AIRCRAFT RADIO EQUIPMENT

COMMUNICATION RECEIVER

Type AD118

TECHNICAL MANUAL
Ref T3591

Marconi

MARCONI'S WIRELESS TELEGRAPH COMPANY LIMITED
Chelmsford, Essex, England · Telephone: Chelmsford 3221 · Telex: 1953 Telegrams: Expanse Chelmsford Telex

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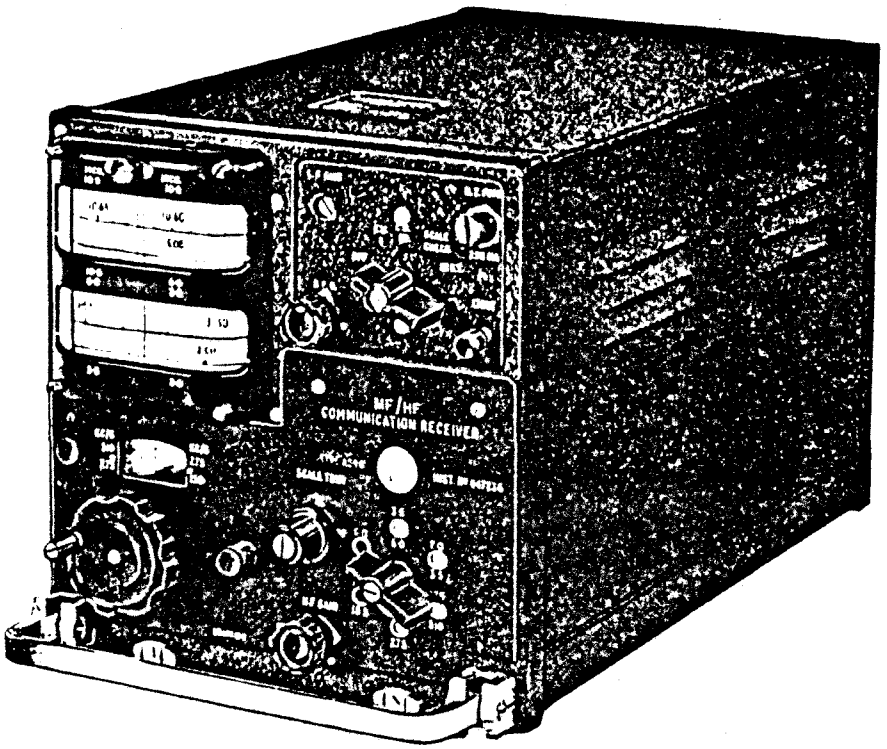

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COMMUNICATION RECEIVER TYPE AD118

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1 INTRODUCTION

The Marconi Communication Receiver Type AD118 is a high performance instrument, primarily intended for use in large aircraft. The receiver is intended for direct control only, enabling special features to be provided which are not normally associated with aircraft receivers.

The direct reading tuning scale has an effective length of over 30 ft., providing high discrimination, and permitting resetting to beat note accuracy throughout the entire frequency range.

A crystal calibrator is included in the receiver, and a control which provides correction of scale errors due to long term ageing or drift.

The circuit, which is a twelve valve superheterodyne, includes a noise limiter to assist in giving protection against interference, particularly from radar apparatus.

In order that full use may be made of the high scale discrimination without recourse to frequent scale checking, special attention had been paid to the mechanical and electrical stability of the equipment.

The receiver is designed to fit the standard aircraft mounting rack (BSR1).

The valve heaters in this equipment are arranged to operate from the aircraft 28 volt supply without the need for a voltage regulator.

2 DATA SUMMARY

Scale Resetting Accuracy :	± 2 Kc/s.
Frequency Coverage :	MF 150 Kc/s—275 Kc/s. 275 Kc/s—510 Kc/s. HF 2 Mc/s—3.5 Mc/s. 3.5 Mc/s—6 Mc/s. 6 Mc/s—10.5 Mc/s. 10.5 Mc/s—18.5 Mc/s.
Artificial Aerial	MF 300 pF capacitor with 10 ohms resistor in series. HF 50 ohms non-inductive resistor. } Including source impedance of signal generator.
Output :	225 mW into 33 ohms or 600 ohms
Sensitivity :	Input required for 10 dB signal to noise ratio with signal modulated 30% at 400 c/s :— MF —Less than 5—20 μV. HF —Less than 2 μV.
Selectivity :	Broad Bandwidth RT & CW :— 6 kc/s at 6 dB attenuation. 25 kc/s at 60 dB ,, Narrow Bandwidth CW :— 1 kc/s at 6 dB attenuation. 15 kc/s at 60 dB attenuation.
Image Ratio :	150 kc/s—510 kc/s Greater than 150 dB. 2 Mc/s ,, ,, 100 dB. 10 Mc/s ,, ,, 70 dB. 18.5 Mc/s ,, ,, 60 dB.
IF Breakthrough :	Greater than 100 dB on all ranges.
Automatic Gain Control :	Less than 8 dB change of output for 80 dB change of input.
Power Consumption :	2.4 amps at 28 volts D.C.
Dimensions :	Height—8 inches (20.3 cm.) Width—8 inches (20.3 cm.) Depth—12½ inches (31.7 cm.)
Weight :	18.7 lbs. (8.5 kg.)
Ministry of Transport and Civil Aviation Type Approval (U.K.)	Certificate No. WR568

3 GENERAL DESCRIPTION

The receiver chassis is strongly constructed of light alloy metal. To facilitate servicing, the IF amplifier and output stages, and the scale check oscillator, are each in the form of self contained, easily removed, sub-assemblies, which connect to the remaining circuits of the receiver by plug and socket.

A small rotary transformer mounted within the receiver case provides the HT supply and also ensures some measure of cooling by means of a small fan at one end of the shaft which draws air into the receiver via a detachable filter unit.

Three separate tuning scales are provided on the receiver front panel. Two scales are for use on the high frequency ranges, and the third is for use on the low frequencies. The high frequency scales are in the form of perforated metal tapes which pass horizontally across the scale windows in the receiver panel unrolling from one spool on to another. (See Figs. 1 and 2.) Each tape passes over sprockets which are geared to the tuning capacitor, so that they move exactly in step with it. To ensure maximum discrimination the scale tape for the two highest frequency ranges moves faster and is longer than the tape for the two other high frequency ranges. The low frequency scale is situated beneath the HF scales and is of the more orthodox dial type calibrated in the two LF ranges. A special feature of the tuning capacitor assembly is a pre-adjusted cam which, as the capacitor rotates, varies the setting of a trimmer capacitor across the oscillator section of the ganged capacitor. This compensates for tolerances inherent in the ganged capacitor law, and ensures very high tracking accuracy throughout each frequency range.

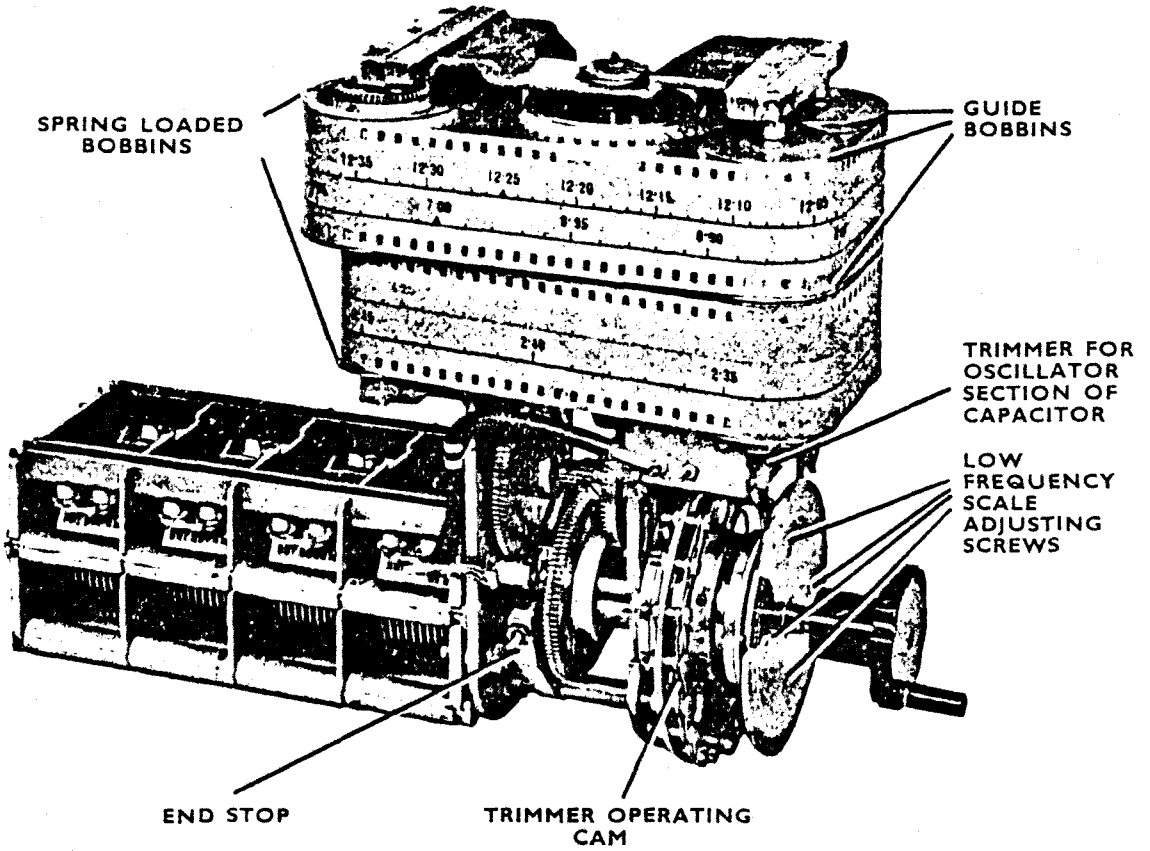

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FIG. 1. TUNING CAPACITOR AND SCALE DRIVE ASSEMBLY. LEFT HAND SIDE

4 INSTALLATION

4.1 General

It is emphasised that all installation work should be performed by experienced aircraft contractors, or qualified ground engineers.

Efficient bonding and shielding of the aircraft electrical and ignition systems is essential for the satisfactory operation of the receiver. Excessive local electrical interference will limit its ultimate sensitivity.

The receiver is manually operated, and will generally therefore be installed in the main radio station rack with other radio units. In certain aircraft however, it may be necessary to mount the receiver separately, in which case the requirements outlined in Section 4.2 below must be complied with. Details of receiver dimensions and the method of mounting are shown in Fig. 16. The receiver should always be installed within easy reach of the operator.

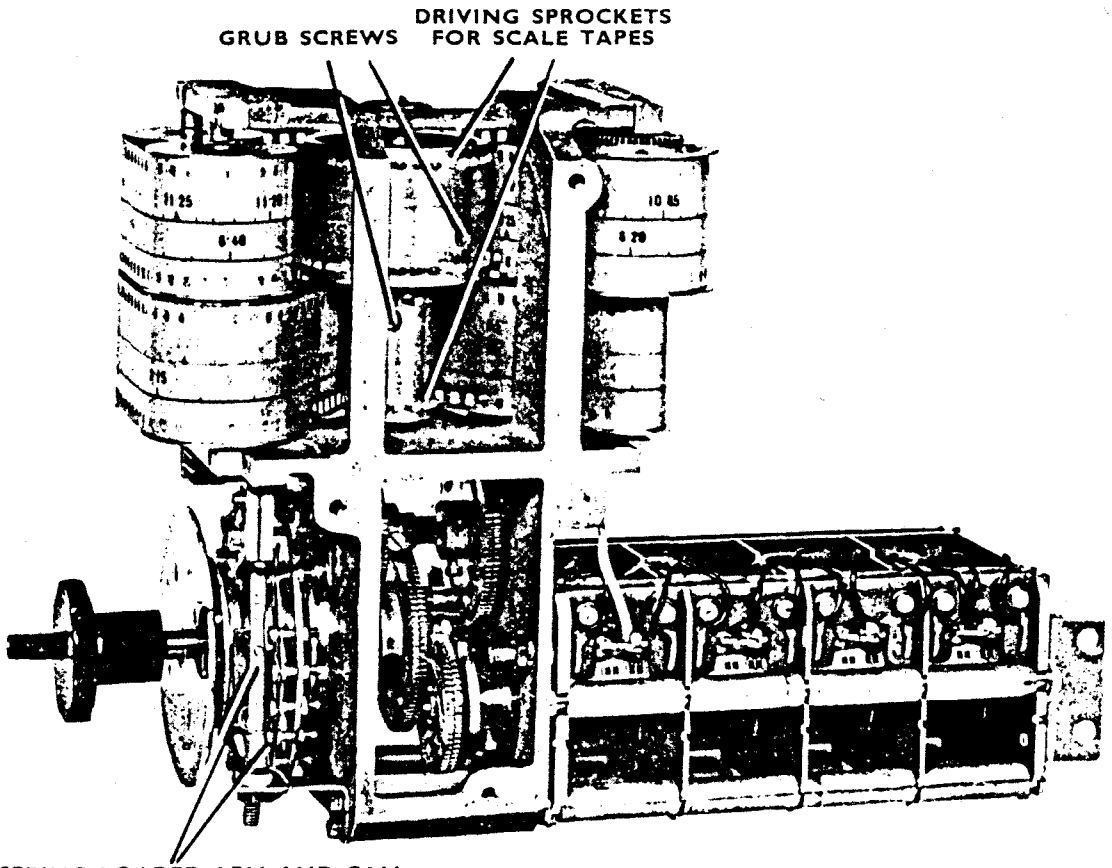


FIG. 2. TUNING CAPACITOR AND SCALE DRIVE ASSEMBLY. RIGHT HAND SIDE

4.2 Suspension Rack and Cabling

When fitting the receiver rack sufficient clearance must be allowed to permit free movement of the receiver in the shock absorbing mountings, and adequate space provided at the rear of the receiver for cable connections to the back plate.

Both fixed and suspended portions of the rack must be bonded to the metal or main earth of the aircraft.

All connecting cables must be firmly cleated to the airframe. Bends should not be of less than 2 inches radius.

4.3 Crystal Oven Heater Supply

It should be noted that the input to the crystal oven is brought out to a separate pin on the power plug (pin 1, plug PLD(CW)), in order that it may be taken to a separate switch on the installation. This arrangement permits the oven to be switched on in advance of the equipment, so that full advantage may be taken of the high scale accuracy as soon as operation of the equipment commences.

5 OPERATING INSTRUCTIONS

5.1 General

The functions of the various controls are clearly engraved on the front panel. Two " CW " positions are provided on the system switch. The one nearest to the off position gives a bandwidth of 1 Kc/s, and is for use when reception is subject to interference. The second " CW " position gives a bandwidth of 6 Kc/s for general reception.

5.2 Scale Checking

To check the tuning scale of the receiver proceed as follows :—

(*a*) Set range switch to the desired frequency range.

(*b*) Set system switch to " Scale check ".

(*c*) Tune the receiver to the scale check point nearest to the desired frequency. (The scale check points are indicated by triangular marks on the scale.)

(*d*) Unlock the control marked " Scale Trim " by turning the inner knob anti-clockwise. Rotate outer knob until zero beat is obtained in the headset. Lock the control. It will be noted that a slipping clutch arrangement is provided on the knob. This prevents the control from being forced against the end stop with the possibility of damage to the variable inductance trimmer.

(*e*) Set the system switch to CW or RT as required, and tune to the desired frequency.

5.3 Volume Control

The L.F. gain control is preset to provide the standard output (225 mW into 33 ohms or 600 ohms) required to feed into the intercommunication amplifier. Control of the LF output is then provided by the volume control in the intercommunication mixing box. Automatic gain control is provided at the RT position of the system switch only, so that the receiver may be used for " Consol " reception. At the CW switch position the volume level is adjusted by means of the HF gain control.

5.4 Radio Range Flying

For radio range flying proceed as follows :—

(*a*) Tune in radio station with system switch at " RT ".

(*b*) Set volume control on intercommunication to maximum or switch intercommunication to " Special " (i.e., to position where receiver output is connected directly to headset).

(*c*) Adjust HF gain control until the volume is at a minimum consistent with reasonable signal discrimination in the headset.

(*d*) Maintain this signal level in the headset by repeated adjustment of the gain control as the aircraft approaches the radio station.

Under these conditions the signal is insufficient to operate the AGC circuits and maximum discrimination of the A and N signals is obtained. If the volume control is inadvertently turned too high the beam will appear to widen. The AGC prevents reversed courses being obtained due to overloading.

5.5 Pulse interference

For C.W reception under conditions of severe pulse interference, it will be found advantageous to operate the receiver with the system switch at the broad bandwidth position.

6 CIRCUIT DESCRIPTION

6.1 General

The receiver circuit is a superheterodyne with HF and MF frequency ranges covered in six bands. A circuit diagram of the receiver is shown in Fig. 17. The valves and their functions are as follows :—

Ref.	*Function*	*Type*
V1	1st RF Amplifier	6AK5
V2	2nd RF Amplifier	6BA6
V3	Frequency Changer	6BE6
V4	Frequency Change Oscillator	6AK6
V5	1st IF Amplifier	6BA6
V6	2nd IF Amplifier	6BA6
V7	Detector and AGC Diode	6AL5
V8	Noise Limiter	6AL5
V9	LF Amplifier	6BA6
V10	Output	6AK6
V11	Beat Frequency Oscillator	6BA6
V12	Scale Check Oscillator	6AK6

6.2 RF Circuits

Two stages of RF amplification are provided by V1 and V2. The use of two stages ensures adequate image protection on all frequency bands. The coupling circuits have been specially designed to reduce variation in sensitivity over each band. Gain control in the second stage is provided by cathode bias variation by means of potentiometer RV2 (HF gain control) which also controls the gain of the 1st IF Amplifier V5.

6.3 Frequency change oscillator

The frequency change oscillator V4 is designed to ensure maximum stability, full use having been made of the most recent developments in insulating materials. Compensation for residual drift in oscillator components due to variations in ambient temperature is provided by a negative temperature coefficient capacitor and an inductance XI which are connected across the oscillator tuning capacitor, and the cathode circuit of the oscillator tuning coil respectively. The assembly consists of a pancake wound coil and a small fixed plate, between which is mounted a bi-metal strip. The strip is arranged so that increasing temperature will cause it to bend away from the fixed plate and towards the inductance, reducing the capacity shunted across the ganged tuning capacitor section (C63) and by its damping action reducing the effective inductance of the coil.

The scale trimmer (L33) across the oscillator coils provides a constant percentage frequency change on all bands to reduce the necessity for frequent scale checking.

The tolerances inherent in the ganged capacitor law are corrected by means of a small trimmer capacitor across the oscillator section (C63). The trimmer is operated by means of a cam which is adjusted during manufacture. If at any time a ganged capacitor is replaced, the cam should be re-adjusted against the internal calibrating oscillator.

6.4 Frequency Changer and Crystal IF Filter

The oscillator is electron coupled to the frequency changer control grid via C65, this arrangement ensuring minimum pulling of the oscillator at the higher frequencies. The frequency changer (V3) is coupled to the first IF valve by a coupled pair of circuits for RT and CW broad bandwidth. For narrow band CW however the system switch brings into circuit a crystal filter XLA, together with a damping circuit L27, C74. The circuit arrangement at each position of the system switch is shown in Fig. 3.

6.5 IF Amplifier

Two stages of IF amplification are used employing variable mu HF pentode valves V5 and V6. The gain of V2 and V5 is controlled by potentiometer RV2 (HF gain control) while automatic gain control is applied to V5 and V6.

6.6 Detector, Noise Limiter and AGC

Detection of audio signals is obtained by one diode of the double diode valve V7. The detected signal developed across R31 is fed to the LF amplifier stages via one diode of a second double diode valve V8 which functions as a noise limiter.

The anode of one section of V8 is connected to the junction of R31 and R30, and since the cathode is returned via R33 and R32 to the junction of R30 and R29 which is a more negative point, the diode conducts under normal conditions and offers a low impedance to the audio signal. The time constant of the cathode circuit is considerably greater than that of the anode circuit and when a pulse of noise is received, the signal rectifier produces a negative pulse which swings the anode of this diode negatively. The long time constant prevents the cathode from following the pulse, and the output is instantaneously disconnected from the LF valve for the duration of the noise pulse. Simultaneously the cathode of the second diode section of V8 goes more negative than its anode and this section conducts and short circuits any remnants of the initial pulse.

The second diode of V7 provides automatic gain control. Full AGC volts developed across R36 and R37 are applied to valves V1, V2, V3 and V5. Reduced AGC volts obtained from the junction of R36 and R37 are applied to V6.

6.7 Beat Frequency Oscillator

The beat frequency oscillator stage employs an HF pentode valve V11 in a cathode coupled circuit, the valve being tapped well down the coil (L32) to ensure a high stability of oscillation. The output is fed via C105 to the anode of the detector diode.

6.8 LF and Output Stages

A first stage of LF amplification is provided by the HF pentode valve V9, control of LF volume being obtained by the pre set potentiometer RV1. This arrangement provides a high impedance load for the detector stage, reducing damping and the possibility of distortion in the detector. The output stage employs an LF pentode valve (V10) and is matched by a transformer (TR1), which has a tapping on its secondary winding, providing an output of 225 mW into 33 ohms or 600 ohms. The 33 ohm output line is connected to socket SKD(CY) and the 600 ohm line to socket SKE(EY). Negative feed back is applied in the output stage by means of R44, in order that variable loads may be accommodated.

6.9 Crystal Calibrating Oscillator

The calibrating oscillator employs an LF pentode valve (V12) connected as a triode. The oscillatory circuit incorporates a crystal (XLB) which is maintained at a constant temperature of 60° C. in a thermostatically controlled oven. Maintenance of the temperature within the oven is provided by a heater coil (R62) and a bimetal thermostat which operates in conjunction with two external resistances R59 and R61. When the oven is switched on the current flows through R59 and the heater coil R62. The contacts of the thermostat are initially open, and R61 is disconnected. As soon as the oven reaches 60° C. the contacts close and connect R61 to earth. This increases the current flow through R59, producing a drop in voltage across R62. Hence by interaction between R62 and the thermostat, the temperature is maintained constant within $\pm$ 2° C.

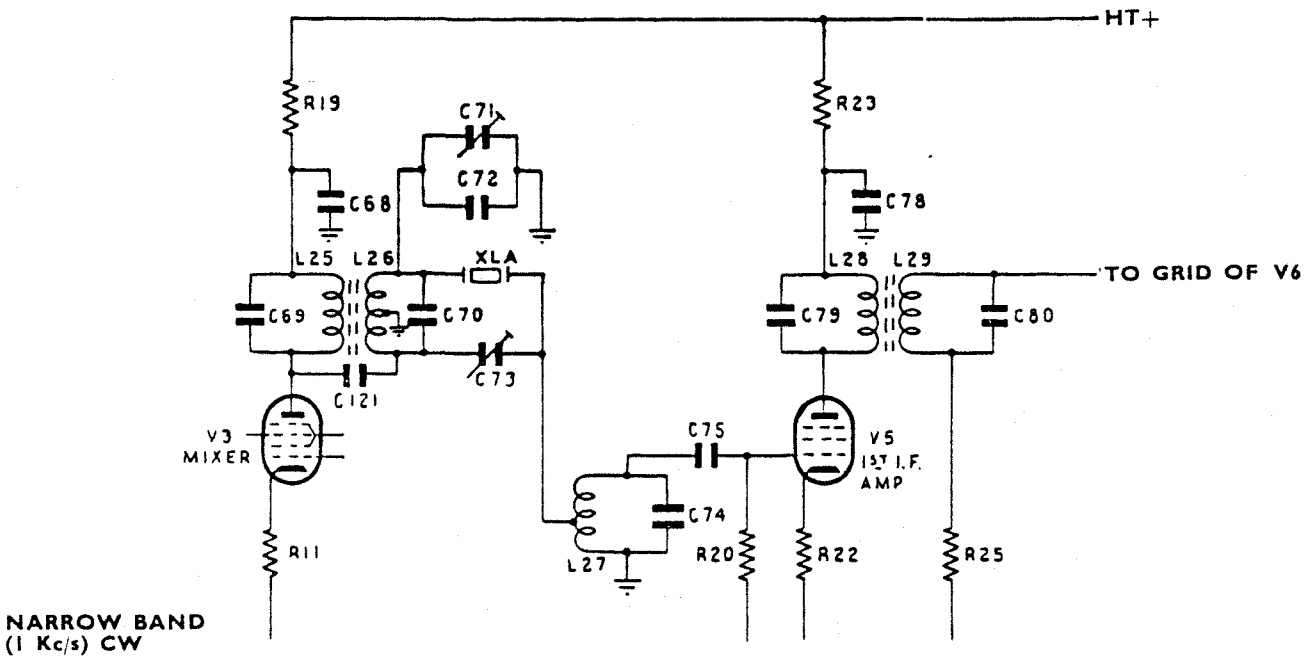
The oscillator is switched on by connecting the HT supply to V12 (when the system switch is turned to scale check) and the output is taken via C108 and C30 to the grid circuit of V2. At the same time the HT supply to the first RF valve V1 is interrupted, so that any incoming signals are prevented from breaking through and giving spurious scale check points.

6.10 Power Supplies

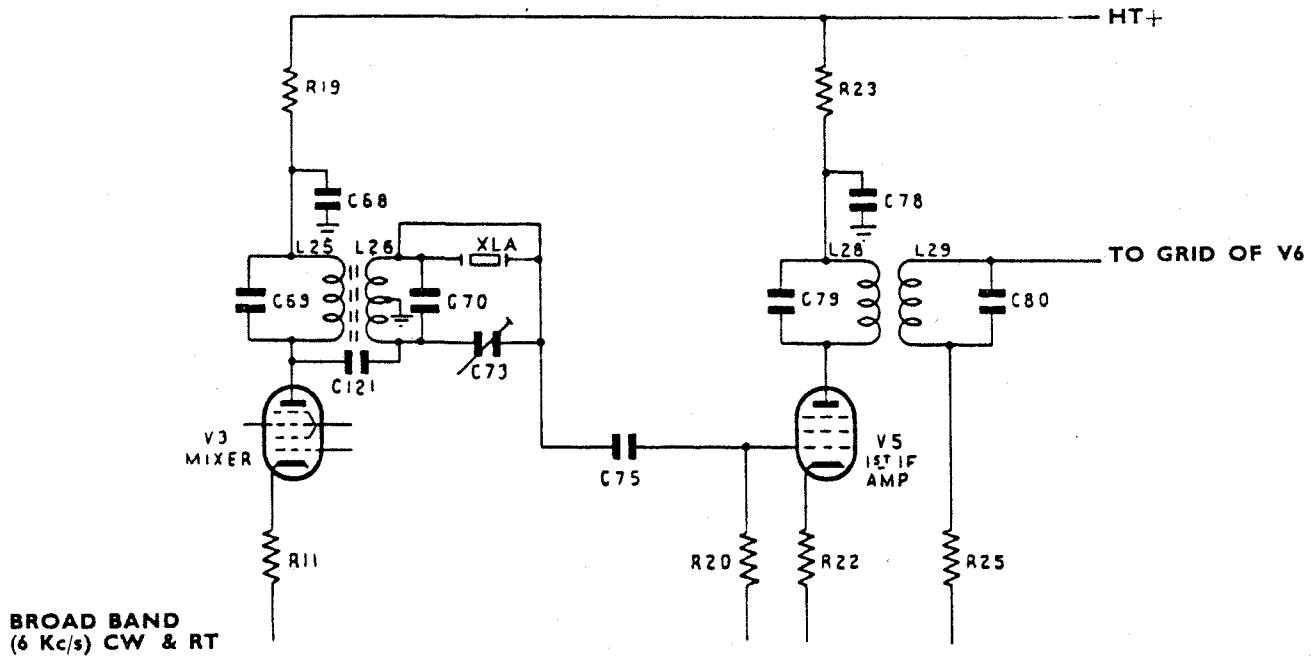
The 28v. DC supply (aircraft LT system) is connected to pin 4 of plug PLD(CW) for valve heaters and the rotary transformer for HT supply. The HT output from the rotary transformer is approximately 230 volts and it is fused for 250 mA (F1). Choke capacity filters are incorporated in both the input and output lines.

The 28 volts DC supply is also connected to pin 1 for crystal oven heating, and enables the oven to be switched on externally.

Pin 2 on plug PLD(CW) provides the earth return for all the above supplies.



NARROW BAND
(1 Kc/s) CW



BROAD BAND
(6 Kc/s) CW & RT

5812 FIG. 3. IF CIRCUIT SELECTIVITY ARRANGEMENTS

7 MAINTENANCE AND FAULT FINDING

Routine ground tests should be applied to the equipment at regular periods by qualified g engineers.

7.1 Routine Inspections

7.1.1 *Pre-flight Inspection*

While the equipment is in service, a visual inspection should be made before each flight, followed by a functional test of the receiver. This should include the following checks :—

(*a*) Check operation of all controls.
(*b*) Test dial lamps.
(*c*) Check sensitivity of receiver on all ranges by tuning to known weak radio stations.

7.1.2 *Rotary Transformer Inspection*

After every 250 flying hours the cover should be removed from the receiver (see note below) and the rotary transformer detached (by removing the two captive securing screws) and inspected as follows :—

(*a*) Remove the brushes and check for wear.
(*b*) Remove the end covers from the machine and clean the interior thoroughly (carbon dust deposits may be removed by means of an air blower).
(*c*) Examine the commutator. If dirty it may be cleaned with a fluffless cloth moistened in carbon tetrachloride (a light brown discoloration is normal and need not be removed).

Note: The receiver cover or box is secured by means of two captive knurled screws on the rear panel. If these screws are loosened, the complete cover may be withdrawn.

7.2 Overhaul of Receiver

It is recommended that the receiver is removed from the aircraft for thorough overhaul in the workshop after every 1000 flying hours.

7.2.1. *Mechanical*

Mechanical inspection should be performed as follows :—

(*a*) Clean receiver exterior and interior (if necessary) thoroughly.
(*b*) Examine all wiring and soldered joints.
(*c*) Check all nuts and bolts for security.
(*d*) Remove air filter from receiver cover by releasing the spring clips at each side and if necessary clean by tapping firmly with its intake side downwards. If dust accumulation is excessive, clean by blowing with compressed air into the side opposite the intake.
(*e*) Examine tuning scale and capacitor drive mechanism. If bearings or gear wheels appear dry, grease sparingly with anti-freeze grease (DTD825).
(*f*) Examine plugs and sockets on rear panel.
(*g*) Remove rotary transformer from receiver and dismantle by removing end covers and bearing brackets.

(See Section 7.5.8.). Clean all parts carefully, using a piece of cloth soaked in carbon tetrachloride. If commutator is very dirty it may be cleaned with fine glass paper (grade 00) or fine carborundum paper. Do not use emery paper. Scores on the commutator should be removed by skimming in a lathe. The minimum diameters to which the commutators may be skimmed are as follows :—

Input—0.590 ins.
Output—0.635 ins.

Examine the bearings for wear, if dry, grease very sparingly with anti-freeze grease. Not more than 25% of the available space should be filled with grease. Check brushes for wear, and examine contact surfaces for pitting. If contaminated with even a small quantity of grease, the brushes should be replaced. Minimum permissible length of brushes is 0.125 in. (3 mm). New brushes must be carefully fitted to the contour of the commutator, using fine carborundum paper held with the smooth side against the commutator so that the brush is shaped to the correct radius.

7.2.2 *Electrical*

For electrical test of the receiver the following apparatus will be required :—

(*a*) Signal generator (see note below)
(*b*) Output Meter (*e.g.*, Marconi Type TF340)
(*c*) Low impedance telephones.
(*d*) 300 pF capacitor.
(*e*) Resistors to provide specified dummy aerial impedances (See note below).

Note : The specified dummy aerial for frequencies of 2 to 18.5 Mc/s, is 50 ohms including the signal generator impedance. The actual resistance required therefore will depend upon the signal generator used. The figures given in Section 7.7 were obtained with a signal generator with a source impedance of 10 ohms and in this case a series resistance of 40 ohms was employed. For frequencies of 150 to 510 Kc/s the specified dummy aerial is 300 pF in series with 10 ohms. This is made by simply placing a 300 pF capacitor in the signal generator output, the impedance of the signal generator (10 ohms) providing the required resistance.

Connect a 28 volts DC supply to pins 4 and 1 of plug PLD(CW). (The earth return in each case is Pin 2.)

Connect dummy aerial to aerial input socket SKF(CX) and connect output power meter and headset to output socket SKD(CY) or SKE(EY).

The following tests should be made :—

(*a*) Inject input at frequencies specified in Section 7.7.4, and check signal/noise ratio and output obtained.
(*b*) Check functioning of *all* controls.
(*c*) Test each valve for microphony (with particular attention to 1st LF valve V9).
(*d*) Test dial lamps.

7.3 Fault finding procedure

Fault finding in this receiver follows normal practice, but the following notes may be of assistance in localising any defects.

If a loss in sensitivity is noted, check the valves in a reliable tester, or alternatively compare them with a spare set of valves. When looking for defects, the procedure should be to first localise the fault to a particular stage and then to isolate the defective component.

Thus in the case of no output on any band the technique would be as follows :—

(*a*) Check HT and LT supplies.
(*b*) Inject a signal of 2.5 Mc/s into the grid of V1. If no output is obtained proceed to the grids of V2 and V3. If there is still no output from the receiver, change the signal generator frequency to 1000 kc/s and inject it into the grid of V3. This eliminates the frequency change oscillator.
(*c*) Proceed to inject the IF signal into the grids of valves V5 and V6 in turn, and then at the anode of the detector V4.
(*d*) If still no output is obtained inject an audio signal into the grids of V9 and V10 in turn.

As soon as the correct output is obtained from the receiver, the fault is localised in the preceding stage. It is then a comparatively simple matter to check the voltage and components in the faulty stage. The locations of components are shown in Figs 8 to 14.

When investigating faults it should be noted that the IF unit may be unscrewed from the receiver and mounted on top of the chassis with its underside exposed, without disconnection. (see Fig. 5 and Section 7.5.1).

The receiver will operate satisfactorily under these conditions provided that an earth connection is made between the unit and the main chassis. It is bad practice to make repeated adjustments to the trimming capacitors and inductors in order to obtain the maximum of performance. If the receiver meets the performance figures specified in Section 7.7 for selectivity, sensitivity and image ratios, the ganging adjustments are correct. It is unnecessary to touch the adjustments in order to prove that they are correct.

Caution : Never remove any valves from the receiver with the heater supply switched on, as the other valves in the equipment are liable to be damaged, due to the series paralleled connections of the heater chains.

7.4 Typical Voltage Measurements

The following list of typical voltage measurements will be of assistance to the service engineer in tracing defects.

Conditions of Test:

Meter : Avometer Model 8 or similar instrument (range 250 Volts unless otherwise stated).
LT Input Voltages : 28v. DC.
HF Gain : Maximum.
System Switch : " CW." Broad.
HT Voltage : 230 Volts.
All measurements positive with respect to earth.

Valve	Anode (Volts)	Screen (Volts)	Cathode (Volts)
V11	115	50	—
V10	225	144	7.6 (10v. range)
V9	95	20	1.6 (10v. range)
V7	—	—	17.5 (25v. range)
V6	98	98	2.1 (10v. range)
V5	75	75	2.2 (10v. range)
V4	200	125	—
V3	220	70	1.8v. (10v. range)
V2	60	60	1.7 (10v. range)
V1	83	83	1.1 (10v. range)

7.5 Removal of Receiver Sub-Assemblies

Removal of the individual sub-assemblies and components from the receiver is very easily carried out, and in the majority of cases the method is fairly obvious. However, for the assistance of service engineers, detailed descriptions of the methods for removal of the main sub-assemblies are given below, together with notes on dismantling and re-assembly of certain items where it is thought that difficulty might be experienced.

7.5.1 *IF Amplifier and Output Unit*

The complete IF amplifier and output unit is secured to the main chassis by means of two 6 BA cheese-headed screws on the front panel (situated immediately below the IF unit control panel), two 6 BA cheese-headed screws, one at the centre and the other at the rear, securing the unit to the vertical chassis member, and a special 4 BA cheeseheaded screw at the rear right-hand corner of the unit chassis. This screw is 2½ inches long, and must be unscrewed completely and removed, before the unit can be withdrawn rearwards from the main receiver chassis.

7.5.2 *Crystal Calibrator Unit*

The calibrator unit is secured to the vertical chassis member by means of two cheeseheaded 6 BA screws accessible from the turret side of the member. Before attempting to detach the unit, the valve can and valve must be removed.

7.5.3 *Tuning Capacitor and Scale Assembly*

Proceed as follows :—

(*a*) Unsolder all leads from the gang capacitor to the turret unit terminals.
(*b*) Remove the LF amplifier and output unit (see Section 7.5.1).
(*c*) Remove the crystal calibrator unit (see Section 7.5.2).
(*d*) Remove the left-hand corner bar (Tuning capacitor side) from the receiver chassis.

(*e*) Detach the tuning control knob. Remove the screws securing the tuning condenser and sub-assembly to the chassis. Two are located at the rear of the tuning condenser and three are situated towards the front of the assembly (accessible from the coil turret side of the chassis).

(*f*) The complete assembly may now be lifted from the receiver.

7.5.4 *Scale Tape Removal and Replacement*

(*a*) *Removal.* To remove the scale tapes from the tuning capacitor assembly, rotate the tuning knob until the scales are at the high frequency end of their travel. Remove the long scale guard wire by removing the 6BA screw from the end of the casting. Rotate the upper left-hand bobbin (viewed from the front) until the tape is completely unrolled. This reveals the metal support strip and adhesive securing tape. Remove the adhesive tape and the end of the scale may be lifted from the bobbin. Remove the tape from the lower left-hand bobbin in the same way. The two ends of the scales may then be unthreaded from the guide bobbins and drive sprockets and unroiled and detached from the right-hand bobbins.

(*b*) *Fitting of Replacement Scale Tape.* Before fitting the replacement tape to the bobbins it is necessary to tension the bobbins as follows :—

Rotate the left-hand gear until the small hole in the gear wheel at the top is visible. Hold the gear wheel and rotate the top bobbin four turns in an anti-clockwise direction (viewed from above) against the tension of the internal spring. Insert the special locking pin provided with the scale (or obtainable from Marconi's W.T. Co. Spare Part Ref. No. XP354) into the hole in the gear wheel and adjust the position of the bobbin until the locking pin can be pushed further through a hole (provided for this purpose) in the bobbin. Press the pin down as far as it will go, insert a screwdriver in the head of the pin and screw in one turn to engage the thread. The gear and bobbin may then be released and the tension setting is held by the locking pin. Hold the gear wheel once more and rotate the lower bobbin three times in an anti-clockwise direction. Then adjust the position of this lower bobbin relative to the upper bobbin until the locking pin passing through the latter may be screwed still further into a hole provided in the lower bobbin. It will then be possible to screw the pin down flush with the gear wheel. Both bobbins and gear may now be released and the tensions of the respective bobbins will be held by the locking pin passing through them and the gear. Tension the right-hand bobbins by the same method, but in this case the upper bobbin should be tensioned three turns in a clockwise direction and the lower bobbin two turns in a clockwise direction.

To fit the scale tapes proceed as follows :—

Place the tuning capacitor and drive assembly on its side with the left-hand bobbins uppermost and lay the scale tapes fully unwound along the work bench. Trim the high frequency end of the long tape (for ranges 5 and 6) so that 17½ inches of blank tape is left at the end of the printed scale. Take the small brass support strip removed previously with the scale from the *large* bobbin (or obtainable from Marconi's W.T. Co. Spare Part Ref. No. XS778) and fit on to the tape with the projecting lugs through the perforations in the tape, which are 1½ inches from the end. It should be noted that the support strips used on the large and small bobbins are not the same. The strip with the larger radius should, of course be used on the larger bobbin. Fit on to the large bobbin so that the projections on the support strip fit into the two holes provided in the bobbin (see Fig. 4). Secure in position with two lengths of cellulose tape, each about 3 inches long. The tape must, of course, be positioned so that the scale markings are on the outside when the tape is wound anti-clockwise on to the bobbin.

Trim the shorter scale tape so that 12½ inches of blank tape are left at the end and attach to the smaller bobbins in exactly the same manner as the longer scale, using the support strip previously removed from the smaller bobbin, (or obtainable from Marconi's WT Co. Spare Part Ref. No. XS779).

Wind the scale on to the bobbins (maintaining a firm tension on the tape until the low frequency end marking on the shorter scale is approximately one inch from the shorter bobbin. Then thread the long scale round the longer bobbin for one additional turn.

Hold the tapes on the bobbins to prevent them unrolling and release the two grub screws in each of the driving sprockets so that they can turn independently. Still holding the tape bobbin pass the ends of the scale tapes over the front guide bobbins and under the driving sprockets (making sure that the teeth engage with the perforations in the tape) pull *taut* and secure the ends of the tapes to the right-hand bobbins using the metal support strips and the cellulose tape in the same way as was used to secure them to the left-hand bobbins. Any excess length of scale tapes should be cut off.

Turn the right-hand bobbins until one turn of scale tape is wound on to the larger bobbin. Hold the bobbin and remove the locking pins from both the right and left-hand bobbins to release the spring tension.

Rotate the bobbins until the low frequency end of the printed scale on the longer tape is central between the guide bobbins at the front of the assembly, and the LF end of the scale on the lower tape is approximately ¼ inch to the left of the central line.

Hold the scale in this position and turn the tuning spindle until the capacitor vanes are fully in mesh and against the stop. Tighten one grub screw in each of the driving sprockets (see Fig. 2). (If a grub screw is not accessible, the tape should be lifted clear of the sprocket teeth and the sprocket turned to a position where the grub screw is visible. Then the tape is released to allow the perforations to re-engage with the teeth of the sprocket.)

Rotate the tuning spindle until the tapes have been wound from the left-hand bobbins on to the right-hand bobbins. While doing so check that the sprocket teeth mesh centrally in the perforations in the tapes (when the assembly is in the position it will occupy in the receiver). If the meshing is incorrect, release the grub screws in the driving sprockets and move the sprockets slightly along the spindle so that the sprocket teeth are exactly central in the perforations. Then re-tighten the grub screws.

To finally align the scales, release the four 6 BA countersunk screws on the low frequency dial (see Fig. 1). Fit the capacitor and drive assembly temporarily in the receiver, and secure by two screws. Rotate the tuning spindle until the capacitor reaches one of the end stops and note the distance between the lines at the end of the high frequency scales in relation to the cursor line on the tuning scale window. Turn the tuning spindle until the scales are at the opposite ends of their travel and again note the distances between the final lines on the scale and the cursor line. If there is a difference between the two distances thus obtained, the grub screws in the driving sprockets must be loosened and the scales moved slightly in relation to the driving spindle in a direction which will tend to equalize the distances. The screws are then tightened and the scales turned to each end of their travel and the distance again checked. This procedure is repeated if necessary until the scales are exactly centralised.

Turn the tuning spindle until the 1850 Kc/s mark on the top scale is level with the cursor line. Then holding the spindle in this position, rotate the low frequency dial independently of the spindle until the high frequency end mark on the red scale is opposite the cursor line.

Remove the assembly from the receiver, taking care not to disturb the setting thus obtained, and tighten the four screws on the LF dial. Then tighten the remaining grub screws on each of the driving sprockets.

Check that the moving vanes of the oscillator section of the capacitor are flush with the fixed vanes (checked with a straight edge) when the tuning knob is against the low frequency stop.

Finally replace the long scale guard wire which should be set as close to the scale as possible without contact.

7.5.5 *Rotary Transformer and Filter Unit*

The rotary transformer is secured to its mounting plate by means of two captive screws. To remove the filter box beneath, proceed as follows :—

Remove the crystal calibrator unit as described in Section 7.4.2. This reveals two 6 BA cheese-headed screws securing the filter box to the chassis. Remove these screws and two further screws, securing the unit to the upper side of the chassis member. Unsolder the two leads from the terminals at the base of the filter unit, and the complete unit may then be lifted from the receiver.

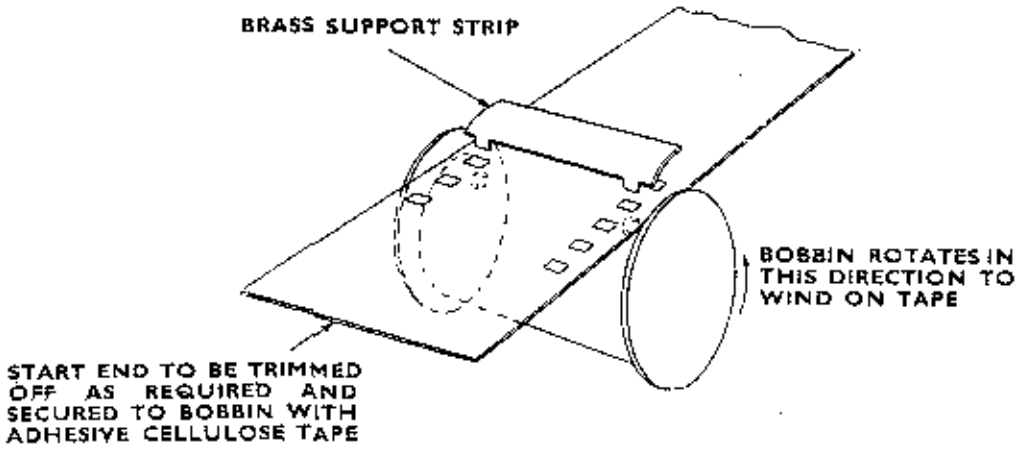


FIG. 4. METHOD OF FIXING SCALE TAPE TO BOBBINS

7.5.6 *Scale Trimmer Assembly*

The scale trimmer assembly is secured to the rear of the escutcheon plate on the front panel of the receiver. Proceed as follows :—

(*a*) Remove the IF amplifier and output assembly (see Section 7.5.1).

(*b*) Unsolder the two scale trimmer connecting leads from the cathode of V4 and earth respectively.

(*c*) Remove the knobs from the tuning, HF gain, scale trim and wavechange controls.

(*d*) Unscrew the three black button headed screws which secure the escutcheon plate (two are situated at the bottom corners of the plate, and one at the top left-hand corner).

(*e*) Remove the four screws situated round the scale trim spindle. This frees the escutcheon plate which can now be removed. The scale trimmer assembly and connecting leads may then be withdrawn through the aperture in the front panel of the receiver.

7.5.7 *Coil Turret Assembly*

Removal of the entire coil turret assembly for servicing is unnecessary as all circuits associated with this assembly are exposed by removal of the IF unit. Individual coil assemblies are easily detached from the turret by removing two 8 BA cheese-headed screws situated diametrically opposite each other near the corner of the small coil panels (see Fig. 15). To release the coil turret sections it is necessary to remove the shaft from the assembly. This is accomplished by releasing the two grub screws securing each section to the main shaft and withdrawing the taper pins. The turret shaft may then be withdrawn through the front panel of the receiver.

7.5.8 *Dismantling and re-assembly of Rotary Transformer*

(*a*) *Dismantling*. First remove the ventilated enclosing covers fitted at both ends of the machine. Unscrew all four brush caps and extract the brushes. Then remove the fan from the shaft end by unscrewing the retaining nut and gently pulling the fan from the shaft. The next step is to extract the screws from the brush holder tags of the two fan end holders. This releases the connecting leads from the machine, incidentally this also releases the suppression capacitor bridged across the brush holders in the fan end bracket. The end brackets are secured to the main body of the rotary transformer by two long bolts with nuts and washers. After the removal of the nuts and washers, the fan end bracket and body may be separated by tapping the end bracket to free it from the locating spigot on the body. The end bracket complete with armature may now be withdrawn from the main body of the rotary transformer. The armature and bearing may be separated from the end bracket by the removal of two countersunk headed screws securing the bearing cover to the end bracket. A suitable extractor, however, must be used to remove the bearings from the armature shaft.

(*b*) *Re-assembly*. Re-assembly can take place in the reverse order to that given above, but the assembler should first assure himself that both bearings of the armature are correctly lubricated in accordance with the instructions in Section 7.2.1. Very little force is needed to fit the fan

end bracket over its bearing, or to insert the back end bearing in its housing. Undue force may lead to ball indentation with consequent rough running and noise. All parts should of course be cleaned thoroughly before re-assembly, and when re-connecting the brush holder to the machine leads, make sure that the correct capacitor is replaced.

7.6 Circuit Alignment Procedure

7.6.1 *Apparatus required*

(*a*) Signal Generator
(*b*) 300 pF mica capacitor
(*c*) Resistances to provide specified dummy aerial impedances
} See Note in Section 7.2.2.
(*d*) Output meter.
(*e*) 0.1 μF paper capacitor.
(*f*) 33 ohms or 600 ohms headset.

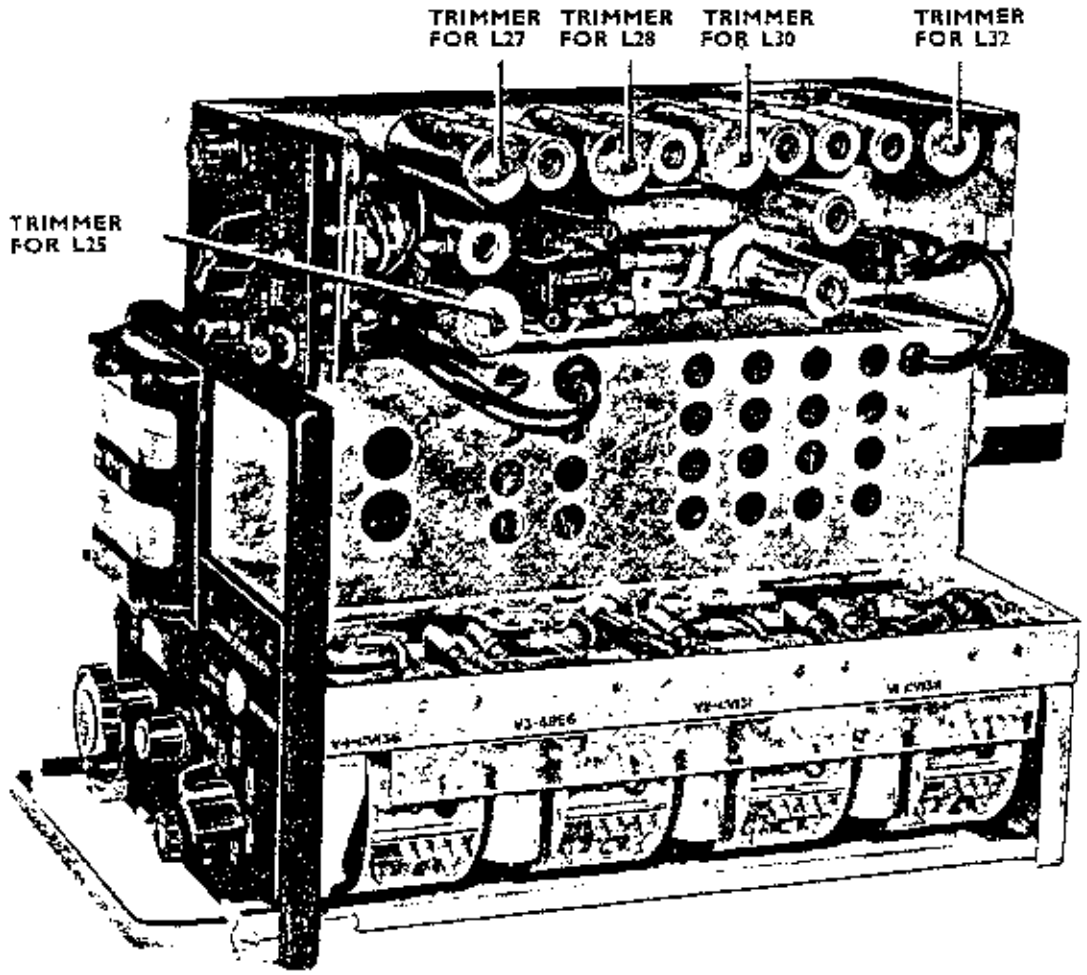


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FIG. 5. IF AMPLIFIER AND OUTPUT UNIT DETACHED AND MOUNTED ON TOP OF CHASSIS FOR CIRCUIT ALIGNMENT

7.6.2 *IF Alignment*

For IF alignment the IF amplifier unit must be detached and mounted on top of the chassis (see Fig. 5 and Section 7.5.1). To avoid instability the bottom cover of the assembly must be in position when the final alignment procedure is carried out.

Conditions of Test :—

(*a*) HF gain control. At a convenient level. (The input signal must be kept below the level at which AGC operates.)
(*b*) LF gain control : Maximum.
(*c*) Waverange switch : Range 1 (Red).
(*d*) System switch : As stated below.
(*e*) Signal generator set at 1,000 kc/s, 30% modulation at 400 c/s. Inject at the grid of valve V3 via a 0.1 μF capacitor.

Proceed as follows :—

(*a*) Set the system switch to RT.
(*b*) Trim the IF circuits in the following order, L31, L30, L29, L28, L26, L25.
(*c*) Switch to CW (narrow bandwidth), and stop the BFO by temporarily connecting the grid of V11 to earth, or disconnecting the HT lead at the system switch.
(*d*) Set the signal generator to 1,008 kc/s and adjust the phasing capacitor C73 for minimum output.
(*e*) Re-adjust the signal generator frequency until maximum output is obtained from receiver.
(*f*) Retrim the IF circuits L31 to L25, including L27, for maximum output.
(*g*) Set system switch to RT and re-trim L25 and L26 for maximum output.
(*h*) Set the system switch to CW (narrow bandwidth) and trim C71 for maximum output.
(*i*) Repeat (*g*) and (*h*) as necessary.
(*j*) Measure the IF bandwidth at 6 dB attenuation.
(See Section 7.7.3). This should be between 800 c/s and 1,600 c/s. If it is too broad it may be narrowed by de-tuning C71 and L27 in opposite directions. It should not be necessary to de-tune these circuits to a greater total loss of sensitivity than 3 dB in order to achieve the correct bandwidth.
(*k*) Start the BFO by removing the shorting link from the grid of V11, or by reconnecting the HT lead. The following explanation of the above operations may help to simplify the alignment procedure :—

Operations (*a*) and (*b*) bring the main IF circuits into approximate alignment, but before final alignment is made, it is necessary to find the maximum of the crystal filter. It is essential that the following circuits are accurately aligned to the same frequency as the crystal. Therefore, after aligning the phasing control and tuning to the maximum of the crystal (operations (*d*) and (*e*)) it is necessary to re-trim the IF circuits accurately to the crystal frequency (operation (*f*)).

Adjustment of the phasing control also affects the tuning of the mixer anode circuits in the RT position. Therefore circuits L25 and L26 must be re-aligned in the RT position (operation (*g*)). The alignment of L26 is then corrected in the narrow band CW position by means of the capacity trimmer C71 (operation (*h*)).

Thus it will be seen that the adjustment of the phasing control and the crystal input circuits are interdependent, and must be regarded as a true ganging operation.

7.6.3 *BFO Adjustment*

Conditions of test as in Section 7.6.2. Proceed as follows :—

(*a*) Set the system switch to the broadband CW position and switch off the modulation on the signal generator.
(*b*) Set the BFO control to the central position of its travel (i.e. pointer vertical).
(*c*) Adjust L32 until zero beat is obtained in the telephones.

7.6.4 *Frequency Change Oscillator Alignment*

The alignment of the frequency change oscillator to the tuning scale must be performed with care in order to obtain an accurate calibration throughout the bands without recourse to frequent "scale checking". If the circuit is badly out of line it should be lined up, using a signal generator prior to using the internal crystal calibrator, so that there will be no difficulty in selecting the correct harmonic. The procedure described overleaf refers to range 6 but is equally applicable to any other HF range.

Conditions of Test :—

(*a*) HF gain control : At a convenient level (input signal must be kept below the level at which AGC operates).

(*b*) LF gain control : At a convenient level.

(*c*) Waverange switch : Range 6 (Black).

(*d*) System switch : CW (Broad Band).

(*e*) Scale trimmer : Locked at the electrical centre of its travel.

NOTE :—The electrical centre of the scale trimmer travel may be found as follows :—

(1) Set range switch to " Range 3 " (Blue) and rotate tuning scale to low frequency end.

(2) Turn scale trimmer to its extreme clockwise position, and set system switch to " scale check ".

(3) Adjust tuning control until zero beat is obtained in telephones. Note frequency reading on scale.

(4) Turn scale trimmer to its extreme counter-clockwise position, and adjust tuning scale until zero beat is again obtained. Note scale reading.

(5) Set tuning scale to the scale reading exactly half way between the two readings obtained in (3) and (4) above. Adjust scale trimmer until zero beat is obtained and lock in this position.

(6) *Return range switch to " Range 6 ".*

(*f*) Signal generator frequency as stated, mod. 30% at 400 c/s. Inject at grid of V3 via 0.1 μF capacitor.

OSCILLATOR GANGING TABLE

Range	Frequency	Capacity	Inductance	Range	Frequency	Capacity	Inductance
1 (Red)	150 kc/s	—	L19	4 (Orange)	3.5 Mc/s	—	L22
	275 kc/s	C50	—		6.0 Mc/s	C53	—
2 (White)	275 kc/s	—	L20	5 (Green)	6.0 Mc/s	—	L23
	510 kc/s	C51	—		10.5 Mc/s	C54	—
3 (Blue)	2.0 Mc/s	—	L21	6 (Black)	10.5 Mc/s	—	L24
	3.5 Mc/s	C52	—		18.5 Mc/s	C55	—

Proceed as follows :—

(*a*) Set the signal generator and receiver scales to 18.5 Mc/s and adjust C55 (oscillator trimmer) until maximum output is obtained from receiver.

(*b*) Set the signal generator and receiver scales to 10.5 Mc/s and adjust L24 for maximum output.

(*c*) Repeat (*a*) and (*b*) as necessary.

(*d*) Disconnect the signal generator and set the receiver system switch to scale check. A beat note should be obtained when the receiver scale is in the region of 18.5 Mc/s, but it may first be necessary to roughly align the RF circuits of the receiver (see Section 7.6.5).

Note: Care must be exercised to ensure that the correct harmonic is used at 18.5 Mc/s and not the 18.25 Mc/s harmonic. This can be checked when approximate ganging is obtained by checking intermediate scale check points between 10.5 and 18.25 Mc/s.

(*e*) Set the receiver scale to 18.5 Mc/s and adjust C55 until zero beat is obtained. Tune the receiver to 10.5 Mc/s and adjust L24 for zero beat. Repeat as necessary until good ganging is obtained.

(*f*) *Having obtained satisfactory ganging at 10.5 and 18.5 Mc/s, the intermediate scale check* points should be finally checked. If zero beat is not obtained at the correct places the capacitor cam screws should be carefully adjusted until the scale is accurate throughout

the band. (See note at the end of this Section.) The procedure for adjusting the cam is as follows :—

(*a*) Remove the spare dial lamp from the front panel of the receiver beside the tuning knob.

(*b*) Set the receiver scale to the 18.0 Mc/s check point. If zero beat is not obtained at this point insert a screwdriver through the hole previously occupied by the spare lamp and fit into the slot in the cam screw beneath. Fit the special spanner (obtainable from Marconi's Wireless Telegraph Co. Ltd. Spare Part Ref. No. XS1097) on to the lock nut on the screw at the rear of the cam. Loosen the nut and adjust the cam screw until zero beat is obtained *when the lock nut is finally tightened.* Continue adjustment of the cam screws right round the cam by the above method. Then re-check the adjustment and if necessary re-adjust the cam until the best possible result is obtained. It will be noted that from 10.5 to 11.5 Mc/s there is a cam screw to adjust every 250 kc/s, but from 11.5 to 18.5 Mc/s the cam screws are situated at 500 kc/s intervals.

Having ganged the oscillator on range 6, the remaining ranges should be ganged in a similar manner at the frequencies specified in the table on page 16, but the *cam screws must on no account be re-adjusted.* On MF bands there are insufficient scale checks to actually gang on the internal calibrator, but a signal generator of known accuracy should be used on these frequencies, and a final check can be made on known stations.

Note: The capacitor cam once set up should not require re-adjustment for a very long period. It should normally only be necessary to adjust the cam if a replacement capacitor is fitted to a receiver. Any serious inaccuracies in the scale calibration must be thoroughly investigated, and *re-adjustment of the cam only performed as a last resort.*

7.6.5 *RF Alignment*

RF CIRCUIT GANGING TABLE

Range	Frequency	2nd RF		1st RF		Aerial	
		Capacity	Inductance	Capacity	Inductance	Capacity	Inductance
1 (Red)	160 kc/s	—	L13	—	L7	—	L1
	265 kc/s	C32	—	C14	—	C1	—
2 (White)	290 kc/s	—	L14	—	L8	—	L2
	490 kc/s	C33	—	C15	—	C2	—
3 (Blue)	2.1 Mc/s	—	L15	—	L9	—	L3
	3.4 Mc/s	C34	—	C16	—	C3	—
4 (Orange)	3.7 Mc/s	—	L16	—	L10	—	L4
	5.8 Mc/s	C35	—	C17	—	C4	—
5 (Green)	6.3 Mc/s	—	L17	—	L11	—	L5
	10.2 Mc/s	C36	—	C18	—	C5	—
6 (Black)	11.0 Mc/s	—	L18	—	L12	—	L6
	18.0 Mc/s	C37	—	C19	—	C6	—

Conditions of Test :—

(*a*) HF gain control : Adjusted to a convenient level.
(The input signal must be kept below the level at which AGC operates).

(*b*) LF gain control : At a convenient level.

(*c*) Waverange Switch : See table on page 17.

(*d*) System Switch : RT.

(*e*) Signal generator frequency as stated below (30% modulated at 400 c/s). Signal input to socket SKF(CX) via specified dummy aerials. (See Note in Section 7.2.2.)

Adjust the RF circuit trimmers in the order given in the table on page 17, at the frequencies stated.

7.6.6 *Adjustment of Pre-set LF Gain Control*

Conditions of Test :—

(*a*) HF gain control : Maximum.

(*b*) Waverange switch : Range 3 (Blue).

(*c*) System switch : RT.

(*d*) Signal generator and receiver scales at 3.5 Mc/s.

Input of 1,000 μV modulated 50% at 1,000 c/s, via Dummy Aerial. Adjust pre-set LF gain control until receiver output is 55 mW into 33 ohms.

7.7 General Performance Tests

The following performance tests should be applied to the receiver after making any major repairs or circuit adjustments, or when it is suspected that the performance of the equipment may have deteriorated.

In addition to the apparatus referred to in Section 7.6.1, a beat frequency oscillator will be required for low frequency tests. A suitable instrument is the Marconi Type TF894.

7.7.1 *Low Frequency Gain*

Conditions of Test :—

(*a*) Pre-set LF gain control at maximum. Position of other controls immaterial.

(*b*) BFO Frequency Scale at 1,000 c/s.

Connect BFO output between grid of V9 and earth. Input required to provide output from receiver of 50 mW into 33 ohms or 600 ohms should not exceed 100 millivolts.

7.7.2 *Low Frequency Response*

Conditions of Test as in Section 7.7.1.

Vary frequency of BFO input and note dB's change in output. This should not be greater than the figure given in the table below :—

Frequency	200 c/s	400 c/s	1000 c/s	3000 c/s
Attenuation	—10 dB	—4 dB	0 dB	—6 dB

7.7.3 *IF Selectivity*

(*a*) *Broad Band*

Conditions of Test :—

(*a*) HF gain control : As stated below.

(*b*) LF gain control : Maximum.

(*c*) Range switch : Range 1 (Red).

(*d*) System switch : RT.

(*e*) Signal generator frequency as stated below (Mod. 30% at 400 c/s.) Input applied via 0.1 μF capacitor into the grid of valve V3. (A convenient method is to inject via the fixed vane connection of the second section of the ganged capacitor.)

Proceed as follows :—

Set the signal generator frequency to 1,000 kc/s and then adjust the vernier scale until maximum output is obtained from the receiver. Adjust the HF gain control until the output is 10 mW. Increase the input from the signal generator by 6 dB's

and retune to a frequency below 997 kc/s. Then tune the signal generator in the opposite direction (i.e. to increase frequency) until an output of 10 mW is obtained from the receiver. Note the scale reading. Continue turning the signal generator scale in the same direction until the output from the receiver is again 10 mW. Note the signal generator scale reading. The difference between this reading and that noted previously is the IF bandwidth at 6 dB attenuation.

Repeat the above procedure for 60 dB attenuation. The method of adjusting the signal generator described above eliminates error due to backlash in the tuning control.

(*b*) *Narrow Band*

Conditions of Test :—

(*a*) HF gain control : As stated below.
(*b*) LF gain control : Maximum.
(*c*) Range Switch : Range 1 (Red).
(*d*) System Switch : CW (Narrow bandwidth).
(*e*) BFO stopped by connecting the grid of V11 to earth, or by disconnecting the HT lead at the system switch.
(*f*) Signal generator frequency as stated below (Mod. 30% at 400 c/s or 100 c/s) applied via a 0.1 μF capacitor to the grid of V3.

The procedure for measuring the IF bandwidth at the narrow band position of the system switch is the same as is used for the broad bandwidth measurement. If, however, the bandwidth is measured using a signal modulated at 400 c/s it will be found that the response curve appears to have a double hump. This is due to the extreme selectivity of the IF circuits at this position, which give maximum output when either the upper or lower sideband is tuned to maximum. The measured response therefore appears 800 c/s wider than it actually is. This may be allowed for in the final result or if the equipment is available it is better to modulate the signal with a lower frequency, say 100 c/s. The bandwidth is then sufficiently wide to accept both sidebands and a true response is obtained.

The specification limits for both narrow band and broad band IF selectivity are given in the table below :—

System Switch Position	Bandwidth at 6 dB attenuation	Bandwidth at 60 dB attenuation
CW (Narrow)	$\leq$ 800 c/s $\geq$ 1,600 c/s	$\geq$ 20 kc/s
CW (Broad)	$\leq$ 4 kc/s	$\geq$ 30 kc/s

7.7.4 *Overall Performance*

Conditions of Test :—

(*a*) HF gain control : At a convenient level.
(*b*) LF gain control : Maximum.
(*c*) Waverange Switch : As stated in table on page 20.
(*d*) System Switch : RT.
(*e*) Signal generator frequency as stated in table. (30% modulated at 400 c/s.) Signal input to socket SKF(CX) via specified dummy aerials (see note in Section 7.2.2.).

In the following table the sensitivity figures quoted are those required to give an output from the receiver of 50 mW into 33 ohms with 10 dB signal to noise ratio. Image ratio figures give the ratio of input required to give an output of 50 mW into 33 ohms at the signal frequency, to the input required to give the same output at the image frequency (i.e. signal frequency $\pm$ 2.0 Mc/s). IF breakthrough figures give the ratio of the input required at the signal frequency to give an output of 50 mW into 33 ohms, to the input required to give the same output at the intermediate frequency (1.0 Mc/s).

Range	Frequency	Sensitivity μV	Image Ratio dB	IF Breakthrough dB
Red	150 kc/s	<20	> 120	—
	275 kc/s	< 5	> 120	—
White	275 kc/s	< 5	> 120	—
	510 kc/s	<10	> 120	—
Blue	2 Mc/s	< 2	> 100	—
	3.5 Mc/s	< 2	> 80	> 110 dB
Orange	3.5 Mc/s	< 2	> 100	—
	6.0 Mc/s	< 2	> 75	—
Green	6.0 Mc/s	< 2	> 80	—
	10.5 Mc/s	< 2	> 60	—
Black	10.5 Mc/s	< 2	> 70	—
	18.5 Mc/s	< 2	> 50	—

7.7.5 *Automatic Gain Control*

Conditions of Test :—

(*a*) HF gain control : Maximum.
(*b*) LF gain control : As stated.
(*c*) System Switch : RT.
(*d*) Waverange Switch : Range 3 (Blue).
(*e*) Signal generator and receiver scales at 3.5 Mc/s. Input (modulated 30% at 400 c/s) applied to socket. SKF(CX) via dummy aerial.

Set the signal generator output to 50,000 μV and adjust the pre-set LF gain control to provide an output from the receiver of 50 mW into 33 ohms or 600 ohms. Reduce the signal to 5 μV. The receiver output should not fall by more than 8 dB.

7.7.6 *Scale Trimmer*

The total frequency variation on the scale trimmer should not be less than 0.8% on any frequency.

7.7.7 *BFO Control*

The total frequency variation on this control should be not less than 2.0 kc/s.

7.7.8 *Performance Testing of IF Assembly as a separate unit*

Conditions of Test :—

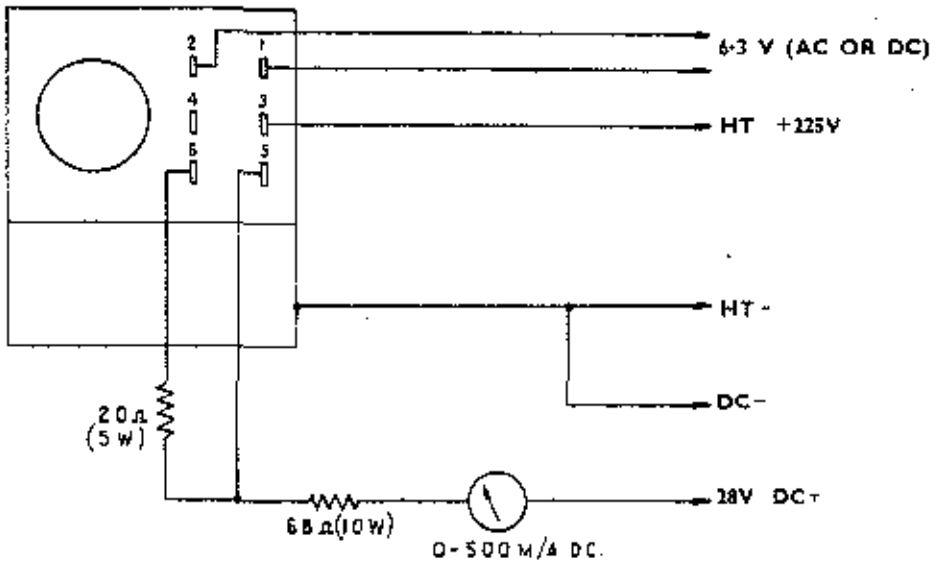
(*a*) Unit connected to power supplies and signal generator connected via 60 μμF capacitor as shown in Fig. 6. (Frequency 1 Mc/s mod. 30% at 400 c.p.s.)
(*b*) Pre-set LF gain control : Maximum.
(*c*) System Switch : RT.

The input required to provide an output of 50 mW into 33 ohms or 600 ohms should be approximately 35 μV.

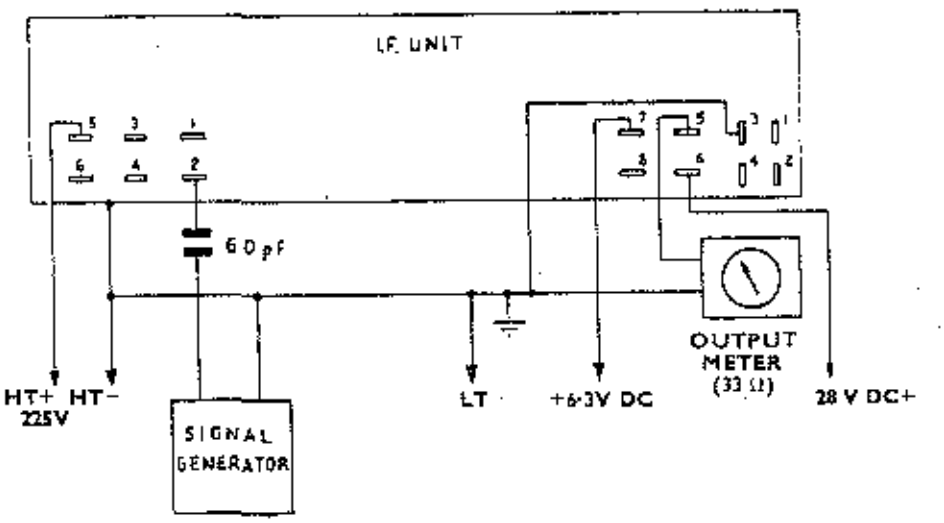
Connect the signal generator output via a 0.1 μF capacitor to the 1st IF grid (V5). The input required to provide the above output should be approximately 180 μV.

Connect the signal generator to the 2nd IF grid (V6). The input required in this case to provide the standard output should be approximately 16,000 μV.

Note: The above sensitivities are not specification limits and variations of ± 6 dB on the above figures are to be expected with valve variations.



METHOD OF CONNECTING
CRYSTAL CALIBRATOR UNIT FOR SEPARATE TEST



METHOD OF CONNECTING
I.F. UNIT FOR SEPARATE TEST

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FIG. 6. METHOD OF CONNECTING CRYSTAL CALIBRATOR UNIT AND IF UNIT TO POWER SUPPLIES FOR SEPARATE TEST

7.7.9 *Performance Testing of Crystal Calibrator Unit*

(*a*) *Crystal Oven*

Unit connected to power supplies as shown in Fig. 6. After switching on 28v. DC Supply, Meter M1 should indicate approximately 190 mA until thermostat operates, when the current should increase to 340 mA. Observe that the thermostat operates satisfactorily and leave for 40 minutes to reach stability.

(*b*) *Adjustment of Frequency Control* (C111)

It cannot be emphasised too strongly that C111 must only be adjusted by skilled personnel with proper equipment. A frequency standard must be used giving a 250 kc/s output accurate to at least 5 parts in 10^6. This trimmer is provided only to take up the production grinding tolerance of the crystal and replacement of any component other than the crystal will in no way affect this adjustment.

Conditions of Test :—

(*a*) HF gain control : As stated below.
(*b*) LF gain control : Set to a convenient level.
(*c*) System Switch : Scale check.
(*d*) Range Switch : Range 1 (Red).
(*e*) Receiver Scale at 250 kc/s with a note of approximately 1,000 c/s in the headset Proceed as follows :—

Inject the signal from the frequency standard into the grid of V2 (a convenient point is the fixed vane connection of the third section of the gang capacitor) and by a combination of adjustment of the HF gain control and input level, a slow beat should be obtained superimposed upon the 1,000 c/s note. Adjust C111 until this slow beat is reduced to zero, leaving the 1,000 c/s note unmodulated.

8 RECOMMENDED FLIGHT SPARES

It is recommended that the following spares should always be carried in the aircraft :—

Qty.	*Description*	*Ref.*	*Qty.*	*Description*	*Ref.*
1	Valve, Type 6BA6	XV132	3	Fuse 250 mA	XF118
1	,, ,, 6AK6	XV153	2	Lamp, Dial	XL145
1	,, ,, 6AK5	XV133	1	Valve release tool	XT262
1	,, ,, 6AL5	XV136	1	Valve pin straightening tool ..	XS877
1	,, ,, 6BE6	XV154			

9 VALVE BASE PIN CONNECTIONS (See Fig. 7)

Valve Type	*Pin Connections* 1	2	3	4	5	6	7
6BA6	G1	C	H	H	A	G3	G2
6AK6	G1	C & G3	H	H	A	—	G2
6AK5	G1	C	H	H	A	G3	G2
6AL5	C1	A2	H	H	C2	S	A1
6BE6	G1	C	H	H	A	G2 & 4	G3

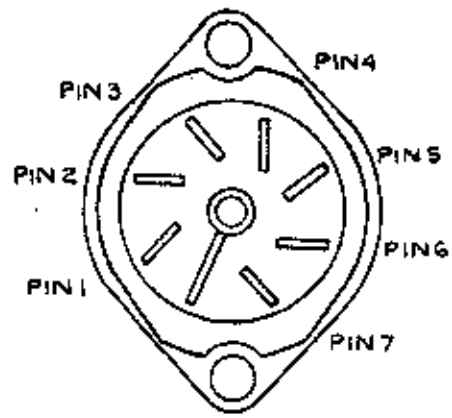


FIG. 7. UNDERSIDE VIEW OF B7G VALVEHOLDER SHOWING PIN NUMBERING

10 VALVE EQUIVALENTS

CHASSIS MARKING	BRITISH TYPE	RETMA DESIGNATION
6AK5	CV4010	5654/6AK5/W/6096
6AK6	—	6AK6
6AL5	CV4007	5726/6AL5/W/6097
6BA6	CV4009	5749/6BA6/W
6BE6	CV4012	5750/6BE6/W

11 SPARE PARTS SCHEDULE

The following schedule has been compiled to assist owners and operators to order any spare components which they may require for servicing the Type AD118 equipment.

Items listed in the break-down schedule are those recommended for the repair and overhaul of the equipment. Many of the items are held in stock but it must not be assumed that any items will be immediately available, due to varying demands.

The schedule lists comprise seven columns, the headings of most of which are self-explanatory. For guidance, however, brief notes on the purpose of each column are given in the table below.

Column	*Heading*	*Remarks*
1	—	A blank column intended for the use of owners and operators as desired.
2	Spare Part Ref. No.	When ordering detail parts the spare part reference numbers only need be given. In the case of spare main units the full instrument type numbers should be quoted.
3	Description	To provide an indication of the relationship between main units, sub-assemblies and detail parts, the descriptive titles of all items (except standard fixings) are compiled on the basis of an alphabetical multi-indentation system. Main unit descriptions appear in sub-column 1, followed by sub-assemblies or detail parts indented to sub-column 2. Further indentation is then made, where required, for detail parts of each sub-assembly. Where every detail part of a sub-assembly is listed, the detail parts are preceded by the phrase " Consisting of "; similarly, where only some of the detail parts are listed and the break-down is incomplete those included are preceded by the phrase " Spares for ". The descriptive titles of detail parts listed are quoted with the generic noun first (e.g., " Board, terminal ", not " Terminal Board ").
4	Number off	The quantity stated for each item within an assembly or sub-assembly is the number required for one such assembly or sub-assembly.
5	Circuit or Other Reference	A cross-reference is provided by this column between the spare parts schedule, the annotated illustrations, and the circuit diagrams appearing in this Manual.
6	Service Reference	Where available, a British Services reference is quoted in this column.
7	Recommended Holding for 25 Overhauls	From the quantities stated, and with knowledge of his own servicing arrangements, the operator can calculate his own requirements. The Marconi Company will, however, be pleased to assist if desired. *Abbreviation* : " PE " indicates " provisioned elsewhere in this Section ".

Included in the schedule for each unit is a complete list of standard fixings used. A separate table covering unit wiring follows the main unit lists.

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
		RECEIVER TYPE AD118	1			
		Spares for				
	XB408	Block	2			
	XB22	Block, Hinge	2			2
	XSA1037	Cable-Assembly	1			
		Spares for				
	XS13	Socket, 6-way	1	SKC		2
	XSA1038	Cable-Assembly	1			
		Spares for				
	XS13	Socket, 6-way	1	SKB		PE
	XSA1039	Cable-Assembly	1			
		Spares for				
	XS12	Socket, 8-way	1	SKA		1
	XSA1034	Capacitor-and-Drive-Assembly	1			
		Spares for				
	XSA754	Arm-Assembly, Stop	1			
		Spares for				
	XN166	Nut, 4BA, Lock, Steel, Cad. Plate	1			12
	*	Screw, Special	1			
	XSA806	Arm-Assembly, Turret	1			
	XP503	Backing-Plate, Dial	1			
	XB124	Ball, $\frac{1}{4}$" dia.	1			2
	XB35	Ball, $\frac{1}{8}$" dia.	3			6
	XB118	Bearing, Ball Journal, " oo " fit	1			2
	XSA861	Bearing-Plate-Assembly	1			
	XS773	Bearing-Strip	2			
	XS774	Bearing-Strip	2			
	XSA837	Bobbin-Assembly	1			
		Consisting of				
	XB385	Bobbin	1			
	XB386	Bobbin	1			
	XB384	Bush	1			
	XB387	Bush	1			
	XG86	Gearwheel (48 teeth)	1			1
	XP354	Pin	1			
	XS2820	Screw, 4BA, Special	2			
	XS734	Screw, 6BA, Special	2			
	XS656	Screw, 6BA, Special	3			
	XS2819	Shim	1			
	XS726	Spindle	1			
	XS728	Spring, Right-hand, Large	1			3
	XS729	Spring, Left-hand, Small	1			3
	*	Bobbin-Assembly	1			
		Consisting of				
	XB385	Bobbin	1			
	XB386	Bobbin	1			
	XB384	Bush	1			
	XB387	Bush	1			
	XG86	Gearwheel (48 teeth)	1			PE
	XP354	Pin	1			
	XS2820	Screw, 4BA, Special	2			
	XS734	Screw, 6BA, Special	2			
	XS656	Screw, 6BA, Special	3			
	XS2819	Shim	1			
	XS726	Spindle	1			
	XS727	Spring, Right-hand, Small	1			3
	XS730	Spring, Left-hand, Large	1			3
	XSA831	Bracket	1			
	XB416	Bush, Dial	1			
	XB418	Bush	1			
	XP387	Bush-Plate	1			

*Not normally stocked as spares

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA867	Capacitor-Assembly	1			
		Consisting of				
	XB394	Bracket	1			
	XCX88	Capacitor, 187.2pF, (4 gang)	1	C12-C25-C42-C63		1
	XSA868	Gearwheel-Assembly	1			1
		Spares for				
	XS789	Spring, Tension	4			8
	XS2217	Screw, 2BA x ¼", Ch. Hd., Steel, Cad. Plate	2			6
	XS937	Screw, Special	2			
	XS935	Spacer	3			
	XS2821	Stud	3			
	XW283	*Washer, 2BA, Single Turn Spring, Steel, Cad. Plate*	2			18
	XP384	Clamp-Plate, Ball Journal	1			
	XS778	Clamp-Strip, Scale	2			
	XS779	Clamp-Strip, Scale	2			
	XC545	Clip, Cable	1			
	XD34	Dial	1			
	XC456	Disc, Clamp	1			
	XSA869	Gearwheel-Assembly	1			1
		Spares for				
	XS937	Screw, Special	1			PE
	XS789	Spring, Tension	4			PE
	XSA872	Gearwheel-Assembly, Bevel	1			1
		Spares for				
	XS937	Screw, Special	2			PE
	XS789	Spring, Tension	4			PE
	XB417	Guide, Bobbin	4			
	XG144	Guide, Scale	1			
	XC421	Mounting	1			
	XN167	Nut, 2BA, Lock, Steel, Cad. Plate	4			12
	XN168	Nut, 6BA, Lock, Steel, Cad. Plate	1			36
	XN77	Nut, Special	1			
	XP82	Pin, Taper, 1/16" dia. x ¾", Stainless Steel	1			12
	XP84	Pin, Taper, 1/16" dia. x 1", Stainless Steel	2			6
	XP362	Pinion	1			
	XSA886	Pinion- and-Spindle-Assembly	1			1
		Consisting of				
	XP82	Pin, Taper, 1/16" dia. x ¾", Stainless Steel	1			PE
	XP386	Pinion	1			1
	XS829	Screw, Set	2			2
	XS2822	Spindle	1			
	XSA1035	Ring-Assembly, Cam	1			1
		Consisting of				
	XB496	Base	1			
	XB495	Boss	1			
	XC543	Cam	1			1
	XC544	Collar	1			
	XN168	Nut, 6BA, Lock, Steel, Cad. Plate	19			PE
	XS1307	Screw, 6BA x 1/16", Ch. Hd. Steel, Cad. Plate	1			18
	XS1260	Screw, 8BA x ¼", Csk. Hd., Steel, Cad. Plate	4			48
	XS930	Screw, Set, 6BA x ¼", Steel	2			4
	XS942	Screw, Cam	19			6
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	1			144
	XW629	Wire, Piano, 24SWG, Nickel Plate	2 ft.			
	XR224	Ring, Dial Clamping	1			
	XS946	Scale, Long	1			1
	XS947	Scale, Short	1			1
	XS790	Screw, 2BA, Special	2			

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XS1312	Screw, 6BA x $\frac{5}{16}$", Ch. Hd., Steel, Cad. Plate	5			18
	XS2243	Screw, 6BA x $\frac{1}{16}$", Csk. Hd., Steel, Cad. Plate	4			24
	XS1261	Screw, 6BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	4			48
	XS930	Screw, Set, 6BA x $\frac{1}{4}$", Steel	1			PE
	XS943	Screw, Set, 6BA x $\frac{5}{16}$", Steel	1			2
	XS1302	Screw, 6BA x $\frac{3}{8}$", Ch. Hd., Steel, Cad. Plate	4			48
	XS2244	Screw, 6BA x $\frac{1}{8}$", Csk. Hd., Steel, Cad. Plate	8			24
	XS2233	Screw, 6BA x $\frac{3}{16}$", Ch. Hd., Steel, Cad. Plate	4			12
	XS1654	Screw, 6BA x $\frac{1}{2}$", Ch. Hd., Steel, Cad. Plate	2			6
	XS1618	Screw, 6BA x $\frac{3}{4}$", Csk. Hd., Steel, Cad. Plate	4			18
	XS944	Screw, Set, 8BA x $\frac{5}{16}$", Steel	1			2
	XS2262	Screw, 8BA x $\frac{1}{4}$", Ch. Hd., Steel, Cad. Plate	2			144
	XS568	Screw, Special	4			
	XS772	Spacer, Dial	4			
	XP385	Spacer	1			
	XS776	Spacer	2			
	XS884	Spacer	1			
	XS845	Spacer	2			
	XS2825	Spacer, Bobbin	2			
	XB452	Spacer	1			
	XS2822	Spindle	2			1
	XS850	Spindle	1			1
	XSA871	Spindle-Assembly, Main	1			1
		Consisting of				
	XB118	Bearing, Ball Journal, " oo " fit	1			3
	XB389	Bearing, Ball, Journal " oo " fit	1			1
	XB397	Bush	1			
	XB396	Bush, Bearing	1			
	XSA870	Gearwheel-Assembly	1			1
		Spares for				
	XS789	Spring, Tension	4			PE
	XP82	Pin, Taper, $\frac{1}{16}$" dia. x $\frac{1}{8}$", Steel	1			PE
	XR216	Ring, Clamp	1			
	XR217	Ring, Clamp	1			
	XS2823	Screw, Special	2			
	XS1641	Screw, 6BA x $\frac{4}{16}$", Csk. Hd., Steel, Cad. Plate	2			48
	XS2262	Screw, 8BA x $\frac{1}{4}$", Ch. Hd., Steel, Cad. Plate	4			PE
	XS738	Spindle	1			
	XP360	Spindle, Pinion	1			
	XSA838	Spindle-Assembly	1			1
		Consisting of				
	XB118	Bearing, Ball Journal, " oo " fit	2			PE
	XP361	Pinion	1			1
	XS892	Screw, Special	1			
	XS2824	Screw, Set	1			2
	XS735	Spindle	1			1
	XS736	Stop	1			
	XW160	Washer, Special	1			
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	4			144
	XS777	Spring	1			2
	XS836	Spring	1			2
	XSA882	Sprocket-Assembly	1			
		Consisting of				
	XB421	Block	1			
	XP82	Pin, Taper, $\frac{1}{16}$" dia. x $\frac{1}{8}$", Steel	1			PE
	XP388	Pinion	1			1
	XR212	Ring, Locking	1			
	XS938	Screw, Set	4			4
	XS782	Spindle	1			
	XS827	Spring	1			2
	XS769	Sprocket	1			
	XS770	Sprocket	1			

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XW287	Washer, 2BA, Plain, Small, Steel Cad. Plate	2			6
	XS849	Stop, Spindle	1			
	XT385	Terminal, 2BA, Single End	1			6
	XT1	Terminal, 6BA, Single End	1			18
	XT29	Terminal, 8BA, Single End	1			36
	XSA751	Trimmer-Assembly	1	C64		2
	XW283	Washer, 2BA, Single Turn Spring, Steel, Cad. Plate	3			PE
	XW630	Washer, 6BA, Plain, Large, Steel, Cad. Plate	2			6
	XW426	Washer, 6BA, Plain, Small, Steel, Cad. Plate	7			18
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	18			PE
	XW631	Washer, 8BA, Plain, Small, Steel, Cad. Plate	2			6
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	2			PE
	XSA683	Chassis-Assembly	1			
		Spares for				
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	5			72
	XS1261	Screw, 6BA, x $\frac{1}{4}$", Csk. Hd., Steel. Cad. Plate	5			PE
	XT1	Terminal, 6BA, Single End	5			PE
	XW285	Washer, 6BA, Single Turn Spring, Steel, Plate	5			PE
	XC338	Clip	2			
*		Cover-Assembly	1			
		Spares for				
	XJ28	Bush, Hank	1			
	XE216	Label, Airworthiness	1			
	XR7	Rivet, $\frac{1}{16}$" long, Semi-tubular, Aluminium	4			
	XS791	Screw, Special	1			
	XSA887	Escutcheon-Assembly (less lamp)	1			
		Consisting of				
	XB409	Bracket	2			
	XC451	Contact	1			2
	XE97	Escutcheon	1			
	XJ29	Insulator	1			6
	XL149	Lampholder	1			6
	XL493	Lamp, 3V 0.6W	1	L.P1	X959103	24
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	4			PE
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	1			
	XS1641	Screw, 6BA, x $\frac{5}{16}$", Csk. Hd., Steel, Cad. Plate	4			PE
	XS1640	Screw, 8BA x $\frac{5}{16}$", Csk. Hd., Steel, Cad. Plate	2			18
	XT29	Terminal, 8BA, Single End	1			PE
	XT436	Terminal	1			2
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	4			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	1			PE
	XW138	Window	1			2
	XF56	Filter, Air	1			6
	XSA906	Filter Unit	1			
		Consisting of				
	XSA875	Filter-Assembly	1			
		Consisting of				
	XSA755	Bracket-Assembly	1			
	XSA756	Bracket-Assembly	1			
	XSA757	Cover-Assembly	1			
	XM324	Mounting, Anti-vibration	6			12

*Not normally stocked as spares

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA2805	Mounting-Assembly	1			
		Spares for				
	XS771	Backing-Strip	1			
	XCX26	Capacitor, 5μF, +50%, 50V DC −20%, Wkg., Electrolytic, Tubular, Metal Case, Insulated	2	C117, C118	Z145047	6
	XSA77	Contact-Assembly	2			6
	XSA832	Cover, Mounting	1			
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	4			PE
	XT1	Terminal, 6BA, Single End	1			PE
	XS2827	Screw, 6BA x $\frac{3}{16}$", Csk. Hd., Steel, Cad. Plate	4			18
	XS2250	Screw, 8BA x $\frac{3}{16}$", Csk. Hd., Stainless Steel	3			48
	XS1260	Screw, 8BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	2			PE
	XSA757	Terminal-Board-Assembly	1			
		Spares for				
	XSA752	Board, Terminal	1			
	XSA753	Board, Terminal	1			
	XB80	Bush	1			
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised, Tubular, Metal Case, Insulated	1	C114	Z115558	12
	XC398	Core, Iron Dust	2			6
	XSA18	Inductor, HT	1	L35		1
	XSA192	Inductor, LT	1	L36		1
	XS1640	Screw, 8BA x $\frac{5}{16}$", Csk. Hd., Steel, Cad. Plate	1			PE
	XSA878	Terminal-Board-Assembly	1	L37		1
		Consisting of				
	XC398	Core, Iron Dust	2			PE
	XS2828	Screw, 8BA x $\frac{1}{8}$", Csk. Hd., Steel, Cad. Plate	1			6
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	4			PE
	XN166	Nut, 4BA, Lock, Steel, Cad. Plate	12			PE
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	1			PE
	XS1261	Screw, 6BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	5			PE
	XS2250	Screw, 8BA x $\frac{3}{16}$", Csk. Hd. Stainless Steel	4			PE
	XT1	Terminal, 6BA, Single End	1			PE
	XSA833	Terminal-Board-Assembly	2			
	XS898	Mounting-Assembly	1			
	XS1261	Screw, 6BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	6			PE
	XG53	Gasket	1			6
	XG26	Grommet	1			24
	XG120	Grommet	1			36
	XG27	Grommet	1			24
	XH11	Handle, Withdrawal	1			1
	XSA2806	IF Unit	1			
		Spares for				
	XB420	Board, Insulating	1			
	XSA852	Board, Terminal	1			
	XB1041	Bracket, Resistor	1			
		Spares for				
	XB822	Bracket	1			
	XC1703	Clip, Tubular	3		10H/20229	24
	XRX734	Resistor, 2.2 Ω ± 5%, 3W, Wirewound, Vitreous Enamelled	1	R69		3
	XRX462	Resistor, 22 Ω ± 5%, 3W, Wirewound, Vitreous Enamelled	1	R68	Z113280	3
	XJ114	Terminal, Pillar	3			24
	XC2402	Can, Screening, B7G	6		Z563003	12
	XC2173	Can, Screening, B7G	2		Z560145	6

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XCX469	Capacitor, 2.2pF ± 10%, 500V CD Wkg., Ceramic, Tubular, Insulated	1	C105		3
	XCX340	Capacitor, 3.3pF ± 10%, 500V DC Wkg. Ceramic, Tubular, Insulated	1	C121		3
	XCX374	Capacitor, 20pF, Variable	2	C71, C73		12
	XCX245	Capacitor, 30pF, Variable	1	C120		4
	XCX585	Capacitor, 33pF ± 5%, 350V DC Wkg., Silvered Mica	1	C72		3
	XCX319	Capacitor, 47pF ± 5%, 500V DC Wkg., Ceramic, Tubular, Insulated	1	C122		3
	XCX708	Capacitor, 100pF ± 20%, 750V DC Wkg., Mica, Foil, Moulded Case	1	C87		3
	XCX473	Capacitor, 470pF ± 20%, 750V DC Wkg., Mica, Foil, Moulded Case	3	C75, C86, C97		6
	XCX709	Capacitor, 0.01μF ± 20%, 200V DC Wkg., Paper, Foil, Tubular, Metal Case, Insulated	1	C92		18
	XCX622	Capacitor, 0.1μF +100%, −0% 250V DC Wkg., Ceramic	1	C124		4
	XCX279	Capacitor, 0.1μF ± 25%, 150V DC Wkg., Paper, Metallised, Tubular, Metal Case, Insulated	1	C104		8
	XCX65	Capacitor, 8μF +50%, −25% 150V DC Wkg., Electrolytic,	1	C113		4
	XCX11	Capacitor, 10μF +50%, −20% 25V DC Wkg., Electrolytic, Tubular, Metal Case, Insulated	2	C96, C98		8
	XSA2807	Chassis-Assembly	1			
	XC557	Clip	1			
	XC458	Clip	1			
	XC553	Collar	1			
	XB419	Cover, Screening	1			
	XSA888	Cover-Assembly	1			
	XC162	Crystal-Unit, 1Mc/s	1	XLA		1
	XF118	Fuse-Link, 250mA	1	FS1		48
	XF8	Fuse-Unit	1			6
	XG120	Grommet	3			PE
	XG121	Grommet	1			12
	XG17	Grommet	1			12
	XSA703	Inductor-Assembly, 1st IF	1	L25—L26		
		Spares for				
	XC239	Can, Screening	1			3
	XCX161	Capacitor, 220pF ±2%, 350V DC Wkg., Silvered Mica	2	C69, C70		3
	XN29	Nut, Special	1			3
	XN5	Nut, 3BA, Lock, Brass	3			6
	XW61	Washer, Special	1			3
	XW10	Washer, 3BA, Shakeproof, Steel, Cad. Plate	3			24
	XSA704	Inductor-Assembly, 2nd IF	1	L27		
		Spares for				
	XC239	Can, Screening	1			PE
	XCX92	Capacitor, 200pF ± 2%, 350V DC Wkg. Silvered Mica	1	C74		4
	XN29	Nut, Special	1			PE
	XN5	Nut, 3BA, Lock, Brass	3			PE
	XW61	Washer, Special	1			PE
	XW10	Washer, 3BA, Shakeproof, Steel, Cad. Plate	3			PE
	XSA705	Inductor-Assembly, 3rd or 4th IF	2	L28—L29 or L30—L31		
		Spares for				
	XC239	Can, Screening	1			

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	20			PE
	XS2264	Screw, 8BA x ⅜", Ch. Hd., Steel, Cad. Plate	4			12
	XS1310	Screw, " PK " No. 2 x 3/16", Bdg. Hd., Steel, Cad. Plate	2			18
	XS2829	Switch, Push-button	1	SWB		2
	XS694	Switch, 12-way	1	SWA		1
		Spares for				
	XW639	Wafer, Switch	1			2
	XW640	Wafer, Switch	1			2
	XW641	Wafer, Switch	1			2
	XW642	Wafer, Switch	1			2
	XT163	Tape, 0.0015" x ½" wide, Polythene	3 in.			
	XT1	Terminal, 6BA, Single End	1			PE
	XT29	Terminal, 8BA, Single End	8			PE
	XSA2808	Terminal-board-Assembly	1			
		Spares for				
	XB1042	Board, Terminal	1			
	XCX76	Capacitor, 50pF ± 20%, 750V DC Wkg., Mica	2	C88, C89		4
	XCX97	Capacitor, 500pF ± 20%, 750V DC Wkg., Mica	1	C95		3
	XCX709	Capacitor, 0.01μF ± 25%, 200V DC Wkg., Paper, Foil, Tubular, Metal Case, Insulated	3	C76, C81, C91		PE
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	4	C68, C78, C85, C93	Z115558	PE
	XCX378	Capacitor, 0.1μF ± 25%, 250V DC Wkg., Paper, Metallised, Tubular, Metal Case, Insulated	3	C77, C82, C90	Z115561	8
	XRX866	Resistor, 39 Ω ± 5%, 3W, Wirewound, Vitreous, Enamelled	1	R56		3
	XRX71	Resistor, 220 Ω ± 10%, ¼W, Comp., Grade 2, Insulated	1	R26	Z221151	3
	XRX605	Resistor, 390 Ω ± 10%, ¼W, Comp., Grade 2, Insulated	1	R22	Z221184	3
	XRX358	Resistor, 3.3k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R19	Z212228	4
	XRX292	Resistor, 33k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	2	R28, R29	Z212238	6
	XRX360	Resistor, 27k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R67	Z212239	3
	XRX293	Resistor, 33k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R27	Z212240	PE
	XRX301	Resistor, 68k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	2	R23, R66	Z213303	6
	XRX298	Resistor, 100k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	2	R21, R24	Z213305	PE
	XRX591	Resistor, 150k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R31	Z213307	3
	XRX295	Resistor, 220k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R30	Z213308	3
	XRX174	Resistor, 470k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R37	Z213312	3
	XRX85	Resistor, 680k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	3	R32, R36, R38	Z213314	6
	XRX609	Resistor, 1M Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R25	Z213316	8
	XRX731	Resistor, 1.5M Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R39	Z223184	3
	XSA2809	Terminal-Board-Assembly	1			
		Spares for				
	XSA850	Board, Terminal	1			
	XCX709	Capacitor, 0.01μF ± 25%, 200V DC Wkg., Paper, Foil Tubular, Metal Case, Insulated	2	C103, C106		PE

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	2	C94, C100	Z115558	PE
	XRX297	Resistor, 1k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R51	Z212222	4
	XRX293	Resistor, 33k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R40	Z212240	PE
	XRX148	Resistor, 47k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R50	Z212242	8
	XRX298	Resistor, 100k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R48	Z213305	PE
	XRX867	Resistor, 120k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R34	Z213306	3
	XRX173	Resistor, 330k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R41	Z213310	PE
	XRX609	Resistor, 1M Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R44	Z213316	PE
	XT359	Transformer, Output	1	TR1		1
	XV132	Valve, Pentode, B7G Base	4	V5, V6, V9, V11	10CV/4009	24
	XV136	Valve, Double Diode, B7G Base	2	V7, V8	10CV/4007	12
	XV153	Valve, Pentode, B7G Base	1	V10		18
	XV33	Valveholder, B7G	8		Z560094	12
	XW354	Washer, 6BA, Plain, Steel, Cad. Plate	5			18
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	15			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	4			72
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	24			PE
	XK4	Knob	1			PE
	XSA873	Knob-Assembly	1			1
		Consisting of				
	XH50	Knob	1			2
	XS287	Sleeve-Assembly	1			2
		Consisting of				
	XS2820	Screw, 6BA x 3/16", Ch. Hd., Brass, Nickel Plate	1			6
	XS2831	Screw, 6BA, x ¼", Csk. Hd., Brass, Nickel Plate	1			6
	XS44	Sleeve	1			2
	XS45	Spindle	1			2
	XW11	Washer, Special	1			
	XL484	Label	1			
	XP383	Nutplate	2			
	XN152	Nut, 2BA, Full, Steel, Cad. Plate	4			12
	XN150	Nut, 4BA, Full, Steel, Cad. Plate	1			6
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	5			PE
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	2			PE
	XSA2810	Oscillator-Assembly	1			
		Spares for				
	XC2402	Can, Screening, B7G	1		Z563003	PE
	XCX374	Capacitor, 20pF, Variable	1	C111		PE
	XCX622	Capacitor, 0.1μF + 100%, 250V DC Wkg., −0% Ceramic	1	C125		PE
	XC463	Chassis	1			
	XC479	Cover	1			
	XSA881	Element, Crystal Oven	1	R62		3
	XL160	Lagging, No. 1	1			1
	XL161	Lagging, No. 2	1			1
	XL162	Lagging, No. 3	1			1
	XL163	Lagging, No. 4	1			1
	XB437	Mounting	1			
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	2			PE
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	6			PE

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XP4	Plug, 6-way	1	PLC		1
	XRX41	Resistor, 10k Ω ± 10%, ¼W, Comp., Grade 2, Insulated	1	R54	Z222130	PE
	XP398	Rod, Support	2			
	XR464	Rod, Support	2			
	XS1261	Screw, 6BA x ¼", Csk. Hd., Steel, Cad. Plate	2			PE
	XS2250	Screw, 8BA x 3/16", Csk. Hd., Stainless Steel	8			PE
	XS1894	Screw, 8BA x 1/16", Ch. Hd., Stainless Steel	2			12
	XS1640	Screw, 8BA x 5/16", Csk. Hd., Steel, Cad. Plate	4			PE
	XS2247	Screw, 8BA x 7/16", Csk. Hd., Steel, Cad. Plate	2			12
	XS2832	Screw, 8BA x 9/16", Csk. Hd., Steel, Cad. Plate	2			12
	XC531	Spacer	2			
	XSA1319	Switch-Assembly, Thermal	1	TRL1		1
		Consisting of				
	XB670	Base, Contact	1			2
	XB671	Bush, Insulating	1			2
	XC867	Contact	1			2
	XC868	Contact	1			2
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	1			PE
	XP671	Plate, Insulating	1			
	XS2260	Screw, 8BA x 7/16", Ch. Hd., Stainless Steel	1			6
	XS2844	Screw, Set, 8BA x ⅛"	2			8
	XT1	Terminal, 6BA, Single End	1			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	1			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	1			PE
	XSA895	Terminal-Board-Assembly	1			
		Spares for				
	XSA907	Board, Terminal	1			
	XCX710	Capacitor, 5pF ± 0.25pF, 750V DC Wkg., Ceramic	1	C108		3
	XCX711	Capacitor, 10pF ± 10%, 500V DC Wkg., Ceramic	1	C109		3
	XCX712	Capacitor, 47pF ± 10%, 350V DC Wkg., Silvered Mica	1	C119		3
	XCX185	Capacitor, 470pF ± 5%, 350V DC Wkg., Silvered Mica	1	C112		3
	XSA894	Inductor, Special	1	L34		2
	XRX358	Resistor, 3.3k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R52	Z212228	PE
	XRX148	Resistor, 47k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R58	Z212242	PE
	XRX173	Resistor, 330k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R53	Z213310	PE
	XT29	Terminal, 8BA, Single End	2			PE
	XV153	Valve, Pentode, B7G Base	1	V12		PE
	XV33	Valveholder, B7G	1		Z560094	PE
	XSA880	Valveholder-Assembly (less crystal)	1			
		Spares for				
	XC420	Crystal Unit, 250 k/cs	1	XLB		1
	XS1639	Screw, 8BA x 3/16", Ch. Hd., Stainless Steel	2			24
	XV140	Valveholder, B7G	1		Z560132	3
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Small, Steel, Cad. Plate	8			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	6			PE
	XW143	Washer, Special	3			

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA686	Panel-Assembly, Front (less lamps)	1			
		Spares for				
	XC451	Contact	1			PE
	XJ29	Insulator	1			PE
	XL172	Lampholder	1			3
	XL493	Lamp, 3V 0.6W	2	LP (1 spare)	X959103	PE
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	1			PE
	XS1544	Screw, 8BA x $\frac{3}{8}$", Csk. Hd., Steel, Cad. Plate	2			8
	XS848	Spacer	1			
	XT29	Terminal, 8BA, Single End	1			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	1			PE
	XSA804	Panel-Assembly, Rear	1			
		Spares for				
	XB353	Block	1			
	XS1619	Screw, 6BA x $\frac{3}{8}$", Csk. Hd., Steel, Cad. Plate	2			24
	XP326	Pin, $\frac{1}{4}$" long	2			
	XP60	Pin, $\frac{3}{16}$" long	1			
	XP555	Plate	1			
	XP794	Plug, 4-way	1	PLD		1
		Spares for				
	XP813	Body, Plug	1		10H/20297	1
	XC2069	Clamp-Assembly	1		10H/18830	
	XS979	Screw, Special	2		10AC/1011	2
	XP423	Rod, Support	1			
	XP554	Rod, Support	1			
	XP553	Rod, Support	1			
		†Rotary Transformer Type 1340B	1			
	XS1265	Screw, 2BA x $\frac{3}{8}$", Ch. Hd., Steel, Cad. Plate	3			12
	XS1355	Screw, 2BA x $\frac{3}{8}$", Rd. Hd., Steel, Cad. Plate	1			6
	XS2833	Screw, 2BA x $\frac{3}{16}$", Ch. Hd., Steel, Cad. Plate	2			6
	XS1641	Screw, 6BA x $\frac{3}{16}$", Csk. Hd., Steel, Cad. Plate	6			PE
	XS1302	Screw, 6BA x $\frac{1}{4}$", Ch. Hd., Steel, Cad. Plate	8			PE
	XS1619	Screw, 6BA x $\frac{3}{8}$", Csk. Hd., Steel, Cad. Plate	13			PE
	XS2235	Screw, 6BA x $\frac{1}{2}$", Ch. Hd., Steel, Cad. Plate	15			24
	XS2244	Screw, 6BA x $\frac{1}{2}$", Csk. Hd., Steel, Cad. Plate	2			PE
	XS1306	Screw, 6BA x $\frac{5}{8}$", Ch. Hd., Steel, Cad. Plate	4			12
	XS1618	Screw, 6BA x $\frac{3}{4}$", Csk. Hd., Steel, Cad. Plate	4			PE
	XS2834	Screw, 6BA x $\frac{3}{4}$", Inst. Hd., Cad. Plate	4			12
	XS1350	Screw, 8BA x $\frac{1}{8}$", Csk. Hd., Steel, Cad. Plate	4			18
	XS1310	Screw, " PK " No. 2 x $\frac{3}{16}$", Bdg. Hd., Steel, Cad. Plate	3			PE
	XS31	Screw, Special	2			
	XS846	Screw, Special, 2 $\frac{11}{16}$" long	1			
	XS939	Screw, Special, $\frac{1}{2}$" long	3			
	XS1032	Screw, Special, $\frac{11}{16}$" long	2			
	XSA318	Socket-Assembly, Coaxial	3	SKD, SKE, SKF		
		Spares for				
	XP185	Plate, Spring	1			
	XS371	Screw, Special	2			
	XS32	Spring	2			
	XP25	Stop-Plate	1			
	XT1	Terminal, 6BA, Single End	4			PE
	XSA2811	Terminal-Board-Assembly	1			
		Spares for				
	XSA899	Board, Terminal	1			
	XCX543	Capacitor, 0.01μF ± 20%, 150V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C123	Z115826	3
	XRX349	Resistor, 22 Ω ± 5%, 4$\frac{1}{4}$W, Wirewound, Vitreous Enamelled	1	R61	Z113447	3
	XRX378	Resistor, 68 Ω ± 5%, 6W, Wirewound, Vitreous Enamelled	1	R59	Z113369	3
	XRX647	Resistor, 220 Ω ± 5%, 3W, Wirewound, Vitreous Enamelled	2	R60, R70	Z113304	4

†See page 46

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA2812	Turret Unit, RF	1			
		Spares for				
	XSA859	Board, Terminal	1			
	XCX713	Capacitor, 2pF ± 0.25pF, 750V DC Wkg., Ceramic	1	C30		3
	XCX236	Capacitor, 10pF ± 20%, 500V, DC Wkg., Silvered Ceramic	2	C29, C44		PE
	XCX237	Capacitor, 30pF ± 5%, 350V DC Wkg., Silvered Mica	1	C62		3
	XCX714	Capacitor, 500pF ± 20%, 350V DC Wkg., Moulded Mica	4	C11, C26, C43, C65		8
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	2			PE
	XRX866	Resistor, 39 Ω ± 5%, 3W, Wirewound Vitreous Enamelled	1	R57		3
	XRX369	Resistor, 100 Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R55	Z211238	3
	XRX611	Resistor, 10k Ω ± 20%, $\frac{1}{10}$W, Variable	1	RV2		3
	XRX292	Resistor, 22k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R13	Z212238	PE
	XRX298	Resistor, 100k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	2	R12, R15	Z213305	PE
	XRX416	Resistor, 2.2M Ω ± 10%, ½W, Comp., 2, Non-insulated	1	R1		4
	XS1336	Screw, 6BA x ¼", Ch. Hd., Steel, Cad. Plate	7			PE
	XS1307	Screw, 6BA x $\frac{5}{16}$", Ch. Hd., Steel, Cad. Plate	2			PE
	XS2827	Screw, 6BA x $\frac{3}{16}$", Csk. Hd., Steel, Cad. Plate	2			PE
	XS568	Screw, Special	1			
	XS772	Spacer	2			
	XC631	Spacer	1			
	XT1	Terminal, 6BA, Single End	1			PE
	XSA2813	Terminal-Board-Assembly	1			
		Spares for				
	XSA851	Board, Terminal	1			1
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C24	Z115558	PE
	XCX279	Capacitor, 0.1μF ± 25%, 150V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C13	Z115560	PE
	XRX628	Resistor, 120 Ω ± 10%, ¼W, Comp., Grade 2, Insulated	1	R3	Z221121	3
	XRX293	Resistor, 33k Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R64	Z212240	PE
	XRX730	Resistor, 39k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R4	Z212241	3
	XRX416	Resistor, 2.2M Ω ± 10%, ½W, Comp., Grade 2, Non-insulated	1	R2		PE
	XSA2814	Terminal-Board-Assembly	1			
		Spares for				
	XSA851	Board, Terminal	1			PE
	XCX595	Capacitor, 0.01μF ± 20%, 350V DC Wkg., Paper, Foil Tubular, Metal Case, Insulated	1	C28		6
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C31	Z115558	PE
	XCX279	Capacitor, 0.1μF ± 25%, 150V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C27	Z115560	PE
	XRX534	Resistor, 330 Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R6	Z211244	3
	XRX301	Resistor, 68k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	2	R9, R65	Z213303	4

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XRX102	Resistor, 100k Ω ± 10%, ¼W, Comp., Grade 2, Insulated	1	R8	Z223037	PE
	XRX609	Resistor, 1M Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R5	Z213316	PE
	XSA2815	Terminal-Board-Assembly	1			
		Spares for				
	XSA851	Board, Terminal	1			PE
	XCX595	Capacitor, 0.01μF ± 20%, 350V DC Wkg., Paper, Foil Tubular, Metal Case, Insulated	1	C46		PE
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C47	Z115558	PE
	XCX279	Capacitor, 0.1μF ± 25%, 150V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	1	C45	Z115560	PE
	XRX290	Resistor, 220 Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R11	Z211242	3
	XRX148	Resistor, 47k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R63	Z212242	PE
	XRX301	Resistor, 68k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R14	Z213303	PE
	XRX609	Resistor, 1M Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R10	Z213316	PE
	XSA2816	Terminal-Board-Assembly	1			
		Spares for				
	XSA851	Board, Terminal	1			PE
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised Tubular, Metal Case, Insulated	2	C66, C67	Z115558	PE
	XRX297	Resistor, 1k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R16	Z212222	PE
	XRX355	Resistor, 1.5k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R17	Z212224	3
	XRX148	Resistor, 47k Ω ± 10%, ¼W, Comp., Grade 2, Non-insulated	1	R18	Z212242	PE
	XSA901	Thermal-Compensator	1	X1		1
		Consisting of				
	XC490	Block	2			
	XF106	Frame	1			
	XSA883	Inductor	1			1
	XB76	Insulator	1			PE
	XN175	Nut, 8BA, Full, Steel, Cad. Plate	2			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	2			48
	XN44	Nut, 10BA, Full, Brass, Nickel Plate	2			12
	XS1344	Screw, 8BA x 1½", Ch. Hd., Steel, Cad. Plate	2			6
	XS1526	Screw, 10BA x ¼", Csk. Hd., Steel, Cad. Plate	1			6
	XS784	Strip, Bi-metal	1			1
	XS781	Strip, Earth	1			
	XT94	Terminal, Cruciform	1			
	XSA862	Trimmer	2			1
	XV26	Vane, Fixed	1			1
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	2			PE
	XW632	Washer, 10BA, Plain, Large, Brass, Nickel Plate	3			9
	XW178	Washer, 10BA, Single Turn Spring, Ph. Bz.	2			6
	XSA2817	Turret-Assembly	1			
		Consisting of				
	XB370	Bearing	2			1
	XB371	Bearing	1			1
	XB499	Bearing, Ball Journal, "00" fit	1			1
	XB366	Block, Bearing	1			

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XB367	Block, Bearing	2			
	XB368	Block, Bearing	1			
	XB365	Bracket	1			
	XB372	Bracket	8			
	XSA865	Cage-Assembly	3			
		Consisting of				
	XB369	Bush	2			
	XSA805	Cheek-Assembly	2			
	XP349	Rod, Support	6			
	XS2263	Screw, 8BA x $\frac{3}{16}$", Ch. Hd., Steel, Cad. Plate	8			PE
	XS1260	Screw, 8BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	12			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	8			PE
	XSA866	Cage-Assembly	1			
		Consisting of				
	XB369	Bush	2			
	XSA805	Cheek-Assembly	2			
	XP350	Plate, Location	1			
	XP349	Rod, Support	6			
	XS2263	Screw, 8BA x $\frac{3}{16}$", Ch. Hd., Steel, Cad. Plate	4			PE
	XS1260	Screw, 8BA x $\frac{1}{4}$", Csk. Hd., Steel, Cad. Plate	16			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	4			PE
	XC2402	Can, Screening, B7G	3		Z563003	PE
	XC2173	Can, Screening, B7G	1		Z560145	PE
	XC429	Channel	2			
	XC2771	Chassis	1			
	XC473	Contact, Spring	32			24
	XG120	Grommet	2			PE
	XSA937	Inductor-Assembly, 1st RF Range 1	1			
		Spares for				
	XSA807	Inductor	1	L1		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C1	Z167005	24
	XC472	Contact	4			36
	XC431	Core, Iron Dust	1			24
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			72
	XS2262	Screw, 8BA x $\frac{1}{4}$", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA938	Inductor-Assembly, 1st RF Range 2	1			
		Spares for				
	XSA808	Inductor	1	L2		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C2	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x $\frac{1}{4}$", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA939	Inductor-Assembly, 1st RF Range 3	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C7		8
	XSA809	Inductor	1	L3		1

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C3	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	44			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA940	Inductor-Assembly, 1st RF Range 4	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C8		PE
	XSA810	Inductor	1	L4		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C4	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA941	Inductor-Assembly, 1st RF Range 5	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C9		PE
	XSA811	Inductor	1	L5		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C5	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA942	Inductor-Assembly, 1st RF Range 6	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C10		PE
	XSA812	Inductor	1	L6		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C6	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA943	Inductor-Assembly, 2nd RF Range 1	1			
		Spares for				
	XSA813	Inductor	1	L7		1

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C14	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA944	Inductor-Assembly, 2nd RF Range 2	1			
		Spares for				
	XSA814	Inductor	1	L8		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C15	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA945	Inductor-Assembly, 2nd RF Range 3	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C20		PE
	XSA815	Inductor	1	L9		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C16	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA946	Inductor-Assembly, 2nd RF Range 4	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C21		PE
	XSA816	Inductor	1	L10		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C17	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA947	Inductor-Assembly, 2nd RF Range 5	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C22		PE
	XSA817	Inductor	1	L11		1

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C3	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	44			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA940	Inductor-Assembly, 1st RF Range 4	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C8		PE
	XSA810	Inductor	1	L4		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C4	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA941	Inductor-Assembly, 1st RF Range 5	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C9		PE
	XSA811	Inductor	1	L5		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C5	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA942	Inductor-Assembly, 1st RF Range 6	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C10		PE
	XSA812	Inductor	1	L6		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C6	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA943	Inductor-Assembly, 2nd RF Range 1	1			
		Spares for				
	XSA813	Inductor	1	L7		1

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C18	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA948	Inductor-Assembly, 2nd RF Range 6	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C23		PE
	XSA818	Inductor	1	L12		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C19	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA949	Inductor-Assembly, 3rd RF Range 1	1			
		Spares for				
	XSA819	Inductor	1	L13		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C32	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA950	Inductor-Assembly, 3rd RF Range 2	1			
		Spares for				
	XSA820	Inductor	1	L14		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C33	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA951	Inductor-Assembly, 3rd RF Range 3	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C38		PE
	XSA821	Inductor	1	L15		1

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C34	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XW178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA952	Inductor-Assembly, 3rd RF Range 4	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C39		PE
	XSA822	Inductor	1	L16		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C35	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Steel, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Lock, Steel, Cad. Plate	2			PE
	XSA953	Inductor-Assembly, 3rd RF Range 5	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C40		PE
	XSA823	Inductor	1	L17		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C36	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA954	Inductor-Assembly, 3rd RF Range 6	1			
		Spares for				
	XCX246	Capacitor, 25pF ± 20%, 500V DC Wkg., Silvered Ceramic	1	C41		PE
	XSA824	Inductor	1	L18		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C37	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XSA955	Inductor-Assembly, Oscillator Range 1	1			
		Spares for				
	XCX85	Capacitor, 25pF ± 5%, 350V DC Wkg., Silvered Mica	1	C48		3
	XCX243	Capacitor, 70pF ± 2%, 350 V DC Wkg., Silvered Mica	1	C56		3
	XSA825	Inductor	1	L19		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C50	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA956	Inductor-Assembly, Oscillator Range 2	1			
		Spares for				
	XCX247	Capacitor, 15pF ± 20%, 350V DC Wkg., Silvered Mica	1	C49		3
	XCX242	Capacitor, 120pF ± 2%, 350V DC Wkg., Silvered Mica	1	C57		3
	XSA826	Inductor	1	L20		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C51	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA957	Inductor-Assembly, Oscillator Range 3	1			
		Spares for				
	XCX241	Capacitor, 560pF ± 2%, 350V DC Wkg., Silvered Mica	1	C58		3
	XSA827	Inductor	1	L21		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C52	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA958	Inductor-Assembly, Oscillator Range 4	1			
		Spares for				
	XCX240	Capacitor, 910pF ± 5%, 350V DC Silvered Mica	1	C59		3
	XSA828	Inductor	1	L22		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C53	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA959	Inductor-Assembly, Oscillator, Range 5	1			
		Spares for				
	XCX239	Capacitor, 160pF ± 5%, 350V DC Wkg., Silvered Mica	1	C60		3
	XSA829	Inductor	1	L23		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C54	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	4			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XSA960	Inductor-Assembly, Oscillator, Range 6	1			
		Spares for				
	XCX238	Capacitor, 2500pF ± 5%, 350V DC Wkg., Silvered Mica	1	C61		3
	XSA830	Inductor	1	L24		1
	XSA707	Mounting-Assembly	1			
		Spares for				
	XCX201	Capacitor, 3-30pF, Variable	1	C55	Z167005	PE
	XC472	Contact	4			PE
	XC431	Core, Iron Dust	1			PE
	XB76	Insulator	1			PE
	XN260	Nut, 8BA, Lock, Brass, Nickel Plate	1			PE
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	2			PE
	XS2262	Screw, 8BA x ¼", Ch. Hd., Steel, Cad. Plate	2			PE
	XW383	Washer, 8BA, Plain, Steel, Cad. Plate	2			PE
	XJ18	Insulator	2			6
	XS897	Insulation-Strip	1			
	XS717	Insulation-Strip	1			
	XK16	Knob	1			PE
	XN161	Nut, 6BA, Full, Steel, Cad. Plate	17			PE
	XN102	Nut, 6BA, Full, " Nyloc "	3			12
	XN229	Nut, 8BA, Full, Steel, Cad. Plate	14			36
	XN178	Nut, 8BA, Lock, Steel, Cad. Plate	4			PE
	XP509	Nutplate	1			
	XN61	Nutplate	8			
	XP214	Pin	1			
	XP85	Pin, Taper, 1/16" dia. x ¾", Stainless Steel	4			8
	XP351	Plate	1			
	XR465	Rod, Support	2			
	XB373	Saddle-Bracket	4			
	XB374	Saddle-Bracket	4			
	XSA764	Saddle-Assembly	8			
	XS1429	Screw, 4BA x ½", Csk. Hd., Steel, Cad. Plate	1			6
	XS1336	Screw, 6BA x ¼", Ch. Hd., Steel, Cad. Plate	16			PE
	XS1641	Screw, 6BA x 1/16", Csk. Hd., Steel, Cad. Plate	15			PE
	XS2835	Screw, 6BA x 1/16", Rd. Hd., Steel, Cad. Plate	1			6

11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XS1302	Screw, 6BA x ⅜", Ch. Hd., Steel, Cad. Plate	8			PE
	XS2263	Screw, 8BA x 3/16", Ch. Hd., Steel, Cad. Plate	68			PE
	XS2250	Screw, 8BA x 3/16", Csk. Hd., Stainless Steel	8			PE
	XS1639	Screw, 8BA x 3/16", Ch. Hd., Steel, Cad. Plate	14			PE
	XS2259	Screw, 8BA x ¼", Ch. Hd., Stainless Steel	4			12
	XS2836	Screw, 8BA x ⅜", Ch. Hd., Steel, Cad. Plate	1			6
	XS894	Screw, Set	1			
	XS734	Screw, Set	5			
	XS938	Screw, Set	14			
	XS1238	Screw, Special	8			
	XS720	Spring	1			3
	XS721	Stud	1			
	XT29	Terminal, 8BA, Single End	6			PE
	XSA835	Terminal-Strip-Assembly	2			
	XSA889	Trimmer-Assembly, Scale	1	L33		1
		Consisting of				
	XB445	Body	1			
	XC484	Collar, Locking	1			
	XSA891	Core-Assembly	1			
	XC486	Core, Cup	2			
	XC485	Cover	1			
	XSA890	Drive-Plate-Assembly	1			
	XP410	End-Plate	1			
	XSA893	Inductor	1			1
	XK19	Knob	1			
	XP411	Plunger	1			
	XS833	Screw, Special	1			
	XS1350	Screw, 8BA x ⅜", Csk. Hd., Steel, Cad. Plate	4			PE
	XSA892	Shaft-Assembly	1			
	XS329	Spring, Compression, 22SWG	1			3
	XS832	Spring, Compression, 26SWG	1			3
	XW144	Washer, Special	3			
	XW633	Washer, Special	1			
	XV133	Valve, Pentode, B7G Base	1	V1	10VC/4010	6
	XV132	Valve, Pentode, B7G Base	1	V2	10CV/4009	PE
	XV154	Valve, Heptode, B7G Base	1	V3	10CV/4012	6
	XV153	Valve, Pentode, B7G Base	1	V4		PE
	XV33	Valveholder, B7G	4		Z560094	PE
	XW147	Washer, Insulating	10			
	XW426	Washer, 6BA, Plain, Small, Steel, Cad. Plate	17			PE
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	49			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	86			PE
	XW426	Washer, 6BA, Plain, Steel, Cad. Plate	4			PE
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	11			PE
	XW283	Washer, 2BA, Single Turn Spring, Steel, Cad. Plate	6			PE
	XW634	Washer, 2BA, Shakeproof, Steel, Cad. Plate	1			6
	XW276	Washer, 4BA, Single Turn Spring, Steel, Cad. Plate	1			6
	XW426	Washer, 6BA, Plain, Small, Steel, Cad. Plate	4			PE
	XW285	Washer, 6BA, Single Turn Spring, Steel, Cad. Plate	14			PE
	XW284	Washer, 8BA, Single Turn Spring, Steel, Cad. Plate	2			PE

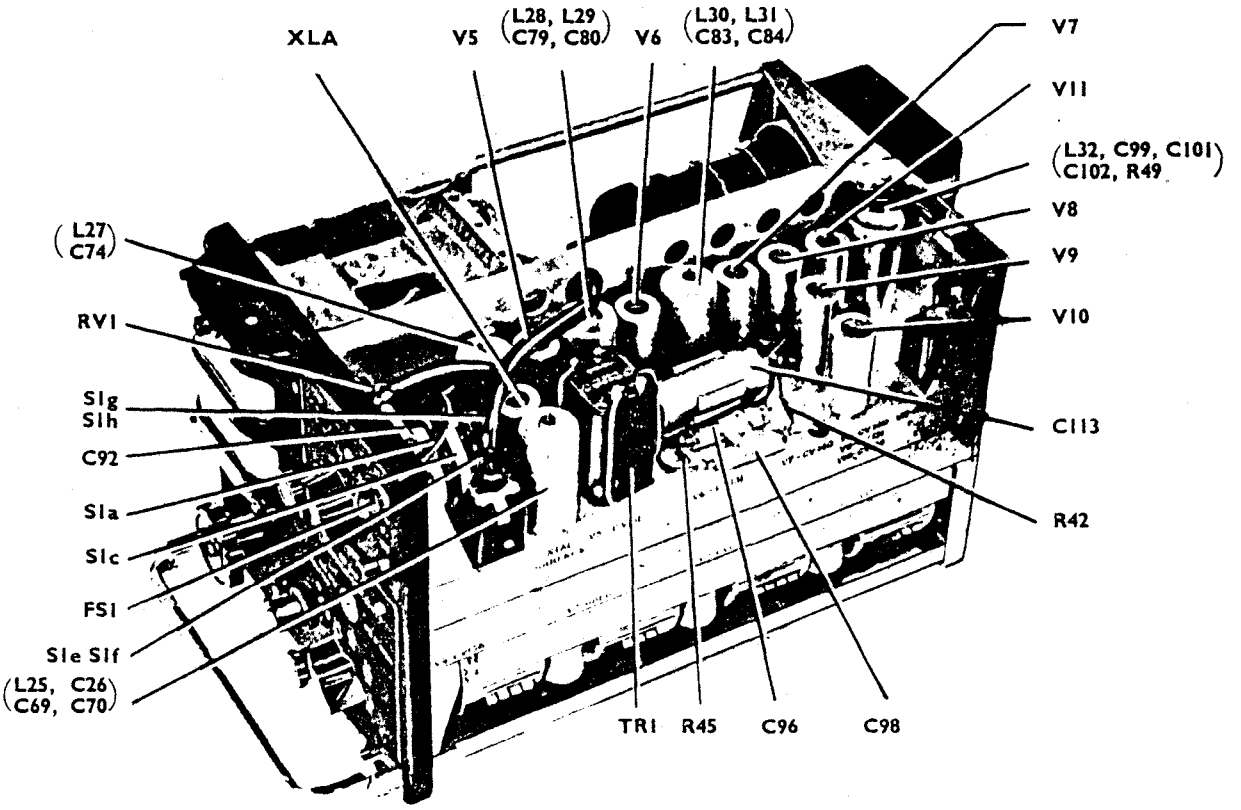
11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XT2	**ROTARY TRANSFORMER TYPE 1340B**	1	MG1	10K/16193	3
		Spares for				
	XA59	Armature-Assembly	1		10K/16251	2
	XB90	Bearing	2		27S/91	4
	XB551	Brush, HT	2		10AD/1015	24
	XB70	Brush, HT	2		10K/16191	24
	XC525	Cap, Brush Holder	4		10AD/1028	8
	XCX282	Capacitor, 0.05μF ± 25%, 250V DC Wkg., Paper, Metallised, Tubular, Metal Case, Insulated	1	C121	Z115558	3
	XCX279	Capacitor, 0.1μF ± 25%, 150V DC Wkg., Paper, Metallised, Tubular, Metal Case, Insulated	1	C122	Z115560	3
	XC526	Cover (fan end)	1		10AP/1055	1
	XC527	Cover (opposite fan end)	1		10AP/1056	1
	XF112	Fan	1		10K/16252	3
	XB96	Holder, Brush, HT	2		10AD/2762	4
	XB97	Holder, Brush, LT	2		10AD/2763	4
	XB479	Terminal-Block-Assembly	1			2
	XB550	Terminal-Block-Assembly	1			2

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
	XW37	Braid, 55/.003", Copper				
	XC554	Cable, Coaxial				
	XC100	Cable, 1/.018", PVC, Red				
	XC102	Cable, 1/.018", PVC, Yellow				
	XC103	Cable, 1/.018", PVC, White				
	XC106	Cable, 1/.018", PVC, Brown				
	XC109	Cable, 1/.018", PVC, Orange				
	XC2371	Cable, 1/.024", PVC, Red			6145-100136	
	XC2398	Cable, 1/.024", PVC, Black			6145-100140	
	XC2397	Cable, 1/.024", PVC, Yellow			6145-100139	
	XC2245	Cable, 1/.024", PVC, White			6145-100141	
	XC2395	Cable, 1/.024", PVC, Blue			6145-100137	
	XC2396	Cable, 1/.024", PVC, Green			6145-100138	
	XC2244	Cable, 1/.024", PVC, Brown			6145-100142	
	XC2456	Cable, 1/.024", PVC, Grey			6145-100145	
	XC2372	Cable, 1/.024", PVC, Orange			6145-100144	
	XC2373	Cable, 1/.024", PVC, Pink			6145-100146	
	XC133	Cable, 1/.028", PVC, Red				
	XC2	Cable, 1/.028", PVC, Black				
	XC134	Cable, 1/.028", PVC, Yellow				
	XC137	Cable, 1/.028", PVC, Green				
	XC3	Cable, 1/.028", PVC, Brown				
	XC1	Cable, 1/.028", PVC, Grey				
	XC6	Cable, 1/.028", PVC, Blue				
	XC115	Cable, 14/.0048", PVC, Red				
	XC116	Cable, 14/.0048", PVC, Black				
	XC117	Cable, 14/.0048", PVC, Yellow				
	XC118	Cable, 14/.0048", PVC, White				
	XC119	Cable, 14/.0048", PVC, Blue				
	XC120	Cable, 14/.0048", PVC, Green				
	XC121	Cable, 14/.0048", PVC, Brown				
	XC122	Cable, 14/.0048", PVC, Violet				
	XC124	Cable, 14/.0048", PVC, Orange				
	XC125	Cable, 14/.0048", PVC, Pink				
	XC2782	Cable, 14/.0076", Polythene				
	XC236	Cable, 23/.004", Polythene, Insulated, Screened				
	XS327	Sleeve, Black				
	XS909	Sleeve, Black				
	XS602	Sleeve, Black				
	XS683	Sleeve, Black				
	XS831	Sleeving, 0.5 mm. bore x 0.5 mm. wall, Yellow				
	XS308	Sleeving, 0.75 mm. bore x 0.35 mm. wall, Red				
	XS278	Sleeving, 0.75 mm. bore x 0.35 mm. wall, Blue				
	XS155	Sleeving, 0.75 mm. bore x 0.35 mm. wall, Yellow				
	XS197	Sleeving, 0.75 mm. bore x 0.35 mm. wall, Black				
	XS75	Sleeving, 1 mm. bore				
	XS2837	Sleeving, 1 mm. bore x 0.625 mm. wall, Red				
	XS2006	Sleeving, 1 mm. bore x 0.625 mm. wall, Black				
	XS2838	Sleeving, 1 mm. bore x 0.625 mm. wall, Orange				
	XS2839	Sleeving, 1 mm. bore x 0.625 mm. wall, Grey				
	XS2004	Sleeving, 1 mm. bore x 0.625 mm. wall, Green				
	XS2001	Sleeving, 3.5 mm. bore x 0.35 mm. wall, Black				
	XS314	Sleeving, 5 mm. bore x 1 mm. wall, Black				
	XS603	Sleeving, 7 mm. bore x 1 mm. wall, Black				
	XC92	Thread, 1.3 mm. dia., PVC, Black				
	XW17	Wire, 22SWG (0.028"), Tinned Copper				

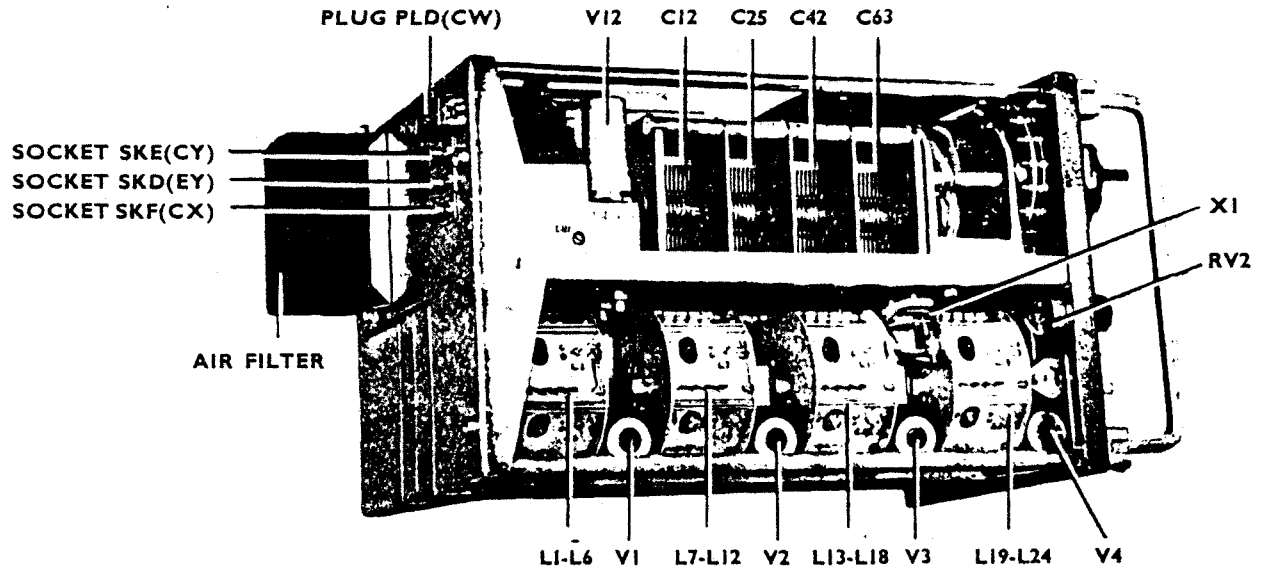
11 SPARE PARTS SCHEDULE—*continued*

1	2	3	4	5	6	7
	Spare Part Ref. No.	Description	Number Off	Circuit or Other Reference	Service Reference	Recommended Holding for 25 Overhauls
		BACKPLATE TYPE 1297	1			
		Spares for				
	XN130	Nut, 48A, Double Anchor	6			
	XD38	Pin, Dowel	2			



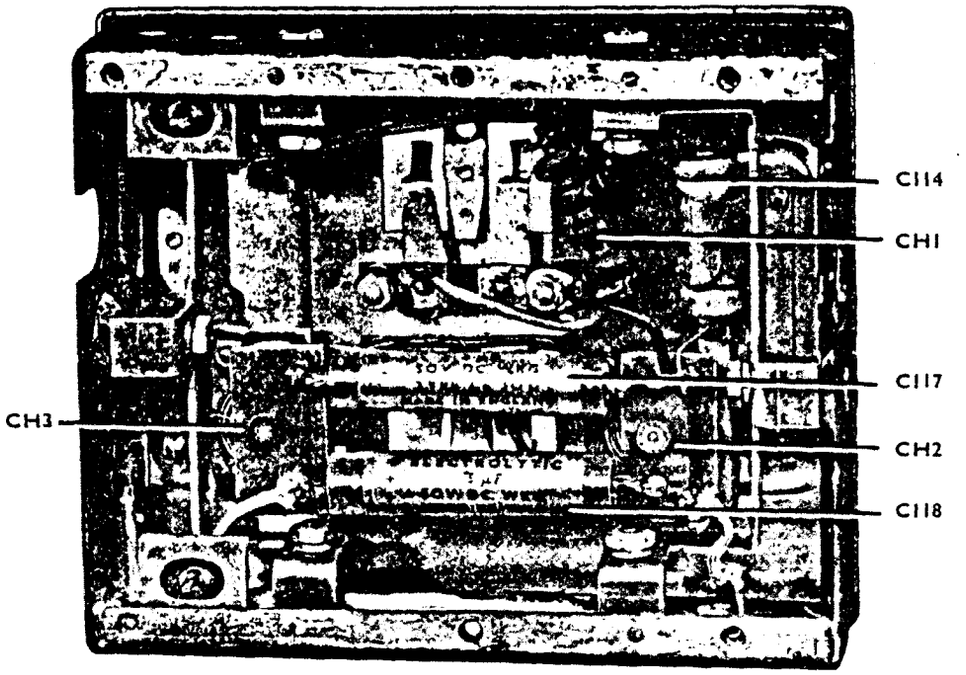
5817

FIG. 8. RECEIVER CHASSIS VIEWED FROM ABOVE SHOWING LOCATION OF COMPONENTS



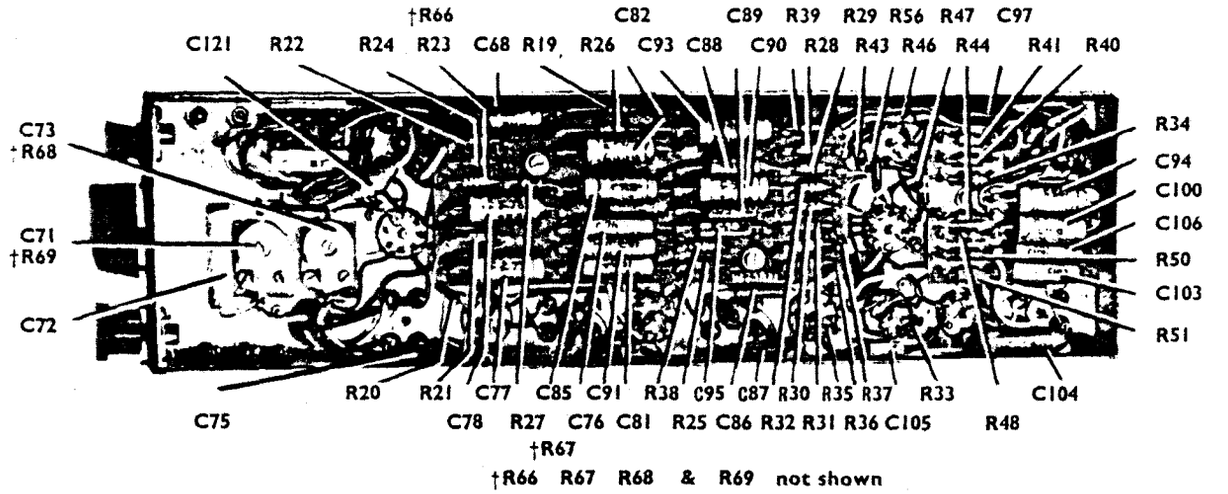
5818

FIG. 9. UNDERSIDE VIEW OF RECEIVER CHASSIS SHOWING LOCATION OF COMPONENTS



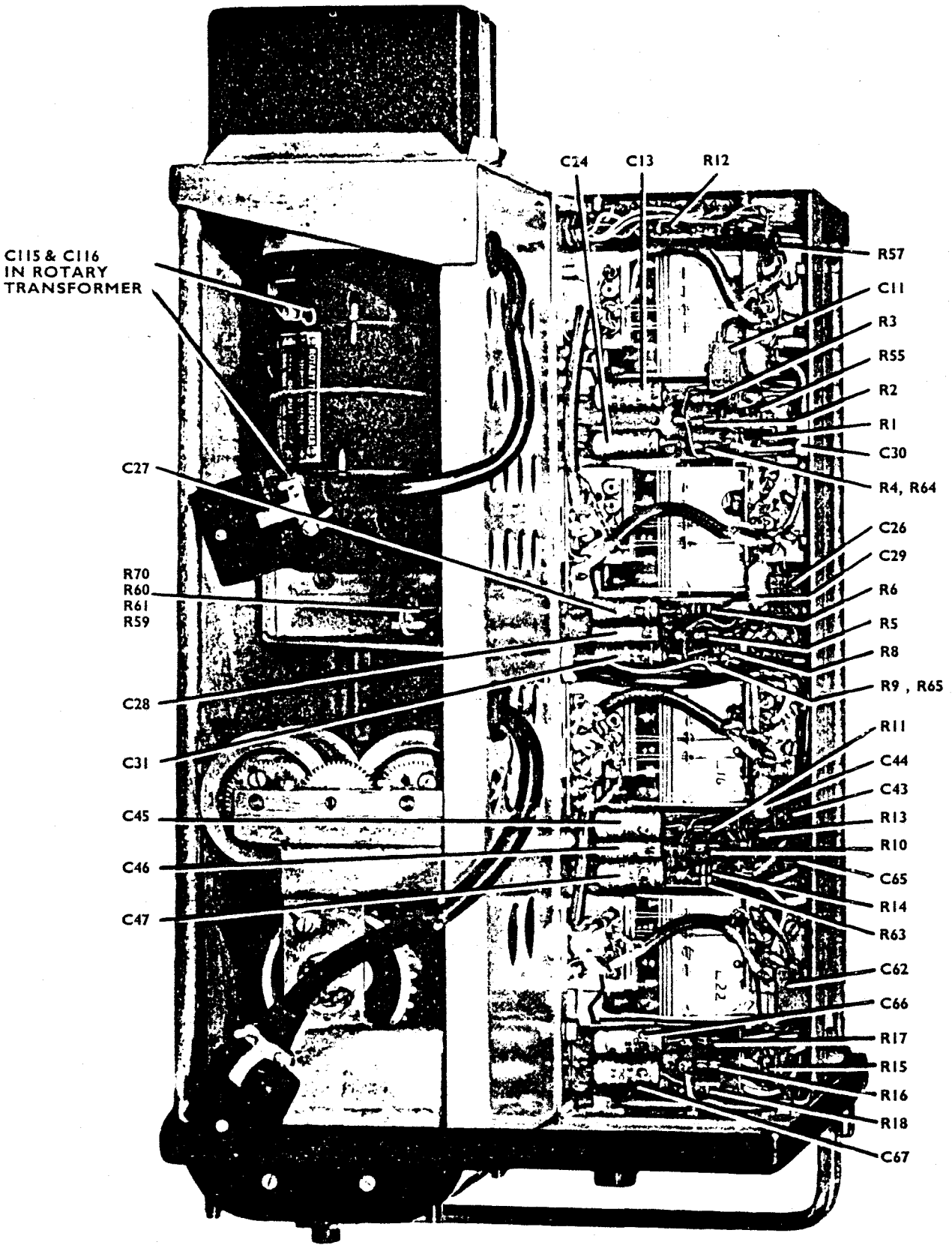
5819

FIG. 10. HT FILTER UNIT. UNDERSIDE VIEW SHOWING LOCATION OF COMPONENTS.



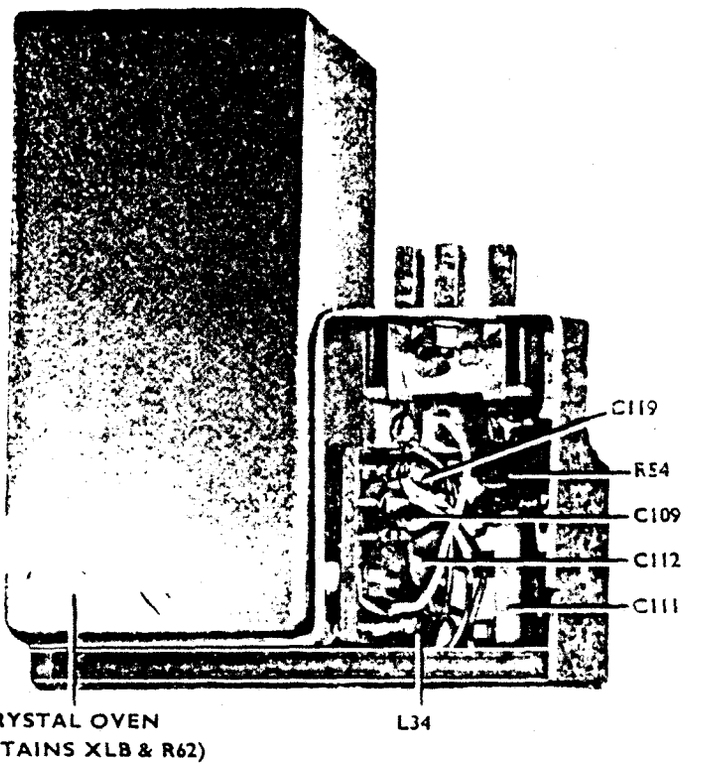
5820

FIG. 11. IF AMPLIFIER UNIT. UNDERSIDE VIEW OF CHASSIS SHOWING LOCATION OF COMPONENTS



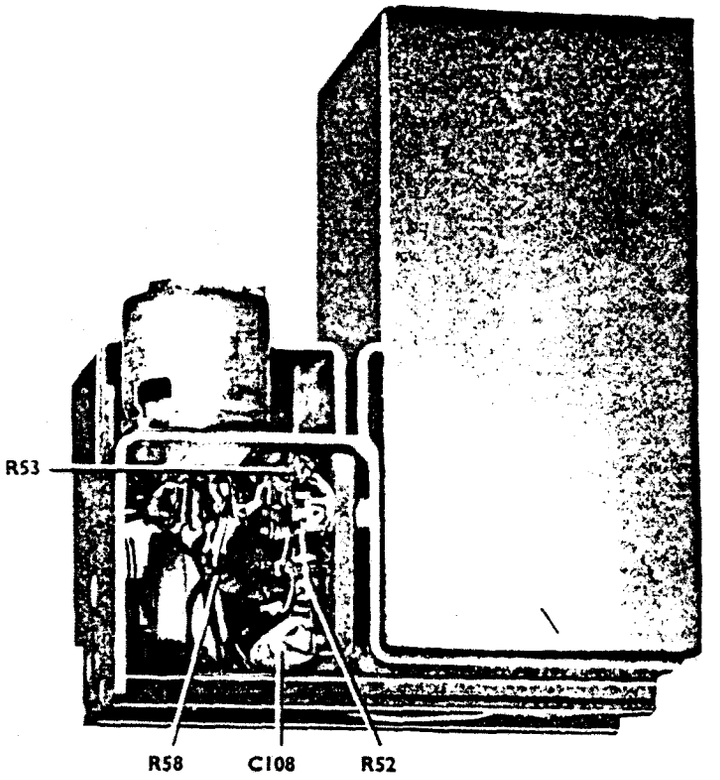
5821

FIG. 12. RECEIVER CHASSIS VIEWED FROM ABOVE (IF AMPLIFIER UNIT REMOVED) SHOWING LOCATION OF COMPONENTS



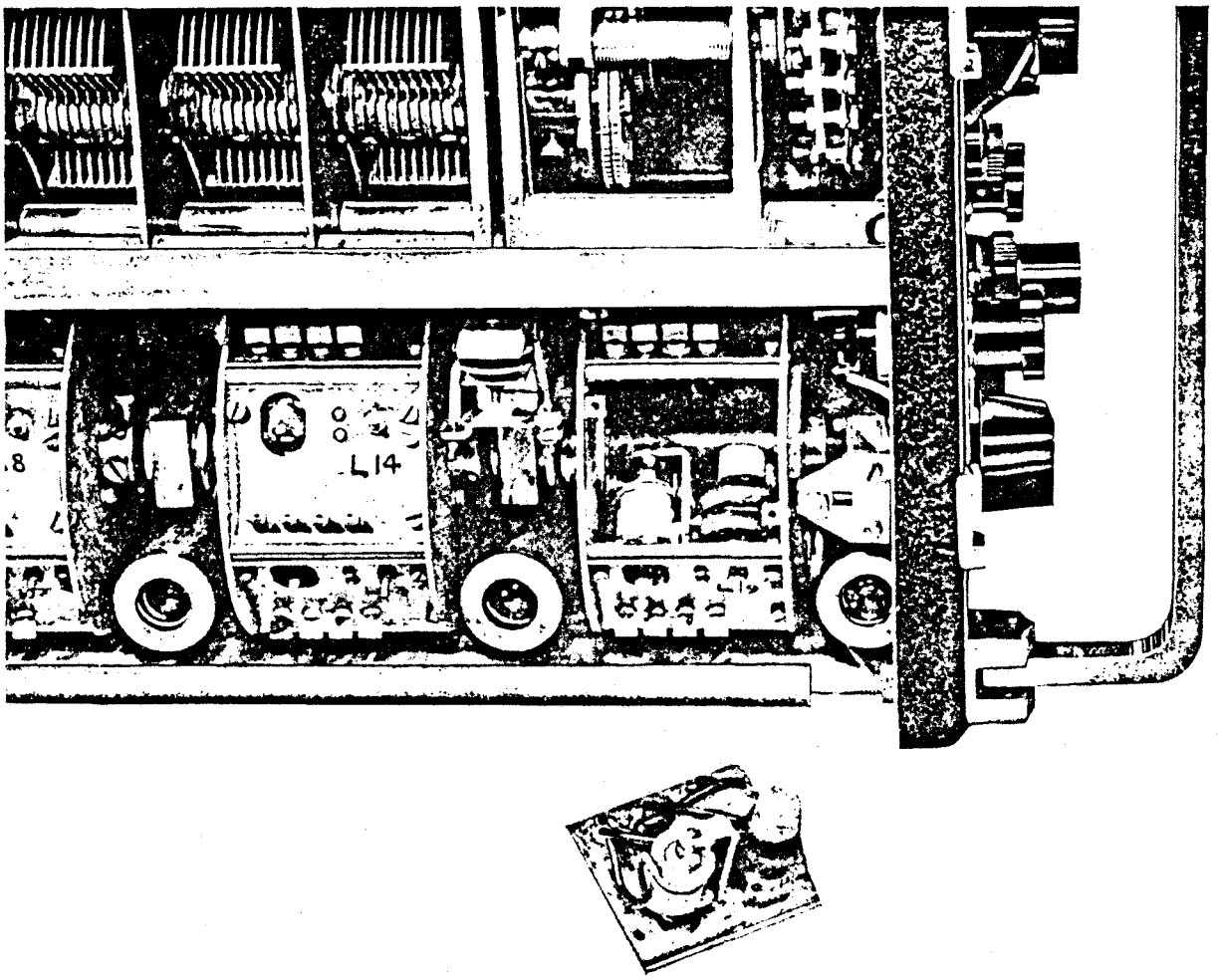
5822

FIG. 13. CRYSTAL CALIBRATOR UNIT. COMPONENT LOCATION (1)



5823

FIG. 14. CRYSTAL CALIBRATOR UNIT. COMPONENT LOCATION (2)



5824

FIG. 15. RF COIL ASSEMBLY (L20). REMOVED FROM TURRET

COMPONENT LOCATIONS AND VALVES

CAPACITORS

Ref.	Loc.	Value	Ref.	Loc.	Value	Ref.	Loc.	Value	Ref.	Loc.	Value	Ref.	Loc.	Value
C1	G5	3-30 pF	C26	I2	500 pF	C51	E2	3-30 pF	C76	R4	0.01 µF	C101	T6	5 pF
C2	B2	3-30 pF	C27	J3	0.1 µF	C52	E3	3-30 pF	C77	S4	0.1 µF	C102	T6	10 pF
C3	B3	3-30 pF	C28	J3	0.01 µF	C53	E4	3-30 pF	C78	S3	0.05 µF	C103	U5	0.01 µF
C4	B4	3-30 pF	C29	I2	10 pF	C54	E5	3-30 pF	C79	S3	200 pF	C104	U6	0.1 µF
C5	B5	3-30 pF	C30	J4	2 pF	C55	E6	3-30 pF	C80	T3	200 pF	C105	U5	2.2 pF
C6	B6	3-30 pF	C31	J3	0.05 µF	C56	N5	70 pF	C81	T3	0.01 µF	C106	U5	0.01 µF
C7	B3	25 pF	C32	K5	3-30 pF	C57	E2	120 pF	C82	T3	0.1 µF	C107	—	Not used
C8	B4	25 pF	C33	D2	3-30 pF	C58	E3	560 pF	C83	T2	200 pF	C108	G6	5 pF
C9	B5	25 pF	C34	D3	3-30 pF	C59	E4	910 pF	C84	U2	200 pF	C109	H6	10 pF
C10	B6	25 pF	C35	D4	3-30 pF	C60	E5	1600 pF	C85	T2	0.05 pF	C110	—	Not used
C11	G2	500 pF	C36	D5	3-30 pF	C61	E6	2500 pF	C86	U2	470 pF	C111	G6	2-20 pF
C12	G3	187.2 pF	C37	D6	3-30 pF	C62	M4	30 pF	C87	U2	100 pF	C112	H6	470 pF
C13	H3	0.1 µF	C38	D3	25 pF	C63	M3	187.2 pF	C88	U3	50 pF	C113	P5	8 µF
C14	I2	3-30 pF	C39	D4	25 pF	C64	L3	*	C89	V3	50 pF	C114	K6	0.05 µF
C15	C2	3-30 pF	C40	D5	25 pF	C65	L4	500 pF	C90	V3	0.1 µF	C115	L6	0.05 µF
C16	C3	3-30 pF	C41	D6	25 pF	C66	L2	0.05 µF	C91	S4	0.01 µF	C116	L6	0.1 µF
C17	C4	3-30 pF	C42	K3	187.2 pF	C67	M4	0.05 µF	C92	W3	0.01 µF	C117	M6	5 µF
C18	C5	3-30 pF	C43	K2	500 pF	C68	P2	0.05 µF	C93	W3	0.05 µF	C118	M6	5 µF
C19	C6	3-30 pF	C44	K3	10 pF	C69	P3	200 pF	C94	X2	0.05 µF	C119	H6	47 pF
C20	C3	25 pF	C45	L3	0.1 µF	C70	Q3	200 pF	C95	X3	500 pF	C120	S6	3-30 pF
C21	C4	25 pF	C46	L3	0.01 µF	C71	Q3	2-20 pF	C96	X3	10 µF	C121	Q3	3.3 pF
C22	C5	25 pF	C47	L2	0.05 µF	C72	Q3	33 pF	C97	X3	470 pF	C122	U4	47 pF
C23	C6	25 pF	C48	M5	25 pF	C73	Q3	2-20 pF	C98	X4	10 µF	C123	O7	0.01 µF
C24	I2	0.05 µF	C49	E2	15 pF	C74	R2	200 pF	C99	S6	200 pF	C124	Y3	0.1 µF
C25	I2	187.2 pF	C50	N5	3-30 pF	C75	R3	470 pF	C100	T6	0.05 µF	C125	I6	0.1 µF

* Cam-operated trimmer.

RESISTORS

Ref.	Loc.	Value Ohms	Ref.	Loc.	Value Ohms	Ref.	Loc.	Value Ohms	Ref.	Loc.	Value Ohms	Ref.	Loc.	Value Ohms
R1	H3	2.2 M	R16	L2	1 k	R31	U4	150 k	R46	Y2	33 k	R61	O6	22
R2	G3	2.2 M	R17	L4	1.5 k	R32	V3	680 k	R47	Y4	100 k	R62	G6	†
R3	H3	120	R18	L4	47 k	R33	V3	2.2 M	R48	T5	100 k	R63	L2	47 k
R4	H2	39 k	R19	P2	3.3 k	R34	V2	120 k	R49	T6	330 k	R64	I2	33 k
R5	I2	1 M	R20	S3	1 M	R35	V3	10 k	R50	T5	47 k	R65	S2	68 k
R6	J3	330	R21	S4	100 k	R36	W2	680 k	R51	T5	1 k	R66	R2	68 k
R7	—	Not used	R22	S4	390	R37	W3	470 k	R52	G6	3.3 k	R67	T2	27 k
R8	J3	100 k	R23	S2	68 k	R38	T4	680 k	R53	H6	330 k	R68	R6	22
R9	J2	68 k	R24	S3	100 k	R39	W2	1.5 M	R54	I6	10 k	R69	R6	2.2
R10	K3	1 M	R25	T3	1 M	R40	X2	33 k	R55	H3	100	R70	N3	220
R11	K3	220	R26	T3	220	R41	W3	330 k	R56	R6	39			
R12	L3	100 k	R27	T2	33 k	R42	W4	3.3 k	R57	N2	39	RV1	W3	2 M
R13	L5	22 k	R28	U2	22 k	R43	X3	470 k	R58	H6	47 k	RV2	K4	10 k
R14	L2	68 k	R29	U3	22 k	R44	X3	1 M	R59	O7	68			
R15	L3	100 k	R30	U3	220 k	R45	X3	1 k	R60	N3	220			

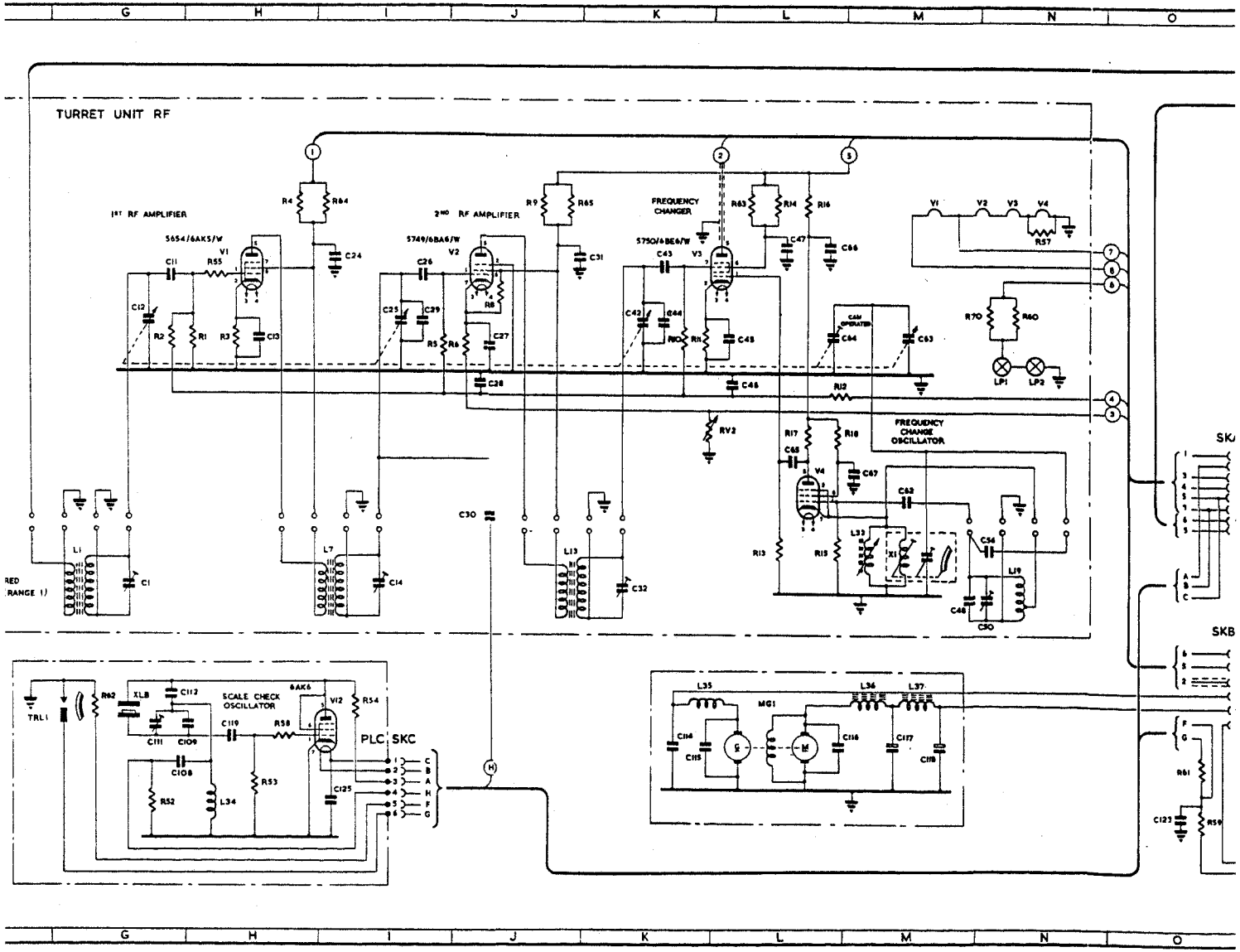
† Heater winding for crystal oven

INDUCTORS

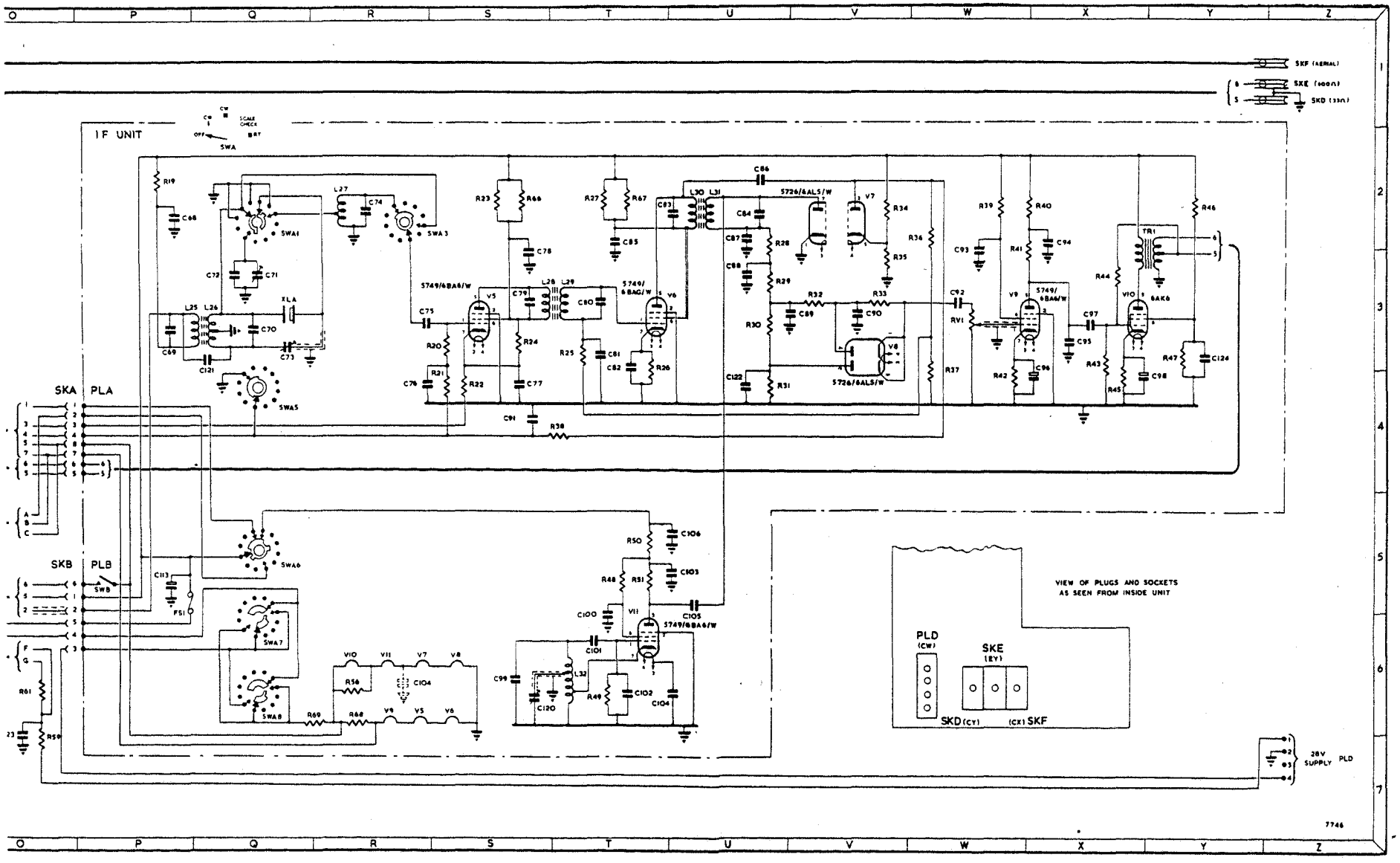
Ref.	Loc.	Ref.	Loc.	Ref.	Loc.	Ref.	Loc.
L1	G5	L11	C5	L21	E3	L31	U2
L2	B2	L12	C6	L22	E4	L32	T3
L3	B3	L13	J5	L23	E5	L33	M4
L4	B4	L14	D2	L24	E6	L34	H6
L5	B5	L15	D3	L25	P3	L35	K6
L6	B6	L16	D4	L26	Q3	L36	M6
L7	I4	L17	D5	L27	R2	L37	M6
L8	C2	L18	D6	L28	S3		
L9	C3	L19	N5	L29	T3		
L10	C4	L20	E2	L30	U2		

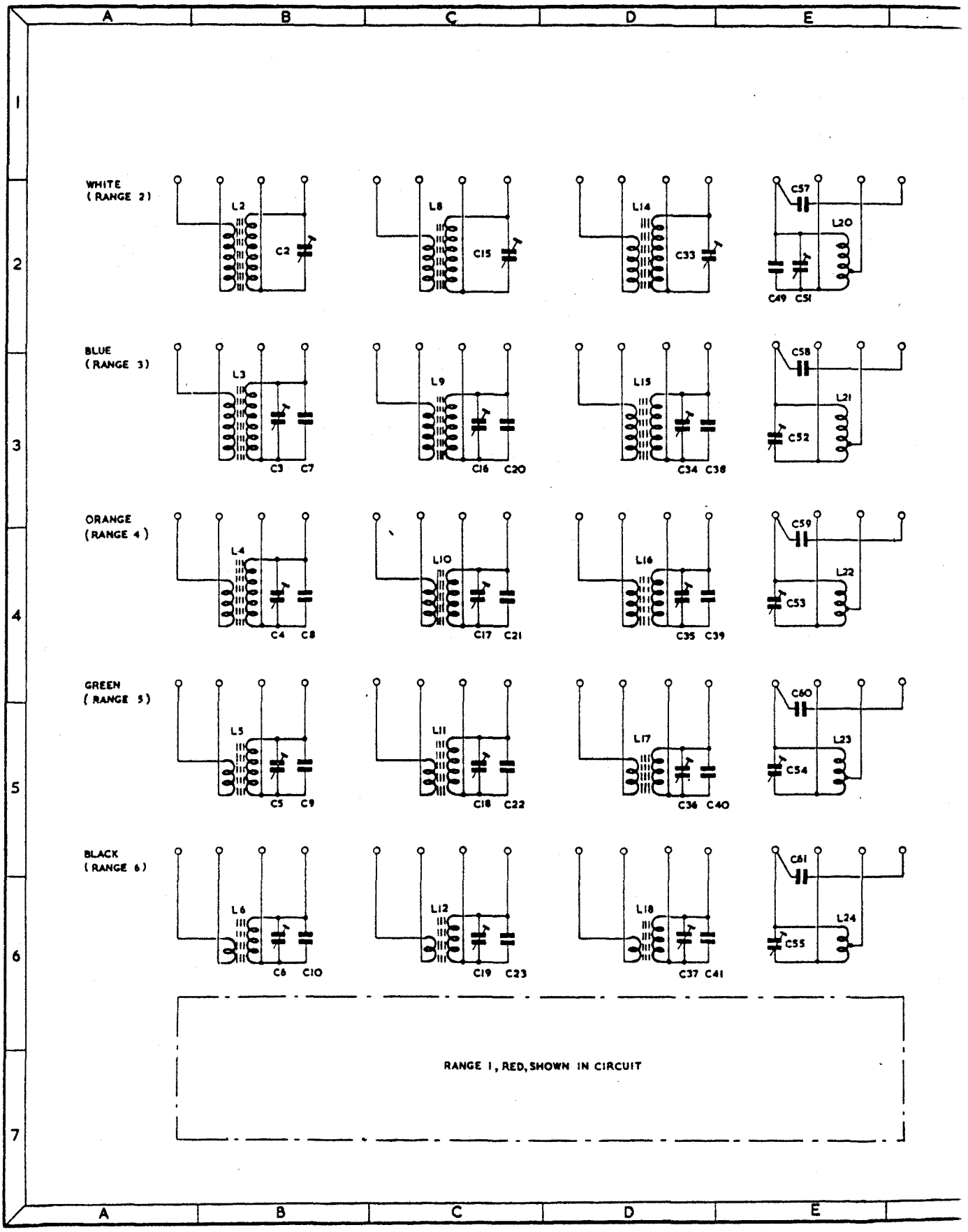
MISCELLANEOUS

Ref.	Loc.	Ref.	Loc.	Ref.	Loc.	Ref.	Loc.	Ref.	Loc.
PLA	P4	SWA6	Q5	5KF	Z1	X1	M5	V9	X3
PLB	P5	SWA7	Q6					V10	X3
PLC	I6	SWA8	Q6	TR1	Y2	V1	H2	V11	T6
PLD	Z7					V2	J2	V12	I6
		SWB	P5	TRL1	G6	V3	L3		
SWA1	Q2					V4	L4	LP1	N3
SWA2	Not	SKA	O4	MG1	L6	V5	S3	LP2	N3
	used	SKB	O5			V6	T3		
SWA3	R2	SKC	I6	XLA	Q3	V7	V2	FS1	P5
SWA4	Not	SKD	Z1	XLB	Q6	V8	V3		
	used	SKE	Z1						
SWA5	Q4								



CIRCUIT DIAGRAM OF RECEIVER


IF UNIT
SKF (AERIAL)
SKE (400Ω)
SKD (33Ω)
SKA
PLA
SKB
PLB
SWA
SWA1
SWA3
SWA5
SWA6
SWA7
SWA8
SWB
XLA
FS1
5749/6BA6/W
5749/6BA6
5726/6AL5/W
6AK6
VIEW OF PLUGS AND SOCKETS AS SEEN FROM INSIDE UNIT
PLD (CW)
SKE (EY)
SKD (CY)
(CX) SKF
28V SUPPLY
PLD
7746


A
B
C
D
E
1
2
3
4
5
6
7
WHITE
(RANGE 2)
L2
C2
L8
C15
L14
C33
C57
L20
C49
C51
BLUE
(RANGE 3)
L3
C3
C7
L9
C16
C20
L15
C34
C38
C58
L21
C52
ORANGE
(RANGE 4)
L4
C4
C8
L10
C17
C21
L16
C35
C39
C59
L22
C53
GREEN
(RANGE 5)
L5
C5
C9
L11
C18
C22
L17
C36
C40
C60
L23
C54
BLACK
(RANGE 6)
L6
C6
C10
L12
C19
C23
L18
C37
C41
C61
L24
C55
RANGE 1, RED, SHOWN IN CIRCUIT