

# Test Equipment Solutions Datasheet

Test Equipment Solutions Ltd specialise in the second user sale, rental and distribution of quality test & measurement (T&M) equipment. We stock all major equipment types such as spectrum analyzers, signal generators, oscilloscopes, power meters, logic analysers etc from all the major suppliers such as Agilent, Tektronix, Anritsu and Rohde & Schwarz.

We are focused at the professional end of the marketplace, primarily working with customers for whom high performance, quality and service are key, whilst realising the cost savings that second user equipment offers. As such, we fully test & refurbish equipment in our in-house, traceable Lab. Items are supplied with manuals, accessories and typically a full no-quibble 2 year warranty. Our staff have extensive backgrounds in T&M, totalling over 150 years of combined experience, which enables us to deliver industry-leading service and support. We endeavour to be customer focused in every way right down to the detail, such as offering free delivery on sales, covering the cost of warranty returns BOTH ways (plus supplying a loan unit, if available) and supplying a free business tool with every order.

As well as the headline benefit of cost saving, second user offers shorter lead times, higher reliability and multivendor solutions. Rental, of course, is ideal for shorter term needs and offers fast delivery, flexibility, try-before-you-buy, zero capital expenditure, lower risk and off balance sheet accounting. Both second user and rental improve the key business measure of Return On Capital Employed.

We are based near Heathrow Airport in the UK from where we supply test equipment worldwide. Our facility incorporates Sales, Support, Admin, Logistics and our own in-house Lab.

All products supplied by Test Equipment Solutions include:

- No-quibble parts & labour warranty (we provide transport for UK mainland addresses).
- Free loan equipment during warranty repair, if available.
- Full electrical, mechanical and safety refurbishment in our in-house Lab.
- Certificate of Conformance (calibration available on request).
- Manuals and accessories required for normal operation.
- Free insured delivery to your UK mainland address (sales).
- Support from our team of seasoned Test & Measurement engineers.
- ISO9001 quality assurance.

Test equipment Solutions Ltd  
Unit 8 Elder Way  
Waterside Drive  
Langley  
Berkshire  
SL3 6EP

T: +44 (0)1753 596000  
F: +44 (0)1753 596001

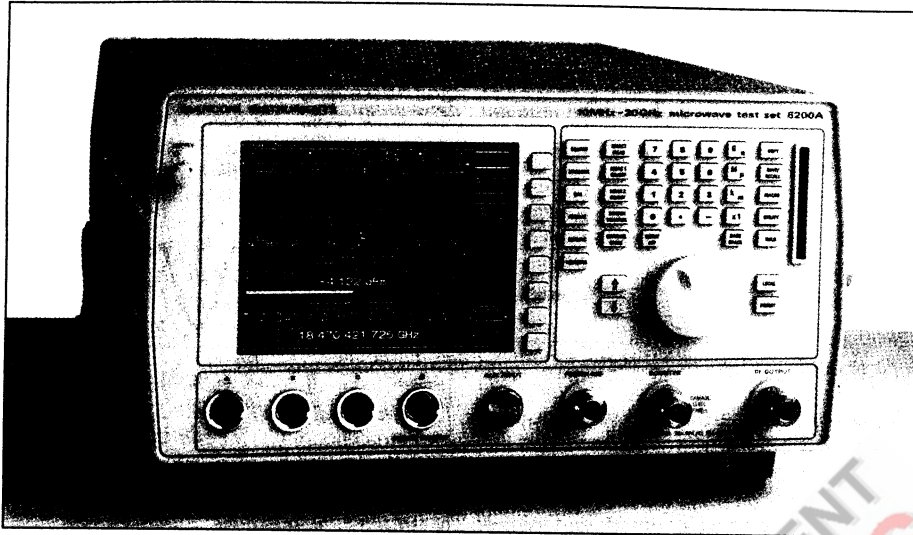
Email: [info@TestEquipmentHQ.com](mailto:info@TestEquipmentHQ.com)  
Web: [www.TestEquipmentHQ.com](http://www.TestEquipmentHQ.com)



# Microwave Test Set

## Microwave Test Set

## 6200A series



- Many instrument functions in one unit
- Economical, Compact and Portable
- 8 GHz, 20 GHz, 26.5 GHz and 46 GHz versions
- Synthesized Sweep Generator
- Four input Scalar Analyzer
- Color Liquid Crystal Display
- Accurate power measurement
- Integral frequency counter
- Real time Fault Location with high resolution
- Programmable V/I source for component evaluation
- 70 dB Sweep Generator step attenuator options
- Ideal for development, production and maintenance
- Memory card for increased storage capacity
- 6210 Reflection Analyzer for precision reflection coefficient and time domain measurements

6200A series Microwave Test Set (MTS) is an innovative instrument combining many measurement functions in a compact and portable package. The high specification and its portability makes it equally suitable for both bench and field applications.

The introduction of the 6200A series MTS enhances the product range with a new color liquid crystal display and additional measurement features.

6200A is more flexible than an assembly of discrete instruments, it is a total test system. In a single unit the facilities of a precision synthesized sweep generator, four-input scalar analyzer with color display, power meter, frequency counter and programmable voltage/current source are combined.

Integration provides a new breadth of measurement functions at a lower cost than an assembly of discrete instruments, with the added benefit of enhanced ease of use. An example is transmission line fault location for locating faults in antenna feeders and sub-systems.

Four versions of the MTS are available; 6200A covers 10 MHz to 20 GHz, 6201A

covers 10 MHz to 8 GHz, 6203A covers 10 MHz to 26.5 GHz and 6204A has full coverage from 10 MHz to 46 GHz. A 70 dB step attenuator option available on most versions provides synthesized outputs over a wide amplitude range.

### System Integration

System integration of many functions improves ease of use. A keyboard is used for rapid selection of mode and parameters and soft keys and menus are used for function selection. The user is prompted to make the required selection. Help messages are used to guide and assist.

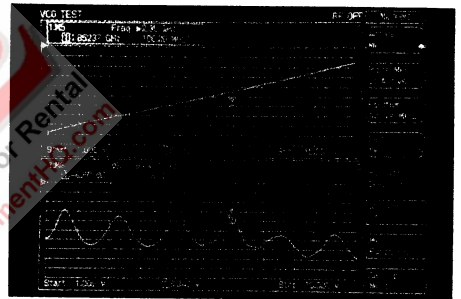
A sophisticated Man-Machine Interface using innovative soft key labels and intuitive menu structures ensure rapid assimilation and fast operation. Macros can be written to simplify complex procedures and speed up operation.

### Multi Facility

A major advantage of an integrated test set is the ability to characterize devices in many different and novel ways. In addition to swept frequency response and return

loss a power sweep capability is available. Using the step attenuator a sweep over 80 dB may be made to fully characterize amplifiers.

The programmable voltage/current source may be used to stimulate devices such as PIN diode attenuators and voltage controlled oscillators (VCOs). The vertical and horizontal axes can display different parameters. The stimulus frequency, power or voltage can be displayed on the horizontal axis and the response is displayed on the vertical axis. Attenuation values against frequency can therefore be viewed for a PIN attenuator under different bias conditions, or the frequency characteristic of a VCO can be measured, as a function of applied voltage.



Voltage/current output port used to characterize a VCO automatically. The upper trace shows frequency against voltage, the lower trace plots the power variation.

### SYNTHESIZED SWEEP GENERATOR

- Rapid sweeps with synthesizer precision
- Up to +11 dBm levelled power
- Low harmonics and spurious
- Levelled accuracy typically  $\pm 0.5$  dB
- Step attenuator options
- Excellent source match
- Power sweeps up to 80 dB

The MTS incorporates a fast fully synthesized sweep generator which combines the speed and convenience of an analog sweep generator with the precision of a synthesized sweep.

Fast step times coupled with high frequency stability ensures that even narrow filters can be measured with accuracy and confidence. A 400 point sweep can be made in less than 200 ms allowing interactive tuning without compromising accuracy.

Both start/stop and center/span sweep modes may be used as well as CW mode for spot frequency measurements. Power level is settable over a 40 dB range with a maximum typical power of +11 dBm. With the step attenuator (option 001), amplitudes down to -90 dBm may be set for the characterization of amplifiers and other active devices.

## 6200A series

Fundamental frequency generation to 26.5 GHz gives low level spurious signals. Low harmonics of typically less than -40 dBc between 2 and 26.5 GHz are achieved. Spurious signal generation is kept to a low level.

Self-calibration of the output power of the sweep generator is possible because the MTS also incorporates a power meter. Two 'user calibration' stores can be used to give power calibration points over a selected frequency range.

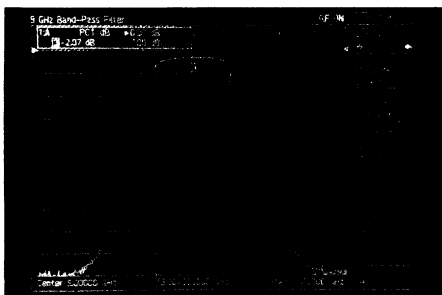
The levelled accuracy of typically  $\pm 0.5$  dB to 26.5 GHz and a superior source match means that a second live detector may be omitted for many swept frequency applications.

### SCALAR ANALYZER

- Four inputs
- High accuracy
- High resolution color display
- Up to 90 dB dynamic range
- Excellent overall linearity
- AC and DC detection
- Eight markers

The four-input scalar analyzer with a clear high resolution color display has a dynamic range of up to 90 dB. Eight markers provide detailed trace examination. Both AC and DC detection modes are provided. Two auto-scaling display channels, each capable of displaying up to two swept measurements, are available.

The channels may be coupled together for the simultaneous update of up to four traces. Each trace can have a different amplitude scale. The channels can be uncoupled so that one displays a different frequency range, allowing simultaneous display of pass-band and stop-band characteristics along with dual amplitude and frequency scales.



One channel frequency response display. Overall response is displayed at 7 dB/division, pass-band ripple is displayed with a scale of 0.10 dB/division.

Intelligent markers and automatic pass/fail analysis against user-entered limit lines assist screen interpretation. The markers may be set to a specific frequency or they can automatically make an 'N-dB'

bandwidth search. Delta, search left, search right functions are also available as well as maximum and minimum find, 'peak-to-peak' and limit checking.

To aid in analysis both averaging and smoothing are provided. Frequency scaling is also available to assist when measuring multipliers and dividers. Frequency offset mode gives the true frequency readout when evaluating mixers.

### VOLTAGE CURRENT SOURCE

- Programmable source to characterize components and devices
- Voltage range -15 V to +15 V
- Current range -150 mA to +150 mA

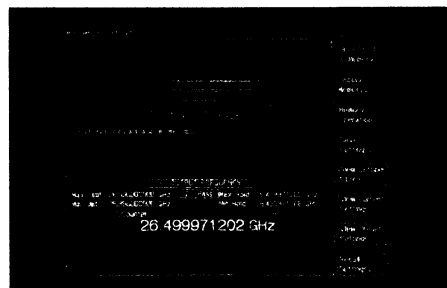
The programmable voltage/current source increases the range of applications so that devices such as VCOs, PIN modulators and amplifiers can be characterized at fixed or swept voltages and currents.

### POWER METERS

- Wide dynamic range, -70 dBm to +35 dBm
- Wide frequency coverage, 30 kHz to 40 GHz
- Analog peaking indicator
- Maximum/minimum hold
- Range of 12 power sensors available
- Linearity correction improves accuracy
- Four digit resolution

The fourth input of the scalar analyzer can alternatively be used as a power sensor input. Any of the Marconi Instruments 6900 series power sensors can be connected to permit power measurements over a wide range of powers and frequencies. Power range is -70 dBm (100 pW) to +35 dBm (3 W), frequency range is 30 kHz to 40 GHz. The sensors have an excellent match to minimise mismatch errors.

A 50 MHz internal calibrator port is provided on the front panel to ensure precise power measurements. Full calibration factor and linearity correction is incorporated to further ensure very high accuracy.



Simultaneous measurement of power and frequency.

An analog peaking meter is provided in addition to the four digit display to assist when tuning and peaking. The user can select from 2 to 4 digits of resolution to optimise the response time. The maximum/minimum hold function has many applications including long-term drift monitoring. Upper and lower limits may be entered for automatic pass/fail indication to assist with set-up and adjustment.

### FREQUENCY COUNTER

- 6200A: 10 MHz to 20 GHz
- 6201A: 10 MHz to 20 GHz
- 6203A/6204A: 10 MHz to 26.5 GHz
- Provides both swept and readout response
- Frequency offset facility
- Maximum/minimum hold for drift analysis
- Automatic limit checking

The frequency counter has two principal functions within the MTS. When 'Readout' mode is selected a digital readout of frequency is given. Resolution can be set from 1 Hz to 100 MHz in decade steps to give the optimum compromise between counter gate time (speed) and resolution. In swept mode the counter is used to read and then display the frequency graphically. The vertical axis of the display can be set to record the frequency of a device under test; a typical application is automatic VCO characterization whereby frequency against voltage is automatically plotted.

Maximum/minimum hold for long term drift monitoring is provided for power measurements as well as automatic pass/fail indication against limits.

### FAULT LOCATION

- Real time processing gives rapid fault analysis
- Fault Location measurements from 10 mm to 25 km
- Accuracy 0.1% of range
- High resolution
- Integrated Test Head for convenient connections
- Optional Transmission Line Database for fast measurement setup

The real-time Fault Location capability makes field repair of coaxial and waveguide antenna feeders quick and economical. A display of return loss or VSWR against distance is given to locate the position and magnitude of discontinuities.

Fault Location operates by analyzing the interference patterns generated when signals reflected from impedance discontinuities are combined with a reference signal. A rapid and clear display of return loss against distance is given. Accuracy is 0.1% of range up to 1 km.

Waveguides are analyzed using a non-

# Microwave Test Set

## 6200A series

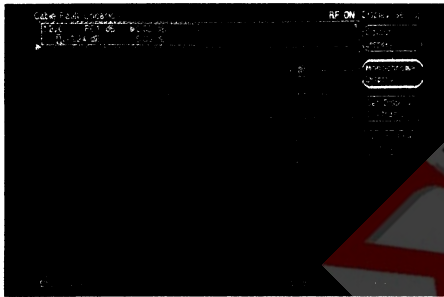
linear sweep to totally eliminate the effects of dispersion so that waveguide results are as fast and clear as for coaxial cable.

Closely spaced faults can be determined so that even loose contacts within a bulkhead connection can be pin-pointed.

The MTS Fault Location has a simple user-interface to allow measurements to be made with little training. It is ideal for microwave and cellular radio operators for antenna feeder measurements. Military applications include fault location on aircraft Electronic Warfare systems and on board ship.

The optional Transmission Line Database contains the necessary parameters for the majority of current waveguide and coaxial medium. This enables rapid instrument setup without the need to refer to manufacturer's datasheets.

The accuracy and resolution makes Fault Location also applicable to laboratory applications since short range discontinuities spaced just a few millimetres apart can also be analyzed using this powerful technique.



*Fault location software clearly and precisely locates faults in cable and waveguides.*

A range of Transmission Line Test Heads and Fault Location Test Heads (6581/6583 series) are available covering to either 20 GHz or 26.5 GHz with coverage extending to 40 GHz to simplify connection to the device under test. A divider and a detector are incorporated in the heads as well as an optional return loss bridge for evaluation after the fault has been repaired. The heads are supplied in a carrying case for ease of transportation.

Scalar analyzer detectors are required for swept frequency measurements. Three detectors are available for use with the MTS. 6230 has an N type connector and is specified for measurements to 20 GHz, 6233 has a 3.5 mm connector and is specified to 26.5 GHz whilst 6234 incorporates a 2.92 mm connector and operates to 46 GHz.

The detectors are self-identifying when connected to the MTS allowing the

appropriate linearity correction data to be applied automatically. The detectors can also be temperature corrected.

Return loss bridges or 'Autotesters' are available for the swept measurement of return loss. Versions are available covering to 40 GHz with a choice of connectors.

A power sensor is required if the power meter function is to be used. A range of twelve sensors are listed in the Accessories section, they cover from 30 kHz to 40 GHz with a choice of power range and connector type.

### Operational Ease

Integrating many instruments into one assembly has many advantages. Connecting leads between discrete instruments are eliminated. A further major advantage is that only one common control and display is required.

Many techniques are used to speed up both initial assimilation of the MTS and subsequent routine operation. The soft keys are labelled to guide the operator, the shape of the boxes around the soft key labels indicates the class of operation.

Whenever data needs to be entered a 'Dialogue Box' appears to prompt the user. Should data be entered incorrectly an error message is generated which can give useful hints or advice.

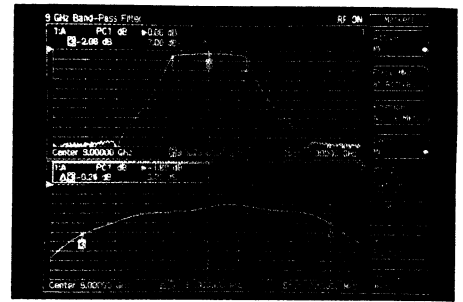
Programming the MTS over the GPIB has also been simplified. Mnemonics are easy to learn since natural language abbreviations are used. GPIB complies with IEEE 488.2.

The six primary function keys provide a logical approach to making measurements. The SOURCE key defines the stimulus to be applied, MEASURE allows the measurement to be defined, CAL provides a means for calibrating out systematic errors, FORMAT selects an appropriate format, SCALING allows choice of reference level and scaling and MARKERS permits detailed examination of measurement.

One or two channel operation is available, in addition 1 or 2 measurements can be selected per channel.

In two channel mode two separate gratitudes, each capable of displaying up to two traces, can be selected. Alternatively up to four digital readouts are available. Power and frequency can be simultaneously displayed for example, or the power sensor can be used at the same time as the scalar analyzer to give high accuracy gain compression measurements.

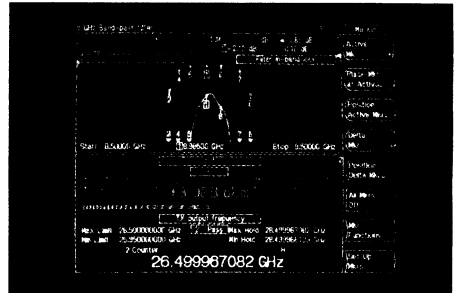
Hard copies of all measurements can be easily obtained either on any compatible HPGL GPIB plotter or any Epson FX series



*Uncoupled mode provides two swept measurement channels with different frequency scales and two vertical scales for comprehensive filter evaluation.*

parallel printer using the COPY key. Control settings, limit lines and measured traces can be saved using the SAVE/RECALL key. The memory card provides additional storage to assist in de-skilling operator actions or to archive results.

Ten complete front panel settings and four traces can be saved using the internal non-volatile memory. The UTILITY key provides access to service, diagnostics and various ancillary functions not required for routine operation.



*In dual channel mode two scalar measurements and two readout measurements can be displayed.*

### Macros

The Macro facility allows the operator to write procedures to simplify and automate measurement tasks. A sequence of key presses and on-screen operator prompts can be stored either in the internal memory or on a memory card. Instructions and messages are generated using the integral TEXT function.

The enhanced Macro capability of the 6200A allows for branching and looping within a macro plus the ability to edit and amend existing macros.

A typical Macro would initially set up the instrument by recalling instrument settings from memory and then display text to guide the user to make the appropriate connections. On completion of each task the operator is asked to press a 'continue' key. Limit lines can be recalled from

# 6200A series

memory to give simple automatic pass/fail results. Pauses can be included so that activities such as averaging can be concluded before the next stage of the Macro is executed. This innovative technique speeds up measurement procedures, reduces operator training and minimises error.

## Wide Ranging Applications

6200A Series Microwave Test Set has applications throughout the microwave measurement field. For measurements in development it is ideal since so little bench space is taken up. Measurement accuracy is not compromised and the performance is superior to larger and more expensive sweeper systems. A power meter and counter are always conveniently available.

In production the MTS is ideal for assembly, test and quality control measurements. The memory card and macro facilities assist in speeding up and de-skilling measurement tasks and the sophisticated GPIB implementation allows for full integration into an ATE.

For installation and commissioning engineers the MTS is an ideal measurement tool combining a wide range of facilities in a compact and portable unit. Sub-systems, filters and feeders can be readily characterized by measuring frequency response and return loss. Field maintenance and repair is also an ideal application for the MTS. Fault Location measurements permit the rapid and precise location of feeder and connector problems.



## SYNTHESIZED SWEEP GENERATOR

### FREQUENCY

#### Range

6200A: 10 MHz to 20 GHz.  
6201A: 10 MHz to 8 GHz.  
6203A: 10 MHz to 26.5 GHz.  
6204A: 10 MHz to 46 GHz.

#### Resolution

0.01 to 26.5 GHz: 1 Hz.  
26.5 GHz to 46 GHz: 2 Hz.

#### CW Accuracy

<±50 Hz ± Frequency standard accuracy to 26.5 GHz  
<±100 Hz ± Frequency standard accuracy to 46 GHz.

#### Typical Sweep Accuracy

Step Time	Frequency	
	Up to 2 GHz	>2 GHz
250 µs	<5 kHz	<100 kHz
1 ms	<500 Hz	<1.5 kHz
10 ms	<50 Hz	<50 Hz

## POWER

### 6200A/6201A/6203A standard

Frequency range (GHz)	Power-levelled (dBm)	
	Guaranteed	Maximum typical
0.01 to 2	-10 to +7	+11
2 to 8	-10 to +6	+8
8 to 18	-10 to +5	+10
18 to 20	-10 to +5	+8
20 to 26.5	-10 to +4	+8

### 6204A

Frequency range (GHz)	Power-levelled (dBm)	
	Guaranteed	Maximum typical
0.01 to 2	-10 to +6	+10
2 to 8	-10 to +5	+8
8 to 18	-10 to +5	+8
18 to 20	-10 to +5	+6
20 to 26.5	-10 to +3	+6
26.5 to 40	-10 to 0	+2
40 to 46	-10 to -3 typical	-1

### 6200A/6201A/6203A + option 001 (step attenuator)

Frequency range (GHz)	Power-levelled (dBm)	
	Guaranteed	Maximum typical
0.01 to 2	-80 to +5	+9
2 to 8	-80 to +4	+6
8 to 18	-80 to +3	+7
18 to 20	-80 to +2	+5
20 to 26.5	-80 to +1	+4

For option 002 (Field replaceable RF connector) guaranteed output is reduced by 0.5 dB.

#### Settable power range

Standard: -20 dBm to +20 dBm.

With option 001: -90 dBm to +20 dBm.

#### Resolution

0.01 dB.

#### Power Sweep range

(From maximum levelled power)

Option 001 not fitted:

0.01 to 26.5 GHz >25 dB.  
26.5 to 40 GHz >10 dB.  
40 to 46 GHz >7 dB typical.  
With option 001: >80 dB.

## INTERNAL LEVELLING

### Accuracy (including flatness at 0 dBm)

#### 6200A/6201A/6203A/6204A standard and option 002 if fitted

0.01 to 26.5 GHz: <±1 dB, ±0.5 dB typical.  
26.5 to 40 GHz <±1.5 dB, ±0.7 dB typical.  
40 to 46 GHz <±3.0 dB typical.

Linearity: <±0.5 dB over guaranteed levelled power range.

#### 6200A/6201A/6203A with option 001 (including option 002 if fitted)

10 MHz to 8 GHz: <±1 dB ±0.3 dB ±2% of attenuator setting in dB.  
8 GHz to 26.5 GHz: <±1 dB (±1 dB or ±4% of attenuator setting in dB, whichever is greater).

## EXTERNAL LEVELLING

Via rear panel BNC input socket.

Accepts signals from a detector (positive or negative) or from the analog output of a power meter (0 to ±1 V). Accuracy depends on levelling technique.

## POWER STABILITY WITH TEMPERATURE

Typical values following power calibration at operating temperature. Self-calibration with a Power Sensor removes temperature effects.

### 6200A/6201A

0°C to 20°C <0.02 dB/°C.  
20°C to 40°C <0.04 dB/°C.  
40°C to 50°C <0.08 dB/°C.

### 6203A

0°C to 20°C <0.1 dB/°C.  
20°C to 30°C <0.08 dB/°C.  
30°C to 50°C <0.06 dB/°C.

### 6204A

Frequency	Power levelled (dBm)	
	Guaranteed	Maximum typical
Up to 2 GHz	<0.12 dB/°C	<0.05 dB/°C
20°C to 20°C	<0.15 dB/°C	<0.05 dB/°C
30°C to 50°C	<0.08 dB/°C	<0.06 dB/°C

## SIGNAL PURITY

### Harmonics

0.01 to 2 GHz <-27 dBc, -35 dBc typical  
2 to 8 GHz <-35 dBc, -40 dBc typical  
8 to 26.5 GHz <-40 dBc, -50 dBc typical  
26.5 to 40 GHz <-20 dBc typical.

## Sub-harmonics

2 to 26.5 GHz None.  
26.5 to 40 GHz <-40 dBc typical.

## Spurious signals, typical

Frequency range (GHz)	25 kHz to 150 kHz		150 kHz to >1 MHz	
	Guaranteed	Maximum typical	Guaranteed	Maximum typical
0.01 to 2 GHz	<-50 dBc	<-60 dBc	<-60 dBc	<-60 dBc
2 to 8 GHz	<-50 dBc	<-50 dBc	<-60 dBc	<-60 dBc
8 to 26.5 GHz	<-50 dBc	<-60 dBc	<-60 dBc	<-60 dBc
26.5 to 40 GHz	<-40 dBc	<-50 dBc	<-50 dBc	<-50 dBc

## Phase noise

Typical values measured in 1 Hz bandwidth at 20 kHz offset from the carrier in CW mode.

0.01 to 2 GHz <-90 dBc/Hz.  
2 to 8 GHz <-78 dBc/Hz.  
8 to 12 GHz <-74 dBc/Hz.  
12 to 20 GHz <-70 dBc/Hz.  
20 to 26.5 GHz <-67 dBc/Hz.  
26.5 to 40 GHz <-57 dBc/Hz.

## Residual FM

In 100 kHz bandwidth in CW mode:  
0.01 to 2 GHz <1 kHz peak.  
2 to 26.5 GHz <(500F) Hz peak.  
26.5 to 46 GHz <(1000F) Hz peak.  
F is the frequency in GHz.

## OUTPUT CONNECTOR

### Type

6200A/6201A: Precision N (female), 50 Ω.  
6203A: MPC (Marconi Precision Connector) 3.5 mm (female), 50 Ω.  
6204A: Precision 2.92 mm (female) 50 Ω.  
Option 002: Field replaceable, 50 Ω precision 3.5 mm (female) and N-type (female) – not for 6204A.

### Reverse input power

100 mW maximum.

### Source Match (Internally levelled) 6200A/6201A/6203A

Frequency Range (GHz)	VSWR	Return Loss (dB)	
		Minimum	Typical
0.01 to 0.05	<1.45:1	>15	>17
0.05 to 2	<1.11:1	>26	>33
2 to 8	<1.2:1	>21	>30
8 to 12	<1.35:1	>16.5	>25
12 to 26.5	<1.45:1	>15	>20

### 6204A

0.01 to 40 <1.93:1 >10 >12  
40 to 46 >10 >10

With option 001 minimum return loss specification degrades by up to 5 dB.

With option 002 minimum return loss specification degrades by up to 3 dB.

## VOLTS/GHZ

Voltage proportional to frequency available from rear panel BNC Voltage/Current output.

Range: 1 V/GHz or 0.5 V/GHz selectable (20 V maximum in 1 V/GHz mode).

Linearity: ±15 mV.

## PROGRAMMABLE VOLTAGE/ CURRENT SOURCE

### VOLTAGE OUTPUT

Range: -15 V to +15 V.

Resolution: 1 mV.

Accuracy: <±15 mV.

Total power supplied not to exceed 2.5 W.

### CURRENT OUTPUT

Range: -150 mA to +150 mA.

Resolution: 10 µA.

Accuracy: <±300 µA.

### Stability with temperature

10 µA/°C.

Total power supplied not to exceed 1.25 W.

## OUTPUT CONNECTOR

Rear panel BNC.

## SCALAR ANALYZER

### NUMBER OF INPUTS

Four (A, B, C and D).

### DETECTION MODES

AC and DC.

# 6200A series

## DYNAMIC RANGE

AC detection: 85 dB (-65 to +20 dBm),  
90 dB typical (-70 to +20 dBm).  
DC detection: 80 dB (-60 to +20 dBm).

## MEASUREMENT POINTS

User selectable from 2 to 1601.

## NUMBER OF CHANNELS

Two channels, two measurements may be made per channel allowing a total of four simultaneous measurements.

## SWEEP TIME

**Settable range**  
40 ms to 500 s.

## Measurement times

401 points: <200 ms.  
1601 points: <800 ms.

## DIRECT VOLTAGE INPUT RANGE

Input A, B and C 0 V to -4.5 V.  
Input D 0 V to -9 V.

## NOISE REDUCTION

### Averaging

1 to 1000 (applied per measurement).

### Smoothing

Aperture settable from 0.01 to 20% of span, resolution 0.01%.

## CALIBRATION

**Path calibration (Normalization) types**  
Through, short/open, short.

## INSTRUMENTATION ACCURACY

±0.05%.

## SYSTEM ACCURACY

Refer to individual specifications for Detectors and Return Loss Bridges.

## FAULT LOCATION

### DISTANCE

#### Units

Metres or feet.

#### Accuracy

<0.1% of range or 3 mm, whichever is the larger (for a single fault up to 1 km range).

#### Full scale

Up to 25 km depending on cable or waveguide loss.

#### Minimum resolution

For two equal amplitude discontinuities using maximum sweep width.

6200A:  $1.82 \times V_r$  cm.

6201A:  $4.54 \times V_r$  cm.

6203A:  $1.37 \times V_r$  cm.

6204A:  $0.91 \times V_r$  cm.

Where  $V_r$  is the relative velocity.

## DYNAMIC RANGE

Detection	Frequency	
	To 26.5 GHz	26.5 to 40 GHz
AC	80 dB	>40 dB typical.
DC	70 dB	>40 dB typical.

## MEASUREMENT TIME (401 POINTS)

Normal mode: <250 ms.  
Enhanced mode: <500 ms.

## NUMBER OF MEASUREMENT POINTS

User selectable from 51 to 512.

## POWER METER

### FREQUENCY RANGE

30 kHz to 40 GHz, dependent upon sensor used.

### POWER RANGE

-70 dBm (100 pW) to +35 dBm (3 W), dependent upon sensor used.

## INSTRUMENTATION ACCURACY

<±0.05%.

## CORRECTION

### Calibration Factor

Range: 0.01 to 200%.  
Resolution: 0.01.

### Linearity Factor

Range: 0.1 to 15.  
Resolution: 0.1.

## POWER REFERENCE

Used for Power Sensor correction.

### Output Connector

N (female), 50 Ω. Adapters are supplied with 75 Ω MPC (Marconi Precision Connector) 3.5 mm and 2.92 mm Power Sensors.

### Frequency

50 MHz ±0.01 MHz.

### Level

1 mW.

### Uncertainty

±0.7% traceable to National Standards.

### Accuracy

±1.2% worst case for one year.

## AUTO-ZERO

### Set

Removes DC offset from signal input.

6910 Series: ±200 nW.

6920 Series: ±100 pW.

6930 Series: ±6 μW.

### Drift over one hour at constant temperature

6910 Series: ±10 nW.

6920 Series: ±100 pW.

6930 Series: ±300 nW.

## NOISE

6910 Series: ±100 nW.

6920 Series: ±100 pW.

6930 Series: ±3 μW.

## RESPONSE TIME

<100 ms.

## AVERAGING

1 to 1000 selected automatically or manually entered.

## RESOLUTION

2 to 4 digits, user selectable.

## CHART RECORDER

Rear panel voltage/current BNC output gives a voltage proportional to measured power.

### Sensitivity

0 V to 5 V: 0 V level dependent upon detector or sensor.

### Log mode

1 V per decade.

### Linear mode

Scaling dependent on detector or sensor.

## FREQUENCY COUNTER

### FREQUENCY RANGE

6200A/6201A: 10 MHz to 20 GHz.  
6203A/6204A: 10 MHz to 26.5 GHz.

### RESOLUTION

#### Readout mode

1 Hz to 100 MHz, user selectable.

#### Swept mode

6 digits.

## ACCURACY

### Readout mode

< ±25 Hz ± frequency standard error.

### Swept mode

< (6 significant figures or ±100 Hz, whichever is greater) ± frequency standard error.

## TYPICAL SENSITIVITY

	6200A/6201A/6203A	6204A
25 MHz to 10 GHz	< -20 dBm	< -19 dBm.
10 GHz to 20 GHz	< -15 dBm	< -14 dBm.
20 GHz to 26.5 GHz	< -10 dBm	< -8 dBm.

## MAXIMUM INPUT LEVEL

+5 dBm.

## DAMAGE LEVEL

+27 dBm peak.

## INPUT CONNECTOR

### Type

6200A/6201A: Precision N Type (female).  
6203A/6204A: MPC (Marconi Precision Connector) 3.5 mm (female).  
Option 002: Field replaceable, 50 Ω precision 3.5 mm (female) and N-type (female).

### Input impedance

50 Ω nominal.

## FM TOLERANCE

### Readout mode

20 MHz peak to peak at 45 Hz to 10 MHz rate.

### Swept mode

1.5 MHz peak to peak at 75 Hz to 10 MHz rate.

## AM TOLERANCE

Up to 40% modulation depth for signals within the range of sensitivity and maximum input level.

## ACQUISITION TIME

### Readout mode

Typically 2 s for frequencies greater than 300 MHz, for 1 Hz resolution.

### Swept mode

Typically 50 ms per point.

## SELECTIVITY

Typically 25 dB.

## DISPLAY

### TYPE

Color active matrix TFT Liquid Crystal Display with 16.5 cm (6.5 inch) visible diagonal.  
External color monitor (VGA) output on rear panel.

## NUMBER OF CHANNELS

Two. A channel may be configured either as a swept channel for displaying traces or a readout channel for displaying read-outs of values such as power and frequency.

## NUMBER OF TRACES/READOUTS

Four. Maximum of two per channel.

## TITLES

Screen title plus individual measurement titles.  
Individual title coded to each trace/readout.

## SWEPT CHANNEL CHARACTERISTICS

The horizontal and vertical axes can be configured to display a variety of different measurements. The horizontal axes, referred to as 'Domain', may be defined to display the stimulus such as frequency, power, voltage and current. The vertical axis, referred to as 'Response', may display frequency, power and voltage.

### Domain (Horizontal axis)

#### Frequency Modes

CW, start/stop, center/span, alternate sweep.

#### Frequency Resolution

Settable to 1 Hz, displayed as six digits.

#### Frequency Offset

Frequency offset between source and display can be entered to characterize frequency changing devices such as mixers.

#### Frequency Scaling

Multiplication factor between source and display can be entered to characterize frequency multipliers and dividers.

#### Power Sweep Range

Range depends on option – refer to Synthesized Sweep Generator section.

#### Power Offset

Power offset between source and display can be entered for use when measuring amplifiers and attenuators.

# 6200A series

## Response (Vertical axis)

**Units**  
dBm, dB, pW to kW, nV to V, VSWR, Hz to GHz.

**Scaling**  
Manual auto-scale (single shot), continuous auto-scale (every sweep) or user selectable.

**Reference level position**  
Reference level may be set to any graticule line.

**Reference level value**  
-199.99 to +199.99 all units except VSWR.  
1 to 100 VSWR.

## MEASUREMENT MANIPULATION

**Scalar detector and counter inputs**  
Display live measurement.  
Display trace memory.  
Display live measurement relative to trace memory.  
Measurement hold may be applied for each trace.

**Scalar detector inputs only**  
Any input or ratio of inputs may be assigned to any one or more than one of the traces. A trace may display absolute power, power relative to a path calibration or power minus a trace memory.

**Complex limit lines**  
Four stores of 12 segments each. Each segment defines an upper and a lower limit line or point. Any store can be applied to any trace.

**Input Offsets**  
An offset in the range -99.99 to +99.99 dB in 0.01 dB steps may be applied per detector input.

## MARKERS

Eight per trace plus a separate delta marker.

### Marker functions

Marker, delta marker, minimum, maximum, search left, search right, N-dB bandwidth (with center frequency) marker tracking. Peak to peak response value and optional test against limit.

**Marker resolution**  
Domain (Horizontal)

**Frequency**  
Six digits with override to give 1 Hz resolution.

**Power**  
0.01 dB.

**Voltage**  
1 mV.

**Current**  
10 µA.

## Response (Vertical)

**Power**  
0.01 dB.

**Frequency**  
Six digits.

**Voltage**  
1 nV.

## READOUT CHANNEL CHARACTERISTICS

### RESOLUTION

**Power**  
2 to 4 digits, user selectable.

**Frequency**  
1 Hz to 100 MHz, user selectable.

**Voltage**  
Four digits.

## UNITS

**Power**  
dBm, dB, pW to kW.

**Frequency**  
Hz to GHz.

**Voltage**  
nV, µV, mV, V, kV.

## MEASUREMENT MANIPULATION

**Marker readout**  
Spot readings may be made at the domain value specified by the active marker.

## Limit checking

Upper and lower test limits may be entered.

## Relative measurement

To display the measured offset from a previously entered or measured reading.

## Max/Min hold

To display maximum and minimum values over a period of time for drift measurements.

## Duty Cycle

To display peak power given by average power measured/duty cycle. Range: 0.001 to 100%.

## Peaking Meter Display

Analog display to assist when adjusting power levels.

## Input Offsets

An offset in the range -99.99 to +99.99 dB in 0.01 dB steps may be applied per detector or sensor input.

## AUXILIARY INPUTS AND OUTPUTS

### GPIB INTERFACE

GPIB is IEEE 488.1 and 488.2 compatible. The interface has three applications:-  
- Instrument control with full talk and listen.  
- Control of a plotter using HPGL. Plotter output is buffered to permit measurements to proceed whilst plotting.  
- Control of a second MTS for mixer measurements. The instruments may be set to sweep with a fixed frequency offset between them.

### MEMORY CARD INTERFACE

For external storage of data.

### PARALLEL PRINTER OUTPUT

Compatible with any Epson FX series printer. Output is buffered to allow further measurements whilst printing.

### FREQUENCY STANDARD IN/OUT BNC

1 or 10 MHz input or 10 MHz output (nominally 2 V pk-pk into 50 Ω) selectable from front panel.

### EXTERNAL LEVELLING INPUT BNC

For connection of remote detector or power meter for source levelling.

### VOLTAGE/CURRENT OUTPUT BNC

User definable to be:

### Volts/GHz

Voltage proportional to frequency output from source.

### Fixed

Fixed voltage or current output for bias measurements.

### Swept V/I

Swept voltage or current for voltage/current domain measurements.

### Chart recorder

Voltage proportional to power level of scalar detector or power meter sensor input.

### EXTERNAL MONITOR

Output to a VGA 640x480 standard, color monitor.  
Rear panel 15 way 'high density' D type female connector.

## GENERAL

### FREQUENCY STANDARD

For synthesized sweep generator and frequency counter.

### Internal

30 MHz VCXO.

### Temperature stability

Better than ±0.15 ppm/°C.

### Ageing

Better than ±2 in 10<sup>6</sup> per year.

### External

1 or 10 MHz standard rear panel BNC input socket.

## MEMORIES

### Standard Trace memories

Four.

### Settings stores

Ten.

## Power sensor cal stores

Stores for 10 sets of Power Sensor calibration and linearity factor data.

## Memory card

Extra stores available on memory card.

## REAL TIME CLOCK

### Date and time

Used to date-stamp hard copies and to determine instrument operating hours.

## ELECTRO-MAGNETIC COMPATIBILITY

Conforms with the protection requirements of EEC Council Directive 89/336/EEC.

Complies with the limits specified in the following standards:

EN55011-1:1991 (Emissions)	CISPR11
EN50082-1:1992 (Immunity)	IEC801-2:1991
	IEC801-3:1984
	IEC801-4:1988
EN60555-2:1987 (Main Harmonics)	IEC555-2

## SAFETY

Complies with IEC 348.

## RATED RANGE OF USE

(over which full specification is met)

**Temperature**  
0 to 50°C.

## CONDITIONS OF STORAGE AND TRANSPORT

**Temperature**  
-40 to +70°C.

**Humidity**  
93% RH at 40°C.

## POWER REQUIREMENTS

### Switchable voltage ranges

115 V set: 90 to 132 V  
230 V set: 188 to 265 V.

### AC Supply

45 to 440 Hz. 500 VA maximum.

## DIMENSIONS AND WEIGHT

Height	Width	Depth
197 mm	389 mm	546 mm
7.75 in	15.3 in	21.5 in

### Weight

6200A	16 kg 35 lb
6201A	15 kg 33 lb
6203A	16.25 kg 36 lb
6204A	17 kg 37.4 lb

### Notes:

Guaranteed Power Range, Power Accuracy and VSWR are calibrated for the temperature range 0 to 50°C and are subject to the availability of National Standards.

Typical performance figures are non-warranted.

# Microwave

## Accessories for Microwave Scalar and System Analyzers

**AEROFLEX**  
A passion for performance.



The following optional accessories are designed for use with the 6200B series of Microwave Test Sets, the 6820 series Scalar Analyzers and the 6840 series Microwave System Analyzers.

The 6230A series of scalar detectors provides excellent linearity and flatness from a built-in EEPROM that allows near power meter performance. Diode linearity correction provides improved performance over a wide dynamic range.

The 6240 series of fault locators provides measurement of both return loss (VSWR) and fault location (distance to fault) from a single measuring port but where tighter specifications are required a range of autotesters with better directivity and 40 GHz frequency range is available.

Ratio measurements require a power splitter to be used and a range is available for frequencies up to 40 GHz.

Power dividers can be used for simple power division or can be operated with a scalar detector and the 6800 series to generate a low cost fault location system.

The 6146 and 6147 pulse modulators provide for external pulse modulation of all of the 6200B series and the 6820 and 6840 series. The 6146 is a high performance active pulse modulator providing fast rise and fall times with 70 dB on/off ratio over a frequency range of 500 MHz to 18 GHz. The 6147 operates from 70 MHz to 40 GHz but is a passive pulse modulator with lower on/off ratio and slower rise/fall time performance.



# 6230A/L series

## Scalar Detectors



The 6230A and 6230L series of scalar detectors have EEPROM correction for improved frequency response. Users can achieve swept power measurements with accuracy close to that achieved with a power sensor.

The 6230A series scalar detectors have typically 85 dB dynamic range (-65 dBm to +20 dBm) and are used when best sensitivity and maximum dynamic range are required. The 6230L series scalar detectors (-59 dBm to +26 dBm typically) have integral input attenuators. This provides improved input match and greater power handling capability. The 6230L series detectors should be used when measuring low loss devices, such as semi-rigid cables or when measuring high power devices such as amplifiers.

### Scalar Detectors (with EEPROM correction)

#### Ordering

Number	Version
6230A series	Standard Detectors (-65 dBm to +20 dBm) typical
6230A	10 MHz to 20 GHz, N type (m)
6232A	1 MHz to 3 GHz, N Type (m)
6233A	10 MHz to 26.5 GHz, 3.5 mm (m)
6234A	10 MHz to 46 GHz, 2.92 mm (m)
6230L series	Low VSWR Detectors (-59 dBm to +26 dBm) typical
6230L	10 MHz to 20 GHz, N type (m)
6233L	10 MHz to 26.5 GHz, 3.5 mm (m)
6234L	10 MHz to 46 GHz, 2.92 mm (m)

#### Supplied Accessories

43139/099	1.5 m DC Cable
-----------	----------------

#### Optional Accessories

43139/100	3 m DC Cable
43139/101	10 m DC Cable
43139/102	25 m DC Cable
43139/103	50 m DC Cable

Typical specifications are non-warranted.

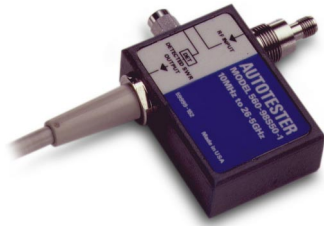
## SPECIFICATION

	6230A	6230L	6232A	6233A	6233L	6234A	6234L
Frequency Range	10 MHz to 20 GHz	10 MHz to 20 GHz	1 MHz to 3 GHz	10 MHz to 26.5 GHz	10 MHz to 26.5 GHz	10 MHz to 46 GHz	10 MHz to 46 GHz
Dynamic range							
AC detection:	-65 dBm to +20 dBm, typical -60 dBm to +20 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +26 dBm, guaranteed	-65 dBm to +20 dBm, typical -60 dBm to +20 dBm, guaranteed	-65 dBm to +20 dBm, typical 60 dBm to +20 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +26 dBm, guaranteed	-65 dBm to +20 dBm, typical -60 dBm to +26 dBm, guaranteed	-59 dBm to +26 dBm, typical -54 dBm to +26 dBm, guaranteed
DC detection:	-50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm	-50 dBm to +20 dBm, guaranteed +20 dBm	50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm	-50 dBm to +20 dBm, guaranteed +20 dBm	-44 dBm to +26 dBm, guaranteed +26 dBm
Maximum RF input VSWR							
1 to 10 MHz	-----	-----	1.43	-----	-----	-----	-----
10 to 40 MHz	1.4	1.4	1.14	1.4	1.4	1.58	1.58
40 to 100 MHz	1.15	1.1	1.14	1.15	1.1	1.15	1.15
0.1 to 2 GHz	1.12	1.1	1.14 (to 2.7 GHz)	1.12	1.1	1.12	1.1
2 to 5 GHz	1.17	1.1	1.2 (to 3 GHz)	1.17	1.1	1.33	1.1
5 to 18 GHz	1.29	1.15	-----	1.29	1.15	1.33	1.15
18 to 20GHz	1.5†	1.22†	-----	1.5	1.22	1.5	1.22
20 to 26.5 GHz	-----	-----	-----	1.5	1.22	1.5	1.22
26.5 to 33 GHz	-----	-----	-----	-----	-----	1.5	1.31
33 to 40 GHz	-----	-----	-----	-----	-----	1.95	1.31
Linearity	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total	0.2 dB/10 dB but not >0.5 dB in total
Frequency Response (EEPROM corrected)	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB	±0.2 dB (±0.4 dB >26.5 GHz)	±0.2 dB (±0.4 dB >26.5 GHz)
Connector	Precision Type N (m)	Precision Type N (m)	Type N (m)	Precision 3.5 mm (m)	Precision 3.5 mm (m)	Precision 2.92 mm (m)	Precision 2.92 mm (m)
Length	89 mm	89 mm	73 mm	80 mm	80 mm	88.5 mm	88.5 mm
Width	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm	33.5 mm
Weight	151 g	151 g	180 g	151 g	151 g	149 g	149 g

† Specifications involving Type N connectors above 18 GHz are not traceable to national standards as these do not exist at present.

†† Specifications involving 2.92 mm connectors above 40 GHz are not traceable to national standards as these do not exist at present.

# Return Loss Bridges and Autotesters



For measurement of return loss (or VSWR) with a scalar analyzer an autotester is the best solution. An autotester is an RF bridge with a built in detector. An RF bridge needs to be used with a 6230 series detector for the measurement of return loss. An autotester with the correct type and sex of test port connector should be used because

test port adapters seriously degrade directivity and hence measurement accuracy.

## Ordering Number

59999/151  
59999/158  
59999/159  
59999/152  
59999/166  
59999/168  
59999/169

## Version

10 MHz to 18 GHz 7 mm  
10 MHz to 18 GHz N (m)  
10 MHz to 18 GHz N (f)  
10 MHz to 26.5 GHz 3.5 mm WSMA (m)  
10 MHz to 26.5 GHz 3.5 mm WSMA (f)  
10 MHz to 40 GHz 2.92 mm (m)  
10 MHz to 40 GHz 2.92 mm (f)

## Supplied With

Open/Short Circuit  
Autotester adapter cable  
Return Loss Bridge 5 MHz to 2 GHz N (f)

## Optional Accessories

1.5 m Autotester adapter cable

43137/604

59999/170

43139/107

## SPECIFICATION

Model/Test Port Connector Characteristic	59999/151 GPC-7	59999/158 N (m) 59999-159 N (f)	59999/152 WSMA (m) 59999/166 WSMA (f)	59999/168 2.92 mm (m) 59999/169 2.92 mm (f)	59999/170
Frequency range	10 MHz to 18 GHz	10 MHz to 18 GHz	10 MHz to 26.5 GHz	10 MHz to 40 GHz	5 MHz to 3 GHz
Directivity					
0.01 to 18 GHz	40 dB	38 dB	40 dB	35 dB	5 MHz to 50 MHz >25 dB
18 to 26.5 GHz	N/A	N/A	38 dB	32 dB	50 MHz to 3 GHz >40 dB
26.5 to 40 GHz	N/A	N/A	N/A	30 dB	
Frequency sensitivity	±1.2 dB	±1.5 dB	±2.0 dB	±3.0 dB	
Accuracy <sup>1</sup>					
0.01 to 8 GHz	0.010 +0.06ρ <sup>2</sup>	0.013 +0.08ρ <sup>2</sup>	0.010 +0.10ρ <sup>2</sup>	0.018 +0.15ρ <sup>2</sup>	
8 to 18 GHz	0.010 +0.10ρ <sup>2</sup>	0.013 +0.12ρ <sup>2</sup>	0.010 +0.10ρ <sup>2</sup>	0.018 +0.15ρ <sup>2</sup>	
18 to 26.5 GHz	N/A	N/A	0.013 +0.12ρ <sup>2</sup>	0.025 +0.15ρ <sup>2</sup>	
26.5 to 40 GHz	N/A	N/A	N/A	0.032 +0.18ρ <sup>2</sup>	
Insertion loss <sup>2</sup>	6.5 dB Nominal	6.5 dB Nominal	6.5 dB Nominal	6.5 dB Nominal	<7.5 dB Nominal
Maximum input power	+27 dBm	+27 dBm	+27 dBm	+27 dBm	+31 dBm
Input connector	N (f)	N (f)	2.92 mm (f)	2.92 mm (f)	N (f)
Size <sup>3</sup>	76 x 50 x 28 mm	76 x 50 x 28 mm	54 x 38 x 19 mm	54 x 38 x 19 mm	115 x 51 x 29 mm
Weight	340 g	340 g	198 g	198 g	680 g

<sup>1</sup>Where ρ = measured reflection coefficient - includes directivity and test port reflection effects over the specified frequency range.

<sup>2</sup> Nominal value from input port to test port

<sup>3</sup> Excluding connectors and cable

# Power Splitters/Dividers



Three different power splitters are available with N type, 3.5 mm or 2.92 mm connectors. Power splitters are primarily intended to be used in scalar measuring systems, in a ratioing arrangement, where a reference channel is used to improve source match. Power dividers can be used as a simple accessory for single Autotesters and Bridges input fault location measurements. This technique offers less accuracy than a Test Head or Fault Locator but is an economical measurement technique.

## Power Splitters/Dividers

54311/123	Power Splitter DC to 18 GHz, Type N
54311/124	Power Splitter DC to 26.5 GHz, 3.5 mm
54311/161	Power Splitter DC to 40 GHz, 2.92 mm
54311/187	Power Divider DC to 18 GHz, Type N
54311/188	Power Divider DC to 26.5 GHz, 3.5 mm

# 6240 Series Fault Locators

The 6240 series Fault Locators provide a quick and convenient method of measuring return loss, VSWR and fault location from a single test port. Fault locators are compact and rugged making them ideal for field measurements.

Typical applications include antenna and antenna feeder testing of mobile communications base stations and waveguide feeds on microwave towers.

When used with the 6820 scalar analyzer or 6840 series microwave system analyzers the display can show simultaneously on two channels, return loss and fault location traces.

As both measurements are made from a single test port, setup time is reduced and a system can be completely characterized without the need to make repetitive reconnections.



## Fault Locators

### Ordering Numbers Versions

6242F	10 MHz to 3 GHz, N (f)
6242M	10 MHz to 3 GHz, N (m)
6240F	10 MHz to 20 GHz, N (f)
6240M	10 MHz to 20 GHz, N (m)
6243F	10 MHz to 26.5 GHz, 3.5 mm (f)
6243M	10 MHz to 26.5 GHz, 3.5 mm (m)
6241	10 MHz to 20 GHz, 7 mm

### Supplied Accessories

43138/663	1.5 m DC Cable (2 off) Open/Short Circuit (Not 6242) 50 Ω Termination
-----------	---

### Optional Accessories

43138/664	3.0 m DC Cable (2 off necessary, for use with 3.0 m RF or microwave cable)
-----------	--

### RF Ruggedized Cables for Fault Locators

54311/199	1.5 m, 3 GHz, N (m) to Right Angle N (m)
54311/200	3.0 m, 3 GHz, N (m) to Right Angle N (m)

### Microwave Ruggedized Cables for Fault Locators

54311/197	1.5 m, 20 GHz, N (m) to Right Angle N (m)
54311/198	3.0 m, 20 GHz, N (m) to Right Angle N (m)
54311/201	1.5 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)
54311/202	3.0 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)

## SPECIFICATION

	6242F (Female Test Port) 6242M (Male Test Port)	6240F (Female Test Port) 6240M (Male Test Port)	6241 (7 mm Test Port)	6243F (Female Test Port) 6243M (Male Test Port)
Frequency Range	10 MHz to 3 GHz	10 MHz to 20 GHz	10 MHz to 20 GHz	10 MHz to 26.5 GHz (usable to 40 GHz)
Fault Location	10 MHz to 3 GHz	10 MHz to 18 GHz	10 MHz to 18 GHz	10 MHz to 26.5 GHz
Return Loss	10 MHz to 3 GHz	10 MHz to 18 GHz	10 MHz to 18 GHz	10 MHz to 26.5 GHz
Test Port Connector	Type N	Type N	7 mm	3.5 mm
Input Connector	Type N female	Type N female	Type N female	3.5 mm female
Test Port Return Loss				
10 MHz to 3 GHz	20 dB	20 dB	20 dB	20 dB
3 GHz to 18 GHz	—	20 dB	20 dB	20 dB
18 GHz to 26.5 GHz	—	—	—	15 dB
Directivity				
10 MHz to 50 MHz	35 dB	35 dB	35 dB	35 dB
50 MHz to 3 GHz	38 dB	38 dB	38 dB	38 dB
3 GHz to 8 GHz	—	35 dB	35 dB	35 dB
8 GHz to 18 GHz	—	34 dB	35 dB	32 dB
18 GHz to 26.5 GHz	—	—	—	32 dB
Accuracy of return loss <sup>1</sup>				
10 MHz to 50 MHz	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>
50 MHz to 3 GHz	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>	0.013 + 0.1 ρ <sup>2</sup>
3 GHz to 8 GHz	—	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>
8 GHz to 18 GHz	—	0.018 + 0.1 ρ <sup>2</sup>	0.018 + 0.1 ρ <sup>2</sup>	0.025 + 0.1 ρ <sup>2</sup>
18 GHz to 26.5 GHz	—	—	—	0.025 + 0.18 ρ <sup>2</sup>
Insertion Loss	7 dB Nominal	7 dB Nominal	7 dB Nominal	7 dB Nominal
Max input power	+26 dBm	+26 dBm	+26 dBm	+26 dBm
Size	79 x 73 x 34 mm	79 x 73 x 34 mm	79 x 73 x 34 mm	79 x 73 x 34 mm
Weight	358 g	358 g	362 g	315 g

<sup>1</sup> Where ρ = measured reflection coefficient - includes directivity and test port reflection effects over the specified frequency range.

# 6146 and 6147

## Pulse Modulators



The 6146 Pulse Modulator is ideal for modulating RF and Microwave signals to enable testing of radar systems. Its wide frequency range of 70 MHz to 20 GHz means it can test both the RF and IF performance of the radar.

Fast rise and fall times coupled with >70 dB ON/OFF ratio ensures that the 6146 can be used to test the majority of modern radars. Modulation is controlled by a TTL input. Any suitable pulse generator can be used to drive the 6146. An integral amplifier gives the 6146 an insertion gain of 5 dB. This enhances the ability to measure the dynamic range of a radar compared with traditional pulse modulators that typically have an insertion loss up to 10 dB.

The 6146 is a small lightweight and rugged package. It can be connected directly onto the output of a signal source and has type N connectors. When used with the 6840 series Microwave System Analyzer it is powered with the accessory power supply.

The combination of a 6146 and a 6840 fitted with an internal attenuator forms the basis of an excellent solution for testing radar systems. The fundamental radar tests of minimum discernible signal, 1 dB compression and subclutter rejection are made simple.

## SPECIFICATIONS

### 6146

#### Frequency Range

500 MHz to 18 GHz

useable from 70 MHz to 20 GHz

#### ON/OFF Ratio

>70 dB from 500 MHz to 18 GHz

>35 dB 70 MHz to 200 MHz

>60 dB 200 MHz to 500 MHz

#### Rise/Fall Time

<5 ns

#### Delay Time

≤20 ns

#### Minimum Pulse Width

50 ns

#### Maximum PRF

20 MHz

#### Pulse Width Compression

≤10 ns

#### Video Breakthrough

<150 mV pk-pk 500 MHz to 18 GHz

<200 mV pk-pk 70 MHz to 500 MHz

#### Switch Generated RF

<-35 dBm from 70 MHz to 500 MHz

<-50 dBm from 500 MHz to 1 GHz

<-70 dBm from 1 GHz to 18 GHz

#### Reverse Power Damage Level

+20 dBm, ±42 V DC

#### Harmonics

≤15 dBc for >10 dBm output power

#### Power Accuracy

±1 dB after user calibration

#### Insertion Gain at +23°C

>5 dB 500 MHz to 18 GHz

Gain temperature coefficient, -0.05/°C typical

#### Minimum Output Power at +23°C

(with +5 dBm input power)

≥+8 dBm 500 MHz to 18 GHz

#### Input Damage Level

+20 dBm, ±42 V DC

#### Modulation Input Type

Standard TTL levels. BNC input for RF ON when logic level low

#### Modulation Input Impedance

>10 kΩ

#### RF Input

Connector

Type N (m) 50 Ω

Return loss

>5 dB 70 MHz to 200 MHz Typical

>8 dB 200 MHz to 18 GHz Typical

#### RF Output

Connector

Type N (f) 50 Ω

Return loss

>10 dB 200 MHz to 6 GHz Typical

>6 dB 6 GHz to 18 GHz Typical

#### Electromagnetic Compatibility

Conforms with the protection requirements of the EEC Council Directive 89/336/EEC

#### Complies with the limits specified in the following standards:

EN55011 Class B CISPR 11

EN50082-1 IEC 801-2,3,4

#### Safety

Complies to IEC 348

#### Rated Range of Use

##### Temperature

0 to +50°C

##### Humidity

Up to 93 % humidity at 40°C

#### Conditions of Storage and transport

##### Temperature

-40 to +70°C

##### Humidity

Up to 93 % humidity at 40°C

##### Altitude

Up to 4,600 meters (15,000 feet)

#### Dimensions and Weight

148 mm x 86 mm x 41 mm

400 g

#### Supply Voltages

+18 to 36 V DC, 500 mA

Available from the optional AC adapter.

### 6147

#### Frequency Range

70 MHz to 40 GHz

#### ON/OFF Ratio

>23 dB

#### Rise/Fall Time

<150 ns

#### Pulse Width Compression

<150 ns

#### Minimum Pulse Width

500 ns

#### Maximum PRF

1 MHz

#### Insertion Loss

<10 dB

#### Minimum Output Power

(with +5 dBm input power)  $\geq$  -5 dBm

#### Reverse Power Damage Level

+20 dBm,  $\pm$ 42 VDC

#### Input Damage Level

+20 dBm,  $\pm$ 42 VDC

#### Modulation Input Type

Standard TTL, BNC input for RF ON when logic level low

#### Modulation Input Impedance

>10 k $\Omega$

#### Input/Output Return Loss

7 dB typ

#### RF Input/Output Connectors

2.92 mm (f)

#### Electromagnetic Compatibility

Conforms with the protection requirements of the EEC Council Directive 89/336/EEC. Conforms with the limits specified in the follow standards.

IEC/EN61326-1: 1997 Conducted emission Class A

Radiated emission Class B. Immunity Table 1 Performance Criterion B

#### Safety

Conforms with the requirements of EEC Council Directive 73/23/EEC (as amended) and the product safety standard IEC / EN 61010-1 : 2001 + C1 : 2002 + C2 : 2003 for class 1 (or 3) portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 (or / and 1) supply.

#### Operating Temperature

0°C to +50°C

#### Dimensions and Weight

112 mm x 86 mm x 41 mm, 450g

#### Supply Voltages

+12 V DC 400 mA & -12 V DC 70 mA

Available from the optional AC adapter

### ACCESSORIES - PART NUMBER LIST

When ordering please quote the full ordering number information.

#### Ordering numbers

6146	500 MHz to 18 GHz Pulse Modulator
6147	70 MHz to 40 GHz Pulse Modulator
54441/019	AC Power Supply (for 6146 & 6147)

#### 6230A/L SCALAR DETECTORS

6230A series	Standard Detectors (-65 dBm to +20 dBm) typical
6230A	10 MHz to 20 GHz, N type (m)
6232A	1 MHz to 3 GHz, N Type (m)
6233A	10 MHz to 26.5 GHz, 3.5 mm (m)
6234A	10 MHz to 46 GHz, 2.92 mm (m)
6230L series	Low VSWR detectors (-59 dBm to +26 dBm) typical)
6230L	10 MHz to 20 GHz, N type (m)
6233L	10 MHz to 26.5 GHz, 3.5 mm (m)
6234L	10 MHz to 46 GHz, 2.92 mm (m)

#### AUTOTESTERS AND RF BRIDGE

	Autotesters
59999/151	10 MHz to 18 GHz 7 mm
59999/158	10 MHz to 18 GHz N (m)

59999/159	10 MHz to 18 GHz N (f)		
59999/152	10 MHz to 26.5 GHz 3.5 mm WSMA (m)		
59999/166	10 MHz to 26.5 GHz 3.5 mm WSMA (f)		Scalar Detector cables for use with 6240 series fault locator
59999/168	10 MHz to 40 GHz 2.92 mm (m)		
59999/169	10 MHz to 40 GHz 2.92 mm (f)	43138/663	1.5 m
	RF Bridge	43138/664	3.0 m
59999/170	5 MHz to 3 GHz N (f)	43138/665	10 m
		43138/666	25 m
		43138/667	50 m

## FAULT LOCATORS

	Fault Locators		
6242F	10 MHz to 3 GHz, N (f)	431389/007	100 m
6242M	10 MHz to 3 GHz, N (m)	43138/897	120 m
6240F	10 MHz to 20 GHz, N (f)	43138/837	150 m

## MILLIMETER WAVEGUIDE, SINGLE DIODE HARMONIC MIXERS

		Model Number	Frequency Range	Waveguide Designation	Flange Type
6243F	10 MHz to 26.5 GHz, 3.5 mm (f)				
6243M	10 MHz to 26.5 GHz, 3.5 mm (m)				
6241	10 MHz to 20 GHz, 7 mm	M42HW	18-26.5 GHz	WR42, WG20, R220	UG-597/U
	Microwave Ruggedized Cables for Fault Locators	M28HW	26.5-40 GHz	WR28, WG22, R320	UG-599/U
54311/197	1.5 m, 18 GHz, N (m) to Right Angle N (m)	M22HW	33-50 GHz	WR22, WG23, R400	UG-383/U
54311/198	3.0 m, 18 GHz, N (m) to Right Angle N (m)	M19HW	40-60 GHz	WR19, WG24, R500	UG-383/U
54311/201	1.5 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)	M15HW	50-75 GHz	WR15, WG25, R620	UG-385/U
54311/202	3.0 m, 26.5 GHz, 3.5 mm (m) to Right Angle 3.5 mm (m)	M12HW	60-90 GHz	WR12, WG26, R740	UG-387/U
		M10HW	75-110 GHz	WR10, WG27, R900	UG-387/U

### RF Ruggedized Cables for Fault Locators

54311/199	1.5 m, 3 GHz, N (m) to Right Angle N (m)
54311/200	3.0 m, 3 GHz, N (m) to Right Angle N (m)

### Microwave Ruggedized Cables

54311/116	1.5 m, 20 GHz, N (m) to N (m)
54311/109	3.0 m, 20 GHz, N (m) to N (m)
54311/117	1.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)
54311/110	3.0 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)

### Scalar Detector and Fault Locator DC Cables

	Scalar Detector cables for use in conjunction with 6800 series
	(Color coded blue)
43139/099	1.5 m, DC Cable
43139/100	3.0 m, DC Cable
43139/101	10 m, DC Cable
43139/102	25 m, DC Cable
43139/103	50 m, DC Cable

For other frequencies and sizes please consult factory for details.

A Diplexer (DPL.313A) is required for use with the mixers listed above. It is supplied with two SMA (m) barrel adapters for IF and LO interconnection to the spectrum analyzer Option 020 connectors and a 1 meter long, high quality interconnecting cable for connection between mixer and diplexer.

## ACCESSORIES

### Power Splitters/Dividers

54311/123	Power Splitter DC to 18 GHz, Type N
54311/124	Power Splitter DC to 26.5 GHz, 3.5 mm
54311/161	Power Splitter DC to 40 GHz, 2.92 mm
54311/187	Power Divider DC to 18 GHz
54311/188	Power Divider DC to 26.5 GHz

### RF Ruggedized Cables for Bridges and Dividers

54311/195	1.5 m, 3 GHz, N (m) to N (m)
54311/196	3.0 m, 3 GHz, N (m) to N (m)

### Fixed Loads

54421/020	7 mm Fixed Load
54421/021	3.5 mm (f) Fixed Load
54421/022	3.5 mm (m) Fixed Load

54421/023	N (m) Fixed Load		Miscellaneous Electrical Cables
54421/024	N (f) Fixed Load	54311/170	Positive Voltage Measurement Cable
	Precision Adapters	54311/112	Negative Voltage Measurement Cable
54311/175	N (m) to N (m)	43129/189	GPIB Cable
54311/167	N (m) to N (f)	43139/042	BNC (m) to BNC (m) 1.5 m
54311/174	N (f) to N (f)	46884/560	Parallel Printer Interface Cable
54311/176	N (f) to 3.5 mm (f)	43137/604	Autotester Adapter Cable 0.5 m
54311/177	N (m) to 3.5 mm (f)	43139/107	Autotester Adapter Cable 1.5 m
54311/178	N (m) to 3.5 mm (m)		Standard Microwave Cables
54311/185	N (f) to 3.5 mm (m)	54351/022	0.5 m, 18 GHz, N (m) to N (m)
54311/137	N (m) to TNC (f)	54351/025	0.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)
54311/138	N (m) to TNC (m)		
54311/139	N (f) to TNC (f)	54351/027	0.5 m, 40 GHz, 2.92 mm (m) to 2.92 mm (m)
54311/186	N (f) to TNC (m)		Attenuators
54311/203	7 mm to N (f)	56534/901	Precision Fixed Coaxial Attenuator 3 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/204	7 mm to TNC (m)	56534/902	Precision Fixed Coaxial Attenuator 6 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/205	7 mm to TNC (f)	56534/903	Precision Fixed Coaxial Attenuator 10 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/136	TNC (m) to TNC (m)	56534/904	Precision Fixed Coaxial Attenuator 20 dB DC to 18 GHz 5 W, N(m) to N(f)
54311/107	3.5 mm (f) to 3.5 mm (f)		Software Support
54311/165	3.5 mm (m) to 3.5 mm (f)	59000/327	MIPlot Software Pack
54311/164	3.5 mm (m) to 3.5 mm (m)		<b>MISCELLANEOUS</b>
54311/162	2.92 mm (m) to 2.92 mm (m)	54152/001	3.5 mm Torque Wrench
54311/206	2.92 mm (m) to 2.92 mm (f)	54211/008	Compact Keyboard
54311/207	2.92 mm (f) to 2.92 mm (f)	52388/900	1.25 GHz Active Probe
	Standard Adapters	54441/012	Power supply for 2388
54311/133	N (f) to SMA (f)		
54311/134	N (m) to SMA (f)		
54311/135	TNC (m) to SMA (m)		

#### CHINA

Tel: [+86] (21) 6282 8001  
Fax: [+86] (21) 6282 8002

#### EUROPE

Tel: [+44] (0) 1438 742200  
Fax: [+44] (0) 1438 727601

#### FRANCE

Tel: [+33] 1 60 79 96 00  
Fax: [+33] 1 60 77 69 22

#### HONG KONG

Tel: [+852] 2832 7988  
Fax: [+852] 2834 5364

#### SCANDINAVIA

Tel: [+45] 9614 0045  
Fax: [+45] 9614 0047

#### SPAIN

Tel: [+34] (91) 640 11 34  
Fax: [+34] (91) 640 06 40

#### UNITED KINGDOM

Tel: [+44] (0) 1438 742200  
Toll Free: [+44] (0800) 282 388 (UK only)  
Fax: [+44] (0) 1438 727601

#### USA

Tel: [+1] (316) 522 4981  
Toll Free: [+1] (800) 835 2352 (US only)  
Fax: [+1] (316) 522 1360



As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice. All trademarks are acknowledged. Parent company Aeroflex, Inc. ©Aeroflex 2004.

[www.aeroflex.com](http://www.aeroflex.com)  
[info-test@eroflex.com](mailto:info-test@eroflex.com)



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.

Part No. 46891/170, Issue 1 06/04

# Counters & Power Meters

## 6910/20/30 RF Power Sensors



A range of 17 power sensors available for use with 6200B series MTS, CPM, 6960B and 6970 power meters

- Wide frequency coverage  
30 kHz to 46 GHz
- Power levels from: -70 dBm (100 pW) to +44 dBm (25 W)
- 50  $\Omega$  and 75  $\Omega$  sensors
- Low VSWR reduces measurement uncertainty
- Linearity correction data supplied
- Field replaceable RF assembly
- High overload capability

These stable and accurate power sensors operate at frequencies up to 46 GHz. They are for use with the 6960B and 6970 Power Meters as well as the CPM 20, 46 Counter Power Meter and the 6200B series Microwave Test Set.

### High Measurement Accuracy

High measurement accuracy over a wide frequency range is ensured by low input VSWR - the result of innovative design.

### Fully Interchangeable

The sensors are fitted with precision connectors. They have a multi-way socket for cable connection to the Power Meter, and are interchangeable.

### Small and Lightweight

The small size and light weight of these sensors makes them very adaptable for use anywhere without requiring additional mechanical support.

### Rugged Construction

Rugged mechanical construction makes them ideal for both bench and field use. Minimum down-time is ensured by using a pre-calibrated field replaceable RF sensing assembly. Unit lifetime is enhanced by high overload capabilities. Seventeen different sensors are currently available covering a range of frequencies from 30 kHz to 46 GHz. Type N, APC-7, MPC 3.5 and 2.92 mm connectors are available from -70 dBm (100 pW) to +44 dBm (25 W). A 75  $\Omega$  sensor is also available.

For the 40 GHz sensors (6914, 6924 and 6934) a waveguide 22 transformer is optionally available. By ordering version '002' the transformer (54417/002) is supplied as well as a calibration table to give both accurate waveguide and coaxial measurements. The calibration information is traceable to national standards.



**6910 series: Medium Power Thermocouple Power Sensors**

	<b>6910</b>	<b>6911</b>	<b>6912</b>
FREQUENCY RANGE	10 MHz - 20 GHz	10 MHz - 20 GHz	30 kHz - 4.2 GHz
POWER RANGE	-30 dBm to +20 dBm (1 $\mu$ W to 100 mW)	-30 dBm to +20 dBm (1 $\mu$ W to 100 mW)	-30 dBm to +20 dBm (1 $\mu$ W to 100 mW)
MAX RF INPUT	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 $\mu$ s	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 $\mu$ s	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 $\mu$ s
SENSING ELEMENT	Semiconductor thermocouple	Semiconductor thermocouple	Semiconductor thermocouple
VSWR	<1.25 10 MHz - 30 MHz <1.1 30 MHz - 2GHz <1.18 2 GHz - 16 GHz <1.28 16 GHz - 18 GHz <1.4 typical 18 GHz - 20 GHz	<1.25 10 MHz - 30 MHz <1.15 30 MHz - 2 GHz <1.18 2 GHz - 16 GHz <1.28 16 GHz - 18 GHz <1.4 typical 18 GHz - 20 GHz	<1.6 30 kHz - 100 kHz <1.2 100 kHz - 300 kHz <1.1 300 kHz - 4.2 GHz
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	$\pm$ 0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	$\pm$ 0.5% at 25°C between +10 and +20 dBm Improves by a factor of 10 for each lower range	$\pm$ 0.5% at 25°C between +10 and 20 dBm Improves by a factor of 10 for each lower range
CALIBRATION FACTOR	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male 50 $\Omega$	APC-7, 50 $\Omega$	Precision N-type, male 50 $\Omega$
SIZE & WEIGHT	87 mm long, 33.5 mm dia. 140g	87 mm long, 33.5 mm dia. 140 g	87 mm long, 33.5 mm dia. 140 g
ORDER CODES	56910/900	56911/900	56912/900

**6910 Series: Medium Power Thermocouple Power Sensors (continued)**

	<b>6913</b>	<b>6914</b>	<b>6914S</b>	<b>6919</b>
FREQUENCY RANGE	10 MHz - 26.5 GHz	10 MHz - 40 GHz	10 MHz - 46 GHz	30 kHz - 3 GHz
POWER RANGE	-30 dBm to +20 dBm (1 mW to 100 mW)	-30 dBm to +20 dBm (1 mW to 100 mW)	-30 dBm to +20 dBm (1 mW to 100 mW)	-30 dBm to +20 dBm (1 mW to 100 mW)
MAX RF INPUT	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 ms	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 ms	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 ms	+25 dBm (300 mW) CW +42 dBm (15 W) peak for 2 ms
SENSING ELEMENT	Semiconductor thermocouple	Semiconductor thermocouple	Semiconductor thermocouple	Semiconductor thermocouple
VSWR	<1.4 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.1 100 MHz - 2 GHz <1.15 2 GHz - 12.4 GHz <1.2 12.4 GHz - 18 GHz <1.25 18 GHz - 26.5 GHz	<1.58 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.1 100 MHz - 2 GHz <1.15 2 GHz - 12.4 GHz <1.21 12.4 GHz - 18 GHz <1.25 18 GHz - 26.5 GHz <1.43 26.5 - 40 GHz (vers. /001) <1.55 26.5 - 40 GHz (vers. /002)	<1.58 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.1 100 MHz - 2 GHz <1.15 2 GHz - 12.4 GHz <1.43 12.4 GHz - 33 GHz <2.32 33 GHz - 40 GHz <3.6 40 GHz - 46 GHz	<1.4 30 kHz - 100 kHz <1.15 100 kHz - 300 kHz <1.1 300 kHz - 2 GHz <1.2 typical 2 GHz - 3 GHz
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	$\pm$ 0.5% at 25°C between +10 and +20 dBm. Improves by a factor of 10 for each lower range	$\pm$ 0.5% at 25°C at 100 mW, decreasing by 0.005% per mW	$\pm$ 0.5% at 25°C at 100 mW, decreasing by 0.005% per mW	$\pm$ 0.5% at 25°C between +10 and +20 dBm. Improves by a factor of 10 for each lower range
CALIBRATION FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%	0.01%
RF CONNECTOR	MPC 3.5 mm, male 50 $\Omega$	MPC 2.92 mm, male 50 $\Omega$	MPC 2.92 mm, male 50 $\Omega$	Precision N-type, male, 75 $\Omega$
SIZE & WEIGHT	80 mm long, 33.5 mm dia. 140g	88.5 mm long, 33.5 mm dia. 140g	88.5 mm long, 33.5 mm dia. 140g	89 mm long, 33.5 mm dia. 140g
ORDER CODES	56913/900	56914/001 56914/002 includes waveguide 22 coax transition and cal table	56914/003	56919/900
Supplied with	Adapter part no. 23443/822 for connection between 6913 and 0 dBm Power Reference.	Adapter part no. 23443/822 for connection between 6914 and 0 dBm Power Reference.	Adapter part no. 23443/822 for connection between 6914 and 0 dBm Power Reference.	Adapter part no. 23443/842 for connection between 6919 and 0 dBm Power Reference.

**6920 Series: High Sensitivity Diode Sensors**

	<b>6920</b>	<b>6923</b>	<b>6924</b>	<b>6924S</b>
FREQUENCY RANGE	10 MHz - 20 GHz	10 MHz - 26.5 GHz	30 kHz - 40 GHz	10 MHz - 46 GHz
POWER RANGE	-70 dBm to -20 dBm† (0.1 nW to 10 μW)	-70 dBm to -20 dBm* (0.1 nW to 10 μW)	-70 dBm to -20 dBm* (0.1 nW to 10 μW)	-70 dBm to -20 dBm* (0.1 nW to 10 μW)
MAX RF INPUT	+26 dBm (300 mW) CW +30 dBm (1 W) peak for 2 μs	+26 dBm (300 mW) CW +30 dBm (1 W) peak for 2 μs	+26 dBm (400 mW) CW +30 dBm (1 W) peak for 2 μs	+26 dBm (300 mW) CW +30 dBm (1 W) peak for 2 μs
SENSING ELEMENT	Shottky barrier diode	Shottky barrier diode	Shottky barrier diode	Shottky barrier diode
VSWR	<1.4-1.2 10 MHz - 40 MHz <1.2 40 MHz - 10 GHz <1.35 10 GHz - 18 GHz <1.4 typ 18 GHz - 20 GHz	<1.4 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.12 100 MHz - 2 GHz <1.17 2 GHz - 8 GHz <1.3 8 GHz - 18 GHz <1.5 18 GHz - 26.5 GHz	<1.58 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.12 100 MHz - 2 GHz <1.33 2 GHz - 18 GHz <1.50 18 GHz - 33 GHz <1.95 33 GHz - 40 GHz(vers./001) <1.97 26.5 - 40 GHz(vers./002)	<1.58 10 MHz - 40 MHz <1.15 40 MHz - 100 MHz <1.12 100 MHz - 2 GHz <1.33 2 GHz - 18 GHz <1.5 18 GHz - 33 GHz <1.95 33 GHz - 40 GHz <3.6 40 GHz - 46 GHz
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	±1% at 25°C between -30 and -20 dBm. Improves by a factor of 10 for each lower range	±1% at 25°C between -30 and -20 dBm. Improves by a factor of 10 for each lower range	±1% at 25°C between -30 and 20 dBm at 23°C	±1% at 25°C between -30 and -20 dBm at 23°C
CALIBRATION FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male 50 Ω	MPC 3.5 mm, male 50 Ω	MPC 2.92 mm, male 50 Ω†	MPC 2.92 mm, male 50 Ω†
SIZE & WEIGHT	104 mm long, 33.5 mm dia. 180 g	87 mm long, 33.5 mm dia. 180 g	88.5 mm long, 33.5 mm dia. 150 g	88.5 mm long, 33.5 mm dia. 150 g
ORDER CODES	56920/900	56923/900	56924/001 56924/002 includes waveguide 22 coax transition and calibration table	56924/003
Supplied with	Precision Attenuator part no. 23448/873. 30 dB ±0.05 dB at 50 MHz at 25°C	Precision Attenuator part no. 23448/873 30 dB ±0.05 dB at 50 MHz at 25°C Adapter part no. 23443/822 for connection between 6923 and 0 dBm Power Reference.	Precision Attenuator part no. 23448/873. 30 dB ±0.05 dB at 50 MHz at 25°C Adapter part no. 23443/822 for connection between 6924 and 0 dBm Power Reference.	Precision Attenuator part no. 23448/873. 30 dB ±0.05 dB at 50 MHz at 5°C Adapter part no. 23443/822 for connection between 6924 and 0 dBm Power Reference.

\* Lower limit is -65 dBm (0.3 nW) when used with 6970 & -60 dBm when used the Counter Power Meter

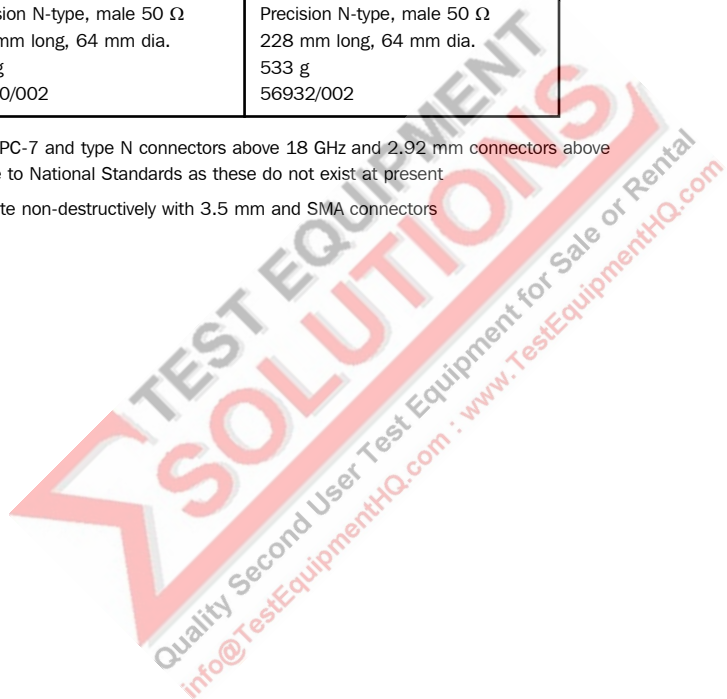
† Lower limit is -65 dBm (0.3 nW) when used with Counter Power Meter

**6930 Series: High Power Thermocouple Sensors**

	<b>6930</b>	<b>6932</b>	<b>6934</b>	<b>6934S</b>
FREQUENCY RANGE	10 MHz - 18 GHz	30 kHz - 4.2 GHz	10 MHz - 40 GHz	10 MHz - 46 GHz
POWER RANGE	-15 dBm to +35 dBm (30 μW to 3 W)	-15 dBm to +35 dBm (30 μW to 3W)	-15 dBm to +30 dBm (30 μW to 1W)	-15 dBm to +30 dBm (30 μW to 1 W)
MAX RF INPUT	+37 dBm (5 W) CW +50 dBm (100 W) peak for 2 μs	+37 dBm (5 W) CW +50 dBm (100 W) peak for 2 μs	+33 dBm (2 W) CW +45 dBm (32 W) peak for 2 μs	+33 dBm (2W) CW +45 dBm (32 W) peak for 2 μs
SENSING ELEMENT	Semiconductor thermocouple	Semiconductor thermocouple	Semiconductor thermocouple	Semiconductor thermocouple
VSWR	<1.1 10 MHz - 2 GHz <1.18 2 GHz - 16 GHz <1.28 16 GHz - 18 GHz	<1.1 30 kHz - 4.2 GHz	<1.12 10 MHz - 100 MHz <1.1 100 MHz - 2 GHz <1.15 2 GHz - 12.4 GHz <1.2 12.4 GHz - 18 GHz <1.25 18 GHz - 26.5 GHz <1.43 26.5 - 40 GHz (vers./001) <1.55 26.5 - 40 GHz (vers./002)	<1.12 10 MHz - 100 MHz <1.1 100 MHz - 2 GHz <1.15 2 GHz - 12.4 GHz <1.2 12.4 GHz - 18 GHz <1.25 18 GHz - 26.5 GHz <1.43 26.5 GHz - 40 GHz <2.3 40 GHz - 46 GHz
LINEARITY FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	-1% to +5% between +25 and +35 dBm. Improves by a factor of 10 for each lower range.	-1% to +5% between +25 and +35 dBm. Improves by a factor of 10 for each lower range.	-1% to +5% between +25 and +30 dBm, less on other ranges.	-1% to +5% between +25 and +30 dBm, less on other ranges.
CALIBRATION FACTOR	Provided with sensor	Provided with sensor	Provided with sensor	Provided with sensor
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%	0.01%	0.01%
RF CONNECTOR	Precision N-type, male 50 Ω	Precision N-type, male 50 Ω	MPC 2.92 mm, male 50 Ω	MPC 2.92 mm, male 50 Ω
SIZE & WEIGHT	93 mm long, 33.5 mm dia. 190g	93 mm long, 33.5 mm dia. 190g	87 mm long, 33.5 mm dia. 150g	87 mm long, 33.5 mm dia. 150g
ORDER CODES	56930/900	56932/900	56934/001 56934/002 includes waveguide 22 coax transition and calibration table.	56934/003
Supplied with			Adapter part no. 23443/822 for connection between 6934 and 0 dBm Power Reference.	Adapter part no. 23443/822 for connection between 6934 and 0 dBm Power Reference.

	<b>6930 (Option 002)</b> <i>(Comprises standard 6930 plus calibrated precision 10 dB attenuator)</i>	<b>6932 (Option 002)</b> <i>(Comprises standard 6932 plus calibrated precision 10 dB attenuator)</i>
FREQUENCY RANGE	10 MHz - 18 GHz	30 kHz - 4.2 GHz
POWER RANGE	-5 dBm to +44 dBm (0.3 mW to 25W)	-5 dBm to +44 dBm (0.3 mW to 25W)
MAX RF INPUT	+45 dBm (30 W) CW +60 dBm (1 kW) peak for 2 $\mu$ s	+45 dBm (30 W) CW +60 dBm (1 kW) peak for 2 $\mu$ s
Sensing element	Semiconductor thermocouple	Semiconductor thermocouple
VSWR	<1.2 10 MHz - 8 GHz <1.25 8 GHz - 12.4 GHz <1.35 12.4 GHz - 18 GHz	<1.2 30 kHz - 4.2 GHz
LINEARITY FACTOR	Provided with sensor	Provided with sensor
Accuracy	-2% to +6% between +35 and +44 dBm. Improves by a factor of 10 for each lower range	-2% to +6% between +35 and +44 dBm. Improves by a factor of 10 for each lower range
CALIBRATION FACTOR	Provided with sensor	Provided with sensor
Accuracy	Uncertainty provided with sensor	Uncertainty provided with sensor
Resolution	0.01%	0.01%
RF CONNECTOR	Precision N-type, male 50 $\Omega$	Precision N-type, male 50 $\Omega$
SIZE & WEIGHT	228 mm long, 64 mm dia. 533 g	228 mm long, 64 mm dia. 533 g
ORDER CODES	56930/002	56932/002

Notes: Specifications involving APC-7 and type N connectors above 18 GHz and 2.92 mm connectors above 40 GHz are not traceable to National Standards as these do not exist at present  
2.92 mm connectors mate non-destructively with 3.5 mm and SMA connectors



**CHINA**

Tel: [+86] (21) 6282 8001  
Fax: [+86] (21) 6282 8002

**EUROPE**

Tel: [+44] (0) 1438 742200  
Fax: [+44] (0) 1438 727601

**FRANCE**

Tel: [+33] 1 60 79 96 00  
Fax: [+33] 1 60 77 69 22

**HONG KONG**

Tel: [+852] 2832 7988  
Fax: [+852] 2834 5364

**SCANDINAVIA**

Tel: [+45] 9614 0045  
Fax: [+45] 9614 0047

**SPAIN**

Tel: [+34] (91) 640 11 34  
Fax: [+34] (91) 640 06 40

**UNITED KINGDOM**

Tel: [+44] (0) 1438 742200  
Toll Free: [+44] (0800) 282 388 (UK only)  
Fax: [+44] (0) 1438 727601

**USA**

Tel: [+1] (316) 522 4981  
Toll Free: [+1] (800) 835 2352 (US only)  
Fax: [+1] (316) 522 1360



As we are always seeking to improve our products, the information in this document gives only a general indication of the product capacity, performance and suitability, none of which shall form part of any contract. We reserve the right to make design changes without notice. All trademarks are acknowledged. Parent company Aeroflex, Inc. ©Aeroflex 2004.

[www.aeroflex.com](http://www.aeroflex.com)  
[info-test@aeroflex.com](mailto:info-test@aeroflex.com)



Our passion for performance is defined by three attributes represented by these three icons: solution-minded, performance-driven and customer-focused.