INSTRUCTION MANUAL

EDDYSTONE

S770U
COMMUNICATIONS RECEIVER
(WITH MUTING)

STRATTON & CO. LTD.
EDDYSTONE WORKS
BIRMINGHAM 31

EDDYSTONE

"S770U"

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(WITH MUTING)

INTRODUCTION

The " S770U " is a double conversion communications superhet receiver of advanced design covering the ultra-high frequencies in the range 150 — 500 Mc/s. Provision is made for the reception of both A.M. and N.B.F.M. signals

Rugged construction and high quality components are employed throughout and the receiver may be used for continuous operation in all areas under extreme climatic conditions.

Operation will normally be from AC mains, the receiver having a built-in power unit. Provision is made for the connection of external power supplies if an AC mains supply is not available.

Ease of handling is assured by intelligent positioning of all controls, while operator fatigue is reduced by an internal muting circuit which eliminates background noise in the absence of a signal. The operator has the option of loudspeaker reception, but where conditions make this impracticable telephones may be used. The receiver can be located at a distance from the listening point, in which case an output for connection to remote lines is provided.

In addition to its use as a communications receiver, the " S770U " has many applications as a test instrument. In this role, the wide continuous frequency coverage and the simplicity of tuning are valuable assets.

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TECHNICAL INFORMATION

GENERAL

Frequency Coverage.

The complete coverage is from 150 Mc/s. to 500 Mc/s. The individual ranges are as follows (excluding overlaps).

Range 1	..	400 to 500 Mc/s.	Range 4	..	220 to 270 Mc/s.
Range 2	..	330 to 400 Mc/s.	Range 5	..	180 to 220 Mc/s.
Range 3	..	270 to 330 Mc/s.	Range 6	..	150 to 180 Mc/s.

Intermediate Frequencies.

"First IF" — 50 Mc/s. "Second IF" — 5·2 Mc/s.

Valve Sequence.

The valves and germanium diodes used are as follows :

Circuit Ref.	*Type*	*Circuit Function*
V1	6AM4 or 6AJ4	Grounded grid RF Amplifier
D1	GEX66	1st Mixer
V2	6AF4 or 6AF4A	1st Local Oscillator
V3	12AT7 (CV455)	50 Mc/s. Cascode Amplifier
V4	6AK5 or EF95 (CV850)	50 Mc/s. Pentode Amplifier
V5	12AT7 (CV455)	2nd Mixer and Local Oscillator
V6 and V7	6BA6 (CV454)	5·2 Mc/s. IF Amplifiers
V8	6AU6 (CV2524)	5·2 Mc/s. Cathode Follower
V9	6AU6 (CV2524)	F.M. Limiter
V10	6AL5 (CV140)	F.M. Discriminator
D2	GEX34	A.M. Demodulator
V11	6AU6 (CV2524)	Noise Amplifier
D3 and D4	GEX34	Noise Rectifier
V12	12AU7 (CV491)	Muting Control and 1st AF Amplifier
V13	12AU7 (CV491)	2nd AF Amplifier and Meter Control
V14	6AL5 (CV140)	Noise Limiter and AVC Rectifier
V15	VR150/30 (CV216)	Voltage Stabiliser
V16	5Z4G (CV1863)	HT Rectifier
V17	6AM5 (CV136)	AF Output Stage

Input and Output Impedances

Aerial Input	..	75 ohms (nominal) unbalanced	
IF Input	.. ..	75 ohms (nominal) unbalanced	
IF Output	.. ..	75 ohms (nominal) unbalanced	matching is not critical
Audio Input	..	0·1 Megohm (approx.)	matching is not critical
Audio Output	..	Loudspeaker : 2·5—3 ohms.	
		Lines : 600 ohms.	
		Telephones : High impedance (nominally 2000 ohms)	

Power Supply

Mains Operation ..	100/125 volts or 200/250 volts AC (40—60 c/s.) Consumption approximately 90 volt-amperes
External Power Supplies	HT : 225 volts at 115 mA LT : 6·3 volts at 4·8 Amps
Fuses	A 1·5 Amp cartridge fuse is fitted in each pole of the AC mains input. When operating from external power supplies it is advisable to fuse these supplies at their source.

PERFORMANCE

Sensitivity.

Better than 10 microvolts for an output of 50 milliwatts with a signal modulated to a depth of 30% and a signal-to-noise ratio of 15dB.

Selectivity.

The following figures are indicative of the overall selectivity of the "S770U" during A.M. reception. On F.M., the Discriminator, although designed for a N.B.F.M. deviation of 15 kc/s., will accept a deviation of up to 40 kc/s. with negligible distortion.

Response at	15	kc/s	off	resonance	3 dB down (plus or minus 2dB)
,,	,, 20	,,	,,	,,	6 dB down (plus or minus 2dB)
,,	,, 50	,,	,,	,,	20 dB down (plus or minus 3 dB)
,,	,, 100	,,	,,	,,	greater than 36 dB down.

Graphs showing the overall selectivity, the selectivity of the 50 Mc/s. IF Stages and the Discriminator characteristic appear at the rear of this manual.

Stability.

After a warming up period of fifteen minutes, the overall drift does not exceed 1 part in 10,000 per degree Centigrade at any frequency.

Image Rejection.

Image rejection figures for the six bands are as follows :

Range 1	..	20 dB down
Range 2	..	30 dB down
Range 3	..	30 dB down
Range 4	..	40 dB down
Range 5	..	45 dB down
Range 6	..	50 dB down

AVC.

The audio output level does not change by more than 12 dB when the input is varied 60 dB above 10 microvolts.

Audio Output and Response.

The AF Output Stage will deliver up to 0·5 watts to a 2·5 ohm loudspeaker. The audio response is level within 6 dB from 100 to 10,000 c/s. A response curve plotted on a typical receiver appears at the rear of the manual.

IF Output.

The maximum output of the 5·2 Mc/s. Cathode Follower is approximately 1 volt.

CIRCUIT DESCRIPTION

THE RF SECTION

For efficient operation, the RF Section of any UHF receiver must show a close integration of electrical and mechanical design. This maxim has been applied to the " S770U " and is a contributory factor to the excellent performance of the receiver as a whole.

The first stage, V1, is an RF Amplifier operating at fixed gain employing a specially designed UHF triode valve (6AJ4 or 6AM4) in a grounded grid circuit. This type of amplifier, while not providing the gain obtainable from a conventional circuit using an RF pentode, has the advantage of a much lower noise figure — a very desirable feature in a receiver operating at UHF.

After amplification in the grounded grid stage, the signal is fed to a germanium diode, D1, which functions as the 1st Mixer. Also fed to the 1st Mixer is the output from the 1st Local Oscillator, V2. This stage employs another special UHF triode (6AF4) in an ultraudion circuit. Great care has been taken to ensure a high degree of stability in this stage which operates in the fundamental mode throughout the complete coverage of the receiver. At frequencies below 330 Mc/s. the oscillator tracks " high," but on frequencies above 330 Mc/s. the oscillator operates on the low side of the signal frequency. This technique helps maintain stability on the higher frequencies in the tuning range of the receiver.

The heart of the RF Section is a miniature six position coil turret, associated with which is a miniature three gang tuning capacitor of unique construction. All components are positioned so as to ensure the shortest possible connections, and for the same reason the valve holders form an integral part of the tuning assembly.

THE IF SECTION

The output from the germanium diode mixer is fed to the 2nd Mixer via two stages of amplification at the " first IF " of 50 Mc/s. The first stage, V3, is a low noise cascode amplifier, which, in addition to its normal function, permits connection of an **external** 50 Mc/s. signal. This signal may be, for example, the output of a special convertor unit operating at a signal frequency outside the tuning range of the " S770U." Alternatively, a convertor operating on a " guard " frequency — either within or outside the tuning range of the " S770U " — may be used. In this event, reception is possible on normal and " guard " frequencies simultaneously.

The second stage of amplification, V4, uses a conventional circuit employing a miniature RF pentode, the gain of which may be adjusted by means of the IF Gain Control, R17.

The 2nd Mixer, V5, converts the 50 Mc/s. " first IF " to the " second IF " of 5·2 Mc/s. A double triode is used with one section functioning as the 2nd Local Oscillator using an ultraudion circuit and operating 5·2 Mc/s. below the " first IF."

After conversion to the " second IF " the signal is further amplified by two conventional pentode IF stages, V6 and V7. The output from the second stage feeds V8, V9, V11, one diode of V14 and the germanium diode D2.

V8 functions as a cathode follower providing a low impedance output at 5·2 Mc/s. This output may be connected to a cathode ray oscilloscope for signal monitoring purposes or may feed an external IF strip if so desired.

V9 is the F.M. Limiter feeding the Foster-Seeley F.M. Discriminator which employs the two diodes of V10.

The Noise Amplifier Valve, V11, feeds the germanium diode rectifier circuit, D3 and D4 which, in the absence of a signal provides a positive bias for one triode of V12 which acts as the Muting Control Valve. Under these conditions, the Muting Control Valve applies a " cut-off " bias to the 1st AF Amplifier so rendering it in-operative. On receipt of a signal the noise level falls, removing the positive bias from the Muting Control Valve which now allows the 1st AF Amplifier to function normally. The negative bias produced at the Limiter grid on receipt of the signal is used to hasten the action described above so ensuring a rapid recovery. The level at which the muting becomes in-operative may be varied by means of the internal Muting adjustment.

The one diode of V14 fed by V7 functions as the AVC Rectifier. AVC bias is available (if desired) for both A.M. and N.B.F.M. reception and is applied to V4, V5, V6 and V7.

The germanium diode, D2, is used as Demodulator during A.M. reception. Incorporated in the diode circuit is a series Pulse Limiter — one diode of V14 — which is effective in reducing impulse noise which may be encountered during the reception of A.M. signals. The limiter may be switched out of circuit if not required.

A voltage is available from either the A.M. Demodulator or the F.M. Discriminator for one half of V13 which functions as the Meter Control Valve. The meter operates about a " centre-zero " during N.B.F.M. reception and provides an indication of correct tuning. The meter may be used as a tuning indicator on A.M. signals but it is mainly intended for the measurement of carrier level in this mode of operation.

THE AF SECTION

The AF Section comprises two AF Amplifiers — one triode of V12 and one triode of V13 — and a pentode AF Output Stage, V17.

Facilities are provided so that the AF Section may be fed from an external source. The AF Gain Control, R54 functions with both internal and external audio signals. The Output Stage may feed either a loudspeaker or high impedance telephones together with balanced or unbalanced lines if required.

THE POWER SUPPLY SECTION

This portion of the receiver is of conventional design, V16 functioning as a full wave rectifier employing a condenser input smoothing filter. This smoothing circuit remains in use when the receiver is operated from external power supplies. The extra smoothing afforded is advantageous when using a rotary generator or vibrator unit to provide the HT supply.

Both the mains transformer and the smoothing choke have " C " cores giving high efficiency whilst keeping weight to a minimum.

The voltage stabiliser V15 provides a stabilised HT supply to V1, V2, V4 and V5. This stabilised supply is also available when using external power supplies.

CONSTRUCTION

MECHANICAL FEATURES

Overall Dimensions and Weight.

Width :	16¾" (42·5 cm.)	Depth :	15" (38·1 cm.)
Height :	8¾" (22·2 cm.)	Weight :	60 lbs. (27·2 kg.)

Cabinet.

The cabinet is stoutly made from rustproofed steel, is provided with a lift up lid and may be drawn away from the chassis by removal of four large screws at the rear. Adequate ventilation is provided by louvres in the sides and back and by perforations in the lid.

Front Panel.

The front panel is a solid aluminium diecasting to which are bolted the chassis supports. All controls are located for operating convenience along the lower half of the panel and an anodised finger plate behind the controls is labelled with their functions.

The chromium plated handles — besides their normal use in lifting the receiver — allow it to be placed " face down " without the risk of damaging any of the panel controls.

Tuning Dial.

This is individually hand calibrated on all ranges, the wide horizontal scales making for ease in reading the frequency to which the receiver is tuned.

A well designed gear drive providing a reduction ratio of approximately 140 — 1 is used to operate the ganged tuning capacitors. The drive is completely free from backlash and ensures a resetting accuracy in which human error becomes a deciding factor.

The vernier bandspread device is used in conjunction with the bottom horizontal scale to provide 2500 " logging " divisions on each range. By use of this feature, each scale is expanded to the equivalent of 34 feet.

Chassis.

Sub-chassis construction is employed throughout. All units are of silver plated brass or rustproofed steel and ensure a rigid assembly when fitted together. The coil turret housing is an aluminium diecasting.

Steel protecting rails allow the chassis to be placed in any desired position when removed from the cabinet.

FINISH

Exterior.

Deep polychromatic grey wrinkle.

Interior.

Smooth " radio " grey.

INSTALLATION

MOUNTING

The " S770U " as supplied, is suitable for table mounting only. The receiver can be supplied with a special cabinet when rack mounting is required. This cabinet is provided with rack mounting plates, and when these are fitted, the receiver may be mounted in a standard rack. (19 inch width). The fixing slots conform to the Post Office standard for rack mounting panels.

If the receiver is to be table mounted, it may be advantageous in certain situations to have it firmly bolted to the operating table. " Fixing Plates " are available for this purpose and may be ordered separately under the part number 5344P — deep grey polychromatic wrinkle being the finish required. Two plates are needed and these are supplied complete with fixing screws.

Another useful accessory for table mounting is the " Receiver Mounting Block." A pair of these will lift up the front of the receiver and give a more convenient operating position. The catalogue number to be quoted when ordering is 774/B, it being unnecessary to state the finish required.

EXTERNAL CONNECTIONS

Mains.

A three-core mains lead is provided, one end being terminated in a suitable plug for connection to the receiver. The other end is left free so that the user may fit a plug of a type suitable for connection to the local mains supply. The Octal " shorting " plug must be inserted in the " EXTERNAL POWER SUPPLIES " socket when the receiver is operated from an AC mains supply.

External Power Supplies.

If permanent operation from external power supplies is envisaged, the Octal " shorting " plug used for AC mains operation may be utilised for connecting the supplies to the receiver. The existing internal wiring of the plug should be removed before re-wiring is commenced.

When operation is likely to be from both AC mains and external power supplies, an additional Octal plug should be obtained for connection of the external supplies. The Bulgin type P 112 is suitable for this application.

A wiring diagram showing the plug connections for operation from external supplies is given with the circuit diagram. It is advisable to use heavy gauge wire for connection of the LT supply since this will reduce the voltage drop in the external cables and maintain the correct heater voltage.

The voltages necessary to operate the receiver are as follows :

HT : 225 v at 115 mA.
LT : 6·3v at 4·8 Amps.

These supplies may be obtained from any convenient source, but it should be noted that the HT negative and LT negative lines are common connections.

Aerial.

The aerial feeder should be terminated with a coaxial plug for connection to the coaxial aerial socket which is located within the receiver cabinet at the rear of the large screening box containing the tuning assembly. A suitable coaxial plug is provided with the receiver.

General information on aerials for use with the " S770U " is given later. (Appendix 'A').

Earth.

The earth terminal should be connected to a suitable earthing point via a short heavy gauge conductor.

Loudspeaker.

Connection should be made to the two " quick release " terminals marked " 2·5Ω." The right hand terminal, looking at the rear of the set, is the earthy side of the output.

A suitable speaker is the EDDYSTONE Cat. No. 688/B. This is recommended since it matches the receiver both electrically and in finish.

Telephones.

High impedance telephones may be connected by means of a standard jack plug inserted in the socket at the left hand side of the front panel. Insertion of the telephones disconnects the loudspeaker.

Line Output.

This may be balanced or unbalanced as required. When a balanced output is called for, the terminal marked " CT " (centre tap) should be strapped to the " EARTH " terminal. The terminals are of the " quick release " type.

Audio Input.

A high impedance audio source may be connected to the two " quick release " terminals at the rear of the receiver, the left hand terminal being earthed.

IF Input and Output.

Connection to these sockets should be made by means of standard coaxial plugs. (Belling Lee type L 734).

Limiter Grid.

Connection is by means of a standard jack plug, the sleeve of which is the earth connection. V9 grid current may be metered at this point, or by shunting the jack plug with a 50 K resistor, a DC voltage will become available for connection to an oscilloscope when using a sweep generator for checking the IF response.

MAINS VOLTAGE ADJUSTMENT

As despatched, the mains transformer is connected for 230/240 volt operation as indicated on the plate covering the tuner unit. Reference should be made to page 27 when the need arises to adjust to another voltage.

OPERATION

CONTROL FUNCTIONS

Tuning.

This control alters the setting of the ganged tuning capacitors and the pointer on the main tuning dial. Ease of tuning is assured by the large control knob and the high reduction ratio of approximately 140 — 1. The dial calibration is accurate to within 0·2 per cent on all ranges.

Wavechange.

Rotates the coil turret to select the correct inductances for the range required. Range indication is provided by six miniature lamps at the left hand side of the main tuning dial. No mechanical " stop " is fitted to the " Wavechange " control which may be rotated in either direction when selecting the desired range.

IF Gain

Varies the gain of the 50 Mc/s. pentode IF stage. In normal operation, with AVC in use, this control should be set to maximum and the output adjusted to a convenient level by means of the AF Gain. Adjustment of volume level by means of the IF Gain will alter the point at which the AVC delay is overcome so reducing the effectiveness of the AVC system. With the AVC out of operation, the IF Gain provides adequate control of the signal input to the Demodulator or Discriminator.

AF Gain.

Controls the input level to the 1st AF Amplifier with either internal or external audio signals. It is suggested that the AF Gain is set near maximum when AVC is not in use. Control of volume will then be by means of the IF Gain with a consequent reduction in background noise.

Signal Mode Switch.

This switch, marked " A.M. — F.M.," brings about circuit changes necessary for the desired type of reception.

Noise Limiter Switch (N.L.).

The Noise Limiter Switch is only operative during A.M. reception. With the switch placed to the " ON " position, a series type pulse limiter is introduced into the A.M. Demodulator circuit and is effective in reducing impulse noises which may be experienced during the reception of A.M. signals.

AVC Switch.

Permits a choice of automatic or manual gain control of the IF Section of the receiver depending on prevailing conditions. The AVC time constant is fixed and the AVC may be used for both A.M. and N.B.F.M. reception if so desired.

Standby Switch.

Applies a large negative bias to V4 so de-sensitising the receiver on " standby." The HT supplies remain on all stages during standby periods and the receiver functions normally immediately the switch is placed to the " ON " position. The retention of HT supplies in this way ensures that oscillator drift is negligible during periods when the receiver is not required but must be available for immediate use.

Muting Switch.

In the " OFF " position of the switch a large negative bias is applied to the Noise Amplifier so rendering it in-operative. The Muting Control Valve is also disabled by breaking its cathode return. Under these conditions the 1st AF Amplifier functions normally giving amplification to both signal and background noise.

Mains Switch.

When placed in the " OFF " position, one side of the mains supply is disconnected from the mains transformer. It should be noted that if the mains supply is connected so that the switch lies in the neutral pole, the mains transformer primary winding will still be live when the receiver is switched off. This is avoided if the red lead is connected to the live side of the mains supply.

Internal Controls.

In addition to the panel controls described above, three internal pre-set controls are provided. Access to these controls is by lifting the lid of the cabinet, while adjustments may be carried out using a screwdriver. The three controls are as follows.

Muting.

This control is connected in the cathode circuit of the Noise Amplifier and provides a means of adjusting the signal level at which the muting is rendered in-operative.

Zero—A.M.

Adjustment of this control allows the meter reading to be set to zero when it is desired to use the meter for carrier level indication during the reception of A.M. signals.

Centre Zero—F.M.

On switching to F.M., the meter needle is electrically biased towards the centre of its traverse. Adjustment of the Centre Zero—F.M. control will put the needle in the dead centre of the meter scale coincident with the vertical red line. This is the correct setting required when it is desired to use the meter as a tuning indicator while receiving F.M. signals.

TUNING INSTRUCTIONS

Preliminary.

Check that the AC mains supply or external HT and LT supplies are available. Ascertain that a suitable aerial is connected, and either connect a loud speaker or, if speaker reception is not required, insert a pair of high impedance telephones into the socket at the left hand side of the front panel.

Next, place the " Mains " and " Standby " switches to " ON." (In the case of operation from external HT and LT supplies, the " Mains " switch may be left in the " OFF " position but the " Standby " switch must be " ON "). An indication that the receiver is operative is given by the illumination of the main tuning dial. One of the " range indicator " lamps should also be alight.

While the receiver is warming up, the following adjustments may be carried out. Firstly, select the required range by means of the " Wavechange " control and adjust the " Tuning " control approximately to the required frequency.

If AVC is to be used, place the " AVC " switch to " ON " and the " IF Gain " to maximum (fully clockwise). When AVC is not required, the " **AF Gain** " should be set near maximum, but whichever control is set to maximum the other should be placed at an intermediate position.

Background noise should now be heard and may be adjusted to a comfortable level by use of the " IF Gain " when not using AVC or the " AF Gain " if the AVC is in use.

A.M. Reception.

Place the " Signal Mode " switch to the " A.M." position. The receiver can now be accurately tuned to the desired signal using maximum deflection of the meter needle as an indication of the correct tuning point. Impulse noise, if troublesome, may be reduced by setting the " N.L." switch to " ON."

N.B.F.M. Reception.

Place the " Signal Mode " switch to the " F.M." position. The receiver may be accurately tuned to the desired signal using the meter as an indication of correct tuning. The receiver is accurately tuned to an F.M. signal when the meter needle is coincident with the red line at the centre of the meter scale. Incorrect tuning is indicated when the meter needle lies on either side of the centre zero. In tuning across an F.M. signal the pointer will swing first to one side, back to centre and then to the other side as the signal is tuned out. If the meter needle does not lie on the red line in the absence of a signal, reference should be made to page 11 which details the procedure to be adopted in correcting the meter zero-ing.

Muting.

If it is desired to take advantage of the muting facility, the " Muting " control should now be adjusted as detailed on page 11.

Standby.

The receiver may be de-sensitised at any time by means of the " Standby " switch which applies a cut-off bias to one of the IF Stages. The receiver functions normally immediately the switch is returned to the " ON " position, *i.e.* with the dolly down.

Use of the Receiver as an AF Amplifier.

The source of audio should be connected to the two terminals marked " AUDIO INPUT " at the rear of the receiver. The left hand terminal (viewed from the rear) is the earthy side of the input.

The receiver should be switched to standby to avoid interference from incoming signals, while the level of the audio output may be adjusted in the normal way by means of the " AF Gain."

Use of the Receiver as an IF Amplifier.

A 50 Mc/s. IF output from an external convertor should be connected through 75 ohm coaxial cable to the socket marked " IF INPUT." To avoid interference caused by signals received on the " S770U," the coil turret should be set to an intermediate position. All controls function as for normal reception with the exception of the " Tuning " and " Wavechange."

If desired, a 5·2 Mc/s. IF output is available at the " IF OUT " socket and may be connected via 75 ohm coaxial cable to an IF strip having greater selectivity than that provided by the " S770U." This external IF strip may include its own AF Section, or its audio output may be connected to the " AUDIO INPUT " terminals of the " S770U."

If the latter technique is adopted, the Signal Mode Switch on the " S770U" should be placed at " F.M." and the Discriminator valve V10 removed. This will prevent the signal passing within the " S770U " from the last IF Stage to the 1st AF Amplifier and so by-passing the external IF strip.

The noise limiter in the " S770U" will be out of circuit, but the AVC may be used if required. The IF and AF Gains will function in the normal way.

ADJUSTMENT OF INTERNAL CONTROLS

Muting.

Tune in the receiver to the required signal and adjust the IF and/or AF Gains to obtain a convenient level of signal output. Now tune the receiver slightly off the signal so that the output consists only of the background noise.

Place the "Muting" switch to "ON" and adjust the "Muting" control so that the noise just disappears. Tune back to the desired signal and ensure that it is still of the same strength and that when the distant transmitter is switched off the receiver output is effectively silenced.

The setting of the IF Gain should not be disturbed once the muting adjustment has been made. Operation on a different frequency may call for a slight change in the setting of the " Muting " control.

Meter Adjustments.

The correct procedure to be adopted in adjusting the meter zero-ing controls is as follows.

The " Zero—A.M." control must be adjusted first, controls being set as indicated below.

Signal Mode Switch	A.M. position
IF Gain	Maximum
Noise Limiter and AVC . .	Off

The aerial should be disconnected and its socket shunted by a 75 ohm carbon resistor. No signal is required. The tuning is set to the centre of any range and the " Zero—A.M." control rotated until the meter needle corresponds with the " O " mark at the left of the meter scale.

It is now in order to proceed with the adjustment of the " Centre Zero—F.M." control. An unmodulated signal on any convenient frequency within the tuning range of the receiver is fed into the aerial socket, the 75 ohm carbon resistor having been removed. The receiver (or signal generator) tuning is now adjusted for a maximum reading on the meter. (Signal Mode Switch still in the A.M. position). The output from the signal generator should now be adjusted so that a convenient meter reading (something less than full scale) is obtained.

The Signal Mode Switch is now moved to " F.M." and, without touching anything else, the " Centre Zero—F.M." control is adjusted to bring the meter needle coincident with the red line on the meter scale.

The two adjustments affect each other to a very small degree, but if the procedure outlined above is adopted, it should not be necessary to repeat either adjustment.

During A.M. reception, switching in the Noise Limiter and/or AVC will alter the meter reading slightly. These controls — and the IF Gain — should therefore be left well alone if carrying out comparative checks on carrier level.

MAINTENANCE

GENERAL

The " S770U " receiver is robustly constructed to withstand hard wear and tear. Nevertheless, it can in some ways be classed as a laboratory instrument and is therefore deserving of careful treatment.

A change of valve can be carried out by opening the lid of the cabinet. One or two valves are difficult of access but can be removed quite simply by using a suitable valve extraction tool.

When it becomes necessary to gain access to other parts of the receiver, the cabinet can be removed after withdrawal of the four large screws at the rear. Protective rails allow the receiver to be placed in any position without risk of damage.

Should the performance fall off after a period of use, the most likely reason is the ageing or partial failure of one or more of the valves. Checks should be made at the points indicated in the circuit diagram using the " voltage values " chart as a guide. It will be well to commence checks at point " R–," since, if the voltage is low here (indicating a weak rectifier valve) it will naturally be low throughout.

Complete failure, as always, can be due to any of a number of faults — a valve, a resistor or a capacitor going open circuit for example. In the majority of cases, the fault if not immediately obvious should be quickly and easily traceable by making voltage checks and, if these do not help, by logical deduction. Always suspect a simple fault until it is proved otherwise. The " S770U," by virtue of its design, lends itself to external analysis in fault finding. For instance, an audio signal applied to the " AUDIO INPUT " terminals will show immediately if the audio and output stages are at fault. Similarly, a signal generator with the output applied to the first IF Stage at a suitable level (see Alignment Instructions) will, if everything is in order, result in a correct reading on the output meter. This same procedure can be repeated at the aerial input socket with the receiver and generator tuned to a convenient frequency.

Fuse Replacement.

A fuse is fitted in each side of the mains supply, the holders being readily accessible at the rear of the receiver near the power input plug. Standard glass tubular fuses rated at 1·5 Amps are employed, two spare ones being provided in clips on the top cover of the tuner assembly.

It will be well to endeavour to ascertain the reason why a fuse has blown before putting the receiver back into operation.

Lamp Replacement.

The lamps illuminating the main dial are of the festoon type rated at 6 volts, 3 watts.

To replace, the cabinet is removed exposing the two 2BA screws which secure the lamp brackets. With these screws removed, the mounting strip can be drawn clear of the panel. It is then a simple matter to replace the lamps and restore the fittings to normal.

The pilot lamps which indicate the range in use are of the Lilliput Edison Screw type (LES for short), rated at 6·5 volts, 0·15 amps. With the receiver — minus cabinet — on end, power unit side downwards, there will be seen the knurled screw which holds the pilot lamp strip. Undoing this screw will permit the withdrawal of the strip and allow the lamps to be replaced with ease.

POINTER DRIVE WIRE REPLACEMENT

In the unlikely event of the pointer drive wire either breaking or slipping off the drive pulleys, it will be necessary to obtain a replacement wire before the fault can be rectified. In the case of the drive wire slipping off the drive pulleys, it is almost certain to foul the drive gearing, crimping the wire and rendering it unusable.

The wire used is of multi-strand stainless steel which is very strong and flexible and should only give trouble if the drive mechanism is handled roughly. Spare drive wires may be obtained by quoting the reference number SKK75A.

The procedure to be adopted in fitting a replacement wire is as follows. Reference should be made to the relevant drawing at the rear of this manual.

1. Remove the receiver cabinet.
2. Remove all knobs, switch rings, jack sockets and potentiometer nuts.
3. Remove the finger plate. (Some slight resistance will be felt in this operation. It is due to an adhesive which is applied during the initial assembly of the receiver). Remove the screws holding the coaxial sockets.
4. Place the receiver on a bench so that the panel overhangs the edge, and remove the screws and distance pillars which secure the panel handles.
5. The panel can now be removed, exercising care in easing the loose controls, etc. from their respective fixings.
6. Having taken off the panel, next withdraw the range lamp carrier by unscrewing the knurled screw at the left-hand side of the scale.
7. The scale plate must now be removed by taking out the four fixing screws. It should be noted that the left-hand screws also serve to secure the " shade fitting " for the range indicator lamps and that spacing washers are fitted to the two right-hand screws. Remove the scale by sliding down behind the pointer.
8. Next, slacken off the flywheel and slide it forward so that the vernier scale can be removed.
9. Once the vernier scale has been taken off, the complete drive wire mechanism will be clearly visible. The faulty drive wire can be removed by unsoldering from the pointer carrier and taking out the anchor screws on the two drive pulleys after these have been taken off the drive plate.
10. The tuning control should now be rotated in a clockwise direction until the tuning gang is set to minimum capacity. The right-hand drive pulley can now be replaced after one end of the new drive wire has been fitted to the anchor screw. The anchor screw should be positioned as shown in the diagram at the rear of the manual.
11. Bring the wire forward, press firmly into pulley slot and wind three turns round the pulley in a clockwise direction. To simplify the next part of the operation, the wire can be secured in the pulley grooves by means of a short length of adhesive tape.
12. Using the drawing as a guide, take the wire round the jockey wheel and the two top pulleys, applying sufficient tension to maintain the jockey wheel in a position almost touching the dial mounting bracket. The wire should pass beneath the pointer carrier.
13. Take the left-hand drive pulley, place drive wire in rearmost groove, press into pulley slot and secure to anchor screw. Refit left-hand pulley with anchor screw in position shown in diagram. The tape can now be removed from the right-hand drive pulley.
14. Refit the vernier scale but **do not secure.** Slide the flywheel back into the correct position and lock its grub screw.
15. Replace the scale plate, remembering to fit the " shade fitting " at the left-hand side and the spacing washers at the right-hand side. The range indicator lamp mounting can also be replaced.
16. Check that the tuning gang is still set to minimum capacity and set the pointer to exactly 2500 on the logging scale.
17. Temporarily secure the drive wire to the pointer carrier by means of a small piece of adhesive tape. Rotate the tuning control and check that the pointer traverse is correct. Remove the tape and solder the drive wire to the pointer carrier.
18. Set the pointer to read exactly 1200. Rotate the vernier scale so that its zero mark lies at " 12 o'clock." Tighten the two grub screws securing the vernier.
19. Replace panel, etc. by reversing operations 1 to 5.
20. Check dial calibration using an accurate signal generator or frequency meter.

RE-ALIGNMENT

The alignment of a complex receiver such as the " S770U " is a task for skilled personnel and appropriate test instruments must be available. Normally, the alignment will only require slight re-adjustment to correct any slight discrepancies which have come about through either a change of valve or ageing and possible replacement of faulty components. Full re-alignment calls for a considerable amount of work and will only be needed if it has been necessary to change coil units or IF Transformers.

The test instruments necessary for full re-alignment are as follows :—

Signal Generator(s) covering the range 5—500 Mc/s.

A Crystal Calibrator giving 1 Mc/s. and 10 Mc/s. calibration markers.

An Output Meter matched to an impedance of 2·5 ohms.

A centre zero 50—0—50 microammeter.

Re-alignment of the IF Section.

The receiver is switched on, allowed to warm up and the controls set as follows :—

Signal Mode Switch .. A.M. position.

AF and IF Gains .. .. Maximum.

Noise Limiter, Muting and AVC .. Off.

Remove the cover on the tuner assembly and also the top and bottom lids of the screened 2nd Mixer unit.

Adjust the signal generator to 5·2 Mc/s. and set the modulation depth to 30%. Connect the output meter to the 2·5 ohm speaker terminals.

To begin with, the input lead of the signal generator is connected to the grid of the final IF Amplifier V7 via a 0·01 mfd. capacitor and the attenuator adjusted until a reading is obtained on the output meter. The secondary winding (upper core) of T9 is then set for maximum reading on the meter, reducing the generator output as necessary. This adjustment is repeated with the lower core (primary winding), after which the generator output is transferred to the grid of V6. The windings of T8 are resonated with the injected signal further attenuated.

Next, the signal generator output is taken to the input grid (not the oscillator grid) of the 2nd Mixer V5, and the transformer windings of T6 (in screening box — see plan view) adjusted for maximum output.

The frequency of the signal generator is now changed to 50 Mc/s. (plus or minus 100 kc/s.) and T7 (actually the 2nd Local Oscillator coil) adjusted for maximum reading on the output meter, so ensuring the frequency of the 2nd Local Oscillator is correct.

With the signal from the generator applied next to the grid of V4, the core in T5 is rotated to bring the tuned winding to resonance.

The generator output, still at 50 Mc/s., is then taken to the coaxial socket marked " IF INPUT " (on the front panel) and the cores in T2 and T3 adjusted. These transformers form part of the tuner unit assembly, their position being shown in the drawing. Transformer T4, on the IF chassis is also brought to resonance.

There remains the transformer T1, which is the one immediately following the diode 1st Mixer. No direct connection is permissible. It is therefore necessary to tune the receiver to 180 Mc/s., inject a signal at that frequency and resonate T1 on this signal after conversion to 50 Mc/s. in the 1st Mixer.

The approximate inputs for an output of 50 milliwatts with the gain controls at maximum are as follows :—

Grid V7	16 millivolts.	Grid V4	5 microvolts.
Grid V6	360 microvolts.	Coaxial socket	
Grid V5	37 microvolts.	(IF INPUT)	1 microvolt.

Discriminator Alignment.

All the controls are set as for IF alignment with the exception of the Signal Mode Switch which should be placed at " F.M."

The signal generator should be adjusted to give an unmodulated output of 1 volt at a frequency of 5·2 Mc/s., and connected via a 0·01 mfd. capacitor to the grid of the F.M. Limiter, V9.

The centre zero microammeter is connected between pin 1 of V10 and chassis in series with a 100 K resistor. (An insulated crocodile clip should be used to connect to the valve pin). Connected in this way, the meter will read the Discriminator output, the audio output meter not being required in this operation.

Should the Discriminator be in perfect alignment at 5·2 Mc/s., the meter will read zero, and if this is so, a check can be made by moving the generator frequency either side of 5·2 Mc/s. This should result in equal deflection of the meter needle to either side. If the deflections are unequal, adjustment of the lower core (primary winding) of the transformer T10 should be made for balanced readings.

Should complete re-alignment of the Discriminator be required, set the secondary core of T10 so that it is flush with the top of the screening can and adjust the primary core (lower) for maximum deflection on the meter. Having done this, adjust the secondary core for zero reading on the meter, checking the balance by swinging the generator tuning to either side of 5·2 Mc/s. Any slight unbalance can be corrected by adjustment of the primary core. In carrying out Discriminator alignment the peak deflection to be expected on the meter is approximately 25 microamps.

Partial Re-alignment of the RF Section.

As mentioned earlier, a complete re-alignment should not be necessary and the following procedure will usually suffice except in cases where it has been necessary to change a coil unit.

Range 6 (lowest frequency scale) is selected. The signal generator and crystal calibrator are connected to the aerial socket of the receiver which is then tuned to 180 Mc/s. The 10 Mc/s. marker from the calibrator is tuned in, after which the receiver is very carefully tuned to the 1 Mc/s. signal. If the pointer setting is inaccurate, it may be corrected by means of the oscillator trimmer, C106. The calibration should now be checked along the entire scale, and the mixer trimmer (C105) and the aerial trimmer (C103) adjusted for optimum performance at 180 Mc/s.

A sensitivity check may be carried out at each end of the range and this will indicate whether further alignment is necessary.

The same procedure is followed on the other ranges using the " end " frequencies on each range as the alignment points.

On Range 1, the trimmer C132 must be adjusted as follows :—

Tune receiver to 400 Mc/s. Inject modulated signal at 300 Mc/s and adjust C132 for **minimum** output.

NOTE : C132 is not shown on the circuit diagram but is connected between contacts 3 and 4 of the **aerial** section of the Range 1 coil unit.

Complete Re-alignment of the RF Section.

All the inductance strips in the tuner unit are removed, with the exception of Range 6 (lowest frequency). The signal generator and crystal calibrator are connected as in the foregoing paragraph and checks made of the calibration accuracy at each end of the scale — 150 Mc/s. and 180 Mc/s. If the discrepancy is appreciable, the trimmer (C106) is adjusted at the high frequency end (180 Mc/s.) and the inductance (L17) at the low frequency end (150 Mc/s.). When the calibration is satisfactory, the aerial and mixer trimmers are adjusted at 180 Mc/s. It is extremely unlikely that the inductance will require adjustment but, if thought essential, the setting must be made with the receiver tuned to 150 Mc/s.

A similar procedure is carried out on the other ranges, replacing the strips one at a time and using the " end " frequencies on each range as the alignment points. It should be remembered that any alteration of inductance has an effect on the setting of the associated trimmer and the alignment should be checked several times where the inductance has been varied.

When the alignment is complete and correct, a signal of less than 10 microvolts should produce an output of 50 milliwatts for a 15 dB signal-to-noise ratio, with the equivalent of 30% modulation.

APPENDIX "A"

AERIALS FOR USE WITH THE "S770U"

The choice of aerial for use with the "S770U" is restricted in such a way that the manufacturer can do no more than suggest a number of approaches to the problem.

The user must decide at the outset whether reception is required throughout the complete frequency coverage of the receiver, or only within a few restricted bands. In the latter case, an advantage can be secured by using high gain directional aerial systems, a course which must be avoided when "general coverage" is required.

For "general coverage" it is suggested that the "Discone" type of aerial is suitable when vertical polarisation is required, while for horizontal polarisation an ideal choice is the "Biconical Dipole." Both types must be designed to match into a 75 ohm coaxial feeder for connection to the receiver.

For operation on spot frequencies or within restricted frequency bands, the type of aerial chosen will depend in the main on whether directional or omni-directional reception is required. A "Sleeve Dipole" will afford good all round coverage when mounted vertically, as will a quarter wave "Ground Plane." In the case of the latter, the feed impedance will be of the order of 30 ohms and it is advisable to use a matching transformer for connection to the feeder.

For directional reception, any of the many "Yagi" designs may be used. It should be noted that maximum gain will be obtained in a multi-director "Yagi" array, when all the directors are of the same length, while staggered director lengths will provide a wider bandwidth at the expense of forward gain. A folded dipole will have to be used, and the elements should be made of large diameter tubing to provide adequate bandwidth.

Other suitable aerials are the "Corner Reflector" and the "Colinear," "Broadside" and "End Fire" arrays. Although these types have certain advantages, they are heavier and larger than a "Yagi" system providing the same gain.

Attention must be paid to the type and length of the coaxial feeder employed, since this will attenuate the signal voltage available at the aerial. The shortest possible feeder "run" should be arranged using a good quality low loss cable, preferably of the semi-air spaced type.

Positioning of the aerial is an important consideration at UHF, and the user is advised to try the aerial in several positions in an endeavour to obtain the greatest possible signal pick up. Where a number of aerials are to be used, they should be spaced by at least twice the wavelength of the lowest frequency array to ensure freedom from interaction.

APPENDIX "B"

LIST OF VOLTAGE VALUES

The voltages are between the points indicated and chassis. Set range to Band 6, terminate aerial, Mode switch in FM position.

Set I.F. Control to max. A.F. Control to min. and " standby " switch to "ON," except for point J– when the switch is in " Standby " position.

Voltage readings are D.C. except for " P– " and " Q– " which are A.C.

Values given are for an input voltage of 240V 50 cycles using two types of meter.

It will be evident that the actual voltage indicated depends on the particular meter employed. A tolerance of ± 5% should be allowed on the values given.

Circuit Ref.	*20,000 ohms per volt*	*600 ohms per volt*	
A	106	92·5	
B	0·86	0·68	
C	34	28·5	
D	0·88	0·51	
E	165	155	
F	1·81	1·17	
G	215	214	
H	1·44	0·88	
J	143	140	
K	95	46	
L	1·35	0·82	
M	221	216	
N	4·21	3·5	
P	27·5	2·3	
Q	210	204	
R	84	49·1	
S	0·72	0·54	
T	203	196	
U	93	57·1	
V	0·9	0·68	
W	109	77·5	
X	0·37	0·29	
Y	27	18·6	
Z	98	30	
A–	0·4	0·35	
B–	165	101	
C–	1·82	0·76	
D–	80	17	
E–	4·3	1·2	
F–	210	205	
G–	197	184	
H–	8·6	7·0	
J–	32	11	(Switch in " standby " position).
K–	0·5	0·25	
L–	150	150	
M–	3·8	2·7	
N–	225	223	
P–	226	217	
Q–	226	217	
R–	256	250	
S–	33	16	
T–	26	2·5	
U–	212	84	
V–	35	34	
W–	220	163	
X–	33	24	

Input Current 320 mA A.C. H.T. Current 110 mA D.C.

APPENDIX "C"

LIST OF COMPONENT VALUES, TOLERANCES AND RATINGS

Capacitors		*Circuit Ref.*
C1	2–8 pF (nominal) 3 gang	A4 & 5
C2	2–8 pF (nominal) 3 gang	B4 & 5
C3	2–8 pF (nominal) 3 gang	C4 & 5
C4	15 pF (part of gang)	B4 & 5
C5	15 pF (part of gang)	C4 & 5
C6	20 pF Silvered Ceramic ± 10% 750V DC wkg.	A3
C7	20 pF Silvered Ceramic ± 10% 750V DC wkg.	A3
C8	6 pF Silvered Mica ± 10% 350V DC wkg.	B3
C9	10 pF Sivered Ceramic ± 10% 750V DC wkg...	B4
C10	10 pF Silvered Ceramic ± 10% 750V DC wkg. (nominal)	C2
C11	20 pF Silvered Ceramic ± 10% 750V DC wkg.	C3 & 4
C12	50 pF Silvered Ceramic ± 10% 750V DC wkg.	C4
C13	22 pF Silvered Ceramic or Vitreous ± 10% 350V DC wkg.	C3
C14	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	D1
C15	500 pF Tubular Paper ± 20% 600V DC wkg.	D & E1 & 2
C16	500 pF Tubular Paper ± 20% 600V DC wkg.	D & E5
C17	500 pF Tubular Paper ± 20% 600V DC wkg.	E3
C18	500 pF Tubular Paper ± 20% 600V DC wkg.	E4
C19	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	E5
C20	500 pF Tubular Paper ± 20% 600V DC wkg.	E5
C21	500 pF Tubular Paper ± 20% 600V DC wkg.	F5
C22	500 pF Tubular Paper ± 20% 600V DC wkg.	F2
C23	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	F1
C24	500 pF Tubular Paper ± 20% 600V DC wkg.	F3
C25	0·003 mfd Tubular Paper ± 20% 350V DC wkg.	F5
C26	500 pF Tubular Paper ± 20% 600V DC wkg.	F4
C27	50 pF Silvered Ceramic ± 10% 750V DC wkg.	G2
C28	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	G5
C29	500 pF Tubular Paper ± 20% 600V DC wkg.	G3
C30	500 pF Tubular Paper ± 20% 600V DC wkg.	G5
C31	100 pF Silvered Mica ± 5% 350V DC wkg.	G2
C32	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	G1
C33	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	G4
C34	500 pF Tubular Paper ± 20% 600V DC wkg.	G3
C35	100 pF Silvered Mica ± 5% 350V DC wkg.	G2
C36	91 pF Feed Thru' Silvered Ceramic ± 20% 750V DC wkg.	H1
C37	500 pF Tubular Paper ± 20% 600V DC wkg.	H2
C38	100 pF Silvered Mica ± 5% 350V DC wkg.	H2
C39	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	H2
C40	50 pF Silvered Ceramic ± 10% 750V DC wkg.	H2

Capacitors		*Circuit Ref.*
C41	20 pF Silvered Mica ± 10% 350V DC wkg.	H3
C42	50 pF Silvered Mica ± 10% 350V DC wkg.	H4
C43	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	H5
C44	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	H3
C45	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	H5
C46	100 pF Silvered Mica ± 5% 350V DC wkg.	J2
C47	100 pF Silvered Mica ± 5% 350V DC wkg.	J2
C48	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	J2
C49	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	J5
C50	100 pF Silvered Mica ± 5% 350V DC wkg.	K2
C51	50 pF Silvered Ceramic ± 10% 750V DC wkg.	J2
C52	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	J3
C53	100 pF Silvered Ceramic or Silvered Mica ± 10% 350V DC wkg.	J & K4
C54	100 pF Silvered Ceramic or Silvered Mica ± 10% 350V DC wkg.	J & K4 & 5
C55	0·1 mfd Tubular Paper ± 20% 350V DC wkg...	K4 & 5
C56	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	K2
C57	0·01 mfd Tubular Paper ± 20% 350V DC wkg.	L2
C58	100 pF Silvered Mica ± 5% 350V DC wkg.	L2
C59	50 pF Silvered Mica ± 5% 350V DC wkg.	L & M2
C60	50 pF Silvered Ceramic ± 10% 750V DC wkg.	L2
C61	50 pF Silvered Ceramic ± 10% 750V DC wkg.	L2
C62	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	L3
C63	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	L4
C64	10 pF Silvered Ceramic ± 10% 750V DC wkg.	L4
C65	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	L5
C66	100 pF Silvered Ceramic ± 20% 750V DC wkg.	M3
C67	100 pF Silvered Ceramic ± 20% 750V DC wkg.	M & N4
C68	50 pF Silvered Ceramic ± 10% 750V DC wkg.	N3
C69	10 pF Silvered Ceramic ± 10% 750V DC wkg.	N3
C70	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	N4
C71	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	N4
C72	0·005 mfd Tubular Paper ± 20% 250V DC wkg.	N3
C73	100 pF Silvered Ceramic ± 10% 750V DC wkg.	N2
C74	4 mfd Tubular Electrolytic 350V DC wkg.	P1
C75	0·005 mfd Tubular Paper ± 20% 250V DC wkg.	P2
C76	0·01 mfd Moulded Mica ± 20% 350V DC wkg.	Q & R2
C77	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	K6
C78	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	L6
C79	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	L6
C80	50 mfd Tubular Electrolytic 450V DC wkg.	M6
C81	50 mfd Tubular Electrolytic 450V DC wkg.	N6
C82	20 pF Silvered Ceramic ± 10% 750V DC wkg.	A6
C83	20 pF Silvered Ceramic ± 10% 750V DC wkg.	A6

Capacitors		*Circuit Ref.*
C84	1–5 pF Air Trimmer	B & C6
C85	2–12 pF Air Trimmer	C6
C86	100 pF Silvered Ceramic ± 10% 750V DC wkg.	C6
C87	1–5 pF Air Trimmer	D6
C88	1–5 pF Air Trimmer	E6
C89	2–12 pF Air Trimmer	F6
C90	100 pF Silvered Ceramic ± 10% 750V DC wkg.	F6
C91	1–5 pF Air Trimmer	G6
C92	1–5 pF Air Trimmer	G6
C93	2–12 pF Air Trimmer	A7
C94	100 pF Silvered Ceramic ± 10% 750V DC wkg.	A7
C95	1–5 pF Air Trimmer	B7
C96	1–5 pF Air Trimmer	B & C7
C97	25 pF Silvered Mica ± 5% 350V DC wkg.	C7
C98	2–12 pF Air Trimmer	C7
C99	100 pF Silvered Ceramic ± 10% 750V DC wkg.	D7
C100	1–5 pF Air Trimmer	D7
C101	1–5 pF Air Trimmer	E7
C102	25 pF Silvered Mica ± 5% 350V DC wkg.	E7
C103	2–12 pF Air Trimmer	F7
C104	100 pF Silvered Ceramic ± 10% 750V DC wkg.	F7
C105	1–5 pF Air Trimmer	G7
C106	1–5 pF Air Trimmer	G7
C107	25 pF Silvered Mica ± 5% 350V DC wkg.	H7
C108	0·01 mfd. Tubular Paper ± 20% 350V DC wkg.	G1
C109	500 pF Tubular Paper ± 20% 600V DC wkg.	E3
C110	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	H3
C111	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	H5
C112	22 pF Silvered Ceramic or Vitreous ± 10% 350V DC wkg.	C3
C113	25 pF Silvered Mica ± 5% 350V DC wkg.	H6
C114	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	G1
C115	1 pF Silvered Ceramic + ½ pF — 0 pF 750V DC wkg.	G2
C116	1 pF Silvered Ceramic ± ¼ pF 750V DC wkg.	D & E7
C117	1 pF Silvered Ceramic ± ¼ pF 750V DC wkg.	G7
C118	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	P5
C119	0·005 mfd Tubular Paper ± 20% 250V DC wkg.	P4 & 5
C120	0·005 mfd Tubular Paper ± 20% 250V DC wkg.	P4 & 5
C121	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	P4
C122	0·1 mfd Tubular Paper ± 20% 350V DC wkg.	P4 & 5
C123	5 mfd Tubular Electrolytic 50V DC wkg.	Q4 & 5
C124	0·005 mfd Tubular Paper ± 20% 250V DC wkg.	R3
C125	4 mfd Tubular Electrolytic 350V DC wkg.	R & S1
C126	0·01 mfd Moulded Mica ± 20% 350V DC wkg.	R2
C127	0·01 mfd Moulded Mica ± 20% 350V DC wkg.	S3
C128	0·01 mfd Tubular Paper ± 20% 150V DC wkg.	R3 & 4
C129	30 mfd Tubular Electrolytic 15V DC wkg.	R4 & 5
C130	30 mfd Tubular Electrolytic 15V DC wkg.	S4 & 5
C131	500 pF Tubular Paper ± 20% 600V DC wkg.	M5
C132	1–5 pF Air Trimmer. Not shown on Circuit — see Page 15.	

Resistors		Circuit Ref.
R1	3·3K ½ watt	E4
R2	22K ¼ watt	C3
R3	150 ohms ¼ watt	C3
R4	6·8K ½ watt	D1
R5	2·2K ¼ watt	E1
R6	10K ¼ watt	E2
R7	200 ohms ¼ watt	E3
R8	6·8K ½ watt	E4
R9	200 ohms ¼ watt	E5
R10	2·2K ¼ watt	E1
R11	1000 ohms ¼ watt	F1
R12	270K ¼ watt	F4
R13	200 ohms ¼ watt	F4
R14	33K ½ watt	F2
R15	100K ¼ watt	G3
R16	100K ¼ watt	G4 & 5
R17	10K Potentiometer (Part No. 4814PA)	G5
R18	Not applicable	—
R19	2·2K ¼ watt	G3 & 4
R20	2·2K ¼ watt	G1
R21	100K ¼ watt	H1 & 2
R22	22K ¼ watt	H2
R23	270K ¼ watt	H3
R24	10K ¼ watt	G & H4 & 5
R25	68 ohms ¼ watt 5%	H4 & 5
R26	2·2K ¼ watt	H1
R27	47K 1 watt	H1
R28	270K ¼ watt	J4
R29	2·2K ¼ watt	J1
R30	47K 1 watt	J1
R31	68 ohms ¼ watt 5%	J4
R32	100K ¼ watt	K4
R33	100K ¼ watt	K5
R34	47K ½ watt	J5
R35	1 Megohm ¼ watt	K4
R36	2 Megohm ¼ watt	K5
R37	100K ¼ watt	K4
R38	270K ¼ watt	K5
R39	22K ½ watt	K1
R40	100K ½ watt	L1
R41	22K ½ watt	L2
R42	68 ohms ¼ watt 5%	K4
R43	270K ¼ watt	L4
R44	270K ¼ watt	L5
R45	100K ¼ watt 5%	M3
R46	22K ¼ watt	M & N3
R47	100K ¼ watt 5%	M4
R48	470K ¼ watt	M4
R49	1 Megohm ¼ watt	N1
R50	270K ¼ watt	N1
R51	47K 1 watt	N1
R52	150 ohms ¼ watt	N3

Resistors		Circuit Ref.
R53	5000 ohm Potentiometer 3W wire wound	N4
R54	500K Potentiometer (Part No. 4103PB)	N4
R55	10K ½ watt	N4 & 5
R56	27K ¼ watt	Q1
R57	100K ½ watt	Q1
R58	47K 1 watt	Q1
R59	47K 1 watt	Q1
R60	820K ¼ watt	P2
R61	1 Megohm ¼ watt	P2
R62	1 Megohm ¼ watt	P3
R63	1 Megohm ¼ watt	Q2
R64	470K ¼ watt	P4
R65	270K ¼ watt	Q4
R66	270K ½ watt	J6
R67	1·8K 6 watt wire wound	M5
R68	270K ½ watt	M5
R69	6·8K ½ watt	M6
R70	68 ohms ¼ watt 5%	A6
R71	Not applicable	—
R72	68 ohms ¼ watt 5%	C6
R73	10K ¼ watt	E6
R74	68 ohms ¼ watt 5%	F6
R75	6·8K ¼ watt	G & H6
R76	68 ohms ¼ watt 5%	A7
R77	10K ¼ watt	C7
R78	68 ohms ¼ watt 5%	C & D7
R79	10K ¼ watt	E7
R80	68 ohms ¼ watt 5%	F7
R81	10K ¼ watt	G & H7
R82	3·3K ¼ watt	Q4
R83	6·8K ½ watt	Q4
R84	1 Megohm ¼ watt	Q & R3
R85	600 ohm Potentiometer 3 watt wirewound	Q3
R86	330 ohms ½ watt	Q4
R87	1000 ohms ½ watt	R4
R88	600 ohms Potentiometer 3 watt wirewound	R4
R89	22K ½ watt	R1
R90	10K 1 watt	R1
R91	220K ½ watt	R1 & 2
R92	6·8K ½ watt	S1
R93	3·3 Megohm ½ watt	S2
R94	470K ¼ watt	R3
R95	6·8K ½ watt	R4
R96	470K ¼ watt	S4
R97	680 ohms ½ watt	S4
R98	47K 1 watt	S3
R99	4·7K ½ watt	S4
R100	470K ¼ watt	L3
R101	1 Megohm ¼ watt	N3

ALL RESISTORS ARE 10% TOLERANCE UNLESS STATED OTHERWISE.

APPENDIX "D"

VALVE BASE CONNECTIONS

B7G Types.

Type	Pin Connections						
	1	2	3	4	5	6	7
6AF4/6AF4A ..	A	G	H	H	K	G	A
6AK5/EF95 ..	G1	K	H	H	A	G2	K
6AL5	K1	A2	H	H	K2	S	A1
6AM5	G1	G3 & K	H	H	A	—	G2
6AU6/6BA6 ..	G1	G3 (S)	H	H	A	G2	K

B9A (Noval) Types.

Type	Pin Connections								
	1	2	3	4	5	6	7	8	9
6AJ4/6AM4 ..	G	K	G	G	A	G	H	H	G
12AT7/12AU7 ..	A2	G2	K2	H	H	A1	G1	K1	H tap

Octal Types.

Type	Pin Connections							
	1	2	3	4	5	6	7	8
VR150/30 ..	—	K	—	—	A	—	—	—
5Z4G	—	H	—	A2	—	A1	—	H & K

APPENDIX "E"

SPARES

The following list contains items which can only be obtained from the manufacturer. Resistors and capacitors can be supplied if these are not available locally. Where direct equivalents are not available, a suitably rated component will be supplied in lieu.

IF Transformers.

Description	*Part No.*
T1. 1st Mixer Transformer	D2043
T2. Cascode Input Transformer	D2044
T3. Cascode Output Transformer	D2045
T4. Buffer Input Transformer	D2045
T5. Buffer Output Transformer	D2042
T6. 1st IF Transformer	D1906/1
T7. 2nd Oscillator Transformer	D2046
T8. 2nd IF Transformer	D1906/2
T9. 3rd IF Transformer	D1906/1
T10. Discriminator Transformer	D1908/1

RF Coil Units.

Description	*Part No.*
Range 1. 400—500 Mc/s.	D2158
Range 2. 330—400 Mc/s.	D2159
Range 3. 270—330 Mc/s.	D2160
Range 4. 220—270 Mc/s.	D2161
Range 5. 180—220 Mc/s.	D2162
Range 6. 150—180 Mc/s.	D2163
Coil Unit Contacts	5025P

NOTE :—Order one " micro-washer " with each contact.

Transformers and Chokes.

Description	*Part No.*
T12. Mains Transformer	4969P
T11. Output Transformer	4967PA
CH7. Smoothing Choke	4968P

Drive Assembly.

Description	*Part No.*
Drive Assembly Unit (less flywheel, drive control spindle and associated bearing)	LP2242
Drive Control Spindle and associated bearing	4055P
Flywheel (complete with screw)	5174P
Stainless Steel Driving Disc with associated gears	D1559/1
Vernier Gear	D1562/1
Condenser Gear	D2077
Pulley Gear Wheel	3954PA
Fixing screw for Pulley Gear Wheel	3958P

Drive Assembly (*continued*)

Description	*Part No.*
Pulley Wheel	3537PD
Fixing screw for Pulley Wheel	3966P
Pointer Carrier with sleeve	4443/4447P
Pointer	4650P
Pointer Carrier Guide Rod (front)	5290P
Pointer Carrier Guide Rod (rear)	5290P
Length of steel drive wire	SKK75A
Vernier Dial with hub	D1633
Glass Window	3961/1P
Window Glass Clips (top)	4439P
Window Glass Clips (bottom)	4439/1P
Scale (plain uncalibrated)	D1843/1

Knobs.

Description	*Part No.*
IF Gain Control	4984/1P
AF Gain Control	4984/1P
Noise Limiter	4984/1P
Wavechange	3146P
Tuning	3146P
Mode Switch	4669P

Switches.

Description	*Part No.*
Mains S.P.S.T.	5789P
AVC S.P.S.T.	5789P
Standby D.P.D.T.	5788P
Noise Limiter (Rotary on/off)	23
Muting D.P.D.T.	5788P

Miscellaneous.

Description	*Part No.*
Flexible Coupler	D1680
Flexible Shaft (as used on IF Gain Control)	D1958
Finger Plate	5314P
Cover Fixing Screws	3405P
Mains Input Connector (Female, non-reversible with earth clip)	D2311
Clicker Plate and Switch Rod (as used on Mode Switch)	D2145
Switch Wafer (as used on Mode Switch)	4593P
Chrome Protecting Handles	3138P
Meter (Type F2A)	4595PB
Miniature Stand-off Insulators	4823P
Potentiometer — 10,000 ohms (as used for IF Gain Control)	4814PA
Potentiometer — 0·5 Megohm (as used for AF Gain Control)	4103PB

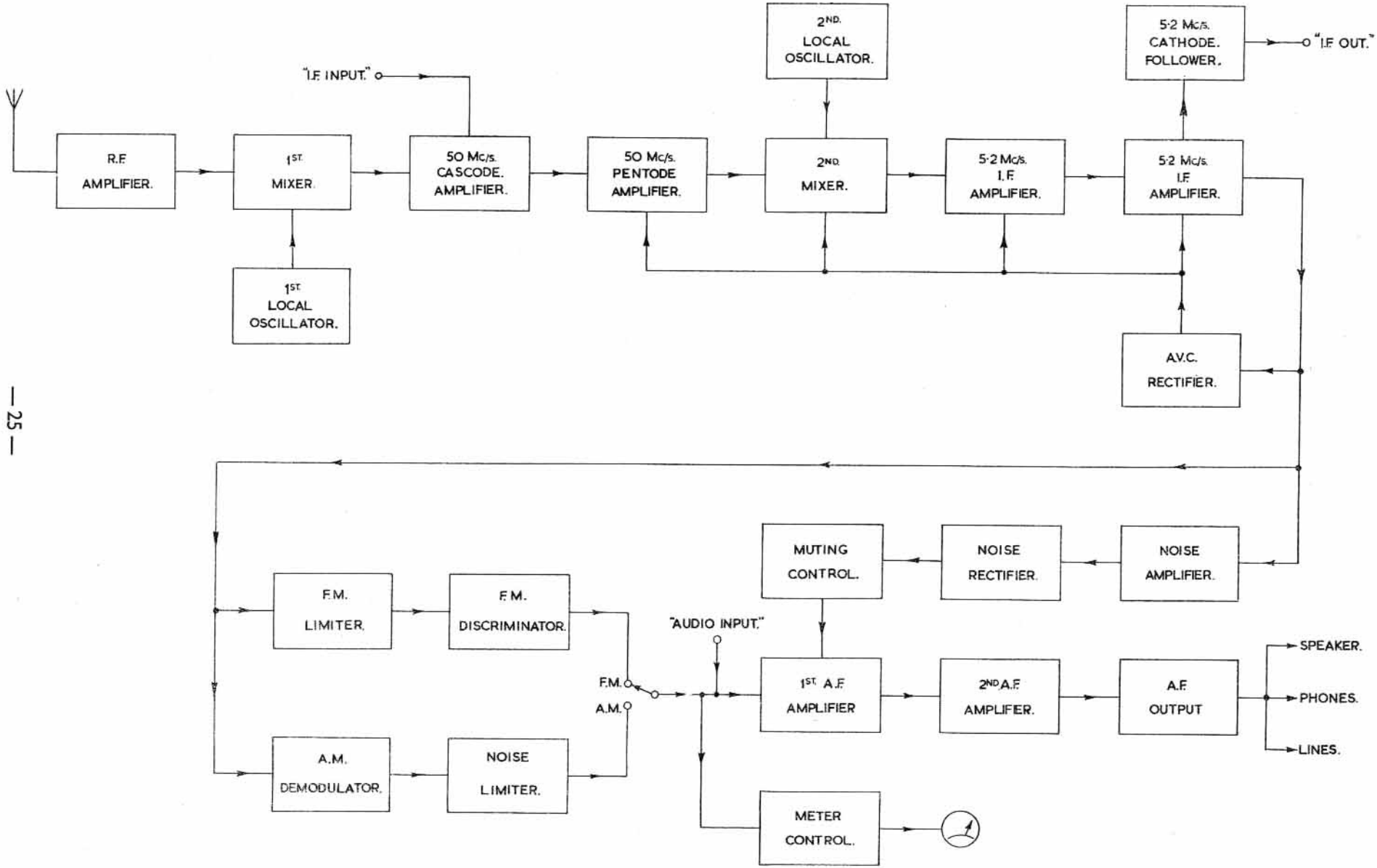


Fig. 1 Block Schematic Diagram.

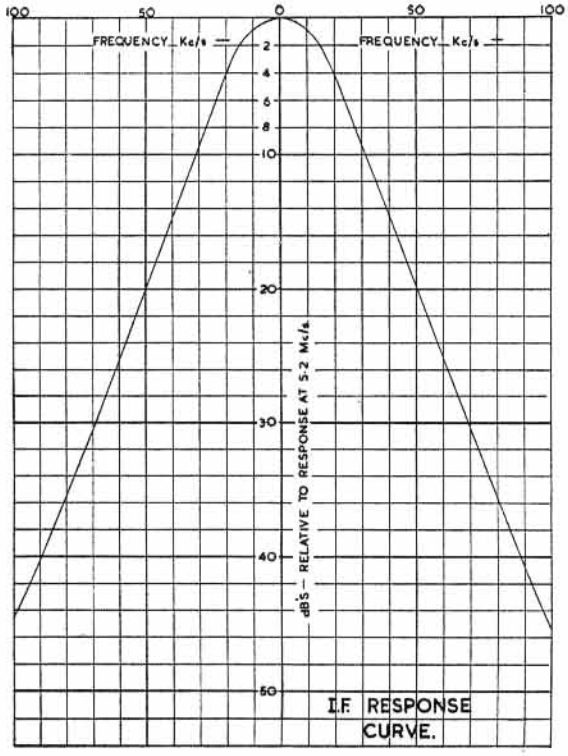


Fig. 2. Graph of Overall Selectivity

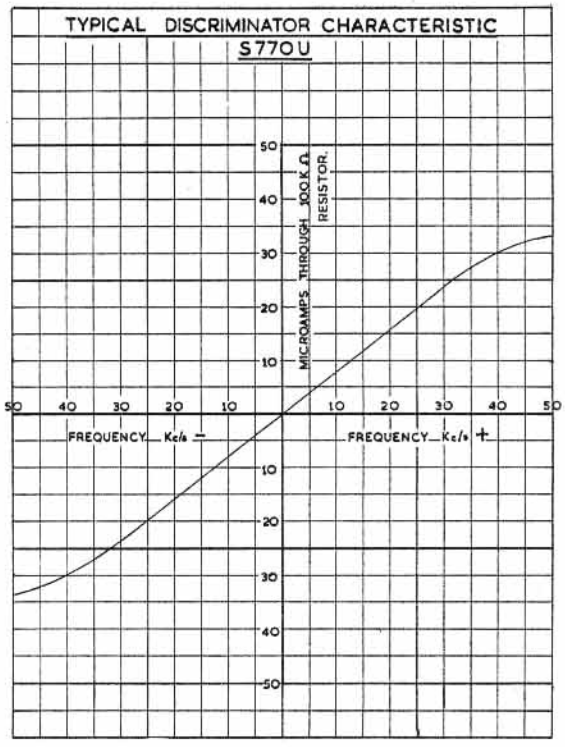


Fig. 3. Graph of Typical Discriminator Characteristic

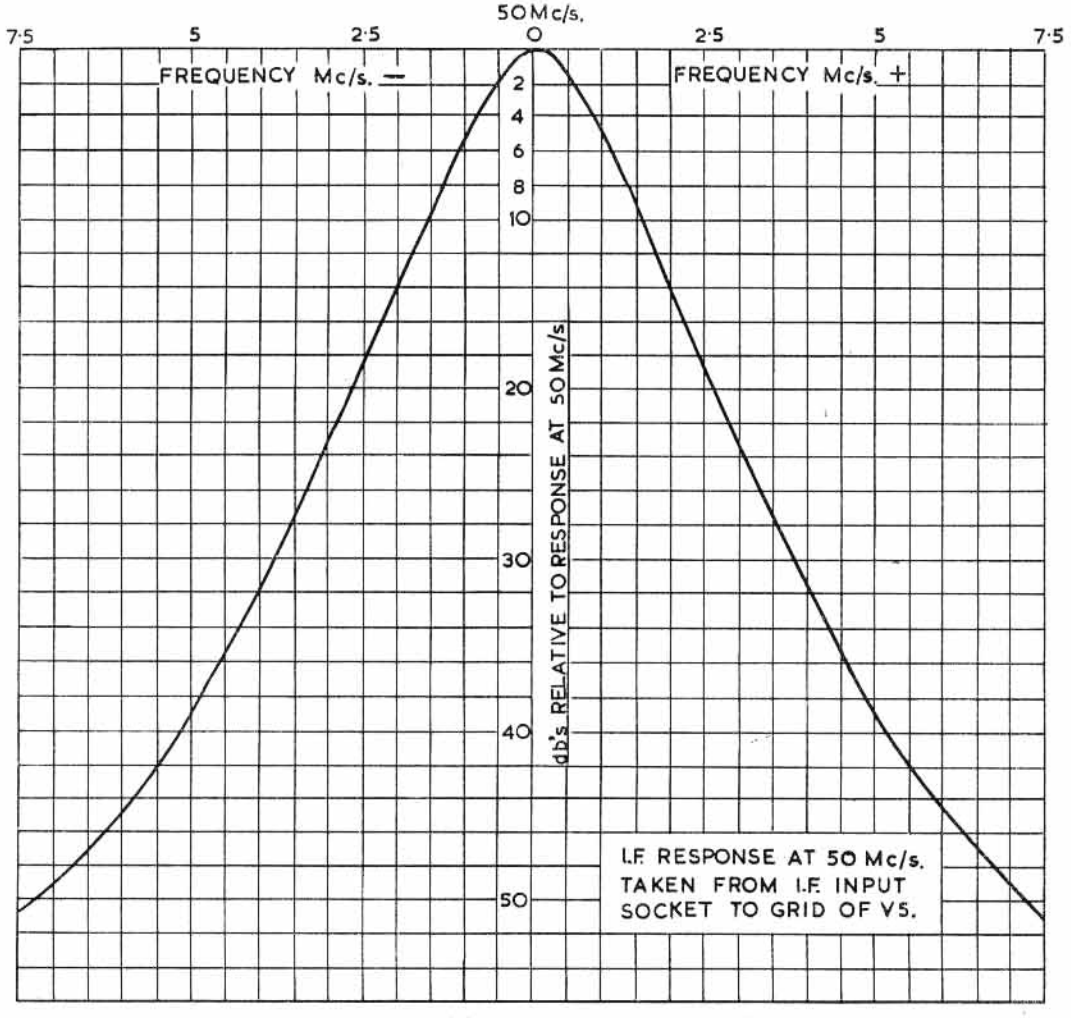


Fig. 4. Graph of Selectivity of 50 Mc/s. IF Stages

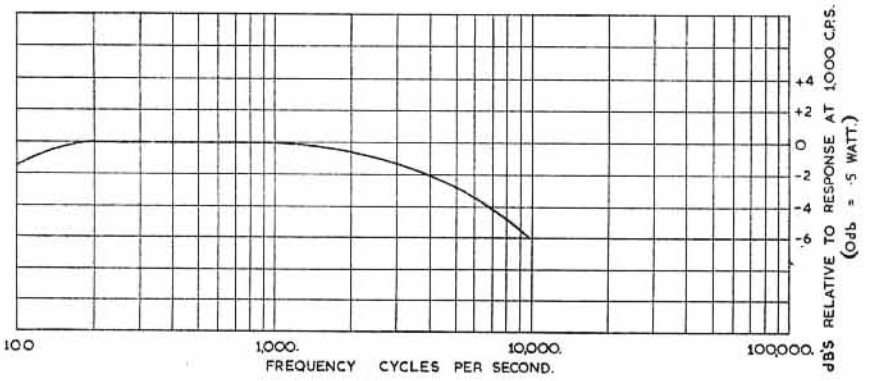
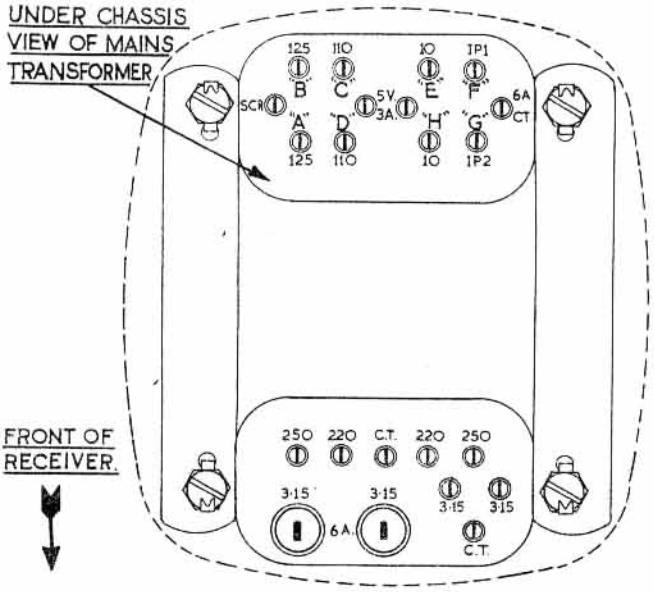


Fig. 5. Graph of Audio Response



FOR 250V. OPERATION
LINK "A" TO "F"
CONNECT INPUT TO "B" & "G"

FOR 240V. OPERATION
LINK "A" TO "E"
CONNECT INPUT TO "B" & "G"

FOR 220V. OPERATION
LINK "D" TO "F"
CONNECT INPUT TO "C" & "G"

FOR 200V. OPERATION
LINK "D" TO "E"
CONNECT INPUT TO "C" & "H"

FOR 125V. OPERATION
LINK "F" TO "G" & "A" TO "B"
CONNECT INPUT TO "A" & "G"

FOR 110V. OPERATION
LINK "C" TO "D" & "F" TO "G"
CONNECT INPUT TO "C" & "G"

Fig. 6. Mains Input Connections

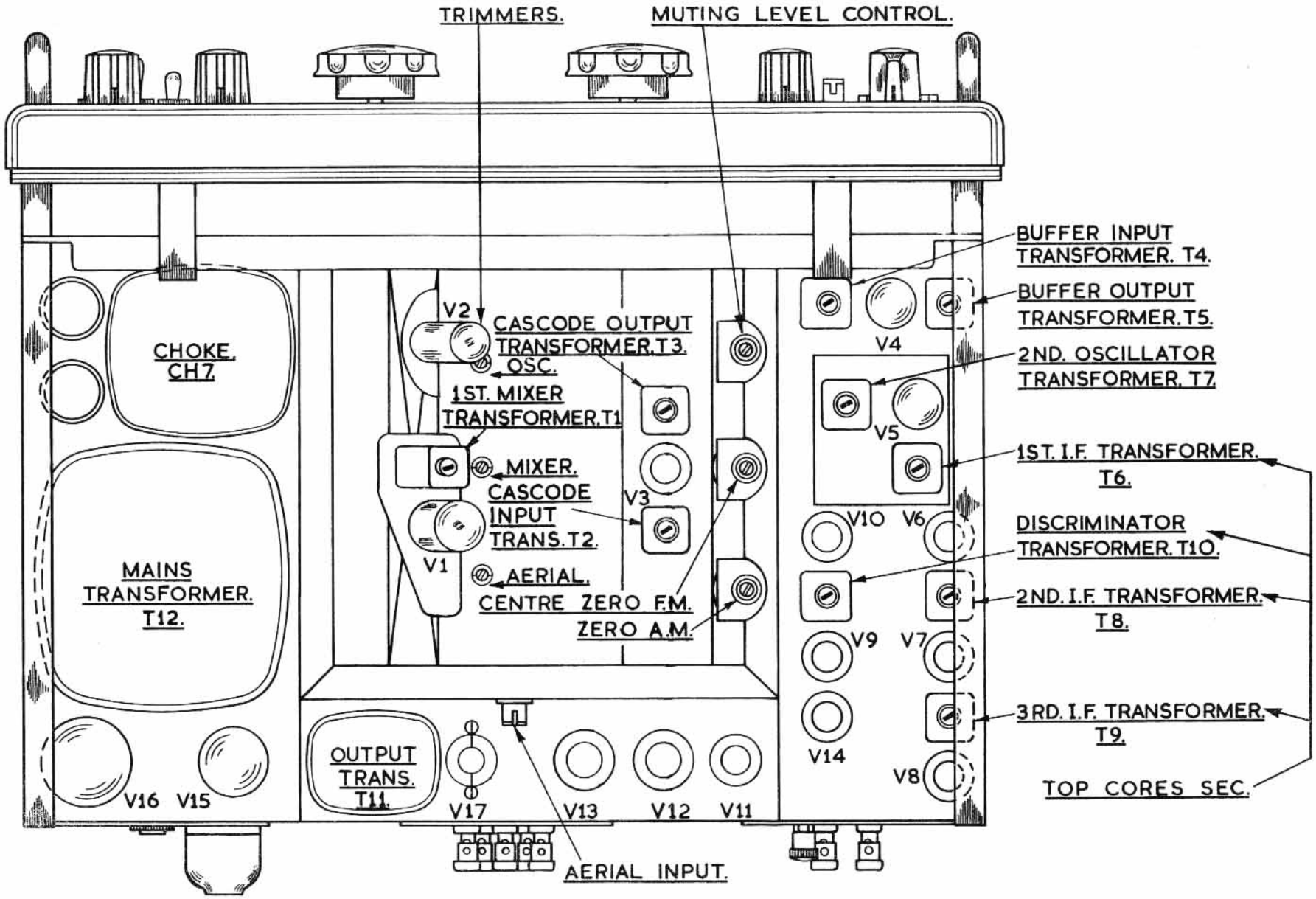


Fig. 7. Plan View (in outline)

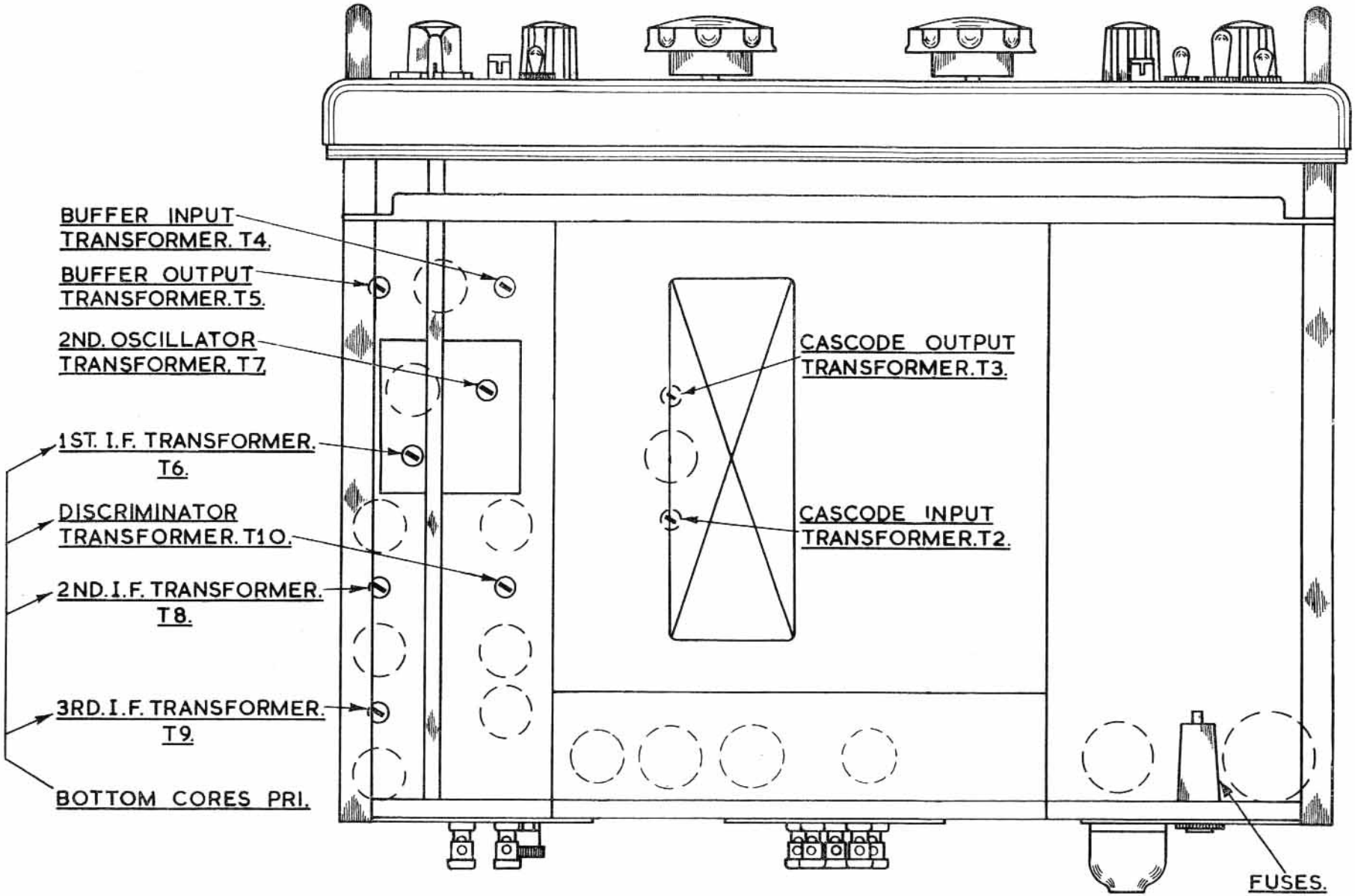


Fig. 8. Underside View (in outline)

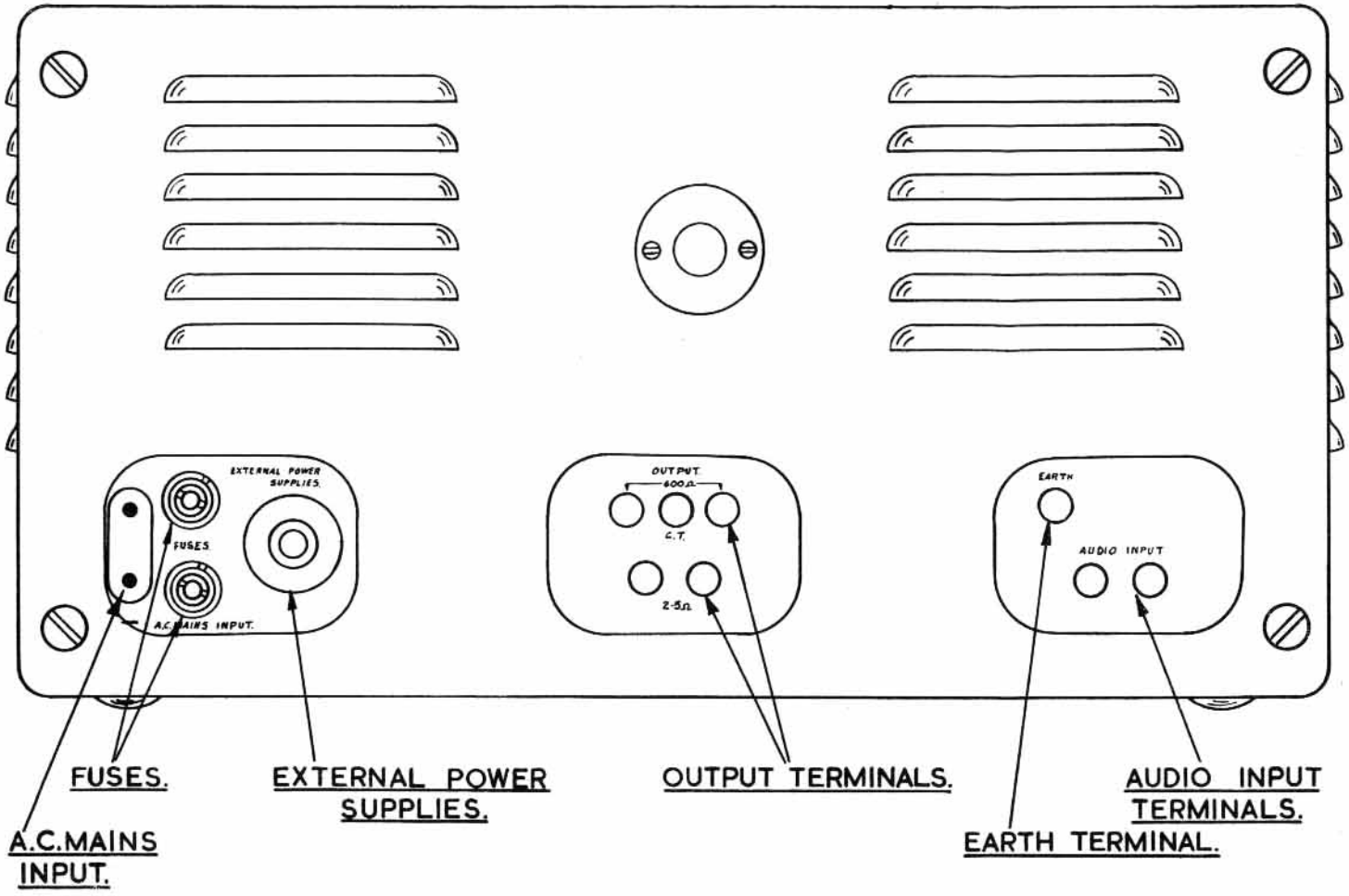


Fig. 9. Rear View (in outline)

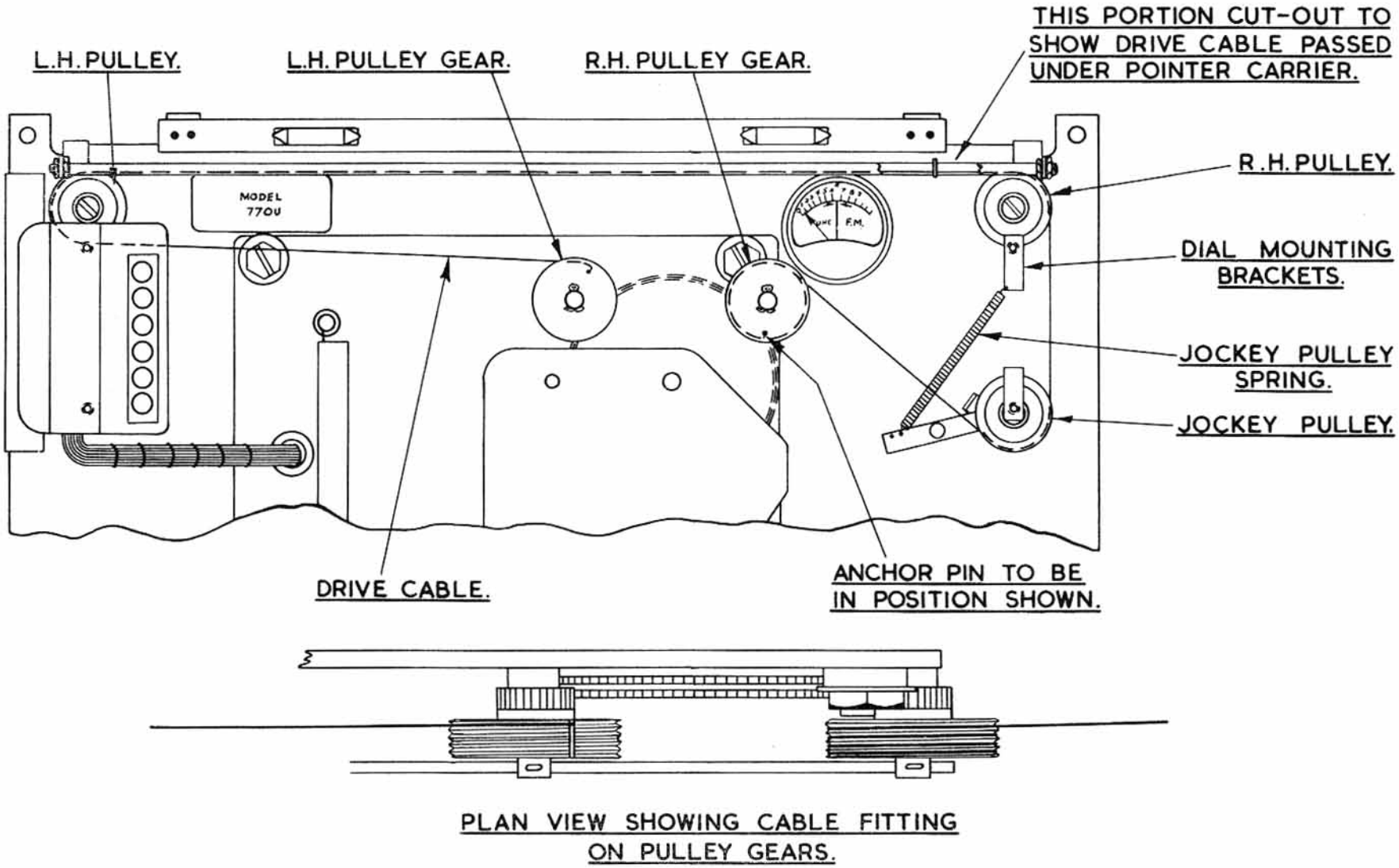
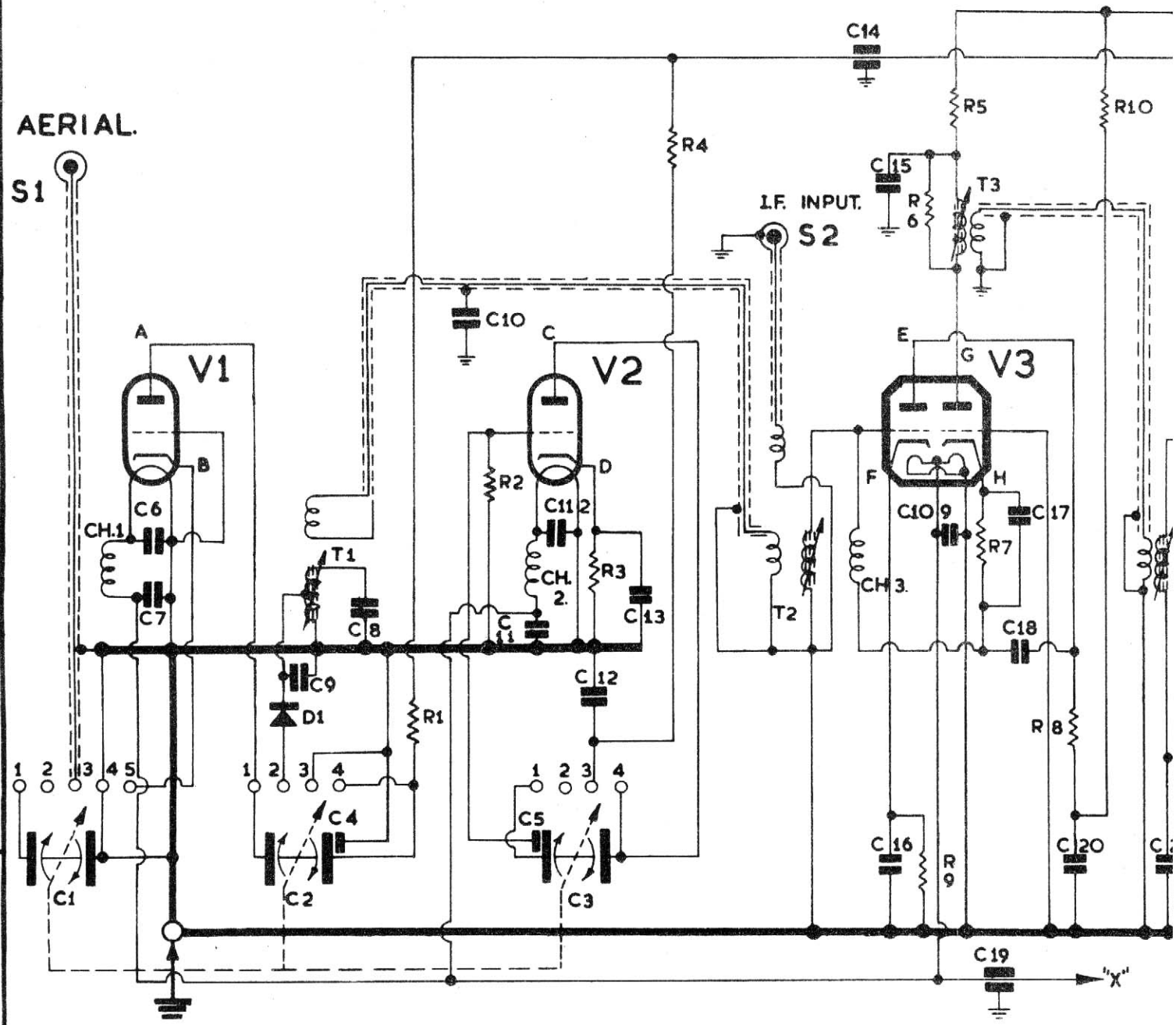
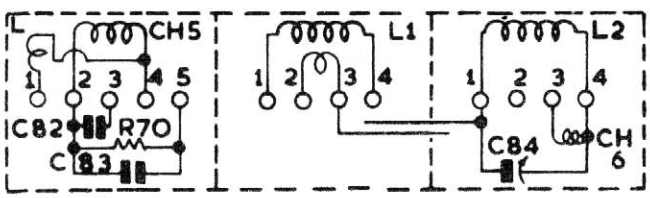
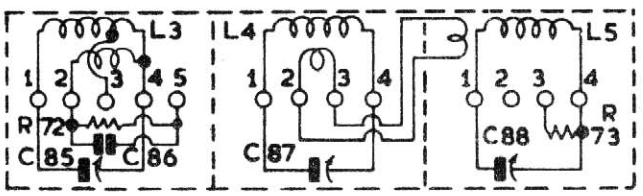


Fig. 10. Drive Cable Fitting

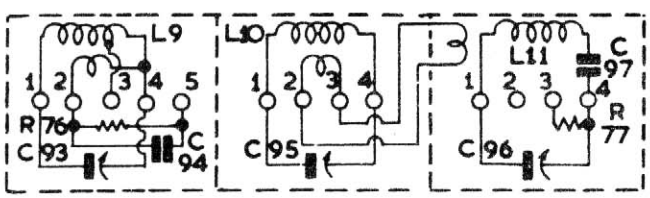




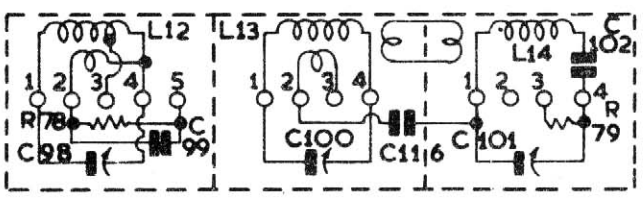
RANGE 1.



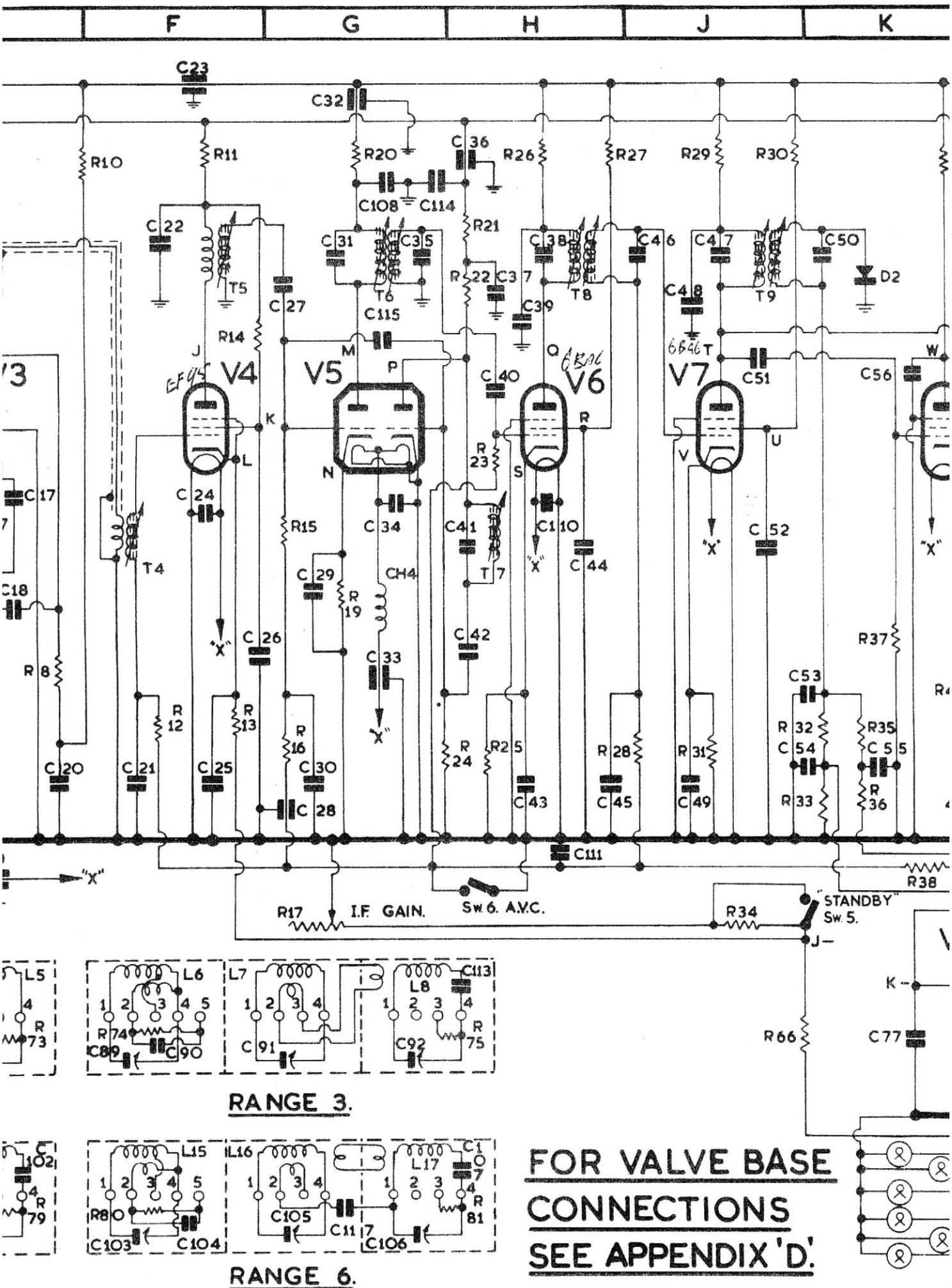
RANGE 2.

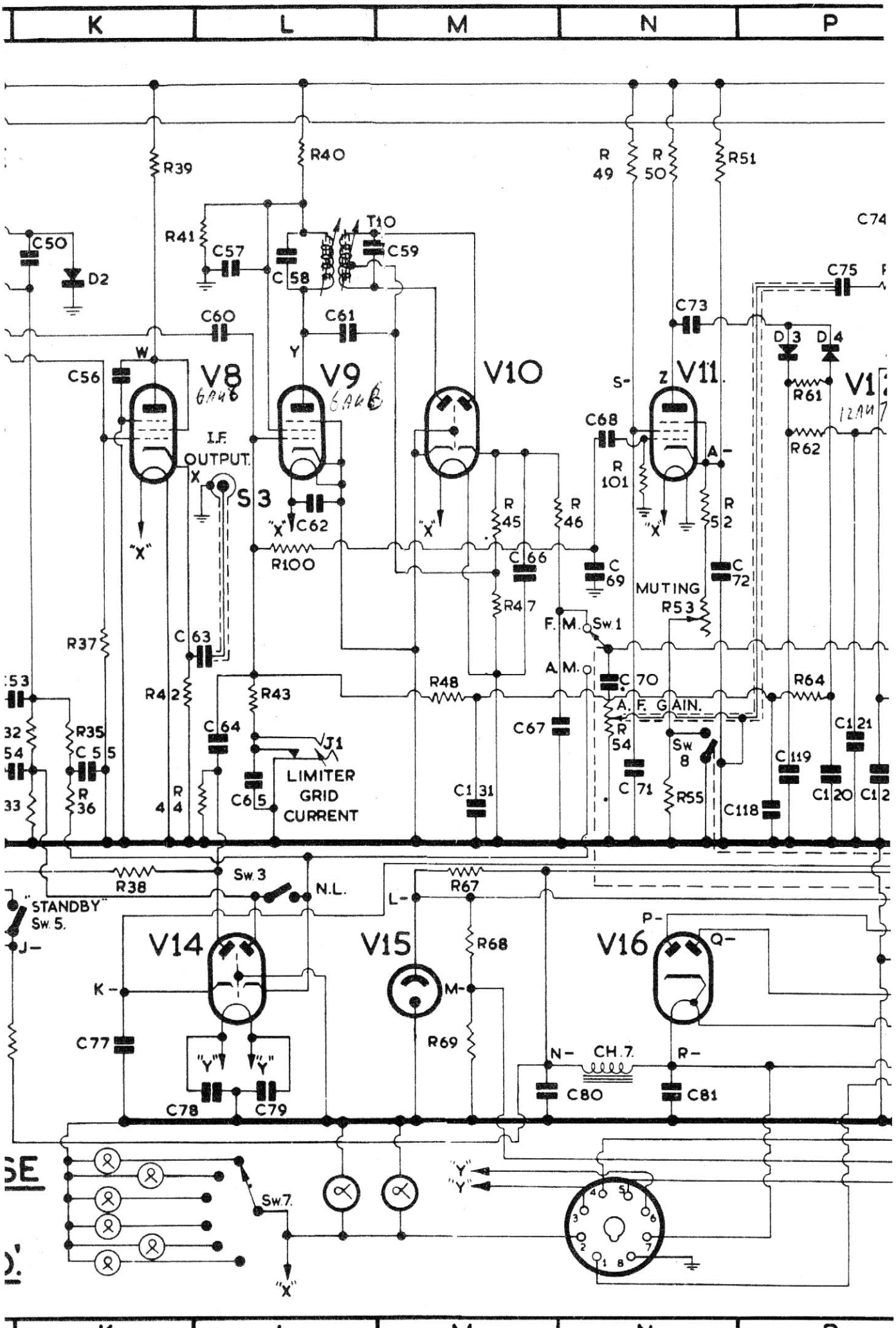


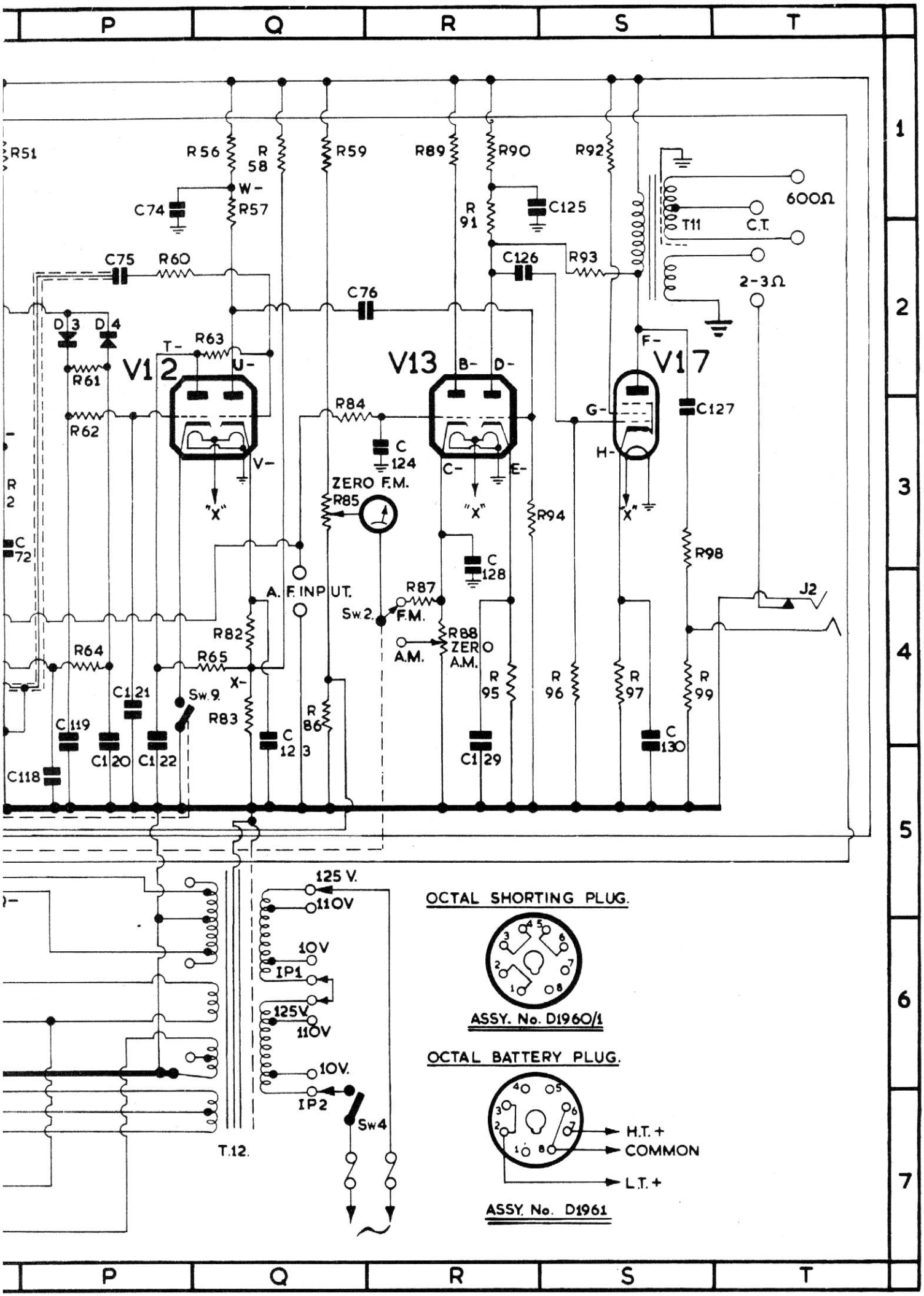
RANGE 4.



RANGE 5.


F
G
H
J
K
C23
C32
R10
R11
R20
C36
R26
R27
R29
R30
C108
C114
C22
C31
C35
C38
C46
C47
C50
R21
R22
C37
C48
D2
T5
T6
T8
T9
C27
C115
C39
R14
V4
V5
V6
V7
EF95
6BA6
6BA6
6646
C40
C51
C56
K
L
M
N
P
Q
R
S
T
U
V
W
R23
C17
C24
C34
C41
C110
C52
T4
R15
C29
R19
CH4
T7
C44
C18
C42
R37
R8
C26
C33
C53
R12
R13
R16
R32
R35
C54
C55
C20
C21
C25
C30
C28
R24
R25
R28
R31
C43
C45
C49
R33
R36
C111
R38
"X"
R17
I.F. GAIN.
Sw.6. A.V.C.
R34
"STANDBY"
Sw.5.
J
K
R66
C77
L5
L6
L7
L8
C113
R74
C89
C90
C91
C92
R73
R75
RANGE 3.
L15
L16
L17
C102
C107
R79
R80
R81
C103
C104
C105
C111
C106
RANGE 6.
FOR VALVE BASE CONNECTIONS SEE APPENDIX 'D'.


K
L
M
N
P
R39
R40
R 49
R 50
R51
C74
C50
D2
R41
C57
C 58
T10
C59
C75
C73
C60
C61
D 3
D 4
W
Y
V8
6AU6
V9
6AU6
V10
S-
Z
V11
V1
12AU7
C56
C68
R61
R62
I.F. OUTPUT
X
S3
A-
R 101
R 45
R 46
R 52
"X"
C62
R100
C 66
C 69
C 72
MUTING
R53
R47
F. M.
Sw 1
A. M.
R37
C 63
R48
C 70
R64
R42
R43
A. F. GAIN.
C67
R 54
Sw 8
C 121
C 119
J1
LIMITER GRID CURRENT
C65
C 71
R55
C118
C120
C 12
C131
R35
C 55
R 36
R38
Sw 3
N.L.
R67
L-
"STANDBY" Sw. 5.
J-
V14
V15
V16
R68
P-
Q-
K-
M-
C77
R69
N-
CH. 7.
R-
C80
C81
"Y"
"Y"
C78
C79
Sw. 7.
"X"
"Y"
"Y"


P
Q
R
S
T
1
2
3
4
5
6
7
R51
R56
R 58
R59
R89
R90
R92
W-
R57
C74
R 91
C125
600Ω
T11
C.T.
2-3Ω
C75
R60
C126
R93
C76
D3
D4
T-
R63
V12
U-
V13
B-
D-
F-
V17
R61
R62
R84
C 124
G-
C127
H-
V-
C-
E-
"X"
ZERO F.M.
R85
R94
R98
C 128
A. F. INPUT.
R87
Sw.2.
F.M.
A.M.
R88
ZERO A.M.
J2
R82
R64
R65
X-
Sw.9.
R83
R 86
C 123
C121
C119
C120
C122
C118
R 95
R 96
R 97
R 99
C 129
C 130
125 V.
110V
10V
IP1
125V
110V
10V.
IP2
Sw4
T.12.
OCTAL SHORTING PLUG.
ASSY. No. D1960/1
OCTAL BATTERY PLUG.
H.T.+
COMMON
L.T.+
ASSY. No. D1961