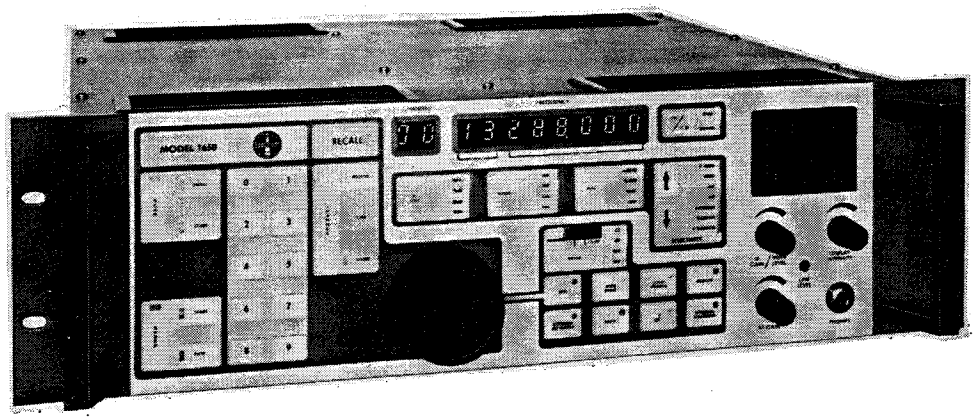
Eddystone

Model 1650/7

High Stability HF/MF Receiver



Eddystone Radio

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Issue Number One APRIL 1986

AMENDMENT RECORD

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The Manufacturer reserves the right to modify the content of this publication as necessary to accommodate modifications, design improvements etc. Relevant Amendment Sheets will be incorporated at date of issue.

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Section 1

INTRODUCTION

Description

The 1650 series of receivers is intended for maritime and high stability applications in the frequency range 10kHz to 30MHz.

The 1650/7 is a special version of the 1650 High Stability Receiver, and is designed primarily to provide reception facilities for CW, MCW and AM signals, together with upper sideband signals in accordance with Specification IT4659.

Operation is from any standard 40Hz to 60Hz supply, a positive 24V DC supply, or from an external inverter unit. The 1650/7 is only available with suffix 'C' protocol remote control, and has slightly modified front panel control to the parent 1650/1 (including remotely controlled 'lockout' of front panel controls) and a remotely controllable audio line attenuator.

A highly advanced circuit design is employed using double conversion on all ranges. A first IF frequency at 46MHz ensures adequate image and IF breakthrough performance, and a second IF of 1.4MHz allows optimum versatility for specific customer requirements for different bandwidths to the standard supplied. The frequency to which the receiver is tuned is controlled by a high stability synthesiser tunable within 3Hz, with the frequency shown by an eight digit electronic display. Frequency selection is by means of a single tuning knob giving the operator the feel of a conventional receiver for search facilities. A keyboard is also provided for direct entry when the required frequency is known. Up to 99 channel frequencies, (including their various modes of operation) can be loaded and stored in non-volatile memory for use in the receive and scanning modes.

Bandpass input tuned circuits are provided on all frequencies above 100kHz with a single low pass filter for operation from 10kHz to 100kHz. These RF circuits are gang tuned by a motor and are automatically tuned to the correct frequency, from information derived from the synthesiser control. This arrangement provides for optimum freedom from cross modulation, blocking, and intermodulation under traffic conditions when high-level interfering signals are present.

Selectivity is adjustable to suit signal mode, and a choice of AM or product detector is available. The associated insertion oscillator for the product detector is derived from the master oscillator for optimum stability on both SSB reception (fixed injection) and CW reception (variable injection from front panel control).

Output is provided at the intermediate frequency of 1.4MHz for connection to ancillary equipment. Audio outputs are available for loudspeaker, headphones and lines, the line output being fed from an independent low-level amplifier with an adjustable pre-set gain control and a remotely controllable line attenuator. A monitor speaker is fitted and provision for connection to an external speaker provided. Aerial muting relay and input attenuator are also incorporated.

The receiver is provided with serial inputs and outputs to enable remote control in accordance with specification IT4659.

The 1763 RIA unit is employed to enable remote control of IF gain and audio line attenuator, and provide meter revertive data (see 1763 handbook). This unit also determines whether the receiver is set for local or remote control (local/remote switching not being provided on the receiver front panel).

GENERAL SPECIFICATION

Frequency Coverage

10kHz-30MHz (General specification only applies over 400kHz to 4MHz as required by IT4659)
Bandpass input tuned circuits 150kHz-30MHz
with low pass filter from 10kHz-150kHz, is available as an optional extra.

Intermediate Frequencies

46.205MHz 1st IF
1.4MHz 2nd IF

Aerial Impedance

50 ohm nominal (unbalanced)

Reception Modes

1650/7 AM, CW, USB, MCW

Reception Bandwidths

Narrow	:	400Hz
Intermediate	:	2.25kHz
Wide	:	7kHz
USB	:	2.4kHz

NOTE Very Narrow and LSB are not available. Also note that Sweep, Standby and Front Panel Local/Remote Switching facilities are not available.

Stability and Tuning

Tunable with 3Hz resolution with all frequencies derived from standard oscillator.

Better than 1 ppm over 10°C to 30°C. (30 day period)
Display: Eight digit displayed to 5Hz.
Can be locked to external master if required for higher order of stability.

BFO

100Hz steps over ±3.9kHz, derived from master oscillator.

Muting

Internal reed relay controlled from associated transmitter interrupts aerial feeder and grounds input circuit during transmission.

IF and AF desensitising is also provided.

Power Supply

100V/130V and 200V/260V (40Hz-60Hz) single phase AC. Consumption aproximately 70VA maximum.

Operation from 24V DC negative ground automatically selected in the absence of AC mains supply. Operation from 12V DC using external inverter unit.

Mounting Styles

Rack mounting:	Including	handles and cabling at rear
	Height	133mm (5.25 inches)
	Depth	550mm (21.75 inches)
	Width	483mm (19 inches)
	Weight	Approximately 19Kg (42 lbs)

Bench mounting:	Including	feed.
	Height	164mm (6.5 inches)
	Depth	560mm (22.5 inches)
	Width	502mm (19.75 inches)
	Weight	Approximately 23Kg (51 lbs)

Environmental

Operational temperature	:	$-15^{o}C$ to $+55^{o}C$
Storage temperature	:	$-40^{o}C$ to $+70^{o}C$
Relative humidity	:	95% at $+40^{o}C$
Bump and vibration	:	Meets requirements of MPT1204 and CEPT requirements.

Stored Channels

Maximum of ninety-nine channels can be stored with sensitivity, AGC, detector, selectivity and BFO offset settings. Channels can be interrogated and changed without interruption of the signal received. Any number of these channels can be automatically scanned at a rate adjustable from the front panel.

Internal Battery back up is provided to prevent loss of information in the event of a power failure.

TYPICAL PERFORMANCE

The performance meets 'Specification IT4659', a summary of the major points is given below.

NOTE: All input levels are given in EMF.

Sensitivity

16dB S/N on USB for 2uV input with 2.4kHz bandwidth over 400kHz to 4MHz.

Selectivity

	-6dB	-60dB
Narrow	300Hz to 500Hz	<2.5kHz
Intermediate	2kHz to 2.5kHz	<8kHz
Wide	6kHz to 8kHz	<18kHz

USB	Frequency Relative to Carrier	Attenuation
	+350Hz to 2700Hz	Not more than 3dB
	-100Hz to 3100Hz	Not less than 35dB
	-400Hz and below	Not less than 60dB
	+3400Hz and above	Not less than 60dB

Image Rejection

74dB (typically 90dB)

IF Rejection

74dB (typically 90dB)

Frequency Stability

Better than 1ppm in any 30 day period with ambient temperature range of +10°C to +30°C.

Cross Modulation

With AGC on and a wanted signal of +60dBuV (modulated 30% at 1kHz) providing standard output, an interfering signal of +100dBuV at 20kHz off-tune (also modulated 30% at 1kHz) will produce an output at least 30dB below standard output (with modulation of wanted signal removed).

Intermodulation (In-Band)

With AGC on and two signals, each of +80dBuV, producing tones in the audio passband, each in-band intermodulation product will be at least 35dB (typically 40dB) below the level of either tone.

Intermodulation (Out-of-Band)

With AGC inoperative and a wanted signal of +6dBuV providing standard output, two interfering signals, adjusted to produce an intermodulation product at the wanted frequency, will each be of level greater than +90dBuV to provide standard output (with wanted signal removed). The interfering signals should be adjusted so that neither is closer than 20kHz to the wanted signal or is capable of producing an appreciable output when applied alone.

Blocking

With AGC on and a wanted signal of +60dBuV, output will be reduced by less than 3dB with an interfering signal of +100dBuV (typically 110dBuV) at 20kHz off-tune.

Reciprocal Mixing

With AGC inoperative, USB mode, and a wanted signal of +10dBuV providing standard output, an interfering signal of +90dBuV (typically +95dBuV) at 20kHz off-tune will produce a noise output at least 10dB below standard output (with wanted signal removed).

AGC Characteristics

Output is maintained within 6dB (typically 3dB) for an input signal range of +6dBuV to +100dBuV.

Time Constants (for 20dB steps inside AGC range)

	ATTACK	DECAY
Audio AGC	<20mS	2 sec. pedestal
Fast AGC	<40mS	250mS
Slow AGC	<40mS	1 sec.

Audio Output

Line:-	600 ohm, 20dB return loss 300Hz - 2700Hz, +6dBm maximum (typically > +10dBm maximum). Adjustable locally or remotely down to -10dBm. Total distortion <2%.
Loudspeaker:-	500mW maximum (typically 1W maximum).
Headphones:-	10mW maximum, low/medium impedance.

Radiation: The power of any disctrete component in a 50 ohm artificial antenna does not exceed 1nW in the range 10kHz to 1GHz (typically voltage levels < 10uV).

Section 2

INSTALLATION

2.1 Assembly Instructions

Accessories Kit

A kit of accessories is supplied with the receiver. The contents of the kit should be checked against Table 2.1.

Rack-Mounting Receivers

The rack mounting versions can be installed directly in 483mm (19 inch) racks, 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 standard with centre spacing of 57mm (2.1/4" inches). Dimensions of the receiver are shown in Figure 2.1c and 2.1d.

Bench Mounting Receivers

Four mounting feet are included with the accessories kit. These shopuld be fixed to the bottom cornersof the cabinet using the four M4 x 10mm screws provided. Dimensions of the receiver are shown in Figure 2.1b.

Conversion-of Mounting Style

Rack mounting receivers may easily be converted to bench mounting and vice-versa. The accessories required are listed in Table 2.2.

Anti-Vibration Mountings

These are available to order for bench mounting receivers for use under arduous conditions. The dimensions of the receiver and cabinet fitted with anti-vibration mountings are shown in Figure 2.1a.

To fit anti-vibration mountings Catalogue Number 1547 proceed as follows:-

1) Remove the cabinet feet (if fitted).

2) If access to the underside of the mounting surface (i.e. the bench or shelf) is available, drill sixteen clearance holes on the centres shown in figure 2.2. to enable the anti-vibration mountings to be bolted to the surface. If access to the underside of the surface is not available these holes must be drilled and tapped to take suitable hexagon-headed screws.

3) Fix the four anti-vibration mountings to the base of the cabinet using M6 x 20mm screws, ensure the bases are correctly aligned.

4) Secure the bases of the mountings to the mounting surface.

Figure 2.1
Dimensions of the receiver in all mounting styles

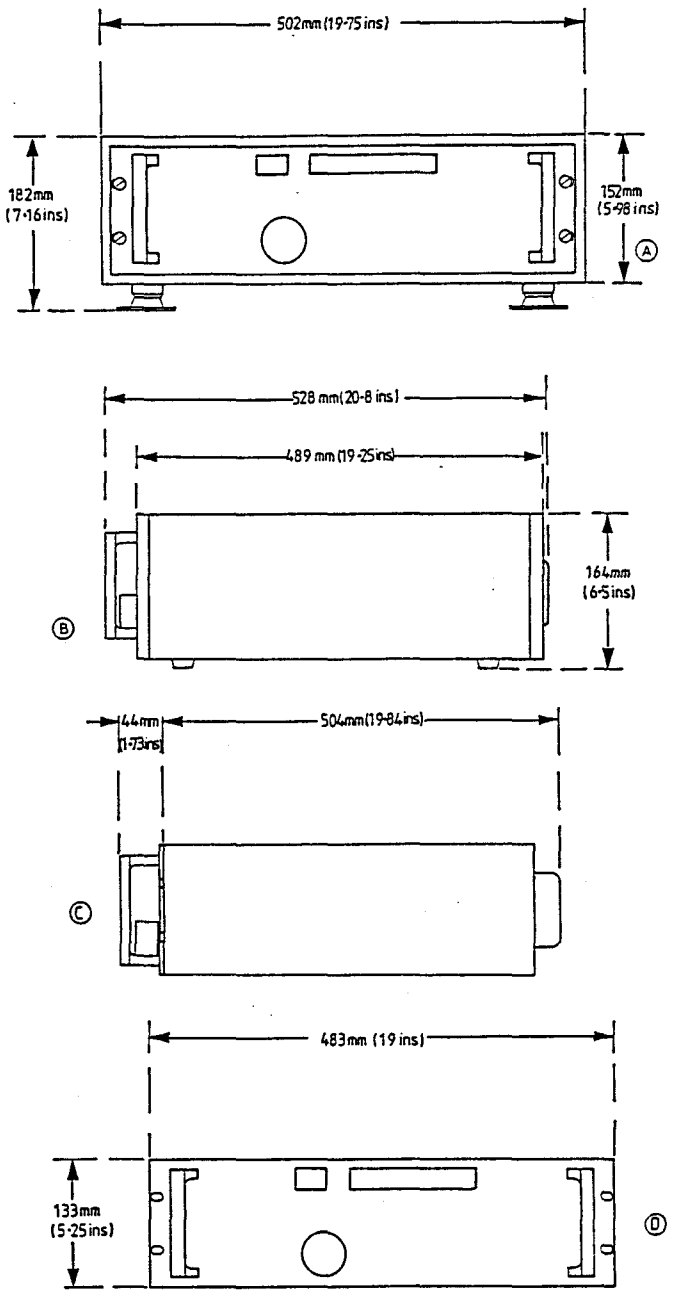
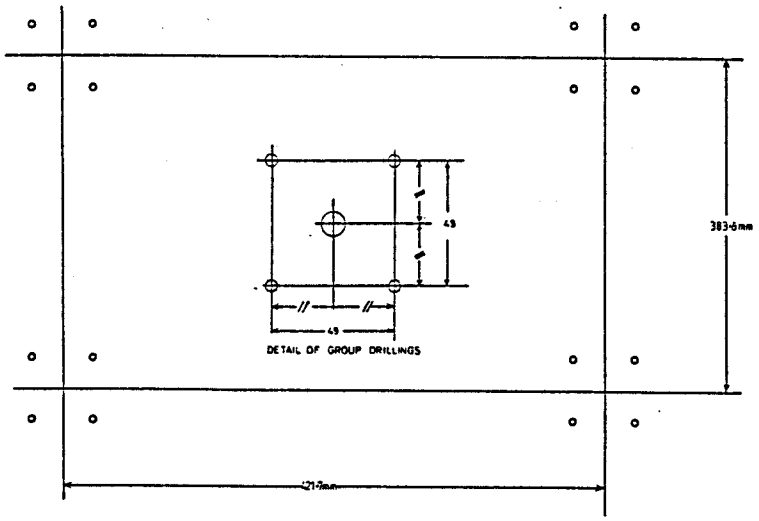


Figure 2.2
Drilling details for fixing Anti-Vibration Mountings, Catalogue Number 1547



2.2 Power Supplies

Before connecting to the local mains supply, ensure that the mains voltage selector switch is set to the correct position to suit the available mains supply. (Do not operate the mains voltage selector with the supplies connected).

Fuse Ratings

AC Fuses - The mains transformer primary circuit is double-pole fused. The fuse ratings are 1 amp anti-surge. 1 amp (T).

DC Fuses - The two DC supplies in the receiver are each protected with a 3.15 amp fuse. The external DC supply is protected with a 5 amp fuse.

All fuses are accessible on the rear plate of the receiver.

2.3 External Connections

With the exception of the headphone socket all external connections are made at the rear of the receiver. (See Figure 2.3).

AC Mains Socket

This socket accepts a 40Hz-60Hz mains supply within the ranges specified using a standard IEC connector. If the plug and lead supplied in the accessories kit 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

Aerial Input

This socket accepts a 50 ohm BNC Bayonet-Lock co-axial connector.

IF Output

This socket accepts a 50 ohm BNC Bayonet-Lock co-axial connector. The output is approximately 20mV RMS into 50 ohm at 1.4MHz with nominal 50 ohm output impedance.

External Standard Connector

When fitted this socket accepts a 50 ohm BNC Bayonet-Lock co-axial connector. (Input level as specified separately).

Earth Terminal

An earth terminal is provided to enable direct earthing of the receiver.

Remote Connector

A 9 way 'D' connector is provided for remote control inputs. Its functions meet the requirements of IT4659. These are detailed in the 'Remote' section 6, and installation connections to the associated 1763 'Remote Interface Adaptor' are detailed in the 1650/7 supplement contained in the 1763 Handbook.

Ancillaries Connector

Figure 2.3
1650/7 Rear Panel Connector 1SKT3

(View into Connector)

The Pin Connections and their fundamental characteristics are given in Table 2.3.

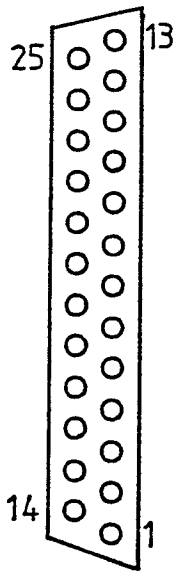


Table 2.1
Accessories Kit

1	Mains Connector and Lead	D4815P
1	25 way Plug	11153P
1	9 way Socket	11973P
1	Cover for 25 way Plug	10977P
1	Cover for 9 way Socket	11974P
1	1 amp anti-surge Fuse	9816P
1	3.15 amp Fuse	11967P
1	5 amp Fuse	7814P
4*	Cabinet Mounting Feet (with screws)	9817P

*Not supplied for rack-mounting receivers.

Table 2.2
List of Accessories Available to Order

Description	Part Number
Cabinet	LP3862
Anti-Vibration Mounting Kit	Catalogue Number 1547
Drip-Proof Cowl	Catalogue Number 1597
Cabinet Loudspeaker Unit	Catalogue Number 1615
Headphones	Catalogue Number 1588
Basic Spares Kit	LP3836

Table 2.3
1650/7 Ancillary Connections

25 way 'D' type female connector mounted on receiver rear panel.

Pin 1 AF output from amplifier (LS) - typically 1 watt maximum into 4/8 ohm. (See pins 14 and 15).

Pin 2 Not used.

Pin 3 Sidetone input - 2V RMS input to give 220mW AF output (>10K input resistance).

Pin 4 Diversity out)
Pin 5 Diversity in) Screened cable must be used for external connections.

Pin 6 600 ohm Output)
Pin 7 600 ohm Centre-tap) up to >6dBm pre-set into 600 ohm (floating)
Pin 8 600 ohm Output)

Pin 9 RF Mute (ground to mute). Pulled down 'R' to mute from +15V through 10K.

Pin 10 RF Mute)
Pin 11 IF Dense) +12V to +30V maximum to mute or desense

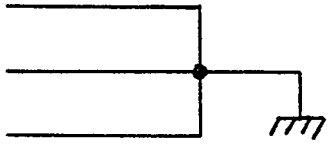
Pin 12 AF Mute (ground to mute internal speaker). Pulled down 'R' to mute from +15V through 10k.

Pin 13 Mute indicator. (Open collector transistor output, 50mA maximum current, 30V maximum voltage, transistor 'ON' when signal not present).

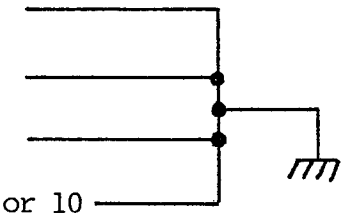
Table 2.3 Ancillary Connections Continued...

Pin 14 Earth for 1 (unmuted ground))
) Audio LS output. (See Pin 1)
Pin 15 Muted ground)

Pin 16 Earth for 3
Pin 17 Earth for 4
Pin 18 Earth for 5



Pin 19 Earth for 6
Pin 20 Earth for 7
Pin 21 Earth for 8
Pin 22 Earth for 9 or 10



Pin 23 Supply from receiver (+15.5V at 150mA maximum).

Pin 24 External positive supply. (Nominal +24V DC at 2.5 amp).

Pin 25 Ground return for 24. (Internally connected to receiver chassis).

Notes

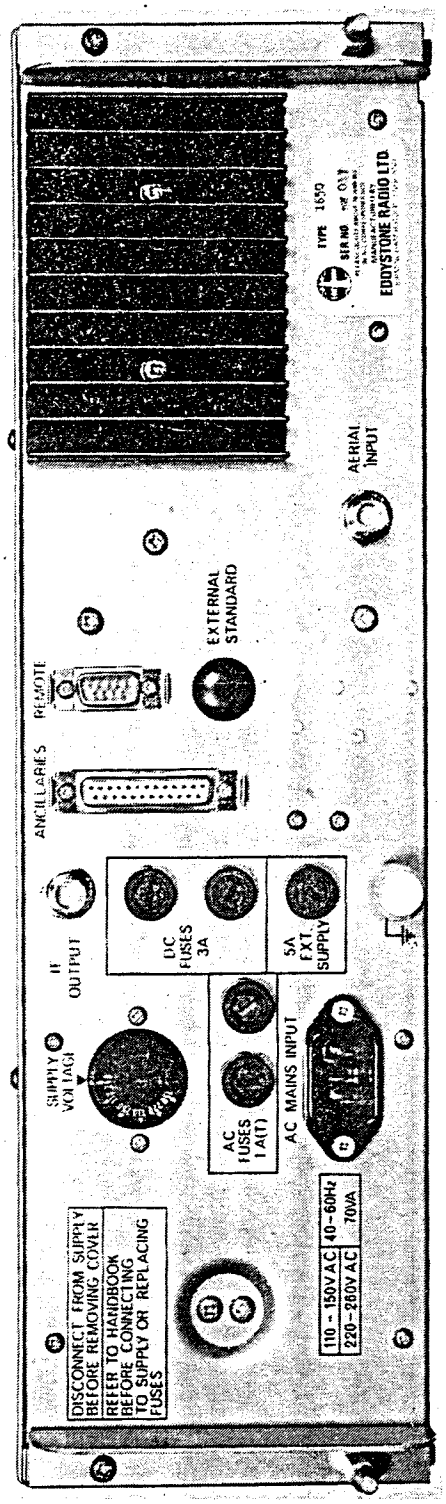
a) Use pin 15 for external speaker ground return if muting of this speaker is required when the 'PHONE' jack is inserted.

b) For dual diversity operation of two receivers crosslink diversity in and out connections (i.e. pin 4 of receiver 'A' to pin 5 of receiver 'B' and vice-versa) via a type 1639 Diversity Combiner.

Note diversity links must be screened, particularly from audio outputs. The line outputs can be combined in series to provide a common output.

c) Pins 10 and 11 can be combined (even if grounded line to pin 9 is used as mute input) to obtain simultaneous RF muting and IF desensitisation.

Figure 2.3
Rear View of Model 1650/7 Receiver



Section 3

OPERATION

Introduction

The 1650/7 receiver can be tuned over the range 10kHz to 30MHz and has provision for storage of the Frequency, BFO, RF Sensitivity, AGC, Detector and Selectivity settings of any number of channels up to a maximum of 99.

Channel 100 (number ØØ) can be used for storage, but is normally used for 'search' tuning, and entry of data for storage in one of the other 99 channels (channel ØØ being the only channel that can be used for this purpose). The receiver can also 'scan' through the stored channels.

In the 'scan' mode the receiver listens on each stored channel in turn, starting at any predetermined channel and continuing to channel 99, this sequence being repeated until 'scan' mode is cancelled by selection of another mode.

The period of time the receiver 'dwells' on each channel can be adjusted between 1 second and 99 seconds in 1 second steps.

A wide variety of facilities are provided to enable easy loading, interchange and interrogation of channels, setting of required listening channels and construction of scan tables. All these facilities can be used without interruption of the received (listening) channel.

When the receiver is not displaying the status of the listening channel this is shown by flashing of the channel number decimal points.

Sweep, Standby and front panel Local/Remote switching facilities are not available on the 1650/7. Attempted use of the associated keys ('Sweep', 'Start (Sweep)', 'Rate', 'ON/ST BY' and 'Remote') produces no action except for sounding the invalid tone if tone 'on' is selected (♂).

Local/remote switching is performed remotely via the rear panel remote connector and 1763 Remote Interface Adaptor. The green indicator LED associated with the front panel 'Remote' switch indicates whether remote or local control has been remotely selected. When remote control is selected (LED 'on') the 1650 front panelcontrols are 'locked-out'.

Also note that 'Very Narrow' and 'LSB' selectivities are not provided. These settings cannot be selected via the front panel.

Basic Control Functions

Main Tuning Knob - selects received frequency,BFO offset (dependent on [BFO] key) or channel number dependent on control mode (see Table 3.1).

IF GAIN/MUTE LEVEL - sets IF Gain when 'AGC OFF' selected, otherwise it sets the audio mute level. (Muting enabled by [MUTE] key).

Display Intensity - sets intensity of display (can be dimmed to extinction).

Line Level - preset control to set level of line output (monitored by meter set to 'AF') in range 0 to +6dBm into 600 ohm.

AF Gain - sets level of headphone or loudspeaker output.

[RF SENS] key - sets level of RF input attenuation. 'Maximum' is zero dB attenuation, 'Minimum' is an unspecified level obtained by virtually open-circuiting the input.

[MODE] key - selects envelope (on AM) or product detector. 'SSB' has fixed injection to the detector. 'CW' or 'FSK' has variable injection, ±3.9kHz, which can be viewed or adjusted when 'BFO' selected. 'CW' or 'AM' (on the two narrowest available selectivity positions only) introduces an audio CW filter peaking at 800- 1000Hz.

[AGC] - selectes AGC mode (see also 'IF GAIN/MUTE LEVEL').

[SELECTIVITY] - selects overall RF/IF bandwidth (note that 'Very Narrow' and 'LSB' settings are made not available).

[WIDEBAND] - selects wideband RF front-end (LED ON) or preselector if fitted (LED OFF).

[LOUDSPEAKER] - selects internal loudspeaker on or off.

[MUTE] - selects operation of audio mute circuit (see also IF GAIN/MUTE LEVEL).

For function of other keys see 'Operation'.

Operation

Control of the receiver is initially determined by use of the eight available 'CONTROL MODE' keys grouped on the left hand side of the front panel together with the numerical keypad (which does not itself take part in mode selection) and the three unused sweep mode keys.

Only one mode can be selected and in use at any one time, the mode in use being indicated by the red LED associated with its selection switch.

Any mode can be selected by a single operation irrespective of the mode already in use (although 'STORE' automatically selects 'CHANNEL' after a brief delay and the actual 'STORE' operation only occurs if 'CHANNEL' was also the previously selected mode).

The mode selected determines the receivers signal circuit operation, the operation of the rest of the keyboard and provides an appropriate display format. (See Table 3.1).

The formats and each mode are described in the following section, however the use of the tone key described below should be noted.

[♪] The keyboard is a membrane type and hence a tone output is provided to give audible feedback for correct key use. A warble tone is generated if the key pressed (or knob turned) has no operation for the mode in use.

The '♪' switch can be used to select this facility (indicated by associated green LED) or cancel the tone output if it is not required.

Display Formats

The mode selected automatically provides one of two display formats as required, to show stored and entered data. The majority of modes use the conventional display format where the numeric section idicates the frequency of tune, or the BFO frequency of the channel whose number is displayed. (Figures 3.1 and 3.2).

Tuned or BFO frequency display is determined, by the ['BFO'] key at the lower centre of the front panel.

Figure 3.1
Conventional Display-Tuned Frequency

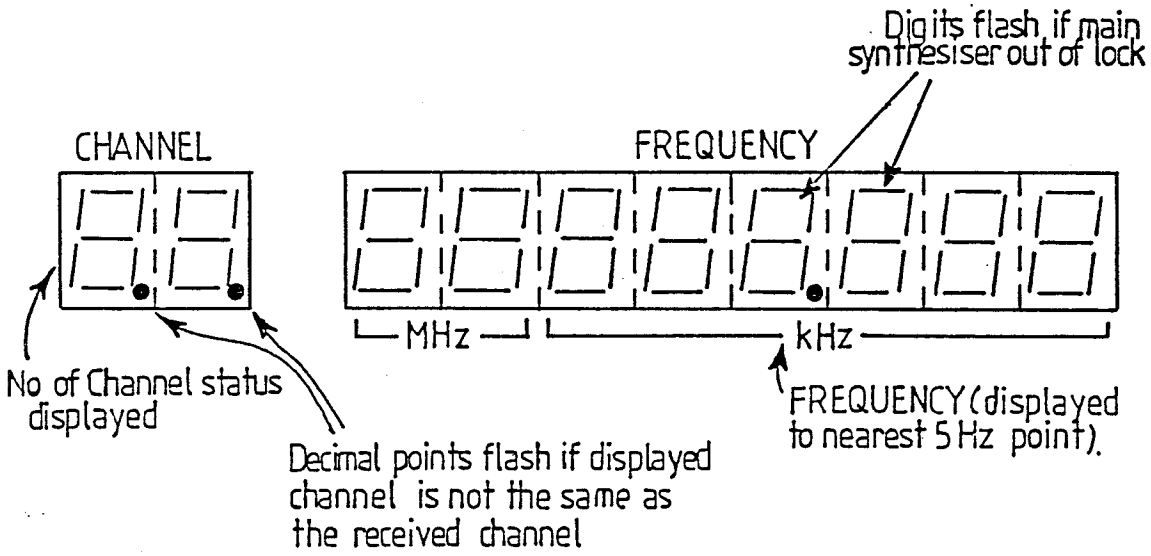
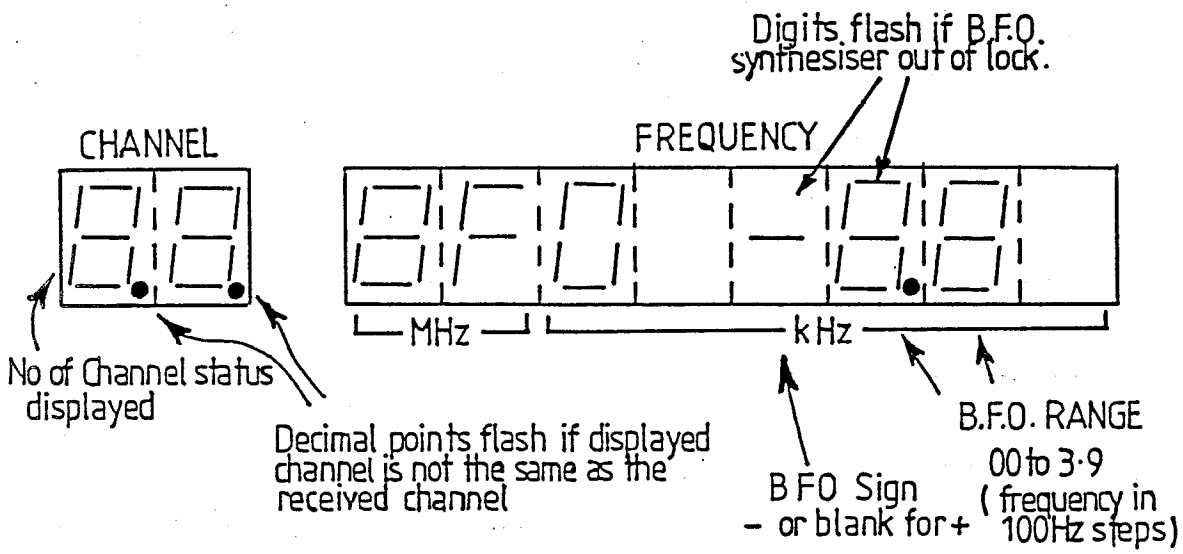


Figure 3.2
Conventional Display-BFO Frequency



The tuned frequency displays to the nearest 5Hz. Leading zeros are normally blanked, except where a frequency is being entered via the numeric keypad in 'RECALL' or 'TUNE' modes.

If leading zeros appear in any other mode it indicates that a frequency entry was not completed, therefore return to 'RECALL' or 'TUNE' and complete entry via the keyboard or knob. (See 'RECALL' or 'TUNE' paragraphs).

BFO offset is displayed over the range ±3.9kHz. The negative sign is displayed when appropriate otherwise the positive sign is implied by a blank sign display. The central point is indicated by '  '.

The settings of other stored channel data ('Sensitivity', 'AGC', 'Detector' and 'Selectivity') are shown by the orange LED's below the numeric display.

The green LED's shown information independent of channel or mode selected.

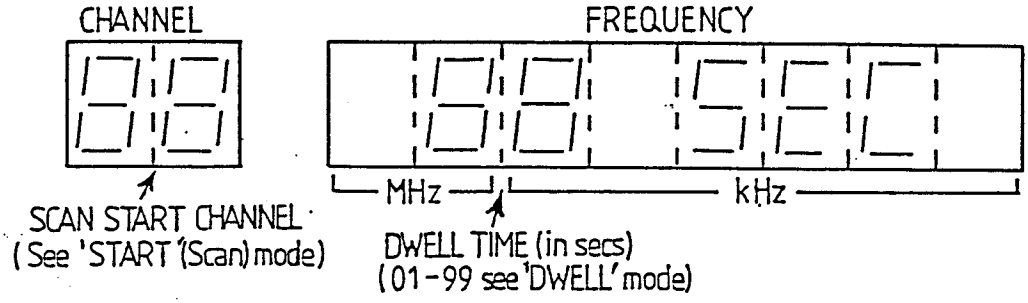
The 'EXTERNAL STANDARD' LED, which has no active key operation associated with it, flashes when an external standard is applied but not locked to the receiver standard. When lock is obtained the LED remains steadily illuminated.

The 'EXTERNAL DC SUPPLY LED' indicates that the external DC supply (nominal +24V DC) has taken over the power supply to the receiver from the AC mains supply.

The yellow 'SIGNAL' LED indicates a signal level greater than the mute level and operates in conjunction with the 'MUTE' switch, the 'IF GAIN/MUTE LEVEL' rotary control and the 'AGC' mode selection switch.

When 'DWELL' or 'START' (scan channel) modes are selected, scan parameter data can be entered. The display format now shows the parameters (Figure 3.3).

Figure 3.3
Scan Parameter Display Format



Control Modes

When using the various modes the following points should be noted:-

1) The receiver can receive any of the channels ØØ to 99 and display the state of any of these channels. However the displayed channel need not necessarily be the received channel. In this circumstance the 'CHANNEL' number is that of the displayed status and the channel number decimal points flash to indicate that the received channel is not the displayed channel.

2) Channel ØØ is not normally used for storage as it is the channel used for search tuning and for entry of data via the keyboard (for transfer to other channels) in addition to being used as an intermediate channel for data transfer between other channels. Therefore use of the different modes frequenctly causes channel ØØ data to be modified, thus making it unsuitable for long term channel storage.

'RECALL' MODE

If in doubt the operator should select this mode, as it makes the receiver operate as a conventional tuning receiver, operating on the signal or frequency which is actually being received.

When selected, this mode duplicates the status of the received channel in channel ØØ and the receiver is made to display and receive channel ØØ.

The receiver can now be tuned or the BFO, Sensitivity, AGC, detector and selectivity changed as required.

The channel number displayed will be ØØ and the decimal points remain off as previously described.

To determine which channel number was being received, before 'RECALL' was operated [CHANNEL] mode should be selected. The first number shown is that channel, and the status is the status of that channel. If the status was modified in channel ØØ (e.g. a slight frequency change) it can be used to update or modify that channel by pressing ['STORE'] mode. The channel for storing the possibly modified data can be altered, if required, before pressing ['STORE'] . (See 'Channel' mode).

It should be noted that the frequency can be altered by the Tuning Knob or via the numeric keypad. The knob provides a tuning rate dependent on the rate at which it is turned. This rate varies from aproximately 100Hz/revolution to 100kHz/revolution.

When the keypad is used, the whole frequency is entered. Leading zeros are displayed and must be entered, bars show the remaining digits to be entered (down to 10Hz). The entry can be completed (trailing zeros filled in) by turning the Tune Knob. Once entry is complete, any leading zeros are suppressed, and a longer single note sounded.

Any leading zeros appearing in any mode indicate that an entry was not complete, therefore go to [RECALL] or [TUNE] and complete entry. Also note that 2 is the maximum input digit for the 10MHz point (any higher number being translated to 2) thus giving 29.999.90 as the highest keypad entered frequency. BFO offset can only be adjusted by use of the Tuning Knob when ['BFO'] is selected (and offset displayed).

RF sensitivity, AGC mode, Detector mode and selectivity are adjusted in steps, via their appropriate keys.

All these status entries are only valid in 'RECALL' or 'TUNE' modes. Entries such as ['METER'] , ['WIDEBAND'] , ['MUTE'] and ['LOUDSPEAKER'] are valid in any mode. ['MUTE'] only has effect when 'AGC OFF' is not in use, when the audio outputs are muted by 20dB if the signal level is below that set by the 'IF GAIN/MUTE LEVEL' rotary control. The yellow 'SIGNAL' LED indicates the presence of a signal and the lifting of the mute. When ['AGC OFF'] is selected this rotary control operates as a conventional IF gain control.

'TUNE' MODE

This is similar to 'RECALL' except that it recalls the channel being displayed rather than that being received. If the displayed channel is the one also being received, then use of this mode is identical to using 'RECALL' mode. This arrangement means that channels can be modified without interruption of the received signal by selecting the required channel, using 'CHANNEL' mode and recalling it by using [TUNE] . After modification, by pressing [CHANNEL] again the first channel displayed is that from which the data originally came. The received channel must not of course, by ØØ or the channel being modified.

'CHANNEL' MODE

In this mode, channel numbers can be entered via the numeric keypad or incremented/de-incremented by use of the Tuning Knob. As channels are entered, their status is displayed and the channel decimal points flash, unless the channel is also the received channel. The channel selected can be modified (see 'TUNE' mode and 'STORE' mode) or received (see 'RECEIVE' mode).

Use of this mode also enables channel status to be interrogated without breaking into the received channel.

If [CHANNEL] mode is selected immediately after 'RECALL' or 'TUNE' mode has been in use, then the first channel displayed is that from which data originated for modification.

'RECEIVE' MODE

Use of this mode causes the receiver to receive on the channel being displayed. The channel decimal points therefore remain 'OFF' in this mode. The channel to be received is normally selected using [CHANNEL] mode.

'STORE' MODE

When selected this causes the data in channel ØØ to be duplicated inthe channel being displayed (electrically overwriting it).

This only happens however if 'CHANNEL' was the previous mode. 'STORE' mode is thus used to modify channel data, to load completely fresh channel data, or to transfer data from one channel to another to set up the scan table. The receiver does not stay in 'STORE' but automatically goes to 'CHANNEL' after a brief period (no matter what the previously selected mode).

Loading of channel data: Select ['RECALL'] and enter channel data as required. Select ['CHANNEL'] and enter number of channel in which data is to be stored (present contents of that channel will be displayed). Select ['STORE'] to overwrite the present data with the new data. Note the mode will return automatically to 'CHANNEL'.

Modification of data without breaking into received channel: (Note received channel must not be ØØ or the channel or channels being modified). Select ['CHANNEL'] and enter channel number of channel to be modified. Select ['TUNE'] to call channel data to channel ØØ. Modify data as required. Select ['CHANNEL'] and channel which supplied data will be displayed with present contents. Enter new channel number (if modified data to be put in a different channel) otherwise just press

['STORE'] to load the modified data. Note the mode will return automatically to ['CHANNEL']. If access to the received channel is required select ['RECALL'] and receiver will display contents of received channel which can be adjusted if necessary. The channel number displayed will be ØØ. If the number of the stored position of the received channel data is required, select ['CHANNEL'] .

Transference of channel data:

Select ['CHANNEL'] and input channel number, of originating channel; by pressing ['TUNE'], transfer contents to channel ØØ . Select ['CHANNEL'] and input channel number of destination channel, then select ['STORE']. This enables a scan table to be set up by transference of the required channel data to suitable channel. (See 'START' (Scan) mode).

The following three modes apply to the receiver 'SCAN' facilities and except for 'SCAN' itself, generate the scan parameter display format.

'DWELL' MODE

In this mode the scan dwell time can be entered via the numeric keypad. A time of 01 to 99 seconds in 1 second steps can be entered here.

'START' (scan) MODE

In this mode, the channel number at which the scan commences can be entered via the numeric keypad. The scan starts at that channel and stays, for the dwell time on each channel in sequence to channel '99'. It then returns directly to the 'START' channel and recommences its scan. Thus if 98 is entered, the receiver scans 98-99-98-99 only, and if channel ØØ is entered the receiver scans over the whole channel memory. Thus any number of channels can be scanned from 2 to 100. Data for scanning is thus normally stored in the higher numbered channels and can be first transferred from other channels as described previously.

'SCAN' MODE

In this mode the receiver displays and receives on each channel in sequence as described above. The scan can be stopped by selection of any other mode.

If [RECEIVE] , [RECALL] or [TUNE] is selected, the channel being scanned at that moment is held. Note when [SCAN] is selected, the scan will start at the displayed frequency if it is in the 'scan table' otherwise it will start at the channel entered under 'START' scan mode. Thus if re-started after a channel is held by [RECEIVE] , it will commence at the point at which it stopped. If [RECALL] or [TUNE] stopped the scan, the channel can be tuned.

At any time during scanning, the scan channel can be incremented or de-cremented by use of the Tuning Knob. Thus with a long dwell time the Tuning Knob can be used to display and receive each channel within the scan table in sequence, under direct operator control.

Figure 3.4
1650/7 Front Panel & Keyboard

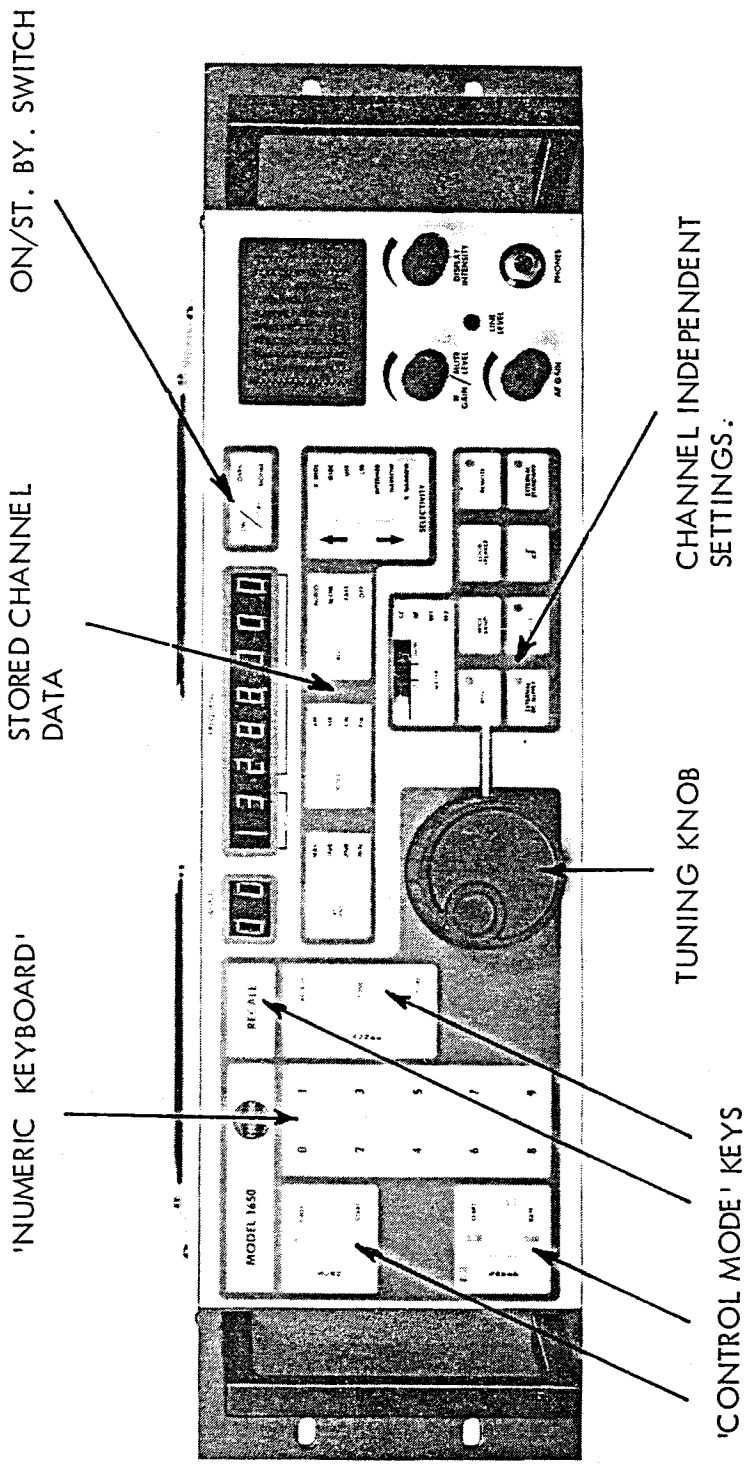


Table 3.1
1650/7 Receiver, Table of Control Mode Operations

CONTROL MODE	DISPLAY	KNOB	NUMERICAL KEYS	CHANNEL DATA KEYS	BASIC OPERATION
Recall	Conventional Receiver Display	Changes Frequency or BFO	Load Frequency only	Enter Channel Data	Receiver operates conventionally starting at channel being received.
Tune	ditto	ditto	ditto	ditto	ditto - but starting at channel being displayed.
Store	ditto	invalid	invalid	invalid	Loads data in free tune or recall channel ØØ into channel selected.
Receive	ditto	invalid	invalid	invalid	Receive on channel selected (data entry inhibited).
Channel	ditto	Alters Channel Number	Enter Channel Number	invalid	Select a channel for 'TUNE', 'RECEIVE' or 'STORE' modes.
Start (Scan	Scan Parameters	invalid	Enter Scan Start Channel	invalid	Scan Parameter entry.
Dwell	ditto	invalid	Enter Dwell period (secs.)	invalid	ditto
Scan	Conventional Receiver Display	Alters Channel Number	invalid	invalid	Scans each channel from 'START' to '99', staying on each for 'DWELL'.

NOTE: Operation of a key or the knob when invalid will produce a warning warble tone (δ selected). Also note 'STORE' will only produce the specified operation if 'CHANNEL' was previously selected.

Section 4

BASIC CIRCUIT DESCRIPTION

Refer to circuit diagram BP1858 for interconnections etc. between units described.

4.1 Signal Circuits

Refer to block diagram BP1666 and to circuit diagrams BP1859 for RF and 1st IF circuitry (reference 7), BP1860 for Main IF and audio circuitry (reference 10) and BP1857 for line attenuator circuitry (reference 39). The optional preselector circuit is BP1568 (reference 2).

The input signal is passed via a 30MHz 'INPUT LOW PASS FILTER' and a switched aerial attenuator to a balanced RF amplifier (7TR5/6, 2 x BFW30). This amplifier has a flat response between 100kHz and 30MHz with additional negative feedback giving a gradual gain reduction from 100kHz down to 10kHz.

When 'Wideband' is selected the input signal passes through a fixed 3dB attenuator (7R12A, 7R17A and 7R17) fitted between pins 1/2 and 3/4 on the RF and 1st IF board (BP1859).

Differential outputs from 7TR5/6 drive an integrated circuit, high level, double-balanced mixer 7IC3 (SL6440C). After mixing with an input from the synthesiser (42.216MHz to 76.206MHz) the signal passes through roofing filter 7FL1 (46.205MHz with approximately 14kHz-17kHz bandwidth). This filter also provides most of the selectivity of the 'VERY WIDE' setting. The signal now passes via a double bridged 'T', pin diode attenuator (7D17-20 inclusive, 4 x HP5082-3081), providing up to 55dB of RF AGC and then to 1st IF amplifier 7TR12 (BFX89) before feeding the second double-balanced mixer 7IC6 (SL6440C), 7IC6 converts the 46.205MHz IF signal to 1.4MHz IF by mixing with an input from the synthesiser. The signal now passes through the filter selected (10FL1 10FL4-6 inclusive or 'VERY WIDE' 'straight through') and is then amplified by 10IC1/2 (2 x MC1350P) and 10TR1 (BFR54). The output from the filter selected also feeds the RF AGC amplifiers 10TR3/4 (2 x BFR54) and detector 10IC9 (SL1625). The RF AGC generated (at input levels greater than 0.5mV emf) controls the pin diode attenuator via 7IC4/5 (2 x CA3240E), 7TR8/9 (2 x BC560B) and 7TR10/11 (2 x BC547B). The signal output from 10TR1 feeds envelope detector (and IF AGC generator) 10IC15 (SL1625), product detector 10IC13 (SL1641) and emitter follower IF output stage 10TR2 (BFR54). IF AGC selection and amplification etc. is performed by 7IC6 (MC14555), 7IC5 (MC14016) and 7IC3/4 (2 x CA3240E). 7IC4b is also the mute level comparator.

Additional audio amplification of the signal is performed by 10TR9 (BC547B). 10IC18 (741) forms a 'CW' filter peaking at 800Hz-1000HZ which is automatically switched into circuit whenever 'CW' mode is selected or when one of the two narrowest available 'selectivity' positions is selected as well as 'AM' mode. 'Audio' AGC is generated by 10IC17 (SL1621). Separate audio amplifiers are employed for loudspeaker output (10TR7, UC734B and 10IC22, TBA810S) and floating line level output 10IC20, TBA810S).

10IC20 is driven by the remotely controllable 'line audio attenuator'. This (circuit diagram BP1857, circuit reference 39) uses 39TR2 (40673) as a variable attenuator which can alter the level of audio signal passed to the line amplifier over a range of about 20dB. When local opeation is selected the switching transistor 39TR1 (BC547B) switches the analogue gate 39IC1 (1/4 MC14016) off and isolates the analogue attenuation control voltage (generated by the associated 1763 Remote Interface Adaptor), from 39TR1. In this state attenuation is automatically set to minimum. When the local/remote line (pins 1/2 of 39PL1) is pulled low by the 1763 to select remote control, 39TR1 is switched 'off' and 39IC1 'on' to connect the control voltage to 39TR2 thus enabling remote control setting of line attenuation.

The line level meter drive is provided via 10IC21a/b (CA3240E).

The preselector is optional and when fitted can be switched into circuit (by de-selecting 'Wideband') between the aerial attenuator and the RF amplifier (by-passing the fixed 3dB attenuator). It consists of eight bandpass pair tuned circuits covering 150kHz to 30MHz (fitted on 'coil boards' reference 4 and 5), with a fixed low pass filter below 150kHz. The appropriate tuned circuit is selected by diode switches 4D1-4D8 inclusive and 5D1-5D8 inclusive (16 x BAX13) or the low pass filter via 2D1/2 (2 x BAX13). The motor driven tuning gang is switched to the bandpass pair in use via relays on relay boards (reference 3). The required bandpass pair and the gang position are automatically determined by the microcomputer from the synthesiser setting and no additional manual tuning or peaking is required.

The bandpass pair relays are selected via 2IC4 (MC14504) and the BCD to decimal decoder 2IC3 (MC14028). The motor driven gang is set via 2IC2 (NE544N) and 2TR7/8 (2 x BC636).

4.2 Synthesiser Circuits

Refer to block diagram BP1668 and to circuit diagram BP1574 (VCO module reference 9), synthesiser main circuits reference 8).

Two main outputs drive the first and second mixers and a third drives the product detector. The receiver has an internal 5.6MHz proportional oven controlled standard and provision is made for external standard by optional 'external standard adaptor' boards. (Fitted to customer requirements).

A signal phase lock loop (PLL) provides the first mixer drive of 46.216MHz to 76.206MHz in 2kHz steps. The standard synthesiser device 8IC4 (HEF4750) employed incorporates double sample and hole hold and frequency detection, giving rapid switching and very low reference frequency sidebands. Loop division is provided by 8IC2 (SP8690B) and 8IC5 (HEF4751). The first mixer drive is derived directly from the voltage controlled oscillator 9TR1 (40673) via a buffer 9TR2 (40673). A separate buffer 9TR3 (40673) isolates the VCO from divider noise. The VCO has four ranges selected by relays 9RLA/B inclusive, to reduce the vari-cap diode control lines sensitivity and thus phase noise. The second mixer drive interpolates between the 2kHz steps of the first loop in 5Hz steps (the interpolation being automatically performed by the microcomputer). The output is derived from the multiplied crystal controlled oscillator 8TR7 (BFX89). An isolted portion of the output is mixed in 8IC26 (SL1641) with the eighth harmonic of the master (generated by 8TR2, BFX89) to give a 4kHz-6kHz input to the loop phase detector 8IC27 (MC14046). The other input to the detector is generated by dividing the 5.6MHz standard frequency in loop dividers 8IC32 (MC14569) and 8IC31 (MC14526).

Drive to the product detector is derived from the standard by a divide by four circuit 8IC17 (MC14013) when 'SSB' mode selected or from a single PLL when 'CW' or 'FSK' mode selected, this giving ±3.9kHz in 100Hz steps. The PLL controls the L/C oscillator 8TR4 (40673) using 8IC21 (MC14568) phase detector and 8IC22 (MC14526) and 8IC23 (MC14569) as loop dividers with 8IC18 (MC14569) and 8IC20 (MC14013) as 5.6MHz reference dividers.

The synthesiser settings are calculated and generated in serial form to drive the dividers etc. All but the first signal mixer drive PLL are converted from serial to latched parallel form in 8IC24/33/34 (3 x MC14094). Data to this other PLL is passed via 8IC8 (MC14504B) and 8IC7 (MC14011B).

When fitted the optional 'external standard adaptor board' connects to 8PL6/8PL4 and with link 5-6 broken, phase locks the internal standard to the external standard. An additional socket on the rear panel is provided to input this standard.

4.3 Control Circuits and Microcomputer Unit

Refer to block diagram BP1667 and to circuit diagram BP1556 for the microcomputer unit (reference 13), BP1553 for the display or front panel board (reference 11) and to BP1555 for the interface board (reference 12). A simplified program executive flow chart is given on BP1669.

The microcomputer unit uses a 6802P microprocessor (13IC12), 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 (6840P). All of the 'RAM' is non-volatile, its power being supplied via a 3.6V, 100mAH battery when the receiver is 'off'. Comprehensive resetting circuitry is provided by 13IC6 (CA3140), 13IC15 (MCT2), 13IC4 (MC14528) and 13TR1 (BC547B).

The microcomputer sends and receives mainly serial data signals to and from the receiver via the interface board. The display is controlled via 12IC10 (74LS374) and converted to latched paralled data to drive the display LEDs in 11IC4/5/6/7 (4 x MM5450). The LED display intensity is equalised and set by the negative feedback control loop consisting of 11IC8/9/10 (3 x CA3240E) and the current mirror 11IC11 (LM3046) using the output of the front panel 'Display Intensity' control as a reference. 12IC10 also passes the receivers remote control output or reverted data signal to the rear panel connector. The synthesiser (see Section 4.2) is controlled via 12IC9 (74LS374). Signal circuit receiver function settings are also controlled via 12IC9 in conjunction with the serial to latched parallel data converters 12IC2/3/4 (3 x MC14094). Various sense and the remote control inputs are passed to the microcomputer via 12IC7/8 (2 x MC14503).

Control Circuits and Microcomputer Unit (Modified BP1858)

Only suffix 'C' protocol is available on the 1650/7. The handshake input connection on the Remote connector is used as a local/remote switching line (low for remote, therefore, automatically in local when any remote connection removed since line pulled high in receiver). This connection goes to the Interface board via pins 1/2 of 39PL1 on the line attenuator board. A connection on the Remote Connector is provided for the line attenuator analogue control voltage input and goes directly to the audio line attenuator pins 3/4 of 39PL1.

All the front panel keys, used are on a six by six matrix. To reduce radiated interference, this matrix is only actively scannned 'on demand'. The keyboard write signals being via 12IC12 (74LS374) and the read via 12IC11 (MC14503). The microcomputer triple timer produces pulse outputs to drive the preselector motor control integrated circuit (see Section 4.1) and the keyboard piezo sounder 11PZ1 (PB2720). The front panel tuning knob provides two inputs to the microcomputer triple timer via 11IC1 (MC14583), 11IC2 (MC14077) and 11IC3 (MC14506).

These integrated circuits convert the two phase pulse streams 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.

Section 5

1650/7 MAINTENANCE AND TEST

The 1650/7 is generally tested and aligned in its completely assembled condition, apart from screens, covers etc. However, the front panel assembly may be more conveniently tested when removed from the receiver (sub-section 1). Also the rear panel and power supply assembly and VCO. (Voltage Controlled Oscillator, circuit reference 9) may be pre-tested before final test and alignment (sub-section 2 and 3 with final alignment in sub-section 4).

Removal of assemblies and modules is detailed in sub-section 5. Note only the VCO and final alignment sub-sections need be read with regard to regular maintenance. Front and rear panel assembly tests are only given as an aid to fault finding or verification of correct operation.

1) Front Panel Assembly (Power Inputs via 12PL1)

1.1 Test Equipment Required

a) EP4000 EPROM Emulator complete with standard simulator cable (GP Industrial Electronics).

b) Power supply unit giving +15.5V at 100mA to 12PL1 pin 10, +10.5V at 1 amp to 12PL1 pin 6, 10.5V at 0.5 amp to 12PL1 pin 4. Ground returns to 12PL1 pins 9, 7 and 5 respectively.

c) Oscilloscope with >5MHz bandwidth and 10X probe.

d) AV08 multi-meter or similar with at least 25V DC range.

NOTE

The EP4000 must be used on '2732' EPROM setting and great care taken when connecting to the microcomputer board under test. The 24 way connector must be inserted correctly into the board EPROM sockets and the following sequences observed.

When connecting to board under test:-

a) Ensure all power to board is 'OFF'.
b) Ensure EP4000 DMA is not selected.
c) Connect to board the correct way round.
d) Select EP4000 DMA.
e) Apply power to board.

When-disconnecting from board under test:-

f) Remove power to board
g) De-select EP4000 DMA.
h) Remove connector.

1.2 Test Procedure for Microcomputer Board

If the programmer/emulator or personnel fully consistent with microprocessor technology are not available it is recommended that the unit is returned to Eddystone Radio for servicing.

The first tests are made without use of the emulator but with power supplied.

a) Check the principal regulated supply lines on the microprocessor and interface boards.

b) Check the 'E' (enable) pulse at 13TP2 and the shortened enable pulses at 13TP1 and 13TP3.

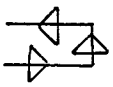
c) Check that pin 4 of 13IC15 (MCT2) goes high when the microprocessor power supply to pin 4 of 12PL1 exceeds a maximum of 9.8V and goes low when the supply falls below a minimum of 8.5V. (Note that supply to the microprocessor board is via a diode 12D2 (IR30S1) with 0.6V drop situated on the interface board).

d) Check that each time the supply rises above the level found (and pin 4 of 13IC15 rises) the approximate 0.1-0.2 second low going $\overline{\text{RESET}}$ pulse is generated at the collector of 13TR1 (BC547B) (note this level can be checked at pin 1 of 13PL2).

The next series of tests on this board requires the use of the emulator. These checks are of the address strobes generated by 13IC13 and 13IC3 (74LS138) and if these are generated correctly by the short programs used, the microprocessor unit should be sufficiently usable to enable any other faults to be found by conventional techniques. The outputs at 13IC13 should be checked first. The following program should be entered into the EP4000 before connecting to the board under test.

EP4000

ADDRESS	CODE	MNEMONIC
3ØØØ	B7XØØØ	STAA $XØØØ
3ØØ3	7EFØØØ	JMP $FØØØ
3FFE	FØØØ	-RESET VECTOR



(N.B. $ means following number in HEX form, X can take any HEX value).

Note:- This program does a repetitive store at a memory page specified by 'X' (data stored is not critical).

a) The value of X should be 'E' to check that a low going pulse repeats at pin 9 of 13IC13 (none at pins 13, 14 and 15).

b) X should be '2' to obtain this pulse at pin 13 (none at pins 9, 14 and 15).

c) X should be '1' to obtain this pulse at pin 14 (none at pins 9, 13 and 15).

d) X should be 'Ø' to obtain this pulse at pin 15 (none at pins 9, 13 and 14).

e) Pin 7 should be checked to ensure that low going pulses occur there irrespective of the value at X.

Note:- To enter a new value of X, simply de-select 'DMA' enter the new value and re-select 'DMA' (i.e. do not disconnect the printed circuit board). Then RESET the microcomputer by temporarily removing the supply.

f) To check the outputs of 13IC3 alter line 3ØØØ of program to B71ØØX. The value of X determines which of pins 7, 9, 10, 11, 12, 13, 14 or 15 of 13IC3 has the repetitive low going pulse train (only one pin at a time).

The value of 'X' determines the pin as follows:-

'X'	Pin	'X'	Pin
Ø	15	4	11
1	14	5	10
2	13	6	9
3	12	7	7

g) Finally fit EPROMs pages E and F which must have been verified as correct to the master using the EMULATOR. EPROMs supplied as spares units already have been verified.

1.3 Remaining-Front Panel Assembly Test. (i.e. all but microcomputer)

This assembly has three printed circuit boards interconnected by IDC (insulation displacement conductors) connectors etc. If faults occur ensure that all are connected securely and if front panel keyboard operation is incorrect particularly check the membrane connection to 12PL5 to ensure it is not laterally displaced from its correct insertion position.

Also check that the 'PHONE' jack lead is connected to 11PL3 and the tuning knob lead to 11PL1. A check of correct knob operation can be made as follows:-

a) Select 'Channel Mode'.
b) Turn tuning knob so that indent is at '12^{O}clock' (as a marker point).
c) Select channel ØØ with keyboard (ØØ channel displayed).
d) Turn knob slowly anti-clockwise, one complete turn, note new channel number.
e) Repeat (b-d) but turning knob clockwise.

If operating correctly, the first check should result in approximately channel '76' being displayed and the second in approximately channel '24' (i.e. ±24 channels per revolution). Some early 1650 receivers give '40' or '60' respectively. These can be identified by the fact that the BFO control loops around from +3.9kHz to -3.9kHz and vice-versa. The later receivers stop at ±3.9kHz settings. Knob control pulses travel via pin 2 12R5/pin 7 12SK1 for 'up' (clockwise) or pin 1 12RS5/pin 4 12SK1 for 'down' (anti-clockwise).

Operation of all front panel controls (except 'AF GAIN') and displays can be verified with the front panel assembly removed from the receiver (see OPERATION Main Section 3). However correct operation of the corresponding receiver circuitry 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 serial to parallel converters or the gates on the interface board part of the front panel assembly. The corresponding ICs are as follows:

a) Synthesiser - control via 12IC9 (74LS374)

b) Pre-Selector and RF/1st RF Board. - control via 12IC9 (74LS374), 12IC6 (MC14081) and 12IC4 (MC14094) serial to parallel converters. Pre-selector motor driven gang via pulse on pin 11 of 12SK1 and pin 4 of 12RS4.

c) Main IF and Audio - as for (b) but with additional 12IC3 (MC14094) and 12IC2 (MC14094).

d) Remote Control Output (and Display Drive) - control via 12IC10 (74LS374)

e) Remote Control Input and External DC Supply sense - input via 12IC8 (MC14503)

f) Other sense inputs - input via 12IC7 (MC14503)

g) Keyboard - Read via 12IC11 (MC14503), write via 12IC12 (74LS374)

h) Keyboard tone sounder - pulses via pin 8 of SK1 and pin 6 of 12RS5

If faults occur in these areas, the appropriate ICs can be checked for digital logic level activity at their outputs (inputs are generally in common). If required to operate simultaneously the receiver during such checks, the front panel assembly can be fitted in its 'forward' test position (see sub-section 5, 'Removal of Modules').

2) Rear Panel Assembly Test Procedure

2.1 Test Equipment Required

AV08 multi-meter or similar with at least 25V DC range and an ohms range capable of reading up to 40 ohms.

2.2 Test Procedure

a) Check input resistance across mains input socket L-N (1SKT5) with all mains input disconnected. Input resistance should be as stated on circuit for the selected mains supply voltage.

b) With the mains selector at a setting to suit the local mains supply available, mains should be connected and the 15.5V and 10.5V outputs at 14PL1, 14PL2, 14PL4 and 14PL5 of the power supply board checked.

c) With mains applied the relay 1RLA should be activated (note 16V across relay coil (pins 1 and 4) with no load on power supply).

d) With mains supply removed, check for continuity between the 'EXTERNAL SUPPLY' fuse socket and pin 8 of the relay socket 1SKT2 (or anode of 1D1).

3) VCO

3.1 Test Equipment Required

a) Oscilloscope with ≥120MHz bandwidth (dual beam, 50 ohm input preferred to load both VCO outputs simultaneously).

b) DC power supplies +12V at 50mA, +15.5V at 50mA and variable 0 to +13.5V at 10mA.

c) Frequency counter with 90MHz capability (50 ohm input preferred).

3.2 Test Procedure

a) With the VCO completely assembled in its diecast box apply +12V and +15.5V to 9PL3 and apply a +15.5V switching voltage to one line at a time of 9PL2 (to suit the required VCO range).

b) A variable supply should be applied to 9PL1 to tune the oscillator (<4.5V to <12.5V) and the outputs monitored on 50 ohm loads via 9PL4 and 9PL5.

c) Apply power and check basic DC levels. Select LF range by applying the 15.5V switch voltage to pin 1 of 9PL2.

d) If a new coil 9L1 has been fitted set the output frequency to 46.2MHz (±50kHz) with +4.5V at 9PL1 by adjusting the coil winding of 9L1 (the screw adjustor should remain at approximately 12mm of clear thread).

e) Set the output frequency to 52MHz (±50kHz), with +12.5V at 9PL1, using 9C4.

f) Repeat (d) and (e) 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 initially align correctly or in the case where the coil assembly is already araldited).

g) The remaining three ranges should be selected in turn and the HF end set with the appropriate trimmer capacitor (control voltage at +12.5V). The LF ends should then be obtainable within the control voltage range +3.5V to 5.5V. (See circuit for frequencies).

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

h) Check output level at 9PL4 and 9PL5, peaking the levels at 76.2MHz, with 9C5 and 9C6. These trimmers interact and the equalisation and peaking is best carried out by observing each output simultaneously on a double beam oscilloscope. (With correct adjustment both trimmers should be close to minimum capacitance).

i) Check coil assembly and components round the varactor diode are fixed with 'twin pack', 'slow setting' 'ARALDITE' to prevent movement under vibration.

4) Final Test and Alignment

With receiver in its fully assembled state, the following sequence of tests is carried out:-

4.1 - Synthesiser (including an 'in situ' test of the VCO).
4.2 - Main IF and Audio
4.3 - RF and 1st IF
4.4 - Pre-selector (when fitted)
4.5 - Final overall check

It should be noted that most of the internal settings are made via serial data signals generated by the microprocessor board. There are four main serial data outputs:-

a) Control of the 'DISPLAY' board.

b) Control settings of the 'MAIN IF/AUDIO' board, 'RF/1st IF' board and 'PRE-SELECTOR' board.

c)
) Control of the 'SYNTHESISER'.
d)

A further two pulse output trains are generated to drive the 'KEYBOARD/KNOB' tone generator and to drive the 'PRESELECTOR' motor. These serial outputs and pulse trains need not normally be checked, but any lack of control of the items listed may be due to faults in these signals, and maintenance section 1.3 indicates the areas to check.

4.1 Synthesiser

4.1.1 Test Equipment Required

a) Dual beam oscilloscope with ≥120MHz bandwidth and X10 probes.
b) Frequency counter to 90MHz (probe from (a)).
c) AV08 multi-meter or similar with at least 25V DC range.

4.1.2 Test Procedure

The synthesiser has three basic outputs which can be checked as follows. (Note some checks are also performed after section 4.3):-

a) To Product Detector 10IC13 On Main IF/AUDIO BOARD:-

If the external master board is not fitted, ensure the link between pins 5 and 6 is made, and also set 8RV2 to give +3.5V on link if new master oscillator 8OSC1 has been fitted or is thought to have a large error.

Select SSB Mode and monitor output to product detector with oscilloscope and frequency counter. (10TP6 on MAIN IF/AUDIO).

Set level to 300mV peak to peak using 8RV3 and set frequency to 1400kHz (±5Hz) with the master oscillator (8OSC1) internal trimmer, if a new oscillator has been fitted or error is greater than 5Hz.

N.B. An insulated trimming tool must be used for 8OSC1. Do not short trimmer to box.

Select CW Mode and set BFO to 0.0kHz. Adjust core of BFO coil 8L1 to give +2.0V to +6V at 8TP7. (Check set for best SINAD with 50dBuV signal at 1001kHz after section 4.3 complete). Check all BFO settings give correct output frequency (inverted relative to 1400kHz) at 10TP6 and check 8TP7 goes approxmately +0.3V at 1396.1kHz and approximately -0.2V at 1403.9kHz. Check level at 10TP6 is 300mV ±2dB peak to peak.

Select FSK Mode and ensure BFO output still present.

Select AM Mode and check that no significant output at 10TP6 is present.

b) To Second Mixer 7IC6 on RF/1st IF Board:-

Select AM Mode. Tune to 1001kHz. Monitor output of mixer 8IC26 at 8TP11 with crystal oscillator trimmer capacitor 8C100 at mid-position. Peak up level at 8TP11 (approximately 5kHz frequency) using 8C95 and 8C73. Then set level to 500mV peak to peak using 8RV5. Set the crystal frequency trimmer 8C100 to give +5.6V at 8TP13 and check voltage is approximately +8.3V when tuned to 1000.005kHz and approximately +3.5V when tuned to 999.995kHz. The level at 8TP11 should be approximately 500mV peak to peak when tuned 999.995kHz (and frequency =4kHz) and 400mV peak to peak when tuned to 1000.005kHz (and frequency =6kHz). Monitoring 8TP13 with the oscilloscope set to 2V/CM and tuning between 999.995kHz and 1000.005kHz should cause the switching waveforms shown.

Finally monitor the second mixer drive at 7TP11 on the RF/1st IF board and peak the level using 8C85, then set up to 300mV peak to peak using 8RV4.

N.B. Take care to earth scope probe near to test point.

c) To First Mixer 7IC3 On RF/1st IF Board

Check that the VCO has been pre-tested as previously described, that the components are correctly secured with 'araldite' and the internal wiring secured with rubber compound. Ensure insulation pieces separate lid from braids of co-axial cables on VCO board connectors.

Set loop filter potentiometer 8RV1 to fully anti-clockwise position and check DC supply to pin 7 of 8IC3 (LF356N) is $\geqslant$14.5V. Monitor drive to - 10/11 prescaler 8IC2 at 8TP2 to ensure it is in the range 400mV-800mV peak to peak over the whole tuning range of the receiver. Monitor drive to 1st mixer at 7TP4 on RF/1st IF board and check that it is approximately 400mV at 29.000MHz tuned frequency. (Reduce 270R AOT resistor 7R32 if necessary).

Note:- Measuring levels at 7TP4 and 8TP2 using the oscilloscope and X10 probe requires careful choice of earthing point for the probe. (The earth point should be close to test point and the earth lead kept as short as possible). If necessary the VCO output trimmers 9C5 and 9C6 may be slightly re-adjusted for best sinewave output at the 29.000MHz point. Although the VCO has been pre-tested it is advisable to check the end of each range with the unit 'in situ'. Monitor the varactor line at 8PL1 and check the voltage is +12.5V ($\pm$0.25V) at tuned point.

5790kHz (LF range)
12790kHz (LF +1 range)
20790kHz (HF -1 range)
29999kHz (HF range)

Adjust 9C4, 9C3, 9C2 and 9C1 respectively via holes in the VCO lid if corresponding voltage is incorrect. (9C1 is via the hole closest to 8PL1, then 9C2, 9C3 and 9C4). Check that the varactor line is in the range +3.5V to 5.5V at tuned points.

0kHz (LF Range)
6000kHz (LF +1 range)
13000kHz (HF -1 range)
21000kHz (HF range)

Once all signal circuits have been checked after section 4.3, check at 29MHz and 1MHz tuned points that a 20dB increase in signal level above that which gives a 20dB SINAD (AGC FAST, SSB MODE, USB) gives a SINAD of ≥35dB. If not obtainable 8RV1 should be adjusted for maximum SINAD. Also listen for any extraneous background noise on DFM output. If any present, check earth straps and internal wiring positioning of synthesiser.

4.2 Main IF and Audio

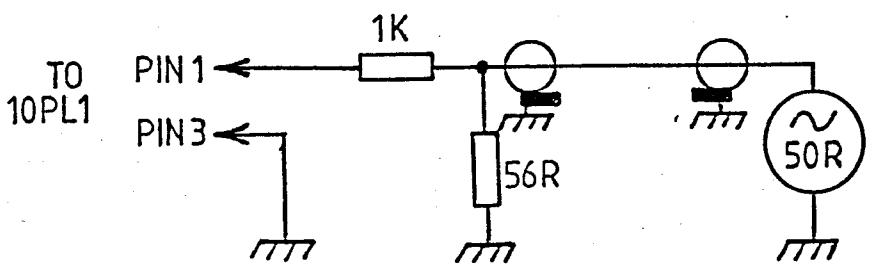
4.2.1 Test Equipment Required

a) Signal generator at approximately 1.4MHz (Marconi TF2002 or similar).
b) Distortion Factor Meter (DFM - Marconi TF2331).
c) Oscilloscope with ≥5MHz bandwidth and X10 probe.
d) AV08 multi-meter or similar with at least 25V DC range.

4.2.2. Test Procedure

a) Main Signal Circuits. Test signal generator into final IF (Main IF printed circuit board) via:

Figure 5.1
Main Signal Circuits Input Test Network



Select AGC 'OFF' SSB MODE, VERY WIDE bandwidth, mute OFF and IF gain control fully clockwise.

Check product detector oscillator level is 300mV peak to peak at 1.4MHz (10TP6), IF gain distribution potentiometer 10RV1 is central and +2V DC is on IF gain voltage line (check at pin 4 adjacent 'D8'). If 2V is not present reset 10RV8 accordingly.

Monitor 10TP4 with oscilloscope and with the signal generator producing an approximate 1kHz audio beat and giving 500mV peak to peak at test point, peak coils 10L1 and 10L2 for maximum output. Then adjust threshold potentiometer 10RV2 so that the output (i.e. IF gain) is just at maximum. 10RV2 should then be approximately central. This setting affects AGC attack time. If later found to be too long, advance setting of potentiometer 10RV2 that a drop of ½dB in gain is obtained at +2V. Check level of generator to give 500mV peak to peak at 10TP4 is approximately 12uV (±2dB) PD RMS across 56 ohm load resistor in figure 5.1.

Increase generator output by 65dB and adjust manual IF gain control to fully anti-clockwise. Adjust potentiometer 10RV9 to give 100mV peak to peak at 10TP5. Decrease generator by 65dB and check that +1.8V to +2V at pin 4 is still avilable with manual IF gain control fully clockwise (i.e. still at maximum gain). If not repeat preceding sequence.

With 500mV peak to peak output level at 10TP4 (in 'VERY WIDE' bandwidth) check:-

6dB IF bandwidth	approximately ±40kHz
IF output level at rear panel 1SKT4	approximately 120mV peak to peak open circuit. 60mV peak to peak into 50 ohm.
SSB Sinad	approximately 20dB) 600 ohm DFM on ancillaries
AM Sinad (60%, 1kHz modulation)	approximately 16dB) line output.
Gain variations over all bandwidth positions	approximately 3dB maximum
Input to SL1641 detector (at 10TP5)	approximately 100mV peak to peak
Input to SL1625 AM detector (at 10TP10)	approximately 350mV peak to peak.

Finally set AGC output of 10IC15 (SL1625) at anodes of 10D12/10D17 to +2.6V DC using 10RV4.

b) AGC Adjustments ('threshold' level is that input which gives 500mV peak to peak at 10TP4 with AGC 'OFF').

Select 'FAST AGC' and ensure output level remains the same (reset DC output of SL1625 (10IC15) to approximately 2.6V if necessary using 10RV4).

Increase input by 60dB from threshold and check that output at 10TP4 rises by no greater than 4dB. (This should also apply when 'SLOW AGC' is selected).

Select 'Audio AGC' and increase input by 60dB from threshold, adjust audio AGC potentiometer 10RV7 to give a rise of 2dB above 500mV at 10TP4. Return input to threshold and check that 10TP4 does not fall by more than 3dB. (i.e. below 500mV approximately 450mV peak to peak).

Select 'MUTE ON' and 'FAST AGC', and set hysteresis potentiometer 10RV3 to maximum anti-clockwise position. Check by varying input level that receiver is muted and audio attenuated by 20dB ±3dB compared to unmuted position.

With DFM presenting 600 ohm load to ancillaries line output, obtain with signal at threshold level, an output of 10mW at 1kHz.

Set line level meter drive calibration potentiometer (10RV10) so that meter reads 10mW when 'AF METER' selected. Increasing the audio to 3kHz or decreasing to 300Hz should not vary the meter reading. Increasing the line output to 20/25mW at 1kHz should just give full scale deflection on the meter.

4.3 RF and 1st IF

4.3.1 Test Equipment Required

a) Signal Generator 10kHz-30MHz (Marconi TF2002 or similar).
b) Distortion Factor Meter (DFM - Marconi TF2331).
c) Dual beam oscilloscope with ≥120MHz bandwidth and 10X probe.
d) AV08 multi-meter or similar with at least 25V DC range.

4.3.2 Test Procedure

a) Signal circuits. With receiver RF/1st IF board reconnected to main IF/Audio board introduce a signal via the aerial input.

Select 'WIDEBAND', 'SSB' mode, 'USB' selectivity, 'MUTE' off, 'AGC/GAIN' as required, and 'RECALL' mode.

Check oscillator levels are 300mV peak to peak at 7TP11, into 2nd mixer (7IC6) over 2kHz range (tune 1000kHz-1002kHz) and 400mV-500mV peak to peak, at 7TP4 into 1st mixer (7IC3) over 0MHz-30MHz RF range. (N.B. on some receivers a 56 ohm to 220 ohm resistor is connected across 7TP4 and ground to reduce oscillator level to 400mV maximum at 30MHz and remove spurrii).

Ensure that 3V DC is present between 7TP7 and 7TP8 to give correct mixer bias (note 7TP8 is not at earth potential - see RF/1st IF board circuit diagram). With AGC 'OFF', tune receiver to 1MHz and apply an input signal at 1001kHz, at a suitable level to enable peaking of the 2nd mixer input and output coils 7L1 and 7L2. Then with 2uV emf input and 'FAST AGC' selected obtain a 17dB SINAD by adjusting RF amplifier gain. At a higher input level, using dual beam scope, ensure both levels are equal and at 180^{O} out of phase at 1st mixer input 7TP2 and 7TP3. The gain of each RF amplifier and should be in the range 4dB-6dB (from test point 7TP1 to each mixer input). 7RV1/2 set gains of each half. Then with AGC 'OFF' and no signal input (generator disconnected) check background noise remains within 1dB over the range 160kHz-30MHz (genrally noise increases by 1dB over approximately 20MHz). Below 100kHz background interference may increase noise slightly. Check SINAD = 16-17dB for 2uV emf over whole range 400kHz-4MHz.

Then with above conditions and using a 2uV emf signal input, check overall receiver gain stays within 3dB over 100kHz-30MHz and is typically:-

6dB	below	maximum	at	50kHz
14dB	below	maximum	at	20kHz
20dB	below	maximum	at	10kHz

N.B. Generator output level should be increased to determine the levels below 100kHz.

b) AGC With 'FAST AGC' selected and receiver tuned to 1MHz and an input signal at 1001kHz, increase signal input level until 300mV peak to peak is obtained at input (10TP12) to SL1625 AGC generator (10IC9) Main IF/Audio board. Set 10RV6 for +2V DC output at 10TP13.

Then set generator level to +57dBuV emf and set AGC input gain potentiometer 10RV5 to give 2.6V on 7TP5 at input to AGC buffer amplifier 7IC4 on RF/1st IF printed circuit board.

Then increase generator level by 50dB and ensure that input level to 10IC9 (SL1625) on Main IF/Audio board does not increase more than 6dB at 10TP12 (3dB typical).

Check using 'FAST AGC' that AGC overall threshold at 1MHz approximately +3dBuV ±3dB and an increase of 100dB above +6dBuV does not increase audio output by more than 6dB (check on 'AUDIO AGC' as well).

Check that threshold level remains within 1dB in all AGC modes (including 'OFF'). Also check that a 20dB rise of input anywhere in AGC range has an attack time of $\leq$40mS on 'SLOW AGC' and 'FAST AGC', and $\leq$20mS on 'AUDIO AGC'. 'FAST AGC' should have a decay time of approximately 200mS-500mS (reducing input in 20dB steps anywhere in AGC range). 'SLOW AGC' should have a decay time of 1-4 seconds (returning input in 20dB steps anywhere in AGC range to 20dB SINAD level). 'AUDIO AGC' should have a 1-2 second 'PEDESTAL' (all times to within +2dB of steady state output).

Then check that the 'RF2' meter setting increases from this threshold level to approximately half full scale deflection at 57dBuV emf, at which point 'RF1' meter setting should start to increase ('RF2' staying at half full scale deflection) until it also reads approximately half full scale deflection at 106dBuV emf.

Check using 'AM' mode, 'WIDE' bandwidth and a 1kHz 60% modulated signal that no noticable (audible) distortion occurs in the output until a signal level of 109dBuV emf is present (check dB by dB over range 57dBuV emf upwards, as RF AGC is generated).

Finally check RF attenuator operation (AGC 'OFF') which should give 10dB, 20dB and >60dB (at MINIMUM RF sensitivity) at 1MHz.

C) Setting of internal standard (preferred method).

To set the internal standard oscillator '8OSC1' to obtain the specified overall frequency setting accuracy, an additional test frequency source of accuracy better than $\pm$0.1 ppm is required. A signal generator locked to an external standard of such accuracy or checked using a counter of such accuracy is preferred.

The generator must be settable to 29002.000kHz and 1002.000kHz. A counter is required to measure an audio output beat of approximately 1kHz across the ANCILLARIES line output.

Select 'SSB Mode', 'MAXIMUM SENSITIVITY', 'FAST AGC', 'USB SELECTIVITY' and 'WIDEBAND'.

Tune receiver to +29001.000kHz and introduce accurate input signal at29002.000kHz and level >40dBuV (to give high SINAD). Using 8RV2 (via hole in SYNTHESISER module cover set the audio output beat as measured on the counter to 1000Hz. Tune receiver to 1001.000kHz and with 1002.000kHz input signal, check beat is still 1000Hz.

After section 4.3 complete check SINADS, using BFO (CW and FSK modes) at 1MHz and 29MHz (see sub section 4.1) 'ANCILLARY' input characteristics are given in section 2 and 'REMOTE' in section 6.

4.4 Preselector (when fitted)

This is the final item to be aligned. The preselector motor driven gang and range selection are controlled directly by the microprocessor which sets them to correspond to the tuned frequency.

The ranges are as follows:- (all to 2kHz resolution).

Range 1	20000kHz	-	30000kHz
Overlap 1	19900kHz	-	19998kHz
Range 2	10000kHz	-	19898kHz
Overlap 2	9900kHz	-	9998kHz
Range 3	4990kHz	-	9898kHz
Overlap 3	4950kHz	-	4988kHz
Range 4	2500kHz	-	4948kHz
Overlap 4	2476kHz	-	2498kHz
Range 5	1200kHz	-	2474kHz
Overlap 5	1176kHz	-	1198kHz
Range 6	600kHz	-	1174kHz
Overlap 6	590kHz	-	598kHz
Range 7	300kHz	-	588kHz
Overlap 7	296kHz	-	298kHz
Range 8	150kHz	-	294kHz
Overlap 8	148kHz		

For frequencies less than 148kHz a multi-pole low pass filter is used (range 9).

To provide hysteresis at range ends, frequencies in the 'OVERLAP # N' range do not cause a change in the range selected as long as it was already one of the adjacent ranges.

4.4.1 Test Equipment Required

a) Signal generator 10kHz-30MHz, (Marconi TF2002 or similar)
b) Distortion Factor Meter (DFM - Marconi TF2331).
c) Oscilloscope with >5MHz bandwidth and X10 probe.
d) AV08 multi-meter or similar with at least 25V DC range.
e) Capacity measuring bridge with range 15pf-400pf. (Not required during general servicing re-alignment).

4.2.2 Test Procedure

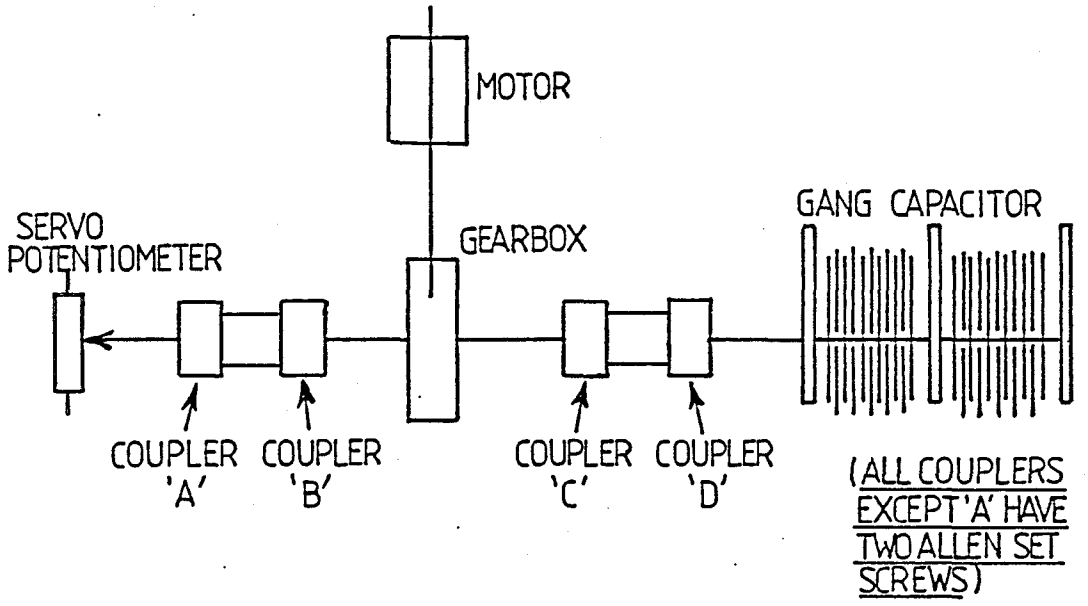
The alignment of the preselector is split into two stages:-

a) Mechanical alignment of motor-gearbox-gang assembly and electrical setting of associated servo integrated circuit.

b) Alignment of ranges (except low pass filter which does not require any alignment).

Note:- (a) need only be performed if an associated component has been replace (e.g. gang). The order in which the shaft coupler screws are adjusted is important and reference should be made to the diagram below.

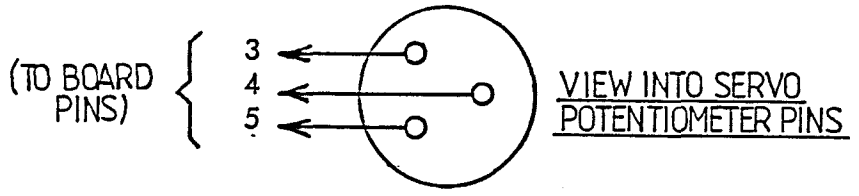
Figure 5.2
Motor Driven Gang Coupler Identification



a) Mechanical Alignment Of Gang etc.

Set potentiometer 2RV2 to central position, ensure that all coupler screws in A, B, C and D couplers (see figure 5.2) are loose and ensure wiring from board to servo potentiometer 2RV1 is as figure 5.3 (if wiring has been disconnected previously).

Figure 5.3
Servo-Potentiometer Wiring



Ensure that pin 3 voltage is approximately +2.5V.

Ensure that pin 5 voltage is approximately +1.1V, and pin 4 goes between +1.1V and 2.5V as 2RV1 is turned.

Tighten screws in couplers 'A' and 'B'. With power to receiver removed, remove all four 'Relay Boards' carefully noting positioning for later re-fitting.

Apply power to receiver and select 'Wideband'. Check, using capacity bridge that capacity of each gang section is approximately 15pf minimum and 378pf maximum. (Note some capacity bridges may need power to be removed from receiver during actual measurement to prevent 'earth loops' etc.).

Then de-select 'Wideband' (i.e. preselector into circuit) and tune to 585kHz. The motor should settle in a certain position. Set the gang to give approximately 36pf per section and lightly tighten couplers 'C' and 'D'. Tune to 296kHz and note that gang should turn to near maximum capacity (if it travels through or goes to near minimum capacity, tune to 296kHz again by tuning higher than 296kHz with the knob and then, after the gang has turned to near maximum, slowly tune down to 296kHz). 2RV2 should then be adjusted to give 365pf per gang section. The mechanical setting of C/D at 585kHz and the electrical setting of 2RV2 at 296kHz should be repeated until capacities are obtained correctly. The capacity at 315kHz should then be checked as approximately 311pf and at 450kHz as approximately 118pf. The control pulse from the microcomputer unit can be checked at the non-earthly end of 2R22 (47k). When tuned to 315kHz (and 'WIDEBAND' de-selected) it should be a +5V pulse of approximately 1.2mS width repeated every 40mS and when tuned to 585kHz it should be aproximately 1.8mS wide. The screws in couplers A, B, C and D can then all be fully tightened and the boards re-fitted (power removed).

b) Finally align ranges 1-8 in a conventional manner using the tracking points given below. Peak appropriate trimmers at HF tracking points and coil cores at LF tracking points, checking loss, compared to 'WIDEBAND' selected, at these points and the tracking check points is not greater than 6dB (typically 3-4dB).

Range	HF Track	LF Track	Tracking Check Point
8	292kHz	158kHz	250kHz
7	585kHz	315kHz	510kHz
6	1170kHz	620kHz	1000kHz
5	2430kHz	1240kHz	2140kHz
4	4900kHz	2600kHz	4200kHz
3	9800kHz	5100kHz	8600kHz
2	19500kHz	10300kHz	18500kHz
1	29500kHz	20400kHz	28000kHz

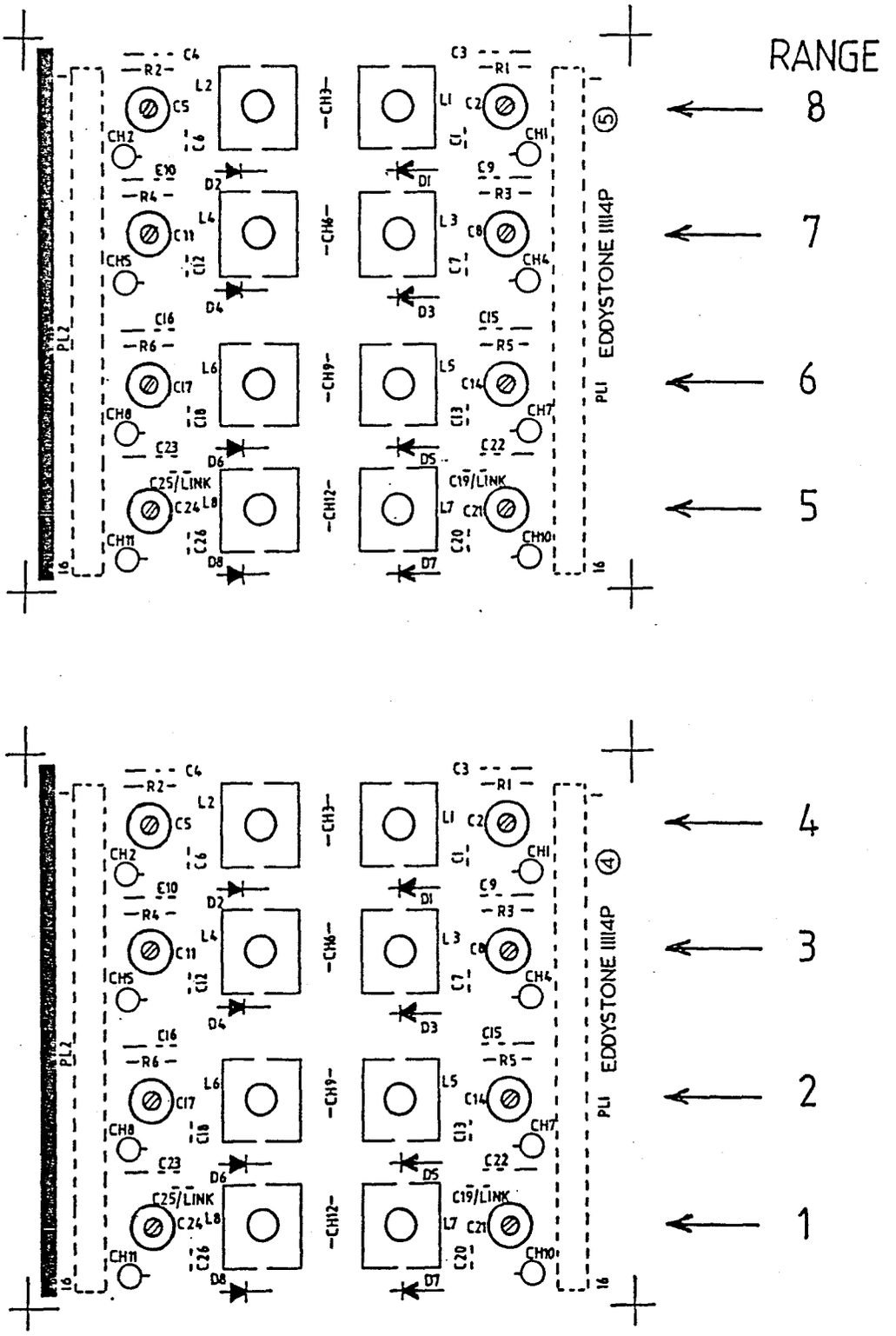
Finally check 'Range 9' insertion loss (compared to 'WIDEBAND' selected at 148kHz, 100kHz, 50kHz and 10kHz). Insertion loss should not exceed 6dB at any point (tyically 3-4dB).

Note:- The receiver does not have to be exactly set to the above frequencies (within ±2kHz is satisfactory) to obtain correct alignment.

Note:- When adjusting at the HF tracking point, or checking at the 'Tracking Check Point' rock gang side to side, (by lightly forcing couplers C/D to either side) to ensure setting from either direction of rock produces a 'peaked' output within 1dB.

Note:- See figure 5.4 for positions of trimmers and coil cores.

Figure 5.4
Positions of Trimmers and Coil Cores



5) Removal of Modules

The receiver consists of six main modules or assemblies all of which, apart from the rear panel assembly, can be removed by releasing the appropriate retaining screws and un-plugging the appropriate connecting leads. Reference to 'Chassis Interconnections and Miscellaneous Modules' circuit diagram will be found helpful (BP1648).

a) Front Panel Assembly

To access:- Remove top and bottom dust covers, and, if necessary, remove three M4 fixing screws in either sidepanel enabling assembly to be moved forward and retained, using just one screw per side, in its 'forward' test position. This position is also recommended for use when inserting or removing connections to this assembly.

To remove:- Starting as above then disconnect all leads to assembly, remove the two screws and pull assembly forward.

Special Notes:- Ribbon connectors go the the plugs on the assembly in the same order as they come from the receiver chassis (i.e. none cross). Also note that ribbons from 7STC1 (to 12RS2) and 10STC1 (to 12RS1) emerge from same aperture. If the loudspeaker is removed from assembly note that M4 spacing washers are fitted between loudspeaker frame and printed circuit board.

b) Rear Panel Assembly

To access:- Remove top and bottom dust covers. Transformer covers can also be removed to acccess circuitry which is live when the receiver is operated from a mains supply (note in this case, great care must be taken).

To remove:- Unscrew 'Ancillaries', 'Remote', IF OUTPUT' and, if fitted, 'EXTERNAL STANDARD' connectors. Un-plug connectors to Power Supply circuit board and to 7PL1 on the RF/1st IF board (removing cover on this board section first). Unsolder lead to pin 6 of 1RLA socket 1SKT2 and leads from pins 25 and 24 of the 'Ancillaries' connector to ground and 'External Supply' fuse 1SF3 respectively. Remove four M4 fixing screws and two taper pins and pull assembly away from chassis.

Special Notes:- When re-fitting assembly to receiver ensure grommet is correctly repositioned in centre screen cut-away and ensure two taper pins are fitted at bottom of receiver with bends of rear protection brackets facing inwards.

c) Main IF and Audio Board

To access:- Remove top dust cover.

To remove:- Un-plug 10PL1 to 10PL7 inclusive and 39PL1 on the audio line attenuator board. Remove two M3 screws and two M3 pillars holding the audio line attenuator board to the main IF and audio board (note that these two boards remain hardwired together (see figure 5.7) and un-plug ribbon cable connectors from 11RS1 and 12RS1 on front panel assembly. Remove remaining nine M3 retaining screws and pull board upwards.

Special Notes:- When re-fitting ensure leads on LHS (when viewed from front panel) are neatly 'dressed' and not trapped against edge of board. Ensure leads to 10PL3 and 10PL4 are held on screens with cable clips.

d) RF and 1st IF Board

To access:- Remove top dust cover.

To remove:- Remove three screened box lids which cover leads to 7PL1, 7PL5 and 7PL6/7. Un-plug 7PL1 to 7PL7 inclusive and un-plug ribbon cable connector from 12RS2 on front panel assembly. Remove all twelve M3 retaining screws and pull board upwards.

Special Notes:- When re-fitting note that ribbon cable travels to front panel assembly via an aperture in the centre screen (to the Main IF and audio board compartment) and then through the same aperture as the lead between 10STC1 and 12RS1, also note that the lid of the central screened box on the right hand side of the board and the large screened box at the front have cut-away sections over the filter.

e) Synthesiser

To access:- Remove bottom dust cover. Remove cover (six M3 screws) over synthesiser module (which is the larger of the two modules). Temporarily retain three earth straps in normal positions using M3 screws.

To remove VCO module:- Remove lid of module, un-plug 9PL1-5 inclusive and pull leads clear with grommets. Pull away and clean off lead retaining compound. Remove VCO box by releasing four rubber mounted screws. (N.B. printed circuit board may need to be removed first by releasing five M3 screws).

Special Notes On VCO Module:- When re-fitting, ensure rubber mounted screws not over-tightened. Ensure that the lead to 9PL4 is kept well away from the coil 9L1. Use silicone rubber compound to set wiring and grommets in position. Also ensure earth straps between VCO lid and the main synthesiser board and the side screen are fitted. The latter must be insulated so that it does not touch the synthesiser box or lid.

To remove main synthesiser board:- Remove screen held by four M3 screws. Un-plug 8PL1, 8PL2, 8PL3, 8PL5, 8PL7, 8PL8, 8PL9 and 8PL20, ribbon cable to 12RS3 on front panel assembly and leads to external standard board (if fitted). Remove six M3 retaining screws and four retaining pillars and pull board upwards.

Special Notes:- When re-fitting ensure ribbon cable lead to 12RS3 is not trapped against metalwork edges. Ensure all five earth sraps are correctly fitted, (VCO box to centre screen strap is insulated), and ensure twisted lead to 8PL3 is held by retaining clips fitted on two rear synthesiser module cover retaining screws (not underneath the one rear screw which holds the earth strap).

f) Preselector (when fitted)

To access:- Remove bottom dust cover. Remove cover (four M3 screws) over preselector module (which is the smaller of the two modules).

To remove:- Un-plug 3PL5, 3P16 and 3PL7. Un-plug ribbon cable to 12RS4 on front panel assembly. Remove coil board (reference 4) remove eight M3 retaining screws and pull board upwards. Note, if required, coil boards and relay boards can be removed by simply un-plugging from the main board.

Special Notes:- When re-fitting ensure twisted lead to 3PL7 is held by cable clip underneath rear board retaining screw near exit aperture. Also ensure co-axial lead to 3PL6 is guided through adjacent aperture in side of module box. When re-fitting module cover, ensure that foam relay board retaining pad is above these boards.

Figure 5.5
TOP INTERNAL VIEW

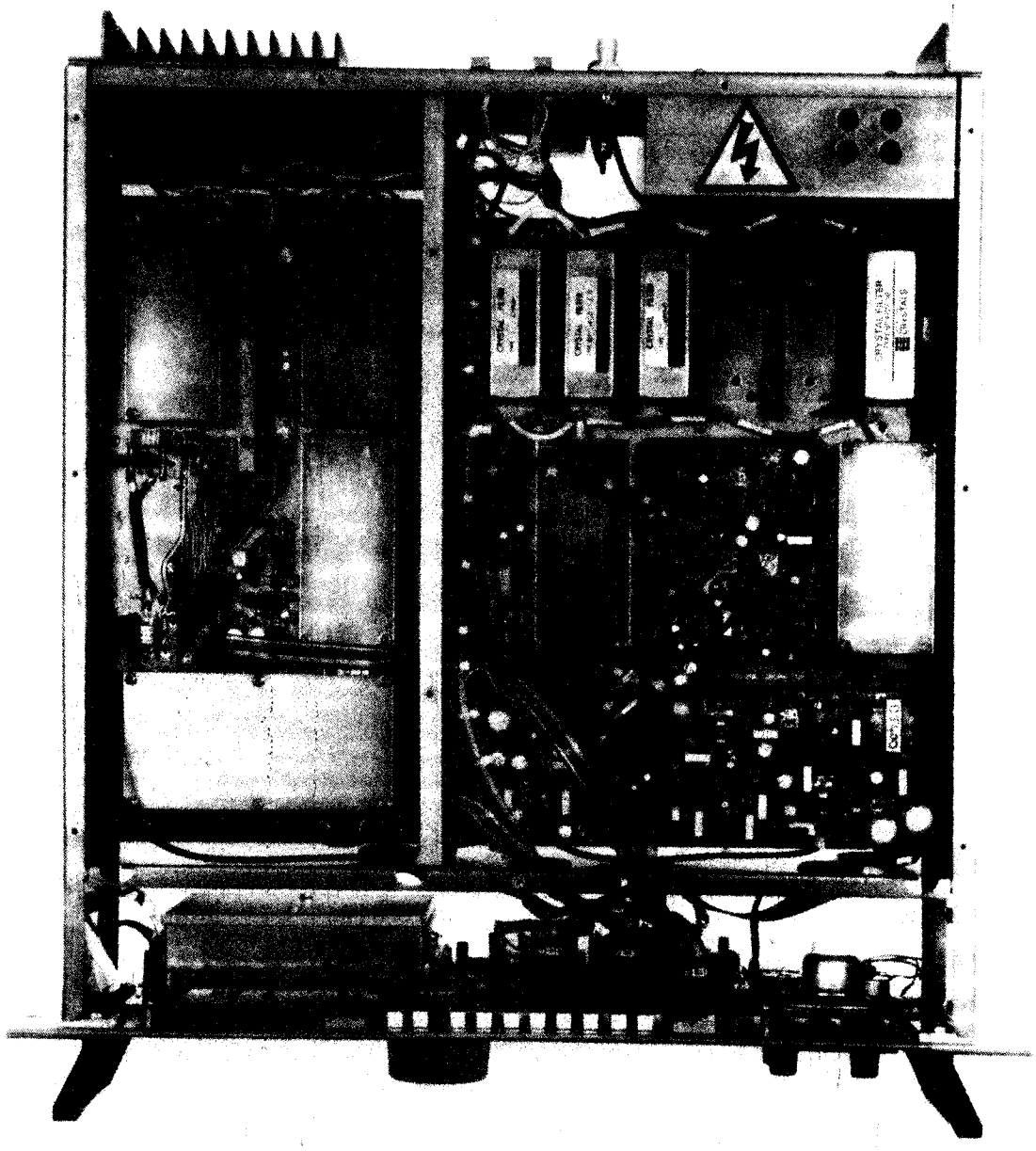
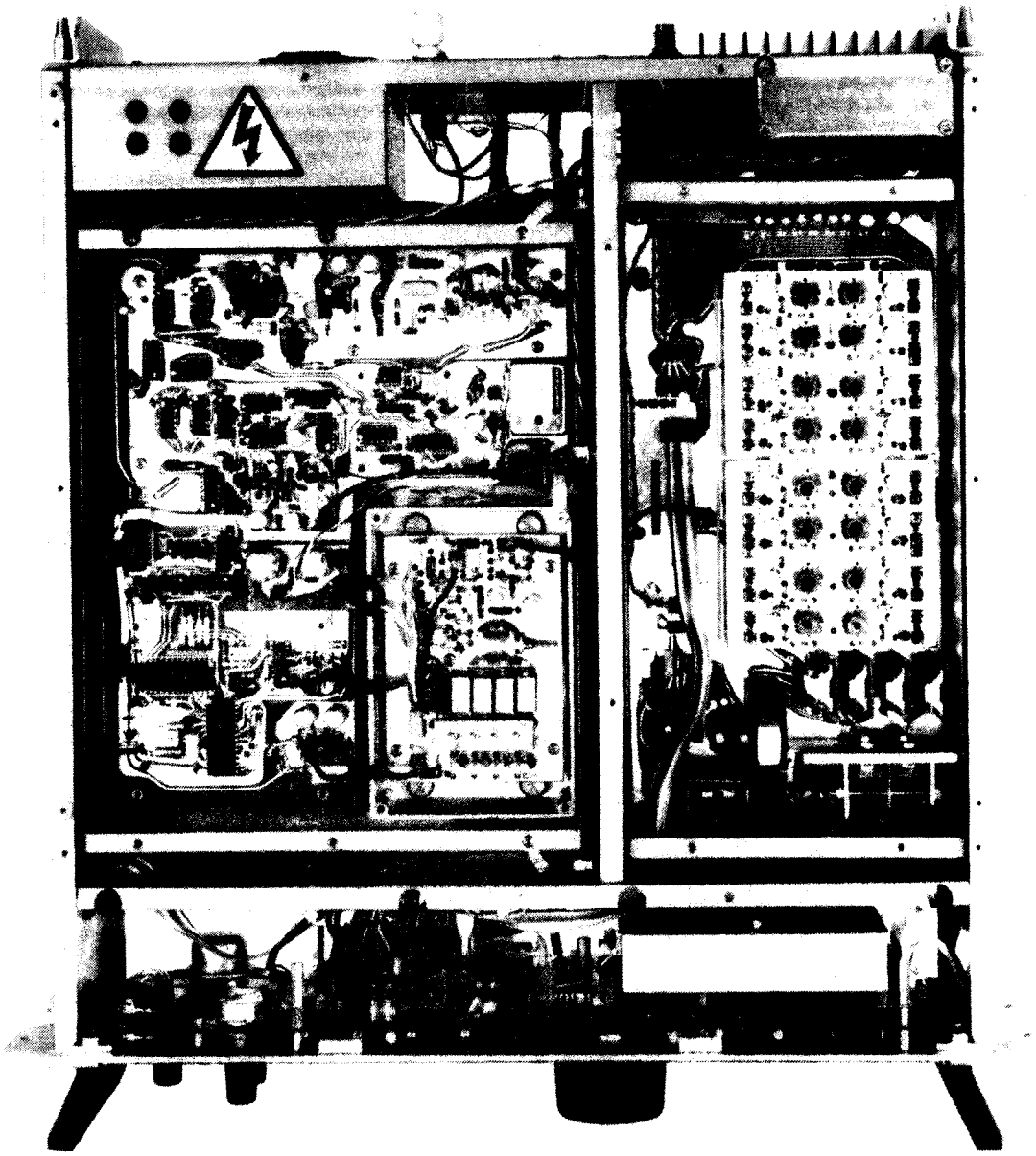


Figure 5.6
BOTTOM INTERNAL VIEW



Section 6

Remote Control Introduction

This section refers to the use of the rear panel 'Remote' input on the 1650/7 receiver. This system uses serial asynchronous data transfer at 1200 Baud, and TTL level to and from the 1650/7 via the connector. The remote control facilities meet the requirements of IT4659. Suffix 'C' protocol remote control is employed.

All receiver functions can be operated and interrogated remotely except loudspeaker monitoring and display intensity. Manual IF gain/Mute level and line level control inputs and meter output are at analogue levels only at the connector (1763 used to convert them to digital signals). The system is such that no memory of the 1650's status needs to be retained at the controller end.

Error protection is provided in three ways:-

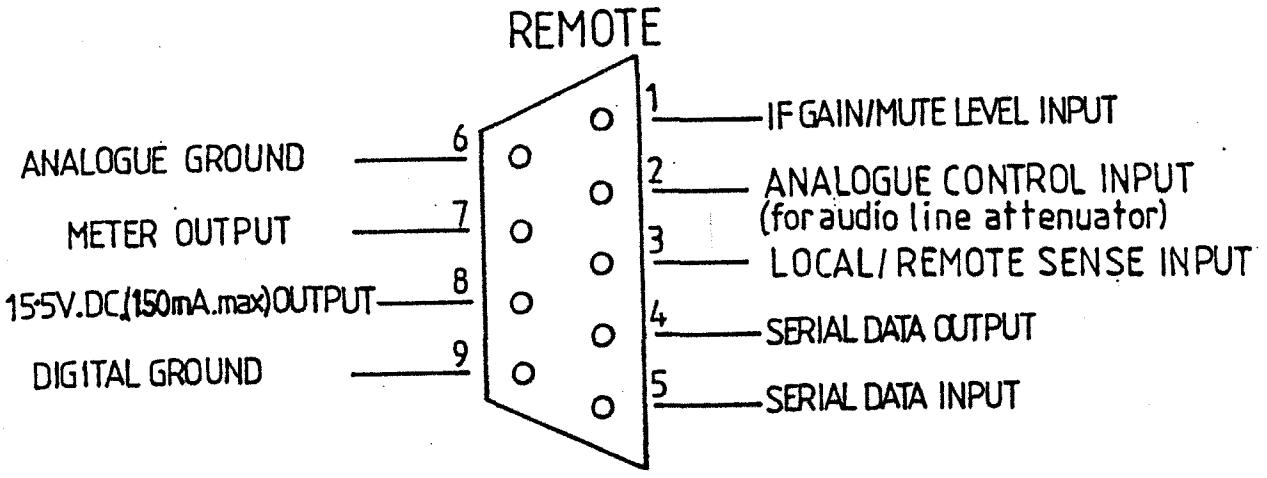
a) By providing a CHECKSUM code with each data transfer. (See 'INPUTS' and 'OUTPUTS').

b) By providing redundancy in the code words chosen (so that not all are valid).

c) By providing a controller selectable option which enables the control data sent, to be reverted, after use, to the controller for checking by comparison (see 'INPUTS' and 'REMOTE SET-UP' and 'ERROR PROTECTION').

The sequence of remote control operations follows those used locally except that Channel ØØ data can be entered without selecting the appropriate mode first. Also the BFO offset can be entered numerically under remote control and a special 'fast tune' control sequence is provided for remote manual search tuning.

Figure 6.1
1650/7 Rear Panel Connector 1PL1 (View into connector)



Pin 1	IF Gain/Mute Level input	-	Analogue voltage +2V (Maximum gain, minimum mute level) to +4V approximately. (Minimum gain, maximum mute level). 1k source impedance approximately.
Pin 2	Analogue control input for audio line attenuator	-	A control voltage of +1.5V to +2V provides approximately 20dB audio attenuation, and +4V provides zero attenuation. 1k source impedance approximately.
Pin 3	Local/Remote sense input	-	When the line is held low, the receiver will be in 'remote' (indicated by the front panel LED with the front panel controls 'locked out'). When the line is high the receiver will be in 'local' with front panel controls operative. Note that this input is pulled high internally and thus, if no connection is made to pin 3 the receiver will automatically be in 'local'.
Pin 4	Serial data output	-	At TTL level (will drive up to 20 LSTTL loads or equivalent).
Pin 5	Serial data input	-	CMOS input (2k7 pull up if driven by TTL).
Pin 6	Analogue ground	-	For pins 1, 2 and 7.

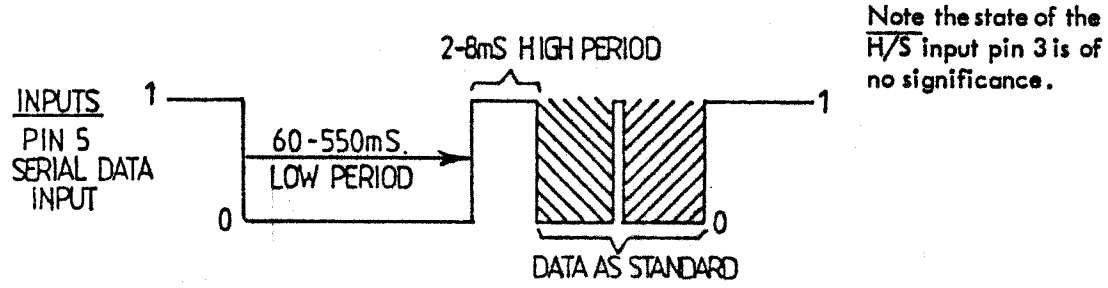
Pin 7	Meter Output	-	Analogue voltage corresponding to 1650 meter display. In range 1V to 3V (3V ⏚ FSD). Output impedance approximately 10k ohm.
Pin 8	15.5V at 150mA maximum	-	DC supply for external equipment (e.g. TTL/V28 level adaptor).
Pin 9	Digital ground	-	For pins 4, 5 and 8.

When making external connections to the 'REMOTE' connector ensure all leads are adequately screened and particularly ensure that the analogue connections are individually and separately screened from the digital connections.

Inputs

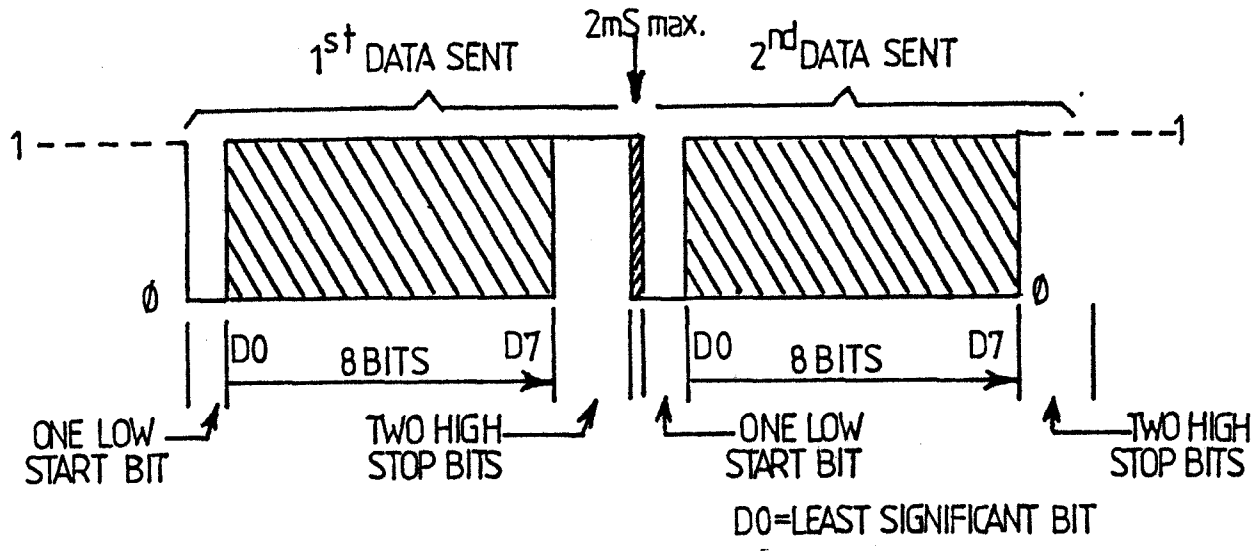
The serial control input is shown in Figure 6.2

Figure 6.2
Data Inputs



Details of the two data bytes shown in figure 6.2. are given in figure 6.3. The eight data bits (no parity) have additionally one low start bit and two high stop bits. The time between sending each 'byte' should not exceed 2mS. The baud range should be 1200 baud ±2%.

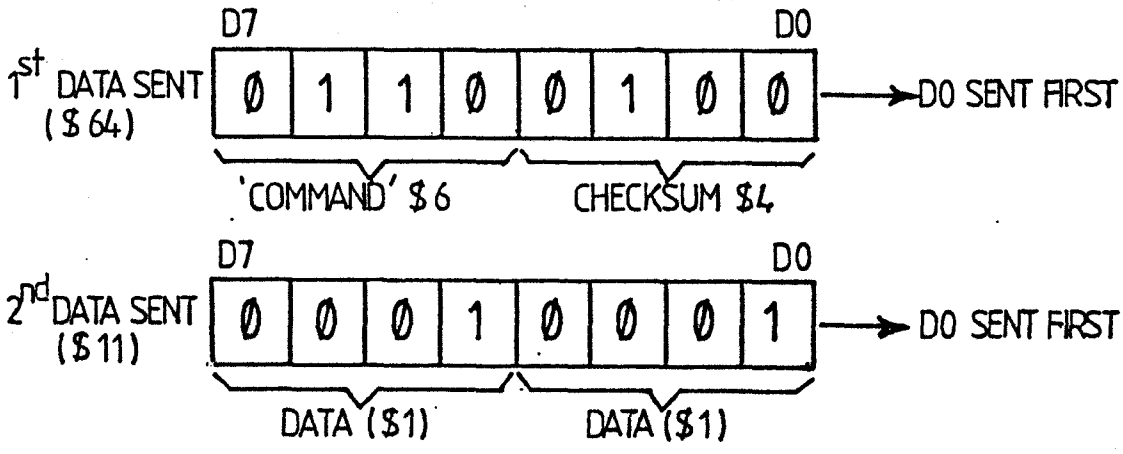
Figure 6.3
Details of Data Bytes



The time taken for the two complete 'bytes' to be sent is approximately 18.3mS (with zero gap between bytes).

The two bytes sent are described as the 'CONTROL CODE' and consist of the parts shown in figure 6.4 (start and stop bits not shown) which gives a typical example.

Figure 6.4
Typical Control Code (=$6411)



The CHECKSUM is sent as the sum of the '1's in the rest of the data. For example in figure 4, COMMAND has two '1's and 'DATA' has two '1's giving four in total therefore CHECKSUM = 4 i.e. Ø1ØØ. The example control word in HEXADECIMAL (HEX) form is $6411 ($ denotes HEX), and this will be the method used to define all of the control codes.

Remote Set-Up and Error Protection

Four control codes are reserved for use in setting up the characteristics of the remote control system itself by arranging the setting of 'ACKNOWLEDGE' (ACK) and 'DISPLAY INHIBIT' (DI) flags in the receiver being controlled.

These codes are as follows:-

Table 6.1
'Remote Set-Up' Control Codes

CODE	ACKNOWLEDGE FLAG	DISPLAY INHIBIT FLAG
$6310	CLEAR	CLEAR
$6411	SET	CLEAR
$6412	CLEAR	SET
$6513	SET	SET

Note that the CHECKSUM 3, 4 or 5 is second digit from the left.

Whenever the receiver is switched to 'remote' off, both flags are cleared. When switched to 'remote' on, the flags can be adjusted from the controller end.

The 'ACK' flag when SET, causes the receiver to revert the exact data received, in the same order, after being used to control the receiver (see 'OUTPUTS').

This only happens when the received CHECKSUM agrees with the received COMMAND and DATA and if the COMMAND is recognised, otherwise no control action takes place at the receiver and no data is reverted.

If KNOB UP, KNOB DOWN or KEYBOARD MIMIC control codes are sent, even if the 'ACK' flag is SET, then no data is reverted. In the case of KNOB codes this is to maintain the speed of control, KEYBOARD MIMIC codes are only intended for control over very short distances (e.g. two linked receivers with combined controls). When data is reverted, it can be checked with that sent as a final check against errors. If no data is reverted when it should have been, this in itself is an indication of an error having occurred.

When the 'DI' flag is set, the initial low period on the data input, (pin 5), before the 2-8mS high period and the data is sent, can be reduced from a minimum of 60mS to aproximately 30mS to enable a more rapid speed of control. This mode of operation is principally intended to enhance the speed of KNOB UP and KNOB DOWN manual search tuning (although 'DI' does not have to be set in this circumstance). However, whenever 'DI' is set, the scan rate will differ from that selected (will be aproximately three times quicker), and the receivers local display will not be up-dated.

Note that use of $6411 or $6513 as appropriate will enable a check of the remote control system (including measurement of the total loop transit time) to be made without affecting the receiver settings.

Interrogation Control Codes

Four control codes are reserved for use in interrogating the receiver status. When received the 1650 will send out seventeen bytes of data, (see OUTPUTS) including a CHECKSUM byte. The control codes and the data reverted are shown in table 6.2.

Table 6.2
Interrogation Control Codes

Control Code	Data Reverted
$662E	Revert data of 'DISPLAYED' channel i.e. that selected in 'CHANNEL' mode.
$674F	Revert data of received channel
$68FC	Revert numbers of displayed and received channels and scan parameters.
$69BF	Revert all other essential data including signal status.

Note that the CHECKSUM 6, 7, 8 or 9 is second digit from the left.

Knob Up and Down Control Codes

These codes provide the same effect as use of the 1650's front panel tuning control (including the variable rate speed of tuning and it's use in 'CHANNEL', 'SCAN' and 'BFO' modes). The codes are shown in table 3. It is recommended that the data byte 'YY' is provided by counting the pulses (and inverting if necessary) from a rotary encoder. If a type with two 90^{O} phase shifted outputs is used, the relative phase between the outputs can be used to determine the direction of control 'UP' or 'DOWN'.

Table 6.3
Knob Control Codes

Control Code	'Recall or Tune' Mode selected 'BFO' not selected	'Recall or Tune' mode and 'BFO' selected	'Channel or Scan' mode selected
$1XYY) (Knob up)	Control tune frequency up or down with variable rate characteristic	Controls the BFO offset	Controls the channel number selected (displayed)
$2XYY) (Knob down)	The number of pulses increment or decrement the frequency from its original position as follows:	The number of pulses change the offset in one or other direction in 100Hz increments or decrements depending directly on the number of pulses sent divided by 5*.	The number of pulses increment or decrement the channel number selected by an amount depending directly on the number of pulses sent divided by 5*.
Where 'X' = CHECKSUM	1-2 pulses - 1Hz digit altered		
	3-8 pulses - 10Hz digit altered		
'YY' = number of pulses inverted	9-17 pulses - 100Hz digit altered		
	>17 pulses - 1kHz digit altered		

i.e.

$Ø1 pulse sent as $FE	Software inside the 1650 'smooths' out the transition from one step to the next. Lesser significant digits to those being altered are set at 00 etc. on up and --95 on 'down'.

NOTE: The digit altered is, in each case, the least significant digit for the number of pulses specified (more significant digits are altered pro rata).

*The result of these control signals being sent should also be checked by the appropriate Interrogation Control Code to determine the actual BFO setting or channel setting obtained. In general it is recommended that obsolute control codes are used for BFO or Channel Setting (see table 6.4).

Keyboard Mimic Control Codes

These codes provide the same effect as use of the 1650's front panel keyboard (except for loudspeaker monitoring, and '$\mathcal{O}$',). It should be noted therefore items such as 'RF SENSITIVITY' are 'stepped' through their settings rather than set at a particular point. When absolute settings of such items are required ABSOLUTE control codes should be used. A complete list of KEYBOARD MIMIC codes is given in table 6.4.

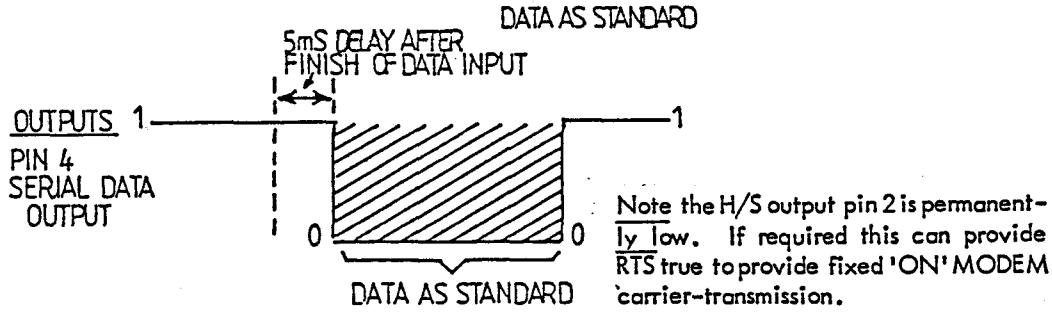
Absolute Control Codes

These codes produce absolute settings of the receivers functions. The same procedure for local control is generally followed, however data required for channel storage etc. can be directly loaded into channel ØØ (including BFO offset) without first selecting 'Recall or Tune'. Also channel numbers, and scan parameters are directly entered as two digit numbers. A complete list of ABSOLUTE control codes is given in table 6.4.

Outputs

The 1650 produces two forms of serial output. The first, shown in figure 6.5, is the reverted data signal produced, under certain circumstances, when the 'ACK' flag is SET. The bytes are returned in the same order as received (complete with 1 start and 2 stop bits) at 1200 baud, and with ØmS gap between bytes.

Figure 6.5
Reverted Data Output In Answer to a Control Setting



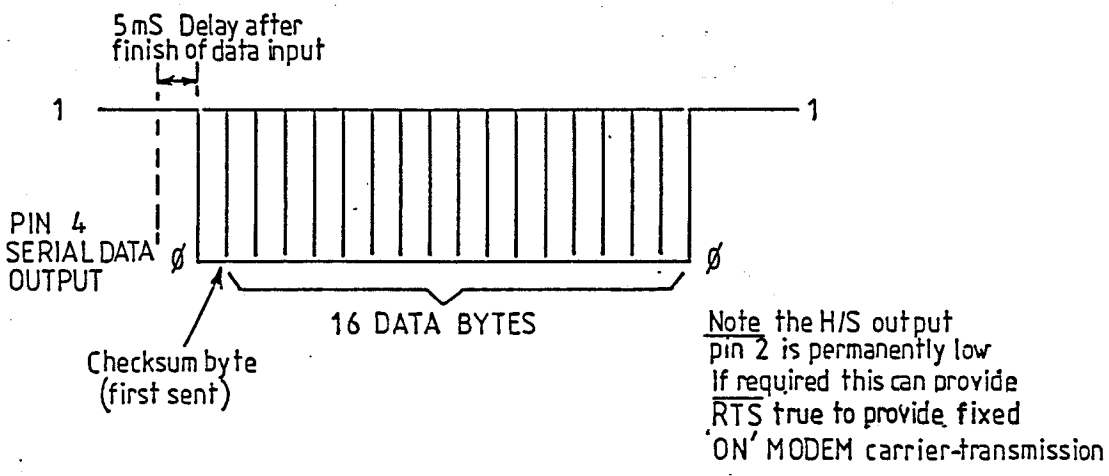
The circumstances in which the data is reverted are as follows:-

i) The control code sent is not a KNOB UP, KNOB DOWN or KEYBOARD MIMIC code.
ii) The 'ACK' flag in the 1650 has been SET.
iii) The calculated CHECKSUM at the 1650 is the same as the received CHECKSUM.
iv) The received command/data has been recognised.

When data is reverted it can be used in a comparative check with the data sent as a final check that the control action has been successful. If it is not reverted when it should have been, this is an indication of a possible error which can be checked by use of an interrogation code or, in certain circumstances, by repeating the control code.

The second type of serial output is shown in figure 6.6. This shows the receiver status data reverted in answer to an interrogation control code.

Figure 6.6
Reverted Receiver Status Data In Answer to an Interrogation Code



(N.B. If 'ACK' flag is also 'SET' this is followed by the output shown in figure 6.5).

The seventeen data bytes are reverted (complete with 1 start and 2 stop bits) at 1200 baud with ØmS gap between bytes. The first byte sent is a CHECKSUM byte containing the binary total of the number of 1's in the remaining sixteen actual data bytes. Comparison of the received CHECKSUM and that calculated from the received sixteen bytes can be used in an error checking procedure. (Note start and stop bits are not included in the CHECKSUM). The least significant data bit of each byte is sent first after the start bit. A full description of the contents of the data bytes is given in table 6.7.

Examples of typical control sequencies are given in table 6.6 and a recommended test sequence in table 6.7.

Table 6.4
Complete List of Input Control Codes

Code In Hexadecimal	Action	Notes
1XYY	KNOB UP code. (Equivalant to turning 1650 tuning knob clockwise).	X = CHECKSUM YY = Number of pulses inverted i.e. Ø1 pulse to FE, Ø2 pulses to FD etc.
2XYY	KNOB DOWN code. (Equivalant to turning 1650 tuning knob anti-clockwise).	As above
361E	Mute key	) Keyboard mimic control codes which produce effect equivalant to direct use of 1650 front panel key. (Note: CHECKSUM is fixed for each code).
3519	BFO key	)
34Ø9	Selectivity key ▲	)
33Ø8	Selectivity key ▼	)
34ØA	RF sensitivity key	)
3421	Mode key	)
3627	AGC key	)
371F	Wideband key	) Keyboard mimic control codes which produce effect equivalant to direct use of 1650 front panel key. (Note: CHECKSUM is fixed for each code).
3525	Loudspeaker key	)
35ØB	Recall key	)
331Ø	Channel key	)
3529	Receive key	)
3428	Tune key	)
361B	Store key	)
3422	Start (Scan) key	)
3411	Dwell key	)
3523	Scan key	)
332Ø	Meter key	)
3617	Ø key	)
361D	1 key	)
3516	2 key	)
351C	3 key	)
36ØF	4 key	)
3515	5 key	)
3414	6 key	)
351A	7 key	)
35ØD	8 key	)
3513	9 key	)

Table 6.4 continued....

Code In Hexadecimal	Action	Notes
4XØY	Load Channel ØØ 1Hz digit (5Hz Res.)	Absolute control codes:- Direct load of channel ØØ data.
4X1Y	Load Channel ØØ 10Hz digit	Y = number in binary coded decimal
4X2Y	Load Channel ØØ 100Hz digit	form in range Ø-9 inclusive, unless otherwise stated.
4X3Y	Load Channel ØØ 1kHz digit	X = CHECKSUM
4X4Y	Load Channel ØØ 10kHz digit	Note: Data can be loaded into channel ØØ with any receiver control
4X5Y	Load Channel ØØ 100kHz digit	mode selected.
4X6Y	Load Channel 1MHz digit	
4X7Y	Load channel ØØ 10MHz digit (2 Max.)	Absolute control codes:- Direct load of channel ØØ data.
4X8Y	Load channel ØØ BFO 100Hz digit	Y = number in binary coded decimal
4X9Y	Load channel ØØ BFO 1kHz digit (3 Max.)	form in range Ø-9 inclusive, unless otherwise stated. X = CHECKSUM Note: Data can be loaded into channel ØØ with any receiver control mode selected.
44A1	Select BFO '+' side	Absolute control codes:-
43AØ	Select BFO '-' side	Direct load of ØØ channel data.
44BØ	Select off AGC	
45B1	Select fast AGC	(Note CHECKSUM is fixed for each
45B2	Select slow AGC	code).
46B3	Select audio AGC	
43CØ	Select FSK mode	Also note data can be loaded into
44C1	Select CW mode	channel ØØ with any receiver
44C2	Select SSB mode	control mode selected.
45C3	Select AM mode	
44DØ	Select minimum RF sensitivity	
45D1	Select -20dB RF sensitivity	
45D2	Select -10dB RF sensitivity	
46D3	Select maximum RF sensitivity	
45E1	Select very wide selectivity	
45E2	Select wide selectivity	
46E3	Select USB selectivity	

Table 6.4 continued....

Code In-Hexadecimal	Action	Notes
46E5	Select intermed selectivity	
46E6	Select narrow selectivity	
5412	Select 'Store' mode*	Absolute control codes:-
5414	Select 'Tune' mode	
5418	Select 'Receiver' Mode	(Note CHECKSUM is fixed for
5421	Select 'Channel' mode	each code).
5422	Select 'Recall' mode	
5532	Select 'Start (Scan)' mode	*Also 'Store' is only valid
5534	Select 'Dwell' mode	after 'Channel' mode and will
5538	Select 'Scan' mode	return receiver to 'Channel'
5441	Select RF2 meter display	mode.
5442	Select RF1 meter display	
5444	Select AF meter display	
5448	Select CZ meter display	
5551	Select 'BFO' (display etc. ON	
5450	Select 'BFO' (display etc. OFF	
57AD	Select 'Mute' ON	
56AC	Select 'Mute' OFF	
59F7	Select 'Wideband' ON	
58F6	Select 'Wideband' OFF	
631Ø	Clear 'ACK' flag, Clear 'DI' flag	Remote set-up and interrogation control codes.
6411	Set 'ACK' flag, Clear 'DI' flag	
6412	Clear 'ACK' flag, Set 'DI' flag	Remote set-up and interrogation control codes.
6513	Set 'ACK' flag, Set 'DI' flag	
662E	Revert display channel data	
674F	Revert 'Received' channel data	
68FC	Revert channel number and scan paras.	
69BF	Revert other essential data	
7XML	Select channel number	Direct load of a two digit number.
8XML	Select dwell time (seconds)	X = CHECKSUM
9XML	Select scan start channel	M = Most significant L = Least significant Digit (0-9 in BCD)

Table 6.5
Complete List of Reverted Status Data in Answer To 'Interrogation' Control Codes

In each case, the first byte reverted is the CHECKSUM byte which contains the binary total of the number of '1's in the following 16 data bytes (excluding start and stop bits, but including don't care 'X' bits). D_0 in each byte is sent first after the start bit.

i) Data reverted in answer to control codes $662E (revert status of 'displayed' channel, i.e. that selected by 'Channel' number) and $674F (revert status of channel being received).

Byte Number	Most Significant Nibble	Least Significant Nibble	Data Reverted		
	D_7 D_4	D_3 D_0			
2	X	Y	Y	=	1Hz frequence setting (N.B. 1650 automatically selects Ø to 4 as 'Ø'; 5-9 as '5'.
3	X	Y	Y	=	10Hz frequency setting) Sent
4	X	Y	Y	=	100Hz " ") in
5	X	Y	Y	=	1kHz " ") BCD
6	X	Y	Y	=	10kHz " ") form
7	X	Y	Y	=	100kHz " ")
8	X	Y	Y	=	1MHz " ")
9	X	Y	Y	=	10MHz " ")
10	X	Y	Y	=	BFO, 100Hz" ")
11	X	Y	Y	=	BFO, 1kHz frequency setting) Sent
12	X	XXXY	Y	=	'1' (+BFO) " ") in
			Y	=	Ø (-BFO)) BCD
					) form
13	X	Y	AGC,Y	=	1 (OFF) = 2 (FAST),
				=	4 SLOW = 8 (AUDIO)
14	X	Y	MODE, Y	=	1 (FSK) = 2 (CW)
				=	4 (SSB) = 8 (AM)
15	X	Y	RF sensitivity,		
			Y	=	1 (MIN) = 2 (-20dB)
				=	1 (-10dB) = 8 (MAX)
16	Y	Y	Select-ivity, 'YY'	=	Ø2 (VERY WIDE)
				=	Ø4 (WIDE)
				=	Ø8 (USB)
				=	2Ø (INTER)
				=	4Ø (NARROW)
17	X	X			Not relevant to 1650/7

In all cases, X = Don't care data bits.

Table 6.5 continued...

ii) Data reverted in answer to control code $68FC (channel number, sweep and scan parameters).

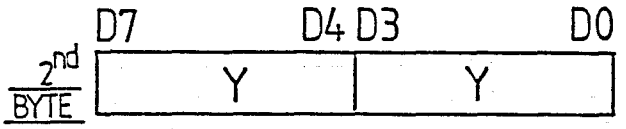
Byte Number	Most Significant Nibble	Least Significant Nibble	Data Reverted	
	D_7 D_4	D_3 D_0		
2	X	L	'Received Channel'	L = least significant
3	X	M		digit
4	X	L	'Displayed	M = most significant
5	X	M	Channel'	digit
6	X	X	Not relevant to	L and M sent in BCD
7	X	X	1650/7	form
8	X	X		
9	X	X		
10	X	X	Not relevant to	
11	X	X	1650/7	
12	X	X	Not relevant to	
13	X	X	1650/7	
14	X	L	Scan start channel	
15	X	M		
16	X	L	Dwell (seconds)	
17	X	M		

In all cases, X = Don't care data bits.

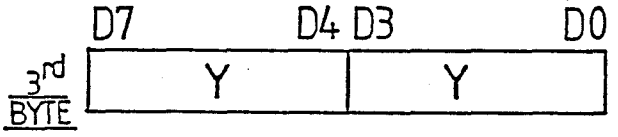
Table 6.5 continued.....

iii) Data reverted from answer to control code $69BF (revert all other essential status data). Only the first six bytes after the checksum contain specified data. The remaining 10 bytes are also sent however, and their contents included in the CHECKSUM bytes as well as any don't care bits or nibbles.

Mode			
	YY =	$Ø2	for 'Store'
	YY =	$Ø4	for 'Tune'
	YY =	$Ø8	for 'Receive'
	YY =	$1Ø	for 'Channel'
	YY =	$2Ø	for 'Recall'



Mode			
	YY =	$Ø2	for 'Start' (scan)
	YY =	$Ø4	for 'Dwell'
	YY =	$Ø8	for 'Scan'



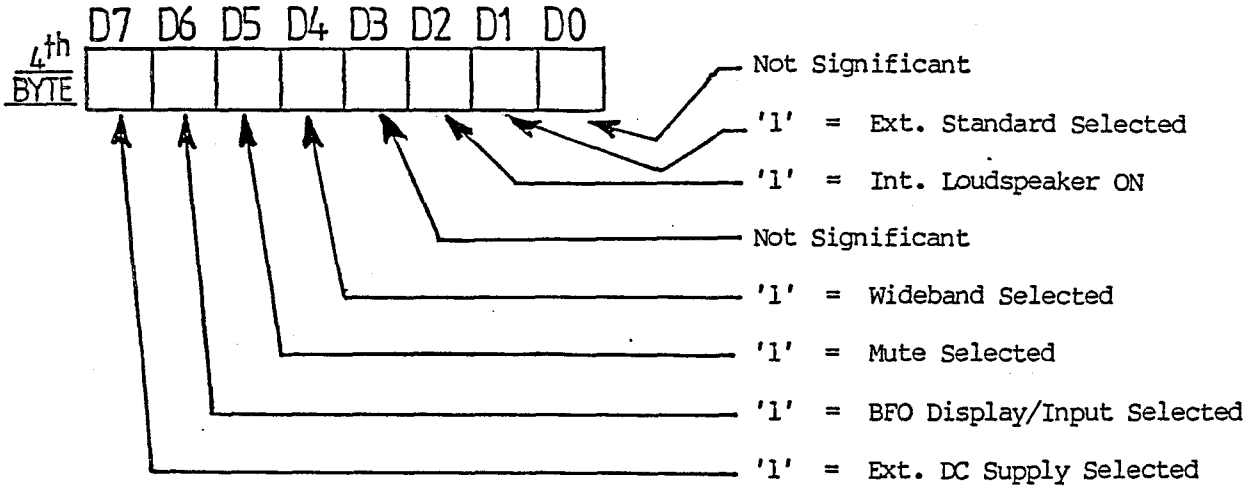
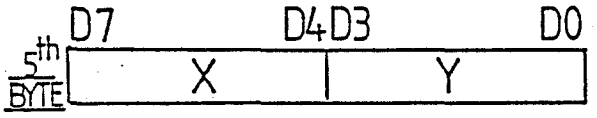
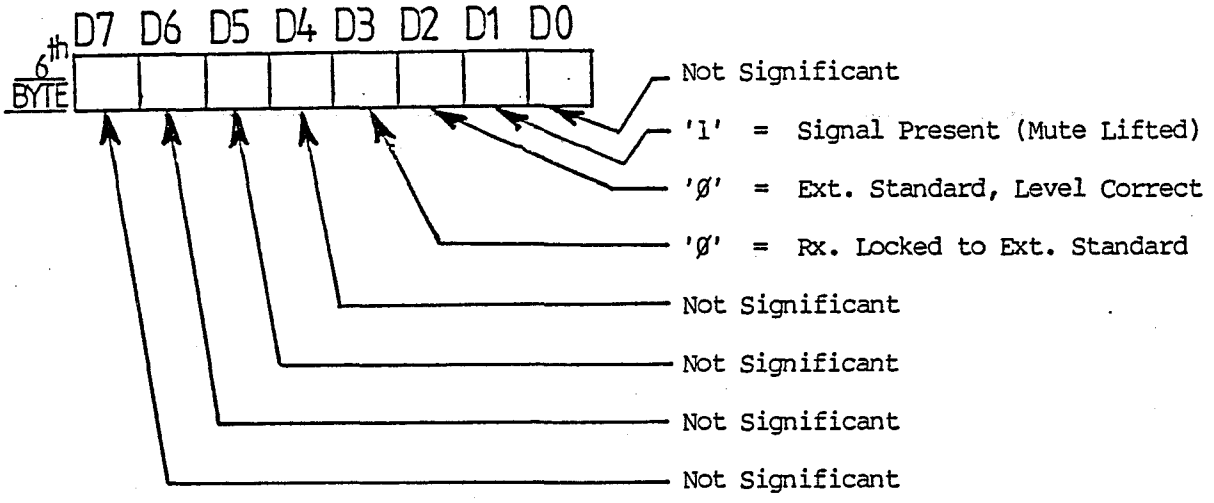


Table 6.5. continued....

Y = $1 for RF2 Meter setting
Y = $2 for RF1 Meter setting
Y = $4 for AF Meter setting
Y = $8 for CZ Meter setting
X = Don't care nibble





YY = $ØØ if display channel number does not equal received channel number.

Else YY = $FF

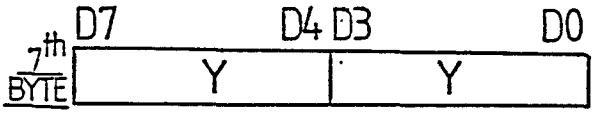


Table 6.6
Simple Examples of Control Sequence

As can be seen a wide range of control facilities is available. However, in any particular system not all of the control codes need be generated or used. For example if simple control of basic receiving functions is required over short distances (i.e. negligible transmission errors), the following control codes can be sent in sequence:-

```
$6310   (Ensures 'ACK' and 'DI' flags cleared)
$5422   (Ensures receiver in 'Recall' mode)
$46D3   (Selects maximum RF sensitivity for example)
$46B3   (Selects Audio AGC for example)
$44C2   (Selects 'SSB' mode for example)
$46E3   (Selects USB selectivity for example)

$4X0Y   )  To SET frequency as required
$4X1Y   )
$4X2Y   )
$4X3Y   )
$4X4Y   )
$4X5Y   )
$4X6Y   )
$4X7Y   )
```

Interrogation of the receiver status can be made by sending $662E or $674F (produce same effect when receiver in 'Recall' mode) or $68FC or $69BF as appropriate.

Another simple example is the checking of the contents of a particular receiver stored channel. This could be done by the sequence:-

```
$631Ø   (Ensure 'ACK' and 'DI' flags cleared)
$5421   (Select 'Channel' receiver mode)
$7581   (Select channel number ('81' for example)
$662E   (Revert data of 'Displayed' channel)
```

If the setting of the receiver given in the first sequence example is to be stored in Channel '92', this can be done by the sequence:-

```
$5421   (Select 'Channel' receiver mode)
$7692   (Select channel number '92')
$5412   (Select 'Store' mode)
```

The receiver mode will automatically return to 'CHANNEL' after the data is stored.

Table 6.7
Complete Remote Control Test Procedure

These checks need only be performed on receivers required for remote operation.

A suitable control code sender and receiver/decoder will be required (contact Eddystone Radio Limited for further information) as well as an AV08 or similar multi-meter with at least 24V DC range and a 0 to +5V at 10mA variable power supply.

a) Analogue Input/Output Check Note in all cases 'Remote' is selected by grounding pin 3 of the 'Remote' socket.

Ensure a voltage corresponding to the meter (front panel) 'deflection' is always present on pin 7 of the remote socket with 'Remote' 'ON' or 'OFF. The voltage (on AV08/10V range) is in the range 1V to 3V for a meter deflection zero to maximum (the exact range is not critical).

When Remote is 'ON', ensure that a control voltage applied to pin 1 of the 'Remote' socket controls the IF gain of the receiver. To do this, with Remote 'off' introduce a convenient input signal, select AGC off and obtain a standard output level using the front panel IF gain control, then select Remote 'on' and ensure the gain or output can be varied about this level using an external DC supply to pin 1 in the range +2V to +4V. Finally switch Remote 'OFF' and ensure this supply now has no effect on the output level. Note that the gain of the receiver varies rapidly with the applied voltage. In a similar way ensure that a control voltage applied to pin 2 of the 'Remote' socket controls the audio line output. A voltage change from +4V down to +1.5/2V should produce about 20dB of attenuation.

Finally, an analogue side check that +15.5V ±5% is present on pin 8. (N.B. Take great care not to short this pin to any other pin at the connector).

b) Serial Data Inputs and Outputs

Connect receiver via 'Remote' connector to control code sender/receiver-decoder. Set receiver to 'Recall'.

1000.000 FREQUENCY
0.0 BFO
MAXIMUM RF SENSITIVITY
AM MODE
SLOW AGC
VERY WIDE
FREQUENCY DISPLAY
WIDEBAND
LS ON
MUTE OFF
ON

Section 7

Spares for 1650

Synthesiser Board Spares — Module Prefix '8'

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	10n	+80% -20%	25V	Disc Ceramic
C2	1u	20%	100V	Polycarbonate
C3	220u	+50% -20%	25V	Electrolytic
C4	220u	+50% -20%	25V	Electrolytic
C5	1nf	+80% -20%	100V	Plate Ceramic
C6	100n	+80% -20%	50V	Multi-Layer Ceramic
C7	100n	+80% -20%	50V	Multi-Layer Ceramic
C8	6n8	1%	160V	Polystyrene
C9	120p	2%	100V	Plate Ceramic
C10	2n7	1%	160V	Polystyrene
C11	22n	20%	400V	P.E.T.P.
C12	100n	+80% -20%	50V	Multi-Layer Ceramic
C13	10u	20%	25V	Tantalum
C14	10u	20%	25V	Tantalum
C15	10n	+80% -20%	25V	Disc Ceramic
C16	10n	+80% -20%	25V	Disc Ceramic
C17	10n	+80% -20%	25V	Disc Ceramic
C18	10u	+50% -20%	50V	Electrolytic
C19	3u3	20%	35V	Tantalum
C20	10n	+80% -20%	25V	Disc Ceramic
C21	1n	10%	100V	Plate Ceramic
C22	1n	10%	100V	Plate Ceramic
C23	3u3	20%	35V	Tantalum
C24	10n	+80% -20%	25V	Disc Ceramic
C25	4p7	0.25p	100V	Plate Ceramic
C26	4p7	0.25p	100V	Plate Ceramic
C27	100n	+80% -20%	50V	Multi-Layer Ceramic
C28	100n	+80% -20%	50V	Multi-Layer Ceramic
C29	1u	+50% -20%	100V	Electrolytic
C30	10u	+50% -20%	50V	Electrolytic
C31	1u	+50% -20%	100V	Electrolytic
C32	3u3	20%	35V	Tantalum
C33	1u	+50% -20%	100V	Electrolytic
C34	100n	+80% -20%	50V	Multi-Layer Ceramic
C35	100n	+80% -20%	50V	Multi-Layer Ceramic
C36	10n	+80% -50%	25V	Disc Ceramic
C37	10u	20%	25V	Tantalum
C38	1000u	+50% -20%	25V	Electrolytic
C39	1u	+50% -20%	100V	Electrolytic
C40	220u	+50% -20%	25V	Electrolytic
C41	10n	+80% -20%	25V	Disc Ceramic
C42	10n	+80% -20%	25V	Disc Ceramic
C43	1000u	+50% -20%	25V	Electrolytic

Synthesiser Board Spares Module Prefix '8' Continued....

Capacitors Continued....

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C44	10n	+80% -20%	25V	Disc Ceramic
C45	330p	2%	100V	Plate Ceramic
C46	56p	2%	100V	Plate Ceramic
C47	10n	+80% -20%	25V	Disc Ceramic
C48	10n	+80% -20%	25V	Disc Ceramic
C49	100n	+80% -20%	50V	Multi-Layer Ceramic
C50	220u	+50% -20%	25V	Electrolytic
C51	10u	+50% -20%	50V	Electrolytic
C52	10n	+80% -20%	25V	Disc Ceramic
C53	220u	+50% -20%	25V	Electrolytic
C54	10n	+80% -20%	25V	Disc Ceramic
C55	10n	+80% -20%	25V	Disc Ceramic
C56	680p	1%	160V	Polystyrene
C57	10n	+80% -20%	25V	Disc Ceramic
C58	220u	+50% -20%	25V	Electrolytic
C59	100n	+80% -20%	50V	Multi-Layer Ceramic
C60	10n	+80% -20%	25V	Disc Ceramic
C61	1u	+50% -20%	100V	Electrolytic
C62	10u	+50% -20%	50V	Electrolytic
C63	100n	+80% -20%	50V	Multi-Layer Ceramic
C64	100n	+80% -20%	50V	Multi-Layer Ceramic
C65	10u	+50% -20%	50V	Electrolytic
C66	10n	+80% -20%	25V	Disc Ceramic
C67	100n	+80% -20%	50V	Multi-Layer Ceramic
C68	10u	+50% -20%	50V	Electrolytic
C69	10p	2%	100V	Plate Ceramic
C70	10n	+80% -20%	25V	Disc Ceramic
C71	56p	2%	100V	Plate Ceramic
C72	100p	2%	100V	Plate Ceramic
C73	2-30 pf	-	250V	Film Dielectric Trimmer
C74	10n	+80% -20%	25V	Disc Ceramic
C75	1n	10%	100V	Plate Ceramic
C76	1n	10%	100V	Plate Ceramic
C77	10u	+50% -20%	50V	Electrolytic
C78	10n	+80% -20%	25V	Disc Ceramic
C79	10u	+50% -20%	50V	Electrolytic
C80	10n	+80% -20%	25V	Disc Ceramic
C81	100n	20%	100V	P.E.T.P.
C82	100n	+80% -20%	50V	Multi-Layer Ceramic
C83	10n	+80% -20%	25V	Disc Ceramic
C84	10n	+80% -20%	25V	Disc Ceramic
C85	2-30 pf	-	250V	Film Dielectric Trimmer
C86	100p	2%	100V	Plate Ceramic
C87	100p	2%	100V	Plate Ceramic

Synthesiser Board Spares Module Prefix '8' Continued....

Capacitors Continued....

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C88	1n	10%	100V	Plate Ceramic
C89	10n	+80% -20%	25V	Disc Ceramic
C90	1n	10%	100V	Plate Ceramic
C91	100p	2%	100V	Plate Ceramic
C92	10p	2%	100V	Plate Ceramic
C93	100u	+50% -20%	25V	Electrolytic
C94	1n	10%	100V	Plate Ceramic
C95	2-30 pf	-	250V	Film Dielectric Trimmer
C96	10n	+80% -20%	25V	Disc Ceramic
C97	47p	2%	100V	Plate Ceramic
C98	150p	2%	100V	Plate Ceramic
C99	10n	+80% -20%	25V	Disc Ceramic
C100	2-30 pf	-	250V	Film Dielectric Trimmer
C101	100n	20%	100V	P.E.T.P.
C102	22n	20%	400V	P.E.T.P.
C103	220u	+50% -20%	25V	Electrolytic
C104	220u	+50% -20%	25V	Electrolutic
C105	220n	20%	100V	P.E.T.P.
C106	100u	+50% -20%	25V	Electrolytic
C107	10n	+80% -20%	25V	Disc Ceramic
C108	10n	+80% -20%	25V	Disc Ceramic
C109	10u	+50% -20%	50V	Electrolytic
C110	10n	20%	400V	P.E.T.P.
C111	10u	+50% -20%	50V	Electolytic
C112	10u	+50% -20%	50V	Electrolytic
C113	1n	10%	100V	Plate Ceramic
C114	220p	2%	100V	Plate Ceramic
C115	10n	+80% - 20%	25V	Disc Ceramic
C116	10n	+80% - 20%	25V	Disc Ceramic
C117	10u	+50% -20%	50V	Electrolytic
C118	10n	+80% -20%	25V	Disc Ceramic
C119	10u	+50% -20%	50V	Electrolytic
C120	10n	+80% -20%	25V	Disc Ceramic

Synthesiser Board Spares Module Prefix '8' Continued....

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	3k3			
R2	6k8			
R3	4k7			
R4	100R			
R5	150k			
R6	8k2			
R7	4k7			
R8	1M			
R9	68k			
R10	10k			
R11	100R			
R12	220R			
R13	68k			
R14	1k			
R15	1k			
R16	820R			
R17	560R			
R18	1k			
R19	1k			
R20	8x10k	±5%	1.1W Total	DIL Resistor Pack
R21	8x10k	±5%	1.1W Total	DIL Resistor Pack
R22	4k7			
R23	390R			
R24	100k			
R25	4k7			
R26	10k			
R27	10k			
R28	100R			
R29	100k			
R30	220R			
R31	4k7			
R32	10k			
R33	10k			
R34	220R			
R35	220R			
R36	10k			
R37	1k			
R38	1M			
R39	39k			
R40	10k			
R41	10k			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Synthesiser Board Spares Module Prefix '8' Continued....

Resistors Continued....

Circuit Ref.	Value	Tolerance	Power Rating	Type
R42	100R			
R43	220R			
R44	47k			
R45	10k			
R46	270R			
R47	220R			
R48	560R			
R49	560R			
R50	390R			
R51	10k			
R52	10k			
R53	100k			
R54	10k			
R55	100R			
R56	270R			
R57	100R			
R58	27k			
R59	4k7			
R60	56k			
R61	3k3			
R62	4k7			
R63	4k7			
R64	12k			
R65	56R			
R66	10k			
R67	10k			
R68	56k			
R69	1M			
R70	10k			
R71	10k			
R72	220R			
R73	100k			
R74	220R			
R75	27k			
R76	1M			
R77	10k			
R78	4k7			
R79	220R			
R80	100R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Synthesiser Board Spares Module Prefix '8' Continued....

Variable Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
RV1	2k2	20%	0.5W	Cermet Preset
RV2	1k	20%	0.5W	Multi-Turn
RV3	1k	20%	0.5W	Cermet Preset
RV4	100R	20%	0.5W	Cermet Preset
RV5	220R	20%	0.5W	Cermet Preset

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC78L05CP	Motorola	Voltage Regulator
IC2	SP8690B	Plessey	Prescaler Divide x 10/11
IC3	LF356N	National	FET OP Amp (Low Noise)
IC4	HEF4750	Mullard	Frequency Synthesiser
IC5	HEF4751	Mullard	Universal Divider
IC6	MC7812CT	Motorola	Voltage Regulator
IC7	MC14011BCP	Motorola	Quad 2 Input Nand Gate
IC8	MC14504BCP	Motorola	Hex. Level Shifter
IC9	MC78L05CP	Motorola	Voltage Regulator
IC10	MC14091BCP	Motorola	Quad 2 Input Nand Gate
IC11	MC14504BCP	Motorola	Hex. Level Shifter
IC12	MC7805CT	Motorola	Voltage Regulator
IC13	MC78L12CP	Motorola	Voltage Regulator
IC14	MC78L12CP	Motorola	Voltage Regulator
IC15	SN74LS04N	Texas	Hex. Inverter
IC16	MC14011BCP	Motorola	Quad 2 Input Nand Gate
IC17	MC14013BCP	Motorola	Dual 'D' Flip Flop
IC18	MC14569BCP	Motorola	Dual Counter
IC19	MC14011BCP	Motorola	Quad 2 Input Nand Gate
IC20	MC14013BCP	Motorola	Dual 'D' Flip Flop
IC21	MC14568BCP	Motorola	Counter/Phase Detector
IC22	MC14526BCP	Motorola	Programmable 4 Bit Down Counter
IC23	MC14569BCP	Motorola	Dual Counter

Synthesiser Board Spares Module Prefix '8' Continued....

Integrated Circuits Continued....

Circuit Ref.	Type	Manufacturer	Description
IC24	MC14094BCP	Motorola	8 Bit Shift Store Latch
IC25	CA3240E	RCA	MOSFET Dual OP Amp.
IC26	SL1641C	Plessey	Mixer
IC27	MC14046BCP	Motorola	Phase Lock Loop Monostable
IC28	MC14001BCP	Motorola	Quad 2 Input Nor Gate
IC29	MC14001BCP	Motorola	Quad 2 Input Nor Gate
IC30	MC14001BCP	Motorola	Quad 2 Input Nor Gate
IC31	MC14526BCP	Motorola	Programmable 4 Bit Down Counter
IC32	MC14569BCP	Motorola	Dual Counter
IC33	MC14094BCP	Motorola	8 Bit Shift Store Latch
IC34	MC14094BCP	Motorola	8 Bit Shift Store Latch

Chokes

Circuit Ref.	Value	Tolerance	Manufacturer	Type
CH1	10uH	20%	Sigma	Miniature RF Choke
CH2	4.5mH	-	Eddystone	D5116
CH3	33uH	20%	Sigma	Miniature RF Choke
CH4	10uH	20%	Sigma	Miniature RF Choke
CH5	100nH	20%	Sigma	Miniature RF Choke
CH6	10uH	20%	Sigma	Miniature RF Choke
CH7	10uH	20%	Sigma	Miniature RF Choke
CH8	100nH	20%	Sigma	Miniature RF Choke
CH9	100nH	20%	Sigma	Miniature RF Choke
CH10	10uH	20%	Sigma	Miniature RF Choke

Inductors

Circuit Ref	Type	Manufacturer	Number
L1	BFO Coil	Eddystone	D5725

Miscellaneous

Osc.1	5.6MHz Crystal Oscillator	Cathodeon	11314P
Xtl.1	14935kHz Crystal 30pf Parallel	Resonance	11469P
Printed Circuit Board			11113P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Ceramic
C2	100n	+80% -20%	50V	Multi-Layer Ceramic
C3	100n	+80% -20%	50V	Multi-Layer Ceramic
C4	100n	+80% -20%	50V	Multi-Layer Ceramic
C5	100n	+80% -20%	50V	Multi-Layer Ceramic
C6	100n	+80% -20%	50V	Multi-Layer Ceramic
C7	100n	+80% -20%	50V	Multi-Layer Ceramic
C8	100n	+80% -20%	50V	Multi-Layer Ceramic
C9	100n	+80% -20%	50V	Multi-Layer Ceramic
C10	100n	+80% -20%	50V	Multi-Layer Ceramic
C11	100n	+80% -20%	50V	Multi-Layer Ceramic
C12	100n	+80% -20%	50V	Multi-Layer Ceramic
C13	10u	+50% -20%	50V	Electrolytic
C14	10u	+50% -20%	50V	Electrolytic
C15	10U	+50% -20%	50V	Electrolytic
C16	10u	+50% -20%	50V	Electrolytic
C17	220u	+50% -20%	25V	Electrolytic
C18	100n	+80% -20%	50V	Multi-Layer Ceramic
C19	100n	+80% -20%	50V	Multi-Layer Ceramic
C20	100n	+80% -20%	50V	Multi-Layer Ceramic
C21	220n	20%	100V	P.E.T.P.
C22	100n	+80% -20%	50V	Multi-Layer Ceramic
C23	100n	+80% -20%	50V	Multi-Layer Ceramic
C24	100n	+80% -20%	50V	Multi-Layer Ceramic
C25	220u	+50% -20%	25V	Electrolytic
C26	220n	20%	100V	P.E.T.P.
C26A	1n	10%	100V	Plate Ceramic
C27	10u	20%	25V	Tantalum
C28	100n	+80% -20%	50V	Multi-Layer Ceramic
C29	100n	+80% -20%	50V	Multi-Layer Ceramic
C30	100n	+80% -20%	50V	Multi-Layer Ceramic
C31	10u	20%	25V	Tantalum
C32	100n	+80% -20%	50V	Multi-Layer Ceramic
C33	100n	+80% -20%	50V	Multi-Layer Ceramic
C34	10u	20%	25V	Tantalum
C35	56p	2%	100V	Plate Ceramic
C36	56p	2%	100V	Plate Ceramic
C37	56p	2%	100V	Plate Ceramic
C38	56p	2%	100V	Plate Ceramic
C39	27p	2%	100V	Plate Ceramic
C40	100n	+80% -20%	50V	Multi-Layer Ceramic
C41	10u	20%	25V	Tantalum
C42	100n	+80% -20%	50V	Multi-Layer Ceramic
C43	100n	+80% -20%	50V	Multi-Layer Ceramic
C44	100n	+80% -20%	50V	Multi-Layer Ceramic

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C45	10u	20%	25V	Tantalum
C46	100n	+80% -20%	50V	Multi-Layer Ceramic
C47	100n	+80% -20%	50V	Multi-Layer Ceramic
C48	10u	20%	25V	Tantalum
C49	100n	+80% -20%	50V	Multi-Layer Ceramic
C50	1n	10%	100V	Plate Ceramic
C51	15p	2%	100V	Plate Ceramic
C52	100n	+80% -20%	50V	Multi-Layer Ceramic
C53	100n	+80% -20%	50V	Multi-Layer Ceramic
C54	10u	20%	25V	Tantalum
C55	27p	2%	100V	Plate Ceramic
C55A	27p	2%	100V	Plate Ceramic
C56	1n	10%	100V	Plate Ceramic
C57	1n	10%	100V	Plate Ceramic
C58	10n	+80% -20%	25V	Disc Ceramic
C59	1n	10%	100V	Plate Ceramic
C60	100n	+80% -20%	50V	Multi-Layer Ceramic
C61	1n	10%	100V	Plate Ceramic
C62	10n	+80% -20%	25V	Disc Ceramic
C63	10n	+80% -20%	25V	Disc Ceramic
C64	100n	+80% -20%	50V	Multi-Layer Ceramic
C65	10n	+80% -20%	25V	Disc Ceramic
C66	10n	+80% -20%	25V	Disc Ceramic
C67	1n	10%	100V	Plate Ceramic
C68	1n	10%	100V	Plate Ceramic
C69	10n	20%	25V	Tantalum
C70	27p	2%	100V	Plate Ceramic
C71	1n	10%	100V	Plate Ceramic
C72	10p	2%	100V	Plate Ceramic
C73	100n	+80% -20%	50V	Multi-Layer Ceramic
C74	10u	20%	25V	Tantalum
C75	100n	+80% -20%	50V	Multi-Layer Ceramic
C76	1n	10%	100V	Plate Ceramic
C77	100n	+80% -20%	50V	Multi-Layer Ceramic
C78	10u	20%	25V	Tantalum
C79	100n	+80% -20%	50V	Multi-Layer Ceramic
C80	100n	+80% -20%	50V	Multi-Layer Ceramic
C81	10u	20%	25V	Tantalulm
C82	100n	+80% -20%	50V	Multi-Layer Ceramic
C83	27p	2%	100V	Plate Ceramic
C84	2n2	1%	160V	Polystyrene
C85	1n	10%	100V	Plate Ceramic
C86	100n	+80% -20%	50V	Multi-Layer Ceramic
C87	10u	+50% -20%	50V	Electrolytic
C88	100n	+80% -20%	50V	Multi-Layer Ceramic
C89	10u	+50% -20%	50V	Electrolytic
C90	220u	+50% -20%	25V	Electrolytic
C91	470u	+50% -20%	10V	Electrolytic
C92	10u	+50% -20%	50V	Electrolytic
C93	10u	+50% -20%	50V	Electrolytic
C94	220u	+50% -20%	25V	Electrolytic
C95	10u	+50% -20%	50V	Electrolytic

RF/1st IF Board Assembly Module Prefix '7' Continued....

Resistors

Circuit Ref.	Value	Circuit Ref.	Value
R1	82k	R37	82R
R2	150R	R38	82R
R3	150R	R39	82R
R4	27R	R40	82R
R5	33R	R41	1k5
R6	27R	R42	1k
R7	150R	R43	39R
R8	27R	R44	270R
R9	33R	R45	15R
R10	27R	R46	270R
R11	150R	R47	27R
R12	150R	R48	39R
R12A	330R		
R13	100R	R49	10R
R14	100R	R50	10R
R15	220R	R51	10R
R16	1k8	R52	56R
R17	68R	R53	2k2
R17A	18R		
R18	150R	R54	10k
R19	10R	R55	10k
R20	1k8	R56	2k2
R21	220R	R57	2k2
R22	220R	R58	10k
R23	1k	R59	10k
R24	270R	R60	1k
R25	270R	R61	680R
R26	68R	R62	2k2
R27	68R	R63	2k2
R28	68R	R64	33k
R29	68R	R65	2k2
R30	39R	R66	5k6
R31	10R	R67	120R
R32	270R	R68	3k3
R33	10R	R69	2k2
R34	100R	R70	120R
R35	39R	R71	120R
R36	82R		

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Variable Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
RV1	47R	20%	0.5W	Cermet Preset
RV2	47R	20%	0.5W	Cermet Preset
RV3	470R	20%	0.5W	Cermet Preset

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC14504BCP	Motorola	Hex Level Shifter
IC2	MC1741CP	Motorola	Op Amp.
IC3	SL6440C	Plessey	High Level Mixer
IC4	CA3240E	RCA	Dual Mos. Op Amp.
IC5	CA3240E	RCA	Dual Mos. Op Amp.
IC6	SL6440C	Plessey	High Level Mixer

Diodes

Circuit Ref	Type	Manufacturer	Description
D1	BAV10	Mullard	HS Switching
D2	BAV10	Mullard	HS Switching
D3	BAV10	Mullard	HS Switching
D4	BAV10	Mullard	HS Switching
D5	BAV10	Mullard	HS Switching
D6	BAV10	Mullard	HS Switching
D7	BAV10	Mullard	HS Switching
D8	BAV10	Mullard	HS Switching
D9	BAX13	Mullard	HS Switching
D10	BAX13	Mullard	HS Switching
D11	BAX13	Mullard	HS Switching
D12	BAX13	Mullard	HS Switching
D13	BZX79C3V9	Mullard	Zener Diode

Diodes Continued...

Circuit Ref.	Type	Manufacturer	Description
D14	BAX13	Mullard	HS Switching
D15	BZX91	Mullard	Ref. Diode
D16	OA47	Mullard	Germanium Gold Bonded
D17	HP5082-3081	Hewlett Packard	P.I.N. Diode
D18	HP5082-3081	Hewlett Packard	P.I.N. Diode
D19	HP5082-3081	Hewlett Packard	P.I.N. Diode
D20	HP5082-3081	Hewlett Packard	P.I.N. Diode

Chokes

Circuit Ref.	Value	Circuit Ref.	Value
CH1	3uH3	CH8	3uH3
CH2	220nH	CH9	3uH3
CH3	220nH	CH10	3uH3
CH4	3uH3	CH11	3uH3
CH5	3uH3	CH12	3uH3
CH6	3uH3	CH13	3uH3
CH7	330nH	CH14	3uH3
		CH15	3uH3

All Chokes ±20% Miniature RF Chokes

Inductors

Circuit Ref.	Type	Manufacturer	Number
L1	2nd Mix Input	Eddystone	D5703
L2	2nd Mix Output	Eddystone	D5704

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BC547B	Mullard	NPN GP Amp.
TR2	BC547B	Mullard	NPN GP Amp.
TR3	BC547B	Mullard	NPN GP Amp.
TR4	BC547B	Mullard	NPN GP Amp.
TR5	BFW30	Mullard	NPN RF Amp.
TR6	BFW30	Mullard	NPN RF Amp.
TR7	BC560B	Mullard	PNP GP Amp.
TR8	BC560B	Mullard	PNP GP Amp.
TR9	BC560B	Mullard	PNP GP Amp.
TR10	BC547B	Mullard	NPN GP. Amp.
TR11	BC547B	Mullard	NPN GP Amp.
TR12	BFX89	Mullard	NPN RF Amp.
TR13	BC560B	Mullard	PNP GP.Amp.

Transformers

Circuit Ref.	Description	Manufacturer	Number
T1	RF Amp. Inp. Splitter	Eddystone	D5722
T2	RF Amp. Output Balun	Eddystone	D5723
T3	RF Amp. Output Balun	Eddystone	D5723

Miscellaneous

RLA	SP/CO Reed Relay	11946P
RLB	SP/CO Reed Relay	11946P
RLC	SP/CO Reed Relay	11946P
RLD	SP/CO Reed Relay	11946P
RLE	SP/CO Reed Relay	11946P
RLF	SP/CO Reed Relay	11946P
FL1	46.205MHz BP Filter	11421P
Printed Circuit Board		11112P

Display Board Spares

Module Prefix '11'

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Ceramic
C2	100n	+80% -20%	50V	Multi-Layer Ceramic
C3	100n	+80% -20%	50V	Multi-Layer Ceramic
C4	100n	+80% -20%	50V	Multi-Layer Ceramic
C5	22u	+50% -20%	35V	Electrolytic
C6	1n	10%	100V	Disc Ceramic
C7	22u	+50% -20%	35V	Electroytic
C8A	1n	10%	100V	Disc Ceramic
C8B	10n	+80% -20%	25V	Disc Ceramic
C9	1n	10%	100V	Disc Ceramic
C10	22u	+50% -20%	35V	Electrolytic
C11	1n	10%	100V	Plate Ceramic
C12	1n	10%	100V	Plate Ceramic
C13	1n	10%	100V	Plate Ceramic
C14	1n	10%	100V	Plate Ceramic
C15	1n	10%	100V	Plate Ceramic
C16	100u	+50% -20%	10V	Electrolytic
C17	10u	+50% -20%	50V	Electrolytic
C18	100u	+50% -20%	25V	Electrolytic
C19	47u	+50% -20%	25V	Electrolytic
C20	100u	+50% -20%	25V	Electrolytic
C21	100n	+80% -20%	50V	Multi-Layer Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	820R			
R2	33k			
R3	2R7			
R4	820R			
R5	33k			
R6	2R7			
R7	10k			
R8	1k5			
R9	10k			
R10	10k			
R11	3k9			
R12	5k6			
R13	3k9			
R14	22k			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Resistors Continued...

Circuit Ref.	Value	Tolerance	Power Rating	Type
R15	1k2			
R16	10k			
R17	22k			
R18	22k			
R19	10k			
R20	10k			
R21	100k			
R22	100k			
R23	10k			
R24	10k			
R25	10k			
R26	330R			
R27	22R			
R28	560R			
R29	8x47k	±5%	1.2W Total	DIL Resistor Pack
R30	270R			
R31	820R			
R32	33k			
R33	2R7			
R34	820R			
R35	33k			
R36	2R7			
R37	470R			
R38	39R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Variable Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
RV1	10k	20%	0.5W	Panel Variable
RV2	10k	20%	0.5W	Preset Carbon
RV3	10k	20%	0.5W	Panel Variable
RV4	5k	20%	0.5W	Panel Variable

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC14583	Motorola	Dual Schmitt Trigger
IC2	MC14077	Motorola	Quad Exclusive NOR GAte
IC3	MC14506	Motorola	Dual Exp. AND-OR-INV Gate
IC4	MM5450	National Semi	34 Segment LED Driver
IC5	MM5450	National Semi	34 Segment LED Driver
IC6	MM5450	National Semi	34 Segment LED Driver
IC7	MM5450	National Semi	34 Segment LED Driver
IC8	CA3240E	RCA	Dual Mos. OP Amp.
IC9	CA3240E	RCA	Dual Mos. Op Amp.
IC10	CA3240E	RCA	Dual Mos. OP Amp.
IC11	CA3046	RCA	NPN GP Array

Displays

Circuit Ref.	Type	Manufacturer	Description
DS1	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS2	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS3	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS4	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS5	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS5	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS6	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS7	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS8	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS9	CS-318H	China Semi-Cond.	Red 7 Segment Display
DS10	CS-318H	China Semi-Cond.	Red 7 Segment Display

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	BAX13	Mullard	HS Switching
D3	BAX13	Mullard	HS Switching
D4	BAX13	Mullard	HS Switching
D5	BAX13	Mullard	HS Switching
D6	5082-2800	Hewlett Packard	Hot Carrier Diode
D7	1N4004	Mullard	Rectifier Diode
D8	1N4004	Mullard	Rectifier Diode

LED's

Circuit Ref.	Type	Manufacturer	Description
LD1			Not Allocated
LD2	SBR5501	ITT	LED (Clear Red)
LD3	SBR5501	ITT	LED (Clear Red)
LD4	SBR5501	ITT	LED (Clear Red)
LD5	SBR5501	ITT	LED (Clear Red)
LD6	SBR5501	ITT	LED (Clear Red)
LD7	SBR5501	ITT	LED (Clear Red)
LD8	SBR5501	ITT	LED (Clear Red)
LD9	SBR5501	ITT	LED (Clear Red)
LD10	SBR5501	ITT	LED (Clear Red)
LD11	SBR5501	ITT	LED (Clear Red)
LD12	SBR5501	ITT	LED (Clear Red)
LD13	V512PB	AEG	LED (Green)
LD14	V512PB	AEG	LED (Green)
LD15	V512PB	AEG	LED (Green)
LD16	V512PB	AEG	LED (Green)
LD17	V511PB	AEG	LED (Amber)
LD18	V511PB	AEG	LED (Amber)
LD19	V511PB	AEG	LED (Amber)
LD20	V511PB	AEG	LED (Amber)
LD21	V511PB	AEG	LED (Amber)
LD22	V511PB	AEG	LED (Amber)
LD23	V511PB	AEG	LED (Amber)
LD24	V511PB	AEG	LED (Amber)
LD25	V511PB	AEG	LED (Amber)
LD26	V511PB	AEG	LED (Amber)
LD27	V511PB	AEG	LED (Amber)
LD28	V511PB	AEG	LED (Amber)
LD29	V513PB	AEG	LED (Yellow)

LED's Continued....

Circuit Ref.	Type	Manufacturer	Description
LD30	V511PB	AEG	LED (Amber)
LD31	V511PB	AEG	LED (Amber)
LD32	V511PB	AEG	LED (Amber)
LD33	V511PB	AEG	LED (Amber)
LD34	V511PB	AEG	LED (Amber)
LD35	V511PB	AEG	LED (Amber)
LD36	V511PB	AEG	LED (Amber)
LD37	SBG5501	ITT	LED (Clear Green)
LD38	SBG5501	ITT	LED (Clear Green)
LD39	SBG5501	ITT	LED (Clear Green)
LD40	SBG5501	ITT	LED (Clear Green)
LD41	SGB5501	ITT	LED (Clear Green)
LD42	SBG5501	ITT	LED (Clear Green)
LD43	SBG5501	ITT	LED (Clear Green)
LD44			Not Allocated
LD45	VP512PB	AEG	LED (Green)
LD46	VP512PB	AEG	LED (Green)
LD47	VP512PB	AEG	LED (Green)
LD48	VP512PB	AEG	LED (Green)
LD49	VP512PB	AEG	LED (Green)
LD50	VP512PB	AEG	LED (Green)
LD51	VP512PB	AEG	LED (Green)
LD52	VP512PB	AEG	LED (Green)
LD53	VP512PB	AEG	LED (Green)
LD54	VP512PB	AEG	LED (Green)
LD55	VP513PB	AEG	LED (Yellow)

Miscellaneous

PZ1	Piezosounder	11428P
LS1	8 ohm LS Unit	8657P
RLA1	DIL Relay SP ON/OFF	11944P
Printed Circuit Board		11126P

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	1p2-10p			Trimmer
C2	1p2-10p			Trimmer
C3	1p2-10p			Trimmer
C4	1p2-10p			Trimmer
C5	2-30p	-	250V	Film Dielectric Trimmer
C6	2-30p	-	250V	Film Dielectric Trimmer
C7	220u	+50% -20%	25V	Electrolytic
C8	220u	+50% -20%	10V	Electrolytic
C9	22u	+50% -20%	35V	Electrolytic
C10	10u	20%	25V	Tantalum
C11	10u	20%	25V	Tantalum
C12	10u	20%	25V	Tantalum
C13	10n	+80% -20%	25V	Disc Ceramic
C14	10n	+80% -20%	25V	Disc Ceramic
C15	10n	+80% -20%	25V	Disc Ceramic
C16	10n	+80% -20%	25V	Disc Ceramic
C17	10n	+80% -20%	25V	Disc Ceramic
C18	10n	+80% -20%	25V	Disc Ceramic
C19	10n	+80% -20%	25V	Disc Ceramic
C20	10n	+80% -20%	25V	Disc Ceramic
C21	10n	+80% -20%	25V	Disc Ceramic
C22	10n	+80% -20%	25V	Disc Ceramic
C23	10n	+80% -20%	25V	Disc Ceramic
C24	10n	+80% -20%	25V	Disc Ceramic
C25	1n	10%	100V	Plate Ceramic
C26	1n	10%	100V	Plate Ceramic
C27	1n	10%	100V	Plate Ceramic
C28	1n	10%	100V	Plate Ceramic
C29	1n	10%	100V	Plate Ceramic
C30	1n	10%	100V	Plate Ceramic
C31	1n	10%	100V	Plate Ceramic
C32	330p	2%	100V	Plate Ceramic
C33	330p	2%	100V	Plate Ceramic
C34	330p	2%	100V	Plate Ceramic
C35	68p	2%	100V	Plate Ceramic
C36	68p	2%	100V	Plate Ceramic
C37	12p	2%	100V	Plate Ceramic
C38	4p7	0.25p	100V	Plate Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating.	Type
R1	22k			
R2	6k8			
R3	6k8			
R4	6k8			
R5	6k8			
R6	6k8			
R7	3k9			
R8	3k9			
R9	3k9			
R10	3k9			
R11	3k3			
R12	220R			
R13	220R			
R14	150R			
R15	100R			
R16	82R			
R17	82R			
R18	47R			
R19	47R			
R20	47R			
R21	220R			
R22	4x270R	±5%	0.8W Total	DIL Resistor Pack
R23	2k2			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Inductors

Circuit Ref.	Type	Manufacturer	Number
L1	VCO Coil	Eddystone	D5705

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	40673	RCA	Dual Gate Mosfet
TR2	40673	RCA	Dual Gate Mosfet
TR3	40673	RCA	Dual Gate Mosfet
TR4	BC547B	Mullard	NPN GP Amp.
TR5	BC547B	Mullard	NPN GP Amp.
TR6	BC547B	Mullard	NPN GP Amp.
TR7	BC547B	Mullard	NPN GP Amp.

Chokes

Circuit Ref.	Value	Tolerance	Manufacturer	Description
CH1	10uH	20%	Sigma	Miniature RF Choke
CH2	10uH	20%	Sigma	Miniature RF Choke
CH3	10uH	20%	Sigma	Miniature RF Choke
CH4	10uH	20%	Sigma	Miniature RF Choke
CH5	100nH	20%	Sigma	Miniature RF Choke
CH6	100nH	20%	Sigma	Miniature RF Choke
CH7	470nH	20%	Sigma	Miniature RF Choke

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	MV209	Motorola	Varicap Diode
D2	MV209	Motorola	Varicap Diode
D3	MV209	Motorola	Varicap Diode
D4	MV209	Motorola	Varicap Diode

Miscellaneous

RLA	12V Reed Relay SPCO (RH12)	8445P
RLB	12V Reed Relay SPCO (RH12)	8445P
RLC	12V Reed Relay SPCO (RH12)	8445P
RLD	12V Reed Relay SPCO (RH12)	8445P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	10-365p	-	-	2 Gang Capacitor (C27)
C2	220n	+80% -20%	50V	Multi-Layer Ceramic
C3	100n	+80% -20%	50V	Multi-Layer Ceramic
C4	3u3	20%	35V	Tantalum
C5	33n	20%	400V	Polyester
C6	2n7	1%	160V	Polystyrene
C7	47n	20%	250V	Polyester
C8	6n8	1%	160V	Polystyrene
C9	33n	20%	400V	Polyester
C10	3u3	20%	35V	Tantalum
C11	100n	+80% -20%	50V	Multi-Layer Ceramic
C12	100u	+50% -20%	25V	Electrolytic
C13	1u	+50% -20%	100V	Electrolytic
C14	1u	+50% -20%	100V	Electrolytic
C15	1u	+50% -20%	100V	Electrolytic
C16	10u	+50% -20%	50V	Electrolytic
C17	1u	+50% -20%	100V	Electrolytic
C18	2u2	+50% -20%	100V	Electrolytic
C19	220n	20%	100V	Polyester
C20	100u	+50% -20%	10V	Electrolytic
C21	100n	20%	100V	Polyester
C22	100n	1%	100V	Polycarbonate to be selected by Eddystone
C23	100n	20%	100V	Polyester
C24	1u	+50% -20%	100V	Electrolytic
C25	100n	+80% -20%	50V	Multi-Layer Ceramic
C26	100n	+80% -20%	50V	Multi-Layer Ceramic
C27	10-365p	-	-	2 Gang Capacitor (C1)
C28	1u	+50% -20%	100V	Electrolytic
C29	1u	+50% -20%	100V	Electrolytic
C30	1u	+50% -20%	100V	Electrolytic
C31	1u	+50% -20%	100V	Electrolytic
C32	100u	+50% -20%	25V	Electrolytic
C33	100u	+50% -20%	25V	Electrolytic
C34	220n	+80% -20%	50V	Multi-Layer Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	4x270R	5%	0.8W Total	DIL Resistor Pack
R2	4x270R	5%	0.8W Total	DIL Resistor Pack
R3	150R	5%	0.5W	Standard Film
R4	39R			
R5	3k3			
R6	680R			
R7	1k			
R8	100R			
R9	150R	5%	0.5W	Standard Film
R10	39R			
R11	3k3			
R12	680R			
R13	4x270R	5%	0.8W Total	DIL Resistor Pack
R14	22R			
R15	560k			
R16	240R	2%	0.33W	Metal Oxide
R17	18k	2%	0.33W	Metal Oxide
R18	1k			
R19				* AOT
R20	39R			
R21	75k	2%	0.33W	Metal Oxide
R22	47k			
R23	4x10k	5%	0.8W Total	DIL Resistor Pack
R24	4x270R	5%	0.8W Total	DIL Resistor Pack
R25	22R			
R26	820R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

*Adjust On Test.

Variable Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
RV1	5k	±20% (Linearity ±.5%)	-	Servo Pot.

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC7805CT	Motorola	Voltage Regulator
IC2	NE544N	Mullard	Servo Amp.
IC3	MC14028	Motorola	BCD To DEC Decoder
IC4	MC14504B	Motorola	Hex Level Shifter

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	BAX13	Mullard	HS Switching

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BFR54	Mullard	NPN RF Amp.
TR2	BFR54	Mullard	NPN RF Amp.
TR3	MPSA13	Motorola	Darlington
TR4	MPSA13	Motorola	Darlington
TR5	MPSA13	Motorola	Darlington
TR6	MPSA13	Motorola	Darlington
TR7	BC636	Mullard	PNP GP Amp.
TR8	BC636	Mullard	PNP GP Amp.
TR9	MPSA13	Motorola	Darlington
TR10	MPSA13	Motorola	Darlington
TR11	MPSA13	Motorola	Darlington
TR12	MPSA13	Motorola	Darlington
TR13	MPSA13	Motorola	Darlington

Preslector Board Module Prefix '2' continued...

Miscellaneous

Motor Gear Box Assembly	11419P
Printed Circuit Board	11115P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Ceramic
C2	2-30p	-	250V	Film Dielectric Trimmer
C3	2-30p	-	250V	Film Dielectric Trimmer
C4	100n	+80% -20%	50V	Multi-Layer Ceramic
C5	100n	+80% -20%	50V	Multi-Layer Ceramic
C6	2-30p	-	250V	Film Dielectric Trimmer
C7	2-30p	-	250V	Film Dielectric Trimmer
C8	100n	+80% -20%	50V	Multi-Layer Ceramic
C9	100n	+80% -20%	50V	Multi-Layer Ceramic
C10	2-30p	-	250V	Film Dielectric Trimmer
C11	2-30p	-	250V	Film Dielectric Trimmer
C12	100n	+80% -20%	50V	Multi-Layer Ceramic
C13	100n	+80% -20%	50V	Multi-Layer Ceramic
C14	2-30p	-	250V	Film Dielectric Trimmer
C15	2-30p	-	250V	Film Dielectric Trimmer
C16	100n	+80% -20%	50V	Multi-Layer Ceramic
C17	22p	2%	100V	Plate Ceramic
C18	22p	2%	100V	Plate Ceramic
C19	22p	2%	100V	Plate Ceramic
C20	22p	2%	100V	Plate Ceramic
C21	220p	2%	100V	Miniature Plate Ceramic
C22	220p	2%	100V	Miniature Plate Ceramic

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	BAX13	Mullard	HS Switching
D3	BAX13	Mullard	HS Switching
D4	BAX13	Mullard	HS Switching
D5	BAX13	Mullard	HS Switching
D6	BAX13	Mullard	HS Switching
D7	BAX13	Mullard	HS Switching
D8	BAX13	Mullard	HS Switching

Preselector Coil Board Range 1-4 Module Prefix '4' Continued...

Chokes

Circuit Ref.	Value	Tolerance	Description
CH1	560uH	20%	Miniature RF Choke
CH2	560uH	20%	Miniature RF Choke
CH3	470nH	20%	Miniature RF Choke
CH4	560uH	20%	Miniature RF Choke
CH5	560uH	20%	Miniature RF Choke
CH6			Not Allocated
CH7	560uH	20%	Miniature RF Choke
CH8	560uH	20%	Miniature RF Choke
CH9			Not Allocated
CH10	560uH	20%	Miniature RF Choke
CH11	560uH	20%	Miniature RF Choke

Inductors

Circuit Ref.	Type	Manufacturer	Number
L1	R4 Aerial	Eddystone	D5712
L2	R4 RF	Eddystone	D5713
L3	R3 Aerial	Eddystone	D5710
L4	R3 RF	Eddystone	D5711
L5	R2 Aerial	Eddystone	D5708
L6	R2 RF	Eddystone	D5709
L7	R1 Aerial	Eddystone	D5706
L8	R1 RF	Eddystone	D5707

Miscellaneous

Printed Circuit Board	11114P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Ceramic
C2	2-30p	-	250V	Trimmer
C3	2-30p	-	250V	Trimmer
C4	100n	+80% -20%	50V	Multi-Layer Ceramic
C5	100n	+80% -20%	50V	Multi-Layer Ceramic
C6	2-30p	-	250V	Trimmer
C7	2-30p	-	250V	Trimmer
C8	100n	+80% -20%	50V	Multi-Layer Ceramic
C9	100n	+80% -20%	50V	Multi-Layer Ceramic
C10	2-30p	-	250V	Trimmer
C11	2-30p	-	250V	Trimmer
C12	100n	+80% -20%	50V	Multi-Layer Ceramic
C13	100n	+80% -20%	50V	Multi-Layer Ceramic
C14	2-20p	-	250V	Trimmer
C15	2-30p	-	250V	Trimmer
C16	100n	+80% -20%	50V	Multi-Layer Ceramic

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	BAX13	Mullard	HS Switching
D3	BAX13	Mullard	HS Switching
D4	BAX13	Mullard	HS Switching
D5	BAX13	Mullard	HS Switching
D6	BAX13	Mullard	HS Switching
D7	BAX13	Mullard	HS Switching
D8	BAX13	Mullard	HS Switching

Preselector Board Spares Range 5-8 Module Prefix '5' Continued....

Chokes

Circuit Ref.	Value	Tolerance	Description
CH1	1mH	20%	Miniature RF Choke
CH2	1mH	20%	Miniature RF Choke
CH3	100uH	20%	Miniature RF Choke
CH4	1mH	20%	Miniature RF Choke
CH5	1mH	20%	Miniature RF Choke
CH6	27uH	20%	Miniature RF Choke
CH7	1mH	20%	Miniature RF Choke
CH8	1mH	20%	Miniature RF Choke
CH9	4uH7	20%	Miniature RF Choke
CH10	1mH	20%	Miniature RF Choke
CH11	1mH	20%	Miniature RF Choke
CH12	1uH5	20%	Miniature RF Choke

Inductors

Circuit Ref.	Type	Manufacturer	Description
L1	R8 Aerial	Eddystone	D5720A
L2	R8 RF	Eddystone	D5721A
L3	R7 Aerial	Eddystone	D5718
L4	R7 RF	Eddystone	D5719
L5	R6 Aerial	Eddystone	D5716
L6	R6 RF	Eddystone	D5717
L7	R5 Aerial	Eddystone	D5714
L8	R5 RF	Eddystone	D5715

Miscellaneous

Printed Circuit Board	11114P

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	6800u	+50% -20%	40V	Electrolytic
C2	6800u	+50% -20%	40V	Electrolytic
C3	1u	+50% -20%	100V	Electrolytic
C4	1u	+50% -20%	100V	Electrolytic
C5	1u	+50% -20%	100V	Electrolytic
C6	1u	+50% -20%	100V	Electrolytic
C7	1u	+50% -20%	100V	Electrolytic
C8	1u	+50% -20%	100V	Electrolytic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	2k7			
R2	2k7			
R3	1k8			
R4	1k8			
R5	240R			
R6	240R			
R7	240R			
R8	240R			
R9	100R	±5%	2.5W	Metal Film

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	1R30-S1	Int. Rect.	Power Rectifier
D2	1R30-S1	Int. Rect.	Power Rectifier
D3	1R30-S1	Int. Rect.	Power Rectifier
D4	1R30-S1	Int. Rect.	Power Rectifier
D5	1R30-S1	Int. Rect.	Power Rectifier

Power Supply Board Module Prefix '14' Continued....

Diodes Continued....

Circuit Ref.	Type	Manufacturer	Description
D6	IR30-S1	Int. Rect.	Power Rectifier
D7	1R30-S1	Int. Rect.	Power Rectifier
D8	IR30-S1	Int. Rect.	Power Rectifier
D9	IR30-S1	Int. Rect.	Power Rectifier
D10	IR30-S1	Int. Rect.	Power Rectifier
D11	IR30-S1	Int. Rect.	Power Rectifier

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	LM317T	National Semi	Voltage Regulator
IC2	LM317T	National Semi	Voltage Regulator
IC3	LM317T	National Semi	Voltage Regulator
IC4	LM317T	National Semi	Voltage Regulator

Miscellaneous

Printed Circuit Board	11111P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Plate Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	39R	±5%	0.33W	Standard Film

Miscellaneous

ILD1	Infra-Red Source (Blue)	CQY37N
ILD2	Infra-Red Source (Blue)	CQY37N
Printed Circuit Board		11235P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Plate Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating.	Type
R1	820R	±5%	0.33W	Standard Film
R2	820R	±5%	0.33W	Standard Film

Miscellaneous

PTR1	Infra-Red Sensor (Transparent)	BPW17N
PTR2	Infra-Red Sensor (Transparent)	BPW17N
Printed Circuit Board		11235P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100p	2%	100V	Plate Ceramic
C2	22p	2%	100V	Plate Ceramic
C3	180p	2%	100V	Plate Ceramic
C4	56p	2%	100V	Plate Ceramic
C5	150p	2%	100V	Plate Ceramic
C6	39p	2%	100V	Plate Ceramic
C7	180p	2%	100V	Plate Ceramic
C8	6p8	0.25p	100V	Plate Ceramic
C9	120p	2%	100V	Plate Ceramic

Inductors

Circuit Ref.	Type	Manufacturer	Number
L1	Filter Coil	Eddystone	D5748
L2	Filter Coil	Eddystone	D5748
L3	Filter Coil	Eddystone	D5748
L4	Filter Coil	Eddystone	D5748

Miscellaneous

Printed Circuit Board	11490P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	22u	+50% -20%	35V	Electrolytic
C2	10u	+50% -20%	50V	Electrolytic
C3	100n	+80% -20%	50V	Multi-Layer Ceramic
C4	10u	+50% -20%	50V	Electrolytic
C5	10u	+50% -20%	50V	Electrolytic
C6	100n	+80% -20%	50V	Multi-Layer Ceramic
C7	22u	+50% -20%	35V	Electrolytic
C8	10u	+50% -20%	50V	Electrolytic
C9	22u	+50% -20%	35V	Electrolytic
C10	100n	+80% -20%	50V	Multi-Layer Ceramic
C11	10u	+50% -20%	50V	Electrolytic
C12	10u	+50% -20%	50V	Electrolytic
C13	100n	+80% -20%	50V	Multi-Layer Ceramic
C14	10u	+50% -20%	50V	Electrolytic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	10k			
R2	10k			
R3	8x47k	±5%	1.1W Total	DIL Resistor Pack
R4	150R			
R5	2R7	±5%	6W	Wirewound
R6	10k			
R7	10k			
R8	8x2k2	±5%	1.1W Total	DIL Resistor Pack
R9	8x10k	±5%	1.1W Total	DIL Resistor Pack
R10	8x10k	±5%	1.1W Total	DIL Resistor Pack
R11	8x2k2	±5%	1.1W Total	DIL Resistor Pack

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC14016BCP	Motorola	Quad Analog Switch
IC2	MC14094BCP	Motorola	8 Bit Shift Store Latch
IC3	MC14094BCP	Motorola	8 Bit Shift Store Latch
IC4	MC14094BCP	Motorola	8 Bit Shift Store Latch
IC5	MC7805CT	Motorola	Voltage Regulator
IC6	MC14081BCP	Motorola	Quad 2 Inp. Nand Gate
IC7	MC14503BCP	Motorola	Hex. Tri-State Buffer
IC8	MC14503BCP	Motorola	Hex. Tri-State Buffer
IC9	SN74LS374N	Texas	Octal 3 State Flip Flop
IC10	SN74LS374N	Texas	Octal 3 State Flip Flop
IC11	MC14503BCP	Motorola	Hex. Tri-State Buffer
IC12	SN74LS374N	Texas	Octal 3 State Flip Flop

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BC547B	Mullard	NPN GP Amp.
TR2	BC547B	Mullard	NPN Gp Amp.
TR3	BC547B	Mullard	NPN GP Amp.

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	IR30-S1	Int. Rect.	Rectifier Diode

Interface Board Assembly Module Prefix '12' Continued....

Miscellaneous

RLA Relay 12V Reed Printed Circuit Board	11946P 11125P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	+80% -20%	50V	Multi-Layer Ceramic
C2	3u3	+50% -20%	16V	Electrolytic
C3	10n	+80% -20%	25V	Disc Ceramic
C4	10n	+80% -20%	25V	Disc Ceramic
C5	10n	+80% -20%	25V	Disc Ceramic
C6	10n	+80% -20%	25V	Disc Ceramic
C7	10n	+80% -20%	25V	Disc Ceramic
C8	10n	+80% -20%	25V	Disc Ceramic
C9	10n	+80% -20%	25V	Disc Ceramic
C10	10n	+80% -20%	25V	Disc Ceramic
C11	180p	5%	500V	Polystyrene
C12	10n	+80% -20%	25V	Disc Ceramic
C13	10u	+50% -20%	50V	Electrolytic
C14				Not Fitted
C15	100n	+80% -20%	50V	Multi-Layer Ceramic
C16	10n	+80% -20%	50V	Disc Ceramic
C17	10n	+80% -20%	50V	Disc Ceramic
C18	27p	2%	100V	Plate Ceramic
C19	27p	2%	100V	Plate Ceramic
C20	3u3	+50% -20%	16V	Electrolytic
C21	10n	+80% -20%	50V	Disc Ceramic
C22	100u	+50% -20%	10V	Electrolytic
C23	220u	+50% -20%	25V	Electrolytic
C24	100n	+80% -20%	50V	Multi-Layer Ceramic

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	8x2k2		1.2W Total	DIL Resistor Pack
R2	8x47k		1.2W Total	DIL Resistor Pack
R3	33k			
R4	8x47k		1.2W Total	DIL Resistor Pack
R5	1k5			
R6	470R			
R7	33k			
R8	3k3			
R9	3k3			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Micro-Computer Board Module Prefix '13' Continued....

Resistors Continued....

Circuit Ref.	Value	Tolerance	Power Rating	Type
R10	330R			
R11	33k			
R12	33k			
R13	33k			
R14	33k			
R15	4k7			
R16	100k			
R17	33k			
R18	1k			
R19	8x2k2		1.2W Total	DIL Resistor Pack
R20	47k			
R21	47k			
R22	47k			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC6840P	Motorola	Triple Timer
IC2	74LS245N	Texas	Octal Bus Transceiver
IC3	74LS138N	Texas	3 To 8 Line Decoder
IC4	MC14528BCP	Motorola	Dual Monostable
IC5	HM6116LP-4	Hitachi	2k CMOS RAM
IC6	CA3140E	RCA	Mosfet OP Amp.
IC7	MC14011BCP	Motorola	Qud 2 Input Nand Gate
IC8*	HN462732G	Hitachi	4k EPROM
IC9*	HN462732G	Hitachi	4k EPROM
IC10	74LS02N	Texas	Quad 2 Input Nor Gate
IC11	74LS123N	Texas	Dual Monostable
IC12	MC6802P	Motorola	C.P.U.
IC13	74LS138N	Texas	3 To 8 Line Decoder
IC14	MC7805CT	Motorola	Voltage Regulator
IC15	MCT2	Monsanto	Opto Isolator

IC8 12594P IC9 12595P

*Note: These EPROMs are programmed by Eddystone Radio Limited.

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BC547B	Mullard	NPN GP Amp.

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	OA47	Mullard	Germanium Gold Bonded
D2	OA47	Mullard	Germanium Gold Bonded
D3	BZX79-C3V9	Mullard	Zener Diode

Miscellaneous

XTL1	3276.8kHz Xtal	11947P
BATT	3.6V 100mAH Battery	11948P
Printed Circuit Board		11129P

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	100n	20%	100V	P.E.T.P.
C2	10n	+80% -20%	25V	Disc Ceramic
C3	10n	+80% -20%	25V	Disc Ceramic
C4	10n	+80% -20%	25V	Disc Ceramic
C5	10n	+80% -20%	25V	Disc Ceramic
C6	10n	+80% -20%	25V	Disc Ceramic
C7	10n	+80% -20%	25V	Disc Ceramic
C8	10n	+80% -20%	25V	Disc Ceramic
C9	10n	+80% -20%	25V	Disc Ceramic
C10	10n	+80% -20%	25V	Disc Ceramic
C11	10n	+80% -20%	25V	Disc Ceramic
C12	10n	+80% -20%	25V	Disc Ceramic
C13	10n	+80% -20%	25V	Disc Ceramic
C14	10n	+80% -20%	25V	Disc Ceramic
C15	10n	+80% -20%	25V	Disc Ceramic
C16	10n	+80% -20%	25V	Disc Ceramic
C17	10n	+80% -20%	25V	Disc Ceramic
C18	10n	+80% -20%	25V	Disc Ceramic
C19	10n	+80% -20%	25V	Disc Ceramic
C20	10n	+80% -20%	25V	Disc Ceramic
C21	22p	2%	100V	Plate Ceramic
C22	10n	+80% -20%	25V	Disc Ceramic
C23	10n	+80% -20%	25V	Disc Ceramic
C24	10n	+80% -20%	25V	Disc Ceramic
C25	100n	20%	100V	P.E.T.P.
C26	10n	+80% -20%	25V	Disc Ceramic
C27	47u	+50% -20%	25V	Electrolytic
C28	10n	+80% -20%	25V	Disc Ceramic
C29	10n	+80% -20%	25V	Disc Ceramic
C30	10n	+80% -20%	25V	Disc Ceramic
C31	10n	+80% -20%	25V	Disc Ceramic
C32	10n	+80% -20%	25V	Disc Ceramic
C33	100p	2%	100V	Plate Ceramic
C34	1n2	1%	160V	Polystyrene
C35	10n	+80% -20%	25V	Disc Ceramic
C36	100n	+80% -20%	50V	Multi-Layer Ceramic
C37	47u	+50% -20%	25V	Electrolytic
C38	100n	+80% -20%	50V	Multi-Layer Ceramic
C39	10n	+80% -20%	25V	Disc Ceramic
C40	10n	+80% -20%	25V	Disc Ceramic
C41	10n	+80% -20%	25V	Disc Ceramic
C42	10n	+80% -20%	25V	Disc Ceramic
C43	3n3	1%	63V	Polystyrene

Capacitors Continued....

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C44	100n	+80% -20%	50V	Multi-Layer Ceramic
C45	100u	+50% -20%	25V	Electrolytic
C46	100n	+80% -20%	50V	Multi-Layer Ceramic
C47	10n	+80% -20%	25V	Disc Ceramic
C48	10n	+80% -20%	25V	Disc Ceramic
C49	3n3	+50% -20%	63V	Polystyrene
C50	10n	+80% -20%	25V	Disc Ceramic
C51	10n	+80% -20%	25V	Disc Ceramic
C52	100n	+80% -20%	50V	Multi-Layer Ceramic
C53	10n	+80% -20%	25V	Disc Ceramic
C54	100n	+80% -20%	50V	Multi-Layer Ceramic
C55	10n	+80% -20%	25V	Disc Ceramic
C56	100u	+50% -20%	10V	Electrolytic
C57	10n	+80% -20%	25V	Disc Ceramic
C58	100n	+80% -20%	50V	Multi-Layer Ceramic
C59	10n	+80% -20%	25V	Disc Ceramic
C60	22p	2%	100V	Plate Ceramic
C61	22n	20%	400V	P.E.T.P.
C62	22u	+50% -20%	35V	Electrolytic
C63	22u	+50% -20%	35V	Electrolytic
C64	1u	+50% -20%	100V	Electrolytic
C65	1u	+50% -20%	100V	Electrolytic
C66	220u	+50% -20%	25V	Electrolytic
C67	10n	+80% -20%	25V	Disc Ceramic
C68	220u	+50% -20%	25V	Electrolytic
C69	100u	+50% -20%	25V	Electrolytic
C70	100u	+50% -20%	10V	Electrolytic
C71	22u	+50% -20%	35V	Electrolytic
C72	22u	+50% -20%	35V	Electrolytic
C73	10n	+80% -20%	25V	Disc Ceramic
C74	10n	+80% -20%	25V	Disc Ceramic
C75	1u	+50% -20%	100V	Electrolytic
C76	10n	+80% -20%	25V	Disc Ceramic
C77	100u	+50% -20%	10V	Electrolytic
C78	3u3	+50% -20%	16V	Electrolytic
C79	10n	+80% -20%	25V	Disc Ceramic
C80	10n	20%	400V	P.E.T.P.
C81	22u	+50% -20%	35V	Electrolytic
C82	22u	+50% -20%	35V	Electrolytic
C83	1u	+50% -20%	100V	Electrolytic
C84	1n	10%	100V	Plate Ceramic
C85	220u	+50% -20%	25V	Electrolytic
C86	220u	+50% -20%	25V	Electrolytic

Main IF & Audio Board Module Prefix '10' Continued....

Capacitors Continued....

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C87	100u	+50% -20%	10V	Electrolytic
C88	22u	+50% -20%	35V	Electrolytic
C89	1000u	+50% -20%	10V	Electrolytic
C90	22u	+50% -20%	35V	Electrolytic
C91	22u	+50% -20%	35V	Electrolytic
C92	22u	+50% -20%	35V	Electrolytic
C93	22u	+50% -20%	35V	Electrolytic
C94	100u	+50% -20%	25V	Electrolytic
C95	100u	+50% -20%	10V	Electrolytic
C96	100u	+50% -20%	25V	Electrolytic
C97	47n	20%	250V	P.E.T.P.
C98	47n	20%	250V	P.E.T.P.
C99	100u	+50% -20%	25V	Electrolytic
C100	100u	+50% -20%	25V	Electrolytic
C101	100n	20%	100V	P.E.T.P.
C102	100n	20%	100V	P.E.T.P.
C103	22u	+50% -20%	35V	Electrolytic
C104	22u	+50% -20%	35V	Electrolytic
C105	22u	+50% -20%	35V	Electrolytic
C106	22u	+50% -20%	35V	Electrolytic
C107	10n	+80% -20%	25V	Disc Ceramic
C108	22u	+50% -20%	35V	Electrolytic
C109	330p	2%	100V	Plate Ceramic
C110	10n	+80% -20%	25V	Disc Ceramic
C111	10n	+80% -20%	25V	Disc Ceramic
C112	10n	+80% -20%	25V	Disc Ceramic
C113	22u	+50% -20%	35V	Electrolytic
C114	330p	2%	100V	Plate Ceramic
C115	10n	+80% -20%	25V	Disc Ceramic
C116	10n	+80% -20%	25V	Disc Ceramic
C117	1u	+50% -20%	100V	Electrolytic
C118	1u	+50% -20%	100V	Electrolytic
C119	10n	+80% -20%	25V	Disc Ceramic
C120	3u3	+50% -20%	16V	Electrolytic
C121	1u	+50% -20%	100V	Electrolytic
C122	10n	+80% -20%	25V	Disc Ceramic
C123	10n	+80% -20%	25V	Disc Ceramic
C124	100u	+50% -20%	10V	Electrolytic
C125	10n	+80% -20%	25V	Disc Ceramic
C126	10n	+80% -20%	25V	Disc Ceramic
C127	1u	+50% -20%	16V	Electrolytic
C128	1u	+50% -20%	16V	Electrolytic
C129	100n	+80% -20%	50V	Multi-Layer Ceramic
C130	100n	+80% -20%	50V	Multi-Layer Ceramic

Capacitors Continued....

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C131	100u	+50% -20%	25V	Electrolytic
C132	22u	+50% -20%	35V	Electrolytic
C133	100n	20%	100V	P.E.T.P.
C134	22u	+50% -20%	35V	Electrolytic
C135	100n	20%	100V	P.E.T.P.
C136	220u	+50% -20%	25V	Electrolytic
C137	100n	20%	100V	P.E.T.P.
C138	220u	+50% -20%	25V	Electrolytic
C139	100u	+50% -20%	25V	Electrolytic
C140	3n9	1%	63V	Polystyrene
C141	820p	1%	250V	Polystyrene
C142	100u	+50% -20%	25V	Electrolytic
C143	100n	20%	100V	P.E.T.P.
C144	22u	+50% -20%	35V	Electrolytic
C145	22u	+50% -20%	35V	Electrolytic
C146	22u	+50% -20%	35V	Electrolytic
C147	22u	+50% -20%	25V	Electrolytic
C148	22u	+50% -20%	35V	Electrolytic
C149	100n	20%	100V	P.E.T.P.
C150	22u	+50% -20%	35V	Electrolytic
C151	100n	20%	100V	P.E.T.P.
C152	100n	20%	100V	P.E.T.P.
C153	1000u	+50% -20%	25V	Electrolytic
C154	220u	+50% -20%	25V	Electrolytic
C155	100u	+50% -20%	25V	Electrolytic
C156	10n	20%	400V	P.E.T.P.
C157	100u	+50% -20%	25V	Electrolytic
C158	1n8	1%	160V	Polystyrene
C159	100n	20%	100V	P.E.T.P.
C160	100n	20%	100V	P.E.T.P.
C161	1000u	+50% -20%	25V	Electrolytic

Main IF & Audio Board Module Prefix '10' Continued....

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	22R			
R2	150R			
R3	150R			
R4	150R			
R5	150R			
R6	150R			
R7	150R			
R8	150R			
R9	150R			
R10	150R			
R11	150R			
R12	150R			
R13	150R			
R14	180R			
R15	2k7			
R16	180R			
R17	150R			
R18	150R			
R19	22R			
R20	1k2			
R21	47R			
R22	47R			
R23	820R			
R24	1k2			
R25	47R			
R26	47R			
R27	47R			
R28	2k2			
R29	47R			
R30	47R			
R31	10k			
R32	2k2			
R33	47R			
R34	120R			
R35	33k			
R36	15k			
R37	3k3			
R38	270R			
R39	47R			
R40	220R			
R41	68R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Resistors Continued....

Circuit Ref.	Value	Tolerance	Power Rating	Type
R42	10k			
R43	470R			
R44	100R			
R45	82R			
R46	47k			
R47	820R			
R48	10k			
R49	4k7			
R50	10k			
R51	10k			
R52	10k			
R53	4k7			
R54	3k9			
R55	8k2			
R56	10k			
R57	10k			
R58	18k			
R59	4k7			
R60	470k			
R61	10k			
R62	39k			
R63	150k			
R64	47k			
R65	10k			
R66	1k			
R67	47k			
R68	47k			
R69	47k			
R70	10k			
R71	10k			
R72	68R			
R73	47k			
R74	680R			
R75	390R	±5%	0.5W	Carbon Film
R76	10k			
R77	2k2			
R78	2k2			
R79	2k2			
R80	220R			
R81	47k			
R82	18k			
R83	1k			
R84	220R			
R85	1k			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Main IF & Audio Board Module Prefix '10' Continued....

Resistors Continued....

Circuit Ref.	Value	Tolerance	Power Rating	Type
R86	820R			
R87	22R			
R88	1k			
R89	1k			
R90	1k8			
R91	47k			
R92	680R			
R93	22k			
R94	33k			
R95	2k2			
R96	3k3			
R97	1k5			
R98	33k			
R99	10k			
R100	470R			
R101	82R			
R102	560R			
R103	47R			
R104	3k3			
R105	1k2			
R106	470R			
R107	47R			
R108	390R			
R109	47R			
R110	68R			
R111	22R			
R112	8x10k	±5%	1.2W Total	DIL Resistor Pack
R113	22k			
R114	100k			
R115	100R			
R116				Not Allocated
R117	47k			
R118	220R			
R119	22R	±5%	3W	Wirewound
R120	100R			
R121	1R			
R122	220R			
R123	10k			
R123A	150R			
R124	1k			
R125	10k			
R126	10k			
R126A	22k			
R127	100k			
R128	100R			
R129	470R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Resistors Continued....

Circuit Ref.	Value	Tolerance	Power Rating	Type
R130	470R			
R131	47k			
R132	18R			
R133	10k			
R134	470R			
R135	100R			
R136	10k			
R137	1R			

All Resistors ±5% 0.33W Standard Film. Unless otherwise specified.

Variable Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
RV1	47k	20%	0.5W	Cermet Preset
RV2	2k2	20%	0.5W	Cermet Preset
RV3	10k	20%	0.5W	Cermet Preset
RV4	2k2	20%	0.5W	Cermet Preset
RV5	10k	20%	0.5W	Cermet Preset
RV6	1k	20%	0.5W	Cermet Preset
RV7	470R	20%	0.5W	Cermet Preset
RV8	10k	20%	0.5W	Cermet Preset
RV9	47k	20%	0.5W	Cermet Preset
RV10	10k	20%	0.5W	Cermet Preset

Main IF & Audio Board Module Prefix '10' Continued....

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	MC1350P	Motorola	IF Amplifier
IC2	MC1350P	Motorola	IF Amplifier
IC3	CA3240E	RCA	Dual Mosfet OP Amp.
IC4	CA3240E	RCA	Dual Mosfet OP Amp.
IC5	MC14016BCP	Motorola	Quad Analogue Switch
IC6	MC14555BCP	Motorola	Dual Binary to 1 of 4 Decoder
IC7	SN74LS145N	Texas	BCD-DEC Decoder/Driver
IC8	MC78L08CP	Motorola	Voltage Regulator
IC9	SL1625C	Plessey	AM DET/AGC
IC10	MC78L05CP	Motorola	Voltage Regulator
IC11	MC14504BCP	Motorola	Hex. Level Shifter
IC12	MC14011BCP	Motorola	Quad 2 Input Nand Gate
IC13	SL1641C	Plessey	Balanced Mixer
IC14	MC78L08CP	Motorola	Voltage Regulator
IC15	SL1625C	Plessey	AM DET/AGC
IC16	MC14016BCP	Motorola	Qud Analog Switch
IC17	SL162IC	Plessey	Audio AGC
IC18	MC1741CP	Motorola	Op Amp.
IC19	MC14016BCP	Motorola	Quad Analog Switch
IC20	TBA810S	SGS	AF Amplifier
IC21	CA3240E	RCA	Dual Mosfet Op Amp.
IC22	TBA810S	SGS	AF Amplifier

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BFR54	Mullard	NPN RF Amp.
TR2	BFR54	Mullard	NPN RF Amp.
TR3	BFR54	Mullard	NPN RF Amp.
TR4	BFR54	Mullard	NPN RF Amp.
TR5	BC547B	Mullard	NPN GP Amp.
TR6	BC547B	Mullard	NPN GP Amp.
TR7	UC734B	Union Carbide	Junction FET
TR8			Not Allocated
TR9	BC547B	Mullard	NPN GP Amp.

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	HS Switching
D2	BAX13	Mullard	HS Switching
D3	BAX13	Mullard	HS Switching
D4	BAX13	Mullard	HS Switching
D5	BAX13	Mullard	HS Switching
D6	BAX13	Mullard	HS Switching
D7	BAX13	Mullard	HS Switching
D8	BZX91	Mullard	Reference Diode
D9	BAX13	Mullard	HS Switching
D10	BAX13	Mullard	HS Switching
D11	BAX13	Mullard	HS Switching
D12	BAX13	Mullard	HS Switching
D13	BAX13	Mullard	HS Switching
D14	BAX13	Mullard	HS Switching
D15	BAX13	Mullard	HS Switching
D16	BAX13	Mullard	HS Switching
D17	BAX13	Mullard	HS Switching
D18	BZX79C6V2	Mullard	Zener Diode
D19	BAX13	Mullard	HS Switching

Inductors

Circuit Ref.	Type	Manufacturer	Number
L1	1.4MHz IF	Eddystone	D5673
L2	1.4MHz If	Eddystone	D5673

Main IF & Audio Board Module Prefix '10' Continued....

Chokes

Circuit Ref.	Value	Tolerance	Type
CH1	10uH	20%	Miniature RF Choke
CH2	33uH	20%	Miniature RF Choke
CH3	33uH	20%	Miniature RF Choke
CH4	470uH	20%	Miniature RF Choke
CH5	68mH	20%	Miniature RF Choke

Filters

Circuit Ref.	Description	Number
FL1	LSB 1.4MHz	10961P
FL2		Not Allocated
FL3		Not Allocated
FL4	Narrow 1.4MHz	12611P
FL5	Inter 1.4MHz	12612P
FL6	Wide 1.4MHz	12613P

Miscellaneous

RLA	SPCO Reed Relay	11946P
RLB	SPCO Reed Relay	11946P
RLC	SPCO Reed Relay	11946P
RLD	SPCO Reed Relay	11946P
RLE	SPCO Reed Relay	11946P
RLF	SPCO Reed Relay	11946P
RLG	SPCO Reed Relay	11946P
RLH	SPCO Reed Relay	11946P

Miscellaneous Continued....

RLJ	SPCO Reed Relay	11946P
RLK	SPCO Reed Relay	11946P
RLL	SPCO Reed Relay	11946P
RLM	SPCO Reed Relay	11946P
RLN	SPCO Reed Relay	11946P
RLP	SPCO Reed Relay	11946P
T1	Line OP Trans. Eddystone	D5400
Printed Circuit Board		11110P

Front & Rear Panel Assembly Spares

Front Panel Assembly Spares

Miscellaneous

Membrane Switch Panel	11224P
Interface Board Assembly	LP3802/4
Display Board Assembly	LP3802/5
Tuning Knob Assembly	LP3803
Phone Jack (R32640005)	8736P

Rear Panel Assembly Spares

Module Prefix '1'

Resistors

Circuit Ref.	Value	Tolerance	Power Rating	Type
R1	1R5	5%	5W	Wirewound Heat Sink Type
R2	4R7	5%	10W	Wirewound Heat Sink Type

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	IR30-S1	Int. Rectifier	Power Diode

Miscellaneous

T1	Mains Transformer	11162PB
	Low Pass Filter Module	LP3860
	Power Supply Board Assembly	LP3802/10
SKT5	Filter Mains Socket	9715P
S1	Voltage Selector	11945P
FS1-FS5	Fuse Holder	9458P
SKT1-4	BNC Socket	7225P
SKT3	25 Way Socket	10976P
PL1	9 Way Plug	10588P
RLA	2PCO Relay Plug In	11582P

Miscellaneous

RLA	SP/On-Off Relay	11981P
RLB	SP/On-Off Relay	11981P
RLC	SP/On-Off Relay	11981P
RLD	SP/On-Off Relay	11981P
Printed Circuit Board		11116P

NOTE 4 Boards used per receiver.

Capacitors

Circuit Ref.	Value	Tolerance	Voltage Wkg.	Type
C1	10n	+80% -20%	25V	Ceramic Disc
C2	47u	+50% -20%	25V	Electrolytic
C3	100u	+50% -20%	25V	Electrolytic
C4	100u	+50% -20%	25V	Electrolytic
C5	100u	+50% -20%	25V	Electrolytic

Resistors

Circuit Ref.	Value
R1	1k
R2	56k
R3	220k
R4	10k
R5	100k
R6	39k
R7	56k
R8	10k
R9	22k
R10	820R
R11	330R

All Resistors ±5% 0.4W Standard Film

Line Attenuator Board Module Prefix '39' Continued....

Diodes

Circuit Ref.	Type	Manufacturer	Description
D1	BAX13	Mullard	Silicon H/S
D2	BAX13	Mullard	Silicon H/S

Transistors

Circuit Ref.	Type	Manufacturer	Description
TR1	BC547B	Mullard	NPN GP Amp.
TR2	40673	RCA	Dual Gate Mosfet

Integrated Circuits

Circuit Ref.	Type	Manufacturer	Description
IC1	14016	Motorola	Quad Analogue Gate

Miscellaneous

PL1 4 Pin Plug	12650P
Printed Circuit Board	12600P

Main Assembly Spares

Miscellaneous

VCO Assembly	LP3808
Preselector Main Board	LP3802/3
Preselector Board Range 1-4	LP3802/7
Preselector Board Range 5-8	LP3802/8
Relay Board Assembly	LP3802/12
RF & 1st IF Board Assembly	LP3802/11
Synthesiser Board Assembly	LP3802/1
Main IF & Audio Board Assembly	LP3802/16
Fuse 1A Anti-Surge	9816P
Fuse 3.15A	10967P
Fuse 5A	7814P

Spares should be ordered by quoting the complete Circuit Reference including the module prefix (where applicable), the description and the part number given in the list. From time to time, components of the type listed may be unavailable and equivalent types may be fitted or supplied as spares. All orders and enquiries should be directed to the address below, quoting the Type and Serial Number of the equipment in all communications.

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

TELEPHONE: 021-475-2231
TELEX: 337081
CABLES: EDDYSTONE BIRMINGHAM
FAX: 021-477-5224

APPENDIX A

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 (approximately 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 five 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 re-produced, 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 susceptiable to damage when exposed to high static 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 eqipment should be swiched off when devices or boards are inserted or removed.

4. Nylon clothing should not be worn.

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

APPENDIX B

Eddystone Remote Control Interface Adaptors for Model 1650/7 HF/LF Receivers

Introduction

A range of remote control interface adaptors (R.I.A.'s) is available for use in various remote control systems.

The R.I.A.'s available will be increased in number and if required, customised versions can be supplied, however, examples of the use of the basic range will be given in the section 'Recommended Systems'. The R.I.A.'s are generally supplied as die-cast box modules which can be table mounted or bulkhead mounted using brackets supplied. The majority of them only require the DC supply provided by the receiver 'REMOTE' connector (+15V at 150mA).

Recommended Systems

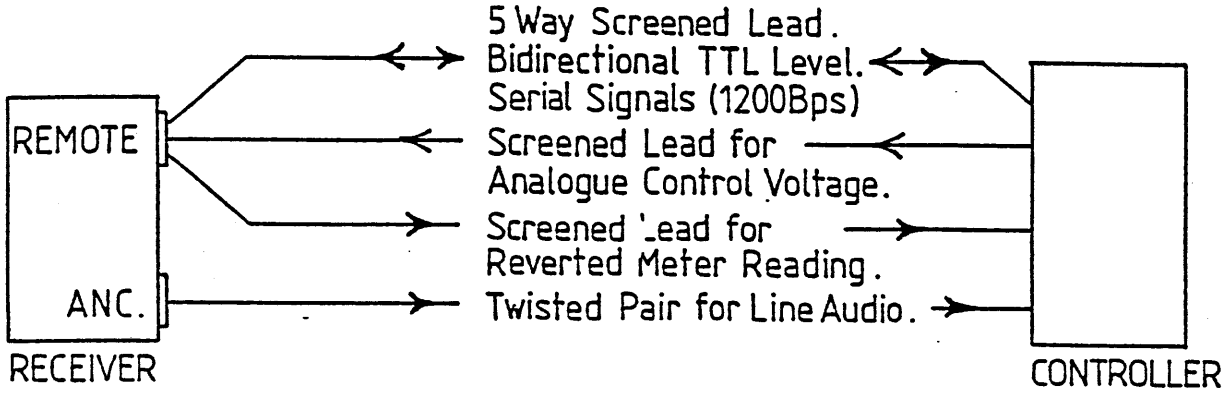
The R.I.A.'s required generally depend on the separation between the control unit and the receiver. The type of control unit also may help determine which R.I.A.'s to use. If the control unit is also supplied by Eddystone, the appropriate manual should be consulted before arranging the complete system.

The following recommended systems are presented with the control unit/receiver distance as the major consideration.

The controller shown may be an Eddystone 1775 series control unit or a mini/micro-computer based unit with appropriate serial and analogue interfaces. The receivers shown are as described in the basic 1650 handbook. However, receivers can be supplied with combined data and handshake lines (receivers type suffixed 'C'), this halving the number of serial control lines for systems which do not normally require or generate 'handshake' signals. Receivers with the type suffix 'D' cannot be used in the recommended systems shown. These receivers are intended for situations such as dual diversity operation where it is convenient for one receiver to be able to control or tune another receiver in step with itself. This situation is briefly described at the end of this Appendix.

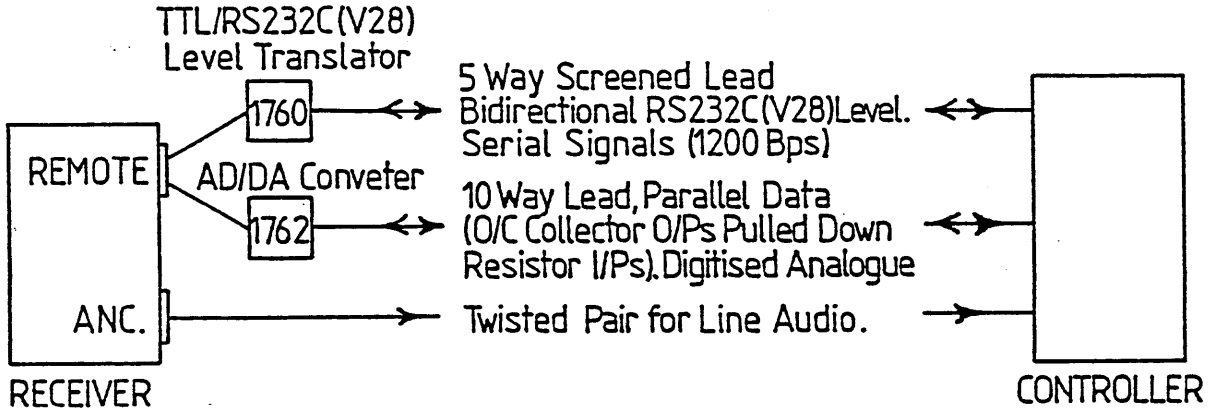
a) Short Distances

For distances up to 5/10 M R.I.A.'s may not be required.



b) Medium Distances

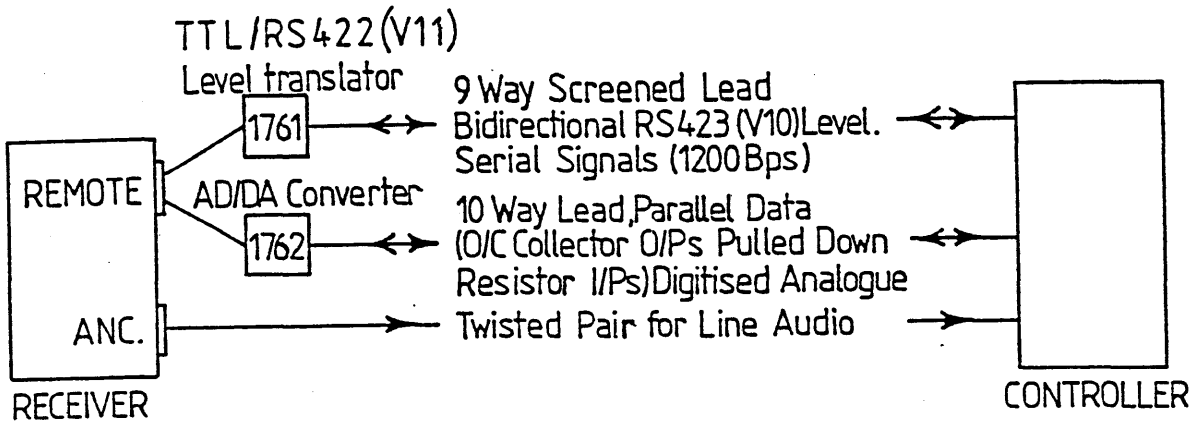
For distances up to 20/50 M TTL level translation to RS232C levels (i.e. V28 level) is required for the digital signals and digitisation of the analogue signals.



Note that the AD/DA converter model 1762 can also be preset to a desired analogue input level at the receiver end and the 10 way LINK omitted if remote control of IF GAIN/MUTE level is not required and reversion of the meter reading is not required.

c) Long Distances

For distances up to 1/1.5kM. A different level translator, TTL to RS422 level (i.e. V11 levels) is required.



As for (b) the 10 way LINK can be omitted if remote control of IF GAIN/MUTE LEVEL and reversion of meter reading is not required.

d) Very Long Distances

For distances greater than 1/1.5kM. A MODEM or MODEM SIMULATOR (for up to fifteen miles only typically) will be required (with a MODEM also at the controller end).

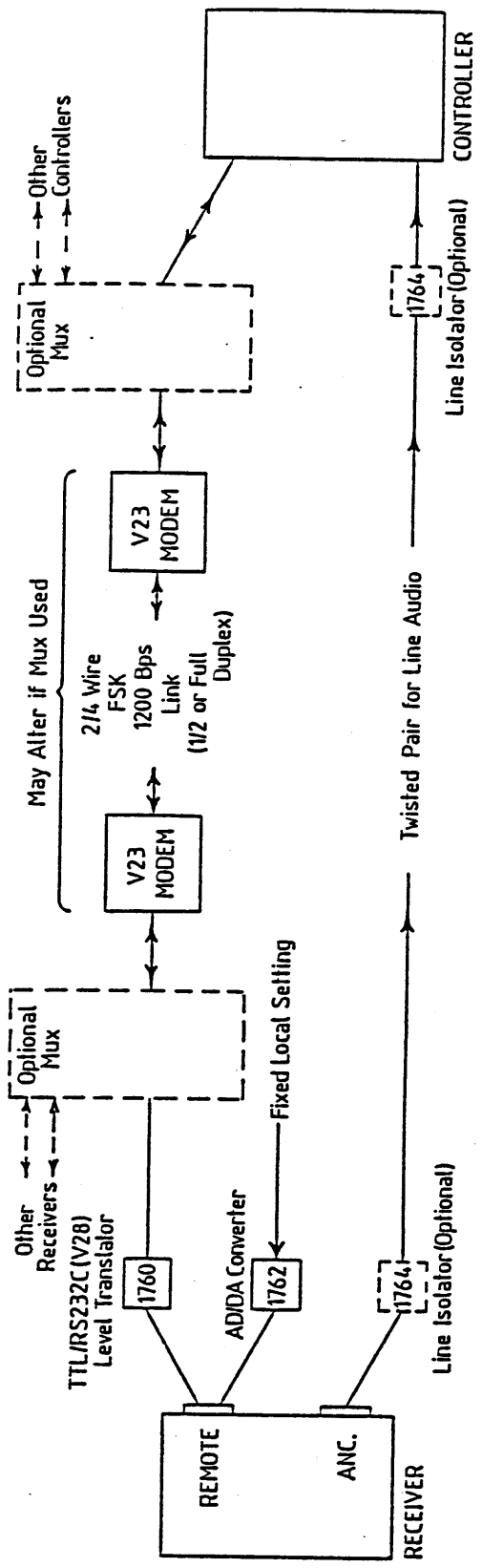
The remote control system is 1200Bps (or less to customer requirement), asynchronous data and 1/2 duplex. A V23 MODEM is recommended with either a two or four wire interconnection. The system requires full active use of the data carrier detect and request to send control lines. The R.I.A.'s required now depend on whether or not the two analogue connections are required. (See over page). Model 1764 may also be required for the line output.

Receivers with the combined handshake and serial data lines (suffix 'C') do not require or generate the data carrier detect and request to send control lines and are therefore more suitable for use in full duplex systems which use continuous, non-switched carriers.

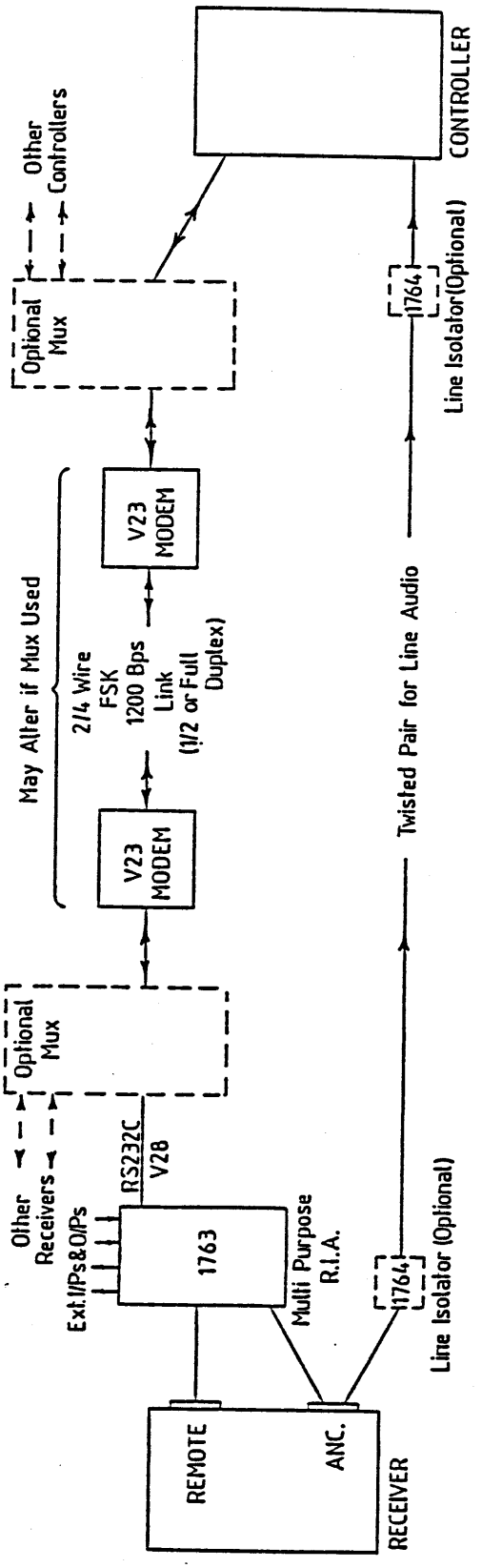
For systems which consist of several receivers and controllers but only use link, data multiplexers may be used as shown. These however will generally require a four wire, full duplex link and the MODEM type, link data rate and receiver data rate will have to be determined in consultation with Eddystone Radio Limited.

The 1763 can also supply control outputs such as IF de-sense, aerial muting and various non-receiver control outputs and sense I/P's.

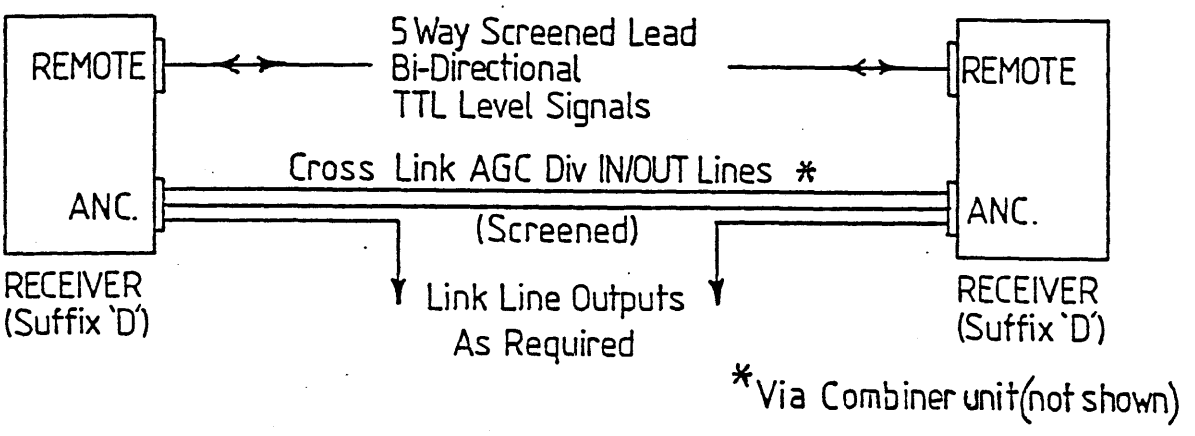
d) (i) Without analogue controls (and meter data).



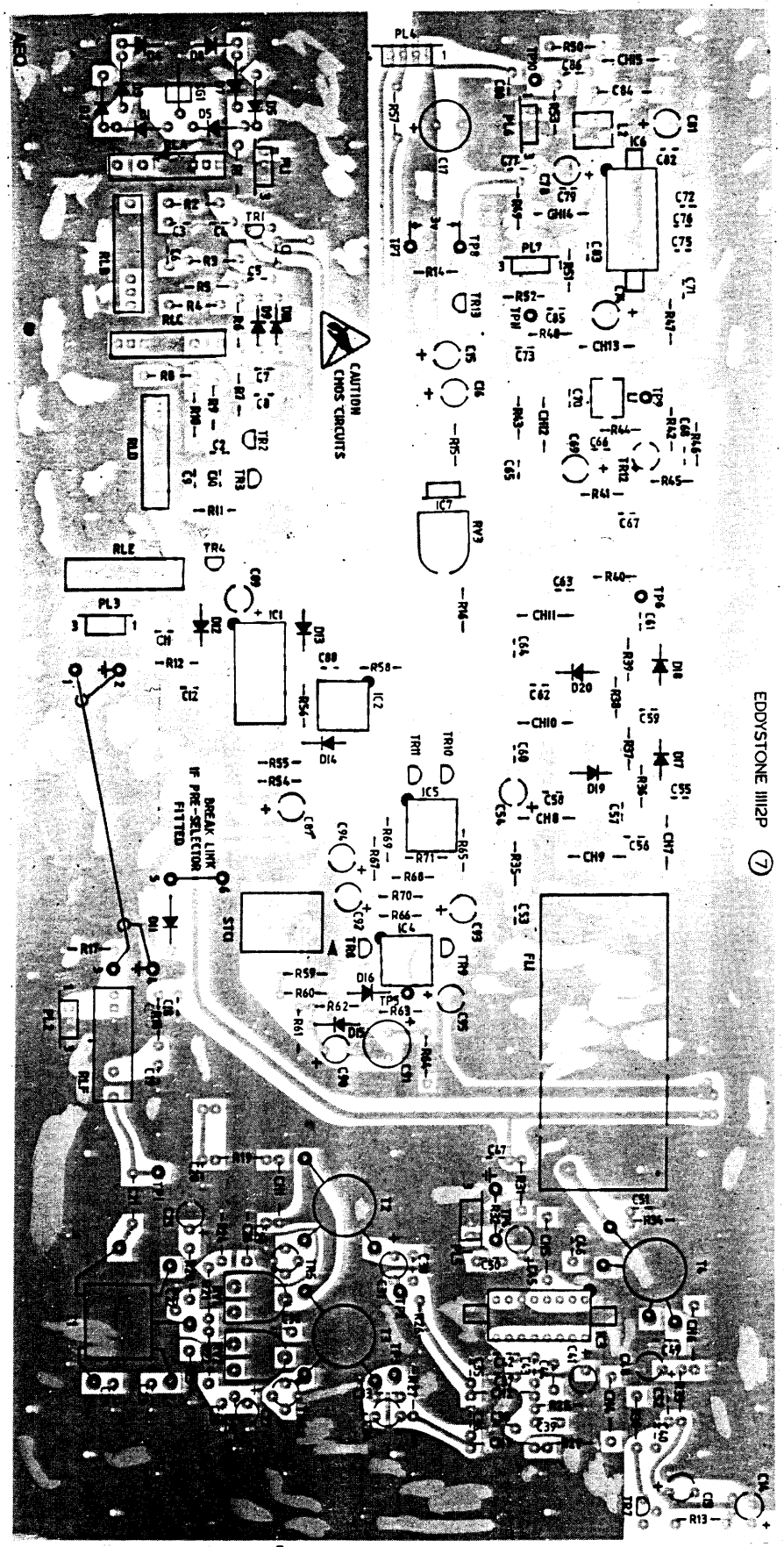
d) (ii) With analogue controls (and meter data).



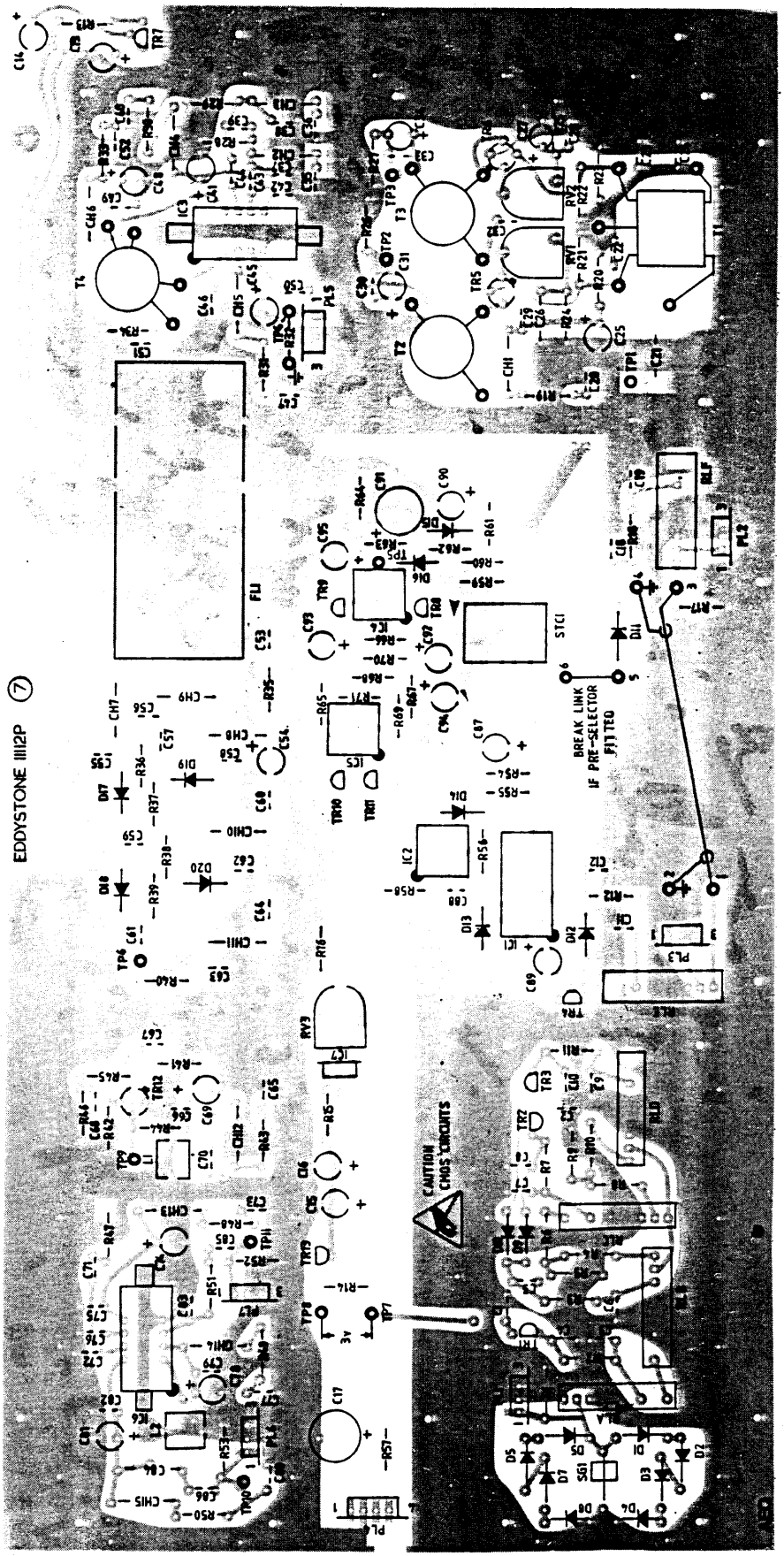
e) Receivers with type suffix 'D'. These receivers can be linked so that simultaneous 'in-step' control of both can be effected from either receiver control panel. This is primarily for use in dual diversity systems but also can be used for short range remote control of a receiver by another receiver of the same type. Since no revertive status data is supplied by the controlled receiver however, the useful physical distance of such control is limited. For full remote control of diversity pairs, receivers with the standard or suffix 'C' remote facilities should be used.



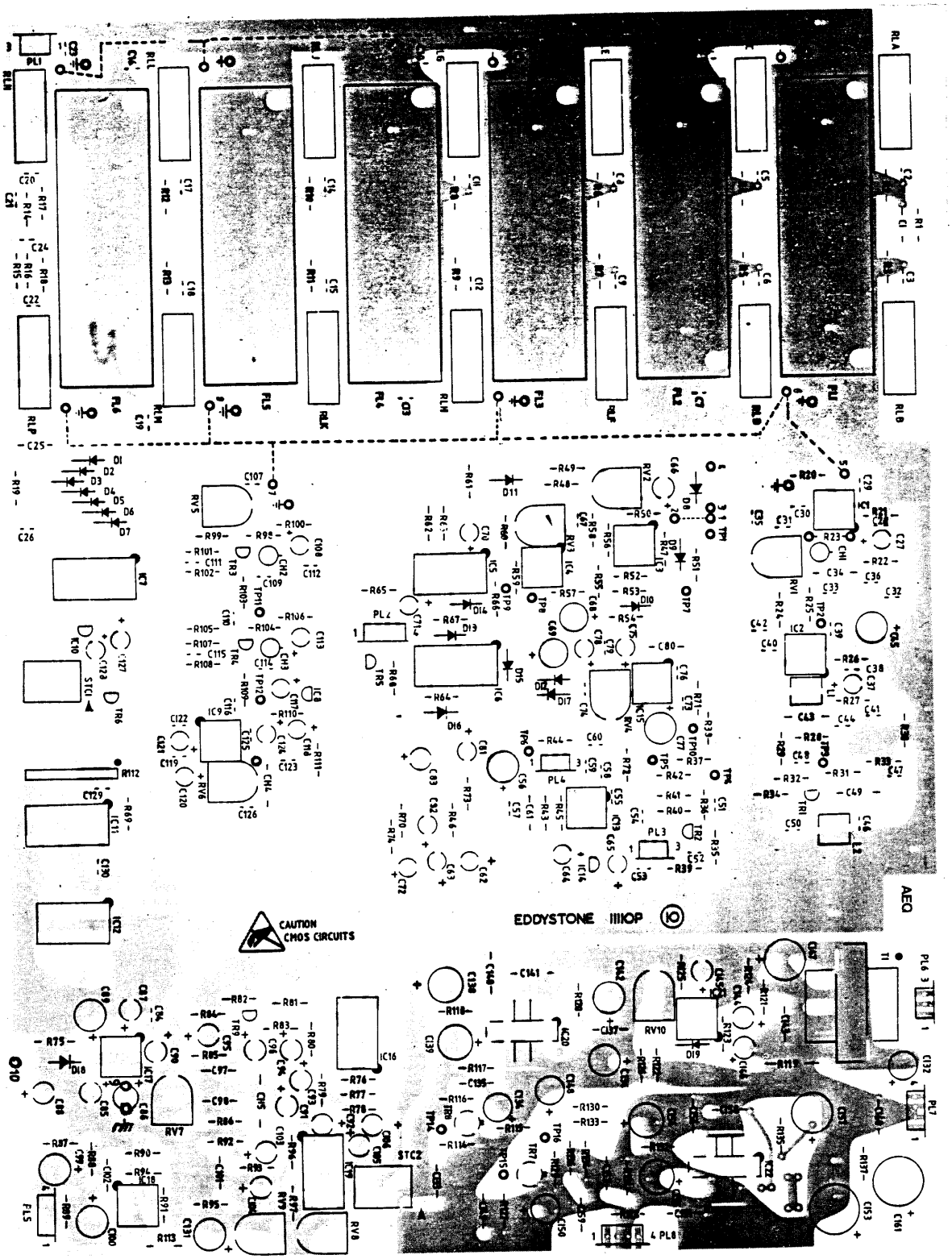
11112P
RF/1st IF Board Reference 7



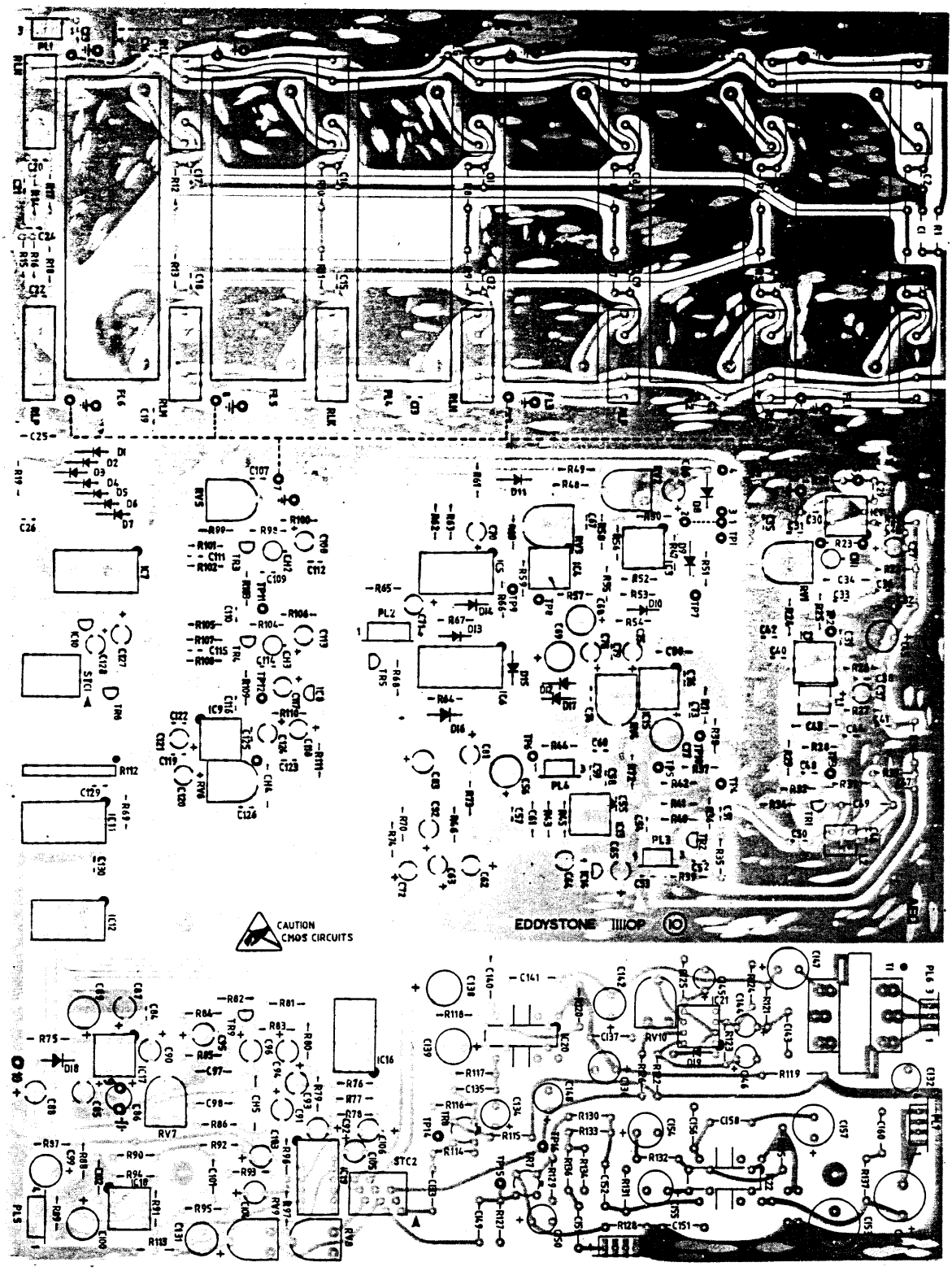
11112P
RF/1st IF Board Reference 7



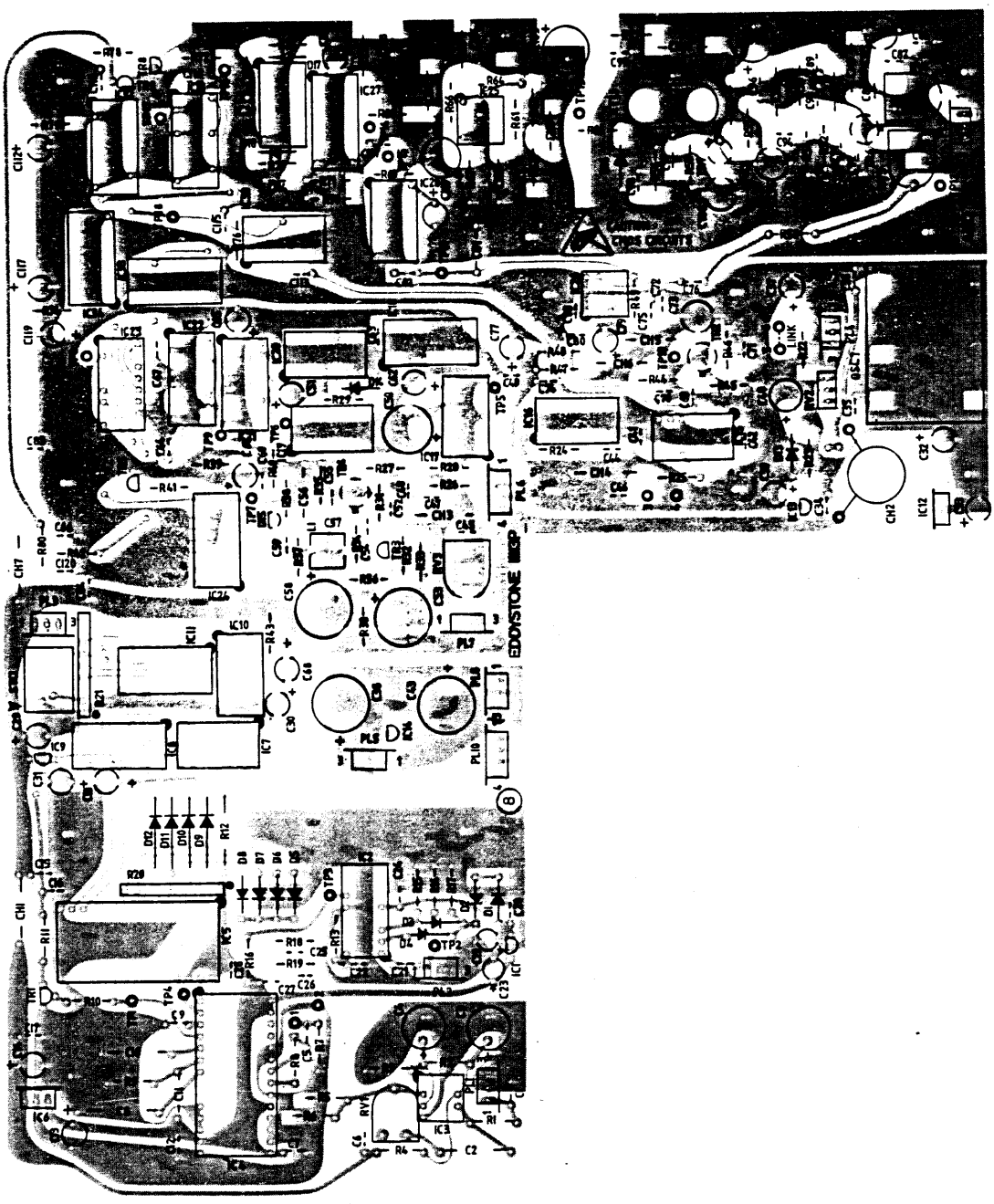
11110P
Main IF & Audio Board Reference 10



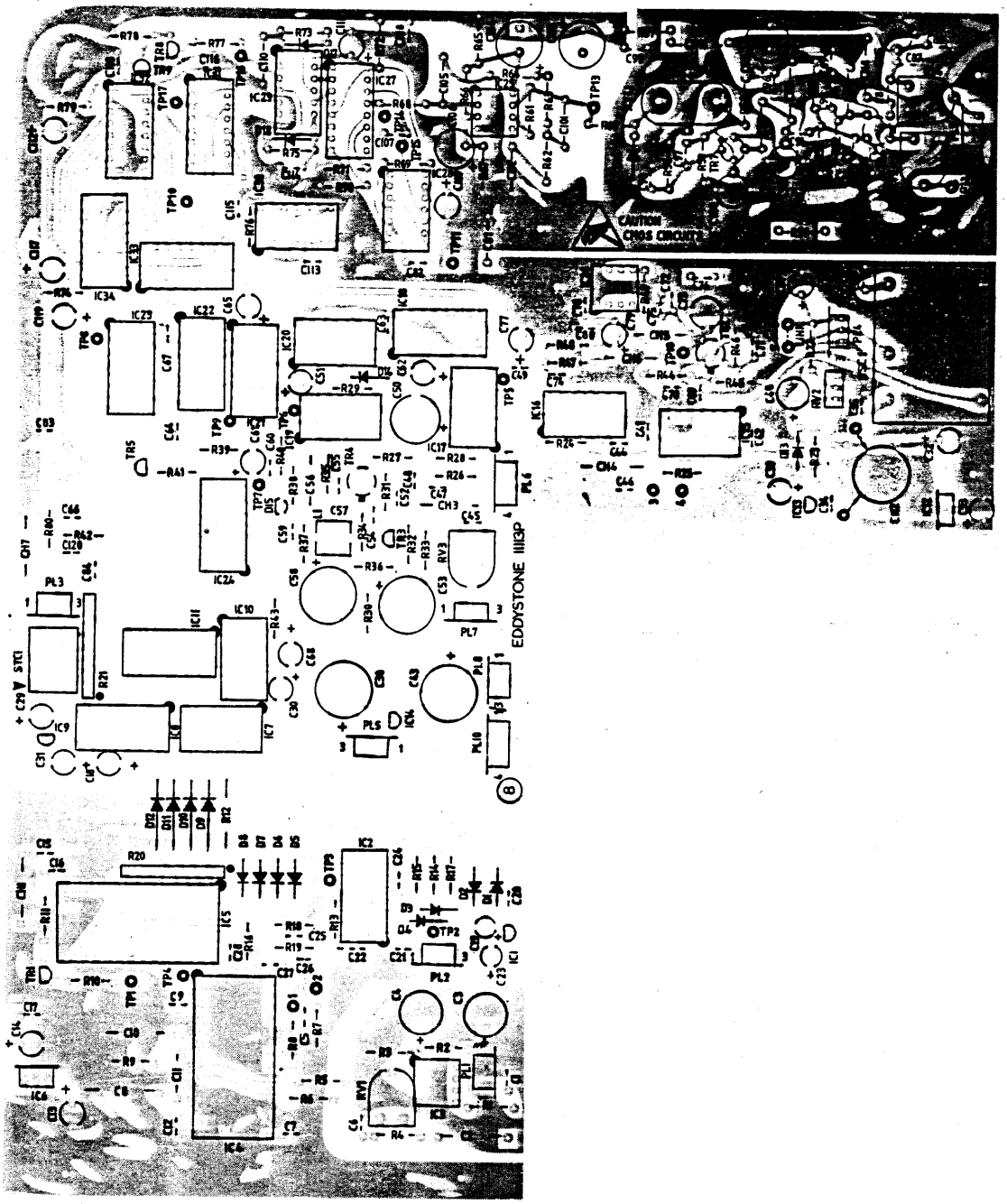
11110P
Main IF & Audio Board Reference 10



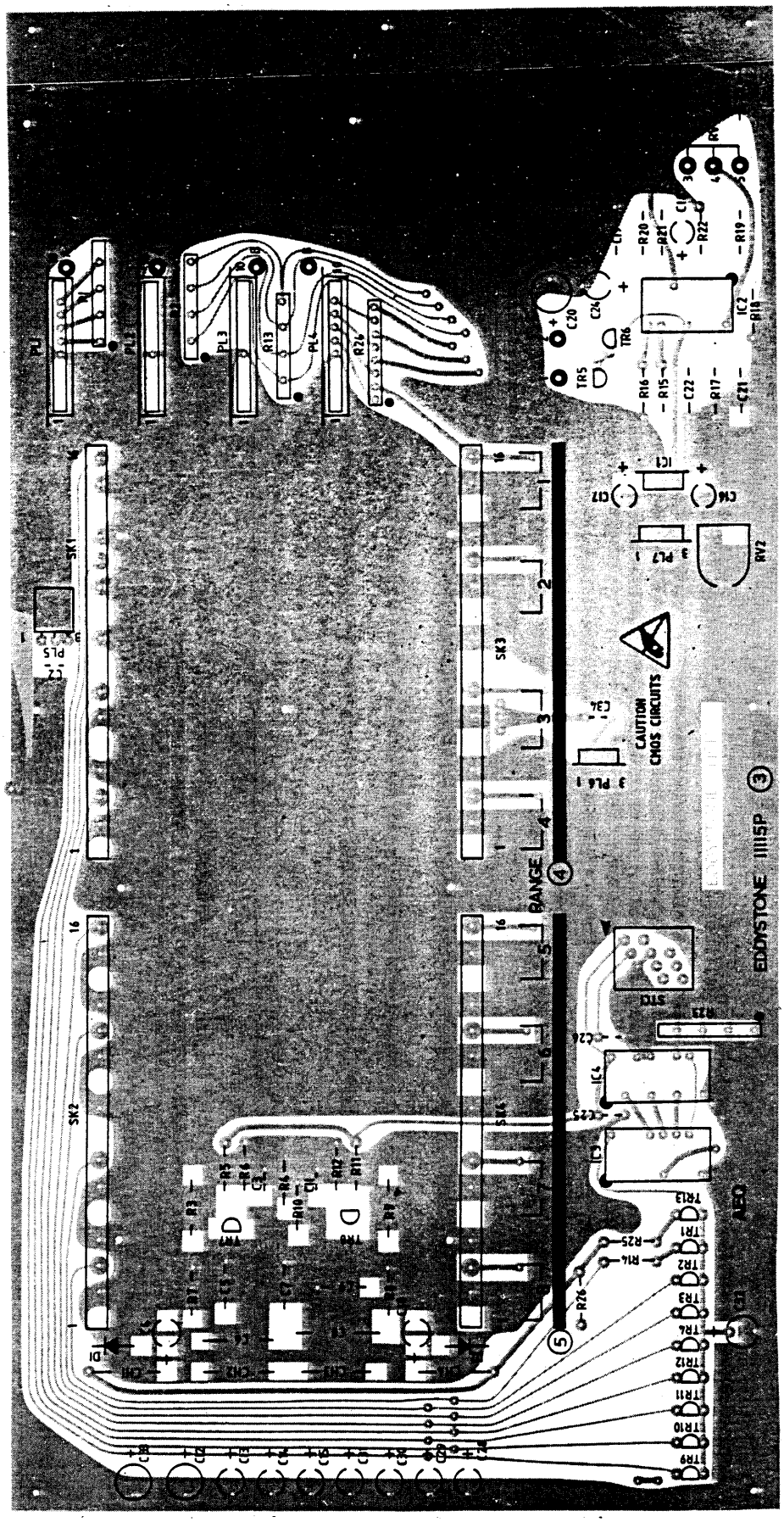
11113P
Synthesiser Board Reference 8



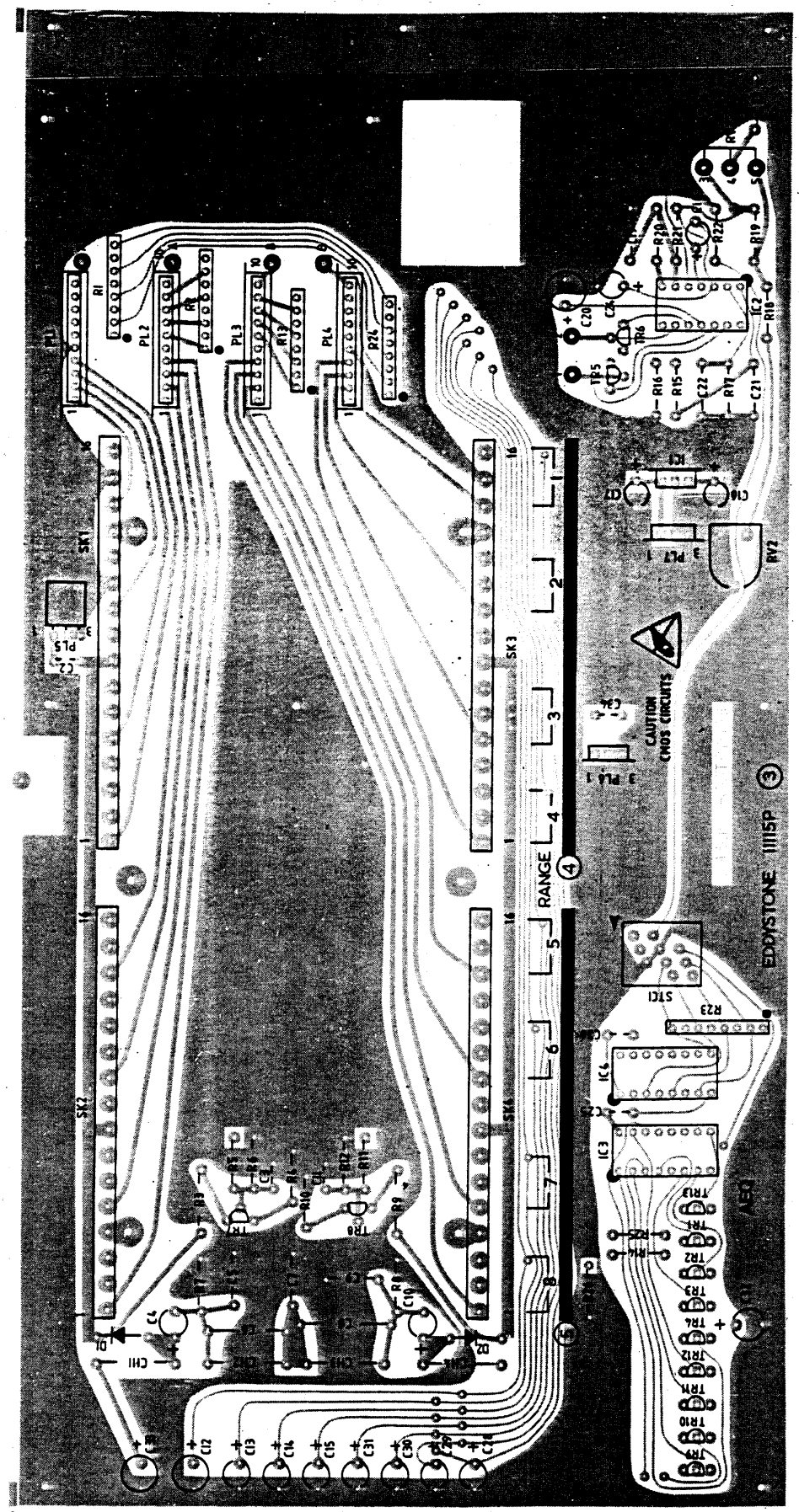
11113P
Synthesiser Board Reference 8



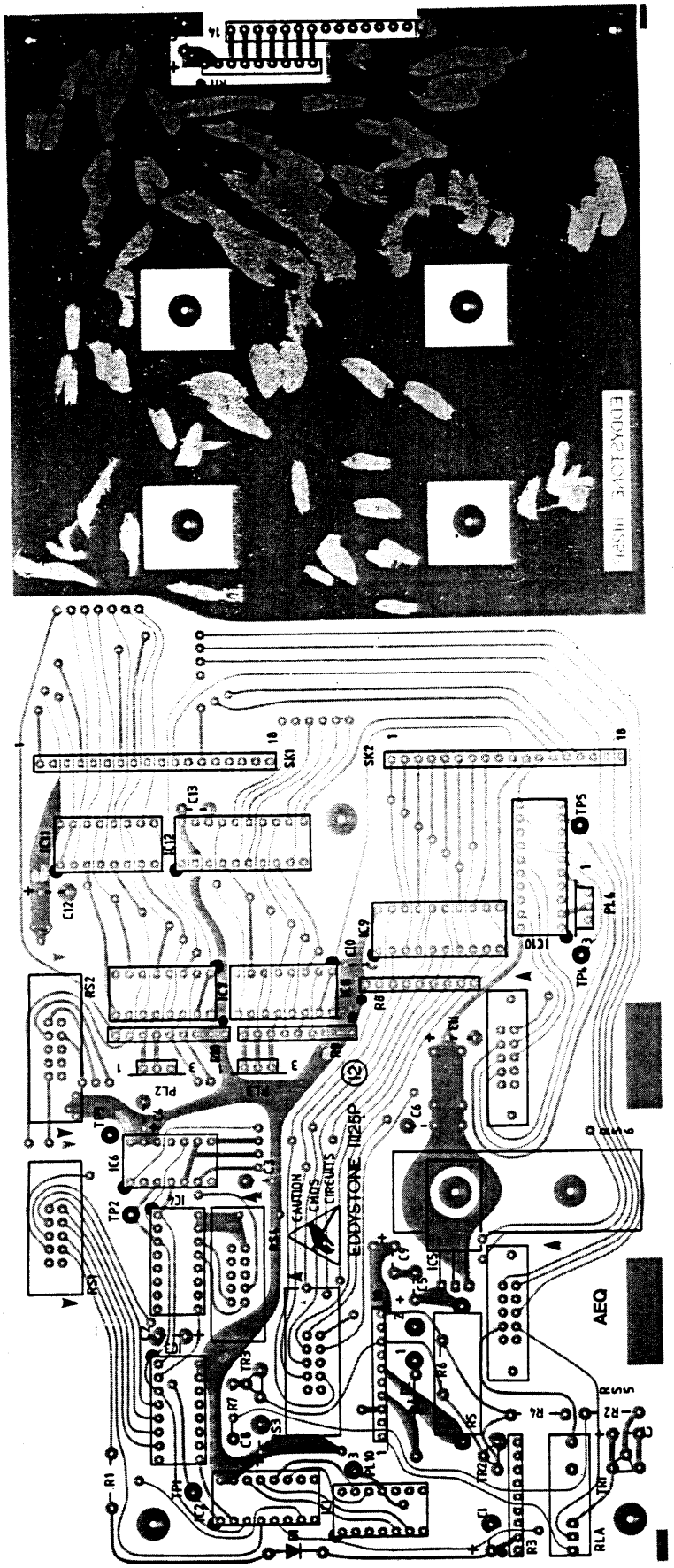
11115P
Preselector Board Reference 3



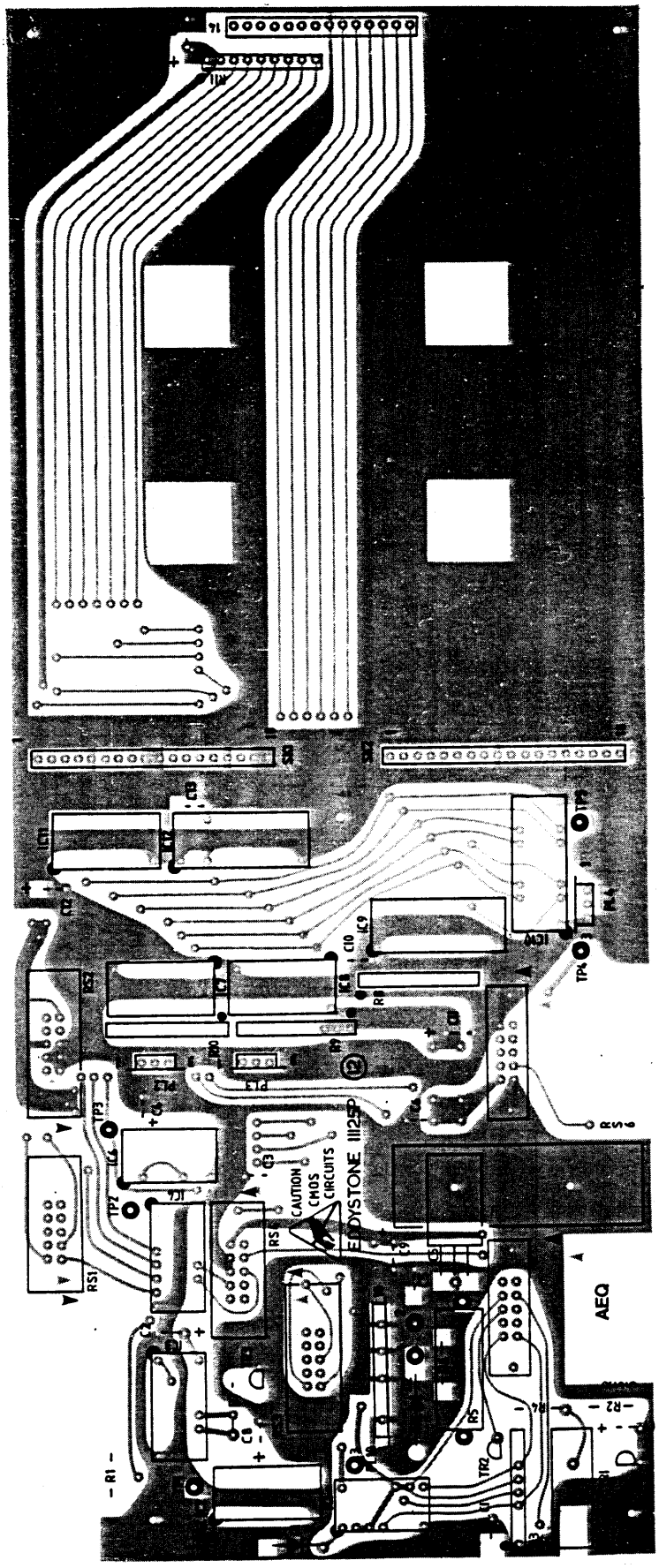
11115P
Preselector Board Reference 3



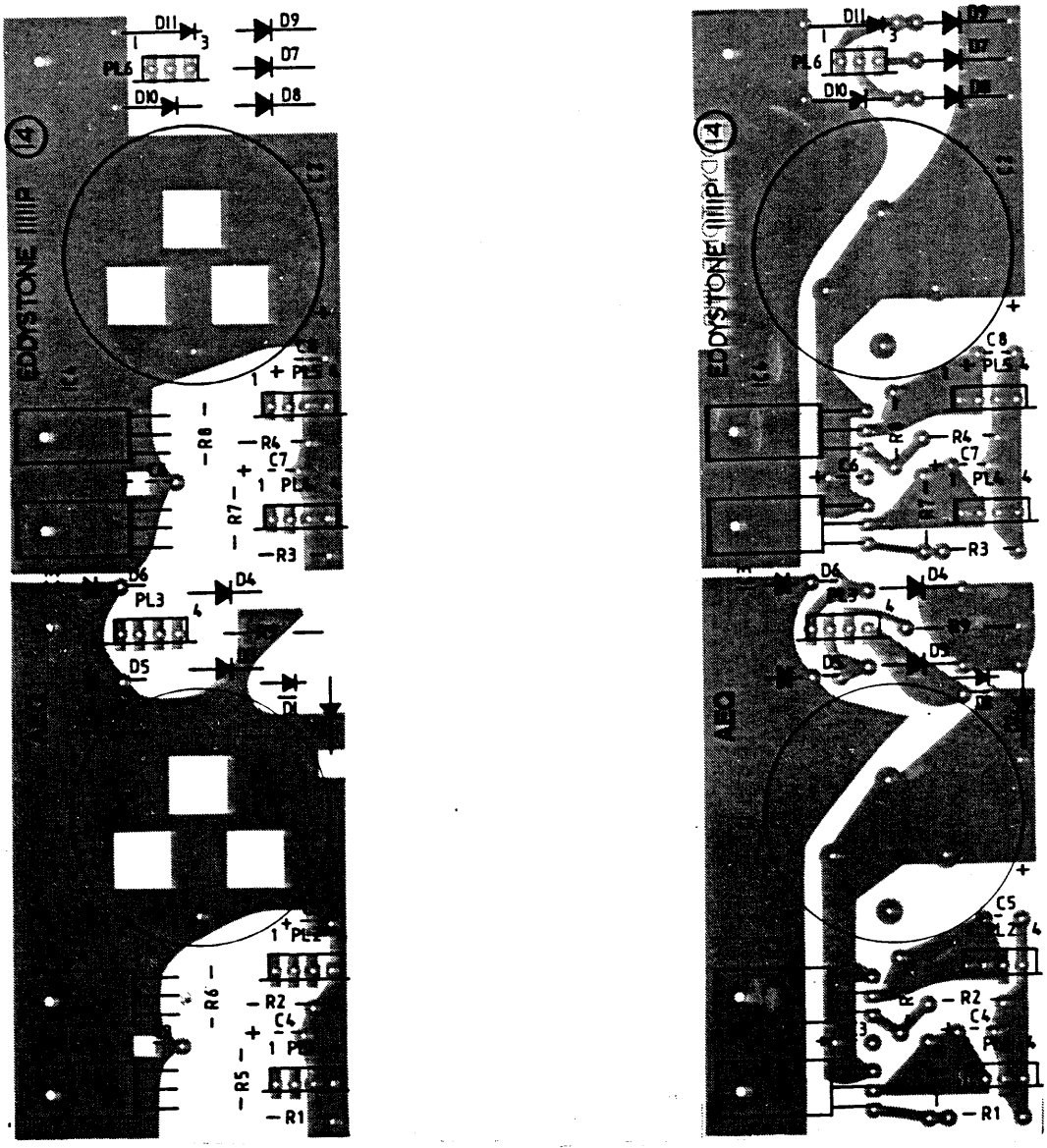
11125P
Interface Board Reference 12



11125P
Interface Board Reference 12

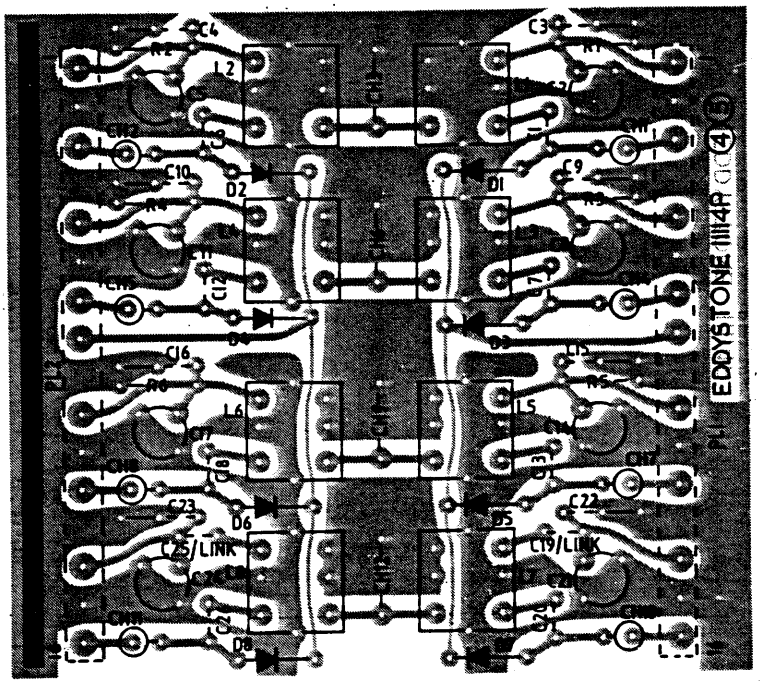


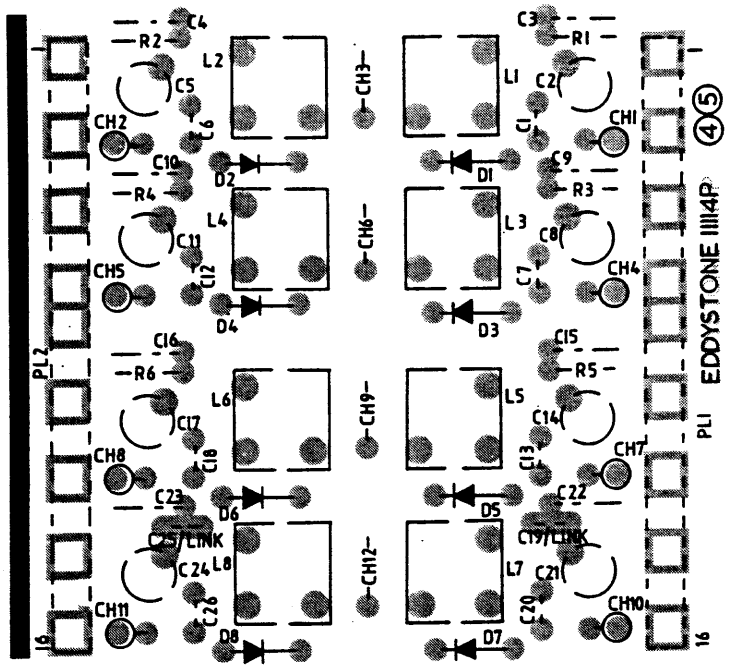
11111P
Power Supply Board Reference 14



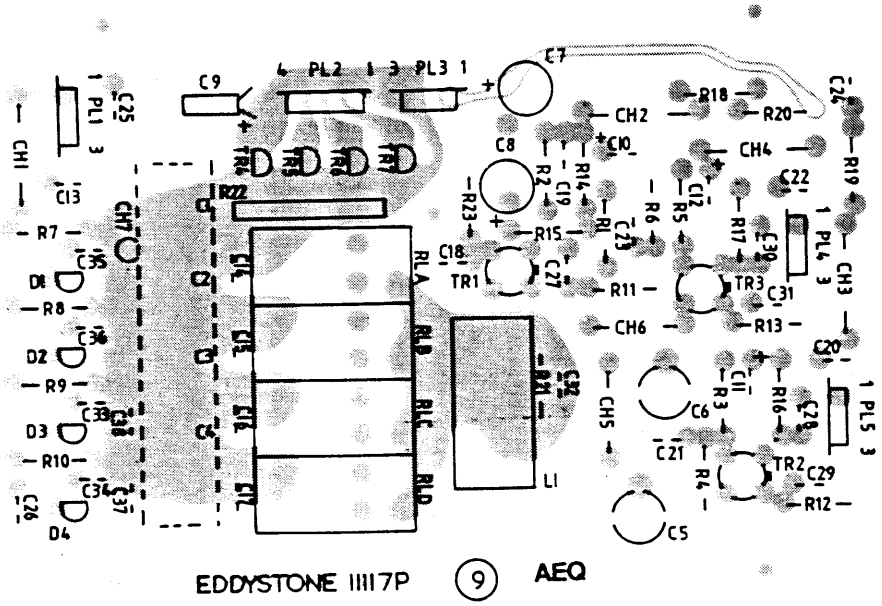
11116P
Relay Board Reference 3

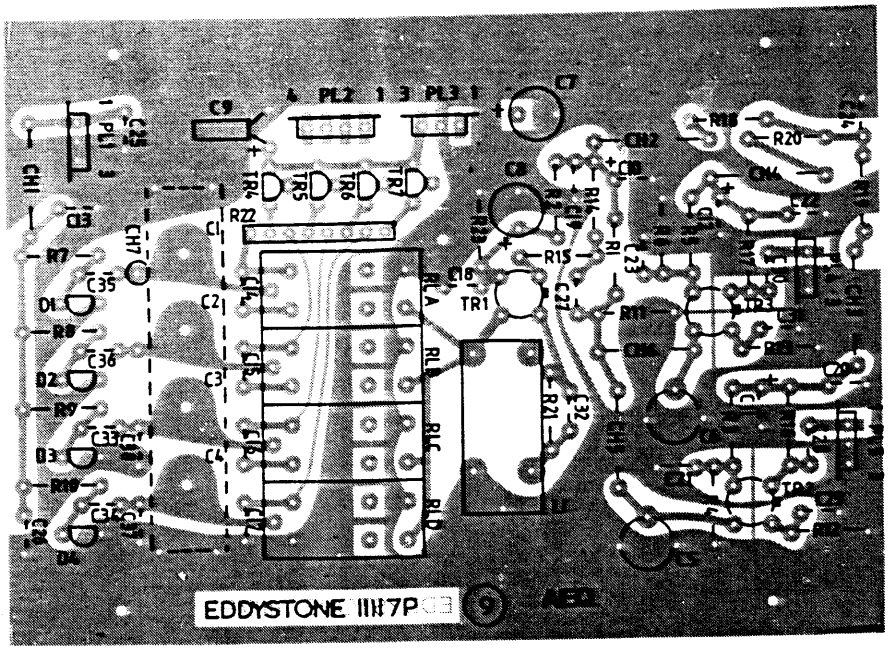
11114P
Preselector Coil Board Reference 4 & 5



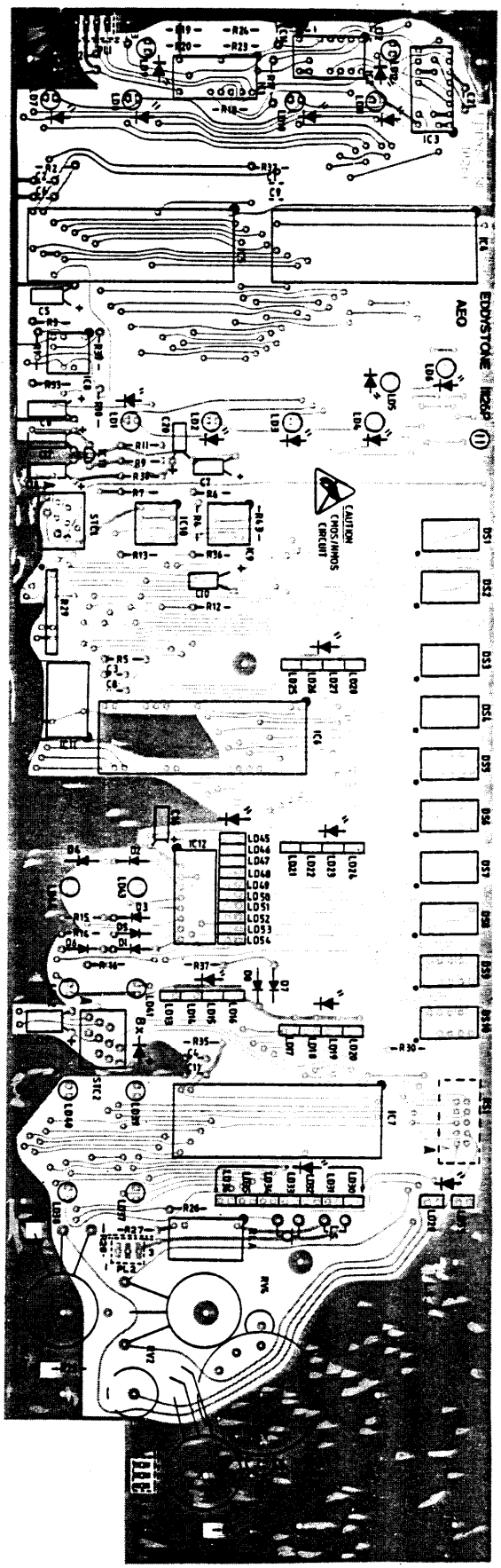


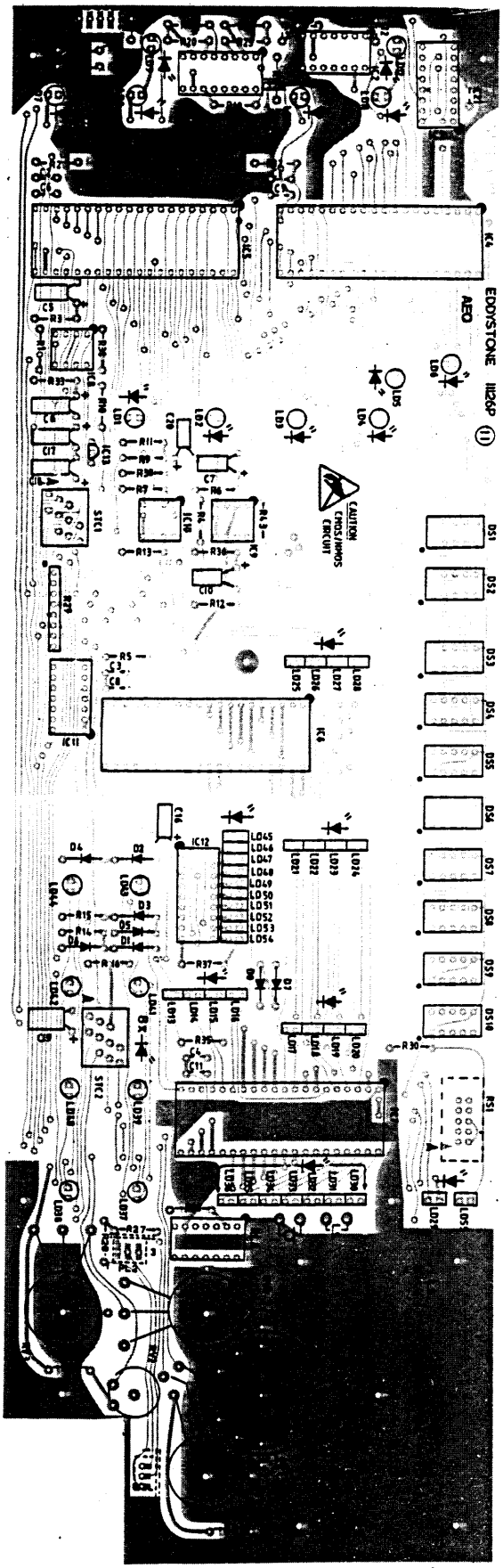
11117P
VCO Board Reference 9



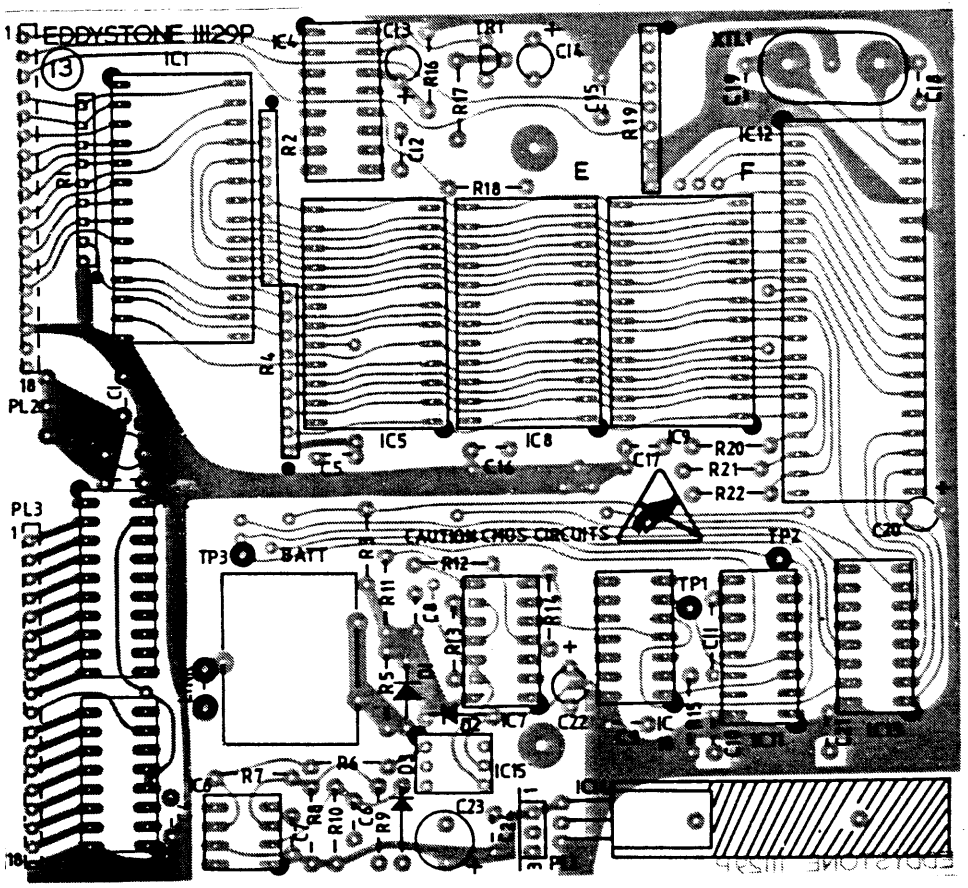


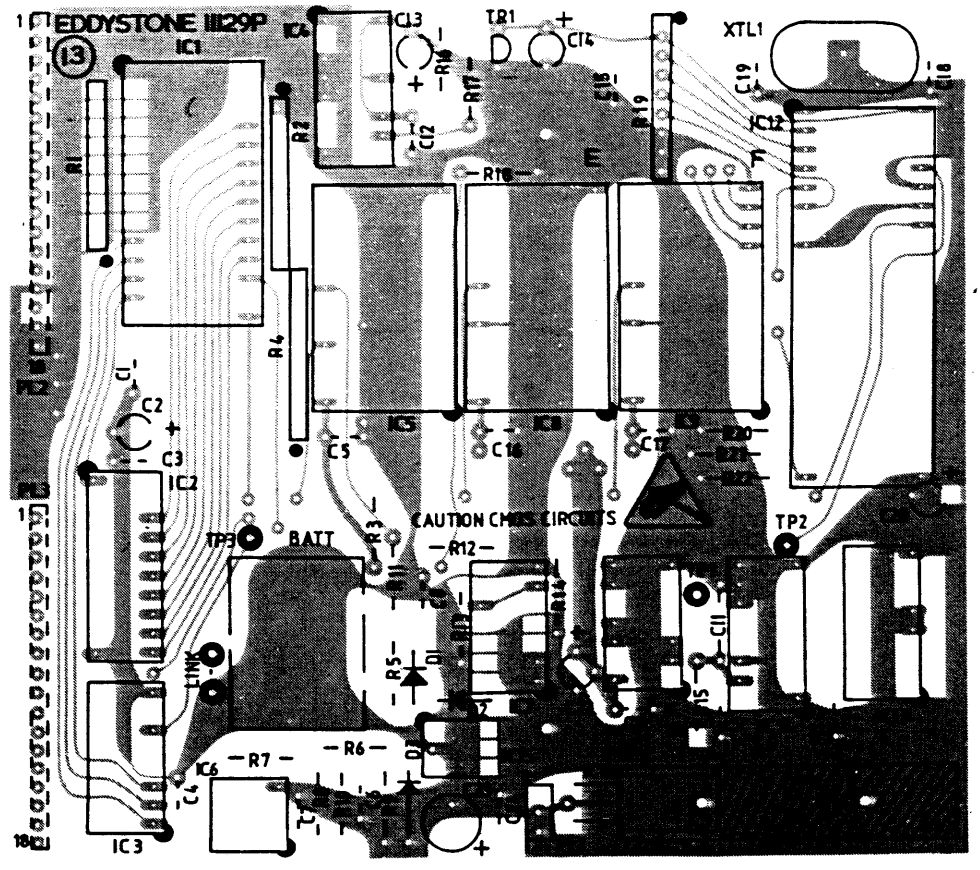
11126P
Display Board Reference 11



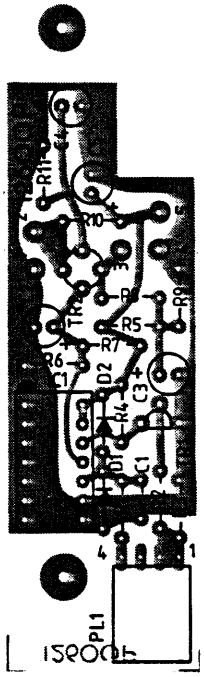


11129P
Microcomputer Board Reference 13

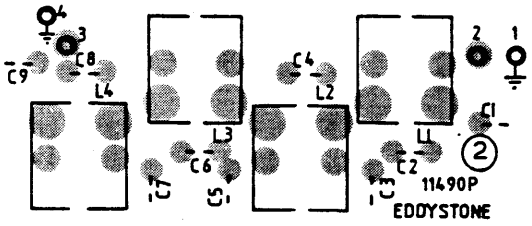


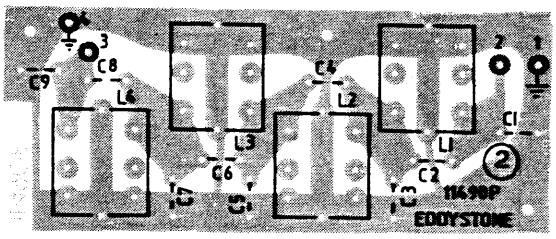


12600P
Line Attenuation Board Reference 39



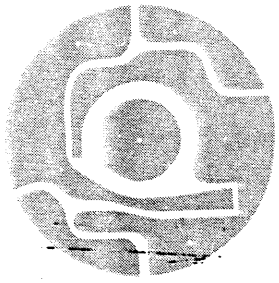
11490P
Low Pass Filter Board Reference 2





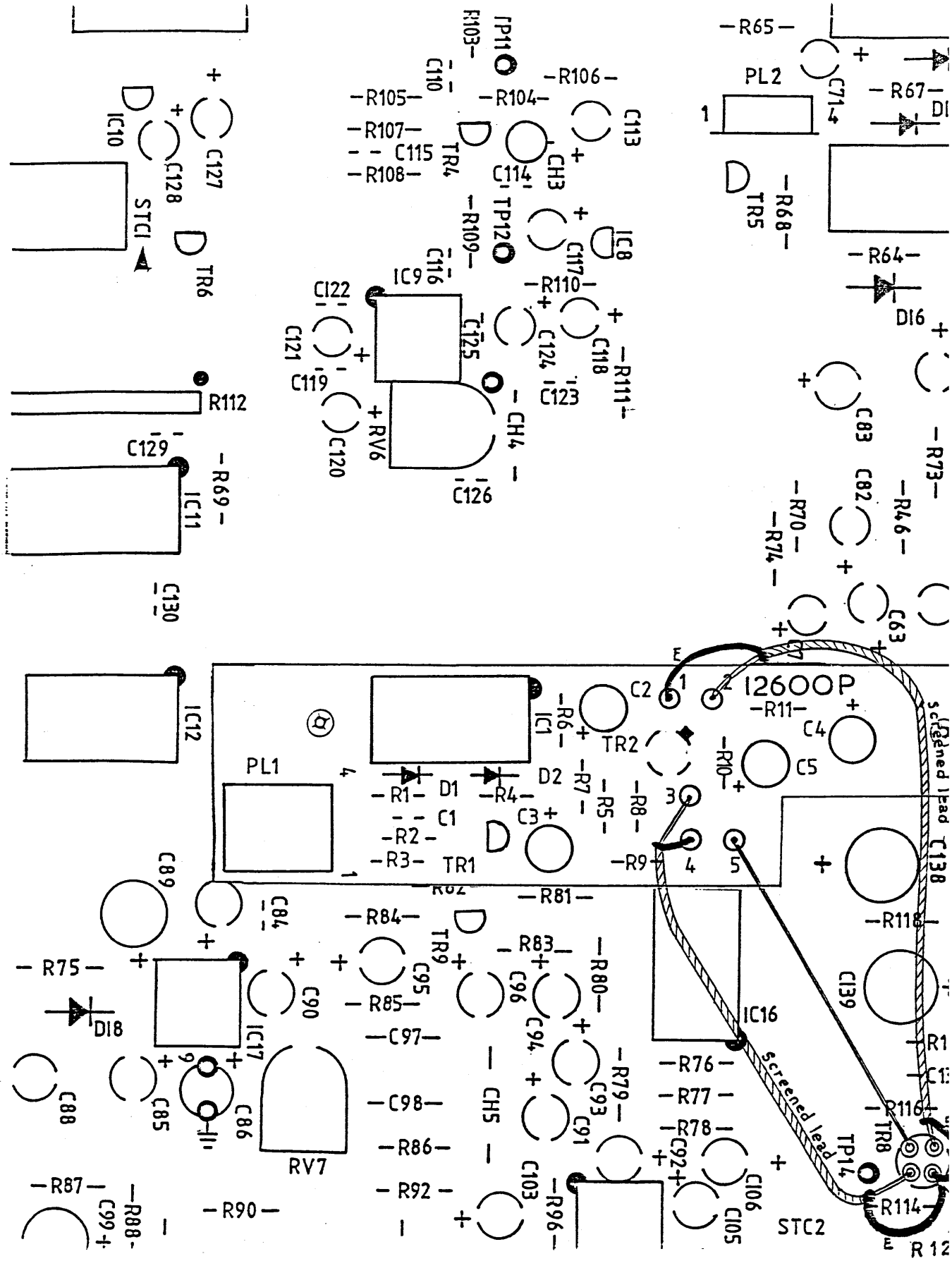
11235P
Infra-Red Sensor Board Reference 16

(First Side)

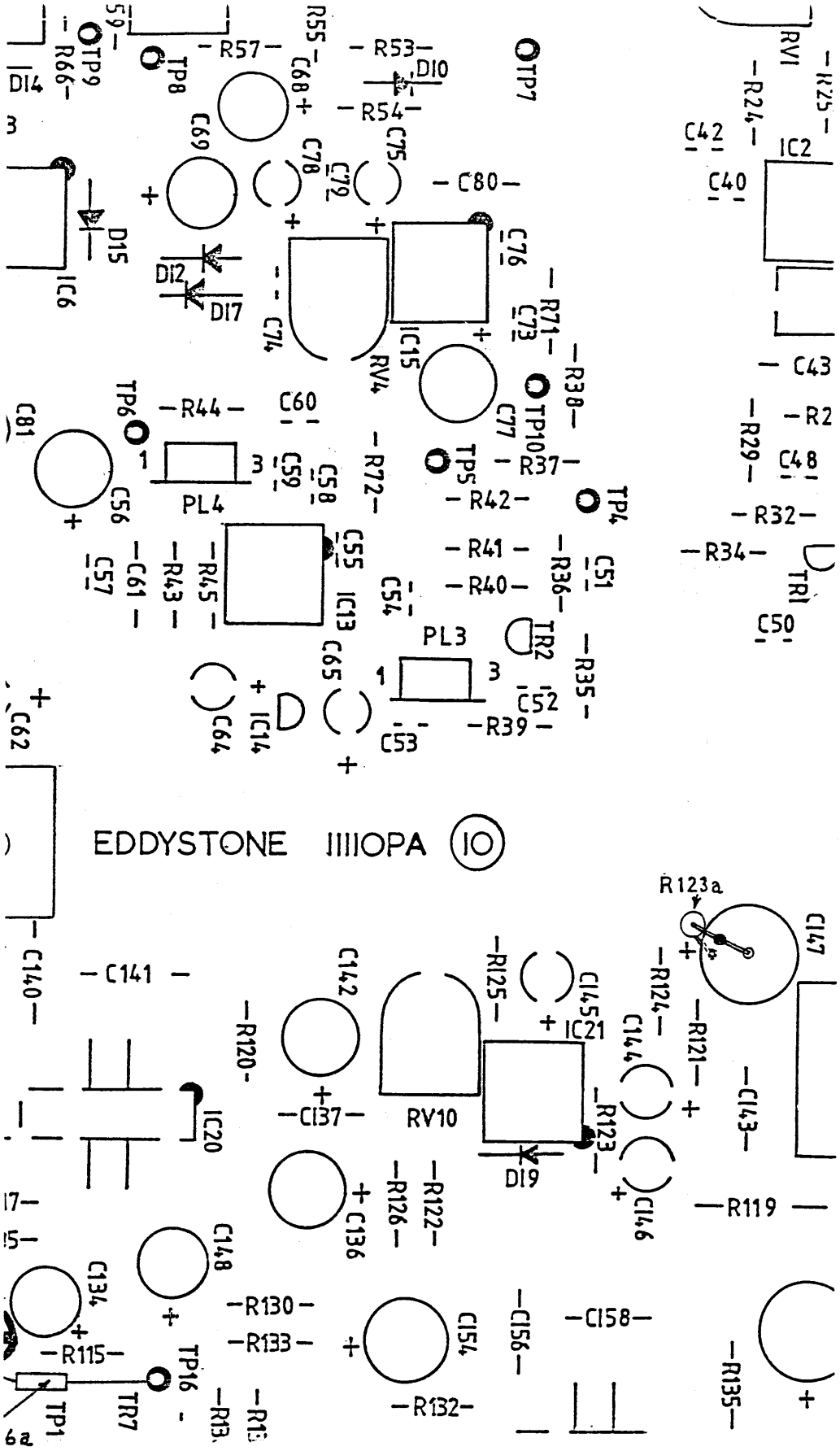


11235P
Infra-Red Source Board Reference 15

(Second Side)

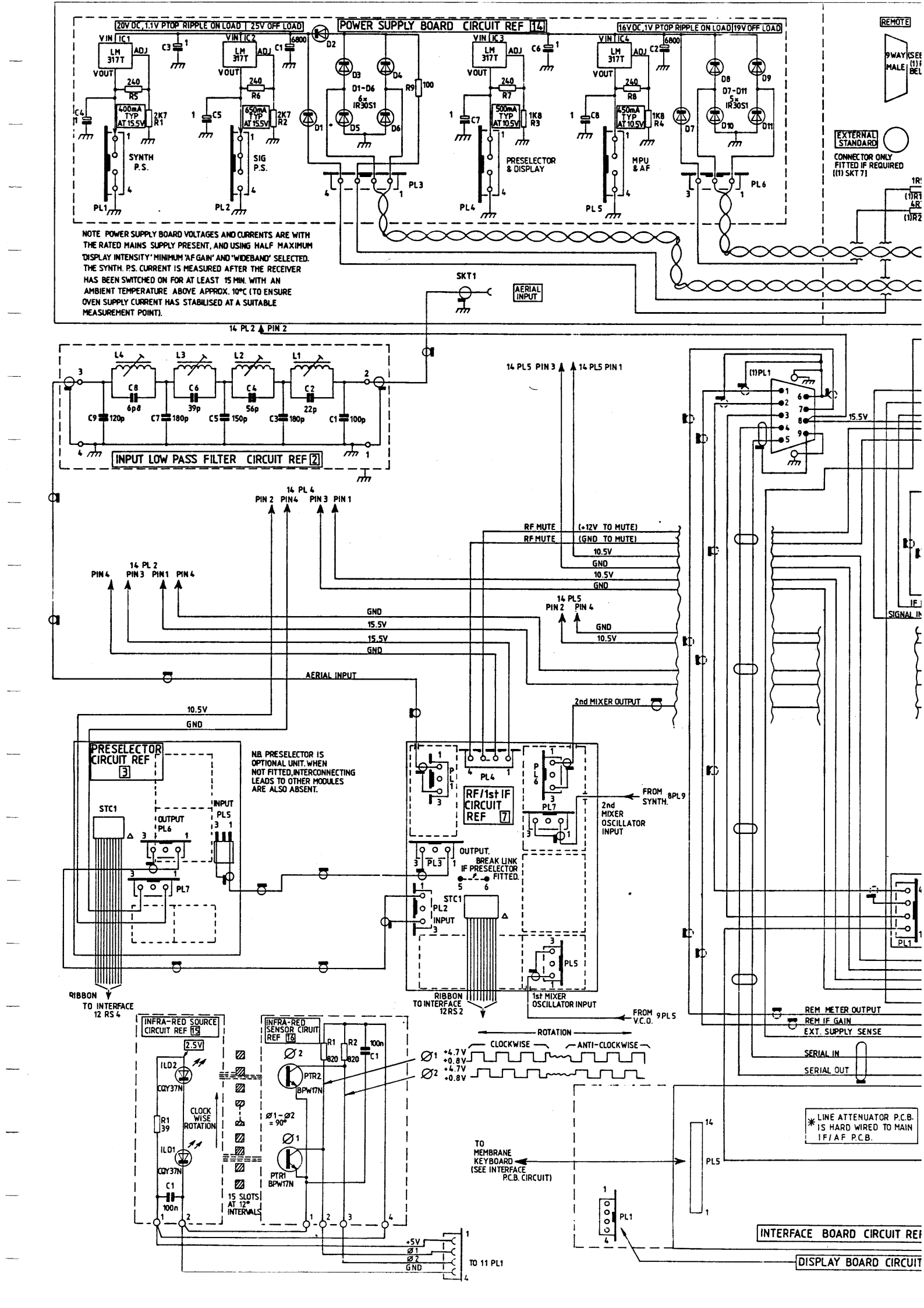


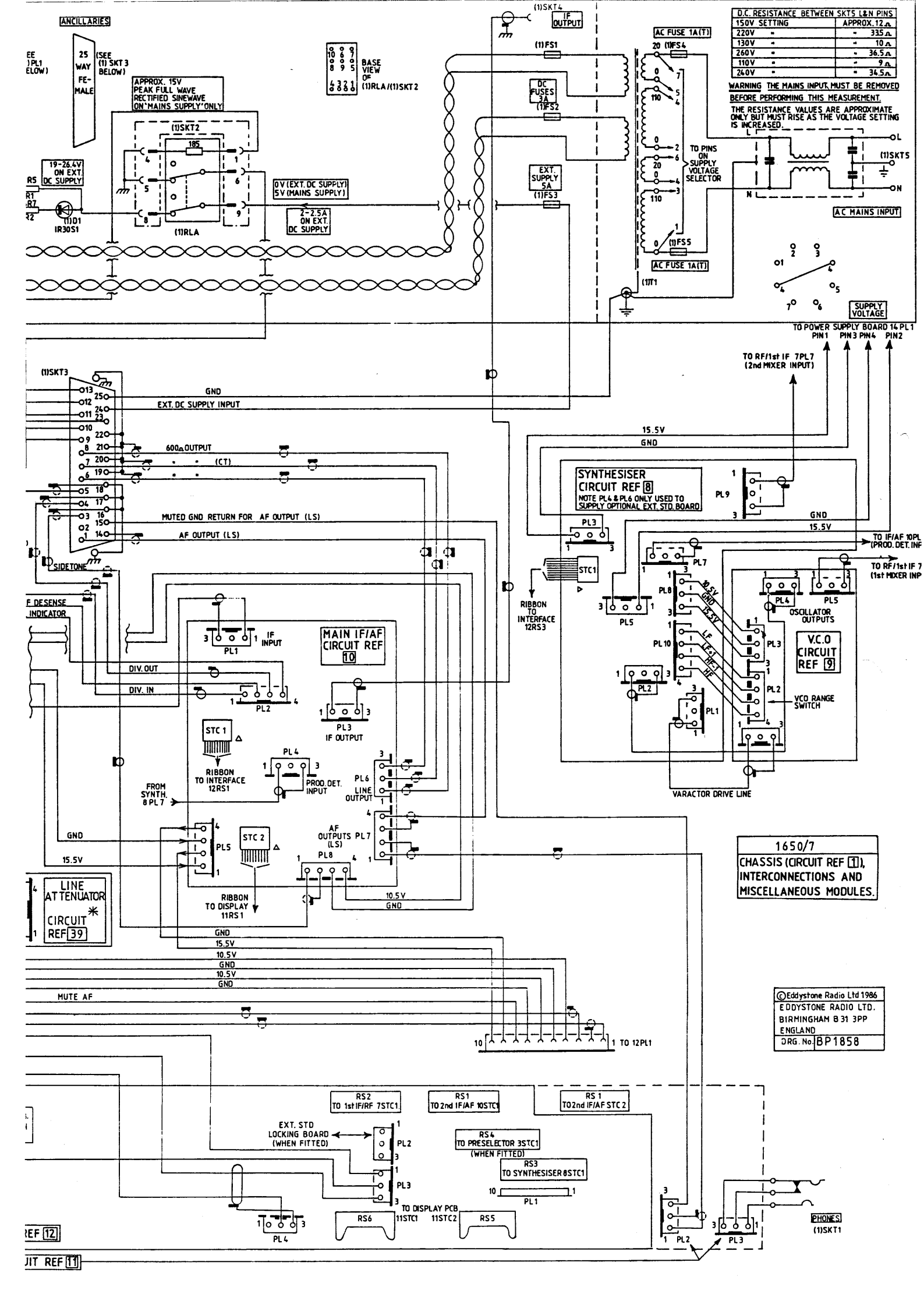
CONNECTIONS TO LINE ATTENUATOR P.C.B. & ADDI



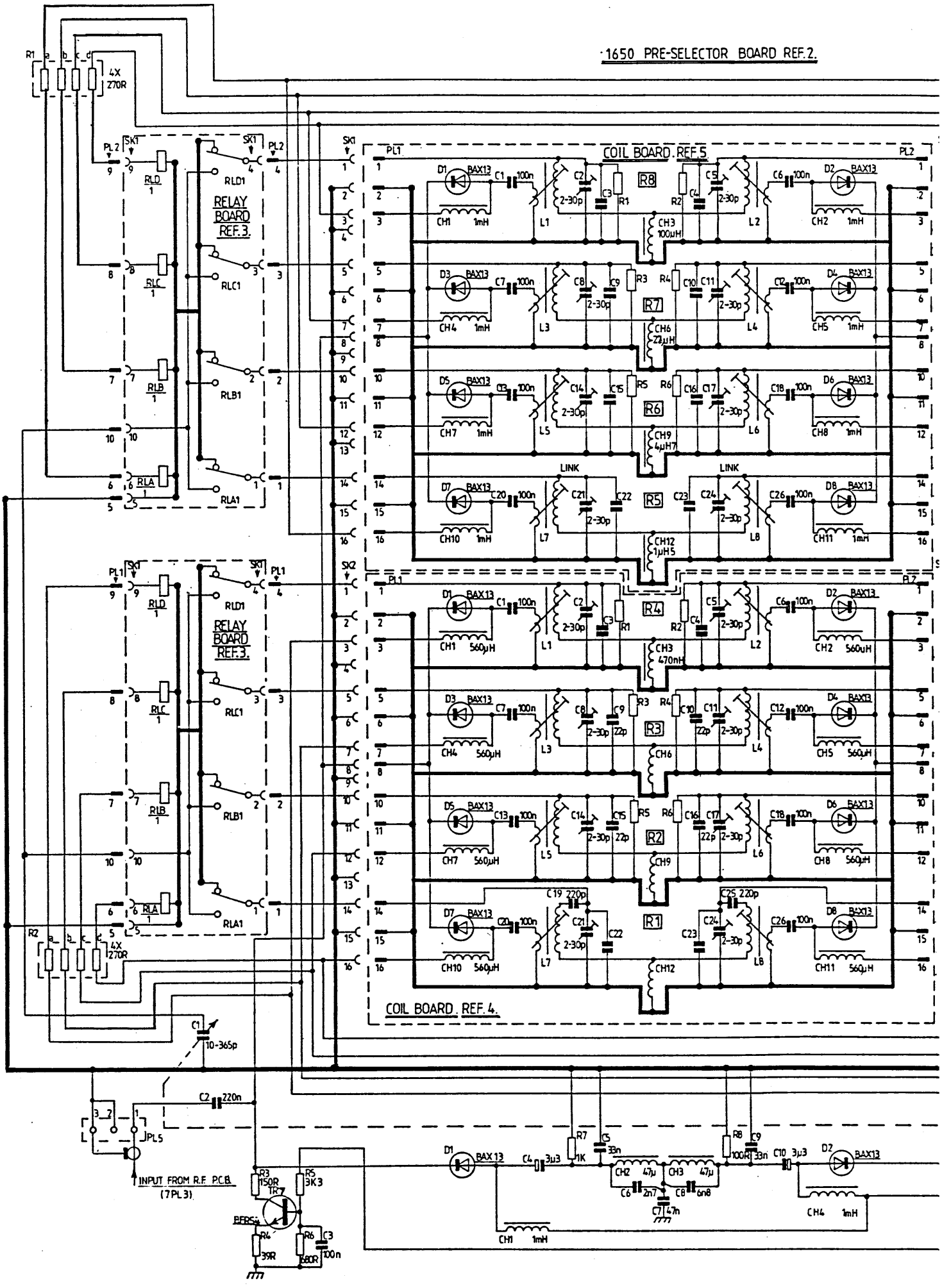
TIONAL RESISTORS FOR 165017

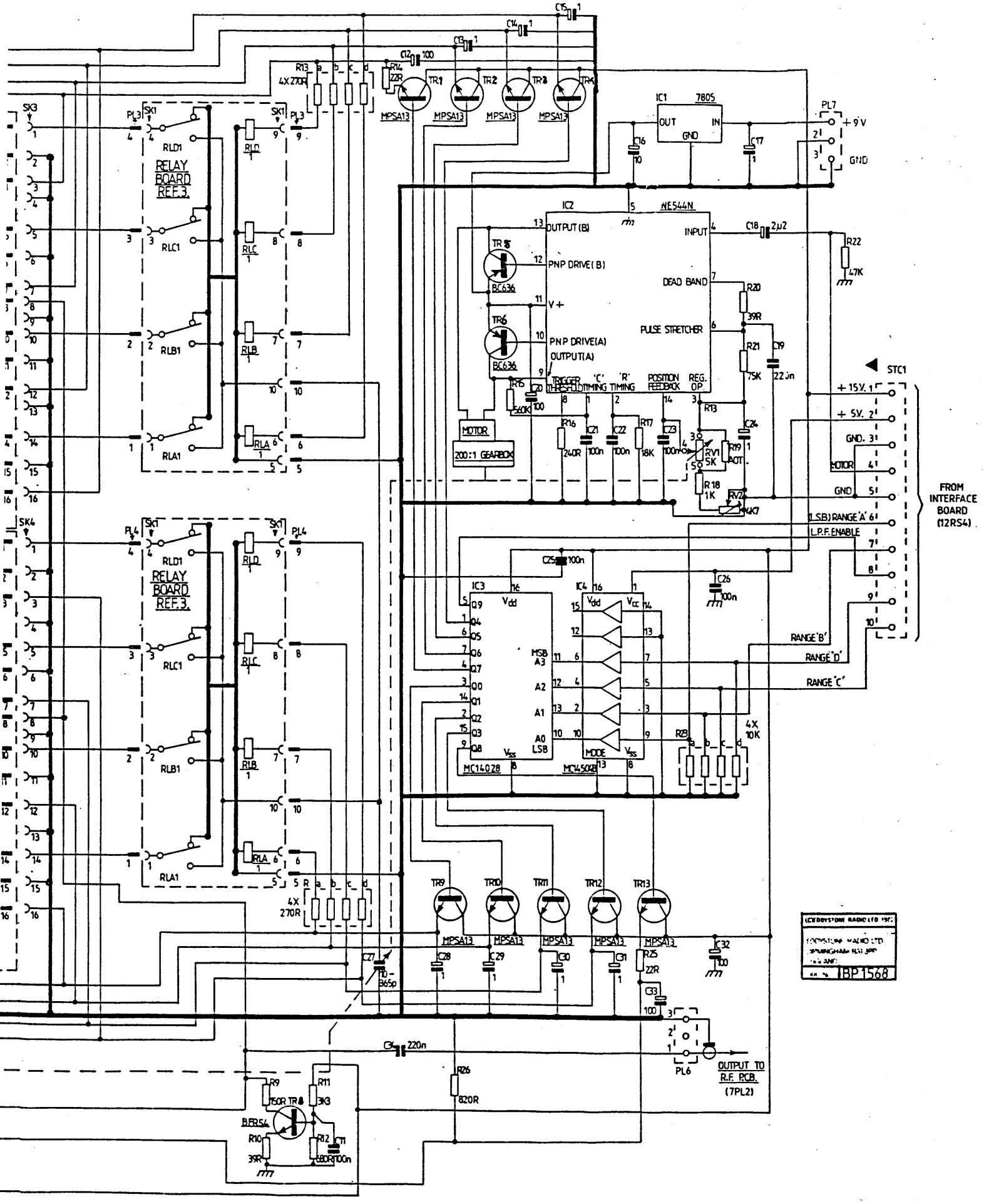
FIG.5.7.

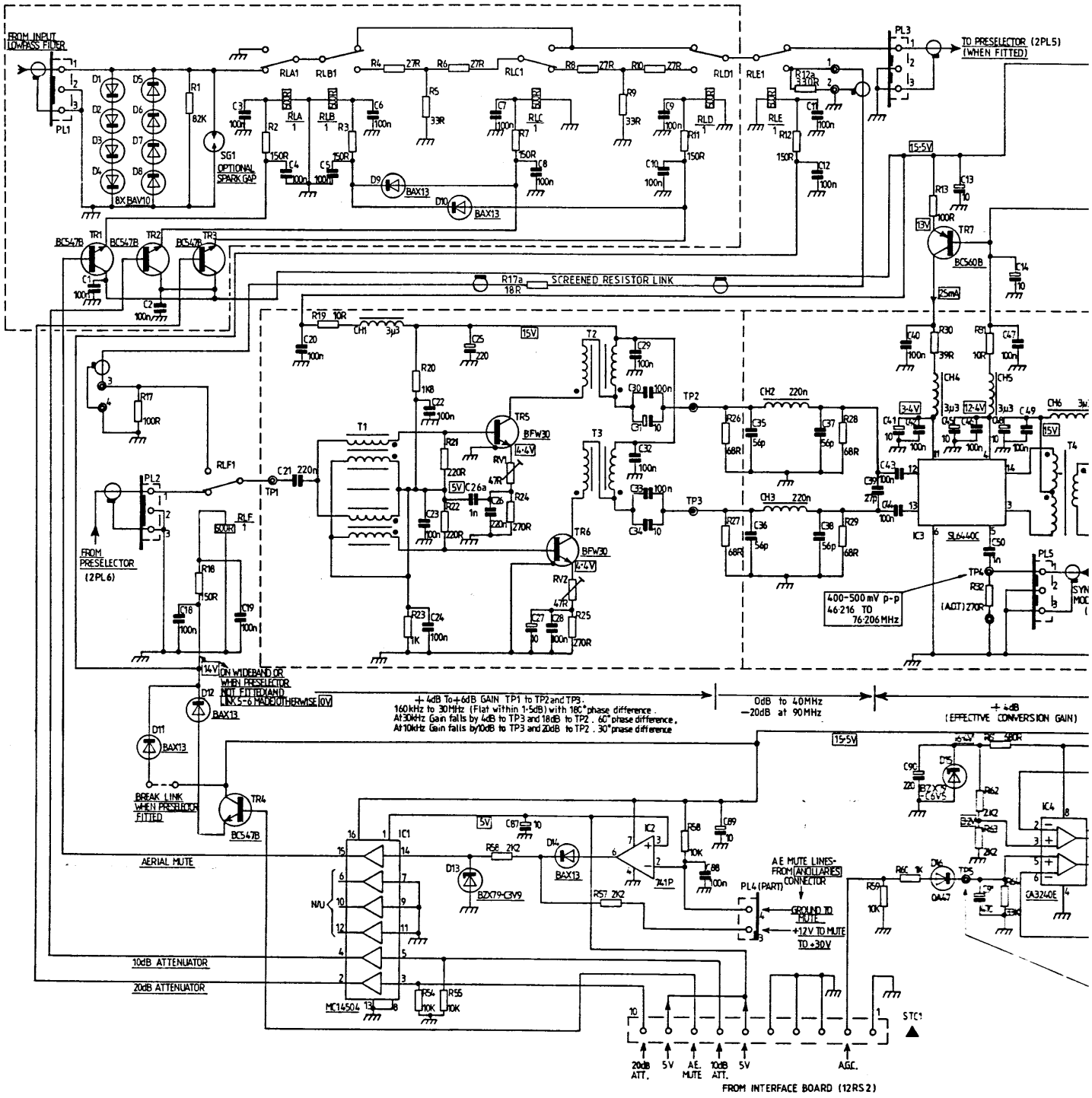

POWER SUPPLY BOARD CIRCUIT REF 14
20V DC, 1.1V PTOP RIPPLE ON LOAD 25V OFF LOAD
16V DC, 1V PTOP RIPPLE ON LOAD 19V OFF LOAD
IC1 LM 317T
IC2 LM 317T
IC3 LM 317T
IC4 LM 317T
SYNTH P.S.
SIG P.S.
PRESELECTOR & DISPLAY
MPU & AF
PL1
PL2
PL3
PL4
PL5
PL6
NOTE POWER SUPPLY BOARD VOLTAGES AND CURRENTS ARE WITH THE RATED MAINS SUPPLY PRESENT, AND USING HALF MAXIMUM 'DISPLAY INTENSITY' MINIMUM 'AF GAIN' AND 'WIDEBAND' SELECTED. THE SYNTH. P.S. CURRENT IS MEASURED AFTER THE RECEIVER HAS BEEN SWITCHED ON FOR AT LEAST 15 MIN. WITH AN AMBIENT TEMPERATURE ABOVE APPROX. 10°C (TO ENSURE OVEN SUPPLY CURRENT HAS STABILISED AT A SUITABLE MEASUREMENT POINT).
REMOTE
9WAY MALE
EXTERNAL STANDARD
CONNECTOR ONLY FITTED IF REQUIRED ((1) SKT 7)
SKT1
AERIAL INPUT
INPUT LOW PASS FILTER CIRCUIT REF 2
14 PL 2 PIN 2
14 PL 5 PIN 3
14 PL 5 PIN 1
14 PL 4 PIN 2 PIN 4 PIN 3 PIN 1
14 PL 2 PIN 4 PIN 3 PIN 1 PIN 4
14 PL 5 PIN 2 PIN 4
RF MUTE (+12V TO MUTE)
RF MUTE (GND TO MUTE)
10.5V
GND
15.5V
AERIAL INPUT
2nd MIXER OUTPUT
PRESELECTOR CIRCUIT REF 3
N.B. PRESELECTOR IS OPTIONAL UNIT. WHEN NOT FITTED, INTERCONNECTING LEADS TO OTHER MODULES ARE ALSO ABSENT.
RF/1st IF CIRCUIT REF 7
FROM SYNTH. 8PL9
2nd MIXER OSCILLATOR INPUT
BREAK LINK IF PRESELECTOR FITTED.
1st MIXER OSCILLATOR INPUT
FROM V.C.O. 9PL5
RIBBON TO INTERFACE 12 RS 4
RIBBON TO INTERFACE 12 RS 2
INFRA-RED SOURCE CIRCUIT REF 15
INFRA-RED SENSOR CIRCUIT REF 16
ROTATION
CLOCKWISE
ANTI-CLOCKWISE
REM METER OUTPUT
REM IF GAIN
EXT. SUPPLY SENSE
SERIAL IN
SERIAL OUT
* LINE ATTENUATOR P.C.B. IS HARD WIRED TO MAIN IF/AF P.C.B.
TO MEMBRANE KEYBOARD (SEE INTERFACE P.C.B. CIRCUIT)
INTERFACE BOARD CIRCUIT REF
DISPLAY BOARD CIRCUIT
TO 11 PL1

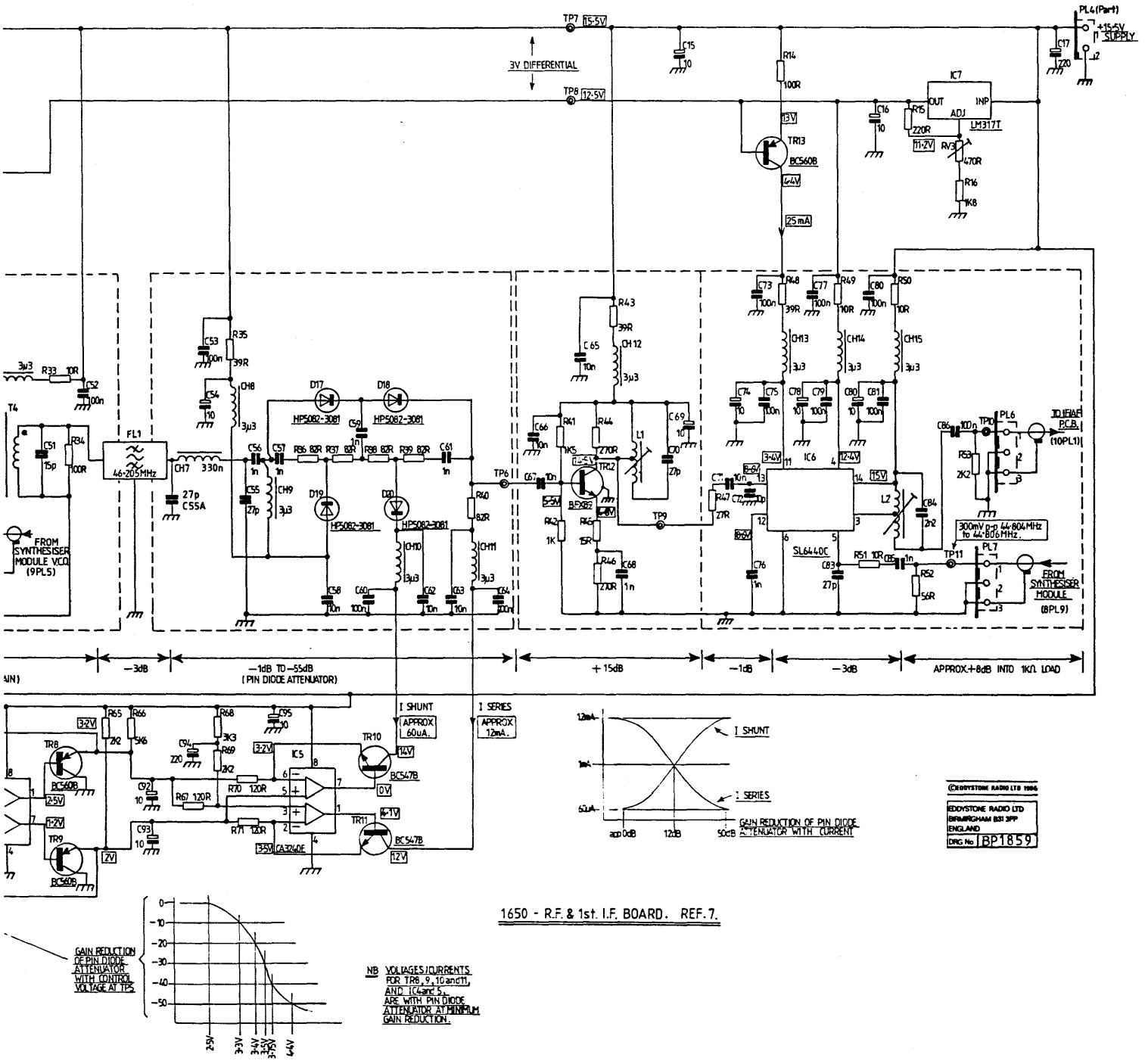

ANCILLARIES
25 WAY FE-MALE
(SEE (1) SKT 3 BELOW)
APPROX. 15V PEAK FULL WAVE RECTIFIED SINEWAVE ON 'MAINS SUPPLY' ONLY
(1)SKT2
185
19-26.4V ON EXT. DC SUPPLY
(1)D1 IR30S1
(1)RLA
0V (EXT. DC SUPPLY) 5V (MAINS SUPPLY)
2-2.5A ON EXT. DC SUPPLY
BASE VIEW OF (1)RLA/(1)SKT2
(1)SKT4
IF OUTPUT
(1)FS1
DC FUSES 3A (1)FS2
EXT. SUPPLY 5A (1)FS3
AC FUSE 1A(T)
20 (1)FS4
TO PINS ON SUPPLY VOLTAGE SELECTOR
(1)FS5
AC FUSE 1A(T)
(1)T1
(1)SKT5
AC MAINS INPUT
SUPPLY VOLTAGE
D.C. RESISTANCE BETWEEN SKT5 L&N PINS
150V SETTING APPROX. 12Ω
220V " " 335Ω
130V " " 10Ω
260V " " 36.5Ω
110V " " 9Ω
240V " " 34.5Ω
WARNING THE MAINS INPUT MUST BE REMOVED BEFORE PERFORMING THIS MEASUREMENT.
THE RESISTANCE VALUES ARE APPROXIMATE ONLY BUT MUST RISE AS THE VOLTAGE SETTING IS INCREASED.
TO POWER SUPPLY BOARD 14 PL1
PIN1 PIN3 PIN4 PIN2
TO RF/1st IF 7PL7 (2nd MIXER INPUT)
(1)SKT3
GND
EXT. DC SUPPLY INPUT
600Ω OUTPUT
(CT)
MUTED GND RETURN FOR AF OUTPUT (LS)
AF OUTPUT (LS)
SIDETONE
15.5V
GND
SYNTHESISER CIRCUIT REF 8
NOTE PL4 & PL6 ONLY USED TO SUPPLY OPTIONAL EXT. STD. BOARD
PL9
PL3
STC1
RIBBON TO INTERFACE 12RS3
TO IF/AF 10PL (PROD. DET. INP
TO RF/1st IF 7 (1st MIXER INP
PL7
PL8
PL5
PL10
PL4
OSCILLATOR OUTPUTS
V.C.O CIRCUIT REF 9
VCO RANGE SWITCH
VARACTOR DRIVE LINE
F DESENSE INDICATOR
IF INPUT
PL1
MAIN IF/AF CIRCUIT REF 10
DIV. OUT
DIV. IN
PL2
PL3
IF OUTPUT
STC 1
RIBBON TO INTERFACE 12RS1
PL4
PROD. DET. INPUT
FROM SYNTH. 8 PL7
PL6
LINE OUTPUT
AF OUTPUTS PL7 (LS)
PL5
STC 2
PL8
RIBBON TO DISPLAY 11RS1
10.5V
GND
LINE ATTENUATOR CIRCUIT REF 39
GND
15.5V
10.5V
GND
10.5V
GND
MUTE AF
10 1 TO 12PL1
1650/7
CHASSIS (CIRCUIT REF 1), INTERCONNECTIONS AND MISCELLANEOUS MODULES.
©Eddystone Radio Ltd 1986
EDDYSTONE RADIO LTD.
BIRMINGHAM B 31 3PP
ENGLAND
DRG. No. BP1858
RS2 TO 1st IF/RF 7STC1
RS1 TO 2nd IF/AF 10STC1
RS 1 TO 2nd IF/AF STC 2
EXT. STD LOCKING BOARD (WHEN FITTED)
PL2
RS4 TO PRESELECTOR 3STC1 (WHEN FITTED)
RS3 TO SYNTHESISER 8STC1
PL3
PL1
TO DISPLAY PCB
11STC1 11STC2
RS6
RS5
PL4
PHONES
(1)SKT1
EF 12
JIT REF 11

1650 PRE-SELECTOR BOARD REF.2.



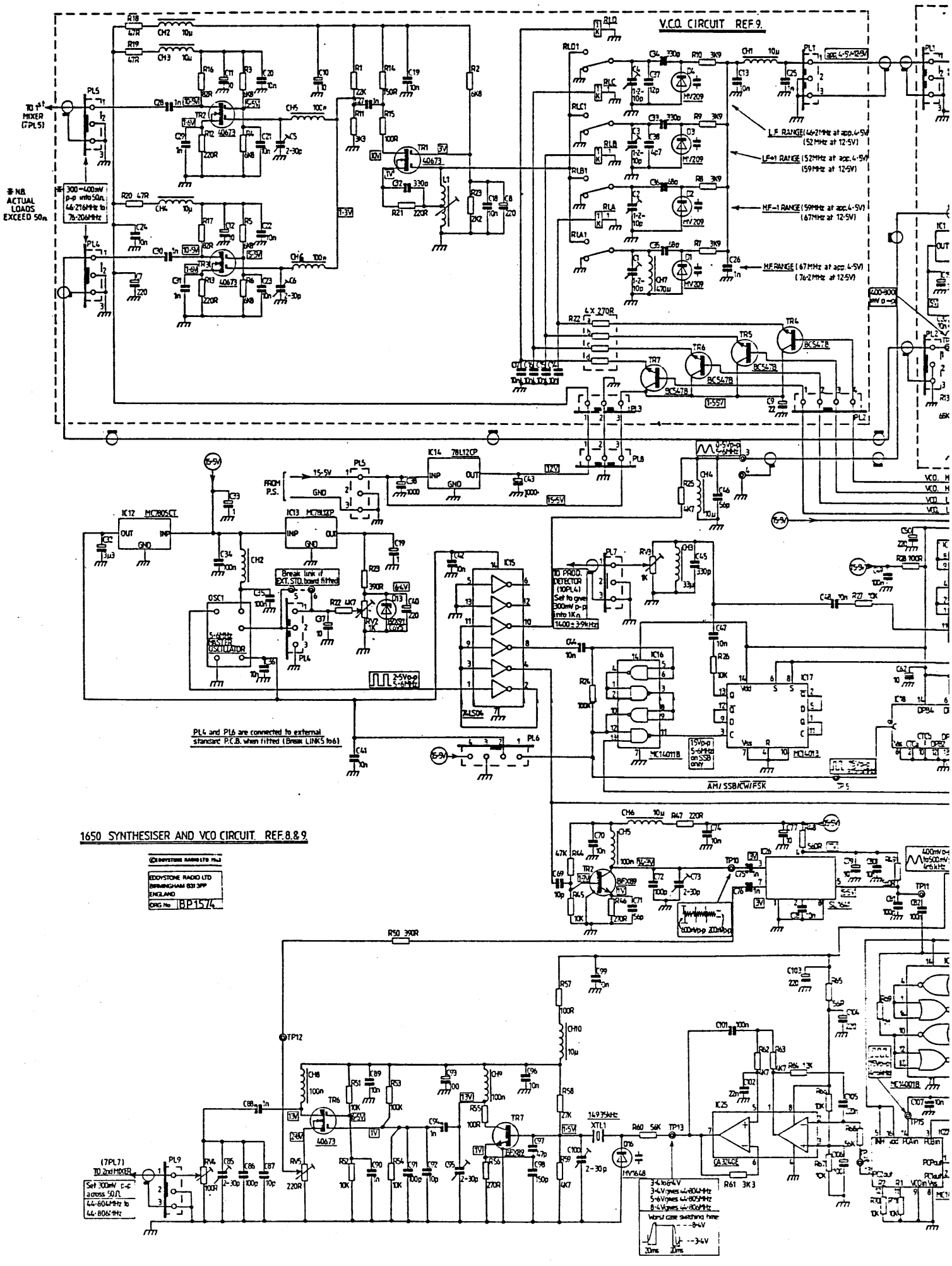

RELAY BOARD REF.3.
RELAY BOARD REF.3.
IC1 7805
IC2 NE544N
IC3 MC14028
IC4 MC14508
TR1 TR2 TR3 TR4 MPSA13
TR5 BC636
TR6 BC636
TR7 BFR54
TR8
TR9 TR10 TR11 TR12 TR13 MPSA13
MOTOR
200:1 GEARBOX
PL7 +9V GND
STC1
FROM INTERFACE BOARD (12RS4)
+15V. 1
+5V. 2
GND. 3
MOTOR 4
GND 5
(LSB) RANGE 'A' 6
L.P.F. ENABLE 7
RANGE 'B'
RANGE 'D'
RANGE 'C'
OUTPUT TO R.F. PCB. (7PL2)
PL6
4X 270R
4X 10K
IBP1568


FROM INPUT LOWPASS FILTER
PL1
D1
D2
D3
D4
D5
D6
D7
D8
8X BAV10
R1
82K
SG1
OPTIONAL SPARK GAP
RLA1
RLB1
RLC1
RLD1
RLE1
R4 27R
R6 27R
R8 27R
R10 27R
RLA
RLB
RLC
RLD
RLE
R2 150R
R3 150R
R5 33R
R7 150R
R9 33R
R11 150R
R12 150R
R12a 330R
C3 100n
C4 100n
C5 100n
C6 100n
C7 100n
C8 100n
C9 100n
C10 100n
C11 100n
C12 100n
D9 BAX13
D10 BAX13
PL3
TO PRESELECTOR (2PL5) (WHEN FITTED)
15-5V
TR1 BC547B
TR2 BC547B
TR3 BC547B
C1 100n
C2 100n
R17a 18R
SCREENED RESISTOR LINK
R13 100R
C13 10
13V
TR7 BC560B
C14 10
25mA
R19 10R
CH1 3µ3
C20 100n
C25 220
15V
T2
C29 100n
C30 100n
C31 10
TP2
R20 1K8
C22 100n
TR5 BFW30
4·4V
RV1 47R
T1
R21 220R
C21 220n
TP1
5V
C26a 1n
C26 220n
R24 270R
C23 100n
R22 220R
T3
C32 100n
C33 100n
C34 10
TP3
TR6 BFW30
4·4V
RV2 47R
R23 1K
C24 100n
C27 10
C28 100n
R25 270R
CH2 220n
CH3 220n
R26 68R
C35 56p
C37 56p
R28 68R
R27 68R
C36 56p
C38 56p
R29 68R
C40 100n
R30 39R
R31 10R
C47 100n
CH4
CH5
3-4V
12-4V
3µ3
C41 10
C42 100n
C45 10
C46 100n
C49 10
C48 100n
CH6 3µ
15V
T4
C43 100n
C39 100n
Z7R
C44 100n
IC3 SL6440C
C50 1n
PL5
TP4
R32 (ADJ) 270R
400-500mV p-p 46·216 TO 76·206MHz
RLF1
PL2
FROM PRESELECTOR (2PL6)
RLF 600R
R18 150R
C18 100n
C19 100n
14V
ON WIDEBAND OR WHEN PRESELECTOR NOT FITTED AND LINK 5-6 MADE OTHERWISE 0V
D12 BAX13
D11 BAX13
BREAK LINK WHEN PRESELECTOR FITTED
TR4 BC547B
+4dB To +6dB GAIN TP1 to TP2 and TP3:
160kHz 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
0dB to 40MHz
−20dB at 90MHz
+4dB
(EFFECTIVE CONVERSION GAIN)
15-5V
C90
D15
BZX79-C6V5
R62 2K2
R63 2K2
IC4
GA3240E
AERIAL MUTE
IC1
N/U
MC14504
5V
C87 10
R58 2K2
D14 BAX13
D13 BZX79-C3V9
IC2
741P
R58 10K
C89 10
C88 100n
R57 2K2
A.E. MUTE LINES FROM ANCILLARIES CONNECTOR
PL4 (PART)
GROUND TO MUTE
+12V TO MUTE TO +30V
R59 10K
R60 1K
D16 OA47
10dB ATTENUATOR
20dB ATTENUATOR
R54 10K
R55 10K
STC1
20dB ATT.
5V
A.E. MUTE
10dB ATT.
5V
A.G.C.
FROM INTERFACE BOARD (12RS2)

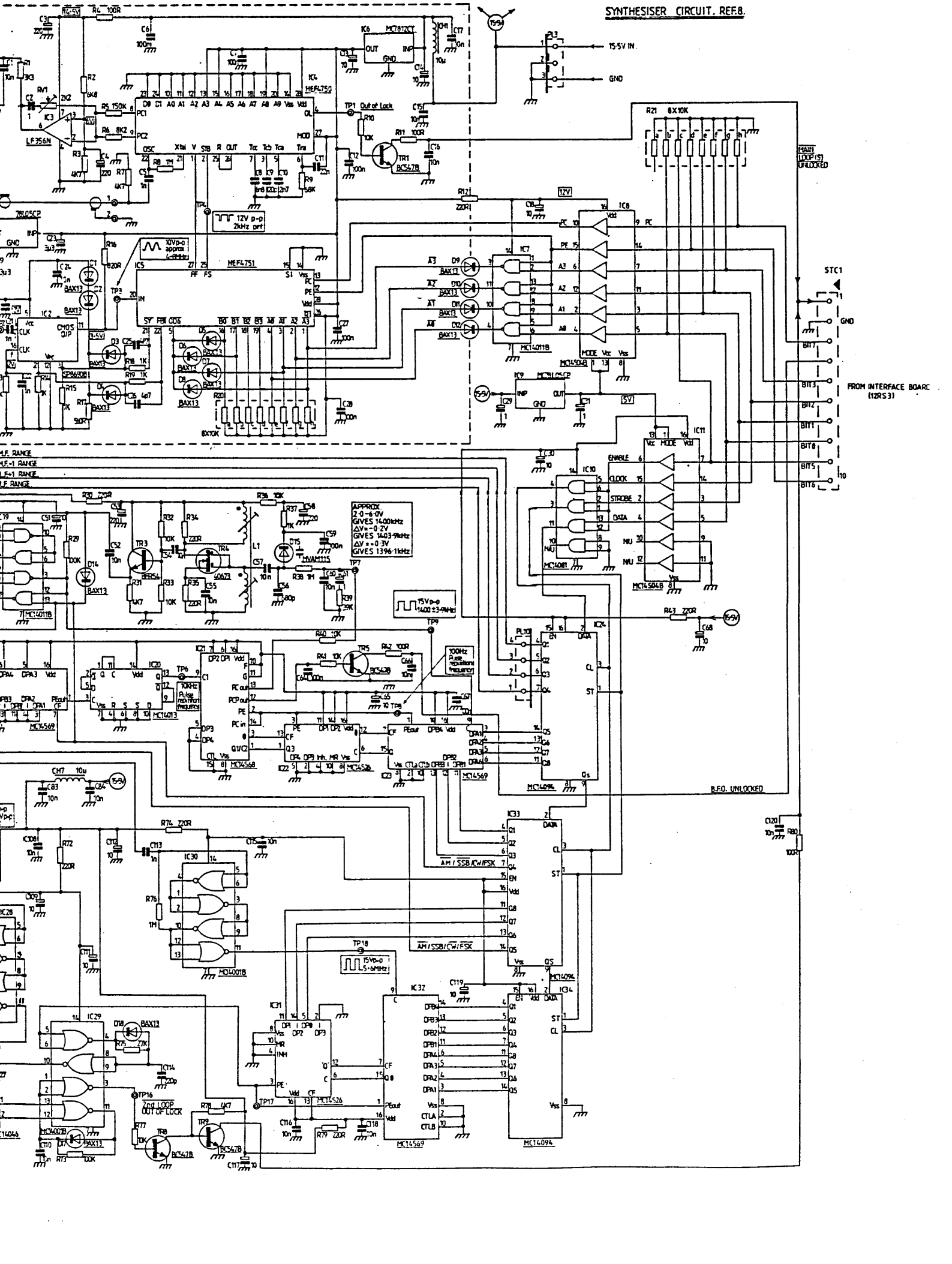


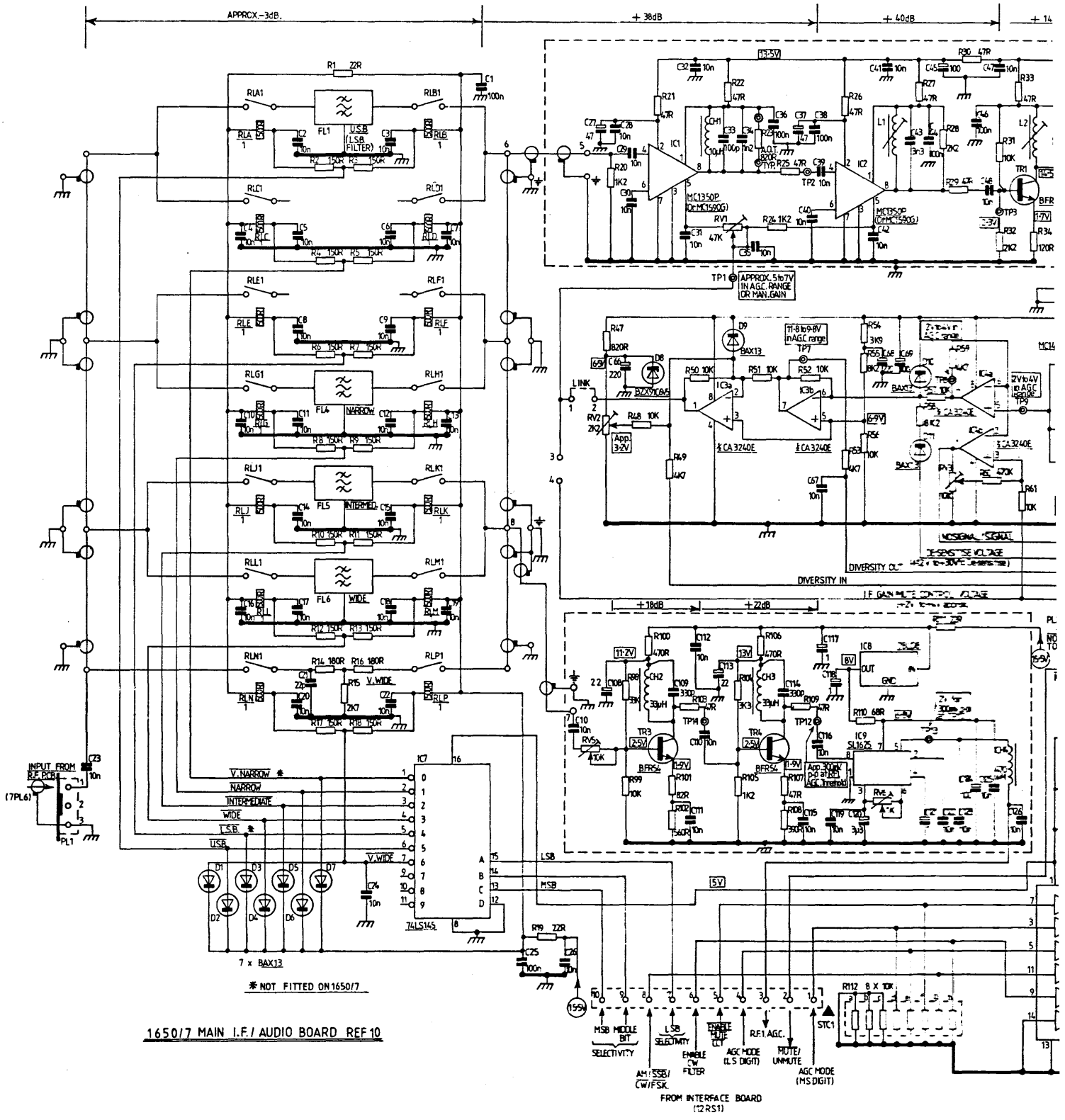
1650 - R.F. & 1st. I.F. BOARD. REF. 7.

NB VOLTAGES/CURRENTS FOR TR8, 9, 10 and 11, AND IC4 and 5, ARE WITH PIN DIODE ATTENUATOR AT MINIMUM GAIN REDUCTION.

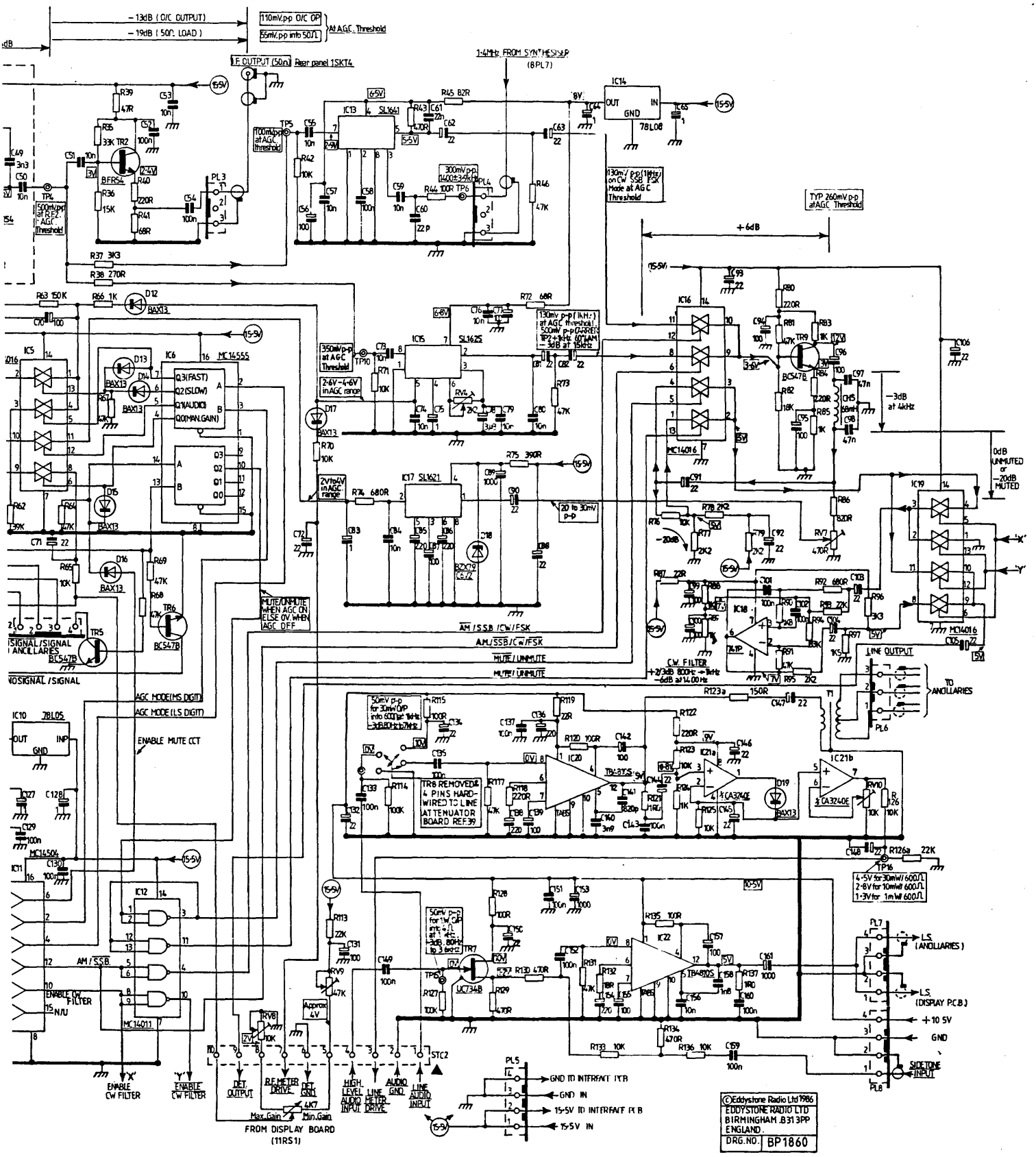

V.C.O. CIRCUIT REF.9.
1650 SYNTHESISER AND VCO CIRCUIT REF.8.&9.
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND
DRG No BP1574
* NB. ACTUAL LOADS EXCEED 50Ω
L.F. RANGE (46·21MHz at app.4·5V (52MHz at 12·5V)
LF-1 RANGE (52MHz at app.4·5V (59MHz at 12·5V)
HF-1 RANGE (59MHz at app.4·5V (67MHz at 12·5V)
H.F. RANGE (67MHz at app.4·5V (76·2MHz at 12·5V)
PL4 and PL6 are connected to external standard P.C.B. when fitted (Break LINKS to 6)
Break link if EXT. STD. board fitted
AM/SSB/CW/FSK
Set 300mV p-p across 50Ω 44·604MHz to 44·806MHz
3·4 to 4V 3·4V gives 44·804MHz
5·6 Vgives 44·805MHz
8·4 Vgives 44·806MHz
Worst case switching here
8·4V
3·4V
20ms
20ms

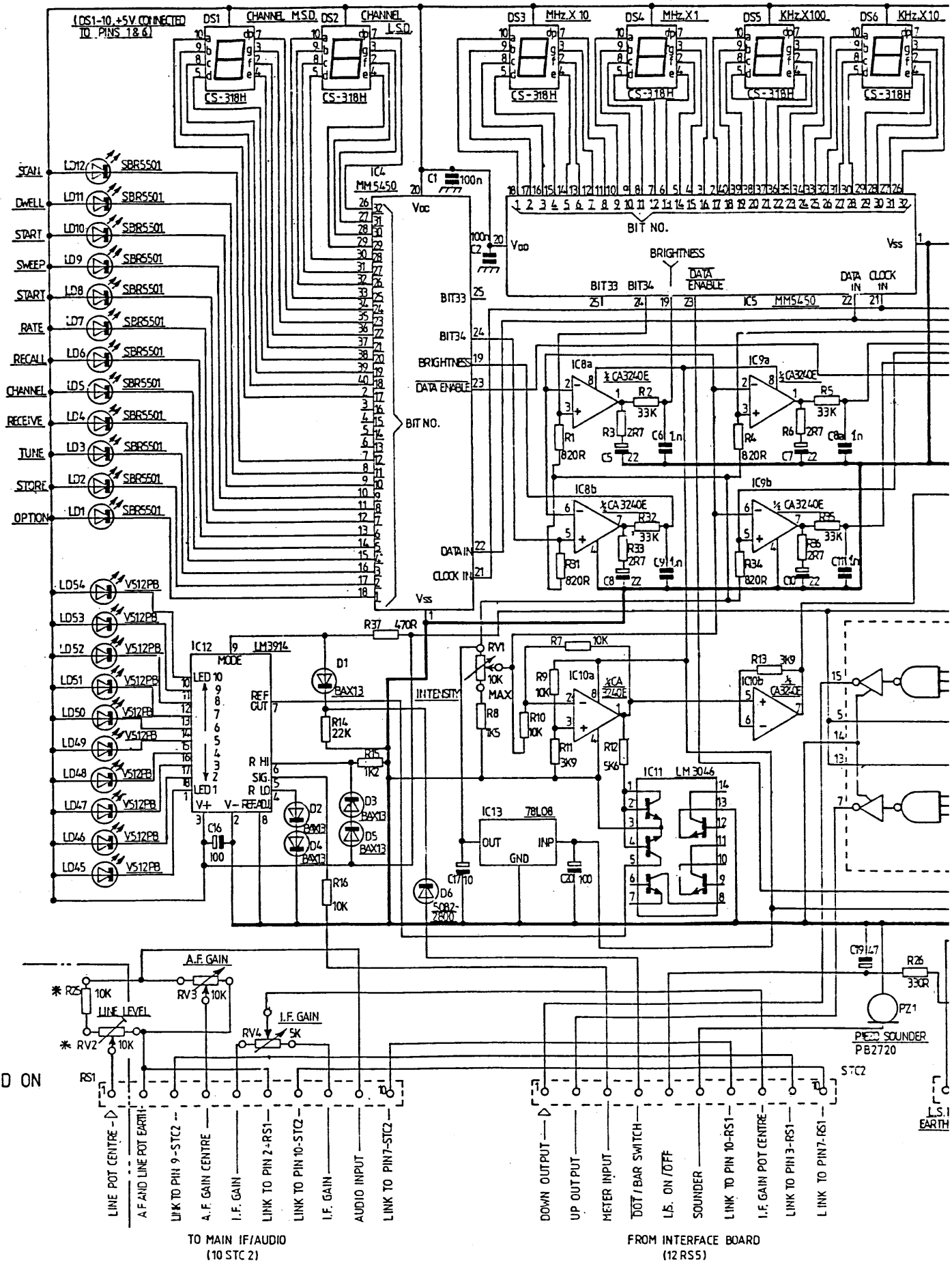
SYNTHESISER CIRCUIT. REF.8.





1650/7 MAIN I.F./ AUDIO BOARD REF 10

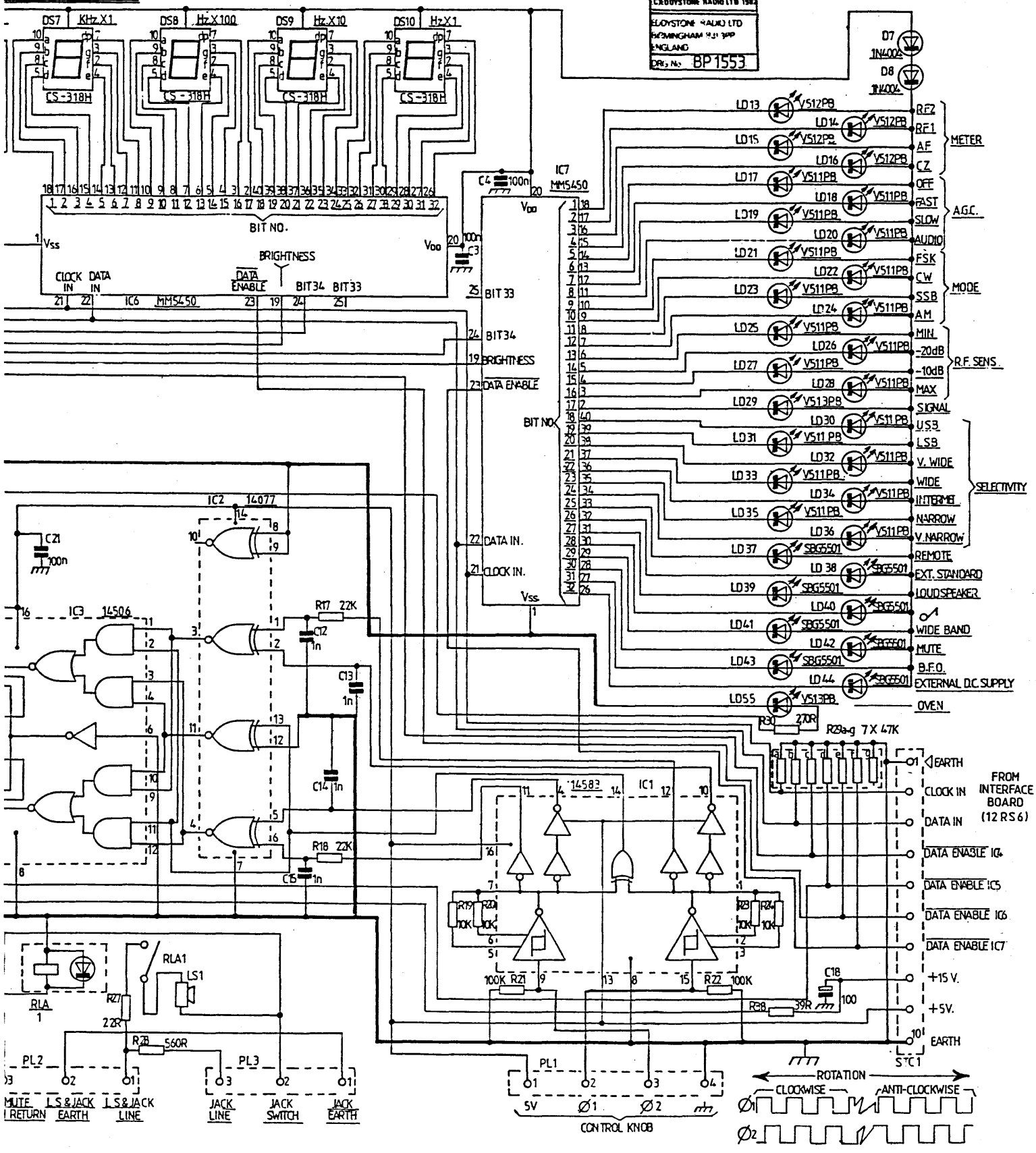

-13dB (O/C OUTPUT)
-19dB (50Ω LOAD)
110mV p-p O/C O/P
55mV p-p into 50Ω
At AGC Threshold
IF OUTPUT (50Ω) Rear panel 1SKT4
1·4MHz FROM SYNTHESISER (8PL7)
IC14
78L08
IC13 SL1641
IC15 SL1625
IC17 SL1621
IC16 MC14016
IC19 MC14016
IC6 MC14555
IC18 TL071P
IC20 TBA810S
IC21a ½CA3240E
IC21b ½CA3240E
IC22 TBA810S
IC10 78L05
IC11 MC14504
IC12 MC14011
TR5 BC547B
TR6 BC547B
TR7 2N3819
TR9 BC547B
TR2 BFR54
D12 BAX13
D13 BAX13
D14 BAX13
D15 BAX13
D16 BAX13
D17 BAX13
D18 BZX79 C6V2
D19 BAX13
PL3
PL4
PL5
PL6
PL7
PL8
TP4
TP5
TP6
TP10
TP16
RV4
RV5
RV6
RV7
RV8
RV9
RV10
T1
STC2
+6dB
-3dB at 4kHz
0dB UNMUTED or -20dB MUTED
CW FILTER +2·3dB 800Hz → 1kHz -6dB at 1400Hz
MUTE/UNMUTE
AM/SSB/CW/FSK
AGC MODE (MS DIGIT)
AGC MODE (LS DIGIT)
ENABLE MUTE CCT
MUTE WHEN AGC ON ELSE 0V WHEN AGC OFF
TR8 REMOVED & 4 PINS HARD-WIRED TO LINE ATTENUATOR BOARD REF 39
LINE OUTPUT
TO ANCILLARIES
LS (ANCILLARIES)
LS (DISPLAY P.C.B.)
+10·5V
GND
SIDETONE INPUT
FROM DISPLAY BOARD (11RS1)
DET. OUTPUT
R.F. METER DRIVE
DET. GND
HIGH LEVEL AUDIO INPUT
LINE METER DRIVE
AUDIO GND
LINE AUDIO INPUT
ENABLE CW FILTER
GND TO INTERFACE PCB
GND IN
15·5V TO INTERFACE PCB
15·5V IN
©Eddystone Radio Ltd 1986
EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
ENGLAND.
DRG. NO. BP1860

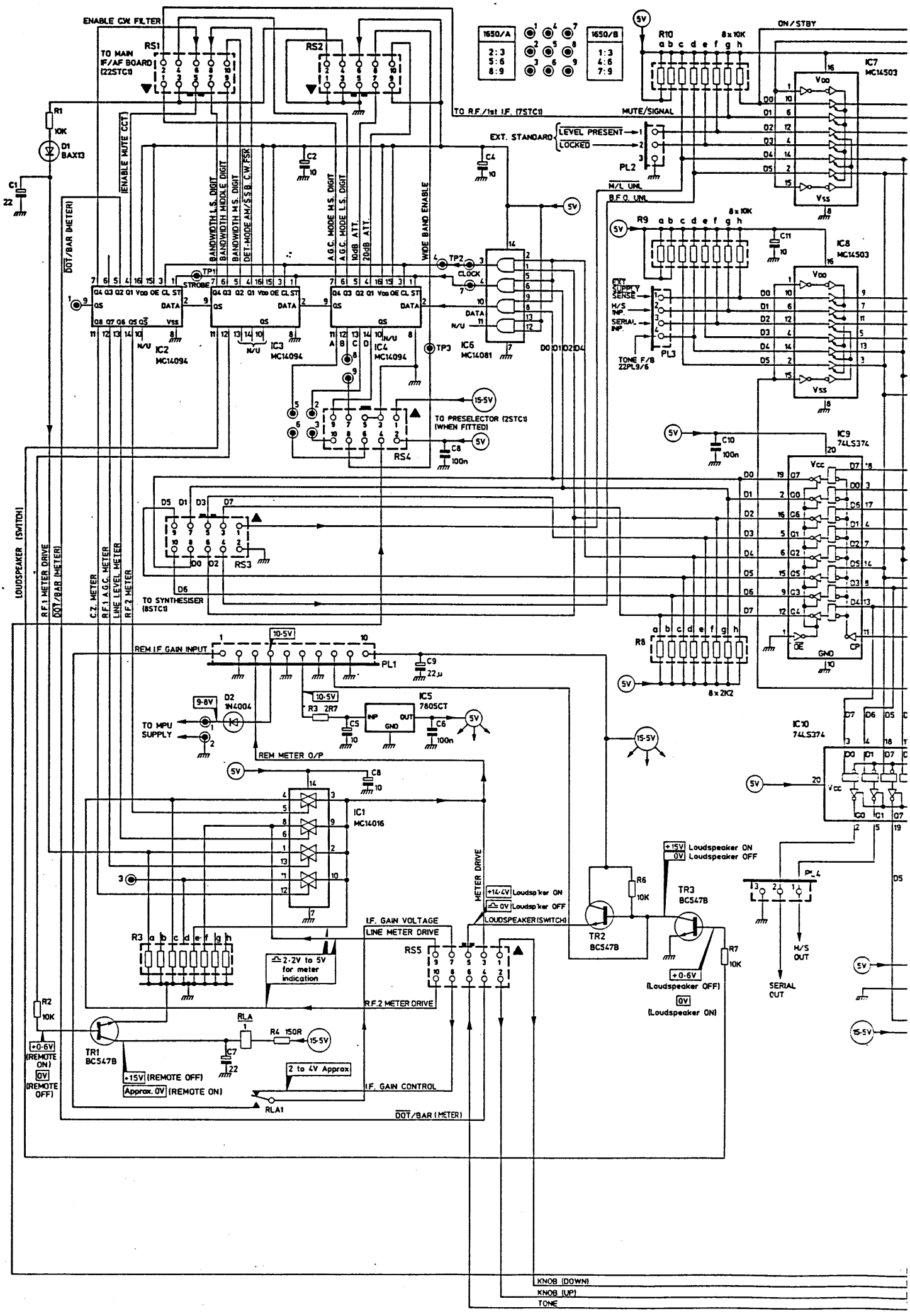


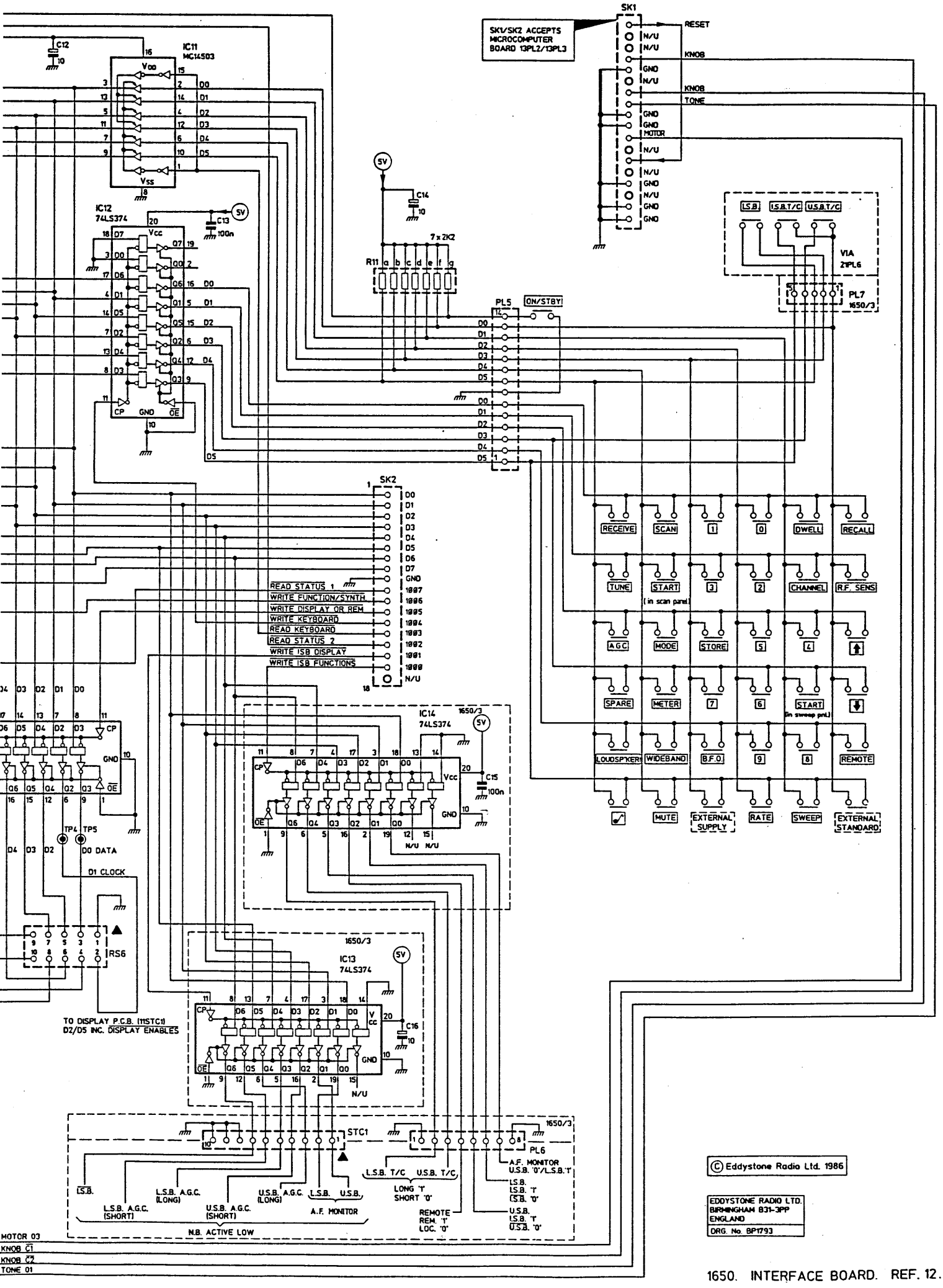
[(22 STC2) 1650/3 ONLY]

ISSUE : 2

EL CIRCUIT REF 11

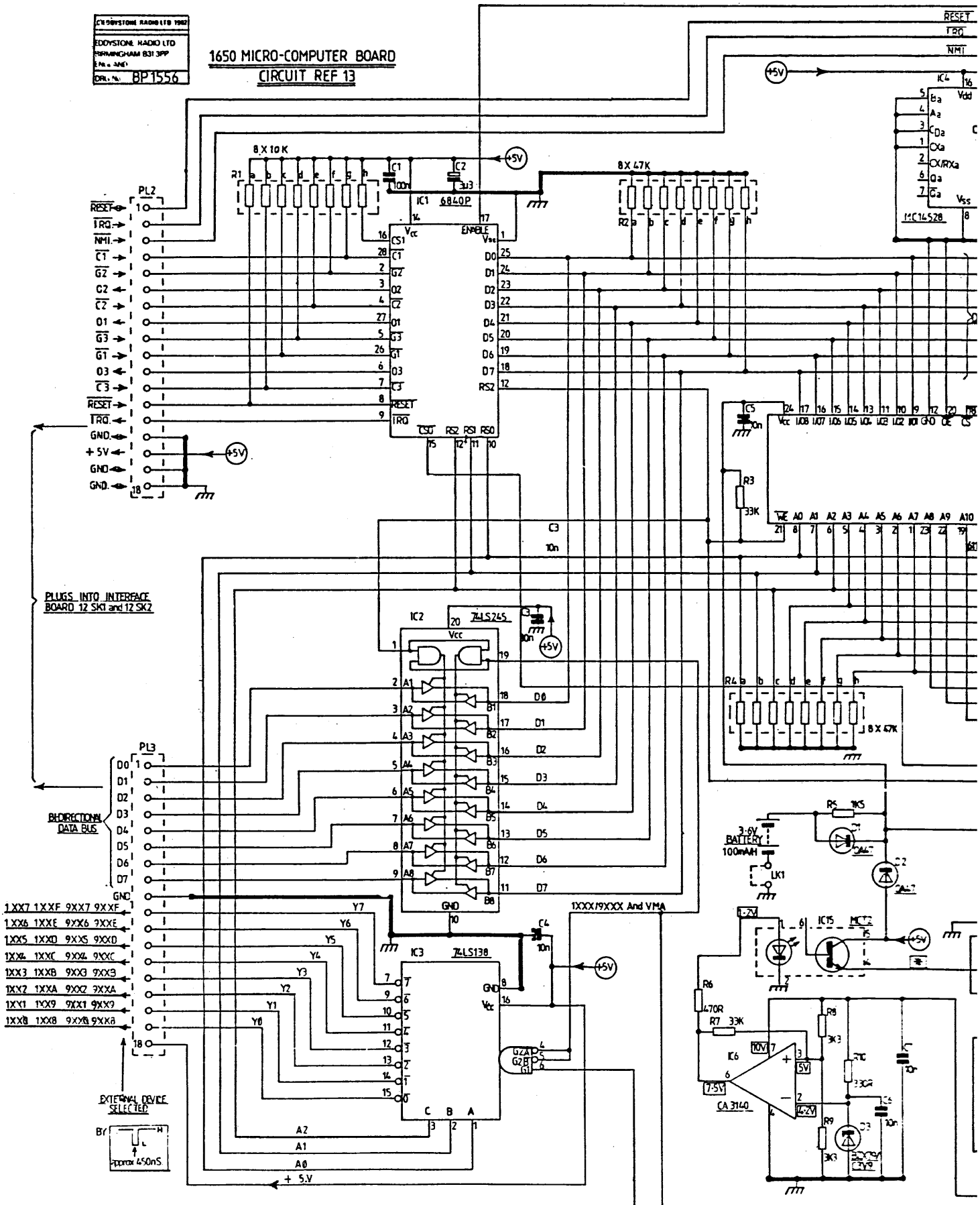


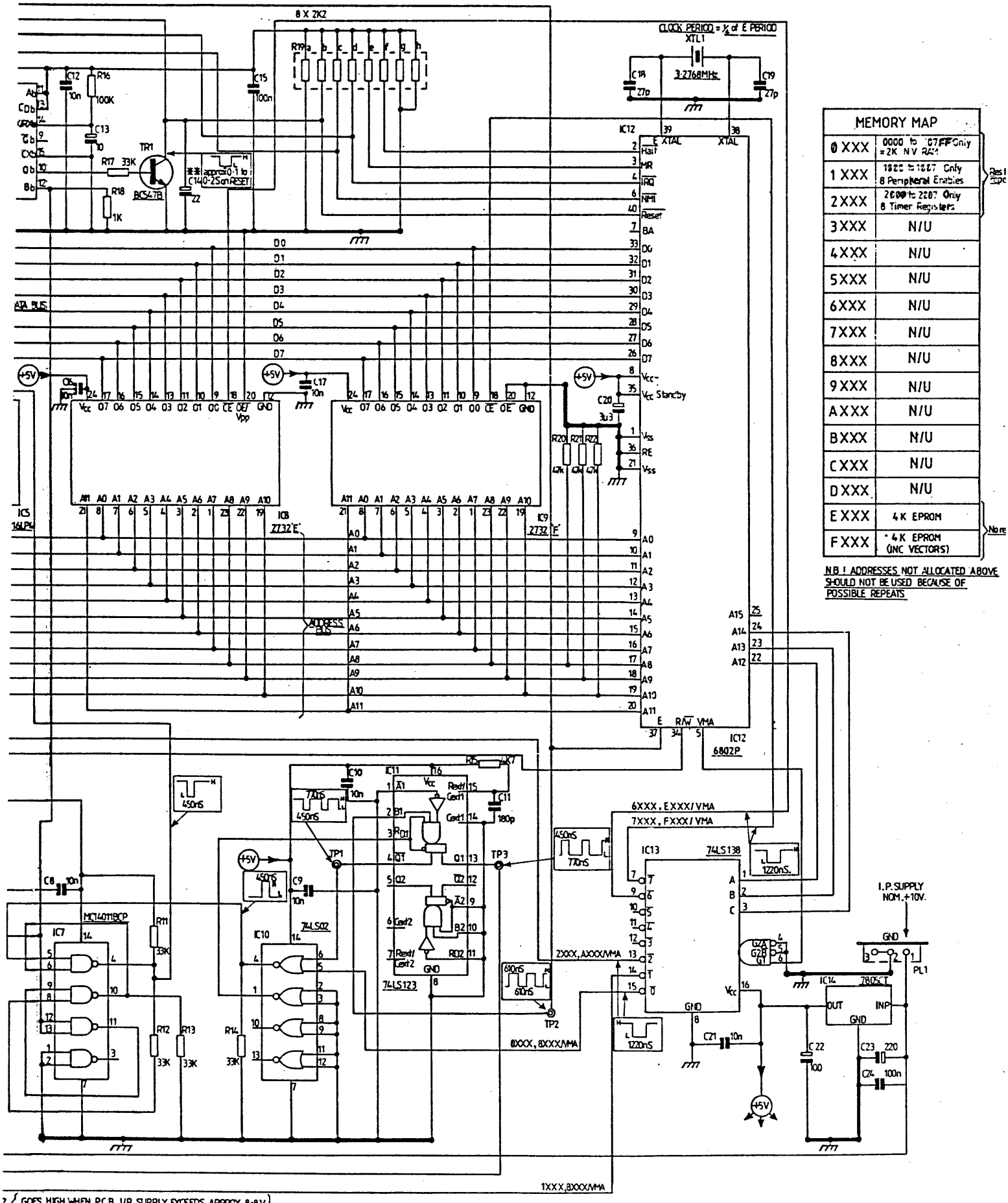

ENABLE CW FILTER
TO MAIN IF/AF BOARD (22STC1)
RS1
RS2
1650/A
2:3
5:6
8:9
1650/B
1:3
4:6
7:9
TO R.F./1st I.F. (7STC1)
MUTE/SIGNAL
EXT. STANDARD
LEVEL PRESENT
LOCKED
PL2
M/L UNL
B.F.O. UNL
ON/STBY
R10
8x10K
IC7
MC14503
R9
IC8
MC14503
EXT SUPPLY SENSE
H/S INP.
SERIAL INP.
PL3
TONE F/B 22PL9/6
IC9
74LS374
IC10
74LS374
R8
8x2K2
R1
10K
D1
BAX13
C1
22
ENABLE MUTE CCT
DOT/BAR (METER)
BANDWIDTH L.S. DIGIT
BANDWIDTH MIDDLE DIGIT
BANDWIDTH M.S. DIGIT
DET-MODE AM/SSB.CW/FSK
A.G.C. MODE M.S. DIGIT
A.G.C. MODE L.S. DIGIT
10dB ATT.
20dB ATT.
WIDE BAND ENABLE
STROBE
DATA
CLOCK
IC2
MC14094
IC3
MC14094
IC4
MC14094
IC6
MC14081
TP1
TP2
TP3
RS4
TO PRESELECTOR (2STC1) (WHEN FITTED)
RS3
TO SYNTHESISER (8STC1)
LOUDSPEAKER (SWITCH)
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
REM I.F. GAIN INPUT
PL1
9-8V
TO MPU SUPPLY
IC5
7805CT
REM METER O/P
IC1
MC14016
METER DRIVE
+14·4V Loudspker ON
0V Loudspker OFF
LOUDSPEAKER (SWITCH)
TR2
BC547B
R6
10K
TR3
BC547B
R7
10K
+15V Loudspeaker ON
0V Loudspeaker OFF
+0·6V (Loudspeaker OFF)
0V (Loudspeaker ON)
PL4
H/S OUT
SERIAL OUT
I.F. GAIN VOLTAGE
LINE METER DRIVE
RS5
2·2V to 5V for meter indication
R.F.2 METER DRIVE
R3
R2
10K
TR1
BC547B
RLA
R4 150R
+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)
KNOB (DOWN)
KNOB (UP)
TONE



EDDYSTONE RADIO LTD.
BIRMINGHAM B31-3PP
ENGLAND
DRG. No. BP1793

1650. INTERFACE BOARD. REF. 12.


EDDYSTONE RADIO LTD
BIRMINGHAM B31 3PP
DRG. No. BP1556
1650 MICRO-COMPUTER BOARD
CIRCUIT REF 13
RESET
IRQ
NMI
+5V
8 X 10 K
8 X 47K
IC1 6840P
IC2 74LS245
IC3 74LS138
IC4 MC14528
PL2
PL3
PLUGS INTO INTERFACE BOARD 12 SK1 and 12 SK2
BI-DIRECTIONAL DATA BUS
EXTERNAL DEVICE SELECTED
approx 450nS
1XX7 1XXF 9XX7 9XXF
1XX6 1XXE 9XX6 9XXE
1XX5 1XXD 9XX5 9XXD
1XX4 1XXC 9XX4 9XXC
1XX3 1XXB 9XX3 9XXB
1XX2 1XXA 9XX2 9XXA
1XX1 1XX9 9XX1 9XX9
1XX0 1XX8 9XX0 9XX8
1XXX/9XXX And VMA
A2
A1
A0
+ 5.V
3·6V BATTERY 100mAH
LK1
IC5 MCT2
IC6 CA 3140
470R
33K
3K3
330R
10n
* PIN 6 MCT2
** C14 NOT FIT

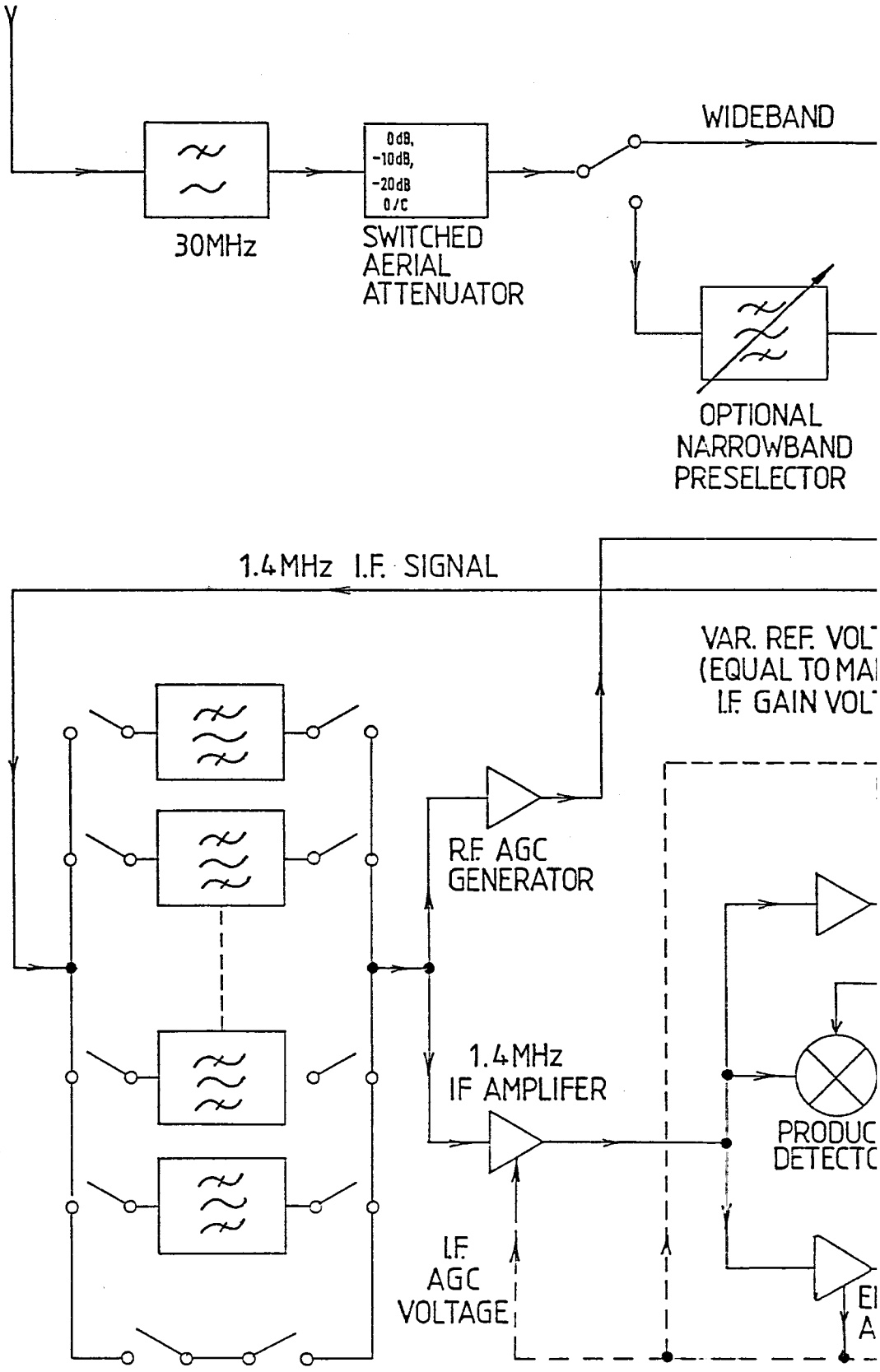


MEMORY MAP	
0 XXX	0000 to 07FF Only = 2K N V RAM
1 XXX	1800 to 1807 Only 8 Peripheral Enables
2XXX	2000 to 2007 Only 8 Timer Registers
3XXX	N/U
4XXX	N/U
5XXX	N/U
6XXX	N/U
7XXX	N/U
8XXX	N/U
9XXX	N/U
AXXX	N/U
BXXX	N/U
CXXX	N/U
DXXX	N/U
EXXX	4K EPROM
FXXX	4K EPROM (INC VECTORS)

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

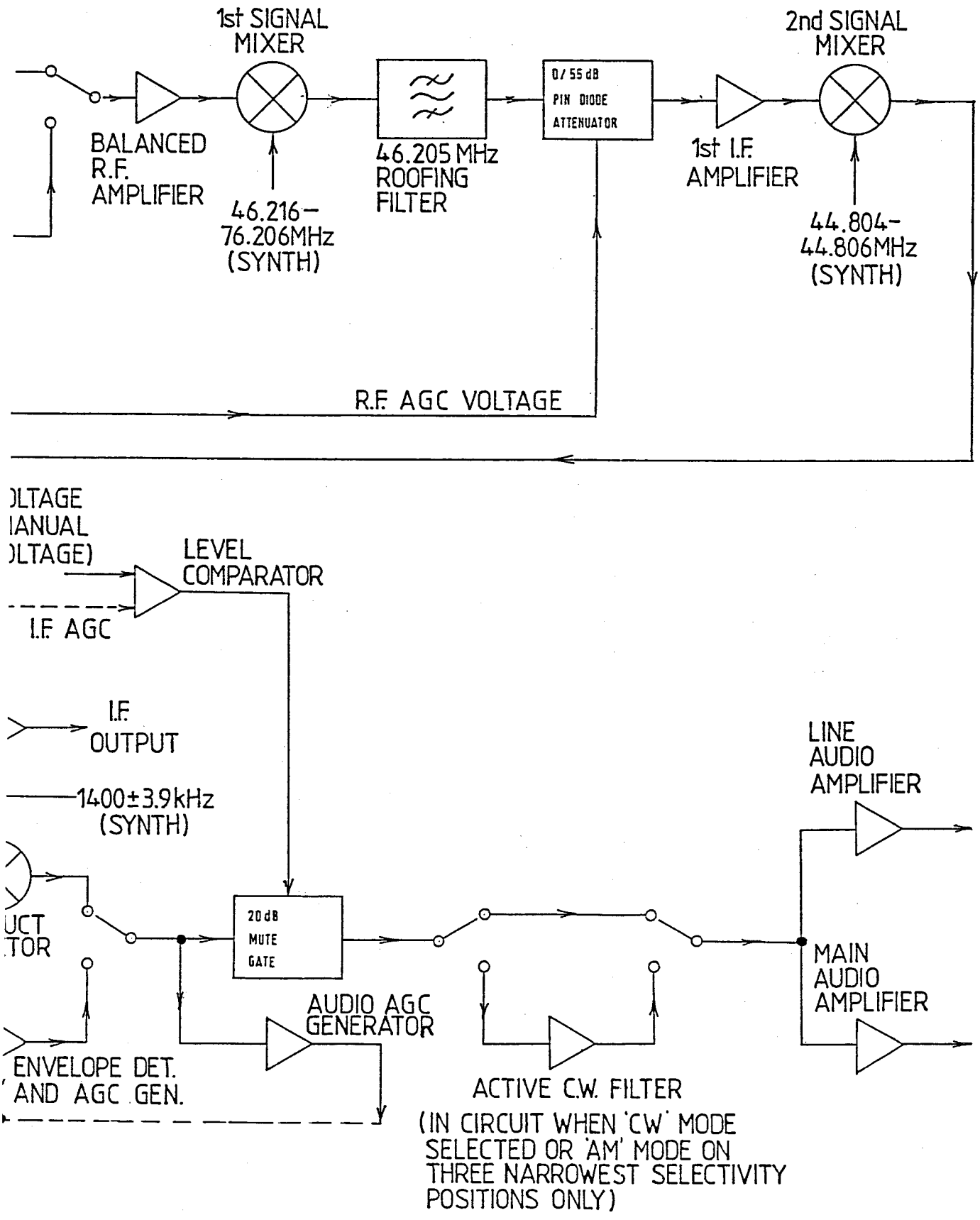
GOES HIGH WHEN P.C.B. I/P SUPPLY EXCEEDS APPROX 8·8V
GOES LOW WHEN P.C.B. I/P SUPPLY FALLS BELOW 8·3V
} 0·5V HYSTERESIS

FITTED ON UNITS IN 1650Rx

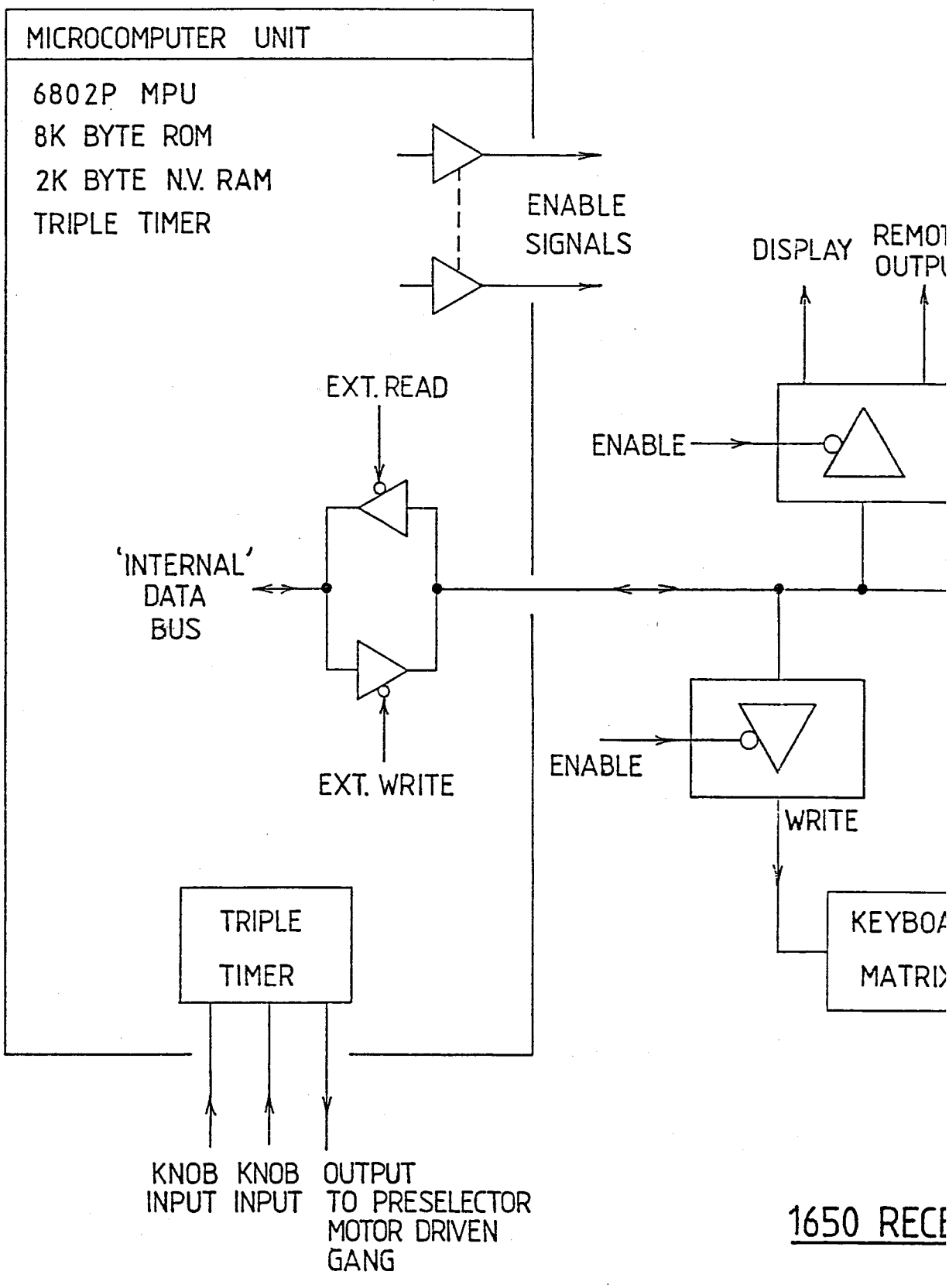


1650 RECEIVER, SIGNAL CI

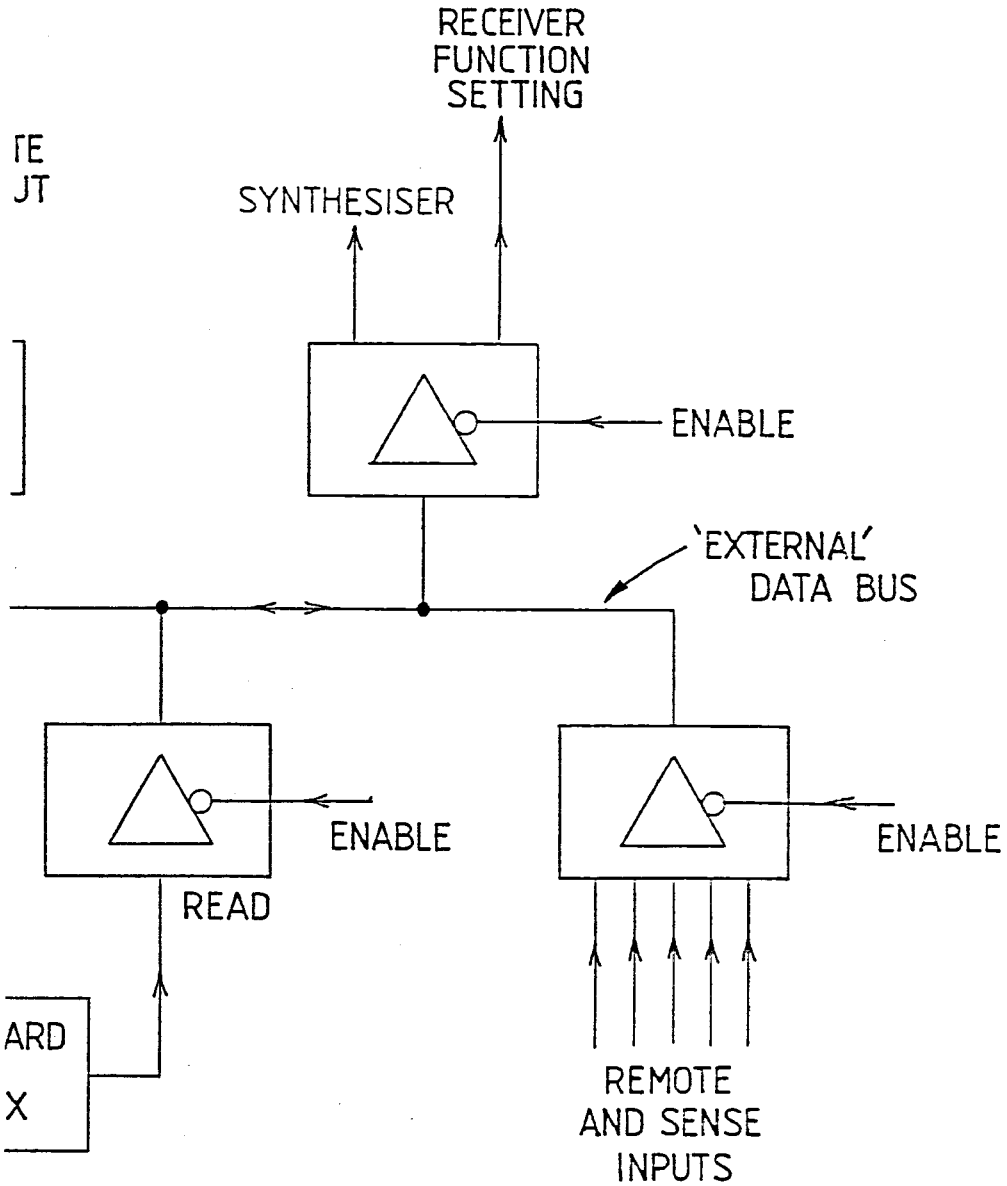
BP1666



CIRCUITS, BLOCK DIAGRAM

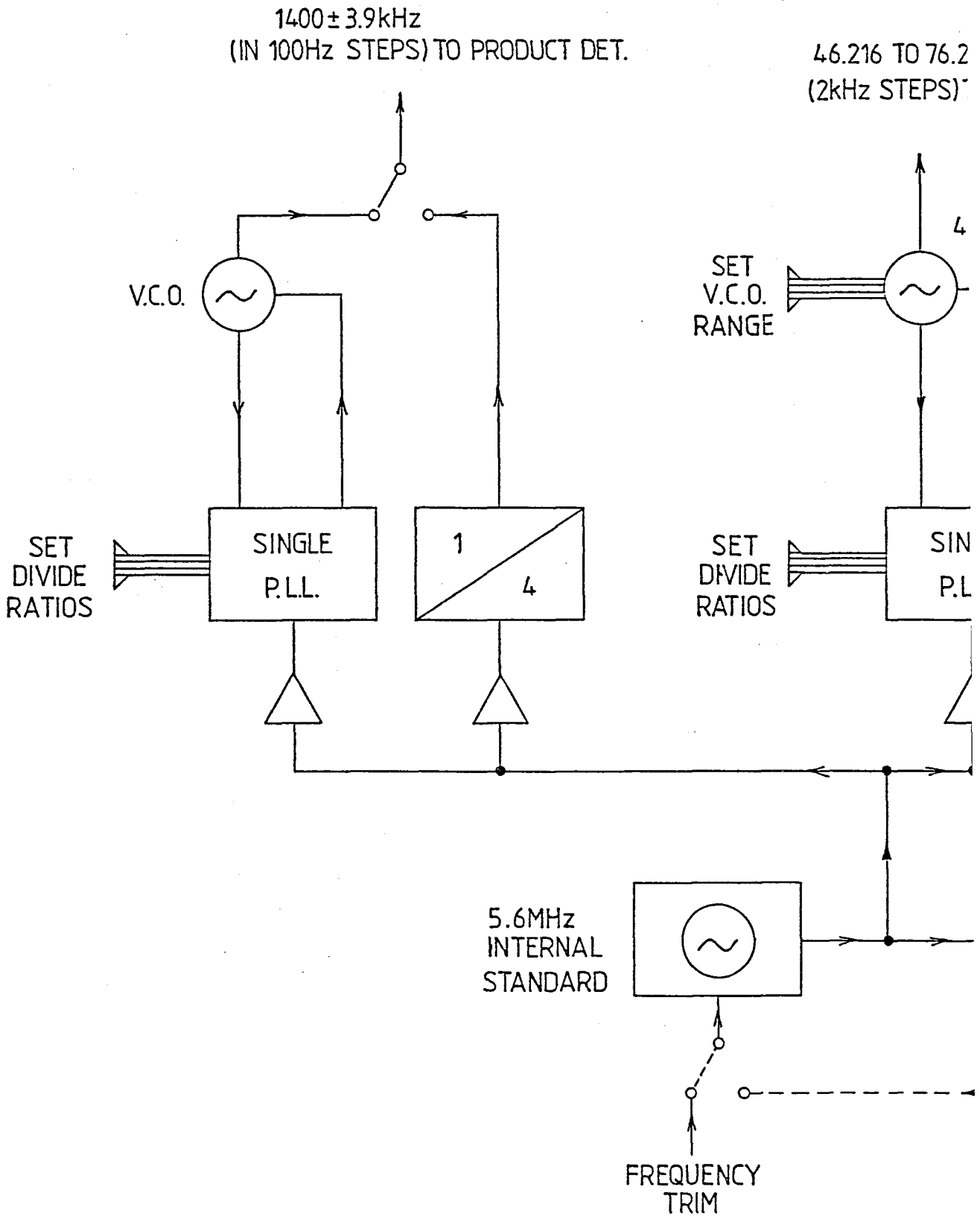

MICROCOMPUTER UNIT
6802P MPU
8K BYTE ROM
2K BYTE N.V. RAM
TRIPLE TIMER
ENABLE SIGNALS
DISPLAY
REMOT
OUTPU
EXT. READ
ENABLE
'INTERNAL' DATA BUS
EXT. WRITE
ENABLE
WRITE
TRIPLE TIMER
KEYBOA
MATRI
KNOB INPUT
KNOB INPUT
OUTPUT TO PRESELECTOR MOTOR DRIVEN GANG

1650 RECE



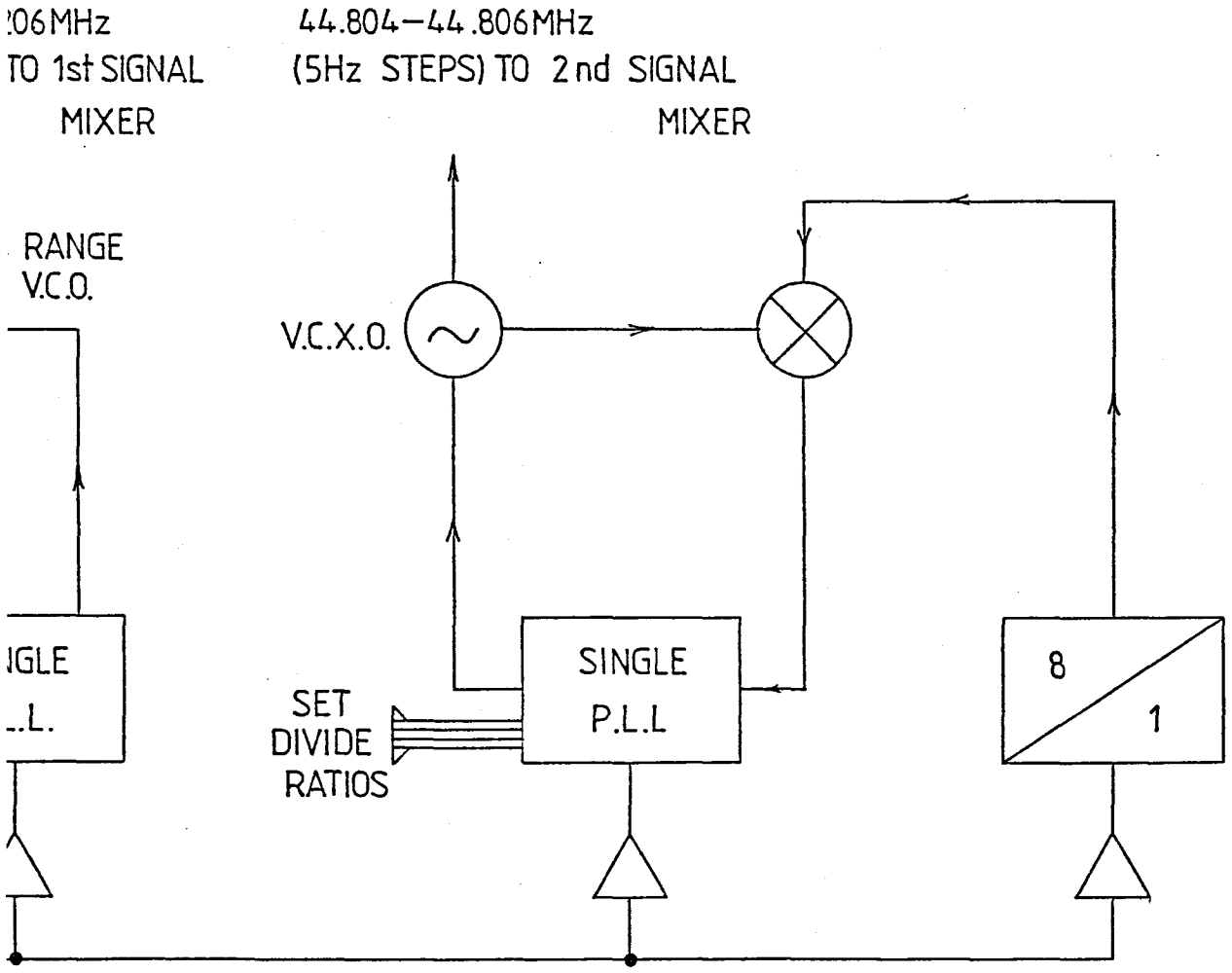
EIVER, CONTROL AND MCU CIRCUITS, BLOCK DIAGRAM

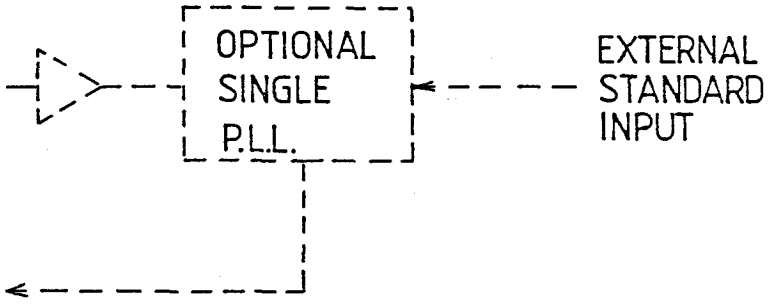
BP1667



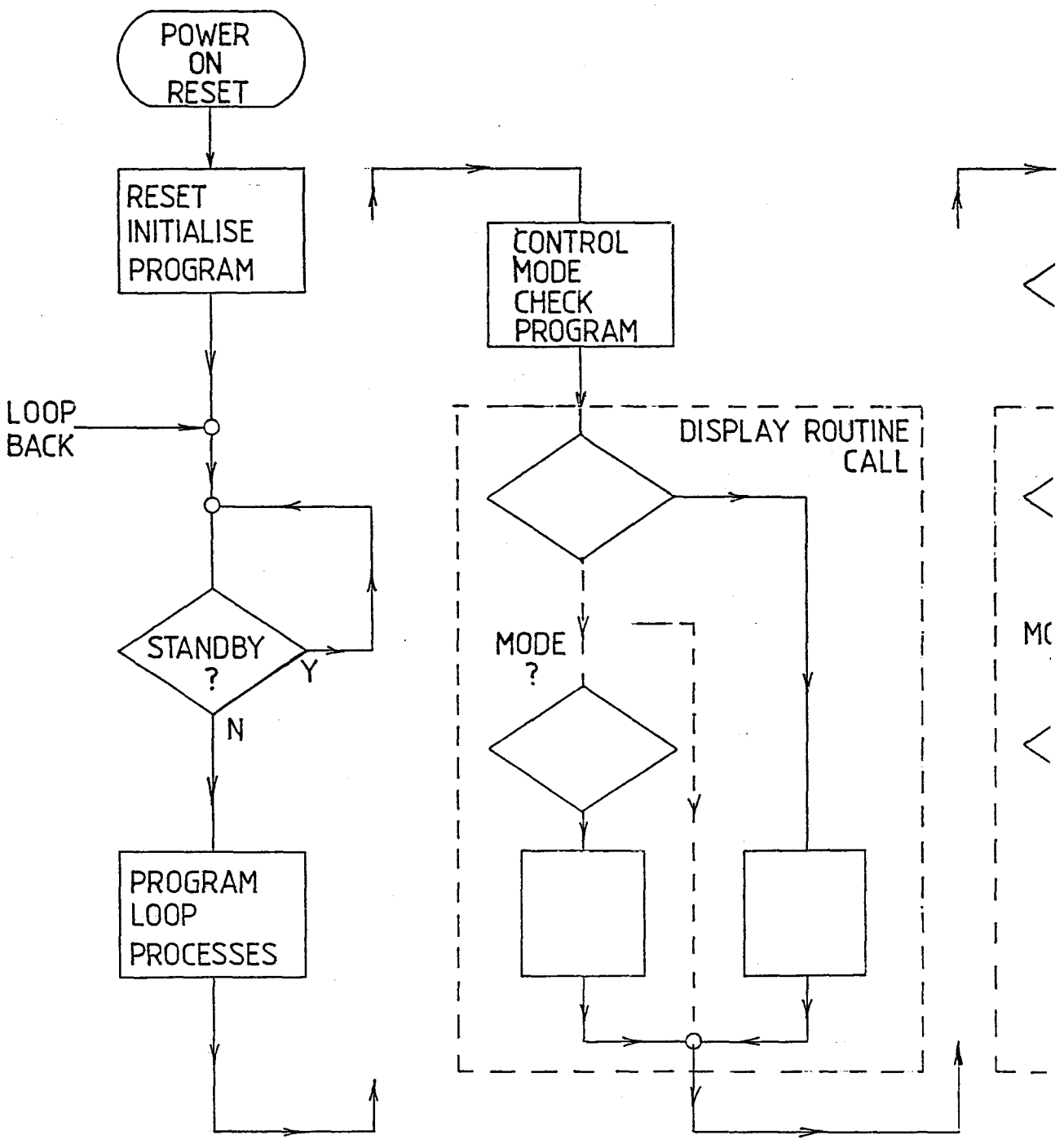
1650 RECEIVER, SYNTHESISE

BP166



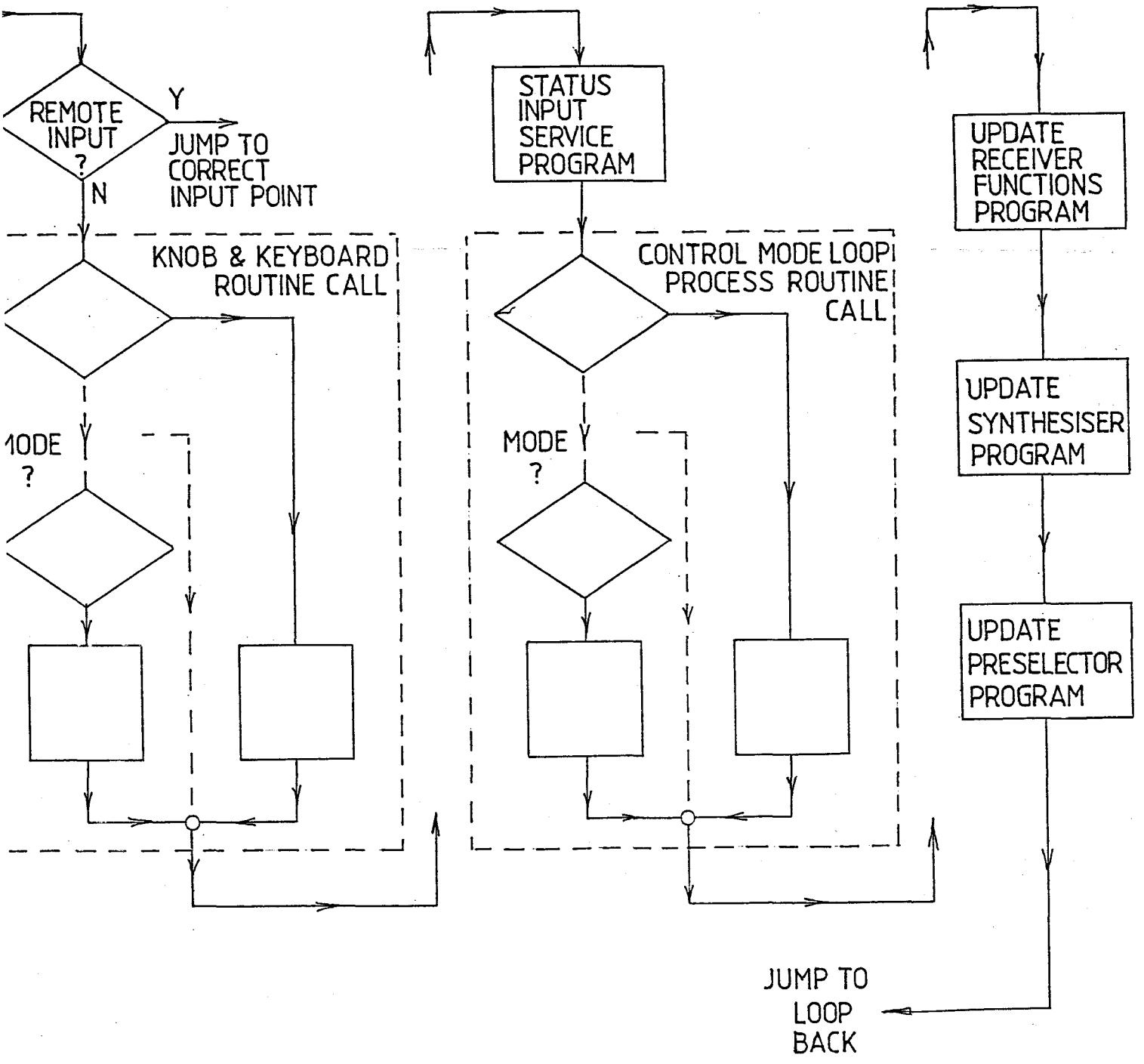


ER CIRCUITS, BLOCK DIAGRAM

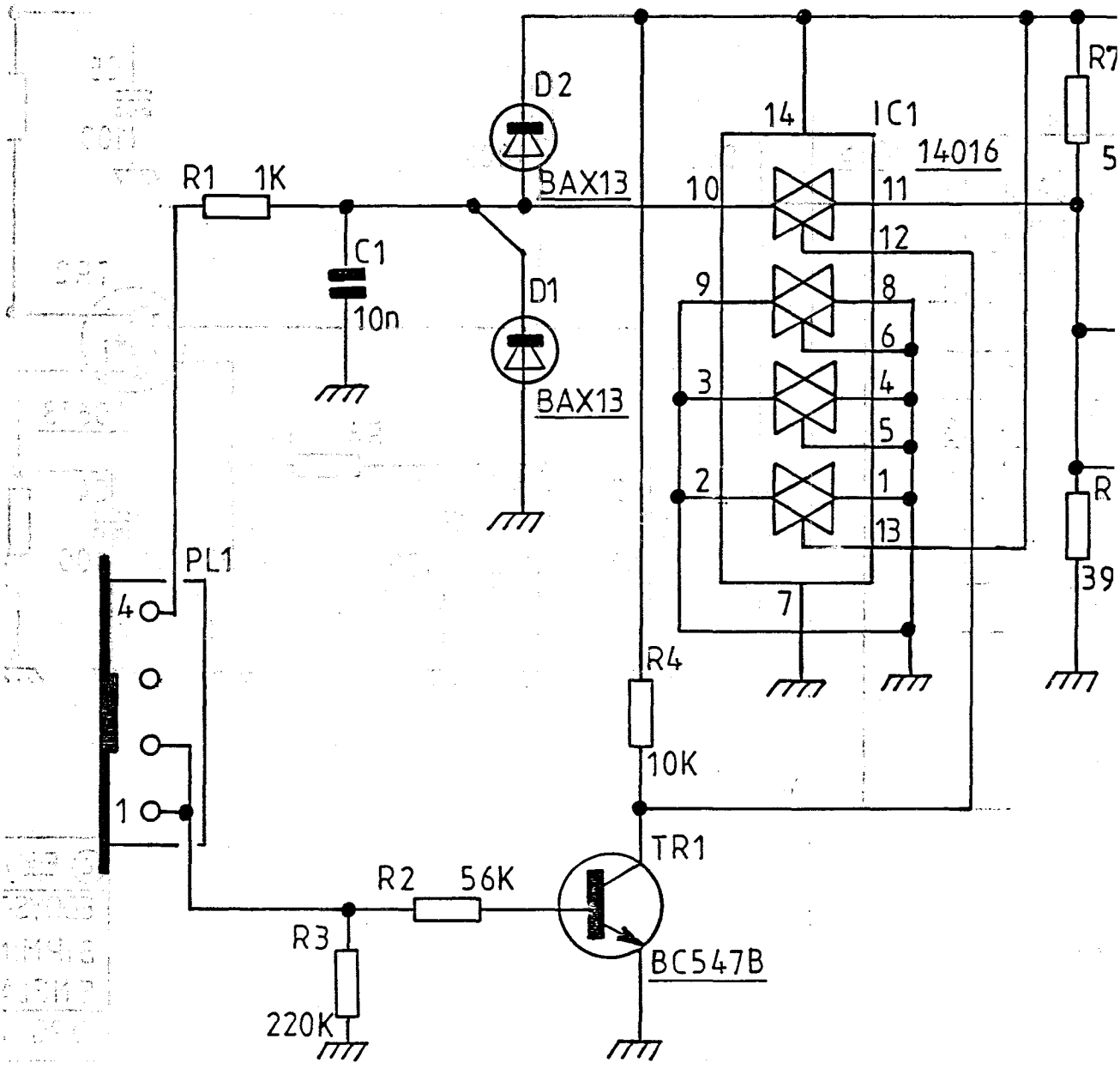


1650 RECEIVER, SIMPLIFIED PROGRAM E

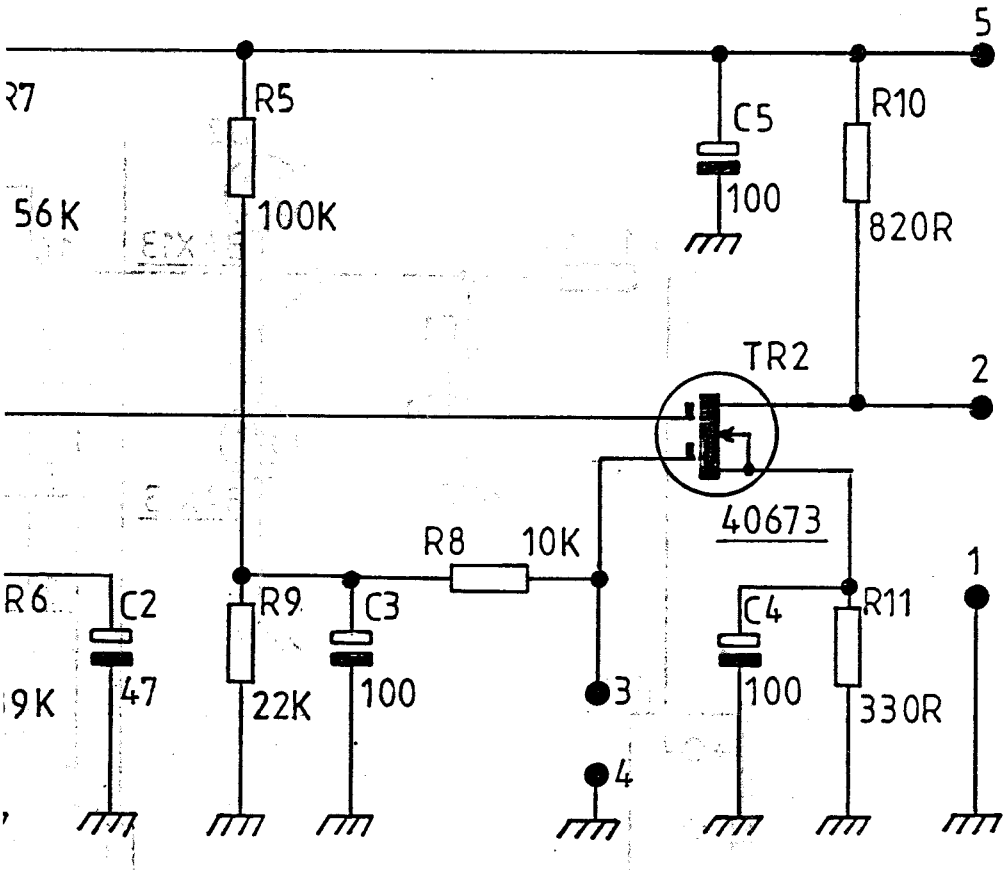
BP1669



EXECUTIVE FLOWCHART



165017 LINE ATTE



EDDYSTONE RADIO LTD.
BIRMINGHAM B31.3PP.
ENGLAND

DRG.NO. BP1857

ENUATOR P.C.B. REF.39.