Microwave 6840 Series RF & Microwave System Analyzer

6840 series Microwave System Analyzers provide an integrated solution to component and subsystem testing

- Integrated synthesized source, scalar and spectrum analyzer
- 3 GHz, 8.4 GHz, 20 GHz, 24 GHz, 40 GHz and 46 GHz frequency versions
- Precision scalar network measurements with high dynamic range
- Spectrum analyzer with full range tracking generator
- Offset tracking on network measurements
- Group Delay option
- FM option
- Complete solution to comprehensive component and subsystem characterization
- Real time transmission line Fault Location with 0.1% accuracy
- EEPROM corrected scalar detectors for accurate measurements
- Applications interface allows guided and automatic testing
- Modular design for rapid service
- 3.5 in disk drive for results storage

The 6840 series RF and microwave system analyzers are a powerful new tool for the microwave industry. Integrated into a single instrument are a synthesized source, a three input scalar analyzer and a synthesized spectrum analyzer. The internal source can be used as a simple CW output, as a swept source for scalar measurements, as a tracking generator with the spectrum analyzer and as an offset tracking source for network measurements on frequency translation devices.

This flexibility simplifies a range of previously complex but commonly made measurements. The receiver in the spectrum analyzer can be used as a tuned input for high dynamic range scalar measurements. The FM option adds frequency modulation to the source. The Group Delay option allows simultaneous measurement and display of group delay and amplitude response, and includes the frequency modulation option.

1 Series - 8 Instruments

The range covers five frequency bands in various convenient combinations of source and spectrum analyzer frequencies, enabling for example the harmonic content of microwave radios to be measured.

6840 series Microwave System Analyzers

6841 1 MHz to 3 GHz Scalar Analyzer with 4.2 GHz Spectrum Analyzer
6842 10 MHz to 8.4 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer
6843 10 MHz to 20 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer
6844 10 MHz to 24 GHz Scalar Analyzer with 24 GHz Spectrum Analyzer
6845 10 MHz to 46 GHz Scalar Analyzer with 46 GHz Spectrum Analyzer
6845R 10 MHz to 40 GHz Scalar Analyzer with 40 GHz Spectrum Analyzer
6846 10 MHz to 8.4 GHz Scalar Analyzer with 24 GHz Spectrum Analyzer
6847 10 MHz to 20 GHz Scalar Analyzer with 26.5 GHz Spectrum Analyzer
6848 1 MHz to 3 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer
Synthesized Source

The synthesized source has low phase noise and 1 Hz frequency resolution. VCOs are used for frequencies above 3 GHz and an integrated RF synthesizer for the 1 MHz to 3 GHz range. Optionally increased output power is available from 3 to 24 GHz. Internal filtering results in excellent harmonic performance of <-55 dBc for improved scalar measurement accuracy. Optional step attenuators are available to set low output powers for amplifier or receiver testing.

In CW mode the source can be used for local oscillator substitution. A power sweep is provided for amplifier gain compression testing. External FM can be applied by connecting a generator to the rear panel. With the FM option, an internal generator provides frequency modulation of the source.

When used with the scalar analyzer the source provides a swept synthesized output for frequency characterization of components and systems. It can also be used as a spectrum analyzer tracking generator to 46 GHz. The source can be set to any frequency offset or frequency multiple of the receiver tuned input. This powerful feature simplifies measurements of mixers, upconverters and down-converters that have frequency translation.

Scalar Analyzer

The three input scalar analyzer provides network characterization of components and systems. Simultaneous measurement of insertion and return loss are displayed on the 6840 color screen. Excellent measurement accuracy is assured by the use of EEPROM corrected detectors. Each detector is individually characterized for linearity and frequency response to provide a measurement accuracy close to that achieved with a power sensor. A range of autotesters with high directivity is available for return loss measurements.

It is also possible to make scalar measurements with a tuned input. A tuned input gives improved dynamic range. Insertion loss measurements of >80 dB are possible.

Spectrum Analysis

The 6840 variants contain an integral synthesized spectrum analyzer with 3 MHz to 1 kHz resolution bandwidth filters, >80 dB instantaneous dynamic range and an excellent 3rd order intermodulation intercept point. 6840 series are designed to make routine spectrum measurements on RF and microwave components, subsystems and systems.

Continuous full band sweeps simplify harmonic and spurious measurements. The low distortion front end combined with wide dynamic range ensures that even on full span sweeps, spurious measurements to better than -60 dBc can be performed. High sensitivity at microwave frequencies is ensured by the use of wideband oscillators, this reduces the harmonic number used in the front end mixer.

The spectrum analyzer is fully featured with FM demodulator and built in loudspeaker. This is ideal for locating and identifying the source of interfering transmissions. Individual signals can be precisely identified by use of the internal frequency counter.
Fault location measurement of a coaxial feed and antenna

Group Delay

The Group Delay option allows the simultaneous measurement and display of group delay and amplitude response over the full frequency range of the instrument. Components and assemblies including frequency translation devices can be readily characterized for ripple and variation from linear and parabolic variation using the powerful and easy to use marker functions. Measurement in any operator-specified sub-band within the passband can be displayed as maximum peak to peak ripple in both amplitude and group delay, maximum slope and maximum rate of change of slope.

Amplitude and delay response of a filter

Simplified User Interface

Integration of a source, spectrum analyzer and scalar analyzer into a single instrument has many benefits. The operator uses a single interface to set up any measurement. This saves time and is easier than writing software to perform complex measurement tasks, such as frequency offset network measurements.

Eight softkeys give rapid access to all commonly used parameters. Softkeys are shaped to inform the user of the action that the key will perform, e.g. enter data, select from list, move to another menu or immediate action. All commonly accessed functions are no more than one level deep, so that the instrument operation is easily learnt.

Applications Interface

An applications interface is built into the 6840 series which allows the user to create their own measurement routines and guide the operator through the test procedure. For example it can display on the 6840 screen how to set up the measurement, lead the operator through a calibration, show where to connect the device under test and then test the device’s performance against predefined limits. The applications facility can reduce the incidence of operator error, improve measurement repeatability, provide guidance to infrequent users or simplify complex test procedures.

Color Display

A large TFT color display is fitted to the 6840 as standard displaying up to four measurements on two channels. Scalar and spectrum measurements can be displayed simultaneously on independent channels. Alternatively two spectrum channels can be shown with a wide and narrow frequency sweep. This could be used to scan a frequency spectrum for interfering signals whilst simultaneously displaying the wanted carrier.

Dual channel display, showing wide band and narrow band frequency sweeps

Comprehensive Markers

Up to eight markers are available. The marker menus provide the tools that are most commonly used in each of the measurement modes.

Harmonic measurement with dynamic marker table

In spectrum mode the markers identify the frequency and level of a signal, position signals on the display and measure relative signal values. A peak search feature places markers on the eight highest signals displayed for spurious signal identification. A table displayed below the traces shows the values of all eight markers dynamically.

In scalar mode markers automatically calculate peak to peak ripple, N-dB bandwidth, -1 dB compression point and find the maximum and minimum signal levels. This simplifies device characterization and reduces test time.

For fault location measurements the next peak left/right feature identifies the position and magnitude of each of the discontinuities along the transmission line. The peak find softkey quickly locates the biggest discontinuity on the line.

Fast Field Repair

6840 has a modular architecture with modules slotted onto a common mother board. In the event of a module failure the instrument can be...
repaired by module replacement to reduce instrument downtime. Following a repair, software routines realign the replaced module.

Future Proof
The 6840 series microwave system analyzers have been designed to expand and adapt to changing test requirements. A standard instrument has capacity for additional modules. As future options are added, the flexibility and capability of the 6840 platform will expand. This ensures that investment made in the 6840 series today will provide a basis for future test needs.

For Design Engineers
For designers of components and subsystems the 6840 provides a powerful and flexible analysis tool. Devices such as filters, amplifiers, mixers, attenuators and oscillators can be characterized with a single test instrument. This flexibility reduces design cycles as the need to make instrument interconnections is reduced. 6840 has a low noise source for LO substitution and swept frequency measurements. The use of EEPROM detectors ensures accurate scalar measurements. Amplifiers can be precisely characterized for gain compression, output power and frequency response. The use of a tuned input can give >80 dB dynamic range for filter testing and the accessory autotesters, with 40 dB directivity, ensure accurate return loss results. The spurious and harmonic output of oscillators can be measured with the wide span high dynamic range spectrum analyzer.

Manufacturing Test
To the production manager the 6840 offers reduced programming time, reduced test time and simplified archiving of results. 6840 is fully compliant with the IEEE 488.2 GPIB standard. A full 401 data points can be transferred over the GPIB in typically <50 ms. Individual data points can be repetitively read in typically 10 ms. This enables full results archiving with minimal time penalty.

A single instrument replaces ‘rack and stack’ alternatives which makes program generation simpler. Rack space is also reduced.

Continuity of test is essential in a production environment. A failed test system can result in expensive loss of output. 6840 with its field replaceable modules minimizes any output loss due to test system failure.

Installing and Maintaining Systems
During the installation period of a microwave system it is always necessary to revalidate key parameters. 6840 provides a comprehensive solution for installation teams. It is housed in a ruggedized case, has secure handles and can be supplied with a protective carrying case.

For systems with long waveguide or coaxial feeds the 6840 is used by the installation team to measure return loss and if necessary fault location. The synthesized source with 1601 measurement points ensures precise fault location measurements. The 6840 series provides a tuned input that can be used for return loss and fault location measurements. This measurement technique rejects interfering signals from other transmitters, a common cause of poor measurement performance in the field.

By archiving results onto disk, or the internal instrument memory, the 6840 forms the basis of a preventative maintenance system. Experience shows that degradation in the antenna feed is the major source of system field failures. 6840 has the accuracy to monitor and identify gradual system degradation with time.

Results Logging and Outputting
Measurement results can either be saved to internal non-volatile memory or to 3.5 in disk. Traces saved onto disk can then be archived or imported into a spreadsheet for viewing.

An alternative method for displaying results in a standard word processor document or in a graphics package is to use the optional MIPlot software. MIPlot captures the measurement data either via the GPIB or from a saved trace on disk. This data can then be embedded into a document and reformatted, colors changed, markers and text added.

**SPECIFICATION**

**SOURCE**

**Functionality**

- Synthesized CW
- Synthesized sweeper for use with scalar analyzer,
- Tracking generator for use with spectrum analyzer,
- Offset tracking generator for use with spectrum analyzer (offset by scale or multiplication factor)
- CW Power sweep.
- External Frequency Modulation
- Optional Internal Frequency Modulation in spectrum, scalar and source-only modes.

**Frequency Range**

- 6841/6848, 1 MHz to 3 GHz
- 6842/6846, 10 MHz to 8.4 GHz
- 6843/6847, 10 MHz to 20 GHz
- 6844, 10 MHz to 24 GHz
- 6845, 10 MHz to 46 GHz
- 6845R, 10 MHz to 40 GHz
- 6842/6846, 10 MHz to 8.4 GHz
- 6841/6848, 1 MHz to 3 GHz
- 6843/6847, 10 MHz to 20 GHz
- 6844, 10 MHz to 24 GHz
- 6845, 10 MHz to 46 GHz
- 6845R, 10 MHz to 40 GHz

**Resolution (Settable)**

- 1 Hz to 46 GHz

**CW Accuracy**

- (Frequency Standard error x Frequency) ± 10 Hz

**Swept Accuracy (Typical)**

- 300 ms Step Time
  - 1 MHz to 3 GHz <20 kHz
  - 3 GHz to 46 GHz <200 kHz
- 1 ms Step Time
  - 1 MHz to 3 GHz <1 kHz
  - 3 GHz to 46 GHz <10 kHz
- 10 ms Step Time
  - 1 MHz to 3 GHz <100 Hz
  - 3 GHz to 46 GHz <1 kHz

**Levelled Power Range**

- 6841/2/3/4/6/7/8 standard
  - 1 MHz to 3 GHz -10 dBm to +10 dBm
  - 3 GHz to 24 GHz -10 dBm to +5 dBm
- 6842/3/4/6/7/8 + option 030 (higher power)
  - 1 MHz to 24 GHz -10 dBm to +10 dBm
- 6841/48 + option 010 (110 dB Step Attenuator)
  - 1 MHz to 3 GHz -120 dBm to +8 dBm
- 6842/3/6/7 + option 011 (70 dB Step Attenuator)
  - 10 MHz to 3 GHz -80 dBm to +8 dBm
3 GHz to 20 GHz -80 dBm to +2 dBm
+ option 030 (higher power)
3 GHz to 20 GHz -80 dBm to +7 dBm

6842/3/4/6/7 + option 012
(90 dB Step Attenuator)
10 MHz to 3 GHz -100 dBm to +8 dBm
3 GHz to 24 GHz -100 dBm to +2 dBm
+ option 030 (higher power)
3 GHz to 24 GHz -100 dBm to +7 dBm

6845 & 6845R
10 MHz to 8 GHz -10 dBm to +6 dBm +8 dBm typ
8 GHz to 20 GHz -80 dBm to +2 dBm +4 dBm typ
20 GHz to 24 GHz -80 dBm to +1 dBm +3 dBm typ
24 GHz to 40 GHz -80 dBm to -3 dBm 0 dBm typ
40 GHz to 46 GHz -10 dBm to 0 dBm typ*
* excluding the effect of connector moding

6845 & 6845R+ option 013 (70 dB Step Attenuator)
10 MHz to 8 GHz -80 dBm to +6 dBm +8 dBm typ
8 GHz to 20 GHz -80 dBm to +2 dBm +4 dBm typ
20 GHz to 24 GHz -80 dBm to +1 dBm +3 dBm typ
24 GHz to 40 GHz -80 dBm to -3 dBm 0 dBm typ

Feed replacement accuracy is reduced by 0.5 dB

Settable Power Resolution
0.01 dB

Power Sweep Range (from Maximum Levelled Power) Without Attenuator
>20 dB

External Frequency Modulation
Peak deviation (1 V peak input)
10 MHz - 375 MHz 1 kHz to 5 MHz
375 MHz - 750 MHz 250 Hz to 1.25 MHz
750 MHz - 1.5 GHz 500 Hz to 2.5 MHz
1.5 GHz - 3 GHz 1 kHz to 5 MHz
3 GHz - 46 GHz 20 kHz to 1 MHz

Accuracy (1 kHz modulating frequency) 20 - 400 kHz deviation
±3 % of indication ±1 Hz excluding residual FM
-3 dB bandwidth, AC coupled mode
10 MHz - 3 GHz <100 Hz to >1 MHz typical
3 GHz - 46 GHz <100 Hz to <500 kHz typical

-3 dB bandwidth, DC coupled mode
10 MHz - 3 GHz DC to >1 MHz typical
3 GHz - 46 GHz DC to >500 kHz typical

Internal Modulation Generator Option 023 & 022 (Group Delay)

FM Source
Modulation signal sinewave, 0.1 Hz to 500 kHz, resolution 0.1 Hz
Other specifications as for External Frequency Modulation except:
Accuracy (1 kHz modulating frequency) 20 - 400 kHz deviation ±5 % of indication ±1 Hz excluding residual FM

Pulse Generator Source
Modes Single Pulse
Trigger Modes External, Internal continuous
Pulse Widths (PW) 120 ns to >1 second
Resolution 120 ns
Pulse Period (PRI) 240ns to 7 seconds (PRF <1 Hz to 4.16 MHz)
Resolution 120 ns
Pulse Delay Zero to 100 ms where zero is <120 ns referred to trigger or sync pulse falling edge

For the very latest specifications visit www.aeroflex.com
### Phase Noise $<\text{dBc/Hz}$ in CW mode

<table>
<thead>
<tr>
<th>CW Freq</th>
<th>Frequency offset 1 kHz</th>
<th>10 kHz</th>
<th>100 kHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.25 GHz</td>
<td>-86</td>
<td>-95</td>
<td>-108</td>
</tr>
<tr>
<td>0.5 GHz</td>
<td>-98</td>
<td>-112</td>
<td>-134</td>
</tr>
<tr>
<td>1 GHz</td>
<td>-92</td>
<td>-106</td>
<td>-128</td>
</tr>
<tr>
<td>2 GHz</td>
<td>-86</td>
<td>-100</td>
<td>-122</td>
</tr>
<tr>
<td>4 GHz</td>
<td>-80</td>
<td>-92</td>
<td>-100</td>
</tr>
<tr>
<td>10 GHz</td>
<td>-72</td>
<td>-84</td>
<td>-90</td>
</tr>
<tr>
<td>20 GHz</td>
<td>-66</td>
<td>-78</td>
<td>-82</td>
</tr>
<tr>
<td>24 GHz</td>
<td>-64</td>
<td>-76</td>
<td>-80</td>
</tr>
<tr>
<td>40 GHz</td>
<td>-63</td>
<td>-75</td>
<td>-79</td>
</tr>
</tbody>
</table>

Source Match (Typical)

1 MHz to 3 GHz, 15 dB
3 GHz to 20 GHz, 10 dB
20 GHz to 40 GHz, 8 dB

Output Connector

6841/2/3/6/7/8: Precision Type N, female
6844: Precision 3.5 mm, female
6845: Precision 2.92 mm, female
or optional field replaceable connectors

### Spectrum Analyzer

#### Frequency

**Frequency Range (Usable from 100 kHz)**

- 6841, 1 MHz to 3 GHz (usable to 4.2 GHz)
- 6842, 6843, 6848, 10 MHz to 20 GHz
- 6844, 6846, 10 MHz to 24 GHz (usable to 30 GHz)
- 6845, 10 MHz to 46 GHz
- 6845R, 10 MHz to 40 GHz
- 6847, 10 MHz to 26.5 GHz (usable to 30 GHz)
Extendible for all units to 110 GHz in waveguide only with external waveguide mixers. The 6840 series unit must be fitted with option 020.

**Frequency Span Range**

Full span to Zero span, plus any intermediate value

**Start Frequency Accuracy**

(start frequency x frequency standard error) $\pm$ frequency readout resolution $\pm$ 3% of span $\pm$ 20% resolution bandwidth setting

**Span Accuracy**

Fully synthesized for spans of 20 MHz or less

$\pm$ 3% for spans $>20$ MHz

**Number of Measurement Points**

Fixed 512

**Frequency Readout Resolution**

Span/512

**Marker Readout Accuracy**

As per start frequency accuracy

**Sweep Speed**

Auto coupled or user set, 10 ms/div to 50 s/div

### System Related Sidebands

$<-65$ dBc at offsets greater than 30 kHz from the carrier

### AMPLITUDE

**Maximum Input Amplitude**

+20 dBm

**Damage Level**

+27 dBm @ $>10$ dB attenuation

+20 dBm @ 0 dB attenuation

**Input Return Loss (typical) with 210 dB of Input Attenuation**

10 MHz to 3 GHz 20 dB
3 GHz to 12 GHz 12 dB
12 GHz to 40 GHz 10 dB

**Input Connector**

- 6841/2/3/8: Precision Type N, female
- 6844/6/7: Precision 3.5 mm, female
- 6845: Precision 2.92 mm female
or optional field replaceable connectors

**Input Attenuator**

Range 0 to 60 dB in 10 dB steps

**Reference Level**

Range +30 dBm to -99 dBm

**Amplitude Scaling**

Range 10 dB/div to 0.1 dB/div

**Amplitude Accuracy at 0 dBm Reference Level and 0 dBm Input**

(at selected bandwidth)

- 10 MHz to 3 GHz $\pm 1$ dB
- to 4.2 GHz* $\pm 1.5$ dB
- to 20 GHz $\pm 4.0$ dB
- to 24 GHz** $\pm 4.5$ dB
- to 40 GHz $\pm 5.0$ dB

* does not apply to 6841, ** to 26.5 GHz for 6847

**Incremental Reference Level Accuracy from +20 dBm to -40 dBm (Typical)**

$\pm 0.5$ dB

**Response Flatness (Typical)**

$\pm 3.0$ dB

**Log Incremental Accuracy (Typical)**

0.2 dB / 10 dB

**Display Linearity**

$\pm 1.5$ dB over 8 divisions (10 dB/div)
Gain Compression (0 dB Attenuation)
<0.5 dB with -10 dBm at the input connector

Resolution Bandwidth Range
1 kHz to 3 MHz in 1, 3, 10 sequences

Resolution Bandwidth Accuracy
± 20 %

Resolution Bandwidth Selectivity
60 dB / 3 dB ratio
1 kHz to 3 MHz 15:1

Resolution Bandwidth Switching Error
<0.25 dB

Video Bandwidth
1, 3, 10, 30, 100, 300, Hz
1, 3, 10, 30, and 100 kHz

Third Order Intermodulation Response (0 dB Attenuation)
<-70 dBc with 2 tones each -30 dBm, with
>50 kHz separation applied at the input connector

Third Order Intercept Point
>+5 dBm

Second Order Single Tone Intercept Point
>+45 dBm

Second Harmonic Distortion >40 MHz and @ -40 dBm
<-70 dBc for -40 dBm at the input connector with 0 dB attenuation

Residual Responses (Input Terminated with 50 Ω)
<-90 dBm

Other Input Related Spurii (0 dB Attenuation)
<-60 dBc with -10 dBm at the input connector

Displayed Average Noise Level in 1 kHz RBW, 30 Hz VBW, 0 dBm
Attenuation (Input Terminated with 50 Ω)
@ 1 GHz  <-105 dBm
@ 6 GHz  <-100 dBm
@ 12 GHz <-95 dBm
@ 18 GHz <-80 dBm typ

EXTERNAL MIXER INTERFACE (option)
LO output, 4.5 - 9.2 GHz @ +17 dBm typical
IF output, 479.3 MHz, maximum level -15 dBm typical
Connectors
SMA (female)

DEMODULATION
Narrow band FM, <.20 kHz
Display, kHz vs time
Audio output via speaker

MEASUREMENT FEATURES
Frequency counter
Ability to display channel occupancy masks, user defined
Accurate marker frequency readout
Multiple markers
Two independent channels
Scrollable center frequency, span and resolution bandwidth
Measurement of noise in a 1 Hz bandwidth
Auto-tune display set-up for CW signals
NBFM demodulator with audio output

Demodulated output displayed on screen
Speed 1 ms/div to 1 s/div

Millimeter waveguide, single diode harmonic mixers
Available for all 684X units, option 020 external mixer interface is required.

<table>
<thead>
<tr>
<th>Model</th>
<th>Frequency Range</th>
<th>Waveguide Designation</th>
<th>Flange Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M42HW</td>
<td>18-26.5 GHz</td>
<td>WR42, WG20, R220</td>
<td>UG-597/U</td>
</tr>
<tr>
<td>M28HW</td>
<td>26.5-40 GHz</td>
<td>WR28, WG22, R320</td>
<td>UG-599/U</td>
</tr>
<tr>
<td>M22HW</td>
<td>33-50 GHz</td>
<td>WR22, WG23, R400</td>
<td>UG-383/U</td>
</tr>
<tr>
<td>M19HW</td>
<td>40-60 GHz</td>
<td>WR19, WG24, R500</td>
<td>UG-383/U</td>
</tr>
<tr>
<td>M15HW</td>
<td>50-75 GHz</td>
<td>WR15, WG25, R620</td>
<td>UG-385/U</td>
</tr>
<tr>
<td>M12HW</td>
<td>60-90 GHz</td>
<td>WR12, WG26, R740</td>
<td>UG-387/U</td>
</tr>
<tr>
<td>M10HW</td>
<td>75-110 GHz</td>
<td>WR10, WG27, R900</td>
<td>UG-387/U</td>
</tr>
</tbody>
</table>

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.

SCALAR ANALYZER

SYSTEM FEATURES
Frequency Range
As per source frequency range

Number of Inputs
3 detector inputs plus tuned input

Number of Measurement Points
User selectable from 2 to 1601

Applications
Return loss vs frequency
Insertion loss vs frequency
Fault Location
Voltage vs frequency
Group Delay vs Frequency (optional)

Detection Modes
AC and DC

Noise Reduction
Averaging, 1 to 1000
Smoothing, 0.01 to 20%

Power Measurements
Using scalar detectors

Detector Correction
Frequency response and linearity read from EEPROM for 6230A/L and fault locators.
Support for 6230 and autotesters.

INSERTION LOSS MEASUREMENTS
Measurement Dynamic Range, AC Scalar Detection, with 623XA Detector
Max source output to -60 dBm
Max source output to -65 dBm (with averaging)

Typical values:
> 65 dB (10 MHz to 40 GHz)
> 75 dB (1 MHz to 3 GHz) only with 6232A
**Measurement Dynamic Range, Tuned Input**

- Maximum source output to -75 dBm
- Typically >80 dB (10 MHz to 17 GHz)

**Measurement Update Rate**

- 401 points in 270 ms with DC detection

**Calibration**

- Through path calibration or short and short/open calibrations for single ended insertion loss

**Inputs**

- Single input or ratio

**Accuracy (detector inputs and tuned input)**

- Linearity + mismatch

**Linearity (applies after normalization)**

- Linearity (for Power Levels >-45 dBm) scalar detector inputs
  - ±0.2 dB / 10 dB but not >0.5 dB in total

- Linearity (tuned input)

**Log incremental accuracy (typical)**

- 0.2 dB/10 dB

**Display Linearity**

- ±1.5 dB over 8 divisions (10 dB/div)

**RETURN LOSS MEASUREMENTS**

**Measurement Update Rate**

- 401 points in 270 ms with DC detection

**Calibration**

- Short, Open, Short/Open

**Inputs**

- Single input or ratio

**Accuracy**

- Linearity + directivity + test port mismatch

**Linearity (for Power Levels >-45 dBm)**

- ±0.2 dB / 10 dB but not >0.5 dB in total

**FAULT LOCATION MEASUREMENTS**

**Measurement Range**

- Up to 25 km depending on cable or waveguide loss

**Units**

- Feet or meters

**Number of Measurement Points**

- User selectable from 50 to 1601

**Minimum Resolution**

- For two equal amplitude discontinuities using maximum sweep width
  
  - 6841/8: 12.18 x Vr cm
  - 6842/6: 4.32 x Vr cm
  - 6843/7: 1.82 x Vr cm
  - 6844: 1.51 x Vr cm
  - 6845: 0.91 x Vr cm

  Where Vr is the relative velocity factor for the transmission line

**Measurement Update Rate**

- 512 points in 250 ms, DC detection

**Dynamic Range**

- DC detection 70 dB
- AC detection 80 dB

**Distance Accuracy**

- 3 mm or 0.1% of range for a single fault

**Transmission Line Database**

- Data supplied as standard

**Required Accessory**

- 624X series fault locator
- or 658X series transmission line test head
- or divider

**GROUP DELAY**

**Measurement Range**

- ±1 µs to ±10 µs

**Resolution* (3 MHz aperture)**

- 0.1 ns to 15 GHz
- 0.2 ns 15 to 30 GHz
- 0.3 ns 30 to 40 GHz

**Absolute Accuracy* (3 MHz aperture)**

- ±0.5 ns, 10 MHz to 24 GHz
- ±2.5 ns, 24 GHz to 40 GHz

*excluding effects of imperfect match

**Relative Accuracy (for peak to peak measurement)**

- As Resolution (typical)

**Scales**

- 0.1 ns/div to 5 µs/div in a 1, 2, 5 sequence with increment keys
- Keypad entry provides user scaling

**Reference delay**

- Defaults to zero, user selectable

**Reference position**

- User selectable, default is centre display

**Delay offset**

- User entry of offset value

**Trace displays**

- Simultaneous amplitude and group delay vs frequency
- Absolute delay and “zoom” display vs frequency
- Dual channel mode
- Comparison over same frequency range at same centre frequency
- Comparison over different centre frequencies

**FREQUENCY STANDARD**

**Internal 10 MHz OCXO**

**Drift**

- ± 5 in 10^8 over 0 to 55°C

**Ageing**

- ± 2 in 10^-7 per year (OCXO)

**External Frequency Standard**

- 1 MHz or 10 MHz
**Rear Panel Connectors**

**RS-232**
- 9 way D-type connector, male
- Baud rate 300 to 9600

**GPIB Interface**
- GPIB is IEEE 488.1 and 488.2 compatible. The interface has 2 functions.
  - Instrument control with full Talk/Listen capability
  - Control of plotter using HPGL. Plotter is buffered to permit measurements to proceed whilst plotting.

**10.7 MHz IF Output (from Spectrum Analyzer)**
- Connector: BNC

**Frequency Standard In/Out BNC**
- 10 MHz input or 10 MHz output selectable from front panel

**Mod In/Out BNC**
- Mod in/out
- Rear panel BNC connector, TTL level. Impedance approx 100 Ω

**Printer Output**
- 25 way D-type connector
- Parallel interface.
- Drivers supplied for PCL DeskJet and LaserJet printers. Printer is buffered to permit measurements to proceed whilst printing.

**External Monitor**
- Standard VGA, 640 by 480 color output
- 15 way high density D-type female connector

**Voltage Output (Auxiliary 9-pin Connector)**
- Settable for 0 to 10 V ramp, fixed voltage or chart recorder drive

**Video Output (Auxiliary 9-pin Connector)**
- Output from spectrum analyzer detector
- Bandwidth: as per RBW setting

**External Levelling Input**
- Input voltage range: 0 to +1 V
- Connector: BNC

**General Features**

**Number of Display Channels**
- 2

**Number of Measurements**
- 4 (2 per display channel)

**Number of Measurement Points**
- 2 to 1601 for one trace, scalar
- 512 fixed, spectrum

**Display**
- Color active matrix TFT liquid crystal display with 16.5 cm (6.5 in) visible diagonal

**Data Storage**
- 3.5 in floppy disc drive, 1.44 Mb. Trace storage in DOS format.

**Limits**
- 4 stores of 12 segments each. Each segment defines an upper limit, upper and lower limits, or a point. Any store can be applied to any trace.

**Markers**
- 8 per trace plus separate delta marker

**Marker Functions**
- Marker, delta marker, minimum, maximum, search left, search right, N-dB bandwidth (with center frequency), marker tracking.

**Spectrum Analyzer**
- Find Peak / Next Peak (next highest amplitude or next Left / Right) / Identify Peaks
- MKR to CF
- MKR to Ref Level
- Counter / Set Resolution
- Measure Relative to Carrier (dBc)
- Search Left / Right
- Delta MKR / Set Span / Fixed Delta

**Scalar Analyzer**
- Active marker Max / Min
- Max / Min Tracking
- Find PK-PK
- PK-PK Tracking
- Bandwidth / Optional CF / DF (Q)
- dB / Octave, dB / Decade Readout
- Delta Marker On / Off
- -1 dB Gain Compression
- Peak to peak delay between two markers
- Max peak to peak delay in a user defined bandwidth
- Deviation from linear between two markers
- Deviation from parabolic between two markers

**Fault Location**
- Find Max / Track Max
- Next PK Right / Left
- Set PK Level
- Delta marker On / Off

**General**
- Marker Table
- Assign Active MKR / Position Active MKR
- Set-up Markers (i.e. On / Off, Position)
- Large Readout
- All Off

**Marker Resolution**
- Frequency: 6 digits or 1 Hz, user selectable
- Power: 0.01 dB
- Voltage: 1 nV

**Measurement Manipulation**
- Display live measurement.
- Display trace memory.
- Display live measurement relative to trace memory.
- Measurement hold may be applied for each trace.
- Any input or ratio of inputs may be assigned to any one or more than one trace(s). A trace may display absolute power, power relative to a path calibration or power minus a trace memory.

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

**Weight - Variant and Option Dependent**
- 24 kg (53 lb)

**Size (Not including front handles)**
- 230 mm H x 430 mm W x 570 mm D
- 9 in H x 17 in W x 22 in D

**Power Supply**
- 100-240 V~ (Limit 90-264 V~)
50-60 Hz (Limit 45-66 Hz)
108-118 V~ (Limit 90-132 V~)
50-400Hz (Limit 45-440 Hz)
300 W Maximum

**Rated Range of Use**

Temperature  
6845 and 6845R only +5 to 45°C
Humidity  
Up to 93% RH at 40°C

**Conditions of Storage and Transportation**

Temperature  
-40 to +71°C
Humidity  
Up to 93% RH at 40°C
Altitude  
Up to 4570 m (15000 ft)

**Electromagnetic Compatibility**

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

IEC/EN61326-1 : 1997, RF Emission Class B, Immunity Table 1, Performance Criteria 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 portable equipment, for use in a Pollution Degree 2 environment. The instrument is designed to be operated from an Installation Category 2 supply.

Note: All specifications quoted are for operation at calibration temperature ±3°C.
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.
Typical specifications are non-warranted.

**Versions and Options**

When ordering please quote the full ordering number information.

**Ordering Numbers**

<table>
<thead>
<tr>
<th>Version</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6840</td>
<td>Microwave System Analyzers</td>
</tr>
<tr>
<td>6841</td>
<td>1 MHz to 3 GHz Scalar Analyzer with 4.2 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6842</td>
<td>10 MHz to 8.4 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6843</td>
<td>10 MHz to 20 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6844</td>
<td>10 MHz to 24 GHz Scalar Analyzer with 24 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6845R</td>
<td>10 MHz to 40 GHz Scalar Analyzer with 40 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6845</td>
<td>10 MHz to 46 GHz Scalar Analyzer with 46 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6846</td>
<td>10 MHz to 8.4 GHz Scalar Analyzer with 24 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6847</td>
<td>10 MHz to 20 GHz Scalar Analyzer with 26.5 GHz Spectrum Analyzer</td>
</tr>
<tr>
<td>6848</td>
<td>1 MHz to 3 GHz Scalar Analyzer with 20 GHz Spectrum Analyzer</td>
</tr>
</tbody>
</table>

**Supplied Accessories**

<table>
<thead>
<tr>
<th>Accessory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>46882/330</td>
<td>Operating Manual</td>
</tr>
<tr>
<td>46882/354</td>
<td>Getting Started Guide</td>
</tr>
<tr>
<td>46882/360</td>
<td>Remote Operating Manual</td>
</tr>
<tr>
<td>37591/755</td>
<td>AC Supply Lead</td>
</tr>
<tr>
<td>43123/076</td>
<td>Front Panel Cover</td>
</tr>
</tbody>
</table>

**Options**

<table>
<thead>
<tr>
<th>Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>002</td>
<td>Field Replaceable Precision N (f) or 3.5 mm (f) RF Connectors for Source and Spectrum Analyzer for 6842/6843/6844/6846/6847 Field Replaceable Precision N (f) or 2.92 mm (f) RF Connectors for Source and Spectrum Analyzer for 6845 &amp; 6845R</td>
</tr>
<tr>
<td>010</td>
<td>3 GHz, 110 dB Step Attenuator (only available for 6841 and 6848)</td>
</tr>
<tr>
<td>011</td>
<td>20 GHz, 70 dB Step Attenuator (only available for 6842/6843/6846/6847)</td>
</tr>
<tr>
<td>012</td>
<td>26.5 GHz 90 dB Step Attenuator (not available for 6841/6845/6848/6845R)</td>
</tr>
<tr>
<td>013</td>
<td>40 GHz 70 dB Step Attenuator (only available for 6845 &amp; 6845R)</td>
</tr>
<tr>
<td>020</td>
<td>External Mixer Interface</td>
</tr>
<tr>
<td>022</td>
<td>Group Delay</td>
</tr>
<tr>
<td>023</td>
<td>Internal Modulation (included in Group Delay option 022)</td>
</tr>
<tr>
<td>030</td>
<td>Higher Power Output (not applicable to 6841/6848/6845/6845R)</td>
</tr>
</tbody>
</table>

**Complementary Product**

<table>
<thead>
<tr>
<th>Product</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>6146</td>
<td>500 MHz to 18 GHz Pulse Modulator</td>
</tr>
<tr>
<td>54441/109</td>
<td>AC Power Supply for 6146</td>
</tr>
<tr>
<td>6147</td>
<td>70 MHz to 40 GHz Pulse Modulator</td>
</tr>
</tbody>
</table>
ACCESSORIES

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)

6232A/L SCALAR DETECTORS

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)
59999/166 10 MHz to 26.5 GHz 3.5 mm WSMA (m)
59999/168 10 MHz to 40 GHz 2.92 mm (m)
59999/169 10 MHz to 40 GHz 2.92 mm (f)

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.

For other frequencies and sizes please consult factory for details

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 Divider DC to 40 GHz, 2.92 mm
- 54311/187 Power Divider DC to 18 GHz
- 54311/188 Power Divider DC to 26.5 GHz

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
- 54421/024 N (f) Fixed Load

Precision Adapters

- 54311/175 N (m) to N (m)
- 54311/167 N (m) to N (f)
- 54311/174 N (f) to N (f)
- 54311/176 N (f) to 3.5 mm (f)
- 54311/177 N (m) to 3.5 mm (f)
- 54311/178 N (m) to 3.5 mm (m)
- 54311/185 N (f) to 3.5 mm (m)
- 54311/137 N (m) to TNC (f)

MILLIMETER WAVEGUIDE, SINGLE DIODE HARMONIC MIXERS

<table>
<thead>
<tr>
<th>Model Number</th>
<th>Frequency Range</th>
<th>Waveguide Designation</th>
<th>Flange Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>M42HW</td>
<td>18-26.5 GHz</td>
<td>WR42, WG20, R220</td>
<td>UG-597/U</td>
</tr>
<tr>
<td>M28HW</td>
<td>26.5-40 GHz</td>
<td>WR28, WG22, R320</td>
<td>UG-599/U</td>
</tr>
<tr>
<td>M22HW</td>
<td>33-50 GHz</td>
<td>WR22, WG23, R400</td>
<td>UG-383/U</td>
</tr>
<tr>
<td>M19HW</td>
<td>40-60 GHz</td>
<td>WR19, WG24, R500</td>
<td>UG-383/U</td>
</tr>
<tr>
<td>M15HW</td>
<td>50-75 GHz</td>
<td>WR15, WG25, R620</td>
<td>UG-385/U</td>
</tr>
<tr>
<td>M12HW</td>
<td>60-90 GHz</td>
<td>WR12, WG26, R740</td>
<td>UG-387/U</td>
</tr>
<tr>
<td>M10HW</td>
<td>75-110 GHz</td>
<td>WR10, WG27, R900</td>
<td>UG-387/U</td>
</tr>
</tbody>
</table>

For other frequencies and sizes please consult factory for details.
<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54311/138</td>
<td>N (m) to TNC (m)</td>
</tr>
<tr>
<td>54311/139</td>
<td>N (f) to TNC (f)</td>
</tr>
<tr>
<td>54311/186</td>
<td>N (f) to TNC (m)</td>
</tr>
<tr>
<td>54311/203</td>
<td>7 mm to N (f)</td>
</tr>
<tr>
<td>54311/204</td>
<td>7 mm to TNC (m)</td>
</tr>
<tr>
<td>54311/205</td>
<td>7 mm to TNC (f)</td>
</tr>
<tr>
<td>54311/136</td>
<td>TNC (m) to TNC (m)</td>
</tr>
<tr>
<td>54311/107</td>
<td>3.5 mm (f) to 3.5 mm (f)</td>
</tr>
<tr>
<td>54311/165</td>
<td>3.5 mm (f) to 3.5 mm (m)</td>
</tr>
<tr>
<td>54311/164</td>
<td>3.5 mm (m) to 3.5 mm (m)</td>
</tr>
<tr>
<td>54311/162</td>
<td>2.92 mm (m) to 2.92 mm (m)</td>
</tr>
<tr>
<td>54311/206</td>
<td>2.92 mm (m) to 2.92 mm (f)</td>
</tr>
<tr>
<td>54311/207</td>
<td>2.92 mm (f) to 2.92 mm (f)</td>
</tr>
</tbody>
</table>

**Standard Adapters**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54311/133</td>
<td>N (f) to SMA (f)</td>
</tr>
<tr>
<td>54311/134</td>
<td>N (m) to SMA (f)</td>
</tr>
<tr>
<td>54311/135</td>
<td>TNC (m) to SMA (m)</td>
</tr>
</tbody>
</table>

**Miscellaneous Electrical Cables**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54311/170</td>
<td>Positive Voltage Measurement Cable</td>
</tr>
<tr>
<td>54311/112</td>
<td>Negative Voltage Measurement Cable</td>
</tr>
<tr>
<td>43129/189</td>
<td>GPIB Cable</td>
</tr>
<tr>
<td>43139/042</td>
<td>BNC (m) to BNC (m) 1.5 m</td>
</tr>
<tr>
<td>46884/560</td>
<td>Parallel Printer Interface Cable</td>
</tr>
<tr>
<td>43137/604</td>
<td>Autotester Adapter Cable 0.5 m</td>
</tr>
<tr>
<td>43139/107</td>
<td>Autotester Adapter Cable 1.5 m</td>
</tr>
</tbody>
</table>

**Standard Microwave Cables**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>54351/022</td>
<td>0.5 m, 18 GHz, N (m) to N (m)</td>
</tr>
<tr>
<td>54351/025</td>
<td>0.5 m, 26.5 GHz, 3.5 mm (m) to 3.5 mm (m)</td>
</tr>
<tr>
<td>54351/027</td>
<td>0.5 m, 40 GHz, 2.92 mm (m) to 2.92 mm (m)</td>
</tr>
</tbody>
</table>

**Attenuators**

<table>
<thead>
<tr>
<th>Part No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>56534/901</td>
<td>Precision Fixed Coaxial Attenuator 3 dB DC to 18 GHz</td>
</tr>
<tr>
<td>56534/902</td>
<td>Precision Fixed Coaxial Attenuator 6 dB DC to 18 GHz</td>
</tr>
<tr>
<td>56534/903</td>
<td>Precision Fixed Coaxial Attenuator 10 dB DC to 18 GHz</td>
</tr>
<tr>
<td>56534/904</td>
<td>Precision Fixed Coaxial Attenuator 20 dB DC to 18 GHz</td>
</tr>
</tbody>
</table>

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