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Colin Hinson

In the village of Blunham, Bedfordshire, UK.



**CONCISE DETAILS OF
PREFERRED GENERAL PURPOSE
ELECTRICAL ENGINEERING
TEST EQUIPMENT**

(Chapters 1 to 5)

BY COMMAND OF THE DEFENCE COUNCIL

Ministry of Defence

**Sponsored for use in the
ROYAL AIR FORCE by DDSM(Av)11(RAF)**

Prepared by: CSDE(RAF) Test Systems Flight

Publications authority: MOD ATP(RAF)

Service users should send their comments through the channel
prescribed for the purpose in:-

AP 100B-01 Order 0504 (RAF)

CONTENTS

Preliminary Material

Title Page
 Amendment Record
 Contents (this list)
 Preface

AP 117A-0104-1AChapters

- 1 POWER MEASURE INSTRUMENTS
 - .2 Wattmeters
 - .2 Radiation Hazard Monitors
- 2 POWER SUPPLIES
 - .1 Power Supplies
 - .2 Current and Voltage Calibrators
- 3 FREQUENCY, WAVEFORM & TIME MEASURING DEVICES
 - .1 Waveform Analysers
 - .2 Spectrum Analysers
 - .3 Modulation Meters
 - .4 Counters, Counter Timers & Frequency Meters
 - .5 Time Interval Meters
 - .6 Data/Transmission Line Testers
- 4 SIGNAL SOURCES
 - .1 Noise Generators
 - .2 Signal Generators
 - .3 Pulse and Waveform Generators
 - .4 Radio Test Equipment
- 5 IMPEDANCE MEASURING INSTRUMENTS (R L C Q G B & Y)
 - .1 Bridges
 - .2 Insulation Testers
 - .3 Decade Boxes
 - .4 Continuity Testers
 - .5 Thermocouple Testers
 - .6 Slotted Line Systems

AP 117A-0104-1B

- 6 CURRENT, VOLTAGE AND FIELD STRENGTH MEASURING INSTRUMENTS
 - .1 Multimeters
 - .2 Voltmeters
 - .3 Ammeters
 - .4 Safety Meters
 - .5 Galvanometers
- 7 FILTERS, ATTENUATORS, TRANSFORMERS AND MATCHING PADS
 - .1 Filters
 - .2 Attenuators
 - .3 Micromatch Transformers

Chapters

8	RECORDERS
.1	Recorders (X-Y, PEN etc)
9	CRT EQUIPMENT
.1	Oscilloscope
10	COMPONENT TEST EQUIPMENT
.1	Component Testers
11	LOGIC TEST EQUIPMENT
.1	Logic Test Equipment
.2	Programmings
12	BATTERY TEST EQUIPMENT
.1	Capacity Testers
13	GYROSCOPIC EQUIPMENT
.1	Test Cables
.2	Phase Angle Voltmeters
14	PRESSURE MEASUREMENT
.1	Pitot Static Testers
.2	Vacuum Pumps
15	TEMPERATURE MEASUREMENT
.1	Thermometers
16	GPIB ASSOCIATED EQUIPMENT AND COMPUTER ACCESSORIES
.1	GPIB Associated Equipment
.2	Computer Accessories
17	WATCHES AND CLOCKS
18	TACHOMETER EQUIPMENT
.1	Tachometer Testers
19	LEAK DETECTION EQUIPMENT
.1	Leak Detectors
20	AUTOMATIC TEST EQUIPMENT
.1	Automatic Test Equipment
.2	Printed Circuit Board Testers
21	FIBRE OPTIC TEST EQUIPMENT
.1	Optical Time Domain Reflectometers
22	MISCELLANEOUS TEST EQUIPMENT
.1	Synchro Transmitters
.2	Ground Isolation Devices
.3	Measuring Instruments
▶ 23	WORKPLACE ENVIRONMENT MONITORING EQUIPMENT ◀
.1	Atmosphere
.2	Illumination
.3	Radiation
.4	Noise

PREFACE

1. This Air Publication (parts 1A and 1B) contains Concise Details of "Preferred" general purpose electrical engineering test equipment (GPEETE). All the items listed have full engineering support and are either currently available on the commercial market or are RAF stock held items. Project staff and sponsors should endeavour to satisfy any new requirement for EETE from the items given in this AP (paragraphs 9 and 10 refer).

2. Note that:

2.1 General Purpose Electrical Engineering Test Equipment (GPEETE) is defined as EETE designed for use on more than one main equipment, notwithstanding that it may be introduced initially for one application.

2.2 Special to Type (STTEETE) is defined as EETE designed specifically for use on one main equipment only.

DEFINITION OF TERMS USED

3. Environment. Environmental limitations are indicated by a code letter:

3.1 Items suitable for use only in sheltered controlled environments, eg electronic bays, workshops etc indicated by "A"

3.2 Items suitable for use in sheltered but uncontrolled conditions, eg hangars, mobile workshops, tents etc indicated by "B"

3.3 Items suitable for use in unsheltered conditions. These instruments are weather resistant, but not necessarily weatherproof "C"

4. Maintenance Policy. The maintenance policy stated indicates the depth of maintenance (excluding recalibration) permissible at specific lines of servicing, defined as per DCI S88/76.

5. Recalibration. The recalibration location and periodicity is shown as a two element code:

5.1 First Element. Location:

5.1.1 At approved recalibration laboratories only "A"

5.1.2 On site, but only by an approved recalibration agency..... "B"

5.1.3 On site by user using an approved recalibration procedure "C"

5.2 Second Element. The period in months between recalibrations:

5.2.1 Daily before use. "DBU"

5.2.2 Recalibrate when calibration state is suspect.... "SCAN"

5.2.3 Recalibration not required "CNR"

6. Availability. A numerical code to indicate the availability of instruments is included as follows:

- 6.1 Instruments usually available from RAF stock "1"
- 6.2 Instruments commercially available but normally no surplus assets held..... "2"
- 6.3 Instruments commercially available but normally reserved for Calibration and 3rd line establishments only "3"

7. There are five main reasons why GPEETE will be superseded:

- 7.1 No longer commercially available.
- 7.2 Rationalisation, whereby several instruments can be economically replaced by the introduction of one new instrument.
- 7.3 Significantly less expensive alternatives available.
- 7.4 Supporting the instrument is becoming either too difficult or too expensive.
- 7.5 Unreliability is such that replacement is justifiable.

8. When an instrument is superseded it will either be reclassified or removed from the publication, depending on the circumstances. In either case, details of the replacement instrument will be inserted in this AP as a category 2 instrument. In all cases the original item nominated, or scaled, will continue to be issued against AFDEETEC Bids until stocks are exhausted. At that time the replacement instrument will be issued to satisfy further demands. Because supersession of instruments is primarily a scaling and supply management responsibility, no supersession information is included in this publication.

HOW TO USE THIS AP WHEN COMPILING LISTS OF TEST EQUIPMENT

9. Staff involved in the selection of EETE to meet a servicing application should use the following procedure:

- 9.1 Determine the full specification of the requirement in terms of the electrical parameters, range, accuracy etc, and the environmental use, temperature, humidity etc.
- 9.2 Identify within the Publication the section and chapter dealing with the type of instrument.
- 9.3 Compare the specification of the requirement with that of the instruments available and identify all that are capable of meeting the requirement.
- 9.4 By considering such factors as price, performance, calibration periodicity etc select the most cost effective instrument to satisfy the requirement. Whenever possible instruments with an availability code '1' should be selected.

10. Where an application cannot be satisfied by GPEETE contained within this publication the MOD GPEETE Sponsor (MOD SE4(RAF)) should be informed in order that, a task may be placed on CSDE to identify a suitable item of GPEETE from the commercial market. Alternatively, advice may be obtained from CSDE, Electrical Engineering Wing, Test Systems Flight (Swanton Morley 291, Extension 430, 310 or 417). Under no circumstances should GPEETE that is not already in service be nominated for an application without the prior approval of MOD SE4(RAF).

GENERAL PURPOSE INTERFACE BUS (GPIB) - BRIEF DESCRIPTION

11. Basically, GPIB is a standard interfacing system whereby programmable instruments marketed by various manufacturers can operate with each other in a complete testing role. Depending on the test requirements, units under test can be interlinked with measuring instruments and a controller, normally in the form of a computer, is used for the over-all management of the test system. Each participating device in the test system must be able to perform at least one of the following functions:

11.1 Talker - transmits data only

11.2 Listener - receives data only

11.3 Controller - manages the operation of the bus system mainly by detailing which devices are to send and receive data. The term "computing controller" is often used to describe such a device which is, in effect, the system manager.

12. Configuration. In its most simple form a GPIB system can consist of only one talker and one listener. However, the power and flexibility of the system can be better exploited by considering several interconnected devices which stimulate and inter-react with each other via the controller. Therefore, the controller must be capable of:

12.1 Scheduling measurement tasks.

12.2 Setting up instruments to perform specified tests and measurements.

12.3 Monitoring processes on line.

12.4 Processing data, analysing and interpreting the results.

13. Principles of operation. The heart of the GPIB concept lies in the bi-directional flow of data between the various devices which are connected with each other. These devices consist of any commercially available programmable instruments which are connected to the bus by means of a GPIB interface card. These cards, which are peculiar to each instrument, act as translators or converters between the instrument and the bus itself. The cards may be either added on to an existing instrument or more commonly, included in the design of the more recently introduced range of instruments either as a standard feature or as a plug-in optional extra. Physically the interface bus consists of 2 elements: the interface card just described together with one or more 'bus interface cables'. These cables contain 16 active signal lines and have a well-defined, 'piggy back' connector at each end; these double-sided male/female connectors may be stacked one on another, thus allowing several cables to be connected to one source quite

simply. The signal lines within the cable, which is passive itself, are grouped into 3 sets:

13.1 Data Lines. The 8 Data lines carry coded messages - such as addresses, program data, measurements, and status bytes - to and from as many as 15 devices interconnected with a single bus (using as many cables as necessary).

13.2 Data Byte Transfer Control Lines. For unambiguous and intelligible communication between instrument and computer devices, some rules or protocol must apply to the communication process itself. Thus the exchange of data is controlled by the second set of signal lines, the 3 Data Byte Transfer Control Lines.

13.3 General Interface Management Lines. The remaining 5 General Interface Management lines are used for such things as activating all the connected devices at once, clearing the interface, remotely controlling the devices connected to the bus, or 'attention getting' request by the devices.

14. Device interconnections. The device or instrument to be connected to a GPIB need only have the 'interface card' and mechanical provision to accept the standard GPIB cable connector: these are the only two essential characteristics. In all other respects (the functional operation, internal design, size and shape of the instrument) the GPIB standard allows complete freedom of choice.

15. GPIB specification summary

15.1 Interconnected Devices. Up to 15 devices (maximum) can be connected to one bus. Additional devices, on one or more separate buses, can be controlled by the same computing controller.

15.2 Interconnection Path. GPIB instruments are connected together on a Star or linear bus network. The total transmission path length is 2 metres (6.6 feet) times the number of devices or 20 metres (66 feet) whichever is less. This path length can be extended by means of common carrier interface modules interconnected by a dedicated and shielded 2-twisted pair cable.

15.3 Message Transfer Scheme. Byte-serial, bit parallel asynchronous data transfer is employed using an interlocked 3-wire handshake technique.

15.4 Data Rate. One megabyte per second (maximum) can be achieved over limited distances. Over full transmission paths, this data rate falls to 250 to 500 kilobytes per second, depending on the devices.

15.5 Address Capability. The system can deal with primary addresses (31 Talk and 31 Listen) and secondary (2-byte) addresses (961 Talk and 961 Listen). A maximum of 1 Talker and up to 14 Listeners is permissible at a time.

15.6 Control Shift. In systems with more than one controller, only one can be active at a time. A currently active controller can pass control to another, but only a designated system controller can assume control over others.

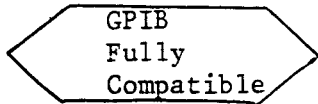
15.7 Interface Circuits. Driver and receiver circuits are TTL (Transistor to Transistor Logic) compatible.

16. GPIB page legend



GPIB facility can be made available by:

- (1) modification action or
- (2) purchase of a fully compatible model.



GPIB facility is fully incorporated in the subject model.

ASSOCIATE PUBLICATIONS

Concise details of Non-Preferred and Obsolescent
General Purpose Electrical Engineering
Test Equipment

AP

117A-0105-1

Note ...

This publication has been produced primarily for the use of Electrical Engineering Test Equipment Co-ordinators (EETEC's) to assist in the identification of Non-Preferred and Obsolescent GPEETE and their comprising items. The AP is not for use in identifying or selecting GPEETE to satisfy any new or existing requirements; AP 117A-0104-1A and -1B are to be used for this purpose.

Service and civilian organisations having a responsibility for calibration, repair, storage, transfer or use of GPEETC, without the involvement of EETEC's may consider AP 117A-0105-1 to be of use to them. If this is so, demands should be submitted through the usual channels. CSDE (EEW/TSF/DEA41), on behalf of the sponsor (MOD SE4c(RAF)) will approve all issues of the AP).

Chapter 1

POWER MEASURING INSTRUMENTS

Chapter 1POWER MEASURING INSTRUMENTS

CONTENTS

Chap	Nomenclature	Sect/Ref/Stock No.	Manf/Part No.
1.1 WATTMETERS			
.1	Wattmeter Absorption AF	6625-99-9149811	Marconi TF893A
.2	Wattmeter Set	6625-99-651879	Bird 4112 Opt 010
▶ .3	RF Power Meter Set	10S/6625-99-4066428	Marconi 6960B Opt 1,3,4
.4	Thermocouple Power Sensors	-	Hewlett Packard 8480 Series
.5	Wattmeter Directional RF	6625-00-6495070	Bird 43
.6	Wattmeter Absorption CT418	6625-99-1019916	Marconi TF1152A
.7	To be issued later		
.8	To be issued later		
.9	To be issued later		
.10	Wattmeter Electronic	6625-99-6641965	Feedback Instruments EW 604
.11	Directional Power Meter	10S/7600677	Farnell TM10
▶ .12	RF Power Meter Set	10S/2809266	Hewlett Packard 435 Opt C51
.13	Laser Energy Meter FMk2	10S/7477729	GEC A79-600
1.2 RADIATION HAZARD MONITORS			
.1	Radiation Hazard Monitor	10S/2297429	General Microwave Raham 4A
.2	Personal RF Radiation	-	Loral Narda 8841C Series

Section Reference 10S/6625-99-9149811		Nomenclature WATTMETER ABSORPTION AF		
Manufacturer MARCONI		Part No. TF893A		Cost/Date £260.00 1978
Height 28.0 cm	Width 19.0 cm	Depth 17.0 cm	Weight 4.1 kg	
Power Supplies -			Air Publication 117B-0102-13D	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/18	AFDETEEC/AFDSEC No. 11417



1 Description

This instrument is a wattmeter for use in the audio frequency range.

2 Specification

Power Ranges: 0 to 10 W in five ranges.

Impedance: 2.5, 3, 4.5, 6, 8, 6.25, 7.5, 10, 12.5, 15 and 20 Ω with X1, X10, X100 and X1000 multipliers.

Accuracy: 2½% of fsd up to half scale deflection
(at 1 kHz) 5% of fsd from half scale to full scale.

Impedance Accuracy: 5%

3 Comprising

Instrument only

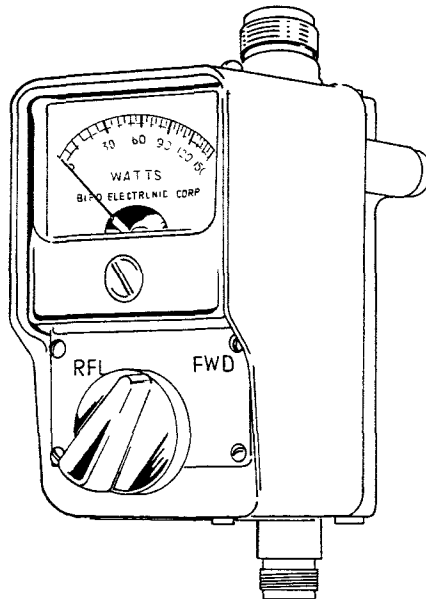
4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference 10S/6625-99-6516879		Nomenclature WATTMETER SET		
Manufacturer BIRD		Part No. 4112 (Opt. 010)		Cost/Date £120.00 1978
Height 8.7 cm	Width 5.0 cm	Depth 7.5 cm	Weight 0.45 kg	
Power Supplies -			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEFTOC/AFDSEC No. 18859



1 Description

A robust in-line power meter for measuring forward and reflected power in the 2-30 MHz range. The forward power is 200 W and reflected (selected by a spring loaded switch) is 20 W.

2 Specification

Power Rating: Forward 200 W
Reflected 20 W
Insertion VSWR 1.1 max

Frequency Range: 2-30 MHz

► Accuracy: 10% of full scale

Connectors: Female type N

Construction: Die cast housing, finished in light grey backed enamel.

3 Comprising

Instrument case.

4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference: 10S/6625-99-4066428		Nomenclature: RF POWER METER SET		
Manufacturer: MARCONI INSTRUMENTS		Part No: 6960B OPT 1,3,4		Cost/Date: £1838/FEB 94
Height: 108 mm	Width: 256 mm	Depth: 369 mm	Weight: 3.5 kg	
Power Supplies: Switchable 105 to 120 V AC and 210 to 240 V AC \pm 10%, 45 - 440 Hz DC Supply (OPT 4) 11 V to 32 V DC			Air Publication: None	
Availability: 2	Environment: B	Maintenance Policy: 2B/4D	Calibration: TBA	AFDEETEC No: 19527



1. Description

The 6960B can be manually operated or is GPIB programmable, and together with its associated power sensors provides measurements at frequencies from 30 kHz to 40 GHz over a wide range of power levels. Although the 6960B is a true average power measuring instrument, it may be used for pulsed power measurements. The duty cycle of the signal to be measured may be entered in the range 100 to 0.001%. The power meter then calculates the peak power by dividing the measured average power by the duty cycle and displaying a "peak" annunciator. A relative measurements facility is provided to enable the measurement of high powers by entering the calibrated value of an attenuator or coupler directly as a negative number. Positive relative values to account for amplifier gains can also be entered. For remote location operation a DC supply unit is available and can accept any voltage within the range 11 to 32 volts. For more information on its use, refer to paragraph 3, KEY FUNCTIONS.

2. Specification

Frequency Range: 30 kHz to 40 GHz depending on sensor used.

2. Specification (continued)

Power Range:	-70 dBm (100pW) to +35 dBm (3 W) depending on sensor used.
Power Reference:	0 dBm 1 mW), 50 MHz, Type N(F), 50 ohms
Uncertainty:	± 0.7%
Accuracy:	± 1.2% worst case for one year.
Display	Four digit LCD. Over-range, Remote, Peak, Under-range, dB, dBm, dB REL, nW to kW, Zero.
Instrumentation Accuracy:	Watts mode ± 0.5% dBm mode ± 0.02 dB dB REL mode ± 0.02 dB
Zero	
Set:	± 1% of FSD on most sensitive range.
Carryover:	± 0.03% of FSD (when zeroed on most sensitive range).
Drift:	± 0.1% of FSD (± 2% 6920 series) on range 1 (most sensitive). Decreasing by factor 10 for each higher range. (Over one hour at constant temperature after 24 hours stabilization).
Noise:	Less than 1% of FSD (2% for 6920 series) for most sensitive range with an average factor greater than 19.
Outputs (BNC sockets)	
Fast levelling:	0 to 1 V each range, 1 kohm impedance, excludes correction for Cal Factor, Linearity Factor and Average Number. (For external levelling of RF source.)
Recorder:	± 1%. dB mode: 1 V/decade, 7 V maximum on range 5. Watts mode: 5 V linear. Fully corrected for Cal Factor, Linearity Factory and Average Number. (For plots of the full 50 dB dynamic range.)
Blanking:	Maximum voltage: 25 V. Maximum current: 50 mA, open collector, short circuit for blank.
Response Time	
Range 1 (most sensitive):	1 s, selectable.
Ranges 2 to 5:	250 ms (display update), selectable. 25 ms using GPIB.

(continued)

2. Specification (continued)

GPIB Interface: GPIB unit built into instrument (opt 001). All front panel functions are remotely programmable except for test modes.

Limit Range of Operation
Temperature: 0°C to 55°C.

3. Key Functions

Units: Selects either linear (mW) or logarithmic (dBm) units with toggle action.

dB Rel: Displays current offset which may be entered in ranges -99 to +99 dB.

Store and Recall: Stores up to nine complete instrument settings for 10 years for any set-up condition (e.g. Cal Factors at different frequencies); store 0 contains instrument settings prior to last power down.

Max Hold: Retains maximum reading of changing signal. When enabled, unit's annunciators flash.

Range: Displays current range in use; "Au" denotes auto ranging. "Hd" indicates held range. Any range may be selected and held at any time.

Averaging: Enables any integer number in the range 1 to 256 to be set. In Auto Averaging mode the following response times are obtained.

Range	Average No.	Response Time
5	1	0.25 s
4	1	0.25 s
3	4	1 s
2	20	5 s
1	50	12.5 s

Power Up: Displays power up mode currently in use. In power-up mode 1, instrument assumes default settings. Power-up mode 2 reinstates the settings in use at power down.

Linearity Factor: Provides data entry for individual sensor linearity data to improve accuracy.

3. Key Functions (continued)

Duty cycle: Enables entry of duty cycle of pulsed signal in range 100% to 0.001%. It then calculates the peak value of the pulsed signal from the average power measured by the sensor. "Peak" annunciator displayed when duty cycle less than 100%.

Calibration Factor: Allows entry of sensor calibration factor in range 100% to 0.001%.

Local: Returns instrument to "local" front panel operation when remotely addressed unless "local lock out" is employed. In manual operation, displays current GPIB address.

Auto Zero: Initiates zero routines to store zero offset for each of five ranges.

Auto Cal: Initiates self-calibration routine after connection of sensor to Power Reference.

Power Ref: Toggles internal 0 dBm (50 MHz) power reference on and off.

Resolution: Resolution may be changed by altering the Average Number in the following format:

Range	Resolution (dB)	0.1	0.01	0.001
5	Average Number	1	1	4
4		1	1	4
3		1	1	4
2		1	4	20
1		4	20	50

4. Comprising Items

Power Meter 6960B
 Storage Pouch
 Operating Manual
 Operating Summary
 2 metre Sensor Cable
 Front Panel Cover
 Mains Lead
 DC Input Lead
 20 dB Attenuator
 N Type (F) to BNC(F) Adaptor

5. Accessory Items

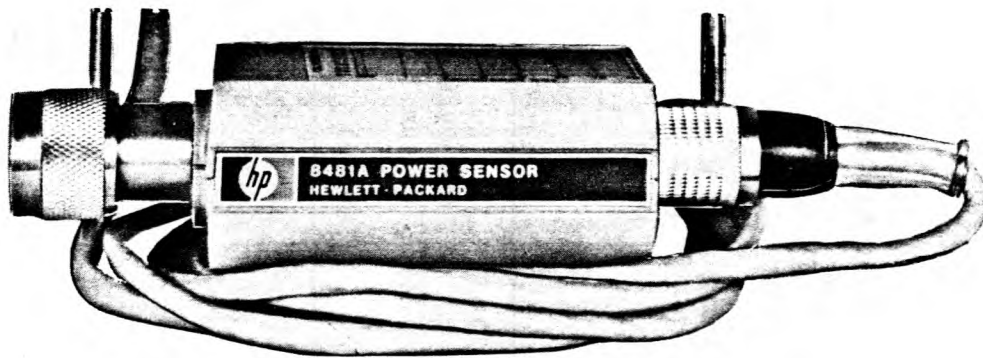
- a) 10S/6625-99-7995889 AFDEETEC 19528, Power Sensor 6910
 Frequency Range: 10 MHz to 20 GHz
 Power Range: -30 dBm (1 micro watt) to +20 dBm (100 milli watts)
 Max. I/P Powers: +25 dBm (300 milli watt) CW
 +42 dBm (15 watts) peak for 2 micro secs.
 Connector: Type N male, 50 ohms
- b) 10S/ -99-3826259 AFDEETEC 19526, Power Sensor 6914
 Frequency Range: 10 MHz to 40 GHz
 Power Range: -30 dBm (1 micro watt) to +20 dBm (100 milli watts)
 Max. I/P Powers: +25 dBm (300 milli watt) CW
 +42 dBm (15 watts) peak for 2 micro secs.
 Connector: 2.92 mm male, 50 ohms
- c) 10S/ -99-4377782 AFDEETEC 19533, Power Sensor 6920
 Frequency Range: 10 MHz to 20 GHz
 Power Range: -70 dBm (0.1 nano watt) to -20 dBm (100 micro watts)
 Max. I/P Powers: +26 dBm (400 milli watt) CW
 +30 dBm (1 watt) peak for 2 micro secs.
 Connector: Type N male, 50 ohms
- d) 10S/ -99-8313594 AFDEETEC 19529, Power Sensor 6930
 Frequency Range: 10 MHz to 18 GHz
 Power Range: -15 dBm (30 micro watt) to +35 dBm (3 watts)
 Max. I/P Power: +37 dBm (5 milli watt) CW
 +50 dBm (100 watts) peak for 2 micro secs.
 Connector: Type N male, 50 ohms

6. Associated Equipment

None

Section Reference †		Nomenclature THERMOCOUPLE POWER SENSORS		
Manufacturer HEWLETT PACKARD		Part No. 8480 SERIES		Cost/Date -
Height †	Width †	Depth †	Weight	
Power Supplies Derived from HP 435 Power Meter			Air Publication 117B-0204-0	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. †

† see text



1 Description

Power Sensors designed for use with Hewlett Packard 435A Power Meter Set.

<u>Model No</u>	<u>Sect/Reference</u>	<u>Afdeetec No</u>
8481A	10S/6625-99-6402163	18642
8481A-001	10S/6625-99-6402165	18643
8482A	10S/6625-99-0154412	-
8482H	10S/6625-99-6574821	19098
8484A	110S/6625-01-0282882	19059

2 Specification

See overleaf

TABLE 1 8480 SERIES SPECIFICATIONS

Model	Frequency Range (GHz)	Nominal Impedance	SWR Maximum (Reflection Coefficient)	Power Range	Maximum Power	Dimensions mm (in.)	Shipping Weight kg (lb)	Power Linearity ³	RF Connector
8481A	10 MHz to 18 GHz	50Ω	1.1 (0.048) 50 MHz-2 GHz 1.18 (0.082) 30MHz-50MHz 2-12.4 GHz 1.28 (0.123) 12.4-18GHz	0.3μW to 100mW	300mW Av 15W Peak 30 W μs (per pulse)	30x38x105 (1 ¹ / ₈ x1 ¹ / ₂ x4 ¹ / ₈)	0.5 (1)	+10 to +20 dBm +1.5, -1%	N (m)
Option 001									Add APC-7
8482H	100kHz to 4.2 GHz	50Ω	1.2 (0.091) 100 kHz to 4.2 GHz	30 μW to 3 W	3.5W Av 100W Peak 100W μs (per pulse)	30x38x149 (1 ¹ / ₈ x1 ¹ / ₂ x5 ⁷ / ₈)	0.5 (1)	+25 to +35 dBm ±5%	N (m)
8484A	10 MHz to 18 GHz	50Ω	1.15(0.070) 30MHz-4GHz 1.2 (0.091) 4GHz-10GHz 1.3 (0.113) 10GHz-18GHz 1.4 (0.17) 10MHz-30MHz	0.1nW to 10 μW	200mW Av 200mW Peak	40x50x170 (1 ⁵ / ₈ x2x6 ¹¹ / ₁₆)	0.5 (1)		N (m)

1. Only specifications listed in this table apply to 8481H and 8482H. No other specifications are implied.

► TABLE 2 UNCERTAINTY OF CALIBRATION FACTOR DATA FOR 8481A/B and 8484A

Frequency (GHz)	Sum of Uncertainties (%) ¹			Probable Uncertainties (%) ²		
	8481A	8481B	8484A	8481A	8481B	8484A
1.0	-	5.8	-	-	3.1	-
2.0	3.45	5.8	4.70	1.92	3.1	2.25
4.0	2.95	5.8	4.36	1.58	3.1	1.97
6.0	2.95	5.8	4.55	1.58	3.1	2.00
8.0	2.85	6.0	4.47	1.46	3.1	1.91
10.0	2.85	6.2	4.42	1.46	3.3	1.89
12.4	2.85	7.8	4.71	1.46	4.1	1.98
14.0	5.05	7.9	7.00	2.95	4.1	3.24
16.0	5.45	8.0	7.62	3.07	4.2	3.40
18.0	5.45	8.3	7.15	3.07	4.3	3.30

1. Includes uncertainty of reference standard and transfer uncertainty. Directly traceable to NBS.
2. Square root of sum of the individual uncertainties squared (RSS).

3 Comprising

8481A Sensor only
8481A-001 Sensor only
8482H Sensor only
8484A Sensor with 11708A 50 MHz reference attenuator fitted

4 Accessory Items

None.

5 Associated Equipment

10S/6625-99-6402159 Power Meter Set 435A ◀

Section Reference 110S/6625-00-6495070		Nomenclature WATTMETER DIRECTIONAL RF.		
Manufacturer BIRD		Part No. 43		Cost/Date £90.00 1978
Height 17.4 cm	Width 13.4 cm	Depth 9.6 cm	Weight 2.25 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/24	AFDENTEC/AFDSEC No. 11716



1 Description

The model 43 Thru-Line Wattmeter is an insertion type RF wattmeter, designed to measure power flow and load match in 50Ω coaxial transmission lines. It is intended for use on CW, AM, FM and TV modulation envelopes, but not pulsed modes.

The power ranges used are determined by the plug in element used (see attached list).

2 Specification

Meter Ranges:	0-25 W, 0-50 W, and 0-100 W Direct full scale reading, 1 W to 10,000 W by means of plug in units/element
Accuracy:	5% of full scale
Insertion VSWR:	1.05 maximum
Connectors:	2 female type N

Plug-in elements: See List in Para. 4. Special elements outside these ranges are available on request.

Terminations: Where a thru-line measurement is not possible, a dummy load is required. See list in Para. 5. Special loads outside the ranges are available on request.

Note ...

For modulated and SSB signals the Bird 43 is not suitable, the Bird 4311 should be used - elements and loads as for Bird 43.

3 Comprising

Instrument
Case

4 Accessory Items

<u>Sect/Ref No</u>	<u>Description</u>	<u>Part No</u>
▶ 1OZZ/209259	100 mW 72 - 76 MHz	432-2
1OZZ/209257	100 mW 328 - 336 MHz	430-3
1OZZ/210896	100 mW 400 MHz	430-7
1OZZ/207923	250 mW 72 - 76 MHz	430-22
1OZZ/209260	250 mW 328 - 336 MHz	430-16
1OZZ/209258	500 mW 105 - 120 MHz	430-26
1OAD/6255468	1 W 60 - 80 MHz	060-1
1OAD/6255469	1 W 80 - 95 MHz	080-1
11OAD/6252434	1 W 95 - 125 MHz	095-1
11OS/1185422	1 W 110 - 160 MHz	110-1
11OAD/1162960	1 W 150 - 250 MHz	150-1
1OZZ/207786	1 W 200 - 300 MHz	200-1
1OS/2690868	1 W 275 - 450 MHz	275-1
6625-00-502745	1 W 950 - 1260 MHz	1J
1OS/2690869	2.5 W 95 - 150 MHz	095-2
11OAD/1162961	2.5 W 150 - 250 MHz	150-2
1OZZ/210897	2.5 W 250 - 450 MHz	250-2
1OZZ/207859	2.5 W 950 - 1260 MHz	2.5J
1OZZ/207052	2.5 W 1100 - 1800 MHz	2.5K
11OAD/6252432	5 W 50 - 125 MHz	5B
1OZZ/210175	5 W 100 - 250 MHz	5C
11OAE/1161947	5 W 200 - 500 MHz	5D
6625-00-5027431	5 W 950 - 1260 MHz	5J
1OZZ/207053	5 W 1100 - 1800 MHz	5K
1OZZ/207587	10 W 25 - 60 MHz	10A
11OS/6403544	10 W 50 - 125 MHz	10B
11OB/4768400	10 W 100 - 250 MHz	10C
11OS/9135175	10 W 200 - 500 MHz	10D
1OZZ/206214	10 W 400 - 1000 MHz	10E
11OB/5439481	25 W 25 - 60 MHz	25A
11OB/6105791	25 W 50 - 125 MHz	25B
11OAE/9808255	25 W 100 - 250 MHz	25C
11OAD/1163466	25 W 200 - 500 MHz	25D
11OB/9456092	50 W 2 - 30 MHz	50H
11OAD/6252433	50 W 50 - 125 MHz	50B
1OZZ/206842	50 W 100 - 250 MHz	50C

Section Reference 110S/6625-00-6495070		Nomenclature WATTMETER DIRECTIONAL RF.		
Manufacturer BIRD		Part No. 43		Cost/Date £90.00 1978
Height 17.4 cm	Width 13.4 cm	Depth 9.6 cm	Weight 2.25 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/24	AFDEBTEC/AFDSEC No. 11716



1 Description

The model 43 Thruline Wattmeter is an insertion type RF wattmeter, designed to measure power flow and load match in 50Ω coaxial transmission lines. It is intended for use on CW, AM, FM and TV modulation envelopes, but not pulsed modes.

The power ranges used are determined by the plug in element used (see attached list).

2 Specification

Meter Ranges: 0-25 W, 0-50 W, and 0-100 W
Direct full scale reading, 1 W to 10,000 W
by means of plug in units/element

Accuracy: 5% of full scale

Insertion VSWR: 1.05 maximum

Connectors: 2 female type N

Plug-in elements: See List in Para. 4. Special elements outside these ranges are available on request.

Terminations: Where a thru-line measurement is not possible, a dummy load is required. See list in Para. 5. Special loads outside the ranges are available on request.

Note ...

For modulated and SSB signals the Bird 43 is not suitable, the Bird 4311 should be used - elements and loads as for Bird 43.

3 Comprising

Instrument
Case

4 Accessory Items

<u>Sect/Ref No</u>	<u>Description</u>	<u>Part No</u>
1OZZ/209259	100 mW 72 - 76 MHz	432-2
1OZZ/209257	100 mW 328 - 336 MHz	430-3
1OZZ/210896	100 mW 400 MHz	430-7
1OZZ/207923	250 mW 72 - 76 MHz	430-22
1OZZ/209260	250 mW 328 - 336 MHz	430-16
1OZZ/209258	500 mW 105 - 120 MHz	430-26
1OAD/6255468	1 W 60 - 80 MHz	060-1
1OAD/6255469	1 W 80 - 95 MHz	080-1
11OAD/6252434	1 W 95 - 125 MHz	095-1
11OS/1185422	1 W 110 - 160 MHz	110-1
11OAD/1162960	1 W 150 - 250 MHz	150-1
1OZZ/207786	1 W 200 - 300 MHz	200-1
1OS/2690868	1 W 275 - 450 MHz	275-1
6625-00-502745	1 W 950 - 1260 MHz	1J
1OS/2690869	2.5 W 95 - 150 MHz	095-2
11OAD/1162961	2.5 W 150 - 250 MHz	150-2
1OZZ/210897	2.5 W 250 - 450 MHz	250-2
1OZZ/207859	2.5 W 950 - 1260 MHz	2.5J
1OZZ/207052	2.5 W 1100 - 1800 MHz	2.5K
11OAD/6252432	5 W 50 - 125 MHz	5B
1OZZ/210175	5 W 100 - 250 MHz	5C
11OAE/1161947	5 W 200 - 500 MHz	5D
6625-00-5027431	5 W 950 - 1260 MHz	5J
1OZZ/207053	5 W 1100 - 1800 MHz	5K
1OZZ/207587	10 W 25 - 60 MHz	10A
11OS/6403544	10 W 50 - 125 MHz	10B
11OB/4768400	10 W 100 - 250 MHz	10C
11OS/9135175	10 W 200 - 500 MHz	10D
1OZZ/206214	10 W 400 - 1000 MHz	10E
11OB/5439481	25 W 25 - 60 MHz	25A
11OB/6105791	25 W 50 - 125 MHz	25B
11OAE/9808255	25 W 100 - 250 MHz	25C
11OAD/1163466	25 W 200 - 500 MHz	25D
11OB/9456092	50 W 2 - 30 MHz	50H
11OAD/6252433	50 W 50 - 125 MHz	50B
1OZZ/206842	50 W 100 - 250 MHz	50C

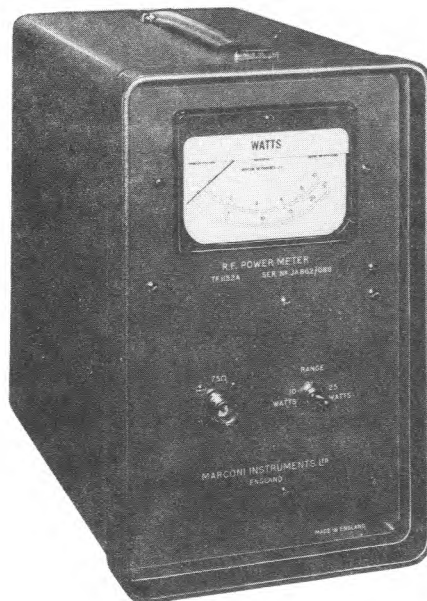
<u>Sect/Ref No</u>	<u>Description</u>	<u>Part No</u>
110AD/3077124	50 W 200 - 500 MHz	50D
10ZZ/210010	50 W 950 - 1260 MHz	50J
110AD/5238439	100 W 2 - 30 MHz	100H
10S/5317066	100 W 50 - 125 MHz	100B
10ZZ/210444	100 W 100 - 250 MHz	100C
6625-00-6780464	100 W 200 - 500 MHz	100D
10ZZ/206277	100 W 400 - 1000 MHz	100E
110B/9542784	250 W 2 - 30 MHz	250H
110AE/8684638	250 W 100 - 250 MHz	250C
10S/5317067	250 W 200 - 500 MHz	250D
110B/8684635	500 W 2 - 30 MHz	500H
110S/9823930	500 W 400 - 1000 MHz	500E
10ZZ/210011	500 W 950 - 1260 MHz	500J
110B/9542785	1000 W 2 - 30 MHz	1000H
10ZZ/206278	1000 W 400 - 1000 MHz	1000E
10S/4709648	2500 W 2 - 30 MHz	2500H
10ZZ/204480	2500 W 200 - 500 MHz	2500D
5840-99-6270325	2500 W 950 - 1260 MHz	2500J
10S/4709649	5000 W 2 - 30 MHz	5000H

5 Associated Equipment

Termaline Loads:

<u>Sect/Ref No</u>	<u>Description</u>	<u>Part No</u>
10ZZ/207924	5 W	80F
110S/5985-00-5199063	5 W	80M
110S/5985-00-7684069	10 W	8053
110S/5985-00-9462163	25 W	8080
10B/5905-99-6500873	25 W	8340 200
10B/5905-99-6500874	40 W	8341 030
6625-99-1163534	50 W	8085
10S/5985-00-9735833	50 W	8130
10ZZ/206232	100 W	8160
10ZZ/206893	100 W	8164
10B/5905-99-6500872	100 W	8323
110S/6625-00-7737311	150 W	8135
10ZZ/205090	500 W	8325
110S/6625-00-9301810	500 W	82A
110AD/6273456	1000 W	8251
10S/6625-99-4709647	2500/5000 W	8890
10ZZ/204236	10 000 W	8732
10ZZ/204237	10 000 W	8736

Section Reference 10S/6625-99-1019916		Nomenclature WATTMETER ABSORPTION CT.418		
Manufacturer MARCONI		Part No. TF 1152A		Cost/Date £450.00 1977
Height 30.0 cm	Width 16.0 cm	Depth 30.0 cm	Weight 2.3 kg	
Power Supplies -			Air Publication 117B-0403-1	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEEC/AFDSEC No. 11733



1 Description

A portable meter measuring from 0.5 to 25 W at any frequency up to 500 MHz in 75Ω systems

2 Specification

Power Range: 0.5 to 10 W and 5 to 25 W

Frequency Range: DC to 250 MHz within 5% of full scale
250 MHz to 500 MHz within 10% of full scale

VSWR: Better than 1.2 from dc to 500 MHz

3 Comprising

Instrument only.

4 Accessory Items

Co-axial plugs, type N for RF input socket.

5 Associated Equipment

None.

Section Reference 10S/6625-99-6641965		Nomenclature WATTMETER ELECTRONIC		
Manufacturer FEEDBACK INSTRUMENTS LTD.		Part No. EW 604		Cost/Date £205 10/81
Height 10.5 cm	Width 30 cm	Depth 22.5 cm	Weight 1.9 kg	
Power Supplies 200/250 V or 100/125 V, 50 - 60 Hz			Air Publication ----	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19156



1. Description

The Electronic Wattmeter EW 604 is a wide range wattmeter that is exceptionally robust and easy to use. It provides power measurement of any waveform with a power factor in the range 0.25 W to 10 kW. The frequency range covered is from d.c. to 20 KHz.

The wattmeter terminals are arranged as two pairs marked 'SUPPLY' and 'LOAD' to facilitate correct connections. The output is displayed on a moving-coil meter calibrated in watts and mounted on the front panel.

Separate warning lights are provided on the voltage and current inputs to indicate when an overload might affect the reading accuracy. Additional precautions are taken to prevent damage to the instrument in the event of gross overload of current or voltage.

Pushbuttons enable the meter deflections to be reversed to measure reverse power flows and also to increase the meter sensitivity by X2 to improve readability of small deflections.

2. Specification

Three-terminal wattmeter (1 terminal common to voltage and current ranges) connected to four front panel binding posts of which two are for connection to the 'SUPPLY' and two for connection to the 'LOAD'.

Power Ranges:	250 mW to 10 kW fsd
Voltage Ranges:	Nominal 5, 10, 20, 50, 100, 200, 500 and 1000 Volts. Not more than 1.5 kV peak should be applied between the upper pair of terminals and either ground or the lower terminals. The latter must not exceed 400 V peak to ground.
Current Ranges:	Nominal 50, 100, 200, 500 mA, 1, 2, 5 and 10 A.
Overload Indication:	Input peaks of voltage or current in excess of 1.5 X the nominal range can cause overload which is clearly indicated by the appropriate voltage or current overload lamp.
Overload Protection:	All current circuits are protected by a 10 A, slow-blow, $\frac{1}{4}$ " x $1\frac{1}{4}$ " fuse mounted on the rear panel. The circuit is designed to withstand the transients associated with normal rupturing of this fuse on all current ranges. The voltage circuit will withstand the nominal 250 V a.c. supply indefinitely on any range.
Frequency Range:	D.C. to 20 KHz
Burden:	All voltage ranges; $5\text{ k}\Omega/\text{Volt}$. All current ranges less than 60 m Ω .
Indication:	$3\frac{1}{4}$ " mirror scale graduated 0 to 1.0 in 50 divisions. Pushbutton to give X2 scale expansion and pushbutton motor reversal.
Accuracy:	All figures are at 50 Hz, unity power factor, 25°C. Typically better than 1.5% of fsd measured on 100 V and 0.5 A range at 20, 40, 60, 80 and 100% of fsd with a 200 Ω load (guaranteed better than 2.5% of fsd). Better than 2% of fsd for all combinations of 0.25 A, 0.5 A, 0.75 A and 1 A with 25 V, 50 V, 75 V and 100 V applied to the 1 A and 100 V ranges.

2. Specification (Cont)

Range-to-range Accuracy: Errors in the current and voltage range multipliers contribute a combined error to power indication that is typically less than 1% of reading (guaranteed less than 2.3% of reading).

Power Requirements: Line voltage: 200/250 V or 100/125 V
rms, 50 - 60 Hz
Consumption: 4 VA
Fuse: 315 mA slow blow (20 mm x 5 mm).

3. Comprising

Instrument and mains lead combined.

4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/7600677		Nomenclature DIRECTIONAL POWER METER		
Manufacturer FARNELL		Part No. TM10		Cost/Date £820 5/82
Height 85 mm	Width 220 mm	Depth 160 mm	Weight 2.3 kg	
Power Supplies Battery dry PP9 (5J/9456814) or external dc input 6.6 V to 15 V via 2.5 mm jack socket				Air Publication -
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration -	AFDEETEC/AFDSEC No. 19246

This instrument replaces Power Meter Set 6625-99-6402159



1 Description

The Farnell TM10 directional power meter is a fully portable instrument complete with carrying case. The instrument measures forward or reflected power and is a 'thru-line' type and not an absorption type power meter.

2 Specification

Frequency range:	25 MHz to 1 GHz
Forward/reflected power range:	20 mW to 100 W in three ranges: 1 W (+30 dBm), 10 W (+40 dBm) and 100 W (+50 dBm) fsd
Characteristic impedance:	50 Ω
Forward/reflected power accuracy:	$\pm 3\%$ of reading $\pm 2\%$ of fsd 25 MHz to 500 MHz $\pm 10\%$ of reading $\pm 5\%$ of fsd 500 MHz to 1 GHz

VSWR accuracy:	± 10% 25 MHz to 500 Mhz ± 20% 500 MHz to 1 GHz
VSWR range:	1.0 to 3.0
Temperature range:	0°C to 50°C operating -25°C to +75°C storage
Function selection:	Two front panel pushbuttons
Range selection:	Two front panel pushbuttons
RF detector head:	Separate head incorporates two N-type connectors and a 1.5 m length cable with locking plug for connection to meter assembly
Detector head insertion loss:	0.5 dB maximum
Battery condition indicator:	Indicates low battery voltage when unit switched on. Indicates battery life by delayed flash when unit switched off.
Battery life:	1000 hours (gives 1 year's use at 4 hours per working day)

3 Comprising

NYR instrument
NYR RF detector head

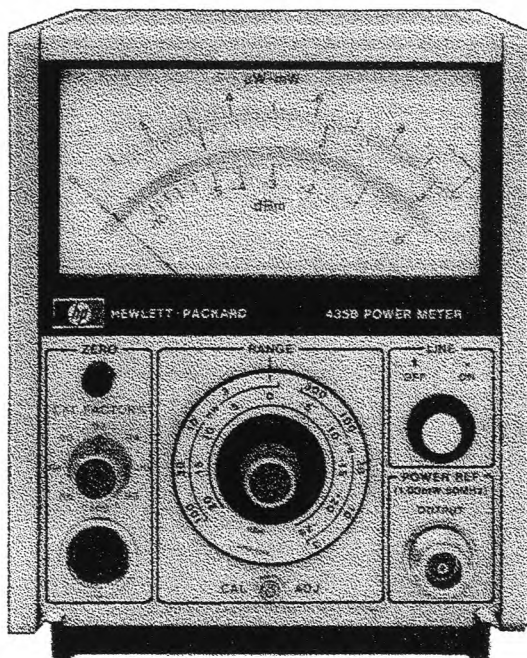
4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference: 10S/2809266		Nomenclature: RF POWER METER SET		
Manufacturer: HEWLETT PACKARD		Part No: 435B OPT. C51		Cost/Date: £800 1982
Height: 15.5 cm	Width: 13.0 cm	Depth: 27.9 cm	Weight: 2.6 kg	
Power Supplies: 100 - 120 V/220 - 240 V; 48 - 440 Hz			Air Publication: 117B-0204-0	
Availability: 2	Environment: B	Maintenance Policy: B2/D4	Calibration: AH 18	AFDEETEC No: 19192



1. Description

The HP435B is an analogue power meter compatible with the entire range of 8480 series of power sensors (Chap 1.1.4). Depending upon which sensor is used, power can be measured from -65 dBm to +45 dBm full scale, in the frequency range 100 kHz to 26.5 GHz. This instrument features a less than 1% uncertainty, low noise and drift, auto zero and recorder output.

2. Specification

For over-all specification with a specific power sensor, cross refer to the table in Chapter 1.1.4 (8480 Thermocouple Power Sensors).

Accuracy:

Instrumentation:	± 1% fsd on all ranges
Zero:	Automatic - operated by front panel switch
Zero set:	± 0.5% fsd on most sensitive range (typical)
Zero carryover:	± 0.5% fsd when zeroed on most sensitive range

2. Specification (continued)

Power reference: Internal 50 MHz oscillator with Type N-female connector on front panel

Power level: 1.00 mW

Power accuracy: 0.7%

Cal. factor adjustment: 16-position switch on meter
85 - 100% in 1% steps

Recorder output: 0 - +1 V, 1 k Ω BNC connector

Cal. adjust: Adjust gain of meter to match power in use.

3. Comprising

NYR	Instrument	
10S/6207364	Mains cable	Pt. No. 8120-1378
10S/6402161	Power sensor cable (5 ft)	Pt. No. 00435-60011
5995-01-0943303	Power sensor cable (10 ft)	Pt. No. 8120-2264

4. Accessory Items

10S/6402162	Carrying case	Pt. No. 11076A
10S/6402163	Power sensor	Pt. No. 8481A
10S/6402165	Power sensor	Pt. No. 8481A-001
10S/0154412	Power sensor	Pt. No. 8482A
10S/0282882	Power sensor	Pt. No. 8484A
10S/6574821	Power sensor	Pt. No. 8482H

5. Associated Equipment

None

Section Reference 10S/7477729		Nomenclature LASER ENERGY METER F Mk 2		
Manufacturer G.E.C.		Part No. A79-600		Cost/Date -
Height -	Width -	Depth -	Weight -	
Power Supplies 240 V, 50-60 Hz			Air Publication -	
Availability 2	Environment 6	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19195

- 1 Data to be issued later. This instrument replaces the Laser Meter F Series - 5860-99-6480787, Part No A77/497.

Section Reference 10S/2297429		Nomenclature RADIATION HAZARD MONITOR		
Manufacturer GENERAL MICROWAVE		Part No. RAHAM 4A		Cost/Date £2490/1986
Height 498mm	Width 64mm	Depth 41mm	Weight 1.47 kg	
Power Supplies INTERNAL BATTERY, MALLORY TYPE TR133 (2 off)			6135-99-9232492 Air Publication 117G-0903-1	
Availability 2	Environment B	Maintenance Policy 4BCD	Calibration A6/12	AFDEETEC/AFDSEC No. 19375



1. Description

The RAHAM 4A is a portable, battery operated instrument, used for detecting and measuring potentially hazardous electromagnetic radiation from rf and microwave sources. It operates in the range 200 kHz to 26 GHz and uses a single probe giving isotropic response (ie, it detects radiation from all directions except from or through the handle).

2. Specification

Frequency Range

200 kHz to 26 GHz

Power Density Ranges

43 dB dynamic range. Four ranges with full scale readings of 0.02 mW/cm^2 ,

Specification (continued)

Power density ranges (cont.)	0.2 mW/cm ² , 2 mW/cm ² and 20mW/cm ² . Sensitivity on lowest range extends from 1 μW/cm ²
Frequency Sensitivity	±2 dB
Calibration accuracy	±0.5 dB
Average Power Overload	0.5 W/cm ²
Peak Power Overload	30 W/cm ²
Pulse Energy Density Overload	150 W-μsec/cm ²
Isotropy	Response varies ±0.5 dB (Max) for energy incident from any direction except from/through the handle
Noise	Less than 3% peak-to-peak on most sensitive range
Response time	1.5 seconds (approx.)
Battery operation	900 hours (expendable)
Recorder output	0.124 V full scale into a nominal resistance of 100 kohms
Operating Temperature Range	0° C to +50° C

3 Comprising

Meter	Model 484
Probe	Model 84B
Check source	10 GHz
Cable extension	
Mating Plug, Recorder Carry Case	

4 Accessory Items

None

5 Associated Equipment

None

Section Reference See text		Nomenclature PERSONAL RF RADIATION MONITORS		
Manufacturer LORAL NARDA		Part No. 8841C series	Cost/Date £314/MAY 92	
Height 97 mm	Width 70 mm	Depth 27 mm	Weight 90 g	
Power Supplies 1 X 12 V Dry battery 2 X 1.5 V Button cells		Air Publication N/A		
Availability CLASS 1	Environment C	Maintenance Policy 4 C/D	Calibration 12 month	AFDEETEC No. See text



1. Description

The Narda 8841C series of radiation monitors provide personnel wearing them with an audio/visual warning that they have been irradiated by some form of RF energy in the range 1 GHz to 18 GHz. They are designed for use in areas where personnel are likely to be exposed to such hazards i.e. ground radar sites, flight lines and radar maintenance workshops. They are however, only warning devices and quantitative measurements should only be taken using proprietary survey metering instruments. The visual alarm will latch in the live state until reset. Indications are given of unit failure and low battery state. Each instrument comes complete with a carrying case and an acoustic earpiece assembly for use in high noise environments. Two models are available, with different detection levels as follows:

<u>Section Reference</u>	<u>Detection level</u>	<u>Part No</u>	<u>AFDEETEC No</u>
10S/6625-99-4622240	1 mW/cm ²	8841C-01S	19478
10S/6625-99-7293443	5 mW/cm ²	8841C-05S	19479

2. Specification

Frequency range:	1 - 18 GHz.
Directional sensitivity:	>120 degrees for all polarisations.
Alarm level:	8841C-01.....1 mW/cm ² . 8841C-05.....5 mW/cm ² .
Average power overload:	600 mW/cm ² .
Peak power overload:	200 W/cm ² .
Battery life:	30 days. (Main battery)

3. Comprising Times

RF monitor:	10S/7012887	1 mW/cm ²
	10S/1100115	5 mW/cm ²
Earpiece assembly set:	10S/7293439	
Case:	10S/8031405	
Battery, alkaline:	TBN	
Battery, button cell:	TBN	

4. Accessory Items

Earpiece set:	10S/7293439
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5. Associated Items

None.

Chapter 2

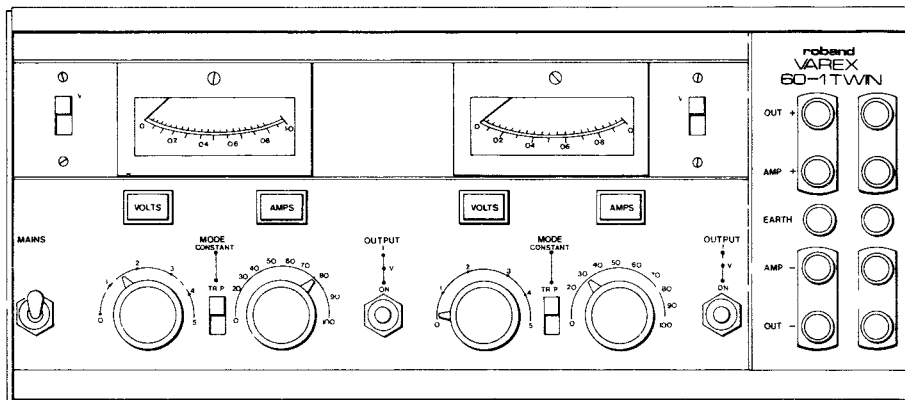
POWER SUPPLIES

Chapter 2POWER SUPPLIES

CONTENTS

Chap		Sect/Ref/Stock No.	Manf/Part No.
2.1	POWER SUPPLIES		
2.1.1	Power Supply	6130-99-0014107	Roband VAREX T60-1
.2	Bench Power Supplies	See text	Farnell L Series
.3	Bench Power Supplies Set	6625-99-6458996	Farnell TSV 70
.4	Power Supplies Stabilised	See text	Farnell B30 range
▶ .5	DC Power Supply/Amplifier	10S/4415845	Hewlett Packard 6826A ◀
.6	To be issued later		
.7	To be issued later		
.8	AC Voltage Injection	6C/1934586	Smiths 1212/ITE
.9	Precision Voltage Source	6625-99-1142230	Fluke 415B
.10	Power Supply	6625-99-1141758	Thorn Automation PS5040
2.2	CURRENT/VOLTAGE CALIBRATORS		
2.2.1	DC Current Meter	6625-99-6480793	Time Electronics 505
.2	Voltage Calibrator	6625-99-6475587	Time Electronics 2003N
.3	Voltage Calibrator	6625-99-5370037	Time Electronics 2003S
.4	Calibrator AC Precision	6625-99-6331601	Fluke 5200A
.5	Amplifier, Precision Power	6625-99-6331602	Fluke 5205A
▶ .6	DC Voltage Standard	10S/3615246	Fluke 335D ◀
.7	Meter Calibrator	10S/7648293	Fluke 5100
▶ .7a	Transconductance Amplifier	10S/7283884	Fluke 5220A
.8	Millivolt Source	10S/0831171	Time Electronics 404S ◀
.9	Thermal Transfer Standard	10S/2880184	Fluke 540B
.10	Electronic Load	5P/7825113	Amplicon EL 750 B-K

Section Reference 10K/6130-99-0014107		Nomenclature POWER SUPPLY		
Manufacturer ROBAND		Part No. ▶ VAREX T60-1 ◀		Cost/Date £232.00 1977
Height 14.29 cm	Width 31.75 cm	Depth 30.16 cm	Weight 8.3 kg	
Power Supplies 100-125/200-250 V; 48-100 Hz				Air Publication None
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDDETEC/AFDSEC No. 11096



1 Description

This is a twin power supply with the facility for doubling the current or voltage rating by operating the outputs in parallel or series. It can be operated in 3 modes - constant voltage - constant current and re-entrant current. A manually operated front panel switch selects either the constant current or re-entrant current mode. Re-entrant current mode provides over-current protection, safeguarding external loads against fault condition by reducing to a low current in 3 μ s. It is superior to constant current protection which maintains high energy levels during fault conditions. The point of current trip is adjusted by continuously variable coarse and fine controls and indicated (in the preset position) on the ammeter. Once set, the trip point is constant and independent of the voltage. Both the voltage and current is manually adjusted by continuously variable coarse and fine controls. Remote programming over the entire range of voltage and current is readily available through a rear terminal strip.

2 Specification

Voltage Range:	2 x 0-60 V
Current Range:	2 x 0-1 A
Drift:	±0.005%
Mains Variation Accommodation:	±10% max
Ripple and Noise: (at Max Output)	100 µV peak to peak for voltage. 300 µA peak to peak for current.
Stabilisation Ratio:	10000:1 for voltage; 1000:1 for current
Output Impedance:	Less than 100 mΩ at 100 Hz
Output Conductance:	1/30 000 mho
Ambient Temperature:	-10°C to +50°C
Temperature Coefficient:	0.01% per °C

3 Comprising

Instrument only

4 Accessory items

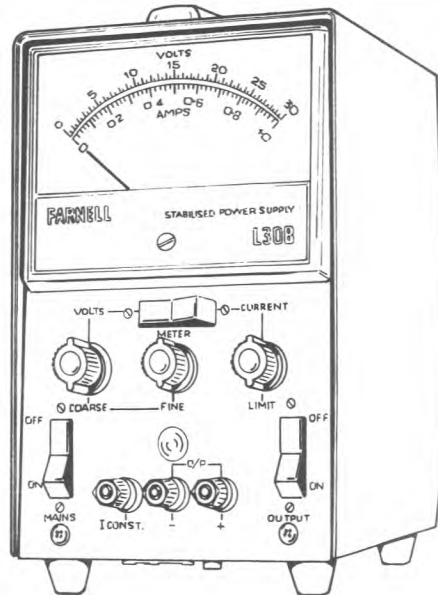
None.

5 Associated equipment

None.

Section Reference †		Nomenclature BENCH POWER SUPPLIES "L" Series		
Manufacturer FARNELL		Part No. †		Cost/Date †
Height †	Width †	Depth †	Weight †	
Power Supplies 105-120/210-240 V; 50-400 Hz			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/SCAN	AFDDETEC †

† see text



1 Description

The units can be operated as either constant voltage or constant current supplies, the mode being selected by a simple link. The continuously variable output level is monitored on a meter which is switched to read either voltage or current.

Protection against overload and accidental short circuit is provided on all units by adjustable current limiting circuitry.

2 Specification

Voltage/Current Range: See Selection Chart (page 3)

Output Voltage Variations:

- | | |
|----------------------------|---|
| (1) 10% mains fluctuations | (a) Less than 0.01% or 1 mV whichever is greatest (short term). |
| | (b) Less than 0.02% or 2 mV whichever is greatest (long term). |

- (2) Zero to full load
- (a) Less than 0.01% or 2 mV whichever is greatest (short term).
- (b) Less than 0.02% or 4 mV whichever is greatest (long term).

Output Current Variations:

- (1) 10% mains fluctuation
- (a) Less than 0.1% or 1 mA whichever is greatest (short term).
- (b) Less than 0.02% or 2 mA whichever is greatest (long term).
- (2) Zero to max resistance change:
- (a) Less than 0.01% short term.
- (b) Less than 0.02% long term.

Ripple Voltage (At full load): Less than 1 mV peak to peak.

Ripple Current (At full load): Less than 1 mA peak to peak.

Output Impedance: 0.1Ω measured at 100 kHz at 20°C.

3 Comprising

Instrument only.

4 Accessory items

None.

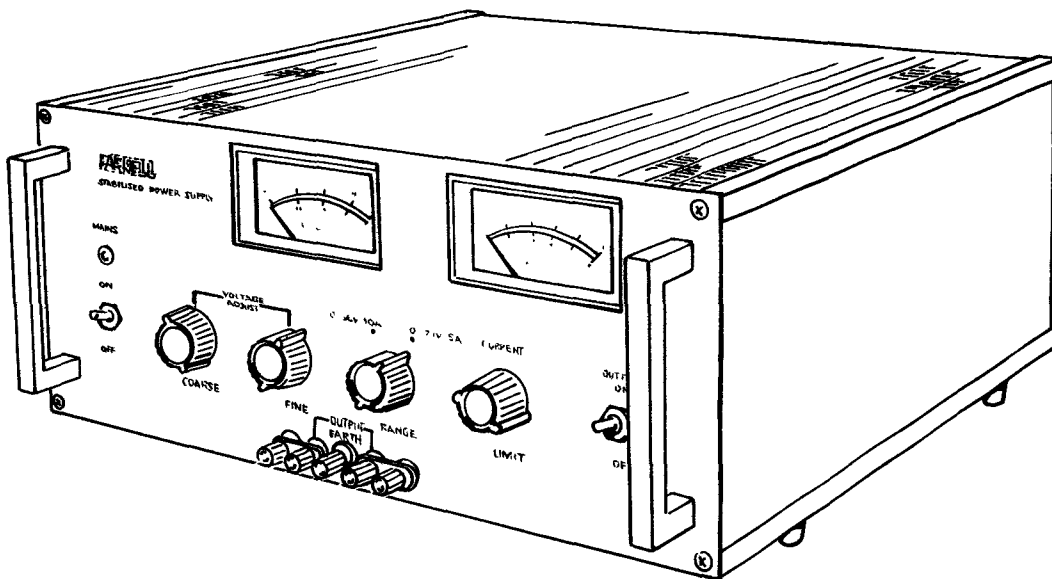
5 Associated equipment

None.

SELECTION CHART

Section/ Reference	Type	DC Output	Height mm	Width mm	Depth mm	Weight kg	Approx Cost	AFDEETEC No
5P/6130-99- 6428099	L30-1	P-30 V, 1A	225	132	205	3.86	£80	18790
5P/6130-99- 6428101	L30-5	0-30 V, 5A	225	228	248	8.06	£179	18793
5P/6130-99- 6428102	LT30-1	0-30 V, 1A	225	255	205	7.26	£158	18795
5P/6130-99- 6428103	LT30-2	0-30 V, 2A	225	255	230	7.71	£208	18794

Section Reference 5P/6625-99-6458996		Nomenclature BENCH POWER SUPPLY SET		
Manufacturer FARNELL		Part No. TSV70 Mk 2	Cost/Date £374.00 1979	
Height 17.78 cm	Width 43.0 cm	Depth 41.0 cm	Weight 26.2 kg	
Power Supplies 105-120 V/210-240 V; 50-60 Hz			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/SCAN	AFDTEPEC/AFDSEC No. 18805



1 Description

The TSV 70 laboratory bench power supply is a source of stabilized d.c. voltage continuously variable over two ranges, 0 to 70 V at 0 to 5 A or 0 to 35 V at 0 to 10 A, selected by a switch.

A switch isolates the output voltage which may be selected by course and fine controls prior to connection to the load. Conversely the load may be disconnected by the same switch without switching off the mains supply. Output voltage and current are monitored independently by dual scale meters.

Remote sensing facilities are provided to ensure optimum performance when supplying distant loads. Overload protection is by adjustable constant current limiting.

2 Specification

Output:	0-70 V at 5 A or 0-35 V at 10 A selected by switch.
Output Impedance:	0.05 Ω to 10 kHz
Line Regulation:	Output change for a $\pm 10\%$ mains change less than 0.01% + 1 mV.
Load Regulation:	Output change for a zero to full load change less than 0.01% + 1 mV
Ripple and Noise:	Content at full load, less than 1 mV peak to peak.
Mains Variation Tolerated:	$\pm 10\%$ of nominal.
Voltage Adjust:	The coarse and fine controls provide continuous adjustment of output voltage from zero to maximum output.
Current Limit Control:	This sets the point of maximum output current and may be adjusted from zero to 5.5 A or 11 A depending on the setting of the 'range' switch

3 Comprising

Instrument only.

4 Accessory items

None.

5 Associated equipment

None.

Section Reference †		Nomenclature POWER SUPPLIES, STABILISED		
Manufacturer FARNELL		Part No. B.30 RANGE		Cost/Date †
Height †	Width †	Depth †	Weight †	
Power Supplies 105-120/210-240 V; 50-400 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFDETEPEC/AFDSEC No. †

† see text



1 Description

These are stabilized d.c. power supplies giving a voltage output of 0-30 V in steps of 6 V with overlapping fine control between each step. Maximum current is available at any voltage setting.

Units may be connected directly in series or parallel to obtain increased voltage or current. Feedback terminals are provided for remote sensing of the voltage at the load so that the effects of resistance in the load connecting leads may be minimized if required.

Electronic current limiting circuitry and input and output fuses protect the unit against overload or accidental short circuits. The limiting circuitry automatically resets itself when the overload is cleared.

► 2 Specification

	B30/10	B30/20
Section Reference	5P/6130-99-9557478	5P/6130-99-6185353
AFDEETEC No	10186	18240
Voltage	0-30 V, fully variable by 5 position switch.	
Current	0-10 A	0-20 A
Height	177 mm	177 mm
Width	160.5 mm	283 mm
Depth	372 mm	406 mm
Line Regulation for a $\pm 10\%$ Mains change	Less than 0.01% +2 mV	
Load Regulation for a 0-Full Load change	Less than 0.01% +2 mV	
Ripple and Noise	Less than 1 mV p-p, at full load	
Output Impedance	0.1 Ω at 100 kHz and 20 ^o C	
Overload Protection	Constant current limiting on lowest range. Re-entrant to 10% of I max on other ranges. Input and Output fuses.	
Mains Variation Tolerated	$\pm 10\%$	
Cost	£198 (1979)	£360 (1979)

3 Comprising

Instrument only.

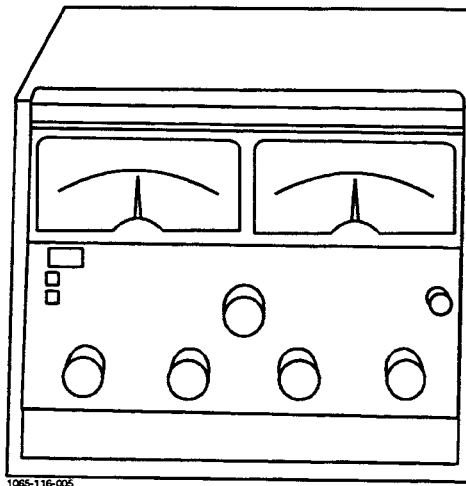
4 Accessory items

None.

5 Associated Equipment

None.

Section Reference: 10S/4415845		Nomenclature: DC POWER SUPPLY/AMPLIFIER		
Manufacturer: HEWLETT PACKARD		Part No: 6826A		Cost/Date: £1665 1986
Height: 155 mm	Width: 198 mm	Depth: 316 mm	Weight: 8.2 kg	
Power Supplies: 100,120,220 OR 240V AC, -13% +6%, 48-63Hz			Air Publication:	
Availability: 2	Environment: B	Maintenance Policy: 4BCD	Calibration: TBA	AFDEETEC No: 19372



1065-116-005

1. Description

The 6826A is a general purpose instrument which can be operated in one of two basic modes, power supply or amplifier. It features dual range output and constant voltage/constant current operation. Output voltage and current as a DC supply, or gain as a power amplifier are available.

Used as a DC power supply, the unit can provide a bipolar, constant voltage or constant - current output. It can be used as a current sink or source thus permitting it to serve as a variable load device.

Used as a direct coupled power amplifier, the unit offers a signal-to-noise ratio of approximately 80 dB at full output with low distortion and a frequency response up to 40 kHz in the fixed gain mode.

2. Specification

DC output:	-5 V to +5 V	0 - 1.0A
	-50 V to +50 V	0 - 1.0A

Specification (continued)

Power Supply Performance

PARD (rms/p-p)

Voltage	6/35 mV
Current	0.8/5 mA

Transient Recovery

Time	100 μ s
Level	50 mV

Resolution

Voltage	100 mV
Current	3 mA

Power Amplifier Performance

Voltage Gain	Fixed 1X	:	Variable 0-2X
	Fixed 10X	:	Variable 0-20X

Frequency Response +1, -3 dB

Fixed Gain	dc - 40 kHz
Variable Gain	dc - 15 kHz

Distortion at full output

100 Hz	0.1% THD
10 kHz	0.5%

3. Comprising Items

Instrument
Mains lead
Handbook

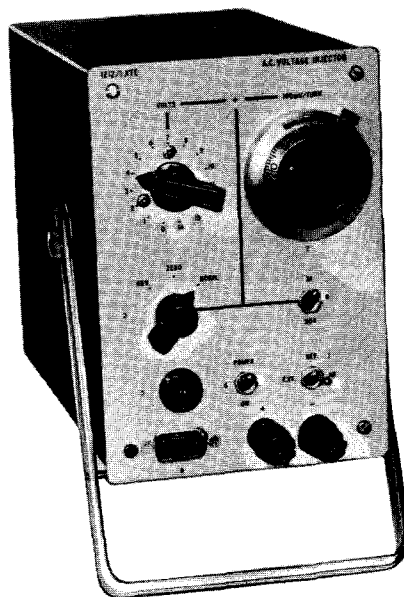
4. Accessory Items

10ZZ/211845 Adaptor Frame Pt No 5060-8762
(Allows two 6826A's to be rack-mounted)

5. Associated Equipment

None

Section Reference 6C/1934586		Nomenclature A.C. VOLTAGE INJECTOR		
Manufacturer SMITHS		Part No. 1212/ITE		Cost/Date £698.00 1976
Height 14.9 cm	Width 10.8 cm	Depth 24.1 cm	Weight 2.7 kg	
Power Supplies 115/200 V; 400 Hz			Air Publication 112T-01427-1	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDRETEC/AFDSEC No. 10690



1 Description

This is a compact bench instrument providing a continuously variable 400 Hz output between zero and 15 V rms. The output voltage is in phase with the mains supply and is proportional to the mains voltage, the output being at the nominal voltage when the mains supply is at the nominal voltage.

The instrument is intended for general gain testing, on units having 400 Hz a.c. voltage inputs, in conjunction with output measuring devices whose readings are expressed as a ratio of the reference phase voltage.

2 Specification

- Ranges: 0-1 V continuously variable and 0-14 V in 1 V steps. These outputs are additive and subject to a $\times 1$ or $\times 0.1$ ranging switch. ◀
- Accuracy: 0-100 mV ± 2 mV
 100 mV - 1.5 V $\pm 0.2\%$ of reading ± 0.2 mV
 1.5 V - 15 V $\pm 0.1\%$ of reading ± 2 mV
- Output Impedance: 0-1.5 V output Z less than 1Ω .
 1.5 V - 15 V output Z less than 10Ω ◀

3 Comprising

Instrument only

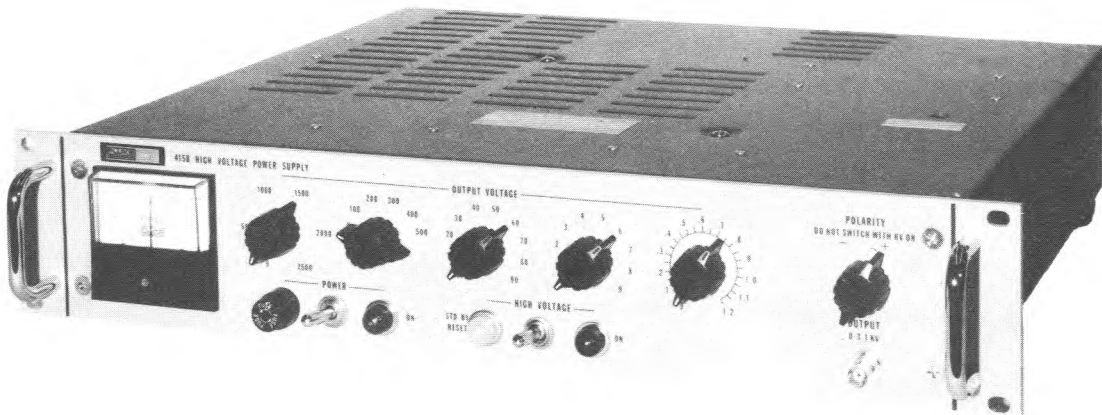
4 Accessory items

None

5 Associated equipment

None

Section Reference 1OK/6625-99-1142230		Nomenclature PRECISION VOLTAGE SOURCE		
Manufacturer FLUKE		Part No. 415B		Cost/Date £945 JAN 1980
Height 8.9 cm	Width 48.2 cm	Depth 38.1 cm	Weight 13.64 kg	
Power Supplies 115/230 V ac \pm 10%; 50-60 Hz			Air Publication	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 18967



1 Description

The 415B is an extremely stable, high voltage dc source. The output voltage level is controlled by five rotary switches on the front panel which give a range from 0-3100 V with 5 mV resolution. The voltage polarity is controlled by a switch on the front panel which provides either a positive or negative grounded output. The instrument is protected against over-current conditions and the maximum current that can be drawn is 30 mA.

2 Specification

Voltage Output:	Continuously variable between 0 and 3100 V dc
Line Regulation:	For 10% fluctuation of supply voltage, \pm 0.005% or 2 mV, whichever is the greater.
Load Regulation	Zero to full load, \pm 0.005% or 5 mV, whichever is the greater.
Maximum Current:	30 mA (Current trip adjustable 5 to 40 mA)
Ripple:	1 mV p-p
Resolution:	5 mV

▶ 3 Comprising

Instrument only

4 Accessory items

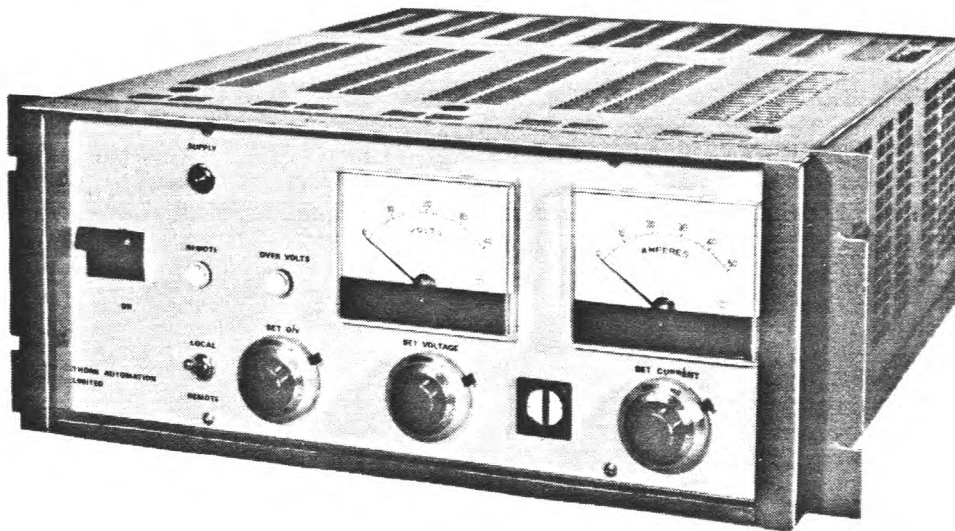
None.

5 Associated equipment

None.



Section Reference 5P/6625-99-1141758		Nomenclature POWER SUPPLY		
Manufacturer THORN AUTOMATION		Part No. PS 5040		Cost/Date £3050 DEC 1979
Height 17.8 cm	Width 48.2 cm	Depth 47.0 cm	Weight 52.5 kg	
Power Supplies 220 V \pm 10% ac or 240 V \pm 10% ac; 48 to 60 Hz			Air Publication 116U-0525-1	
Availability 2	Environment B	Maintenance Policy B2/DF	Calibration A/SCAN	AFDETEC/AFDSEC No. 18818



1 Description

The PS 5040 is designed for test system and general laboratory applications. The unit can be operated in either the Constant Voltage (CV) mode or Constant Current (CC) mode, overvoltage protection is available in both modes. The voltage, current and overvoltage requirements are set locally by individual turn counting controls on the front panel, or by remote programming via a connector at the rear of the unit, the selection being made by the front panel LOCAL/REMOTE switch. A remote sensing facility is provided for control of the set voltage at the user equipment input terminals.

2 Specification

Output Voltage: 0 to 40 V dc fully variable

Output Current: 0 to 50 A fully variable

► Line Regulation: Output change for \pm 10% mains change
0.001% in CV mode
0.02% in CC mode

Load Regulation: 0.015% for a current change of 50 A
0.1% for a voltage change of 40 V

► Ripple and Noise: less than 2 mV p-p in CV mode
(at full load) 20mA p-p in CC mode

Remote Programming:
(Selected by Local/Remote switch) CV mode 200 Ω /V
Overvoltage 200 Ω /V
CC mode 10 Ω /A

Overvoltage Protection: 0 to 40 V fully variable

Operating Temperature: 0° C to 45° C

3 Comprising

Instrument only.

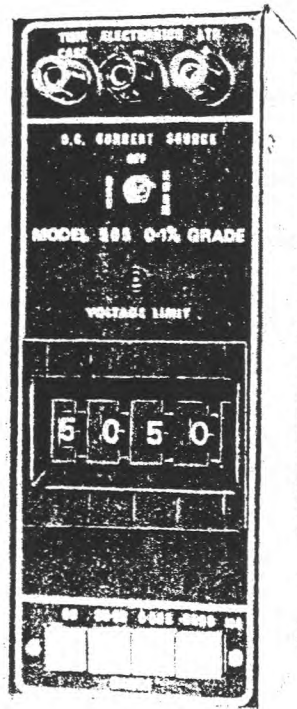
4 Accessory items

<u>Reference No.</u>	<u>Description</u>	<u>Part No.</u>
10H/5935-99-0131553	Socket electrical free (SK1)	508/1/07210/225
10H/5935-99-0148840	Plug electrical free (PL2)	508/1/07231/220
10H/5935-99-1024258	Plug electrical free (PL3)	PT-06E-106P
10H/5935-99-0149512	Accessory set (SK1, PL2)	508/1/03032/1
10H/5935-99-0149514	Accessory set (PL3)	508/1/03033/1

5 Associated Equipment

None. ◀

Section Reference: 10S-6625-99-7826077		Nomenclature: D.C. CURRENT SOURCE		
Manufacturer: TIME ELECTRONICS		Part No: 505N		Cost/Date: £127.00 1978
Height: 11.0 cm	Width: 7.5 cm	Depth: 20.0 cm	Weight: 2.2 kg	
Power Supplies: Rechargeable battery			Air Publication: None	
Availability: 2	Environment: B	Maintenance Policy: B2/D4	Calibration: IAW 100C-50	AFDEETEC No: 18917



1. Description

The 505N is a precision DC source suitable for calibration and test application from micro-amp levels up to 100 mA. The basic reference source is a precision aged diode. A current capability of 100 mA is achieved with long battery life by using nickel cadmium rechargeable cells. One panel indicator shows the state of charge of the batteries and doubles as an 'On-Off' indicator whilst a second indicator provides warning of insufficient output drive voltage.

2. Specification

Output:

- 0-100 mA in 3 ranges
- 0-99.99 mA in 10 μ A steps
- 0-9.999 mA in 1 μ A steps
- 0-999.9 μ A in 0.1 μ A steps

Accuracy: $\pm 0.1\%$ of setting
 $\pm 0.02\%$ of range

Voltage Capability: 10 V

Out of Limit Warning: A front panel indicator provides warning of insufficient drive voltage.

Output Stability: Less than 60 ppm per $^{\circ}\text{C}$ (-10 to 50°C).
Less than 25 ppm per hour at constant temp.

Output Noise: Less than 15 ppm of full scale.

Load Regulation: Better than 20 ppm per volt change in output.

Output Polarity: Positive or negative switch selected with a centre 'Off' position providing an open circuit on output.

Power Supply: Integral nickel cadmium rechargeable battery.

3. Comprising

Instrument carrying case (Vinyl)
Charger constant current type CE.80

4. Accessory Items

None

5. Associated Equipment

1 A output unit NYR

Section Reference 10S/6625-99-6475589		Nomenclature VOLTAGE CALIBRATOR		
Manufacturer TIME ELECTRONICS		Part No. ▶ 2003N OPT 02 PU2 ◀		Cost/Date £360.00 1978
Height 16 cm	Width 21.6 cm	Depth 19.5 cm	Weight 3.32 kg	
Power Supplies 240 V ac 50 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/6	AFDEETEC/AFDSEC No. 18875



1 Description

The 2003N DC Voltage Calibrator is a portable solid-state instrument. It is suitable for applications requiring a precision voltage source of low internal resistance and the addition of a microvolt null balance display enables it to be used for potentiometric voltage measurement in addition to its basic function as a calibrator. The null zero and sensitivity are adjustable via front panel controls. A high performance null amplifier system enables null balance to within 1 microvolt and a current limiter is fitted to protect the instrument.

The 2003N is supplied with a rechargeable power supply containing rechargeable cells and an automatic charger. Mains or battery operation is possible, the power supply automatically switching to battery power when the mains supply is disconnected.

2 Specification

Output:	(0-9.9999 V in 5 ranges) 0-9.9999 V in 100 μ V steps 0-999.99 mV in 10 μ V steps 0-99.999 mV in 1 μ V steps 0-9.9999 mV in 0.1 μ V steps 0-999.99 μ V in 0.01 μ V steps
Accuracy:	
10 V and 1 V ranges:	$\pm 0.02\%$ of setting; $\pm 0.005\%$ of range.
100 mV, 10 mV and 1 mV ranges:	$\pm 0.05\%$ of setting; $\pm 0.005\%$ of range $\pm 0.25 \mu$ V
Output Resistance:	
10 V, 1 V and 100 mV ranges:	Less than 0.1 Ω (typically 0.05 Ω)
10 mV and 1 mV ranges:	1 Ω
Maximum Output Current:	30 mA max. on 10 V, 1 V and 100 mV ranges with an automatic output current limit set at 35 mA.
10 mV and 1 mV ranges:	Up to short circuit value although it should be noted that loads less than 1 k Ω will give greater than 0.1% error. The instrument can withstand a continuous short circuit on the output for all ranges.
Output Voltage Stability:	Less than 30 ppm/ $^{\circ}$ C (0 $^{\circ}$ C to +50 $^{\circ}$ C) Less than 5 ppm/V variation in supply voltage. Less than 75 ppm/year (not cumulative) Less than 10 ppm/hour (short term) at constant temperature.
Output Polarity:	Positive or negative switch selected. A centre 'off' position on this switch provides a short circuit on the output terminals in calibrate mode and open circuit in null mode.
Output Noise Level (0-10 Hz)	
▶ 10.0 to 0.1 V ranges:	Less than 10 ppm of setting $\pm 2 \mu$ V ◀
10 mV, 1 mV ranges:	Less than $\pm 0.05 \mu$ V

Null Detector:

▶ Maximum Sensitivity:	±20 μ V fsd	
Minimum Sensitivity:	±200 mV fsd	
Meter Scale:	20-0-20	
Input resistance:	10 M Ω increasing to 100 M Ω at null balance	◀

3 Comprising

Instrument only

4 Accessory items

None

5 Associated equipment

None

Section Reference 10S/6625-99-5370037		Nomenclature D.C. VOLTAGE CALIBRATOR		
Manufacturer TIME ELECTRONICS		Part No. ▶ 2003S OPT 02 PU2 ◀		Cost/Date £300.00 1978
Height 16.0 cm	Width 21.6 cm	Depth 19.5 cm	Weight 3.32 kg	
Power Supplies 240 V ac with rechargeable batteries			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/6	AFDEETEC/AFDSEC No. 18876



1 Description

The 2003S DC Voltage Calibrator is a portable solid-state instrument suitable for applications requiring a precision voltage source of low internal resistance. A current limiter is fitted to protect the instrument against overloads. The 2003 is supplied complete with a rechargeable power supply containing rechargeable cells and an automatic charger. Mains or battery operation is possible, the power supply automatically switching to battery power when the mains supply is disconnected. Approximately 40 hours of continuous operation is possible from a fully charged set of batteries. The instrument can be used for calibration and measurements normally undertaken with conventional voltage potentiometer. The high stability and low noise levels are particularly advantageous where an extremely stable voltage is required in addition to the normal functions of a precision voltage source.

► 2 Specification

Output:	(0-9.9999 V in 5 ranges) 0-9.9999 V in 100 μ V steps 0-999.99 mV in 10 μ V steps 0-99.999 mV in 1 μ V steps 0-9.9999 mV in 0.1 μ V steps 0-999.99 μ V in 0.01 μ V steps
Accuracy:	
10 V and 1 V ranges	$\pm 0.02\%$ of setting; $\pm 0.005\%$ of range
100 mV, 10 mV and 1 mV ranges	$\pm 0.05\%$ of setting; $\pm 0.005\%$ of range $\pm 0.25 \mu$ V
Output Resistance:	
10 V, 1 V and 100 mV ranges	Less than 0.1 Ω (typically 0.05 Ω)
10 mV and 1 mV ranges:	1 Ω
Maximum Output Current:	30 mA max on 10 V, 1 V and 100 mV ranges with an automatic output current limit set at 35 mA
10 mV and 1 mV ranges:	Up to short circuit value although it should be noted that loads less than 1 k Ω will give greater than 0.1% error. The instrument can withstand a continuous short circuit on the output for all ranges.
Output Voltage Stability:	Less than 30 ppm/ $^{\circ}$ C (0 $^{\circ}$ C to +50 $^{\circ}$ C) Less than 5 ppm per V variation in supply voltage Less than 75 ppm per year (not cumulative) Less than 10 ppm per hour (short term) at constant temperature.
Output Polarity:	Positive or negative switch selected. A centre 'off' position on this switch provides a short circuit on the output terminals in calibrate mode and open circuit in null mode.
Output Noise Level (0-10 Hz):	
10.0 to 0.1 V ranges:	Less than 10 ppm of setting $\pm 2 \mu$ V
10 mV, 1 mV ranges:	Less than $\pm 0.05 \mu$ V

3 Comprising

Instrument only.

4 Accessory items

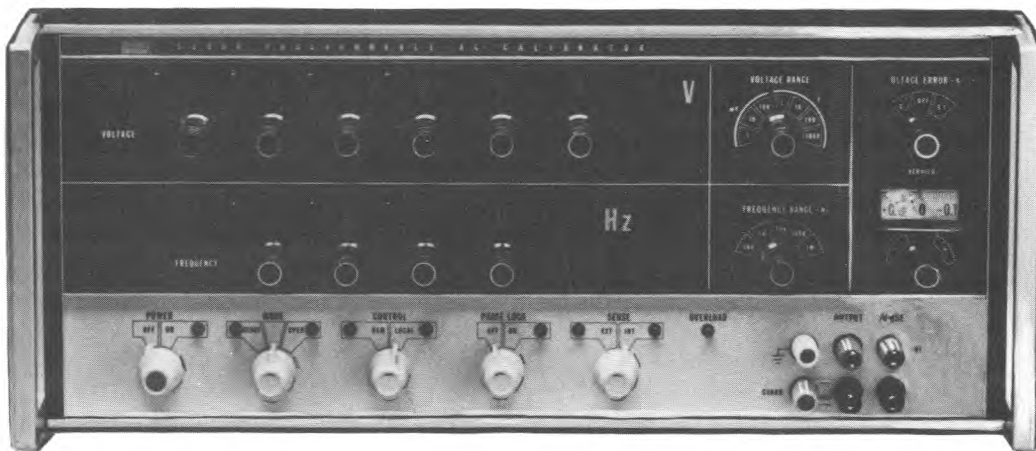
None

5 Associated equipment

None

GPIB
Available

Section Reference 10S/6625-99-6331601		Nomenclature CALIBRATOR. AC PRECISION		
Manufacturer FLUKE		Part No. 5200A		Cost/Date £3995.00 1978
Height 17.8 cm	Width 43.2 cm	Depth 53.3 cm	Weight 24.1 kg	
Power Supplies 100-115 V: 200-230 V: 50-60 Hz				Air Publication NONE
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/6	AFDEPTEC/AFDSEC No. 18858



1 Description

The 5200A AC Calibrator has a voltage range of 100 μ V rms to 120 V rms at currents up to 50 mA. The operational frequency range is 10 Hz to 1.2 MHz. Accurate output amplitude selection is made in six decade ranges of 1 mV to 100 V. (A seventh range of 1000 V is provided by a Precision Power Amplifier Type 5205A, 10S/6331602). The 5200A is fully guarded which allows for floating operation and eliminates the system ground loop problems of non-guarded calibrators.

The oscillator of the 5200A may be phase locked to an external source to effectively produce synchronous signals of precision amplitude and stability. A rear input jack is provided for the external signal and a front panel On-Off switch enables the phase lock function to be selected as required.

A quadrature output which is 90° out of phase with the fundamental is provided on the rear panel. Quadrature signal amplitude is proportional

to the dialed output settings of the fundamental, up to 10 V rms maximum for a full scale setting on any range.

The output of the 5200A is protected by current limiting. When the overload is removed, the output will recover automatically to the preset level.

2 Specification

Voltage:

Voltage Ranges:	1 mV, 10 mV, 100 mV, 1 V, 10 V, 100 V (1000 V with 5205A Power Amp)	
Overrange:	20% on all ranges	
Resolution:	0.001% of range (1 nV on 1 mV range)	
Accuracy:	<u>1, 10, 100 Volt Ranges</u> (X% of setting + Y% of range)	
	10 Hz to 30 Hz	(0.1 + 0.005)
	30 Hz to 20 kHz	(0.02 + 0.002)
	20 kHz to 100 kHz	(0.05 + 0.005)
	100 kHz to 1 MHz	(0.33 + 0.03)
	<u>1, 10, 100 mV Ranges</u> (X% of setting + Y μ V)	
	10 Hz to 30 Hz	(0.1 + 10)
	30 Hz to 20 kHz	(0.02 + 10)
	20 kHz to 100 kHz	(0.05 + 10)
	100 kHz to 1 MHz	(0.33 + 30)

Output Current:

Maximum:	50 mA rms from 10% to 120% of range
Current Limit:	The output is protected against overloads and short circuits by a current limiter.

Frequency:

Frequency Ranges:	100 Hz, 1 kHz, 10 kHz, 100 kHz, 1 MHz
Overrange:	20% on all ranges
Resolution:	0.01% of Range (0.01 Hz on 100 Hz Range)
Accuracy:	100 Hz to 100 kHz Ranges (1.0% setting +0.1% range)
	1 MHz Range (3.0% setting +0.3% range)
Temperature Coefficient:	(0 to 18°C and 28 to 50°C) ±0.025% of setting per °C)

External Frequency Phase Lock Input:

The oscillator of the 5200A has the capability of being phased locked to an external signal. Phase lock accuracy is $\pm(1^\circ + 0.05^\circ \text{ per kHz})$ over $\pm 1\%$ band around the centre frequency

3 Comprising

Instrument only.

4 Accessory items

None

5 Associated equipments

10S/6625-99-6331602 Amplifier, Precision Power Fluke 5205A

GPIB
Fully
Compatible

Section Reference 10S/6625-99-6331602		Nomenclature AMPLIFIER, PRECISION POWER		
Manufacturer FLUKE		Part No. 5205A		Cost/Date £2995.00 1978
Height 26.7 cm	Width 43.2 cm	Depth 62.7 cm	Weight 54.5 kg	
Power Supplies 100-115 V, 200-230 V; 50-60 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/6	AFDEETEC/AFDSEC No. 18857



1 Description

The 5205A Precision Power Amplifier is a d.c. coupled, programmable inverting amplifier with a fixed gain of 100. Designed to extend the range of the Model 5200A AC Calibrator (10S/6331601) to 1200 V rms, the 5205A is also intended to be operated as an independent amplifier for a wide range of waveforms from d.c. to 120 kHz. D.c. output voltages to 1600 V and a.c. output voltages to 1200 V rms can be achieved. The 5205A has an automatic overload recovery circuit which senses and protects the amplifier from any condition which might cause instability or damage.

2 Specification

Calibrator mode

These specifications apply when using the 5205A and its interface cable with the 5200A Calibrator on the 1000 V range.

Range:	100 V to 1099.999 V rms	
Frequency Range:	d.c. to >100 kHz	
Resolution:	1 mV	
Amplitude Accuracy (1000 V Range):		
	% of Setting	% of Range
10 Hz to 30 Hz	0.12	+0.005
30 Hz to 20 kHz	0.04	+0.002
20 kHz to 50 kHz	0.08	+0.005
50 kHz to 100 kHz	0.1	+0.01

Amplifier mode

These specifications apply when using the 5205A as a stand-alone amplifier.

Maximum Output Voltage: ± 1500 V d.c., 1100 V rms.

Frequency Range: d.c. to >100 kHz

Gain: X100

Gain Accuracy:

	Maximum Load	d.c. to 20 kHz	20 kHz to 100 kHz	
▶	500 Ω /100 pF	$\pm 0.05\%$	$\pm 0.02\%$	◀
	5000 Ω /100 pF	$\pm 0.05\%$	$\pm 0.15\%$	
▶	1M Ω /100 pF	$\pm 0.05\%$	$\pm 0.2\%$	◀
	1M Ω /500 pF	$\pm 0.06\%$	$\pm 0.4\%$	
	1M Ω /1000 pF	$\pm 0.08\%$	$\pm 0.8\%$	
▶	1M Ω /1500 pF	$\pm 0.1\%$	$\pm 0.12\%$	◀

Maximum Capacitive Load: 1500 pF

Input Impedance: 10 k Ω < 120 pF

Maximum Input Voltage: 50 V d.c. or rms

Line Regulation: $\pm 0.001\%$ of setting for 10% line change

3 Comprising

Instrument only.

4 Accessory items

None.

5 Associated equipment

10S/6625-99-6331601 Calibrator, AC Precision Fluke 5200A

Section Reference 1OZZ/207353		Nomenclature DC VOLTAGE STANDARD		
Manufacturer FLUKE		Part No. 335D	Cost/Date £6977 1984	
Height 178 mm	Width 482 mm	Depth 457 mm	Weight 23 kg	
Power Supplies 115 V or 230 V ac $\pm 10\%$, 40 to 60 Hz			Air Publication -	
Availability 2	Environment B	Maintenance Policy 2B/4D	Calibration AS/6	AFDEETEC/AFDSEC No. 19333



1. Description

The FLUKE type 335D combines the functions of a precision dc voltage standard with those of a differential voltmeter and high impedance null detector. It provides a 0.1 ppm resolution using seven in-line decade switches.

2. Specification

Voltage ranges:	0 to 11.111110 (1 μ V steps) 0 to 111.111110 (10 μ V steps) 0 to 1111.111110 (100 μ V steps)
Output current:	0 to 50 mA
Accuracy:	10 V range. \pm (0.001% of setting + 10 μ V) 100 V range. \pm (0.001% of setting + 20 μ V) 1000 V range. \pm (0.0015% of setting + 200 μ V)
Stability:	10 V range. \pm (0.0005% of setting + 7 μ V)/ month 100 V and 1000 V range. \pm (0.0005% of setting + 30 μ V)/ month

Chap 2.2.6

2. Specification (continued)

Note: The accuracy and stability are absolute relative to NBS standards, and include effects of stability, line regulation, load regulation, and calibration uncertainties under standard reference conditions of $23^{\circ}\text{C} \pm 1^{\circ}\text{C}$ and up to 70% relative humidity.

Overcurrent protection: Limits current at 1 mA to 60 mA via continuously variable front panel control.

Overvoltage protection: Trips output if voltage level exceeds setting of front panel controls. Continuously variable from 10% to 110% of each range.

Isolation: Either output terminal may be floated up to 100 V dc from chassis ground.

Remote sense: Separate terminals are provided for sensing the output voltage directly at the load.

3. Comprising

Instrument
Power cord
Manual

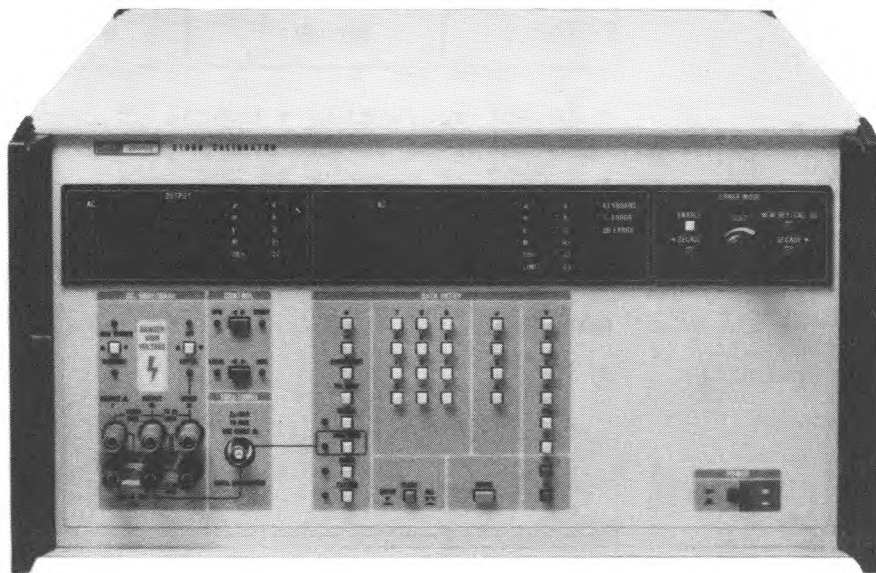
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/7648293		Nomenclature METER CALIBRATOR		
Manufacturer FLUKE		Part No. 5100B		Cost/Date £8385 1984
Height 222 mm	Width 603 mm	Depth 432 mm	Weight 30.4 kg	
Power Supplies 100/110/115/120/200/220/230 or 240 V ac \pm 10%, 50 to 60 Hz				Air Publication -
Availability 2	Environment B	Maintenance Policy 2B/4D	Calibration AH/6	AFDEETEC/AFDSEC No. 19332



1. Description

The 5100B meter calibrator is used to calibrate precision meters that measure ac or dc voltage, ac or dc current, and/or resistance. All data is entered via a calculator-type keyboard. The 5100B performs the mathematical computations associated with calculating the error of the unit-under-test (UUT), in % or dB. It then indicates to the operator whether the UUT has passed or failed, according to its specified accuracy and the magnitude of the error. All service instruments are supplied with option 05 (IEEE-488 interface), for ATE use.

2. Specification

DC VOLTAGE:

Range	Resolution	Maximum Current
20 mV	0.1 μ V	Limited to 50 Ω output resistance or 25 mA using 50 Ω override
200 mV	1 μ V	
2 V	10 μ V	
20 V	100 μ V	25 mA/1000 pF
200 V	1 mV	10 mA/ 400 pF
1100 V	10 mV	6 mA/ 400 pF

2. Specification (continued)

Accuracy: \pm (0.005% of setting + 0.001% of range + 5 μ V)
for all ranges, for six months, 20°C to 30°C
ambient, non-override.

AC VOLTAGE:

Range	Resolution	Maximum Current/Load
20 mV	0.1 μ V	50 Ω source
200 mV	1 μ V	
2 V	10 μ V	2 k Ω /1000 pF
20 V	100 μ V	25 mA/1000 pF
200 V	1 mV	10 mA/ 400 pF
1100 V	10 mV	6 mA/ 400 pF

Accuracy: \pm (0.05% of setting + 0.005% of range + 50 μ V)
from 50 Hz to 10 kHz and \pm (0.08% of setting
+ 0.008% of range + 50 μ V) from 10 kHz to 50 kHz
for six months, 20°C to 30°C ambient.

Frequencies
available (Hz): 50, 60, 70, 80, 90, 100, 200, 300, 400, 500,
600, 700, 800, 900 for all ranges.

Frequency accuracy: \pm 3%

DC CURRENT

Range	Resolution	Compliance Voltage
200 μ A	1 nA	0 to 10 V
2 mA	10 nA	
20 mA	100 nA	
200 mA	1 μ A	
2 A	10 μ A	0 to 2.1 V

Accuracy: \pm (0.025% of setting + 0.0025% of range + 0.01 μ A)
for compliance voltage up to 1 V. Add 0.002% of
setting per volt above 1 V rms. Applies for six
months and 20°C to 30°C ambient.

AC CURRENT

Range	Resolution	Compliance Voltage
200 μ A	1 nA	0 to 7 V rms
2 mA	10 nA	
20 mA	100 nA	
200 mA	1 μ A	
2 μ A	10 μ A	0 to 1.4 V rms

(continued)

2. Specification (continued)

Accuracy: $\pm (0.07\% \text{ of setting} + 0.01\% \text{ of range} + 2 \mu\text{A})$
 for compliance voltage up to 1 V rms. Add
 0.005% of setting per volt above 1 V rms.
 Applies for six months in 20°C to 30°C ambient.

RESISTANCE

Range: 1 Ω to 10 M Ω in decade steps.
 Accuracy: $\pm 0.005\%$, except $\pm 0.02\%$ (1 Ω), $\pm 0.01\%$ (10 Ω
 to 1 M Ω), and $\pm 0.05\%$ (10 M Ω). Applies for six
 months, 20-30°C.

3. Comprising

Instrument
 Power cord
 Manual

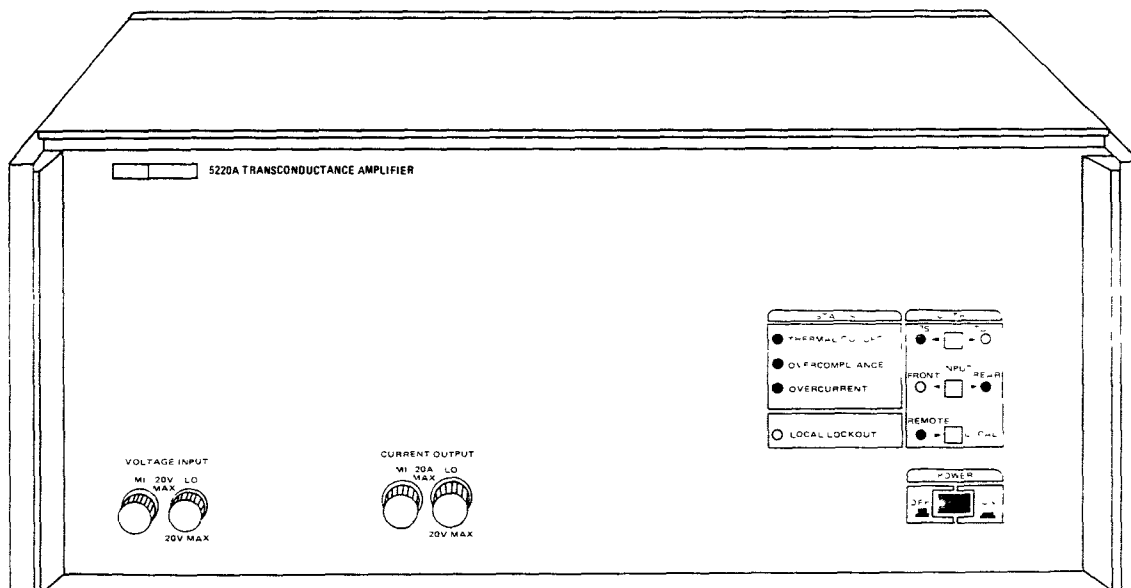
4. Accessory Items

None.

5. Associated Equipment

10ZZ/209166 Transconductance Amplifier Fluke 5220A AFDEETEC No. 19331

Section Reference 10ZZ/209166		Nomenclature TRANSCONDUCTANCE AMPLIFIER		
Manufacturer FLUKE		Part No. 5220A		Cost/Date £3102 1984
Height 178 mm	Width 432 mm	Depth 559 mm	Weight 22.7 kg	
Power Supplies 100/110/115/120/200/220/230 or 240 V ac, 50-60 Hz			Air Publication -	
Availability 2	Environment B	Maintenance Policy 2B/4D	Calibration AH/6	AFDEETEC/AFDSEC No. 19331



1. Description

The model 5220A Transconductance Amplifier is used to calibrate ac or dc current meters and shunts and the current functions of digital multi-meters and VOM's that measure up to 20 A. The transconductance is 1 A/V either dc or rms ac from 30 Hz to 5 kHz. The 5220A is designed to be driven by the 5100B Meter Calibrator. When used with the 5100B the current range of that instrument is extended by a factor of 10:1. Protection is designed to eliminate problems caused by excessive inputs, open inputs, and overcompliance. Indicators on the front panel inform the user of the presence of any of these conditions. Automatic shutdown occurs should the internal temperature rise excessively.

2. Specification

Transconductance:	1 Siemens (1 A/V)
Output range:	0 to 20 A dc or rms (28.3 A peak)
Compliance voltage:	$\geq \pm 4$ V dc, or 3 V rms ac (4.25 V peak)

(continued)

2. Specification (continued)

DC accuracy:	$\pm (0.25\% \text{ of output} + 1 \text{ mA})$
AC accuracy:	$\pm (0.05\% \text{ of output} + 1 \text{ mA})$
Harmonic distortion and noise:	$\pm (0.05\% \text{ of output} \pm 1 \text{ mA rms})$ over frequency range of 30 Hz to 1 kHz and measured with a noise bandwidth of 300 kHz, $\pm (0.05\% \text{ of output} + 1 \text{ mA}) \times f$ from 1 kHz to 5 kHz, where f =frequency in kHz.
Load capability:	Drives all resistive and capacitive loads consistent with current and compliance voltage capability. Drives inductive loads (with reduced accuracy) up to 200 μ H, consistent with current and compliance voltage capabilities.
Maximum isolation voltage:	$\pm 20 \text{ V dc}$ or 20 V ac rms .

3. Comprising Items

Instrument
Power cord
Manual

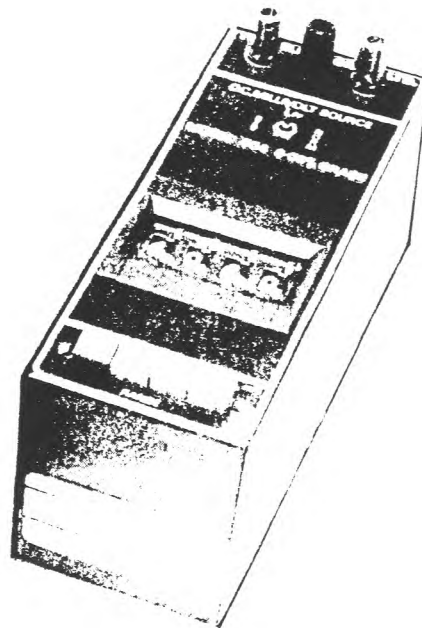
4. Accessory Items

None.

5. Associated Equipment

10ZZ/209117 Meter Calibrator Fluke 5100B AFDEETEC No. 19332

Section Reference: 6625-99-7655260		Nomenclature: MILLIVOLT SOURCE		
Manufacturer: TIME ELECTRONICS LTD.		Part No: 404S		Cost/Date: £100 9/79
Height: 8.5 cm	Width: 7.5 cm	Depth: 19.7 cm	Weight: 1 kg	
Power Supplies: 6 x U7 Dry cell batteries			Air Publication: None	
Availability: 2	Environment: B	Maintenance Policy: B2/D4	Calibration: IAW 100C-50	AFDEETEC No: 19049



1. Description

The 404S is an accurate millivolt source providing, in 3 ranges, adjustable outputs from 1 μ V to 1 V. The output is short circuit and overload protected, and the polarity can be reversed by a three-position switch on the front panel. The output range is selected by one of three push-buttons, and the voltage required is set by four thumbwheel switches. Battery life is several months depending on usage - the battery condition is monitored by an indicator which is mounted on the side of the unit.

2. Specification

Output:	0-1 V in 3 ranges 0-999.9 mV in 100 μ V steps 0-99.99 mV in 10 μ V steps 0-9.999 mV in 1 μ V steps
Accuracy:	$\pm 0.05\%$ of setting, $\pm 0.02\%$ of range

Maximum Output Current: 20 mA on 1 V and 100 mV ranges. Up to short circuit on 10 mV range, but loads less than 1 k Ω will give errors > 0.1%.

Maximum Overload: Continuous short circuit on all ranges.

Output Resistance: Less than 0.1 k Ω on 1 V and 100 mV ranges. 1 k Ω on 10 mV range.

Output Stability: Better than 60 ppm/ $^{\circ}$ C.
Less than 25 ppm per hour at constant temp.

Operating Temperature Range: -10 $^{\circ}$ C to 60 $^{\circ}$ C

Output Polarity: Positive or negative switch selected with a centre 'Off' position.

3. Comprising

Instrument only

4. Accessory Items

None

5. Associated Equipment

None

GPIB AS
STANDARD

Section Reference: 5P/1620153		Nomenclature: ELECTRONIC LOAD		
Manufacturer: AMPLICON		Part No: EL750B-K		Cost/Date: £1452 (1985)
Height: 6 inch	Width: 9 inch	Depth: 17.3 inch	Weight: 24 lb	
Power Supplies: 215-264 V AC, 47-63 Hz			Air Publication: N/R	
Availability: 2	Environment: B	Maintenance Policy: 1A/2B/4CD	Calibration: IAW 100C-50	AFDEETEC No: 19399

Photograph to be issued later

1. Description

The EL750B-K is ideal for verification of single output power supply operation, static or dynamic resistance loading tests performance such as output regulation or transient response. External variable load modulation can determine output impedance at specific frequencies. In the constant current mode it functions to test discharge rates of batteries or capacitor banks. Used with a DC power source it becomes a variable, constant current supply useful for measurement of resistance values of components or motor coils under operating conditions. The forward voltage drop of rectifier diodes or high current terminal connections can also be tested in this fashion.

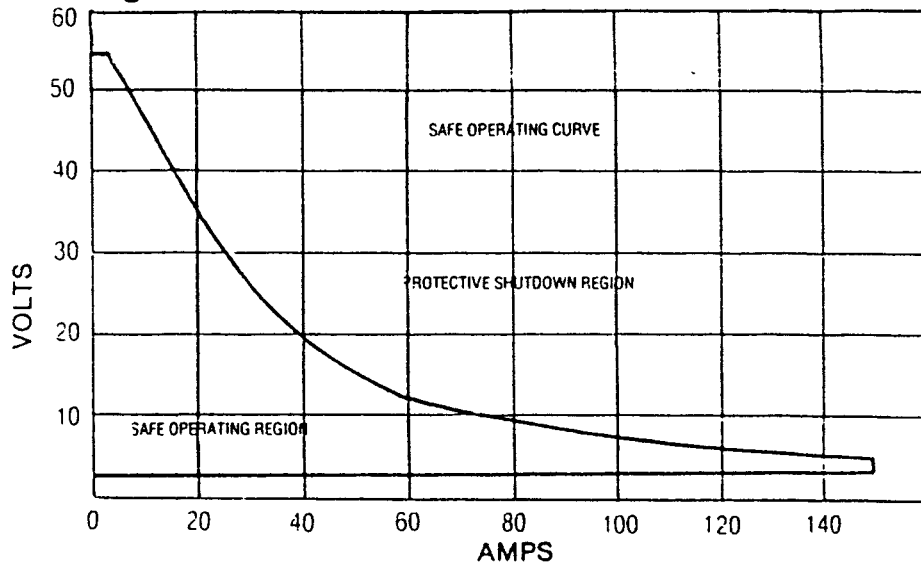
2. Specification

Maximum loading power:	750 W (see safe operating curve)
Maximum load voltage:	1.8 V DC
Maximum load voltage:	55 V DC
Maximum load current:	150 A
Operating mode:	Constant current or constant voltage.
Current ripple:	Less than 0.1 A P-P
Dynamic loading:	Allows switching between two current levels at a switch selected rate of ~1 kHz or twice input line frequency. The two current levels are set by front panel controls.
Dynamic Load Response Time:	1 microsecond per amp or 60 microseconds whichever is greater.
Remote Programming (constant current):	0-10 V is equal to 0-150 A. Accuracy is $\pm 1\%$. Program voltage input impedance approx 100 k Ω .
Meter Range:	Voltmeter 0-60 V DC Ammeter 0-10-50-100-200 A
Protection Circuits:	Electronic circuit limits power dissipation to 750 W. Load shuts down in the event of an overvoltage. Thermal sensors shut off load in the event of an overtemperature condition. Unit is protected against application of reversed polarity voltages.
Current Signal Output:	Voltage proportional to current is provided. 1 mV per amp, $\pm 1\%$.
Operating Temperature Range:	0°C - 40°C
Cooling:	Forced air cooling integral in design.
Front Panel Indicators:	Voltmeter, ammeter, power-on indicator, overvoltage-overcurrent indicator (EI), Saturation indicator and overtemperature indicator.

2 Specification (cont.)

Rear Panel: ac power connector, fuse, remote program, input/output connector (MOLEX), positive and negative bus bars.

Derating Chart



Chapter 3

FREQUENCY, WAVEFORM AND TIME MEASURING DEVICES

Chapter 3FREQUENCY, WAVEFORM AND TIME MEASURING DEVICES

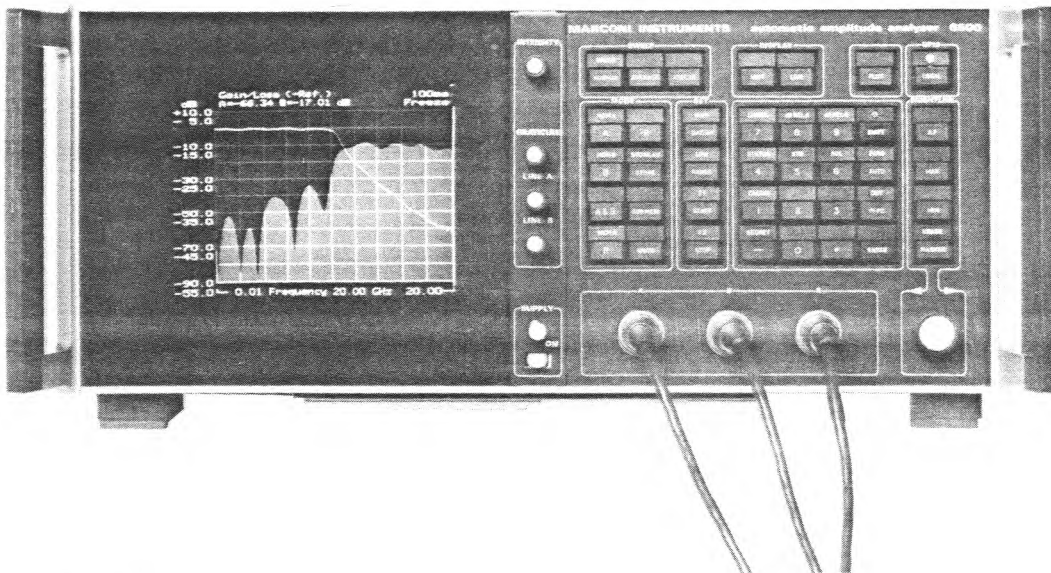
CONTENTS

Chap	Nomenclature	Sec/Ref/Stock No.	Part No.
3.1	WAVEFORM ANALYSERS		
.1	Automatic Amplitude Analyser	10S/7214869	Marconi 6500 OPT 002
.2	Not used		
.3	Not used		
.4	Selective Level Meter	10S/8400956	Hewlett Packard 3586C-908
.5	Amplitude/Delay Distortion Analyser	6625-99-6475401	Hewlett Packard 3770B
.6	Distortion Analyser	110S/8718012	Hewlett Packard 334A
.7	Wave Analyser	10S/0127669	Hewlett Packard 3581A
.8	Sound Recording Test Set	6625-99-6208914	Ferrograph RTS 2
.9	Storage Normaliser	see text	Hewlett Packard 8750A
.10	Sweep Tester	10S-1870506	Rohde and Schwarz Polyskop SWOB 5
▶ .11	Frequency Response Analyser	6625-99-7804898	Solartron S1250
.12	Frequency Response Analyser	10S/78122230	Solartron S1253
3.2	SPECTRUM ANALYSERS		
.1	Spectrum Analyser	10S/6440957	Hewlett Packard 3580A Opt 001 and 002
.2	Spectrum Analyser Comms Band	10S/0523433	Hewlett Packard 8560A Opt 002 and H03
.3	Spectrum Analyser Microwave Band	10S/5932313	Hewlett Packard 8563A Opt 103, 104, H09
3.3	MODULATION METERS		
.1	Modulation Meter Automatic AM/FM	6625-99-6343388	Racal 9009
.2	Not used		
.3	Modulation Meter	10S/7465601	Marconi 2305

CONTENTS (Continued)

Chap	Nomenclature	Sec/Ref/Stock No.	Manuf/Part No.
3.4	COUNTERS, COUNTER TIMERS, FREQUENCY METERS		
.1	Microwave Frequency Counter	10S/6625-99- 4094784	Racal Instruments 2101 OPT, 04A. 60
.2	1.3 GHz Frequency Counter	10S/6625-99- 7864628	Racal Instruments 1998 OPT. 04A
.3	Source Locking Frequency Counter	10S/2255467	EIP 575-09-22
.4	Universal Counter Timer 1.3 GHz	10S/7439270	Racal Dana 1992- 55-04ES
.5	Frequency Meter	6625-00-9666728 6625-00-9309687	Hewlett Packard 546A 537A
.6	Not used		
.7	Not used		
.8	Not used		
.9	Not used		
.10	Not used		
.11	Frequency Difference Meter	10S/0857707	Tracor 527E
.12	Strobotorch	6625-99-6368851	Dawe 1222A
.13	Not used		
.14	Not used		
.15	Microwave Pulse Counter	6625-99-6235830	Racal/Dana 451
3.5	TIME INTERVAL METERS		
3.6	DATA/TRANSMISSION LINE TESTERS		
.1	Protocol Analyser	10S/9085747	Phoenix Datacom Ltd. Part No.9440
.2	Data Tester	10S/5731076	Trend DT 108A
.3	Data Transmission Analyser	10S/5393133	Anritsu Europe Ltd. Part No. MD 6401A
.4	V35 Breakout Box	10S/1920841	Trend 960025
.5	RS449 Breakout Box	10S/4054329	Trend 960020
.6	X21/V11 Breakout Box	10S/2999530	Trend 960016
.7	Maintenance Set	10S/6419486	Phoenix Datacom Ltd. Phokit 3
.8	Data Analyser	10S/7094458	Phoenix Datacom Ltd. 5500A
.9	Data Bus Tester	6C/0000905	SDE Ltd. S2470

Section Reference 10S/7214869		Nomenclature AMPLITUDE ANALYSER		
Manufacturer MARCONI		Part No. 6500 OPTION 002	Cost/Date £6500 1984	
Height 192 mm	Width 427 mm	Depth 533 mm	Weight 15.7 kg	
Power Supplies 240 V and 115 V ac, 400 Hz			Air Publication 117M-0309-12	
Availability 2	Environment B	Maintenance Policy 4D	Calibration AH/12	AFDEETEC/AFDSEC No. 19335



1. Description

The 6500 Automatic Amplitude Analyser has features that include an easy to use keyboard, microprocessor control and sophisticated bus programming functions. It has the capability of accurate scalar measurements of transmission loss or gain, return loss and power for microwave systems. It provides versatile and intelligent control of an external swept frequency source, by outputting a programmable ramp voltage at up to 70 ms sweep speeds for easy tuning adjustments to the device under test. Full IEEE-488 data bus compatibility is available, and advanced software of the 6500 gives access to a wide range of GPIB programmable features. The analyser is in a standard 19 in rack mounting configuration with integral display.

2. Specification

Frequency Range:	0-126 GHz (Dependent on detector)
Dynamic Range:	66 dB; +16 dBm to -50 dBm
	71 dB; +16 dBm to -55 dBm (average mode)
	All channels

(continued)

2. Specification (continued)

Resolution (Brightline)

Frequency:	Digital readout to 10 MHz
Amplitude:	Digital readout to 0.01 dB(m)
Frequency Linearity:	Dependent on linearity of sweeper. See Ramp Output Linearity.
Markers:	Up to eight on-screen markers with 10 MHz resolution.

Front Panel Selectable Parameters

Range:	0.1 to 10.9 dB(m)/division; 0.1 dB(m) increments
Datum:	± 99.9 dB(m); 0.1 dB(m) increments. Above parameters individually selectable on A, B and R channels.
dB Relative:	Enter using BRIGHTLINE position or keyboard. Range: ± 99.99 dB(m). Resolution: 0.1 dB(m).
High/Low Limits:	± 99.99 dB(m) individually selectable on A and B channels.
F1, F2 (Sweeper Range):	Selectable in Range 0 to 126 GHz; 10 MHz resolution.
ΔF :	Selectable Symmetrical within range F1-F2; Centre Frequency in BRIGHTLINE position. 10 MHz resolution.
Start, Stop (Selected Range):	Selectable within Range F1-F2; 10 MHz resolution.
Display Format:	Line or histogram
Sweep Speed:	70 ms to 20 s nominal (10 alternative speeds)
X-Y Plotter Output:	Analog plot with nine alternative speeds. Digital plot if TALK ONLY is selected. Live Y output.

Ramp Output

Fixed:	0-10 V ± 10 mV
Linearity:	± 5 mV
Resolution:	4096 points
Variable:	Adjustable from 1.20 V (approx) using Coarse and Fine rear panel controls.
Offset:	Bottom of range = 0 V $\pm 10\%$ of range.
Linearity:	$\pm 0.25\%$

(continued)

2. Specification (continued)

Channel Memories:

At any time when valid data are available on the screens, the trace may be stored in any of the three memories. New data may be averaged with data already present. When invoked:

A memory is subtracted from A trace.

B memory is subtracted from B trace.

R memory is subtracted from A and/or B trace, as selected. Recall is available on all memories.

Plotter Output

Analog:

Menu allows pen locations to be set up, axes drawn and labelled, pen lift polarity to be set. Live Y to be selected.

X output: See Ramp Output BNC socket.

Y output: 9 to 10 V \pm 50 mV, BNC socket.

Z output: Open collector drive with selectable High/Low for pen Up/Down, BNC socket.

Live Y:

0 to 10 V to cover screen display.

Resolution is 1/256 of screen range. For example 10 dB/div - 100 dB screen range, hence resolution is 0.39 dB.

Digital:

Menu allows Plot All, Draw Graticule, Label Graticule, Plot and Live Y selection. The standard HPGL command sub-set is used with functions: DF, SC, SR, PA, PU, PD, LB and SP. (SP is Select Pen, but will also function if only one pen is available). Graticule is labelled with sweep speed, vertical scale units, vertical scaling, frequency scaling BRIGHTLINE cursor measurement values, measurement type.

CRT

Dimensions:

105 mm x 135 mm used screen area.

GPIB Programming:

Compatible with IEEE 488-78.

Transfer Formats:

ASCII: Single point read/write or 422 point measurement read/write to any channel data store or memory using NR2* numeric data format.
*NR2 as defined in IEEE 728-1982

Binary: 422 point measurement read/write to any channel data store or memory using a block data format.

Speed:

ASCII format: 800 ms typical for 422 point measurement.

Binary format: 200 ms typical for 422 point measurement.

These times are for an HP Series 200 controller using standard transfer techniques.

2. Specification (continued)

 GPIB Programming (continued)

 Programmable Functions:

Every front panel key has related GPIB commands. Additional commands are classified as follows:

- Reading status information
- Reading/writing measurement data
- Reading/writing instrument settings
- Digital plotter control (stand-alone mode available)
- Single step mode for use with synthesizers

 User-accessible display:

Complete control of displayed text in two modes:

- Text overlaying normal measurement display
- Normal display switched off, giving full vdu facilities.

The full ASCII character set is available, plus additional scientific characters and a complete range of control codes.

 Interrupts:

The 6500 may be programmed to generate the following interrupts:

- Any front panel key press
- BRIGHTLINE control rotation
- End of sweep
- User-defined limits exceeded
- Plot menu selection required
- Error condition detected

 General

 Temperature Range

 Storage: -40°C to +70°C

 Operational: 0°C to 50°C

 (full Specification) 10°C to 35°C

 Humidity 95% relative at 35°C

 Power Consumption: 120 VA max.

3. Comprising

- Instrument
- Mains Cable
- Operating Handbook

4. Accessory Items

▶	10ZZ/210994	Detector	6511	(0.01 - 18 GHz, N(n)50 Ω)	
	10ZZ/210995	Detector	6512	(0.01 - 18 GHz, APC-7)	◀

5. Associated Equipment

 None.

Section Reference 10S/8400956		Nomenclature SELECTIVE LEVEL METER		
Manufacturer HEWLETT PACKARD		Part No. 3586C-908		Cost/Date £8600 / 1986
Height 177 mm	Width 425 mm	Depth 475 mm	Weight 23 kg	
Power Supplies 100,120,220,240 V ac +5% -10% 48-66 Hz				Air Publication -
Availability 2	Environment B	Maintenance Policy 4 BCD	Calibration A/12	AFDEETEC/AFDSEC No. 19370



1. Description

The HP 3586C is a general purpose instrument used for wave analysis applications in the maintenance of electronic systems. It covers the range 50 Hz to 32.5 MHz allowing measurements of audio, sonar and other low frequency systems as well as high frequency communications and sub-systems.

2. Specifications

Frequency Range :	50/75 Ω unbalanced input, 50 Hz to 32.5 MHz 600 Ω balanced input, 50 Hz to 108 kHz
Frequency resolution :	0.1 Hz
Center frequency accuracy :	$\pm 1 \times 10^{-5}$ /year
Counter accuracy :	± 1.0 Hz in addition to centre frequency accuracy for signals within the 60 dB bandwidth of the IF filter chosen or greater

Counter accuracy : (continued) than -100 dBm (largest signal is measured)
 Frequency display : 9-digit LED

Selectivity

3 dB bandwidth,* ±10% 20 Hz, 400 Hz, 3100 Hz
 *Noise bandwidth is the same as the 3 dB bandwidth
 60 dB bandwidth : 3100 Hz BW, ±1850 Hz; 400 Hz BW, ±1100 Hz; 20 Hz BW, ±90 Hz
 Adjacent channel rejection : 75 dB minimum at ±2850 Hz, 3100 Hz BW
 Passband flatness ±0.3 dB

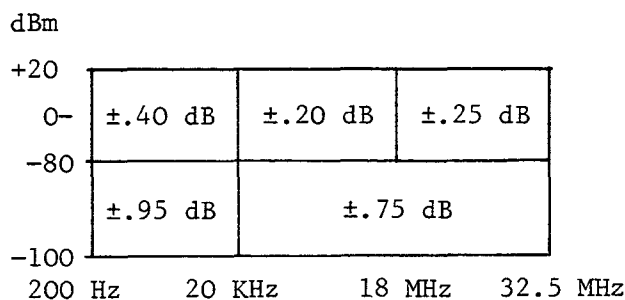
Passband Flatness

Bandwidth	Flatness Range	Flatness
3100 Hz	±1000 Hz	-
400 Hz	± 50 Hz	±0.3
20 Hz	± 3 Hz	dB

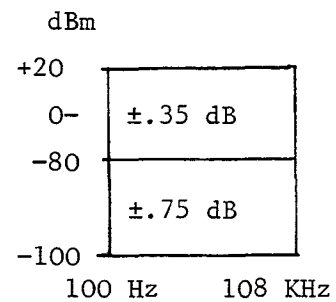
Amplitude

Measurement range : +20 to -120 dBm
 Amplitude resolution : .01 dB
 Level accuracy : 10 dB auto range, low distortion mode, after calibration, signal at ±1 Hz from centre frequency

50/75 Ω Inputs



600 Ω Input



*20 Hz & 400 Hz BW below -90 dBm

Level accuracy : 100 dB range (after calibration), add correction to 10 dB auto-range accuracy for dB below full scale. (Not required when in 10 dB auto-range).

dB Below Full Scale	Accuracy Correction
0 to -20 dB	±.25 dB
-20 to -40 dB	±.50 dB
-40 to -80 dB	±2.0 dB

Wideband power accuracy : after calibration, 100 dB range, average on, -45 to +20 dBm

±2.0 dB	±1.0 dB	±2.0 dB
200 Hz	20 kHz	10 MHz
		32.5 MHz

Dynamic Range

Spurious Responses : -110 dBm maximum or the following, whichever is greater

Image rejection (100-132 MHz) : -80 dBc

IF rejection : 15625 Hz, -80 dBc; 50 MHz, -60 dBc

Spurious signals : >1600 Hz offset, >-80 dBc; 300 Hz to 1600 Hz, >-75 dBc

Residual spurious : -110 dBm maximum; <350 Hz, -95 dBm

Distortion

Harmonic distortion : -75 dB below full scale, low distortion mode, above 4 kHz

Intermodulation distortion : two-tone second and third order, separation 10 kHz to 1 MHz, -78 dB below full scale. Either tone ≥ 10 MHz, -70 dB

Noise Floor (full scale setting -35 to -120 dBm)

Frequency	Bandwidth	Noise Level
100 kHz to 32.5 MHz	3100	-114 dBm
	20 Hz, 400 Hz	-120 dBm
2 kHz to 100 kHz	All	-105 dBm

The noise floor for full scale settings of -30 to +25 dBm will be 75 dB below full scale for >100 kHz, or 55 dB below full scale for <100 kHz.

Signal Inputs

Impedance	Frequency	Matling Connector
50/75 Ω unbalanced	50 Hz to 32.5 MHz	BNC
600 Ω balanced	50 Hz to 108 kHz	Dual Banana Plug 0.75 inch Spacing

Return loss : 50/75 Ω, 30 dB; 600 Ω, 25 dB

Balance : 600 Ω; 40 dB

Demodulated Audio Output

Output level : 0 dBm into a 600 Ω load

Output connector : 1/4" jack, mates with WECO 347

Auxiliary Signal Inputs/Outputs

Tracking output :	0 dBm rear panel tracking output
Ext. reference input :	1 MHz to 10 MHz or sub-harmonic input
Reference output :	10 MHz at 8 dBm output
Probe power :	front panel dc output for HP active high impedance accessory probes, (+15, -12 V dc)
HP-IB Interface Functions :	SH1,AH1,T6,L4,SR1,RL1,PP1,DC1,DT1,C1,C3,C28
Additional outputs :	audio, phase jitter and meter output

3. Comprising

Instrument
Mains lead
Handbook

4. Accessory Items

None

5. Associated Equipment

None

Section Reference 110S/6625-99-6475401		Nomenclature AMPLITUDE/DELAY DISTORTION ANALYSER		
Manufacturer HEWLETT PACKARD		Part No. 3770B Opt 002 and 061		Cost/Date £4427.00 1980
Height 20.0 cm	Width 27.0 cm	Depth 56.0 cm	Weight 12.0 kg	
Power Supplies 90-126 V/195-253 V; 48-66 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEEPEC/AFDSEC No. 18840



1. Description

The HP 3770B makes point-by-point and sweep measurements of Delay Distortion, Attenuation Distortion and Received Level over the frequency range 200 Hz to 20 kHz. The measuring frequency can be adjusted manually with a tuning control, incremented in 100 Hz steps, or swept over any part of the band using the continuous or single sweep modes. The HP 3700B supersedes the HP 3770A (10S/6625-99-6362354) which is now out of production.

2. Specification

Sender:

Reference carrier: 0.4 to 19.9 kHz in 100 Hz steps
 Measuring carrier: 0.20 to 20.00 kHz in 10 Hz steps
 Modulation envelope frequency: 41.66 Hz

Measuring frequency sweep rates: 10, 20, 40, 80, 160 Hz nominal

Measuring frequency sweep limits: Settable in range 0.2 to 19.9 kHz (100 Hz steps). Accuracy as for measurement frequency

Carrier level: 0 to -49 dBm in 1 dB steps

Receiver

Operating level range: < -50 dBm to > +10 dBm

Frequency measuring: 0.1%

Weighted Noise Measurement

Range: 0 to -85 dBm

Detector type: True rms

Weighting filters: CCITT telephone and 3 kHz flat

Noise With Tone Measurement

Range: 0 to 80 dBm

Tone frequency: 1004 Hz

Impulse Noise

Threshold: Single level, adjustable in 1 dB steps from 0 to -49 dB (0 dB is equivalent to 1.1 V)

Dead time: 125 ± 25 rms

An optional slave facility for group delay and attenuation distortion measurements allows the measurement results for both direction of transmission on a 4 wire circuit to be displayed at one end of the circuit. The full specification is available on request to CSDE-TSF/EA41.

3. Comprising

Instrument only.

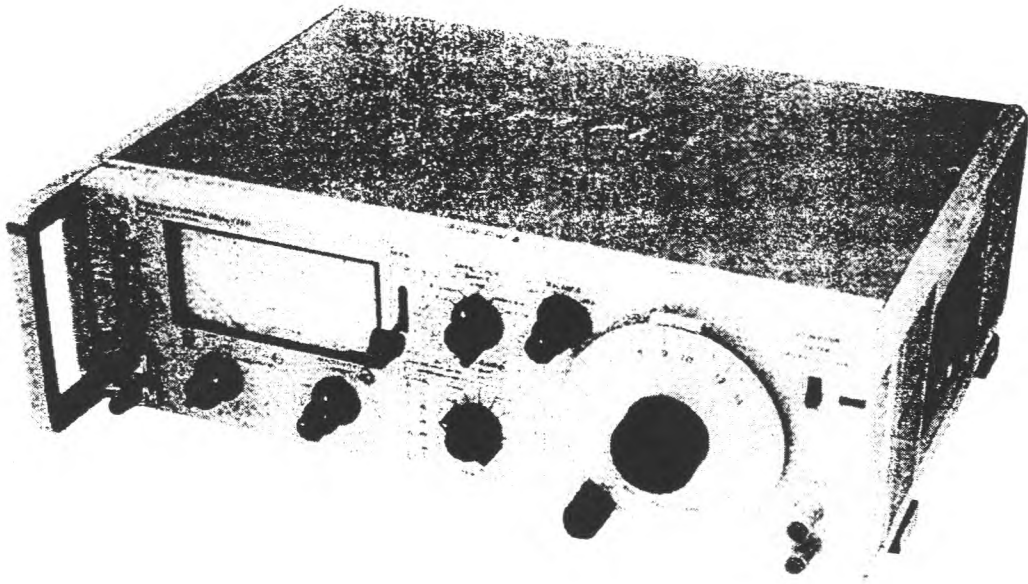
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference: 10S/6625-00-8718012		Nomenclature: DISTORTION ANALYSER		
Manufacturer: HEWLETT PACKARD		Part No: 334A		Cost/Date: £2525 1985
Height: 126 mm	Width: 426 mm	Depth: 337 mm	Weight: 8 kg	
Power Supplies: 115 V or 230 V, 48 to 66 Hz			Air Publication: 117D-0500-1	
Availability: 1	Environment: B	Maintenance Policy: B2/D4	Calibration: IAW 100C-50	AFDEETEC No: 13643



1. Description

The HP334A Distortion Analyser measures total distortion down to 0.1% full scale at any frequency between 5 Hz and 600 kHz; harmonics are indicated up to 3 MHz. Noise levels as low as 25 microvolts can be measured. The HP334A includes automatic fundamental nulling and amplitude modulation detector.

2. Specification

Input Level for Distortion
Level Measurements:

0.3 V rms for 100% set level or 0.245 V
for 0 dB set level (up to 300 V may be
attenuated to set level reference.)

Harmonic Measurement Accuracy:

Full scale.

Specification (continued)

Fundament Input Less than 30 V:

Range	± 3%	± 6%	± 12%
100% - 0.3% 0.1%	10 Hz - 1 MHz 30 Hz - 300 kHz	10 Hz - 3 MHz 20 Hz - 500 kHz	10 Hz - 1.2 MHz

Fundamental Rejection: > 80 dB

Residual Distortion: > -70 dB (0.03%) from 5 Hz to 200 kHz;
> -64 dB (0.06%) from 200 kHz to 600 kHz.
Meter indication is proportional to average value of a sine wave.

Frequency Calibration Accuracy: Better than ± 5% from 5 Hz to 300 kHz.
Better than ± 10% from 300 kHz to 600 kHz.

Input Impedance: distortion mode: 1 M Ω ± 5% shunted by < 70 pF.

DC Isolation: Signal ground may be ± 400 V DC from external chassis.

Voltmeter Range: 300 μ V to 300 V rms full scale (13 ranges)
10 dB per range. Average responding calibrated in rms.

Noise Measurements: Voltmeter residual noise on the 300 μ V range; 25 μ V rms, when terminated in 600 (shielded) Ω .

Output: 0.1 ± 0.01 V rms open circuit.

Output Impedance: 2 k Ω .

Automatic Nulling Mode: Set level: at least 0.2 V rms.

Frequency Ranges: X1, manual null tuned to less than 3% set level; total frequency hold-in ± 0.5% about true manual null. X10 thru X10k, manual null tuned to less than 10% of set level; total frequency hold-in ± 1% about true manual null.

Automatic Null Accuracy: 5 Hz to 100 Hz; meter reading within 0 to +3 dB of manual null. 100 Hz to 600 Hz; meter reading within 0 to +1.5 dB of manual null.

High Pass Filter: 3 dB point at 400 Hz with 18 dB per octave roll off.

AM Detector: 550 kHz to 65 Mhz; 40 V p-p max input.

Specification (continued)

Distortion Introduced by
Detector; Carrier Frequency:

550 kHz - 1.6 MHz: <50 dB (0.3%) for
3-8 V rms carriers modulated 30%.
1.6 MHz - 65 MHz: <40 dB (1%) for 3-8 V
rms carriers modulated 30%.

3. Comprising

Instrument only.

4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/0127669		Nomenclature WAVE ANALYZER		
Manufacturer HEWLETT PACKARD		Part No. 3581A		Cost/Date £4960 1985
Height 412 mm	Width 203 mm	Depth 285 mm	Weight 11.5 kg	
Power Supplies 100/120/220/240 V, +5%, -10%, 48 to 440 Hz			Air Publication -	
Availability 2	Environment B	Maintenance Policy 4D	Calibration A/12	AFDEETEC/AFDSEC No. 19353



1. Description

The HP3581A Wave Analyzer resolves and measures the amplitude and frequency of spectral components. Since not all signals originate from a stable frequency source, the HP3581A incorporates an AFC circuit which locks to a drifting signal for stable, accurate measurements.

Digital readout of tuned frequency is located above the analogue meter. Resolution of the digital readout is 1 Hz for any frequency between 15 Hz and 50 kHz. Readout is updated five times per second so delay between tuning and readout is minimized.

Four meter scales are used to provide a wide range of displays. Two scales are used for linear voltage readings. Two log scales provide either a 90 dB or 10 dB display. The same voltage used to drive the meter is also available on the rear panel for driving X-Y recorders.

2. Specification

Frequency Characteristics

Range:	15 Hz to 50 Hz
Display:	5 digit LED readout
Resolution:	1 Hz
Accuracy:	± 3.5 Hz, 0 to 55 °C
Typical Stability:	± 10 Hz/hour after 1 hour and ± 5 Hz/°C
Automatic Frequency control (AFC) Hold-in Range:	± 800 Hz

Amplitude Characteristics

Instrument Range

Linear:	30 V to 100 nV full scale
Log:	+30 dBm or dBV to -150 dBm or dBV

Amplitude Accuracy	Log	Linear
Frequency Response, 15 Hz - 50 kHz	± 0.4 dB	$\pm 4\%$

Dynamic Range:	>80 dB
Noise Sidebands:	greater than 70 dB below CW signal. 10 bandwidths away from signal.
Spurious Responses:	>80 dB below input reference level.

Sweep Characteristics

Scan Width:	50 Hz to 50 kHz, adjustable in a 1-2-5 sequence from 50 Hz to the full frequency range.
Sweep Error Light:	This LED indicates a sweep that is too fast to capture full response. When the light is on, response will be lower than it should be.
External Trigger:	A short to ground stops the normal sweep. Opening the short then enables a sweep.

Input Characteristics

Impedance:	1 M Ω , 30 pF.
Maximum Input Level:	100 V rms, ± 100 V dc.

Output Characteristics

Tracking Generator Output:	(also known as BFO or tracking oscillator output).
Range:	0 to >1 V rms into 600 Ω .

Specification (continued)

Output Characteristics

Frequency Response: $\pm 3\%$ 15 Hz to 50 kHz.

X-Y Recorder Analogue Outputs

Vertical: 0 to +5 V $\pm 2.5\%$.

Horizontal: 0 to +5 V $\pm 2.5\%$.

Impedance: 1 k Ω

Recommended Accuracy: HP7090A Measurement Plotting System.

Pen Lift: Contact closure to ground during sweep.

Restored Output: Acts as a narrow band amplifier.

3. Comprising

Instrument only.

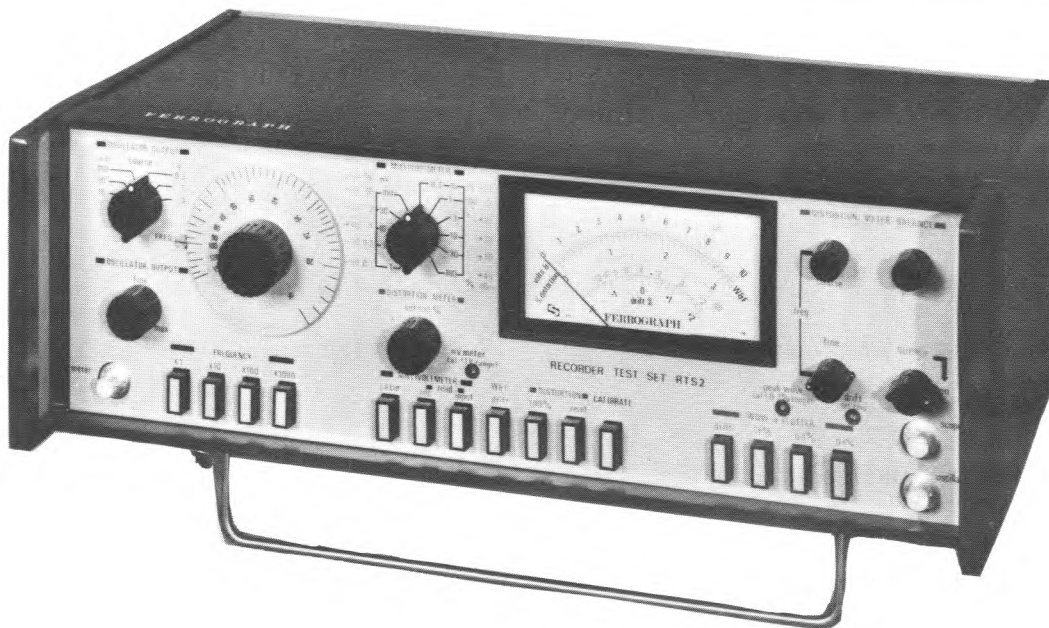
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/6625-99-6208914		Nomenclature SOUND RECORDING TEST SET		
Manufacturer FERROGRAPH		Part No. RTS 2		Cost/Date £370.00 1978
Height 14.3 cm	Width 44.1 cm	Depth 25.4 cm	Weight 6.4 kg	
Power Supplies 105-120 V/200-250 V; 50-60 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEC/AFDSEC No. 18164



1. Description

Portable test set for the servicing of magnetic tape recorders. It incorporates:

- (a) Variable Frequency Audio Generator
- (b) Millivoltmeter
- (c) Wow and Flutter Unit
- (d) Distortion Measuring Network

A test tape is supplied as a standard for checking Head, Azimuth and Replay characteristics of magnetic tape recorders.

2. Specification

Generator Section:

Frequency Coverage	15 Hz to 150 kHz in 4 ranges
Distortion:	0.025% at 1 kHz; 0.08% over range 100 Hz to 20 kHz
Frequency Response:	± 0.2 dB over range 15 Hz to 150 kHz
Output Level:	600 Ω load
Output Attenuator:	Coarse - Six 10 dB steps Fine - Continuous over approx 15 dB range
Output Impedance:	Dependent on attenuator setting. Max 450 Ω
Millivoltmeter Indicator:	Average-reading meter, calibrated in rms for sinusoidal inputs
Ranges:	11 (in 10 dB steps) from 1.0 mV to 100 V fsd
Input Impedance:	2 M Ω (No dc path)
Accuracy:	Within ± 2% fsd over range 30 Hz to 20 kHz
Frequency Response:	± 0.2 dB over range 10 Hz to 150 kHz

Wow and Flutter Meter

Internal Oscillator:	3.15 kHz
Frequency Response:	4 Hz (3 dB points 1.2 Hz and 12 Hz)
Input Requirement:	35 mV to 5 V
Sensitivity:	3 ranges: 0.1%, 0.3% and 1.0% peak fsd

Distortion Section

Second Harmonic Rejection:	0.25 dB
Bandwidth of Harmonic Measurement:	15 Hz to 20 kHz
Minimum Reading:	0.05%
Minimum Input Signal:	100 mV
Input Impedance:	100 k Ω

3. Comprising

Instrument Only.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference SEE TEXT PARA 1		Nomenclature STORAGE NORMALISER		
Manufacturer HEWLETT PACKARD		Part No. 8750A		Cost/Date £1000 1980
Height 10.2 cm	Width 21.2 cm	Depth 28 cm	Weight 2.72 kg	
Power Supplies 100, 120, 220 or 240 V +5% -10% 48-440 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFDEETEC/AFDSEC No. See Text Para 1



1. Description

The 8750A unit offers both digital storage and normalisation to a range of Hewlett Packard Network and Spectrum Analysers.

DIGITAL STORAGE DISPLAY:

By constantly refreshing the CRT at a flicker free rate while updating the stored data at the actual sweep rate, the 8750A always provides continuous CRT displays regardless of system sweep speed.

In Network Analyser applications, two channels with 256 point horizontal resolution are available for simultaneous displays such as insertion and return loss or magnitude and phase.

In Spectrum Analyser applications, up to two traces can be displayed for the comparison of a stored trace to the current input trace (drift tests) or, for the analysis of two stored traces. Video Peak Detection is provided for accurate signal level measurements.

DIGITAL NORMALISATION:

The 8750A unit will store a reference and automatically display the measurement data minus the reference (normalisation).

DIGITAL NORMALISATION (Cont):

High resolution measurements of amplifier, attenuator or filter passband flatness are made easy since the 8750A normalises out frequency response errors and a unique vector generator always presents a smooth trace free from spikes and transients.

The 8750A allows comparison measurements such as matching two test devices or measuring swept amplifier gain compression by displaying the deviation between two measurements directly.

MODEL	REFERENCE N ^o	AFDEETEC N ^o	COST	DATE
8750A	110S/6625-01-0512367	19102	£900	1980
8750A-003	110AD/6636-99-6235938	19129	£950	1980

2. Specification

DISPLAY:

Horizontal Memory Resolution: Two display channels, 256 points per channel (0.4% of full scale, 8 bit word)

Vertical Memory Resolution: 512 points displayed full scale (0.2% of full scale, 10 bit word) plus a 50% overrange (256 points) both above and below full screen. The overrange capability is useful in storing and normalising traces that exceed full scale.

Horizontal Input Sweep Rates: 100smax/10 ms min.

Display Refresh Rate: 6 ns

Video Detection:

Network Analyser: Average Detection (20 kHz)
Spectrum Analyser: Peak Detection

Vector Generator: A vector generation technique is used to connect points on a CRT display or X-Y recorder, yielding a smooth continuous display.

INPUT/OUTPUT:

A/D Inputs

Horizontal Input:

Network Analyser: 0 to 10 V nominal
Offset ± 0.5 V and gain adjust 6 V to 15 V

Spectrum Analyser: ± 5 V nominal
Offset ± 0.5 V and gain adjust ± 4.5 V to ± 5.5 V

Adjustment: Gain and Offset potentiometers adjustable on rear panel interface card.

Vertical Input:

Network Analyser: ± 0.8 V min (nominal) and ± 2.25 V max (nominal) with continuous gain adjustment.
Offset ± 0.3 V.

Spectrum Analyser: 0 to 0.8 V or 0 to -0.8 V nominal.
Offset ± 0.1 V and gain adjust ± 80 mV.
Gain and Offset potentiometers adjustable on rear panel interface card.

D/A Outputs:

Horizontal Output:

Network Analyser: Gain and adjustment from 1 V to 3 V nominal.
Offset adjustment allows ± 1.5 V or 0 V to 3 V sweep output.

Spectrum Analyser: 0 V to 3 V nominal.
Offset ± 0.5 V and gain adjustment from 0.7 V to 3.5 V.

Adjustment: Gain and Position potentiometers adjustable on front panel (Display Adjust).

Vertical Output:

Network Analyser: Same as vertical input with $\pm 10\%$ adjustment range.

Spectrum Analyser: Same as vertical input with $\pm 10\%$ adjustment range.

Adjustment: Gain and Position potentiometers adjustable on front panel (Display Adjust).

X-Y Recorder Outputs:

Horizontal Range and Accuracy: 0 ± 20 mV to 1 V nominal, settable within $\pm 3\%$ of full scale. BNC female output (rear panel).

Sweep Time: 30 s per displayed trace.

Pen Lift:

Voltage: 20 V maximum.

Interface:

Blanking in: TTL.
Blanked condition is TTL high (typically 3.5 V).
Unblanked condition is TTL low (typically 0 V).

Blanking out: TTL.
Blanked condition is TTL high (typically 3.5 V).
Unblanked condition is TTL low (typically 0 V).

Interface (Cont):

Channel Blanking:

TTL.

The 8750A is a two display channel instrument: either of the two channels can be turned off (blanked) with a TTL low (typically 0 V).

GENERAL

Controls:

Select:

LED display indicates Network or Spectrum Analyser operation depending on the plug in interface card.

Network Analyser:

Two keys activate front panel controls for adjustment of either channel 1 or 2 channel displays.

Spectrum Analyser:

Two keys allow the storing, viewing and manipulation of up to two display traces (A and B).

Display:

Input:

Initiates digital storage.

Input Mem:

(Input minus Mem) Stored reference trace is subtracted from input data (Normalisation) and the difference displayed directly.

Hold:

Freezes display for CRT photos or further analysis.

Reference Memory:

Store Input:

Current input trace is stored as reference for future normalisation (input mem).

Recall:

Displays stored reference trace.

Bypass:

Bypasses 8750A so display is returned to conventional analogue operation.

X-Y plot:

Initiates X-Y plots. Data and pen lift are outputted through rear panel BNC connectors.

Display Adjust:

Gain and Position potentiometers for adjustment of D/A outputs to CRT display requirements (see D/A outputs).

3. Comprising

Instrument
Mains Lead.

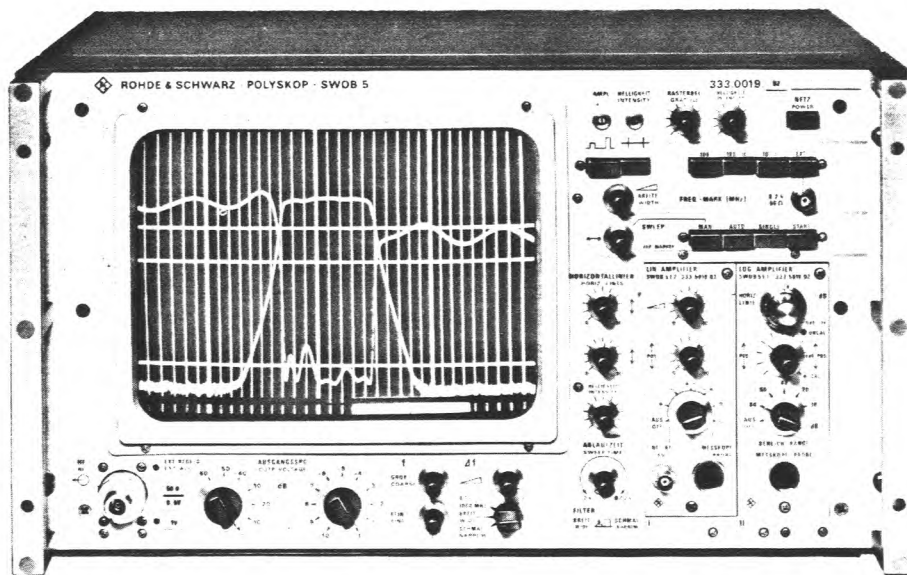
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 2105/6825-12-1943189 1022/210609		Nomenclature SWEEP TESTER		
Manufacturer RHODE & SCHWARZ		Part No. POLYSKOP SWOB 5		Cost/Date E9845 1984 K3750 4/82
Height 48.4 cm	Width 32.8 cm	Depth 43.6 cm	Weight 25 kg	
Power Supplies 110/125/220/235 V ± 10% 47 to 63 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19158



1. Description

The Polyskop SWOB5 is a combined sweep generator and visual display unit. It offers sweep frequency measurements from 0.1 MHz to 1000 MHz with logarithmic or linear display of returns.

2. Specification

FREQUENCY RANGE: 0.1 MHz to 1000 MHz.
(in one band: only centre frequency and sweep width need be adjusted).

Sweep Width: Max. Min.
Wide: ≈ 1000 MHz ≈ 5 MHz
Narrow: ≈ 50 MHz ≈ 0.3 MHz

Spurious F.M.:
Narrow: ≤ 5 kHz, typically 3 kHz

Sweep Linearity:	1:1.01
Indication Linearity:	better than 1:1.1
Sweep Adjustment:	ΔF and Centre Frequency (course fine).
External:	Via Remote Control input.
Scale Error of Range Indication:	$\pm 4\%$ of full scale.
Remote Control:	Via 7-pole female connector on rear.
Centre Frequency Adjustment:	5 V to 8 V
Sweep Width Adjustment: (ext. potentiometer = 5 k Ω)	0 Ω for Fmin, Rmax for Fmax.
Sweep Time:	0 - 5 V for 2 s to 0.02 s.
R.F. Monitoring Output:	50 mV into 50 Ω BNC female connector on rear.
Output EMF:	50 Ω 1 V $\pm 5\%$ (can be increased by 6 dB using the rear switch).
Connector:	N female
Frequency Response Flatness of output voltage with matched termination:	< ± 0.5 dB (typically ± 0.25 dB) For 0.1 MHz to 1000 MHz < 0.15 dB for 10 MHz sweep
with 6 dB increase:	± 0.2 dB in addition (5 MHz to 300 MHz otherwise ≈ 1 dB)
Output attenuator:	0 to 70 dB in 1 dB steps.
Error Coarse (10 dB steps) Fine (1 dB steps)	$\leq \pm 0.5$ dB } overall error $\leq \pm 0.2$ dB }
Harmonic Suppression:	(For V out = 0.5 V or 0.35 V)
0.1 MHz to 1 MHz:	≥ 30 dB
> 1 MHz to 1000 MHz:	≥ 36 dB (typically 40 dB)
Suppression of non-harmonic spurious signals:	≥ 40 dB
FREQUENCY SWEEP:	
Auto:	Forward/return with rf blanked during return.

Man: Manual Sweep adjustment.

Single: Triggered by button recorder operation.

Sweep Time: Auto: Forward 0.02 s to 2 s continuously
adjustable return: 0.01 s to 0.3 s.

Single: \approx 0.02 s to 2 s, continuously adjustable.

Triggering: In single mode.

Ext. Trigger level: \approx +5 V (at rear input).

Frequency Markers internal: 100 MHz; 100/10 MHz; 10/1 MHz.
Error $< \pm 1 \times 10^{-4}$

external: 1 to 1000 MHz, \approx 0.2 V (50 Ω)

Marker type: Pulse and vertical line markers.

Orientation along frequency
axis internal: Marker amplitude or brightness modu-
lated to highlight the decades.

Bright up marker: By man adjustment in auto mode.

Trigger Signal for counter: T.T.L.H. during unblanked period
(> 10 ms), BNC female connector.

Level Lines: Two, separate adjustment of vertical
position.
Common adjustment of intensity.

Useful Display Area: 21 cm x 16 cm;
Screen type M28 - 12 GM.

Recorder Output: ± 2.5 V for max. X deflection.
2.5 V for max. Y deflection.
R out ≈ 5 k Ω .

Connector: 6-pole female (1 channel) or BNC female
(2 channels).

External X Deflection: ± 1 V (Triangular) for full display
width.

Connector: 7-pole female on rear.

AMPLIFIER PLUG-IN

Measurement range (full
display height): 10/20/40/60/80 dB

Noise level (with demodulator
SWOB5Z1 or RF insertion unit
SWOB5Z3): Typically 170 μ V (with filter).

Max test voltage: 1 V

AMPLIFIER PLUG-IN (Cont)

Level line calibrated in dB:
 Reference level: Shiftable by 10 dB, detent position calibrated at 1 V = 0 dB.

Adjustment Range: 0 to < -80 dB, resolution 0.1 dB.

Zero adjustment range: >>0 dB (setting error ± 1.5 dB typ.)

Low pass filter: Switch selected, indicated.

3 dB point: 40 Hz

Connector for measuring head: 7-pole female.

LINEAR AMPLIFIER

Inputs:	AF	Meas Head Connector
Input impedance:	500 k Ω	500 k Ω
Connector:	BNC Female	7-pole female
Input selector positions:	+/-/+ \approx /- \approx	=/ \approx (compensation for spurious rf signals in test item).
Deflection Coefficient:	0.2 mV/cm	-
Voltage required for full display height with max sensitivity:	< 3 V	< 15 mV
Max permissible input voltage:	10 V (= or \approx)	5 V (\approx) or 10 V (=)

MEASURING HEADS

Demodulator SWOB5Z1 (with built-in termination)

Impedance:	50 Ω Connector N-female VSWR < 1.1
Frequency Range:	0.1 MHz to 1000 MHz
Frequency Response Flatness:	< ± 0.5 dB typically 0.25 dB.
Max test voltage:	1 V
Max permissible input voltage:	5 V (\approx) or 10 V (=)
Connection to lin/log amplifier:	Via cable (1 m) and 7-pole male connector

R.F. Insertion Unit SWOB5Z3

Impedance: 50 Ω
 Connector: N Male/N Female
 VSWR: < 1.1 (75 Ω : 1.2)
 Frequency Range: 0.1 MHz to 1000 MHz
 Frequency Response Flatness: < ± 0.5 dB, typically 0.25 dB.
 Max test voltage: 1 V
 Max permissible input voltage: 5 V (\approx) or 10 V (=)
 Connection to lin/log amplifier: Via cable (1 m) and 7-pole male connector.

Log Probe SWOB5Z2

Impedance (depending on frequency and attenuator): > 3 k Ω to > 20 M Ω \parallel 0.5 pF to 2.5 pF.
 Frequency Range: 0.1/5/1 to 500 MHz (rough indication up to 1000 MHz).
 Frequency Response Flatness: < ± 1 dB
 Attenuation of probe tips: 0/20/40 dB
 Input voltage range: 0.2 mV to 1 V/2 mV to 10 V
 20 mV to 100 V (rms).

Demodulator SWOB3-Z (probe with BNC male connector)

Frequency Range: 0.5 MHz to 400 MHz (rough indication up to 1000 MHz).
 Input impedance at 50 MHz: ≤ 30 M Ω \parallel 2 to 3 pF
 at 200 MHz: ≤ 10 k Ω
 Input voltage: Min 50 mV for full display height.
 Max permissible 5 V rf
 Superimposed dc up to 100 V
 Output voltage: + dc ≥ 5 mV into > 500 k Ω
 for 50 mV rms (0.5 MHz to 400 MHz).

Active Demodulator (50 Ω)

Input voltage range: 20 μ V to 50 mV
 Frequency Response Flatness: $\leq \pm 1.5$ dB for 5 MHz to 1000 MHz
 Input VSWR: ≤ 1.2

3. Comprising

▶	SWOB 5	50 Ω Model	333.0019.52	◀
	SWOB 5E1	Log Amp	333.5610.02	
	SWOB 5E2	Lin Amp	333.5010.02	
	SWOB 5Z1	Demodulator	333.7513.52	
	SWOB 5Z3	RF Insertion Unit	333.8010.52	
	SWOB 5Z2	Log Probe	333.9016.22	
	SWOB 3-Z	Demodulator Probe	241.2116.00	
		Power Cable		

4. Accessory Items

None.

5. Associated Equipment

None.


 GPIB
COMPATIBLE

Section Reference 6625-99-7804898		Nomenclature FREQUENCY RESPONSE ANALYSER		
Manufacturer SOLARTRON		Part No S1250		Cost/Date £12.7K - 93/94
Height 176 mm	Width 432 mm	Depth 573 mm		Weight 18 kg
Power Supplies Selectable 90 - 127 V, 188 - 265 V, 45 - 440 Hz				Air Publication Handbook
Availability 2	Environment B	Maintenance Policy iaw AP100C-50	Calibration iaw AP100C-50	AFDEETEC/AFDSEC No 19412

SOLATRON S1250
TBA

1. Description

The Solatron S1250 frequency response analyser use the 'single sine' measurement technique to provide precise measurement of gain and phase between any points in a dynamic system. This technique is used for analysis which will assess performance, or characterise both simple and complex systems. The device under test is stimulated by a sine wave and the responses analysed at one, two or more points in the system. These responses are then correlated with the stimulus to determine the amplitude and phase relative to the generator. The ratio of the two measured signals can then be calculated to provide the system transfer function. The item has full GPIB compatibility.

2. Specification

GENERATOR

Waveform:	Sine, square, triangle
Distortion:	<2%
Output impedance:	50 Ω +2%
Maximum voltage, Lo to ground:	150 V
Impedance, Lo to ground	100 k Ω , 100 pF
Stop control:	Immediate, or at 0°, 90°, 180°, 270°
Stop input:	Contact closure or TTL logic 0
Connections	
Front:	Floating, 4 mm
Rear:	Floating, BNC
Frequency	
Range:	10 μ Hz to 65 kHz
Resolution:	1 in 65535
Error:	<0.01%
Sweep:	Logarithmic, up or down linear, up or down harmonic
Amplitude	
Range:	10 mV to 10.23 V rms (triangle: 5.11 V)
Resolution:	1 in 1023
Error:	<1% \pm 1 digit
Bias	
Range:	\pm 10.23 V
Resolution:	1 in 1023
Error:	<1% \pm 1 digit

MODULATOR/DEMODULATOR

Input:	Two independent carrier inputs
Impedance, Hi or Lo to ground:	>100 k Ω , <100 pF
Common mode rejection, up to 100 Hz:	>50 dB
Maximum common mode:	300 V
Maximum input, Hi or Lo to ground:	350 V peak, 250 V rms

2. Specification (continued)

Carriers 1 and 2

Frequency range: 48 Hz to 20 kHz
 Voltage range: 6 V to 250 V rms

Generator output

May modulate either Carrier 1 or Carrier 2

Carrier phase shift:
 50 Hz to 300 Hz: <3°
 300 Hz to 3 kHz: <1°
 3 kHz to 20 kHz: <6°

Analysers

Either carrier may demodulate any analyser

Analyser quadrature rejection: >26 dB
 Additional errors when demodulating
 Mod frequency: 0.05 x carrier
 Input >10% full scale,
 integration time: 200 ms
 r: <0.5%
 log r: 0.05 dB
 θ , single channel: <0.5°
 θ , point to point: <1°

ANALYSER

Two independent analysers operating in parallel.

<u>Range</u>	<u>Sensitivity</u>	<u>Full Scale pk Input</u>	<u>Common Rejection Mode</u>
30 mV	1 μ V	45 mV	30 V
300 mV	10 μ V	500 mV	30 V
3 V	100 μ V	5 V	30 V
30 V	1 mV	50 V	30 V
300V	10 mV	500 V	30 V

Sensitivity is for integration time >100 ms

Maximum input, Hi or Lo to ground: 500 pk, 300 V rms
 Coupling: dc or ac (<1 dB at 2.5 Hz)
 Input configuration
 Connection Front: Differential, 4 mm
 Rear: Differential, BNC
 Impedance, Hi or Lo to ground: 1 M Ω
 Front sockets: <70 pF
 Rear sockets: <100 pF

2. Specification (continued)

Com mode rejection, dc coupling, to 100 Hz
 up to 50 V pk: >65 dB
 over 50 V pk: >60 dB

Cross channel isolation,
 1 k Ω across inputs up to 10 kHz; >100 dB

Integration time
 Minimum: the longer of 1 cycle or 10 ms
 Maximum: 10⁶ cycles or 10⁵ s

Auto-integration
 Minimum: the longer of 3 cycles or
 1.5 ms
 Maximum: the programmed integration time

SYNCHRONISER

Input configuration
 Connection: Differential, rear terminals
 Coupling: dc or ac (<3 dB at 3 Hz)
 Impedance, Hi or Lo to ground: >200 k Ω >100 pF
 Comm mode rejection,
 dc coupling to 100 Hz: >50 dB
 Maximum rejected: 20 V
 Maximum input,
 Hi or Lo to ground: 350 V peak, 250 V rms

Synchronisation
 Frequency range: 1 mHz to 65 kHz
 Sensitivity: 0.25 V
 Level adjustment: \pm 5 V in steps of 0.02 V
 Time to synchronise: The longer of 4 cycles or
 500 ms

3. Comprising

Instrument
 Operating manual
 Spare fuses
 Rack mount ears
 Power cable
 3 x 4 mm test leads

4. Accessory Items

None.

5. Associated Equipment

None.


 GPIB
COMPATIBLE

Section Reference 10S/78122230		Nomenclature FREQUENCY RESPONSE ANALYSER		
Manufacturer SOLARTRON		Part No S1253		Cost/Date 1996
Height 108 mm	Width 423 mm		Depth 472 mm	Weight 10 kg
Power Supplies 90 - 110 V, 198 - 242 V, 216 - 264 V, 48 - 65 Hz				Air Publication None
Availability 2	Environment B	Maintenance Policy A/4BCD	Calibration iaw AP100C-50	AFDEETEC/AFDSEC No 19413

SOLARTRON S1253
TBA

1. Description

The Solatron S1253 frequency response analyser use the 'single sine' measurement technique to provide precise measurement of gain and phase between any points in a dynamic system. This technique is used for analysis which will assess performance, or characterise both simple and complex systems. The device under test is stimulated by a sine wave and the responses analysed at one, two or more points in the system. These responses are then correlated with the stimulus to determine the amplitude and phase relative to the generator. The ratio of the two measured signals can then be calculated to provide the system transfer function. The item has full GPIB compatibility.

2. Specification

GENERATOR

Waveform:	Sine wave
Distortion:	<2%
Output impedance, Hi to Lo:	50 Ω \pm 10%
Maximum voltage, Lo to ground:	\pm 15 V
External stop input:	Contact closure or TTL logic 0 to kill or freeze
Connections	
Front:	Floating, 4 mm
Rear:	Floating, single BNC
Maximum current:	300 mA
Frequency	
Range:	1 mHz to 20 kHz
Resolution:	1 in 4000
Sweep type:	Logarithmic, up or down
Point per sweep:	2 to 9999
Amplitude	
Range:	10 mV to 10.23 V rms
Resolution:	20 mV
Error (driving open circuit):	\pm 1% \pm 10 mV
Bias	
Range:	\pm 10.22 V
Resolution:	20 mV
Error (driving open circuit):	\pm 1% \pm 20 mV
Maximum output Hi to Lo (bias +ac):	\pm 15 V

MODULATOR/DEMODULATOR

Input:	Differential, single BNC
Impedance, Hi or Lo to ground:	>100 k Ω , <100 pF
Maximum input	
Hi to ground:	\pm 350 V peak, 250 V rms
Lo to ground:	\pm 30 V peak
Common mode rejection up to 100 Hz:	>50 dB
Carrier frequency range:	48 Hz to 10 kHz
Phase shift carrier input to generator output	
48 Hz to 300 Hz:	<3 $^\circ$
300 Hz to 1 kHz:	<1 $^\circ$
1 kHz to 10 kHz:	<(1 $^\circ$ +1/2/kHz)

2. Specification (continued)

Additional analysis error when demodulating

Mod freq = 0.05 carrier freq: <1%, <1°
 Analyser quadrature rejection: >26 dB

ANALYSER

Two independent, auto ranging input channels, with common analyser.

<u>Range</u>	<u>Sensitivity</u>	<u>Full Scale pk Input</u>	<u>Common Rejection Mode</u>
30 mV	1 μ V	45 mV	30 V
300 mV	10 μ V	500 mV	30 V
3 V	100 μ V	5 V	30 V
30 V	1 mV	50 V	30 V
300V	10 mV	500 V	30 V

Maximum input

Hi to ground: \pm 500 V peak, 250 V rms
 Lo to ground: \pm 30 V peak

Coupling: dc

Connections

Front: Differential, 4 mm
 Rear: Differential, single BNC

Impedance, Hi to Lo (grounded): 1 M Ω \pm 2%

Capacitance

Front inputs, Hi to Lo
 (grounded): <70 pF
 Rear inputs, Hi to Lo
 (grounded): <100 pF

Common mode rejection up to 100 Hz: >60 dB

Integration time range: 0.1 to 10°

Cross channel isolation: <1 kHz, 1 k Ω

Across inputs, Lo grounded: >100 dB

SYNCHRONISER

Connection: Differential BNC

Impedance, Hi or Lo to ground: >200 k Ω <100 pF

Maximum input

Hi to ground: \pm 350 V peak, 300 V rms
 Lo to ground: \pm 30 V

Trigger point: Positive zero crossing

Minimal signal to trigger (<1 kHz): <-0.6 to >+0.1 V

2. Specification (continued)

Maximum time to synchronise
 <12 Hz: 6 cycles
 >12 Hz: 500 mS

Accuracy of period measurement: $\pm 1 \mu\text{S}$

Additional analyser error
 (stable trigger signal),
 transfer function mode

Gain: $1\% + 0.2\%/kHz$
 Phase: $1^\circ + 0.2^\circ/kHz$

DATA PROCESSING

Scaling: Division by vector (a +jb, r θ)
 Division by last result,
 magnitude or vector

History file

Maximum size: 400 results
 Minimum size: 100 results

Battery discharge time: Typically >1000 hrs

PROGRAM STORE

Battery backed RAM

Maximum number of programs: 9
 Maximum number of program steps: 400

Permanent key switched EPROM

Maximum number of programs: 6
 Maximum number of program steps: 100

PLOTTING

Type: Digital, compatible with
 Hewlett Packard graphics
 language

Parameters

X-axis: a, linear scale
 f, lin or log scales
 Y-axis: b,r,r(dB), lin scale θ , degrees

Plot size A4 or 8.5 x 11 inches

INTERFACES

Serial output: Suitable for use with printers
 and keyboards compatible with
 RS232 and RS423

Baud rate: 110 to 9600

2. Specification (continued)

GPIB:	Compatible with IEEE488 (1978) Fully compatible talker/ listener switch selectable talk only
Maximum data rate:	1000 bytes/sec
Functions implemented:	SH1, AH1, T5, TEO, SR1, RL1, PP2, DC1, C0, DT0

3. Comprising

Instrument
Operating manual
Spare fuses
Rack mount ears
Power cable
3 x 4 mm test leads

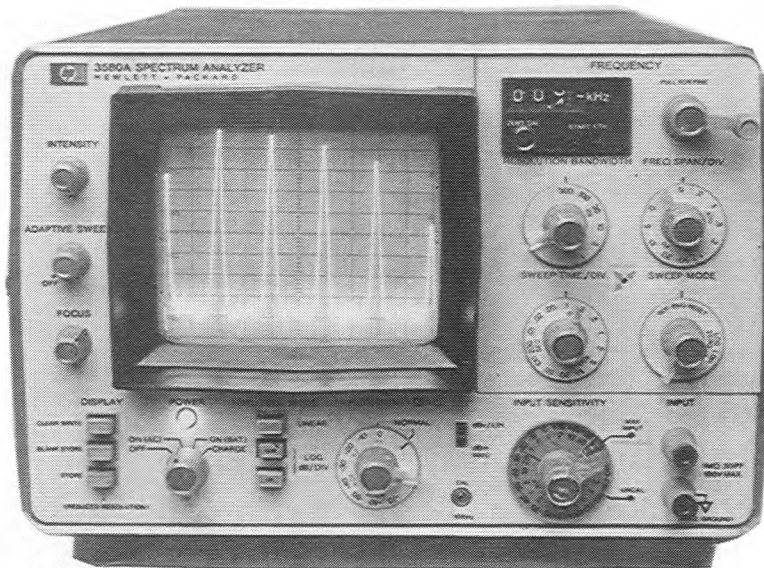
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-6440957		Nomenclature SPECTRUM ANALYSER		
Manufacturer HEWLETT PACKARD		Part No. 3580A Opt -001 & 002		Cost/Date £3640.00 1978
Height 20.3 cm	Width 41.2 cm	Depth 28.5 cm	Weight 12.25 kg	
Power Supplies 100-120 V/220-240 V + 5% -10%; 48-66 Hz				Air Publication NONE
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDE/TEC/AFDSEC No. 18842



1. Description

The HP 3580A is a low frequency high performance spectrum analyser. The frequency coverage is 5 Hz to 50 kHz and the analysers 1 Hz bandwidth allows examination of signals close together. It also has a digital storage and adaptive sweep facilities.

2. Specification

Frequency Range: 5 Hz to 50 kHz

Display Accuracy: Frequency error between any two points is less than $\pm 2\%$ of their indicated separation

Dial Accuracy: ± 100 Hz 20° C to 30° C
 ± 300 Hz 0° C to 55° C

Chap 3.2.1

Sep 94 (Amdt 23)

Page 1

Typical Stability: ± 10 Hz/hr after 1 hour; ± 5 Hz/ $^{\circ}$ C

Amplitude Range: Linear 240 V to 100 nV full scale
 +30 dBm or dBV)
 -150 dBm or dBV) LOG

Amplitude Accuracy: Better than ± 1 dB

Dynamic Range: 80 dB

Sweep Characteristics: Scan width: 50 Hz to 50 kHz
 Sweep times: 1 sec to 2000 sec

Adaptive Sweep: When in adaptive sweep below the threshold level, scan speed is 20 to 25 times faster. Threshold is adjustable to cover 0 to 60% of screen. Signals greater than about 6 dB above threshold are detected and swept slowly

Options: 001 - internal rechargeable battery
 002 - floating input

3. Comprising

Instrument only.

4. Accessory Items

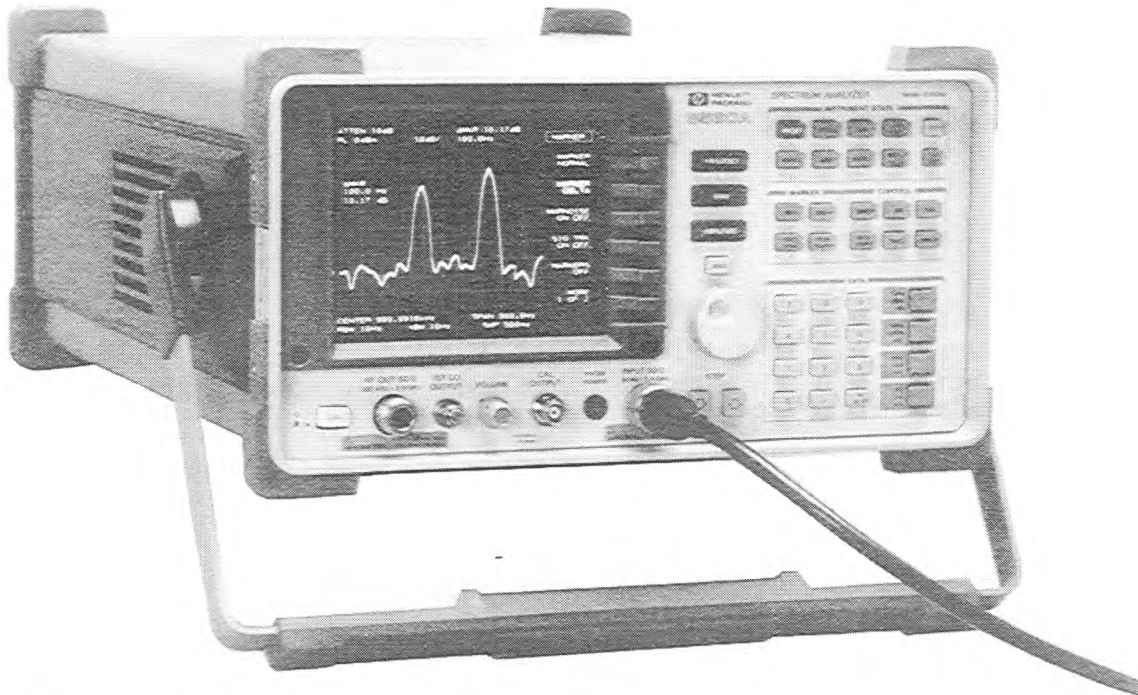
None.

5. Associated Equipment

None.

GPIB
COMPATIBLE

Section Reference: 10S/0523433		Nomenclature: SPECTRUM ANALYSER COMMS BAND		
Manufacturer: HEWLETT PACKARD		Part No.: HP 8560A OPT 002 & H03		Cost/Date: £13000 Jul 91
Height: 163 mm	Width: 325 mm	Depth: 427 mm	Weight: 18.2 kg	
Power Supplies: 90 to 140 Vac, 47-440 Hz/180 to 250 Vac 47-66 Hz				Air Publication: NONE
Availability: 2	Environment: A	Maintenance Policy: 2A/4CD	Calibration: TBD	AFDETEC No.: 19464



1. Description

The HP 8560A is a Comms band high performance Spectrum Analyser. The frequency coverage is from 50 Hz to 2.9 GHz and has selectable 10, 30 and 100 Hz resolution bandwidths. With the built-in tracking generator stimulus-response measurements are possible. Data can be stored in the non-volatile memory or sent directly to an external printer or plotter.

2. Specification

Frequency

Frequency Range	300 kHz to 2.9 GHz
Accuracy	\pm (freq ref accy. x tuned freq +5% x span +265 Hz) After Peaking.
Tracking Drift (nominal)	Useable in 1 kHz RBW after 5 min warmup. Useable in 300 Hz RBW after 30 min warmup
Minimum RBW	300 Hz

Amplitude

Output Level	-10 dBm to + 1 dBm -10 dBm to + 2.8 dBm (typical) Resolution 0.1 dBm
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Accuracy

Vernier	\pm 0.20 dB, \pm 0.5 dB max. (25 °C \pm 10 °C)
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Absolute	\pm 0.75 dB
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Level Flatness	\pm 2.0 dB
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Effective Source Match	1.92:1 (nominal)
------------------------	------------------

Total Absolute Accuracy	\pm 3.25 dB
-------------------------	---------------

Spurious Output (at +1 dBm)

Harmonic Spurious	-25 dBc
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Non-harmonic Spurious (from 50 Hz - 2.9 GHz)	
50 Hz - 2.0 GHz	-27 dBc
2.0 GHz - 2.9 GHz	-23 dBc

LO Feedthrough (3.9 GHz - 6.8 GHz)	-16 dBm
---------------------------------------	---------

Power Sweep	10 dB range, 0.1 dB resolution
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Inputs/Outputs

RF Input	Type-N female, 50 ohm (nominal)
RF Output (front panel)	Type-N female, 50 ohm (nominal)
Ext ALC Input (rear panel)	BNC female Use with negative detector

3. Comprising

Spectrum Analyser
c/w OPT 002 & H03

Part No
HP 8560A

Mains lead
Cable assy, RF, 50 Ω , BNC
Adaptor, BNC to N type
Dummy load, 50 Ω
Front cover
Sun hood
Spare fuse X2
Quick reference guide
Operating and Programming Manual
Installation and Verification Manual

4. Accessory Items

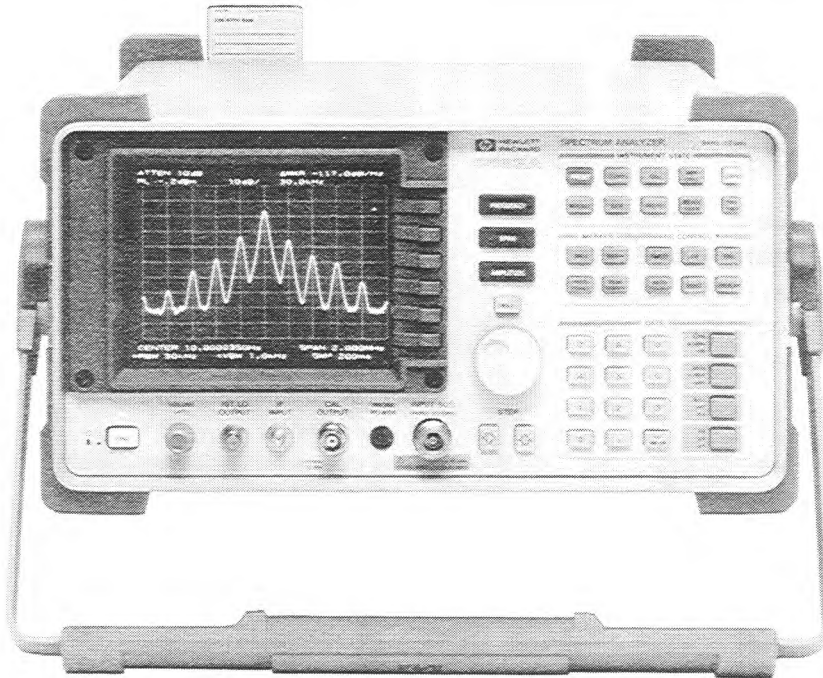
None

5. Associated Equipment

None.

GPIB
COMPATIBLE

Section Reference: 10S/5932313		Nomenclature: SPECTRUM ANALYSER MICROWAVE BAND		
Manufacturer: HEWLETT PACKARD		Part No.: HP 8563A OPT 103, 104, H09		Cost/Date £27000 Jul 91
Height: 163 mm	Width: 325 mm	Depth: 427 mm	Weight: 20.2 kg	
Power Supplies: 90 to 140 Vac 47-440 Hz/180 to 250 Vac 47-66 Hz				Air Publication: None
Availability: 2	Environment: A	Maintenance Policy: 2A/4CD	Calibration: TBD	AFDEETEC No.: 19465



1. Description

The HP 8563A is a Microwave band high performance Spectrum Analyser. With a frequency range of 9 kHz to 22 GHz and digitally implemented 10-, 30-, and 100-Hz resolution bandwidths, closely spaced signals of different amplitudes can be resolved. The HP8563A can be used with a tracking generator to provide scalar-measurement capability.

2. Specification

Frequency

Frequency Range	9 kHz to 22 GHz	
Accuracy		
Readout Accuracy	$<\pm[(\text{freq readout} \times \text{freq ref accuracy}) + (5\% \times \text{span}) + (15\% \times \text{RBW}) + 350 \text{ Hz}]$	
Accuracy at 1 GHz	$<\pm 270 \text{ Hz}$	
Counter Resolution	Selectable from 1 Hz to 1 MHz	
Frequency Span	0 Hz, 100 Hz * n to 19.25 GHz	
Accuracy	$<\pm 5\%$	
Sweep Time Range		
Span = 0 Hz	50 μ s to 60 s	
Span $\geq 100 \text{ Hz} * N$	50 ms (minimum)	
Accuracy (Span = 0)	Sweep Time	Accuracy
	$\geq 30 \text{ ms}$	$\pm 1\%$
	$< 30 \text{ ms}$	$\pm 15\%$
Sweep Trigger	Free Run, Line, Single, Video, External	
Resolution Bandwidth		
Range (-3 dB)	10 Hz - 1 MHz in a 1,3,10 sequence and 2 MHz (3 MHz @ -6 dB)	
Selectivity (-60 dB/-3 dB)	$<15:1$ (RBW $\geq 300 \text{ Hz}$) $<5:1$ nominal (RBW $\leq 100 \text{ Hz}$)	
Accuracy	$<\pm 10\%$ (10 Hz to 300 kHz) $<\pm 25\%$ (1 MHz and 2 MHz)	
Switching Uncertainty	$<\pm 0.5 \text{ dB}$ (ref BW = 300 kHz)	
Video Bandwidth Range	1 Hz - 3 MHz in a 1, 3, 10 sequence	

Spurious Responses		Mixer Level
Spurious Responses	<-60 dBc	<-40 dBm
Second Harmonic Distortion		
10 MHz - 2.9 GHz	<-72 dBc	<-40 dBm
> 2.75 GHz	<-100 dBc	<-10 dBm
3rd Order Intermod Distortion		
(Two -30 dBm signals at mixer)		
10 MHz - 2.9 GHz	<-70 dBc	
2.75 - 26.5 GHz	<-75 dBc	
Image Multiple and		
Out-of-Band Responses		
10 MHz - 18 GHz	<-70 dBc	
10 MHz - 26.5 GHz	<-60 dBc	
Residual Responses	(no sig at input, 0 dB input	
200 kHz - 6.46 GHz	atten) <-90 dBm	
Display Range		
Viewing Area	Approx 7 cm (V) x 9cm (H)	
Scale Calibration	10 x 10 divisions	
Log Scale	10, 5, 2, 1 dB per division	
Linear Scale	10% of ref level per division	
Reference Level Range		
Log	-120 to +30 dBm in 0.1 dB steps	
Linear	2.2 μ V to 7.07 V in 1% steps	
Demodulation		
Spectrum Demodulation		
Modulation Type	AM and FM	
Audio Output	Speaker and phone jack with	
	volume control	
Marker Pause Time	100 ms to 60 s (nominal)	

Inputs/Outputs

RF Input (Front Panel)	Type - N female, 50 ohm
Second IF Input (Front Panel)	SMA female, 50 ohm
Frequency	310.7 MHz
Full Screen Level	-30 dBm
Gain Compression	-20 dBm
1st LO Output (Front Panel)	SMA female, 50 ohm
Frequency	3.000 - 6.8107 GHz
Amplitude	+16.5 dBm \pm 2.0 dB
2nd IF Output (Rear Panel)	SMA female, 50 ohm
Frequency	310.7 MHz
Cal Output (Front Panel)	BNC female, 50 ohm
Probe Power (Front Panel)	+15 and -12.6 V, 150 mA max
10 MHz REF In/Out (Rear Panel)	Shared BNC female, 50 ohm
Output Freq Accuracy	10 MHz \pm (10 MHz x freq ref acc'y)
Output Amplitude	0 dBm
Input Amplitude	-2 to +10 dBm
Video Output (Rear Panel)	BNC, 50 ohm
Amplitude	0 to +1 V full scale
LO Swp/0.5 V/GHz Output (Rear Panel)	Shared BNC female, 2 kilohm
Amplitude (LO Sweep)	0 to +10 V, no load
Blanking Output (Rear Panel)	BNC Female
During Sweep	Low TTL level (sink 150 mA max)
During Retrace	High TTL level (source 0.5 mA max)

Ext Trig Input (Rear Panel)	BNC female >10 kilohm Trigger on rising edge of TTL level
Earphone (Rear Panel)	Subminiature mono jack, 0.25 W into 4 ohm
HP-IB (Rear Panel)	IEEE-488 bus connector
Interface Functions	SH1, AH1, T6, L4, SR1, RL1, PP0, DC1, DT0, C1, C28, E1
Outputs	Direct Printer Output Direct Plotter Output

3. Comprising Items

Instrument Only

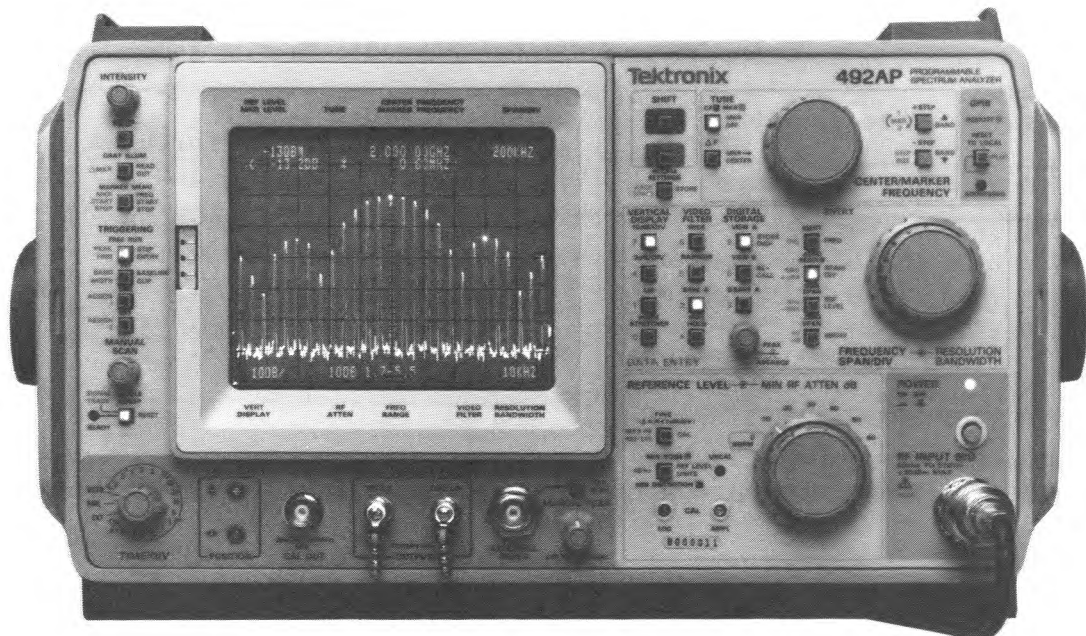
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10ZZ/212296		Nomenclature SPECTRUM ANALYZER, PROGRAMMABLE		
Manufacturer TEKTRONIX		Part No. 492AP (Opt 01)		Cost/Date £37023 1986
Height 232 mm	Width 382 mm	Depth 499 mm	Weight 20 kg	
Power Supplies 90-132 V ac; 180-250 V ac, 48-440 Hz			Air Publication -	
Availability 2	Environment B	Maintenance Policy 2AB/4CD	Calibration TBD	AFDEETEC/AFDSEC No. 19387



1. Description

The 492AP is a high performance, programmable, portable ruggedized instrument. Microcomputer control of most functions simplifies and enhances operation. the following is a list of the main features:

- 1.1 Synthesized frequency accuracy
- 1.2. Precise amplitude measurement capability
- 1.3 Digital storage display
- 1.4 Single and delta marker modes
- 1.5 Internal memory to retain front-panel settings and displays
- 1.6 Front panel data entry
- 1.7 HELP message readout that describes the function of front-panel pushbuttons and controls as well as messages that explain operating errors.

2. Specification

Frequency Related

Frequency range: 50 kHz to 21 GHz coaxial input.
 50 kHz to 325 GHz external mixer input
 (Amplitude specified from 18 GHz to 325 GHz with Tektronix WM490 Series Waveguide Mixers).

Centre and Marker Frequency Accuracy: $\pm 20\%D+(Fx10^{-5})$ Hz
 Bands 1 & 5-12 with Span/div ≤ 200 kHz and, Bands 2-4 with Span/div ≤ 100 kHz (Phase locked); $\pm 20\%D+(Fx10^{-5}) +15kN$ Hz (unlocked)
 Where D = Span/div or Res BW
 Whichever is the greater.
 F = Centre or Marker Frequency
 N = Harmonic Mixing Number

Response

Band and Freq. Range	About the mid-point between two extremes	Referenced to 100 MHz
1 (50 kHz -1.8 GHz)	± 1.5 dB	± 2.5 dB
2 (1.7 GHz - 5.5 GHz)	± 2.5 dB	± 3.5 dB
3 (3.0 GHz - 7.1 GHz)	± 2.5 dB	± 3.5 dB
4 (5.4 GHz - 18 GHz)	± 3.5 dB	± 4.5 dB
5 (15.0 GHz - 21.0 GHz)	± 5.0 dB	± 6.5 dB

Centre Frequency Drift

(After 1 hour warm-up): ≤ 50 Hz per minute of sweeptime (corrected at least every 30 sec.)
 Bands 1 and 5-12 with Span/Div ≤ 200 kHz, and band 2-4 with Span/div ≤ 100 kHz (Phase locked); $\leq (5 \text{ kHz}) N$ per minute of sweeptime (unlocked).

Frequency Readout Resolution: $\leq 10\%$ Span/Div to 1 kHz minimum (100 kHz in Delta Marker mode).

Residual FM: $\leq (10 + 2N)$ Hz peak-peak in 20 ms. Bands 1 and 5-12 with Span/Div ≤ 200 kHz, and Bands 2-4 with Span/Div ≤ 100 kHz (Phase locked); $\leq (7 \text{ kHz}) N$ peak-peak in 20 ms (unlocked).

Noise Sidebands:	dBc/Hz	Offset From Carrier
	≤ -95	3 kHz
	≤ -105	30 kHz
	≤ -115	300 kHz

Resolution Filters: 100 Hz to 1 MHz (6 dB bandwidth $\pm 20\%$) in decade steps. Shape factor $\leq 7.5:1$ (60 dB/6 dB)

(continued)

2. Specification (continued)

Video Filter Range:	0.3 Hz to 30 kHz (coupled to resolution filter by front panel pushbuttons).
Frequency Span Division:	0 Hz (zero span pushbutton or keypad data entry): 200 Hz to 10 GHz (in a 1-2-5 sequence) via Span/Div knob: 200 Hz to 15 GHz (to two significant digits) via keypad or start/stop data entry, or marker start/stop: Full band via MAX SPAN pushbutton (12 bands). Accuracy $\pm 5\%$ of selected Span/Div.
Amplitude Related	
Vertical Display Modes:	10 dB, 2 dB and linear via pushbutton; any integer from 1 to 15 dB/Div via Data Entry keypad.
Display Dynamic Range:	80 dB log mode; 8 Divisions linear.
Reference Level Range:	Log mode; -117 to +40 dBm, +30 dBm max. -130 to 27 dBV, +17 dBV max. -70 to 87 dBmV, +77 dBmV max. -10 to 147 dB μ V, +137 dB μ V max. Linear Mode: 39.6 nV/Div to 2.8 V/Div 1 W max.
Reference Level Steps:	10 dB coarse, 1 dB fine in 10 dB log; 1 dB coarse, 0.25 dB fine in 2 dB log; 1-2-5 sequence coarse, 1 dB equivalent fine in linear; coarse step = log/Div, fine is 1 dB for 5 dB/Div or greater, 0.25 dB for 4 dB/Div or less set via Data Entry keypad.
Reference Level Accuracy:	Accuracy is dependant on a combination of RF Attenuator Accuracy, IF Gain Accuracy, Resolution Bandwidth, Display Mode, Calibrator Accuracy, Frequency Band, Frequency Response and Temperature Change (± 0.15 dB/ $^{\circ}$ C max.)
Display Amplitude Accuracy:	± 1.0 dB/10 dB to a maximum of ± 2 dB over 80 dB (10 dB log); ± 0.4 dB/2 dB to a maximum of ± 1.0 dB over 16 dB (2 dB log); $\pm 5\%$ of full scale in linear.
RF Attenuator Range:	0 to 60 dB in 10 dB steps
Accuracy:	dc to 1.8 GHz; 0.5 dB/10 dB, 1 dB maximum cumulative error over 60 dB. 1.8 to 18 GHz; 1.5 dB/10 dB, 3 dB maximum cumulative error over 60 dB. 18 to 21 GHz; 3 dB/10 dB, 6 dB maximum cumulative error over 60 dB.
Resolution Bandwidth Gain Variation:	± 0.4 dB (After CAL with respect to 1 MHz filter)
IF Gain Range:	87 dB increase; 10 dB decrease in MIN NOISE; 10 dB and 1 dB steps.

(continued)

2. Specification (continued)

IF Gain Accuracy: ≤ 0.2 dB/dB to maximum of 0.5 dB/9 dB except at the decade transitions -19 to -20 dBm, -29 to 30 dBm, -39 to -40 dBm, -49 to -50 dBm, -59 to -60 dBm. An additional ≤ 0.5 dB for a maximum cumulative error of 1 dB over 10 dB; ± 2 dB maximum deviation over the 97 dB range.

Marker/s Accuracy; Equal to Reference Level Accuracy plus Display Amplitude Accuracy.

Spurious Responses:

3rd Order Intermodulation Products

50 kHz - 21 GHz (Bands 1 - 5)	At least -70 dBc from any two on-screen signals within any frequency span	≥ -100 dBc when signals are separated 100 MHz or more in pre-selected bands
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Harmonic Distortion

50 kHz to 1.8 GHz (Band 1)	-60 dBc or less	Measured at -40 dBm input level in Minimum Distortion Mode.
1.7 to 21 GHz	Not discernible	Typically - 100 dBc
LO Emission	Less than -70 dBm to 21 GHz	With 0 dB rf Attenuation

Spurious Responses (Residual): ≤ -100 dBm

Input Signal Characteristics

RF Input: Type "N" female 50 ohms nominal impedance

Maximum Safe Input Level (Attenuator Max. Rating): + 30 dBm (1 W) continuous, 75 W peak, pulse width 1 μ s or less with a maximum duty factor of 0.001 (attenuator limit) DO NOT APPLY DC VOLTAGE TO THE RF INPUT (See Optional Accessories for dc Block)

1 dB Gain Compression ≥ -18 dBm in MIN Distortion Mode.

VSWR

Frequency	(Typical) 0 dB Attenuation	10 dB Attenuation
50 kHz to 2.5 GHz	1.9:1	1.3:1 max. 1.2:1 Typical
2.5 to 6.0 GHz	1.9:1	1.7:1 max. 1.5:1 Typical
6.0 to 18 GHz	2.3:1	2.3:1 max. 1.9:1 Typical
18 to 21 GHz	3.0:1	3.5:1 max. 2.7:1 Typical
Measured at ± 3 MHz of pre-selector peak for Opt.01		

(continued)

2 Specification (continued)

Sensitivity

Band and Freq. Range	Equivalent Input Noise in dBm versus Resolution Bandwidth					
	100 Hz	1 kHz	10 kHz	100 kHz ^a	300 kHz ^a	1 MHz
1 (50kHz-1.8 GHz)	-120	-110	-100	-90	-85	-80
2 & 3 (1.7-7.1 GHz)	-119	-109	-99	-89	-84	-79
4 (lower part) (5.4-12.0 GHz)	-105	-95	-85	-75	-70	-65
4 (upper part) (12.0-18.0)	-100	-90	-80	-70	-65	-60
5 (15.0-21.0 GHz)	-100	-90	-80	-70	-65	-60
Equivalent maximum input noise with internal pre-selection for each resolution bandwidth for frequency bands 1-5 (50 kHz-21 GHz), the NARROW Video filter is activated for resolution bandwidths of 1 kHz or less, and the wide filter for resolution bandwidths above 1 kHz.						

Output Characteristics

Calibrator (Cal Out):	20 dBm \pm 0.3 dB at 100 MHz \pm 1.0 kHz.
1st and 2nd LO:	Provides access to the output of the respective local oscillators (1st LO + 7.5 dBm minimum to a maximum of +15 dBm, 2nd LO -22 dBm minimum to a maximum of +15 dBm). These ports must be terminated in 50 ohms at all times.
Vertical Out:	Provides 0.5 V \pm 5% of signal per division of video above and below the centreline.
Horizontal Out:	Provides 0.5 V either side of centre. Full range -2.5 V to +2.5 V \pm 10%.
IF Out:	Output of the 10 MHz i.f. Level is approx. -5dBm for a full screen signal at -30 dBm input reference level. Nominal impedance is 50 ohms.
Pen Lift	TTL: 5V nominal to lift pen
GPIB Interface:	In accordance with IEEE-488 Standard

3 Comprising

Instrument plus:

	10ZZ/210068	50 ohm Coaxial Cable (BNC-BNC)	0.457 m	012-0076-00	
	10ZZ/210069	50 ohm Coaxial Cable (N-N)	1.829 m	012-0114-00	
	10ZZ/210073	CRT Light filter (Grey)		378-0115-02	
	10ZZ/210079	CRT Light Filter (Amber)		378-0115-01	
▶	10ZZ/210075	CRT Mesh Filter		378-0227-00	◀
	10ZZ/210076	Adaptor N(m)-BNC(f)		103-0045-00	
▶	5995-01-2895697	Mains Lead		161-0104-07	◀
		Mains Lead Clamp		343-0170-00	
		Fuse 4A Fast Blow (Qty 2)		159-0017-00	
		Operator's Manual		070-5562-00	
		Programmer's Manual		070-5564-00	
▶		Transit Cover		200-3195-00	◀

4 Accessory Items

	10ZZ/210077	Mixer 18 GHz-26.5 GHz		AFDEETEC 19290
	10ZZ/210078	Mixer 26.5 GHz-40 GHz		AFDEETEC 19291
	10ZZ/210070	GPIB Cable		012-0630-01

5 Associated Equipment

None

2. Specification

Input Characteristics:

Carrier Frequency Range (Automatic Operation): 30 to 1000 MHz
Automatic Measurements can also be made in the bands
10 to 13 MHz

Carrier Frequency Range (Manual Tuning): 6 to 1000 MHz using external local oscillator with a range of 13 to 28 MHz. Input required 200 mV to 1 V rms into 50 ohms

Input Level:

Low Input: 10 to 100 mV rms up to 500 MHz
20 to 150 mV rms up to 1 GHz

High Input: 100 mV to 1 V rms up to 500 MHz
150 mV to 1 V rms up to 1 GHz

Level Setting: Fully automatic

Input Impedance: 50 Ω nominal

FM Measurement:

Deviation Ranges: 1.5, 3, 5, 10, 15, 30, 50 and 100 kHz peak deviation fsd
Measurements of positive and negative deviations can be made

Modulation Frequency: 50 Hz to 10 kHz

Accuracy: Better than $\pm 30\%$ of fsd and $\pm 2\%$ of reading over the modulating frequency range 300 Hz to 3 kHz, ± 0.5 dB wrt above, over the modulating frequency range 50 Hz to 10 kHz

Residual FM Noise: Without filter: less than 100 Hz for carrier frequencies up to 250 MHz then doubling per octave.
With af filter: less than 30 Hz for carrier frequencies up to 250 MHz then doubling per octave.

AM Rejection: Additional deviation error is less than 250 Hz with an am depth of 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% fsd modulation depth. Measurements of either peak or trough relative to mean carrier can be made.

Modulation Frequency: 50 Hz to 10 kHz

Accuracy: Better than $\pm 3\%$ of fsd and $\pm 2\%$ of reading up to 95% modulation over the modulating frequency range 300 Hz to 3 kHz; ± 0.5 dB, wrt the above, over the modulation frequency range 30 Hz to 10 kHz

Residual am: Less than 1% modulation

FM rejection: Additional am error less than 1.5% with peak deviations of up to 100 kHz

IF Output:

Frequency: 500 kHz

Level: 100 mV rms emf

Output Impedance: 600 Ω nominal

AF Output:

Bandwidth: Normal: 50 Hz to 10 kHz ± 0.5 dB
With filter: 300 Hz to 3 kHz at 2 dB points

Level: 1 V emf rms when meter is at fsd

Output Impedance: 600 Ω nominal

Distortion: Less than 0.5% for fm deviations up to 100 kHz
Less than 1% for am depths up to 80%, (typically 0.5%)

Environmental Conditions:

Operating Temperature: 0 to 55^o C, 0 to 40^o C with battery pack

Storage Temperature: -25 to +70^o C, -25 to +50^o C with battery pack

3. Comprising

Instrument only.

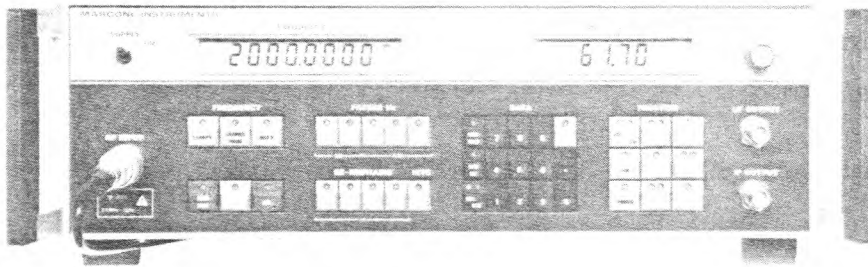
4. Accessory Items

<u>REF NO.</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
10S/5905-99-5800511	75/50 Ω Matching Pad	TM 6599

5. Associated Equipment

None.

Section Reference 10S/7465601		Nomenclature MODULATION METER		
Manufacturer MARCONI		Part No. 2305		Cost/Date £6000 1982
Height 152 mm	Width 425 mm	Depth 535 mm	Weight 13.5 kg	
Power Supplies AC supply 105-110 V, 115-120 V, 210-220 V, 230-240 V all $\pm 10\%$ 45 to 440 Hz				Air Publication TBA
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19230



1. Description

The Modulation Meter 2305 is an automatic tuning instrument suitable for a wide range of measurements on signal sources. Conventional measurements such as fm or pm deviation and am depth are made with excellent resolution and high accuracy over a carrier frequency range from 500 kHz to 2 GHz. Additional measurements such as frequency, rf power, frequency response, signal to noise ratio, etc can be made and a high quality demodulated output is provided for monitoring purposes. An internal calibrator is fitted to ensure optimum accuracy for all modulation measurements.

With its wide range of measurement facilities, the 2305 is suitable for development, production and maintenance testing of equipment for fixed and mobile communications, broadcasting, telemetry and multichannel links. The unit can also be used for measuring and calibrating precision signal sources.

The 2305 is fitted with a GPIB option interface so that all functions can be controlled over the bus. Simple commands set up the required measurement conditions and the unit will then send results to the GPIB controller when requested.

2. Specification

RF Input:

Carrier frequency range:	500 kHz to 2 GHz
Automatic tuning:	Selecting 'Auto Tune' causes the instrument to tune automatically to the strongest signal in the carrier frequency range. Acquisition time is typically 500 ms.
Frequency indication:	8 digit LCD
Manual tuning:	By front panel keyboard or GPIB entry
Sensitivity:	-25 dBm (13 mV) from 0.5 MHz to 1 GHz -18 dBm (28 mV) from 1 GHz to 2 GHz
Maximum input:	+30 dBm (1 W or 7 V rms into 50 Ω From 500 kHz to 2 GHz
Overload protection:	Automatic trip provides protection against overloads up to 25 W
Input connector:	Type N female
Input impedance:	50 Ω

Frequency Modulation:

Maximum deviation:	500 kHz peak deviation at modulation rates of 30 Hz to 275 kHz at carrier frequencies above 5.5 MHz. 50 kHz peak deviation at modulation rates of 30 Hz to 15 kHz up to 5.5 MHz.
Range selection:	Ranges automatically selected for best resolution.
Accuracy:	After calibration using internal calibrator $\pm 0.5\%$ of reading ± 1 digit at 1 kHz modulation rate with the 50 Hz to 15 kHz filter selected. Frequency response relative to 1 kHz modulation rate with the 10 Hz to 300 kHz filter selected: <ul style="list-style-type: none"> $\pm 0.5\%$ of reading for modulation rates from 20 Hz to 20 kHz + 0.5% - 1% of reading for modulation rates from 20 Hz to 50 kHz + 0.5% - 5% of reading for modulation rates from 20 Hz to 275 kHz.
AM rejection:	Typically 40 Hz peak deviation for 50% am at 1 kHz modulation rate with the 300 Hz to 3.4 kHz filter selected.

Phase Modulation:

Carrier frequency range:	5.5 MHz to 2 GHz useable down to 500 kHz
Maximum deviation:	500 radians for modulating frequencies up to 1 kHz (500/F)radians for modulating frequencies above 1 kHz, where f is the modulating frequency in kHz.
Range selection:	Ranges automatically selected for best resolution.
Accuracy:	After calibration using internal calibrator, $\pm 2\%$ of reading ± 1 digit for 1 kHz modulation rate. Frequency response relative to 1 kHz modulation rate $\pm 2\%$ of reading for modulation rates from 300 Hz to 4 kHz. Useable from 50 Hz to 20 kHz.
AM rejection:	Typically 0.04radian peak deviation for 50% am at 1 kHz modulation rate.

Amplitude Modulation:

Maximum modulation depth:	99.9%
Modulation rates:	30 Hz to 50 kHz for carrier frequencies from 5.5 MHz to 2 GHz. 30 Hz to 15 kHz for carrier frequencies from 0.5 to 5.5 MHz.
Range selection:	Ranges automatically selected for best resolution.
Accuracy:	After calibration using internal calibrator $\pm 1\%$ of reading ± 1 digit at 1 kHz modulation rate for depths up to 95%. Frequency response relative to 1 kHz: $\pm 1.5\%$ of reading for modulation rates from 30 Hz to 50 kHz.
FM rejection:	Less than 0.5% am for 50 kHz peak deviation for carrier frequencies above 5.5 MHz measured with the 50 Hz to 15 kHz filter selected.
Residual am noise:	Less than 0.02% rms am measured with the 300 Hz to 3.4 kHz filter selected for input levels above -17 dBm (30 mV).

Power Measurement:

Range:	10 mW to 1 W (+10 to +30 dBm)
Accuracy:	± 1 dB at 800 MHz
Frequency response:	± 1 dB from 500 kHz to 1.5 GHz useable to 2GHz.
VSWR:	Better than 2:1 from 500 kHz to 1.5 GHz

- Frequency Display:** Front panel keys select display of the following on an 8 digit LCD carrier frequency.
Carrier error - the difference between carrier frequency received and carrier frequency set from the front panel or by GPIB control modulation rate.
- Carrier frequency mode:** Range: 0.5 MHz to 2 GHz
Resolution: 10 Hz for carrier frequencies up to 1000 MHz, 100 Hz for carrier frequencies up to 2 GHz.
- Carrier error mode:** Resolution: 10 Hz for all carrier frequencies.
- Modulation rate mode:** Range: 20 Hz to 275 kHz.
Resolution: 0.1 Hz up to 5 kHz and 10 Hz to 5 kHz.
- Accuracy (all modes):** ± 1 count \pm frequency standard error.
- Modulation Display:** 4 digit LCD indicates results in the following units:
- AM - % modulation depth
 - FM - kHz deviation
 - PM - radians deviation
 - Power - dBm or W as selected
 - Relative - dB
- Detector modes:** The following detector modes may be selected:
- Average peak (pk-pk)/2
 - Positive peak
 - Negative peak
 - Noise averaging
- Display modes:** The following display modes may be selected:
- Absolute - displays absolute value of modulation.
 - Relative - displays modulation in dB relative to a reference level entered from the front panel.
 - Peak hold - holds and displays the peak value of the modulation.
- Filters:** Five IF (post detection) filters may be selected:
- | | |
|-------------------|---------------------------|
| 10 Hz to 300 kHz | Flat within
0.1 dB |
| 30 Hz to 50 kHz | |
| 65 Hz to 250 Hz | |
| 50 Hz to 15 MHz | nominal 3 dB
bandwidth |
| 300 Hz to 3.4 MHz | |

De-emphasis:	Three de-emphasis time constants may be selected: 50 μ s, 75 μ s and 750 μ s (De-emphasis affects only the IF output and relative measurements not the modulation reading).
IF Output:	IF output is available at front panel BNC socket.
Frequency:	As carrier frequency for inputs up to 1.5 MHz. 250 kHz nominal for inputs from 1.5 to 5.5 MHz. 1.5 MHz nominal for inputs above 5.5 MHz.
Amplitude:	100 mV rms nominal into 50 Ω load.
Output impedance:	50 Ω nominal.
LF Output:	A demodulated, filtered and de-emphasised IF output is available at a front panel socket.
Level:	Front panel control adjusts level from 0 to at least 3 V rms into 600 Ω for fm deviations greater than 300 Hz, am depth greater than 1% or pm greater than 0.3 radians (at 1 kHz rate).
FM distortion:	At modulation rates up to 20 kHz: Better than 0.1% thd for deviations up to 100 kHz. Better than 0.5% thd for deviations up to 500 kHz. At modulation rates up to 100 kHz better than 1% thd for deviations up to 500 kHz.
AM distortion:	At a 1 kHz modulation rate: better than 1% thd for modulation depths up to 95%.
Stereo separation:	Better than 50 db at 1 kHz.
Frequency Standard:	Internal standard or external input. Front panel indicator shows when external standard is selected.
Internal standard:	Frequency 10 kHz Temperature stability: better than \pm 0.1 ppm over temperature range of 0 to 40° C. Warm up time: within 0.5 ppm of final frequency within 5 min from switch on at 20° C ambient.
Distortion/Weighting Filter:	A distortion and SINAD measuring facility is available.
Distortion/Sinad:	Measured frequencies: 300 Hz, 500 Hz and 1 kHz (all \pm 5%). Functional rejection: greater than 65 dB. Distortion range: 0.1 to 100%. Sinad range: 0 to 60 dB. Accuracy \pm 1 dB.

3. Comprising

▶ Instrument		
10S/6625-99-7770378	GPIB Module	54433-001U
10ZZ/210705	GPIB Lead Assy	43129-189U
10S/6625-99-7770379	Distortion/Weighting Filter Kit	46883-527G
10ZZ/210164	AC Supply Lead	43123-076Y
10ZZ/210165	Stereo Jack Plug	23421-620H
Operating Manual		46881-431P

4. Accessory Items

10ZZ/210166	RF Connecting Cable (TM4969/3) 50 Ω , 1.5 m, BNC	43126-012S
10ZZ/210167	RF Connecting Cable 50 Ω , 457 mm, N Type	43126-026A
10ZZ/210168	Front Handle Kit	46883-511R
10ZZ/210169	Rack Mounting Kit	46883-506M
NYR	Carrying Case	2019-Olive

5. Associated Equipment

None.

Section Reference: 10S/6625-99-4094784		Nomenclature: MICROWAVE FREQUENCY COUNTER		
Manufacturer: RACAL INSTRUMENTS		Part No: 2101 OPT 04A, 60		Cost/Date: £2700
Height: 101 mm	Width: 212 mm	Depth: 420 mm	Weight: 5.5 kg	
Power Supplies: 90 - 127 V, 193 - 253 V, 45 - 440 Hz			Air Publication: MANUFACTURER'S HANDBOOK	
Availability: 2	Environment: B	Maintenance Policy: 4D	Calibration: AH 12	AFDEETEC No: 19521



1. Description

The Racal 2102 Microwave Counter is an easy to use, half rack counter that gives the advantage of high performance by using an advanced single sampler technique. Features of this instrument include Ratio, full Math, signal tracking and acceptance of low FM rates. To minimise the need to change channels, the three inputs have large bandwidth overlaps. Input C has a maximum input of +34 dBm through the use of an internal power limiter. In addition to the automatic operation, a manual mode allows the approximate frequency to be entered giving low acquisition times and increasing data output rates. A track mode also allows the counter to follow drifting signals with optimum performance. Full GPIB is fitted as standard.

2. Specification

INPUT A

Range: 10 Hz to 80 MHz

Sensitivity: 20 mV rms

Input Impedance: 1 M Ω /35 pF

Maximum Input: 260 V (DC + AC rms) to 2 kHz, decreasing to 10 V rms at 50 kHz and above.

Filter: Low pass filter (50 kHz).

2. Specification (continued)INPUT B

Range: 40 MHz to 1.3 GHz

Sensitivity: 10 mV (to 1 GHz) 25 mV (at 1.3 GHz)

Input Impedance: 50 Ω nominal.

Operating Range: 10 mV to 5 V rms.

Damage Overload: 7 V rms (protected by fuse).

VSWR: 2.3:1 (to 1.3 GHz)

INPUT C (MICROWAVE CHANNEL)

Range: 500 MHz to 20 GHz

Sensitivity: -32 dBm (to 12.4 GHz), -27 dBm (to 20 GHz)

Operating Level: +7 dBm

Damage Level: +25 dBm peak

Input Connector: Precision type N female.

VSWR: < 2:1 (to 10 GHz), < 3:1 (to 20 GHz)

AM Tolerance: 99%

FM Tolerance: 60 MHz pk-pk (Manual), (1 kHz - 10 MHz rates)
20 MHz pk-pk (45 Hz to 10 MHz rates).

Acquisition Time: 20 mSec (Manual), 60 mSec (Track), 120 mSec (Auto), 1.25 mSec (Low FM).

Amplitude Discrimination: 20 dB (6 dB if within 500 MHz) (Typical).

MEASUREMENT MODESFrequencies A and B

Range Frequency A: 10 Hz to 80 MHz

Range Frequency B: 40 MHz to 1.3 GHz

Digits Displayed: 3 to 10 digits.

LSD Displayed (Hz): F X 10E-D (F = Frequency rounded to next decade, D = Number of digits).

Frequency C

Range: 500 MHz to 20 GHz

2. Specification (continued)Frequency C (continued)

LSD Displayed: 0.1 Hz to 1 MHz (Resolution selectable).

Ratio B/A, C/A, C/B

Range (B/A): 500 MHz to 20 GHz
10 Hz to 80 MHz

Range (C/A): 500 MHz to 20 GHz
10 Hz to 80 MHz

Range (C/B): 500 MHz to 20 GHz
40 MHz to 1.3 GHz

Check 10 MHz displayed as check function.

TIMEBASE SPECIFICATIONS

Frequency: 10 MHz

Ageing Rate: 3×10^{-9} /day averages over 10 days after three months continuous operation.

Temperature Stability: $\pm 3 \times 10^{-9}$ /%C averaged over range 0°C to +45°C (operable to +50°C).

GENERAL SPECIFICATIONS

Gate Time: Automatically determined depending upon resolution set.

Range: 1 mSec to 20 Sec (10 Sec maximum for Channel C).

Sample Rate: Selectable display and output rates.

Display: 13 digit high brightness 14 mm LED display, separate indicators for GHz, MHz, kHz and Hz.

FEATURES

Low FM: For accepting very low modulation rates.

Track: For following drift/tuning without reacquisition (1 GHz/Sec).

Multiply: Displays the measured frequency multiplied by an entered number.

2. Specification (continued)FEATURES (continued)

Offset: Allows a stored or keyboard entered frequency to be added or subtracted from the measured signal.

Smooth: Displays the optimum resolution relevant to the stability of the input signal.

3. Comprising Items

Mains lead
Fuse 315 mA 240 V working
Fuse 500 mA 115 V working
RF Fuse 1.3 GHz (X5)
Front Cover
Accessory Pouch
Operators Handbook

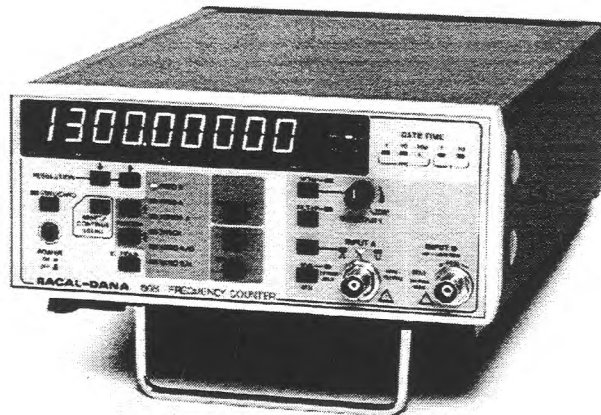
4. Accessory Items

None

5. Associated Equipment

None

Section Reference: 10S/6625-99-7864628		Nomenclature: 1.3 GHz FREQUENCY COUNTER		
Manufacturer: RACAL INSTRUMENTS		Part No: 1988 OPT 4A		Cost/Date: £1100/JAN 94
Height: 101 mm	Width: 238 mm	Depth: 363 mm	Weight: 3.6 kg	
Power Supplies: 90 - 110 V, 103 - 127 V, 193 - 237 V, 207 - 253 V, 45 - 440 Hz			Air Publication: MANUFACTURER'S HANDBOOK	
Availability: 2	Environment: B	Maintenance Policy: 4D	Calibration: AH 12	AFDEETEC No: 19522



1. Description

The Racal 1988 is a 10 Hz to 1.3 GHz counter offering frequency, period and ratio measurement modes with the capability of external arming, nulling and single shot measurement. It is a reciprocal counter with nine digit resolution in one second. Resolution can be varied between three and ten digits to provide optimum speed/resolution times from 1 msec to 20 seconds. An IEEE488.2 interface is included for use in controlled systems.

2. Specification

INPUT A

Frequency Range:	10 Hz to 160 MHz	
Input Impedance:	x1 att.	1 M Ω /40 pF (AC coupled) or 50 Ω (DC coupled)
	x20 att.	1 Ω /25 pF (AC coupled) or 50 Ω (DC coupled)

2. Specification (continued)

Dynamic Range: ± 1 V pk (x1), \pm x20 V pk (x20)

Sensitivity: Sinewave
 < 10 mV rms, 20 Hz to 120 MHzS
 < 50 mV rms, 120 MHz to 160 MHz
 < 20 mV rms, 10 Hz to 20 Hz

Pulse
 5 nS min. pulse width
 (\sim) 45 mV pk-pk at 25% and 75% duty cycle
 (Π / U) 28 mV pk-pk at up to 105 duty cycles
 45 mV pk-pk at 255 and 75% duty cycle

Input Attenuation: 0 dB to approx. 58 in two ranges,
 continuously variable using sensitivity
 control and 1/20 attenuator control.

Maximum Input: 50 Ω , 10 V rms (DC coupled)
 1 M Ω (X1 attenuation) 260 V (DC + AC rms),
 from 10 Hz to 2 kHz, decreasing to 10 V rms
 at 40 kHz and above.
 1 m Ω (20 attenuation) 260 V (DC+ AC rms), from
 10 Hz to 40 kHz, decreasing to over 10 V rms
 at 1 MHz and above.

Trigger Levels: Three selectable trigger levels are available
 to provide optimum triggering on waveforms
 with different duty cycles. (Sens. control
 set to maximum, x1 attn.).

	Offset	Trigger Edge
(Π)	+9 mV	Negative
(\sim)	0mV	Positive
(U)	-9 mV	Positive

Filter: 50 kHz nominal low pass filter. Attenuation
 rate 20 dB/decade nominal.

INPUT B

Frequency Range: 40 MHz to 1.3 GHz, AC coupled.

Input: 50 Ω nominal (BNC connector).

VSWR: <2.1(1 GHz)

Operating Range: (Sinewave) <10 mV - 5 V rms to 1 GHz, <75 mV
 - 5 V rms to 1.3 GHz.

Maximum Input: 7 V rms (fuse protected).

Damage Level: 25 W

2. Specification (continued)MEASUREMENT MODES

Frequency A and B

Digits Display:	3 to 10 digits.
LSD Displayed (Hz):	$F \times 10^E - D$ (F=Frequency rounded up to next decade, D = No. of digits).
Resolution (Hz):	$\pm n \text{ LSD}$ $\pm (\text{Trigger Error} \times \text{Freq}) / \text{Gate Time}$
Accuracy (Hz):	$\pm \text{Resolution}$ $\pm (\text{Timebase Error} \times \text{Freq})$

PERIOD A

Range:	6.25 nS to 100 mS
Digits Displayed:	3 to 10 digits
LSD Displayed (Sec):	$P \times 10^E - D$ (P = Period rounded up to next decade, D = No. of digits).
Resolution (Sec):	$\pm n \text{ LSD} \pm 1.4$ $(\text{Trigger Error} \times \text{Period}) / \text{Gate Time}$
Accuracy (Sec):	$\pm \text{Resolution}$ $\pm (\text{Timebase Error} \times \text{Period})$
RATIO B/A:	SPECIFIED FOR HIGHER FREQUENCY APPLIED TO INPUT B.
Input A:	10 Hz to 100 MHz.
Input B:	40 MHz to 1.3 GHz.
LSD Displayed:	1 to 8 digits determined by Freq A and gate time selected.
Resolution:	$\pm \text{LSD} \pm 1.4 (\text{Trigger Error}(A) \times \text{Ratio}) / \text{Gate Time}$.
Accuracy:	$\pm \text{Resolution}$

BURST

Min. Burst Time:	1 mS + Gate Time
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2. Specification (continued)GENERALINTERNAL TIMEBASE

Frequency:	10 MHz
Aging Rate:	3 x 10E-9/day averaged over 10 days after three months continuous operation.
Temp. Stability:	± 3x10E-9/%C averaged over range 0°C to + 45°C (operable to + 50°C).
Warm Up:	Typically ± 1x10E-7 within six minutes.

FREQUENCY STANDARD OUTPUT

Frequency:	10 MHz
Amplitude:	TTL levels giving approximately 10 V p-p into 50.
Impedance:	90 nominal
Max. Reverse I/P:	± 15 V.

EXTERNAL STANDARD INPUT

Frequency:	10 MHz
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GATE TIME

Automatically determined by the number of digits selected. LED annunciators indicate gate time.

No. of Digits Selected	Gate Time (Seconds)
10	20
9	1
8	0.1
7	0.01
6,5,4,3	0.001

These nominal gate times will be extended depending on period of input signal.

Gate Output:	Available as a TTL compatible signal at the rear panel
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3. Comprising Items

Mains lead
 Fuse 250 mA 240 V working
 Fuse 500 mA 115 V working
 RF Fuse 1.3 GHz (5)

3. Comprising Items (continued)

Front Protection Cover
Accessory Pouch
Operators Handbook

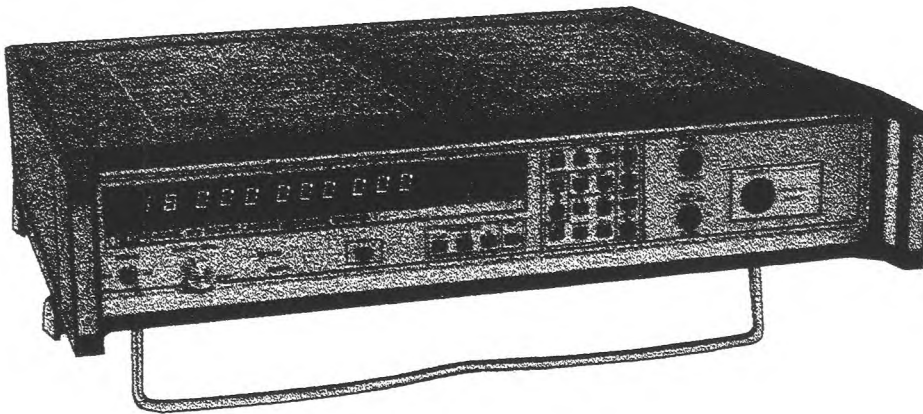
4. Accessory Items

None

5. Associated Equipment

None

Section Reference: 10S/2255467		Nomenclature: SOURCE LOCKING FREQUENCY COUNTER		
Manufacturer: EIP (RACAL DANA)		Part No: 575 OPT 09, 22		Cost/Date: £9400/84
Height: 89 mm	Width: 425 mm	Depth: 356 mm	Weight: 9.07 kg	
Power Supplies: 100, 120, 220, 240 V ac \pm 10%, 50-60 Hz			Air Publication: -	
Availability: 2	Environment: B	Maintenance Policy: 4D	Calibration: AH/12	AFDEETEC/AFDSEC No: 19339



1. Description

The 575 counter provides fully automatic control in phase-locking virtually any swept signal source to the same accuracy and long-term stability as the time-base oscillator in the counter.

The 575 can also operate as a CW frequency counter. Features include a 5 W input protection, 10 dB amplitude discrimination, frequency offsets, multiply function and frequency limit capability. Option 09 provides a rear input and Option 22 allows 240 V 50 Hz operation.

2. Specification

	<u>BAND 1</u>	<u>BAND 2</u>	<u>BAND 3</u>
Range	10 Hz - 100 MHz	10 MHz - 1 GHz	1 GHz - 18 GHz
Sensitivity	25 mV rms	-20 dBm	-30 dBm : 1-12.4 GHz -25 dBm : 12.4-18 GHz

2. Specification (continued)

	<u>BAND 1</u>	<u>BAND 2</u>	<u>BAND 3</u>
Connector	BNC Female	BNC Female	Precision Type N Female
Coupling	ac	ac	ac
Maximum Operating Level	120 V rms	+10 dBm	+7 dBm
Damage Level	150 V rms*	+27 dBm	+37 dBm (5 W)

* above 1 kHz maximum input decreases at 6 dB/octave down to 3.0 V rms)

Acquisition Time - < 50 ms < 250 ms

BAND 3 only

Automatic Amplitude Discrimination: 10 dB

FM Tolerance: 20 MHz p-p up to 10 MHz rate

VSWR: 2.5 : 1 (typical)

Frequency Limit: Keyboard controlled. Counter will measure largest signal within programmed limits. Signal outside desired range must be separated by 200 MHz (typical) from either limit.

Overload Indication: Display indicates "OVERLOAD" when input level exceeds approx. + 10 dBm.

Time Base (Standard):

 Crystal Frequency: 10 MHz

 Stability:

 Ageing Rate <3 x 10⁻⁷ /month

 Short Term <1 x 10⁻⁹ rms for one second averaging₆ time

 Temperature <2 x 10⁻⁶ over the range 0° to 50°C

 Line Variation ± 10% change in line voltage produces frequency shift <1 x 10⁻⁶

 Warm-up Time None required

 Output Frequency 10Hz, square wave, 1V p-p minimum into 50 Ω

 External Time Base Requires 10 MHz, 1V p-p minimum into 300 Ω

General:

 Resolution Front panel keyboard select 1 Hz to 1 GHz

 Measurement Time 1 ms for 1 kHz resolution
 1 s for 1 Hz resolution

 Display 12-digit LED sectionalized to read GHz, MHz, kHz, Hz

 Accuracy ± 1 count ± time base error

General (continued)

Sample Rate	Controls time between measurements, variable from 100 ms typical to 10 s. Switchable HOLD position holds display indefinitely.
Reset	Resets display to zero and initiates new reading.
Offsets	Keyboard control of frequency. Displayed frequency is offset by the entered value to 1 Hz resolution.
Multiply	Keyboard controlled. Counter will multiply the measured signal by any integer from 1 to 99 and display to 1 kHz resolution. Then OFFSET can be added or subtracted to obtain $y = mx \pm b$ result.
Operating Temperature	0° to 50°C

Source Locking Specifications

Frequency Range	10 MHz Max capability of counter.
Resolution	10 kHz for phase lock freq > 50 MHz 2.5 kHz for < 50 MHz
Accuracy	Equal to counter's Time Base
Long Term Stability	Equal to counter's Time Base
Minimum Phase Lock Signal Level	Equal to counter sensitivity
Polarity	Automatically selected
Bandwidth	User select, 10 kHz, 2 kHz or 500 Hz, or automatically selects widest bandwidth capable of locking.

Lock Time (Typical)

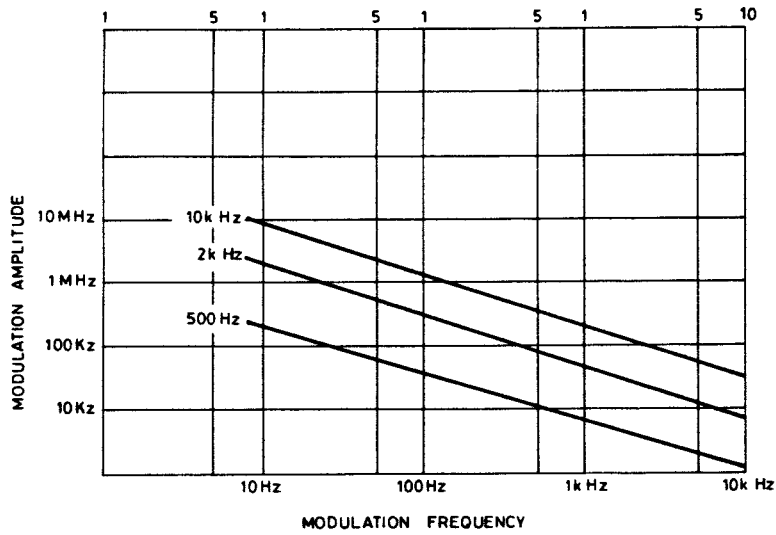
Coarse Tune	50 ms + 1 counter acquisition time for source bandwidth greater than 100 Hz; limited by source timing speed below 100 Hz.
Phase Lock	200 ms
Recall Stored Data	1 counter acquisition + 100 ms limited by source tuning speed.

Output Drive
(Maximum)

Coarse Tune Output	+ 10 V into 5 k Ω min
Phase Lock Output	\pm 10 V into 5 k Ω min for source gain constant < 64 MHz/V. \pm 75 mA into 10 Ω max for source gain constant < 3.2 MHz/mA. \pm .6 V into 5 k Ω min for source gain constant > 64 MHz/V.

Output Drive (continued)
(Maximum)

Phase Lock Output	± 4.5 MA into 10Ω max for source gain constant > 3.2 MHz/ mA.
Capture Range	
Coarse Tune	Entire range of selected counter band limited by maximum output drive.
Phase Lock	Source gain constant X maximum output drive.
Output Connector	
Coarse Tune	Rear panel BNC, female
Phase Lock	Rear panel BNC, female
Phase Locked Spectrum	
Noise Floor vs Input Frequency	The noise floor extends from the carrier to approximately the loop bandwidth. Beyond this the noise floor decreases 12 dB/bandwidth octave. The noise floor is the greater of: <ol style="list-style-type: none"> 1. NOISE FLOOR = 70 dBC/Hz 2. NOISE FLOOR = $(20 \log F - 65)$ dBC/Hz where F = Input frequency in GHz
Required Source Characteristics	
External Sweep	
(Coarse Tune) Input:	
Bandwidth	5 Hz minimum
Tuning Sensitivity	10 MHz/V minimum; 10 GHz/V maximum
FM (Phase Lock) Input:	
Bandwidth	2 kHz minimum
Tuning Sensitivity	
Voltage Driven Input	± 2 MHz/V minimum ± 1000 MHz/V maximum
Current Driven Input	± 0.1 MHz/ mA minimum ± 50 MHz/ mA maximum
Maximum FM	The counter will still frequency stabilize if maximum FM is exceeded, but accuracy and long term stability will not equal the counter's time base.



3. Comprising

Instrument
Power lead
Manual

4. Accessory Items

10ZZ/211073 Rack Mounting Kit 2010008-01.

5. Associated Equipment

None

Section Reference: 10S/7439270		Nomenclature: UNIVERSAL COUNTER TIMER, 1.3 GHz		
Manufacturer: RACAL - DANA		Part No: 1922-55-04ES		Cost/Date: £2484/1985
Height: 88 mm	Width: 210 mm	Depth: 320 mm	Weight: 3.63 kg	
Power Supplies: 100, 115, 215, 230 V AC \pm 10%, 45-450 Hz			Air Publication: -	
Availability: 2	Environment: B	Maintenance Policy: 2AB/4CD	Calibration: AH 12	AFDEETEC/AFDSEC No: 19362



1. Description

The model 1922 is a compact, lightweight Counter Timer providing frequency measurement up to 1.3 GHz with a 9-digit resolution in one second at any frequency. Measurement functions, in addition to frequency, include frequency ratio, time interval, totalise, phase, period and peak amplitude. Other features include GPIB control, auto-trigger and attenuator, direct digital trigger entry, external arming, time interval delay and offset and normalise capability.

2. Specification

Input Characteristics

Channels A and B

Frequency range:	Channel A, dc coupled 0 to 160 MHz (10 Hz ac coupled)
	Channel B, dc coupled 0 to 100 MHz (10 Hz ac coupled)
	25 mV rms sine wave dc to 100 MHz (50 mV to 160 MHz)

2. Specification (continued)

Sensitivity:	75 mV p-p minimum pulse width 5 ns
Trigger Level	
Range:	± 5.1 V in 20 mV steps (x1 attenuator) ± 51 V in 200 mV steps (x10 attenuator)
Accuracy:	± 30 mV ± 1% of trigger level reading (x1)
Auto Trigger	
Frequency range:	dc and 50 Hz to 100 MHz
Minimum amplitude:	50 mV rms sine wave, 150 mV p-p
Attenuator:	1 or 10 independently selectable
Auto Attenuation:	Selected with auto trigger.
Coupling:	ac or dc
Trigger Slope:	Positive or negative
Impedance:	
Separate Mode:	50 Ω or 1 MΩ /45 pF
Common Mode:	50 Ω or 1 MΩ /55 pF
Low-Pass Filter (Chan A):	50 kHz nominal

Channel C

Range:	40 MHz to 1.3 GHz
Sensitivity:	10 mV rms 40 MHz to 1.0 GHz (75 mV to 1.3 GHz)
Maximum Input	7 V rms (fuse protected)
Total Impedance	50 Ω nominal

Measurement Functions

Frequency A	
Range:	dc to 160 MHz
Resolution (LSD):	Up to nine digits + overflow
Frequency C	
Range:	40 MHz to 1.3 GHz
Resolution (LSD):	Up to nine digits + overflow
Period A	
Range:	6.25 ns to 1.7 x 10 ³ s
Resolution (LSD):	Up to nine digits + overflow
Time Interval (A to B)	
Range:	Minus 2 ns to 8 x 10 ³ s
Input Channel	
Common:	START and STOP Channel A
Separate:	START Channel A, STOP Channel B
Resolution (LSD):	1 ns

Time Interval Delay (Time Interval and Totalize measurements)

Range :	200 ns to 800 ms
Step Size (nominal) :	25 μ s (entered via keyboard)
Ratio A/B ¹	
Range :	dc to 100 MHz (both channels)
Ratio C/B	
Range :	40 MHz to 1.36 GHz, Channel C dc to 100 MHz, Channel B
Totalize (A by B) ¹	
Range :	0 to (10 ¹⁸) -1
Maximum Rate :	100 MHz
Phase A relative to B ¹	
Range :	0.1 ^o to 360 ^o
Resolution (LSD) :	0.1 ^o to 1 MHz
Read Peak Amplitude :	Maximum or minimum input
signal peaks to Channel A and B may be displayed.	
Frequency Range :	dc and 50 Hz to 20 MHz
Resolution :	20 mV (X1)
Math (Not applicable to phase measurement function) :	$\frac{\text{Result} - X}{Z}$

General

Gate Time :	3 to 6 digits, 1 ms 7 digits 10 ms 8 digits 100 ms 9 digits 1 s 9 digits + overflow, 10 s (in frequency and period modes)
Resolution :	Generally resolution depends upon the least significant digit (LSD) and the trigger uncertainty due to the noise and the slew rate of the input signal. For frequency measurements, Resolution = $\pm 2 \times \text{LSD} + \frac{(1.4 \times \text{trig. error}) \times \text{freq.}}{\text{gate time}}$
Accuracy :	The accuracy for absolute measurement functions depends on the frequency standard (time base) uncertainty and resolution. For frequency measurements; Accuracy = \pm resolution \pm (time base uncertainty) \times frequency

External Arming :	Independently selectable, positive, negative or off on START and STOP (TTL/CMOS compatible).
Time Base	
Internal Reference Oscillator	(Option 04ES)
Long term stability	$<5 \times 10E^{-10}$ /day
Short term stability	$<1 \times 10E^{-10}$ RMS Averaged for 1s after a 30 minute warm-up period $<5 \times 10E^{-11}$ RMS Averaged for 1s within five hours
Temperature stability	$<\pm 7 \times 10E^{-9}$ over the temperature range 0 to 50°C
Line Voltage Stability	$<\pm 1 \times 10E^{-10}$ for a 10% line voltage change
Warm-up	$<\pm 5 \times 10E^{-9}$ of final frequency within five hours of warm-up
	Note ... Standby mode allows the oscillator to be continuously powered
Output	A 10 MHz signal derived from the internal timebase is available from the rear panel
Input	An external frequency standard input is provided for operation from primary frequency standards
Option 55 - GPIB Interface	IEEE Std-488 (1978)
Control Capability	All front panel controls except Power On/Off and Standby/Charge
Interface Functions	SH1,AH1,T5,TE0,L4,LE0,SR1,RL1, PPO,DC1,DT1,CO,E2
Power Requirements	100,115,215,230 V ac $\pm 10\%$ 45-450 Hz
Consumption	35 VA approx
Operating Temperature	0°C to 50°C (excluding battery option)
Dimensions	Height 88 mm, Width 210 mm, Depth 320 mm
Weight	3.63 kg (8 lb) excluding battery option.

3. Comprising

Instrument

Mains lead

Operator's Manual

4. Accessory Items

None

5. Associated Equipment

None

Section Reference †		Nomenclature FREQUENCY METER		
Manufacturer HEWLETT PACKARD		Part No. 536A & 537A		Cost/Date †
Height 23.2 cm	Width 15.2 cm	Depth 15.2 cm	Weight 5.9 kg	
Power Supplies -			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. †

† see text



1. Description

A series of direct reading frequency meters measuring frequencies in coax. The instruments comprise a special transmission section with a high Q resonant cavity which is tuned by a choke plunger. A 1 dB or greater dip in output indicates resonance. Tuning is by a precise lead screw, spring loaded to eliminate backlash.

Model	Reference No	Afdeetec No	Cost	
536A	110T/6625-00-9666728	13317	£838	1980
537A	110T/ 6625-00-9309687	17124	£646	1980

2. Specification

Model	Frequency Range (GHz)	Overall Accuracies (%)	Calibration Increments (MHz)	W/G - Coax Equivalent Flange (Connector)
536A	0.96-4.20	0.22-0.96 to 1 GHz 0.17-1 to 4.2 GHz	2	Coax (Type N(f))
537A	3.7-12.4	0.170	10	Coax (Type N(f))

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

$$\text{Gate time} = \frac{\text{units to be displayed}}{\text{i/p freq. to obtain units}} = \frac{100\%}{66.6 \text{ Hz}} = 1.5020$$

Set 15020 at 'n' on the counter front panel.

3. Comprising

- ▶ - Instrument
- Mains Lead (Some counters have the mains lead wired in permanently and others have a detachable plug-in lead). ◀

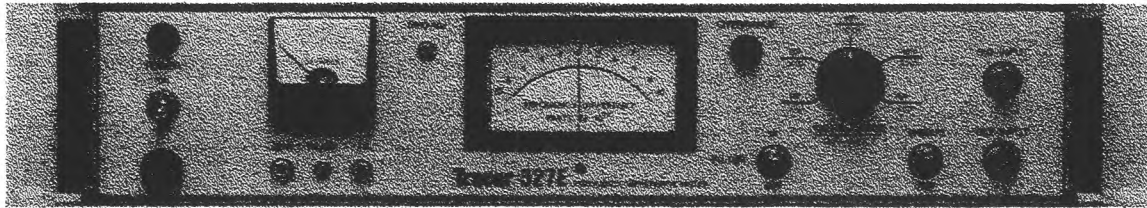
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference: 10S/0857707		Nomenclature: FREQUENCY DIFFERENCE METER		
Manufacturer: TRACOR		Part No: 527E		Cost/Date: £4538/1978
Height: 8.9 cm	Width: 42.6 cm	Depth: 32.4 cm	Weight: 6.8 kg	
Power Supplies: 115 v/230 V \pm 15%; 48 to 420 Hz			Air Publication: NONE	
Availability: 2	Environment: B	Maintenance Policy: B2/C3/D4	Calibration: AH 12	AFDEETEC/AFDSEC No: 19009



1. Description

The Tracor 527E meter gives an instant reading of the fractional frequency difference, with an accuracy of one part in 10^{11} or better, between two stable oscillators. A second panel meter indicates the phase relationship between the two input frequencies and its use increases the accuracy to one part in 10^{12} .

2. Specification

Input

Frequencies: 100 kHz \pm 0.25%; 1 MHz \pm 0.50%
2.5 MHz \pm 0.50%; 5 MHz \pm 0.50%
10 MHz \pm 0.50% (Signal only - not reference).
Reference and signal frequencies need not be the same.

Voltages: 0.5 V to 10.0 V rms

Impedance: 1 k Ω nominal

2. Specification (continued)

Output

Frequencies:	1 MHz derived from reference input 1 MHz + $10^N \Delta F$ signal input
Voltages:	2 V p-p
Impedance:	2 k Ω nominal

Frequency Difference Indicators

Frequency meter:	Front panel mounted; centre zero. Scale from -10 to +10 parts in $(10)^N$.
Phase meter:	The phase of the signal with multiplied differential error is shown with respect to the reference.
Overrange Lamp:	Indicates excessively noise input signal or frequency difference exceeding meter range.
Difference Multiplication:	Fractional frequency is multiplied by 10, 100, 1000, or 10,000. (Use of the latter with 100 kHz input requires exceptionally pure and stable input signal).
Accuracy:	$\pm 5\%$ of full scale reading on all ranges.
Filter:	Crystal filter with front panel switch allows operation with relatively noisy input signals.

3. Comprising

Instrument only.

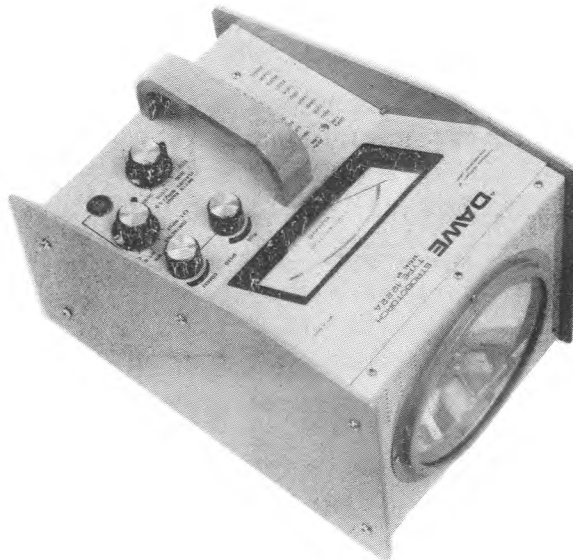
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 6C/6625-99-6368851		Nomenclature STROBOTORCH		
Manufacturer DAWE		Part No. 1222A		Cost/Date £300.00 1978
Height 19 cm	Width 19.7 cm	Depth 29.2 cm	Weight 5 kg	
Power Supplies 110 V/200-250 V ac; 50-60 Hz			Air Publication 120M-0501-13D	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFD/AFTEC/AFDSEC No. 18762



1. Description

The Type 1222A is a compact and portable general purpose stroboscope with a high intensity white light and a comprehensive range of facilities.

The instrument employs a transistorized oscillator which triggers the Xenon flash tube and also drives an analogue frequency meter. Facilities are provided for switching the internal oscillator out of circuit and triggering the instrument from an external source such as an oscillator, an electromagnetic pickup, phototransistor pickup, photoelectric pickup, vibration meter or vibration analyser. In all cases the flashing rate of the lamp is accurately indicated on the meter. The lamp may also be triggered at the supply frequency to check the calibration of the meter.

WARNING

Beryllium is used in the construction of this instrument.

Chap 3.4.12 ◀

2. Specification

Range:	300 to 36000 flashes/min in 4 over-lapping ranges. Speeds up to 360000 rev/min may be measured indirectly.
Accuracy:	$\pm 1\%$ of fsd when standardized. On the 2 highest ranges, above quarter scale $\pm 1\%$ of reading, when standardized at nearest available calibration point on the meter.
Colour of Light:	White
Flash Duration:	5 to 10 μ s
Mean Flash Tube Power:	12 W maximum
External Trigger:	Minimum 200 mV rms Maximum 200 V rms at 50 Hz
Input Impedance:	100 k Ω in parallel with approx 50 pF
Output:	The instrument has an output to drive a counter. This give a minimum 4 V peak to peak pulse, over all ranges of the instrument, into a 100 k Ω load.
External Contact:	The flash may be initiated by closing a pair of external contacts. Potential across contacts prior to closing 2 V approx. Capacitance across contacts 0.1 μ F.
Calibration Check:	Multi-point calibrator derived from the supply.
Accessories:	Handlamp Type 1222-1A. An external lamp unit for the type 1222A for stroboscopic observation in restricted locations. When the handlamp is in use the lamp in the Type 1222A is switched off.

3. Comprising

Instrument only.

4. Accessory Items

Hand Lamp Type 1222-1A

5. Associated Equipment

None.

Maximum Input Panels:	250 V rms up to 10 kHz 50 V rms up to 100 kHz 10 V rms above 100 kHz 400 V dc
AGC:	Approx 50 dB range. A clipping circuit becomes effective above 10 V pp
Frequency Standard:	
Frequency:	5 MHz
Ageing Rate:	± 3 parts in 10^9 /day after 3 months continuous operation
Warm-up Time:	Better than ± 2 parts in 10^7 within 6 minutes
Temperature Stability:	Better than ± 3 parts in 10^9 per $^{\circ}$ C over the range of 10° C to $+ 45^{\circ}$ C
Standard Frequency Output:	
Frequency:	1 MHz
Panel:	Standard TTL output
Waveform:	Approx rectangular
External Standard Input:	
Frequency:	1 MHz
Minimum Level:	500 mV rms
Maximum Level:	10 V rms 400 V dc
Input Impedance:	Approx 200 Ω (ac coupled)
Environmental Conditions:	
Temperature Range:	0° C to $+ 55^{\circ}$ C
Specification:	Tested in accordance with IEC 68 (BS 2011) recommendations
Safety Standard:	Designed to meet IEC 348 (BS 4743) recommendations

3. Comprising

Operators Manual
Spare Fuses
Supply Voltage Label

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 6625-99-6235830		Nomenclature MICROWAVE PULSE COUNTER		
Manufacturer RACAL/DANA		Part No. 451		Cost/Date £5250 3/80
Height 8.9 cm	Width 42.5 cm	Depth 48.25 cm	Weight 13.6 kg	
Power Supplies 100/120/240V ac \pm 10% 50-60 Hz			Air Publication -	
Availability 2	Environment A	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19072



1 Description

The 451 microwave Pulse Counter is capable of automatically measuring the frequency of pulse modulated microwave signals up to 18 GHz. Pulse widths of 100 ns can be measured and there are no limitations on pulse repetition frequencies. The display is a seven digit LED giving 10 kHz resolution.

2 Specification

Frequency range: 925 MHz to 18 GHz

Pulse characteristics:

Pulse width (3dB points) : 100 ns minimum

PRF: Minimum - 50 Hz, 0 Hz rear panel selected.
Maximum - No limit.

Accuracy:

CW or pulses $>$ 100 μ s Time base accuracy \pm 1 count

Pulses < 100 μ s	Time base accuracy \pm averaging error \pm gate error.
Averaging error: (kHz rms)	$\frac{100}{\sqrt{\text{Pulse width} - 0.03 \mu\text{s}}}$
Gate error (max):	$\pm \frac{40 \text{ kHz}}{\text{Pulse width} - 0.03 \mu\text{s}}$
Time Base:	
Crystal frequency	10 MHz
Stability:	
Ageing rate:	< 3×10^{-7} /month
Temperature 0-50°C:	< 3×10^{-5}
Line voltage:	\pm 10% change produces frequency shift < 1×10^{-7}
Sensitivity:	925 MHz to 10 GHz - 10 dBm peak. 10 GHz to 18 GHz - 5 dBm peak.
FM tolerance:	40 MHz p-p deviation worst case for modulation rates from dc to 10 MHz
Max. input level (peak):	Operating - +10 dBm Burnout level - +30 dBm
Input impedance:	50 Ω nominal
Connector:	Type N precision
Measurement speed:	
Acquisition time:	
PRF > 100 Hz:	100 ms + 50 ms/GHz
PRF < 100 Hz:	$100 \text{ ms} + \frac{5}{\text{prf}} \text{ sec/GHz}$
Reading time:	$\frac{1}{\text{prf}} \times \frac{100}{\text{pulse width}(\mu\text{s})} \text{ sec.}$
Display:	Seven digit LED with fixed decimal point. Leading zero suppression.
Resolution:	10 kHz, 100 kHz, 1 MHz.

3 Comprising

NYR Instrument

NYR Power cord

NYR Instruction manual (Initial issue only).

4 Accessory items

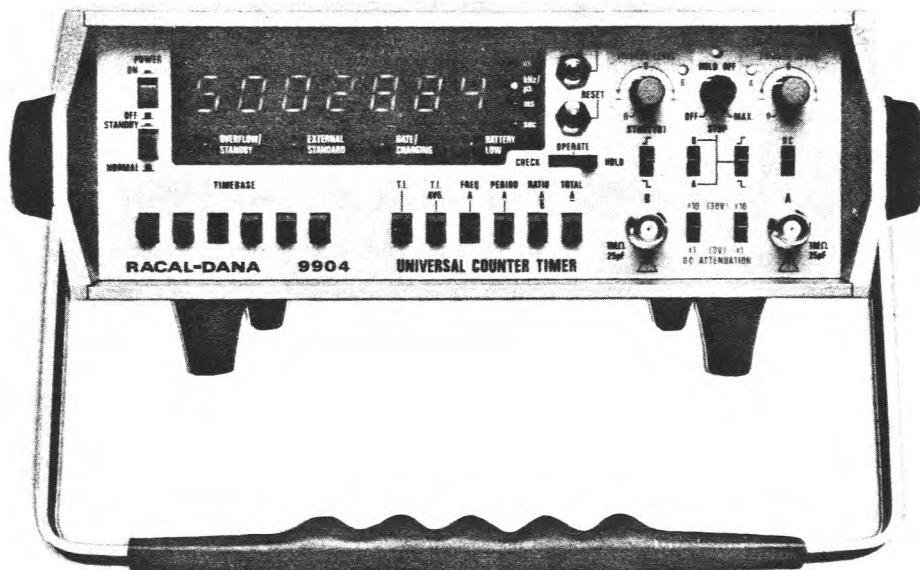
NYR Racal/Dana Model 400 Delay Generator.
(being assessed for introduction into Service)

5 Associated equipment

None.

Section Reference 10S/6625-99-6575085		Nomenclature UNIVERSAL COUNTER TIMER		
Manufacturer RACAL-DANA		Part No. 9904-04A		Cost/Date £495 1982
Height 84 mm	Width 241 mm	Depth 268.5 mm	Weight 2.7 kg	
Power Supplies 94-265 V ac; 45-450 Hz			Air Publication AP 117D-1020-0	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19074

This instrument replaces Universal Counter Timer 10S/6457782



1 Description

The 9904 is a sophisticated Universal Counter in the 99 Hundred series; it has a frequency range from dc to 50 MHz, a seven-digit display and can be operated from all normal ac line supplies. The trigger Hold-off and Start Inhibit features provide a fully variable trigger window and improved versatility in all timing measurements. Tri-state level indication simplifies the adjustment of trigger level and prevents errors.

2 Specification

Frequency Range:	dc to 50 MHz
Measuring Functions:	Frequency manual Single and Multiple Period Single and Multiple Ratio Single and Double-line Time Interval Single and Double-line Time Interval Averaging Single and Multiple Totalizing

Display:

Format: Seven, 7-segment LEDs

Units indicator: kHz, s, ms, μ s or ns

Display time: Gate time plus 150 ms in Frequency, Period and Ratio modes
1.5 s in other modes

Reset: Manual or automatic

Channel A Input (ac coupled):

Frequency range: 10 Hz to 50 MHz

Sensitivity: 10 mV rms sinewave maximum

Maximum input level: 250 V rms up to 20 kHz
50 V rms up to 100 kHz
10 V rms above 100 kHz
400 V dc

Input Z: 1 M Ω / 25 pF

Channel A-B (dc coupled):

Frequency range: dc to 20 MHz

Input attenuator: Two-position switch x 1 and x 10

Sensitivity: \pm 140 mV about trigger level \pm 3 V
 \pm 1.4 V about trigger level \pm 30 V

Trigger levels: Variable between \pm 3 V

Maximum signal level: 100 V rms up to 1 MHz decreasing to
10 V rms at 20 MHz

Input Z: 1 M Ω / 25 pF falling to 100 k Ω at 5 V

Pulse duration: 25 ns at trigger points

External gate: Controlled in Time Interval, Time Interval Average and Totalize modes

Trigger hold-off: Time Interval or Totalize mode

Frequency Measurement:

Input: Channel A

Coupling: ac or dc

Frequency range: dc - 50 MHz

Accuracy: \pm 1 count \pm timebase accuracy

Gate times: 1 ms to 100 s in decade steps

Single and Multiple Period Measurement:

Input: Channel A

Range: 1 μ s to 10 s (Single Period)
100 ns to 10 s (Multiple Period)

Clock unit: 1 μ s

Coupling: ac or dc

Periods averaged: 1 to 10⁵ in decade steps

Resolution: 10 ps maximum

Time Interval Single and Double Input:

Input:
 Single input: Channel B
 Double input: Start Channel B
 Stop Channel A
 Time range: 100 ns to 10^5 s (28 hours approx)
 Clock units: 100 ns to 10 ms decade steps
 Coupling: dc
 Start/stop signals: Electrical or contact
 Trigger slope selection: Positive or negative slope selected by
 Stop and Start signals

Time Interval Averaging Single and Double Inputs

Input:
 Single input: Channel B
 Double input: Start Channel B
 Stop Channel A
 Time range: 150 ns to 1 s
 Clock unit: 100 ns
 Time interval averaged: 1 to 10^5 in decade steps

Ratio:

Higher frequency input: Channel A
 Higher frequency range: dc to 50 MHz
 Lower frequency input: Channel B
 Lower frequency range: dc to 10 MHz
 Reads: $\frac{\text{Freq A}}{\text{Freq B}} \times \Omega$
 Multiplier n: 1 to 10^5 in decade steps

Totalizing:

Input: Channel A (10 MHz maximum)
 Maximum rate: 10^7 events per second
 Pulse width: 50 ns minimum at trigger points

Standard Frequency Output:

Frequency: 1 MHz
 Level: TTL compatible output
 600 mV peak to peak into 50 Ω
 Impedance: 50 Ω

External Timebase:

Frequency: 1 MHz
 Waveform: Sinewave or rectangular wave of mark
 to space ratio up to 4:1
 Input: Channel B

Input/Output Data:

Display: Serial BCD output TTL logic levels
 Static outputs: Function, timebase and overflow information
 Control inputs: Print Hold and Reset

Environmental Conditions:

Operating temperature: 0°C to +55°C
 Storage temperature: -40°C to +70°C
 Humidity: 95% RH at 40°C

Frequency Standard Option 04A:

Frequency: 5 MHz
 Temperature stability: Better than ± 3 parts in 10^9 per °C to 45°C
 Warm-up time: Six minutes for an accuracy better than ± 2 parts in 10^7

3 Comprising

-	Instrument	
10AH/6436425	Power Lead	Pt.No. 10-2394
-	Fuse 250 mA	Pt.No. 23-0031
-	Operators Manual	
10S/6575088	Rigid carrying case	Pt.No. 15-0450

4 Accessory Items

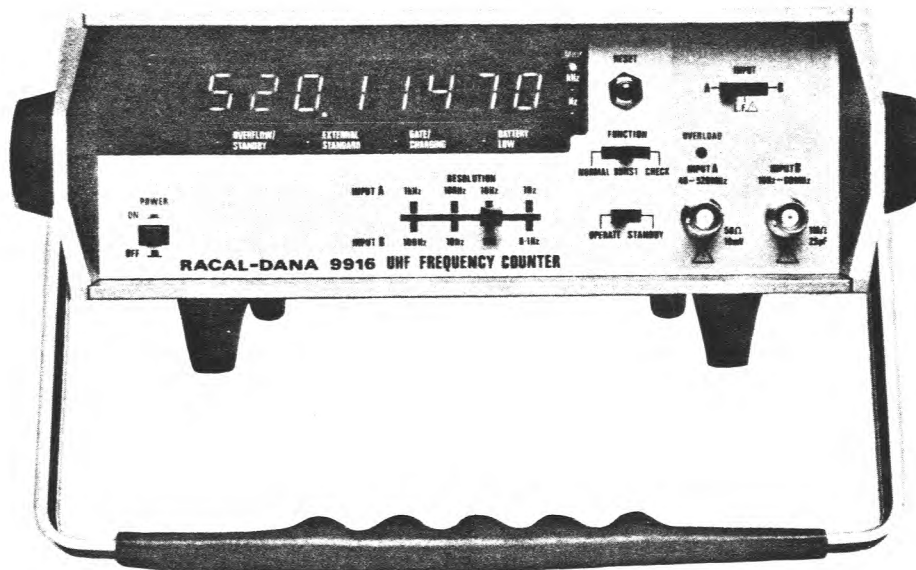
6625-99-6450029 Rack Mounting Kit

5 Associated Equipment

None.

Section Reference 10S/6625-99-6575087		Nomenclature FREQUENCY METER SET		
Manufacturer RACAL-DANA		Part No. 9916-04A		Cost/Date £590 1982
Height 84 mm	Width 241 mm	Depth 268.5 mm	Weight 2.7 kg	
Power Supplies 94-265 V ac; 45-450 Hz			Air Publication 117D-1019-0	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEEC/AFDSEC No. 19075

This instrument replaces Digital UHF Frequency Meter 10S/6459261



1 Description

The 9916 is a 520 MHz frequency counter with an eight-digit display; signals of short duration can be measured using the frequency burst capability. For ease of use, AGC is included on both channels. Fast acting overload protection by a PIN diode attenuator and reed relay is provided for the highly sensitive UHF input channel.

2 Specification

Display:

Format:	Eight, 7-segment LEDs
Unit indicator:	MHz, kHz or Hz
Display time:	Gate time plus 1 ms
Reset:	Manual or automatic

Channel A Input - cw and Burst:

Frequency range: 40 MHz - 520 MHz
 Input impedance: 50 Ω
 Overload protection: Up to 35 V rms maximum by PIN diode,
 and reed relay
 AGC: 50 dB minimum range
 Burst measurement: Minimum measurement time comprises a
 40 ms time plus gate time

Channel B Input - cw and Burst:

Frequency range: 10 Hz to 60 MHz (directly gated)
 Input impedance: 1 M Ω / 25 pF
 Maximum input level: 250 V rms up to 10 kHz
 50 V rms up to 100 kHz
 10 V rms above 100 kHz
 400 V dc
 AGC: 50 dB minimum range. A clipping cct
 operates above 10 V peak to peak
 Burst measurement: as Channel A

Frequency Measurement:

Frequency range: A CHAN - 40 MHz to 520 MHz
 B CHAN - 10 Hz to 60 MHz
 Accuracy: ± 1 count \pm Timebase accuracy
 Gate times: 0.01 s, 0.1 s, 1.0 s, 10 s
 Burst mode: Gate remains closed until signal is
 detected. Gate opens after a 40 ms
 arming period - display held until
 manually reset

Internal Timebase:

Frequency: 5 MHz
 Option 04A: as for 9904 10S/6575085 (Chap 3.4.20)

Standard Frequency Output:

Frequency: 1 MHz
 Level: TTL compatible output 600 mV peak to peak
 into 50 Ω
 Impedance: 200 Ω

External Timebase:

Frequency: 1 MHz
 Waveform: Sinewave or rectangular wave of mark/
 space ratio up to 4:1
 Minimum level: 100 mV rms
 Input impedance: 1 k Ω (ac coupled)

Input/Output Data:

Display: Serial BCD output provided at standard
TTL logic level

Static outputs: Function, timebase and overflow informa-
tion

Control inputs: Print Hold and Reset

Environmental Conditions:

As for 9904 10S/6575085 (Chap 3.4.20).

3 Comprising

-	Instrument	
10AH/6436425	Power Lead	Pt.No. 10-2394
-	Fuse 250 mA	Pt.No. 23-0031
-	Operators Manual	
10S/6575088	Rigid Carrying Case	Pt.No. 15-0450
10B/6339354	Telescopic Antenna	Pt.No. 23-9020

4 Accessory Items

▶	10ZZ/211309	Rack Mounting Kit	Pt.No. 11-1126	◀
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5 Associated Equipment

None.

Section Reference: 10S/7703037		Nomenclature: PROTOCOL ANALYSER		
Manufacturer: PHOENIX DATACOM LTD		Part No: 9440		Cost/Date: £8041/1991
Height: 18.0 cm	Width: 33.5 cm	Depth: 40.0 cm	Weight: 7.5 kg	
Power Supplies: 90 to 250 Vac, 45-66 Hz single phase				Air Publication: None
Availability: 2	Environment: B	Maintenance Policy: 2A/4CD	Calibration: TBA	AFDEETEC No: 19437



1. Description

The 9440 Protocol Analyser is for use on Synchronous/Asynchronous and bit orientated protocols SDLC/HDLC, SNA, X25. Has full screen VT-100 terminal emulation. BERT facility has 63, 511, 2047, 4095, Alt 1-0, 1, 0, FOX and user definable messages. The 9440 has an integral Breakout Box for true in-line monitoring. The unit can utilize HEX, ASCII, EBCDIC, BAUDOT, IPARS, JISC7 & JISC8 codes. Cable testing on RS-232/V24 cables can detect open and short circuit faults as well as cross connects. The Analyser has a 3.5 inch disc drive with 1.44 Megabyte capacity for data storage.

2. Specification

Protocols

Synchronous, asynchronous, and bit-orientated protocols (SDLC/HDLC),
 SNA, X.25, Transparent (binary)
 ISDN LAPD/Q.931 optional
 DDCMP Analysis optional

Codes

HEX, ASCII, EBCDIC, BAUDOT, IPARS, JIS7 & JIS8

Monitoring Speeds

Asynchronous: 30 bits per second to 38.4 kbps
 Synchronous: internal clock to 19.2 kbps
 Synchronous: external clock to 64 kbps
 BOP: Internal clock to 19.2 kbps
 BOP: External clock to 64 kbps

Breakout Box

Complete including 25 individually numbered switches,
 access pins and voltage source pins
 Provides true in-line monitoring capability
 Can be used purely as a breakout box

Interfaces

RS-232/V.24 (internal)
 V.35, X.21, RS-449, Mil-188 optional (external)
 ISDN BRA optional (internal)

Information Windows

Instant access to pop-up windows from most menu or result screens
 RS-232/V24 interface listing
 V.35 interface listing
 Hex/decimal/EBCDIC code chart
 Hex/decimal/ASCII code chart

Autoconfigure

Unit automatically determines these lines characteristics:
 Protocol, Speed, Stop bits, Parity, BCC, Code, Level

Selective Data Capture

Filter by X.25 Logical Channel Number (LCN)
 Filter by SNA Physical Unit (PU)
 Filter by SNA Logical Unit (LU)
 Filter SNA Receiver Readys (RR's)
 Filter out of sync interframe data (SYNC, BSC, BOP, X.25, SNA)

Timing Measurements

Measure time between events, data and/or interface while examining captured data

Simultaneous Real Time Displays

Asynchronous: data or data & interface, stats
 Synchronous: data or data & interface, stats
 BOP: data or data & interface, stats, frame level, stats
 SNA: data, frame level, SNA level, frame stats, SNA stats
 X.25: data, frame level, packet level, frame stats, packet stats, LCN stats [32]
 Additional decodes available after halt

Real Time Statistics for Performance Analysis

Automatic real time compilation for both DTE & DCE simultaneously
 BOP, X.25, & SNA show total frames, info frames, frame rejects, invalid frames, rejects, selective rejects, SABMs, SARMs, SARM(DM)s, SNRM(E)s, FCS errors, aborts
 SNA shows negative responses, ACT PUs, Deact PUs, Act LUs, Deact LUs, Binds, Unbinds
 X.25 shows for each of first active 32 LCNs: total packets, data packets, reject packets, reset packets, call packets, invalid packets, characters, chars/pkt, segments, chars/segment
 X.25 shows totals for all LCNs, total packets, data packets, reject packets, reset packets, call packets, invalid packets, characters, chars/pkt, segments, chars/segment

Error Check

Parity, LCR-8, CRC-6, CRC-16, CRC-CCITT

Traps

On character string: up to 16 characters, including up to 4 bit masks and up to 15 don't-care characters
 On user message
 On buffer full
 On interface transition
 On error: parity, BCC, abort, any error
 On frame type: Info, UA, SNRM, DISC, DM, RR, RNR, REJ, SREJ, FRMR, SABM, SRM/DM

On SNA request, SNA response, SNA request/response, SNA negative response: DACTPU, APU, DACTLU, ALU, bind, any, unbind, LUSTAT, cancel, clear, notify, RTR

On packet type: Q-bit, D-bit, call, clear, reject, interrupt, diagnostic, reset, restart. RNR

Trap Actions

Halt data capture, or automatically count, tag, and rearm
Trap with or without audible alarm and definable video attribute (blinking, inverse...)

Termination Emulation

Normal async (16x40)
VT-100 (24x80)
6 user definable text strings
XMODEM protocol for PC compatible file transfer with no file size restriction

Cable Testing

tests RS-232/V.24 cables
detects opens, shorts, crossconnects

BERT

Messages include:

- 63, 511, 2047, 4095, Alt 1-0, 1, 0, FOX
- any user definable message

Emulate DTE or DCE

Block size 1000 bits or CCITT

Duration definable in blocks or minutes

Asynchronous, synchronous

Full duplex, half duplex, or multidrop

Up to 64 kbps full duplex

Internal or external clock

Insert error capability

Reset counters while running

Full CCITT G.821 compatibility

Bits received, bit errors, blocks received, block errors, error free seconds, errored seconds, sync loss seconds, elapsed seconds, percent errored seconds, sync losses, BER calculation, degraded minutes, severely errored seconds, available seconds, unavailable seconds

Automatic Error logging capabilities

Automatic circuit analysis determines line quality and provides definable English interpretation

Supports flow control for start mux testing

Memories

3.5 inch disk drive with 1.44 Megabyte capacity. Wrap or halt on buffer full. Continuous disk capture supported at 64 kbps FDX on 9440. Disks formatted on unit are MSDOS 3.3 compatible
64k bytes RAM for data plus interface status
Data can be saved as PC compatible file

User Messages

Unlimited number, up to 1000 characters each

Print Functions

RS-232/V.24 port for connection to local printer
Can print out test results, setups, user messages, data buffer, programs, any screen
Supports XON/XOFF and DTR flow control up to 19.2 kbps
Supports autoprint of BERT results while running BER tests

Remote File Transfer

Transfer any file over asynchronous circuits using XMODEM protocol or direct ASCII transfer.
File transfer between 9440, 9460, PC, XT, AT, PS/2

Programming

Ability to execute state programs is standard on 9440

Printer/Terminal Auto Configure

Automatically determines a printer/terminal's speed, parity, data level, and flow control
Manual DTE testing also supported

Keyboard

Full QWERTY plus 6 soft keys, 4 hard keys

Display

800 to 1920 character high resolution 5" CRT
PC compatible TTL video output

Weight

7.5 kg, 16.5 lb - 9440
8.2 kg, 18.0 lb - 9460

Dimensions

h 18 cm, w 33.5 cm, d 40 cm
 h 7.1", w 13.2", d 15.7"

Temperature

Operating Range
 5 °C to 40 °C

Power

90 to 250 Vac, 45-66 Hz single phase

3. Comprising items

10S/7703038	Mains Lead
10S/7703039	Storage Pouch
10S/7703040	1 Set of Jumper Leads (quantity 5)
10S/7703041	Master System Disc
10S/7703042	Blank Disc
10S/7703044	Operating Guide
10S/7703043	V24 Interface Lead

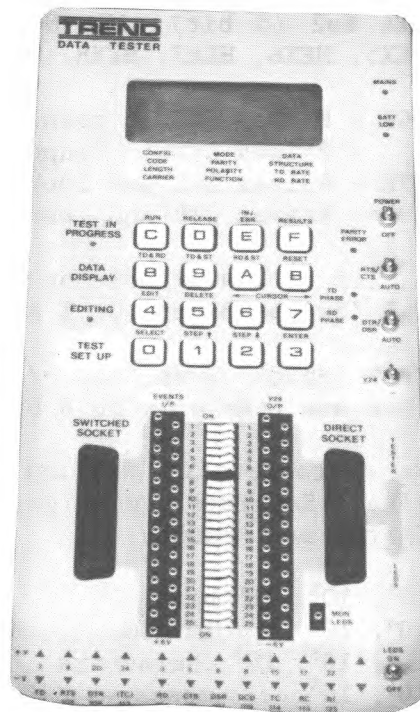
4. Accessory Items

None

5. Associated Equipment

10S/9677774, X21 Plug in Module, AFDEETEC 19457
 10S/5231320, RS449 Plug in Module, AFDEETEC 19458

Section Reference		Nomenclature		
10S/5731076		DATA TESTER		
Manufacturer		Part No.	Cost/Date	
TREND		DT 108A	£990/1991	
Height	Width	Depth	Weight	
9.5 cm	12.2 cm	24.5 cm	1.5 kg	
Power Supplies			Air Publication	
220/250 Vac and Rechargeable NiCad Batteries			None	
Availability	Environment	Maintenance Policy	Calibration	AFDEETEC/AFDSEC No.
1	B	2A/4CD	TBA	19454



1. Description

The Data Tester 108A will test synchronous and asynchronous systems at speeds of up to 19.2 kbits per second. The tester is battery or mains powered with a Liquid Crystal Display of 64 characters, which provides easy checking of transmit and receive data, test messages, parameters and results. The data tester features a standard V24/V28 (RS232) interface with integral breakout box. D type connectors are provided to configure as a DTE/DCE. Interface signals can be monitored by the tri state LED indicators while dual-in-line switches provide interrupt and cross patch facilities.

2. Specification

Test Modes: Full Duplex, Half Duplex, Single Shot Character, Single Shot Message, Multi-drop, X-on/X-off, RFS Delay, Trap (Mon), Carrier Control.

Memory: Receive Store 4K data + 4K status, Edit & Transmit Store 4K, Save Store 12K Partitioned as 3 x 4K bytes individually addressable.

Bit Rates: 50, 75, 100, 110, 134.5, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 14400, 19200. External clocking up to 20K bps (selection of pins 15,17 or 24 for synchronous working). Separate Tx & Rx Bit Rates.

Test Data: The following test data may be selected:
Binary 0, Binary 1, 1:1, 63 P-R, 511 P-R, (8, 7, 6 and 5 bit characters plus odd, even, mark or space parity).
2047 P-R, QBF, QBFN, QBFT, User Message, Receive Buffer, 3 Saved Messages.

Data Codes: ITA No2 (5 bit), ITA No5/ASCII (7 bit), EBCDIC, HEX5, HEX6, HEX7, HEX8.

Hardware Flow Control: DCE - Raises CTS in response to RTS
- Raises DSR in response to DTR
DTE - Raises RTS and looks for CTS
- Raises DTR and looks for DSR

Stop Bits: 1, 1.5 or 2 available on all test data including P-R (except Binary 0, 1 and 1:1).

Parity: Mark, Space, Even, Odd or None.
(Odd and Even only on 8 bit data).

Display: 64 character LCD dot matrix. 16 characters per line. Separately configurable for:- Set Up, Data, Status and Results.

Test Lengths: 10^4 , 10^5 , 10^6 bits
 10^4 , 10^5 blocks
 10^4 , 10^5 , 10^6 characters
 10^4 , 10^5 messages
Continuous
Stop when receive store full.
Stop on trap.

Function Keys: Run, Release, Inject Error, Results, Tx/Rx Data, Tx + Control, Rx + Control, Reset, Edit, Delete, Cursor Left, Cursor Right, Select, Step Up, Step Down, Enter.

Indicators: Test in progress, Parity Error, Editor Mode, TxSync/Phase, Charging, Battery Low, RxSync/Phase.

Interface: V24 in the form of a break-out box.
Tri-state LED indicators show signal condition
(Red +V, Green -V).
Software configurable for:- DTE, DCE, MONitor and
Positive/Negative mark polarity.

Outputs: +6 V, -6 V, V24, 0 V.

Inputs: Events, Tri-state LED Monitor.

Switches: Power ON/OFF, V24 +6 V or -6 V, RTS/CTS ON/AUTO,
DTR/DSR ON/AUTO, LED ON/OFF.

Power Supply: Internal Batteries:
Battery life (fully charged): Approx. 5 hours
minimum.
Rechargeable nickel-cadmium cells, 220/250 VAC via
integral battery charger/eliminator.
Consumption: 8 watts.
120 volts/60 Hz option also available.

Operational Conditions:
Dimensions (Overall) Length: 245 mm
Width: 122 mm
Depth: 95 mm
Weight: 1.5 kg approx.

Safety Meets the requirements of IEC 380.

Environmental
Temperature Operating Range +5°C to 40°C.

Storage and
Transportation -29°C to +55°C.

Humidity 40% to 90% ambient.

- | 3. <u>Comprising Items</u> | <u>Part No</u> |
|---------------------------------|----------------|
| 10S/2576654 Ribbon Cable Y Lead | 130300-A2 |
| 10S/5226439 Jumper Leads | CON004744 |
| Operating Manual. | |
| 4. <u>Accessory Items</u> | |
| None | |
| 5. <u>Associated Equipment</u> | |
| None | |

Section Reference: 10S/5393133		Nomenclature: DATA TRANSMISSION ANALYSER		
Manufacturer: ANRITSU EUROPE LTD		Part No: MD 6401A		Cost/Date: £13247/1991
Height: 17.7 cm	Width: 28.2 cm	Depth: 35.0 cm	Weight: 7.8 kg	
Power Supplies: 85 to 132 Vac/170 to 250 Vac, 47 to 64 Hz			Air Publication: None	
Availability: 2	Environment: B	Maintenance Policy: 2A/4CD	Calibration: TBA	AFDEETEC No: 19436



1. Description

The MD 6401A Data Transmission Analyser is a light-weight integrated measuring instrument, for analysing devices from low speed modems to high speed digital lines. Up to five plug-in interfaces can be mounted in the instrument, allowing maintenance and monitoring of multi-media devices using differing interfacing standards. The unit has an integral printer which prints measurement conditions and measurement results. Error rate and performance can be measured and displayed simultaneously. Signal generation includes FOX, eight pseudo-random patterns, word patterns and 1 kHz tone signals. One touch operation allows the measurement of frequency, pulse count and voltage.

2. Specification

Sending clock signal

Internal clock signal (ST1, ASYNC, ST/SP)

Fixed (b/s)

Low speed: 50, 75, 100, 110, 200, 300, 600,
1.2k, 1.8k, 2.0k, 2.4k, 3.0k, 3.6k, 4.8k,
7.2k, 8.0k, 9.6k, 14.2k, 16k, 19.2k.
High speed: 24k, 32k, 48k, 56k, 64k, 72k, 96k, 112k,
128k, 144k, 168k, 192k, 256k, 320k, 384k,
512k, 1,024k, 2,048k, 4,096k, 8,192k.

Variable

Low speed: 50 b/s to 20 kb/s (In units of 5 b/s)
High speed: 0.1 to 400 kb/s (In units of 100 b/s)

Accuracy

Self oscillation: ± 10 ppm
Subordinate oscillation: Subject to 8 kb/s or 8 kb/s
of (64k + 8k) external input

External Input

Operated by the external input clock signal (TTL level
or sine waves)

External clock signal (ST2)

Clock (inversion can be used) by each 50 b/s to 10 Mb/s
interface

Receiving clock signal

External clock signal (RT)

Clock (inversion can be used) by each 50 b/s to 10 Mb/s
interface

Internal clock signal (ASYNC, ST/SP)

The same as the sending clock signal (only for fixed
clock)

Pattern

Code: A, Z, 1:1, 3:1, 1:3, 4:1, 1:4, 7:1, 1:7.

Programmable pattern:

8 bit repetition (5 to 8 bits for ST/SP)

Pseudo-random pattern:

$2^n - 1$ bits repetition (n: 6, 7, 9, 11, 15,
19, 20, 23), positive/negative logic

Word pattern:

8 bits x 8k words (manual input, remote setting,
user's pattern)

FOX pattern:

Conforms to CCITT

Error Insertion

Manual error:

Single-bit error whenever the key is pressed or
single-bit error every second

Cyclic error:

2.5×10^{-1} to 1.7×10^{-7}
($N \times 10^{-n}$ N: 1.0, 1.1, 1.3, 1.5, 1.7, 2.0, 2.5, 3.0, 4.0,
5.0, 6.0, 7.0, 8.0, 9.0)

Start and stop synchronisation

Start/stop bit length:

Start bit: 1
Stop bit: 1, 1.5 and 2 bits

Data Length:

5, 6, 7 and 8 bits

Parity:

none, odd, even

Error measurement

Detection error:

Bit error, code error, parity error and CRC error
are selected

Measurement error:

Error count, error rate, block error count, block
error rate, ES, %ES, DM, %DM, SES, %SES

Block Length:

2^5 to 2^{16} or 10^1 to 10^6 bits

Measurement time:

10^2 to 10^9 bits measurement and repetition of 10
seconds to 1000 hours

Display of measurement results:

Among the measurement results, three optional items
can be displayed simultaneously. The buzzer sounds
if an error is detected (the volume can be adjusted).
The lapsetime after the measurement starts is displayed
in units of seconds

Pattern trace

No. of trace bytes:

32k bytes max.

Trace stop trigger:

Manual, Code detection, Not code detection,
signal lines ON/OFF, No. of trace bytes, external input signal
ON/OFF, error signal (parity error etc.)

Delay trace aftertrigger detection:

0-8000 bytes

Trace data display:

Displays together with trace stop time in HEX,
JIS8, ASCII, EBCDIC, EBCDIK

Voltage measurement

Measuring range:

-30 V to +30 V

Error difference:

$\pm 2\% \pm 1$ digit

Frequency measurement and count

Measuring range:

DC to 10 MHz

Error:

± 5 ppm ± 1 digit

Display:

Decimal 7 digits

Time measurement

Measuring range:

0 to 10 sec. (10 μ s steps)

Error:

± 5 ppm, ± 1 digit

Display:

Decimal 7 digits

Signal monitor

Monitor lamp:

Displays the status of each signal line ("1", ON:
Green; "0", OFF: Lamp off)

Monitor terminal:

Outputs signal lines to monitor terminals

Error output

Error output:

Issues error pulse at TTL level

Clock signal output:

Issues receiving clock or sending 8 kHz clock signal

Print output**Printing in error measurement**

At start of measurement:

Prints measurement conditions and time at start of measurement

During measurement:

Prints time and error count in 1 second. Prints time and measurement result after start of measurement. Prints time and error count if an error occurs at termination of each measurement cycle.

At end of measurement:

Prints time and measurement result at termination of measurement

Other printing

Prints measurement conditions, measurement results, and time in manual measurement.

Internal Timer

Year, month, day, hour, minute, second

Power

85 to 132V/170 to 250 Vac (changeable), 47 to 64 Hz, ≤ 50 VA

Rated operating temperature range

0 to 50 °C

Connectable Units

5 units max

Dimensions and weight

177H, 282W, 350D(mm), 7.8kg approx. (including printer)

3. Comprising items**Part No**

10S/4772604	V24/V28 Module	MD0601A
10S/1073288	V36 Module	MD0601C
10S/2159442	G703/HDB3 Module	MD0603A1
10S/1033623	CODEC Module	MD0610B
10S/4510698	RS232C remote control module	MD0620B
10S/9106801	Carrying Case	B0252

4. Accessory Items

Printer Paper type TH 57 from HMSO via station APFS

5. Associated Equipment

None

Section Reference 10S/1920841		Nomenclature V35 BREAKOUT BOX		
Manufacturer TREND		Part No. 960025	Cost/Date £417/1993	
Height 7.0"	Width 4.5"	Depth 2.0"	Weight 18 oz	
Power Supplies Duracell MN1604 9 Volt Alkaline Battery X2			Air Publication None	
Availability 2	Environment B	Maintenance Policy 2A/4CD	Calibration CNR	AFDEETEC No. 19426



1. Description

The V.35 Input/Output tester has been designed to monitor data lines where the electrical characteristics of the interchange conform to CCITT Recommendations V.35. The cabling allows connection to both Data Terminal Equipment (DTE) and Data Communication Equipment (DCE). The LEDs are powered by the battery and are bi-colour. Two types of circuits are provided in the equipment. Both are high input impedance and are powered by the battery rather than the data lines. One of these is the differential receiver circuit for the V.35 modem signals and the other is a single input receiver for the RS232 control lines. When a signal pair with CCITT V.35 characteristics of 0.55 volts (+/-20%) is applied to a standard V.35 load impedance the LED associated with the buffered high impedance receiver will respond as follows:

- a. Glow Red when the A wire of the signal pair is positive with respect to the B wire.
- b. Glow Green when the A wire of the signal pair is negative with respect to the B wire.
- c. Glow Red and Green when the signal pair rapidly alternates between conditions 1 and 2 above.

2. Specification

Input - Signal ± 0.55 ($\pm 20\%$) volts, differential
 Control ± 3 to ± 25 volts single ended
 Power Source - Two 9 volt alkaline batteries
 Size - Height - 7"
 Width - 4.5"
 Depth - 2"
 Weight - 18 ounces (including batteries)
 Case - Durable vinyl SoftPak case
 Front Panel - Clear acrylic faceplate silkscreened on the back to eliminate marring.

3. Comprising Items

Instruction Manual
 10S/5226439 Qty 10, Jumper leads
 6135-99-6348080 Qty 2, Duracell 9 Volt Alkaline Battery type MN1604

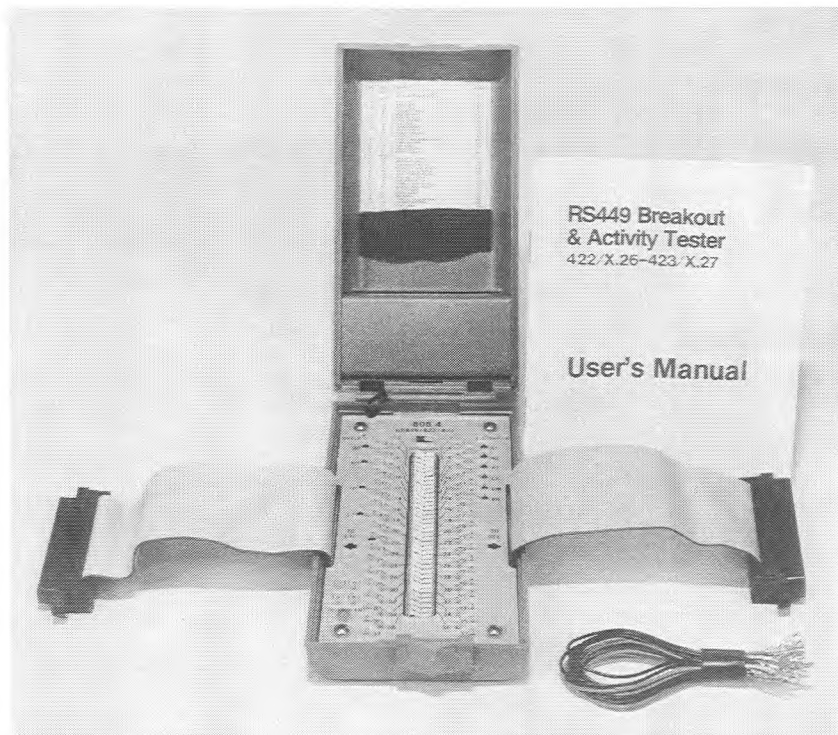
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/4054329		Nomenclature RS449 BREAKOUT BOX		
Manufacturer TREND		Part No. 960020	Cost/Date £251/1993	
Height 5.55"	Width 2.9"	Depth 1.45"	Weight 10 oz	
Power Supplies Duracell MN1604 9 Volt Alkaline Battery X1			Air Publication None	
Availability 2	Environment B	Maintenance Policy 2A/4CD	Calibration CNR	AFDEETEC No. 19428



1. Description

The RS422/423 (X26/x27) Input/Output Tester is designed to monitor data interchange complying with CCITT Recommendations X26/X27 and EIA Recommendations RS422/RS423. Allows access to all 37 signal lines without altering information passing through it. Cabling allows connection to Data Terminal Equipment (DTE) and data Communications Equipment (DCE). Power for the LEDs is derived from a 9 volt battery.

2. Specification

Input Signal - RS422 + 6 V nominal, ± 25 V maximum differential.
RS423 ± 6 V nominal, ± 25 V maximum single ended.

Power Source - One 9-volt battery

Size - Height: 5.55"
Width: 2.90"
Depth: 1.45"

Weight - 10 ounces including battery

Case - Durable polypropylene injection moulded case with an integral living hinged cover.

Front Panel - Injection moulded clear acrylic plastic.

3. Comprising Items

Instruction Manual

10S/5226439 Qty 10, Jumper leads

6135-99-6348080 Qty 1, Duracell 9 Volt Alkaline Battery type MN1604

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/2999530		Nomenclature X21/V11 BREAKOUT BOX		
Manufacturer TREND		Part No. 960016	Cost/Date \$164/1993	
Height 5.55"	Width 2.9"	Depth 1.45"	Weight 10 oz	
Power Supplies Duracell MN1604 9 Volt Alkaline Battery X2 Duracell MN2400 1.5 Volt Alkaline Battery X1			Air Publication None	
Availability 2	Environment B	Maintenance Policy 2A/4CD	Calibration CNR	AFDEETEC No. 19427



1. Description

The X.21/X.27/V.11/RS422 Input/Output tester has been designed to monitor data lines where the electrical characteristics of the interchange conform to CCITT Recommendations X.21 or V.11 (balanced double current circuits) or EIA Recommendations RS 422 (balanced voltage digital interface). The cabling allows connection to both Data Terminal Equipment (DTE) and Data Communications Equipment (DCE). The LEDs are powered by internal batteries and driven by internal amplifiers. Power is derived from two 9 volt batteries. An additional 1.5 Volt AAA size battery, isolated from all circuits, is provided to strap signal lines to a fixed high or low condition. Pulse trap circuits are provided to catch and display fast signal transitions. An RS232 monitor output is available.

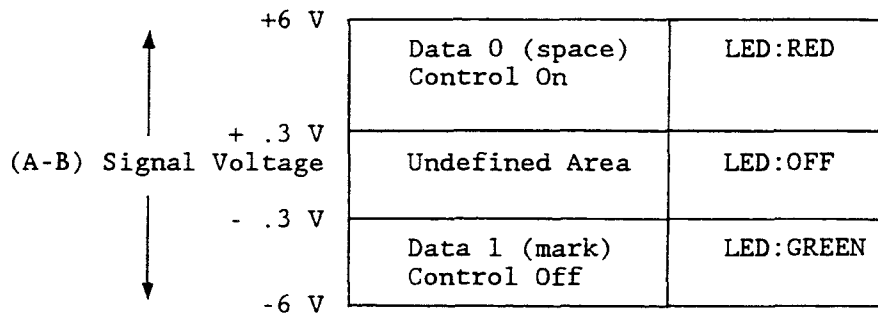
2. Specification**INTERFACE SIGNAL TRANSLATION**

X.21/X.27/V.11 signals are defined as follows:

Receiver: .3 V <(A-B) <6 V = Data 0/Control On
 .3 V <(B-A) <6 V = Data 1/Control Off

Transmitter: $V_{max} < 6$ V into 3.9 K ohm Load
 V_{out} greater than 2 V or $\frac{1}{2} V_{max}$ (whichever is greater) with 100 Ohm load.

These signals are translated in the I/O Tester as:

**INPUT SIGNAL LIMITS**

± 8 volts maximum with respect to pin 8
 $\pm .3$ V minimum between leads of a pair for LED indication
 ± 16 V max between leads of a pair

LINES MONITORED

All 14 signal lines defined by the X.21/X.27/V.11 and RS422 interface specifications.

LINE SWITCHING

Seven double pole, single throw switches are provided for opening or closing the signal line pairs. Test pins on each side of the switches enable cross connection or strapping of test signals.

LINE JUMPERS

Eight, 6 inch jumpers are provided for line swapping.

POWER SOURCE

Two 9 V alkaline batteries
 One 1.5 V alkaline 'AAA' cell, isolated from all circuits.

SIZE

Height: 5.55"
 Width: 2.90"
 Depth: 1.45"

WEIGHT

10 oz. including batteries

CASE

Durable polypropylene injection moulded case with integral living hinge cover.

FRONT PANEL

Clear acrylic plastic with silkscreened legend on back to preserve appearance.

3. Comprising Items

Instruction Manual

10S/5226439 Qty 10, Jumper leads

6135-99-6348080 Qty 2, Duracell 9 Volt Alkaline Battery type MN1604

6135-99-1173143 Qty 1, Duracell 1.5 Volt Alkaline Battery type MN2400

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference: 10S/6419486		Nomenclature: MAINTENANCE SET		
Manufacturer: PHOENIX DATACOM LTD.		Part No: PHOKIT 3		Cost/Date: £6154/1993
Height:	Width:	Depth:	Weight:	
See specification				
Power Supplies: See specification			Air Publication: -	
Availability: 2	Environment: B	Maintenance Policy: 2A/4CD	Calibration: CNR	AFDEETEC No: 19473



1. Description

The Phoenix Maintenance Set Phokit 3, consists of a Phoenix 1542-2 Quick Send and a Phoenix 1541-2 Quick Test for ascertaining the status of G.703 (2.048 Mbit ccts). The Phoenix 1542/1541 test sets provide a rapid and easy method of determining the status of a 2.048 Mbit cct. These units are battery operated

and hand held which permits ease of operation. Also included in the test kit are two Datatest 3 BER testers, these are menu driven testers capable of running at 64 kbit/s. Power is provided by an ac adaptor or rechargeable ni-cad batteries.

2. Specification

Phoenix 1542-2 Quick Send

Line Code:	AMI or HDB3
Framing:	Framed or CRC4 Multi-framed
Output Rate:	2.048 Mbps \pm 25 ppm
Output Signal:	2 pattern IAW CCITT G.703 when terminated in 75 ohms.
Power Requirements:	Internal 9 V Alkaline Battery type 6AM6/MN1604 or Mains Adaptor.
Size:	3.75 x 6 x 1.25 in.
Weight:	8 ozs

Phoenix 1542-2 Quick Test

Line Code:	AMI or HDB3 Continuous Monitor
Framing:	Framed, Multi-framed or CRC4 Multi-framed.
Line Rate:	2.048 Mbps \pm 300 Hz
Signal Level:	+6dbDsx to -27dbDsx ALBO for Cable Loss in Terminate
Input Impedance:	
TERMINATE	75 or 120 ohms \pm 5%, switch selectable.
BRIDGE	1000 ohms \pm 5%
Overvoltage:	Secondary Transient Protection
Power Requirements:	Internal 9 V Alkaline Battery type 6AM6/MN1604 or Mains Adaptor.
Size:	3.75 x 6 x 1.25 in.
Weight:	8 ozs

Datatest 3

Test Pattern:	Fox: 5 level Baudot, 6 level IPARS, 7 level ASCII asynchronous and 8 level EBCDIC synchronous.
	A-Z: printable character set (20-FE Hex), asynchronous only. 5 level uses Baudot, 6 level uses EBCD, 7 level uses ASCII and 8 level uses Extended ASCII.
	Pseudo Random Words (PRW): 63, 511, 2047 and 4095.
	Alternate I/O, all Mark or all Space.
	Two user messages, USR1 and USR2.
Test Length:	Continuous 10E(0-7)blocks 1 min., 5 min., 10 min., 15 min., 1 hour.

2. Specification (continued)Datatest 3 (continued)

Bit Rates:

BERT: 50, 75, 110, 134, 150, 200, 300, 600, 1200, 1800, 2400, 3600, 4800, 7200, 9600, 14400, 19200 BPS, 75/1200(SPL1-TD/RD), 1200/75(SPL2-TD/RD), 150/1200 (SPL3-TD/RD), 1200/150 (SPL4-TD/RD), SPL1-SPL4 only operate in async. protocol. All BERT bit rates can be internally or externally clocked.

HSPD BERT: 56000, 57600 and 64000 bps.
Certain clocking restrictions apply, i.e. internal or external, depending on emulation (see Operator's Manual).

HDX: Same as for BERT, but does not support SPL1-SPL4.

Block Size: 62 to 1003 characters depending on the type of pattern or message being run. The Option key of the DT3 will allow the user to see the block size of all patterns and messages.

3. Comprising Items

<u>Sect Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>	<u>Qty.</u>
6625-99-4320084	Navtel Datatest 3	085831	2
4920-99-5938243	V11/V24 Converter/Monitor	085718-SP	2
5805-99-2192144	Power Supply Unit	40-100636A	4
51TT 7703040	Jumper Lead Set	085511	2
6145-99-7208513	Interface Cable	RT15M1MF	2
	Interface Cable	S025-01	2
4920-99-0513571	Carry Case	CCDT3SP	2
	DT3 Operators Manual	96085831R2	2
6135-99-6348080	Volt Alkaline Battery	MN1604	2
6625-99-4094433	Phoenix Quick Test	1541-2048-1	1
6625-99-7359451	Phoenix Quick Send	1542-2048-2	1
5805-99-8622910	Power Supply Unit	TA-381	2
6145-99-5178489	Coaxial Lead	34-00050	2
4920-99-0513570	Carry Case	CCQTQS	1
	1542-2 Instruction Manual	34-00063	1
	1541-2 Instruction Manual	34-00064	1

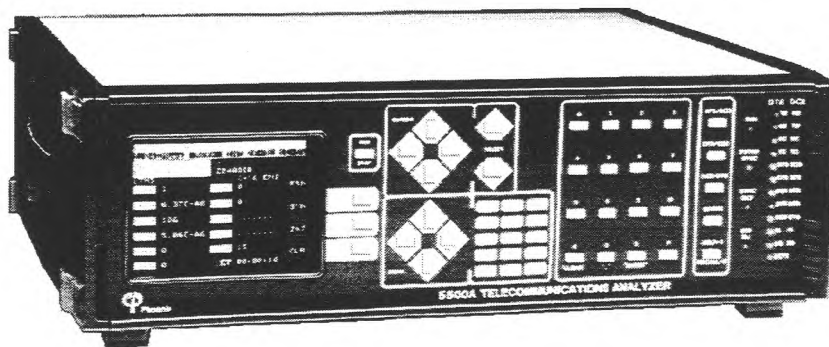
4. Accessory Items

None

5. Associated Equipment

None

Section Reference: 10S/7094458		Nomenclature: DATA ANALYZER		
Manufacturer: PHOENIX DATACOM LTD.		Part No: 5500A		Cost/Date: £9266/1993
Height: 13.3 cm	Width: 43.7 cm	Depth: 32.59 cm	Weight: 8.2 kg	
Power Supplies: 90 - 130 V and 180 - 250 V AC, 45 - 450 Hz			Air Publication: -	
Availability: 2	Environment: B	Maintenance Policy: 2A/4CD	Calibration: TBN	AFDEETEC No: 19523



1. Description

The Phoenix 5500A Telecommunications Analyzer is designed for Bit Error Rate Testing and system analysis on circuits and links operating from 50 bps to 13 Mbps. The 5500A is equipped with a high resolution CRT to provide a display of results and set ups. The analyzer features a range of plug-in interface modules for testing to international standards. Powerful trigger and trap features enable the capture and examination of live traffic. An RS232 port allows results to be output to a printer.

2. Specification

INTERNAL BIT RATE

Synthesizer controlled:

Tuning increments -
 50 Hz - 500 kHz at 1 Hz increments.
 500 kHz - 6.5 MHz at 1 Hz increments.
 6.5 MHz - 13 MHz at 2 Hz increments.

Clock Sources:

Internal clock (as above).
 User clock (user supplied TTL clock - 50 bps to 13 Mbps).

2. Specification (continued)

Clock Sources (continued):	External clock (clock supplied by interface module -TC, RC, XC etc) Recovered clock(recovered from received bit stream).
Patterns:	Mark, Space, Alt, Loop Up, Loop Down, REV 2047, 2 ²⁰ -1, 63 511, SYSY 511, X25 511, 2047, 2 ¹⁵ -1, QRW, FOX, USER - 24 to 16384 bit repeating pattern.
Pattern Sync. Criteria:	To acquire pattern synchronisation: For Mark, Space, Alt, Fox, T1Reset, =24+32=56 bits. For SYS511, X25 511, = entire pattern = 4088 bits. For Pseudorandom = 24+32 = 56 bits.
Loss of Pattern Synchronisation:	Adjustable - user may set from 1 bit to 20000 bit errors in a 100000 bit test block.
Injectable Error Rates:	Single error inject available on all the below:- Bit Errors 9E-3 to 1E-9, CRC 9E-3 to 1E-7 BPVs 9E-3 to 1E-7, F-Bit 9E-3 to 1E-7 S-Bit 9E-3 to 1E-7, Bit errors in live traffic 9E-3 to 1E-7
Selected Test Results:	ABE Adjusted Bit Errors ABER Adjusted Bit Error Rate BE Bit Errors BER Bit Error Rate BLE Block Errors BLK Blocks BITS Bits Analyzed RVR Receive BPV Rate CRCE CRC Errors CBER Current Bit Error Seconds CSLP Clock Slips CRER CRC Error Rate EFB Error Free Blocks EBR Errored Block Rate FBE Frame Bit Errors FBER Frame Bit Error Rate BALS Blue Alarm Seconds CRES CRC Errored Seconds CEFS CRC Error Free Seconds ET Elapsed Test Time ED Elapsed Test Days ETS Elapsed Test Time in Seconds ES Errored Seconds EFS% Percentage of Error Free Seconds

(Continued)

Specification (continued)Selected Test Results
(continued)

EFS	Error Free Seconds
ESR	Errored Second Rate
FBES	Frame Bit Errored Seconds
FEFS	Frame Bit Error Free Seconds
FLS	Frame Loss Seconds
ALRM	Alarm Status
FLOS	Occurrences of Frame Losses
LOS	Pattern Sync Loss
PF	Power Failures
RBPV	Received Bipolar Violations
CBE	Current Bit Errors
RSL	Receiver Sync Losses
TBPV	Transmitter Bipolar Violations
TVR	Transmitter BPV Rate
TSL	Transmitter Sync Losses
WND+	Positive Peak Wander
WND-	Negative Peak Wander
15Z	Occurrences of more than 15 consecutive zeros.
%1sD	Percentage Ones Density

Frequency Measurement:

Selections:	TC - Transmit Clock
	RC - Receive Clock
	XC - External Clock
	BR - Bit Rate

Range:	150 Hz - 16 MHz
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Accuracy:	$\pm 0.0005\% \pm \text{LSD}$
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Resolution:	$\pm 1 \text{ Hz}$
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Event Timing:

(low speed modules)

Start Stop Sources:	TD, RD, CTS, RTS, DCD, DSR, DTR, SQ
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Measurement range:	1 μsec to 4.67 minutes.
--------------------	------------------------------------

Resolution:	$\pm 1 \mu\text{sec}$.
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Network Loop Delay:

Measurement Range	1 μsec to 17 minutes
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Resolution:	$\pm 1 \mu\text{sec}$
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Bias Measurement:

Source:	Receive data
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Range:	0 to 100% (0% = all zeros, 100% - all ones)
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Accuracy:	$\pm 1\%$
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2. Specification (continued)

Graphs:

Graph Parameters:	Bit Errors, Errored Blocks, Errored Seconds, Error Free Blocks, Error Free Seconds, Sync Loss, Transmit BPVs (T1), Receive BPVs (T1), Transmit BPV Seconds (T1), Receive BPV Seconds (T1), Transmit BPV Free Seconds (T1), Receive BPV Free Seconds (T1).
Vertical Scaling Factors (Data):	10 ⁰ through 10 ⁵ , storage of approximately 5000 events before overflow.
Horizontal Scaling (Time):	1 sec/div, 10 sec/div, 1 minute/div and 1 hour div.

Jitter - Low Speed:

Frequency Range:	60 bps to 72 kbps				
Measurement (in % of one bit time):	<table> <tr> <td>Positive Peak Jitter</td> <td>Average Jitter</td> </tr> <tr> <td>Negative Peak Jitter</td> <td>Peak to Peak Jitter</td> </tr> </table>	Positive Peak Jitter	Average Jitter	Negative Peak Jitter	Peak to Peak Jitter
Positive Peak Jitter	Average Jitter				
Negative Peak Jitter	Peak to Peak Jitter				

Jitter - High Speed (Optional):

Available Frequencies:	1.544 Mbps (T1-J02 option) and 2.048 Mbps (G.703-J05 option)
Amplitude Range:	0 - 12.75 unit intervals, generator/received.
Modulation Range:	10 Hz to 40 kHz generator/receiver.
Available Masks:	AT&T and CCITT

Remote Control:

Connections:	RS-232 Printer/Remote Control Interface and IEEE Bus Interface.
Controllable Functions:	All menu selections, hexadecimal keypad entries and front panel keys.

Display:	High resolution, 5 in. monochrome, cathode ray tube.
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Environmental:

Operating Temp.:	0°C to +50°C
Storage Temp.:	-10°C to +85°C
Humidity:	90% non-condensing.

3. Comprising Items

<u>Sec/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>
	Manual	34-00057
	Mains Cable	E30-142
	V24 Ribbon Cable	7-5501-200-1
10S/1103349	RS-232 Interface Module	5500-200-1
	Manual	34-00037
	V24 Ribbon Cable	7-5501-200-1
10S/7801944	RS-449 Interface Module	5500-450-1
	Manual	34-00039
	X21/RS-449 Cable	7-5501-104-1
	X21 F/F Ribbon Cable	7-5501-105-1
10S/9938822	G.703 2 Mbit Drop and Insert Interface Module	500A-836B-111
	Manual	34-00093
	75 ohm BNC Cable	E34-103
10S/7750808	Vinyl Carrying Case	6-3251-062-1

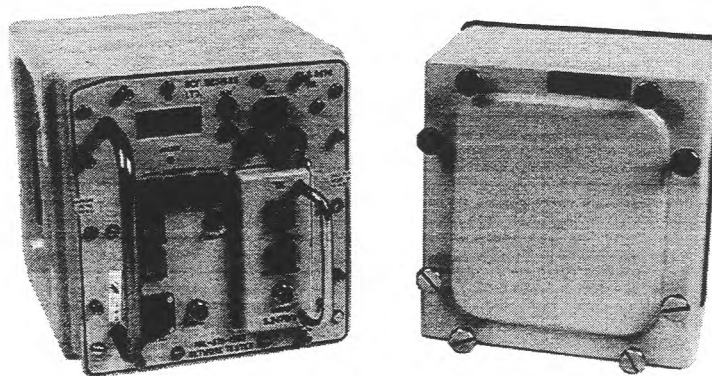
4. Accessory Items

<u>Sec/Ref.</u>	<u>Nomenclature</u>	<u>AFDEETEC</u>	<u>Part No.</u>
6625-99-9305085	Hard Transit Case	N/A	6-5501-182-1
10S 3495342 V35	Interface Module	19524	F-5500-300-1
	Manual	(comprising item)	34-00038
	V35 Cable	(comprising item)	GK-EY-450

5. Associated Equipment

None

Section Reference: 6C/0000905		Nomenclature: DATA BUS TESTER		
Manufacturer: SDE LTD.		Part No: S2470	Cost/Date: £5279 93/94	
Height: 100 mm	Width: 220 mm	Depth: 220 mm	Weight: 3.5 kg	
Power Supplies: 240 V AC RECHARGEABLE BATTERIES - INTEGRAL CHARGING UNIT			Air Publication: -	
Availability: 1	Environment: C	Maintenance Policy: B2/D4	Calibration: AN 12	AFDEETEC No: 19481



1. Description

The S2470 is a compact and Ruggedised, MIL-STD-1553 Bus tester. It is a simple to use, lightweight and portable unit designed to detect simultaneously, open and short circuits, crossovers, short circuits to screen and insertion loss measurements. It has a special feature enabling it to differentiate between short circuits to screen on the main bus or on the stubs. Suitable for use at first or second line, the S2470 data bus tester can easily be operated by one man without the requirement to disconnect the main bus. The transmitter can be removed from the case facilitating remote operation from the detector.

2. Specification

Transmitter:

Output terminated into 75 ohm.

Measurement of insertion loss 5.5 volts peak to peak, frequency 200 KHz.

Measurement of open circuits, short circuits, crossovers and short circuits to screen 4.5 volts 5 KHz repetition rate.

2. Specification (continued)

Battery powered, life before recharge 30 hours minimum.

Receiver:

Measured insertion loss between any two stubs in decibels in the range 0 dB to -31 dB. The nominal stub to stub loss of the data bus network is -12 dB, above enables very long buses (300 m) to be measured.

Resolution of insertion loss 0.1 dB.

Functions Measured:

Short circuits between the twisted pairs of bus or stubs.

Open circuits on bus or stubs.

Crossovers of the twisted pairs, on bus or stubs.

Short circuits between either of the wires of the twisted pair to the screen system.

Short circuits between either of the wires of the bus twisted pair to the screen systems.

Detection of open circuit or short circuit bus terminating resistors.

Insertion loss in dBs between any two remote terminals.

Displays:

GREEN/RED LED giving a pass/fail indication, for open circuits, short circuits, crossovers and short circuits to screen.

LCD giving insertion loss information in dB between any two remote terminals.

3. Comprising

Mains cable (Part No. S2470B)

4. Accessory Items

<u>Sect/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>
6C/7108830,	1.5 m cable	2C 010114
6C/6634105	1.5 m cable	2C 010115
6C/8958722	Cal pad	2C 010116

5. Associated Equipment

None

Chapter 4

SIGNAL SOURCES

Chapter 4SIGNAL SOURCES

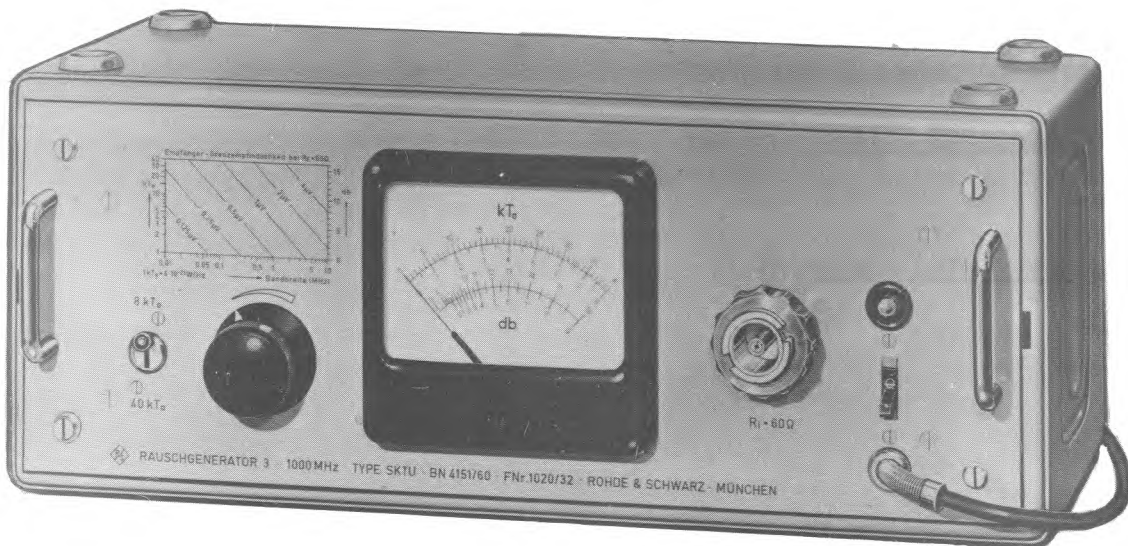
CONTENTS

Chap	Nomenclature	Sec/Ref/Stock No	Manuf/Part No
4.1	NOISE GENERATORS		
.1	Noise Generator	6625-12-1239860	Rhode & Schwarz SKTU/BN4151/2/50
.2	Noise Figure Meter Set	10S/7531184	Magnetic AB117/B(Set)
.3	Noise Gain Analyser	10S/5476077	Eaton Airtech 2075
4.2	SIGNAL GENERATORS		
.1	Signal Generator	10S/8016596	Rhode & Schwarz AN62
.2	Function Generator	10S/0831172	Hewlett Packard 3314A-001-908
.3	Signal Generator	10S/0006555	Marconi 52032-599 Opt 001, 002 and 006
.4	Sine/Square Oscillator	6625-99-6473466	Farnell LFM4
.5	Signal Generator	10S/0006598	Hewlett Packard 83731A
.6	Oscillator	10S/5184659	Hewlett Packard 200CD
.7	TV Pattern Generator	10S/7968697	Philips PM 5515 I
.8	Test Oscillator	10S/0543483	Hewlett Packard 625A
.9	Frequency Standard		Hewlett Packard 5065A
.10	Frequency Standard	10S/6370540	Racal-Dana 9475
.11	Not used		
.12	Not used		
.13	Not used		
.14	Not used		
.15	Quartz Oscillator	6625-00-4808675	Hewlett Packard 105A
.16	Not used		
.17	Not used		
.18	Sweep Oscillator Mainframe	4931-00-0197890	Hewlett Packard
.19	Not used		
.20	Not used		
.21	Not used		
.22	Sine Square Oscillator	6625-99-6642106	Farnell LMF3
.23	Not used		
.24	Signal Generator	10S/7551127	Marconi 2019A
.25	Programmable Function Generator	6625-01-7485831	Hewlett Packard 3325A
.26	Oscillator (Sine/Square)	5820-99-6571737	Levell TG200DMP

CONTENTS (Continued)

Chap	Nomenclature	Sec/Ref/Stock No	Manuf/Part No
.27	High Power Signal Source (Mainframe)	10S/4119622	Airtech 445
.28	Test Oscillator	10S/6418435	Hewlett Packard 654A
4.3	PULSE AND WAVE FORM GENERATORS		
.1	Function Generator	10S/8001360	Toellner GMBH TOE 7405
.2	Signal Generator	10S/9520447	Marconi TF 2005R
.3	Function Generator	10S/6597757	Hewlett Packard 3312A
.4	Not used		
.5	Time Mark Generator	6625-00-5205199	Tektronix TG501
.5a	Mainframe (Power Supply)	6625-00-5006646	Tektronix TM501
.6	Pulse Generator, High Power	10S/6573577	Hewlett Packard 214B
.7	Not used		
.8	Not used		
.9	50 MHz Pulse Generator	10S/5178462	Philips Test and Measurement PM 5715
.10	Time Mark Generator	10S/5881683	Tektronix TG 501A
4.4	RADIO TEST EQUIPMENT		
.1	Antenna Test Set	10S/7982646	HR Smith (Tech- test)Ltd 12-602-4
.2	Navigation Test Set	10S/7976535	Avionics Systems ASH 7700AA
.3	AM Test Oscillator 125/250 MHz	10S/7774431	Techtest 210 (AM)
.4	FM Test Oscillator 78.4/156.8 MHz	10S/7774432	Techtest 220 (FM)
.5	AM Test Oscillator 172/334 MHz	6625-99-7990257	Techtest 230 (AM)
.6	Radio Communications Test Set	10S/7702661	Marconi Instruments 52955-324L
.7	Lightweight Comprehensive Communications Test Set (LCCTS)	10S/1969817	Rhode & Schwarz CMS33
▶ .8	Radar Stimulator (Threat Signal Generator)	10S/8591661	Republic Electronics MTS- 300A ◀

Section Reference 210S/6625-12-1239860		Nomenclature NOISE GENERATOR		
Manufacturer ROHDE & SCHWARZ		Part No. SKTU/BN4151/2/50		Cost/Date £919.00 1978
Height 26.0 cm	Width 47.0 cm	Depth 19.5 cm	Weight 9.0 kg	
Power Supplies 115-125 V; 220-235 V; 47-63 Hz			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDE/FEFC/AFDSEC No. 13106



1 Description

This is a white-noise generator for use in the range 1 MHz to 1000 MHz, with a continuously adjustable power output. A special diode, operating in the temperature-limited region, generates the continuous frequency spectrum; there is a direct relation between saturation current and noise current and, with a given source impedance, the available noise power. The saturation current is varied by controlling the diode heating current. The saturation current is a measure of the noise figure.

2 Specification

Frequency Range:	1 to 1000 MHz
Source Impedance:	50Ω
VSWR:	<1.1:1

Noise Power: continuously adjustable

Max. variation of noise power with
10% ac supply variation: $\pm 2.5\%$

Noise Figure Ranges (dB): 0-8 0-15

Indication Error:

below 300 MHz ± 0.5 dB
above 300 MHz ± 1.0 dB

Output Connector: adaptable R&S Dexifix B

3 Comprising

Instrument only

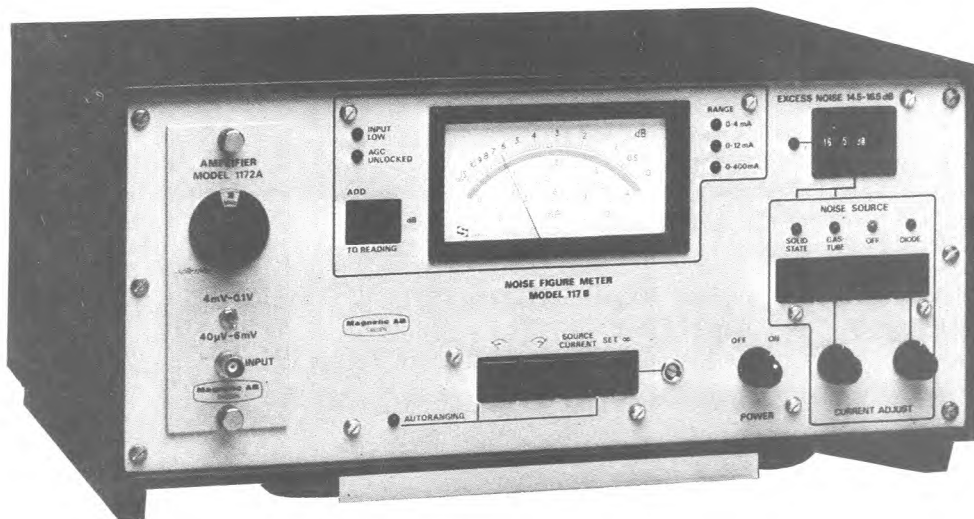
4 Accessory items

None

5 Associated equipment

None

Section Reference 10ZZ/210943		Nomenclature NOISE FIGURE METER SET		
Manufacturer MAGNETIC AB		Part No. 117B (set)		Cost/Date £3269 1985
Height 180 mm	Width 420 mm	Depth 305 mm	Weight 12 kg	
Power Supplies 115/220/230 V ac \pm 10%, 50-400 Hz			Air Publication -	
Availability 2	Environment B	Maintenance Policy 4D	Calibration -	AFDEETEC/AFDSEC No. 19337



1. Description

In conjunction with a Magnetic AB Noise Source, the model 117B automatically measures the noise figure of amplifiers and receivers. Expanded scale design gives a very high resolution for indicating changes during adjustments of receivers. The 117B has been designed for simplicity of operation with pushbutton controls and LED's for activated functions. By setting the value of the excess noise of the noise source used on a digital switch, the operator can read the correct noise figure directly. The 117B features a new automatic range switching function with a display indication of the range switching which can be set to manual override if required.

2. Specification

Frequency Range:	5 MHz to 40 GHz, depending on noise source.
Noise Figure Range:	0-30 dB indication to infinity, in six ranges.

(continued)

2. Specification (continued)

Accuracy: 0-9 dB \pm 0.1 dB
 9-18 dB \pm 0.2 dB
 18-25 dB \pm 0.5 dB
 25-30 dB \pm 1.0 dB

Input Frequencies: 10.7, 30, 36.15, 42, 50 and 60 MHz

Bandwidth: 1.0 MHz \pm 0.2 MHz

Input Voltage: 40 μ V - 0.1 V

Noise Sources:

Freq. Range	Type No.	Discharge Current	Termination	Type
2.6 - 3.95 GHz	S121	200 mA	S912	Waveguide 10
3.95 - 5.8 GHz	G121	175 mA	G912	Waveguide 12
5.3 - 8.2 GHz	J121	175 mA	J912	Waveguide 14
8.2 - 12.4 GHz	X121	175 mA	X912	Waveguide 16
0.01 - 4.0 GHz	125E	-	-	Solid State

3. Comprising

10ZZ/210959	Noise Figure Meter	117B
6625-99-6429810	Amplifier	1172B
6625-99-6429811	Modulator (for gas tube)	1175
10ZZ/210960	Modulator (solid state)	1179

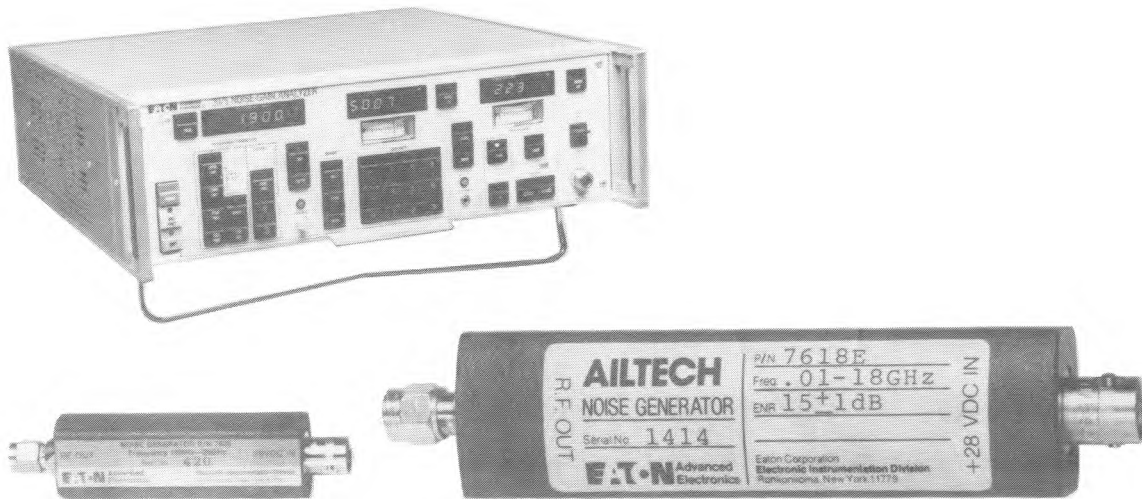
4. Accessory Items

10B/2236004	Noise Source	S121	AFDEETEC No. 16452
10B/2236005	Noise Source	G121	AFDEETEC No. 16453
10B/2235988	Noise Source	J121	AFDEETEC No. 16449
10B/2235989	Noise Source	X121	AFDEETEC No. 16450
10ZZ/210961	Noise Source	125E	AFDEETEC No. 19336
10B/2236006	Termination	S912	
10B/2236007	Termination	G912	
10B/2236008	Termination	J912	
10B/2236009	Termination	X912	

5. Associated Equipment

None.

Section Reference 10ZZ/212205		Nomenclature NOISE GAIN ANALYZER		
Manufacturer EATON AILTECH		Part No. EATON 2075		Cost/Date £8700 MAR 87
Height 146 mm	Width 428.6 mm	Depth 355.6 mm	Weight 15.5kg	
Power Supplies 100/120/220 or 240 V 10% 48-66 Hz 150 VA max.			Air Publication TBN	
Availability 2	Environment B	Maintenance Policy 2AB/4CD	Calibration TBN	AFDEETEC/AFDSEC No. 19390



1. Description

The EATON 2075 Noise Gain Analyzer is a programmable microprocessor controlled instrument providing both noise and gain measurement facilities from 10 MHz to high microwave frequencies. The Analyzer can be controlled in its local mode using its front panel controls or, in the remote mode, by an external controller via an IEEE 488 GPIB (General Purpose Interface Bus).

2. Specification

Noise Measurement:

Noise Figure Range:	0 to 30 dB
Measurement Accuracy:	±0.05 dB
	A) 0 to 12 dB Noise Figure
	B) +10°C to +40°C
	C) ENR 5 to 18 dB

(Continued)

Chap 4.1.3

2. Specification (Continued)

±0.01 dB
 A) 12 to 30 dB Noise Figure
 B) T < 10°C
 > 40°C

Resolution: 0.01 dB

Measurement accuracy specifications are valid for uncorrected noise figure over the full gain measurement range of the instrument.

Gain Measurement:

Gain Range: -20 to > 50 dB
 Measurement Accuracy: ±0.2 dB
 Resolution: 0.01 dB

Input:

Frequency Range: 10 to 1800 MHz, tuneable
 Tuning Accuracy: ± (0.5 MHz + 0.0005F), (F = tuned frequency). ±3 MHz max.
 Frequency Response: 0.1 MHz
 Noise Figure: <7 dB +0.002 dB/MHz
 A) Input level < -40 dBm
 Input VSWR: < 1.5
 Maximum Input Power: +20 dBm
 Maximum Net External Gain: > 75 dB

General:

Noise Source Drive (ON): +28 V -0.05 V up to 100 mA available
 (OFF): < 1 V
 Operating Temperature: 0 to 55°C
 Storage Temperature: -55 to 75°C

Supplemental Characteristics:

Bandwidth: 5 MHz (nominal)
 Measurement Speed: 6 to 10 meas/sec
 Maximum Safe Input Level: ±20 Vdc; +25 dBm RF

3. Comprising

Mains Lead

4. Accessory Items

10ZZ/212206 Noise Source Generator 7618E, 10 MHz to 18 GHz solid state
 AFDEETEC No. 19391

(Continued)

4. Accessory Items (Continued)

10ZZ/212207 Noise Source Generator 7626, 10 MHz to 26.6 GHz solid
state AFDEETEC No. 19392

5. Associated Equipment

None

Section Reference		Nomenclature		
10S/6625-99-8016596		SIGNAL GENERATOR SET		
Manufacturer		Part No.	Cost/Date	
ROHDE & SCHWARZ		APN 62	£2,731 1993	
Height	Width	Depth	Weight	
103 mm	435 mm	350 mm	7.5 kg	
Power Supplies			Air Publication	
94 - 127 V / 188 - 265 V. 45 - 440 Hz			None	
Availability	Environment	Maintenance Policy	Calibration	AFDEETEC No.
1	B	-	A/12	19439



1. Description

The APN 62 is a synthesised signal generator producing sine and square waveforms in the range 1 Hz to 260 kHz or triangular and sawtooth waveforms in the range 1 Hz to 20 kHz. It has 3 modes of operation; CONTINUOUS, FREQUENCY SWEEP and LEVEL SWEEP. Parameters are easily selected by means of the keypad and LCD display, or remotely, as the instrument is GPIB compatible. Up to 20 different sets of parameters can be stored in the non-volatile memory.

Outputs are BALANCED (floating/non-floating), UNBALANCED or through an output transformer. Separate square wave and TTL/HCMOS outputs are provided. Source impedance may be set to any value between 10 and 640 ohms in 5 ohm steps. The interconnecting cable supplied is 2-core shielded with polarised 3-contact connector (DIN 41 628) for connecting to the instrument, terminated with 3 'banana' type plugs.

2. Specification

Frequency:

Range:	
Sine & Square:	1 Hz to 260 kHz.
Triangle & Sawtooth:	1 Hz to 20 kHz.
Resolution:	0.1 Hz at $f < 20$ kHz.
Squarewave:	
Rise/Fall Time:	<100 ns.
Over/Undershoot:	<5%.
Tilt ($f > 500$ Hz):	<5%.
Switching time after last character via IEC bus):	15 ms.
Frequency error (after 10 minute warm-up time):	$< 4 \times 10^{-5} + \text{ageing error.}$
Ageing:	$< 10^{-5} / \text{year.}$

Signal Output:

Configurations:	Balanced Floating. Balanced Grounded. Unbalanced. Transformer.
Balanced Floating:	
Impedance:	10 to 640 ohms in 5 ohms steps.
Levels:	100 μV to 20 V EMF. (I max = 200 mA; 10 V into 50 ohms).
Balanced Grounded:	
Impedance:	2 x (5 to 320 ohms) in 2.5 ohm steps.
Level:	2 x (50 μV to 10 V) EMF. (I max = 200 mA; 2 x 5 V into 25 ohms).
Unbalanced:	
Impedance:	10 to 640 ohms in 5 ohm steps.
Level:	100 μV to 20 V EMF. (I max = 200 mA; 10 V into 50 ohms).
Transformer:	
Frequency Range:	20 Hz to 25 kHz.
Impedance:	2 kilohm.
Level:	100 μV to 30 V into 2 kilohm.
Impedance error:	≤ 2 ohms.
Level Units:	V; dBV & dBm.
Level Resolution:	min 10 μV or 0.1 dB.
Total Level error:	$< \pm 0.5$ dB; Transformer $< \pm 1$ dB
Frequency Response:	< 0.5 dB; Transformer < 1.2 dB.
Attenuator error:	< 0.3 dB; Transformer < 0.6 dB.

Level Setting Time (after last character via IEC bus): 15 ms.

Spectral Purity:

10 Hz to 100 kHz:	<-60 dBc (<0.1%; typical -70 dBc).
Sum 2nd to 9th harmonic 10 Hz to 20 kHz:	-80 dBc.
Harmonics & nonharmonics 100 to 260 kHz:	<-46 dBc (<-55 dBc typical).

SYNC Output:

Frequency:	Same as signal.
Impedance:	50 ohms.
Level:	TTL/HCMOS.
Duty Cycle:	2

Sweep Mode:

Modes:	Frequency or Level, digital start-stop, automatic after sawtooth or triangular signal, single shot, manual with knob.
Types:	Linear or Logarithmic
Step Time:	1 ms to 65 s.
Frequency:	
Sweep Range:	Any value from 1 Hz to 260 kHz.
Step Width:	Any value \geq 1 Hz (linear) or 1% (logarithmic).
Level:	
Sweep Range:	Any value \leq 20 dB
Step Width:	Any value \geq 10 μ V (linear) or 0.1 dB (logarithmic)

SINAD (Signal to Noise and Distortion)
Measured at $f = 1$ kHz; R source = R load = 600 ohms; balanced and unbalanced; bandwidth = 22 Hz to 22 kHz.

Level:	
1 V:	80 dB.
100 μ V:	40 dB.

Remote Control:

System:	IEC 625-1 (IEEE 488).
Functions:	All front panel functions which can be set manually, except power ON/OFF & variation.
Address:	Set via keypad, 00 to 30.
Interface functions:	Listener & talker; SH1; AH1; T6; L4; SR1; RL1; PPO; DC1; DT0; C0.

General:

Working Temperature	0 °C to +55 °C.
---------------------	-----------------

3. Comprising

REF NO.	DESCRIPTION	MAKERS PART NO.
10S/8016597	GENERATOR APN 62	844.6001.62
NONE	OPERATING MANUAL	844.7889.12
10S/2554590	POWER CABLE	NOT KNOWN
10S/2554589	INTERCONNECTING CABLE	APN-Z1
10S/2554592	ACCESSORY CASE	ZZT-97
10S/1243145	SPARE FUSES (X2)	020 7417.00
		020 7475.00
10S/2554591	PROTECTIVE COVERS (X2)	NOT KNOWN

4. Accessory Items

None.

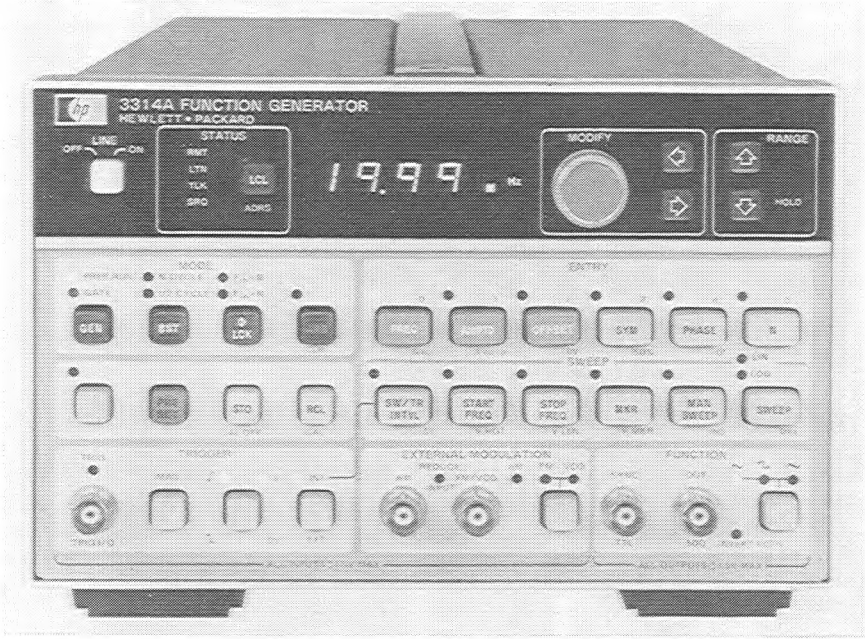
5. Associated Equipment

None.

GPIB
Fully
Compatible

AP 117A-0104-1A

Section Reference 10S/0831172		Nomenclature FUNCTION GENERATOR		
Manufacturer HEWLETT PACKARD		Part No. 3314A-001-908		Cost/Date £3860
Height 132 mm	Width 212 mm	Depth 419 mm	Weight 7.3 kg	
Power Supplies 100,120,220,240 V ac +5% -10%, 48-66 Hz				Air Publication -
Availability 2	Environment B	Maintenance Policy 4CD	Calibration A/12	AFDEETEC/AFDSEC No. 19371



1. Description

The 3314A is a Function/Waveform generator with the precision and versatility to produce numerous waveform shapes. It's features include the generation of accurate sine, square and triangular waves, with ramps and pulses available using variable symmetry. Additional features include counted bursts gate, lin/log sweeps, AM, FM/VCO, dc offset and phase lock. For increased versatility, the Arbitrary Waveform mode allows a countless number of user defined waveforms.

Since complete programmability is provided, all these capabilities are available for ATE systems as well as bench applications.

Frequency

Frequency range : 0.001 Hz to 19.99 MHz sine, square and triangle waveforms, 0.001 Hz through 2 MHz range when symmetry = 50%

Resolution : 3½ digits

Frequency Accuracy

GPIB #	Range	Minimum Frequency		Maximum Frequency	Accuracy
		Range Hold	Autorange		
1	2 Hz	.001 Hz	.001 Hz	1.999 Hz	=(0.4% setting + 0.2% range)
2	20 Hz	0.01 Hz	1.50 Hz	19.99 Hz	
3	200 Hz	00.1 Hz	15.0 Hz	199.9 Hz	=(0.2% setting + 0.1% range)
4	2 kHz	001. kHz	150. Hz	1999. Hz	
5	20 kHz	0.01 kHz	1.50 kHz	19.99 kHz	
6	200 kHz	00.1 kHz	15.0 kHz	199.9 kHz	
Synthesized					
7	2 MHz	001. kHz	150. kHz	1999. kHz	=(0.01% setting +50 ppm/year)
8	20 MHz	0.01 MHz	1.50 MHz	19.99 MHz	

Accuracy applies in the Free Run mode, with VCO Off, and Symmetry = 50% (Fixed)

Amplitude

Amplitude range : 1.0 mVp-p to 10 Vp-p into 50 Ω

Resolution : 3½ digits

HP-IB #	Range	Minimum	Maximum	Step Attenuator
1	10 mV	1.0 mV	10.00 mV	60 dB
2	100 mV	10.0 mV	100.0 mV	40 dB
3	1 V	.100 V	1.000 V	20 dB
4	10 V	1.00 V	10.00 V	0 dB

Absolute Amplitude Accuracy : ±(1% of display +0.035 V p-p), sine and square wave
±(1% of display +0.06 V p-p), triangle

Amplitudes : 1.00 Vp-p to 10.00 Vp-p (Range 4)

Frequency : 10 kHz, Autorange ON

Flatness-sine wave : relative to 10 kHz, 1.00 V to 10.0 V (Range 4)
20 Hz to 50 kHz - 0.07 dB
50 kHz to 1 MHz - 0.33 dB
1 MHz to 19.99 MHz - 1.5 dB

Frequency Sweep

	Range (decades)	Start Freq	Stop Freq	Sweep Time
LINEAR	0 to 2	≥ .001 Hz	≤ 19.99 MHz	7.2 ms to 1999 s/sweep
LOG	1 to 7 (integer only)	≥ 0.2 Hz	≤ 19.99 MHz	40 ms to 1999 s/decade

Manual Sweep

Modify knob tunes between start and stop frequencies. X drive follows sweep

X Drive Start/Stop Voltage

-5 V to +5 V into 1 kΩ load

Z Axis Output

Blanking Pulse, > +5 V
Baseline, 0 V ± 1 V
Marker Pulse, < -5 V into 1 kΩ load

Modulation Inputs

	Bandwidth	Sensitivity	Range	Z
AM	dc to 100 kHz	2 Vp-p for 100% -1 Vdc for suppressed carrier	>100%	10 kΩ
FM	100 Hz to 100 kHz	±1 Vp for =1% of range deviation	1% of Freq. range	10 kΩ
VCO	dc to 100 kHz	10% volt	+1 to -10 V	10 kΩ

Waveform Characteristics
Sine Harmonic Distortion

Individual harmonics will be below these levels, relative to the fundamental. Offset = 0 V. Function Invert = OFF. Range Hold = OFF.
20 Hz to 50 kHz, -55 dB*
50 kHz to 1490 kHz -40 dB
*add 4 dB for ambient temperature 0 to 5°C and 45 to 55°C, 20 Hz to 50 kHz

Square Wave Rise/Fall Time

<9 ns, 10% to 90% at 10 Vp-p output

N Integer

N = 1 to 1999, Preset to 1
For Phase-lock Fin ÷ N, Fin X N or N CYCLE (counted burst)

Function Invert

Invert ac portion of signal outputs Sine, square, triangle, ramp, pulse, and ARBs. Does not affect Sync and Trigger outputs or dc offset setting

Phase

Phase Offset-Phase Lock Modes

Resolution :

0.1°

Range :

±199.9°

Accuracy :

±2° (50 Hz to 15 kHz)

Phase Offset is Referenced to	signal output for $F_{in} \div N$ signal input for $F_{in} \times N$
Start/Stop Phase - Burst Modes	
Resolution :	0.1°
Range :	$\pm 90.0^\circ$ for frequencies to 19.99 MHz
Accuracy :	$\pm 3^\circ$ (applies from .001 Hz to 1 kHz)
Trigger	
Internal Trigger	
Range :	.002 ms (500 kHz) to 1999 s (0.5 mHz) square wave
Period Accuracy :	$\pm(0.01\% + 50 \text{ ppm/year})$ of displayed interval (excluding sweep intervals)
Trigger output :	low $< 0.5 \text{ V}$, high $> 2.5 \text{ V}$; output resistance 1 $k\Omega$
External Trigger	For Gate, N Cycle, $\frac{1}{2}$ Cycle, $F_{in} \times N$, $F_{in} \div N$, and external sweep triggers
Frequency range :	50 Hz to 20 MHz
Trigger slope :	Selectable, positive or negative
Trigger level :	Selectable to 0 V or +1 V
Trigger level hysteresis :	$\pm 0.15 \text{ V}$ Input resistance = 1 $k\Omega$
Symmetry	
Symmetry range :	5% to 95% of period
Frequency range :	2 Hz to 2 MHz ranges
Arbitrary Waveforms :	Output consists of a series of voltage ramps called vectors. Arbitrary waveforms can be composed of 2 to 150 vectors. A maximum of 160 vectors can be stored in six available storage registers with a minimum of 2 vectors per waveform (#1 and return-to-start vectors).

Waveform Parameters

Key	Range	Description
Δt	0.2 ms to 19.99 ms	sets the time value for each unit of V LEN (length)
V HGT	0 to ± 1999	sets the relative height of an individual vector
V LEN	1 to 127	sets the length in time of an individual vector in integral multiples of Δt
V MKR	1 to 150	marker is used to select an individual vector
INS		insert is used to add a vector before the marker location
DEL		deletes the vector at marker location
FREQ	.002 Hz to 2.5 kHz	$\text{Freq} = \frac{1}{\Delta t (VLEN_1 + VLEN_2 + \dots + VLEN_n)}$
AMPTD	.01 mV to 10 Vp-p	sets amplitude window for ARB waveform
OFFSET	0 to ± 5 V dc	offsets the ARB waveform independent of AMPTD setting
PHASE	$+90^\circ$ to -90°	sets wave start/stop voltage within the window defined by AMPTD

Marker output :

located on Z axis rear panel connector

Sync output :

low during the return-to-start vector

Gate mode :

allows external gating of ARB output complete ARB waveforms only

Option 001

Voltage Amplifier :

Simultaneous X3 amplitude output on rear panel (into $>500 \Omega$) 30 V p-p max., dc to 1 MHz

3. Comprising

Instrument

Mains lead

Handbook

50 Ω feed-through termination HP 11048C

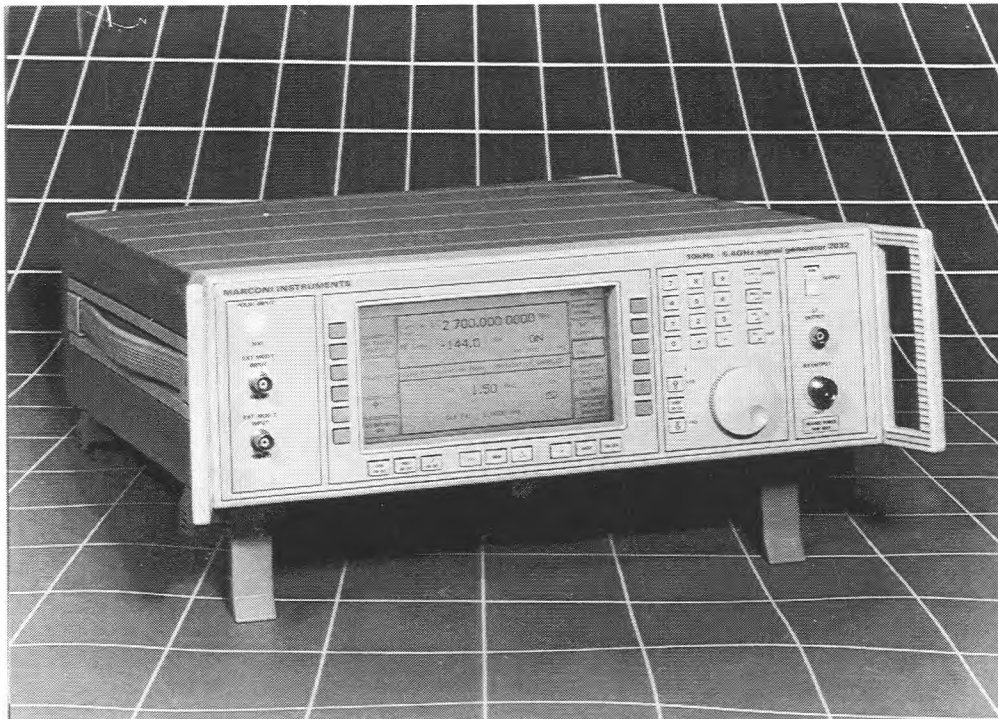
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/0006555		Nomenclature SIGNAL GENERATOR		
Manufacturer MARCONI INSTRUMENTS		Part No. 52032-599 Opt. 001,002 & 006.	Cost/Date .£13000 1992	
Height 152 mm	Width 425 mm	Depth 525 mm	Weight 16.5 kg	
Power Supplies 90-115 V, 105-132 V, 188-242 V, 216-265 V, 45 Hz-400 Hz. 120 VA Max.		Air Publication -		
Availability 2	Environment B	Maintenance Policy 2A/4D	Calibration TBN	AFDEETEC No. 19480



1. Description

The M2032 is a synthesized signal generator covering the frequency range 10 kHz to 5.4 GHz. The output may be frequency pulse, amplitude or phase modulated from internal or external modulation sources. A maximum of four modulation channels can be made available by the use of the two internal oscillators together with two externally applied modulation signals. The instrument has the capability to test ILS/VOR at second line. The instrument can be controlled by the built in General Purpose Interface Bus (GPIB).

2. Specification

Carrier Frequency	
Range:	10 kHz to 5.4 GHz.
Resolution:	0.1 kHz at all frequencies.
Accuracy:	0.2 ppm/year.
Spectral Purity	
Harmonics:	For output levels up to +7 dBm, better than -30 dBc to 1 GHz, better than -27 dBc to 1.35 GHz, better than -25 dBc to 5.4 GHz.
Sub-Harmonics:	Better than -90 dBc up to 1.35 GHz, better than -40 dBc up to 2.3 GHz, better than -30 dBc up to 5.4 GHz.
Non-Harmonics:	Better than -70 dBc at offsets from the carrier of 3 kHz or greater.
SSB phase noise:	Less than -116 dBc/Hz (typically -122 dBc/Hz) at an offset of 20 kHz from a carrier frequency of 470 MHz.
Output:	
Range:	+13 dBm to -140 dBm. Units may be μ V, mV, V EMF or PD; dB relative to 1 μ V, 1 mV, EMF or PD; dBm. Conversion between dB and voltage units may be achieved by pressing the appropriate units key (dB, or V, mV, μ V)
Resolution:	0.1 dBm.
Accuracy:	+ or - 1 dB to 1.35 GHz, + or - 2 dB to 2.7 GHz, + or - 2 dB to 5.4 GHz for output levels above -50 dBm.
Reverse Power: Protection:	Reverse Power of 50 W from a source VSWR of up to 5 : 1.
Modulation Modes:	
Single:	FM, Wideband FM, Phase M, AM or Pulse.
Dual:	Two independent channels of differing modulation type (e.g. AM with FM).
Composite:	Two independent channels of the same modulation type (e.g. FM1 with FM2).
Dual Composite:	A combination of Dual and Composite modes providing four independent channels (e.g. AM1 with AM2 and FM1 with FM2).

Frequency Modulation:

Deviation: Peak deviation from 0 to 1 MHz for carrier frequencies up to 21.09375 MHz. Peak deviation from 0 to 1% of carrier frequency above 21.09375 MHz.

Rate: Variable 0.1 Hz to 500 kHz.

Source: Internal LF generator or external via front panel sockets.

Wideband FM:

Deviation: As Frequency Modulation.

Input Level: 1.414 V peak (1 V RMS sinewave) to achieve indicated deviation.

3 dB Bandwidth: Typically 10 MHz (DC or AC coupled)

Source: External via rear panel socket (50 ohm impedance).

Amplitude Modulation:

Rate: Variable 0.1 Hz to 500 kHz.

Deviation: 0 to 99.9%.

Resolution: 0.1%

Distortion: At a modulation rate of 1 kHz less than 1% total harmonic distortion for depths up to 30%, less than 3% total harmonic distortion for depths up to 80%.

Source: Internal LF generator or external via front panel sockets.

Phase Modulation:

Deviation: 0 to 10 radians.

Resolution: 0.01 radians.

Accuracy: At 1 kHz + or - 5% of indicated deviation excluding residual phase modulation.

Distortion: Less than 3% at maximum deviation at 1 kHz modulation rate.

Source: Internal LF generator or external via front panel sockets.

Sweep:

Control Modes: Start/Stop values of selected parameters. Number of steps. Time per step.

Step time:	1 ms to 10 s per step.
Sweep ramp:	Synchronized analogue ramp with a nominal amplitude of 0 to 10 V peak on rear panel BNC connector.
Markers:	User selectable markers for frequency or level provide an indication when specified parameter values have been reached. Output 0 to +5 V from 600 ohms on rear panel BNC socket.
Trigger:	Rear panel BNC connector. Applying 0 V or a switch closure starts the sweep. Socket is internally connected via 10 kilohm pull-up resistor to +5 V.
Modulation Oscillator:	
Frequency Range:	0.1 Hz to 500 kHz.
Resolution:	0.1 Hz.
Signalling Tones:	The modulating oscillator can be used to generate sequential (up to 16 tones) or sub-audible signalling tones in accordance with EIA, ZVEI, DZVEI, CCIR, EURO 1, EEA, NATAL and DTMF standards. Facilities are also available for creating and storing user defined tone systems.
Options	
001	Specification as Modulation Oscillator
002	Pulse Modulation Oscillator; Pulse Modulation may be used alone or in conjunction with FM, Phase Modulation or Wideband FM. Rise Time:- 1350 MHz and below: <15 ns (typically 5 ns) >1350 MHz:<20 ns (typically 12 ns) ON/OFF ratio is 70 dB. Input impedance is 50 ohms.
006	Avionics Option; The instrument has the capability to provide test facilities for the maintenance and calibration of airborne VHF Omni-directional Range (VOR) and Instrument Landing System (ILS) receivers and the ILS ground installations.

3. Comprising

10S/0006553	Signal Generator	52032-520C
10S/0006556	Carry Case	34136-665B
6150-99-9673658	Mains Lead	54341-012F
5995-99-7988875	1 m N Type RF Cable	54311-095C
5995-99-5800513	1.5 m BNC RF Cable	43126-012S
6225-99-7988861	N to BNC Adaptor	54311-092P
5915-99-5374845	50 ohm to 75 ohm Adaptor	54411-051X

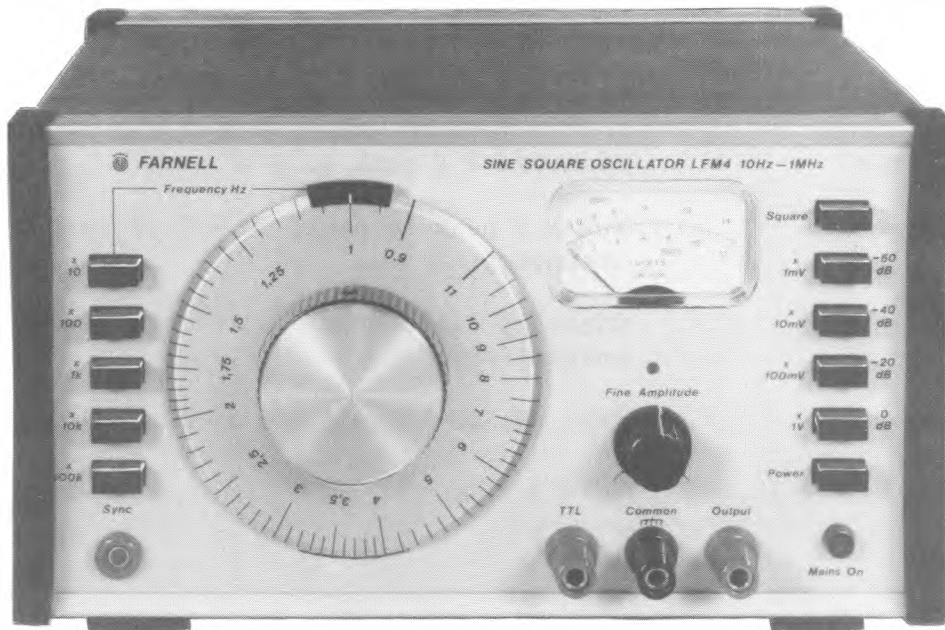
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-6473446		Nomenclature SINE/SQUARE OSCILLATOR		
Manufacturer FARNELL		Part No. L.F.M.4		Cost/Date £100.00 1978
Height 13.2 cm	Width 22.0 cm	Depth 23.0 cm	Weight 2.5 kg	
Power Supplies Battery 3 x PP7 or 95-130 V ac or 190-260 V ac 50-60 Hz				Air Publication NONE
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDRETEC/AFDSEC No. 18872



1. Description

The LFM-4 is a low cost, portable Wien Bridge Sine/Square oscillator supplying a stabilised but fully variable output into a calibrated 600 ohm impedance. A separate terminal allows a direct sinewave output for oscilloscope triggering or the input of a frequency lock signal. A TTL output socket is also provided when the instrument is functioning in the square wave mode.

2. Specification

Frequency Range:	10 Hz to 1 MHz in 5 bands
Calibration Accuracy:	To within $\pm 3\%$ (up to 100 kHz) To within $\pm 4\%$ (100 kHz - 1 MHz)

Harmonic Distortion: 10 Hz - 100 Hz less than 0.5%
 100 Hz - 20 kHz less than 0.2%
 20 kHz - 60 kHz less than 0.5%
 60 kHz - 100 kHz less than 0.9%
 100 kHz - 1 MHz less than 5%

Square Wave Rise Time: Less than 200 ns (Typically 160 ns)

Stability: 10 Hz - 100 kHz less than 2%
 100 kHz - 1 MHz less than 10%

Output Voltage: 1 mV to 12 V peak to peak

Meter Accuracy: 4% of fsd to 100 kHz

Trigger Output: Sinewave 4 V peak to peak

Locking Range: For 1 V peak to peak, $\pm 0.75\%$ of output frequency

Tuning: Directly calibrated dial with 5 push-button multipliers

Meter Ranges: 1-12 mV; 10-120 mV; 100-1200 mV; 1-12 V

Impedance: 600 Ω

3. Comprising

Instrument only

4. Accessory items

► 10ZZ/210942 Carry Case CDB/RAF

(Note: Case scaled for Victor, Hercules, VC10 tankers and Buccaneer squadrons at 1st line only). ◀

5. Associated Equipment

None



Section Reference 10S/0006598		Nomenclature SYNTHESIZED SIGNAL GENERATOR		
Manufacturer HEWLETT PACKARD		Part No. 83731A	Cost/Date 1992	
Height 133 mm	Width 426 mm	Depth 498 mm	Weight 16 kg	
Power Supplies 90 to 132 V (47 to 440 Hz), 198 to 264 V (47 to 66 Hz) 400 V maximum.		Air Publication -		
Availability 2	Environment B	Maintenance Policy 4/D	Calibration 2YRS	AFDEETEC No. 19497



1. Description

The HP83731A is a synthesized signal generator covering the frequency range 1 GHz to 20 GHz. The output may be frequency, pulse or amplitude modulated from internal or external sources with the capability of operating simultaneously with FM, PM and AM combined. The instrument has a non-volatile memory capable of storing up to ten complete front panel settings. The instrument can be controlled by the built in General Purpose Interface Bus (GPIB).

2. Specification

Carrier Frequency

Range: 1 GHz to 20 GHz.

Resolution: 1 kHz.

Accuracy: 0.2 ppm/year

Spectral Purity:

Harmonics: Less than -50 dBc at output levels below +8 dBm.

Sub-Harmonics: None.

Non-Harmonics: Less than -60 dBc.

Phase Noise: Less than -77 dBc/Hz at 10 kHz offset @ 18 GHz.
Less than -92 dBc/Hz at 10 kHz offset @ 2 GHz.

Output

Range: +10 dBc to -100 dBc. Typically +15 dBc to 18 GHz.

Resolution: 0.01 dB.

Accuracy: Better than + or -1 dB.

Reverse Power Protection: 1 W.

Flatness: + or -0.5 dB.

Modulation

Amplitude Modulation

Source: Internal or External. Internal source for AM is a fully variable sine, square, triangle, ramp and White Gaussian Noise Generator.

Rate: DC to 100 kHz.

Depth: 0 to 99.9%.

Sensitivity: 10 dB/V.

Frequency Modulation:

Source: Internal or External. Internal source for FM is a fully variable sine, square, triangle, ramp and White Gaussian Noise generator.

Rate: DC to 1 MHz.

Deviation: + or -10 MHz.

Sensitivity: 5 MHz/V

Pulse Modulation:

Source: Internal or External. Internal Pulse Generator Width range 25 ns to 419 ns, rate 10 Hz to 3 MHz. Delay -419 ns to +419 ns giving a very high fidelity pulse modulation with minimum overshoot and ringing at less than 10 ns rise/fall times.

Rate: DC to 3 MHz.

On/Off Ratio: Greater than 80 dB typically 95 dB.

Rise/Fall Time: 10 ns typically 5 ns.

3. Comprising

Operators Handbook
Mains Lead
Carrying Case
Protective Front Panel
20 dB Attenuator

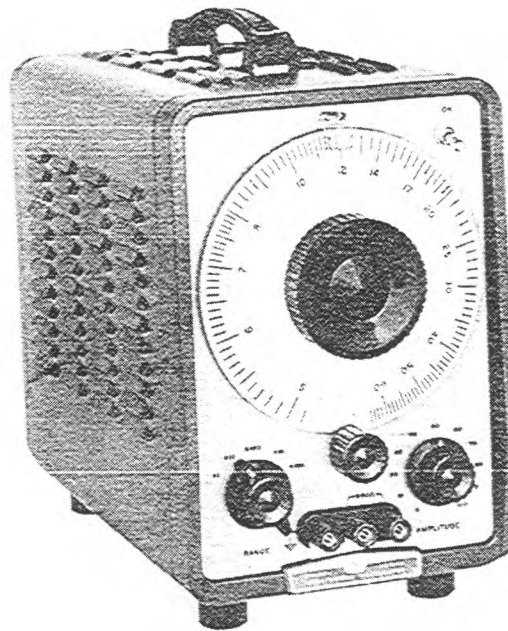
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/5184659		Nomenclature		
Manufacturer HEWLETT PACKARD		Part No. 200CD	Cost/Date .£269/JUL 93	
Height 292 mm	Width 187 mm	Depth 365 mm	Weight 9.9 kg	
Power Supplies 115 V/230 V \pm 10%; 48-440 Hz		Air Publication None.		
Availability 1	Environment B	Maintenance Policy -	Calibration A/12	AFDEETEC No. 13024



1. Description

The HP200CD wide range oscillator has high stability and accurate, easily resettable tuning.

2. Specification

Frequency:

Range: 5 Hz to 600 kHz in 5 ranges.

Response: \pm 1 dB (1 kHz ref).

Dial Accuracy: \pm 2%.

Output:

Level: >160 mW (10 V) into 600 Ω .
Impedance: 600 Ω .
Balance: Balance and floating better than 0.1%
at lower frequencies; approx 1% at
higher frequencies.
Attenuator: Bridged "T".

Distortion:

20 Hz to 200 kHz: 0.2%.
5 Hz to 20 Hz and
200 kHz to 600 kHz: 0.5%.

Hum and Noise: <0.1% of rated output.

3. Comprising

Not known.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S 7968697		Nomenclature T.V. PATTERN GENERATOR		
Manufacturer PHILIPS		Part No. PM 55151		Cost/Date £1506/88
Height 140 mm	Width 300 mm	Depth 395 mm	Weight 10 kg	
Power Supplies 110-240 V - 10 + 12%, 50/60 Hz \pm 5%			Air Publication NONE	
Availability 1	Environment A/B	Maintenance Policy 1A/4BCD	Calibration AH	AFDEETEC/AFDSEC No. 19403



1. Description

The PM 55151 is a colour pattern generator used for testing video and television equipment. Capable of generating up to 70 patterns and combinations, it can test PAL or RGB devices. The generator will store pre-determined user-programs in non-volatile memory and has RF modulation.

2 SpecificationVIDEO CARRIERFrequency

Range A:	32....300 MHz
Range B:	470...900 MHz
Range A covers:	IF + TV band 1 32.... 90 MHz Band S1...S10 104...174 MHz TV band III 174...230 MHz Band S11...S20 230...300 MHz
Range B covers:	TV bands IV-V 470...900 MHz
Frequency selection:	Keyboard
Fine tuning:	250 kHz steps for TV frequencies 100 kHz steps for IF frequencies (32...44.9 MHz)
Frequency tuning:	Either in positive or negative direction Tuning speed increase by holding the step button
Storage:	a) Possibility of 10 different RF frequencies b) as a), indicated as TV channel numbers
Indication:	4 digit 7-segment LED display a) first digit: memory, store and recall position 0...9 b) 2nd, 3rd and 4th digit. Three digit indication for frequency in MHz. Separate indication for 250 kHz, 500 kHz and 750 kHz steps c) via keyboard selectable TV channel numbers (eg C21 of C70)

RF OUTPUT

RF output:	BNC connector (front panel)
Impedance:	75 Ω
Output voltage:	>10 mV
Attenuation:	>60 dB, continuous

VIDEOVideo Modulation

Modulation:	AM internal-external switchable
Polarity:	Negative
RF sync level:	100%

2. Specification (cont.)Video input

Video input: BNC connector (front panel)
 Input voltage (pp): 1 V
 Max. permissible input voltage: ± 5 V
 Impedance: 75 Ω
 Polarity: White level positive
 Coupling: dc (clamping on sync)

Video output

Video output: a) BNC connector
 b) SCART connector (Euro-AV-connector)
 Pin 19 (rear)
 Impedance: 75 Ω
 Voltage (pp): a) 1 V fixed
 b) Variable between 0.1..5 V into 75 Ω
 Polarity: Negative
 Coupling: dc

CHROMA

Chroma standards: PAL and NTSC, selectable at rear, panel
 PAL according to system B, D, G, H, I, (M, N)
 NTSC according to system M (switchable)
 Subcarrier Frequency: 4.433619 MHz for PAL B, D, G, H, I coupled with line freq.
 3.575611 MHz for PAL M according to selected standard
 3.582056 MHz for PAL N
 3.579545 MHz for NTSC
 Tolerance: $<3 \times 10^{-5}$ (+ 5...+ 40° C)
 Burst: Position, number of cycles and phase according to selected standard
 Amplitude: Chroma with burst
 a) fixed (100%)
 b) continuous adjustable from 0-150%
 Chroma vectors inaccuracy: phase $<3^\circ$
 amplitude $\leq 5\%$ relative to luminance amplitude

2. Specification (cont.)SOUND CARRIER AND MODULATION

Sound carrier (mono):	on/off switchable
Frequency:	4.5 MHz, standard M, N 5.5 MHz, standard B, G, H 6.0 MHz, standard I 6.5 MHz, standard D
Tolerance:	$<3.10^{-5}$ (+5...+40° C)
Vision/sound carrier ratio:	13 dB, standard B, G, H 11 dB, standard D 13 dB, standard M,N 12 dB, standard I
Sound modulation:	FM intern. on/off switchable extern. on/off switchable
Pre-emphasis:	50 μ s, standard B, D, G, H, I 75 μ s, standard M, N

Internal

Frequency deviation:	\pm 30 kHz, standard B, G, H \pm 15 kHz, standard M, N \pm 27 kHz, standard I \pm 24 kHz, standard D
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External

	0.4 V will give the same deviation as with internal modulation
Input:	DIN connector Pin 3+5 (rear panel)
Impedance:	0.5 M Ω
Bandwidth:	40 Hz - 15 kHz
Max input voltage:	\pm 40 V
Output:	SCART connector, (Euro-AV-connector) Pin 3 (rear panel)
Impedance:	1 k Ω
Voltage:	0.4 V

SYNCHRONISATION

Line frequency:	15,625 Hz for CCIR 15,734 HZ for RTMA
Frequency tolerance	<0.4 Hz (+5...+40° C)
Number of lines:	625 for CCIR 525 for RTMA
Field frequency:	50 Hz for CCIR 60 Hz for RTMA

2 Specification (cont.)

Line + frame sync: According to TV standard, interlacing

Output: BNC connector (front panel)

Sync signal: Combined signal with line and field synchronization pulses with amplitude difference.

Voltage (open circuit): 2.6 V for line pulse
5 V for field pulse

Impedance: 6 k Ω

Polarity: Negative

Inputs DIN connector (rear panel)

Contacts: pin 2 (ground)
pin 3 sound channel 1
pin 5 sound channel 2

Impedance: 0.5 M Ω

Bandwidth: 40 Hz - 15 kHz

Max permissible voltage: \pm 40 V

Outputs SCART connector (Euro-AV-connector)
sound channel 1 pin 3
sound channel 2 pin 1

Impedance: 1 k Ω

Voltage: 0.4 V

Operation mode detection

Pilot frequency: 54.6875 kHz ($83.5 \times f_{line}$)

Tolerance: $<3 \times 10^{-5}$ (+5...+ 40° C)

Modulation: AM

Modulation depth: 50%

Identification frequencies: 117.5 Hz ($f_{line}/133$) stereo mode
274.1 Hz ($f_{line}/57$) two channels mode

Deviation of second sound carrier: \pm 2.5 kHz by modulation of carrier with unmodulated pilot

For standards D, I, M, N the stereo versions X and TX offer all Mono facilities.

POWER SUPPLY

Voltage 110, 127, 220, 240 V

Tolerance: -12... + 10%

2 Specification (cont.)

Frequency: 50/60 Hz
 Tolerance: 5%
 Power consumption: Depending on version

DIMENSIONS AND WEIGHT

Height: - 140 mm
 Width: - 300 mm
 Depth: - 395 mm
 Weight: - Depending on version approx. 10 kg

ACCESSORIES

Standard: - PM 9538 RF cable
 BNC TV connector 75 Ω
 - Operating manual
 - Mains cable
 Option: - PM 9539 RF cable + 300 Ω TRAFO
 - PM 9075, 75 Ω BNC-BNC cable
 - Service manual

OPTION R-G-B

R-G-B outputs BNC connectors (rear)

Output voltage (pp): 0.7 V (into 75 Ω)
 Impedance: 75 Ω

Subcarrier output BNC connector (rear)

Output voltage (pp): 1 V (into 75 Ω)
 Impedance: 75 Ω

Sync. output BNC connector (rear)

Output voltage (pp): 1 V (into 75 Ω)
 Impedance: 75 Ω

3 Comprising

10S 7968697 TELEVISION PATTERN GENERATOR	9452 055 15025
OPERATING CARD	9499 520 08711
OPERATORS MANUAL	9499 520 08601
SERVICE MANUAL	9499 525 01111
RF LEADS (QTY 3)	9538
MAINS LEAD	

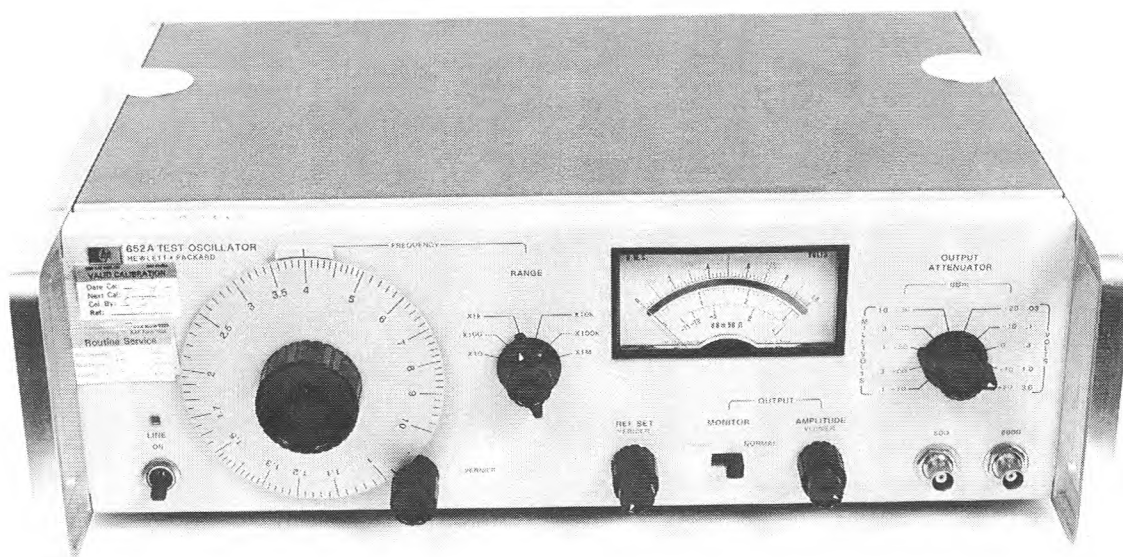
4 Accessory

None.

5 Associated Equipment

None.

Section Reference 10S/0543483		Nomenclature TEST OSCILLATOR		
Manufacturer HEWLETT PACKARD		Part No. 652A	Cost/Date £4208 MAR93	
Height 133 mm	Width 425 mm	Depth 337 mm	Weight 11.8 kg	
Power Supplies 115 V/230 V ac +/- 10%, 48-440 Hz		Air Publication None.		
Availability 2	Environment B	Maintenance Policy 2B/4CD	Calibration A/12	AFDEETEC No. 14250



1. Description

The HP 652A test oscillator provides a sinusoidal output of 10 Hz to 10 MHz at an output of +23 to -70 dBm into 50 ohms, variable in 10 steps.

2. Specification

Frequency Range: 10 Hz to 10 MHz.

Dial Accuracy: +/- 2%, 100 Hz to 1 MHz.
+/- 3%, 10 Hz to 100 Hz & 1 MHz to 10 MHz.

Flatness: +/- 0.25%, 3 V & 1 V range.
+/- 0.75%, 0.3 V to 0.3 mV range.
+/- 1.75%, 0.1 mV range.

Output Voltage: +23 dBm to -70 dBm variable in 10 steps
(1-3-10 sequence)

Output Impedance: 50 / 600 ohms.

Attenuator: 90 dB range in 10 dB steps.

Attenuator Accuracy: +/- 0.075 dB, -60 dBm to +20 dBm.
+/- 0.2 dB, -70 dBm to -60 dBm.

Distortion: < 1%, 10 Hz to 2 MHz.
< 2%, 2 MHz to 5 MHz.
< 4%, 5 MHz to 10 MHz.

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

SWEEP MODE	AVAILABLE MARKERS
Full	F ₀ , M ₁ , M ₂
F ₁ , F ₂	F ₀ , M ₁ , M ₂
F ₁ /ΔF	F ₀ , M ₁ , M ₂
F ₀ /ΔF	M ₁ , M ₂
M ₁ , M ₂	F ₀

Accuracy : Same as frequency accuracy.

Resolution : 0.4% of sweep width.

Display : Front panel pushbuttons select three alternate marker displays:

Video: Positive video pulse of up to 5 V amplitude, adjustable with MARKER AMPLITUDE control.

RF: Attenuated rf pulse of up to 5 dB amplitude, adjustable with MARKER AMPLITUDE control.

Intensity: Intensified dot on trace, obtained by momentary dwell in sweep.

Marker Output : 0 to +5 V TTL-compatible pulse, coincident with video markers, 1 kΩ impedance. Rear panel BNC connector. Adjustable with MARKER AMPLITUDE control.

SWEEP AND TRIGGERING MODES

Sweep Triggering

Auto : Triggers sweep automatically.

Line : Triggers sweep from power line frequency.

External : Triggers sweep from externally applied 4 to 25 Vpk or TTL-compatible pulse with > 1 μs width and > 5 μs fall time. Rear panel BNC connector.

Single : EXT OR SINGLE SWEEP selects mode, triggers, aborts and resets single sweep.

Sweep Time : Adjustable from approximately 0.01 s to 99 s. Entered on keypad in ms or s.

Retrace RF : Front panel pushbutton blanks rf power during sweep retrace.

Horizontal Output : 0 to 10 V ramp coincident with sweep in all sweep modes. In CW mode, output voltage varies in proportion to frequency, 0 V at 0 GHz and 10 V at 26.5 GHz. Rear panel BNC connector.

2. Specification

Frequency Range:	10 Hz to 10 MHz.
Dial Accuracy:	+/- 2%, 100 Hz to 1 MHz. +/- 3%, 10 Hz to 100 Hz & 1 MHz to 10 MHz.
Flatness:	+/- 0.25%, 3 V & 1 V range. +/- 0.75%, 0.3 V to 0.3 mV range. +/- 1.75%, 0.1 mV range.
Output Voltage:	+23 dBm to -70 dBm variable in 10 steps (1-3-10 sequence)
Output Impedance:	50 / 600 ohms.
Attenuator:	90 dB range in 10 dB steps.
Attenuator Accuracy:	+/- 0.075 dB, -60 dBm to +20 dBm. +/- 0.2 dB, -70 dBm to -60 dBm.
Distortion:	< 1%, 10 Hz to 2 MHz. < 2%, 2 MHz to 5 MHz. < 4%, 5 MHz to 10 MHz.

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

SWEEP MODE	AVAILABLE MARKERS
Full F_1, F_2 $F_1 / \Delta F$ $F_0 / \Delta F$ M_1, M_2	F_0, M_1, M_2 F_0, M_1, M_2 F_0, M_1, M_2 M_1, M_2 F_0

Accuracy : Same as frequency accuracy.

Resolution : 0.4% of sweep width.

Display : Front panel pushbuttons select three alternate marker displays:

Video: Positive video pulse of up to 5 V amplitude, adjustable with MARKER AMPLITUDE control.

RF: Attenuated rf pulse of up to 5 dB amplitude, adjustable with MARKER AMPLITUDE control.

Intensity: Intensified dot on trace, obtained by momentary dwell in sweep.

Marker Output : 0 to +5 V TTL-compatible pulse, coincident with video markers, 1 k Ω impedance. Rear panel BNC connector. Adjustable with MARKER AMPLITUDE control.

SWEEP AND TRIGGERING MODES

Sweep Triggering

Auto : Triggers sweep automatically.

Line : Triggers sweep from power line frequency.

External : Triggers sweep from externally applied 4 to 25 Vpk or TTL-compatible pulse with > 1 μ s width and > 5 μ s fall time. Rear panel BNC connector.

Single : EXT OR SINGLE SWEEP selects mode, triggers, aborts and resets single sweep.

Sweep Time : Adjustable from approximately 0.01 s to 99 s. Entered on keypad in ms or s.

Retrace RF : Front panel pushbutton blanks rf power during sweep retrace.

Horizontal Output : 0 to 10 V ramp coincident with sweep in all sweep modes. In CW mode, output voltage varies in proportion to frequency, 0 V at 0 GHz and 10 V at 26.5 GHz. Rear panel BNC connector.

2. Specification (continued)

Sequential Sync Output :	+5 V TTL-compatible pulse occurring at oscillator bandswitching points and during sweep retrace. Rear panel BNC connector.
Retrace Blanking (-) Output :	-5 V pulse occurring during sweep retrace. Rear panel BNC connector. <100 Ω impedance.
Retrace Blanking (+) Output :	+5 V TTL-compatible pulse occurring during sweep retrace. Rear panel BNC connector.
Bandswitch Blanking Output :	\pm 5 V pulse occurring during oscillator bandswitching points. Polarity selected on rear panel switch. Rear panel BNC connector. <100 Ω impedance.
V/GHz Output :	Reference voltage of 1 V per GHz, varying in proportion to output frequency. On 6636A, 6640A, 6642A, 6653A and 6659A, output is 0.5 V per GHz. Rear panel BNC connector. <100 Ω impedance.
Penlift Output :	Normally-open relay contacts for lifting recorder pen during sweep retrace. Internal jumper can be installed to provide normally-closed contacts. Rear panel BNC connector.
Sweep Dwell Input :	Low true TTL-compatible pulse causes frequency sweep to stop. May be used to count marker frequencies with an external counter and Frequency Counter Interface output, Option 13.
External Sweep Input :	Externally applied 0 to 10 V ramp sweeps frequency between selected sweep limits. Rear panel BNC connector. 10 k Ω impedance. Front panel control.
CW Filter Enable/Disable	
Enabled :	Filter inserted for CW mode and sweep widths <50 MHz.
Disabled :	Filter removed for all modes of operation.
Levelling and Modulation	
Levelling :	
External Detector :	Levels output power at remote test position where directional detector samples rf power and provides a positive or negative polarity detected signal of 5 mV to 500 mV to front panel BNC connector. Front panel BNC

gain control adjusts input signal level to optimum value.

Power Meter : Levels output power at remote test position where a power meter samples rf power and provides a ± 1.0 V full scale video signal to a front panel BNC connector. Front panel ALC gain control adjusts input signal level to optimum value.

Unlevelled Indicator : Lights when output power is insufficient to maintain levelling across the selected sweep range.

RF Slope Control : Adjusts slope of levelled output power by increasing power at the higher frequencies to compensate for frequency-dependent cable losses in test setup.

External AM Input : Rear panel BNC connector. 10 k Ω impedance.

Sensitivity : 1 dB/V

Frequency Response (Typical): DC-50 kHz

Input Impedance : 10 k Ω

Amplitude Control Range : >13 dB

Maximum Input : 20 V

External FM and Phase Lock Input : Rear panel BNC connector. 10 k Ω impedance.

Sensitivity : -6 MHz/V

Maximum Deviation for Modulation Frequency of : DC-100 kHz: ± 25 MHz
100-250 kHz: ± 5 MHz

Instrument Status

GPIB Indicators : When General Purpose Interface Bus (GPIB), Option 3 is added to the instrument, LED lights indicate the following conditions:

Remote : Operating on GPIB.

Talk : Talking on GPIB.

Listen : Listening on GPIB.

SRQ : Sending a service request.

Local Lockout : Disabling the RETURN TO LOCAL push-button. The instrument can be placed in local mode only via GPIB.

Non-Volatile Memory : Retains front panel settings in memory for more than 20 days. Whenever instrument is turned out, control settings come on at the same functions and values existing when power was removed.

Reset

Reset Control :	Returns controls of following conditions.
Frequency Range :	Full
Trigger :	Auto
Markers :	Off
RF :	On
Level :	Specified power level
Levelling :	Internal. Not available on 6640A and 6642A >26.5 GHz.
Sweep Time :	50 ms
$F_0, F_1, F_2, M_1, M_2, \Delta F$:	Frequency varies with model number.
Self-Test :	Performs self-test every time power is applied or when SELF TEST push-button is pressed. If an error is detected, a diagnostic code appears, identifying the cause and location of the error.

General

Power Variation With Temperature :	± 0.05 dB/ $^{\circ}$ C. Not applicable to 6632A, 6640A and 6642A.
Output Connector :	UG-599/U.
Decrease/Increase Control :	Electronically increases and decreases value of frequency, sweep time, and power. Rate of change is greatest when lever is in extreme position, decreasing as it is moved toward the centre. A "tap" moves the parameter by one increment.
Data Entry :	Frequency, sweep time, and power level are entered on keypad with up to 5 digit resolution. Entry is terminated by pressing appropriate unit (MHz, dB, ms or GHz, dBm, Sec) pushbutton. Entry errors are cleared by pressing CLEAR ENTRY.
Shift Key :	Activates dual function controls-ALT (alternating sweep), CW FILTER (CW filter enable/disable), CW RAMP (horizontal output ramp), and EXTERNAL SWEEP (external sweep input).

Frequency Characteristics

Accuracy (at 25°C) :	±20 MHz (CW Mode), ±30 MHz (Sweep Mode)
Stability with temperature :	±1 MHz/°C
Stability with 10% time voltage change :	±200 kHz
Stability with 10 dB power level change :	±400 kHz
Stability with 3:1 load S.W.R:	±400 kHz
Stability with time (10 min typical) :	±200 kHz

Output Characteristics

Max. levelled power (25°C ± 5°C) :	>1 mW (0 dBm)
Spectral Purity :	Harmonics >30 dBc, Non-harmonics >60 dBc
Connector type :	UG-599/U waveguide

Modulation Characteristics

External FM & phaselock Sensitivity :	-12 MHz/V
Max. deviation for Modulation frequency of :	dc - 100 kHz = ±50 MHz 100 - 250 kHz = ±10 MHz

3. Comprising

Instrument
Mains lead
Handbook

4. Accessory Items

None

5. Associated Equipment

None

Section Reference SEE TEXT		Nomenclature RUBIDIUM FREQUENCY STANDARD		
Manufacturer HEWLETT PACKARD		Part No. 5065A	Cost/Date .SEE TEXT	
Height 133 mm	Width 425 mm	Depth 416 mm	Weight SEE TEXT	
Power Supplies 115/230 V +/-10%, 50/60/400 Hz		Air Publication None.		
Availability 2	Environment B	Maintenance Policy -	Calibration A/12	AFDEETEC No. SEE TEXT

1. Description

The HP5065A is an atomic-type secondary frequency standard, having sinusoidal outputs of 100 kHz, 1 MHz and 5 MHz. There are 2 models in service, the standard HP5065A and the HP5065A with options 002 (Standby Battery) and 908 (Rack Mount Kit).

<u>Model</u>	<u>Sect/Ref</u>	<u>AFDEETEC</u>	<u>Cost/Date</u>
5065A	10S/0247377	14126	£19,968 JUN 93
5065A-002-908	10S/7229300	19031	£26,534 JUN 93

2. Specification

Outputs:

Frequency: 100 kHz, 1 MHz, and 5 MHz.

Amplitude: 1 volt into 50 ohms.

SSB Phase Noise Signal
(1 Hz BW). Offset from
signal (frequency):

0.001 Hz;	-25 dB.
0.01 Hz;	-52 dB.
0.1 Hz;	-72 dB.
D.C.;	-93 dB.
10 Hz;	-120 dB.
100 Hz;	-126 dB.
1 kHz;	-140 dB.

Non-Harmonic Related
Output: >80 dB.

Harmonic Distortion: >40 dB.

Stability:

Long Term: $\pm 1 \times 10^{-11}$ /month.

Short Term (5 MHz)

Averaging time:

10^{-3} ;	7.5×10^{-10} .
10^{-2} ;	1.5×10^{-10} .
10^{-1} ;	1.5×10^{-11} .
10^0 ;	5×10^{-12} .
10^1 ;	1.6×10^{-12} .
10^2 ;	5×10^{-13} .
10^3 ;	5×10^{-13} .

Warm-up Characteristics

(at 25 °C) : 1×10^{-10} ; 1 hour.
 5×10^{-11} ; 4 hours.

Range of Frequency
Adjustment: $\pm 2 \times 10^{-12}$.

General:

Power Consumption: 5065A; 49 W.
5065A-002-908; 55 W.

Operating Temperature
Range: 0 °C to +50 °C.

Weight: 5065A; 15.4 kg.
5065A-002-908; 17 kg.

3. Comprising

Not known.

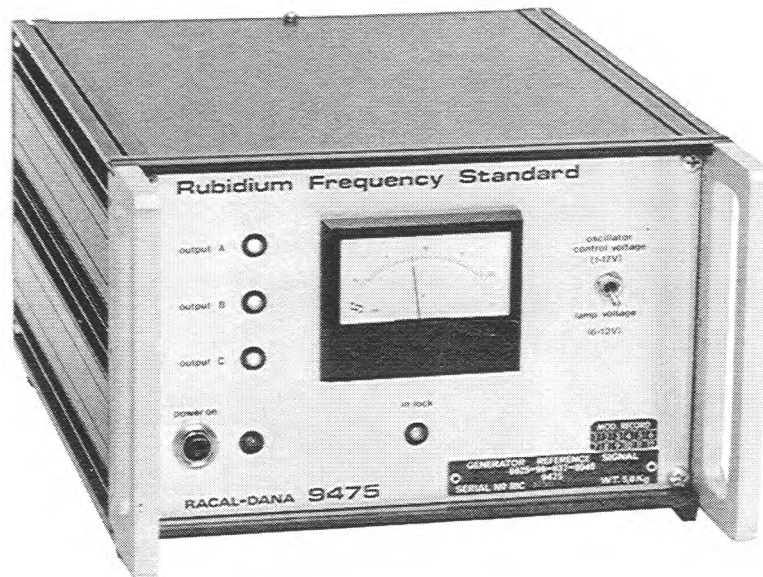
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-6370540		Nomenclature RUBIDIUM FREQUENCY STANDARD		
Manufacturer RACAL-DANA		Part No. 9475	Cost/Date £2750 1976	
Height 132 mm	Width 216 mm	Depth 287 mm	Weight 5 kg	
Power Supplies 100-120 V +/-6% or 200-250 V +/-6%, 50-60 Hz +/-10%			Air Publication None.	
Availability 2	Environment B	Maintenance Policy -	Calibration A/12	AFDEETEC No. 18761



1. Description

The Racal-Dana 9475 Rubidium Frequency Standard is a stable atomic oscillator which has a fast warm-up time. It provides 3 buffered, short circuit protected outputs at 1 MHz. These outputs are stabilized sinusoidal waveforms of high spectral purity and amplitude greater than 1 volt into 50 ohms. An additional 10 MHz sine wave output is provided, primarily for monitoring purposes.

2. Specification

Outputs (x3, isolated and protected):

Frequency:	1 MHz.
Amplitude:	>1 volt RMS into 50 ohms.
Signal-to-Noise Ratio:	>100 dB measured in a 1 Hz band at 200 Hz from carrier.
Non-Harmonically Related Spurious:	<-100 dBc.
Hum Related Sidebands:	<-80 dBc.
Harmonic Distortion:	<-30 dBc.

Monitor Output:

Frequency:	10 MHz.
Amplitude:	>1 volt RMS into 50 ohms.

Stability:

Long Term:	Average drift rate less than 4×10^{-11} /month.
Short Term:	Less than 3×10^{-11} over a sampling time of one second.
Warm-up characteristics:	2×10^{-10} of final frequency within 15 minutes. 1×10^{-10} of final frequency within 1 hour. (These times are after switch-on following 24 hours switched off in the temperature range +5 °C to +30 °C).
Range of Frequency Adjustment:	$>2 \times 10^{-9}$

General:

Power Consumption:	65 VA initially, 40 VA after warm-up.
Operating Temperature Range:	0 °C to +45 °C.

3. Comprising

Mains Lead.
Manual.

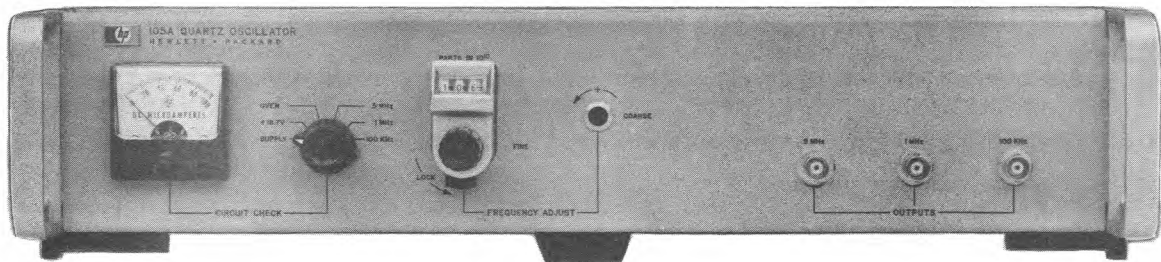
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 110S/6625-00-4808675		Nomenclature QUARTZ OSCILLATOR FREQUENCY STANDARD		
Manufacturer HEWLETT PACKARD		Part No. 105A		Cost/Date 1978 £1,700. 00
Height 8.8 cm	Width 42.5 cm	Depth 28.6 cm	Weight 8.0 kg	
Power Supplies 115/230 V 50-400 Hz			Air Publication 117E-0118-16	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration B/SCAN	AFDEETEC/AFDSEC No. 18678



1. Description

The HP 105A is a highly stable precision quartz oscillator, its predictable warm up time (retrace) enables this instrument to be switched off at cease work or transported without recourse to a standby power supply.

2. Specification

Output frequencies	5, 1, 0.1 MHz
Output volts	1 V (r.m.s.)
Frequency accuracy:	5×10^{-10}
Frequency stability:	
Long Term (per day)	5×10^{-10}

Short Term (over 1 sec)	5×10^{-12}
Temperature -10 to 50°C	2.5×10^{-9}
Load o/c to s/c	2×10^{-11}
Supply Volts ±10%	5×10^{-11}
Retrace (24 hrs OFF TIME)	1×10^{-8} after 20 minutes
	1×10^{-9} after 30 minutes
Distortion: (Harmonic)	40 dB
(Non-harmonic)	80 dB
Frequency Adjust	1×10^{-6}

Note: the OFS 2B, 10D/6625-99-6343274 is to be used in preference wherever practicable.

3. Comprising

110S/6625-00-4808675 Quartz Oscillator HP105A

4. Accessory items

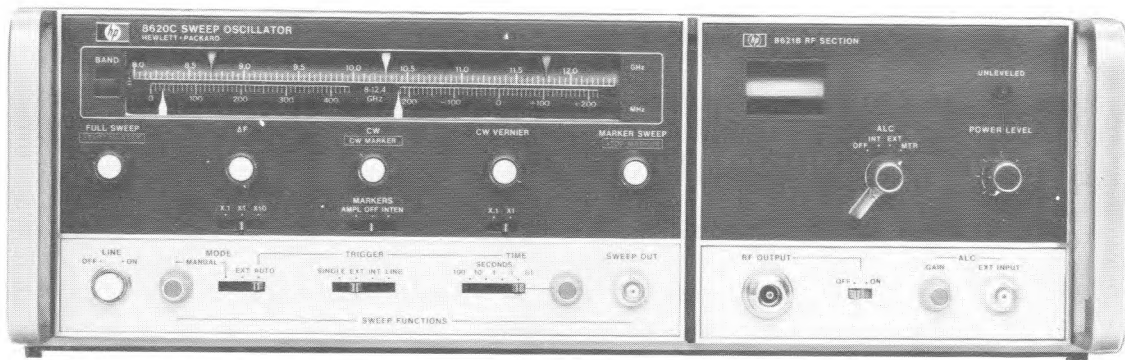
None

5. Associated equipment

None

GPIB
Available

Section Reference 10S/4931-00-0197890		Nomenclature SWEEP OSCILLATOR MAINFRAME		
Manufacturer HEWLETT PACKARD		Part No. 8620C		Cost/Date 1978 £1256.00
Height 13.2 cm	Width 42.5 cm	Depth 33.7 cm	Weight 11.1 kg	
Power Supplies 115/230 V \pm 10% 50-400 Hz			Air Publication 117E-0612-0	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEEC/AFDSEC No. 18760



1. Description

The HP8620C replaces the now-discontinued 8620A (110S/0076661) and is fully compatible with the existing range of RF modules as listed at Pages 4, 5 & 6. The 8620C offers additional sweep modes and other new operating features to increase flexibility and convenience of swept frequency measurements. Now included are up to 3 markers, Marker Sweep, Fullband Sweep and ΔF fully calibrated from 0-100% of band. At the same time, the 8620C retains such useful features as the CW Vernier and narrow band ΔF . These effectively increase frequency resolution and settability to that of a >300 inch dial scale, making it easy and accurate to increment frequency or set ΔF sweep widths of 1 MHz even at 18 GHz. The modules in Service use have internal levelling to 12.4 GHz, external from 8 to 18 GHz. Internal modulation at a nominal 1 kHz square wave plus external AM, FM and pulse modulation are possible (see individual module specifications).

2. Mainframe specifications

Frequency range: determined by band select level and RF unit selected.

Generator functions:

Sweep: FULL SWEEP (3 markers): the sweeper automatically covers the full band as determined by the RF module and the band select lever, regardless of the frequency settings of the front panel controls. In this function, 3 continuously variable, calibrated markers are available, controlled by the START MARKER, CW MARKER and STOP MARKER knobs.

MARKER SWEEP: Sweep between the START and STOP MARKER settings. In this mode, the CW MARKER is still available.

DELTA F: Sweep is symmetrical about CW setting, selectable at 1, 10 or 100% of band. In this mode, the START and STOP MARKERS are still available.

CW: Spot frequency, resolution 0.25% of band.

CW VERNIER: Fine tune about CW setting. Calibrated in MHz, selectable between ± 0.5 and $\pm 5\%$ of band.

Marker: AMPLITUDE/OFF/INTENSITY: amplitude (constant width power dips), intensity (Z-axis modulation of display), resolution better than 0.25% of band.

Sweep modes: MANUAL/EXTERNAL/AUTO 0.01-100 secs.

Trigger: SINGLE/EXTERNAL/INTERNAL/LINE

Outputs:

Z Axis (BNC): Switched between +6 V/1 k Ω for pen lift and -5 V/1 k Ω for Z axis modulation (Intensity marker), both outputs coincidental with RF blanking.

Sweep output (BNC): Linear ramp (zero to 10 V).

Inputs:

Ext FM (BNC): DC to 1 MHz

Ext AM (BNC) : 100 kHz bandwidth
Ext Trigger (BNC) : Not less than +2 V dc, 0.5 μ s. Less than
1 MHz prf.

Options:

001: BCD frequency programming
011: IEC-bus compatibility

3 Comprising

▶ Instrument only
Power Cable 7 $\frac{1}{2}$ foot
Calibration Scale ◀

4 Accessory Items

See description

5 Associated Equipment

See lists overleaf

HEWLETT PACKARD 8620C SERIES SWEEP OSCILLATOR UNITS

(Individual single band units plugging into the 8620 Mainframe)

		HP86220A	HP86222B	HP86230B	HP86250D OPT.001	HP86260A OPT.001
Reference No 10S/6625-99-		6287335	6485826	6287336	6487097	6487098
AFDEETEC No		18382	18980	18421	18905	18906
Frequency Range		10-1300 MHZ	0.01-2.4 GHz	1.8-4.2 GHz	8-12.4 GHz	12.4-18 GHz
CW Accuracy		±10 MHz	±10 MHz	±10 MHz	±40 MHz	±50 MHz
Residual FM (peak less than)		5 kHz	5 kHz	7 kHz	15 kHz	25 kHz
Maximum Levelled Power		+10 dBm (10 mW)	+13 dBm (20 mW)	+10 dBm (10 mW)	+10 dBm (10 mW)	+10 dBm (10 mW)
Levelling Mode (Operating)		Internal	Internal	Internal	Internal	Internal
Power Variation (Levelled)		±0.5 dB	±0.25 dB	±0.5 dB	Error of Sampler ±0.1 dB	Error of Sampler ±0.1 dB
Spurious Signals	Harmonics	-25 dB	-25 dB	-20 dB	-30 dB	-25 dB
	Non Harmonics	-40 dB	-30 dB	-60 dB	-60 dB	-50 dB
Residual AM		-50 dB	-50 dB	-50 dB	-50 dB	-50 dB
Source VSWR (50 Ω nom. less than)		1.3	1.5	1.6	1.6	1.6
Ext. FM Peak Deviation	DC to 100 Hz	±15 MHz	±75 MHz	±25 MHz	±150 MHz	±75 MHz
	DC to 1 MHz	±500 kHz	±5 MHz	±2MHz	±7 MHz	±5 MHz
Int. AM ON/OFF Ratio		35 dB		25 dB	40 dB	25 dB
Ext. Pulse (µs)	Risetime	8	8	8	8	8
	Falltime	4	4	4	4	4
Price (1978)		£1,699	£1,700	£1,699	£2,062	£2,159

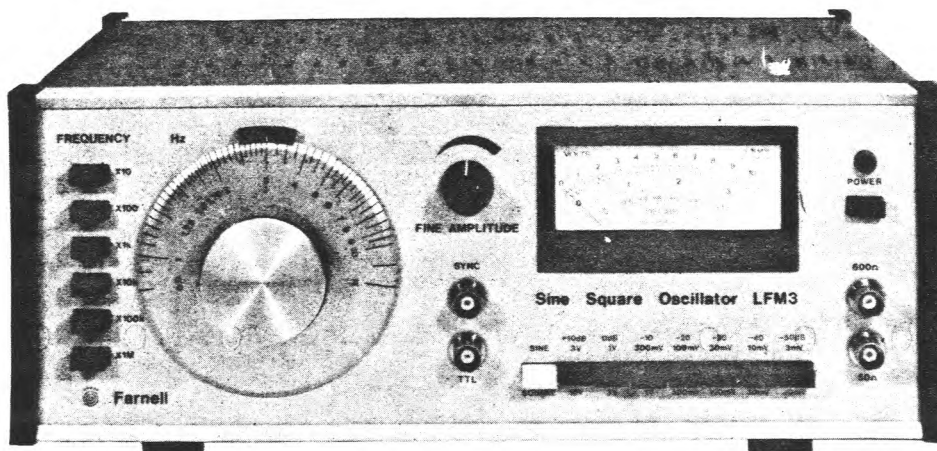
HEWLETT PACKARD 86300 SERIES SWEEP OSCILLATOR MODULE

1. One or two 86300 modules can be installed in the 8621B RF Drawer. Where double band operation is required OPTION 100 (Multi-band) is required.
2. The 86320A Heterodyne unit can be installed in addition to one or two modules, it requires the 86330A as a drive but its installation does not require Option 100.

	HP86320B	HP86331C	HP86341C	HP86342C	HP86350C	
Reference No 10S/6625-99	10ZZ/ 206768	10ZZ/ 206492	10ZZ/ 206489	10ZZ/ 206490	10ZZ/ 206491	
AFDEETEC No	18387	18910	18907	18908	18909	
Frequency Range	0.1-2.0 GHz	1.7-4.3 GHz	3.2-6.5 GHz	5.9-9.0 GHz	8-12.4 GHz	
CW Accuracy	±10 MHz	±20 MHz	±30 MHz	±35 MHz	±40 MHz	
Residual FM (peak less than)	15 kHz	7 kHz	7 kHz	15 kHz	15 kHz	
Max. Levelled Power	+13 dBm (20 mw)	+16 dBm (40 mw)	+10 dBm (10 mw)	+7 dBm (5 mw)	+6 dBm (4 mw)	
Levelled Mod (Operating)	Internal	Internal	Internal	Internal	Internal	
Power Variation	±0.7 dB	±0.8 dB	±0.7 dB	±1.0 dB	±1.0 dB	
Spurious Signals	Harmonics	-30 dB	-20 dB	-25 dB	-30 dB	-30 dB
	Non-Harmonics	-30 dB	-60 dB	-60 dB	-60 dB	-60 dB
Residual AM	-50 dB	-50 dB	-50 dB	-50 dB	-50 dB	
Source VSWR (50Ω nom. less than)	1.6	1.6	1.6	1.5	1.5	
Ext FM Peak Devia- tion	DC - 100 Hz	±75 MHz	±75 MHz	±75 MHz	±75 MHz	±75 MHz
	DC - 1 MHz	±5 MHz	±5 MHz	±5 MHz	±5 MHz	±5 MHz
	DC - 2 MHz	±2 MHz	±2 MHz	±2 MHz	±2 MHz	±2 MHz
Int AM ON/OFF Ratio	15 dB	40 dB	25 dB	40 dB	40 dB	
Ext. Pulse Risettime (µs)	Risettime	2	2	2	2	2
	Falltime	1	1	1	1	1
Price (1978)	£1,557	£1,723	£1,709	£1,881	£1,881	

Reference	Nomenclature	Part No	Price	Multiband Option
10S/6625-99-6287344	RF Drawer	HP8621B	£442	Opt. 100 £354 extra 10S/6625-99-6287345

Section Reference 10S/6625-99-6642106		Nomenclature SINE/SQUARE OSCILLATOR		
Manufacturer FARNELL		Part No. LFM 3		Cost/Date £324 1982
Height 130 mm	Width 320 mm	Depth 265 mm	Weight 43 kg	
Power Supplies 95-130 V/190-260 V; 50-60 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19148



1 Description

A general purpose, broadband test oscillator which will provide sine waves from 10 Hz to 10 MHz and square wave from 10 Hz to 1 MHz. The synchronized output may be used to trigger ancillary equipments, it will also produce fixed amplitude, low distortion, sine wave output with a source impedance of about 10 k Ω . Low harmonic distortion and flat response make it ideal for ac bridge measurements and for checking audio and video amplifiers. In addition, the accurately levelled and measured output is suitable for calibration and tests of instruments, setting up Dolby units, tape tests and telephone line checks.

2 Specification

Frequency Range: 10 Hz to 10 MHz sinewave in six switched ranges
 10 Hz to 1 MHz square wave (specified)
 extended unspecified square waves to 10 MHz

Scale Accuracy:	2% of scale reading 100 Hz - 100 kHz 3% of scale reading 10 Hz - 100 Hz 3% of scale reading 100 kHz - 1 MHz 10% of scale reading 1 MHz - 10 MHz
Frequency Stability:	(For a $\pm 10\%$ change from 220 V) 0.2%
Amplitude Stability:	(For a $\pm 10\%$ change from 220 V) 0.2% for 10 Hz to 1 MHz 0.5% for 1 MHz to 10 MHz
Frequency Response:	100 Hz - 1 MHz ± 0.2 dB 1 MHz - 10 MHz ± 3 dB
Output Voltage:	20 V peak to peak into open cct
Output Impedance:	50 Ω and 600 Ω
Protection:	Short term short circuit protection
Square wave rise/fall time:	Less than 35 ns
TTL output:	Square wave 5 V nominal amplitude. Only 'square mode' TTL fan out of 10
Sync output:	6 V peak to peak sine wave source impedance 10 k Ω
Meter Calibration:	Sine wave volts rms Square wave volts peak to peak into matched load dB scale provided. Ref. 0 dB = 1 mW into 600 Ω
Meter Accuracy:	3% of fsd 100 Hz to 1 MHz 10% of fsd 1 MHz to 10 Mhz
Attenuator:	Seven steps of 10 dB per step
attenuator Accuracy:	1% 10 Hz to 300 kHz 2% 300 kHz to 1 MHz 15% 1 MHz to 10 MHz
Operating temperature:	0 $^{\circ}$ - 40 $^{\circ}$ C

3 Comprising

Instrument only.

4 Accessory Items

None.

5 Associated Equipment

None.

GPIB FULLY
COMPATIBLE

Section Reference 10S/7551127		Nomenclature SIGNAL GENERATOR		
Manufacturer MARCONI		Part No. 2019A		Cost/Date £4820 1984
Height 152 mm	Width 425 mm	Depth 525 mm	Weight 16 kg	
Power Supplies 105V to 120V, 210V to 240V 45 Hz to 440 Hz			Air Publication 117E-0418-0	
Availability 2	Environment B	Maintenance Policy 3C/4D	Calibration A/12	AFDEETEC/AFDSEC No. 19318



1. Description

The 2019A is a synthesized signal generator covering the frequency range 80 kHz to 1040 MHz. The output may be amplitude, phase or frequency modulated using either the built-in source or an external source. All control settings are entered from a front panel keyboard. Three liquid crystal displays give simultaneous readout of frequency, modulation and output level. Remote control via GPIB is standard.

2. Specification

Carrier Frequency	Range	80 kHz to 1040 MHz, usable down to 30 kHz.
	Selection	By keyboard entry.
	Indication	8 digit lcd.
	Resolution	10 Hz up to 520 MHz, 20 Hz from 520 MHz to 1040 MHz.
	Accuracy	Equal to the frequency standard accuracy. See Frequency Standard.

Chap 4.2.24

RF Output

Level	0.2 μ V to 2V emf (-127 to +13 dBm) in cw and fm modes. 0.2 μ V to 1V emf (-127 to +7 dBm) in am mode.
Selection	By keyboard entry. Units may be μ V, mV, V emf or pd; dB relative to 1 μ V, 1 mV, 1V emf or pd; dBm. Conversion between dB and voltage units may be achieved by pressing the appropriate unit key (dB, or V, mV, μ V).
Indication	4 digit lcd with units annunciators.
Resolution	0.1 dB or better over entire voltage range.
Output level accuracy	± 1 dB from 80 kHz to 520 MHz. ± 2 dB above 520 MHz.
Output impedance	50 Ω , type N female socket to MIL 39012/30 - For output levels below 300 mV emf the VSWR is better than 1.2:1 for carrier frequencies up to 520 MHz, and better than 1.5:1 for carrier frequencies above 520 MHz.
Reverse power protection	An electronic trip protects the generator output against reverse power of up to 50 W from dc to 1 GHz. The trip may be reset from the front panel or via the GPIB.

Spurious Signals

Harmonically related signals	For output levels less than 1V emf. Better than -30 dBc for carrier frequencies up to 520 MHz and better than -20 dBc for carrier frequencies above 520 MHz.
Sub-harmonics	None for carrier frequencies up to 520 MHz. -20 dBc for carrier frequencies above 520 MHz.
Non-harmonically related signals	Better than -70 dBc for carrier frequencies from 2.03126 MHz to 1040 MHz. Better than -60 dBc for carrier frequencies from 80 kHz to 2.03125 MHz.

Residual fm	Less than 6 Hz rms in CCITT telephone psophometric band at 520 MHz and improving by approximately 6 dB per octave with reducing carrier frequency down to 2.03126 MHz.
Single sideband phase noise	Better than -130 dBc/Hz at 90 MHz and 20 kHz offset from the carrier.
RF leakage	Less than 0.5 μ V pd generated in a 50 Ω load by a two-turn, 25 mm loop, 25 mm or more from the case of the generator with the output level set to less than -10 dBm and the output terminated in a 50 Ω sealed load.
Frequency Modulation	
Range	Peak deviation from 0 to 100 kHz for carrier frequencies up to 2.03125 MHz. Peak deviation from 0 up to 1% of carrier frequency for carrier frequencies above 2.03125 MHz.
Selection	By front panel keyboard, internal source (see AF oscillator) or external input may be selected.
Display	3 digit lcd.
Deviation accuracy	\pm 5% of deviation at 1 kHz modulating frequency excluding residual fm.
Frequency response	\pm 1 dB from 50 Hz to 100 kHz relative to 1 kHz. Usable down to 10 Hz with reduced deviation.
Distortion	Better than 3% total harmonic distortion at 1 kHz modulating frequency and a deviation of up to 70% of maximum available at any carrier frequency. Better than 0.3% total harmonic distortion at 75 kHz deviation at carrier frequencies from 88 MHz to 108 MHz at 1 kHz modulating frequency.
External modulation	With modulation ALC on, the deviation is calibrated for input levels between 0.8 V and 1.2 V pd. With modulation ALC off, the deviation is calibrated for an input level of 1 V pd. HI and LO led's are provided as an aid to maintaining calibrated modulation in the ALC OFF mode. When the HI and LO led's are extinguished, the input voltage will be in the range 1 V \pm 5%. Input impedance: 100 k Ω nominal.

Phase Modulation

Range	Modulation index: 0 to 10 radians for carrier frequencies below 2.03125 MHz; 0 to a value in radians equal to the carrier frequency in MHz, for frequencies above 2.03125 MHz.
Selection	By front panel keyboard. Internal source (see AF oscillator) or external input may be selected.
Display	3 digit lcd.
Accuracy	$\pm 5\%$ excluding residual ϕ_m .
Frequency response	± 1 dB from 50 Hz to 10 kHz wrt 1 kHz.
Distortion	Better than 3% total harmonic distortion at 1 kHz modulating frequency.
External modulation	With modulation ALC on, the deviation is calibrated for input levels between 0.8 V and 1.2 V pd. With modulation ALC off, the deviation is calibrated for an input level of 1 V pd. HI and LO led's are provided as an aid to maintaining calibrated modulation in the ALC OFF mode. When the HI and LO led's are extinguished, the input voltage will be in the range 1 V \pm 5%. Input impedance: 100 k Ω nominal.

Amplitude Modulation

Range	0 to 99% in 1% steps.
Selection	By front panel keyboard. Internal source (see AF oscillator) or external input may be selected.
Display	2 digit lcd.
Accuracy	Better than \pm (4% of depth setting +1%) for modulation depths up to 95% at 1 kHz modulating frequency and carrier frequencies up to 400 MHz.
Frequency response	± 1 dB from 20 Hz to 50 kHz relative to 1 kHz at 80% depth dc coupled.
Envelope distortion	Better than 3% total harmonic distortion for modulation depths up to 80% at 1 kHz modulating frequency, and carrier frequencies up to 400 MHz. Better than 2% total harmonic distortion for modulation depths up to 90% at 1 kHz modulating frequency for carrier frequencies up to 32 MHz.

External modulation	With the modulation ALC on, the modulation depth is calibrated for input levels between 0.8 V and 1.2 V pd. With the modulation ALC off, the modulation depth is calibrated for an input level of 1 V pd. HI and LO led's are provided as an aid to maintaining calibrated modulation in the ALC OFF mode. When the HI and LO led's are extinguished, the input voltage will be in the range $1\text{ V} \pm 5\%$. Input impedance: 100 k Ω nominal, dc coupled.
AF Oscillator	
Frequencies	300 Hz, 400 Hz, 500 Hz, 1 kHz, 3 kHz and 6 kHz selected sequentially by repetitive pressing of the AF OSC key.
Display	Six led's indicated selected frequency.
Frequent accuracy	$\pm 5\%$
Output level	0.1 mV to 5 V into a load of 2 k Ω or greater, selected by keyboard entry. Output may be entered in mV, V or as dBm into 600 Ω . Capable of driving a 600 Ω load for levels below 2 V.
Level accuracy	$\pm 5\%$ for output levels above 50 mV. $\pm 10\%$ for levels below 50 mV.
Frequency Standard	Internal or external frequency standard may be selected from the front panel. Annunciators show which is selected.
Input/Output	A rear-panel BNC socket provides an output from the internal frequency standard at either 1 MHz or 10 MHz when internal standard is selected. This socket becomes the external standard input when external standard is selected.
Internal Frequency Standard	
Frequency	10 MHz
Temperature stability	Better than ± 0.1 ppm over the temperature range 0 to 40°C.
Warm-up time	Within 0.5 ppm of final frequency 5 min. from switch-on at 20°C ambient.

Internal standard output Either 1 MHz or 10 MHz at nominally
 3 V p-p square wave. Source impedance
 100 Ω nominal.

External Frequency Standard

External standard
 input

Accepts either a 1 MHz or 10 MHz
 signal of at least 1 V rms. Frequency
 is selected by Second Function control.
 Maximum input 2.5 V.
 Input impedance: 100 Ω nominal.

3. Comprising

▶	NYR	Signal Generator	52019-910E	◀
	NYR	GPIB Module	54433-001U	
	1OZZ/210168	Front Handle Kit	46883-511R	
	1OZZ/210169	Rack Mounting Kit	46883-506M	

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-01-7485831		Nomenclature PROGRAMMABLE FUNCTION GENERATOR		
Manufacturer HEWLETT-PACKARD		Part No. HP 3325 A		Cost/Date £3000 1984
Height 13.26 cm	Width 42.5 cm	Depth 49.78 cm	Weight 9 kg	
Power Supplies 100/120/220 V 48-66 Hz			Air Publication NIL	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration AH/12	AFDEETEC/AFDSEC No. 19232



1. Description

The HP 3225 A is a high performance instrument combining synthesizer, function generator and wideband sweeper. Its eleven digit readout permits frequency coverage from 0.000001 Hz to 20.999 999 999 MHz. It is able to provide precision sine and square waveforms; triangular and ramps with 0.05% linearity are available up to 10.9 kHz. All waveforms can be dc and phase offset. Its wideband, phase continuous, sweep capability covers the full frequency range of each waveform. All the main functions are programmable on the HP-IB making the HP 3225 A a powerful addition to automatic test systems.

2. Specifications

Waveforms - Sine, Square, Triangle, negative and positive Ramp.

Frequency Range:

Sine	1 μ Hz	to	20.999 999 999 MHz
Square	1 μ Hz	to	10.999 999 999 MHz
Triangle	1 μ Hz	to	10.999 999 999 MHz
Ramp	1 μ Hz	to	10.999 999 999 MHz

Frequency Resolution:	1 μ Hz below 100 kHz 1 mHz above 100 kHz
Warm-up Time:	20 mins to achieve spec. accuracy.
Signal output:	
Connector	BNC
Impedance	50 Ω
Amplitude	1 mV to 10 V p-p 0.354 mV to 3.536 V rms (sine)
Resolution	0.03% of full range (4 digits)
Rise/Fall time (square wave) -	less than 20 ns
Phase Offset:	
Range	$\pm 719.9^\circ$
Resolution	0.1 $^\circ$
Accuracy	$\pm 0.2^\circ$
dc Offset:	
Range	dc only (no ac signal) 0 to ± 5 V/ 50 Ω dc + ac max offset ± 4.5 V on highest range decreasing to ± 4.5 mV on lowest range.
Resolution	4 digits
Sinewave Amplitude Modulation	
Depth	0-100% at max output for each range.
Frequency	dc to 500 kHz (0-21 MHz carrier)
Sensitivity	± 5 V peak for 100% modulation
Sinewave Phase Modulation	
Range	$\pm 850^\circ$, ± 5 V input
Frequency	dc to 5 kHz
Frequency Sweep	
Linear	0.01s to 99.99s
Log	2s to 99.99s single 0.1s to 99.99s continuous
Max Sweep Width	Full frequency range of the main signal output for the waveform in use, except min Log.Start frequency is 1 Hz.
Phase Continuity	Sweep is phase continuous over the full frequency range of the main output.

Auxiliary Inputs and Outputs

Reference input	for phase-locking to an external frequency from 0 dBm to +20 dBm into 50 Ω . Ref Sig must be a sub-harmonic of 10 MHz.
Aux Freq output	21 MHz to 60.999 999 999 MHz. 0 dBm; output impedance 50 Ω .
Sync Output	Squarewave with V (high) equal to or greater than 1.2 V. With V (low) equal to or less than 0.2 V into 50 Ω .
X Axis Drive	0 to greater than 10 V dc linear ramp proportional to sweep frequency. Linearity 10-90% \pm .1% of final value.
Sweep Marker O/P	High to Low TTL compatible voltage transition at selected marker frequency.
Z Axis Blank O/P	TTL compatible voltage levels capable of sinking 200 mA from a positive source.
1 MHz Reference O/P	0 dBm output for phase locking additional instruments to the 3325 A.

3. Comprising

Instrument
Power Cable
Operating Manual

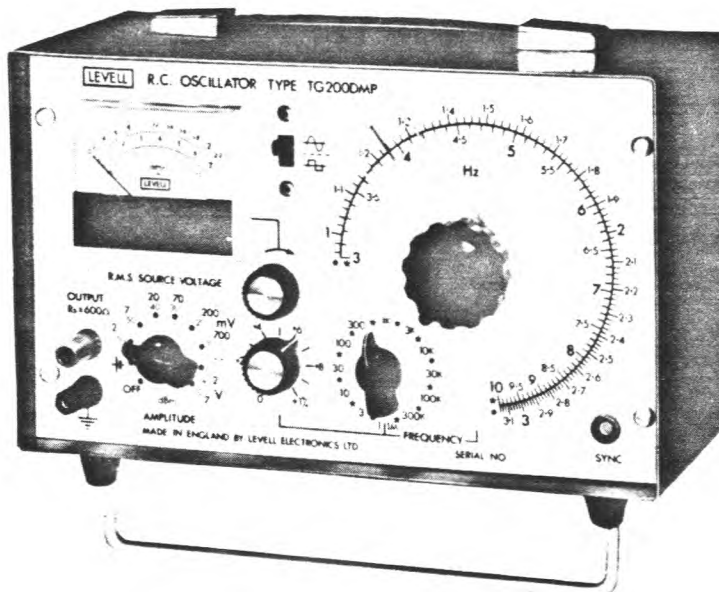
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/5820-99-6571737		Nomenclature OSCILLATOR (SINE/SQUARE)		
Manufacturer LEVELL		Part No. TG 200 DMP		Cost/Date £135 1980
Height 180 mm	Width 260 mm	Depth 140 mm	Weight 4.5 kg	
Power Supplies 4 x PP9 BATTERIES. PROVIDE 33V \pm 15% CENTRE EARTH SUPPLY				Air Publication 117E-0120-0
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration AH/12	AFDEETEC/AFDSEC No. 19104



1. Description

A solid state RC oscillator with frequency coverage 1 Hz to 1 MHz providing both sine and square waves, with a fine frequency control. Output of the oscillator is 7 V rms. The squarewave output is produced by a trigger circuit to ensure that the rise time is independent of the frequency. Output terminals are fed via a low-distortion power amplifier which acts as a buffer to prevent pick-up on the output levels modulating the oscillator.

2. Specification

Frequency: 1 Hz to 1 MHz

Output Amplitude: 7 V rms (20 V p-p on sine) source voltage reduceable to less than 200 μ V by a continuously variable control and switched attenuator with 10 dB steps up to 70 dB. Power output -74 dBm to +13 dBm (20 mW) into 600 Ω .

Output Accuracy: Better than 2% over full range.

Impedance: 600 Ω \pm 1% at all amplitude settings.

Sync Output: Sine wave in phase with output amplitude greater than 1 V rms, source resistance 3.3 k Ω .

Sync Input: The frequency can be locked to an external signal over a range of \pm 1% per volt rms input up to 10 V maximum. The frequency control then varies the phase of the output.

3. Comprising

Instrument.
Handbook.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/4119622		Nomenclature HIGH POWER SIGNAL SOURCE (MAINFRAME)		
Manufacturer AILTECH		Part No. 445		Cost/Date £4847 1983
Height 29.2 cm	Width 20.3 cm	Depth 43.1 cm	Weight 18.2 kg	
Power Supplies 115/230 V \pm 5%. 50-60 Hz, 450 W				Air Publication -
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration AH/12	AFDEETEC/AFDSEC No. 19293



1. Description

The Ailtech 445 and the two in-service plug-in heads 185 and 186 cover the range 50 to 200 MHz; and 200 to 500 MHz up to 50 W respectively. The instrument features positive load mismatch protection, and forward and reflected power metering. The plug-in heads incorporate a direct reading dial and have a coupling control that provides for optimization of power transfer to the load. The output power is continuously variable from full rated power down to 50 mW. A low power sample is available for use with an external counter or detector. The positive mismatch protection circuit is designed so that the power supply voltage is automatically switched off when the reflected power exceeds 10 W.

▶ The Ailtech 445 mainframe and plug-in head 185 together provide 50 MHz to 200 MHz up to 50 W.

The Ailtech 445 mainframe and plug-in head 186 together provide 200 MHz to 500 MHz up to 50 W. ◀

2. Specification

Other than the frequency differences, both systems have identical specifications.

Frequency:

Accuracy: $\pm 1\%$ at optimum coupling after $\frac{1}{2}$ hour operation at maximum rated power.

Stability: $\pm 0.001\%$ /10 minutes after $\frac{1}{2}$ hour stabilization at constant power and frequency.

Power:

Metering: Forward power: 10 and 50 W full scale.
Reflected power: 10W full scale.

Stability: ± 0.1 dB/hr after $\frac{1}{2}$ hour stabilization at constant power and frequency.

Sample output: 15 to 40 dB below main rf output.

Overload: Fully protected against excessive power reflected back into the output port.

Adjustment: Continually variable down to 50 mW.

Spectral Purity (CW operation):

Residual AM: 1% maximum

Residual FM: 0.003% maximum

Modulation:

Internal: 100% squarewave, 1000 Hz adjustable $\pm 10\%$.

External: Pulse: zero residual: +15 V required.

3. Comprising

Instrument
Mains lead

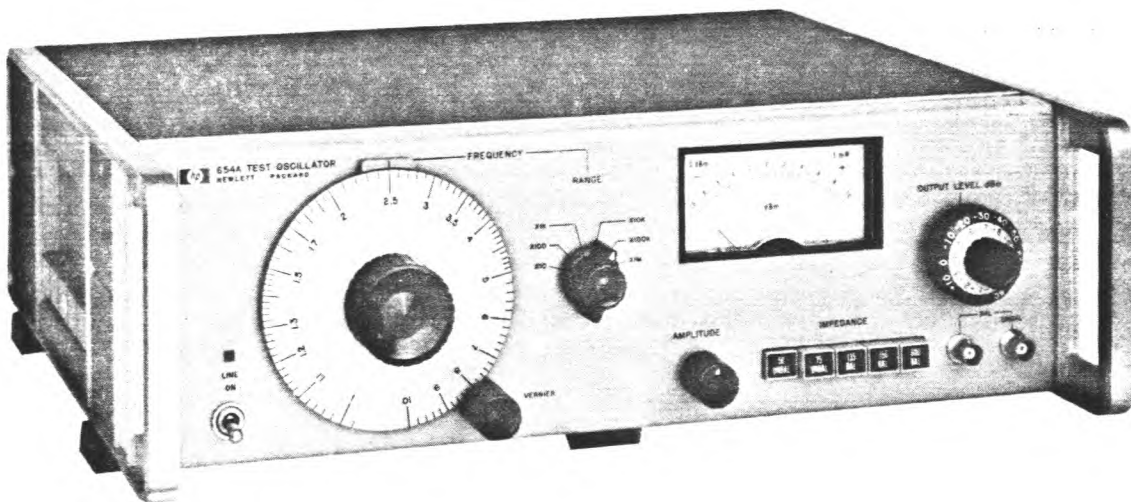
4. Accessory Items

None.

5. Associated Equipment

Ailtech 185	10S/3765106	AFDEETEC No 19295	Cost £4356
Ailtech 186	10S/5938239	AFDEETEC No 19294	Cost £4356

Section Reference 10ZZ/204472		Nomenclature TEST OSCILLATOR		
Manufacturer HEWLETT PACKARD		Part No. 654A		Cost/Date £1700 1984
Height 133 mm	Width 425 mm	Depth 337 mm	Weight 11.8 kg	
Power Supplies 115/230 V ac \pm 10%, 48-440 Hz				Air Publication -
Availability 2	Environment B	Maintenance Policy 2B/4CD	Calibration AH/12	AFDEETEC/AFDSEC No. 19308



1. Description

The HP 654A test oscillator provides a sinusoidal output of 10 Hz to 10 MHz at an output of +11 dBm to -90 dBm, variable in 1 dB steps.

2. Specification

Frequency Range:	10 Hz to 10 MHz
Dial Accuracy:	\pm 2%, 100 Hz to 5 MHz \pm 3%, 10 Hz to 100 Hz \pm 4%, 5 MHz to 10 MHz
Flatness (1 kHz ref):	(\pm 10 dBm and 0 dBm, 1 kHz ref) \pm 0.5% for: 10 Hz to 10 MHz for unbalanced outputs 10 Hz to 5 MHz for 135 Ω and 150 Ω outputs 10 Hz to 1 MHz for 600 Ω output
Output Voltage:	+11 dBm to -90 dBm in 10 dB and 1 dB steps

Output Impedance:	50,75 Ω unbalanced; 135 Ω , 150 Ω , 600 Ω balanced
Attenuator:	99 dB range in 10 dB and 1 dB steps with ± 0.13 dB ($\pm 1.5\%$) accuracy except ± 1 dB ($\pm 10\%$) at levels below 60 dBm at frequencies 300 kHz
Distortion:	10 Hz to 1 MHz, 40 dB (1%) 1 MHz to 10 MHz, 34 dB (2%)
Hum and Noise Voltage:	70 dB (.003%) of rated output
Balance:	50 dB 10 Hz to 1 MHz 40 dB 1 MHz to 10 MHz

3. Comprising

Instrument only.

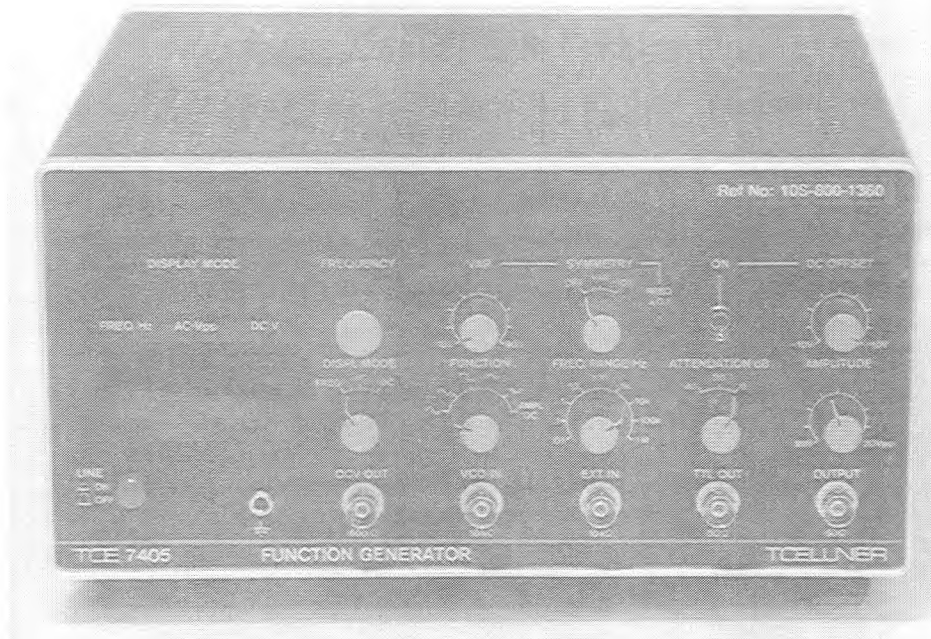
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/3152259		Nomenclature FUNCTION GENERATOR		
Manufacturer TOELLNER GMBH		Part No. TOE 7405		Cost/Date £ 1988
Height 135 mm	Width 255 mm	Depth 280 mm	Weight 3.5 Kg	
Power Supplies 115/230 V 48-60 Hz			Air Publication NONE	
Availability 1	Environment A	Maintenance Policy AB2/CD4	Calibration A/12	AFDEETEC/AFDSEC No. 19408



1 Description

The TOE 7405 Function Generator is compact generator with 9 decades of range. Sine, triangle, rectangle and pulse functions are available. In a special mode, the instrument will perform as a wide-band amplifier or generate a bipolar DC output voltage. DC offset and external voltage control provide wide versatility. A fast rise time TTL compatible sync output is provided.

2 Specification

- Signal Functions: Sine, triangle, rectangle, +ve pulse, - ve pulse. Adjustable symmetry.
- Operational modes: Free-running oscillator, external frequency control, amplifier mode, bipolar DC voltage source.
- Frequency Range: 0.00005 Hz to 5 MHz in 9 decade ranges.

Read-out: 3½ digit display

Frequency Offset: 5%

Frequency Error: 2% of full range value, 5% of full range value
in the range xMHz

Signal Amplitude: 10 mV to 30 V (peak to peak)
15 V (peak to peak) in pulse mode

Read-out: 3½ digit display

Output Impedance: 50 Ohms

DC Offset: 0 V to ± 10 V

Output Attenuator: 30 dB continuously variable plus selectable
20 or 40 dB steps.

Frequency Response (Sine, Triangle) 0.3 dB up to 1 MHz, 0.5 dB over 1 MHz

Signal Function Data: Sinewave Harmonic Distortion: < 0.5% up to 50 kHz
(at max. output voltage into 50 Ohm load) < 5% up to 5 MHz

Triangle linearity Error: < 1% up to 100 kHz
Triangle Symmetry Error: < 1% up to 100 kHz
Rectangle/Pulse Transition Time: < 28 ns
Rectangle/Pulse Overshoot: < 5%
Symmetry Variation: 10% to 90%

Amplifier Mode Details Gain: Approx. 17 dB
Frequency Range: DC to approx. 10 Mhz
Harmonic Distortion: < 0.1% up to 100 kHz
Input Impedance: 10 kohms

Other Signal Inputs and Outputs: Sync signal output: TTL compatible, source
impedance 50 Ohms. Modulation signal input VCO:
Approx 4 V for a frequency variation ratio
of 1000:1
OCV-output: 0 to 4 V output voltage for frequency
variation of 1:1000
EXT-IN: Amplifier input, max input voltage ± 40V

3 Comprising:

Instrument Mains Lead

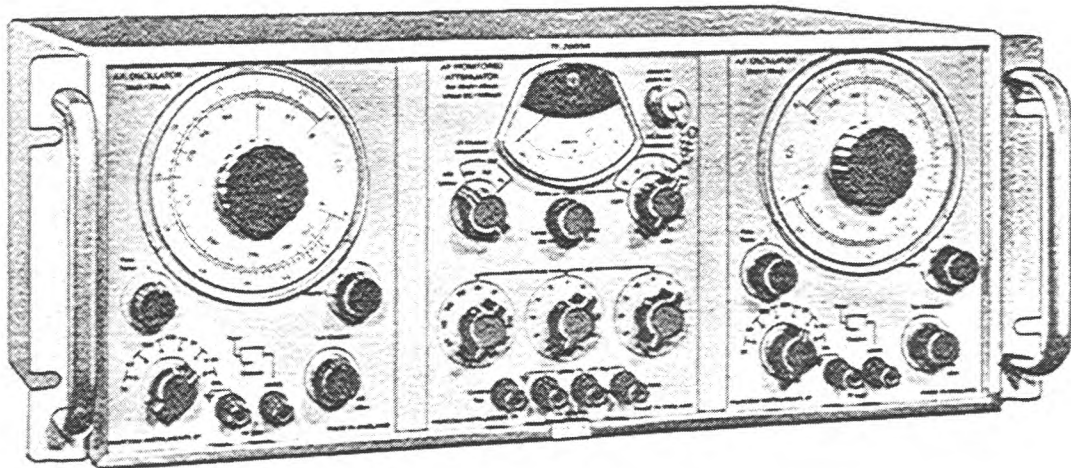
4 Accessory Items

None

5 Associated Equipments

None

Section Reference 10S/9520447		Nomenclature SIGNAL GENERATOR		
Manufacturer MARCONI		Part No. TF2005R	Cost/Date .£3659/JUL 93	
Height 190 mm	Width 469 mm	Depth 320 mm	Weight 13 kg	
Power Supplies SEE TEXT		Air Publication 117E-0113-13D		
Availability 1	Environment B	Maintenance Policy -	Calibration -	AFDEETEC No. 12287



1. Description

The Marconi TF2005R is a two-tone signal source comprising 2 identical AF oscillators and an AF monitored attenuator mounted in a cabinet and provides for measurement of intermodulation distortion. Each oscillator can be used separately or, through the attenuator, both oscillators can be intermodulated.

2. Specification

Frequency Range: 20 Hz to 20 kHz in 6 bands. (Each oscillator can be adjusted independently).

Outputs:

 Level:

 Reference: Up to +10 dBm from each oscillator.

 Attenuator Range: 111 dB in 0.1 dB steps.

 Distortion Harmonic: Less than 0.05% between 63 Hz and 63 kHz when using unbalanced output. Generally less than 0.1% under other conditions.

 Intermodulation: Below -80 dB with respect to the wanted signal.

 Hum: Below -80 dB with respect to the wanted signal.

General:

Power Supplies:

 AC: 95 V to 130 V or 190 V to 260 V at 45 Hz to 500 Hz; 105 V to 130 V or 210 V to 260 V at 500 Hz to 1 kHz.

 DC: 65 V to 90 V.

Power Consumption:

 AC: 14 VA.

 DC: Load 60 mA.

3. Comprising

Not known.

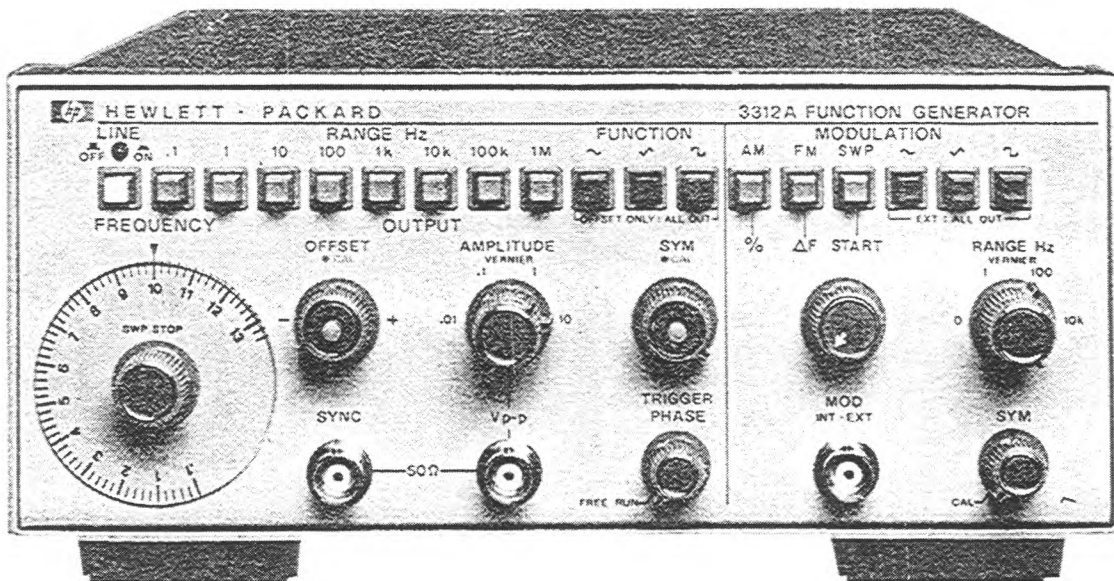
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6597757		Nomenclature FUNCTION GENERATOR		
Manufacturer HEWLETT PACKARD		Part No. 3312A	Cost/Date .f1285/JUL 93	
Height 102 mm	Width 213 mm	Depth 377 mm	Weight 3.8 kg	
Power Supplies 100 V/120 V/220 V/240 V +5%-10%; 48 Hz to 440 Hz		Air Publication		
Availability 1	Environment B	Maintenance Policy -	Calibration -	AFDEETEC No. 19253



1. Description

The HP3312A combines two separate, independent function generators with a modulator section. Sweep functions, AM or FM or tone burst are all easily selectable by push buttons on the modulator section. The output is 1 mV to 10 V peak to peak into 50 Ω , with a DC offset up to 10 V.

2. Specification

Waveforms:	Sine; square; triangle +ve/-ve ramp; pulse; AM; FM; sweep; triggered and gated.
Frequency:	
Range:	0.1 Hz - 13 MHz in 8 decade ranges.
Dial Accuracy:	±5% of full scale.
Square wave rise/fall time:	<18 ns (10% to 90%).
Aberrations	<10%.
Triangle Linearity Error:	<1% at 100 Hz.
Variable Symmetry:	80:20:80 to 1 MHz.
Sinewave Distortion:	<0.5% (-46 dB) THD from 10 Hz to 50 kHz. >30 dB below fundamental from 50 kHz to 13 MHz.
Output:	
Impedance:	50 Ω ± 10%.
Level:	20 V p-p into open cct; 10 V p-p into 50 Ω.
Level flatness (sinewave):	<±3% from 10 Hz to 100 kHz at full rated output (1 kHz ref). <±10% from 100 kHz to 10 MHz.
Attenuator:	1:1; 10:1; 100:1; 1000:1 and >10:1 continuous control.
Attenuator error:	<5%.
Sync Output:	
Impedance:	50 Ω ± 10%.
Level:	>1 V p-p square wave into open cct. Duty cycle varies with symmetry control.
D.C. Offset:	Variable up to ± 10 V. Instantaneous ac voltage + Vdc offset cannot exceed ± 10 V (open cct) or ± 5 V (50 Ω).
Modulation:	
Types:	AM;FM; sweep, trigger; gate or burst.
Source:	Internal or External (all types)
Frequency Range:	0.01 Hz to 10 kHz.
Output Level:	>1 V p-p into 1 kΩ.
Amplitude Modulation:	
Depth:	0% to 100%.
Frequency:	
Internal:	0.1 Hz to 10 kHz.
External:	D.C. to >1 MHz.
Carrier 3 dB Bandwidth:	<100 Hz to >5 MHz.
Carrier Envelope Distortion:	<2% at 70% sine wave modulation with fc = 1 MHz; fm = 1 kHz.
External Sensitivity:	<10 V p-p (100% modulation).

Frequency Modulation:

Deviation: 0 to $\pm 5\%$ (internal).
 Frequency:
 Internal: 0.01 Hz to 10 kHz.
 External: DC to >50 kHz.
 Distortion: <-35 dB ($f_c = 10$ MHz, $f_m = 1$ kHz, 10% Mod).

Sweep Characteristics:

Sweep Width: $>100:1$ on any range.
 Sweep Rate: 0.01 Hz to 10 kHz; 90:10 ramp and 0 Hz Range (provides manual setting of "Sweep Start" without modulation generator oscillating).
 Sweep Mode: Repetitive linear sweep between start and stop frequency settings. Retrace time can be increased with symmetry control.
 Ramp Output: 0 to >-4 p-p into 5 k Ω .

Gate Characteristics:

Start/Stop Phase Range: $+90^\circ$ to -80° .
 Frequency Range: 0.1 Hz to 1 MHz (useful to 10 MHz).
 Gating Signal Frequency Range (external): DC to 1 MHz, TTL compatible.

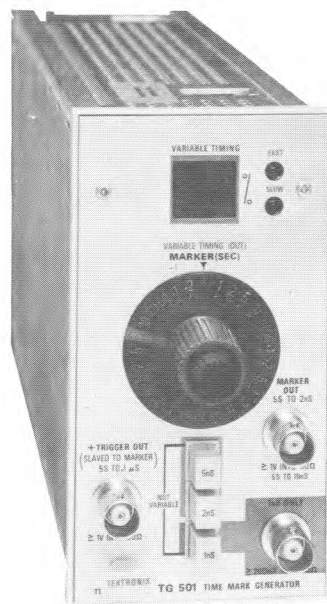
External Frequency Control:

Range: 1000:1 on any range.
 Input Requirement: With dial set at 10, 0 to -2 V $\pm 20\%$ will linearly decrease frequency $>1000:1$. An ac voltage will FM about a dial setting within the limits $(0.1 < f < 10) \times$ range setting.
 Linearity: 0.5% of f_{max} for $f_{max} \leq 1$ MHz. 5% of f_{max} for $f_{max} > 1$ MHz. Deviation is from a best fit straight line. VCO frequency span $\leq 100:1$.
 Input Impedance: 2.8 k Ω $\pm 5\%$.

General:

Operating Temperature: 0 $^\circ$ C to $+55$ $^\circ$ C.
 Power Consumption: ≤ 25 VA.

Section Reference 110S/6625-00-5205199		Nomenclature TIME MARK GENERATOR		
Manufacturer TEKTRONIX		Part No. TG501		Cost/Date £800.00 1978
Height 12.7 cm	Width 6.6 cm	Depth 31 cm	Weight 3.5 kg	
Power Supplies Obtained from Mainframe TM500 Series (Chap 2.1.11 refers)			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 18999



1. Description

The TG501 Time Mark Generator provides marker outputs from 1 nanosecond to 5 seconds. A unique feature is the 'Variable Timing' output on the front panel and is a two digit LED display which indicates percentage of timing error between the normal time interval and a variable interval set to line up the marker pulse with a graticule or division mark on the display.

2. Specification

Markers: 1 ns - 5 s in a 1-2-5 sequence

Marker Amplitude: Greater than 1 V peak on 5 s - 10 ns markers
Greater than 750 mV p-p on 5 ns and 2 ns markers
Greater than 200 mV p-p on 1 ns markers
All into 50 Ω

Trigger Output Signal: Slaved to marker output from 5 s - 100 ns

Internal Timebase:

Crystal Frequency:	1 MHz
Stability 0° - 50°C:	1 part in 10 ⁵ (after ½ hr warm-up)
Long-term Drift:	1 part or less in 10 ⁵ per month
Stability:	Adjustable to within 1 part in 10 ⁷
Timing Error Readout Range:	To ± 7.5%
Timing Error Measuring Accuracy:	Device, under test, error is indicated to within one least significant digit (to within one displayed count)

3. Comprising

Instrument only

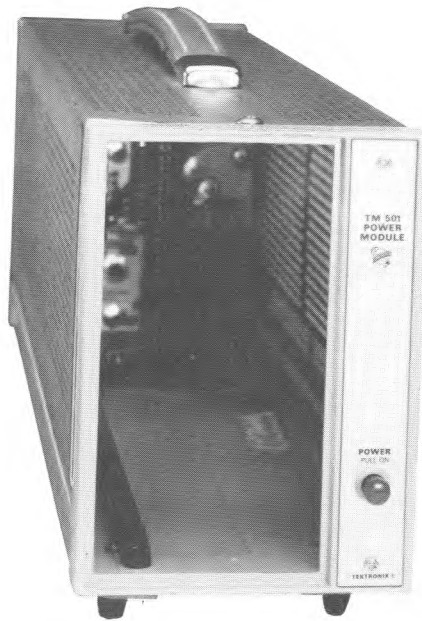
4. Accessory Items

None

5. Associated Equipment

110S/6625-00-5006646 Mainframe (Power Supply) TM501

Section Reference 110S/6625-00-5006646		Nomenclature MAINFRAME (POWER SUPPLY)		
Manufacturer TEKTRONIX		Part No. TM501		Cost/Date £112.00 1978
Height 15.2 cm	Width 9.9 cm	Depth 38.9 cm	Weight 2.4 kg	
Power Supplies 100, 110, 120, 200, 220, 240 V ac only; 48-440 Hz			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEC/AFDSEC No. 19000



1. Description

The Tektronix TM501 is a single hole mainframe with integral power supply which will accept a single module from the TM501 series.

2. Specification

The mainframe provides all the power requirements for the relevant plug - in modules.

3. Comprising

Instrument only

4. Accessory Items

None

5. Associated Equipment

110S/6625-00-5205199
NYR

Time Mark Generator
Current Probe Amplifier

TG501
AM503

Section Reference 10S/6573577		Nomenclature PULSE GENERATOR HIGH POWER		
Manufacturer HEWLETT PACKARD		Part No. 214B		Cost/Date £2452 1984
Height 133 mm	Width 426 mm	Depth 422 mm	Weight 13.6 kg	
Power Supplies 100/120/220/240 V ac rms; +5% to -10%, 48 to 66 Hz				Air Publication -
Availability 2	Environment B	Maintenance Policy 2B/4D	Calibration AH/12	AFDEETEC/AFDSEC No. 19054



1. Description

The HP214B pulse generator has high-power pulse generation up to 10 MHz repetition rate delivering 100 V pulses with 15 ns rise times. The 214B is well equipped for low duty cycle applications. Where changing duty cycle threatens destruction of the device under test, the 214B Constant Duty Cycle (CDC) mode provides device protection. In CDC operation the duty cycle, hence power, remains constant as frequency is varied. The 214B is itself protected against excessive duty cycles via an overload protection circuit. Operating into unmatched loads, clean pulse shape is guaranteed by the low reactance (50Ω) source impedance. Pulse distortions such as preshoot and overshoot are specified as 5% at all amplitudes.

2. Specification

Timing

Repetition rate: 10 Hz to 10 MHz in six ranges. In 30 V - 100 V amplitude range, maximum rep. rate is 4 MHz. Calibrated vernier provides continuous adjustment within ranges.

(continued)

Chap 4.3.6

2. Specification (continued)

Timing (continued)

Period jitter:	$< 0.1\% + 300 \text{ ps}$
Pulse delay/advance:	Pulse can be delayed/advanced with respect to the trigger output from 10 ns to 10 ms (\pm fixed delay of 45 ns) in five ranges. Calibrated vernier provides continuous adjustment within ranges.
Position jitter:	$\leq 0.1\% + 500 \text{ ps}$
Maximum pulse position duty cycle:	$\geq 50\%$
Double pulse:	5 MHz maximum in all ranges except 30 V - 100 V range which is 2 MHz max. Minimum separation is 100 ns.
Pulse width:	25 ns to 10 ms in six decade ranges. Calibrated vernier provides continuous adjustment within ranges.
Max duty cycle:	$\geq 10\%$ for 30 - 100 V range. $\geq 50\%$ all other ranges.
Constant duty cycle mode (disabled in ext trigger mode):	Duty cycle of output pulse remains constant as the period is varied. The duty cycle limits in this mode are typically 8% fixed for the 10 MHz - 1 MHz range (max 4 MHz); 2.5% to 10% for 1 MHz to 0.1 MHz range; 0.25% to 10% for 0.1 MHz to 10 kHz range; 0.1% for all other ranges. Calibrated vernier provides continuous adjustment within ranges.
Accuracy:	$\pm (15\% \text{ of setting} + 1\% \text{ of full scale}).$
Trigger output:	Amplitude is $\geq + 5 \text{ V}$ (50 Ω into open circuit). Pulse width is 10 ns typical.

External Operating Modes:

External input (Impedance 10 k Ω , dc coupled):	Repetition rate: dc to 10 MHz Sensitivity: 500 mV p-p, dc coupled Slope: pos or neg. Trigger level: +5 V to -5 V adjustable. Max input level: -100 V Trigger pulse width: $\geq 10 \text{ ns}$
EXT. TRIG mode:	An output pulse is generated for each input pulse.
GATE mode:	Gate signal turns on rep rate generator synchronously. Last pulse always completed.
Manual:	Pushbutton can be used for triggering single pulses (EXT TRIG mode), generating gate signals (GATE mode) or triggering pulse bursts (BURST mode).

(continued)

2. Specification (continued)

Output:

Amplitude:	0.3 V to 100 V in five ranges. Calibrated vernier provides adjustment within ranges.
Source impedance:	Fixed 50 Ω nominal on ranges up to 10 V. Selectable 50 Ω nominal or HI-Z on 10-30-100 V ranges (with 50 Ω /50 Ω impedance, amplitude decreases to 5-15-50 V).
Polarity:	Pos or neg selectable.
Transition times:	\leq 15 ns for leading and trailing edges.
Pulse top perturbations:	\leq -5% of amplitude.

3. Comprising

Instrument
Power cord
Operating and instruction manual

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference: 10S/5178462		Nomenclature: 50 MHz Pulse Generator		
Manufacturer: Philips Test & Measurement		Part No: PM 5715		Cost/Date: £1800 Jul 91
Height: 130 mm	Width: 210 mm	Depth: 275 mm	Weight: 4 kg	
Power Supplies: 100 to 130 Vac and 200 to 260 Vac (Switchable), 50 to 400 Hz			Air Publication: None	
Availability: 2	Environment: B	Maintenance Policy: 2AB/4CD	Calibration: CNR	AFDEETEC No: 19463



1. Description

The PM 5715 is a universal pulse generator providing pulses of variable duration, delay and transition times within a frequency range of 1 Hz to 50 MHz. Amplitudes up to 10 V can be selected and permit the generator to work directly into circuits using high level logic components. An adjustable DC offset of -2.5 to +2.5 V is available. A second output provides the same signals as the main output but at a fixed amplitude at TTL level.

1.1 Modes of Operation

Three pulse modes are available; single pulse, double pulse and square wave with normal or inverted operation. The output can be externally triggered or gated. Two PM 5715 can be interconnected, as shown in Fig. 1, to form a true dual channel pulse generator

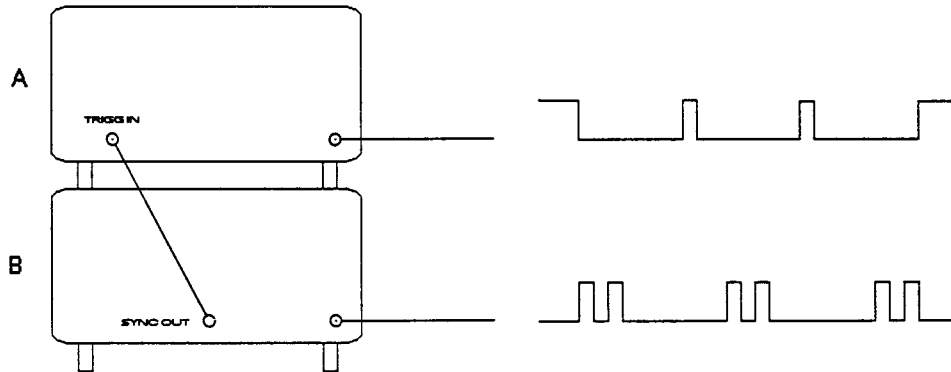


Fig. 1

2. Specification

Repetition Rate

Rate: 1 Hz to 50 MHz. Variable in 8 ranges with continuous control within the ranges.

Pulse Duration

Range: 10 ns to 100 ms. Variable in 7 ranges with continuous control within the ranges.

Jitter: $\leq 0.1\%$ or 50 ps whichever is the greater.

Duty Cycle: More than 50% in normal and inverted mode. (Approaching 100% in inverted mode).

Pulse Delay

Range: 10 ns to 100 ms. Variable in 7 ranges with continuous control within the ranges.

Jitter: $\leq 0.1\%$ or 50 ps whichever is greater.

Main Output Characteristics

Amplitude: 0.2 to 10 V into 50 Ω . Variable in 4 ranges (0.5 V, 1.5 V, 5 V and 10 V) with continuous control within the ranges.

Polarity: Positive or negative (switchable).

Transition Times: ≤ 6 ns to 0.5 s. Rise and fall times
(at 5 V and lower) independently variable within 6 ranges.
(Transition times remain constant when
pulse amplitude is varied).

Source Impedance: Current source at 10 V range
50 Ω at 5 V, 1.5 V and 0.5 V ranges

Wave Form

Aberrations: $\leq 5\%$ of set amplitude

DC-Offset: -2.5 V to +2.5 V into 50 Ω , continuously
variable. (Pulse amplitude plus DC-offset
maximum ± 10 V).

Auxiliary Output Characteristic

Amplitude: Fixed output level, TTL compatible, 4.5 V
open circuit.

Source Impedance: 50 Ω .

Timings: As main output (not square wave).

Synchronous Output

Pulse Duration: Square wave.

Amplitude: 1.5 V into 50 Ω .

Source Impedance: 50 Ω .

External Triggering

Input Level: >1 V.

Maximum Voltage: 12 V.

Repetition Rate: 0 to 50 MHz.

Input Impedance: <1.5 V approx 220 Ω .
 >1.5 V approx 800 Ω .

Manual Triggering: Single shot push-button.

External Gating

Input Voltage: >1 V. (Synchronous, last pulse completed).

Input Impedance: <1.5 V approx 220 Ω .
 >1.5 V approx 800 Ω .

Modes of Operation

Single Pulse Mode: Single pulses are continuously generated at a frequency of 1 Hz to 50 MHz in eight ranges within continuous vernier control in each range.

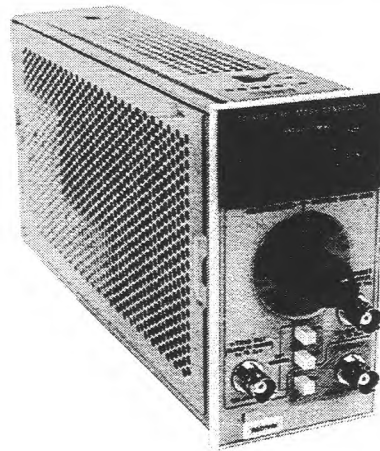
Double Pulse mode: Twin pulses are generated with the time between pulses set by the delay control. Both pulses have the same duration and transition times.

Square Wave (T/2) Mode: A square wave of 1 Hz to 50 MHz. (Adjustment of pulse delay and duration settings do not affect the output).

3. Comprising

<u>Item</u>	<u>Part Number</u>	<u>Qty</u>
Pulse Generator	9446 857 15111	1
Operators manual	9499 460 12801	1
Mains Cable	5322 321 20816	1
Carrying Case	940 900 00911	1

Section Reference: 10S/5881683		Nomenclature: TIME MARK GENERATOR		
Manufacturer: TEKTRONIX		Part No: TG 501A		Cost/Date: £3987/1993
Height:	Width:	Depth:	Weight:	
Power Supplies: N/A			Air Publication: N/A	
Availability: 2	Environment: B	Maintenance Policy: 2A/4CD	Calibration: TBN	AFDEETEC No: 19518



1. Description

The TG 501A Time Mark Generator provides marker outputs from one nano-second to five seconds. A feature of the TG 501A is a variable timing output with a front panel two digit LED display. The display indicates percentage of timing error between the normal time interval and a variable interval that lines up the marker pulse with graticule or division marks on the display. This feature provides direct readout in terms of percentage error and also helps eliminate errors associated with visually estimating error from a display.

2. Specification

Markers: 1 ns through 5 s in a 1-2-5 sequence.

Marker Amplitude: Equal or greater than 1 V peak into 50 ohm on 5 s through 10 ns markers.
Equal or greater than 750 mV peak to peak into 50 ohm on 5 ns and 2 ns markers.
Equal to or greater than 200 mV peak to peak into 50 ohm on 1 ns markers.

Trigger Output Signal: Slaved to marker output from 5 s through 100 ns. Remains at 100 ns for faster markers.

2. Specification (continued)

Internal Time Base: Crystal frequency 5 MHz; stability 0 to 50°C within five parts in 10,000,000 after ½ hour; long - term drift one part or less in 10,000,000 per month; stability adjustable to within five parts in 100,000,000.

External Reference Input: Available with internal changes. Acceptable frequencies, 1 MHz, 5 MHz or 10 MHz. Input amplitude must be TTL compatible.

Timing Error Readout Range: To 7.5%.

Timing Error Measurement Accuracy: Device under test error is indicated to within one least significant digit (to within one displayed count).

3. Comprising

Introduction Manual, Part No. 070-1576-02

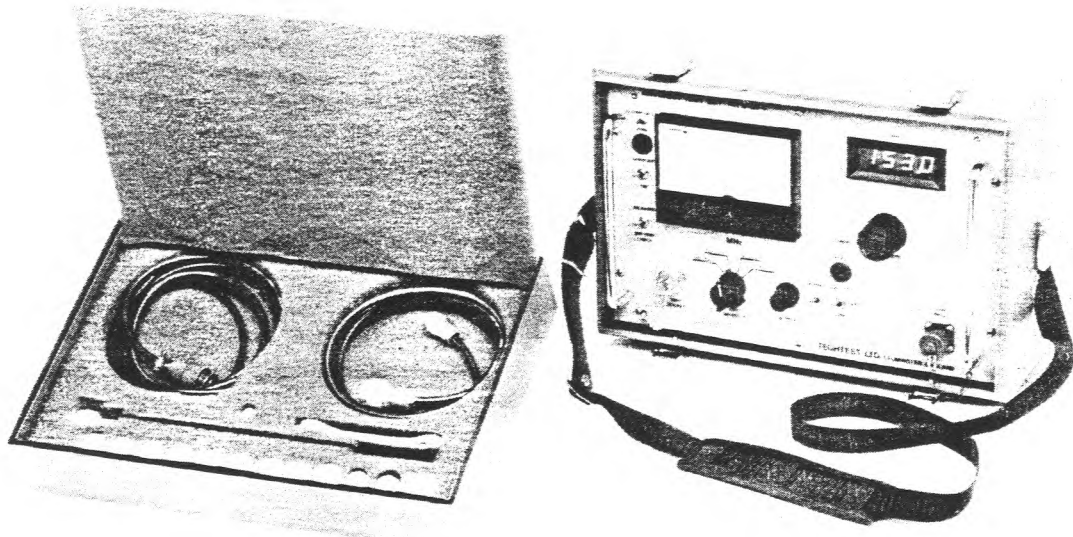
4. Accessory Items

None

5. Associated Equipment

<u>Sect/Ref No.</u>	<u>Nomenclature</u>
10S 5006646	Tektronix TM 501 Mainframe
10S 3737528	Tektronix TM 503 Mainframe

Section Reference 10S/7982646		Nomenclature ANTENNA TEST SET		
Manufacturer H R SMITH (TECHTEST) Ltd.		Part No. 12-602-4		Cost/Date £4026 1987
Height 203 mm	Width 305 mm	Depth 212 mm	Weight 8.2 Kg	
Power Supplies 28 V dc \pm 2 V or INTERNAL BATTERY			Air Publication TBD	
Availability 2	Environment B	Maintenance Policy 2AB/3C/4D	Calibration TBA	AFDEETEC/AFDSEC No. 19396



1 Description

The 12-602-4 is a versatile and portable test set designed to measure accurately the VSWR of antenna systems or other RF loads referred to 50 ohms. It will also determine any feeder loss by measuring the effective mismatch of a cable when the far end is terminated in a short circuit. The output may be used as a source of modulated RF. The test set covers the frequency ranges 60 to 400 MHz and 850 to 1250 MHz in four bands and is housed in a showerproof, ruggedized metal case.

There are two read-outs, a digital display of output frequency and a moving coil meter with three calibrated scales as follows:

- 1 VSWR calibrated logarithmically from 1:1 with 5:1 being the mid scale point.
- 2 Expanded VSWR calibrated logarithmically from 1:1 with 2:1 being the mid scale point.
- 3 Line loss in dB calibrated logarithmically for each VSWR scale.

In addition Battery level is indicated when a biased toggle switch is operated.

2 Specification

Frequency Coverage: Band 1 60-100 MHz
 Band 2 100-200 MHz
 Band 3 200-400 MHz
 Band 4 850-1250 MHz
 The frequency is continuously tuneable
 and displayed on a digital readout.

Digital Frequency Readout
 Accuracy: 60-400 MHz + 25 kHz + LSD
 850-1250 MHz + 500 kHz + LSD

Measurement Connector 'N' Type

RF Level at Measurement
 Connector -10 dBm.

Battery Life: 8 hours nominal.

Power Consumption (Batteries): 350 mA nominal.

Battery Charger
 Characteristics: 28V dc 2A.

3 Comprising

5935-99-5199828	Coupler	SA/ST 102405
5935-99-5199806	Adaptor	'BNC' Male GE 507
5935-99-5199817	Adaptor	'BNC' Female GE 508
5935-99-5199808	Adaptor	'C' Male GE 503
5935-99-5199819	Adaptor	'C' Female GE 504
5935-99-5199807	Adaptor	'N' Male GE 501
5935-99-5199818	Adaptor	'N' Female GE 502
5935-99-5208432	Adaptor	'TNC' Male GE 511
5935-99-5208433	Adaptor	'TNC' Female GE 512
5935-99-6487566	Short Circuit Plug	'BNC' Female GE 508-4850
5935-99-6487565	Short Circuit Plug	'C' Female GE 504-4850
5935-99-6487564	Short Circuit Plug	'N' Female GE 502-4850
5935-99-6487567	Short Circuit Plug	'TNC' Female GE 512-4850
5935-99-6570506	Cable Assembly	1.5 Metre KA-00-007
5935-99-6554904	Whip Antenna	JA-00-031
5935-99-5199827	Spanner (Qty 2)	JA-00-029
TBA	Mains/Charging cable	

4 Accessory Items

None

5 Associated Equipment

None

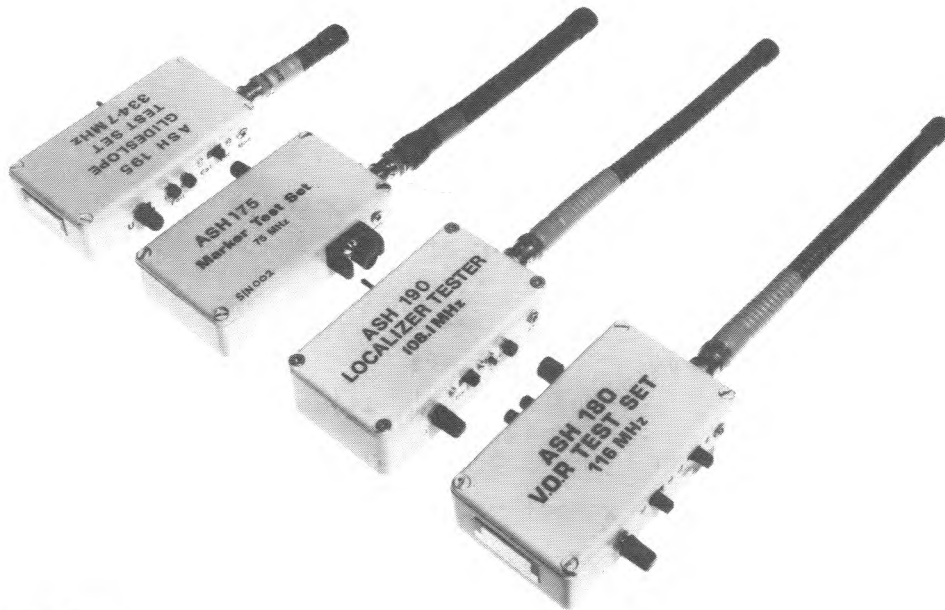
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/7976535		Nomenclature NAVIGATION TEST KIT		
Manufacturer AVIONIC SYSTEMS (HEATHROW) LTD.		Part No. ASH 7700AA		Cost/Date £975 1984
Height 152 mm	Width 460 mm	Depth 280 mm	Weight 1.8 kg	
Power Supplies INTERNAL 9 V BATTERY			Air Publication 116B-0450-0	
Availability 2	Environment C	Maintenance Policy 2B/4D	Calibration -	AFDEETEC/AFDSEC No. 19325



1. Description

The Navigation Test Kit is a set of four individual hand-held test sets used for First Line confidence testing of aircraft ILS/VOR systems. There are four testers, Localiser, Glideslope, Marker and VOR giving an over-all system test capability. All test sets are set to one preset frequency at manufacture. The Navigation Test Kit is only a confidence tester and any fault or suspect fault must be followed up by using the CRM555 Comprehensive ILS/VOR Test Set.

2. Specification

Localiser Test Set:

Operating frequency:	111.95 MHz
Output power:	-10 dBm to 0 dBm
Modulation tones:	90 Hz and 150 Hz locked
Temperature range:	-10°C to +50°C
Frequency stability:	± 0.005%

Tone distortion:	3% maximum
Tone frequency stability:	$\pm 0.5\%$
Modulation depth:	20% ± 7 each tone
DDM range:	0 to 0.150 approx.
DDM centering accuracy:	± 0.01

Glideslope Test Set:

Operating frequency:	330.95 MHz
Output power:	-10 dBm to 0 dBm
Modulation tones:	90 Hz to 150 Hz locked
Temperature range:	-10°C to +50°C
Frequency stability:	$\pm 0.005\%$
Tone distortion:	3% maximum
Tone frequency stability:	-0.5%
Modulation depth:	40% ± 5 each tone
DDM range:	0 to 0.2 approx.
DDM centering accuracy:	-0.01

Marker Tester:

Operating frequency:	75 MHz
Output power:	-1 dBm, +1 dBm, -4 dBm
Frequency stability:	$\pm 0.005\%$
Operating temperature range:	-10°C to +50°C
Tone frequency stability:	$\pm 1\%$
Modulation depth:	90% $\pm 10\%$
Modulation frequency:	3000 Hz(inner), 1300 Hz(middle), 400 Hz(outer) cw

VOR Tester:

Frequency:	108.0 MHz
Output power:	-10 dBm to 0 dBm
VOR accuracy (calibrate):	± 2
VOR setting range:	250 -360 To or From
Modulation depth:	30 Hz, 9960 Hz 30% $\pm 5\%$
VOR multiplex output:	2 V p-p into 100 k Ω
9960 Hz sub-carrier deviation:	960 Hz p-p ± 100 Hz FM
30 Hz stability:	$\pm 0.3\%$

3. Comprising

1OZZ/210449	Marker Tester	0175CA
1OZZ/210450	VOR Tester	0180CA
1OZZ/210451	Localiser Tester	0190CA
1OZZ/210452	Glideslope Tester	0195CA
1OZZ/210454	Transit Case	ASH 7010AA

4. Accessory Items

1OZZ/206201	Attenuator 20 dB	FP50-20
6135-99-9496083	Battery	PP3

5. Associated Equipment

10S/6382785	Comprehensive ILS/VOR Test Set	CRM555
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Section Reference 10S/6625-99-7774431		Nomenclature AM TEST OSCILLATOR 125/250 MHz		
Manufacturer TECHTEST LTD.		Part No. 210(AM)		Cost/Date £400 1983
Height 110 mm	Width 68 mm	Depth 45 mm	Weight 0.2 kg	
Power Supplies INTERNAL 9 V BATTERY			Air Publication -	
Availability 2	Environment B	Maintenance Policy B2/C3	Calibration CNR	AFDEETEC/AFDSEC No. 19311



1. Description

The Test Oscillator 210(AM) is used to check both the operation of the guard frequency receiver and, the homing circuits and indicator of the main receiver on aircraft. The Model 210 operates in the airborne frequency band and provides amplitude modulated signals at switched frequencies of 125 MHz and 250 MHz.

2. Specification

Frequency:	VHF 125 MHz UHF 250 MHz
Frequency Accuracy:	± 10 ppm
Spectral Purity:	Spurious products: Non-harmonically related below -60 dBc. Harmonically related below -45 dBc.

Modulation:

Type: AM
 Frequency: 800 Hz nominal
 Depth: 50% \pm 10% modulation
 Spurious FM: Less than 1 kHz

Power Output: \gt -10 dBm into 50 Ω

Antenna: Flexible and detachable helical whip
 with BNC connector

3. Comprising

10S/6625-99-7774433 Padded carrying case RA-00-010

4. Accessory Items

6135-99-9496083 Battery 9 V PP3

5. Associated Equipment

None.

Modulation:

Type: FM
 Frequency: 800 Hz nominal
 Deviation: 1200 Hz nominal \pm 20%
 Spurious AM: Less than 1 dB

Power Output: > -10 dBm into 50 Ω

Antenna: Flexible and detachable helical whip with BNC connector

3. Comprising

Instrument
 Padded Carry case

4. Accessory Items

6135-99-9496083 Battery 9 V PP3

5. Associated Equipment

None

Section Reference 10S/7990257		Nomenclature TEST OSCILLATOR 172-344 MHz		
Manufacturer TECHTEST LTD.		Part No. 230 AM		Cost/Date £400 1984
Height 110 mm	Width 68 mm	Depth 45 mm	Weight 0.2 kg	
Power Supplies Internal 9 V Battery			Air Publication -	
Availability 2	Environment B	Maintenance Policy B2/C3	Calibration CNR	AFDEETEC/AFDSEC No. 19349

1. Description

The Test Oscillator is used to check the operation of aircraft V/UHF receivers and airborne sonobuoy equipment. The model 230 operates in the airborne frequency band and provides amplitude modulated signals at switched frequencies of 172 MHz and 344 MHz.

2. Specification

Frequency:	VHF 172 MHz UHF 344 MHz
Frequency Accuracy:	± 10 ppm
Spectral Purity:	Spurious products: Non-harmonically related below -60 dBc. Harmonically related below -45 dBc.

Specification (continued)

Modulation:

Type: AM
Frequency: 800 Hz nominal
Depth: 50% \pm 10% modulation.
Spurious FM: Less than 1 kHz.

Power Output: > -10 dBm into 50 Ω .

Antenna: Flexible detachable helical whip with BNC connector.

3. Comprising

▶ Instrument
Padded Carry Case ◀

4. Accessory Items

6135-99-9496083 Battery 9 V, PP3.

5. Associated Equipment

None

GPIB
COMPATIBLE

Section Reference 10S 7702661		Nomenclature RADIO COMMUNICATIONS TEST SET		
Manufacturer MARCONI INSTRUMENTS		Part No. 52955 - 324L		Cost/Date £9599/AUG 89
Height BOX 1: 34 cm BOX 2: 25 cm	Width 66 cm 40 cm	Depth 46 cm 33 cm	Weight BOX 1: 30 kg (15.5 kg INST ONLY) BOX 2: 12 kg	
Power Supplies 105-120 V ac, 210-240 V ac; 45-440 Hz. 11-32 V dc and Battery Pack			Air Publication TBA	
Availability 1	Environment C	Maintenance Policy 1A/2B/4CD	Calibration TBA	AFDEETEC/AFDSEC No. 19416



1 Description

The 52955-324L Radio Communications Test Set combines all the instruments required for transceiver testing within a single unit. It is designed for bench and field service applications. The instrument may be operated from all standard ac supplies, aircraft or vehicle supplies or battery pack. Comprehensive facilities are provided for testing all types of AM, FM and Phase Modulated radio equipment including, Selcal, low-power hand portables and digital pagers.

The 52955-324L comprises 14 instrument functions for transceiver testing: RF power meter, RF frequency meter, modulation meter, RF signal generator, dual AF signal generators, AF frequency meter, AF voltmeter, 1 kHz AF distortion meter, S/N and SINAD meter, sequential tones encoder/decoder, DTMF encoder/decoder, digitally coded squelch (DCS) encoder/decoder, POCSAG digital pager encoder and digital oscilloscope. Using the relevant directional power head the instrument gives a direct reading of forward power, reverse power and VSWR.

The 52955-324L is provided with 26 non-volatile stores, each capable of retaining a complete front panel set-up, with instant recall when required. One additional storage location provides power fail back-up so that the last front panel setting is restored after a supply failure.

The 52955-324L's GPIB option provides full instrument control and adds further versatility for automatic testing, and computer assisted manual testing. A write-to-screen capability enables the CRT to be used as a VDU for operator instructions and simple straight line graphics.

2 Specification

RF SIGNAL GENERATOR

Frequency

Range:	0.4 MHz to 1000 MHz
Resolution:	50 Hz up to 530 MHz 100 Hz up to 1000 MHz
Indication:	8 digit display
Setting:	Via keyboard entry. Step change variation by IND/DEC keys and rotary control
Accuracy:	As internal standard

OUTPUT LEVEL

Range:	Rx Mode: -135 dBm to -15 dBm (0.04 μ V to 40mV) N-type socket selected -115 dBm to 5 dBm (0.4 μ V to 400 mV) BNC socket selected One Port Duplex Mode: -140 dBm to -21.5 dBm (0.0224 μ V to 18.85 mV) Two Port Duplex Mode: -115 dBm to -15 dBm (0.04 μ V to 40 mV)
Resolution:	0.1 dB
Indication:	4 digits with units dBm/ μ V and pd/emf and dB μ V selection
Setting:	Via keyboard entry. Step change variation by IND/DEC keys and rotary control.
Accuracy:	\pm 2 dB for levels above - 127 dBm

SPECTRAL PURITY

Residual FM:	Less than 30 Hz up to 520 MHz typ. 15 Hz Less than 60 Hz up to 1000 MHz typ. 30 Hz Measured in 300 Hz to 3.4 kHz bandwidth
Residual AM:	<0.5%, 0.3 - 3.4 kHz B.W.
Harmonics:	Less than -20 dBc up to 1.5 MHz -25 dBc up to 250 MHz -20 dBc up to 1000 MHz
Sub-harmonics:	None up to 530 MHz Less than -25 dBc to 1000 MHz
Spurious signals:	For carrier frequencies up to 88 MHz Less than -45 dBc up to 110 MHz Less than -35 dBc above 110 MHz For carrier frequencies up to 1000 MHz Less than -60 dBc
Signal/noise at 20 kHz:	Less than -106 dBc/Hz up 500 MHz Less than -100 dBc/Hz to 1000 MHz
RF leakage:	Less than 0.2 μ V pd generated in a 50 Ω load by a 2-turn 25 mm loop as near as 25 mm to the case of the instrument with the output set to less than -20 dBm and the output terminated in a 50 Ω sealed load
Protection:	50 W reverse power trip, automatically resets on removal of power input (BNC socket) Visual alarm warning (REMOVE RF INPUT) and audible alarm provided for added protection

OUTPUT IMPEDANCE 50 Ω nominal

VSWR Less than 1.2 to 500 MHz, less than
1.35 to 1000 MHz (N-type)
Less than 2.2 to 1000 MHz (BNC)

MODULATION

INTERNAL AMPLITUDE MODULATION

CW range:	1.5 to 400 MHz usable from 400 kHz to 500 MHz
Mod. depth range:	0 to 99%
Mod. frequency range:	20 Hz to 20 kHz
Resolution:	1%
Indication:	2 digits
Setting:	Via keyboard entry. Step change variation by INC/DEC keys and rotary control

2 Specification (cont.)

Accuracy: $\pm 7\%$ of reading ± 1 digit at 1 kHz
 $\pm 10\%$ of reading ± 1 digit 50 Hz to
5 kHz up to 70% AM $\pm 15\%$ of reading
 ± 1 digit
50 Hz to 15 kHz up to 85% AM

EXTERNAL As internal plus

Input impedance: 1 M Ω in parallel with approximately
40 pF

Sensitivity: 1.0 V pp for 30% AM at 1 kHz $\pm 15\%$
reading $\pm 1\%$ AM

AM distortion: Less than 2% distortion at 1 kHz with
30% AM (300 Hz to 3.4 kHz bandwidth)

FREQUENCY MODULATION INTERNAL

CW range: 0.4 to 1000 MHz

Modulation range: 0 to 25 kHz

Mod. frequency range: 20 Hz to 20 kHz

Resolution: 25 Hz (<6.25 kHz dev.)
100 Hz (<25 kHz dev.)

Indication: 4 digits

Setting: Via keyboard entry. Step change
variation by INC/DEC keys and rotary
control

Accuracy: $\pm 7\% \pm 10$ Hz (at 1 kHz)
 $\pm 10\%$ (50 Hz to 15 kHz)

EXTERNAL As internal plus:

Input Impedance: 1 M Ω in parallel with approximately
40 pF

Modulation range: 0 to 30 kHz

Mod. frequency range: 1 Hz to 50 kHz

Sensitivity: 1 V pp for 5 kHz deviation:
 $\pm 10\%$ at 1 kHz

FM distortion: Less than 1% distortion at 1 kHz with
5 kHz deviation (300 Hz to 3.4 kHz
bandwidth)

PHASE MODULATION INTERNAL

CW range: 0.4 to 1000 MHz

Modulation range: 0 to 10 rads

Mod. frequency range: 300 Hz to 3.4 kHz

Resolution: 0.02/0.03 rads, up to 6.3 rads

Indication: 3 digits

2 Specification (cont.)

Setting:	Via keyboard entry. Step change variation by IND/DEC keys and rotary control
Accuracy:	$\pm 8\%$ at 1 kHz, $\pm 11\%$ from 300 Hz to 3.4 kHz
Φ M distortion:	Less than 2% at 1 kHz with 5 rads (measured in a 300 Hz to 3.4 kHz bandwidth)
EXTERNAL	As internal plus:
Input impedance:	1 M Ω in parallel with approximately 40 pF
Sensitivity:	1 V pp for 5 rads. $\pm 12\%$ at 12 kHz
<u>DUAL AUDIO GENERATOR</u>	
OUTPUT IMPEDANCE	Less than 5 Ω nominal
WAVEFORM SHAPE	Sine, square, triangle, sawtooth
FREQUENCY	
Range:	50 Hz to 15 kHz (Usable 20 Hz to 20 kHz)
Resolution:	0.1 Hz (10 Hz to 9.999 kHz) 1 Hz (10 kHz to 20 kHz)
Indication:	5 digits
Setting:	Via keyboard and with rotary control for step change variation
Accuracy:	± 0.01 Hz from 10 Hz to 100 kHz ± 0.1 Hz from 100 Hz to 20 kHz
Distortion:	Less than 1% from 50 Hz to 15 kHz (sine) Less than 0.5% at 1 kHz
Residual noise:	Less than 0.1 mV r.m.s. in a psophometric bandwidth
dc offset:	Less than 10 mV dc
OUTPUT LEVEL (emf)	
Range:	0.1 mV to 4.095 V rms (sine and square) 0.1 mV to 4.095 V peak (triangle and sawtooth)
Accuracy:	$\pm 5\% \pm 1$ digit. 50 Hz to 15 kHz
Setting:	0.1 mV steps (0.1 mV to 409.5 mV) 1 mV steps (409.5 mV to 4.095 V)

2 Specification (cont.)RF FREQUENCY METER

FREQUENCY

Range: 1.5 MHz to 1000 MHz

Resolution: 1 Hz or 10 Hz to 200 MHz
10 Hz from 200 MHz to 1000 MHz

Typ. acquisition: Up to 200 MHz, 100 ms with 10 Hz resolution; 1 s with 1 Hz resolution
Up to 1000 MHz, 400 ms, 10 Hz resolution only

INPUT

Sensitivity: Input to type-N socket;
5 mW (0.5 V), TX mode selected
20 mW (1 V) one/two port duplex
0.05 mW (50 mV) BNC input

Accuracy: As internal standard ± 1 digit

RF POWER METER

INPUT

Range: 0.05 mW to 150 W
Input to type-N socket;
50 mW to 75 W continuous. TX mode selected
100 mW to 75 W continuous in single port duplex mode
(150 W max. for typically 2 minutes at 25° C continuous). End of safe working is indicated by screen warning "REMOVE RF INPUT" and audible alarm
Input to BNC socket
Usable 0.05 mW to 1.0 W

Frequency range: As RF Frequency Meter

Resolution: 1% full-scale

Indication: 2/3 digits and analog display

Setting: Automatic ranging on scales 0 to 30, 0 to 10
0 to 300 mW. 0 to 1, 0 to 3, 0 to 10, 0 to 30
0 to 100 W and 0 to 300 W

Accuracy: $\pm 10\% \pm 1$ digit up to 500 MHz
 $\pm 15\% \pm 1$ digit up to 960 MHz
 $\pm 20\% \pm 1$ digit up to 1000 MHz
 $\pm 20\%$ typ. BNC socket

VSWR: Less than 1.2 to 500 MHz, less than 1.35 to 1000 MHz (N-type)
Less than 2.2 to 1000 MHz (BNC)

2 Specification (cont.)MODULATION METER

Manual-tune: Provides frequency offset indication from carrier. 3 Digits and decimal point indicate most significant positive or negative error

Auto-tune: Provides: Measurement and simultaneous display of RF frequency, power, modulation frequency and level, and 1 kHz demod. distortion

Acquisition: Less than 3 seconds at 10 Hz resolution

INPUT

Frequency range: As RF Frequency Meter

Sensitivity: As RF Frequency Meter

AF filters: The following filters are available:
Bandpass - 300 Hz to 3.4 kHz
Low pass - 300 Hz
Low pass - 15 kHz

AMPLITUDE MODULATION

CW range: 1.5 MHz to 400 MHz

Modulation range: 0 to 90% up to 100 MHz
0 to 80% up to 400 MHz
in auto-tune mode
0 to 100% up to 400 MHz in manual-tune mode
Automatic ranging (bar chart) 0 to 10,
0 to 30, 0 to 100% depth

Mod. frequency range: 50 Hz to 10 kHz (usable 10 Hz to 15 kHz)

Resolution: 1% AM

Indication: 2 digits and +/- peak analog display

Accuracy: $\pm 5\% \pm 1$ digit at 1 kHz $\pm 8.5\% \pm 1$ digit from 50 Hz to 10 kHz

Demod. distortion: Less than 5% below 21 MHz and less than 2% above. Measured with 300 Hz to 3.4 kHz filter and 30% AM at 1 kHz modulation frequency

Residual AM: <1% at frequency meter sensitivities +6 dB

FREQUENCY MODULATION

Modulation range: 0 to 25 kHz
Automatic ranging (bar chart) 0 to 1,
0 to 3, 0 to 10, 0 to 30 kHz

2 Specification (cont.)

Mod. frequency range: 50 Hz to 10 kHz (typically 10 Hz to 15 kHz)

Resolution: 10 Hz up to 2.5 kHz deviation
1% up to 25 kHz deviation

Indication: 3 digits and +/- peak analog display

Accuracy: $\pm 5\% \pm 1$ digit at 1 kHz $\pm 7.5\%$ over range 50 Hz to 10 kHz

Demod. distortion: Less than 1.5% at 5 kHz deviation and 1 kHz modulation frequency in a 300 Hz to 3.4 kHz bandwidth

Residual FM: Less than 30 Hz rms up to 500 MHz, typ. 15 Hz
Less than 60 Hz rms up to 1000 MHz, typ. 30 Hz
For inputs above 20 mW/0.2 mW (N/BNC) measured in a 300 Hz to 3.4 kHz bandwidth

PHASE MODULATION

Modulation range: 0 to 10 radians
Automatic ranging (bar chart) 0 to 1, 0 to 3, and 0 to 10 radians

Mod. frequency range: 300 Hz to 3.4 kHz. Phase de-modulation is obtained using 750 μ s de-emphasis

Resolution: 1% or 0.01 radians

Indication: 3 digits and +/- peak analog display

Accuracy: $\pm 5\% \pm 1$ digit at 1 kHz
 $\pm 7.5\% \pm 1$ digit from 0.3 to 3.4 kHz w.r.t. 750 μ s de-emphasis

Demod. distortion: Less than 2% at 5 rads modulated by 1 kHz measured in 300 Hz to 3.4 kHz bandwidth

SINAD METER/S/N METER

Frequency: 1 KHz

Range: 0 to 18 dB, 0 to 50 dB (SINAD)
0 to 30, 0 to 100 dB (S/N)

Resolution: 0.1 dB

Indication: 3 digits plus analog display

Accuracy: ± 1 dB

Sensitivity: 50 mV (100 mV for 40 dB SINAD/S/N)

DISTORTION METER

Frequency: 1 kHz

Range: 0 to 10%, 0 to 30% distortion

2 Specification (cont.)

Resolution: 0.1% distortion
 Indication: 3 digits plus analog display
 Accuracy: $\pm 5\%$ of reading $\pm 0.5\%$ distortion
 Sensitivity: 50 mV/100 mV (100 mV for 1% distortion)

AF LEVEL METER

Features: ac + dc, or ac measurements
 Input impedance: 1 M Ω in parallel with approximately 40 pF
 Frequency range: 50 Hz to 20 kHz (or dc)
 usable 20 Hz to 50 kHz
 Level range: 0 to 100 mV, 0 to 300 mV 0 to 1,
 0 to 3
 0 to 10, 0 to 30, and 0 to 100 V
 Resolution: 1 mV on 1% dependent on range
 Indication: 3 digits plus analog display
 Accuracy: $\pm 3\%$ ± 3 mV ± 1 digit
 Frequency response: Switchable: bandpass 0.3 to 3.4 kHz low
 pass 300 Hz or 50 kHz

AF FREQUENCY METER

Range: 20 Hz to 20 kHz
 Resolution: 0.1 Hz/1 Hz
 Indication: 3, 4 or 5 digits
 Accuracy: As internal standard ± 1 digit ± 0.1 Hz
 or 0.02% (whichever is greater)
 Sensitivity: 50 mV

INTERNAL FREQUENCY STANDARD

OCXO Oven controlled crystal oscillator,
 nominal frequency 10 MHz
 Temperature coefficient: Less than ± 5 parts in 10^8 from
 0 to 50° C
 Less than 4 parts in 10^9 /deg C from
 50 to 70° C
 Ageing rate: Less than ± 1 part in 10^7 /month,
 ± 5 parts in 10^7 /year after 1 month's
 continuous use
 Short-term stability: Less than ± 1 part in 10^9 rms
 frequency error
 Over a 1 s period

2 Specification (cont.)

Retrace error: less than ± 2 parts in 10^7 over 24 hours at constant temperature and after 25 minutes warm-up

EXTERNAL FREQUENCY STANDARD INPUT

Frequency: 1 MHz
 Level: 100 mV to 3 V rms
 Impedance: 10 k Ω in parallel with 100 pF approximately

DIGITAL STORAGE OSCILLOSCOPE

Features: Single or repetitive sweep, available in TX, RX and Audio Test modes, calibrated for AM, FM and Φ M
 Frequency range: dc to 50 kHz (from 3 Hz on ac)
 Voltage range: 10 mV/div to 20 V/div in a 1-2-5 sequence
 Accuracy: $\pm 5\%$
 FM ranges: $\pm 30, 15, 6, 3, 1.5$ kHz deviation at $>10\%$ accuracy
 Φ M ranges: $\pm 15, 7.5, 3, 1.5$ rad at $\pm 10\%$ accuracy
 AM ranges: 20, 10, 5%/div. at $\pm 10\%$ accuracy
 Sweep rates: 100 μ s/div to 5s/div in 1-2-5 sequence, accuracy locked to internal standard
 Trigger: Repetitive or single-shot storage

SELCALL ENCODER/DECODER

Tone encoder facilities: Send continuous, burst, single step, extend any tone, null, repeat or frequency shift up to $\pm 9\%$ in 1% steps
 Tone decoder facilities: Displays tone number, frequency and percentage error. Screen indicates null tones (using CRT) and annotates out of limit frequencies with for ease of identification
 User define: Allows definition of up to 15 tones. Frequency range is 20 Hz to 20 kHz, duration 10 ms to 1.2 s (encode) and 300 Hz to 3.4 kHz duration 10 ms to 999 ms (decode)
 Frequencies are stored in non-volatile memory
 Tones in audio mode: Tones encode and decode facility available using AFGEN output and AF input BNC sockets

2 Specification (cont.)

Revertive tones: Available in Receive Test Mode, tones are sent to the radio and the 2955A awaits a response.

ADDITIONAL FEATURES

IF OUTPUT SOCKET

Frequency: 110 kHz nominal
 Level: Minimum 180 mV
 Impedance: 50 Ω minimum load 5 k Ω
 Bandwidth: 50 kHz to 350 kHz

DEMODULATION OUTPUT SOCKET

Level: 400 mV pp for ± 1 kHz deviation $\pm 10\%$
 Impedance: 10 k Ω nominal
 Bandwidth: Either 300 - 3.4 kHz, 15 kHz LP or 300 Hz LP set via front panel filter switch

EXTERNAL MODULATION

In RX MOD, the 2955A can be configured to measure the modulation at the EXT MOD INPUT. Adjustment will provide the desired modulation level.

ACCESSORY SOCKET

Pins 3, 4, 5, 6 accessory control
 Pin 2, + 12 V, 100 mA max
 Pin 7, AF output, 1 W into 8 Ω
 Pin 1, pulse output available under GPIB control, approximately 600 ns

DTMF ENCODE/DECODER

Provides DTMF encoder and decoder under Tones menu

PAGER TESTER

Encoding of POCSAG code CCIR No. 1 Rec. 584 Bit rate 400 - 1500 bits/s, deviation 0 to 25 kHz. Allows entry of Radio Identity Code (RIC), 4 addresses, 2 preset numeric messages, 4 alphanumeric messages and insertion of bit errors.

DCS ENCODER

Digitally Coded Squelch encoder, allows entry of Bit rate 100 - 200 bits/s, deviation 0 - 25 kHz. Polarity, normal or inverted, RIC 3 digit code

DCS DECODER

Displays bit rate, deviation, polarity and all possible codes

SPECIAL KEY FUNCTIONS

RX=TX FREQ: Presets the RF signal generator frequency for receiver test mode to that shown in TX mode

2 Specification (cont.)

Hold Display:	Freezes instrument settings and readings, facilitating high RF power measurements and hard copy printout of TX, RX, Duplex or AF test screens
INC/DEC:	Available in TX, RX, Duplex and AF test modes for defining frequency or level increments of the AF and RF signal generators. Any step size setting within the range and resolution of the test set is permissible
Store/Recall:	26 non-volatile stores (01 to 26) are provided, each capable of retaining all front panel settings for up to 10 years. An additional store (00) is provided to retain the last test set-up, in the event of a power fail
Help:	Provides access to SELF TEST, stores lock, RF meter resolution, SINAD or S/N default values, external attenuator offset, variable default deviation, 2955/2955A emulation, default AF filter, RX/TX mod. type lock, USA/Europe tone standard selection, and user help for TX, RX, Duplex and AF test modes
Hold range:	The displayed bar chart can be held, ie no autoranging, by use of the scope pushbuttons
Audible output:	For listening to demod output and received audio
Two tone modulation:	In transmit mode, two tones are available under tones menu. In receiver mode, external modulation inputs add to internal modulation

GENERAL

POWER REQUIREMENTS

Rated supply voltage:	105-120 V ac, 210-240 V ac all \pm 10%
Supply frequency range:	45 Hz-440 Hz
Maximum consumption:	100 VA
DC supply voltage:	11-32 V dc
DC supply consumption:	Less than 60 W

GPIB INTERFACE

Capabilities:

A GPIB interface is fitted as optional. All functions except the supply switch are remotely programmable

Complies with the following subsets as defined in IEEE 488-1978 and IEC Publication 625-1: SH1, AH1, T5, L4, SR1, RL1, PPO, DT1, E1

2 Specification (cont.)

RADIO FREQUENCY INTERFERENCE	Conforms with the requirement of EEC Directive 76/889 as to limits of rf interference			
SAFETY	Complies with IEC 348			
RATED RANGE OF USE	0° C to 50° C			
LIMIT RANGE OF OPERATION	0° C to 55° C			
CONDITIONS OF STORAGE AND AND TRANSPORT				
Temperature:	-40° C to +70° C			
Humidity:	Up to 90% humidity			
Altitude:	Up to 2500 m (pressurized freight at 27 kPa differential, i.e. 3.9 lbf/in ²)			
DIMENSIONS AND WEIGHT	Height	Width	Depth	Weight
	197 mm	389 mm	584 mm	15.5 kg
	7.75 in	15.3 in	23.0 in	34 lb
	Includes dimension of handle, feet and front cover			

3 Comprising

BOX 1: MAIN INSTRUMENT

<u>Item</u>	<u>Part No.</u>	<u>Sect/Ref</u>	<u>Qty</u>
Transit Case	46662-353Y	TBA	1
Test Set Radio	52955-910L	TBA	1
dc Supply Lead	43130-119U	TBA	1
Battery Pack	54462-023W	TBA	1
dc Charging Lead	43130-518M	TBA	1
Mains Lead	54341-012F	TBA	1
Fuse Pack	54377-001M	TBA	1
Operating Manual	52955-325J	TBA	1

BOX 2 ACCESSORIES 54717-013E

<u>Item</u>	<u>Part No.</u>	<u>Sect/Ref</u>	<u>Qty</u>
Accessory Case	54112-154L	TBA	1
Microphone PTT Interface	54432-013E	TBA	1
Directional Power Head (HF) 1-50 MHz	54421-002L	TBA	1
Directional Power Head (V/UHF 25-1000 MHz	54421-003J	TBA	1
Power Head Cable (3M)	43130-591B	TBA	2
N/BNC Adapter	54311-092P	TBA	1
Telescopic Antenna	54421-001N	TBA	1
IEEE 488 Cable	43129-189U	TBA	1
BNC/BNC 26 cm Cable	43130-499J	TBA	2
N/N 1 m Cable	54311-095C	TBA	2
BNC/BNC Cable	43126-012S	TBA	4
Printer	54211-001D	TBA	1
Printer Ribbon/Paper	46883-877P	TBA	1
20 dB 1 w Attenuator	54431-011D	TBA	1

3 Comprising (cont.)

<u>Item</u>	<u>Part No.</u>	<u>Sect/Ref</u>	<u>Qty</u>
20 dB 20 w Attenuator	54431-028Y	TBA	1
20 dB AF Attenuator	54431-023A	TBA	2
Accessories Operating Manual	54717-013E		1
RAF Interface	54490-050D	TBA	1
Complete With:			
BNC/BNC 13 cm Cable	43130-498L	TBA	3
BNC/BNC 26 cm Cable	43130-499J	TBA	4
BNC/BNC 7 cm Cable	43137-590R	TBA	2
Cable Assy. (Tels 1/Mic)	43137-586C	TBA	1
Cable Assy. (Tels 2)	43137-587R	TBA	1
Power Lead	43137-588B	TBA	1
Power Lead	43137-589K	TBA	1

4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference: 10S/1969817		Nomenclature: LIGHTWEIGHT COMPREHENSIVE COMMUNICATIONS TEST SET (LCCTS)		
Manufacturer: RHODE & SCHWARZ		Part No: CMS 33		Cost/Date: £6185 00/95
Height: 175 mm	Width: 320 mm	Depth: 375 mm	Weight: 18.5 kg, 23 kg WITH BATTERY	
Power Supplies: 100/120/220/240 V AC \pm 10% 47 to 420 Hz or 11 to 32 V DC (50 W)			Air Publication: User's Handbook	
Availability: 1	Environment: C	Maintenance Policy: 1A/4BCD	Calibration: 36 Months	AFDEETEC No: 19539



1. Description

The CMS 33 Lightweight Comprehensive Communications Test Set (LCCTS) tests AM, FM and SSB transceivers in the HF, VHF and UHF bands, including the necessary selective call methods (SELCAL) and also permits analysis of the intercom network. The unit provides signals to enable testing of ILS/VOR, Market Beacon, Homing and ADF. It may be powered from mains AC, an external DC supply (through a locally manufactured dc power lead using accessory item CMS Z7 connector) or when used with the CMS Z42 battery pack, is ideal for field and first line use, yet maintains the accuracy of similar workshop based instruments. The minimum operating time of the battery is one hour.

The CMS 33 has a large LCD display and makes extensive use of 'soft keys', this, in addition to its "off air" capabilities, remote operation and auto-run facilities improve the instrument's useability. The comprehensive measuring facilities incorporate a spectrum monitor and transient recorder, as well as VSWR, enabling all kinds of applications (distance to fault, filter tests etc.), to be undertaken. A PCMCIA smart card facility allows for the development of PC based analysis of test results as well as the use of approved automated test procedure. Locally manufactured MIC/TEL cables are required.

2. SpecificationRECEIVER MEASUREMENTS

SIGNAL GENERATOR

Frequency:	
Range:	400 kHz to 1000 MHz (Useable from 300 kHz).
Resolution:	10 Hz
Accuracy:	$\pm 1 \times 10^{-6}$
Harmonics:	≤ -25 dbc
Nonharmonics (at >5 kHz from f_c and -3 dBm):	≤ -50 dbc
Residual Effects:	
AM (CCITT, RMS)	$\leq 0.03\%$
FM (CCITT, RMS)	
0.4 - 250 MHz	≤ 10 Hz
250 - 500 MHz	≤ 5 Hz
500 - 1000 MHz	≤ 10 Hz
Phase Noise (at 20 kHz from f_c)	≤ -110 dbc/Hz
Timebase:	
Stability	
0 to 50°C	$\leq 1 \times 10^{-6}$
Ageing:	
	$\leq 5 \times 10^{-8}$ /day
	$\leq 5 \times 10^{-7}$ /month
	$\leq 1 \times 10^{-6}$ /year
Warm-up (from switch-on):	
0°C Ambient:	5 minutes
$+ 30^\circ\text{C}$ Ambient:	1 minute
Modulation:	
Modes:	Internal single-tone/two-tone), external, internal + external.
AM:	
Modulation	
Depth:	0 to 90%
Resolution:	0.5%
Frequency	
Range:	DC to 20 kHz.

(Continued)

2. Specification (continued)

Distortion
 (see Note 1)
 (at $f_{AF} = 1$ kHz
 and $<80\%$): $\pm 2\%$ Error (see Note 1)
 (at $f_{AF} = 300$ Hz
 to 3 kHz and
 $<80\%$): $\pm 5\%$ + resolution + residual AM.

FM

Deviation at f_{AF} :

250 to 500 MHz: 0 to 50 kHz
 Others: 0 to 100 kHz

Resolution:

$\Delta f < 100$ Hz: 1 Hz
 $\Delta f \geq 100$ Hz: 1%

Frequency Range: 20 Hz to 20 kHz

Ext Modulation: 20 Hz to 100 kHz

Distortion (at
 $(f_{AF} = 1$ kHz and
 $\Delta f \geq 10$ kHz): $\leq 1\%$

Error: $\pm 5\%$ + resolution + residual FM $\emptyset M$ Deviation (internal)
at f_{RF} :

250 to 500 MHz 0 to 5 rad
 Others: 0 to 10 rad

Resolution:

$\Delta \emptyset < 0.1$ rad: 1 mrad
 $\Delta \emptyset \geq 0.1$ rad: 1%

Frequency Range: 100 Hz to 6 kHz

Distortion (at f_{AF}
 $= 1$ kHz and $\Delta f \geq$
 rad): $\leq 1\%$

Error: $\pm 5\%$ + resolution + residual $\emptyset M$

External:

Default AM
 AM Input 1 mV at 1 kHz produces 35% modulation.

2 Specification (continued)

Output Level

FM, ϕ M, CW:	-128 to 0 dBm
AM:	-128 to -3 dBm (dependent upon modulation depth).
Resolution:	0.1 dB
Fine Variation:	
FM, ϕ M, CW:	0 to -19.9 dB, non-interrupting.
AM:	0 to -4.9 dB, non-interrupting.
Error: (see Note 1):	≤ 2 dB

DISTORTION METER, SINAD METER AND AF FREQUENCY COUNTER - see transmitter and receiver measurements.

AF VOLTMETER

Frequency Range:

Front Panel:	20 Hz to 20 kHz
TEL 1/2:	50 Hz to 20 kHz

Level:

Measurement Range:

Front Panel:	0.1 mV to 30 V
TEL 1/2:	0.1 mV to 20 V

Resolution:

V < 100 mV:	100 μ W
V \geq 10 mV:	1%

Error (see Note 2)
(at 1 kHz): $\leq 3\%$ + resolution.

Input Impedance:

Front Panel:	1M Ω
TEL1/2:	150 Ω and 300 Ω

(Continued)

2. Specification (continued)TRANSMITTER MEASUREMENTS

RF POWER METER

Frequency Range: 1.5 to 1000 MHz

Power:

Measurement Range: 5 mW to 125 mW (see Note 3).

Resolution:

P < 100 mW: 1 mW

P ≥ 100 mW: 1%

Error
(at P > 20 mW
and 0% mod): ± 10% + resolution.

Selective Level Measurement:

Frequency Range: 1 to 1000 MHz

Level Range:

Without weighting
filter: -60 to +50 dBm

With 2 kHz
resonance
filter: -80 to +50 dBm

VSWR METER

Operating Modes: Direct display of forward and reflected power
and VSWR.

Frequency Range: 70 to 1000 MHz

VSWR:

Measurement Range: 1.1:1 to 10:1

Error: < 6.5% of reading.

RF FREQUENCY COUNTER

Frequency:

Range: 400 kHz to 1000 MHz

Resolution: 10 Hz, 1 Hz

Error: As timebase + resolution.

2. Specification (continued)

Input 1 Level Range: 5 mW to 125 W (see Note 3).

Input 2 Sensitivity: 0.1 μ W

FREQUENCY DEVIATION METER

Operating Modes: +PK, -PK, \pm PK/2. PK HOLD, RMS, RMS $\ast \sqrt{2}$

Frequency:

RF Range: 1.5 to 1000 MHz

AF Range: 20 Hz to 20 kHz (DC decoupled at demodulator output).

Deviation:

Measurement Range: DC to 100 kHz

Resolution:

$\Delta f < 1$ kHz: 1Hz

$\Delta f \geq 1$ kHz: 1%

Residual FM (CCITT, RMS)

0.4 - 250 MHz ≤ 10 Hz

250 - 500 MHz ≤ 5 Hz

500 - 1000 MHz ≤ 10 Hz

Error

(see Note 2): $\pm 5\%$ + resolution + residual FM.

Input Level Range: 5 mW to 125 W (see Note 3).

PHASE DEVIATION METER

Operating Modes: +PK, -PK, \pm PK/2, RMS, RMS $\ast \sqrt{2}$

Frequency:

RF Range: 1.5 to 1000 MHz

AF Range: 300 Hz to 6 kHz

Deviation:

Measurement Range: 0.001 to 5 rad

Resolution:

$\Delta \phi \leq 0.1$ rad: 0.001 rad

$\Delta \phi > 0.1$ rad: 1%

(Continued)

2. Specification (continued)

Error
(see Note 2): $\pm 5\%$ + resolution + residual FM + 2%
frequency response.

Input Level Range: 5 mW to 125 W (see Note 3).

AM DEPTH METER

Operating Modes: +PK, -PK, \pm PK/2, RMS, RMS $\ast\sqrt{2}$

Frequency:

RF Range: 1.5 MHz to 1000 MHz

AF Range: 20 Hz to 20 kHz

Depth:

Measurement Range: 0.01 to 90%

Resolution:

<10%: 0.01%

\geq 10%: 0.1%

Residual AM (CCITT,
RMS): $\leq 0.03\%$

Error (see Note 2)
(at $f_{AF} = 300$ Hz to
3 kHz and <80%
mod): $\leq 7\%$ + resolution + residual AM

Input Level Range: 20 mW to 125 W (see Note 3).

DISTORTION METER, SINAD METER AND AF FREQUENCY COUNTER - see transmitter and receiver measurements.

RF SPECTRUM MONITOR

Frequency:

Range: 1 to 1000 MHz

Span: Zero to 50 MHz

Filters (3 dB
bandwidth): 150 Hz, 6, 16, 50 and 300 kHz (dependent upon
span).

Display Dynamic Range
(at reference level
>-7 dBm): >60 dB

(Continued)

2. Specification (continued)

Resolution: 0.4 dB
 Error: <3 dB + resolution.

Input 1 Level Range: -47 to +50 dBm

TRANSMITTER MEASUREMENTS AT 2ND RF INPUT

General: Measurement of RF frequency, modulation (AM, FM, ϕ M), modulation frequency and RF spectrum (level) of small RF signals, e.g. in off-air or module measurements.

Input Levels:

RF Frequency
 Counter: 100 μ V (Selective frequency counter with presetting).

Modulation Meter
(IF Narrow):

Normal Mode: 20 μ V

Selective
 Measurement: 10 μ V

Selective Level:

Without
 Weighting
 Filter: -75 to -35 dBm

With 2 kHz
 Resonance
 Filter: -100 to -35 dBm

TRANSMITTER AND RECEIVER MEASUREMENTSMODULATION GENERATORS 1 AND 2

Frequency:

Range:

Front Panel: 20 Hz to 20 kHz

MIC: 100 Hz to 10 kHz

Resolution: 0.1 Hz

Error: As timebase + $\frac{1}{2}$ resolution.

Distortion: $\leq 0.5\%$

(Continued)

2. Specification (continued)

Output:

Level:

Range:

Front Panel: 10 μ V to 5 V_{EMF}

Resolution:

V < 1 mV: 10 μ VV \geq 1 mV: 1%

Error (at

V > 1 mV): \pm 5%Maximum Current: 20 mA_{peak}

Impedance:

Front Panel: 5 Ω MIC: Automatic matching for loads 50 to 400 Ω .

DISTORTION METER/MODULATION DISTORTION

Frequency:

Range: 100 Hz to 5 kHz

Resolution: 10 Hz

Input:

Level Range: 100 mV to 30 V

Measurement Range: 0.1 to 100%

Resolution: 0.1%

Inherent

Distortion: \leq 0.5%Error: \pm 5% + inherent distortion.Weighting Bandwidth: \leq 12 kHz

SINAD METER

Frequency:

Range: 100 Hz to 5 kHz

Error: \pm 10 Hz

(Continued)

2. Specification (continued)

Input:

Level Range: 100 mV to 30 V

Measurement Range: 0 to 46 dB

Resolution: 0.1 dB

Error (at 12 dB): ± 1 dB

Weighting Bandwidth: ≤ 12 kHz

SIGNAL + NOISE TO NOISE

Measurement Range: 0 to 48 dB

Resolution: 0.1 dB

Error: $\pm 5\%$ + resolution

AF FREQUENCY COUNTER

Operating Modes: Demodulation, AF, beat (frequency offset), external.

Frequency:

Range
(RF superimposed): 20 Hz to 500 kHz

Resolution: 1 Hz, 0.1 Hz

Error: As timebase + resolution.

Input Level Range
(at $f \geq 20$ kHz): 10 mV to 30 V

OSCILLOSCOPE

Bandwidth:

DC Coupled: DC to 20 kHz

AC Coupled: 10 Hz to 20 kHz

Deflection Scaling:

Horizontal: 50 to 0.5 ms/div.

Vertical:

FM: kHz

ϕ M: Radians

(Continued)

2. Specification (continued)

AM: Percent

AF: mV, V

Input:

Level Range: 0 to 40 V_{peak} Impedance
(approx.): 1 $M\Omega$

AF FILTERS

Highpass:

 f_{cutoff} : 300 HzAttenuation at
200 Hz: 40 dB (typical)

Lowpass:

 f_{cutoff} : 3.4 kHzAttenuation at
10 Hz: 40 dB (typical).

Bandpass:

Broadband: Highpass + lowpass.

Narrowband:

Frequency:

Range: 50 Hz to 5 kHz

Resolution: 10 Hz

Attenuation (at
0.8 f and 1.2 f): 40 dB (typical)

IF Filter Frequency: 150 Hz

Notch Filter:

Frequency:

Range: 100 Hz to 5 kHz

Resolution: 10 Hz

Attenuation
(at 0.8 f and 1.2 f): 40 dB (typical)

(Continued)

2. Specification (continued)

CCIT Filter

SELECTIVE CALL CODER

Tone Sequences: SELCAL, ZVEI1, ZVEI2, CCIR, EIA, EEA, EURO, NATEL, CCIT, VDEW, VDEW direct dialling and user defined sequences.

AUDIO MONITOR (LOUDSPEAKER)

Facilities: Demodulated signal, AF signal, beat (frequency offset).

IMPEDANCE MATCHING

Facilities: Load impedance measurement, automatic output impedance setting.

VOR/ILS GENERATOR (see Note 4)

GENERAL: The Localiser and Glideslope carrier frequencies have the capability of varying the modulation depth of the 90 Hz and 150 Hz tones, thus displaying fly left/right and up/down indications on the aircraft displays. To test the operation of the flag alarm the test set has the capability of deleting either of the 90 Hz or 150 Hz tones. The marker beacon is simulated by transmitting a 75 MHz carrier modulated by one of the three AF tones. VOR signals are simulated by modulating a VHF carrier with two separate 30 Hz tones, the phase of one being variable with respect to the other. Localiser and Glideslope frequencies have specific pairings and the test set automatically selects the paired Glideslope frequency when a Localiser frequency is selected.

VOR

Power Output: -128 to 0 dBm dependent upon modulation depth.

Frequency:

Bands: 108 to 117.95 MHz. Odd/even 100 kHz spacing.

Error:

0 to 35°C ± 0.0035%

0 to 50°C ± 0.005%

Phase Output:

Range: 0 to 360°

Resolution: 0.01°

(Continued)

2. Specification (continued)

Error:
 RF: $\leq 0.06^\circ$
 AF: $\leq 0.04^\circ$

9960 Hz Carrier:

Modulation:

Frequency: 7.9 to 12 kHz

AM Depth:

Range: 0 to 100%

Resolution: 0.1%

Error (at
 (30% mod): $\pm 2\%$

FM Deviation:

Range: 384 to 576 Hz

Resolution: 1 Hz

Error: ≤ 1 Hz

30 Hz VAR

Modulation:

Frequency: 7.9 to 12 kHz

AM Depth:

Range: 0 to 100%

Resolution: 0.1%

Error (at
 30% mod): $\pm 2\%$

FM Deviation:

Range: 384 to 576 Hz

Resolution: 1 Hz

Error: ≤ 1 Hz

1020 Hz AUX

Switchable: TO or FROM

(Continued)

2. Specification (continued)

Modulation:

Frequency: 50 Hz to 20 kHz

AM Depth:

Range: 0 to 100%

Resolution: 0.1% AM

Error (at
1020 Hz and 10
to 20% mod): $\leq 3\%$

ILS

General:

90 Hz and 150 Hz Phase:

Range (referred to
150 Hz): 0 to 180°

Resolution: 0.01°

Error: $\pm 0.1^\circ$

Modulation:

Frequency:

90 Hz Tone: 72 to 108 Hz

150 Hz Tone: 120 to 180 Hz

1020 Hz Tone
(AUX): 50 Hz to 20 kHz

AM Depth:

Range: 0 to 100%

Resolution: 0.1%

Error (at
1020 Hz and 10
to 20% mod): $\leq 3\%$

LOCALISER

Modulation:

AM Depth:

Range: 0 to 50%

Resolution: 0.1%

(Continued)

2. Specification (continued)

Error (at 20%
mod): $\pm 2\%$

DDM RF Output
(see Note 5)

Range
(at 20% mod): ± 0 to 0.4 DDM

Course error
(at - 128 to - 12 dBm)

On course: <0.0004 DDM

Off course: $\pm 2\% + 0.0004$ DDM

DDM AF Output
(see Note 5)

Range
(at 20% mod): ± 0 to 0.4 DDM

Resolution: 0.001 DDM

Error (at AF
level 0.5 to 5 V
and IDDMI ≤ 0.4): $\pm 3\% + 0.0002$ DDM

GLIDESLOPE

Frequency Range: 329.15 to 333.95 MHz

Modulation:

AM Depth:

Range: 0 to 50%

Resolution: 0.1%

Error (at
40% mod):

-128 to
-12 dBm: $<2\%$ typical

-88 to
-48 dBm: $\pm 2\%$

DDM RF Output
(see Note 5)

Range
(at 40% mod): ± 0 to 0.8 DDM

(Continued)

2. Specification (continued)

Error:	0.001 DDM
Course error (at -128 to -12 dBm):	
On course:	<0.001 DDM
Off course (at IDDMI ± 0.4):	± 2% + 0.0004 DDM
DDM AF Output (see Note 5)	
Range (at 40% mod):	± 0 to 0.8 DDM
Resolution:	0.001 DDM
Error (at AF level 0.5 to 5 V and IDDMI ≤0.4):	≤3% + 0.002 DDM

MARKER BEACON

Carrier Frequency:	75 MHz
Modulation:	
Frequency:	400 Hz, 1.3 kHz and 3 kHz.
AM Depth:	0 to 100%
Resolution:	0.1%
Error: (at 95% mod):	± 5%

1020 Hz AUX

Modulation:	
Frequency:	50 Hz to 20 kHz
AM Depth:	
Range:	0 to 100%
Resolution:	0.1% AM
Error (af f_{AF} = 300 to 3 kHz and >80% mod):	± 5% + resolution + residual AM.

(Continued)

2. Specification (continued)

AUTORUN PROGRAM

VOR and ILS tests able to be undertaken automatically. The tests are initiated and monitored by the user from the Remote Control Box CMS Z34. The tests will have to be approved for use on the equipment/aircraft by the relevant authority.

GENERAL:

GPIB Bus: IEEE 488 with listener/talker function.

Temperature Range:

Operating: 0 to +50°C

Storage: -40 to +70°C

BATTERY CMS Z42

Minimum Operating Time: 1 hour at 0 to 50°C

NOTES

1. Fine level variation 0 dB.
2. Without weighting filters.
3. Power:
 - a) 80 W continuous, 125 W for 2 mins. then 10 mins. off.
 - b) Audio/visual warning in the event of overload.
4. Data for VOR/ILS/MB signals are specified in the RF level range; -128 to -12 dBm, fine variation 0 dB, for discrete RF frequencies as well as for the following continuous ranges:
 - a) VOR; 108 to 118 MHz.
 - b) ILS Glideslope; 329 to 335 MHz.
 - c) Marker Beacon; 74 to 76 MHz.
5. Difference in Depth of Modulation describes the modulation depth difference between the 90 and 150 Hz tones. $IDDMI = I(90 \text{ Hz modulation in } \% - 150 \text{ Hz modulation in } \%) I/100\%$.

3. Comprising Items

<u>Sec/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>
	Communications Test Set	CMS 33
10S 0518485	Antenna Base/Front Cover (complete with 15 m antenna cable)	CMS Z35
10S 5831-99- 5648782	VSWR Insertion Unit (complete with 5 m VSWR cable)	NAS Z5
10S 7478856	Remote Control Box (complete with 15 m cable)	CMS Z34
	Power Cable	285.638
	Spare Fuses:	
	0.8A	0020.7417.00
	10A	0606.3136.00
	Operating Manual	1078.1930.12
	User Guide	1078.1947.32
10S 0161034	Carrying Case (complete with battery case)	CMS Z44

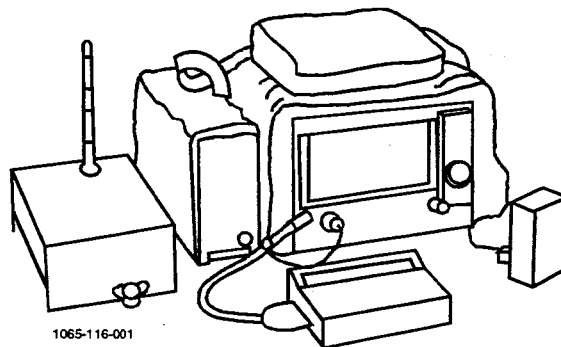
4. Accessory Items

<u>Sec/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>
10S 0874912	External Battery pack AFDEETEC 19543	CMS Z42
	External DC Supply Connector	CMS Z7
	128 kByte Memory Card	CMS Z2
	Additional:	
10S 1969818	VSWR Cable	084295300
10S 5831-99-0284872	Remote Control Cable	1065446500

5. Associated Equipment

Not known.

Section Reference: 10S/2156878		Nomenclature: LIGHTWEIGHT COMPREHENSIVE COMMUNICATIONS TEST SET (LCCTS) - AUTOLAND OPTION		
Manufacturer: RHODE & SCHWARZ		Part No: CMS B38		Cost/Date: £10,000 03/97
Height: 175 mm	Width: 320 mm	Depth: 375 mm	Weight: 18.5 kg, 23 kg WITH BATTERY	
Power Supplies: 100/120/220/240 V AC \pm 10% 47 to 420 Hz or 11 to 32 V DC (50 W)			Air Publication: User's Handbook	
Availability: 1	Environment: C	Maintenance Policy: IAW AP 100C-50	Calibration: 36 Months	AFDEETEC No: 19590



1. Description

The CMS B38 is the Autoland version of the CMS33. The specification is identical to that of the CMS33 (see Chapter 4.4.7) with the exception of a second ILS output to allow simultaneous glideslope and localiser stimulation.

Section Reference 10S 8591661		Nomenclature RADAR STIMULATOR (THREAT SIGNAL GENERATOR)		
Manufacturer REPUBLIC ELECTRONICS		Part No MTS - 300A		Cost/Date £85,000 1996
Height 16 inches	Width 13 inches	Depth 11 inches	Weight 24 lbs	
Power Supplies Supply for battery charger: Current less than 3 amperes		14 V dc rechargeable battery 100 - 130 V rms: 45 - 66 Hz or 360 - 440 Hz 200 - 240 V rms: 45 - 66 Hz		Air Publication None
Availability 2	Environment C	Maintenance Policy iaw AP100C-50	Calibration iaw AP100C-50	AFDEETEC/AFDSEC No 19545



1. Description

The MTS-300A is a portable, battery or external mains power supply operated instrument. It can be used to perform pre-flight and pre/post flight maintenance testing of radar warning receivers and electronic surveillance measures equipment in either a radiate, (via an internal antenna) or direct-connect mode of operation. The MTS-300A is capable of up to 1000 pre-programmed threat type signals in an automatic mode, or manually formulated signals under keypad control.

2. Specification

Frequency Ranges

Low Band:	0.70 - 5.2 GHz (Tuneable)
Mid Band:	5.20 - 13.0 GHz (Tuneable)
High Band:	13.0 - 18.0 GHz (Tuneable)
Accuracy:	±1% at 20°C

Modulation:

CW
Pulse Modulation
Single Pulse
Coded Pulse Group
Selectable 2-20 pulses/groups

Rating Capability:

Minimum effective radiated power (ERP). At 20 feet ERP - 35 dBm throughout frequency range

Nominal Antenna Beam Width

Low Band:	50°
Mid Band:	30°
High Band:	25°

Direct Connect Mode:

Minimum +10 dBm level is provided in each band via three top panel connectors

Direct Connect Cable:

10 feet of ruggedized cable is provided RF with SMA male connectors at each end. Cable loss as a function of frequency is:

Freq (MHz)	Cable Loss (dBm)
1175	0.8
2750	1.4
7000	2.4
9600	2.7
16000	4.0

Controls:

Power On/Off
36 position QWERTY style keyboard and 2 four-position keypads.

Display:

40 character 4 row LCD DOT Matrix Display for:

Frequency
Frequency Modulation
Pulse Modulation Code
Pulse Width
Pulse Spacing

2. Specification (continued)

Display: (continued)

Pulse Reputation Interval
 Battery Voltage
 Scan Type
 Stagger Level
 Jitter

Automatic Power Down:

Terminates power to test
 after 11 minutes of no keypad
 activity.

Power Source:

Integral rechargeable sealed
 lead-acid batteries providing
 four hours of operation at a
 50% duty cycle at -20°C.
 External Power Supply/Battery
 Charger allows ac operation
 and battery charging with
 115/230 V ac, 50-60, 400 Hz.

Battery:

14 V dc (nominal) sealed
 lead-acid.

3. Comprising Items

<u>NSN</u>	<u>Pt No.</u>	<u>Description</u>	<u>Qty</u>
	EB054000-1	MTS-300A	1
TBN	DB054070-2	Battery Assembly	2
10S 6130-99-9680257	DB054160-1	Power Supply	1
10S 6625-99-9682058	XB053996-1	Adapter Kit	1
10S 6625-99-3017753	AJ024747-1	Transit Case	1

4. Accessory Items

<u>NSN</u>	<u>Pt No.</u>	<u>Description</u>
10S 8322857	A1056	PCMCIA Flash Card

Note: This item is controlled by OC Fast Jet Ops, Air Warfare Centre,
 RAF Waddington.

5. Associated Equipment

<u>NSN</u>	<u>Pt No.</u>	<u>Description</u>
10S 5920-99-1263815	F1056	Fuse (located in battery assembly)

Chapter 5

IMPEDANCE MEASURING INSTRUMENTS
(INCLUDING R, L, C, Q, G, B & Y)

Chapter 5IMPEDANCE MEASURING INSTRUMENTS(INCLUDING R, L, C, Q, G, B & Y)

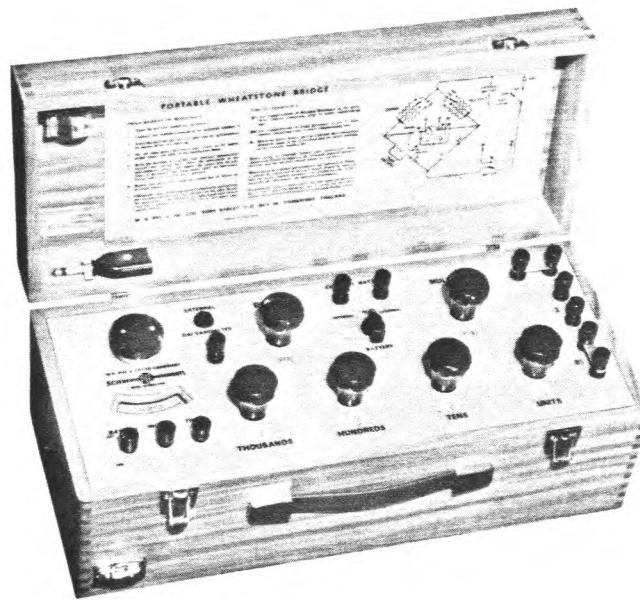
CONTENTS

Chap	Nomenclature	Sect/Ref/Stock No.	Manf/Part No.
5.1	BRIDGES		
.1	Bridge Set Resistance	6625-99-9532597	Cammetric 7383
.2	Bridge Admittance VHF	6625-99-1053847	Wayne Kerr B801B
.3	LCR Databridge	10S/4955673	Racal Dana 9343M
.4	Bridge RF	6625-99-9535239	Wayne Kerr B601
.5	Rho Bridge Kit	6625-99-9289527	Marconi TM9953
.6	Lohmeter	6625-99-1117473	Startronic 100.2S/D
5.2	INSULATION TESTERS		
.1	Multi-range Insulation Tester	6625-99-6506337	Megger BM8 M2
.2	Multi-range Insulation Tester	6625-99-1112740	Comark 1905
.3	Insulation Tester High Voltage	6625-99-6204072	Miles Hi-volt IT30
.4	To be issued later		
.5	Safety Ohmmeter Mk 7	6625-99-0149532	Fairey Mk 7
.6	To be issued later		
.7	AC/DC Breakdown Tester	10S/2522320	Megger Instruments FT6/12
.8	Tester Earth Resistivity Set	5G 7556108	Megger Instruments ET3/2MIN
.9	Tester Portable Appliance	10S/7933156	Megger Pat 2/MIN/R
.10	Safety Ohmmeter	10S/8536447	Bradley Electronics Ltd. 1672 M
5.3	DECADE BOXES		
.1	Decade Resistance Boxes	See text	Cammetric
.2	Decade Resistance Box	6625-99-6471285	JJ Insts R802
.3	Voltage Dividing Resistance Box	5905-99-1003338	Muirhead D801D
.4	Decade Capacitance Box	10S/4957821	Lloyd Inst. SVC5
.5	Decade Variable Capacitor	6625-99-1998743	JJ Insts PVC2
.6	Box Voltage Divider	6C/10195	Croydex Precision Insts RBG
.7	Precision Voltage Divider	4920-99-4370327	Muirhead K175-E1

CONTENTS (Continued)

Chap	Nomenclature	Sect/Ref/Stock No.	Manf/Part No.
5.4	CONTINUITY TESTERS		
.1	Test Circuit Continuity	6625-99-9563049	MPE Tran Test Mk 1
.2	Phase and Continuity	5G/1022589	Martindale PC 8700/400
.3	RF Vector Impedance Meter	6625-00-0610225	Hewlett Packard 4815A
.4	Personnel Resistance Tester	5G/2522317	Algo Instrument PRT2
.5	Earth Bonding Tester	10S/1222371	Lucas Bradley 1671M
.6	Continuity & Insulation Tester	6625-99-8092747	Robin KMP 3075DL
.7	Portable Appliance Tester (PAT)	10S/3524078	Robin Electronics SmartPAT3000
.8	Portable Appliance Tester (PAT)	10S/6173854	Robin Electronics SmartPAT3000G
5.5	THERMOCOUPLE TESTERS		
.1	Test Set Thermocouple	6625-99-9545656	Cammetric 7556
5.6	SLOTTED LINE SYSTEMS		
.1	Indicator SWR	6625-00-9938843	Hewlett Packard 415E
.2	Slotted Line	6625-99-1142343	Hewlett Packard 805C
.3	Slotted Line	6625-99-4395100	Hewlett Packard 817A
▶ 5.7	INSTALLATION TESTERS		
.1	Installation Tester	10S/6625-99- 7308912	Metrix MX4900

Section Reference 10S/6625-99-9532597		Nomenclature BRIDGE SET RESISTANCE		
Manufacturer CAMMETRIC		Part No. 7383		Cost/Date £250.00 1978
Height 19.0 cm	Width 46.0 cm	Depth 18.0 cm	Weight 7.5 kg	
Power Supplies 4.5 V Internal Battery			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 12334



1. Description

A portable Wheatstone Bridge which is completely self-contained and incorporating a built in galvanometer and dry battery.

2. Specification

Measurement Range: 0.0001 Ω to 1 M Ω

Series Arm: 4 decades in steps of hundreds, tens, units and tenths of ohm

Ratio Arms: Contain 1, 10, 100 and 1000 Ω coils

▶ Accuracy: \pm 0.04% ◀

3. Comprising

Instrument only.

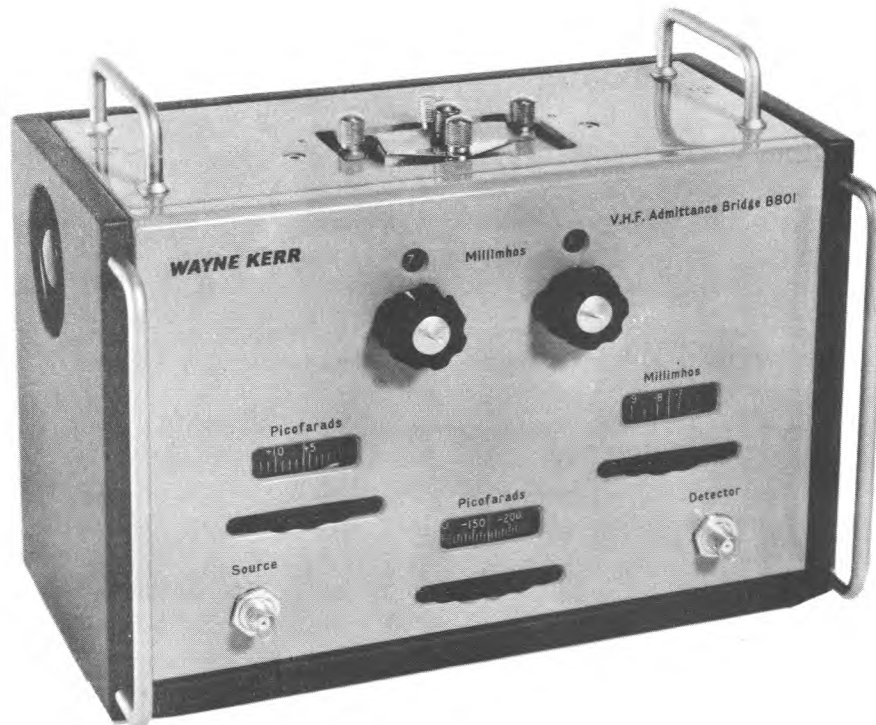
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-1053847		Nomenclature BRIDGE ADMITTANCE VHF		
Manufacturer WAYNE KERR		Part No. B 801B		Cost/Date £800.00 1978
Height 22.9 cm	Width 28.0 cm	Depth 19.0 cm	Weight 4.1 kg	
Power Supplies Oscillator giving 1 V into 100 Ω			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 16075



1. Description

A passive instrument for the accurate determination of the constants of lines, antennas, feeders and components, whether balanced or unbalanced.

2. Specification

Measurement Range:

Frequency: 1 to 100 MHz
 Conductance: 0 to 100 milli mho
 Capacitance: 0 to \pm 230 pF

Accuracy:

Conductance: $\pm 2\% \pm 0.1$ milli mho

Capacitance: $\pm 2\% \pm 1.5$ pF

Discrimination:

Conductance: 0.1 milli mho at 100 MHz

Capacitance: 0.2 pF

3. Comprising

Instrument only.

4. Accessory Item

Source Detector 10S/2220561

5. Associated Equipment

None.

GPIB

Section Reference 10S/4955673		Nomenclature LCR DATABRIGE		
Manufacturer RACAL DANA INSTRUMENTS LTD		Part No. 9343 M		Cost/Date £706/JAN 90
Height 42 mm	Width 250 mm	Depth 440 mm	Weight 5.6 kg	
Power Supplies 188 V to 265 V & 94 V to 127 V at 45 Hz to 66 Hz 188 V to 212 V & 108 V to 122 V at 360 Hz to 440 Hz			Air Publication TBN	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration TBN	AFDEETEC/AFDSEC No. 19434

Photograph to be issued later

1 Description

The 9343M LCR Databrige is a high performance, microprocessor controlled component measuring bridge which automatically measures resistance, capacitance, inductance, quality factor (Q) and dissipation factor (D) to within 0.1% accuracy. Having full auto-ranging facilities, the 9343M needs the minimum of operator intervention to obtain fast accurate readings. Both measurement frequency (100 Hz, 1 kHz or 10 kHz) and the measurement mode (parallel or series equivalent circuit) are user selectable.

Once the component has been plugged into the 9343M's integral test fixture and the quantity to be measured (L, C, R, D and Q) has been selected, the 9343M will display the measured value twice each second. A microprocessor controls the internal operation of the LCR Databridge. As well as managing all the measurement functions and computation, it sets the display precision to be compatible with the measurement certainty. It also prompts the user to make any changes to the measurement frequency or mode which will improve this. The automatic mode can be cancelled to enable measurement of the minor term to be carried out.

2 Specifacation

Variable Measured: L, C, R, D and Q

Modes: Series or parallel equivalent

Measurement Frequency: User settable to 100 Hz, 1 kHz or 10 kHz

Accuracy of Measurement Frequency: + or -0.01% of nominal

Maximum Voltage Across Component: 0.3 Volts rms

Measurement Update Rate: 2 per Second

Maximum time for Valid Reading: 1 Second

Display: 5 Digit

Connection to Component Under Test: 4 Terminal integral test jig

Measurement Ranges

R:	0.1 m Ω to 990 M Ω
L:	0.001 μ H to 9900 H
C:	0.001 pF to 9999 μ F
D:	0.001 to 999
Q:	0.001 to 999

Basic Accuracy: + or -0.1% of reading + or -1 digit

Range for Basic Accuracy:

Measurement Frequency	100 Hz	1 kHz	10 kHz
Range of Inductance	4 mH - 2000 H	400 μ H - 200 H	40 μ H - 10 H
Range of Capacitance	4 nF - 2000 μ F	400 pF - 200 μ F	40 pf - 10 μ F
Range of Inductance	2 Ω - 1 M Ω	2 Ω - 500 k Ω	2 Ω - 100 k Ω

Ultimate Resolution:

L:	0.001 μ H
C:	0.001 pF
R:	0.1 m Ω

Input Protection: Protected against connection of capacitors of up to 10 mF charged to not more than 50 volts

dc Bias Voltage: 2 volts for use when testing electrolytic capacitors

Interface: IEEE-488
Operating Temperature Range: 0° C to 50° C

3 Comprising

Instrument	Pt No 9343/55M
Extender Cables	Pt No 1401
Extender Cables (with Kelvin Clips)	Pt No 3401
Adaptors Qty 2 (for axial lead component measurement)	
Adaptor Support Plate	
Accessory Pouch	
Handbook	

4 Accessory Items

None

5 Associated Equipment

None

Section Reference 10S/6625-99-9535239		Nomenclature BRIDGE RADIO FREQUENCY		
Manufacturer WAYNE KERR		Part No. B601		Cost/Date £650.00 1978
Height 28.0 cm	Width 38.0 cm	Depth 24.0 cm	Weight 8.3 kg	
Power Supplies Oscillator giving 1 V into 100 Ω			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 12338



1. Description

The Bridge Radio Frequency has separate dials and multiplier switches to enable the resistive and reactive terms of an unknown impedance to be measured simultaneously.

2. Specification

Measurement Range:

Frequency 15 kHz to 5 MHz
Resistance: 10 Ω to 10 M Ω
Capacitance: 10 fF to 20 mF (Note f = femto = 10⁻¹⁵)

Inductance: 500 nH to 50 mH

Accuracy: $\pm 1\%$ up to 3 MHz, $\pm 2\%$ at 5 MHz

NOTE: The B601 requires a source of RF and a nullmeter; a suitable source/detector is:

10S/2220561 WAYNE KERR SR 268 AFDEETEC 16427

3. Comprising

Instrument only.

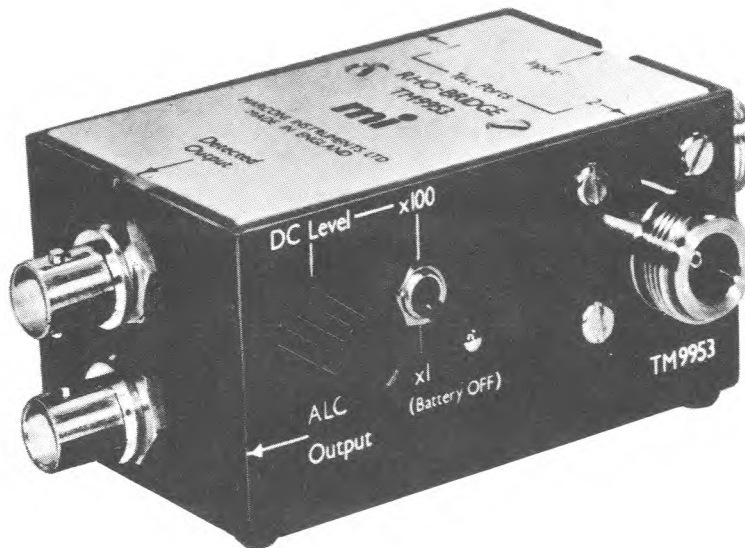
4. Accessory Items

10S/2220561 Source Detector

5. Associated Equipment

None.

Section Reference 10S/6625-99-6289527		Nomenclature RHO BRIDGE KIT		
Manufacturer MARCONI		Part No. TM 9953		Cost/Date £222.00 1976
Height 8.3 cm	Width 4.1 cm	Depth 12.5 cm	Weight 0.4 kg	
Power Supplies TWO MALLORY TR 132R CELLS			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEC/AFDSEC No. 18273



1. Description

The TM 9953 Rho Bridge is designed for VSWR measurement, by the comparison method, over a wide frequency range in conjunction with a signal source, such as the Marconi TF 2361 sweep generator and a suitable display. The Rho Bridge is a symmetrical rf bridge where the unknown impedance is compared to a calibrated known impedance. The level of the detected dc output is proportional to the degree of mismatch. In the case of spot frequency testing an analogue meter calibrated in VSWR is used, and for sweep frequency measurement an oscilloscope display (external x axis sweep driven from the sweep generator, Y axis indicates the dc level (VSWR) against frequency). Calibration of the display is possible by either use of the calibrated mismatch supplied, or the output attenuator of the sweep generator and the nomograph supplied.

One of the problems encountered with low values of VSWR using the bridge method has been that these low values produce low post detection dc levels, often necessitating a high sensitivity display. This has been overcome with the TM 9953 which has a built in battery powered X100 amplifier which can be switched in for low level measurements and allows the use of normal displays.

The system is designed for 50 Ω operation, but use of the correct calibrated mismatch as a standard allows measurement on systems of other impedances, eg, 1.5:1 mismatch = 75 Ω .

2. Specification

Frequency Range:	1 to 1000 MHz
Characteristic Impedance:	50 Ω
Maximum Input:	0.5 W (5 V rms)
Residual VSWR:	1.01 : 1 (5 to 1000 MHz) 1.03 : 1 (1 to 5 MHz)
Detector Output:	Negative
Load Impedance:	500 k Ω or above
Amplifier Gain:	X100 (provides a detector output of 0.6 V with VSWR of 1.2:1 and 0.04 V with VSWR of 1.01:1 with an input (RF) of 0.5 V). Maximum output 2 V pp.
DC Level Adjustment:	\pm 0.5 V
ALC Output:	Negative
Battery Life:	10 000 hours operation 2½ years shelf life
Connections:	RF Input: Type N socket Test Ports: Precision Type N sockets Detector and ALC Outputs: BNC sockets

3. Comprising

RHO Bridge	TM 9953
Nomograph	-
Accessory Case	41674-038G
50 Ω Termination	54423-011G
Calibrated Mismatch 1.1:1 (55 Ω)	54423-021X
Calibrated Mismatch 1.2:1 (60 Ω)	54423-031Z
Calibrated Mismatch 1.5:1 (75 Ω)	54423-061K

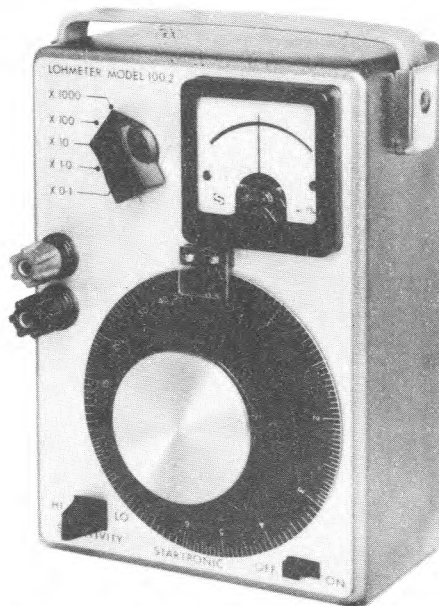
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 6C/6625-99-1117473		Nomenclature LOHMETER		
Manufacturer STARTRONIC		Part No. 100. 2 S/D		Cost/Date £160 1979
Height 18.6 cm	Width 13.2 cm	Depth 6.9 cm	Weight 1.8 kg	
Power Supplies 3 x SP 2 Batteries			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDE/TEC/AFDSEC No. 10687



1 Description

The Lohmeter model 100. 2 S/D is a portable resistance bridge capable of measuring resistances to a high degree of accuracy. This model has a single decade scale 11 in. in length and which is calibrated 0.5 to 5 so providing a high degree of resolution.

2 Specification

Range 1:	0.05 Ω to 0.5 Ω	Accuracy 1.5%
Range 2:	0.5 Ω to 5 Ω	Accuracy 0.5%
Range 3:	5 Ω to 50 Ω	Accuracy 0.5%
Range 4:	50 Ω to 500 Ω	Accuracy 0.5%
Range 5:	500 Ω to 5 k Ω	Accuracy 0.5%

3 Comprising

Instrument only.

4 Accessory Items

None

5 Associated Equipment

None

Section Reference 5G/6625-99-6505337		Nomenclature MULTIRANGE INSULATION TESTER		
Manufacturer MEGGER		Part No. BM 8 MK 2		Cost/Date £113.00 1979
Height 15.3 cm	Width 9.5 cm	Depth 5.9 cm	Weight 0.68 kg	
Power Supplies 6 x 1.5 V Batteries (5J/6282360 or 5J/1956708)			Air Publication 117F-0306-2	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 18894



1. Description

The BM 8 Mk 2 operates from 6 x 1.5 V cells, the test voltage being electronically developed to the required level. A battery condition indicator, located below the meter scale, gives an immediate indication of the battery voltage. Five test voltages are available over the range 50 to 1000 V dc and the measurement of insulation resistance covers most insulation requirements.

After testing and before disconnecting the test leads external circuit, capacitance can be discharged through an internal resistor, by turning the selector switch to 'discharge' and releasing the operating button.

2. Specification

Insulation Range:	Test voltage dc	Resistance range
	50 V	0.005 to 1000 MΩ
	100 V	0.01 to 2000 MΩ
	250 V	0.02 to 5000 MΩ
	500 V	0.05 to 10 000 MΩ
	1000 V	0.1 to 20 000 MΩ

Short circuit current: 0.8mA approximately

Accuracy: ± 1.27 mm from any marked position on the scale when measured against standard resistors.

Battery Drain: 200 mA max.

Terminals: 4 mm sockets.

3. Comprising

5G/6501361	Instrument
5G/6501362	Case
5G/6501363	Test Lead Set
5J/6282360 or 5J/1956708	Batteries

Qty 6 (Metal clad batteries may used after satisfaction of STI/Test Equipment/64) ◀

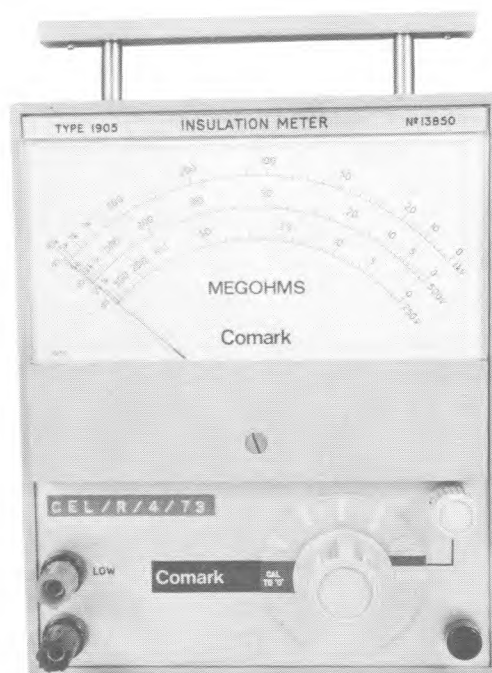
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 5G/6625-99-1112740		Nomenclature INSULATION TESTER MULTIRANGE No 2		
Manufacturer COMARK		Part No. 1905		Cost/Date £97.00 1978
Height 16.9 cm	Width 14.0 cm	Depth 8.9 cm	Weight 1.35 kg	
Power Supplies 8 x SP 11 Batteries (5J/9101132)			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration C/24	AFDEETEC/AFDSEC No. 10149



1. Description

The type 1905 Insulation Meter gives direct readings of insulation resistance up to 10 000 M Ω , dependent on test voltage. A transistor converter is used to generate test voltages of 1000 V, 500 V, 250 V, 50 V and 25 V from internal batteries. The output is electronically stabilised and the maximum current is limited to 10 μ A. The test voltage falls proportionally from its full value under open circuit to zero when the output is short circuited. In this way the risk of destructive breakdown is virtually eliminated and the instrument may be used safely for the measurement of leakage current in semiconductor rectifiers, diodes etc. A push-button ON/OFF switch gives instant one-hand operation, eliminating unnecessary battery drain.

NOTE: The Comark Type 1905 is only to be used where a voltage limit of 25 V is required.

For all other normal insulation testing the Megger BM 8/Mk 2 5G/6505337 should be used.

2. Specification

<u>Test Voltage</u>	<u>Resistance Range</u>
25 V	0.1 to 200 M Ω
<u>Voltage Accuracy</u>	Plus or minus 5% at infinity ohms.
<u>Resistance Accuracy</u>	Plus or minus 5% at mid-scale.
<u>Output Terminals</u>	4 mm sockets.

3. Comprising

Instrument
Case
Test Leads and Probes

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 5G/6625-99-6204072		Nomenclature INSULATION TESTER HIGH VOLTAGE		
Manufacturer MILES HI-VOLT		Part No. IT 30		Cost/Date £1000.00 1978
Height 12.6 cm	Width 48.0 cm	Depth 27.0 cm	Weight 11.0 kg	
Power Supplies Mains 100-125 V or 200-250 V 45-66 Hz Battery Operation, 24 V battery supplied with set			Air Publication 117F-0303-2	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 13842



1. Description

The tester is a portable, solid state, non-destructive insulation tester used for measuring leakage currents and is sensitive down to 0.01 μA at voltages up to 30 kV. The tester will run either from a mains supply or from its built-in rechargeable power pack. This provides about 2½ hours operation at full load. For safety in operation an external interlock, guard terminal and internal discharge path are built in.

2. Specification

Output Voltage Ranges: Two outputs available:
 0.5 kV to 5 kV
 3.0 kV to 30 kV

Output Voltage Metering: In two ranges, 5 kV and 30 kV FSD.

Output Polarity: Negative.

Maximum Output Current: Approx 1 mA at full voltage, ie, 30 kV or 5 kV.

Output Current Metering: (a) 0-1 μ A
 (b) 0-10 μ A
 (c) 0-100 μ A
 (d) 0-200 μ A

Trip Circuits: Four fixed current trips set to: 1.5, 13, 130 and 270 μ A depending on current range in use.

3. Comprising

(a) 5G/6284176 Leather carrying case.

(b) 5G/6207279 30 kV pistol probe incorporating interlock microswitch.

(c) 5G/6284181 25 ft screened high voltage cable.

(d) 5G/6284178 Battery power pack.

(e) 6625-99-6207278 Mains charging unit.

(f) NYR Mains power lead

(g) NYR Co-axial cable

(h) NYR Instrument

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 5G/6625-99-0149532		Nomenclature SAFETY OHMMETER Mk 7		
Manufacturer FAIREY ENGINEERING		Part No. Mk 7		Cost/Date £350.00 1978
Height 11.1 cm	Width 19.0 cm	Depth 29.3 cm	Weight 4.5 kg	
Power Supplies Internal 1.35 V Battery			Air Publication 120G-0719-1	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/6	AFDEETEC/AFDSEC No. 18101



1. Description

The Fairey Safety Ohmmeter has been developed for the direct resistance testing of circuits where the applied current of a conventional ohmmeter would cause the circuit to malfunction. It is intrinsically safe in hazardous environments containing explosives or flammable liquids and gases and complying with Defence Standard 66-6. (ohmmeter safety multi-range).

2. Specification

Measurement Ranges: 0 to 1 Ω , 0 to 10 Ω , 0 to 100 Ω , 0 to 1000 Ω ,
0 to 10 000 Ω

Accuracy: $\pm 2\%$ of range.

Scale Size: 17.1 cm = 100 divisions.

- ▶ Electrical Output: Voltage 1.5 V
Max current less than 10 mA.
- Anti-static: The insulation resistance of the instrument outer case is such as to minimise the accumulation of static charge. ◀
- RF Rejection: 100% over the frequency range 10 kHz to 10 GHz.
- Sealing: Leakproof with an internal pressure of 5 lb/in² applied.
- Battery: Mallory mercury cell 1.35 V 6135-99-6613325

3. Comprising

- ▶ Instrument + Shoulder Strap ◀

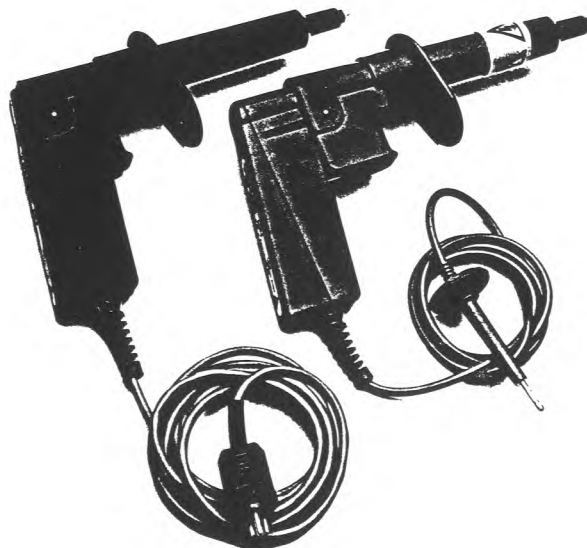
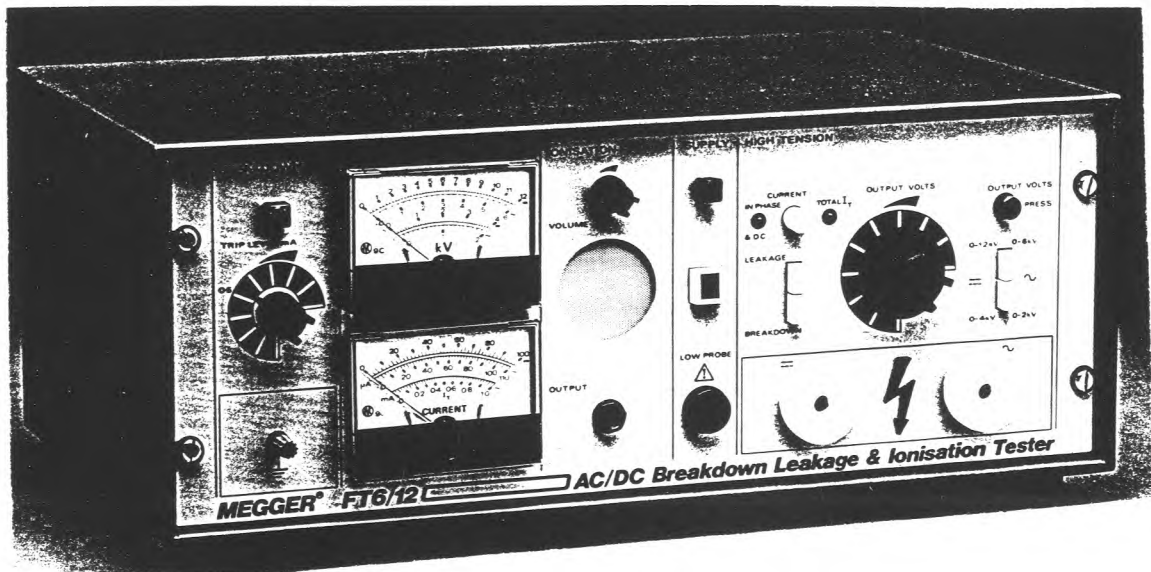
4. Accessory Items

Special to type leads to be specified by sponsor of the equipment under test.

5. Associated Equipment

None.

Section Reference 10S/2522320		Nomenclature AC/DC BREAKDOWN TESTER		
Manufacturer MEGGER INSTRUMENTS		Part No. FT6/12		Cost/Date £1152 (89)
Height 29.8 cm	Width 49.5 cm	Depth 19 cm	Weight 16 kg	
Power Supplies 110 V, 220 V, 240 V ac, 50-60 Hz (Voltage adjuster on rear panel)			Air Publication -	
Availability 2	Environment B	Maintenance Policy 1A/2B/4CD	Calibration A/12	AFDEETEC/AFDSEC No. 19407



1 Description

The RM 215L/2MN Tester is used for the general flash testing and measurement of the breakdown voltage of electrical components and insulating materials. The instrument is mains operated and produces a continuously variable eht output voltage of up to 12 kV dc or 6 kV rms ac each in two ranges. In addition, provision is made for the detection of ionisation in electrical assemblies and the measurement of ac and dc leakage current. Leakage resistance, both ac and dc, and ac capacitive current can be calculated. These facilities enable the non-destructive testing of electrical components and materials. Breakdown and flashover on ac and dc tests are indicated by an amber signal neon mounted on the front panel. The relay controlling this indicator has an additional pair of closing contacts which may be used to operate a remote indication if required. An internal loudspeaker provides audible indication of ionisation or alternatively, provision is made for the external connection of head-phones or an oscilloscope.

2 Specification

Testing Voltage: dc 0-4 kV (first indication 100 V)
 0-12 kV (first indication 250 V)
 ac 0-2 kV rms (first indication 100 V)
 0-6 kV rms (first indication 250 V)

Current Metering:

 dc leakage current: 0-100 μ A (first indication 2.5 μ A)
 ac in-phase current: 0-110 μ A (first indication 2.5 μ A)
 ac total current: 0-1 mA (first indication 25 μ A)

Output short circuit
 current: 7.4 A rms ac \pm 20% at 240 V 50 Hz
 (Output volts control
 set to max): 2.1 A mean dc \pm 20% at 240 V 50 Hz

Accuracy:

 dc voltage (direct
 reading): \pm 1.5% of fsd, \pm 1% of reading
 dc current (leakage): \pm 2% of fsd, \pm 1% of reading
 ac voltage (direct
 reading): \pm 1.5% of fsd, \pm 2% of reading
 ac current (total): \pm 4% of fsd.

Ripple content dc: Less than 5% pp of mean dc at output
 currents up to 100 μ A and load
 resistances greater than 100 M Ω

Waveform: The ac output waveshape will not deviate
 from the fundamental by more than \pm 5% at
 any point on the voltage waveform for
 load impedances greater than 100 M Ω on
 the dc range or 6 M Ω on the ac.

Power Supply: 110 V, 220 V and 240 V ac, 50-60 Hz
 (nominal values). Voltage adjusted at
 rear of instrument.

Power Consumption: 80 VA maximum.

3 Comprising

Instrument

TBN
10S/6625-99-6645702

High Voltage Probe Pt. No. 6110-459
Low Voltage Probe Pt. No. 6330-127

4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference 5G/7556108		Nomenclature TESTER EARTH RESISTIVITY SET		
Manufacturer MEGGER INSTRUMENTS LTD		Part No. ET3/2 MIN		Cost/Date £264 1982
Height 16.5 cm	Width 17.1 cm	Depth 24.1 cm	Weight 3 kg	
Power Supplies Integral hand powered ac generator			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 19244



1 Description

The earth tester is a compact, portable instrument and is supplied with a carrying case and accessory kit (see section 3). Tests provided by the instrument are:

- (a) Earth electrode resistance measurement
- (b) Soil resistivity measurement
- (c) Earth continuity testing
- (d) Neutral earth test
- (e) Direct resistance measurement within the instrument range

The test current from the integral hand driven ac generator is passed between the earth electrode under test and a current electrode. The pd across the test electrode and a separate intermediate electrode is balanced by the generator output via a current transformer across a digital resistor system. Any out of balance current caused by a potential difference is rectified and applied to a centre zero meter. The three resistor switches are adjusted to give a zero reading on the meter. The readings on the switches combined with the setting of the range switch provides an accurate resistance reading.

Purpose

- (a) Earth electrode resistance measurement.
- (b) Soil resistivity measurement.
- (c) Earth continuity testing.
- (d) Neutral earth test.
- (e) Direct resistance measurement within the instrument range.

2 Specification

Measurement Range: 0.01 Ω to 9990 Ω
 Ranges: x 0.01; x 0.1; x 1; x 10
 Accuracy: At 20°C, ± 1% of range in use with individual spike resistance up to 1500 Ω
 Temperature Effect: ± 0.05%/°C
 Temperature Range: Operating: -20°C to +55°C
 Storage: -40°C to +70°C
 Power Source: Integral hand-powered ac generator

3 Comprising

-	Instrument	ET3/2 MIN
5G/3708253	Instrument Carrying Case	63144
▶ 5G/8948129 Accessory Kit	}	1 Canvas Carrying Case
		1 1.13 kg Hammer
		4 Galvanised steel spikes, 12 mm Square section, 450 mm long
		2 Spike extractors
		30 m Cable on cable winder complete with connectors and clip
		50 m Cable on cable winder complete with connectors and clip
	}	2 3 m leads complete with connector and clip

4 Accessory Items

None.

5 Associated Equipment

None.

Section Reference 10S/7933156		Nomenclature TESTER PORTABLE APPLIANCE		
Manufacturer MEGGER		Part No. PAT 2/MIN/R		Cost/Date £344
Height 344 mm	Width 245 mm	Depth 200 mm	Weight 6 kg	
Power Supplies 240 V ac, 50 Hz			Air Publication 117F-0305-0	
Availability 2	Environment B	Maintenance Policy 2B/4D	Calibration AH/12	AFDEETEC/AFDSEC No. 19328



1 Description

The Tester PAT 2 is used to check the electrical safety of portable appliances. The tester will also check earthed appliances and double insulated appliances. Fitted to the lid of the tester is an accessory pouch containing the test leads and probes. A basic diagrammatic instruction card is attached to the inside of the lid. Each tester will carry out five tests on an appliance, ie an earth bond test, an insulation test, a flash test, a load test, and an appliance operation test. The appliance to be tested is simply plugged into a standard 3-pin socket on the instrument front panel. Also available is a 200 V Continental version, 10ZZ/211055, AFDEETEC No. 19348, Pt. No. PAT 2 EUR 220.

2 Specification

TESTS AVAILABLE

Earth bond, Test 1
 Insulation, Test 2
 Flash, Test 3
 Load test, Test 4
 Operation, Test 5

(continued)

Specification (continued)

EARTH BOND TEST

Meter reading range	0 to 0.5 Ω
Pass-band limit	0.1 Ω + 0 - 0.01 Ω
Open-circuit voltage	6 V ac rms (nominal)
Short-circuit current	37.9 A (nominal)

INSULATION TEST

Meter reading range	0.75 M Ω to 20 M Ω
Pass-band limit	2 M Ω + 0.2 M Ω -0
Open-circuit voltage	600 V dc (nominal)
Short-circuit current	2.0 mA (nominal)

FLASH TEST

Meter reading range	0 to 6 mA (linear scale)
Pass-band limit	3 mA (nominal)
Open-circuit voltage	1.5 kV ac rms (nominal) for Class 1 3 kV ac rms (nominal) for Class 2
Short-circuit current	6 mA (nominal)

LOAD TEST

Meter reading range	green/white/red arc
Pass-band	green
Open-circuit voltage	6 V ac (nominal)
Short-circuit voltage	330 mA

OPERATION TEST

Meter reading range	0 to 3.5 kVA
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3 Comprising

	Instrument
6231-043	Lead Earth Bond with Crocodile Clip
6331-225	Lead Test HV with Probe

4 Accessory Items

6331-229	Lead Earth Bond with Probe
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5 Associated Equipment

None.

Section Reference: 10S/8536447		Nomenclature: SAFETY OHMMETER		
Manufacturer: BRADLEY ELECTRONICS LTD.		Part No: 1672M		Cost/Date: £1250/OCT 93
Height: 220 mm	Width: 200 mm	Depth: 150 mm	Weight: 2 kg	
Power Supplies: 4 X AA SIZE BATTERIES			Air Publication: NONE	
Availability: 2	Environment: C	Maintenance Policy: B2/D2	Calibration: TBN	AFDEETEC No: 19517

PHOTOGRAPH TO BE ISSUED LATER

1. Description

The Safety Ohmmeter 1672M is a small, portable, intrinsically safe instrument that enables accurate measurement of resistances below 200 ohms in a hostile environment. It employs four wire resistance measurement techniques and is designed to provide immunity from thermal EMF and contact potentials. Additionally it is designed so that the test voltage will not exceed 1 volt peak and the applied test current is less than 3.5 milliamps. Layout of the controls permits easy operation in the protective carrying case which is fitted with a carrying strap enabling it to be used hung around the neck leaving both hands free. Additionally, the carrying case provides stowage for the wide range of test leads.

The test set utilizes a low frequency AC measurement principle. The AC signal is applied to the resistance under test by two source wires and is monitored by two sense wires which feed the amplifier. After amplification the signal is filtered and rectified before being fed to a 3.5 digit LCD display. Power to the test set is provided by four AA size batteries and a low battery condition annunciator is fitted to indicate when 90% of battery life has been consumed. The instrument is activated by a push button ON switch, but incorporates a timer circuit which automatically switches it OFF after four minutes. Additionally, backlighting for the LCD display is operated by a push switch. The 50 metre accessory lead has a significant inductance which varies according

to how it is deployed. A zero adjustment is therefore provided to trim out this offset which can be up to 4 milliohms.

Note ...

The battery compartment cover is secured with special Allen key-headed tamper proof screws to prevent batteries being changed too easily in an explosive environment. The special allen key should not be kept with the instrument.

2. Specification

Ranges:	000.0 to 199.9 milli-ohms	Resolution 0.1 milli-ohm
	0.000 to 1.999 ohms	Resolution 0.001 ohm
	00.00 to 19.99 ohms	Resolution 0.01 ohm
	000.0 to 199.9 ohms	Resolution 0.1 ohm

Accuracy: $\pm 1\%$ of reading ± 1 digit

Maximum Applied Voltage: Instrument designed so as not to exceed 1 volt.

Applied Test Current: 3.5 micro-amps to 3.5 milli-amps dependant upon range selected.

Battery Life: Approx. 56 hours.

Operating Temperature: -20 to +60°C

Storage Temperature: -40 to +60°C

3. Comprising

<u>Sect/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>	<u>Qty.</u>
	Safety Ohmmeter Instrument		
10S/5512115	Test Lead - Small Kelvin Clip	162612-A2	2
10S/7606695	Test Lead - Large Kelvin Clip	162613-A2	1
10S/2442864	Test Lead - Probe	162609-A2	2
10S/2999742	Extension Lead - 5 metre	162614-A2	1
	Operator Handbook		1
	Carrying Case	163313-A2	1

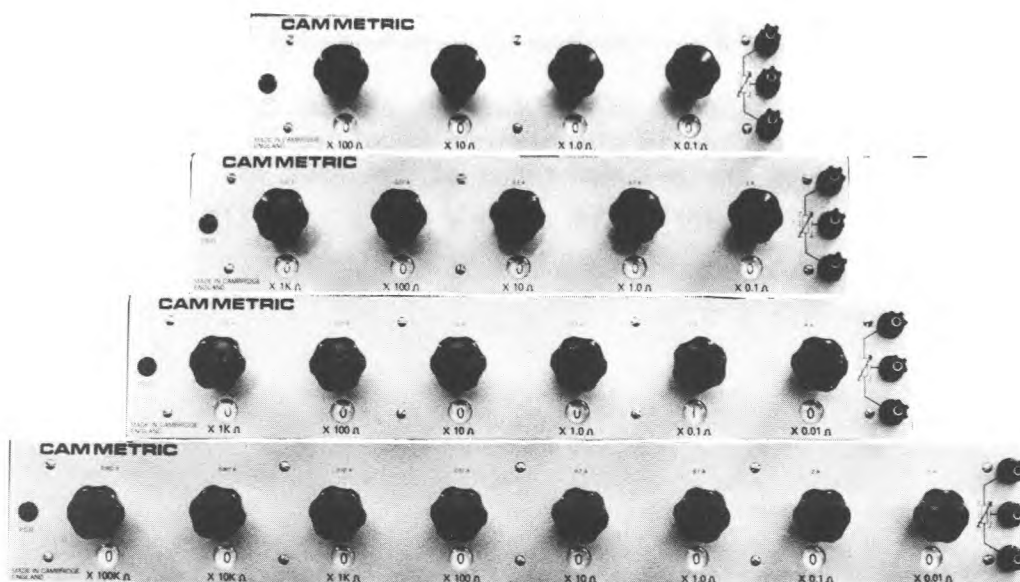
4. Accessory Items

<u>Sect/Ref.</u>	<u>Nomenclature</u>	<u>Part No.</u>	<u>Qty.</u>
10S/9730399	Extension lead - 50 metre	162620-A2	
TBN	Allen Key (Battery Compartment)	137733-A4	

5. Associated Equipment

None

Section Reference -		Nomenclature DECADE RESISTANCE BOXES			
Manufacturer CAMMETRIC		Part No. -		Cost/Date -	
Height 8.5 cm per decade	Width 110.0 cm	Depth 9.0 cm		Weight 0.85 kg per decade	
Power Supplies -				Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/2	AFDEETEC/AFDSEC No. -	



1. Description

This series of decade resistance boxes give maximum resistances of 1111 Ω for type 4403 to 1,111,111 Ω for type 8802.

2. Specification

- Insulation Resistance : Greater than 20 000 M Ω
- Residual Resistance : 0.005 Ω /decade
- Contact Resistance Variation : Less than 20 $\mu\Omega$ /decade switch
- Maximum Potential to Screen : 400 V (peak)

Sect/Ref	AFDEETEC No	Type	Decades Ohms								Cost Aug 76
			10 ⁵	10 ⁴	10 ³	100	10	10 ⁰	10 ⁻¹	10 ⁻²	
10S/6327623	18415	4403				*	*	*	*		£145
10S/6327624	18416	5502				*	*	*	*	*	£172
10S/6327625	18417	5503			*	*	*	*	*		£175
10S/6327626	18418	6602			*	*	*	*	*	*	£203
10S/6327627	18407	8802	*	*	*	*	*	*	*	*	£275
Current Rating (Amps)			0.002	0.007	0.02	0.07	0.2	0.7	2.0	2.0	

NOTE: The value listed in the decades column is the switchable increment of each decade ie the maximum total will be 10 times the listed column eg the maximum range of the 5502 is

$$\begin{aligned}
 & (100 \times 10) + (10 \times 10) + (10 \times 1) + (10 \times 0.1) + 10 \times 0.01 \\
 & = 1000 + 100 + 10 + 1 + .1 \\
 & = 1111.1 \Omega
 \end{aligned}$$

3. Comprising

Instruments only.

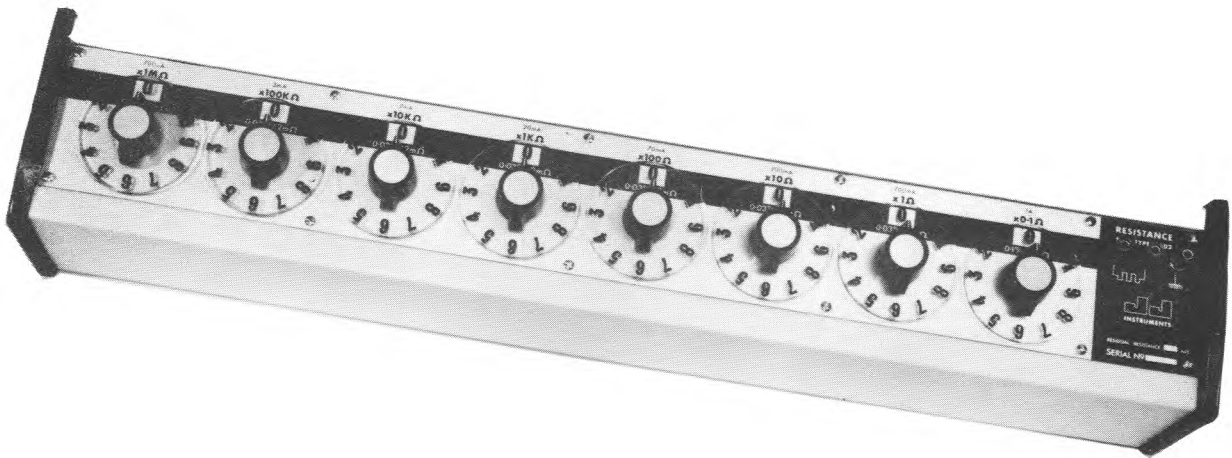
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-6471285		Nomenclature DECADE RESISTANCE BOX			
Manufacturer J.J. INSTRUMENTS		Part No. R 802		Cost/Date £200.00 1978	
Height 11.4 cm	Width 71.1 cm	Depth 12.7 cm		Weight -	
Power Supplies -				Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDETEC/AFDSEC No. 18863	



1. Description

An 8 decade resistance box giving a maximum resistance of 11,111,111 Ω and a resolution of 0.1 Ω .

2. Specification

at 20°C

Decade Steps Ohms

	10^6	10^5	10^4	10^3	10^2	10^1	10^0	10^{-1}
Accuracy:	0.3%	0.03%	0.03%	0.03%	0.03%	0.03%	0.03%	0.1%
Maximum Continuous I	700 μ A	3 mA	7 mA	20 mA	70 mA	200 mA	1 A	1 A

Resolution:	0.1 (10^{-1}) Ω
Temperature Coefficient:	25 ppm/ $^{\circ}$ C
Residual Resistance:	24 m Ω
Annual Stability:	Better than 0.03%
Insulation Resistance:	Between test terminals and case 1000 M Ω at 500 V dc

3. Comprising

Instrument only.

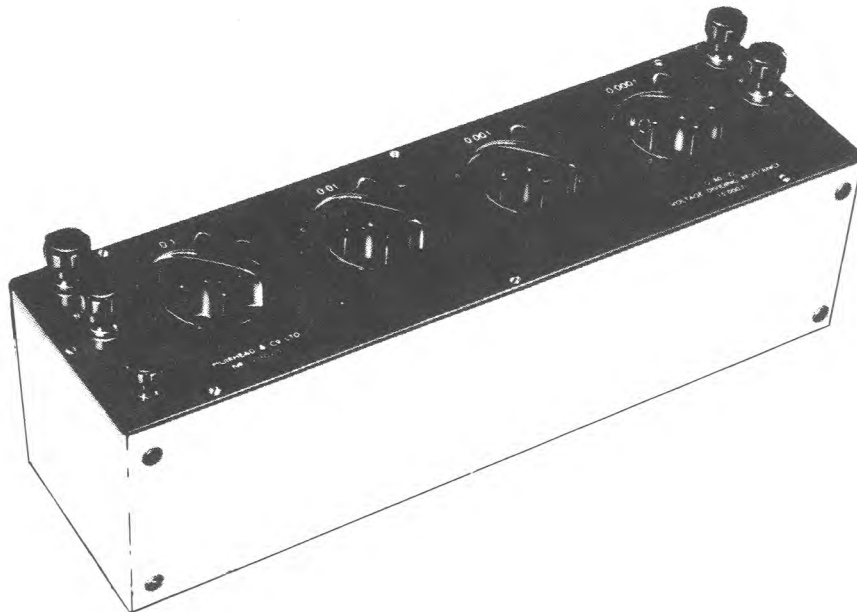
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 6C/5905-99-1003338		Nomenclature VOLTAGE DIVIDING RESISTANCE BOX		
Manufacturer MUIRHEAD		Part No. D 801D		Cost/Date £250.00 1978
Height 12.9 cm	Width 36.8 cm	Depth 10.5 cm	Weight 2.27 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 10468



1. Description

This instrument operates as a potential divider in which the total resistance presented to the input is kept constant. The switches are so designed that as resistance is added to one side of the dividing point, an equal resistance is removed from the other side.

Dual decade switches, rotated by a common shaft, are mounted in an aluminium alloy box. The all metal enclosure gives complete electrostatic screening. The resistors have non-reactive windings and possess a good, long-term stability.

The instrument can also be used as a decade resistance box.

2. Specification

Range (Voltage Ratio): 1: 0.0001 to unity in steps of 0.0001
Input Resistance: 10 000 Ω
Accuracy: dc \pm 0.1%
Voltage: Maximum input voltage 250 V rms

3. Comprising

Instrument only.

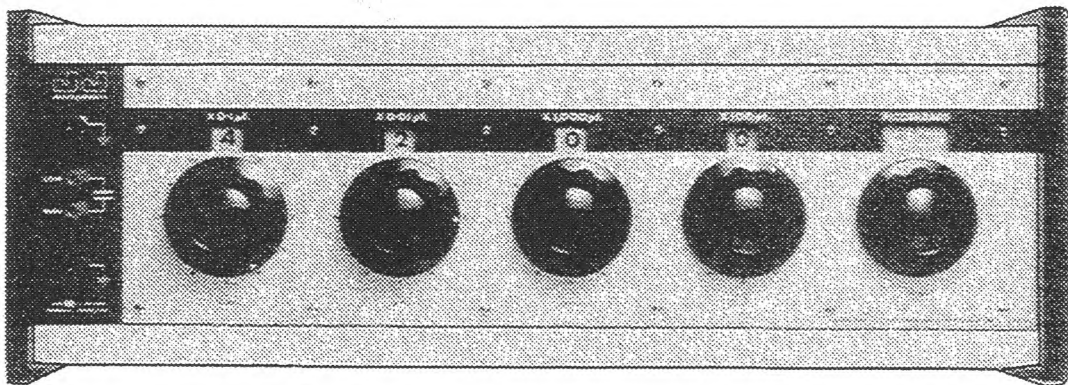
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference: 10S/4957821		Nomenclature: DECADE CAPACITANCE BOX		
Manufacturer: LLOYD INSTRUMENTS		Part No: SVC5		Cost/Date: £2322/OCT 1987
Height: 208 mm	Width: 603 mm	Depth: 208 mm	Weight: -	
Power Supplies: NONE REQUIRED			Air Publication: NONE	
Availability: 2	Environment: B	Maintenance Policy: A2/D4	Calibration: AH 12	AFDEETEC No: 19395



1. Description

The instrument consists of four switched decades of sintered silver mica capacitors, coupled to an air space capacitor which is driven through a slow motion drive enabling a resolution and readability of 0.25 pF to be readily achieved on a repeatable basis. Though normally calibrated as a three terminal capacitor, the double screened case permits two terminal use with only slightly reduced accuracy.

2. Specification

Range and Accuracy:

SVC5	DECADE STEPS				VARIABLE	TOTAL RANGE
	0.1 μ F	0.01 μ F	0.001 μ F	100 pF	50-150 pF	50 Pf-1.10005 μ F
Accuracy %	0.05	0.1	0.1	0.1	0.5+0.5 pF	3 Terminal
Accuracy %	0.05	0.1	0.1	0.3	0.5+1 pF	2 Terminal

2. Specification (continued)

Maximum Working Voltage:	300 V DC
Resolution:	0.5 pF
Long Term Stability:	Better than 0.03% + 0.5 pF/annum.
Capacitor Dissipation Factor:	Better than 0.0005 (at 1 kHz)
Residual Capacitance:	0.5 pF

3. Comprising

Instrument only.

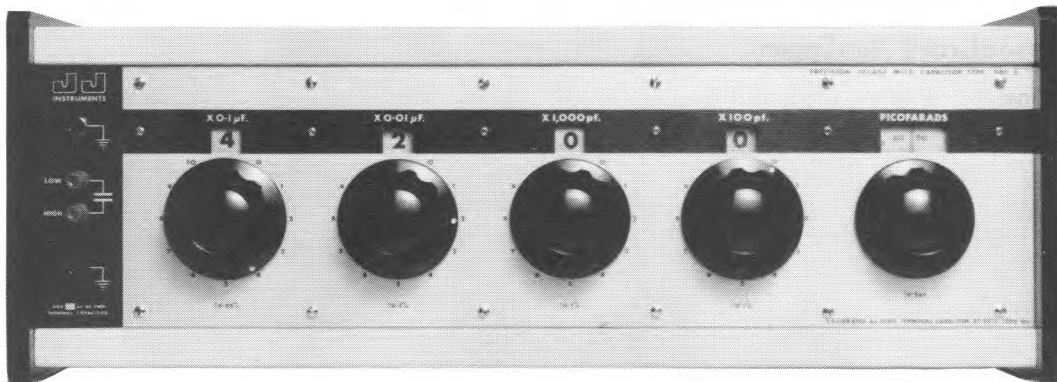
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10ZZ/212330		Nomenclature DECADE CAPACITANCE BOX		
Manufacturer LLOYD INSTRUMENTS		Part No. SVC5		Cost/Date £2322 APR 87
Height 208 mm	Width 603 mm	Depth 208 mm	Weight -	
Power Supplies NONE REQUIRED			Air Publication NONE	
Availability 2	Environment B	Maintenance Policy A2/D4	Calibration 12M/AH	AFDEETEC/AFDSEC No. 19395



1 Description

The instrument consists of four switched decades of sintered silver mica capacitors, coupled to an air space capacitor which is driven through a slow motion drive enabling a resolution and readability of 0.25 pF to be readily achieved on a repeatable basis. Though normally calibrated as a three terminal capacitor, the double screened case permits two terminal use with only slightly reduced accuracy.

2 Specification

Range and Accuracy:

SVC5	DECADE STEPS				VARIABLE	TOTAL RANGE
	0.1 μ F	0.01 μ F	0.001 μ F	100 pF	50-150 pF	50 pF-1.10005 μ F
Accuracy %	0.05	0.1	0.1	0.1	0.5+0.5 pF	3 Terminal
Accuracy %	0.05	0.1	0.1	0.3	0.5+1 pF	2 Terminal

2 Specification (Continued)

Maximum Working Voltage:	300 V dc
Resolution:	0.5 pF
Long Term Stability:	Better than 0.03% + 0.5 pF/annum
Capacitor Dissipation Factor:	Better than 0.0005 (at 1 kHz)
Residual Capacitance:	0.5 pF

3 Comprising

Instrument only

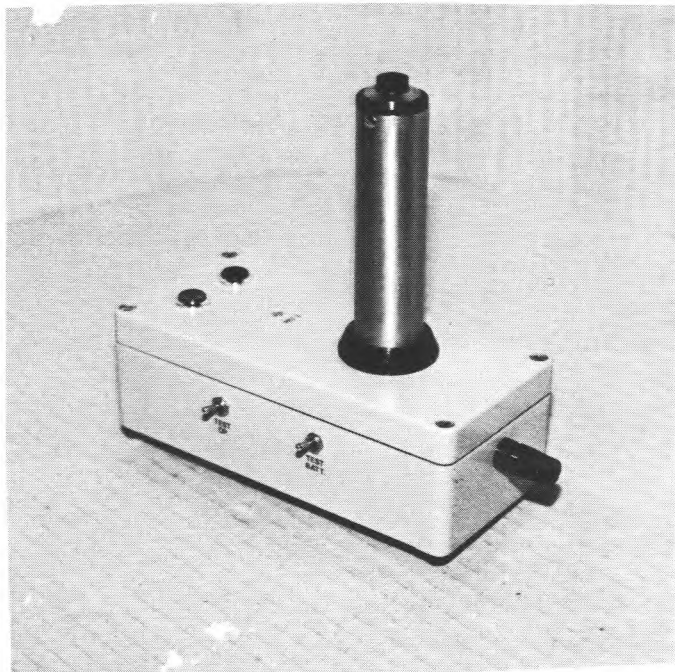
4 Accessory Items

None

5 Associated Equipment

None

Section Reference 5G/2522317		Nomenclature PERSONNEL RESISTANCE TESTER		
Manufacturer ALGO INSTRUMENT SERVICES LTD		Part No. PRT 2		Cost/Date £550 1989
Height 17 cm Ground Plate 45.5 cm x 30 cm	Width 6.5 cm	Depth 16.5 cm	Weight 2 kg (Inc Ground Plate)	
Power Supplies 9 VOLT dc (BATTERY)			Air Publication TBN	
Availability 2	Environment B	Maintenance Policy 1A/2B/4CD	Calibration CH/12M	AFDEETEC/AFDSEC No. 19409



1 Description

The Personnel Resistance Tester PRT2 is designed for checking the electrical resistance of personnel, wearing conductive shoes, in explosive testing and assembling departments and in locations where a high concentration of explosive vapours are present. The shoes permit the harmless discharge of static electricity from the body and so eliminate the risk of fire and explosion which might otherwise result.

The PRT2 comprises an aluminium case on which is mounted an insulated chromium plated metal handle. The handle incorporates a momentary switch which operates the tester. The handle forms one side of the resistance testing circuit which is completed via a metal earthplate connected to the earthplate terminal on the tester. The tester incorporates two additional momentary switches for checking the operation of the PRT2 and the state of the battery. Two LEDs are provided to indicate if the measured resistance is above or below 1 M Ω .

2 Specification

Green LED lit if body resistance is less than 1 M Ω .

Red LED lit if body resistance is greater than 1 M Ω .

Battery test, Green LED lit above 7 volts and Red LED lit if below.

3 Comprising

Personnel Resistance Tester

Metal Earthplate

4 Accessory Items

Battery PP3 9 volt

6135-99-9496083

5 Associated Equipment

None

Section Reference 10S/1222371		Nomenclature EARTH BONDING TESTER		
Manufacturer LUCAS BRADLEY ELECTRONICS		Part No. 1671 M		Cost/Date £803/89
Height 220 mm	Width 200 mm	Depth 150 mm	Weight 2 kg	
Power Supplies 4 x AA size Batteries			Air Publication TBN	
Availability 2	Environment C	Maintenance Policy B2/D4	Calibration TBN	AFDEETEC/AFDSEC No. 19421



1 Description

The Earth Bonding Tester is a small, portable instrument that enables the accurate measuring of low resistances in a hostile environment. It employs 4 wire resistance measurement techniques and is designed to provide immunity from thermal emf's and contact potentials. Layout of the controls permits easy operation in the protective carrying case, which is fitted with a carrying strap which enables it to be used hung around the neck leaving both hands free. Additionally the carrying case provides stowage for the wide range of test leads.

The test set utilizes a low frequency ac measurement principle. The ac signal is applied to the resistance under test by 2 source wires and is monitored by 2 sense wires which feed an amplifier. After amplification the signal is filtered and rectified before being fed to a 3.5 digit LCD display. Power to the test set is provided by 4 AA size batteries and a low battery condition annunciator is fitted which indicates when 90% of battery life has been consumed. The instrument is activated by a push button ON switch but incorporates a timer circuit which automatically switches it OFF after 4 minutes. Additionally, backlighting for the LCD display is operated by a push switch.

It should be noted that the 50 metre accessory lead has significant inductance which varies according to how it is deployed. A zero adjustment is therefore provided to trim out this offset which can be up to 4 m Ω .

2 Specification

Ranges:	000.0 to 199.9 m Ω	resolution 0.1 m Ω
	0.000 to 1.999 Ω	resolution 0.001 Ω
	00.00 to 19.99 Ω	resolution 0.01 Ω
	000.0 to 1999.9 Ω	resolution 0.1 Ω

Accuracy: + or -1% of reading + or -1 digit

Maximum Applied Voltage: Instrument designed so as not to exceed 1 volt

Applied test current: 3.5 micro-amps to 3.5 milli-amps dependent upon range selected

Battery Life: 56 hours

Operating Temperature: -20° C to +60° C

Storage Temperature: -40° C to +60° C

3 Comprising

Earth Bonding Instrument	Pt No	1671M	Qty 1
Test Lead - Small Kelvin Clip		162612-A2	Qty 2
Test Lead - Large Kelvin Clip		162613-A2	Qty 1
Test Lead - Probe		162609-A2	Qty 2
Extension Lead 5 Metre		162614-A2	Qty 1
Operator Handbook		162645	Qty 1
Carrying Case		162648-A2	Qty 1

4 Accessory Items

Extension Lead 50 Metre	Pt No	162620-A2	10S/9730399
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5 Associated Equipment

None

Section Reference 6C/1998743		Nomenclature DECADE CAPACITOR, VARIABLE			
Manufacturer J.J. INSTRUMENTS		Part No. PV 2		Cost/Date £150.00 1978	
Height 14.0 cm	Width 33.0 cm	Depth 20.3 cm	Weight -		
Power Supplies -			Air Publication None		
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFT... -	



1. Description

The instrument consists of a single air-spaced capacitor which is fitted with a slow motion dial calibrated directly in picofarads. An additional single decade is incorporated to extend the range.

2. Specification

Range: 20 to 1100 pF.
 Accuracy: At 20°C ± 0.5% or 0.5 pF whichever is greater
 Maximum Voltage: 500 V dc
 Resolution: 0.5 pF

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 6C/10195		Nomenclature BOX VOLTAGE DIVIDER		
Manufacturer CROYDEX PRECISION INST.		Part No. RBG 4		Cost/Date £130.00 1978
Height 11.4 cm	Width 40.6 cm	Depth 15.2 cm	Weight 5.0 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 10595



1. Description

This instrument operates as a potential divider in which the total resistance presented to the input is kept constant. The switches are so designed that as resistance is added to one side of the dividing point, an equal resistance is removed from the other side.

2. Specification

Input Resistance: 1000 Ω

Number of Decades: 4

Range (Voltage Ratio): 1 : 0.0001 in steps of 0.0001

Accuracy: dc 0.05%

Voltage: Maximum input voltage 100 V rms

3. Comprising

Instrument only.

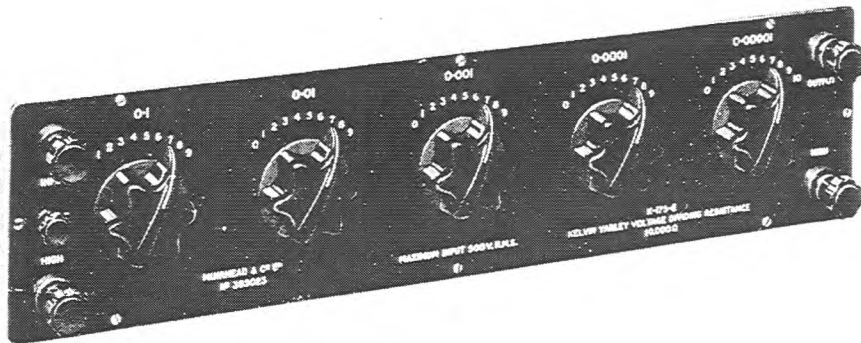
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 6C/4370327		Nomenclature PRECISION VOLTAGE DIVIDER		
Manufacturer MUIRHEAD		Part No. K 175-E1		Cost/Date £250.00 1978
Height 12.9 cm	Width 44.0 cm	Depth 10.5 cm	Weight 2.6 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/24	AFDEETEC/AFDSEC No. 10641



1. Description

This instrument operates as a potential divider in which the total resistance presented to the input is kept constant. The switches are so designed that as resistance is added to one side of the dividing point, an equal resistance is removed from the other side.

2. Specification

Input Resistance: 100 k Ω

Number of Decades: 5

Range (Voltage Ratio): 1 : 0.0001 in steps of 0.00001

Accuracy: Dials (dc)
 0.1 and 0.01 \pm 0.01%
 0.001 and 0.0001 \pm 0.05%
 0.00001 \pm 0.2%

Voltage: Maximum input voltage 750 V rms

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-99-9563049		Nomenclature TESTER CIRCUIT CONTINUITY			
Manufacturer MPE LTD		Part No. TRANTEST MK 4		Cost/Date £12.00 1978	
Height 13.9 cm	Width 6.9 cm	Depth 3.8 cm	Weight 0.18 kg		
Power Supplies Battery 1.5 V (5J/1994776)				Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFDEETEC/AFDSEC No. 12406	



1. Description

This instrument is specifically designed for qualitative testing of continuity in electrical circuits. The discriminatory characteristics of the device are obtained by the use of a circuit arrangement wherein the resistive value of a conductor under test (this comprising the circuit across which the probes are connected) may be assessed in relation to a pre-determined value to which the unit has been adjusted by the user. This discrimination may be in the range 1.0Ω to 20Ω , in standard units. When the resistance of the circuit under test exceeds the pre-set value the unit will not produce the audible 'pass' signal. On this basis such circuit defects as 'dry joints', poor contacts or actual discontinuities may readily be detected by use of the instrument.

2. Specification

Discrimination: Adjustable in the range 0.1 Ω to 5 Ω

Sensitivity: 0.1 Ω

AC Test Signal: Maximum 50 mV across probes

3. Comprising

Instrument with probes attached.
Case

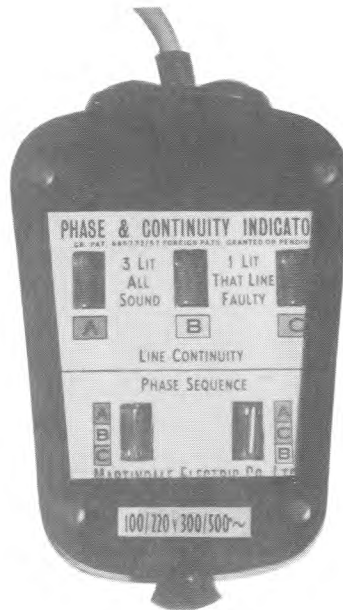
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 5G/1022589		Nomenclature PHASE AND CONTINUITY INDICATOR TYPE 2			
Manufacturer MARTINDALE		Part No. PC 8700/400		Cost/Date £20.00 1978	
Height 8.9 cm	Width 6.3 cm	Depth 1.9 cm		Weight 12.0 kg	
Power Supplies -				Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFDEETEC/AFDSEC No. None	



1. Description

The instrument is contained in a robust plastic case with transparent front. The three neon tubes in the top row indicate continuity and the two in the bottom row indicate phase sequence.

2. Specification

Voltage Range: 100 V to 220 V
Frequency Range: 300 Hz to 500 Hz

3. Comprising

The indicator is supplied with a 36 inch length of three-cored cable terminated in crocodile clips.

Three detachable probes.

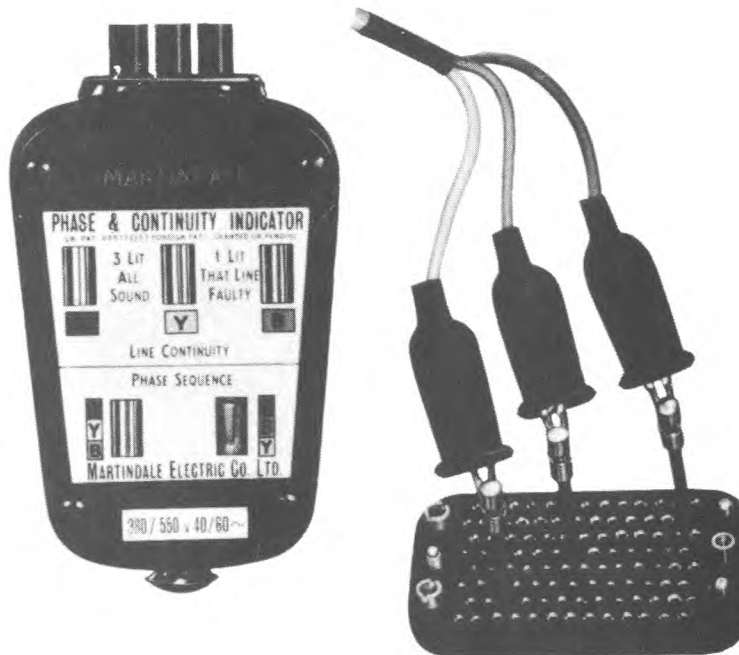
4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 5G/ID22589		Nomenclature PHASE AND CONTINUITY INDICATOR TYPE 2		
Manufacturer MARTINDALE		Part No. PC 8700/400		Cost/Date £20.00 1978
Height 8.9 cm	Width 6.3 cm	Depth 1.9 cm	Weight 12.0 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration CNR	AFDEETEC/AFDSEC No. None



1. Description

The instrument is contained in a robust plastic case with transparent front. The three neon tubes in the top row indicate continuity and the two in the bottom row indicate phase sequence.

2. Specification

Voltage Range: 100 to 220 V

Frequency Range: 300 Hz to 500 Hz

3. Comprising

The indicator is supplied with a 36 inch length of three-cored cable terminated in crocodile clips.

Three detachable probes.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 10S/6625-00-0610225		Nomenclature RF VECTOR IMPEDANCE METER		
Manufacturer HEWLETT PACKARD		Part No. 4815A		Cost/Date £2440.00 1978
Height 17.5 cm	Width 42.55 cm	Depth 50.17 cm	Weight 17.6 kg	
Power Supplies 105-125 V, 210-250 V; 50-400 Hz			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 18861



1. Description

The 4815A RF Vector Impedance Meter is a versatile instrument that provides fast, direct reading measurements of impedance and phase angle over the frequency range 500 kHz to 108 MHz. It has continuous tuning over this frequency range and does not require balancing or data interpretation, therefore, it is useful for the evaluation of the complex impedance of both active circuits and components. An internal LC oscillator, operating over the range from 500 kHz to 108 MHz, supplies a low-level excitation signal to the circuit under test through a convenient probe attached to a 5 ft cable. A unique sampling AGC loop maintains the excitation constant at 4 μ A. At the same time, the voltage response of the test circuit is sensed and converted by a second sampling channel, located within the same probe, to read out directly in impedance. A phase detector monitors the difference between the voltage and current channels to the phase angle of the impedance vector. Therefore one probe excites the test circuit and measures its impedance and phase angle.

Where impedance must be determined over a band of frequency, the 4815A may be swept manually or electronically at rates up to 1 MHz per second by an external sweep oscillator. An analogue output of frequency and phase angle are provided so that these values may be recorded on an X-Y recorder.

A front panel monitor output allows the internal 500 kHz to 108 MHz oscillator in the 4815A to be monitored with a frequency counter or other frequency measuring device. This output may be also used as a general purpose oscillator, since it provides excellent stability, reasonable power output, and extremely low microphonism.

For direct measurement of inductors and capacitors, the frequency dial can be accurately set to either the 1.592 or 15.92 MHz point. At these frequencies, the impedance magnitude meter reads directly in the numerical value of L or 1/C, with range and frequency determining the correct placement of the decimal point. Values of C ranging from 0.1 pF to 0.1 μ F and L from 0.01 μ H to 10 mH may be measured by this technique.

2. Specification

Frequency:

Range: 500 kHz to 108 MHz in five bands:
500 kHz to 1.5 MHz, 1.5 to 4.5 MHz,
4.5 to 14 MHz, 14 to 35 MHz, 35 to 108 MHz

Accuracy: $\pm 2\%$ of reading, $\pm 1\%$ of reading at 1.592 MHz and 15.92 MHz.

RF Monitor Output: 100 mV minimum into 50 Ω .

Impedance Magnitude Measurement:

Range: 1 Ω to 100 k Ω in nine ranges:
10 Ω , 30 Ω , 100 Ω , 300 Ω , 1 k Ω , 3 k Ω , 10 k Ω ,
30 k Ω , 100 k Ω .

Accuracy: $\pm 4\%$ of full scale $\pm \left(\frac{f}{30 \text{ MHz}} + \frac{Z}{25 \text{ k}\Omega} \right) \%$
of reading, where f = frequency in MHz and Z is in ohms; reading includes probe residual impedance.

Calibration: Linear meter scale with increments 2% of full scale.

Phase Angle Measurement:

Range: 0 to 360 $^{\circ}$ in two ranges:
0 \pm 90 $^{\circ}$, 180 $^{\circ}$ \pm 90 $^{\circ}$.

Accuracy: $\pm \left(3 + \frac{f}{30 \text{ MHz}} + \frac{Z}{50 \text{ k}\Omega} \right)$ degrees; where f = frequency in MHz and Z is in ohms.

Calibration: Increments of 2°

Adjustments: Front panel screwdriver adjustments for
Magnitude and Phase Zero.

3. Comprising

<u>Ref No</u>	<u>Nomenclature</u>	<u>Part No</u>
N7R	Instrument	4815A
N7R	Probe	00600A

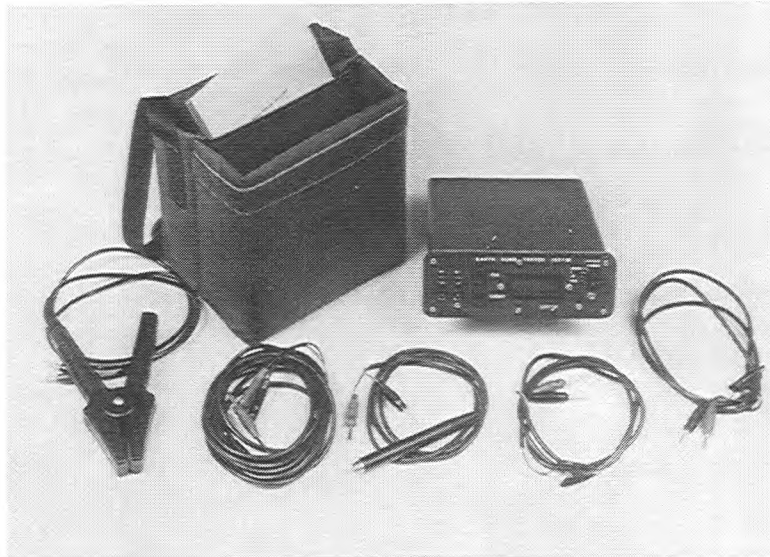
4. Accessory Items

None

5. Associated Equipment

None

Section Reference 10S/1222371		Nomenclature EARTH BONDING TESTER		
Manufacturer LUCAS BRADLEY ELECTRONICS		Part No. 1671 M		Cost/Date £803/89
Height 220 mm	Width 200 mm	Depth 150 mm	Weight 2 kg	
Power Supplies 4 x AA size Batteries			Air Publication TBN	
Availability 2	Environment C	Maintenance Policy B2/D4	Calibration AH12M	AFDEETEC/AFDSEC No. 19421



1 Description

The Earth Bonding Tester is a small, portable instrument that enables the accurate measuring of low resistances in a hostile environment. It employs 4 wire resistance measurement techniques and is designed to provide immunity from thermal emf's and contact potentials. Layout of the controls permits easy operation in the protective carrying case, which is fitted with a carrying strap which enables it to be used hung around the neck leaving both hands free. Additionally the carrying case provides stowage for the wide range of test leads.

The test set utilizes a low frequency ac measurement principle. The ac signal is applied to the resistance under test by 2 source wires and is monitored by 2 sense wires which feed an amplifier. After amplification the signal is filtered and rectified before being fed to a 3.5 digit LCD display. Power to the test set is provided by 4 AA size batteries and a low battery condition annunciator is fitted which indicates when 90% of battery life has been consumed. The instrument is activated by a push button ON switch but incorporates a timer circuit which automatically switches it OFF after 4 minutes. Additionally, backlighting for the LCD display is operated by a push switch.

It should be noted that the 50 metre accessory lead has significant inductance which varies according to how it is deployed. A zero adjustment is therefore provided to trim out this offset which can be up to 4 m Ω .

2 Specification

Ranges:	000.0 to 199.9 m Ω	resolution 0.1 m Ω
	0.000 to 1.999 Ω	resolution 0.001 Ω
	00.00 to 19.99 Ω	resolution 0.01 Ω
	000.0 to 1999.9 Ω	resolution 0.1 Ω

Accuracy: + or -1% of reading + or -1 digit

Maximum Applied Voltage: Instrument designed so as not to exceed 1 volt

Applied test current: 3.5 micro-amps to 3.5 milli-amps dependent upon range selected

Battery Life: 56 hours

Operating Temperature: -20° C to +60° C

Storage Temperature: -40° C to +60° C

3 Comprising

Earth Bonding Instrument	Pt No	1671M	Qty	1
Test Lead - Small Kelvin Clip		162612-A2	Qty	2 10S/5512115
Test Lead - Large Kelvin Clip		162613-A2	Qty	1 10S/7606695
Test Lead - Probe		162609-A2	Qty	2 10S/2442864
Extension Lead 5 Metre		162614-A2	Qty	1 10S/2999742
Operator Handbook		162645	Qty	1 10S/4616996
Carrying Case		162648-A2	Qty	1 10S/0511523

4 Accessory Items

Extension Lead 50 Metre	Pt No	162620-A2	10S/9730399
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5 Associated Equipment

None

Section Reference: 6625-99-8092747		Nomenclature: CONTINUITY AND INSULATION TESTER		
Manufacturer: ROBIN		Part No: KMP 3075DL		Cost/Date:
Height: 86 mm	Width: 175 mm	Depth: 115 mm	Weight: 640 kg	
Power Supplies: 6 X 1.5V AA SIZE BATTERIES			Air Publication: NONE	
Availability: 1	Environment: C	Maintenance Policy:	Calibration: IAW 100C-50	AFDEETEC No:



1. Description

The Tester KMP 3075DL is a compact high specification digital continuity and insulation tester. The cabinet uses thememory plastics to give an enhanced look as well as durability. The design of the cabinet is such that it is an integral part of the unit. The instrument is protected in transit by its own integral lid. Microprocessor technology provides advanced functionality and maximises the user friendly aspects. In the past digital insulation testers have been renowned for the excessive scatter of digits as capacitive circuits are charging, i.e. digital flicker. These effects have been eliminated with this unit. A backlight for the display is provided in low light conditions. An additional feature of this unit is a function called 'Traclok'. This enables the unit to maintain a display of the reading after the test source voltage has been removed.

2. Specification

INSULATION RESISTANCE RANGES

KMP 3075DL

<u>Test voltage</u>	<u>250 V</u>	<u>500 V</u>	<u>1000 V</u>
Measuring range	0 - 20 M Ω 0 - 200 M Ω 0 - 2000 M Ω	0 - 20 M Ω 0 - 200 M Ω 0 - 2000 M Ω	0 - 20 M Ω 0 - 200 M Ω 0 - 2000 M Ω
Output voltage on Open circuit	250 V DC $\pm 10\%$ max	500 V DC $\pm 10\%$ max	1000 V DC $\pm 10\%$ max
Output voltage	250 V DC min at 0.25 M Ω	500 V DC min at 0.5 M Ω	1000 V DC min at 1.0 M Ω
Output current (as per BS 7671)	1 mA DC min at 0.25 M Ω	1 mA DC min at 0.5 M Ω	1 mA DC min at 1.0 M Ω
Output short circuit current	-----1.3 mA approx -----		
<u>Accuracy</u>	<u>Range</u>		
	20 M Ω	$\pm 1.5\%$ rdg +5 dgt	
	200 M Ω	$\pm 1.5\%$ rdg +5 dgt	
	2000 M Ω	$\pm 10\%$ rdg +3 dgt	

CONTINUITY RESISTANCE RANGES

Measuring ranges	0-20 Ω	0-200 Ω , 0-2000 Ω
Open circuit voltage	4 - 9 V	
Short circuit current (BS 7671)	200 mA min	
Accuracy	0-20 Ω , $\pm(1.5\%$ rdg+5 dgt), 0-200 Ω & 0-2000 Ω $\pm 1.5\%$ rdg +3 dgt)	

GENERAL

Withstand voltage	5000 V AC maximum for one minute between electrical circuit and housing case.
Overload protection	600 V AC for 30 seconds (insulation resistance ranges) 500 mA HRC ceramic fuse (continuity resistance ranges)
Safety standard	Designed to comply with the requirements of BS EN 61010-1 Cat 111, BS 4743

3. Comprising

Bag set 10S NIV	Comprising: Bag carrying complete with shoulder strap
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Section Reference: 10S/3524078		Nomenclature: PORTABLE APPLIANCE TESTER (PAT)		
Manufacturer: ROBIN ELECTRONICS		Part No: SmartPAT3000		Cost/Date:
Height: 350 mm	Width: 370 mm	Depth: 210 mm	Weight: 5 kg	
Power Supplies: 110/240 V			Air Publication: NONE	
Availability: 1	Environment: C	Maintenance Policy: C4	Calibration: IAW 100C-50	AFDEETEC No: 19600



1. Description

Under the Electricity at Work Regulations there is a requirement for all electrically operated equipment and appliances to be tested to ensure the users safety. The SmartPAT3000 Portable Appliance Tester (PAT) carries out all the requirements that are necessary for testing Class I and II appliances. It has a large digital display giving detailed test results and includes a 100 mA business equipment earth bond test and will test 110 V and 240 V appliances.

NOTE

The PAT required for European use is the SmartPAT3000G, 10S/6173854, AFDEETEC No. 19608.

2. Specification

	<u>Earth Bond</u>	<u>Business Equipment</u>	<u>P-N Continuity</u>	<u>Insulation</u>
O/C volts	7.5 V RMS	100 mV AC RMS	7.5 V AC RMS	500 V DC
Current into 0.10 ohms	26A, 8A AC RMS	-	-	-
Current into s/c	-	100 mA AC RMS	>20 mA	-
Displayed values	0.00-1.99 Ω , >2 Ω	0.00-1.99 Ω , >2 Ω	pass/fail	0.1-19.9M Ω , >20M Ω
Accuracy	\pm 10% \pm 2 dgt	\pm 10% \pm 2 dgt	-	\pm 5% \pm 2 dgt
Test time	5s	5s	5s	5s, 30s

3. Comprising

Nil

4. Accessory Items

Nil

5. Associated Equipment

Nil

Section Reference: 10S/6173854		Nomenclature: PORTABLE APPLIANCE TESTER (PAT)		
Manufacturer: ROBIN ELECTRONICS		Part No: SmartPAT3000G		Cost/Date:
Height: 350 mm	Width: 370 mm	Depth: 210 cm	Weight: 5 kg	
Power Supplies: 110/240 V			Air Publication: NONE	
Availability: 1	Environment: C	Maintenance Policy: C4	Calibration: IAW 100C-50	AFDEETEC No: 19608



1. Description

Under the Electricity at Work Regulations there is a requirement for all electrically operated equipment and appliances to be tested to ensure the users safety. The SmartPAT3000G Portable appliance Tester (PAT) carries out all the requirements that are necessary for testing Class I and II appliances. It has a large digital display giving detailed test results and includes a 100 mA business equipment earth bond test and will test 110 V and 240 V appliances.

NOTE

The PAT required for UK use is the SmartPAT3000, 10S/3524078, AFDEETEC No. 19600.

2. Specification

	<u>Earth Bond</u>	<u>Business Equipment</u>	<u>P-N Continuity</u>	<u>Insulation</u>
O/C volts	7.5 V RMS	100 mV AC RMS	7.5 V AC RMS	500 V DC
Current into 0.10 ohms	26A, 8A AC RMS	-	-	-
Current into s/c	-	100 mA AC RMS	>20 mA	-
Displayed values	0.00-1.99 Ω , >2 Ω	0.00-1.99 Ω , >2 Ω	pass/fail	0.1-19.9M Ω , >20M Ω
Accuracy	$\pm 10\%$ ± 2 dgt	$\pm 10\%$ ± 2 dgt	-	$\pm 5\%$ ± 2 dgt
Test time	5s	5s	5s	5s, 30s

3. Comprising

Nil

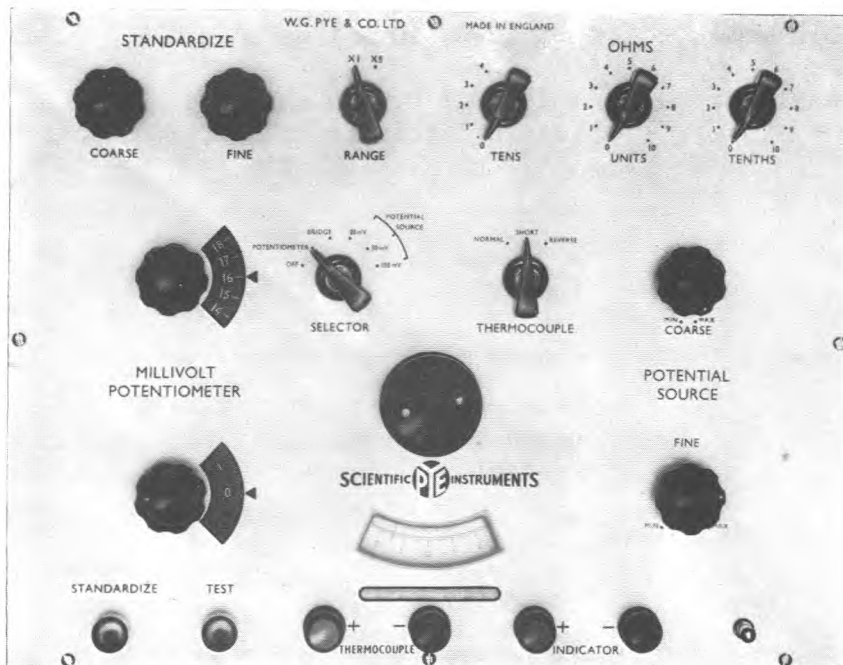
4. Accessory Items

Nil

5. Associated Equipment

Nil

Section Reference 10S/6625-99-9545656		Nomenclature TEST SET THERMOCOUPLE		
Manufacturer CAMMETRIC		Part No. 7556		Cost/Date £285.00 1978
Height 15.0 cm	Width 37.0 cm	Depth 30.5 cm	Weight 7.0 kg	
Power Supplies Internal Batteries (2 x 1.5 V Type T)			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 12363



1. Description

The Thermocouple Test Set is portable and is completely self contained combining the functions of a Wheatstone bridge/thermocouple simulator, a potential source and a dc potentiometer. Built into the set are separate batteries for the potentiometer and Wheatstone bridge, a miniature standard cell and a taut suspension pointer galvanometer with graduated scale. In addition a thermometer is incorporated to permit accurate cold-junction temperature compensation. Abridged instructions and schematic diagrams are permanently fixed inside the lid.

The most common uses of the instrument are the complete testing of thermocouple systems and the calibration of thermocouples by comparison with a standard thermocouple. The test set can also be used as a straightforward potentiometer and Wheatstone bridge.

2. Specification

Potentiometer:

Ranges: 20 mV and 100 mV

Resolution: 10 μ V on 20 mV range
50 μ V on 50 mV range

Accuracy: $\pm 0.1\%$ or $\pm \frac{1}{2}$ slidewire division whichever is the greater.

Wheatstone Bridge:

Ratio Arms: 200 Ω each

Variable Arm: 4 x 10 Ω , 10 x 1 Ω , 10 x 0.1 Ω

Accuracy: $\pm 2\%$ or $\pm 0.01 \Omega$ whichever is greater at any setting (this includes ratio arm error).

Potential Source:

Ranges: - 0.4 mV to 20 mV; - 1 μ V to 50 mV; - 2 mV to 100 mV

Controls: Coarse - 19 equal steps
Fine - continuously variable slidewire, the full sweep being equivalent to one step of the coarse control.

Built-in Galvanometer:

Sensitivity: Nominally 2 mm/ μ A

Resistance: Nominally 15 Ω

Period: Nominally 3 s

Scale: 25-0-25 mm

Levelling: Not critical

3. Comprising

Instrument only.

4. Accessory Items

None.

5. Associated Equipment

None.

Section Reference 110S/6625-00-9938843		Nomenclature INDICATOR STANDING WAVE RATIO		
Manufacturer HEWLETT PACKARD		Part No. HP 415E		Cost/Date £700.00 1978
Height 15.5 cm	Width 19.0 cm	Depth 27.9 cm	Weight 4.0 kg	
Power Supplies 115/230 V 400/50 Hz			Air Publication 117F-0901-1A3D	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEBTEC/AFDSEC No. 13066



1. Description

The instrument is a tuned amplifier/voltmeter calibrated in dB and SWR for use with square-law detectors. The 415E responds to a standard frequency of 1 kHz and is tunable by 7% for exact matching to the source frequency. A precision 60 dB attenuator ensures high accuracy when making substitution measurements. Both ac and dc outputs allow use of the 415E as a high-gain, tuned amplifier or for X-Y recorder operation.

2. Specification

Sensitivity: 0.15 μ V rms for FSD at max. bandwidth

Range: 70 dB in 10 and 2 dB steps

Input: Lo and Hi Z unbiased crystal
Lo and Hi current bolometer

Bandwidth: Variable 15 to 130 Hz

Meter Scales: SWR 1 to 4, 3.2 to 10 (norm), 1 to 1.25 (expand).
 dB 0 to 10 (norm), 0 to 20 (expand)

3. Comprising

Instrument only.

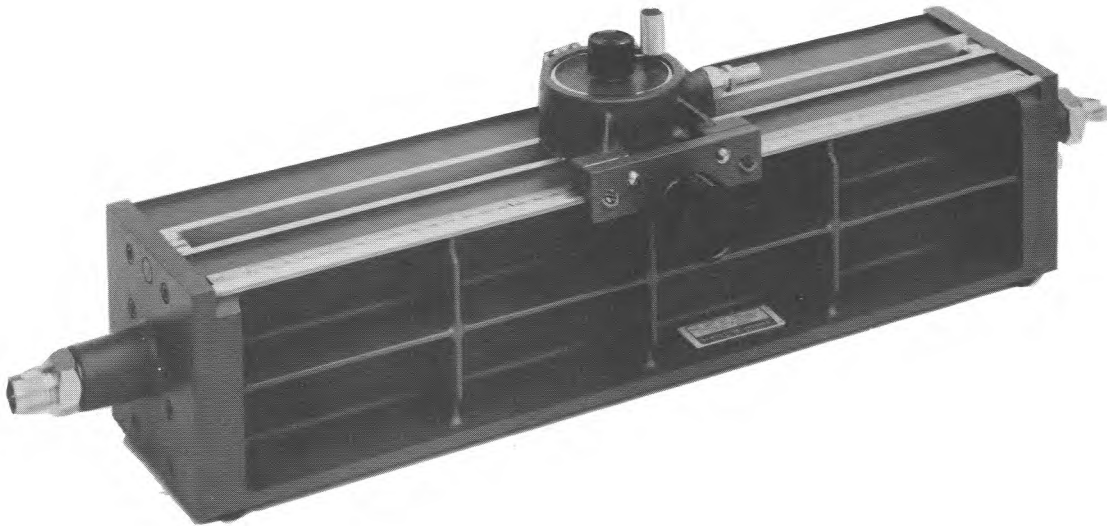
4. Accessory Items

None.

5. Associated Equipment

110B/6625-99-1142343	Slotted Line System	HP 805C (0.5 to 4 GHz)
110B/6625-99-4398100	Slotted Line System	HP 817A (1.8 to 18 GHz)

Section Reference 6625-99-1142343		Nomenclature SLOTTED LINE		
Manufacturer HEWLETT PACKARD		Part No. HP 805C		Cost/Date £950.00 1978
Height 17.8 cm	Width 57.3 cm	Depth 17.8 cm	Weight 12.1 kg	
Power Supplies -			Air Publication None	
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 12851



1. Description

The HP 805C is a complete slotted line system for use as the sampling component when making VSWR measurements. The probe circuit is tunable and depth of penetration is variable.

2. Specification

Frequency Range: 0.5 to 4 GHz
 SWR Max: 1.04
 Connector: N type

3. Comprising

6625-99-1142343 Slotted Line System HP 805C

4. Accessory Items

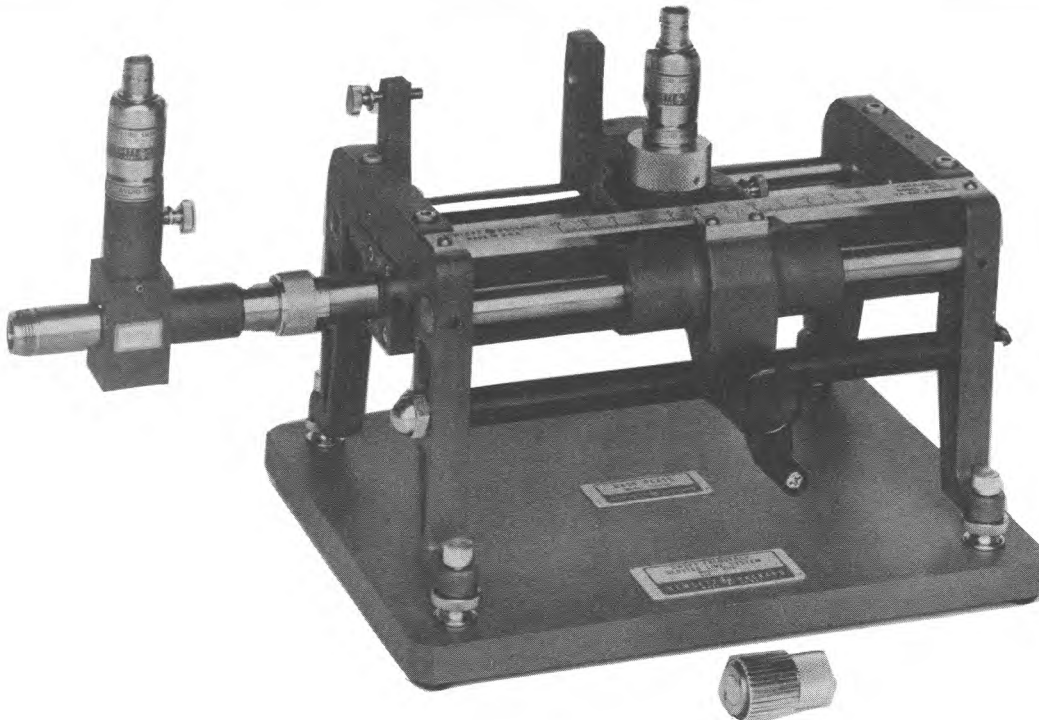
None.

5. Associated Equipment

110S/6625-00-9938843

Indicator VSWR

Section Reference 110B/6625-00-4395100		Nomenclature SLOTTED LINE SYSTEM		
Manufacturer HEWLETT PACKARD		Part No. 817A		Cost/Date £1000.00 1978
Height 17.8 cm	Width 34.3 cm	Depth 17.8 cm		Weight 9.9 kg
Power Supplies -				Air Publication None
Availability 2	Environment B	Maintenance Policy B2/D4	Calibration A/12	AFDEETEC/AFDSEC No. 18520



1. Description

The 817A consists of a slotted line system, carriage and sweep adaptor complete with two matched detectors. One of the detectors has a probe which fits into the slotted line and its depth of penetration is variable. The other detector can be connected in series with the line and used to level the signal source when making swept measurements. The probe carriage has a calibrated scale for precise positioning of the probe along the slotted line.

2. Specification

Frequency Range: 1.8 to 18 GHz

SWR Max: 1.06

Connectors: "N" female and APC-7

3. Comprising

110B/6625-00-4959930	Slotted Line	HP 816A
110B/6625-00-3047213	Carriage	HP 809C
110AD/6626-00-1963186	Sweep Adaptor	HP 448A

4. Accessory Items

If the system is required to be used with "N" type leads at both ends of the slotted line then an adaptor is required:

110B/6625-00-4636037	Adaptor APC-7 to "N" type	HP 11525A
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5. Associated Equipment

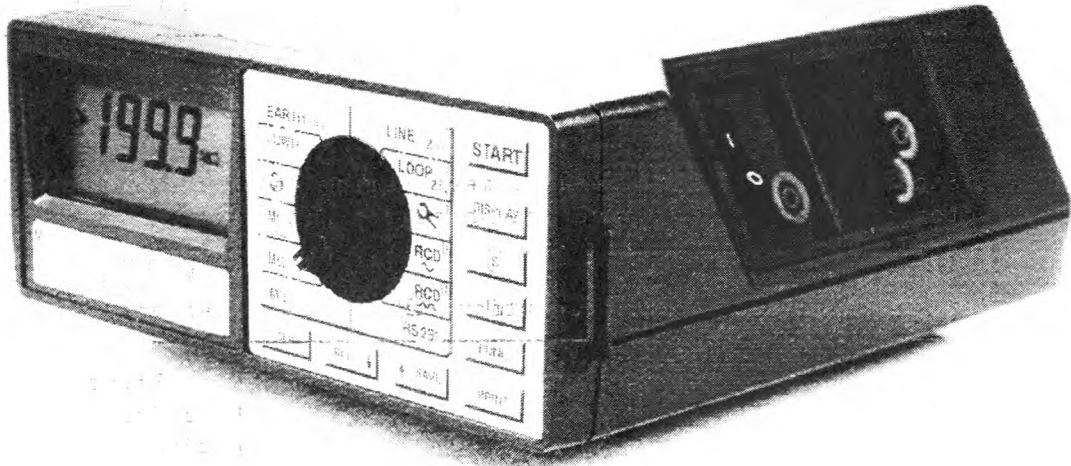
110S/6625-00-9938843	VSWR Indicator	HP 415E
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Section Reference: 10S/6625-99-7308912		Nomenclature: INSTALLATION TESTER		
Manufacturer: METRIX ELECTRONICS PLC		Part No: MX4900		Cost/Date: £547/JULY 98
Height: 85 mm	Width: 230 mm	Depth: 220 cm	Weight: 1.6 kg (INSTRUMENT ONLY)	
Power Supplies: 4 x 1.5 V IEC R14 cells			Air Publication: MANUFACTURER'S HANDBOOK	
Availability: TBN	Environment: TBN	Maintenance Policy: TBN	Calibration: TBN	AFDEETEC/AFDSEC No: TBN



1. Description

The MX4900 is a comprehensive, portable, multi-function electrical installation tester designed to IEC EN 61010-1 and Low Voltage Directive safety standards.

2. Specification

a. Two-wire continuity test of protective conductor and potential equalizing conductor LOW Ω :

Range (Ω):	Resolution (Ω):	Accuracy:
0 to 20.0	0.01	$\pm 2\%R+2d$

b. Two-, three- or four-wire ground resistance measurement:

Range (Ω):	Resolution (Ω):	Accuracy:
0 to 19.99	0.01	$\pm 2\%R+2d$
20.0 to 199.9	0.1	$\pm 2\%R+2d$
200 to 1999	1	$\pm 2\%R+2d$

c. Insulation resistance measurement of electric installation using measuring voltage 250 V, 500 V, 1000 V:

Range ($M\Omega$):	Resolution ($K\Omega$):	Accuracy:
0 to 1.999	1	$\pm 2\%R+2d$
2.00 to 19.99	10	$\pm 2\%R+2d$
20.0 to 199.9	100	$\pm 2\%R+2d$

d. Measurement of effective (RMS) value of AC voltage:

Range (V):	Resolution (V):	Accuracy:
0 to 500	1	$\pm 2\%R + 2d$

e. Measurement of frequency:

Range (Hz):	Resolution (Hz):	Accuracy:
14.0 to 99.9	0.1	$\pm 0.1\%R + 2d$
100 to 499	1	$\pm 0.1\%R + 2d$

f. Short-circuit loop impedance measurement between the phase and neutral conductor or between the phase and phase conductor and short-circuit calculation f, ZPN, PP, IK:

Range (Ω):	Resolution (Ω):	Accuracy:
0 to 1.999	0.001	$\pm 2\%R + 16d$
2.00 to 19.99	0.01	$\pm 2\%R + 2d$
20.0 to 199.9	0.1	$\pm 2\%R + 2d$
200 to 1999	1	$\pm 2\%R + 2d$

g. Fault loop impedance measurement between the phase and protective conductor and short circuit current calculation f, ZPE, IK:

Range (Ω):	Resolution (Ω):	Accuracy:
0 to 1.999	0.001	$\pm 2\%R + 16d$
2.00 to 19.99	0.01	$\pm 2\%R + 2d$
20.0 to 199.9	0.1	$\pm 2\%R + 2d$
200 to 1999	1	$\pm 2\%R + 2d$

h. Three phase sequence: L1, L2, L3 or L'2, L1, L3

i. Measurement of disconnection time $t_{\Delta N}$ of ordinary and selective current protection switches (RCD), contact voltage U_B and earth resistance R_E with an AC or DC load, RCD, RCD/DC, RCDs, RCD/DCs:

Range $t_{\Delta N}$ (ms):	Resolution (ms):	Accuracy:
0 to 199.9 ($21\Delta N$, $51\Delta N$)	0.1	$\pm 2\%R + 2ms$
200 to 1999 ($1\Delta N$, $0.51\Delta N$)	0.1 (1 if $t > 200$ ms)	$\pm 2\%R + 2ms$

j. Contact voltage U_B : U_B lim: 25 V or 50 V

Range U_B (V):	Resolution (V):	Accuracy:
0 to 100	0.1	+10%/-0% (of U_B lim)

k. Earth resistance RE:

Range RE(Ω):	Resolution (Ω):	Accuracy:	1 Δ N (mA)
10 to 10k	10	$\pm 10\% - 0\% \pm \text{resolution}$	10
3.3 to 3.33k	3.3	$\pm 10\% - 0\% \pm \text{resolution}$	30
1 to 1000	1	$\pm 10\% - 0\% \pm \text{resolution}$	100
0.33 to 333	0.33	$\pm 10\% - 0\% \pm \text{resolution}$	300
0.2 to 200	0.2	$\pm 10\% - 0\% \pm \text{resolution}$	500
0.1 to 100	0.1	$\pm 10\% - 0\% \pm \text{resolution}$	1000

1. Measurement of disconnection current 1 Δ , disconnection time t Δ at the disconnection current and contact voltage UB at the disconnection current RCD, RCD/DC:

(1) Disconnection current, 1 Δ :

Range 1 Δ (mA)	Resolution (mA):	Accuracy:
(0.5 to 1.4) 1 Δ N	0.1 1 Δ N	0.15 1 Δ N

(2) Disconnection time, t Δ at the disconnection current:

Range t Δ (ms):	Resolution (ms):	Accuracy:
0 to 500	0.1 (1 if t > 200 ms)	$\pm (2\%R + 2 \text{ ms})$

(3) Contact voltage UB at the disconnection current: UB lim 25 V or 50 V

Range UB (V):	Resolution (V):	Accuracy:
0 to 100	0.1	$\pm 10\% / -0\%$ (of UB lim)

3. Comprising

a. Tester, Electrical Installation (Bag 1 of 2), part of 10S/6625-99-7308912 (see illustration at top of next page)

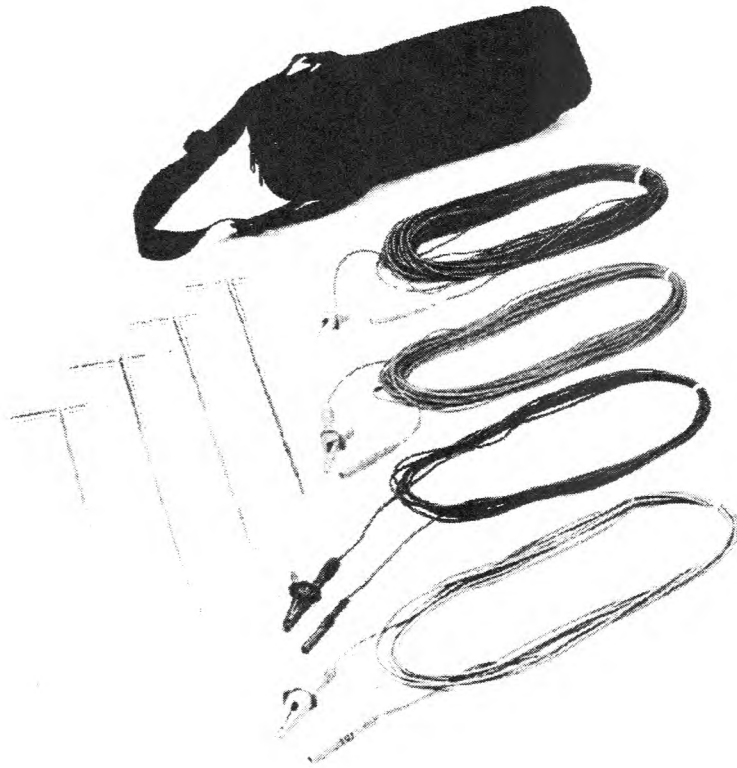
Item	Ref No	Qty
Tester, electrical installation	10S/6625-99-1311863	1
Bag, carrying	10S/6625-99-3354955	1
Cable, mains plug (3 x banana)	10S/6625-99-5938702	1
Lead, banana 2 m (banana black)	10S/6625-99-8326593	1
Lead, banana 2 m (banana green)	10S/6625-99-6239525	1
Lead, banana 2 m (banana blue)	10S/6625-99-8326624	1
Test prod (black)	10S/6625-99-3020597	1
Test prod (blue)	10S/6625-99-2448773	1
Crocodile clip (black)	10S/6625-99-3020599	1
Crocodile clip (blue)	10S/6625-99-8700525	1
Crocodile clip (green)	10S/6625-99-3020598	1
Battery, 1.5 V	R14 type	4



Tester, Electrical Installation (Bag 1 of 2)

b. Tester, Electrical Installation (Bag 2 of 2), Earth Test Kit, part of 10S/6625-99-7308912 (see illustration at top of next page)

Item	Ref No	Qty
Bag, carrying	10S/6625-99-2193565	1
Earth spike	10S/6625-99-7232999	4
Lead, banana, 5 m (crocodile black)	10S/6625-99-0758934	1
Lead, banana, 5 m (crocodile green)	10S/6625-99-8111810	1
Lead, banana, 15 m (crocodile red)	10S/6625-99-5914035	1
Lead, banana, 25 m (crocodile blue)	10S/6625-99-3961463	1



Tester, Electrical Installation (Bag 2 of 2)

4. Accessory Items

Nil

5. Associated Equipment

Nil