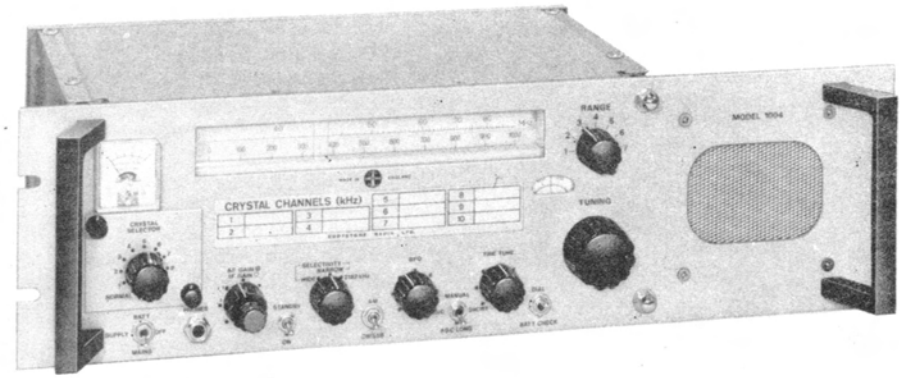
Eddystone

RESERVE MARINE RECEIVER

MODEL 1004



150–535kHz, 1·6–30 MHz

Manufactured in England by

Eddystone Radio Limited

Member of Marconi Communication Systems Limited

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Cables: Eddystone Birmingham Telex: 337081

LIST OF CONTENTS

Illustrations

Amendment Sheets

Amendment Sheets incorporated on issue of this handbook will be bound immediately following page 4.

AMENDMENT RECORD

Amend No.	Pages subject to change	Amended by	Date
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The manufacturer reserves the right to modify the content of this publication to accommodate modifications, design improvements etc. Amendment Sheets will be incorporated where applicable at date of issue.

AMENDMENT NO: 4

This amendment incorporates and supersedes Amendment No. 1, dated January 1973; Amendment No. 2, dated March 1973 and Amendment No. 3, dated June 1973. The following changes and additions should be made as indicated.

Page 16

Accessory Kit: 9 x spare fuses (6 at 1A + 3 at 2A) are supplied.

Page 18

External Connections Ancillaries Plug.
Figure 4.6 Muting Control Circuits. The Battery connections for the 12V and 24V battery are shown reversed. Battery positives should go to pins 10 and 14 respectively and common negative to pin 11. The supply polarity must not be reversed.

Page 43

Add: D5A; 1S44; Texas; AGC Control Element
D6A; 1S44; Texas; AGC Control Element
Change the type no. of D16 to MV1648

Page 45

Change the value of C8 to 170pF (160pF and 10pF in parallel)
Add: C9A; 15pF; Polystyrene; 5%; 125V; C.
Change the value of C11 to 115pF (100pF and 15pF in parallel)
Add: C12A; 15pF; Polystyrene; 5%; 125V; C.
Change the value of C24 to 500pF
Change the value of C25 to 200pF, 2% tolerance
Change the value of C28 to 115pF (100pF and 15pF in parallel)

Page 46

Add: C76A; 4.7pF; Tubular Ceramic; $\pm$0.5pF; 750V; G.

Page 47

Change C85 to 1800pF; Polystyrene; 1%; 125V.
Change C86 to 1800pF; Polystyrene; 1%; 125V.
Change C89 type to Ceramic; + 80% - 20%; 500V; P.
Add: C89A; 0.01µF Ceramic +80% - 20%; 250V; N.
Change C90 type to Ceramic; + 80% - 20%; 500V; P.
Change the value of C92 to 22µF
Delete C99
Add: C99A; 0.01µF; Polyester: 20%; 250V; B.

Page 48

Change the value of C137 to 0.022µF
Add: C151; 0.1µF; Polyester; 20%; 250V; B.
Add: C153; 0.047µF; Disc Ceramic; + 80% - 20%; 250V;
Add: C154; 1000p; Disc Ceramic; + 80% - 20%; 250V;

Page 50

Add: R1A; 390Ω; 10%; 0.1W
Change value of R3 to 560Ω
Change value of R8A to 470kΩ
Change value of R10 to 330Ω
Add: R10A; 1kΩ; 10%; 0.1W
Change value of R11 to 220Ω
Add: R11A; 330Ω; 10%; 0.1W
Add: R13A; 2200Ω; 10%; 0.1W
Add: R21A; 180Ω; 10%; 0.1W
Add: R21B; 390Ω; 10%; 0.1W
Change value of R22 to 180Ω

Page 50 (continued)

Add: R22A; 180Ω; 10%; 0.1W
Change value of R24 to 270Ω
Add: R41A; 2200Ω; 10%; 0.1W
Change value of R70 to 12kΩ 5%;

Page 52

Add: R5A; 680kΩ; 10%; 0.1W
Change value of R17 to 820Ω

Page 54

Add: AGC Printed Circuit Board; LP 3325/5

Page 55

Change Part No. of RV3 and RV5 to 8354PB.
FL3 (720kHz filter) comprises of a matched pair - Resonator and Filter types TL720 and TF720.

Page 56

Inductors - Main Board.
Change Part No. of L3 to D4579A
Change Part No. of L5 to D4581A
Change Part No. of L6 to D4582A
Change Part No. of L9 to D4585/1D
Change Part No. of L10 to D4586/1B
Change Part No. of L11 to D4587A
Change Part No. of L12 to D4588C
Change Part No. of L14 to D4590/1A
Change Part No. of L17 to D4593A
Change Part No. of L18 to D4594A
Change Part No. of L19 to D4595A
Change Part No. of L21 to D4597A
Change Part No. of L22 and L23 to D4571
Change Part No. of L24 to D4567A

Inductors - 2182kHz Board.
Change Part No. of L1 to D4598A

Page 57

Change Part No. of Diffusion Strip to 8597/PA
Change Part Nos. of knobs:
D4704 to LP3459/1
D4705 to LP3460
D4706 to LP3473
D4707, D4708 to LP3462/1 (Dual Concentric)

Page 58

Change Part No. of Loudspeaker to D4712
Change Part No. of Bottom Cover to 8605PD

Circuit Diagram

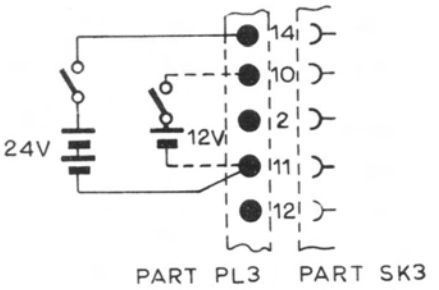
(Components on Main Board unless specified otherwise)
Change the type No. of D16 to MV1648
Change value of C8 to 170p (two capacitors: 160p in parallel with 10p)
Add: C9A (15p) in parallel with C3
Change value of C11 to 115p (two capacitors: 100p in parallel with 15p)
Add: C12A (15p) in parallel with C12
Change value of C24 to 500p
Change value of C25 to 200p
Change value of C28 to 115p (two capacitors: 100p in parallel with 15p)
Add: C76A (4.7p) across pins 60,61
Change value of C85 to 1800p
Change value of C86 to 1800p

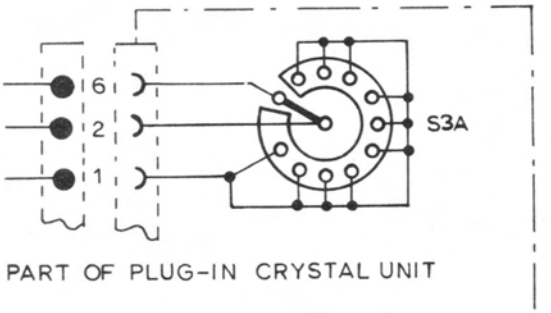
Circuit Diagram (continued)

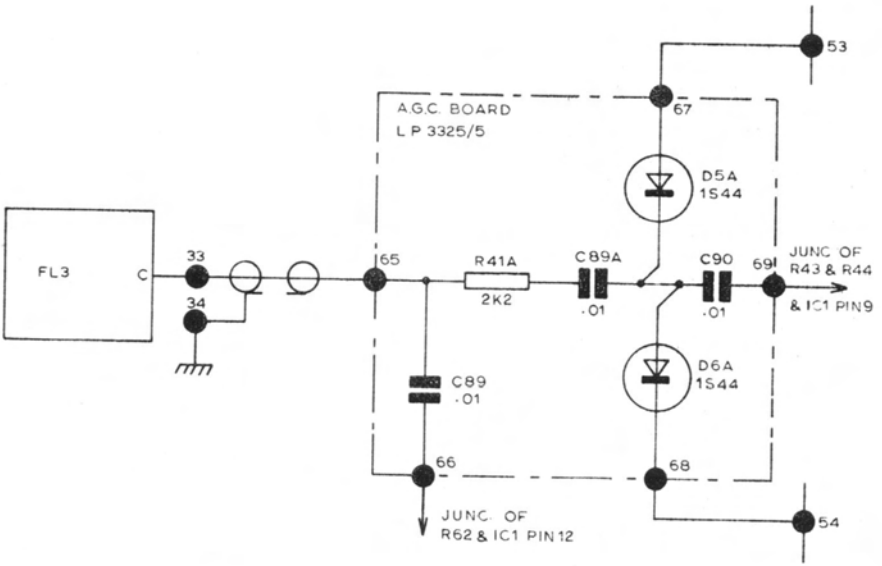
Add: C151 (.1) between pin 57 and circuit earth.
Add: C153 (.047) across secondary winding of T2.
Add: C154 (1000pF) across PL4.
Add: R1A (390) in series with primary winding of L1.
Change R3 to 560Ω
Change value of R8A to 470kΩ
Change value of R10 to 330Ω
Add: R10A (1k) in parallel with primary of L9
Change value of R11 to 220Ω
Add: R11A (330) in parallel with primary of L10
Add: R13A (2k2) in parallel with R13
Add: R21A (180) in parallel with primary of L17
Add: R21B (390) in parallel with primary of L16
Change value of R22 to 180Ω
Add: R22A (180) in parallel with primary of L18
Change value of R24 to 270Ω

2182kHz Board.
Add: R5A (680k) across pins 201-207
Change value of R17 to 820Ω

Also make the changes shown below:







A.G.C. BOARD LP3325/5

Section 1

GENERAL DESCRIPTION AND PERFORMANCE SUMMARY

G E N E R A L D E S C R I P T I O N

EDDYSTONE Model 1004 is a solid-state equipment with reception facilities for CW, AM and SSB transmissions in the bands 150-535kHz and 1.6-30MHz. Seven frequency ranges are employed and provision is made for high-stability operation (with crystal control) on up to ten channels in the band above 1.6MHz. An integral pre-tuned crystal-controlled converter is fitted to provide instantaneous selection of the International Distress and Calling Channel (2182 kHz) for emergency watchkeeping at sea.

The receiver is specifically designed for maritime applications and is approved by the British Ministry of Posts and Telecommunications as a 'reserve' receiver for use on ships. It has a standard 483mm (19in) panel and is directly suitable for installation in any standard racking unit or equipment housing which complies with the UK Post Office Specification.

Operating voltage can be taken from any standard 40-60Hz AC supply or from a 12V or 24V battery, changeover from one mode of operation to the other being by means of a panel control. Internal circuitry is isolated from frame to permit use with all forms of DC supply irrespective of earthing arrangements.

A single-conversion circuit arrangement is employed using an intermediate frequency of 720kHz with selectable bandwidth. All normal communications features are provided including manual/AGC switching and standby facility, variable BFO and meter. The input circuit is protected and can be interrupted with a relay when using the receiver with an associated transmitter.

Output facilities include a built-in loudspeaker and connections for external loudspeaker, telephone headset and 600Ω lines, the line output being provided by an independent amplifier with adjustable pre-set level control. Sidetone can be fed into the audio circuits through connections at the rear.

GENERAL SPECIFICATION

Frequency Coverage	150-535kHz and 1.6-30MHz in 7 ranges plus pre-tuned channel set to 2182kHz. Ten spot frequencies can be crystal-controlled in the band 1.6-30MHz using Style 'D' (International Style 'AA') crystals.
Frequency Ranges	Range 1 :: 18.0 - 30.0MHz. Range 2 :: 8.5 - 18.0MHz. Range 3 :: 3.6 - 8.5MHz. Range 4 :: 2.6 - 3.8MHz. Range 5 :: 1.6 - 2.65MHz. Range 6 :: 380 - 535kHz. Range 7 :: 150 - 385kHz.
Intermediate Frequency	720kHz (BFO coverage : 720kHz ± 3kHz).
Reception Modes	A1, A2 & A2H telegraphy. A3, A3A, A3H & A3J telephony with upper and lower sideband selectable in SSB mode.
Scale Accuracy and Resolution	Accuracy 1%. Resolution is typically 5kHz/mm in band 150-535kHz, 10kHz/mm from 1.6-3.8MHz.
Environmental	0°C to +50°C (-20°C to +70°C storage).
Aerial Input	Below 4MHz : 10Ω in series with 200 to 600pF. Above 4MHz : 75Ω
Power Supply	DC :: 12V or 24V. Consumption (12V) : 230mA at 1W o/p, 38mA quiescent. AC :: 100/130V or 200/260V (40-60Hz). Consumption : 12VA approx.
Dimensions and Weight	See Page 13
Semiconductors	The complete circuit employs a total of 20 transistors, 2 integrated circuits and 30 diodes. A full list of types and circuit functions is given in Appendix 'B' on page 43.

PERFORMANCE SUMMARY

Performance figures quoted in the data below are typical only and should not be interpreted as a test specification.

Sensitivity	5µV on Ranges 1-5 (& 2182kHz), and 15µV on Ranges 6 & 7. (Taken for 15dB S+N/N ratio in 'AM' mode with 3kHz IF B/W, 30% mod at 1kHz and 50mW output).
Selectivity	WIDE: 8kHz at -6dB, 20kHz at -60dB NARROW: 3kHz at -6dB, 18kHz at -60dB
Image Rejection	400kHz : 90dB. 1.6MHz : 60dB. 18MHz : 40dB.
IF Rejection	75dB on all ranges rising to 90dB at 12MHz.
Stability	Better than 1 part in 10^4/°C, or 3 in 10^5/°C with crystal controlled osc.
Radiation	Not greater than 400pW.
Blocking	With a wanted signal 60dBµV, unwanted carrier 20kHz off-tune must exceed 100 dBµV to affect output by 3dB.
Cross Modulation	With a wanted carrier 40dBµV, unwanted signal 20kHz off-tune must exceed 80 dBµV to give standard output.
Intermodulation	With a wanted signal 40dBµV adjusted for standard output, simultaneous application of two interfering signals of level 100dBµV, one modulated and the other not, will give an output not greater than standard output. (Taken on Range 6).
* AGC Characteristic	Less than 12dB change in output for an 80dB increase in input from 6µV.
Audio Output	Loudspeaker : 800mW @ 5% dis. (1W max). Line : 10mW max into 600Ω (pre-set). Headset : Low/medium-Z output.
(*) Taken at 2MHz.	Response : level within 6dB 300Hz-6kHz.

Section 2

CIRCUIT DESCRIPTION

THE RF SECTION

Tunable Stages (TR1, TR2, TR3, TR4 & TR5)

Aerial input to the tunable stages on the main printed circuit board is taken via the normally-closed contacts of RLA/1 on the 2182kHz CONVERTER BOARD, and one section of the SELECTIVITY/2182kHz SWITCH (S2A) when set to 'WIDE' or 'NARROW' position. Connection is to low-impedance primary windings on the signal frequency tuning circuits L1-L7 selected by RANGE SWITCH wafers S1A & S1B. The primaries are fully insulated from the tuned secondaries and are returned to frame earth to preclude any danger of the aerial feeder attaining a high potential when operating the receiver with floating circuit earth.

A static leak is provided (R1A), and input protection diodes (PC1) are permanently wired across the aerial feeder: both items are located on the 2182kHz CONVERTER BOARD.

The RF Amplifier comprises TR1 and TR2 in cascode configuration with a delayed AGC line permanently connected to the gate of TR2 to obviate the need for manual gain control in this part of the circuit. Amplified signal at the drain of TR2 is taken via L8-L14 to gate 1 of the dual-gate MOSFET used in the Mixer position TR3. Various forms of coupling are employed at L8-L14 to ensure sensibly constant gain from range to range. 720kHz IF output is taken from the Mixer via SELECTIVITY/2182kHz SWITCH section S2B when this is set to 'WIDE' or 'NARROW' position.

Local oscillator injection is derived from TR4 with isolation provided by the FET Source Follower TR5. A tuned-gate oscillator configuration is employed, with initial operating conditions set by D2 and R28. Damping resistors across the feedback windings on L15 -L21 maintain sensibly constant output from range to range. Injection is applied to gate 2 of the Mixer.

All stages. TR1-TR5 run from a zenered 11V rail which is completed through the SELECTIVITY/2182kHz SWITCH section S2C: the supply for TR4 & TR5 is further zenered by D4 and runs at 9.1V.

Crystal Oscillator (TR6 & TR7)

The tunable local oscillator TR4/5 can be disabled by interrupting the 11V line at S3A to permit operation with crystal-controlled local oscillator injection derived from TR6 & TR7.

S3A is one section of the CRYSTAL SELECTOR SWITCH in the plug-in CRYSTAL UNIT at the left-hand side of the receiver: the other two sections (S3B & S3C) select up to ten crystals installed in holders within the unit. All unselected crystals are shorted out and grounded to prevent spurious excitation. S3A transfers the 11V supply to TR6 & TR7 when set to any 'CRYSTAL' position.

TR7 functions as a parallel-mode oscillator and is direct-coupled to the Emitter Follower TR6 which provides injection in parallel with the normal injection feed to gate 2 of the Mixer. Diode D3 limits the voltage excursion at the base of TR6 when using crystals of high activity.

2182kHz Converter Board

All stages TR1-TR7 on the main printed board are disabled when the SELECTIVITY/2182kHz SWITCH is set to '2182kHz'. S2A routes the aerial input to the 2182kHz RF Amplifier, S2B connects the 720kHz IF output from the 2182kHz Mixer to the IF Section and S2C applies the zenered 11V supply to the three 2182kHz stages.

The RF Amplifier and Mixer circuitry used on the 2182kHz channel is identical to that used on the tunable ranges. The local oscillator utilises a dual-gate MOSFET and is crystal-controlled at 2902kHz: C18 allows the crystal to be trimmed to exact frequency.

Muting Relay (RLA/1)

RLA/1 provides protection for the tunable and 2182kHz input stages when using the receiver in conjunction with an associated transmitter: the relay is a high-speed reed type and is arranged to be operated from an external control circuit during periods of transmission.

The control circuit can be arranged to switch the relay using the receiver supply, or alternatively external supplies of 12V or 24V can be used. Connection is via the Ancillaries Connector PL/SK-3 and full wiring details will be found on page 18.

The single-pole changeover contact on the relay is wired to interrupt the aerial feeder at its point of entry, while simultaneously grounding the input connection to the operative stage.

IF AMPLIFIER AND DETECTOR/AGC CIRCUITS

720kHz IF Amplifier (TR8, TR9 & PART IC1)

IF o/p from the operative mixer is taken via S2B to a pair of tuned circuits L22/L23 which feed a multi-element ceramic ladder filter FL3. O/p from the filter is taken to the 1st IF Amp and the RF AGC Amp, both of which employ transistors in IC1 (transistor package).

The emitter of the 1st IF Amp is taken via a further section of the SELECTIVITY/2182kHz SWITCH (S2D) to a single 720kHz resonator, separate from the main filter, but in the same case. This additional resonator is brought into circuit with S2 at 'NARROW' and provides a 6dB IF bandwidth of 3kHz. At 'WIDE' and '2182kHz' selectivity is fixed by the main filter and is 8kHz at -6dB.

The 1st and 2nd IF Amplifiers are choke-capacity coupled via a diode attenuator D5/D6 which is part of the IF AGC circuit. The final IF Amp is a further transistor from IC1.

Detectors and AGC

AM Detector: The AM Detector D9 is fed from the final IF Amp via L24 and is forward biased by the potential across D7 & D8. An emitter follower (using another transistor ex-IC1) passes the recovered audio to the 'AM' position of MODE SWITCH S6A.

CW/SSB Detector: 720kHz input for this stage is provided by the FET isolating stage TR9 which also drives the IF AGC system. A dual-gate MOSFET CW/SSB Detector is used (TR13) with signal (IF) fed to gate 1 and BFO injection to gate 2. Audio appearing in the drain circuit is filtered and then passes to the CW/SSB position of S6A.

BFO: This stage employs a junction-FET and is activated by S6B which completes the 11V supply to zener D17 to give a 3.3V supply for the oscillator and its associated tuning system. The latter comprises the two voltage variable capacitance diodes D15/D16 and potentiometers RV1 & RV2. RV2 serves as the normal BFO PITCH CONTROL while RV1 is a 'fine' control which allows more precise setting of the beat oscillator frequency when taking SSB.

RF AGC: The RF AGC Amplifier fed directly from the output of FL3 drives a pair of diodes (D10/D11) in a voltage doubler circuit to provide a controlling voltage for the cascode RF Amplifier. The circuit has a fast attack/decay time constant and is arranged to operate only at high signal levels.

IF AGC: Control of signal level (both manually and with AGC) in the IF part of the receiver circuit is effected by a diode attenuator (D5/D6) between the 1st and 2nd IF stages. The diode current is controlled by junction-FET TR10 to vary the shunting effect of the diodes on the signal path.

Gate voltage for TR10 is applied via one part of the STANDBY SWITCH (S4B) and one part of the MANUAL/AGC SWITCH (S5A). With S4 set to 'ON' and S5 at 'MANUAL', control voltage is derived from RV3 which provides a normal manual gain control facility. With S5 moved to either of the two 'AGC' positions, controlling voltage is obtained from the voltage doubler D13/D14 which is driven by the final IF Amplifier through TR9 and TR11. Time constant is determined by S5B which introduces a large capacitor at the gate of TR10 when set to the 'AGC LONG' position.

STANDBY SWITCH section S4A interrupts the 9V supply to both the IF Amplifier and RF AGC circuit to disable the receiver at 'STANDBY'. S4B disconnects the manual and AGC circuits from TR10 gate which is returned to a fixed positive potential (R69) during stand-by periods.

A DC output is taken from D14 via R72 to operate the carrier-level meter when the DIAL/METER SWITCH S7 is set to either the 'DIAL' or unmarked centre position.

THE AUDIO SECTION

Audio from the appropriate detector is selected by MODE SWITCH section S6A which is wired to the two parallel-connected potentiometers RV4 and RV5 to give independently adjustable inputs for the two audio channels provided.

Main Audio (IC2)

This channel is located on the main printed board and utilises a single integrated circuit fed from the slider of the AF GAIN RV5. A secondary input is provided from the Ancillaries Connector PL/SK3 via C136A to permit connection of sidetone when using the receiver with an associated transmitter.

IC2 provides an 8Ω output for the panel-mounted loudspeaker and is also wired to the Ancillaries Connector to permit connection to external 3Ω or 8-15Ω loudspeakers. An output for a telephone headset is provided at JK1 and the circuit is arranged so that the loudspeaker circuits are interrupted when the headset is connected.

600Ω Line Amplifier Board

This board carries a two-stage R/C coupled amplifier fed from the slider of the pre-set LINE LEVEL CONTROL RV4. Output is adjustable up to a maximum of 10mW in 600Ω and is fed to the Ancillaries Connector via the centre-tapped transformer T1 which incorporates an electrostatic screen connected to frame earth: provision is made for linking the centre-tap of the secondary to frame when a balanced output is required.

P O W E R S U P P L Y U N I T

The receiver can be operated from DC supplies of 12V or 24V and AC supplies of 100/130V or 200/260V (40-60Hz). Changeover from AC to DC working is by means of the 3-position SUPPLY SWITCH S8A-D which interrupts both inputs when set to centre 'OFF' position.

DC Working

Adjustment to suit 12V or 24V input is provided by an internal link which introduces R103 and 12V zener D19 for 24V operation. A fuse and reverse-polarity protection diode (D21) are included directly at the supply input: the fuse will blow if the supply polarity is reversed.

The 12V supply from D19 (or direct from battery in 12V working) is zenered by D18 to give a regulated 11V line which feeds all stages except the IF and main audio: these are fed at 9V via the series transistor regulator TR14.

Battery state can be checked on the panel meter by setting S7 to the 'BATT CHECK' position.

Circuit earth (negative supply rail) is isolated from the frame of the receiver to permit operation from supplies which have their positive pole at true earth potential: C100A and C147 provide a 'signal' (RF/IF/AF) path between circuit earth and frame. Terminals are provided so that frame and circuit earth can be commoned when operating from supplies with negative pole earthed.

AC Working

When operating from an AC supply the mains voltage is stepped down by T2 and then rectified by the full-wave bridge rectifier D22 to feed D18 and TR14 exactly as in DC working.

Fuses are included in both legs of the AC supply: the DC fuse remains in circuit during AC operation.

Section 3

MECHANICAL CONSTRUCTION

General

Model 1004 is a basic rack-mounting equipment for installation in standard 483mm (19in) racking.

Dimensions	Weight
See Fig. 3.1 below.	7.7kg (17lb).

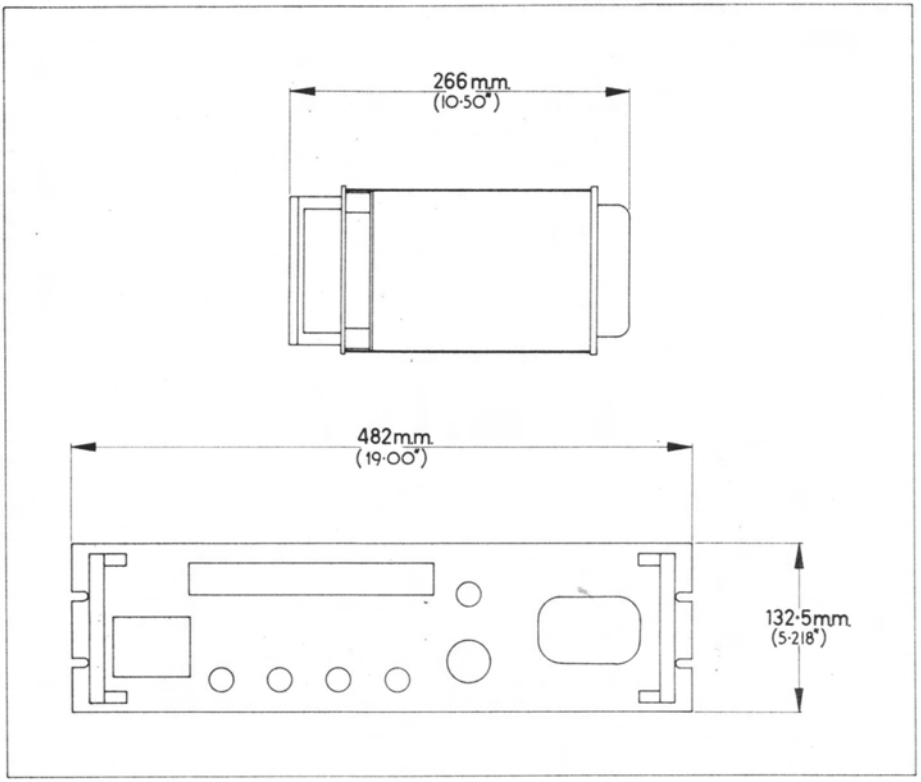


Fig. 3.1 Dimensions of Model 1004 Receiver.

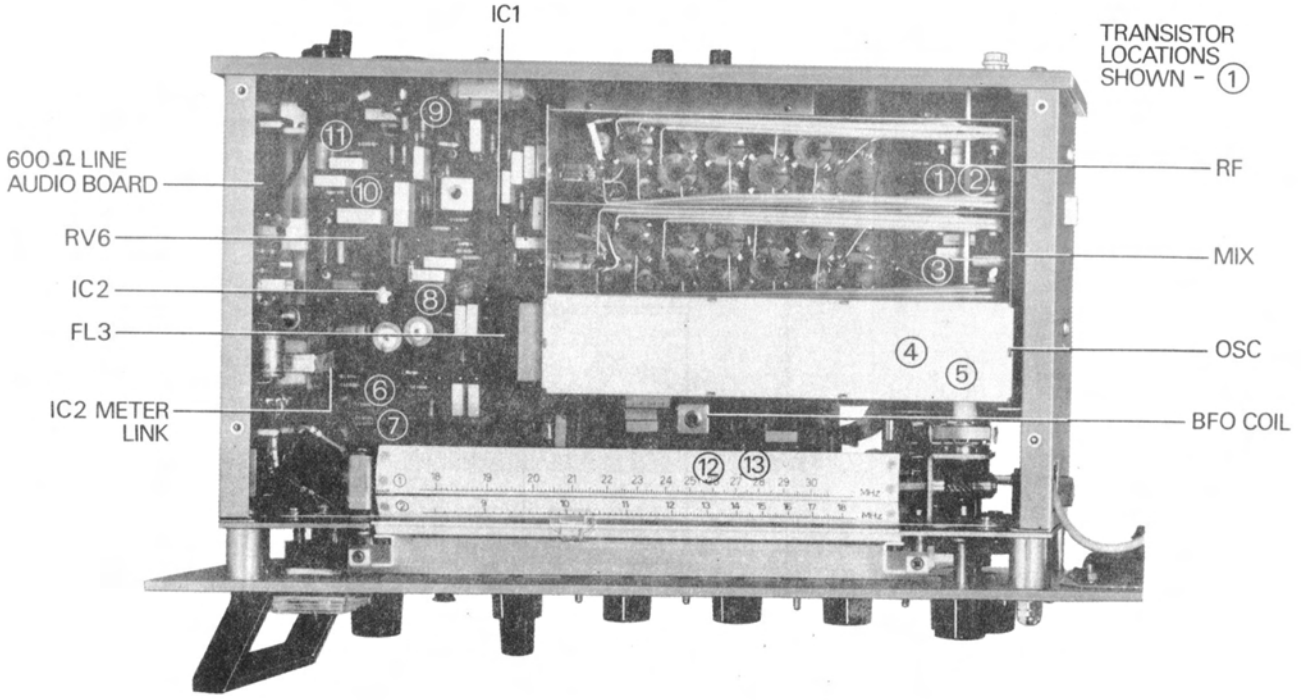


Fig. 3.2 Plan view showing major component location.

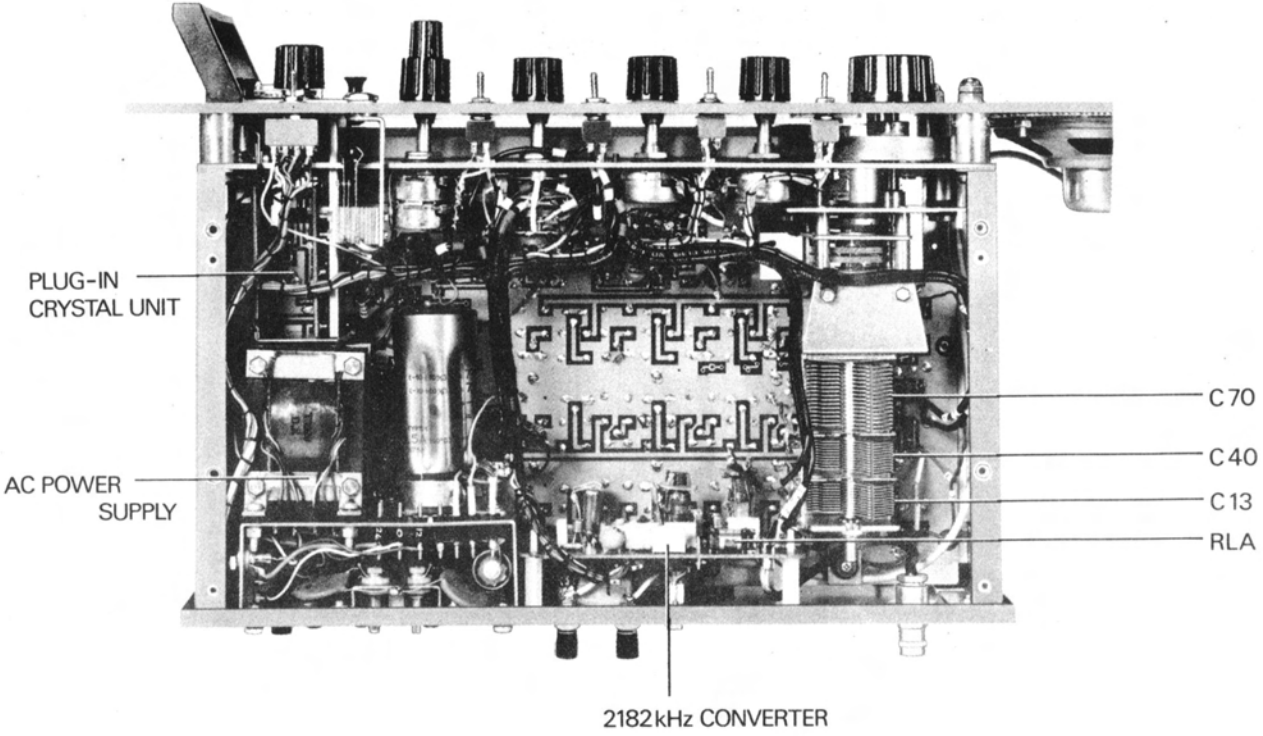


Fig. 3.3 Underside view showing major component location.

Section 4

I N S T A L L A T I O N

ACCESSORY KIT (Items supplied with receiver)

1 x AC SUPPLY CONNECTOR (complete with 3-core cable)		D2311/1
1 x DC SUPPLY CONNECTOR (complete with 2-core cable)		D3641
1 x ANCILLARIES CONNECTOR (unwired - with cover)		8631P
1 x BNC AERIAL PLUG		8012P
1 x SPARE DIAL BULB (12V @ 80mA, wire-ended)		8448P
2 x SPARE FUSES (1 @ 1A + 1 @ 2A, or 2 @ 2A if delivered for 100/130V operation)	1 Amp	7173P
	2 Amp	6704P
2 x TRIMMING TOOLS (1 off each type)		8333P & 8450P

OPERATING VOLTAGES

AC :: 100/130V or 200/260V (40-60Hz).

DC :: 12V or 24V (floating supply or any battery arrangement).

NB: RECEIVERS ARE ADJUSTED FOR 240V AC AND 24V DC BEFORE DISPATCH.

MAINS VOLTAGE ADJUSTMENT

Remove bottom cover for access and adjust mains transformer taps by reference to Fig. 4.1 and Table.

Voltage	Link	Supply
100V	2-6, 3-7	2 & 3
110V	1-5, 3-7	1 & 3
120V	2-6, 4-8	2 & 4
130V	1-5, 4-8	1 & 4
200V	3-6	2 & 7
210V	3-6	1 & 7
220V	3-5	1 & 7
230V	3-6	1 & 8
240V	4-6	2 & 8
250V	4-6	1 & 8
260V	4-5	1 & 8

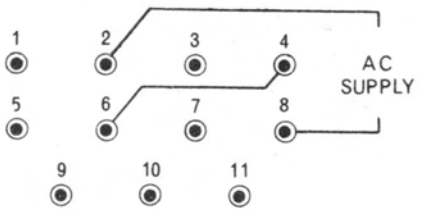


Fig. 4.1.

Mains transformer tappings (shown set for 240V operation)

BATTERY VOLTAGE ADJUSTMENT

Remove bottom cover for access. Locate battery voltage selector pins by reference to Fig. 4.2. Fit link in appropriate position.

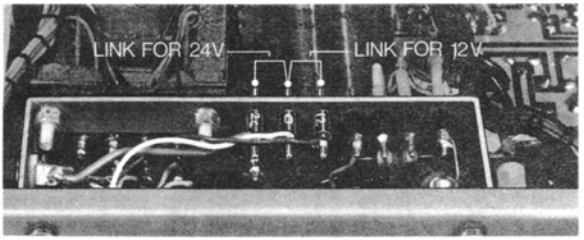


Fig. 4.2. Location and linking of battery voltage selector pins.

FUSE COMPLEMENT

AC :: 2 @ 1A for 200/260V, 2 @ 2A for 100/130V.
DC :: 1 @ 2A for 12V and 24V (also in circuit for mains operation).

CIRCUIT EARTH AND FRAME EARTH TERMINALS

These two terminals should be linked with a wire strap to provide a common earth connection when operating the receiver from:-

(1) AC Mains.
(2) Battery with NEGATIVE pole earthed.
(3) Battery to which no other connection is made.

The link must be removed to allow circuit earth to 'float' when the receiver is operated from:-

(1) Battery with POSITIVE pole earthed.
(2) Battery on float charge with both poles at a potential other than earth.

EXTERNAL CONNECTIONS

AC Connector: LIVE : Brown NEUTRAL : Blue EARTH : Green/Yellow

DC Connector: POSITIVE : Red NEGATIVE : Black

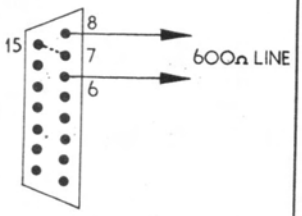
Aerial Input: The receiver can be used throughout its coverage with aerials of 50-75Ω nominal impedance. The input circuit incorporates a static leak and is diode-protected to withstand high induced aerial EMF's. Plug accepts 6.35mm (0.25in) dia. coaxial cable.

Earth: Connect direct local earth to frame terminal 'E'.

EXTERNAL CONNECTIONS (contd.)

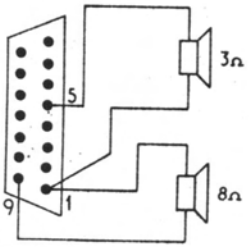
Ancillaries Plug Connections (Plug viewed on wiring side)

Fig. 4.3. 600Ω LINE OUTPUT



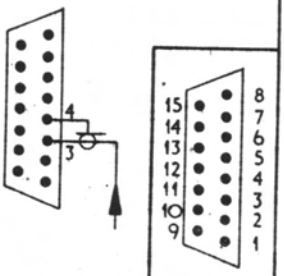
Link Nos 7 & 15 to obtain balanced 600Ω output with centre-tap connected to frame.

Fig. 4.4. EXTERNAL LOUDSPEAKER



External wiring to speaker is at +ve potential w.r.t. circuit earth and must be insulated from ground.

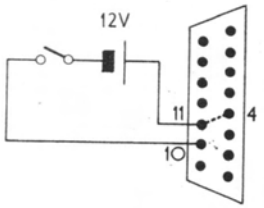
Fig. 4.5. SIDETONE INPUT



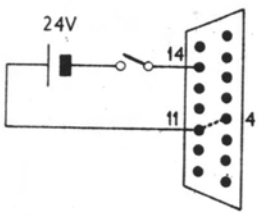
Link must be in position between Nos 2 & 10.

External wiring to switch must be insulated from ground when operating with floating circuit earth.

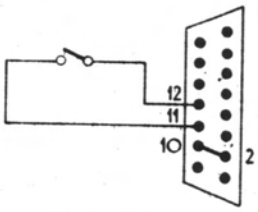
No. 11 (common) can be earthed to frame by linking to No. 4 as shown. Supply polarity can be reversed.



(a) Switched 12V supply.



(b) Switched 24V supply.



(c) Switched receiver supply.

Fig. 4.6. MUTING CONTROL CIRCUITS (close switch to energise aerial relay)

Headset: Connect to 'PHONES' socket on panel. Output is primarily intended for use with telephone headsets of 8Ω - 600Ω impedance but satisfactory results will be obtained with impedances up to 4,000Ω. 600Ω line output is available with headset connected but the loudspeaker output is muted. Headset circuit is returned to frame for safety when operating receivers with floating circuit earth.

MOUNTING

Basic '1004' Receiver requires height of 133mm (5.25in) in standard 483mm (19in) rack. Intrusion into the rack is of the order 250mm. (10in approx).

Section 5

O P E R A T I O N

C O N T R O L F U N C T I O N S

TUNING CONTROL: Operates the tuning cursor and vernier scale. Accurate dial settings can be recorded by combining readings on logging scale (0-1000), and vernier (0-100). e.g. if cursor lies between 600/700 and vernier reads 56, log '656'.

RANGE SWITCH: Range 1 is the highest frequency band. Calibration : 'MHz' on ranges 1-5, 'kHz' on Ranges 6 & 7.

CRYSTAL SELECTOR: Part of plug-in Crystal Unit. Provides selection of up to ten crystal-controlled local oscillator frequencies for high - stability working on Ranges 1-5.

SET CRYSTAL SELECTOR TO 'NORMAL' FOR MANUAL TUNING WITH FREE-RUNNING LOCAL OSCILLATOR. THE RECEIVER WILL BE DISABLED WHEN PLUG-IN CRYSTAL UNIT IS WITHDRAWN FROM PANEL.

MODE SWITCH: Two position toggle switch:- 'AM' - 'CW/SSB'. Selects appropriate detector circuit and intro -duces the BFO when set to 'CW/SSB'.

SELECTIVITY SWITCH: Dual-purpose three-position control providing choice of bandwidth for normal working, plus instantaneous selection of the pre-tuned crystal-controlled 2182kHz channel. Bandwidth at -6dB is 8kHz at 'WIDE', 3kHz at 'NARROW' and 8kHz at '2182kHz'.

TUNING AND RANGE SWITCH SETTINGS NEED NOT BE ALTERED TO RECEIVE 2182kHz TRAFFIC.

BFO CONTROL: Gives coarse adjustment of beat oscillator frequency with Mode Switch at 'CW/SSB'.

'CW' : Set for desired audio beat.

'USB' : Set clockwise from centre position.

'LSB' : Set anti-clockwise from centre.

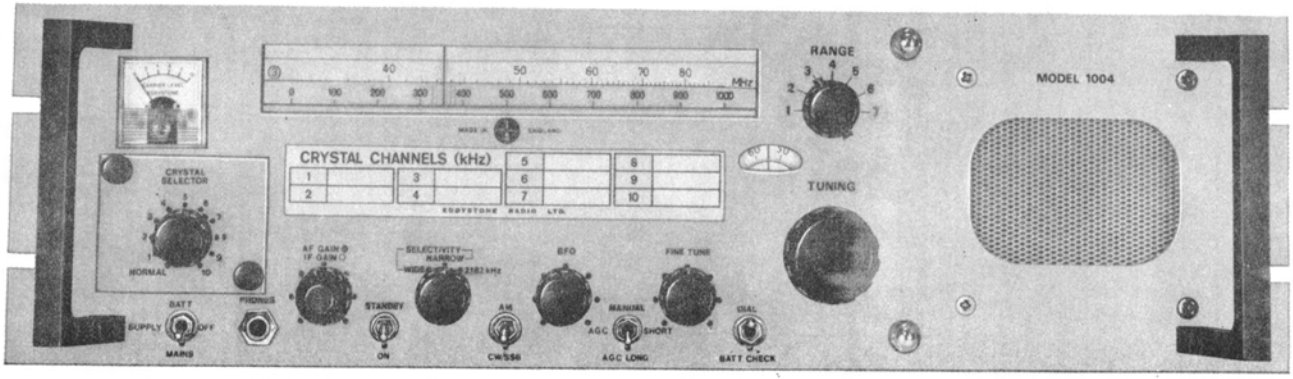


Fig. 5.1 Front view of Model 1004 Receiver showing controls.

FINE TUNING CONTROL: Use for 'fine' adjustment of beat oscillator frequency when receiving SSB signals (speech clarifier).

IF/AF GAIN CONTROLS: AF Gain (red knob) controls output to loud speaker and headset but does not affect 600Ω line output (see Line Level Control).

IF Gain is inoperative when using AGC.

MANUAL/AGC SWITCH: MANUAL: Control gain manually with IF GAIN - AGC circuit is disabled.

AGC SHORT: IF Gain Control is inoperative. AGC decay of the order 0.5 sec for AM and high-speed CW telegraphy.

AGC LONG: Decay time approximately 8 secs for SSB reception.

STANDBY SWITCH: (ST. BY.) Set to 'ON' position to operate receiver. IF Stages are desensitized with switch set to 'ST BY'.

This control is independent of the aerial relay circuit (see Muting - page 18).

SUPPLY SWITCH: Completes external supply direct to receiver circuits for battery operation and to internal power unit for AC working.

Battery can be permanently connected to provide emergency standby operation when working from an AC supply.

DIAL/METER SWITCH: DIAL: Dial lights on, meter gives relative indication of carrier-level.

CENTRE: Dial lights off, meter as 'DIAL'.

BATT CHECK: Dial lights off, meter shows state of external battery. Change battery if needle lies below red sector of scale.

LINE LEVEL CONTROL: Pre-set potentiometer located at rear of receiver. Controls output level to 600Ω line circuit and is set for 1mW output when receiver is dispatched from factory. Output is adjustable up to a maximum of 10mW in 600Ω

TUNING INSTRUCTIONS

NORMAL OPERATION (refer to page 24 for crystal control)

1. Set SUPPLY SWITCH to 'BATT' for battery operation, or 'MAINS' for AC operation.
2. Check that STANDBY SWITCH (ST. BY.) is set to 'ON' and that external muting (aerial relay) switch is set to receive position.
3. When operating from a battery (or if battery is provided for emergency use), set DIAL/METER SWITCH to 'BATT CHECK' to determine battery state: meter should read in red sector of scale.
4. Set DIAL/METER SWITCH to 'DIAL' if scale illumination is required.
5. Connect telephones if required (loudspeaker becomes muted).
6. Set CRYSTAL SELECTOR to 'NORMAL'.
7. Select appropriate RANGE and adjust TUNING for required frequency - Range 1 is highest band.
8. Set MODE SWITCH to 'AM' for reception of A2, A2H and A3 signals or to 'CW/SSB' for A1 telegraphy and A3A, A3H or A3J telephony.
9. Set SELECTIVITY SWITCH to 'WIDE' for A3 reception, to 'NARROW' for other signal modes.
10. Set MANUAL/AGC SWITCH to required position (IF GAIN CONTROL is disabled at 'AGC' settings).
11. Adjust AF GAIN (and IF GAIN if operational) for a comfortable listening level.
12. A3 telephony signals can now be tuned in the normal manner: for CW and SSB signals (A1, A3J etc.) proceed as follows:-

    NB: It is assumed that the MODE SWITCH is set to 'CW/SSB', and the SELECTIVITY SWITCH to 'NARROW'. The FINE TUNING CONTROL (SSB Clarifier) should be set initially to centre position.

CW Reception

(a) Set BFO CONTROL to an initial setting of approximately 30° to right or left of 12 o'clock position. Direction of offset is unimportant at this stage.

(b) Adjust TUNING CONTROL to required transmission, setting for beat note of the order 1000Hz.

(c) Re-adjust BFO CONTROL for higher or lower pitch to suit operator's preference.

(d) In the event of an interfering beat being audible due to the presence of another station on an adjacent channel, re-adjust BFO CONTROL for zero-beat with the interference. The wanted station will remain readable but with higher or lower pitch. In some cases, interference can be reduced by setting the BFO CONTROL to opposite side of centre setting.

(e) If AGC is to be used when receiving CW transmissions, compare reception in 'AGC SHORT' and 'AGC LONG' positions. Select setting which best suits prevailing conditions and keying speed in use.

SSB Reception

(a) Set BFO CONTROL to first index mark clockwise or anti-clockwise from 12 o'clock setting. Offset should be clockwise for USB signals, anti-clockwise for LSB.

(b) Adjust TUNING CONTROL to required transmission. This adjustment should be performed much more slowly than when tuning to a double-sideband signal, especially when tuning on the high frequency ranges where precise adjustment becomes more critical.

(c) Inability to obtain clear intelligible speech by use of the TUNING CONTROL alone indicates that the carrier insertion frequency is incorrect. In this event, adjust the FINE TUNING CONTROL to one or more trial settings and repeat the tuning adjustment in (b) above.

(d) As intelligibility improves, adjustment of the TUNING and FINE TUNING controls should be carried out with greater precision, the final adjustment being performed by use of the FINE TUNING CONTROL alone.

NB: Under normal circumstances, the FINE TUNING CONTROL provides adequate coverage to fully resolve any single-sideband transmission without need for altering the initial setting of the BFO CONTROL. A minor change in the setting of this control would however be necessary if for any reason the beat oscillator circuit was out of adjustment. In this event the degree of misalignment will be small and well within the range of the BFO CONTROL. Re-alignment would not be required but a note should be made of the modified settings to be used for USB and LSB reception.

SSB Reception (contd.)

(e) Once the BFO and FINE TUNING have been set in the manner described on the previous page, the receiver can be tuned to SSB signals by using the TUNING CONTROL alone. Use of the FINE TUNING CONTROL may be found necessary above about 10MHz but should be unnecessary below this frequency. Care should be taken to preserve as nearly as possible the initial setting obtained in (d).

(f) It is recommended that all preliminary tuning adjustments are carried out with the MANUAL/AGC SWITCH at 'MANUAL' and the IF GAIN set at moderately low level. The 'AGC LONG' setting can be selected on completion of tuning.

CRYSTAL CONTROL FACILITY

The plug-in Crystal Unit fitted at the left-hand side of the panel can be equipped with up to ten crystals to provide high-stability local oscillator working at frequencies on Ranges 1-5.

†Calculation of crystal frequency

CRYSTAL FREQUENCY = SIGNAL FREQUENCY ± INTERMEDIATE FREQUENCY.

NOTE 1 Intermediate frequency is nominally 720kHz. Exact frequency for each receiver is measured during test and recorded on receiver panel behind front plate of plug-in Crystal Unit.

NOTE 2 If reception channel is for an 'SSB' signal, the calculated crystal frequency must be adjusted by ± 1.5kHz: the following rules must be observed:-

Crystal freq. chosen ABOVE signal freq. : ADD 1.5kHz for USB.
DEDUCT 1.5kHz for LSB.

*Crystal freq. chosen BELOW signal freq. : ADD 1.5kHz for LSB.
DEDUCT 1.5kHz for USB.

(*) Setting of BFO CONTROL must be reverse of normal to obtain correct carrier insertion frequency, i.e. set clockwise for LSB and anti-clockwise for USB.

NOTE 3 If calculated crystal frequency is above 20MHz, divide by 2 or 3 and use second or third crystal harmonic to furnish the required oscillator injection frequency.

(†) Refer to page 26 for crystal specification.

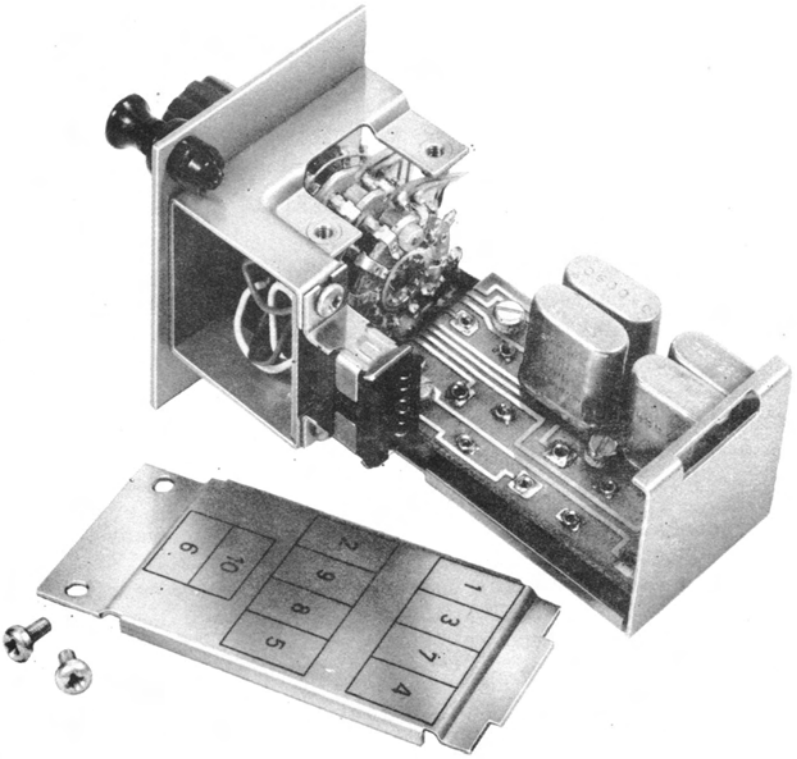


Fig. 5.2 Internal view of plug-in Crystal Unit LP3329.

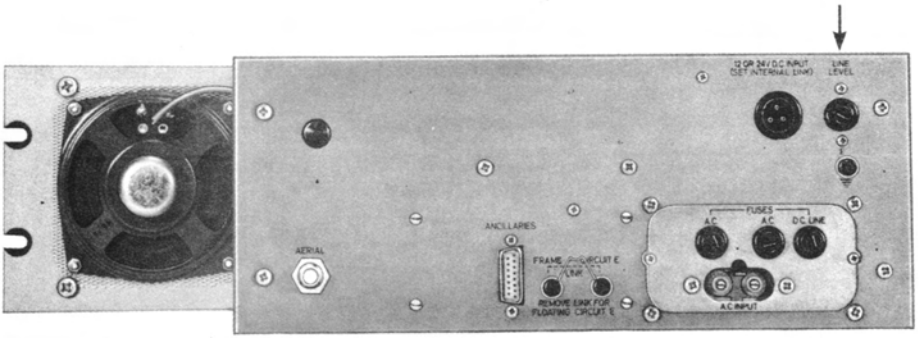


Fig. 5.3 Rear view showing location of line level control.

Crystal Specification

Crystal - Inter-Services Style 'D' (International Style 'AA'), for parallel mode oscillator service with load capacity of 30pF. Frequency in kHz. Tolerance 0.002% calibrated at 25°C.

Orders placed with EDDYSTONE RADIO LIMITED can be abbreviated as follows:-

Quantity - Crystal(s) for use with Model 1004 Receiver, frequency or frequencies of crystals quoted in kHz.

Procedure for fitting crystals

1. Disengage the two pull-to-release buttons and slide Crystal Unit forward clear of panel.
2. Remove screws and take off cover plate to gain access to crystal holders.
3. Fit crystals. Sockets are numbered 1-10 to correspond with the CRYSTAL SELECTOR switching.
4. Record signal frequencies corresponding to each crystal position on CRYSTAL CHANNEL CHART below dial aperture.
5. Replace cover plate and re-fit Crystal Unit: press retainers to lock unit in position.

Operation in crystal-controlled mode

1. Locate frequency on CRYSTAL CHANNEL CHART and set CRYSTAL SWITCH to appropriate position.
2. Select correct RANGE and adjust TUNING CONTROL to frequency, peaking for maximum signal strength.
3. Other controls function normally including '2182kHz' switching.

2182kHz FACILITY

Set SELECTIVITY SWITCH to '2182kHz' to activate pre-tuned crystal-controlled converter for watchkeeping on the International Distress and Calling Channel. MODE SWITCH should be set to 'AM' to suit mode of transmission used for this service.

TUNING, RANGE SWITCH and normal crystal facilities are disabled with SELECTIVITY SWITCH at '2182kHz'.

CARRIER LEVEL METER

Panel meter gives relative indication of signal strength except when DIAL/METER SWITCH is set to 'BATT CHECK'. Meter functions with or without AGC in use. Tune for maximum deflection.

Section 6

M A I N T E N A N C E

G E N E R A L

The 1004 Receiver has been designed for maximum reliability and should require very little in the way of routine maintenance even when used continuously under arduous operating conditions.

This section of the Handbook gives guidance for simple operations such as changing fuses and dial lights, and more detailed instructions on performance testing, re-alignment etc. Appendix 'A' on page 41 contains a comprehensive analysis of voltages to facilitate fault-finding. Spares can be supplied ex-stock for user-servicing and arrangements can be made for equipment to be returned to the manufacturer for specialised attention. The Receiver Type and Serial No. should be quoted in all communications.

F U S E R E P L A C E M E N T

Bulgin Type F.270 quick action glass cartridge fuses (or an equivalent 5mm x 20mm fuse) are supplied as spares in the Accessories Kit sent out with the receiver. Part Nos. 1 Amp fuse 7173P, 2 Amp 6704P.

Fuse ratings are as follows:-	AC FUSES	::	1A (200/260V) 2A (100/130V)
	DC FUSE	::	2A

NB: DC Fuse remains operative when receiver is operated from AC supply.

D I A L L A M P R E P L A C E M E N T

One spare dial bulb is supplied with receiver and additional spares can be ordered by quoting Part No. 8448P. Proceed as follows to fit spare.

1. Remove four screws retaining top cover: lift off carefully and disengage dial lamp supply connector to allow complete removal.
2. Unsolder faulty bulb from printed circuit termination and then push bulb out of retainer (towards centre of cover).
3. Insert new bulb (wire-end first) and solder to printed circuit termination: examine soldering for possible short-circuit.
4. Re-connect dial lamp supply, apply power to receiver and check that both bulbs light normally.
5. Replace cover and tighten screws.

INSTRUCTIONS FOR RE-STRINGING CURSOR DRIVE CORD

A replacement drive cord can be obtained from the manufacturer by quoting Part No. D4709. The cord is supplied complete with eyelets which are spaced 848mm ($33\frac{3}{8}$in). Procedure for fitting is as follows:-

1. Remove top and bottom cover plates (disengage dial lamp connector when removing top cover).

2. Remove calibrated scale drum for access to guide pulleys on rear of drive mounting plate. Proceed as follows:-

   (a) Set Range Switch to Range 1 for access to interior of scale drum.

   (b) Locate scale drum locking screws and slacken about $1\frac{1}{2}$-turns (the drum will rotate due to tension of coil spring at right-hand end).

   (c) Slacken screw in scale drum spindle collar (adjacent to meter).

   (d) Slide collar off spindle and remove also the steel shim washer which is trapped behind it.

   (e) Grip helical gear and withdraw spindle through right-hand side plate (support drum and extract coil spring as spindle clears end bearing).

   (f) Lift drum clear and store with other loose items in readiness for re-assembly.

3. Remove panel for access to vernier dial and flywheel.

   (a) Unsolder leads to loudspeaker and meter.

   (b) Remove plug-in Crystal Unit.

   (c) Remove all control knobs (set Tuning to full extreme of anti-clockwise travel before removal).

   (d) Slacken and remove the panel nuts/washers which retain toggle switches: push switches through panel.

   (e) Slacken and remove two screws holding right-hand side plate to panel.

   (f) Place receiver in face-down position resting on blocks so that handles are clear of bench.

   (g) Slacken and remove screws holding panel handles. Receiver unit is now free of panel and can be lifted clear.

4. Remove vernier dial and flywheel to expose aperture in drive mounting plate for access to cord drum.

5. Re-string cursor drive cord by proceeding as follows:-

   (a) Take off broken cord and remove cursor.

   (b) Check that drive is set in fully anti-clockwise position and that slot in cord drum lies at 6 o'clock.

   (c) Trap one eyelet of replacement cord in rear end of cord drum slot.

   (d) Lay cord over cord drum, winding on approximately $\frac{1}{2}$-turn with cord leaving pulley towards right-hand side plate.

   (e) Pass cord under 1st guide pulley, then vertically upwards and over 2nd guide pulley - keep cord in tension.

   (f) Run cord across dial aperture, over 3rd guide pulley, and then downwards under sprung jockey pulley - keep cord in tension.

   (g) Pass cord back across dial aperture, over 4th guide pulley, over vernier spindle and then bring free end out through aperture in front of cord drum - keep cord in tension.

   (h) Maintain tension on free end of cord and rotate tuning spindle clockwise to extreme of travel so that just over 5-turns of cord are wound onto cord drum.

   (i) Grip free end of cord with tweezers or long-nose pliers, pass over cord drum to wind on $\frac{1}{2}$-turn in clockwise direction, and then trap eyelet in front end of cord drum slot.

   (j) Temporarily fit control knob and rotate through complete travel to ensure that cord runs smoothly.

6. Re-fit flywheel and vernier dial with Tuning at fully anti-clockwise position (secure vernier with '0' at 12 o'clock).

7. Fit cursor and set to '0' on logging scale: check for smooth operation.

8. Replace front panel by reversing procedure given in (3) above. Check that Crystal Unit fits correctly before finally tightening the six screws which retain the panel.

9. Replace calibrated scale drum by using procedure detailed below.

   (a) Pass scale drum spindle through right-hand bearing and slide in the tension spring removed in 1(e). Locate tail of spring in hole in bearing bracket.

   (b) Cradle scale drum in left hand and continue feeding in spindle until it passes through bearing at left-hand end. Slide on the steel shim washer and retaining collar.

   (c) Push helical gear against bearing surface and secure collar so that gear is retained in this position.

9. (d) Insert other tail of tension spring in hole in end of drum. Rotate drum with fingers approximately four complete revolutions to apply tension to spring. Tighten retaining screws through rear of drum with drum set so that Range 1 shows through scale window: ensure that drum is central in window.

   (e) Select all ranges in turn and observe that drum movement is positive in each position. If more positive action is required, increase spring tension by one or possibly two more turns.

10. Check calibration accuracy and replace top/bottom cover plates.

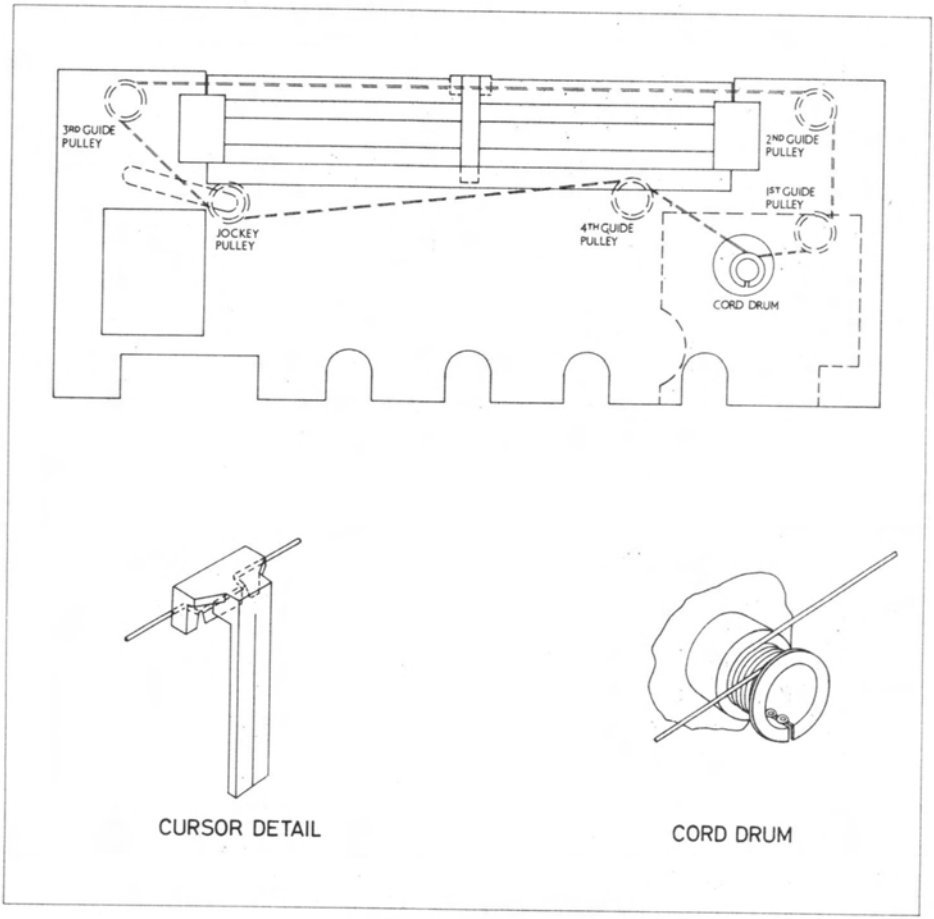


Fig. 6.1. Cording arrangement for cursor drive.

PROCEDURES FOR PCB REMOVAL ETC

Most fault-finding can be carried out without need for removal of the printed circuit boards, but occasions may arise (e.g. failure of RLA), where it becomes necessary to gain access to the underside of the board in order to change a faulty component. The basic procedure for taking out any of the small printed boards will be obvious from visual inspection, it being necessary only to slide them with minimum pressure upwards on their plastic mounting pillars. Complete removal will necessitate unsoldering of the cable harness from the board terminations but both these and the leads are numbered to facilitate replacement.

Removal of the Main p.c.b. should not be necessary since access can be gained to all parts of the underside by removing either the 2182kHz Converter Board or the Power Unit chassis.

Procedure for removing Power Unit

1. Remove the plug-in Crystal Unit to clear space in front of T2 (mains transformer).
2. Un-plug the leads from Pins Nos 71, 72, 73, 79 & 80.
3. Remove the four screws located at the corners of the power unit aperture in the back-plate.
4. Slide unit forward and upward to remove.

   NB: When complete removal of power unit is required it is necessary to free Supply Switch from panel and disconnect DC Input lead.

Procedure for setting IC2 quiescent current

If IC2 is replaced, RV6 must be adjusted to set the IC2 quiescent current to the correct value: proceed as follows.

1. Remove the link between Pins Nos 57 & 58 (see Fig. 3.2 for location)
2. Connect a milliammeter in place of the link with polarity connection as indicated on board.
3. Switch on receiver, set AF GAIN to minimum and then adjust RV6 for a standing current of 10mA.
4. Disconnect meter and replace link.

> **C A U T I O N**
>
> When removing top cover from receiver, lift cover slowly, locate position of dial lamp supply connector and disengage before cover is completely removed. Connector is located near front left-hand corner of receiver - behind meter.

PERFORMANCE TESTING

WARNING

The 1004 Receiver has provision for operation with floating circuit earth to permit direct connection to DC power supplies which do not have their negative pole connected to earth. Personnel should note, that when the receiver is operated in this manner, there is a possibility that on some installations a dangerous potential may exist between the internal circuitry and the outer frame. Caution must therefore be exercised in handling the set with the covers removed, and special precautions should be taken when connecting test equipment. Wherever possible the receiver should be transferred to an alternative power source which allows it to be operated with the FRAME/CIRCUIT EARTH LINK in position.

Voltage Analysis

A complete list of voltage values for all transistors etc. will be found in Appendix 'A' on page 41.

Test Equipment

The following equipment in the Marconi Instruments range is recommended for performance testing of the 1004 Receiver.

TF.2002AS SIGNAL GENERATOR

Freq. range: 10kHz - 72MHz.
Int. Calibrator: 10kHz, 100kHz and 1MHz markers.
Incremental tuning facility.

TF.1101 R-C OSCILLATOR

Freq. range: 20Hz - 200kHz.
Thermistor stabilised.
60dB step attenuator.
Integral o/p level meter.

TF.2500 AF POWER METER

Seven power ranges.
Wide impedance range.
Also usable as voltmeter with range 15mV - 150V.

TF.2414 COUNTER

Frequency measurement to 12.5MHz.
75mV sensitivity.
Self-test facility.
Six digit read-out.

TF.2414A COUNTER

Frequency measurement to 40MHz.
10mV sensitivity.
Self-test facility.
Six digit read-out.

1. Overall Performance Check

If substandard performance is suspected, withdraw the receiver from service and carry out an overall performance check at the mid-frequency of each range and also on '2182kHz'. Proceed as follows:-

(a) Connect 50Ω signal generator output to AERIAL INPUT socket using BNC connector.

(b) Connect output meter (matched to 8Ω) to ANCILLARY PLUG connections PL-3/1 & PL-3/9 and disconnect one lead from panel-mounted loudspeaker. Caution: loudspeaker circuit is at +ve potential w.r.t. earth - take care to avoid shorting leads.

(c) Set SUPPLY SWITCH to 'MAINS' or 'BATT' as appropriate, STANDBY SWITCH to 'ON' and other receiver controls as follows:-

CRYSTAL SELECTOR	::	'NORMAL'	IF GAIN	::	'MAX'
SELECTIVITY	::	'NARROW'	AF GAIN, RANGE SWITCH	∝	
MODE SWITCH	::	'AM'	TUNING	::	Adjust during
MANUAL/AGC	::	'MANUAL'			test

(d) Tune receiver/generator to frequencies listed below and check sensitivity for 15dB (S+N)/N ratio with output of 50mW (generator modulated 30% at 400Hz).

RANGE 1 :: 24MHz	RANGE 4 :: 3MHz	RANGE 7 :: 200kHz.
RANGE 2 :: 12MHz	RANGE 5 :: 2MHz	
RANGE 3 :: 6MHz	RANGE 6 :: 450kHz	

(e) Set SELECTIVITY SWITCH to '2182kHz', tune generator to 2182kHz and test as in 1.(d) above.

(f) Sensitivity figures should be better than 5μV on Ranges 1-5, better than 15μV on Ranges 6 & 7, and 5-10μV on 2182kHz.

(g) If the overall sensitivity is found to be low on some but not all ranges, re-alignment should be carried out as detailed on page 37.

(h) If overall sensitivity is generally low on all ranges, carry out audio and IF tests as detailed in (2) and (3) below.

2. Audio Sensitivity Checks

(a) 8Ω Channel

(i) Connect audio generator to top end of AF GAIN CONTROL.

(ii) Set AF GAIN and LINE LEVEL (at rear) to maximum.

(iii) Connect output meter as for Overall Performance Check.

(iv) Tune audio generator to 1kHz and check that an output of 50mW is obtained for 4-10mV input.

Audio Sensitivity Checks (contd.)

(b) 600Ω Line Channel

(i) Carry out operations (i) and (ii) as for 8Ω channel.

(ii) Connect output meter (matched to 600Ω) to ANCILLARY PLUG connections PL-3/6 & PL-3/8.

(iii) Tune audio generator to 1kHz and check that an output of 10mW is obtained for an input of 4-10mV.

(c) Sidetone Check

Repeat test as for 8Ω channel but with generator connected to PL-3/3 (earth screen to PL-3/4). Sensitivity should be of the order 3-4V R.M.S. for 50mW output.

(d) Audio Response

Response on either 8Ω or 600Ω channel should be level within 6dB over the range 300Hz to 6kHz.

3. IF Sensitivity Checks

(a) Overall IF Sensitivity

(i) Connect signal generator to stator of C40 (middle section of tuning gang).

(ii) Connect output meter as for Overall Performance Check.

(iii) Set receiver controls as follows:-

RANGE SWITCH	::	'7'	CRYSTAL SELECTOR	::	To
MANUAL/AGC	::	'MANUAL'	any vacant 'crystal' posn.		
IF GAIN	::	'MAX'	to disable local osc.		
AF GAIN	::	'MAX'	stage.		
SELECTIVITY	::	'NARROW'			
MODE SWITCH	::	'AM'			

(iv) Tune generator to 720kHz (modulated 30% at 400Hz) and adjust attenuator for reading of 50mW with signal at centre of IF passband. Sensitivity should lie in the range 4-6μV.

(v) If sensitivity is below normal, re-align IF circuits as described on page 36.

(vi) If low sensitivity still persists, carry out stage by stage testing as in (b) below.

(vii) Check that gain does not change by more than 3dB when the SELECTIVITY SWITCH is moved from 'NARROW' to 'WIDE'.

3. IF Sensitivity Checks (contd.)

(b) Stage Testing

The following tests will assist in fault location when the IF channel exhibits low overall sensitivity.

NOTE 1 Live generator lead must be blocked to DC with a 0.1µF capacitor when carrying out tests below.

NOTE 2 Output meter is connected as in 1 (b), but loudspeaker is not disconnected. Controls should be set as for an overall IF sensitivity check.

NOTE 3 Direct connection to IC1 is facilitated by using the blade of a screwdriver as a probe (outer braid of generator lead can be earthed to coil pack screens).

NOTE 4 When testing from No. 38 on PCB, the wide bandwidth and high gain of the amplifier may give rise to errors in measurement unless screening of the generator output lead is complete. Soldered connections are recommended with earthing to adjacent pin No. 39.

Connect generator (modulated 30% at 400Hz, tuned to 720kHz) to each input point in turn. Allow 10% deviation in measured result to accommodate transistor spread.

Generator Input Point		Sensitivity for 50mW o/p
IC1	Pin 1	44mV
IC1	Pin 2	1.1mV
IC1	Pin 11	360µV
PCB	Pin 38	50µV
PCB	Pin 23*	80µV

(*) Check that generator is tuned to centre of filter response.

R E - A L I G N M E N T

General

Close-tolerance components are used in all tuned circuits throughout the receiver and re-alignment is not likely to be required unless coils and/or associated capacitors have been changed. Detailed instructions for re-aligning all pre-set circuits are given below on the assumption that the necessary adjustments will be carried out by skilled technicians with a sound knowledge of the basic procedures involved. A suitable range of test equipment is listed on page 32. Receivers can be returned to the manufacturer if this course of action is preferred.

NOTE: ALL CORES AND TRIMMERS ARE SELF-LOCKING.

WARNING Refer to warning on page 32.

Re-alignment of 720kHz IF circuits

1. Carry out operations (i) to (iv) in 3(a) on page 34.
2. Tune generator across IF passband and set accurately to centre of filter response.
3. Trim cores in L22, L23 & L24 for maximum reading on output meter.
4. Check that sensitivity is of the order 4-6μV for 50mW output.
5. Transfer SELECTIVITY SWITCH to 'WIDE' and check that change in sensitivity does not exceed 3dB.
6. Check IF bandwidth in both selectivity positions:-

   'NARROW' .:: 2-4kHz at -6dB, 18kHz at -60dB.

   'WIDE' :: 8kHz at -6dB, 20kHz at -60dB.

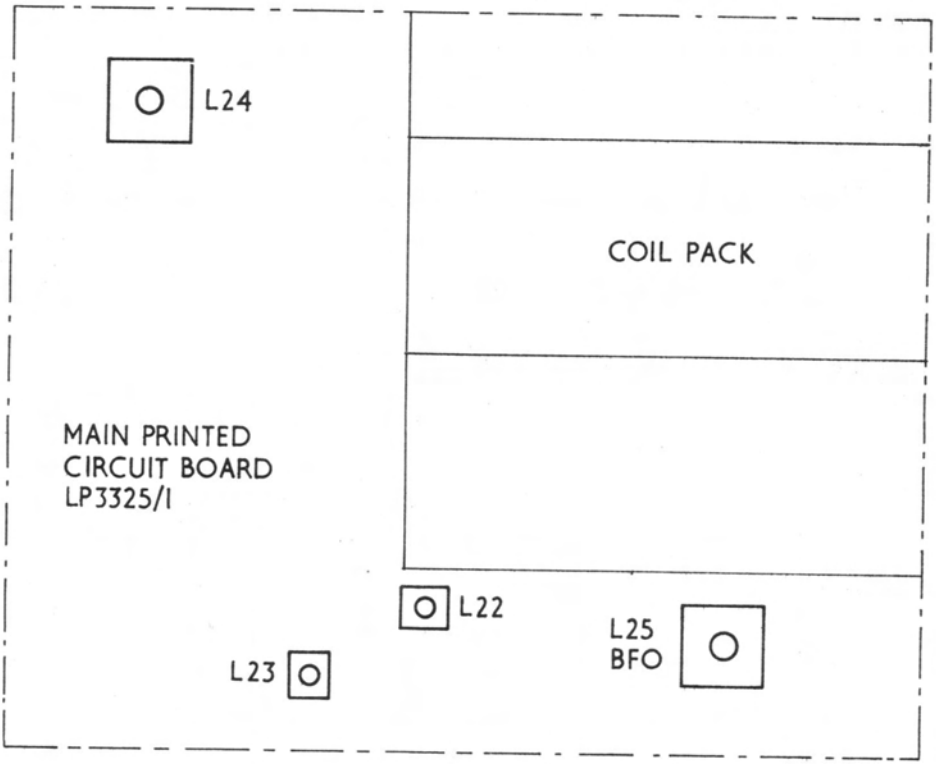


Fig. 6.2. Location of IF and BFO trimming adjustments

Re-alignment of BFO

1. Connect generator (set to 720kHz, unmodulated) as in (1) above.
2. Set receiver controls as in 3(a)(iii) on page 34, but with MODE set to 'CW/SSB' and BFO / FINE TUNE at mid-travel position.
3. Adjust generator output to approximately 40μV and tune accurately to IF centre frequency using carrier-level meter as indicator.
4. Adjust L25 for zero-beat.
5. Check that swing of BFO CONTROL is not less than ± 3kHz, and FINE TUNE coverage is of the order ± 100Hz.

Front-end re-alignment

1. Re-alignment of the local oscillator circuits

This alignment should only be carried out if scale errors have been noted in excess of 1%. The task should be performed preferably with a signal source equipped with internal scale check facility providing markers at 1MHz, 100kHz and 10kHz: Marconi Instruments signal generator Type TF.2002AS is recommended as a suitable choice.

In the event of this instrument (or one with comparable specification) not being available, the necessary adjustments can be carried out by combined use of any stable standard signal generator with a separate crystal-controlled harmonic generator. The procedure given below assumes use of the TF.2002AS because the alternative method can be lengthy and tedious. Under no circumstances should the re-alignment be attempted using an unchecked signal source.

(a) Remove cover from oscillator section of coil pack by twisting tabs with pliers.

(b) Connect signal generator Type TF.2002AS to AERIAL INPUT socket.

(c) Set receiver controls as follows:-

MANUAL/AGC	::	'MANUAL'	CRYSTAL SELECTOR	::	'NORMAL'
IF GAIN	::	'MAX'			
AF GAIN	::	As reqd.			
SELECTIVITY	::	'NARROW'			
MODE SWITCH	::	'AM'			

(d) Modulate TF.2002AS 30% at 400Hz and standardise calibration scale at 28MHz.

(e) Select Range 1 on receiver and set cursor accurately to 28MHz.

(f) Trim C61 for maximum signal response using carrier-level meter as tuning indicator.

(g) Standardise generator at 19MHz and set receiver cursor to 19MHz.

(h) Adjust core in L15 for maximum signal response.

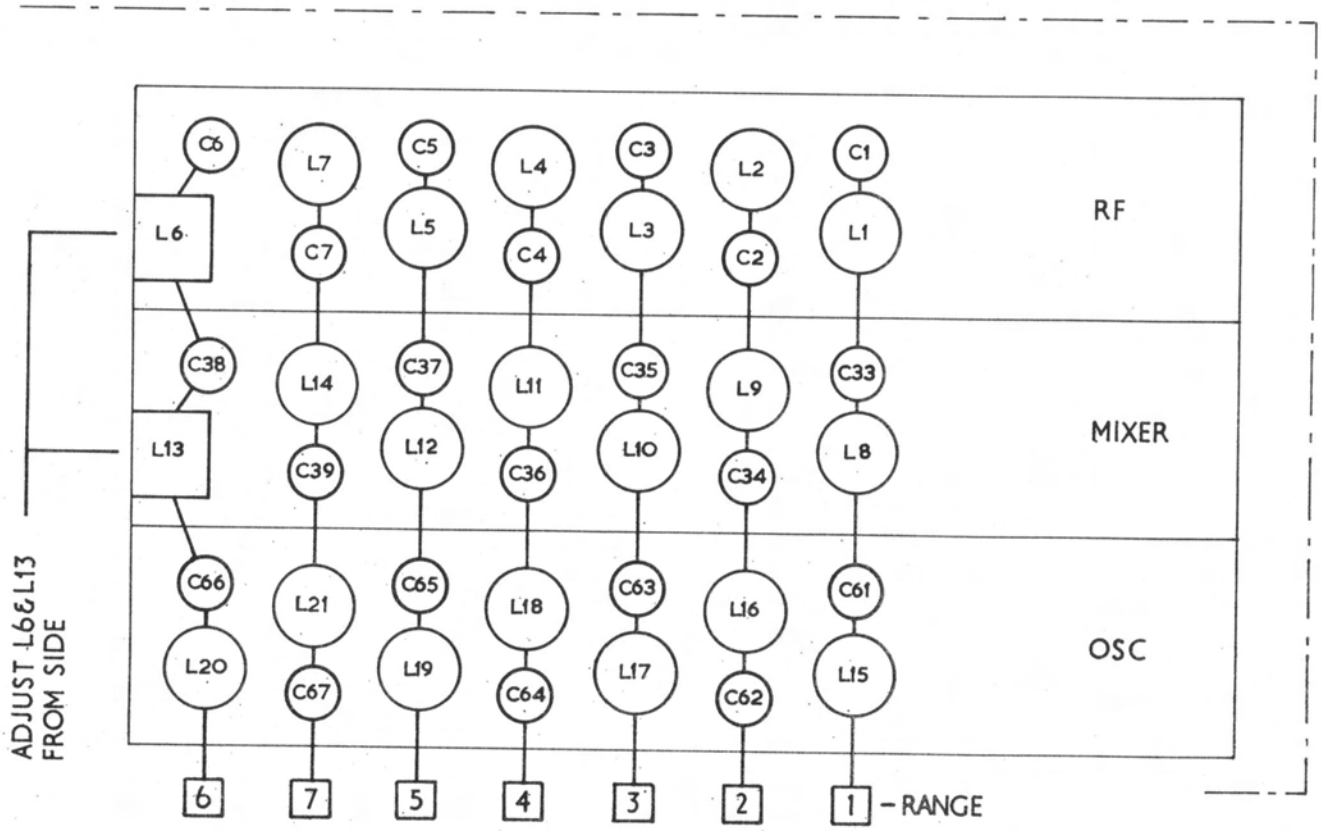


Fig. 6.3 Location of RF, Mixer and Oscillator trimming adjustments.

(i) Repeat adjustments of trimmer and core until interaction is nullified.

(j) Select Ranges 2-7 in turn and adjust trimmers and cores at frequencies indicated in Table 6.1.

(k) Replace cover and twist tabs to retain.

TABLE 6.1 LOCAL OSCILLATOR ALIGNMENT FREQUENCIES AND ADJUSTMENTS

Range	Freq.	Core	Freq.	Trimmer
1	19MHz	L15	28MHz	C61
2	9MHz	L16	16MHz	C62
3	4MHz	L17	7MHz	C63
4	2.8MHz	L18	3.6MHz	C64
5	1.7MHz	L19	2.6MHz	C65
6	400kHz	L20	500kHz	C66
7	160kHz	L21	320kHz	C67

2. Signal frequency circuits

(a) Connect TF.2002AS to AERIAL INPUT socket: set modulation to 30% at 400Hz and output level as required.

(b) Connect output meter (matched to 8Ω) to ANCILLARIES PLUG connections PL-3/1 & PL-3/9 and disconnect one lead from panel-mounted loudspeaker. Caution: loudspeaker circuit is at +ve potential w.r.t. earth - take care to avoid shorting leads.

(c) Set receiver controls as in 1(c) above.

(d) Tune receiver/generator to 28MHz and adjust trimmers C1 & C33 for maximum reading on output meter. Local oscillator frequency will pull when adjusting C33 but calibration accuracy can be preserved by 'rocking' tuning during adjustment.

(e) Tune receiver/generator to 19MHz and adjust cores in L1 & L8 for maximum output: rock tuning as before.

(f) Repeat adjustments in (d and e) until interaction is nullified.

(g) Select Ranges 2-7 in turn and adjust trimmers and cores at frequencies indicated in Table 6.2. Rock tuning for adjustments marked (*).

(h) On completion of alignment on each range, reduce generator o/p to 5μV (15μV on Ranges 6 & 7) and check that S+N/N ratio is at least 15dB (50mW audio output).

TABLE 6.2. RF/MIXER ALIGNMENT FREQUENCIES AND ADJUSTMENTS

Range	Core Adjustments			Trimmer Adjustments		
	Freq.	RF	Mixer	Freq.	RF	Mixer
1	19MHz	L1	L8*	28MHz	C1	C33*
2	9MHz	L2	L9*	16MHz	C2	C34*
3	4MHz	L3	L10	7MHz	C3	C35
4	2.8MHz	L4	L11	3.6MHz	C4	C36
5	1.7MHz	L5	L12	2.6MHz	C5	C37
6	400kHz	L6	L13	500kHz	C6	C38
7	160kHz	L7	L14	320kHz	C7	C39

(*) Rock tuning during adjustment.

3. 2182kHz Converter

(a) Set receiver controls as in 1(c) on page 37, but with SELECTIVITY SWITCH at 2182kHz position.

(b) Connect counter to gate 2 of TR3 on the 2182kHz Converter Board. Trim crystal by adjusting C18 to give an oscillator frequency of 2902kHz.

(c) Connect signal generator (tuned to 2182kHz with 30% mod at 400Hz) to AERIAL INPUT socket.

(d) Connect output meter (matched to 8Ω) to ANCILLARIES PLUG connections PL-3/1 & PL-3/9, and disconnect one lead from panel-mounted loudspeaker. Caution: loudspeaker circuit is at +ve potential w.r.t. earth. Take care not to short leads together.

(e) Peak generator tuning and then adjust the cores in L1 & L2 on 2182kHz Converter Board for maximum output.

(f) Adjust generator to give 5-10μV and check that a S+N/N ratio of 15dB is obtained with an indicated audio output of 50mW.

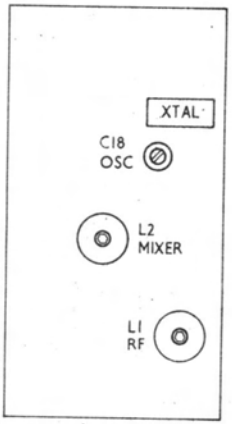


Fig. 6.4. Location of trimming adjustments on 2182kHz Converter Board.

APPENDIX 'A'

VOLTAGE ANALYSIS

In the event of the receiver failing to operate normally, voltage analysis should be carried out in the sequence given below. Voltages quoted here were taken with a standard 20,000Ω/V testmeter (AVO Model 8): 10% variation should be allowed on all readings to cover the usual zener and semiconductor spread. All voltages are positive w.r.t. circuit earth.

1. Check availability of +11V supply at Power Unit termination No. 71, and +9V at No. 72.

2. Check availability of +11V and +9V supplies at PCB terminations listed below:-

   Nos 4 & 64 : +11V with SELECTIVITY at 'WIDE' or 'NARROW'.

   Nos 10 & 62 : +11V with SELECTIVITY as above, CRYSTAL SELECTOR at 'NORMAL'.

   Nos 15, 22, 49, 53 & 101 (600Ω PCB) : +11V under all conditions of switching.

   No. 207 (2182kHz PCB) : +11V with SELECTIVITY at '2182kHz'.

   No. 43 : +9V with STANDBY SWITCH at 'ON'.

   No. 50 : +9V under all conditions of switching.

3. Check individual stage voltages by reference to Table which follows. Readings should be taken with receiver controls at settings listed below:-

RANGE SWITCH	:	'5'	MODE SWITCH	:	'CW/SSB'
TUNING	:	1.6MHz	AF GAIN	:	Minimum
CRYSTAL SELECTOR	:	'NORMAL'	MANUAL/AGC	:	'MANUAL'
SELECTIVITY	:	'NARROW'	STANDBY	:	'ON'
BFO/FINE TUNE	:	Centre-posn.	DIAL/METER	:	Centre-posn
IF GAIN	:	Maximum			

NOTES The following notes refer to the Table on page 42.

NOTE 1 - CRYSTAL SELECTOR at 'crystal' posn. with crystal fitted.

NOTE 2 - Gate voltage of TR10 swings 1.6V to 5.6V for full coverage of IF GAIN.

NOTE 3 - RV6 set for 10mA quiescent current.

NOTE 4 - SELECTIVITY at '2182kHz'.

Board	Ref	Emitter/ Source	Base/ Gate (1)	Gate 2	Collector /Drain	Notes
Main Board See foot of page for IC's & TR14	TR1	0.85V	0V	-	2.8V	
	TR2	2.8V	1.2V*	-	9.5V	
	TR3	0.35V	0V	0.4V**	10.8V	
	TR4	0.65V	0V	-	9.2V	
	TR5	3.7V	0.8V*	-	9.3V	
	TR6	8.0V	4.2V	-	10.5V	1
	TR7	1.5V	0.9V*	-	4.1V	1
	TR8	0.25V	0.8V	-	5.9V	
	TR9	1.4V	0V	-	6.0V	
	TR10	4.5V	1.6V*	-	10.5V	2
	TR11	0.85V	1.4V*	-	3.3V	
	TR12	1.1V	0V	-	3.1V	
	TR13	1.3V	0V	0.6V*	4.3V	
2182kHz Converter	TR1	0.7V	0V	-	1.6V	4
	TR2	1.6V	1.5V*	-	10.0V	
	TR3	0.3V	0V	0.4V**	11.0V	
	TR4	2.6V	1.6V*	4.3V	10.5V	
600Ω Line Amplifier	TR1	0.5V	0.7V*	-	5.0V	
	TR2	0.9V	1.5V*	-	10.5V	

Integrated Circuits & TR14 (See Note 3 for IC1)

IC1 :: 14-lead dual-in-line package.

1	8.15V	5	0V	9	5.9V	13	0V
2	1.3V	6	0.4V	10	5.3V	14	4V
3	0.6V	7	12μA+	11	8.1V		
4	0V	8	8.2V	12	0.7V		

IC2 :: 10-lead TO-74 package.

1	0V	4	8.6V	7	3.7V	10	0V
2	4.1V	5	8.6V	8	4V		
3	8.6V	6	6.5V	9	3.2V		

(*) 10V range.
(**) 2.5V range.
(+) 50μA range.

Use most convenient range for all other readings.

TR14 :: Power Unit.

Emitter	9V.
Base	10V.
Collector	14V.

APPENDIX 'B'

SEMICONDUCTOR COMPLEMENT

Main Printed Circuit Board & Power Unit

Ref	Type	Mfr.	Circuit Function
TR1	UC734B	Solidev	Cascode RF Amplifier
TR2	3N128	RCA	
TR3	40673	RCA	Mixer
TR4	3N128	RCA	Local Oscillator 1. (VFO)
TR5	UC734B	Solidev	Local Osc. 1 Buffer.
TR6	2N4254	Texas	Local Osc. 2 Buffer.
TR7	2N4254	Texas	Local Oscillator 2. (CRYSTAL)
TR8	BC107B	Mullard	2nd 720kHz IF Amplifier
TR9	UC734B	Solidev	CW/SSB Isolator
TR10	UC734B	Solidev	IF AGC Controller
TR11	BC107B	Mullard	IF AGC Amplifier
TR12	UC734B	Solidev	Beat Frequency Oscillator
TR13	40673	RCA	CW/SSB Detector
TR14	2N4921	RCA	Voltage Regulator (9V supply)
IC1	CA3046	RCA	(1) 1st 720kHz IF Amplifier (2) 3rd 720kHz IF Amplifier (3) Emitter Follower (AM Det.) (4) RF AGC Amplifier
IC2	TAA300	Mullard	Main Audio Amplifier
D2	1S44	Texas	Oscillator Bias Diode
D3	1S44	Texas	Breakdown Protection
D4	BZY88/C9V1	Mullard	Zener Regulator
D5/6	2 x 1S44	Texas	IF AGC Control Elements
D7/8	2 x 1S44	Texas	AM Detector Bias Diodes
D9	1S44	Texas	AM Detector
D10/11	2 x 1S44	Texas	RF AGC Rectifier
D12	BZY88/C6V8	Mullard	Zener Regulator
D13/14	2 x 1S44	Texas.	IF AGC Rectifier
D15	BA111	ITT	Fine Tune VVC
D16	BA112	ITT	BFO Pitch VVC
D17	BZY88/C3V3	Mullard	Zener Regulator
D18	BZY95/C11	Mullard	Zener Regulator (11V supply)
D19	BZY93/C12	Mullard	Zener Regulator (12V)
D20	BZY88/C10	Mullard	Zener Regulator (10V)
D21	DD006	Lucas	Reverse Polarity Protection
D22	OSH01/A-100	Mullard	Supply Rectifier (Bridge)

D1 not fitted on Model 1004

2182kHz Converter Board

Ref	Type	Mfr.	Circuit Function
TR1	UC734B	Solidev }	Cascode 2182kHz RF Amplifier
TR2	3N128	RCA }	
TR3	40673	RCA	2182kHz/720kHz Mixer
TR4	40673	RCA	2902kHz Crystal Oscillator
PC1	8 x 1N4148	Newmarket	Input Protection (diode package)

600Ω Line Amplifier Board

Ref	Type	Mfr.	Circuit Function
TR1	BC107B	Mullard	Audio Amplifier
TR2	BC107B	Mullard	Audio Output (600Ω line)

APPENDIX 'C'

COMPONENT VALUES TOLERANCES AND RATINGS

MAIN CIRCUIT BOARD, SIDETONE BOARD & POWER UNIT

CAPACITORS (See page 49 for Code/Manufacturers' Ref. Nos etc.)

Ref	Value	Type	Tol	Wkg V	Cde
C1	4-30pF	Foil Trimmer	-	-	A
C2	4-30pF	Foil Trimmer	-	-	A
C3	4-30pF	Foil Trimmer	-	-	A
C4	4-30pF	Foil Trimmer	-	-	A
C5	4-30pF	Foil Trimmer	-	-	A
C6	4-30pF	Foil Trimmer	-	-	A
C7	4-30pF	Foil Trimmer	-	-	A
C8	150pF	Polystyrene	5%	125V	C
C9	50pF	Polystyrene	5%	125V	C
C10	240pF	Polystyrene	2%	125V	C
C11	100pF	Polystyrene	5%	125V	C
C12	250pF	Polystyrene	2%	125V	C
C13	12-358pF	Air-spaced Variable	-	-	-
C14	60pF	Tubular Ceramic	10%	750V	G
C15	0.1µF	Polycarbonate	10%	100V	E
C16	0.1µF	Polycarbonate	10%	100V	E
C17	0.1µF	Polycarbonate	10%	100V	E
C18	0.1µF	Polycarbonate	10%	100V	E
C19	2pF	Tubular Ceramic	0.25pF	750V	F
C20	2pF	Tubular Ceramic	0.25pF	750V	F
C21	3pF	Tubular Ceramic	0.25pF	750V	G
C22	-	Not allocated	-	-	-
C23	0.001µF	Disk Ceramic	+80% -20%	500V	H
C24	0.001µF	Disk Ceramic	+80% -20%	500V	H
C25	160pF	Polystyrene	5%	125V	C
C26	50pF	Polystyrene	5%	125V	C
C27	220pF	Polystyrene	2%	125V	C
C28	100pF	Polystyrene	5%	125V	C
C29	-	Not allocated	-	-	-
C30	250pF	Polystyrene	2%	125V	C
C31	0.01µF	Metallised Paper	20%	250V	I
C32	0.01µF	Metallised Paper	20%	250V	I
C33	4-30pF	Foil Trimmer	-	-	A
C34	4-30pF	Foil Trimmer	-	-	A
C35	4-30pF	Foil Trimmer	-	-	A

Ref	Value	Type	Tol	Wkg V	Cde
C36	4-30pF	Foil Trimmer	-	-	A
C37	4-30pF	Foil Trimmer	-	-	A
C38	4-30pF	Foil Trimmer	-	-	A
C39	4-30pF	Foil Trimmer	-	-	A
C40	12-358pF	Air-spaced Variable	-	-	-
C41	60pF	Tubular Ceramic	10%	750V	G
C42	0.1µF	Polycarbonate	10%	100V	E
C43	150pF	Polystyrene	2%	125V	C
C44	0.1µF	Polycarbonate	10%	100V	E
C45	0.1µF	Polycarbonate	10%	100V	E
C46	0.1µF	Polycarbonate	10%	100V	E
C47	0.1µF	Polycarbonate	10%	100V	E
C48	0.047µF	Polycarbonate	10%	100V	E
C49	190pF	Polystyrene	5%	125V	C
C50	0.0049µF	Polystyrene	1%	125V	C
C51	39pF	Polystyrene	5%	125V	C
C52	0.002µF	Polystyrene	1%	125V	C
C53	0.00282µF	Polystyrene	1%	125V	C
C54	250pF	Polystyrene	2%	125V	C
C55	0.0012µF	Polystyrene	1%	125V	C
C56	120pF	Polystyrene	5%	125V	C
C57	640pF	Polystyrene	1%	125V	C
C58	390pF	Polystyrene	2%	125V	C
C59	100pF	Polystyrene	1%	125V	C
C60	20pF	Polystyrene	5%	125V	C
C61	7-35pF	Disk Ceramic Trimmer	-	-	J
C62	7-35pF	Disk Ceramic Trimmer	-	-	J
C63	7-35pF	Disk Ceramic Trimmer	-	-	J
C64	7-35pF	Disk Ceramic Trimmer	-	-	J
C65	7-35pF	Disk Ceramic Trimmer	-	-	J
C66	7-35pF	Disk Ceramic Trimmer	-	-	J
C67	7-35pF	Disk Ceramic Trimmer	-	-	J
C68	-	Ref Not Allocated	-	-	-
C69	-	Ref Not Allocated	-	-	-
C70	18-364pF	Air-spaced Variable	-	-	-
C71	100pF	Polystyrene	5%	125V	C
C72	100pF	Polystyrene	5%	125V	C
C73	0.047µF	Plate Ceramic	+80% -20%	30V	K
C74	0.1µF	Polycarbonate	10%	100V	E
C75	0.01µF	Polycarbonate	10%	100V	E
C76	70pF	Polystyrene	5%	125V	C
C77	22µF	Tantalum	20%	16V	L
C78	0.047µF	Plate Ceramic	+80% -20%	30V	K
C79	10µF	Tantalum	20%	16V	L

Ref	Value	Type	Tol	Wkg V	Cde
C80	22µF	Tantalum	20%	16V	L
C81	0.0047µF	Polystyrene	5%	125V	C
C82	0.001µF	Disk Ceramic	+80% -20%	500V	H
C83	20pF	Tubular Ceramic	10%	750V	G
C84	60pF	Tubular Ceramic	10%	750V	G
C85	0.0047µF	Polystyrene	1%	63V	C
C86	0.0047µF	Polystyrene	1%	63V	C
C87	470pF	Polystyrene	5%	125V	C
C88	0.1µF	Polycarbonate	10%	100V	E
C89	0.1µF	Polycarbonate	10%	100V	E
C90	0.1µF	Polycarbonate	10%	100V	E
C91	10µF	Tantalum	20%	16V	L
C92	0.001µF	Polystyrene	2%	125V	C
C93	0.1µF	Polycarbonate	10%	100V	E
C94	0.1µF	Polycarbonate	10%	100V	E
C95	0.1µF	Polycarbonate	10%	100V	E
C96	0.1µF	Polycarbonate	10%	100V	E
C97	0.001µF	Polystyrene	2%	125V	C
C98	0.1µF	Polycarbonate	10%	100V	E
C99	390pF	Polystyrene	5%	125V	C
C100	0.1µF	Polycarbonate	10%	100V	E
C100A	1µF	Polycarbonate	10%	400V	E
C101	0.0022µF	Silvered Mica	5%	200V	M
C102	0.001µF	Disk Ceramic	+80% -20%	500V	H
C103	0.1µF	Polycarbonate	10%	100V	E
C104	200pF	Polystyrene	5%	125V	C
C105	0.047µF	Plate Ceramic	+80% -20%	30V	K
C106	0.001µF	Disk Ceramic	+80% -20%	500V	H
C107	0.1µF	Polycarbonate	10%	100V	E
C108	0.1µF	Polycarbonate	10%	100V	E
C109	0.1µF	Polycarbonate	10%	100V	E
C110	0.1µF	Polycarbonate	10%	100V	E
C111	0.1µF	Polycarbonate	10%	100V	E
C112	0.1µF	Polycarbonate	10%	100V	E
C113	0.47µF	Polycarbonate	10%	100V	E
C114	10µF	Tantalum	20%	16V	L
C115	0.47µF	Polycarbonate	10%	100V	E
C116	0.1µF	Polycarbonate	10%	100V	E
C117	0.005µF	Metallised Paper	20%	250V	I
C118	0.1µF	Polycarbonate	10%	100V	E
C119	0.1µF	Polycarbonate	10%	100V	E
C120	100pF	Polystyrene	5%	125V	C
C121	0.01µF	Polycarbonate	10%	100V	E
C122	0.1µF	Polycarbonate	10%	100V	E

Ref	Value	Type	Tol	Wkg V	Cde
C123	150pF	Polystyrene	2%	125V	C
C124	0.1µF	Polycarbonate	10%	100V	E
C125	250pF	Silvered Mica	5%	350V	M
C125A	390pF	Polystyrene	2%	125V	C
C126	100pF	Polystyrene	5%	125V	C
C127	0.47µF	Polycarbonate	10%	100V	E
C128	0.01µF	Disk Ceramic	+80% -20%	250V	N
C129	0.001µF	Disk Ceramic	+80% -20%	500V	H
C130	22µF	Tantalum	20%	16V	L
C131	10µF	Tantalum	20%	16V	L
C132	0.1µF	Polycarbonate	10%	100V	E
C133	0.01µF	Disk Ceramic	+80% -20%	250V	N
C134	0.001µF	Disk Ceramic	+80% -20%	500V	H
C135	0.001µF	Disk Ceramic	+80% -20%	500V	H
C136	0.022µF	Polycarbonate	10%	100V	E
C136A	0.01µF	Disk Ceramic	+40% -20%	500V	Q
C137	0.01µF	Polycarbonate	10%	100V	E
C138	150µF	Tubular Electrolytic	+50% -10%	16V	V
C139	470µF	Tubular Electrolytic	+50% -10%	25V	U
C140	22µF	Tantalum	20%	16V	L
C141	0.047µF	Plate Ceramic	+80% -20%	30V	K
C142	470µF	Tubular Electrolytic	+50% -10%	25V	U
C143	0.1µF	Disk Ceramic	+80% -20%	500V	P
C144	1000µF	Tubular Electrolytic	+100% -20%	16V	R
C145 C146	7500µF + 7500µF	Dual Electrolytic	+50% -10%	16V	T
C147	1µF	Polycarbonate	10%	400V	E
C148	0.005µF	Disk Ceramic	+80% -20%	3000V	S
C149	0.005µF	Disk Ceramic	+80% -20%	3000V	S
C150	0.005µF	Disk Ceramic	+80% -20%	3000V	S

SUMMARY OF MANUFACTURERS' REFERENCE NUMBERS ETC - CAPACITORS

Code	Manufacturer	Type	Ref. No.
A	Dau	Foil Dielect. Trimmer	107-34S
B	-	Not allocated	-
C	GEC	Polystyrene	PF125
D	-	Not allocated	-
E	ITT	Met. Polycarbonate	PMA
F	Lemco	Tub. Ceramic	310S
G	Lemco	Tub. Ceramic	310
H	Erie	Disk Ceramic	K350081/831
I	Erie	Met. Paper	W99
J	Steatite	Disk Cer. Trimmer	7S Triko N1500-02
K	Lemco	Plate Ceramic	1212K
L	Union Carbide	Tantalum	Kemet 'E' Series
M	Matthey	Silvered Mica	C12F
N	Erie	Disk Ceramic	K800011/801
O	-	Not allocated	-
P	Erie	Disk Ceramic	K800011/CD17
Q	Erie	Disk Ceramic	K350081/811
R	Erie	Tubular Electrolytic	211 Series
S	Erie	Disk Ceramic	K350011
T	Mullard	Tub. Electrolytic	072-15752
U	Mullard	Tub. Electrolytic	017-16471
V	Mullard	Tub. Electrolytic	016-15151
W	Erie	Tub. Ceramic	SN1300/YD
X	Erie	Tub. Ceramic	NP0/YD
Y	Mullard	Tub. Electrolytic	016-16101
Z	Mullard	Tub. Electrolytic	015-16229

NOTE: EQUIVALENT TYPES WILL BE FITTED WHERE SPECIFIED COMPONENTS ARE NOT AVAILABLE AT TIME OF MANUFACTURE.

RESISTORS (Main Circuit Board, Sidetone Board and Power Unit)

Ref	Value	Tol	Rtg
R1	47Ω	5%	0.1W
R2	22Ω	5%	0.1W
R3	820Ω	5%	0.1W
R4	1.8MΩ	10%	0.1W
R5	270Ω	5%	0.1W
R6	22Ω	5%	0.1W
R7	0.1MΩ	5%	0.1W
R8	4.7MΩ	10%	0.1W
R8A	1.8MΩ	10%	0.1W
R9	180Ω	5%	0.1W
R10	2,700Ω	5%	0.1W
R11	2,700Ω	5%	0.1W
R12	2,200Ω	5%	0.1W
R13	2,200Ω	5%	0.1W
R14	1MΩ	5%	0.1W
R15	4,700Ω	5%	0.1W
R16	0.47MΩ	5%	0.1W
R17	33,000Ω	5%	0.1W
R18	270Ω	5%	0.1W
R19	22Ω	5%	0.1W
R20	220Ω	5%	0.1W
R21	270Ω	5%	0.1W
R22	330Ω	5%	0.1W
R23	220Ω	5%	0.1W
R24	390Ω	5%	0.1W
R25	Not used	-	-
R26	0.1MΩ	5%	0.1W
R27	22Ω	5%	0.1W
R28	330Ω	5%	0.1W
R29	0.22MΩ	5%	0.1W
R30	100Ω	5%	0.1W
R31	270Ω	5%	0.1W
R32	820Ω	5%	0.1W
R33	1,000Ω	5%	0.1W
R34	100Ω	5%	0.1W
R35	47Ω	5%	0.1W
R36	4,700Ω	5%	0.1W
R37	150Ω	5%	0.1W
R38	0.27MΩ	5%	0.1W
R39	1,000Ω	5%	0.1W

Ref	Value	Tol	Rtg
R40	47,000Ω	5%	0.1W
R41	220Ω	5%	0.1W
R42	Not used	-	-
R43	8,200Ω	5%	0.1W
R44	27,000Ω	5%	0.1W
R45	3,300Ω	5%	0.1W
R46	47,000Ω	5%	0.1W
R47	5,600Ω	5%	0.1W
R48	3,300Ω	5%	0.1W
R49	390Ω	5%	0.1W
R50	27,000Ω	5%	0.1W
R51	5,600Ω	5%	0.1W
R52	2,700Ω	5%	0.1W
R53	390Ω	5%	0.1W
R54	150Ω	5%	0.1W
R55	0.47MΩ	5%	0.1W
R56	1.8MΩ	10%	0.1W
R57	470Ω	5%	0.1W
R58	1,000Ω	5%	0.1W
R59	1,000Ω	5%	0.1W
R60	4,700Ω	5%	0.1W
R61	33,000Ω	5%	0.1W
R62	0.27MΩ	5%	0.1W
R63	330Ω	5%	0.1W
R64	3,300Ω	5%	0.1W
R65	0.22MΩ	5%	0.1W
R66	47,000Ω	5%	0.1W
R67	22,000Ω	5%	0.1W
R68	1.8MΩ	10%	0.1W
R69	33,000Ω	5%	0.1W
R70	22,000Ω	5%	0.1W
R71	22,000Ω	5%	0.1W
R72	27,000Ω	5%	0.1W
R73	3,300Ω	5%	0.1W
R74	390Ω	5%	0.1W
R75	68,000Ω	5%	0.1W
R76	12,000Ω	5%	0.1W
R77	330Ω	5%	0.1W
R78	4,700Ω	5%	0.1W
R79	22,000Ω	5%	0.1W
R79A	22,000Ω	5%	0.1W

Ref	Value	Tol	Rtg
R80	1MΩ	5%	0.1W
R80A	2,200Ω	5%	0.1W
R81	10,000Ω	5%	0.1W
R82	22,000Ω	5%	0.1W
R83	390Ω	5%	0.1W
R84	0.39MΩ	5%	0.1W
R85	1,000Ω	5%	0.1W
R86	22,000Ω	5%	0.1W
R87	0.1MΩ	5%	0.1W
R88	0.22MΩ	5%	0.1W
R89	22,000Ω	5%	0.1W
R90	1,000Ω	5%	0.1W
R91	2,700Ω	5%	0.1W
R92	100Ω	5%	0.1W
R93	330Ω	5%	0.1W
R94	220Ω	5%	0.1W
R95	33,000Ω	5%	0.1W
R96	47Ω	5%	0.1W
R97	8Ω w.w.	5%	2.5W
R98	10Ω w.w.	5%	6W
R99	0.15MΩ	5%	0.1W

Ref	Value	Tol	Rtg
R100	10Ω	10%	0.5W
R101	330Ω	5%	0.1W
R102	5Ω w.w.	5%	2.5W
R103	25Ω w.w.	5%	10W
R104	33Ω	10%	0.5W
R105	Not used	-	-
R106	-do-	-	-
R107	-do-	-	-
R108	-do-	-	-
R109	-do-	-	-
R110	1,000Ω	10%	0.5W
R111	0.33MΩ	5%	0.1W
R112	10,000Ω	5%	0.1W
R113	0.1MΩ	5%	0.1W
R114	3.3Ω w.w.	5%	2.5W

MANUFACTURERS' REFERENCE NUMBERS - RESISTORS

All resistors in this list with the exception of those listed below are MULLARD Type CR25.

R97 WELWYN Type W.21

R98 WELWYN Type W.22

R100 ERIE Type BTT

R102 WELWYN Type W.21

R103 C.G.S. Type HSA10

R104 ERIE Type BTT

R110 ERIE Type BTT

R114 WELWYN Type W.21

2182kHz Converter Board

CAPACITORS (See page 49 for Code/Manufacturers' Ref. Nos etc.)

Ref	Value	Type	Tol	Wkg V	Cde
C1	250pF	Polystyrene	2%	125V	C
C2	60pF	Tubular Ceramic	10%	750V	G
C3	0.1µF	Polycarbonate	10%	100V	E
C4	0.1µF	Polycarbonate	10%	100V	E
C5	0.1µF	Polycarbonate	10%	100V	E
C6	0.1µF	Polycarbonate	10%	100V	E
C7	250pF	Polystyrene	2%	125V	C
C8	20pF	Tubular Ceramic	10%	200V	X
C8A	150pF	Polystyrene	2%	125V	C
C9	0.1µF	Polycarbonate	10%	100V	E
C10	0.1µF	Polycarbonate	10%	100V	E
C11	0.001µF	Polystyrene	5%	125V	C
C12	0.1µF	Polycarbonate	10%	100V	E
C13	0.01µF	Polycarbonate	10%	100V	E
C14	150pF	Tub. Ceramic	5%	200V	W
C15	0.1uF	Polycarbonate	10%	100V	E
C16	300pF	Polystyrene	2%	125V	C
C17	20pF	Tubular Ceramic	5%	750V	G
C18	7-35pF	Disk Ceramic Trimmer	-	-	A

RESISTORS (All resistors below are Mullard Type CR25)

Ref	Value	Tol	Rtg
R1	1.8MΩ	10%	0.1W
R1A	2.2MΩ	10%	0.1W
R2	270Ω	5%	0.1W
R3	22Ω	5%	0.1W
R4	0.1MΩ	5%	0.1W
R5	4.7MΩ	10%	0.1W
R6	180Ω	5%	0.1W
R7	1,500Ω	5%	0.1W
R8	1MΩ	5%	0.1W
R9	4,700Ω	5%	0.1W

Ref	Value	Tol	Rtg
R10	0.47MΩ	5%	0.1W
R11	33,000Ω	5%	0.1W
R12	22Ω	5%	0.1W
R13	270Ω	5%	0.1W
R14	1,000Ω	5%	0.1W
R15	8,200Ω	5%	0.1W
R16	5,600Ω	5%	0.1W
R17	220Ω	5%	0.1W
R18	0.12MΩ	5%	0.1W
R19	22,000Ω	5%	0.1W

600Ω Line Amplifier Board

CAPACITORS (See page 49 for Code/Manufacturers' Ref. Nos etc.)

Ref	Value	Type	Tol	Wkg V	Cde
C1	0.01μF	Polycarbonate	10%	100V	E
C2	100μF	Tubular Electrolytic	+50% -10%	25V	Y
C3	22μF	Tubular Electrolytic	+50% -10%	25V	Z
C4	0.005μF	Metallised Paper	20%	250V	I
C5	0.1μF	Polycarbonate	10%	100V	E
C6	0.1μF	Polycarbonate	10%	100V	E
C7	100μF	Tubular Electrolytic	+50% -10%	25V	Y

RESISTORS (All resistors below are Mullard Type CR25)

Ref	Value	Tol	Rtg
R1	1MΩ	5%	0.1W
R2	0.1MΩ	5%	0.1W
R3	82,000Ω	5%	0.1W
R4	10,000Ω	5%	0.1W
R5	39Ω	5%	0.1W

Ref	Value	Tol	Rtg
R6	10,000Ω	5%	0.1W
R7	47,000Ω	5%	0.1W
R8	8,200Ω	5%	0.1W
R9	150Ω	5%	0.1W
R10	150Ω	5%	0.1W

APPENDIX 'D'

LIST OF SPARES FOR MODEL 1004 RECEIVER

The following list details all major spares applicable for use with the Model 1004 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.

Spares falling in the following categories are not included in this list but will be found in Appendices 'B' and 'C' :-

SEMICONDUCTORS CAPACITORS (excluding variables) RESISTORS

The Serial No. of the receiver should be quoted in all communications which should be addressed to:-

EDDYSTONE RADIO LIMITED, SALES & SERVICE DEPARTMENT,
ALVECHURCH ROAD, BIRMINGHAM B31 3PP, ENGLAND.

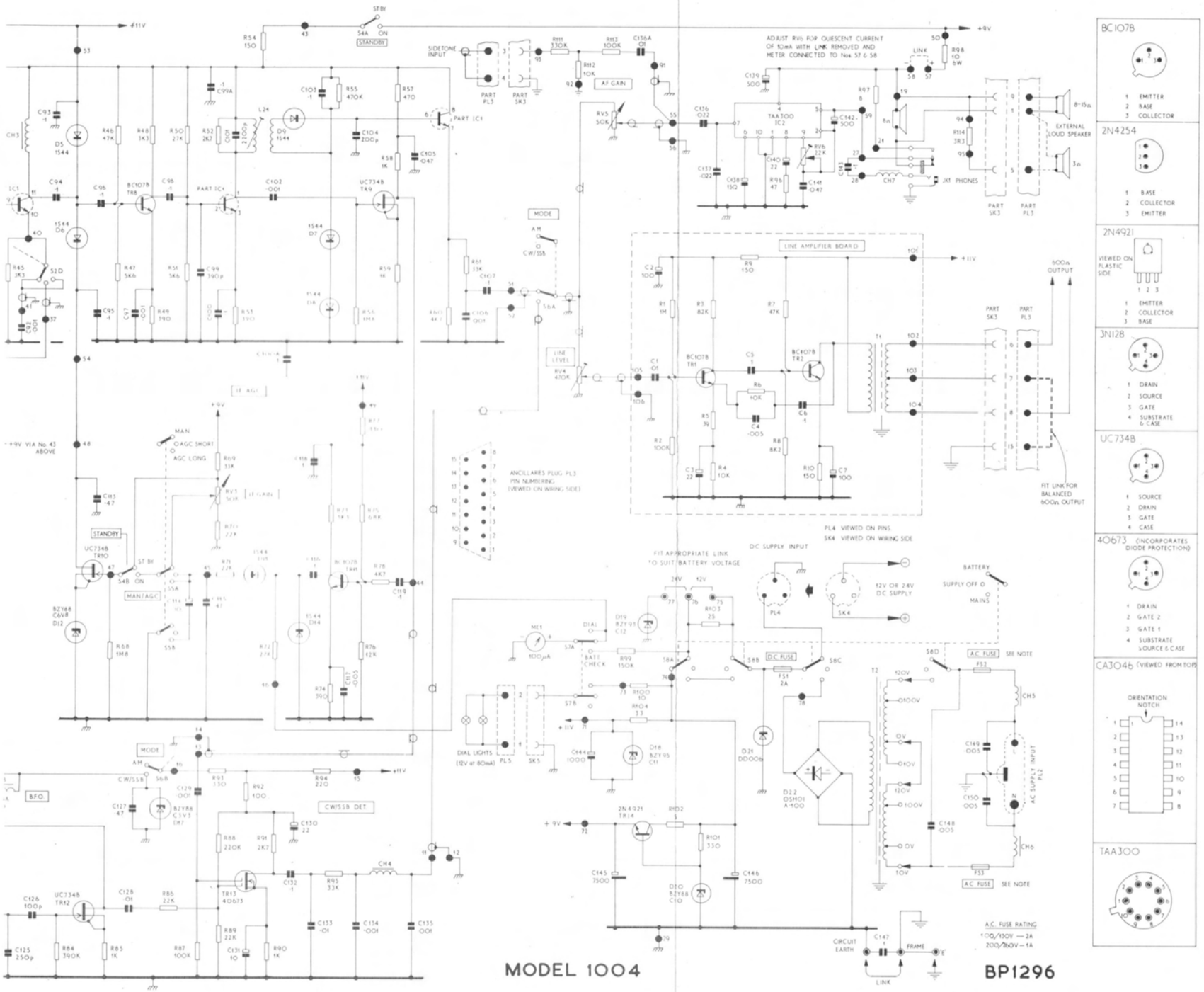
Ref	Description	Part No.
	PRINTED CIRCUIT BOARD ASSEMBLIES ETC	
	Main Printed Circuit Board	LP3325/1
	2182kHz Converter Board	LP3325/2
	600Ω Line Amplifier Board	LP3325/3
	Sidetone Board	LP3325/4
	Power Unit	D4701
	Plug-in Crystal Unit (less crystals)	LP3329
	SWITCHES	
S1	RANGE SWITCH :: Wafers S1A, B, C, D, F	8528P
	Wafer S1E	D4611
	Clicker mechanism	D4603
S2	SELECTIVITY SWITCH :: Complete assembly	D4702
S3	CRYSTAL SELECTOR :: Not supplied as a spares item.	
S4	STANDBY SWITCH : Min. 2-posn toggle	7352P
S5	MANUAL/AGC SWITCH : Min. 3-posn toggle	8732P
S6	MODE SWITCH : Min. 2-posn toggle	7352P
S7	DIAL/METER : Min. biased 3-posn toggle	8733P
S8	SUPPLY SWITCH : Min. 4-pole 3-posn toggle	8634P

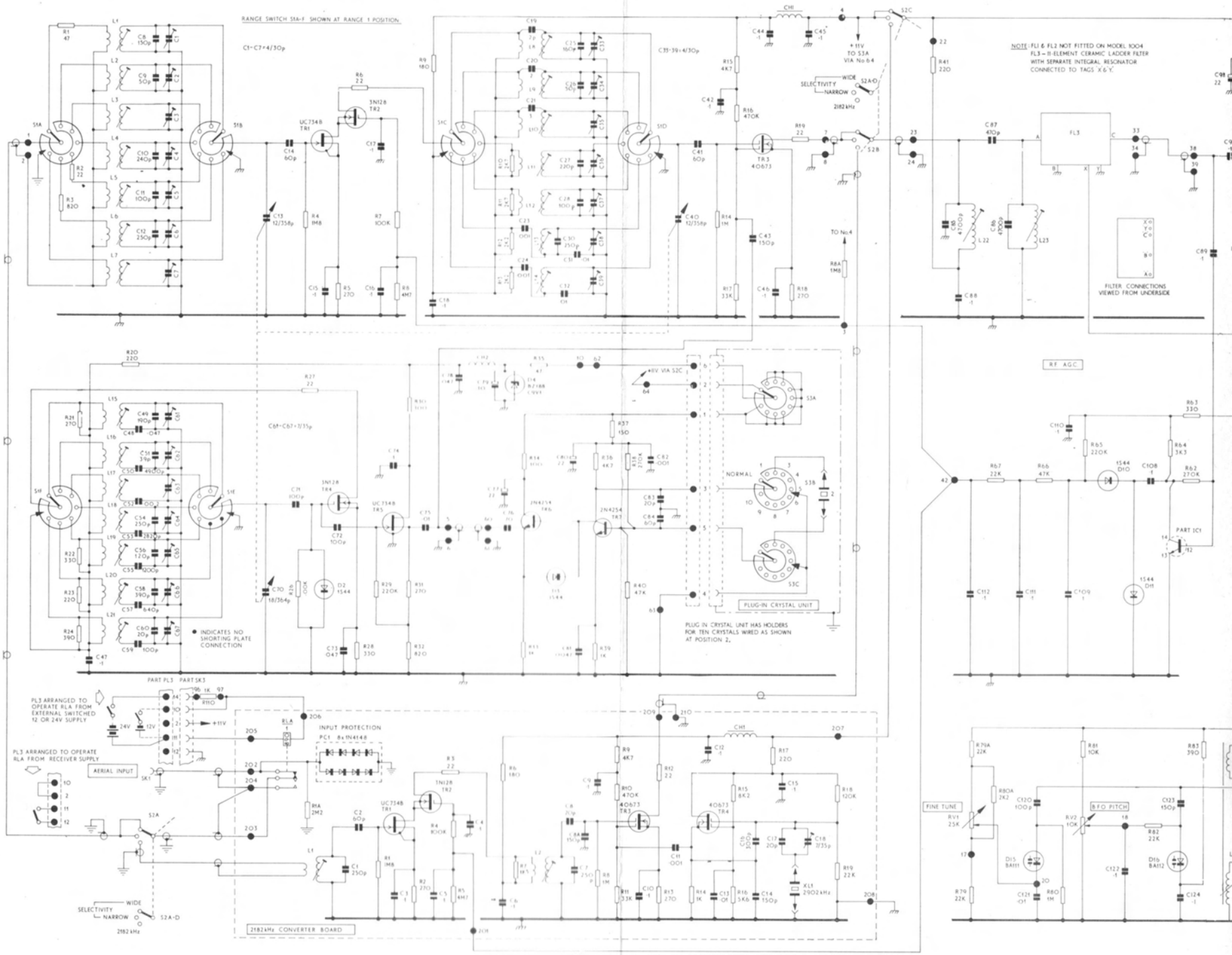
Ref	Description	Part No.
	POTENTIOMETERS	
RV1	FINE TUNE :: 25,000Ω Lin.	8621P
RV2	BFO PITCH :: 10,000Ω Lin.	8620P
RV3	IF GAIN :: 50,000Ω	8530P
RV4	LINE LEVEL :: 0.47MΩ	6077P
RV5*	AF GAIN :: 50,000Ω	-
RV6	IC2 ADJUSTER :: 22,000Ω pre-set	8734P
	(*) Combined with RV3 (dual-concentric)	
	VARIABLE CAPACITORS AND TRIMMERS	
	3-gang Tuning Capacitor (2 x 12-358pF + 1 x 18-364pF)	7357PD
	4-30pF Disk Trimmer	8735P
	7-35pF Disk Trimmer	8468P
	PLUGS AND SOCKETS	
PL1	Aerial Input (BNC coaxial plug)	8012P
PL2	AC Supply Connector (chassis-mounting)	D2310/2
PL3	Ancillaries Connector (plug with cover)	D4703
PL4	DC Supply Connector (chassis-mounting)	7130P
PL5	Dial Light Plug (male portion)	6083P
-	Telephone Plug	6567P
SK1	Aerial Input Socket (BNC coaxial)	6084P
SK2	AC Supply Connector (with 3-core lead)	D2311/1
SK3	Ancillaries Socket (chassis-mounting)	7770P
SK4	DC Supply Connector (with 2-core lead)	D3641
SK5	Dial Light Socket (female portion)	6089P
JK1	Telephone Headset Socket	8736P
	CRYSTALS	
XL1	2902kHz Style 'D', 40pF, 0.002% at 25°C	7143P
	FILTERS (FL1 & FL2 not fitted on 1004)	
FL3	720kHz Ceramic Ladder Filter	CAT1505

Ref	Description	Part No.
	INDUCTORS (Main Board)	
L1	Range 1 RF coil	D4577
L2	Range 2 RF coil	D4578
L3	Range 3 RF coil	D4579
L4	Range 4 RF coil	D4580
L5	Range 5 RF coil	D4581
L6	Range 6 RF coil	D4582
L7	Range 7 RF coil	D4583
L8	Range 1 Mixer coil	D4584
L9	Range 2 Mixer coil	D4585
L10	Range 3 Mixer coil	D4586
L11	Range 4 Mixer coil	D4587
L12	Range 5 Mixer coil	D4588
L13	Range 6 Mixer coil	D4589
L14	Range 7 Mixer coil	D4590
L15	Range 1 Oscillator coil	D4591
L16	Range 2 Oscillator coil	D4592
L17	Range 3 Oscillator coil	D4593
L18	Range 4 Oscillator coil	D4594
L19	Range 5 Oscillator coil	D4595
L20	Range 6 Oscillator coil	D4596
L21	Range 7 Oscillator coil	D4597
L22	720kHz IF Bandpass coil (pri)	D4568
L23	720kHz IF Bandpass coil (sec)	D4568
L24	720kHz Detector transformer	D4567
L25	Beat Frequency Osc. coil	D4696
	INDUCTORS (2182kHz Converter Board)	
L1	2182kHz RF coil	D4598
L2	2182kHz Mixer coil	D4599
	CHOKES (Main Board and Miscellaneous)	
CH1	100mH	7350P
CH2	4.7mH	7755P
CH3	560µH	8042P
CH4	100mH	7350P
CH5	Mains Filter	D2854
CH6	Mains Filter	D2854
CH7	Headset Filter	D2854
CH8	100mH	7350P

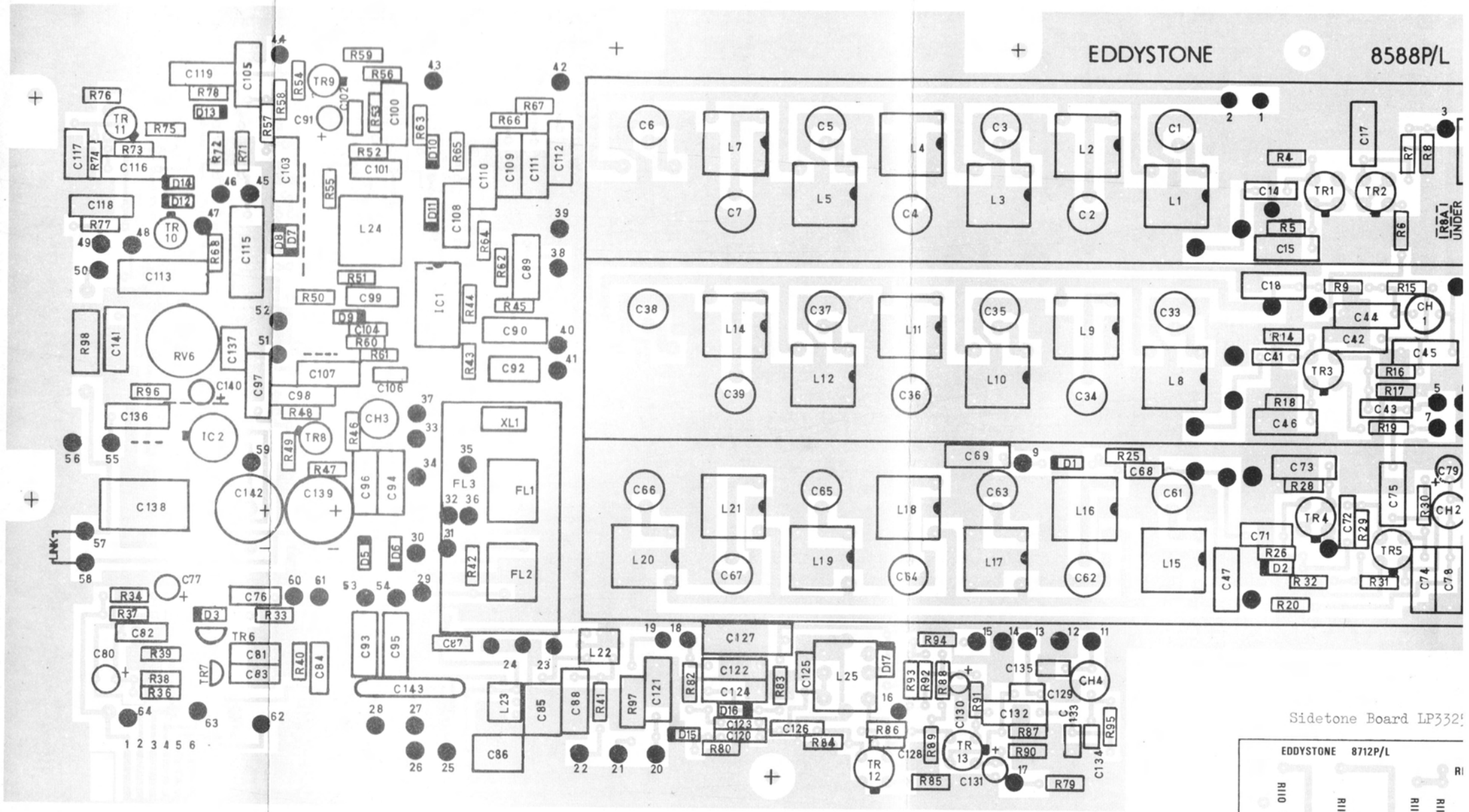
Ref	Description	Part No.
	CHOKES (2182kHz Converter Board)	
CH1	100mH	7350P
	TRANSFORMERS	
T1	Line Output Transformer (6000 CT sec.)	7524P
T2	Mains Transformer	8527P
	DRIVE MECHANISM & ASSOCIATED ITEMS	
	Drive Mechanism (complete with cord drum)	LP3326
	Vernier Dial	D4608
	Drive cord (complete with eyelets)	D4709
	Cursor	8244/1P
	Flywheel	8469P
	Guide Pulleys	6125P
	Jockey Spring	5237P
	Coil Spring (for scale drum)	8355P
	Dial Window	8601P
	Vernier Window	8598P
	Diffusion Strip	8597P
	CONTROL KNOBS	
	Tuning	D4704
	Range Switch	D4706
	Fine Tuning	D4705
	BFO Pitch	D4705
	Selectivity Switch	D4705
	IF Gain	D4707
	AF Gain	D4708
	Crystal Selector	D4705
	FUSES & LAMPS	
	Fuseholder	6372P
	Cartridge Fuse 1-Amp rating	7173P
	Cartridge Fuse 2-Amp rating	6704P
	Scale Lamp (12V @ 80mA, wire-ended)	8448P

Ref	Description	Part No.
	MISCELLANEOUS	
	Panel Handles	8253/1P
	Meter	8619P
RLA	Muting Relay	8445P
	Loudspeaker	8526P
	Flexible Coupler	LP3310
	Solid Coupler	7353P
	Trimming Tool No. 1	8333P
	Trimming Tool No. 2 (Type H.S.1.)	8450P
	Top Cover (including dial lights)	D4612
	Bottom Cover	8605P
	Dial Strip - Range 1	8550P
	Ranges 2 & 3	8551P
	Ranges 4 & 5	8552P
	Ranges 6 & 7	8553P


MODEL 1004
BP1296
STBY
STANDBY
AF GAIN
SIDETONE INPUT
ADJUST RV6 FOR QUIESCENT CURRENT OF 10mA WITH LINK REMOVED AND METER CONNECTED TO Nos 57 & 58
LINK
EXTERNAL LOUD SPEAKER
JK1 PHONES
MODE
AM
CW/SSB
LINE AMPLIFIER BOARD
600Ω OUTPUT
FIT LINK FOR BALANCED 600Ω OUTPUT
LINE LEVEL
ANCILLARIES PLUG PL3 PIN NUMBERING (VIEWED ON WIRING SIDE)
PL4 VIEWED ON PINS
SK4 VIEWED ON WIRING SIDE
D.C SUPPLY INPUT
FIT APPROPRIATE LINK TO SUIT BATTERY VOLTAGE
12V OR 24V DC SUPPLY
BATTERY
SUPPLY OFF
MAINS
D.C FUSE
A.C FUSE
SEE NOTE
A.C SUPPLY INPUT PL2
A.C. FUSE RATING
100/130V — 2A
200/260V — 1A
CIRCUIT EARTH
FRAME
LINK
IF AGC
MAN
AGC SHORT
AGC LONG
IF GAIN
MAN/AGC
B.F.O.
CW/SSB DET.
DIAL LIGHTS (12V at 80mA)
BATT CHECK
+9V VIA No. 43 ABOVE
BC107B
1 EMITTER
2 BASE
3 COLLECTOR
2N4254
1 BASE
2 COLLECTOR
3 EMITTER
2N4921
VIEWED ON PLASTIC SIDE
1 EMITTER
2 COLLECTOR
3 BASE
3N128
1 DRAIN
2 SOURCE
3 GATE
4 SUBSTRATE & CASE
UC7348
1 SOURCE
2 DRAIN
3 GATE
4 CASE
40673 (INCORPORATES DIODE PROTECTION)
1 DRAIN
2 GATE 2
3 GATE 1
4 SUBSTRATE (SOURCE & CASE
CA3046 (VIEWED FROM TOP)
ORIENTATION NOTCH
TAA300


RANGE SWITCH S1A-F SHOWN AT RANGE 1 POSITION
C1-C7=4/30p
C35-39=4/30p
NOTE: FL1 & FL2 NOT FITTED ON MODEL 1004
FL3 – 11-ELEMENT CERAMIC LADDER FILTER WITH SEPARATE INTEGRAL RESONATOR CONNECTED TO TAGS 'X' & 'Y'
+11V TO S3A VIA No 64
SELECTIVITY WIDE NARROW 2182kHz
S2A-D
S2B
S2C
TO No 4
UC734B TR1
3N128 TR2
40673 TR3
2N4254 TR4
2N4254 TR5
2N4254 TR6
1N128 TR1
1N128 TR2
1544 D10
1544 D11
BA111 D15
BA112 D16
FL3
L22
L23
FILTER CONNECTIONS VIEWED FROM UNDERSIDE
RF AGC
PART 1C1
C67=C67+7/35p
INDICATES NO SHORTING PLATE CONNECTION
PLUG-IN CRYSTAL UNIT
PLUG IN CRYSTAL UNIT HAS HOLDERS FOR TEN CRYSTALS WIRED AS SHOWN AT POSITION 2.
NORMAL
PART PL3 PART SK3
PL3 ARRANGED TO OPERATE RLA FROM EXTERNAL SWITCHED 12 OR 24V SUPPLY
PL3 ARRANGED TO OPERATE RLA FROM RECEIVER SUPPLY
AERIAL INPUT
SK1
RLA
INPUT PROTECTION
PC1 8x1N4148
2182kHz CONVERTER BOARD
FINE TUNE
B.F.O. PITCH
XL1 2902kHz

(continued)



Main Printed Circuit Board LP3325/1

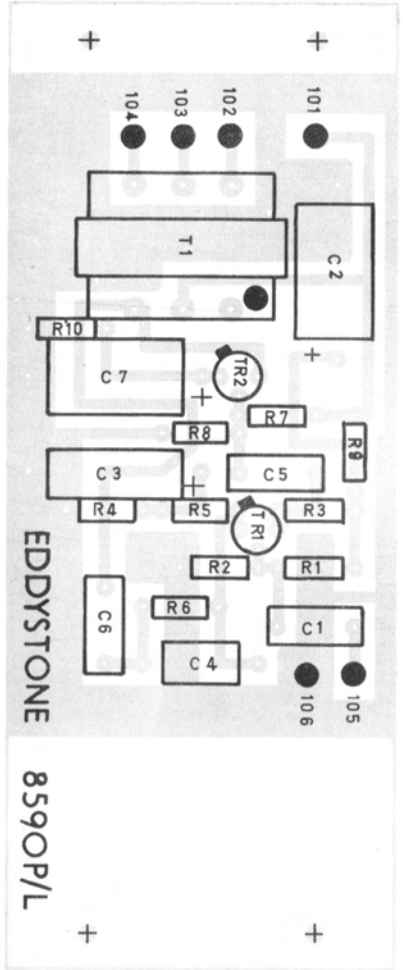
Sidetone Board LP332

APPENDIX 'E'

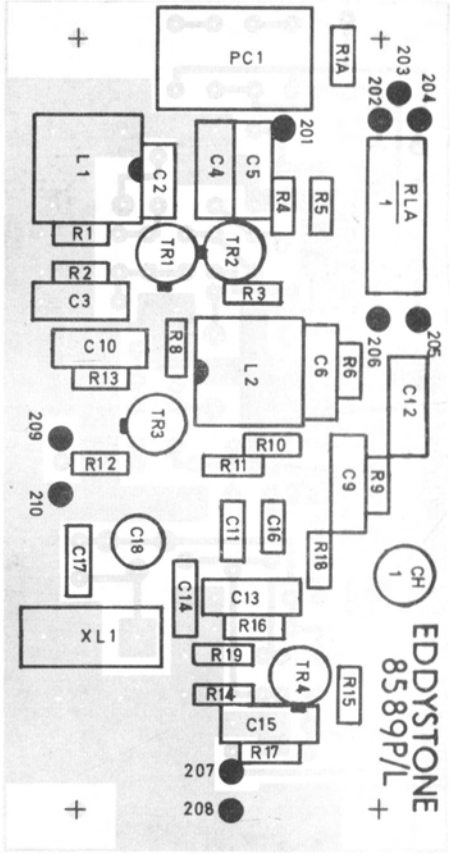
PRINTED CIRCUIT BOARDS

NOTE: The following components shown on the Main Printed Circuit Board overleaf are not fitted on Model 1004:- D1 R25 C68 C69

This board is a multi-purpose board which is also used for other 1000 Series Receivers including Models 1000, 1001 and 1002.



600Ω Line Amplifier Board LP3325/3



2182kHz Converter Board LP3325/2

OPEN FLAP AT RIGHT TO VIEW MAIN AND SIDETONE BOARDS OVERLEAF