System manual

T.A. 1816
500W Linear Amplifier Assembly

RACAL
THE ELECTRONICS GROUP

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DANGER LETHAL VOLTAGES

Although every reasonable precaution has been observed in design to safeguard operating personnel this warning is . . .

VITAL !

ADJUSTMENTS

EXERCISE GREAT CARE

DO NOT ADJUST ALONE

If possible, when making adjustments, ensure the presence of another person capable of rendering aid.

SERVICING

SWITCH OFF

DO NOT TAMPER WITH INTERLOCKS

Only authorised personnel should be allowed to remove or neutralise the effect of interlocks. Do not rely on interlock switches for protection.

DO NOT SERVICE ALONE

If possible, when servicing, ensure the presence of another person capable of rendering aid.

SEE OVER FOR RESUSCITATION INSTRUCTIONS

HANDBOOK AMENDMENTS

Amendments to this handbook (if any), which are on coloured paper for ease of identification, will be found at the rear of the book. The action called for by the amendments should be carried out by hand as soon as possible.

TA. 1816 500W LINEAR AMPLIFIER ASSEMBLY

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TECHNICAL SPECIFICATION

Frequency Range:	1.6MHz to 30MHz.
RF Output Power:	CW: 500W nominal (continuous, key down) ±1dB.
	SSB: 500W p.e.p. nominal ±1dB with associated ATU.
Output Impedance:	50 ohm nominal as presented by associated ATU optimally tuned.
Intermodulation Products:	Better than -35dB from 1.6 to 10MHz and -25dB from 10 to 30MHz relative to either tone in a standard two tone test.
Spurious Emissions and Harmonics:	-43dB relative to p.e.p. at output of associated ATU.
Harmonics:	-35dB relative to p.e.p. into wideband 50 ohm load.
Wideband Noise:	TA.1816A and C: 120dB below p.e.p. in 3kHz bandwidth.
	TA.1816B: 135dB below p.e.p. in 400Hz bandwidth.
Input Level:	25 - 200mW nominal ± 1.5dB over the frequency range.
Input Impedance:	50 ohms.
Hum:	-50dB relative to p.e.p.
Tuning Time:	5 seconds max.
Muting:	80dB below rated output (with full drive).
Supply:	210-250 volts single phase, 47-60Hz. Consumption: not exceeding 3.3kVA.
Operating Temperature:	-10°C to +55°C.
Storage Temperature:	-40°C to +70°C.
Relative Humidity:	95% at +40°C.

Wt. 250 kg excl. drive equipt
Width 525 mm
Depth 610 mm
Height 1332 mm

CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1. The Racal TA.1816 500W Linear Amplifier Assembly consists of a 500W Linear Amplifier Type TA.1813 and a Switched Filter Unit Type MA.1034. The units are contained in a single floor standing cabinet as shown in figure 1.

2. The Linear Amplifier Assembly is all solid state and provides a nominal 500W r.f. output in the frequency range from 1.6MHz to 30MHz, dependent upon the associated drive unit employed. A low-level r.f. input (25mW to 200mW, 50 ohm) is required from the drive unit.

VARIANTS AVAILABLE

TA.1816A Linear Amplifier Assembly

3. The assembly is suitable for operation with a Channelized drive unit, such as the MA.7917, an external antenna tuning unit (a.t.u.) and consists of the TA.1813A Linear Amplifier and MA.1034A Switched Filter Unit.

TA.1816B Linear Amplifier Assembly

4. The assembly comprises a TA.1813B Linear Amplifier, which incorporates special r.f. modules to allow undistorted transmission of 10Hz modulation, and MA.1034A Switched Filter Unit for operation with a channelized drive unit and an external antenna tuning unit.

TA.1816C Linear Amplifier Assembly

5. The assembly is suitable for operation with a MA.1720 free tuning drive unit, an external antenna tuning unit and consists of the TA.1813A Linear Amplifier, the MA.1034B Switched Filter Unit and the MS.139 Line Switching Module.

BRIEF TECHNICAL DESCRIPTION

6. The following paragraphs briefly describe the various units of the Linear Amplifier Assembly; for detailed information, reference should be made to the respective individual handbooks.

TA.1813 Linear Amplifier

7. The Linear Amplifier Type TA.1813 is a wide-band amplifier which requires no tuning and provides a nominal 500W output in the frequency range from 1.6MHz to 30MHz.

8. The amplifier consists of basically four interchangeable plug-in r.f. power modules with each module capable of providing a nominal 125W output. The r.f. output power of each module is combined via hybrid transformers to produce 500W output.

9. Front access to the r.f. power modules is provided to facilitate ease of servicing with the minimum interruption to traffic. The Linear Amplifier may be divided into two 250W sections and permits one section to be released for maintenance whilst the other section provides operation at half-power.

10. Each r.f. power module is fitted with an ON-OFF switch and two lamps which indicate d.c. supply and r.f. output. An r.f. monitor connector is also provided for each module.

11. Two front panel mounted meters and associated switches provide indications of input power, forward and reflected power, and voltage supplies in and current drawn by each r.f. power module.

Cooling

12. Two internal air blowers in the TA.1813 Linear Amplifier provide cooling, one for each bank of two r.f. power modules.

MA.1034 Switched Filter Unit

13. The Switched Filter Units Type MA.1034A and B are used with the TA.1813 Linear Amplifier where it is required to work in conjunction with an antenna tuning unit, which on its own, will not provide sufficient attenuation of harmonics. The MA.1034A is intended for extended channelized control and/or local control. The MA.1034B is intended for use with the MA.1720 in extended or local control.

14. The Switched Filter Unit is inserted into the r.f. power output line between the linear amplifier and the v.s.w.r. monitor, and connects one of nine band-pass filters in series or provides a through r.f. connection, wide-band, in the tenth position. The correct filter may be selected either by front panel push-buttons in local control mode or automatically when in extended control mode by command from the amplifier drive unit or a channel selector switch.

CHAPTER 2

OPERATING INSTRUCTIONS

INTRODUCTION

1. The operating instructions detailed in the following paragraphs assume that the units of the TA.1816 have been installed and connected in accordance with the installation details in Chapter 3, and in the appropriate system handbook. It is also assumed that the transmitter terminal is connected to a suitably adjusted antenna tuning unit and antenna or dummy load.

AUTOMATIC TUNING

Initial Procedure

2. (1) At the drive unit for the transmitter terminal, select the required operating frequency or channel number with a channelized system and mode to provide a tuning signal by referring to the appropriate handbook for the drive unit.

(2) On the MA.1034, set the SUPPLY switch to ON and press the EXTEND CONTROL push-button and in the case of the TA.1816C press the AUTO LINE SELECTION push-button.

(3) Set the SUPPLY switch on each r.f. module of the TA.1813 to ON.

(4) Set the left hand and right hand circuit breakers on the TA.1813 Power Supply Unit to ON.

(5) On the TA.1813, check that the green and white lamps on all four r.f. modules are illuminated.

(6) When the MA.1034 has selected the appropriate filter and line length, the lamps in the relevant FREQUENCY BAND and LINE SELECTION push-buttons illuminate indicating that the transmitter terminal is ready for traffic.

NOTE: In addition a 'ready' indication is available from the MA.1034 and may be used to light a lamp on the drive unit or operating console.

Changing Frequency

3. (1) Mute the drive unit and select the new operating frequency and Tune Mode.

(2) Adjust the a.t.u. tuning to the appropriate setting for the new operating frequency, unless this is arranged automatically on channel or frequency selection.

8. The amplifier consists of basically four interchangeable plug-in r.f. power modules with each module capable of providing a nominal 125W output. The r.f. output power of each module is combined via hybrid transformers to produce 500W output.

9. Front access to the r.f. power modules is provided to facilitate ease of servicing with the minimum interruption to traffic. The Linear Amplifier may be divided into two 250W sections and permits one section to be released for maintenance whilst the other section provides operation at half-power.

10. Each r.f. power module is fitted with an ON-OFF switch and two lamps which indicate d.c. supply and r.f. output. An r.f. monitor connector is also provided for each module.

11. Two front panel mounted meters and associated switches provide indications of input power, forward and reflected power, and voltage supplies in and current drawn by each r.f. power module.

Cooling

12. Two internal air blowers in the TA.1813 Linear Amplifier provide cooling, one for each bank of two r.f. power modules.

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14. The Switched Filter Unit is inserted into the r.f. power output line between the linear amplifier and the v.s.w.r. monitor, and connects one of nine band-pass filters in series or provides a through r.f. connection, wide-band, in the tenth position. The correct filter may be selected either by front panel push-buttons in local control mode or automatically when in extended control mode by command from the amplifier drive unit or a channel selector switch.

CHAPTER 2

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INTRODUCTION

1. The operating instructions detailed in the following paragraphs assume that the units of the TA.1816 have been installed and connected in accordance with the installation details in Chapter 3, and in the appropriate system handbook. It is also assumed that the transmitter terminal is connected to a suitably adjusted antenna tuning unit and antenna or dummy load.

AUTOMATIC TUNING

Initial Procedure

2. (1) At the drive unit for the transmitter terminal, select the required operating frequency or channel number with a channelized system and mode to provide a tuning signal by referring to the appropriate handbook for the drive unit.

(2) On the MA.1034, set the SUPPLY switch to ON and press the EXTEND CONTROL push-button and in the case of the TA.1816C press the AUTO LINE SELECTION push-button.

(3) Set the SUPPLY switch on each r.f. module of the TA.1813 to ON.

(4) Set the left hand and right hand circuit breakers on the TA.1813 Power Supply Unit to ON.

(5) On the TA.1813, check that the green and white lamps on all four r.f. modules are illuminated.

(6) When the MA.1034 has selected the appropriate filter and line length, the lamps in the relevant FREQUENCY BAND and LINE SELECTION push-buttons illuminate indicating that the transmitter terminal is ready for traffic.

NOTE: In addition a 'ready' indication is available from the MA.1034 and may be used to light a lamp on the drive unit or operating console.

Changing Frequency

3. (1) Mute the drive unit and select the new operating frequency and Tune Mode.

(2) Adjust the a.t.u. tuning to the appropriate setting for the new operating frequency, unless this is arranged automatically on channel or frequency selection.

(3) Demute the drive unit and note that there is an indication of forward power on the TA.1813 meter panel, but only a small amount of reflected power indicated.

(4) Change to the drive unit to the required traffic mode when 'ready' is signalled or the relevant FREQUENCY BAND and LINE SELECTION push-buttons are illuminated.

MANUAL TUNING

Initial Procedure

4. (1) At the drive unit for the transmitter terminal, select the required operating frequency or channel number with a channelized system and mode to provide a tuning signal by referring to the appropriate handbook for the drive unit.

(2) On the MA.1034, set the SUPPLY switch to ON, press the LOCAL CONTROL push-button and the appropriate FREQUENCY BAND push-button, according to the selected operating frequency (see Chapter 2 in the MA.1034 handbook).

(3) Adjust the a.t.u. to the appropriate setting for the operating frequency, unless this is arranged automatically on channel or frequency selection.

(4) Set the SUPPLY switch on each r.f. module of the TA.1813 to ON.

(5) Set the left hand and right hand circuit breakers on the TA.1813 Power Supply Unit to ON.

(6) On the TA.1813, check that the green and white lamps on all four r.f. modules are illuminated and that there is an indication of forward power on the meter panel, but only a small amount of reflected power indicated.

(7) On the MA.1034, press the LINE SELECTION push-buttons 1 to 4 in turn and note the forward power indication on the TA.1813 meter panel for each push-button position. Select the LINE SELECTION push-button that gave the highest power indication.

(8) Select the required operating mode on the drive unit.

Changing Frequency

5. (1) Mute the drive unit and select the new operating frequency and Tune Mode.

(2) On the MA.1034, press the appropriate FREQUENCY BAND push-button according to the new selected frequency.

(3) Adjust the a.t.u. to the appropriate setting for the new operating frequency, unless this is arranged automatically on channel or frequency selection.

(4) Demute the drive unit and note that there is an indication of forward power on the TA.1813 meter panel, but only a small amount of reflected power indicated.

(5) On the MA.1034, press the LINE SELECTION push-buttons 1 to 4 in turn and note the forward power indication on the TA.1813 meter panel for each push-button position. Select the LINE SELECTION push-button that gave the highest power indication.

(6) Select the required operating mode on the drive unit.

'POZIDRIV' SCREWDRIVERS

Metric thread cross-head screws fitted to Racal equipment are of the 'Pozidriv' type. Phillips type and 'Pozidriv' type screwdrivers are not interchangeable, and the use of the wrong screwdriver will cause damage. POZIDRIV is a registered trade mark of G.K.N. Screws and Fasteners Limited. The 'Pozidriv' screwdrivers are manufactured by Stanley Tools Limited.

CHAPTER 3

INSTALLATION AND SETTING-UP PROCEDURE

INTRODUCTION

1. The Installation Procedure consists of connecting inputs and outputs to the Linear Amplifier Assembly as given in Tables 1 to 5 for the required functions. The Setting-Up Procedure is detailed in paragraphs 6 to 13.

2. Prior to connection, it is important to ensure that the drive unit and other equipment is compatible with the TA.1816 Linear Amplifier Assembly.

INSTALLATION

NOTE: See also Chapter 3 in the TA.1813 handbook.

3. The connections to the Linear Amplifier Assembly are tabulated below.

TABLE 1 - RF CONNECTIONS

Connection	Function	Connects to
12SK2	RF input from drive unit (25mW to 200mW, 50 ohm)	Drive Unit
10SK1	RF output from linear amplifier (500W nominal, 50 ohm)	Antenna Tuning Unit (or dummy load)
Cabinet earth terminal	Earth	Station main earthing system

TABLE 2 - CONTROL AND INDICATOR CONNECTIONS

Connection	Function	Signal States
1TB9-6	VSWR Warning	Provides a +12V output when the Linear Amplifier Assembly is operating with an excessive VSWR. Normally provides a 0V output.
1TB9-10	Mute	The Linear Amplifier Assembly is muted when a 0V (earth) input is applied. The muting is removed when a +12V or open circuit input is applied.

Connection	Function	Signal States
1TB10-2	Band Selection	Selection at the MA.1034 is initiated when an open circuit or +12V input is applied. The input is normally at 0V. NOTE: If terminal 1TB10-2 is not connected to a separate drive unit or control unit it should be connected to 1TB10-4 (earth).
1TB10-3	Ready	Ready is indicated by a 0V output at this pin. When the MA.1034 is not ready the output is at +12V. NOTE: In this equipment 1TB10-12 is normally used for the READY connection to external units.
1TB10-4	Earth	
1TB10-8 and 9	Remote Start	The Linear Amplifier Assembly can be remotely started by a +12V and 0V applied to these pins (when the front panel switch is set to REMOTE).
1TB10-10	Reduced Power	Provides a +12V output if the Linear Amplifier Assembly operates at reduced power, due to r.f. module or PSU failure. Output is normally at 0V.
1TB10-11	Fault	Provides a 0V output if a fault occurs in the MA.1034 or the main contactor. Output is normally at +12V.
1TB10-12	Ready	Provides a 0V output when the Linear Amplifier Assembly is ready to accept traffic. Output is +12V when the Assembly is not ready to accept traffic.

TABLE 3 - EXTENDED BAND OR CHANNEL SELECTION

Connection	Function	Signal States
1TB11-1	Channel 9	+12V Selects 0V Off
1TB11-4	Wide-Band	+12V Selects 0V Off
1TB11-5	Channel 5	+12V Selects 0V Off
1TB11-6	Channel 6	+12V Selects 0V Off
1TB11-7	Channel 7	+12V Selects 0V Off
1TB11-8	Channel 8	+12V Selects 0V Off
1TB11-9	Channel 1	+12V Selects 0V Off
1TB11-10	Channel 2	+12V Selects 0V Off
1TB11-11	Channel 3	+12V Selects 0V Off
1TB11-12	Channel 4	+12V Selects 0V Off

TABLE 4 - EXTENDED VSWR METER

Connection	Function
1TB16-11	External Meter
1TB16-12	Earth

TABLE 5 - POWER CONNECTIONS

Connection	Function
1TB1-1	Line input
1TB1-2	Neutral input
1TB1-3	Earth
1TB1-5 & 6	Extended on/off switching (line supply to main contactor).

MUTING

4. It is important that whenever possible, the mute line from the linear amplifier assembly should be interlocked with the frequency selection controls on the associated drive unit so that the amplifier is muted immediately any change of operating frequency is commenced and until the required change is completed.

5. If this method of interlocking is not possible, the mute line should be interconnected with the drive unit muting control circuit and care should be taken to ensure that the transmitter is muted before a frequency change is initiated and remains muted until the change in frequency is completed.

SETTING-UP

6. Before carrying out the setting-up procedure the individual units in the Transmitter Terminal should be set up as detailed in the appropriate handbook.

7. The procedures detailed in paragraphs 9 and 10 should be carried out in the order given. These procedures should be carried out after the connection or re-connection of any unit to the cabinet.

8. Ensure that an antenna and a.t.u. of the correct type or a suitable dummy load is connected to the antenna socket of the Transmitter Terminal.

TA.1813 Linear Amplifier

9. (1) Remove the power supply panel to obtain access to the Muting Unit.

(2) Remove the Muting Unit cover and check that the internal link in the Muting Unit is set for -6dB attenuation when used with an MA.7917, or to suit if another drive unit is used. The Linear Amplifier requires a 100mW nominal input. (Connections within the Muting Unit are given in Chap.2 of the TA.1813 handbook.)

(3) Replace the Muting Unit cover.

(4) Remove the screws securing one of the power supply units, move the power supply unit forward and check that the Mains Voltage Selector is set to the local a.c. mains supply voltage.

(5) Replace the power supply unit and repeat the check on the other power supply unit.

(6) Replace the power supply panel.

Transmitter Terminal RF Levels

10. (1) Connect the output of the Transmitter Terminal to a dummy load and operate the system for nominal output at the highest frequency available from the drive unit as detailed in Chapter 2.

(2) Reduce the output level of the associated drive unit until the r.f. output level of the TA.1813 Linear Amplifier just drops, allowing time for the automatic level control (a.l.c.) to recover.

NOTE: If the drive unit output level is fixed, adjustments may be made at the Muting Unit (see para.9).

(3) Slightly increase the RF output level of the drive unit and tune the system for nominal output at each operating frequency and ensure that drive level variations are not sufficiently large to allow the output of the TA.1813 Linear Amplifier to fall below automatic level control (a.l.c.); if it does, increase the drive level until the amplifier is just into a.l.c.

VSWR Facility

11. The VSWR Warning Board on the TA.1813 Linear Amplifier will give an indication (to an external position) when the reflected power of the amplifier exceeds a pre-determined level. If the facility is to be used calibration should be carried out using either of the following methods.

12. Calibrating for 3:1 VSWR

(1) Operate the system as detailed in paragraphs 2(1) to 2(6) of Chapter 2. Check that the output is 500W.

(2) Switch OFF two RF power modules.

(3) Lower the TA.1813 meter panel and set the internal CAL/NORMAL switch to CAL.

(4) Adjust the pre-set control 11AR12 (inside the meter panel) until the VSWR Warning Signal just operates the external lamp or buzzer.

(5) Set the CAL/NORMAL switch to NORMAL.

(6) Replace meter panel.

13. Calibrating for Other Than 3:1 VSWR

(1) Operate the system as detailed in paragraphs 2(1) to 2(6) of Chapter 2, using the associated drive unit or a signal generator output.

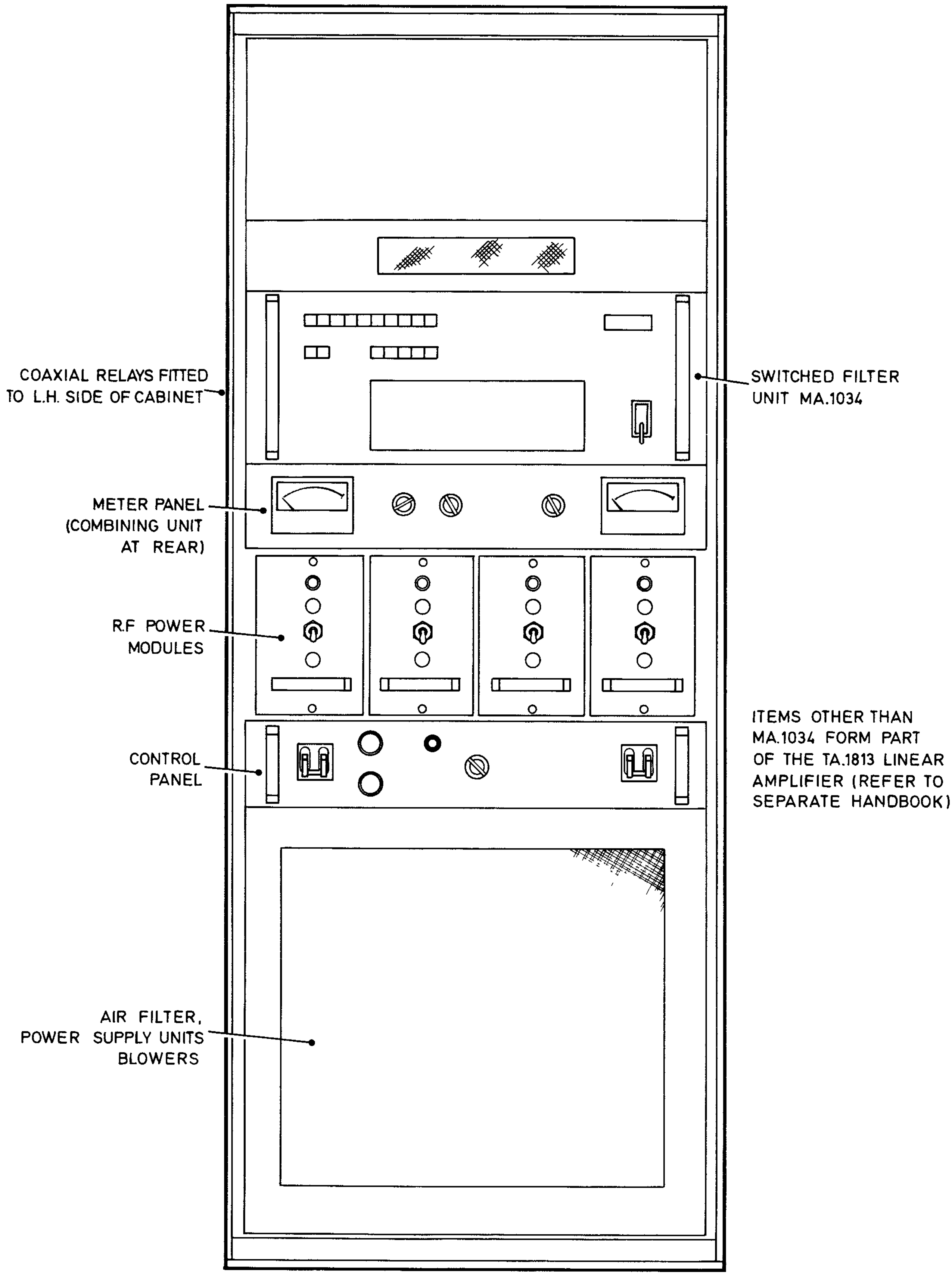
(2) Reduce the drive unit (or signal generator) output until the indicated forward power corresponds to the required reflected power at which the warning signal is required to operate.

(3) Lower the TA.1813 meter panel and set the internal CAL/NORMAL switch to CAL.

(4) Adjust the pre-set control 11AR12 (inside the meter panel) until the VSWR warning signal just operates the external lamp or buzzer.

(5) Set the CAL/NORMAL switch to NORMAL.

(6) Replace meter panel.



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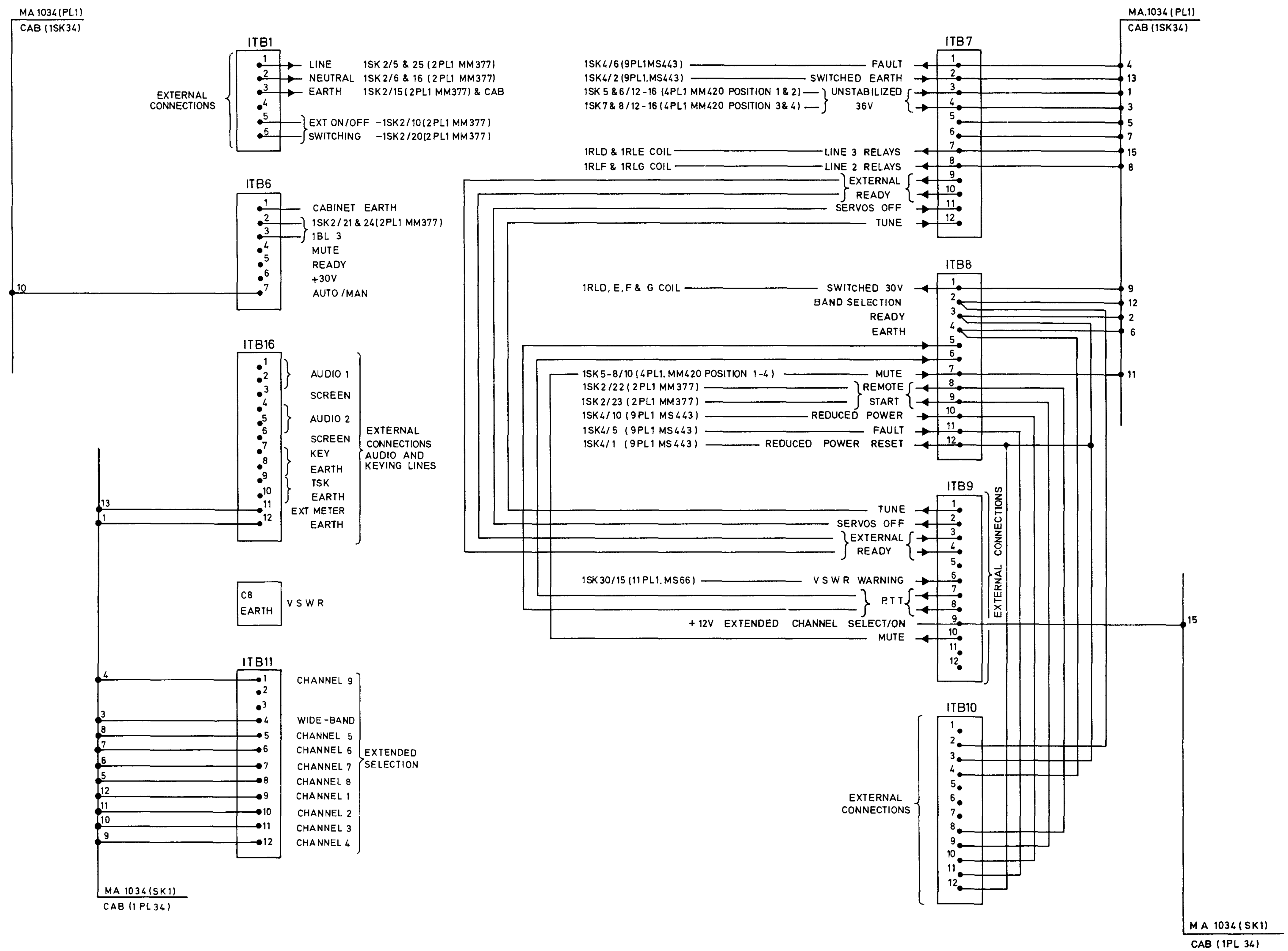
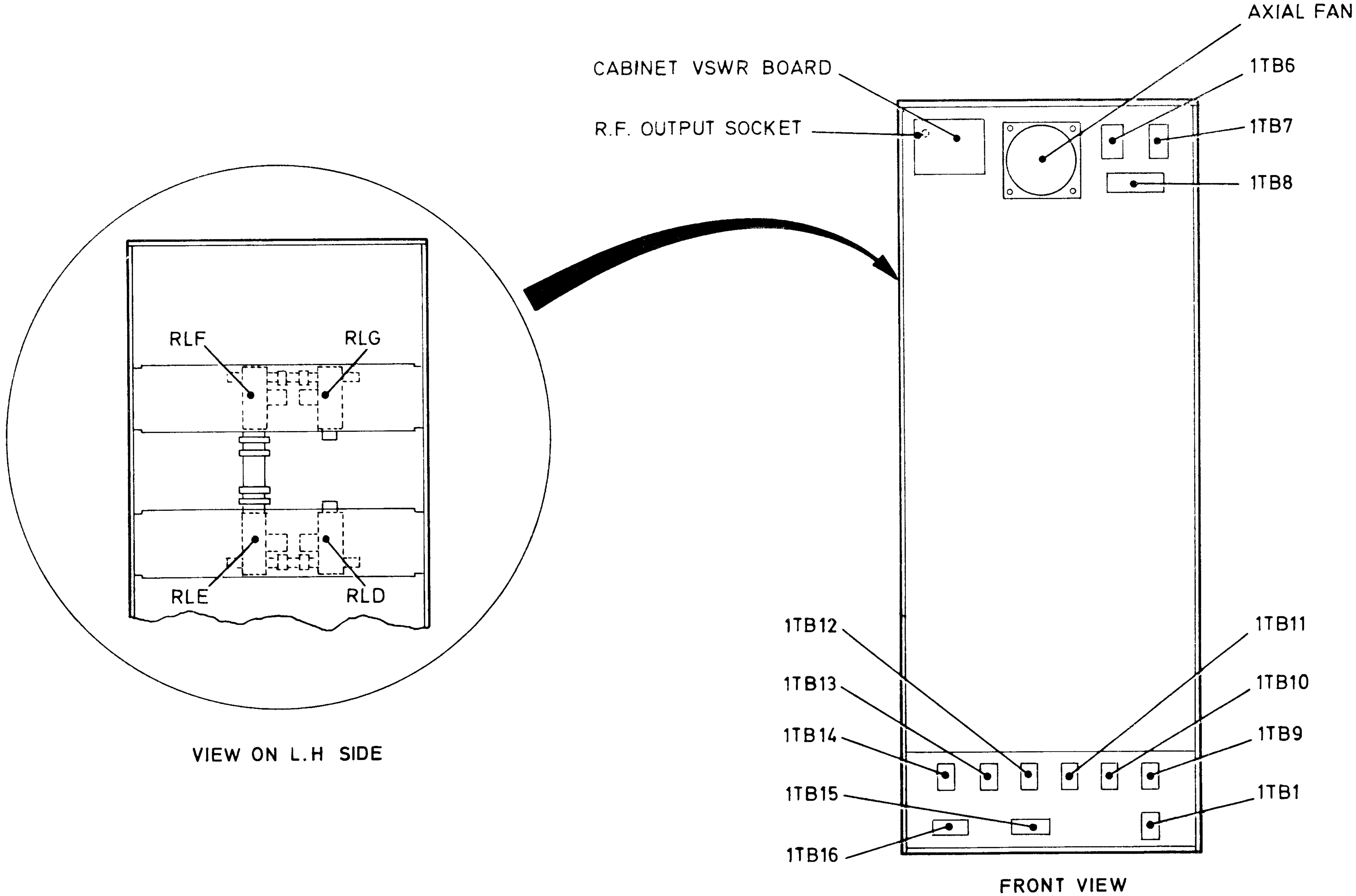
Cabinet Layout : TA.1816

Fig. 1



Inter-Unit Wiring : TA.1816

Fig. 2



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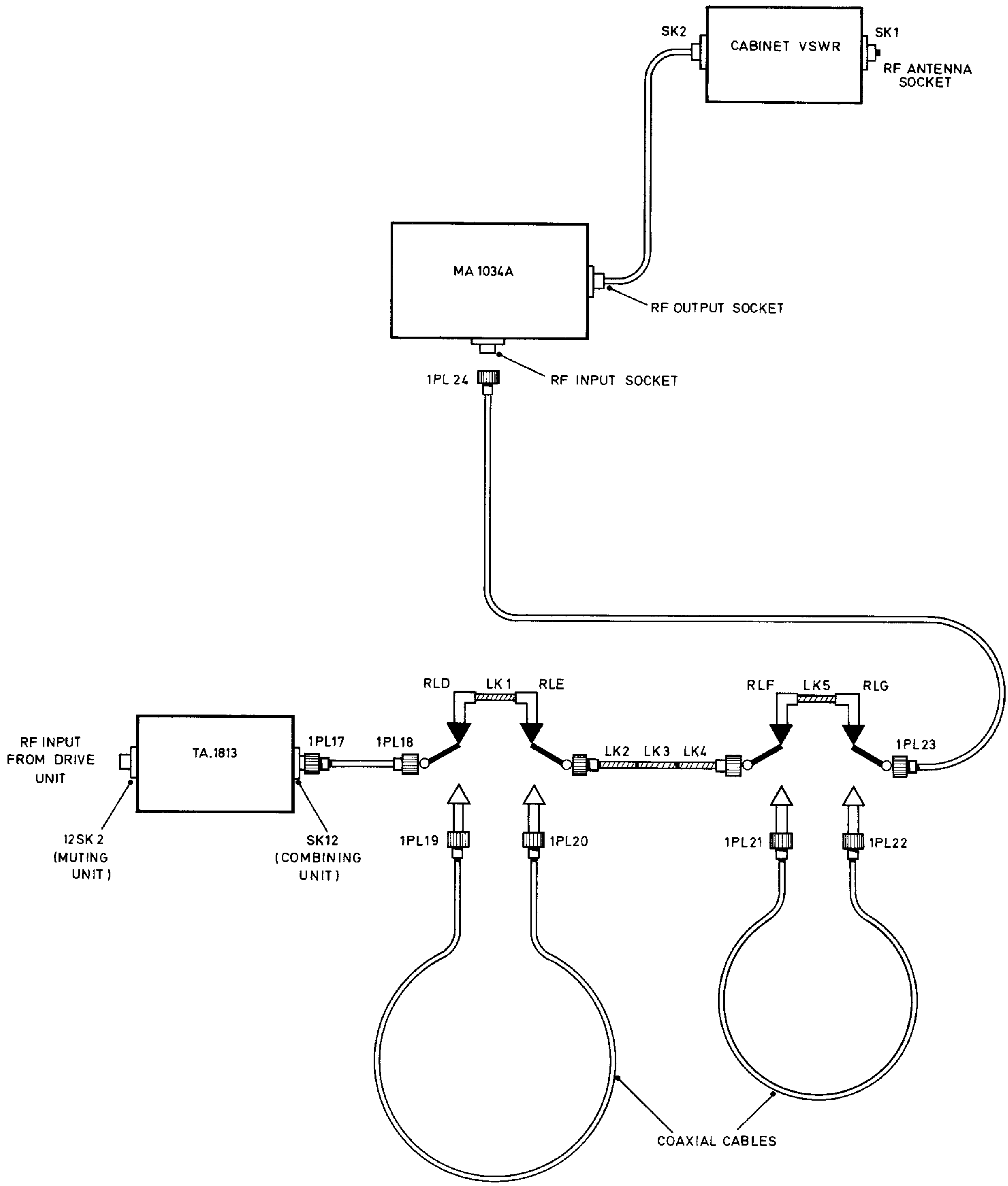
Location of Connectors, Relays etc. TA.1816

Fig. 3



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Coaxial Connections : TA.1816

Fig. 4

PART 2

500W LINEAR AMPLIFIER

TYPE TA.1813

Ref. WOH 4083
Issue B-2.74.100

BERYLLIUM OXIDE - SAFETY PRECAUTIONS

INTRODUCTION

The following safety precautions are necessary when handling components which contain Beryllium Oxide. Most RF transistors contain this material although the Beryllium Oxide is not visible externally. Certain heatsink washers are also manufactured from this material.

PRACTICAL PRECAUTIONS

Beryllium Oxide is dangerous only in dust form when it might be inhaled or enter a cut or irritation area. Reasonable care should be taken not to generate dust by abrasion of the bare material.

Power Transistors

There is normally no hazard with power transistors as the Beryllium Oxide is encapsulated within the devices. They are safe to handle for replacement purposes but care should be exercised in removing defective items to ensure that they do not become physically damaged.

They MUST NOT:

(a) be carried loosely in a pocket, bag or container with other components where they may rub together or break and disintegrate into dust,

(b) be heated excessively (normal soldering is quite safe),

(c) be broken open for inspection or in any way abraded by tools.

Heatsink Washers

Heatsink washers manufactured from Beryllium Oxide should be handled with gloves, cloth or tweezers when being removed from equipment. They are usually white or blue in colour although sometimes difficult to distinguish from other types. Examples of washers used are 917796, 917216 and 700716.

They MUST NOT:

(a) be stored loosely,

(b) be filed, drilled or in any way tooled,

(c) be heated other than when clamped in heatsink application.

DISPOSAL

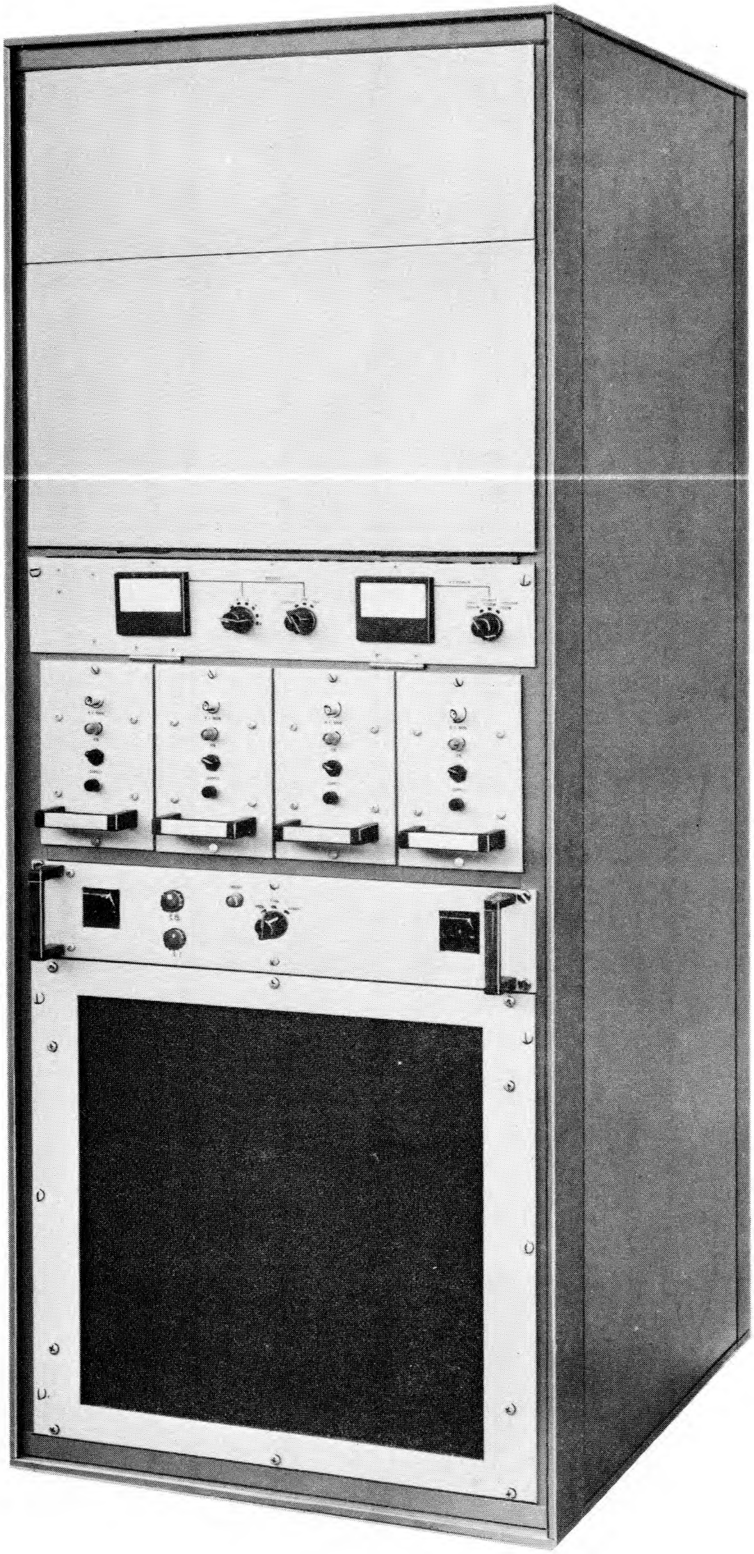
Defective and broken components must not be disposed of in containers used for general refuse. Defective components should be individually wrapped, clearly identified as "DEFECTIVE BERYLLIA COMPONENTS" and returned to the Equipment Manufacturer for subsequent disposal.

Broken components should be individually wrapped and identified as "BROKEN BERYLLIA COMPONENTS". They must not be sent through the post and should be returned by hand.

MEDICAL PRECAUTIONS

If Beryllia is believed to be on, or to have entered the skin through cuts or abrasions, the area should be thoroughly washed and treated by normal first-aid methods followed by subsequent medical inspection.

Suspected inhalation should be treated as soon as possible by a Doctor - preferably at a hospital.



Linear Amplifier Type TA.1813

500W LINEAR AMPLIFIER TA.1813

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TECHNICAL SPECIFICATION

Frequency Range:	1.6 to 30.0MHz
Power Output:	500W ± 1dB p.e.p. and C.W.
Output Impedance:	50 ohm (will operate at full power into 3:1 V.S.W.R. when operating with MA 1004 Feeder Matching Unit).
Intermodulation Products:	35dB below 1 tone 1.6 to 10MHz in a standard two tone test. 25dB below 1 tone 10.0 to 30MHz in a standard two tone test.
Harmonic Radiation:	Better than -43dB below p.e.p. when operating with MA1004 or MA1034 units.
Wideband Noise:	125dB below p.e.p. in 3KHz bandwidth - with drive unit muted.
Input Level:	25mW - 200mW nominal ± 1.5dB over the frequency range.
Input Impedance:	50 ohm
Supply:	210-250V single phase 47-60Hz. Consumption 3KVA.

CHAPTER 1

GENERAL DESCRIPTION

INTRODUCTION

1. The TA.1813 is an all solid-state wideband linear amplifier which operates over the frequency range 1.6MHz to 30MHz. The output power (500W) is obtained by combining the 125W outputs of four identical plug-in modules in a passive combining network.

2. The amplifier, complete with power supplies etc. is mounted in a floor standing cabinet, the top section of which contains space for fitting associated drive equipments and filter/feeder matching units (para. 5). The amplifier operates from a 210/250V single phase AC supply, and internal regulation (up to ± 6%) is provided, as are all necessary cooling and air filtering facilities.

3. Installation is extremely simple (see Chap.3). For fixed station operation it is not essential to bolt the cabinet to the floor, since it can be free standing if required, (see CAUTION on page 3-1). Alternatively the cabinet can be bolted permanently to the floor. Electrical connections i.e. audio, keying and AC supply are made to terminals in the bottom rear of the cabinet; the RF output connector is situated at the top rear.

ASSOCIATED EQUIPMENTS

4. The TA.1813 amplifier is designed to operate primarily with the Racal MA.1720 (Synthesized) or MA.7917 (Channelized) Transmitter Drive Units. It can, however, be used in conjunction with any HF drive unit with a nominal 100mW output over the required frequency range.

5. Connection to an external antenna should be made via one of two alternative units, dependent upon the type of antenna to be used, viz

   (i) For operation into a wideband antenna, cut dipole, or any other antenna which will normally present a V.S.W.R. better than 3:1 at the operating frequency, the Racal Feeder Matching Unit Type MA.1004 is recommended. This is a fast-acting automatically-tuned unit which ensures maximum power transfer into the antenna at all frequencies, and at the same time provides a high degree of attenuation to harmonic frequencies.

   (ii) When operating into a whip or long wire antenna with an associated aerial tuning unit, the Racal Filter Switching Unit (Type MA.1034) is required. This unit is a simpler device than the MA.1004, and provides harmonic attenuation; impedance matching is provided by the external A.T.U.

6. The TA.1813 cabinet assembly is designed to include, as required, any combination of drive unit (MA.1720 or MA.7917) and output filtering/matching unit (MA.1034 or MA.1004) thereby providing a self-contained, fully automatic, solid state H.F. transmitter.

7. The following table lists the units, modules and printed circuit (p.c.) boaras which form the TA.1813 linear amplifier. Detailed technical descriptions are given in Chap.5.

Prefix Codes

8. Prefix codes are given to each unit or module and to each board in a unit or module as listed below. As an example, the complete reference for resistor R1 of a board A in sub-unit No.5 is 5AR1. Prefix codes are shown encircled on illustrations.

PREFIX CODES

Prefix Code	Unit, Module or PC Board	Type No.	Quantity Used	Circuit Diagram Fig. No.
1	Cabinet Assembly	TA.1813	1	32
	Containing			
None	Power Supply Module	MS64	) 1 each	
None	Power Supply Module	MS64	) Two identical	25
			) Modules	
2	Control Panel	MM377	1	30
None	RF Power Module	MM420	4	21 + 27
	Consisting of			
4	Stabilizer Module	MS440	4 (total)	27
	Containing			
4A	PC Board	PS313	4 (total)	27
5	RF Amplifier Module	MM320	4 (total)	21
	Containing			
5A	Low Level Board	PS351	4 (total)	13
5B	High Level Board	PS315	4 (total)	15
5C	Protection Board	PS251	4 (total)	19
5D	VSWR Board	PS316	4 (total)	17
6	Combining Unit 500W	MS126	1	23
	Containing			
6	PC Board	PS122	1	23
7	Splitter Unit	MS444	1	1
	Containing			
7	PC Board	PS318	1	1
8	Distribution Amplifier	MS240	1	3
	Containing			
8	PC Board	PS319	1	3
12	Muting Unit	MS564	1	34
	Containing			
12A	PC Board	PS565	1	34

Prefix Code	Unit, Module or PC Board	Type No.	Quantity Used	Circuit Diagram Fig. No.
9	Overload Unit	MS443	1	5
	Containing			
9	PC Board	PS322	1	5
10	Cabinet VSWR Unit	MS447	1	7
	Containing			
10	PC Board	PS317	1	7
11	Meter Panel Assembly	MS445	1	9
	Containing			
11A	VSWR Warning PC Board	PS446	1	11

THE R.F. CIRCUITS

Fig. 1.2

9. A block diagram showing the RF path and the RF levels within the RF circuits is given in Fig.1.2. The RF input from the associated transmitter drive unit is fed, via the muting unit, into the splitter unit which provides two outputs to the distribution amplifier. The distribution amplifier provides four buffered 50 ohm outputs with a nominal gain of 3dB from the input to each output. The four outputs are fed, via 50 ohm coaxial lines, to the inputs of the MM 420 RF Power Modules. The 125W output from each RF module is fed, via 50 ohm coaxial lines, to inputs on the combining units MS 126.

10. The module outputs are combined two at a time in hybrid stages. The first two hybrid stages each provide 250W outputs which are combined in a further hybrid stage to produce the 500W output. The two 250W outputs are available separately, at 50 ohm impedance, at a patch panel. During normal operation both outputs are connected to the final hybrid transformer to produce a combined output of 500W.

11. The gain characteristics of each module are maintained at similar values, via automatic level control circuits. In addition electrical path lengths, including coaxial cable lengths, are similar for each circuit. These provisions ensure that the phase and amplitude characteristics of each path are similar, thus allowing the combining unit to function at optimum efficiency.

12. The complete amplifier is wideband, therefore no tuning or moving parts are involved.

13. The output from the combining unit is normally fed via an MA.1004 or MA.1034 unit (see para.5) which, in turn, feeds the V.S.W.R. unit Type MS 447. The V.S.W.R. unit monitors the forward and reflected output power from the amplifier and provides visual indication on the meter and an external warning voltage should a pre-determined reflected output power level be exceeded.

14. The automatic level control circuits (para.11) also provide protection by automatically reducing power if a mismatch occurs at the module outputs.

15. The overload unit Type MS 443 (shown on Fig. 1.4) automatically monitors the operational state of the amplifier and provides an external signal if unbalanced RF inputs are fed to the combining unit, or if either MS64 power supply unit fails (see Chap. 5 for a detailed description).

POWER SUPPLY DISTRIBUTION — Figs. 1.3 and 1.4

16. Each 250W amplifier is provided with its own power supply which can be independently switched. Each power supply consists of a DC power supply unit Type MS64 whose outputs provide DC supplies to a pair of RF modules. Associated with each RF module is a Stabilizer Module MS 440 which forms part of the Type MM 420 Amplifier. Each MS 440 module provides a stabilized DC output to each RF module, and includes a fast current trip circuit to protect the RF circuits if an overload occurs. The DC voltage and the current taken by each module can be monitored at the amplifier meter panel.

OPERATIONAL FEATURES

Active Standby Philosophy

17. The 500W amplifier TA.1813 consists basically of two 250W amplifiers, each comprising two 125W RF modules. Each 250W amplifier is mechanically and electrically independent of the other; at the final hybrid stage of the combining unit the two 250W outputs are combined to give 500W. The final hybrid stage can be by-passed by external patching, allowing one amplifier to continue to function and provide a 250W output, regardless of the condition of the second 250W amplifier.

18. The operational flexibility of the two 250W amplifiers is increased by using four independent RF modules each providing 125W output. As the outputs of the modules are combined, (not parallelled) they are isolated from each other electrically. Therefore, an operational module is not affected by a defective module even if the defect is a short-circuit, open circuit or any other fault condition. In addition, a defective module can be unplugged and replaced while the remainder of the modules continue to operate. The only effect on transmission due to a defective module will be small reduction in output power (of the order of 1.75dB).

19. This extremely important feature together with the ability to transmit temporarily with only one 250W amplifier in use (para. 17) ensures an overall equipment reliability very much greater than that obtained using conventional transmitters, giving a "lost transmission time" due to faults that is extremely small.

20. It should be noted that when a failure of one 250W amplifier occurs the radiated power is reduced from 500W to 125W until the output connector is transferred (patched) to the still functioning 250W outlet. Until patching is carried out 125W is dissipated internally in the combiner (which is continuously rated) allowing only 125W to appear at the output. Patching for 250W output can be carried out at a suitable break in transmission; approximately 30 seconds is required for this operation.

Operating Indicators on Modules

21. Each module can be switched off separately at its own front panel. The operating state of each module is indicated by two front-panel lamps. The illumination of the green lamp shows the presence of the D.C. supply; the white lamp illuminates when the module is providing an RF output. A faulty or weak module is indicated by a lower level of illumination when compared with the remainder of the indicator lamps.

Metering and Monitoring

22. The Metering panel (MS 445) allows metering of the 30V and 20V DC supply voltages and current of the 30V supply to each module. In addition the input RF power level and the forward and reflected output power levels are indicated. Front panel monitoring is provided for all module outputs, each 250W output and the 500W output, via 50 ohm BNC connectors.

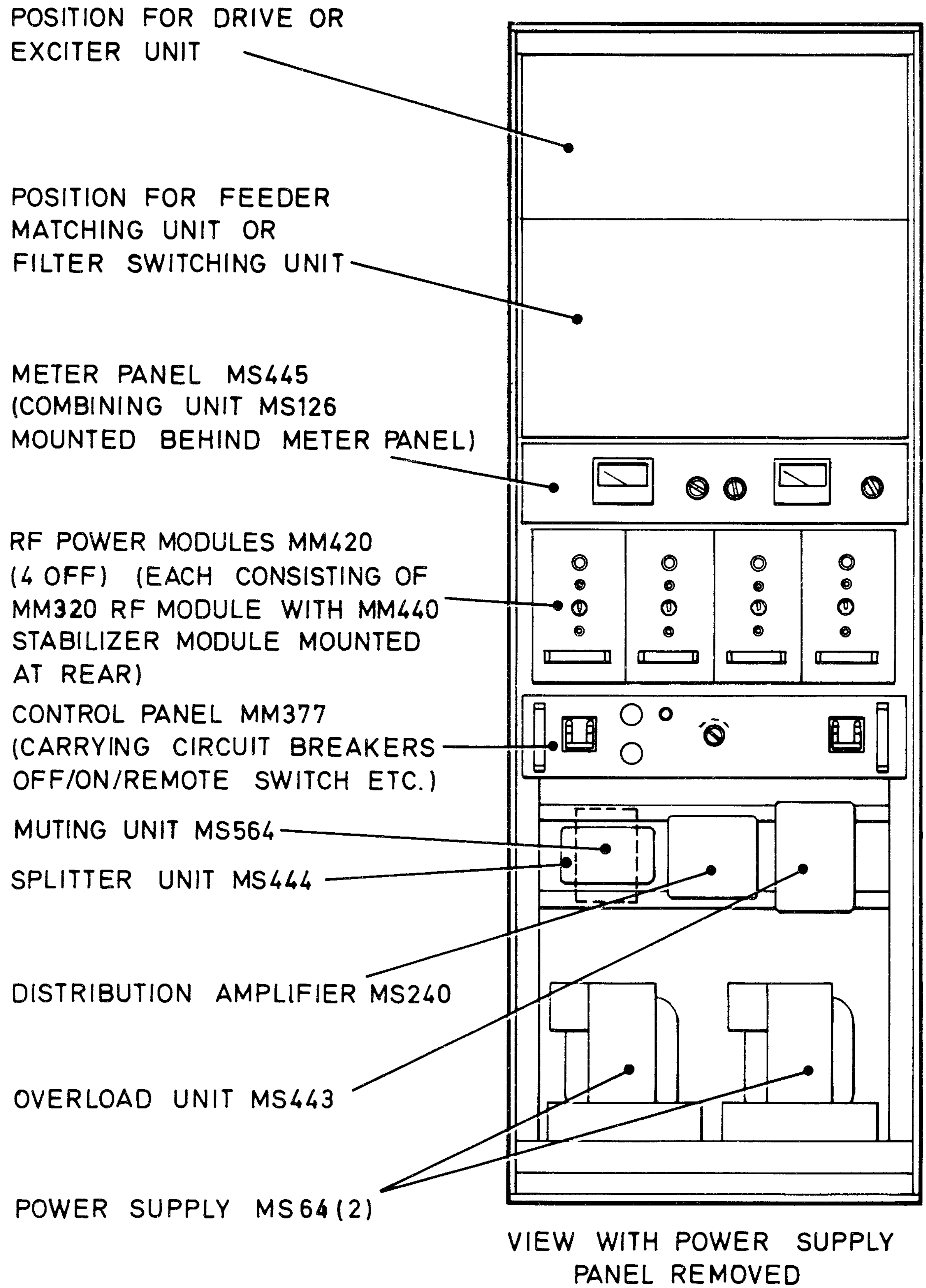
NOTE: Only positions 1 to 4 of switch SA on the panel are connected in circuit.

COOLING

23. Forced air cooling is built into the amplifier cabinet. Two similar blowers are fitted at the bottom of the cabinet for cooling the RF modules, a third is located at the top rear of the cabinet and provides general cooling for the units fitted at the top of the cabinet. The total air flow from each blower fitted to the base of the cabinet is approximately 220cfm at 1.3W.G.

24. When the standard version of the cabinet is used air is taken in from the front via the filter panel which covers the power supply units at the bottom of the cabinet, and is exhausted at the rear of the cabinet. When a ducted system (to special order) is required the air filter is fitted at the rear of the cabinet and inlet and outlet ducting are bolted to the rear cabinet skin.

25. The air flow is not interlocked with the electrical system since all RF modules are individually protected against overheating. The RF modules will operate for a considerable period of time (dependent on ambient temperature) with both blowers inoperative. This means that the equipment can be operated satisfactorily for several minutes with a module removed and a consequent loss of air through the gap created.

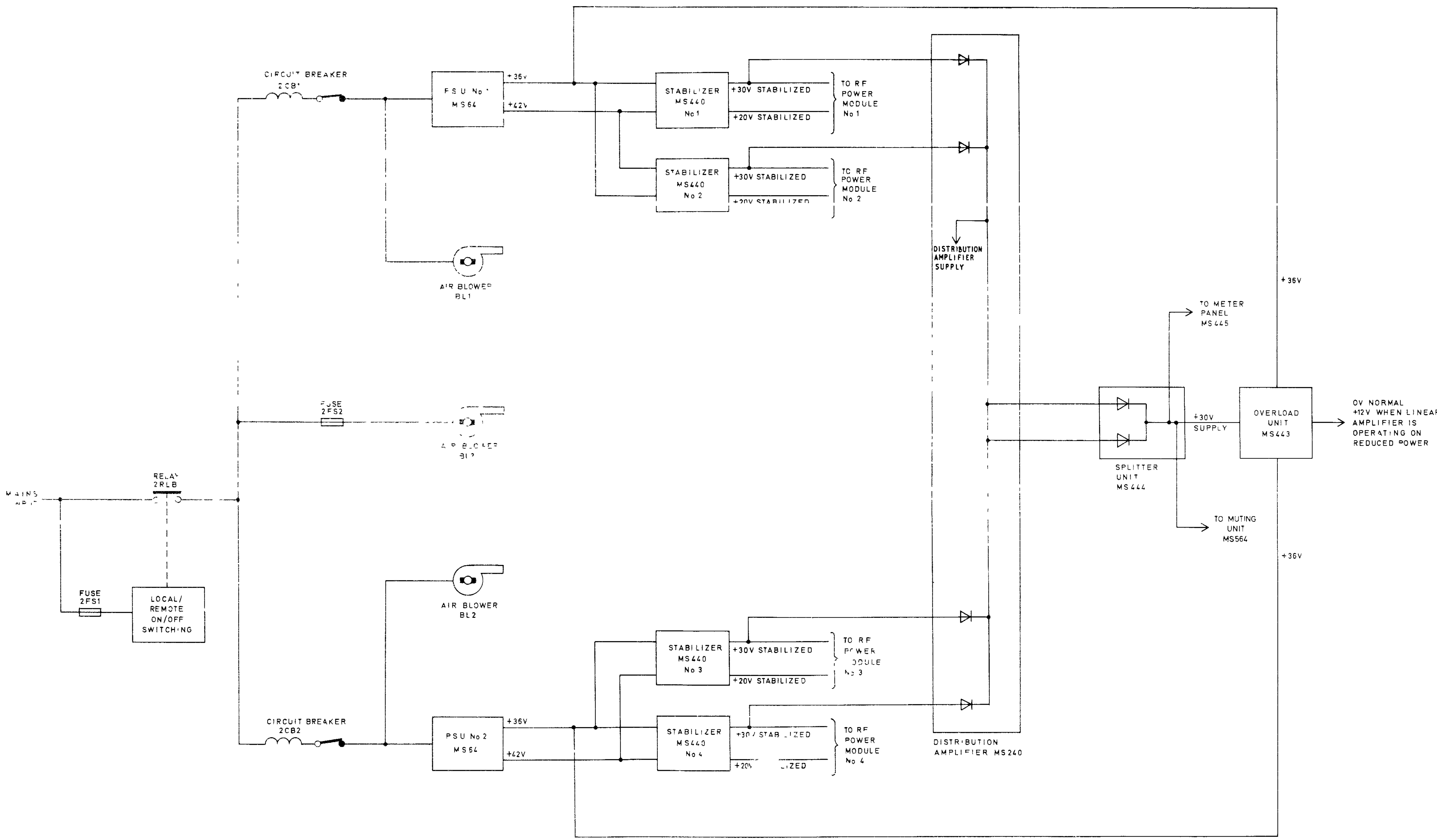


NOTE: SEE ALSO FIG.33

WOH4083

TA.1813 Location of Sub-Units

Fig.1-1



TA.1813 Block Diagram: Power Supply Distribution

Fig.1.3

CHAPTER 2

SETTING-UP AND OPERATING INSTRUCTIONS

INTRODUCTION

1. It is assumed that the installation procedure described in Chapter 3 has been carried out, i.e. all units are mounted within the cabinet assembly, and all external wiring connections made in accordance with the appropriate system handbook. Initially, the Setting-up Procedure given in paras.3 to 5 should be carried out in conjunction with the Operating Procedure.

OPERATING PROCEDURE

2. Switching on is achieved as follows:-

    (i) Set the amplifier control switch to ON for 'local' operation, or to REMOTE.

    NOTE: When REMOTE is selected the amplifier is switched on from an external source by a 12V line. Switching is normally carried out from the MA.1720 drive unit when this unit is fitted.

    (ii) Check that the blower at the top of the cabinet operates when ON is selected.

    (iii) Set the two front panel circuit breakers on the TA.1813 to ON. This immediately energizes the blowers and switches on all the supplies to the overall amplifier. In this condition the individual RF modules are not muted. To externally mute them it is necessary to apply an external earth connection to TB9 pin 10.

    (iv) Switch ON all the RF modules via their respective front panel switches, and note that all green lights are illuminated.

    (v) Check that the 20V and 30V supplies are present at all modules as indicated on the appropriate meter. Monitor the individual module currents on the switched meter, and ensure they all indicate approximately equal values when an RF output is being supplied.

    NOTE: Only positions 1 to 4 of the meter switch are used.

SETTING-UP PROCEDURE

3. Ensure that the Splitter Unit attenuators are set to 0dB (i.e. SK1 linked to pin 13; pin 10 linked to pin 9).

4. Terminate the RF output connector on the TA.1813 with a 500W, 50 ohm resistive load.

5. Feed in a CW drive signal, in the frequency range 1.6 to 30MHz, to PL28. Adjust the drive level, in conjunction with the Muting Unit attenuators, for an input power

of 25mW as monitored on the Meter Panel. Refer to the table below for the Muting Unit attenuator settings:

Pins linked on Muting Unit	Attenuation
8 and 10 14 and 13	0dB
8 and 11 15 and 13	3dB
8 and 9 12 and 13	6dB
8 and 11 15 and 9 12 and 13	9dB

6. Ensure that the clear lamps on the four RF modules are glowing at approximately equal brightness.

7. Monitor module currents at the front panel meter and ensure that they all indicate approximately 12A and that in no case is 15 amps exceeded. Currents will be lower at the LF end of the band, and highest at midband, but at any one frequency setting, individual module currents should be similar.

8. Switch-off, disconnect dummy load and connect antenna.

9. For system operation refer to the appropriate system handbook.

250W RF Output

10. If it is required to operate the TA.1813 as two separate 250W amplifiers, i.e. for maintenance purposes, the following procedure should be adopted.

(1) Set the control switch to OFF.

(2) Switch off the circuit breaker on the power supply feeding the modules not required for traffic i.e. 2CB1 for RF Modules Nos.1 and 2, or 2CB2 for RF Modules Nos.3 and 4.

NOTE: 2CB1 is the left hand circuit breaker, 2CB2 is the right hand.

(3) Remove the front panel of the Power Supply, by undoing eight quick-release fasteners.

(4) Disconnect 7 PL2 from 8SK5 of the distribution amplifier if RF Modules Nos. 1 and 2 are to be removed from service, or disconnect 7PL3 from 8SK6 if RF Modules Nos.3 and 4 are to be removed from service.

(5) Connect the plug, disconnected in operation (4), to the Dummy Load socket 1SK29 which is located on the hinged mounting plate.

(6) Lower the meter panel to its fullest extent by removing the retaining arm and allowing the meter panel to rest gently on its hinges.

(7) Disconnect the output lead from the 500W output.

(8) Disconnect the output lead from the required 250W output and use the Combiner Patch Lead Assembly BA604047 supplied with Accessory Kit CA.607, to connect the required 250W output to the output lead disconnected in (7).

NOTE: This is important to maintain the pre-programmed line selection when the linear amplifier is used in pre-programmed systems e.g. with the MA.7917 Exciter or the MA.1034A Filter Switching Unit.

(9) Switch on the amplifier and operate normally.

(10) The other half of the amplifier may be operated for test purposes by connecting a dummy load to the 250W RF output socket and a Signal Generator to the appropriate Distribution Amplifier input socket.

CHAPTER 3

INSTALLATION

GENERAL

1. The equipment is shipped with the RF modules and the power supply units packed separately. Unpacking and fitting instructions are given in paras. 8, 9 and 10.

FLOOR MOUNTING

2. The cabinet is provided with floor standing fitments and need not be permanently fixed to the floor. If a permanent fixing is intended, the feet provided should be removed and the base screwed to the floor.

CAUTION: When the cabinet is not fixed to the floor not more than one power unit should be removed at a time to prevent toppling of the cabinet.

MAIN EARTH

3. An earth strap should be connected between the earth point in the base of the cabinet and the main station earthing system.

POWER AND SIGNAL CONNECTIONS

Mains Supply

4. A single phase supply at 3kVA maximum is required. Line, neutral and earth connections are made in the rear of the cabinet at the bottom (TB1 Pins 1, 2 and 3 respectively). Each MS64 Power Supply has an individual mains selector plug. This should be set to the voltage appropriate to the incoming mains supply.

Antenna Connection

5. This is made to the RF output connector (Type C) at the top rear of the cabinet. UR 102 (50 ohm) cable is recommended.

Audio and Keying Inputs

6. These connections to the associated drive unit (if fitted) should be made to TB16 at the bottom of the cabinet in accordance with the following table, using the fanning strips provided.

NOTE: For further information refer to the associated System Handbook.

TABLE OF AUDIO/KEYING CONNECTIONS

TB16 pin	
1) 2)	Audio 1
3	Screen
4) 5)	Audio 2
6	Screen
7)	Key
8)	Earth
9)	TSK
10)	Earth
11	Not Used
12	Earth

Miscellaneous External Connections

7. Interconnections required between the TA. 1813 and units such as the MA.1720 Drive Unit and the MA.1004 Feeder Matching Unit will be found in the associated System handbook.

FITTING THE RF MODULES

8. The four RF modules are packed in pairs. Carefully unpack them and slide one into each of the four compartments in the cabinet. Signal and power connectors on the rear of the RF modules will mate with fixed connectors at the rear of the cabinet as the modules are slid into position. Secure each module with the two quick-release fasteners attached to the front panels.

FITTING THE POWER SUPPLY UNITS

9. The two power supply units are packed in a specially strengthened case. Before unpacking them, study carefully the illustrated unpacking instructions attached to the packing case.

NOTE: Failure to observe these instructions may result in the units being damaged.

10. To fit the power supply units into the cabinet proceed as follows:-

(1) Remove the power supply panel from the front of the cabinet by releasing the eight quick-release screws.

(2) Remove the two screws which secure each power supply unit mounting tray to the cabinet, and withdraw the trays.

(3) Bolt each power unit to a mounting tray, using the six Pozidriv screws provided.

(4) Slide the trays with power supplies into the cabinet and bolt into place with two screws.

(5) Connect the cable harness to the power supply units as follows:

Cable with red or orange sleeve	+ve 36V terminal
Cable with black sleeve	-ve 36V terminal
Orange leads	+ve 42V terminal
Green leads	E terminal
Blue leads	N terminal
Brown leads	L terminal

(6) Clamp the cables to the front of the power supply units using a 'P' clip at each unit.

(7) Re-fit the power supplies panel to the cabinet.

CHAPTER 4

BRIEF TECHNICAL DESCRIPTION

INTRODUCTION

1. The following paragraphs briefly describe the function of the units and sub-units which constitute the TA.1813 Linear Amplifier; detailed technical descriptions are given in Chapter 5.

CONTROL PANEL MM377

2. The Control Panel carries the contactors and relay which control the a.c. power supply to the amplifier.

MUTING UNIT MS564

3. The Muting Unit provides muting of the r.f. drive signal to the Splitter Unit. On de-mute, it ensures that the r.f. drive level is restored at a controlled rate.

SPLITTER UNIT MS444

4. The Splitter Unit is a passive network providing two separate outputs of equal amplitude and phase to the Distribution Amplifiers. The RF input level is sampled at the Splitter Unit, and the output is fed to a metering circuit on the Meter Panel.

DISTRIBUTION AMPLIFIER MS240

5. The Distribution Amplifier provides four separate and isolated RF outputs to the four RF Power Modules. The unit contains four buffer amplifiers each with an approximate gain of 3dB.

OVERLOAD UNIT MS443

6. The overload unit provides a reduced power warning signal in the event of failure of a power supply or an RF Power Module. The unit also provides a 'fault' signal if either the main contactor fails or a fault signal is received from an associated unit, such as the MA.1004 Feeder Matching Unit.

CABINET VSWR UNIT MS447

7. The Cabinet VSWR Unit monitors the forward and reflected powers on the RF output feeder and provides d.c. outputs to the metering circuit on the Meter Panel MS445.

METER PANEL MS445

8. The Meter Panel contains two meters and associated switches to provide an indication of the voltages applied to, and the current drawn from the 30V supply, by each RF Power Module. The RF input power and the Forward and Reflected RF output power of each module is also indicated. The Meter Panel also contains a VSWR Warning Board which comprises a trip circuit operated by the VSWR Unit reflected power line. The trip circuit can be used to operate a fault line to a suitable external circuit.

RF POWER MODULE MM420

9. The RF Power Module Type MM420 is an all solid-state wideband linear amplifier capable of delivering at least 125 Watts over the frequency range of 1.6MHz to 30MHz.

10. The module consists of a basic RF Amplifier Type MM320 and a power stabiliser unit Type MM440. The two units consist of printed circuit boards mounted on finned castings which are bolted together in line to form a complete plug-in unit. When required they can be readily separated, for example, when replacing a faulty stabiliser unit.

11. Four complete modules (MM420) are used in the TA.1813 Linear Amplifier and each module plugs directly into the TA.1813 cabinet.

RF Amplifier Module MM320

12. The RF Amplifier Type MM320 consists of a Low Level Board and High Level Board which make up the basic RF amplifier together with two associated printed circuit boards, namely a VSWR Board and a Protection Board. A block diagram of the amplifier assembly is shown in Fig. 4.1 at the rear of this chapter whilst the inter-connection and physical location of the sub-units are shown in Figs. 21 and 22 respectively.

Low Level Board PS351

13. This board amplifies the input RF signal of 10mW nominal from the Distribution Amplifier to approximately 2W. In addition it provides a variable gain stage which is used as the automatic level control circuit to maintain the output RF level of the High Level Board constant and to reduce the output to a safe level when a load mismatch occurs.

14. The RF input to the Low Level Board is fed first to the Automatic Level Control (a.l.c.) stage consisting basically of two transistors operating in class A push-pull. The gain of the stage is varied by causing two diodes, connected in series, to partially conduct and shunt part of the RF drive in accordance with signals from detectors (para.26). The shunting effect controls the output of the stage.

15. Following the a.l.c. stage are two further class A amplifier stages. The first stage comprises two transistors operating in grounded base mode and connected in a push-pull configuration. The second stage is similar to the first but employs four transistors connected in a parallel/push-pull configuration and transformer coupled to the output.

High Level Board PS315

16. This board contains two stages of RF amplification. The drive stage consists of two power transistors operating in class B push-pull with grounded base. This stage is transformer coupled to the final PA stage which comprises 8 power transistors which are connected in a parallel push-pull arrangement and operated in a common emitter mode. Negative feedback is applied to the PA stage to ensure a flat response over the frequency range.

17. All components associated with the RF output amplifier, with the exception of the transistors and diodes, are mounted on the High Level Board. The transistors themselves are stud-mounted on the main casting to ensure maximum heat dissipation. Replacement of a transistor can be effected without removing the High Level Board (refer to Chapter 6).

18. The High Level Board includes diodes monitoring the RF collector voltage swing of the power transistors. If this becomes too large, the diodes conduct and operate the a.l.c. stage reducing the drive level to avoid saturation (refer to para. 14).

VSWR Board PS316

19. The Voltage Standing Wave Ratio Board monitors the forward and reflected output power of the High Level Board before it is fed to the RF output connector of the MM420.

20. The forward power detector is fed back to the a.l.c. stage on the Low Level Board to control the output level under normally matched conditions (i.e. 50 ohm). The actual forward output level is set by a potentiometer.

21. Under mismatched conditions, the resultant output from the reflected power detector is also fed back to the a.l.c. stage to reduce the output level appropriate to the degree of mismatch. The level at which the reflected power takes over from normal a.l.c. controls is adjustable via a second potentiometer.

WARNING

THE POTENTIOMETERS OF THE RF POWER MODULE MM420 SHOULD ONLY BE ADJUSTED WHEN SETTING UP THE MODULE AS PART OF THE ALIGNMENT PROCEDURE (CHAPTER 7 PARAGRAPH 14). THEY SHOULD NOT BE ADJUSTED WHEN THE MODULE IS INSTALLED IN THE TA.1813, SINCE THE PROTECTION AFFORDED TO THE OUTPUT TRANSISTORS WILL BE REDUCED WITH THE CONSEQUENT RISK OF TRANSISTOR FAILURE.

Protection Board PS251

22. The Protection Board is designed to provide protection for the RF amplifier against d.c. fault conditions. Depending on the actual fault, it operates in one of two ways.

(a) Firstly if a short circuit should occur on the Stabiliser Unit (MS440) this would apply approximately 40V to the Amplifier H.T. rail, overstressing the RF transistors. To prevent this a power thyristor is included which, in the event of such a fault, conducts and operates a fuse thereby open circuiting the positive supply.

(b) Secondly, if the collector currents of the RF output transistors exceed a prescribed maximum (approximately 7 Amps for each group of four transistors) a fast acting d.c. overload signal is applied to the a.l.c. stage on the Low Level Board, to ensure this current level is not exceeded.

NOTE: If reducing the RF drive does not control the transistor currents then a d.c. overload trip in the stabiliser unit will operate.

COMBINING UNIT 500W MS126

23. The Combining Unit is a completely passive unit containing a series of hybrid combining transformers, impedance transformers and ballast load resistors.

24. The function of the unit is to accept the output of each RF Power Module and to combine their outputs into a common output line whilst providing RF isolation between any one module and the others.

25. As shown on the block diagram of the Unit, Fig. 4.2, the four RF inputs from the RF Power Modules are fed into hybrid transformers in pairs. The first two hybrid stages produce two 250W outputs. The two 250W outputs are combined to produce a 500W output. The final hybrid may be by-passed if it is required to provide a 250W output. (Chap. 1, para. 17 refers).

AUTOMATIC LEVEL CONTROL

26. Four separate detectors control the output level of the module via the Automatic Level Control (ALC) circuit, these are.-

(1) Forward Power Control - Normal operation into 50 ohms.

(2) Reflected Power Control - Operates ro reduce the output of the module when working into a mismatch i.e. when the Reflected Power Level would be liable to damage the output stage.

(3) 'Swingometer' - This operates by monitoring the collector voltage swing of the output stages and under certain load impedances will reduce the output level to prevent the output transistors running into saturation.

(4) Current a.l.c. - Operates quickly to reduce the output of the module in the event of fast transients by sensing the current in each half of the output stage.

PROTECTION METHODS

27. In addition to a.l.c. protection each module is protected against over-heating by a thermostat whilst a voltage detecting circuit in conjunction with a fuse in the supply line provides protection against short circuits in the stabilizer. AC supply overload protection is provided for each power unit by circuit breakers on the Control Panel.

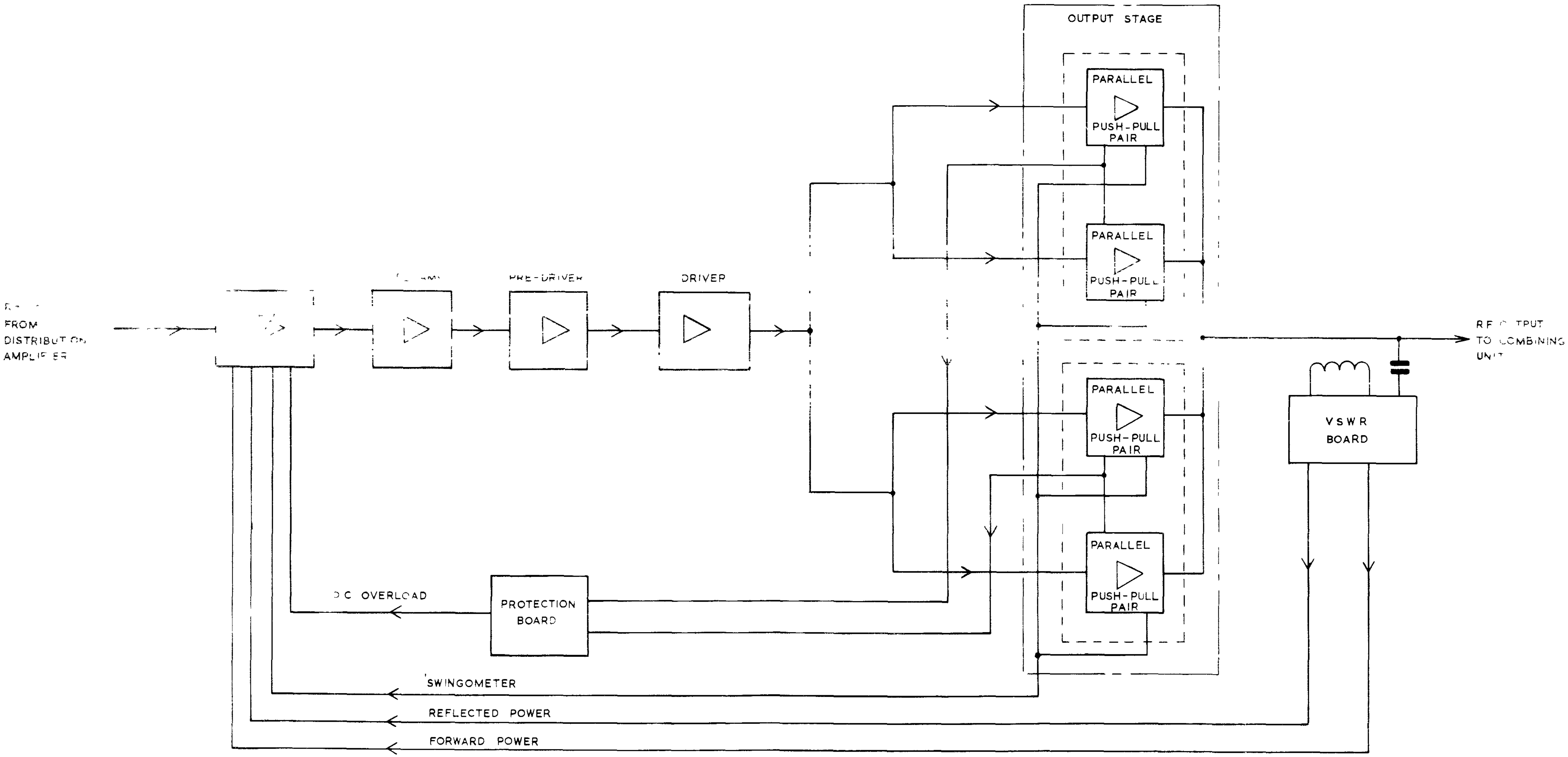
POWER SUPPLIES

Power Supply Unit MS64

28. The main d.c. power supply for the TA.1813 is provided by two d.c. power supplies Type MS64, each providing smoothed unregulated d.c. outputs to the individual stabilizers. The power supplies operate from a single phase a.c. mains input.

Stabilizer MS440

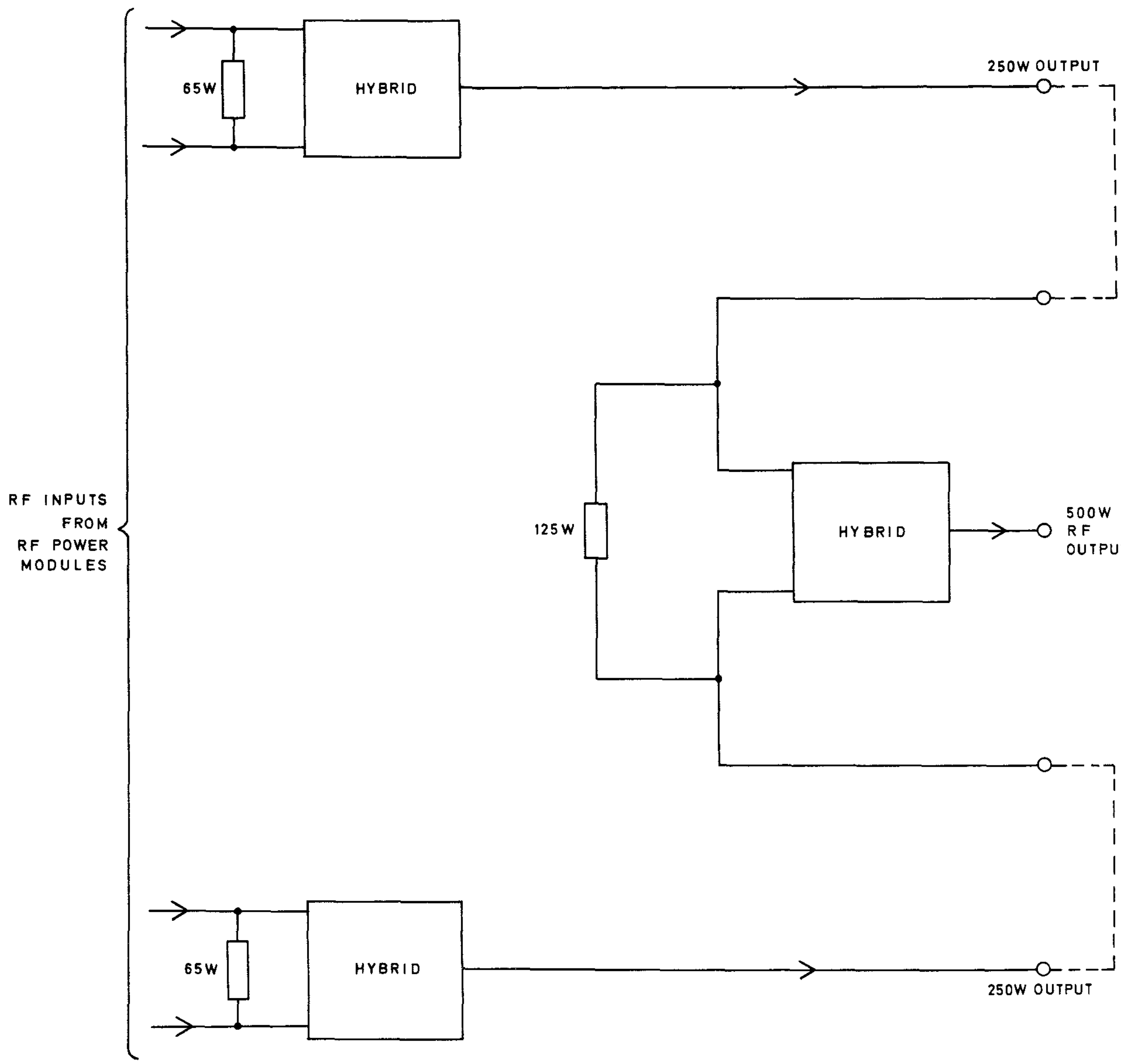
29. The stabilizer Type MS440 provides stabilized +30V d.c. and +20V d.c. supplies to each RF Amplifier Type MM320. In addition each stabilizer provides inputs to the +30V current metering facility on the Meter Panel.



WOH 4083

Block Diagram: R.F. Amplifier MM320

Fig. 4·



WOH 3037

Block Diagram: Combining Unit MS126 Fig.4.2

CHAPTER 5

DETAILED TECHNICAL DESCRIPTION

INTRODUCTION

1. The circuit descriptions detailed in the following paragraphs should be read in conjunction with the appropriate circuit diagram.

CABINET ASSEMBLY

2. As outlined in Chapter 1, the TA.1813 cabinet assembly comprises the Muting Unit, Splitter Unit, Distribution Amplifier, Overload Unit, Cabinet VSWR Unit, Meter Panel and Control Panel. Fitted within the cabinet are blowers, coaxial line switching relays and interconnecting cableforms. The overall interconnection diagram is shown in Fig.32.

Control Panel MS377

3. Switching of the overall cabinet assembly can be accomplished from the local position (i.e. TA.1813 front panel) or from a remote position. Remote switching can be carried out in two ways:

(i) by the application of an external 12V supply to an internal relay, or

(ii) by the closure of a mains circuit by means of an external switch.

Selection of OFF, ON (local control) or REMOTE is made from the front of the cabinet assembly. The two power supplies and associated blowers can be switched off independently by operation of the appropriate circuit breaker.

Muting Unit MS564 — Fig.34

4. The r.f. drive signal is fed to SK2 and routed, via an attenuator network, to the primary of transformer T2. Transistors TR1 and TR2 form a push-pull, class A amplifier operating in grounded base mode and providing approximately unity gain. The r.f. output from the secondary of T1 is fed to SK1. Base bias for TR1 and TR2 is derived from the emitter of TR3 and is approximately +9.3V, i.e. zener diode D3 voltage (+10V) minus TR3 base/emitter junction voltage (0.7V).

5. During normal operation (de-muted) the mute control line, PL1-3, is held at +12V: when muted it is grounded. Noise immunity is provided by diode D7. With the unit de-muted, the voltage at the junction D1/D2 is approximately +7.2V, i.e. zener D3 (+10V) minus the junction voltages of D5, TR5, TR7 and TR4 (0.7V each). As the emitter voltage of both TR1 and TR2 is approximately +8.6V, D1 and D2 are cut-off and TR1 and TR2 are conducting, thus allowing the r.f. drive signal at T2 to be coupled to T1.

6. When muting occurs, D8 is grounded and the base potential of TR6 falls to approximately +1.4V thus switching off TR6. This causes TR5 to be switched on allowing C8 to be charged-up via R14 and TR5. The base voltage of TR5 will now rise to approximately +12.1V (i.e. zener D3 (+10V) plus the junction voltages of D4, D9 and D6 (0.7V each)), and the voltage at the junction D1/D2 will rise to +10V, i.e. 12.1V minus the base/emitter junction voltages of TR5, TR7 and TR4. As D1 and D2 are now forward biased, they conduct thereby raising the voltage at the emitter of TR1 and TR2 to approximately +9.3V. Transistors TR1 and TR2 are therefore cut-off thus blocking the r.f. drive.

7. On de-muting, the mute control line at PL1-3 reverts to +12V switching on TR6 which, in turn, switches off TR5. Capacitor C8 will now discharge through R16 reducing the voltage at the emitter of TR5. (Transistors TR7 and TR4 form a Darlington pair which prevents significant loading across C8, thus ensuring the major discharge path for C8 is R16.) The fall in voltage at the base of TR5 will be held to approximately +9.3V by the action of D5. During the discharge time of C8 (approximately 5 to 7 milliseconds) the potential at D1/D2 junction falls to approximately +7.2V, i.e. +9.3V minus the base/emitter junctions of TR5, TR7 and TR4. As the potential at D1/D2 falls, TR1 and TR2 start to conduct, thus ensuring that the r.f. drive to SK1 is restored at a controlled rate.

8. The attenuation level afforded by the muting action is approximately 40dB at the H.F. end of the frequency range, and greater towards the L.F. end.

Splitter Unit MS444

Fig. 1

9. The RF input from the muting unit is fed in at SK1. It is then routed, via an attenuator network, to a passive splitter (R9 and R10) to provide two equal outputs at PL1 and PL2.

10. The output of the attenuator stage, at the junction of R9 and R10, is detected and a d.c. output fed from an emitter follower (TR1) to provide meter indication of the RF level. Calibration of this is effected by R12.

11. Four stabilizer outputs are connected via diodes in the appropriate Distribution Amplifier and the outputs from the two Distribution Amplifier supplies are connected via diodes in the Splitter Unit, this ensures that the Splitter Unit will always have a supply whilst one MS440 module is operating.

Distribution Amplifier MS240

Fig.3

12. The Distribution Amplifier provides a nominal 3dB gain from the two inputs to each of the four outputs. One input from the Splitter Unit is fed into SK5 which is connected to auto transformers T2 and T4. Capacitor C4 ensures that the input impedance is correct. The centre tap of each transformer is fed via a resistor to the emitter of grounded base transistors (TR1 and TR2) biased by a DC voltage derived from a resistive network R1 and R2 across the 30V supply rail.

13. The collectors of transistors TR1 and TR2 are transformer-coupled providing isolated RF outputs at SK1 and SK2. The diodes D1, D3 and zener diodes D2, D4 across each output transformer ensure that the positive collector voltage swing never exceeds the safe transistor rating.

14. The input at SK6 is fed to a circuit, comprising TR3 and TR4, which operates in a similar manner to that given in paras. 12 and 13.

15. Four 30V inputs at PL1, Pins 1, 2, 3 and 4, fed from the four MM440 stabilizers, ensure that the Distribution Amplifier can still operate as long as just one MM440 stabilizer remains active. The inputs are connected via diodes D9 to D12. The 30V output at PL1 Pin 5 connects to the Splitter Unit.

Overload Unit MS443

Fig. 5

16. The function of this unit is to provide a 'reduced power' warning signal in the event of failure of a power supply to an RF module. It also provides a 'fault' signal if either the main contactor fails or a fault signal is received from an associated unit, such as the MA.1004 Feeder Matching Unit.

17. The DC outputs of both MS64 units are monitored and fed to PL1, pins 8, 9, 11 and 12 of the Overload Unit. Each input is fed via noise immunity circuits (e.g. C1, D1, R3, R7). These circuits ensure that transient noise spikes will not cause the circuit to give a false indication, and that they will only respond to genuine input signals. The input transistors are connected in series so that when any are switched off due to having no input, TR5 will be switched on.

18. If an RF imbalance signal, whose value exceeds the bias on the base of TR8, is present at PL1 pin 4, TR6 will switch on, TR9 will switch off, TR7 will switch on, TR10 will switch off and C9 will charge via R25. Transistors TR11 and TR12 form a latching circuit which, in the normal state, has TR12 switched on and TR11 off. However, as C9 charges up, after an RF imbalance signal is received, TR11 is turned on, and after a delay, the circuit switches over to the latched state with TR11 conducting and TR12 switched off. In this condition TR13 is switched off and +12V (via R35) appears at the output PL1 pin 10 to operate an external circuit. In the normal operating condition the output at PL1 pin 10 is 0V.

19. This latched condition is maintained even if the fault signals are removed. It is set by an unlatching signal applied to PL1 Pin 1 from the external 'Coarse-tune initiate/Reset' or the 'Ready/Not Ready' line. This is normally derived from the MA.1720 drive unit. Noise immunity is provided by D8, D9, R36 and C11.

Cabinet VSWR Unit MS447

Fig.7

20. This unit monitors the forward and reflected powers on the RF output feeder and provides the respective d.c. outputs to the Meter Panel MS445. The design is that of a conventional reflectometer and is identical in principle to the RF Module VSWR unit described in paras. 41 to 48. It is balanced by adjusting C3 for an indicated null on reflected power when the feeder is terminated in 50 ohm.

Meter Panel MS445

Fig.9

21. This unit contains two meters; ME1, which is switched and meters the +30V, +20V supplies to, and the +30V supply drawn by, each of the four RF modules, and ME2, which is switched to monitor the input power (fed from the Splitter Unit), and the forward and reflected powers fed from the VSWR Unit. Only positions 1 to 4 of switch SA are used.

22. Also included is a VSWR Warning P.C.B. (Fig.11) which contains a trip circuit operating from the VSWR Unit reflected power line. The trip circuit comprises a long-tailed pair, TR2 and TR3, driven from TR1. TR4 provides the output which can be used to operate a 'fault' line to a suitable external circuit. The trip level is normally set to operate at 3:1 VSWR but can be changed by altering R12.

23. Switch S1 on the VSWR Warning Board is set to NORMAL during traffic condition. The CAL position is used during setting-up procedure.

RF AMPLIFIER MM320

Interconnection of Sub-Units Fig.21

24. The overall interconnections of the sub-units making up the RF Amplifier Assembly are shown on Fig.21.

Inputs

25. The power supply inputs are +20V and +30V DC on TS1 pins 3 and 2 respectively. These are connected directly to the associated Stabiliser Unit Type MM440. The only other connection is the external muting line on TS1 pin 4. This applies a 0V signal to the Low Level Board which operates the relevant switching transistors thereby cutting off the RF output. The RF input from the Distribution Amplifier is at PL1.

Outputs

26. The RF Output appears at PL2. It is fed from two outputs on the High Level Board, which are connected together prior to T1. The latter is a monitoring transformer, feeding LP2 and an external RF monitor socket. T2 is the reflectometer toroid for the VSWR unit and C3 is the associated capacitive probe.

Protection Components

27. CSR1 is fired under a fault condition from the Protection Board, thereby short-circuiting the +30V line and blowing FS1 if the stabilizer trip does not operate. C1, L1 and C2 are RF decoupling components. THE1 is the thermostat on the Assembly heat sink which open circuits the +20V supply rail if the safe working temperature (approx. 85°C) is exceeded.

Low Level Board PS351 Fig.13

28. The RF input is connected to pins 4 and 5 of the printed circuit board. It is transformer coupled via T4 to provide a balanced push-pull signal at the a.l.c. stage

which consists of TR18, TR19, D15, D16 and associated components. Transistors TR18 and TR19 act as an RF amplifying stage operating in class A grounded-base mode. Diodes D15 and D16 provide control of the stage by shunting a part of the drive current, thus reducing the output of the TR18, TR19 stage, in accordance with an input signal from TR7 (see para.33).

NOTE: Two versions of the board are available, version DC604137/A which has a normal a.l.c. discharge time and version DC604137/B which has a long discharge time. The differences between the two versions are given on Fig.13.

29. The RF output from the a.l.c. stage is transformer coupled (via T3) to the following amplifier stage comprising TR17 and TR21 which also operates in a grounded base, push-pull class A condition.

30. T2 couples the signal to the emitters of the final stage of the Low Level Board comprising TR15 and TR16 in parallel, operating push-pull class A, with TR20 and TR22 in parallel.

31. T1 combines the outputs from TR15, TR16 and TR20, TR22 and feeds the signal at between 1W to 2W to pins 2 and 3 of the board.

Automatic Level Control (a.l.c.) Detectors (On Low Level Board)

32. The forward d.c. voltage derived from the VSWR Board is fed to pin 11. R1 is the 'set forward power' control which determines the threshold level at which the a.l.c. holds the output power under normal conditions. This voltage is amplified by TR1 and is gated via D1 into the a.l.c. switching circuits.

33. The d.c. voltage derived from the reflected power monitor on the VSWR Board is amplified by TR3 and is combined with a fixed fraction of the forward power (via TR2) at the parallel collectors. The output signal, whose level is adjusted by R6, controls the level at which the a.l.c. will respond to a reflected power signal caused by a load mismatch. This output is gated to the a.l.c. switching circuits via D2. These circuits provide current gain via TR6, TR7 and TR24 (where fitted) and a reference level determined by R29, D20 in conjunction with TR9, TR11 and TR25 (where fitted) and associated components.

34. The attack time is approximately 200-500uS and the discharge time is determined by C3 discharging through R18. When TR24 and TR25 are fitted and R18 = 1Mohm this approximates to 1 second. Normally, however, the discharge time without TR24 or TR25 and R18 = 100K is approximately 50 milliseconds.

Muting Circuit (On Low Level Board)

35. The external muting signal is applied to pin 12 (0V muted, +12V normal). With +12V applied, TR10 and TR12 are switched on, thereby supplying +20V to the TR17/TR18 amplifier stage. TR13 is also conducting, supplying a positive bias voltage to the final amplifying stage. Under muted conditions transistors TR8, TR10, TR12 and TR13 are cut off thereby applying muting to both the penultimate and final stages.

36. On the standard version (DC604137/A) of the amplifier, when muting occurs the gain of the a.l.c. stage is increased to maximum by the action of D13 and R52 which reduce the voltage on C3. On the DC604137/B version this effect of increased gain of the a.l.c. stage is reduced by D14 and R54 which reduce the voltage on C12. However, since the action of D13 and R52 is still present the module will operate at maximum gain, after a short delay, on de-muting.

37. TR8 and associated diodes, resistors etc., form an input noise immunity circuit. Diodes D11 and D12 provide temperature compensation for TR13 to maintain a stable bias voltage.

High Level Board PS315 — Fig.15

38. The RF input signal from the Low Level Board is connected to pin 4 which feeds four transformers whose primary windings are connected in parallel via T6, T7, T9 and T10. The secondary winding of T6 and T7 each feed a group of three paralleled resistors and all 6 feed the emitter of TR5. T9 and T10 are similarly connected to drive the emitter of TR6 but are wired in antiphase to T6 and T7. The resultant effect is therefore to drive TR5 and TR6 in push-pull. TR5 and TR6 form the driver stage and operate in grounded base Class B mode. T8 is the driver output push-pull transformer, and it drives T1/T2 and T4/T5 in push-pull, and also T11/T12 and T14/T15 in push-pull. Transformers T4, T5, T11 and T12 are therefore all connected in parallel. Similarly T1, T2, T14 and T15 are also connected in parallel, both groups operating in push-pull.

39. All eight transformers are 2:1 step-down auto-transformers driving the base of each of the eight P.A. transistors. The eight transistors are connected as four parallel pairs, operating in push-pull, each stage being a grounded emitter class B amplifier. TR1 and TR2 are in parallel giving an output via T3 in push-pull with TR3 and TR4 which are in parallel. Similarly TR7 and TR8 are in parallel giving an output via T13 in push-pull with TR9 and TR10 which are also connected in parallel. The outputs of T3 and T13 are connected together (external to the board) to provide the output of the module.

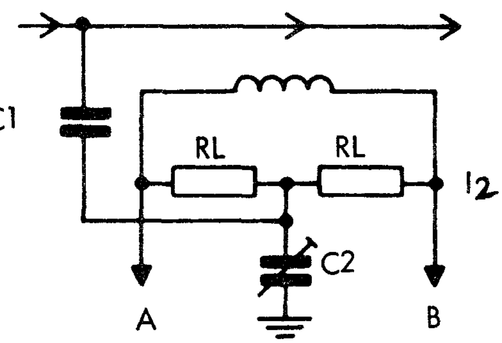
40. RF feedback is applied from the collectors of each pair of output transistors via a 470 ohm resistor to the collectors of the appropriate driver transistors.

V.S.W.R. Board PS316 — Fig.17

41. Two RF inputs are fed into the VSWR Board. The first is derived from the reflectometer toroid T2 and is portional to the RF output line current, and the second is fed from C3 (Fig.21) which is proportional to the RF output line voltage.

Principles of Operation

42. A simplified circuit of the VSWR Board is shown below to illustrate the principle of operation.



43. The secondary induced voltage in the feeder toroid causes a current to flow I2 which is equal to $\frac{j\Omega M I1}{2RL+j\Omega L2}$ where I1 is the primary current, M is the toroid mutual inductance, 2RL is the total secondary load resistance and L2 is secondary inductance of the toroid, Ω is the angular frequency in radians.

44. If $2RL << j\Omega L2$ at the lowest frequency then $L2 = \frac{MI}{L2}$ which is independent of frequency. The output voltage developed across each secondary resistor is then I2RL and they are 180° out of phase.

45. The RF voltage divided down by C1 and C2 is applied between the resistor junction point and earth, and adjusted by C2 so that, with the matched line condition, the voltage across C2 is equal in amplitude to the voltage across each resistor. This voltage Vc is also not frequency conscious since $Vc = \frac{V_1 C_1}{C_1+C_2}$ and is in phase with the voltage across one RL and out of phase with the other. The result is that under matched conditions at terminal A the voltage ($Vc + I_2RL$) appears (the forward power output) and at terminal B the voltage ($Vc - I_2RL$) = 0 appears (reflected power output).

46. Under mismatched conditions such that a short circuit appears on the feeder, then Vc is zero and the forward and reflected outputs are equal. Similarly with an open circuit on the line, the voltages appearing across the two resistors from the toroid are zero, and again the forward and reflected outputs are equal.

47. It can be shown that intermediate mismatched impedance produces some output from the reflected port, but that the forward output remains constant for a given linear amplifier output power.

48. R1 and R2 form the resistor loads and C3 and C5, in parallel, produce the required capacitive voltage. The outputs are coupled via C2 and C7, then rectified by voltage doubler circuits (D1, D2, C1 and D5, D6, C8). C9 and R5 boost the low frequency

power response of the module, by effectively reducing the d.c. level at the forward output at the low frequency end (i.e. below approximately 5MHz). This means that more power is required from the RF amplifier module to reach the same a.l.c. threshold voltage.

Protection Board PS251 Fig. 19

49. The Protection Board has two main functions.

(1) It monitors the module positive supply voltage and if this exceeds a safe operating level, a pulse is generated to fire a thyristor (mounted on the RF power module chassis) which in turn trips the stabiliser or if this has failed blows an associated fuse FS1.

(2) It also monitors the DC current taken by each group of four output transistors and operates the a.l.c. line if this exceeds a predetermined level.

50. The +30V supply is monitored on pin 1 and connected via a chain of Zener diodes, and a potentiometer R1 to the base of TR1. R1 provides an adjustable reference voltage for the operation of the long-tailed pair comprising TR1 and TR2. The output from TR1 is amplified by TR3, the operating voltage of which is determined by R10 and R13. When transistor TR3 conducts, a voltage is generated which operates the thyristor gate, SCR1, via pin 8.

51. The d.c. current overload inputs are fed to pins 3 and 4; as either or both these levels increase, transistors TR4 and TR5 will start to conduct and cause TR6 and TR1, connected as emitter followers, to conduct and provide a d.c. output to the a.l.c. circuit via pin 5 of the p.c.b. Diode D7 maintains C3 in a charged state so that TR6 will switch on quickly. The Zener diode D5 limits the maximum voltage to approximately 12.5 volts to prevent possible damage to the transistors in the a.l.c. stage on the Low Level Board.

COMBINING UNIT MS126 Fig. 23

52. The Combining Unit is a completely passive unit which combines the 125W outputs from the RF Power Modules to produce the 500W output.

Power Combining

53. The operation of the Combining Unit is best described by considering just one combining operation. Thereafter all subsequent combining sequences are essentially the same, apart from variations of actual impedance and power level. The principle however, applies at each stage.

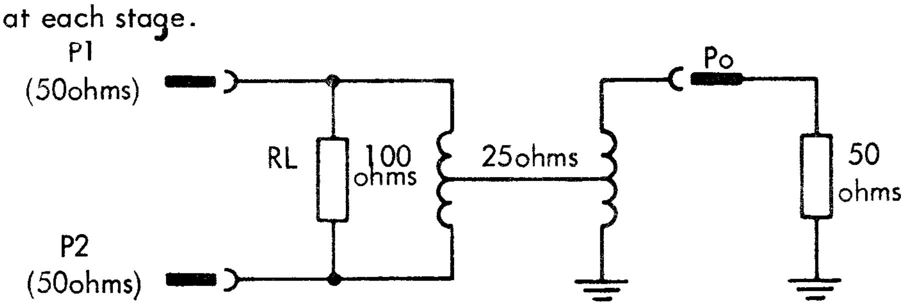


Fig. (a)

54. Fig.(a) shows a simple combining circuit with a 50 ohm input and 50 ohm output impedance. The features of this network are as follows:-

If P1 and P2 are equal and in phase then Po = P1 + P2 and there is zero power dissipated in RL.

If P1 = 0 then $Po = \frac{P2}{2}$

i.e. -6dB reduction on original Po with both inputs present. In this case $\frac{P2}{2}$ is also dissipated in RL. If P1 and P2 are 180° out of phase, zero power appears at the output and P1 + P2 is dissipated in RL.

55. Although for maximum power output P1 and P2 should ideally be matched exactly in amplitude and phase, fairly large differences can be tolerated within the extremes quoted above before a significant reduction in output power occurs. For example, a 10% difference in amplitude results in a power output reduction of approximately 0.2% while a phase difference of 10° only results in a power output reduction of 0.75% of the total input Power P1 + P2.

Isolation

56. The second basic property of the combining network is that it provides isolation between the two inputs. This means that any impedance change at either input does not affect the input impedance presented to the other generator.

57. How this isolation is achieved is illustrated by considering the equivalent circuit of the two extremes i.e. open circuit and short circuit as well as the normal 50 ohm condition.

58. Fig. (b) shows the 50 ohm input case. Since there is no voltage, i.e. output and input volts are the same and no power dissipation i.e. power output equals the power at A + the power at B, the output impedance must equal half the impedance at A or B. Therefore the impedance at the hybrid transformer output is 25 ohm for the two inputs to be 50 ohm.

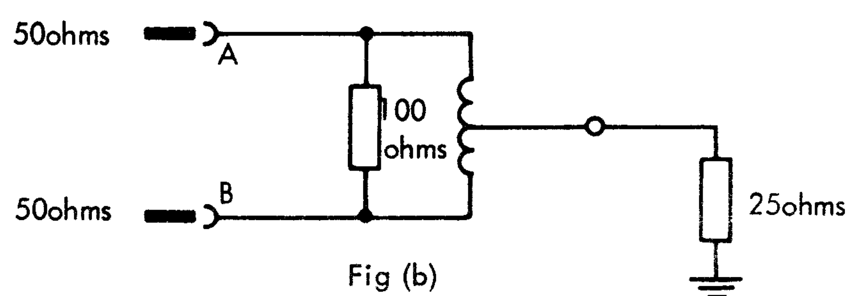


Fig (b)

59. Fig. (c) shows the equivalent circuit for a short circuit at input B. The 50 ohm impedance at the hybrid output is transformed up to 100 ohm at input A, in parallel with RL giving a resultant input impedance of 50 ohm (i.e. as normal).

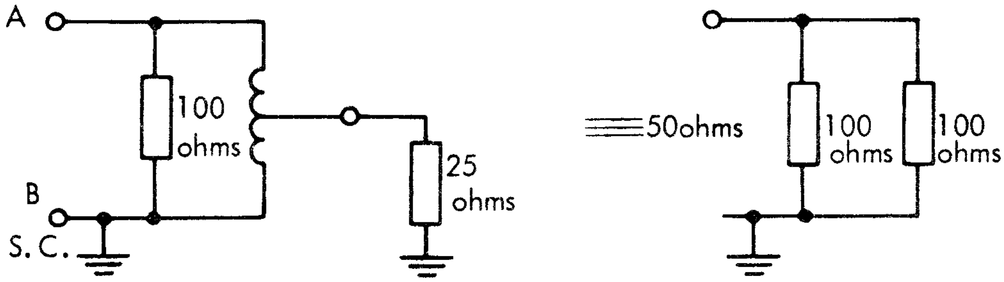


Fig.(c)

60. Fig. (d) shows the equivalent circuit for an open circuit at input B. The 100 ohm impedance of RL is transformed to 25 ohm in series with the existing 25 ohm load impedance giving a resultant impedance of 50 ohm at input A (i.e. as normal). It can be shown that input A will always be 50 ohm for miscellaneous impedances appearing at input B.

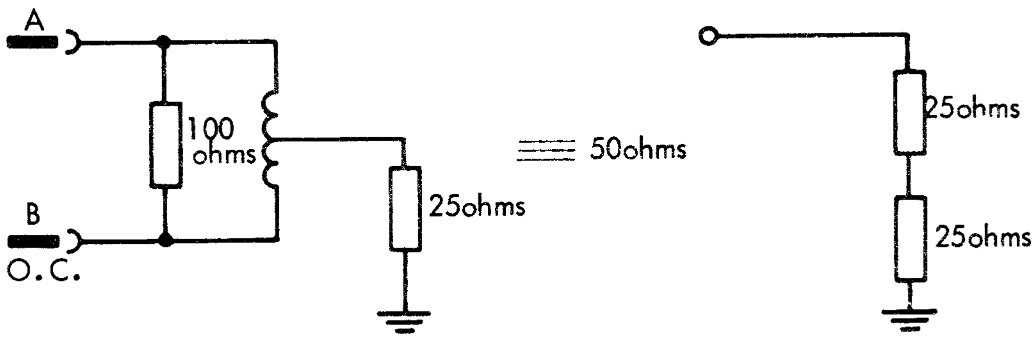


Fig. (d)

Design Features

61. In order to meet the theoretical performance outlined in the preceeding paragraphs it is necessary to provide balancing coils in series with each ballast resistor to ensure optimum isolation and input impedance matching over the full frequency range. This offsets the effects of transformer leakage inductance and circuit stray capacitance which would otherwise cause an inferior performance.

WARNING

THE SETTING OF THESE ADJUSTABLE INDUCTORS (BALANCING COILS) IS CRITICAL AND THEY ARE ACCURATELY SET UP BEFORE DESPATCH FROM THE FACTORY. ANY FURTHER ADJUSTMENT SHOULD NOT BE NECESSARY BUT IF ADJUSTMENT IS NECESSARY THE PROCEDURE GIVEN IN CHAPTER 7 PARA. 14 MUST BE FOLLOWED.

Power Dissipation

62. As described previously, if power from one or more modules is lost then an unbalanced situation is created in the combining unit which results in power dissipation within the combining unit, as well as a reduction of output power. Fig. 5.1 shows the approximate output power against numbers of inoperative modules - the white sections show the power dissipated internally and the shaded columns indicate the actual output power.

NOTE: The conditions given in Fig.5.1 are 'worst case'. With two modules operational the linear amplifier can be 'patched' to give 250W output (refer to Chap.2, para.7).

63. The combining unit is rated to withstand the maximum dissipated power (i.e. 125W) continuously. A warning signal is however signalled showing that power is being lost in the combining unit. This is sensed by a current transformer in each input ballast resistor line. This RF unbalanced signal is rectified and fed to the Overload Unit MS443 where it is available to operate an external circuit which will indicate that the TA.1813 is operating on reduced power. It is only a warning indication and does not trip the amplifier, as there is no risk of damage whilst continuing to operate in this condition.

64. The four RF inputs from the RF modules are fed into hybrid transformers in pairs. Inputs 1 and 2 are fed to opposite ends of T3 and T5 in parallel. Inputs 3 and 4 are connected to opposite ends of T4 and T6 in parallel.

65. Also connected in parallel with T3 and T5 is ballast resistor R3 in series with a current monitoring transformer T1 and an inductor L1. L1 operates in conjunction with C3 and is adjusted for maximum isolation and optimum input impedance matching. The output of T1 is detected by R1 and D1 and fed to PL1 pins 5 and 6, then to the Overload Unit, to provide an RF unbalance signal. The remaining input circuit is similar to that described.

66. The outputs from T3, T5 and T4, T6 are fed to a further hybrid transformer stage T11 via T7 and T8 which provides a 50 ohm output. R5 and R6 are connected in parallel across the primary of T11, forming the ballast load in series with L3, which improves isolation. Two 250W outputs can, if required, be taken from SK5 and SK6.

67. The output from T11 is at at an impedance of 25 ohm and is 'stepped up' to 50 ohm by T12. This is then fed to SK7 via T13 current monitoring transformer. C5 is included to improve the isolation of the two 250W inputs. T13 is a current transformer for output monitoring.

AUTOMATIC LEVEL CONTROL AND PROTECTION

68. The overall Automatic Level Control (a.l.c.) protection aspect of the TA.1813 Linear Amplifier is an important and basic feature of the design, both for normal operation and for protection under abnormal conditions.

69. Protection of the transistorized RF Power Modules is vital for the overall reliability of the equipment and in many instances the protection circuits operate via the a.l.c. stages of the module so that the two are closely interdependent.

70. The details of the actual a.l.c. stage have been described in paras. 32 to 34. It is this stage which is controlled under various overload conditions as well as for normal operation.

71. The following inputs are connected to the a.l.c. and, on exceeding the pre-set threshold level, will determine the operating gain and hence the output level of the RF Power Module.

(1)	Forward Power	-	normal operation into 50 ohm.
(2)	Reflected Power	-	operates the a.l.c. if mismatch at the outputs of the module is worse than approximately 2:1 VSWR.
(3)	Transistor Collector RF Voltage (Swingometer)	-	Operates the a.l.c. if the voltages exceeds a pre-determined level (normally approximately 25V peak).
(4)	DC current	-	Operates the a.l.c. if the mean d.c. current, when driven, exceeds 15 Amps approximately.

72. The levels at which the forward and reflected power take over control of the a.l.c. are adjustable but should only be set up in accordance with the instructions laid down in Chapter 7. In the case of the collector RF voltage and DC current detectors these are pre-determined by the design values of components and cannot be varied. The attack and decay times of the respective inputs are listed in para. 34 with the exception of d.c. current which is approximately 10μ seconds.

73. In addition to the previously mentioned a.l.c. protection circuits, additional protection is included as follows:-

(1) A thermostat to detect overheating of each module.

(2) A 'latching' current trip circuit for each Stabiliser Unit.

(3) A high rupturing capacity fuse for each module for protection against a stabilizer short circuit.

(4) A magnetic circuit-breaker for AC supply input overload protection to each power unit.

(5) Two fuses for low mains current consumption.

74. Together these overload circuits provide an extremely high degree of overall protection.

POWER SUPPLIES

Power Supplies Unit Type MS64 — Fig.25

75. Each Power Supply Unit Type MS64 is a self-contained d.c. power supply providing smoothed unregulated d.c. outputs from a single phase a.c. supply.

76. Two outputs are provided:-

(1) +36V at 30 amps

(2) +42V at 100 milliamps.

Each incorporates a bridge rectifier, from two separate transformer windings. The +36V rail has a choke input filter, while the +42V supply employs a capacitor input filter. Under no load conditions, however, the +36V supply behaves like a capacitor input filter and the no load voltage rises to approximately 60V. The associated units are adequately rated to withstand this.

77. A plug-in mains selector is provided on each MS64, to provide simple adjustment on installation.

Stabilizer Unit Type MS440 Fig.27

78. The stabilizer Unit Type MS440 provides a stabilized +30V and +20V supply to the RF Amplifier Type MM320. It is fed from the main power supply unit Type MS64 which provides a smoothed nominal 36V, at full load, to each stabilizer.

79. In addition the Stabilizer unit provides current metering facilities for the +30V supply to each RF Amplifier Assembly. A fast acting current overload trip circuit is also included. The latter is reset by removing the d.c. input. All power dissipating components e.g. power transistors and resistors are mounted directly on the finned casting. The low level circuitry is included on a printed circuit board, PS313.

Output Ratings

80. The maximum current ratings of the two supply lines are:-

(1) +30V at 15 amps

(2) +20V at 2 amps.

81. The normal 36V DC input to the Stabilizer Unit from the MS64 power unit is connected to pins 12, 13, 14, 15 and 16 in parallel (positive) and pins 4, 5, 6, 7 and 8 in parallel (0V); pin 3 is a separate earth.

82. A second d.c. input at 42V is required to feed 4TR2 and 4TR5. This is also fed from the MS64 power units. The maximum current consumption, from the 42V supply, is 50mA. The +30V and +20V stabilised outputs appear on TS1 pins 2 and 3 respectively.

83. The stabiliser itself comprises three separate circuits as follows:-

(1) +30V Stabilizer

(2) +20V Stabilizer and

(3) DC Overload/Trip Circuit.

+30V Stabilizer

84. The main d.c. input is fed to TR1 and TR4 connected in parallel. These are the main series stabilizing transistors. They are controlled by a feedback system comprising 4TR5, 4TR2 and 4TR3. Transistor 4TR5 is the comparator stage while 4TR2 and 4TR3 provide current amplification for the feedback loop. The emitter of 4TR5 is held at 5.6V by 4AD3 while the base voltage is derived from the stabilised +30V rail via an adjustable resistor 4A R10. This control determines the setting of the +30V output level.

85. The overall stabilizer loop functions as follows. As the volts tend to rise, due to a reduction of load current, TR5 base voltage will also rise, causing 4TR5 to conduct more, which in turn causes 4TR2, 4TR3 and TR1 and 4TR4 to conduct less. This gives a greater voltage drop across 4TR1 and 4TR4, thereby reducing the output voltage and opposing the initial change of output level. The circuit is therefore self compensating, and with the high loop gain involved relatively large input voltage variations have no effect on the output voltage.

+20V Stabilizer

86. This follows the +30V stabilizer and has 4TR7 as the main series stabilizer, with 4TR6 as an amplifier and 4TR4 as the reference detector stage. The output level is set by R16. In principle it functions exactly as the +30V stabilizer.

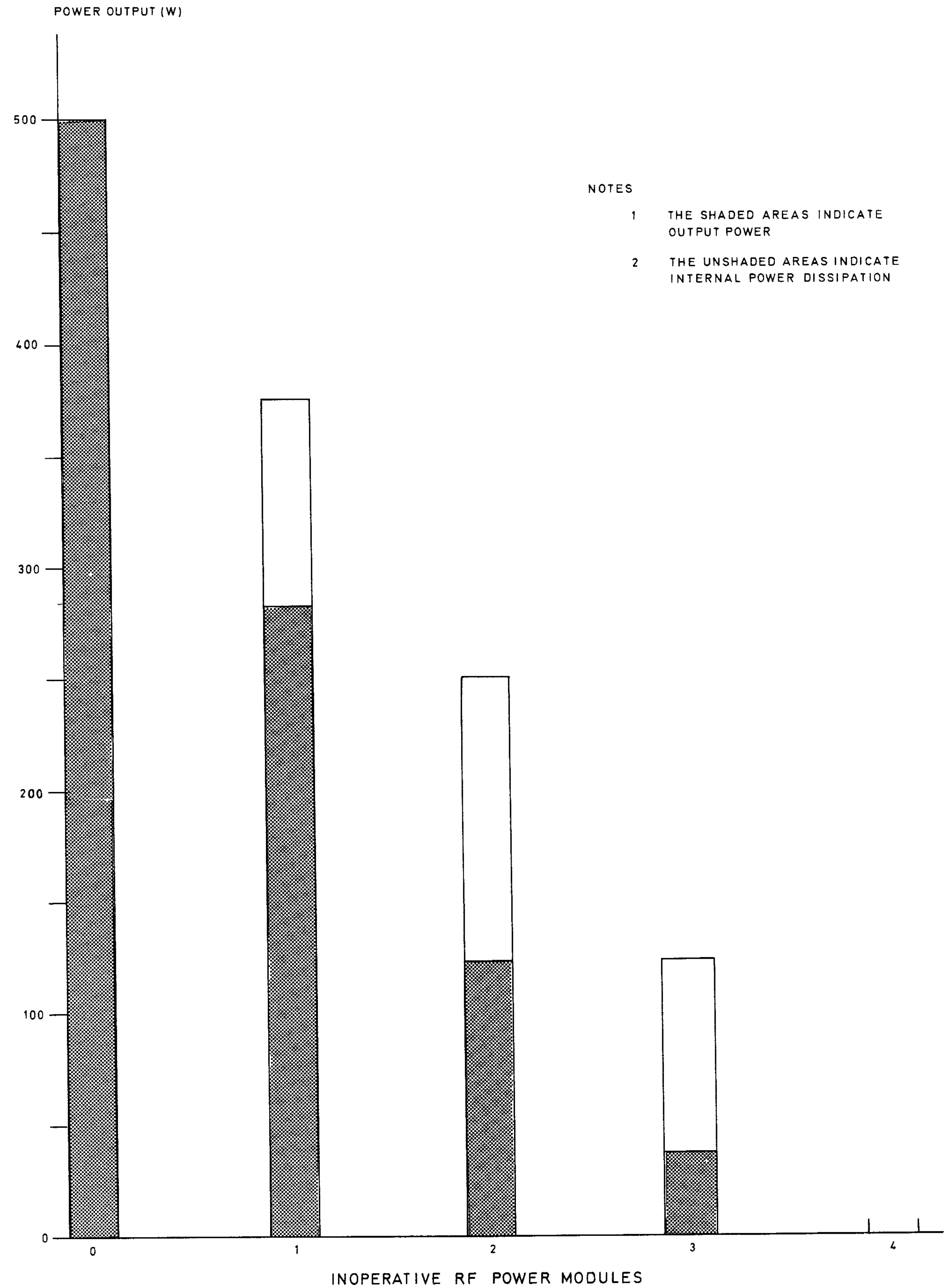
D.C. Trip Circuit

87. As the d.c. load current increases the voltage drop across 4R1 increases. This increases the voltage appearing across the base of 4ATR1 - which is adjustable via 4AR3. Under normal conditions this voltage is insufficient to cause 4ATR1 to conduct so that 4ATR2 is also non-conducting. The collector voltage of 4ATR2 is high and therefore isolated from the main +30V stabilizing feedback loop, i.e. base of 4TR2, by 4AD2.

88. A similar trip circuit for the +20V supply is provided by 4ATR3, the trip voltage being developed across R9 and applied to Board pins 9 and 10. Transistor 4ATR3 is coupled to 4ATR1 via diode 4AD1.

89. The voltage level at which 4ATR3 starts to conduct is determined by the Vbe of 4ATR3 i.e. 0.6V. Under normal operating conditions this voltage is less than 0.6V and again 4ATR2 is non-conducting.

90. In the event of either 4ATR1 or 4ATR3 switching on however, caused by an overload current in either the main input or the +20V stabilizer input, then 4ATR2 will switch on, causing the main +30V stabilizer transistors to be switched off. Positive feedback between 4ATR2 and 4ATR1 then causes them to 'latch' on, so that the main stabilizing transistors are held non-conducting until the unit is reset by interrupting the d.c. supply in, by unplugging and re-inserting the RF Power Module or by operation of the appropriate circuit breaker on the front panel of the Power Supply Unit.



Ratio: Approximate Output / Inoperative Modules

Fig.5.1

WOH 4083

CHAPTER 6

ROUTINE MAINTENANCE, DISMANTLING AND REASSEMBLY

ROUTINE MAINTENANCE

1. Routine maintenance requirements on the TA.1813 amplifier are minimal, as only the following items need be checked at regular intervals.

Centrifugal Type Blowers

2. The two air blowers fitted above the power units embody bearings which are 'sealed for life'. No regular maintenance action is, therefore, required.

'Woods' Type Air Blower

3. A Woods type air blower is fitted at the top rear of the cabinet. After a considerable period of use, or after some 12 months storage under tropical conditions without use, it may be found that the oil has migrated from the grease in the bearings of this blower. As a result the blower will start to overheat, and will ultimately seize up and fail.

4. To obviate this failure the blower should be overhauled and the bearings replaced at routine intervals. This could be immediately before putting into service if storage as above has occurred, or after 1 to 5 years operation dependent upon environment and duty cycle.

5. A spare set of bearings, packed for tropical storage, can be obtained from Racal (Part No. BA44126). The bearings are Ransome Hoffman Pollard type 106P V2 and the grease is SHELL ALVANIA RA. Bearing replacement should be carried out as follows:

(1) Disconnect the mains supply to the unit and render the unit safe.

(2) Disconnect the mains leads to the blower and remove the blower from the unit.

(3) Using a 4 B.A. open-jaw spanner, slacken off the hexagon headed screw retaining the impeller. Remove the impeller and clean off any dust. Remove any dust from the fan housing.

(4) Using a 6 B.A. box spanner, remove the two nuts securing the two through-bolts. Withdraw the through-bolts.

(5) Remove the rear bearing housing.

(6) Remove the rotor with its two bearings. If the rotor and bearings show signs of gross over-heating (due to a stalled blower left on for a considerable time) the blower should be scrapped. A certain amount of discolouring will not, however, be harmful.

(7) Remove the bearings using a bearing puller, taking care to avoid damaging the shaft. Scrap the bearings.

(8) If the shaft is scored or damaged, restore polish with very fine emery. The new bearings should be a neat fit, not requiring excess force to fit them, but the shaft must not slip in the inner race.

(9) Fit the replacement bearings, non-shielded faces outwards avoiding pressure on the outer race. If SHELL ALVANIA RA grease is available it may be added to the two bearing housing after cleaning. This will increase the life of the blower by acting as a reservoir. Excess grease will cause pressure in the bearing, which will result in over-heating and failure.

(10) Check the field windings for overheating, continuity and insulation to frame. Clean off any dust.

(11) Refit the rotor with bearings and bearing housings. Secure with two through-bolts.

(12) Re-fit the impeller, ensuring that the screw seats in the dimple in the shaft.

(13) Before re-fitting the blower, connect to the mains supply and check for correct operation.

(14) Return the blower to the unit and reconnect all leads.

Air Filter

6. This should be washed at appropriate intervals in water with a detergent.

NOTE: Ensure filter is completely dried before replacing in cabinet.

Contactor Contacts

7. It is recommended that the contacts on the main switching contactor be examined every six months, and replaced if significant deterioration is observed.

DISMANTLING AND REASSEMBLY

8. Modular construction is used throughout and access to all sub-units and cabinet connectors is via the front of the cabinet.

Power Supply Unit MS64

9. The Power Supply Units Type MS64 are mounted in the base of the TA.1813 cabinet.

CAUTION: When the cabinet is not fixed to the floor care should be taken in withdrawing power units to avoid the danger of the cabinet toppling.

Removal

10. (1) Switch off the circuit breaker appropriate to the power supply unit to be removed.

(2) Undo the quick-release screws holding the Power Supply Unit front panel and remove the panel.

(3) If power is not fully isolated, use a meter to re-check that mains is not present on the unit to be removed.

(4) Remove the cable clip from the front of the power unit, and remove six cables (see Chap.3, para.10).

(5) Remove two screws and slide out the power unit and its mounting tray.

(6) Repeat for other power unit if required.

Replacement

11. Replacement of a power supply is effected by reversing the procedure described in para.6(1) to 6(6), but reference should be made to Chap.3, para.10.

Splitter Unit, Distribution Amplifier, Overload Unit and Muting Unit

12. The Splitter Unit, Distribution Amplifier, Overload Unit and Muting Unit are mounted on a pair of hinged angle members which are located above the power supplies. The cover to each unit is secured by four slotted screws whilst the units are secured to the hinged angles by Pozidriv screws. The angle members and units can be swung out on hinges for access to blowers by removing two screws from the left hand side of the angles.

13. To gain access to the Muting Unit, which is mounted behind the Splitter Unit, proceed as follows:-

(1) Isolate the cabinet from the mains supply.

(2) Remove the power supplies panel and control panel.

(3) Hinge forward the angle members as described in para.12.

Circuit Breakers

14. The circuit breaker assemblies and contactor are mounted on the control panel, which can be unplugged after four screws have been removed.

Air Blowers

15. Two air blowers are located immediately above the power supplies. The control panel should be removed to give access to the fixings on the blower plate.

Removal

16. (1) Isolate the cabinet from the mains supply.

(2) Remove the power supplies panel and control panel.

(3) Hinge forward the angle members as described in para.12.

(4) Slide the power supply units forward to their fullest extent.

(5) Disconnect the cables at the blower terminals.

(6) Use a 3/8" box spanner through the access holes, provided by removing the control panel, to undo the 4 blower plate captive fixings.

(7) Lower the blower and remove it from the cabinet.

Replacement

17. (1) Replacement of an air blower is effected by reversing the procedures described in para.16.

(2) Before attempting to tighten the 4 blower plate captive fixings, locate the blower in position and ensure that fan outlet is correctly located within the air duct.

Meter Panel

18. The Meter Panel is located above the RF Power Modules and houses two meters and the VSWR Warning PCB.

Removal

19. (1) Remove cabinet connector mating with the Meter Panel Plug (11PL1).

(2) Remove the 4 screws securing the hinges and remove the Meter Panel from the cabinet.

(3) To obtain access to the meters and the VSWR Warning PCB remove the 5 fixing screws (3 front and 2 rear) and remove the cover.

NOTE: Access to the VSWR Warning PCB may be gained without removing the meter panel.

Replacement

20. To replace the Meter Panel reverse the procedures detailed in para.19.

Combining Unit

21. The unit or units located above the Combining Unit must be removed to give reasonable access to the rear fixings.

Removal

22. (1) Remove the MA.1004 FMU (see appropriate handbook).

(2) Remove top cover from combining unit.

(3) Disconnect the four RF connectors and the multi-way connector from the rear of the unit.

(4) Disconnect the RF connector from the front of the unit.

(5) Remove the two fixing screws from the rear edge of the unit.

(6) Loosen the two quick-release fasteners at each side of the unit.

(7) Lift one side of the unit and ease it out from the cabinet through the gap immediately above, taking care not to foul cables.

Replacement

23. Replacement of the Combining Unit is effected by reversing the procedures detailed in paras.22(1) to 22(7).

RF Power Modules

24. The RF Power Modules are removed by undoing the 2 quick release screws and sliding the module forward from the cabinet. When replacing a module ensure that it is properly located in the guide channel.

RF Power Module MM420

25. To separate the Stabilizer Module from the RF Power Module proceed as follows:

(1) Slacken the 4 fixing screws on tag strip TS1 and remove the fanning strip.

(2) Remove the fixing nuts and washers on both RF connectors (5PL1 and 5PL2) on the rear panel noting carefully the order in which the washers are removed.

(3) Remove both Pozidriv screws connecting the top plate of the MM440 Module to MM320 Module.

(4) Slacken off the two nuts and bolts connecting the mating edges of the heat sink.

(5) Remove the Stabilizer Module by pulling it in the direction of the heat sink.

High Level Board and Protection Board

26. To obtain access to the High Level Board proceed as follows:

(1) Place the complete module assembly on a bench with the front panel of the module to the right and the heat sink on the bench.

(2) Remove the fixing nut on plug 5PL2 on the rear panel noting carefully the order in which the washers are removed.

(3) Remove both Pozidriv screws fixing the Low Level plate to the pillar nuts.

(4) Remove 2 nuts and bolts connecting the Low Level plate to the front panel.

(5) The Low Level plate may now be hinged away to give access to the High Level Board.

CAUTION: If it is required to operate the module in this condition care must be taken to ensure that the Low Level plate does not short the live points.

WARNING:
THE P.A. TRANSISTORS AND THEIR ASSOCIATED INSULATING WASHERS CONTAIN BERYLLIUM OXIDE, THE DUST OF WHICH IS TOXIC. BEFORE HANDLING THESE DEVICES REFER TO THE SAFETY PRECAUTIONS AT THE FRONT OF THE HANDBOOK.

Method of Changing a P.A. Transistor

27. (1) Remove the fixings on the Low Level Board sub-assembly (including its mounting plate) so that it can be hinged up and over to gain access to the High Level Board (refer to para. 26). Unsolder the pins of the relevant

transistor, and then place the module in its normal upright position with access to both sides of the transistor.

(2) Undo the nuts on the stud end with a box spanner. To do this and prevent rotation of the transistor it will be necessary to hold a broad screw driver blade against one side of the hexagonal shaped transistor body through the appropriate hole on the High Level Board.

(3) When refitting a new transistor use new insulating washers (Racal Part No. 920916) if necessary and cover both sides of the washer with 'Thermaflow' thermal past Type A30/J (Jermyn Industries) before assembly. Reverse the procedure detailed in (1) and (2) for reassembly.

NOTE: It is important 'Thermaflow' or other high conductivity paste is used in preference to silicone grease to ensure adquate thermal conductivity.

Access to Stabilizer Heat Sink

28. Remove the Stabilizer (refer to para.25) or hinge back the Low Level plate (refer to para. 26).
Undo 2 screws fixing the top plate to the rear plate on the stabilizer. Hinge back the top plate to obtain access to the components mounted on the stabilizer heat sink.

CHAPTER 7

FAULT LOCATION & ALIGNMENT PROCEDURE

INTRODUCTION

1. A list of test equipment required for fault location and alignment procedure is given below.

TEST EQUIPMENT

2. (1) DC Power Supply +36V at 15 amps) required when not using internal
(2) DC Power Supply +40V at 100 milliamps) supplies refer to para.16.

(3) RF Power Meter (Example: Bird Thruline Model 43 with 250W head).

(4) 50 ohm, 250W Dummy Load. (Example: Bird Model 8141).

(5) Valve Voltmeter. (Example: Marconi TF1041C).

(6) Variable resistor load 3 ohm 135W rating.

(7) Variable resistor load 10 ohm 35W rating.

(8) RF Drive Source, 10mW minimum output, 2MHz - 30MHz. (Example: Racal MA.1720).

(9) Accessory Kit CA607 containing:-

(i) 1 set of Module RF and DC Connectors

(ii) Combiner Patch Lead Assembly

(iii) Extension Lead Assembly.

FAULT LOCATION PROCEDURE

3. Any fault on the TA.1813 can be very quickly located to a particular sub-unit using the front panel facilities provided.

4. Each RF module has a green lamp indicating that the DC supply is present, and a clear lamp which is illuminated when the module is radiating RF. A meter is included to show the current and voltage levels, and RF monitoring points are included at each stage to provide check facilities, using an oscilloscope or spectrum analyser. The RF input and RF output powers (both forward and reflected) are also indicated on a meter.

5. If a malfunction occurs, the following should be checked:-

(i) All module green lights are illuminated.

(ii) All module clear lights are illuminated when the amplifier is driven.

(iii) Individual module currents and voltages.

(iv) RF input power.

(v) RF output power (forward and reflected).

The sequence of checks outlined in Tables 1 and 2 will, in conjunction with the previous checks, locate the fault quickly to the Power Supplies, Stabilizer Unit, RF Modules, Combining Unit, Distribution Amplifie or Splitter Unit.

TABLE 1

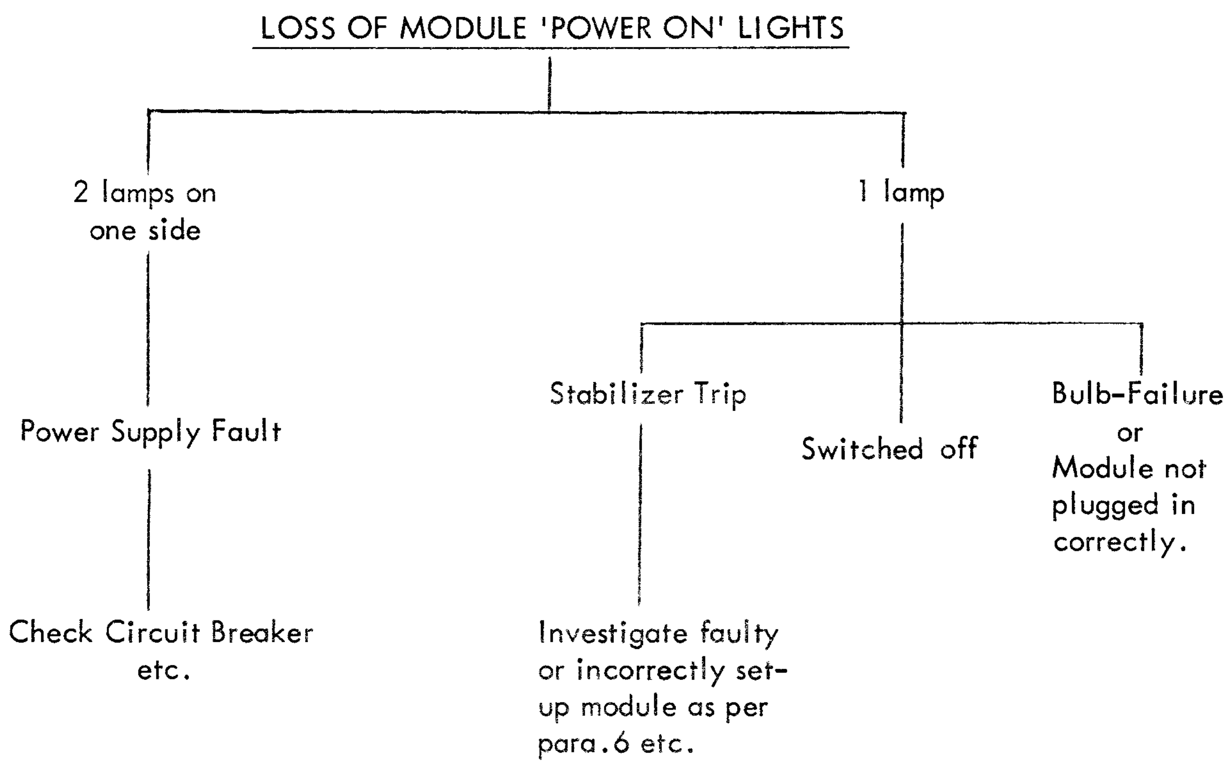
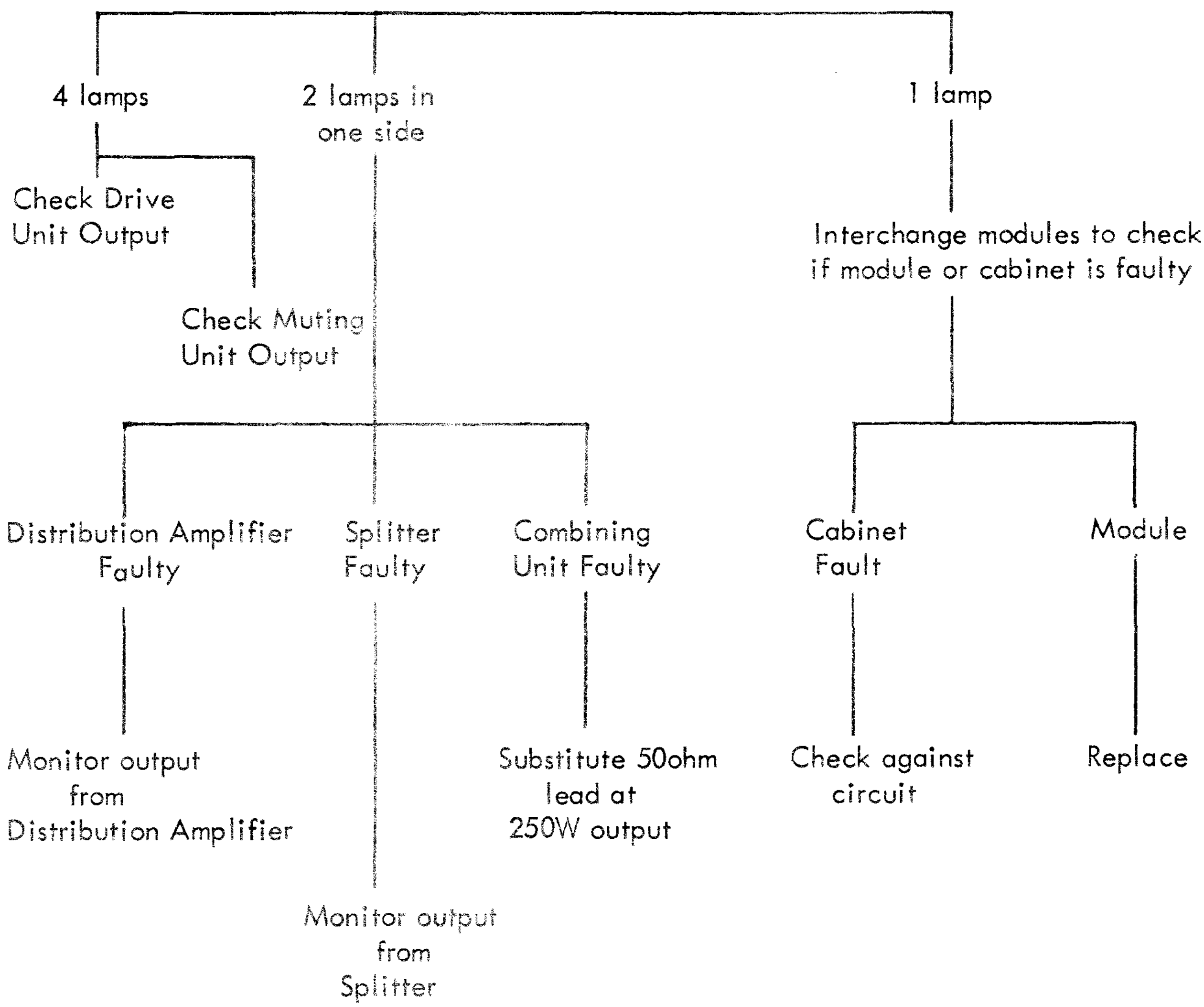


TABLE 2

LOSS OF MODULE RF OUTPUT LIGHT



Sub-Unit Fault Location

6. Fault location on sub-units is a fairly simple process; in most cases it is merely a matter of checking against the circuit diagram. The exception is the RF Amplifier Module Type MM420, and procedures for detailed circuit checking are described below.

Fault Location - RF Module MM420

7. When a faulty module has been identified it is recommended that it be replaced and subsequent fault location carried out away from the transmitter. (Refer to Chapter 7, para.16).

RF Module Checks - Without RF Drive

8. Remove module from cabinet and set switch on module to the ON position. Measure the impedance of the +30V supply input to earth, using a multimeter (Avo type). If the impedance is less than 10 ohm an abnormal condition is indicated, and the module circuits should be investigated. If the impedance appears satisfactory the setting of the Stabilizer Trip level (para.18) should be checked, followed by the module checks with RF drive (paras. 9 to 14).

RF Module Checks - With RF Drive

9. Check that the +30V supply current (to the High Level Board) is approximately 8A to 12A dependent on the drive frequency. Even if the current measured appears to be correct it is advisable to check all RF power transistors by measuring each emitter voltage (from each transistor stud to earth).

NOTE: Ensure transistor stud is not earthed or the transistor may be destroyed. The eight output transistors should be equal within 0.1V. Typical voltages are approximately 0.6V but are slightly dependent on the drive level and frequency applied.

10. If zero voltage or a significantly low voltage exists, the appropriate transistor should be changed using the procedure described in Chap.6 Para.26.

11. If a discrepancy of more than 0.1V exists, then checks on RF drive levels to the transistor must be made, following logically the RF signal path as given in the circuit diagram. Typical causes could be bias voltage errors or circuit dry joints.

12. Measurements of RF gain on both the Low Level Board and overall module are sometimes necessary to locate a low gain stage. When checked at 10MHz below the A.L.C. operating level the input signal for a 100W output should be between 250mV and 400mV injected at the module input socket.

13. With the Low Level Board terminated in a 50 ohm 2W non-inductive resistor, and isolated from the High Level Board, its output should be 2W for an input signal of not more than 10mW, injected at the module input socket.

14. When the low gain stage is located, detailed DC measurements on individual components will enable easy identification of the fault.

ALIGNMENT PROCEDURES

Adjustments to RF Module MM420

15. Following repair work and/or component replacement, it is necessary to carry out the complete adjustment procedure (paras. 17 to 23) on the RF Module, to ensure that all operating and protection levels are correct. Unless the procedure is correctly carried out the RF module may not be performing to its specification and may suffer further malfunction if not adequately protected due to incorrect settings. In addition it may periodically be necessary to carry out a routine check of the module performance. In such cases, the following procedure should be carried out.

16. For the purpose of setting-up and re-aligning, the module may be operated completely separately from the main amplifier using items (1), (2), (4) and the Module D.C. Connectors (part of Accessory Kit CA607 - item (9)) of the test equipment listed in para.1. Alternatively the MM420 can be operated out of the transmitter cabinet by using the Extension Lead Assembly (part of Accessory Kit CA607) to connect to the TA.1813 supplies. If the second procedure is used, the TA.1813 should be operated as two separate 250W units and the second module associated with the one under test should be switched off.

NOTE: Since the module is operated outside the cabinet it will not be forced air cooled, therefore it is recommended that it is not operated for more than 20 minutes at full power. If, however, this time is greatly exceeded the module thermostat will operate to avoid overheating.

Setting-up the Stabilizer Output Volts

17. Check the nominal 30V supply at tags 2 and 1 of TS1. Adjust 4AR10 on the Stabilizer Unit to set this voltage to 30.5 volts. Check the nominal 20V supply at tags 3 and 1 of TS1. Adjust 4AR16 on the Stabilizer Unit to set this voltage to 20 volts.

Setting-up the Stabilizer Trip Level

18. Switch off the module and disconnect it from the supply. Set 4AR3 on the Stabilizer fully anti-clockwise and connect an external load resistor (item (6) of the test equipment) between tag 1 and tag 2 of TS1 without disconnecting the Stabilizer from the module. Reconnect the module to the supply and switch on the supply, adjust the load resistor for a reading of 18.5 to 19 amp, indicated on an ammeter connected in series with the +36V supply, or for a reading of 16.5 to 17 amp. on the front panel meter of the TA.1813 (switched to the appropriate module). Slowly adjust 4AR3 clockwise until the stabilizer trip circuit operates. Remove external load resistor.

19. The trip circuit for the +20V supply is pre-set on manufacture. To check the action of the trip circuit, switch off the module and disconnect it from the supply. Connect an external load resistor (item (7) of the test equipment) in series with an ammeter (set to read 5A FSD) between tags 1 and 3 of TS1 . Reconnect the module to the supply and switch on the supply. Increase the load current by adjusting the external load resistor and note that the trip circuit operates between 3 and 3.5 amps.

NOTE: The current must not be adjusted to exceed 4 amps.

Setting-up Module Over Voltage - Low Level Trip

NOTE: Before applying RF to the module the supply voltage must be set to 30.5V by adjustment of 4AR10.

20. Monitor the nominal 30V supply between Tags 2 and 1 on TS1, and adjust 4AR10 to increase the output voltage. Check that the over voltage trip operates between 32.5 and 33.5 volts. This adjustment should be carried out with the module undriven. In no circumstances should the output voltage be increased above 34 volts. If the trip does not operate at the specified levels, slowly adjust 5CR1 on the protection board until it does so.

Setting-up the V.S.W.R. Detectors

21. Before setting-up the Reflected and Forward Power Levels the VSWR detectors on each individual RF Module should be balanced. Connect the RF output socket of the module to a 50 ohm load.

NOTE: It is important that a true 50 ohm resistive load is used.

Apply an RF signal at 10MHz to the module, switch on the module and increase the level of drive signal until the module is delivering 100W into the load. Connect a multimeter (set to read d.c. volts) between pin 10 on the Low Level PCB and earth. Adjust 5DC3 on the VSWR PCB (through the access hole in the cover) for a minimum reading on the multimeter, this should be between 0.4 and 0.6V.

NOTE: The cover of the VSWR PCB must always be in position when the module is operating.

Setting-up Reflected Power Level

22. Set 5AR6 on the Low Level Board (PS351) fully clockwise. Disconnect the RF output socket 5PL2 and apply an RF input signal of 10MHz at a level of 2mW. Check that the DC current does not exceed 3 amps. if measured on the front panel meter, or 5 amps.if measured on an ammeter connected in series with the 36V supply. If these values are exceeded a fault condition exists and must be corrected before proceeding further.

23. Apply a short circuit at the RF output connector, increase the RF drive level to approximately 10mW and adjust 5AR6 to obtain a reading of 6.5 amp. on the front panel meter or 8.5 amp. on an ammeter connected in series with the 36V supply. Remove the short circuit and re-connect the RF output load.

NOTE: It is important that the short circuit is applied at the RF output connector 5PL2 and not at an earlier point in the output circuit.

Setting-up the Forward Power Level

24. Set the drive signal to 18MHz at a level of 10mW. Set the module output power to 135 watts (into a 50 ohm dummy load) by adjusting 5AR1 on the module Low Level Board. Check that as the frequency is raised from 1.6 to 30MHz (at 10mW input) the output does not exceed 150W or drop below 120W.

Setting-up and Adjustment of V.S.W.R. Unit MS447

25. This unit should be set up with the TA.1813 operating into a 50 ohm dummy load at full power. With the reflected power meter selected, observe the indicator. If this exceeds 25 watts, (and the load is 50 ohm) then the VSWR unit is unbalanced. Adjust C3 for a null at an operating frequency of 10MHz. If the null cannot be reduced to 25W or below switch off and remove the unit. Carry out detailed d.c. measurements against the circuit diagram to check diodes, resistors etc.

Setting-up the Meter Panel

26. After setting-up the VSWR Unit MS447 (and with the RF output still connected to a dummy load) the transmitter output power should be measured on a power meter. With switch 11SA (located in the meter panel) set to NORMAL, the meter panel potentiometer 11AR1 should be adjusted to give the same power indication on the upper scale of the front panel meter (with meter switch set to FORWARD POWER) as that measured on the RF power meter. Switch off a number of modules until the forward power indication on the meter drops to below 250 watts. Set switch 11SA to CALIBRATE and the meter panel switch to REFLECTED POWER, adjust 11AR2 on the meter panel to obtain the same reading on the lower scale of the meter as the forward power reading on the upper scale.

27. If the VSWR warning indication is being used, this can now be set up by adjusting the indicated reflected power to the required warning level by switching off modules or adjusting the drive level and adjusting 11R12 until the warning signal is just given. Set switch 11SA back to NORMAL.

Setting-up and Adjustment of the Combining Unit MS126

28. As described in Chapter 5, all adjustments to the Combining Unit are carefully set up in the factory prior to dispatch; re-alignment is not normally necessary. Only in the very rare occurrence of a transformer requiring to be replaced should this unit need to be re-set. The procedure requires the use of specialized equipment such as Rhode and Schwarz Polyscop. Using such an equipment adjustment of the relevant coils should be made to achieve a compromise of matched input impedance and isolation over the frequency range.

ORDERS FOR SPARE PARTS

In order to expedite handling of spare part orders please quote:-

(1) Type and serial number of equipment.

(2) Circuit reference, description, Racal part number, and manufacturer of part required.

(3) Quantity required.

NOTE: If the equipment is designed on a modular basis, please include the type and description of the module for which the replacement part is required.

CHAPTER 8

COMPONENTS LIST

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
		CABINET ASSEMBLY				
Resistors (ohm)						
1R1	Not Used					
1R2	Not Used					
1R3	Not Used					
1R4	Not Used					
1R5	51	Metal Oxide		5	907490	Electrosil TR5
Capacitors (uF)						
1C1	4		440V	10	Supplied with 1BL1&1BL2	'Motor Run' Capacitors Ltd.
1C2	4		440V	10		
1C3	22	Electrolytic	100V	-10 +50	922186	Erie
1C4	22	Electrolytic	100V	-10 +50	922186	Erie
Diodes						
1D1		1N4002			911460	Texas
1D2		1N4002			911460	Texas
Relays						
1RLA	Not Used					
1RLB	Not Used					
1RLC	Not Used					
1RLD		Remote co-axial (26V d.c.)			921770	Dowkey Series 60
1RLE		Remote co-axial (26V d.c.)			921770	Dowkey Series 60
1RLF		Remote co-axial (26V d.c.)			921770	Dowkey Series 60
1RLG		Remote co-axial (26V d.c.)			921770	Dowkey Series 60
Blowers						
1BL1		Centrifugal			BD603418	Racal
1BL2		Centrifugal			BD603418	Racal
1BL3		6" dia. Axial			CD31502	Racal

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

CABINET ASSEMBLY (Continued)

Connectors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
1PL1		Coaxial 50 ohm			905031	Transradio BN7/5
1PL2		Coaxial 50 ohm			905031	Transradio BN7/5
1PL3		Coaxial 50 ohm			905031	Transradio BN7/5
1PL4		Coaxial 50 ohm			905031	Transradio BN7/5
1PL5	Not Used					
1PL6	Not Used					
1PL7	Not Used					
1PL8	Not Used					
1PL9		Coaxial 50 ohm			905031	Transradio BN7/5
1PL10	Not Used					
1PL11		Coaxial 50 ohm			905031	Transradio BN7/5
1PL12	Not Used					
1PL13		Coaxial 50 ohm			905031	Transradio BN7/5
1PL14	Not Used					
1PL15		Coaxial 50 ohm			905031	Transradio BN7/5
1PL16	Not Used					
1PL17		Coaxial 50 ohm			922179	Transradio C7/5
1PL18		Coaxial 50 ohm			922179	Transradio C7/5
1PL19		Coaxial 50 ohm			901716	Transradio C1/5
1PL20		Coaxial 50 ohm			901716	Transradio C1/5
1PL21		Coaxial 50 ohm			901716	Transradio C1/5
1PL22		Coaxial 50 ohm			901716	Transradio C1/5
1PL23		Coaxial 50 ohm			922179	Transradio C7/5
1PL24		Coaxial 50 ohm			922179	Transradio C7/5
1PL25		Coaxial 50 ohm			922179	Transradio C7/5
1PL26		Coaxial 50 ohm			922179	Transradio C7/5
1PL27		Coaxial 50 ohm			905031	Transradio BN7/5
1PL28		Coaxial 50 ohm			900038	Transradio BN1/5
1SK1		15-way 'D'			900905	Cannon DA15S
1SK2		25-way Pattern 102			921506	Belling Lee L1328/5/AG
1SK3		15-way 'D'			900905	Cannon DA15S
1SK4		25-way 'D'			915970	Cannon DB25S
1SK5		16-way			920178	Amphenol 26-190-16

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

CABINET ASSEMBLY (Continued)

Connectors (contd)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
1SK6		16-way			920178	Amphenol 26-190-16
1SK7		16-way			920178	Amphenol 26-190-16
1SK8		16-way			920178	Amphenol 26-190-16
1SK9	Not Used					
1SK10	Not Used					
1SK11	Not Used					
1SK12	Not Used					
1SK13		Coaxial 50 ohm			912050	Radiall R15000
1SK14		Coaxial 50 ohm			912050	Radiall R15000
1SK15		Coaxial 50 ohm			912050	Radiall R15000
1SK16		Coaxial 50 ohm			912050	Radiall R15000
1SK17		Coaxial 50 ohm			912050	Radiall R15000
1SK18		Coaxial 50 ohm			912050	Radiall R15000
1SK19		Coaxial 50 ohm			912050	Radiall R15000
1SK20		Coaxial 50 ohm			912050	Radiall R15000
1SK21 to 1SK28	Not Used					
1SK29		Coaxial 50 ohm			908387	Transradio BN5/5A
1SK30		50-way 'D'			900574	Cannon DD50S
1SK31		9-way 'D'			918090	Cannon DE9S
1SK32		Coaxial 50 ohm			912258	Transradio BN2/5B
1SK33		Coaxial 50 ohm			918394	Transradio BN2/5A
1LK1		Adaptor Plug coaxial 50 ohm			922215	Transradio C8/5
1LK2		Adaptor Plug coaxial 50 ohm			922215	Transradio C8/5
1LK3		Adaptor Socket coaxial 50 ohm			922214	Transradio C3/5A
1LK4		Adaptor Plug coaxial 50 ohms			922215	Transradio C8/5
1LK5		Adaptor Plug coaxial 50 ohms			922215	Transradio C8/5

Terminals

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
1TB1		6-way 40A			922932	Klippon MK6/6
1TB2	Not Used					
1TB3	Not Used					
1TB4		4-way 36A			917678	Klippon, KS4D
1TB5		4-way 36A			917678	Klippon, KS4D

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

CABINET ASSEMBLY (Continued)

Terminals (contd.)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
1TB6		6-way 25A			922379	Klippon, MK3/6
1TB7		12-way 25A 110V			922181	Klippon, MK2L/12
1TB8		12-way 25A 110V			922181	Klippon, MK2L/12
1TB9		12-way 25A 110V			921768	Klippon, MK2/12
1TB10 to 1TB15	Not Used					
1TB16		12-way 25A 110V			921768	Klippon, MK2/12

SPLITTER UNIT MS444 (and P.C. Board PS318)

Resistors (ohm)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
7R1	390	Metal Oxide		5	908472	Electrosil TR4
7R2	150	Metal Oxide		5	909121	Electrosil TR4
7R3	1.2k	Metal Oxide		5	908285	Electrosil TR4
7R4	39	Metal Oxide		5	917062	Electrosil TR4
7R5	18	Metal Oxide		5	916626	Electrosil TR4
7R6	150	Metal Oxide		5	909121	Electrosil TR4
7R7	1.2k	Metal Oxide		5	908285	Electrosil TR4
7R8	390	Metal Oxide		5	908472	Electrosil TR4
7R9	51	Metal Oxide		5	917056	Electrosil TR4
7R10	51	Metal Oxide		5	917056	Electrosil TR4
7R11	1.5k	Metal Oxide		5	908296	Electrosil TR4
7R12	2.2k	Pre-set Linear			920518	Plessey, MPWT
7R13	82	Metal Oxide		5	908290	Electrosil TR4

Capacitors (uF)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
7C1	.01	Fixed	25V	+50 -25	911845	Erie, 831/T/25V
7C2	10	Electrolytic	16V	-10 +50	900068	Mullard, C426AR/E10

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

SPLITTER UNIT (Continued)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
Transistors						
7TR1		BC107			911929	Mullard
Diodes						
7D1		1N4149			914898	S.T.C.
7D2		1N4002			911460	Texas
7D3		1N4002			911460	Texas
Connectors						
7PL1		15-way			909729	Cannon DA15P
7PL2		Coaxial 50 ohm			905031	Transradio BN7/5
7PL3		Coaxial 50 ohm			905031	Transradio BN7/5
7SK1		Coaxial 50 ohm			908387	Transradio BN5/5A

DISTRIBUTION AMPLIFIER MS240 (and P.C. Board PS319)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
Resistors (ohm)						
8R1	470	Wirewound	$2\frac{1}{2}$W	5	913612	Welwyn W21
8R2	47	Metal Oxide		5	911930	Electrosil TR4
8R3	10	Metal Oxide		5	912868	Electrosil TR4
8R4	27	Metal Oxide		5	908473	Electrosil TR4
8R5	10	Metal Oxide		5	912868	Electrosil TR4
8R6	27	Metal Oxide		5	908473	Electrosil TR4
8R7	10	Metal Oxide		5	912868	Electrosil TR4
8R8	27	Metal Oxide		5	908473	Electrosil TR4
8R9	10	Metal Oxide		5	912868	Electrosil TR4
8R10	27	Metal Oxide		5	908473	Electrosil TR4
8R11	22	Wirewound	$2\frac{1}{2}$W	5	913580	Welwyn W21
Capacitors (uF)						
8C1	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C2	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C3	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C4	27p	Fixed	500V	5	919483	Erie 831/N750
8C5	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100

Cct Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
		DISTRIBUTION AMPLIFIER (Continued)				
Capacitors (contd.)						
8C6	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C7	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C8	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C9	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C10	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C11	27p	Fixed	500V	5	919483	Erie 831/N750
8C12	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C13	0.1	Fixed	100V	20	914173	STC PMC2R/0.1/M100
8C14	0.1	Fixed	100V	20	914173	STC PMC2R/01./M100
Transistors						
8TR1		2N3553			916730	
8TR2		2N3553			916730	
8TR3		2N3553			916730	
8TR4		2N3553			916730	
Diodes						
8D1		1N4149			914898	STC
8D2		BZY88C 9V1			914899	Mullard
8D3		1N4149			914898	STC
8D4		BZY88C 9V1			914899	Mullard
8D5		1N4149			914898	STC
8D6		BZY88C 9V1			914899	Mullard
8D7		1N4149			914898	STC
8D8		BZY88C 9V1			914899	Mullard
8D9		1N4002			911460	Texas
8D10		1N4002			911460	Texas
8D11		1N4002			911460	Texas
8D12		1N4002			911460	Texas
Transformers						
8T1					CT603608	Racal
8T2					CT603607	Racal
8T3					CT603608	Racal
8T4					CT603607	Racal
8T5					CT603608	Racal

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

DISTRIBUTION AMPLIFIER (Continued)

Transformers (contd.)

8T6					CT603607	Racal
8T7					CT603607	Racal
8T8					CT603608	Racal

Connectors

8PL1		Connector 15-way			909729	Cannon DA15P
8SK1		Connector 50Ω			908387	BN5/5A
8SK2		Connector 50Ω			908387	BN5/5A
8SK3		Connector 50Ω			908387	BN5/5A
8SK4		Connector 50Ω			908387	BN5/5A
8SK5		Connector 50Ω			908387	BN5/5A
8SK6		Connector 50Ω			908387	BN5/5A

OVERLOAD UNIT MS443 (and P.C. Board PS322)

Resistors (ohm)

R1	560	Wirewound	$2\frac{1}{2}$W	5	913614	Welwyn W21
R2	560	Wirewound	$2\frac{1}{2}$W	5	913614	Welwyn W21
R3	4.7k	Metal Oxide		5	906022	Electrosil TR5
R4	4.7k	Metal Oxide		5	906022	Electrosil TR5
R5	4.7k	Metal Oxide		5	906022	Electrosil TR5
R6	4.7k	Metal Oxide		5	906022	Electrosil TR5
R7	470	Metal Oxide		5	900992	Electrosil TR4
R8	470	Metal Oxide		5	900992	Electrosil TR4
R9	470	Metal Oxide		5	900992	Electrosil TR4
R10	470	Metal Oxide		5	900992	Electrosil TR4
R11	4.7k	Metal Oxide		5	906022	Electrosil TR5
R12	1k	Metal Oxide		5	919805	Electrosil TR4
R13	1k	Metal Oxide		5	919805	Electrosil TR4
R14	1k	Metal Oxide		5	919805	Electrosil TR4
R15	10k	Metal Oxide		5	900986	Electrosil TR4
R16	4.7k	Metal Oxide		5	906022	Electrosil TR5
R17	270	Metal Oxide		5	908284	Electrosil TR4
R18	1k	Metal Oxide		5	919805	Electrosil TR4
R19	8.2k	Metal Oxide		5	900986	Electrosil TR4
R20	1.5k	Metal Oxide		5	908285	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

OVERLOAD UNIT (Continued)

Resistors (ohm) (contd.)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
R21	10k	Metal Oxide		5	900986	Electrosil TR4
R22	10k	Metal Oxide		5	900986	Electrosil TR4
R23	1k	Metal Oxide		5	919805	Electrosil TR4
R24	1k	Metal Oxide		5	919805	Electrosil TR4
R25	10k	Metal Oxide		5	900986	Electrosil TR4
R26	10k	Metal Oxide		5	900986	Electrosil TR4
R27	47k	Metal Oxide		5	908391	Electrosil TR4
R28	2.2k	Metal Oxide		5	906020	Electrosil TR5
R29	4.7k	Metal Oxide		5	900989	Electrosil TR4
R30	4.7k	Metal Oxide		5	900989	Electrosil TR4
R31	4.7k	Metal Oxide		5	900989	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	4.7k	Metal Oxide		5	906022	Electrosil TR5
R36	4.7k	Metal Oxide		5	900989	Electrosil TR4

Capacitors (uF)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
C1	0.1	Fixed	100V	20	914173	ITT, PMC2R
C2	0.1	Fixed	100V	20	914173	ITT, PMC2R
C3	0.1	Fixed	100V	20	914173	ITT, PMC2R
C4	0.1	Fixed	100V	20	914173	ITT, PMC2R
C5	0.1	Fixed	100V	20	914173	ITT, PMC2R
C6	0.1	Fixed	100V	20	914173	ITT, PMC2R
C7	0.1	Fixed	100V	20	914173	ITT, PMC2R
C8	0.1	Fixed	100V	20	914173	ITT, PMC2R
C9	20	Electrolytic	25V	-10 +50	921354	Mullard C428AR/F20
C10	.01	Fixed	100V	20	914171	ITT, PMC2R
C11	0.1	Fixed	100V	20	914173	ITT, PMC2R
C12	0.1	Fixed	100V	20	914173	ITT, PMC2R
C13	0.1	Fixed	100V	20	914173	ITT, PMC2R

Diodes

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
D1		BZY88C18			915920	Mullard
D2		BZY88C18			915920	Mullard
D3		BZY88C18			915920	Mullard
D4		BZY88C18			915920	Mullard
D5		1N4149			914898	STC

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

OVERLOAD UNIT (Continued)

Diodes (contd.)

D6		BZY88C6V8			914064	Mullard
D7		BZY88C6V8			914064	Mullard
D8		BZY88C5V6			912747	Mullard
D9		1N4149			914898	STC
D10		BZY88C12			914310	Mullard
D11		1N4149			914898	STC

Transistors

TR1		BC107			911929	Mullard
TR2		BC107			911929	Mullard
TR3		BC107			911929	Mullard
TR4		BC107			911929	Mullard
TR5		BC107			911929	Mullard
TR6		BC107			911929	Mullard
TR7		BC107			911929	Mullard
TR8		BC107			911929	Mullard
TR9		BC107			911929	Mullard
TR10		BC107			911929	Mullard
TR11		BC107			911929	Mullard
TR12		BC107			911929	Mullard
TR13		BC107			911929	Mullard

Connectors

PL1		25-way			916489	Cannon DB25P

CABINET V.S.W.R. UNIT MS447 (and P.C. Board PS317)

Resistors (ohm)

R1	22	Metal Oxide		5	922070	Electrosil TR8
R2	22	Metal Oxide		5	922070	Electrosil TR8
R3	22	Metal Oxide		5	922070	Electrosil TR8
R4	22	Metal Oxide		5	922070	Electrosil TR8

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
		CABINET VSWR UNIT (Continued)				
Capacitors (uF)						
C1	2pF	Ceramic Disc		0.5pF	920558	Plessey Type 10
C2	0.1	Fixed	100V	20	914173	ITT, PMC2R
C3	4-60pF	Dielectric Trimmer	200V		916940	Mullard, 809-07011
C4	150pF	Fixed			902238	Lemco, MS199/M
C5	0.1	Fixed	100V	20	914173	ITT, PMC2R
C6	0.1	Fixed	100V	20	914173	ITT, PMC2R
C7	0.1	Fixed	100V	20	914173	ITT, PMC2R
C8	1000pF	Feed-through		20	907011	Erie 361K2600
C9	1000pF	Feed-through		20	907011	Erie 361K2600
Diodes						
D1		1N4149			914898	Mullard
D2		1N4149			914898	Mullard
D3		1N4149			914898	Mullard
D4		1N4149			914898	Mullard
Inductors						
L1		Coil Assembly			BT603391	Racal
Connectors						
SK1					917555	Transradio C4/5CH
SK2					917555	Transradio C4/5CH
		METER PANEL MS445				
Switches						
SA					BSW603464	Racal
SB					BSW603463	Racal
SC					BSW603463	Racal
Meters						
ME1					AD603409	Racal
ME2					AD603410	Racal
Connectors						
PL1		50-way			900577	Cannon DD50P

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

METER PANEL (Continued)

Resistors (ohm)

R1	220k	Metal Oxide		2	921771	Electrosil TR4
R2	220k	Metal Oxide		2	921771	Electrosil TR4
R3	10k	Metal Oxide		2	914042	Electrosil TR4
R4	180k	Metal Oxide		2	920644	Electrosil TR4
R5	180k	Metal Oxide		2	920644	Electrosil TR4
R6	10k	Metal Oxide		2	914042	Electrosil TR4

VSWR WARNING P.C.Board PS446

Resistors (ohm)

R1	22k	Pre-set linear			919816	Plessey MPWT Dealer
R2	22k	Pre-set Linear			919816	Plessey MPWT Dealer
R3	2.2k	Metal Oxide		5	908270	Electrosil TR4
R4	1k	Metal Oxide		5	908267	Electrosil TR4
R5	22k	Metal Oxide		5	908269	Electrosil TR4
R6	27k	MetalOxide		5	908295	Electrosil TR4
R7	27k	Metal Oxide		5	908295	Electrosil TR4
R8	4.7k	Metal Oxide		5	900989	Electrosil TR4
R9	470	Metal Oxide		5	900992	Electrosil TR4
R10	4.7k	Metal Oxide		5	900989	Electrosil TR4
R11	10k	Metal Oxide		5	900986	Electrosil TR4
R12	4.7k	Pre-set linear		20	921023	Plessey MPWT Dealer
R13	22k	Metal Oxide		5	908269	Electrosil TR4
R14	10k	Metal Oxide		5	900986	Electrosil TR4
R15	1k	Metal Oxide		5	908267	Electrosil TR4

Capacitors (uF)

C1	0.1	Fixed	100V	20	914173	STC, PMC2R
C2	0.1	Fixed	100V	20	914173	STC, PMC2R
C3	0.1	Fixed	100V	20	914173	STC, PMC2R

Transistors

TR1		BC107			911929	Mullard
TR2		BC107			911929	Mullard
TR3		BC107			911929	Mullard
TR4		BCY71			911928	Mullard

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
		VSWR WARNING P.C.Board (Continued)				
Inductors						
L1	10uH				921609	Painton 58/10/0011/10
Switches						
S1		2-position, c/o			915644	EMI T15014/001

RF POWER MODULE - MM420 CHASSIS

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
Resistors (ohms)						
5R1	0.1	Fixed		5	920183	CGS HSA5
5R2	0.1	Fixed		5	920183	CGS HSA5
5R3	1k	Metal Oxide		5	906031	Electrosil TR5
5R4	220	Metal Oxide		5	906544	Electrosil TR5
Capacitors (uF)						
5C1	0.1	Fixed	100V	20	914173	ITT, PMC2R
5C2	47	Tantalum	35V	20	917478	STC, LWA/403/KA
5C3	6.8pF	Disc Ceramic	500V	0.5pF	919457	Erie 831/NPO
5C4	18pF	Ceramic	750V	5	902017	Erie P100B
Diodes						
5D1		1N4002			911460	Texas
Transformers						
5T1		RF Mon. Toroid			BT603397	Racal
5T2		VSWR Toroid			BT603391	Racal
Inductors						
5L1		Ferrite Core			919244	Neosid, F14
5L2		Choke			900760	Painton, C4
Connectors						
5PL1		Coaxial			912192	Radiall R15510
5PL2		Coaxial			912192	Radiall R15510
5SK3		Coaxial			905449	Transradio BN5/5B

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

RF POWER MODULE (Continued)

Miscellaneous

5CSR1		Thyristor, 12RCM10			920129	Int. Rectifiers
5THE1		Thermostat			AD602957	Racal
5RLA		Relay 26.5V			921683	Clare Elliott, G24
5PL1		Lamp 28V, 0.04A			918756	Guest, 727T
5PL2		Lamp, 28V, 0.04A			918756	Guest, 727T
5FS1		Fuse, 17A (L350/16)			920921	Int. Rectifiers
5SA		Switch, DPDT			917716	NSF

LOW LEVEL BOARD PS351

Resistors (ohms)

5AR1	100k	Pre-set linear			920057	Plessey, MPWT Dealer
5AR2	4.7k	Metal Oxide		5	900989	Electrosil TR4
5AR3	4.7k	Metal Oxide		5	900989	Electrosil TR4
5AR4	100k	Metal Oxide		5	908293	Electrosil TR4
5AR5	47k	Metal Oxide		5	908391	Electrosil TR4
5AR6	10k	Variable		5	919815	Plessey MPWT Dealer
5AR7	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR8	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR9	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR10	10k	Metal Oxide		5	900986	Electrosil TR4
5AR11	100	Metal Oxide		5	908276	Electrosil TR4
5AR12	10k	Metal Oxide		5	900986	Electrosil TR4
5AR13	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR14	47k	Metal Oxide		5	908391	Electrosil TR4
5AR15	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR16	27k	Metal Oxide		5	908295	Electrosil TR4
5AR17	18k	Metal Oxide		5	908272	Electrosil TR4
5AR18*	100k	Metal Oxide		5	907866	Electrosil TR5
5AR18**	1M	Metal Oxide		5	914036	Electrosil TR4
5AR19	47	Wirewound		5	913588	Welwyn W21
5AR20	1k	Metal Oxide		5	908267	Electrosil TR4

* Used on Version DC604137/A Board only.

** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

LOW LEVEL BOARD (Continued)

Resistors (ohms) (contd.)

5AR21	47k	Metal Oxide		5	908391	Electrosil TR4
5AR22	470	Metal Oxide		5	906019	Electrosil TR5
5AR23	1k	Metal Oxide		5	908267	Electrosil TR4
5AR24	4.7k	Metal Oxide		5	900989	Electrosil TR4
5AR25	220	Metal Oxide		5	900988	Electrosil TR4
5AR26	47	Metal Oxide		5	911930	Electrosil TR4
5AR27	1k	Metal Oxide		5	908267	Electrosil TR4
5AR28	1k	MetalOxide		5	908267	Electrosil TR4
5AR29	2.2k	Metal Oxide		5	908270	Electrosil TR4
5AR30	Not Used					
5AR31	820	Metal Oxide		5	906024	Electrosil TR5
5AR32	56	Metal Oxide		5	908289	Electrosil TR4
5AR33	1k	Metal Oxide		5	908267	Electrosil TR4
5AR34	330	Wirewound	2½W	5	913608	Welwyn W21
5AR35	27	Metal Oxide		5	908473	Electrosil TR4
5AR36	Not Used					
5AR37	10	Metal Oxide		5	912868	Electrosil TR4
5AR38	22	Metal Oxide		5	911495	Electrosil TR4
5AR39	100	Metal Oxide		5	913962	Electrosil TR6
5AR40	10	Metal Oxide		5	912868	Electrosil TR4
5AR41	10	Metal Oxide		5	912868	Electrosil TR4
5AR42	10	Metal Oxide		5	912868	Electrosil TR4
5AR43	10	Metal Oxide		5	912868	Electrosil TR4
5AR44	100	Metal Oxide		5	913962	Electrosil TR6
5AR45	10	Metal Oxide		5	912868	Electrosil TR4
5AR46	22	Metal Oxide		5	911495	Electrosil TR4
5AR47	Not Used					
5AR48*	10	Metal Oxide		5	908471	Electrosil TR5
5AR48**	27	Metal Oxide		5	906341	Electrosil TR5
5AR49**	270	Metal Oxide		5	908143	Electrosil TR5
5AR50*	10	Metal Oxide		5	908471	Electrosil TR5
5AR50**	27	Metal Oxide		5	906341	Electrosil TR5

* Used on Version DC604137/A Board only.
** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

LOW LEVEL BOARD (Continued)

Resistors (ohms) (contd.)

5AR51**	270	Metal Oxide		5	908143	Electrosil TR5
5AR52	4.7k	Metal Oxide		5	900989	Electrosil TR4
5AR53	33k	Metal Oxide		5	908291	Electrosil TR4
5AR54**	1k	Metal Oxide		5	908267	Electrosil TR4

Capacitors (uF)

5AC1	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC2	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC3	100	Electrolytic	20V	20	913970	ITT, TAA
5AC4	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC5	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC6	1000pF	Fixed		20	915243	Erie 831K2600
5AC7	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC8	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC9	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC10	100	Electrolytic	20V	20	913970	ITT, TAA
5AC11	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC12*	10	Electrolytic		20	905399	ITT, TAA B/10/M20
5AC13	Not Used					
5AC14	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC15	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC16	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC17	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC18	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC19	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC20	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC21	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC22	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC23	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC24	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC25	0.1	Fixed	100V	20	914173	ITT, PMC2R

* Used on Version DC604137/A Board only.

** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

LOW LEVEL BOARD (Continued)

Capacitors (uF) (contd.)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5AC26	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC27	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC28	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC29	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC30	0.01	Fixed	25V	+50 -25	911845	Erie, 831/T
5AC31	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC32	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC33	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC34	Not Used					
5AC35	Not Used					
5AC36	Not Used					
5AC37	470pF	Fixed		10	914325	Erie H1-K AD
5AC38	470pF	Fixed		10	914325	Erie HI-K AD
5AC39	470pF	Fixed		10	914325	Erie HI-K AD
5AC40	470pF	Fixed		10	914325	Erie HI-K AD
5AC41	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC42	0.1	Fixed	100V	20	914173	ITT, PMC2R
5AC43**	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC44**	0.01	Fixed	25V	+50 -25	911845	Erie 831/T
5AC45	4.5-20pF	Variable			910061	Steatite 7S
5AC46	33pF	Disc Ceramic		5	919459	Erie 831/N750

** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

LOW LEVEL BOARD (Continued)

Transistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5ATR1		BC107			911929	Mullard
5ATR2		BC107			911929	Mullard
5ATR3		BC107			911929	Mullard
5ATR4		BCY71			911928	Mullard
5ATR5		BC107			911929	Mullard
5ATR6		BFY51			908753	Mullard
5ATR7		BFY51			908753	Mullard
5ATR8		BC107			911929	Mullard
5ATR9		BFY51			908753	Mullard
5ATR10		BCY71			911928	Mullard
5ATR11		BFY51			908753	Mullard
5ATR12		BFX29			915267	Mullard
5ATR13		BFY51			908753	Mullard
5ATR14	Not Used					
5ATR15		2N3553			916730	Mullard
5ATR16		2N3553			916730	Mullard
5ATR17		2N3553			916730	Mullard
5ATR18		2N3866			917219	Mullard
5ATR19		2N3866			917219	Mullard
5ATR20		2N3553			916730	Mullard
5ATR21		2N3553			916730	Mullard
5ATR22		2N3553			916730	Mullard
5ATR23	Not Used					
5ATR24**		BC107			911929	Mullard
5ATR25**		BC107			911929	Mullard

Diodes

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5AD1		1N4149			914898	STC
5AD2		1N4149			914898	STC
5AD3		BZY88C5V1			912059	Mullard
5AD4		BZY88C5V1			912059	Mullard
5AD5		1N4149			914898	STC

** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

LOW LEVEL BOARD (Continued)

Diodes (contd.)

5AD6		1N4149			914898	STC
5AD7		1N4149			914898	STC
5AD8		1N4149			914898	STC
5AD9		1N4149			914898	STC
5AD10*		1N4149			914898	STC
5AD11		1N4149			914898	STC
5AD12		1N4149			914898	STC
5AD13		1N4149			914898	STC
5AD14**		1N4149			914898	STC
5AD15		1N4002			911460	Texas
5AD16		1N4002			911460	Texas
5AD17 *		1N4149			914898	STC
5AD18*		1N4149			914898	STC
5AD19	Not Used					
5AD20		BZY88C10			917217	Mullard

Transformers

5AT1		Output			CT603360	Racal
5AT2		Interstage			CT603358	Racal
5AT3		Interstage			CT603358	Racal
5AT4		Input			CT603357	Racal

Miscellaneous

5AFB1		Ferrite Bead			907488	Mullard FX1242
5AFB2		Ferrite Bead			907488	Mullard FX1242
5AFB3		Ferrite Bead			907488	Mullard FX1242
5AFB4		Ferrite Bead			907488	Mullard FX1242
5AFB5		Ferrite Bead			907488	Mullard FX1242
5AFB6		Ferrite Bead			907488	Mullard FX1242

* Used on Version DC604137/A Board only.
** Used on Version DC604137/B Board only.

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

HIGH LEVEL BOARD PS315

Resistors (ohms)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BR1	180	Wirewound	$2\frac{1}{2}$W	5	913602	Welwyn W21
5BR2	47	Wirewound	9W	5	913738	Welwyn W23
5BR3	1.5	Wirewound	$2\frac{1}{2}$W	5	917139	Welwyn W21
5BR4	10	Wirewound	$2\frac{1}{2}$W	5	913571	Welwyn W21
5BR5	470	Metal Oxide		5	906019	Electrosil TR5
5BR6	1	Metal Film		2	921418	Beyschlag MBE
5BR7	1	Metal Film		2	921418	Beyschlag MBE
5BR8	100	Metal Oxide		5	907491	Electrosil TR5
5BR9	100	MetalOxide		5	907491	Electrosil TR5
5BR10	1	Metal Film		2	921418	Beyschlag MBE
5BR11	1	Metal Film		2	921418	Beyschlag MBE
5BR12	470	Metal Oxide		5	906019	Electrosil TR5
5BR13	1	Metal Film		2	921418	Beyschlag MBE
5BR14	1	Metal Film		2	921418	Beyschlag MBE
5BR15	100	Wirewound	9W	5	913746	Welwyn W23
5BR16	100	Metal Oxide		5	907491	Electrosil TR5
5BR17	100	Metal Oxide		5	907491	Electrosil TR5
5BR18	4.7	Wirewound	$2\frac{1}{2}$W	5	917145	Welwyn W21
5BR19	27	Wirewound	$2\frac{1}{2}$W	5	913582	Welwyn W21
5BR20	1	Metal Film		2	921418	Beyschlag MBE
5BR21	1	Metal Film		2	921418	Beyschlag MBE
5BR22	12	Metal Oxide		5	917782	Electrosil TR4
5BR23	12	Metal Oxide		5	917782	Electrosil TR4
5BR24	12	Metal Oxide		5	917782	Electrosil TR4
5BR25	12	Metal Oxide		5	917782	Electrosil TR4
5BR26	12	Metal Oxide		5	917782	Electrosil TR4
5BR27	12	Metal Oxide		5	917782	Electrosil TR4
5BR28	12	Metal Oxide		5	917782	Electrosil TR4
5BR29	12	Metal Oxide		5	917782	Electrosil TR4
5BR30	12	Metal Oxide		5	917782	Electrosil TR4
5BR31	12	Metal Oxide		5	917782	Electrosil TR4
5BR32	12	Metal Oxide		5	917782	Electrosil TR4
5BR33	12	Metal Oxide		5	917782	Electrosil TR4
5BR34	1	Metal Film		2	921418	Beyschlag MBE
5BR35	1	Metal Film		2	921418	Beyschlag MBE

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

HIGH LEVEL BOARD (Continued)

Resistors (contd.)

5BR36	4.7	Wirewound	$2\frac{1}{2}$W	5	917145	Welwyn W21
5BR37	27	Wirewound	$2\frac{1}{2}$W	5	913582	Welwyn W21
5BR38	100	Metal Oxide		5	907491	Electrosil TR5
5BR39	100	Metal Oxide		5	907491	Electrosil TR5
5BR40	100	Wirewound	9W	5	913746	Welwyn W23
5BR41	1	Metal Film		2	921418	Beyschlag MBE
5BR 42	1	Metal Film		2	921418	Beyschlag MBE
5BR43	470	Metal Oxide		5	906019	Electrosil TR5
5BR44	1	Metal Film		2	921418	Beyschlag MBE
5BR45	1	Metal Film		2	921418	Beyschlag MBE
5BR46	100	Metal Oxide		5	907491	Electrosil TR5
5BR47	100	Metal Oxide		5	907491	Electrosil TR5
5BR48	1	Metal Film		2	921418	Beyschlag MBE
5BR49	1	Metal Film		2	921418	Beyschlag MBE
5BR50	470	Metal Oxide		5	906019	Electrosil TR5
5BR51	47	Wirewound	9W	5	913738	Welwyn W23
5BR52	1.5	Wirewound	$2\frac{1}{2}$W	5	917139	Welwyn W21
5BR53	10	Wirewound	$2\frac{1}{2}$W	5	913571	Welwyn W21
5BR54	180	Wirewound	$2\frac{1}{2}$W	5	913602	Welwyn W21

Capacitors (uF)

5BC1	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC2	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC3	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC4	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC5	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC6	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC7	0.1	Fixed	100V	20	914173	ITT PMC2R
5CB8	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC9	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC10	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC11	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC12	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC13	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC14	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC15	1000pF	Ceramicon	500V	20	915243	Erie HI-K831

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

HIGH LEVEL BOARD (Continued)

Capacitors (uF) (contd.)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BC16	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC17	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC18	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC19	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC20	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC21	1000pF	Ceramicon	500V	20	915243	Erie HI-K831
5BC22	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC23	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC24	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC25	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC26	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC27	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC28	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC29	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC30	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC31	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC32	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC33	0.1	Fixed	100V	20	914173	ITT PMC2R
5BC34	0.1	Fixed	100V	20	914173	ITT PMC2R

Transistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BTR1		Special Racal Type				
5BTR2		Special Racal Type				
5BTR3		Special Racal Type				
5BTR4		Special Racal Type				
5BTR5		Special Racal Type				
5BTR6		Special Racal Type				
5BTR7		Special Racal Type				
5BTR8		Special Racal Type				
5BTR9		Special Racal Type				
5BTR10		Special Racal Type				

Diodes

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BD1		1N4997			920571	Motorola
5BD2		1N4997			920571	Motorola
5BD3		1N4149			914898	STC
5BD4		1N4002			911460	Texas
5BD5		1N4002			911460	Texas

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

HIGH LEVEL BOARD (Continued)

Diodes (contd.)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BD6		1N4149			914898	STC
5BD7		1N4149			914898	STC
5BD8		1N4002			911460	Texas
5BD9		1N4002			911460	Texas
5BD10		1N4149			914898	STC
5BD11		1N4997			920571	Motorola
5BD12		1N4997			920571	Motorola

Transformers

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BT1					CT603362	Racal
5BT2					CT603362	Racal
5BT3					CT603385	Racal
5BT4					CT603362	Racal
5BT5					CT603362	Racal
5BT6					CT603387	Racal
5BT7					CT603387	Racal
5BT8					DT603386	Racal
5BT9					CT603387	Racal
6BT10					CT603387	Racal
5BT11					CT603362	Racal
5BT12					CT603362	Racal
5BT13					DT603385	Racal
5BT14					CT603362	Racal
5BT15					CT603362	Racal

Miscellaneous

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
5BFB1		Ferrite Bead			907488	Mullard FX1242
5BFB2		Ferrite Bead			907488	Mullard FX1242
5BFB3		Ferrite Bead			907488	Mullard FX1242
5BFB4		Ferrite Bead			907488	Mullard FX1242

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

VSWR BOARD PS316

Resistors (ohms)

R1	22	Fixed		2	911627	Electrosil TR5
R2	22	Fixed		2	911627	Electrosil TR5
R3	10k	Metal Oxide		5	900986	Electrosil TR4
R4	22k	Metal Oxide		5	908269	Electrosil TR4
R5	2.7k	Metal Oxide		5	908294	Electrosil TR4
R6	15k	Metal Oxide		5	908280	Electrosil TR4

Capacitors (uF)

C1	0.01	Fixed	25V	+50 -20	911845	Erie 831/T
C2	0.01	Fixed	25V	+50 -20	911845	Erie 831/T
C3	4-60pF	Dielectric Trimmer	200V	+50 -25	916940	Mullard 809-07011
C4	0.01	Fixed	25V	+50 -20	911845	Erie 831/T
C5	270pF	Silver Mica	125V	2	920435	Lemco M5119MR
C6	0.1	Fixed	100V	20	914173	ITT PMC2R
C7	0.01	Fixed	25V	+50 -20	911845	Erie 831/T
C8	0.01	Fixed	25V	+50 -20	911845	Erie 831/T
C9	47pF	Fixed	500V	10	917418	Erie 831/T

Diodes

D1		1N4149			914898	STC
D2		1N4149			914898	STC
D3		1N4149			914898	STC
D4		1N4149			914898	STC
D5		1N4149			914898	STC
D6		1N4149			914898	STC

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

PROTECTION BOARD PS251

Resistors (ohms)

5CR1	1k	Pre-set Linear			919805	Plessey MPWT (Dealer)
5CR2	2.2k	Metal Oxide		5	908270	Electrosil TR4
5CR3	2.2k	Metal Oxide		5	908270	Electrosil TR4
5CR4	4.7k	Metal Oxide		5	900989	Electrosil TR4
5CR5	1k	Metal Oxide		5	908267	Electrosil TR4
5CR6	2.2k	Metal Oxide		5	908270	Electrosil TR4
5CR7	68k	Metal Oxide		5	908279	Electrosil TR4
5CR8	27k	Metal Oxide		5	908295	Electrosil TR4
5CR9	1k	Metal Oxide		5	908267	Electrosil TR4
5CR10	68	Metal Oxide		5	908278	Electrosil TR4
5CR11	220	Metal Oxide		5	900988	Electrosil TR4
5CR12	220	Metal Oxide		5	900988	Electrosil TR4
5CR13	1k	Metal Oxide		5	917265	Electrosil TR4
5CR14	100	Metal Oxide		5	908276	Electrosil TR6
5CR15	Not Used					
5CR16	680	Metal Oxide		5	908390	Electrosil TR4
5CR17	10k	Metal Oxide		5	900986	Electrosil TR4
5CR18	330	Metal Oxide		5	908268	Electrosil TR4
5CR19	6.8k	Metal Oxide		5	900987	Electrosil TR4
5CR20	100	Metal Oxide		5	908276	Electrosil TR4
5CR21	Not Used					
5CR22	27	Metal Oxide		2	911628	Electrosil TR5
5CR23	330	Metal Oxide		5	908268	Electrosil TR4
5CR24	27	Metal Oxide		2	911628	Electrosil TR5
5CR25	120k	Metal Oxide		5	908281	Electrosil TR4
5CR26	2.2k	Metal Oxide		5	908270	Electrosil TR4

Capacitors (uF)

5CC1	3300pF	Fixed	500V	25	917437	Erie 831/K7004
5CC2	0.1	Fixed	100V	20	914173	ITT PMC2R
5CC3	1	Fixed	100V	20	919311	ITT PMC2R
5CC4	0.1	Fixed	100V	20	914173	ITT PMC2R
5CC5	1000pF	Ceramicon	500V	20	915243	Erie HI-K831

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

PROTECTION BOARD (Continued)

Capacitors (uF) (contd.)

5CC6	1000pF	Ceramicon	500V	20	915243	Erie HI-K831
5CC7	0.1	Fixed	100V	20	914173	ITT PMC2R

Transistors

5CTR1		BC107			911929	Mullard
5CTR2		BC107			911929	Mullard
5CTR3		BCY71			911928	Mullard
5CTR4		BCY71			911928	Mullard
5CTR5		BCY71			911928	Mullard
5CTR6		BFY51			908753	Mullard
5CTR7		BFY51			908753	Mullard

Diodes

5CD1		BZY88C5V6			912747	Mullard
5CD2		BZY88C5V6			912747	Mullard
5CD3		BZY88C5V6			912747	Mullard
5CD4		BZY88C5V6			912747	Mullard
5CD5		BZY88C15			919797	Mullard
5CD6		1N4149			914898	STC
5CD7		1N4149			914898	STC
5CD8		1N4002			911460	Texas

STABILIZER MODULE MS440

Resistors (ohms)

4R1	0.05	Wirewound		10	920181	CGS, HSA50
4R2	100	Metal Oxide		5	908276	Electrosil TR4
4R3	100	Metal Oxide		5	908276	Electrosil TR4
4R4	680	Metal Oxide		5	908390	Electrosil TR4
4R5	0.1	Wirewound		10	920407	CGS, HSA25
4R6	0.1	Wirewound		10	920407	CGS, HSA25
4R7	0.05	Wirewound		5	921606	CGS, HSA5
4R8	0.05	Wirewound		5	921606	CGS, HSA5
4R9	0.2	Wirewound		5	920418	CGS, HSA5
4R10	2.7	Wirewound		5	920184	CGS, HSA50

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

STABILIZER MODULE (Continued)

Resistors (ohms) (contd.)

4R11	680	Metal Oxide		5	908390	Electrosil TR4
4R12	100	Metal Oxide		5	908276	Electrosil TR4
4R13	56	Metal Oxide		5	908142	Electrosil TR5

Capacitors (uF)

4C1	Not Used					
4C2	0.1	Fixed	250V	20	919807	ITT PMC2R
4C3	68	Electrolytic	63V		919121	Mullard 108-18689
4C4	0.1	Fixed	250V	20	919807	ITT PMC2R

Diodes

4D1		1N4002			911460	Texas

Transistors

4TR1		2N3055			915654	Mullard
4TR2		BSW66			917389	Mullard
4TR3		2N3055			915654	Mullard
4TR4		2N3055			915654	Mullard
4TR5		BFY51			908753	Mullard
4TR6		BFY51			908753	Mullard
4TR7		2N3055			915654	Mullard

STABILIZER P.C.B. PS313

Resistors (ohms)

4AR1	10k	Metal Oxide		5	900986	Electrosil TR4
4AR2	1k	Metal Oxide		5	908267	Electrosil TR4
4AR3	100	Variable			920531	Plessey MPWT (Dealer)
4AR4	150	Metal Oxide		5	909121	Electrosil TR4
4AR5	1k	Metal Oxide		5	908267	Electrosil TR4
4AR6	10k	Metal Oxide		5	900986	Electrosil TR4
4AR7	100	Metal Oxide		5	908276	Electrosil TR4
4AR8	1k	Wirewound	$2\frac{1}{2}$W	5	913626	Welwyn W21
4AR9	2.2k	Metal Oxide		5	908270	Electrosil TR4
4AR10	470	Variable			920058	Plessey MPWT (Dealer)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

STABILIZER P.C.Board (Continued)

Resistors (ohms) (Contd.)

4AR11	470	Metal Oxide		5	900992	Electrosil TR4
4AR12	1.2k	Metal Oxide		2	906550	Electrosil TR5
4AR13	1k	Metal Oxide		5	908267	Electrosil TR4
4AR14	680	Metal Oxide		5	908390	Electrosil TR4
4AR15	560	Metal Oxide		5	909841	Electrosil TR4
4AR16	100	Variable			920531	Plessey MPWT (Dealer)
4AR17	220	Metal Oxide		5	900988	Electrosil TR4
4AR18	3.3k	Metal Oxide		5	900991	Electrosil TR4

Capacitors (uF)

4AC1	0.1	Fixed	250V	20	919807	ITT PMC2R
4AC2	0.1	Fixed	250V	20	919807	ITT PMC2R
4AC3	33	Electrolytic	63V		920534	Mullard 108-18339
4AC4	0.01	Fixed		20	920533	ITT PMC2R
4AC5	0.1	Fixed	250V	20	919807	ITT PMC2R
4AC6	0.1	Fixed	250V	20	919807	ITT PMC2R
4AC7	0.01	Fixed		20	920533	ITT PMC2R
4AC8	0.1	Fixed	250V	20	919807	ITT PMC2R

Diodes

4AD1		1N4002			911460	Texas
4AD2		1N4002			911460	Texas
4AD3		BZY88C5V6			912747	Mullard
4AD4		BZY88C5V6			912747	Mullard

Transistors

4ATR1		BSV68			915267	Mullard
4ATR2		BSW66			917389	Mullard
4ATR3		BCY71			911928	Mullard
4ATR4		BFY51			908753	Mullard

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
		COMBINING UNIT 500W MS126 (and P.C. Board PS122)				
Resistors (ohms)						
6R1	180	Metal Oxide		5	909125	Electrosil TR4
6R2	180	Metal Oxide		5	909125	Electrosil TR4
6R3	100	High Power		5	919969	Electrosil H37
6R4	100	High Power		5	919969	Electrosil H37
6R5	200	High Power		5	921588	Electrosil H37
6R6	200	High Power		5	921588	Electrosil H37
6R7	10	Metal Oxide		5	908471	Electrosil TR5
6R8	10	Metal Oxide		5	908471	Electrosil TR5
6R9	10	Metal Oxide		5	908471	Electrosil TR5
Capacitors (uF)						
6C1	0.1	Fixed	100V	20	914173	ITT PMC2R/0.1/M100
6C2	0.1	Fixed	100V	20	914173	ITT PMC2R/0.1/M100
6C3	68pF	Fixed		10	920176	LCC CAI
6C4	Not Used					
6C5	100pF	Fixed		10	920177	LCC AAU020
6C6	0.1	Fixed			914173	ITT PMC2R/0.1/M100
Diodes						
6D1		1N4149			914898	STC
6D2		1N4149			914898	STC
Inductors						
6L1					CT603079	Racal
6L2					CT603079	Racal
6L3					CT603080	Racal
6L4		Choke			922364	Cambion 550-3640-45-02
Transformers						
6T1					BT603141	Racal
6T2					BT603141	Racal
6T3					DT602946	Racal
6T4					DT602946	Racal
6T5					DT602946	Racal

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

COMBINING UNIT (Continued)

Transformers (contd.)

6T6					DT602946	Racal
6T7					BT603701	Racal
6T8					BT603701	Racal
6T9					BT603066	Racal
6T10					BT603066	Racal
6T11					CT602989	Racal
6T12					BT603701	Racal
6T13					BT603066	Racal

Connectors

6SK1		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK2		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK3		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK4		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK5		Receptacle Sub-assembly			AA602978	Racal
6SK6		Receptacle Sub-assembly			AA602978	Racal
6SK7		Receptacle Sub-Assembly			AA602978	Racal
6SK8		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK9		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6SK10		BNC, 50 ohms			900061	Transradio 5935-99-911-8079
6PL1		Printed Circuit Connector			915643	Cannon DE9P
6PL2		Right Angle Plug (50 ohms)			908713	Amphenol AMP82
6PL3		Right Angle Plug (50 ohms)			908713	Amphenol AMP82
6TS1		Terminal Strip			905221	Wingrove & Rogers TS8-04

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

CONTROL PANEL MM377

Resistors (ohms)						
2R1	150k	Fixed	$\frac{1}{4}$W	10	902534	Morganite
Diode						
2D1		1N4002			911460	Texas
Miscellaneous						
2FS1		Fuselink 5A Size 0			906975	Belling Lee L693
2FS2		Fuselink 5A Size 0			906975	Belling Lee L693
		Fuseholder Size 0			900005	Belling Lee L1382
2LP1		Lamp, Neon			918753	Guest 1$\frac{3}{4}$ NPSC/15/110
2RLA		Relay, Sealed, SP HD 12V 170 ohm			916469	ITT 4190EC
2RLB		Relay, 3 pole			921509	Arrow 128 A3U/100
2CB1		Circuit Breaker, 50/60Hz 10A 2 pole			921324	Highland Elect. APL-11-1-6-2-103
2CB2		Circuit Breaker, 50/60Hz 10A 2 pole			921324	Highland Elect. APL-11-1-6-2-103
2SA		Switch, Rotary 2way c/o and off 5A 250V			921590	Tok PS/110-7NSH
2P1		Plug 25 way Pattern 102			921508	Belling Lee L1328/P/Ag

POWER SUPPLY MS64

The following list is compiled from Gresham Transformers Ltd., drawing number A43360A

Capacitors (uF)				Gresham Drawing No.
C1	10		250Va.c.	
C2	10,000	Electrolytic		
C3	10,000	Electrolytic	100V	A43360E-01
C4	10,000	Electrolytic	100V	A43360E-01
C5	10,000	Electrolytic	100V	A43360E-01

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

POWER SUPPLY (Continued)

Diodes					Gresham Drawing No.	
D1-D4		1R-25G10 (4 off)			A43360E-07	
D5-D8		1R-BS1				

Miscellaneous

T1		Mains Transformer			43365	
L1		Choke, 5mH			43366	
VS1		Mains Selector Unit			UE 60666L5-2	

MUTING UNIT (MS565)

Resistors (ohm)

12AR1	100	Fixed		5	913962	Electrosil TR6
12AR2	100	Fixed		5	913962	Electrosil TR6
12AR3	47	Wirewound		5	913695	Welwyn W22
12AR4	390	Metal Oxide		5	908472	Electrosil TR4
12AR5	150	Metal Oxide		5	909121	Electrosil TR4
12AR6	1.2k	Metal Oxide		5	908285	Electrosil TR4
12AR7	1k	Metal Oxide		5	908267	Electrosil TR4
12AR8	39	Metal Oxide		5	910491	Electrosil TR4
12AR9	18	Metal Oxide		5	916626	Electrosil TR4
12AR10	1.2k	Metal Oxide		5	908285	Electrosil TR4
12AR11	2.2k	Metal Oxide		5	908270	Electrosil TR4
12AR12	150	Metal Oxide		5	909121	Electrosil TR4
12AR13	390	Metal Oxide		5	908472	Electrosil TR4
12AR14	33	Wirewound		5	913584	Welwyn W21
12AR15	1k	Metal Oxide		5	908267	Electrosil TR4
12AR16	4.7k	Metal Oxide		5	900989	Electrosil TR4
12AR17	47k	Metal Oxide		5	908391	Electrosil TR4
12AR18	10k	Metal Oxide		5	900986	Electrosil TR4
12AR19	4.7k	Metal Oxide		5	900989	Electrosil TR4
12AR20	220	Metal Oxide		5	900988	Electrosil TR4
12AR21	470	Metal Oxide		5	906019	Electrosil TR5
12AR22	47k	Metal Oxide		5	908391	Electrosil TR4
12AR23	18k	Metal Oxide		5	916626	Electrosil TR4
12AR24	27k	Metal Oxide		5	908295	Electrosil TR4

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

MUTING UNIT (Continued)

Capacitors (uF)

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
12AC1	0.1	Fixed	25V	+50 -25	911845	Erie 831/T
12AC2	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC3	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC4	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC5	0.1	Fixed	25V	+50 -25	911845	Erie, 831/T
12AC6	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC7	22	Electrolytic	63V	+50 -10	923636	Erie, 20101-100-OT
12AC8	10	Tantalum	20	20	905399	TAAB10M20
12AC9	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC10	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC11	0.1	Fixed	100V	20	914173	ITT, PMC2R
12AC12	39p	Fixed	500V	5	919459	Erie, 831/N750

Diodes

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
12AD1		1N4002			923564	Fairchild
12AD2		1N4002			923564	Fairchild
12AD3		BZY88C10			917217	Mullard
12AD4		1N4149			914898	STC
12AD5		1N4149			914898	STC
12AD6		1N4149			914898	STC
12AD7		1N4149			914898	STC
12AD8		1N4149			914898	STC
12AD9		1N4149			914898	STC

Transistors

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer
12ATR1		2N3553			916730	Mullard
12ATR2		2N3553			916730	Mullard
12ATR3		BFY51			908753	Mullard
12ATR4		BFY51			908753	Mullard
12ATR5		BFY51			908753	Mullard
12ATR6		BC107			911929	Mullard
12ATR7		BC107			911929	Mullard

Cct. Ref.	Value	Description	Rat.	Tol. %	Racal Part Number	Manufacturer

MUTING UNIT (Continued)

Transformers

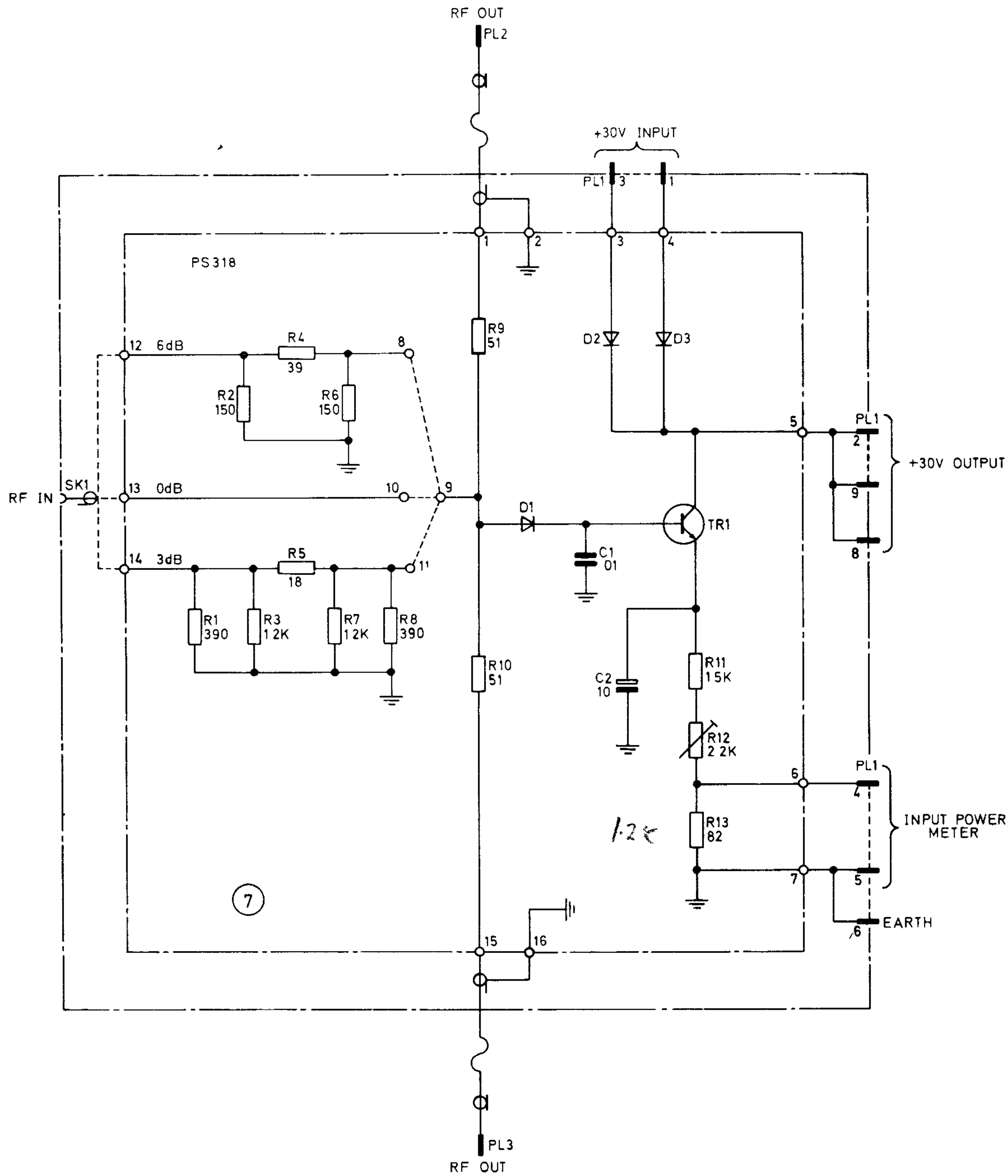
12AT1		Output Transformer			CT604693	Racal
12AT2		Input Transformer			CT604693	Racal

Ferrite Beads

12AFB1		FX1242			907488	Mullard
12AFB2		FX1242			907488	Mullard
12AFB3		FX1242			907488	Mullard
12AFB4		FX1242			907488	Mullard

Connectors

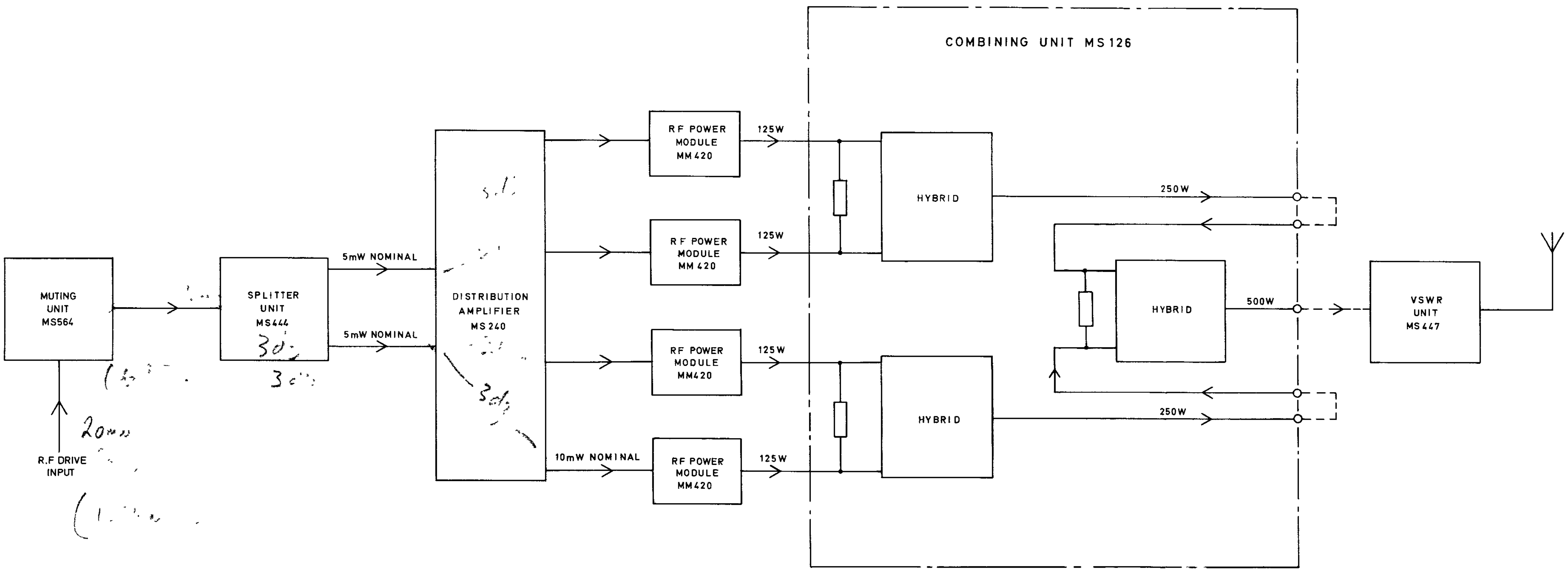
12SK1		Coaxial 50 ohms			908387	Transradio BN5/5A
12SK2		Coaxial 50 ohms			908387	Transradio BN5/5A
12PL1		9-way plug			915643	Cannon DE9P



WOH4083	CC603327
E	

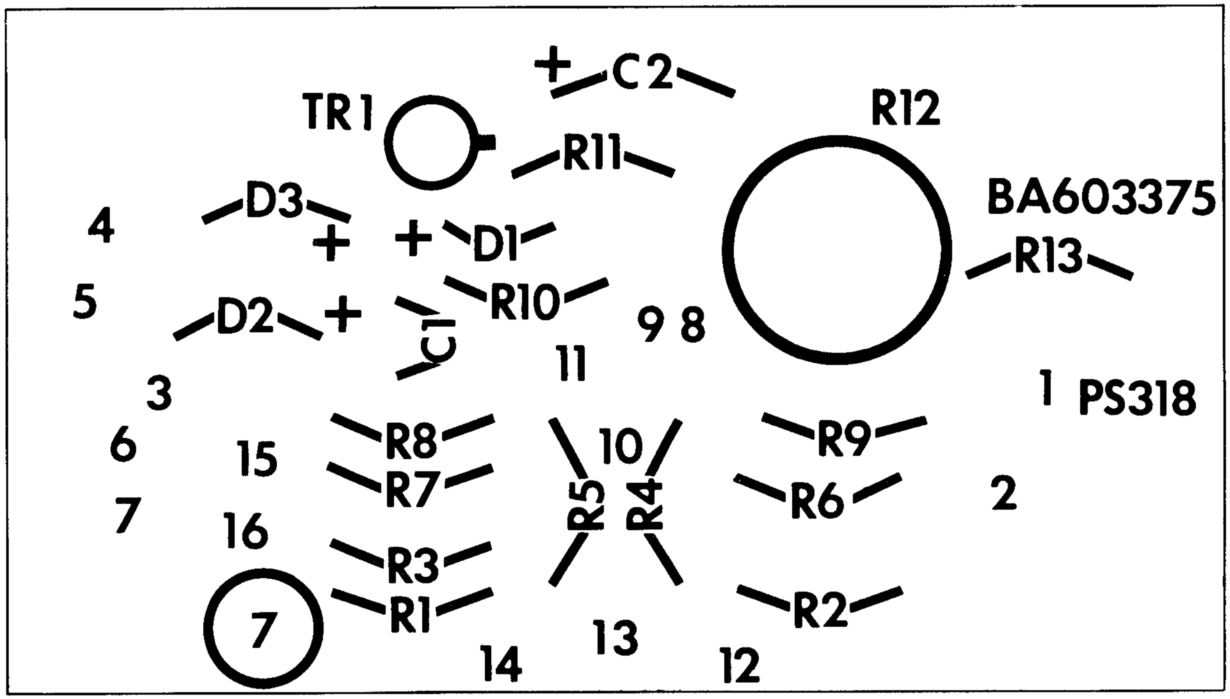
Circuit: Splitter Unit **MS444**

Fig. 1



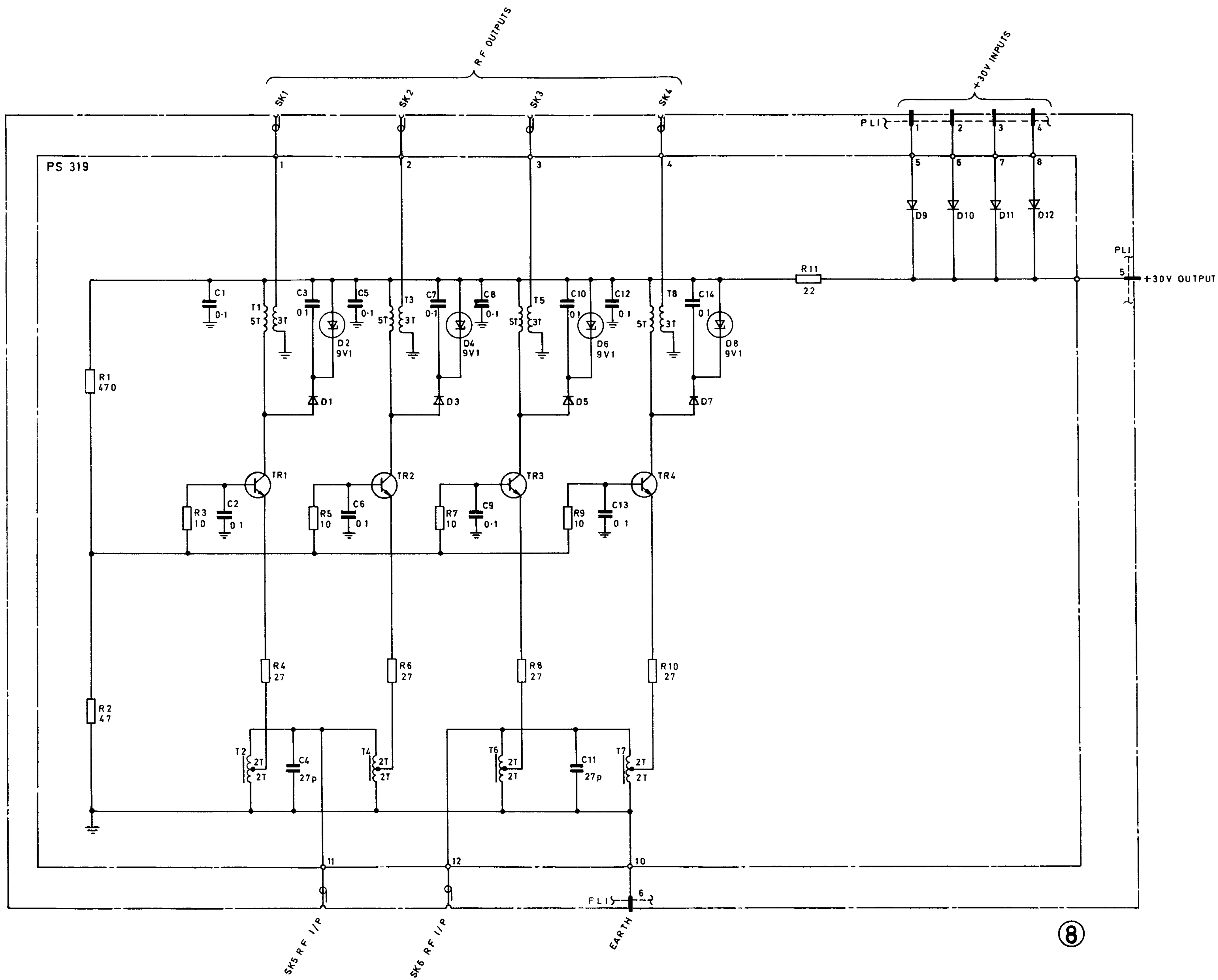
Block Diagram: Linear Amplifier Type TA.1813

Fig.1.2



Component Layout: Splitter Unit PCB PS318 Fig 2

WOH 4083 BA603375



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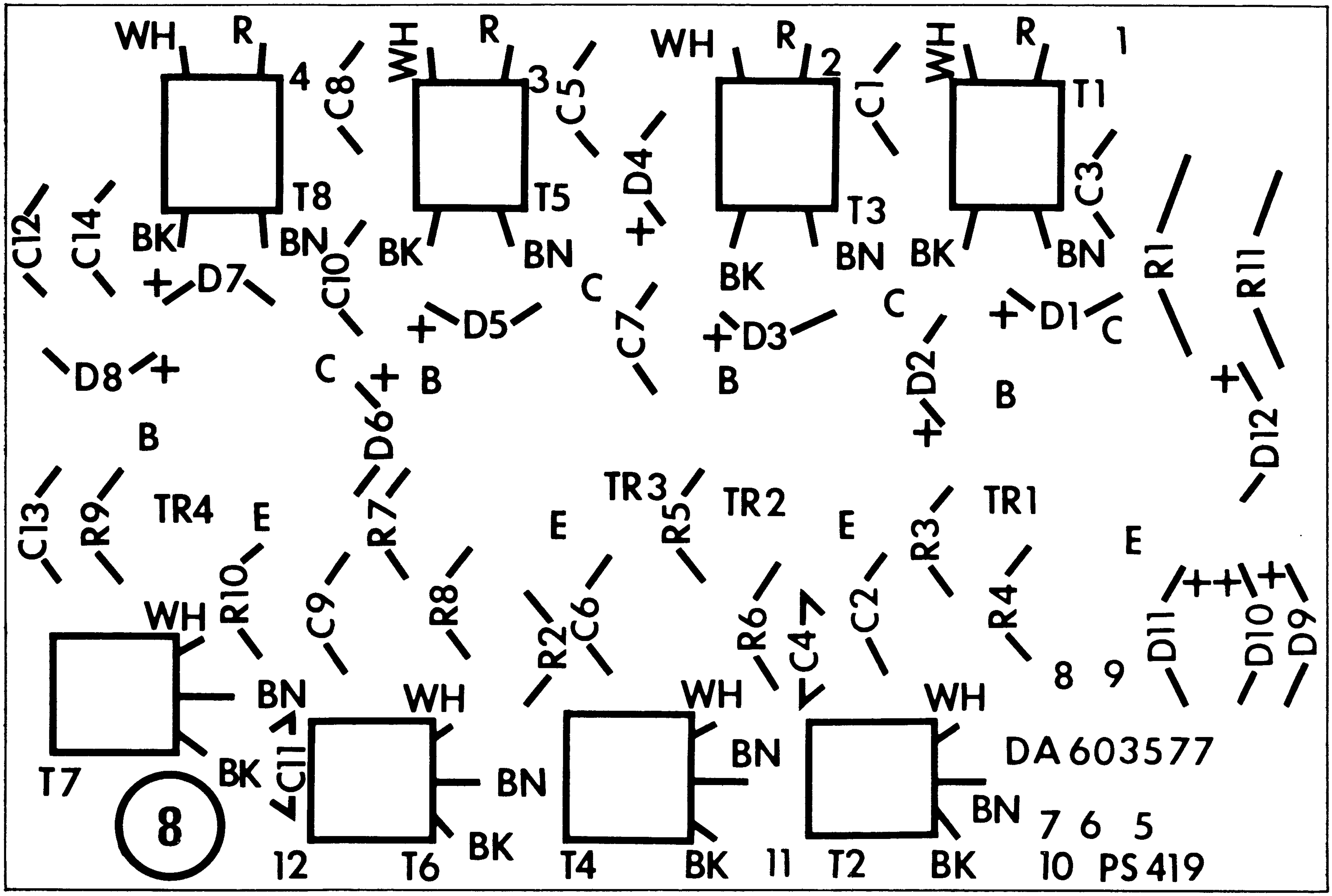
W0H4083	DC603339/B
A	

Circuit: Distribution Amplifier MS 240

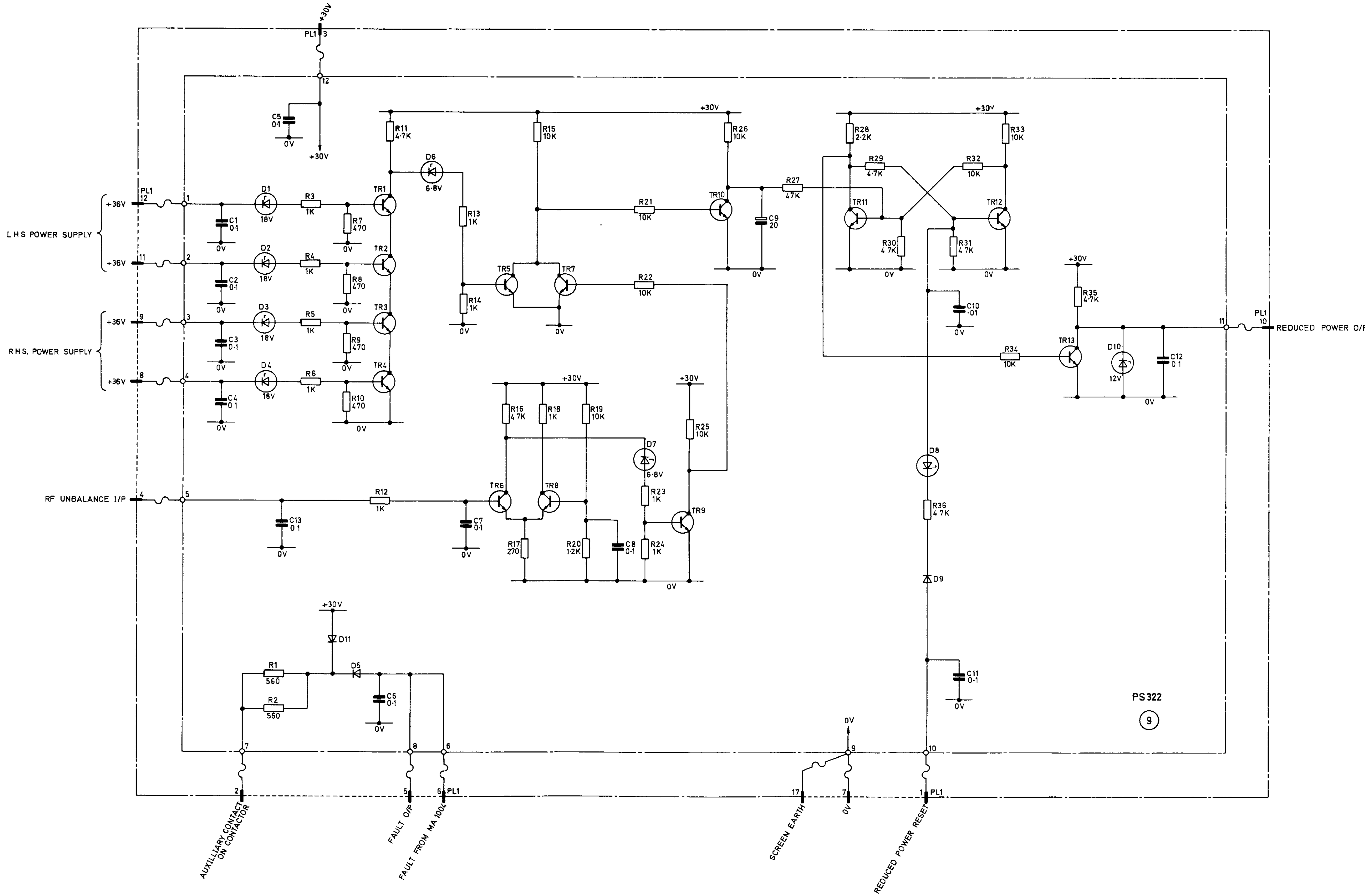
Fig. 3



WOH4083

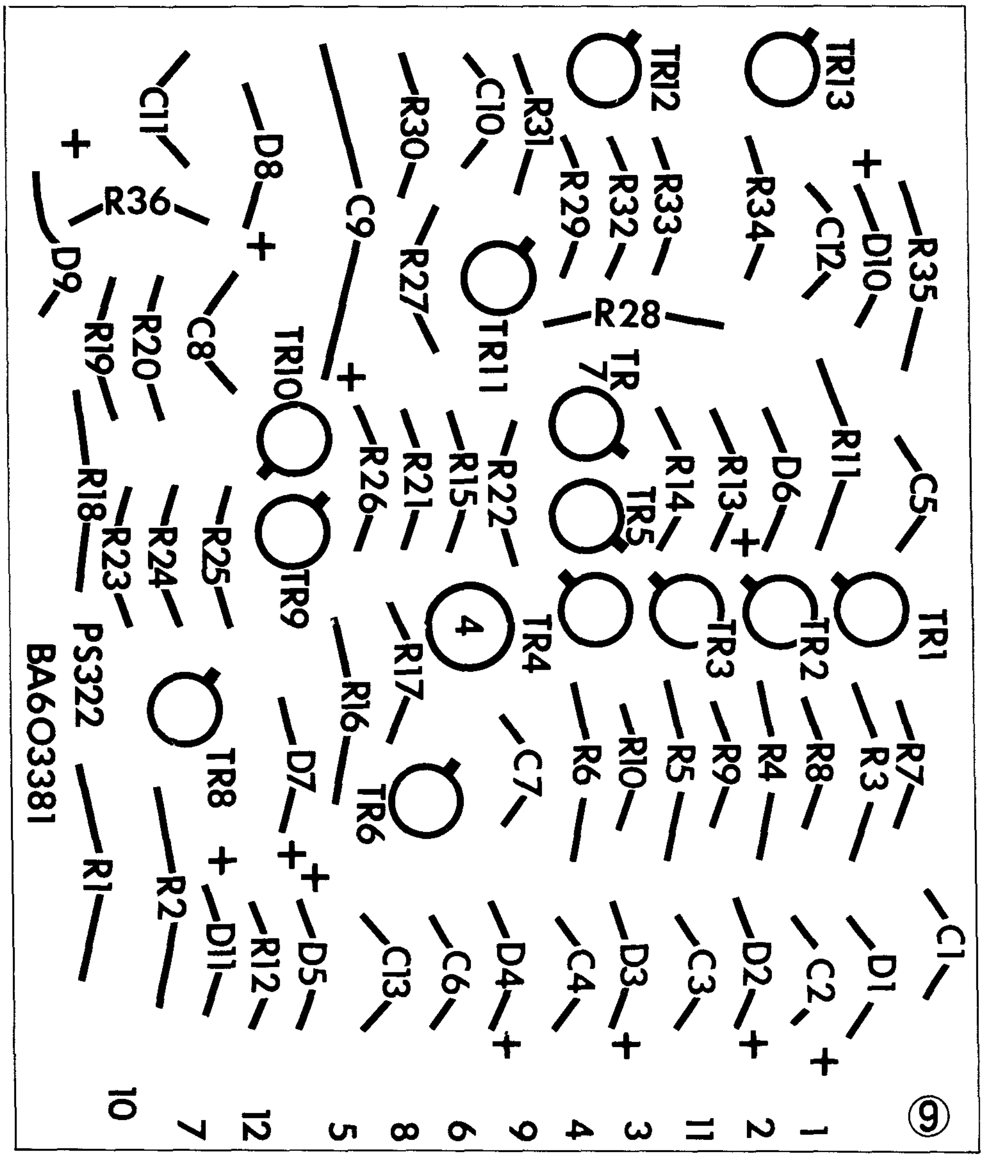
Component Layout: Distribution Amplifier P.C.B. PS319

Fig. 4



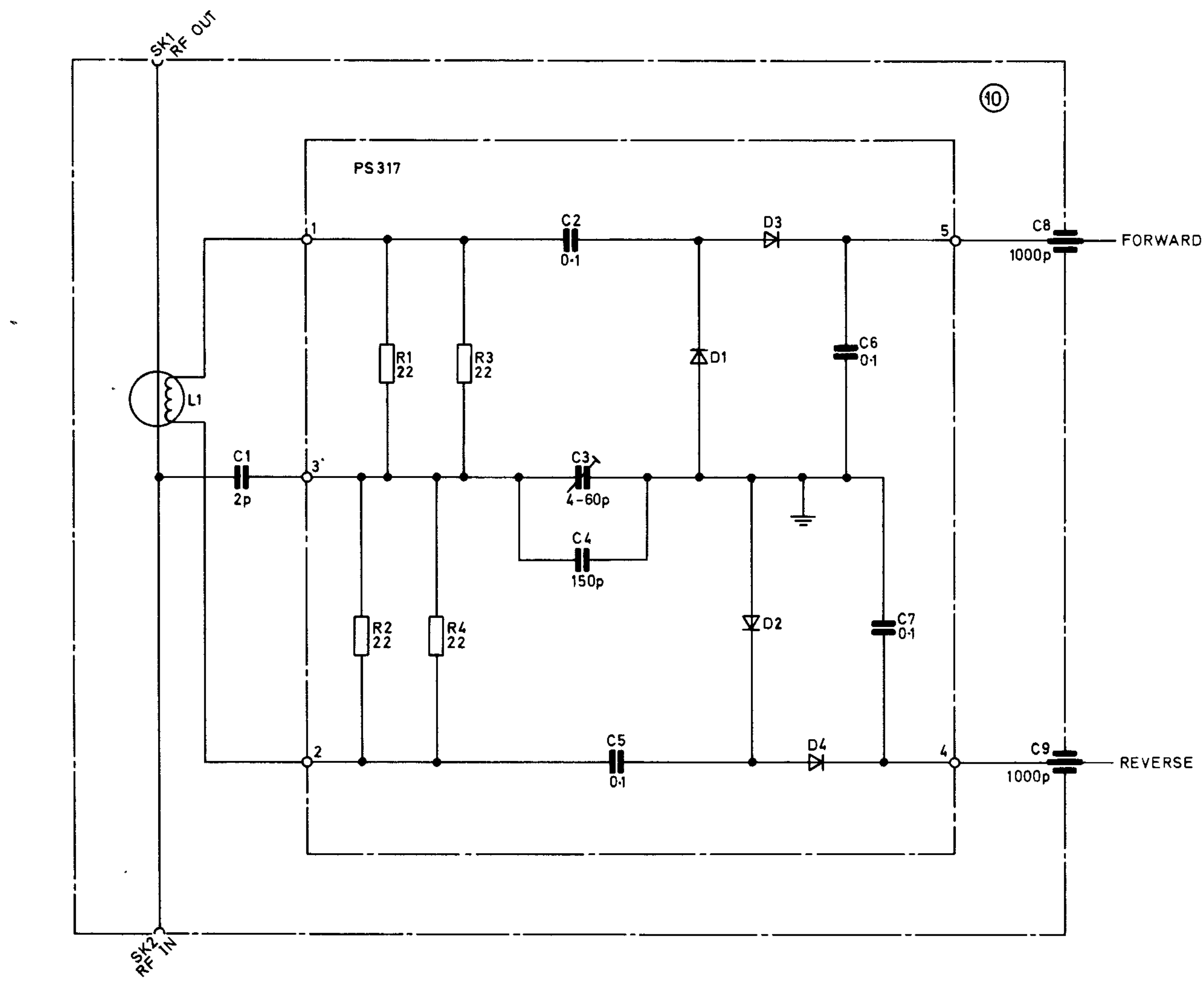
Circuit: Overload Unit MS443

Fig. 5



WOH4083 BA603381

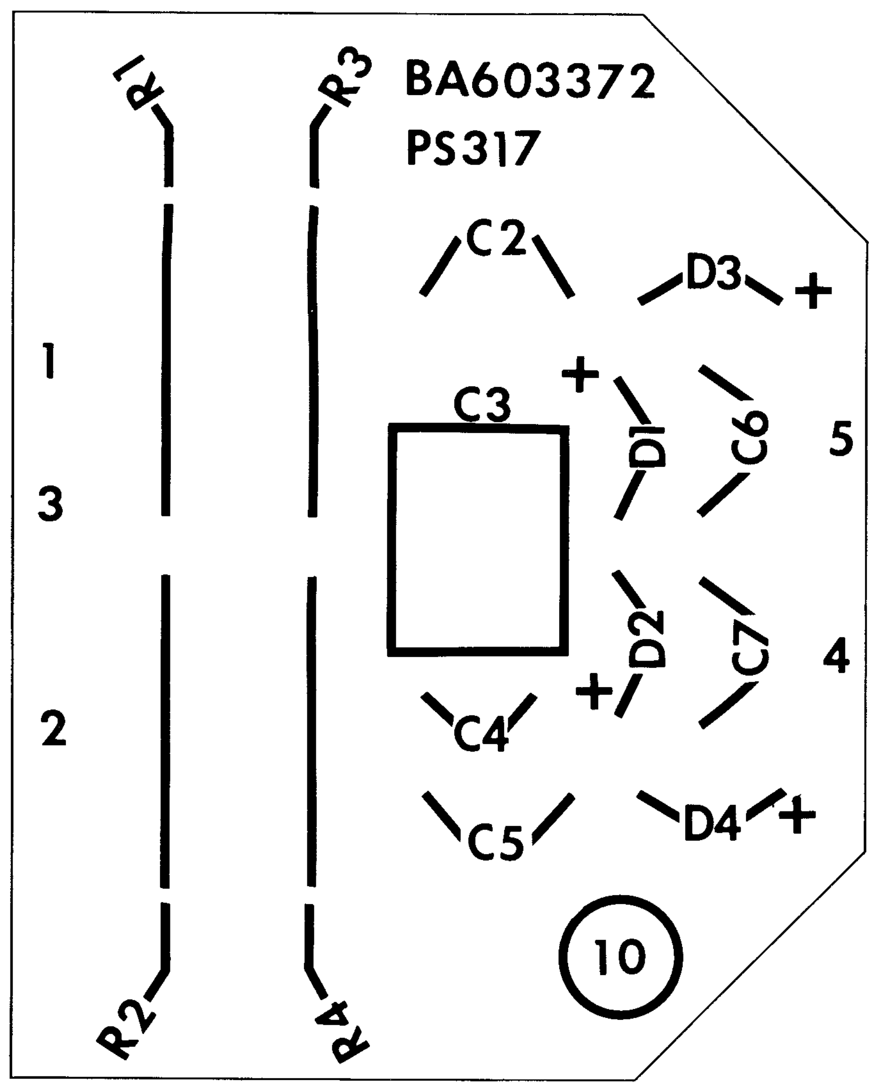
Component Layout : Overload Unit PCB PS322 Fig. 6



WOH 4083	CC603384
B	

Circuit: Cabinet V.S.W.R. Unit MS447

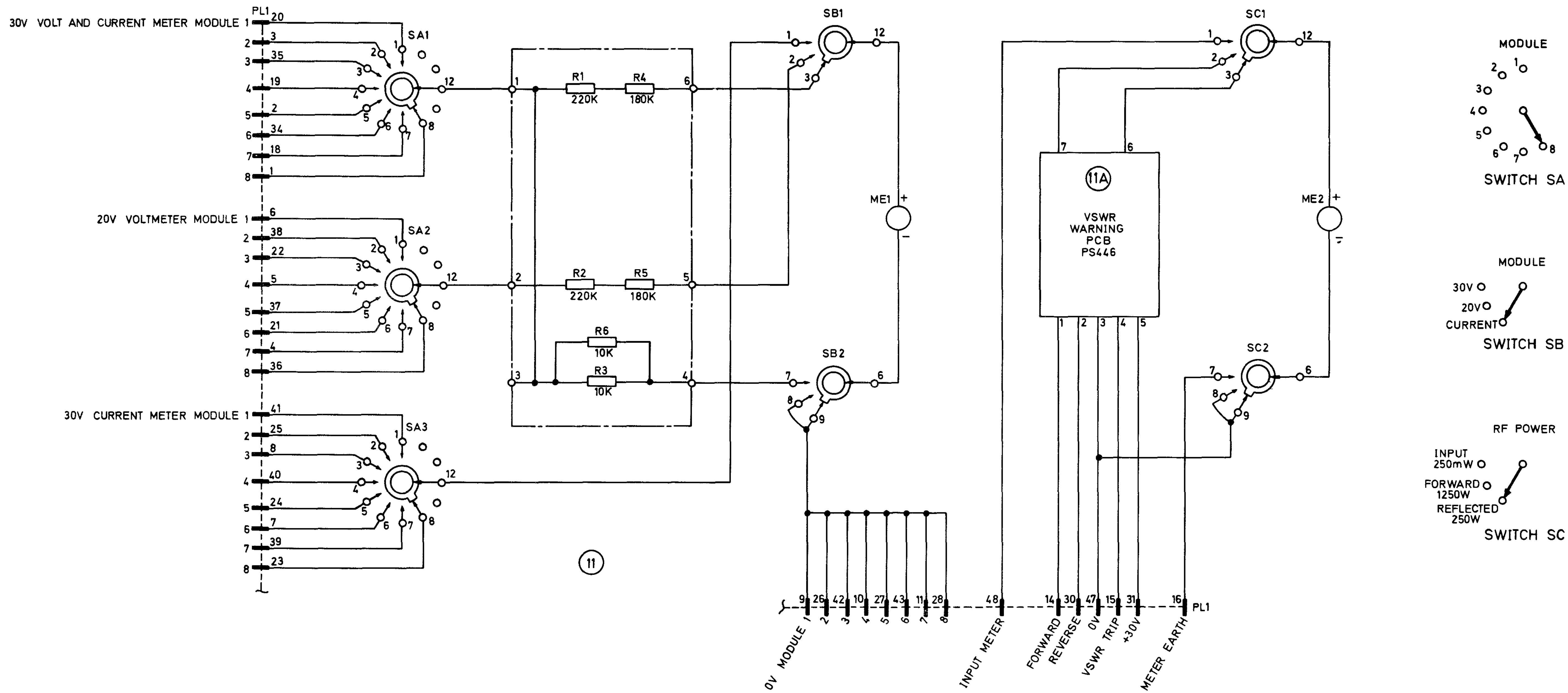
Fig. 7



WOH 4083	BA 603372

Component Layout:
Cabinet V.S.W.R. Unit PCB PS317

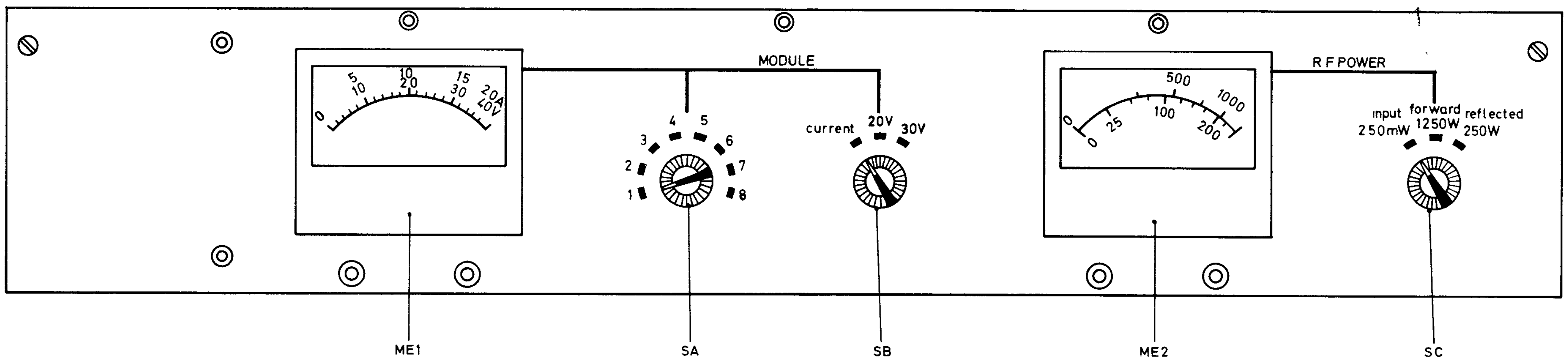
Fig. 8



WOH 4083	CC603450
C	

Circuit: Meter Panel MS445

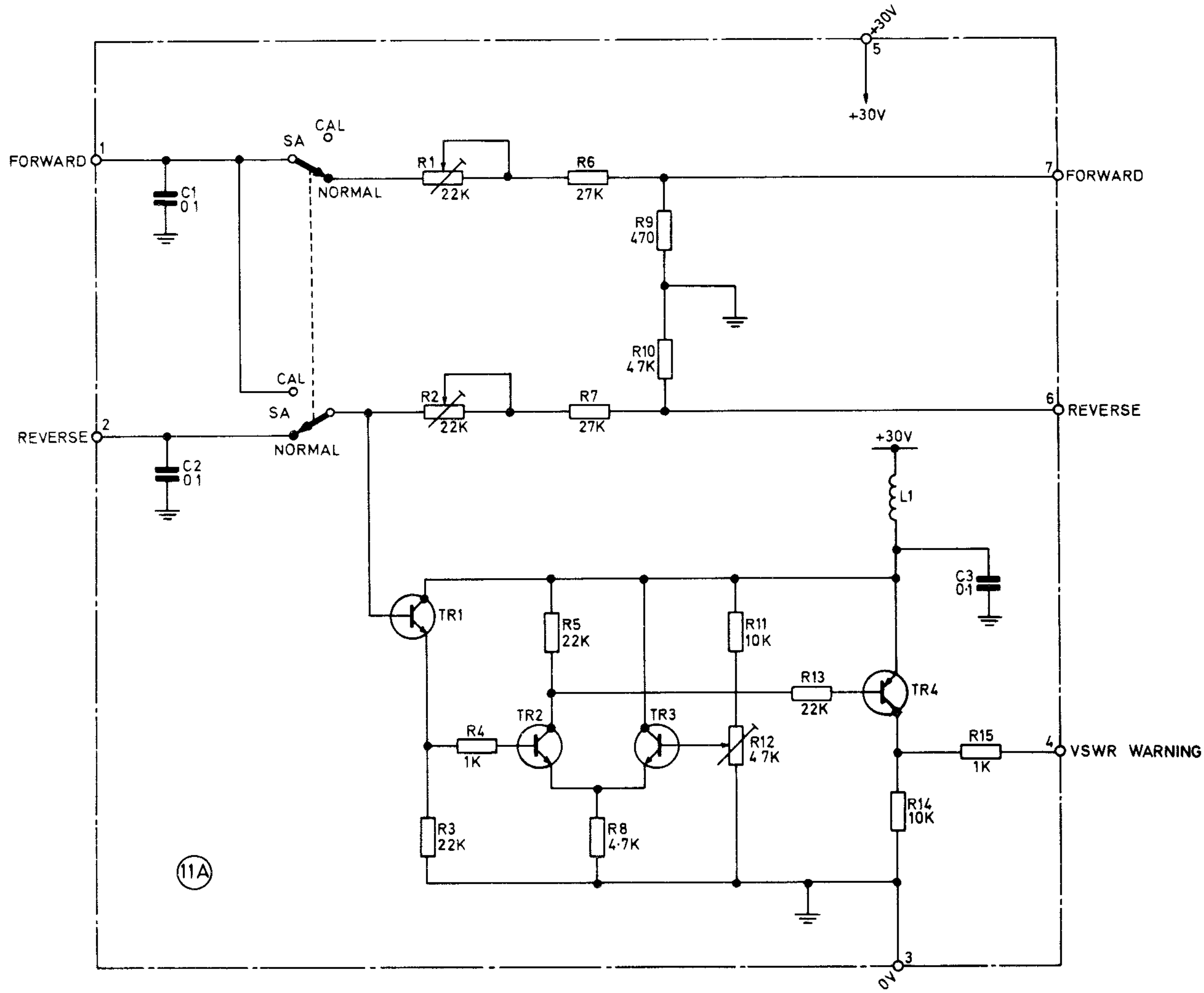
Fig. 9



WOH 4083

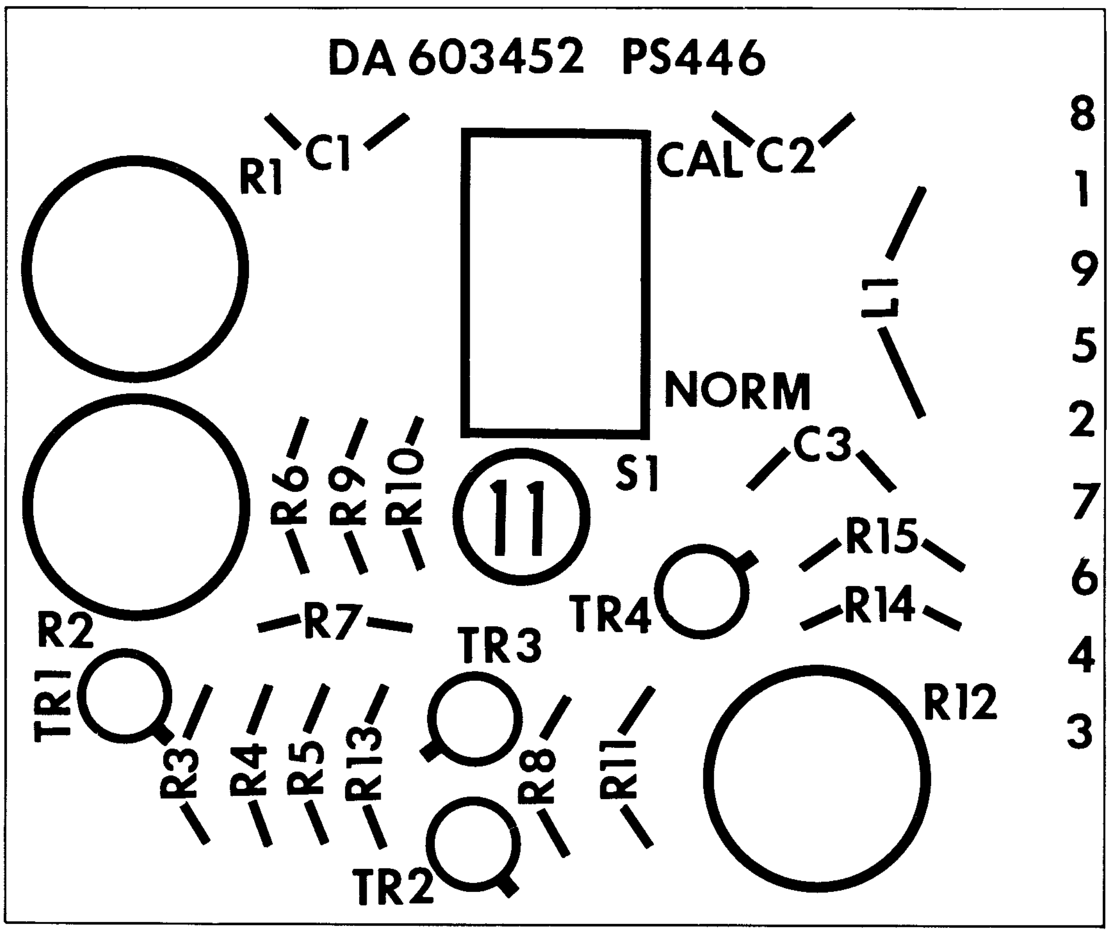
Component Layout : Meter Panel MS445

Fig. 10



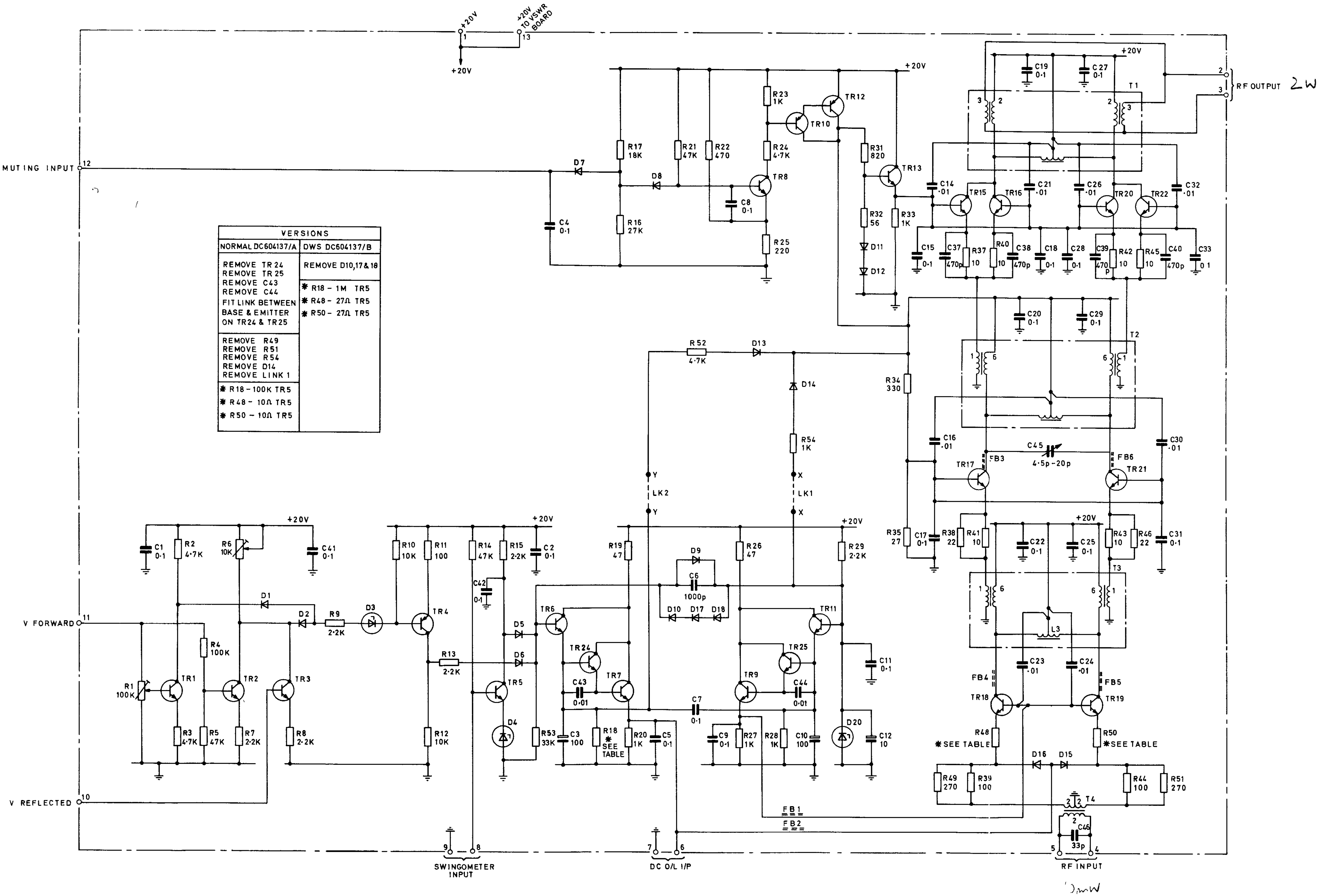
WOH 4083	BC603451
A	

Circuit: V.S.W.R. Warning P.C.B PS446 Fig. 1'



WOH 4083	BA 603452

Component Layout : VSWR Warning P.C.B. PS446 Fig.12

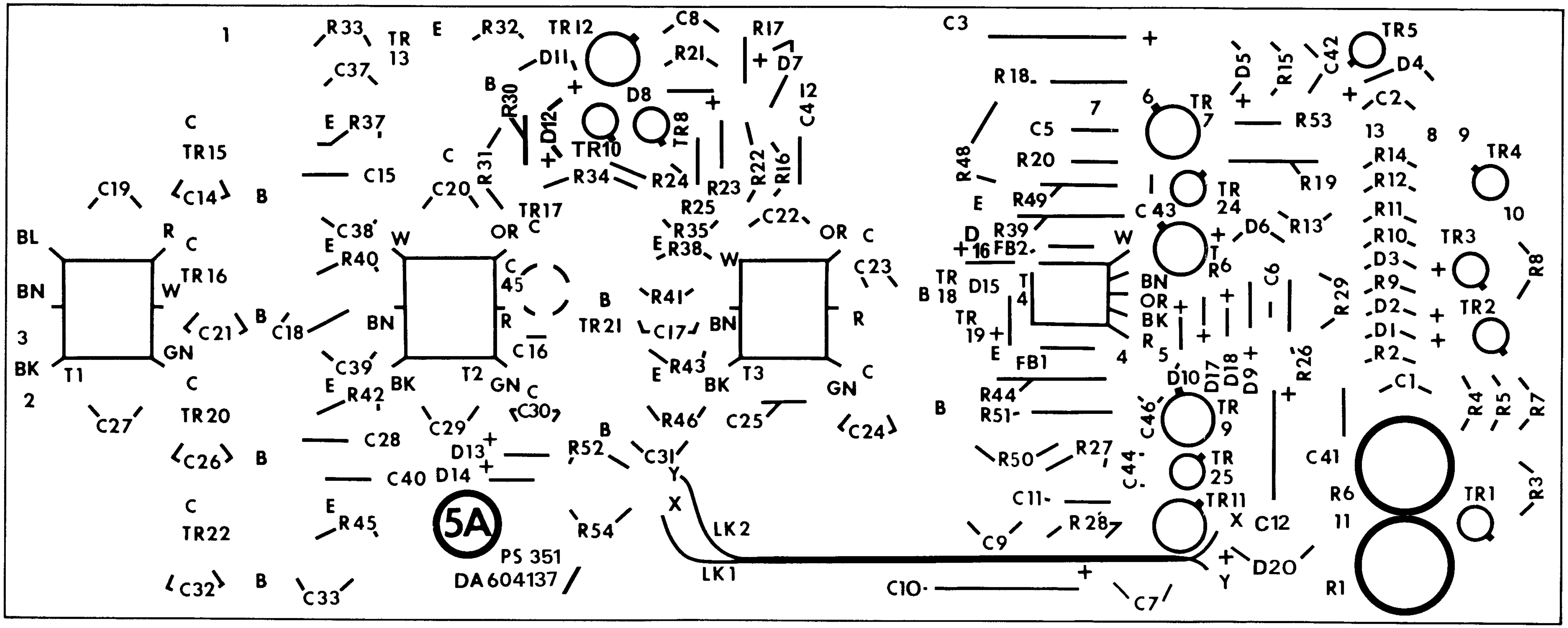


VERSIONS	
NORMAL DC604137/A	DWS DC604137/B
REMOVE TR 24 REMOVE TR 25 REMOVE C43 REMOVE C44 FIT LINK BETWEEN BASE & EMITTER ON TR24 & TR25	REMOVE D10,17&18 * R18 – 1M TR5 * R48 – 27Ω TR5 * R50 – 27Ω TR5
REMOVE R49 REMOVE R51 REMOVE R54 REMOVE D14 REMOVE LINK 1	
* R18 – 100K TR5 * R48 – 10Ω TR5 * R50 – 10Ω TR5	

WOH4083	DC604137
C	

Circuit: Low Level P.C.B. PS351

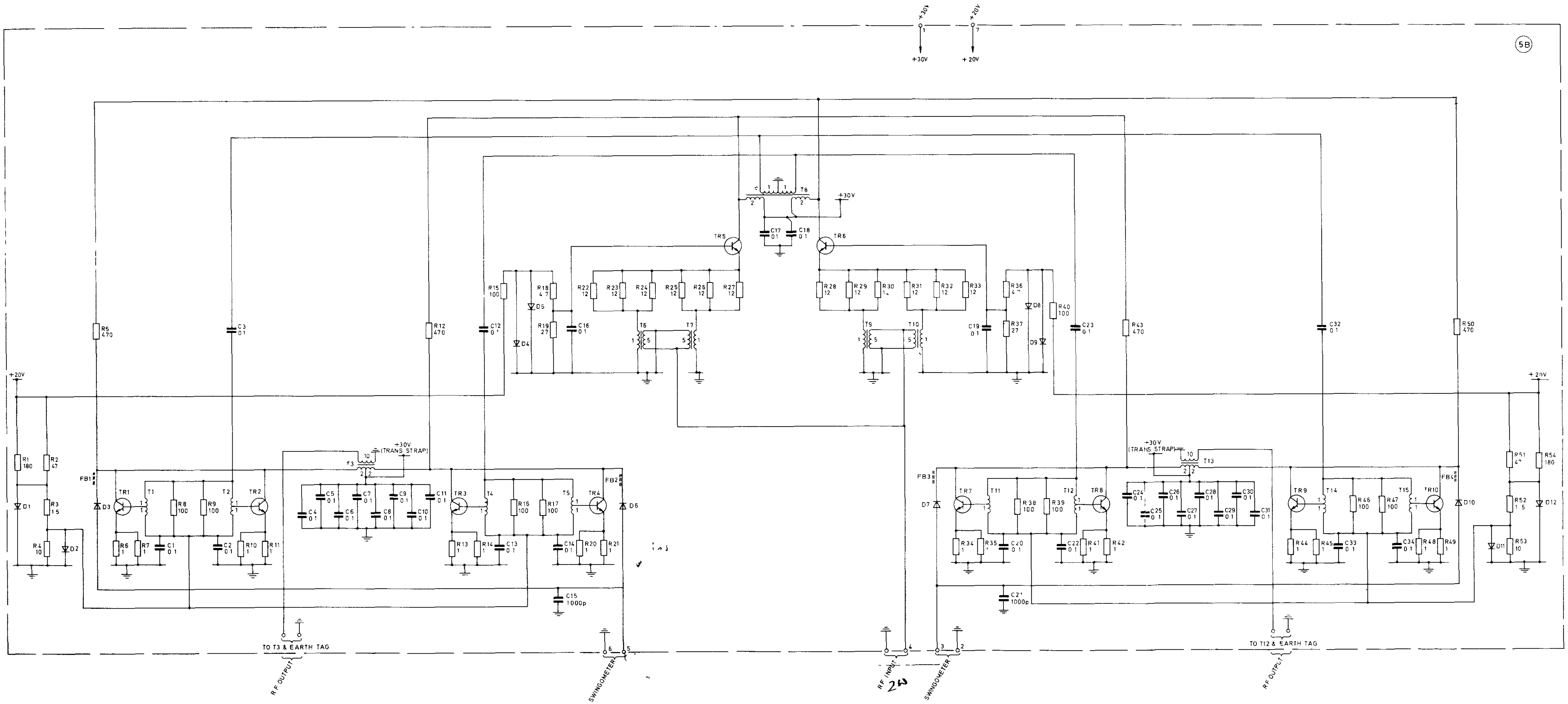
Fig.13



WOH 4083

Component Layout: Low Level P.C.B PS351

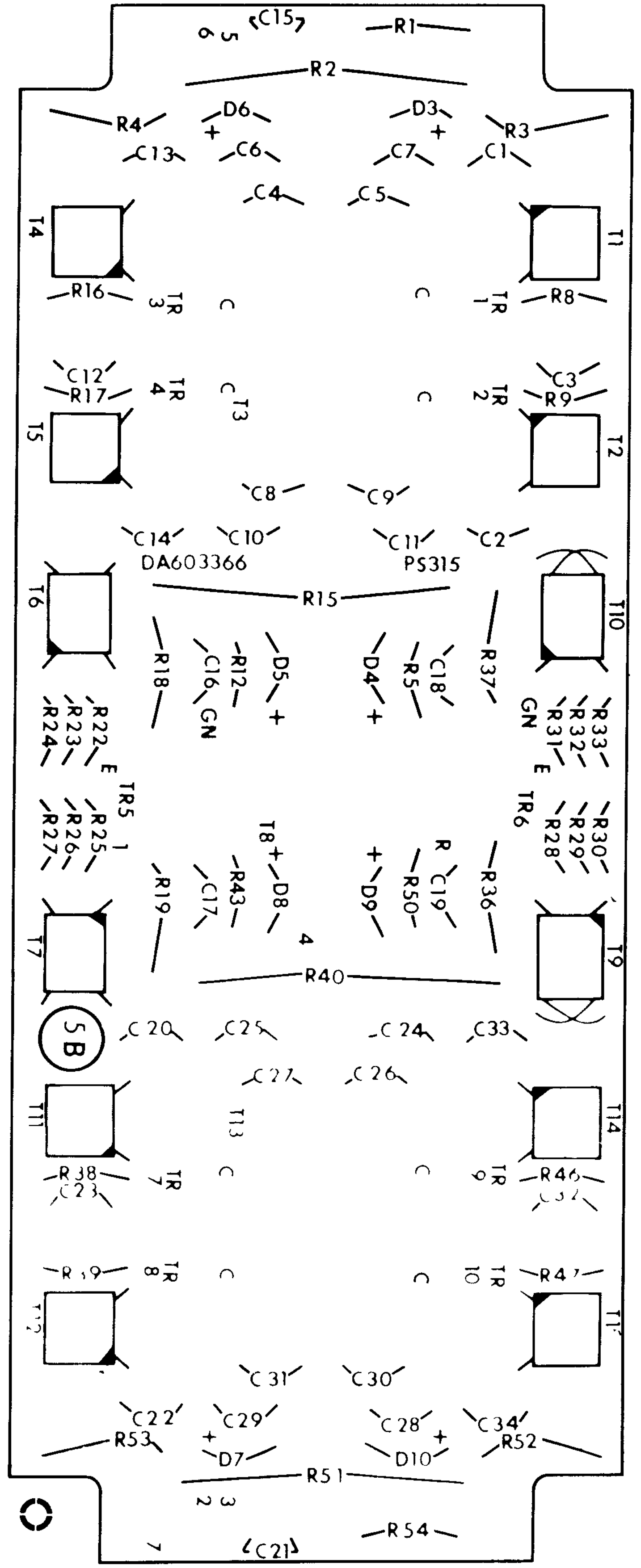
Fig. 14



WOH4083 | EC603366
D

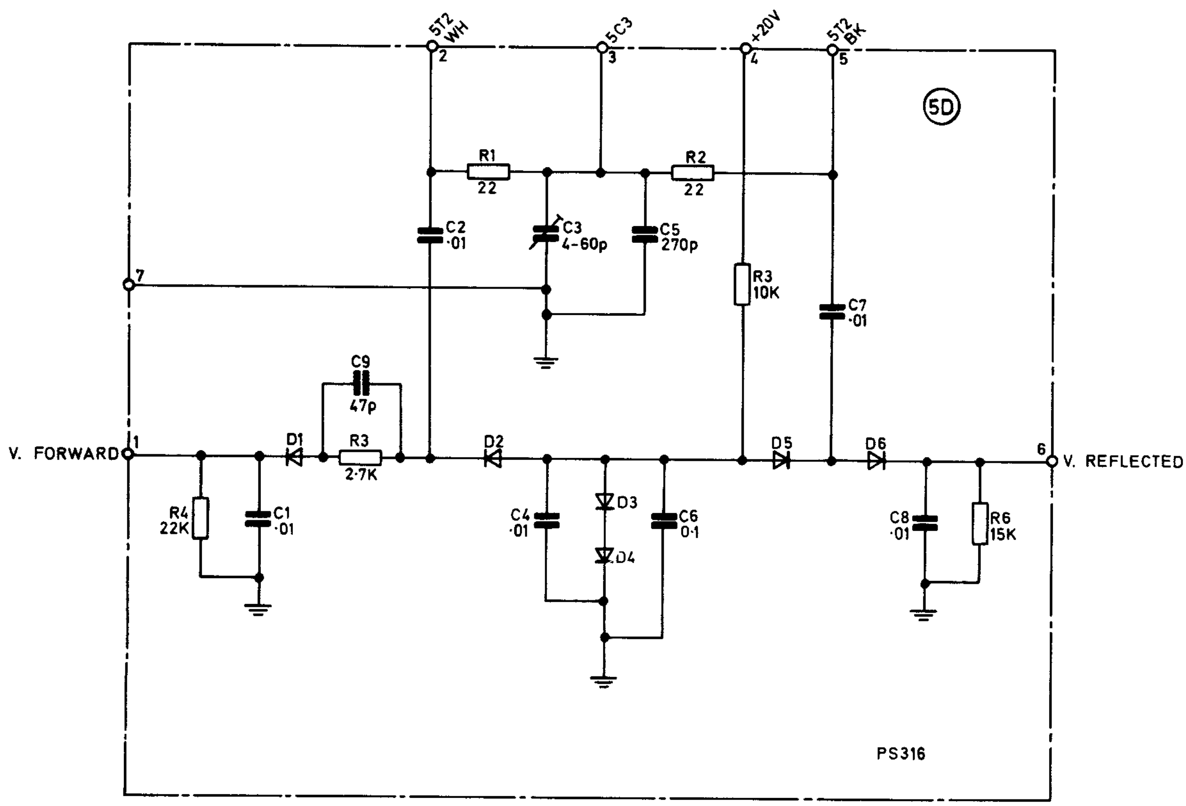
Circuit: High Level Board PS315

Fig.15



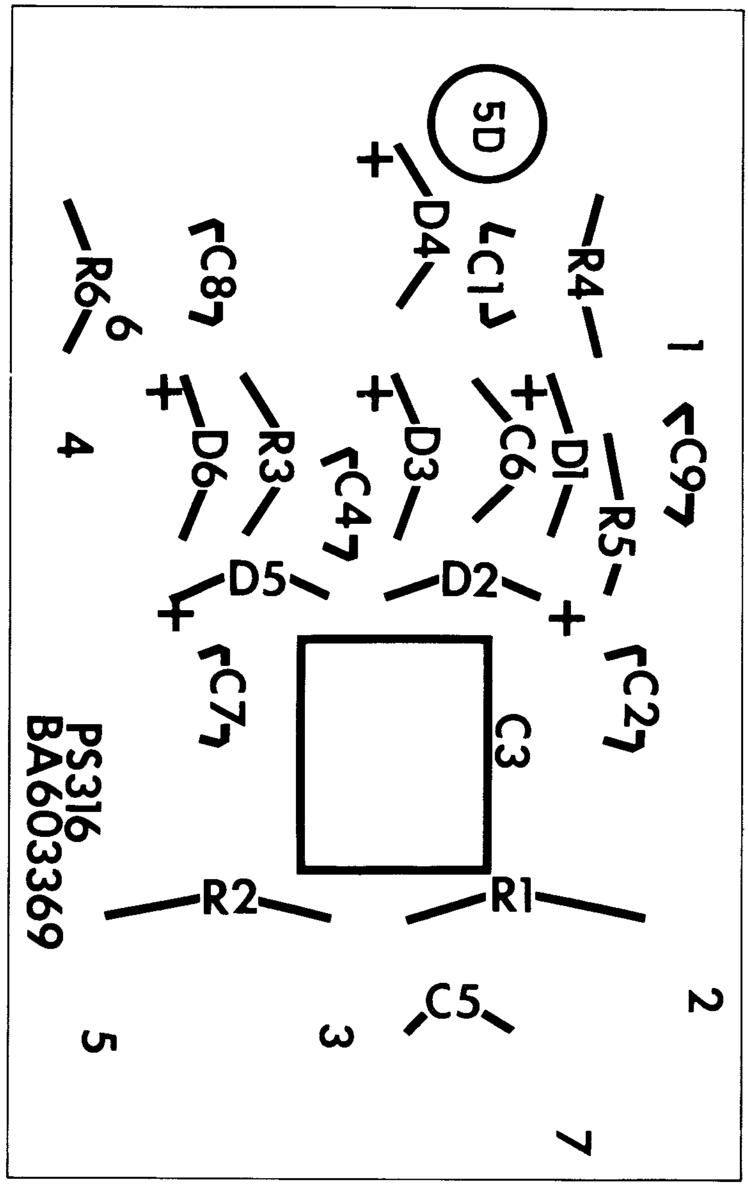
WOH 4083	DA 603366

Component Layout : High Level P.C.B. PS315 Fig 16



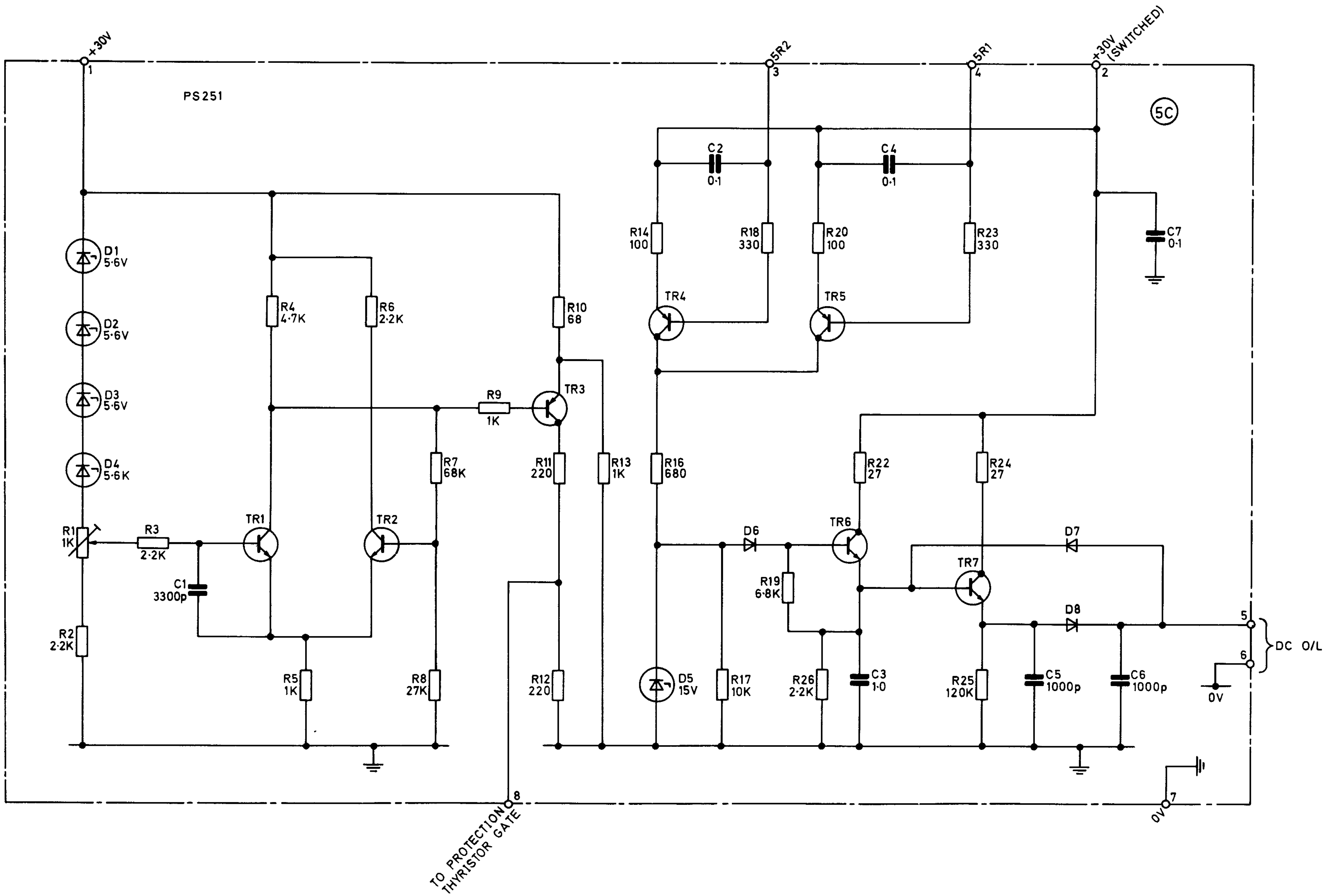
WOH4083	BC603369
D	

Circuit: V.S.W.R. P.C.B **PS316** **Fig. 17**



WOH 4083	BA 603369

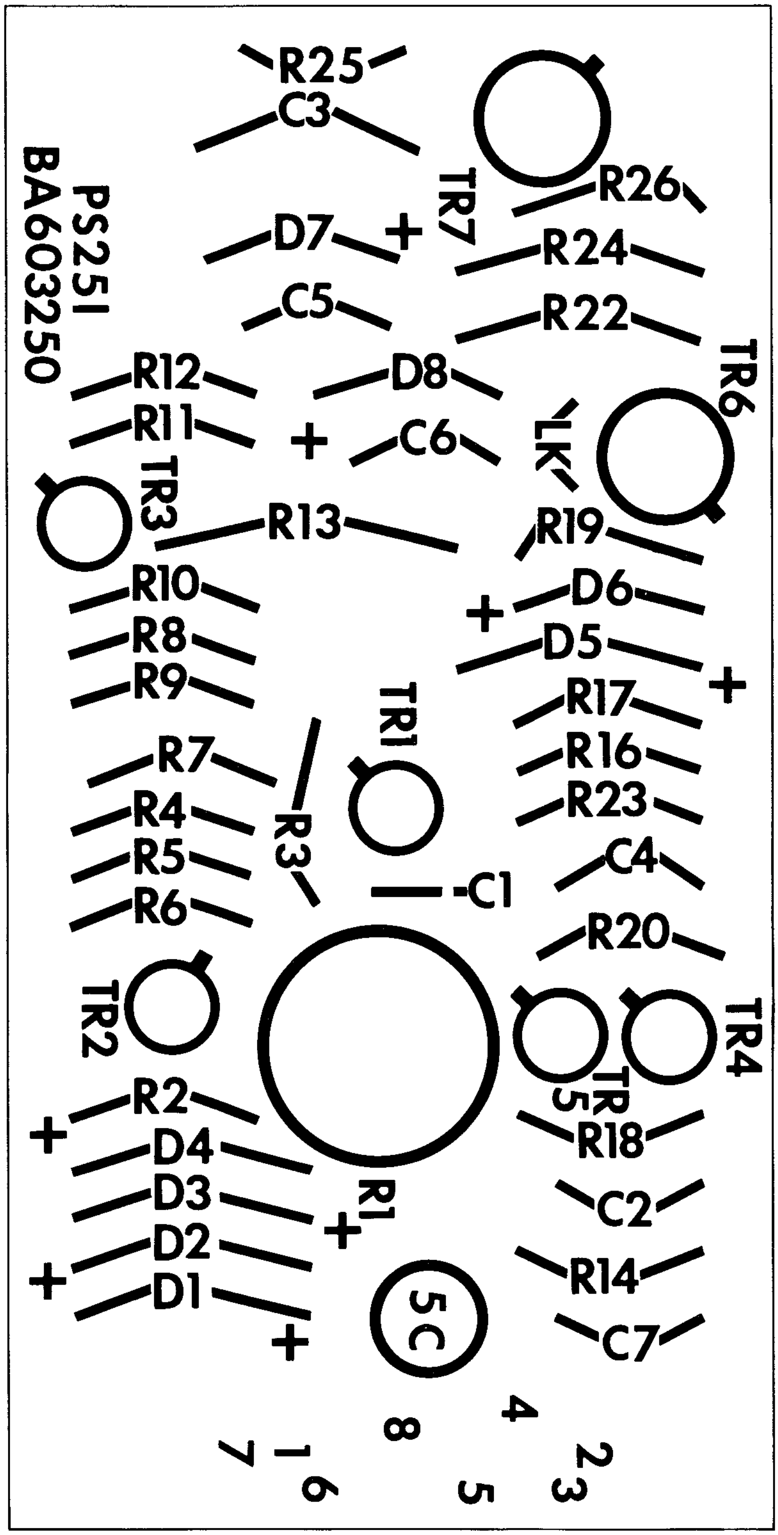
Component Layout V.S.W.R P.C.B PS316 Fig.18



WOH 4083	DC603250
D	

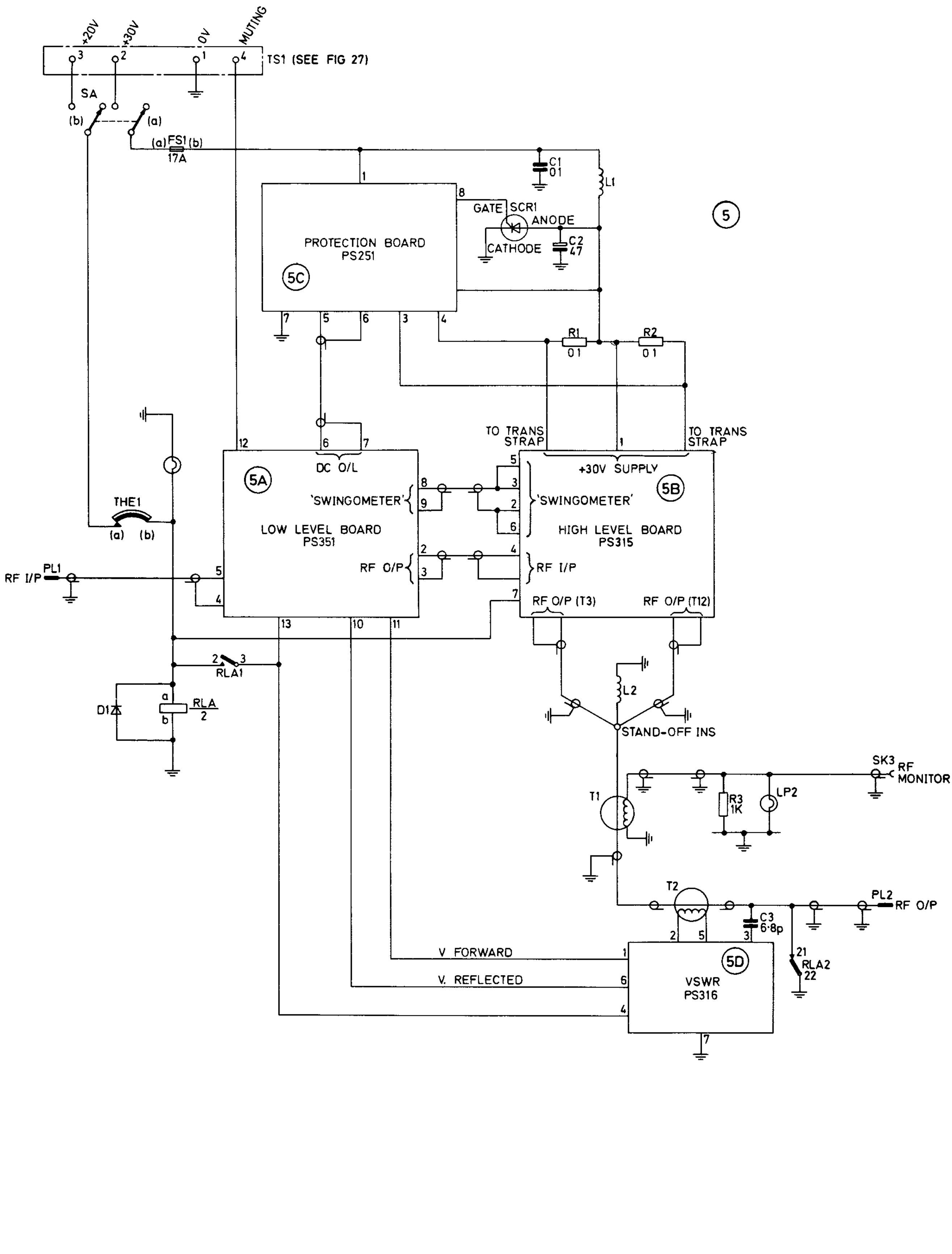
Circuit: Protection P.C.B PS251

Fig. 19



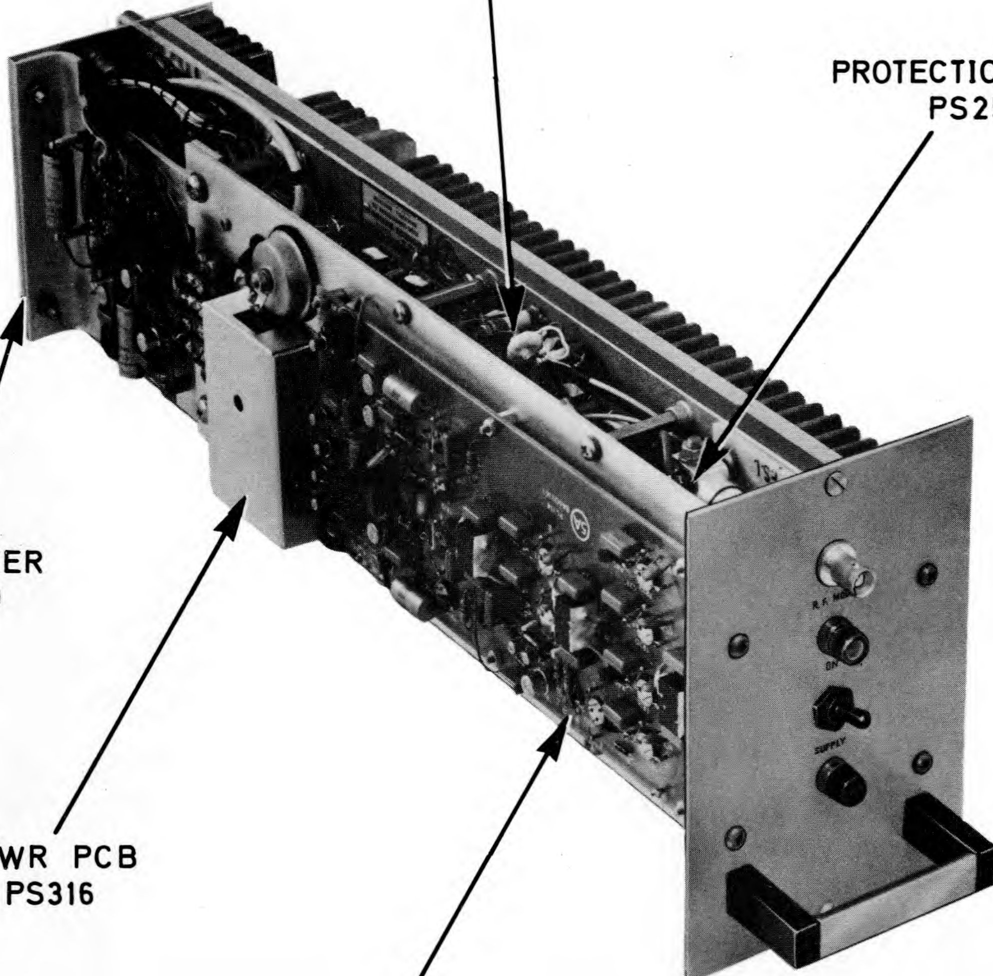
WOH 4083	BA 603250

Component Layout : Protection P.C.B. PS251 Fig 20



WOH 4083	DC602850
E	

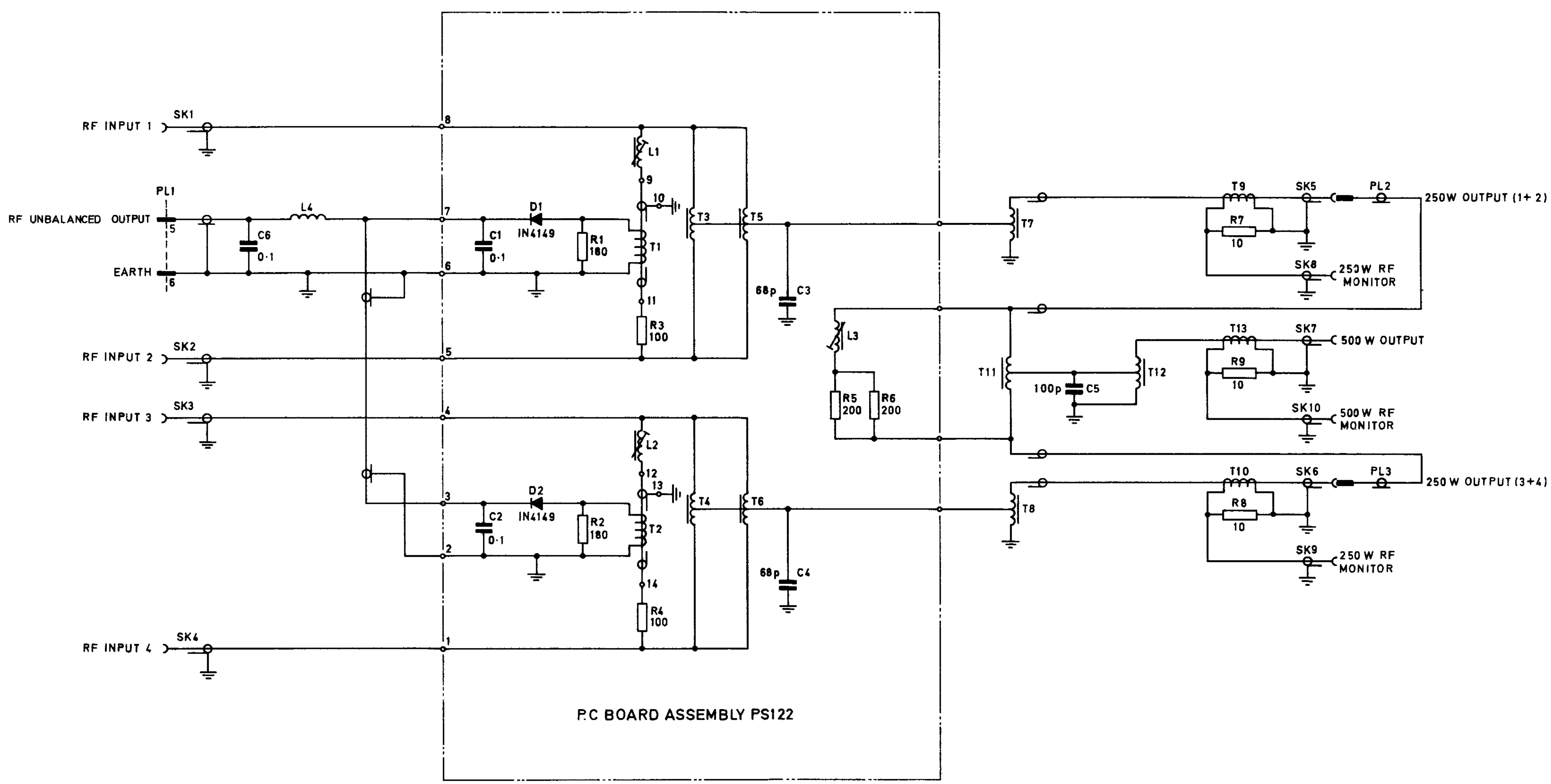
Circuit: Interconnections R.F. Module MM320 Fig. 2



RF Power Module MM420
Sub-Unit Location

WOH4083

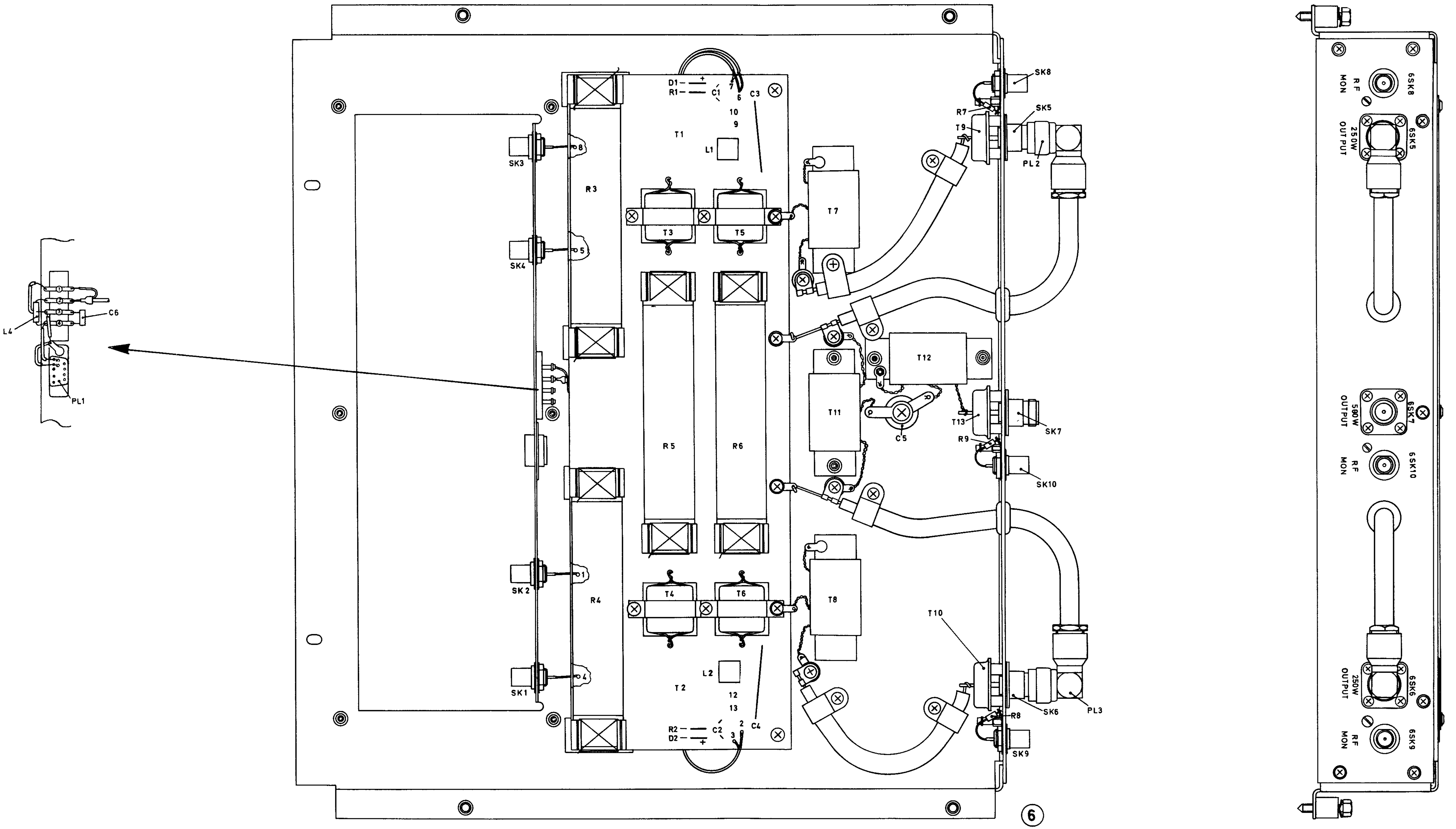
Fig. 22



WOH 4083 | CC603674 | C

Circuit : Combining Unit M.S. 126 (500 W)

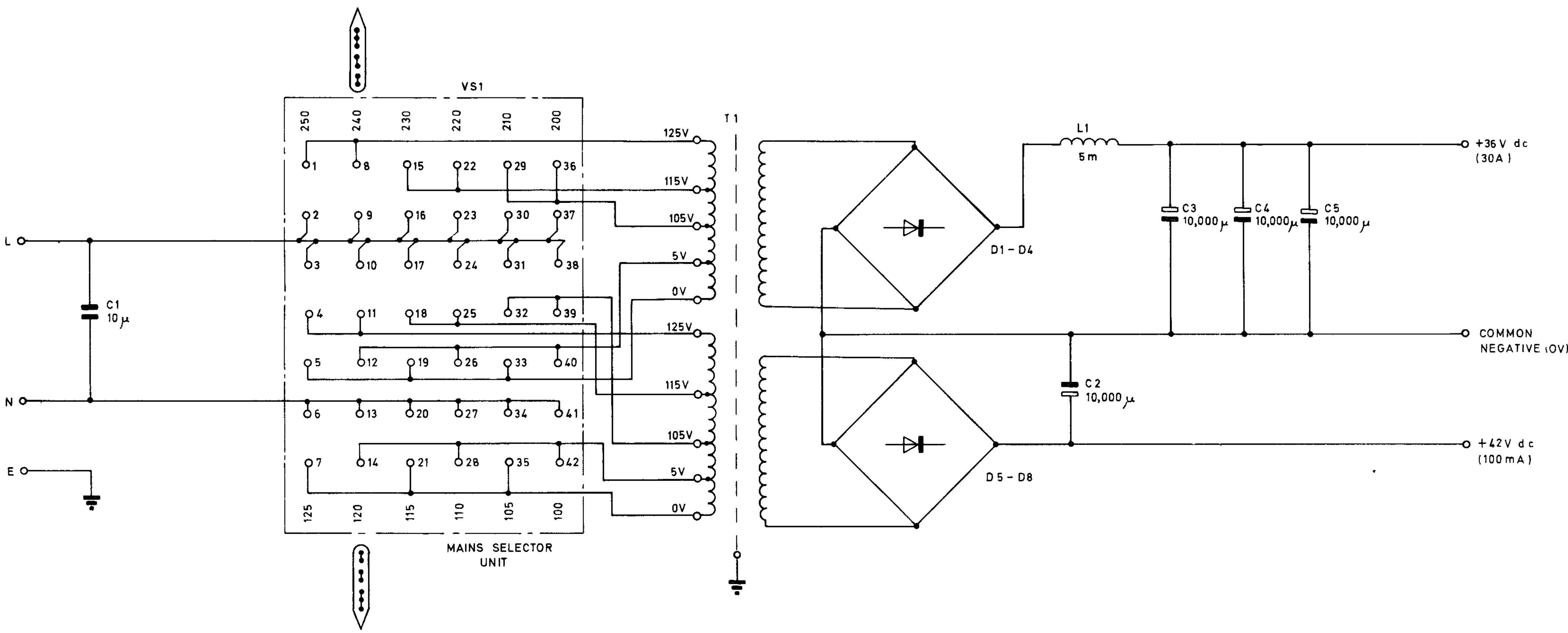
Fig. 23



WOH 4083

Component Layout : Combining Unit MS126

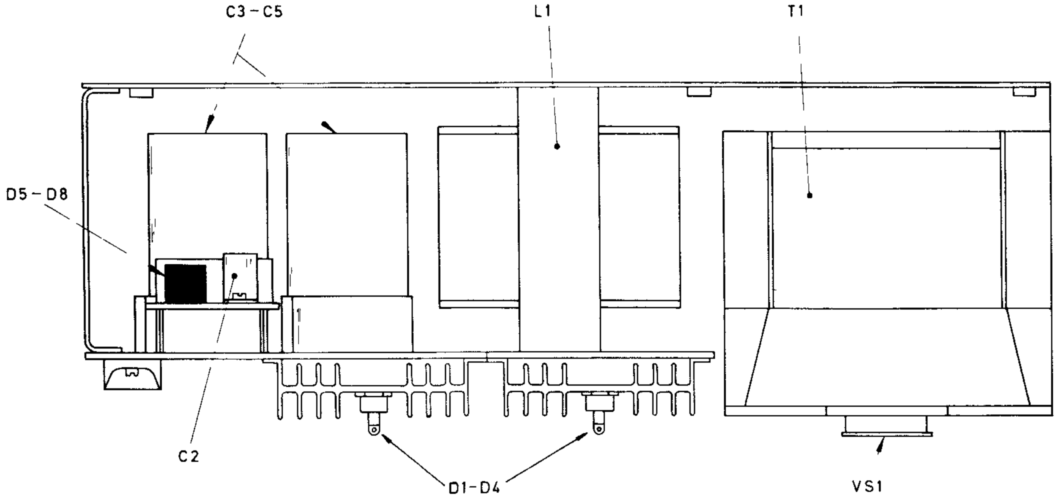
Fig.24



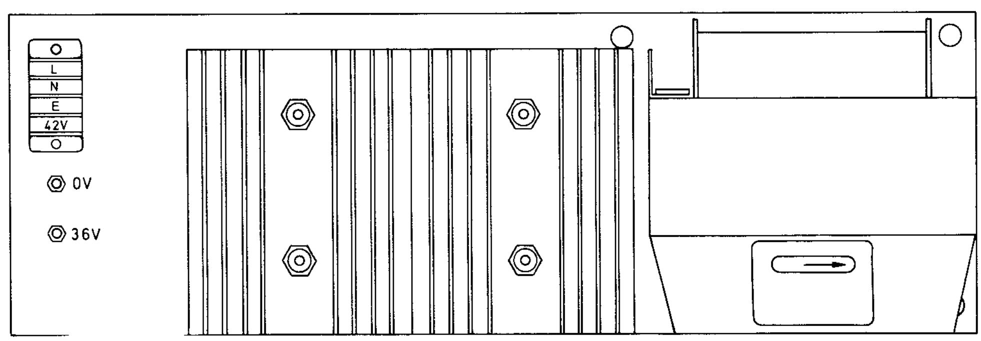
WOH 4083

Circuit: Power Supply Unit MS64

Fig. 25



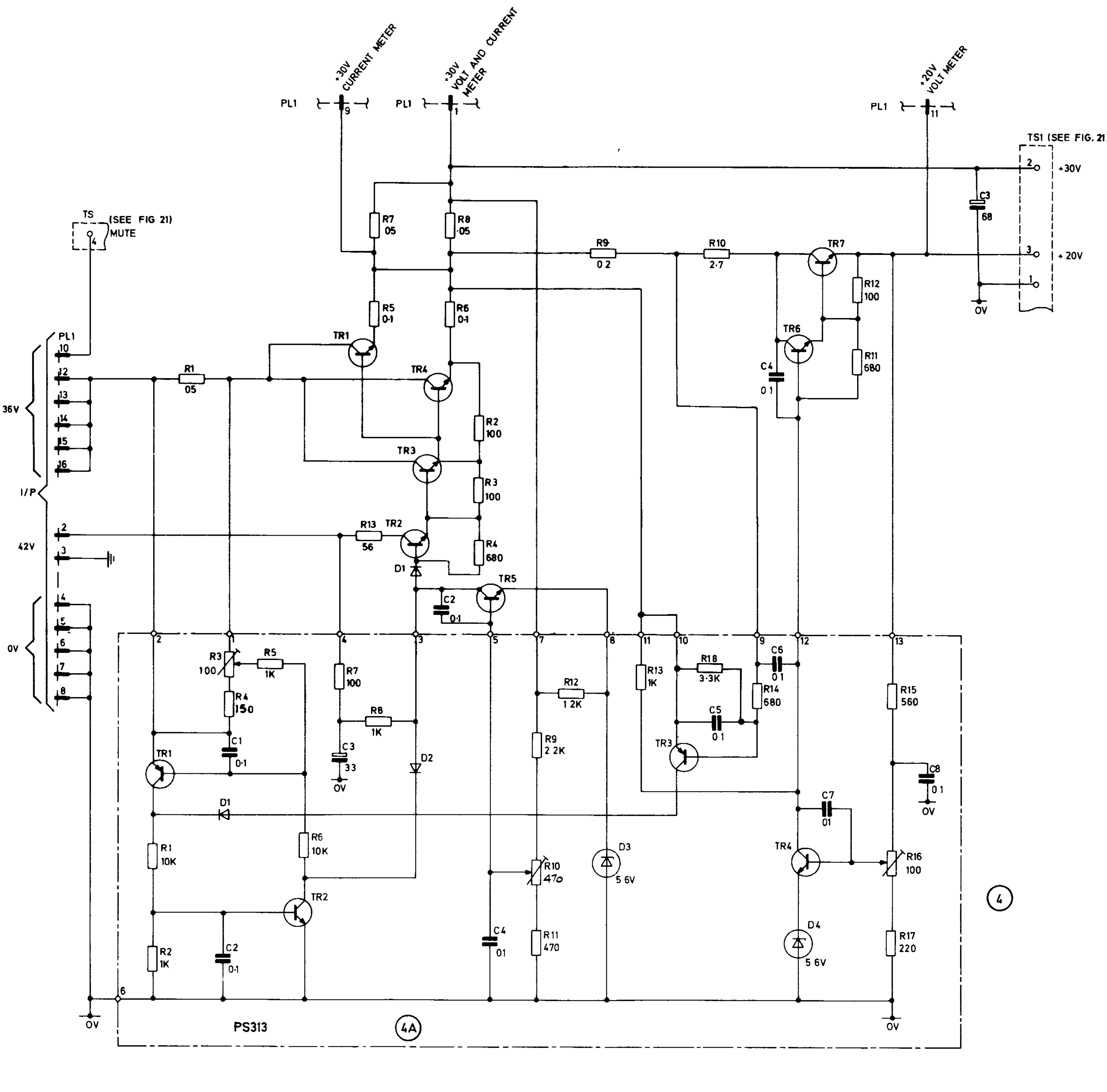
TOP VIEW



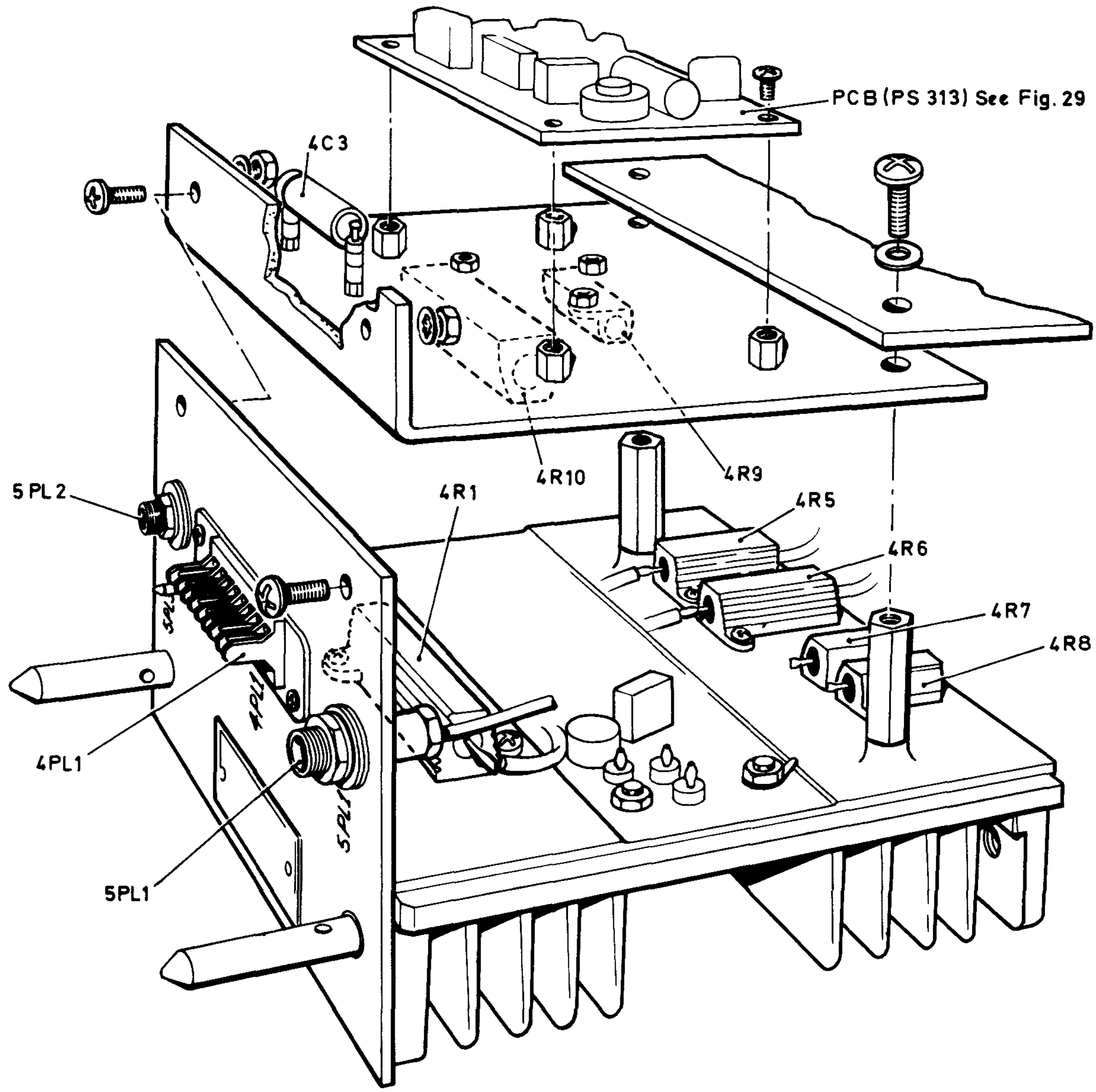
FRONT VIEW

WOH 4083

Component Layout : Power Supply Unit MS64 Fig.26



Circuit : Stabilizer Module MS440 Fig 27

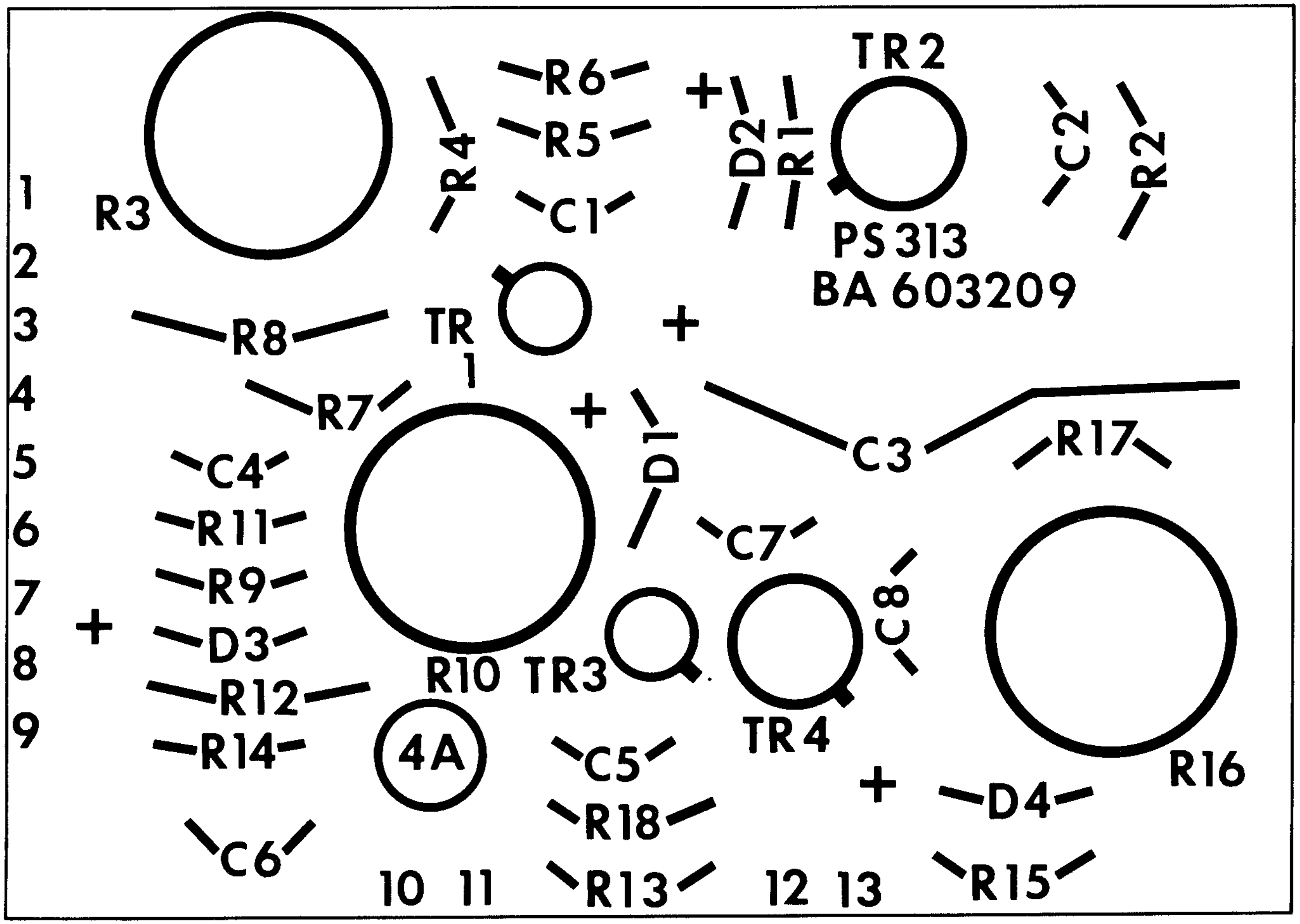


Component Layout

Stabilizer Module MS 440

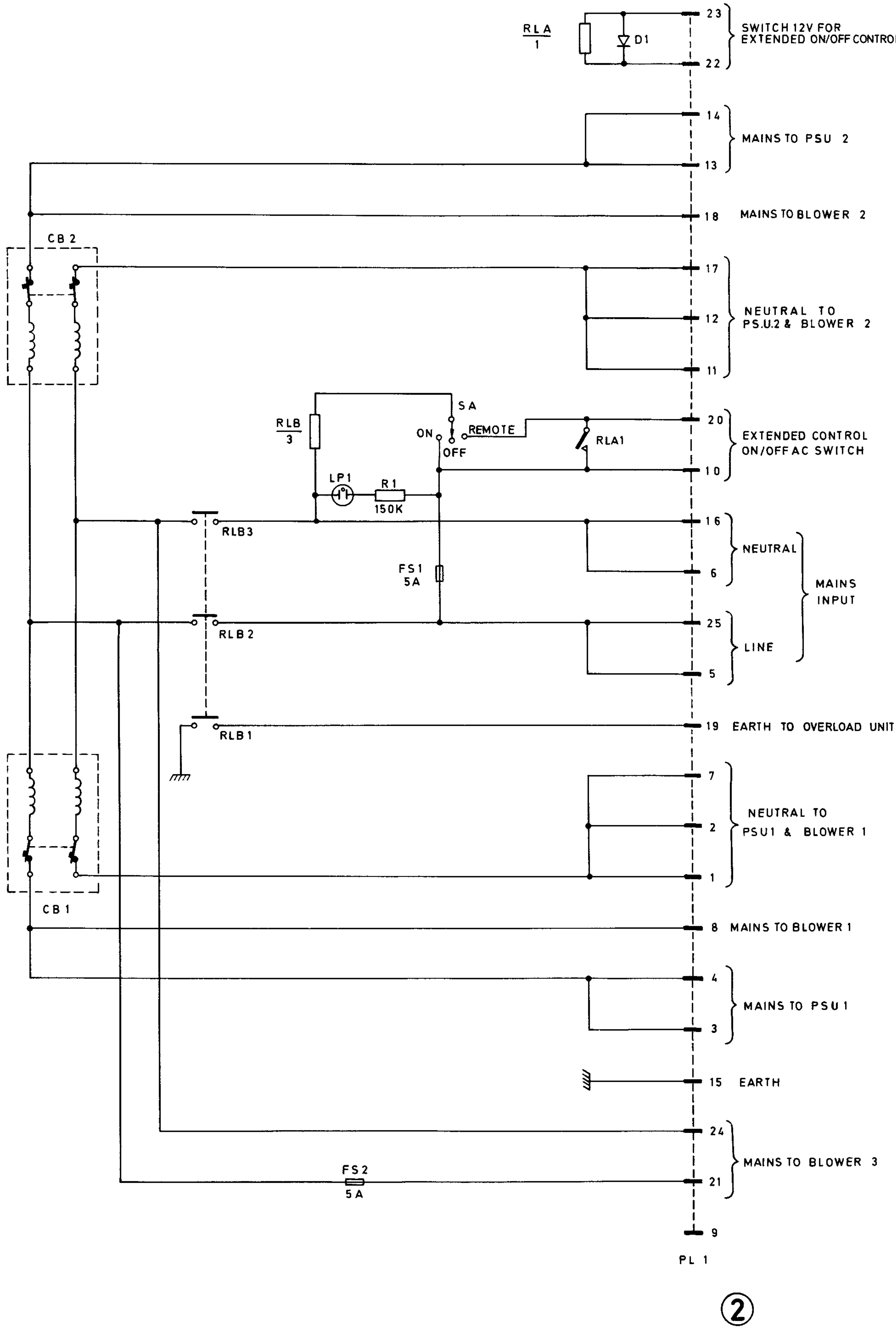
WOH4083

Fig. 28



Component Layout : Stabilizer PCB PS313 Fig. 29

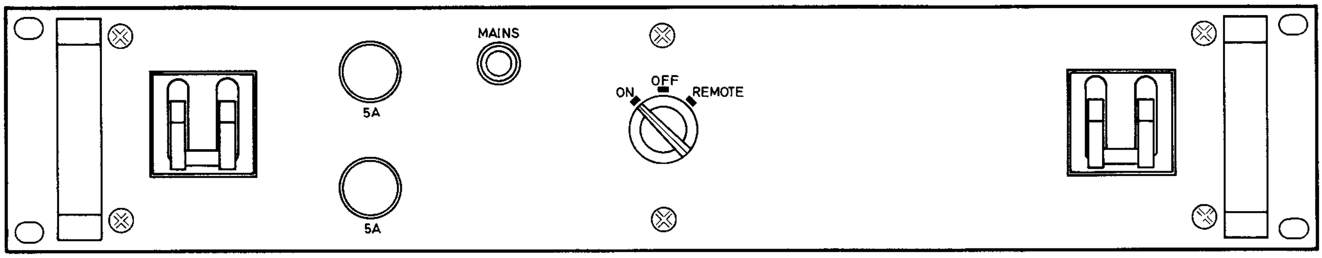
WOH 4083 BA603209



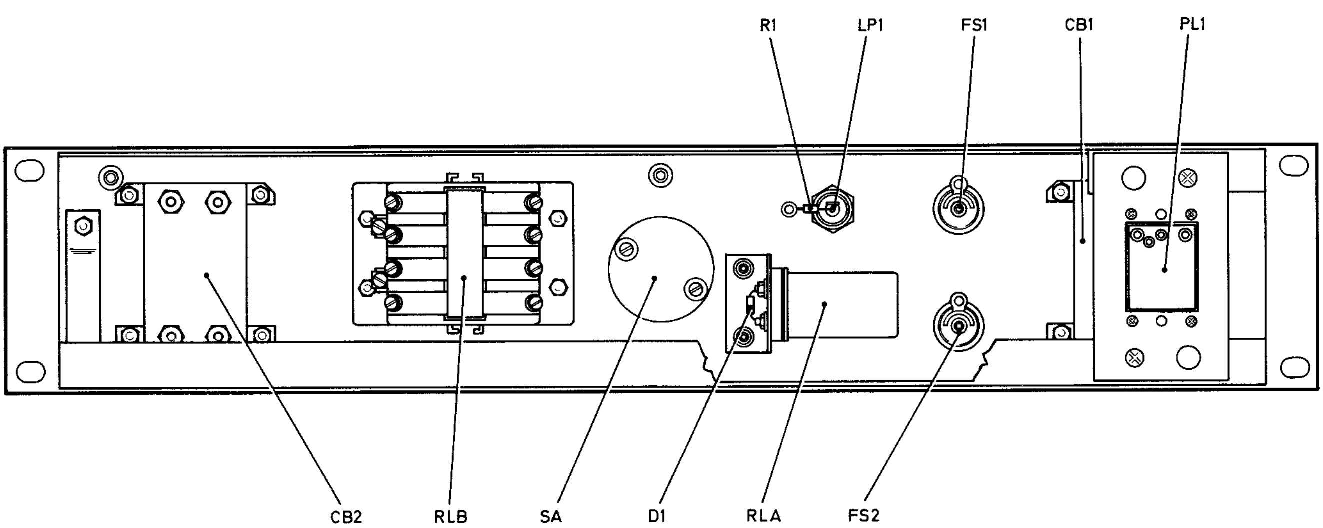
WOH 4083	CC603582
B	

Circuit : Control Panel MM377

Fig. 30

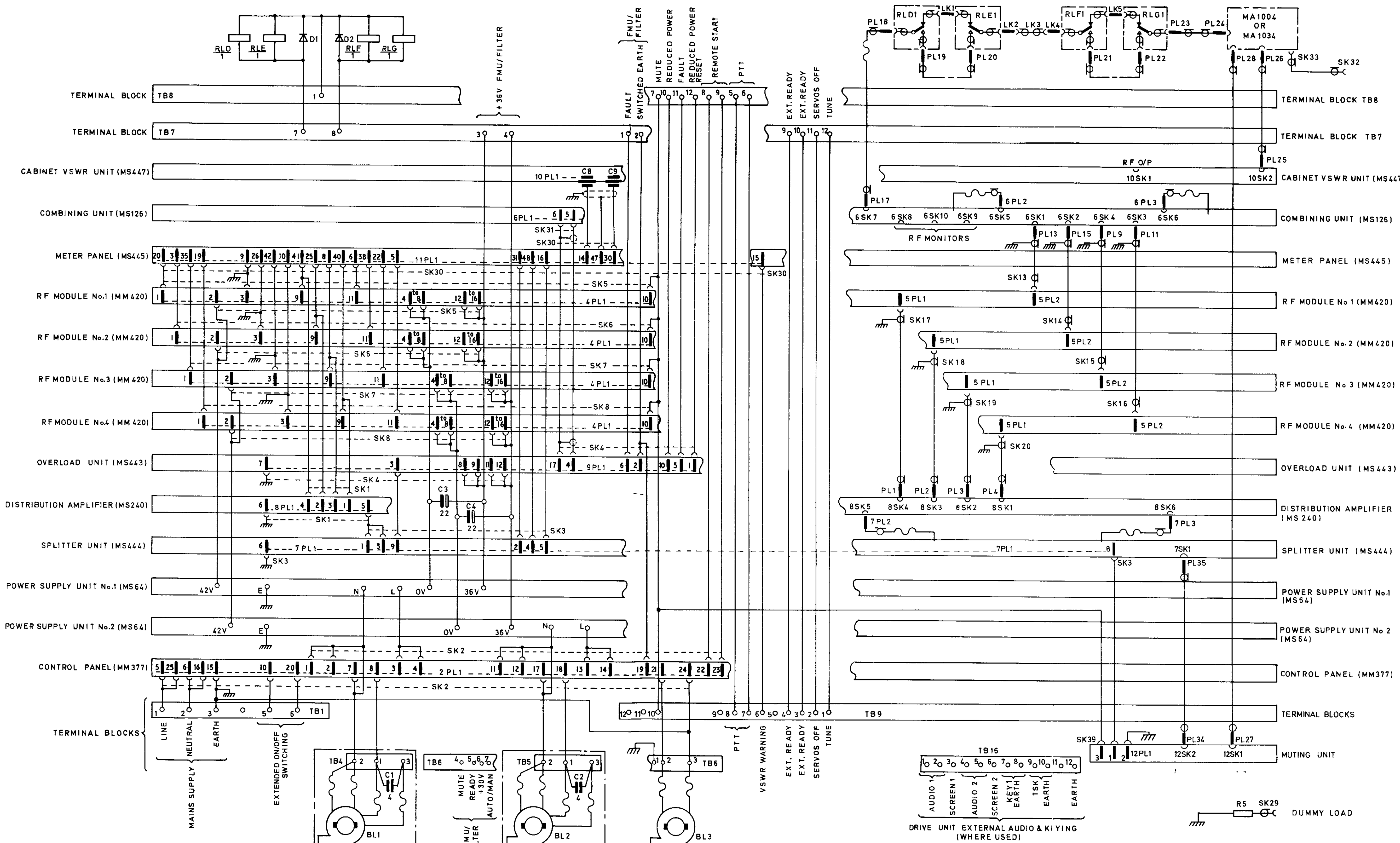


FRONT VIEW



REAR VIEW

Layout : Control Panel MM 377 **Fig.31**

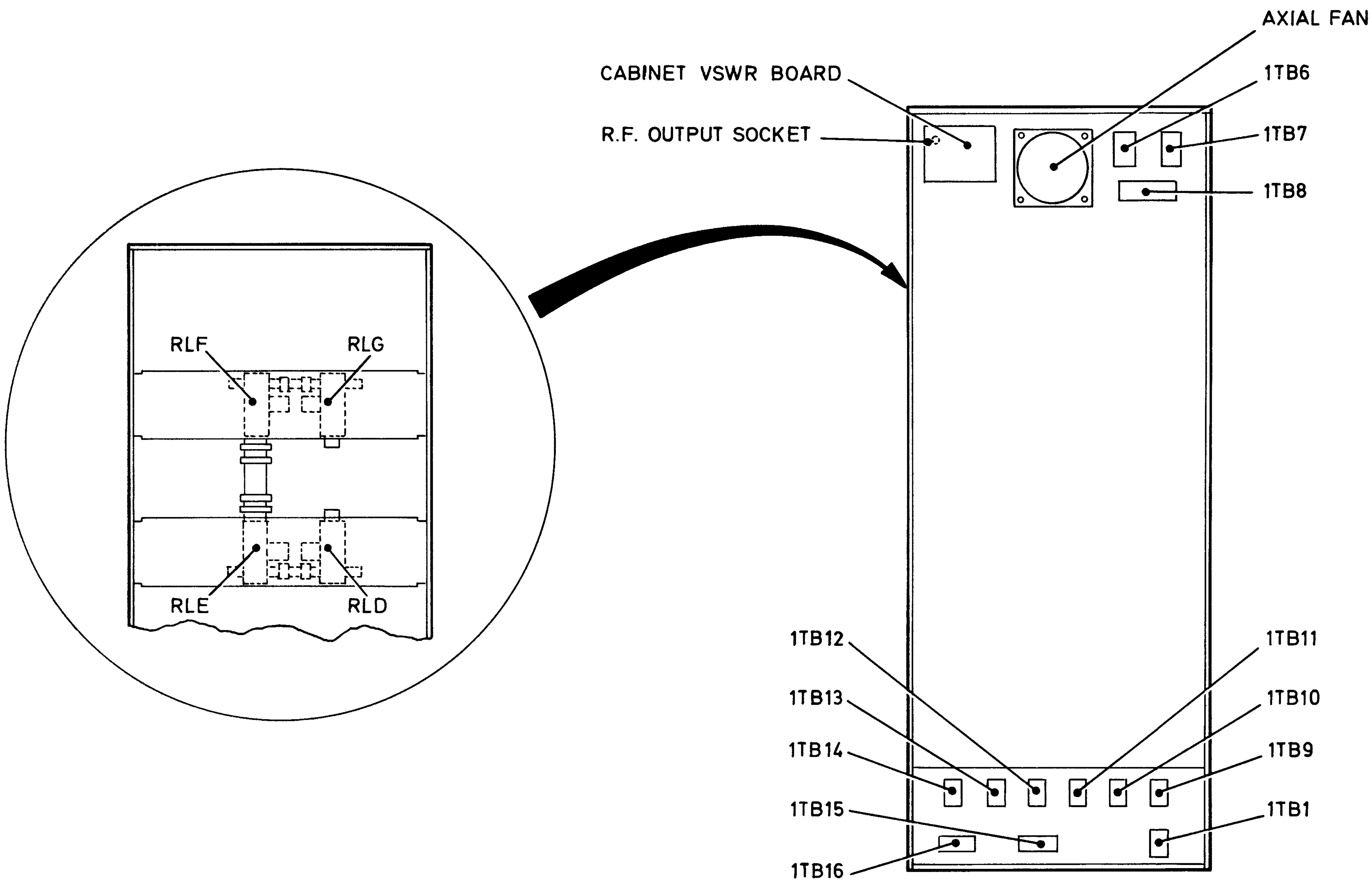


NOTE
1 CABINET COMPONENTS PREFIXED 1
2 1D1 AND 1D2 1N4002

WOH 4083	DC603501
B	

Overall Interconnecting Diagram: TA 1813

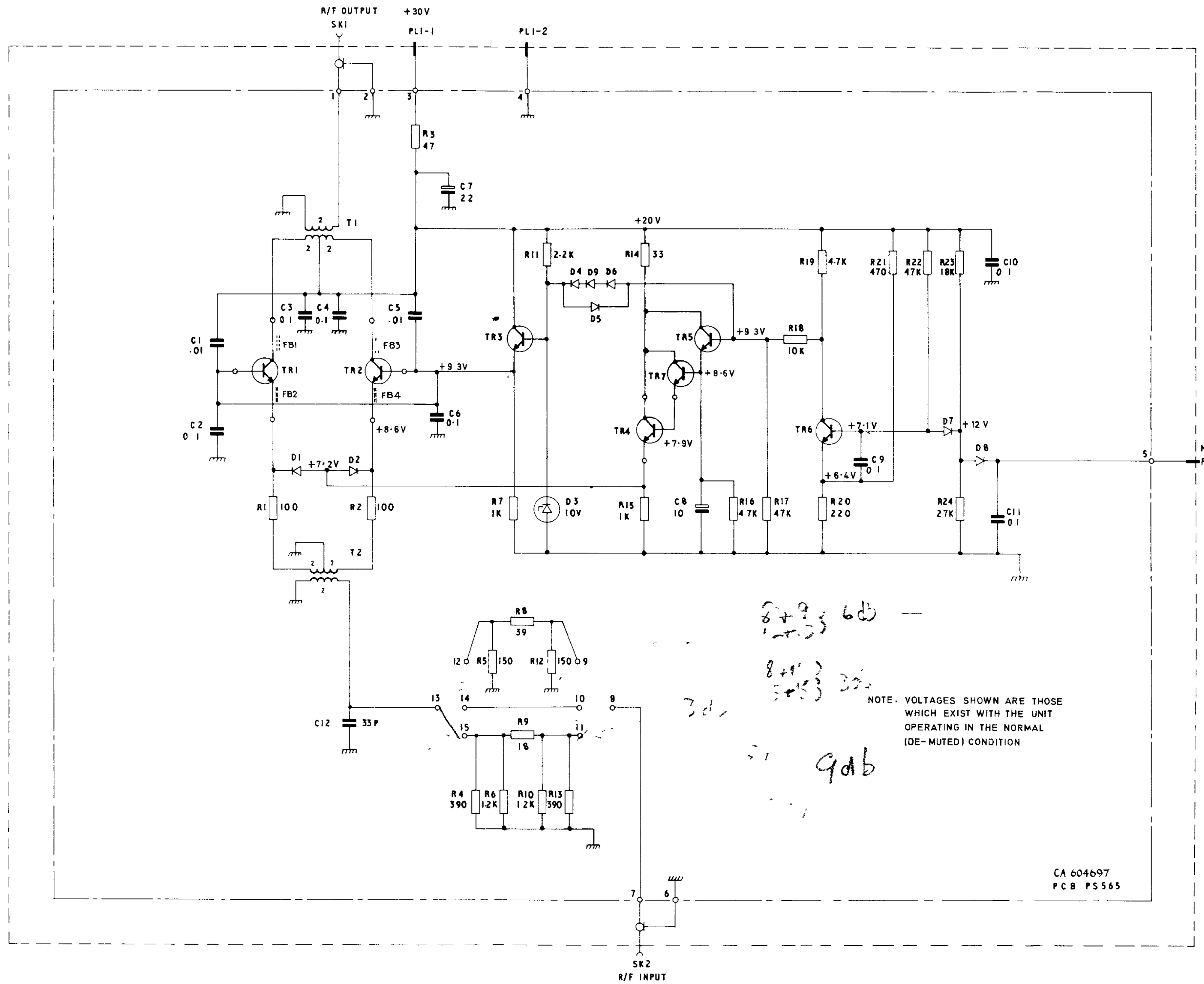
Fig.32



WOH4083

Location of Connectors, Relays etc. TA.1813

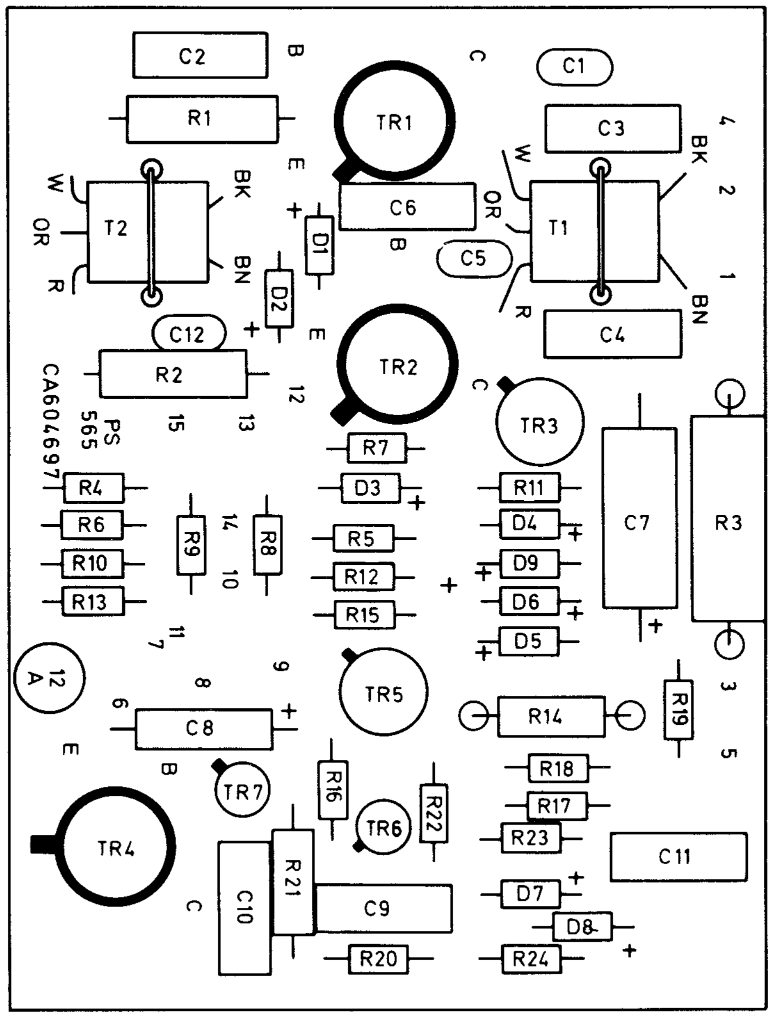
Fig. 33



WOH4083 | DC604702

Circuit: Muting Unit MS564

Fig .34



WOH 4083			
CA604697	1		

Component Layout: Muting Unit

Fig. 35

PART 3

Technical manual

MA. 1034
Switched Filter Unit

RACAL
THE ELECTRONICS GROUP

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Prepared by Technical Publications, Racal Group Services Limited.

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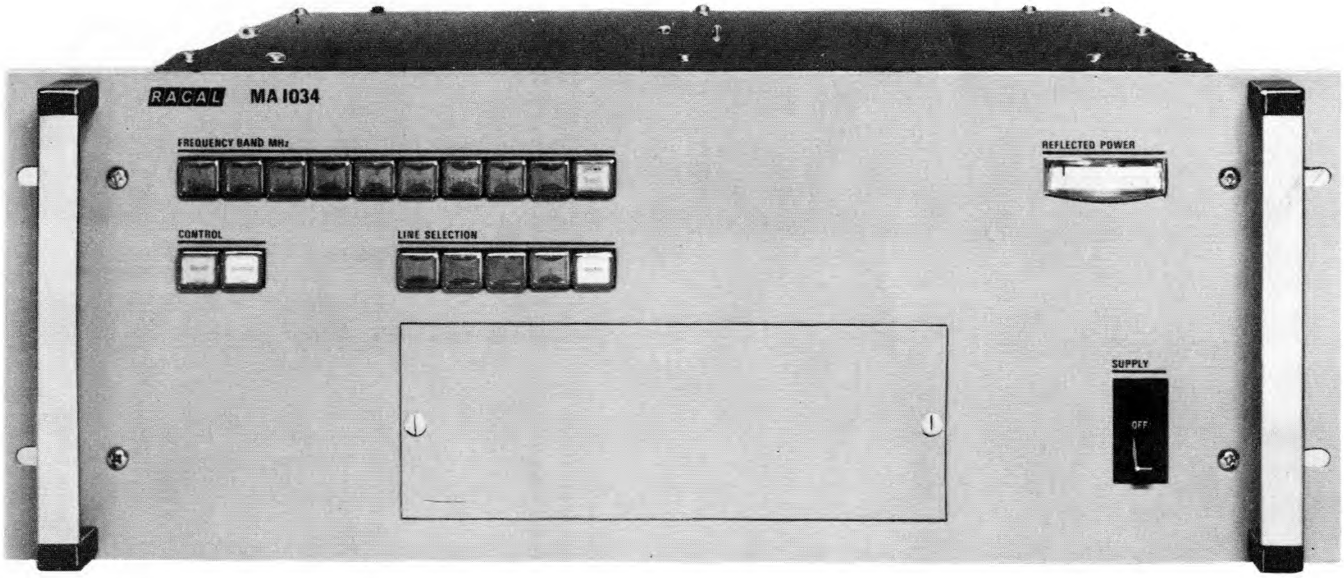

Switched Filter Unit MA.1034

SWITCHED FILTER UNIT

MA.1034

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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.

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-programme 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.

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.

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 ~~MA. 1034,~~ T.A. 1816 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 ~~MA. 1034~~ T.A. 1816., 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 motherboard, 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. <u>MA.1034B.</u> 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

	INPUT FREQUENCY LINES										BAND OUTPUTS								
MHz (DECIMAL)	10MHz (INVERTED 9's		COMPLEMENT BCD) 1MHz				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.)

	INPUT FREQUENCY LINES										BAND OUTPUTS								
MHz (DECIMAL)	10MHz (INVERTED 9's COMPLEMENT BCD)		1MHz (INVERTED 9's COMPLEMENT 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
6.0 to	0	0	1	1	0	0	1	1	1	1	0	0	0	0	1	0	0	0	0
8.1999	0	0	1	1	1	0	1	1	1	0	0	0	0	0	1	0	0	0	0
8.2 to	0	0	1	1	1	0	1	1	0	1	0	0	0	0	0	1	0	0	0
11.3999	0	1	0	1	1	1	1	1	0	0	0	0	0	0	0	1	0	0	0
11.4 to	0	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	1	0	0
15.7999	0	1	1	0	1	1	1	0	0	0	0	0	0	0	0	0	1	0	0
15.8 to	0	1	1	0	1	1	0	1	1	1	0	0	0	0	0	0	0	1	0
21.9999	1	0	0	1	1	1	0	1	1	0	0	0	0	0	0	0	0	1	0
22 to	1	0	1	0	0	0	1	1	1	1	0	0	0	0	0	0	0	0	1
29.9999	1	0	1	1	1	1	0	1	1	0	0	0	0	0	0	0	0	0	1

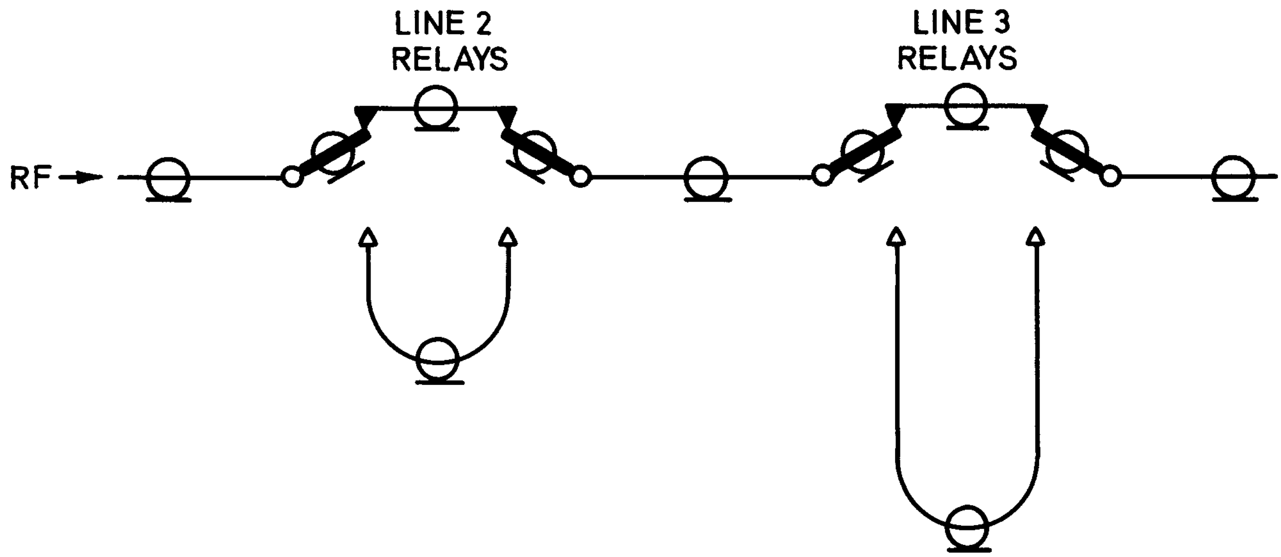
NOTE: 0 = 0V approximately.
1 = +12V approximately.

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

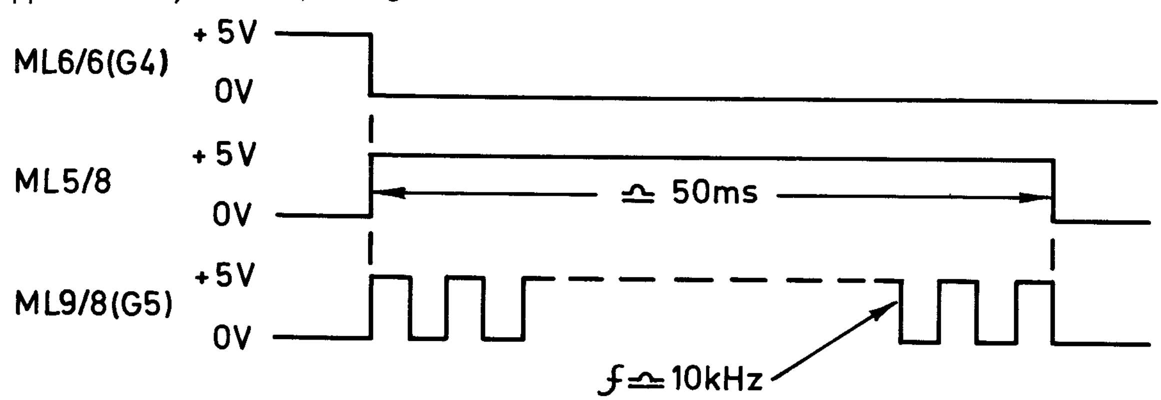
22. Manual Selection. Manual selection can only occur when the LOCAL push-button, SE, is pressed. Selection of the lines by the MA.1034 requires the use of two outputs, designated LINE 2 and LINE 3. From Figure 4-1, the four line lengths are selected as follows:-

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.

Filter Assembly — Fig.5

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.

Reflected Power Unit — Figs. 5,6 and 10

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 $\pm$ 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 $\pm$ 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.

<u>NO RF OUTPUT</u>

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.

ORDERS FOR SPARE PARTS

In order to expedite handling of spare part orders please quote:-

(1) Type and serial number of equipment.

(2) Circuit reference, description, Racal part number, and manufacturer of part required.

(3) Quantity required.

NOTE: If the equipment is designed on a modular basis, please include the type and description of the module for which the replacement part is required.

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
		<u>Control Board - PS507</u>				<u>Fig.16</u>
<u>Resistors</u>			<u>W</u>			
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

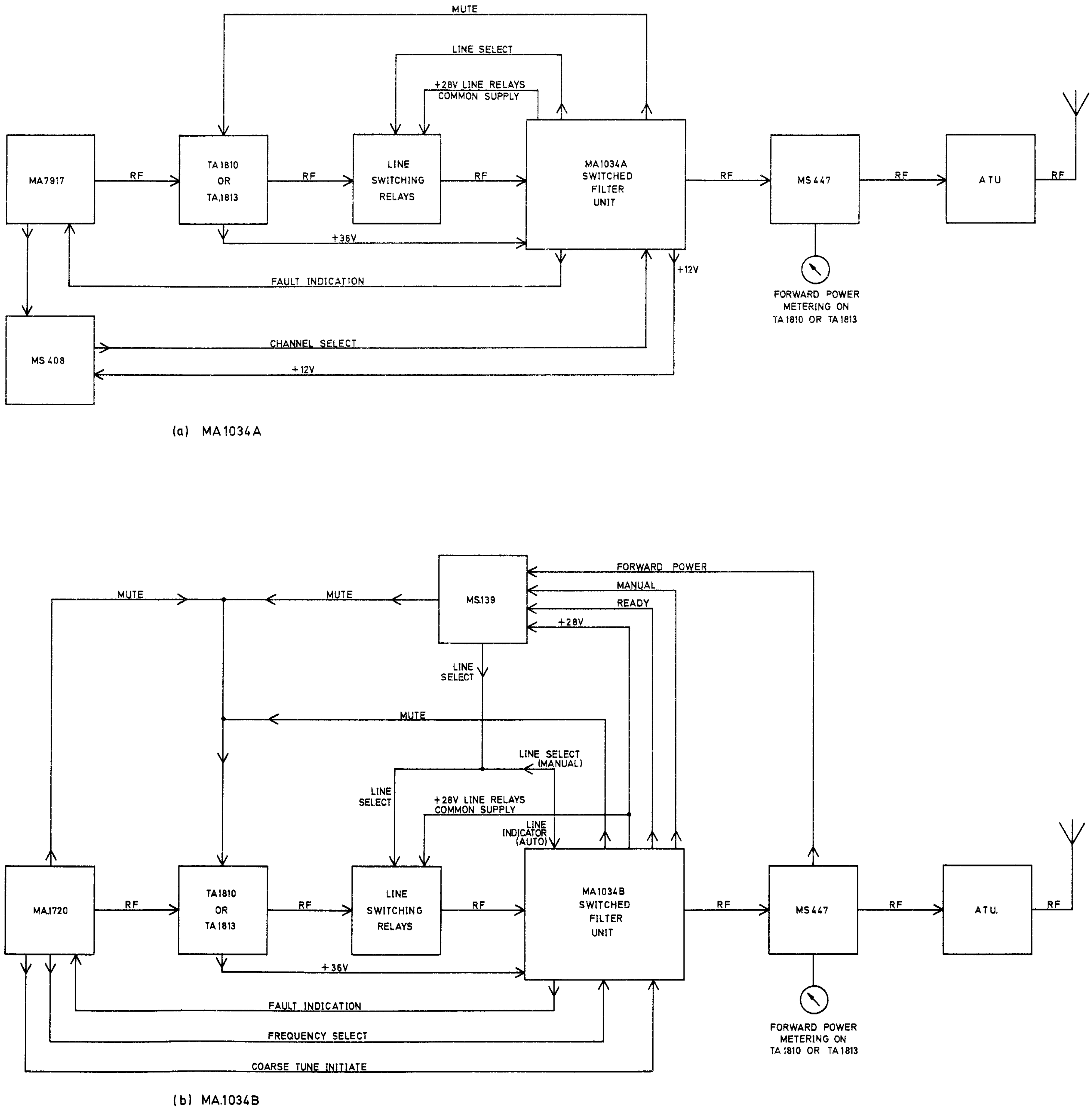
Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number	Manufacturer
Resistors (Contd.)			W			
R36	1.2k	Metal Oxide		5	908285	Electrosil TR4
R37	15k	Metal Oxide		5	908280	Electrosil TR4
R38	1.8k	Metal Oxide		5	908283	Electrosil TR4
R39	1.8k	Metal Oxide		5	908283	Electrosil TR4
R40	4.7k	Metal Oxide		5	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



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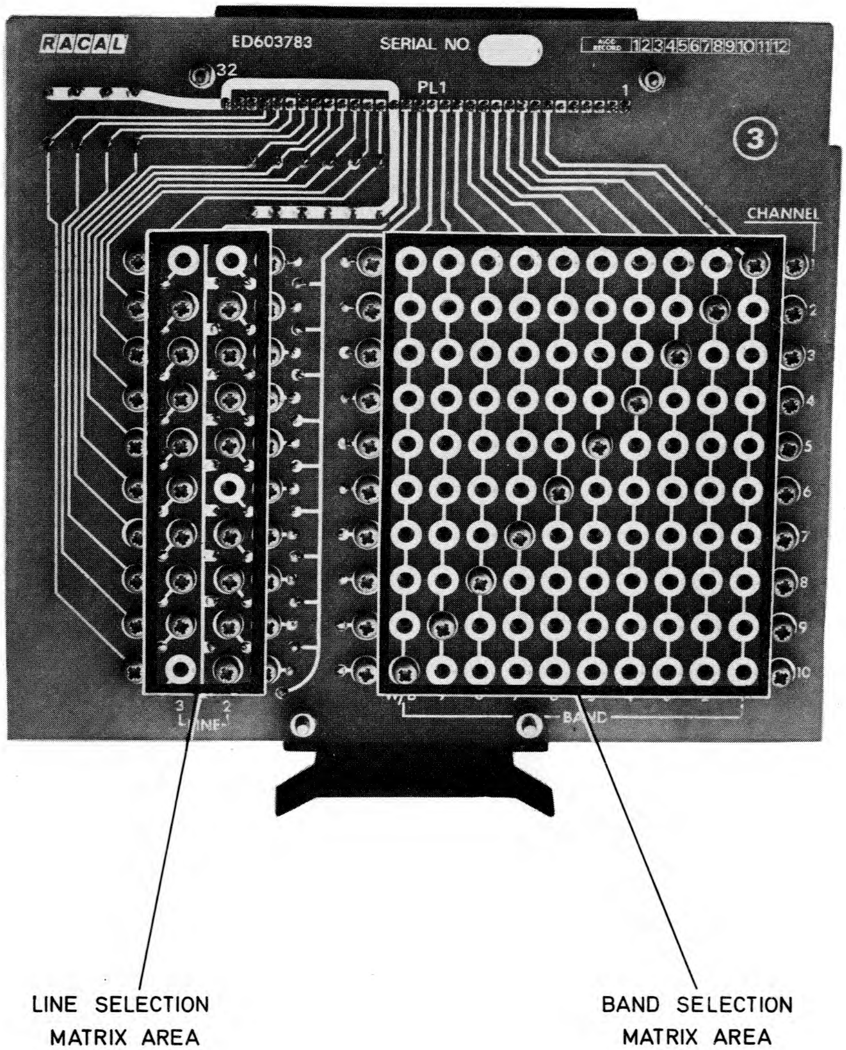
External Signal and Control Flow in a Typical Installation Fig.1

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 332CL
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



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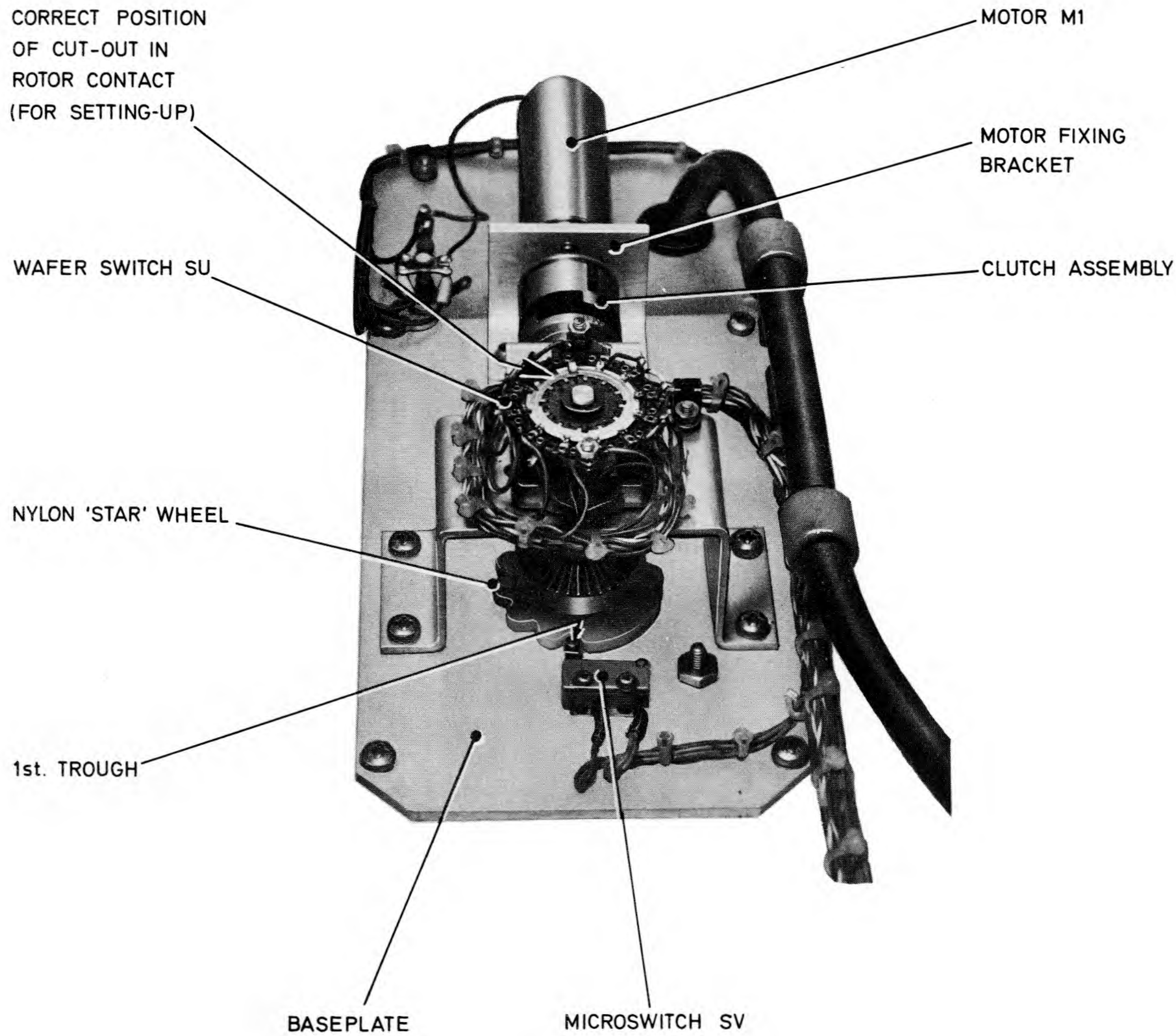
Matrix Board Programming

Fig. 2



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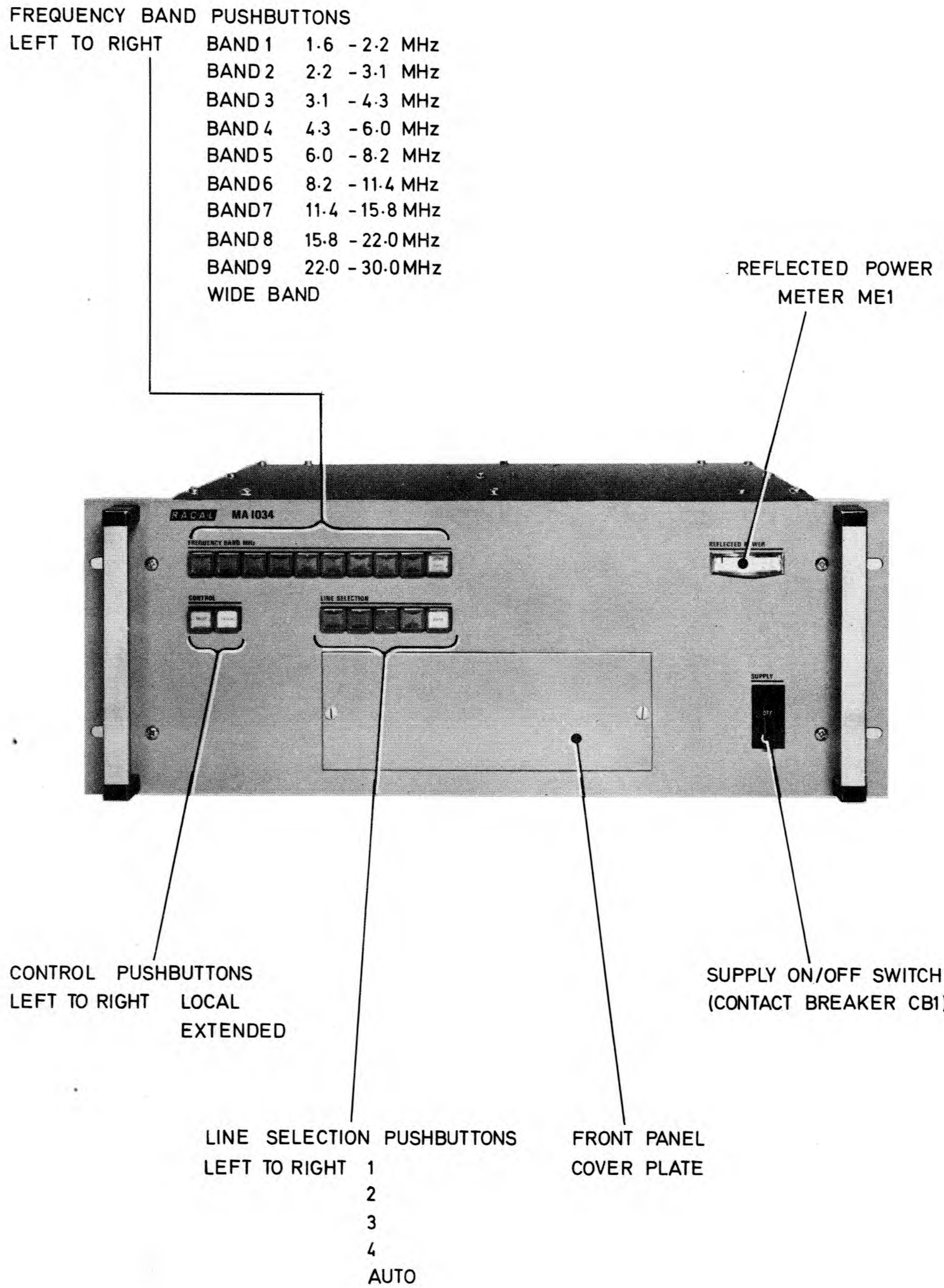
Wafer Switch Alignment

Fig. 3



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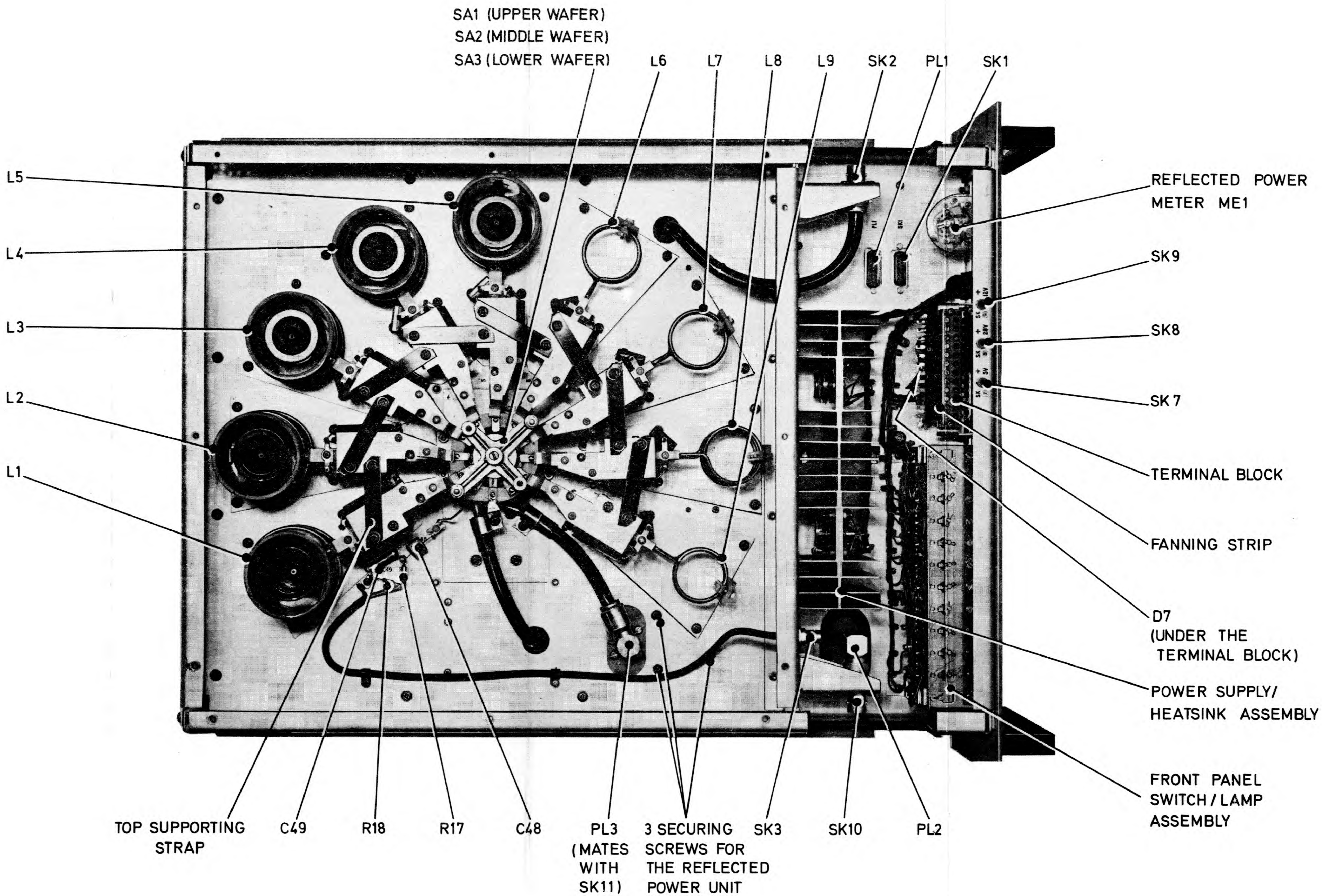
Layout : Front Panel - MA.1034

Fig. 4



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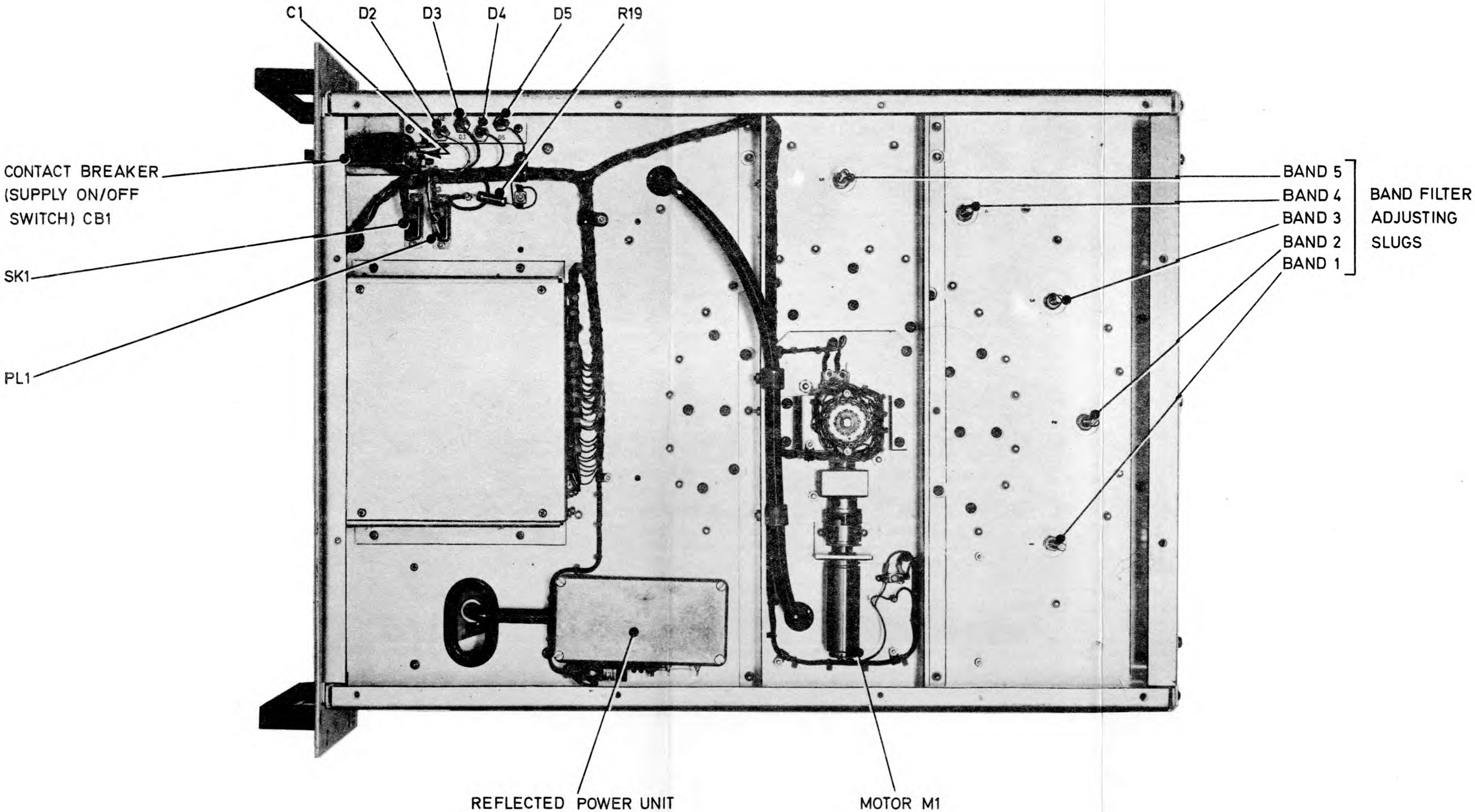
Layout: Upper Compartment - MA.1034

Fig. 5



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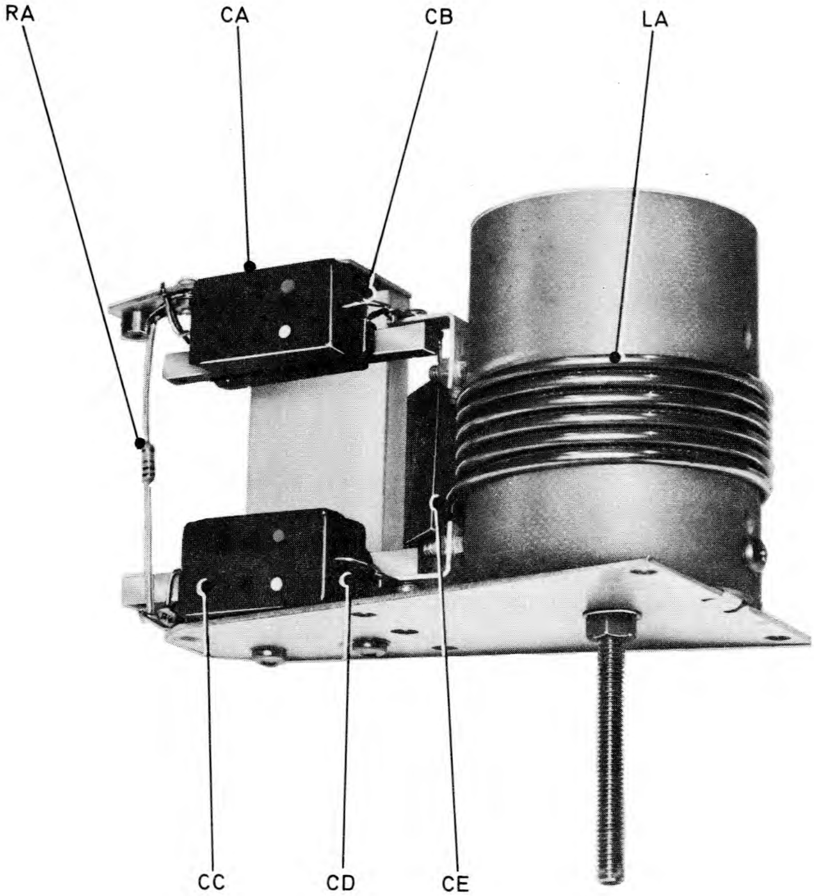
Layout : Lower Compartment - MA.1034

Fig. 6

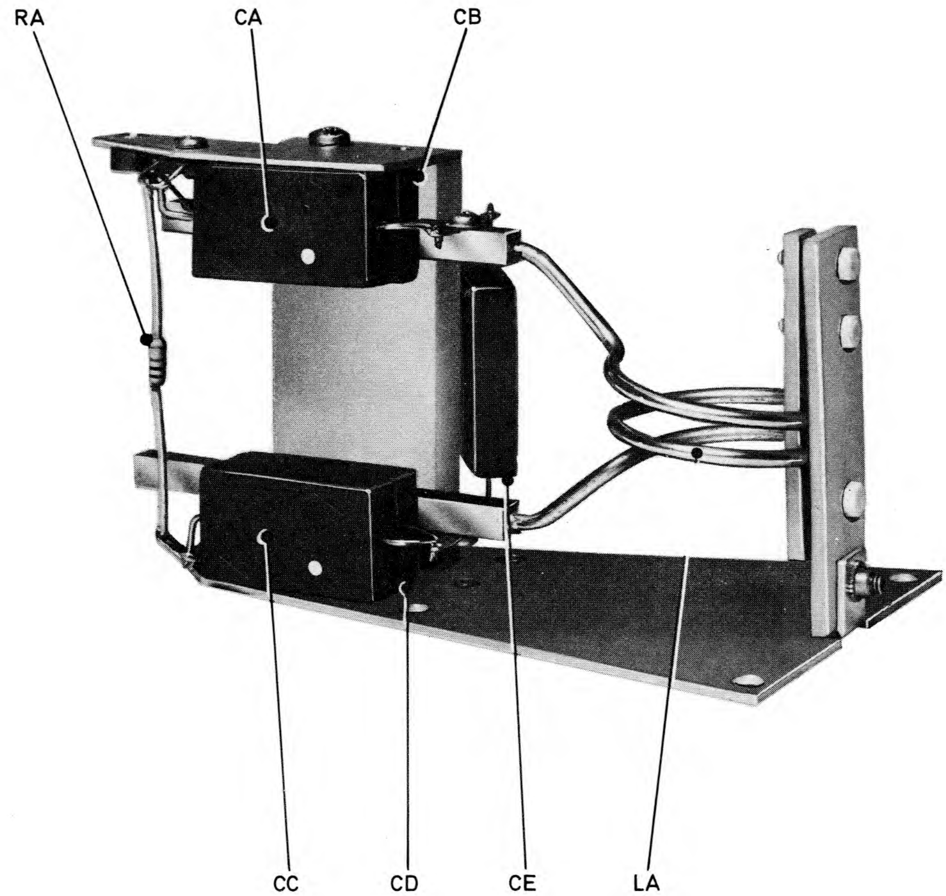


	BAND FILTER 1	2	3	4	5
RA	R15	R16	R8	R9	R10
CA	C30	C31	C32	C33	C34
CB	C39	C40	C41	C42	C43
CC	C3	C4	C5	C6	C7
CD	C12	C13	C14	C15	C16
CE	C21	C22	C23	C24	C25
LA	L1	L2	L3	L4	L5

WOH3117C

Layout : Adjustable-core Band Filters

Fig. 7

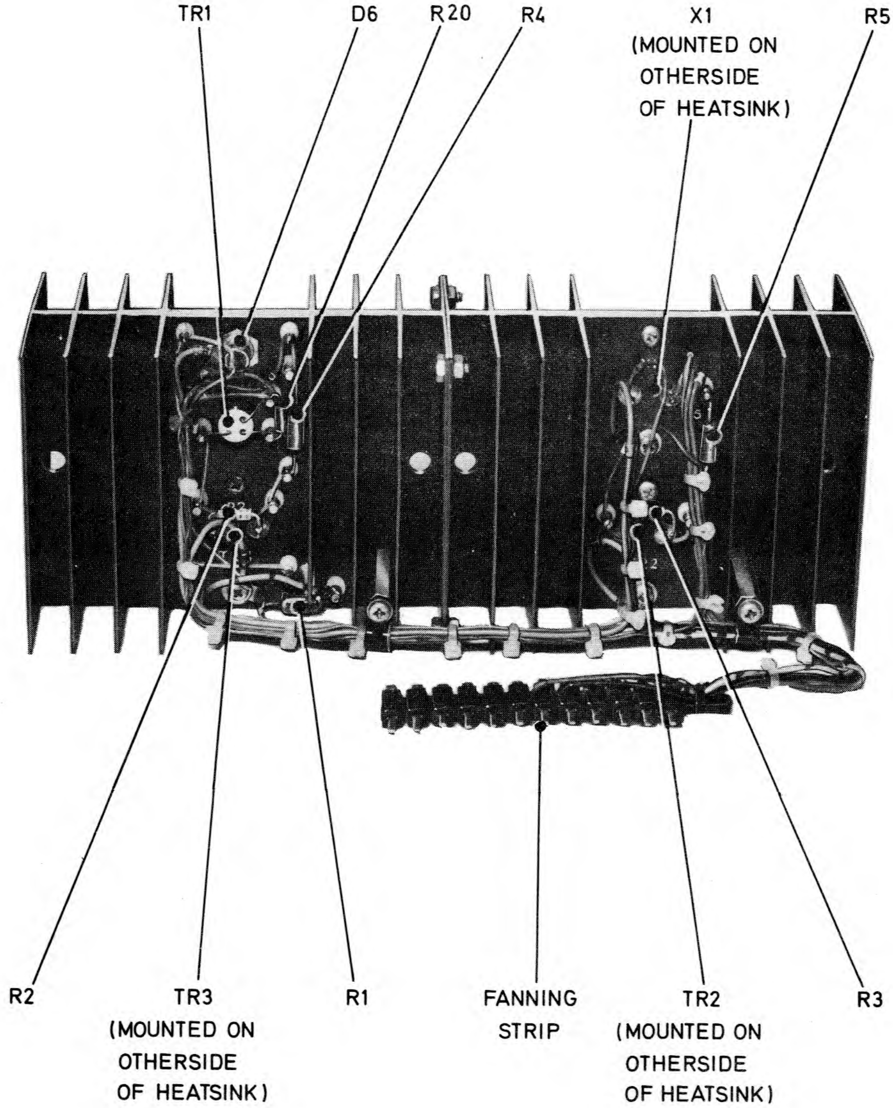


	BAND FILTER 6	7	8	9
RA	R11	R12	R13	R14
CA	C35	C36	C37	C38
CB	C44	C45	C46	C47
CC	C8	C9	C10	C11
CD	C17	C18	C19	C20
CE	C26	C27	C28	C29
LA	L6	L7	L8	L9

WOH3117C

Layout : Air-cored Band Filters

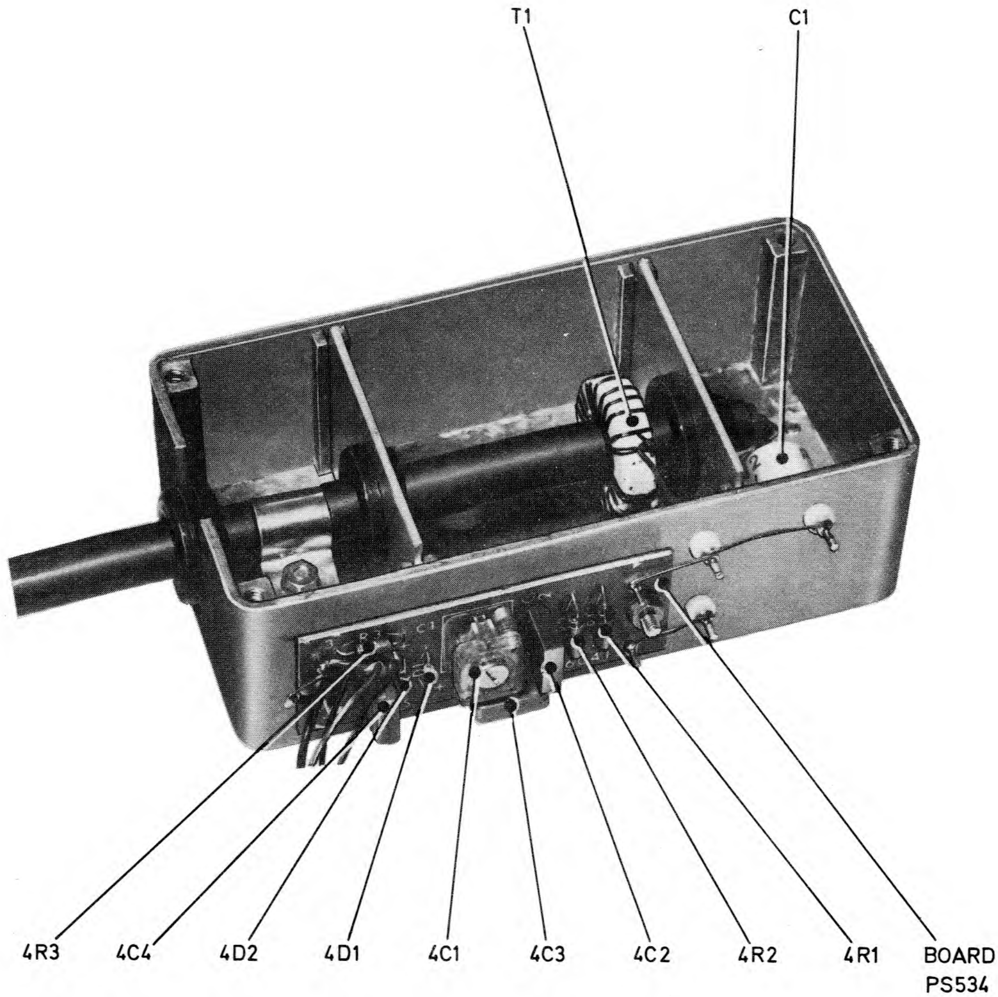
Fig. 8



WOH3117C

Layout : Power Supply / Heatsink Assembly

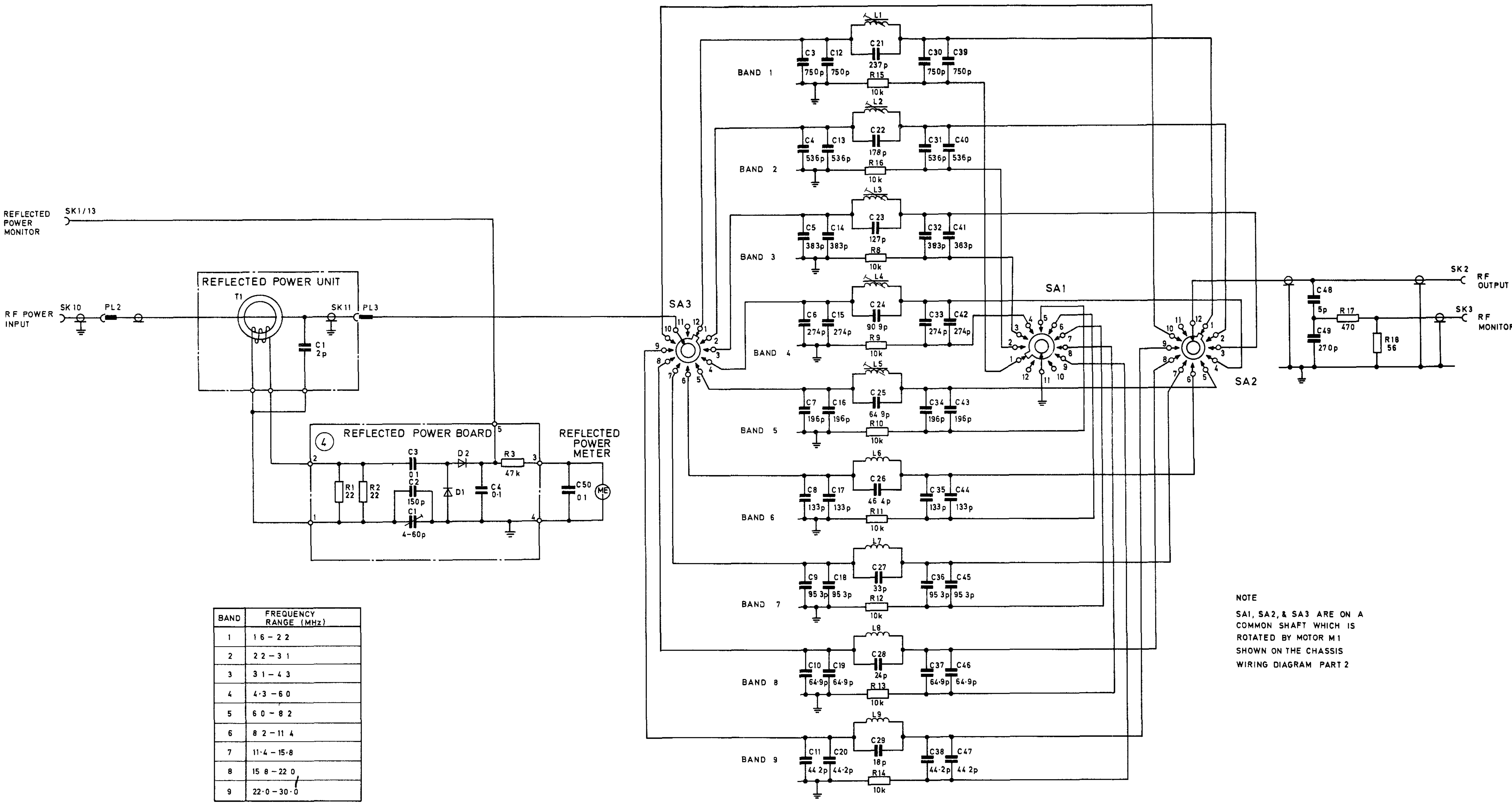
Fig. 9



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

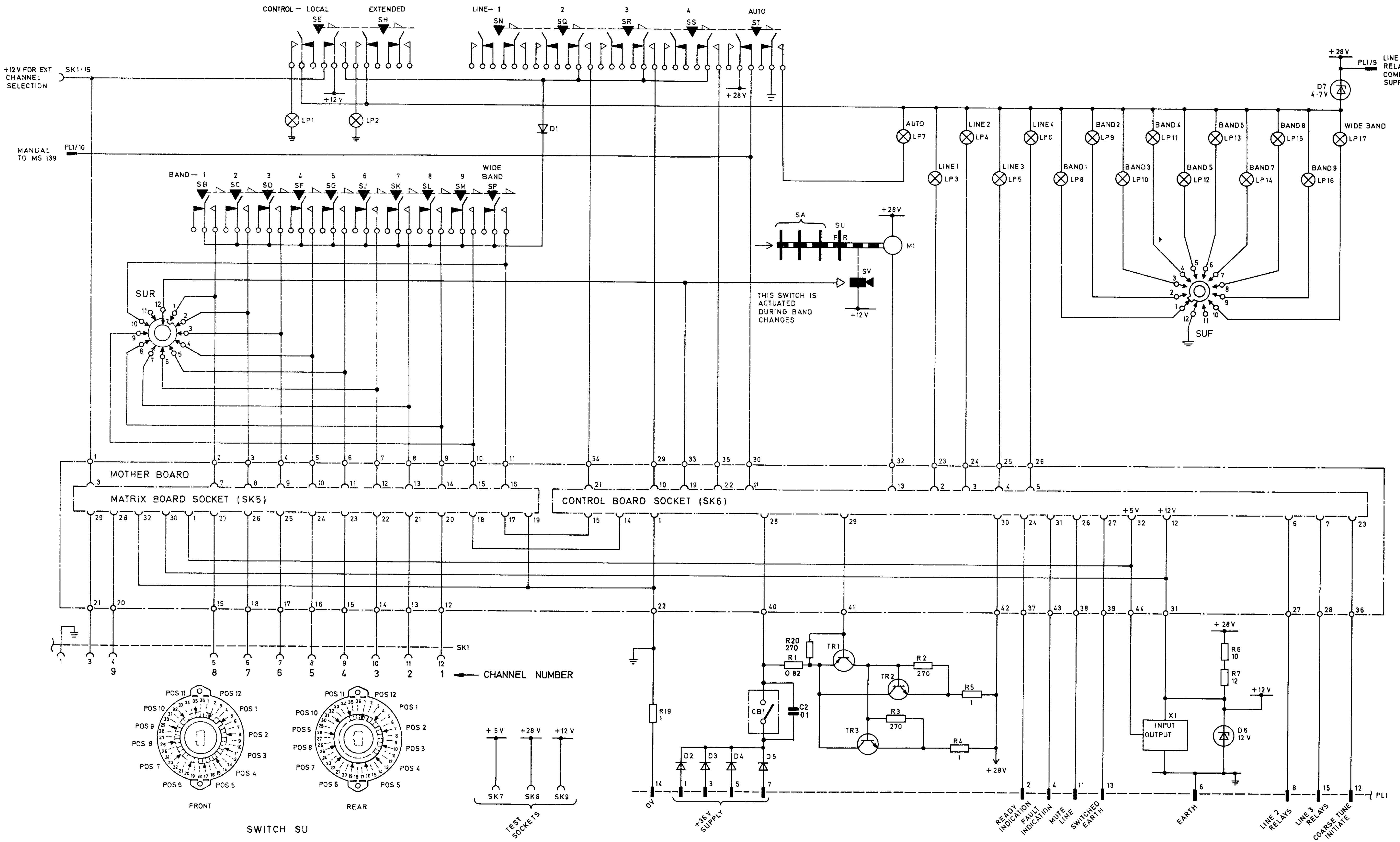
NOTE

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

WOH 3117 C	EC 603753
PL F	

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

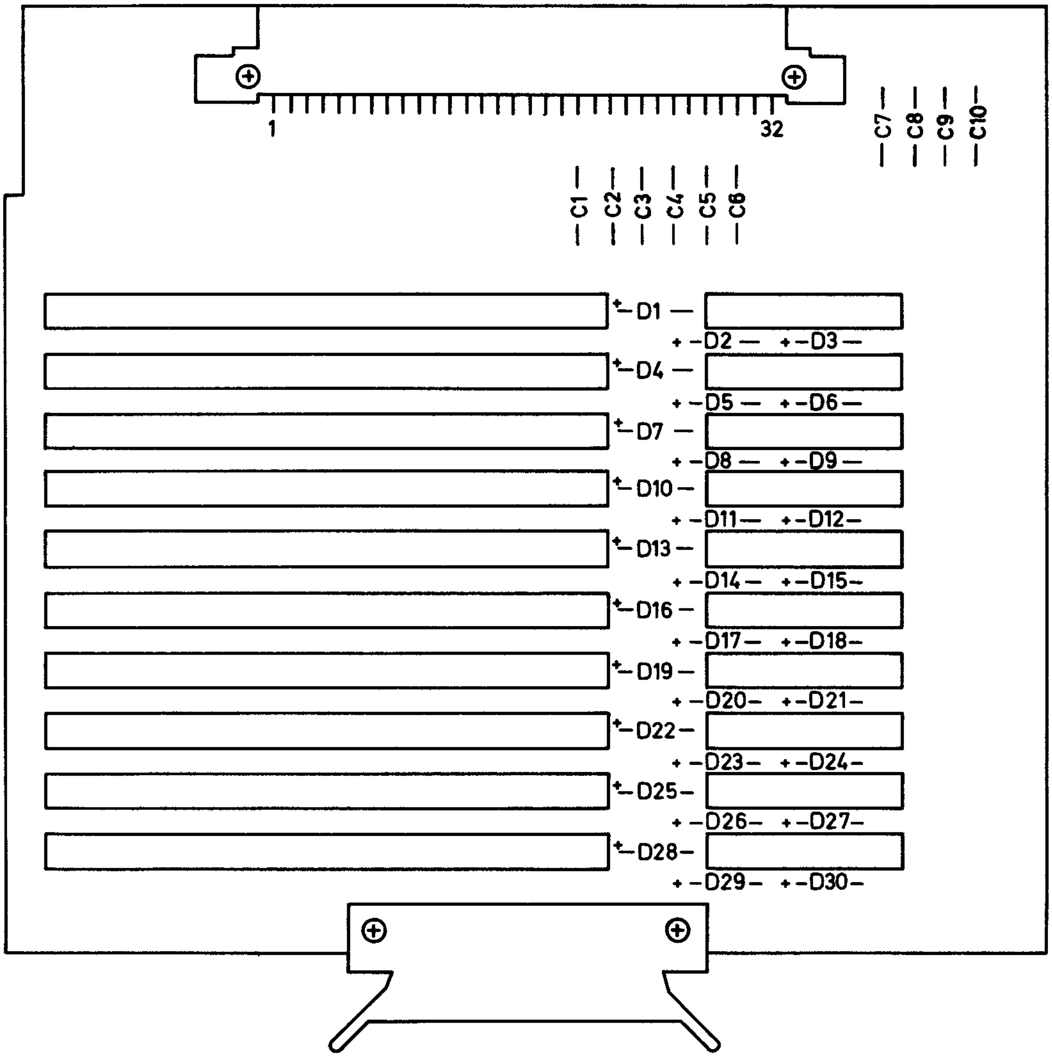
Fig. 11



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

Fig.12

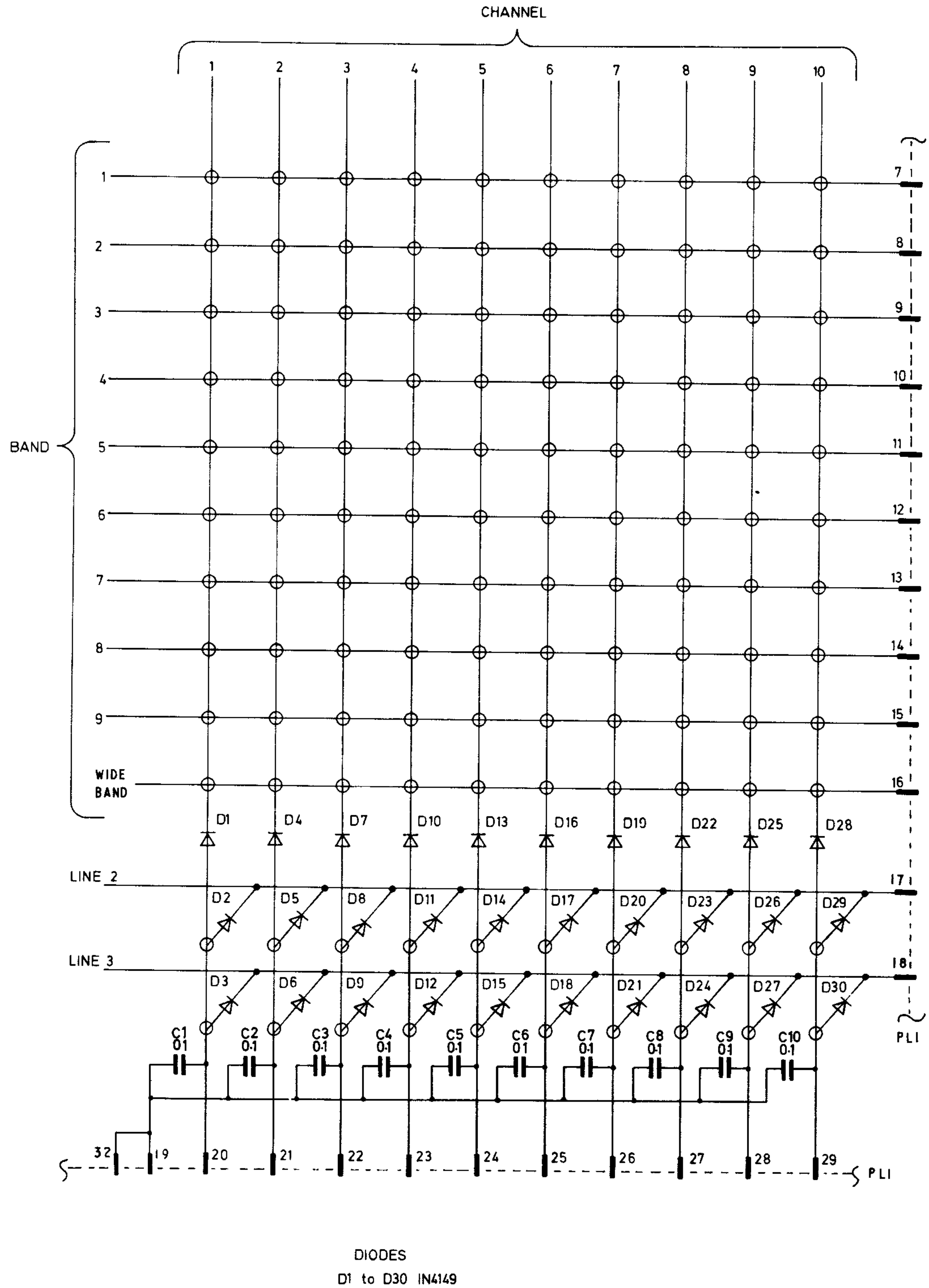
WOH 3117 C	EC 603753
E PL F	



WOH3117C	BA603784
PL	

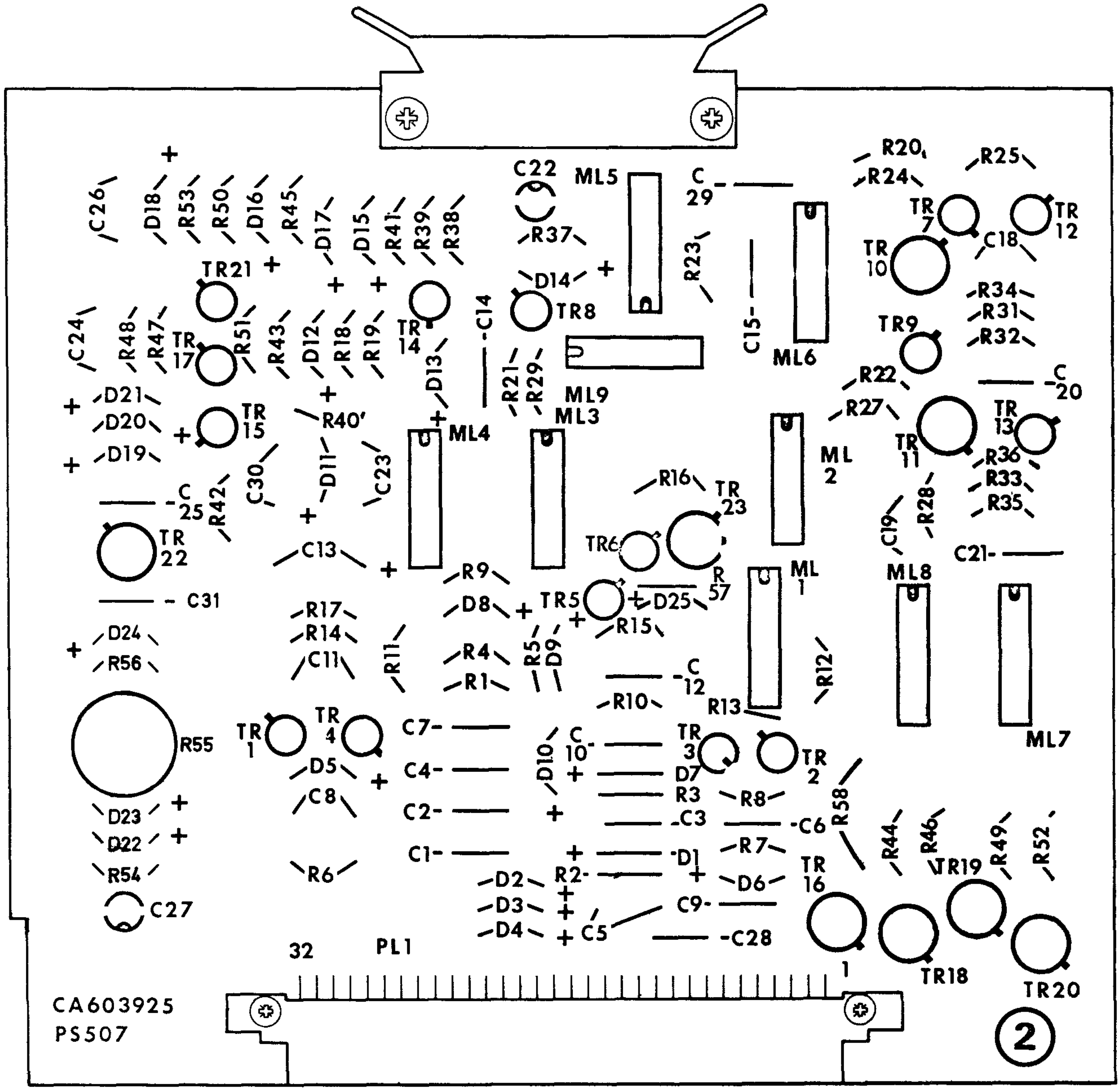
Layout : Matrix Board PS506

Fig.13



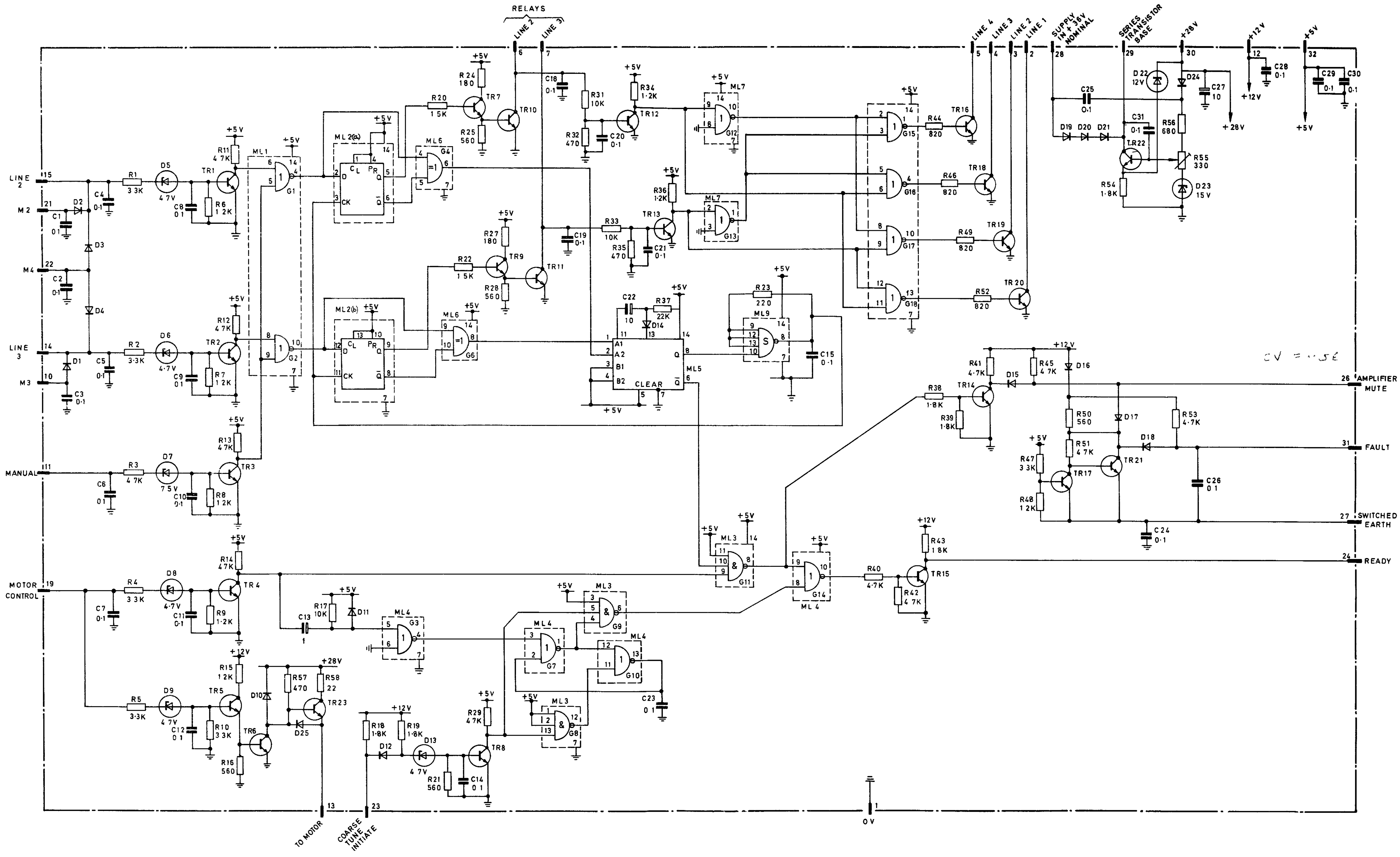
WOH3117C	CC603784
1	

Circuit : Matrix Board PS506 **Fig. 14**



WOH3117C	ED603927	SHT.4
C D		

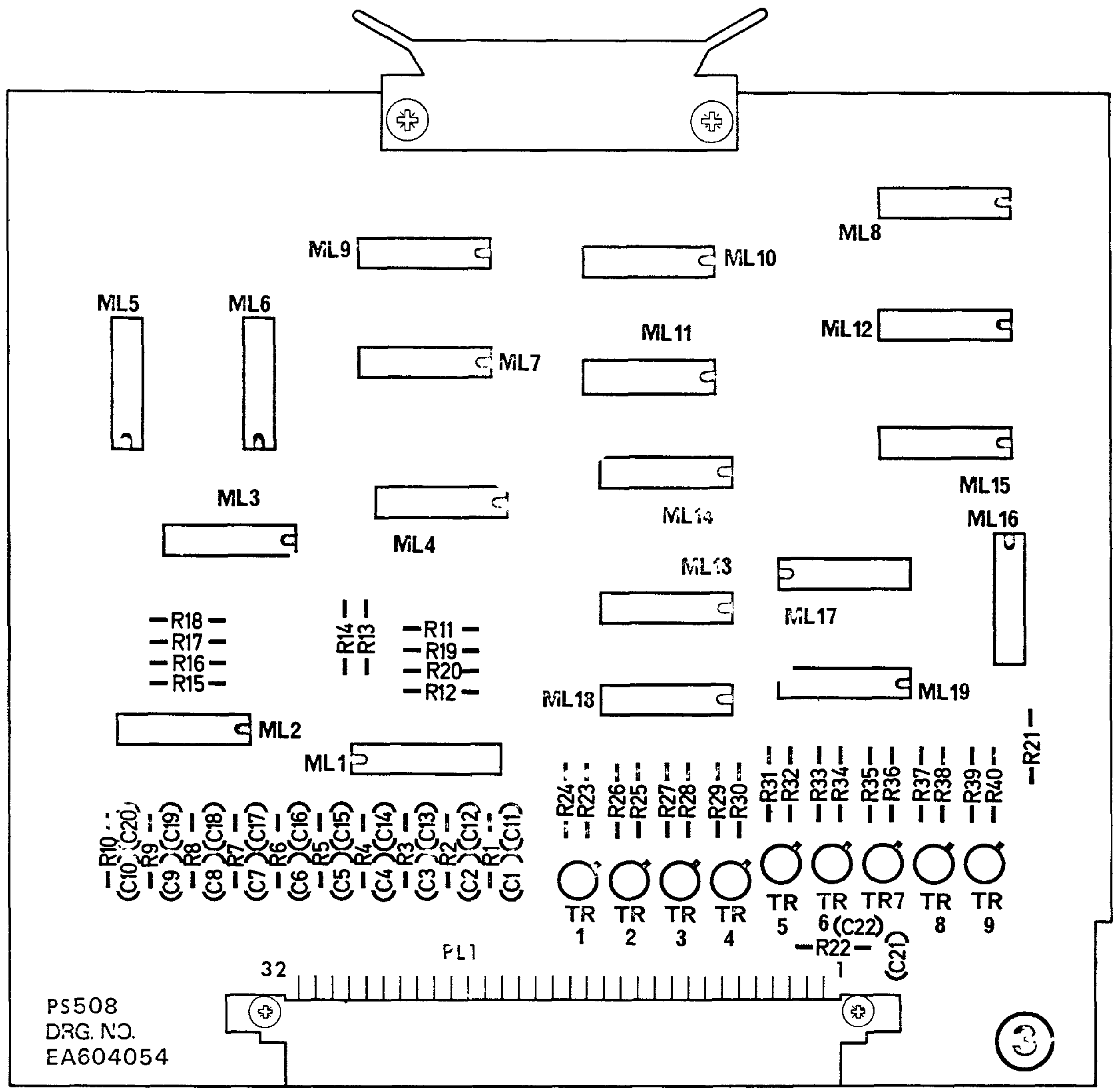
Layout: Control Board PS507 **Fig.15**



WOH3117C	DC603925
PL	

Circuit: Control Board PS507

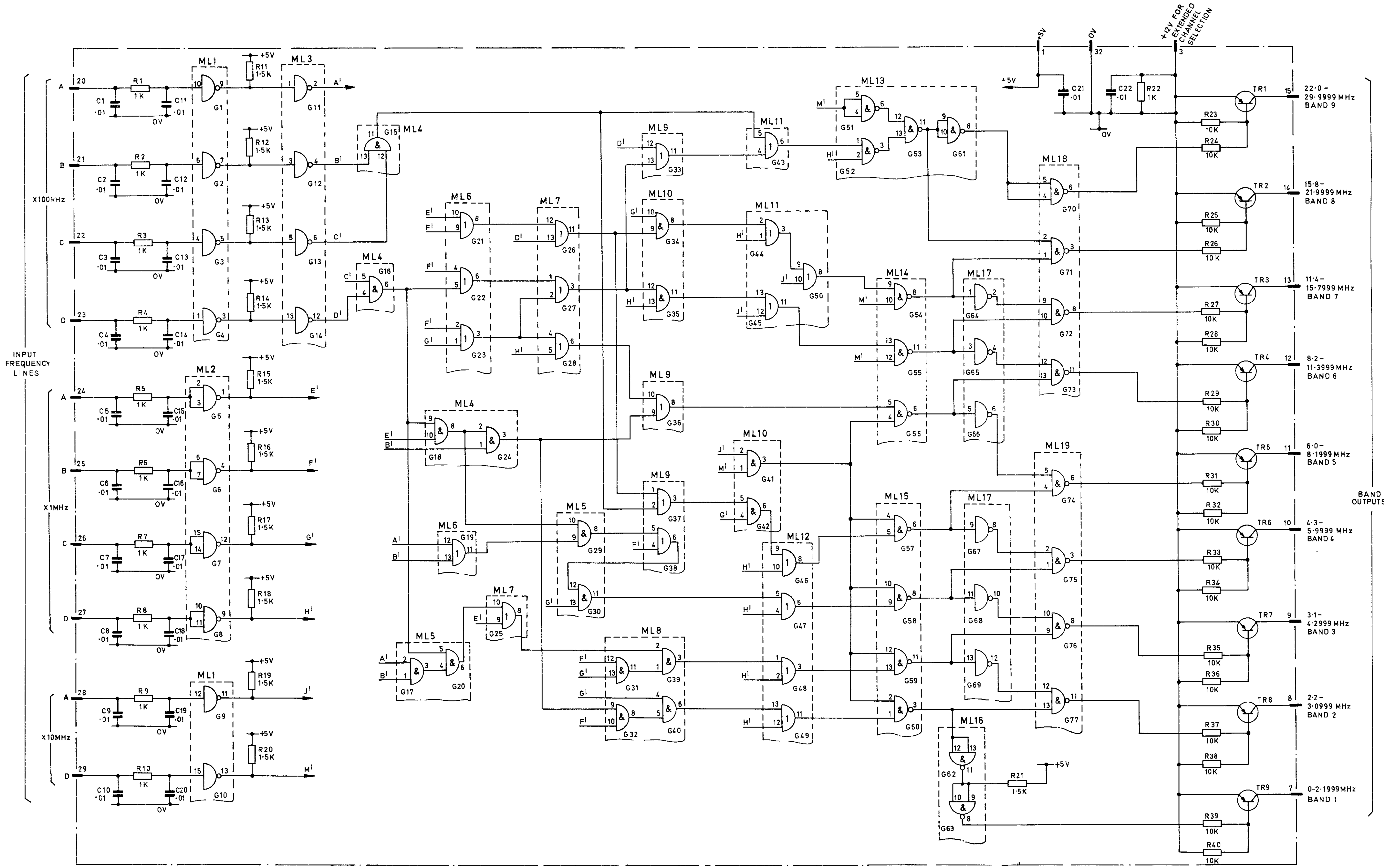
Fig. 16



WOH3117C	EA604054
B	

Layout: Decoder Board PS508

Fig.17



WOH 3117C	DC604054
B	

Circuit: Decoder Board PS508

Fig.18