EDDYSTONE

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LOW FREQUENCY COMMUNICATION RECEIVER

MODEL 850/4

The EDDYSTONE Model 850/4 is a high-performance communication receiver for use on the lower frequencies in the radio spectrum. Six tuning ranges provide continuous coverage of the band 10 kc/s to 600 kc/s with reception facilities for AM and CW signals. Up to eight preselected channels can be crystal controlled for high stability applications. The receiver operates directly from all standard AC mains supplies.

A single conversion circuit is employed with an intermediate frequency of 720 kc/s and separate detectors for each signal mode. Selectivity arrangements are quite versatile and include two independent crystal filters plus a sharply tuned 1000 c/s audio filter for selective CW reception. Independent RF, IF and AF gain controls are fitted and other standard features include a built-in tuning meter, an efficient AGC system and a carrier-controlled noise limiter circuit.

Audio outputs are available for connection to an external loudspeaker, telephones and remote lines, the latter output being restricted to 10mW for direct connection to GPO circuits. A cathode follower provides a low impedance output from the intermediate frequency channel and the AGC line is brought out for convenience in diversity installations. Provision is made for desensitising the receiver when used in conjunction with a local transmitter.

Construction follows the same pattern as that used on other receivers in the Eddystone range. Styling and finish are in keeping with modern trends and the receiver is suitable for continuous operation under adverse climatic conditions.

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Sole Manufacturer:- EDDYSTONE RADIO LTD., ALVECHURCH RD., BIRMINGHAM 31, ENGLAND.

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TECHNICAL DATA

GENERAL

Frequency Coverage.

Range 1	300 - 600 kc/s
Range 2	150 - 310 kc/s
Range 3	80 - 160 kc/s
Range 4	40 - 85 kc/s
Range 5	19 - 40 kc/s
Range 6	10 - 20 kc/s

Intermediate Frequency.

720 kc/s.

Valve Complement.

V1	6BA6	(CV454)	RF Amplifier.
V2 ECH81	6AJ8	(CV2128)	Frequency Changer.
V3	6BA6	(CV454)	1st IF Amplifier.
V4	6BA6	(CV454)	2nd IF Amplifier.
V5 EAA91	6AL5	(CV140)	N/L and Meter Protection.
V6 EF94	6AU6	(CV2524)	Cathode Follower.
V7 EBC90	6AT6	(CV452)	AM Detector, Audio Amplifier and AGC.
V8 EL91	6AM5	(CV136)	Audio Output.
V9 EK90	6BE6	(CV453)	CW Detector.
V10	OD3	(CV216)	HT Stabiliser.
V11	5Z4G	(CV1863)	HT Rectifier.

Power Supply.

Single-phase AC mains 100/125V and 200/250V (40-60 c/s). Consumption : 80VA.

Input and Output Impedances.

Aerial Input . .	75 and 300Ω (balanced or unbalanced).
IF Output . .	Nominally 75Ω unbalanced but suitable for terminating impedances 75-300Ω.
Audio Output . .	Loudspeaker : 2.5/3Ω. Lines : 600Ω. Telephones : 2000Ω.

TYPICAL PERFORMANCE FIGURES

Sensitivity.

Better than 5μV for 15dB s/n ratio in AM mode at all frequencies above 100 kc/s. In the CW mode, sensitivity is better than 5μV for 15dB s/n throughout the whole frequency coverage.

Selectivity.

Three positions of IF selectivity are provided, two of which employ crystal filter circuits. Typical bandwidths are as follows:-

Pos 1 :	single crystal filter	: 400 c/s at -6dB 6 kc/s at -40dB
Pos 2 :	dual crystal filter	: 1.5 kc/s at -6dB 6 kc/s at -40dB
Pos 3 :	transformer coupling	: 6 kc/s at -6dB 15 kc/s at -40dB

A sharply tuned audio filter can be introduced to give bandwidths of the order 120 c/s at -6dB, 400 c/s at -30dB centred on 1000 c/s.

Image Rejection.

Better than 75dB at 600 kc/s.

IF Breakthrough.

Better than 70dB down at all frequencies.

Stability.

Under conditions of continuous operation after an initial warm-up period of two hours, drift during any one hour period is unlikely to exceed 200 c/s and is normally better than 100 c/s. Drift with crystal control is dependent entirely on the frequency and characteristics of the crystals employed.

Calibration Accuracy.

Scale calibration is directly in kc/s and is accurate to within 0.5% at frequencies above 100 kc/s and within 2.5% below this frequency.

IF Output.

Approximately 100mV in 75Ω for an input of 5μV at 500 kc/s with AGC in use.

AGC Characteristic.

Audio output level does not change by more than 10dB when the input is increased 80dB above 10μV at 600 kc/s.

Audio Output.

Maximum output to an external 2.5/3Ω loudspeaker is approximately 1 watt. Line o/p can be restricted to 10mW when required.

Audio Response.

Within 6dB over the range 200c/s to 5kc/s.

CIRCUIT DESCRIPTION

The RF Section.

This portion of the receiver comprises V1 (6BA6/EF93) and V2 (6AJ8/ECH81). The first stage is a conventional pentode RF Amplifier and the second a triode-heptode Frequency Changer. Both stages are built upon a diecast aluminium chassis provided with screened compartments to house the RF, Mixer and Local Oscillator coils. The three-gang tuning capacitor is mounted on top of the chassis and is protected by a dust cover.

The RF Amplifier is located towards the rear of the chassis and operates with automatic and/or manual gain control. The latter is effected by the variable resistor RV1 in the cathode circuit, this forming part of a potential divider across the main HT rail with the 100,000Ω resistor R7 as the upper part of the network. RV1 is returned to chassis via R57 which is normally short-circuited by a wire strap connected to terminals at the rear. R57 can thus be brought into circuit to extend the lower leg of the potential divider network to permit desensitising when using the receiver in conjunction with an associated transmitter. The external control switching must be arranged to open the terminals on transmit and short-circuit the terminals on receive.

AGC is shunt-fed to the RF Amplifier via R1/R2 and an improved AGC characteristic is obtained by feeding the screen of V1 from the potential divider R4/R5. AGC is <u>not</u> applied to the Mixer Stage V2A.

The primary windings of all the input coils are centre-tapped to permit connection to feeders of either 75 or 300Ω impedance. Balanced or unbalanced connection can be accommodated by suitable linking of the terminals at the rear. C11 functions as an aerial trimmer and takes the form of a panel control to allow correct alignment of the input circuits when using mis-matched antennae.

Range switching is achieved by S1a, S1b and S1c, the circuit arrangements being such that all coils are short-circuited except when actually in use. Absorption effects etc. are thus avoided since spurious resonances occur well outside the tuning range of the receiver.

Breakthrough at the 720 kc/s intermediate frequency is limited by a rejector circuit which is included in the cathode return of the RF Amplifier. The circuit comprises L7/C15 and produces current-derived negative-feedback at the unwanted frequency without affecting the operation of the amplifier at its normal tune frequency.

Tuned-secondary transformer coupling is used between the RF Stage and the heptode portion of V2 which functions as the Mixer. Damped primaries are used on certain ranges to maintain accurate tracking. Range switching is handled by S1d and S1e, both of which are arranged to short-circuit all coils except the one selected.

The triode portion of V2 functions as a tuned-anode variable frequency oscillator for normal "Manual" operation but can be switched by S8 to become a series-mode crystal oscillator for high stability applications. Some measure of temperature compensation is effected in "Manual" operation by the negative temperature coefficient capacitor C98 which is wired directly across the oscillator circuit on all ranges. Range switching is by S1f and S1g with short-circuiting arrangements as on the RF and Mixer circuits.

HT for the anode of the Local Oscillator and the screen of the Mixer Stage is taken from the stabilised 150V supply (HT2) via R54/55 and R16 respectively.

The IF/AF Stages.

IF output from the Mixer Stage is coupled via the 1st IF Transformer T1 to the Selectivity Switch S2. The secondary winding of T1 is balanced by the series-connected capacitors C37 and C38 to provide a suitable input for the two crystal filters. Both filters have pre-set phasing capacitors and are phased to provide symmetrical responses. Each has its own individual output circuit (T2 and T3) and the switching is arranged so that all unused elements are earthed to prevent stray excitation of the crystals when these are not in use. With the Selectivity Switch at "WIDE" the output from T1 is taken direct to the grid of the 1st IF Amplifier via the coupling capacitor C46.

Two stages of IF amplification are employed (V3 & V4), both of which use vari-mu pentodes of the 6BA6/EF93 type. AGC is applied and is shunt fed to the first stage and series fed to the second. Manual gain control is restricted to the 1st IF Amplifier and is effected by the variable resistor RV2 in the cathode circuit. As in the case of the RF Gain control, a bleed current is introduced (via R19) and the control is returned via the desensitising circuit to further reduce the overall gain when an associated transmitter is in use.

Variation in the screen current of the second stage of IF amplification due to AGC action is utilised to operate the Carrier Level Meter (M1). This is wired in series with the diode V5A ($\frac{1}{2}$-6AL5/EB91) and connected to a tap on the screen feed of V4. The voltage across R26 in the absence of a signal is balanced by the voltage at the slider of RV3 so that the meter reads zero under "no-signal" conditions. On receipt of a signal, the voltage across R26 decreases to unbalance the bridge network and causes the meter to read. The diode prevents possible damage to the meter in the event of reverse current flowing while adjusting RV3.

The final IF Stage feeds V6, the two diodes of V7 and the CW Detector V9.

V6 is a triode-connected pentode (6AU6/EF94) which functions as a cathode follower to provide an unrectified IF output at 720 kc/s. The output is available at a coaxial socket at the rear of the set and may be terminated in any load in the range 75-300Ω.

The first diode of V7 (6AT6/EBC90 double-diode-triode) is used as a conventional series-connected detector for reception of normal AM signals. V5B ($\frac{1}{2}$-6AL5/EB91) is incorporated in this circuit and functions as a series type noise limiter which can be taken out of circuit by means of S4 when not required. Output from the AM Detector is taken via the appropriate position of the Mode Switch (S5a) and the coupling capacitor (C66) direct to the AF Gain control RV4.

The other diode of V7 is fed from the anode of V4 via C57 and serves as the AGC Rectifier. AGC is delayed by the voltage drop across R42 and R43, the greater proportion of the voltage appearing across R43 which forms the lower part of the voltage divider R39/R43 across the main HT supply. A delay voltage of approximately 22V is obtained. AGC is applied to the RF Stage and both IF Amplifiers. The line is also brought out to a terminal at the rear for use in diversity operation. AGC is switched off by means of S3 which directly earths the control line.

CW detection is effected by V9 (6BE6/EK90) which functions as a single-valve product detector. The unit is built into a small screening can with the valve mounted on top. It is located towards the front of the Power Unit chassis.

Signal input is taken from the secondary of T5 via C68 to g3 of the valve. Output is taken via the low-pass filter comprising R63, C105 and C106 to the appropriate position of the Mode Switch (S5a) and thence to the AF Gain control RV4. HT from the stabilised line (HT2) is applied to the screen of V9 by S5b when this is set to "CW."

The triode portion of V7 (6AT6/EBC90) functions as the 1st Audio Stage and is resistance-capacity coupled to the Audio Output Stage V8 (6AM5/EL91), either direct or via the audio filter T6 dependent on the setting of S6.

The Output Stage provides outputs for connection to telephones, loudspeaker and lines. The circuit is arranged so that insertion of the telephone plug interrupts the loudspeaker output by breaking the earth return from the earthy loudspeaker terminal. The line output winding (600Ω) is electrostatically screened from the primary and the other secondary. An attenuator can be brought into circuit to limit the line output to a maximum of 10mW when connecting to GPO lines.

Power Supply Section.

This portion of the receiver is of conventional design and provides two HT supplies one of which is stabilised.

All heaters with the exception of V5 are fed from the main 6.3V secondary, the centre-tap of which is earthed to give a balanced supply. The heater of V5 is fed from the other 6.3V winding and in this case the centre-tap is maintained at some 9V above earth by the voltage divider R67/R68. This form of feed is employed to overcome the problem of hum in the noise limiter circuit and obviates the need for special selection of the 6AL5/EB91 for use in this position.

MECHANICAL CONSTRUCTION

Overall Dimensions and Weight.

Width . . .	16⅞" (43.0 cm.).	Depth . . .	15" (38.1 cm.).
Height . . .	8¾" (22.2 cm.).	Weight . . .	50 lb. (22.6 kg.).

Cabinet.

The type of cabinet provided with the Model 850/4 depends on the method of mounting which is to be employed. Cabinets are available for rack or bench-mounting. Both types are basically the same but the rack-mounting version has cut-outs along the leading edges of the vertical sides. These cut-outs extend approximately ½" back from the panel and give clearance for the two angled brackets which are attached to the rear of the panel to allow the receiver to be mounted in the rack. The brackets are provided with fixing slots which conform to the British Post Office standard for racks of 19" width.

Either form of cabinet has extensive perforation to ensure adequate ventilation. Three apertures at the rear allow access to the various terminals sockets etc. Cabinets are made of steel, suitably rust-proofed and stove-enamelled.

Front Panel.

The front panel is an aluminium diecasting and contributes great mechanical strength to the receiver as a whole. All controls are located for operating convenience along the lower half of the panel and their functions are indicated on a clearly marked finger plate. Chromium-plated panel handles are fitted for convenience in lifting the receiver and these also allow it to be placed "face-down" without damage to the panel controls when removing the cabinet for servicing etc.

Chassis Assembly.

Three separate sub-chassis make up the complete chassis assembly. The central unit is a diecast box which is divided up into sections and provided (on the underside) with an aluminium cover plate. This unit houses all the tuned circuits associated with the RF Section and is firmly attached to four large lugs which protrude from the rear of the front panel casting.

The other units are the Power Unit chassis and the IF/AF chassis. The latter is made of brass and is mounted on the right-hand side of the central RF Section to which it is firmly attached by four 2BA screws. The IF/AF chassis is also bolted to the right-hand chassis endplate which itself is attached to the panel by the same two screws used to retain the panel handle.

In the same relative position, but to the left of the central RF Section is the Power Unit chassis. This is of steel and employs the same fixing arrangements as the IF/AF chassis. In addition to the power supply circuits, this chassis also carries the CW Detector Unit.

All three sub-units are supported at the rear by a narrow back-plate which extends the full width of the receiver and is screwed to the chassis endplates.

Dial and Drive Assembly.

The main tuning control drives a spring-loaded split-gear system having a reduction ratio of approximately 140-1. The drive is flywheel-loaded, substantially free from backlash and ensures a consistently high degree of re-setting accuracy. Pointer travel is some 13" across clearly marked scales which are calibrated directly in kilocycles.

A vernier dial used in conjunction with a horizontal logging scale sub-divides the pointer travel into 2300 arbitrary divisions for scale logging purposes.

INSTALLATION

MOUNTING

Unless otherwise stipulated, 850/4 receivers are supplied complete with a standard cabinet in a form suitable for bench-mounting only. An interchangeable cabinet is available to special order and this has slots to clear the angled brackets which are fitted to the receiver proper to allow it to be mounted in a standard 19" rack. If a receiver is supplied initially as a rack-mounting unit it is designated Model 850/4/RM.

In certain bench-mounted installations it may be found advantageous to have the receiver firmly bolted to the operating table. Fixing plates are available for this purpose and can be ordered separately under the part number 5344P. Two plates are required, these being supplied complete with fixing screws.

Converting a Standard 850/4 to 850/4/RM.

1. Remove the existing cabinet (four large screws at the rear) and store for use in the event of the receiver being required as a bench-mounted unit at a later date.
2. Place the receiver on its left-hand side and remove the two screws that hold the right-hand panel handle (an 18" screwdriver will be found most suitable for this operation).

3. Remove the two spacing washers from between the sideplate and panel (store with the cabinet).

4. Slide one of the two angled brackets between the panel and the sideplate and replace the handle fixing screws.

5. Turn the receiver up the other way and repeat the operations described above in fitting the angle bracket at the left-hand side of the panel.

6. Fit the replacement cabinet.

NB Part Nos. to be quoted when ordering rack-mounting cabinets and brackets are 5911/1P and 5912P respectively.

EXTERNAL CONNECTIONS

Mains.

One end of the mains lead is left free and should be wired to a plug of a type that is suitable for connection to the local mains supply. The lead is colour-coded as follows:- Red : Live, Black : Neutral, Green : Earth.

The receiver leaves the factory with the Voltage Selector set in the 230V position which is correct for operation from AC supplies in the range 220/250V. For other voltages the Selector must be set as follows:-

100/125V . . . . 110V position. 200/220V . . . . 200V position.

The Voltage Selector is located on the side of the power transformer and is readily accessible after removal of the cabinet.

UNDER NO CIRCUMSTANCES SHOULD THE RECEIVER BE CONNECTED TO A DC SUPPLY.

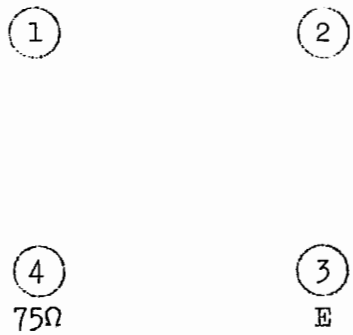
Aerial.

Aerial feed impedances of either 75 or 300Ω can be accommodated as follows:-

75Ω balanced . .	feeder to terminals 1 & 4.
75Ω unbalanced . .	feeder to terminals 1 & 4 with link between terminals 1 & 3.
300Ω balanced . .	feeder to terminals 1 & 2*.
300Ω unbalanced . .	feeder to terminals 1 & 2 with link between terminals 1 & 3.

*Link terminals 3 & 4 for centre-tapped earth.

Random wire lengths should be connected to terminal 2 with a link in position between terminals 1 & 3.



Earth.

Although the receiver chassis may be earthed by virtue of the connection to the supply earth, it may be desirable to connect a more direct earth since this will in many cases improve reception by reducing the level of background interference. Connection should be made to terminal 3 above using a short heavy-gauge wire connected to a suitable earth plate or rod.

In cases where the receiver is powered from a source which includes an earth leakage trip, check that the operation of this device is not affected by the direct earth connection.

Loudspeaker.

Connection should be made to the two quick-release terminals labelled 2.5Ω. The right-hand terminal (looking at the rear of the set) is the earthy side of the output. The circuit is arranged so that the loudspeaker output is interrupted while using telephones.

Any 2.5/3Ω loudspeaker can be used and literature on suitable loudspeaker units in the Eddystone range will be sent free on request.

Telephones.

The output impedance at the telephone socket is nominally 2000Ω but the circuit is such that telephones of almost any impedance can be used with satisfactory results. The socket is at the left-hand side of the panel and has an auxiliary contact to mute the speaker output when the telephone plug is inserted. The 600Ω output is unaffected when telephones are in use.

Line Output.

This output (marked 600Ω) can be taken at either high or low level dependent on whether or not the link is connected between the two right-hand terminals. Low-level output is obtained when the link is connected and reference to the circuit diagram will show how connection of the link introduces the line output attenuator.

Desensitising.

When using the Model 850/4 in close proximity to an associated transmitter, it will be necessary to desensitise the receiver during transmission periods to prevent overload, feedback etc. A relay contact wired across the desensitising terminals (lower terminal is earthy) should be arranged to close during reception periods and open when transmitting.

With this arrangement, monitoring of the outgoing transmission will not be possible. If monitoring is considered desirable it will be necessary to have some control over the level to which the receiver is desensitised. This can be arranged quite simply by connecting a 50,000Ω variable resistor across the desensitising terminals. The variable resistor will function as a combined RF/IF Gain control and allow a wide adjustment of the overall sensitivity.

If the transmitter is rated at more than 250 watts output, a further relay could be arranged to short down the aerial input to prevent possible damage to the aerial coils.

The two desensitising terminals must be shorted with a wire strap when the desensitising facility is not required.

AGC.

When two 850/4 receivers are operated in diversity, their AGC terminals should be strapped together with a length of screened cable. The braid can be earthed at the adjacent earth terminals located on the right-hand side of the AGC terminals.

IF Output.

Connection should be made to the standard coaxial socket by using a coaxial lead wired to a BNC type connector.

The output can be terminated in any impedance in the range 75-300Ω and has a maximum bandwidth of 6 kc/s at 6dB down. The output is suitable for direct connection to the Eddystone Model EP15 Panoramic Display Unit.

OPERATION

CONTROL FUNCTIONS

Tuning.

This control is conveniently positioned to the right of centre and alters the setting of the RF Section three-gang tuning capacitor and also the pointer on the main tuning scale. Ease of tuning is assured by the large control knob which operates a flywheel-loaded drive having a reduction ratio of approximately 140:1.

Wavechange Switch.

Selects the appropriate inductances for the range in use. Range indication is provided by means of suitable marking on the finger plate concentric with the control knob.

Crystal Selector Switch.

This is located at the rear of and concentric with the WAVECHANGE SWITCH. It has nine positions which are labelled M - A - B - C - D - E - F - G - H. In the first position (M) the receiver is arranged for normal "Manual" tuning, all crystal sockets being short-circuited to prevent accidental excitation of the crystals. When set to positions A-H the appropriate crystal is brought into circuit in series with the feedback coil in the grid circuit. Oscillation of the crystal will only occur when the grid circuit is tuned approximately to the crystal frequency.

Aerial Trimmer.

Provides a means of correctly resonating the aerial input circuit when using aerials of impedances differing widely from 75 or 300Ω. The control should always be adjusted for maximum signal or background hiss.

Gain Controls.

Three independent gain controls are fitted as follows:-

RF GAIN (RV1)	controls V1 (RF Amplifier).
IF GAIN (RV2)	controls V3 (1st IF Amplifier).
AF GAIN (RV4)	controls level of audio input to V7 (AF Amp.).

The RF and IF Gains are operated by means of concentric control knobs. The RF control is the one with the red index line.

Signal Mode Switch.

Selects audio output from the appropriate detector for CW or AM reception. HT is removed from the screen of the CW Detector when receiving AM signals.

BFO (Pitch) Control.

Varies the pitch of the audio beat when receiving CW signals. The control can be set so that the beat oscillator frequency lies on either side of the IF passband so providing a means of "single-signal" CW reception with attenuation of either the HF or LF adjacent channel as required.

Selectivity Switch.

Selects the appropriate crystal filter as required. CRYSTAL 1 position provides a 6dB bandwidth of 400 c/s and CRYSTAL 2 position 1.5 kc/s. In the WIDE position the 6dB bandwidth is 6 kc/s.

N/L Switch.

Introduces an efficient series type noise limiter to reduce impulse noise during AM reception. The limiter is not operative on CW but in this mode a high degree of limiting is inherent in the method of detection employed.

AGC Switch.

Earths the AGC line when using manual gain control.

AF Filter Switch.

Brings into circuit a selective ferrite filter for CW reception under conditions of severe adjacent channel interference.

Bandwidths of the order 120 c/s at 6dB and 400 c/s at 30dB obtain when the filter is in use. Care must be taken to ensure that the BFO is adjusted to give a 1000 c/s beat when the signal is centred in the IF passband.

Mains Switch.

A double-pole switch which breaks both sides of the mains supply to the mains transformer when the receiver is switched off.

TUNING INSTRUCTIONS

1. Ascertain that a suitable aerial is connected and that the terminals are linked as shown on page 7. Check loudspeaker leads and other connections for sound termination and verify that a link is in place across the EXT RELAY terminals. If the installation incorporates transmit/receive switching, ensure that this is set to "receive."
2. Set the MAINS SWITCH to "ON" and allow the receiver time to warm-up. An indication that the mains supply is available is given by illumination of the tuning scales.
3. Select "Manual" ("M") or "Crystal" (A-H) operation by moving the CRYSTAL SELECTOR SWITCH to the appropriate position.

   NB In the case of crystal controlled operation, a crystal of the correct frequency must be installed in the holder assembly. This necessitates removal of the cabinet. Crystal holders are labelled A, B, C etc to correspond with the panel markings for the CRYSTAL SELECTOR SWITCH. The formula for calculating the crystal frequency is:-

   CRYSTAL FREQUENCY = SIGNAL FREQUENCY + 720 kc/s.

   It is suggested that a small card is made up giving the following information. It can be attached to the outside of the receiver for the convenience of the operator.

CRYSTAL POSITION	SIGNAL FREQUENCY	VERNIER SETTING	CRYSTAL FREQUENCY
A	85 kc/s	395	805 kc/s
B			
C etc., etc.			

4. Set the SIGNAL MODE SWITCH to "AM" or "CW" to suit the signal to be received.
5. Adjust the RF GAIN, IF GAIN and AF GAIN as follows:- If using automatic gain control it is usual to advance the RF and IF controls to maximum to secure best AGC action, volume level being controlled with the AF GAIN. In the case of manual gain control the AF GAIN is advanced towards maximum, the IF GAIN is reduced towards minimum and its control range is extended by reducing the RF GAIN in the same manner if the incoming signal is very strong.

6. The IF selectivity can be set in the "WIDE" position for all initial tuning except when using Ranges 5 & 6. On these two ranges, the SELECTIVITY SWITCH should be set to "CRYSTAL 2" to avoid the possibility of misleading effects which may occur due to the proximity of the local oscillator frequency to the intermediate frequency.

7. Put the AGC SWITCH to "ON" if receiving AM signals on the higher frequency ranges. On CW, the gain is best controlled manually as described in (5) above. The AGC must be "ON" to permit use of the built-in carrier level meter.

8. Switch "OUT" the Audio Filter and switch "OFF" the Noise Limiter unless these two facilities are required. If the Audio Filter is to be used, complete all initial tuning before bringing the filter into circuit.

9. Set the WAVECHANGE SWITCH to the appropriate Range as indicated at the l.h.s. of the correct frequency scale.

10. Tune to the required frequency using the TUNING CONTROL in the normal way. The drive is flywheel-loaded and the knob can be spun for rapid traverse if necessary. In the case of crystal controlled operation, tune in the normal manner but with the CRYSTAL SELECTOR SWITCH set to the appropriate position (A-H) for the frequency in use. Care should be taken to peak the signal with the AERIAL TRIMMER after setting the TUNING CONTROL. The built-in meter can be used to facilitate this operation provided the AGC is set to "ON."

11. In the case of CW reception, be extremely careful to adjust the BFO PITCH for a beat of 1000 c/s when using the Audio Filter.

12. The pre-set METER ZERO CONTROL (at rear of receiver) should be adjusted from time to time so that the meter needle lies on the zero mark at the left of the scale in the absence of a signal. The adjustment is best made with the AGC switched off. Best meter indication will be obtained in normal operation when the RF and IF GAINS are set to maximum.

MAINTENANCE

GENERAL

The 850/4 receiver is suitable for continuous operation in all areas under adverse climatic conditions and should require very little in the way of maintenance over quite long periods of use. Normal routine maintenance schedules can be drawn up but should be restricted to such tasks as cleaning the exterior, checking the serviceability of external connections etc., etc.

The geared drive system and other mechanical arrangements will not normally require attention because initial lubrication during manufacture is carried out with a permanent lubricant (molybdenum disulphide). If additional lubrication should become necessary after the equipment has been in use for a prolonged period, this can be carried out with any light mineral oil suitable for the temperature conditions under which the receiver is operated. The lubricant should be applied very sparingly.

Receivers can be returned to the Manufacturer for advanced servicing should this become necessary. Prior arrangements should be made before despatching receivers and enquiries should be directed to the "Sales & Service Dept." at our usual address.

Dial Lamp Replacement.

Faulty dial bulbs can be changed quite simply after removal of the cabinet. To free a holder from the support strip, merely squeeze its two sides together and pull away from the strip. The bulbs are standard bayonet types with a rating of 6.5V @ 0.3A.

Fuse Replacement.

The mains input fuse is located at the rear of the receiver and is readily accessible for replacement in the event of failure. Replacement fuses should be rated at 1 Amp and are of the cartridge type with o/s dimensions $1\frac{1}{4}$" x $\frac{1}{4}$". Two spare fuses are supplied with the receiver (located in clip on gang cover).

Valve Replacement.

All valves are immediately accessible on removal of the cabinet. The majority are fitted with screening cans and care should be taken to replace these after changing a valve.

Standard CV valve types are used throughout and no difficulty should be experienced in obtaining replacements. Direct equivalents can be used where necessary and any valve can be changed without necessitating re-alignment of the tuned circuits.

Pointer Drive Wire Replacement.

In the unlikely event of the drive wire either breaking or slipping out of the pulley grooves, replacement will be much simplified (even when the wire is undamaged) if a new length is obtained. This can be made longer than the length actually needed (this being approximately 4 feet) and will therefore be easier to handle. Fitting a new wire is quite straightforward and will present no difficulties if the instructions given below are followed carefully, step by step.

NB In these instructions, left-hand and right-hand are as viewed from the rear of the receiver.

1. Take off the cabinet and remove the gang cover to improve access to the drive mechanism. The two filter crystals and the BFO tube can also be removed if required.
2. Slacken the two 8BA screws in the drive pulleys and remove the old drive wire after unsoldering from the pointer carrier.
3. Rotate the tuning control in an anti-clockwise direction until the tuning gang is fully meshed.
4. Attach one end of the new drive wire to the 8BA screw in the left-hand drive pulley.
5. Feed the wire through the pulley slot and into the groove nearest to the panel so that it leaves the pully from right to left.
6. Pass wire round jockey pulley and across dial between pointer guide rods, passing under pointer carrier.
7. Hold the free end of the wire and rotate the tuning control in a clockwise direction so that three complete turns are wound onto the left-hand drive pulley. The wire must be held in tension while winding and rotation of the tuning control should continue until the gang is fully unmeshed.
8. Maintain tension. Pass wire clockwise over the top right-hand guide pulley, down and under the lower right-hand guide pulley and then across under the meter towards the right-hand drive pulley.
9. Lay the wire in the second groove from the edge of the pulley which is closest to the rear of the receiver. Feed the wire along the groove and into the pulley slot.

10. Apply sufficient tension to the free end of the wire to "spring" the jockey pulley and then secure to the 8BA screw in the drive pulley. Cut off the surplus wire.

11. Slide the pointer to the low frequency end of the scale.

12. Rotate tuning control to fully mesh gang.

13. Set pointer to "0" on base logging scale.

14. Solder drive wire to pointer carrier and then check drive for free and normal operation.

15. Check the calibration accuracy against an external frequency standard.

Cleaning the Scale and Scale Window.

1. Take off the cabinet.

2. Remove the small side castings at the extremeties of the glass window. These are held in place by hexagon-headed screws which are accessible through small rectangular cut-outs near the leading edge of the side-plates. The screws are captive and can be loosened with a standard 4BA spanner.

3. Remove the three dial lamp holders from their support strip. These are clipped into position and are easily disengaged from the fixing slots by squeezing together the two sides of the holder.

4. Slacken the four countersunk screws along the top edge of the panel and slide back the long dial lamp strip.

5. This strip also serves to support the top edge of the dial glass which can now be removed by lifting up and tilting back slightly.

6. The dial glass can be cleaned with one of the many domestic products which are available for this purpose. The scale can be cleaned if necessary by rubbing gently with a soft lint-free cloth which has been moistened slightly in warm water. Any surplus moisture should be removed with a dry cloth before replacing the dial glass.

RE-ALIGNMENT

General.

In the unlikely event of a complete re-alignment being required, the instructions given on the following pages should be followed step by step in full. In the more usual case of partial re-alignment required to compensate for ageing components etc., the relevant instructions can be extracted as required. It must be stressed that alignment adjustments should not be tampered with unless there is a clear indication that alignment is in fact required, and furthermore adjustments should only be carried out by fully skilled technicians equipped with suitable test instruments.

NB All dust cores are self-locking (rubber string and silicone core-retaining compound) so that there is no need to use wax etc. for sealing purposes. The concentric trimmers likewise are also self-locking.

Re-alignment of the 720 kc/s IF Amplifiers and BFO.

Test Equipment ..... Standard Signal Generator covering the IF of 720 kc/s with 400 c/s modulation at 30% depth.

Valve Voltmeter (f.s.d. 1 volt).

Output Meter matched to 2.5/3Ω.

Trimming Tools : Insulated screwdriver and small tommy bar 5/64" diameter.

Switch on the receiver, signal generator and valve voltmeter and allow half an hour to reach operating temperature. Set the receiver controls as follows:-

RANGE SWITCH	Range 1.	IF GAIN	Maximum.
SELECTIVITY	Crystal 1.	AGC	Off.
MODE SWITCH	AM	N/L	Off.

Connect the output lead from the signal generator to the stator of the centre section of the main tuning gang (i.e. to the grid of V2A). The valve voltmeter should be connected to the IF Output socket. (If a valve voltmeter is not available, the built-in carrier level meter can be used - AGC must be "ON" - but the indication will be inferior to that obtained with the valve voltmeter).

When the equipment has reached operating temperature, set the signal generator to approximately 720 kc/s and tune slowly across the IF passband, observing the reading on the valve voltmeter. Adjust the signal generator carefully so that the signal lies on the peak of the crystal and then trim the cores in T1, T2, T4 and T5 for maximum reading on the valve voltmeter. The output level should be kept below some 500mV by adjustment of the attenuator on the signal generator.

It must be noted that T4 is slightly overcoupled and it will therefore be necessary to damp this transformer to obtain correct alignment. A 4,700Ω resistor in series with a 0.01μF capacitor will make a convenient damping arrangement since one end of the combination can be directly earthed and the other end connected directly to the grid of V4 (pin 1) while adjusting the primary winding (bottom core) and to the anode of V3 (pin 5) while adjusting the grid winding.

Having aligned all transformers accurately to the centre frequency, again swing the generator tuning slowly across the IF passband and check on the symmetry of the response. If the response is at all assymmetrical this will be revealed most clearly by the presence of a rejection notch due to the crystal phasing capacitor (C43) being set incorrectly. This capacitor is accessible on the side of T2 nearest to the central RF Section and can be adjusted with a small tommy bar slipped into one of the holes in the spindle extension which protrudes through the side of the can. C43 is adjusted, first slightly in one direction and then in the other to determine which way the capacitor must go to eliminate the rejection notch.

Once the correct direction has been established, adjust C43 by very small increments until the notch disappears. A check should be made to see that the notch does not re-appear on the other side of the response. T2 may require slight re-adjustment and it is advisable to check the response again after trimming this core to ensure that the filter is still phased correctly. Any further adjustment of C43 will be very small indeed and will ensure a perfectly symmetrical response.

Leave the generator set to the crystal peak and switch to "Crystal 2." Adjust the core in T3 for greatest reading on the meter. Again tune across the IF response and make a careful check on the symmetry. Misalignment of the phasing capacitor (C39) will be shown by the presence of minor side-lobes and rejection notches on either side of the response. If these are in evidence, C39 should be adjusted to eliminate them and under this condition a symmetrical response will be obtained. (C39 is accessible through a trimming aperture in the side-plate).

Slight re-adjustment of the core in T3 may be required to produce a reasonably flat-nosed response.

This completes alignment of the IF Stages since no further adjustment is called for in the "Wide" position. A check on the overall IF sensitivity can be carried out if the output meter is connected to the 2.5/3Ω terminals at the rear. The attenuator link at the 600Ω terminals should be removed while making this check. The generator remains connected as during alignment and the receiver controls are set as follows:-

RANGE SWITCH	Range 1.	IF/AF GAINS	Maximum.
SELECTIVITY	Wide.	AGC & N/L	Off.
MODE SWITCH	AM.	AUDIO FILTER	Out.

Tune the generator to 720 kc/s (modulated 30% at 400 c/s) and adjust the attenuator for a reading of 50mW on the output meter. Average sensitivity should be of the order 16μV. If a lower figure is obtained, further checks can be made with the generator connected in turn to the grids of V3 and V4. Typical figures are as follows:-

Generator applied at grid of V3 . . . . . 180μV for 50mW output.
Generator applied at grid of V4 . . . . . 22mV for 50mW output.

Re-alignment of the BFO.

Switch to "Crystal 1", set the generator to the crystal peak and the MODE SWITCH to "CW." Adjust the BFO PITCH capacitor control knob so that the white index mark lies at 12 o'clock. Check that this corresponds to the half-capacity setting and then trim L20 (accessible from underside of BFO Unit) to obtain zero-beat. Finally, check that the control swing is of the order ± 3 kc/s.

Re-alignment of the IF Rejector.

With the receiver adjusted as for IF alignment, transfer the signal generator output lead to the 75Ω aerial input terminals. Increase the RF GAIN setting and adjust the signal generator (tuned to 720 kc/s) for a reading of 500mV on the valve voltmeter.

Locate the trimming aperture for the IF rejector coil (underside of RF coil box, left-hand side towards rear of receiver). Using a narrow-bladed trimming tool, adjust the rejector (L7) for minimum reading on the meter.

RE-ALIGNMENT OF THE RF SECTION. 1. Checking Scale Calibration.

Test Equipment ..... Crystal Calibrator providing 10 and 100 kc/s markers and a Standard Signal Generator covering the range 10-40 kc/s.

Set up the receiver for CW reception with the SELECTIVITY SWITCH at "Crystal 2" and the BFO centred in the IF passband. Allow half an hour for the equipment to reach operating temperature before commencing the check.

Select Ranges 1, 2 and 3 in turn and tune the receiver to zero-beat with each 100 kc/s calibration marker. Repeat the same procedure on Range 4 but use the 10 kc/s markers as a guide. On Ranges 5 and 6, standardise the signal generator against the 10 kc/s markers from the calibrator and then use the generator to check the scale at 5 kc/s intervals on Range 5 and at every kilocycle on Range 6.

If the calibration accuracy is within the limits 0.5% at frequencies above 100 kc/s and 2.5% below 100 kc/s there will be no need to touch the pre-set adjustments associated with the Local Oscillator Stage. Otherwise proceed as detailed in the paragraphs which follow, adjusting only those ranges which are in error.

2. Re-alignment of the Local Oscillator.

Test Equipment ..... As for checking scale calibration.

Select each range in turn and set the generator (or use the calibrator) at each of the frequencies listed in the Table on the following page. Trim the appropriate pre-set adjustments with the receiver set accurately to the correct frequencies as indicated on the scale. Greatest accuracy will be obtained if the receiver is operated under CW conditions and all tuning adjustments are made for zero-beat. Each adjustment should be made several times to compensate for interaction and to ensure accurate tracking.

Range	LOW		MIDDLE		HIGH	
	Freq.	Trim	Freq.	Trim	Freq.	Trim
1	300 kc/s	L14	-	-	550 kc/s	C79
2	150 kc/s	L15	-	-	300 kc/s	C82
3	80 kc/s	C84	110 kc/s	L16	150 kc/s	C86
4	40 kc/s	C88	55 kc/s	L17	80 kc/s	C90
5	19 kc/s	C91	27 kc/s	L18	40 kc/s	C92
6	10 kc/s	C94	15 kc/s	L19	19 kc/s	C95

On Ranges 5 and 6, extra care must be taken in trimming the pre-set adjustments since quite a small movement of the series capacitor or the core will produce a considerable change in oscillator frequency. It is possible for example to adjust Range 6 so that the oscillator tunes the range 750-760 kc/s giving an RF coverage of 20-30 kc/s. Any possible confusion will be overcome if a signal generator is available to identify the appropriate markers from the crystal calibrator.

3. Re-alignment of the RF and Mixer Stages.

Test Equipment ..... Standard Signal Generator covering the range 10-600 kc/s with 75Ω o/p and 400 c/s modulation at 30%. Output Meter matched to 2.5/3Ω.

Select each range in turn and tune both the receiver and generator (modulated 30% at 400 c/s* and connected to the 75Ω input terminals) to the frequencies listed in the Table below. The output meter should be connected to the two external loudspeaker terminals, the aerial trimmer (panel control) should be set to half-capacity and the appropriate trimmers and cores adjusted for maximum reading on the output meter. All adjustments should be repeated as necessary until any interaction between trimmer and core is eliminated.

*On Ranges 5 and 6 it will be necessary to switch to CW and use an unmodulated carrier for alignment. The BFO should be set to produce any convenient beat.

Range	TRIMMERS			CORES		
	Freq.	RF	Mixer	Freq.	RF	Mixer
1	300 kc/s	C1	C20	550 kc/s	L1	L8
2	150 kc/s	C3	C22	300 kc/s	L2	L9
3	80 kc/s	C5	C24	150 kc/s	L3	L10
4	40 kc/s	C7	C26	80 kc/s	L4	L11
5	19 kc/s	C9	C28	40 kc/s	L5	L12
6	10 kc/s	C10	C30	19 kc/s	L6	L13

NB The dust cores in L3, L4, L10 and L11 are "hexagon" types and should be trimmed with a Neosid Type H.S.1. core adjuster. All other cores except those in the Vinkor assemblies can be adjusted with a standard insulated screwdriver. A non-magnetic tool (Mullard DT2047) should be used to adjust the Vinkors.

APPENDIX "A"

VOLTAGE ANALYSIS

The following "Table of Voltage Values" will prove useful in the event of the receiver developing a fault which makes it necessary to carry out voltage checks. All readings are typical and were taken with a meter having a sensitivity of 20,000Ω/V and an applied mains voltage of 240V. A nominal tolerance of 10% will apply to all readings taken with a meter of this sensitivity, the tolerance being increased accordingly if a meter of lower sensitivity is employed.

Readings should be taken under "no-signal" conditions with the receiver controls set as follows:-

RANGE SWITCH . . . . . Range 1.
MODE SWITCH . . . . . AM.
CRYSTAL SELECTOR . . . . M (Manual).
AGC . . . . Off.
RF/IF GAINS . . Maximum.

Ref	Anode		Screen		Cathode		Note
	Pin	Reading	Pin	Reading	Pin	Reading	
V1	5	235V	6	85V	7	0.92V	
V2A	6	240V	1	95V	3	1.8V	
V2B	8	100V	-	-	3	1.8V	NOTE 1.
V3	5	240V	6	98V	7	0.72V	
V4	5	240V	6	88V	7	1.2V	
V5A	7	182V	-	-	1	182V	
V5B	2	-	-	-	5	-	
V6	5	190V	6	190V	7	2.5V	
V7	7	130V	-	-	2	20V	
V8	5	248V	7	238V	2	11.3V	
V9	5	200V	6	78V	2	1.3V	NOTE 2.
V10	5	150V	-	-	2	0V	
V11	4/6	255V AC	-	-	8	280V	

NOTE 1. Anode voltage varies within the limits 86-100V depending on range in use. Voltage falls to 68V with oscillator stopped.

NOTE 2. V9 is not accessible for direct voltage checks. Voltages on the supply leads to the unit are:- Anode (red lead) : 210V, Screen (Blue lead) : 137V. Set MODE SWITCH to "CW."

APPENDIX "B"

LIST OF COMPONENT VALUES, TOLERANCES AND RATINGS

Capacitors.

Ref	Value	Type	Tolerance	Wkg. V.
C1	4-29pF	Air Trimmer	-	-
C2	80pF	Silvered Mica	5%	350V
C3	4-29pF	Air Trimmer	-	-
C4	40pF	Silvered Mica	5%	350V
C5	4-29pF	Air Trimmer	-	-
C6	60pF	Silvered Mica	5%	350V
C7	4-29pF	Air Trimmer	-	-
C8	40pF	Silvered Mica	5%	350V
C9	4-29pF	Air Trimmer	-	-
C10	4-29pF	Air Trimmer	-	-
C11	3.5-54pF	Air-spaced variable	-	-
C12	12.5-535pF	3-gang Air-spaced variable	-	-
C13	100pF	Silvered Mica	10%	350V
C14	0.25µF	Metallised Paper	20%	200V
C15	0.001µF	Polystyrene	5%	125V
C16	0.01µF	Metallised Paper	20%	200V
C17	0.25µF	Metallised Paper	20%	200V
C18	8µF	Tubular Electrolytic	+100% -20%	275V
C19	0.05µF	Tubular Paper	20%	400V
C20	4-29pF	Air Trimmer	-	-
C21	80pF	Silvered Mica	5%	350V
C22	4-29pF	Air Trimmer	-	-
C23	80pF	Silvered Mica	5%	350V
C24	4-29pF	Air Trimmer	-	-
C25	80pF	Silvered Mica	5%	350V
C26	4-29pF	Air Trimmer	-	-
C27	60pF	Silvered Mica	5%	350V
C28	4-29pF	Air Trimmer	-	-
C29	20pF	Tubular Ceramic	5%	750V
C30	4-29pF	Air Trimmer	-	-
C31	100pF	Silvered Mica	10%	350V
C32	-	Reference not allocated	-	-
C33	0.25µF	Metallised Paper	20%	200V
C34	0.25µF	Metallised Paper	20%	200V
C35	0.05µF	Tubular Paper	20%	400V
C36	390pF	Polystyrene	5%	125V
C37	790pF	Polystyrene	2%	125V
C38	790pF	Polystyrene	2%	125V
C39	2-10pF	Air Trimmer (Differential)	-	-

Ref	Value	Type	Tolerance	Wkg. V.
C40	50pF	Silvered Mica	5%	350V
C41	100pF	Polystyrene	5%	125V
C42	50pF	Silvered Mica	5%	350V
C43	2-10pF	Air Trimmer	-	-
C44	100pF	Polystyrene	5%	125V
C45	2µF	Metallised Paper	25%	200V
C46	100pF	Silvered Mica	5%	350V
C47	0.05µF	Tubular Paper	20%	400V
C48	0.05µF	Tubular Paper	20%	400V
C49	390pF	Polystyrene	5%	125V
C50	390pF	Polystyrene	5%	125V
C51	0.05µF	Tubular Paper	20%	400V
C52	0.05µF	Tubular Paper	20%	400V
C53	0.05µF	Tubular Paper	20%	400V
C54	0.05µF	Tubular Paper	20%	400V
C55	390pF	Polystyrene	5%	125V
C56	390pF	Polystyrene	5%	125V
C57	50pF	Tubular Ceramic	10%	750V
C58	500pF	Metallised Paper	20%	600V
C59	0.05µF	Tubular Paper	20%	400V
C60	0.05µF	Tubular Paper	20%	400V
C61	0.05µF	Tubular Paper	20%	400V
C62	20pF	Tubular Ceramic	10%	750V
C63	0.05µF	Tubular Paper	20%	400V
C64	0.04µF	Metallised Paper	20%	250V
C65	200pF	Tubular Ceramic	10%	750V
C66	0.01µF	Tubular Paper	20%	400V
C67	500pF	Metallised Paper	20%	600V
C68	6pF	Tubular Ceramic	10%	750V
C69	25µF	Tubular Electrolytic	+100% -20%	25V
C70	25µF	Tubular Electrolytic	+100% -20%	25V
C71	32 + 32µF	Tubular Electrolytic	+50% -20%	350V
C72	0.01µF	Tubular Paper	20%	400V
C73	0.007µF	Polystyrene	1%	125V
C74	0.007µF	Polystyrene	1%	125V
C75	0.005µF	Disc Ceramic	+80% -20%	900V
C76	25µF	Tubular Electrolytic	+100% -20%	25V
C77	0.01µF	Tubular Paper	20%	400V
C78	330pF	Silvered Mica	5%	350V
C79	4-29pF	Air Trimmer	-	-
C80	25pF	Silvered Mica	5%	350V
C81	180pF	Silvered Mica	1%	350V
C82	4-29pF	Air Trimmer	-	-
C83	25pF	Silvered Mica	5%	350V
C84	4-29pF	Air Trimmer	-	-
C85	60pF	Silvered Mica	5%	350V
C86	4-29pF	Air Trimmer	-	-
C87	20pF	Tubular Ceramic	5%	750V
C88	4-29pF	Air Trimmer	-	-
C89	20pF	Tubular Ceramic	5%	750V

Ref	Value	Type	Tolerance	Wkg. V.
C90	4-29pF	Air Trimmer	-	-
C91	4-29pF	Air Trimmer	-	-
C91a	20pF	Tubular Ceramic	5%	750V
C92	4-29pF	Air Trimmer	-	-
C93	25pF	Tubular Ceramic	5%	750V
C94	4-29pF	Air Trimmer	-	-
C94a	20pF	Tubular Ceramic	5%	750V
C95	4-29pF	Air Trimmer	-	-
C96	250pF	Tubular Ceramic	5%	750V
C97	80pF	Tubular Ceramic	5%	750V
C98	20pF	Silvered Mica	5%	350V
C99	100pF	Tubular Ceramic	5%	750V
C100	200pF	Tubular Ceramic	10%	750V
C101	0.25µF	Metallised Paper	20%	200V
C102	50pF	Tubular Ceramic	10%	750V
C103	100pF	Silvered Mica	10%	350V
C104	0.05µF	Tubular Paper	20%	400V
C105	500pF	Metallised Paper	20%	600V
C106	500pF	Metallised Paper	20%	600V
C107	0.01µF	Metallised Paper	20%	200V
C108	0.005µF	Tubular Ceramic	20%	750V
C109	0.001µF	Tubular Ceramic	10%	750V
C110	100pF	Silvered Mica	5%	350V
C111	30µF	Tubular Electrolytic	+100% -20%	15V
C112	3.5-25pF	Air-spaced variable	-	-
C113	0.001µF	Polystyrene	5%	125V
C114	25µF	Tubular Electrolytic	+100% -20%	25V
C115	50µF	Tubular Electrolytic	+50% -20%	450V
C116	0.25µF	Metallised Paper	20%	200V
C117	0.25µF	Metallised Paper	20%	200V

Resistors.

Ref	Value	Tol.	Rating
R1	0.47MΩ	10%	½ watt
R2	0.47MΩ	10%	½ watt
R3	12Ω	10%	½ watt
R4	68,000Ω	10%	½ watt
R5	33,000Ω	10%	1 watt
R6	68Ω	10%	½ watt
R7	0.1MΩ	10%	1 watt
R8	1,000Ω	10%	½ watt
R9	470Ω	10%	½ watt
R10	470Ω	10%	½ watt
R11	2,200Ω	10%	½ watt
R12	2,200Ω	10%	½ watt
R13	0.47MΩ	10%	½ watt
R14	150Ω	10%	½ watt

Ref	Value	Tol.	Rating
R15	47,000Ω	10%	½ watt
R16	10,000Ω	10%	½ watt
R17	1,000Ω	10%	½ watt
R18	0.47MΩ	10%	½ watt
R19	47,000Ω	10%	1 watt
R20	47,000Ω	10%	1 watt
R21	1,000Ω	10%	½ watt
R22	68Ω	10%	½ watt
R23	0.47MΩ	10%	½ watt
R24	27,000Ω	10%	1 watt
R25	10,000Ω	10%	1 watt
R26	22,000Ω	10%	1 watt
R27	27,000Ω	10%	1 watt
R28	1,000Ω	10%	½ watt
R29	100Ω	10%	½ watt

Resistors. (contd.)

Ref	Value	Tol.	Rating
R30	1MΩ	10%	½ watt
R31	2.2MΩ	10%	½ watt
R32	0.1MΩ	10%	½ watt
R33	0.1MΩ	10%	½ watt
R34	0.47MΩ	10%	½ watt
R35	220Ω	10%	½ watt
R36	4,700Ω	10%	½ watt
R37	27,000Ω	10%	1 watt
R38	0.27MΩ	10%	½ watt
R39	0.1MΩ	10%	1 watt
R40	0.47MΩ	10%	½ watt
R41	0.27MΩ	10%	½ watt
R42	3,300Ω	10%	½ watt
R43	6,800Ω	10%	½ watt
R44	10,000Ω	10%	½ watt
R45	0.47MΩ	10%	½ watt
R46	4,700Ω	10%	½ watt
R47	680Ω w.w.	5%	3 watt
R48	2,200Ω	10%	1 watt
R49	680Ω	10%	½ watt
R50	47Ω	10%	½ watt
R51	680Ω	10%	½ watt
R52	33,000Ω	10%	½ watt
R53	3,300Ω	10%	½ watt
R54	1,000Ω	10%	½ watt
R55	10,000Ω	10%	½ watt
R56	47,000Ω	10%	½ watt
R57	47,000Ω	10%	1 watt
R58	0.47MΩ	10%	½ watt
R59	47Ω	10%	½ watt
R60	10,000Ω	10%	½ watt
R61	2,200Ω	10%	½ watt
R62	10,000Ω	10%	½ watt
R63	47,000Ω	10%	½ watt
R64	22,000Ω	10%	½ watt
R65	220Ω	10%	½ watt
R66	2,700Ω w.w.	5%	6 watt
R67	0.1MΩ	10%	½ watt
R68	6,800Ω	10%	½ watt

Potentiometers.

Ref	Value	Type
RV1*	10,000Ω	Wirewound
RV2*	10,000Ω	Wirewound
RV3	5,000Ω	Wirewound
RV4	0.5MΩ	Carbon

*Common unit with concentric spindles.

APPENDIX "C"

SPARES

The following list details all major spares for the 850/4 receiver. Spares should be ordered by quoting the Circuit Ref. (where applicable), the written description given in the list and the Part No. in the right-hand column. The Serial No. of the receiver should be stated in all communications.

All orders and enquiries should be addressed to:-

EDDYSTONE RADIO LIMITED, SALES & SERVICE DEPT., ALVECHURCH ROAD, BIRMINGHAM 31.

In cases of extreme urgency, ring PRIory 2231/4, cable EDDYSTONE Birmingham or use TELEX 33708.

Ref	Description	Part No.
	INDUCTORS	
	NB: All coils are supplied complete with mounting foot, trimming, tracking and coupling capacitors as applicable and damping resistors where required.	
L1	Range 1 Aerial coil	D3490
L2	Range 2 Aerial coil	D3493
L3	Range 3 Aerial coil	D3496
L4	Range 4 Aerial coil	D3499
L5	Range 5 Aerial coil	D2763
L6	Range 6 Aerial coil	D2766
L7	720 kc/s IF Rejector coil	D2769
L8	Range 1 Mixer coil	D3491
L9	Range 2 Mixer coil	D3494
L10	Range 3 Mixer coil	D3497
L11	Range 4 Mixer coil	D3500
L12	Range 5 Mixer coil	D2764
L13	Range 6 Mixer coil	D2767
L14	Range 1 Oscillator coil	D3492
L15	Range 2 Oscillator coil	D3495
L16	Range 3 Oscillator coil	D3498
L17	Range 4 Oscillator coil	D3501
L18	Range 5 Oscillator coil	D3502
L19	Range 6 Oscillator coil	D3503
L20*	Beat Oscillator coil	D2732
	CHOKES & TRANSFORMERS	
CH1	HT Smoothing Choke	D2049B
T1	1st 720 kc/s IF Transformer	D2770
T2**	Crystal Filter Unit 1 (single crystal)	D2773A
T3**	Crystal Filter Unit 2 (dual crystal)	D2774A
T4	2nd 720 kc/s IF Transformer	D2771
T5	3rd 720 kc/s IF Transformer	D2772

*Not normally supplied as separate item. Order CW Detector Unit complete.

**Supplied with screening can but less crystal.

Ref	Description	Part No.
	CHOKES & TRANSFORMERS (cont'd)	
T6	Audio Filter	D2735
T7	Output Transformer (2.5 and 600Ω)	D1697
T8	Power Transformer	3937P
	CRYSTALS	
XL1	Single crystal 720 kc/s ± 0.05%	6121P
XL2	Dual crystal centred 720 kc/s ± 0.05%, spaced 1100 c/s ± 50 c/s	6122P
	SWITCHES	
S1	Range Switch : Wafer - 1P6W with shorting plate	5011P
	Clicker Mechanism	5433P
	Extension Spindle	5431P
	Coupler	5428P
S2	Selectivity Switch : 3P3W complete	5959P
S3/4	AGC/Noise Limiter Switches : SPST Toggle Type	4771PB
S5-7	Mode/Filter/Mains Switches : DPDT Toggle Type	4772PC
S8	Crystal Selector Switch : complete assembly including gearing	D3010
	VARIABLE CAPACITORS & ASSOCIATED ITEMS	
C11	Aerial Trimmer (3.5-54pF)	LP2125/2
-	Extension spindle for Aerial Trimmer	5783/1P
-	Flexible coupler for Aerial Trimmer	D2874
C12	3-gang Tuning Capacitor (3 x 12.5-535pF)	5957P
-	Flexible coupler for C12	D1680
C112	BFO Pitch Capacitor (3.5-25pF)	D2807
-	Air Trimmer (4-29pF) as used on RF coils etc.	6597P
	POTENTIOMETERS	
RV1/2	2 x 10,000Ω wirewound (concentric spindles)	5810P
RV3	5,000Ω wirewound	6123P
RV4	0.5MΩ carbon	4103PB
	PLUGS & SOCKETS	
-	IF Output Socket (BNC)	6085P
-	Telephone Socket	6090P
-	Mains socket (polarised with earth contact)	D2310
-	BNC Plug (for IF O/P)	6084P
-	Telephone Plug	6567P
-	Mains Plug (polarised with earth connection and 6' lead)	D2311/1
	DRIVE ASSEMBLY	
-	Main drive unit	LP2686
-	Control spindle and bearing assembly	6429P
-	Flywheel	5174P

Ref	Description	Part No.
	DRIVE ASSEMBLY (contd.)	
	Screw for flywheel	1484P
	Stainless steel driving disc with associated gear	D1559/1
	Vernier gear	D1562/1
	Condenser gear	D2077
	Drive pulley	5837P
	Bearing screw for drive pulley	3958P
	Guide pulley	6125P
	Pointer guide rod	5801P
	Pointer assembly	D2695
	Length of steel drive wire	SKL77
	Vernier dial with hub	D1633
	KNOBS	
	Main Tuning	5817P
	Wavechange	D3513
	RF Gain	5834PA
	IF Gain	5786P
	Selectivity, AF Gain, BFO Pitch	5816P
	Aerial Trimmer	D3055
	Crystal Selector Lever	5385P
	MISCELLANEOUS	
	Chromium-plated panel handles	5826P
	Scale plate	D2748/1
	Glass window	5847P
	Carrier level meter	5956/1P
	Finger plate	6909P
	Terminal (as used for audio output etc.)	6102P
	Fuseholder	6103P
	Fuse (1A x $1\frac{1}{4}$" x $\frac{1}{4}$" cartridge)	6124P
	Dial lamps (6.5V @ 0.3A)	3131P
	Dial lamp holders	6374P
	Valve screening can (B7G)	6126P
	Valve screening can (B9A - large)	6695P
	Valve retainer (spring type as used for output valve)	5311PA
	Cover fixing screws	5446PC
	CW Detector Unit (less valve)	LP2695

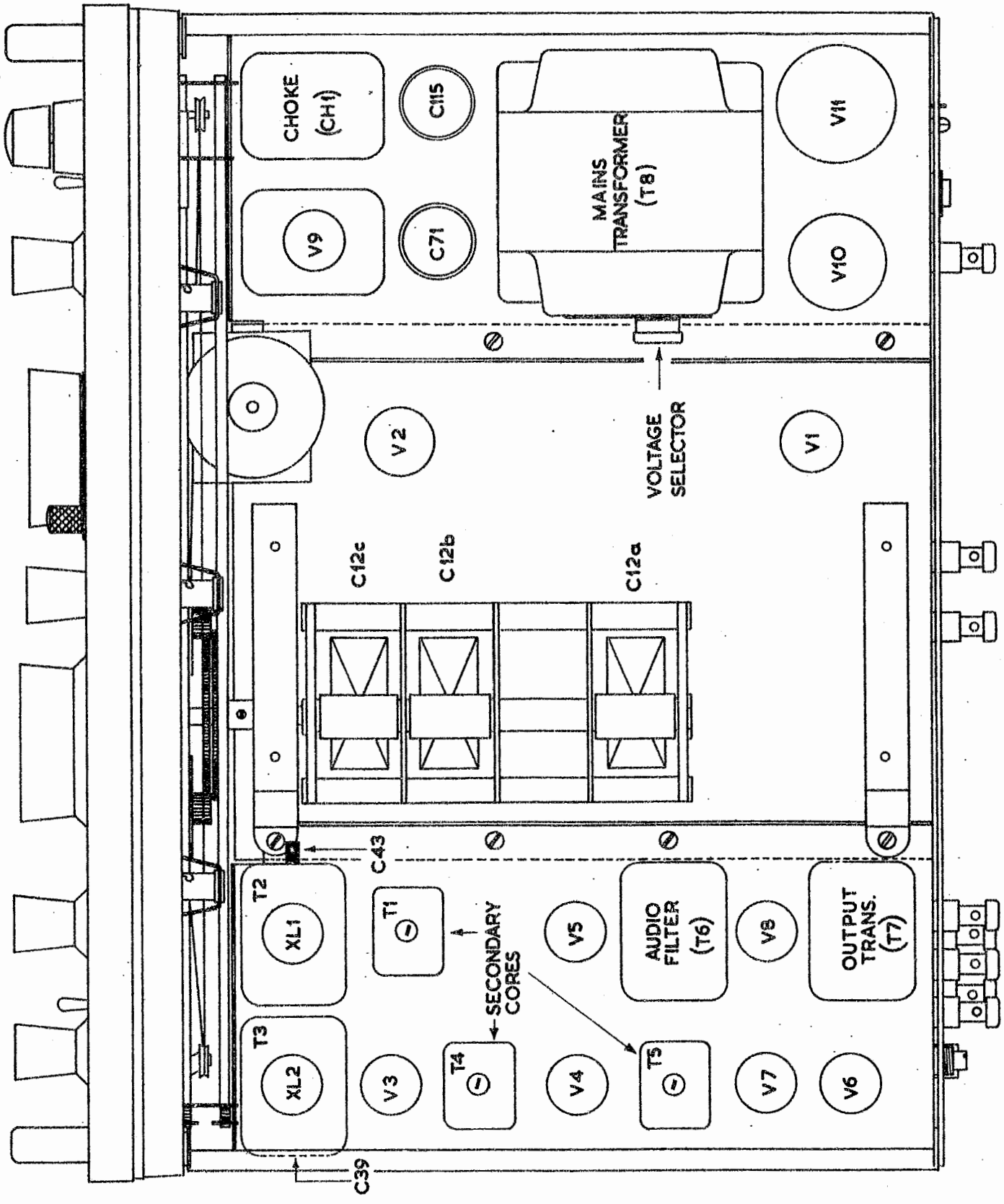


Fig. 1. Plan View of 850/4 Receiver.

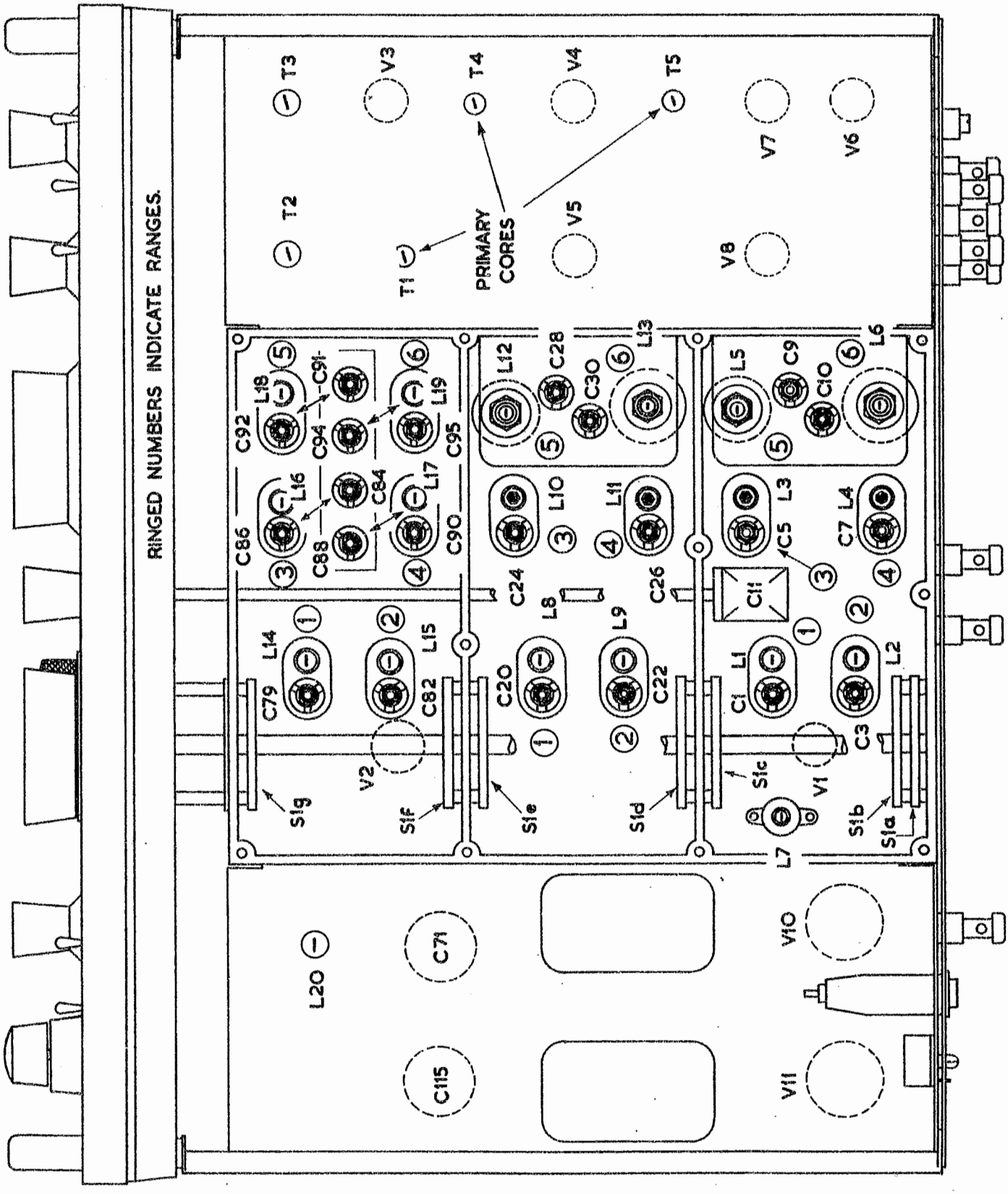


Fig. 2. Underside View of 850/4 Receiver.

AMENDMENT SHEET NO. 1

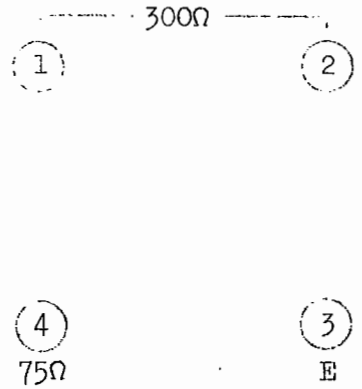
Page 7.

Delete existing paragraph headed "Aerial" and substitute the following:-

Cut along dotted lines and paste over existing text

Aerial.

Aerial feed impedances of either 75 or 300Ω can be accommodated as follows:-



75Ω balanced	. .	feeder to terminals 1 & 4.
75Ω unbalanced	. .	inner feeder conductor to terminal 4, outer braid to 3 and link between 2 & 3.
300Ω balanced	. .	feeder to terminals 1 & 2.*
300Ω unbalanced	. .	feeder to terminals 1 & 2 with link between 2 & 3.

*Link terminals 3 & 4 for centre-tapped earth.

Random wire lengths should be connected to terminal 1 with a link in position between terminals 2 & 3.

Performance is identical whether connection is made as indicated on page 7 or as given in the paragraph above. The modified termination offers a slight advantage in ease of connection.

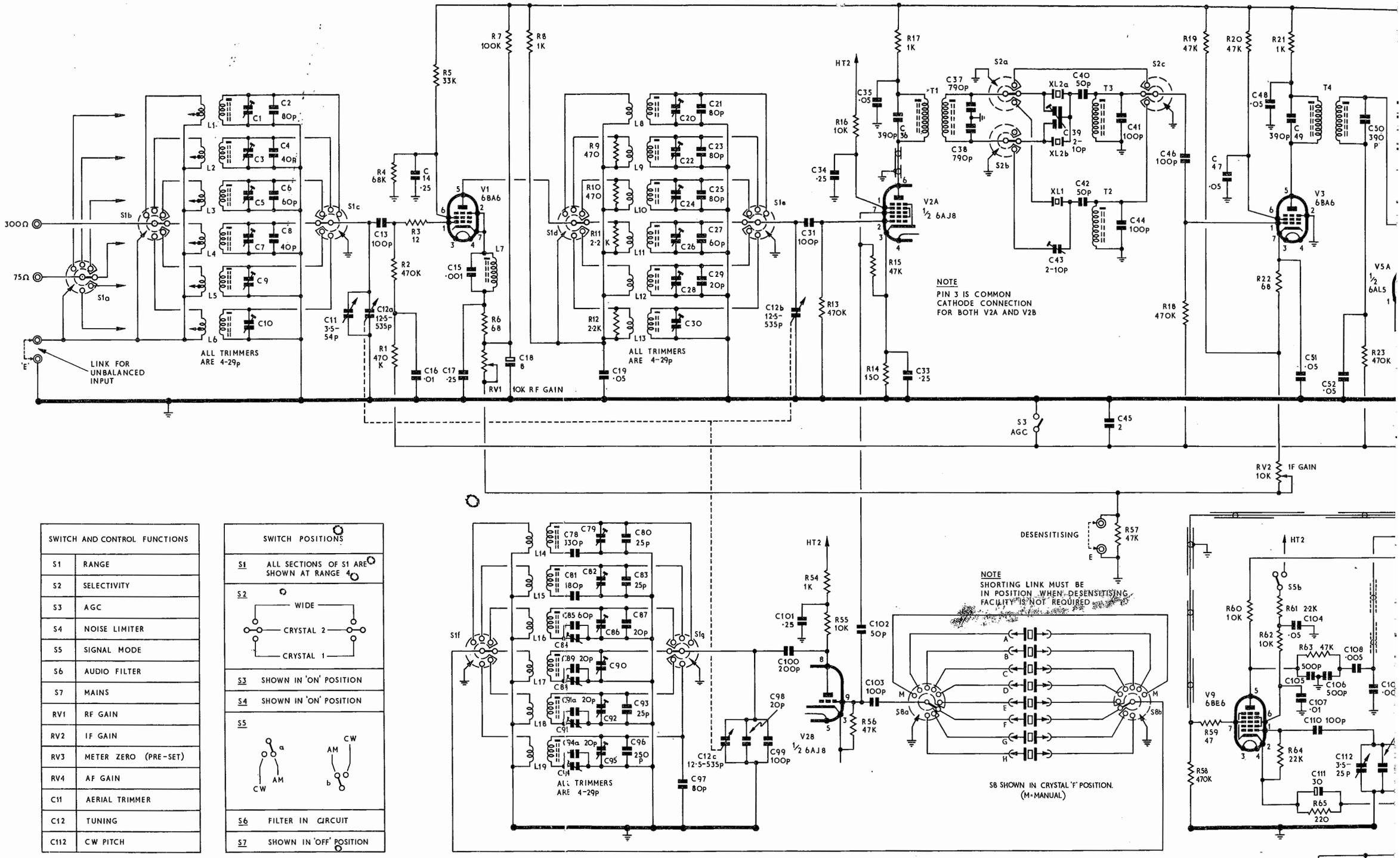
NOTE
PIN 3 IS COMMON CATHODE CONNECTION FOR BOTH V2A AND V2B

NOTE
SHORTING LINK MUST BE IN POSITION WHEN DESENSITISING FACILITY IS NOT REQUIRED

S8 SHOWN IN CRYSTAL 'F' POSITION. (M=MANUAL)

* 600Ω TERMINALS TO BE LINKED AS SHOWN FOR ATTENUATED OUTPUT

350/4.



SWITCH AND CONTROL FUNCTIONS	
S1	RANGE
S2	SELECTIVITY
S3	AGC
S4	NOISE LIMITER
S5	SIGNAL MODE
S6	AUDIO FILTER
S7	MAINS
RV1	RF GAIN
RV2	IF GAIN
RV3	METER ZERO (PRE-SET)
RV4	AF GAIN
C11	AERIAL TRIMMER
C12	TUNING
C112	CW PITCH

SWITCH POSITIONS	
S1	ALL SECTIONS OF S1 ARE SHOWN AT RANGE 4
S2	WIDE / CRYSTAL 2 / CRYSTAL 1
S3	SHOWN IN 'ON' POSITION
S4	SHOWN IN 'ON' POSITION
S5	a, AM, CW / CW, AM, b
S6	FILTER IN CIRCUIT
S7	SHOWN IN 'OFF' POSITION

MODEL 850/4.