

System manual

TA. 1816

500W Linear Amplifier Assembly

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) ± 1 dB. SSB: 500W p.e.p. nominal ± 1 dB 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 ± 1.5 dB 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.

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.

- (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. r. 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.

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

<u>Connection</u>	<u>Function</u>	<u>Connects to</u>
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

<u>Connection</u>	<u>Function</u>	<u>Signal States</u>
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.

<u>Connection</u>	<u>Function</u>	<u>Signal States</u>
1TB10-2	Band Selection	<p>Selection at the MA.1034 is initiated when an open circuit or +12V input is applied. The input is normally at 0V.</p> <p>NOTE: If terminal 1TB10-2 is not connected to a separate drive unit or control unit it should be connected to 1TB10-4 (earth).</p>
1TB10-3	Ready	<p>Ready is indicated by a 0V output at this pin. When the MA.1034 is not ready the output is at +12V.</p> <p>NOTE: In this equipment 1TB10-12 is normally used for the READY connection to external units.</p>
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

<u>Connection</u>	<u>Function</u>	<u>Signal States</u>
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

<u>Connection</u>	<u>Function</u>
1TB16-11	External Meter
1TB16-12	Earth

TABLE 5 - POWER CONNECTIONS

<u>Connection</u>	<u>Function</u>
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.

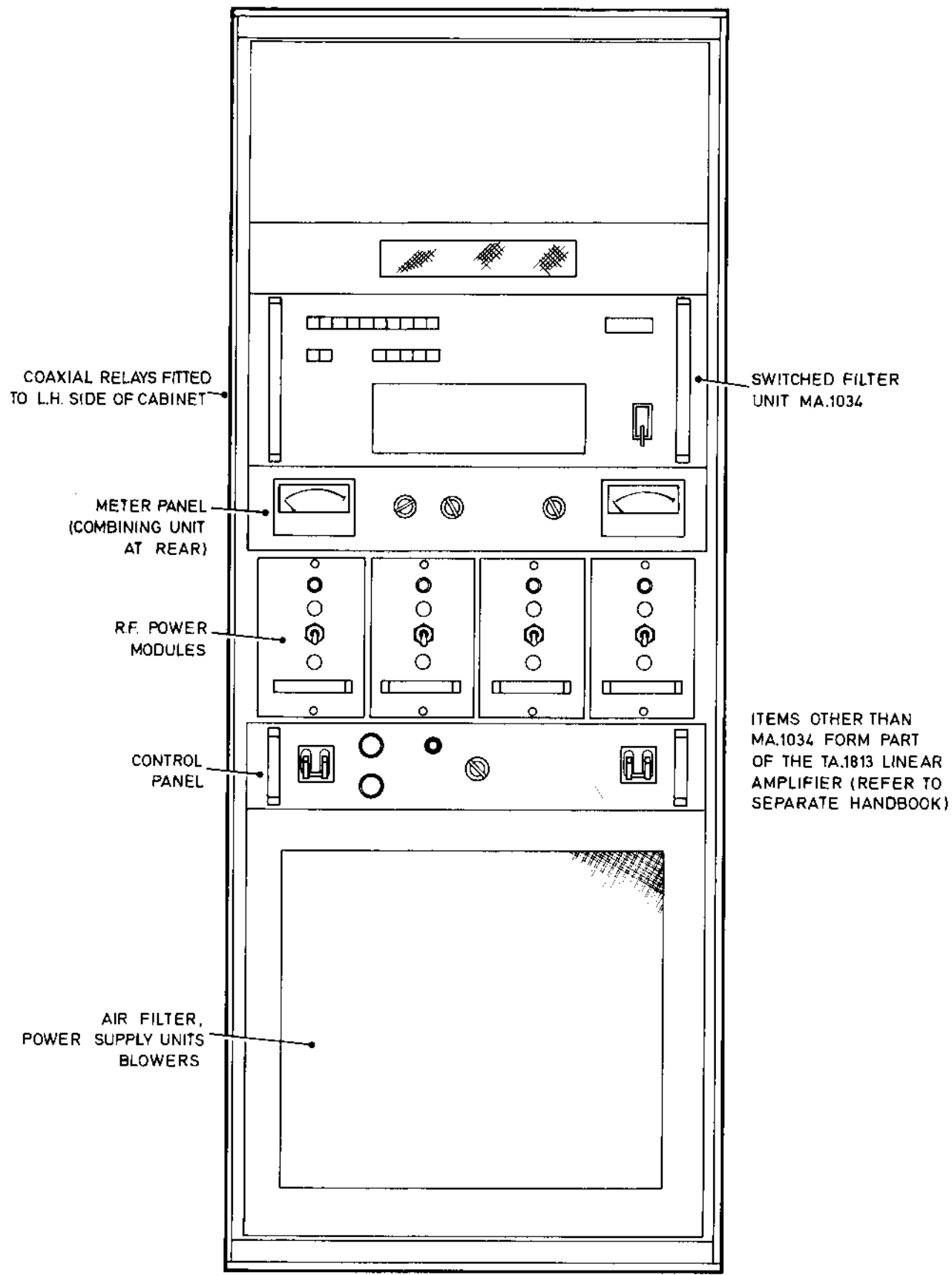
12. Calibrating for 3:1 VSWR

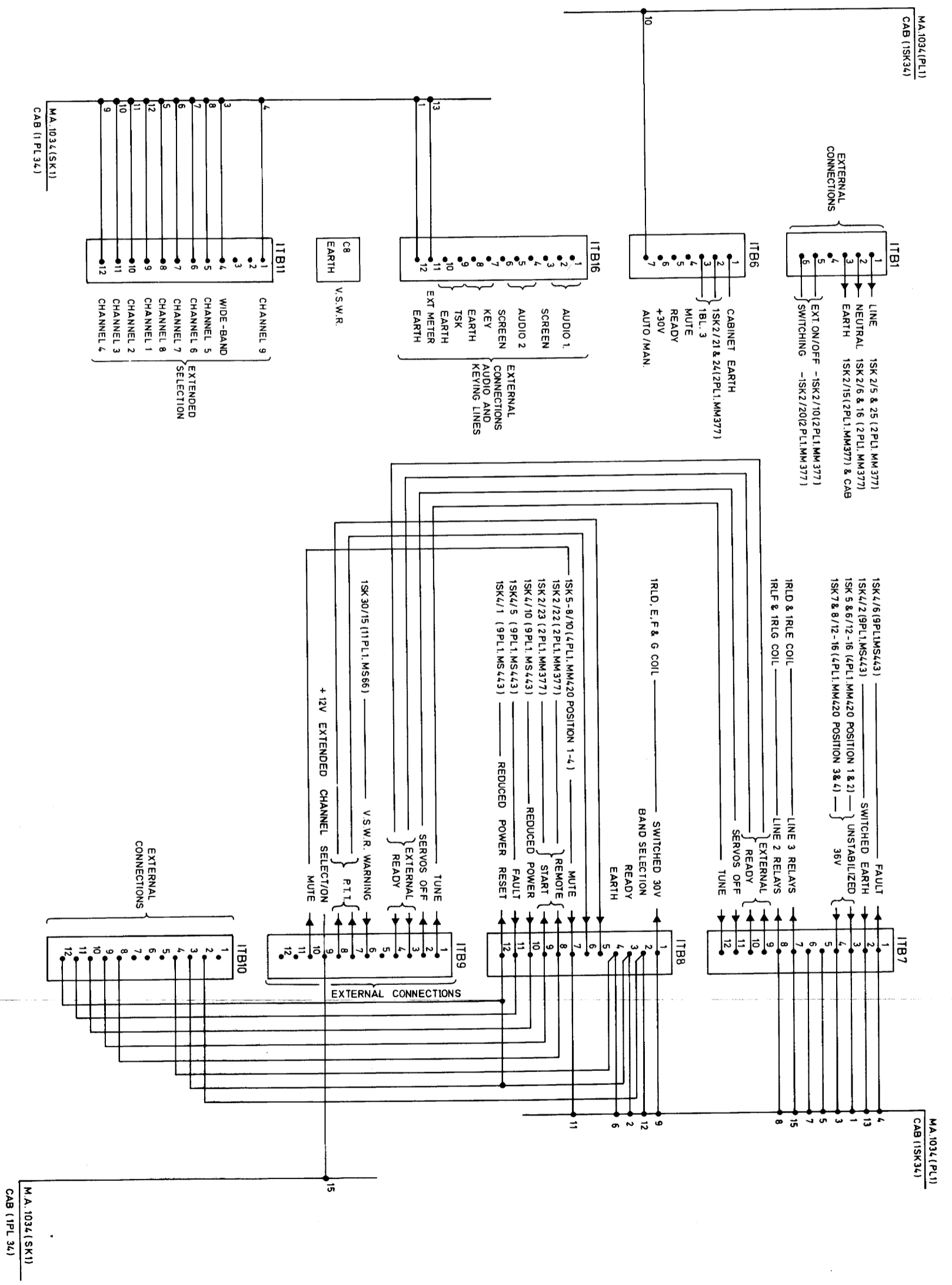
- (1) Operate the system as detailed in paragraphs 2(1) to 2(6) of Chapter 2. Check that the output is 500W.
- (2) Switch OFF two RF power modules.
- (3) Lower the TA.1813 meter panel and set the internal CAL/NORMAL switch to CAL.
- (4) Adjust the pre-set control 11AR12 (inside the meter panel) until 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

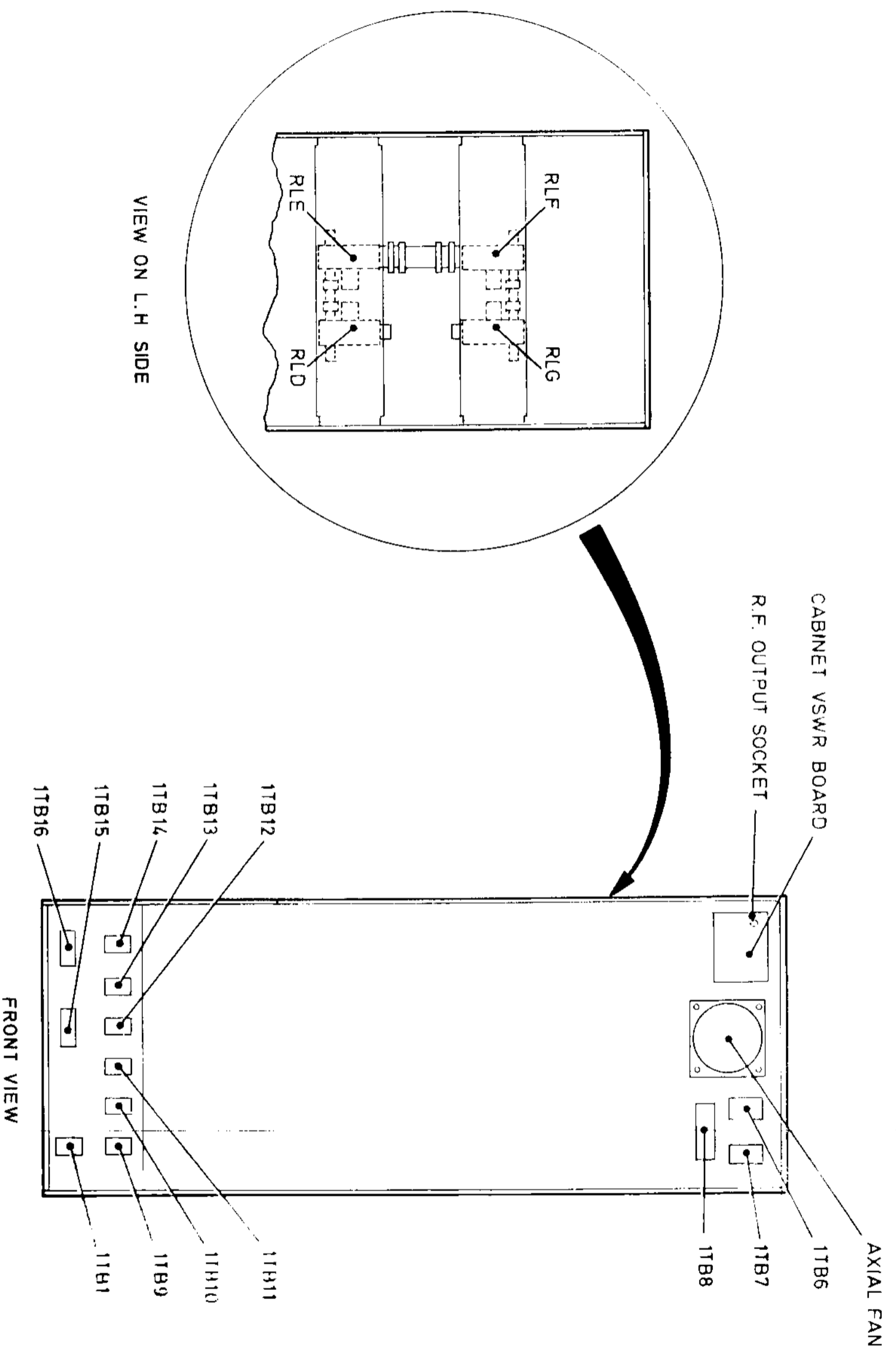
- (1) Operate the system as detailed in paragraphs 2(1) to 2(6) of Chapter 2, using the associated drive unit or a signal generator output.
- (2) Reduce the drive unit (or signal generator) output until the indicated forward power corresponds to the required reflected power at which the warning signal 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.





Inter - Unit Wiring : TA.1816

Fig. 2



Location of Connectors, Relays etc. TA.1816

Fig. 3

