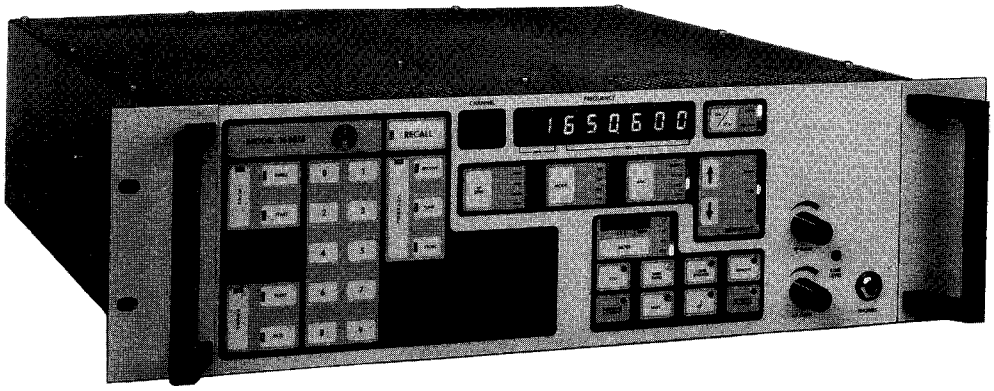
Eddystone

1650/6 RECEIVER

PART 1

INSTALLATION NOTES OPERATING INSTRUCTIONS AND SERVICE DATA



Eddystone Radio

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1650/6 HANDBOOK INDEX

- PART 1 -

SECTION ONE : INTRODUCTION (White Pages)

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First Edition.....1650/6 Handbook Part 1. May 1988.

1650/6 Handbook Ammendment

SOFTWARE REVISION 1. 1650/6 RECEIVER

EPROM : 13IC8 (11898PB) Page 'E'

Mod. Record Label Status : 1 (ONE)

Installation

1) Remove power from the receiver and with reference to Section 5.2 MODULE ACCESS AND REMOVAL - remove front panel assembly.

2) Support front panel assembly on it's handles and remove the microcomputer cover - see Section 5.2.4 MICROCOMPUTER ASSEMBLY.

3) Remove the microcomputer lid - Section 5.2.4 and locate 13IC8.

4) Observing the Component Handling precautions for MOS devices described in in Appendix A.1, replace EPROM 13IC8 with 11898PB.

5) Replace microcomputer lid and restore front panel assembly to receiver as Section 5.2.

Operation

This software revision affects only the 'out of lock' indication of the synthesiser.

Circuit diagrams BP1827 Main IF/Audio Board, BP1828 Synthesiser and VCO Board and Section Four : Circuit Description should be studied along with the following:-

An 'out of lock' condition of either of the two synthesiser loops is detected by the microcomputer. Where this condition persists for a period of one second, the microcomputer causes the signal path of the main IF/audio board to be open circuit by selecting an unused position (0) on BCD-decimal decoder 10IC7. This deselects relays 10RLJ,K,L,M,N,P and so disconnects the 1.4MHz signal path.

The microcomputer measures the 'out of lock' time by monitoring the relevant input during repetitive program cycles and accumulating the result. The receiver is therefore, by implication, under 'local control' and the 'clock line' 1PL1-3 is High (1). During 'remote control' however, 'clock line' 1PL1-3

is Low (0) and the microcomputer performs only one program cycle and then waits for the next data word to be sent. In order to test for the 'out of lock' condition under 'remote control' it is necessary therefore to take the 'clock line' 1PL1-3 High (1) for a period of one second so that the microcomputer (now under local control) can test for the 'out of lock' condition with repetitive program cycles.

Performance

Insertion loss under 'out of lock' conditions.

f. input 1MHz >80dB below standard output

--oOo--

Eddystone Radio Ltd *July 1989.*

SECTION ONE : INTRODUCTION

WARNING

Before connecting the receiver to the power supply SECTION TWO : INSTALLATION must be read especially with regard to the instructions concerning wiring of the mains connector. Information about first aid in the case of electric shock and about the 'Health and Safety at Work Act 1974 (United Kingdom)' is bound at the rear in Appendix A.

The 1650/6 Handbook is organised into two volumes; Part 1 and Part 2. This is Part 1 and consists of the following sections:-

SECTION ONE : INTRODUCTION which includes safety warnings, a general description of the receiver and ancillaries with a data summary and typical performance.

SECTION TWO : INSTALLATION which details physical dimensions and fittings and all external connections. Setting-up procedures and fuse details are also given.

SECTION THREE : OPERATION which describes all the receiver's controls and their use.

SECTION FOUR : CIRCUIT DESCRIPTION which explains operation with reference to the block and circuit diagrams.

SECTION FIVE : MAINTENANCE details alignment and setting up techniques as well as test procedures for the microcomputer related parts.

SECTION SIX : SPARES lists all printed circuit and related electronic components used in the 1650/6.

1.1 GENERAL DESCRIPTION

The Eddystone 1650/6 is a purpose designed variant of the 1650 receiver in order to meet the requirements of Specification ME 0634 issue 1.4.1. The main features are restricted 'local' operation, 100kHz IF output, three selectable IF bandwidths and fast 'remote' control. The two audio outputs, at 600 ohms and 8 ohms, are centred about 5kHz at the tuned frequency with an erect frequency response matching that of the bandwidth selected. Selectivity, AGC and frequency settings are input via the front panel membrane keyboard. The frequency is displayed to 5Hz on eight seven segment displays while selectivity, AGC and meter settings are seen as LED 'bars' through the membrane panel. Further LED indicators

are used to show 'remote' operation and 'wideband' input selection. During 'remote' operation, selected by the remote control system only, the keyboard is locked out and no 'local' operation is possible. The aerial input impedance is 50 ohms as is the 100kHz IF output both using BNC connectors. The 'remote' and 'ancillaries' connections utilise 9 way and 25 way 'D' connectors respectively. The receiver is rack mounted, constructed of zinc plated steel using stainless steel or zinc plated fixings.

1.2 DATA SUMMARY

Frequency coverage	10kHz to 30MHz.
Selectivity	16kHz, 8kHz, 3kHz.
AGC Slow Fast	Attack 300mS. Decay 4 Seconds. Attack 20 mS. Decay 300mS.
Aerial input	50 ohms BNC socket.
IF output	100kHz at 100mV/50 ohms (adjustable internally) BNC socket.
AF output line	1mW/600 ohms isolated output with center tap and electrostatic screen. (Preset adjustment via front panel).
AF output loudspeaker	1 Watt/8 ohms.
Headphone jack	4mW/600 ohms (with facility to mute external LS if required).
External antenna switch	Open collector transistor O/P 50mA maximum current, 30V maximum voltage. Transistor 'on' above 10.5 MHz.
Remote control	Synchronous system 40 bit word at 1200-4800 bits per second. Frequency setting to 10Hz.
Power supply	240V $\pm$ 10% 50Hz single phase.
Power consumption	40-60VA. (depending on settings).
Temperature range	+10 to +40deg. C (operating) -40 to +70deg.C (storage).
Maximum humidity	95% relative at +40 deg.C.
Width	483mm (19in).
Height	3U 132.5mm (5.22in).
Depth	499mm (19.65in) intrusion into rack.
Weight	approx. 17.24Kg. (38lb).

1.3 TYPICAL PERFORMANCE

THE 1650/6 meets the requirements of ME 0634 issue 1.4.1. The main differences are outlined below.

Sensitivity	17dB S/N for 3uV PD input with 8kHz bandwidth at 2 MHz.	
Selectivity	-6dB	-60dB
16kHz position	18kHz	30kHz
8kHz	9kHz	12kHz
3kHz	3.7kHz	5kHz
1st Image	100dB.	
2nd Image	85dB.	
IF rejection	90dB.	
Frequency stability	Better than 10 Hz over the operating temperature range.	
AGC characteristic	3dB change in output for a 90dB increase above AGC threshold.	
Intermodulation	The level of third order intermodulation products produced by two in-band signals of 100mV PD will be at least 40dB below that of either signal.	
Radiation	Less than 10uV PD (50 ohms) over 0-120MHz.	
Remote control speed	50-80mS depending on frequency step size.	

SECTION TWO : INSTALLATION

WARNING

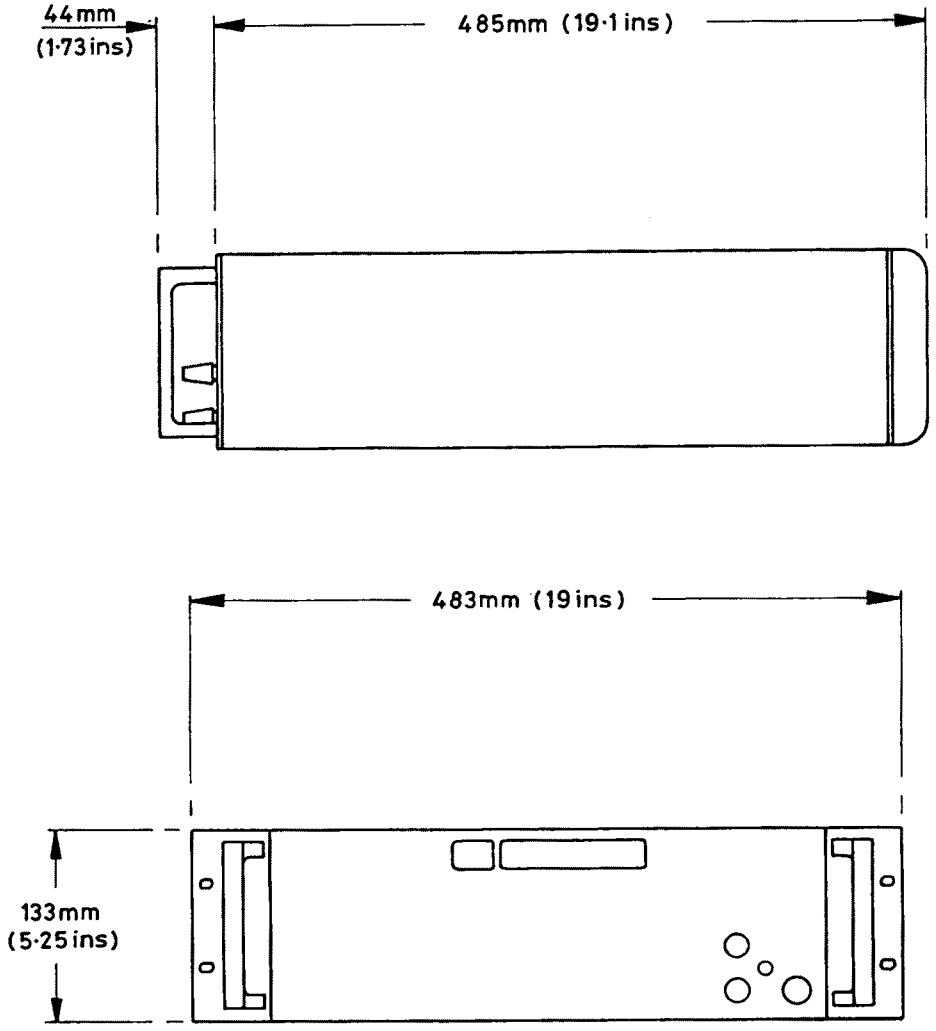
Before connecting to the power supply, the sub-sections 'EXTERNAL CONNECTIONS - 2.2.1 A.C. MAINS INPUT Connector and 2.3.1 FUSES' must be read.

2.1 PHYSICAL DIMENSIONS AND FITTING

2.1.1 Rack Mounting

The receiver can be installed directly in 483mm (19 in) racking using four suitable screws. Plain washers or plastic cup washers should be used beneath the screwheads to prevent damage to the paint finish. Fixing slots conform to the standard spacing of 57mm (2.25 in). Overall dimensions of the receiver are shown in Figure 2.1.

Figure 2.1
Dimensions of Receiver



2.2 EXTERNAL CONNECTIONS

All external connections are made at the rear of the receiver with the exception of the headphone jack on the front panel.

2.2.1 A.C. MAINS INPUT Connector

WARNING

The A.C. MAINS INPUT socket accepts a standard 40-60Hz 240 Volt mains supply using a standard I.E.C. connector. If a moulded plug and lead is used, a connector to suit the local supply arrangements can be fitted to the free end, observing the colour code which is as follows:-

LINE	-	BROWN
NEUTRAL	-	BLUE
EARTH	-	GREEN/YELLOW

The following additional information is issued in accordance with British Standard BS415 and concerns mains supply connections for the U.K.

'If the colours of the wires in the mains lead of this apparatus do not correspond with the coloured markings identifying the terminals in your mains connector (or plug), proceed as follows:-

1. The GREEN/YELLOW wire must be connected to the plug terminal marked "E" or " ! " or coloured GREEN or GREEN/YELLOW.

2. The BLUE wire must be connected to the plug terminal marked "N" or coloured either BLUE or BLACK.

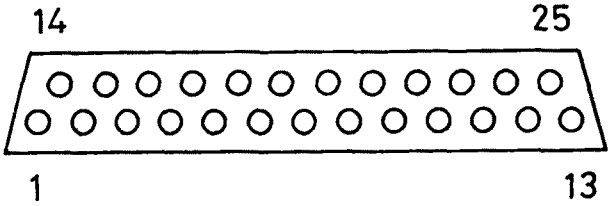
3. The BROWN wire must be connected to the plug terminal marked "L" or coloured either BROWN or RED.

4. If a 13A (BS1363) Fused Plug is used for connection to the supply output, the plug MUST be protected by a 3A FUSE. If another type of plug is used, a fuse of the appropriate rating must be fitted either in the plug, or the adaptor, OR AT THE DISTRIBUTION BOARD.'

2.2.2 INPUT/OUTPUT Connections

Aerial input and 100kHz IF output connections are by 50 ohm BNC sockets while ancillaries are by 25 way 'D' type socket and remote control by 9 way 'D' type plug. The connections are detailed in Figure 2.2 and Figure 2.3.

Figure 2.2
ANCILLARIES Connector



view into 25 way
female connector

ANCILLARIES Connector

Pin	Description
1	AF O/P (8 ohms).
2	Not Used.
3	Not Used.
4	Not Used.
5	Not Used.
6	600R line O/P)
7	600R line O/P CT)preset at 0dBm)by front panel)control (11)RV2.
8	600R line O/P)
9	Not Used.
10	Not Used.
11	Not Used.
12	Not Used.
13	10.5MHz Ae. changeover O/P. Maximum rating 50Ma at 30V. 'On' above 10.5MHz.
14	Earth for 1 (unmuted).

Figure 2.2 (continued)

15 Earth for 1 (muted via headphone jack on front panel).

16 Earth.

17 Earth.

18 Earth.

19 Earth.

20 Earth.

21 Earth.

22 Earth.

23 15V supply O/P maximum 100mA.

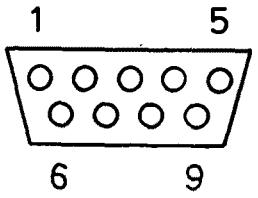
24 Not Used.

25 Not Used.

Connector 25Way 'D' SOCKET Ref. (1) SK3

--oOo--

Figure 2.3
REMOTE Connector



view into 9 way
male connector

Figure 2.3 (continued)

REMOTE Connector

Pin	Description	
1	Digital ground (chassis).	
2	Serial data input	)5V CMOS input: use)2K7 pull up to 5V
3	Serial clock input	)with TTL driver.
4	Serial data output	)drive capability)
5	Serial clock output	)20 LSTTL loads.
6	Not Used.	
7	Not Used.	
8	Not Used.	
9	Not Used.	

Connector 9Way 'D' PLUG Ref. (1) PL1

--oOo--

2.3 POWER UNIT PROTECTION

2.3.1 A.C. Supply

WARNING

The A.C. mains supply MUST be completely disconnected from the receiver whilst the fuses are replaced.

2.3.2 Fuses

A.C. FUSE (1)FS1 : 1A(T) anti-surge 20mm cartridge fuse in series with the LINE input.

D.C. FUSES (1)FS2, (1)FS3 : 3A 20mm cartridge fuse in series with the mains transformer secondary.

All fuses are accessible on the rear panel.

SECTION THREE : OPERATION

3.1 CONTROLS

The following should be read in conjunction with the front panel drawing BP2028 bound in Part 2.
The 1650/6 features a membrane front panel switch array with LED indication and three rotary controls. Only certain functions of the membrane front panel switch are used in the receiver and these are described below, the remainder are non-operative.

ON/ST BY — Turns the receiver on and illuminates the display and front panel control indicators. No operation is possible with the receiver in standby mode.

0 - 9 — Numeric keys 0-9 enter the frequency, most significant digit first, on the eight digit LED display. All trailing digits must be entered for the correct tuned frequency.

AGC — The AGC key selects Slow, Fast, Off.....Slow etc. with each key press, the setting is indicated by orange LED.

SELECTIVITY — One of three bandwidths is selected by 'up and down' keys, either 3kHz, 8kHz, 16kHz.....3kHz etc. or the reverse with the other key pressed. The selectivity is indicated by orange LED.

METER — The METER key selects CZ, AF, RF1, RF2.....CZ etc. with each key press, the setting being indicated by green LED while the level is shown on a 10 LED bargraph. RF1 indicates the RF AGC voltage and RF2 the IF AGC voltage. AF displays line output level at 10mW. CZ is not used.

IF GAIN — The IF gain control is only operative with the AGC switched off. Clockwise rotation provides maximum gain.

AF GAIN — The AF gain control adjusts the 8 ohm AF output to an external loudspeaker or a headset (when connected to the Phones jack socket). Clockwise rotation provides maximum gain.

LINE LEVEL The line level preset control adjusts the 600 ohm isolated AF output to external lines. It may be preset, with a suitable tool, via the front panel access. Clockwise rotation provides maximum gain.

3.2 LOCAL OPERATION

The receiver should be set up as described in SECTION TWO : INSTALLATION and the power applied.
If the receiver is in standby mode then the LED digital display will first show 'reset' for one second and then only the oven LED will remain on. Pressing ON/ST BY will turn the receiver on and illuminate the display.
If the receiver is not in standby mode then the LED digital display will first show 'reset' for one second and then revert to the tune frequency.
The receiver is now ready to be adjusted to the required frequency and signal level. This is shown in the following examples :-

Example 3.1
To tune to 1000kHz

Press <0>, <1>, <0>, <0>, <0>, <0>, <0>.

After entering the most significant or leading zero the display will show :-

0 - - - -.- - 0

Subsequent key entries fill the display clearing all the 'bars' and blanking leading zeros :-

1 0 0 0.0 0 0

N.B. The frequency is only entered to an accuracy of 10Hz.

Example 3.2
To tune to 10MHz

Press <1>, <0>, <0>, <0>, <0>, <0>, <0>.

After entering the most significant digit the display will show :-

1 - - - -.- - 0

Subsequent key entries fill the display clearing all the 'bars' :-

1 0 0 0 0.0 0 0

AGC and Selectivity settings are indicated by the relevant LED pointer and are 'stepped through' by repeated key presses.

Example 3.3
To set AGC Fast and Selectivity 3kHz.

Press <AGC>, repeatedly until LED pointer shows Fast AGC :-

AUDIO
SLOW
FAST *
OFF

Press <SELECTIVITY> (either key) repeatedly until LED pointer shows 3kHz :-

16kHz

8kHz

3kHz *

3.3 REMOTE OPERATION

Remote control operation is via the 'REMOTE connector' (1) PL1 detailed in Figure 2.3.
The system uses serial synchronous data transfer at 1200 to 4800 bits per second to interrogate the receiver status and to control tuned frequency, selectivity, AGC fast or slow and Wideband on/off.
Connection of the 'remote control' automatically switches the receiver to remote operation and illuminates the green Remote LED. The front panel membrane switch is locked out during remote operation.

Error protection is provided in three ways:

a) By providing a CHECKSUM code with each data transfer (see 'CODES').

b) By providing a fixed two bit sequence at the start of each word. (see 'THE SERIAL WORD').

c) By reverting the data word received back to the controller to enable bit by bit comparison. Note data is only reverted if it passes checks (a) and (b) at the receiver and thus has been used to alter settings etc. Any failure to revert data back after approximately 25mS plus two line delays and a word period indicates that either the receiver did not receive the data or did not receive it correctly or that there was a line failure in one or both directions. In all cases a check of system and settings should be made by use of the interrogation code (see 'CODES').

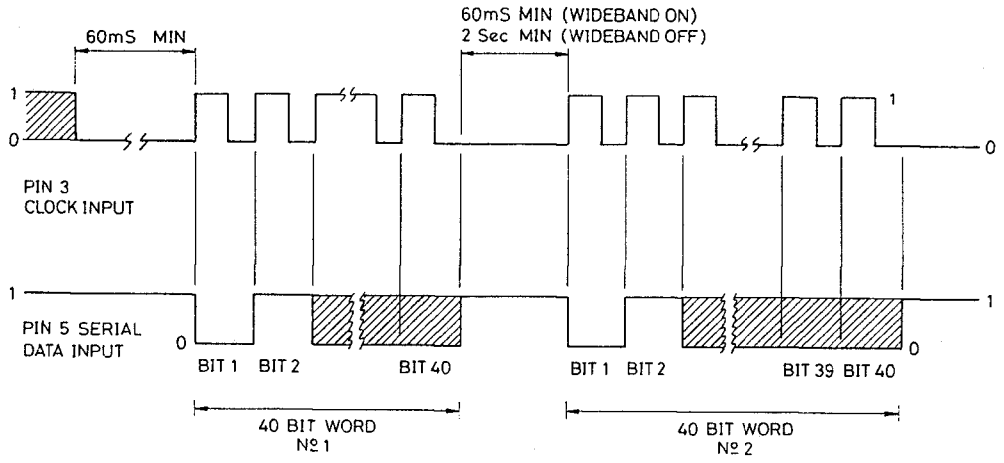
All serially controllable settings are made simultaneously with just one code transmission (see CODES). The 5Hz digit is automatically set to 0Hz when remote operation is selected and the meter setting stays as selected under local control.

3.3.1 THE SERIAL WORD

INPUTS

The serial control inputs are in the form shown in Figure 3.2

Figure 3.2
Data Inputs



Each word is 40 bits long , the first bit transmitted (bit 1) is always '0' and the second bit (bit 2) is always '1'. Bits are sampled by the receiver on the falling edge of the clock input (see Figure 3.2). The receiver will not accept or revert any data in which bits 1 and 2 are not as described.

In normal remote use, when data is not being sent, the clock line is maintained low. It is this that keeps the receiver in remote control mode, locking out the keyboard and looking for a serial word input. The clock line must be low for at least 60mS before the first word is transmitted and should ideally be kept low between words to ensure rapid frequency switching (of the order of 50mS). Gaps of at least 60mS should be left between words if 'Wideband' operation is selected or at least two seconds if 'Wideband' is deselected (i.e. the narrow RF preselector has been installed). In the latter case 'Wideband' operation is automatically selected until the preselector is brought onto tune (which takes one to two seconds maximum).

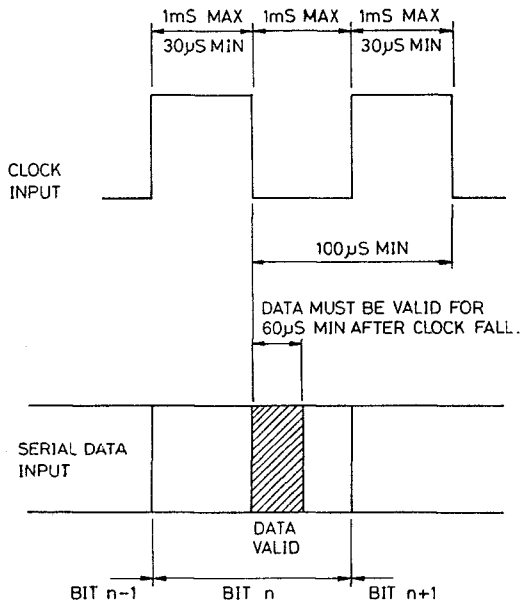
OUTPUTS

These are of the same form as the 'INPUTS' except that the clock line is held in the high '1' state between words. The output is only generated in response to an input and starts about 25mS maximum after the end of an input word. The output clock has a 1:1 mark-space ratio with the low going edge half way through the data bit. An output bit rate of 1200Bps, 2400Bps or 4800Bps is selected automatically by measuring the corresponding clock input period and selecting the nearest available output rate.

3.3.2 INPUT BIT DETAIL

Timing of the individual bits is shown in Figure 3.3

Figure 3.3
INDIVIDUAL BIT TIMING



The following conditions at the remote connector input (1) PL1 must apply for reliable operation.

i) Data must be valid for 60uS minimum on and after the falling edge of the clock.

ii) The maximum clock/data input period is 2mS (1:1 mark-space ratio on clock line). This gives an absolute minimum bit rate of approximately 600Bps (n.b. reverted data would still be at 1200Bps).

iii) The minimum period between successive falling edges is 100uS which, combined with (i) gives a maximum bit input rate of approximately 9600Bps (N.B. reverted data would still be at 4800Bps).

iv) The minimum clock high period is 30 uS.

The input bit rate accuracy is not generally important since data bit sampling is synchronised to the clock and thus any input rate between 600Bps and 9600Bps is satisfactory as long as conditions (i) to (iv) are met at the remote connector (1) PL1. The output data rate however is only at 1200Bps, 2400Bps or 4800Bps, whichever is closest to the input bit period.

3.3.3 CODES

The format of the data word both (control and revertive) are as follows in order of transmission (i.e. bit 1 first)

Bit 1	Always '0'	
Bit 2	Always '1'	
Bit 3	Revert/ *	)
Bit 4	Selectivity	)
Bit 5	LSB	)
Bit 6	...	) 10Hz
Bit 7	...	)
Bit 8	MSB	)
Bit 9	LSB	)
Bit 10	...	) 100Hz
Bit 11	...	)
Bit 12	MSB	)
Bit 13	LSB	)
Bit 14	...	) 1kHz
Bit 15	...	)
Bit 16	MSB	)
Bit 17	LSB	)
Bit 18	...	) 10kHz
Bit 19	...	)
Bit 20	MSB	)
Bit 21	LSB	)
Bit 22	...	) 100kHz
Bit 23	...	)
Bit 24	MSB	)

Bit 25	LSB	)
Bit 26	...	) 1MHz
Bit 27	...	)
Bit 28	MSB	)
Bit 29	LSB	)
Bit 30	MSB	) 10MHz
Bit 31	Wideband	'1' for 'ON' '0' for 'OFF'
Bit 32	AGC	'1' for 'FAST' '0' for 'SLOW'
Bit 33	EXCLUSIVE 'OR' of bits 1,9,17,25	
Bit 34	EXCLUSIVE 'OR' of bits 2,10,18,26	
Bit 35	EXCLUSIVE 'OR' of bits 3,11,19,27	
Bit 36	EXCLUSIVE 'OR' of bits 4,12,20,28	
Bit 37	EXCLUSIVE 'OR' of bits 5,13,21,29	
Bit 38	EXCLUSIVE 'OR' of bits 6,14,22,30	
Bit 39	EXCLUSIVE 'OR' of bits 7,15,23,31	
Bit 40	EXCLUSIVE 'OR' of bits 8,16,24,32	

* BITS	4	3
REVERT ONLY	1	1
16kHz	1	0
8kHz	0	1
3kHz	0	0

NOTES

i) Frequency settings are sent in B.C.D form. Any digits greater than 9 sent are interpreted by the receiver as '9' but are reverted for comparison checking purposes as the actual digit received. In the case of 10MHz, if '3' is sent, it is interpreted as '2' but reverted as '3' etc.

ii) The last eight bits are an Exclusive OR error checksum. If the 40 bits are considered as a vertical block of 5 bytes, this checksum is a 'vertical' even parity check.

iii) If bits 3 and 4 are both '1', then the present settings of the receiver are reverted to the controller for a status check. No change in settings will occur at the receiver. As long as bits 1, 2 are '0', '1' respectively and the checksum is correct, then the settings of the other 28 bits are not important. Note that data returned to the controller can only be checked for a leading '0', '1' and a correct checksum since bit by bit comparison with the 'revert only' command is obviously not possible.This contrasts with setting commands which need only perform bit by bit comparison of the data reverted with that sent (since a leading '0', '1' and a correct checksum are already present in the data sent).

SECTION FOUR : CIRCUIT DESCRIPTION

4.1 SIGNAL CIRCUITS

The following should be read in conjunction with BP2022 1650/6 Receiver Signal Circuits Block Diagram bound in Part 2. Refer to BP2021 1650/6 Chassis Interconnections & Misc. Modules for connections etc. between the modules described.

Circuit diagrams BP1968 RF & 1st. IF board and BP1827 Main IF/Audio Board should be studied along with the following:-

The input signal is passed via a 30MHz Input Low Pass Filter and a 3dB pad to a balanced RF amplifer 7TR5/6 (2 X BFW30). This amplifer has a flat response between 100kHz and 30MHz with additional negative feedback giving a gradual gain reduction down to 10kHz. The optional Preselector BP 2030 (where fitted) is switched in place of the 3dB pad when Wideband is deselected.

Differential transformer outputs 7T2/3 from 7TR5/6 drive a high level mixer 7IC3 (SL6440C). 'Up Conversion' provides an output at the 1st IF frequency of 46.205MHz which is filtered by 75ohm Roofing Filter 7FL1 at a bandwidth of 16kHz. The subsequent signal is applied to a double bridged 'T' attenuator 7D17-20 (4 X HP5082-3081) which provides up to 55dB of attenuation.

Attenuator control is performed by drawing current through i.e. turning 'ON' the shunt diodes 7D19,20 and turning 'OFF' the series diodes 7D17,18. This is performed by a voltage to current control circuit comprising 7IC4, 7TR8, 7TR9, 7IC5, 7TR10, 7TR11 which enables attenuator control over the range 0-4.5V. CMOS Op-Amp 7IC4 (CA3140E) has RF AGC voltage applied via time constant components 7R60, 7C91, 7R64. Transistor 7TR20 (BC547B) is used to 'quench' AGC voltage under remote control.

7TR12 (BFX89) provides gain and isolation between the attenuator and the second high level mixer 7IC6 (SL6440C). 'Down Conversion' provides an output at 1.4MHz where the signal is passed to the Main IF/Audio Board (BP1827).

Bias for both Mixer circuits 7IC3 and 7IC6 is controlled by 7TR7,13 (BC560B) providing 25mA bias current to each mixer. This condition is met when a 3V differential exists between 7TP7 and 7TP8 - adjusted by 7RV3. Both of the Mixer circuits form part of the synthesiser-see Section 4.2 Synthesiser and VCO circuit.

The Main IF/Audio Board BP1827 provides the main selectivity of the receiver. Selection of the three bandwidths is by BCD-Decimal decoder 10IC7 (74LS145) selecting a crystal filter for 3kHz and 8kHz positions while 16kHz employs a matching 3dB pad 10R14-16. Diodes 10D1,D4,D5 protect the decoder outputs from extraneous voltage produced by relays 10RLJ,K,L,M,N,P. Each selectivity position uses relays on input and output to provide maximum isolation from each other, only the pair of relays associated with the chosen selectivity position is energised-the remainder being open circuit. The 16kHz position is effectively the bandwidth of the Roofing Filter 7FL1 on the RF/IF Board. A 3dB pad matches the insertion loss of the other two selectivity positions and preserves the load impedance on the second high level mixer 7IC6. In order to ensure that this pad does not impair the response of the 8kHz and 3kHz selectivity positions, 10C21 (22pf) forms part of a capacitive attenuator with the O/C contact leakage capacity of 10RLN thus enhancing the isolation when this position is de-selected.

The 1.4MHz IF amplification is performed after the main selectivity. 10IC1,IC2 (MC1350P) and 10TR1 (BFR54) comprise a 90dB gain controlled amplifier some 80kHz wide. 10RV1 allows gain reduction matching between 10IC1 and 10IC2 under AGC conditions. 10TR1 is a high current high dynamic range buffer stage from where the signal is split off to the Product Detector, IF AGC Detector and IF Output stages.

Double balanced mixer 10IC13 (SL1641C) forms a product detector with 1405kHz from the Synthesiser Board to produce a 5kHz audio output for a 1.4MHz IF input. The audio signal is amplified and filtered by 10TR9 (BC547B), 10CH5 (10mH), 10C97,98 (5n6) and output via 10STC 2 to gain controls 11RV2 (600 ohm Line Audio) and 11RV3 (L.S. Audio).

IF AGC is derived from a fast acting AGC detector 10IC15 (SL623C). 10RV4 sets the point above which AGC output voltage is produced at 10IC15-4 (not to be confused with AGC threshold). The AGC voltage is split off to RF2 meter circuit via 10STC2 and to the AGC time constant selector switch 10IC6. AGC selection is by two control bits via 10STC1 AGC Mode LS Digit and AGC Mode MS Digit. These provide AGC modes as Table 4.1.

Table 4.1
AGC Selection

MSD	LSD	Function
0	0	None
0	1	Fast AGC (X1,Y1)
1	0	Manual Gain
1	1	Slow AGC

AGC voltage from 10D12 (BAX13) charges time constant capacitor 10C70 (10u) via 10R66 (15k). 10R63 (4M7) provides a discharge path for 10C70. This is the situation for SLOW AGC. FAST AGC enables transmission gate X1 Y1 10IC5 (MC14052B) connecting 10R175 (1k) in parallel with 10R66 and 10R176 (220k) in parallel with 10R63. This reduces the charge and discharge time of 10C70. 10TR18 (BC547B) and 10R172 'quench' the AGC line under remote control. Quad transmission gate 10IC5 (MC14016B) selects either AGC voltage from 10C70 or manual IF gain voltage from 10C71 and 10R65 under logic control as in Table 4.1. The remaining two gates in 10IC5 form a 2 input NOR gate with the MSD effectively inverted so that Manual IF gain is only enabled 10IC5-6 when the MSD is 1. 10IC4a (CA3240E) provides a low impedance for level shifting by 10IC3b (CA3240E) and summing of 'AGC threshold' voltage from 10RV2 (2k2) by 10IC3a. 'Half rail' reference voltage is applied to both amplifiers (10IC3a,b) and changes in its level will not be seen at the output. Variations in HT supply are not therefore superimposed on the AGC control voltage output from 10IC3a.

RF AGC is developed completely separate from the 1.4MHz IF amplifier and is connected at all times. Connected straight after the main selectivity a two stage wideband amplifier 10TR3,4 (BFR54) drives a fast acting AGC detector 10IC9 (SL1623C). RF AGC threshold is set by 10RV6 (1k) and the control voltage is routed to the RF & 1st IF Board via 10STC1.

IF output at 100kHz is provided by a mixer circuit using a 'high side' crystal oscillator to produce an 'erect' frequency characteristic. 10TR2 (BFR54) buffers the 1.4MHz IF output and provides a low impedance drive to double balanced mixer 10IC30 (SL1641C). A Colpitts oscillator is formed around Dual MOSFET 10TR15 (40673) and quartz crystal XTL1 (1500kHz). The resulting 100kHz output from 10IC30

is passed through a low pass filter 10C222-224,CH12,13 with a -3dB cut off of 185kHz. Tuned buffer 10TR16 (BC547B) limits the -3dB bandwidth to approx. 50kHz and allows output level adjustment (10RV11). PNP transistor 10TR7 (BC560B) provides impedance transformation and a 50ohm output at 100mV.

Two independently adjusted audio amplifiers are employed for line driving and external loudspeaker monitoring. Junction FET 10TR8 (UC734B) drives the audio amplifier circuit 10IC20 (TB810S) from a low impedance source, resulting in optimum low noise operating conditions for the latter. In order to maintain stability the bandwidth of 10IC20 is restricted by 10C141 (330p) and 10C140 (1n5). The output is coupled via 10C147 (100u) to centre tapped line isolating transformer 10T1, allowing matching of a 600 ohm line to some 4-8 ohms for the amplifier. The transformer drives but does not terminate a 600 ohm line. 10IC21a (CA3140E) acts as a half wave detector with 10D19 (BAX13) and with IC21b drives the 'line level' meter circuit via 10STC2. Operation of the external loudspeaker audio amplifier 10TR7 and 10IC22 is similar to the above. The output drives headphones via 10PL7 and 1SK5 and external loudspeaker via 10PL7 and 1SK3.

An open collector transistor 10TR9 (BC547B) switches 'ON' at and above 10.5MHz and is output via 10PL2 and 1SK3. Switching is under software control via 10STC1.

4.2 SYNTHESISER AND VCO CIRCUIT

The following should be read in conjunction with BP2023 1650/6 Receiver Synthesiser Circuits Block Diagram bound in Part 2. Refer to BP2021 1650/6 Chassis Interconnections & Misc. Modules for connections etc. between the modules described.

Table 4.2
Synthesiser Frequencies

Tuned Freq.	VCO Range	1st Loop	
0.010MHz	)	46.214MHz	
	) LF		
5.794MHz	)	51.998MHz	
	) LF+1		1st Oscillator is
12.794MHz	)	58.998MHz	46.204MHz above signal
	) HF-1		freq. in 2kHz steps.
20.794MHz	)	66.998MHz	
	) HF		
30MHz	)	76.204MHz	

2kHz step+	2nd Loop	Comparison Freq.	
0.005kHz	44.805,995MHz	5.995kHz	
			2nd Oscillator is
1.000kHz	44.805,000MHz	5.000kHz	1.4MHz below 1st IF
			in 5Hz steps
2.000kHz	44.804,000MHz	4.000kHz	

--oOo--

Example 4.1
19.999,995MHz Tune Frequency

19.999,995MHz Tune frequency is produced by 66.204,000MHz 1st oscillator & 44.804,005MHz 2nd oscillator.

Example 4.2
20.000,000MHz Tune Frequency

20.000,000MHz Tune frequency is produced by 66.204,000MHz 1st oscillator & 44.804,000MHz 2nd oscillator.

Example 4.3
20.000,005MHz Tune Frequency

20.000,005MHz Tune frequency is produced by 66.206,000MHz 1st oscillator & 44.805,995MHz 2nd oscillator.

Circuit diagrams BP1828 Synthesiser and VCO Board should be studied along with the following:-

The 1650/6 Synthesiser is a two phase locked loop design. The first loop generating frequencies covering the tuned frequency range 10kHz to 30MHz in 2kHz steps, the second loop providing 2kHz interpolation in 5Hz steps. Table 4.2 shows the operating frequencies of the two loops, their setting and interelation being under software control. Worked examples are shown for particular Tune Frequencies in Example 4.1 to Example 4.3.

8IC2 (SP8690B), 8IC3 (LF356N), 8IC4 (HEF4750), 8IC5 (HEF4751) and 9TR1 (40673) form a phase locked loop circuit. 8IC4 functions as a dual output phase comparator, Phase Comparator 1 (PC1) is a sample and hold circuit providing a very accurate control voltage. Phase Comparator 2 (PC2) is a wide range digital circuit with three states-positive, negative and high impedance. The output comprises a pulse train of varying mark/space ratio depending upon the phase difference between the reference (2kHz derived from the 5.6MHz standard) and the output of the Variable Ratio Divider 8IC5. Close to lock PC2 becomes high impedance and sample and hold comparator PC1 takes over. This technique gives rapid switching and very low reference frequency sidebands. PC1 and PC2 are summed into a low noise integrator circuit 8IC3. The integrator is 'half rail' biased so that digital comparator PC2 may provide both positive and negative correction i.e. $\pm$ 6V. 'Out of lock' indication is available at 8IC4-1.

The Variable Ratio Divider provides 2kHz output drive to the Phase Comparator. The divide ratio is set by 8D9-12 (BAX13), 8IC7 (MC14011B), 8IC8 (MC14504B) on a bit parallel digit serial basis. The Variable Ratio Divider controls the 'divide by 10/11' prescaler 8IC2 which is driven by VCO buffer 9TR3 (40673)

The Voltage Controlled Oscillator has four ranges, selected by relays 9RLA-D, in order to reduce the varicap diode control line sensitivity and the 'inband' phase noise. Separate buffered outputs are provided, 9TR2 (40673) for the 1st Signal Mixer and 9TR3 (40673) for the prescaler 8IC2.

The second phase locked loop generates frequencies in the range 44.804,000MHz to 44.805,995MHz in 5Hz steps which are applied to the second signal mixer.

8TR7 (BFX89), 8XTL1 (14935kHz) and 8D16 (MV1648) form a third overtone voltage controlled crystal oscillator (VCXO). 8TR6 (40673) amplifies and splits the oscillator signal, from the drain via 8PL9 to the 2nd signal mixer and from the source, tapped down by 8RV5 (220R), to IC26 (SL1641). Mixed with the eighth harmonic of 5.6MHz it produces an output in the range 4kHz to 5.995kHz. 8IC28 (MC14001B) acts as an amplifier/limiter to produce a 15V p-p squarewave to feed phase comparator A input of 8IC27 (MC14046B). 8IC31 (MC14526B) and 8IC32 (MC14569B) form a variable ratio divider preset by two eight stage shift registers 8IC33,34 (MC14094B). The output from the variable ratio divider is in the range 4kHz to 5.995kHz and is fed to phase comparator B input 8IC27 via 8IC28 (MC14001B). 8IC25 (CA3240E) amplifies the phase comparator error voltage produced and applies it to varicap diode 8D16 (MV1648). Altering the variable ratio divider under software control pulls the VCXO over it's 2kHz range. 'Out of lock' detection is provided by 8IC29, 8D17 (BAX13), 8R73 (100k) and 8C110 (10n). The output at collector 8TR9 (BC547B) is 'ORed' with the first phase locked loop 'out of lock' detector at 8STC1-1 where it's state may be read by the micro-computer.

The 5.6MHz standard is 80SC1, a voltage controlled ovened crystal oscillator. Trimming is via 8RV2 (1k) and the signal is shaped and distributed to the two phase locked loops via 8IC15 (74LS04).

A Colpitts oscillator is formed around Dual MOSFET 8TR20 (40673) and quartz crystal 8XTL2 (1405kHz). The output drives product detector 10IC13 via 8RV3 (1k) and 8PL7.

4.3 CONTROL, DISPLAY AND MICROCOMPUTER CIRCUITS

The following should be read in conjunction with BP2042 1650/6 Receiver ,Control and MCU Circuit, Block Diagram BP2025 1650/6 Interface board, BP1975 1650/6 Front Panel Display and BP2043 1650/6 Micro-Computer board bound in Part 2. A simplified program executive flowchart BP2024 should also be studied.

The micro-computer unit uses a MC6802P microprocessor (MPU 13IC2), 8K bytes of 'read only memory' (ROM-2 X 2732, 13IC8,9), 2K bytes of 'random access memory' (RAM-6116LP4, 13IC5), and triple timer 13IC1 (MC6840P). Eight external peripherals may be accessed by the system. All of the RAM is non-volatile, it's power being supplied by a 3.6V 100mAH battery when the receiver is 'off'. Circuitry is incorporated in order to prevent memory corruption at power down during a 'write' to RAM. 13IC7-4,5,6-8,9,10 (MC14011B) form an RS bistable. At power down the RS bistable changes state because current is no longer supplied to Opto-Isolator 13IC15 (MCT2), in doing so the 'chip select' pulse to 13IC5 (6116LP4) is inhibited. If, however, a power down occurs during a 'write ' period this is completed as 13IC7-4 cannot change state when it is Low (0). The RAM is therefore never deselected during a 'write' period. Threshold comparator 13IC6 (CA3140E) detects the supply falling to approx. 8.3V (from 10V) and disables Opto-isolator 13IC15. 0.5V hysteresis is incorporated around the switch over point to prevent mis-triggering. 13IC4 (MC14528B) forms a monostable with 13R16 (100k) and 13C13 (10u) which generates a reset pulse (100-200mS) at power up and from 13IC5-4 going momentarily Low (0). This reset pulse is coupled to 13IC2 via 13TR1 (BC547B) allowing the MPU reset vectors to be loaded.

All Data lines and Address lines A0-A11 are 'pulled up' by 13R2 (47k) and 13R20 (47k) in order to provide known states during power down. Partial decoding is used by the MPU to address both on and off board peripherals. The repeats that occur are not accessed by the software.

It is important that data remains static on the data bus D0-D7 (13IC12-27-33)for at least 30nS after the Enable line (13IC12-37) goes Low (0). In order to improve the margin of safety all peripherals are enabled via leading edge triggered monostable 13IC11 (74LS123). The resulting 'output enable' is shorter, approx. 450nS as opposed to the 'input enable' of 610nS. This gives a much greater margin of safety i.e.610-450=160nS before the 'input enable' falls but with the data lines being static until at least

that time. The actual monostable time is not critical to the system operation. The delay provided removes any possible race hazard between Enable and Data caused by 'clock skewing'.

The micro-computer sends and receives mainly serial data signals to and from the receiver via the interface board BP2025. The LED front panel display is controlled by 12IC10 (74LS74) and data is converted to latched parallel form by display drivers 11IC4,5,6,7 (2 X MM5450). Data is latched into the display driver after 35 serial data bits have been sent. The LED front panel display is fully static in operation. 12IC10 also passes the receiver's remote control output and reverted data signal to the rear panel connector 1PL1. The synthesiser (see Sect 4.2 Synthesiser and VCO circuit) is controlled via 12IC9 (74LS374). Signal and receiver function settings are also controlled by 12IC9 in conjunction with the latched parallel data converter 12IC2,3,4 (3 X MC14094B). Various sense and remote control inputs are passed to the micro-computer via 12IC7,8 (2 X MC14503B).

All the front panel keys, with the exception of 'STANDBY' are organised as a six by six matrix. In order to reduce radiated interference, this matrix is only 'actively' scanned on demand. Key board 'write' signals from 12IC12 (74LS374) go to the six keyboard matrix rows. The six keyboard matrix columns are 'read' by 12IC11 (MC14503B) and 'pulled up' by 12R11 (2k2). Normally all the rows are held Low (0) and, with no key pressed, all the columns are High (1). The keyboard is read in this fashion every 50mS. A key press causes one of the columns to go Low (0) and this initiates a scan routine by the micro-computer. Each row in turn D0-D5 (12IC11) is taken Low (0) and the corresponding column is identified by 12IC11. A consecutive scan, 50mS later, will cause the micro-computer to act on the key press, however any change will cause the key press to be ignored and a return to the normal reading routine.

The tuning knob, used for test purposes only, provides two inputs to the micro-computer triple timer 13IC1 (MC6840P) via 11IC1 (MC14583B), 11IC2 (MC14077B) and 11IC3 (MC14506B). These circuits convert the two-phase pulse stream from the turned knob into separate 'Up' (knob turning clockwise) and 'Down' (knob turning anti-clockwise) pulse streams which can be separately counted and accumulated by the micro-computer.

SECTION FIVE : MAINTENANCE

WARNING

When working on the 1650/6 it may be necessary for power to be applied. In this circumstance normal precautions for safety MUST be observed. Attention must, in particular, be paid to the voltages present at the supply fuse and the mains transformer located under a protection cover at the rear of the receiver. The protection cover should remain fitted at all times.

5.1 ALIGNMENT AND FAULT FINDING

The 1650/6 is suitable for continuous use under arduous conditions and normally requires no routine maintenance. Re-alignment should only be attemped in absolute necessity and with suitable test equipment and tools. The 1650/6 is generally tested and aligned in it's completely assembled state. However, the VCO and front panel assemblies may be more conveniently tested when removed from the receiver and powered from the appropriate test boxes.

5.1.1 ALIGNMENT OF SYNTHESISER AND VCO

Equipment required:-

1) Digital Voltmeter.

2) VHF Oscilloscope with low capacity probes.

3) Digital Frequency Meter with low capacity input.

4) Distortion Factor Meter with 600ohm termination.

Procedure:-

Note the position of all wiring and the position of earth straps on a particular 1650/6.

1) Check the outputs of all voltage regulators

8IC1 = +5V	)
8IC6 = +12V	)
8IC12 = +5V	) ± 5%
8IC13 = +12V	)
8IC14 = +12V	)

2) Connect digital voltmeter to link pins 5 and 6 (near 8PL4) and adjust multi-turn pot 8RV2 for +3.5V dc.

3) Connect oscilloscope to 8IC15-1 and check that 5.6MHz oscillator output is approx. 5V p-p. Use a digital frequency meter to determine frequency of 5.6MHz crystal oscillator, adjusting trimmer in 8OSC1 if necessary. Accurate alignment is best carried out on a complete receiver and is detailed in Section 5.1.8.

Second Loop Alignment

4) Connect oscilloscope to junction 8D16 and 8R60 and check 14.935MHz oscillator is approx. 4-6V p-p.

5) Connect digital frequency meter via a 'low capacity' probe to 8TP17 and set to 1405kHz with trimmer 8C156. The signal level being approx. 800mV p-p.

6) Connect oscilloscope to 8PL7-1 and adjust 8RV3 for 300mV p-p.

7) Tune 1650/6 to 1001.000kHz.

8) Adjust trimmer 8C100 to mid-capacity. Connect oscilloscope to 8TP11 and peak trimmers 8C73 and 8C95 for maximum output.

9) Adjust 8RV5 for 500mV p-p at 8TP11.

10) Connect digital voltmeter to 8TP13 and adjust trimmer 8C100 for 5.6V dc

11) Iteratively peak 8C73, 8C95 and set 8C100 until interaction ceases.

12) Tune 1650/6 to 1000.005kHz and check voltage at 8TP13 is approx. +8.3V dc. Tune 1650/6 to 1000.000kHz and check voltage is +3.5V dc approx.

13) Monitor 7TP11 (RF/1st IF PCB 7) via low capacity probe and <u>good RF earth</u> and peak 8C85. Set 8RV4 for 300mV p-p. Note that signal at 7TP11 does not vary in amplitude when 1650/6 is tuned from 1000.005kHz to 1002.000kHz.

First Loop Alignment

14) Set 8RV1 1/8th of a turn from fully anti-clockwise and ensure that 8IC3-7 is approx. +14.5V dc. 8RV1 affects the 'lock-in time' of the

First Loop.

15) Monitor 8TP2 (divide by 10/11 prescaler I/P) via low capacity probe and good RF earth and check that the signal level is typically 400-800mV p-p when 1650/6 is tuned over the range 10kHz to 30MHz.

16) Check that the waveform at 7TP4 (RF/1st IF PCB 7) via low capacity probe and good RF earth is reasonably sinusoidal and at least 400mV p-p at 29MHz.

17) Tune 1650/6 to 5.793,995MHz and monitor dc voltage at 8PL1. Adjust to 11.5V with trimmer 9C4 in VCO box as detailed in Part 2 Figure 5.1. Tune 1650/6 to 5.794,000MHz and note dc voltage falls to between +3.5V to +5.5V.

18) Tune 1650/6 to 12.793,995MHz and monitor dc voltage at 8PL1. Adjust to 11.5V with trimmer 9C3 in VCO box as detailed in Part 2 Figure 5.1. Tune 1650/6 to 12.794,000MHz and note dc voltage falls to between +3.5V to +5.5V.

19) Tune 1650/6 to 20.793,995MHz and monitor dc voltage at 8PL1. Adjust to 11.5V with trimmer 9C2 in VCO box as detailed in Part 2 Figure 5.1. Tune 1650/6 to 20.794,000MHz and note dc voltage falls to between +3.5V to +5.5V.

20) Tune 1650/6 to 29.999,990MHz and monitor dc voltage at 8PL1. Adjust to 11.5V with trimmer 9C1 in VCO box as detailed in Part 2 Figure 5.1. Tune 1650/6 to 10kHz and note dc voltage falls to between +3.5V to +5.5V.

N.B. No trimmer screw should protude by more than 8mm. If this occurs retune the lowest frequency range, adjusting the tune of 9L1 to allow more capacity. Coil 9L1 should have approx. 12mm of clear thread, after adjustment repeat steps 17-20.

'Out of lock' Indication

21) Adjust 8RV5 for negligible signal at 8TP11 and observe two digits of the frequency display flashing. Restore 8TP11 to 500mV p-p with 1650/6 tuned to 1001.000kHz.

22) Disconnect 8PL2 and observe the same two digits flashing.

23) Reconnect 8PL2 and observe a steady display. Replace earth straps and position wiring and check by listening on a distortion factor meter for any

extraneous backround noise. See Part 2 Figure 5.2.

5.1.2 ALIGNMENT OF VCO BOARD

Where a VCO board has been repaired or a replacement is to be fitted it is advisable to initially align the circuit by itself as follows:-

Equipment required:-

1) Digital Voltmeter.

2) VCO Test Box 1650/6/D6248

3) VHF Oscilloscope with 50ohm inputs to load both VCO outputs simultaneously.

4) Digital Frequency Meter (100MHz) with low capacity input.

Procedure

1) Install the VCO board into VCO Test Box 1650/6/D6248 and connect to +15.5V regulated supply. Connect a digital frequency meter to the O/P socket. Select VCO range 'LF'.

2) If a new coil has been fitted set the output frequency to 46.2MHz (±50kHz) with +4.5V at9PL1 by adjusting the coil winding of 9L1(the screw adjuster should remain at approx. 12mm of clear thread).

3) Set the output frequency to 52MHz (±50kHz), with +11.5V at 9PL1, using 9C4.

4) Iterate 2 and 3 until satisfactory. (Note it is allowable if 46.2MHz is obtainable with the control voltage in the range +3.5V to +5.5V, especially if other VCO ranges do not align correctly or in the case where a coil is already 'araldited').

5) The remaining three ranges should be selected in turn and the HF end set with the appropriate trimmer (control voltage at +11.5V). The LF ends should then be obtainable within the control voltage range +3.5V to +5.5V. (See Section 5.1.1. for frequencies).

N.B. No trimmer screw should protrude by more than 8mm, if this occurs check the adjustment of the LF range.

6) Check the output level at 9PL4 and 9PL5, peaking these at 76.2MHz, with 9C5 and 9C6. These trimmers interact and the equalisation and peaking is best

carried out by observing each output, terminated in 50ohm, simultaneously on a double beam oscilloscope. (With correct adjustment both trimmers should be close to minimum capacity).

7) Check coil assembly and components around the varactor diode are fixed with 'twin pack slow setting ARALDITE' to prevent movement under vibration. See Part 2 Figure 5.1

5.1.3 ALIGNMENT OF MAIN IF/AUDIO BOARD

Equipment required:-

1) Digital Voltmeter.

2) VHF Oscilloscope with low capacity probes.

3) Digital Frequency Meter with low capacity input.

4) Distortion Factor Meter with 600ohm termination.

5) Audio Power Meter (4-8ohm).

6) Ancillaries Test Box 1650/6/D6245.

7) 1.4MHz IF Pad 1650/6/D6249.

8) Sensitive RF millivoltmeter.

9) 50ohm load

10) Signal Generator 10kHz - 110MHz/50ohm

Procedure:-
---

1) Connect the Distortion factor meter and the Audio power meter via the Ancillaries Test Box 1650/6/D6245 to the Ancillaries Connector 1SK3. Connect the Sensitive RF millivolt meter and the 50ohm load to the 100kHz IF output 1SK2 and select 'MANUAL GAIN/8kHz BANDWIDTH'.

IF AGC adjustment
---

2) Set 10RV1, 10RV4 midway and 10RV2 fully anti-clockwise.

3) Connect digital voltmeter to IF gain control 'slider' and with control fully clockwise, adjust 10RV8 for +2V. A convenient connection for the digital voltmeter is on the pad/track adjacent to 10C72 - allowing better access than the IF gain slider.

4) Rotate IF gain control fully anti-clockwise and adjust 10RV9 for approx. +3.8V.
Iterate 2 and 3 until the IF gain control extremes are set ensuring +2V with the IF gain pot. fully clockwise.

5) Disconnect 10PL1 and introduce a 50ohm signal generator via 1.4MHz IF Pad 1650/6/D6249. Adjust the generator to 1.4MHz/24uV emf.

6) Set IF gain control fully clockwise and adjust 10L1 and 10L2 for maximum output.

7) Monitor 10TP4 with oscilloscope - approx. 500mV p-p (use 500mV/cm. scale to avoid confusion by noise).

8) Set a reference output on the distortion factor meter (approx. 1mW) and adjust 10RV2 until the output falls by 1dB. Increase the generator output by 1dB (26.9uV emf) in order to restore the reference. This is the AGC threshold level.

9) Connect digital voltmeter to cathode of 10D12 and set to 2V with 10RV4.

10) Select 'AGC FAST' and check that the voltage remains at approx. +2V.

11) Select 'MANUAL GAIN' and with IF gain control fully clockwise, note generator level required to produce 500mV p-p at 10TP4 (AGC threshold level 26.9uV emf). Rotate IF gain control fully

anti-clockwise and increase generator level by 80dB (269mV emf).

12) Set 10RV9 to produce 100mV p-p at 10TP4. Reset generator to AGC threhold level, and with IF gain control fully clockwise, re-adjust 10RV8, if necessary, to produce +2V on IF gain control slider.

13) Iterate steps 11 and 12 until no more interaction takes place.

14) Set generator to AGC threshold level, IF gain control fully clockwise and recheck for +2V at IF gain pot. slider adjusting RV8 if necessary.

IF output level/frequency adjustment

15) Select 'AGC FAST'. Set generator to 100dBuV emf and note the 100kHz IF output level variation into a 50ohm load when adjusted by 10RV11 over the full extent of it's travel (typically 100mV ±3dB). Adjust IF output to 100mV rms in 50ohms.

16) Connect a digital frequency meter via a 'low copacity' probe to 10TP21 in order to measure the 1500.000kHz crystal oscillator which may be adjusted by 10C200. Typical level at 10TP21 is 300mV p-p.

17) Reconnect 10PL1 flying lead.

RF AGC adjustment

This is aligned with RF and 1st IF board

5.1.4 ALIGNMENT OF RF AND 1st IF BOARD

Equipment required:-

1) Digital Voltmeter.

2) VHF Double Beam Oscilloscope with low capacity probes.

3) Digital Frequency meter with low capacity input.

4) Distortion Factor Meter with 600ohm termination.

5) Audio Power Meter (4-8ohm).

6) Ancillaries Test Box 1650/6/D6245.

7) 1.4MHz IF Pad 1650/6/D6249.

8) Sensitive RF millivoltmeter.

9) 50ohm load.

10) Spectrum Analyser 10kHZ-110MHZ.

11) Signal Generator 10kHz-110MHz/50ohm output.

Procedure:-
---

1) Connect the Distortion Factor Meter and the Audio Power Meter via the Ancillaries Test Box 1650/6/D6245 to the Ancillaries Connector 1SK3. Connect the Sensitive RF millivoltmeter and the 50ohm load to the 100kHz IF O/P 1SK2 and tune 1650/6 to 2MHz selecting 'MANUAL GAIN/8kHz BANDWIDTH'. IF gain control maximum.

RF amplifer adjustment
---

2) Turn 10RV5 and 10RV6 (Main IF/Audio board) fully clockwise.

3) Introduce a signal at the aerial input 1SK1 of 2MHz/6uV emf.

4) Connect a digital voltmeter between 7TP7 and 7TP8 and adjust 7RV3 for a 3V differential.

5) Adjust 7L1 and 7L2 for maximum output.

6) Adjust 7RV1/7RV2 to produce a S+N/N ratio of 17dB. Both pots should be similarly positioned about 1/4 turn from the fully anticlockwise position.

7) Two techniques for balancing the RF amplifer may be employed:-

Method-1:

Connect an oscilloscope with two low capacity probes to 7TP2 and 7TP3 and increase input signal to 100dB/uV emf. Display both traces on an oscilloscope and equalise the amplitudes by slight adjustment of 7RV1/7RV2.

N.B. As these signals are in 'anti- phase' the 'ADD' or 'SUM' facility may be utilised in order to produce a net zero result.

Method-2:

Introduce a signal at the aerial input 1SK1 of 23.102MHz/80dB/uV emf with the 1650/6 tuned to 2MHz

'MANUAL GAIN/8kHz BANDWIDTH'. The resulting second order intermodulation product in the RF amplifer produces the 1st IF frequency of 46.204MHz. This may be minimised by balancing the RF amplifier with a slight adjustment of 7RV1/7RV2.

Ensure that a S+N/N ratio of 17dB for an input of 6uV emf has not been degraded by the above adjustment.

RF AGC adjustment

8) Connect an oscilloscope to 10TP12 (Main IF/Audio board) and adjust input signal to produce a waveform 300mV p-p (typical input 53 to 55dB/uV).

9) Connect a digital voltmeter to 10TP13 and adjust 10RV6 for 2V. Increase the input signal to approx. 64dB/uV emf and adjust 10RV5 to restore a level of 300mV p-p at 10TP12.

Performance check

10) Check S+N/N ratio with an input signal of 60dB/uV emf is >54dB on both IF and 600ohm AF outputs.

11) Check S+N/N ratio at 22MHz is >12dB for 6uV emf input and 8kHz bandwidth (typically 14dB S+N/N).

12) Check AGC range from the threshold point. Typically a change in input of 90dB above the AGC threshold will produce less than a 3dB change in output.

The Front Panel meter RF2 indicates IF AGC threshold when 1-2 Bars are illuminated-similarly RF1 indicates RF AGC threshold.

13) In-band intermodulation measurement. Tune 1650/6 to 2MHz/8kHz bandwidth/AGC FAST. Inject two signals via a combining pad:-

Frequency	Input level at1650/6
2.0005MHz	86dB/uV 200mV emf
1.99995MHz	86dB/uV 200mV emf

14) Measure in-band intermodulation products in AGC FAST and AGC SLOW using a spectrum analyser. (typically >-40dB). See Part 2 Figure 5.3.

N.B. Where the in-band intermodulation products are high some improvement may be gained by the following slight adjustments:-

i) RF AGC threshold 10RV5 may be lowered (rotate clockwise).

ii) IF gain distrubition pot 10RV1 may be changed from it's central position.

iii) IF AGC threshold may be lowered by up to 1dB. See Section 5.1.2.

5.1.5 REAR PANEL ASSEMBLY TEST PROCEDURE

Equipment required:-

1) Digital Voltmeter.

2) 1000V dc 'Megger' Insulation Tester.

3) AC Current Meter.

4) 10 Amp dc Constant Current Power Supply.

5) 4 off Variable Load Resistance for dc supply.

The following electrical safety checks should be carried out on a complete 1650/6 when any Mains Supply related part has been replaced and the results compared with the orignal test results.

N.B. Replacement parts related to the Mains Supply must be exactly as those specified in the Parts List.

Electrical Safety Checks

1) ELECTRICAL STRENGTH. The insulation between the mains connector live and neutral (joined together) and the mains connector earth is measured with a dc voltage of 1000v from a'Megger' insulation tester applied for ten seconds. The resistance must be greater than 100Mohm.

2) EARTH CONTINUITY. The earth continuity from the mains connector earth pin to the front and rear panel metalwork is tested with a current of at least 10 amps. The resistance must be less than 0.1ohm.

3) EARTH LEAKAGE. The earth leakage current must be measured, with all other earths disconnected, whilst powered from the normal mains supply. The leakage current should be less than 500uA under all conditions.

The dc supply capability may be checked by connecting loads to the four supply outputs and comparing the results as follows:-

Output	Idc	+Vout	Tolerance
14PL1	450mA	15.5V	± 5%
14PL2	650mA	15.5V	
14PL4	570mA	10.5V	
14PL5	560mA	10.5V	

A typical 1650/6 receiver set to 28888.880kHz, output 1Watt/8ohm and switched on for at least half an hour produces the following voltage analysis:-

V/Reg.	+O/P	+I/P	ref. pin
14IC1	15.3V	22.05V	14.05V
14IC2	15.25V	22.05V	14V
14IC3	10.55V	16.23V	9.31V
14IC4	10.52V	16.23V	9.28V

AC supply inputs to rectifier bridges:-

Connector	AC voltage (on load)
14PL3	18.3V)
14PL6	13.8V) ± 5%

The above assume a mains supply of 240V/50Hz.

5.1.6 Front Panel Assembly Microcomputer

Refer to circuit diagrams BP1556 and BP2025 in Part 2.

Equipment required

1) VHF Oscilloscope. Greater than 120MHz bandwidth, dual channel with 50 Ohm and high impedance inputs on both channels. High impedance approximately 10 Mohm in parallel with 7pF (using a 10x probe).

2) EP8000 EPROM Emulator. With BSC-8 Buffered Simulator Cable (G.P. Industrial Electronics) (EM/SC).

3) Front Panel Test Box 1650/6/D6247.

4) Regulated Power Supply +15.5V/5A.

Initial Checks

The following checks are of the basic Microcomputer Board 'internal' control signals.

Step 1. Remove the front panel assembly from the receiver (see section 5.2.2).

Step 2. Access the Microcomputer Board (see section 5.2.4).

Step 3. Connect Front Panel Test Box 1650/6/D6247 to 12PL1 and a +15.5V regulated power supply.

Step 4. Check that the output of voltage regulator 13IC14 (MC7805CT) is in the range 4.75 to 5.25V dc.

Step 5. Check that pin 4 of 13IC15 (MCT2) goes high when the Microcomputer power supply, via pin 4 of 12PL1, exceeds a maximum of 9.8V and goes low when the supply falls below a minimum of 8.5V. Note that the supply to the Microcomputer Board is via diode 12D2.

Step 6. Check that each time the supply rises above the upper level found in step 5, an approximately 0.1 to 0.25 second low going RESET pulse is generated at the collector of 13TR1 (BC547B). Note that this level can be checked at pin 1 Of 13PL2. This is a useful initial check if a Microcomputer/control fault is suspected, since pin 1 of 13PL2 can easily be accessed by just removing the top dust cover of the complete receiver and then

generating the RESET pulse by connecting the mains power supply.

Step 6. Check the enable pulses at 13TP1/2/3.

EPROM Verification

If a control fault is suspected, the programs stored in the two Microcomputer Board EPROMs can be checked as follows. Note that the Microcomputer Board has two EPROMs, 11898PA and 11899PA, each with a different stored program, and that to check these, a known good EPROM of each program type will be required. Generally three such EPROMs of each type should be retained to enable verification of the known good EPROMs themselves by comparison against each other (a faulty one would be recognised as being different from the other two).

Step 1. Remove the front panel assembly from the receiver (see section 5.2.2).

Step 2. Access the Microcomputer Board (see section 5.2.4).

Step 3. OBSERVING THE USUAL ANTI-STATIC PRECAUTIONS carefully remove the two EPROMs, 13IC8 and 13IC9, from their sockets and store them on conductive foam pads.

Step 4. Obtain a known good EPROM of each program type.

Step 5. Select 'A 2732' on the EP8000 by pressing <FN>, <DEV> and using its up and down cursor keys as necessary.

Step 6. Press <RST> on the EP8000 and ensure the green power indicator above the zero insertion force (ZIF) socket on the EP8000 is off.

Step 7. Carefully insert one of the known good EPROMS into the lower 24 pins of the 28 pin ZIF socket with pin 1 towards the top left-hand side. Press <FN>, <STOR> to transfer its contents into the EP8000.

Step 8. Press <RST> again and remove the known good EPROM replacing it with the equivalent suspect EPROM from the receiver.

Step 9. Press <FN>, <VFY> to check the contents of the suspect EPROM with that of the known good EPROM

now stored in the EP8000. A 'PASS' display indicates the suspect EPROM is correct, a 'FAIL' display indicates it is faulty.

Step 10. Repeat with the other receiver EPROM and known good EPROM remembering to press <RST> each time before loading or unloading the ZIF socket to ensure power to the socket is first removed.

Address Strobe Checks

The Microcomputer generates strobe pulses for various control ICs on the Microcomputer Board itself and on the Interface Board. The functions of these ICs are detailed in 'SECTION 4 : CIRCUIT DESCRIPTION' and in the following section 5.1.4. The Interface Board circuit diagram BP2025, bound in Part 2, also indicates the general functions of the Interface Board control ICs (pins 10 to 15 inclusive of 13PL3/12SK2). If a fault occurs in a particular control operation, the address strobes to the associated ICs should be checked. For example, for faulty keyboard operation, the address strobes to 12IC11 and 12IC12 should be checked via pins 14 (READ KEYBOARD '1003') and 13 (WRITE KEYBOARD '1004'), respectively, of 13PL3/12SK2, through to pins 1/15 of 12IC11 or pin 11 of 12IC12. A method of generating regular address strobes, which can be easily monitored on an oscilloscope, is given as follows. Note that each control IC has a its own numerical address ('1003' and '1004' in the previous example) which is given on circuit diagram BP2025.

Step 1. Remove the front panel assembly from the receiver (see section 5.2.2).

Step 2. Access the Microcomputer Board (see section 5.2.4).

Step 3. OBSERVING THE USUAL ANTI-STATIC PRECAUTIONS carefully remove the two EPROMs, 13IC8 and 13IC9, from their sockets and store them on conductive foam pads.

Step 4. Ensuring that it is not switched on, connect the EP8000 via the BSC-8 buffered simulator cable to the EPROM socket for 13IC9. Note that the BSC-8 requires the 24 pin lead option and requires internal switch settings to be made for 2732 type EPROMS. Ensure, in particular, that the connector is fitted into the EPROM socket correctly (pin 1 of the cable plug to the marked end of the EPROM socket).

Step 5. Switch the EP8000 on and select 'A 2732' by

pressing <FN>, <DEV> and using its up and down cursor keys as necessary. Press <RST> and enter the short program, given in Table 5.1, into the EP8000. The control IC function, the associated address and test points are given in Table 5.2.

Step 6. Press <DMA> on the EP8000 and apply +15.5V to 12PL1 pin 10, +10.5V to 12PL1 pins 4 and 6, ground returns to pins 9, 5 and 7 respectively (Interface Board). The Microcomputer should RESET and run just the short simple test program entered into the EP8000. This program just does a repetitive load from the specified address simply to obtain a repetitive address strobe pulse, the actual loading being inconsequential.

Step 7. Monitor the appropriate test point, in Table 5.2, where the waveforms shown in Part 2 Figure 5.4 or 5.5 should be found.

Step 8. If a check of another address strobe is required, first remove all power to the Interface Board, press <DMA> on the EP8000, replace the original address in the EP8000 program (xxyy) with the new address, press <DMA> again and re-apply power to the Interface Board.

Table 5.1
Address Strobe Test Program

Address	Code	Mnemonic
3000	B6	LDAA
3001	xx	see Table 5.2
3002	yy	see Table 5.2
3003	7E	JMP
3004	F0	back to prog-
3005	00	ram start
:		
:		
:		
3FFE	F0	RESET
3FFF	00	Vector

Table 5.2
Function Address xxyy

Function	xxyy	Monitor Points/Waveform
2Kbyte RAM	0000	pin 15 of 13IC13 / Fig 5.4 pin 18 of 13IC5 / Fig 5.5
Interface Board Decoder	1000	pin 14 of 13IC13 / Fig 5.4 pins 4/5 of 13IC3 / Fig 5.4
Tuning knob, Pre-selector motor control	2000	pin13 of 13IC13 / Fig 5.4 pin 15 of 13IC1 / Fig 5.4
2nd EPROM	E000	pin 9 of 13IC13 / Fig 5.4 pin 18 of 13IC8 / Fig 5.4
Pres. Rec. and Synth unlock sense. ON/STBY key.	1002	pin 13 of 13IC3 /Fig 5.5 pin 15 of 13PL3/12SK2 pins 1/15 of 12IC7 / Fig 5.5
Keyboard Read	1003	pin 12 of 13IC3 / Fig 5.5 pin 14 of 13PL3/12SK2 pins 1/15 of 12IC11 /Fig 5.5
Keyboard Write	1004	pin 11 of 13IC3 / Fig 5.5 pin 13 of 13PL3/12SK2 pin 11 of 12IC12 / Fig 5.5
Display and Remote output	1005	pin 10 of 13IC3 / Fig 5.5 pin 12 of 13PL3/12SK2 pin 11 of 12 IC10 / Fig 5.5
Synth. and receiver settings	1006	pin 9 of 13IC3 / Fig 5.5 pin 11 of 13PL3/12SK2 pin 11 of 12IC9 / Fig 5.5
Remote input	1007	pin 7 of 13IC3 / Fig 5.5 pin 10 of 13PL3/12SK2 pins 1/15 of 12IC8 /Fig 5.5

5.1.7 Front Panel Assembly Control Functions

Refer to circuit diagrams BP1556, BP2025 and BP1975 bound in part 2.

Front Panel Controls

Operation of all front panel controls (except 'AF GAIN' and 'LINE LEVEL') and displays can be verified with the front panel assembly removed from the receiver. Details of the operation of each control are given in section 3.1 'Controls'. Correct operation of the corresponding receiver circuitry however, can obviously only be verified with the assembly connected to the receiver. If correct operation is not obtained in this circumstance, then the fault may lie in the Interface Board control ICs or serial to parallel converters. Table 5.3 indicates the ICs used to control the various receiver sections. If a fault is suspected in the control of a section, the appropriate ICs can be checked for digital logic level activity at their outputs (inputs are generally in common). To gain better access to the Interface Board, the front panel assembly can be moved to its 'forward' test position (see section 5.2.1 Front Panel Access). It is important before any 'logic analysis' takes place on either the Interface or Display boards that the voltage regulator 12IC5 (5V) is checked and the supply to all associated integrated circuits.

Table 5.3
Control Integrated Circuits

Section	Control via -
Synthesiser	12IC9 and connector 12RS3
Pre-selector and RF/1st IF	12IC9, 12IC6, 12IC4. Pre-selector motor driven gang via pulse on pin 11 of 13PL2/12SK1 and pin 4 of connector 12RS4.
Main IF /Audio	12IC9, 12IC6, 12IC4, 12IC3 and 12IC2
Display and Remote output	12IC10
Remote input	12IC8
Synth. unlock, Pres. Rec. sense ON/STBY key	12IC7
Keyboard	12IC11 (Read), 12IC12 (Write)
Main Tuning Knob	Pulses from knob via pin 2 of 12RS5 and pin 7 of 13PL2/12SK1 when knob turned clockwise ('up'). Pulses from knob via pin 1 of 12RS5 and pin 4 of 13PL2/12SK1 when knob turned anti-clockwise ('down').

Output Control IC Tests

If faults are suspected in output control ICs 12IC9, 12IC10 or 12IC12 and the address strobes to them have been checked (see previous section 5.1.3), the test program given can be modified to check that the outputs of these ICs are functioning. The full procedure is as follows.

Step 1. Remove the front panel assembly from the receiver (see section 5.2.2).

Step 2. Access the Microcomputer Board (see section 5.2.4).

Step 3. OBSERVING THE USUAL ANTI-STATIC PRECAUTIONS carefully remove the two EPROMs, 13IC8 and 13IC9, from their sockets and store them on conductive foam

pads.
Step 4. Ensuring that it is not switched on, connect the EP8000 via the BSC-8 buffered simulator cable to the EPROM IC socket for 13IC9. Note that the BSC-8 requires the 24 pin lead option and requires internal switch settings to be made for 2732 type EPROMS. Ensure, in particular, that the connector is fitted into the EPROM socket correctly (pin 1 of the cable plug to the marked end of the EPROM socket).

Step 5. Switch the EP8000 on and select 'A 2732' by pressing <FN>, <DEV> and using its up and down cursor keys as necessary. Press <RST> and enter the short program, given in Table 5.4, into the EP8000. The output control IC function, the associated address and test points are given in Table 5.5.

Step 6. Press <DMA> on the EP8000 and apply +15.5V to 12PL1 pin 10, +10.5V to 12PL1 pins 4 and 6, ground returns to pins 9, 5 and 7 respectively (Interface Board). The Microcomputer should RESET and run just the short simple test program entered into the EP8000. This program just does a repetitive load of alternating data into the selected IC's outputs.

Step 7. Monitor the appropriate test point, in Table 5.5, where the waveforms shown in Part 2 Figure 5.6 should be found.

Step 8. If a check of another output IC is required, first remove all power to the Interface Board, press <DMA> on the EP8000, replace the original address in the EP8000 program (xxyy) with the new address, press <DMA> again and re-apply power to the Interface Board.

Table 5.4
Output Control IC Test Program

Address	Code	Mnemonic
3000	86	LDAA
3001	55	01010101
3002	B7	STAA
3003	xx	see Table 5.5
3004	yy	see Table 5.5

```
3005      86       LDAA
3006      AA       10101010
3007      B7       STAA
3008      xx       as above
3009      yy       as above
300A      7E       JMP
300B      F0       back to prog-
300C      00       ram start
 :
 :
 :
3FFE      F0       RESET
3FFF      00       Vector
```

Table 5.5
Output IC Address xxyy

Function	xxyy	Monitor Points
Keyboard Write	1004	pins 5, 6, 9, 12, 15, 16, of 12IC12. Pins 1/6 inc. of 12PL5
Display and Remote output	1005	pins 2, 5, 6, 9, 12, 15, 16, 19, of 12IC10. Pins 1/2 of 12PL4. Test points TP4/5
Synth. and receiver settings	1006	pins 2, 5, 6, 9, 12, 15, 16, 19, of 12IC9 pins 1, 2, 5, 6, 8, 9 of 12IC6. Pins 3 and 5/10 inc of 12RS3

Input Control IC Tests

If faults are suspected in input control ICs 12IC7, 12IC8 or 12IC11 and the address strobes to them have been checked (see previous section 5.1.3), the test program given can be modified to check that the inputs of these ICs are functioning. The full procedure is as follows.

Step 1. Remove the front panel assembly from the receiver (see section 5.2.2).

Step 2. Access the Microcomputer Board (see section 5.2.4).

Step 3. OBSERVING THE USUAL ANTI-STATIC PRECAUTIONS

carefully remove the two EPROMs, 13IC8 and 13IC9, from their sockets and store them on conductive foam pads.

Step 4. Ensuring that it is not switched on, connect the EP8000 via the BSC-8 buffered simulator cable to the EPROM IC socket for 13IC9. Note that the BSC-8 requires the 24 pin lead option and requires internal switch settings to be made for 2732 type EPROMS. Ensure, in particular, that the connector is fitted into the EPROM socket correctly (pin 1 of the cable plug to the marked end of the EPROM socket).

Step 5. Switch the EP8000 on and select 'A 2732' by pressing <FN>,<DEV> and using its up and down cursor keys as necessary. Press <RST> and enter the short program, given in Table 5.6, into the EP8000. The control IC function, the associated address and test points are given in Table 5.7.

Step 6. Press <DMA> on the EP8000 and apply +15.5V to 12PL1 pin 10, +10.5V to 12PL1 pins 4 and 6, ground returns to pins 9, 5 and 7 respectively (Interface Board). The Microcomputer should RESET and run just the short simple test program entered into the EP8000. This program just does a immediate repetitive transfer of an input IC's settings to the output of 12IC10 where they can be monitored.

Step 7. Monitor the 'D0' output of 12IC10 (pin 9) with the oscillocsope, and short the 'D0' input of the selected input IC to ground. The 'D0' output of 12IC10 should fall to a logic zero (less than 0.5V). Remove the short on the selected input IC and the 'D0' output of 12IC10 should immediately rise to a logic one (greater than 2.4V). Repeat this using the 'D1' to 'D5' inputs monitoring the 'D1' to 'D5' outputs respectively. Shorting points for specific control functions are given in Table 5.7.

Step 8. If a check of another input IC is required, first remove all power to the Interface Board, press <DMA> on the EP8000, replace the original address in the EP8000 program (xxyy) with the new address, press <DMA> again and re-apply power to the Interface Board.

Table 5.6
Input Control IC Test Program

Address	Code	Mnemonic
3000	B6	LDAA
3001	xx	see Table 5.2
3002	yy	see Table 5.2
3003	B7	STAA
3004	10	Output IC
3005	05	12IC10
3006	7E	JMP
3007	F0	back to prog-
3008	00	ram start
:		
:		
:		
3FFE	F0	RESET
3FFF	00	Vector

Table 5.7
Input IC Address xxyy

Function	xxyy	Shorting Points
On/Stdby key	1002	pin 10 of 12IC7 or pin 14 of 12PL5 ('D0' monitored at pin 9 of 12IC10)
Pres. Rec. sense	1002	pins 12/4 of 12IC7 or pins 1/2 of 12PL2 ('D2/D3' monitored at pins 12/15 of 12IC10)
Synth. unlock sense	1002	pins 14/2 of 12IC7 or pins 1/4 of 12RS3 ('D4/D5' monitored at pins 16/19 of 12IC10)
Keyboard Read	1003	pins 2, 14, 4, 12, 6 and 10 of 12IC11 or pins 13/8 inc. of 12PL5 ('D0/D5' inc. monitored at pins 9, 6, 12, 15, 16 and 19 of 12IC10
Remote Input	1007	pins 6/12 of 12IC8 or pins 2/3 of 12PL3 ('D1/D2' monitored at pins 6/12 of 12IC10)

5.1.8 ADJUSTMENT OF INTERNAL STANDARD OSCILLATOR

Equipment Required
---

1) 'Off Air' Standard.

2) Signal Generator 10kHz-30MHz/50ohm capable of being locked to 1).

3) Digital Frequency Meter (50MHz).

4) Ancillaries Test Box 1650/6/D6245.

Procedure

In order to allow the internal standard to be adjusted a reference source of better than ±0.1ppm is required. The 1650/6 must have been 'on' for at least half an hour and have temperature stabilised in it's operational environment. Both crystal oscillators (1405kHz, 1500kHz) must have already been adjusted.

1) Lock the signal generator to the 'Off Air' standard and set to 29.001,000MHz/1mV (60dB/uV).

2) Connect the digital frequency meter to the signal generator output and check the former's calibration.

3) Connect the 1650/6 to the signal generator and via the 600ohm audio output to the digital frequency meter using Ancillaries Test Box 1650/6/D6245.

4) Tune 1650/6 to 29.001,000MHz selecting 'AGC SHORT/8kHz BANDWIDTH'.

5) Observe 5000Hz on digital frequency meter and adjust 8RV2 through acces hole in Synthesiser cover if required.

6) Lock the signal generator to the 'Off Air' standard and set to 1.001,000MHz/1mV (60dB/uV).

7) Tune 1650/6 to 1.001,000MHz selecting 'AGC SHORT/8kHz BANDWIDTH'.

8) Check output on digital frequency meter is still 5000Hz.

5.1.9 REMOTE CONTROL SWITCHING TIME

Equipment Required

1) Signal Generator 10kHz-30MHz/50ohm.

2) 100kHz Discriminator (sensitivity 0.14Hz/mV).

3) Storage Oscilloscope with low capacity input.

4) Remote Breakout Box 1650/6/D6250.

5) Remote Control Facility.

Procedure

The remote Control Switching Time is considered to be the time taken for the 1650/6 to change from one frequency (i.e. the start of the Remote Control Word) to within 200Hz of a new frequency.

1) Connect the 1650/6 to the signal generator and via the Remote Breakout Box 1650/6/D6250 to the Remote Control Facility. The Remote Control is described in Section 3.3.

2) Connect the Storage Oscilloscope to the 100kHz discriminator connected to 1650/6 IF O/P.Arrange for the storage oscilloscope to be triggered from the rising edge of the first CLOCK PULSE sent at the start of the 40 Bit DATA WORD.

3) Tune the receiver and generator to the desired frequency f1 and calibrate the discriminator for f1 ±200Hz.

4) Connect the remote control facility and switch to a new frequency f2.

5) Switch to f1 and observe, on the storage oscilloscope, the time the receiver takes to tune to within ±200Hz of f1. This time will vary as to whether f1 and f2 are within the same VCO range or not. Times will vary between 40-75mS. See Part 2 Figure 5.7.

6) It is important to check the operation of the two AGC 'quench transistors' 10TR18 and 7TR20 as these only operate under remote control. This may be shown by switching from a strong signal (110dB/uV) in slow AGC. The noise should rise straight away. Contrast this with a similar situation in 'local' control. 1mS 'Quench' pulses may be measured at 10STC1-6 for IF AGC and 7STC1-10 for RF AGC under remote control.

5.1.10 AGC ATTACK AND DECAY TIME

Equipment Required

1) Signal Generator 10kHz-30MHz/50ohm.

2) Ancillaries Test Box 1650/6/D6245.

3) Storage Oscilloscope with low capacity input.

4) Distortion Factor Meter with 600ohm termination.

5) Sensitive RF millivoltmeter.

6) 50ohm load.

Procedure

AGC 'attack' and 'decay' times are measured by viewing the receiver waveform envelope, at IF or AF, on a storage oscilloscope at the instantaneous onset or absence of signal.

Attack time

1) Connect the 1650/6 to the signal generator and via the 600ohm audio output to the storage oscilloscope using Ancillaries Test Box 1650/6/D6245. Connect the RF millivoltmeter and 50ohm load to the 1650/6 IF O/P.

2) Tune the receiver and generator to the desired frequency and observe the waveform envelope when the RF signal is switched on. See Part 2 Figure 5.8.

3) Repeat 2) observing IF O/P.

Decay time

4) Tune the receiver and generator to the desired frequency and observe the waveform envelope when the RF signal is switched off. See Part 2 Figure 5.9.

5) Repeat 4) observing IF O/P.

N.B. If a digital storage osilloscope is used it is important not to confuse RF envelope distortion with aliasing. A small change in the input frequency will usually identify an alias, even causing it to dissappear. Beware of relay switching on some signal generators modulating the RF output at switch on

(relay 'bounce') over part of the output range.

5.1.11 SYNTHESISER PURITY

Equipment Required

1) Signal Generator 10kHz-30MHz/50ohm.

2) Ancillaries Test Box 1650/6/D6245.

3) Distortion Factor Meter with 600ohm termination.

4) 3M Mincom 8300A-W Flutter Meter.

Procedure

This test examines the short term stability of the 1650/6 synthesiser and should only be carried on a fully covered receiver as earth straps and wiring position are critical.

1) Connect the 1650/6 to the signal generator and via the 600ohm audio output to the 3M Mincom 8300A-W Flutter Meter using Ancillaries Test Box 1650/6/D6245.

2) Tune the 1650/6 to frequency f1/AGC SHORT/8kHz BANDWIDTH. Tune the signal generator to frequency f1-1.62kHz so producing an audio output of 3.38kHz. Set the input level 1mV (60dB/uV).

3) Operate flutter meter as per the following instructions:-

Operation of 3M MINCOM 8300A-W FLUTTER METER

For 1650/6 Synthesiser Purity Test

Control Settings

1)	Power	ON.
2)	Test/Cal	TEST.
3)	Drift BW	FAST.
4)	Test Frequency	3.38KHz. *

5) Drift Zero Set 0%.

6) Drift Full Scale 1%.

7) Flutter 1%.
Peak to Peak

8) Flutter Bandwidth 0.625KHz. *

9) PK Time 3 Sigma.

10) Meter Select DEMOD

* These controls are ganged

Connections
---

1) INPUT 3.38KHz signal from 600 ohm line.
Level to bring LEVEL lamp to NORM

2) FLUTTER Output may be viewed on an oscilloscope.
NOT REQUIRED FOR MEASUREMENT PURPOSES.

3) OSC OUTPUT NOT USED

4) DRIFT OUTPUT NOT USED

5) EXT INPUT NOT USED

Operation
---

1) Using DRIFT ZERO SET tune DRIFT meter to Centre Zero. NORM LEVEL lamp should be on.

2) After 10 seconds observe Flutter level on FLUTTER meter. Consider both peak and average readings.

Specification to ME 0634 Issue 1.4.1 Clause 13

Limit 2% on primary AF output.

5.2 MODULE ACCESS AND REMOVAL

5.2.1 FRONT PANEL ACCESS

1) Remove top and bottom dust covers.

2) Loosen M4 fixing screw in either sidepanel slot and remove the other two allowing the front panel to slide forward into it's 'forward test position'. Tighten fixing screw in either sidepanel slot.

3) This position is also recommended for use when inserting or removing connections to this assembly.

5.2.2 FRONT PANEL ASSEMBLY

1) See section 5.2.1.

2) Disconnect all leads to the assembly and remove both sidepanel M4 fixing screws.

3) Slide front panel forward clear of receiver and support either on it's handles or on the side panel brackets.

N.B. Take care not to damage the membrain switch top or bottom edge.

5.2.3 INTERFACE BOARD

1) See section 5.2.2.

2) Carefully disconnect membrain switch tail at 12PL5 keeping the connector faces parallel throughout.

3) Disconnect ribbon connectors 12RS5 and 12RS6 and remove five M3X16 fixing pillars and washers.

4) Withdraw interface board and microcomputer assembly from studs.

5.2.4 MICROCOMPUTER ASSEMBLY

1) See section 5.2.3.

2) Remove cover held by two M3X6 hexscrews.

3) Disconnect 13PL1 and remove two M3X20 fixing pillars and washers holding PCB and one locating heatsink.

4) Very gently prise apart 13PL2/12SK1 and 13PL3/12SK2 keeping the connector faces parallel throughout.

N.B. Sockets 12SK1 and 12SK2 must remain at right angles to the printed circuit board at all times in order to avoid strain and possible 'track fracture'.

5) Withdraw microcomputer board from studs.

Re-assembly

Re-assembly is the reverse of the above except where the microcomputer board is to be fitted to another interface board.This will require the microcomputer box to be re-aligned (see Part 2 Figure 5.10/11/12) as follows:-

6) Loosen four M3 hexscrews allowing microcomputer box to'float'.

7) Install microcomputer board taking care that the connector faces 13PL2/12SK1 and 13PL3/12SK2 are parallel throughout and at right angles to the interface board.

8) Orientate microcomputer box so that the board fixing studs are centralised in the fixing holes.

9) Tighten four M3 hexscrews fixing microcomputer box.

10) Replace two M3X20 fixing pillars and washers holding PCB and one locating heatsink and connect 13PL1.

11) Reconnect 13PL1 and replace microcomputer box lid.

5.2.5 DISPLAY BOARD

1) See section 5.2.3.

2) Remove front panel control knobs.

3) Remove connector 11PL3.

3) Remove five M3X8 fixing pillars and washers and three M3X6 hexscrews and washers.

4) Withdraw display board from studs.

N.B. Take care not to lay the display board on it's LED face in order to avoid damage to the latter.

5.2.6 REAR PANEL ASSEMBLY

1) Remove top and bottom dust covers.

2) Disconnect 10PL10 and 7PL1 (removing covers on these board sections first).

3) Disconnect power supply connectors 14PL1/2 and 14PL4/5.

4) Remove fixings completely from 15 way connector 1SK3 and from 9 way connector 1PL1 and ease back through their apertures to clear rear panel. Take care not to damage the wiring in the process.

5) Remove six M4 fixing screws and two protection brackets and withdraw rear panel assembly, 'easing out' grommet from the centre screen cut-away carrying the mains transformer-secondary leads.

5.2.7 POWER SUPPLY BOARD

1) Remove top and bottom dust covers.

2) Disconnect all leads from the power supply board.

3) Remove three M4 fixing screws and washers which 'sandwich' rear panel between the power supply heatsinks.

4) Ease out power supply board and heatsink bracket through the top of the receiver.

5) Remove four voltage regulator fixings and one board fixing and carefully part heatsink contact surface taking care not to strain voltage regulator soldered joints.

Re-assembly

Re-assembly is the reverse of the above. However, it is important that all 'heatsink compound' is replaced with new (Dow Corning DC340) and similarly any damaged insulating items.

5.2.8 MAIN IF AND AUDIO BOARD

1) Remove top and bottom dust covers.

2) Disconnect all connectors from the main IF and audio board removing covers over board sections as required.

3) Remove ten M3X6 and one M3X8 fixing screws and washers.

N.B. The M3X8 fixing screw has an M3 overlapping tooth washer associated with it. This ensures proper 'single point earthing ' of the audio stage and must

be replaced in the same position i.e. fixing adjacent to 10PL7.

4) Withdraw main IF and audio board upwards clearing leads and noting position of cable harness underneath.

Re-assembly

Re-assembly is the reverse of the above. However, it is important that all pillars are tightened before the printed circuit board is replaced in the chassis and that subsequently no leads are trapped .

5.2.9 RF AND 1st IF BOARD

1) Remove top and bottom dust covers.

2) Disconnect all connectors from the RF and 1st IF board removing covers over board sections as required.

3) Remove twelve M3X6 fixing screws and washers.

4) Withdraw RF and 1st IF board upwards clearing leads and chassis.

Re-assembly

Re-assembly is the reverse of the above. However, it is important that all pillars are tightened before the printed circuit board is replaced in the chassis and that subsequently no leads are trapped .

5.2.10 SYNTHESISER BOARD

1) Remove top and bottom dust covers.

2) Remove synthesiser cover and note position of any earth straps removed.

3) Disconnect all connectors from the synthesiser board removing covers over board sections as required. Extract ribbon cable connector from interface board 12RS3 and note lead positions.

4) Remove six M3X6 fixing screws, four M3X20 pillar/studs and associated washers.

5) Withdraw synthesiser board upwards clear of synthesiser box. Take care not to disturb leads in close proximity to the VCO box.

Re-assembly

Re-assembly is the reverse of the above. However, it is important that all pillars are tightened before the printed circuit board is replaced in the chassis and that subsequently no leads are trapped.

N.B. Where the 'first loop' below board screen has been disturbed it must be re-aligned before the synthesiser board is replaced.

6) Refering to Part 2 Figure 5.13/14 remove below board screen.

7) Loosen four M3X6 screws in screen allowing earthing bars to 'float'.

8) Re-assemble four pillar/studs and 'first loop' cover and then tighten earthing bars in the attitude adopted.

9) Disassemble four pillar/studs and 'first loop' cover and refit below board screen to synthesiser box.

10) Replace synthesiser board.

5.2.11 VCO MODULE

1) Remove top and bottom dust covers.

2) Remove synthesiser cover and note position of any earth straps removed.

3) Remove VCO cover and note position of any earth straps removed.

4) Disconnect all leads from the VCO board removing the adhesive as necessary.

5) Remove five M3X6 fixing screws and washers.

6) Remove VCO board.

N.B. An access hole is provided to allow removal of the synthesiser box obviating the need to remove the VCO box.

The VCO box is supported on flexible mounts insulating the former both mechanically and electrically.

7) Remove four slotted head screws saving eight bushes and withdraw VCO box.

Re-assembly

Re-assembly is the reverse of the above. The flexible mounts should be firm but not distorted. All leads should be re-positioned and adhesive applied as Part 2 Figure 5.2.

SECTION SIX : SPARES

6.1 CHASSIS : CIRCUIT REF. 1

Ref.	Description	Manufacturer - Type	Part No.
FS1	Fuseholder	Bulgin F396	18-53
FS2	Fuseholder	Bulgin F396	18-53
FS3	Fuseholder	Bulgin F396	18-53
Fuses for the above:-			
FS1	1A(T) 20x5mm Fuse	Bulgin F286/1AT	8-30
FS2	3.15A 20X5mm Fuse	Bulgin F370/3.15A	8-59
FS3	3.15A 20X5mm Fuse	Bulgin F370/3.15A	8-59
PL1	9 way Male D Plug	Lorlin DP9Z	33-313
SK1	BNC Bulkhead Socket	Greenpar GE35039-C22	33-402
SK2	BNC Bulkhead Socket	Greenpar GE35039-C22	33-402
SK3	25 Way D Socket	Lorlin DS25Z	33-430
SK4	Mains Inlet Filter	Bulgin PS620/1/3A	33-371
SK5	Jack Socket	Rendar R32640005	33-57
T1	Mains Transformer	Eddystone 12885P	23-1388
Cable Harness Connectors:-			
2PL1	3 Way Housing	Molex 22-01-2035	33-499
7PL1-7	3 Way Housing	Molex 22-01-2035	33-499
8PL1-8	3 Way Housing	Molex 22-01-2035	33-499
8PL10	4 Way Housing	Molex 22-01-2045	33-487
9PL1	3 Way Housing	Molex 22-01-2035	33-499
9PL2	4 Way Housing	Molex 22-01-2045	33-487
9PL3-5	3 Way Housing	Molex 22-01-2035	33-499
10PL1-4	3 Way Housing	Molex 22-01-2035	33-499
10PL5	4 Way Housing	Molex 22-01-2045	33-487
10PL6	3 Way Housing	Molex 22-01-2035	33-499
10PL7-8	4 Way Housing	Molex 22-01-2045	33-487
10PL10	3 Way Housing	Molex 22-01-2035	33-499
11PL2-3	3 Way Housing	Molex 22-01-2035	33-499
12PL1	10 Way Housing	Molex 22-01-2105	33-506
12PL3-4	3 Way Housing	Molex 22-01-2035	33-499
13PL1	3 Way Housing	Molex 22-01-2035	33-499
14PL1-5	4 Way Housing	Molex 22-01-2045	33-487
14PL6	3 Way Housing	Molex 22-01-2035	33-499
*	Crimp terminal 4809CL	Molex 08-50-0032	33-488

6.1 (continued)

Ref.	Description	Manufacturer - Type	Part No.

The following connectors are omitted from the cable harness:-

7PL2-3/8PL4/8PL6/10PL9/11PL1/12PL2/12PL6/12PL7

6.2 : LOW PASS FILTER BOARD : CIRCUIT REF 2

Ref.	Description	Manufacturer - Type	Part No.
C1	100p 2% 100V cer.	Mullard 683-34101	6F-205
C2	22p 2% 100V cer.	Mullard 683-34229	6F-252
C3	180p 2% 100V cer.	Mullard 683-58181	6F-275
C4	56p 2% 100V cer.	Mullard 683-34569	6F-270
C5	150p 2% 100V cer.	Mullard 683-34151	6F-224
C6	39p 2% 100V cer.	Mullard 683-34399	6F-221
C7	180p 2% 100V cer.	Mullard 683-58181	6F-275
C8	6p8 2% 100V cer.	Mullard 683-09688	6F-231
C9	120p 2% 100V cer.	Mullard 683-34121	6F-228
L1	Coil	Eddystone D5748	23-1190
L2	Coil	Eddystone D5748	23-1190
L3	Coil	Eddystone D5748	23-1190
L4	Coil	Eddystone D5748	23-1190

6.7 : RF AND 1st IF BOARD : CIRCUIT REF 7

Ref.	Description	Manufacturer - Type	Part No.
C1	Omitted		
C2	Omitted		
C3	Omitted		
C4	Omitted		
C5	Omitted		
C6	Omitted		
C7	Omitted		
C8	Omitted		
C9	Omitted		
C10	Omitted		
C11	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C12	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C13	10u 20% 50V elec.	Mullard 035-90003	6D-240
C14	10u 20% 50V elec.	Mullard 035-90003	6D-240
C15	10u 20% 50V elec.	Mullard 035-90003	6D-240
C16	10u 20% 50V elec.	Mullard 035-90003	6D-240
C17	220u 20% 25V elec.	Mullard 035-56221	6D-193
C18	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C19	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C20	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C21	220n 10% 100V petp.	Mullard 344-25224	6E-123
C22	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C23	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C24	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C25	220u 20% 25V elec.	Mullard 035-56221	6D-193
C26	220n 10% 100V petp.	Mullard 344-25224	6E-123
C26a	1n0 10% 100v cer.	Mullard 630-19102	6F-247
C27	10u 20% 25V tan.	AVX TAG10/25	6D-250
C28	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C29	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C30	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C31	10u 20% 25V tan.	AVX TAG10/25	6D-250
C32	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C33	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C34	10u 20% 25V tan.	AVX TAG10/25	6D-250
C35	56p 2% 100V cer.	Mullard 642-34569	6F-190
C36	56p 2% 100V cer.	Mullard 642-34569	6F-190
C37	56p 2% 100V cer.	Mullard 642-34569	6F-190
C38	56p 2% 100V cer.	Mullard 642-34569	6F-190
C39	27p 2% 100V cer.	Mullard 642-34279	6F-190
C40	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C41	10u 20% 25V tan.	AVX TAG10/25	6D-250
C42	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C43	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C44	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245

Ref.	Description	Manufacturer - Type	Part No.
C45	10u 20% 25V tan.	AVX TAG10/25	6D-250
C46	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C47	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C48	10u 20% 25V tan.	AVX TAG10/25	6D-250
C49	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C50	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C51	15p 2% 100V cer.	Mullard 642-34159	6F-217
C52	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C53	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C54	10u 20% 25v tan.	AVX TAG10/25	6D-250
C55	27p 2% 100v cer.	Mullard 642-34279	6F-190
C55a	27p 2% 100v cer.	Mullard 642-34279	6F-190
C56	1n0 10% 100v cer.	Mullard 630-19102	6F-247
C57	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C58	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C59	1n0 10% 100v cer.	Mullard 630-19102	6F-247
C60	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C61	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C62	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C63	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C64	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C65	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C66	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C67	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C68	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C69	10u 20% 25V tan.	AVX TAG10/25	6D-250
C70	27p 2% 100V cer.	Mullard 642-34279	6F-190
C71	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C72	10p 2% 100V cer.	Mullard 642-34109	6F-206
C73	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C74	10u 20% 25V tan.	AVX TAG10/25	6D-250
C75	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C76	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C77	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C78	10u 20% 25V tan.	AVX TAG10/25	6D-250
C79	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C80	10u 20% 25V tan.	AVX TAG10/25	6F-250
C80a	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C81	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C82	Omitted		
C83	27p 2% 100V cer.	Mullard 642-34279	6F-190
C84	2n2 1% 160V polysty.	Mullard 425-42202	6C-250
C85	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C86	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C87	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
C88	Omitted		
C89	10u 20% 50V elec.	Mullard 035-90008	6D-240
C90	220u 20% 25V elec.	Mullard 035-56221	6D-193
C91	22u 20% 10V solid alum.	Mullard 122-54229	6D-298
C92	10u 20% 50V elec.	Mullard 035-90008	6D-240
C93	10u 20% 50V elec.	Mullard 035-90008	6D-240
C94	220u 20% 25V elec.	Mullard 035-56221	6D-193
C95	10u 20% 50V elec.	Mullard 035-90008	6D-240
CH1	3u3 RF choke	Sigma SC10	23-1050
CH2	220nH RF choke	Sigma SC10	23-1140
CH3	220nH RF choke	Sigma SC10	23-1140
CH4	3u3 RF choke	Sigma SC10	23-1050
CH5	3u3 RF choke	Sigma SC10	23-1050
CH6	3u3 RF choke	Sigma SC10	23-1050
CH7	330nH RF choke	Sigma SC10	23-1012
CH8	3u3 RF choke	Sigma SC10	23-1050
CH9	3u3 RF choke	Sigma SC10	23-1050
CH10	3u3 RF choke	Sigma SC10	23-1050
CH11	3u3 RF choke	Sigma SC10	23-1050
CH12	3u3 RF choke	Sigma SC10	23-1050
CH13	3u3 RF choke	Sigma SC10	23-1050
CH14	3u3 RF choke	Sigma SC10	23-1050
CH15	3u3 RF choke	Sigma SC10	23-1050
D1	Silicon diode	Mullard BAV10	29-251
D2	Silicon diode	Mullard BAV10	29-251
D3	Silicon diode	Mullard BAV10	29-251
D4	Silicon diode	Mullard BAV10	29-251
D5	Silicon diode	Mullard BAV10	29-251
D6	Silicon diode	Mullard BAV10	29-251
D7	Silicon diode	Mullard BAV10	29-251
D8	Silicon diode	Mullard BAV10	29-251
D9	Omitted		
D10	Omitted		
D11	Silicon diode	Mullard BAX13	29-217
D12	Silicon diode	Mullard BAX13	29-217
D13	Omitted		
D14	Omitted		
D15	Voltage reference diode	Mullard BZX91	29-235
D16	Schottky diode	Mullard BAT85	29-37
D17	PIN diode	HP HP5082-3081	29-382
D18	PIN diode	HP HP5082-3081	29-382
D19	PIN diode	HP HP5082-3081	29-382
D20	PIN diode	HP HP5082-3081	29-382

Ref.	Description	Manufacturer - Type	Part No.
FL1	46.205MHz B/P filter	Eddystone 12890P	1-271
L1	2nd mixer I/P coil	Eddystone D5703	23-1169
L2	2nd mixer O/P coil	Eddystone D5704	23-1170
IC1	Omitted		
IC2	Omitted		
IC3	High level mixer	Plessey SL6440C	44A-223
IC4	Mosfet op-amp	RCA CA3240E	44B-222
IC5	Mosfet op-amp	RCA CA3240E	44B-222
IC6	High level mixer	Plessey SL6440C	44A-223
IC7	Voltage regulator	Motorola LM317T	44A-215
PL1	3 Way male header	Molex 22-27-2031	33-473
PL2	3 Way male header	Molex 22-27-2031	33-473
PL3	3 Way male header	Molex 22-27-2031	33-473
PL4	3 Way male header	Molex 22-27-2031	33-473
PL5	3 Way male header	Molex 22-27-2031	33-473
PL6	3 Way male header	Molex 22-27-2031	33-473
PL7	3 Way male header	Molex 22-27-2031	33-473
R1	82k 5% 0.4W	Mullard SFR25	21-452
R2	Omitted		
R3	Omitted		
R4	Omitted		
R5	Omitted		
R6	Omitted		
R7	Omitted		
R8	Omitted		
R9	Omitted		
R10	Omitted		
R11	Omitted		
R12	150R 5% 0.4W	Mullard SFR25	21-187
R13	100R 5% 0.4W	Mullard SFR25	21-217
R14	100R 5% 0.4W	Mullard SFR25	21-217
R15	220R 5% 0.4W	Mullard SFR25	21-216
R16	1k8 5% 0.4W	Mullard SFR25	21-298
R17	Omitted		
R18	150R 5% 0.4W	Mullard SFR25	21-187
R19	10R 5% 0.4W	Mullard SFR25	21-184
R20	1k8 5% 0.4W	Mullard SFR25	21-298
R21	220R 5% 0.4W	Mullard SFR25	21-216
R22	220R 5% 0.4W	Mullard SFR25	21-216
R23	1k0 5% 0.4W	Mullard SFR25	21-194
R24	270R 5% 0.4W	Mullard SFR25	21-169
R25	270R 5% 0.4W	Mullard SFR25	21-169

Ref.	Description	Manufacturer - Type	Part No.
R26	68R 5% 0.4W	Mullard SFR25	21-188
R27	68R 5% 0.4W	Mullard SFR25	21-188
R28	68R 5% 0.4W	Mullard SFR25	21-188
R29	68R 5% 0.4W	Mullard SFR25	21-188
R30	39R 5% 0.4W	Mullard SFR25	21-171
R31	10R 5% 0.4W	Mullard SFR25	21-184
R32	270 5% 0.4W AOT	Mullard SFR25	21-169
R33	10R 5% 0.4W	Mullard SFR25	21-184
R34	100R 5% 0.4W	Mullard SFR25	21-217
R35	39R 5% 0.4W	Mullard SFR25	21-171
R36	82R 5% 0.4W	Mullard SFR25	21-732
R37	82R 5% 0.4W	Mullard SFR25	21-732
R38	82R 5% 0.4W	Mullard SFR25	21-732
R39	82R 5% 0.4W	Mullard SFR25	21-732
R40	82R 5% 0.4W	Mullard SFR25	21-732
R41	1k5 5% 0.4W	Mullard SFR25	21-230
R42	1k0 5% 0.4W	Mullard SFR25	21-194
R43	39R 5% 0.4W	Mullard SFR25	21-171
R44	270R 5% 0.4W	Mullard SFR25	21-169
R45	15R 5% 0.4W	Mullard SFR25	21-806
R46	270R 5% 0.4W	Mullard SFR25	21-169
R47	27R 5% 0.4W	Mullard SFR25	21-674
R48	39R 5% 0.4W	Mullard SFR25	21-171
R49	10R 5% 0.4W	Mullard SFR25	21-184
R50	10R 5% 0.4W	Mullard SFR25	21-184
R51	10R 5% 0.4W	Mullard SFR25	21-184
R52	56R 5% 0.4W	Mullard SFR25	21-719
R53	2k2 5% 0.4W	Mullard SFR25	21-251
R54	Omitted		
R55	Omitted		
R56	Omitted		
R57	Omitted		
R58	Omitted		
R59	10k 5% 0.4W	Mullard SFR25	21-355
R60	1k0 5% 0.4W	Mullard SFR25	21-194
R61	680R 5% 0.4W	Mullard SFR25	21-183
R62	2k2 5% 0.4W	Mullard SFR25	21-251
R63	2k2 5% 0.4W	Mullard SFR25	21-251
R64	1M5 5% 0.4W	Mullard SFR25	21-1230
R65	2k2 5% 0.4W	Mullard SFR25	21-251
R66	5k6 5% 0.4W	Mullard SFR25	21-312
R67	120R 5% 0.4W	Mullard SFR25	21-699
R68	3k3 5% 0.4W	Mullard SFR25	21-278
R69	2k2 5% 0.4W	Mullard SFR25	21-251
R70	120R 5% 0.4W	Mullard SFR25	21-699

Ref.	Description	Manufacturer - Type	Part No.
R71	120R 5% 0.4W	Mullard SFR25	21-699
R72	Omitted		
R73	Omitted		
R74	Omitted		
R75	Omitted		
R76	Omitted		
R77	Omitted		
R78	Omitted		
R79	Omitted		
R80	Omitted		
R81	Omitted		
R82	Omitted		
R83	Omitted		
R84	Omitted		
R85	Omitted		
R86	Omitted		
R87	Omitted		
R88	Omitted		
R89	Omitted		
R90	Omitted		
R91	Omitted		
R92	Omitted		
R93	Omitted		
R94	Omitted		
R95	Omitted		
R96	Omitted		
R97	Omitted		
R98	Omitted		
R99	Omitted		
R100	10k 5% 0.4W	Mullard SFR25	21-355
R101	100R 5% 0.4W	Mullard SFR25	21-217
R102	330R 5% 0.4W	Mullard SFR25	21-193
R103	18R 5% 0.4W	Mullard SFR25	21-678
R104	68R 5% 0.4W	Mullard SFR25	21-188
RLA	Omitted		
RLB	Omitted		
RLC	Omitted		
RLD	Omitted		
RLE	Relay	Hamlin HE-321-C1200	38-434
RLF	Relay	Hamlin HE-321-C1200	38-434
RV1	47R horiz. preset	AB C90H	20-215
RV2	47R horiz. preset	AB C90H	20-215
RV3	470R horiz. preset	AB C90H	20-112

Ref.	Description	Manufacturer - Type	Part No.
STC1	Ribbon cable assy	Eddystone D5726/2	28-353
T1	Input balun	Eddystone D5722	23-1165
T2	Output transformer	Eddystone D5723	21-1166
T3	Output transformer	Eddystone D5723	21-1166
T4	1st mixer O/P trans.	Eddystone D5724	23-1167
TR1	Omitted		
TR2	Omitted		
TR3	Omitted		
TR4	Silicon NPN transistor	Mullard BC547B	29-321
TR5	Silicon NPN transistor	Mullard BFW30	29-256
TR6	Silicon NPN transistor	Mullard BFW30	29-256
TR7	Silicon PNP transistor	Mullard BC560B	29-316
TR8	Silicon PNP transistor	Mullard BC560B	29-316
TR9	Silicon PNP transistor	Mullard BC560B	29-316
TR10	Silicon NPN transistor	Mullard BC547B	29-321
TR11	Silicon NPN transistor	Mullard BC547B	29-321
TR12	Silicon NPN transistor	Mullard BFX89	29-233
TR13	Silicon PNP transistor	Mullard BC560B	29-316
TR14	Omitted		
TR15	Omitted		
TR16	Omitted		
TR17	Omitted		
TR18	Omitted		
TR19	Omitted		
TR20	Silicon NPN transistor	Mullard BC547B	29-321

6.8 : SYNTHESISER BOARD : CIRCUIT REF 8

Ref.	Description	Manufacturer - Type	Part No.
C1	10n 10% 25 cer.	Murata DD406SF103K25	6F-173
C2	1u 10% 100V polycarb.	Mullard 344-21105	6E-121
C3	220u 20% 25V elec.	Mullard 035-56221	6D-193
C4	220u 20% 25V elec.	Mullard 035-56221	6D-193
C5	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C6	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C7	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C8	6n8 1% 160V polysty.	Mullard 425-46802	&c-266
C9	120p 2% 100V cer.	Mullard 683-43121	6F-228
C10	2n7 1% 160V polysty.	Mullard 425-42702	6C-249
C11	22n 10% 400V petp.	Mullard 344-55223	6E-134
C12	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C13	10u 20% 25V tan.	AVX TAG10/25	6D-99
C14	10u 20% 25V tan.	AVX TAG10/25	6D-99
C15	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C16	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C17	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C18	10u 20% 35v elec.	Mullard 035-90003	6D-189
C19	3u3 20% 35V tan.	AVX TAG3.3/35	6D-106
C20	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C21	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C22	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C23	3u3 20% 35V tan.	AVX TAG3.3/35	6D-106
C24	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C25	4p7 0.25% 100V cer.	Mullard 683-09478	6F-271
C26	4p7 0.25% 100V cer.	Mullard 683-09478	6F-271
C27	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C28	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C29	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C30	10u 20% 35v elec.	Mullard 035-90003	6D-189
C31	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C32	3u3 20% 35V tan.	AVX TAG3.3/35	6D-106
C33	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C34	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C35	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C36	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C37	10u 20% 25V tan.	AVX TAG10/25	6D-99
C38	1000u 20% 25v elec.	Mullard 035-56102	6D-191
C39	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C40	220u 20% 25V elec.	Mullard 035-56221	6D-193
C41	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C42	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C43	1000u 20% 25v elec.	Mullard 035-56102	6D-191
C44	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C45	330p 2% 100V cer.	Mullard 683-58331	6F-223

6.8 (continued)

Ref.	Description	Manufacturer - Type	Part No.
C46	56p 2% 100V cer.	Mullard 683-34569	6F-270
C47	Omitted		
C48	Omitted		
C49	Omitted		
C50	Omitted		
C51	Omitted		
C52	Omiited		
C53	Omitted		
C54	Omitted		
C55	Omitted		
C56	Omitted		
C57	Omitted		
C58	Omitted		
C59	Omitted		
C60	Omitted		
C61	Omitted		
C62	Omitted		
C63	Omitted		
C64	Omitted		
C65	Omitted		
C66	Omitted		
C67	Omitted		
C68	10u 20% 50V elec.	Mullard 035-90008	6D-189
C69	10p 2% 100V cer.	Mullard 683-10109	6F-206
C70	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C71	56p 2% 100V cer.	Mullard 683-34569	6F-270
C72	100p 2% 100V cer.	Mullard 683-34101	6F-205
C73	2-30p Trimmer	Dau 107-3901-027	5-80
C74	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C75	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C76	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C77	10u 20% 50V elec.	Mullard 035-90008	6D-189
C78	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C79	10u 20% 50V elec.	Mullard 035-90008	6D-189
C80	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C81	100n 10% 100V polysty.	Mullard 344-25104	6E-118
C82	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C83	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C84	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C85	2-30p Trimmer	Dau 107-3901-027	5-80
C86	100p 2% 100V cer.	Mullard 683-34101	6F-205
C87	10p 2% 100V cer.	Mullard 683-10109	6F-206
C88	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C89	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C90	1n0 10% 100V cer.	Mullard 630-19102	6F-247

Ref.	Description	Manufacturer - Type	Part No.
C91	100p 2% 100V cer.	Mullard 683-34101	6F-205
C92	10p 2% 100V cer.	Mullard 683-10109	6F-206
C93	100u 20% 25V elec.	Mullard 035-26101	6D-241
C94	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C95	2-30p Trimmer	Dau 107-3901-027	5-80
C96	10n 10% 25v cer.	Murata DD406SF103K25	6F-173
C97	47p 2% 100V cer.	Mullard 683-34339	6F-263
C98	150p 2% 100V cer.	Mullard 683-34151	6F224
C99	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C100	2-30p Trimmer	Dau 107-3901-027	5-80
C101	100n 10% 100V polysty.	Mullard 344-25104	6E-118
C102	22n 10% 400V polysty.	Mullard 344-55223	6E-134
C103	220u 20% 25V elec.	Mullard 035-56221	6D-193
C104	220u 20% 25V elec.	Mullard 035-56221	6D-193
C105	220n 10% 100V petp.	Mullard 344-25224	6E-123
C106	100u 20% 25V elec.	Mullard 035-26101	6D-241
C107	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C108	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C109	10u 20% 50V elec.	Mullard 035-90008	6D-189
C110	10n 10% 400V petp.	Mullard 344-55103	6E-124
C111	10u 20% 50V elec.	Mullard 035-90008	6D-189
C112	10u 20% 50V elec.	Mullard 035-90008	6D-189
C113	1n0 10% 100v cer.	Mullard 630-19102	6F-247
C114	220p 2% 100v cer.	Mullard 683-58221	&f-226
C115	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C116	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C117	10u 20% 50V elec.	Mullard 035-90008	6D-189
C118	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C119	10u 20% 50V elec.	Mullard 035-90008	6D-189
C120	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C121	Omitted		
C122	Omitted		
C123	Omitted		
C124	Omitted		
C125	Omitted		
C126	Omitted		
C127	Omitted		
C128	Omitted		
C129	Omitted		
C130	Omitted		
C131	Omitted		
C132	Omitted		
C133	Omitted		
C134	Omitted		
C135	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
C136	Omitted		
C137	Omitted		
C138	Omitted		
C139	Omitted		
C140	Omitted		
C141	Omitted		
C142	Omitted		
C143	Omitted		
C144	Omitted		
C145	Omitted		
C146	Omitted		
C147	Omitted		
C148	Omitted		
C149	Omitted		
C150	470p 2% 160V polysty.	GEC PF125	6C-55
C151	22u 20% 35V elec.	Mullard 035-90003	6D-245
C152	10u 20% 50V elec.	Mullard 035-90008	6D-189
C153	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C154	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C155	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C156	2-27p Trimmer	Mullard 308-11279	5-103
C157	22p 2% 160V polysty. AOT	GEC PF125	6C-157
C158	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C159	150p 2% 160V polysty.	GEC PF125	6C-75
C160	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C161	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C162	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C163	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
CH1	10uH RF choke	Sigma SC60	23-750
CH2	Choke	Eddystone D5116	23-849
CH3	33uH RF choke	Sigma SC60	23-1004
CH4	10uH RF choke	Sigma SC60	23-750
CH5	100nH RF choke	Sigma SC10	23-1136
CH6	10uH RF choke	Sigma SC60	23-750
CH7	10uH RF choke	Sigma SC60	23-750
CH8	100nH RF choke	Sigma SC10	23-1136
CH9	100nH RF choke	Sigma SC10	23-1136
CH10	10uH RF choke	Sigma SC60	23-750
D1	Silicon diode	Mullard BAX13	29-217
D2	Silicon diode	Mullard BAX13	29-217
D3	Silicon diode	Mullard BAX13	29-217
D4	Silicon diode	Mullard BAX13	29-217
D5	Silicon diode	Mullard BAX13	29-217

Ref.	Description	Manufacturer - Type	Part No.
D6	Silicon diode	Mullard BAX13	29-217
D7	Silicon diode	Mullard BAX13	29-217
D8	Silicon diode	Mullard BAX13	29-217
D9	Silicon diode	Mullard BAX13	29-217
D10	Silicon diode	Mullard BAX13	29-217
D11	Silicon diode	Mullard BAX13	29-217
D12	Silicon diode	Mullard BAX13	29-217
D13	Voltage reference diode	Mullard BZX91	29-235
D14	Omitted		
D15	Omitted		
D16	Varicap diode	Motorola MV1648	29-280
D17	Silicon diode	Mullard BAX13	29-217
D18	Silicon diode	Mullard BAX13	29-217
IC1	+5V regulator	Motorola MC78L05CP	44A-137
IC2	10/11 prescaler	Plessey SP8690B	44B-241
IC3	Fet op-amp	National LF356N	44B-239
IC4	Freq. synthesiser	Mullard HEF4750	44B-189
IC5	Universal divider	Mullard HEF4751	44B190
IC6	+12V Regulator	Motorola MC78012	44A-115
IC7	Quad 2 I/P NAND gate	Motorola MC14011BCP	44B-104
IC8	Hex level shifter	Motorola MC14504BCP	44B-240
IC9	+5V regulator	Motorola MC78L05CP	44A-137
IC10	Quad 2 I/P AND gate	Motorola MC14081BCP	44B-242
IC11	Hex level shifter	Motorola MC14504BCP	44B-240
IC12	+5V regulator	Motorola MC7805CT	44A-90
IC13	+12V regulator	Motorola MC78L12CP	44A-171
IC14	+12V regulator	Motorola MC78L12CP	44A-171
IC15	Hex inverter	Motorola SN74LS04N	44A-198
IC16	Quad 2 I/P NAND gate	Motorola MC14011BCP	44B-104
IC17	Omitted		
IC18	Omitted		
IC19	Omitted		
IC20	Omitted		
IC21	Omitted		
IC22	Omitted		
IC23	Omitted		
IC24	8 bit shift/store/latch	Motorola MC14094BCP	44B-243
IC25	Mosfet op-amp.	RCA CA3240E	44B-222
IC26	Mixer	Plessey SL1641C	44A-143
IC27	Phase-locked loop	Motorola MC14046BCP	44B-245
IC28	Quad 2 I/P NOR gate	Motorola MC14001BCP	44B-105
IC29	Quad 2 I/P NOR gate	Motorola MC14001BCP	44B-105
IC30	Quad 2 I/P NOR gate	Motorola MC14001BCP	44B-105
IC31	Counter	Motorola MC14526BCP	44B-145

Ref.	Description	Manufacturer - Type	Part No.
IC32	Dual counter	Motorola MC14569BCP	44B-178
IC33	8 bit shift/store/latch	Motorola MC14094BCP	44B-242
IC34	8 bit shift/store/latch	Motorola MC14094BCP	44B-243
OSC1	5.6MHz crystal osc.	Eddystone 11314P	1-217
PL1	3Way male header	Molex 22-27-2031	33-473
PL2	3Way male header	Molex 22-27-2031	33-473
PL3	3Way male header	Molex 22-27-2031	33-473
PL4	3Way male header	Molex 22-27-2031	33-473
PL5	3Way male header	Molex 22-27-2031	33-473
PL6	4Way male header	Molex 22-27-2041	33-474
PL7	3Way male header	Molex 22-27-2031	33-473
PL8	3Way male header	Molex 22-27-2031	33-473
PL9	3Way male header	Molex 22-27-2031	33-473
PL10	4Way male header	Molex 22-27-2041	33-474
R1	3k3 5% 0.4W	Mullard SFR25	21-278
R2	6k8 5% 0.4W	Mullard SFR25	21-334
R3	4k7 5% 0.4W	Mullard SFR25	21-295
R4	100R 5% 0.4W	Mullard SFR25	21-217
R5	150k 5% 0.4W	Mullard SFR25	21-705
R6	8k2 5% 0.4W	Mullard SFR25	21-339
R7	4k7 5% 0.4W	Mullard SFR25	21-295
R8	1M0 5% 0.4W	Mullard SFR25	21-679
R9	68k 5% 0.4W	Mullard SFR25	21-449
R10	10k 5% 0.4W	Mullard SFR25	21-355
R11	100R 5% 0.4W	Mullard SFR25	21-217
R12	220R 5% 0.4W	Mullard SFR25	21-216
R13	68k 5% 0.4W	Mullard SFR25	21-449
R14	1k0 5% 0.4W	Mullard SFR25	21-194
R15	1k0 5% 0.4W	Mullard SFR25	21-194
R16	820R 5% 0.4W	Mullard SFR25	21-297
R17	560R 5% 0.4W	Mullard SFR25	21-172
R18	1k0 5% 0.4W	Mullard SFR25	21-194
R19	1k0 5% 0.4W	Mullard SFR25	21-194
R20	8 x 10k network	AB 770-91-R10k	21-885
R21	8 x 10k network	AB 770-91-R10k	21-885
R22	4k7 5% 0.4W	Mullard SFR25	21-295
R23	390R 5% 0.4W	Mullard SFR25	21-159
R24	100k 5% 0.4W	Mullard SFR25	21-463
R25	4k7 5% 0.4W	Mullard SFR25	21-295
R26	Omitted		
R27	Omitted		
R28	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
R29	Omitted		
R30	Omitted		
R31	Omitted		
R32	Omitted		
R33	Omitted		
R34	Omitted		
R35	Omitted		
R36	Omitted		
R37	Omitted		
R38	Omitted		
R39	Omitted		
R40	Omitted		
R41	Omitted		
R42	Omitted		
R43	220R 5% 0.4W	Mullard SFR25	21-216
R44	47k 5% 0.4W	Mullard SFR25	21-434
R45	10k 5% 0.4W	Mullard SFR25	21-355
R46	270R 5% 0.4W	Mullard SFR25	21-169
R47	220R 5% 0.4W	Mullard SFR25	21-216
R48	560R 5% 0.4W	Mullard SFR25	21-172
R49	560R 5% 0.4W	Mullard SFR25	21-172
R50	390R 5% 0.4W	Mullard SFR25	21-159
R51	10k 5% 0.4W	Mullard SFR25	21-355
R52	10k 5% 0.4W	Mullard SFR25	21-355
R53	100k 5% 0.4W	Mullard SFR25	21-434
R54	10k 5% 0.4W	Mullard SFR25	21-355
R55	100R 5% 0.4W	Mullard SFR25	21-217
R56	270R 5% 0.4W	Mullard SFR25	21-169
R57	100R 5% 0.4W	Mullard SFR25	21-217
R58	27k 5% 0.4W	Mullard SFR25	21-682
R59	4k7 5% 0.4W	Mullard SFR25	21-295
R60	56k 5% 0.4W	Mullard SFR25	21-709
R61	3k3 5% 0.4W	Mullard SFR25	21-278
R62	4k7 5% 0.4W	Mullard SFR25	21-295
R63	4k7 5% 0.4W	Mullard SFR25	21-295
R64	12k 5% 0.4W	Mullard SFR25	21-362
R65	56R 5% 0.4W	Mullard SFR25	21-719
R66	10k 5% 0.4W	Mullard SFR25	21-355
R67	10k 5% 0.4W	Mullard SFR25	21-355
R68	56k 5% 0.4W	Mullard SFR25	21-709
R69	1MO 5% 0.4W	Mullard SFR25	21-679
R70	10k 5% 0.4W	Mullard SFR25	21-355
R71	10k 5% 0.4W	Mullard SFR25	21-355
R72	220R 5% 0.4W	Mullard SFR25	21-216
R73	100k 5% 0.4W	Mullard SFR25	21-463

Ref.	Description	Manufacturer - Type	Part No.
R74	220R 5% 0.4W	Mullard SFR25	21-216
R75	27k 5% 0.4W	Mullard SFR25	21-682
R76	1MO 5% 0.4W	Mullard SFR25	21-679
R77	10k 5% 0.4W	Mullard SFR25	21-355
R78	4k7 5% 0.4W	Mullard SFR25	21-295
R79	220R 5% 0.4W	Mullard SFR25	21-216
R80	100R 5% 0.4W	Mullard SFR25	21-217
R81	Omitted		
R82	Omitted		
R83	Omitted		
R84	Omitted		
R85	Omitted		
R86	Omitted		
R87	Omitted		
R88	Omitted		
R89	Omitted		
R90	Omitted		
R91	Omitted		
R92	Omitted		
R93	Omitted		
R94	Omitted		
R95	Omitted		
R96	Omitted		
R97	Omitted		
R98	Omitted		
R99	Omitted		
R100	1k2 5% 0.4W	Mullard SFR25	21-684
R101	100R 5% 0.4W	Mullard SFR25	21-217
R102	560R 5% 0.4W	Mullard SFR25	21-172
R103	22R 5% 0.4W	Mullard SFR25	21-220
R104	3k3 5% 0.4W	Mullard SFR25	21-278
R105	39k 5% 0.4W	Mullard SFR25	21-720
R106	22k 5% 0.4W	Mullard SFR25	21-393
R107	3k3 5% 0.4W	Mullard SFR25	21-278
R108	5k6 5% 0.4W	Mullard SFR25	21-312
R109	4 x 390R Network	AB 770-83-R390	21-988
RV1	2k2 horiz. preset	AB C90H	20-213
RV2	1kO multi-turn pot	Spectrol 64W102	20-228
RV3	1kO horiz. preset	AB C90H	20-184
RV4	100R horiz. preset	AB C90H	20-161
RV5	220R horiz. presrt	AB C90H	20-226
STC1	Ribbon cable assy	Eddystone D5726/1	28-352
TR1	Silicon NPN transistor	Mullard BC547B	29-321

6.8 (continued)

Ref.	Description	Manufacturer - Type	Part No.
TR2	Silicon NPN transistor	Mullard BFX89	29-233
TR3	Omitted		
TR4	Omitted		
TR5	Omitted		
TR6	Mosfet transistor	RCA 40673	29-182
TR7	Silicon NPN transistor	Mullard BFX89	29-233
TR8	Silicon NPN transistor	Mullard BC547B	29-321
TR9	Silicon NPN transistor	Mullard BC547B	29-321
TR10	Omitted		
TR11	Omitted		
TR12	Omitted		
TR13	Omitted		
TR14	Omitted		
TR15	Omitted		
TR16	Omitted		
TR17	Omitted		
TR18	Omitted		
TR19	Omitted		
TR20	Mosfet transistor	RCA 40673	29-182
XTL1	14935kHz crystal	Eddystone 11469P	1-221
XTL2	1405kHz crystal	Eddystone 12348P	1-273

6.9 : V.C.O. BOARD : CIRCUIT REF 9

Ref.	Description	Manufacturer - Type	Part No.
C1	1p2-10p trimmer	Steatite 11701MD	5-91
C2	1p2-10p trimmer	Steatite 11701MD	5-91
C3	1p2-10p trimmer	Steatite 11701MD	5-91
C4	1P2-10p trimmer	Steatite 11701MD	5-91
C5	2-30p trimmer	Dau 107-3941-027	5-80
C6	2-30p trimmer	Dau 107-3941-027	5-80
C7	220u 20% 25V elec.	Mullard 035-56221	6D-193
C8	220u 20% 10V elec.	Mullard 035-54221	6D-222
C9	22u 20% 35V elec.	Mullard 035-90003	6D-199
C10	10u 20% 25V tant.	AVX TAG10/25	6D-99
C11	10u 20% 25V tant.	AVX TAG10/25	6D-99
C12	10u 20% 25V tant.	AVX TAG10/25	6D-99
C13	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C14	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C15	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C16	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C17	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C18	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C19	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C20	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C21	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C22	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C23	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C24	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C25	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C26	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C27	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C28	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C29	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C30	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C31	1n0 10% 100V cer.	Mullard 630-19102	6F-247
C32	330p 2% 100V cer.	Mullard 683-58331	6F-223
C33	330p 2% 100V cer.	Mullard 683-58331	6F-223
C34	330p 2% 100V cer.	Mullard 683-58331	6F-223
C35	68p 2% 100V cer.	Mullard 683-34689	6F-234
C36	68p 2% 100V cer.	Mullard 683-34689	6F-234
C37	12p 2% 100V cer.	Mullard 683-10129	6F-198
C38	4p7 2% 100V cer.	Mullard 683-09478	6F-271
CH1	10uH RF choke	Sigma SC60	23-750
CH2	10uH RF choke	Sigma SC60	23-750
CH3	10uH RF choke	Sigma SC60	23-750
CH4	10uH RF choke	Sigma SC60	23-750
CH5	100nH RF choke	Sigma SC10	23-1136
CH6	100nH RF choke	Sigma SC10	23-1136

Ref.	Description	Manufacturer - Type	Part No.
CH7	470nH RF choke	Sigma SC10	23-1138
D1	Varicap diode	Motorola MV209	29-345
D2	Varicap diode	Motorola MV209	29-345
D3	Varicap diode	Motorola MV209	29-345
D4	Varicap diode	Motorola MV209	29-345
L1	V.C.O. coil	Eddystone D5705	23-1144
PL1	3 Way male header	Molex 22-27-2031	33-473
PL2	4 Way male header	Molex 22-27-2041	33-474
PL3	3 Way male header	Molex 22-27-2031	33-473
PL4	3 Way male header	Molex 22-27-2031	33-473
PL5	3 Way male header	Molex 22-27-2031	33-473
R1	22k 5% 0.4W	Mullard SFR25	21-393
R2	6k8 5% 0.4W	Mullard SFR25	21-334
R3	6k8 5% 0.4W	Mullard SFR25	21-334
R4	6k8 5% 0.4W	Mullard SFR25	21-334
R5	6k8 5% 0.4W	Mullard SFR25	21-334
R6	6k8 5% 0.4W	Mullard SFR25	21-334
R7	3k9 5% 0.4W	Mullard SFR25	21-283
R8	3k9 5% 0.4W	Mullard SFR25	21-283
R9	3k9 5% 0.4W	Mullard SFR25	21-283
R10	3k9 5% 0.4W	Mullard SFR25	21-283
R11	3k3 5% 0.4W	Mullard SFR25	21-278
R12	220R 5% 0.4W	Mullard SFR25	21-216
R13	220R 5% 0.4W	Mullard SFR25	21-216
R14	150R 5% 0.4W	Mullard SFR25	21-187
R15	100R 5% 0.4W	Mullard SFR25	21-217
R16	82R 5% 0.4W	Mullard SFR25	21-732
R17	82R 5% 0.4W	Mullard SFR25	21-732
R18	47R 5% 0.4W	Mullard SFR25	21-192
R19	47R 5% 0.4W	Mullard SFR25	21-192
R20	47R 5% 0.4W	Mullard SFR25	21-192
R21	220R 5% 0.4W	Mullard SFR25	21-216
R22	4 x 270R network	AB 770-83-R270	21-914
R23	2k2 5% 0.4W	Mullard SFR25	21-251
RLA	Relay	SDS Relais RH12	38-292
RLB	Relay	SDS Relais RH12	38-292
RLC	Relay	SDS Relais RH12	38-292
RLD	Relay	SDS Relais RH12	38-292
TR1	Mosfet transistor	RCA 40673	29-182

6.9 (continued)

Ref.	Description	Manufacturer - Type	Part No.
TR2	Mosfet transistor	RCA 40673	29-182
TR3	Mosfet transistor	RCA 40673	29-182
TR4	Silicon transistor	Mullard BC547B	29-321
TR5	Silicon transistor	Mullard BC547B	29-321
TR6	Silicon transistor	Mullard BC547B	29-321
TR7	Silicon transistor	Mullard BC547B	29-321

6.10 : MAIN I.F. & AUDIO BOARD : CIRCUIT REF 10

Ref.	Description	Manufacturer - Type	Part No.
C1	100n 10% 100V petp.	Mullard 344-25104	6E-118
C2	Omitted		
C3	Omitted		
C4	Omitted		
C5	Omitted		
C6	Omitted		
C7	Omitted		
C8	Omitted		
C9	Omitted		
C10	Omitted		
C11	Omitted		
C12	Omitted		
C13	Omitted		
C14	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C15	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C16	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C17	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C18	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C19	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C20	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C21	22p 2% 100V cer.	Mullard 683-34229	6F-252
C22	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C23	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C24	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C25	100n 10% 100v petp.	Mullard 344-25104	6E-118
C26	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C27	47u 20% 25V elec.	Mullard 035-56479	6D-197
C28	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C29	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C30	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C31	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C32	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C33	100p 2% 100V cer.	Mullard 683-34101	6F-205
C34	1n2 5% 160V polysty.	Mullard 425-41202	6C-269
C35	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C36	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C37	47u 20% 25V elec.	Mullard 035-56479	6D-197
C38	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C39	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C40	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C41	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C42	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C43	3n3 1% 160V polysty.	Mullard 425-43302	6C-278
C44	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C45	100u 20% 25V elec.	Mullard 035-24101	6D-242

Ref.	Description	Manufacturer - Type	Part No.
C46	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C47	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C48	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C49	3n3 1% 160V polysty.	Mullard 425-43302	6C-278
C50	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C51	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C52	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C53	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C54	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C55	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C56	100u 20% 10V elec.	Mullard 035-24101	6D-242
C57	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C58	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C59	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C60	22p 2% 100V cer.	Mullard 683-34229	6F-252
C61	5n6 1% 160V polysty.	Mullard 425-45602	6C-279
C62	22u 20% 35V elec.	Mullard 035-90034	6D-245
C63	22u 20% 35V elec.	Mullard 035-90034	6D-245
C64	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C65	1u0 20% 35V elec.	Mullard 035-59108	6D-198
C66	220u 20% 25V elec.	Mullard 035-56221	6D-193
C67	Omitted		
C68	220u 20% 25V elec.	Mullard 035-56221	6D-193
C69	100u 20% 25V elec.	Mullard 035-26101	6D-241
C70	10u 10% 10V solid alum.	Mullard 122-54109	6D-218
C71	22u 20% 35v elec.	Mullard 035-90034	6D-245
C72	22u 20% 35V elec.	Mullard 035-90034	6D-245
C73	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C74	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C75	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C76	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C77	100u 20% 10V elec.	Mullard 035-24101	6D-242
C78	1u 20% 35V tan.	AVX TAG1.0/35	6D-109
C79	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C80	Omitted		
C81	Omitted		
C82	Omitted		
C83	Omitted		
C84	Omitted		
C85	Omitted		
C86	Omitted		
C87	Omitted		
C88	Omitted		
C89	Omitted		
C90	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
C91	Omitted		
C92	Omitted		
C93	22u 20% 35V elec.	Mullard 035-90034	6D-245
C94	100u 20% 25V elec.	Mullard 035-26101	6D-241
C95	100u 20% 10V elec.	Mullard 035-24101	6D-242
C96	100u 20% 25V elec.	Mullard 035-26101	6D-241
C97	5n6 1% 160V polysty.	Mullard 425-45602	6C-279
C98	5n6 1% 160v polysty.	Mullard 425-45602	6C-279
C99	Omitted		
C100	Omitted		
C101	Omitted		
C102	Omitted		
C103	Omitted		
C104	Omitted		
C105	22u 20% 35v elec.	Mullard 035-90034	6D-245
C106	22u 20% 35V elec.	Mullard 035-90034	6D-245
C107	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C108	22u 20% 35V elec.	Mullard 035-90034	6D-245
C109	330p 2% 100V cer.	Mullard 683-58331	6F-223
C110	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C111	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C112	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C113	22u 20% 35V elec.	Mullard 035-90034	6D-245
C114	330p 2% 100V cer.	Mullard 683-58331	6F-223
C115	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C116	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C117	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C118	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C119	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C120	3u3 20% 16V tan.	AVX TAG3.3/16	6D-111
C121	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C122	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C123	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C124	100u 20% 10V elec.	Mullard 035-24101	6D-242
C125	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C126	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C127	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C128	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C129	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C130	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C131	100u 20% 25V elec.	Mullard 035-26101	6D-241
C132	22u 20% 35V elec.	Mullard 025-90034	6D-245
C133	100n 10% 100V petp.	Mullard 344-25104	6E-118
C134	22u 20% 35V elec.	Mullard 035-90034	6D-245
C135	100n 10% 100V petp.	Mullard 344-25104	6E-118

Ref.	Description	Manufacturer - Type	Part No.
C136	220u 20% 25V elec.	Mullard 035-56221	6D-193
C137	100n 10% 100V petp.	Mullard 344-25104	6E-118
C138	220u 20% 25V elec.	Mullard 035-56102	6D-193
C139	100u 20% 25V elec.	Mullard 035-26101	6D-241
C140	1n5 1% 160V polysty.	Mullard 425-41502	6C-252
C141	330p 1% 630V polysty.	Mullard 427-43301	6C-206
C142	100u 20% 25V elec.	Mullard 035-26101	6D-241
C143	100n 10% 100V petp.	Mullard 344-25104	6E-118
C144	22u 20% 35V elec.	Mullard 035-90034	6D-245
C145	22u 20% 35V elec.	Mullard 035-90034	6D-245
C146	22u 20% 35V elec.	Mullard 035-90034	6D-245
C147	100u 20% 25V elec.	Mullard 035-26101	6D-241
C148	22u 20% 35V elec.	Mullard 035-90034	6D-245
C149	100n 10% 100V petp.	Mullard 344-25104	6E-118
C150	22u 20% 35V elec.	Mullard 035-90034	6D-245
C151	100n 10% 100V petp.	Mullard 344-25104	6E-118
C152	100n 10% 100V petp.	Mullard 344-25104	6E-118
C153	1000u 20% 25V elec.	Mullard 035-56102	6D-191
C154	220u 20% 25V elec.	Mullard 035-56221	6D-193
C155	100u 20% 25V elec.	Mullard 035-26101	6D-241
C156	3n9 1% 160V polysty.	Mullard 425-43902	6C-282
C157	100u 20% 25V elec.	Mullard 035-26101	6D-241
C158	820p 1% 250V polysty.	Mullard 426-48201	6C-255
C159	100n 10% 100V petp.	Mullard 344-25104	6E-118
C160	100n 10% 100V petp.	Mullard 344-25104	6E-118
C161	1000u 20% 25V elec.	Mullard 035-56102	
C162	Omitted		
C163	Omitted		
C164	Omitted		
C165	Omitted		
C166	Omitted		
C167	Omitted		
C168	Omitted		
C169	Omitted		
C170	Omitted		
C171	Omitted		
C172	Omitted		
C173	Omitted		
C174	Omitted		
C175	Omitted		
C176	Omitted		
C177	Omitted		
C178	Omitted		
C179	Omitted		
C180	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
C181	Omitted		
C182	Omitted		
C183	Omitted		
C184	Omitted		
C185	Omitted		
C186	Omitted		
C187	Omitted		
C188	Omitted		
C189	Omitted		
C190	Omitted		
C191	Omitted		
C192	Omitted		
C193	Omitted		
C194	Omitted		
C195	Omitted		
C196	Omitted		
C197	Omitted		
C198	Omitted		
C199	Omitted		
C200	2-27p Trimmer	Mullard 308-11279	5-103
C201	10n 10% 25V cer.	Murata DD406SF103K25	6F-173
C202	22p 2% 160V polysty.	AOT GEC PF125	6C-157
C203	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C204	22u 20% 35V elec.	Mullard 035-90034	6D-245
C205	470p 1% 600v polysty.	GEC PF125	6C-55
C206	150p 1% 600V polysty.	GEC PF125	6C-175
C207	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C208	10n 10% 25v cer.	Murata DD406SF103K25	6F-173
C209	100u 20% 10V elec.	Mullard 035-24101	6D-242
C210	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C211	10n 10% 25v cer.	Murata DD406SF103K25	6F-173
C212	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C213	10n 10% 25v cer.	Murata DD406SF103K25	6F-173
C214	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C215	1u0 20% 100v elec.	Mullard 035-59108	6D-198
C216	10u 20% 50v elec.	Mullard 035-90035	6D-240
C217	3n9 1% 160v polysty.	Mullard 425-43901	6C-282
C218	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C219	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C220	10u 20% 50v elec.	Mullard 035-90035	6D-240
C221	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245
C222	560p 1% 160v polysty.	GEC PF125	6C-89
C223	1n8 1% 160v polysty.	Mullard 425-41802	6C-251
C224	560p 1% 160v polysty.	GEC PF125	6C-89
C225	100n 20% 50v cer.	Murata RPE132Z5U104M50	6F-245

Ref.	Description	Manufacturer - Type	Part No.
C226	330p 2% 630v polysty.	GEC PF125	6C-20
C227	100u 20% 25v elec.	Mullard 035-26101	6D-241
C228	Omitted		
C229	Omitted		
C230	47u 20% 25v elec.	Mullard 035-56479	6D-197
CH1	10u RF choke	Sigma SC60	23-750
CH2	33u RF choke	Sigma SC60	23-1004
CH3	33u RF choke	Sigma SC60	23-1004
CH4	470u RF choke	Sigma SC60	23-706
CH5	10mH RF choke	Sigma SC60	23-726
CH6	Omitted		
CH7	Omitted		
CH8	Omitted		
CH9	Omitted		
CH10	33u RF choke	Sigma SC60	23-1004
CH11	680u RF choke	Sigma SC60	23-756
CH12	1mH5 RF choke	Sigma SC60	23-832
CH13	1mH5 RF choke	Sigma SC60	23-832
D1	Silicon diode	Mullard BAX13	29-217
D2	Omitted		
D3	Omitted		
D4	Silicon diode	Mullard BAX13	29-217
D5	Silicon diode	Mullard BAX13	29-217
D6	Omitted		
D7	Omitted		
D8	Voltage reference diode	Mullard BZX91	29-235
D9	Silicon diode	Mullard BAX13	29-217
D10	Silicon diode	Mullard BAX13	29-217
D11	Omitted		
D12	Silicon diode	Mullard BAX13	29-217
D13	Omitted		
D14	Omitted		
D15	Omitted		
D16	Omitted		
D17	Silicon diode	Mullard BAX13	29-217
D18	Omitted		
D19	Silicon diode	Mullard BAX13	29-217
FL5	1.4MHz (3kHz) Filter	Eddystone 12888P	1-269
FL6	1.4MHz (8kHz) Filter	Eddystone 12889P	1-270
IC1	IF Amp	Motorola MC1350P	44A-268
IC2	IF Amp	Motorola MC1350P	44A-268

Ref.	Description	Manufacturer - Type	Part No.
IC3	Dual mosfet op-amp.	RCA CA3240E	44B-222
IC4	Dual mosfet op-amp.	RCA CA3240E	44B-222
IC5	Quad analogue switch	Motorola MC14016BCP	44B-112
IC6	Analogue multiplexer	Motorola MC14052BCP	44B-392
IC7	BCD-DEC decoder/driver	Motorola 74LS145N	44A-195
IC8	+8V Regulator	Motorola MC78L08CP	44A-122
IC9	AM det/agc.	Plessey SL1625C	44A-221
IC10	+5V Regulator	Motorola MC78L05CP	44A-137
IC11	Hex level shifter	Motorola MC14504BCP	44B-240
IC12	Omitted		
IC13	Mixer	Plessey SL623C	44A-296
IC14	+8V Regulator	Motorola MC78L08P	44A-122
IC15	A.M. det/agc.	Plessey SL1625C	44A-221
IC16	Omitted		
IC17	Omitted		
IC18	Omitted		
IC19	Omitted		
IC20	AF amp.	SGS TBA810P	44A-111
IC21	Dual mosfet op-amp.	RCA CA3240E	44B-222
IC22	AF amp.	SGS TBA810P	44A-111
IC23	Omitted		
IC24	Omitted		
IC25	Omitted		
IC26	Omitted		
IC27	Omitted		
IC28	Omitted		
IC29	Omitted		
IC30	Mixer	Plessey SL623C	44A-296
IC31	+8V regulator	Motorola MC78L08CP	44A-122
L1	1.4mHz coil	Eddystone D5673	23-1164
L2	1.4mHz coil	Eddystone D5673	32-1164
PL1	3Way male header	Molex 22-27-2031	33-473
PL2	3Way male header	Molex 22-27-2031	33-473
PL3	3Way male header	Molex 22-27-2031	33-473
PL4	3Way male header	Molex 22-27-2031	33-473
PL5	4Way male header	Molex 22-27-2041	33-474
PL6	3Way male header	Molex 22-27-2031	33-473
PL7	4Way male header	Molex 22-27-2041	33-474
PL8	4Way male header	Molex 22-27-2041	33-474
PL9	Omitted		
PL10	3Way male header	Molex 22-27-2031	33-473
R1	22R 5% 0.4W	Mullard SFR25	21-220

Ref.	Description	Manufacturer - Type	Part No.
R2	Omitted		
R3	Omitted		
R4	Omitted		
R5	Omitted		
R6	Omitted		
R7	Omitted		
R8	Omitted		
R9	Omitted		
R10	150R 5% 0.4W	Mullard SFR25	21-187
R11	150R 5% 0.4W	Mullard SFR25	21-187
R12	150R 5% 0.4W	Mullard SFR25	21-187
R13	150R 5% 0.4W	Mullard SFR25	21-187
R14	180R 5% 0.4W	Mullard SFR25	21-219
R15	2k7 5% 0.4W	Mullard SFR25	21-263
R16	180R 5% 0.4W	Mullard SFR25	21-219
R17	150R 5% 0.4W	Mullard SFR25	21-187
R18	150R 5% 0.4W	Mullard SFR25	21-187
R19	22R 5% 0.4W	Mullard SFR25	21-220
R20	1k2 5% 0.4W	Mullard SFR25	21-684
R21	47R 5% 0.4W	Mullard SFR25	21-192
R22	47R 5% 0.4W	Mullard SFR25	21-192
R23	820R 5% 0.4W AOT	Mullard SFR25	21-297
R24	1k2 5% 0.4W	Mullard SFR25	21-684
R25	47R 5% 0.4W	Mullard SFR25	21-192
R26	47R 5% 0.4W	Mullard SFR25	21-192
R27	47R 5% 0.4W	Mullard SFR25	21-192
R28	2k2 5% 0.4W	Mullard SFR25	21-251
R29	47R 5% 0.4W	Mullard SFR25	21-192
R30	47R 5% 0.4W	Mullard SFR25	21-192
R31	10k 5% 0.4W	Mullard SFR25	21-355
R32	2k2 5% 0.4W	Mullard SFR25	21-251
R33	47R 5% 0.4W	Mullard SFR25	21-192
R34	120R 5% 0.4W	Mullard SFR25	21-699
R35	33k 5% 0.4W	Mullard SFR25	21-409
R36	15k 5% 0.4W	Mullard SFR25	21-374
R37	3k3 5% 0.4W	Mullard SFR25	21-278
R38	270R 5% 0.4W	Mullard SFR25	21-169
R39	47R 5% 0.4W	Mullard SFR25	21-192
R40	220R 5% 0.4W	Mullard SFR25	21-216
R41	68R 5% 0.4W	Mullard SFR25	21-188
R42	10k 5% 0.4W	Mullard SFR25	21-355
R43	470R 5% 0.4W	Mullard SFR25	21-150
R44	100R 5% 0.4W	Mullard SFR25	21-217
R45	82R 5% 0.4W	Mullard SFR25	21-732
R46	47k 5% 0.4W	Mullard SFR25	21-434

Ref.	Description	Manufacturer - Type	Part No.
R47	820R 5% 0.4W	Mullatd SFR25	21-297
R48	10K 5% 0.4W	Mullard SFR25	21-355
R49	Omitted		
R50	10k 5% 0.4W	Mullard SFR25	21-355
R51	10k 5% 0.4W	Mullard SFR25	21-355
R52	10k 5% 0.4W	Mullard SFR25	21-355
R53	Omitted		
R54	3k9 5% 0.4W	Mullard SFR25	21-283
R55	8k2 5% 0.4W	Mullard SFR25	21-399
R56	10k 5% 0.4W	Mullard SFR25	21-355
R57	10k 5% 0.4W	Mullard SFR25	21-355
R58	Omitted		
R59	4k7 5% 0.4W	Mullard SFR25	21-295
R60	Omitted		
R61	Omitted		
R62	Omitted		
R63	4M7 5% 0.4W	Mullard SFR25	21-772
R64	Omitted		
R65	10k 5% 0.4W	Mullard SFR25	21-355
R66	15k 5% 0.4W	Mullard SFR25	21-374
R67	Omitted		
R68	Omitted		
R69	Omiited		
R70	10k 5% 0.4W	Mullard SFR25	21-355
R71	10k 5% 0.4W	Mullard SFR25	21-355
R72	68R 5% 0.4W	Mullard SFR25	21-188
R73	Omitted		
R74	Omitted		
R75	Omitted		
R76	Omitted		
R77	Omitted		
R78	Omitted		
R79	Omitted		
R80	220R 5% 0.4W	Mullard SFR25	21-216
R81	47k 5% 0.4W	Mullard SFR25	21-216
R82	18K 5% 0.4W	Mullard SFR25	21-379
R83	1kO 5% 0.4W	Mullard SFR25	21-194
R84	220R 5% 0.4W	Mullard SFR25	21-216
R85	1kO 5% 0.4W	Mullard SFR25	21-194
R86	1k2 5% 0.4W	Mullard SFR25	21-684
R87	Omitted		
R88	Omitted		
R89	Omitted		
R90	Omitted		
R91	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
R92	Omitted		
R93	Omitted		
R94	Omitted		
R95	Omitted		
R96	Omitted		
R97	Omitted		
R98	33k 5% 0.4W	Mullard SFR25	21-409
R99	10k 5% 0.4W	Mullard SFR25	21-355
R100	470R 5% 0.4W	Mullard SFR25	21-150
R101	82R 5% 0.4W	Mullard SFR25	21-732
R102	560R 5% 0.4W	Mullard SFR25	21-172
R103	47R 5% 0.4W	Mullard SFR25	21-192
R104	3k3 5% 0.4W	Mullard SFR25	21-278
R105	1k2 5% 0.4W	Mullard SFR25	21-684
R106	470R 5% 0.4W	Mullard SFR25	21-150
R107	47R 5% 0.4W	Mullard SFR25	21-192
R108	390R 5% 0.4W	Mullard SFR25	21-159
R109	47R 5% 0.4W	Mullard SFR25	21-192
R110	68R 5% 0.4W	Mullard SFR25	21-188
R111	22R 5% 0.4W	Mullard SFR25	21-220
R112	8 x 10k network	AB 770-91-R10k	21-885
R113	22k 5% 0.4W	Mullard SFR25	21-393
R114	100k 5% 0.4W	Mullard SFR25	21-463
R115	100R 5% 0.4W	Mullard SFR25	21-217
R116	470R 5% 0.4W	Mullard SFR25	21-150
R117	47k 5% 0.4W	Mullard SFR25	21-434
R118	18R 5% 0.4W	Mullard SFR25	21-678
R119	22R 5% 3W	Welwyn W21	21-661
R120	100R 5% 0.4W	Mullard SFR25	21-217
R121	1R0 5% 0.4W	Mullard SFR25	21-831
R122	220R 5% 0.4W	Mullard SFR25	21-216
R123	10k 5% 0.4W	Mullard SFR25	21-355
R124	1k0 5% 0.4W	Mullard SFR25	21-194
R125	10k 5% 0.4W	Mullard SFR25	21-355
R126	10k 5% 0.4W	Mullard SFR25	21-355
R127	100k 5% 0.4W	Mullard SFR25	21-463
R128	100R 5% 0.4W	Mullard SFR25	21-217
R129	470R 5% 0.4W	Mullard SFR25	21-150
R130	470R 5% 0.4W	Mullard SFR25	21-150
R131	47k 5% 0.4W	Mullard SFR25	21-434
R132	18R 5% 0.4W	Mullard SFR25	21-678
R133	10k 5% 0.4W	Mullard SFR25	21-355
R134	470R 5% 0.4W	Mullard SFR25	21-150
R135	100R 5% 0.4W	Mullard SFR25	21-217
R136	10k 5% 0.4W	Mullard SFR25	21-355

Ref.	Description	Manufacturer - Type	Part No.
R137	1R0 5% 0.4W	Mullard SFR25	21-831
R138	Omitted		
R139	Omitted		
R140	Omitted		
R141	Omitted		
R142	Omitted		
R143	Omitted		
R144	Omitted		
R145	Omitted		
R146	Omitted		
R147	Omitted		
R148	Omitted		
R149	Omitted		
R150	22k 5% 0.4W	Mullard SFR25	21-393
R151	39k 5% 0.4W	Mullard SFR25	21-720
R152	5k6 5% 0.4W	Mullard SFR25	21-312
R153	3k3 5% 0.4W	Mullard SFR25	21-278
R154	1k2 5% 0.4W	Mullard SFR25	21-684
R155	Omitted		
R156	10k 5% 0.4W	Mullard SFR25	21-355
R157	22R 5% 0.4W	Mullard SFR25	21-220
R158	82R 5% 0.4W	Mullard SFR25	21-732
R159	10k 5% 0.4W	Mullard SFR25	21-355
R160	Omitted		
R161	1k5 5% 0.4W	Mullard SFR25	21-230
R162	4k7 5% 0.4W	Mullard SFR25	21-295
R163	1k0 5% 0.4W	Mullard SFR25	21-194
R164	820R 5% 0.4W AOT	Mullard SFR25	21-297
R165	150R 5% 0.4W	Mullard SFR25	21-187
R166	2k7 5% 0.4W	Mullard SFR25	21-263
R167	2k2 5% 0.4W	Mullard SFR25	21-251
R168	68R 5% 0.4W	Mullard SFR25	21-188
R169	7R5 5% 0.4W	Mullard SFR25	21-1231
R170	220R 5% 0.4W	Mullard SFR25	21-216
R171	220R 5% 0.4W	Mullard SFR25	21-216
R172	1k0 5% 0.4W	Mullard SFR25	21-194
R173	10k 5% 0.4W	Mullard SFR25	21-355
R174	10k 5% 0.4W	Mullard SFR25	21-355
R175	1k0 5% 0.4W	Mullard SFR25	21-194
R176	220k 5% 0.4W	Mullard SFR25	21-676
R177	100k 5% 0.4W	Mullard SFR25	21-463
R178	10k 5% 0.4W	Mullard SFR25	21-355

Ref.	Description	Manufacturer - Type	Part No.
RLA	Omitted		
RLB	Omitted		
RLC	Omitted		
RLD	Omitted		
RLE	Omitted		
RLF	Omitted		
RLG	Omitted		
RLH	Omitted		
RLI	Omitted		
RLJ	Relay	Hamlin HE3321-A1200	38-437
RLK	Relay	Hamlin HE3321-A1200	38-437
RLL	Relay	Hamlin HE3321-A1200	38-437
RLM	Relay	Hamlin HE3321-A1200	38-437
RLN	Relay	Hamlin HE3321-A1200	38-437
RLO	Omitted		
RLP	Relay	Hamlin HE3321-A1200	38-437
RV1	47k horiz. preset	AB C90H	20-171
RV2	2k2 horiz. preset	AB C90H	20-213
RV3	Omitted		
RV4	2k2 horiz. preset	AB C90H	20-213
RV5	10k horiz. preset	AB C90H	20-170
RV6	1k0 horiz. preset	AB C90H	20-184
RV7	Omitted		
RV8	10k horiz. preset	AB C90H	20-170
RV9	47k horiz. preset	AB C90H	20-171
RV10	10k horiz. preset	AB C90H	20-170
RV11	1k0 cermet trim. horiz.	Bourns 3329H-1k	20-264
STC1	Ribbon cable assy	Eddystone D5726/3	28-354
STC2	Ribbon cable assy	Eddystone D5726/4	28-355
T1	600 ohm Transformer	Eddystone D5400	23-938
TR1	Silicon NPN transistor	Mullard BFR54	29-320
TR2	Silicon NPN transistor	Mullard BFR54	29-320
TR3	Silicon NPN transistor	Mullard BFR54	29-320
TR4	Silicon NPN transistor	Mullard BFR54	29-320
TR5	Omitted		
TR6	Omitted		
TR7	Fet transistor	Solitron UC734B	29-104
TR8	Fet Transistor	Solitron UC734B	29-104
TR9	Silicon NPN transistor	Mullard BC547B	29-321
TR10	Omitted		
TR11	Omitted		
TR12	Omitted		

Ref.	Description	Manufacturer - Type	Part No.
TR13	Omitted		
TR14	Omitted		
TR15	Mosfet transistor	RCA 40673	29-182
TR16	Silicon NPN transistor	Mullard BC547B	29-321
TR17	Silicon PNP transistor	Mullard BC560B	29-316
TR18	Silicon NPN transistor	Mullard BC547B	29-321
TR19	Silicon NPN transistor	Mullard BC547B	29-321
XTL1	1500kHz crystal	Eddystone 10269P	1-273

6.11 : DISPLAY BOARD : CIRCUIT REF 11

Ref.	Description	Manufacturer - Type	Part No.
C1	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C2	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C3	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C4	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C5	Omitted		
C6	1n 20% 100V cer.	Mullard 630-19102	6F-247
C7	Omitted		
C8	Omitted		
C8a	1n 20% 100V cer.	Mullard 630-19102	6F-247
C9	Omitted		
C10	Omitted		
C11	1n 20% 100V cer.	Mullard 630-19102	6F-247
C12	1n 20% 100V cer.	Mullard 630-19102	6F-247
C13	1n 20% 100V cer.	Mullard 630-19102	6F-247
C14	1n 20% 100V cer.	Mullard 630-19102	6F-247
C15	1n 20% 100V cer.	Mullard 630-19102	6F-247
C16	100u 20% 10V elec.	Mullard 035-54101	6D-196
C17	Omitted		
C18	100u 20% 25V elec.	Mullard 035-56101	6D-195
C19	Omitted		
C20	100u 20% 25V elec.	Mullard 035-56101	6F-195
C21	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
D1	Silicon diode	Mullard BAX13	29-217
D2	Silicon diode	Mullard BAX13	29-217
D3	Silicon diode	Mullard BAX13	29-217
D4	Silicon diode	Mullard BAX13	29-217
D5	Silicon diode	Mullard BAX13	29-217
D6	Schottky diode	HP 5082-2800	29-396
D7	Silicon diode	Mullard IN4004	29-208
D8	Silicon diode	Mullard IN4004	29-208
DS1	Omitted		
DS2	Omitted		
DS3	Display	Liton LTS360P BINH1	44A-414
DS4	Display	Liton LTS360P BINH1	44A-414
DS5	Display	Liton LTS360P BINH1	44A-414
DS6	Display	Liton LTS360P BINH1	44A-414
DS7	Display	Liton LTS360P BINH1	44A-414
DS8	Display	Liton LTS360P BINH1	44A-414
DS9	Display	Liton LTS360P BINH1	44A-414
DS10	Display	Liton LTS360P BINH1	44A-414
IC1	Dual Schmitt Trigger	Motorola MC14583BCP	
IC2	4x2 I/P NOR gate	Motorola MC14077BCP	44B-255

Ref.	Description	Manufacturer - Type	Part No.
IC3	2x2 I/P AND-OR-INV gate	Motorola MC14506	44B-256
IC4	Omitted		
IC5	Display Driver	NSC MM5450N	44B-251
IC6	Display Driver	NSC MM5450N	44B-251
IC7	Display Driver	NSC MM5450N	44B-251
IC8	Omitted		
IC9	Omitted		
IC10	Omitted		
IC11	Omitted		
IC12	Bargraph Display Driver	NSC LM3914N	44A-252
IC13	Omitted		
LD1	Omitted		
LD2	Omitted		
LD3	Omitted		
LD4	Omitted		
LD5	Omitted		
LD6	Omitted		
LD7	Omitted		
LD8	Omitted		
LD9	Omitted		
LD10	Omitted		
LD11	Omitted		
LD12	Omitted		
LD13	Green LED	AEG/TFK V512PB	16-39
LD14	Green LED	AEG/TFK V512PB	16-39
LD15	Green LED	AEG/TFK V512PB	16-39
LD16	Green LED	AEG/TFK V512PB	16-39
LD17	Amber LED	AEG/TFK V511PB	16-38
LD18	Amber LED	AEG/TFK V511PB	16-38
LD19	Amber LED	AEG/TFK V511PB	16-38
LD20	Omitted		
LD21	Omitted		
LD22	Omitted		
LD23	Omitted		
LD24	Omitted		
LD25	Omitted		
LD26	Omitted		
LD27	Omitted		
LD28	Omitted		
LD29	Omitted		
LD30	Omitted		
LD31	Amber LED	AEG/TFK V511PB	16-38
LD32	Omitted		
LD33	Amber LED	AEG/TFK V511PB	16-38

Ref.	Description	Manufacturer - Type	Part No.
LD34	Omitted		
LD35	Amber LED	AEG/TFK V511PB	16-38
LD36	Omitted		
LD37	Clear green LED	Stanley SBG5501	16-37
LD38	Omitted		
LD39	Omitted		
LD40	Omitted		
LD41	Clear green LED	Stanley SBG5501	16-37
LD42	Omitted		
LD43	Omitted		
LD44	Omitted		
LD45	Green LED	AEG/TFK V512PB	16-39
LD46	Green LED	AEG/TFK V512PB	16-39
LD47	Green LED	AEG/TFK V512PB	16-39
LD48	Green LED	AEG/TFK V512PB	16-39
LD49	Green LED	AEG/TFK V512PB	16-39
LD50	Green LED	AEG/TFK V512PB	16-39
LD51	Green LED	AEG/TFK V512PB	16-39
LD52	Green LED	AEG/TFK V512PB	16-39
LD53	Green LED	AEG/TFK V512PB	16-39
LD54	Green LED	AEG/TFK V512PB	16-39
LD55	Yellow LED	AEG/TFK V513PB	16-40
PL1	4 Way male header	Molex 22-27-2041	33-474
PL2	3 Way male header	Molex 22-27-2031	33-473
PL3	3 Way male header	Molex 22-27-2031	33-473
R1	Omitted		
R2	47k 5% 0.4W	Mullard SFR25	21-434
R3	Omitted		
R4	Omitted		
R5	47k 5% 0.4W	Mullard SFR25	21-434
R6	Omitted		
R7	Omitted		
R8	Omitted		
R9	Omitted		
R10	Omitted		
R11	Omitted		
R12	Omitted		
R13	Omitted		
R14	22k 5% 0.4W	Mullard SFR25	21-393
R15	1k2 5% 0.4W	Mullard SFR25	21-684
R16	10k 5% 0.4W	Mullard SFR25	21-355
R17	22k 5% 0.4W	Mullard SFR25	21-393
R18	22k 5% 0.4W	Mullard SFR25	21-393

Ref.	Description	Manufacturer - Type	Part No.
R19	10k 5% o.4W	Mullard SFR25	21-355
R20	10k 5% 0.4W	Mullard SFR25	21-355
R21	100k 5% 0.4W	Mullard SFR25	21-463
R22	100k 5% 0.4W	Mullard SFR25	21-463
R23	10k 5% 0.4W	Mullard SFR25	21-355
R24	10k 5% 0.4W	Mullard SFR25	21-355
R25	10k 5% 0.4W	Mullard SFR25	21-355
R26	Omitted		
R27	Omitted		
R28	560R 5% 0.4W	Mullard SFR25	21-172
R29	7 x 47k Network	AB 770-81-R47K	21-918
R30	270R 5% 0.4W	Mullard SFR25	21-169
R31	Omitted		
R32	Omitted		
R33	Omitted		
R34	Omitted		
R35	47k 5% 0.4W	Mullard SFR25	21-434
R36	Omitted		
R37	470R 5% 0.4W	Mullard SFR25	21-150
R38	39R 5% 0.4W	Mullard SFR25	21-171
R39	Omitted		
R40	Omitted		
R41	Omitted		
R42	Omitted		
R43	Omitted		
R44	Omitted		
R45	Omitted		
R46	Omitted		
R47	Omitted		
R48	Omitted		
R49	Omitted		
R50	1k5 5% 0.4W	Mullard SFR25	21-230
RS1	10 Way male header	Farnell 145-025	33-479
RV1	Omitted		
RV2	10k Pot Preset	Citec MPWT/404	20-127
RV3	10k Pot Log	AB 11269P Type 45	20-200
RV4	5k Pot Log	AB 11271P Type 45	20-222
STC1	Ribbon cable assy.	Eddystone D5726/6	28-357
STC2	Ribbon cable assy.	Eddystone D5726/7	28-358

6.12 : INTERFACE BOARD : CIRCUIT REF 12

Ref	Description	Manufacturer - Type	Part No.
C1	22u 20% 35V elec.	Mullard 035-90003	6D-199
C2	10u 20% 50V elec.	Mullard 035-90008	6D-189
C3	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C4	10u 20% 50V elec.	Mullard 035-90008	6D-189
C5	10u 20% 50V elec.	Mullard 035-90008	6D-189
C6	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C7	22u 20% 35V elec.	Mullard 035-90003	6D-199
C8	10u 20% 50V elec.	Mullard 035-90008	6D-189
C9	22u 20% 35V elec.	Mullard 035-90003	6D-199
C10	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C11	10u 20% 50V elec.	Mullard 035-90008	6F-189
C12	10u 20% 50V elec.	Mullard 035-90008	6F-189
C13	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C14	10u 20% 50V elec.	Mullard 035-90008	6F-189
D1	Silicon diode	Mullard BAX13	29-219
D2	Silicon diode	Mullard IN4004	29-308
IC1	Quad analog switch	Motorola MC14016BCP	44B-112
IC2	8 Bit shift/store/latch	Motorola MC14094BCP	44B-250
IC3	8 Bit shift/store/latch	Motorola MC14094BCP	44B-250
IC4	8 Bit shift/store/latch	Motorola MC14094BCP	44B-250
IC5	+5V Regulator	Motorola MC7805CT	44A-90
IC6	Quad 2 I/P AND gate	Motorola MC14081BCP	44B-249
IC7	Hex tri-state buffer	Motorola MC14503BCP	44B-185
IC8	Hex tri-state buffer	Motorola MC14503BCP	44B-185
IC9	Octal D-type flip flop	Texas SN74LS374N	44A-248
IC10	Octal D-type flip flop	Texas SN74LS374N	44A-248
IC11	Hex tri-state buffer	Motorola MC14503BCP	44B-185
IC12	Octal D-type flip flop	Texas SN74LS374N	44A-248
PL1	10 Way male header	Molex 22-27-2101	33-496
PL2	3 Way male header	Molex 22-27-2031	33-473
PL3	4 Way male header	Molex 22-27-2041	33-474
PL4	3 Way male header	Molex 22-27-2031	33-473
PL5	14 Way male header	Molex 22-03-2141	33-481
R1	10k 5% 0.4W	Mullard SFR25	21-355
R2	10k 5% 0.4W	Mullard SFR25	21-355
R3	8 x 47k Network	AB 770-91-R47K	21-915
R4	150R 5% 0.4W	Mullard SFR25	21-187
R5	2R7 5% 6W w.w.	Welwyn W22	21-979
R6	10k 5% 0.4W	Mullard SFR25	21-355
R7	10k 5% 0.4W	Mullard SFR25	21-355
R8	8 x 2k2 Network	AB 770-91-2K2	21-916

6.12 (continued)

Ref	Description	Manufacturer - Type	Part No.
R9	8 x 10k Network	AB 770-91-R10K	21-885
R10	8 x 10k Network	AB 770-91-R10K	21-885
R11	7 x 2k2 Network	AB 770-81-2k2	21-983
RLA	Relay	Hamlin HE3321-C1200	38-434
RS1	10 Way IDC male header	Farnell 145-025	33-479
RS2	10 Way IDC male header	Farnell 145-025	33-479
RS3	10 Way IDC male header	Farnell 145-025	33-479
RS4	10 Way IDC male header	Farnell 145-025	33-479
RS5	10 Way IDC male haeder	Farnell 145-034	33-480
RS6	10 Way IDC male haeder	Farnell 145-034	33-480
SK1	18 Way Female socket	Molex 20-02-2185	33-482
SK2	18 Way Female socket	Molex 20-02-2185	33-482
TR1	Silicon NPN transistor	Mullard BC547B	29-321
TR2	Silicon NPN transistor	Mullard BC547B	29-321
TR3	Silicon NPN transistor	Mullard BC547B	29-321

6.13 : M.P.U. BOARD : CIRCUIT REF 13

Ref.	Description	Manufacturer - Type	Part No.
BATT1	3.6V 100mAH Battery	Berec Memtec 3.6V	41-4
C1	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C2	3u3 20% 16V elec.	AVX TAG3.3/16	6D-111
C3	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C4	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C5	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C6	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C7	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C8	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C9	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C10	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C11	180p 5% 160V polysty.	Mullard 427-21801	6C-281
C12	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C13	10u 20% 63V elec.	Mullard 035-90008	6D-189
C14	Not fitted		
C15	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C16	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C17	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C18	27p 2% 100V cer.	Mullard 642-34279	6F-190
C19	27p 2% 100V cer.	Mullard 642-34279	6F-190
C20	3u3 20% 16V elec.	AVX TAG3.3/16	6D-111
C21	10n 20% 25V cer.	Murata DD406SF103K25	6F-173
C22	100u 20% 10V elec.	Mullard 035-54101	6D-196
C23	220u 20% 25V elec.	Mullard 035-56221	6D-193
C24	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
D1	Schottky diode	Mullard BAT85	29-37
D2	Schottky diode	Mullard BAT85	29-37
D3	Zener diode	Mullard BZX79C3V9	29-338
IC1	Triple timer	Motorola MC6840P	44B-259
IC2	Octal bus transceiver	Texas 74LS245N	44A-266
IC3	3 to 8 line decoder	Texas 74LS138N	44A-199
IC4	Dual monostable	Motorola MC14528BCP	44B-186
IC5	2K Cmos RAM	Hitachi HM6116LP4	44B-260
IC6	Mosfet op-amp.	R.C.A. CA3140E	44B-149
IC7	Quad 2 I/P NAND gate	Motorola MC14011BCP	44B-104
IC8	4K EPROM(prog.page'E')	Hitachi 11894P	44B-279
IC9	4K EPROM(prog.page'F')	Hitachi 11895P	44B-280
IC10	Quad 2 I/P NOR gate	Texas 74LS02N	44A-264
IC11	Dual monstable	Texas 74LS123N	44A-265
IC12	CPU	Motorola MC6802P	44B-258
IC13	3 to 8 line decoder	Texas 74LS138N	44A-199
IC14	+5V Regulator	Motorola MC7805CT	44A-90

Ref.	Description	Manufacturer - Type	Part No.
IC15	Opto-isolator	Monsanto MCT2	44A-109
PL1	3 Way male header	Molex 22-27-2031	33-473
PL2	18 Way male header	Molex 22-03-2181	33-483
PL3	18 Way male header	Molex 20-03-2181	33-483
R1	8 x 2k2 Network	AB 770-91-R2k2	21-916
R2	8 x 47k Network	AB 770-91-R47k	21-915
R3	33k 5% 0.4W	Mullard SFR25	21-409
R4	8 x 47k Network	AB 770-91-R47k	21-915
R5	1k5 5% 0.4W	Mullard SFR25	21-230
R6	470R 5% 0.4W	Mullard SFR25	21-150
R7	33k 5% 0.4W	Mullard SFR25	21-409
R8	3k3 5% 0.4W	Mullard SFR25	21-278
R9	3k3 5% 0.4W	Mullard SFR25	21-278
R10	330R 5% 0.4W	Mullard SFR25	21-193
R11	33k 5% 0.4W	Mullard SFR25	21-409
R12	33k 5% 0.4W	Mullard SFR25	21-409
R13	33k 5% 0.4W	Mullard SFR25	21-409
R14	33k 5% 0.4W	Mullard SFR25	21-409
R15	4k7 5% 0.4W	Mullard SFR25	21-295
R16	100k 5% 0.4W	Mullard SFR25	21-403
R17	33k 5% 0.4W	Mullard SFR25	21-409
R18	1k0 5% 0.4W	Mullard SFR25	21-194
R19	8 x 2k2 Network	AB 770-91-R2k2	21-916
R20	47k 5% 0.4W	Mullard SFR25	21-434
R21	47k 5% 0.4W	Mullard SFR25	21-434
R22	47k 5% 0.4W	Mullard SFR25	21-434
TR1	Silicon NPN transistor	Mullard BC547B	29-321
XTL1	3276.8kHz crystal	Eddystone 10486P	1-191

6.14 : P.S.U. BOARD : CIRCUIT REF 14

Ref.	Description	Manufacturer - Type	Part No.
C1	6800u 20% 40V elec.	Mullard 2222-050-57682	6D-190
C2	6800u 20% 40V elec.	Mullard 2222-050-57682	6D-190
C3	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C4	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C5	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C6	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C7	1u0 20% 100V elec.	Mullard 035-59108	6D-198
C8	1u0 20% 100V elec.	Mullard 035-59108	6D-198
D3	Silicon diode	IR IN5401	29-351
D4	Silicon diode	IR IN5401	29-351
D5	Silicon diode	IR IN5401	29-351
D6	Silicon diode	IR IN5401	29-351
D8	Silicon diode	IR IN5401	29-351
D9	Silicon diode	IR IN5401	29-351
D10	Silicon diode	IR IN5401	29-351
D11	Silicon diode	IR IN5401	29-351
IC1	*Voltage regulator	National LM317T	44A-215
IC2	*Voltage regulator	National LM317T	44A-215
IC3	*Voltage regulator	National LM317T	44A-215
IC4	*Voltage regulator	National LM317T	44A-215
*	These parts should be used with an insulating kit:-		
	Flexipad	Redpoint F30220/1	38-455
	Insulating bush	Eddystone	24C-151
PL1	4 Way male header	Molex 22-27-2041	33-474
PL2	4 Way male header	Molex 22-27-2041	33-474
PL3	4 Way male header	Molex 22-27-2041	33-474
PL4	4 Way male header	Molex 22-27-2041	33-474
PL5	4 Way male header	Molex 22-27-2041	33-474
PL6	3 Way male haeder	Molex 22-27-2031	33-473
R1	2k7 5% 0.4W	Mullard SFR-25	21-263
R2	2k7 5% 0.4W	Mullard SFR-25	21-263
R3	1k8 5% 0.4W	Mullard SFR-25	21-298
R4	1k8 5% 0.4W	Mullard SFR-25	21-298
R5	240R 5% 0.4W	Mullard SFR-25	21-911
R6	240R 5% 0.4W	Mullard SFR-25	21-911
R7	240R 5% 0.4W	Mullard SFR-25	21-911
R8	240R 5% 0.4W	Mullard SFR-25	21-911

6.15 : ANCILLARIES TEST BOX : 1650/6/D6245

Ref	Description	Manufacturer - Type	Part No.
D1	LED Red	AEG/TFK V168P	16-31
D2	LED Red	AEG/TFK V168P	16-31
D3	LED Green	AEG/TFK V169P	16-32
PL1	5 Pin DIN Plug	B & L L1904A/5/FP	33-688
PL2	5 Pin DIN Plug	B & L L1904A/5/FP	33-688
PL3	5 Pin DIN Plug	B & L L1904A/5/FP	33-688
PL4	25 Way 'D' Plug	McMurdo DB-25P	33-428
PL4 Cvr	Cvr strt c/w Jscrews	Souriau 8630-3639	33-754
R1	560R 5% 0.4W	Mullard SFR25	21-172
R2	560R 5% 0.4W	Mullard SFR25	21-172
R3	560R 5% 0.4W	Mullard SFR25	21-172
SK1	5 Pin DIN Skt.	B & L L1904A/5/CS	33-682
SK2	5 Pin DIN Skt.	B & L L1904A/5/CS	33-682
SK3	5 Pin DIN Skt.	B & L L1904A/5/CS	33-682
SW1	2 Pole 2Way Rotary	Lorlin	22-272
SW2	2 Pole 2Way Rotary	Lorlin	22-272
SW3	2 Pole 2Way Toggle Sw.	C & K	22-94
SW4	2 Pole 2Way Toggle Sw.	C & K	22-94
T1	Push Terminal	H. S. Cooke	18-6
T2	Push Terminal	H. S. Cooke	18-6
T3	Push Terminal	H. S. Cooke	18-6
T4	Push Terminal	H. S. Cooke	18-6
T5	Push Terminal	H. S. Cooke	18-6
T6	Push Terminal	H. S. Cooke	18-6
T7	Push Terminal	H. S. Cooke	18-6
T8	Push Terminal	H. S. Cooke	18-6
T9	Push Terminal	H. S. Cooke	18-6
T10	Push Terminal	H. S. Cooke	18-6
Knob1	21mm Wing Knob	Sifam W211 006 BK	12-268
Knob2	21mm Wing Knob	Sifam W211 006 BK	12-268
Cap1	Cap for Knob	Sifam C210 BK	12-271
Cap2	Cap for Knob	Sifam C210 BK	12-271
Box	Diecast box & screws	Eddystone 6827P	6827P

6.16 : FRONT PANEL TEST BOX : 1650/6/D6247

Ref	Description	Manufacturer - Type	Part No.
C1	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C2	22u 20% 35V Elec.	Mullard 035-90003	6D-199
IC1	Voltage Regulator	National LM317T	44A-215
PL1	10 Pin KK Housing	MOLEX 22-01-2105	33-506
R1	1K5 5% 0.4W	Mullard SFR25	21-230
R2	220R 5% 0.4W	Mullard SFR25	21-216
R3	240R 5% 0.4W	Mullard SFR25	21-911
R4	1K8 5% 0.4W	Mullard SFR25	21-298
RV1	1KO C/Pl. Linear	Bourns 91A1A-B28 1K	F148-573
Knob1	15mm Knob	Sifam K151 250 BK	12-259
Cap1	Cap for Knob	Sifam C150 BK	12-263
CVR1	Nut Cover for Knob	Sifam N151 BK	12-270
Box	Diecast box & screws	Eddystone 7134P	7134P

6.17 : VCO TEST BOX : 1650/6/D6248

Ref	Description	Manufacturer - Type	Part No.
C1	10n 10% 25V cer	Murata DD406SF103K25	6F-173
C2	100n 20% 50V cer.	Murata RPE132Z5U104M50	6F-245
C3	22u 20% 35V Elec.	Mullard 035-90003	6D-199
IC1	Voltage Regulator	National LM317T	44A-215
PL1	3 Pin KK Housing	Molex 22-01-2035	33-499
PL2	4 Pin KK Housing	Molex 22-01-2045	33-487
PL3	3 Pin KK Housing	Molex 22-01-2035	33-499
PL4	3 Pin KK Housing	Molex 22-01-2035	33-499
R1	1K5 5% 0.4W	Mullard SFR25	21-230
R2	3K3 5% 0.4W	Mullard SFR25	21-278
R3	2K7 5% 0.4W	Mullard SFR25	21-263
R4	100R 5% 0.4W	Mullard SFR25	21-217
R5	1K1 5% 0.4W	Mullard Metal Film	21-1076
RV1	10K C/Pl. Linear	Bourns 91A1A-B28 10K	F148-576
RV5	470R horiz. preset	A.B. C90H	20-112
SK1	BNC Bulk Hd. Jack.	Greenpar GE35039-C22	33-402
SW1	1 Pole 4Way Rotary	Lorlin (11268P)	22-272
Knob1	15mm Knob	Sifam K151 250 BK	12-259
Cap1	Cap for Knob	Sifam C150 BK	12-263
Knob2	15mm Knob	Sifam K151 250 BK	12-259
Cap2	Cap for Knob	Sifam C150 BK	12-263
Cvr1	Nut Cover for Knob	Sifam N151 BK	12-270
Cvr2	Nut Cover for Knob	Sifam N151 BK	12-270
Box	Diecast box & screws	Eddystone 6908P	6908P
Box	VCO	Eddystone D5667	17A-3079
Bar1	VCO support	Eddystone 11251P	17A-3068
Bar2	VCO support	Eddystone 11251P	17A-3068
Pillar	VCO support M3X16	Eddystone 10979P	15-354

6.18 : 1.4MHz IF I/P PAD : 1650/6/D6248

Ref	Description	Manufacturer - Type	Part No.
PL1	3 Pin KK Housing	Molex 22-01-2035	33-499
R1	1KO 5% 0.4W	Mullard SFR25	21-194
R2	56R 5% 0.4W	Mullard SFR25	21-719
SK1	BNC Bulk Hd. Jack.	Radiall 141563	33-659
T1	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
T2	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
Box	Diecast box & screws	Eddystone 11451P	11451P
Pillar	Transipillar M3X13	TP1/6.5/13/M3/11	F147-957

6.19 : REMOTE BREAKOUT BOX : 1650/6/D6250

Ref	Description	Manufacturer - Type	Part No.
PL1	9 Way 'D' Plug	Cannon DE-9P	33-313
SK1	9 Way 'D' Socket	Cannon DB-9S	33-312
SK1 Cvr	Cvr strt c/w Jscrews	Souriau 8630-3637A	33-752
SK2	BNC Bulk Hd. Jack.	Radiall 141563	33-659
SK3	BNC Bulk Hd. Jack.	Radiall 141563	33-659
Box	Diecast box & screws	Eddystone 7134P	7134P
Stud	4-40 UNC Stud for SK1	Eddystone 12584PC	15-470
Stud	4-40 UNC Stud for SK1	Eddystone 12584PC	15-470

6.20 : CONTROL KNOB TEST BOX : 1650/6/D6246

Ref	Description	Manufacturer - Type	Part No.
Knob	Digital Encoder Assy	Eddystone LP3803/1	LP3803/1
T1	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
T2	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
T3	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
T4	Crimp Terminal 4809CL	Molex 08-50-0136	33-488
Housing	4 Way housing 6471-4-1	Molex 22-01-2045	33-487
Box	Diecast box & screws	Eddystone 9830P	9830P

APPENDIX A

A.1 COMPONENT HANDLING

Lead bending. Component leads need in general, to be bent to enable the device to be fitted. The bend should be made so that the radius of the bend is not less than the diameter of the lead (or the thickness of the lead in the case of flat leads), and the lead should be supported between the body of the component and the bend. The bend should be at least 2mm (approx 1/16") from the component.

Soldering. A soldering iron having a bit temperature not exceeding 245°C may be used. The soldered joint should be completed within 5 seconds. Overheating may damage the component.

Heat Sinks. Certain devices which are required to dissipate power are fitted with heat sinks. When replacing these devices, the heat sinking arrangement should be carefully reproduced, e.g. thermal conducting compound may be used. If an insulating washer has been used, this should be replaced and thermal conducting compound applied to both sides.

MOS Devices. These have an exceptionally high input resistance and they are susceptible to damage when exposed to high electrical charges. To avoid possible damage the following procedures should be followed:

1. Devices should be stored and transported in contact with a conductive material.

2. Soldering iron, bench surface, tools etc., should all be earthed. The operator should be earthed using a 1M ohm series resistor.

3. The equipment should be switched off when devices or boards are inserted or removed.

4. Nylon clothing should not be worn.

Anti-static precautions take an added importance in dry weather (relative humidity less than 30%).

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A.2 FIRST AID IN CASE OF ELECTRIC SHOCK

The Royal Life Saving Society recommends the **Expired Air** *method of artificial respiration for use in any case of electric shock.* **It is comparatively simple and produces the best and quickest results when correctly applied.** *It also has an important advantage over the accepted manual methods in that* **it can be carried out in awkward situations in confined spaces,** *such as might well be encountered at sea.*

However, where there is a facial injury, or if the patient is trapped in a face downwards position, *it might be necessary to use a manual method of artificial respiration: of this type the* **Holger Nielson** *method is considered the most satisfactory*

Directions for applying both methods are therefore given.

EXPIRED AIR METHOD OF ARTIFICIAL RESPIRATION

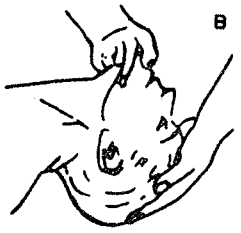
It is essential to commence artificial respiration without delay.

DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until the circuit is broken.

SWITCH OFF. If this is not possible, **PROTECT YOURSELF** with dry insulating material and pull the victim clear of the conductor.

1. **Lay the patient on his back** and, if on a slope, have the stomach slightly lower than the chest.

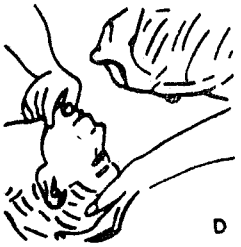
2. **Make a brief inspection of the mouth and throat** to ensure that they are clear of obvious obstruction.



3. **Give the patient's head the maximum backwards tilt** so that the chin is prominent, the mouth closed and the neck stretched to give a clear airway—Fig. A.

4. **Open your mouth wide, make an airtight seal over the nose of the patient and blow.** The operator's cheek or the hand supporting the chin can be used to seal the patient's lips—Fig. B, **or if the nose is blocked,** open the patient's mouth using the hand supporting the chin; open your mouth wide and make an airtight seal over his mouth and blow—Fig. C. This may also be used as an alternative to the mouth-to-nose technique.

5. **After exhaling, turn your head to watch for chest movement** whilst inhaling deeply in readiness for blowing again—Fig. D.



6. If the chest does not rise, check that the patient's mouth and throat are free of obstruction and the head is tilted backwards as far as possible. Blow again.

Send for medical assistance if possible.

HOLGER NIELSON METHOD OF ARTIFICIAL RESPIRATION

It is essential to commence artificial respiration without delay.

DO NOT TOUCH THE VICTIM WITH YOUR BARE HANDS until the circuit is broken.

SWITCH OFF. If this is not possible, **PROTECT YOURSELF** with dry insulating material and pull the victim clear of the conductor.

1. **Lay patient face downwards** with the forehead resting on the hands, placed one above the other.

2. **Remove false teeth, tobacco or gum** from patient's mouth; make sure the **tongue is free** by firm blows between the shoulders with the flat of the hand.

3. **Kneel on one knee at patient's head,** one foot by the patient's elbow.

4. **Place palms of your hands on patient's shoulder blades**—Fig. A.

5. **Rock forward until arms are vertical,** the pressure should be light and without force (22–30 lb. is sufficient); this should take 2½ seconds—Fig. B.

6. **Release the pressure** by allowing the hands to slide down the arms to the patient's elbow (approximately 1 second) then raise the patient's arms and shoulders slightly pulling at the same time by swinging backwards (approximately 2½ seconds)—Fig. C, lower the patient's arms—Fig.D, and return your hands to the patient's shoulder blades.

7. **Repeat the movements** taking 7 seconds for each complete respiration.

8. **While artificial respiration is continued, have someone else—**

   (*a*) Loosen patient's clothing.

   (*b*) Keep patient warm.

9. **If patient stops breathing, continue artificial respiration.** Four hours or more may be required

10. **Do not give liquids until patient is conscious.**

Send for medical assistance if possible.

A.3 HEALTH & SAFETY AT WORK ACT 1974 (UNITED KINGDOM

The objective of this Act is to maintain or improve standards of health, safety and welfare of persons at work, and to protect persons at work and others, against risks to health, safety and welfare.

To the best of current knowledge, there is no risk to health or safety when Eddystone equipment is installed and operated properly, provided it has been properly maintained.

Precautions have been taken during the design and manufacture of this equipment to reduce the risks involved when repairing or maintaining the equipment but a certain degree of risk must always be present, particularly under fault conditions. The list below has been prepared to draw attention to the general risks envisaged; further information is available from Eddystone Radio Limited, at any time.

1. **Electric Shock**
   Beware mains voltage and induced aerial voltages, ensure metal chassis is properly bonded to earth. Some units generate a high voltage even when the equipment is operated from a battery supply. Circuitry operating at low voltage is not necessarily at or near earth potential.

2. **Physical Strain**
   Obtain assistance if a heavy unit is to be lifted or removed from an equipment rack.

3. **Explosion and Implosion**
   Cathode ray tubes may implode if carelessly handled or dropped.
   Use protective masks and gloves.
   Electrolytic capacitors may explode if subjected to excessive voltage or voltage of incorrect polarity, and toxic materials may be released.

4. **Burns**
   Resistors and power transistors (for example) may attain a high temperature. Aviod contact with these.

5. **X-Rays**
   Cathode ray tubes operated at excessive voltage may generate harmful X-rays.

6. **Soldering**
   Beware of flying droplets of molten solder and careless use of soldering irons (place in a proper stand when not in use). Avoid fumes. Do not handle food or drink, cigarettes, etc., without washing hands (risk from lead poisoning).

7. Cleaning Solutions

Certain solutions give off flammable or toxic fumes, e.g., trichloroethylene and its derivatives. Do not smoke and avoid inhalation of vapours.

8. Disposal of Faulty Components

Certain components contain toxic materials which may be released if the component is broken or disposed of carelessly, e.g., semi conductor devices containing poisonous metallic compunds; electrolytic capacitors containing poisonous organic compounds.

TREATMENT FOR BURNS

1. No attempt should be made to remove clothing adhering to the burn.

2. If other help is available, or as soon as artificial respiration is no longer required, cover the burn with a dry dressing.

3. Oil or grease in any form should not be applied.

4. Warm, weak, sweet tea may be given when the patient is able to swallow.

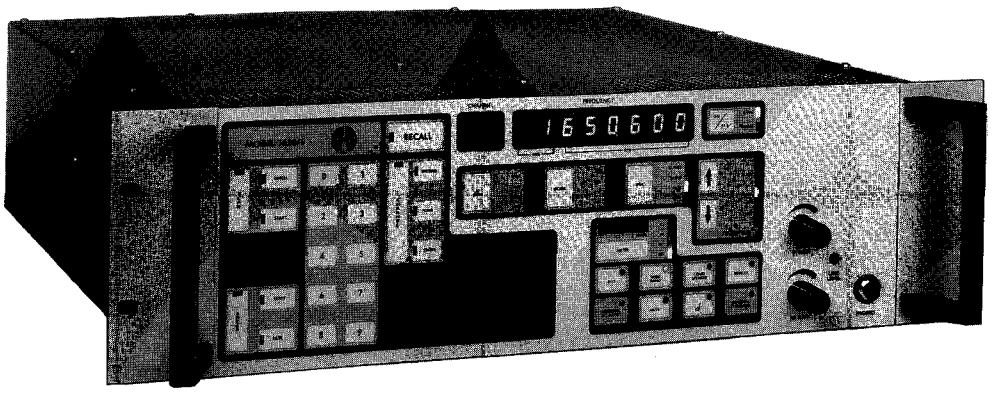
These instructions are approved by The Royal Life Saving Society. A handbook and charts dealing with Artificial Respiration can be obtained from the Society at 14 Devonshire Street, London, W.1.

Eddystone

1650/6 RECEIVER

PART 2

INSTALLATION NOTES OPERATING INSTRUCTIONS AND SERVICE DATA



Eddystone Radio

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1650/6 HANDBOOK INDEX

- PART 2 -

DIAGRAMS AND WAVEFORMS (Blue Pages)

PCB ILLUSTRATIONS (Light Green Pages)

CIRCUIT DIAGRAMS

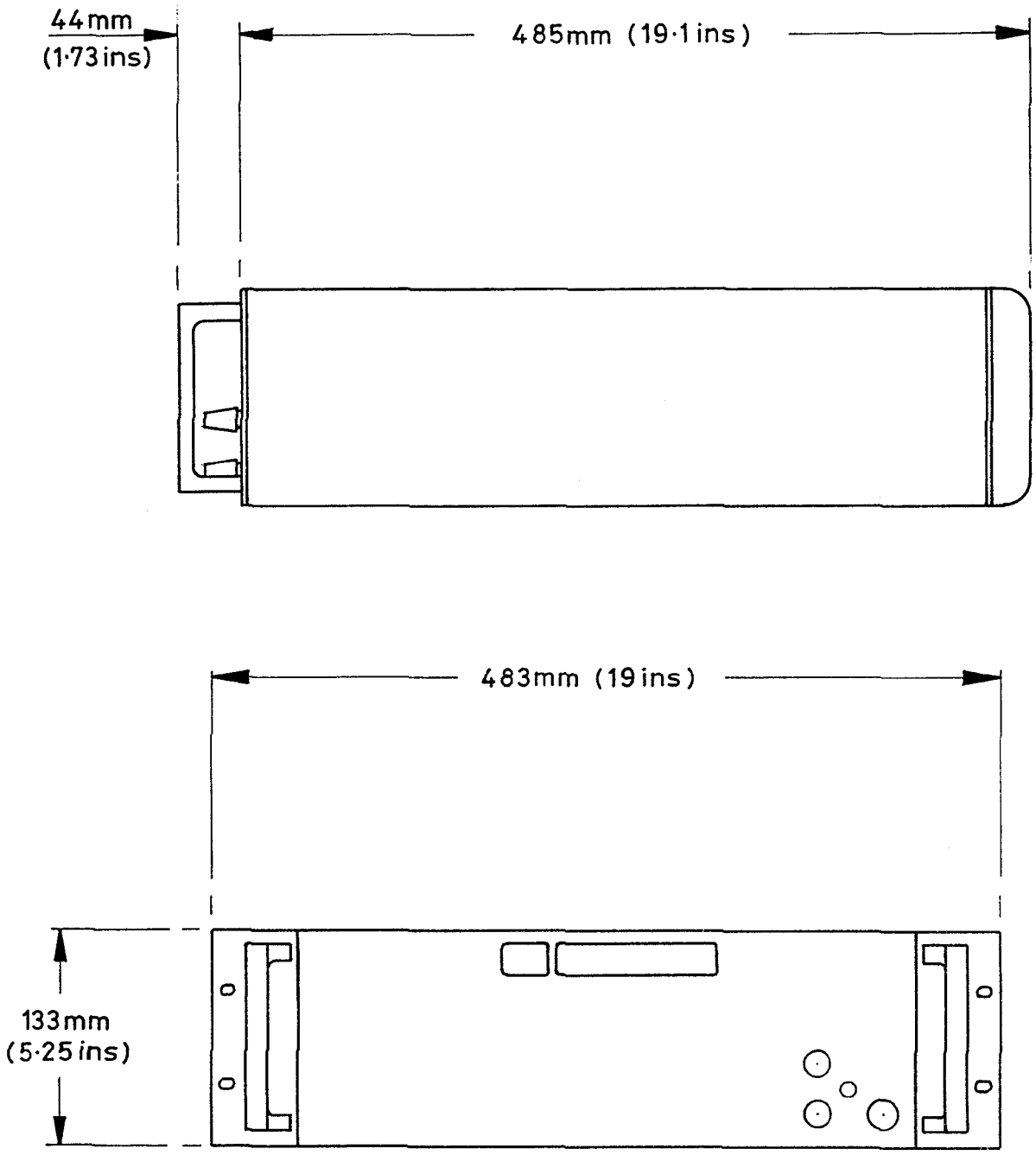
Cct. Ref.	Module Title	Drg. No.
1	CHASSIS INTERCONNECTIONS & MISC. MODULES	BP2021
2	INPUT LOW PASS FILTER	BP2021
3	Not Allocated	
4	Not Allocated	
5	Not Allocated	
6	Not Allocated	
7	RF & 1st IF BOARD	BP1968
8	SYNTHESISER AND VCO BOARD	BP1828
9	VCO CIRCUIT	BP1828
10	MAIN IF/AUDIO BOARD	BP1827
11	FRONT PANEL DISPLAY BOARD	BP1975
12	INTERFACE BOARD	BP2025
13	MICROCOMPUTER BOARD	BP1556
14	POWER SUPPLY BOARD	BP2021
	RX SIGNAL CIRCUITS BLOCK DIAGRAM	BP2022
	RX SYNTHESISER CIRCUITS BLOCK DIAGRAM	BP2023
	RX CONTROL AND MCU CIRCUITS BLOCK DIAGRAM	BP2042
	SIMPLIFIED EXECUTIVE PROGRAM FLOWCHART	BP2024
15	1650/6/D6245 ANCILLARIES TEST BOX	BP2019
16	1650/6/D6247 FRONT PANEL TEST BOX	BP2038
17	1650/6/D6248 VCO TEST BOX	BP2037
18	1650/6/D6249 1.4MHz IF I/P PAD	BP2039
19	1650/6/D6250 REMOTE BREAKOUT BOX	BP2036

CONTROL AND CONNECTOR LAYOUTS

	1650/6 RECEIVER FRONT PANEL LAYOUT	BP2028
	1650/6 RECEIVER REAR PANEL LAYOUT	BP2029

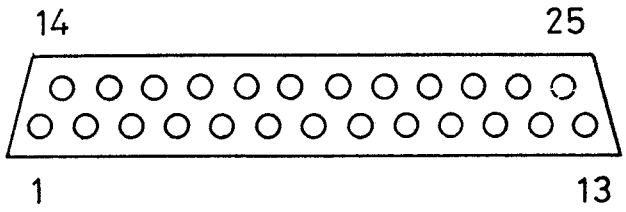
APPENDIX B (Dark Green Pages)

First Edition.....1650/6 Handbook Part 2. May 1988.



Dimensions of Receiver

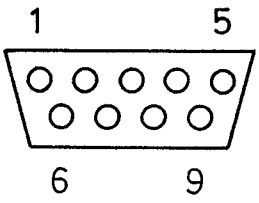
Figure 2.1



VIEW INTO 25 WAY FEMALE CONNECTOR

ANCILLARIES Connector

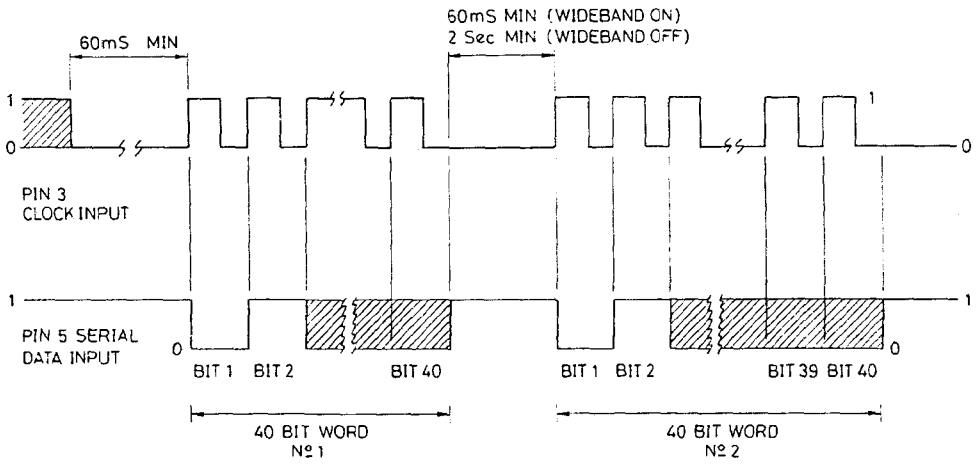
Figure 2.2



VIEW INTO 9 WAY MALE CONNECTOR

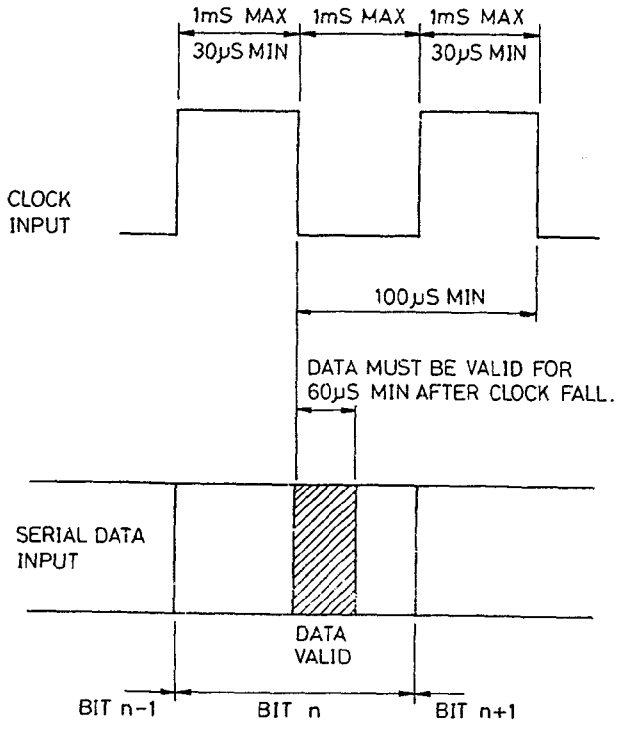
REMOTE Connector

Figure 2.3



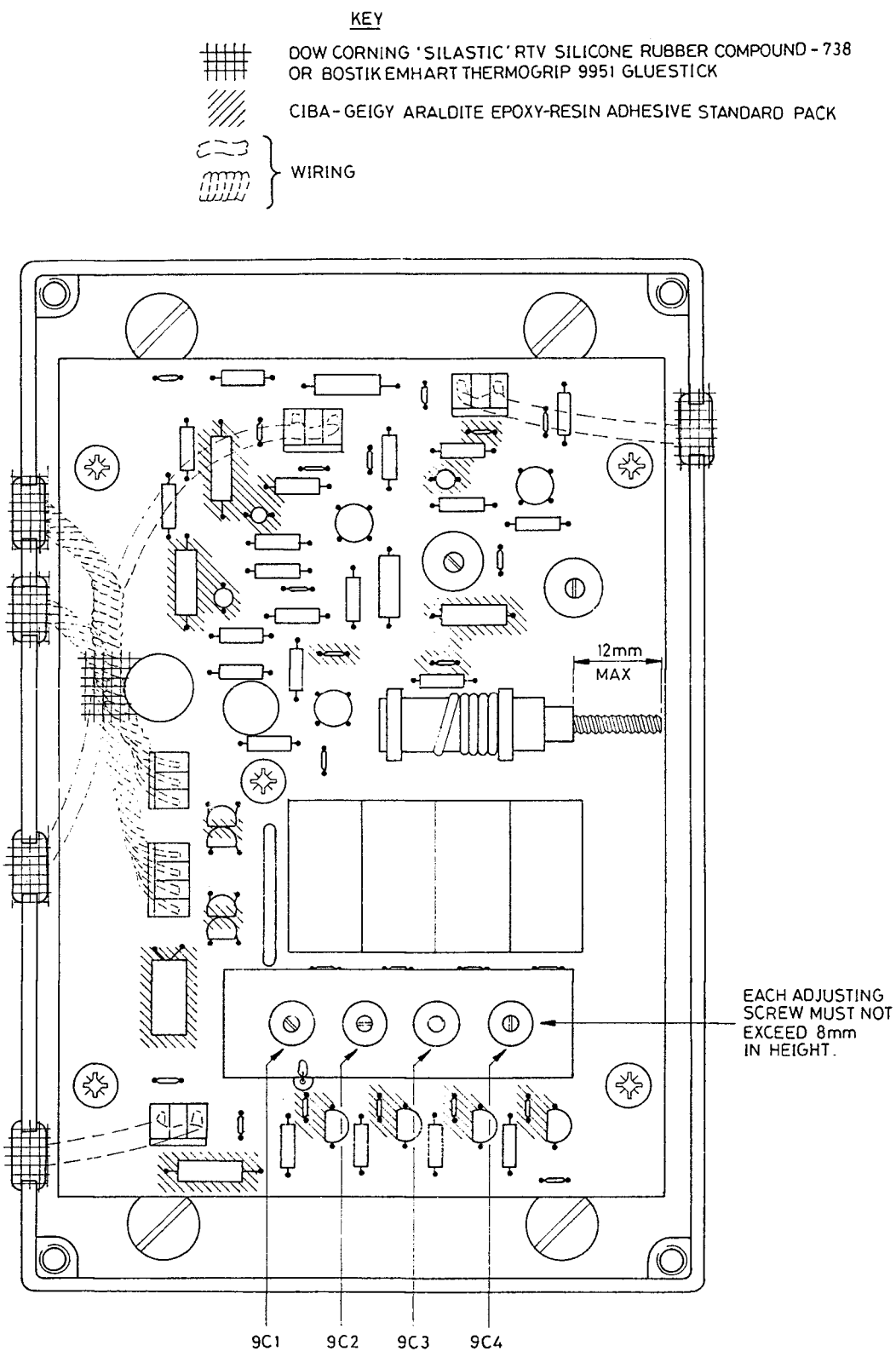
Data Inputs

Figure 3.2



Individual Bit Timing

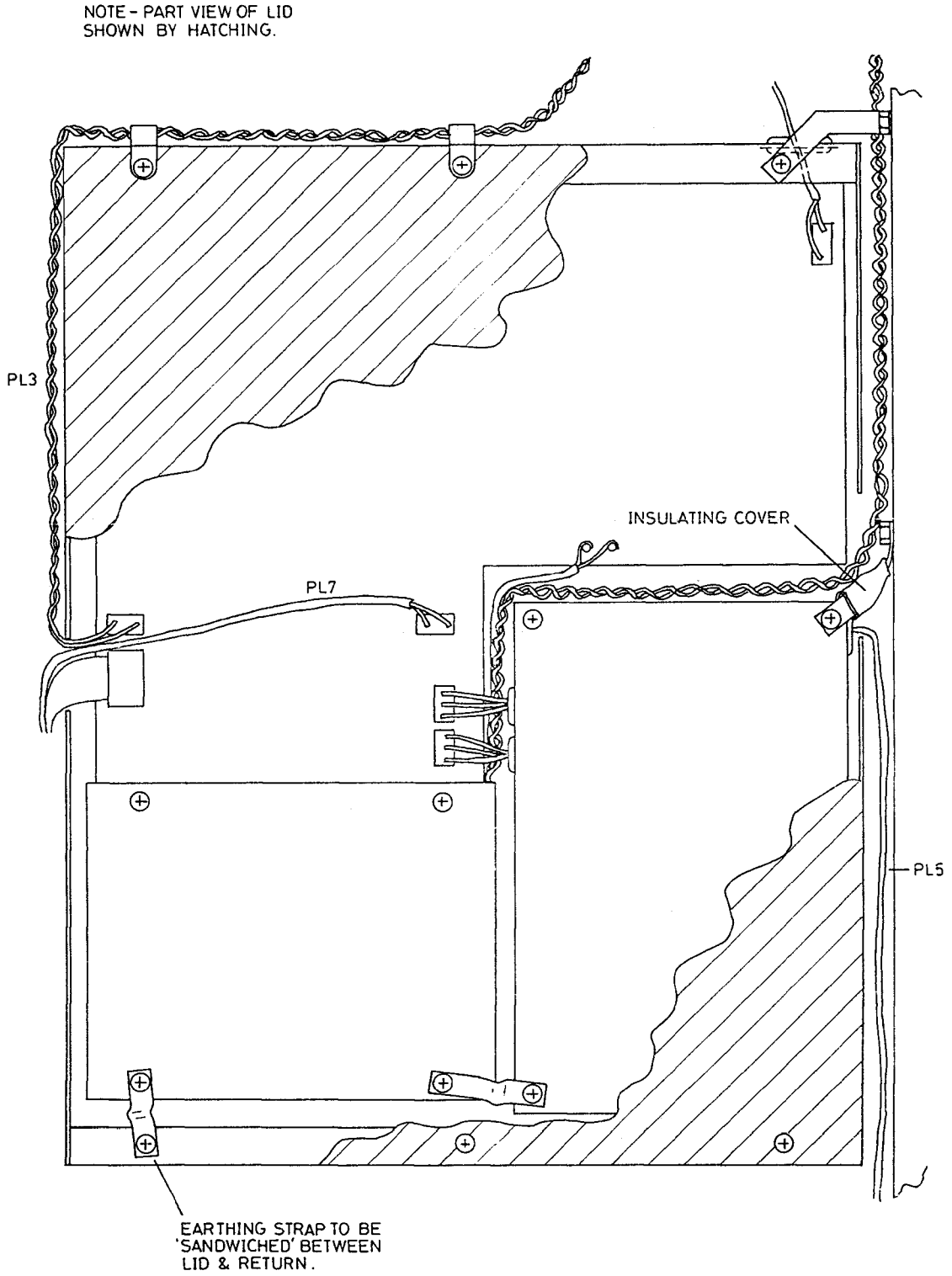
Figure 3.3



VCO BOARD DETAILS

VCO Board Details

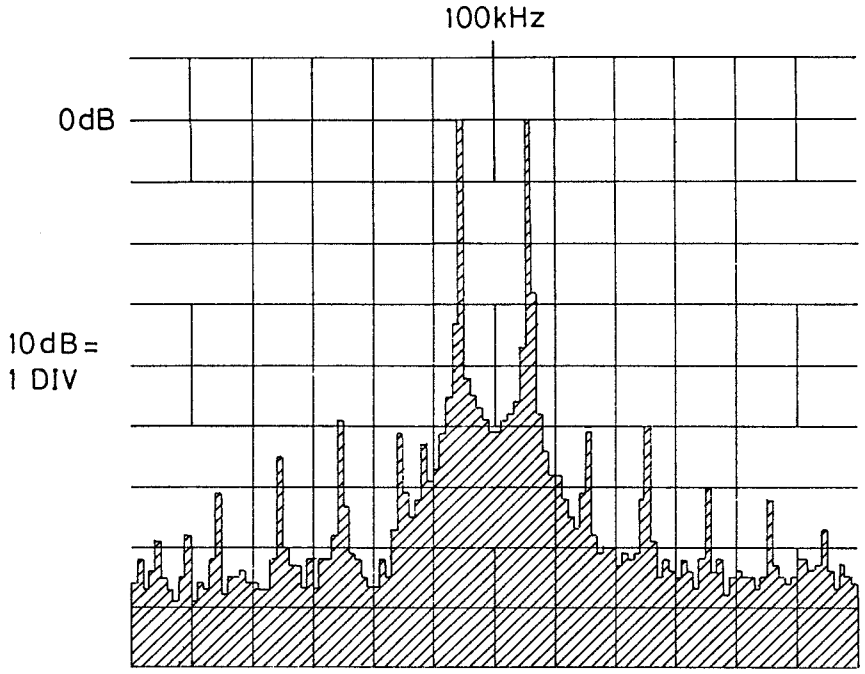
Figure 5.1



Earth Strap/Wiring Position in Synthesiser Box

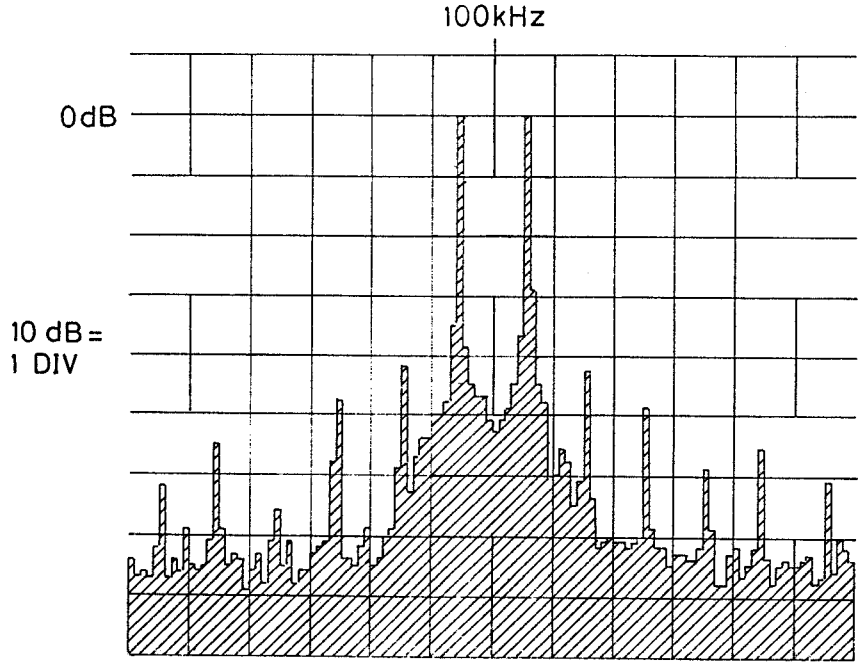
Figure 5.2

MARCONI TF2370 SPECTRUM ANALYSER



1kHz = 1 DIV

IN BAND IPs AGC SLOW



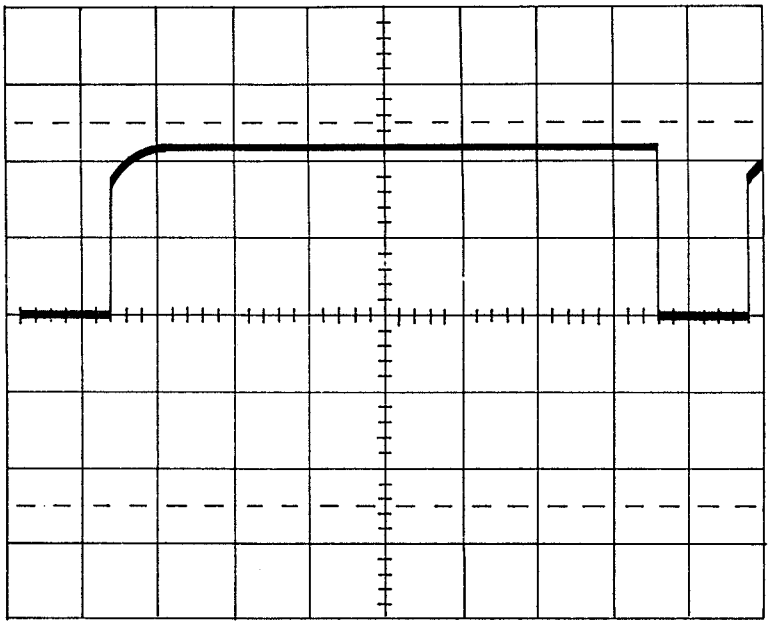
1kHz = 1 DIV

IN BAND IPs AGC FAST

In-Band Intermodulation Products (IF O/P)

Figure 5.3

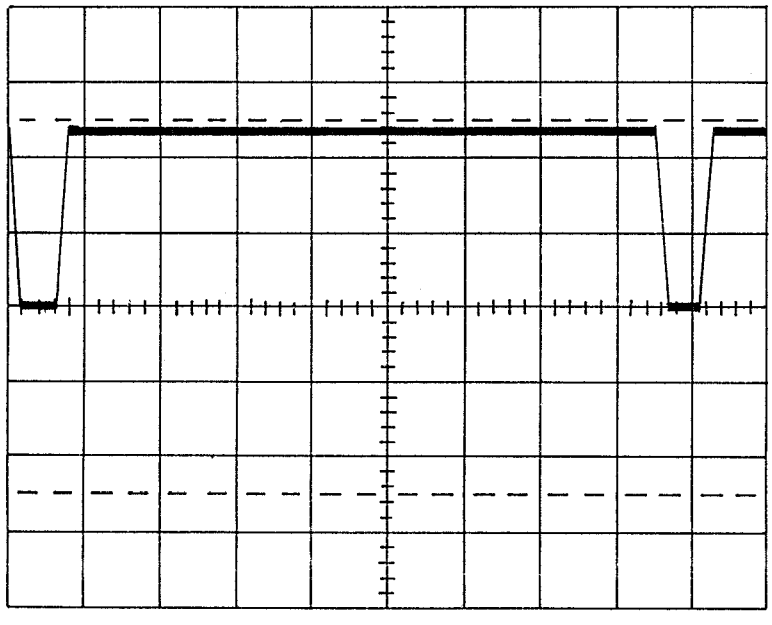
TEKTRONIX 485



Address Strobe Test (1)

Figure 5.4

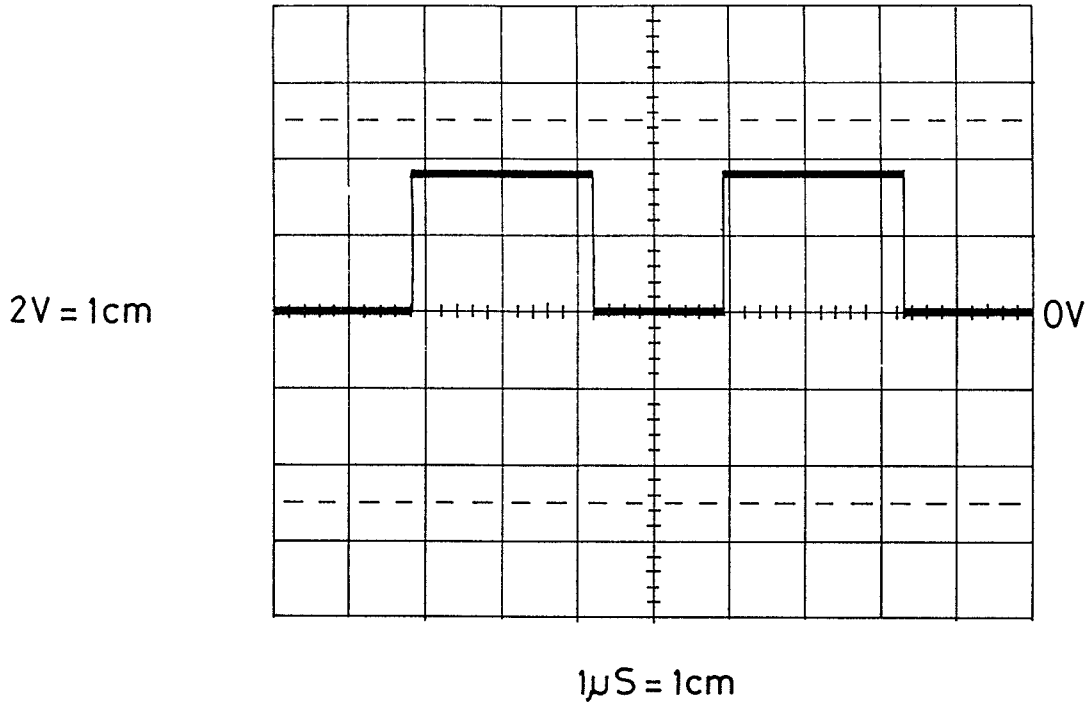
TEKTRONIX 485



Address Strobe Test (2)

Figure 5.5

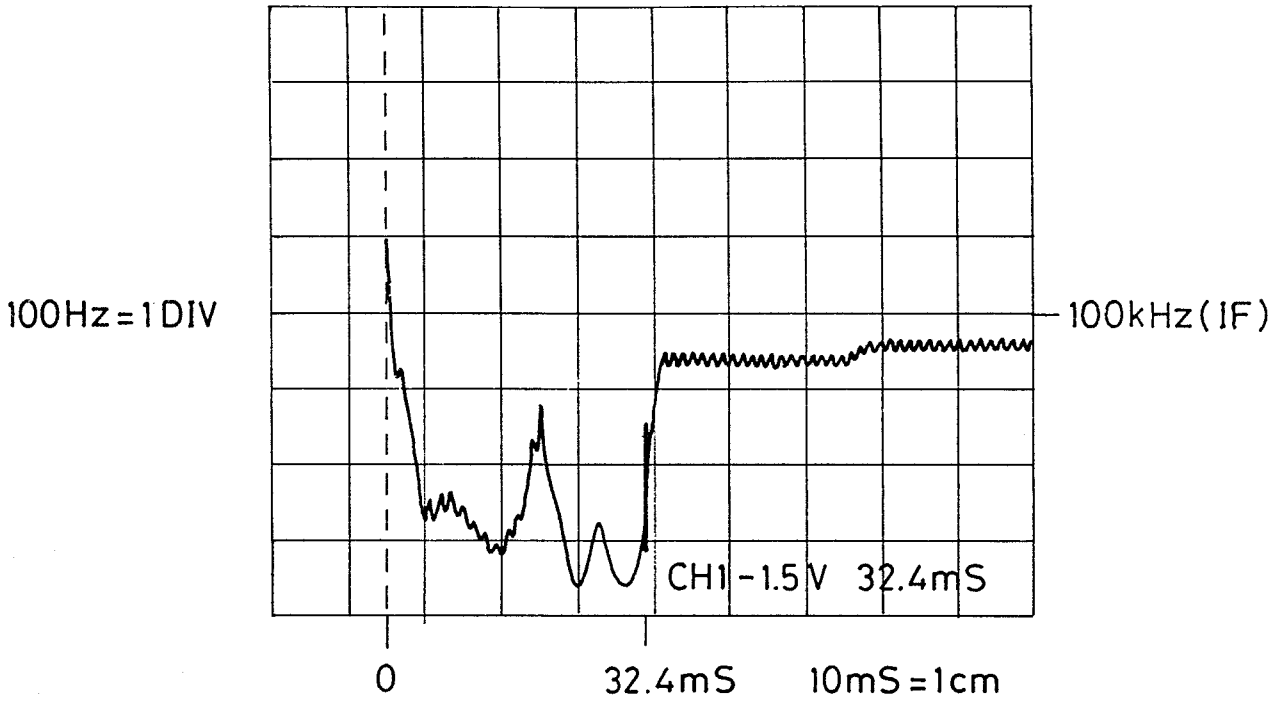
TEKTRONIX 485



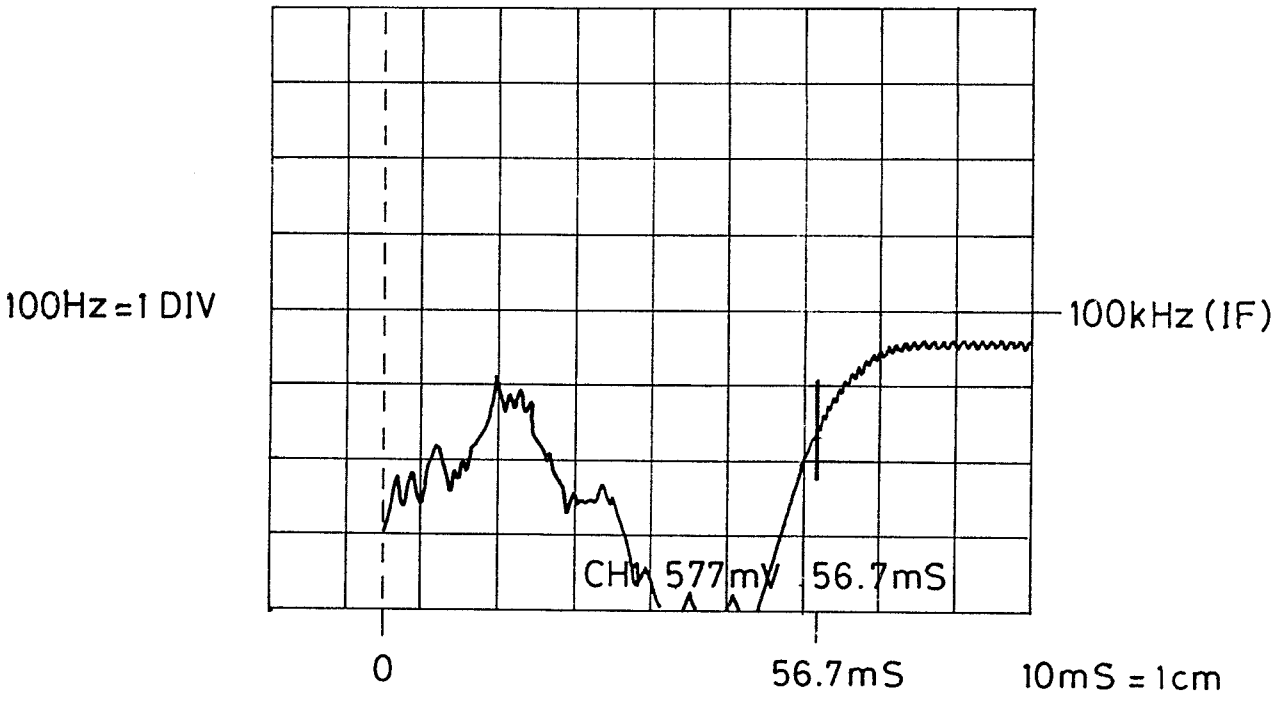
Output Control Test

Figure 5.6

GOULD 1425 DIGITAL STORAGE OSCILLOSCOPE



FROM 1MHz TO 2MHz (AGC FAST)

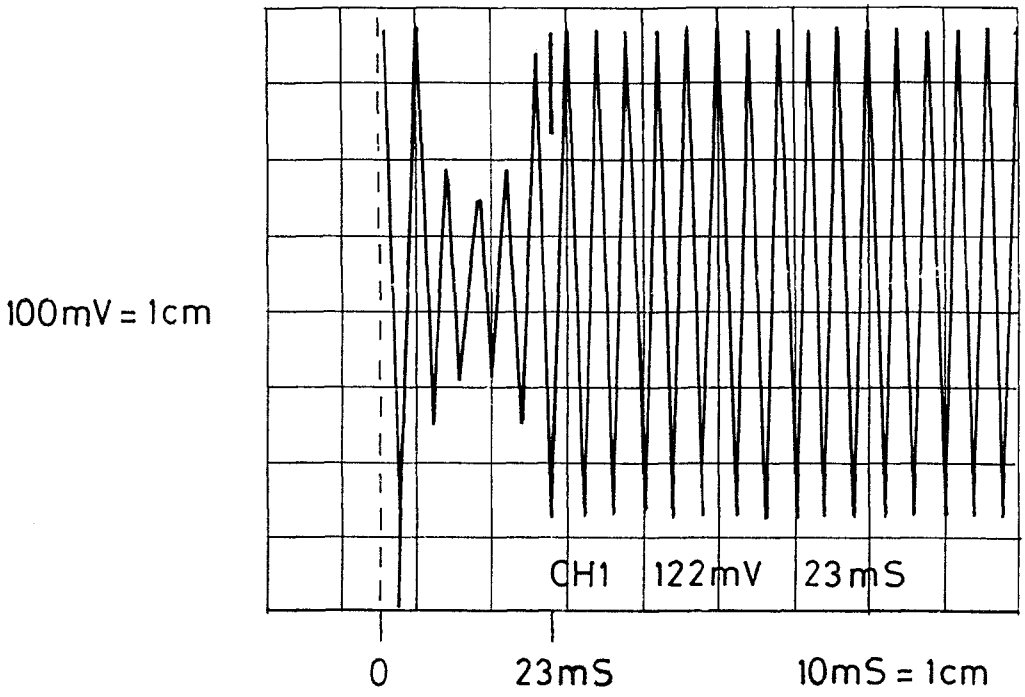


FROM 1MHz TO 29·701MHz (AGC FAST)

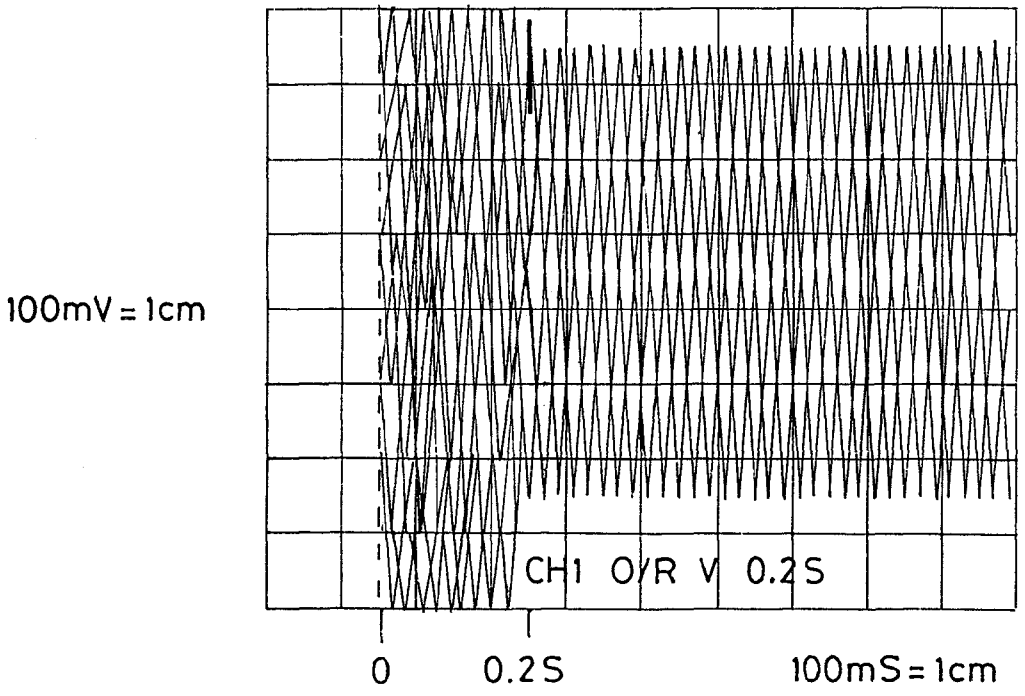
Remote Switching Time

Figure 5.7

GOULD 1425 DIGITAL STORAGE OSCILLOSCOPE



AGC FAST ATTACK

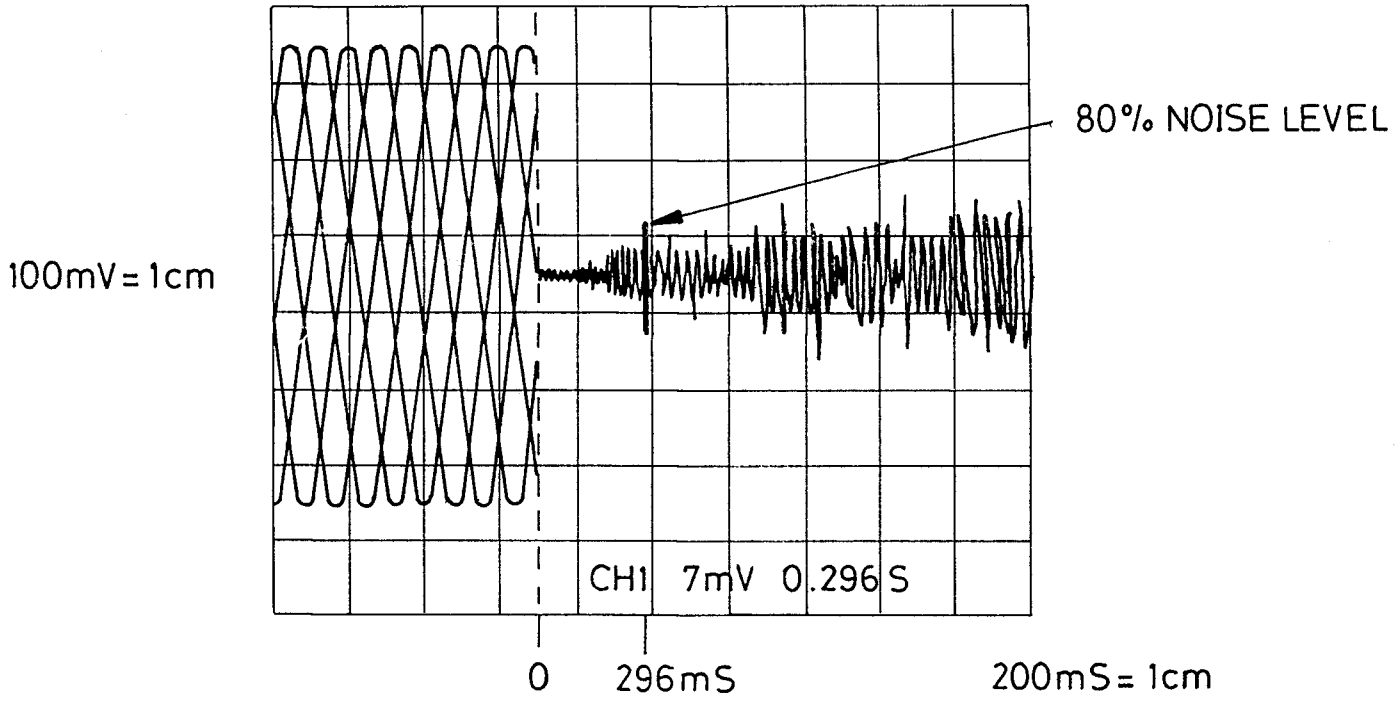


AGC SLOW ATTACK

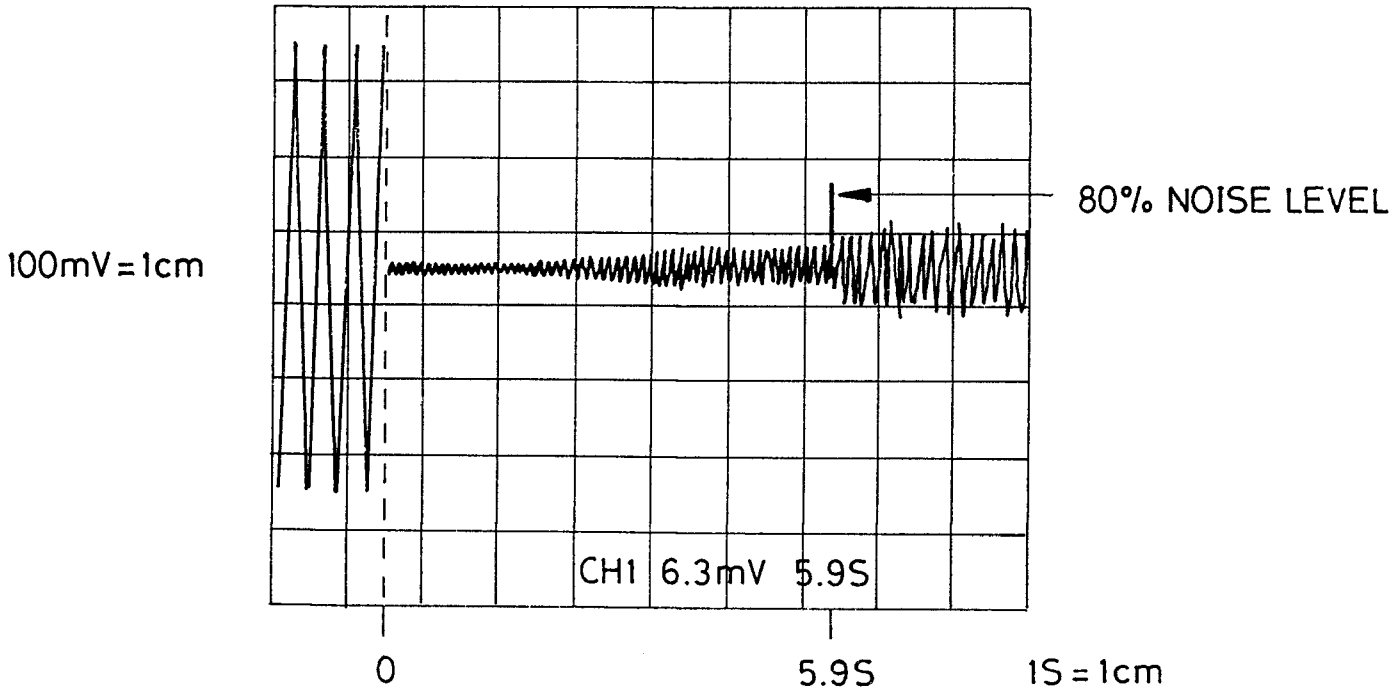
AGC Attack Time

Figure 5.8

GOULD 1425 DIGITAL STORAGE OSCILLOSCOPE



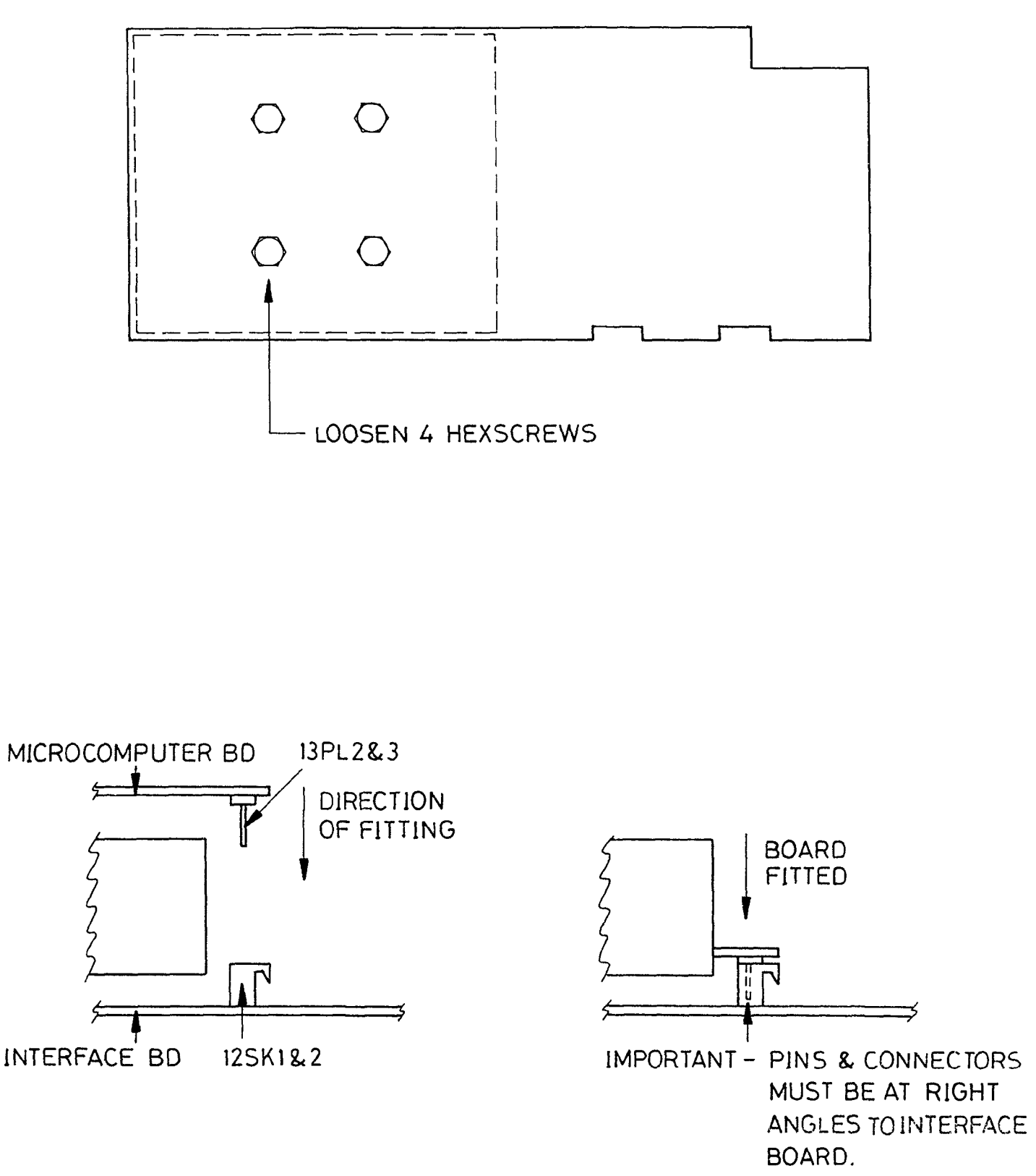
AGC FAST DECAY



AGC SLOW DECAY

AGC Decay Time

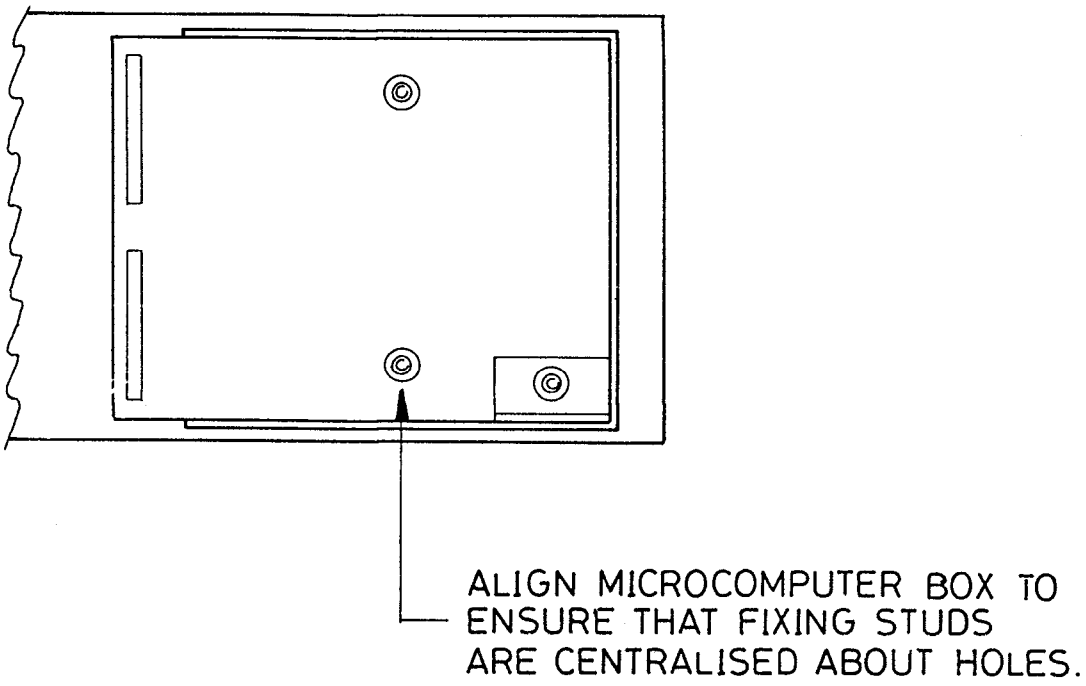
Figure 5.9



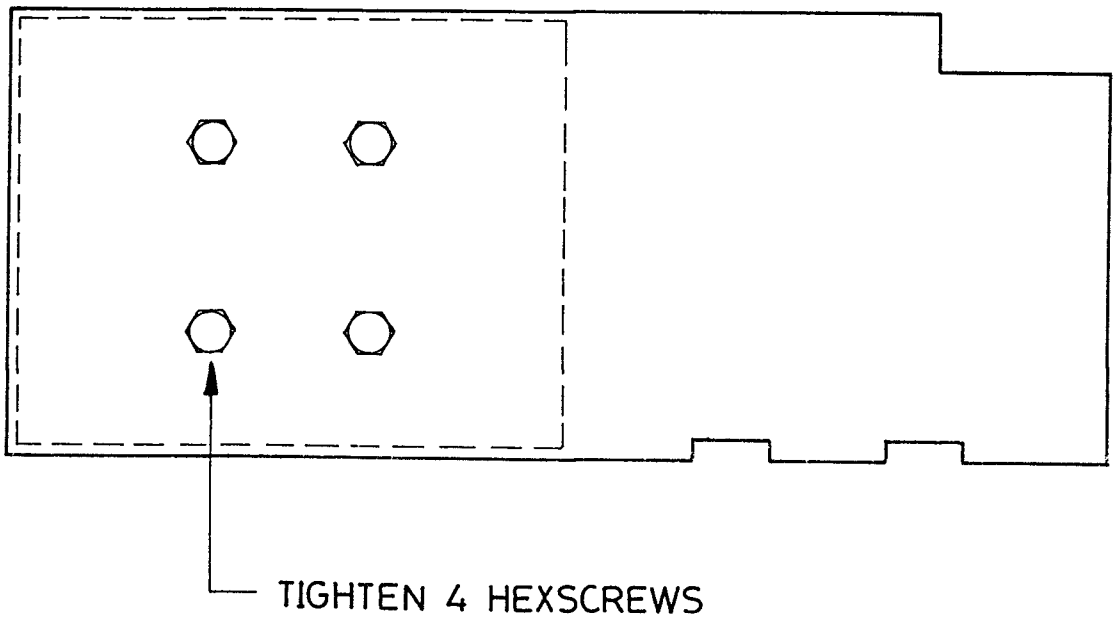
Microcomputer Alignment (1)

Figure 5.10

PLAN VIEW OF MICROCOMPUTER BOARD IN POSITION



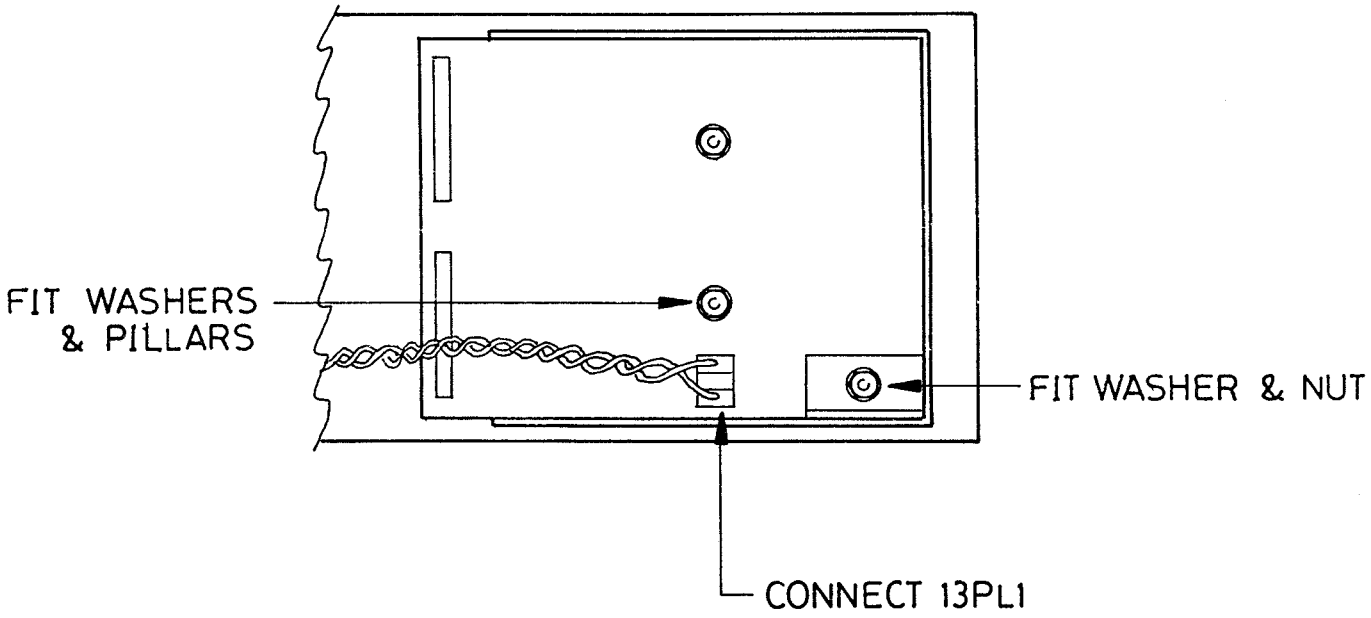
UNDERSIDE OF INTERFACE BOARD



Microcomputer Alignment (2)

Figure 5.11

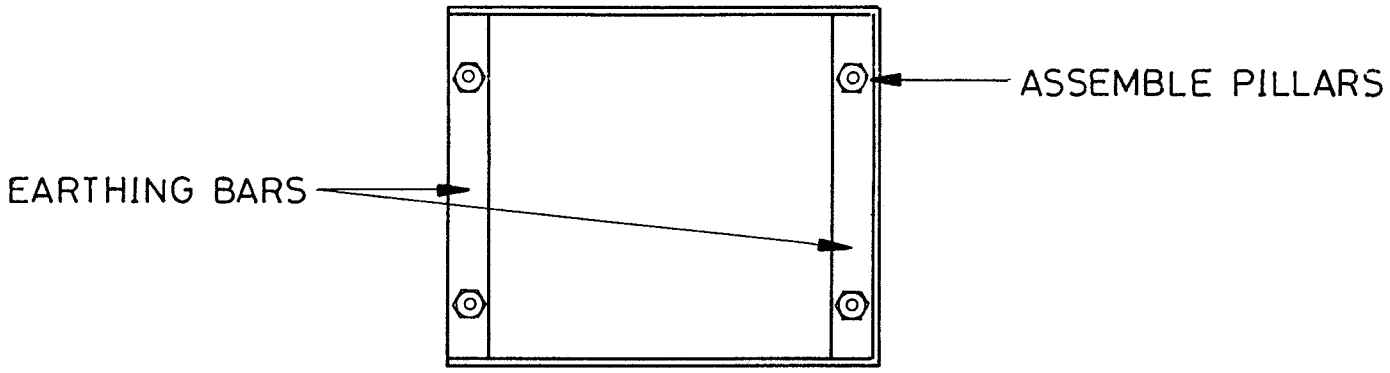
PLAN VIEW OF MICROCOMPUTER BOARD IN POSITION



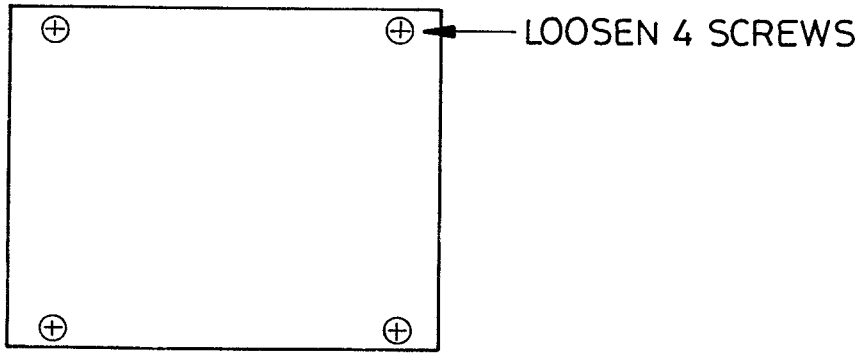
Microcomputer Alignment (3)

Figure 5.12

PLAN VIEW OF BELOW BOARD SCREEN



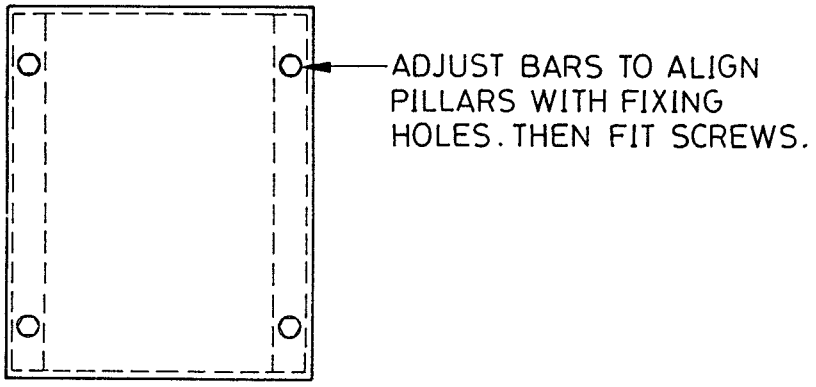
UNDERSIDE VIEW



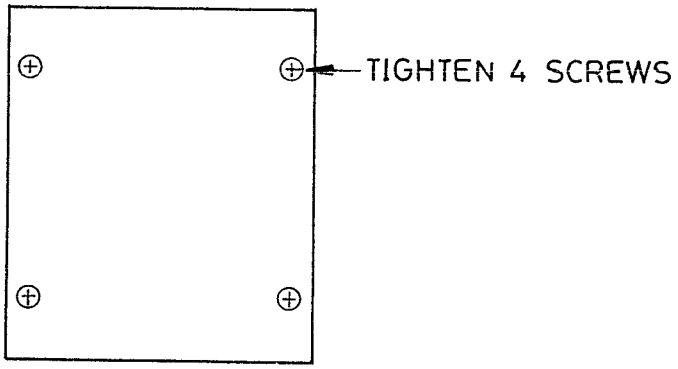
Synthesiser 'Below Board' Screen Alignment (1)

Figure 5.13

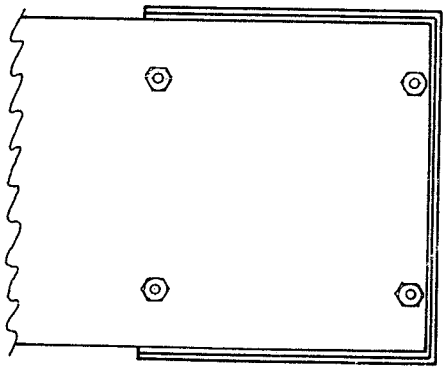
ASSEMBLE COVER



UNDERSIDE VIEW

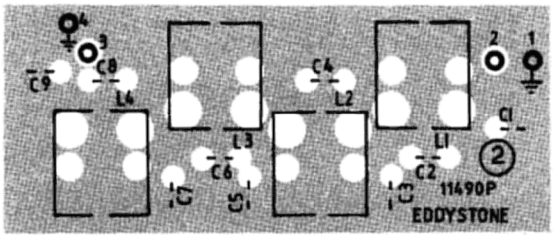


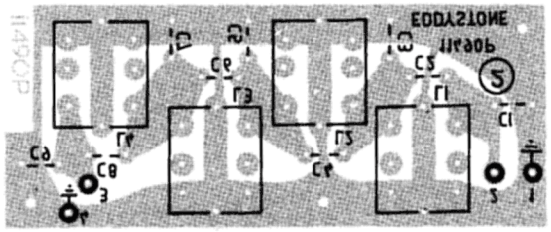
DISASSEMBLE COVER & PILLARS AND
FIX SYNTH BOARD INTO POSITION.



Synthesiser 'Below Board' Screen Alignment (2)

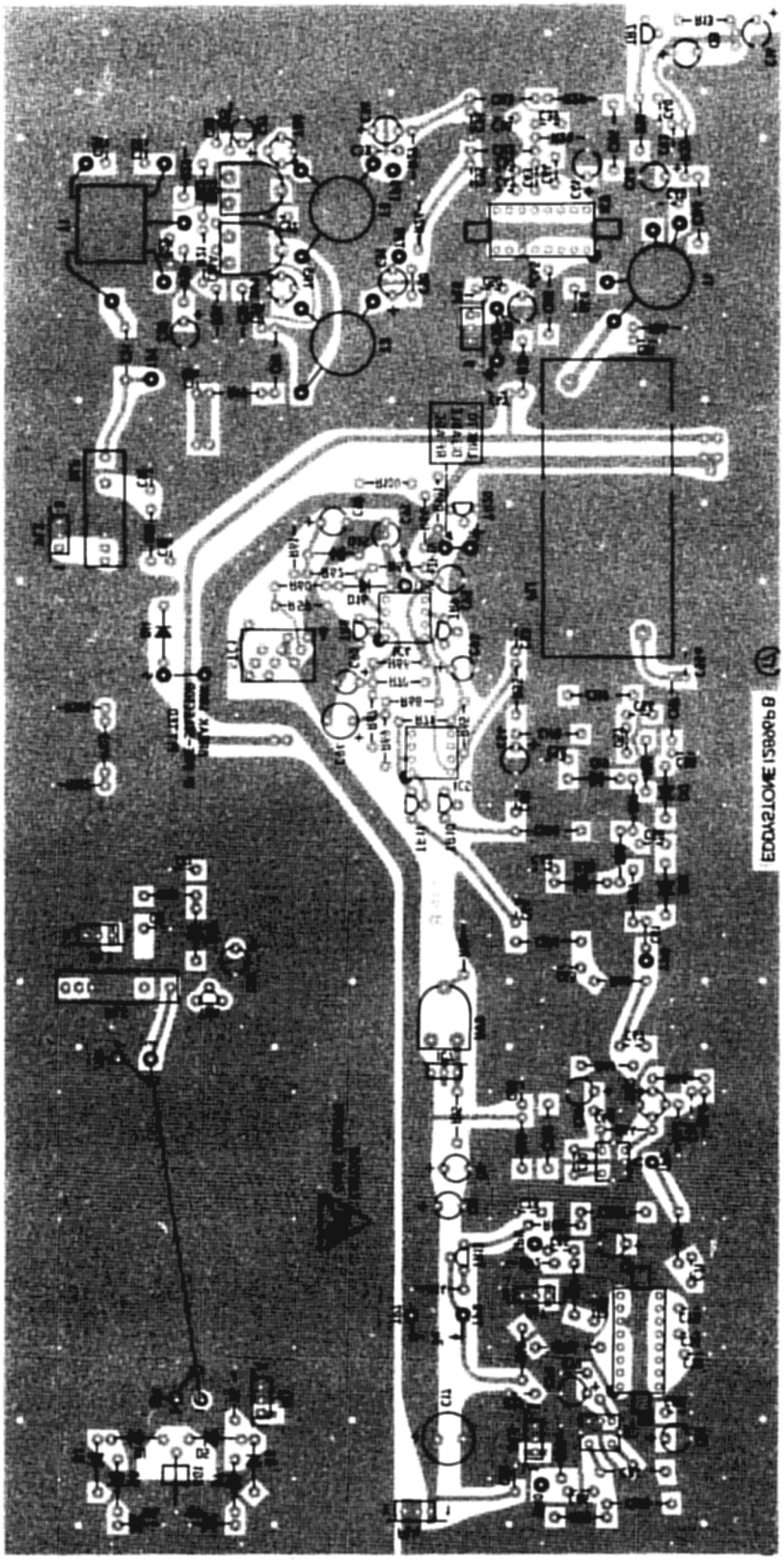
Figure 5.14





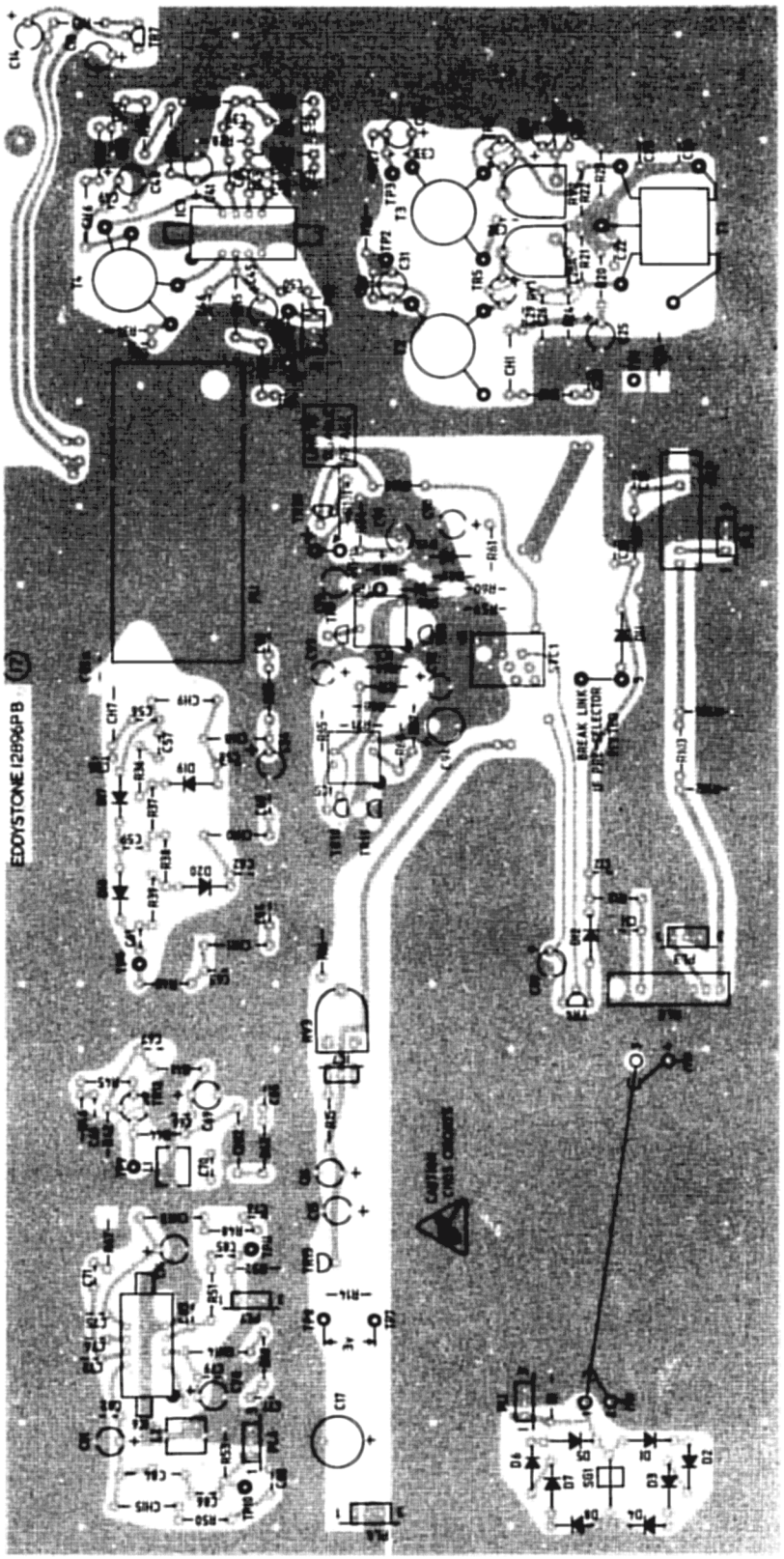
(2) Input Low Pass Filter Board

11490P : Both Faces



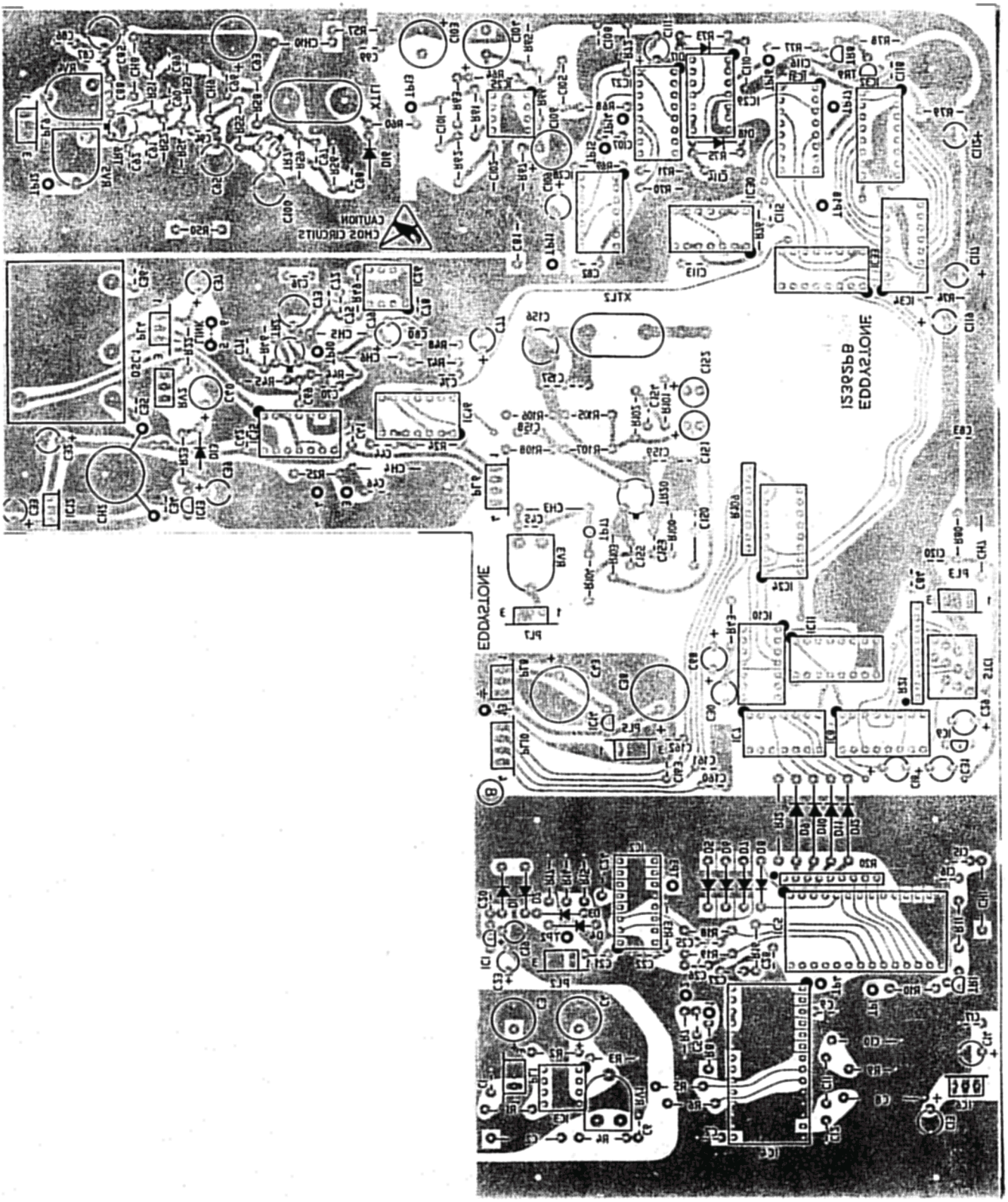
(7) RF and 1st IF Board

12896P : Wiring Face



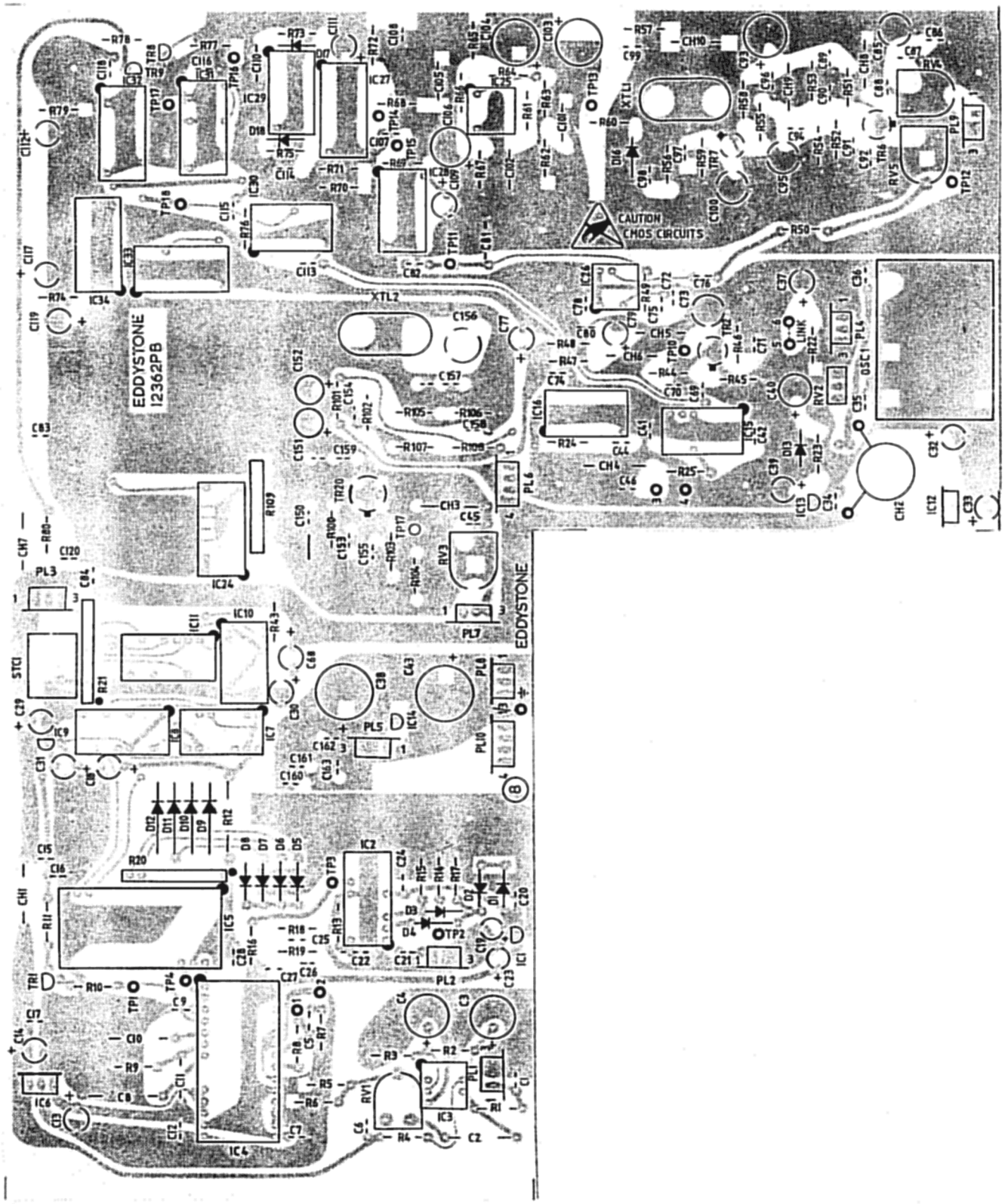
(7) RF and 1st IF Board

12896P : Component Face



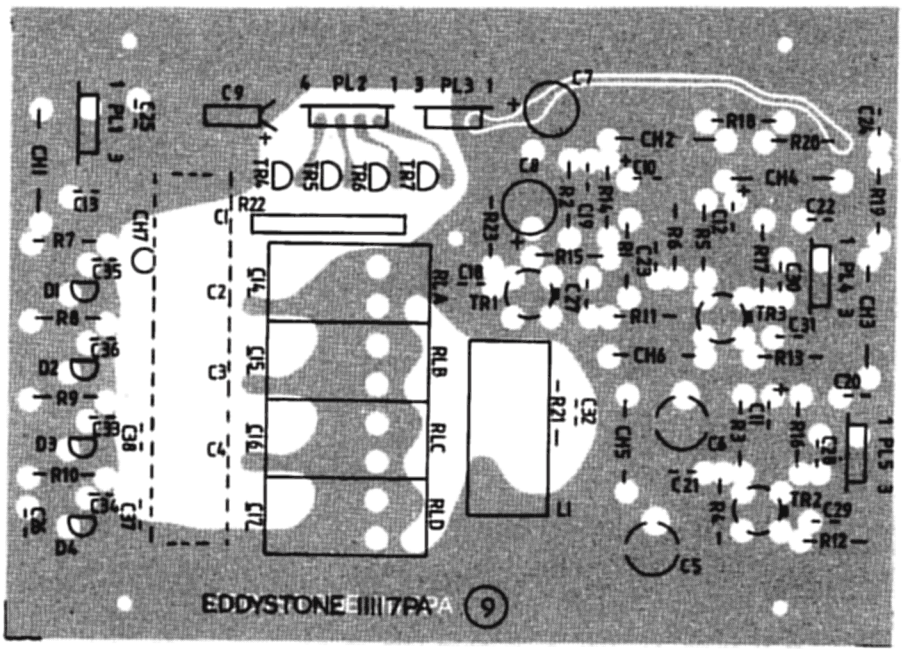
(8) Synthesiser Board

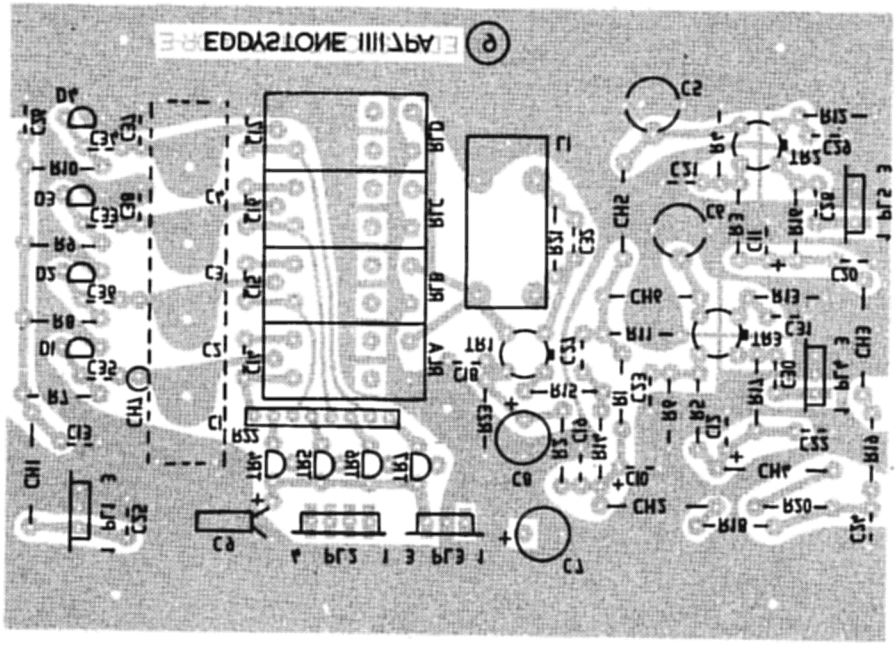
12362P : Wiring Face



(8) Synthesiser Board

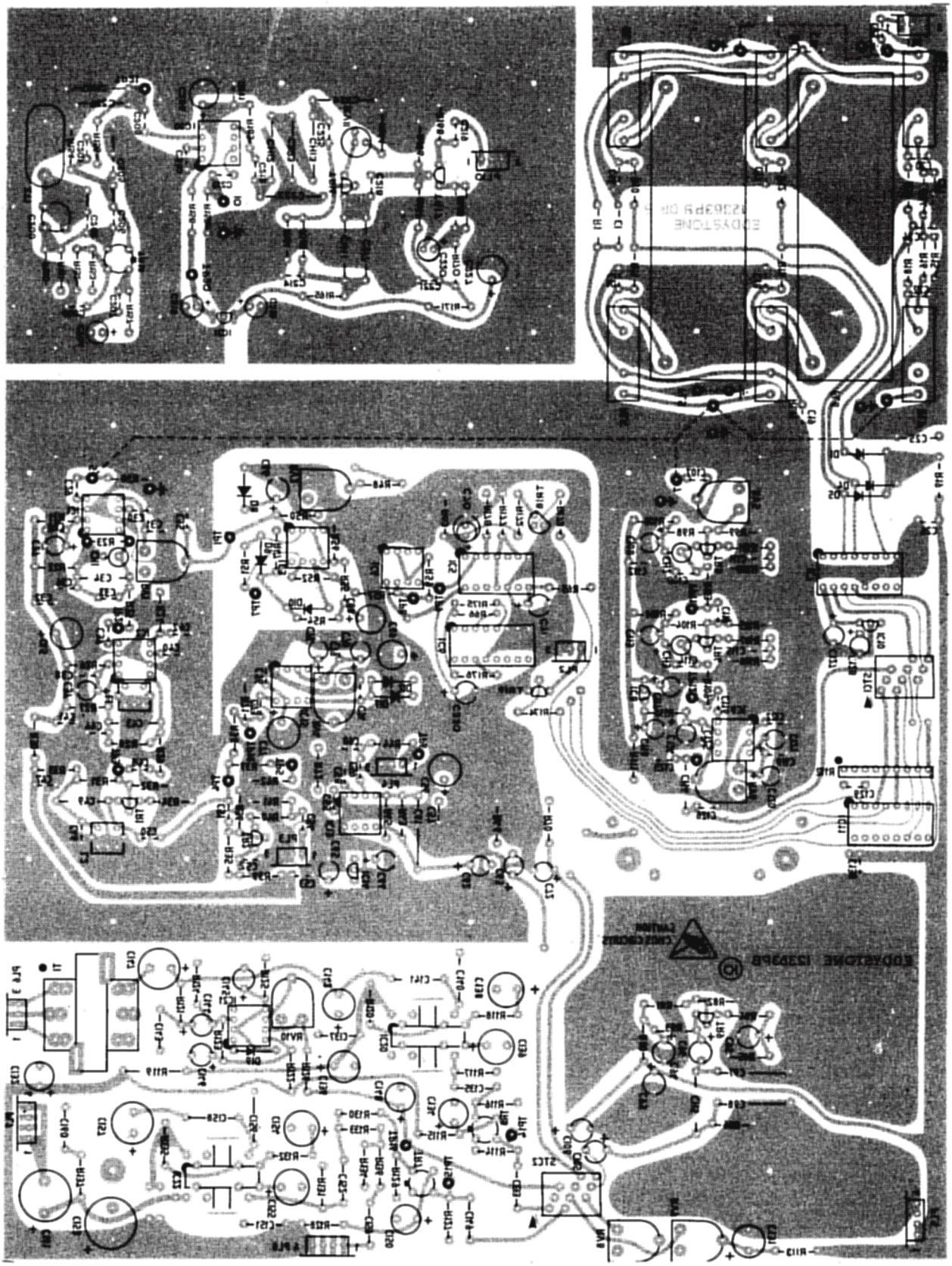
12362P : Component Face





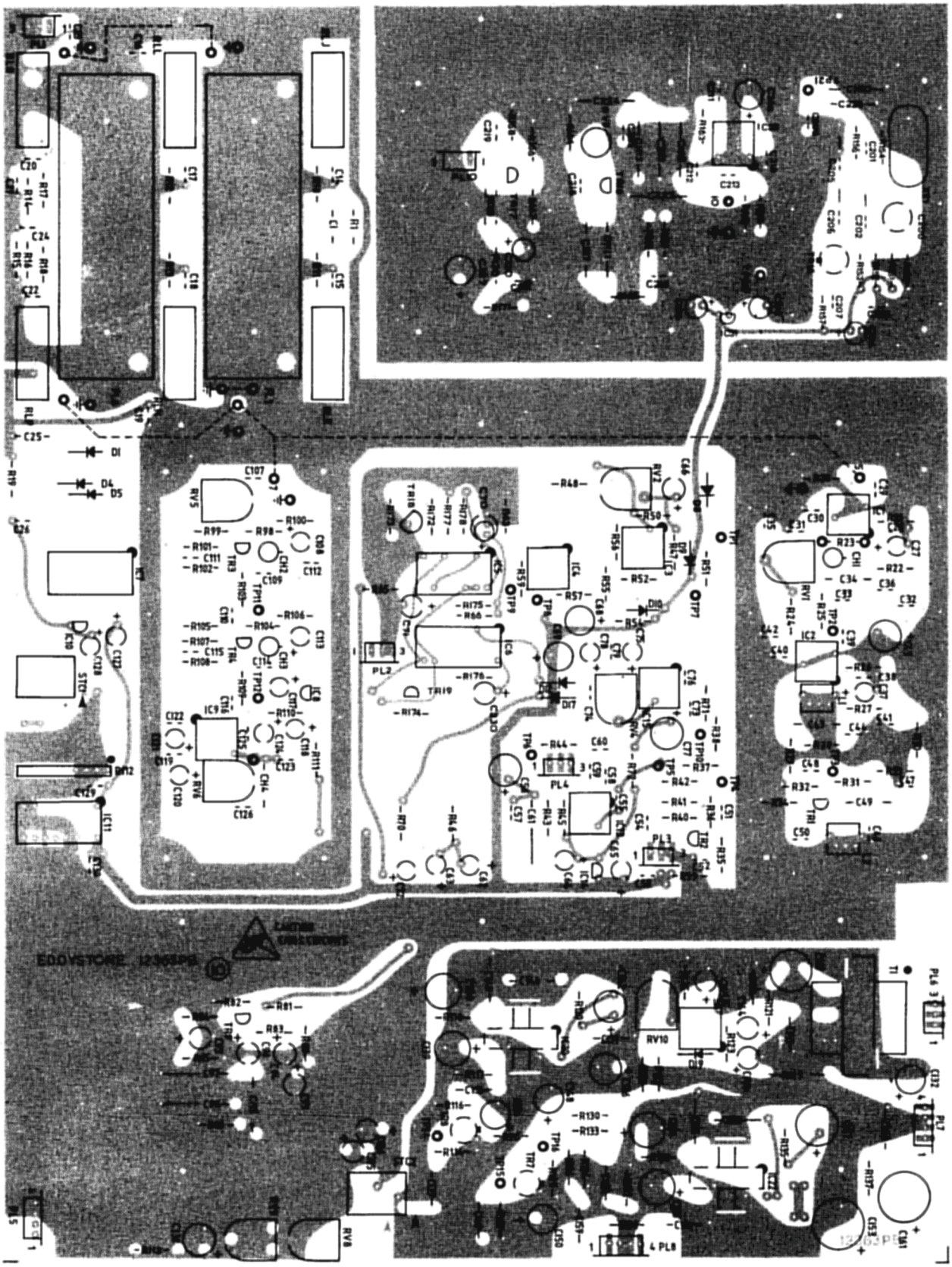
(9) VCO Board

11117P : Both Faces



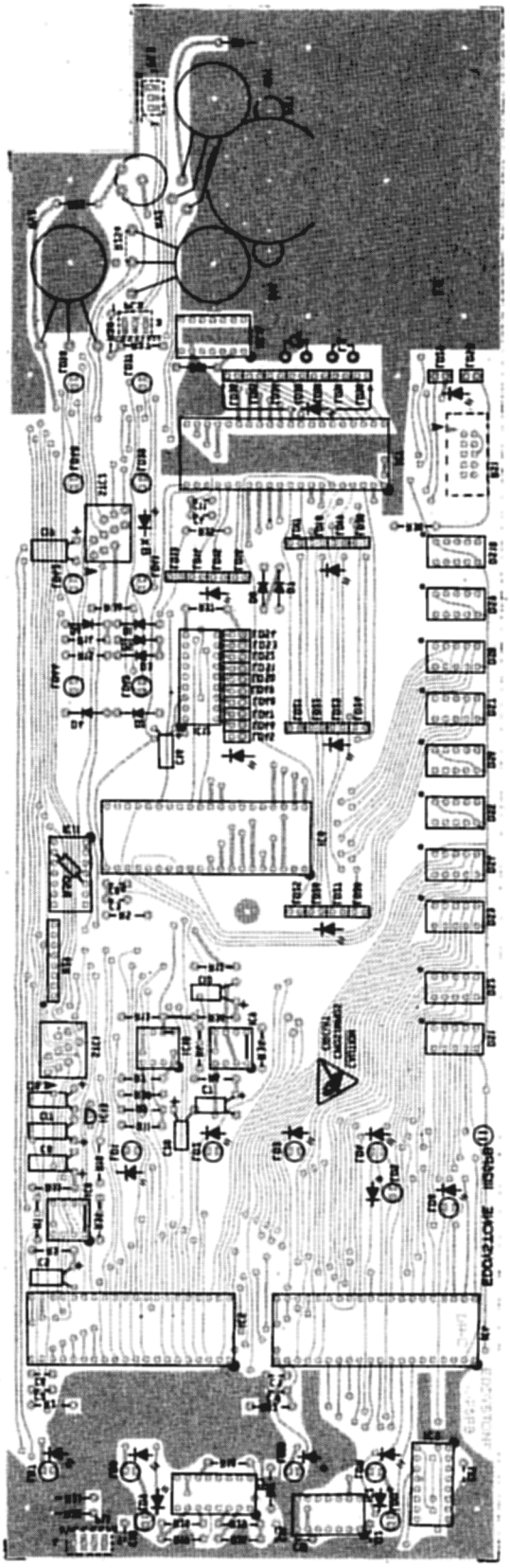
(10) Main IF/Audio Board

12363P : Wiring Face



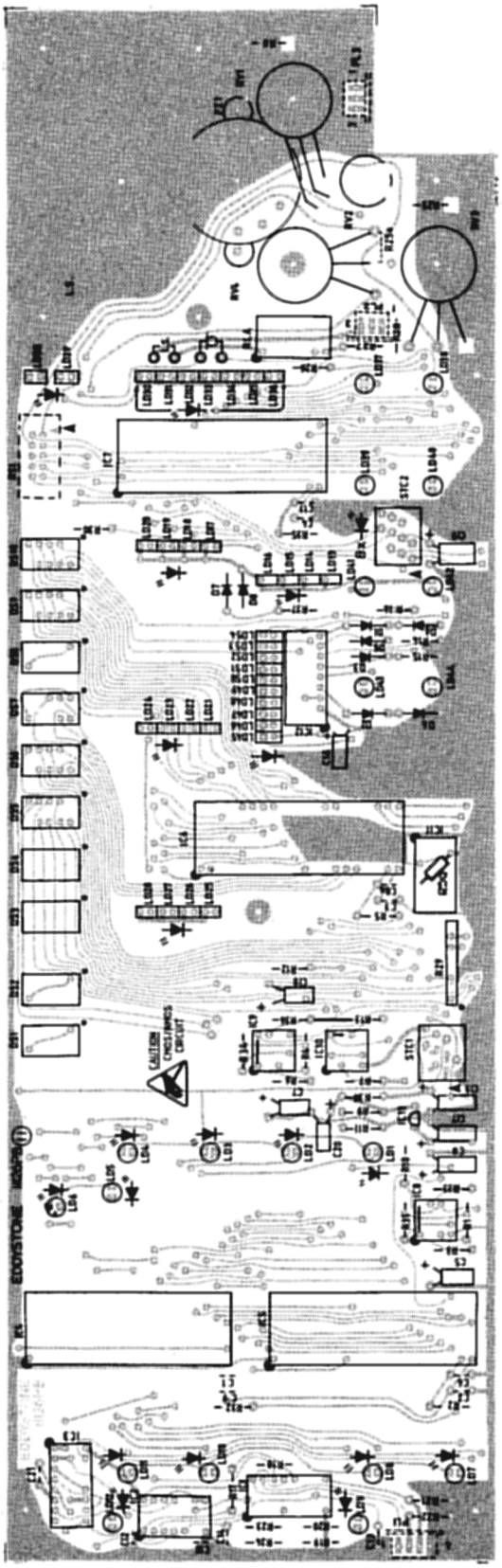
(10) Main IF/Audio Board

12363P : Component Face



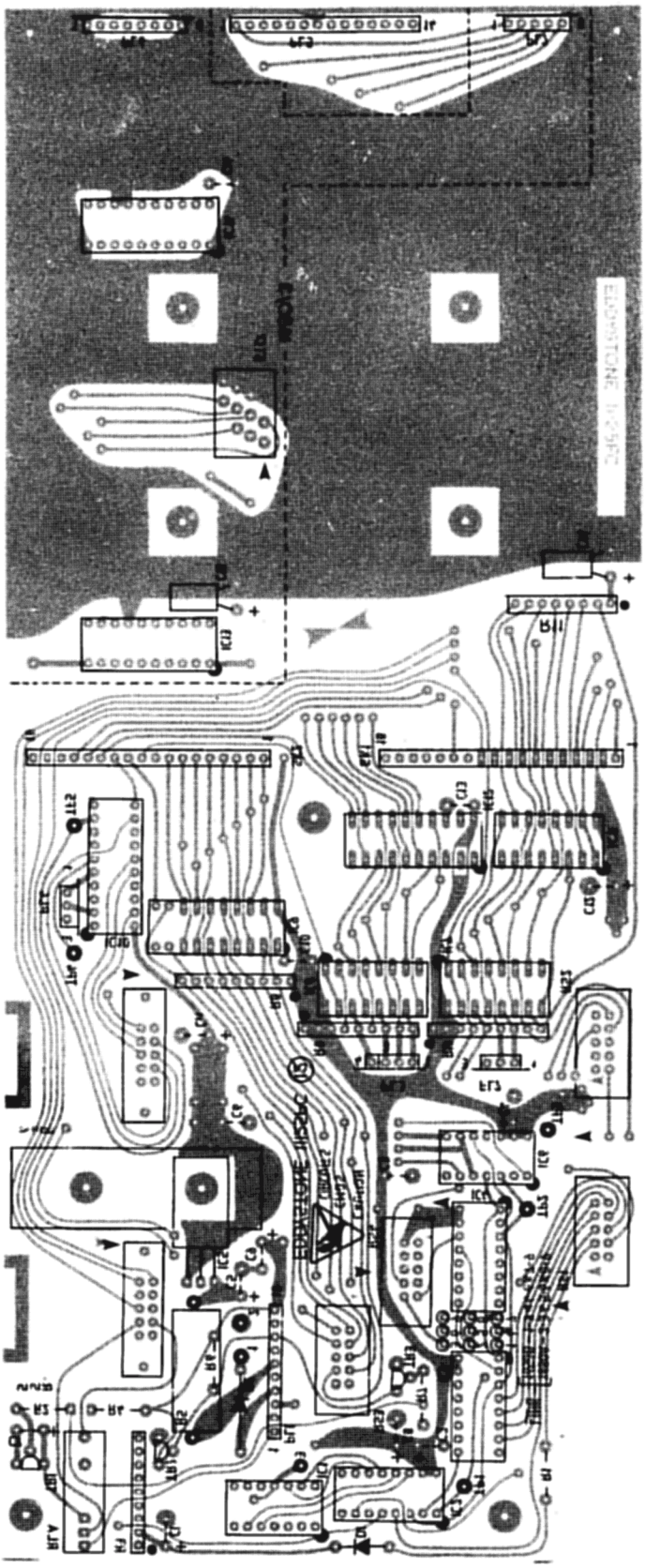
(11) Front Panel Display Board

11126P : Wiring Face



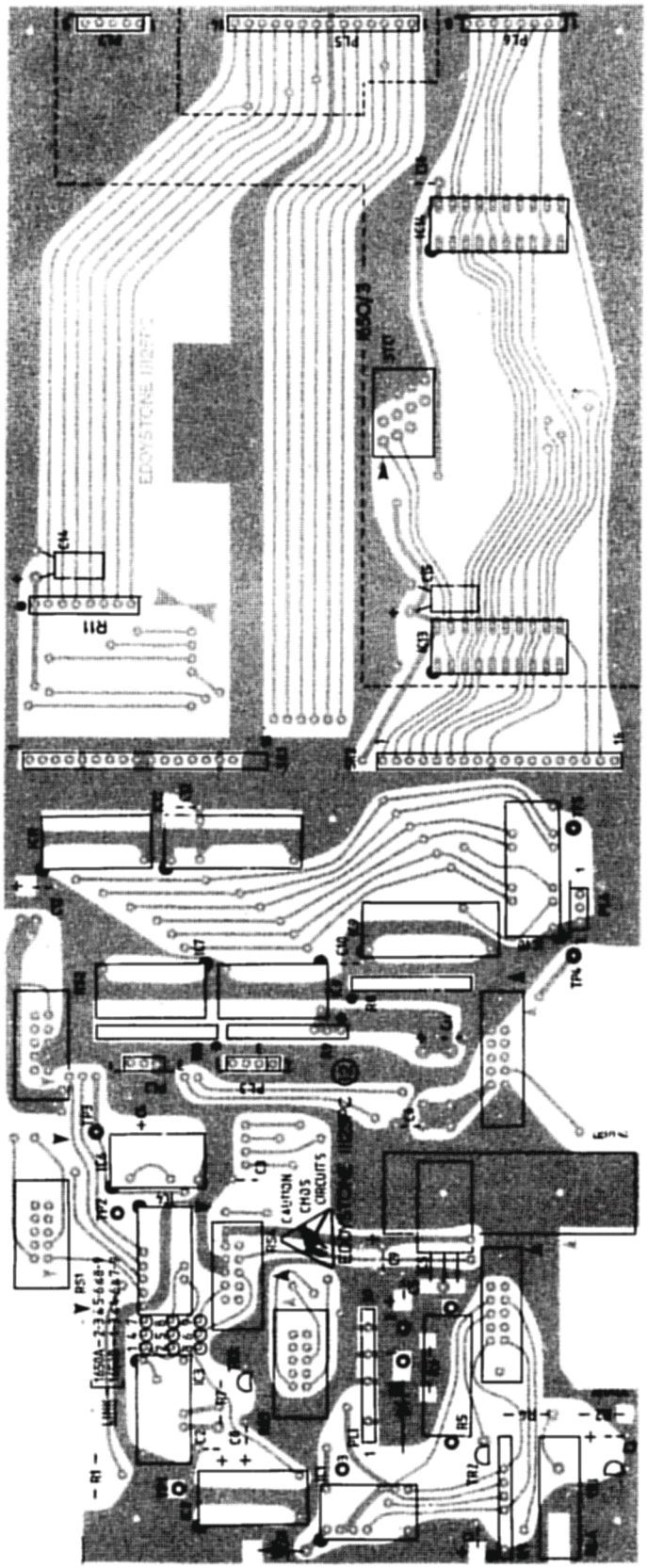
(11) Front Panel Display Board

11126P : Component Face



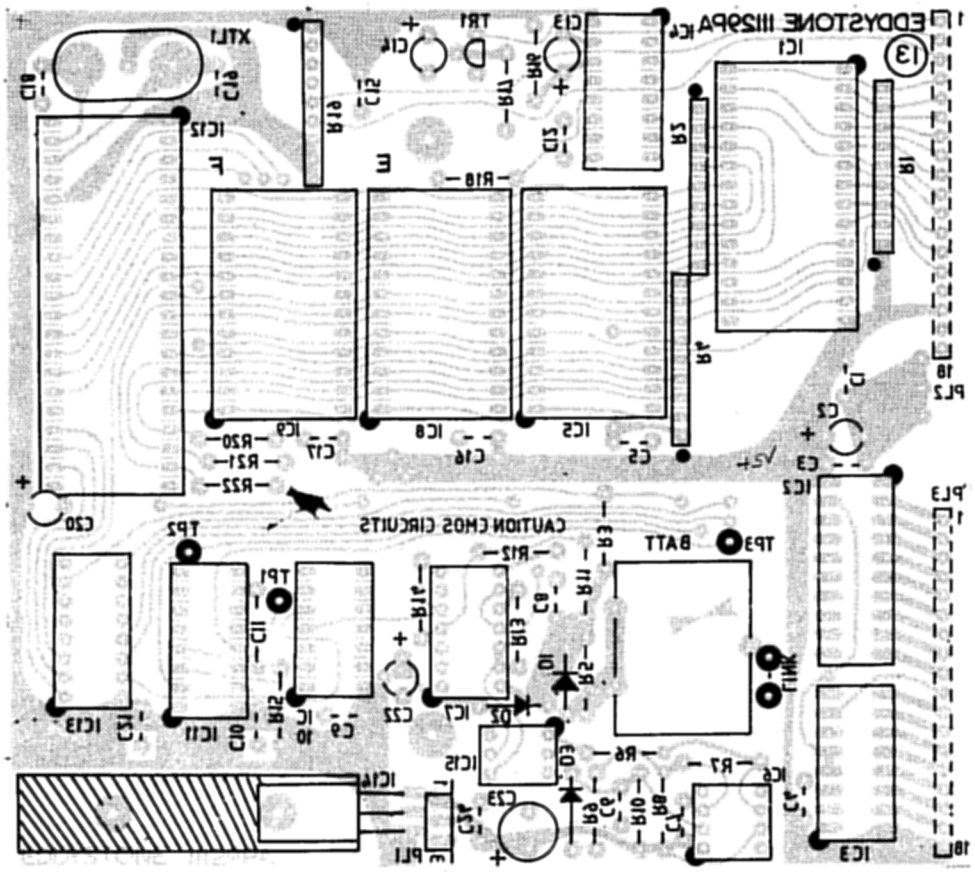
(12) Interface Board

11125P : Wiring Face



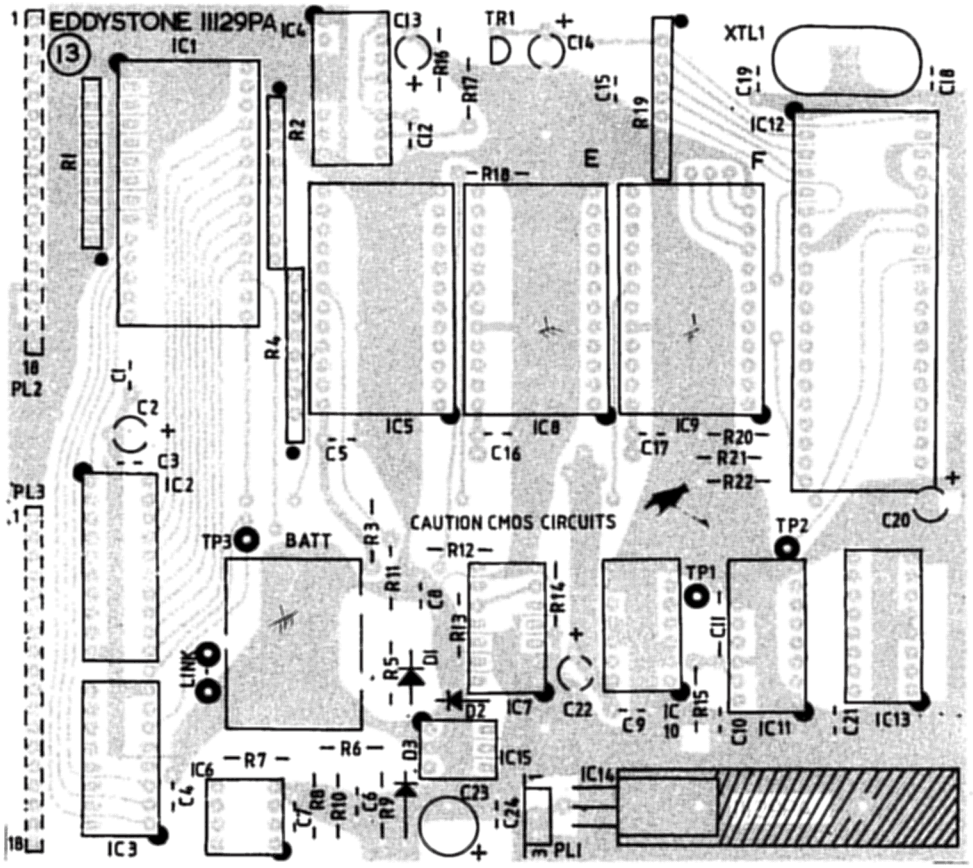
(12) Interface Board

11125P : Component Face



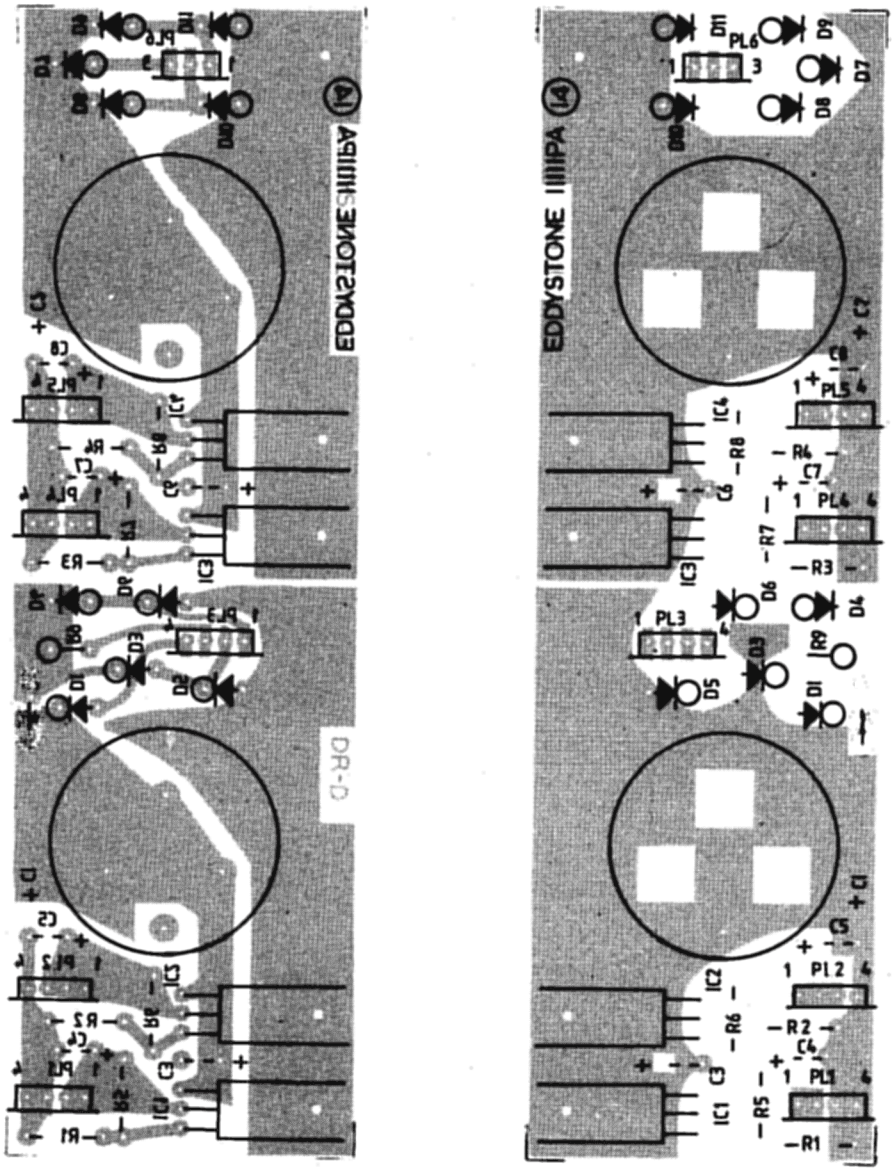
(13) Microcomputer Board

11129P : Wiring Face



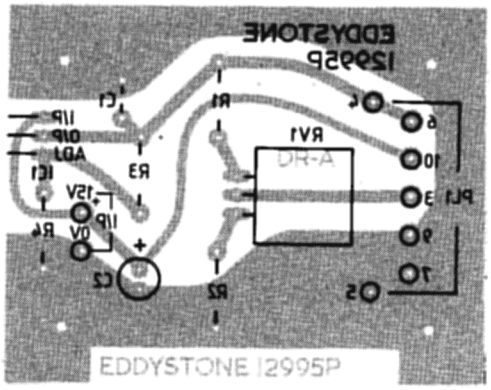
(13) Microcomputer Board

11129P : Component Face



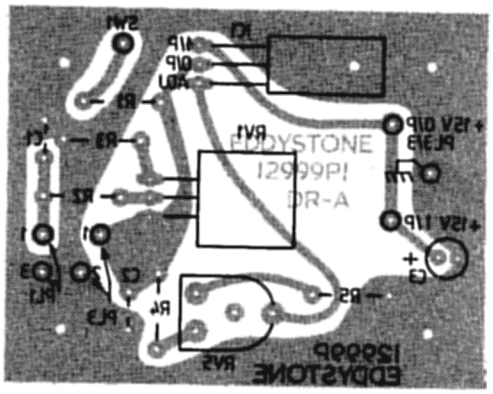
(14) Power Supply Board

11111P : Both Faces



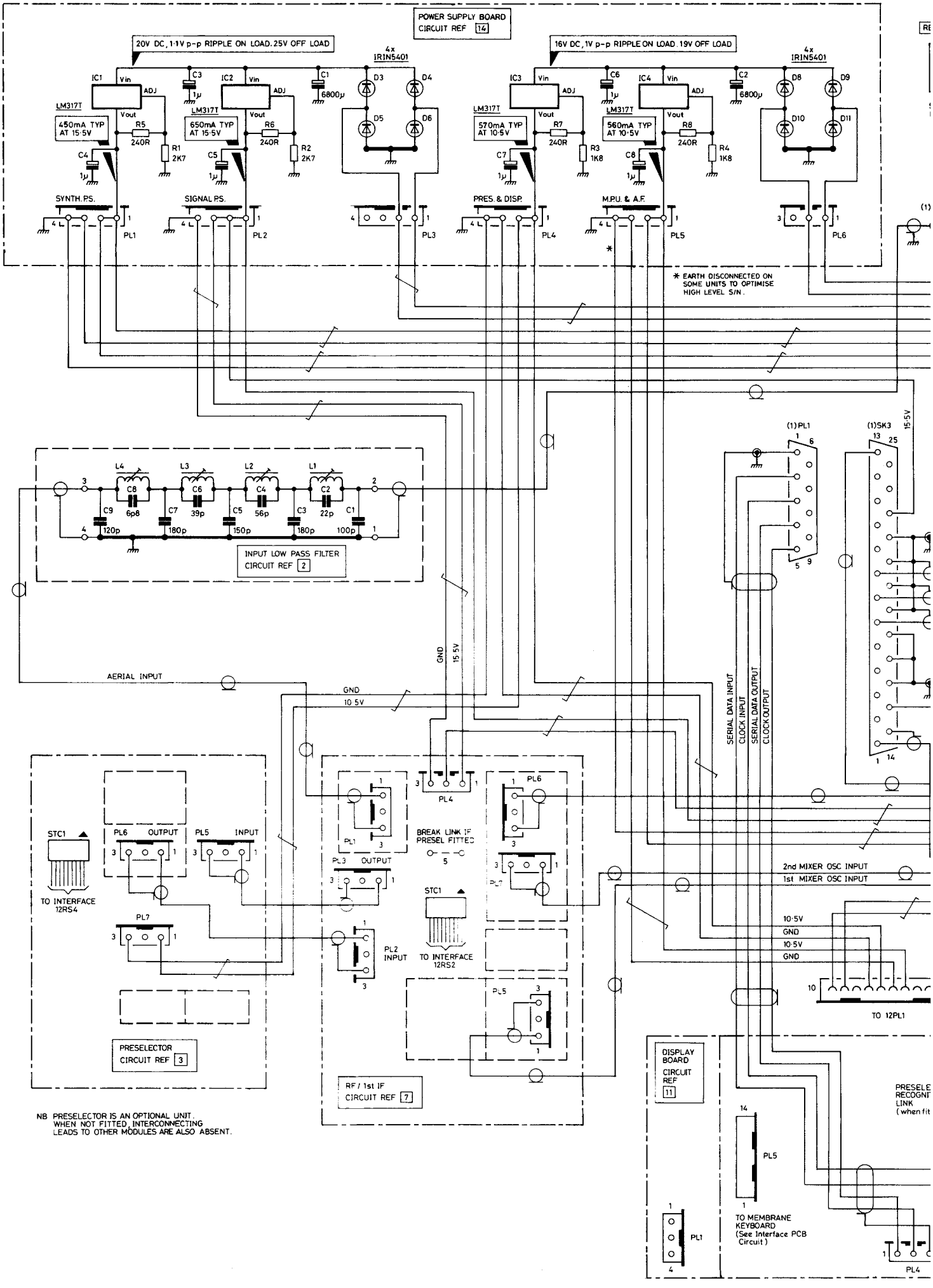
(16) Front Panel Test Box Board

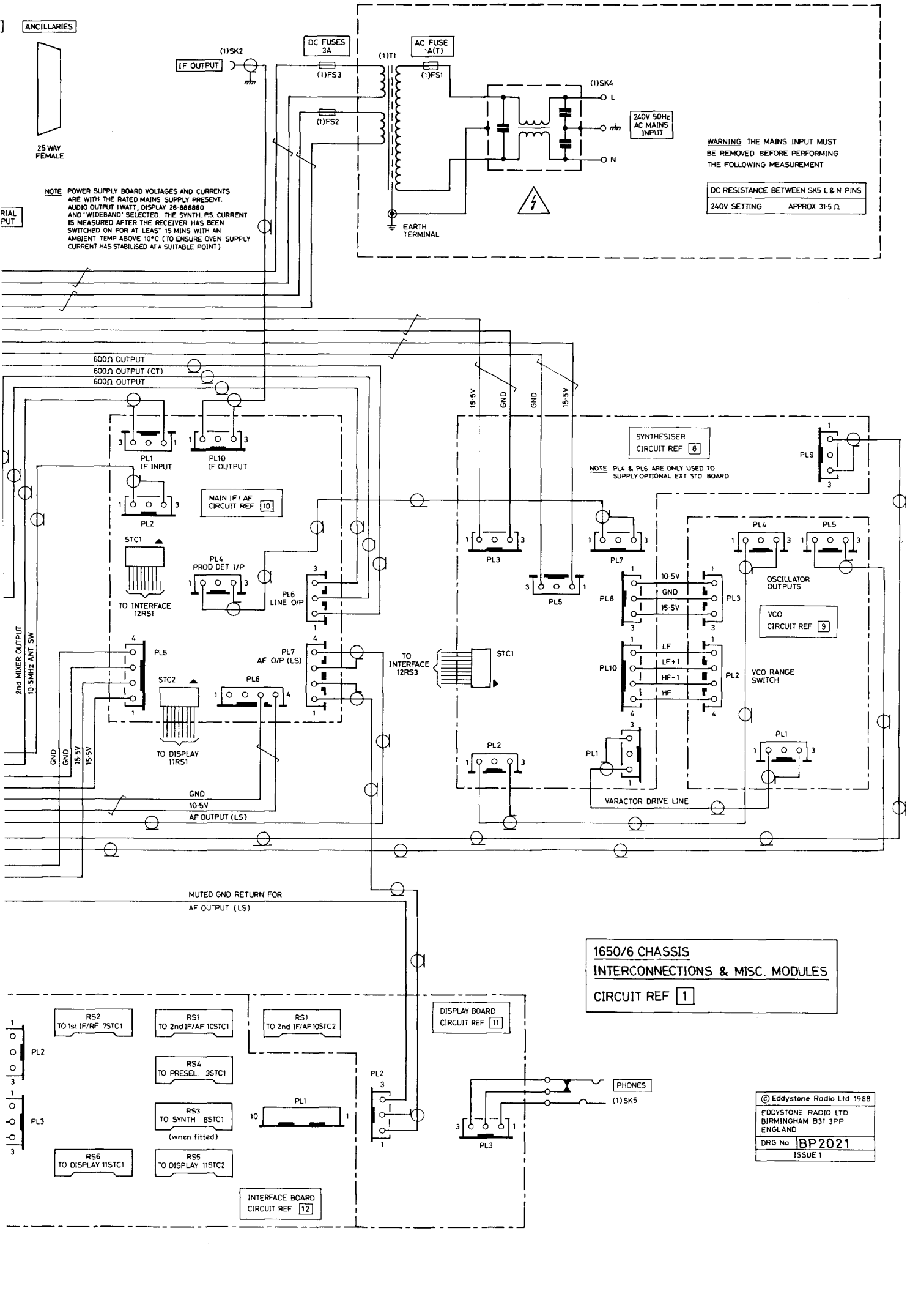
12995P : Wiring Face



(17) VCO Test Box Board

12999P : Wiring Face


POWER SUPPLY BOARD
CIRCUIT REF 14
20V DC, 1·1V p-p RIPPLE ON LOAD. 25V OFF LOAD
16V DC, 1V p-p RIPPLE ON LOAD. 19V OFF LOAD
4x IRIN5401
IC1
IC2
IC3
IC4
LM317T
450mA TYP AT 15·5V
650mA TYP AT 15·5V
570mA TYP AT 10·5V
560mA TYP AT 10·5V
R5 240R
R6 240R
R7 240R
R8 240R
R1 2K7
R2 2K7
R3 1K8
R4 1K8
C1 6800µ
C2 6800µ
C3 1µ
C4 1µ
C5 1µ
C6 1µ
C7 1µ
C8 1µ
D3
D4
D5
D6
D8
D9
D10
D11
SYNTH. PS.
SIGNAL PS.
PRES. & DISP.
M.P.U. & A.F.
PL1
PL2
PL3
PL4
PL5
PL6
* EARTH DISCONNECTED ON SOME UNITS TO OPTIMISE HIGH LEVEL S/N.
INPUT LOW PASS FILTER
CIRCUIT REF 2
L4
L3
L2
L1
C8 6p8
C6 39p
C4 56p
C2 22p
C9 120p
C7 180p
C5 150p
C3 180p
C1 100p
AERIAL INPUT
GND
10·5V
15·5V
(1)PL1
(1)SK3
SERIAL DATA INPUT
CLOCK INPUT
SERIAL DATA OUTPUT
CLOCK OUTPUT
2nd MIXER OSC INPUT
1st MIXER OSC INPUT
TO 12PL1
STC1
PL6 OUTPUT
PL5 INPUT
PL7
TO INTERFACE 12RS4
PRESELECTOR
CIRCUIT REF 3
PL1
PL3 OUTPUT
BREAK LINK IF PRESEL FITTED
5
PL2 INPUT
TO INTERFACE 12RS2
RF / 1st IF
CIRCUIT REF 7
DISPLAY BOARD
CIRCUIT REF 11
TO MEMBRANE KEYBOARD (See Interface PCB Circuit)
NB PRESELECTOR IS AN OPTIONAL UNIT. WHEN NOT FITTED, INTERCONNECTING LEADS TO OTHER MODULES ARE ALSO ABSENT.


ANCILLARIES
25 WAY FEMALE
(1)SK2
IF OUTPUT
DC FUSES 3A
(1)FS3
(1)FS2
AC FUSE 1A(T)
(1)FS1
(1)T1
(1)SK4
L
N
240V 50Hz AC MAINS INPUT
EARTH TERMINAL
WARNING THE MAINS INPUT MUST BE REMOVED BEFORE PERFORMING THE FOLLOWING MEASUREMENT
DC RESISTANCE BETWEEN SK5 L & N PINS
240V SETTING APPROX 31·5Ω
NOTE POWER SUPPLY BOARD VOLTAGES AND CURRENTS ARE WITH THE RATED MAINS SUPPLY PRESENT. AUDIO OUTPUT 1WATT, DISPLAY 28·888880 AND 'WIDEBAND' SELECTED. THE SYNTH. PS. CURRENT IS MEASURED AFTER THE RECEIVER HAS BEEN SWITCHED ON FOR AT LEAST 15 MINS WITH AN AMBIENT TEMP ABOVE 10°C (TO ENSURE OVEN SUPPLY CURRENT HAS STABILISED AT A SUITABLE POINT)
600Ω OUTPUT
600Ω OUTPUT (CT)
600Ω OUTPUT
PL1 IF INPUT
PL10 IF OUTPUT
PL2
MAIN IF/AF CIRCUIT REF 10
STC1
TO INTERFACE 12RS1
PL4 PROD DET I/P
PL6 LINE O/P
PL7 AF O/P (LS)
PL5
STC2
PL8
TO DISPLAY 11RS1
2nd MIXER OUTPUT
10·5MHz ANT SW
GND
GND
15·5V
15·5V
15·5V
GND
GND
15·5V
SYNTHESISER CIRCUIT REF 8
NOTE PL4 & PL6 ARE ONLY USED TO SUPPLY OPTIONAL EXT STD BOARD
PL9
PL3
PL7
PL5
PL8
10·5V
GND
15·5V
PL3
PL4
PL5
OSCILLATOR OUTPUTS
VCO CIRCUIT REF 9
PL10
LF
LF+1
HF-1
HF
PL2
VCO RANGE SWITCH
TO INTERFACE 12RS3
STC1
PL2
PL1
PL1
VARACTOR DRIVE LINE
GND
10·5V
AF OUTPUT (LS)
MUTED GND RETURN FOR AF OUTPUT (LS)
1650/6 CHASSIS
INTERCONNECTIONS & MISC. MODULES
CIRCUIT REF 1
DISPLAY BOARD CIRCUIT REF 11
RS2 TO 1st IF/RF 7STC1
RS1 TO 2nd IF/AF 10STC1
RS1 TO 2nd IF/AF 10STC2
PL2
RS4 TO PRESEL. 3STC1
PL3
RS3 TO SYNTH 8STC1
(when fitted)
PL1
PL2
PL3
PHONES
(1)SK5
RS6 TO DISPLAY 11STC1
RS5 TO DISPLAY 11STC2
INTERFACE BOARD CIRCUIT REF 12
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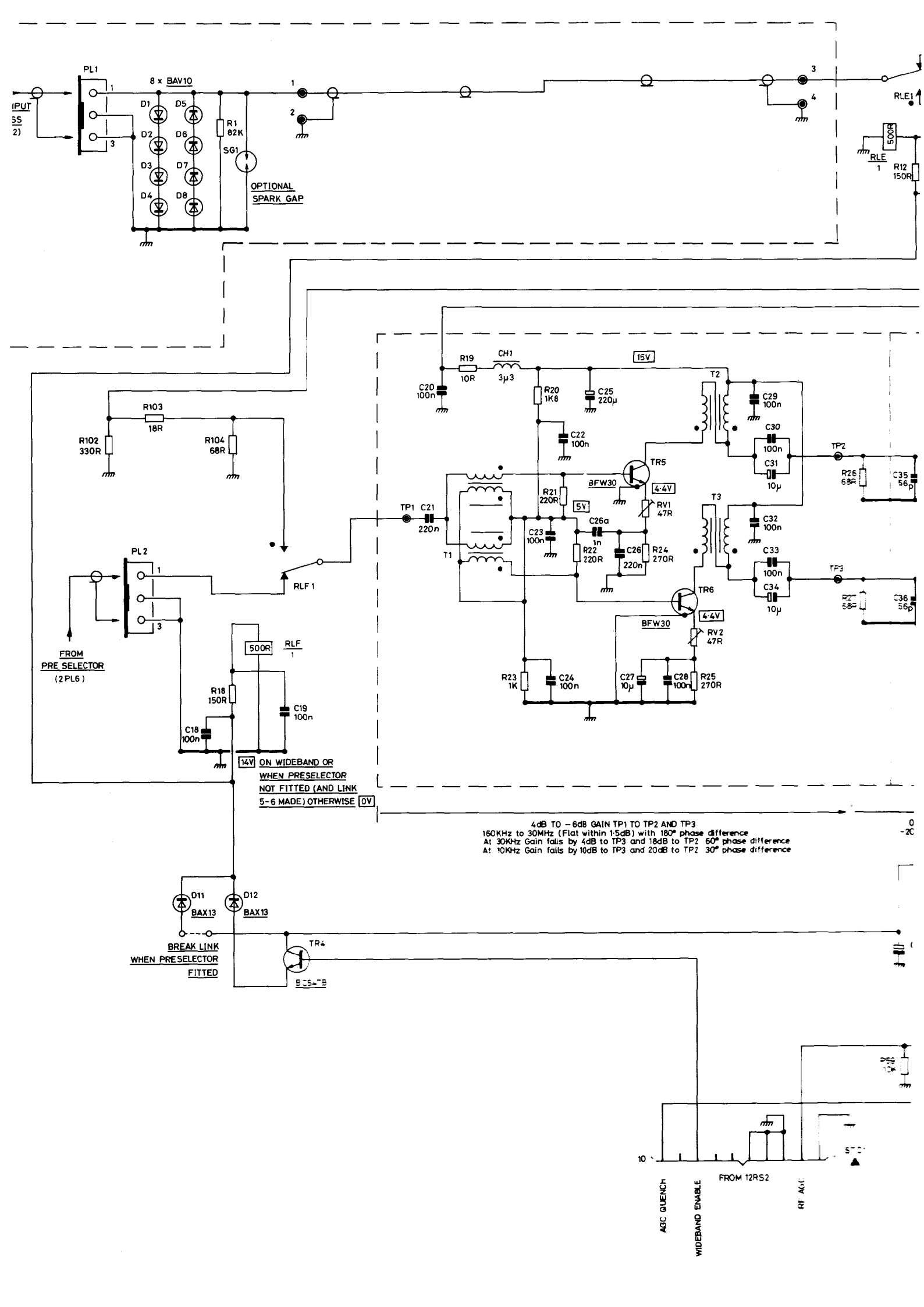
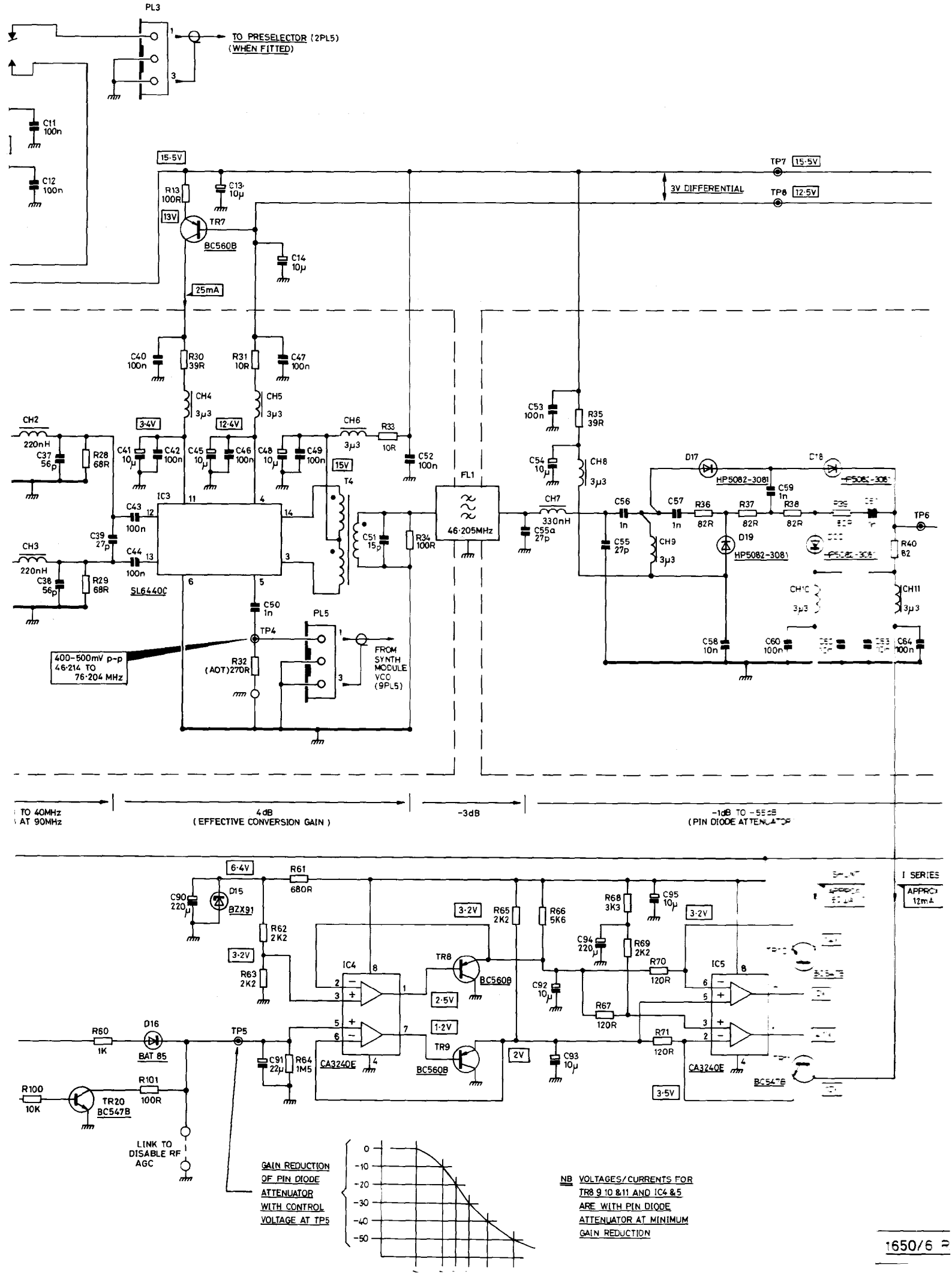
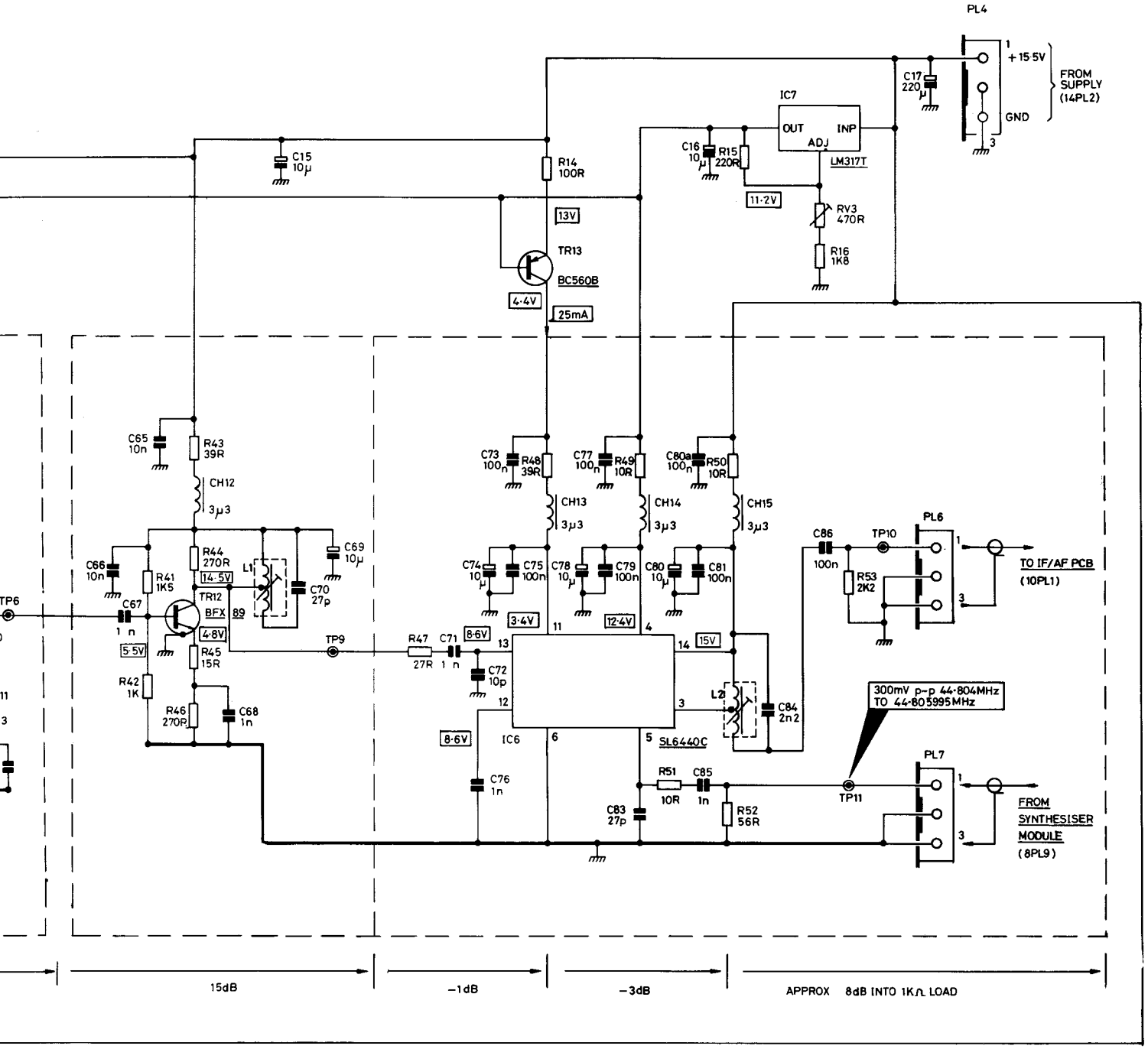
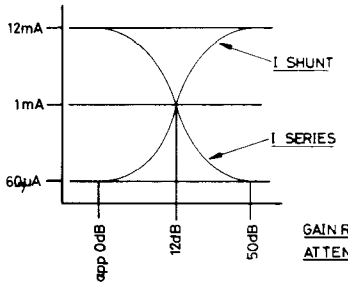
BIRMINGHAM B31 3PP
ENGLAND
DRG No BP2021
ISSUE 1


PL1
8 x BAV10
D1
D2
D3
D4
D5
D6
D7
D8
R1
82K
SG1
OPTIONAL
SPARK GAP
RLE1
500R
RLE
1
R12
150R
R103
18R
R102
330R
R104
68R
PL2
RLF 1
FROM
PRE SELECTOR
(2PL6)
500R
RLF
1
R18
150R
C18
100n
C19
100n
14V ON WIDEBAND OR
WHEN PRESELECTOR
NOT FITTED (AND LINK
5-6 MADE) OTHERWISE 0V
D11
BAX13
D12
BAX13
BREAK LINK
WHEN PRESELECTOR
FITTED
TR4
BC547B
R19
10R
CH1
3µ3
C20
100n
15V
R20
1K8
C25
220µ
C22
100n
T2
C29
100n
C30
100n
C31
10µ
TP2
R26
68R
C35
56p
TR5
BFW30
4·4V
RV1
47R
R21
220R
5V
TP1
C21
220n
T1
C23
100n
C26a
1n
R22
220R
C26
220n
R24
270R
T3
C32
100n
C33
100n
C34
10µ
TP3
R27
68R
C36
56p
TR6
BFW30
4·4V
RV2
47R
R23
1K
C24
100n
C27
10µ
C28
100n
R25
270R
4dB TO −6dB GAIN TP1 TO TP2 AND TP3
150KHz to 30MHz (Flat within 1·5dB) with 180° phase difference
At 30KHz Gain falls by 4dB to TP3 and 18dB to TP2 60° phase difference
At 10KHz Gain falls by 10dB to TP3 and 20dB to TP2 30° phase difference
FROM 12RS2
AGC QUENCH
WIDEBAND ENABLE


PL3
TO PRESELECTOR (2PL5)
(WHEN FITTED)
C11 100n
C12 100n
15·5V
R13 100R
C13 10µ
13V
TR7
BC560B
C14 10µ
25mA
TP7 15·5V
3V DIFFERENTIAL
TP8 12·5V
C40 100n
R30 39R
R31 10R
C47 100n
CH4 3µ3
CH5 3µ3
CH2 220nH
C37 56p
R28 68R
3·4V
12·4V
C41 10µ
C42 100n
C45 10µ
C46 100n
C48 10µ
C49 100n
CH6 3µ3
R33 10R
15V
C52 100n
T4
IC3
SL6440C
C43 100n
C39 27p
C44 100n
CH3 220nH
C38 56p
R29 68R
C50 1n
TP4
PL5
400-500mV p-p
46·214 TO
76·204 MHz
R32 (AOT)270R
FROM SYNTH MODULE VCO (9PL5)
C51 15p
R34 100R
FL1
46·205MHz
C53 100n
R35 39R
C54 10µ
CH8 3µ3
CH7 330nH
C55a 27p
C56 1n
C55 27p
C57 1n
R36 82R
R37 82R
R38 82R
D17
D18
HP5082-3081
C59 1n
CH9 3µ3
D19
HP5082-3081
R40 82
TP6
CH10 3µ3
CH11 3µ3
C58 10n
C60 100n
C64 100n
TO 40MHz
AT 90MHz
4dB
(EFFECTIVE CONVERSION GAIN)
-3dB
-1dB TO -55±3
(PIN DIODE ATTENUATOR
I SERIES
APPROX 12mA
6·4V
R61 680R
C90 220µ
D15
BZX91
R62 2K2
3·2V
R63 2K2
IC4
TR8
BC560B
2·5V
1·2V
TR9
BC560B
CA3240E
R65 2K2
R66 5K6
R68 3K3
C95 10µ
3·2V
C94 220µ
R69 2K2
R70 120R
IC5
C92 10µ
R67 120R
R71 120R
CA3240E
BC547B
3·5V
2V
C93 10µ
C91 22µ
R64 1M5
R60 1K
D16
BAT 85
TP5
R100 10K
TR20
BC547B
R101 100R
LINK TO DISABLE RF AGC
GAIN REDUCTION OF PIN DIODE ATTENUATOR WITH CONTROL VOLTAGE AT TP5
0
-10
-20
-30
-40
-50
NB VOLTAGES/CURRENTS FOR TR8 9 10 &11 AND IC4 &5 ARE WITH PIN DIODE ATTENUATOR AT MINIMUM GAIN REDUCTION



SERIES
APPROX
12mA



GAIN REDUCTION OF PIN DIODE ATTENUATOR WITH CURRENT

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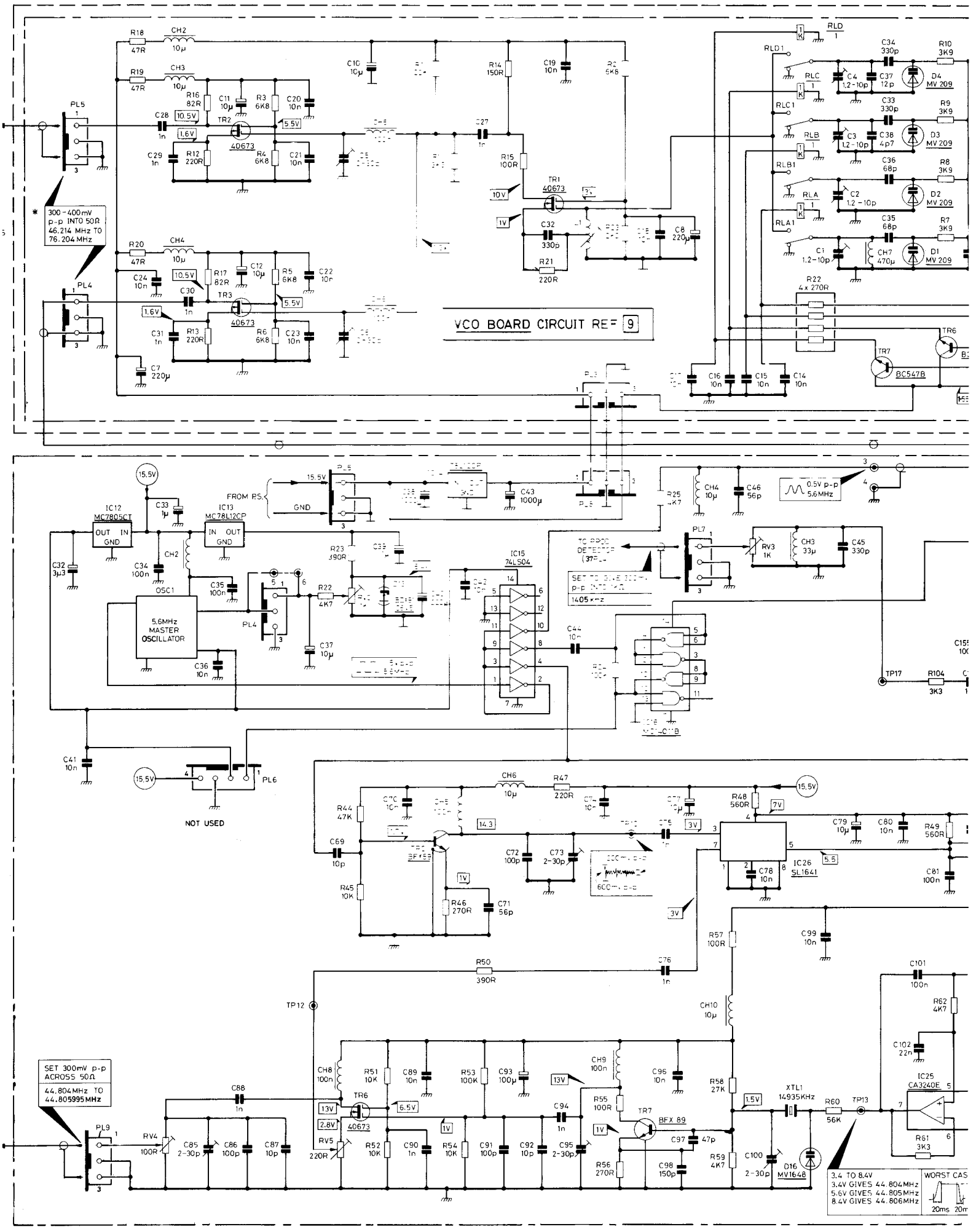
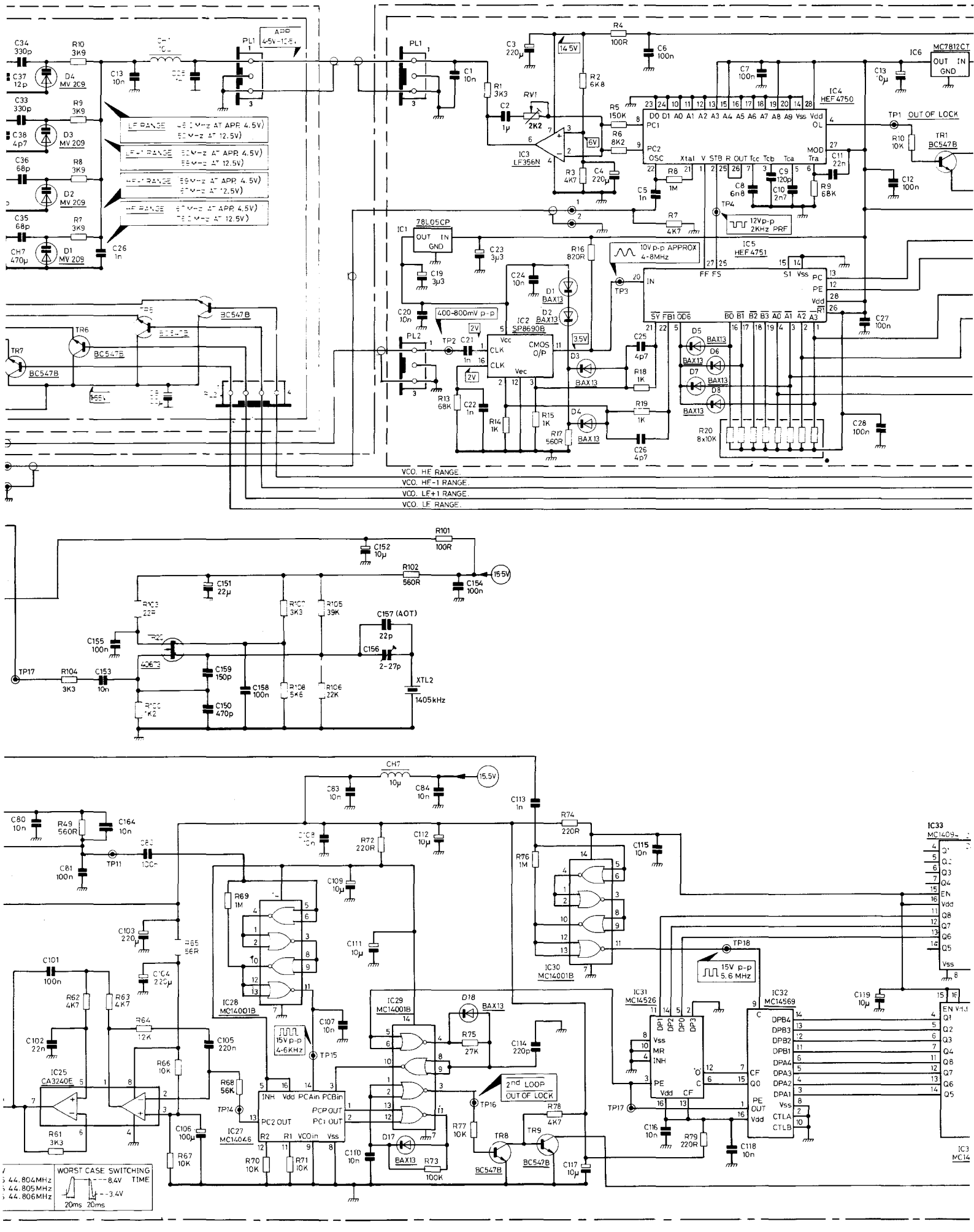
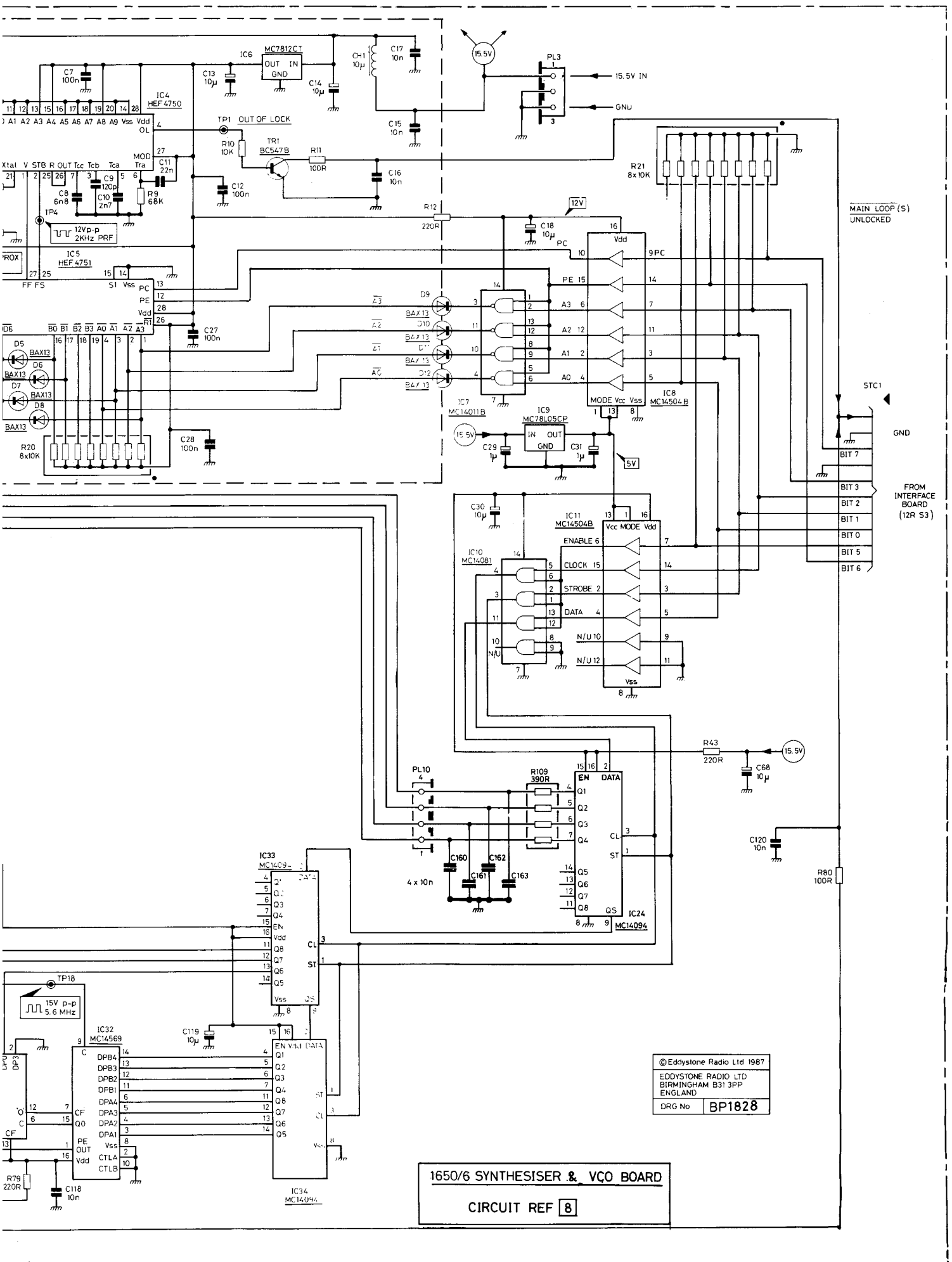
BIRMINGHAM B31 3PP
ENGLAND

DRG Nº BP 1968

0/6 RF & 1st IF BOARD CIRCUIT REF 7


VCO BOARD CIRCUIT REF 9
300 - 400mV p-p INTO 50Ω 46.214 MHz TO 76.204 MHz
SET 300mV p-p ACROSS 50Ω
44.804MHz TO 44.805995MHz
NOT USED
FROM PS
GND
5.6MHz MASTER OSCILLATOR
IC12 MC7805CT
IC13 MC78L12CP
IC15 74LS04
IC25 CA3240E
IC26 SL1641
TR1 40673
TR2 40673
TR3 40673
TR6 40673
TR7 BFX 89
BC547B
BF455
XTL1 14935KHz
D1 MV 209
D2 MV 209
D3 MV 209
D4 MV 209
D16 MV1648
3.4 TO 8.4V
3.4V GIVES 44.804MHz
5.6V GIVES 44.805MHz
8.4V GIVES 44.806MHz
WORST CAS
20ms


VCO. HF RANGE.
VCO. HF-1 RANGE.
VCO. LF+1 RANGE.
VCO. LF RANGE.
IC1 78L05CP
IC2 SP8690B
IC3 LF356N
IC4 HEF4750
IC5 HEF4751
IC6 MC7812CT
IC25 CA3240E
IC27 MC14046
IC28 MC14001B
IC29 MC14001B
IC30 MC14001B
IC31 MC14526
IC32 MC14569
IC33 MC1409
XTL2 1405kHz
TP1 OUT OF LOCK
TP3
TP4 12Vp-p 2KHz PRF
TP11
TP14
TP15 15V p-p 4-6KHz
TP16
TP17
TP18 15V p-p 5.6 MHz
2nd LOOP OUT OF LOCK
WORST CASE SWITCHING TIME
8.4V
3.4V
20ms 20ms
44.804MHz
44.805MHz
44.806MHz


IC6 MC7812CT
OUT IN GND
15.5V
PL3
15.5V IN
GND
IC4 HEF4750
TP1 OUT OF LOCK
TR1 BC547B
R21 8x10K
MAIN LOOP (S) UNLOCKED
12V
TP4
12Vp-p 2KHz PRF
IC5 HEF4751
R12 220R
C18 10µ
IC7 MC14011B
IC8 MC14504B
IC9 MC78L05CP
5V
STC1
GND
BIT 7
BIT 3
BIT 2
BIT 1
BIT 0
BIT 5
BIT 6
FROM INTERFACE BOARD (12R S3)
IC10 MC14081
IC11 MC14504B
ENABLE 6
CLOCK 15
STROBE 2
DATA 4
N/U 10
N/U 12
R20 8x10K
R43 220R
C68 10µ
PL10
R109 390R
4 x 10n
C160
C161
C162
C163
IC24 MC14094
C120 10n
R80 100R
IC33 MC14094
IC32 MC14569
IC34 MC14094
TP18
15V p-p 5.6 MHz
C119 10µ
R79 220R
C118 10n
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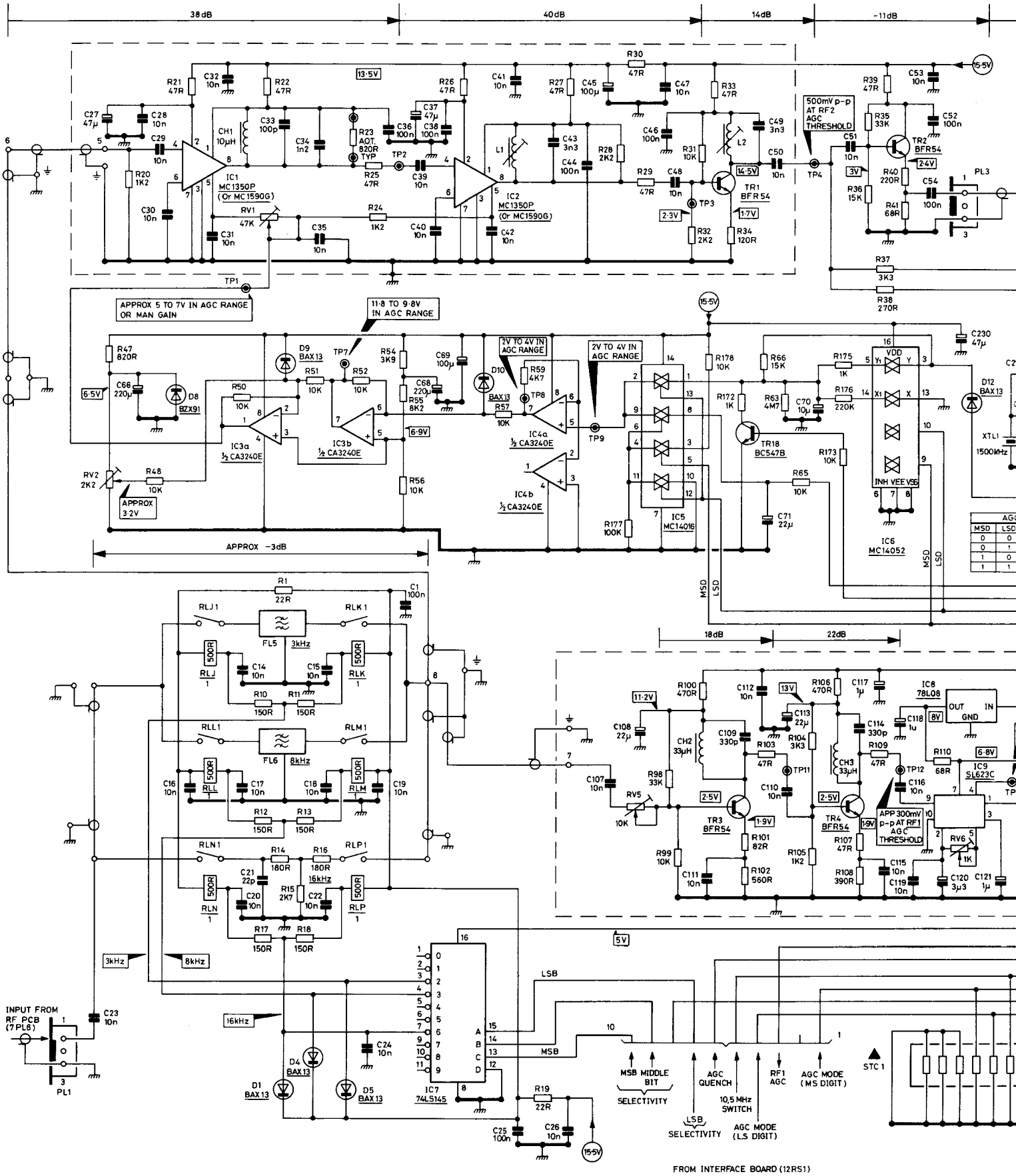
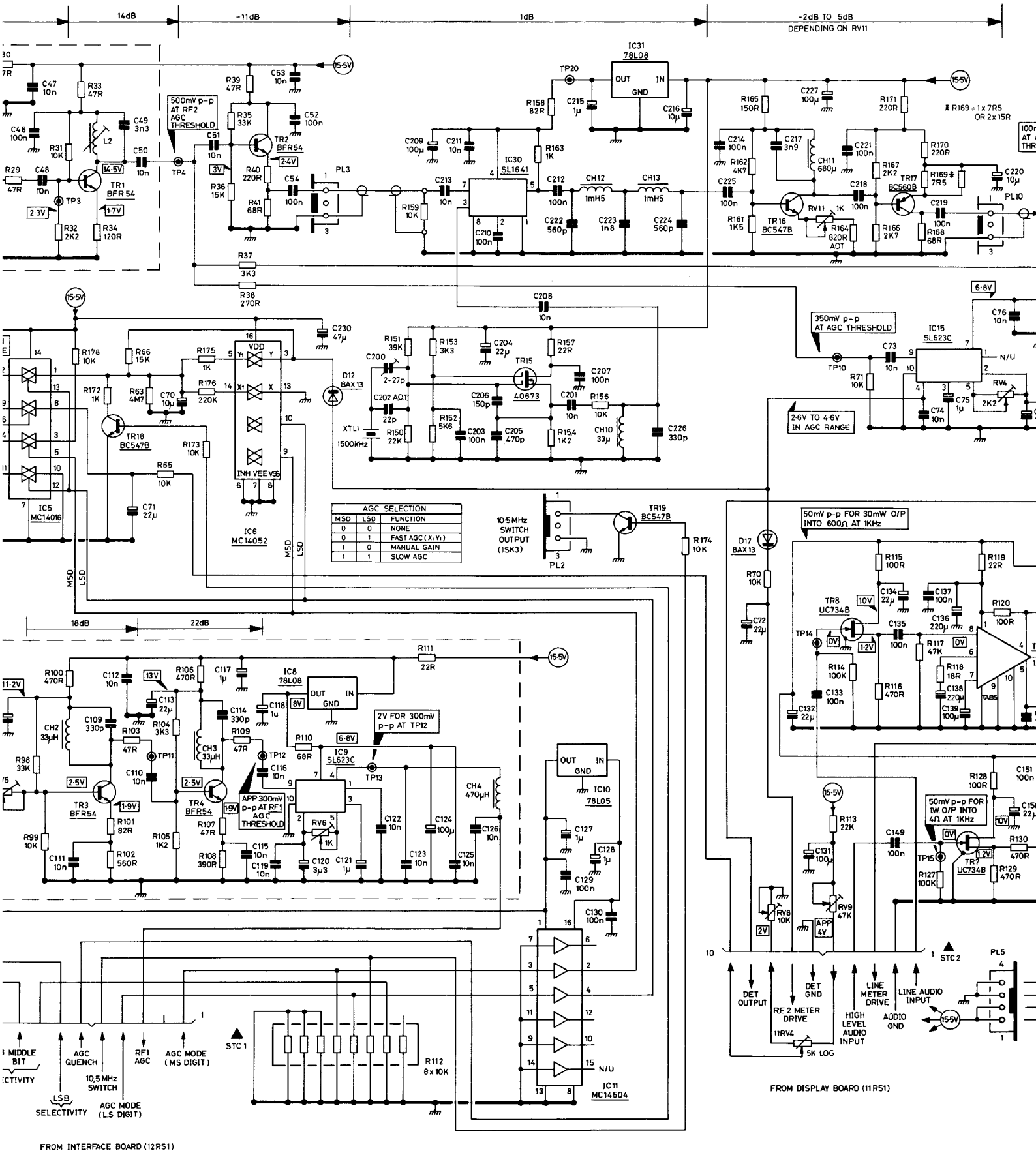
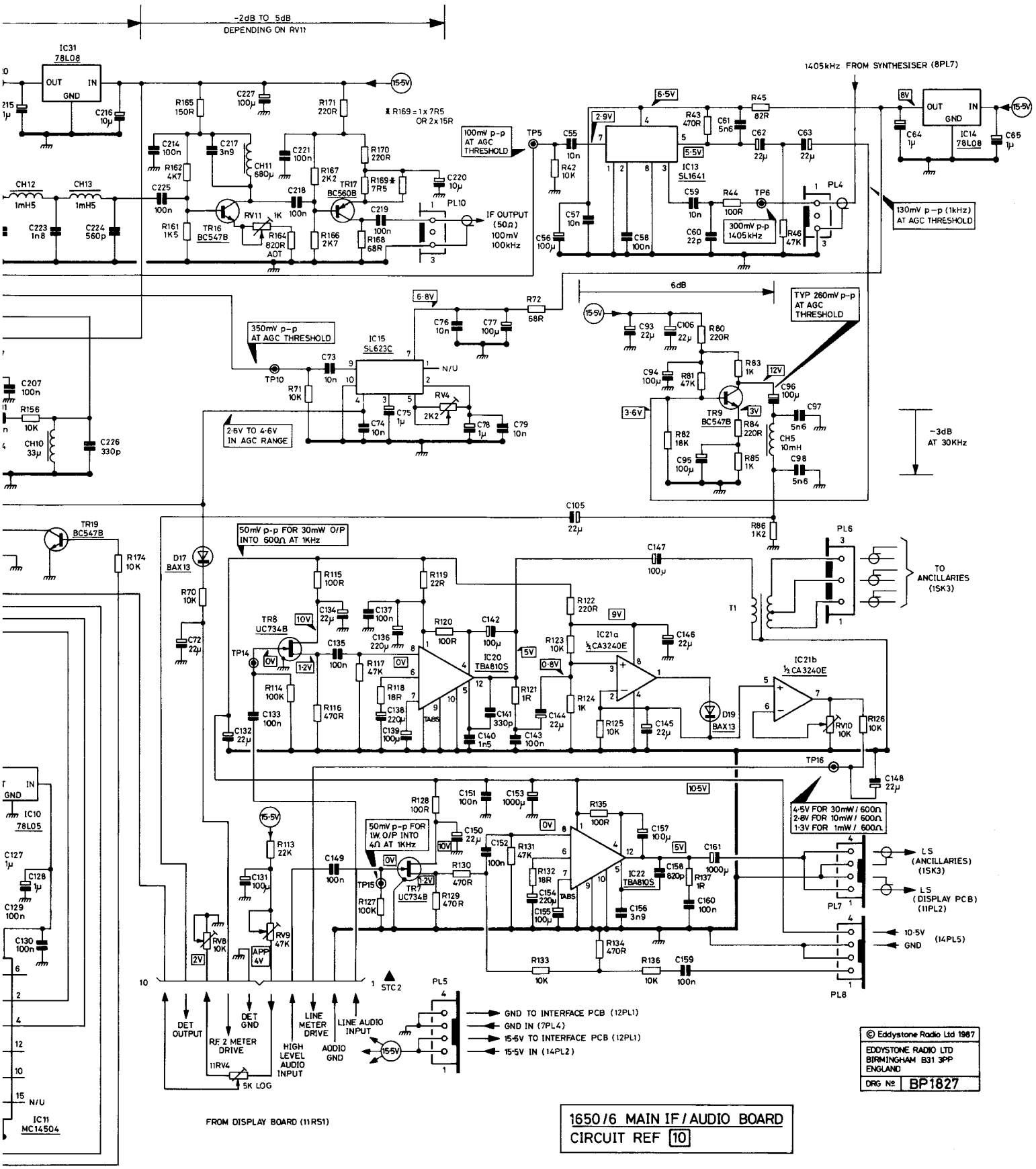
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND
DRG No BP1828
1650/6 SYNTHESISER & VCO BOARD
CIRCUIT REF 8


38dB
40dB
14dB
-11dB
IC1 MC1350P (Or MC1590G)
IC2 MC1350P (Or MC1590G)
500mV p-p AT RF2 AGC THRESHOLD
APPROX 5 TO 7V IN AGC RANGE OR MAN GAIN
11·8 TO 9·8V IN AGC RANGE
2V TO 4V IN AGC RANGE
2V TO 4V IN AGC RANGE
APPROX -3dB
IC3a ½ CA3240E
IC3b ½ CA3240E
IC4a ½ CA3240E
IC4b ½ CA3240E
IC5 MC14016
IC6 MC14052
TR1 BFR54
TR2 BFR54
TR3 BFR54
TR4 BFR54
TR18 BC547B
D1 BAX13
D4 BAX13
D5 BAX13
D8 BZX91
D9 BAX13
D10 BAX13
D12 BAX13
IC7 74LS145
IC8 78L08
IC9 SL623C
XTL1 1500kHz
FL5 3kHz
FL6 8kHz
APP 300mV p-p AT RF1 AGC THRESHOLD
INPUT FROM RF PCB (7PL6)
PL1
PL3
STC 1
LSB
MSB
MSB MIDDLE BIT SELECTIVITY
AGC QUENCH
10,5 MHz SWITCH
RF1 AGC
AGC MODE (MS DIGIT)
LSB SELECTIVITY
AGC MODE (LS DIGIT)
FROM INTERFACE BOARD (12RS1)


14dB
-11dB
1dB
-2dB TO 5dB
DEPENDING ON RV11
500mV p-p AT RF2 AGC THRESHOLD
TR1 BFR54
TR2 BFR54
IC30 SL1641
IC31 78L08
TP20
TP3
TP4
PL3
PL10
R37 3K3
R38 270R
C208 10n
350mV p-p AT AGC THRESHOLD
IC15 SL623C
TP10
2·6V TO 4·6V IN AGC RANGE
IC5 MC14016
IC6 MC14052
TR18 BC547B
D12 BAX13
XTL1 1500kHz
TR15 40673
AGC SELECTION
MSD LSD FUNCTION
0 0 NONE
0 1 FAST AGC (X1 Y1)
1 0 MANUAL GAIN
1 1 SLOW AGC
10·5MHz SWITCH OUTPUT (1SK3)
PL2
TR19 BC547B
D17 BAX13
50mV p-p FOR 30mW O/P INTO 600Ω AT 1KHz
TR8 UC734B
50mV p-p FOR 1W O/P INTO 4Ω AT 1KHz
TR7 UC734B
18dB
22dB
IC8 78L08
IC9 SL623C
IC10 78L05
2V FOR 300mV p-p AT TP12
APP 300mV p-p AT RF1 AGC THRESHOLD
TR3 BFR54
TR4 BFR54
IC11 MC14504
STC1
STC2
R112 8x10K
MIDDLE BIT
ACTIVITY
LSB SELECTIVITY
AGC QUENCH
10,5 MHz SWITCH
AGC MODE (LS DIGIT)
RF1 AGC
AGC MODE (MS DIGIT)
FROM INTERFACE BOARD (12RS1)
DET OUTPUT
RF 2 METER DRIVE
DET GND
11RV4
5K LOG
HIGH LEVEL AUDIO INPUT
LINE METER DRIVE
LINE AUDIO INPUT
AUDIO GND
FROM DISPLAY BOARD (11RS1)


-2dB TO 5dB
DEPENDING ON RV11
1405kHz FROM SYNTHESISER (8PL7)
IC31
78L08
OUT
IN
GND
15·5V
R165 150R
C227 100µ
R171 220R
* R169 = 1 x 7R5 OR 2 x 15R
C214 100n
C217 3n9
C221 100n
R170 220R
R162 4K7
CH11 680µ
R167 2K2
TR17 BC560B
R169* 7R5
C220 10µ
CH12 1mH5
CH13 1mH5
C225 100n
C218 100n
C219 100n
PL10
IF OUTPUT (50Ω) 100mV 100kHz
C223 1n8
C224 560p
R161 1K5
TR16 BC547B
RV11 1K
R164 820R AOT
R166 2K7
R168 68R
100mV p-p AT AGC THRESHOLD
TP5
C55 10n
R42 10K
6·5V
2·9V
IC13 SL1641
5·5V
R43 470R
C61 5n6
R45 82R
C62 22µ
C63 22µ
C59 10n
R44 100R
TP6
PL4
C57 10n
C56 100µ
C58 100n
C60 22p
300mV p-p 1405kHz
R46 47K
130mV p-p (1kHz) AT AGC THRESHOLD
8V
IC14 78L08
C64 1µ
C65 1µ
6·8V
R72 68R
C76 10n
C77 100µ
350mV p-p AT AGC THRESHOLD
TP10
C73 10n
IC15 SL623C
N/U
R71 10K
RV4 2K2
C75 1µ
C74 10n
C78 1µ
C79 10n
2·6V TO 4·6V IN AGC RANGE
6dB
TYP 260mV p-p AT AGC THRESHOLD
C93 22µ
C106 22µ
R80 220R
C94 100µ
R81 47K
R83 1K
12V
C96 100µ
3·6V
TR9 BC547B
3V
R84 220R
C97 5n6
R82 18K
CH5 10mH
C95 100µ
R85 1K
C98 5n6
-3dB AT 30KHz
C207 100n
R156 10K
CH10 33µ
C226 330p
C105 22µ
R86 1K2
PL6
TO ANCILLARIES (15K3)
TR19 BC547B
R174 10K
D17 BAX13
50mV p-p FOR 30mW O/P INTO 600Ω AT 1KHz
C147 100µ
T1
R70 10K
C72 22µ
R115 100R
R119 22R
TR8 UC734B
10V
C134 22µ
C137 100n
C136 220µ
R120 100R
C142 100µ
R122 220R
9V
IC21a ½CA3240E
C146 22µ
TP14
0V
1·2V
C135 100n
R117 47K
IC20 TBA810S
5V
0·8V
R123 10K
R114 100K
R116 470R
R118 18R
C138 220µ
C139 100µ
TABS
R121 1R
C141 330p
R124 1K
C133 100n
C132 22µ
C140 1n5
C143 100n
C144 22µ
R125 10K
C145 22µ
D19 BAX13
IC21b ½CA3240E
RV10 10K
R126 10K
TP16
C148 22µ
10·5V
4·5V FOR 30mW / 600Ω
2·8V FOR 10mW / 600Ω
1·3V FOR 1mW / 600Ω
R128 100R
C151 100n
C153 1000µ
R135 100R
C157 100µ
C161 1000µ
50mV p-p FOR 1W, O/P INTO 4Ω AT 1KHz
C150 22µ
C152 100n
R131 47K
R132 18R
C154 220µ
C155 100µ
IC22 TBA810S
C158 820p
R137 1R
C160 100n
C156 3n9
R113 22K
C149 100n
TP15
TR7 UC734B
1·2V
R130 470R
R129 470R
R127 100K
C131 100µ
RV8 10K
RV9 47K
2V
APP 4V
R134 470R
R133 10K
R136 10K
C159 100n
PL7
PL8
LS (ANCILLARIES) (15K3)
LS (DISPLAY PCB) (11PL2)
10·5V
GND
(14PL5)
STC2
PL5
DET OUTPUT
DET GND
RF 2 METER DRIVE
11RV4
5K LOG
LINE METER DRIVE
LINE AUDIO INPUT
HIGH LEVEL AUDIO INPUT
AUDIO GND
GND TO INTERFACE PCB (12PL1)
GND IN (7PL4)
15·5V TO INTERFACE PCB (12PL1)
15·5V IN (14PL2)
FROM DISPLAY BOARD (11RS1)
IC10 78L05
C127 1µ
C128 1µ
C129 100n
C130 100n
IC11 MC14504
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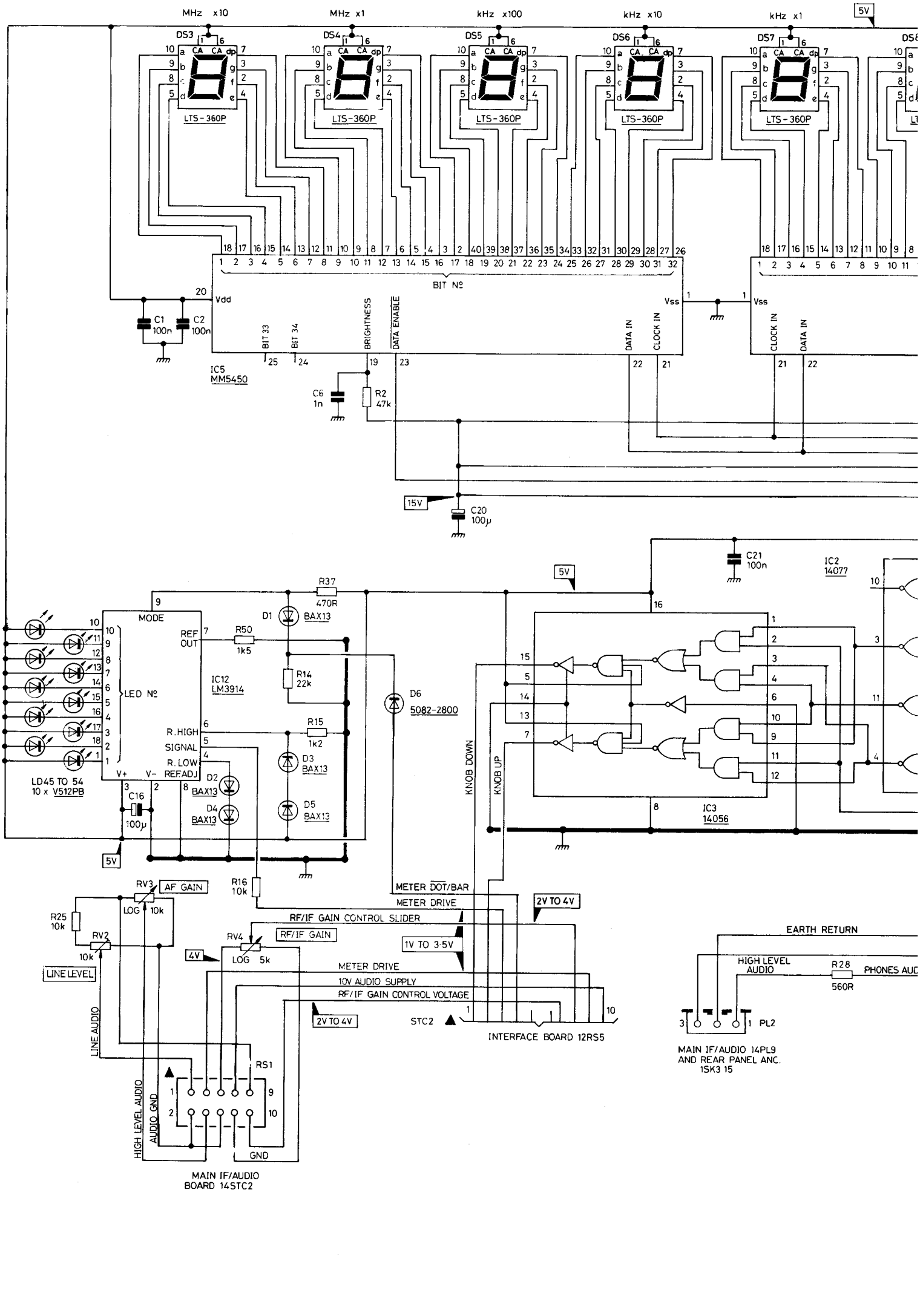
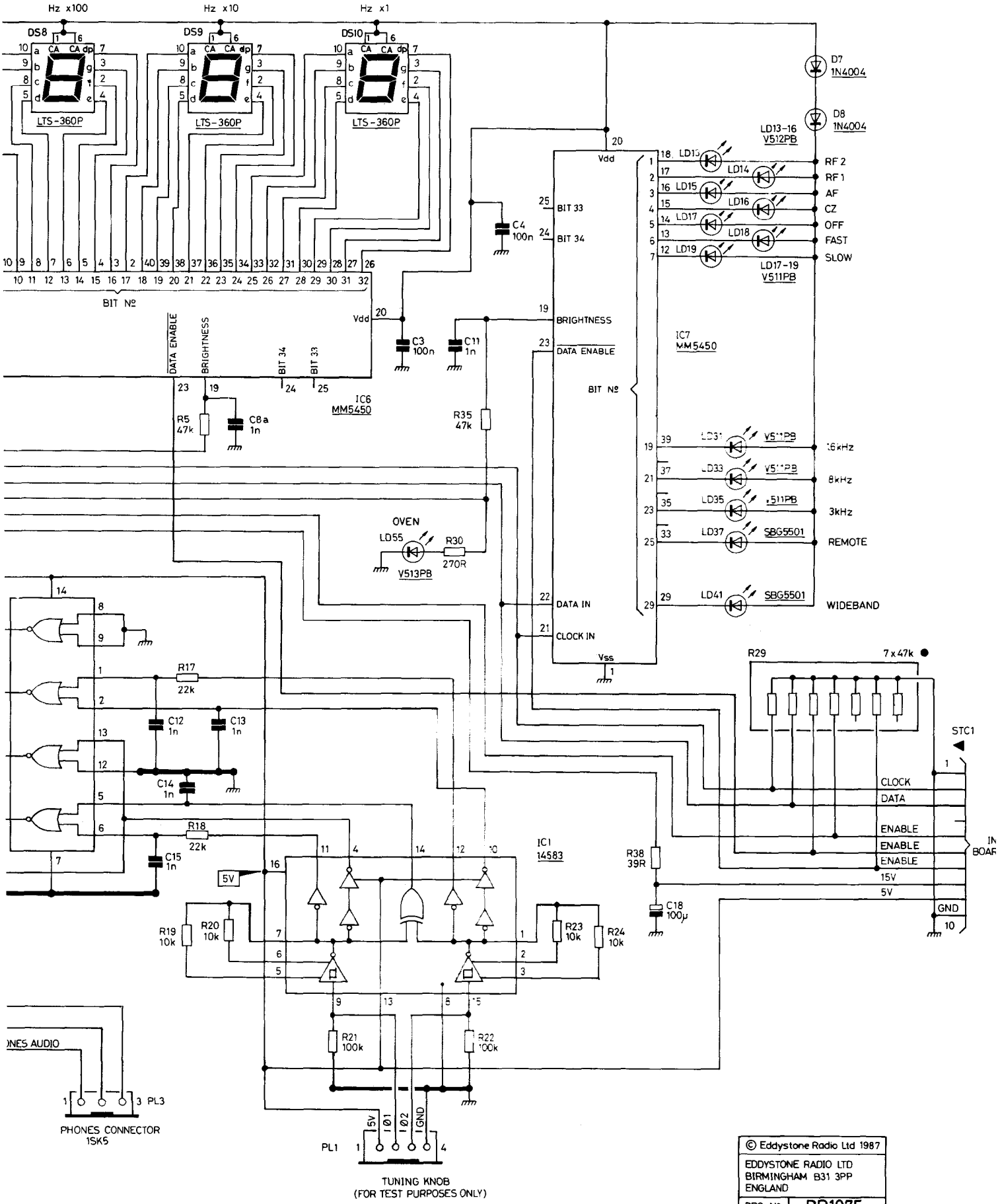
BIRMINGHAM B31 3PP
ENGLAND
DRG Nº BP1827
1650/6 MAIN IF/AUDIO BOARD
CIRCUIT REF 10


MHz x10
MHz x1
kHz x100
kHz x10
kHz x1
5V
DS3
DS4
DS5
DS6
DS7
LTS-360P
BIT Nº
Vdd
Vss
BIT 33
BIT 34
BRIGHTNESS
DATA ENABLE
DATA IN
CLOCK IN
C1 100n
C2 100n
IC5 MM5450
C6 1n
R2 47k
15V
C20 100µ
C21 100n
IC2 14077
R37 470R
D1 BAX13
MODE
REF OUT
R50 1k5
R14 22k
IC12 LM3914
LED Nº
R.HIGH
SIGNAL
R.LOW
REFADJ
R15 1k2
D3 BAX13
D2 BAX13
D4 BAX13
D5 BAX13
D6 5082-2800
C16 100µ
LD45 TO 54
10 x V512PB
KNOB DOWN
KNOB UP
IC3 14056
RV3 AF GAIN
LOG 10k
R25 10k
RV2 10k
LINE LEVEL
LINE AUDIO
R16 10k
METER DOT/BAR
METER DRIVE
2V TO 4V
RF/IF GAIN CONTROL SLIDER
RF/IF GAIN
RV4 LOG 5k
4V
1V TO 3·5V
METER DRIVE
10V AUDIO SUPPLY
RF/IF GAIN CONTROL VOLTAGE
2V TO 4V
STC2
INTERFACE BOARD 12RS5
RS1
HIGH LEVEL AUDIO
AUDIO GND
GND
MAIN IF/AUDIO BOARD 14STC2
EARTH RETURN
HIGH LEVEL AUDIO
R28 560R
PHONES AUD
PL2
MAIN IF/AUDIO 14PL9 AND REAR PANEL ANC. 1SK3 15



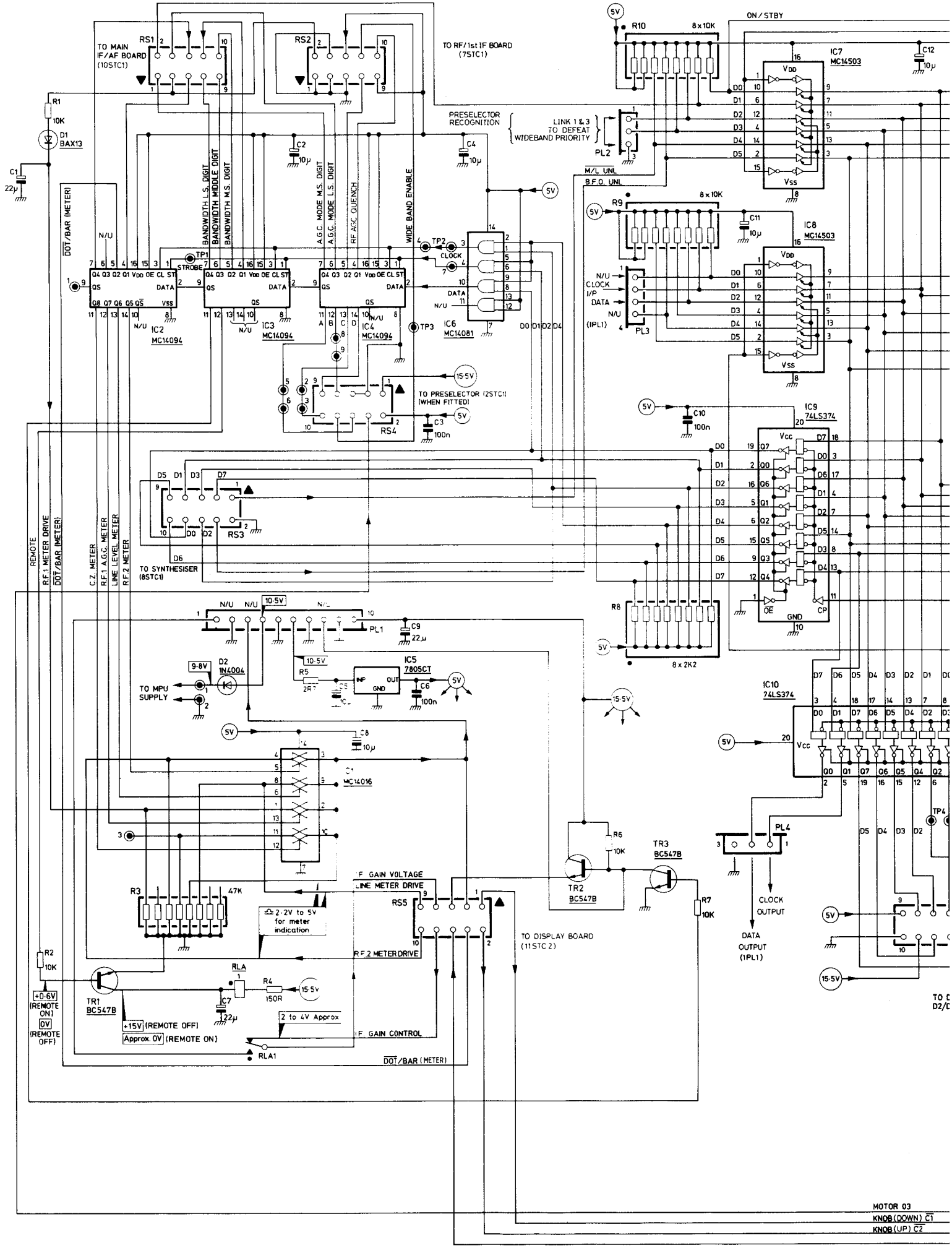
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG Nº BP1975

ISSUE 1

1650/6 FRONT PANEL DISPLAY BOARD

CIRCUIT REF 11


TO MAIN IF/AF BOARD (10STC1)
RS1
RS2
TO RF/1st IF BOARD (7STC1)
ON/STBY
R10
8 x 10K
IC7 MC14503
C12 10µ
PRESELECTOR RECOGNITION
LINK 1 & 3 TO DEFEAT WIDEBAND PRIORITY
PL2
M/L UNL
B.F.O. UNL
R1 10K
D1 BAX13
C1 22µ
C2 10µ
C4 10µ
BANDWIDTH L.S. DIGIT
BANDWIDTH MIDDLE DIGIT
BANDWIDTH M.S. DIGIT
A.G.C. MODE M.S. DIGIT
A.G.C. MODE L.S. DIGIT
RF AGC QUENCH
WIDE BAND ENABLE
DOT/BAR (METER)
N/U
TP1 STROBE
TP2 CLOCK
DATA
IC2 MC14094
IC3 MC14094
IC4 MC14094
IC6 MC14081
TP3
R9 8 x 10K
C11 10µ
IC8 MC14503
PL3
(1PL1)
15·5V
TO PRESELECTOR (2STC1) (WHEN FITTED)
RS4
C3 100n
C10 100n
IC9 74LS374
RS3
D6
TO SYNTHESISER (8STC1)
R8 8 x 2K2
REMOTE
R.F.1 METER DRIVE
DOT/BAR (METER)
C.Z. METER
R.F.1 A.G.C. METER
LINE LEVEL METER
R.F.2 METER
10·5V
PL1
C9 22µ
9·8V
D2 IN4004
TO MPU SUPPLY
IC5 7805CT
INP
OUT
GND
C6 100n
C8 10µ
IC1 MC14016
IC10 74LS374
PL4
CLOCK OUTPUT
DATA OUTPUT (1PL1)
TP4
R6 10K
TR3 BC547B
TR2 BC547B
R7 10K
R3 47K
F. GAIN VOLTAGE LINE METER DRIVE
RS5
2·2V to 5V for meter indication
TO DISPLAY BOARD (11STC 2)
R.F.2 METER DRIVE
R2 10K
RLA
R4 150R
C7 22µ
TR1 BC547B
+0·6V (REMOTE ON)
0V (REMOTE OFF)
+15V (REMOTE OFF)
Approx. 0V (REMOTE ON)
2 to 4V Approx
I.F. GAIN CONTROL
RLA1
DOT/BAR (METER)
MOTOR 03
KNOB (DOWN) C1
KNOB (UP) C2

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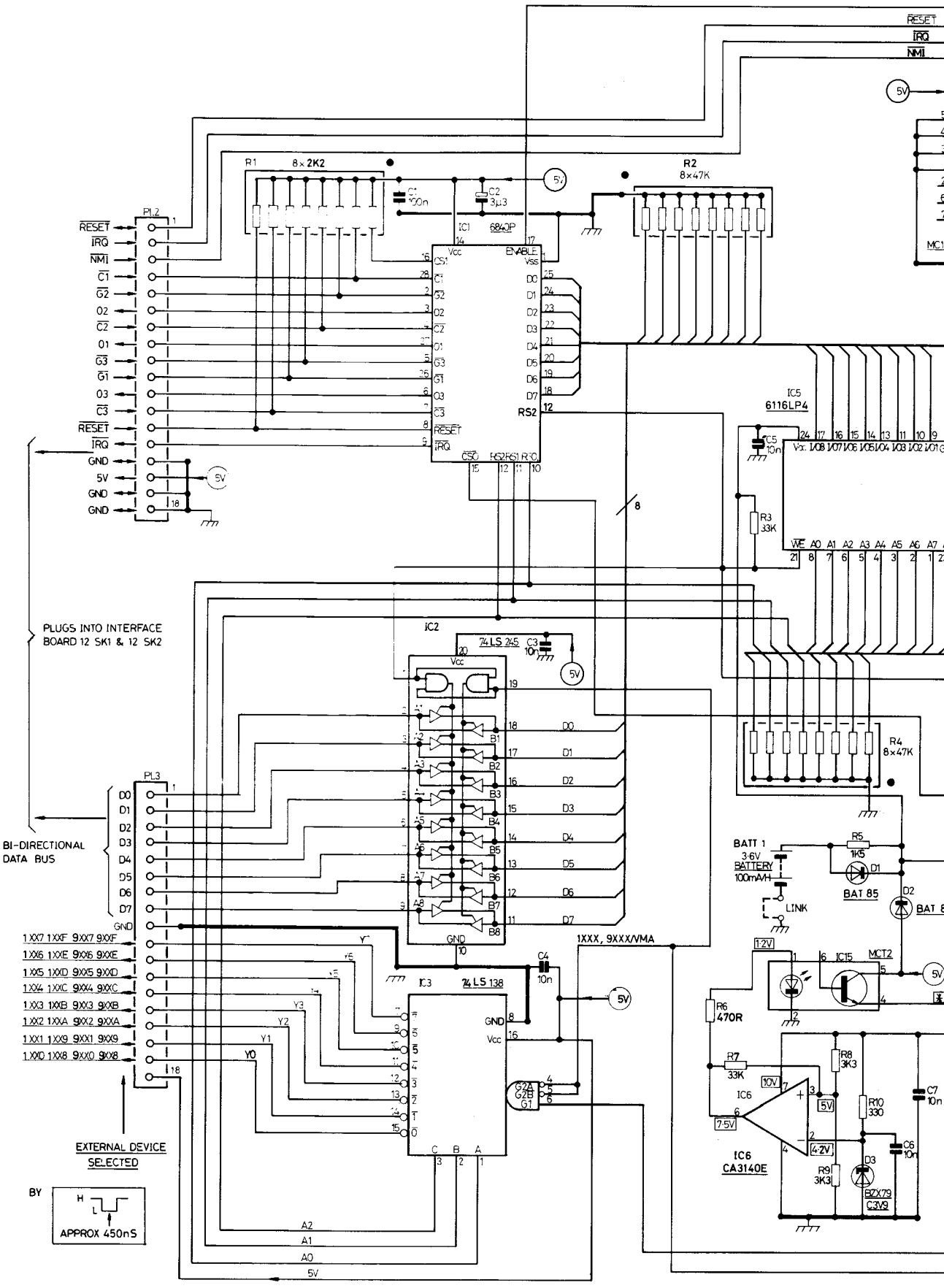
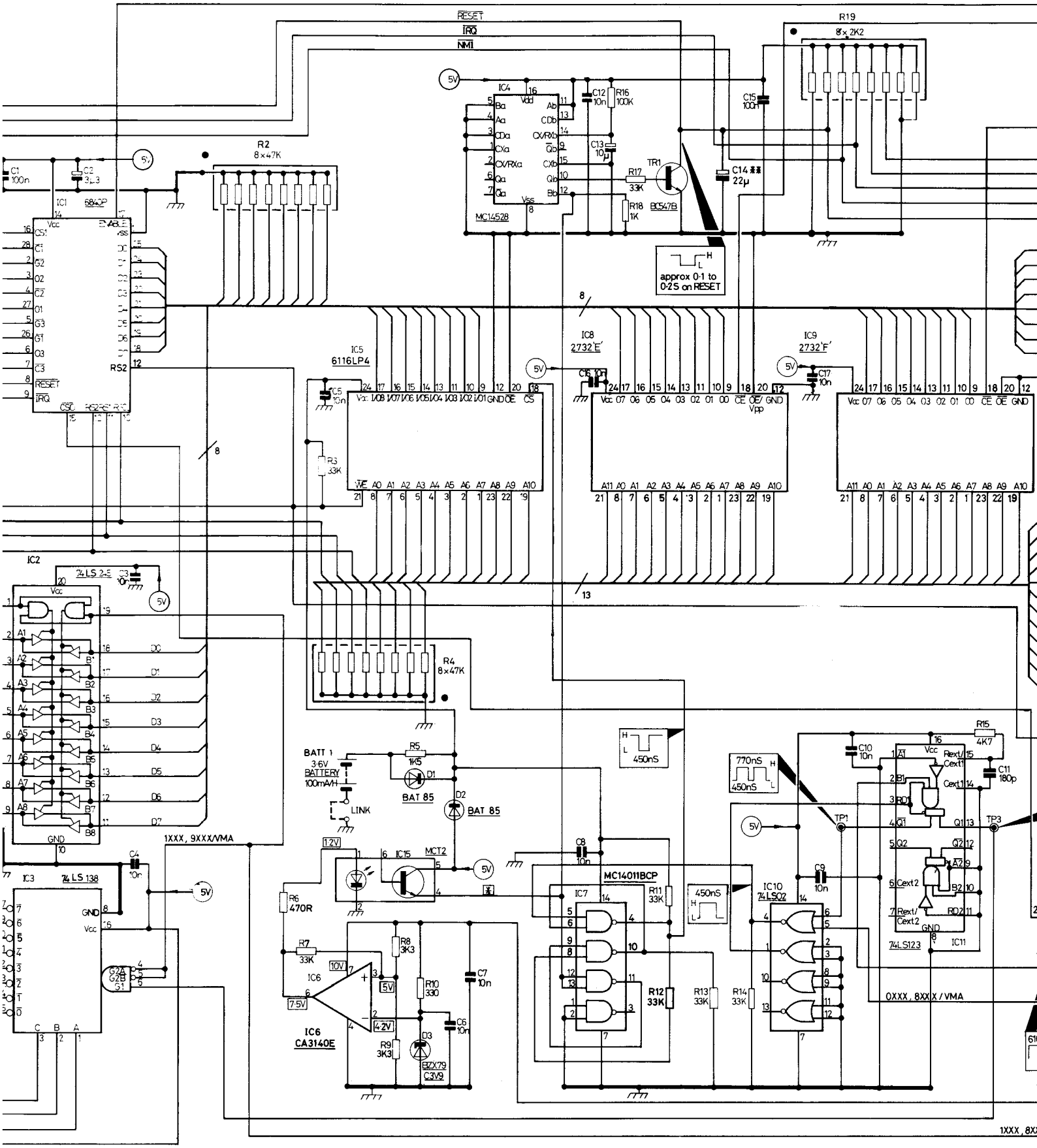
ENGLAND

DRG No BP2025
ISSUE 1

1650/6 INTERFACE BOARD.
CIRCUIT REF. 12

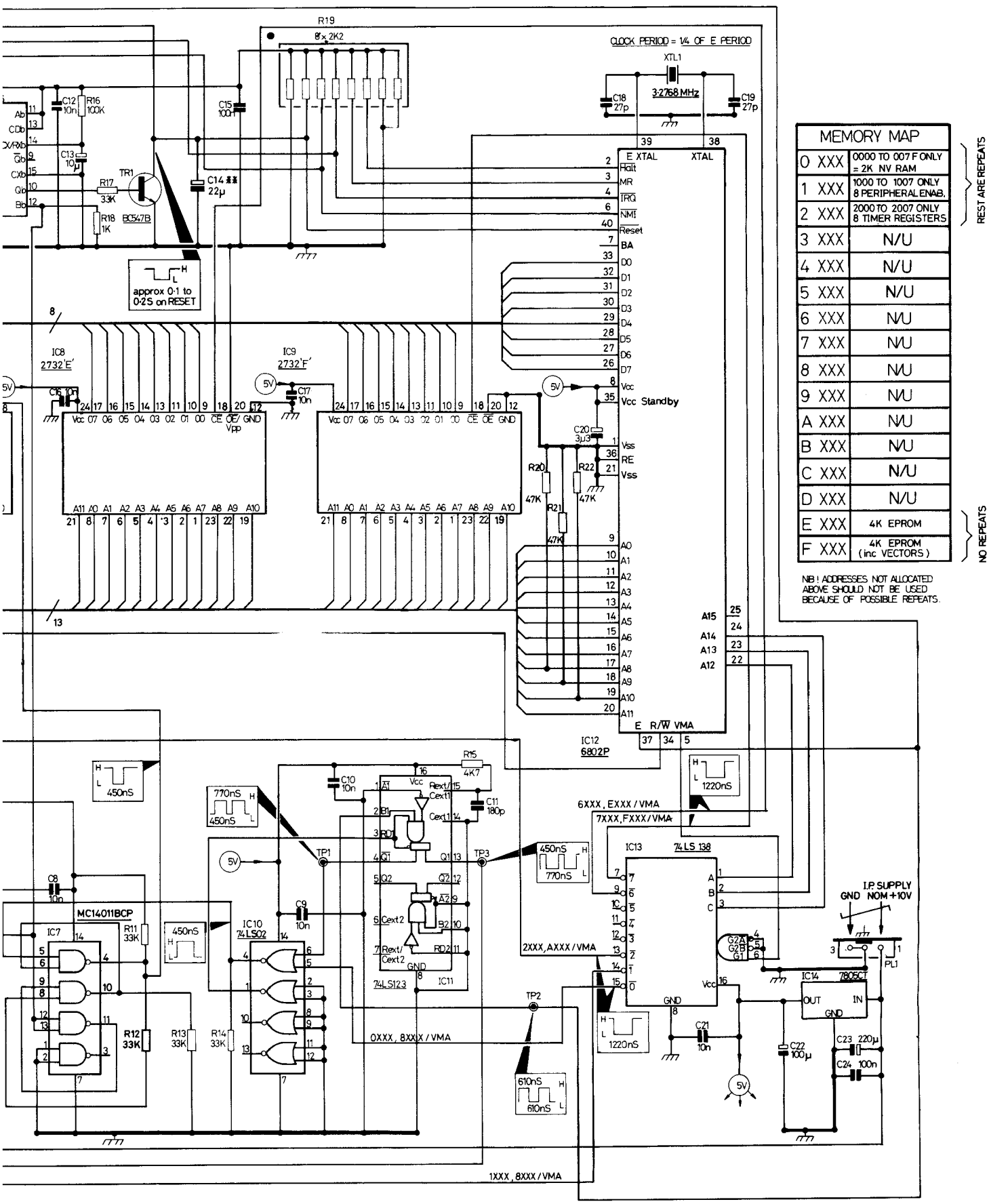

R1 8×2K2
R2 8×47K
R3 33K
R4 8×47K
R5 1K5
R6 470R
R7 33K
R8 3K3
R9 3K3
R10 330
C1 100n
C2 3µ3
C3 10n
C4 10n
C5 10n
C6 10n
C7 10n
IC1 6840P
IC2 74LS245
IC3 74LS138
IC5 6116LP4
IC6 CA3140E
IC15 MCT2
P1.2
P1.3
RESET
IRQ
NMI
GND
5V
PLUGS INTO INTERFACE BOARD 12 SK1 & 12 SK2
BI-DIRECTIONAL DATA BUS
EXTERNAL DEVICE SELECTED
BY
APPROX 450nS
BATT 1 3·6V BATTERY 100mAH
LINK
BAT 85
D1
D2
D3
BZX79 C3V9
1·2V
4·2V
7·5V
10V
1XXX, 9XXX/VMA
A0
A1
A2
* PIN 4 MCT 2
** C14 NOT FIT



* PIN 4 MCT 2 { GOES HIGH WHEN PCB 1/P SUPPLY EXCEEDS APPROX 8·8V / GOES LOW WHEN PCB 1/P SUPPLY FALLS BELOW 8·3V } 0·5V HYSTERESIS

** C14 NOT FITTED ON 1650/6 RX

1650/6 MICRO-COMP
CIRCUIT F



MEMORY MAP		
0 XXX	0000 TO 007F ONLY = 2K NV RAM	REST ARE REPEATS
1 XXX	1000 TO 1007 ONLY 8 PERIPHERAL ENAB.	
2 XXX	2000 TO 2007 ONLY 8 TIMER REGISTERS	
3 XXX	N/U	
4 XXX	N/U	
5 XXX	N/U	
6 XXX	N/U	
7 XXX	N/U	
8 XXX	N/U	
9 XXX	N/U	
A XXX	N/U	
B XXX	N/U	
C XXX	N/U	
D XXX	N/U	
E XXX	4K EPROM	NO REPEATS
F XXX	4K EPROM (inc VECTORS)	

NB ! ADDRESSES NOT ALLOCATED ABOVE SHOULD NOT BE USED BECAUSE OF POSSIBLE REPEATS.

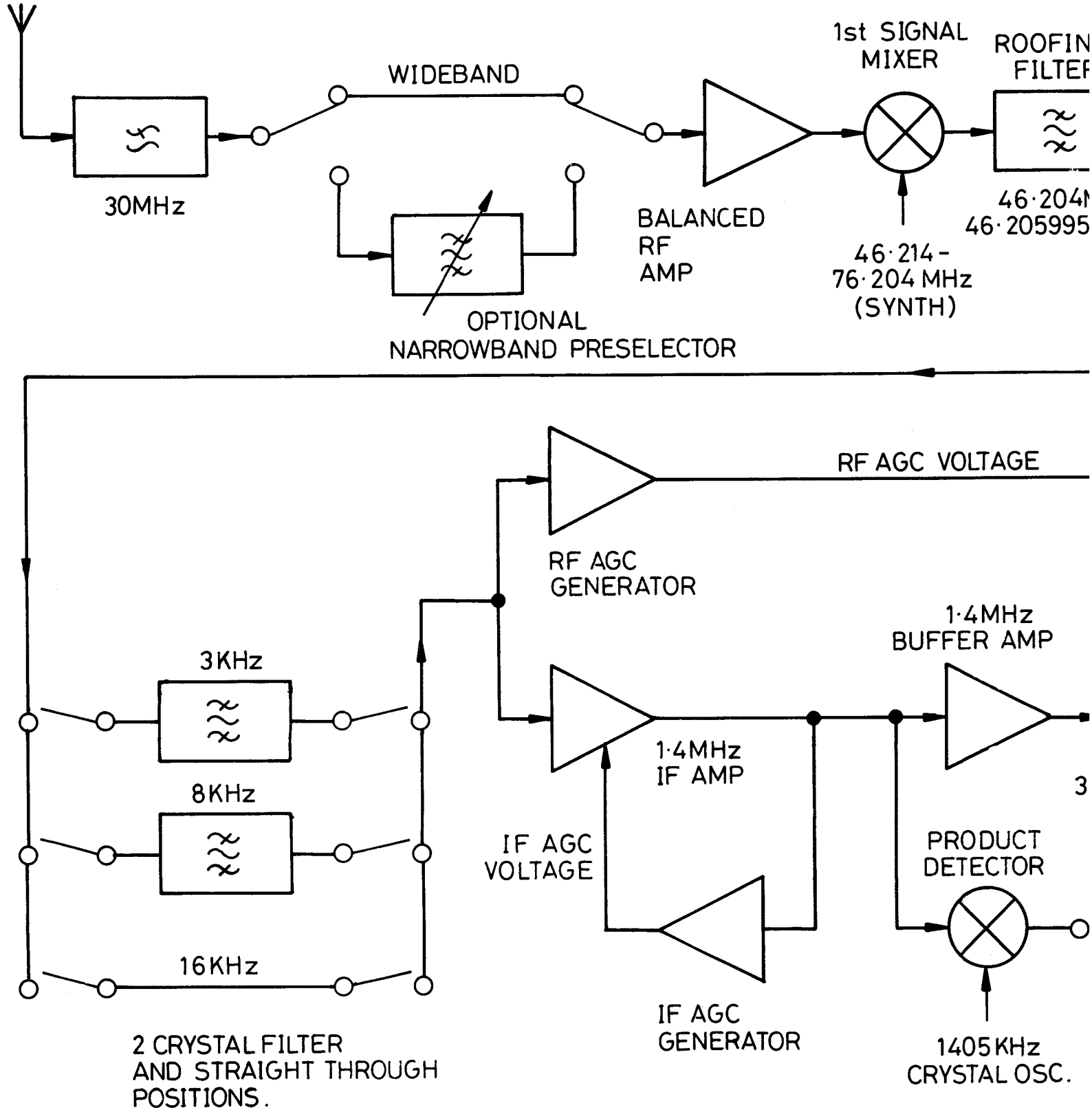
HIGH WHEN PCB I/P SUPPLY EXCEEDS APPROX 8·8V
OW WHEN PCB I/P SUPPLY FALLS BELOW 8·3V
} 0·5V HYSTERESIS

1650/6 RX

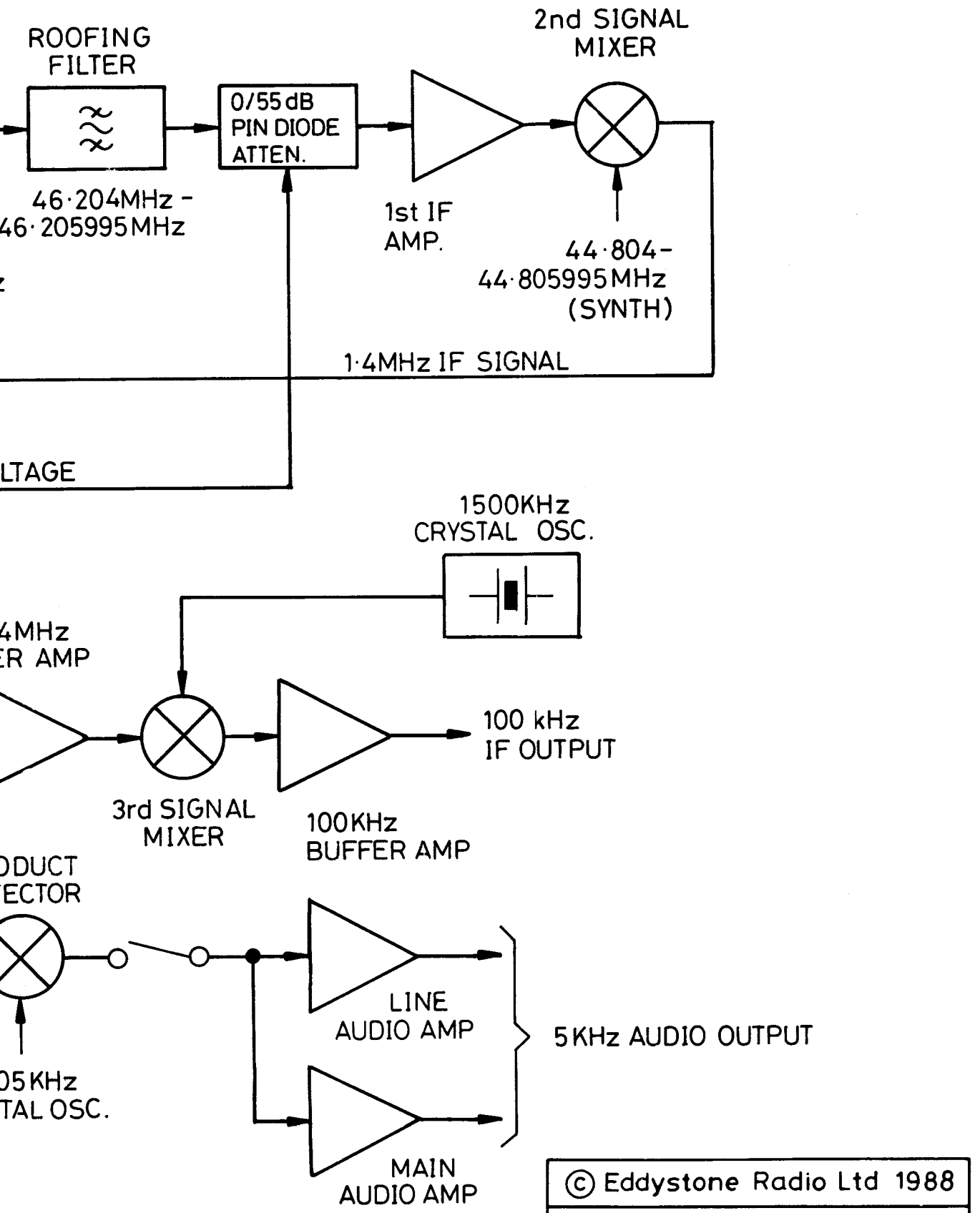
1650/6 MICRO-COMPUTER BOARD
CIRCUIT REF 13

EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG № BP1556



1650/6 RECEIVER SIGNAL CIRCUITS BLOCK DIAGRAM

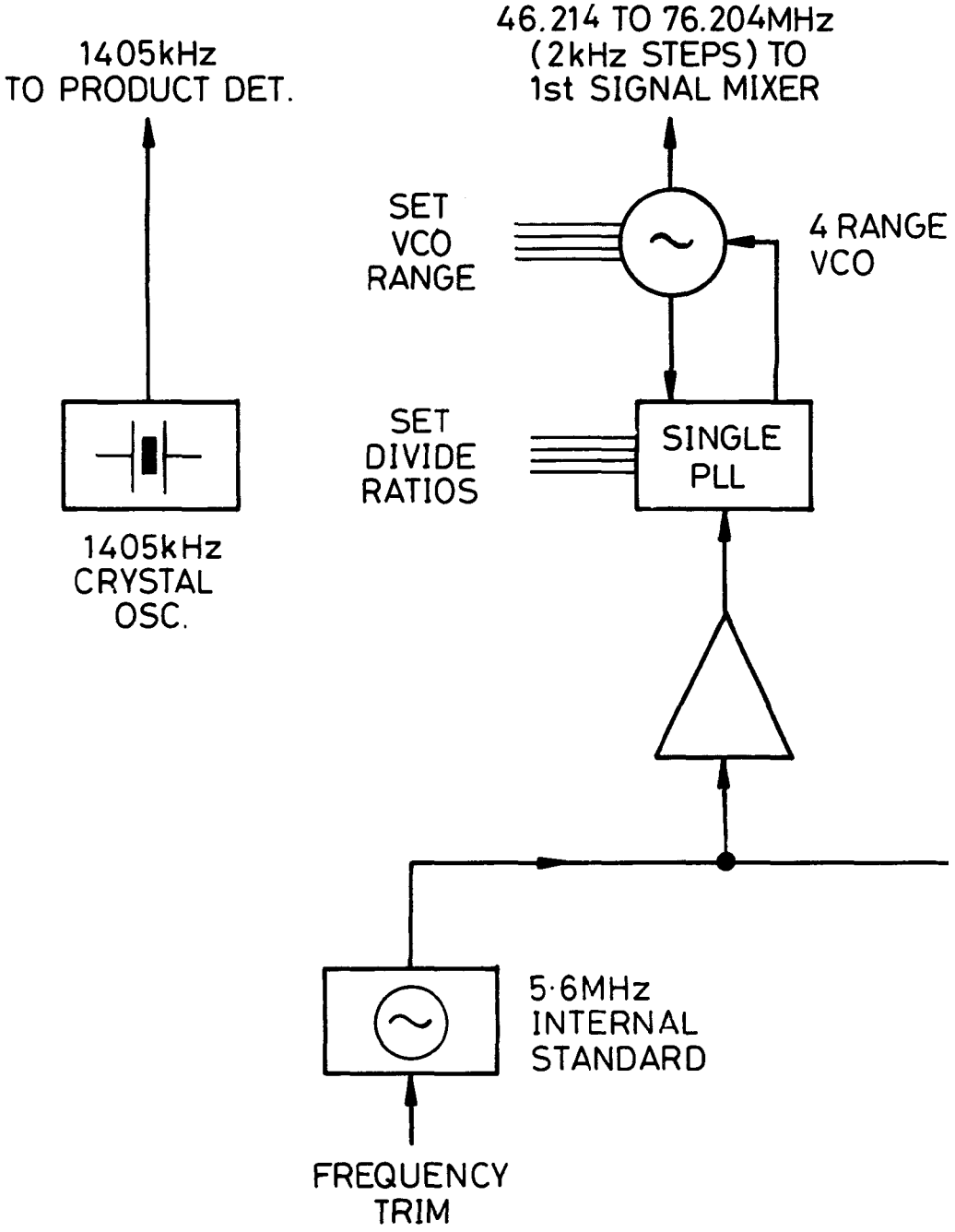


AGRAM

EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

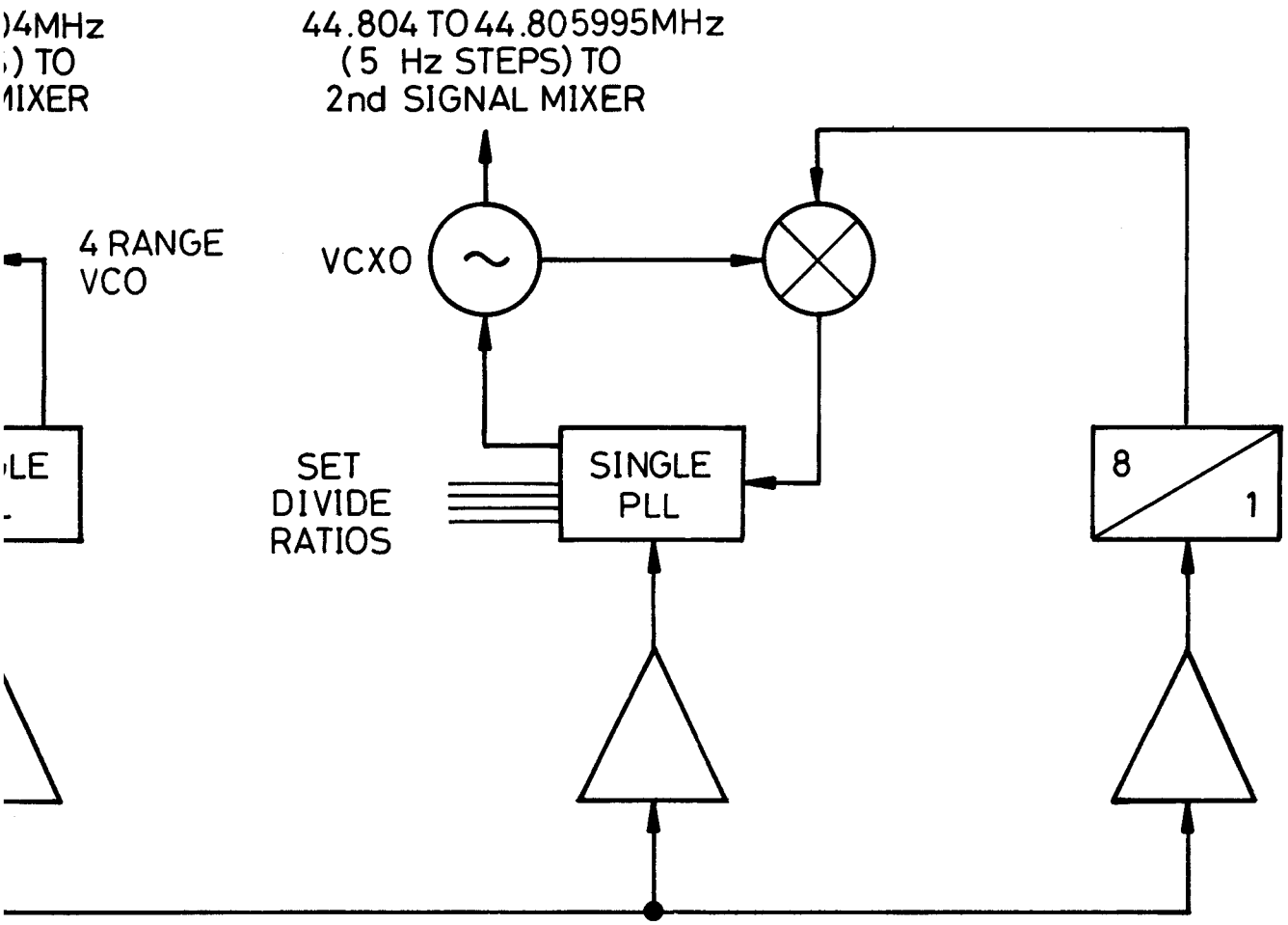
DRG No BP2022

ISSUE 1



1650/6 RECEIVER SYNTHESISER CIRCU

BLOCK DIAGRAM

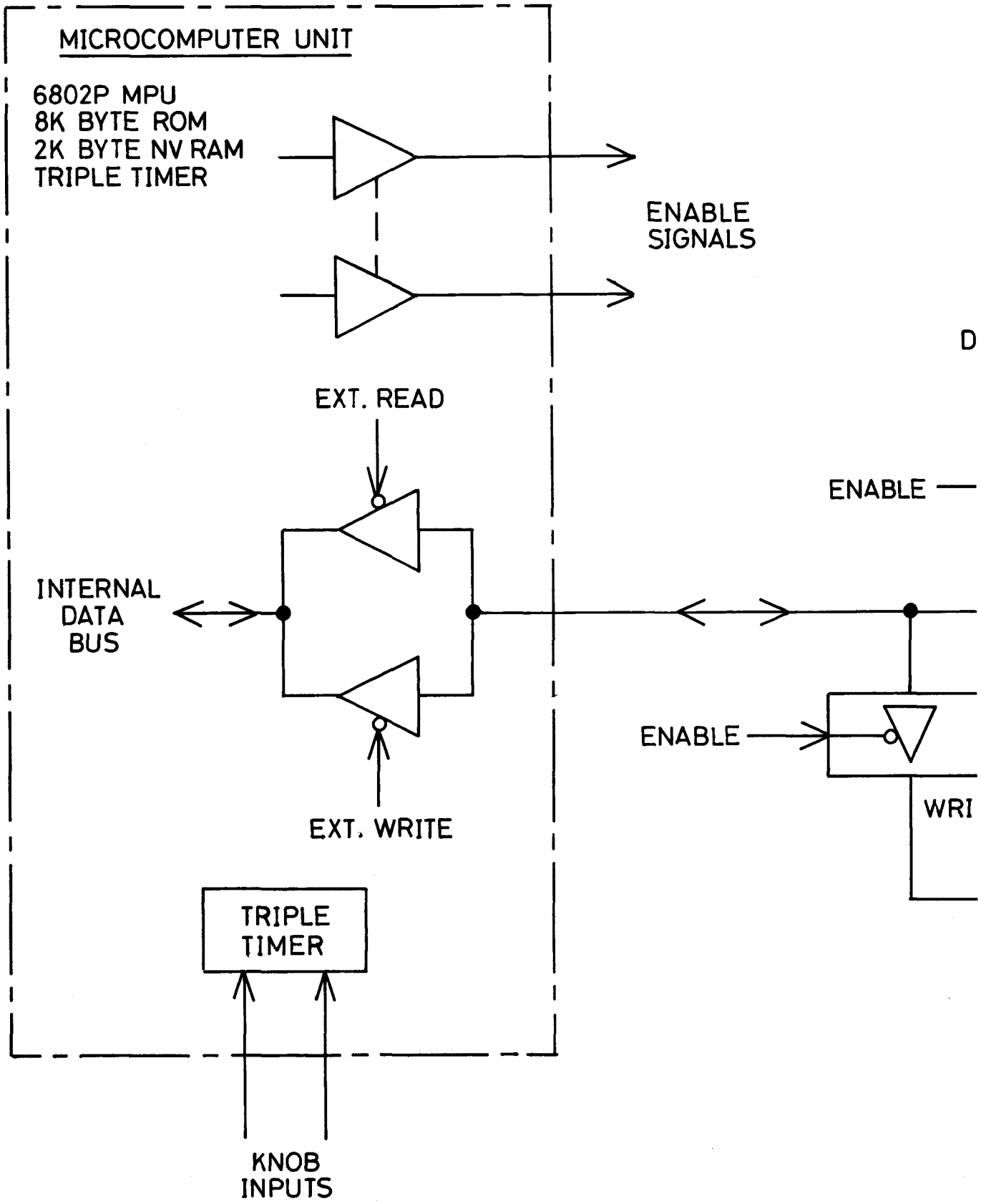


R CIRCUITS

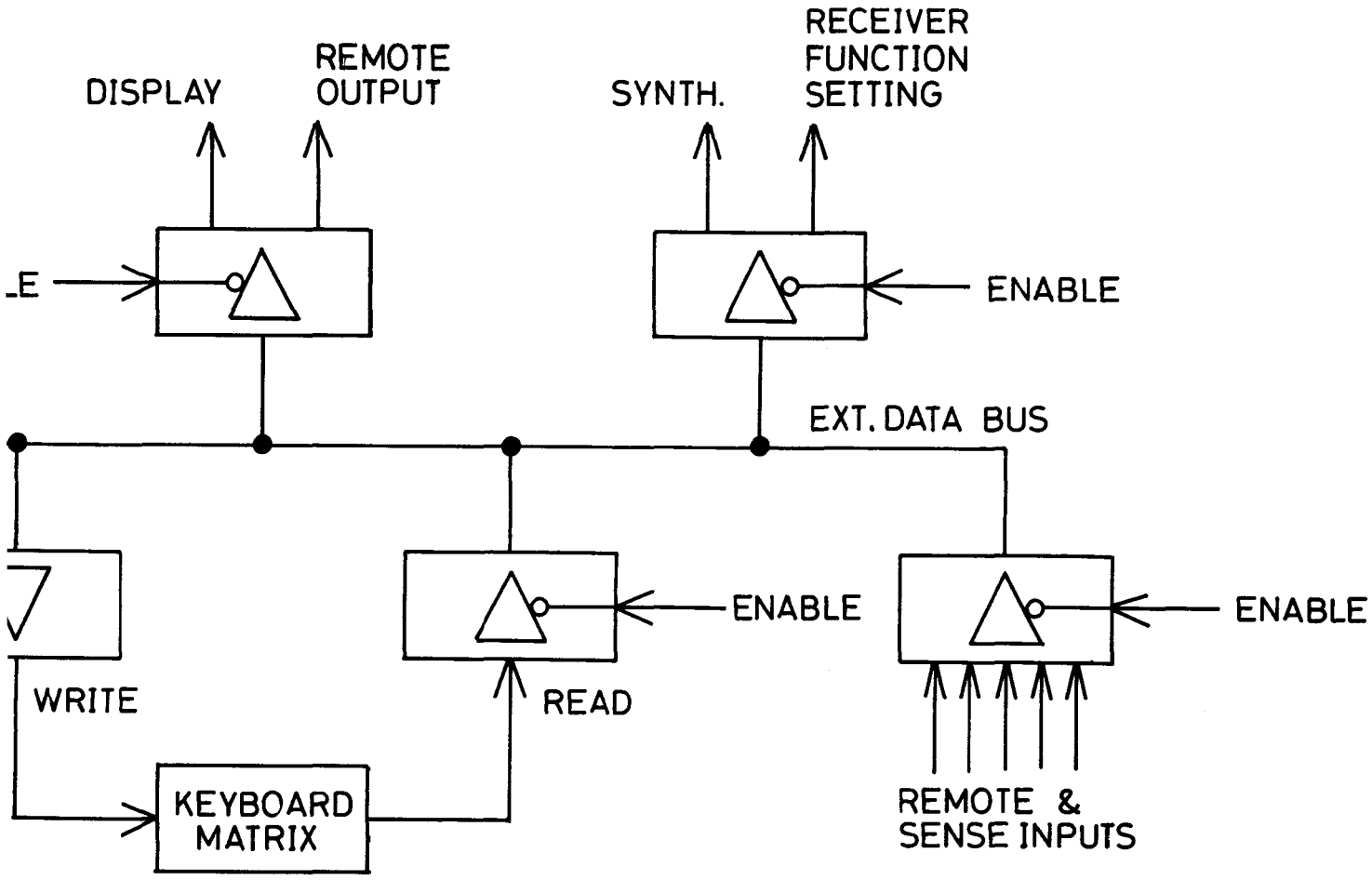
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No BP2023

ISSUE 1



1650/6 RECEIVER, CONTROL & MCU



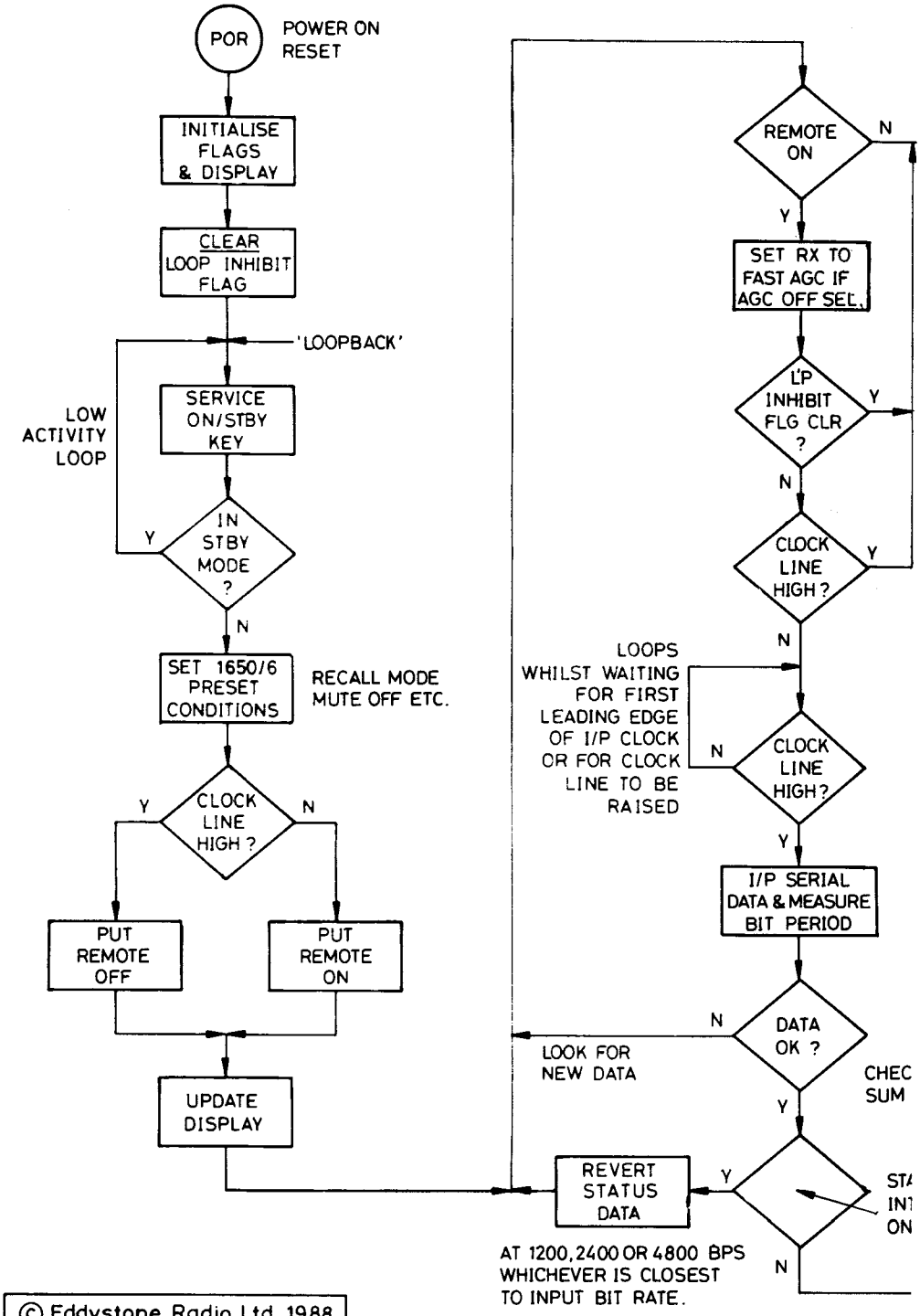
MCU CIRCUITS

EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No BP2042

ISSUE 1

1650/6 SIMPLIFIED EXECUTI



EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

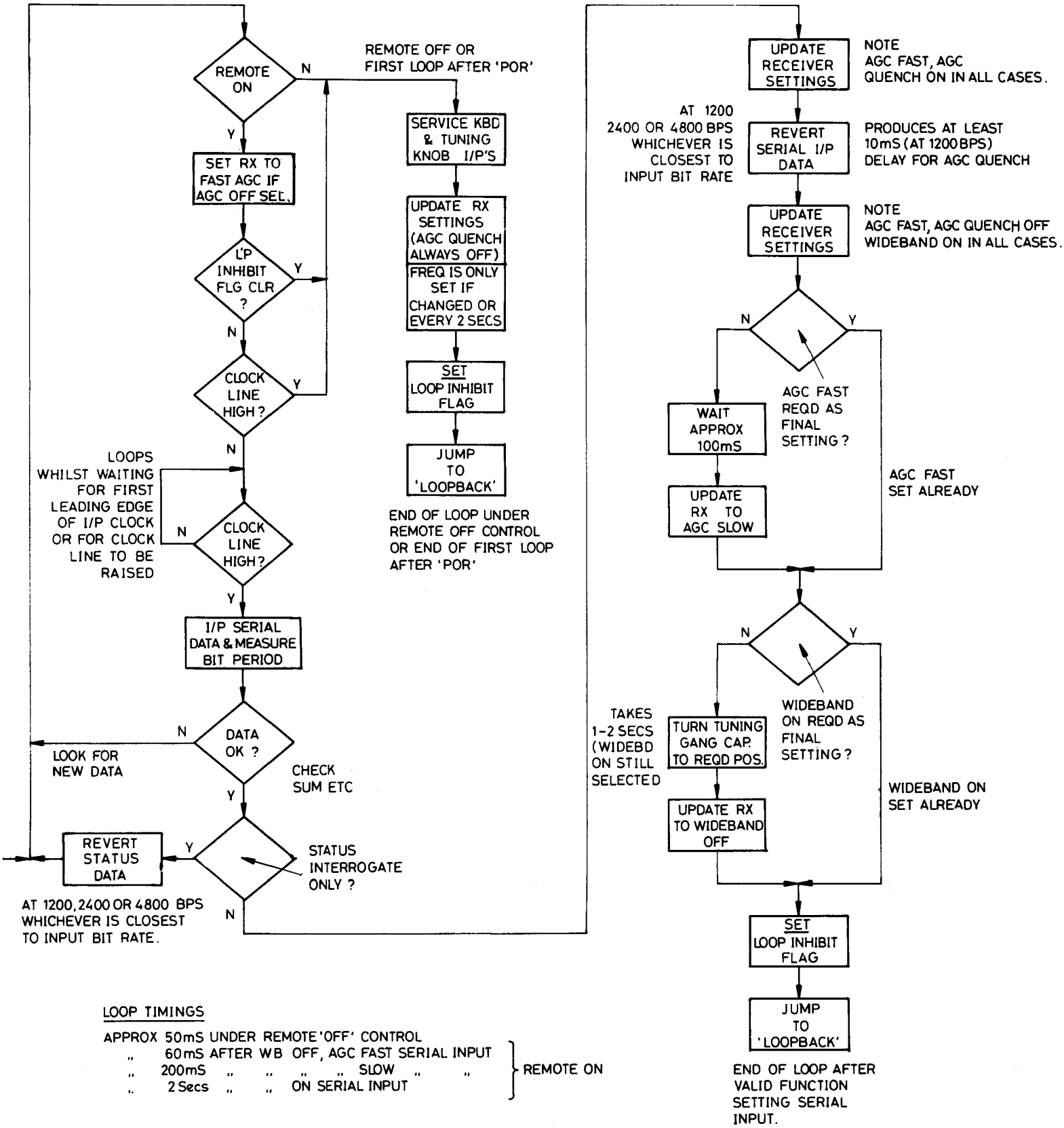
DRG No **BP2024**

ISSUE 1

LOOP TIMINGS

APPROX 50mS UNDER REMOTE '(
" 60mS AFTER WB OFF,
" 200mS " " "
" 2 Secs " " ON S

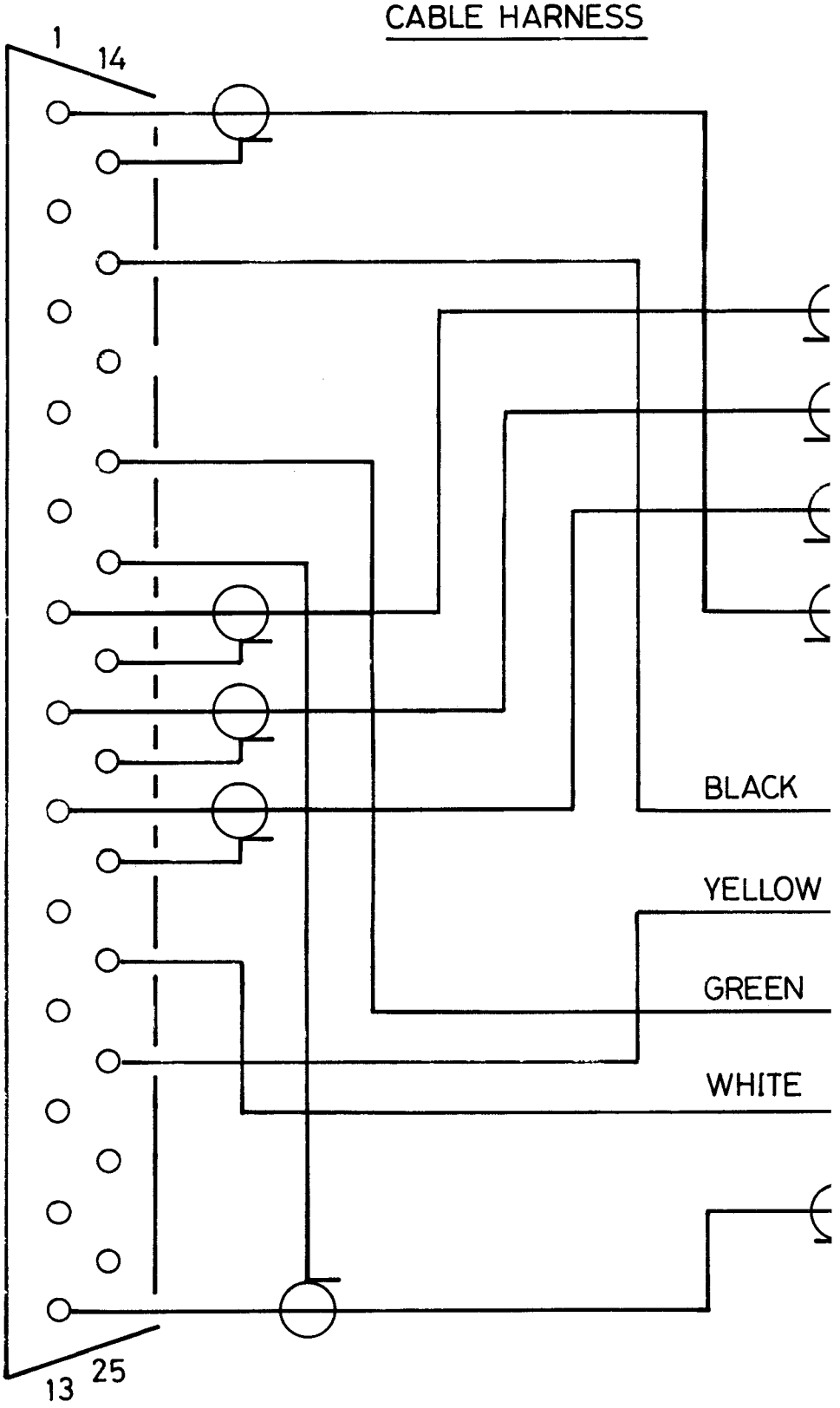
0/6 SIMPLIFIED EXECUTIVE PROGRAM FLOWCHART



LOOP TIMINGS

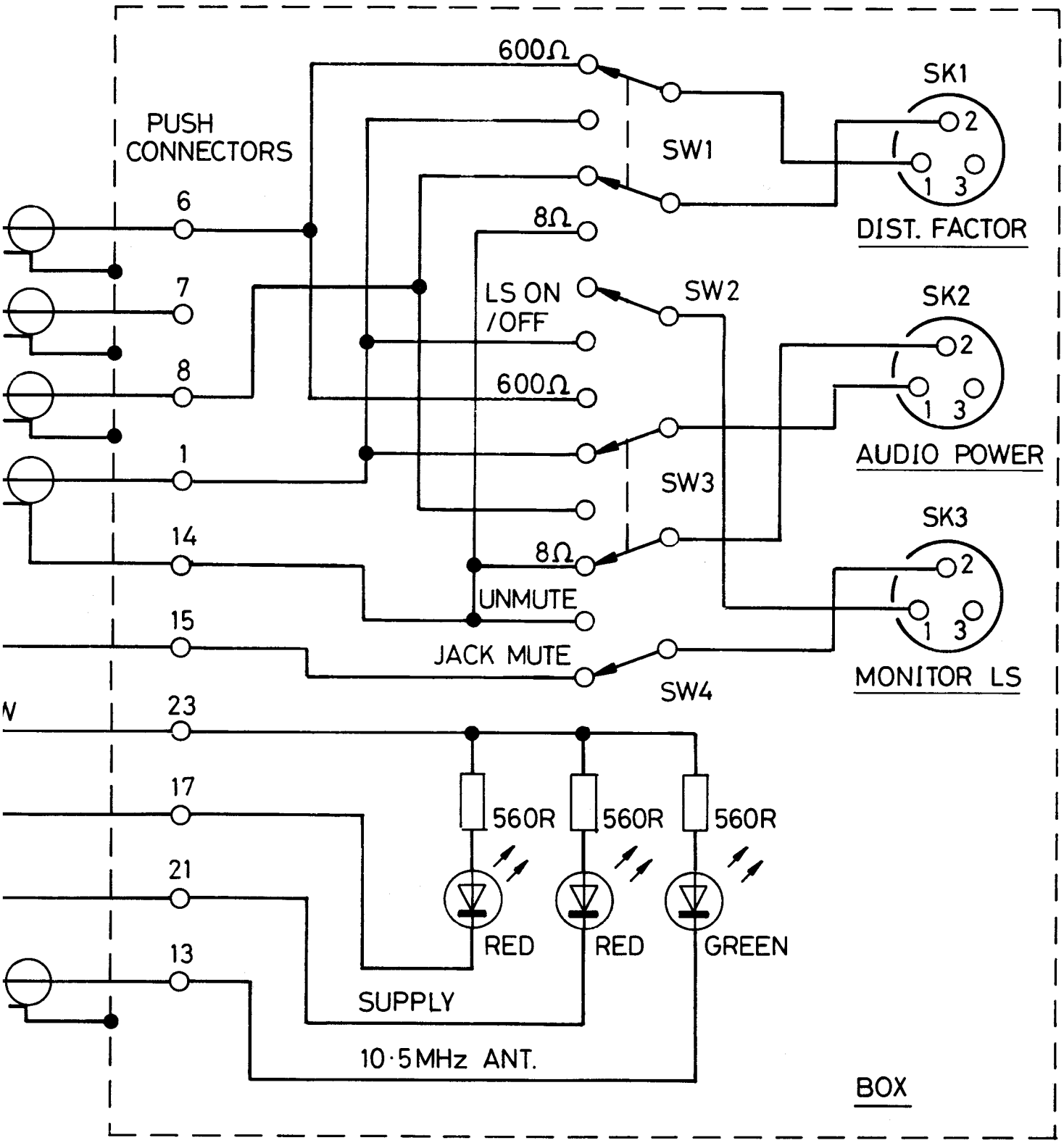
APPROX 50mS UNDER REMOTE 'OFF' CONTROL
" 60mS AFTER WB OFF, AGC FAST SERIAL INPUT
" 200mS " " " " SLOW " "
" 2 Secs " " ON SERIAL INPUT
} REMOTE ON

CABLE HARNESS



CONNECTOR 25 WAY
'D' MALE VIEW ONTO
SOLDER BUCKETS.

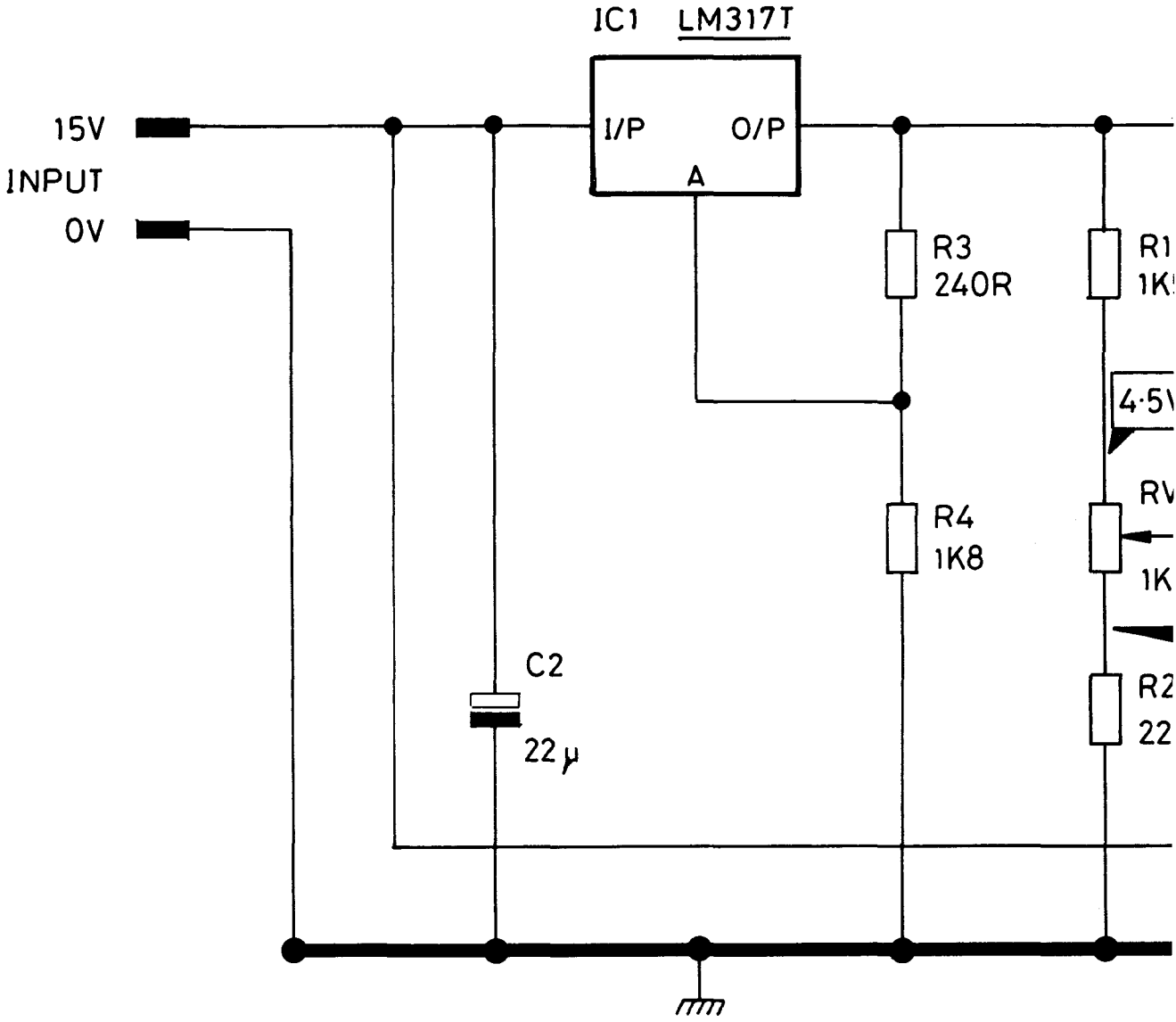
ANCILLARIES TEST BOX WIRING-1650



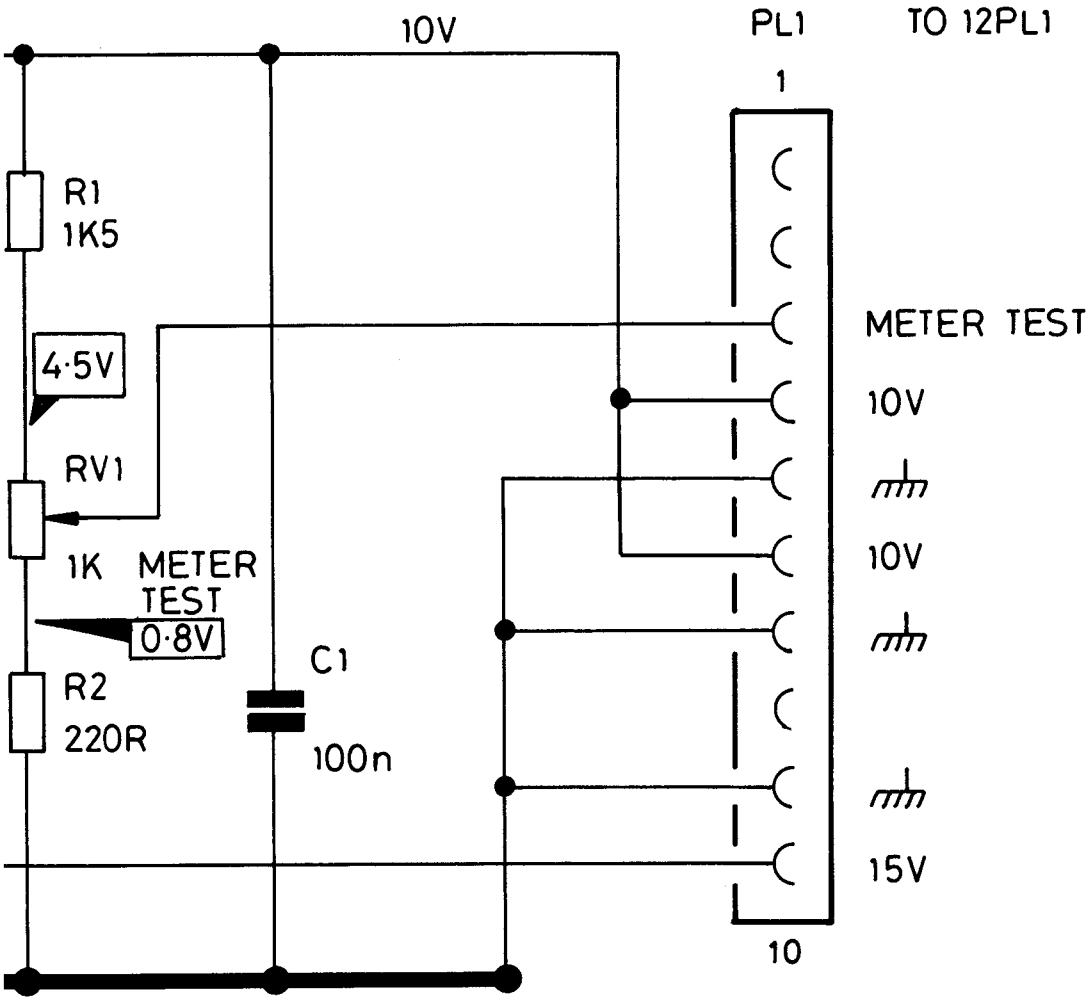
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No	BP2019
ISSUE 1	

)/6/D6245



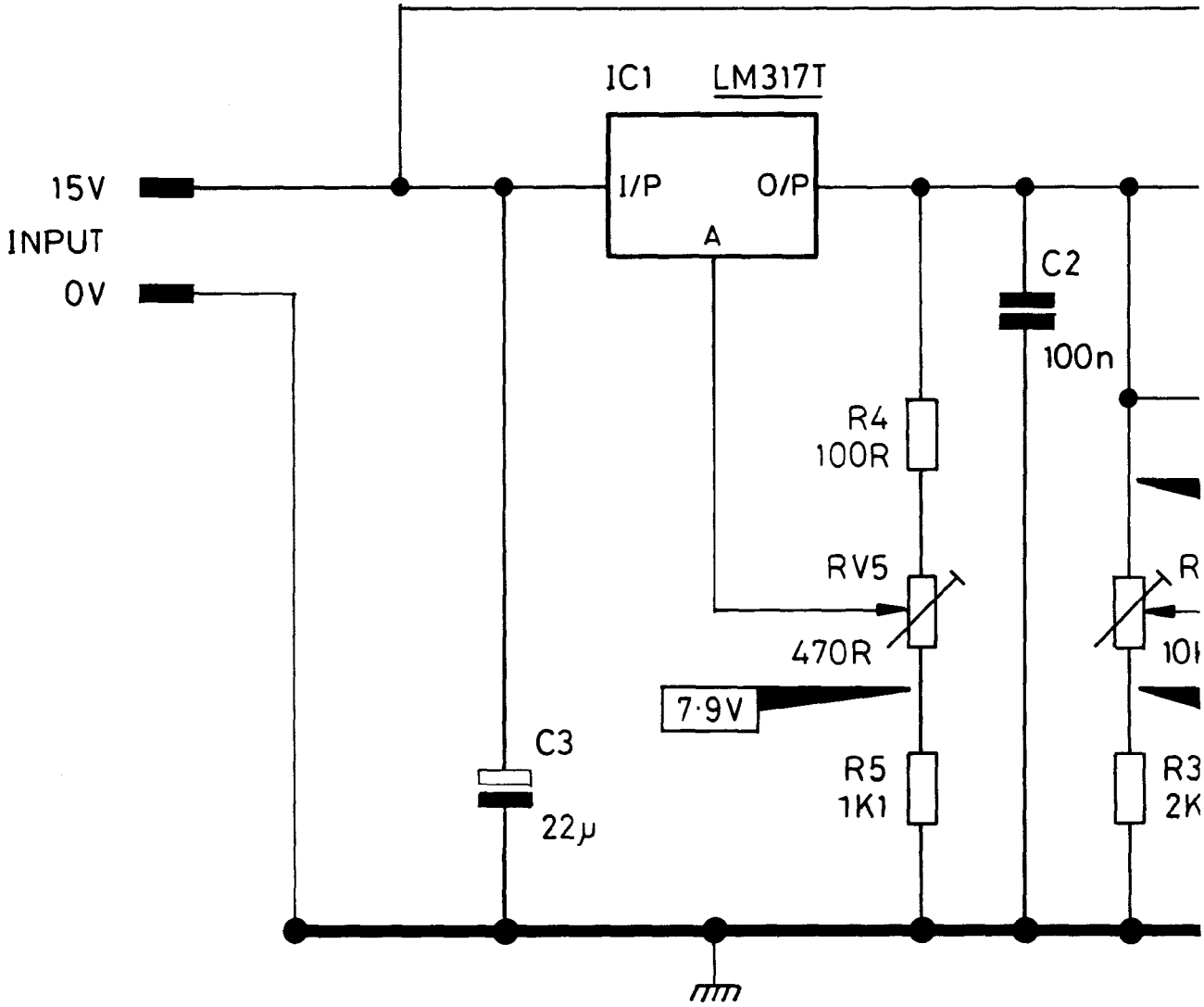
1650/6 / D6247 FRONT PANEL TEST BOX



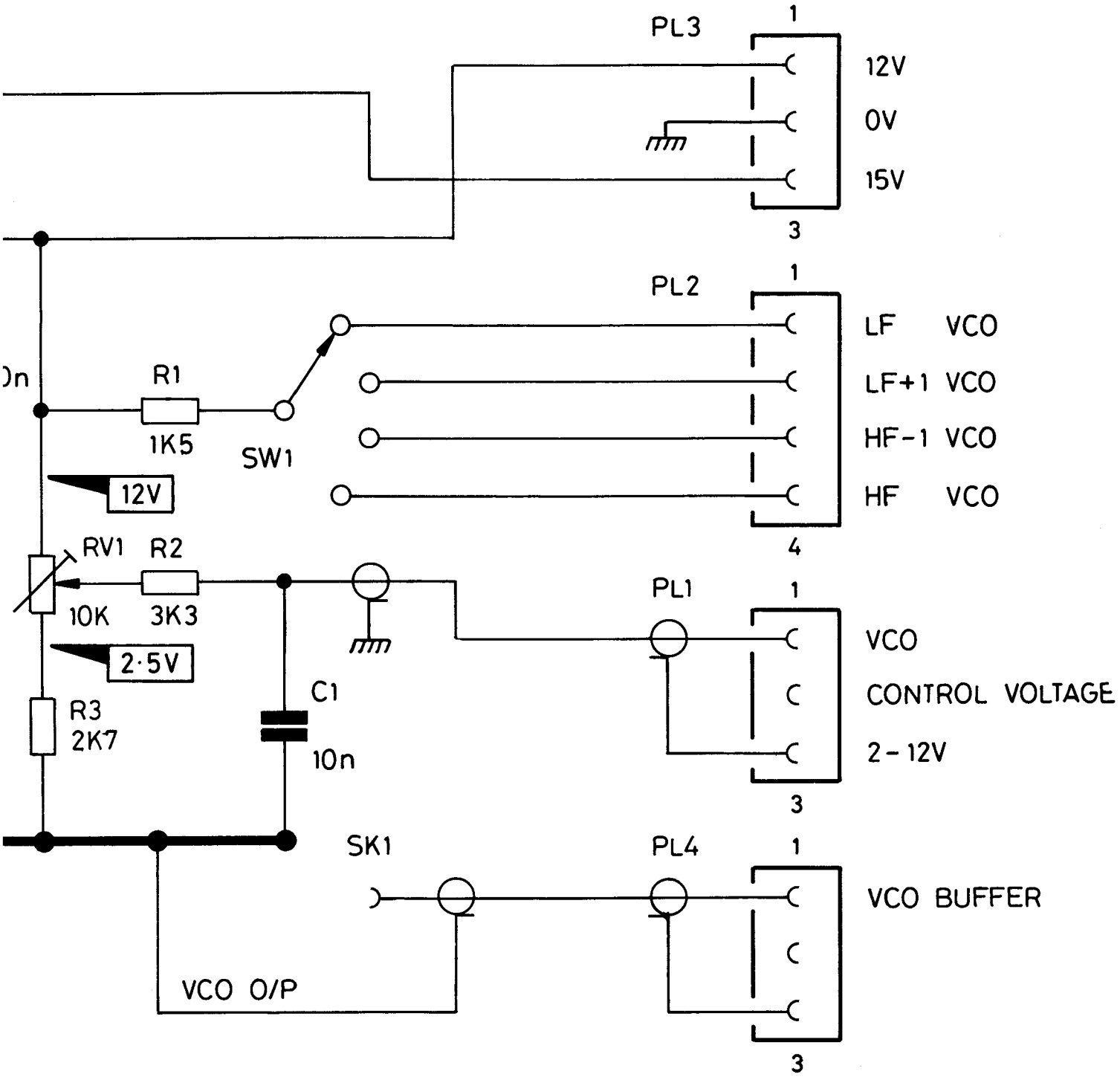
OX CIRCUIT

EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No	BP2038
ISSUE 1	



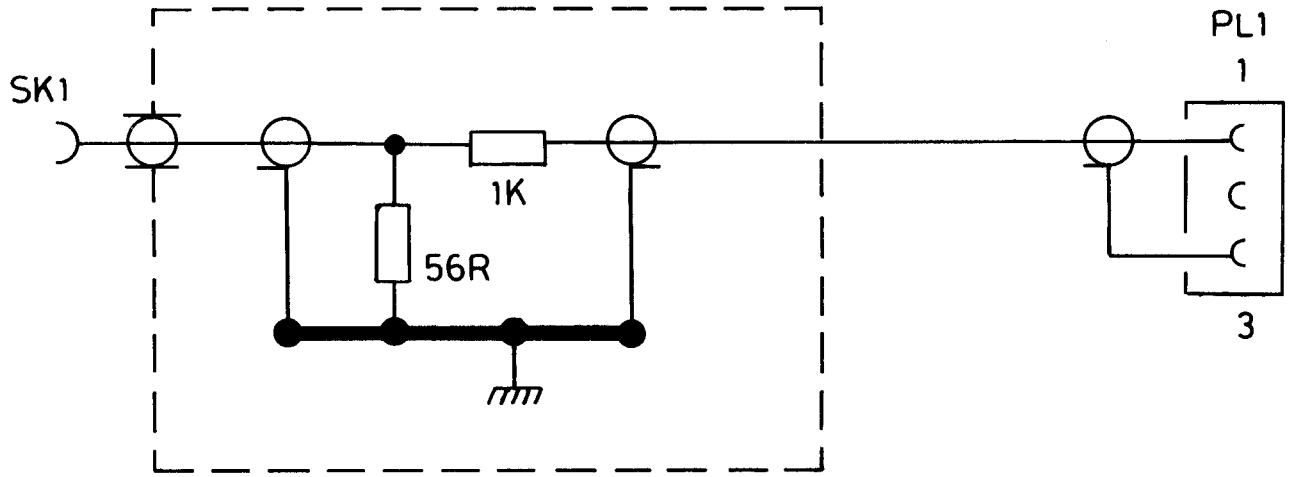
1650/6 / D6248 VCO TEST BOX



EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No **BP2037**

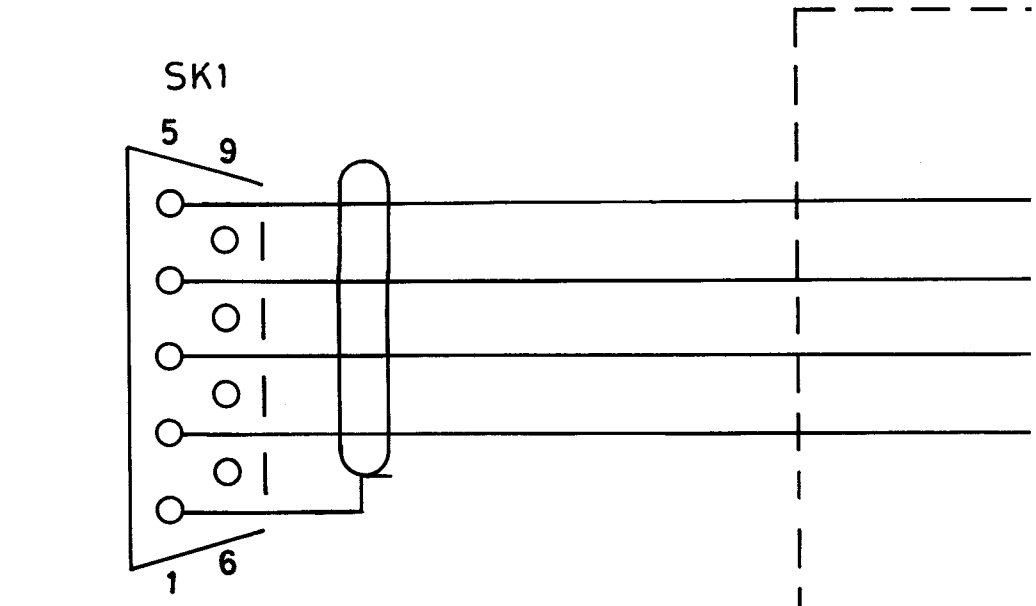
ISSUE 1



1650/6 / D6249 1·4MHz IF I/P PAD

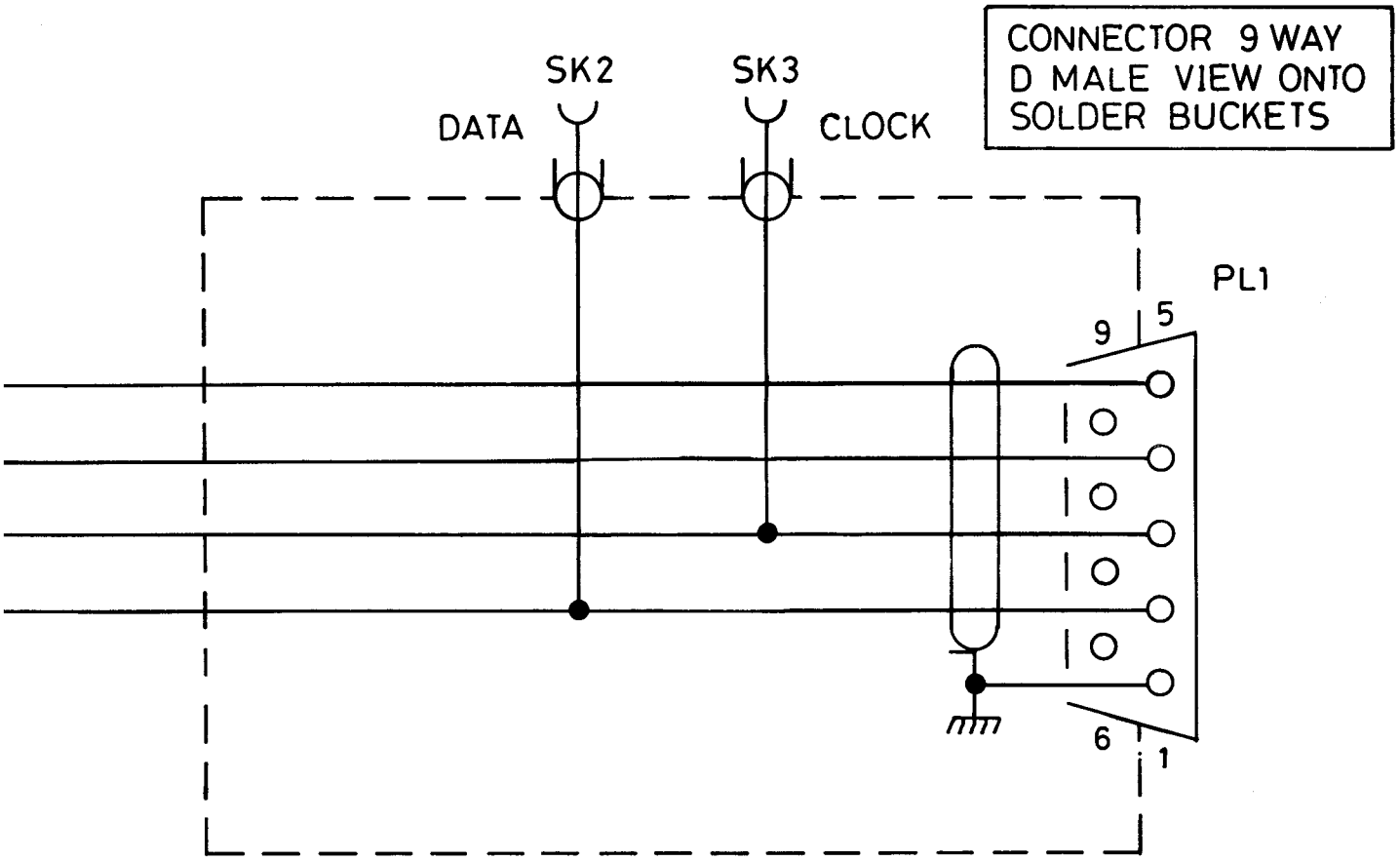
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No	BP2039
ISSUE 1	



CONNECTOR 9 WAY
D FEMALE VIEW
ONTO SOLDER BUCKETS

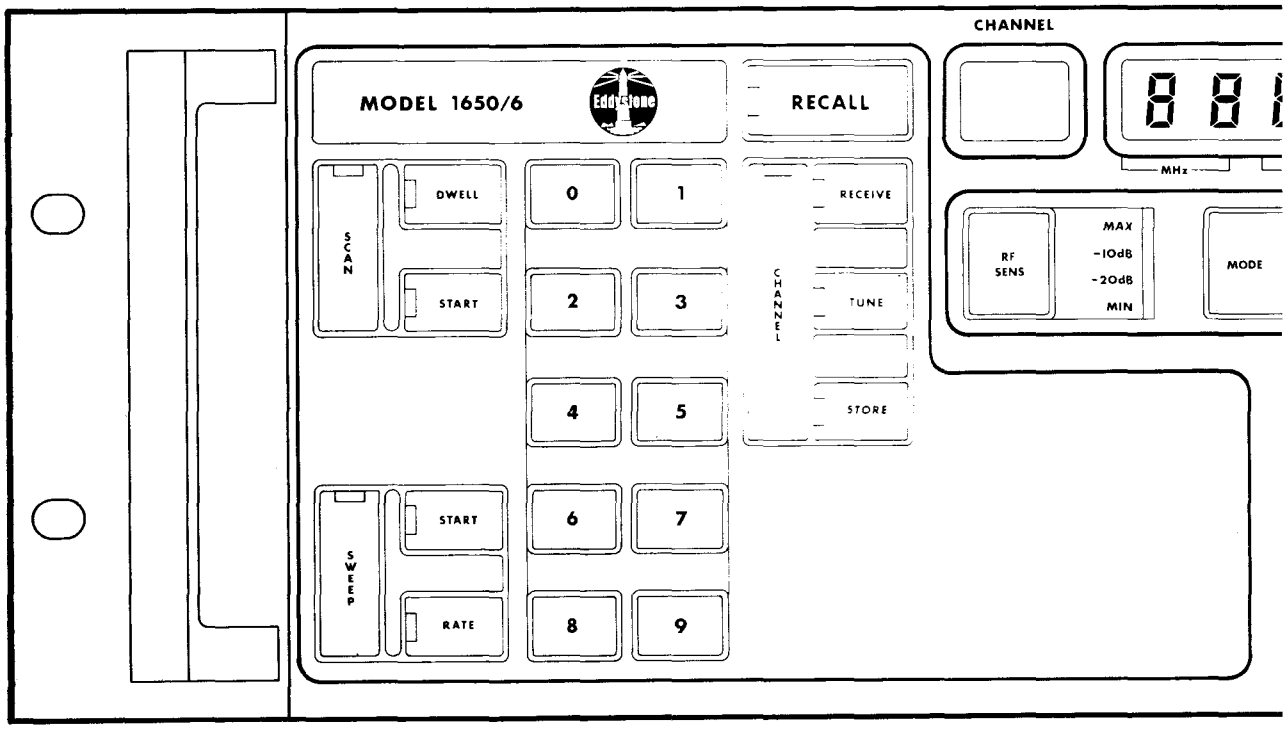
1650/6 / D6250 REMOTE BREA



REMOTE BREAKOUT BOX

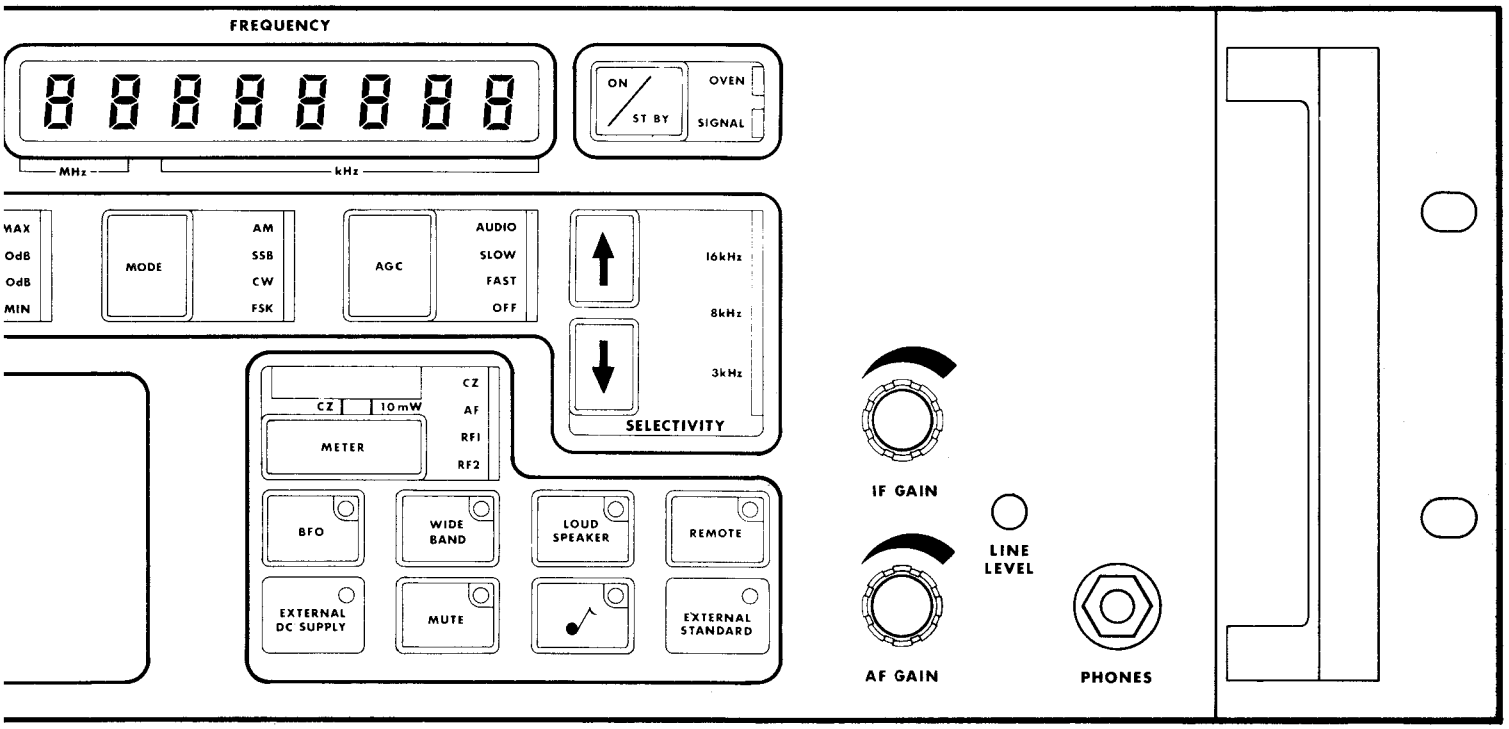
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND

DRG No	BP2036
ISSUE 1	



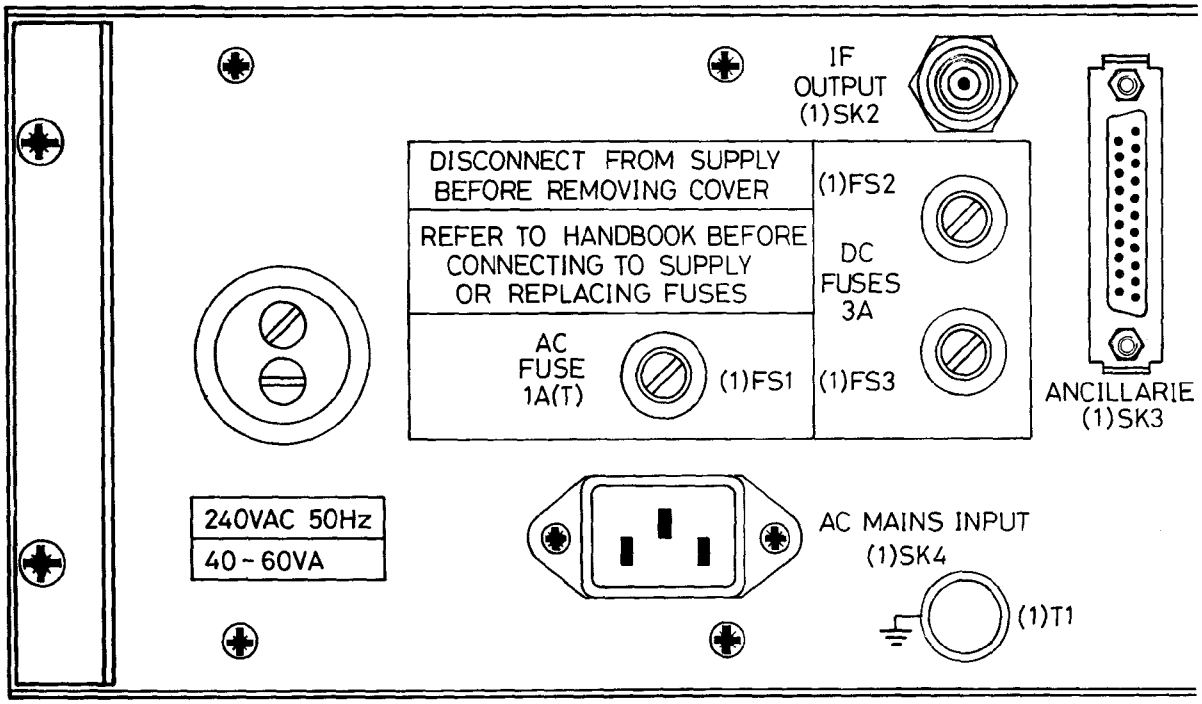
1650/6 RECEIVER FRONT PA

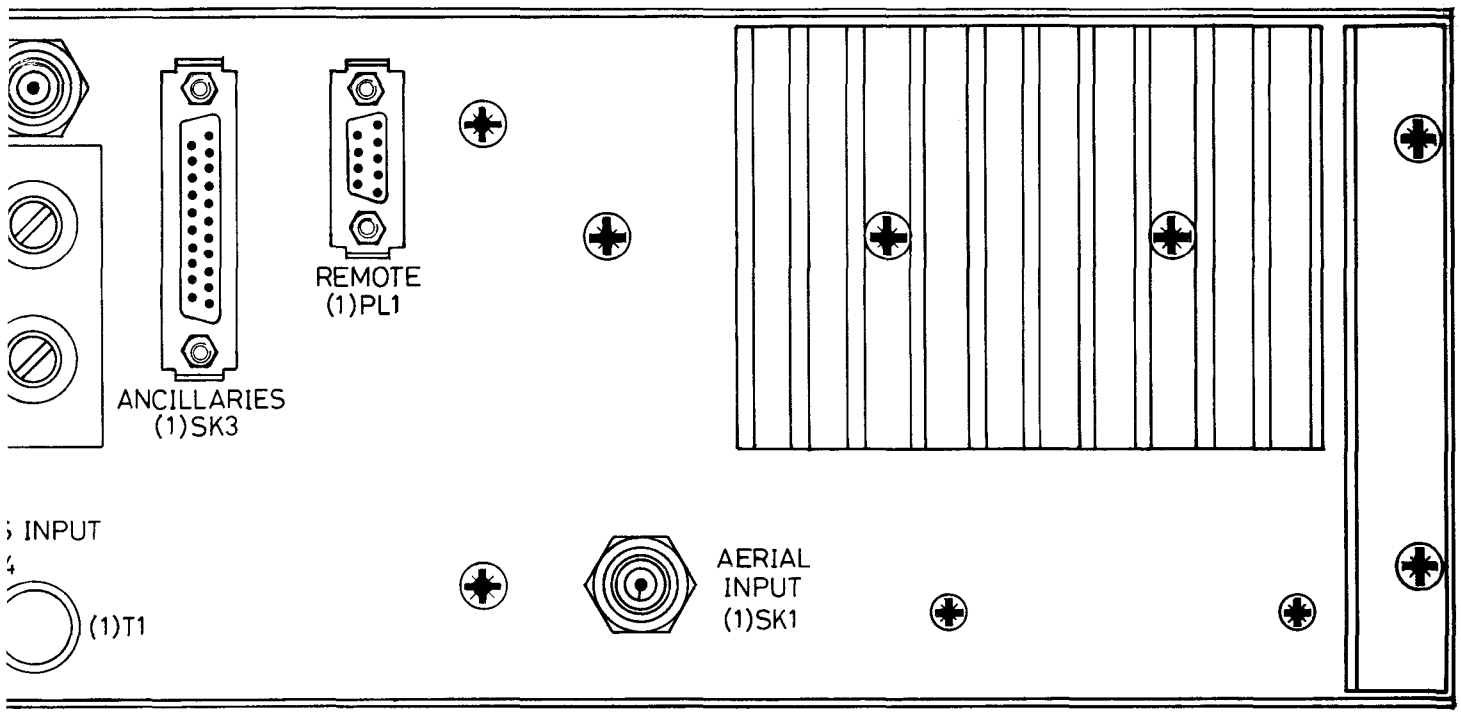
BP2028



FRONT PANEL LAYOUT

P2028


IF
OUTPUT
(1)SK2
DISCONNECT FROM SUPPLY
BEFORE REMOVING COVER
REFER TO HANDBOOK BEFORE
CONNECTING TO SUPPLY
OR REPLACING FUSES
AC
FUSE
1A(T)
(1)FS1
(1)FS2
DC
FUSES
3A
(1)FS3
ANCILLARIE
(1)SK3
240VAC 50Hz
40 - 60VA
AC MAINS INPUT
(1)SK4
(1)T1



1650/6 RECEIVER REAR PANEL LAYOUT

BP2029

APPENDIX B

B.1 EXTENDER CABLES AND FITTINGS (use)

The 1650/6 circuit boards may be operated 'out of the receiver' for maintenance purposes with extender cables. This may be carried out on a 'board at a time' basis as follows:-

Procedure
---

1) The relevant circuit board is removed from the receiver-see Part 1 Section 5.2 MODULE ACCESS AND REMOVAL.

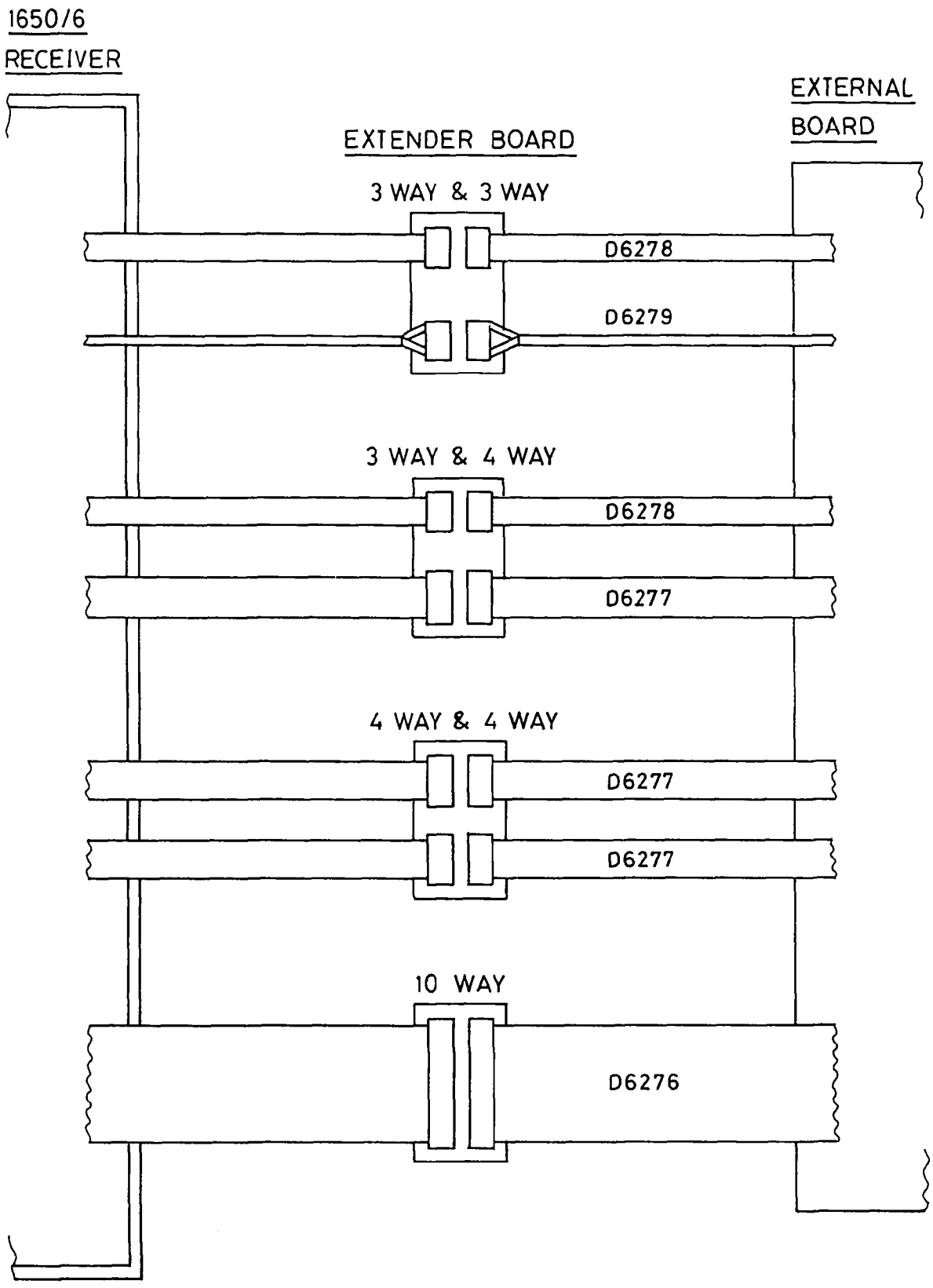
2) The appropriate Test Lead Terminations, see Figure B.1, are connected to the receiver's cable harness and the Extender Cables attached.

3) The circuit board may now be attached to the Extender Cables and run from the receiver.

N.B. Operation of the 1650/6 with Extender Cables may, in certain circumstances, degrade the performance of the receiver. Performance measurements should always be made with the receiver in operational trim i.e. all covers, screens and earth straps fitted.

B.2 EXTENDER CABLES AND FITTINGS (parts)

Description	Part No.
Ribbon cable extender 10way	1650/6/D6275
10 way to 10 way (123&8 N/C) KK cable	1650/6/D6276
4 way to 4 way KK cable	1650/6/D6277
3 way to 3 way KK cable	1650/6/D6278
Co-ax KK cable	1650/6/D6279
10 way to 10 way KK adaptor	1650/6/D6280
3 way to 3 way KK adaptor	1650/6/D6281
3/4 way to 3/4 way KK adaptor	1650/6/D6282
4/4 way to 4/4 way KK adaptor	1650/6/D6283
3/3 way to 3/3 way KK adaptor	1650/6/D6284



Test Lead Terminations

Figure B.1