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REDIFON

Technical Information

Instruction Manual

for

LINEAR AMPLIFIER TYPE GA480A

and AERIAL COUPLING UNIT

TYPE ACU9

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Amendment Sheet No... 1
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Page/Drg. reference	Details of Amendment(s)
PART 1 GA.480A	
Page 5-1 Para 5.2 Sub-para (16) Sub-para (17)	Amend 10 lb per sq. inch to read: 5 lb per sq. inch Note: An alternative recommended method is: Using dry air, the unit is to be pressurised to 5 lb per sq. inch. After 30 minutes the pressure should not have fallen below 3 lbs per sq. inch. Care should be taken to conduct this test at a steady temperature.
Page 1-2 Transmit Duty Cycle	Amend paragraph immediately following the first table to read:- The amplifier will operate continuously when the A0 on/off duty cycle does not exceed 1 : 9 (1 min. on, 9 min. off) or when the A3j duty cycle does not exceed 1 : 5 (1 min. on, 5 min. off) at + 55°C
FIG 9.2 CONTROL CARD COMPONENTS LIST	Under Resistors amend 5R15 details to read: 100Ω ± 5% 1W Amphenol 990GB-PC100 (Potentiometer) 5R19 amend TR5 to read TR6 Under Transistors amend to read 5VT1 Mullard 2N2303 5VT2 Motorola 2N1613 5VT3 Motorola 2N3906 5VT4 Motorola 2N1613
FIG 9.5 CONTROL CARD	VT1 delete 2N1132 insert 2N2303 VT2 delete 2N3904 insert 2N1613 VT3 no change VT4 delete 2N3904 insert 2N1615
FIG 9.4 100W AMPLIFIER UNIT COMPONENTS LIST	Under Resistors add: 1R6 10kΩ ± 2% ½W Electrosil TR5
FIG 9.5 CIRCUIT DIAGRAM	Enter on to the circuit diagram in parallel with MR3, resistor R6 10K. Delete R5 from its existing position and relocate it between the base of VT1 and the adjacent terminal 5.

(E. Briggs. P.D.S. Engr.)

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INSTRUCTION MANUAL FOR LINEAR AMPLIFIER TYPE GA.480A AND AERIAL COUPLING UNIT TYPE ACU9

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Page/Drg. reference	Details of Amendment(s)

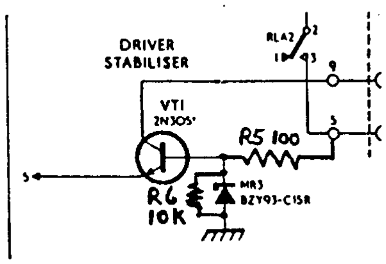
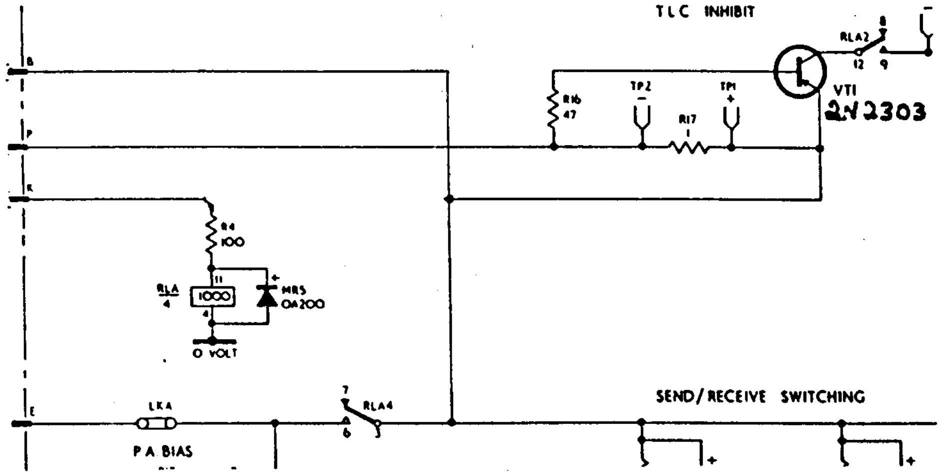


FIG 9.5
CIRCUIT DIAGRAM
Section 5, Control Card

Delete circuit from the top of R4 (which leads to VT1 TLC INHIBIT) to the point where it intersects the circuit line from connection "B" to RLA4.

Add a connection symbol at the previous mentioned intersect point thereby connecting the emitter of VT1 (TLC INHIBIT) to the circuit line joining connection B to RLA4



Between connection 15 at socket SKA and chassis, connect a .1 capacitor C4.

Between connection 14 at socket SKA and chassis, connect a .1 capacitor C3.

Add an RF choke L1 330 uH between the junction of connection 15 and cathode of MR6 leading to connection C at sockets SKE and SKF.

(E. Briggs. P.D.S. Engr.)

AMENDMENT

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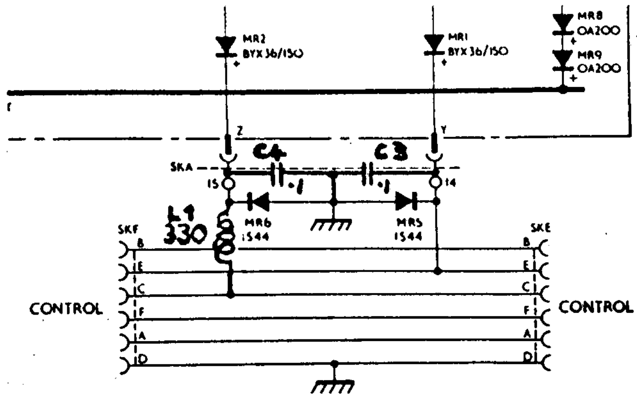
Page/Drg. reference	Details of Amendment(s)
	
FIG 9.4. COMPONENTS LIST	Under Capacitors add: 1C3 0.1 µF ± 20% 100V STC PMA0.1M100 1C4 0.1 µF ± 20% 100V STC PMA0.1M100 Under Switches add: Inductors 1L1 330 uH ± 10% Painton C20M/58/10/0062/10
FIG 9.3 TLC CARD COMPONENTS LIST	Under Capacitors change the value of 2C6 to read 220 µF. Amend 2C10 to read 2C11. Under Diodes amend 2MR4 type details to read: Mullard BYX36/150.
FIG 9.5 CIRCUIT DIAGRAM TLC CARD	Change value of C6 to read 220 Change details of MR4 to read BYX36/150.

(E. Briggs. P.D.S. Engr.)

PREFACE

This handbook is comprised of two Parts: Part 1 deals with the Linear Amplifier type GA480A and the associated AC Power Unit; Part 2 covers the Aerial Coupling Unit type ACU9.

An appendix contains general information on vehicle installation.

PART 1

LINEAR AMPLIFIER Type GA480A

CONTENTS

1 BRIEF DESCRIPTION AND SPECIFICATION

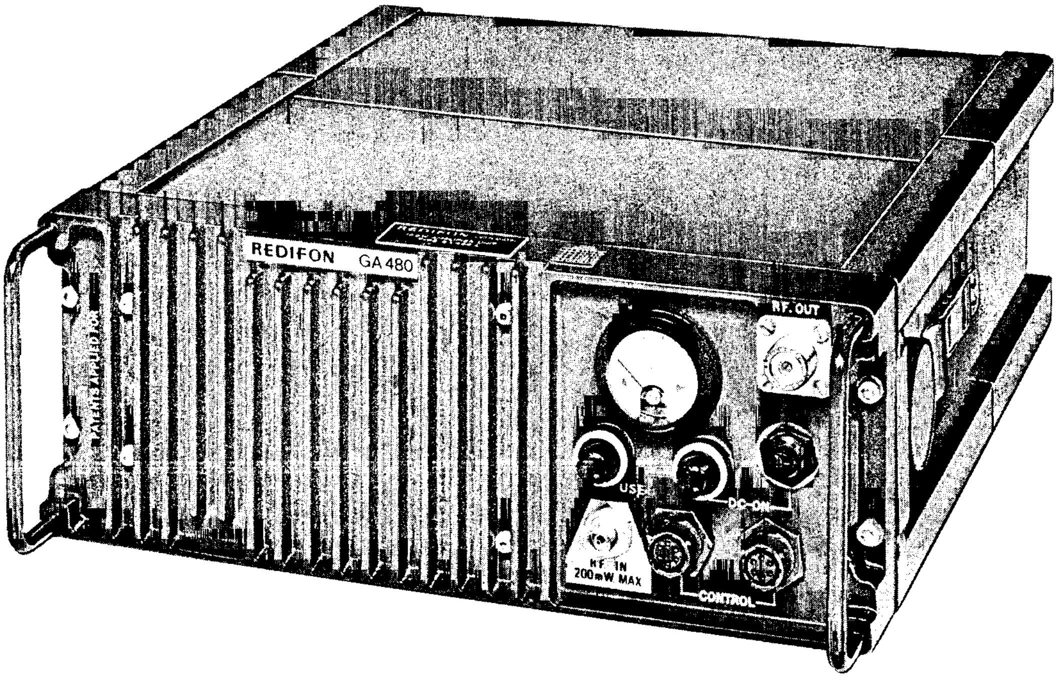


PLATE 1.1 LINEAR AMPLIFIER TYPE GA480A

1 BRIEF DESCRIPTION and SPECIFICATION

1.1 BRIEF DESCRIPTION

The Redifon Linear Amplifier type GA480A is a 100 W HF amplifier for operation in the frequency range 1·5 to 12 MHz. It is designed specifically for man-portable and vehicular roles, in conjunction with transmitter-receivers such as the Redifon GR345 Manpack.

The amplifier complies with the relevant clauses of the Ministry of Defence Specification DEF133 Table L3, and will operate over the temperature range −20°C to +55°C.

Protection is afforded against damage from incorrect aerial tuning or loading including open-circuit or short-circuit at the output socket, excessive drive and supply transients.

Operation involves no adjustment other than switching on or off and maximum power output is attained simply by adjustment of the associated aerial coupling unit for maximum aerial current.

A patented Transmit Level Control (TLC) circuit is incorporated to protect the transistor output stages from current and voltage overloads and to obviate the need for adjustments normally required to ensure optimum performance of a linear amplifier. The TLC automatically regulates the gain to prevent either the voltage or current in the PA circuit from exceeding the values consistent with linear operation, and prevents damage due to incorrect loading conditions while the aerial coupling unit is being adjusted.

If, at any time, high power output is not required, the GA480 can be by-passed simply by switching off, when the drive input is fed directly to the output socket. This by-pass condition is also effected automatically when the temperature of the amplifier exceeds a predetermined value; when the temperature returns to a safe level, full power operation is restored automatically.

The design of the amplifier permits continued operation in many instances of component failure, the output being only partially reduced.

Servicing is facilitated by the employment of modular construction including the use of plug-in printed circuit cards.

An AC power unit is available which also complies with the relevant clauses of the Ministry of Defence Specification DEF133 Table L3, and will operate over the temperature range −20°C to +55°C.

Also available is an aerial coupling unit for use with dipole or short whip aerials: this is described in Part II.

A list of ancillary equipment is included in the specification.

1.2 SPECIFICATION

GA480A

Frequency Range:
1·5–12 MHz

Load Impedance:
75Ω nominal

Power Output:
100 W r.m.s. ± 1 dB, assuming sinusoidal input and nominal supply voltage of 24 V d.c.
On sustained 100% modulated A2/A3 emission, the carrier power is limited by TLC action to 25 W ± 1 dB
Not more than 0·5 dB increase in output for 10% increase in supply voltage; not more than 1 dB reduction in output for 10% decrease in supply voltage

Input Impedance and Drive Level:
50 or 75Ω high level
50 or 75Ω low level
Maximum drive: 16 W high level
200 mW low level
Nominal input sensitivities:—
High level: not greater than 12 W for 100 W ± 1 dB
Low level: not greater than 100 mW for 100 W ± 1dB.
Intermediate levels: other input levels can be accommodated after a simple modification.

Transmit Level Control (TLC):
Automatically regulates the gain, by reference to the r.f. output voltage and PA current, to maintain constant output power irrespective of variations in supply voltage and input drive level. Protects output transistors against aerial mismatch ranging from short circuit to open circuit, and against supply transient overloads.
The output power will remain constant within 1 dB for an increase in input level of not more than 6 dB from the TLC threshold (TLC threshold is that input power level which results in an output of 100 W ± 1 dB).
Attack time: less than 1 mSec.
Recovery time: approximately 1 Sec.

Harmonic Distortion:
No harmonic is greater than 26 dB below 100 W r.m.s into 75Ω.
When the associated aerial coupling unit is used, no harmonic is greater than 40 dB below full power output.

Intermodulation Products:
All intermodulation products derived from a test signal comprising two equal amplitude r.f. sinusoidal inputs spaced 675 Hz apart, will be at least 25 dB below either test signal (full power output using aerial coupling unit with 50Ω dummy load).

Envelope Distortion:
Less than 5% total harmonic distortion of 100% modulated A2/A3 signal, at full power output.

Noise Level:
At 100 W PEP output, internally generated noise components within ± 12 kHz of the operating frequency are at least 50 dB below the output level. When the associated AC power unit is used, the noise level is at least −40 dB.

Control Facilities:
Control facilities are compatible with the Redifon GR345 and similar transmitter-receivers. Two sockets are provided on the control panel for transmit/receive switching in the telegraphy and telephony modes. In the receive or "amplifier off" condition, the r.f. input and r.f. output sockets are directly connected.

Transmit/Receive Switching:
Telephony: Operate time, 3 mSec.
Release time, 0·1 Sec.
Telegraphy: Operate time, 30 mSec.
Release time, 0·5 Sec.
The longer release time on telegraphy provides "hold-on" during keying.

Transmit Duty Cycle:
Disregarding battery life, transmit duty cycle is a function of ambient temperature and mean power output, the limitation being set by the temperature of the silicon coolant in the 100 W amplifier module. When the coolant temperature rises above 75°C, thermal cut-outs prevent operation of the equipment until the coolant temperature falls again below +75°C. Typical periods of operation:—

Ambient Temp.	*Service*	
	A0	*A3j*
+22°C	30 min	90 min
+55°C	7 min	20 min

The amplifier will operate continuously when the on/off duty cycle does not exceed 1:9 (1 min on, 9 min off), at +55°C.

The following are typical battery duration figures for the battery pack:—

Ambient Temp.	*Service*	
	A0	*A3j*
+22°C	10 min	35 min
+55°C	8½ min	29 min

The following are typical battery duration figures for a 1:9 on/off duty cycle:—

Ambient Temp.	*Service*	
	A0	*A3j*
+22°C	60 min	125 min
+55°C	50 min	100 min

Power Supply:
24 V d.c. ± 10%, negative to case. Complete protection is given against inadvertent reversal of supply polarity.

Consumption:
Approximately 12 A at 100 W output.

Climatic and Durability Standard:
Complies with the Ministry of Defence Specification DEF 133 Table L3.

Operating Temperature:
−20°C to +55°C.

Storage Temperature:
−40°C to +70°C.

Approximate Dimensions and Weight:

Height	*Width*	*Depth*	*Weight*
*10¼ in	12¼ in	4¾ in	16 lb
(26 cm)	(31 cm)	(12 cm)	(7·3 kg)

*the battery unit adds 5 in (12·5 cm) to the height, and 18 lb (8·2 kg) to the weight.

AC POWER UNIT

Input:
100–125 or 200–250 V a.c. 48–62 Hz.

Output:
24 V d.c. at 12 A.

Approximate Dimensions and Weight:

Height	*Width*	*Depth*	*Weight*
4¾ in	12¼ in	15½ in	30½ lb
(12 cm)	(31 cm)	(39·5 cm)	(13·8 kg)

ANCILLARY EQUIPMENT
Aerial Coupling Unit type ACU9, for short whip aerials or dipoles (see Part II)
AC Power Unit type 6662/A (100–125 and 200–250 V a.c. 48–62 Hz)
Battery Unit type 6671/A (contains two 12 V batteries)
RF Input Cable type 6681/A (2 ft) and /B (length to order), for use with GR345
RF output cable type 6682/A (1 ft) and /B (length to order), for use with ACU9
Control Cable type 6683/A (2 ft) and /B (length to order)
AC Input Cable type 6684/A (length to order) and /B (6 ft) for use with AC power unit
DC Output Cable type 6722/A (length to order—up to 10 ft) and /B (6 ft), for use with AC power unit
DC Input Cable type 6685/A (6 ft) and /B (length to order) for use with external 24 V supply
Mounting Frame type 6692/A (with shock mounts) and /B (without shock mounts)
TLC, Control, and Preamplifier Cards
Extension Set type 6697/A (for faultfinding)

2 CONSTRUCTION

2.1 LINEAR AMPLIFIER GA480A

2.2 AC POWER UNIT

2 CONSTRUCTION

2.1 LINEAR AMPLIFIER

The linear amplifier and the batteries are contained in two separate cases which are fastened together by snap catches.

The amplifier case is sealed by a front panel casting behind which are mounted the amplifier module and three printed circuit cards.

The amplifier module is itself a sealed unit and is filled with a silicon coolant. Heat is transferred from the module through copper mesh pads to the outer case. Fins on the front casting immediately above the module, assist in heat dissipation.

The three printed circuit cards, designated Control, Preamplifier and TLC, are edge mounted in an accessible position behind the front panel adjacent to the panel controls.

A 2-pin plug on the bottom of the amplifier assembly mates with a socket in the base of the case when the amplifier is inserted. The socket connections are extended through the case to a plug which, in turn, mates with a socket on the battery unit when the two cases are clipped together.

The battery case contains two 12V batteries connected in series and is padded with neoprene rubber to protect the batteries from shock. The rechargeable batteries are of nickel-cadmium sintered plate construction and are non-spillable. Each 12 V battery is comprised of 10 cells encapsulated in low curing temperature resin and incorporating a 3-pin socket; the third pin serves to locate the block when the battery is inserted in the case.

On one side of the amplifier case is fitted a desiccator and on the other side, a desiccator indicator. For some applications, forced air cooling of the amplifier is applied via the desiccator and indicator bushes.

2.2 AC POWER UNIT

The power unit is contained in an aluminium case which is sealed by a front panel casting. The panel carries an On/Off switch, two fuses and a mains warning lamp, whilst the circuit components are chassis-mounted behind the panel.

The case is provided with a desiccator and desiccator indicator and the connections are terminated at sockets on the back of the case.

3 SETTING UP AND OPERATING INSTRUCTIONS

3 SETTING UP AND OPERATING INSTRUCTIONS

This chapter describes the procedure to be followed in setting up and operating the GA480A in conjunction with the GR345 Manpack. In general, the procedures will apply when other types of drive unit are used.

3.1 OPERATING THE GA480A

(1) Confirm that the GA480A is set for the correct input impedance and drive level (see para. 3.8).

(2) Switch off the GA480A and the GR345.

(3) Connect a power supply to the GA480A, which may be one of the following:--
 (i) Battery Unit type 6671/A.
 (ii) Cable type 6685/A or B (see para. 3.5).
 (iii) AC Power Unit type 6662/A (see para. 3.6).

(4) Connect the GA480A to the GR345 and the ACU9 as shown in Fig 3.1 (the positions of the handset and key are reversible). For information on the aerial coupling unit, see Part II of this handbook.

(5) Switch on the GR345 and tune up on key-down SSB/CW or unmodulated AM (refer to GR345 handbook). Tune the ACU9 as detailed in Part II of this handbook.

(6) Switch on the GA480A and check that both lamps light.

(7) Carefully readjust the controls on the GR345 and the ACU9 for peak reading on the ACU9 meter.

(8) Check that the GA480A meter indicates between 8·5–10 A (10 A f.s.d.) on A1 emission.

NOTE: In the above procedure the GR345 is tuned up on low power (GA480A switched off) to ensure minimum interference with other stations. However, if required, the GR345 may be tuned up on high power (GA480A switched on) without damage to the linear amplifier.

3.2 SWITCHING THE GA480A OFF AND ON

Once the initial setting up procedure is completed, the GA480A may be switched off or on to give low or high power output.

Switch off the GA480A during prolonged "receive only" periods.

3.3 EXCEEDING OPERATING TEMPERATURE

The green USE lamp on the GA480A will be extinguished if the safe operating temperature is exceeded, but transmission will continue automatically on low power.

The lamp should light again within 10 minutes, the actual time depending on the ambient temperature and conditions of use.

CAUTION

Ensure that the duty cycle of the GR345 is never exceeded.

3.4 QUICK CHECK OF BATTERY STATE

The red DC On lamp can be used to determine the approximate state of the batteries. This is accomplished by whistling into the microphone when the equipment is in the SSB mode of operation. If the brilliance of the lamp reduces considerably, then the condition of the batteries is beginning to deteriorate or there is a high resistance connection. Charge the batteries, if necessary, as detailed in Chapter 5 para. 5.7.

The same procedure can be used to check an external supply or the AC power unit.

3.5 CONNECTING AN EXTERNAL SUPPLY

The external supply must be 24 V d.c. *negative earth*, at 12 A minimum capacity. It must be of good regulation and preferably free from transient voltages. Use the Cable type 6685/A or B. The socket will mate with the supply plug on the GA480A when the battery unit is removed; the free connections are colour-coded as follows:—

Red—positive

Blue—negative (Earth)

Black—screen (connected to negative terminal of socket).

3.6 CONNECTING THE AC POWER UNIT

Ensure that the mains transformer is set to accommodate the supply voltage (see Fig. 9.6) and that the correct fuses are fitted (see para. 6.5).

Cable type 6684/A or B is the a.c. mains cable: the free connections are colour-coded as under.

Red—live

Blue—neutral

Green—earth.

The cable is terminated at the other end in a free socket which mates with plug PLA on the AC power unit.

Cable type 6722/A or B is the d.c. output cable, with a plug at one end which mates with socket SKA on the AC power unit and a socket at the other end which mates with the supply plug on the GA480A when the battery unit is removed.

Note that the mains input circuit is not completed until a link is effectively connected across pins C and D of the output socket (see Fig. 9.6).

3.7 USING MOUNTING FRAME TYPE 6692/A OR B (See Fig. 3.2)

(1) Bolt the frame to a shelf or bench through the holes provided. If shock mounts are used, they should be bolted or screwed to the shelf or bench, and the frame bolted to the mounts.

(2) After removing the battery unit, place the GA480A on the mount in a horizontal position so that the lip at the rear of the mount secures the back of the GA480A.

(3) Tighten the two clamp screws to secure the front of the GA480A.

3.8 SETTING INPUT IMPEDANCE AND DRIVE LEVEL

When customers requirements are known, the input impedance and drive level adjustments are made during factory test; the double-sided yellow label associated with the RF In socket, shows the maximum permissible r.f. input.

If adjustments have to be made, proceed as follows:—

(1) Remove the amplifier from its case (see para. 5.3).

(2) Remove the Control card (nearest 100 W amplifier module).

(3) Make links on the Control card to suit requirements, as follows:—

High level, 75Ω—link A and B only

High level, 50Ω—link A and B, and link D and E

Low level, 75Ω —link A and F only

Low level, 50Ω —link A and C only.

(4) Replace the Control card.

(5) Set the yellow label on the front panel to suit the drive level, i.e. 200 mW MAX for low level, or 16 W MAX for high level (reverse side). This label is fixed by the nut securing the RF In socket.

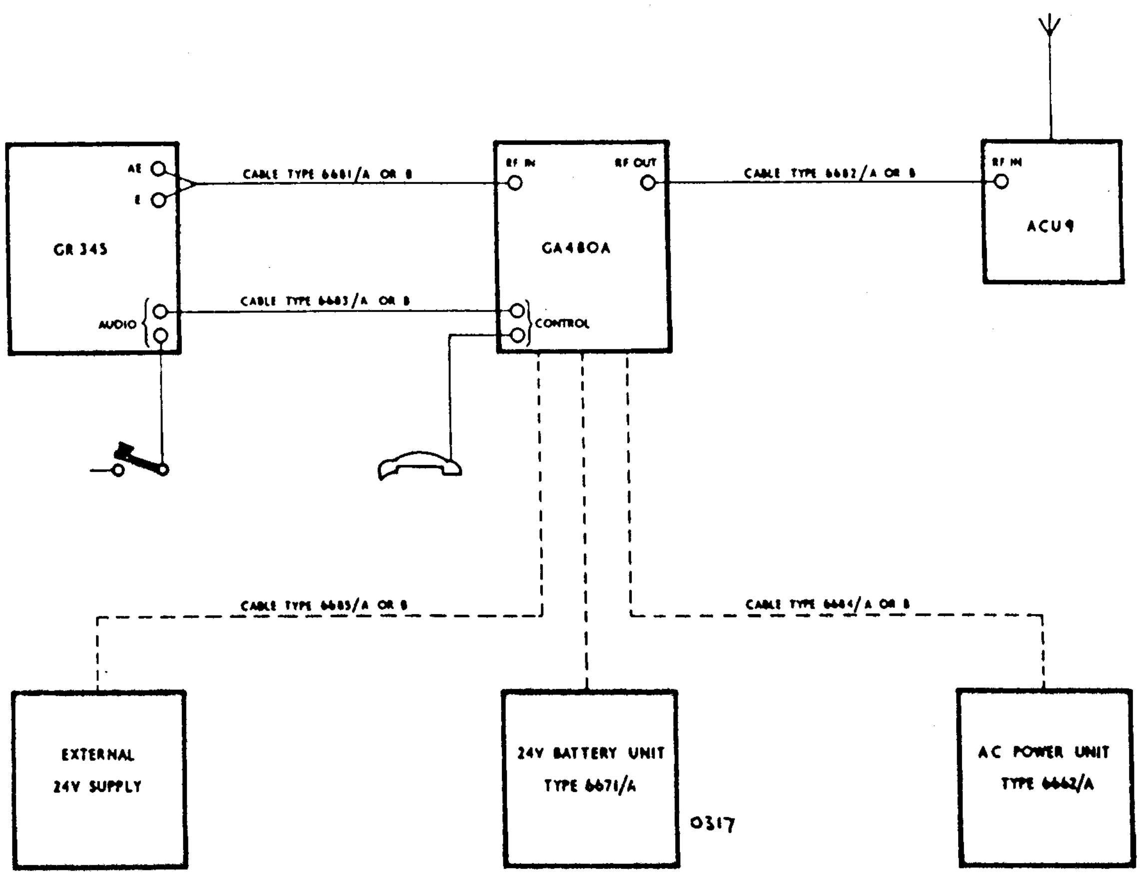
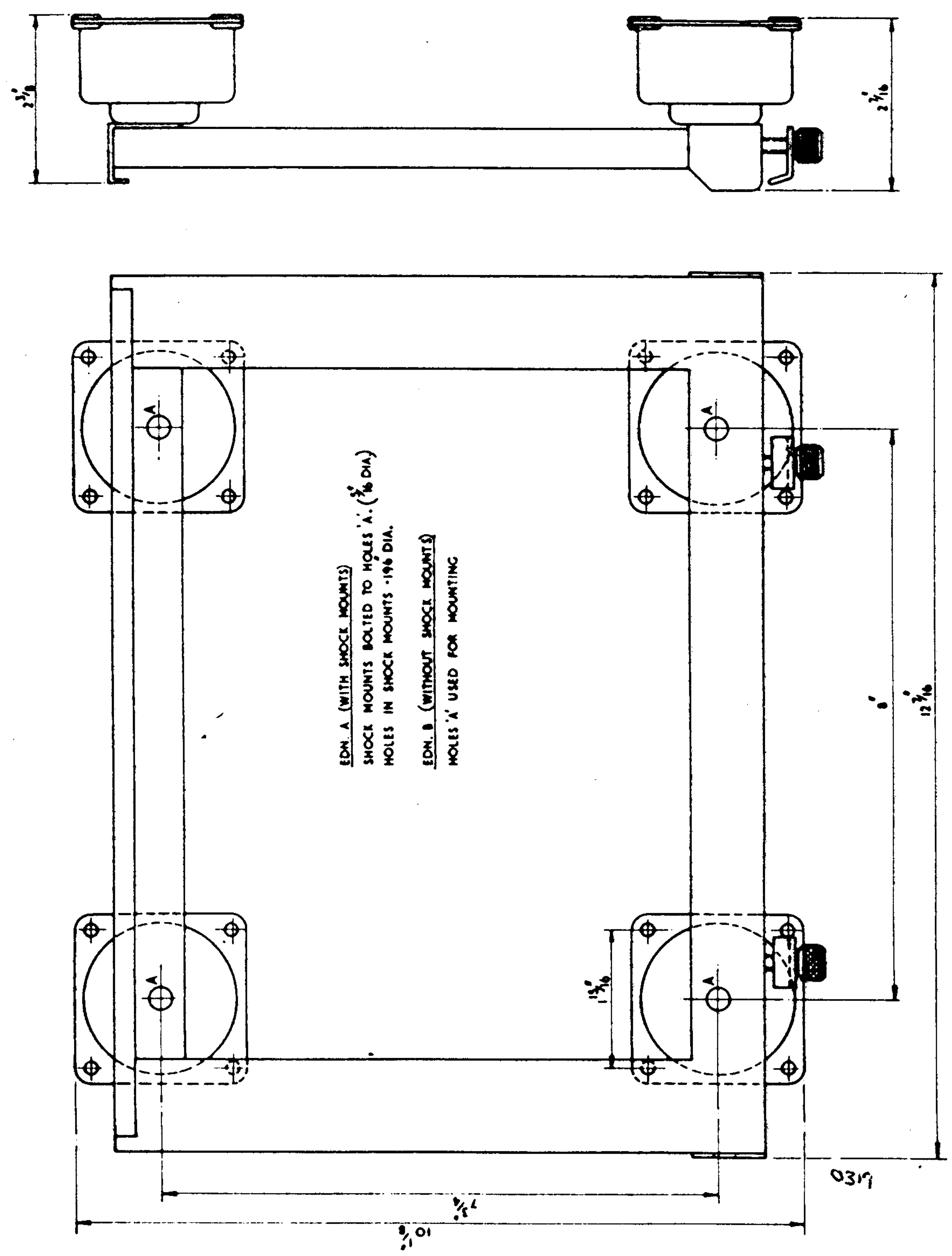


Fig. 3.1 Connecting up the GA480A



898-1 (P1) MOUNTING FRAME, TYPES 6692/A & B FIG. 3.2

4 CIRCUIT DESCRIPTION

4 CIRCUIT DESCRIPTION

4.1 GA480A BRIEF DESCRIPTION

RF drive from the associated transmitter-receiver is applied to the preamplifier via a preset attenuator and an electronic attenuator; the pre-amplifier output is then applied to the 100 W amplifier.

A sample of output voltage and current is derived from the 100 W amplifier and fed to the transmit level control (TLC) circuits, the d.c. output of the TLC, controlling the attenuation of the electronic input attenuator.

The output of the 100 W amplifier is fed to the associated aerial coupling unit.

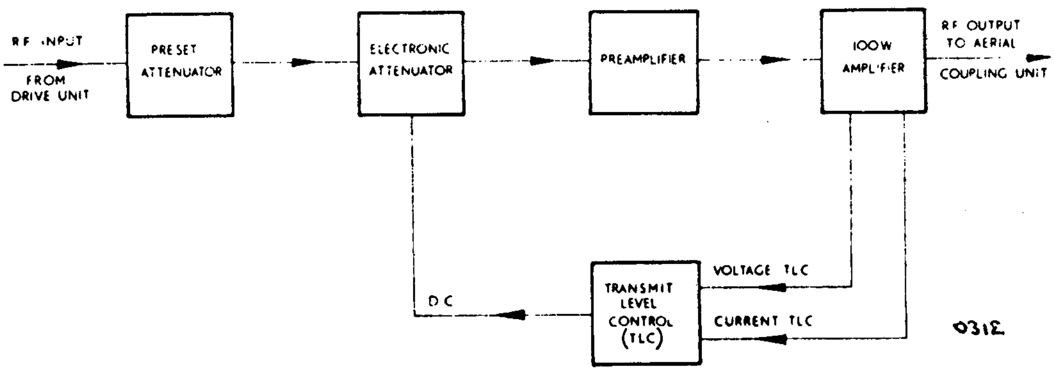


Fig. 4.1 GA480A Block Diagram

4.2 GA480A DETAILED DESCRIPTION (Refer to Fig. 9.5)

Note: In the description that follows, reference is made to relay RLA. There are two relays in the equipment both designated RLA; one is located on the Control card and the other on the main chassis. To distinguish between them, the relay in the main chassis and its contacts are printed in italics: thus *RLA*/2, *RLA*—1.

Front Panel and Interconnection Circuits

The 24 V d.c. supply is obtained from the battery unit, the AC power unit or a 24 V vehicle battery: the negative side of the supply is connected to chassis.

Fuse FS1 protects the supply line, whilst shunt diode MR1 provides protection against reversal of supply voltage; if a supply with the wrong polarity is connected, MR1 conducts heavily and fuse FS1 blows.

Zener diode MR2 in series with R4 across the supply line, protects the amplifier against excessive voltages including spikes or transients on the supply line (not uncommon if the GA480A is used in a vehicle installation with regenerative braking). The break-down voltage of MR2 is 39 V and R4 is included to limit the current during the short period before FS1 fails.

When switch SA is closed, the supply voltage is applied to:—

1LP2
1LP1 (via the thermal cut-outs in the 100 W amplifier, connected across terminals 2 and 3).
Coil of relay *RLA*/2 (via the thermal cut-outs in the 100 W amplifier).
SKA-B of the Control card.
Terminal 1 of the 100 W amplifier (via ME1 and R3).
Common contact of *RLA*-2.
SKC-A of the TLC card (via ME1).

Note that the low potential side of R3 is connected to SKC-J of the TLC card, so that the voltage drop across the resistor can be utilised in the current TLC circuit.

Lamp 1LP2 is the on/off indicating lamp and is designated (in conjunction with switch SA) DC ON. This lamp also provides a rough indication of the state of charge of the battery, which will require charging if the brilliance of the lamp diminishes considerably when the key is pressed, or when the handset associated with the transmitter-receiver is whistled into on SSB operation.

Lamp 1LP1, designated USE, is energised via thermal cut-outs in the 100 W amplifier, and is extinguished if the temperature in the amplifier module exceeds the safe value. If this USE lamp is extinguished, the operator knows that the GA480A is not functioning as an amplifier and that the transmitter-receiver is connected directly to the aerial coupling unit. Resistors R1 and R2 limit the peak current through the bulbs to increase their life.

Relay *RLA*/2 is not energised until the press-to-talk switch or key is pressed, and the equipment remains in the Receive condition with the RF In socket SKD connected directly to the RF Out socket SKG via relay contacts on the Control card and *RLA*-1 contacts.

When the press-to-talk switch or key is pressed, *RLA*/2 is energised via a circuit on the Control card connected to SKA-X, Y and Z. The contacts of the relay close, and:—

(i) *RLA*-1 connects the 100 W amplifier output to the output socket SKG.

(ii) *RLA*-2 switches 24 V to SKA-K on the Control card.

Transistor VT1, resistor R5 and zener diode MR3, form a stabiliser circuit for the 100 W amplifier driver collector supply, the 15 V stabilised output being applied to terminal 5 of the amplifier module.

Meter ME1 (10 A f.s.d.) indicates the total collector current of the 100W amplifier output stages.

Sockets SKE and SKF on the GA480A control panel are for the connection of the key and the headset or handset and are designated CONTROL; they are wired in parallel. Control connections from the GR345 are extended to the amplifier by means of an interconnecting cable, leaving one free socket on the pack-set and one on the amplifier for the connection of a key and handset or headset.

Capacitor C1 decouples the 24 V supply to the output stage collectors in the 100 W amplifier. Diode MR4 is a back-e.m.f. protection diode.

Preamplifier Card

RF input is applied to wideband transformer T1 via the preset attenuator on the Control card. Connected between the secondary of T1 and the primary of T2 is an electronic attenuator comprising MR1-8, C1, C2 and R1. The attenuator is switched to the conducting mode by current from the TLC circuit, applied via SKB-E and A.

One secondary winding of T2 is connected to the bases of push-pull transistors VT1 and VT2; another winding provides feedback from the output stage via R7.

Overlay transistors VT1 and VT2 are operated in Class A, base bias being applied via R3/R4 junction. Resistors R5 and R6 are not decoupled, thus providing internal feedback over this stage; in addition, overall feedback from the collectors of the output transistors is applied via two CR networks C7/R8 and C8/R11, to the emitters of VT1 and VT2. Damping resistors R2 and R19 are connected across T2 and T3 to minimise changes in impedance (and hence changes in feedback) presented by VT3 and VT4 during their conducting cycles.

Base bias for Overlay transistors VT3 and VT4 (operating in Class B) is applied via the junction of R14, and MR9-11 and R20, the diodes providing temperature compensation. The emitter resistors, R15/R16 and R17/R18 are not decoupled and so provide internal feedback over the stage.

Collector voltage to VT1/VT2 is applied via R12/R13 parallel arrangement and the centre tap of T3 primary; the collector voltage to VT3/VT4 is applied via T4 primary centre tap. Inductor L1 and capacitors C9 and C6 are decoupling components.

The preamplifier gives an output of approximately 1W in an impedance of 50Ω.

100W Amplifier

All the components of the 100W amplifier assembly are immersed in a silicon coolant which ensures a highly efficient transfer of heat to the cast container, thus obviating the need for large heat sinks for the output transistors.

The circuit of the amplifier is divided into four sections, each of 25W output, which combine in parallel to give an output of 100W. Each section has an input impedance of 50Ω, so that the four in parallel present an impedance of 12·5Ω, which is matched to the 50Ω output impedance of the pre-amplifier by an internal transformer.

Control Card

(a) Key and Press-to-talk Circuit

The keying and press-to-talk circuit comprises VT2, 3 and 4, MR1, MR2 and associated components. Its purpose is to provide keying and press-to-talk facilities, without interaction, for the amplifier and associated transmitter-receiver.

The emitter of VT3 is connected, via SKA-X to one side of *RLA*/2 energising coil (on the main chassis) the other side being connected to the 24V supply line via the thermostats in the 100W amplifier. SKA-Y is connected to the key via pin E on the control sockets SKE, SKF; SKA-Z is connected to the press-to-talk switch via pin C on the control sockets.

Consider the press-to-talk circuit. When the handset press-to-talk switch is pressed, VT4 emitter is connected to the 0 volt line via MR2, and the transistor conducts. The potential across C2 increases and MR7 conducts, causing base current to be supplied to VT3 which also conducts—*RLA*/2 is then energised.

When the press-to-talk switch is released, VT4 stops conducting, C2 discharges, and MR7 stops conducting—VT3 is then switched off again and *RLA*/2 is consequently de-energised.

The keying circuit, VT2, MR1 and associated components, functions in the same manner as the press-to-talk circuit but a larger capacitor C1 ensures a longer hold-on time so that at normal hand keying speeds, the amplifier remains in the operational condition and does not follow the keying.

Bias for both VT2 and VT4 is derived from the R19, MR8, MR9 arrangement.

(*b*) *Preset Attenuator*

The amplifier is by-passed on Receive (or when it is not in use) by RLA-1 and RLA-3 contacts. On Transmit, contacts RLA-1 connect the r.f. input to the preset input attenuator; contacts RLA-3 connect the straight through r.f. output line to chassis so that r.f. output is not fed back to the transmitter-receiver, should the aerial change-over contacts *RLA*-1 (main chassis) be inadvertently bridged.

Linking on the input attenuator allows different drive levels and impedances to be accommodated, as follows:—

High level, 75Ω — only A and B linked

High level, 50Ω — A and B linked and D and E linked

Low level, 75Ω — only A and F linked

Low level, 50Ω — only A and C linked

The attenuator output at R6 is taken to the preamplifier input through SKA-R.

(*c*) *TLC Inhibit*

Transistor VT1 inhibits the 24V to the TLC card (to switch off the drive) if the driver stages in the 100W amplifier are not drawing current; this ensures that the output transistors are not damaged if the bias supply fails.

The driver supply of 24V is applied via SKA-K, R17 and SKA-P. If current is being drawn, the voltage drop across R17 causes VT1 to conduct and switch 24V to the TLC circuit via contacts RLA-2, R18 and SKA-J.

In the event of bias failure in the 100W amplifier, no driver collector current will flow, VT1 will not conduct, and 24V will not be applied to the TLC circuit—without which there is no 'turn on' current for the input attenuator; hence the r.f. input drive level is automatically reduced to a safe level.

(*d*) *Relay Circuit*

Relay RLA/4 energising voltage is applied via *RLA*-2 contacts (main chassis) and SKA-K. Diode MR5 is a back-e.m.f. protection diode.

Note that relay *RLA*/2 (main chassis) is energised via the thermostats in the 100W amplifier, so that if the temperature rises above the safe limit in the 100W amplifier module, *RLA*/2 is de-energised and so consequently is RLA/4.

(*e*) *Bias Circuit*

Contacts RLA-4 connect 24V to the bias circuit comprising zener diode MR6, R15 and associated components. The bias line is taken to the 100W amplifier via SKA-W. A connection is taken from the R13/R15 junction to SKA-A, which in turn is taken to seven series diodes in the 100W amplifier. These diodes are effectively connected between the R15/R13 junction and the O volt line and compensate for increase in junction temperature of the output transistors in the 100W amplifier. Heat generated by the transistors will be transferred to the oil coolant and thence to the diode chain; these diodes cause a reduction in bias and thus tend to stabilise the standing current of the output transistors. Capacitors C3 and C4 are decoupling components.

TLC Card

(*a*) *Principles of TLC Operation*

Transistor output stages are very sensitive to voltage, current and impedance changes, and unless suitable protection is employed, such changes may result in damaged transistors and associated components.

Excessive transients on the supply line can cause overloads; in this equipment, these are dealt with by the zener diode circuit described in FRONT PANEL AND INTERCONNECTION CIRCUITS para. 4.2.

Overloads in the output stage could occur during normal tuning. When tuning up the equipment, a wide range of impedance is presented to the amplifier output by the aerial coupling unit. For example, a low impedance load results in a high output current, whilst a high impedance load results in a high output voltage. It is necessary therefore to limit both current and voltage demands to a preset maximum value.

The transmit level control (TLC) is designed to limit the amplifier r.f. output to 100 W r.m.s., and on SSB to 100 W PEP, into 75Ω, the drive being automatically adjusted to maintain the output at these levels.

The current delivered to the r.f. load is proportional to the supply current of the output transistors. A current sampling resistor is included in the collector supply line, and a p.d., which is proportional to the supply current, is developed across it. This voltage is applied to the current TLC circuit to control the electronic attenuator in the preamplifier. If therefore the output stage is called upon to deliver more current than the preset amount, the drive input to the output stage is reduced. The amplifier will, in fact, tolerate a short circuit condition without damage.

At the other extreme, consider an open circuit condition. There is now no load current, but the amplifier will attempt to deliver a higher than normal output voltage. The voltage sampling circuit in the 100 W amplifier delivers a rectified sample of the output voltage to the voltage TLC circuit to control the electronic attenuator in the preamplifier—the preset level is exceeded—and again the drive level is reduced.

Thus, the TLC ensures that preset current and voltage limits are not exceeded during tuning up when the load impedance varies. Hence the aerial coupling unit may be adjusted to tune and match a given aerial without the possibility of damage to the amplifier—the ACU is simply adjusted for maximum aerial current. Since maximum aerial current, due to TLC action, is the maximum output power condition, this is the optimum tuning/matching condition.

Another feature of the TLC is that the preset limits of voltage and current are maintained constant for supply voltage variations. This is particularly important in mobile operation where wide variations in supply voltage may occur.

To summarise, the TLC is used:—

(i) To prevent the amplifier delivering excessive current or voltage to the load and thereby causing damage to the output transistors.

(ii) As an aid to tuning, because maximum power output means that the amplifier operating conditions are correctly set.

(iii) To maintain linear operation during variations in supply voltage.

(*b*) *TLC Circuit Operation*

A 24 V reference supply is applied to SKC-A when the DC On switch SA is set to ON.

The 24 V supply to SKC-B is applied via the TLC inhibiting circuit on the Control card. Diode MR2 stabilises SKC-D potential, which is applied to the electronic attenuator via SKB-A on the Preamplifier card.

Two inputs, referenced to the 24 V line, are applied to the TLC card: the voltage from the power amplifier voltage sampling circuit, applied at SKC-K; the voltage developed across R3 by the PA collector current, which is applied to SKC-J.

Transistor VT1 is employed in the TLC voltage sensing circuit; VT4, 5 and 6 form the TLC current sensing circuit, and VT2 and 3 are the electronic attenuator drive transistors.

Consider the current TLC operation. The voltage applied to SKC-J is applied to the base of VT4 via R15. Transistors VT4 and VT6 form a differential amplifier, VT5 acting as a buffer. A preset voltage is applied to the base of VT6, and is derived from the R21/R22/R23 potential divider circuit connected across zener diode MR7. The setting of R22 determines the current TLC threshold. Diode MR7 has almost zero temperature coefficient, and MR6 provides temperature compensation for the base/emitter junction of VT5. The differential amplifier is therefore independent of temperature variations and the change in VT5 collector voltage represents the differential between the reference voltage at VT6 base and the sample voltage applied to VT4 base.

As the 100 W amplifier collector current increases, the potential across resistor R3 (main chassis) increases—the base of VT4 becomes more negative and the transistor is switched on. Current flowing through R19 is essentially constant and hence if VT4 tends to draw more current, VT6 must draw less. Therefore VT4 collector goes positive and VT6 goes negative. This results in VT5 being switched on and supplying drive to VT3 and VT2.

As transistors VT2 and 3 switch on, they draw extra current through resistors R2 and R6—the potential across pins D and E is reversed, and the impedance of the diodes forming the electronic attenuator (Preamplifier card) is increased. Thus the gain of the amplifier is reduced in proportion to TLC control. Capacitor C9 ensures a fast attack/slow decay action.

It can be seen that the attenuator circuit in the preamplifier is in effect connected between MR2 cathode and VT2 emitter, and under normal conditions the attenuator diodes are conducting with, consequently, little attenuation of the r.f. input signal. When maximum TLC voltage or current is applied, the attenuator diodes are reverse biased by several volts to reduce the drive level to zero. Between these two extremes however there is linear operation over a 6–7 dB range. This allows linearity to be maintained up to approximately 6 dB of overdrive at the preamplifier input. Above this input level the TLC circuit progressively causes the input attenuator to be biased off further so that the output transistors are protected.

The voltage TLC sample (referenced to pin J) is applied to pin K and fed via an r.f. filter and isolating diode to the base of VT1. The emitter reference potential of VT1 (voltage TLC threshold) is set by R8, which with R7, R9, R10 and MR3, form a potentiometer chain across the supply line.

If the correct output voltage of the output transistors is exceeded, VT1 is switched on, and the drive is reduced in the same way as already described for current TLC.

Potentiometer R9 is adjusted so that MR4 is just in conduction when the supply is exactly 24 V. Therefore if the supply voltage rises above nominal, the d.c. level at R9 slider, and hence VT1 emitter, remains constant due to the action of zener diode MR5. If however the supply voltage drops below normal, MR4 is reverse biased and the reference level of VT1 emitter will drop due to the potential divider action of R7, R8, R9, R10 and MR3. Diode MR3, besides providing temperature compensation, ensures that the voltage reference has the same "non-linearity" to variations in supply as the output transistors. Thus the voltage swing at the PA collectors is optimum for reduced supply voltages, and power output is held constant for increased supply voltages.

4.3 AC POWER UNIT TYPE 6662/A

(Refer to Fig. 9.6)

The power unit comprises a conventional full-wave rectifier with capacity input filter. It has a nominal output of 24 V at 12 A.

The mains input is applied to transformer T1 through fuses FS1 and 2, switch SA, and pins D and C of socket SKA. These pins are joined in the plug and when the plug is withdrawn, the mains are disconnected from the transformer.

Taps on T1 allow voltages within the ranges 100–125 V and 200–250 V to be accepted. Across the secondary of T1, in series with R1, is a front panel lamp which lights when the power unit is switched on.

The 24 V d.c. output is derived from a bridge rectifier (MR1-4) and a smoothing circuit (C1-6) connected across the transformer secondary.

Resistors R2 and R3 are discharge resistors.

5 MAINTENANCE

5 MAINTENANCE

5.1 WEEKLY MAINTENANCE

During field use, the checks listed below should be carried out at weekly intervals to ensure that the equipment is in reasonable working order.

The person carrying out the tests should be familiar with the operation of the GA480A and its associated drive unit.

Should the equipment exhibit major mechanical defects, it should be returned to the manufacturers. It should be possible to remedy most electrical faults on the GA480A, if reference is made to Chapter 7 FAULTFINDING.

GA480A

MECHANICAL

(1) Check for obvious damage.
(2) Using a clean cloth, slightly dampened in water, clean all dirt from the equipment surface; remove excess moisture with a clean dry cloth.
(3) Check the DC On switch for correct mechanical operation.
(4) Check the condition of other control panel fittings.
(5) Verify that the desiccator humidity indicator is blue. If it is pink, return the equipment for a six monthly inspection as soon as possible (see para. 5.2 GA480A).
(6) Unclip the battery unit, remove the batteries (see para. 5.5), and inspect for damage.
(7) Check for corrosion on the battery case which may have been caused by battery leakage. If there is evidence of leakage refer to para. 6.3.
(8) Clean batteries with a clean dry cloth and replace them.

ELECTRICAL

Operate the GA480A in conjunction with the GR345 (or associated drive unit) on an allocated test frequency as detailed in Chapter 3. Confirm that operation is satisfactory and check that the meter indicates 8.5–10 A on A1 emission.

AC Power Unit

MECHANICAL

(1) Check for obvious damage.
(2) Using a clean cloth, slightly dampened in water, clean all dirt from the equipment surface; remove excess moisture with a clean dry cloth.
(3) Check the On/Off switch for correct mechanical operation.
(4) Check the condition of all other fittings.
(5) Verify that the desiccator indicator is blue. If is it pink, return the equipment for a six monthly inspection as soon as possible (see para. 5.2 AC POWER UNIT).

ELECTRICAL

Operate the power unit with the GA480A and its drive unit, on an allocated test frequency as detailed in Chapter 3.

Check the power supply as detailed in para 3.4 and confirm that the GA480A meter indicates 8·5–10 A on A1 emission.

5.2 SIX MONTHLY MAINTENANCE GA480A

During normal operation, the following procedures should be carried out every six months. They should also be carried out after internal repairs (Chapter 6), faultfinding (Chapter 7) and during a base workshop overall performance check (Chapter 8). If the amplifier has to be removed from its case when in the field, it should be returned to base workshop for a six monthly inspection as soon as conditions permit.

(1) Remove amplifier chassis from its case (refer to para. 5.3).
(2) Check the tightness of all accessible screws.
(3) Inspect the unit carefully for dirt and corrosion.
(4) Remove dust with a low pressure blower or vacuum cleaner.
(5) Check for signs of overheating due to a possible fault condition.
(6) Check continuity of spare fuse.
(7) Carefully remove each printed circuit card and check the condition of the components and copper foil.
(8) Clean the printed circuit card contacts with "Inhibisol" or proprietary brand of cleaning agent, and replace the boards in the unit.
(9) Check the contacts on the aerial change-over relay and clean if necessary with a burnishing tool (the relay assembly is fixed to the rear plate by two screws).
(10) Clean the 24 V supply connections with "Inhibisol" or proprietary brand of cleaning agent (this does not apply if silicon grease is employed—see para. 5.6).
(11) Verify that there is no oil leak from the 100 W amplifier module. There should be no more than a *slight* smear. If there is, refer to para. 6.2.
(12) Check the condition of the rubber sealing gasket behind the control panel, and replace if necessary (see para. 6.4).
(13) Replace the amplifier in the case and tighten the control panel screws.
(14) Remove the desiccator indicator (leaving the O ring in place).
(15) Connect the pressure test assembly, as shown in Fig. 5.1.
(16) Pump in air until the pressure gauge reads 10 lb. per sq. inch.
(17) Immerse the unit in water whilst maintaining the pressure and check that there are no air bubbles to indicate an air leak.

(18) When the air pressure test has been satisfactorily carried out, remove the test assembly, replace the desiccator indicator, and dry out the equipment in a temperature of 60°C at a maximum humidity of 5% for 4 hours. The desiccator should be dried out separately in a temperature of 138°C for 4 hours.

(19) Reassemble the amplifier and fit new security screw covers *immediately* after the drying out procedure is completed.

(20) Carry out the electrical procedure detailed in para. 5.1 GA480A.

AC Power Unit

When in regular use, the following procedures should be carried out every six months.

(1) Remove the power unit from its case (see para. 5.4).

(2) Check the tightness of all accessible screws.

(3) Inspect the unit carefully for dust and corrosion.

(4) Remove dust with a low pressure blower or vacuum cleaner.

(5) Check for signs of overheating due to a possible fault condition.

(6) Check the condition of the rubber sealing gasket behind the control panel and replace if necessary (see para. 6.4).

(7) Carry out the pressure tests and drying-out procedures detailed in Instructions (14) to (18) of GA480A SIX MONTHLY MAINTENANCE.

(8) Reassemble the power unit and fit new security screw covers *immediately* after the drying out procedure is completed.

(9) Carry out the electrical procedure detailed in para. 5.1. AC POWER UNIT, *ELECTRICAL.*

5.3 REMOVING THE GA480 FROM ITS CASE

(1) Unclip the battery unit (or disconnect an external supply if used).

(2) Remove the security screw covers from the control panel fixing screws with a spike.

(3) Undo the four 2BA socket-head fixing screws.

(4) Withdraw the GA480 from the case.

The reverse procedure should be adopted when the amplifier is returned to its case. Make sure that all the copper mesh pads are in position between the fins on the 100 W amplifier module: it is advisable to flatten the pads by squeezing them with the fingers so that they make good thermal contact with the inside of the amplifier case when the amplifier assembly is inserted.

Note. The case should be pressure tested and dried out, after removal and replacement of the GA480A, as recommended in para. 5.2 (14) to (18).

5.4 REMOVING THE POWER UNIT FROM ITS CASE

(1) Disconnect the external connections.

(2) Remove the security screw covers from the control panel fixing screws with a spike.

(3) Undo the four 2BA socket-head fixing screws.

(4) Withdraw the power unit.

The reverse procedure should be adopted when the power unit is returned to its case.

Note. The case should be pressure tested and dried out in the manner recommended for the GA480 case (see para. 5.2 (14) to (18)).

5.5 REMOVING AND REPLACING BATTERIES

To remove:—

(1) Place a hand over the top of the batteries and turn the battery unit upside down so that the batteries can be slid out of the case.

(2) Unplug each battery from the securing plate.

To replace:—

(1) Plug each battery on to the securing plate.

(2) Plug the securing plate into the battery unit.

5.6 MAINTENANCE OF BATTERY CONNECTIONS

It is recommended that the battery contacts and the supply contacts in the battery unit, as well as the associated contacts on the amplifier case, be smeared with silicon grease.

Under no circumstances should grease be allowed to obstruct the filler vents on the battery.

5.7 BATTERY CHARGING

If the GA480A is to be used in conjunction with the GR345, each battery should be charged as detailed in the GR345 handbook.

Should a GR345 battery charger not be available, then each battery must be charged at a constant potential of 14·6 ± 0·2 V until the charging current drops to 100–200 mA. If the two batteries are charged in parallel, ensure that the 100–200 mA charging current is drawn by each battery.

5.8 RE-WETTING THE BATTERIES

The nickel-cadmium batteries used with the GA480A are sealed units which require no routine maintenance. However, after long service in the field they may show appreciable reduction in capacity. When this occurs, their life may be prolonged by the re-wetting procedure given below.

NOTE

(1) This is *not* a routine maintenance procedure.

(2) It should not be carried out on batteries showing a *serious* loss of capacity.

(1) Discharge the battery at a rate of approximately 0·5 A until it is discharged.

(2) Recharge the battery at a constant 300 mA rate for 10 hours.

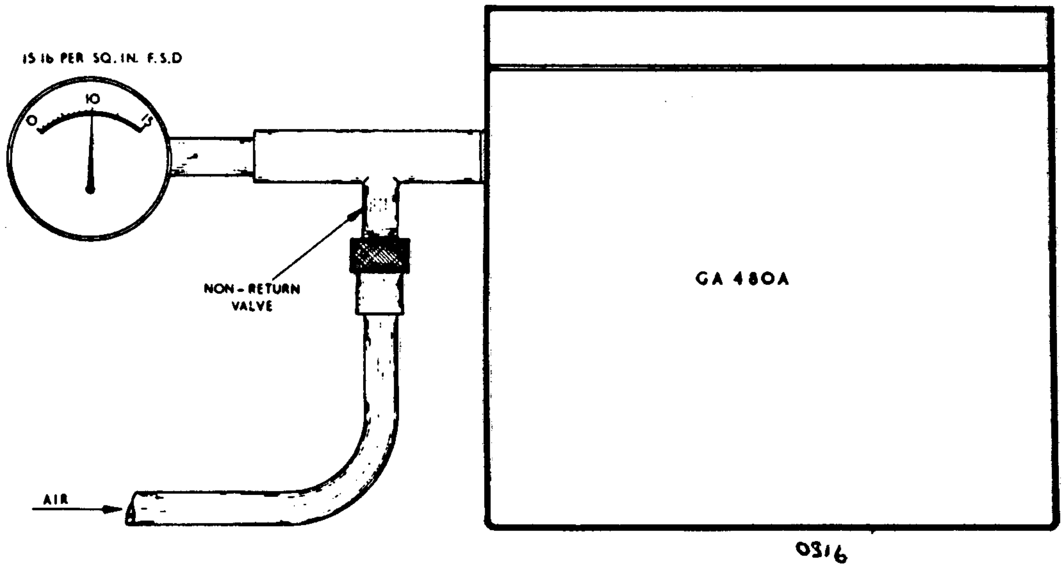
(3) Remove the filler vents from each cell.

(4) Add distilled water as necessary, one drop at a time, until the plates and separators are just visibly moist; allow for the absorption of the added water. Take care not to add too much water—there should be no free liquid within the cell.

(5) Replace the filler vents and continue charging at 300 mA for a further 5 hours.

(6) Again discharge the battery at 0·5 A, and recharge at a constant 300 mA rate for 15 hours.

(7) Discharge the battery once again at 0·5 A; recharge normally and return it to service.



AIR PRESSURE TEST ASSEMBLY FIG. 5.1

6 REPAIR AND REPLACEMENT

6 REPAIR AND REPLACEMENT

6.1 REPLACING THE 100 W AMPLIFIER MODULE

Having removed the GA480A from its case (para. 5.3) proceed as follows:—

(1) Remove the printed circuit cards.

(2) Remove two cheese head screws securing the send/receive relay sub-assembly (situated behind the 100 W amplifier module).

(3) Pull the relay sub-assembly clear of the chassis.

(4) Remove the two cheese head screws and spacers securing the module to the rear plate.

(5) Remove the four socket-head screws and sealing washers on the front panel.

(6) Slide the module to the rear and lift it out.

(7) Unsolder all connections, and remove the copper mesh pads.

(8) Fit the replacement module by adopting the reverse procedure. Make sure that all the copper mesh pads are in position between the fins on the 100 W amplifier module: it is advisable to flatten the pads by squeezing them with the fingers so that there is good thermal contact between the module and the front panel casting and between the module and the amplifier case when the amplifier assembly is inserted.

6.2 OIL LEAK FROM AMPLIFIER MODULE

Tighten the screws on the 100 W module terminal plate (7 lb./in. torque). If this does not cure the trouble, fit a replacement module as detailed in para. 6.1 and return the faulty module to Redifon Ltd.

6.3 BATTERY LEAK

Check the filler vents on the battery and obtain replacements for any that appear to be leaking.

Add distilled water, as necessary, one drop at a time, to any cell that has leaked, until the plates and separators are just visibly moist; allow for the absorption of the added water. Take care not to add too much water—there should be no free liquid within the cell.

Wipe up any electrolyte which may have leaked out (paying special attention to the inside of the battery unit). Neutralise the acid by cleaning the affected area with a cloth soaked in water. Remove any excess moisture with a clean dry cloth. Immediately dispose of any cloths used.

Recharge the battery as detailed in para. 5.7.

6.4 CONTROL PANEL GASKET REPLACEMENT

Control panel gaskets are not held in place by an adhesive, and can be removed by use of a penknife blade.

Replacement gaskets are:—

GA480A—Redifon Specification P43063/S.
AC Power Unit—Redifon Specification P43063/S.

6.5 FUSE REPLACEMENT

GA480A

The amplifier chassis must be withdrawn to replace a fuse (see para. 5.3). The fuse is located on the left hand side of the chassis, with a spare fuse next to it. Be sure to fit a new spare as soon as possible; the type is Belling Lee L1055, 15 A (or equivalent).

AC Power Unit

Both fuses are accessible from the front panel. The types are:—

Standard Fuse Co. C137 3A anti-surge for 200–250 V (or equivalent).

Standard Fuse Co. C137 6A anti-surge for 100-125 V (or equivalent).

6.6. LAMP REPLACEMENT

GA480A

The front panel lamps can be replaced after the associated glass cap has been removed.

The lamps are Thorn L1004 28 V 0·04 A (or equivalent).

AC Power Unit

A lamp is situated on the front panel and can be replaced after the glass cap has been removed.

The lamp is Thorn L1004 28 V 0·04 A (or equivalent).

6.7 PRINTED CIRCUIT REPAIRS

Printed circuits are employed in the GA480A and special care is necessary when carrying out repairs.

Soldering

(a) The printed wiring board must not be overheated by prolonged application of a soldering iron; such action will destroy the bond between the copper foil and the board. The use of irons with a rating greater than 25 W should be avoided.

(b) The most convenient soldering iron bit is a pencil type, not exceeding $\frac{3}{16}$ in. diameter, with the end filed at an angle.

(c) Only approved resin-cored solder to B.S.441, such as Enthoven Superspeed XX Activated, and preferably of 20 s.w.g., must be used.

Replacement of Components

(a) The joints of wire-ended components should be heated with a freshly tinned iron and the wire pulled out from the top, or insulated side of the board using snipe-nosed pliers or stout tweezers.

(b) The joints of multi-spill components should be heated and the solder brushed off, using a stiff brush—a small brush with the bristles cut to a length of $\frac{1}{4}$ in. is ideal. Toothbrushes should not be used, because the bristles are often made of nylon which will melt with the heat of the soldering iron.

(c) When the faulty component is removed, all solder must be cleared from the holes in the board. Once again a stiff brush, assisted by a fine sewing needle, is the tool to employ. The needle should first be oxidised in a flame to ensure that the molten solder does not adhere to it.

(d) Great care is necessary when replacing the component. The wires must be bent to the exact centres of the holes, at the same time ensuring that the component is not damaged. With some types of resistor, it may be necessary to scrape the paint from the wires before they are formed.

(e) When inserting the wires in the holes in the circuit board, the copper foil should be supported by a fingernail, close to the hole, to guard against pushing the copper away from the board.

(f) Before soldering the joints, ensure that the component is pressed hard against the top of the the board and maintain this pressure while the solder is hardening. If a gap is left between the component and the board, subsequent pressure on the component will tend to break the bond between the foil and the insulation.

(g) When soldering, the iron should be applied to the wire and the solder touched to the copper foil; immediately the solder runs the iron should be removed. When the joint has cooled the surplus wire should be cut off.

(h) Heat shunts should, where possible, be used when replacing semi-conductors, and the method of forming the wires should be copied from the faulty component.

(j) Before reassembly, inspect the circuit board for drops of solder splashed over its surface.

(k) If a portion of the printed wiring is damaged, it may be cut out with a very sharp knife and replaced by a piece of thin copper wire. This should be soldered between two points where components are fastened to the board, rather than to the foil itself.

6.8. SEMICONDUCTOR PRECAUTIONS

(a) Low impedance devices such as buzzers must not be used for point-to-point wiring checks—the high current could easily damage the transistors in the circuit. An ohmmeter may be used provided that the current passed does not exceed 1 mA and that polarity is observed.

(b) Electric soldering irons must always have an effective earth connection to guard against possible damage from leakage current.

(c) When connecting transistors or semiconductor diodes, heat shunts should, where possible, be applied to the lead-out wires to prevent heat from the soldering iron reaching the component. The shunt, which may be a pair of long-nosed pliers, must not be removed before the joint has cooled.

6.9 ORDERING SPARES AND REPLACEMENTS

When ordering spares and replacement parts, the following information should be given to ensure prompt delivery and the receipt of correct items.

(a) Type and serial number of the equipment as shown on the label.

(b) Name of sub-unit, where applicable, e.g. Control card.

(c) Modification state of equipment as indicated by strike-off number on modification label.

(d) Component reference number as shown on the circuit and the drawing number or figure number of the circuit diagram.

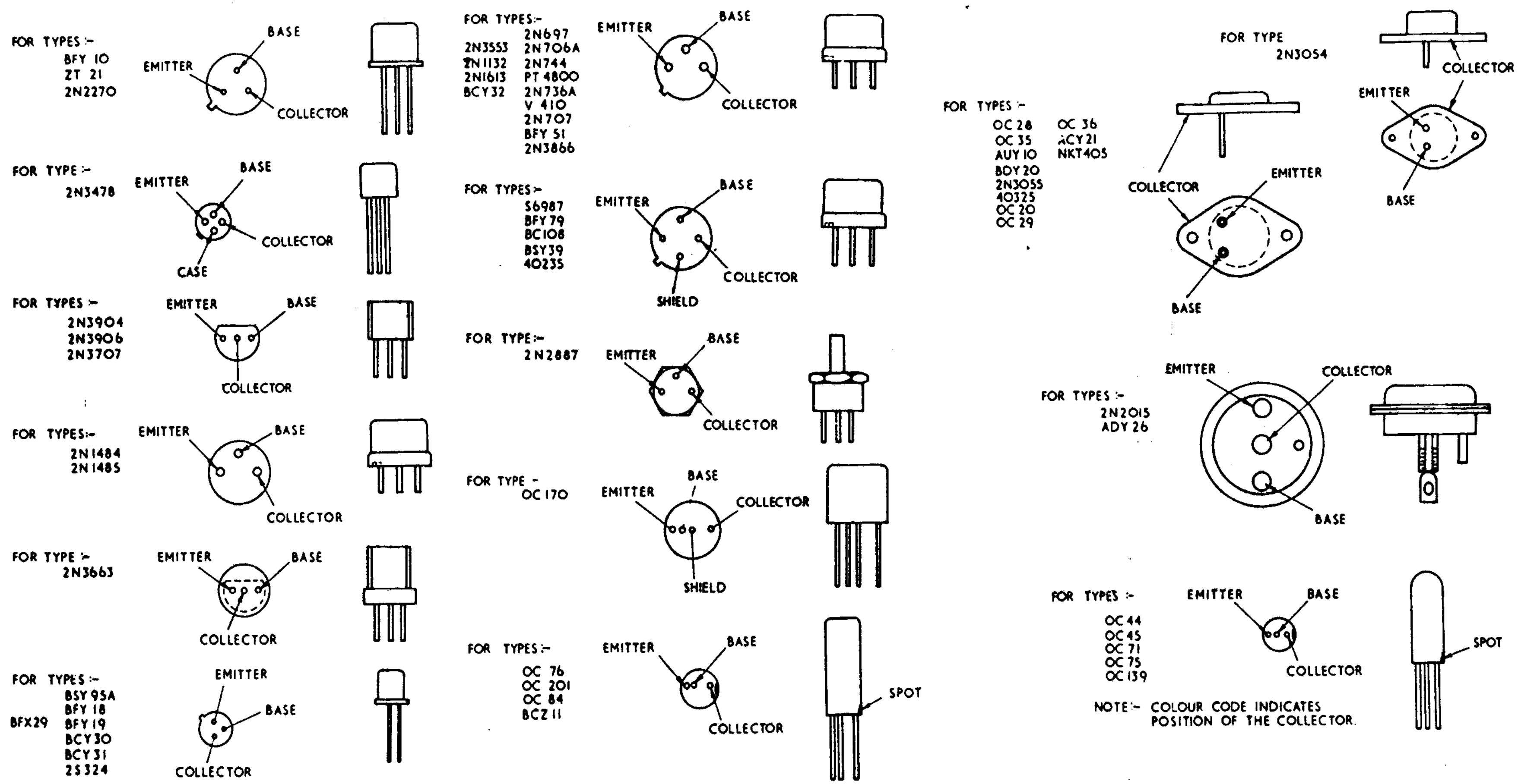
Redifon Ltd. reserves the right to incorporate in equipment, and to supply as spares, alternatives to components listed in handbooks and spares schedules.

6.10 SPARE PARTS LIST

A comprehensive Spare Parts List No. CSD108 for the GA480A equipment is available on request from Redifon Ltd.

6.11 SCHEDULE OF WORKSHOP TOOLS AND EXPENDABLE STORES

Schedule No. 1439 lists workshop tools and expendable stores that can be supplied for general maintenance and repair of electronic equipment: the schedule is available on request from Redifon Ltd.



TRANSISTOR CONNECTIONS

FIG. 6.1

7 FAULTFINDING

7 FAULTFINDING

7.1 GENERAL

Distinction should be made between a real and an apparent fault. An apparent fault may be the result of incorrect operation of the controls: as a first step verify that the correct operating procedure has been followed, as given in Chapter 3.

Having established that a fault condition exists, the first task is to ascertain whether the fault is in the GA480A or in the associated drive equipment.

Disconnect the GA480A and connect the drive unit to the aerial coupling unit. If operation on reduced power is satisfactory, the GA480A is suspect and faultfinding should be proceeded with as indicated on the faultfinding chart in Fig. 7.1. The chart provides a systematic check of the switching circuits in the GA480A.

If the fault is not in the switching circuits, it will be necessary to check the d.c. and a.c. voltage levels to locate the fault to a stage. Typical levels are given in the tables in paras. 7.2 and 7.3.

To facilitate the taking of measurements on the printed circuit cards, Redifon can supply a special extension jig which will raise the card to a more accessible position.

It is recommended that spare printed circuit cards and a spare amplifier module are carried, to enable faults to be cleared quickly by substitution.

The performance of spare amplifier modules and printed circuit cards can be checked in base workshops by following the test procedures given in Chapter 8.

After completing repairs and returning the equipment to its case, it is desirable to check the sealing by carrying out the pressure test detailed in para. 5.2.

7.2 TYPICAL DC LEVELS

The readings given in the table below were taken on an Avometer model 8, switched to the following ranges.

Voltage level	*Range*
above 15 V	25 V f.s.d.
between 1 V and 5 V	10 V f.s.d.
below 1 V	1 V f.s.d.

Conditions:—
Receive: GA480A switched on; key or press-to-talk switch not pressed.
Transmit: GA480A switched on; press-to-talk switch pressed; no drive input; 75Ω dummy load connected to output.
Supply voltage: 24 V.

Point of Measurement	*Voltage (V)*	
	Receive	*Transmit*
Pin 1 of 100 W module	24	24
Pin 2 of 100 W module	24	24
Pin 3 of 100 W module	24	24
Pin 4 of 100 W module	0	1·8
Pin 5 of 100 W module	0	15
Pin 6 of 100 W module	17·7	17·6
Pin 7 of 100 W module	0	5·5
SKB-A	2·8	9·5
SKB-E	0·3	6·0
SKB-L	0	24
SKA-A	0	5·6
SKA-B	24	24
SKA-E	0	24
SKA-J	2·8	22
SKA-K	0	24
SKA-P	0	23
SKA-W	0	1·6
SKA-X	24	23
SKA-Y	1·6	1·7
SKA-Z	1·6	0
SKC-A	24	24
SKC-B	3	20·8
SKC-D	2·8	9·5
SKC-E	0·3	6·0
SKC-J	24	24
SKC-K	17·7	17·6
SA/FS1 junction	24	24
Positive terminal of M1	24	24
1R1/ILP1 junction	6·8	6·8
1R2/ILP2 junction	6·8	6·8
1VT1 base	0	15·5
1VT1 emitter	0	14·9
1VT1 collector	0	23
3T1 secondary/3MR1 junction	2·8	9·5
3T1 secondary/3MR3 junction	2·8	9·5
3MR1/3MR2 junction	2·1	8·7
3MR3/3MR4 junction	2·1	8·6
3MR2/3R1 junction	1·5	7·9
3MR4/3R1 junction	1·5	7·8
3MR5/3MR6 junction	0·8	7·0
3MR7/3MR8 junction	0·8	6·9
3T2 primary/3MR6 junction	0·3	6·0
3T2 primary/3MR8 junction	0·3	6·0
3VT1, 3VT2 base	0	4·6
3VT1, 3VT2 emitter	0	4·0
3VT1, 3VT2, collector	0	19·5

Point of Measurement	Voltage (V)	
	Receive	Transmit
3R5/3R9 junction	0	3·65
3R6/3R10 junction	0	3·65
3VT3, 3VT4 base	0	0·78
3VT3, 3VT4 emitter	0	0·1
3VT3, 3VT4 collector	0	24
3R3/3R12/3R13 junction	0	19·5
5VT1 base	0	23
5VT1 emitter	0	24
5VT1 collector	0	21·2
5VT1 base	1·7	1·8
5VT2 emitter	1·6	1·7
5VT2 collector	23·5	23·5
5VT3 base	19	1·5
5VT3 emitter	24	23
5VT3 collector	1·7	1·8
5VT4 base	1·7	1·8
5VT4 emitter	1·6	0·9
5VT4 collector	23·5	0·9
5R4/5MR5 junction	0	21·8
5R11/5R13 junction	0	10·4
5R13/5R15 junction	0	5·6
2VT1 base	17·0	18·0
2VT1 emitter	18·4	18·4
2VT1 collector	0·3	2·5
2VT2 base	0·1	5·5
2VT2 emitter	0·3	6·0
2VT2 collector	3·0	14·9
2VT3 base	0·2	2·5
2VT3 emitter	0	5
2VT3 collector	18·5	18·4
2VT4 base	23·3	23·3
2VT4 emitter	23·6	23·6
2VT4 collector	16·1	16·1
2VT5 base	22·5	22·5
2VT5 emitter	16·1	16·1
2VT5 collector	0·2	2·5

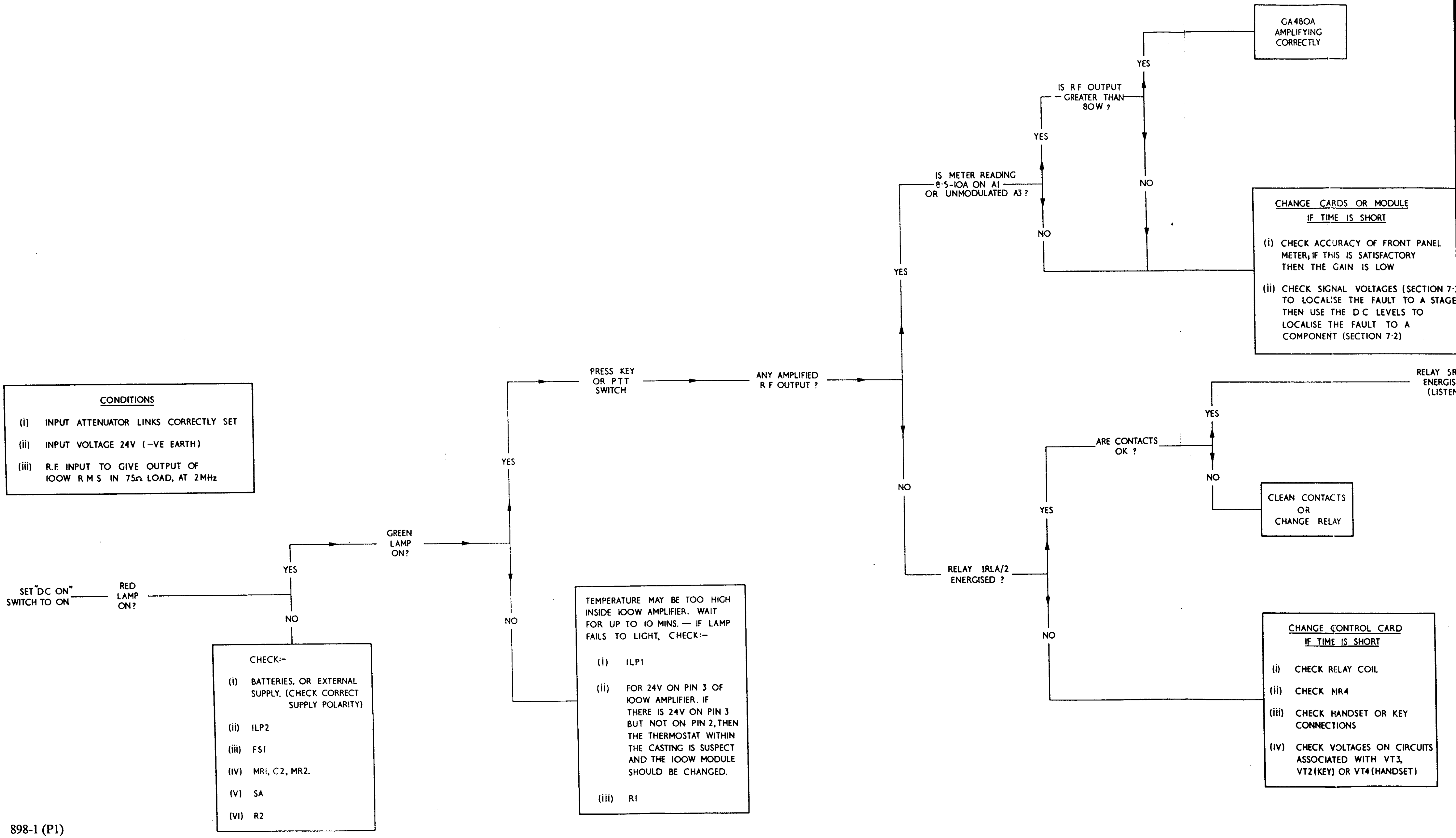
Point of Measurement	Voltage (V)	
	Receive	Transmit
2VT6 base	23	23
2VT6 emitter	23·6	23·6
2VT6 collector	22·5	22·5
2R8/2R7 junction	0·5	0·5
2R8/2R9 junction	18·1	18·1
2R9 Wiper	17·0	17·1
2R9/2R10 junction	15·6	15·6
2R10/2MR3 junction	6·9	6·9
2R22/2R23 junction	22·8	22·8

7.3 TYPICAL AC LEVELS

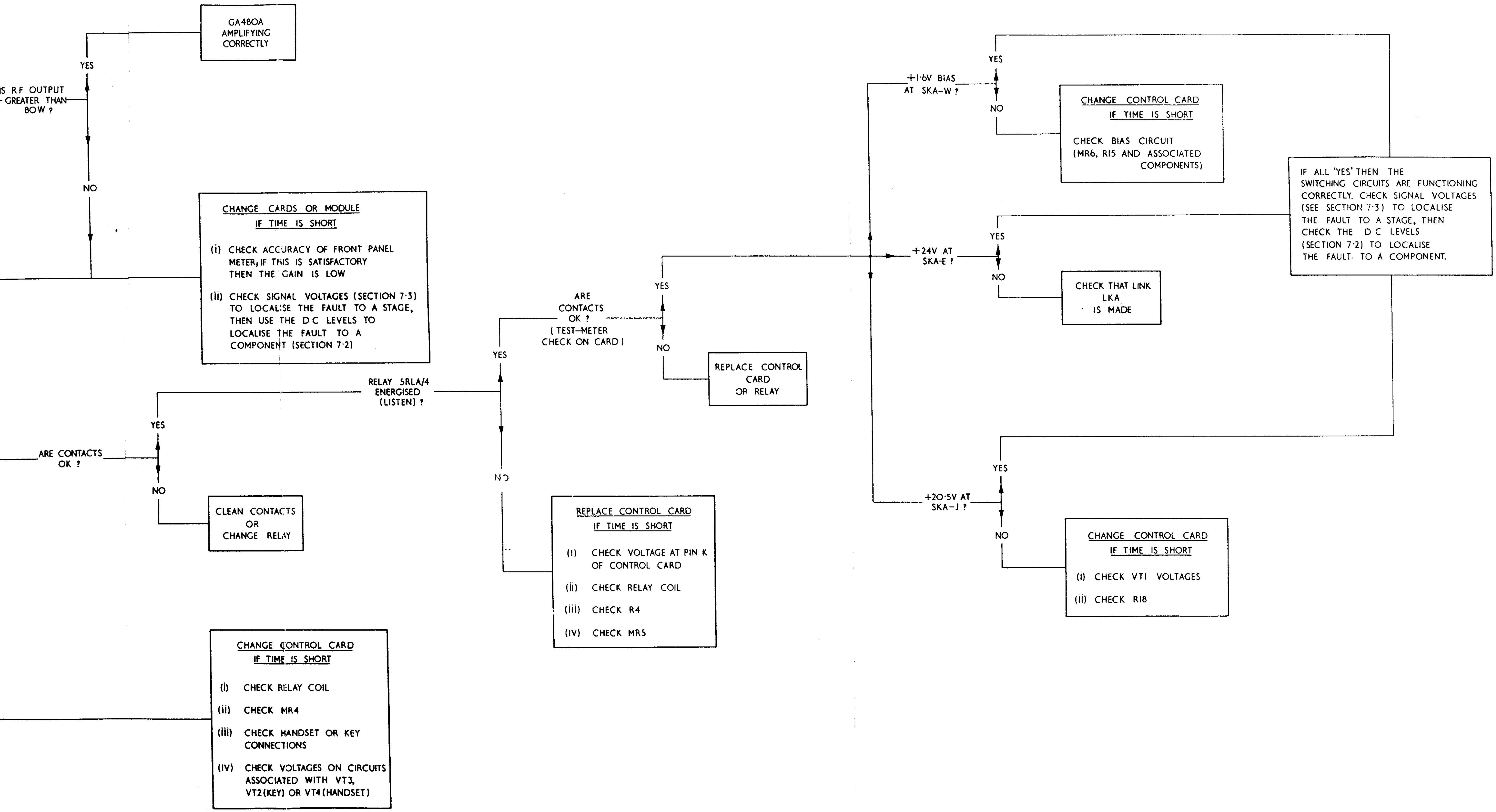
Measurements were taken on a Marconi TF1041C valve voltmeter. The range was selected so that a deflection between half and full scale was obtained for each measurement.

Conditions: Transmit; r.f. drive input just sufficient for 100 W r.m.s. output at 2 MHz.

Point of Measurement	Voltage (V) r.m.s.
Pin 9 of 100 W module	9·5
Pin 11 of 100 W module	87
SKB-C	1·15
SKB-S	9·5
SKA-R	1·15
3T1 secondary/3MR1 junction	0·57
3T1 secondary/3MR3 junction	0·57
3T2 primary/3MR6 junction	0·42
3T2 primary/3MR8 junction	0·42
3VT1, 3VT2 base	0·45
3VT1, 3VT2 collector	6·4
3VT3, 3VT4 base	2·2
3VT3, 3VT4 emitter	1·5
3VT3, 3VT4 collector	9·4


CONDITIONS
(i) INPUT ATTENUATOR LINKS CORRECTLY SET
(ii) INPUT VOLTAGE 24V (-VE EARTH)
(iii) R.F. INPUT TO GIVE OUTPUT OF 100W R M S IN 75Ω LOAD, AT 2MHz
SET "DC ON" SWITCH TO ON
RED LAMP ON?
YES
NO
CHECK:-
(i) BATTERIES, OR EXTERNAL SUPPLY. (CHECK CORRECT SUPPLY POLARITY)
(ii) ILP2
(iii) FS1
(IV) MR1, C2, MR2.
(V) SA
(VI) R2
GREEN LAMP ON?
YES
NO
TEMPERATURE MAY BE TOO HIGH INSIDE 100W AMPLIFIER. WAIT FOR UP TO 10 MINS. — IF LAMP FAILS TO LIGHT, CHECK:-
(i) ILP1
(ii) FOR 24V ON PIN 3 OF 100W AMPLIFIER. IF THERE IS 24V ON PIN 3 BUT NOT ON PIN 2, THEN THE THERMOSTAT WITHIN THE CASTING IS SUSPECT AND THE 100W MODULE SHOULD BE CHANGED.
(iii) R1
PRESS KEY OR PTT SWITCH
ANY AMPLIFIED R F OUTPUT ?
YES
NO
IS METER READING 8·5-10A ON A1 OR UNMODULATED A3 ?
YES
NO
IS R F OUTPUT GREATER THAN 80W ?
YES
NO
GA480A AMPLIFYING CORRECTLY
CHANGE CARDS OR MODULE IF TIME IS SHORT
(i) CHECK ACCURACY OF FRONT PANEL METER; IF THIS IS SATISFACTORY THEN THE GAIN IS LOW
(ii) CHECK SIGNAL VOLTAGES (SECTION 7· TO LOCALISE THE FAULT TO A STAGE THEN USE THE D C LEVELS TO LOCALISE THE FAULT TO A COMPONENT (SECTION 7·2)
RELAY 1RLA/2 ENERGISED ?
YES
NO
ARE CONTACTS OK ?
YES
NO
RELAY SR ENERGIS (LISTEN
CLEAN CONTACTS OR CHANGE RELAY
CHANGE CONTROL CARD IF TIME IS SHORT
(i) CHECK RELAY COIL
(ii) CHECK MR4
(iii) CHECK HANDSET OR KEY CONNECTIONS
(IV) CHECK VOLTAGES ON CIRCUITS ASSOCIATED WITH VT3, VT2 (KEY) OR VT4 (HANDSET)

898-1 (P1)



FAULTFINDING CHART

FIG. 7.1

8 OVERALL PERFORMANCE CHECKS AND ADJUSTMENTS

8 OVERALL PERFORMANCE CHECKS AND ADJUSTMENTS

8.1 GENERAL

This chapter contains the information necessary for carrying out overall performance tests on the GA480A. The procedures are applicable when a deterioration in electrical performance is suspected or when spare printed circuit cards and amplifier modules are to be checked after repair and before return to the field for use as replacement assemblies.

Should the full specification performance be required, it is necessary that the units be checked and adjusted in the GA480A in which they will be used.

The test procedures are based on the use of a GR345 as a drive unit; however, the same basic procedures will apply if other types of drive unit are used.

A list of test equipment, with examples, precedes the testing information. It should be borne in mind that new models of test equipment are always being introduced and if new equipment is to be ordered, consultation with Redifon Ltd. is recommended to ensure that the most suitable equipment is purchased.

8.2 TEST EQUIPMENT REQUIRED

DC Power Supply: 0·30 V 12 A with ammeter and trip, e.g. Roband T113.

DC Power Supply: 12 V 6 A, e.g. Roband SB30/10.

RF Signal Generators (2): 1·5-12 MHz 1 V e.m.f., e.g. Airmec 201.

Oscilloscope: e.g. Tectronix 585.

Spectrum Analyser: e.g. Marconi OA1094.

RF Power Meter: 75Ω 100 W, e.g. Marconi TF1020A.

RF Power Meter. 50Ω 100 W, e.g. Marconi TF1020A.

Valve Voltmeter: 0·30 V r.m.s. 1·5-12 MHz, e.g. Marconi TF1041C.

Test Preamplifier: Redifon type SK6480.

Hybrid Transformer: Redifon type SK6479.

Multirange Meter: e.g. Avometer model 8 (or 100 mA d.c. f.s.d. meter).

Multirange Meter: e.g. Avometer model 8 (or 0·30 V d.c. f.s.d. meter).

Morse Key: Redifon type 5459/A.

Handset: Redifon type 5458/A.

Drive Unit: e.g. Redifon Transmitter-Receiver type GR345.

Aerial Coupling Unit: Redifon type ACU9.

Interconnecting Cable: Redifon type 6683.

Coaxial Cables: 75Ω and 50Ω.

Dummy Load: 10Ω + 50 pF (see Fig. 8.1).

8.3 PRELIMINARIES

(1) Unclip the battery unit or disconnect the external supply if used.

(2) Remove the security screw covers from the control panel fixing screws with a spike.

(3) Undo the four 2BA socket-head screws.

(4) Withdraw the amplifier from the case.

(5) Remove the Control card.

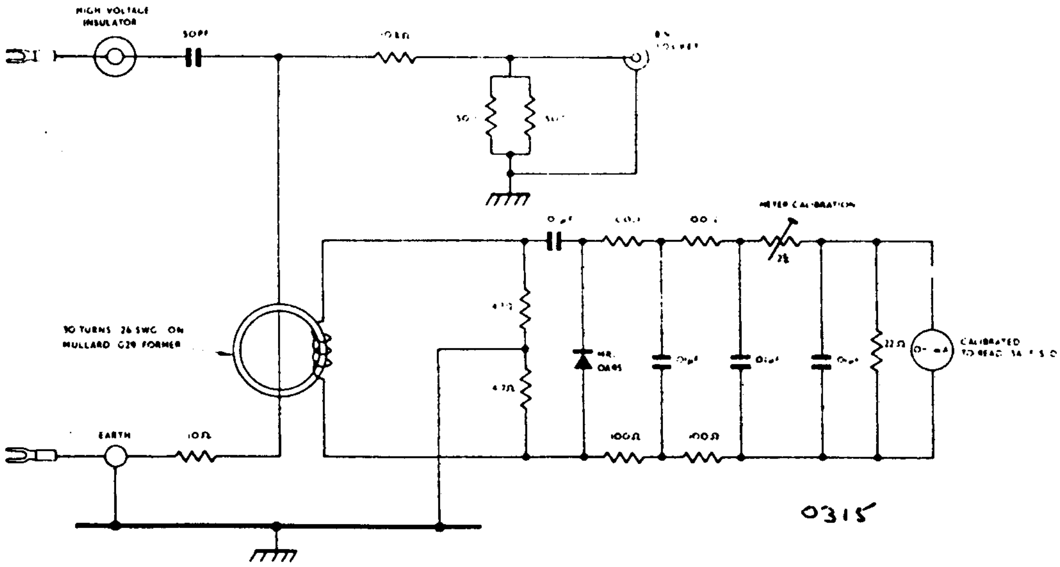


Fig. 8.1 Dummy Load

(6) Rotate R15 (Control card) fully counter-clockwise.

(7) Link A to C (50Ω low level input); ensure that no other links are made.

(8) Replace the Control card.

(9) Rotate R8 fully counter-clockwise, and R9 and R22 fully clockwise (TLC card).

(10) Connect the test equipment to the GA480A as shown in Fig. 8.2. Ensure that both signal generators are set to minimum output and that the power supply is set to minimum output and is switched off.

(11) Disconnect the red lead on terminal 1 of the 100 W amplifier module and connect the 100 mA f.s.d. meter between the free lead and terminal 1.

(12) Set the power supply current trip to 2A.

8.4 DC MEASUREMENTS

(1) Switch on the GA480A.

(2) Press the key.

(3) Switch on the power supply and slowly increase the output voltage to 24 V, at the same time observing the supply current.

(4) Verify that relay *RLA*/2 (main chassis) has actuated and that the supply current does not exceed 1·5 A (a current in excess of this indicates a fault condition which should be investigated immediately).

(5) Check that the 100 mA f.s.d. meter reading is between 25 and 35 mA; note reading.

(6) Check that the red and green lamps on the GA480A control panel are lit: wait 5 minutes before proceeding.

(7) Slowly adjust R15 (Control card) so that the reading obtained in Instruction (5) is increased by 5 mA.

(8) Take the following d.c. measurements (ensure 24 V at the GA480A supply input).

Point of Measurement	*Voltage (V)*
Pin 4 of 100 W module	1·8–2·3
Pin 5 of 100 W module	14·0–15·0
Pin 7 of 100 W module	4·5–5·5
SKA-J	22·0–23·0

(9) Disconnect the 100 mA f.s.d. meter and reconnect the red lead to pin 1 of the 100 W module, after switching off the supply.

(10) Set the power unit trip current to 15A.

8.5 SETTING UP TLC AND INPUT SENSITIVITY

(1) Connect the valve voltmeter to SKA-D of the Control card.

(2) Switch on the power unit.

(3) Set the frequency of signal generator (1) to 2 MHz and set the output control for a reading of 2·0 V r.m.s. on the valve voltmeter.

(4) Confirm that the RF power meter indicates between 30 and 70 W.

(5) Adjust R8 (TLC card) until a power output slightly in excess of 100 W is attained. Then adjust R22 (TLC card) until a power output of 100 W is attained. Rotate R8 counter-clockwise to decrease power by 1 W.

(6) Slowly decrease the signal generator output until the power output falls to 95 W.

(7) Note the valve voltmeter reading; this should be not greater than 1·6 V r.m.s.

(8) Set the signal generator frequency to 12 MHz and adjust the output for a reading of 2·0 V r.m.s. on the valve voltmeter.

(9) Rotate R22 (TLC card) counter-clockwise until the power meter reading falls by 1 W.

(10) Confirm that the power output level is 80–100 W (note this reading) and that the GA480A control panel meter indicates 8·5–10 A.

(11) Rotate R9 (TLC card) counter-clockwise until the point is reached at which power output *just* begins to decrease.

(12) Increase the power supply voltage to 30 V and check that the power output is within 5 W of that noted in Instruction (10); if the power variation is greater than 5 W then readjust R9 slightly: see Instruction (11).

(13) Set the power supply to 24 V again and confirm that the power output is as noted in Instruction (10).

(14) Decrease the supply voltage to 22·5 V and confirm that the power output is between 80–100 W.

(15) Switch off the GA480A.

8.6 INTERMODULATION DISTORTION

(1) Disconnect the 75Ω RF power meter and replace it with the aerial coupling unit.

(2) Connect the 50Ω RF power meter to the aerial coupling unit (Dipole and Earth terminals).

(3) Couple the spectrum analyser to the RF power meter.

(4) Set the frequency of both signal generators to 1·5 MHz and set the output voltage of each to minimum.

(5) Switch on the GA480A.

(6) Increase the output voltage of signal generator (1) until the valve voltmeter indicates 2·0 V r.m.s.

(7) Tune up the ACU (see Chapter 2, Part II) for maximum power output.

(8) Decrease the output voltage of signal generator (1) until the valve voltmeter indicates 1·6 V r.m.s.

(9) Adjust the spectrum analyser controls to display the single r.f. signal in the centre of the screen.

(10) Disconnect the output from signal generator (1).

(11) Increase the output of signal generator (2) until the valve voltmeter indicates 1·6 V r.m.s.

(12) Reconnect signal generator (1) and adjust its frequency to within 1 kHz of the frequency of signal generator (2). This can be carried out by reference to the spectrum analyser display.

(13) Confirm that the reading on the RF power meter is at least 35 W.

(14) Measure, on the spectrum analyser, the level of the 3rd and 5th order intermodulation products; these should be at least −25 dB below either tone.

(15) Repeat Instructions (4), and (6) to (14) at a frequency of 12 MHz.

8.7 FUNCTIONAL AND HIGH LEVEL TESTS

(1) Switch off the GA480A.

(2) Remove the Control card and disconnect the A-C link; link A to B (75Ω high level input) and ensure that no other links are made.

(3) Replace the Control card.

(4) Disconnect the 50Ω coaxial cable from the GA480A RF In socket and connect a 75Ω coaxial cable in its place.

(5) Connect the other end of the 75Ω cable to the GR345 Aerial and Earth terminals.

(6) Connect the Cable type 6683 between the free Control socket on the GA480A and either Audio socket on the GR345.

(7) Insert the handset in the free Audio socket on the GR345.

(8) Ensure that the GR345 is switched off.

(9) Connect the 12 V DC power unit to the battery connector at the base of the GR345.

(10) Switch on the GR345 and tune for maximum output on SSB/CW, key down, at 11·999 MHz (refer to GR345 Operating Instructions); confirm that the power meter indicates 10-16 W.

(11) Release the key and switch on the GA480A; confirm that the power meter indicates 100 W ± 1 dB when the key is pressed.

(12) Release the key and set the GR345 to the AM mode.

(13) Press the press-to-talk switch and verify that the RF power meter indicates 100 W ± 1 dB.

(14) Switch off the GA480A, release the press-to-talk switch, and set the GR345 to the SSB/CW mode.

8.8 KEYING AND STABILITY

(1) Disconnect the 50Ω RF power meter and replace it with the 10Ω + 50 pF load (connected to the Whip terminal). It is essential that the leads connecting the ACU9 to the 10Ω + 50 pF load are kept as short as possible—3 in. maximum.

(2) Switch on the GA480A and press the key.

(3) Tune up the ACU for maximum power output.

(4) Confirm that the ACU meter indicates within 2 or 3 divisions of full scale and that the GA480A meter indicates 8·5–10 A. *Slight* readjustment of the GR345 and ACU controls may be necessary to attain maximum output.

(5) Loosely couple the oscilloscope to the dummy load and adjust the controls to display the r.f. waveform.

(6) Note the display amplitude.

(7) Key a series of dots at approximately 12 words per minute.

(8) Adjust the oscilloscope controls to attain a steady display, and check that it is of the same amplitude as noted in Instruction (6).

(9) Release the key and set the GR345 to a frequency of 5 MHz; press the key and tune the GR345 for a maximum reading on the GR345 control panel meter.

(10) Repeat Instructions (3), (4), (5), (6), (7) and (8).

(11) Keeping the key pressed, rotate the ACU Tune control each side of the resonance position. Check that parasitic oscillations are not present on the displayed waveform.

(12) Switch off the GA480A and disconnect the ACU.

(13) Short circuit the GA480A RF Out socket.

(14) Switch on the GA480A and check that the front panel meter reading does not exceed 10 A.

(15) Switch off the GA480A and remove the short circuit connected in Instruction (13).

(16) Switch on the GA480A and confirm that the front panel meter reading does not exceed 3 A.

(17) Switch off and disconnect all test equipment.

(18) Set the input attenuator as required (see para. 3.8).

(19) Follow Instructions (13) to (19) of para. 5.2 (GA480A) before returning the unit to service.

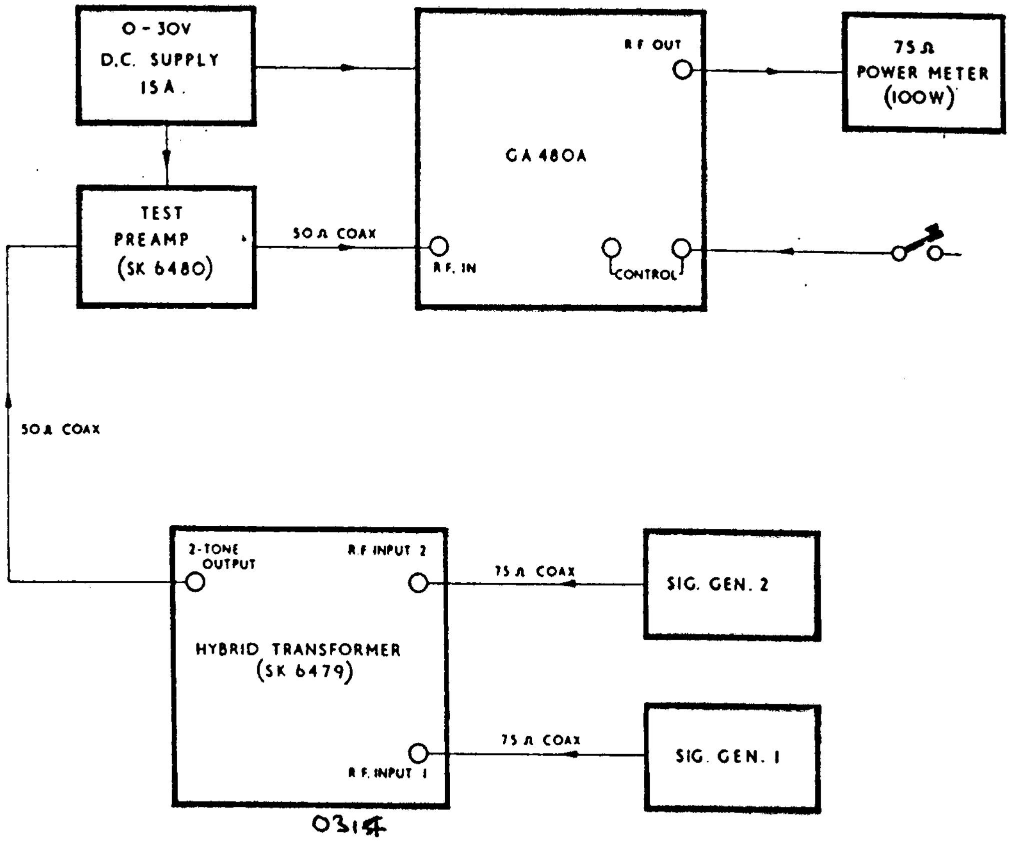
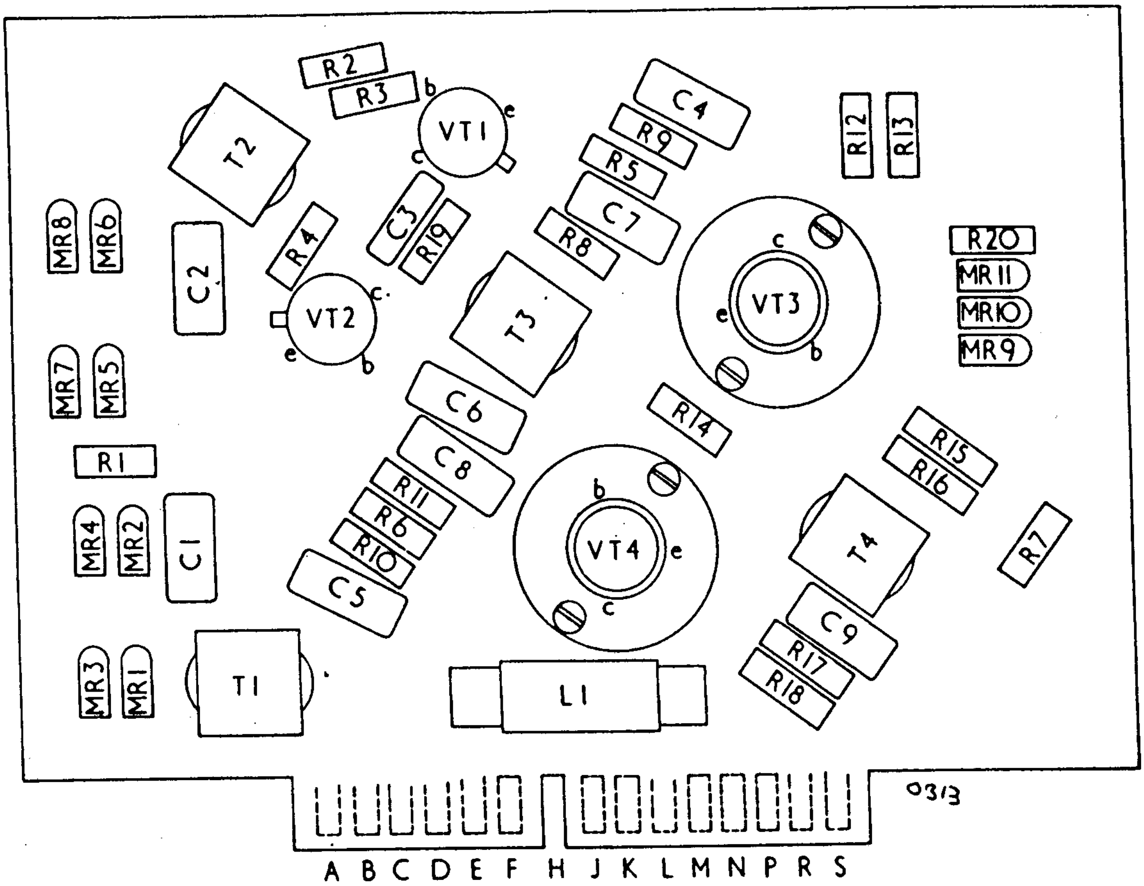


FIG. 8.2 INITIAL TEST EQUIPMENT CONNECTIONS 898-1 (P1)

9 ILLUSTRATIONS



COMPONENTS LIST

PREAMPLIFIER CARD (SECTION 3)

Resistors

3R1 4·7kΩ ±2% ¼W Electrosil TR5
3R2 180Ω ±2% ¼W Electrosil TR5
3R3 820Ω ±2% ¼W Electrosil TR5
3R4 270Ω ±2% ¼W Electrosil TR5
3R5 10Ω ±2% ¼W Electrosil TR5

3R6 10Ω ±2% ¼W Electrosil TR5
3R7 1·5kΩ ±2% ¼W Electrosil TR5
3R8 390Ω ±2% ¼W Electrosil TR5
3R9 100Ω ±2% ¼W Electrosil TR5
3R10 100Ω ±2% ¼W Electrosil TR5

3R11 390Ω ±2% ¼W Electrosil TR5
3R12 100Ω ±2% ¼W Electrosil TR5
3R13 100Ω ±2% ¼W Electrosil TR5
3R14 680Ω ±2% ¼W Electrosil TR5
3R15 15Ω ±2% ¼W Electrosil TR5

3R16 15Ω ±2% ¼W Electrosil TR5
3R17 15Ω ±2% ¼W Electrosil TR5
3R18 15Ω ±2% ¼W Electrosil TR5
3R19 1·5kΩ ±2% ¼W Electrosil TR5
3R20 18Ω ±2% ¼W Electrosil TR5

Capacitors

3C1 0·22μF ±20% 100V STC PMA 0·22 M100
3C2 0·22μF ±20% 100V STC PMA 0·22 M100
3C3 5pF ±½pF 350V Lemco MR1106/I/RS/5PDP/350
3C4 0·22μF ±20% 100V STC PMA 0·22 M100
3C5 0·22μF ±20% 100V STC PMA 0·22 M100
3C6 0·22μF ±20% 100V STC PMA 0·22 M100
3C7 0·22μF ±20% 100V STC PMA 0·22 M100
3C8 0·22μF ±20% 100V STC PMA 0·22 M100
3C9 0·22μF ±20% 100V STC PMA 0·22 M100

Transistors

3VT1 RCA 2N3866
3VT2 RCA 2N3866
3VT3 RCA 2N3553
3VT4 RCA 2N3553

Diodes

3MR1 Mullard OA200
3MR2 Mullard OA200
3MR3 Mullard OA200
3MR4 Mullard OA200
3MR5 Mullard OA200

3MR6 Mullard OA200
3MR7 Mullard OA200
3MR8 Mullard OA200
3MR9 Mullard OA200
3MR10 Mullard OA200
3MR11 Mullard OA200

Inductors

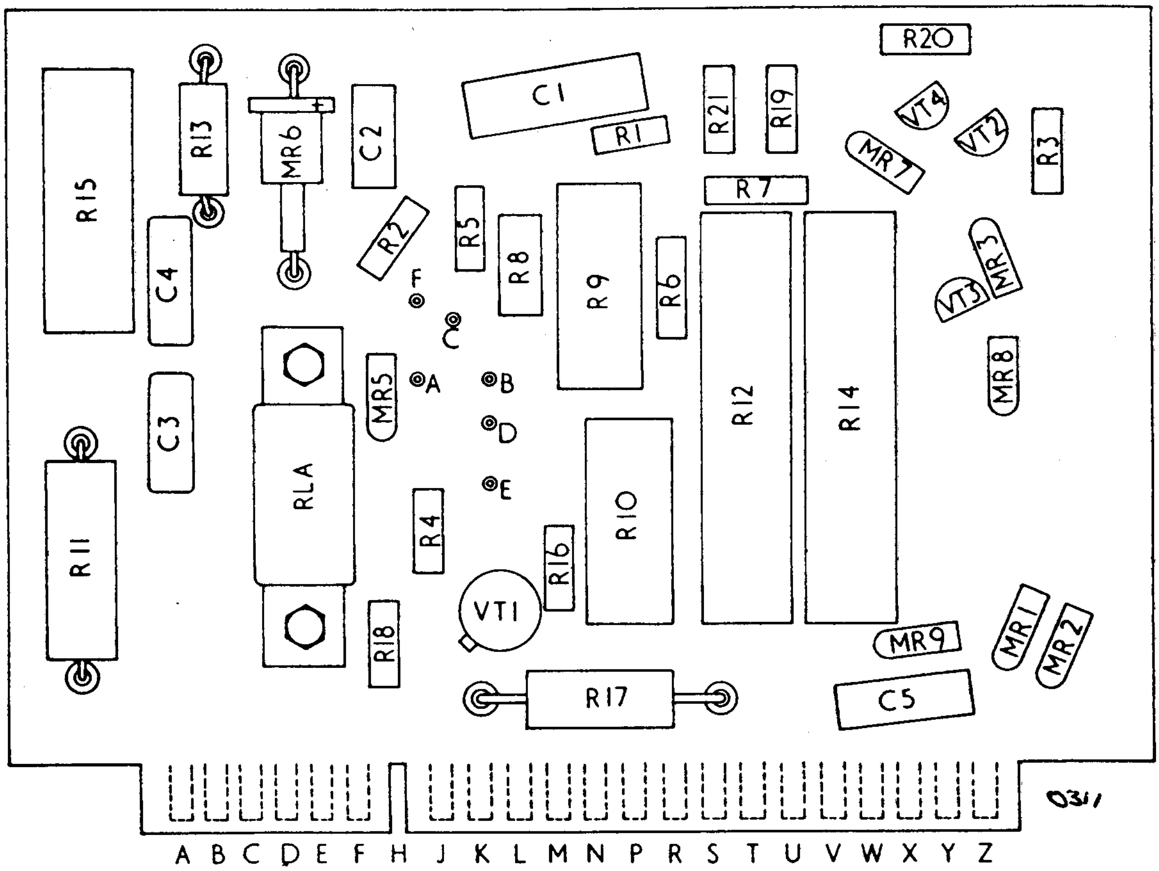
3L1 14μH to Redifon Drg. P43044/5

Transformers

3T1 To Redifon Drg. P43045/M
3T2 To Redifon Drg. P43046/M
3T3 To Redifon Drg. P43047/M
3T4 To Redifon Drg. P43048/M

PREAMPLIFIER CARD COMPONENT LAYOUT

FIG. 9.1



COMPONENTS LIST
CONTROL CARD (SECTION 5)

Resistors

5R1	12kΩ ±2% ¼W Electrosil TR5
5R2	33Ω ±2% ¼W Electrosil TR5
5R3	12kΩ ±2% ¼W Electrosil TR5
5R4	100Ω ±2% ¼W Electrosil TR5
5R5	10Ω ±2% ¼W Electrosil TR5
5R6	27Ω ±2% ¼W Electrosil TR5
5R7	56Ω ±2% ¼W Electrosil TR5
5R8	680Ω ±2% 1W Electrosil TR6
5R9	39Ω ±2% 1·125W Welwyn F32P
5R10	39Ω ±5% 1·125W Welwyn F32P
5R11	120Ω ±5% 3W Painton 306A
5R12	110Ω ±5% 2½W Welwyn F34P
5R13	47Ω ±5% 1½W Painton MV1A
5R14	110Ω ±5% 2½W Welwyn F34P
5R15	100Ω ±5% 1W Amphenol 990G-PC-100 (Potentiometer)
5R16	47Ω ±2% ¼W Electrosil TR5
5R17	1Ω ±10% 3W Painton 306A
5R18	10Ω ±2% ¼W Electrosil TR5
5R19	1kΩ ±2% 1W Electrosil TR5
5R20	12kΩ ±2% ¼W Electrosil TR5
5R21	12kΩ ±2% ¼W Electrosil TR5

Capacitors

5C1	10µF ±10% 35V Union Carbide K10J35SK
5C2	1µF ±10% 35V Union Carbide K10J35KS
5C3	0·22µF ±20% 100V STC PMA 0·22 M100
5C4	0·22µF ±20% 100V STC PMA 0·22 M100
5C5	0·22µF ±20% 100V STC PMA 0·22 M100

Diodes

5MR1	Mullard BYX36/150
5MR2	Mullard BYX36/150
5MR3	Mullard OA200
5MR5	Mullard OA200
5MR6	Mullard BZY96 C10
5MR7	Mullard OA200
5MR8	Mullard OA200
5MR9	Mullard OA200

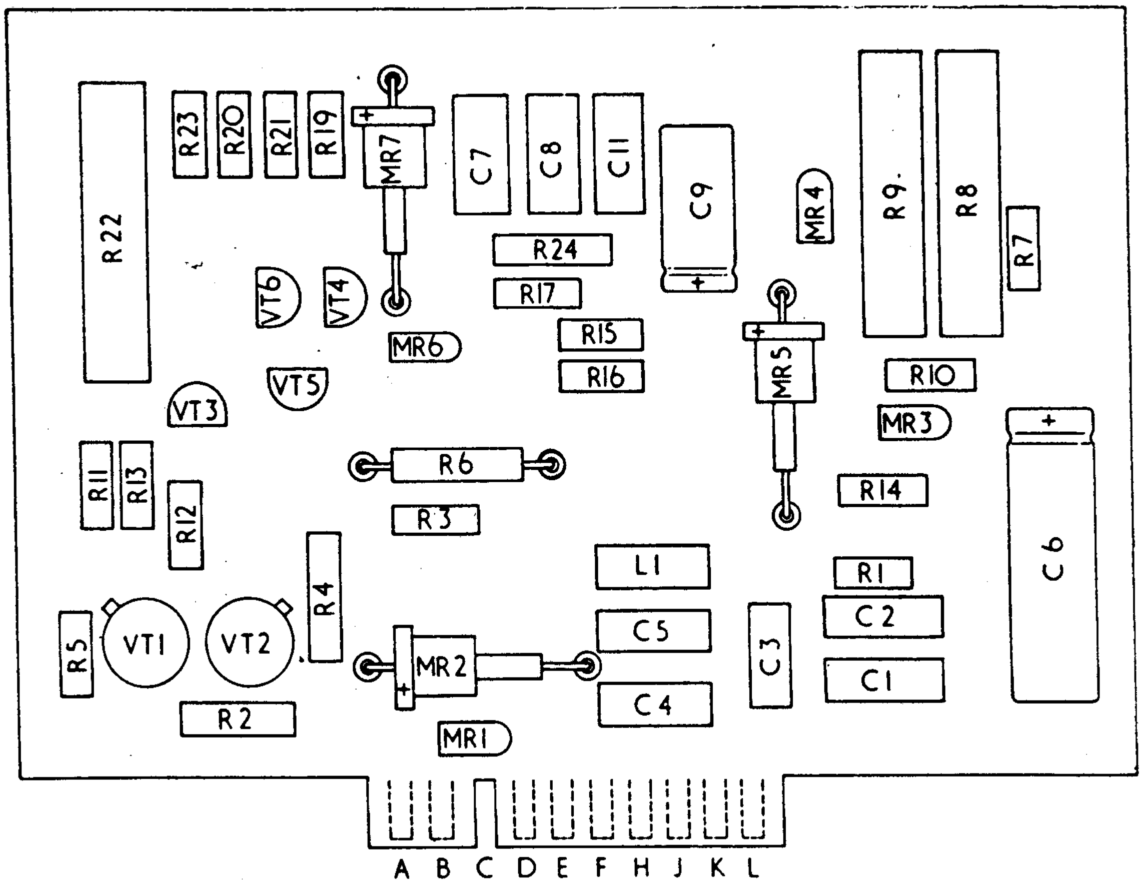
Transistors

5VT1	Mullard 2N1132
5VT2	Motorola 2N3904
5VT3	Motorola 2N3906
5VT4	Motorola 2N3904

Relays

5RLA	Hellerman Deutsch HDD4-S-F2-H-02

FIG. 9.2 CONTROL CARD COMPONENT LAYOUT



COMPONENTS LIST

TLC CARD (SECTION 2)

Resistors
2R1 22Ω ±2% ¼W Electrosil TR5
2R2 91Ω ±2% 1W Electrosil TR6
2R3 10k ±2% ¼W Electrosil TR5
2R4 82Ω ±2% 1W Electrosil TR6
2R5 10kΩ ±2% ¼W Electrosil TR5

2R6 100Ω ±2% 1¼W Painton MV1A
2R7 150Ω ±2% ¼W Electrosil TR5
2R8 100Ω ±5% 1W Amphenol 990GB-PC-100 (Potentiometer)
2R9 100Ω ±5% 1W Amphenol 990GB-PC-100 (Potentiometer)
2R10 330Ω ±2% ¼W Electrosil TR5

2R11 100Ω ±2% ¼W Electrosil TR5
2R12 220Ω ±2% ¼W Electrosil TR5
2R13 820kΩ ±2% ¼W Electrosil TR5
2R14 1kΩ ±2% ¼W Electrosil TR5
2R15 150Ω ±2% ¼W Electrosil TR5

2R16 1kΩ ±2% ¼W Electrosil TR5
2R17 2·2kΩ ±2% ¼W Electrosil TR5
2R19 220Ω ±2% ¼W Electrosil TR5
2R20 2·2kΩ ±2% ¼W Electrosil TR5
2R21 150Ω ±2% ¼W Electrosil TR5

2R22 50Ω ±10% 1W Amphenol 990GB-PC-50 (Potentiometer)
2R23 680Ω ±2% ¼W Electrosil TR5
2R24 680Ω ±2% 1W Electrosil TR6

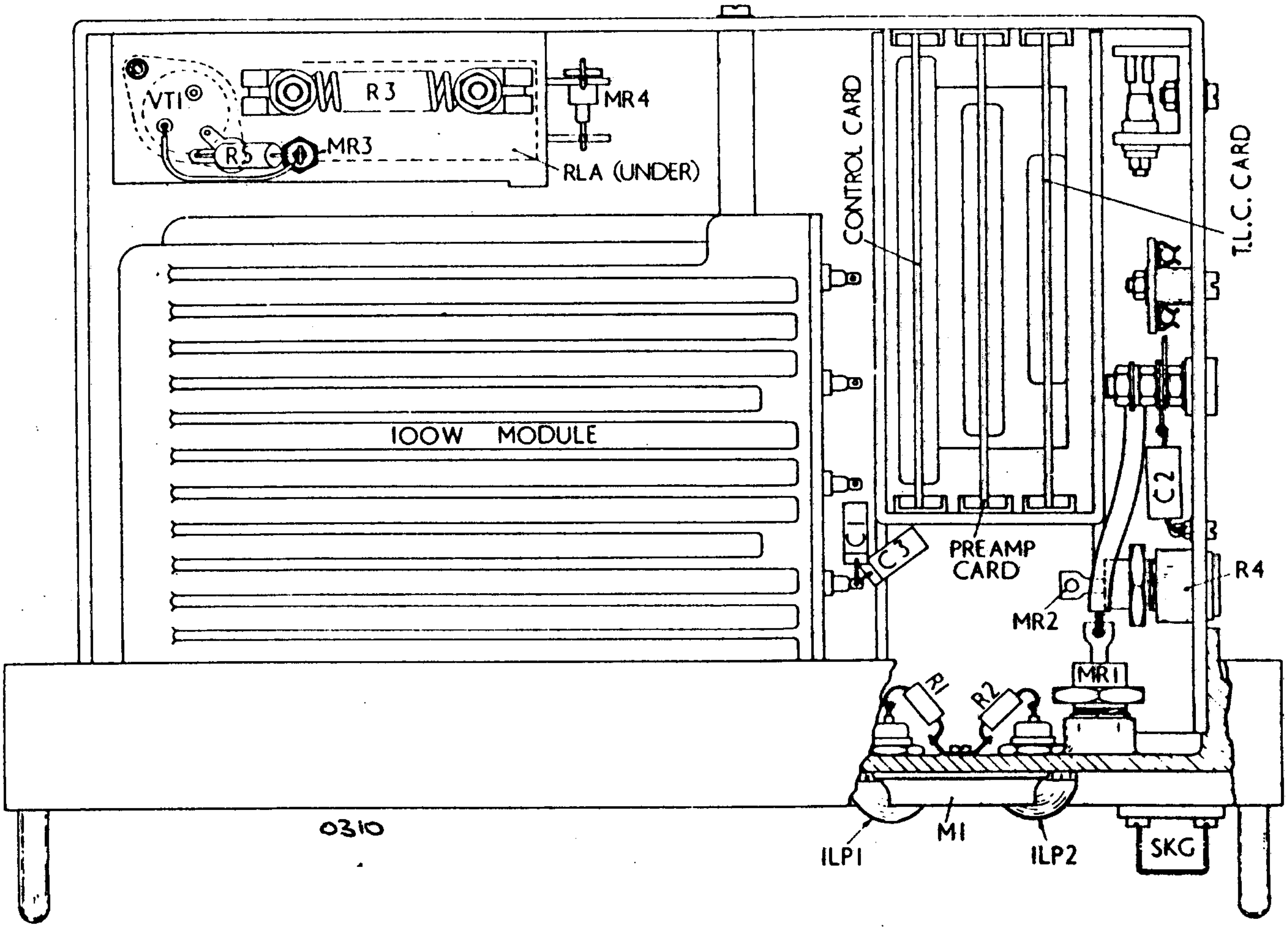
Capacitors
2C1 0·22μF ±20% 100V STC PMA 0·22 M100
2C2 0·22μF ±20% 100V STC PMA 0·22 M100
2C3 0·22μF ±20% 100V STC PMA 0·22 M100
2C4 0·22μF ±20% 100V STC PMA 0·22 M100
2C5 0·22μF ±20% 100V STC PMA 0·22 M100

2C6 250μF +50% −20% 35V Waycom Printilyt 1
2C7 0·1μF ±20% 100V STC PMA 0·1 M100
2C8 0·22μF ±20% 100V STC PMA 0·22 M100
2C9 1μF ±20% 100V STC PMA 1·0 M100
2C10 0·22μF ±20% 100V STC PMA 0·22 M100

Transistors
2VT1 Mullard BFX29 (2N1132 on early models)
2VT2 Mullard 2N1613
2VT3 Motorola 2N3904
2VT4 Motorola 2N3906
2VT5 Motorola 2N3906
2VT6 Motorola 2N3906

Diodes
2MR1 Mullard OA200
2MR2 Mullard BZY96 C10
2MR3 Mullard BZY88 C6V8
2MR4 Hughes HG5007
2MR5 Mullard BZY96 C6VB
2MR6 Mullard OA200
2MR7 Mullard BZY96 C5V6

Inductors
2L1 17·5μH ±10% Painton C3-200506



COMPONENTS LIST

GA480A 100W AMPLIFIER UNIT (SECTION 1)

Resistors
1R1 220Ω ±2% ¼W Electrosil TR5
1R2 220Ω ±2% ¼W Electrosil TR5
1R3 0·04Ω ±10% to Redifon Spec OP9315/S
1R4 0·5Ω ±10% Resistor Modified P43146/S
1R5 100Ω ±5% 2 ½W Welwyn W21

Capacitors
1C1 0·68μF ±20% 100V STC PMAO·68 M100
1C2 47μF ±20% 35V Union Carbide K47J35S

Transistors
1VT1 R.C.A. 2N3055

Sockets and Connectors
1SKA Amphenol 22-way 143-022-07-1007
1SKB Amphenol 15-way 143-015-07-1007
1SKC Amphenol 10-way 143-010-07-1003
1SKD B.N.C. Coax. 5935-99-945-9813
1SKE Thorn 6-way PTO7A-10-65
1SKF Thorn 6-way PTO7A-10-65
1SKG Co-ax Pressurized to Redifon Spec OP8994/S

Plugs
1PLA/SKH To Redifon Drg. P43157/S
1PLB To Redifon Drg. P43518/S

Relays
1RLA To Redifon Spec OP5765/S

Lamps
1ILP1 Thorn Lamp 28V/0·04 Amp L1004
1ILP2 Thorn Lamp 28V/0·04 Amp L1004

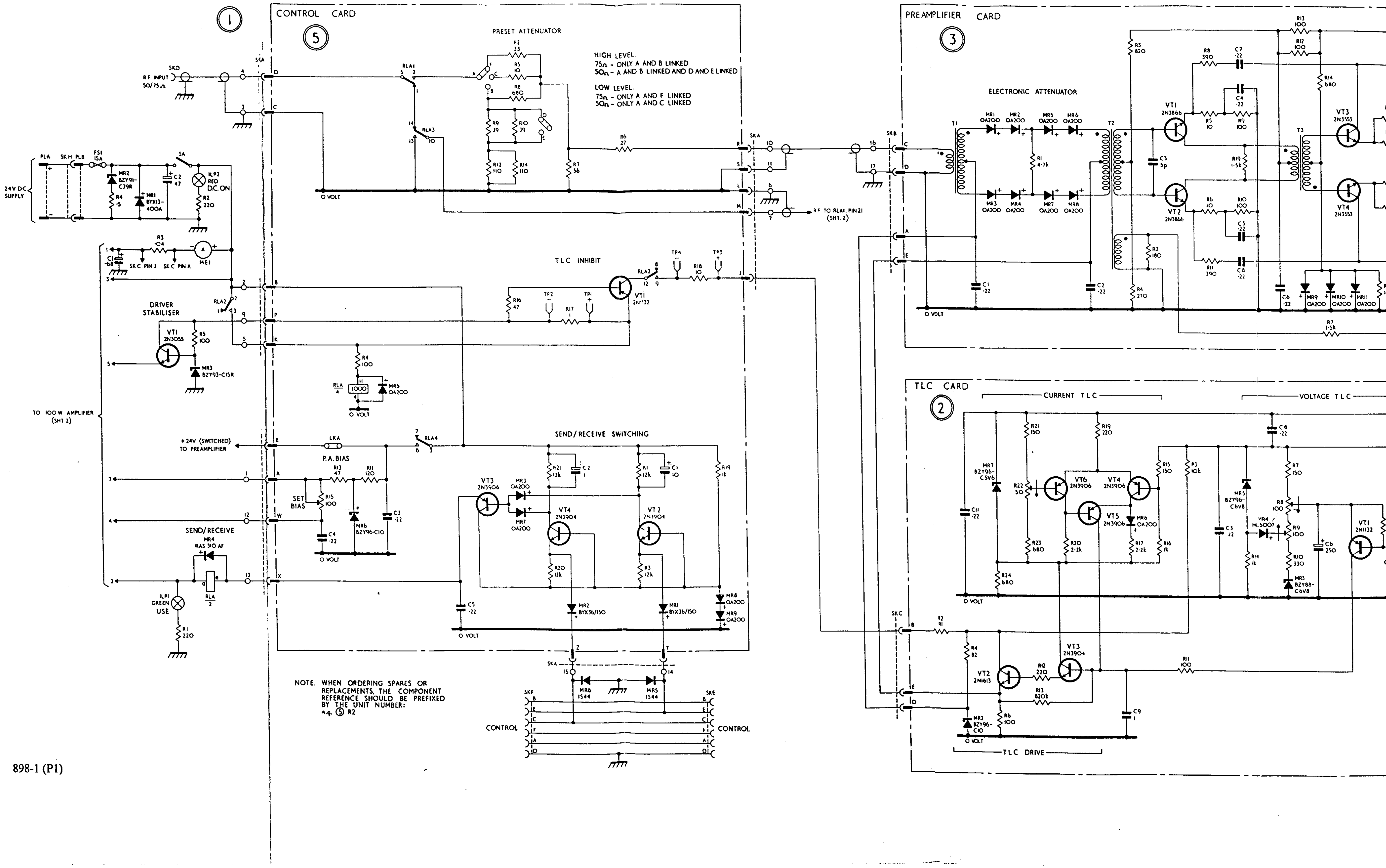
Diodes
1MR1 Mullard BXY25-600R
1MR2 Mullard BZY91-C39R
1MR3 Mullard BZY93-C15R
1MR4 STC RAS310AF
1MR5 Texas IS44
1MR6 Texas IS44

Meters
1M1 10A FSD E. Turner to Redifon Spec OP9136/S

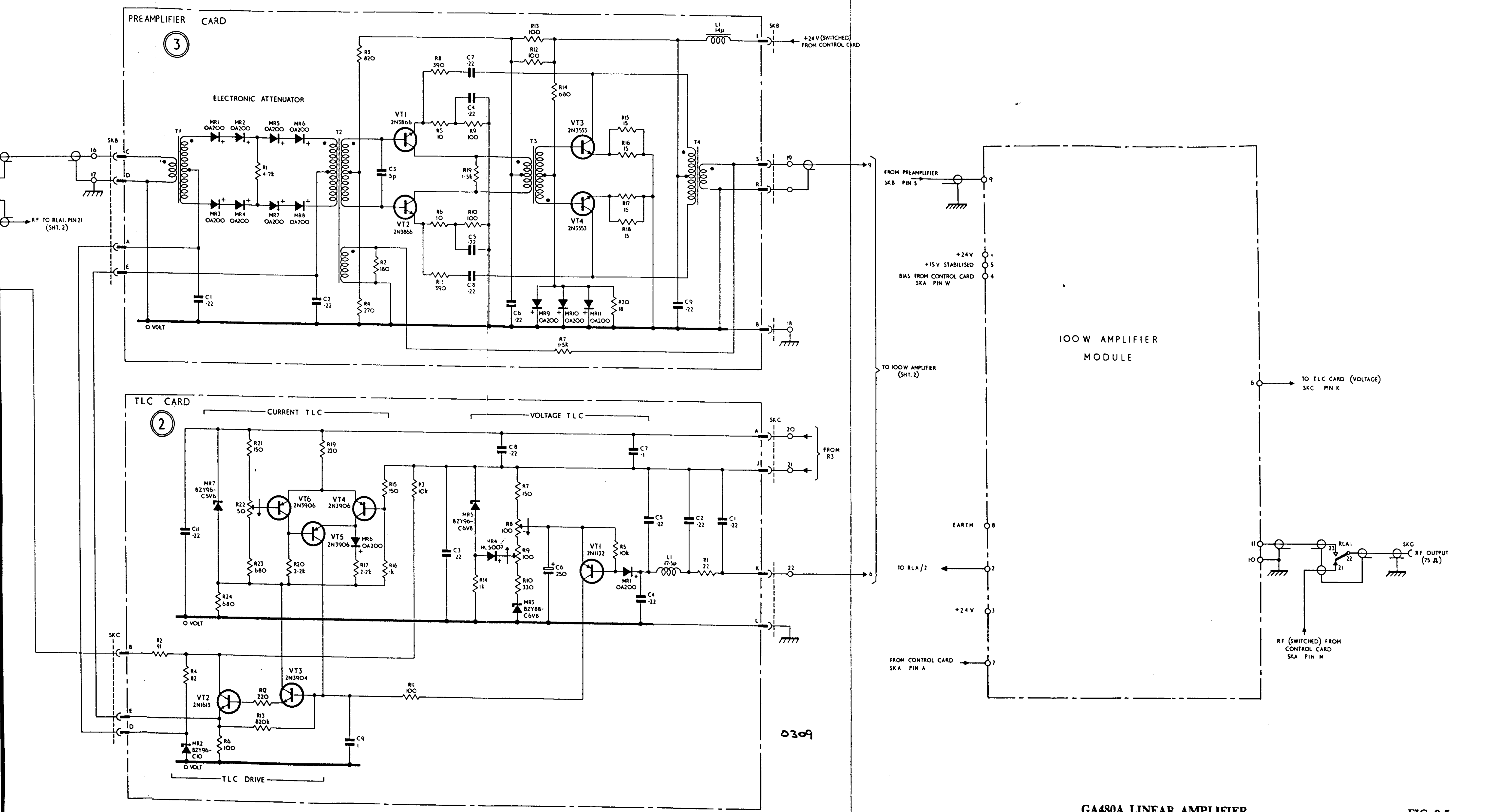
Fuses
1FS1 15A Belling Lee L1055

Switches
1SA Switch 5930-99-051-0578

FIG. 9.4 MAIN CHASSIS COMPONENT LAYOUT


CONTROL CARD
PRESET ATTENUATOR
HIGH LEVEL.
75Ω - ONLY A AND B LINKED
50Ω - A AND B LINKED AND D AND E LINKED
LOW LEVEL.
75Ω - ONLY A AND F LINKED
50Ω - ONLY A AND C LINKED
RF INPUT 50/75Ω
24V DC SUPPLY
DRIVER STABILISER
TLC INHIBIT
TO 100W AMPLIFIER (SHT 2)
+24V (SWITCHED) TO PREAMPLIFIER
P.A. BIAS
SET BIAS
SEND/RECEIVE
SEND/RECEIVE SWITCHING
RF TO RLA1, PIN 21 (SHT. 2)
0 VOLT
CONTROL
CONTROL
NOTE. WHEN ORDERING SPARES OR REPLACEMENTS, THE COMPONENT REFERENCE SHOULD BE PREFIXED BY THE UNIT NUMBER: e.g. (5) R2
PREAMPLIFIER CARD
ELECTRONIC ATTENUATOR
TLC CARD
CURRENT TLC
VOLTAGE TLC
TLC DRIVE

898-1 (P1)



GA480A LINEAR AMPLIFIER

FIG. 9.5

COMPONENTS LIST

AC POWER SUPPLY UNIT

Resistors
R1 220Ω ±2% ½W Electrosil TR5
R2 220Ω ±5% 6W Welwyn W24
R3 220Ω ±5% 6W Welwyn W24

Capacitors
C1 33000μF +50% −10% 40V Mullard 106/17333
C2 33000μF +50% −10% 40V Mullard 106/17333
C3 33000μF +50% −10% 40V Mullard 106/17333
C4 33000μF +50% −10% 40V Mullard 106/17333
C5 33000μF +50% −10% 40V Mullard 106/17333
C6 33000μF +50% −10% 40V Mullard 106/17333

Switches
SA Switch D.P.C.O. 5930-99-0510554

Lamp
1LP1 28V 0·04A Thorn L1004

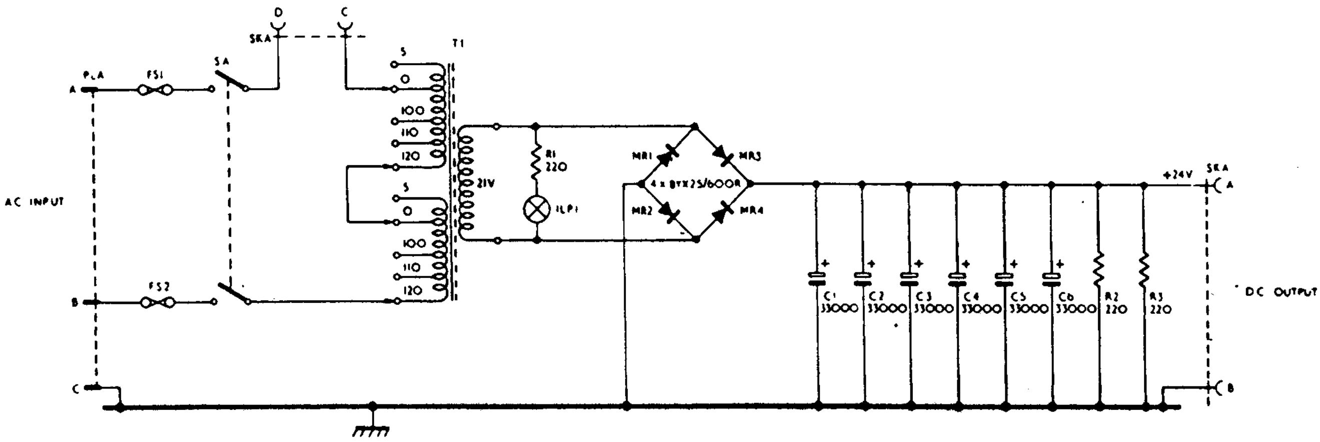
Diodes
MR1 Mullard BYX25/600R
MR2 Mullard BYX25/600R
MR3 Mullard BYX25/600R
MR4 Mullard BYX25/600R

Transformer
T1 To Redifon Spec SR/T2715

Socket
SKA Plessey 508/1/07326/220

Plug
PLA Plessey 508/1/07345/220

Fuses
FS1 } 6A for 100-125V Standard Fuse Co. C137
FS2 } 3A for 200-250V Standard Fuse Co. C137



FS1 AND FS2
3A 200-250V
6A 100-125V

PART II

AERIAL COUPLING UNIT type ACU9

CONTENTS

1 BRIEF DESCRIPTION AND SPECIFICATION

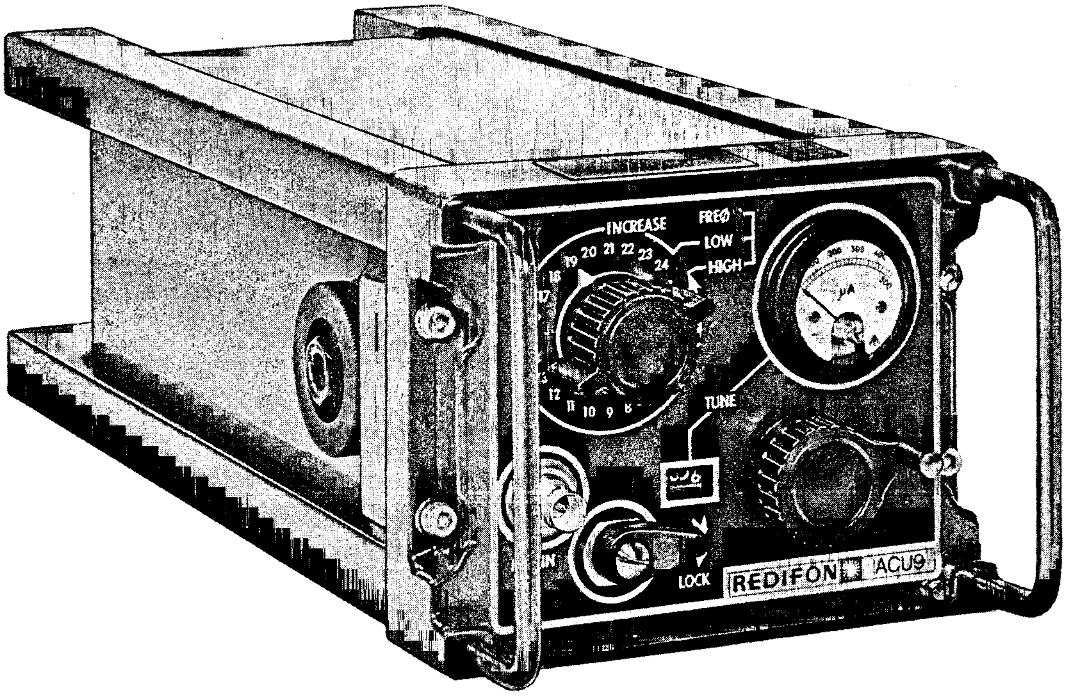


PLATE 1.1 **AERIAL COUPLING UNIT TYPE ACU9** 898-1 (P2)

1 BRIEF DESCRIPTION AND SPECIFICATION

1 BRIEF DESCRIPTION AND SPECIFICATION

1.1 BRIEF DESCRIPTION

The Aerial Coupling Unit type ACU9 is designed to resonate and match short whip aerials to the 75Ω output impedance of the GA480A 100W Linear Amplifier. Dipoles and long wire aerials of certain lengths can also be connected.

If necessary, the ACU9 can be used in conjunction with equipments other than the GA480A which require a load impedance of 75Ω.

Only two controls, in conjunction with a front panel meter, are used for tuning and loading.

A sturdy sealed aluminium-alloy case houses the components.

The ACU9 complies with the relevant clauses of the Ministry of Defence Specification DEF 133 Table L3 and will operate over a temperature range of −20°C to +55°C.

1.2 SPECIFICATION

Frequency Range:
2-14MHz.

Power Rating:
100W r.m.s. input, continuous.

Input Impedance:
75Ω.

Aerials:
12ft. whip (down to 2MHz).
8ft. whip (down to approximately 3MHz).
Dipole.
Long wire aerials of certain lengths.
(See Limitations).

Tuning and Matching Capabilities:
Whip
-jX not greater than 1500Ω
R not greater than 8Ω.
Dipole
-jX greater than 100Ω.
R not greater than 75Ω.
Limitations
The unit will not tune an aerial which has:—
(a) inductive impedance.
(b) resistive component of Z exceeding 100Ω. However, long wire aerials with electrical lengths of a quarter wavelength or less, or just less than an odd number of quarter wavelengths, may be tuned satisfactorily.

RF Output Indication:
Tuning meter (3A f.s.d.) on front panel. Non-linear characteristic facilitates normal tuning, and allows tuning on low power.

Climatic and Durability Standard:
Complies with the revelant clauses of Ministry of Defence Specification DEF 133 Table L3.

Operating Temperature:
−20°C to +55°C.

Storage Temperature:
−40°C to +70°C.

Approximate Dimensions and Weight:

Height	*Width*	*Depth*	*Weight*
15¼ in (39 cm)	6 in (15 cm)	4½ in (11·5 cm)	10 lb (4·5 kg)

Ancillary Equipment:
Mounting Frame type 6708/A (without shock mounts) or /B (with shock mounts).

2 SETTING UP AND OPERATING INSTRUCTIONS

FIGURES

2 SETTING UP AND OPERATING INSTRUCTIONS

The ACU9 may be stood on-end without damage to the Aerial and Earth connections; alternatively it may be fitted into either the Mounting Frame type 6708/A or B.

The Mounting Frame type 6708/A (see Fig. 2.1) is fitted with clamps which enable it to be secured to the side of a suitable framework (it is recommended that this framework be fitted with shock mounts if it forms part of a vehicle installation). If the clamps are not required, they can be removed after the retaining block securing screws have been undone; the mounting frame can then be screwed or bolted to a suitable flat surface, using the fixing holes provided. Shock mounts are fitted to the 'B' version (see Fig. 2.2). These should be removed and screwed or bolted to the shelf or bench; the frame should then be bolted to the shock mounts.

The method of securing the ACU9 in the frame is the same for both versions: first position the ACU9 on the frame so that the two lower rectangular tube legs engage with the two lips at the back; then tighten the two clamp screws to secure the front of the ACU9.

Connect the earth and aerial to the relevant terminals at the back of the ACU (see para. 1.2 for the types of aerial that may be used, and see Fig. 2.3 for earthing arrangements). Non-resonant long wire aerials, when used, must be connected to the Whip terminal. Ensure that the wire connecting the earth to the ACU is as short as possible.

The r.f. input to the ACU is applied via the RF In socket on the control panel; 75Ω Uniradio 70 coaxial cable is recommended.

Tuning of the ACU is very simple. Start by setting the Tune indicator to 250 and the switch to position 20 (below 4MHz) or 12 (above 4MHz). Switch the associated equipment to the A1 transmit condition and observe the ACU9 aerial current meter. Rotate the Tune control for an increase in meter indication. Now try adjacent positions of the switch to see if the aerial current is increased; if it is, leave the switch in this new position and readjust the Tune control for maximum reading. Repeat the procedure until no further increase in aerial current can be attained. Make final adjustments with the Tune control and lock it in position.

Once the ACU has been used to Tune a certain aerial at a given frequency, the switch position and the Tune indicator reading should be noted for future use; a note of the meter reading should also be recorded.

Coaxial Adaptor type 6723/A

An adaptor is available as an optional extra, to facilitate the connection of a coaxial aerial feeder to the aerial terminal at the back of the ACU9.

The adaptor consists of a metal bracket on which is mounted a UHF coaxial socket type SO.239F. The bracket is held in position by the Earth terminal; behind the coaxial socket is a flying lead with a spade terminal for fitting to the Dipole terminal.

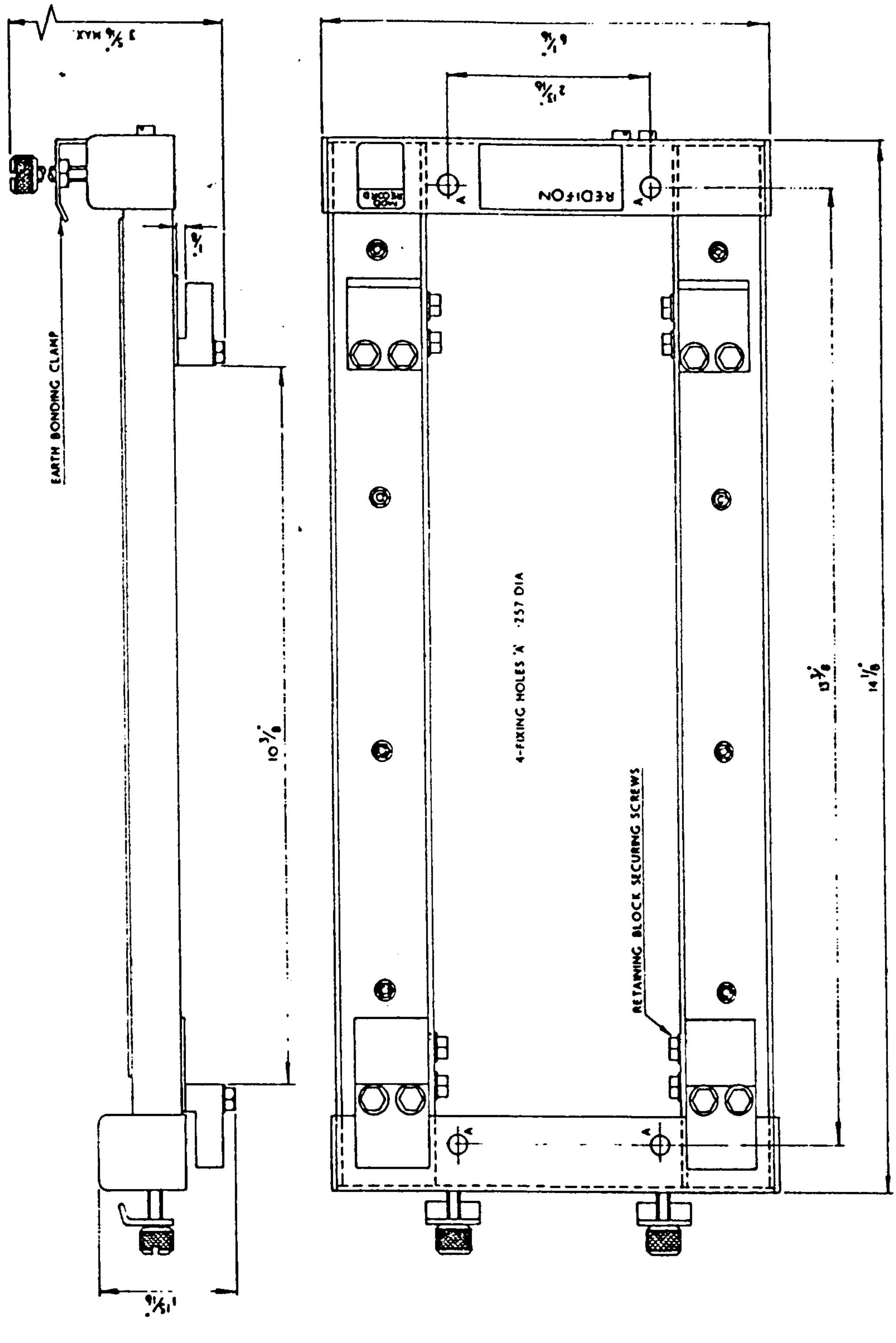
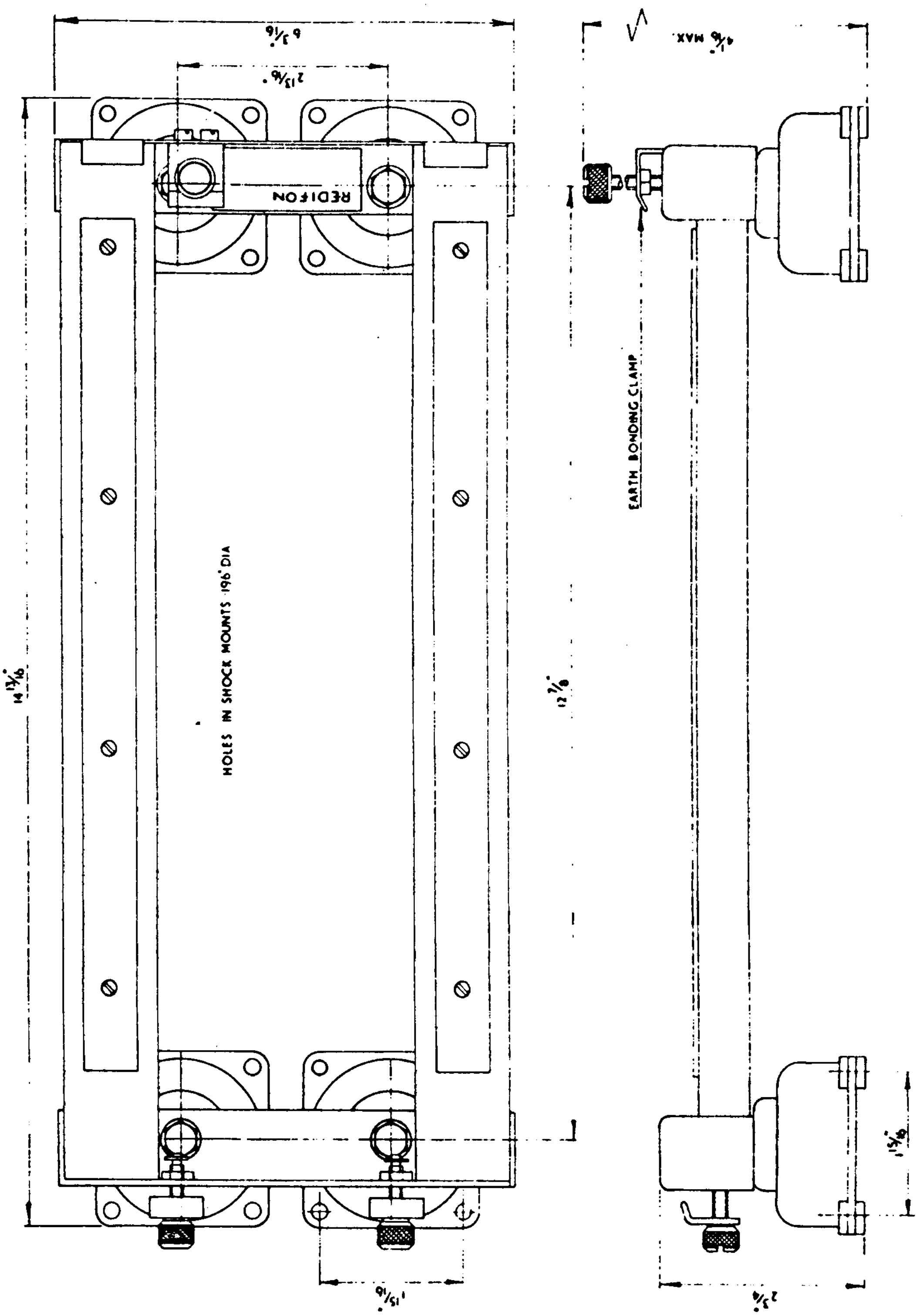


FIG. 2.1 MOUNTING FRAME TYPE 6708/A 898-1 (P2)



898-1 (P2) MOUNTING FRAME TYPE 6708/B FIG. 22

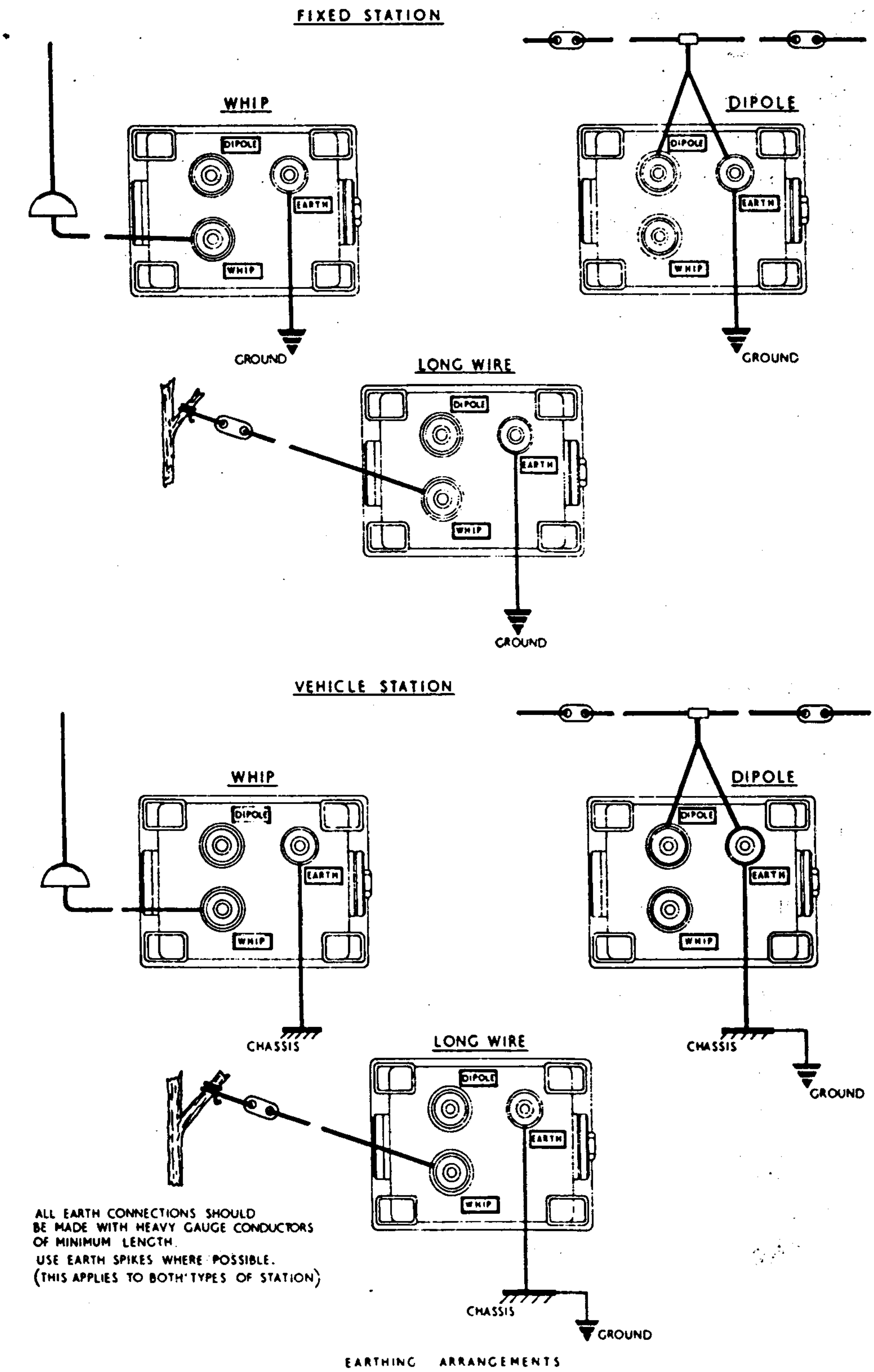


FIG. 2.3 EARTHING ARRANGEMENTS

3 TECHNICAL DESCRIPTION

3 TECHNICAL DESCRIPTION

3.1 CONSTRUCTION

The ACU9 assembly is housed in a sealed aluminium-alloy case and is secured by four socket-head screws.

A cast control panel forms part of the assembly, the ACU components being fitted at the rear; additional support is given by two aluminium side panels. The complete assembly can be withdrawn from its case by means of the control panel handles after the securing screws are undone.

At the rear of the case are terminals for the connection of a whip, dipole, and earth, the three terminals being extended to the inside of the case. Connected to the Earth and Whip extensions on the inside of the case are spring contacts which press against the chassis and an r.f. output pin when the assembly is pushed home. The Dipole terminal is internally connected to the Whip terminal by a capacitor.

Rectangular tube legs allow the ACU to be stood on-end; they also provide a means of fixing when the ACU is installed in a mounting frame.

On one side of the case is fitted a desiccator, and on the other side is a desiccator indicator.

3.2 CIRCUIT DESCRIPTION Fig. 3.1 refers

The aerial coupling unit will resonate and match short whip aerials, and long wire aerials of certain lengths; provision is also made for the connection of a dipole.

An L-network with series or parallel capacity at the output is employed, the 'input' capacitors being selected by contacts SA1, and the parallel output capacitor being switched into circuit by SA2 contacts. Note that contacts SA2 are only closed when switch SA is in positions 17-24.

Inductor L1 is the tuning control, whilst switch SA is the loading control.

The r.f. output is taken to the Dipole terminal via C29. This capacitor in conjunction with part of L1 inductance and any reactive component of the dipole aerial, forms a series tuned circuit.

A sample of the r.f. output is developed across L2 winding and is rectified by MR2 to produce a d.c. voltage proportional to aerial current. The meter scale of ME1 is non-linear so that a readable deflection is attained at low aerial currents. The shunt diode MR1 provides the non-linear operation. When the aerial current, and consequently the rectified voltage, is low, MR1 is inoperative, allowing the full voltage to be applied to the meter. As the aerial current increases MR1 conducts more heavily, shunting the meter. Full scale deflection corresponds to an aerial current of approximately 3A.

COMPONENTS LIST

Resistors

R1	1·2kΩ ±2% ¼W Electrosil TR5
R2	1·8kΩ ±2% ¼W Electrosil TR5
R3	47Ω ±2% ¼W Electrosil TR5
R4	100Ω ±2% ¼W Electrosil TR5
R5	100Ω ±2% ¼W Electrosil TR5
R6	100Ω ±2% ¼W Electrosil TR5
R7	100Ω ±2% ¼W Electrosil TR5
R8	47Ω ±2% ¼W Electrosil TR5
R9	47Ω ±2% ¼W Electrosil TR5

Capacitors

C1	6500pF ±2% 350V: Lemco 4700pF ±2% MS611/I/R/4N7G/350 and Lemco 1800pF ±2% MS611/I/R/1N8G/350 in parallel
C2	5600pF ±2% 350V Lemco MS611/I/R/5N6G/350
C3	4700pF ±2% 350V Lemco MS611/I/R/4N7G/350
C4	3900pF ±2% 350V Lemco MS611/I/R/3N9G/350
C5	3300pF ±2% 350V Lemco MS611/I/R/3N3G/350
C6	2700pF ±2% 350V Lemco MS611/I/R/2N7G/350
C7	2200pF ±2% 350V Lemco MS611/I/R/2N2G/350
C8	1800pF ±2% 350V Lemco MS611/I/R/1N8G/350
C9	2400pF ±2% 350V Lemco MS611/I/R/2N4G/350
C10	1800pF ±2% 350V Lemco MS611/I/R/1N8G/350
C11	1300pF ±2% 350V Lemco MS611/I/R/1N3G/350
C12	1000pF ±2% 350V Lemco MS611/I/R/1NG/350
C13	680pF ±2% 350V Lemco MS611/I/R/680PG/350
C14	470pF ±2% 350V Lemco MS611/I/R/470PG/350
C15	330pF ±2% 350V Lemco MS611/I/R/330PG/350
C16	220pF ±2% 350V Lemco MS611/I/R/220PG/350
C17	150pF ±2% 350V Lemco MS611/I/R/150PG/350
C18	100pF ±2% 350V Lemco MS611/I/R/100PG/350
C19	68pF ±2% 350V Lemco MS611/I/R/68PG/350
C20	47pF ±1pF 350V Lemco MS611/I/R/47PFP/350
C21	33pF ±1pF 350V Lemco MS611/I/R/33PFP/350
C22	22pF ±1pF 350V Lemco MS611/I/R/22PFP/350
C23	12pF ±1pF 350V Lemco MS611/I/R/12PFP/350
C24	140pF ± 10% 5kV pk. Hunts C509/45
C25	0·01μF ±20% 100V STC PMA 0·01 M100
C26	0·01μF ±20% 100V STC PMA 0·01 M100
C27	0·01μF ±20% 100V STC PMA 0·01 M100
C28	0·01μF ±20% 100V STC PMA 0·01 M100
C29	80pF ± 10% 5kV pk. Hunts C509/33

Meters

M1	500μA FSD E. Turner to Redifon Spec OP9395/S

Diodes

MR1	Texas IS44
MR2	Mullard OA95

Switch

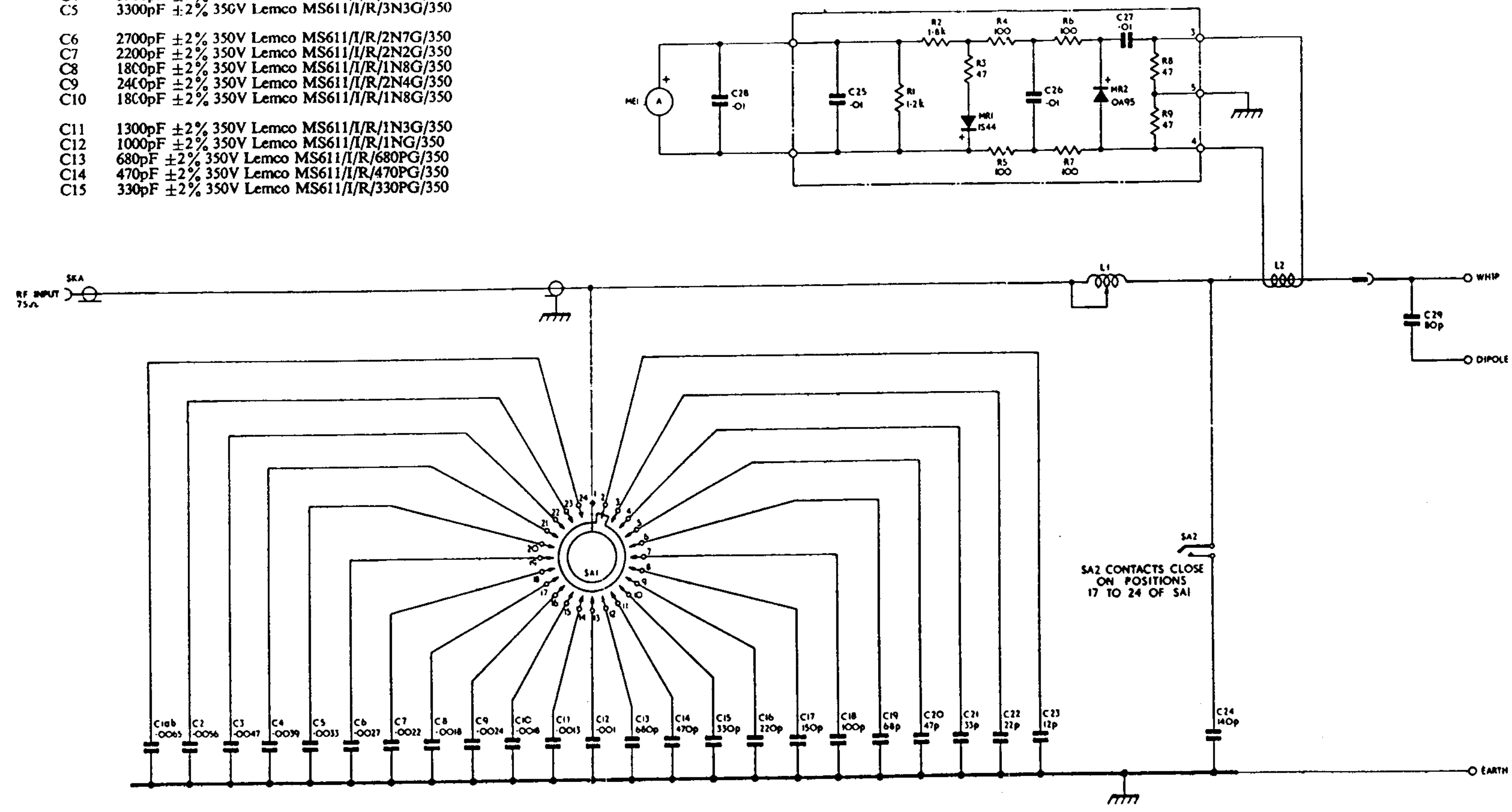
SA	NSF to Redifon Spec OP9320/S

Socket Coaxial

SKA	BNC 75Ω 5935-99-945-9813

Coils

L1	To Redifon Drg. S91A/6680/L
L2	75·5μH to Redifon Drg. P43280/S



AERIAL COUPLING UNIT TYPE ACU9

FIG. 3.1

4 MAINTENANCE

4 MAINTENANCE

4.1 WEEKLY MAINTENANCE

The checks listed below should be carried out weekly during field use to ensure that the equipment is in reasonable working order.

Should the equipment exhibit major mechanical defects, it should be returned to the manufacturers.

Mechanical

(1) Check for obvious damage.

(2) Using a clean cloth, slightly dampened in water, clean all dirt from the equipment surface.

(3) Rotate the Tune control fully clockwise to the stop position and check that the dial reading is 500. Then rotate the control fully counter-clockwise to the other stop position and check that the dial reading is 000.

(4) Confirm that rotation of the Tune control is prevented when the lock is pushed down.

(5) Check the condition of other fittings.

(6) Verify that the desiccator humidity indicator is blue. If it is pink, return the equipment for a six-monthly inspection as soon as possible (see para. 4.2).

Electrical

Operate the ACU9 in conjunction with the associated equipment on an allocated test frequency, using the operational aerial(s).

Check for correct operation of the controls, and for a suitable reading on the meter.

4.2 SIX-MONTHLY MAINTENANCE

During normal operation the following procedures should be carried out every six months. They should also be carried out after faultfinding (Chapter 5) and performance checks (Chapter 6). If the ACU has to be removed from its case in the field, it should be returned to base workshop for a six-monthly inspection as soon as conditions permit.

(1) Remove the ACU from its case (see para. 4.3).

(2) Check the tightness of all accessible screws.

(3) Inspect the unit carefully for dirt and corrosion.

(4) Remove dust with a low pressure blower or vacuum cleaner.

(5) Check for signs of overheating and arcing due to a possible fault condition.

(6) Clean the switch contacts with 'Inhibisol' or proprietary brand of cleaning agent.

(7) Check the condition of the rubber sealing gasket behind the control panel, and replace it if necessary (see para. 4.4).

(8) Clean the tuning coil and runner with a clean dry cloth; *do not oil.*

(9) Check all other moving parts and, if necessary, *sparingly* lubricate with Aeroshell 7A grease.

(10) Remove the desiccator indicator (leave the O ring in place).

(11) Replace the ACU in its case and tighten the control panel screws.

(12) Connect the pressure test assembly, as shown in Fig. 4.1.

(13) Pump in air until the pressure gauge reads 10lb per sq. inch.

(14) Immerse the unit in water whilst maintaining the pressure, and check that there are no air bubbles to indicate an air leak.

(15) When the air pressure test has been satisfactorily carried out, remove the test assembly, replace the desiccator indicator, and dry out the equipment in a temperature of 60°C at a maximum humidity of 5% for 4 hours.

(16) Reassemble the ACU and fit new security screw covers *immediately* the drying out procedure is completed.

(17) Carry out the electrical procedure detailed in para. 4.1.

4.3 REMOVING THE AERIAL COUPLING UNIT FROM ITS CASE

(1) Remove the security screw covers from the control panel fixing screws with a spike.

(2) Undo the four 2BA socket-head fixing screws.

(3) Withdraw the ACU from its case.

The reverse procedure should be adopted when the ACU is returned to its case.

The pressure test detailed in para. 4.2 should be carried out after refitting the unit in its case.

4.4 REPLACING THE CONTROL PANEL GASKET

The control panel gasket is not held in place by an adhesive, and can be removed by use of a penknife blade.

Gaskets for replacement are to Redifon Specification P43130/S.

4.5 FAULTFINDING

First carry out a thorough visual inspection of the ACU9, checking in particular for evidence of overheating or arcing. Use an ohmmeter to check switch contacts.

The tracing of obscure faults should be facilitated by use of the information contained in Chapter 5.

Before returning the equipment to service refer to para. 4.2.

4.6 ORDERING SPARES AND REPLACEMENTS

When ordering spares and replacement parts, the following information should be given to ensure prompt delivery and the receipt of correct items.

(a) Type and serial number of the equipment as shown on the label.

(b) Modification state of equipment, as indicated by strike-off number on modification label.

(c) Component reference on circuit diagram, and circuit diagram number and/or figure number.

Redifon reserves the right to incorporate in equipment and to supply as spares, alternatives to components detailed in handbooks and spares schedules. The Redifon Components Group undertakes a thorough investigation of alternative components, and their suitability and interchangeability is thereby assured.

4.7 SPARE PARTS SCHEDULE

A spare parts list for the ACU9 is included in Schedule No. CSD 108, which is available on request from Redifon Ltd.

4.8 WORKSHOP TOOLS AND EXPENDABLE STORES SCHEDULE

Schedule No. 1439, listing workshop tools and expendable stores is available on request from Redifon Ltd.

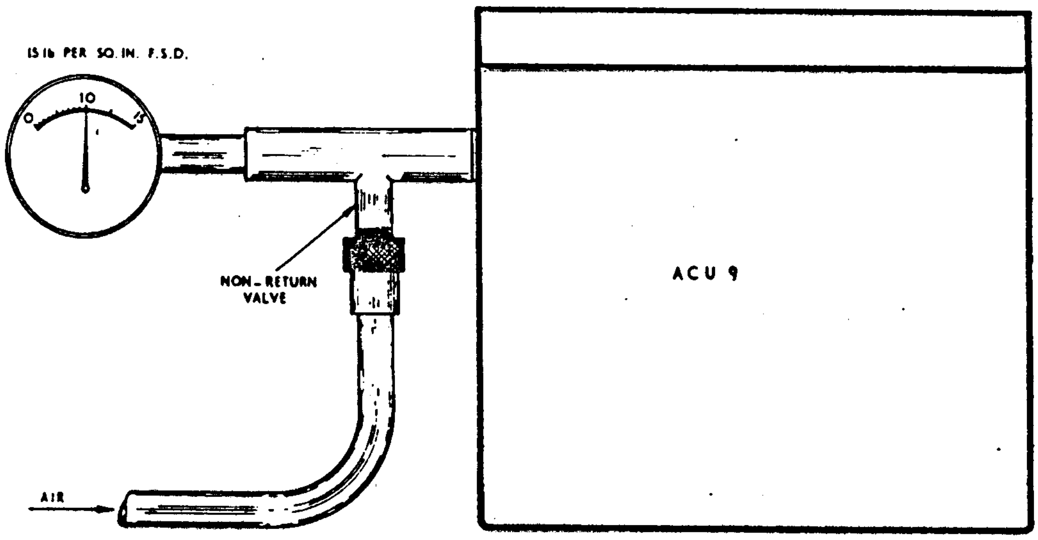


FIG. 4.1 AIR PRESSURE TEST ASSEMBLY

5 PERFORMANCE CHECKS

5 PERFORMANCE CHECKS

5.1 GENERAL

The following information will enable a performance check of the ACU9 to be carried out if a deterioration in electrical performance is suspected; it should also prove useful in the tracing of obscure faults.

The test procedures are based on the use of the GA480A as a linear amplifier, but the same basic procedure, will apply if other types of linear amplifier are used.

A list of test equipment, with examples, precedes the testing information. It should be borne in mind that new models of test equipment are always being introduced and if new equipment is to be ordered, consultation with Redifon Ltd. is recommended to ensure that the most suitable equipment is purchased.

5.2 TEST EQUIPMENT REQUIRED

High Level Oscillator:
2-12MHz, 2·5V output when terminated in 50Ω; e.g. Airmec 304A.

RF Power Meter
75Ω, 100W, 2-12MHz; e.g. Marconi TF1020A

100W Linear Amplifier
e.g. Redifon type GA480A
(with associated AC Power Unit type 6662/A)

Dummy Load
10Ω+50pF (see Fig. 5.1).

Morse Key
Redifon type 5459/A

5.3 PRELIMINARIES

(1) Remove the security screw covers from the control panel fixing screws with a spike.
(2) Undo the four 2BA socket-head fixing screws.
(3) Withdraw the ACU from its case.
(4) Rotate the Tune control fully clockwise to the stop position and check that the dial reading is 500. Then rotate the control fully counter-clockwise to the other stop position and check that the dial reading is 000.
(5) Confirm that rotation of the Tune control is prevented when the lock is pushed down.
(6) Check that switch contacts SA2 are closed when the control panel switch is in positions 17-24, and open when in positions 1-16.
(7) Secure the ACU in its case and tighten the fixing screws.
(8) Connect up the test equipment as shown in Fig. 5.2. Ensure that the GA480A is set for low level 50Ω input, and that the ACU Earth terminal is connected to the earth terminal of the RF power meter.

5.4 HIGH IMPEDANCE TESTS

(1) Set the high level oscillator to 2MHz at minimum output.
(2) Switch on the GA480A and power unit; press the key.
(3) Increase the output of the high level oscillator to approximately 2.5V e.m.f.

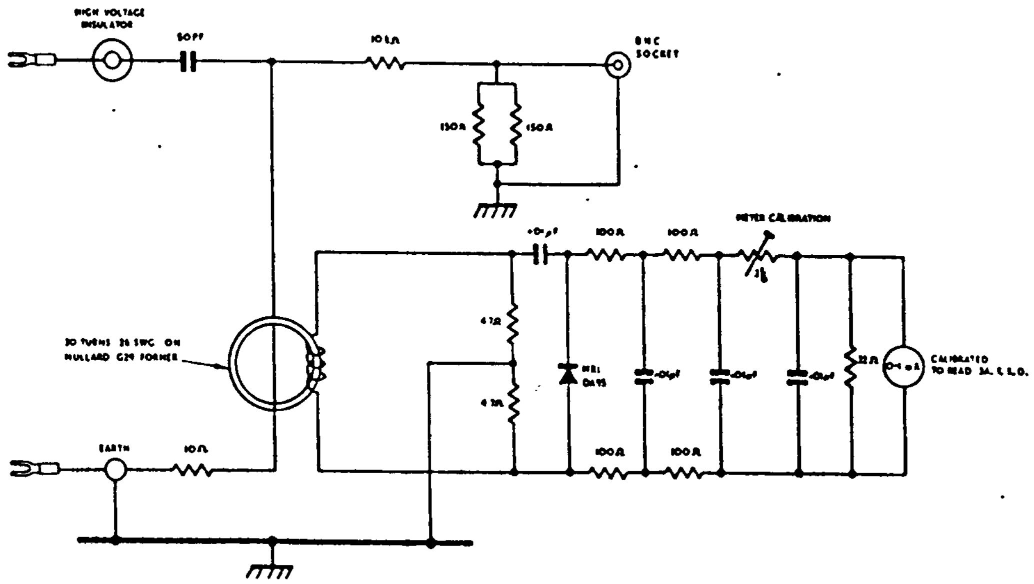


Fig. 5.1 Dummy Load

(4) Adjust the ACU9 Tune control and Load switch for a peak indication on the ACU9 meter. The GA480 meter should indicate 8-10A. Note the indicated power output and the control settings, and compare these with the information in the table below.

(5) Repeat Instruction (4) at the frequencies shown in the table.

Frequency (MHz)	*Switch Position (typical)*	*Tune Dial (typical)*	*Minimum Power Output (W)*
2	19	411	70
3	18	217	80
4	8	274	80
5	6	194	80
6	6	149	80
7	6	120	80
8	5	99	80
9	4	86	80
10	3	74	80
11	2	61	80
12	2	52	70

(6) Switch off the GA480A and disconnect the 75Ω power meter.

5.5 LOW IMPEDANCE TESTS

(1) Connect the 10Ω+50pF load between the ACU9 Whip and Earth terminals, ensuring that the high voltage terminal of the load is connected to the Whip terminal of the ACU9.

(2) Set the high level oscillator to 2MHz at minimum output.

(3) Switch on the GA480A.

(4) Increase the output of the high level oscillator to approximately 2·5V e.m.f.

(5) Adjust the Tune control and the Load switch for a peak reading on the ACU9 control panel meter. The GA480 meter should indicate 8-10A. Note the indicated power output and the control settings and compare these with the information in the table below.

(6) Repeat Instruction (5) at the frequencies shown in the table.

Frequency (MHz)	*Switch Position (typical)*	*Tune Dial (typical)*	*Minimum Power Output (W)*
2	23	433	20
3	22	427	30
4	14	345	70
5	14	242	75
6	13	184	75
7	13	145	75
8	12	121	75
9	12	101	75
10	12	88	75
11	12	77	75
12	12	69	70

(8) Switch off and remove the test equipment.

(9) Refer to para. 4.2 before returning the equipment to service.

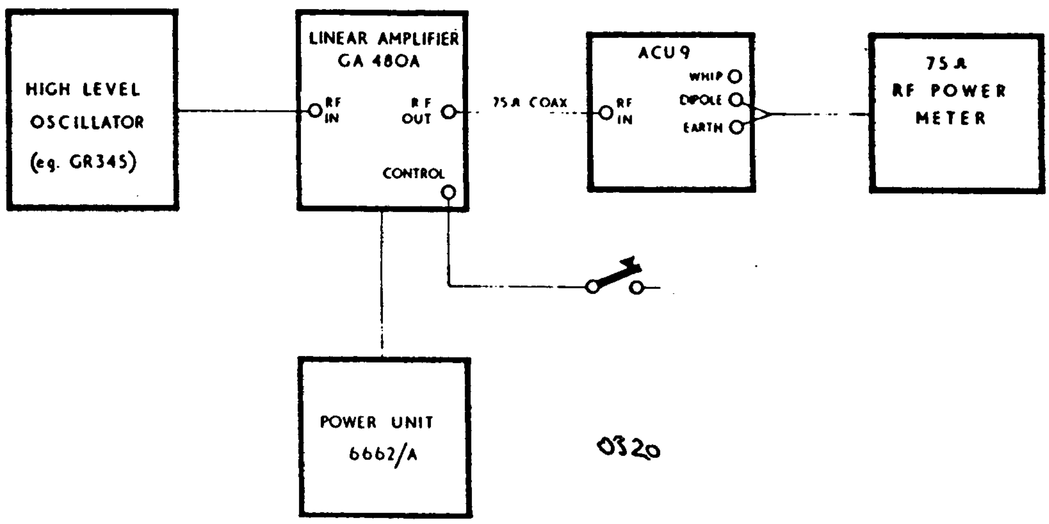


FIG. 5.2 INITIAL TEST EQUIPMENT CONNECTIONS

APPENDIX

VEHICLE INSTALLATION

GENERAL

The equipment should be positioned in a dry weather-proof place where controls and cable connections are easily accessible to the operator. Sufficient space should be allowed for the equipment to be withdrawn from its case if necessary. Good ventilation is essential.

External cables should be positioned where they will not be crushed or damaged. Sharp bends of less than 1 inch radius should be avoided. Where possible, cables carrying r.f. currents should be routed clear of other cables.

The whip aerial is the only aerial suitable for mobile operation, although the use of other aerials will improve communication when a semi-permanent installation is adopted. The structure of the vehicle that is to receive the whip aerial mounting should be robust and rigid to withstand the forces encountered by the aerial whipping when the vehicle is in motion. The mount should be bolted to an upright or stanchion and positioned as high as possible on the vehicle. This will give improved reception and transmission and will also minimise the risk of accidental shock to personnel when the vehicle is stationary.

All earth connections should be made with heavy gauge conductor of minimum length. Use an earth spike to earth the vehicle chassis on semi-permanent installations.

SUPPRESSION OF INTERFERENCE IN MOBILE STATIONS

General

When a mobile station is being installed, certain precautions should be taken to minimise interference from ignition and other electrical systems, and noise caused by locally generated static. Should such interference be encountered, a number of remedies are possible; the extent to which they need to be applied varies with individual installations, and the following notes are intended to serve only as a guide to assist users in obtaining the best possible results from their equipment.

Although these notes are concerned primarily with interference problems encountered in vehicle installation, they also apply, in many respects, to stations in small marine craft.

Feeders and Cables

Interconnecting cables and feeders should be as short as possible, and be kept well away from other electrical wiring. In no circumstances should a feeder be routed along the same path as cables forming part of the electrical system.

Ignition Interference

Examine sparking plugs and distributor points to ensure that they are clean and correctly adjusted. Suppressors should be fitted at the plugs, and at the point where the h.t. lead from the ignition coil enters the distributor. It is advisable to maintain maximum separation between ignition leads and other wires, which might conduct interference to places outside the motor compartment.

If the receiver is to be operated at maximum sensitivity it may be necessary to use screened ignition leads, screened plugs, and to enclose the distributor in a metal box bonded to earth.

Generator Interference

This type of interference can be reduced by fitting a 1·0uF capacitor between the generator output lead and the frame of the generator. Should this prove inadequate, an h.f. choke may be included in series with the output lead. The wire used in the construction of the choke must be of adequate current carrying capacity, and the choke should be rigidly mounted.

Voltage Regulator Interference

Noise emanating from the voltage regulator contacts may be suppressed by fitting a capacitor and a low value resistor, in series, across the contacts. Suggested values for these components are 4·7Ω and 0·02μF.

Wheel Static

If wheel static is troublesome, static collectors provide a suitable remedy. For advice on the availability of these, it is recommended that the vehicle manufacturer or dealer be consulted.

Front-wheel static collectors fit under the dust cap and bear against the end of the stub-axle; to ensure good electrical contact, the bearing point should be wiped clean and kept free of grease. Rear-wheel collectors are in the form of brushes, making contact with the inside of the brake drum.

Tyre Static

A simple remedy for tyre static is to render the inside surface of the tyre conductive by treating it with aluminium paint; wide bands should be painted at intervals around the inside of the tyre, each band extending right across the tyre from edge to edge.

Anti-static powder injected into the inner tube is a further remedy.

Brake Static

When interference is noticed during the application of brakes, the brake shoe pivots should be examined. Scrape away any paint under the pivots, and coat them with graphited grease to improve conductivity from the brake shoes to the chassis. Should the interference persist, metallised brake linings should be fitted in place of those already in use.

Electrical System

Wiring emerging from the motor compartment, including that to dashboard instruments and switches, sometimes carries r.f. interference and it may be necessary to decouple all such wires.

Bonding

Some parts of particular vehicles may be found to be inadequately bonded to the chassis, thereby carrying interference. All insulated parts, such as those mounted in nylon bushes, should be earthed to the chassis by heavy gauge braid. Structural items such as the steering column, exhaust pipe, and motor compartment bulkhead should be checked in this respect.