -101 Mc/s	Band P

Channel spacing

V (version)	20/30 kc/s
N (version)	40/60 kc/s

Power supply

Nominal 12 volts d.c. positive, negative or floating ground.

In the case of floating systems the voltage between either power lead and ground must not exceed 30 volts, even under fault conditions.

Current consumption

Receive only	Standby	Transmit
0.3A	2.3A	8.0A

The consumption on public address (if fitted) is 2.8A.

Dimensions

Control Unit

$6\frac{3}{4}$ in. wide x $3\frac{5}{8}$ in. deep x $1\frac{7}{8}$ in. high
(17.2 cm x 9.2 cm x 4.8 cm)

Main Unit

$12\frac{1}{4}$ in. wide x 14 in. deep x $7\frac{1}{4}$ in. high
(31.1 cm x 35.6 cm x 18.4 cm)

Loudspeaker (overall)

$5\frac{5}{8}$ in. wide x $2\frac{5}{8}$ in. deep x $3\frac{5}{8}$ in. high
(14.3 cm x 6.9 cm x 9.2 cm)

Weights	Control Unit $1\frac{1}{2}$ lb. (0.7 kg) Main Unit (including cradle) 21 lb. (9.5 kg) Loudspeaker 1 lb. (0.45 kg)
Metering	Two test sockets are mounted on the main unit front panel for metering receiver and transmitter using a Pye test meter Type TM1.
Optional features	Switched channel operation with up to six switched 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. Resilient mounts for the cradle. Thermostatically controlled crystal ovens, with a maximum of four switched channels. Public Address facility.

RECEIVER

Sensitivity	0.5μV e.m.f. input for 500mW audio output.
Signal/noise ratio	12db (25-108 Mc/s) or 10db (108-174 Mc/s) with 2μV e.m.f. input.
A.F. output	2 watts 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 5μV e.m.f.

TRANSMITTER

R.F. output	17 to 25 watts, depending on operating frequency.
Rating	Intermittent (E.I.A.) up to 60°C ambient temperature.
Modulation	High level amplitude modulation is employed.

CHAPTER II

CIRCUIT DESCRIPTION

RECEIVER

CIRCUIT SUMMARY

The transistorised receiver employs 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 or 10.7 Mc/s on 68-174 Mc/s equipment. The first i.f., after amplification is mixed with the second local oscillator output to produce a second i.f. of 455 kc/s. The second i.f. is amplified, passed through the band pass filter and then amplified by five stages in the 2nd I.F. Unit before demodulation. The audio output from the detector is amplified in the a.f. section, which includes the push pull output stage.

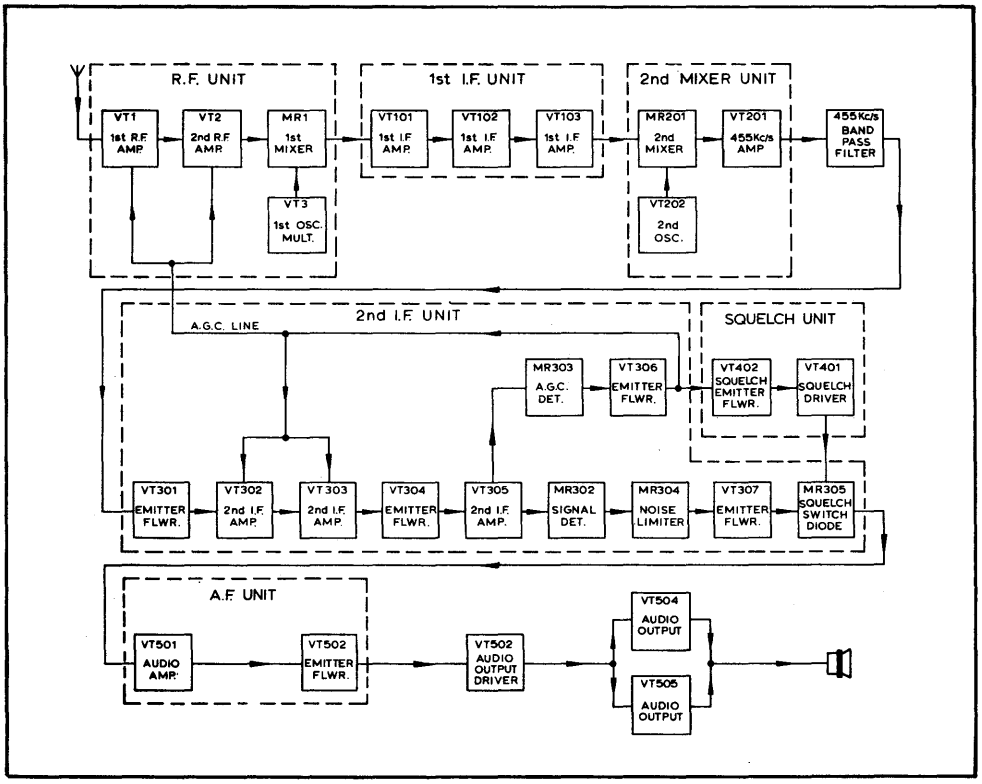


Fig. 1 Receiver Block Diagram

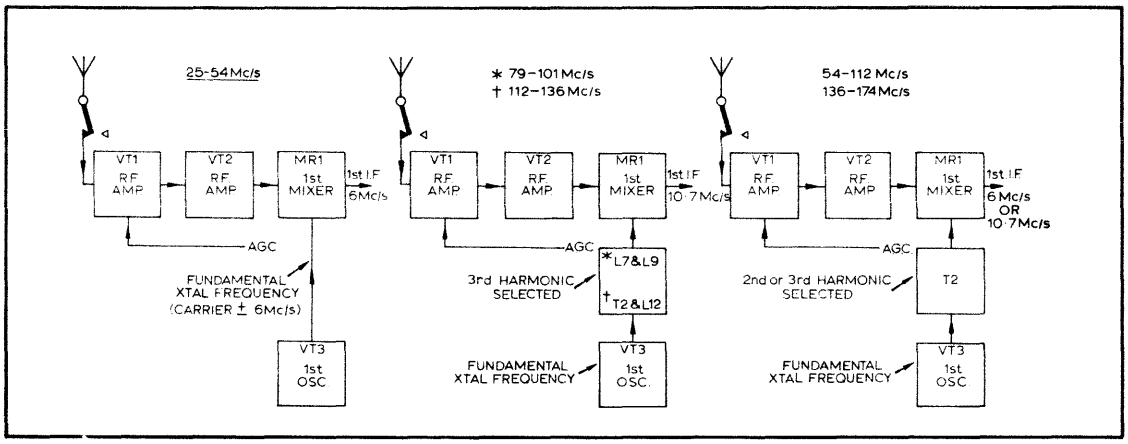
The equipment includes a noise limiter, designed to suppress pulse type interference such as that caused by vehicle ignition systems, and a squelch circuit which silences the receiver in the absence of a signal.

The printed circuit board assemblies shown in the Receiver Block diagram are individually described in the following Unit Descriptions.

UNIT DESCRIPTIONS

Each unit is a self contained printed circuit board assembly.

R.F. Unit



Signals from the antenna are connected to the input of the R.F. printed circuit board assembly by relay contact RLA1 (shown in the receive position).

Local oscillator injection for the first mixer is obtained from VT3 which is an overtone crystal controlled oscillator provided with inductive crystal trimming. The output of VT3 at the oscillator crystal frequency, (or harmonic selected by T2 in the collector circuit of VT3) is mixed with the signal frequency to produce a first i.f. of 6 Mc/s or 10.7 Mc/s (see following table). T2 is replaced by L7/L9 on P band equipments and by T2/L12 on C band equipments.

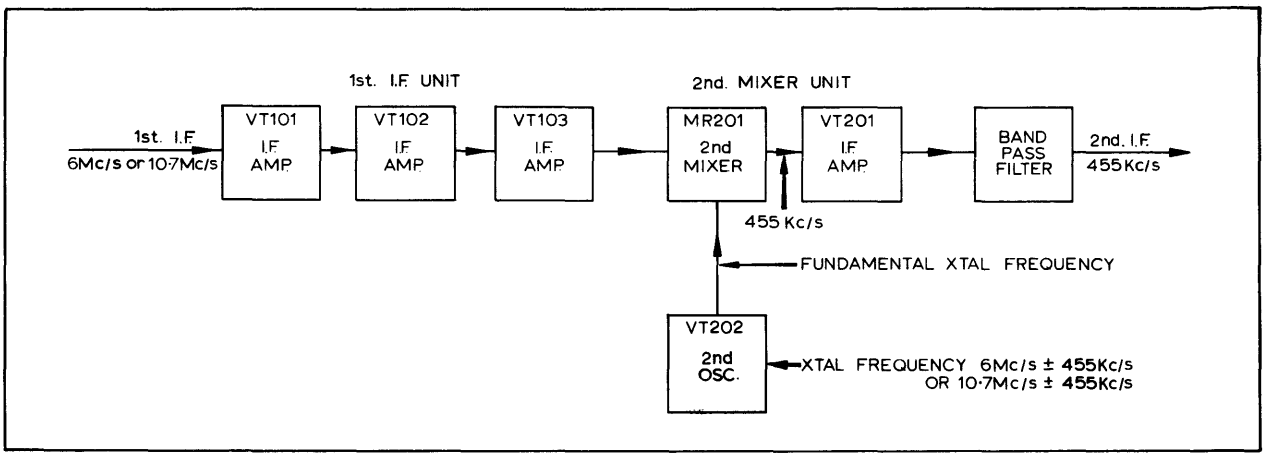
Carrier	Crystal Frequency	Harmonic	1st Local Osc.	1st I.F.
25-32.5 Mc/s	Carrier + 6 Mc/s	Fundamental	Carrier + 6 Mc/s	6 Mc/s
32.5-54 Mc/s	Carrier - 6 Mc/s	Fundamental	Carrier - 6 Mc/s	6 Mc/s
54 - 68 Mc/s	$\frac{\text{Carrier - 6 Mc/s}}{2}$	Second	Carrier - 6 Mc/s	6 Mc/s
68 - 88 Mc/s	$\frac{\text{Carrier - 10.7 Mc/s}}{2}$	Second	Carrier - 10.7 Mc/s	10.7 Mc/s
*88 -174 Mc/s	$\frac{\text{Carrier - 10.7 Mc/s}}{3}$	Third	Carrier - 10.7Mc/s	10.7 Mc/s

*(including P Band)

1st I.F. Unit

The first i.f. at either 6 Mc/s or 10.7 Mc/s is passed through a three stage transformer coupled cascade amplifier with each stage neutralised.

Inductive coupling is used between T102/L101 and T103/L102.



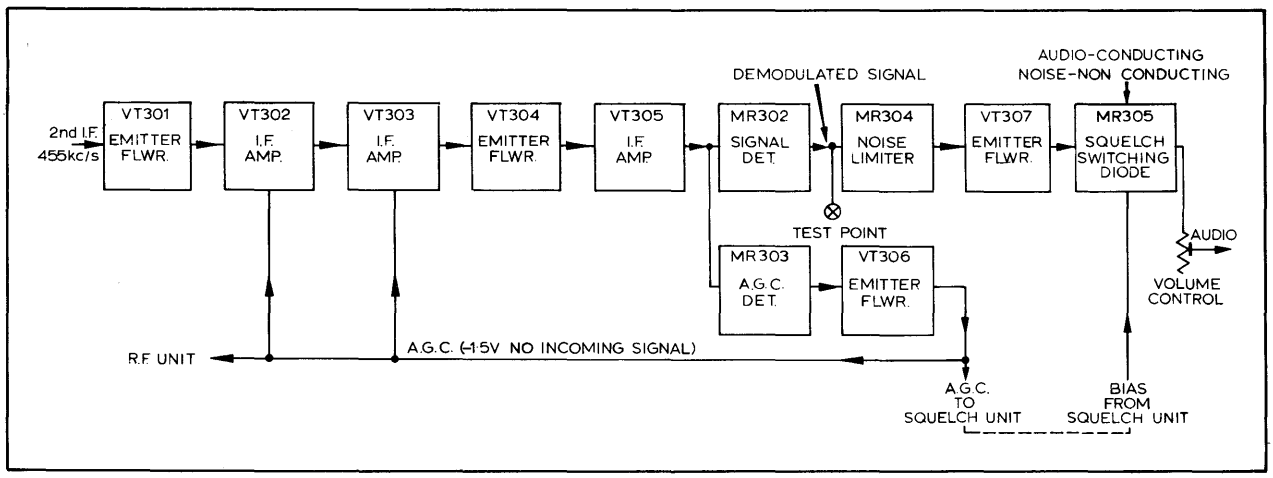
Second Mixer Unit

The second local oscillator normally operates at a frequency of 455 kc/s above the first i.f. (6 Mc/s on 25-68 Mc/s equipment or 10.7 Mc/s on 68-174 Mc/s equipment) but with certain carrier frequencies it is 455 kc/s below the first i.f. (see Receiver Crystal Information).

455 kc/s Band Pass Filter

The 20/30 or 40/60 kc/s channel spacing is determined by the interchangeable 455 kc/s band pass filter unit.

Second I.F. Unit



The clipper diode MR301, located in the base circuit of the i.f. amplifier VT303 prevents overloading of the stage at high signal levels.

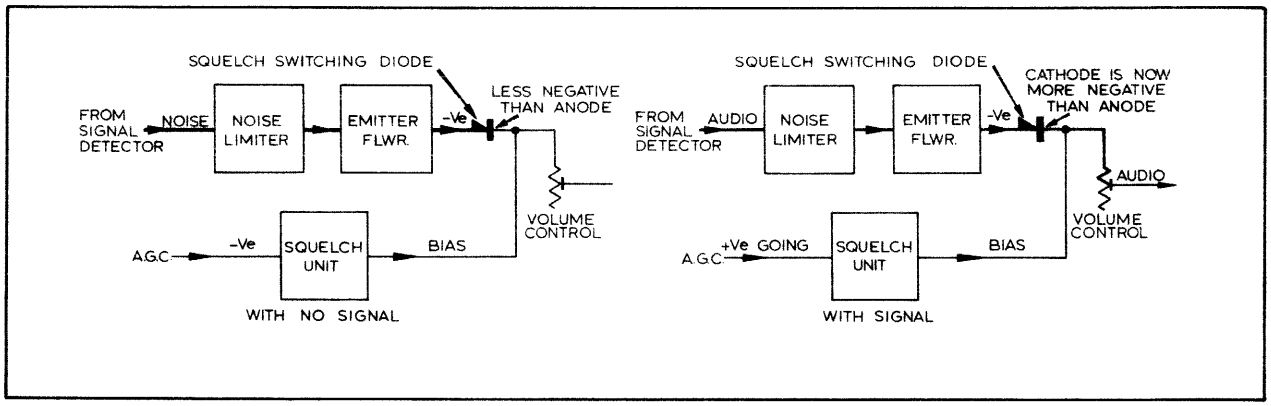
The a.g.c. bias, which is held at approximately negative 1.5 volts with no incoming signal, becomes less negative as the signal level is increased.

A test point is connected in the cathode circuit of the signal detector to enable the demodulated signal current to be monitored during alignment. This test point is available on SKTE (RX TEST socket).

Squelch Unit

The a.g.c. voltage applied to the base of VT402 determines the current drawn by the collector and therefore the voltage drop across R405.

The voltage at the junction of VT402 collector and R405 determines the bias applied to the cathode of the squelch switching diode and consequently whether the diode conducts or is cut off.



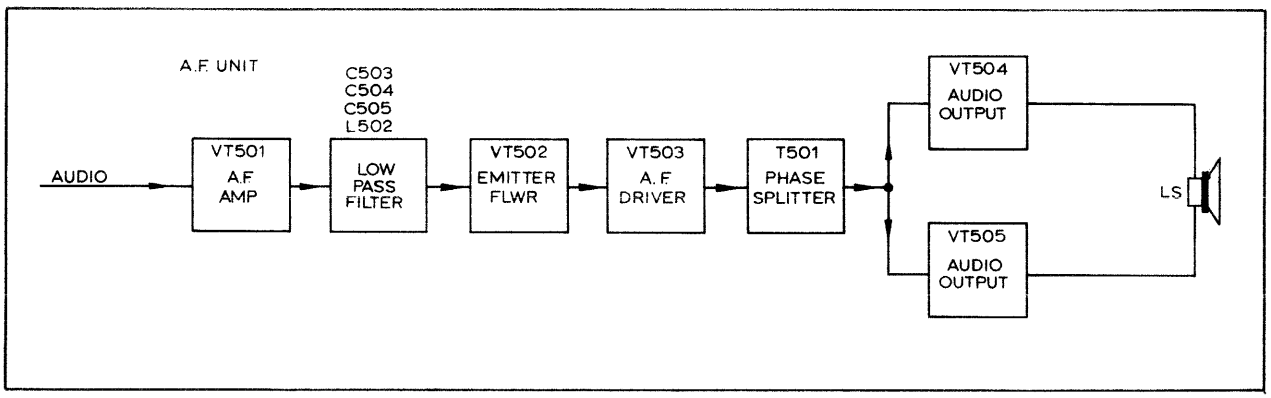
Squelch Switching Diode
Non-conducting

Squelch Switching Diode
Conducting

With no incoming signal, the a.g.c. line is held at approximately negative 1.5 volts, VT402 draws a comparatively high current and the voltage drop across R405 produces a potential at the cathode of the squelch switching diode which is less negative than its anode potential. The diode does not conduct and prevents noise voltage from passing to the following a.f. stages. With an incoming signal, the a.g.c. line becomes less negative (positive going), VT402 draws less current and the voltage drop across R405 is reduced producing a potential at the cathode of the squelch switching diode which is more negative than its anode potential. The diode conducts and allows the audio signal to pass to the following a.f. stages.

The operating level of the squelch circuit is determined by the base potential of VT401 the level being set by the SQUELCH control.

A.F. Unit



The output from the Second I.F. Unit is passed via the VOLUME control to the audio amplifier VT501. The amplified audio is coupled via the low pass filter and matching emitter follower (VT502) to the a.f. driver VT503. The phase splitting transformer T501 drives the Class B push-pull output stages VT504 and VT505.

RECEIVER CRYSTAL INFORMATION

CRYSTAL FORMULAE

First Local Oscillator

Carrier Frequency (fc)	Crystal Frequency (fx)	Crystal Specification No. 40/60 kc/s	Crystal Specification No. 20/30 kc/s
25-32.5 Mc/s	$fx = fc + 6$ Mc/s	P28/C	P28/C
32.5-42 Mc/s	$fx = fc - 6$ Mc/s	P28/C	P28/C
42 - 54 Mc/s	$fx = fc - 6$ Mc/s	P28/C	P28/C
54 - 68 Mc/s	$fx = \frac{fc - 6}{2}$ Mc/s	P28/C	P28/C
68 - 88 Mc/s	$fx = \frac{fc - 10.7}{2}$ Mc/s	P28/C	P28/C
*88 -108 Mc/s	$fx = \frac{fc - 10.7}{3}$ Mc/s	P28/C	P29/C
112-136 Mc/s	$fx = \frac{fc - 10.7}{3}$ Mc/s	P28/C	P29/C
136-156 Mc/s	$fx = \frac{fc - 10.7}{3}$ Mc/s	P28/C	P29/C
148-174 Mc/s	$fx = \frac{fc - 10.7}{3}$ Mc/s	P28/C	P29/C

* including P band.

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/
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 Mc/s
133.86 Mc/s 145.015 Mc/s 156.17 Mc/s 167.325 Mc/s

On 79-101 Mc/s equipment, the crystal frequency is 10.245 Mc/s except when the assigned frequency is within 100 kc/s of the following frequencies in which case the crystal frequency is 11.155 Mc/s.

81.960 Mc/s 92.205 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)	25-68 Mc/s	11.155 Mc/s ±3 kc/s)	68-174 Mc/s
5.545 Mc/s ±3 kc/s)	equipment	10.245 Mc/s ±3 kc/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

CIRCUIT SUMMARY

The output from the microphone is amplified by four stages before being applied to the push pull output. Anode and screen modulation of the power amplifier is employed.

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

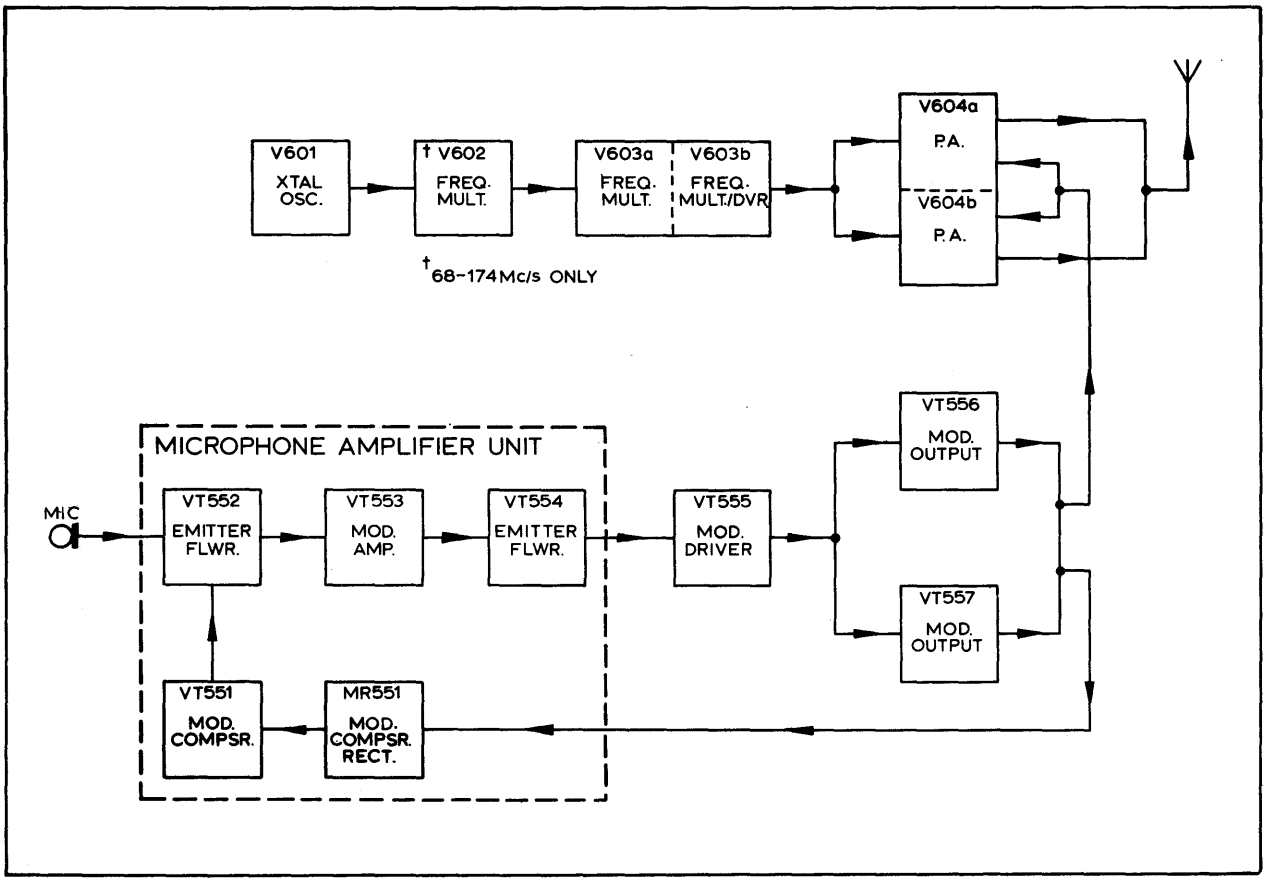


Fig. 2 Transmitter Block Diagram

The modulation compressor action is as follows:-

The negative potential derived from the rectified output of the feedback winding of the modulation transformer is applied to the base of the modulation compressor VT551. When the modulation reaches a sufficiently high level, over-modulation is prevented by the negative potential controlling the shunt resistance of the potential divider formed by R551 and VT551.

TRANSMITTER CRYSTAL INFORMATION

CRYSTAL FORMULAE

Carrier Frequency (fc)	Crystal Frequency (fx)	Crystal Specification No.	
		40/60 kc/s	20/30 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
112-136 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

* including P band

PUBLIC ADDRESS SYSTEM

When fitted, the public address system operates via the microphone amplifier and the modulator, the output of which is routed by one set of contacts of the additional relay RLF to the loudhailer instead of the r.f. power amplifier. Between announcements the receiver functions normally.

POWER SUPPLIES

The vehicle battery is connected to the equipment via the 15A fuse FS701 and the two-pole POWER switch SC on the control unit. When the equipment is switched to receive (RX) the negative side of the supply is connected to the receiver and the green POWER ON lamp ILP901.

Reversed Polarity Protection

When the facility switch SC is set to any of the operating positions, a diode rectifier MR702 (in series with the START relay RLD) is connected across the d.c. supply. If the supply polarity is correct, MR702 conducts and RLD operates. Should the polarity be reversed, MR702 does not conduct, RLD will not operate and the equipment will not switch on.

Switching Detail

Switching the equipment to RX energises the START relay which connects the 12V negative line to the receiver circuit and also operates the POWER ON lamp ILP1.

When the equipment is switched to S'BY the receiver supplies are maintained and the transmitter valve heaters switched on.

When the microphone switch is pressed, the transmit relay RLA is energised to complete the converter circuit, thus applying h.t. to the transmitter.

When the Public Address facility is fitted, selection of the P.A. position energises the P.A. relay to make the connections required for this service.

The red TX ON lamp ILP902 is connected in parallel with the energising coils of RLA and RLB and lights when the microphone switch is pressed.

Converter

The converter circuit consists of the transistors VT701, VT702 connected in a multivibrator circuit using saturating transformer switching with the transformer T701 connected as a centre-tapped load. Starting bias is applied to the circuit by R702, R703 and C703. Feedback is provided by connecting out-of-phase windings on T701 to the bases of VT701 and VT702.

The output from the secondary of T701 is rectified by the bridge rectifier MR701. Filtering is effected by C701a, L701 and C701b.

RELAY OPERATION

RLD — START relay (energised by moving SC from OFF to RX)

- RLD1 — connects negative 12V supply to POWER ON lamp (ILP901) and Ledex assembly (switched channel equipment only).
- RLD2 — connects negative 12V supply to all receiver units.

RLC — STANDBY relay (energised by moving SC to SBY).

- RLC1, RLC2 — connect negative 12V supply to valve heaters.

RLA — TRANSMIT relay (energised by operation of press-to-talk switch).

- RLA1 — connects negative 12V supply to the converter.
- RLA2 — transfers negative 12V supply from receiver A.F. Unit to the Microphone amplifier and Modulator Units.
- RLA3 — grounds V601 cathode.
- RLA4 — disconnects negative 12V supply from all receiver units except the A.F. Unit.

RLB — ANTENNA changeover relay.

- RLB1 — changes over the antenna from receiver to transmitter.

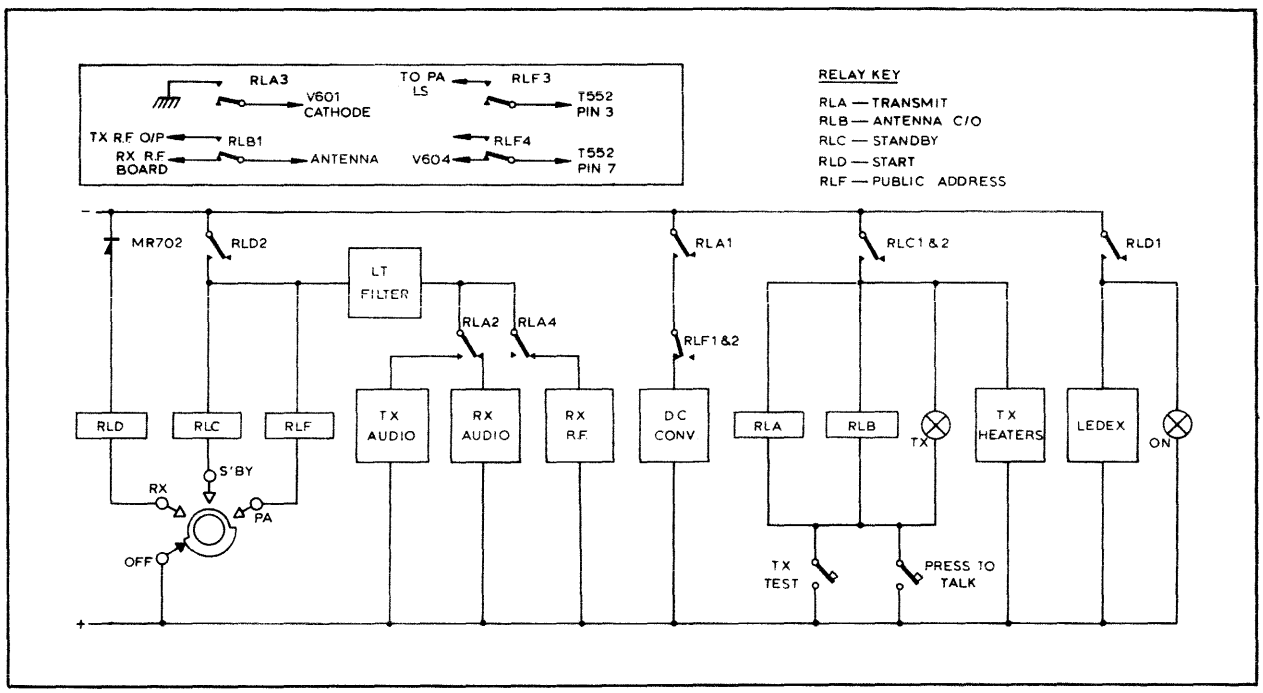


Fig. 3 Relay Operation Diagram

Public Address Facility (when fitted)

RLF — P.A. relay (energised by moving SC to P.A.)

RLF1) RLF2) — disconnect the negative 12V supply from the converter.

RLF3 — connects the P.A. secondary winding of T552 to the loud-hailer.

RLF4 — disconnects the modulated h.t. line from the transmitter r.f. stages.

The TRANSMIT relay RLA is energised when the press-to-talk switch is operated. RLA2 closes to transfer the negative 12V supply from the receiver audio stages to the transmitter audio stages now being used for the public address facility. Since the converter supply circuit is broken through the action of RLF1 and 2, RLA1 is ineffective.

CHANNEL SELECTION (Switched Channel Equipments only)

The appropriate crystals and trimmers for each channel are switched into circuit by the Ledex assembly to correspond with the setting of the channel selector switch.

Four leads in the multi-way interconnecting cable are used to connect the channel selector switch to the Ledex assembly.

Six channel selection via the four control leads is obtained by switching the positive potential to two of the control leads. Each setting of the channel selector switch employs a different combination of two control leads. (Any two from four giving six combinations).

The channel selector switch is mounted in the Control Unit and is set by the operator to the required channel; it connects the positive supply to the Ledex switch wafer SB2(F) and SB2(R) via the appropriate control leads.

The Ledex switch is always rotated by the solenoid in the same direction irrespective of the direction of rotation of the channel selector switch. The Ledex mechanism will continue to cycle until the positive supply is cut off at the Ledex switch wafer SB2(F) and SB2(R). This can only be when the channel crystals switched into circuit by the other Ledex switch wafers SB3 and SB4 correspond with the channel selector switch setting.

CHAPTER III

INSTALLATION AND INITIAL ADJUSTMENT

INSTALLATION

Main Unit

Before commencing the installation remove the main unit from the cradle as described in Servicing, Chapter IV, check that all valves and crystals are firmly seated in position and that no obvious damage has occurred during transit. Replace the covers, place the unit in the cradle and locate the assembly in the required position.

Four important points should be observed in determining the position of the main unit in the vehicle.

1. Sufficient space must be allowed round the unit for the free circulation of air. The minimum space requirements are shown in Fig.5 overleaf.

2. The cradle must be mounted so as to avoid distortion when securing in position.

3. It should be positioned so as to allow access to the antenna trimmer and test sockets on the front panel.

4. Where the unit is mounted vertically, the power amplifier stage must be uppermost.

Remove the unit, mark the position of the fixing holes using the cradle as a template, drill the holes and bolt the cradle in position using $\frac{1}{4}$ in. bolts of suitable length.

Control Unit

The control unit may be fitted in the radio aperture or in any convenient position; brackets are supplied for mounting the unit under the dash. Secure the brackets to the unit using the four 2 B.A. x $\frac{3}{8}$ in. screws and shakeproof washers supplies. Use the assembly as a template to mark the position of the bracket holes.

Using the three No. 6 s.t. screws, secure the fist microphone mounting clip in a position convenient for the operator and mount the loudspeaker where required. Note that the loudspeaker leads are at the supply positive voltage.

Bring the 18-way interconnecting cable, the 6-way cable from the fist microphone and the 2-way cable for the loudspeaker (each terminated in the correct plug) to the back of the unit case. Allow sufficient spare cable to enable the control unit chassis to clear the case when withdrawn. Connect the plugs to the appropriate sockets.

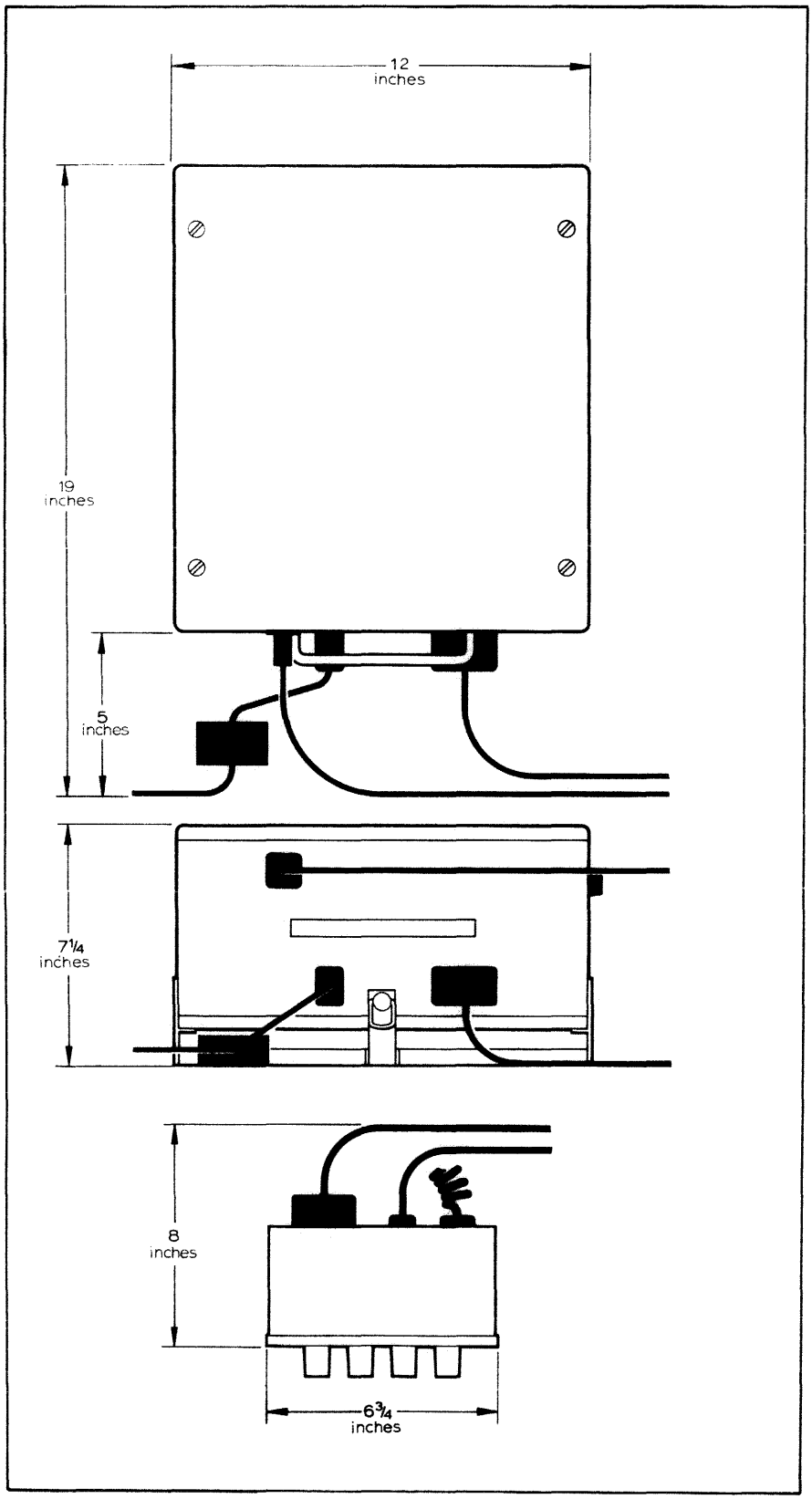


Fig. 4 Installation Space Requirements

Polarity: Warning

Before connecting to the battery it is essential to ensure that the positive (red) supply lead is connected to SKTB pins 1, 3 and 5 and the negative (black) lead to pins 2, 4 and 6.

The equipment will not operate if the lead polarities are reversed.

Power Supply

It is important that the battery leads should be of sufficiently heavy gauge to ensure that the voltage drop at the equipment is not excessive. (Refer to Standard Test Voltage). The following table gives a guide to the size of the cable required.

Supply Voltage	Distance of Equipment	Total length required	Recommended cable	A.W.G.	Resistance per yard of cable
12V	4 yards	8 yards	110/0.0076	10	0.0052Ω
12V	8 yards	16 yards	162/0.0076	12	0.0035Ω

Mount the fuse box as close as possible to the vehicle battery, and the connector block near the main unit. Check that the fuse is intact and of the correct rating - 15A. Connect the battery to the connector block with the fuse in the live power supply lead. Connect the main unit to the connector block with the 6-way socket and leads provided. Do not cleat the control unit cable and power supply leads together; in the run through the vehicle they should be kept separated as far as possible.

In case of floating ground wiring systems, the voltage between either power lead and ground must not exceed 30 volts even under fault conditions.

Standard Test Voltage

The standard test voltage for test and alignment purposes is 13.2 volts d.c. measured at the POWER socket SKTB with the equipment on load.

Antenna and Antenna Connector

The length of antenna required for operation on any frequency in the ranges 25-174 Mc/s can be obtained from the Antenna Frequency/Length Cutting Table, Fig. 6. After installing the antenna connect the antenna plug to the feeder cable as below (Fig. 5):

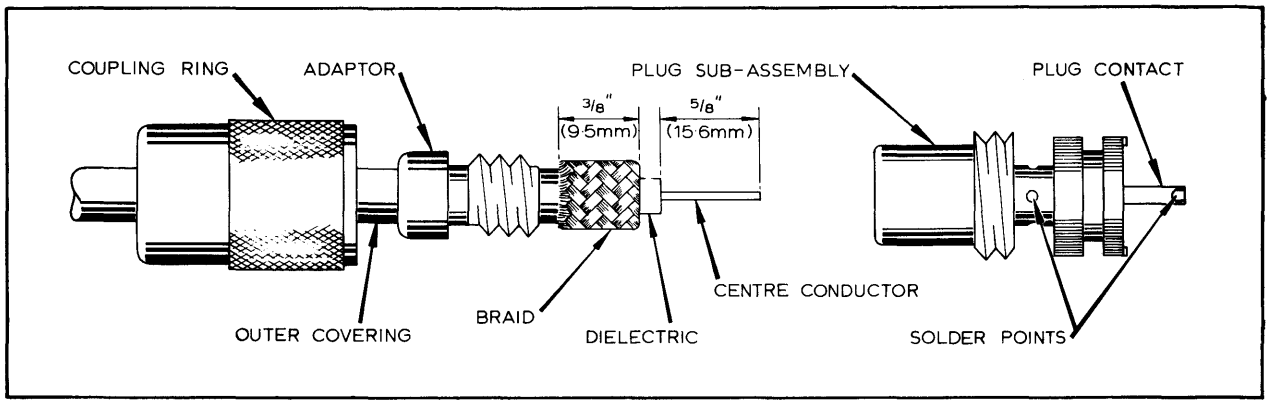


Fig. 5 Antenna Connector Assembly

1. Cut off the end of the cable squarely, remove $\frac{3}{4}$" of the outer covering and slide on the coupling ring and the adaptor.

2. Fan the braid slightly, slide the adaptor to the cut end of the outer covering, fold the braid back over the adaptor and trim the braid to a length of $\frac{3}{8}$".

3. Cut away the dielectric to expose a $\frac{5}{8}$" length of the centre conductor.

4. Tin the exposed centre conductor to facilitate soldering.

5. Screw the plug sub-assembly to the adaptor, ensuring that the centre conductor lies within the plug contact.

6. Solder the braid to the plug sub-assembly and solder the centre conductor to the plug contact.

   IMPORTANT - Solder quickly, with a very hot iron, applying it for the shortest possible time and chill the joints immediately with cold wet cloth.

7. Complete the assembly by screwing the coupling ring to, and past, the threads on the plug sub-assembly.

8. The Part No. of the complete connector assembly is 204060 and that of the adaptor is 204073.

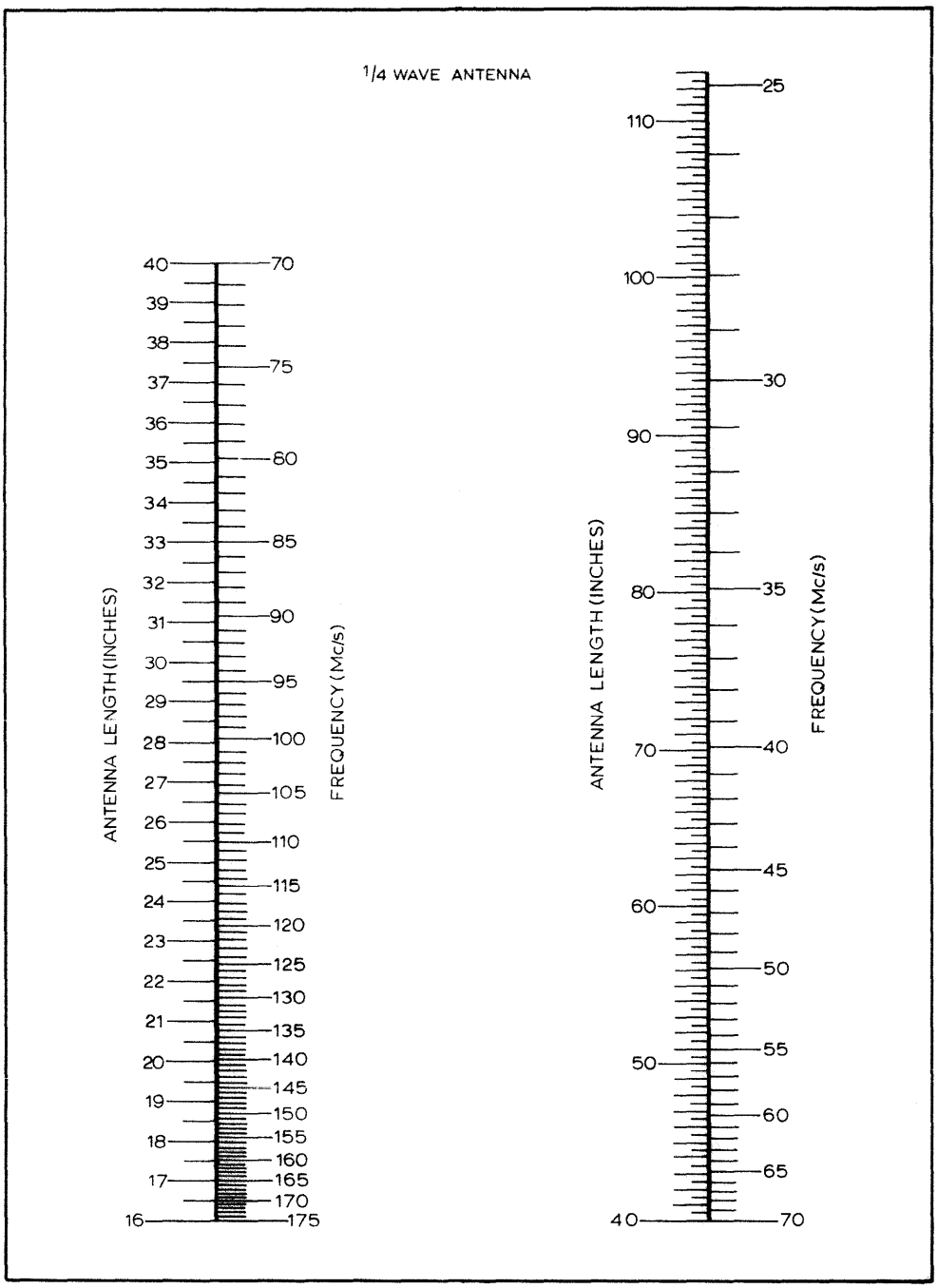


Fig. 6 Antenna Frequency/Length Cutting Table

Main Unit: (Front Panel layout)

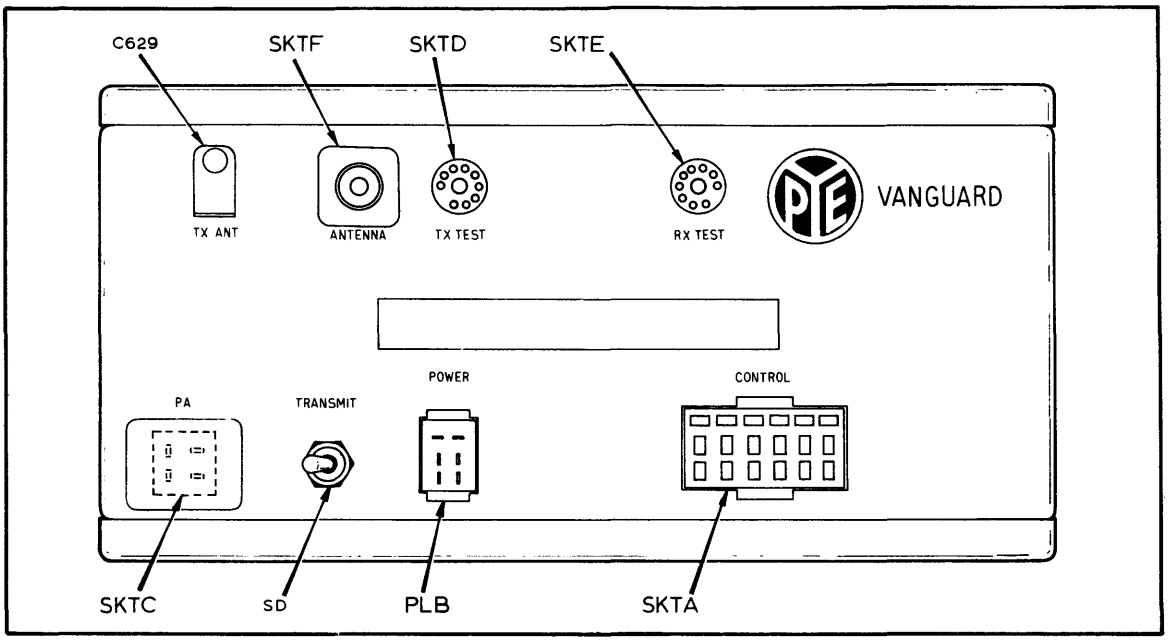


Fig.7 Main Unit: (Front Panel Layout)

Internal controls: TUNE/NORMAL (SA)
Mod Gain (RV551)

Control Unit: (Front Panel Layout)

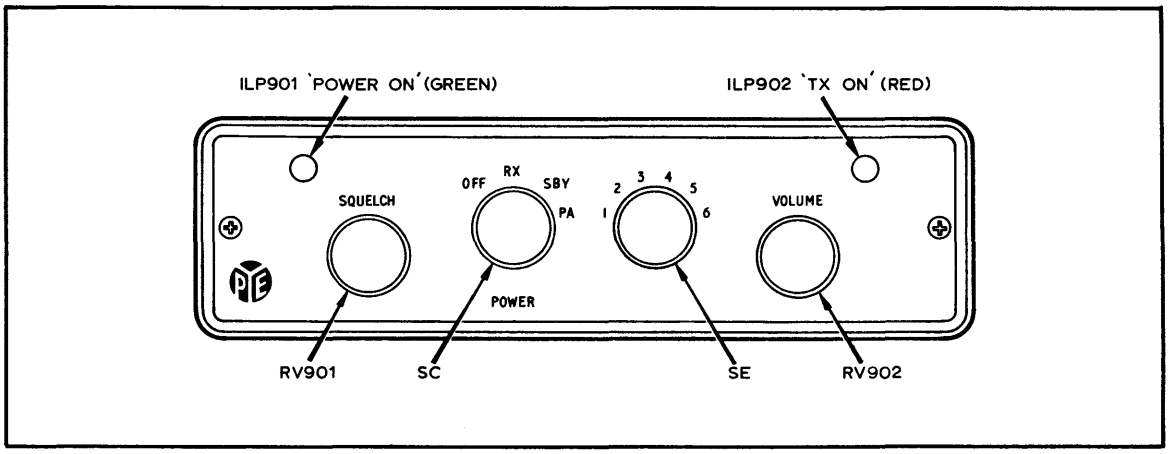


Fig.8 Control Unit: (Front Panel Layout)

Rear Connections: 18-way plug PLA
6-way socket (mic) SKT;
2-way socket (L S) SKTG

INITIAL ADJUSTMENTS

General

1. Connect the antenna feeder to the ANTENNA socket SKTF.

2. Connect the interconnecting plug PLA and the battery socket SKTB to the main unit. Ensure that the connections at the rear of the control unit are securely held in position.

3. Connect the equipment supply leads to the battery. Move the facility switch to the RX position. The green 'POWER ON' lamp should light.

4. Move the facility switch to the SBY position and allow the equipment to warm up. Operate the microphone button and observe that the red 'TX ON' lamp lights. Check that the equipment reverts to receive when the button is released.

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 counter-clockwise.

Transmitter

For detail of test equipment see page 42.

1. Connect the antenna feeder to the ANTENNA socket via a suitable reflectometer. The Pye RFL1 can be used. If a reflectometer is not available connect the antenna feeder directly to the ANTENNA socket and place the TM1 (antenna extended and switch in position No. 11) adjacent to the whip antenna.

2. With the facility switch set to SBY, operate the TRANSMIT switch and adjust the TX ANT (C629) for maximum output.

3. Transfer the TM1 to the main unit and insert the 9-pin plug (refer to Servicing, Chapter IV) into the TX TEST socket SKTD. Set the meter switch on position 7. If a TM1 is not available connect the positive lead of a 0-50μA meter to pin 8 and the negative lead to pin 9 of the TX TEST Socket.

   Check that the meter reading is not greater than 27μA.

   Note: If the meter reading is as above, omit the following paragraphs (4-10). If the reading is in excess of the quoted figure, and the battery voltage is correct, proceed as follows:-

4. Remove the main unit top cover.
   Switch the TUNE/NORMAL switch to TUNE.

5. Reduce the antenna coupling by turning the adjusting screw marked ANT COUPLING counterclockwise.

6. Adjust C628 carefully for the greatest dip in meter reading.

7. Switch the TUNE/NORMAL switch to NORMAL.

8. Increase the antenna coupling (clockwise) and adjust C629 for maximum output and C628 for the greatest dip in the meter reading.

9. Repeat the procedure in para. 8 until, with C628 adjusted last, the required reading is obtained. Critical adjustment may be required in the final stages to ensure that the settings are in the optimum position.

10. Remove the test meter and reflectometer and re-connect the antenna feeder.

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

PA System (when fitted)

Ensure that the shorting link between SKTC pins 2 and 4 is in position. With the loudhailer plug PLC inserted into the PA socket SKTC and the facility switch SC in the PA position, the equipment is in the receive condition. The PA system is brought into operation by closing the press-to-talk switch on the microphone which transfers the negative 12V supply from the receiver audio stages to the transmitter audio stages at the same time disconnecting the receiver r.f. and i.f. supply.

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.

FIELD TESTING PROCEDURE

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 PT503 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 marker 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 20/30 kc/s channel spacing or 2000 c/s for 40/60 kc/s channel spacing, then the mobile receiver crystal trimmer L801 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 the same frequency as that of the base station receiver first or second i.f. If the base station in use is the Pye F 27 AM the 455 kc/s marker oscillator PT503 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 20/30 kc/s channel spacing or 2000 c/s for 40/60 kc/s channel spacing, then the mobile transmitter crystal trimmer C803 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.

VEHICLE INTERFERENCE SUPPRESSION

INTRODUCTION

The following notes on vehicle interference suppression contain information intended to enable an installation engineer to locate and correct various forms of electrical interference. However, the following information can only be considered as a guide and cannot deal exhaustively with the complex problem of interference to mobile radiotelephone equipment.

This information gives the sources of interference, their symptoms and treatment and while covering in general all radio frequency reception, lays special emphasis on v.h.f. equipment.

It is assumed that all essential electrical and mechanical safety precautions will be observed by the engineer when carrying out the following procedures.

SOURCES OF ELECTRICAL INTERFERENCE

Electrostatic fields resulting from sudden variations or interruptions in the electric current taken by electrical apparatus of the vehicle are the main cause of interference. The most likely source of such fields in petrol engined vehicles is the ignition system. Interference from this source increases to a maximum in the region of 40-50 Mc/s and may be maintained up to frequencies of 600 Mc/s.

Other items responsible for causing interference are the generator, the windscreen wiper and fan motors, vibrating contacts of current and voltage regulators and petrol pumps. A further source is the discharge of electrostatic energy built up upon the wheels.

The degree of interference may be tolerable in areas of high signal strength but may assume great nuisance value where signal strength is low, and the intensity depends on the following factors:-

1. Inherent screening properties of the vehicle bodywork.

2. Layout of the vehicle electrical apparatus and associated wiring.

3. Location of vehicle antenna.

Symptoms and Remedies

Most modern vehicles are fitted with an interference suppressor integral with the distributor head.

Source: Ignition System

Symptoms: Regular pulsating noise whilst the engine is running, and synchronised with the engine speed.

Remedies:

1. Check plug gaps and circuit breaker for correct setting.
2. Ensure that h.t. and l.t. leads are well separated.
3. Bond bonnet and engine to main bodywork using a short length of heavy copper braid, allowing for engine movement relative to bodywork.
4. Replace leads between distributor and plugs with commercially obtained resistive leads.
5. Fit individual plug suppressors.
6. In extreme cases of persistent interference, fit a radio-frequency filter into the l.t. supply between ignition switch and ensure that the cable from coil filter is screened.

Source: Dynamo

Symptoms: Continuous whine, varying in pitch with engine speed and present when engine is running.

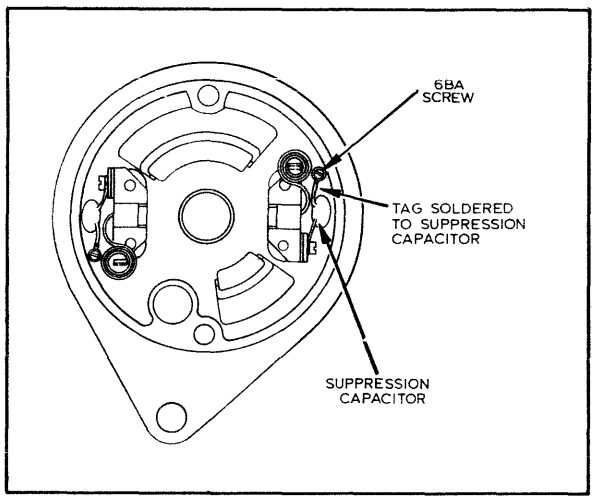


Fig. 9 Dynamo End Plate

Remedies:

1. Check condition of brushes and commutator.
2. If interference persists after checking brushes and commutator refer to Fig.9 and fit two 470pF disc ceramic suppression capacitors close to the brushes as indicated.

Source: Auxiliary Equipment

Symptoms: Interference occurring only when one particular electrical device is switched on.

Remedy: Fit a 470pF capacitor between live side of offending device and chassis, using shortest possible length of lead, well grounded to frame of device. When resilient mounts are used, fit heavy copper braid from device to bodywork keeping the length as short as possible.

SOURCES OF TYRE AND BRAKE STATIC

The rotation of vehicle wheels, especially on dry road surfaces, generates electrostatic energy in the tyres (TYRE STATIC). The resulting electric currents tend to flow from the tyres to the bodywork through the bearings. Normally oil or grease film at these points prevents the passage of current but it is when this insulation intermittently breaks down, producing a series of make and break contacts, that interference to the radio equipment is caused. Similar energy is generated when the brakes are applied (BRAKE STATIC).

Symptoms and Remedies

Sources: Tyres or Brakes

Symptom: Continuous hissing sound when vehicle is moving, even when engine is off or a hissing sound when brakes are applied.

Remedies:

1. Fit commercially obtainable anti-static hub springs. When these are not available fit anti-static springs (Fig. 10) which provide a continuous path for current from wheels to bodywork.

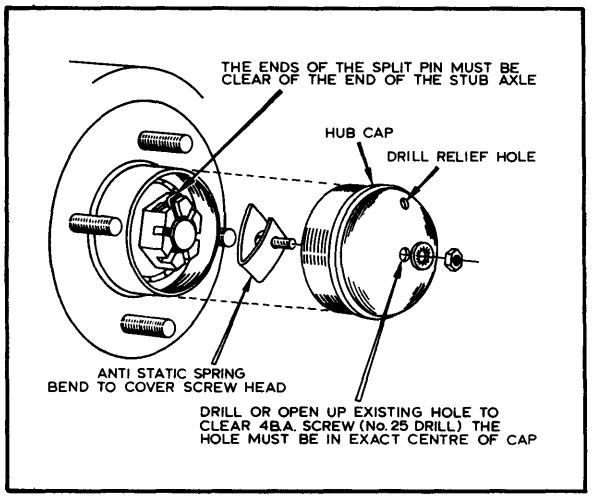


Fig. 10 Fitting Anti-Static Spring

2. Inject anti-static powder, or a little water, into tyres.
3. Paint tyres with lamp-black or graphite.
4. Pump graphite grease into front wheel bearings.
5. Fit anti-static brackets to brake shoes (Figs. 11 & 12).

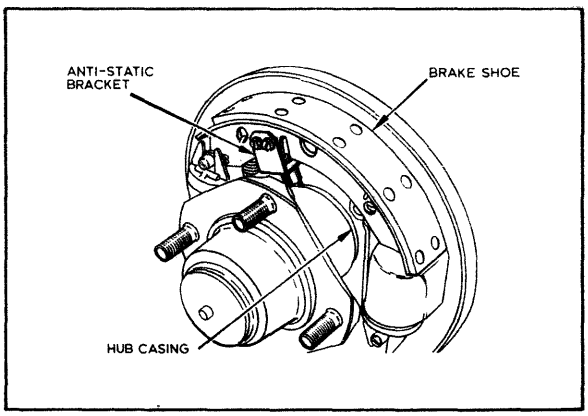


Fig. 11 Brake Shoe Fitting

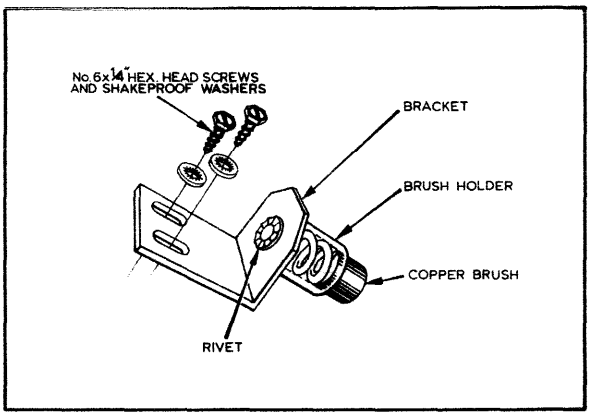


Fig. 12 Anti-Static Bracket

OTHER POSSIBLE SOURCES

Bad electrical contact between adjacent parts of bodywork e.g. exhaust system/bodywork, engine block/bodywork, wings/ bodywork and rear axle assembly/bodywork.

Symptoms and Remedies

Symptoms: Interference persists after all the previously detailed measures have been completed.

Remedies:

1. With the vehicle stationary, rotate the squelch control until receiver noise is heard. Run the engine at varying speeds and check for vibrating cables, pipes and other engine components. Bond where necessary, using heavy copper braid, to the engine block.

2. If noise is not associated with engine vibration, check entire vehicle in order to ensure that all body members are securely fixed in position.

CHAPTER IV

SERVICING

The performance figures given in this chapter and in the Alignment Charts (Figs. 20 and 21) are for new equipment and equipment regularly maintained in accordance with the Routine Maintenance Procedure on page 32.

TRANSISTOR CIRCUITS

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.

Transistors may easily be damaged by removal and it is wise to make certain that the transistor is faulty and not another component in the circuit, before applying a soldering iron.

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 power 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 can result in excessive voltage being applied to transistors.

6. When using a voltmeter 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 a power transistor is suspected and confirmed by voltage analysis fit a replacement transistor, but do not switch on the equipment until the cause of transistor failure has been remedied.

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 are protected by a polystyrene coating (identified by copper colour). Meter readings should be taken from the end wires of the components on the upper side of the board. If it is necessary to take meter readings on the printed circuits, needle point test probes should be used.

2. Soldering should be completed as quickly as possible to avoid softening of the adhesive under the printed circuit board. Use minimum force when removing faulty components. A recommended method is to cut component leads and, holding the board upside down, apply the soldering iron thereby causing the remaining wires to drop out.

3. The end wires of the replacement components should be carefully cleaned before they are inserted through the holes on the board. They should then be cut to length, bent over against the printed circuit sufficient to hold them in position and soldered as rapidly as possible. A 60/40 resin-cored solder is recommended.

4. Use a minimum amount of solder, particularly in the more congested areas of the printed circuit. It will not normally be necessary to clean the circuitry before soldering, but, should the necessity arise, a small glass-fibre brush should be used. After soldering, any exposed copper foil should be coated with polystyrene dope to keep out moisture. Any loose particles of solder should be removed. Printed circuits which are already solder-plated need no further protection.

ROUTINE MAINTENANCE PROCEDURE

TEST EQUIPMENT REQUIRED

The following test equipment is recommended.

1. Hum-free l.t. supply of 13.2V d.c.
2. Pye test meter type TM1.
3. Audio Output Meter with a scale reading of up to 2 watts (10 watts if P.A. facility is fitted) and calibrated in db.
4. Signal generator (see V.H.F. Signal Generators page 33).
5. A.F. Oscillator
6. R.F. Power and Output Meter (Bird Termaline Model 612 is suitable).
7. Crystal Controlled 455 kc/s Marker Oscillator (the Pye PT503 is suitable).
8. Reflectometer (the Pye RFL1 is suitable).
9. Beat Frequency Oscillator.
10. Multi-range d.c. voltmeter of 20,000Ω/volt sensitivity.

* Where the Pye Test Set type TM1 is not available an H.F. valve voltmeter or diode probe used in conjunction with a 0-50μA meter (see Fig. 14) will be required.

Metering Facilities

TX and RX TEST sockets (SKTD and SKTE respectively) are fitted to the main unit front panel for test and equipment alignment procedures in conjunction with the testmeter TM1. This instrument is fitted with a mating plug.

SKTE can be used in carrying out performance checks if the audio output meter is connected to SKTE pins 1 and 2 instead of T2 pins 4 and 5.

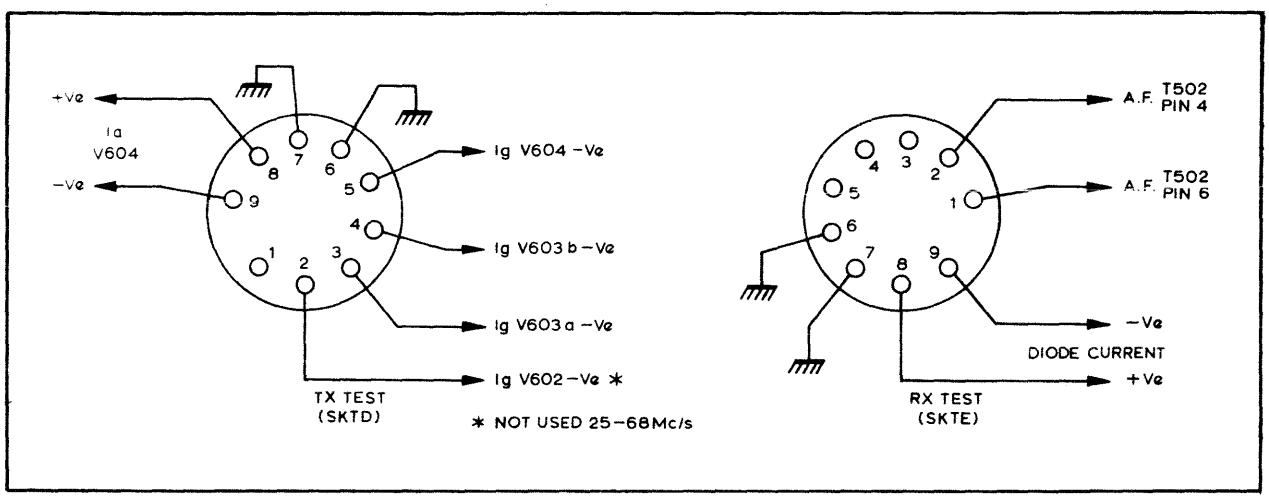


Fig. 13 Equipment Test Sockets

V.H.F. SIGNAL GENERATORS

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

1. Boonton Radio Corporation, Boonton, New Jersey — Type 202E
2. Marconi Instruments Ltd., — TF995A/5

Other signal generators may be suitable for comparative tests.

GENERAL CHECKS

1. Remove the battery socket and antenna connector. Remove the equipment 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. Check all valves and crystals are firmly seated. Replace covers.
3. Check over the antenna installation.
4. Check the power supply leads for wear and replace if necessary. Ensure that all connections are firm.
5. Replace the equipment on the cradle. Replace the antenna connector and battery socket.
6. Check the battery voltage (see Standard Test Voltage on page 19).

7. Operate the equipment, checking all controls and relay operations. On switched channel equipments check the channel selector switch.

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

9. Check the transmitter h.t. voltage at:-

   (a) junction L701/R624 400V

   (b) junction R624/R615 290V

RECEIVER PERFORMANCE CHECKS

Typical voltages are shown on page 40. The complete alignment procedure for the receiver is given in Fig. 20.

1. Check the second local oscillator.

   Using the TM1 (set to PROBE) check that the oscillator injection voltage at the junction of MR201 and L201 on the Second Mixer Unit is at least 0.5 volt.

2. Check the first local oscillator.

   Transfer the probe of the TM1 to the junction of MR1 and L5 on the R.F. Unit and check that the oscillator injection voltage is at least 0.5V.

3. Turn the VOLUME and SQUELCH controls fully clockwise.

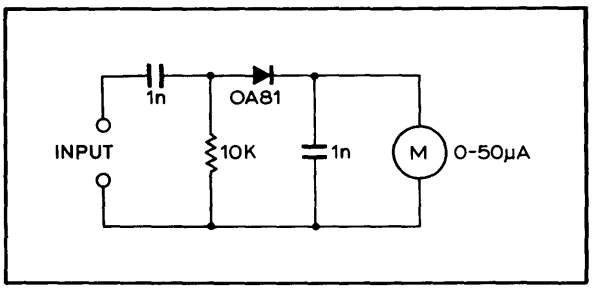


Fig. 14 Diode Probe

4. Check the overall sensitivity.

   Connect 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 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., modulated 30% at 1000 c/s 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 db scale reading. Subtracting the latter reading from the former reading will give the approximate signal to noise ratio at this level. (25-108 Mc/s 12db; 108-174 Mc/s 10db).

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

With the signal generator and output meter connected as in 4 above and 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 the audio output is not greater than 8db (25-108 Mc/s) or 10db (108-174 Mc/s).

7. Check the squelch.

Rotate the squelch control fully counterclockwise. Inject a 2μV r.f. signal modulated 30% at 1000 c/s and check that the squelch remains closed. Remove the r.f. signal.

Check the maximum sensitivity of the squelch which should operate satisfactorily at the threshold setting with a signal input of 0.5μV e.m.f. modulated 30% at 1000 c/s.

RECEIVER SENSITIVITY

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

Connect the TM1 (0-50μA range) to RX TEST socket and set the selector switch to 7. 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. coupling 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.

Test Point (Cont.)	Nominal Signal Level (Cont.)
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.

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

VT501 (audio amplifier) base	2.4mV
VT501 (audio amplifier) collector	82mV
VT502 (emitter follower) base	68mV
VT502 (emitter follower) emitter	65mV
VT503 (audio output driver) collector	1.34V
VT504, VT505 (audio output) base	104mV
VT504, VT505 (audio output) collector	6.7V

Band Pass Filter Check

Check the insertion loss.

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

TRANSMITTER PERFORMANCE CHECKS

Typical voltages are given on page 40. The complete alignment procedure for the transmitter is given in Fig. 21.

1. R.F. Stages

Insert the Test Meter TM1 9-pin plug into the TX TEST socket and switch to the appropriate position as given below. Alternatively connect a 2500Ω 50μA meter to the sockets indicated.

TM1 SWITCH POSITION	TX TEST SOCKET CONNECTIONS	MEASUREMENT	TYPICAL READING
1	Not used		
2	2 (-ve): 7 (+ve) (Not used in 25-68 Mc/s equipments)	V602 grid current	25μA
3	3 (-ve): 7 (+ve)	V603a grid current	25μA
4	4 (-ve): 7 (+ve)	V603b grid current	26μA
5	5 (-ve): 7 (+ve)	V604 grid current	15μA
6	Not used		
7	8 (+ve): 9 (-ve)	V604 anode current	27μA max.

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. 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

2. 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 the hum and noise on the carrier is at a minimum.

3. Check the modulation.

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

4. Check the power output, which should be at least 17 watts.

5. Adjust the antenna trimmer C629 for maximum power output as indicated on the reflectometer or a radiation meter.

6. Check the P.A. system (when fitted).

   With the facility switch set to PA, connect the audio output meter across SKTC pins 1 and 3. Connect the b.f.o. across SKTH pins 5 and 6 (control unit) and inject an input of 20mV modulated at 1000 c/s.

   Close TX TEST switch SD and check that the audio output is not less than 8 watts.

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

Call the base station for a final operational test and carry out the Field Testing Procedure.

Microphone Amplifier Gain Control (RV551)

Should it become necessary to replace this control or any of its associated components, the following procedure should be carried out:-

Connect the R.F. power output meter to ANTENNA and the b.f.o. across SKTH pins 5 and 6. Inject an input of 10mW at 1000 c/s and set up the oscilloscope to display a modulated carrier. Adjust RV551 to present 50% modulation on the oscilloscope trace.

DISMANTLING PROCEDURE

Main Unit

To remove the unit from the cradle give the quick-release fastener a quarter turn counter-clockwise, lower the flap and pull the unit forward to clear the locating pins.

The covers can be removed by giving each of the four quick release fasteners a quarter turn counter-clockwise and lifting the cover off the main unit case.

Control Unit

To remove the chassis from the case, unscrew the two 4 B.A. pan head chrome screws, one at each side of the escutcheon. The chrome bezel, escutcheon and chassis can then be drawn forward to clear the case. It is not necessary to disconnect the cables at the rear of the chassis.

D.C. RESISTANCE OF INDUCTORS

SECOND MIXER UNIT

		Winding	Tag Nos	Resistance
T201	Second I.F. transformer	Primary		3.7Ω
		Secondary		9.6Ω

SECOND I.F. UNIT

T301	Second I.F. transformer	Primary		9.6Ω
		Secondary		3.7Ω
T302	Second 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	Choke filter			19.0Ω
T501	Audio driver transformer	Primary	1 - 3	63.0Ω
		Secondary	4 - 6	4.1Ω
T502	Audio output transformer	Primary	1 - 3	16.0Ω
		Secondary	4 - 6	0.35Ω

MICROPHONE AMPLIFIER AND MODULATOR UNITS

		Winding	Tag Nos.	Resistance
L551	Choke filter			19.0Ω
L552	Choke filter			1.0Ω
L575	Audio choke			4.3Ω
T551	Audio drive transformer	Primary	1 - 3	63.0Ω
		Secondary	4 - 6	4.1Ω
T552	Modulation transformer	Primary	1 - 4	0.14Ω
		Modulation Secondary	7 - 8	78.0Ω
		Feedback Secondary	5 - 6	0.2Ω
		P.A. Secondary	9 - 10	1.2Ω

TRANSMITTER

L603	Cathode choke			7.6Ω

POWER SUPPLY

L701	H.T. smoothing choke			0.4Ω
L703	L.T. smoothing choke			0.076Ω
T701	Converter transformer	Feedback Primary	4 - 7	4.7Ω
		Oscillator Primary	1 - 3	0.03Ω
		Secondary	8 - 10	14.6Ω

RELAYS

RLA	Transmit	186Ω
RLB	Antenna changeover	320Ω
RLC	Standby	625Ω
RLD	Start	625Ω
RLF	P.A.	186Ω

VOLTAGE ANALYSIS

The typical voltage readings given below were made using an Avometer Model 8 (20, 000Ω/volt).

Conditions of Test

1. Supply voltage at standard test voltage:-

   13.2V d.c. for nominal 12 volt equipments.

2. Receiver voltage readings (except for the Squelch Unit), negative with respect to the positive supply line, measured with the SQUELCH control set to just silence the receiver, and with no incoming signal. Meter set to 25V range.

3. Squelch Unit voltages negative with respect to the unit positive line on pin 3.

4. Transmitter and power supply voltages, positive with respect to chassis, measured at the nearest decoupled point. Meter set to 500V range.

RECEIVER

		Collector	Base	Emitter
R.F. Unit	VT1	9	2.1	1.9
	VT2	8.8	2.1	1.85
	VT3	8.8	2.5	2.15
1st I.F. Unit	VT101	11.8	1.39	
	VT102	12.3	1.45	
	VT103	12.3	1.52	
2nd Mixer Unit	VT201	10.3		
	VT202	10.3	*4.9	*4.7
	* with crystal XL201 shorted out.			
2nd I.F. Amplifier	VT301	12.2	5.8	5.7
	VT302	13	2.4	2.2
	VT303	6.5	3.1	3
	VT304	5.7		
	VT305	11.5	3	2.8
	VT306	10	3.2	3.1

Squelch Unit

Double figures are referenced as follows:-

Upper figure with SQUELCH control set fully counter-clockwise.
Lower figure with SQUELCH control set fully clockwise.

		Collector	Base	Emitter
	VT401	5	0.45	0.4 0
	VT402	6	5 0	0.2 0
	VT403	6	2.7 0.5	2.4 0.5
	VT404	5.5 5.2	0.5	2.4
Receiver Audio	VT503	5.4	1.1	1
	VT504	12.25		
	VT505	12		2.25
	VT506	12.9	0.2	
	VT507	12.9	0.2	

TRANSMITTER

	Anode	Screen
V601	300	60
V602	290	180
V603a	300 }	110
V603b	300 }	
V604a, b	410	230

POWER SUPPLY

Junction L701/C701b	410V

TEST EQUIPMENT INFORMATION

TEST METER TYPE TM1

This instrument is used for servicing Cambridge and Vanguard radiotelephones.

It incorporates the following servicing facilities:-

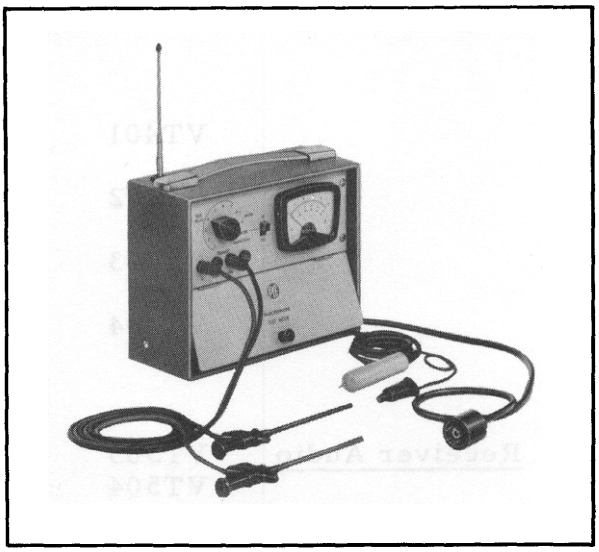
Grid and anode current measurements (0-50μA)

D.C. voltage measurement (0-2.5V and 0-15V)

Signal voltage measurement

Radiation check

A cableform terminated by 9-pin plug mates with the Vanguard test sockets; prods are fitted for connection with the Cambridge test points.



All facilities are selected by the 12-way selector switch (SA) as tabulated below:

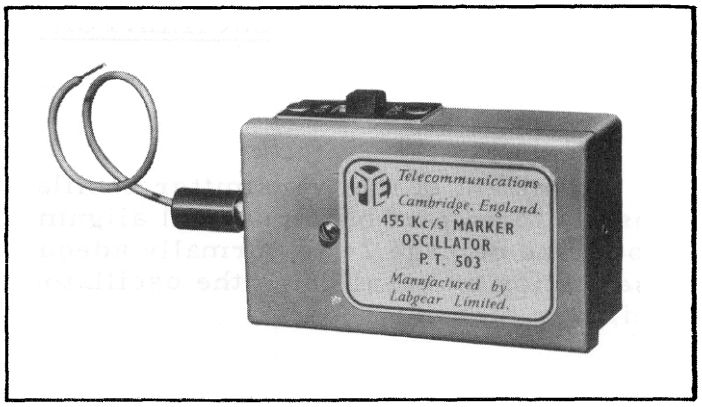
SA Posn	Facility	Connected to	Reading	Stages	Equipment	AM or FM
1 to 7	TEST PLUG	TX TEST socket	Ia or Ig	Multiplier	Vanguard	AM/FM
			Ia or Ig	Driver		
			Ia or Ig	P.A.		
7	TEST	RX TEST	Ia	Detector (MR1)	Vanguard	AM
8	METER +-	TX test points	Ia or Ig	Multiplier	Cambridge	AM/FM
				Driver		
				P.A.		
		RX test points	Ia	Detector	Cambridge	AM
8 & 9	METER +- METER -+	RX test points	Disc output balancing		Vanguard & Cambridge	FM
10	PROBE	RX and TX test points	Signal voltages	Various	Vanguard & Cambridge	AM/FM
11	RADIATION	Equipment Antenna (Loosely couple)	Tx output (Indication)		Vanguard & Cambridge	AM/FM
12	TRANSIT (selected when equipment is out of use)					

MARKER OSCILLATOR (455 kc/s) TYPE PT503

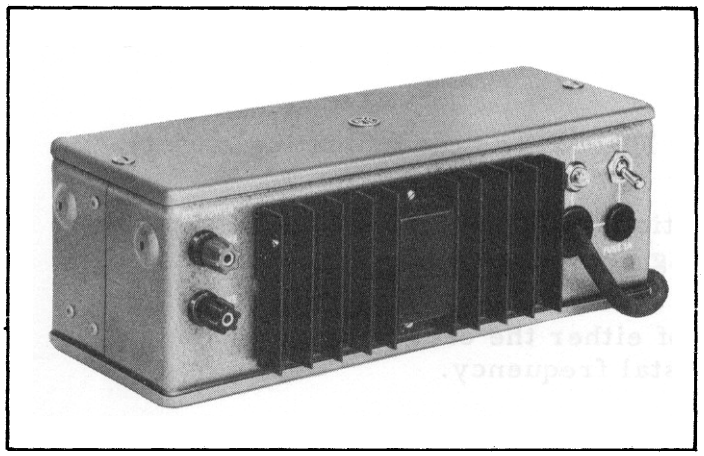
This instrument is a crystal controlled 455 kc/s oscillator used for netting Cambridge and Vanguard radiotelephones and associated fixed stations and the alignment of the receiver i.f. stages.

The instrument is coupled to the unit under test by the small external inductance.

The power supply is a 15V standard dry cell.



POWER UNIT TYPE AC 10 PU



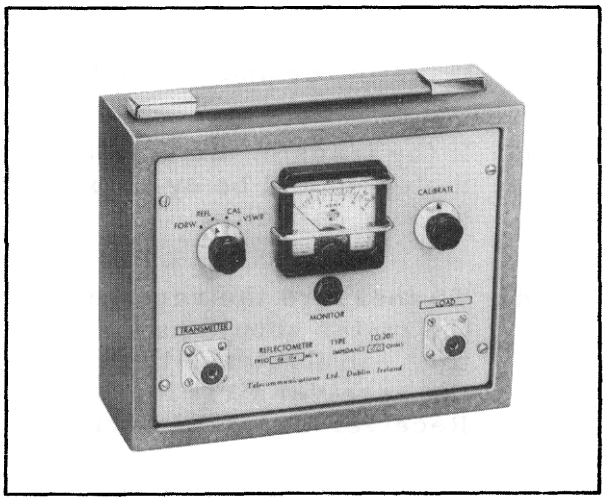
This unit is a small transistorised power supply which operates from an a.c. supply of 100/150 or 190/240V, 40/60 c/s to deliver a d.c. output of 5A at 13.2V.

It is suitable for servicing all Cambridge and Vanguard receivers and dash-mounted Cambridge transmitters.

REFLECTOMETER TYPE RLF1

This instrument is used to measure the forward and reflected power of Cambridge and Vanguard transmitters operating in the frequency range 25-174 Mc/s with output ratings of up to 75W. The directly calibrated meter also reads the VSWR.

In order to make the required measurements, the instrument is interposed in the r.f. transmission line between the transmitter and its load.



The telephone socket on the front panel provides a monitoring facility. When used in conjunction with an AM transmitter, the modulation can be monitored directly by plugging in a pair of telephones and setting the selector switch to the position which gives the most satisfactory listening level. Correct operation of the transmitter will be indicated on the meter and confirmed by an increase of power output when modulation is applied.

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 24 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 coaxial cable from the anode of V601a via a 0.75pF capacitor.

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

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

PARTS LISTS

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.

The right is reserved to fit alternative types of semiconductors with equal or improved performance to those quoted in the Parts Lists.

R.F. UNIT

CAPACITORS

Code			Mc/s			Part No.
†C1	33pF	Silver mica	25-32.5	350V	±1pF	PP06174
	39pF	Silver mica	32.5-42	350V	±1pF	PP06405
	27pF	Silver mica	42 - 54	350V	±1pF	PP05869
	15pF	Ceramic tub.	54 - 68		± 5%	PN10037
	10pF	Ceramic tub.	68 - 88		± 5%	PN09031
	10pF	Ceramic tub.	88 -108		± 5%	PN09031
	8.2pF	Ceramic tub.	112-136		±2.5pF	PN07038
	12pF	Ceramic tub.	132-156		± 5%	PN09111
	10pF	Ceramic tub.	148-174		± 5%	PN09031
	12pF	Ceramic	79 -101		± 5%	PN09111
†C2	150pF	Silver mica	25-32.5	350V	± 2%	PP09405
	390pF	Silver mica	32.5-42	350V	± 2%	PP10905
	220pF	Silver mica	42 - 54	200V	± 2%	PP10054
	150pF	Silver mica	54 - 68	350V	± 2%	PP09405
	100pF	Silver mica	68 -108	350V	± 2%	PP08508
	56pF	Silver mica	112-136	350V	± 2%	PP07205
	82pF	Silver mica	132-156	350V	± 2%	PP08203
	68pF	Silver mica	148-174	350V	±2%	PP07654
	120pF	Silver mica	79 -101			PP08854
C3	2nF	Disc ceramic				PN33301
C4	2nF	Disc ceramic				PN33301
†C5	27pF	Silver mica	25-32.5	350V	±1pF	PP05869
	39pF	Silver mica	32.5-42	350V	±1pF	PP06405
	27pF	Silver mica	42 - 54	350V	±1pF	PP05869
	15pF	Ceramic tub.	54 - 68		± 5%	PN10037
	10pF	Ceramic tub.	68 -108		± 5%	PN09031
	8.2pF	Ceramic tub.	112-136		±2.5pF	PN07038
	12pF	Ceramic tub.	132-156		± 5%	PN09111
	10pF	Ceramic tub.	148-174		± 5%	PN09031
	12pF	Ceramic tub.	79 -101		± 5%	PN09111
†C6	2nF	Disc ceramic				PN33301
C7	1.8pF	Ceramic tub.	25-32.5		±0.1pF	PN00176
	1.2pF	Ceramic tub.	32.5-42		±0.1pF	PN00060
	0.7pF	Ceramic tub.	42 - 54		±0.1pF	PN00013
	0.3pF	Ceramic tub.	54 - 88		±0.1pF	PN00001
	0.3pF	Ceramic tub.	88 -108		±0.1pF	PN00001
	0,4pF	Ceramic tub.	112-174		±0.1pF	PN00010
	0,3pF	Ceramic tub.	79 -101			PN00001
C8	0,1μF	Foil				PQ32000
†C9	27pF	Silver mica	25-32.5	350V	±1pF	PP05869
	47pF	Silver mica	32.5-42	350V	±1pF	PP06671
	27pF	Silver mica	42 - 54	350V	±1pF	PP05869
	15pF	Ceramic tub.	54 - 68		± 5%	PN10037
	10pF	Ceramic tub.	68 -108		± 5%	PN09031
	8.2pF	Ceramic tub.	112-136		±2.5pF	PN07038
	12pF	Ceramic tub.	132-156		± 5%	PN09111
	10pF	Ceramic tub.	148-174		± 5%	PN09031
	18pF	Ceramic	79 -101		± 5%	PN10118
†C10	2nF	Disc ceramic			+40% -20%	PN33301
C11	2nF	Disc ceramic	25 -174		+40% -20%	PN33301
		Not used	79 -101			
C12	56pF	Silver mica	25 - 42	350V	± 2%	PP07205
	39pF	Silver mica	42 - 54	350V	±1pF	PP06405
	56pF	Silver mica	54 -136	350V	± 2%	PP07205
	33pF	Silver mica	132-156	350V	±1pF	PP06174
	27pF	Silver mica	148-174	350V	±1pF	PP05869
	47pF	Ceramic	79 -101		± 5%	PN13105
C13	4.7pF	Silver mica	25 - 88	350V	±0.5pF	PP01772
	4.7pF	Silver mica	88 -108	350V	±0.5pF	PP01772
	12pF	Ceramic tub.	112-136		± 5%	PN09111
	4.7pF	Silver mica	132-174	350V	±0.5pF	PP01772
	15pF	Ceramic	79 -101		±2.5pF	PN10019
C14	2nF	Disc ceramic			+40% -20%	PN33301
C15	0.1μF	Foil				PQ32000
†C16		Not used	25 - 54			
	18pF	Ceramic tub.	54 - 68		± 5%	PN10118
	12pF	Ceramic tub.	68 -108		± 5%	PN09111
	10pF	Ceramic tub.	112-136		± 5%	PN09031
	12pF	Ceramic tub.	132-156		± 5%	PN09111
	10pF	Ceramic tub.	148-174		± 5%	PN09031
	12pF	Ceramic tub.	79 -101		± 5%	PN09111
†C17	27pF	Silver mica	25-32.5	350V	±1pF	PP05869
	39pF	Silver mica	32.5-42	350V	±1pF	PP06405
	27pF	Silver mica	42 - 54	350V	±1pF	PP05869
	15pF	Ceramic tub.	54 - 68		± 5%	PN10037
	10pF	Ceramic tub.	68 -136		± 5%	PN09031
	15pF	Ceramic tub.	132-156		± 5%	PN10037
	10pF	Ceramic tub.	148-174		± 5%	PN09031
	10pF	Ceramic tub.	79 -101		± 5%	PN09031
†C18	2nF	Disc ceramic			+40% -20%	PN33301

CAPACITORS (Cont.

Code			Mc/s			Part No.
†C19		Not used	25 - 54			
	2nF	Disc ceramic	54 -174		+40% -20%	PN33301
		Not used	79 -101			
C20	1.8pF	Ceramic tub.	25-32.5		±0.1pF	PN00176
	1.2pF	Ceramic tub.	32.5-42		±0.1pF	PN00060
	0.7pF	Ceramic tub.	42 - 54		±0.1pF	PN00013
	0.3pF	Ceramic tub.	54 -108		±0.1pF	PN00001
	0.4pF	Ceramic tub.	112-174		±0.1pF	PN00010
	0.2pF	10MΩ resistor used as capacitance	79 -101	0.25W	±10%	PM00273
C21	27pF	Silver mica	25-32.5	350V	±1pF	PP05869
	39pF	Silver mica	32.5-42	350V	±1pF	PP06671
	27pF	Silver mica	42 - 54	350V	±1pF	PP05869
	15pF	Ceramic tub.	54 - 68		± 5%	PN10037
	10pF	Ceramic tub.	68 -108		± 5%	PN09031
	8.2pF	Ceramic tub.	112-136		±2.5pF	PN07038
	15pF	Ceramic tub.	132-156		± 5%	PN10037
	12pF	Ceramic tub.	148-174		± 5%	PN09111
	12pF	Ceramic	79 -101		± 5%	PN09111
†C22	0.1μF	Foil	25 -174			PQ32000
		Not used	79 -101			
C23	0.1μF	Foil				PQ32000
C24	39pF	Silver mica	25 - 54	350V	±1pF	PP06405
	15pF	Silver mica	54 -174	350V	±1pF	PP05015
		Not used	79 -101			
C25	10nF	Disc ceramic				PN50301
C26	2nF	Disc ceramic			+40% -20%	PN33301
C27	12.5μF	Electrolytic		25V		PS24144
C28	2nF	Disc ceramic	25 -174		+40% -20%	PN33301
	10nF	Disc ceramic	79 -101			PN50301
†C29		Not used	25 -108			
	18pF	Ceramic tub.	112-136		± 5%	PN10118
		Not used	132-174			
C30		Not used				
C31		Not used				
C32		Not used				
C33	2nF	Disc ceramic	25 -174		+40% -20%	PN33301
		Not used	79 -101			
C34		Not used	25 -174			
	82pF	Silver mica	79 -101		± 2%	PP08203
C35		Not used	25 -174			
	2nF	Disc ceramic	79 -101			PN33301
C36		Not used	25 -174			
	2nF	Disc ceramic	79 -101			PN33301
C37		Not used	25 -174			
	0.7pF	Ceramic tub.	79 -101		±0.1pF	PN00013
C38		Not used	25 -174			
	12pF	Ceramic	79 -101		± 5%	PN09111
C39		Not used	25 -174			
	22pF	Ceramic	79 -101		± 5%	PN11050
C40		Not used	25 -174			
	150pF	Silver mica	79 -101		± 2%	PP09405
C41		Not used	25 -174			
	10nF	Foil	79 -101			PQ25000
C42		Not used	25 -174			
	10nF	Disc ceramic	79 -101			PN50301

RESISTORS

R1	470Ω	Composition		0.1W	±10%	NG47103
R2	270Ω	Composition		0.1W	±10%	NG27103
R3	560Ω	Composition		0.1W	±10%	NG56103
†R4	470Ω	Composition		0.1W	±10%	NG47103
R5	5.6kΩ	Composition	25 -174	0.1W	±10%	NG56203
	47kΩ	Composition	79 -101	0.1W	±10%	NG47303
R6	680Ω	Composition	25 -174	0.1W	±10%	NG68103
	4.7kΩ	Composition	79 -101	0.1W	±10%	NG47203
R7	68Ω	Composition		0.1W	±10%	NG68003
R8	470Ω	Composition		0.1W	±10%	NG47103

R. F. UNIT (Cont.)

RESISTORS (Cont.)

Code		Mc/s			Part No.
R9	560Ω Composition		0.1W	±10%	NG56103
†R10	470Ω Composition		0.1W	±10%	NG47103
R11	270Ω Composition		0.1W	±10%	NG27103
R12	470Ω Composition		0.1W	±10%	NG47103
R13	470Ω Composition		0.1W	±10%	NG47103
R14	1kΩ Composition		0.1W	±10%	NG10203
R15	Not used				
R16	Not used				
R17	470Ω Composition	25 - 54	0.1W	±10%	NG47103
	Not used	54 -174			
R18	Not used	25 -174			
	470Ω Composition	79 -101	0.1W	±10%	NG47103

SEMICONDUCTORS

VT1	Transistor OC171	25-32.5	FV05049
	Transistor AFZ11	32.5-68	FV05067
	Transistor AFZ12	68 -156	FV05017
	Transistor AFZ12A	148-174	FV05090
	Transistor GM378B	79 -101	FV09827
VT2	Transistor OC171	25-32.5	FV05049
	Transistor AFZ11	32.5-68	FV05067
	Transistor AFZ12	68 -156	FV05017
	Transistor AFZ12A	148-174	FV05090
	Transistor GM378B	79 -101	FV09827
VT3	Transistor OC171	25 - 42	FV05049
	Transistor AFZ11	42 - 54	FV05067
	Transistor OC171	54 -108	FV05049
	Transistor AFZ11	112-156	FV05067
	Transistor AFZ12B	148-174	FV05091
	Transistor AFZ11	79 -101	FV05067
MR1	Diode GEX66		FV09080

TRANSFORMERS

		Freq. (Mc/s)	
T1	R.F.	25-32.5	278686/2
	R.F.	32.5-88	278584
	R.F.	88 -108	278584/9
	R.F.	112-136	278674/2
	R.F.	132-174	278665/2
	R.F.	79 -101	278584/38

TRANSFORMERS (cont.)

Code		Mc/s	Part No.
T2	Not used	25 - 54	
	Multiplier	54 - 88	278584/13
	Multiplier	88 -108	278584/14
	Multiplier	112-136	278674/15
	Multiplier	132-174	278665/6
	Not used	79 -101	
T3	R.F.	25-32.5	278686/4
	R.F.	32.5-88	278584/3
	R.F.	88 -108	278584/11
	R.F.	112-136	278674/4
	R.F.	132-174	278665/4
	Not used	79 -101	

INDUCTORS

L1	Antenna matching coil	25-32.5	278686
	Antenna matching coil	32.5-88	278584/1
	Antenna matching coil	88 -108	278584/6
	Antenna matching coil	112-136	278674
	Antenna matching coil	132-174	278665
L2	VT1 collector coil	25-32.5	278686/1
	VT1 collector coil	32.5-54	278584/12
	VT1 collector coil	54 - 88	278584/2
	VT1 collector coil	88 -108	278584/7
	VT1 collector coil	112-136	278674/1
	VT1 collector coil	132-174	278665/1
L3	R.F. Choke		279052
L4	VT2 collector coil	25-32.5	278686/3
	VT2 collector coil	32.5-68	278584/5
	VT2 collector coil	68 - 88	278584/19
	VT2 collector coil	88 -108	278584/8
	VT2 collector coil	112-136	278674/3
	VT2 collector coil	132-174	278665/3
	VT2 collector coil	79 -101	278584/40
L5	Choke		278582
L6	Not used	25 -174	
	Coil	79 -101	278692/1
L7	Not used	25 -174	
	Coil	79 -101	278584/41
L8	Not used		
L9	Not used	25 -174	
	Coil	79 -101	278584/37
L10	Not used	25 -174	
	Coil	79 -101	278584/39
L11	Not used		
L12	Not used	25 -108	
	Coil	112-136	AT31636
	Not used	132-174	

† Components mounted in cans

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY NOS.

25-32.5 Mc/s	276250/9	88 -108 Mc/s	276250/2
32.5-42 Mc/s	276250/4	112-136 Mc/s	276250/27
42 - 54 Mc/s	276250/3	132-156 Mc/s	276250/7
54 - 68 Mc/s	276250/8	148-174 Mc/s	276250/1
68 - 88 Mc/s	276250	79 -101 Mc/s	276490/10

FIRST I. F. UNIT

CAPACITORS

Code			Mc/s			Part No.
C101	0.1μF	Foil				PQ32000
C102	0.1μF	Foil				PQ32000
C103	334pF	Polystyrene	25 - 68	125V	± 1%	PQ10720
*	75pF	Polystyrene	68 -174	125V	± 1%	PQ08352
or	80pF	Polystyrene	68 -174	125V	± 1%	PQ08380
C104	0.1μF	Foil				PQ32000
C105	18pF	Silver mica		350V	±1pF	PP05400
C106	204pF	Polystyrene	25 - 68	125V	±1%	PQ10020
*	57pF	Polystyrene	68 -174	125V	±1%	PQ07320
or	60pF	Polystyrene	68 -174	125V	±1%	PQ07600
C107	0.1μF	Foil				PQ32000
C108	204pF	Polystyrene	25 - 68	125V	±1%	PQ10020
*	57pF	Polystyrene	68 -174	125V	±1%	PQ07320
or	60pF	Polystyrene	68 -174	125V	±1%	PQ07600
C109	18pF	Silver mica		350V	±1pF	PP05400
C110	204pF	Polystyrene	25 - 68	125V	±1%	PQ10020
*	57pF	Polystyrene	68 -174	125V	±1%	PQ07320
or	60pF	Polystyrene	68 -174	125V	±1%	PQ07600
C111	0.1μF	Foil				PQ32000

CAPACITORS (cont.)

Code			Mc/s			Part No.
C112	204pF	Polystyrene	25 - 68	125V	±1%	PQ10020
*	57pF	Polystyrene	68 -174	125V	±1%	PQ07320
or	60pF	Polystyrene	68 -174	125V	±1%	PQ07600
C113	12pF	Silver mica		350V	±1pF	PP04679
C114	370pF	Polystyrene	25 - 68	125V	±1%	PQ10868
*	106pF	Polystyrene	68 -174	125V	±1%	PQ08530
or	110pF	Polystyrene	68 -174	125V	±1%	PQ08655
C115	0.1μF	Foil				PQ32000
C116	30μF	Electrolytic		15V		PS28500
C117		Not used				
C118		Not used				
C119		Not used				
C120	33pF	Ceramic	25 - 88		± 5%	PN12078
	33pF	Ceramic	88 -108		± 5%	PN12078
	33pF	Ceramic	112-136		± 5%	PN12078
	33pF	Ceramic	132-174		± 5%	PN12078
	33pF	Ceramic	79 -101		± 5%	PN12078
C121	0.1μF	Foil				PQ32000
C122	0.1μF	Foil				PQ32000

* Components selected on manufacture

FIRST I.F. UNIT (Cont.)

Code	RESISTORS			Part No.
R101	33kΩ Composition	0.1W	±10%	NG33303
R102	4.7kΩ Composition	0.1W	±10%	NG47203
R103	1.8kΩ Composition	0.1W	±10%	NG18203
R104	820Ω Composition	0.1W	± 5%	NE82103
R105	33kΩ Composition	0.1W	±10%	NG33303
R106	33kΩ Composition	0.1W	±10%	NG47203
R107	270Ω Composition	0.1W	±10%	NG27103
R108	2.2kΩ Composition	0.1W	±10%	NG22203
R109	820Ω Composition	0.1W	± 5%	NE82103
R110	33kΩ Composition	0.1W	±10%	NG33303
R111	4.7kΩ Composition	0.1W	±10%	NG47203
R112	2.7kΩ Composition	0.1W	±10%	NG27203
R113	820Ω Composition	0.1W	± 5%	NE82103
R114	220Ω Composition	0.1W	±10%	NG22103
	SEMICONDUCTORS			
VT101	Transistor OC171			FV05049
VT102	Transistor OC171			FV05049
VT103	Transistor OC171			FV05049

Code	TRANSFORMERS		Part No.
T101	1st i.f. 10.7 Mc/s		278583
T102	1st i.f. 10.7 Mc/s		278583/1
T103	1st i.f. 10.7 Mc/s		278583/1
T104	1st i.f. 10.7 Mc/s		278583/3
	INDUCTORS		
L101	Coil		278583/2
L102	Coil		278583/2
L103	Choke	25 - 88 Mc/s	278582
	Choke	79 -101 Mc/s	278582
	Choke	88 -108 Mc/s	278582
	Choke	112-136 Mc/s	278582
	Choke	132-174 Mc/s	278582

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NOS.

25 - 68 Mc/s 276251/1
68 -174 Mc/s 276251

SECOND MIXER UNIT

Code	CAPACITORS			Part No.
C201	33pF Silver mica	350V	±1pF	PP06174
C202	0.1μF Foil			PQ32000
C203	220pF Silver mica	200V	± 2%	PP10054
C204	100pF Silver mica	350V	± 2%	PP08508
C205	390pF Silver mica	350V	± 2%	PP10905
C206	0.1μF Foil			PQ32000
C207	39pF Silver mica	350V	±1pF	PP06405
C208	30μF Electrolytic	15V		PS28500
C209	10nF Foil			PQ25000
C210	0.1μF Foil			PQ32000
	RESISTORS			
R201	470Ω Composition	0.1W	±10%	NG47103
R202	1.5kΩ Composition	0.1W	±10%	NG15203
R203	1kΩ Composition	0.1W	±10%	NG10203
R204	27kΩ Composition	0.1W	±10%	NG27303
R205	27kΩ Composition	0.1W	±10%	NG27303
R206	470Ω Composition	0.1W	±10%	NG47103

Code	RESISTORS (cont.)			Part No.
R207	15kΩ Composition	0.1W	±10%	NG15303
R208	1.2kΩ Composition	0.1W	±10%	NG12203
R209	2.2kΩ Composition	0.1W	±10%	NG22203
R210	470Ω Composition	0.1W	±10%	NG47103
	SEMICONDUCTORS			
VT201	Transistor D524			FV07071
VT202	Transistor OC171			FV05049
MR201	Diode OA73			FV09326
	MISCELLANEOUS			
T201	Transformer			278578
L201	Choke			279052
XL201	Crystal frequency to order			
	Bandpass filter 25 kc/s			260008
	Bandpass filter 50 kc/s			260040
SKTE	Test socket			FH02528

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NOS.

25 - 68 Mc/s 276252/1 68 -174 Mc/s 276252
79 -101 Mc/s 276252/8

SECOND I.F. UNIT

Code	CAPACITORS			Part No.
C301	10nF Foil			PQ25000
C302	0.1μF Foil			PQ32000
C303	10nF Foil			PQ25000
C304	0.1μF Foil			PQ32000
C305	39pF Ceramic		±10%	PN12172
C306	180pF Silver mica		± 2%	PP09651
C307	0.1μF Foil			PQ32000
C308	0.1μF Foil			PQ32000
C309	0.1μF Foil			PQ32000
C310	0.1μF Foil			PQ32000
C311	0.1μF Foil			PQ32000
C312	10nF Foil			PQ25000
C313	1.5nF Polystyrene	125V	± 5%	PQ15500
C314	0.1μF Foil			PQ32000
C315	Not used			

Code	CAPACITORS (cont.)			Part No.
C316	470pF Disc ceramic		±20%	PN22400
C317	2nF Disc ceramic		-20% +40%	PN33301
C318	0.1μF Foil			PQ32000
C319	25μF Electrolytic	12V		PS28005
C320	2nF Disc ceramic		-20% +40%	PN33301
C321	0.22μF Polyester	125V		PQ33000
C322	10nF Foil			PQ25000
C323	0.47μF Polyester	125V		PQ34050
C324	30μF Electrolytic	15V		PS28500
C325	0.1μF Foil			PQ32000
C326	30μF Electrolytic	15V		PS28500
C327	0.22μF Polyester	125V		PQ33000
C328	220pF Ceramic		±10%	PN20028

SECOND I.F. UNIT (Cont.)

Code		RESISTORS		Part No.
R301	10kΩ	Composition	0.1W ±10%	NG10303
R302	1.5kΩ	Composition	0.1W ±10%	NG15203
R303	1kΩ	Composition	0.1W ±10%	NG10203
R304	1.8kΩ	Composition	0.1W ±10%	NG18203
R305	1kΩ	Composition	0.1W ±10%	NG10203
R306	3.3kΩ	Composition	0.1W ±10%	NG33203
R307	3.3kΩ	Composition	0.1W ±10%	NG33203
R308	2.2kΩ	Composition	0.1W ±10%	NG22203
R309	270Ω	Composition	0.1W ±10%	NG27103
R310	2.2kΩ	Composition	0.1W ±10%	NG22203
R311	22Ω	Composition	0.1W ±10%	NG22003
R312	1kΩ	Composition	0.1W ±10%	NG10203
R313		Not used		
R314	10kΩ	Composition	0.1W ±10%	NG10303
R315	2.2kΩ	Composition	0.1W ±10%	NG22203
R316	1kΩ	Composition	0.1W ±10%	NG10203
R317	220Ω	Composition	0.1W ±10%	NG22103
R318	22Ω	Composition	0.1W ±10%	NG22003
R319	820Ω	Composition	0.1W ±10%	NG33103
R320	820Ω	Composition	0.1W ±10%	NG82103
R321	10kΩ	Composition	0.1W ±10%	NG10303
R322	470Ω	Composition	0.1W ±10%	NG47103
R323	68kΩ	Composition	0.1W ±10%	NG68303
R324	270Ω	Composition	0.1W ±10%	NG27103
R325	1kΩ	Composition	0.1W ±10%	NG10203
R326	22kΩ	Composition	0.1W ±10%	NG22303
R327	22kΩ	Composition	0.1W ±10%	NG22303
R328	1kΩ	Composition	0.1W ±10%	NG10203
R329	47kΩ	Composition	0.1W ±10%	NG47303
R330	47kΩ	Composition	0.1W ±10%	NG47303
R331	47kΩ	Composition	0.1W ±10%	NG47303

Code		RESISTORS (cont.)		Part No.
R332	47kΩ	Composition	0.1W ±10%	NG47303
R333	1kΩ	Composition	0.1W ±10%	NG10203
R334	47kΩ	Composition	0.1W ±10%	NG47303
R335	270Ω	Composition	0.1W ±10%	NG27103
R336	4.7kΩ	Composition	0.1W ±10%	NG47203
R337	10kΩ	Composition	0.1W ±10%	NG10303
R338	22Ω	Composition	0.1W ±10%	NG22003
R339	270Ω	Composition	0.1W ±10%	NG27103

	SEMICONDUCTORS	
VT301	Transistor GET887	FV07035
VT302	Transistor GET887	FV07035
VT303	Transistor GET887	FV07035
VT304	Transistor GET887	FV07035
VT305	Transistor GET887	FV07035
VT306	Transistor NKT223A	FV06096
VT307	Transistor NKT223A	FV06096
MR301	Diode OA81	FV09047
MR302	Diode OA95	FV09327
MR303	Diode OA81	FV09047
MR304	Diode OA200	FV09303
MR305	Diode OA200	FV09303

	TRANSFORMERS	
T301	2nd i.f. 455 kc/s	278578
T302	2nd i.f. 455 kc/s	278578/2

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276253

SQUELCH UNIT

Code		RESISTORS		Part No.
R401	3.3kΩ	Composition	0.25W ±10%	PM00231
R402	3.3kΩ	Composition	0.25W ±10%	PM00231
R403	1.5kΩ	Composition	0.25W ±10%	PM00227
R404		Not used		
R405	22kΩ	Composition	0.25W ±10%	PM00241
R406	270Ω	Composition	0.25W ±10%	PM00218
R407	10kΩ	Composition	0.25W ±10%	PM00237

Code		MISCELLANEOUS		Part No.
C401	2μF	Electrolytic	150V	PS15055
VT401		Transistor SE4001		FV07751
VT402		Transistor OC200		FV05073

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. AT26744

A.F. UNIT

Code		CAPACITORS		Part No.
C501	0.22μF	Polyester	±10%	PQ33007
C502	25μF	Electrolytic	12V	PS28005
C503	7nF	Polystyrene	± 5%	PQ30503
C504	12.2nF	Polystyrene	± 5%	PQ14050
C505	11.5nF	Polystyrene	± 5%	PQ25332
C506	2μF	Electrolytic	150V	PS15055
C507	100μF	Electrolytic	15V	PS38015
C508	100μF	Electrolytic	6V	PS38021
C509a	1000μF	Electrolytic	15V	PS78702
b	1000μF	Electrolytic		

		RESISTORS		
R501	680kΩ	Composition	0.25W ±10%	PM00259
R502	2.2kΩ	Composition	0.25W ±10%	PM00229
R503	10kΩ	Composition	0.1W ±10%	NG10303
R504	1kΩ	Composition	0.1W ±10%	NG10203
R505	5.6kΩ	Composition	0.1W ±10%	NG56203
R506	820Ω	Composition	0.1W ±10%	NG82103
R507	22Ω	Composition	0.1W ±10%	NG22003
	10Ω	Composition	0.1W ±10%	NG10003
	12Ω	Composition	0.1W ±10%	NG12003
	15Ω	Composition	0.1W ±10%	NG15003
	18Ω	Composition	0.1W ±10%	NG18003
	22Ω	Composition	0.1W ±10%	NG22003
	27Ω	Composition	0.1W ±10%	NG27003
	33Ω	Composition	0.1W ±10%	NG33003
	39Ω	Composition	0.1W ±10%	NG39003
	47Ω	Composition	0.1W ±10%	NG47003
	56Ω	Composition	0.1W ±10%	NG56003
	68Ω	Composition	0.1W ±10%	NG68003
	82Ω	Composition	0.1W ±10%	NG82003
	100Ω	Composition	0.1W ±10%	NG10103

Code		RESISTORS (cont.)		Part No.
R508	10kΩ	Composition	0.1W ±10%	NG10303
R509	4.7kΩ	Composition	0.1W ±10%	NG47203
R510	1kΩ	Composition	0.1W ±10%	NG10203
R511	5.6kΩ	Composition	0.25W ±10%	PM00234
R512	1kΩ	Composition	0.25W ±10%	PM00225
R513	100Ω	Composition	0.25W ±10%	PM00213
R514	100Ω	Composition	0.25W ±10%	PM00213
R515	56Ω	Composition	0.1W ±10%	NG56003
R516	1Ω	Wirewound	±20%	PL21150
R517	1Ω	Wirewound	±20%	PL21150
R518		Not used		
R519	1kΩ	Composition	0.25W ±10%	PM00225
R520	1kΩ	Composition	0.25W ±10%	PM00225

	SEMICONDUCTORS	
VT501	Transistor NKT223A	FV06096
VT502	Transistor NKT223A	FV06096
VT503	Transistor NKT404	FV06060
VT504) VT505)	Transistor NKT404 matched pair	FV06410

	TRANSFORMERS	
T501	Driver	277876
T502	Output	277884

	INDUCTORS	
L501	Choke	279836
L502	Choke	279840

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. AT26384

MICROPHONE AMPLIFIER UNIT

CAPACITORS

Code			Mc/s			Part No.
C551	0.47μF	Disc ceramic		10V		PN65400
C552	0.47μF	Disc ceramic		10V		PN65400
C553	100μF	Electrolytic		6V		PS38021
C554	10μF	Electrolytic		15V		PS23016
C555	100μF	Electrolytic		6V		PS38021
C556	10μF	Electrolytic		15V		PS23016
C557	100μF	Electrolytic		6V		PS38021
C558	20nF	Tubular	25 - 68	100V	±10%	PR15516
	10nF	Tubular	68 -174	200V	±10%	PR14000
C559	5nF	Tubular	25 - 68	250V	±10%	PR10000
		Not used	68 -174			
C560	20nF	Tubular	25 - 68	100V	±10%	PR15516
	10nF	Tubular	68 -174	200V	±10%	PR14000
C561	1nF	Disc ceramic				PN26350
C562	25μF	Electrolytic		15V		PS28010
C563	1nF	Disc ceramic				PN26350

RESISTORS

					Part No.
R551	10kΩ	Composition	0.25W	±10%	PM00237
R552	1.8kΩ	Composition	0.25W	±10%	PM00228
R553	470Ω	Composition	0.25W	±10%	PM00221
R554	470kΩ	Composition	0.25W	±10%	PM00257
R555	10kΩ	Composition	0.25W	±10%	PM00237
R556	4.7kΩ	Composition	0.25W	±10%	PM00233
R557	10kΩ	Composition	0.25W	±10%	PM00237
R558	2.2kΩ	Composition	0.25W	±10%	PM00229
R559	220Ω	Composition	0.25W	±10%	PM00217
R560	10kΩ	Composition	0.25W	±10%	PM00237
R561	1kΩ	Composition	0.25W	±10%	PM00225

RESISTORS (cont.)

Code					Part No.
R562	3.3kΩ	Composition	0.25W	±10%	PM00231
R563	2.2kΩ	Composition	0.25W	±10%	PM00229
R564	10kΩ	Composition	0.25W	±10%	PM00237
R565	3.3kΩ	Composition	0.25W	±10%	PM00231
R566	4.7kΩ	Composition	0.25W	±10%	PM00233
R567	6.8kΩ	Composition	0.25W	±10%	PM00235
R568	47Ω	Composition	0.25W	±10%	PM00209
R569	220Ω	Composition	0.25W	±10%	PM00217
R570	820Ω	Composition	0.25W	±10%	PM00224
RV551	4.7kΩ	Potentiometer (Lin.)			PL02510

SEMICONDUCTORS

			Part No.
VT551	Transistor	2S322	FV07074
VT552	Transistor	NKT224	FV06071
VT553	Transistor	NKT223A	FV06096
VT554	Transistor	NKT224	FV06071
MR551	Diode	OA81	FV09047

INDUCTORS

		Part No.
L551	Choke	279841
L552	Choke	279052

TRANSFORMERS

		Part No.
T551	Modulator driver	277877
T552	Modulator output	277902

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO.

25 - 68 Mc/s AT27643/2 68 -174 Mc/s AT27643/1

MODULATOR UNIT

CAPACITORS

Code				Part No.
C575	100μF	Electrolytic	6V	PS38021
C576	1000μF	Electrolytic	15V	PS51010
C577	1000μF	Electrolytic	15V	PS51010
C578 to C584		Not used		
C585	1000μF	Electrolytic	15V	PS51010
C586 a	1000μF	Electrolytic	15V	PS78702
b	1000μF			
C587	10nF	Disc ceramic	1400V	PN50302

RESISTORS

					Part No.
R575	120Ω	Composition	0.25W	±10%	PM00214
R576	1.5Ω	Wirewound		±10%	PL21069
R577	10Ω	Wirewound		±10%	PG10040
R578	3.3Ω	Wirewound		±0.2Ω	PL21152
R579	100Ω	Composition	0.25W	±10%	PM00213
R580	100Ω	Composition	0.25W	±10%	PM00213
R581	0.25Ω	Wirewound		±10%	PL21151
R582	0.25Ω	Wirewound		±10%	PL21151

RESISTORS (Cont.)

Code					Part No.
R583		Not used			
R584		Not used			
R585	680Ω	Composition	0.25W	±10%	PM00223
R586	680Ω	Composition	0.25W	±10%	PM00223
R587	100Ω	Composition	0.5W	±10%	PM00513
R588	220kΩ	Composition	0.25W	±10%	PM00253
R589	220kΩ	Composition	0.25W	±10%	PM00253

SEMICONDUCTORS

			Part No.
VT555	Transistor	NKT404	FV06060
VT556) VT557)	Transistor	NKT404 matched pair	FV06410

INDUCTORS

		Part No.
L575	Choke	279842

COMPLETE PRINTED CIRCUIT BOARD ASSEMBLY PART NO. 276248/2

TRANSMITTER

CAPACITORS

Code			Mc/s		Part No.
C601	1nF	Disc ceramic			PN26350
C602	10nF	Disc ceramic			PN50301
C603	10pF	Ceramic tub.		±1pF	PN09043
C604	47pF	Ceramic tub.		±10pF	PN13135
C605	6.8pF	Ceramic	25-32.5	±0.25pF	PN05126
	3.3pF	Ceramic	32.5-42	±0.25pF	PN02042
	4.7pF	Ceramic	42 - 54	±0.5pF	PN03099
	2pF	Ceramic	54 - 68	±0.1pF	PN01016
		Not used	68 -174		
C606	56pF	Ceramic	25-32.5	± 2%	PN14102
	22pF	Ceramic	32.5-42	±2.5pF	PN11049
	39pF	Ceramic	42 - 54	± 2%	PN12169
	15pF	Ceramic	54 - 68	±2.5pF	PN10023
	56pF	Ceramic	68 - 88	± 2%	PN14102
	47pF	Ceramic	79 - 93	± 2%	PN13100
	27pF	Ceramic	93 -108	± 2%	PN11114
	56pF	Ceramic	112-136	± 2%	PN14102
	33pF	Ceramic	132-156	± 2%	PN12073
	22pF	Ceramic	148-174	±2.5pF	PN11049
C607		Not used	25 - 68		
	100pF	Ceramic	68 -174	±10%	PN17003
C608		Not used	25 - 68		
	1nF	Disc ceramic	68 -174	-20% +80%	PN26350
C609		Not used	25 - 68		
	1nF	Disc ceramic	68 -174	-20% +80%	PN26350
C610		Not used	25 - 68		
	1nF	Disc ceramic	68 -174	-20% +80%	PN26350
C611		Not used			
C612		Not used	25 - 68		
	56pF	Ceramic	68 - 88	± 2%	PN14102
	47pF	Ceramic	79 - 93	± 2%	PN13100
	27pF	Ceramic	93 -108	± 2%	PN11114
	56pF	Ceramic	112-136	± 2%	PN14102
	33pF	Ceramic	132-156	± 2%	PN12073
	22pF	Ceramic	148-174	±2.5pF	PN11049
C613	100pF	Ceramic tub.		±10%	PN17003
C614	1nF	Disc ceramic			PN26350
C615	1nF	Disc ceramic			PN26350
C616	15pF	Ceramic	25-32.5	±2.5pF	PN10019
	12pF	Ceramic	32.5-42	±2.5pF	PN09118
		Not used	42 -174		
C617	33pF	Ceramic	25-32.5	± 2%	PN12073
	15pF	Ceramic	32.5-42	±2.5pF	PN10019
	6.8pF	Ceramic	42 - 54	±0.25pF	PN05126
		Not used	54 - 68		
	15pF	Ceramic	68 - 78	±2.5pF	PN19019
	8.2pF	Ceramic	78 - 88	±0.5pF	PN07034
	0.2pF	Ceramic	79 - 93	±0.5pF	PN07034
	3.3pF	Ceramic	93 -108	±0.25pF	PN02042
	15pF	Ceramic	112-120	±2.5pF	PN10019
	12pF	Ceramic	120-136	±2.5pF	PN09118
	6.8pF	Ceramic	132-156	±0.25pF	PN05126
	3.3pF	Ceramic	148-174	±0.25pF	PN02042
C618	1nF	Disc ceramic			PN26350
C619	39pF	Ceramic	25-32.5	± 2%	PN12169
	18pF	Ceramic	32.5-42	±2.5pF	PN10109
	8.2pF	Ceramic	42 - 54	±0.25pF	PN07036
		Not used	54 - 68		
	18pF	Ceramic	68 - 78	±2.5pF	PN10109
	12pF	Ceramic	78 - 88	±2.5pF	PN09118
	10pF	Ceramic	79 - 93	±0.25pF	PN09033
	3.3pF	Ceramic	93 -108	±0.25pF	PN02042
	33pF	Ceramic	112-120	± 2%	PN12073
	22pF	Ceramic	120-136	±2.5pF	PN11031
	15pF	Ceramic	132-156	±2.5pF	PN10019
	8.2pF	Ceramic	148-174	±0.25pF	PN07036
C120	18pF	Ceramic	25-32.5	±2.5pF	PN10109
	15pF	Ceramic	32.5-42	±2.5pF	PN10019
		Not used	42 -174		
C621	1nF	Disc ceramic			PN26350
C622	1nF	Disc ceramic			PN26350
C623	1-12pF	Trimmer			PV05018
C624	17.5pF+	17.5pF Trimmer			PV05019
C625	1nF	Disc ceramic			PN26350
C626	1nF	Disc ceramic			PN26350
C627	2nF	Disc ceramic	25 - 68	-20% +80%	PN33300
	1nF	Disc ceramic	68 -174	-20% +80%	PN26350
C628	17.5pF+	17.5pF Trimmer			PV05019
C629	2.4-30pF	Variable			PV05017

CAPACITORS (Cont.)

Code			Mc/s		Part No.
C630	120pF	Ceramic	25-32.5	±2.5pF	PN17153
	82pF	Ceramic	32.5-42	±2.5pF	PN16106
	56pF	Ceramic	42 - 54	±2.5pF	PN14106
	33pF	Ceramic	54 - 68	±2.5pF	PN12087
	39pF	Ceramic	68 - 88	± 2%	PN12169
	33pF	Ceramic	79 -108	± 2%	PN12073
	27pF	Ceramic	112-136	± 2%	PN11114
	15pF	Ceramic	132-148	±2.5pF	PN10019
C631	120pF	Ceramic	25-32.5	±2.5pF	PN17153
	82pF	Ceramic	32.5-42	±2.5pF	PN16106
	56pF	Ceramic	42 - 54	±2.5pF	PN14106
	33pF	Ceramic	54 - 68	±2.5pF	PN12087
	39pF	Ceramic	68 - 88	± 2%	PN12169
	33pF	Ceramic	79 -108	± 2%	PN12073
	27pF	Ceramic	112-136	± 2%	PN11114
	15pF	Ceramic	132-174	±2.5pF	PN10019
C632	1pF	Ceramic	25 - 68	±0.2pF	PN00038
		Not used	68 -174		
C633	1nF	Disc ceramic			PN26350

RESISTORS

R601	330kΩ	Composition		0.25W ±10%	PM00255
R602	10kΩ	Composition		0.25W ±10%	PM00237
R603	10kΩ	Composition		0.25W ±10%	PM00237
R604		Not used	25 - 68		
	100kΩ	Composition	68 -174	0.25W ±10%	PM00249
R605		Not used	25 - 68		
	82kΩ	Composition	68 -174	0.25W ±10%	PM00248
R606		Not used	25 - 68		
	680Ω	Composition	68 -174	0.25W ±10%	PM00223
R607		Not used			
R608		Not used	25 - 68		
	10kΩ	Composition	68 -174	0.25W ±10%	PM00237
R609	56kΩ	Composition		0.25W ±10%	PM00246
R610	82kΩ	Composition		0.25W ±10%	PM00248
R611	100Ω	Composition		0.25W ±10%	PM00213
R612	1.2kΩ	Composition	25 - 68	0.25W ±10%	PM00226
	1.8kΩ	Composition	68 -174	0.25W ±10%	PM00228
R613	56kΩ	Composition		0.25W ±10%	PM00246
R614	39Ω	Composition		0.25W ±10%	PM00209
R615	1kΩ	Composition		0.5W ±10%	PM00525
R616	18kΩ	Composition		0.25W ±10%	PM00240
R617	39kΩ	Composition		0.25W ±10%	PM00244
R618	39kΩ	Composition		0.25W ±10%	PM00244
R619	10kΩ	Wirewound	25 - 68	± 5%	PE10372
	12kΩ	Wirewound	68 -174	± 5%	PE12372
R620	100Ω	Composition		0.25W ±10%	PM00213
R621	22Ω	Composition		0.25W ±10%	PM00205
R622	56kΩ	Composition		0.5W ±10%	PM00546
R623	47Ω	Composition	25 - 68	±10%	PM00509
	60Ω	Wirewound	68 -174	± 5%	PE60071
R624	4kΩ	Wirewound	25 - 68	8W ± 5%	PE40209
	2kΩ	Wirewound	68 -174	± 5%	PE20223

VALVES

V601	Valve 6BH6		FV03611
V602	Not used	25 - 68	
	Valve 6BH6	68 -174	FV03611
V603	Valve QQV03-10		FV01913
V604	Valve QQV03-20A		FV01911

TRANSFORMERS

T601	Driver multiplier	25 - 68	277156/27
	Driver multiplier	68 -108	277156/6
	Driver multiplier	112-174	277156/7
T602	Driver anode	25-32.5	277157
	Driver anode	32.5-42	277159
	Driver anode	42 - 54	277158/1
	Driver anode	54 - 68	277258
	Not used	68 -174	

TRANSMITTER (Cont.)

INDUCTORS

Code		Mc/s	Part No.
L601	V601 anode coil	25 - 68	278576/31
	V601 anode coil	68 -174	278576/9
L602	Not used	25 - 68	
	V602 anode coil	68 -174	278576/9
L603	Choke		279051
L604	Not used	25 - 68	
	Driver anode coil	68 - 88	278590/3
	Driver anode coil	79 -108	278588/3
	Driver anode coil	112-136	278587/5
	Driver anode coil	132-156	278607
	Driver anode coil	148-174	278598
L605	Not used	25 - 68	
	P.A. grid coil	68 -108	278586/4
	P.A. grid coil	112-136	278586/5
	P.A. grid coil	132-156	278586/6
	P.A. grid coil	148-174	278593/4
L606	P.A. anode coil	25-32.5	278678
	P.A. anode coil	32.5-42	278677/1
	P.A. anode coil	42 - 54	278677
	P.A. anode coil	54 - 68	278676
	P.A. anode coil	68 - 88	278587/4
	P.A. anode coil	79 -108	278590/2
	P.A. anode coil	112-136	278587/6
	P.A. anode coil	132-156	278590/4
	P.A. anode coil	148-174	278462/A

INDUCTORS (cont.)

Code		Mc/s	Part No.
L607	Antenna coupling coil	25-32.5	278448/2
		32.5-42	278448/3
		42 - 54	278608/1
		54 - 68	278608
		68 - 88	278461/E
		79 -108	278597/1
		112-136	278592/4
		132-174	278461/A
L608	Antenna filter coil	25 - 68	278604
		68 -136	278595/8
		132-174	278595/9
L609	Antenna filter coil	25 - 68	278604
	Antenna filter coil	68 -136	278595/8
	Antenna filter coil	132-174	278595/9

MISCELLANEOUS

		Part No.
SA	TUNE/NORMAL switch	FS03029
SD	TX TEST switch	FS04705
	Antenna socket	FS16010
RLA	186Ω Relay (transmit)	FR02833
RLB	320Ω Relay (antenna changeover)	283071
SKTD	9-way test socket	FH02528

POWER SUPPLY

CAPACITORS

Code						Part No.
C701	a	20μF	Electrolytic	500V		PS74800
	b	2μF		500V		
C702		1000μF	Electrolytic	15V		PS51010
C703		1μF	Ceramic tub.	150V	±25%	PR25509
C704	a	1000μF	Electrolytic	15V		PS78702
	b	1000μF				
C705		1nF	Disc ceramic			PN26350
C706		1nF	Disc ceramic			PN26350
C707		1nF	Disc ceramic			PN26350
C708		1nF	Disc ceramic			PN26350
C709		1nF	Disc ceramic			PN26350
C710		1nF	Disc ceramic			PN26350
C711		1nF	Disc ceramic			PN26350
C712		1nF	Disc ceramic			PN26350
C713		1nF	Disc ceramic			PN26350
C714		1nF	Disc ceramic			PN26350
C715		250μF	Electrolytic	25V		PS41001

RESISTORS

R701	10Ω	Composition	0.25W	PM00201
R702	330Ω	Wirewound		PE33171

RESISTORS (Cont.)

Code					Part No.
R703	10Ω	Wirewound		± 5%	PE10072
R704	40Ω	Wirewound	25 - 68 Mc/s	± 5%	PE40071
		Not used	68 -174 Mc/s		

SEMICONDUCTORS

VT701		Transistor 2N1554	FV07155
VT702		Transistor 2N1554	FV07155
MR701	(a-d)	Rectifier (4 x [illegible]3108)	FV09002
MR702		Diode 2052	FR00020

MISCELLANEOUS

FS701	Fuse	15A	FF00797
SKTA	18-way socket		FS17304
PLB	6-way power plug		FP00952
RLC	625Ω Relay (standby)		703911
RLD	625Ω Relay (start)		703911

CRYSTAL ASSEMBLY

CAPACITORS

Code			Mc/s		Part No.
C801		Not used			
C802	2nF	Disc ceramic (switched channel only)	25 -174	-20% +40%	PN33301
		Not used	79 -101		
C803	1-12pF	Variable tubular			PV05018
C804 to C809	1-12pF	Variable tubular (switched channel only)			PV05018
C809	10pF	Ceramic (single channel only)	25 -108	±0.5pF	PN09035
		Not used	79 -101		
	6.8pF	Ceramic (single channel only)	112-174	±0.5pF	PN05128
C810	3.3pF	Ceramic (single channel only)		±0.5pF	PN02043
C811		Not used			
C812		Not used (single channel)			
	2nF	Disc ceramic (switched channel only)	25 -174	-20% +40%	PN33301
		Not used	79 -101		

RESISTORS

R801	680Ω	Composition		0.25W ±10%	PM00223
R802 to R806	680Ω	Composition (switched channel only)		0.25W ±10%	PM00223
R807		Not used			
R808		Not used			
R809		Not used	25 -174		
	100Ω	Composition (switched channel)	79 -101	0.25W ±10%	PM00213
R810		Not used	25 -174		
	100Ω	Composition (switched channel)	79 -101	0.25W ±10%	PM00213

INDUCTORS

Code		Mc/s	Part No.
L801	Coil crystal trimming (single channel)	25-32.5	278666/1
	Coil crystal trimming (single channel)	32.5-42	278666/2
	Coil crystal trimming (single channel)	42 - 54	278666/1
	Coil crystal trimming (single channel)	54 - 68	278666/2
	Coil crystal trimming (single channel)	68 - 88	278666/4
	Coil crystal trimming (single channel)	79 -101	278508/3
	Coil crystal trimming (single channel)	88 -108	278666/2
	Coil crystal trimming (single channel)	112-156	278666/1
	Coil crystal trimming (single channel)	148-174	278666/6
L802 to L806	Coil crystal trimming (switched channel)	25-32.5	278666/1
	Coil crystal trimming (switched channel)	32.5-42	278666/2
	Coil crystal trimming (switched channel)	42 - 54	278666/1
	Coil crystal trimming (switched channel)	54 - 68	278666/2
	Coil crystal trimming (switched channel)	68 - 88	278666/4
	Coil crystal trimming (switched channel)	79 -101	278508/3
	Coil crystal trimming (switched channel)	88 -108	278666/2
	Coil crystal trimming (switched channel)	112-156	278666/1
	Coil crystal trimming (switched channel)	148-174	278666/6

MISCELLANEOUS

MR801	Diode DD000	FV09064
SB	Ledex assembly	283203
XL801 to XL812	Crystals to specification	

PUBLIC ADDRESS EQUIPMENT (when fitted)

PLC		4-way plug	FP00951
SKTC		4-way socket	FP17301
RLF	186Ω	Relay	703910
		Loudspeaker	285027

CONTROL UNIT

RESISTORS

Code					Part No.
R901	1kΩ	Composition		0.25W ±10%	PM00225
R902		Not used			
R903	470Ω	Composition		0.25W ±10%	PM00221
RV901	5kΩ	Potentiometer lin. (SQUELCH control)			281421
RV902	10kΩ	Potentiometer log. (VOLUME control)			281420

MISCELLANEOUS

MR901	Diode HS2047			FV09604
ILP901	Indicator lamp	12V	0.75W	FL01063
ILP902	Indicator lamp	12V	0.75W	FL01063

MISCELLANEOUS (cont.)

Code		Part No.
SC	OFF/RX/SBY	283537
SE	Channel selector switch	283538
SKTG	2-way socket (L.S.)	FS17300
SKTH	6-way socket (microphone)	FS17302
SKTJ	18-way socket	FS17305
PLA	18-way plug	FP00955
PLG	2-way plug (L.S.)	FP00950
PLH	6-way plug mic.	FP00953
PLJ	18-way plug	FP00954
LS	Loudspeaker	FS11007
	Microphone & lead assy.	AT29660/3
	Handset & lead assy.	276201

MECHANICAL ITEMS

MAIN UNIT

Wrapper (sides and rear casing)	244159
Lid assembly (top and bottom covers)	276191/1
Front panel	BT23308/A
Handle	248365
Locating pins (front panel)	230901
Spigot	231232
Washers (handle)	243384
Feet	FR06006
Gasket 104" (lid)	205643
Pye medallion	203093
Nyloc nut, 2 B.A.	QA12588
B7A valveholder	FH02651
B7G valveholder	722225
B9A valveholder	FH02528
B7G valve screen and spring	FC00025
B9A valve screen and spring	704748
Post, 6 B.A. thread, 6 B.A. tap (P.C.B s)	231255
Post as above, slotted (1st I.F.)	231286
Spacer $\frac{1}{4}$" tapped 6 B.A. (Capacitors)	310675
Spacer $\frac{5}{16}$" tapped 4 B.A. (Modulator P.C.B.)	310676
Spacer $\frac{1}{4}$" tapped 6 B.A. (metering board)	310677
Insulating washer (power transistors)	243376
Bakelite washer (valveholders)	410194
Locking washer (P.C.B.'s)	QA13650
Rubber washer (transistors)	270661
Insulating bead	FS00007
Stand-off insulator	FJ00014
Grommet $\frac{1}{4}$"	FG02201
Grommet $\frac{5}{16}$"	FG02205
Grommet $\frac{1}{2}$"	FG02224

INSTALLATION

Cradle assembly	276193
Resilient mountings	FR05001
Connector block	FC00661
Fusebox	FH02769
Fuse 15A	FF00797

INSTALLATION (cont.)

Battery lead assembly	275767
Control unit mounting bracket L.H.	244190
Control unit mounting bracket R.H.	244191
Speaker assembly	276296
Antenna:	
Assembly 25 - 60 Mc/s	274090
Whip 60 -140 Mc/s	200023/4
Whip 140-174 Mc/s	200023/2

CONTROL UNIT

Case assembly	276275/1
Panel assembly	276276/1
Bezel	244175
Knob assembly	275902/6
Lampholder clip	200953
Escutcheon (replacement front panel)	
Single channel	201633
Switched channel	201632
Switch stop	242821
Blind grommet	271636
Allen key (for knobs)	271947

CRYSTAL ASSEMBLY

Crystal and trimmer mounting plate assembly (single channel)	276295/6
Crystal trimmer and mounting plate assembly (2-3 channels)	276295/7
Crystal trimmer and mounting plate assembly (4-6 channels)	276295/8
Crystal holder (1, 2, 3)	274676/A
Crystal holder (4, 5, 6)	274676/B
Crystal retaining spring	271885
Adjuster core assembly	274823/1
Nyloc nut	QA12589

NC573/128
NC573/131
NC573/135

AMENDMENT No. 1

August, 1966

to

PYE VANGUARD V.H.F. A.M. MOBILE RADIOTELEPHONE AM25T

SERVICE MANUAL

ISSUE 1

INTRODUCTION

The following changes have been made to this equipment:-

1. In the receiver A.F. Unit, the values of R501, R502 and R515 have been changed.

2. In the Microphone Amplifier Unit, C564, C565 and C566 have been added.

The resistor R901 was omitted from the circuit diagram (Fig. 18) of the Service Manual. This resistor should be added in parallel with the Squelch Control, RV901 in the Control Unit.

SERVICE MANUAL CHANGES

1. PARTS LIST

Page 46

Delete	C20	0.2pF	10MΩ resistor used as capacitor 79 -101	0.25W	±10%	PM00273
Add	C20	0.2pF	10MΩ resistor used as capacitor			NG10625

Page 49

R501					
Delete	680kΩ	Composition	0.25W	±10%	PM00259
Add	220kΩ	Composition	0.25W	±10%	PM00253
R502					
Delete	2.2kΩ	Composition	0.25W	±10%	PM00229
Add	680Ω	Composition	0.25W	±10%	PM00223
R515					
Delete	56Ω	Composition	0.1W	±10%	NG56003
Add	27Ω	Composition	0.1W	±10%	NG27003

Page 50

Add	C564	2nF	Disc ceramic	+40% -20%	PN33301
	C565	2nF	Disc ceramic	+40% -20%	PN33301
	C566	2nF	Disc ceramic	+40% -20%	PN33301

2. CIRCUITS

Fig. 18

Amend value of R501 to 220k

Amend value of R502 to 680

Amend value of R515 to 27

Across the base and emitter of VT551
Add C564 2nF

Across the base and emitter of VT552
Add C565 2nF

Across the base and emitter of VT553
Add C556 2nF

Add R901 (1kΩ) in parallel with RV901

VANGUARD RADIOTELEPHONE

TYPE AM25T

Supplementary Information for 10/15 kc/s Channel Spacing (S Version) Equipments

This supplement enables the Vanguard V.H.F. AM Radiotelephone Type AM25T Service Manual to be used for the maintenance of 'S' Version (10/15 kc/s channel spacing) equipment.

The 'S' Version incorporates the following modifications:-

(a) Inclusion of a 10/15 kc/s bandpass filter.

(b) Fitting of suitable crystal types for 10/15 kc/s channel spacing.

These modifications are covered by the following changes to the Service Manual.

TEXT

Page 2 — SUMMARY OF DATA - Channel Spacing

Add 'S' Version 10/15 kc/s

Page 6 — 455 kc/s Bandpass Filter

Add '10/15 kc/s'

Page 8 — CRYSTAL FORMULAE table - Crystal Specification No.

Add third column headed 10/15 kc/s.

68-88 Mc/s
Add P41 in 10/15 kc/s column.

148-174 Mc/s
Add P42 in 10/15 kc/s column.

Page 12 — CRYSTAL FORMULAE table - Crystal Specification No.

Add third column headed 10/15 kc/s.

68-88 Mc/s
Add P38 in 10/15 kc/s column.

148-174 Mc/s
Add P39 in 10/15 kc/s column.

Page 25 FIELD TESTING PROCEDURE

Receiver para. 3.
Add: If the Audio beat note produced is in excess of 500 c/s (10/15 kc/s channel spacing) then the mobile receiver crystal trimmer L801 should be adjusted for zero beat.

Transmitter (para. 3)
Add: If the audio beat note produced is in excess of 500 c/s (10/15 kc/s channel spacing) then the mobile transmitter crystal trimmer C803 should be adjusted as reported by the base station engineer.

PARTS LIST

Page 48	Add 455 kc/s bandpass filter	260043

CIRCUITS

Not affected by these modifications.

AMENDMENTS

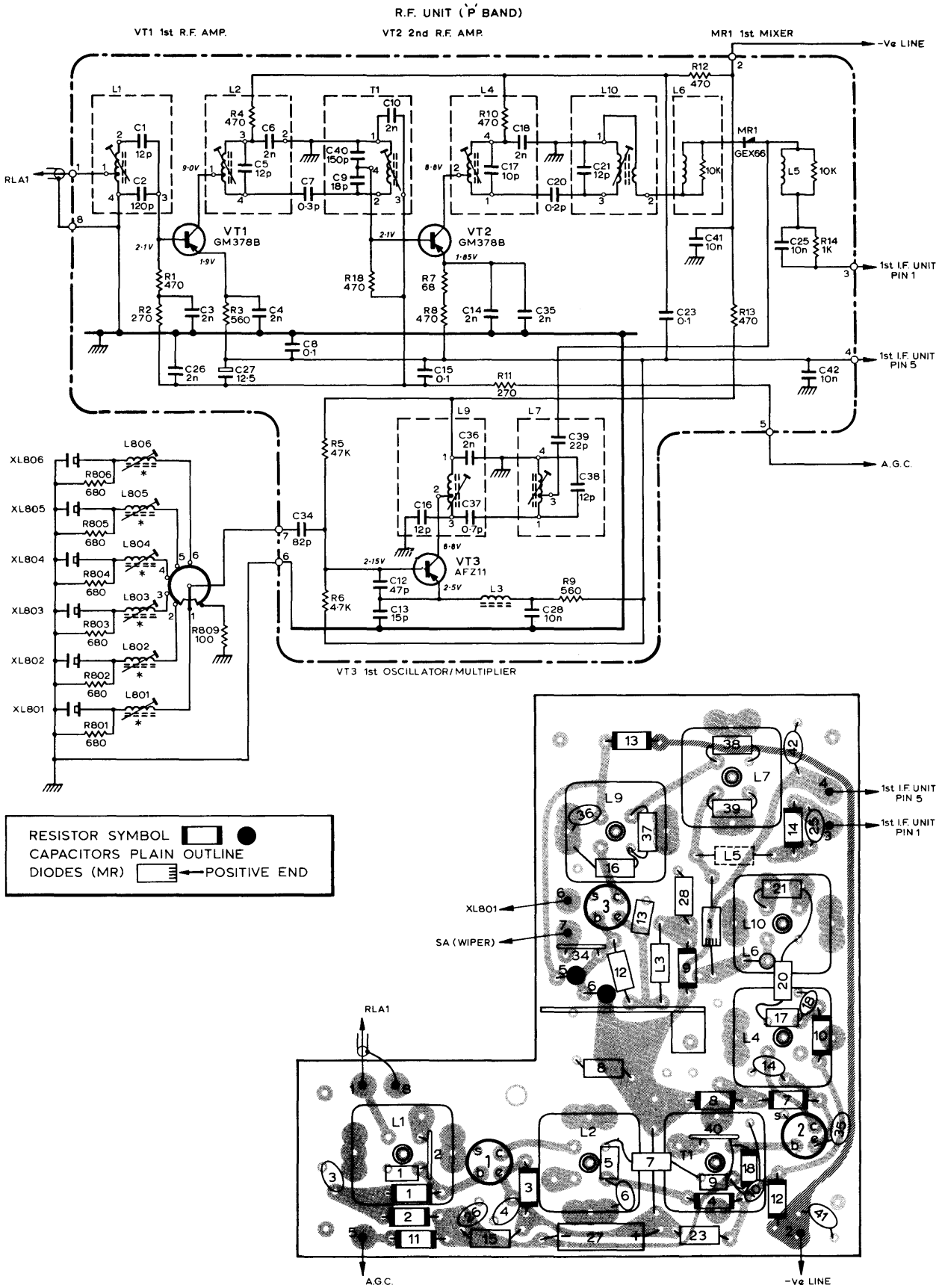


Fig. 15 'P' BAND R.F. UNIT COMPONENT LOCATION AND CIRCUIT DIAGRAM (AM 25 T)

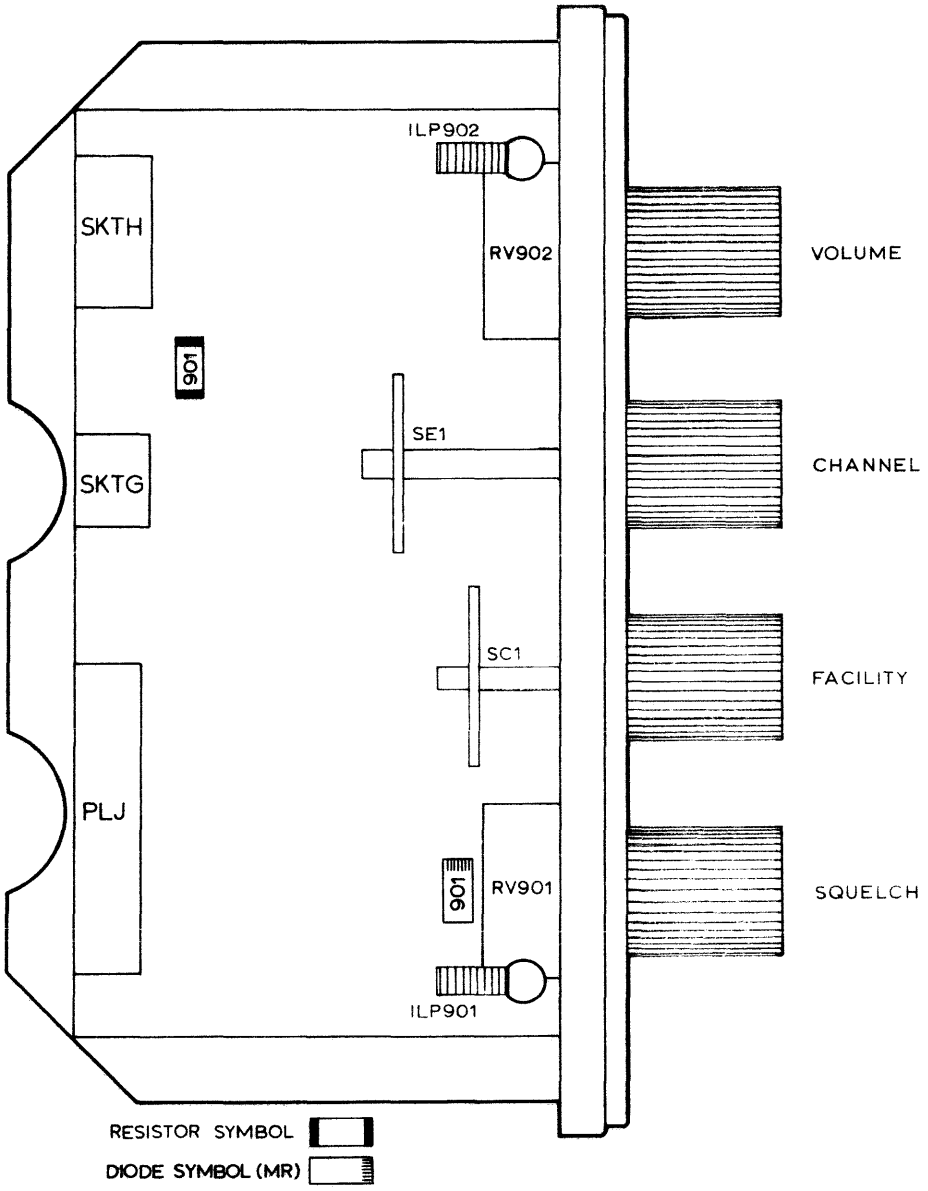


Fig. 16 CONTROL UNIT COMPONENT LOCATION DIAGRAM (AM 25 T)

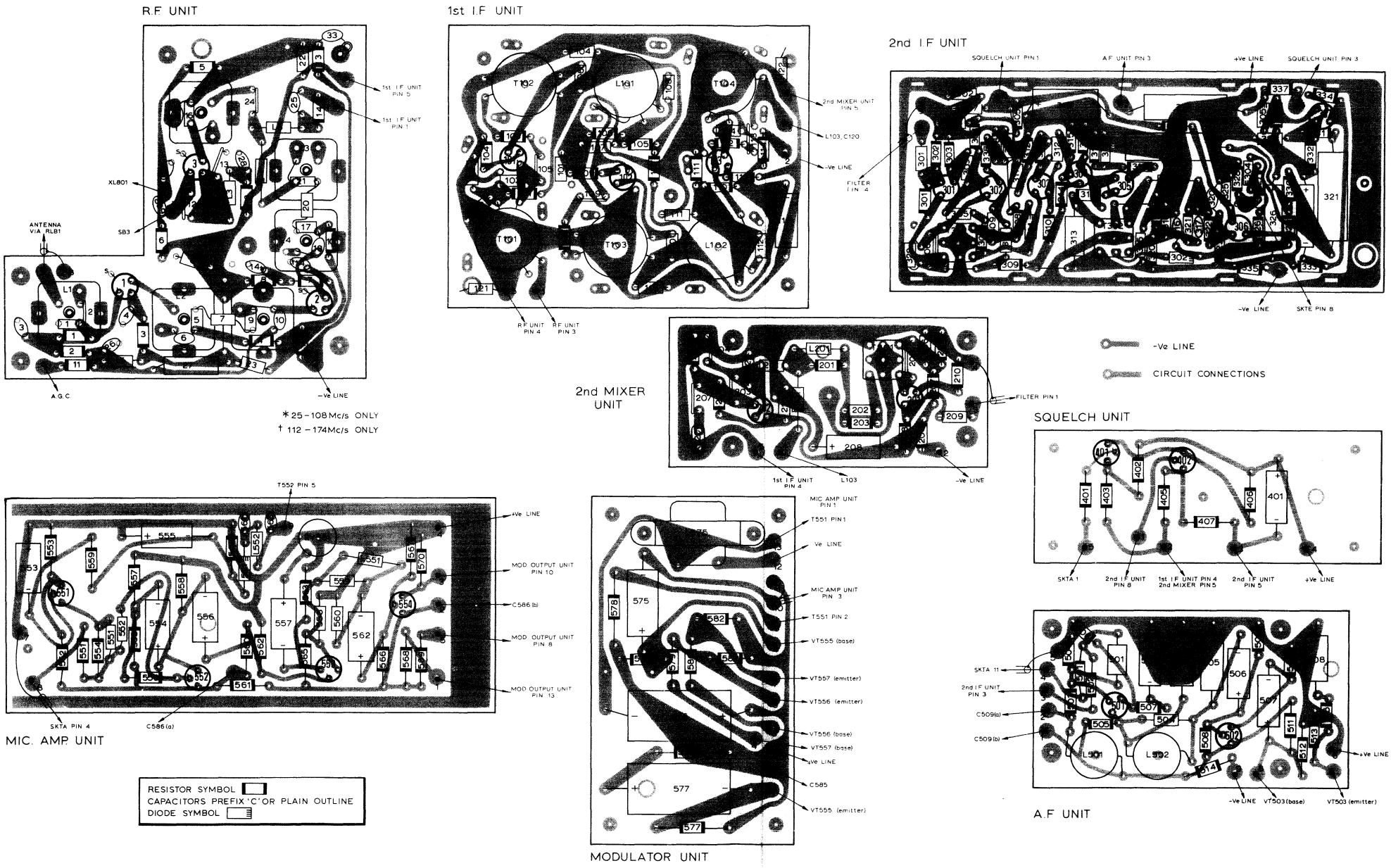
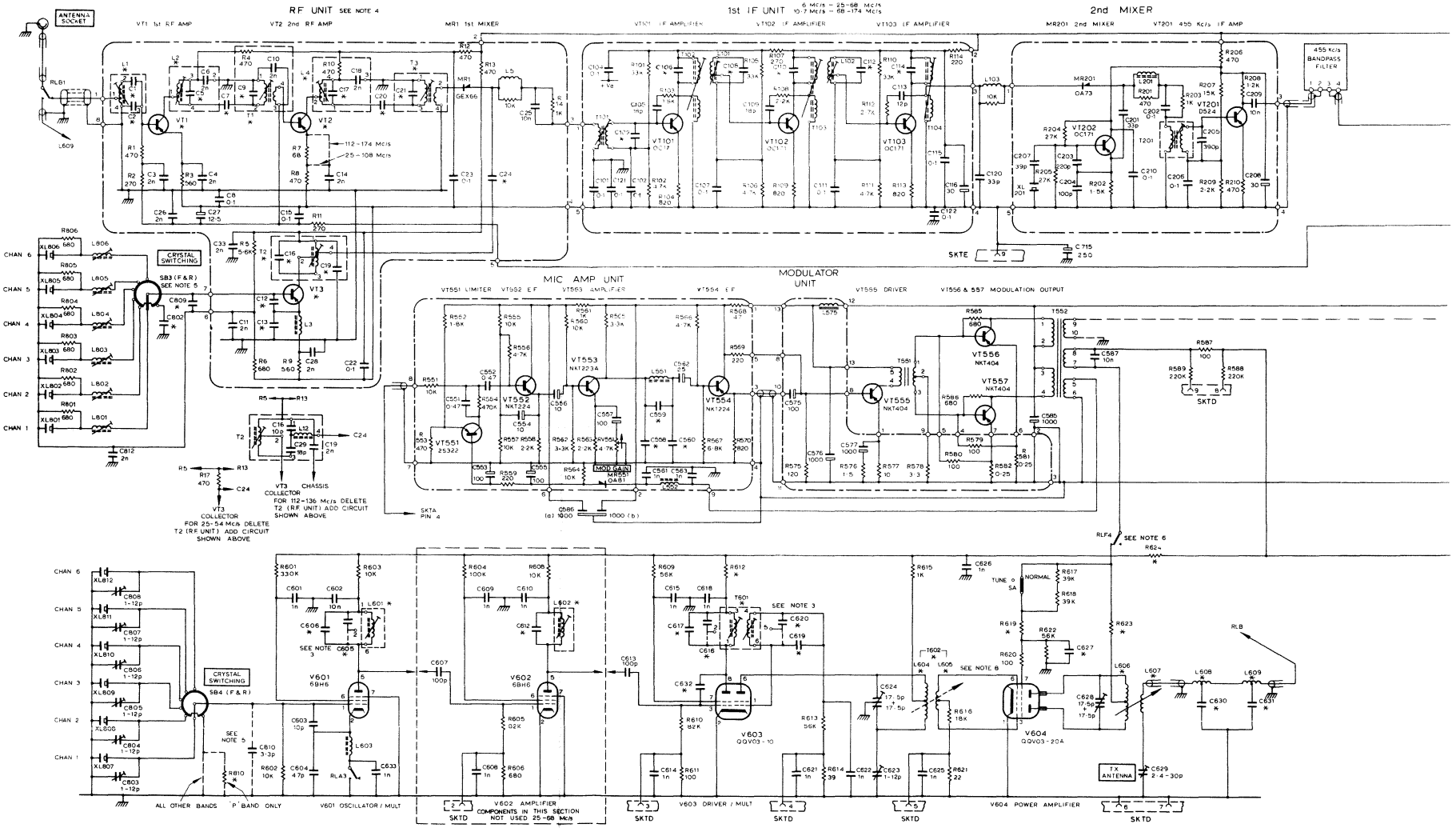


Fig. 17 RECEIVER I.F. SECTION COMPONENT LOCATION DIAGRAM (AM 25 T)



NOTES

1. * FOR UNSPECIFIED VALUES SEE PARTS LISTS
2. ALL RESISTORS QUOTED IN Ω's UNLESS OTHERWISE STATED.
   ALL CAPACITORS QUOTED IN µF's UNLESS OTHERWISE STATED
3. LINKS MAY BE FITTED AS SHOWN TO COVER LOWER FREQUENCIES OF BANDS F TO J (25 TO 68 Mc/s EQUIPMENTS.)
4. FOR 79–101 Mc/s DELETE R.F. UNIT SHOWN, REPLACE WITH R.F. CIRCUIT GIVEN IN FIG.15
5. C809 & C810 USED ON SINGLE CHANNEL ONLY.
6. FOR EQUIPMENT WITHOUT P.A. FACILITY DELETE BROKEN LINES AND REPLACE RLF1, RLF2 & RLF4 CONTACTS WITH DIRECT CONNECTIONS
7. R338, R311 & R318 LINKS MAY BE FITTED ON TEST TO PROVIDE REQUIRED GAIN
8. T602 IS A FIXED TRANSFORMER USED ON 25 – 68 Mc/s. THIS IS REPLACED ON 68 – 174 Mc/s BY TWO SEPARATE COILS WITH VARIABLE COUPLING (L604 & L605.)

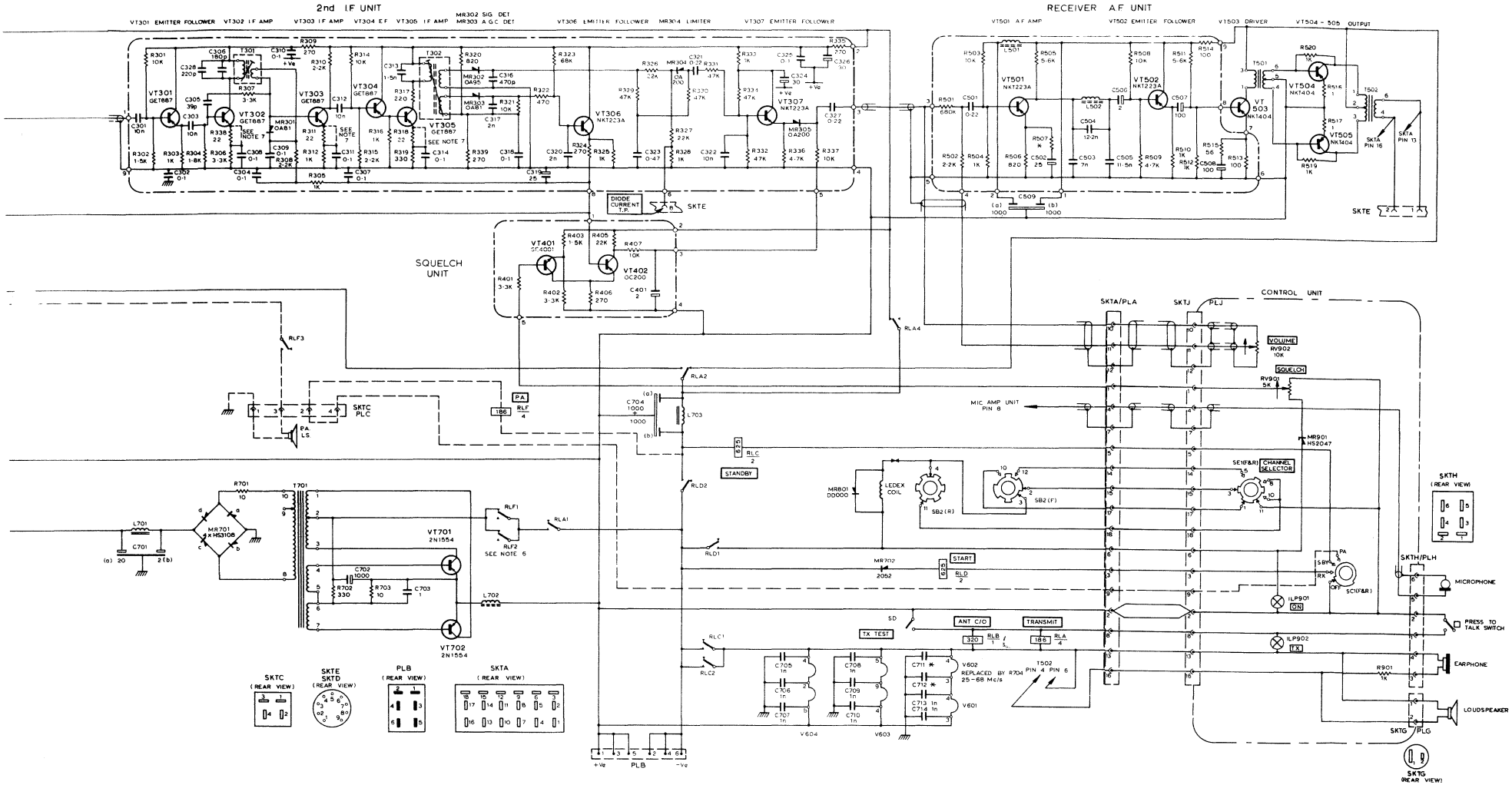
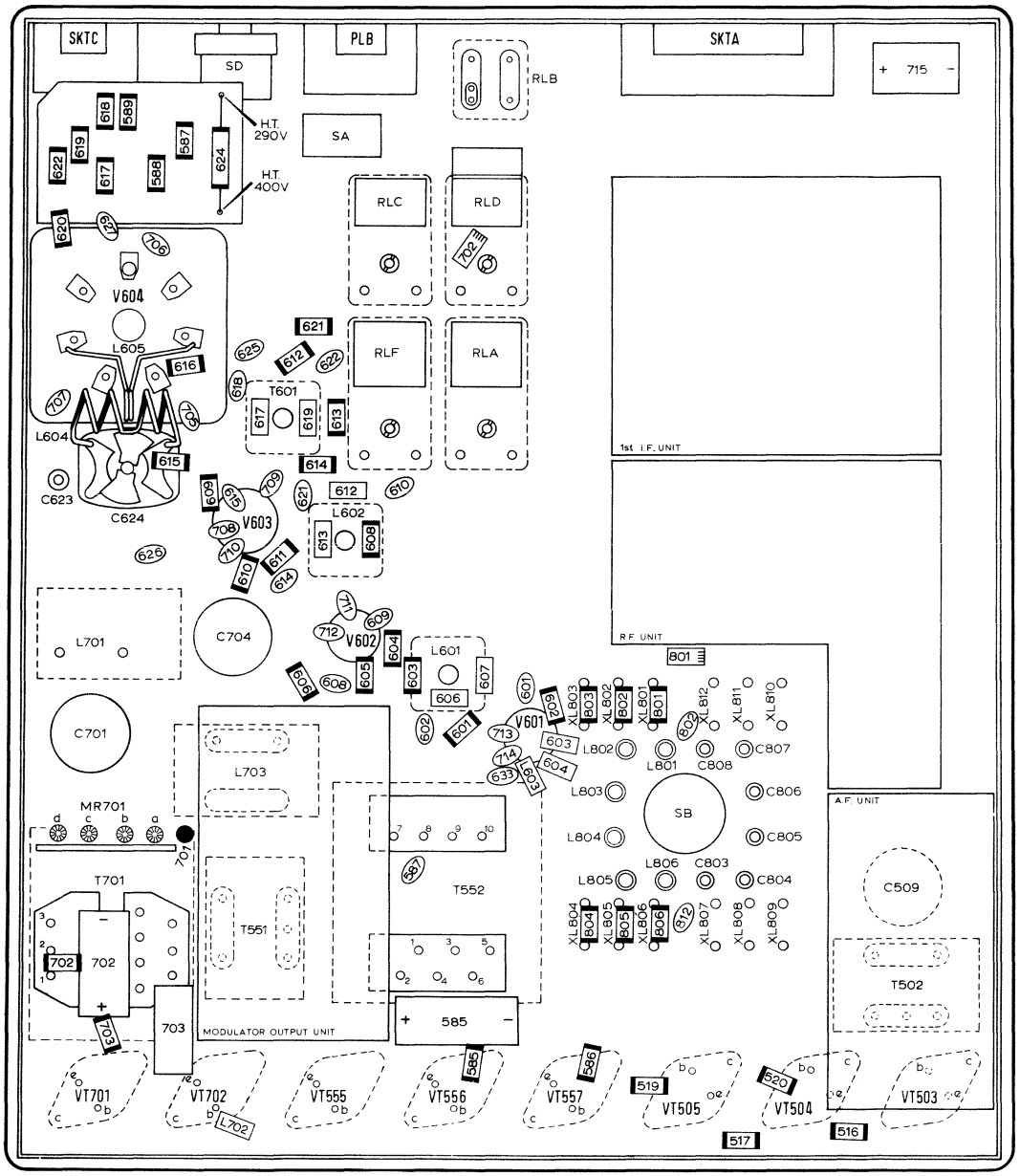
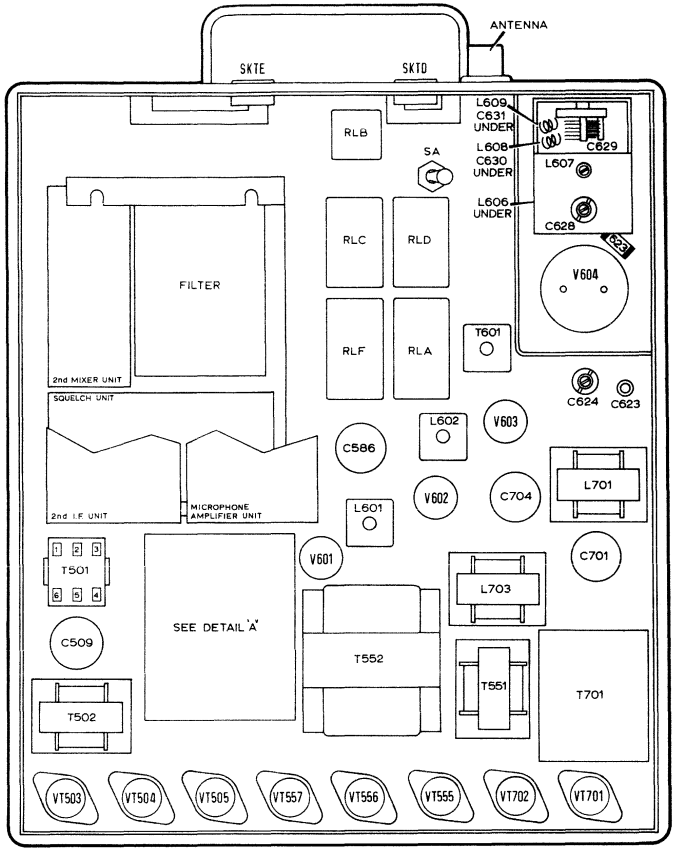
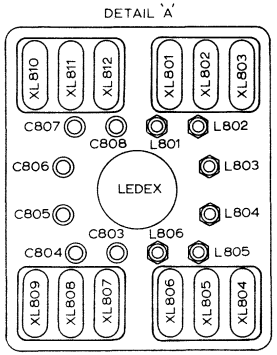


Fig. 18 CIRCUIT DIAGRAM (AM 25 T)







RESISTOR SYMBOL
DIODE SYMBOL (MR)
CAPACITORS PREFIX 'C' OR PLAIN OUTLINE

Fig. 19 TRANSMITTER COMPONENT LOCATION DIAGRAM (AM 25 T)

INTRODUCTION

It is recommended that a trial 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
3. Crystal controlled 455 kc/s marker oscillator
4. *Pye Test Set type TM1
5. Audio output meter reading up to 2W and calibrated in db.

*Where the Pye Test Set type TM1 is not available the following test equipment will be required:-

(a) 0-50μA meter with a resistance of 2.5kΩ

(b) H.F. valve voltmeter or diode probe used in conjunction with a 0-50μA meter.

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).

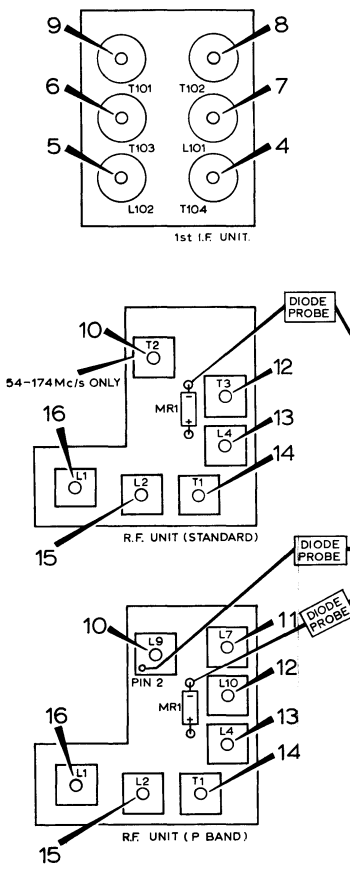
ALIGNMENT PROCEDURE

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.

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 test meter TM1 to RX TEST socket (set to 7) 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.
5. If the receiver working frequency is to be changed or if preliminary alignment of the r.f. circuit is required to obtain a working condition of the receiver, align the R.F. Unit as shown in the chart opposite prior to carrying out the full alignment procedure.



REF.	TEST POINT	TM1 SELECTOR	ADJUSTMENT	READING
1 AND 2	SKTE PIN 8 +VE PIN 9 -VE	7	ADJUST IN SEQUENCE FOR MAXIMUM READING. HINGE UP 2nd I.F. UNIT	
3	SKTE PINS 8 & 9	7	ADJUST FOR MAXIMUM READING	
3	MR201	PROBE	CHECK FOR SECOND LOCAL OSCILLATOR INJECTION VOLTAGE REPLACE AND LOCK 2nd I.F. UNIT	0.5V MINIMUM
4 TO 9	SKTE PINS 8 & 9	7	ADJUST IN SEQUENCE FOR MAXIMUM READING	
THE FOLLOWING SEQUENCE DOES NOT APPLY TO 'P' BAND EQUIPMENT				
10	MR1	PROBE	ADJUST FOR FIRST LOCAL OSCILLATOR INJECTION VOLTAGE	0.5V MINIMUM
11			NOT USED	
12 TO 16	SKTE PINS 8 & 9	7	ADJUST IN SEQUENCE FOR MAXIMUM READING	
THE FOLLOWING SEQUENCE APPLIES TO 'P' BAND EQUIPMENT				
			REMOVE L9 SCREENING CAN	
10	L9 PIN 2	PROBE	ADJUST FOR MAXIMUM READING REPLACE SCREENING CAN	INDICATION
10 AND 11	MR1	PROBE	ADJUST IN SEQUENCE FOR MAXIMUM READING	0.5V MINIMUM
11 TO 16	SKTE PINS 8 & 9	7	ADJUST IN SEQUENCE FOR MAXIMUM READING	
			CARRY OUT PERFORMANCE CHECKS (ALL EQUIPMENTS)	

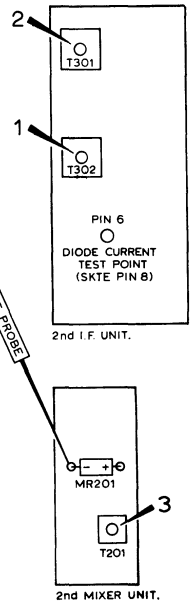


Fig. 20 RECEIVER ALIGNMENT CHART (AM25T)

INTRODUCTION

It is recommended that the procedure be practised prior to aligning the transmitter.

EQUIPMENT REQUIRED

1. L.T. supply of 13.2V d.c.

*2. Pye Test Set Type TM1.

3. R.F. power output meter (The Bird Termaline Model 612 is suitable).

* If the Pye Test Set Type TM1 is not available the following equipment will be required.

0-50μA meter (Avometer Model 8 is suitable)
Hexagonal trimming tool (Part No. 76964)

CRYSTAL OSCILLATOR

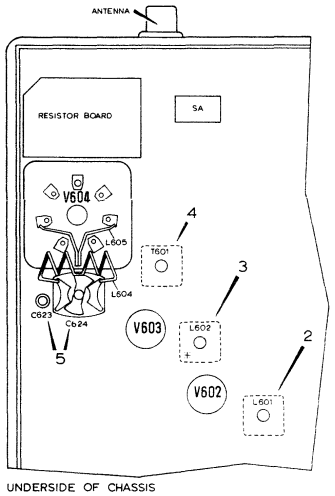
Crystal trimmers C803-C808 must be adjusted only as described in Field Testing Procedure in Chapter 3 or against a substandard. (See Appendix)

ALIGNMENT PROCEDURE

The transmitter is designed for intermittent operation. Use the TRANSMIT switch to switch the H.T. supply and then only when making adjustments.

Insert the TM1 9-way plug into the TX TEST socket on the main unit front panel. If this meter is not available, connect the microammeter to the socket pins shown on the Alignment Chart.

Connect the r.f. power output meter to the ANTENNA socket. Carry out the procedure given in the chart opposite.



REF	TEST SOCKET PINS	TM1 SELECTOR POSITION	COMPONENT	ADJUSTMENT	TYPICAL READINGS
1			SA	SET TO 'TUNE' SET FACILITY SWITCH TO 'S BY' ALLOW 1 MINUTE WARM-UP PERIOD	
25-68 Mc/s EQUIPMENT ONLY					
2	3 (-VE) 6 (+VE)	3	L601	ADJUST FOR MAXIMUM	25μA
68-174 Mc/s EQUIPMENT ONLY					
2	2 (-VE) 6 (+VE)	2	L601	ADJUST FOR MAXIMUM	25μA
3	3 (-VE) 6 (+VE)	3	L602	ADJUST FOR MAXIMUM	25μA
ALL EQUIPMENTS					
4	4 (-VE) 6 (+VE)	4	T601	ADJUST PRIMARY AND SECONDARY CORES FOR MAXIMUM	25μA
5	5 (-VE) 6 (+VE)	5	C624 C623	ADJUST FOR MAXIMUM	15μA
6 7	8 (+VE) 9 (-VE)	7	ANT. COUPLING C629	TURN COUNTERCLOCKWISE FOR MINIMUM COUPLING DETUNE ANTENNA CIRCUIT	
8	8 (+VE) 9 (-VE)	7	C628	ADJUST FOR DIP (MINIMUM)	
1			SA	SET TO 'NORMAL"	
6	8 (+VE) 9 (-VE)	7	ANT. COUPLING	TURN CLOCKWISE FOR RISE IN OUTPUT METER READING	
7	8 (+VE) 9 (-VE)	7		ADJUST FOR MAXIMUM OUTPUT METER READING	
8	8 (+VE) 9 (-VE)	7	C628	ADJUST FOR DIP (MINIMUM)	
6 7 8	8 (+VE) 9 (-VE)		ANT. COUPLING C629 C628	REPEAT UNTIL POWER OUTPUT IS NOT LESS THAN:- 25-88 Mc/s 19 WATTS 68-174 Mc/s 17 WATTS	27μA MAXIMUM

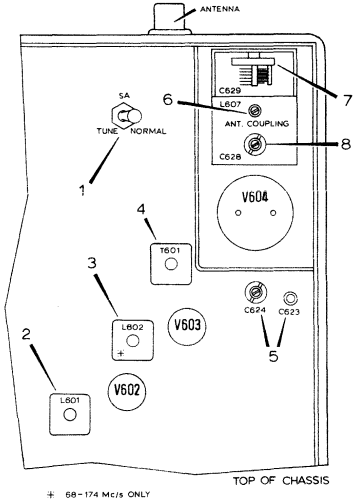


Fig. 21 TRANSMITTER ALIGNMENT CHART (AM25T)