MA. 1034
Switched Filter Unit

RACAL

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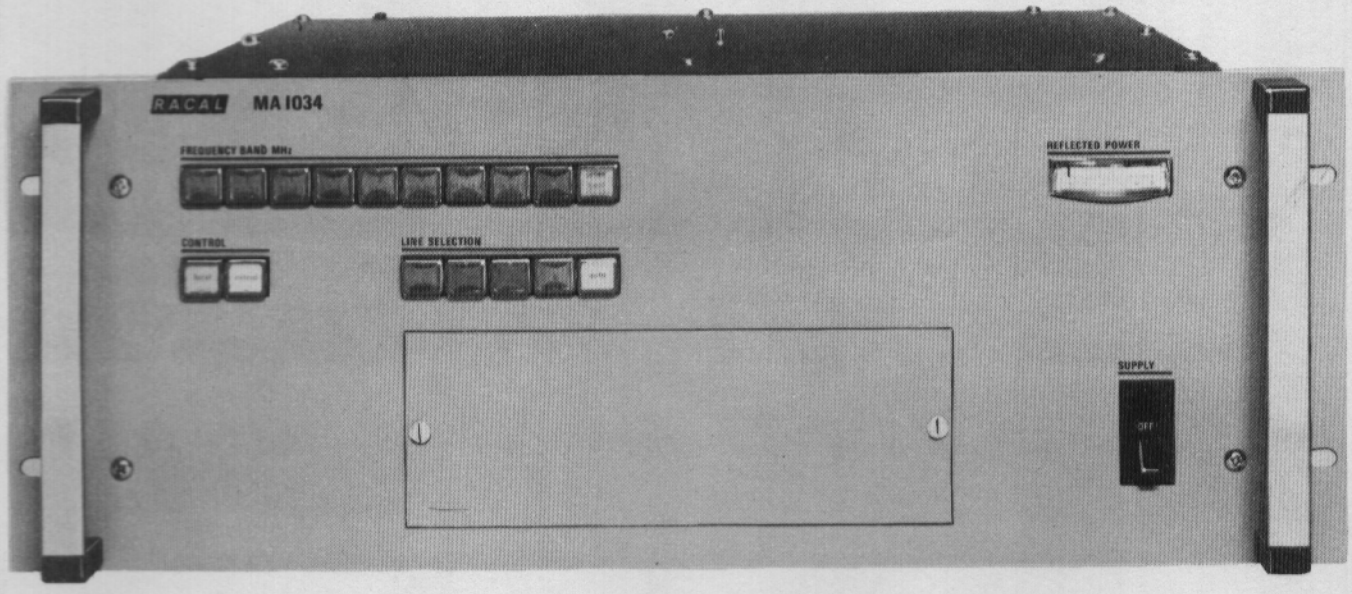

Switched Filter Unit MA.1034

SWITCHED FILTER UNIT

MA.1034

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ILLUSTRATIONS (Contd.)

SWITCHED FILTER UNIT

MA.1034

TECHNICAL SPECIFICATIONS

Frequency Range:	1.6 - 30MHz in 9 Switched Bands
Maximum RF Power Input:	1kW CW
RF Input Impedance:	50 ohm nominal
RF Output Impedance:	50 ohm nominal
Passband Attenuation:	0.3dB maximum) Measured with 50 ohm source and load impedances.
Harmonic Attenuation:	2nd - 6dB minimum) 3rd - 25dB minimum)
Tuning:	Motor driven (also capable of manual adjustment)
Tuning Mode:	(a) Automatic from extended or remote position, or (b) Manual selection of any filter or direct through connection.
Tuning Time:	5 seconds maximum.
Power Requirements:	35 to 65V d.c. at 1.6A.
Dimensions:	Height - 178mm (7 inches) Width - 483mm (19 inches) Depth - 582mm (22 15/16 inches) behind front panel. 626mm (24 5/8 inches) overall.
Weight:	14,5kg (32 lb) approximately.
Cooling:	Convection.
Environment:	Storage Temperature: -40°C to +70°C Operating Temperature: -10°C to +55°C Relative Humidity: 95% at 40°C
Extended Control Line Loop Resistance:	200 ohm.

CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1. The Switched Filter Unit MA.1034 is intended for use with the TA.1810 or TA.1813 wideband linear amplifiers where these are required to work in conjunction with an antenna matching unit which on its own will not provide sufficient attenuation of the amplifiers' harmonics.

2. The MA.1034 is inserted into the r.f. power output line between the linear amplifier and the v.s.w.r. monitor. In series with this line the MA.1034 connects one of nine band-pass filters. The correct filter may be selected automatically (by motor drive) on command from the amplifier drive unit when in extended control mode, or selected manually by front panel push buttons when in local control mode. A wideband facility allows the r.f. to pass through the MA.1034 without filtering.

3. There are two versions of the Switched Filter Unit. The MA.1034A is for use where the linear amplifier is driven by an MA.7917 HF Exciter: the MA.1034B is for use where the linear amplifier is driven by an MA.1720 Drive Unit.

4. The MA.1034 contains line selection circuits which enable the optimum output power from the linear amplifier to be achieved. Both the TA.1810 and TA.1813 incorporate two pairs of coaxial relays to enable selection of one of four coaxial line lengths between the linear amplifier output and the MA.1034 input. Correct selection of a line length ensures that the phase of the harmonics reflected by the MA.1034 is such as to avoid the ALC circuits of the TA.1810 and TA.1813 operating and reducing output power unnecessarily. Those systems containing the MA.1034B utilise a Line Switching Unit MS.139 for line selection.

5. The MA.7917 provides channel information to allow correct filter and line selection by the MA.1034A. Within the MA.1034A is a matrix board which is pre-programmed to relate the selected channel to an operating filter band and an optimum line length. The channel/frequency relationship is derived from the system specification, while the optimum line selection is found empirically.

6. The MA.1720 provides frequency information to allow correct filter selection by the MA.1034B. A decoding logic board replaces the matrix board of the MA.1034A to decode the frequency information to a code suitable for use by the MA.1034B.

7. The linear amplifier is muted automatically during filter and line selection. Automatic muting of the linear amplifier also occurs if there is a power supply failure within the MA.1034, and a command is generated to provide a visual indication of failure, at the MA.1720.

CONSTRUCTION

8. The MA.1034 is contained in a chassis suitable for mounting into the TA.1810 or TA.1813 cabinet.

9. The chassis is divided into upper and lower compartments. The upper compartment supports a bank of nine filter modules which are assembled radially around a ceramic triple wafer switch. Between the filters and the front panel is mounted a heat sink assembly, adjacent to which are connectors for r.f. power and control lines to the transmitter terminal cabinet wiring loom.

10. The lower compartment houses a d.c. motor/gearbox assembly which is coupled to the ceramic wafer switch shaft via a pair of bevel gears, and a combined slipping clutch and oldham type coupling.

11. The front panel carries all controls and indicators. These are:-

(1) Push buttons for local or extended control mode, and manual band and line length selection.

(2) A circuit-breaker for power on/off switching.

(3) A meter for reflected power indication.

(4) Lamps for indication of working band and line length (integral with the push buttons).

12. A plate on the front panel covers both the control circuit board and the matrix board (MA.1034A) or decoding logic board (MA.1034B). This is to allow access primarily to the matrix board for pre-programming activity without removal of the MA.1034A from the cabinet.

CHAPTER 2

INSTALLATION AND OPERATION

INITIAL CHECKS

1. Remove top and bottom panels and inspect the interior of the MA.1034. Check that there are no signs of damage and that the cores of band filter coils L1 to L5 are locked in position (Figures 5 and 7).

2. Using a large screwdriver, turn the slot at the top of the wafer switch shaft (in the upper compartment) to check that the switch is not jammed.

3. Replace the top and bottom panels.

4. Remove the front panel cover plate and check that the correct boards are fitted.

   Notes: (1) The cover plate is secured by two captive screws which need a quarter turn only to release them.

   (2) The boards are removed by pulling them with their integral handle.

The boards are as follows:-

(a) The top board should be either a matrix board (PS506) for the MA.1034A, or a decoder board (PS508) for the MA.1034B.

(b) The lower board should be a control board (PS507) for both variants.

Replace the front panel cover plate.

INSTALLATION

5. The MA.1034 is installed in the transmitter cabinet above the meter panel.

6. In the transmitter cabinet, support the cables clear of the set of runners above the meter panel.

7. Offer the MA.1034 to the cabinet and engage the nylon side runners on the MA.1034 with the runners in the cabinet. Push the MA.1034 into the cabinet until it is possible to connect the C-type flying lead connectors (from the cabinet) to SK2 and SK10 at the sides of the MA.1034.

8. Connect the 15-way plug from the cabinet loom to SK1 on the MA.1034.

9. Connect the 15-way socket from the cabinet loom to PL1 on the MA.1034.

SETTING-UP

10. On the MA.1034 set the SUPPLY circuit breaker to OFF, and press the LOCAL CONTROL and LINE 1 LINE SELECTION push-buttons.

11. Set the transmitter to the MUTE condition.

12. Switch on the transmitter power supplies and power up the system in the standby condition.

13. Set the MA.1034 SUPPLY switch to ON.

14. Using a voltmeter, check the voltages at the test sockets mounted behind the top of the front panel. The voltages should be as follows:-

SK7; +5V ± 0.3V)
SK8; +28V ± 1V) With respect to chassis.
SK9; +12V ± 1V)

Note:- The +5V and +12V supplies are dependent on the +28V supply. Should the +28V supply be outside its tolerance, adjustment of R55 on the control board (PS507) may be necessary; this involves the use of an extension board, Racal part number CA605023.

Push the unit back into the cabinet and secure in position.

15. Check that all LINE SELECTION and FREQUENCY BAND lamps light when the associated push-button is pressed.

Note:- The FREQUENCY BAND lamps will not light immediately a push-button is pressed, but will light when the band filter has been selected internally.

Shut down the transmitting system.

MATRIX BOARD (PS506) PROGRAMMING (MA.1034A only)

16. Remove the front panel cover plate and withdraw the matrix board.

17. Remove all screws from both matrix areas (refer to Figure 2).

Band Selection

18. To select a band for any input channel, a screw is inserted into the threaded hole at the intersection of the channel number and the required band. In Figure 2, the matrix board has been programmed as follows:-

Channel 1 input selects Band 1
Channel 2 input selects Band 2
and so on up to
Channel 10 input, which selects W/B (wideband).

To determine which band to select for any channel, use the following table.

CHANNEL FREQUENCY	SELECT BAND
1.6000MHz to 2.1999MHz	1
2.2000MHz to 3.0999MHz	2
3.1000MHz to 4.2999MHz	3
4.3000MHz to 5.9999MHz	4
6.0000MHz to 8.1999MHz	5
8.2000MHz to 11.3999MHz	6
11.4000MHz to 15.7999MHz	7
15.8000MHz to 21.9999MHz	8
22.0000MHz to 29.9999MHz	9

Notes: (1) W/B (wideband) when selected, passes the rf input directly to the output without filtering.

WARNING: As wideband permits excessive harmonic radiation, its use should be restricted to emergencies only.

(2) More than one channel may be programmed to any band.

Line Length Selection

19. For a detailed explanation of line length selection principles, refer to Chapter 4 paragraphs 20 - 39.

Notes: (1) The matrix board does not need to be installed during the following procedure.

(2) The correct line length is found by trial and error.

20. Terminate the RF output from the transmitter cabinet with its ATU/antenna system.

21. Power up the transmitting system in the CW (key down) TRANSMIT condition, and select LOCAL CONTROL mode on the MA.1034.

22. Set the RF POWER switch on the transmitter meter panel to FORWARD POWER.

23. Set the transmitter system to channel 1 and press the appropriate FREQUENCY BAND push-button on the MA.1034. Refer to the table in paragraph 18.

24. Press the LINE SELECTION push-buttons 1 to 4 in turn and note the forward power indication for each line. Repeat this for all channels.

25. On the matrix board (PS506) there are two columns designated LINE 2 and LINE 3. The table below shows how programming in these two columns selects one of four line lengths.

LINE LENGTH	INSERT A SCREW INTO
1	NEITHER COLUMN
2	LINE 2 ONLY
3	LINE 3 ONLY
4	LINE 2 & LINE 3

Referring to Figure 2, the following line lengths have been selected.

CHANNEL 1;	LINE 1 selected
CHANNELS 2,3,4,5;	LINE 4 selected
CHANNEL 6;	LINE 3 selected
CHANNEL 7,8,9;	LINE 4 selected
CHANNEL 10;	LINE 2 selected

Using the figures obtained in paragraph 24, for each channel select the line that gives the best forward power and program the matrix board as instructed.

26. Replace the matrix board and the front panel cover plate. The MA.1034 is now ready for use.

OPERATION

27. Power up the transmitting system and select the mode and frequency of operation.

28. On the MA.1034, set the SUPPLY switch to ON.

Local Control

29. Press the LOCAL CONTROL push-button on the MA.1034.FREQUENCY BAND and LINE SELECTION are now under control of the front panel push-buttons.

30. Select the required FREQUENCY BAND (see table in paragraph 18).

31. Select the line length that gives maximum forward power.

Note: If the transmitting system includes an MS.139 Line Switching Unit, the AUTO LINE SELECTION push-button may be pressed. The MA.139 then controls line selection automatically.

32. Tune the ATU for minimum Reflected Power reading on the TA 1816 METER, for each change of frequency.

Extended Control

33. Press the EXTEND CONTROL push-button on the MA.1034.

34. Control of FREQUENCY BAND and LINE SELECTION is by means of either the matrix board in systems where a channelized exciter is used (MA.7917) or the MA.1720 Drive Unit and MS.139 Line Switching Unit.

35. Tune the ATU for minimum Reflected Power reading on the TA 1816 METER, for each change of frequency.

CHAPTER 3

PRINCIPLES OF OPERATION

INTRODUCTION

1. Refer to Figure 1. This illustrates the signal and control flow when the MA.1034 is used with the TA.1810 or TA.1813 Wideband Linear Amplifiers, and where these are driven by either the MA.7917 HF Exciter or the MA.1720 Drive Unit.

2. The MA.1034 may be operated in local or extended control mode according to the selection of the front panel control push-buttons. In extended control mode, filter and line length selection is determined by external command. In local control mode, the external commands are overridden by the manual operation of the front panel push-buttons. In either mode, indication of the selected filter and line length is given by lamps integral with the push-buttons.

MA.1034A

3. Refer to Figure 1(a). The MA.1034A receives its d.c. power supplies from the power units in the transmitter cabinet (2 x 36V from the TA.1813, 4 x 36V from the TA.1810). Thus the MA.1034A will continue to function provided that at least one of the power supplies is operational. An internal voltage regulator provides +12V for use by the MS408 Channel Output Unit, which changes the voltage level of the channel select lines from the MA.7917 to a level suitable for use by the MA.1034A.

4. The channel select lines are used by an internal matrix board which is pre-programmed (during installation) to automatically select (in extended mode) a filter and a line length. While the MA.1034A is selecting the filter and the line length, a mute signal is generated to mute the linear amplifier. An indication of the selected filter and line length is provided by lamps integral with the front panel push-buttons.

5. Should a power supply fault develop within the MA.1034A, the linear amplifier is muted.

MA.1034B

6. Refer to Figure 1(b). The MA.1034B receives its d.c. power supplies from the power units in the transmitter cabinet (2 x 36V from the TA.1813, 4 x 36V from the TA.1810). Thus the MA.1034B will continue to function provided that at least one of the power supplies is operational.

7. The frequency select lines from the MA.1720 are used by the MA.1034B to automatically select the required filter. At the MA.1720, after a frequency change is made, the RESET button is pressed, and the MA.1720 generates a coarse tune initiate signal.

8. If manual line length selection is required, a manual signal is generated which inhibits the action of the Line Switching Unit MS.139. The line length is selected on the MA.1034B front panel push-buttons.

9. If automatic line length selection is required, the manual signal is not generated, and the action of the MS.139 is enabled. The MS.139 will select the line which provides the optimum forward power when the ready signal is generated. The ready signal will only be generated when a coarse tune initiate signal has been received and when the MA.1034B has selected the correct filter.

10. An indication of the selected filter and line length is provided by lamps integral with the front panel push-buttons.

11. While the MA.1034B is selecting a filter, a mute signal is generated to mute the linear amplifier. The amplifier is also muted if an internal power supply fault occurs. A fault indication is sent to the MA.1720, on which is a FAULT lamp which lights to indicate the malfunction.

CHAPTER 4

DETAILED CIRCUIT DESCRIPTION

NOTE: Logic levels. Positive logic is used through the MA.1034. Thus logic 0 is equivalent to 0V (which is also referred to as low), while logic 1 is equivalent to +5V (in the case of integrated circuits) or +12V (for some transistor switching circuits). The logic 1 is also referred to as high.

BAND FILTER CIRCUITS (Figure 11)

1. Coverage of the HF spectrum is achieved using nine low pass filters, each covering a half-octave. The filters are selected by means of switch wafers SA1, SA2, and SA3. A tenth position on SA2 and SA3 permits wideband operation, where the incoming r.f. is routed to the output without filtering.

2. Wafer SA1 is used for earth switching on the rear element of each filter. This prevents unwanted coupling in the unselected filters due to earth currents of the used filter flowing in the common impedance. The resistor between the front and rear element earths e.g. R15 in the BAND 1 filter, damps out any inductive coupling between adjacent coils. This resistor is shorted out on the selected filter.

3. The switch wafers are turned by a small d.c. motor (see Figure 12 and description in paragraph 5).

4. The r.f. input to the filters is routed via a reflected power unit. The toroidal transformer T1 samples the r.f. current flowing through the line. This current is circulated through R1 and R2 causing a voltage to be developed which is proportional to the current. An r.f. voltage potentiometer is formed by C1 (reflected power unit) and C1/C2 (reflected power board). The voltage at the junction of these capacitors is vectorially added to the voltage developed across R1/R2. The resultant voltage (which is proportional to the reflected power on the line) is doubled by C3, D1, D2, and C4, and applied to the REFLECTED POWER meter ME1.

CONTROL CIRCUITS (Figures 12 & 16)

Band Filter Selection (Motor Control)

5. The filter selection switches (SA1, SA2, and SA3) are rotated by a small d.c. motor, M1, which has an integral 173:1 reduction gearbox. The motor output is coupled to the switch shaft via a 3:1 ratio pair of bevel gears, and a combined slipping clutch and oldham type coupling. The clutch provides mechanical protection to the motor and gearbox in the event of a switch seizure.

6. Coupled directly to the switch shaft is a fourth wafer and a 'star wheel'. The fourth wafer, SU, has contacts on the front and rear faces. The front face (SUF) wiper switches an earth to one of the band indication lamps LP8 to LP17, integral with the

FREQUENCY BAND selector push-buttons, to indicate the selected filter. The rear face (SUR) wiper has a cut-out segment. It searches through the filter select lines from the front panel FREQUENCY BAND selector push-buttons and the filter select lines from the mother-board, to find the selected line (indicated by +12V being present on that line). When this is found, the +12V on the wiper disappears. The 'star wheel' provides a cam action which acts upon a microswitch SV, to ensure that the motor will only stop when the filter switch contacts are accurately positioned.

Local Band Selection

7. For local operation, the LOCAL push-button, SE, is pressed. The LOCAL lamp LP1 lights, and +12V is applied to the front panel BAND selector switches SB to SP.

8. To illustrate the local operation, assume that the BAND 5 (SG) push-button has been pressed. Switch SUR is shown as being set at position 1. The contacts of SG route +12V to SUR (position 5) and via the wiper of SUR to position 12. Thus +12V is applied to pin 19 on the Control Board socket.

9. On the Control Board, the +12V is applied to TR4 and TR5. TR5 and TR6 conduct, switching motor M1 to earth via D25. M1 starts turning the filter selection switches.

10. When SUR is rotated to position 5, the +12V is cut-off from position 12 by the cut-out segment in the wiper. The drive to TR5 and TR6 on the Control Board would now be removed if it was not for microswitch SV which is in contact with the star wheel on the switch shaft. For all rotational angles except for small angles in each position, SV connects +12V to TR5 and TR6. Each time the switch wafers are accurately aligned with their contacts, SV open circuits the +12V feed. Therefore, when SUR disconnects the +12V to TR5, TR5 remains held on until the switch wafers are accurately positioned and SV opens. Drive to TR5 is removed; this transistor and TR6 cut-off, and the motor is disconnected from earth.

11. To prevent the motor from running on, a damping resistor is connected across the motor to apply regenerative braking. When the motor is running, TR23 is biased off by the voltage dropped across D25. As soon as TR6 is cut-off, the base voltage of TR23 increases positively, and TR23 conducts. The 22 ohm damping resistor R58 is then connected across the motor.

Extended Band Selection

12. For extended operation, the EXTENDED push-button, SH, is pressed. The EXTENDED lamp LP2 lights, and as the EXTENDED and LOCAL push-buttons are mechanically interlocked, SE is released. This supplies +12V for extended channel selection at SK1 pin 15.

13. MA.1034A. Frequency information enters the MA.1034A at SK1 as 1 out-of 10 code i.e. there are ten input lines, but only one is activated (at +12V) at a time. During installation, the Matrix Board (see Figure 14) is pre-programmed. This enables the correct band filter to be selected for each channel selected, for example, at the MA.7917.

14. To illustrate the operation, assume that in the particular transmitting installation, Channel 4 is 7MHz. Referring to the Filter Switching Circuit Diagram (Figure 11), for 7MHz working, band 5 has to be selected. Therefore, on the Matrix Board, the Channel 4 line will be connected to the Band 5 line.

15. Whenever Channel 4 is selected, +12V will enter the MA.1034A at SK1 pin 9; the +12V is consequently routed into the Matrix Board, and to switch SUR (Figure 12) position 5. Band filter selection is then identical to that described for local band selection (paras. 8, 9, 10 and 11).

16. MA.1034B. Binary frequency information enters the MA.1034B at SK1. From the MA.1720 Drive Unit, the 10MHz and 1MHz data is in nines complement inverted binary coded decimal (BCD), and the 100kHz data is inverted BCD.

17. In the MA.1034B, a Decoder Board (Figure 18) is used to convert the frequency data to a 1 out-of 9 code suitable for band filter selection.

18. A truth table to explain the operation of the Decoder Board is given in table 4-1.

Table 4-1 Decoder Board Truth Table

MHz DECIMAL	INPUT FREQUENCY LINES										BAND OUTPUTS								
	10MHz (INVERTED 9's COMPLEMENT BCD)		1MHz (INVERTED BCD)				100kHz (INVERTED BCD)												
	D (2^3)	A (2^0)	D (2^3)	C (2^2)	B (2^1)	A (2^0)	D (2^3)	C (2^2)	B (2^1)	A (2^0)	1	2	3	4	5	6	7	8	9
0	0	0	0	1	1	0	1	1	1	1	1	0	0	0	0	0	0	0	0
to																			
2.1999	0	0	1	0	0	0	1	1	1	0	1	0	0	0	0	0	0	0	0
2.2	0	0	1	0	0	0	1	1	1	1	0	1	0	0	0	0	0	0	0
to																			
3.0999	0	0	1	0	0	1	1	1	1	1	0	1	0	0	0	0	0	0	0
3.1	0	0	1	0	0	1	1	1	1	0	0	0	1	0	0	0	0	0	0
to																			
4.2999	0	0	1	0	1	0	1	1	0	1	0	0	1	0	0	0	0	0	0
4.3	0	0	1	0	1	0	1	1	0	0	0	0	0	1	0	0	0	0	0
to																			
5.9999	0	0	1	0	1	1	0	1	1	0	0	0	0	1	0	0	0	0	0

Continued Overleaf ...

Table 4-1 (Contd.)

MHz (DECIMAL)	INPUT FREQUENCY LINES: 10MHz (INVERTED 9's COMPLEMENT BCD) D (2^3)	A (2^0)	1MHz (INVERTED 9's COMPLEMENT BCD) D (2^3)	C (2^2)	B (2^1)	A (2^0)	100kHz (INVERTED BCD) D (2^3)	C (2^2)	B (2^1)	A (2^0)	BAND OUTPUTS 1	2	3	4	5	6	7	8	9
6.0	0	0	1	1	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0
to																			
8.1999	0	0	1	1	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0
8.2	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	0	0	0
to																			
11.3999	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0
11.4	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	1	0	0
to																			
15.7999	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0
15.8	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	0
to																			
21.9999	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0
22	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1
to																			
29.9999	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1

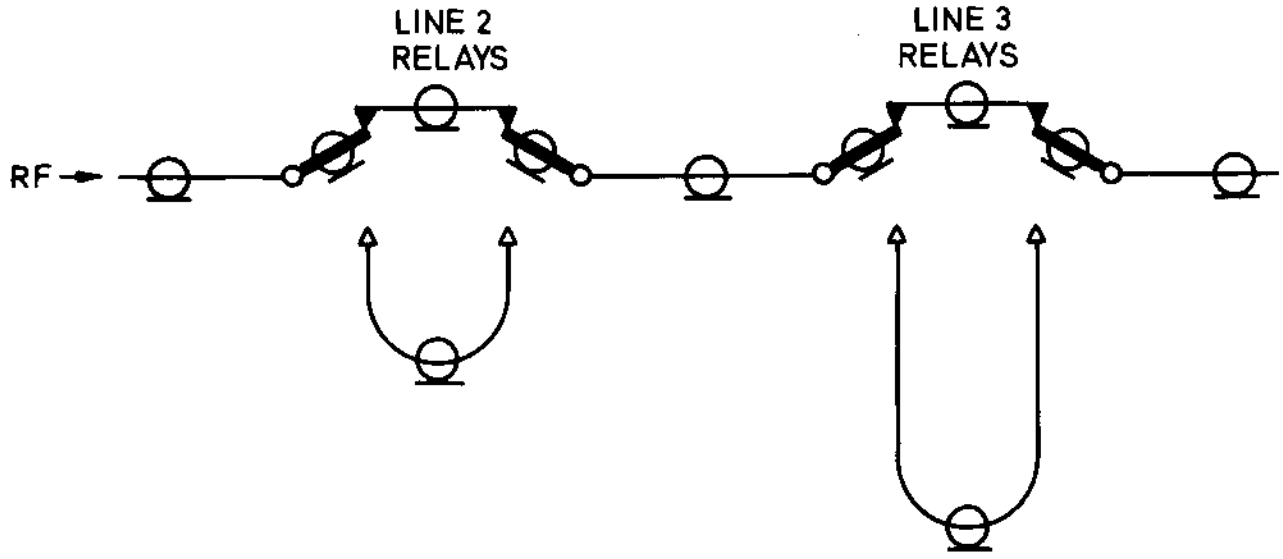
NOTE: 0 = 0V approximately.
1 = +12V approximately.

19. To illustrate the operation, assume that the transmitter is required to work at 7MHz. The frequency data relating to 7MHz is decoded in the Decoder Board, and +12V appears at the 6.0 - 8.1999MHz output (pin 11). The +12V is routed to switch SUR (Figure 12) position 5 (as the correct filter for 7MHz working is band 5). Band Filter Selection is then identical to that described for local band selection (paras. 8, 9, 10 and 11).

Line Length Selection

20. The line relays in the associated transmitter enable selection of one of four different line lengths at the output of the linear amplifier, for reasons explained in Chapter 1 (para.4).

21. The line lengths are designated as line length 1, line length 2, line length 3, and line length 4.



WOH 3117C Coaxial Line Relays Fig. 4-1

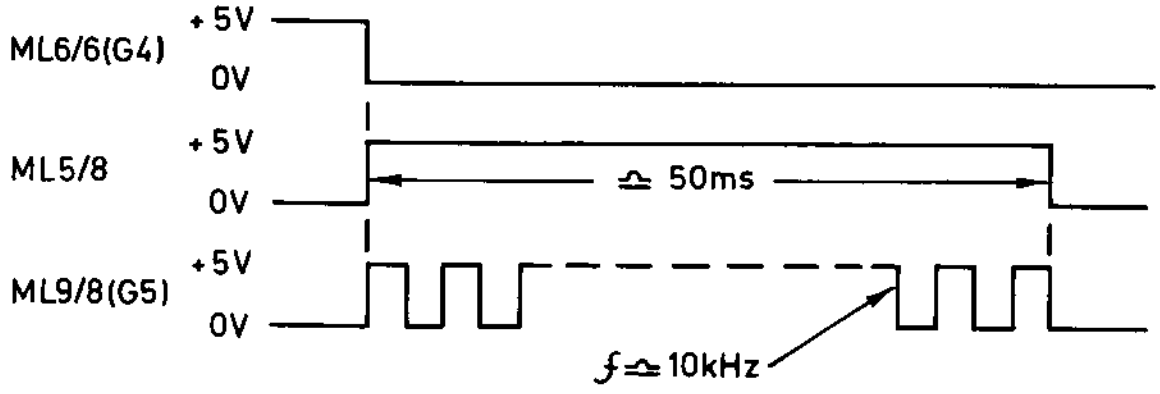
22. Manual Selection. Manual selection can only occur when the LOCAL push-button, SE, is pressed. Selection of the lines by the MA.1034 requires the use of two outputs, designated LINE 2 and LINE 3. From Figure 4-1, the four line lengths are selected as follows:-

Line Length 1 = Both line 2 and line 3 relays de-energised.
Line Length 2 = Line 2 relay energised.
Line Length 3 = Line 3 relay energised.
Line Length 4 = Both line 2 and line 3 relays energised.

23. Referring to Figure 12, for manual selection, +28V is routed to pin 11 of the Control Board via the AUTO LINE push-button (ST). On the Control Board (Figure 16), TR3 is turned on, which applies a low to both nor gates G1 and G2. These gates now function as inverters to the line switching signals.

24. Assume that LINE 3 is already selected. TR7 and TR10 are not conducting, and TR9 and TR11 are conducting. The D and Q connections to the D-type flip-flops ML2(a) and (b) are low and high respectively. The A1 and A2 inputs to the retriggerable monostable ML5 are both high.

25. Assume that a new line selection, LINE 2, is required. The LINE 2 push-button is pressed, which mechanically releases the LINE 3 push-button. +12V (from the LOCAL push-button) is routed to the Control Board, pin 21. The input to pin 10 is open circuited. On the Control Board (Figure 16), TR1 is turned on and TR2 is turned off. The D inputs to ML2(a) and (b) go high and low respectively, as do one of the inputs to the exclusive -OR gates G4 and G6. As both inputs to G4 are now high, and as both inputs to G6 are now low, their outputs go low. ML5 is triggered by this action, and its Q output goes high for approximately 50msecs (as determined by C22 and R37). This allows the Schmidt trigger oscillator ML9 to start: the output from the oscillator is a series of pulses of p.r.f. approximately 10kHz (see Figure 4-2).



W0H 3117C

Oscillator Switching **Fig. 4-2**

26. On the first and successive positive going edges of the oscillator output, the high on the D input to ML2(a) is transferred to its Q output. This high is inverted by TR7 and TR10 to provide a low output at pin 6, thereby energising the LINE 2 relay.

27. Additionally, the low on the D input to ML2(b) is transferred to its Q output to turn off TR9 and TR11. Thus the condition of the LINE 2 and LINE 3 outputs when line 2 has been selected is:-

LINE 2 = 0V (line 2 relay energised)

LINE 3 = open circuit (line 3 relay not energised).

28. Automatic Selection (MA.1034B). Automatic selection can only occur when the MA.1034B is used in conjunction with an MS.139 Line Switching Unit, and when the AUTO push-button, ST, is pressed.

29. When the AUTO push-button is pressed, the AUTO lamp LP7 is earthed, and this lights. Also, the inputs to the Control Board from SQ, SR, SS, and ST are open circuited, and +28V is routed by ST to the MS139 via PL1 pin 10.

30. On the Control Board, TR1, TR2, and TR3 are turned off, and their outputs go high. The low outputs from the NOR gates G1 and G2 are applied to the D-input to the D-type flip-flops ML2(a) and (b), and to one of the inputs of the exclusive-OR gates G4 and

G6. If before AUTO was selected, both LINE 2 and LINE 3 outputs were open circuited (no relay selected), then the D-input to both ML2(a) and (b), and one of the inputs to G4 and G6 were already low. Thus there would not be any circuit action. However, if one or both LINE outputs are low before selection of AUTO, then one or both exclusive-OR gates G4 and G6 have an existing low input from ML2(a) or (b) $\overline{Q}$ output, and an existing high input from ML2(a) or (b) D-input. Thus the high input to the gate goes low, the gate's output goes low, and the monostable ML5 is triggered. The monostable and the Schmidt trigger oscillator operate (as described in paragraph 25) and the low on the D-input to both flip-flops is clocked through to the Q outputs. Consequently, TR7, TR10, TR9, and TR11 are turned off, and the LINE outputs become open circuited, allowing the line relays to be energised by the MS.139.

31. The MS.139 will not commence to change lines automatically until it receives a READY signal from the MA.1034B (READY is active when low).

32. For the READY signal to be generated, the filter switching motor must not be running, and a COARSE TUNE INITIATE signal must have been received from the associated MA.1720 Drive Unit (this is generated when the RESET button on the MA.1720 is depressed after a frequency change). The READY signal must be low to enable the MS.139.

33. While the filter selection motor is running, TR4 on the Control Board conducts. The low output from TR4 causes the READY output to be high (via G11, G14, and TR15). Also, the output from G9 is held high (via G3 and G7), which inhibits the READY signal until the COARSE TUNE INITIATE signal is obtained from the MA.1720, as follows.

34. The COARSE TUNE INITIATE signal is normally low. This holds TR8 off, causing the output from G8 to be low. As soon as the motor starts to run, TR4 collector goes low. This low is applied momentarily to G3 via C13, and the high output from G3 causes G7 output to go low. Thus both inputs to G10 are low, and its high output holds the output from G7 low (G7 and G10 form a bistable). C13 charges up through R17 and the input to G3 goes high. This has no effect on the bistable.

35. The output of G7 being low holds the output from G9 high, the output from G14 low, and the output from TR15 (READY) high.

36. When the RESET button on the MA.1720 is pressed, the COARSE TUNE INITIATE input to the Control Board becomes +12V. TR8 conducts and the high output from G8 causes the bistable (G7 and G10) to switch to its second state (the output from G7 is now high). When the RESET button on the MA.1720 is released, the COARSE TUNE INITIATE signal goes low and TR8 becomes cut-off. Now all inputs to G9 are high, and providing the motor has stopped, the output from G14 goes high, TR15 conducts, and the READY signal goes low to initiate the action of the MS.139.

37. Line Length Indicators. The transmitter line length (selected manually or automatically) is displayed by front panel lamps LP3 to LP6 (integral with the LINE push-buttons). The indicator circuit derives its inputs from the LINE 2 and LINE 3 outputs (Control Board pins 6 and 7 respectively).

38. During manual selection, the line switching commands are outgoing at these pins; during automatic selection, these pins provide inputs which monitor the line switching commands from the MS.139. The voltage level at these pins is as follows:-

Line Length Selected	Pin 6 (LINE 2)	Pin 7 (LINE 3)
1	+28V	+28V
2	0V	+28V
3	+28V	0V
4	0V	0V

Note: The +28V is derived from the relays.

39. Refer to Figure 16. To light a line indicator lamp, the associated transistor (TR16, TR18, TR19, or TR20) has to be switched on (its input must be high). The nor gates G12, G13, G15, G16, G17, and G18 provide the four transistor inputs from the LINE 2 and LINE 3 information according to the following truth table:-

Input		Output			
TR12 collector	TR13 collector	Line 1	Line 2	Line 3	Line 4
0	0	0	1	1	1
1	0	1	0	1	1
0	1	1	1	0	1
1	1	1	1	1	0

Notes: In the above truth table, a 0 input corresponds to the associated transistor conducting, and a 0 output corresponds to the associated line indicator lamp being lit.

Transmitter Muting

40. It is necessary to mute the associated linear amplifier during filter selection and/or line switching to prevent arcing at the switch and relay contacts. The MUTE output is normally high; to mute the amplifier this must go low.

41. Muting During Filter Selection. While the filter selection motor is running, TR4 on the Control Board conducts. This applies a low to G11. The high output from G11 turns TR14 on and the MUTE output goes low.

42. Muting During Line Switching. During the monostable period (see paragraphs 35 and 36) the $\overline{Q}$ output from the retriggerable monostable ML5 goes low. The output from G11 goes high, TR14 conducts, and the MUTE output goes low.

43. The retriggerable facility of the monostable is used to ensure that the transmitter will remain muted continuously if further line changes are made during the monostable period.

Fault Indicator

44. A fault indicator formed by TR17 and TR21 on the Control Board, provides a low FAULT signal and a low MUTE signal should either or both of the internal power supplies (+5V and +12V) fail. The FAULT signal may be used in the associated drive unit to illuminate a FAULT lamp on its front panel (not on the MA.7917).

45. Failure of the +5V supply turns off TR17. TR21 conducts and the FAULT output goes low.

46. Failure of the +12V supply alone allows R50, R53, and D17 to float, and the FAULT output is pulled low via D18, R51, and TR17.

47. Failure of both supplies provides a low FAULT output via D18, R51, and the base-emitter junction of TR21.

48. Whenever the FAULT output goes low, the MUTE output goes low via D17.

49. The fault indicator earth return is switched at the main transmitter power contactor, to ensure that no fault indication is given when the transmitter amplifier is switched off.

POWER SUPPLIES

50. The circuit diagram for the Power Supplies is divided between Figures 12 and 16.

51. The MA.1034 receives +36V d.c. from up to four separate sources (in the TA.1810 there are four separate power supplies; in the TA.1813 there are two).

52. The MA.1034 internal power supply provides stabilised supplies of +28V, +12V, and +5V. These supplies are fully protected.

53. Transistors TR22 (on the Control Board) and TR1, TR2, and TR3 form the main +28V power supply. From the +28V supply are derived the +12V and +5V supplies by D6 and ML1.

54. On switch on, the applied +36V is momentarily transferred by C25 (Control Board) to the base of TR22. TR22 and hence TR1 conduct, and current flows through TR1, TR2, and TR3 to the +28V stabilizer output, thus providing the necessary conditions to sustain

conduction of TR2 and TR3. Diode D24 (Control Board) prevents the starting voltage spike from C25 from leaking to earth through the relatively low impedance load.

55. Diode D22 and R54 hold the emitter voltage of TR22 to 12V below the output voltage, and the base of TR22 is held at a reference level set by D23. If the output voltage (+28V) tends to increase, the emitter voltage of TR22 tends to rise, turning the transistor off. TR22 collector voltage tends to rise thus turning off TR1, TR2, and TR3. The output voltage is thus prevented from rising.

56. If an abnormal load current is drawn, the voltage drop across R1 causes diodes D19 to D21 (Control Board) to conduct, and TR1 turns off. The output voltage drops to zero and TR22 is cut-off. Therefore, even if the cause of the high load current is removed, the power supply will not automatically self-start. In this case it is necessary to switch the MA.1034 off and then on again to provide the necessary starting pulse (see paragraph 54).

57. The circuit breaker CB1 provides overall protection. It will not trip for any overload apart from failure of the power supply stabiliser. Resistor R6, in the negative return path to the d.c. input, ensures that large earth return currents do not cause tripping of the circuit breaker when the MA.1034 is powered from the TA.1810 or TA.1813, which have floating power supplies. The circuit breaker also serves as the main MA.1034 supply on/off switch.

CHAPTER 5

MAINTENANCE

TEST EQUIPMENT REQUIRED

1.	(a)	Associated 500W or 1kW transmitter.	
	(b)	Power Supply	36V d.c. at 2A maximum e.g. Advance Type PP6.
	(c)	Signal Generator	3.2MHz to 66MHz 1mV to 1V output level e.g. Marconi Type 144H or Racal Type 9061/9062
	(d)	Electronic Voltmeter	50 ohm input impedance e.g. Racal Type 314A
	(e)	Frequency Counter	3.2MHz to 66MHz e.g. Racal Type 9021 or Racal Type 9822
	(f)	Multimeter	e.g. Avometer Model 8
	(g)	Dummy Load	50 ohm, 1kW e.g. Bird Termaline Wattmeter Model 694.
	(h)	Rheostat	0 to 100 ohm.
	(j)	Board Extension Adaptor	Racal CA605023
	(k)	Test Lead 1	Length: 1ft (0,3m) approx. Cable Type: UR43 Terminations: To suit signal generator at one end, and C-type connector to mate with SK10 on the MA.1034 at the other end.

(l) Test Lead 2

Length: 3ft (1m) approx.

Cable Type: UR43

Terminations: To suit electronic voltmeter at one end, and C-type connector to mate with SK2 on the MA.1034 at the other end.

(m) Test Lead 3

Length: 2ft (0,6m) maximum.

Cable Type: UR67

Terminations: C-type connectors at both ends. One end to be a plug (to connect to SK10 on the MA.1034); the other end to be a socket (to connect with the cable from the combiner in the transmitter).

(n) Test Lead 4

Length: Not critical

Cable Type: UR67

Terminations: C-type connector at one end to mate with SK2 on the MA.1034; the other end is to suit the dummy load.

(p) C-type coaxial link adaptor.

DISMANTLING AND REASSEMBLY

Power Supply/Heatsink Assembly

Figs. 5 and 9

2. Release the screws securing the fanning strip to the terminal block.

3. Remove the three hexagonal pillars securing the power supply/heatsink assembly to the bulkhead. The heatsink may now be lifted away from the MA.1034.

4. Reassembly is the reversal of the above procedure.

Front Panel Switch/Lamp Assembly

Fig.5

5. Remove the four screws securing the front panel to the MA.1034, and remove the front panel.

6. Remove the four screws securing the switch/lamp assembly to the front of the MA.1034.

7. Remove the two screws securing the switch/lamp assembly rear support brackets to the base of the MA.1034.

8. After removing a sufficient number of cable clamps to allow adequate movement, the switch/lamp assembly may be lifted clear of the MA.1034.

9. Reassembly is the reversal of the above procedure.

Indicator Lamp Bulbs

10. Use the special tool to pull off the head of the lamp. Apply the tool to the upper and lower faces and pull with a downwards movement.

11. The bulb may be withdrawn by pushing a length of wetted 5/16 inch bore sleeving (supplied) over the bulb and pulling the bulb from its socket.

12. If the special tool is not available, the following procedure may be adopted. Using a knife or a sharp screwdriver, prise off the front of the lamp. Take care not to lose the component parts of the front. The bulb may then be removed with the sleeving.

13. Reassembly of the lamp after removal with the special tool is the reversal of the dismantling procedure. If the front of the lamp was prised off, the parts are replaced in the following order:-

Bulb, diffuser, slide, coloured filter, clear top.

Fig.5

Filter Assembly

14. Remove the top cover from the MA.1034.

15. Remove the top supporting straps from the filter assembly.

16. Disconnect the three strips connecting the filter to the wafer switch stator.

17. Remove the four screws securing the filter assembly to the base plate of the MA.1034. The filter assembly may now be removed.

18. Reassembly of the filter assembly is the reversal of the above procedure. When reconnecting the three strips from the switch stator, it may be found to be easier if the MA.1034 is on its side.

Figs. 5, 6 and 10

Reflected Power Unit

19. Remove the top cover from the MA.1034.

20. Disconnect PL3 from SK11 (on the reflected power unit).

21. Disconnect PL2 from the rear of SK10.

22. Remove the bottom cover from the MA.1034.

23. Hold the reflected power unit and remove the three screws securing this to the base plate (accessible from the top).

24. Note the connections to the pins on the printed circuit board and unsolder these wires. The reflected power unit may now be removed.

25. Reassembly is the reversal of the above procedure.

Motor/Switch Assembly — Figs. 3, 5 and 6

26. Removing the Motor.

(1) Remove the top and bottom covers from the MA.1034.

(2) Unsolder the motor supply leads from the stand-off terminals.

(3) Rotate the clutch assembly by hand until the grub-screw nearest the motor is accessible. Release this screw.

(4) Remove the two screws securing the motor fixing bracket to the base plate. The motor may now be lifted away from the clutch.

27. Removing the Clutch Assembly

(1) Remove the motor.

(2) Release the two grub-screws securing the clutch assembly to the shaft, and pull the clutch assembly off.

28. Replacing the Motor. This is the reversal of the removal procedure.

29. Replacing the Clutch Assembly. This is the reversal of the removal procedure.

NOTE: Ensure that the clutch is adjusted for maximum torque. Hold the body of the clutch with the knurled ring at the top, and rotate this ring fully anti-clockwise.

30. Re-setting the Microswitch (Fig.3)

(1) Rotate the wafer switch to Band 1 position with a screwdriver (screwdriver slot is at the end of the switch shaft in the upper compartment).

NOTES: The wiper of the switch rotor must be centrally disposed about the switch stator (position 1).

The cut-out in the rotor of switch SU must be in the position shown in Fig.3.

(2) Slacken the two microswitch securing screws and adjust the position of the switch such that the switch feeler rests at the bottom of the first trough in the nylon 'star' wheel (Fig.3). If the first trough is not in the correct position, slacken the grub-screw securing the 'star' wheel to the shaft and rotate the wheel as required. Re-tighten the grub-screw.

(3) Apply an external 36V power supply (max. 1.6A) between pin 1 on the fanning strip (+ve) and chassis.

(4) If the motor runs continually, the microswitch is set too near the 'star' wheel, and needs to be moved out. The final setting of the microswitch is where the motor stops the wafer switch at the required filter, and the contact on the rotor of the switch is at the centre of the contact on the stator.

(5) Remove the external power supply.

Circuit Boards

31. Release the fasteners at either side of the front panel cover plate (Fig.4) and remove this plate.

32. Using the handle at the edge of the board, pull the board out.

33. A board is replaced by aligning it with the side runners in the board compartment, and pushing back until the rear engages with the connector on the chassis. A cut-out in the board prevents incorrect installation. The board positions are as follows:

Top Board	PS506 for MA.1034A PS508 for MA.1034B
Lower Board	PS507 for both versions.

ALIGNMENT AND PERFORMANCE CHECKS

34. The MA.1034 is not installed for the alignment procedure.

35. For alignment purposes, the MA.1034 is powered from a separate power supply. Connect the power supply set to 36V d.c. between pin 1 (+ve) of the fanning strip (Fig.5) and chassis, and switch the power supply on.

Internal Power Supply

36. Remove the lower circuit board (PS507), and plug in an extension board. Plug board PS507 into the extension board.

37. Connect the rheostat (set to maximum resistance) between the +28V test socket (SK8) (Fig.5) and chassis.

38. Connect the multimeter set to read 28V across the rheostat.

39. Adjust the rheostat until the current drawn from the +36V supply is approximately 1.6A.

40. The voltage reading should be 28V ± 1V. If the voltage is outside the tolerance, adjust R55 on board PS507. Disconnect the multimeter.

41. Set the multimeter to read 12V d.c. and connect it between SK9 (+ve) and chassis. The reading should be 12V ±1V. Disconnect the multimeter.

42. Set the multimeter to read 5V d.c. and connect it between SK7 (+ve) and chassis. The reading should be 5V ± 0.3V. Disconnect the multimeter.

43. Disconnect the rheostat, turn off the external power supply, and replace board PS507 in the board compartment.

Indicator Lamps and Band Selector Switch Position

44. Turn on the external power supply.

45. Press the LOCAL CONTROL, FREQUENCY BAND 1, and LINE SELECTION 1 push-buttons. All three lamps should light.

46. Press the LINE SELECTION 2,3,4, and AUTO push-buttons, and check that these light.

47. Remove the top cover.

48. Check that the wafer switch rotor has stopped at position 1 (L1) (Fig.5) and that the rotor wiper is central on the stator contact. If the wiper misses the contact by any amount, the microswitch may require repositioning (see paragraph 30).

49. Press the FREQUENCY BAND 2 to 9 and WIDEBAND (W/B) push-buttons in turn, and check that the wafer switch steps to the correct position. Also check that when the switch stops, the selected push-button lights.

50. Temporarily refit the top cover using two screws, and replace the bottom cover if this has been removed: if filter alignment is to be performed, leave the bottom cover off.

Filter Alignment

51. Using test lead 1, connect the r.f. output of the signal generator to the coaxial link adaptor.

52. Using test lead 2, connect the other side of the coaxial link adaptor to the 50 ohm input of the electronic voltmeter.

53. Set the electronic voltmeter range to 0dB.

54. Connect the frequency counter to monitor the signal generator output.

55. Set the signal generator frequency to 3.2MHz ± 5kHz, and adjust the output until the electronic voltmeter reads -2dB.

56. Disconnect the test leads from the coaxial link adaptor and connect test lead 1 to SK10 on the MA.1034, and test lead 2 to SK2.

57. Press the LOCAL CONTROL and FREQUENCY BAND 1 push-buttons.

58. The electronic voltmeter should indicate -8.3dB. If necessary, remove the top cover of the MA.1034, loosen the lock nut on band 1 filter coil L1, and adjust the core for the correct voltmeter indication. Tighten the lock nut and replace the top cover.

NOTE: The core is adjusted from the lower compartment of the MA.1034.

59. Disconnect the test leads from the MA.1034 and connect them together with the coaxial link adaptor.

60. Set the signal generator frequency to 4.8MHz ± 10kHz, and adjust the output level until the electronic voltmeter reads -2dB.

61. Disconnect the test leads from the coaxial link adaptor and connect test lead 1 to SK10 on the MA.1034, and test lead 2 to SK2.

62. The electronic voltmeter reading should not be less negative than -26dB. Reset the range to 0dB.

63. Press the FREQUENCY BAND 2 push-button.

64. Repeat paragraphs 51 to 62 using the bands and frequencies listed in the following table:-

NOTES: (1) The coils for bands 6,7,8 and 9 do not have adjustable cores. To tune these coils, loosen the coil locking bar and adjust the inductance by increasing or decreasing the space between the turns on the coil. Increasing the inductance by decreasing the spacing will also increase the attenuation at the initial frequency setting.

(2) The top cover should be replaced before making each measurement although it is not necessary to secure the cover.

(3) The electronic voltmeter reading should be -8.3dB for all initial attenuation measurements, and -26dB for all final attenuation measurements.

Band	Frequency for Initial Attenuation Measurement	Frequency for Final Attenuation Measurement
1	3.2MHz	4.8MHz
2	4.4MHz	6.6MHz
3	6.2MHz	9.3MHz
4	8.6MHz	12.9MHz
5	12.0MHz	18.0MHz
6	16.4MHz	24.6MHz
7	22.8MHz	34.2MHz
8	31.6MHz	47.7MHz
9	44.0MHz	66.0MHz

65. Remove the test leads from the MA.1034, and replace and secure the top and bottom covers.

Reflected Power Meter

66. Using test lead 3, connect the combiner output of the transmitter to SK10 on the MA.1034. Connect SK2 of the MA.1034 to the 50 ohm load with test lead 4.

67. Press the W/B (Wideband) FREQUENCY BAND push-button, and check that the W/B lamp lights after a short period.

68. Set the transmitter to transmit full power at 10MHz in CW mode.

69. Adjust the reflected power trimmer capacitor (C1 in Fig.10) through the hole in the left side of the MA.1034, for a null indication on the REFLECTED POWER meter on the front panel.

NOTE: If there is a "dead zone" in the adjustment, set the capacitor to the centre of this zone.

70. Switch of the transmitter and the external power supply. Disconnect all leads.

CHAPTER 6

FAULT-FINDING

INTRODUCTION

1. Before assuming the MA.1034 is at fault, it is advisable to check the following points:

   (1) Check that the transmitting system is being operated correctly, and that there is no fault in other equipment.

   (2) Check that all system cables are installed properly.

   (3) Check that the front panel controls on the MA.1034 are set correctly.

   (4) Check that the circuit breaker on the front panel is not off.

   (5) Check that the correct circuit boards are fitted to the MA.1034.

2. The following fault-finding procedure is based on the cause and effect principle. The type of fault is listed as a heading, under which are possible causes and checks that can be made.

3. An external fault indication is made by the MA.1034 to the transmitter drive unit if the power supplies in the MA.1034 fail. This indication lights a lamp on the drive unit front panel (MA.1720 only).

FAULT INDICATION TO TRANSMITTER DRIVE UNIT

4. Turn off the circuit breaker, and after 2 seconds or more, turn the circuit breaker back on.

5. If the fault indication remains, pull the MA.1034 from the cabinet until the test sockets are accessible. Check the voltages.

6. If only the +5V supply is incorrect, check the +5V regulator, X1, which is mounted on the Power Supply/Heatsink Assembly.

7. If only the +5V and +12V supplies are incorrect, check the serviceability of D6, R6, and R7, which are mounted on the Power Supply/Heatsink Assembly.

8. If all supplies are incorrect, check that (a) Motor M1 has not seized or is not prevented from turning, and (b) the +28V regulator components are serviceable.

CIRCUIT BREAKER TRIPS

9. Check the +28V regulator components, especially the series regulator transistors TR2 and TR3.

BULB FAILURE

10. If all bulbs fail to light, check D7 (mounted under the terminal block) and the +28V feed to D7.

11. If single bulbs fail to light, check the bulb. If the bulb is serviceable and it is one of the band indicator bulbs (LP8 to LP17), check the wiring from this bulb to the wafer switch SUF.

12. If the bulb is serviceable and it is one of the control bulbs LP1 or LP2, check the wiring to the bulb through the CONTROL switches.

13. If the bulb is serviceable and it is one of the line bulbs (LP3 or LP6), check the wiring from the bulb to the control board. If no wiring fault is found, withdraw the control board and connect it via the extension board to the MA.1034. Check the voltage on the base of the relevant lamp driver transistor (TR16, TR18, TR19, or TR20). The base voltage should be greater than +3V. If this voltage is correct, there is a fault in either the indicator circuits, or the Line relays or connections to these relays.

MOTOR RUNS CONTINUOUSLY

14. Check that the microswitch SV is serviceable and that it is correctly aligned.

15. Check the action of TR5 and TR6 on the control board.

16. Check the wafer switch for jamming or stiff action, and check that the clutch is not slipping. This would cause the motor to run continuously if the wafer switch is stuck in an intermediate position.

17. Check that the matrix board (if fitted) is programmed correctly. There should not be more than one band programmed for each channel, although more than one channel may be programmed for each band.

18. Check the outputs from the decoder board (if fitted). Only one output should be at +12V.

19. Check that the motor clamping circuit consisting of TR23 and associated components is functioning correctly.

MOTOR DOES NOT RUN

20. Check the power supplies. A fault indication to the transmitter drive unit is made when a power supply fails. Refer to paragraph 4.

21. Check the wiring to the motor.

22. If the fault occurs when the MA.1034 is operated in EXTENDED CONTROL, select LOCAL and manually select the bands using the front panel push-buttons. If the correct band is selected, the fault is in either the matrix board PS506, the decoder board PS508, or in the inputs to these boards.

23. If the motor does not run, check TR5, TR6, and associated components on the control board PS507.

24. If the fault occurs when the MA.1034 is operated in LOCAL CONTROL, check the functioning of the LOCAL CONTROL push-button (SE), diode D1, continuity through motor M1, and the serviceability of TR5, TR6, and associated components on the control board PS507.

NO RF OUTPUT

25. Select LOCAL CONTROL and WIDEBAND (W/B). Check that the W/B lamp lights. Check the r.f. output power.

26. If there is r.f. output power in wideband, refer to paragraph 30. If there is no r.f. output power in wideband, check that there is r.f. input to the linear amplifier (use the meter on the transmitter meter panel). If there is no r.f. input, reset the drive unit. If the reset has no effect, the drive unit is at fault.

27. If there is r.f. input, load the output from the linear amplifier with a 50 ohm 1000W load, and check the output power of the linear amplifier (use the meter panel). If the r.f. output power is correct, the fault lies in the r.f. path through the MA.1034 (but not in any of the filters, refer to paragraph 29). If the r.f. output power is not correct, the linear amplifier is probably muted, possibly by the MA.1034.

28. Connect the control board PS507 to the MA.1034 via the extension board. Check the voltage on the collector of TR14. If this voltage is approximately 0V, the MA.1034 is muting the linear amplifier. Check the muting circuit (refer to the circuit description). If the voltage is approximately +12V, check the voltage at pin 26 on the control board edge connector. If this voltage is approximately +12V, there is a fault in the linear amplifier. If this voltage is approximately 0V, the linear amplifier is being muted by another unit in the transmitting system.

29. To check the r.f. path through the MA.1034 (in wideband), first remove all power from the transmitter. Check continuity between SK10 and SK2 and also check for short circuits or low resistance between the r.f. path and chassis. If a short circuit is indicated, first check C1 in the reflected power unit.

30. If there is r.f. output power in wideband, the fault probably lies in the band filter which was being used when the fault occurred. Replace the complete band filter assembly.

LOW R.F. OUTPUT

31. Load the output of the transmitter with a 50 ohm 1000W load. If power delivered into this load is correct, then the fault is probably a mismatched proper load e.g. antenna.

32. If the power output is still low, select wideband on the MA.1034 (press the LOCAL CONTROL and W/B push-buttons). If the power output remains low, there is probably an r.f. loss or mismatch external to the MA.1034 e.g. in the coaxial lines. Refer to paragraph 34.

33. If the power output in wideband is correct, suspect that there is a fault in the band filter selected when the fault occurred. Check that the correct band is selected for the frequency used.

34. If a channelised exciter is used, check the line length programming on the matrix board PS506.

35. If the MA.1034 is used in a system where the line switching is controlled externally, press the LINE SELECTION 1-4 push-buttons in turn (in LOCAL control) and check which line gives the best forward power reading. Select AUTO and check that the line selected automatically corresponds to that found to give the best power reading. If it is not the same, the external line switching controller is at fault.

LINE SWITCHING FAULT

36. Press the LINE SELECTION 1-4 push-buttons in turn (in LOCAL control) and check that the relevant lamps light. If they do, the control board is not at fault.

Note: The line indicator circuit will only function correctly if the line relays are working.

37. If the lamps fail to light or the wrong one lights, but the correct relay is selected, the fault lies in the line indicator circuit on the control board.

38. If the wrong relay is selected, the fault lies in either the LINE SELECTION switches, the wiring between these and the control board, or the line switching circuit on the control board.

39. If the wrong relay is selected when using an MA.1034A, but they are correctly selected manually, check the programming of the matrix board.

40. If the wrong relay is selected when using an MA.1034B, but they are correctly selected manually, the fault lies outside the MA.1034 (also check the READY output from the MA.1034 - paragraph 47).

41. If the correct relay is selected but the wrong indication is made when using an MA.1034B, the fault lies either in the connection between the relays and the MA.1034, or in the line indicator circuit on the control board.

INCORRECT FILTER SELECTION

42. If the correct filter can be selected manually, the fault lies either in the programming of the matrix board (if fitted), in the operation of the decoder board (if fitted), or in the inputs to these boards.

43. If the correct filter cannot be selected manually, check whether the filter selection motor is operating. If not, refer to paragraph 20.

44. If the motor is running, check whether there are any faults in the wafer switch SUR or in the wiring to this switch.

MUTE OUTPUT FAULT

45. If it is proved that the MA.1034 is permanently muting the linear amplifier (paragraph 28), check the operation of the muting circuit in conjunction with the circuit description.

46. The MA.1034 should mute the linear amplifier whenever the filter selection motor is running and whenever the line switching changes. If this does not occur, check the operation of the muting circuit in conjunction with the circuit description.

'READY' OUTPUT FAULT

47. The MA.1034B provides a READY signal to the MS.139 line switching unit to enable this to change lines. The READY signal is only provided when the MA.1034 filter selection motor has stopped running and a COARSE TUNE INITIATE (RESET) signal has been received from the transmitter drive unit.

48. If the READY output does not occur, press the RESET button on the transmitter drive unit. If there is no change, check the action of the READY signal generation circuit in conjunction with the circuit description.

CHAPTER 7

COMPONENTS LIST

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Chassis Components						Figs. 11 & 12
Resistors			W			
R1	0.82	Wirewound	6	10	923479	Welwyn W22
R2	270	Metal Oxide		5	908143	Electrosil TR5
R3	270	Metal Oxide		5	908143	Electrosil TR5
R4	1	Wirewound	2.5	5	917137	Welwyn W21
R5	1	Wirewound	2.5	5	917137	Welwyn W21
R6	10	Wirewound	12	5	913815	Welwyn W24
R7	12	Wirewound	12	5	918486	Welwyn W24
R8	10k	Metal Oxide		5	906023	Electrosil TR5
R9	10k	Metal Oxide		5	906023	Electrosil TR5
R10	10k	Metal Oxide		5	906023	Electrosil TR5
R11	10k	Metal Oxide		5	906023	Electrosil TR5
R12	10k	Metal Oxide		5	906023	Electrosil TR5
R13	10k	Metal Oxide		5	906023	Electrosil TR5
R14	10k	Metal Oxide		5	906023	Electrosil TR5
R15	10k	Metal Oxide		5	906023	Electrosil TR5
R16	10k	Metal Oxide		5	906023	Electrosil TR5
R17	470	Metal Oxide		5	906019	Electrosil TR5
R18	56	Metal Oxide		5	908142	Electrosil TR5
R19	1	Wirewound	6	5	914884	Welwyn W22
R20	270	Metal Oxide		5	908284	Electrosil TR4
4R1	22	Metal Oxide		5	911879	Electrosil TR5
4R2	22	Metal Oxide		5	911879	Electrosil TR5
4R3	47k	Metal Oxide		5	908391	Electrosil TR4
Capacitors						
	F		V			
C1	2p	Ceramic Disc	4k	±0.5p	920558	Plessey Type 10
C2	0.1μ	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C3	750p	Mica	2k	2	922854	LCC Type CA1
C4	536p	Mica	2k	2	922853	LCC Type CA1
C5	383p	Mica	2k	2	922852	LCC Type CA1

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Capacitors (Contd.)						
	F		V			
C6	274p	Mica	2k	2	922851	LCC Type CA1
C7	196p	Mica	2k	2	922849	LCC Type CA1
C8	133p	Mica	2k	2	922847	LCC Type CA1
C9	95.3p	Mica	2k	2	922845	LCC Type CA1
C10	64.9p	Mica	2k	2	922843	LCC Type CA1
C11	44.2p	Mica	2k	2	922841	LCC Type CA1
C12	750p	Mica	2k	2	922854	LCC Type CA1
C13	536p	Mica	2k	2	922853	LCC Type CA1
C14	384p	Mica	2k	2	922852	LCC Type CA1
C15	274p	Mica	2k	2	922851	LCC Type CA1
C16	196p	Mica	2k	2	922849	LCC Type CA1
C17	133p	Mica	2k	2	922847	LCC Type CA1
C18	95.3p	Mica	2k	2	922845	LCC Type CA1
C19	64.9p	Mica	2k	2	922843	LCC Type CA1
C20	44.2p	Mica	2k	2	922841	LCC Type CA1
C21	237p	Mica	2k	2	922850	LCC Type CA1
C22	178p	Mica	2k	2	922848	LCC Type CA1
C23	127p	Mica	2k	2	922846	LCC Type CA1
C24	90.9p	Mica	2k	2	922844	LCC Type CA1
C25	64.9p	Mica	2k	2	922843	LCC Type CA1
C26	46.4p	Mica	2k	2	922842	LCC Type CA1
C27	33p	Mica	2k	5	922840	LCC Type CA1
C28	24p	Mica	2k	5	922839	LCC Type CA1
C29	18p	Mica	2k	5	922838	LCC Type CA1
C30	750p	Mica	2k	5	922854	LCC Type CA1
C31	536p	Mica	2k	2	922853	LCC Type CA1
C32	383p	Mica	2k	2	922852	LCC Type CA1
C33	274p	Mica	2k	2	922851	LCC Type CA1
C34	196p	Mica	2k	2	922849	LCC Type CA1
C35	133p	Mica	2k	2	922847	LCC Type CA1
C36	95.3p	Mica	2k	2	922845	LCC Type CA1
C37	64.9p	Mica	2k	2	922843	LCC Type CA1
C38	44.2p	Mica	2k	2	922841	LCC Type CA1
C39	750p	Mica	2k	2	922854	LCC Type CA1
C40	536p	Mica	2k	2	922853	LCC Type CA1

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Capacitors (Contd.)						
	F		V			
C41	383p	Mica	2k	2	922852	LCC Type CA1
C42	274p	Mica	2k	2	922851	LCC Type CA1
C43	196p	Mica	2k	2	922849	LCC Type CA1
C44	133p	Mica	2k	2	922847	LCC Type CA1
C45	95.3p	Mica	2k	2	922845	LCC Type CA1
C46	64.9p	Mica	2k	2	922843	LCC Type CA1
C47	44.2p	Mica	2k	2	922841	LCC Type CA1
C48	5p	Ceramic Disc	4k	±0.5p	917977	Plessey Type 10
C49	270p	Tubular Ceramic	750	2	902111	Erie C/N750
C50	0.1μ	Polycarbonate	100	20	914174	ITT PMC2R/0.1/M100
4C1	4-60p	Trimmer			916940	Mullard 908-07011-200V
4C2	150p	Silver Mica	350	2	902238	Lemco MS119/1/R
4C3	0.1μ	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
4C4	0.1μ	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
Transformers						
T1		Toroid			BT603391	Racal
Inductors						
L1		Coil Assembly			BA604195	Racal
L2		Coil Assembly			BA604196	Racal
L3		Coil Assembly			BA604197	Racal
L4		Coil Assembly			BA604198	Racal
L5		Coil Assembly			BA604199	Racal
L6		Coil Assembly			BA604210	Racal
L7		Coil Assembly			BA604211	Racal
L8		Coil Assembly			BA604212	Racal
L9		Coil Assembly			BA604213	Racal
Switches						
SA		Ceramic R.F. Wafer			BD603971	Films and Equipment
SB-ST		Switch Key Interlocking 2 c/o springset			923184	TMC S611603
SU		Rotary			CD603802	Multidex
SV		Microswitch			919551	Burgess V4T7YR1

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
CB1		Circuit Breaker			922862	Highland Electronics APL-1-IREC1-5-252
Transistors						
TR1					922900	Motorola 2N5679
TR2					917289	Westinghouse 2N3233
TR3					917289	Westinghouse 2N3233
Diodes						
D1					911460	Texas 1N4002
D2					910957	Mullard BYX38-300
D3					910957	Mullard BYX38-300
D4					910957	Mullard BYX38-300
D5					910957	Mullard BYX38-300
D6	12V	Zener			923151	Mullard BZY93-C12R
D7	4.7V	Zener			923200	Mullard BZY96-C4V7
4D1					914898	ITT 1N4149
4D2					914898	ITT 1N4149
Integrated Circuits						
X1		Voltage Regulator			922901	SGS LM309K
Connectors						
SK1		Socket, 15-way			900905	Cannon DA15S
SK2		Socket, coaxial			922861	Transradio C3/5CH
SK3		Socket, coaxial			900075	Transradio BN6/5A
SK4		Not used				
SK5		Board Socket			919406	Varicon Varelco 8131-032-603-003
SK6		Board Socket			919406	Varicon Varelco 8131-032-603-003
SK7		Test Socket, 2mm			916023	Belling Lee L1737
SK8		Test Socket, 2mm			916023	Belling Lee L1737
SK9		Test Socket, 2mm			916023	Belling Lee L1737
SK10		Adaptor, coaxial			922064	Transradio C3/5B-CH
SK11		Socket, coaxial			914309	Transradio C4/5
PL1		Plug, 15-way			909729	Cannon DA15P
PL2		Plug, coaxial			922179	Transradio C7/5
PL3		Plug, coaxial			922179	Transradio C7/5

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Lamps						
LP1-LP17		Bulb, integral part of SB-ST	24V		921899	HIVAC 24V55
Circuit Boards						
PS506		Matrix Board			CC603784	Racal
PS507		Control Board			DC603925	Racal
PS508		Decoder Board			DC604054	Racal
Miscellaneous						
ME1		Meter, 100μA			922860	Turner Model 125
M1		Motor, complete with 173:1 Gearbox type G03/2			922313	Portescap 330/2055
Items Contained in the Linen Bag						
		Bulb (1 off)	24V		921899	HIVAC 24V55
		Plugs (2 off) for connection to SK7,8, & 9.			924143	Belling Lee L1727
		Trimming Tool (1 off)			919375	Bulgin TT8
		PVC Sleeving (2 inches) for bulb removal.			910478	

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
		Matrix Board - PS506				Fig.14
Capacitors						
C1-C10	0.1μF	Polycarbonate	100V	20	914173	ITT PMC2R/0.1/M100
Diodes						
D1-D30					914898	ITT 1N4149
Connectors						
PL1		Edge Connector			919362	Varicon Varelco 8131-032-603-003

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
		Control Board - PS507				Fig. 16
Resistors			W			
R1	3.3k	Metal Oxide		5	900991	Electrosil TR4
R2	3.3k	Metal Oxide		5	900991	Electrosil TR4
R3	4.7k	Metal Oxide		5	900989	Electrosil TR4
R4	3.3k	Metal Oxide		5	900991	Electrosil TR4
R5	3.3k	Metal Oxide		5	900991	Electrosil TR4
R6	1.2k	Metal Oxide		5	908285	Electrosil TR4
R7	1.2k	Metal Oxide		5	908285	Electrosil TR4
R8	1.2k	Metal Oxide		5	908285	Electrosil TR4
R9	1.2k	Metal Oxide		5	908285	Electrosil TR4
R10	3.3k	Metal Oxide		5	900991	Electrosil TR4
R11	4.7k	Metal Oxide		5	900989	Electrosil TR4
R12	4.7k	Metal Oxide		5	900989	Electrosil TR4
R13	4.7k	Metal Oxide		5	900989	Electrosil TR4
R14	470	Metal Oxide		5	900992	Electrosil TR4
R15	1.2k	Metal Oxide		5	908285	Electrosil TR4
R16	560	Metal Oxide		5	909841	Electrosil TR4
R17	10k	Metal Oxide		5	900986	Electrosil TR4
R18	1.8k	Metal Oxide		5	908283	Electrosil TR4
R19	1.8k	Metal Oxide		5	908283	Electrosil TR4
R20	1.5k	Metal Oxide		5	908296	Electrosil TR4
R21	560	Metal Oxide		5	909841	Electrosil TR4
R22	1.5k	Metal Oxide		5	908296	Electrosil TR4
R23	220	Metal Oxide		5	900988	Electrosil TR4
R24	180	Metal Oxide		5	909125	Electrosil TR4
R25	560	Metal Oxide		5	909841	Electrosil TR4
R26		Not used				
R27	180	Metal Oxide		5	909125	Electrosil TR4
R28	560	Metal Oxide		5	909841	Electrosil TR4
R29	4.7k	Metal Oxide		5	900989	Electrosil TR4
R30		Not used				
R31	10k	Metal Oxide		5	900986	Electrosil TR4
R32	470	Metal Oxide		5	900992	Electrosil TR4
R33	10k	Metal Oxide		5	900986	Electrosil TR4
R34	1.2k	Metal Oxide		5	908285	Electrosil TR4
R35	470	Metal Oxide		5	900992	Electrosil TR4

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Resistors (Contd.)			W			
R36	1.2k	Metal Oxide		5	908285	Electrosil TR4
R37	15k	Metal Oxide		5	908280	Electrosil TR4
R38	1.8k	Metal Oxide		5	908283	Electrosil TR4
R39	1.8k	Metal Oxide		5	908283	Electrosil TR4
R40	4.7k	Metal Oxide		5	900989	Electrosil TR4
R41	4.7k	Metal Oxide		5	900989	Electrosil TR4
R42	4.7k	Metal Oxide		5	900989	Electrosil TR4
R43	1.8k	Metal Oxide		5	908283	Electrosil TR4
R44	820	Metal Oxide		5	908282	Electrosil TR4
R45	4.7k	Metal Oxide		5	900989	Electrosil TR4
R46	820	Metal Oxide		5	908282	Electrosil TR4
R47	3.3k	Metal Oxide		5	900991	Electrosil TR4
R48	1.2k	Metal Oxide		5	908285	Electrosil TR4
R49	820	Metal Oxide		5	908282	Electrosil TR4
R50	560	Metal Oxide		5	909841	Electrosil TR4
R51	4.7k	Metal Oxide		5	900989	Electrosil TR4
R52	820	Metal Oxide		5	908282	Electrosil TR4
R53	4.7k	Metal Oxide		5	900989	Electrosil TR4
R54	1.8k	Metal Oxide		5	908283	Electrosil TR4
R55	330	Potentiometer		20	923372	Plessey MPWT
R56	680	Metal Oxide		5	908390	Electrosil TR4
R57	470	Metal Oxide		5	900992	Electrosil TR4
R58	22	Wirewound	2.5	5	913850	Welwyn W21
Capacitors						
	µF		V			
C1	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C2	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C3	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C4	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C5	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C6	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C7	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C8	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C9	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C10	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100

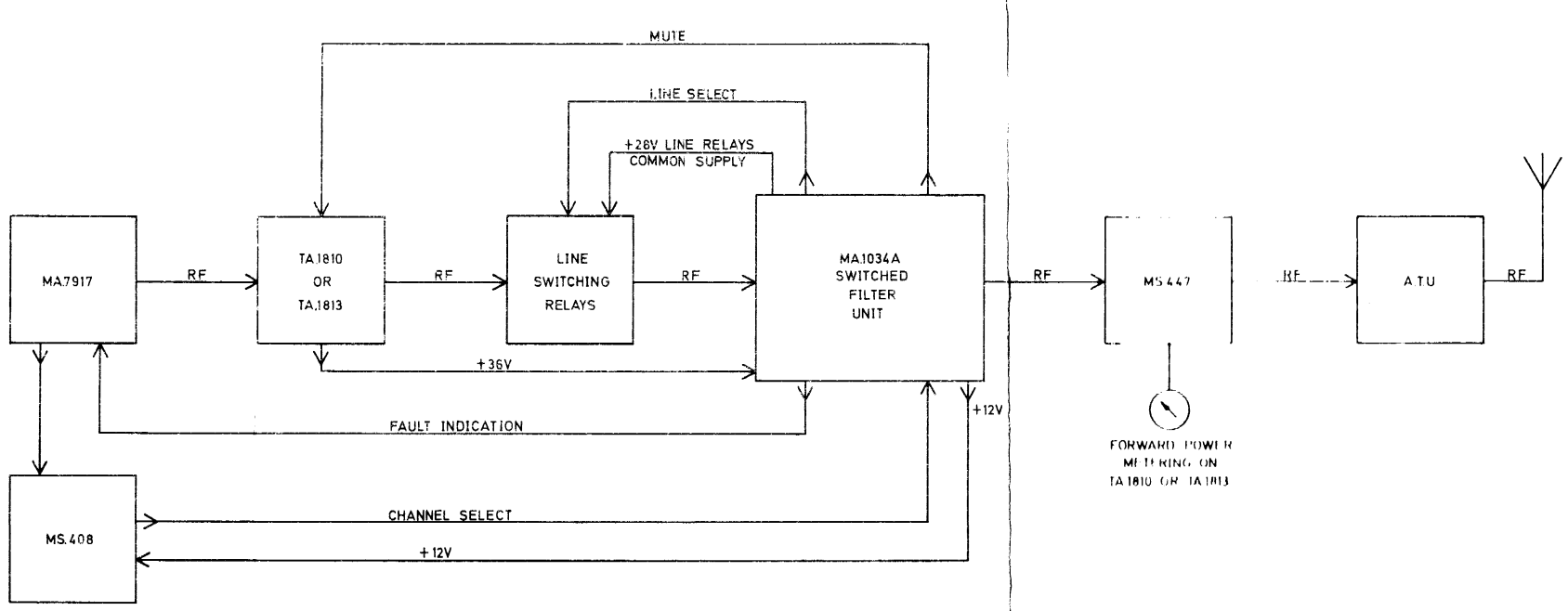
Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Capacitors (Contd.)						
	µF		V			
C11	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C12	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C13	1	Tantalum	35	20	908462	Union Carbide K1J35S
C14	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C15	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C16		Not used				
C17		Not used				
C18	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C19	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C20	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C21	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C22	10	Tantalum	35	20	922789	ITT TAG 10/35
C23	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C24	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C25	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C26	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C27	10	Tantalum	35	20	922789	ITT TAG 10/35
C28	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C29	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C30	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
C31	0.1	Polycarbonate	100	20	914173	ITT PMC2R/0.1/M100
Transistors						
TR1					911929	Mullard BC107
TR2					911929	Mullard BC107
TR3					911929	Mullard BC107
TR4					911929	Mullard BC107
TR5					911929	Mullard BC107
TR6					911929	Mullard BC107
TR7					911929	Mullard BC107
TR8					911929	Mullard BC107
TR9					911929	Mullard BC107
TR10					908753	Mullard BFY51

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Transistors (Contd.)						
TR11					908753	Mullard BFY51
TR12					911929	Mullard BC107
TR13					911929	Mullard BC107
TR14					911929	Mullard BC107
TR15					911929	Mullard BC107
TR16					908753	Mullard BFY51
TR17					911929	Mullard BC107
TR18					908753	Mullard BFY51
TR19					908753	Mullard BFY51
TR20					909753	Mullard BFY51
TR21					911929	Mullard BC107
TR22					917389	Mullard BSW66
TR23					908753	Mullard BFY51
Diodes						
D1					914898	ITT 1N4149
D2					914898	ITT 1N4149
D3					914898	ITT 1N4149
D4					914898	ITT 1N4149
D5	4.7V	Zener			914067	Mullard BZY88 C4V7
D6	4.7V	Zener			914067	Mullard BZY88 C4V7
D7	7.5V	Zener			911681	Mullard BZY88 C7V5
D8	4.7V	Zener			914067	Mullard BZY88 C4V7
D9	4.7V	Zener			914067	Mullard BZY88 C4V7
D10					911460	ITT 1N4002
D11					914898	ITT 1N4149
D12					914898	ITT 1N4149
D13	7.5V	Zener			911681	Mullard BZY88 C7V5
D14					914898	ITT 1N4149
D15					914898	ITT 1N4149
D16					914898	ITT 1N4149
D17					914898	ITT 1N4149
D18					914898	ITT 1N4149
D19					914898	ITT 1N4149
D20					914898	ITT 1N4149

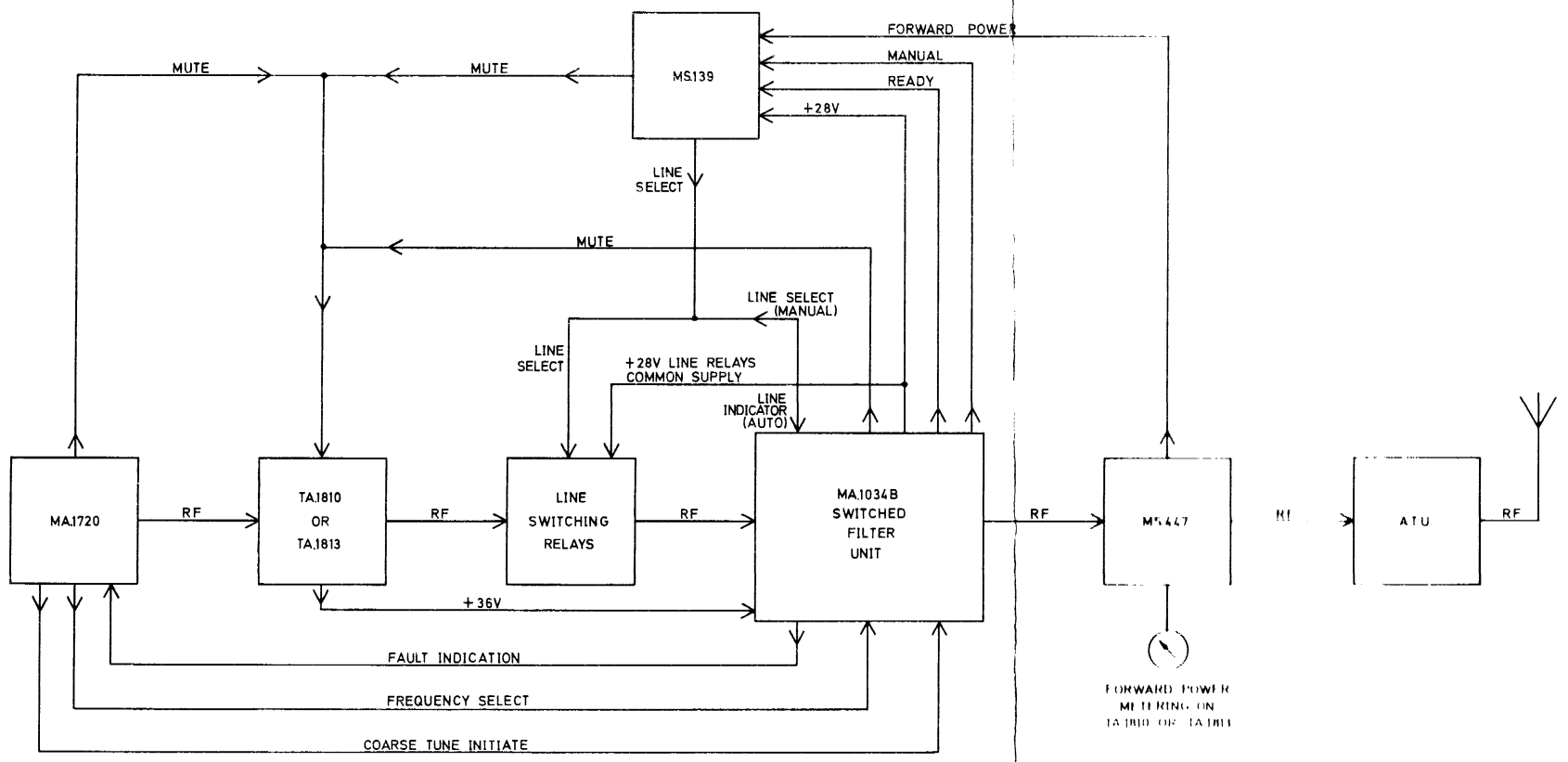
Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Diodes (Contd.)						
D21					914898	ITT 1N4149
D22	12V	Zener			914310	Mullard BZY88C12
D23	15V	Zener			919797	Mullard BZY88C15
D24					914898	ITT 1N4149
D25					911460	ITT 1N4002
Integrated Circuits						
ML1		Quad 2-input NOR gate			919502	ITT 7402J
ML2		Dual D-type Flip-Flop			917509	ITT 7474J
ML3		Triple 3-input NAND gate			918361	ITT 7410J
ML4		Quad 2-input NOR gate			919502	ITT 7402J
ML5		Retriggerable Monostable			922367	ITT 74122J
ML6		Quad 2-input Exclusive OR gate			922790	ITT 7486J
ML7		Quad 2-input NOR gate			919502	ITT 7402J
ML8		Quad 2-input NOR gate			919502	ITT 7402J
ML9		Dual 4-input Schmitt			921278	ITT 7413J
Connectors						
PL1		Edge Connector			919362	Varicon Varelco 8131-032-610-001

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
		Decoder Board - PS508				Fig. 18
Resistors						
R1	1k	Metal Oxide		5	908267	Electrosil TR4
R2	1k	Metal Oxide		5	908267	Electrosil TR4
R3	1k	Metal Oxide		5	908267	Electrosil TR4
R4	1k	Metal Oxide		5	908267	Electrosil TR4
R5	1k	Metal Oxide		5	908267	Electrosil TR4
R6	1k	Metal Oxide		5	908267	Electrosil TR4
R7	1k	Metal Oxide		5	908267	Electrosil TR4
R8	1k	Metal Oxide		5	908267	Electrosil TR4
R9	1k	Metal Oxide		5	908267	Electrosil TR4
R10	1k	Metal Oxide		5	908267	Electrosil TR4
R11	1.5k	Metal Oxide		5	908269	Electrosil TR4
R12	1.5k	Metal Oxide		5	908269	Electrosil TR4
R13	1.5k	Metal Oxide		5	908269	Electrosil TR4
R14	1.5k	Metal Oxide		5	908269	Electrosil TR4
R15	1.5k	Metal Oxide		5	908269	Electrosil TR4
R16	1.5k	Metal Oxide		5	908269	Electrosil TR4
R17	1.5k	Metal Oxide		5	908269	Electrosil TR4
R18	1.5k	Metal Oxide		5	908269	Electrosil TR4
R19	1.5k	Metal Oxide		5	908269	Electrosil TR4
R20	1.5k	Metal Oxide		5	908269	Electrosil TR4
R21	1.5k	Metal Oxide		5	908269	Electrosil TR4
R22	1k	Metal Oxide		5	908267	Electrosil TR4
R23	10k	Metal Oxide		5	900986	Electrosil TR4
R24	10k	Metal Oxide		5	900986	Electrosil TR4
R25	10k	Metal Oxide		5	900986	Electrosil TR4
R26	10k	Metal Oxide		5	900986	Electrosil TR4
R27	10k	Metal Oxide		5	900986	Electrosil TR4
R28	10k	Metal Oxide		5	900986	Electrosil TR4
R29	10k	Metal Oxide		5	900986	Electrosil TR4
R30	10k	Metal Oxide		5	900986	Electrosil TR4
R31	10k	Metal Oxide		5	900986	Electrosil TR4
R32	10k	Metal Oxide		5	900986	Electrosil TR4
R33	10k	Metal Oxide		5	900986	Electrosil TR4
R34	10k	Metal Oxide		5	900986	Electrosil TR4
R35	10k	Metal Oxide		5	900986	Electrosil TR4

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Resistors (Contd.)						
R36	10k	Metal Oxide		5	900986	Electrosil TR4
R37	10k	Metal Oxide		5	900986	Electrosil TR4
R38	10k	Metal Oxide		5	900986	Electrosil TR4
R39	10k	Metal Oxide		5	900986	Electrosil TR4
R40	10k	Metal Oxide		5	900986	Electrosil TR4
Capacitors						
C1-C22	0.01μF	Disc Ceramic	25V	-25 +50	911845	Erie 831/T/25V
Transistors						
TR1-TR9					911928	Mullard BCY71
Integrated Circuits						
ML1		Hex Inverter			923979	Teledyne 332CL
ML2		Quad 2 input Power Gate			923980	Teledyne 3 2CL
ML3		Hex Inverter			919503	ITT 7404J
ML4		Quad 2-input Positive AND gate			921250	ITT 7408J
ML5		Quad 2-input Positive AND gate			921250	ITT 7408J
ML6		Quad 2-input OR gate			921251	ITT 7432J
ML7		Quad 2-input OR gate			921251	ITT 7432J
ML8		Quad 2-input positive AND gate			921250	ITT 7408J
ML9		Quad 2-input OR gate			921251	ITT 7432J
ML10		Quad 2-input positive AND gate			921250	ITT 7408J
ML11		Quad 2-input OR gate			921251	ITT 7432J
ML12		Quad 2-input OR gate			921251	ITT 7432J
ML13		Quad 2-input NAND gate			918366	ITT 7400J
ML14		Quad 2-input NAND gate			918366	ITT 7400J
ML15		Quad 2-input NAND gate			918366	ITT 7400J
ML16		Quad 2 input NAND gate			921371	ITT 7426AJ
ML17		Hex Inverter			919503	ITT 7404J
ML18		Quad 2 input NAND gate			921371	ITT 7426AJ
ML19		Quad 2 input NAND gate			921371	ITT 7426AJ
Connectors						
PL1		Edge Connector			919362	Varicon Varelco 8131-032-610-001



(a) MA.1034A

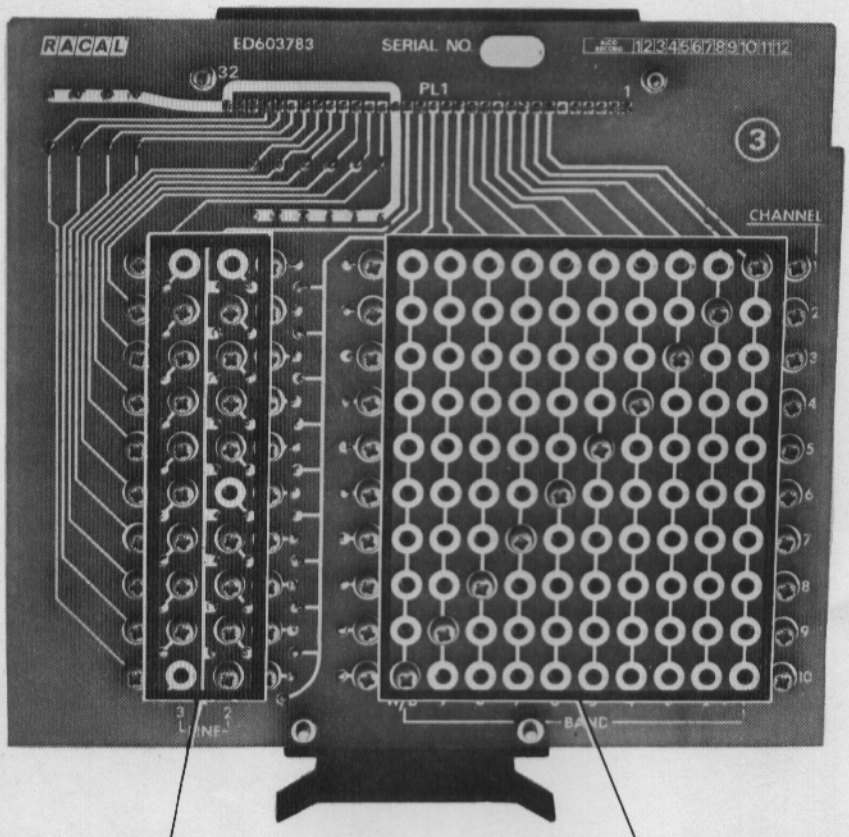


(b) MA.1034B

WOH3117

External Signal and Control Flow in a Typical Installation

Fig.1

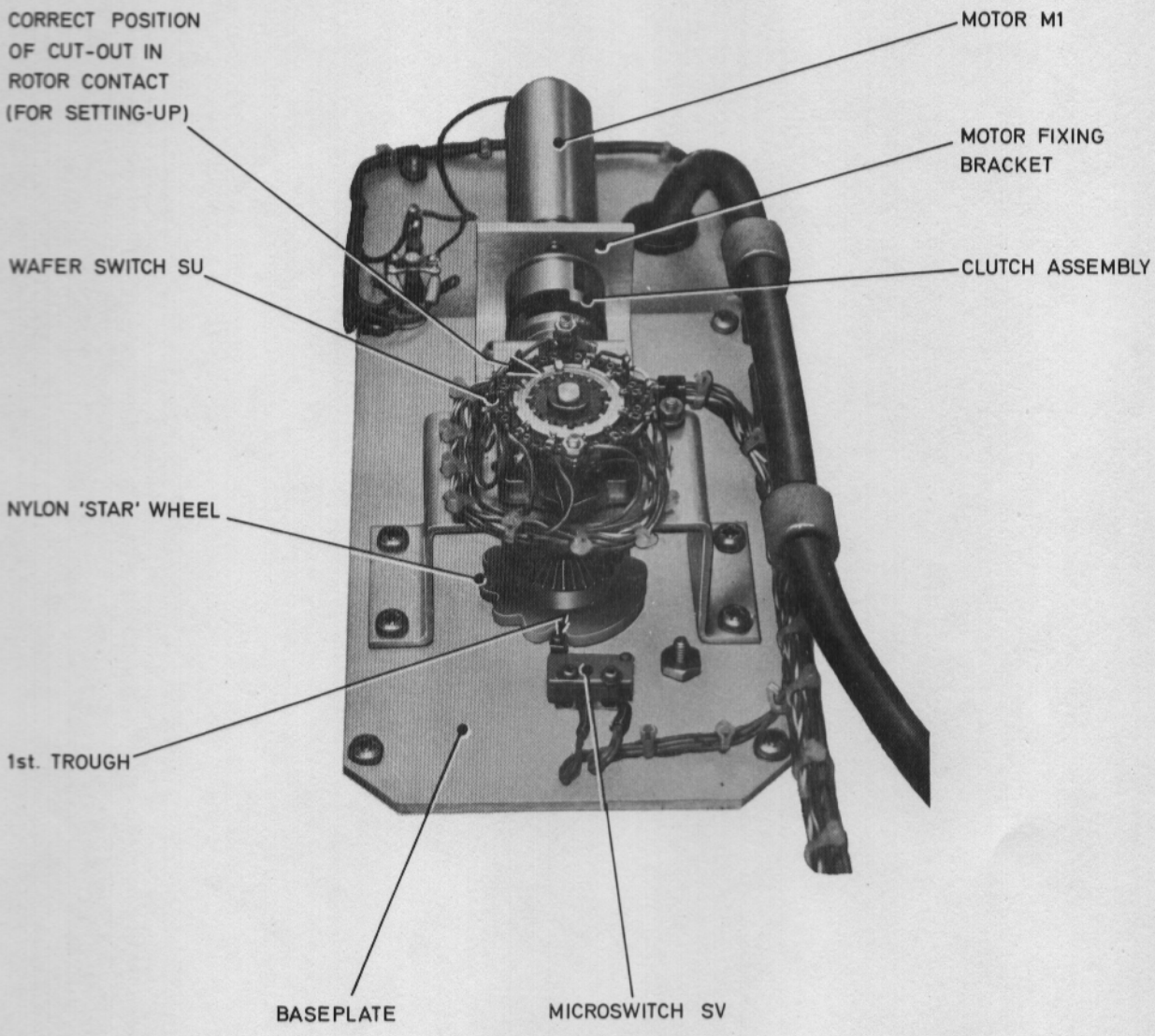


LINE SELECTION
MATRIX AREA

BAND SELECTION
MATRIX AREA

Matrix Board Programming

Fig. 2



WOH3117C

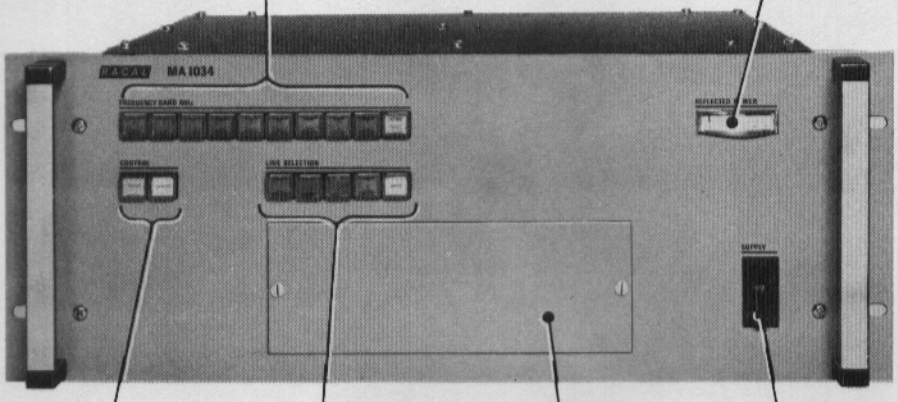
Wafer Switch Alignment

Fig. 3

FREQUENCY BAND PUSHBUTTONS
LEFT TO RIGHT

BAND 1	1·6 - 2·2 MHz
BAND 2	2·2 - 3·1 MHz
BAND 3	3·1 - 4·3 MHz
BAND 4	4·3 - 6·0 MHz
BAND 5	6·0 - 8·2 MHz
BAND 6	8·2 - 11·4 MHz
BAND 7	11·4 - 15·8 MHz
BAND 8	15·8 - 22·0 MHz
BAND 9	22·0 - 30·0 MHz
WIDE BAND	

REFLECTED POWER METER ME1



CONTROL PUSHBUTTONS
LEFT TO RIGHT
LOCAL
EXTENDED

SUPPLY ON/OFF SWITCH
(CONTACT BREAKER CB1)

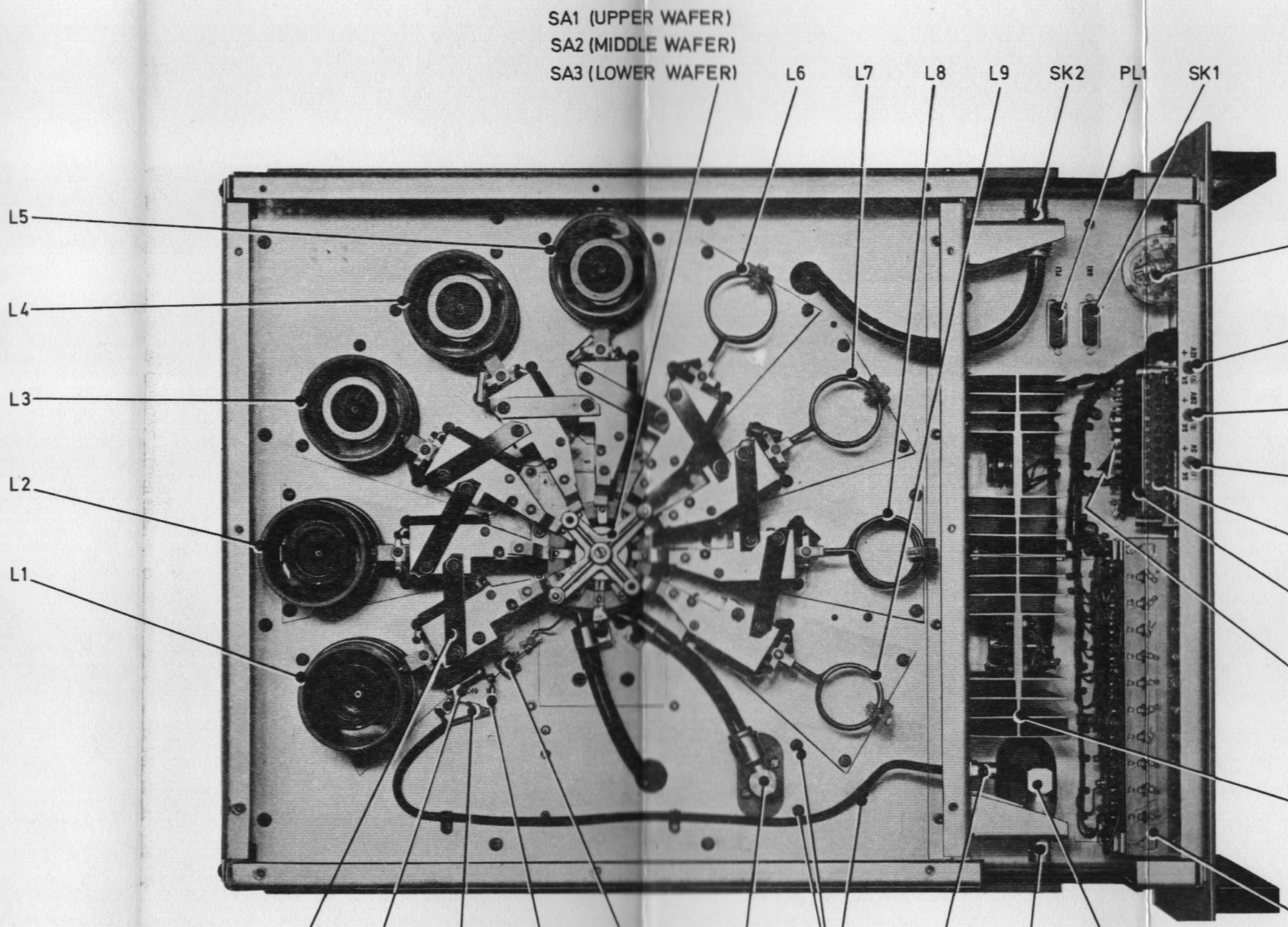
LINE SELECTION PUSHBUTTONS
LEFT TO RIGHT
1
2
3
4
AUTO

FRONT PANEL COVER PLATE

WOH3117C

Layout : Front Panel - MA.1034

Fig. 4



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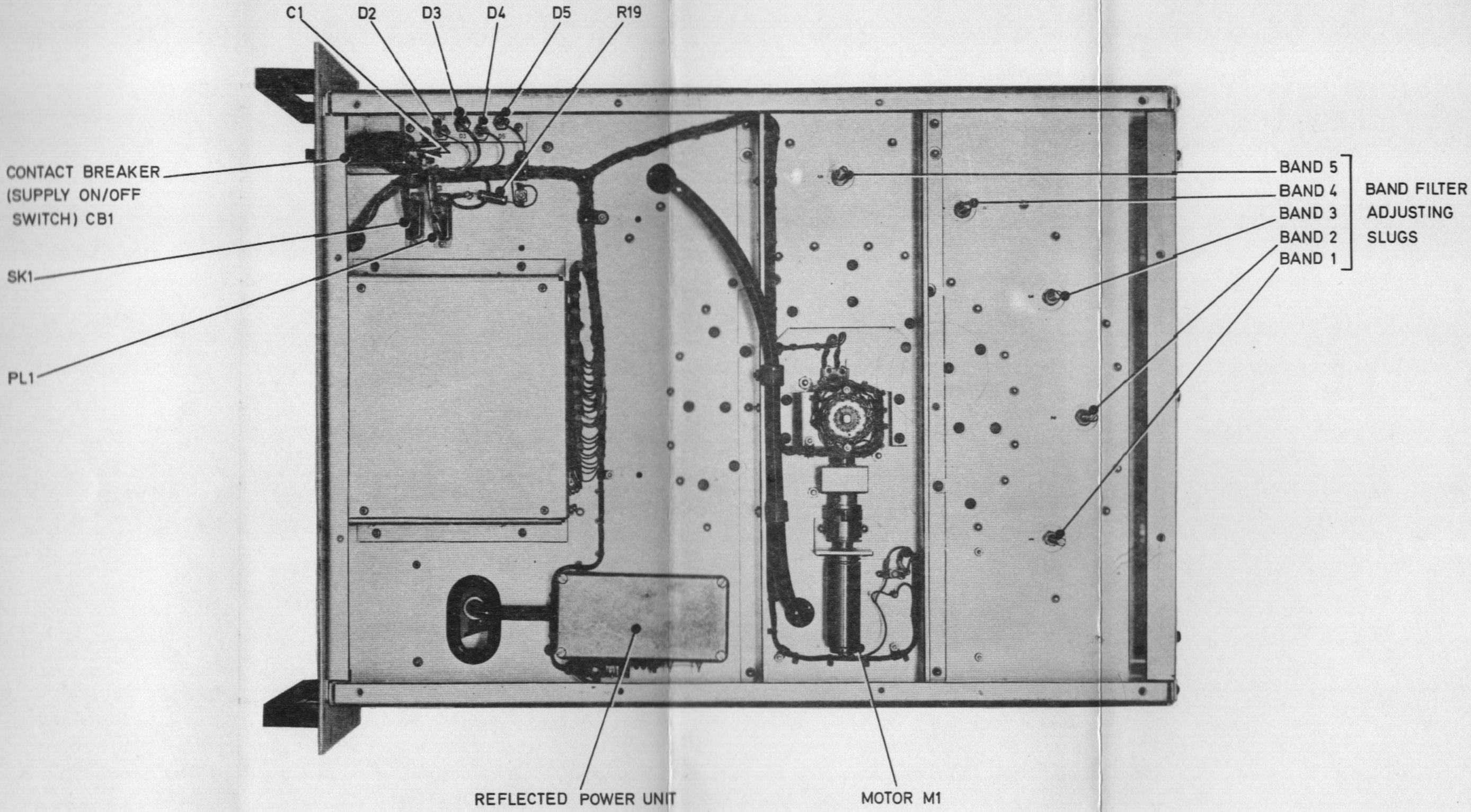
Layout : Upper Compartment - MA.1034

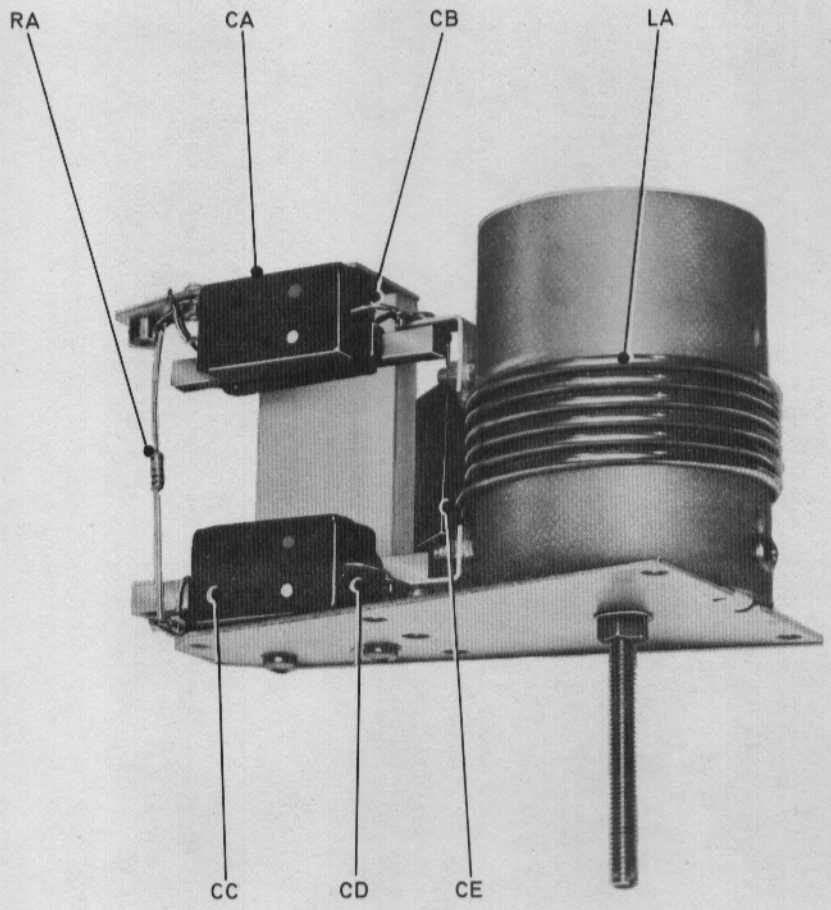
Fig. 5



WOH3117C

Layout : Lower Compartment - MA.1034

Fig. 6

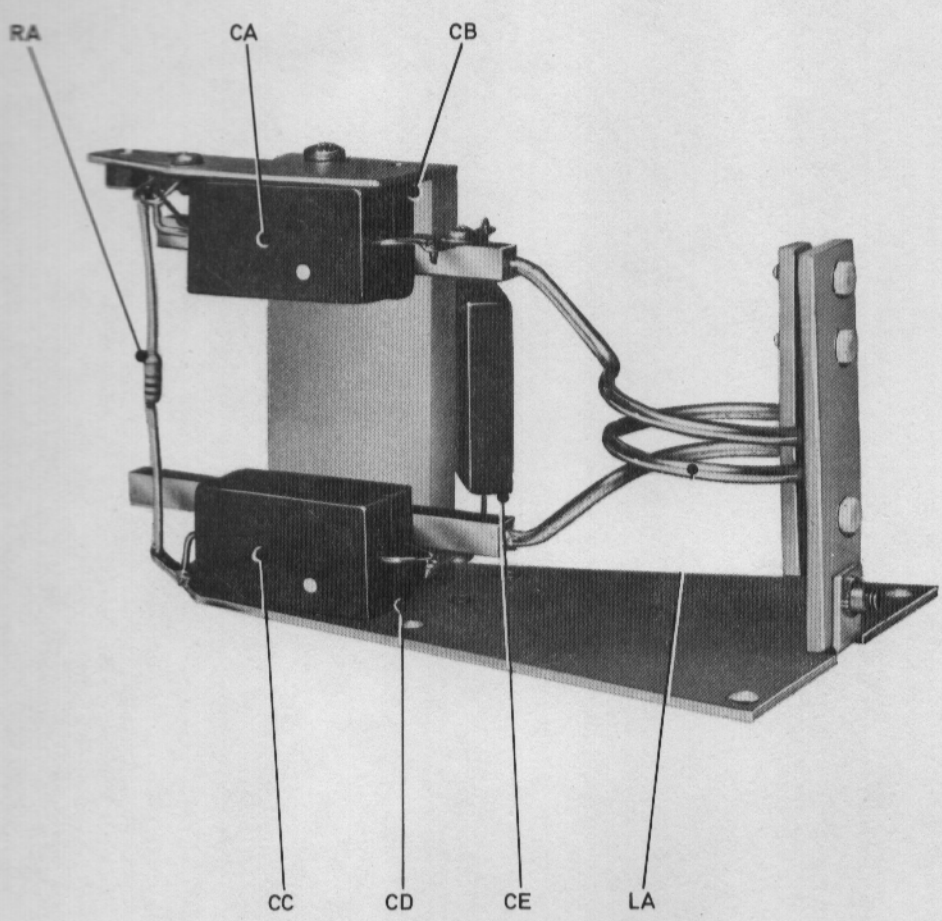


	BAND FILTER				
	1	2	3	4	5
RA	R15	R16	R8	R9	R10
CA	C30	C31	C32	C33	C34
CB	C39	C40	C41	C42	C43
CC	C3	C4	C5	C6	C7
CD	C12	C13	C14	C15	C16
CE	C21	C22	C23	C24	C25
LA	L1	L2	L3	L4	L5

WOH3117C

Layout : Adjustable-core Band Filters

Fig. 7

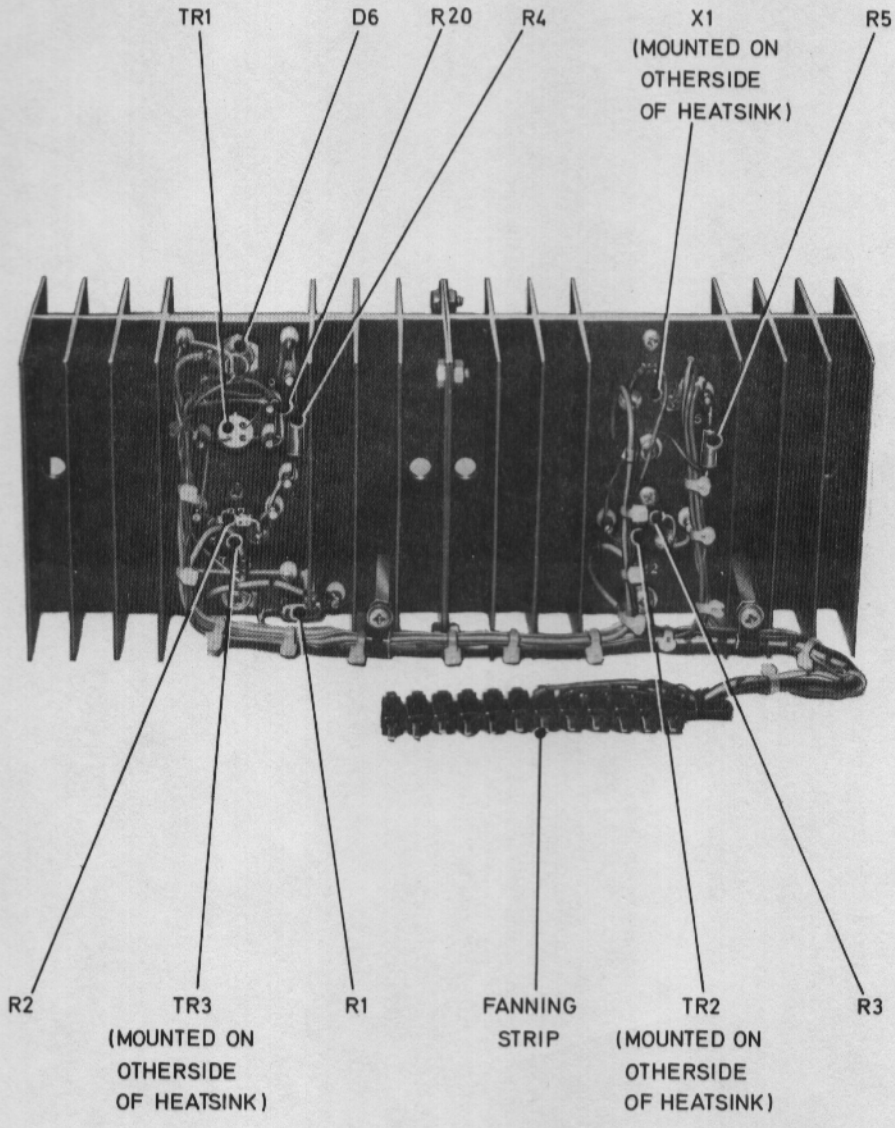


	BAND FILTER			
	6	7	8	9
RA	R11	R12	R13	R14
CA	C35	C36	C37	C38
CB	C44	C45	C46	C47
CC	C8	C9	C10	C11
CD	C17	C18	C19	C20
CE	C26	C27	C28	C29
LA	L6	L7	L8	L9

WOH3117C

Layout : Air-cored Band Filters

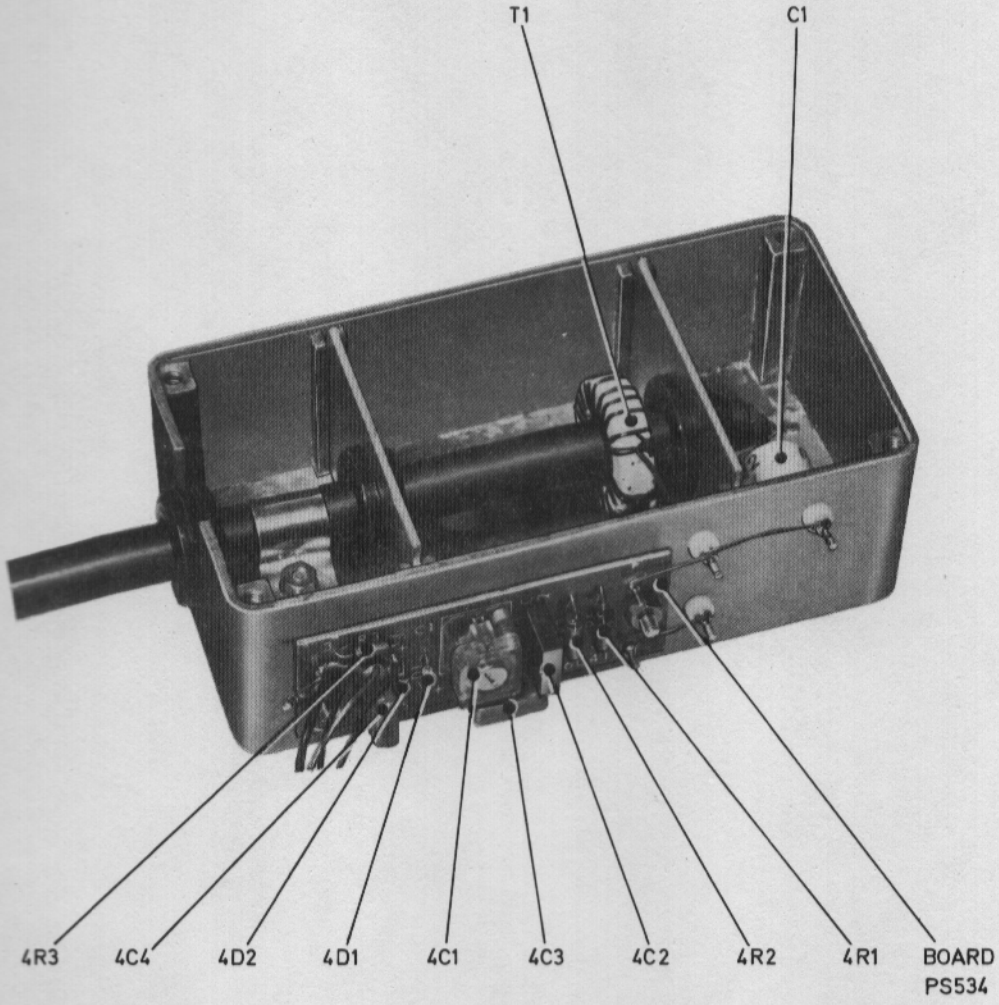
Fig. 8



WOH3117C

Layout : Power Supply / Heatsink Assembly

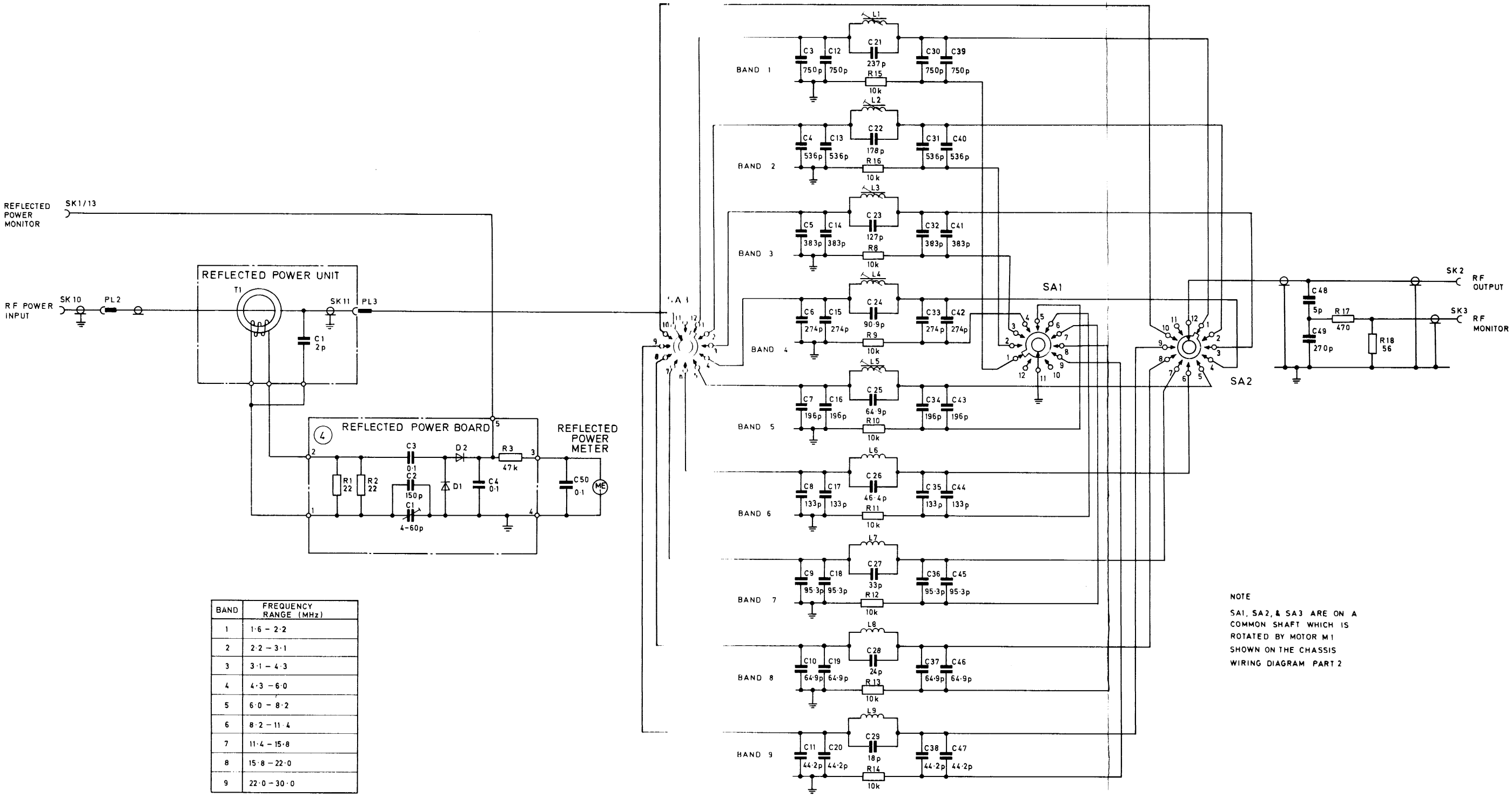
Fig. 9



WOH3117C

Layout : Reflected Power Unit

Fig. 10



BAND	FREQUENCY RANGE (MHz)
1	1·6 – 2·2
2	2·2 – 3·1
3	3·1 – 4·3
4	4·3 – 6·0
5	6·0 – 8·2
6	8·2 – 11·4
7	11·4 – 15·8
8	15·8 – 22·0
9	22·0 – 30·0

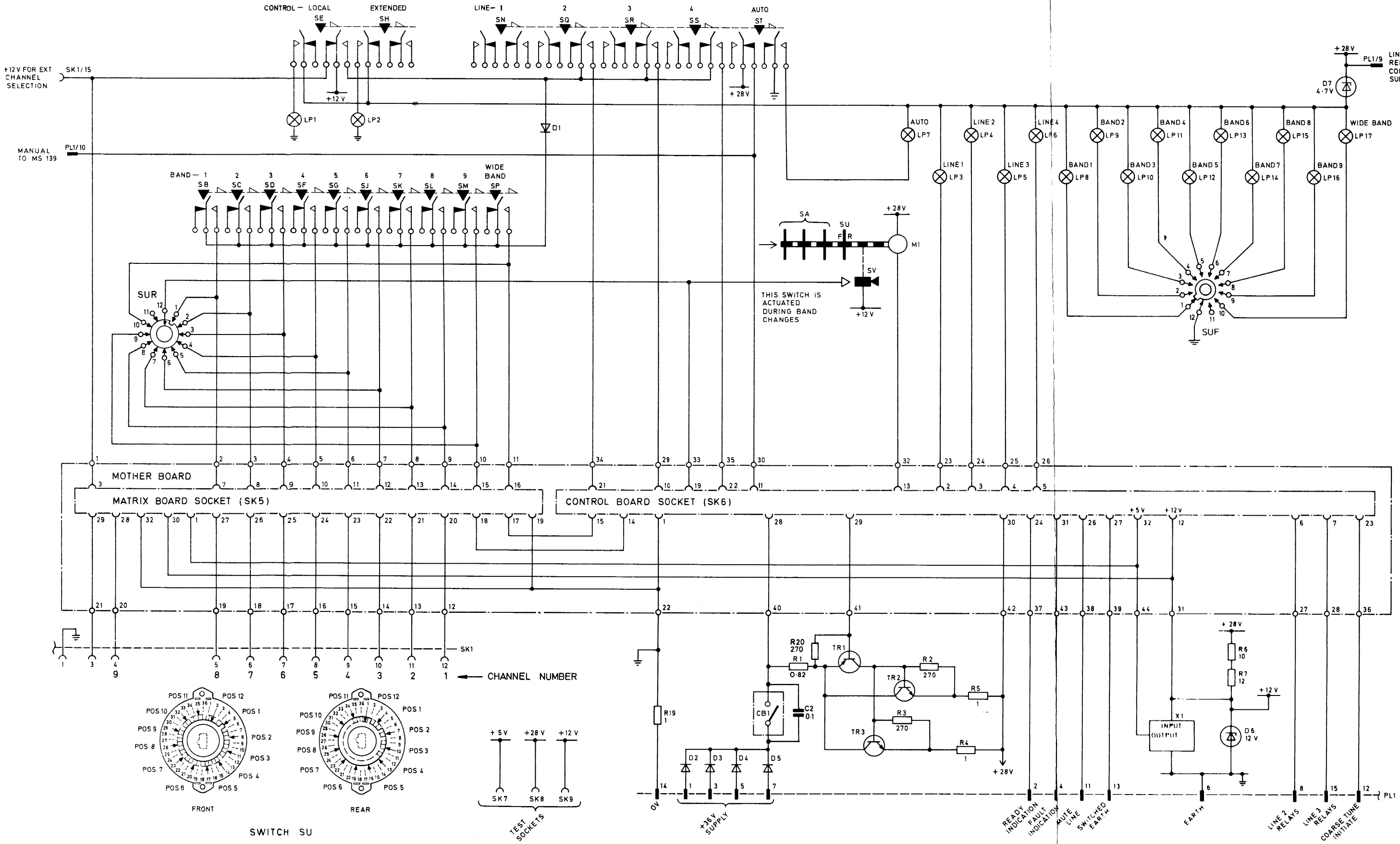
POSITION 10 ON SA2 & SA3 IS FOR WIDEBAND OPERATION

NOTE

SA1, SA2, & SA3 ARE ON A COMMON SHAFT WHICH IS ROTATED BY MOTOR M1 SHOWN ON THE CHASSIS WIRING DIAGRAM PART 2

Circuit: Filter Switching and Reflected Power Metering (Chassis Wiring-Part 1) MA.1034

Fig. 11

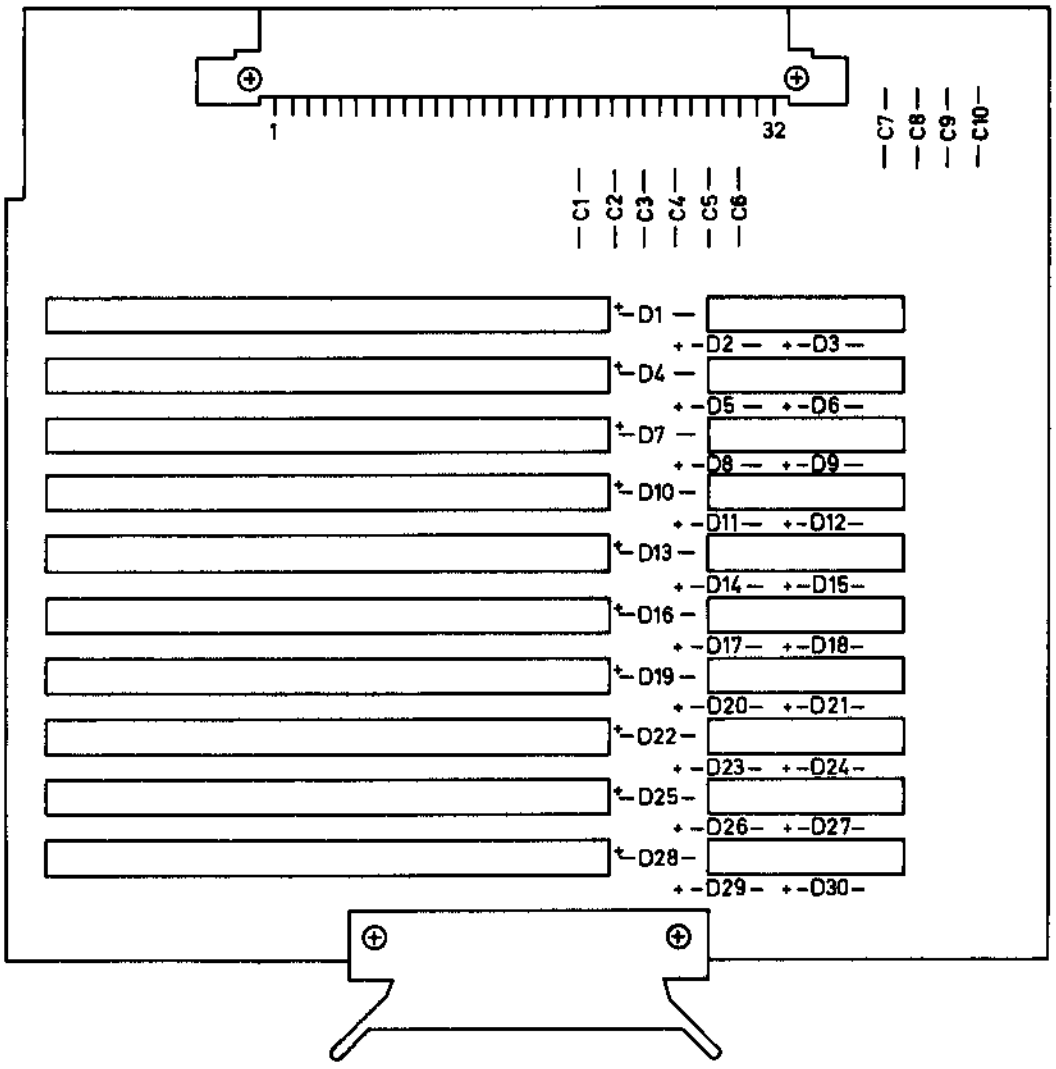


SWITCH SU

WOH 1117.C | EC 603753

Circuit: Front Panel Switching and Power Supply Regulation (Chassis Wiring-Part 2) MA.1034

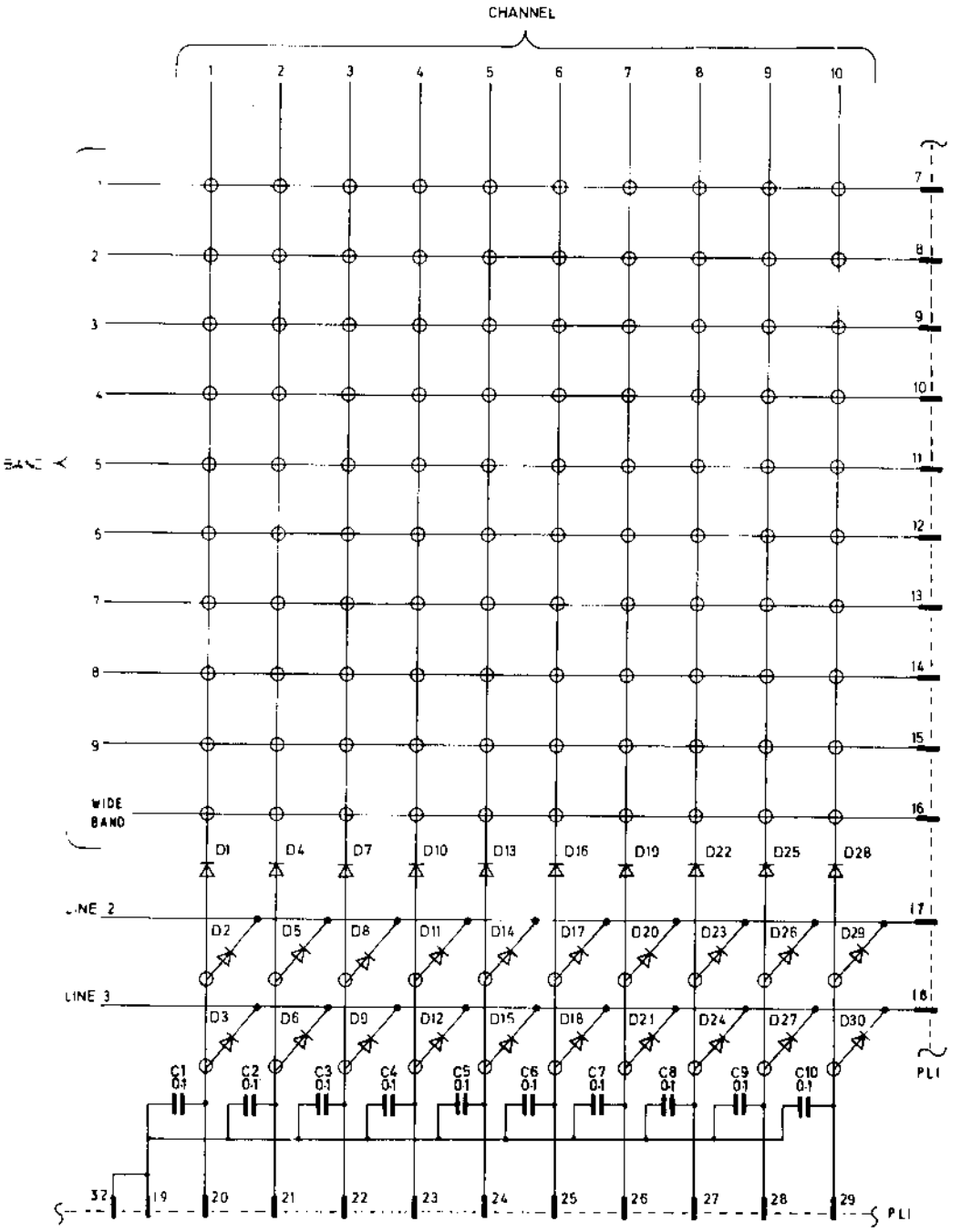
Fig.12



WOH3117C	BA603784
PL	

Layout : Matrix Board PS506

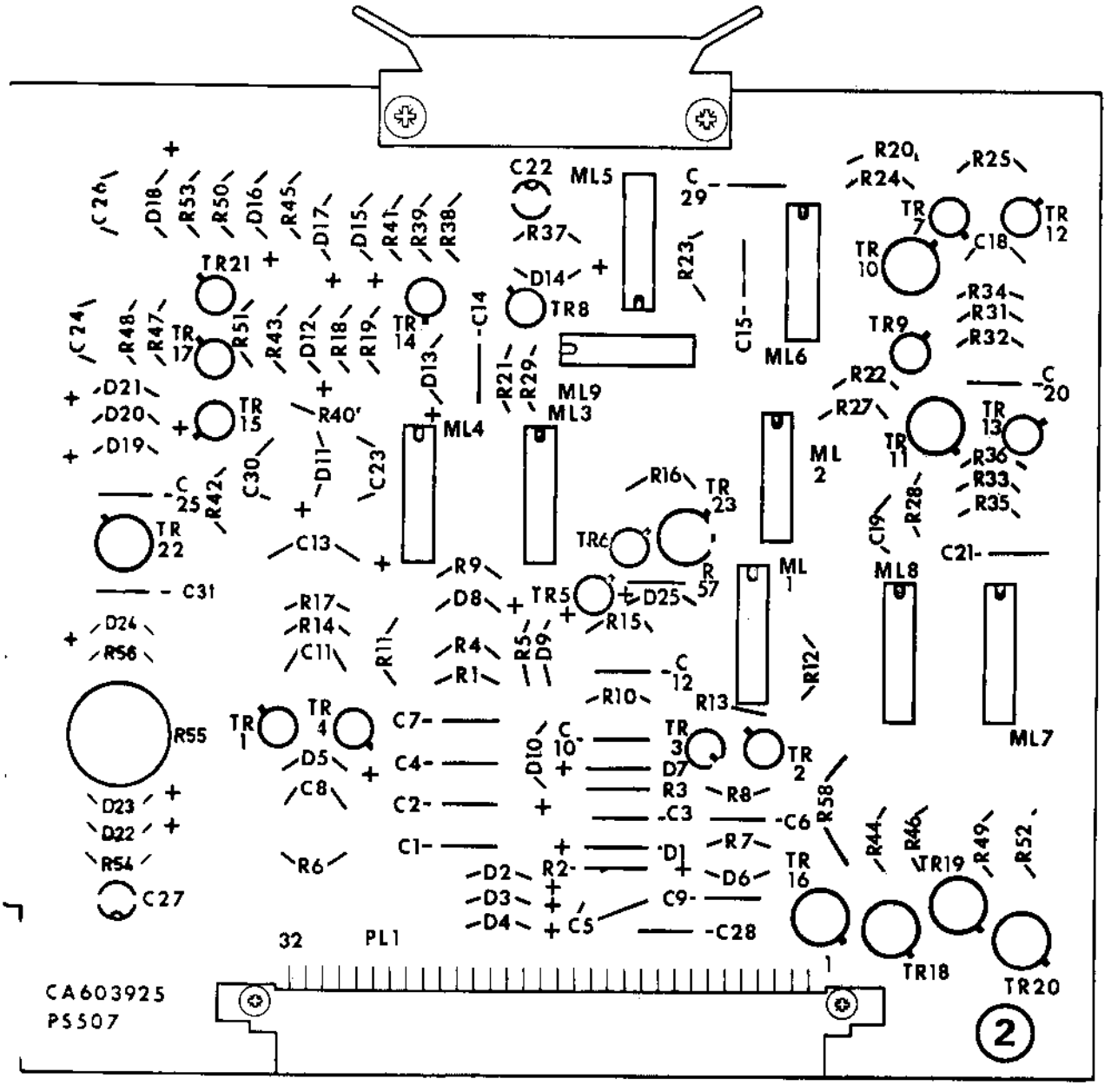
Fig.13



DIODES
D1 to D30 IN4149

Circuit : Matrix Board PS506

Fig. 14



3117C | ED603927 | SHT.4

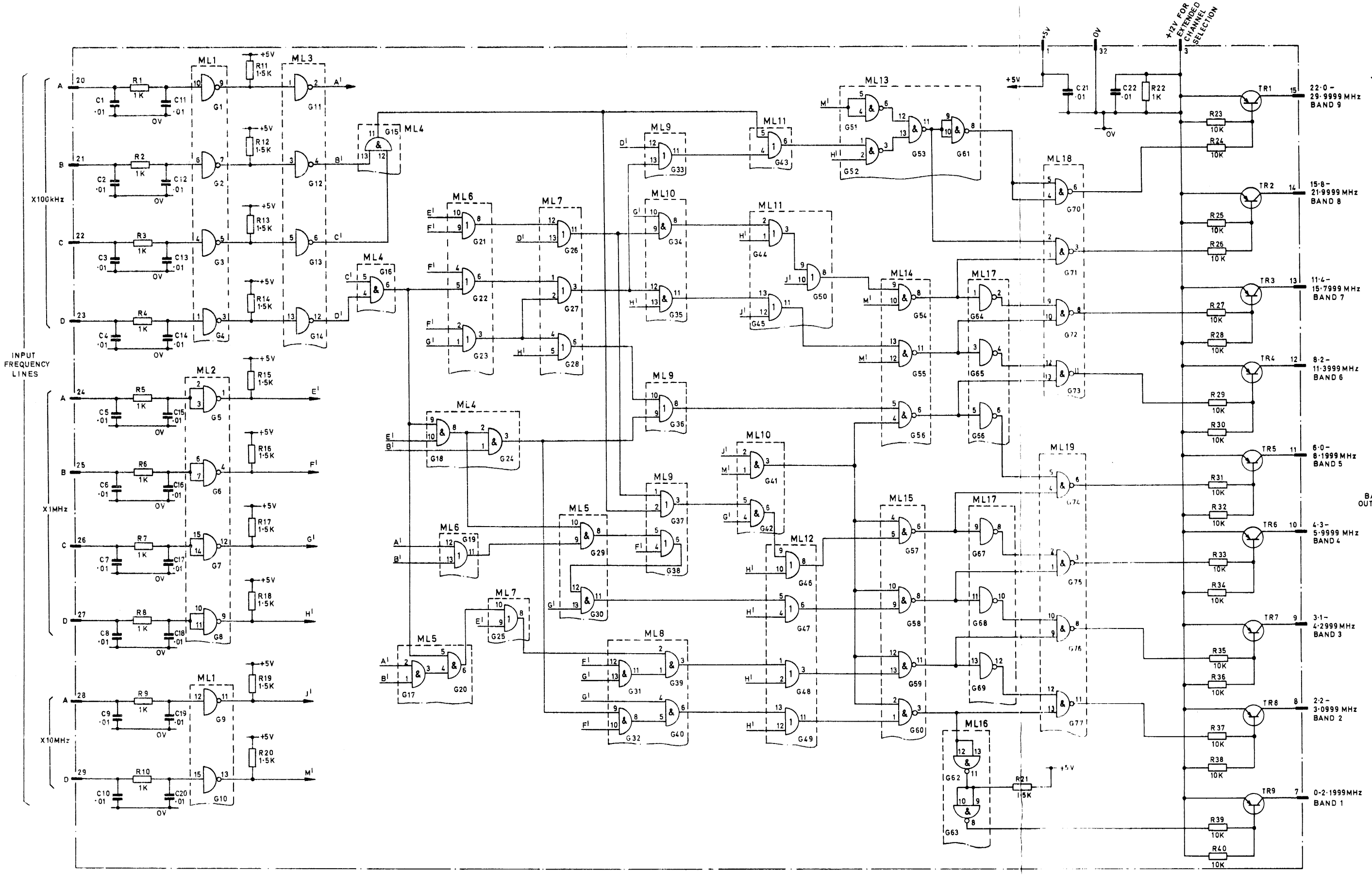
C D

Layout: Control Board PS507 **Fig.15**

RELAYS
LINE 2
LINE 3
LINE 4
LINE 3
LINE 2
LINE 1
SUPPLY IN + 36V NOMINAL
SERIES TRANSISTOR BASE
+28V
+12V
+5V
LINE 1
M2
M4
LINE 3
M3
MANUAL
MOTOR CONTROL
TO MOTOR
COARSE TUNE INITIATE
0 V
AMPLIFIER MUTE
FAULT
SWITCHED EARTH
READY
CLEAR
ML1
ML2(a)
ML2(b)
ML3
ML4
ML5
ML6
ML7
ML9
TR1
TR2
TR3
TR4
TR5
TR6
TR7
TR8
TR9
TR10
TR11
TR12
TR13
TR14
TR15
TR16
TR17
TR18
TR19
TR20
TR21
TR22
TR23
D1
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
D14
D15
D16
D17
D18
D19
D20
D21
D22
D23
D24
D25
R1 3·3K
R2 3·3K
R3 4·7K
R4 3·3K
R5 3·3K
R6 1·2K
R7 1·2K
R8 1·2K
R9 1·2K
R10 3·3K
R11 4·7K
R12 4·7K
R13 4·7K
R14 4·7K
R15 1·2K
R16 560
R17 10K
R18 1·8K
R19 1·8K
R20 1·5K
R21 560
R22 1·5K
R23 220
R24 180
R25 560
R27 180
R28 560
R29 4·7K
R31 10K
R32 470
R33 10K
R34 1·2K
R35 470
R36 1·2K
R37 22K
R38 1·8K
R39 1·8K
R40 4·7K
R41 4·7K
R42 4·7K
R43 1·8K
R44 820
R45 4·7K
R46 820
R47 3·3K
R48 1·2K
R49 820
R50 560
R51 4·7K
R52 820
R53 4·7K
R54 1·8K
R55 330
R56 680
R57 470
R58 22
C1 0·1
C2 0·1
C3 0·1
C4 0·1
C5 0·1
C6 0·1
C7 0·1
C8 0·1
C9 0·1
C10 0·1
C11 0·1
C12 0·1
C13 1
C14 0·1
C15 0·1
C18 0·1
C19 0·1
C20 0·1
C21 0·1
C22 10
C23 0·1
C24 0·1
C25 0·1
C26 0·1
C27 10
C28 0·1
C29 0·1
C30 0·1
C31 0·1
7·5 V
4·7 V
12 V
15 V

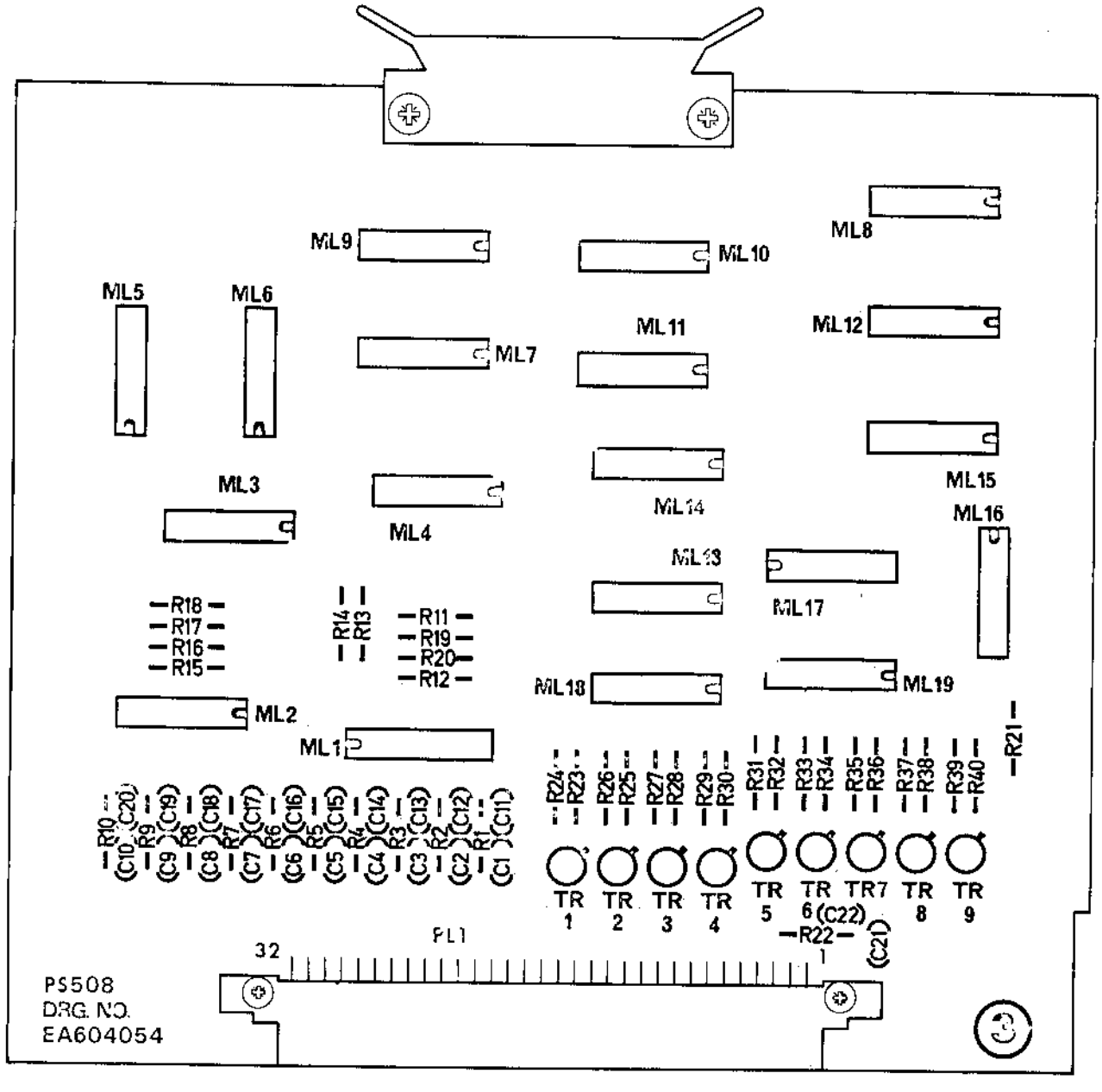
Circuit : Control Board PS 507

Fig. 16



Circuit: Decoder Board PS508

Fig.18



Layout: Decoder Board PS508 **Fig.17**