



9008M

Operator Handbook

Courtesy of:-

M0MBX

and

Racal_Dana user group



[Click to join Racal_Dana](#)

Please enjoy responsibly ☺

G0RSQ

12 May 2012

Operators Handbook

9008M

AM/FM Modulation Meter

**OPERATORS HANDBOOK
AM/FM MODULATION METER
9008M**

RACAL-DANA INSTRUMENTS LIMITED

**Duke Street
Windsor, Berks
England**

Tel: Windsor 69811

Telex: 847013

**Prepared by Central Handbooks Department
Racal Group Services Limited**



RACAL
The Electronics Group

**Ref: WOH 7119
Issue: 2.8.79—250**

Printed in England



Modulation Meter 9008M

CONTENTS

		<u>Page No.</u>
	FRONTISPIECE	
	TECHNICAL SPECIFICATION	Tech. Spec. (1) to (4)
	SUPPLEMENTARY DATA	Tech. Spec. (5) and (6)
CHAPTER 1	GENERAL DESCRIPTION	
	INTRODUCTION	1-1
	FACILITIES AND DISPLAY	1-1
	INPUTS AND OUTPUTS	1-2
	POWER SUPPLY	1-2
	AC Supply	1-2
	DC Supply	1-2
	Battery Charging	1-2
	MAINTENANCE	1-3
	PROGRAMMING ACCESS	1-3
	OPTIONS AND ACCESSORIES	1-3
CHAPTER 2	BRIEF TECHNICAL DESCRIPTION	
	FUNCTIONAL PRINCIPLES	2-1
	Introduction	2-1
	Sampling Mixer	2-1
	In Lock Indication	2-1
	Measurement Circuits	2-3
	DESCRIPTION OF CONTROLS AND INDICATORS	2-4
	REAR PANEL ITEMS	2-6
CHAPTER 3	PREPARATION FOR USE	
	POWER SUPPLY	
	Voltage Selection	3-1
	AC Fuse Check	3-2
	DC Supply Fuses (External)	3-2
	Power Lead	3-2
	REMOVAL OF COVERS	3-2
	INITIAL FUNCTIONAL CHECK	3-3
	BATTERY CHARGING FACILITY	3-3
	REMOTE PROGRAM CONNECTIONS	3-4

CONTENTS (Contd.)

	<u>Page No.</u>
CHAPTER 4 OPERATING INSTRUCTIONS	
AUTOMATIC OPERATION	4-1

IN TEXT ILLUSTRATIONS

Fig. No.

2.1	Theoretical Block Diagram	2-2
2.2	Front Panel 9008M	2-5

LIST OF TABLES

Table No.

1	Rear Panel 15-Way Connector PL4	Tech. Spec. (5)
2	Peak, Trough and Mean Remote Selection Logic	Tech. Spec. (5)
3	Logic Levels	Tech. Spec. (5)
4	Meter Range Program	Tech. Spec. (6)
5	Mains and Battery Power Selection	2-7
6	Mains Voltage Selection	3-1

TECHNICAL SPECIFICATION

INPUT CHARACTERISTICS

Carrier Frequency range:	1.5 MHz to 2 GHz.
Input level:	<u>Low input:</u> 5 to 100 mV r.m.s. up to 500 MHz. 10 to 150 mV r.m.s. from 500 MHz to 1 GHz. 20 to 150 mV r.m.s. from 1 GHz to 2 GHz. <u>High input:</u> 50 mV to 1V r.m.s. up to 500 MHz. 150 mV to 1V r.m.s. from 500 MHz to 2 GHz.
Level setting:	Fully automatic.
Input impedance:	5 Ω nominal.

FM MEASUREMENT

Deviation ranges:	1.5, 3, 5, 10, 15, 30, 50 and 100 kHz peak deviation f.s.d. Measurements of positive, negative and mean deviation can be made.
Modulation frequency range:	50 Hz to 30 kHz.
Accuracy:	$\pm 2\%$ of f.s.d. $\pm 1\%$ of reading at 1 kHz.
Frequency response:	(1) ± 0.2 dB with respect to 1 kHz from 300 Hz to 3 kHz. (2) ± 0.5 dB with respect to 1 kHz from 50 Hz to 30 kHz.
Residual f.m. noise:	-52 dB with respect to 10 kHz peak deviation measured on the AF output, in a 300 Hz to 3 kHz bandwidth, at carrier frequencies up to 250 MHz then increasing at 6 dB per octave above this frequency.

AM rejection:

Additional deviation error is less than 250 Hz with an a.m. depth of up to 80% and a modulating frequency in the range 300 Hz to 3 kHz.

AM MEASUREMENT

Modulation depth ranges:

5, 10, 15, 30, 50 and 100% f.s.d. modulation depth. Measurements of peak, trough or mean amplitude relative to carrier may be made.

Modulation frequency:

50 Hz to 30 kHz

Accuracy:

$\pm 2\%$ of f.s.c. $\pm 1\%$ of reading at 1 kHz.

Frequency response:

- (1) ± 0.2 dB with respect to 1 kHz from 300 Hz to 3 kHz.
- (2) ± 0.5 dB with respect to 1 kHz from 50 Hz to 30 kHz.

Residual a.m.:

Less than 1% for inputs greater than 10mV r.m.s.

IF OUTPUT

Frequency:

430 kHz nominal.

Level:

100 mV r.m.s. e.m.f. ± 2 dB.

Output impedance:

600 Ω nominal.

AF OUTPUT

Response:

- (1) Both FILTER switches to OUT: ± 0.5 dB over the frequency range 50 Hz to 10 kHz, -0.3 dB ± 0.5 dB at 30 kHz.
- (2) With 3 kHz FILTER switch to IN: 3 dB at 3 kHz.
- (3) With 150 Hz FILTER switch to IN the attenuation is:-

Response (Contd):

(a) At least 40 dB at 150 Hz \pm 3 Hz.

(b) 1 dB or less below 100 Hz and above 300 Hz.

Level: 200 mV r.m.s. e.m.f. \pm 2 dB at meter f.s.d. (10 scale).

Output impedance: 600 Ω nominal.

Harmonic distortion: FM: Less than 0.5% for f.m. deviations up to 100 kHz.

AM: Less than 1% typically 0.5% for a.m. depths up to 80%.

DC OUTPUT

Level: 1V e.m.f. \pm 0.5 dB at meter f.s.d. (10 scale).

Output impedance: 10 k Ω nominal.

REMOTE CONTROL CONNECTOR

Functions Selectable: AM or FM.
Meter Range.
150 Hz Filter In/Out.
3 kHz Filter In/Out.
Peak, Trough and Mean (% AM).
Positive, Negative and Mean peak deviation (FM).

Control signals: Parallel input
(1) Logic '0': 0V to +0.5V or open circuit.
(2) Logic '1': +3V to +7V.

Input impedance:

Input impedance: 3.3 k Ω minimum.

Other inputs: Positive and negative d.c. power supply inputs (12V to 20V).

Outputs: (1) d.c. output 1V e.m.f. \pm 0.5 dB at meter f.s.d.

(2) Lock signal.

POWER REQUIREMENTS

AC mains operation:	Voltage 94V to 130V 188V to 260V Frequency 45 to 440 Hz Consumption approximately 15VA.
External d.c. supply:	A 12V to 20V positive and negative supply, which must be fitted with 500 mA fuses at source, can be connected via the rear 15-way connector.

ENVIRONMENTAL & SAFETY SPECIFICATIONS

Operating temperature:	0°C to +55°C.
Storage temperature:	-40°C to +70°C.
	NOTE: The specified temperature ranges refer to the instrument only and not to any battery which may be connected.
Mechanical:	In accordance with IEC 68 and British Joint Services Specification REMC/20/FR CAT III.
Safety:	Designed to meet IEC 348 (BS 4743).

MECHANICAL

Physical:	<u>Height</u>	<u>Width</u>	<u>Depth</u>
	96,5 mm	240 mm	268 mm
	Weight: approximately 3.2 kg.		

OPTIONS AND ACCESSORIES

These are described on page 1-3.

SUPPLEMENTARY DATA

REAR PANEL 15-WAY CONNECTOR

The rear panel connector (PL4) provides connection facilities for a remote control system and for the optional battery pack.

TABLE 1

Rear Panel 15-Way Connector PL4
(See Notes on following page)

Pin	Facility	Program Control Logic	
		'0'	'1'
1	AM/FM Select	FM	AM
2	3 kHz Filter Select	Filter OUT	Filter IN
3	Peak (+) Select)	Not Selected	Selected
4	Trough (-) Select)		
5	6 dB Select)		
6	10 dB Select)		
7	20 dB Select)	Not Selected	Selected
8	DC (analogue) output (NOTE 1)	Not Selected	Selected
9	'In Lock' indication (NOTE 2)	Not Selected	Selected
10	150 Hz Filter Select	Filter OUT	Filter IN
11	Not used		
12	Positive d.c. supply input		
13	Common earth (0V)		
14	Negative d.c. supply input		
15	Meter muting line (NOTE 3)		

TABLE 2

Peak, Trough and Mean Remote Selection Logic

PL4 Pin 3 (PEAK)	PL4 Pin 4 (TROUGH)	Function
0	0	No function
1	0	PEAK
0	1	TROUGH
1	1	MEAN

TABLE 3

Logic Levels

'0'	'1'
Open Circuit or less than +0.5V	Between +3V and +7V

NOTES ON TABLE 1

1. DC (Analogue) Output (pin 8). This output is identical to that at the BNC DC output socket on the rear panel.
2. In Lock Indication. This output is a steady logic level. Logic '1' signal for 'in lock', a '0' signal for 'out of lock'. The output is TTL but can drive only a single load.
3. Pin 15. A connection to 0V on this line will mute the meter reading.
4. Meter Range Selection. The eight measurement ranges are obtained by programming pins 5, 6 and 7 in accordance with Table 4.

TABLE 4

Meter Range Program

Program	Meter Scale	Program	Meter Scale
0 dB	= 1.5	20 dB	= 15
6 dB	= 3	20+6 dB	= 30
10 dB	= 5	20+10 dB	= 50
10+6 dB	= 10	20+10+6 dB	= 100

GENERAL DESCRIPTIONINTRODUCTION

1.1 The Racal Modulation Meter 9008M provides a simple and unambiguous method of measuring the modulation depth of a.m. signals and the peak deviation of f.m. signals. A feature of the instrument is the entirely automatic tuning and level setting, which operates over the entire range of 1.5 MHz to 2 GHz and is available by either local control or remote program.

FACILITIES AND DISPLAY

1.2 Measurements of peak deviation in eight ranges and modulation depth in six ranges are clearly displayed on a meter. A divide-by-two Meter Range switch enables readings always to be taken in the upper half of the meter scale where measurement is more accurate. An IN LOCK indicator flashes if the input signal is outside the specified amplitude or frequency limits.

1.3 A 3 kHz AF bandpass filter can be selected by a front panel switch to reduce noise in the 50 Hz to 3 kHz band and a switched 'notch' filter removes the 150 Hz squelch tone which is present in certain radio transmitter-receiver systems.

1.4 AM or FM operation is selected by a three-position Function switch which includes a position for level indication. When LEVEL is selected, the panel meter indicates the approximate input signal amplitude. This is useful if the lock lamp flashes due to incorrect signal amplitude, as it enables the user to determine immediately whether the signal is above or below the level required and to take the necessary corrective action. This facility is also useful for 'peaking' a transmitter under test.

1.5 Another three-position switch permits measurement of peak and trough amplitudes on AM and positive and negative deviation on FM. In the third position the mean of the modulation depth or the mean of the peak frequency deviation can be measured. Local or Remote control is selected by a front panel switch.

INPUTS AND OUTPUTS

1.6 Two signal input sockets are provided on the front panel, each terminated in 50Ω . The 'low' input is for signal levels between 5 mV and 150 mV r.m.s. The 'high' input is for signals between 50 mV and 1V r.m.s. The sensitivities at different portions of the frequency spectrum are given in Chapter 4 (Operating). The symbol \triangle on the front panel advises the user to consult the handbook for precise input level details.

1.7 On the rear panel, the i.f., the demodulated a.f. and a d.c. (analogue) output equivalent to the meter reading, are available at BNC sockets. These can be monitored by oscilloscope or other measuring equipment. The a.f. output is notable for a very low level of harmonic distortion, thus permitting realistic measurement of modulation distortion by means of a suitable Wave Analyser.

1.8 Other rear panel connectors are the a.c. mains plug and a multiway socket for remote program and d.c. power supply connections.

POWER SUPPLY

AC Supply

1.8 The instrument operates from nominal 110V or 220V a.c. supplies, 45 to 440 Hz. Mains voltage selection is by means of two rear panel switches which provide four possible voltage selections and can be locked to the chosen positions. Refer to page 3-1, Table 6.

DC Supply

1.9 The instrument can be operated from an external positive and negative d.c. supply in the range 12V to 20V, connected to pins 12, 13 and 14 of the rear 15-way connector (see page Tech. Spec. (5) Table 1).

1.10 To ensure reversed polarity protection the user must ensure that the external supply is fitted with a 500 mA quick-action fuse in each supply line.

1.11 To operate from an external d.c. supply the rear panel BATTERY/MAINS switch must be set to BATTERY.

Battery Charging

1.12 If the customer's external d.c. supply is provided by a battery, it will be trickle charged from the inbuilt charging circuit of the 9008M during MAINS powered operation, and can be charged at a higher rate by setting the POWER switch to OFF, with the mains supply connected.

MAINTENANCE

- 1.13 A separate Maintenance Manual is available for purchase from Racal-Dana Instruments Ltd. Military users should return the instrument to the designated repair workshop for servicing and calibration.

PROGRAMMING ACCESS

- 1.14 The 15-way socket fitted to the rear panel gives access to the logic circuits controlling the selection of the following functions:-

AM or FM mode

AF Filters (150 Hz and 3 kHz)

Meter Range:

Peak, Trough and Mean (%AM)

Positive, Negative or Mean peak deviation.

Details of logic levels will be found on page Tech. Spec. (5).

OPTIONS AND ACCESSORIES

Option

- (1) Carrying case This is a robust case with a shoulder strap.

Accessories Available to Order

- (1) RF Coupling Unit: The Coupling Unit (Part No. 11-0167) enables measurement to be made on high powered transmitters without direct connection and with adjustable coupling.
- (2) Telescopic Antenna: This wideband antenna can be plugged into the appropriate input socket. It is suitable for use only where there is no risk of receiving false or interfering signals which could lead to misleading readings.

BRIEF TECHNICAL DESCRIPTIONFUNCTIONAL PRINCIPLESIntroduction

2.1 The 9008M dispenses with the tedious tuning and level setting procedures of conventional modulation meters by exploiting the principle of the Sampling Mixer, combined with a frequency-locked loop controlling a local oscillator. The principle of this part of the instrument is illustrated in Figure 2.1 on the following page.

Sampling Mixer

2.2 Referring to Fig. 2.1, the divided output from the voltage controlled oscillator 'A' drives a pulse generator 'B', thus producing a train of narrow pulses (f_s) which are applied to an input of the Sampling Mixer 'C'. The external signal (f_i) which is applied to the other input of the mixer, is sampled by this pulse train. If a harmonic of the sampling frequency ' f_s ' is identical in frequency to the external signal, the output frequency from the sampling mixer (the i.f.) will be zero. When the two frequencies are not identical a 'difference' frequency output will be obtained.

2.3 The frequency relationship can be expressed by the formula:-

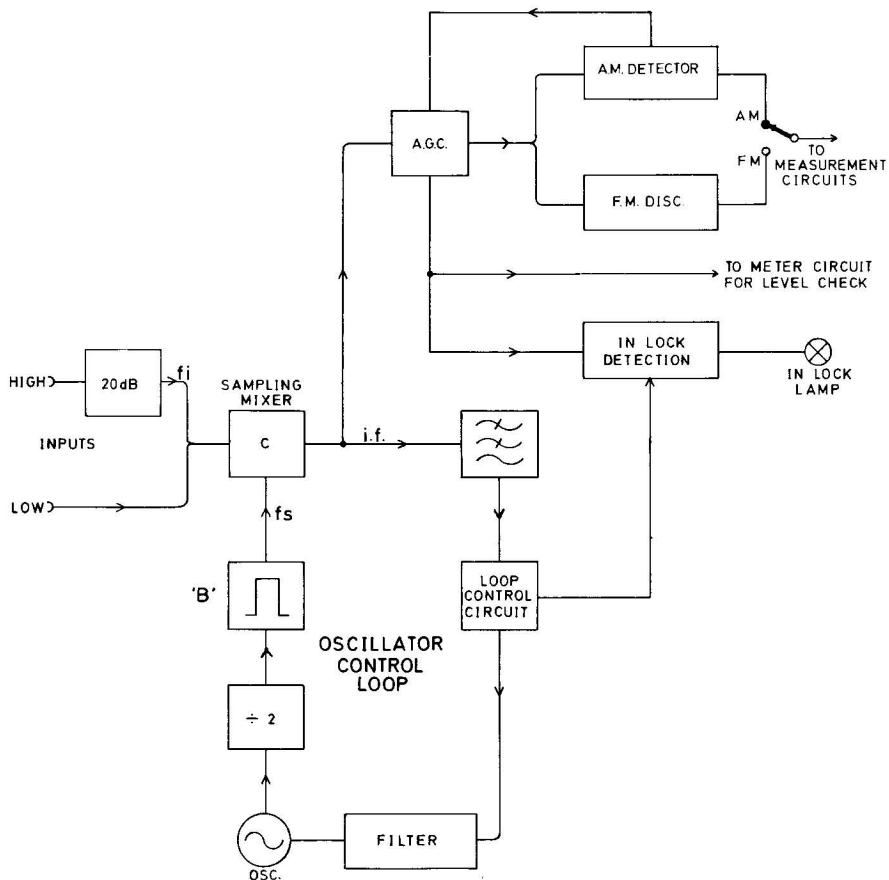
$$i.f = (N.f_s - f_i)$$

where $N.f_s$ is that harmonic of f_s closest to the external signal f_i .

2.4 It is the function of the control loop to sweep the oscillator (and hence the sampling frequency) until the required difference frequency (the i.f.) is obtained at the sampler output. The oscillator frequency is then held at this point.

'In Lock Indication'

2.5 The IN LOCK lamp is driven by a multivibrator which has two primary control lines. The multivibrator will run and cause the 'IN LOCK' lamp to flash until the required conditions on the control lines are satisfied. Measurements are not valid until the flashing indication is replaced by a steady illumination.



Theoretical Block Diagram

Fig.2-1

2.6 The conditions which can cause the IN LOCK lamp to flash are:-

- (a) Input frequency out of range.
- (b) Modulation in excess of the specified maxima (100 kHz deviation or 100% AM).
- (c) Input signal level too high or too low. The LEVEL position of Function switch is used to determine whether amplitude is within specified range. The meter readings corresponding to high and low input levels are given on page 4-1.

Measurement Circuits

2.7 AM Modulation Depth. An automatic level control circuit ensures a constant i.f. level into the detector. By virtue of this constant level the absolute value of the detected audio signal can provide a measurement of percentage modulation depth. This measurement is displayed on the meter. A 'peak-mean-trough' switch permits measurement of both positive and negative peaks of the modulating waveforms, as well as the mean modulation depth. The term 'mean modulation' in this instrument is defined as:-

$$\frac{\text{Peak Reading} + \text{Trough Reading}}{2}$$

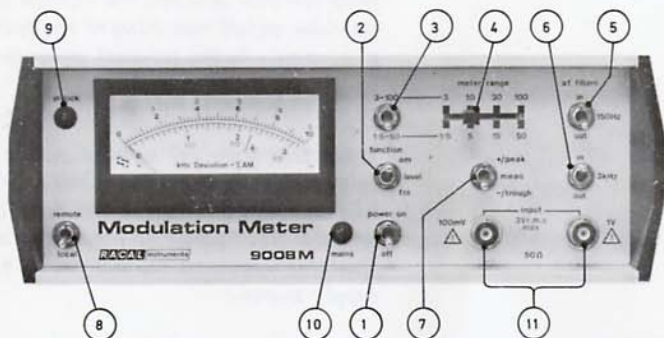
2.8 FM Deviation. For FM measurements the signal (i.f.) is applied to a 'pulse' discriminator which has an output level proportional to frequency. The amplitude of this output waveform has a mean level which corresponds to the i.f. Variations from this level represent positive and negative peak deviations. These variations are 'peak and trough' detected and displayed as a meter reading. The outputs of the peak and trough detectors are combined in the MEAN position of the switch to give a mean deviation indication.

DESCRIPTION OF CONTROLS AND INDICATORS

2.9 The front panel controls are illustrated in Fig. 2.2.

1. POWER ON/OFF switch
The switch function depends on the setting of the rear panel, BATTERY/MAINS switch, as follows:-
Using AC Supply.
With MAINS selected the POWER switch provides on/off switching of the rectified a.c. supply in the internal power unit.
Instrument with DC External Supply.
Table 5 on page 2-7 summarizes the relationship between the POWER switch, the BATTERY/MAINS switch and the alternative mains or d.c. power sources. The term 'Battery' represents the customer's d.c. supply source.
2. AM/LEVEL/FM switch
This switch connects the measurement circuits to the appropriate AM or FM signal path. The LEVEL position gives an approximate logarithmic meter reading of the input signal level.
3. METER RANGE (toggle) switch
This switch is used in conjunction with the Meter Range lever switch and effectively doubles the length of the meter scale. It allows all readings, except those of the lowest range, to be displayed in the upper half of the scale.
4. METER RANGE (lever) switch
Selects the appropriate peak deviation or modulation depth range to provide suitable meter deflections. The range markings are colour coded to match the corresponding scales on the meter.
5. AF FILTER switch (150 Hz)
When switched to IN a notch filter is inserted, centred on 150 Hz.
6. AF FILTER switch (3 kHz)
When switched to IN the upper limit of the AF bandwidth is 3 kHz approximately.

This switch selects the Peak detector or the Trough detector, thus enabling measurements to be made on either peak or trough of an a.m. signal, or positive or negative peak deviations of an f.m. signal. In the MEAN position the peak and trough measurements are averaged (see para. 2.7).



Front Panel 9008M

Fig.2.2

8. LOCAL/REMOTE switch Selects local operation, or control by remote program via the rear panel 15-way connector.
9. IN LOCK Indicator lamp With POWER switch to ON this lamp will flash until the instrument has locked to the input signal, when it will display a steady illumination.
10. MAINS ON Indicator lamp This lamp illuminates in both positions of the POWER switch whilst a.c. power is connected.
11. Input socket (BNC).
Input (high): 1V max, 50Ω impedance.
Input (low): 150 mV max, 50Ω impedance.
- NOTE: The absolute maximum input level is 3V r.m.s. on both inputs.

REAR PANEL ITEMS

2.10 Rear Panel Connections

IF Output (BNC)

430 kHz nominal output.
100 mV r.m.s. e.m.f. nominal.
Output impedance 600 Ω .

AF Output (BNC)

Output level 200 mV r.m.s. e.m.f. (nominal)
at f.s.d. (10 scale). Output impedance 600 Ω .

DC Output (BNC)

Provides analogue output proportional to
meter reading.
Output level 1V e.m.f. (nominal) at f.s.d.
(10 scale).
Output impedance 10 k Ω nominal.

Multiway Connector

Provides for remote program connections and
an input point for an external d.c. supply.
Refer to page Tech. Spec. (5) Table 1.

Mains (AC) Input Plug

A fixed 3-pin plug. A three core supply
cable is supplied with the instrument for
the mains connection.

2.11 Rear Panel Controls

Voltage Selector Switches

Two lockable slide switches permit four
possible voltage selections as follows:-

94V to 110V	188V to 220V
110V to 130V	220V to 260V

The switches must be secured by a screwed
locking plate after the correct voltage range
has been selected. Refer to para. 3.1.

BATTERY/MAINS Switch

This switch will be operated in the MAINS position except when d.c. operation is required. Table 5 summarizes the operational combinations of the POWER and BATTERY/MAINS switches together with the alternative power connections, assuming that an external d.c. supply is connected.

TABLE 5
Mains and Battery* Power Selection

		Mains Plug and Battery Connection State and Operational Condition			
POWER ON/OFF Switch Position	BATTERY-MAINS Switch Position	Mains 'In' Battery 'In'	Mains 'out' Battery 'In'	Mains 'In' Battery 'out'	Mains 'out' Battery 'out'
ON	MAINS	Operates from mains; battery trickles charged	No operation	Operates from mains	No operation.
OFF	MAINS	No operation. Batteries on full charge.	No operation	No operation.	No operation.
ON	BATTERY	Operates from batteries	Operates from batteries.	No operation	No operation
OFF	BATTERY	No operation. Batteries on full charge	No operation.	No operation.	No operation.

* The term 'Battery' represents the customer's d.c. supply system

CHAPTER 2

PREPARATION FOR USE

POWER SUPPLY

Mains voltage Selection

- 3.1 Mains voltage selection is by two rear panel switches S6 and S7 with locking plate. Proceed as follows:-
- (1) On the rear panel extract the two screw securing the cut-away locking plate and remove the plate. The switch marking S6 and S7 will then be visible.
 - (2) Refer to Table 6 below and set the slide switches S6 and S7 to the positions for the required voltage range.
 - (3) Ease the plate over the slide switches such as to align the screw holes. Secure the plate with the two screws previously removed.
 - (4) Verify that the cut-away in the plate allows the required voltage marking to be seen.

TABLE 6

Mains Voltage Selection

Switch Setting		Instrument Voltage Range For Local A.C. Supply
S6	S7	
Up	Down	94V to 110V
Up	Up	110V to 130V
Down	Down	188V to 220V
Down	Up	220V to 260V

AC Fuse Check

3.2 Check that the power fuse on the rear panel has the correct rating for the supply voltage, as follows:-

188V to 260V supply	80 mA)	antisurge fuse
94V to 130V supply	160 mA)	must be used

There are no internal fuses.

DC Supply Fuses (External)

3.3 If a.d.c. supply is provided by the customer it is essential that it be fitted with 500 mA fuses (normal quick action type) in the respective positive and negative supply lines, to ensure reversed polarity protection.

Power Lead

3.4 Fit a suitable plug to the power lead supplied, in accordance with the standard colour code:-

Brown.....	Line
Blue.....	Neutral
Green/Yellow.....	Earth (Ground)

REMOVAL OF COVERS

WARNING: DANGEROUS AC VOLTAGES ARE EXPOSED WHEN COVERS ARE REMOVED WITH AC SUPPLY CONNECTED.

- 3.5
- (1) Switch the instrument POWER switch to OFF and switch off the a.c. supply at the bench outlet. Unplug the power lead from the rear panel of the instrument.
 - (2) If the bottom cover is to be detached, remove the four screws from this cover.
 - (3) Remove the rubber plugs (located near to the rear end) from both side panels of the instrument and slacken, by about two turns, the screws revealed.
 - (4) Grip the rear panel assembly and ease it back from the main case to the maximum extent available (about 5 mm).
 - (5) The rear edge of either cover can now be lifted and the cover withdrawn outwards and rearwards.

- (6) To replace the covers reverse the above procedure.

INITIAL FUNCTIONAL CHECK

- 3.6
- (1) Set the rear BATTERY/MAINS switch to MAINS, connect the power supply and check that the MAINS ON indicator illuminates.
 - (2) Set the POWER switch to ON.
 - (3) Set the FUNCTION switch to AM.
 - (4) Verify that the IN LOCK lamp is flashing.
 - (5) Apply a suitable a.m. signal, within the operating frequency range, to the appropriate input socket.
 - (6) Check that the IN LOCK lamp changes to a steady illumination. If it fails to do so check that:-
 - (a) That the input frequency is within the operating range.
 - (b) Input signal amplitude is within the specification range for the input socket in use. Set the Function switch to the LEVEL position to determine whether the amplitude is too high or low, as follows:-
 - (i) The upper limit corresponds to approximately 8 on the meter 10 scale.
 - (ii) The lower limit corresponds to approximately 2 on the meter 10 scale.
 - (c) Check that modulation is within the specified range.
 - (7) Verify that the meter reading is correct for the signal applied.
 - (8) Select FM on the FUNCTION switch.
 - (9) Repeat (6) and (7) with an f.m. signal input.

BATTERY CHARGING FACILITY

- 3.7 An external battery can be charged as follows:-

- (1) Connect the a.c. supply.

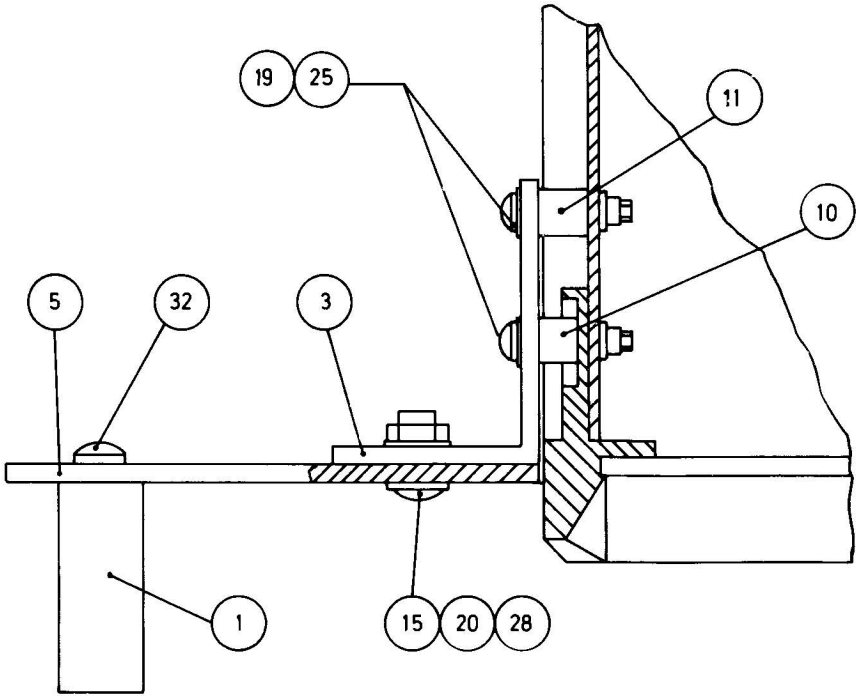
- (2) Set the rear BATTERY/MAINS switch to BATTERY.
- (3) Set the front panel POWER switch to OFF.
- (4) The charging current is approximately 160 mA at a constant rate. Observe the recommended charging instructions for the battery concerned.

REMOTE PROGRAM CONNECTIONS

3.8 Remote program connections are made via the 15-way rear connector PL4. The pin functions are listed in Table 1 and logic data in Tables 2 and 3 on page Tech. Spec. (5). Notes on the various facilities are given after the tables.

FITTING RACK MOUNTING KIT (OPTION) TYPE 11-1126

- (1) Remove the bench type handle assembly by carefully prising off the plastic caps from the handle pivots, and then extracting the screws which secure the assembly to the unit. Store safely for possible future use.
- (2) Remove the rubber bungs referred to in 'removal of covers' procedure and completely remove the two screws revealed. This allows the rear panel to be drawn away from the side panels (as far as wiring permits).
- (3) With the rear panel drawn backwards, slide out the trim strips from the side panels. Store them safely for possible future use. Then refit the rear panel and secure firmly with the two screws removed in (2).
- (4) At the front of the instrument, remove the screw securing the front panel on one side and discard. Refer to diagram below and fit bracket (item 3) using spacers (items 10 and 11) screws (item 25) and washers (item 19).
- (5) Repeat (4) on the other side of the front panel.
- (6) Fit the rack type handles (item 1) to the plates (item 5) using two Taptite screws (item 32) to each handle.
- (7) Fit the plate assemblies to brackets on the unit, using two of items 15, 20 and 28 to each plate assembly.



Plan View: Rack Mounting 11-1126 Fig.31

OPERATING INSTRUCTIONS

NOTE: The instrument should have been prepared for use as described in Chapter 3.

AUTOMATIC OPERATION

- 4.1 (1) Set the controls as follows:-
- (i) POWER switch to ON. LOCAL/REMOTE switch to LOCAL.
 - (ii) FUNCTION switch to AM or FM as required.
 - (iii) Both AF FILTER switches to OUT.
 - (iv) PEAK/MEAN/TROUGH switch, as required.
 - (v) The two-position METER RANGE switch to the 3-100 position.
 - (vi) The METER RANGE lever switch to the 100/50 position.
- (2) Connect the signal to be checked to the appropriate INPUT socket. If the amplitude is not known use the 1V r.m.s. socket initially.
- (3) The IN LOCK lamp should show a steady illumination, if it continues to flash the cause is likely to be one of the following:-
- (a) Signal frequency outside the specified operating range (1.5 MHz - 2 GHz).
 - (b) Modulation in excess of the specified ranges (AM or FM).
 - (c) Signal level too high or too low. Use the LEVEL position of the Function switch to determine whether the amplitude is too high or too low, as follows:-
 - (i) The upper limit corresponds to approximately 8 on the meter 10 scale.
 - (ii) The lower limit corresponds to approximately 2 on the meter 10 scale.

- (4) Check that the appropriate input socket is connected. The input characteristics over the frequency range are as follows:-

Low Input Socket

5 - 100 mV r.m.s. up to 500 MHz
10 - 150 mV r.m.s. from 500 MHz to 1 GHz
20 - 150 mV r.m.s. from 1 GHz to 2 GHz

High Input Socket

50mV - 1V r.m.s. up to 500 MHz
150 mV - 1V r.m.s. from 500 MHz
to 2 GHz.

- (5) A meter reading may be taken when the IN LOCK lamp gives a steady illumination. Set the METER RANGE switches to give the most convenient indication on the meter scale.
- (6) If input conditions are noisy set the 3 kHz AF FILTER switch to IN to provide a 3 kHz bandwidth. The 150 Hz AF FILTER switch may be set to IN to eliminate the 150 Hz 'squelch' tone which is present in certain communications equipment.
- (7) Read the measurement from the appropriate scale on the meter, according to the settings of the METER RANGE switches.