5.A.2.4 The multiplier output is the differential current given by

$(I_P + I_R) - (I_Q + I_S)$ and is proportional to

$$\tfrac{1}{2}I_E \ (1+y)(1+x) + (1-y)(1-x) - (1+y)(1-x) - (1-y)(1+x)$$

$$= \tfrac{1}{2}I_E \cdot 4xy$$

$$= \frac{1}{2I_B} \cdot 2I_B x \cdot 2I_E y$$

The differential output current is therefore proportional to the product of the differential input currents.

6.1 INTRODUCTION

6.1.1 This section is written in five parts which relate to:

(a) General maintenance information

(b) Fault finding procedures for assemblies 19-1014 and 19-1017.

(c) Signature analysis on assemblies 19-1014 and 19-1017.

(d) Setting up and calibration procedures.

(e) Dismantling and reassembly of the 9303.

6.2 GENERAL MAINTENANCE INFORMATION

6.2.1 REPAIR AND CALIBRATION OF THE MEASURING HEAD

6.2.1.1 Although a circuit diagram, a parts list and a description of the operation of the measuring head are given in this manual, it is not recommended that the customer should attempt to repair or recalibrate this item. For this reason the calibration procedure given in this section includes functional checks of the measuring head only. Where the proper functioning or calibration of a measuring head is doubted, it is recommended that customers should take advantage of the repair and calibration service offered by Racal-Dana Instruments and their agents.

6.2.2 BATTERY REPLACEMENT

6.2.2.1 The non-volatile memory is maintained by means of a lithium primary cell, Racal-Dana part number 23-2513, having an expected in-service life of two years. The battery voltage is not an indication of the remaining life, and it is recommended that the cell be changed on a preventive maintenance basis.

6.2.2.2 Whenever possible the battery should be changed with the instrument switched off and disconnected from the AC supply. This will result in corruption of the non-volatile memory contents, and recalibration of the measuring heads (FACTORY ECAL) as described in Section 4, paragraph 4.4 must be carried out. If it is essential that the contents of the non-volatile memory are preserved, it is possible to change the battery with the instrument connected to the AC supply and switched on.

WARNING: (1) DANGEROUS AC VOLTAGE LEVELS ARE EXPOSED WHEN THE COVERS ARE REMOVED WITH THE AC SUPPLY CONNECTED.

(2) BATTERY REPLACEMENT SHOULD ONLY BE CARRIED OUT BY PERSONS SKILLED IN THE REPAIR OF ELECTRONIC EQUIPMENT.

(3) IF THE BATTERY IS TO BE CHANGED WITH THE INSTRUMENT SWITCHED ON, THE TIP OF THE SOLDERING IRON USED MUST BE ISOLATED FROM EARTH.

(4) LITHIUM BATTERIES CAN BE DANGEROUS IF WRONGLY TREATED. FOLLOW THE INSTRUCTIONS GIVEN ON THE WARNING PAGE AT THE FRONT OF THIS MANUAL REGARDING THEIR HANDLING AND DISPOSAL.

6.2.2.3 The battery is mounted at the left hand side of the upper surface of the processor board, 19-1014, towards the front of the instrument. Two different types of battery are supplied by Racal-Dana Instruments. These are electrically interchangeable, but are connected to the circuit in different ways. All instruments will accept both types of battery.

6.2.2.4 The procedure for changing the battery is as follows:

(a) Remove the top and bottom covers from the instument as instructed in paragraph 6.6.2.

(b) Cut the tie wrap securing the battery to the processor board. Retain the insulating pad which is held by the tie wrap to the underside of the board.

(c) Unsolder the NEGATIVE connection of the battery. This is the end of the battery furthest from the front panel of the instrument. It may be secured to pin 22, or to a through hole in the board adjacent to pin 22, according to the battery type.

(d) Unsolder the POSITIVE connection of the battery. This may be secured to pin 23, or to a through hole in the board adjacent to pin 23.

(e) Solder the POSITIVE connection of the replacement battery into position.

(f) Solder the NEGATIVE connection of the replacement battery into position.

(g) Measure the voltage between pin 22 and ground. The voltage difference must not be more than 10 mV, with pin 22 negative with respect to ground.

IF THIS CONDITION IS NOT MET DISCONNECT THE BATTERY IMMEDIATELY. CHECK THAT THE BATTERY POLARITY IS CORRECT, AND THAT IT IS NOT SHORT CIRCUITED.

(h) When the voltage between pin 22 and ground is correct, secure the battery and the insulating pad to the board using a new tie wrap, Racal-Dana part number 24-0140. The insulating pad must cover the track in the vicinity of the battery on the underside of the board.

6.2.3 SPECIAL FUNCTIONS FOR MAINTENANCE PURPOSES

6.2.3.1 The special functions listed in Table 6.1 are provided for use during maintenance and calibration. They are additional to the special functions for operator use, which are listed in Table 4.1 of Section 4, and are called by pressing

/X//X//.//X//SHIFT//SF/

Where XX.X is the special function number.

TABLE 6.1

Additional Special Functions

Special Function Number	Function
30.0	Cancels 30.2
30.2	Turns on internal calibrator
97.0	Enables and initiates ACAL
97.1	Resets all cal factors
	Selects manual ranging
	Selects 1 V range
	Disables automatic ACALs.
98.0	Cancels 98.1
98.1	Enables all display elements (display check)

6.2.4 TEST SWITCHES

6.2.4.1 A bank of eight switches, S30, is mounted on assembly 19-1014. It provides the special facilities shown in Table 6.2 for use during testing and calibration. The function shown in the table is provided when the relevant switch is in the closed position (where the slider is moved in the direction of the arrow moulded on it or towards the switch section number).

TABLE 6.2

Test Switch Functions

Switch Section	Function
1	Inhibits noise cancellation
2	Selects 30 dB attenuator number 2
3	Inhibits all error indications
8	Indicates the GPIB interface is fitted

6.2.4.2 It is essential that switches 1 to 7 are set to the open position and switch 8 is set to the closed position when the 9303 is in use as a measuring instrument.

6.3 **FAULT FINDING ON ASSEMBLIES 19-1014 AND 19-1017**

6.3.1 INTRODUCTION

6.3.1.1 The procedure given in the following paragraphs provides a means of fault finding on assemblies 19-1014 and 19-1017, involving the technique of signature analysis. The signatures given are those obtained using the Hewlett-Packard 5004 signature analyser.

6.3.2 ASSEMBLY 19-1014

6.3.2.1 Suggested procedures to be followed in the event of certain forms of equipment failure are given in Table 6.3. Where required, signature analysis should be carried out in accordance with the instructions in paragraph 6.4.

6.3.3 ASSEMBLY 19-1017

6.3.3.1 Suggested procedures to be followed in the event of malfunction of the GPIB interface are given in Table 6.4. Limited signature analysis can be carried out on assembly 19-1017, as an aid to fault finding, in accordance with the instructions given in paragraph 6.4. No fault finding on assembly 19-1017 should be attempted unless assembly 19-1014 is known to be functioning correctly.

TABLE 6.3

Fault Finding Procedure, Assembly 19-1014

Fault	Procedure
Random LCD elements or LED indicators come on when 9303 is switched on. Keyboard is inoperative.	(a) Check that $\overline{\text{RESET}}$ pulse occurs at IC30/40 when 9303 is switched on. (b) Check that TP9 is at logic '0'. (c) Check address bus signatures at IC16, 17, 18 and 19 sockets. (d) Check data bus signatures. (e) Check the $\overline{\text{OPE}}$ signal signature at IC32/4. (f) Check the display and LED clock signatures at IC32/10, 11, 12, 13, 14 and 15.
All LCD elements on. Keyboard is inoperative.	(a) Check that TP9 is at logic '0'. (b) Check address bus signatures at IC20 and IC21 sockets. (c) If signatures are correct, change IC20 and/or IC21.
Er23, Er24, Er25 or Er26 permanently displayed	(a) Check address bus signatures at IC16, 17, 18 and 19 sockets. (b) If signatures are correct, change IC16, 17, 18 and/or 19.
Display or LED's not operating	(a) Check signatures at IC32/1, 2, 3, 4, 10, 11, 12, 13, 14 and 15. (b) Check for 30 Hz waveform of exact 1:1 mark/space ratio at IC33/10.
Keyboard inoperative or partially operative	(a) Check KEY ENABLE and $\overline{\text{KEY ENABLE}}$ signatures at IC28/19 and IC37/9. (b) Check row scan signal signatures at IC27/8.
Incorrect selection of range, calibrator or measuring head. Incorrect selection of digital output of IC9.	Check signatures at IC34/1, 2, 3, and 4, IC11/23 and IC12/23.

TABLE 6.4

Fault Finding Procedure, Assembly 19-1017

Fault	Procedure
Instrument will not go into Talk, Listen or Remote.	(a) Set the TALK ONLY address switch to logic '1' and check that the TALK annunciator appears in the display. If it does not check that switch 8 of S30 on assembly 19-1014 is closed. Reset the TALK ONLY address switch to logic '0'. (b) Carry out the signature analysis procedure for assembly 19-1017. (c) Set the instrument's address to 00000. (d) Connect a GPIB monitor, set to act as a controller, to the 9303 GPIB connector. (e) Set the DAV message false (high). (f) Set the REN and ATN messages true (low). (g) Check that the 9303 responds and puts NRFD and NDAC true, followed by NRFD false. (h) Set DI08 to DI01 to 00100000, and set DAV true. The 9303 should respond by setting NRFD true. The 9303 should set NDAC false. (j) Set DAV false. The 9303 should respond as in step (g). (k) Set ATN false (high). The 9303 should go to the remote state, and the REMOTE indicator should light.
In the event of failure at any stage, check that the logic levels at IC2 on assembly 19-1017 are the same as those at the controller.	

TABLE 6.4 (Continued)

Fault Finding Procedure, Assembly 19-1017

Fault	Procedure
Instrument will go to listen but not remote.	(a) Carry out steps (a) to (g) as instructed above. (b) Set DI08 to DI01 to 0100000 and set DAV true. The 9303 should respond by setting NRFD true and NDAC false. (c) Set NRFD false and NDAC true by means of the GPIB monitor. (d) Set ATN false. The 9303 should respond by setting DAV true.
In the event of failure at any stage, check that the logic levels at IC2 on assembly 19-1017 are the same as those at the controller. If failure occurs at step (d) check the functioning of the interrupt circuitry.	
Instrument sends incorrect data when talking.	Check data bus lines and bus transceivers on assembly 19-1017 to ensure both logic levels are possible.

6.4 SIGNATURE ANALYSIS

6.4.1 PREPARATION FOR SIGNATURE ANALYSIS

6.4.1.1 Switch off the instrument and disconnect the AC supply. Remove the covers, as instructed in paragraph 6.6.2, and carry out the following operations on assembly 19-1014:

(a) Remove ICs 11, 12, 20 and 21

(b) Short circuit TP8 to TP4

(c) Set switch 1 on switchbank S30 to the closed position (where the slider is towards the switch section number). Set the remaining switches of S30 to the open position.

6.4.1.2 If analysis is to be carried out on assembly 19-1017, IC2 on that assembly must be removed in addition to the operations given in paragraph 6.4.1.1.

6.4.2 CONNECTION OF THE SIGNATURE ANALYSER

6.4.2.1 Connect the signature analyser as follows:

(a) CLOCK input to TP5, negative edge trigger.

(b) START and STOP to IC25/3, positive edge trigger.

(c) GROUND to TP4.

6.4.3 ANALYSIS PROCEDURE

WARNING: THIS PROCEDURE REQUIRES THE INSTRUMENT TO BE OPERATED WITH THE COVERS REMOVED. LETHAL VOLTAGE LEVELS ARE EXPOSED UNDER THESE CONDITIONS.

6.4.3.1 Connect the 9303 to the AC supply and switch the instrument on. Apply the probe of the analyser to the points given in Table 6.5, and check that the correct signatures are obtained.

TABLE 6.5

System Signatures for Assembly 19-1014

Test Point	Signal Name	Signature
IC29/9	Data Bus	0001
IC29/3, 5, 7, 12, 14, 16 and 18	Data Bus	0000
IC23/9	A0	5555
IC23/12	A1	CCCC
IC23/7	A2	7F7F
IC23/14	A3	5H21
IC23/5	A4	OAFA
IC23/16	A5	UPFH
IC23/3	A6	52F8
IC23/18	A7	HC89
IC23/3	A8	2H70
IC24/14	A9	HPPO
IC24/9	A10	1293
IC24/7	A11	HAP7
IC25/1	A12	3C96
IC25/2	A13	3827
IC16/18	R1	F2A6
IC17/18	R2 } ROM	PC01
IC18/18	R3 } ENABLE	12U3
IC19/18	R4	4POA
TP6	IC26 ENABLE	6H49
IC26/9	IC22/29 ENABLE	H814
IC26/12	KEYBOARD SERVICE ENABLE	HFP6
IC36/12	$\overline{\text{KEYBOARD SERVICE ENABLE}}$	HFP7
IC37/8	ROW 1 SCAN	6F34
IC37/6	ROW 2 SCAN } See	495C
IC37/11	ROW 3 SCAN } Note 1	AP72
IC37/3	ROW 4 SCAN	U45A
IC27/8	ROW 1 SCAN	6F35
	ROW 2 SCAN } See	495A
	ROW 3 SCAN } Note 2	AP73
	ROW 4 SCAN	U45C
IC26/11	$\overline{\text{OPE}}$	47F9
IC32/15		HFU5
IC32/14		C73F
IC32/13	SERIAL DATA	PHFP
IC32/12	CLOCKS	3C72
IC32/11		FPHH
IC32/10		C3C6
IC26/4	RAM ENABLE	A8C1
IC26/10	IC34 ENABLE	86F3
IC34/15	IC12 ENABLE	OP84
IC34/14	IC11 ENABLE	UFUA
IC34/12	GPIB ENABLE	PHHO

NOTE: (1) The same ROW SCAN signature is obtained when any key in a row is pressed. A check of every key should be made.

(2) A signature is obtained at IC27/8 when any key is pressed. Although the probe is applied to a single point, each key row has its own signature.

6.4.3.2 If signature analysis on assembly 19-1017 is required it should be carried out at this stage, before carrying out the data bus analysis on assembly 19-1014. Apply the probe of the analyser to the points given in Table 6.6 and check that the correct signatures are obtained.

TABLE 6.6

System Signatures for Assembly 19-1017

Test Point	Signal Name	Signature
IC14/4	$\overline{A3}$	5H20
IC14/6	GPIB ENABLE	PHH1
IC11/6	IC2 SELECT	341A
IC15/15	IC10b CLOCK	053A
IC15/14	IC10a CLOCK	3HA8
IC15/13	IC9a ENABLE	3052
IC15/12	IC7a RESET	0F15
IC15/11	IC9b ENABLE	8304

6.4.3.3 The data bus signatures for assembly 19-1014 depend upon the hardware build state of the instrument and the issue number of the software fitted. For this reason no table of signatures is given. It is essential that the ROMs fitted belong to the same hardware compatible set, that they are of the same issue number, and that they are fitted in the correct positions, as shown in Table 6.7. It should be noted that the part numbers for the ROMs in a set are the same for all software issue numbers, but the issue number is marked on the component body.

6.4.3.4 When the signature analysis is completed, switch off the 9303 and disconnect the analyser. On assembly 19-1014 remove the link from between TP8 and TP4. On switch bank S30, return switch 1 to the open position and set switch 8 to the closed position. Replace the instrument covers.

TABLE 6.7

Integrated Circuit Locations

IC Number	Type	Racal-Dana Part Number		
		Build State 1	Build State 2	Build State 3
16	2732	22-8515	22-8540	22-8570
17	2732	22-8514	22-8539	22-8569
18	2732	22-8513	22-8538	22-8568
19	2732	22-8512	22-8537	22-8567

6.5 CALIBRATION PROCEDURE

WARNING: THIS PROCEDURE REQUIRES THE INSTRUMENT TO BE OPERATED WITH THE COVERS REMOVED. LETHAL VOLTAGE LEVELS ARE EXPOSED UNDER THESE CONDITIONS.

6.5.1 INTRODUCTION

6.5.1.1 The procedure given in the following paragraphs provides the means of calibrating the 9303. It is essential that the tests be carried out in the order given, since the results obtained depend, in many cases, on successful completion of previous tests. The procedure should always be followed before returning the 9303 to use after repair. It may also be used as the basis for testing to check the functioning of the instrument.

CAUTION: When the procedure is used to test the functioning of the instrument special function 97.1 must NOT be used, nor should any variable component be adjusted.

6.5.2 TEST EQUIPMENT REQUIRED

6.5.2.1 The test equipment required is listed in Table 6.8. A particular model of instrument is recommended in some cases, but other instruments having the required parameters may be used.

6.5.3 TEMPERATURE DURING CALIBRATION

6.5.3.1 Throughout the calibration procedure the ambient temperature must be maintained within the range from $18^{o}C$ to $28^{o}C$. During the setting up of the external calibrator circuit the ambient temperature must be maintained between $21^{o}C$ and $25^{o}C$.

6.5.4 SIGNAL SOURCE LEVEL SETTING

6.5.4.1 At several points in the procedure instructions are given to set the level of a signal generator output to a prescribed level. Except where other tolerances are given for a specific setting, all settings must be made to a tolerance of ±1%. Additional test equipment, not shown in Table 6.8, may be required to set the level to this degree of accuracy.

6.5.5 ADDITIONAL MEASURING HEAD

6.5.5.1 The instructions given are for a 9303 fitted with a single measuring head. If an instrument is to be used with two measuring heads, the setting up of both INPUT sockets and testing of both measuring heads should be carried out at the same point in the procedure. The required accuracy must be achieved for both sockets or measuring heads at each stage before proceeding further. The two CALIBRATOR sockets must NOT both be loaded at any point in the calibration procedure.

TABLE 6.8
Test Equipment Required for Calibration

Item	Description Recommended Model	Required Parameters
1	Multimeter AVO Model 8	AC Volts: 90 V to 264 V Ohms: 1 Ω to 41 Ω
2	Digital Voltmeter Racal-Dana Model 4005	DC Volts: 15 V with 10 mV resolution 5 V with 0.1 mV resolution 50 mV with 0.01 mV resolution 2 mV with 1μV resolution
3	Oscilloscope with Qty 2/X10 Probes Qty 1/X1 Probe H.P. 1740A	Bandwidth 100 MHz
4	Signal Generator	Frequency range: 10 kHz to 2 GHz Maximum output: +19 dBm
5	Power Meter H.P. 436A with HP8482A and H.P. 8482H sensors.	VSWR better than 1.05 to 1 GHz
6	Spectrum Analyser	To measure relative powers in the range 15 to 30 dB over the frequency range from 100 MHz to 2 GHz.
7	VSWR Bridge Wiltron Type 60N50 and 60NF50	Type N male and female connections Directivity not less than 46 dB.
8	Fixed Attenuator (2) Radiall Type 414710	10 dB VSWR better than 1.05 to 1 GHz VSWR better than 1.12 from 1 GHz to 2 GHz.
9	Switchable Attenuator	0-90 dB in 1 dB steps Accuracy ±0.01 dB at 500 kHz
10	50 Ω Load	Type N female
11	Thermocouple Ballantine 1395A-0.4	Input impedance 50 Ω ±1%. To accept 0 dBm. Reversal error not more than ±0.1%. Output to be not more than 0.02 dB down at 10 MHz, and not more than 0.5 dB down at 100 MHz, relative to output at DC.
12	DC Power Supply	5 V settable to ±0.5 mV, and 50 mV, settable to ±0.15 mV.
13	Variac	To supply 0 V to 264 V from 240 V supply or 0 V to 132 V from 110 V supply at 50 VA.

6.5.6 SETTING UP THE POWER SUPPLIES

6.5.6.1 Test equipment required:

Description	Table 6.8 Item No.
Multimeter	1
Digital Voltmeter	2
Variac	13

6.5.6.2 (a) Disconnect the power lead from the power input plug.

(b) Put the LINE switch to ON.

(c) Set the supply voltage selector to each of the positions shown in Table 6.9 in turn. Measure the resistance between the line and neutral points on the rear of S29 on assembly 19-1014, and ensure that the correct values are obtained. Ensure that the value obtained for the 120 V setting is greater than that obtained for the 100 V setting, and that the value obtained for the 240 V setting is greater than that for the 220 V setting.

(d) Set the voltage selector to suit the local AC supply. Check that the correct supply fuse for this setting is fitted.

TABLE 6.9

Power Input Resistance

Voltage Selector Setting	Resistance
100 V	6 Ω - 11 Ω
120 V	6 Ω - 11 Ω
220 V	24 Ω - 37 Ω
240 V	26 Ω - 41 Ω

6.5.6.3 On assembly 19-1014:

(a) Remove the integrated circuits shown in Table 6.10.

CAUTION: Ensure that the ROMs, IC16, 17, 18 and 19 can be identified to ensure replacement in the correct sockets.

TABLE 6.10

Integrated Circuit Locations

IC Number	Type	Racal-Dana Part Number		
		Build State 1	Build State 2	Build State 3
9	8750			
11	6821			
12	6832			
16	2732	22-8515	22-8540	22-8570
17	2732	22-8514	22-8539	22-8569
18	2732	22-8513	22-8538	22-8568
19	2732	22-8512	22-8537	22-8567
20	6514-9			
21	6514-9			
30	6802			

(b) Set all sections of the switch bank S30 to the open position (where the slider is furthest from the switch section number).

(c) Measure the resistance from IC39/3 to ground, with the current source lead of the meter to IC39/3. The resistance must be greater than 30 Ω.

(d) Measure the resistance from IC38/3 to ground, with the current source lead of the meter to ground. The resistance must be greater than 30 Ω.

(e) Measure the resistance from TP3 to ground, with the current source lead of the meter to TP3. The resistance must be greater than 30 Ω.

6.5.6.4 Check the resistance between the earth pin of the power input plug and the outer ring of the DIN socket on the front panel. The resistance must be less than 1 Ω.

6.5.6.5 Set the 9303 LINE switch to OFF. Using the power supply lead, connect the earth pin of the power input plug to a good earth point. Connect the line and neutral pins to the output of the variac. Connect the multimeter to monitor the variac output. Connect the measuring head to the rear panel INPUT socket.

6.5.6.6 (a) Switch on the AC supply to the variac. Adjust the variac to give an output equal to the setting of the supply voltage selector.

(b) Switch on the 9303. Using the DVM, measure the voltage, relative to 0 V, on pin 2 of the front panel INPUT socket (see Fig. 6.1). Adjust R44 on assembly 19-1014 until the measured voltage is between +14.99 V and +15.01 V.

(c) Transfer the DVM to measure the voltage, relative to 0 V, on pin 5 of the front panel INPUT socket. Adjust R49 on assembly 19-1014 until the measured voltage is between -14.99 V and -15.01 V.

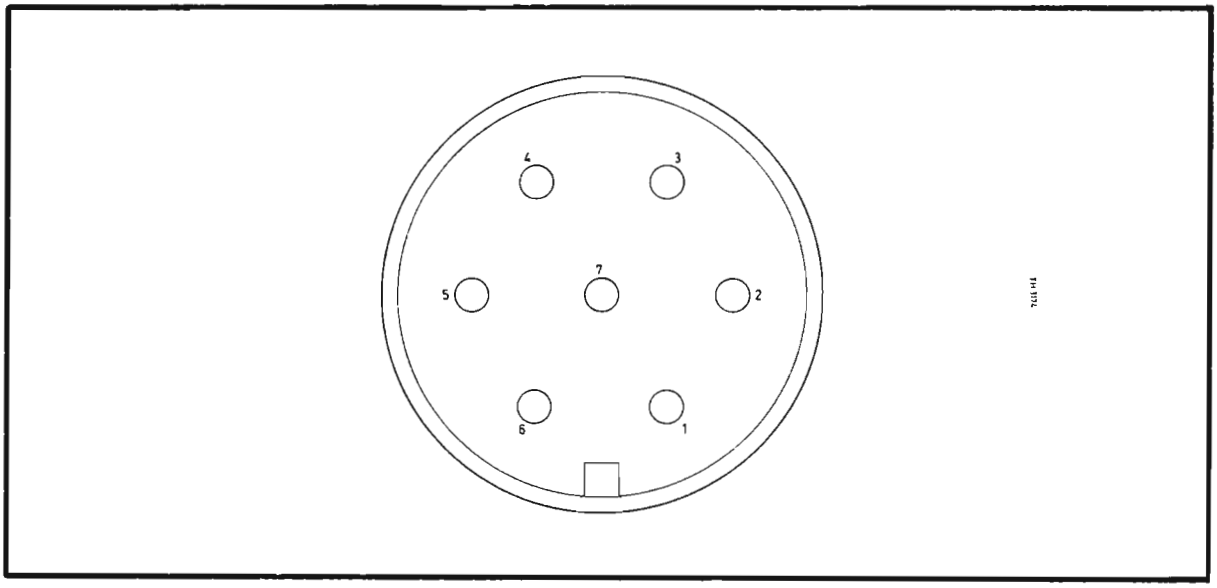


Fig. 6.1 Input Socket
(Viewed from the front)

(d) Transfer the DVM to measure the voltage at TP3 on assembly 19-1014 relative to 0 V. The voltage must be +5 V ±0.25 V.

(e) Transfer the DVM to measure the voltage at pin 1 of R34. The voltage must be +9.3 V ±1 V.

(f) Transfer the DVM to measure the voltage at TP10. The voltage must be 4.9 V ±0.4 V.

6.5.6.7 Adjust the variac to give an output equal to the upper voltage limit relating to the supply voltage selector setting, as given in Table 6.11. Measure the +15 V, -15 V, +5 V and +9.3 V supplies at the points given in the previous paragraph. Adjust the variac output to the lower voltage limit and repeat the measurements. The voltages must not have changed by more than 100 mV.

TABLE 6.11

Voltage Regulation Test Limits

Voltage Selector Setting	Upper Limit	Lower Limit
240 V	269 V	210 V
220 V	246 V	193 V
120 V	134 V	105 V
100 V	112 V	88 V

6.5.6.8 On assembly 19-1014:

(a) Transfer the DVM to measure the voltage at TP9 relative to 0 V.

(b) Turn R25 fully anti-clockwise.

6.5.6.9 (a) Reduce the variac output to zero, and then increase it to the lower limit given in Table 6.11.

(b) Turn R25 clockwise until the voltage at TP9 switches to a level less than +0.5 V.

(c) Reduce the variac output until the voltage at TP9 switches to a level greater than +2.4 V. The variac output must be greater than the voltage given in Table 6.12.

TABLE 6.12

Switching Level

Voltage Selector Setting	Minimum Switching Voltage
240 V	180 V
220 V	165 V
120 V	90 V
100 V	75 V

6.5.6.10 Switch off the 9303 and the supply to the variac. Disconnect the 9303 from the variac. Replace the integrated circuits listed in Table 6.10. Connect the 9303 to the AC supply.

6.5.7 SETTING UP ASSEMBLY 19-1014

6.5.7.1 Test equipment required:

Description	Table 6.8 Item No.
Digital Voltmeter	2
DC Power Supply	12

6.5.7.2 Remove PL15 from assembly 19-1014. Connect the 5 V DC supply between TP2 and 0 V, positive to TP2. Measure the voltage at TP2 with the DVM, and adjust the DC supply to give a voltage of 5 V ±0.5 mV.

6.5.7.3 (a) Switch on the 9303.

(b) Press /9//7//.//1//SHIFT//SF/.

(c) Adjust R15 until the 9303 indicates 1.000 ±0.001.

(d) Press /9//7//.//0//SHIFT//SF/. Wait for the ACAL cycle to finish, and check that the 9303 indicates 1.250 ±0.001.

(e) Adjust the DC supply to give a voltage of 50 mV ±0.15 mV at TP2. Check that the 9303 indicates 0.013 ±0.001.

(f) Remove the DC supply from TP2. Short circuit TP2 to TP1 and check that the 9303 indicates 0 ±0.002. An error indication is normal.

(g) Switch the 9303 off. Remove the short circuit between TP2 and TP1 and replace PL15.

6.5.8 SETTING THE MEASURING HEAD BIAS BALANCE

6.5.8.1 Test equipment required:

Description	Table 6.8 Item No.
Oscilloscope	3
X10 Probe	
X1 Probe	

6.5.8.2 Connect the measuring head to the INPUT socket which will be calibrated for its use. Terminate the head with the matched 50 Ω load. Connect the oscilloscope, via a X1 probe, to monitor TP7 on assembly 19-1016. Use external, negative-edge triggering, taking the trigger signal, via the X10 probe, from TP11 on assembly 19-1016.

(a) Switch the 9303 on. Select FRONT or REAR, as appropriate.

(b) Select the manual ranging mode, and the 3.162 V range.

(c) Adjust R68 on assembly 19-1016 to obtain the best waveform in accordance with Fig. 5.2. Note that there is a delay in circuit response to adjustment of R68.

(d) Disconnect the test equipment.

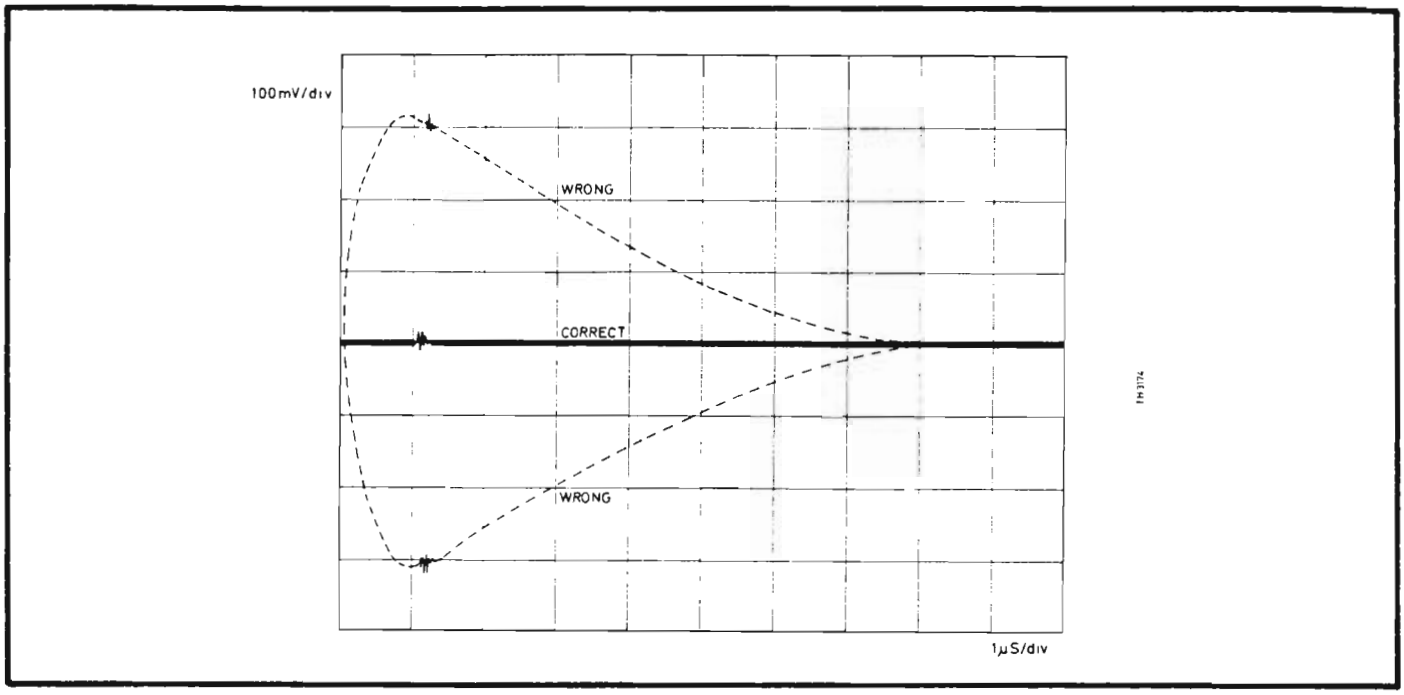


Fig. 6.2 Bias Balance Waveform

6.5.9 SETTING THE SECOND SAMPLER PULSE WIDTH

6.5.9.1 Connect the measuring head to the INPUT socket which will be calibrated for its use. Terminate the head with the matched 50 Ω load, and insert it into the appropriate CALIBRATOR socket.

6.5.9.2 (a) Select FRONT or REAR as appropriate.

(b) Press /WATTS/,/METER/ and /AUTO/.

(c) Press /3//0//.//1//SHIFT//SF/.

(d) Adjust R99 on assembly 19-1016 to obtain the maximum indication possible. The analogue display will be found to be of assistance.

(e) Press /0//SHIFT//SF/.

6.5.10 SETTING THE INTERNAL CALIBRATOR

6.5.10.1 Test equipment required

Description	Table 6.8 Item No.
Oscilloscope	3
X10 Probe (2)	
Signal Generator	4
50 Ω load	10

6.5.10.2 Connect the signal generator output to the 50 Ω load. Connect the probes to the two Y-channel inputs on the oscilloscope, and monitor the signal across the 50 Ω load with both channels of the oscilloscope. Use internal triggering.

6.5.10.3 (a) Set the signal generator output to a frequency of 500 kHz at a level of 1 V ±0.005 V peak-to-peak.

(b) Adjust the oscilloscope Y channel sensitivities until both channel indications are set to the same level at the greatest convenient amplitude.

(c) Press /RECALL//0//0/ and /3//0//.//2//SHIFT//SF/.

(d) Transfer the probe feeding the channel which is providing triggering to monitor IC7/5 on assembly 19-1016. This channel will provide a steady display of the calibrator output, while the other channel will provide an unlocked display of the signal generator output.

(e) Adjust R83 on assembly 19-1016 until the peak-to-peak amplitudes of the two displayed waveforms are identical.

(f) Press /0//SHIFT//SF/ and disconnect the test equipment.

6.5.11 SETTING THE EXTERNAL CALIBRATOR

6.5.11.1 Test equipment required:

Description	Table 6.8 Item No.
Digital Voltmeter	2
Signal Generator	4
Thermocouple	11

6.5.11.2 Press /3//0//.//1//SHIFT//SF/. Wait 15 minutes for 9303 temperature to stabilise. Connect the DVM to measure the output of the thermocouple. Set the output of the signal generator to a frequency of 500 kHz at a level of 0 dBm ±0.004 dB. Connect the output of the signal generator to the thermocouple input. The following procedure must be completed within a period of 10 mins. During this time the ambient temperature must be maintained between 21°C and 25°C.

(a) Note the reading on the DVM.

(b) Transfer the thermocouple input to the front panel CALIBRATOR socket of the 9303.

(c) Adjust R86 on assembly 19-1016 to obtain the same reading on the DVM as was noted in (a) ±0.1 %.

(d) Transfer the thermocouple input to the rear panel CALIBRATOR socket and note the DVM reading.

(e) Adjust R86 until the reading obtained at the rear panel CALIBRATOR socket is the arithmetic mean of the readings obtained in (c) and (d). Note the final reading obtained.

(f) Transfer the thermocouple input to the front panel CALIBRATOR output and note the DVM reading. Ensure that this reading and the final reading obtained in (e) are both within ±0.1% of the reading obtained in (a).

(g) Press /0//SHIFT//SF/ and disconnect the test equipment.

6.5.12 SETTING THE UPPER RANGE ATTENUATORS

6.5.12.1 Test equipment required:

Description	Table 6.8 Item No.
Signal Generator	4
Switchable Attenuator	9

6.5.12.2 Connect the measuring head to the INPUT socket which will be calibrated for its use. Terminate the head with the matched 50 Ω load. Connect the attenuator, set to 0 dB, to the signal generator output. Set the signal generator output to a frequency of 500 kHz at a level which gives +13 dBm at the attenuator output. Connect the measuring head to the attenuator output. Set the attenuator to 30 dB.

6.5.12.3 (a) Press /2//0//.//2//SHIFT//SF/ /WATTS/ and /1//0//STORE//SHIFT//AVERAGE/.

(b) Select the manual ranging mode, and step the 9303 to the 20 µW range. Select FRONT or REAR, as appropriate.

(c) Press /STORE//RATIO//RATIO/. This will store the measured value in the RATIO store and put the 9303 to the ratio measurement function. The display will now indicate 1.000 ± 0.001

(d) Step the 9303 to the 200 µW range, and set the attenuator to 20 dB.

(e) Adjust R36 on assembly 19-1016 until the 9303 indicates 10 ±0.05.

(f) Set the attenuator to 40 dB and step the 9303 to the 2 µW range. press /STORE//RATIO/.

(g) Step the 9303 to the 200 µW range, and set the attenuator to 20 dB.

(h) Adjust R26 on assembly 19-1016 until the 9303 indicates 100 ± 0.5.

(j) Set the attenuator to 30 dB. On assembly 19-1014, set switch 2 of switch bank S30 to the closed position (with the slider towards the switch section number). Step the 9303 to the 20 µW range and press /STORE//RATIO/.

(k) Step the 9303 to the 20 mW range and set the attenuator to 0 dB.

(l) Adjust R16 on assembly 19-1016 until the 9303 indicates 1000 ±5. Return S2 of switch bank S30 to the open position.

(m) Set the attenuator to 40 dB. Step the 9303 to the 2 μW range and press /STORE//RATIO/.

(n) Step the 9303 to the 2 mW range and set the attenuator to 10 dB.

(p) Adjust R4 on assembly 19-1016 until the 9303 indicates 1000 ±5.

(q) Disconnect the test equipment

6.5.13 FINAL ATTENUATOR SETTING

6.5.13.1 Test equipment required:

Description	Table 6.8 Item No.
Signal Generator	4
50 Ω Load	10

6.5.13.2 Connect the measuring head to the INPUT socket which will be calibrated for its use. Terminate the head with the matched 50 Ω load and connect it to the signal generator output. Set the signal generator output to a frequency of 500 kHz at a level of 0 dBm ±0.008 dB.

6.5.13.3 (a) Select FRONT or REAR as appropriate.

(b) Press /1//0//STORE//SHIFT//AVERAGE/, /VOLTS/ and /7//0//.//1//SHIFT//SF/.

NOTE: The 9303 will go through a FACTORY ECAL cycle. The factor measured will be stored.

(c) Disconnect the measuring head from the signal generator output. Load the measuring head input port with the additional 50 Ω load.

(d) Press /7//0//.//1//SHIFT//SF/.

NOTE: The 9303 will go through a second FACTORY ECAL cycle. The factor measured in (b) will not be changed, but a new noise figure will be measured and stored.

(e) Remove the 50 Ω load from the measuring head input port, and reconnect the measuring head to the signal generator output. Select the manual ranging mode and step through to the 316.2 μV range.

(f) Reset the signal generator output to -57 dBm ±0.01 dB.

(g) Adjust R118 on assembly 19-1016 until the 9303 indicates 316 μV ±1μV.

(h) Repeat (b) to (g) until no further adjustment of R118 is required.

NOTE: The final FACTORY ECAL factor and noise figure stored will be used on all measurements made via the INPUT socket in use. If any measuring head other than that used in this test is to be used in this socket, a fresh FACTORY ECAL must be carried out.

(j) Disconnect the test equipment.

6.5.14 CHECKING MEASURING HEAD GAIN

6.5.14.1 Connect the measuring head to the INPUT socket calibrated for its use. Terminate the head with the matched 50 Ω load and insert it into the appropriate CALIBRATOR socket.

(a) Press /RECALL//0//0/.

(b) Select FRONT or REAR, as appropriate.

(c) Press /3//0//.//1//SHIFT//SF/.

(d) Check that the 9303 reads 223.6 mV ±1 mV.

(e) Press /0//SHIFT//SF/.

6.5.15 NOISE CHECKS

6.5.15.1 Test equipment required:

Description	Table 6.8 Item No.
50 Ω Load	10

Connect the measuring head to the INPUT socket calibrated for its use. Terminate the head with the matched 50 Ω load and the additional 50 Ω load.

6.5.15.2 (a) Press /RECALL//0//0/. Select FRONT or REAR as appropriate.

(b) On assembly 19-1014 set switch 1 of switch bank S30 to the closed position (where the slider is towards the switch section number).

(c) Check that the 9303 indicates less than 200 μV.

(d) Press /WATTS/ and /NULL/. Check that the 9303 indicates 0.000 nW ± 0.001 nW.

(e) Remove the 50 Ω load from the measuring head input port and connect the head to the appropriate CALIBRATOR socket.

(f) Check that the 9303 indicates 0.000 nW ± 0.01 nW.

(g) Disconnect the test equipment. Return switch 1 of switch bank S30 to the open position. Ensure that switch 8 of S30 is set to the closed position.

6.5.16 LINEARITY ADJUSTMENT

6.5.16.1 Test equipment required

Description	Table 6.8 Item No.
Signal Generator	4
Switchable Attenuator	9

6.5.16.2 Connect the measuring head to the INPUT socket calibrated for its use. Terminate the head with the matched 50 Ω load, and connect it to the output of the attenuator. Set the attenuator to 20 dB, and connect the attenuator input to the signal generator output. Set the signal generator to an output of 500 kHz at a level giving -7 dBm at the attenuator output. Set the attenuator to 0 dB.

6.5.16.3 (a) Press /RECALL//0//0/. Select the manual ranging mode, and step through to the 1 V range. Press /5//STORE//SHIFT//AVERAGE/. Select FRONT or REAR as appropriate.

(b) Press /STORE//RATIO//RATIO/. This will store the displayed value in the RATIO store and put the 9303 to the ratio measurement function.

(c) Reset the attenuator to 20 dB.

(d) If necessary, adjust R24 on assembly 19-1015 until the 9303 indicates .1000 ±0.002.

(e) Reset the attenuator to 10 dB and check that the 9303 indicates .3162 ±0.002.

(f) If R24 was adjusted in (d), reset the attenuator to 0 dB and repeat stages (b) to (e) until the correct indications are obtained.

(g) Reset the attenuator to 0 dB, and then reduce the output in steps of 0.1 V or 1 dB. At each step check that the 9303 indication is as given in Table 6.13.

(h) Switch off the 9303 and disconnect the test equipment. Replace the instrument covers.

TABLE 6.13

Linearity Check

Signal Generator Output Level		
0.1 V Steps	1 dB Steps	9303 Indication
1 V	+13 dBm	1.000 ± 0.001
0.9 V		.9000 ± 0.002
	+12 dBm	.8913 ± 0.002
0.8 V		.8000 ± 0.002
	+11 dBm	.7943 ± 0.002
	+10 dBm	.7079 ± 0.002
0.7 V		.7000 ± 0.002
	+9 dBm	.6310 ± 0.002
0.6 V		.6000 ± 0.002
	+7 dBm	.5012 ± 0.003
0.5 V		.5000 ± 0.003
0.4 V		.4000 ± 0.003
	+5 dBm	.3981 ± 0.003
	+3 dBm	.3162 ± 0.003
0.3 V		.3000 ± 0.003

6.5.17 ACCURACY CHECK

6.5.17.1 Test equipment required:

Description	Table 6.8 Item No.
Signal Generator	4
Switchable Attenuator	9

6.5.17.2 Connect the measuring head to the INPUT socket calibrated for its use. Terminate the head with the matched 50 Ω load and connect it to the attenuator output. Connect the attenuator input to the signal generator output. Set the attenuator to 19 dB and set the signal generator output to a frequency of 500 kHz at level giving 0 dBm ± 0.008 dB from the attenuator output.

6.5.17.3 (a) Switch on the 9303. Select FRONT or REAR, as appropriate, and the auto-ranging mode.

(b) Press /STORE//SHIFT//EXT CAL/. Wait until the resulting USER ECAL cycle is complete.

(c) Switch off the signal generator output, and set the output to minimum level.

(d) Press /STORE//SHIFT//EXT. CAL/. Wait until the resulting USER ECAL cycle is complete.

(e) Enable the USER ECAL factor by pressing /SHIFT//EXT. CAL/.

(f) Switch on the signal generator and set the output level to that set in paragraph 6.5.17.2.

(g) Vary the attenuator to set the input level to the 9303 to each of the values given in Table 6.14 in turn. At each stage check that the 9303 has auto-ranged to the correct range and gives the correct measurement indication.

(h) Disconnect the test equipment.

TABLE 6.14

Accuracy Check

Attenuator Setting	Attenuator Output		9303 Range	Indication
	dBm	dBV		
76	-57	-70	316.2 µV	316.2 µV ± 5.6 µV
86	-67	-80		100.0 µV ± 3.5 µV
66	-47	-60	1 mV	1.000 mV ± 0.009 mV
76	-57	-70		0.316 mV ± 0.004 mV
56	-37	-50	3.162 mV	3.162 mV ± 0.027 mV
66	-47	-60		1.000 mV ± 0.011 mV
46	-27	-40	10 mV	10.00 mV ± 0.09 mV
56	-37	-50		3.16 mV ± 0.03 mV
36	-17	-30	31.62 mV	31.62 mV ± 0.27 mV
46	-27	-40		10.00 mV ± 0.11 mV
26	-7	-20	100 mV	100.0 mV ± 0.9 mV
36	-17	-30		31.6 mV ± 0.3 mV
16	+3	-10	316.2 mV	316.2 mV ± 2.7 mV
26	-7	-20		100.0 mV ± 1.1 mV
6	+13	0	1 V	1.000 V ± 0.009 V
16	+3	-10		0.316 V ± 0.003 V
0	+19	+6	3.162 V	2.000 V ± 0.030 V
6	+13	0		1.000 V ± 0.020 V

6.5.18 FREQUENCY RESPONSE

6.5.18.1 Test equipment required:

Description	Table 6.8 Item No.
Digital Voltmeter	2
Signal Generator	4
Power Meter	5
Attenuator	8
Thermocouple	11

6.5.18.2 Connect the measuring head to the INPUT socket calibrated for its use. Terminate the measuring head with the matched 50 Ω load. Select FRONT or REAR, as appropriate. Fit the power sensor to the power meter. Connect the attenuator pad to the signal generator output, and set the output to a frequency of 500 kHz.

6.5.18.3 (a) Connect the power sensor to the output of the attenuator. Adjust the signal generator output level to obtain an indication of 0 dBm on the power meter.

(b) Connect the measuring head to the attenuator output in place of the power sensor. Press /STORE//RATIO//RATIO/.

(c) Record the indication on the 9303. Change the signal generator frequency to the next value given in Table 6.15.

(d) Connect the power sensor to the attenuator output in place of the measuring head. Set the signal generator output to give an indication of 0 dBm on the power meter.

(e) Connect the measuring head to the attenuator output in place of the power sensor, and repeat steps (c) to (e) until measurements have been made at each frequency.

(f) Check that the indications recorded in step (c) agree with the calibration curve on the measuring head to within the following limits:

Below 500 MHz ± 1.5 %
500 MHz to 2 GHz ± 2.5 %

(g) Disconnect the test equipment.

TABLE 6.15

Frequency Response Check Points

Frequency
500 kHz
1 MHz
10 MHz
30 MHz
100 MHz
300 MHz
500 MHz
1 GHz
1.5 GHz
2 GHz

6.5.18.4 Connect the DVM to measure the output of the thermocouple. Set the signal generator output to 500 kHz.

6.5.18.5 (a) Connect the thermocouple to the signal generator output. Adjust the signal generator output level to 0 dBm. Note the reading on the DVM.

(b) Connect the measuring head to the signal generator output in place of the thermocouple. Press /STORE//RATIO//RATIO/.

(c) Record the indication on the 9303. Change the signal generator frequency to the next value given in Table 6.16.

(d) Connect the thermocouple to the signal generator output in place of the measuring head, and adjust the signal generator output to obtain the same indication on the DVM as was obtained in (a).

(e) Connect the measuring head to the signal generator output and repeat steps (c) to (e) until measurements have been made at each frequency.

TABLE 6.16

Frequency Response Check Points

Frequency
500 kHz
100 kHz
50 kHz
10 kHz

(f) Check that the indications recorded in step (c) agree with the calibration curve on the measuring head to within ±1.5 %.

(g) Disconnect the test equipment.

6.5.19 VSWR CHECK

6.5.19.1 Test equipment required:

Description	Table 6.8 Item No.
Signal Generator	4
Spectrum Analyser	6
VSWR Bridge (Male)	8
VSWR Bridge (Female)	8
50 Ω Load	10

6.5.19.2 Connect the signal generator to the INPUT port and the spectrum analyser to the OUTPUT Port of the female VSWR bridge as shown in Fig. 6.3. Do not connect the measuring head to the UNKNOWN port. Set the signal generator output to 100 MHz at a level of 0 dBm. Set the spectrum analyser to measure relative power (logarithmic mode). Connect the 9303 measuring head to the INPUT socket calibrated for its use. Terminate the head with the matched 50 Ω load. Select FRONT or REAR as appropriate.

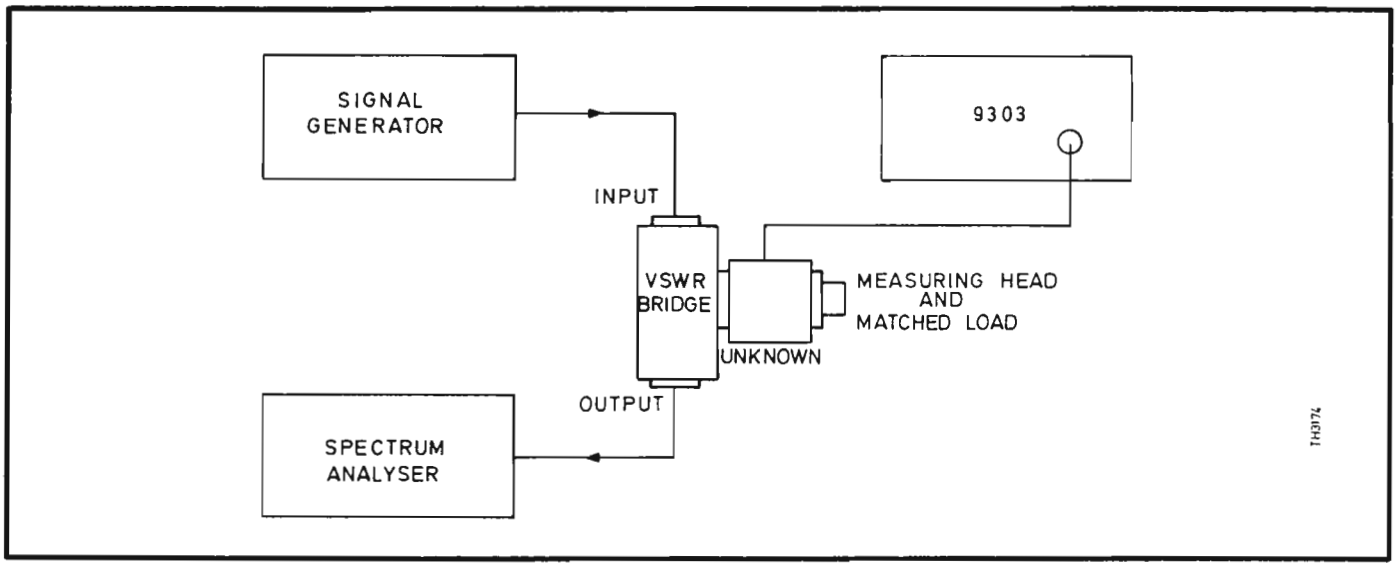


Fig. 6.3 Connections for VSWR Check

6.5.19.3 (a) Adjust the spectrum analyser input attenuator and logarithmic reference level controls until the display is set to a suitable reference level.

(b) Connect the measuring head to the UNKNOWN port of the VSWR bridge and check that the indication on the spectrum analyser is as given in Table 6.17.

(c) Disconnect the measuring head from the VSWR bridge. Adjust the signal generator frequency to the next value given in the table and repeat steps (a) to (c).

TABLE 6.17

VSWR Return Loss

Frequency	Spectrum Analyser Indication with Measuring Head Connected to VSWR Bridge
100 MHz	- (>27 dB)
500 MHz	- (>27 dB)
1.0 GHz	- (>27 dB)
1.5 GHz	- (>14.5 dB)
2.0 GHz	- (>14.5 dB)

(d) Exchange the female VSWR bridge for the male bridge.

(e) Remove the matched 50 Ω load from the measuring head, and terminate the input port with the additional 50 Ω load.

(f) Set the signal generator output to 100 MHz and repeat steps (a) to (c).

(g) Disconnect the test equipment.

6.5.20 INSERTION LOSS

6.5.20.1 Test equipment required:

Description	Table 6.8 Item No.
Signal Generator	4
Power Meter	5
Attenuator pads (2)	8

6.5.20.2 Connect the 9303 measuring head to the INPUT socket calibrated for its use. Select FRONT or REAR as appropriate. Fit the power sensor to the power meter, and connect it to the signal generator output via two 10 dB attenuator pads. Set the signal generator output to a frequency of 30 MHz.

6.5.20.3 (a) Adjust the signal generator output level to give an indication of -10 dBm on the power meter.

(b) Connect the measuring head in line between the two 10 dB attenuator pads. Check that the power meter indication +10 dBm agrees with the insertion loss figure shown on the measuring head calibration label against the signal generator frequency.

(c) Remove the measuring head from the circuit and reconnect the two attenuators.

(d) Set the signal generator frequency to 100 MHz, 300 MHz, 500 MHz, 1.0 GHz, 1.5 GHz and 2.0 GHz in turn, repeating steps (a) to (c) at each step.

(e) Switch off the 9303 and disconnect the test equipment.

6.6 DISMANTLING AND REASSEMBLY

6.6.1 INTRODUCTION

6.6.1.1 Instructions for dismantling and reassembling the 9303 are limited to those areas where special care is required or difficulty may be experienced.

WARNING: THE INSTRUMENT MUST BE SWITCHED OFF AND DISCONNECTED FROM THE AC SUPPLY DURING ALL DISMANTLING AND REASSEMBLY OPERATIONS.

6.6.2 REMOVAL AND REPLACEMENT OF THE COVERS

6.6.2.1 (a) Switch off the instrument and the AC supply. Remove the line power socket.

(b) Stand the instrument on its front handles, and remove the two screws from each of the plastic mouildings at the rear corners of the instrument. Remove the mouldings.

(c) The covers can now be removed by sliding them towards the rear of the instrument. Note that the removal of the plastic mouldings also releases the side trim panels, which should either be removed or secured by replacement of the mouldings.

(d) The covers are replaced in the reverse manner. Note that the straight, unfolded edge of the cover fits to the front of the instrument, and locates in a groove in the rear face of the front panel. The rear edge of the cover is folded under, and locates in a groove in the rear panel.

6.6.3 REMOVAL OF ASSEMBLIES 19-1015 and 19-1016

6.6.3.1 These assemblies are contained in the screening module. Once the instrument covers have been removed the appropriate module cover (the upper for 19-1015 and the lower for 19-1016) can be released by removing the six retaining screws. This will provide sufficient access for test purposes.

6.6.3.2 If access to the unexposed side of an assembly is required, proceed as follows:-

(a) If removing 19-1016, unplug coaxial plugs from SK7, 8, 9 and 10 and lift the ferrite beads on the cable to SK7 from the clip.

(b) Remove the six screws holding the board onto its supports within the module. This will enable the assembly to be tilted and lifted out of the module to the extent of the remaining connections. This provides adequate access for servicing.

6.6.3.3 When replacing the assembly:

(a) Ensure that the board is properly located, flat on its supports, before tightening the retaining screws.

(b) On assembly 19-1016, reconnect the coaxial plugs and insert the ferrite beads in the clip.

(c) When replacing the module cover, align the threaded collets, which are free to slide in the module side rails, with the holes in the module cover. The head of the cover retaining screws should be tilted slightly towards the front-back centre line of the module when engaging the thread.

(d) Ensure that the module cover is flat on the module rim when the retaining screws are tightened.

6.6.4 REMOVAL OF THE FRONT PANEL

6.6.4.1 The front panel must be removed if access is required to the front face of assembly 19-1013. The panel is removed as follows:

(a) Remove the instrument covers and the side trim strips.

(b) Remove the two retaining screws from each front handle and slide the handles out towards the front of the instrument.

(c) Remove the two screws securing the LINE switch to the inside of the panel. This is most easily done with a round-the-corner screwdriver.

(d) Remove the screw securing the bracket at the centre front of assembly 19-1014. This screw is removed from the bottom of the instrument.

(e) Disconnect the ribbon cable 10-2871 between 19-1013 and 19-1014 from 19-1013. (On early model instruments, unsolder the flexible connector from 19-1014).

(f) Remove the two Taptite (self threading) screws from each end of the front panel. The panel can now be drawn forward to the limit of the cable form to the CALIBRATOR and INPUT sockets.

6.6.4.2 To replace the panel follow the reverse of the above procedure.

CAUTION: Do not interchange the Taptite screws with machine threaded screws. The Taptite screws will damage the thread in any machine threaded holes into which they are inserted. Machine threaded screws will not hold the front panel securely.

6.6.5 REMOVAL OF ASSEMBLY 19-1013

6.6.5.1 To remove assembly 19-1013 proceed as follows:

(a) Remove the front panel, to the limit of its cableform, from the front of the instrument, as instructed in paragraph 6.6.4. Lay the panel, front downwards, flat on the bench.

(b) Remove the three nuts securing the bracket to assembly 19-1013 and remove the bracket.

(c) Remove the 14 nuts securing assembly 19-1013 on its support pillars. The assembly can now be lifted clear of the front panel.

CAUTION: Do not touch the contacting surfaces of assembly 19-1013 and the elastomeric contact strips around the LCD on the front panel. Any contamination will lead to poor electrical contact and failure of the LCD elements to function. If the contact strips become contaminated they should be carefully pulled from the slots in the retainers and cleaned with soapy water. The strips must be thoroughly dried before being replaced. If necessary, the contacting surface of assembly 19-1013 should be cleaned using iso-propyl alcohol.

6.6.5.2 The assembly is replaced using the reverse of the above procedure. The securing nuts should be tightened to a torque of 0.34 Nm (3 lbf.in).

6.6.6 REPLACEMENT OF THE LCD

6.6.6.1 To remove the LCD proceed as follows:

(a) Remove the front panel, as instructed in paragraph 6.6.4.

(b) Remove assembly 19-1013, as instructed in paragraph 6.6.5.

(c) Lift the LCD support mouldings from the locating studs. The LCD can then be lifted from the aperture in the front panel.

CAUTION: (1) The elastomeric contact strips are free to move in the slots in the support mouldings. Take care they do not fall out.

(2) Avoid all contamination of the elastomeric contact strips with grease from fingers or tools.

6.6.6.2 The fitting of the LCD is illustrated in Fig. 6.4. The fitting procedure is as follows:

(a) Carefully clean the inside surface of the display viewing window in the front panel. Loose material may be removed using a dry brush. Greasy marks may be removed using a soft, lint-free cloth and iso-propyl alcohol. An anti-static spray may be used, if required, after cleaning.

(b) Clean the contact areas of the LCD using a soft, dry cloth. If necessary a cloth dampened with soapy water may be used to removed grease.

(c) Clean the display face of the LCD with a soft, dry cloth. An anti-static spray may be used, if required, after cleaning.

(d) Place the LCD in the front panel aperture, ensuring that the orientation is correct.

(e) Pull the elastomeric contact strips from the support mouldings and drop the mouldings over the studs. Ensure that they bed down on the front panel, and do not catch on the sides of the LCD.

(f) Clean the elastomeric contact strips using soapy water. Dry them thoroughly, and replace them in the slots in the support mouldings. Leave the contact strips standing proud of the upper surface of the support mouldings.

(g) Clean the contacting surface of assembly 19-1013 using iso-propyl alcohol. Refit the assembly as instructed in paragraph 6.6.5.

(h) Refit the front panel as instructed in paragraph 6.6.4.

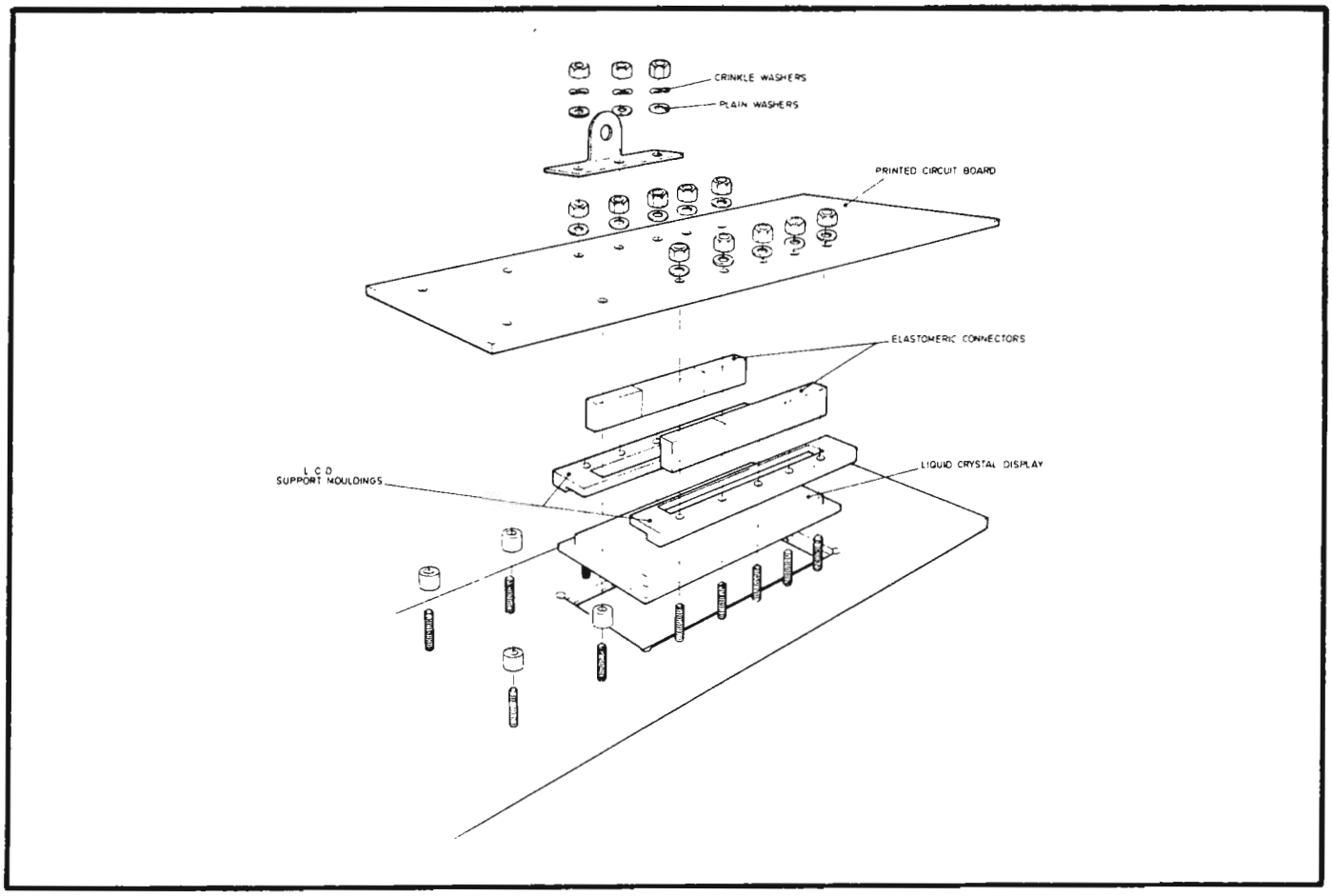


Fig. 6.4 Fitting the Liquid Crystal Display

6.6.7 CALIBRATOR SOCKETS

6.6.7.1 If, for any reason, a CALIBRATOR socket is detached from its panel, care must be taken to ensure that it is remounted correctly when it is replaced. Failure to do so may adversely affect the socket noise performance. The correct assembly of the mounting hardware is shown in Fig. 6.5.

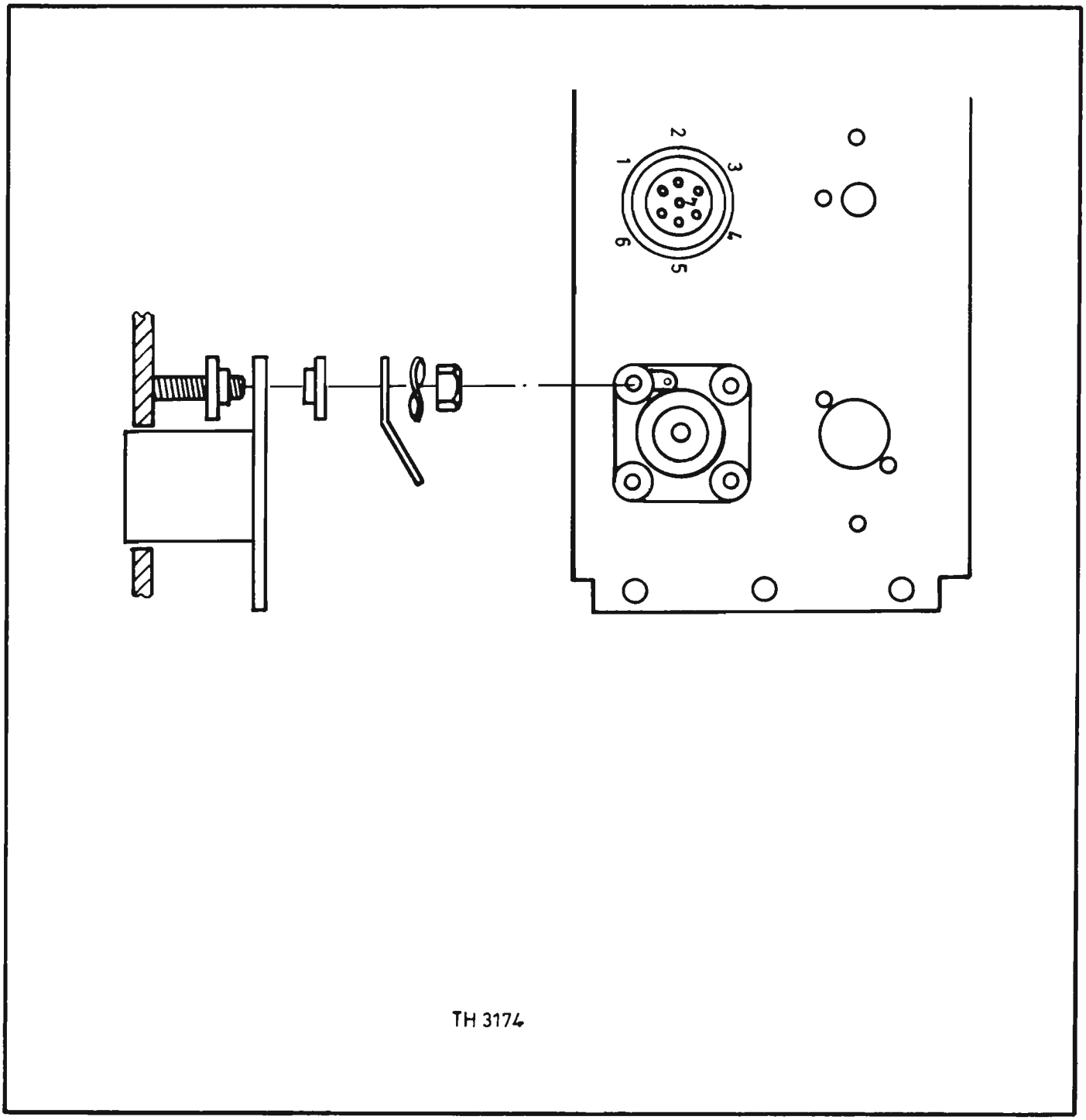


Fig. 6.5 CALIBRATOR Socket Mounting

SECTION 7

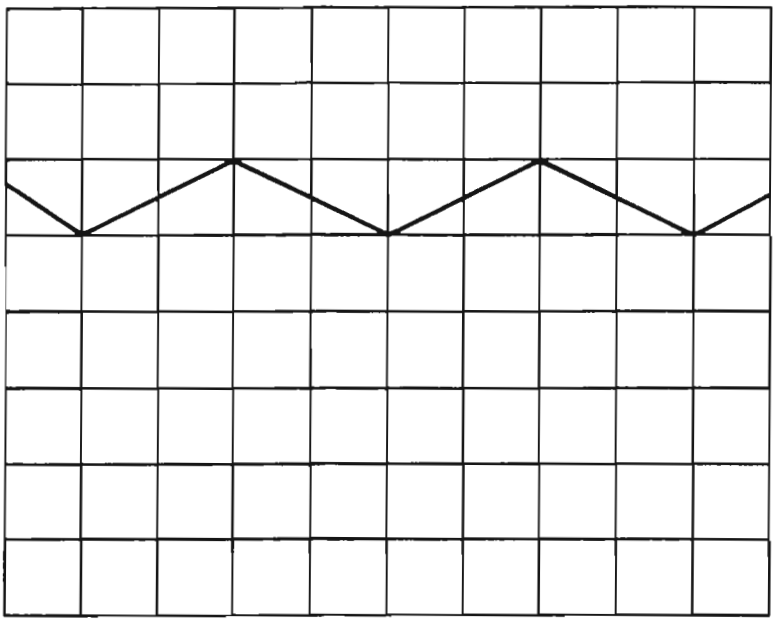
PARTS LIST AND CIRCUIT DIAGRAMS

TEST WAVEFORMS

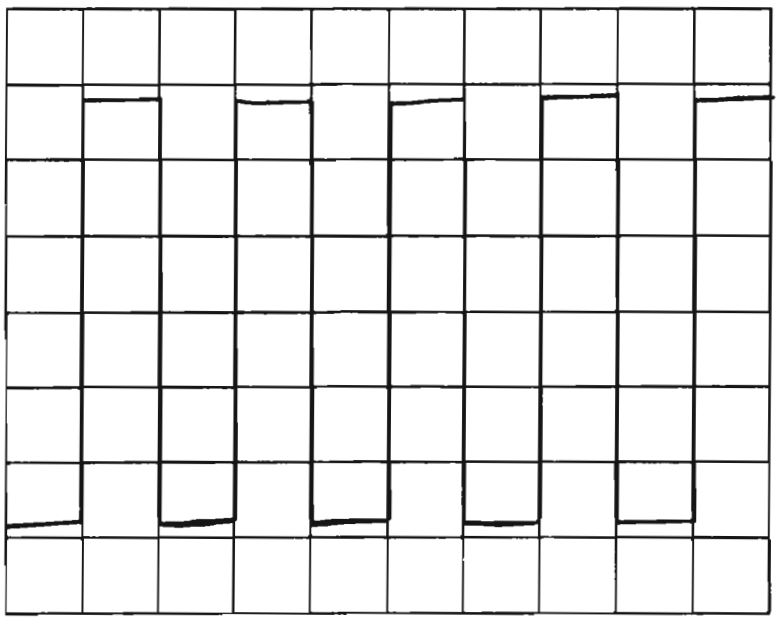
Assembly 19-1015

TEST CONDITIONS

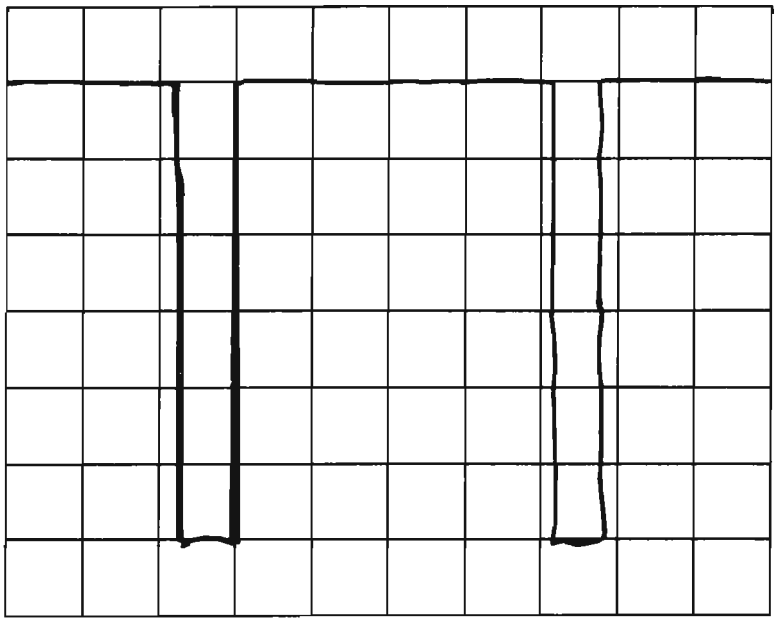
Measuring head connected to the appropriate CALIBRATOR socket.
Special function 30.1 active.
Oscilloscope internally triggered.
DC Coupling.



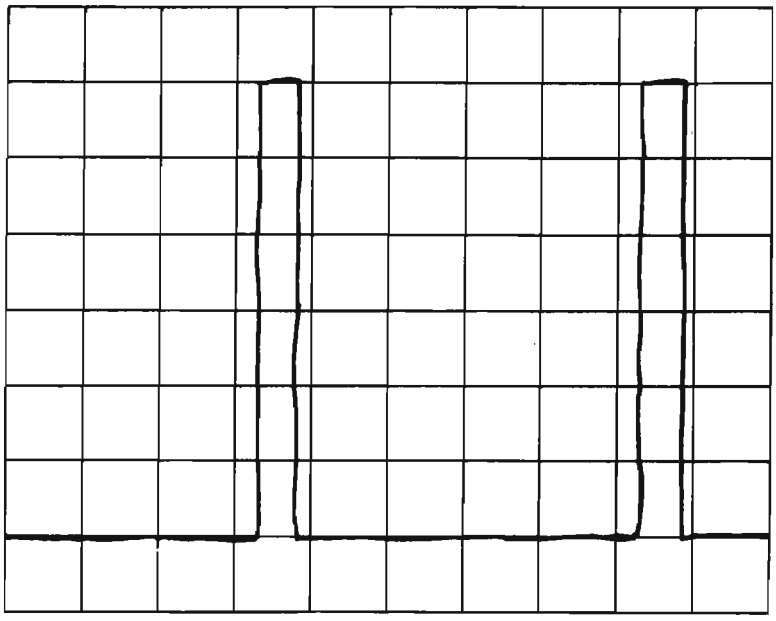
Monitor Point TP 3
Vertical scale 5 V/division
Horizontal scale 20 ms/division



Monitor Point TP 2
Vertical scale 5 V/division
Horizontal scale 5 ms/division



Monitor Point TP 4
Vertical scale 5 V/division
Horizontal scale 20 ms/division

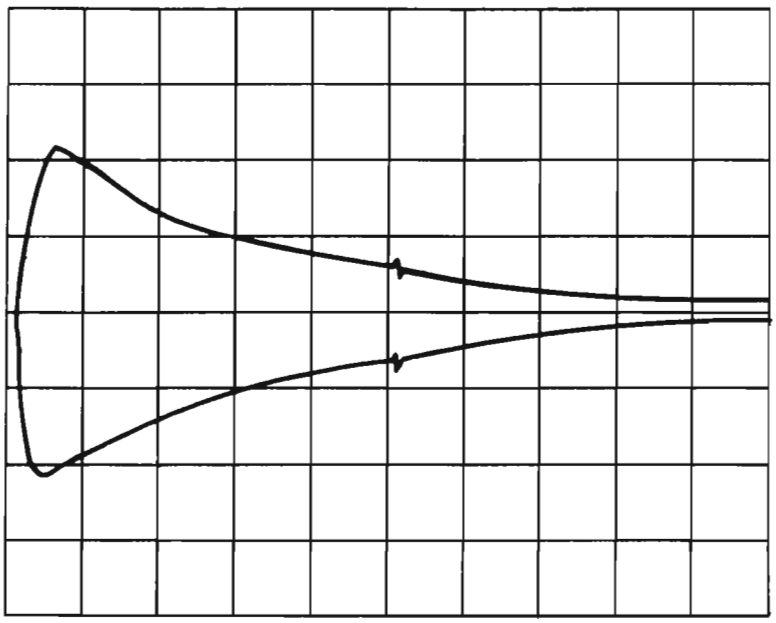


Monitor Point TP 5
Vertical scale 5 V/division
Horizontal scale 20 ms/division

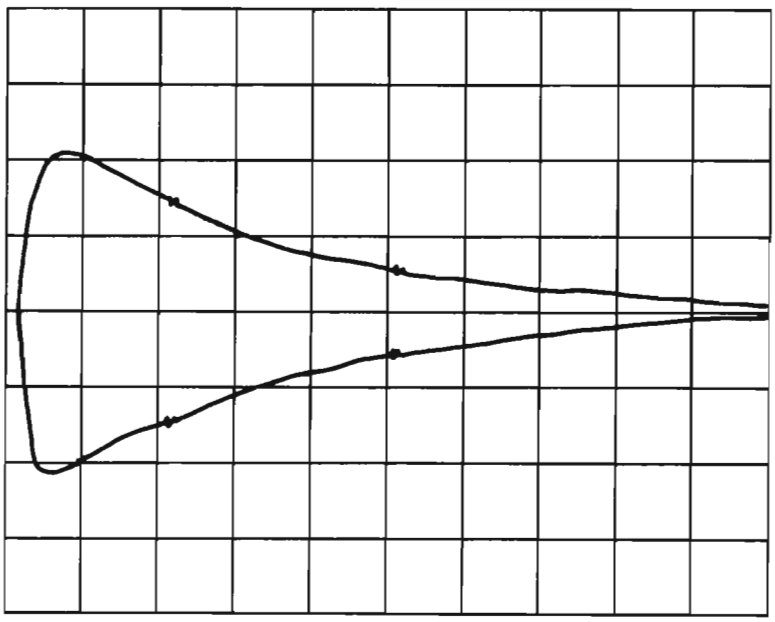
TEST WAVEFORMS

Assembly 19-1016

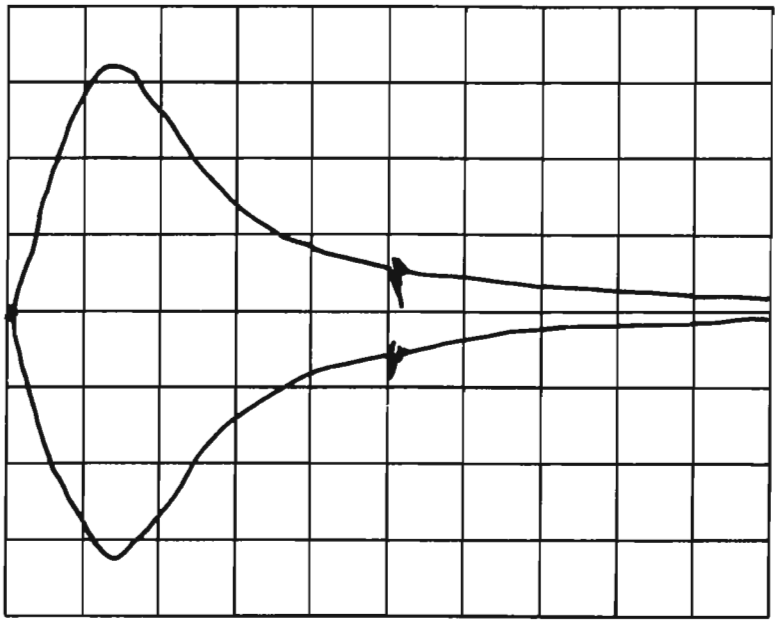
TEST CONDITIONS
Measuring head connected to the appropriate CALIBRATOR socket.
Special function 30.1 active.
Oscilloscope externally triggered from TP11, except where stated.
AC coupling, except where stated.



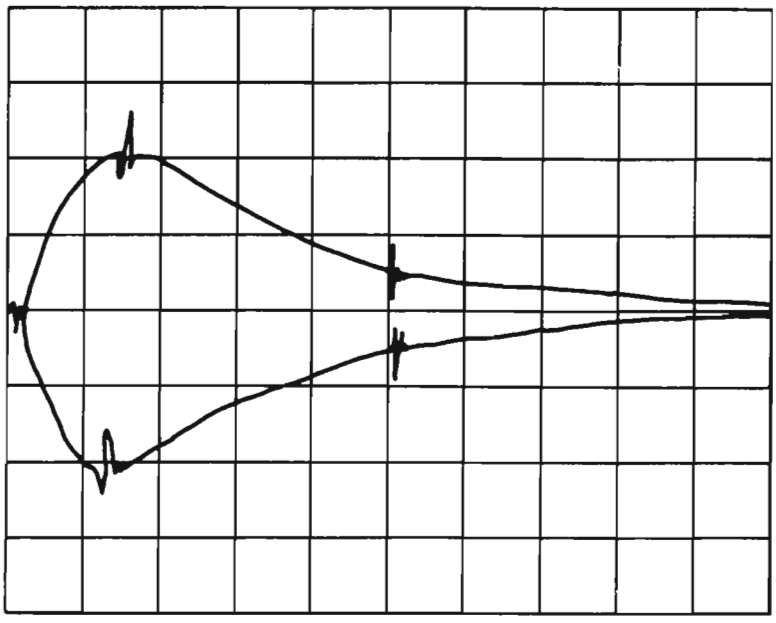
Monitor point	R66
Vertical scale	50 mV/division
Horizontal scale	1 µs/division
Mean DC level	-0.6 V



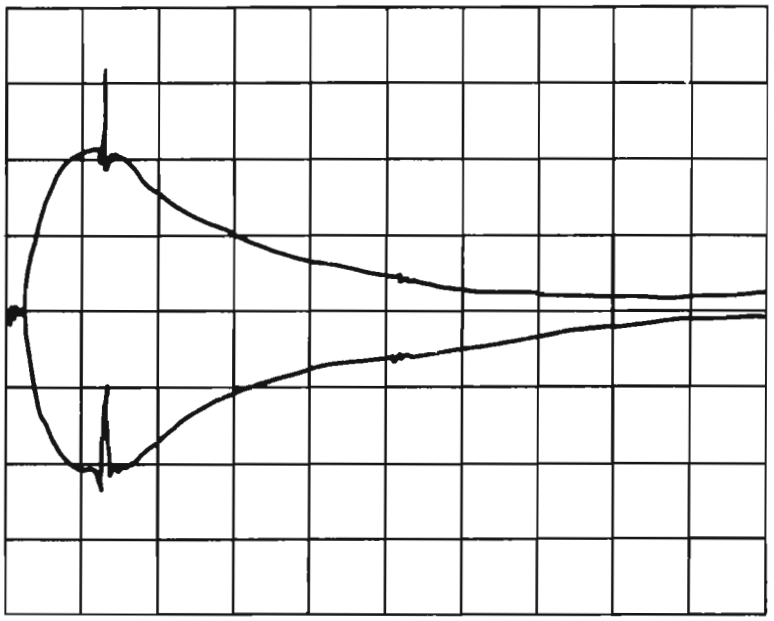
Monitor point	TP7
Vertical scale	50 mV/division
Horizontal scale	1 µs/division
Mean DC level	2.5 V



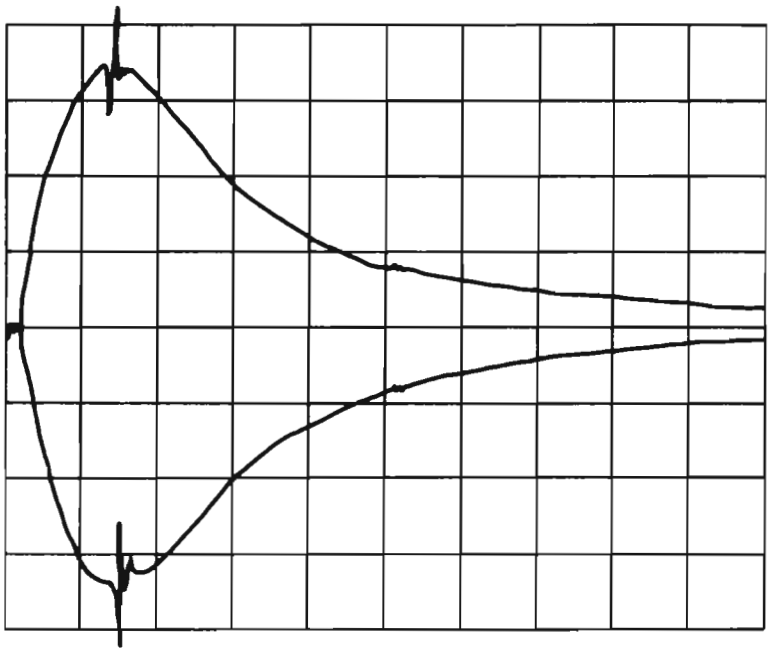
Monitor Point	TP 6
Vertical scale	10 mV/division
Horizontal scale	1 µs/division
Mean DC level	9 V



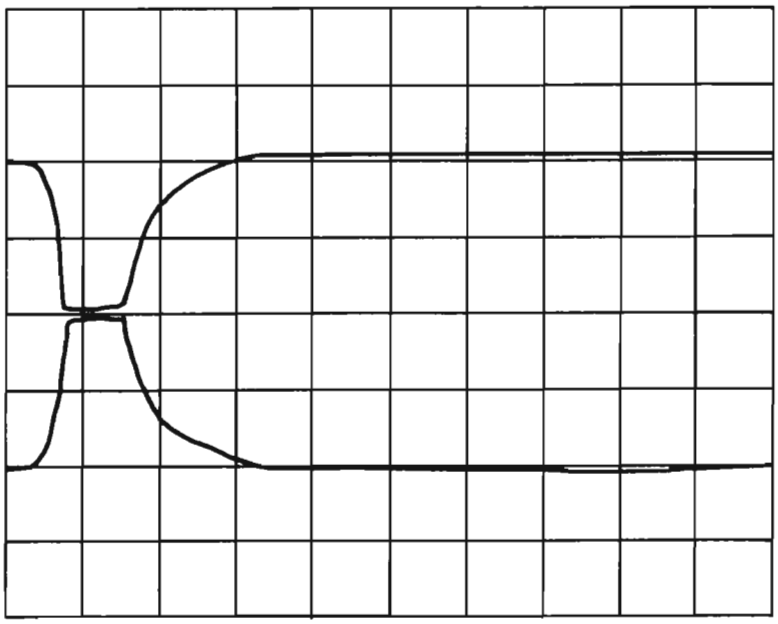
Monitor Point	TP 5
Vertical scale	5 mV/division
Horizontal scale	1 µs/division
Mean DC level	10 V



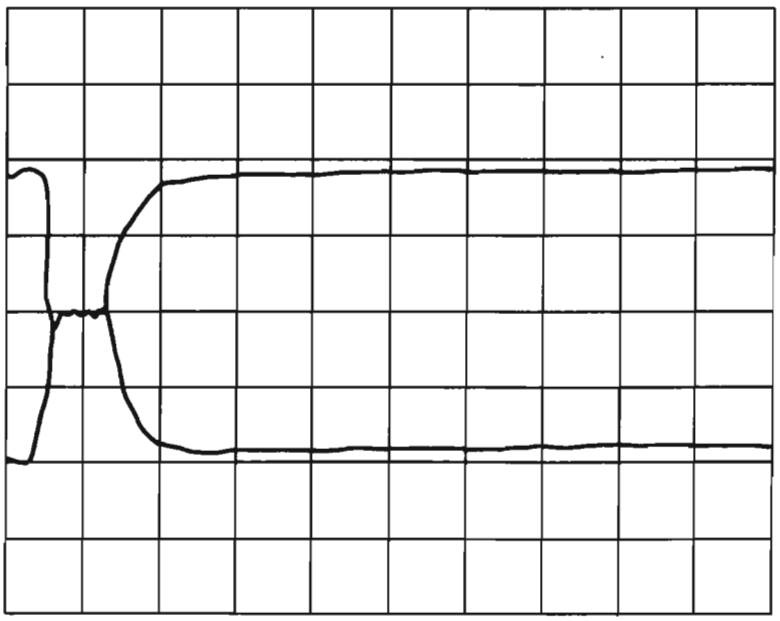
Monitor Point	TP 4
Vertical scale	50 mV/division
Horizontal scale	1 µs/division
Mean DC level	10 V



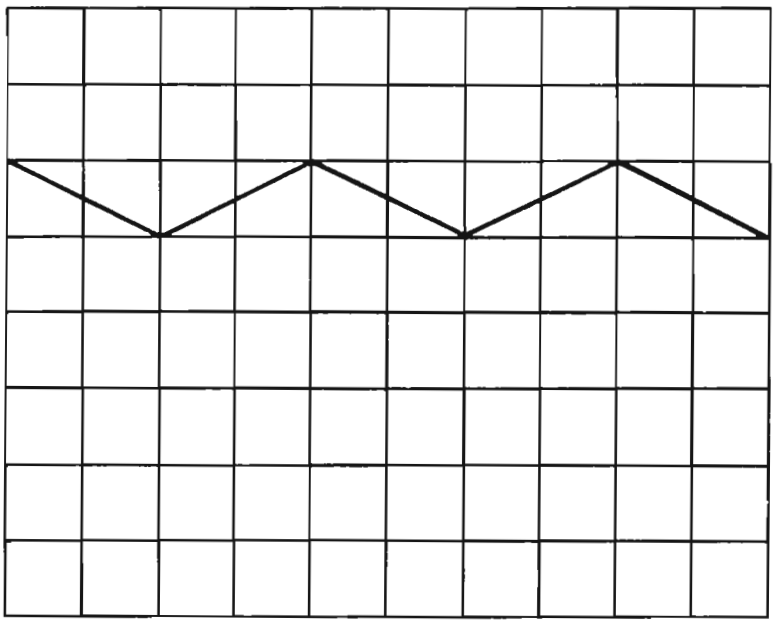
Monitor Point	TP 3
Vertical scale	100 mV/division
Horizontal scale	1 µs/division
Mean DC level	10 V



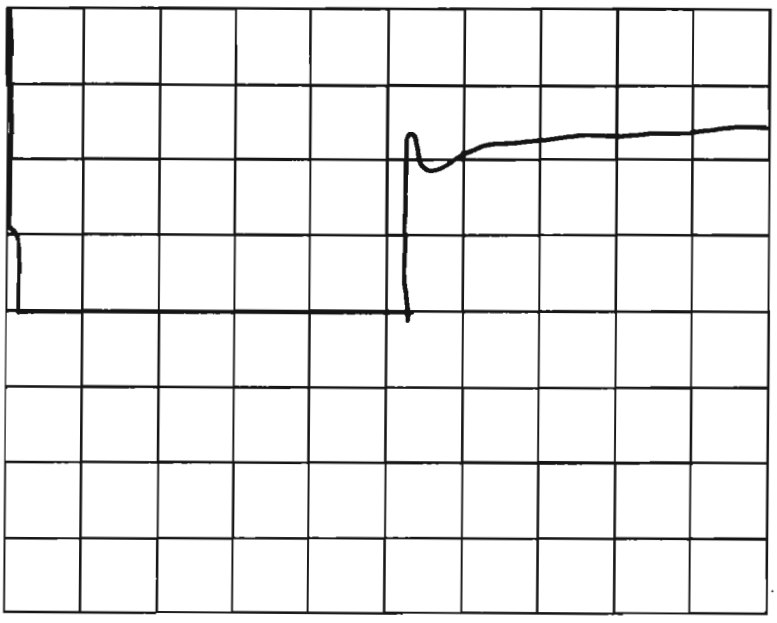
Monitor Point	TP 2
Vertical scale	200 mV/division
Horizontal scale	1 µs/division
Mean DC level	0 V



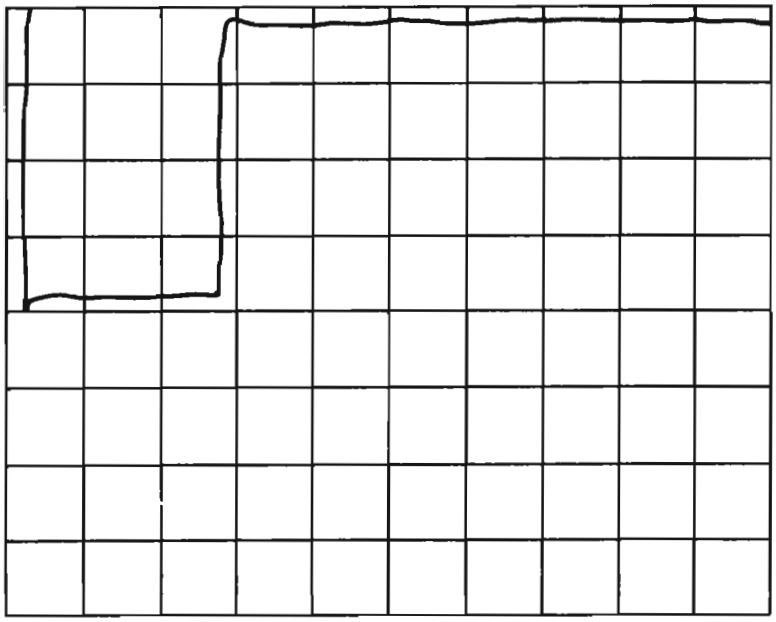
Monitor Point	TP 1
Vertical scale	200 mV/division
Horizontal scale	1 µs/division
Mean DC level	0 V



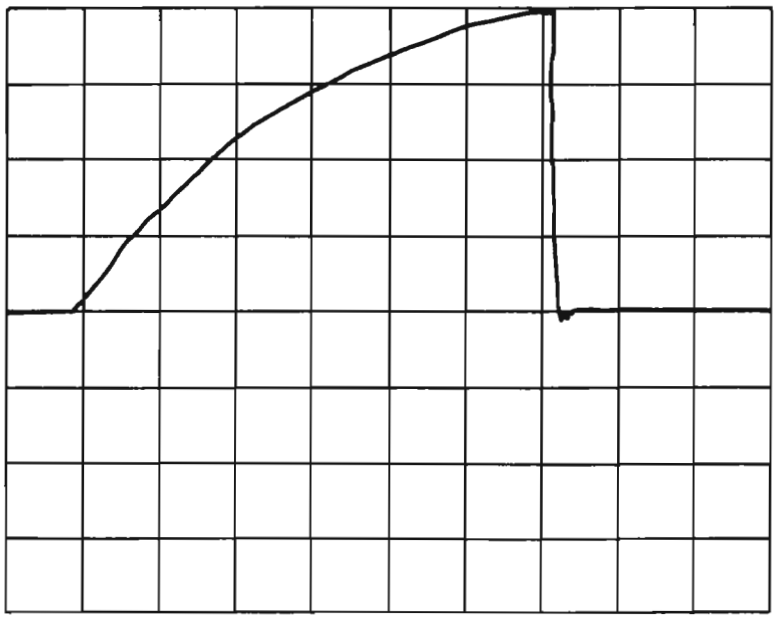
Monitor Point TP 9
Vertical scale 5 V/division
Horizontal scale 20 ms/division
DC coupled
Internal trigger



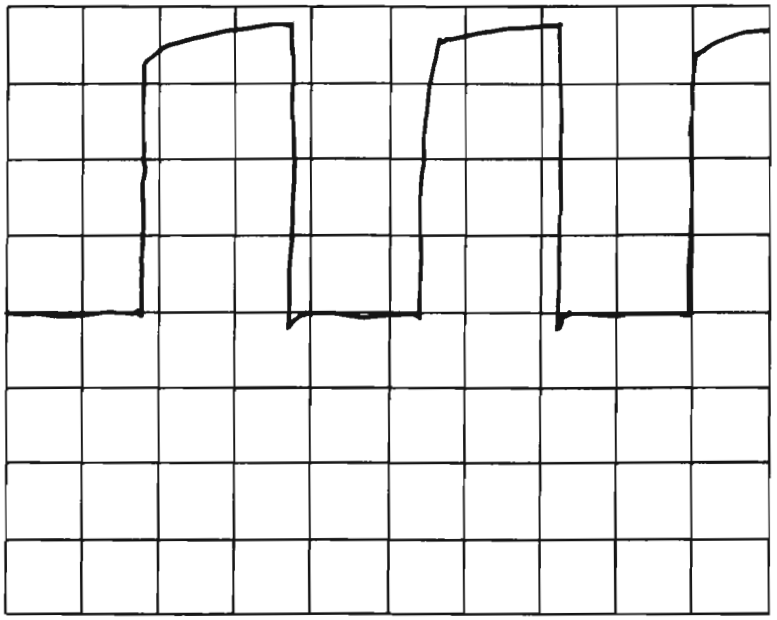
Monitor Point TP 11
Vertical scale 2 V/division
Horizontal scale 1 µs/division
DC coupled
Internal trigger



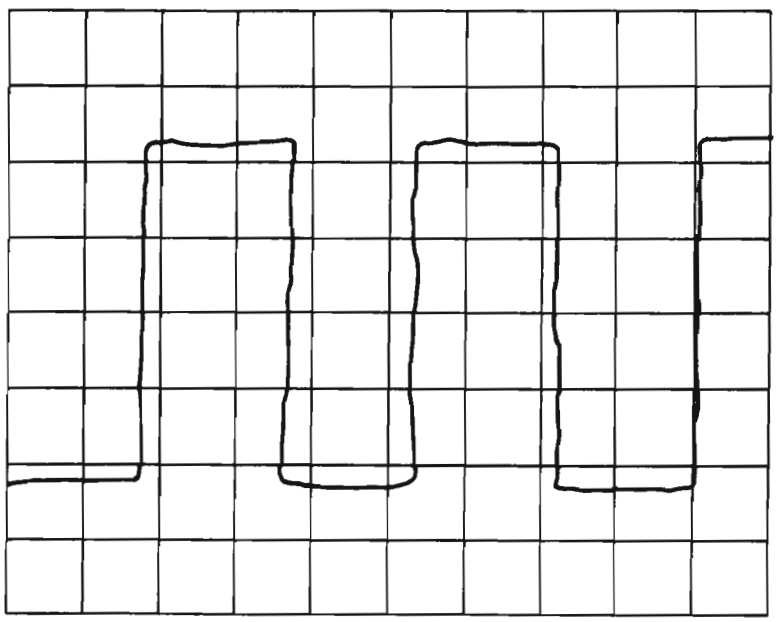
Monitor Point TP 10
Vertical scale 1 V/division
Horizontal scale 0.5 µs/division
DC coupled
Internal trigger



Monitor Point IC 16/3
Vertical scale 1 V/division
Horizontal scale 0.2 µs/division
DC coupled
Internal trigger



Monitor Point	IC 16/8
Vertical scale	1 V/division
Horizontal scale	0.5 µs/division
DC coupled	
Internal trigger	



Monitor Point	SK 8
Vertical scale	200 mV/division
Horizontal scale	0.5 µs/division
Mean DC level	0 V
DC coupled	
Internal trigger	

PARTS LIST

FRONT AND REAR PANEL ASSEMBLIES

Fig. 1 and Fig. 7

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
FRONT PANEL ASSEMBLY 11-1487					
		Liquid crystal display		or	17-1025 17-1022

Note: The display fitted must be compatible with the ROM set fitted in positions IC16 to IC19 on assembly 19-1014.

Display	ROM set
17-1025	22-8540 to 22-8537
	or 22-8570 to 22-8567
17-1022	22-8515 to 22-8512

	Elastomeric connector	23-5600
SK2	Socket, 7-way	23-3301
SK1	Cableform assembly	10-2698
REAR PANEL ASSEMBLY 11-1488		
T1	Transformer, power	17-4097
IC41	Voltage regulator, +5 V (7805)	22-4222
FS2	Fuse link (99 V to 132 V) 500 mA anti-surge	23-0052
	Fuse link (198 V to 264 V) 250 mA anti-surge	23-0056
SK17	Socket, RF, type N	16-0597
SK18	Socket, 7-way	23-3301
	Cableform assembly	10-2699
	AC power plug, filter and fuse holder	23-3294

PARTS LIST

MEASURING HEAD ASSEMBLY

Fig 3

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
SENSOR BODY ASSEMBLY (1 m cable) 11-1479 SENSOR BODY ASSEMBLY (2 m cable) 11-1539					
SK1		Socket, RF, type N			23-3323
PL1		Plug, RF, type N			23-3324
		50 Ω load			23-3329
SAMPLER BOARD 19-1011					
Resistors					
	Ω		W		
R1	18	Chip	0.125	5	20-5763
R2	100 k	Carbon Film	0.1	5	20-1551
R3	2.7 k	Chip	0.125	5	20-5766
R4	2.7 k	Chip	0.125	5	20-5766
R5	1 M	Carbon Film	0.1	5	20-1561
R6	22 k	Carbon Film	0.1	5	20-1563
R7	8.2 k	Chip	0.125	5	20-5767
R8	8.2 k	Chip	0.125	5	20-5767
R9	8.2 k	Chip	0.125	5	20-5767
R10	100	Chip	0.125	5	20-5764
R11	470	Chip	0.125	5	20-5765
Capacitors					
	F		V		
C1	1 n	Chip	100	10	21-1718
C2	1 n	Chip	100	10	21-1718
C3	1 n	Chip	100	10	21-1718
C4	100 p	Chip	100	20	21-1711
C5	10 n	Ceramic	100	20	21-1738
C6	10 n	Chip	100	10	21-1719
C7	10 n	Chip	100	10	21-1719
C8	1 n	Chip	100	10	21-1718
C9	1 n	Chip	100	10	21-1718
C10	5.6 p	Chip	100	0.5 p	21-1713
C11	1.5 p	Chip	50	0.25 p	21-1744

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Diodes					
D1					
D2		Hot Carrier, matched			
D3		set of four (5082.2815)			22-1063
D4					
D5		Step Recovery (A4S112)			22-1059
Transistors					
Q1		BFR30			22-6143
Q2		BCW32R			22-6142
Inductors					
T1		Transformer			17-3221
T2		Transformer			17-3222
L1		30 mm x 0.18 mm (36 SWG) enamelled copper wire wound on D5			25-4512
DRIVER BOARD 19-1012					
Resistors					
	Ω		W		
R1	47 (nom.)	Carbon Film	¼	5	20-2470
R2	1 k	Metal Oxide	½	5	20-3102
R3	120	Carbon Film	¼	5	20-2121
R4	1 k	Carbon Film	0.1	5	20-1521
R5	4.7	Carbon Film	¼	5	20-2008
R6	120	Carbon Film	0.1	5	20-1523
R7	390	Carbon Film	0.1	5	20-1530
R8	1.2 k	Carbon Film	0.1	5	20-1544
R9	680	Carbon Film	0.1	5	20-1554
R10	4.7 k	Carbon Film	0.1	5	20-1542
R11	10 k	Variable			20-7074
R12	3.3 k	Carbon Film	0.1	5	20-1537
R13	2.7 k	Carbon Film	0.1	5	20-1547
R14	2.7 k	Carbon Film	0.1	5	20-1547
R15	1 k	Carbon Film	0.1	5	20-1521
R16	1 k	Carbon Film	0.1	5	20-1521
R17	100	Carbon Film	0.1	5	20-1514
R18	2 k	Variable			20-7073
R19	100	Carbon Film	0.1	5	20-1514
R20	100	Carbon Film	0.1	5	20-1514

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Capacitors					
	F		V		
C1	47 µ	Electrolytic	16	20	21-0788
C2	10 n	Ceramic	100	20	21-1738
C3	10 n	Ceramic	100	20	21-1738
C4	47 µ	Electrolytic	16	20	21-0788
C5	1 n	Ceramic	100	20	21-1737
C6	10 n	Ceramic	100	20	21-1738
C7	10 n	Ceramic	100	20	21-1738
C8	47 µ	Electrolytic	16	20	21-0788
C9	10 n	Ceramic	100	20	21-1738
C10	10 n	Ceramic	100	20	21-1738
C11	47 µ	Electrolytic	16	20	21-0788
C12	1 n	Ceramic	100	20	21-1737
C13	47 µ	Electrolytic	16	20	21-0788
Diodes					
D1		Silicon (1N4149)			22-1029
D2		Voltage regulator (BZY88C5V1)			22-1808
D3		Voltage regulator (BZY88C5V1)			22-1808
D4		Voltage regulator (BZY88C5V1)			22-1808
D5		Voltage regulator (BZY88C5V1)			22-1808
Transistors					
Q1		VN10KM			22-6144
Q2		BFX48			22-6110
Q3		2N2369			22-6017
Inductors					
	H				
L1	10 µ	Inductor, miniature			23-7155

PARTS LIST

KEYBOARD AND DISPLAY ASSEMBLY 19-1013

Fig 5

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Resistors					
	Ω		W		
R1	1 k	Carbon Film	¼	5	20-2102
R2	13x330	DIL Array			20-5582
R3	13x330	DIL Array			20-5582
Capacitors					
	F		V		
C1	10 n	Ceramic	25	-20 +80	21-1545
C2	47 n	Ceramic	10	-20 +80	21-1548
Integrated Circuits					
IC1		MD4332			22-4760
IC2		MD4332			22-4760
IC3		MD4332			22-4760
IC4		74LS164			22-4595
IC5		74LS164			22-4595
IC6		74LS164			22-4595
Diodes					
LP1		LED, red (5082.4684)			26-5013
LP2		LED, red (5082.4684)			26-5013
LP3		LED, red (5082.4684)			26-5013
LP4		Not Used			
LP5		Not Used			
LP6		LED, red (5082.4684)			26-5013
LP7		Not Used			
LP8		LED, red (5082.4684)			26-5013
LP9		Not Used			
LP10		LED, red (5082.4684)			26-5013

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
LP11		LED, red (5082.4684)			26-5013
LP12		LED, red (5082.4684)			26-5013
LP13		LED, red (5082.4684)			26-5013
LP14		Not Used			
LP15		LED, red (5082.4684)			26-5013
LP16		Not Used			
LP17		LED, red (5082.4684)			26-5013
LP18		LED, red (5082.4684)			26-5013
LP19		LED, red (5082.4684)			26-5013
LP20		LED, red (5082.4684)			26-5013
LP21		LED, red (5082.4684)			26-5013
LP22		LED, red (5082.4684)			26-5013
Miscellaneous					
S1 to S28		Keyboard switch			23-4103
		Pushbutton for S1 to S28			15-0538
PL3		PCB Header, 26-way			22-3395

PARTS LIST

PROCESSOR ASSEMBLY 19-1014

Fig. 7

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Resistors					
	Ω		W		
R1	3.3k	Carbon Film	¼	5	20-2332
R2	10 k	Carbon Film	¼	5	20-2103
R3	56 k	Carbon Film	¼	5	20-2563
R4	1 M	Carbon Film	¼	5	20-2105
R5	8.2 k	Carbon Film	¼	5	20-2822
R6	10 k	Carbon Film	¼	5	20-2103
R7	56 k	Carbon Film	¼	5	20-2563
R8	100 k	Carbon Film	¼	5	20-2104
R9	47 k	Carbon Film	¼	5	20-2473
R10	8.2 k	Carbon Film	¼	5	20-2822
R11	150 k	Carbon Film	¼	5	20-2154
R12	1M	Carbon Film	¼	5	20-2105
R13	22 k	Carbon Film	¼	5	20-2223
R14	2.2 k	Carbon Film	¼	5	20-2222
R15	1 k	Variable			20-7070
R16	5.9 k	Metal Film	¼	¼	20-4875
R17	2.2 k	Carbon Film	¼	5	20-2222
R18	113 k	Metal Film	¼	½	20-7518
R19	1 M	Metal Film	¼	1	20-4995
R20	4x22k	DIL Array			20-5527
R21	3.3 k	Carbon Film	¼	5	20-2332
R22	2.2 k	Carbon Film	¼	5	20-2222
R23	100 k	Carbon Film	¼	5	20-2104
R24	100 k	Carbon Film	¼	5	20-2104
R25	2.2 M	Carbon Film	¼	5	20-2225
R26	1.2 k	Carbon Film	¼	5	20-2122
R27	100	Carbon Film	¼	5	20-2101
R28	3.9 k	Carbon Film	¼	5	20-2392
R29	1.5 k	Carbon Film	¼	5	20-2152
R30	8x3.3 k	DIL Array			20-5525

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
R31	2.2 k	Carbon Film	¼	5	20-2222
R32	4.7 k	Carbon Film	¼	5	20-2472
R33	8x3.3 k	DIL Array			20-5525
R34	8x3.3 k	DIL Array			20-5525
R35	8x3.3 k	DIL Array			20-5525
R36	3.3 M	Carbon Film	¼	5	20-2335
R37	2.2 k	Carbon Film	¼	5	20-2222
R38	10 k	Carbon Film	¼	5	20-2103
R39	820	Carbon Film	¼	5	20-2821
R40	10	Carbon Film	¼	5	20-2100
R41	1 k	Carbon Film	¼	5	20-2102
R42	10 k	Carbon Film	¼	5	20-2103
R43	10 k	Carbon Film	¼	5	20-2103
R44	1 k	Variable, 25-turn			20-7040
R45	3.9 k	Metal Film	¼	1	20-7515
R46	2.2 k	Metal Film	¼	1	20-7514
R47	820	Metal Film	¼	1	20-7513
R48	4.3 k	Metal Film	¼	1	20-4990
R49	1 k	Variable, 25-turn			20-7040
R50	2.2 k	Carbon Film	¼	5	20-2222
R51	9x10 k	DIL Array			20-5521
R52	9x10 k	DIL Array			20-5521
R53	3.3 k	Carbon Film	¼	5	20-2332
R54	3.3 k	Carbon Film	¼	5	20-2332
R55	3.3 k	Carbon Film	¼	5	20-2332

Capacitors

	F		V		
C1	22000 µ	Electrolytic	16		21-0595
C2	3300 µ	Electrolytic	35		21-0663
C3	3300 µ	Electrolytic	35		21-0663
C4	3300 µ	Electrolytic	16		21-0597
C5	47 n	Ceramic	12	-20 +80	21-1548
C6	47 n	Ceramic	12	-20 +80	21-1548
C7	100 n	Ceramic	25	-20 +80	21-1551
C8	100 n	Ceramic	25	-20 +80	21-1551
C9	47 n	Ceramic	25	20	21-0789
C10	47 n	Ceramic	25	20	21-0789
C11	47 n	Ceramic	25	20	21-0789
C12	47 n	Ceramic	25	20	21-0789
C13	47 n	Ceramic	25	20	21-0789
C14	47 n	Ceramic	12	-20 +80	21-1548
C15	47 n	Ceramic	12	-20 +80	21-1548

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
C16	10 n	Ceramic	25	-20 +80	21-1545
C17	22 µ	Electrolytic	10		21-0710
C18	100 n	Ceramic	25	-20 +80	21-1551
C19	47 n	Ceramic	12	-20 +80	21-1548
C20	100 n	Ceramic	25	-20 +80	21-1551
C21	10 n	Ceramic	25	-20 +80	21-1545
C22	100 n	Ceramic	25	-20 +80	21-1551
C23	100 n	Ceramic	25	-20 +80	21-1551
C24	10 n	Ceramic	25	-20 +80	21-1545
C25	10 n	Ceramic	25	-20 +80	21-1545
C26	68 p	Silver Mica	350	2	21-2643
C27	270 p	Ceramic	500	10	21-1525
C28	47 n	Ceramic	12	-20 +80	21-1548
C29	47 n	Ceramic	12	-20 +80	21-1548
C30	330 p	Ceramic	500	10	21-1526
C31	47 n	Ceramic	12	-20 +80	21-1548
C32	47 n	Ceramic	12	-20 +80	21-1548
C33	47 n	Ceramic	12	-20 +80	21-1548
C34	47 n	Ceramic	12	-20 +80	21-1548
C35	47 n	Ceramic	12	-20 +80	21-1548
C36	47 n	Ceramic	12	-20 +80	21-1548
C37	47 n	Ceramic	12	-20 +80	21-1548
C38	100 n	Ceramic	25	-20 +80	21-1551
C39	47 n	Ceramic	12	-20 +80	21-1548
C40	47 n	Ceramic	12	-20 +80	21-1548
C41	47 n	Ceramic	12	-20 +80	21-1548
C42	47 µ	Electrolytic	25	20	21-0789
C43	47 n	Ceramic	12	-20 +80	21-1548
C44	47 n	Ceramic	12	-20 +80	21-1548
C45	47 n	Ceramic	12	-20 +80	21-1548
C46	27 p	Ceramic	500	10	21-1513
C47	27 p	Ceramic	500	10	21-1513
C48	47 n	Ceramic	12	-20 +80	21-1548
C49	100 n	Ceramic	25	-20 +80	21-1551
C50		Not Used			
C51	10 n	Ceramic	25	-20 +80	21-1545
C52	4.7 n	Paper	250		21-0004
C53	4.7 n	Paper	250		21-0004
C54	100 n	Ceramic	25	-20 +80	21-1551

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Diodes					
D1		Bridge Rectifier (VH 248)			22-1662
D2		Silicon (1N4003)			22-1603
D3		Silicon (1N4003)			22-1603
D4		Silicon (1N4003)			22-1603
D5		Silicon (1N4003)			22-1603
D6		Silicon (1N4003)			22-1603
D7		Silicon (1N4003)			22-1603
D8		Silicon (1N4003)			22-1603
D9		Silicon (1N4003)			22-1603
D10		Silicon (1N4003)			22-1603
D11		Silicon (1N4003)			22-1603
D12		Voltage Regulator (BZY88C5V6)			22-1809
D13		Hot Carrier (5082.2811)			22-1033
D14		Voltage Regulator (BZX79C5V6)			22-1809
D15		Voltage Regulator (BZX79C5V6)			22-1809
D16		Voltage Regulator (BZX79C10)			22-1815
D17		Hot Carrier (5082.2800)			22-1068
D18		Not Used			
D19		Silicon (1N4149)			22-1029
D20		Silicon (1N4149)			22-1029
Integrated Circuits					
IC1		Not Used			
IC2		Not Used			
IC3		LM339			22-4249
IC4		LM339			22-4249
IC5		LM339			22-4249
IC6		LM339			22-4249
IC7		LM339			22-4249
IC8		4066			22-4761
IC9		8750J			22-4594
IC10		Not Used			
IC11		6821			22-8303
IC12		6821			22-8303
IC13		74LS14			22-4570
IC14		74LS123			22-4547
IC15		74HC00			22-4775

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
IC16		2732 (programmed)	22-8570	22-8540	22-8515
IC17		2732 (programmed)	22-8569	22-8539	22-8514
IC18		2732 (programmed)	22-8568	22-8538	22-8513
IC19		2732 (programmed)	22-8567	22-8537	22-8512
IC20		6514-9			22-8204

Note: When ordering replacements for IC's 16, 17, 18 and 19 the software issue number and the instrument serial number must be quoted in addition to the part number. The software issue number is marked on the component. Each column of part numbers forms a hardware compatible set. The ROMs fitted must all be from the same set, and be of the same software issue.

IC21		6514-9			22-8204 or 22-8205
IC22		74LS245			22-4584
IC23		74LS244			22-4583
IC24		74LS244			22-4583
IC25		74LS138			22-4587
IC26		74LS139			22-4678
IC27		74LS30			22-4597
IC28		74LS240			22-4588
IC29		74LS240			22-4588
IC30		6802			22-8302
IC31		74LS74			22-4534
IC32		74LS138			22-4587
IC33		7407			22-4063
IC34		74LS138			22-4587
IC35		74LS00			22-4531
IC36		74LS04			22-4533
IC37		74LS09			22-4596
IC38		79MGU1C			22-4261
IC39		78MGU1C			22-4260
IC40		ZN458B			22-4250
IC41		Not Used			
IC42		74HC00			22-4775
IC43		74HC4075			22-4776
IC44		7705			22-4267
IC45		3078E			22-4268

Transistors

Q1		BC109			22-6041
Q2		ZTX450			22-6112

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Inductors					
	H				
L1	100 µ	Choke, RF			23-7056
Connectors					
SK3		Cable Assembly			10-2871
PL15		PCB header, 20-way			23-3319
PL13		PCB header, 34-way			23-3325
Miscellaneous					
FS1		Fuse link, 1.6 A			23-0055
		Holder for FS1			23-0054
		Lithium Battery			23-2513
S30		Switch, DIL			23-4089
S29		Switch, with flexible extension			23-4104
		Knob for S29			23-9098

PARTS LIST

SIGNAL CONVERTER ASSEMBLY 19-1015

Fig. 9

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Resistors					
	Ω		W		
R1	1 k	Carbon Film	¼	5	20-2102
R2	1 k	Carbon Film	¼	5	20-2102
R3	150 k	Carbon Film	¼	5	20-2154
R4		Not Used			
R5		Not Used			
R6	100 k	Carbon Film	¼	5	20-2104
R7		Not Used			
R8	470	Carbon Film	¼	5	20-2471
R9	10 k	Carbon Film	¼	5	20-2103
R10	500	Metal Film	¼	½	20-4879
R11	1 k	Carbon Film	¼	5	20-2102
R12	1.2 k	Metal Film	¼	½	20-4922
R13	1.2 k	Metal Film	¼	½	20-4922
R14	68 k	Carbon Film	¼	5	20-2683
R15	1.2 k	Metal Film	¼	½	20-4922
R16	22 k	Carbon Film	¼	5	20-2223
R17	68 k	Carbon Film	¼	5	20-2683
R18	1.2 k	Metal Film	¼	½	20-4922
R19	22 k	Carbon Film	¼	5	20-2223
R20	22 k	Carbon Film	¼	5	20-2223
R21	22 k	Carbon Film	¼	5	20-2223
R22	47 k	Carbon Film	¼	5	20-2473
R23	470 k	Carbon Film	¼	5	20-2474
R24	50 k	Variable			20-7072
R25	1 k	Metal Film	¼	½	20-4921
R26	1 k	Metal Film	¼	½	20-4921
R27	10 k	Carbon Film	¼	5	20-2103
R28	1 k	Carbon Film	¼	5	20-2102
R29	220 k	Carbon Film	¼	5	20-2224
R30	1 k	Carbon Film	¼	5	20-2102
R31	220 k	Carbon Film	¼	5	20-2224
R32	49.9 k	Metal Film	¼	½	20-4958
R33	49.9 k	Metal Film	¼	½	20-4958
R34	12.4 k	Metal Film	¼	¼	20-4927
R35	12.4 k	Metal Film	¼	¼	20-4927

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
R36	7x100 k	DIL Array			20-5504
R37	7x10 k	DIL Array			20-5517
R38	12 k	Carbon Film	¼	5	20-2123
R39	1 k	Carbon Film	¼	5	20-2102
R40	100 k	Metal Film	¼	½	20-4963
R41	49.9 k	Metal Film	¼	½	20-4958
R42	330 k	Carbon Film	¼	5	20-2334
R43	10 M	Carbon Film	¼	10	20-2106
R44	150 k	Carbon Film	¼	5	20-2154
R45	150 k	Carbon Film	¼	5	20-2154
R46	220 k	Carbon Film	¼	5	20-2224
R47	150 k	Carbon Film	¼	5	20-2154
R48	150 k	Carbon Film	¼	5	20-2154

Capacitors

	F		V		
C1	10 n	Ceramic	25	-20 +80	21-1545
C2	220 µ	Electrolytic	16	-10 +50	21-0627
C3	10 n	Ceramic	25	-20 +80	21-1545
C4	220 µ	Electrolytic	16	-10 +50	21-0627
C5	100 p	Ceramic	500	10	21-1520
C6	1 µ	Electrolytic	40	-20 +80	21-0731
C7	10 n	Ceramic	25	-20 +80	21-1545
C8	10 n	Ceramic	25	-20 +80	21-1545
C9	10 n	Ceramic	25	-20 +80	21-1545
C10	10 n	Ceramic	25	-20 +80	21-1545
C11	47 µ	Electrolytic	25	20	21-0789
C12	2.7 n	Ceramic	500	20	21-1537
C13	150 n	Polyester	63	5	21-4564
C14	2.7 n	Ceramic	500	20	21-1537
C15	10 n	Ceramic	25	-20 +80	21-1545
C16	10 n	Ceramic	25	-20 +80	21-1545
C17	10 n	Ceramic	25	-20 +80	21-1545
C18	1 µ	Polycarbonate	100	20	21-5507
C19	10 n	Ceramic	25	-20 +80	21-1545
C20	100 n	Polycarbonate	100	20	21-5501
C21	10 n	Ceramic	25	-20 +80	21-1545
C22	10 p	Ceramic	500	10	21-1508
C23	1 µ	Polyester	100	20	21-4512
C24	220 n	Polycarbonate	100	20	21-5503
C25	100 n	Polyester	63	10	21-4565

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Diodes					
D1		Silicon (1N4149)			22-1029
D2		Not Used			
D3		Voltage Regulator (BZY88C4V7)			22-1807
D4		Hot Carrier (5082.2811)			22-1033
D5		Hot Carrier (5082.2811)			22-1033
D6		Silicon (1N4149)			22-1029
D7		Silicon (1N4149)			22-1029
D8		Silicon (1N4149)			22-1029
D9		Silicon (1N4149)			22-1029
D10		Silicon (1N4149)			22-1029
D11		Silicon (1N4149)			22-1029
D12		Silicon (1N4149)			22-1029
Integrated Circuits					
IC1		TL084			22-4243
IC2		4017			22-4706
IC3		TL081			22-4229
IC4		TL084			22-4243
IC5		CA3046 (specially selected)			22-4246
IC6		CA3046 (specially selected)			22-4246
IC7		CA3046 (specially selected)			22-4246
Transistors					
Q1		J305			22-6141
Q2		Not Used			
Q3		J305			22-6141
Q4		J305			22-6141
Q5		J305			22-6141
Q6		J176			22-6140
Q7		2N4416			22-6092
Q8		2N4416			22-6092
Q9		J305			22-6141
Q10		2N4416			22-6092
Connectors					
PL11		PCB header, 20-way			23-3317

PARTS LIST

AMPLIFIER ASSEMBLY 19-1016

Fig. 11

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Resistors					
	Ω		W		
R1	1 k	Carbon Film	¼	5	20-2102
R2	4.7 k	Carbon Film	¼	5	20-2472
R3	10	Carbon Film	¼	5	20-2100
R4	200	Variable			20-7097
R5	1.8 k	Metal Film	0.125	1	20-4989
R6	68	Metal Film	0.125	1	20-4984
R7	680	Metal Film	0.125	1	20-4986
R8	680	Carbon Film	¼	5	20-2681
R9	100	Carbon Film	¼	5	20-2101
R10	6.8 k	Carbon Film	¼	5	20-2682
R11	100	Carbon Film	¼	5	20-2101
R12	10	Carbon Film	¼	5	20-2100
R13	2.2 k	Carbon Film	¼	5	20-2222
R14	1 k	Carbon Film	¼	5	20-2102
R15	270	Carbon Film	¼	5	20-2271
R16	200	Variable			20-7097
R17	1.8 k	Metal Film	0.125	1	20-4989
R18	68	Metal Film	0.125	1	20-4984
R19	680	Metal Film	0.125	1	40-4986
R20	680	Carbon Film	¼	5	20-2681
R21	6.8 k	Carbon Film	¼	5	20-2682
R22	1 k	Carbon Film	¼	5	20-2102
R23	2.2 k	Carbon Film	¼	5	20-2222
R24	270	Carbon Film	¼	5	20-2271
R25	10	Carbon Film	¼	5	20-2100
R26	200	Variable			20-7097
R27	1.8 k	Metal Film	0.125	1	20-4989
R28	220	Metal Film	0.125	1	20-4985
R29	5.6 k	Metal Film	0.125	1	20-4991
R30	100	Carbon Film	¼	5	20-2101

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
R31	680	Carbon Film	¼	5	20-2681
R32	6.8 k	Carbon Film	¼	5	20-2682
R33	3.3 k	Carbon Film	¼	5	20-2332
R34	2.2 k	Carbon Film	¼	5	20-2222
R35	270	Carbon Film	¼	5	20-2271
R36	200	Variable			20-7097
R37	1.3 k	Metal Film	0.125	1	20-4988
R38	680	Metal Film	0.125	1	20-4986
R39	13 k	Metal Film	0.125	1	20-4992
R40	680	Carbon Film	¼	5	20-2681
R41	6.8 k	Carbon Film	¼	5	20-2682
R42	3.3 k	Carbon Film	¼	5	20-2332
R43	270	Carbon Film	¼	5	20-2271
R44	2.2 k	Carbon Film	¼	5	20-2222
R45	10	Carbon Film	¼	5	20-2100
R46	2.2 k	Carbon Film	¼	5	20-2222
R47	470	Carbon Film	¼	5	20-2471
R48	2.2 k	Carbon Film	¼	5	20-2222
R49	2.2 k	Carbon Film	¼	5	20-2222
R50	470	Carbon Film	¼	5	20-2471
R51	1.5 M	Carbon Film	¼	5	20-2155
R52	1 k	Carbon Film	¼	5	20-2102
R53	4x22 k	DIL Array			20-5527
R54	4x22 k	DIL Array			20-5527
R55	22 k	Carbon Film	¼	5	20-2223
R56	22 k	Carbon Film	¼	5	20-2223
R57	22 k	Carbon Film	¼	5	20-2223
R58	6.8 k	Carbon Film	¼	5	20-2682
R59	22 k	Carbon Film	¼	5	20-2223
R60	22 k	Carbon Film	¼	5	20-2223
R61	22 k	Carbon Film	¼	5	20-2223
R62	22 k	Carbon Film	¼	5	20-2223
R63	1 k	Carbon Film	¼	5	20-2102
R64	22 k	Carbon Film	¼	5	20-2223
R65	100 k	Carbon Film	¼	5	20-2104
R66	390	Carbon Film	¼	5	20-2391
R67	390	Carbon Film	¼	5	20-2391
R68	50 k	Variable			20-7072
R69	100 k	Carbon Film	¼	5	20-2104
R70	1.5 M	Carbon Film	¼	5	20-2155

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
R71	270	Carbon Film	¼	5	20-2271
R72	1 k	Carbon Film	¼	5	20-2102
R73	1 k	Carbon Film	¼	5	20-2102
R74	18 k	Carbon Film	¼	5	20-2183
R75	2.2 k	Carbon Film	¼	5	20-2222
R76	1 k	Metal Film	0.125	1	20-4987
R77	1 k	Metal Film	0.125	1	20-4987
R78	4.7 k	Carbon Film	¼	5	20-2472
R79	4.7 k	Carbon Film	¼	5	20-2472
R80	100 k	Metal Film	¼	½	20-4963
R81	100 k	Metal Film	¼	½	20-4963
R82	16 k	Metal Fim	¼	1	20-4889
R83	1 k	Variable			20-7040
R84	4.3 k	Metal Film	0.125	1	20-4990
R85	20.3 k	Metal Film	¼	¼	20-4934
R86	1 k	Variable			20-7040
R87	4.3 k	Metal Film	0.125	1	20-4990
R88	3.3 k	Carbon Film	¼	5	20-2332
R89	100 k	Metal Film	¼	½	20-4963
R90	100 k	Metal Film	¼	½	20-4963
R91	49.9	Metal Film	0.125	1	20-4997
R92	4.7 k	Carbon Film	¼	5	20-2472
R93	4.7 k	Carbon Film	¼	5	20-2472
R94	3.3 k	Carbon Film	¼	5	20-2332
R95	1.5 k	Carbon Film	¼	5	20-2152
R96	100	Carbon Film	¼	5	20-2101
R97	100	Carbon Film	¼	5	20-2101
R98	12 k	Carbon Film	¼	5	20-2123
R99	20 k	Variable			20-7090
R100	3.3 k	Carbon Film	¼	5	20-2332
R101	33 k	Carbon Film	¼	5	20-2333
R102	100 k	Carbon Film	¼	5	20-2104
R103	1 k	Carbon Film	¼	5	20-2102
R104	47	Carbon Film	¼	5	20-2470
R105	47	Carbon Film	¼	5	20-2470
R106	390	Carbon Film	¼	5	20-2391
R107	390	Carbon Film	¼	5	20-2391
R108	100	Carbon Film	¼	5	20-2101
R109	100	Carbon Film	¼	5	20-2101
R110	100	Carbon Film	¼	5	20-2101

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
R111	5.6 k	Carbon Film	¼	5	20-2562
R112	2.2 k	Carbon Film	¼	5	20-2222
R113	10	Carbon Film	¼	5	20-2100
R114	3.3 k	Carbon Film	¼	5	20-2332
R115	3.3 k	Carbon Film	¼	5	20-2332
R116	4.7 k	Carbon Film	¼	5	20-2472
R117	680	Metal Film	0.125	1	20-4986
R118	200	Variable			20-7097
R119	1.3 k	Metal Film	0.125	1	20-4988
R120	13 k	Metal Film	0.125	1	20-4992
R121	22 k	Carbon Film	¼	5	20-2223
R122	10 k	Carbon Film	¼	5	20-2103
R123	10 k	Carbon Film	¼	5	20-2103
R124	1 k	Carbon Film	¼	5	20-2102
R125	22 k	Carbon Film	¼	5	20-2223
R126	5.6 k	Carbon Film	¼	5	20-2562

Capacitors

	F		V		
C1	22 µ	Tantalum	16	20	21-1039
C2	220 p	Silver Mica	350	1	21-2835
C3	2.2 n	Silver Mica	350	1	21-2932
C4	10 µ	Tantalum	25	20	21-1002
C5	47 µ	Electrolytic	25	20	21-0789
C6	10 n	Ceramic	25	-20+80	21-1545
C7	39 p	Ceramic	500	10	21-1515
C8	10 µ	Tantalum	25	20	21-1002
C9	47 µ	Electrolytic	25	20	21-0789
C10	10 n	Ceramic	25	-20+80	21-1545
C11	39 p	Ceramic	500	10	21-1515
C12	10 µ	Tantalum	25	20	21-1002
C13	47 µ	Electrolytic	25	20	21-0789
C14	10 n	Ceramic	25	-20+80	21-1545
C15	47 µ	Electrolytic	25	20	21-0789
C16	10 n	Ceramic	25	-20+80	21-1545
C17	39 p	Ceramic	500	10	21-1515
C18	10 µ	Tantalum	25	20	21-1002
C19	220 p	Silver Mica	350	1	21-2835
C20	100 p	Ceramic	500	10	21-1520

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
C21	220 p	Silver Mica	350	1	21-2835
C22	100 p	Ceramic	500	10	21-1520
C23	47 n	Ceramic	12	-20+80	21-1548
C24	47 n	Ceramic	12	-20+80	21-1548
C25	47 n	Ceramic	12	-20+80	21-1548
C26	47 n	Ceramic	12	-20+80	21-1548
C27	10 n	Ceramic	25	-20+80	21-1545
C28	100 n	Polyester	63	10	21-4565
C29	100 n	Polyester	63	10	21-4565
C30	100 n	Polyester	63	10	21-4565
C31	47 µ	Electrolytic	25	20	21-0789
C32	47 n	Ceramic	12	-20+80	21-1548
C33	1.5 n	Silver Mica	350	1	21-2917
C34	100 n	Polyester	63	10	21-4565
C35	47 n	Ceramic	12	-20+80	21-1548
C36	47 µ	Electolytic	25	20	21-0789
C37	100 n	Polyester	63	10	21-4565
C38	47 n	Ceramic	12	-20+80	21-1548
C39	47 n	Ceramic	12	-20+80	21-1548
C40	10 n	Ceramic	25	-20+80	21-1545
C41	47 p	Ceramic	500	10	21-1516
C42	220 p	Silver Mica	350	1	21-2835
C43	22 µ	Tantalum	16	20	21-1039
C44	10 n	Ceramic	25	-20+80	21-1545
C45	47 n	Ceramic	12	-20+80	21-1548
C46	1 n	Silver Mica	200	2	21-3061
C47	47 µ	Electrolytic	25	20	21-0789
C48	47 µ	Electrolytic	25	20	21-0789
C49	100 µ	Electrolytic	25	20	21-0790
C50	47 µ	Electrolytic	25	20	21-0789
C51	47 n	Ceramic	12	-20+80	21-1548
C52	47 n	Ceramic	12	-20+80	21-1548
C53	47 n	Ceramic	12	-20+80	21-1548
C54	10 n	Ceramic	25	-20+80	21-1545
C55	47 µ	Electrolytic	25	20	21-0789
C56	47 n	Ceramic	12	-20+80	21-1548
C57	47 n	Ceramic	12	-20+80	21-1548
C58	47 n	Ceramic	12	-20+80	21-1548
C59	220 n	Polyester	63	10	21-4566
C60	1820 p	Silver Mica	250	1	21-2925

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
C61		Not Used			
C62	47 µ	Electrolytic	25	20	21-0789
C63	82 p	Ceramic	500	10	21-1519
C64	100 n	Polyester	63	10	21-4565
C65	47 µ	Electrolytic	25	20	21-0789
C66	47 µ	Electrolytic	25	20	21-0789
C67	100 n	Ceramic	12	-20+80	21-1616
C68	47 µ	Electrolytic	25	20	21-0789
C69	100 n	Ceramic	50	20	21-1708
C70	100 n	Ceramic	12	-20+80	21-1616

Diodes

D1	Voltage Regulator (BZX79C4V7)	22-1807
D2	Silicon (1N4149)	22-1029
D3	Not Used	
D4	Silicon (1N4149)	22-1029
D5	Voltage Regulator (BZX79C5V6)	22-1809
D6	Voltage Regulator (BZX79C7V5)	22-1812
D7	Voltage Regulator (BZX79C7V5)	22-1812
D8	Hot Carrier (5082.2811)	22-1033
D9	Hot Carrier (5082.2811)	22-1033
D10	Hot Carrier (5082.2811)	22-1033
D11	Hot Carrier (5082.2811)	22-1033
D12	Hot Carrier (5082.2811)	22-1033
D13	Hot Carrier (5082.2811)	22-1033

Integrated Circuits

IC1	TL084	22-4243
IC2	4016	22-4780
IC3	4053	22-4763
IC4	4053	22-4763
IC5	4053	22-4763
IC6	4053	22-4763
IC7	4053	22-4763
IC8	TL082	22-4240
IC9	LM339	22-4249
IC10	LM339	22-4249

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
IC11		78L05			22-4247
IC12		555			22-4206
IC13		74LS221			22-4581
IC14		7407			22-4063
IC15		74LS629			22-4688
IC16		74LS74			22-4534
IC17		TL082			22-4240
IC18		ZN458B			22-4250
Transistors					
Q1		2N4416			22-6040
Q2		BCY71			22-6038
Q3		BC109			22-6041
Q4		BC109			22-6041
Q5		BCY71			22-6038
Q6		BC109			22-6041
Q7		BC109			22-6041
Q8		BCY71			22-6038
Q9		BC109			22-6041
Q10		BC109			22-6041
Q11		BCY71			22-6038
Q12		BC109			22-6041
Q13		BC109			22-6041
Q14		BCY71			22-6038
Q15		2N2369			22-6017
Q16		Not Used			
Q17		BCY71			22-6038
Q18		BCY71			22-6038
Q19		BC109			22-6041
Q20		BCY71			22-6038
Q21		BC109			22-6041
Q22		BCY71			22-6038
Q23		BCY71			22-6038
Q24		BCY71			22-6038
Q25		BCY71			22-6038

Cct. Ref.	Value	Description	Rat	Tol %	Racal Part Number
Connectors					
PL4		Cableform Assembly			10-2701
SK11					
PL5		PCB header, 7-way			17-1023
PL6		PCB header, 7-way			17-1005
SK7		Receptacle, coaxial			23-3126
SK8		Receptacle, coaxial			23-3126
SK9		Receptacle, coaxial			23-3126
SK10		Receptacle, coaxial			23-3126

PARTS LIST

GPIB ASSEMBLY 19-1017

Fig. 13

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
Resistors					
	Ω		W		
R1	3.3 k	Carbon Film	¼	5	20-2332
R2	3.3 k	Carbon Film	¼	5	20-2332
R3	3.3 k	Carbon Film	¼	5	20-2332
R4	3.3 k	Carbon Film	¼	5	20-2332
R5	3.3 k	Carbon Film	¼	5	20-2332
R6	3.3 k	Carbon Film	¼	5	20-2332
R7	3.3 k	Carbon Film	¼	5	20-2332
R8	3.3 k	Carbon Film	¼	5	20-2332
R9	3.3 k	Carbon Film	¼	5	20-2332
R10	8x3.3 k	DIL Array			20-5525
R11	56	Carbon Film	¼	5	20-2560
Capacitors					
	F		V		
C1	10 n	Ceramic	25	-20+80	21-1545
C2	47 µ	Electrolytic	25	20	21-0789
C3	47 µ	Electrolytic	25	20	21-0789
C4	100 n	Ceramic	12	-20+80	21-1616
C5	100 n	Ceramic	12	-20+80	21-1616
C6	100 n	Ceramic	12	-20+80	21-1616
C7	100 n	Ceramic	12	-20+80	21-1616
C8	100 n	Ceramic	12	-20+80	21-1616
C9	100 n	Ceramic	12	-20+80	21-1616
C10	10 n	Ceramic	25	-20+80	21-1545
Integrated Circuits					
IC1		74LS30			22-4597
IC2		68488			22-8305
IC3		3447			22-8304
IC4		74LS86			22-4566
IC5		74LS30			22-4597

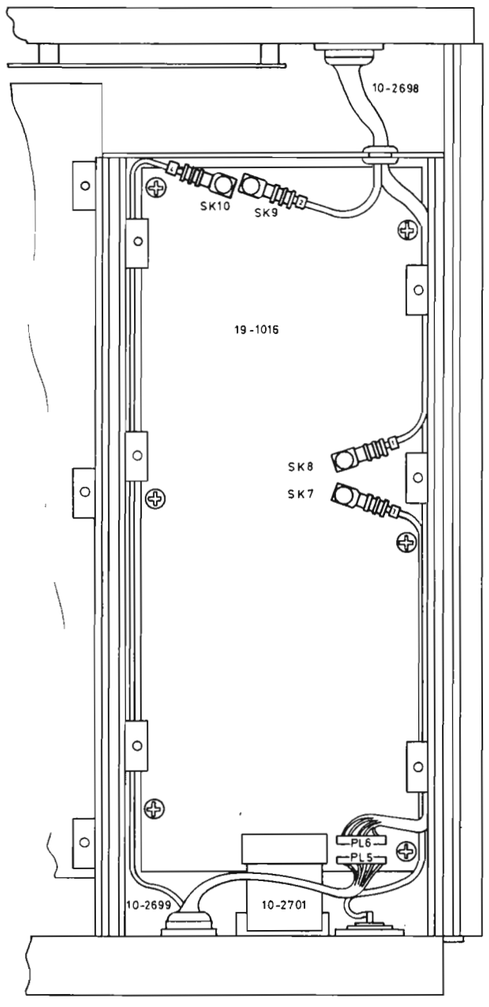
Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
IC6		4066			22-4761
IC7		74LS74			22-4534
IC8		74LS02			22-4532
IC9		74LS125			22-4657
IC10		74LS74			22-4534
IC11		74LS10			22-4557
IC12		74LS240			22-4588
IC13		3447			22-8304
IC14		74LS04			22-4533
IC15		74LS138			22-4587
IC16		Not Used			
IC17		7805			22-4222
IC18		74LS10			22-4557
IC19		74LS245			22-4584
Connectors					
PL21		PCB header, 34-way			23-3325
PL22		PCB header, 34-way			23-3325

PARTS LIST

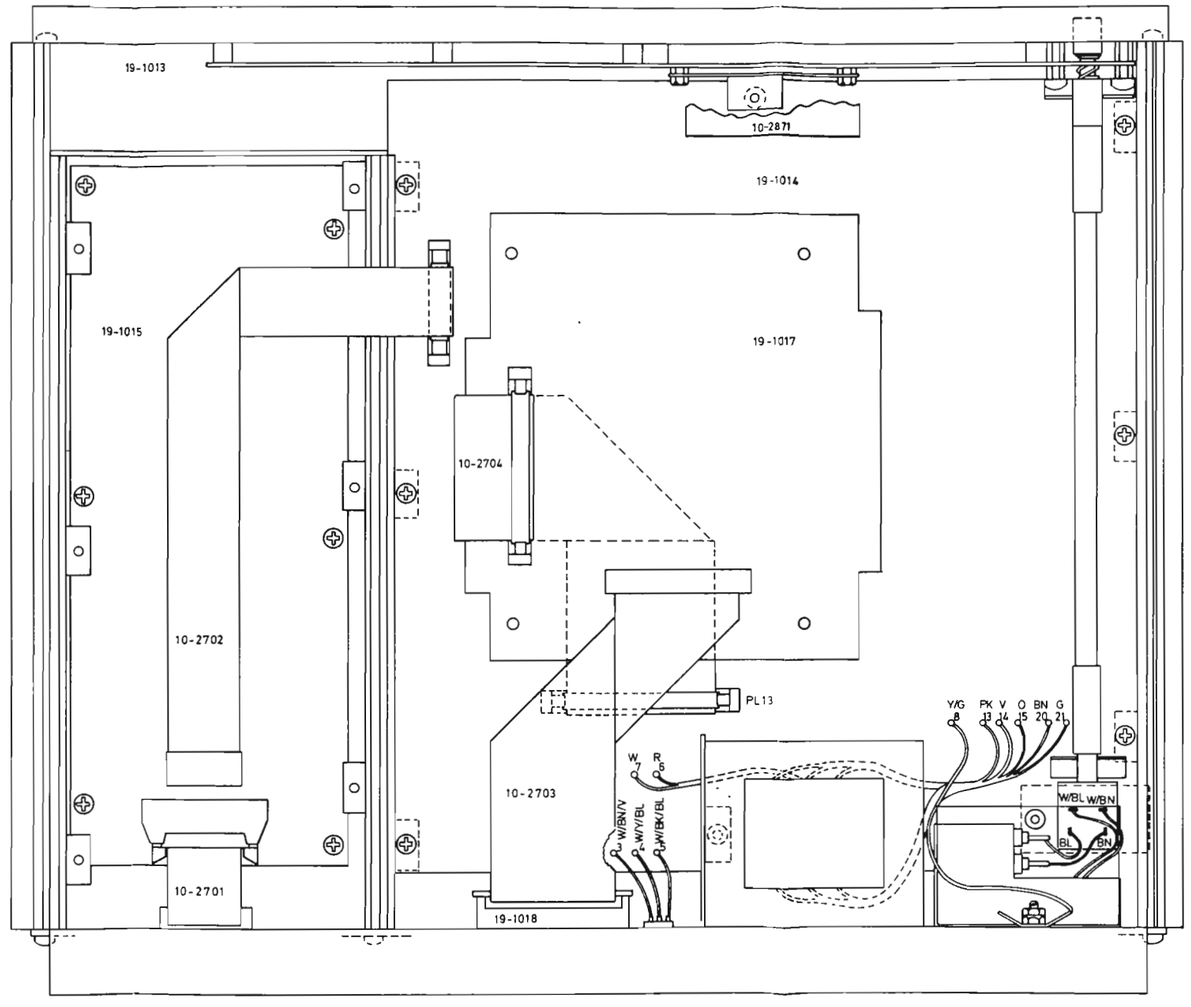
GPIB CONNECTOR ASSEMBLY 19-1018

Fig. 15

Cct. Ref.	Value	Description	Rat	Tol %	Racal Dana Part Number
		Cableform Assembly			10-2703
		Socket, DIL, 16-way			23-3140
SK19		Receptacle, IEEE-488			23-3314
S30		Switch, DIL			23-4102



VIEW OF UNDERSIDE OF MODULE ASSEMBLY



RACAL
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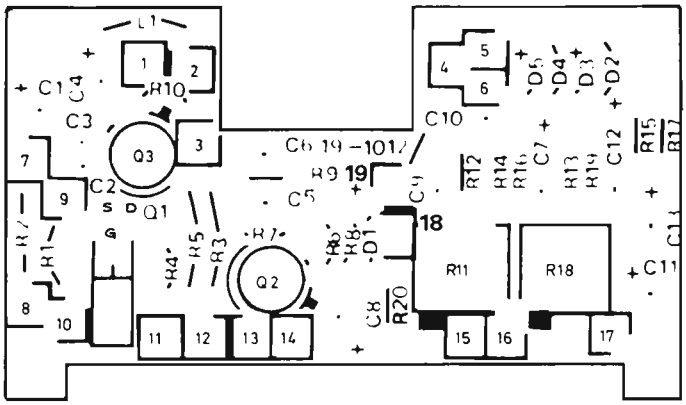
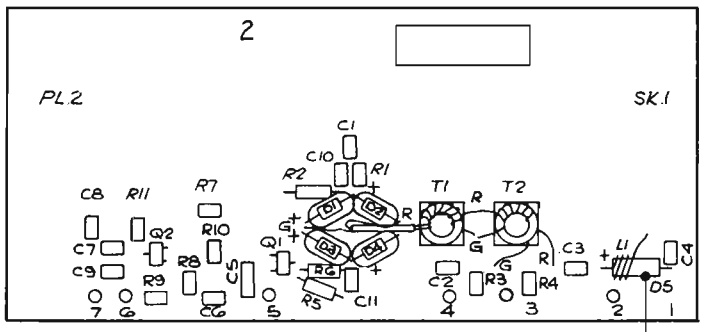
Internal Layout

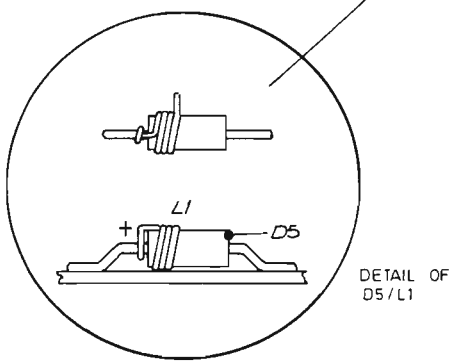
Fig.1



ASSEMBLY 19-1012



TRACKSIDE VIEW



DETAIL OF D5/L1

ASSEMBLY 19-1011

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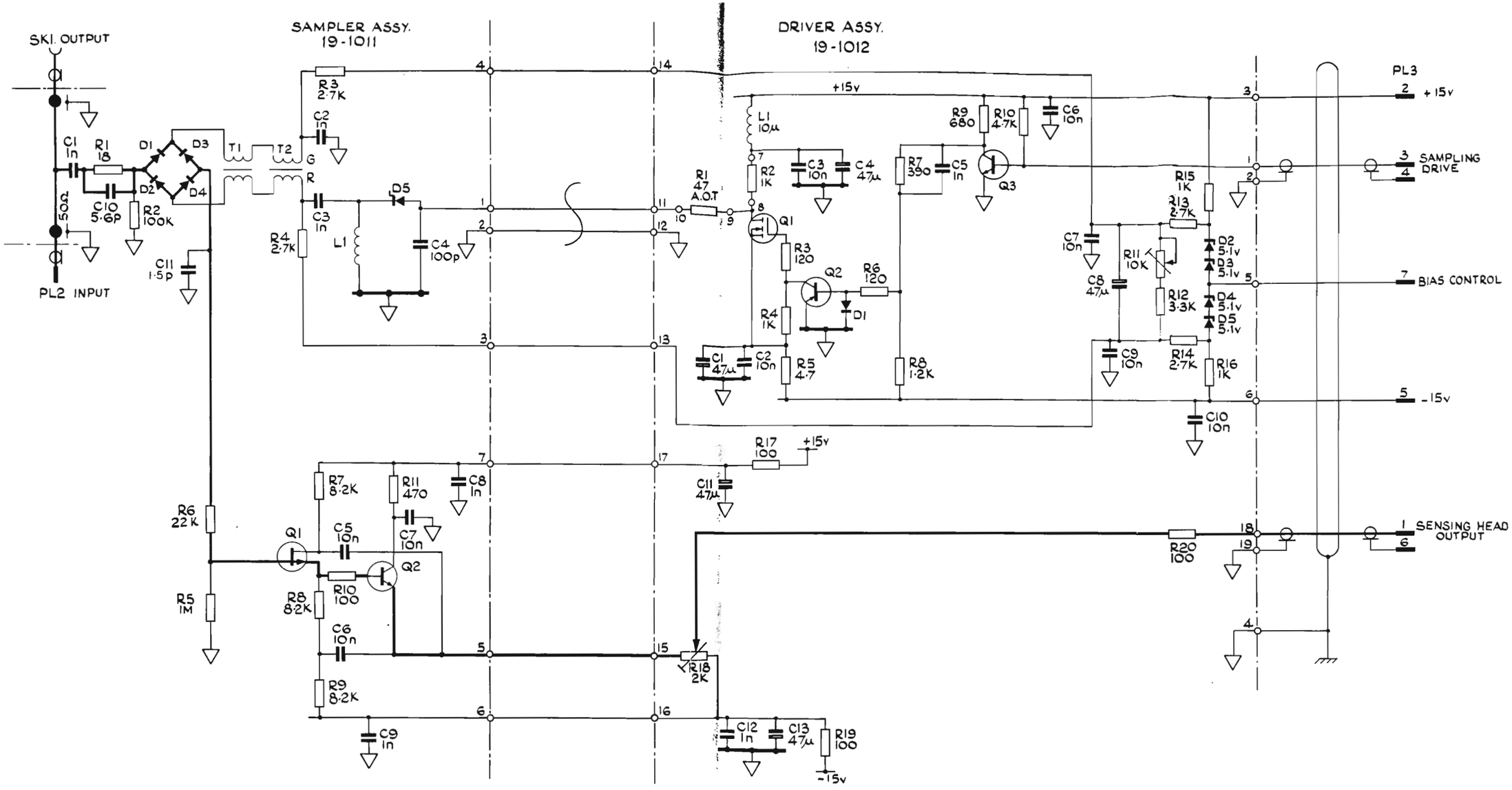
2

Component Layout: Assemblies 19-1011 and 19-1012

Fig.2

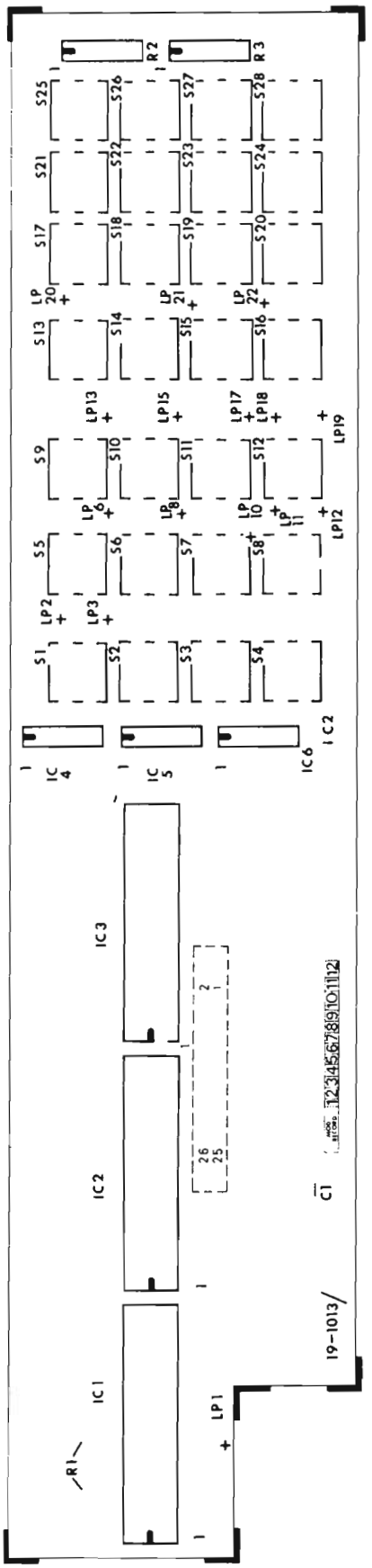


RACAL

TH3174
2|3

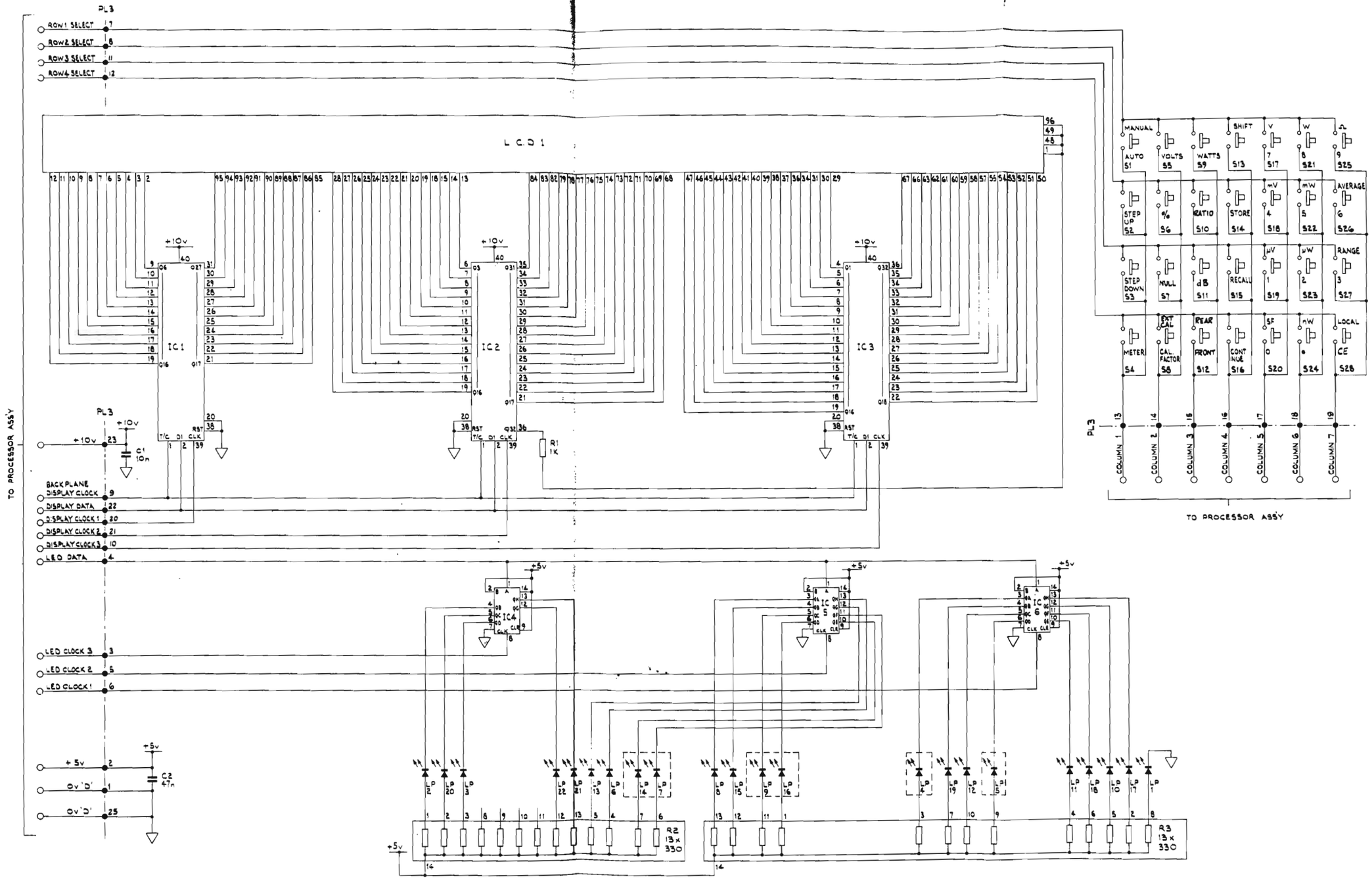
Circuit Diagram: Measuring Head 11-1478 or 11-1540

Fig.3



Component Layout:
Keyboard and Display Assembly 19-1013

Fig. 4



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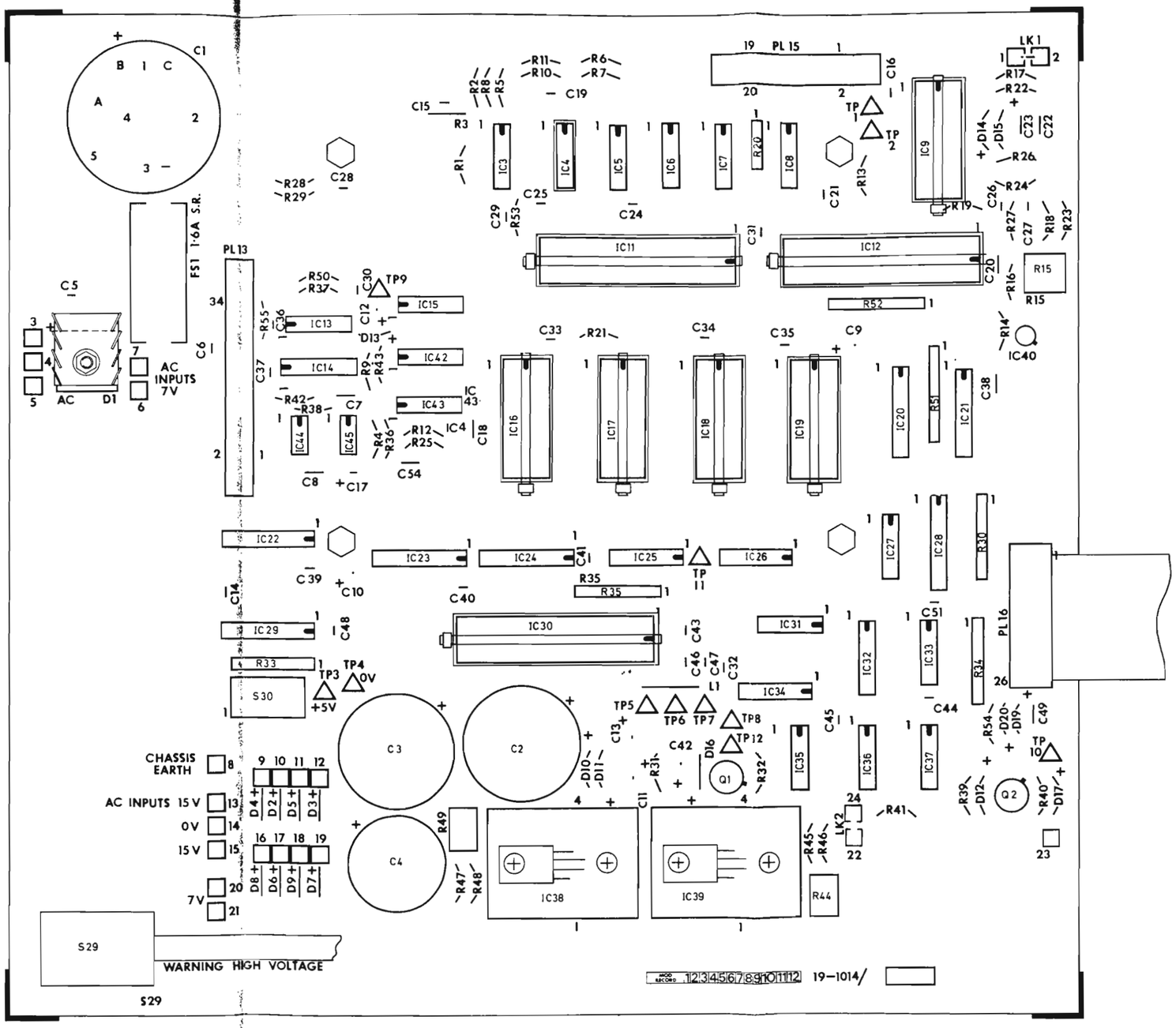
Circuit Diagram: Keyboard and Display Assembly 19-1013

Fig.5



Component Layout:
Processor Assembly 19-1014

Fig.6

REAR PANEL ASSY 11-1488

FUSED LINE VOLTAGE SELECTOR
F52
90-127v-500mA
193-253v-250mA

REAR PANEL

T1

LINE ON/OFF
S29

LK1

PL13

PL15

PL14

TO SIGNAL CONVERTER ASSY

RMS I/P
30 dB SELECT 1
30 dB SELECT 2
20 dB SELECT
10 dB SELECT 1
INT. CAL SELECT
10 dB SELECT 2
REARHEAD SELECT
FRONT HEAD SELECT

SK3 TO KEYBOARD & DISPLAY ASSY

COLUMN 1
COLUMN 2
COLUMN 3
COLUMN 4
COLUMN 5
COLUMN 6
COLUMN 7

ROW 1 SELECT
ROW 2 SELECT
ROW 3 SELECT
ROW 4 SELECT

DISPLAY CLOCK 1
DISPLAY CLOCK 2
DISPLAY CLOCK 3
BACKPLANE DISPLAY CLOCK
DISPLAY DATA
LED DATA
LED CLOCK 1
LED CLOCK 2
LED CLOCK 3

TO KEYBOARD & DISPLAY ASSY

TO GPIB ASSY.

NOTE
1 C50, IC 1, 2, 10 AND PL14 ARE NOT FITTED ON THIS ASSY

SPARE

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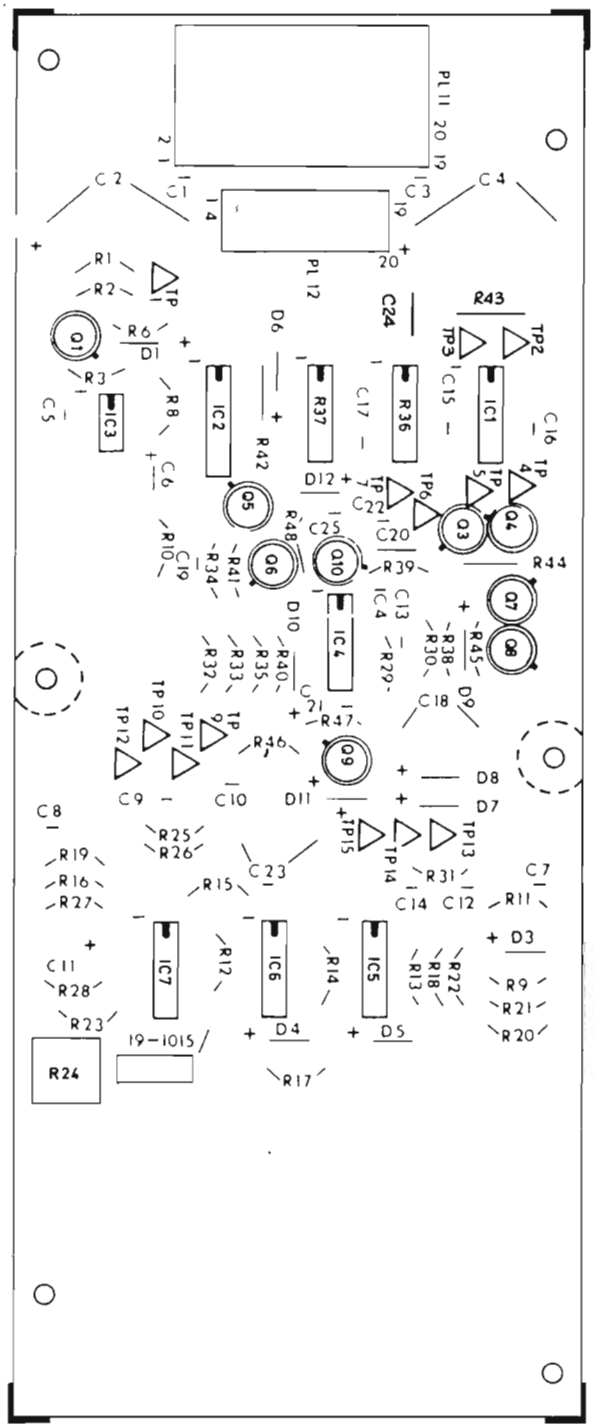
TH 3174
5/5

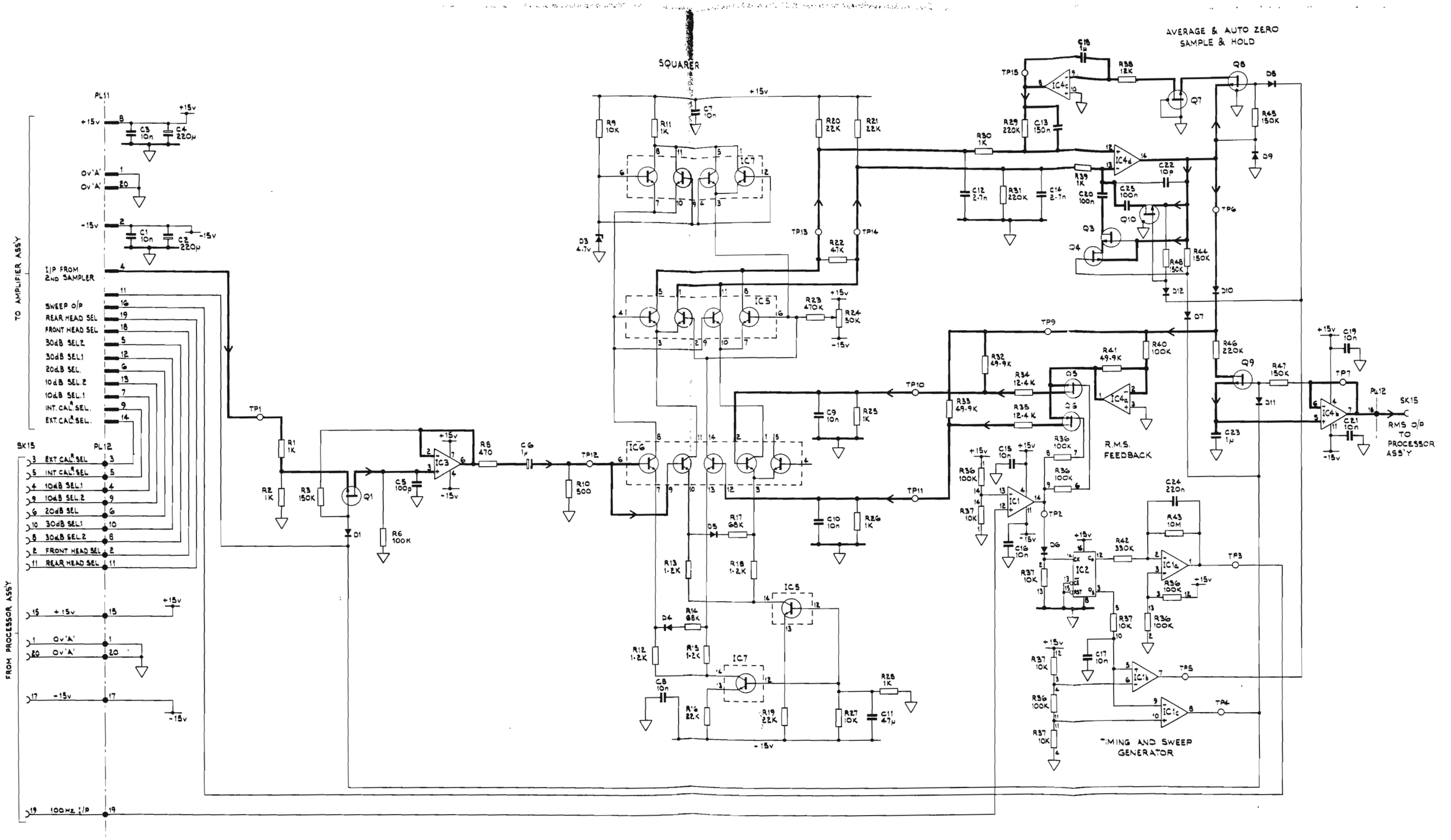
Circuit Diagram:
Processor Assembly 19-1014

Fig.7



Component Layout:
Signal Converter Assembly 19-1015

Fig.8



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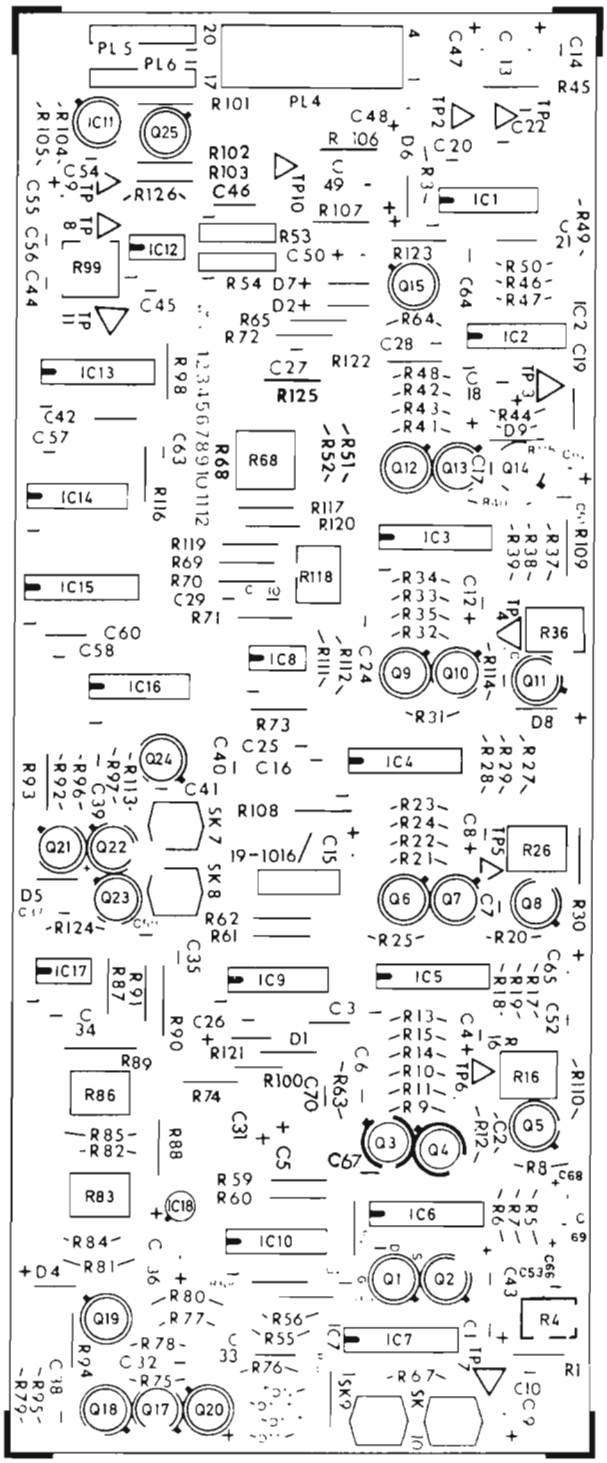
2

Circuit Diagram:
Signal Converter Assembly 19-1015 Fig. 9



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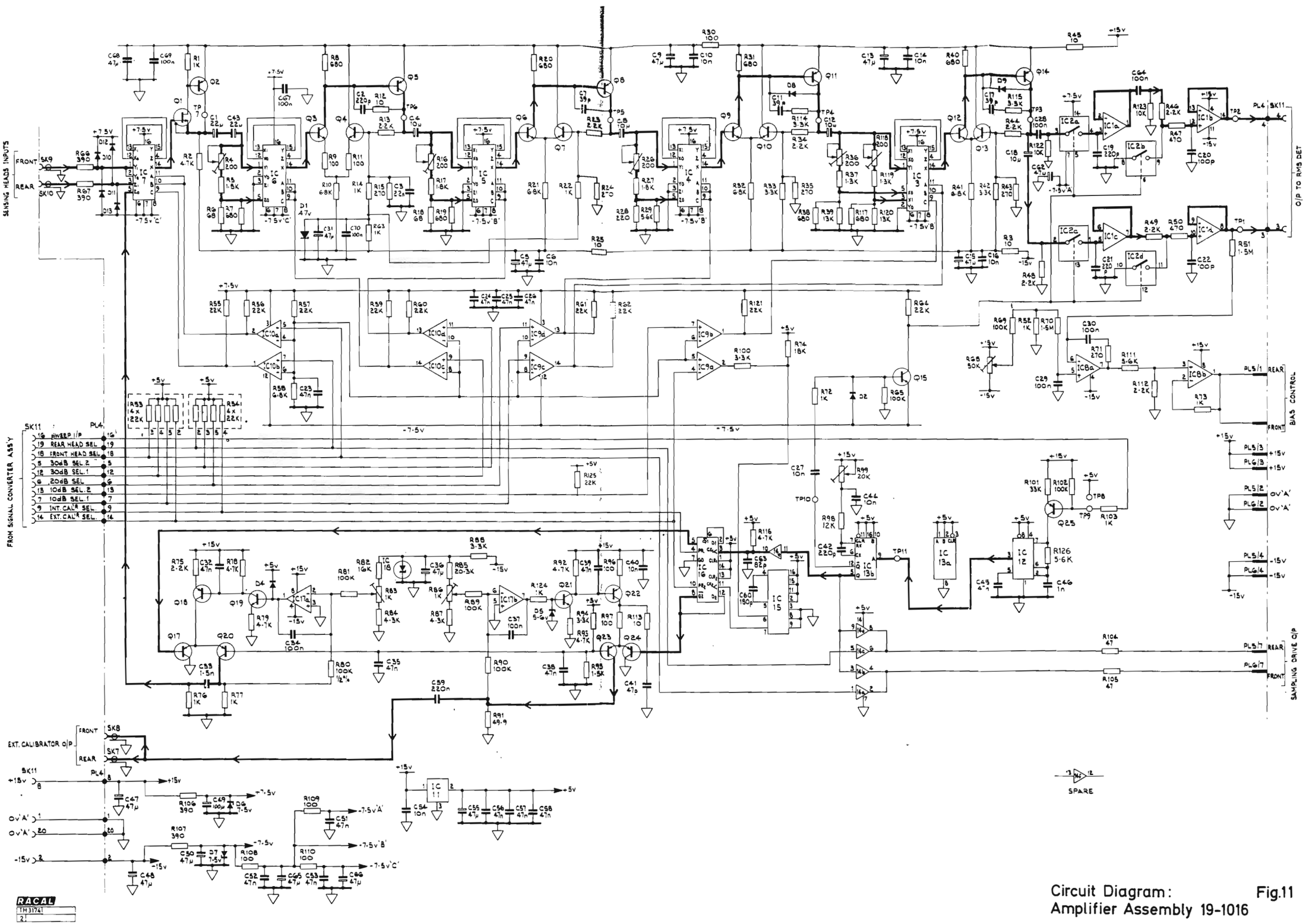
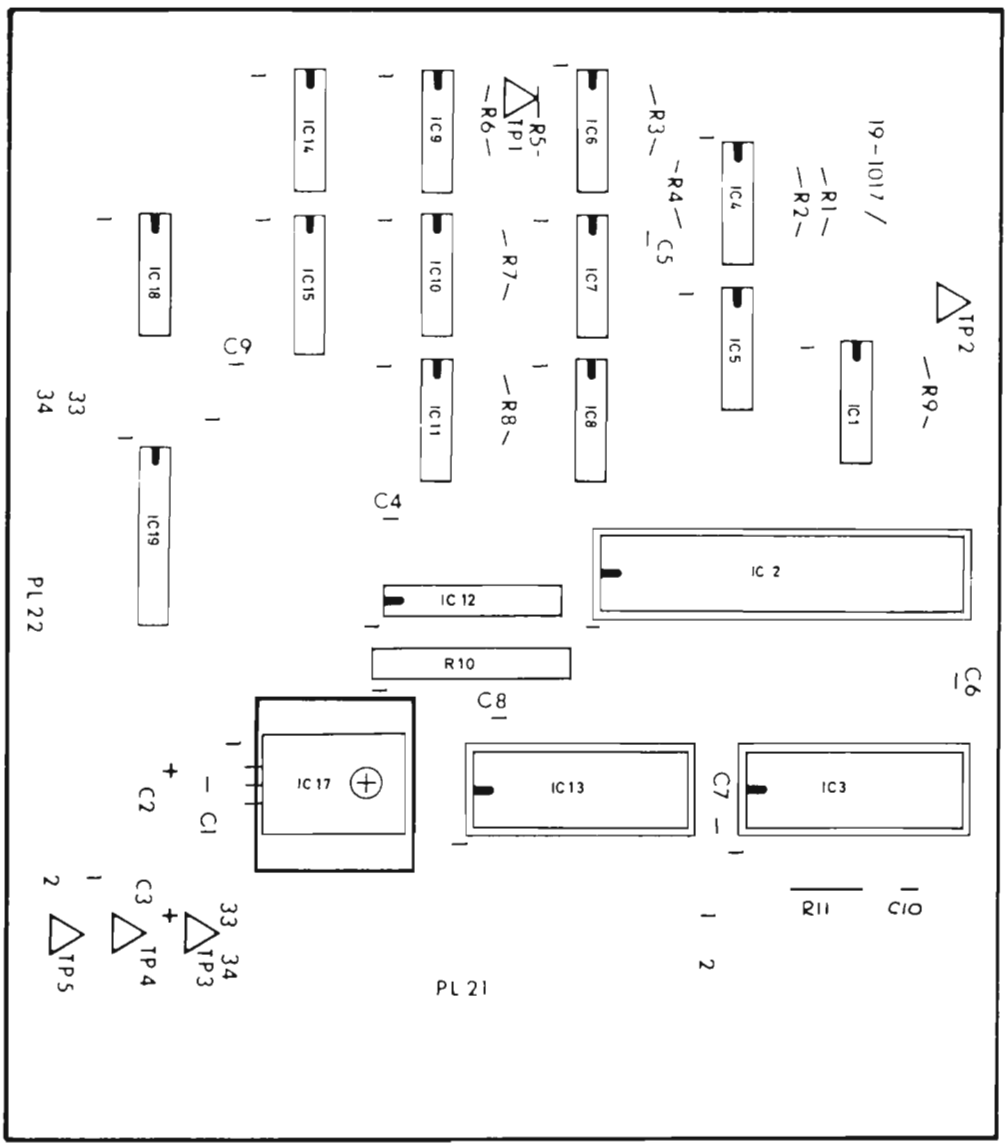
2

Component Layout: Amplifier Assembly 19-1016 Fig.10

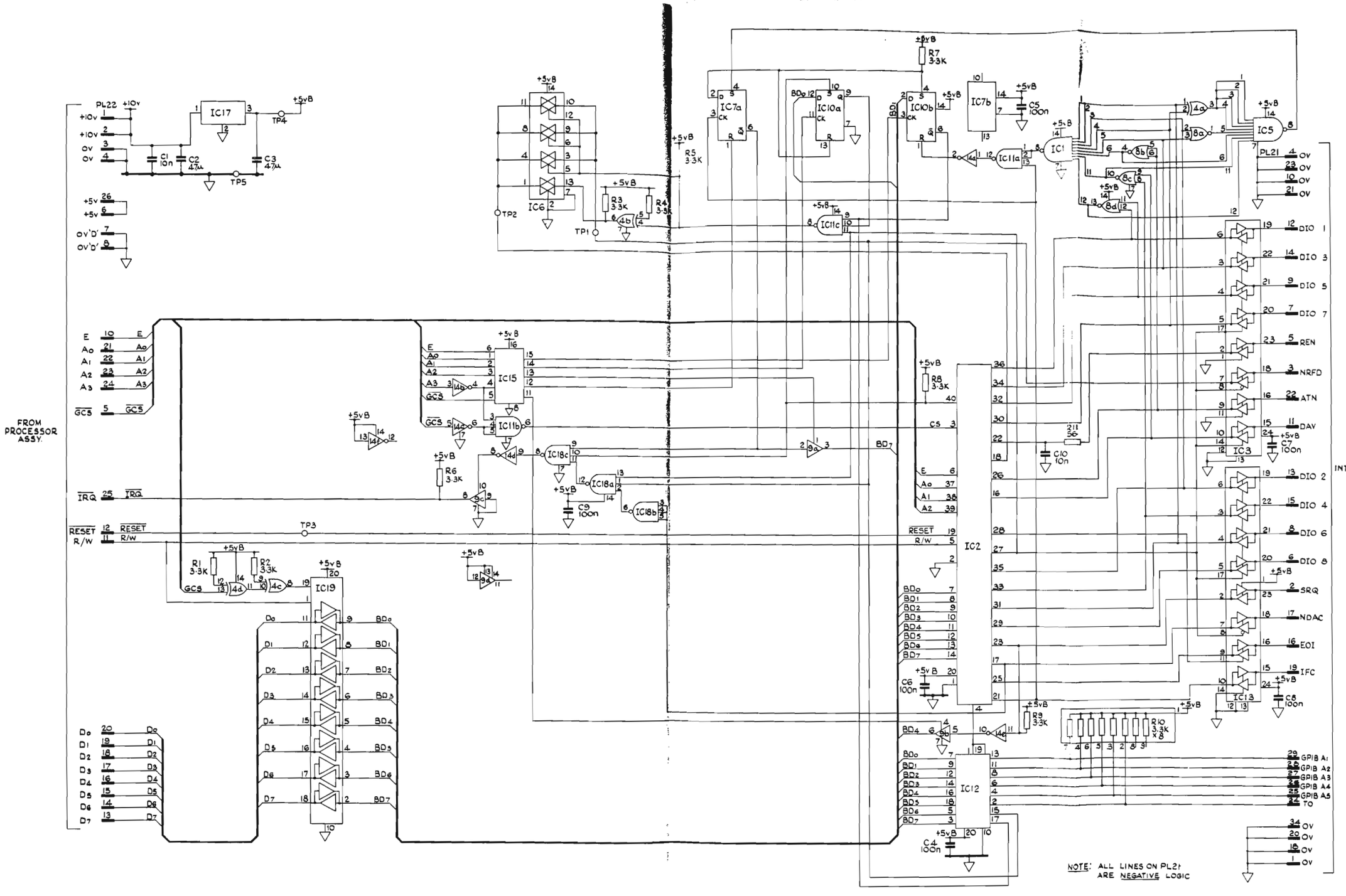


Circuit Diagram: Fig.11
Amplifier Assembly 19-1016



Component Layout:
GPIB Assembly 19-1017

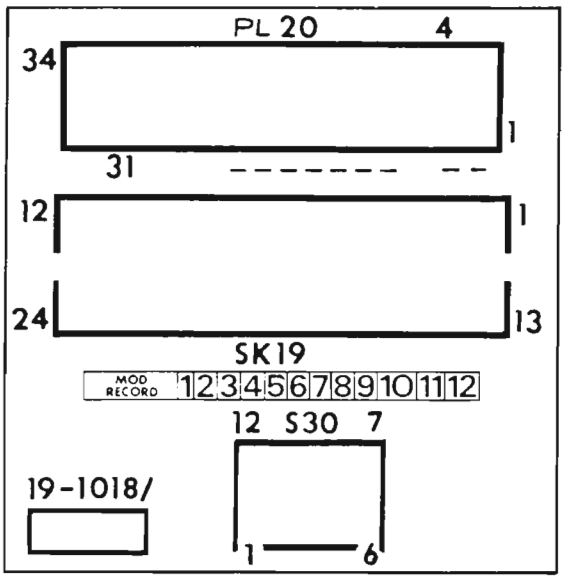
Fig.12



RACAL TH3174 1

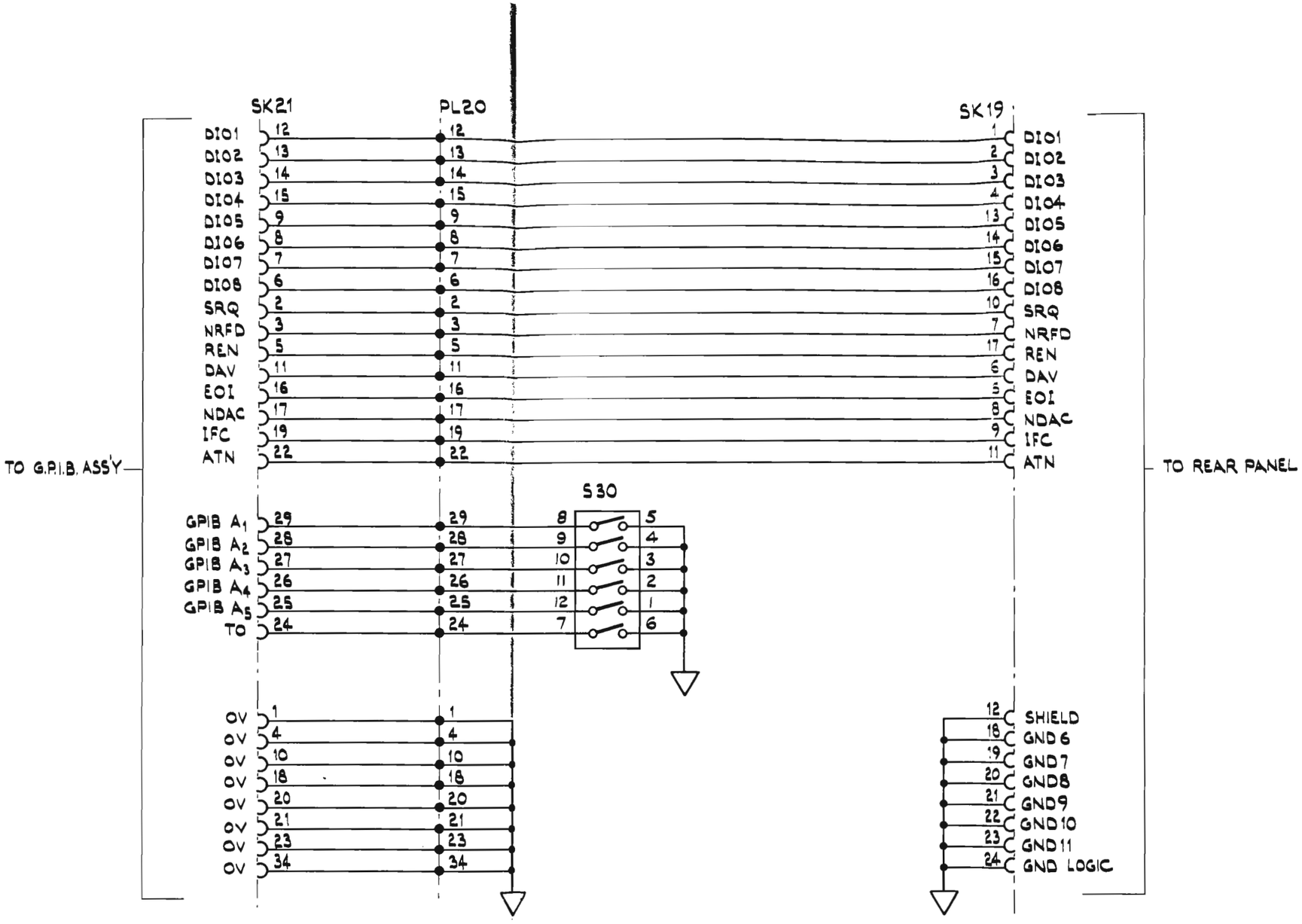
Circuit Diagram:
GPIB Assembly 19-1017

Fig. 13



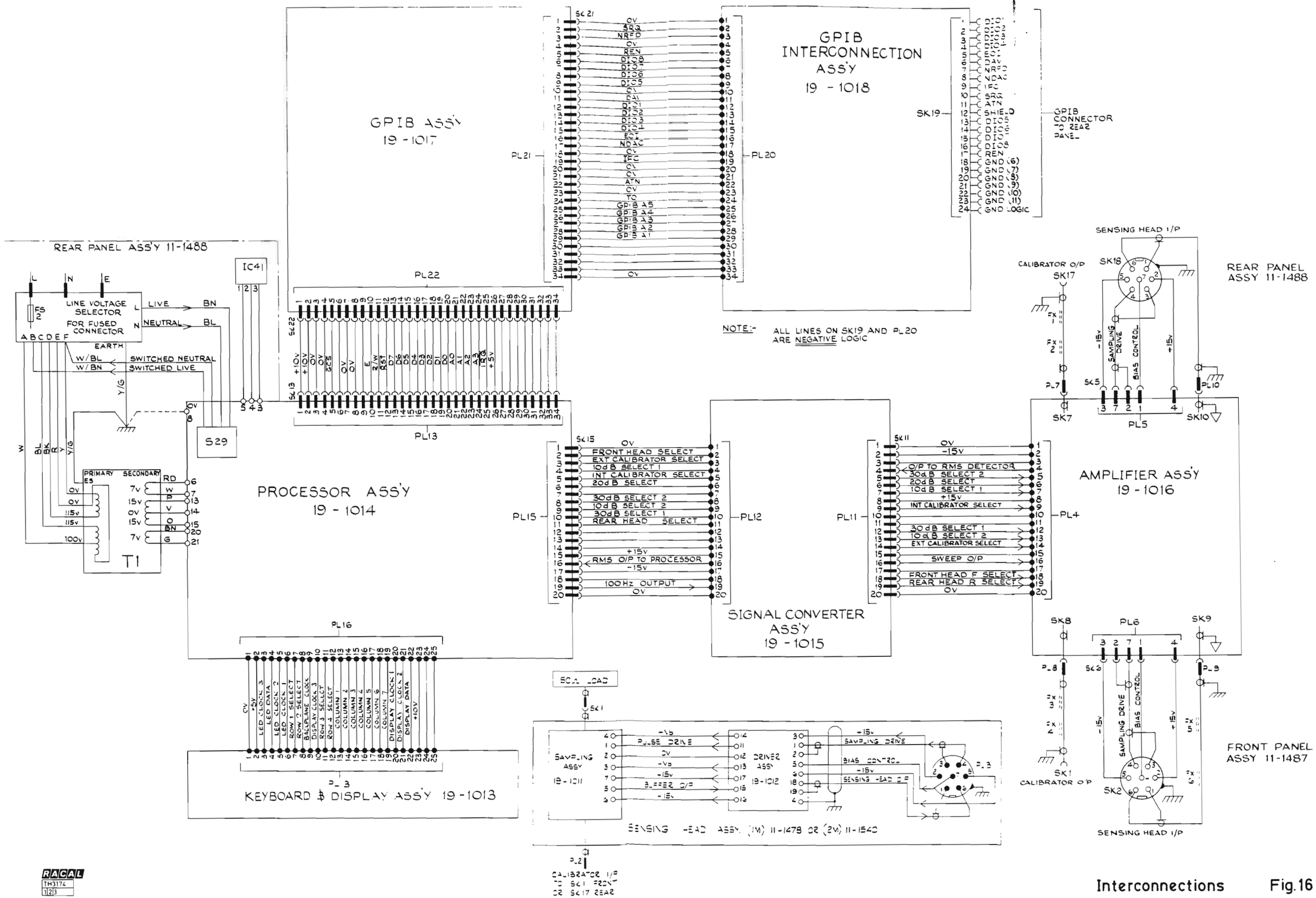
Component Layout :
GPIB Connector Assembly 19-1018

Fig.14



Circuit Diagram: GPIB
Connector Assembly 19-1018

Fig.15



RACAL
TH3174
1|2|3

Interconnections Fig.16

TRUE RMS RF LEVEL METER 9303

The changes listed below have been made to some instruments having serial numbers above 1500.

Changes found to apply to the instrument with which this manual is to be used should be incorporated in the manual by manuscript amendment.

PAGE 1-7

Accessories Provided. Fuse for 100/120V Delete '23-0052'
Insert '23-0022'.

PAGE 3-1

Paragraph 3.2.2.1 Delete '1/4in x 1 1/4in', '23-0052' and '23-0056'
Insert '5mm x 20mm', '23-0022' and '23-0031'.

PAGE 4-6

Paragraph 4.2.3. Line fuse Delete '1/4in x 1 1/4in'
Insert '5mm x 20mm'.

PARTS LIST 1

FS2 Delete '23-0052' Insert '23-0022'
Delete '23-0056' Insert '23-0031'

AC Power Plug Delete '23-3294' Insert '23-3420'.

TRUE RMS RF LEVEL METER 9303

The changes listed below have been made to some instruments having serial numbers above 1350.

Changes found to apply to the instrument with which this manual is to be used should be incorporated in the manual by manuscript amendment.

PARTS LIST 22

R126 Delete '5.6k' and '20-2562'
Insert '100' and '20-2101'

FIG 11

R126 Change value to 100.

TRUE RMS RF LEVEL METER 9303

The changes listed below have been made to some instruments having serial numbers above 1200.

Changes found to apply to the instrument with which this manual is to be used should be incorporated in the manual by manuscript amendment.

FIG.11

PARTS LISTS 23 AND 25

In some units a 74LS629, Racal-Dana part number 22-4688, is fitted in position IC15. When this is the case a 1820p ±1% silver mica capacitor, Racal-Dana part number 21-2925 must be fitted in position C60. AR5155

PARTS LIST 17

Diodes	D2	Delete 'Not Used' Insert 'Voltage Regulator (BZX79C10) 22-1815'	AR5384

FIG.9

1C46 Add D2 as shown