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
Web: www.TestEquipmentHQ.com
HP ESA-L1500A

**HP ESA-L1500A 1.5 GHz Portable Spectrum Analyzer**

HP introduces the ESA-L1500A, our new, low-cost, fully synthesized spectrum analyzer. Now get quick and accurate results every time, at an affordable price. It has the performance of a high-quality spectrum analyzer and the rugged ease of use expected in a field instrument.

**Fast measurements**
The HP ESA-L1500A gives you a rapid display update rate and state-of-the-art 5 ms sweep time that reduces test time and increases throughput.

**Accurate results**
The phase-locked synthesizer adds stability and repeatability to frequency measurements, and the automatic background alignment offers continuous calibration. Plus, you'll have specified performance only 5 minutes after power-up.

**Reliable operation**
Increase your manufacturing up-time: costly repairs can be avoided with the automatic input overload protection, and the use of component integration reduces the probability of failure.

**Rugged packaging and construction**
Ideal for field environments, the HP ESA-L1500A has a sealed front panel, louvered air vents and side-mounted fan to protect the instrument in a wide range of weather conditions. Rubber-encased front and rear frames resist the rigors of transportation.

**Easy to use**
The combination hard key/soft key front panel offers simple operation for basic measurements while providing access to sophisticated features. In addition, testing is simplified with built-in limit lines and pass/fail messages.

**Low cost**
All this at a very affordable price.

**PC Software for the HP ESA-L1500A**
The new HP BenchLink Spectrum Analyzer PC software provides an easy-to-use communications link between your PC and the HP ESA-L1500A spectrum analyzer. Taking full advantage of the Windows® interface, you can easily transfer screen images or trace data via HP-IB or RS-232 interfaces, thereby making it easy to capture, analyze and document measurement results in your PC. For more information, see page 251.

**Specifications**

**Frequency**

- Frequency range of 9 kHz to 1.5 GHz
- Frequency accuracy of ± 2.0 kHz at 1 GHz (without temperature)
- 5 minute warmup
- Rugged, portable package follows you from lab, to factory, to field

**Frequency Readout Accuracy**

- Start, Stop, Center, Marker: ± (frequency readout x frequency reference error) + span accuracy +20% of RBW

**Marker Frequency Counter**

- Resolution: Selectable from 1 Hz to 100 kHz
- Accuracy: ± (marker frequency x frequency reference error) + counter resolution

**Frequency Span**

- Range: 0 Hz (zero span), 100 Hz to 1.5 GHz
- Resolution: Four digits or 2 Hz, whichever is greater
- Accuracy: ± 1% of span

**Sweep Time**

- Range: 5 ms to 2000 s
- Accuracy (5 ms to 2000 s): ± 1%

**Sweep Trigger**

- Free Run, Single, Line, Video, External

**Resolution Bandwidth**

- Range (~3 dB width): 1 kHz to 3 MHz, in 1-3-10 sequence
- 5 MHz, characteristic
- Accuracy (1 kHz to 3 MHz RBW): ± 20%
- Shape (1 kHz to 3 MHz RBW): Approximately Gaussian shape
- Selectivity (1 kHz to 3 MHz RBW) (60 dB/3 dB bandwidth ratio): < 15,1, characteristic

**Video Bandwidth (~3 dB)**

- Range: 20 Hz to 1 MHz in 1-3-10 sequence. 3 MHz, characteristic.

**Stability**

- Residual FM: ± 0 dBc/Hz
- Input signal level: +54 dBmV

**Amplitude**

- **Measurement Range**
  - 75 ohms (Option 1DP): –65 dBmV to +72 dBmV
  - 50 ohms: –120 dBm to +30 dBm

- **Input Attenuator Range**
  - 75 ohms (Option 1DP): 0 dBm to +72 dBmV

- **Input Attenuator Setting**
  - 0 dB, 5 dB, 15 to 60 dB attenuation: ± 1.0 dB, characteristic

- **Total Power at Input Mixer**
  - 0 dB, 5 dB, 15 to 60 dB attenuation: ± 1.0 dB

- **Average Continuous Power**
  - 30 dBm (1 W); +72 dBmV (0.2 W)
  - for 75 Ω (Option 1DP)

- **Peak Pulse Power**
  - +30 dBm (1 W); +72 dBmV (0.2 W)
  - for 75 Ω (Option 1DP)

- **dc: 100 Vdc**

**dB Gain Compression**

- Total power at input mixer: 0 dBm
- 75 Ω (Option 1DP): +54 dBmV

**Displayed Average Noise Level**

- 30 Hz VBW, sample detector, 1 kHz RBW
- 750 kHz to 1 MHz: ± 5 dB, ± 2 Hz

**Display Range**

- Log Scale: 0 to –85 dB from reference level is calibrated
- 1, 2, 0.5, 0.25, 0.1, 0.05, 0.025, 0.01, 0.005 and 0.002 dB/division

**Frequency Response**

- Relative to 50 MHz, 9 kHz to 1.5 GHz
- 10 dB attenuation
  - 20 to 30°C: ± 0.75 dB
  - 0 to 55°C: ± 1.0 dB

**Input Attenuation Switching Uncertainty at 50 MHz**

- 0 dB to 5 dB attenuation: ± 0.3 dB
  - 10 dB attenuation: ± 0.5 dB

**Input Attenuation Switching Uncertainty at 50 MHz**

- 15 dB attenuation: ± 0.6 dB

- 20 to 60 dB attenuation: ± (0.1 dB + 0.01 x attenuator setting)
Absolute Amplitude Accuracy at reference settings: ± 0.3 dB
RF Input VSWR (characteristic)
9 kHz to 1.5 GHz (50 ohms) or 1 MHz to 1 GHz (75 ohms (Option 1DN)); 0 to 5 dB: 1.5:1
10 to 60 dB attenuation: 1.5:1
1 GHz to 1.5 GHz (75 ohms): 0 to 60 dB attenuation: 2.0:1
Resolution Bandwidth Switching Uncertainty (at reference level)
3 kHz RBW: Reference
1 kHz, 10 kHz to 3 MHz RBW: ± 0.4 dB
Reference Level
Range: Adjustable over amplitude measurement range
Resolution
Log Scale: ± 0.01 dB
Linear Scale: ± 0.12% of reference level
Accuracy: (at a fixed frequency, a fixed attenuation, and referenced to –35 dB + attenuation setting)
> –70 dBm + attenuation setting: (0.3 dB + 0.01 x absolute value
< –70 dBm + attenuation setting: ± 0.01 x absolute value
Accuracy, 75 Ω (Option 1DQ) (at a fixed frequency, a fixed attenuation, and referenced to → 1.5 MHz, 75 Ω)
> –21.24 dBm + attenuation setting: (0.3 dB + 0.01 x absolute value
< –21.24 dBm + attenuation setting: ± 0.01 x absolute value
Display Scale Switching Uncertainty
Linear to Log Switching: ± 0.25 dB at reference level
Log Switching: No error
Display Scale Fidelity
Log Maximum Cumulative
0 to –65 dB from reference level: ± 0.3 dB + 0.01 x dB from reference level
Log Incremental Accuracy
0 to –70 dB from reference level: ± 0.4 dB/4 dB
Linear Accuracy: ± 0.2% of reference level
Spurious Responses
Second Harmonic Distortion
2 MHz to 1.5 GHz: < –75 dBc for –40 dBm (1.14 dBm, 75 Ω)
Third Order Intermodulation Distortion
2 MHz to 5 MHz: +5 dBm (+114.3 dBm, 75 Ω); characteristic
5 MHz to 900 MHz: +8 dBc for –30 dBm (22.45 dBm, 75 Ω)
750 MHz to 1 GHz: ± 0.5 dBm, referenced to +42.76 dBmV
900 MHz to 1.2 GHz: ± 0.5 dBm, referenced to +42.76 dBmV
1 MHz to 1.5 MHz: ± 0.5 dBm, referenced to +42.76 dBmV
Other Input Related Spurious
30 kHz ≤ Offset ≤ 1200 MHz: < –65 dBc, for –20 dBm
(34 dBm, 75 Ω) signal at mixer input9 ± 1.5 GHz
Residual Responses
(Reference terminated and 0 dB attenuation)
150 kHz to 1.5 GHz: ± 10 dBm
1 MHz to 1.5 GHz (75 Ω): < –36 dBm
AM Demod: Tune and listen to AM signals

Options
Tracking Generator Specifications (Option 1DN or 1DQ)

Output Frequency Range
50 Ω (Option 1DN): 9 kHz to 1.5 GHz
75 Ω (Option 1DQ): 1 MHz to 1.5 GHz

Temperature Range
Operating: 0 °C to + 55 °C
Storage: –40 °C to + 75 °C
Audible Noise (ISO 7779)
Sound pressure at 25 °C: ≤ 33 dB (< 4.8 Bel power)
Military Specification: Has been type tested to the environmental specifications of MIL-PRF-28800F Class 3
EMI Compatibility: Conducted and radiated emission is in compliance with CISPR Pub.11/1990 Group 1 Class A
Power Requirements (Uses CUKonvertor ® topology in the power supply)
Voltage: 90 to 250 Vac rms
Frequency: 47 to 440 Hz
Power Consumption, On: < 200 W
Power Consumption, Standby: < 5 W
Weight (without options)
Net: 12.3 kg (27 lb), characteristic
Shipping: 25 kg (55 lb), characteristic
Dimensions
Height: 222 mm (8.75 in)
Width: 373 mm (14.7 in) w/o handle, 408 mm (16.1 in) w/handle
Depth: 409 mm (16.1 in) w/o handle, 516 mm (20.3 in) w/handle

Specifications of MIL-PRF-28800F Class 3
Signal Analyzers

Spectrum Analyzers, Portable

**Inputs and Outputs**

**Internal**
- 50 MHz oscillator
- Frequency: 50 MHz
- Frequency Accuracy: Frequency reference error + Amplitude: –27 dBm, nominal (+24.8 dBmV, nominal for 75 Ω)

**Front Panel**
- Input Connector/Impedance: Type N (f), 50 ohm, nominal; BNC (f), 75 ohm, nominal (Option 1DP)
- RF Out
  - Option 1DN, Connector/Impedance: Type N (f), 50 ohm, nominal
  - Option 1DP, Connector/Impedance: BNC (f), 75 Ω, nominal
- Probe Power
  - Voltage/Current: +15 Vdc, –12.6 Vdc at 150 mA max., characteristic
  - Ext. Keyboard: 6-pin mini-DIN, PC keyboards
  - Speaker: Front-panel knob controls volume
  - Headphone: 3.5-mm (1/8 inch) miniature audio jack

**Rear Panel**
- 10 MHz Ref Out: BNC (f), 50 ohm, > 0 dBm, characteristic
- 10 MHz Ref In: BNC (f), > 10 +10 dBm, characteristic
- Ext. Trig In: BNC (f), (5 V TTL)
- Hi Swp Out: BNC (f), (5 V TTL)
- VGA Output: VGA-compatible monitor, 15-pin mini D-SUB, (31.5 kHz horizontal, 60 Hz vertical sync rates, non-interlaced)
- Analog RGB, Resolution: 640 x 480
- Aux IF Out (Option A4J): BNC (f), 21.4 MHz, nominal (–10 to –70 dBm (uncorrected), characteristic)
- Aux Video Out (Option A4J): BNC (f), 0 to 1 V (uncorrected), characteristic
- Hi Swp in (Option A4J): BNC (f), low stops sweep, (5 V TTL)
- Hi Swp out (Option A4J): BNC (f), (5 V TTL)
- Swp Out (Option A4J): BNC (f), 0 to +10 V ramp, characteristic
- HP-IB Interface (Option A4H): IEEE-488 bus connector
- Serial Interface (Option 1AX): RS-232, 9-pin D-SUB
- Parallel Interface (Option A4H or 1AX): 25-pin D-SUB, printer port only
- Frequency reference error = (aging rate x period of time since adjustment) + temperature stability

**Key Literature**
- HP ESA-L1500A 1.5 GHz Portable Spectrum Analyzer, Product Overview p/n 5965-6309E
- For more information on compatible printers, visit our web site: http://www.hp.com/go/pcg

**Ordering Information**
- HP ESA-L1500A (E4411A) 9 kHz to 1.5 GHz Portable Spectrum Analyzer
  - Opt A4H HP-IB and parallel (Centronics) interfaces (cannot combine with Option 1AX)
  - Opt 1AX RS-232 and parallel (Centronics) interfaces (cannot combine with Option A4H)
  - Opt A4J IF, Sweep, and Video Ports
  - Opt 1DN 50 Ohm Tracking Generator (9 kHz to 1.5 GHz)
  - Opt 1DP 75 Ohm Input Impedance (1 MHz to 1.5 GHz)
  - Opt 1DG 75 Ohm Tracking Generator (1 MHz to 1.5 GHz) (requires Option 1DP)
  - Opt A50 12 Vdc power cable
  - Opt A70 50 to 75 Ohm matching pad (type N) to BNC (f)
  - Opt UK5 Front panel protective cover
  - Opt 1CP Rackmount kit with handles and slides
  - Opt GB1 Additional user and calibration guides
  - Opt 0BX Assembly level service guide and schematics
  - Opt UK6 Commercial calibration certificate with data
  - Opt DB0 Delete manuals
  - Opt AXT Add transit case
  - Opt AYT Grey soft carrying/operating case
  - Opt AVU Yellow soft carrying/operating case
  - Opt E70 HP BenchLink Spectrum Analyzer

**Accessories**
- HP 10833A HP-IB cable (1 meter)
- HP 24542U RS-232 cable (3 meter, 9 pin F to 9 pin F)
- HP 24542E RS-232 cable (3 meter, 25 pin M to 25 pin F)
- (for serial 25 pin PC or printer connection to analyzer)
- HP 24542M RS-232 cable (3 meter, 25 pin M to 9 pin F)
- (for serial 25 pin modem connection to analyzer)
- HP 87405A Preamplifier (10 MHz to 3 GHz, 24 dB gain)
  - (fastened to RF input, powered from analyzer)
- HP 8905A 75 Ohm preamplifier (45 MHz to 1 GHz, 20 dB gain) (powered from analyzer)
- HP 41800A Active probe (5 Hz to 500 MHz)
- HP 85024A High frequency active probe
  - (300 Hz to 3 GHz)
- HP E1779A Snap-on battery pack
- HP 34397A DC-to-AC power inverter for operating ESA-L1500A from 11 to 15 Vdc power sources such as automotive batteries

**HP E4444A BenchLink Spectrum Analyzer Software**

HP BenchLink Spectrum Analyzer provides an easy-to-use communications link between your PC and the HP 856x, 859x and ESA-L1500A spectrum analyzer families. HP BenchLink Spectrum Analyzer is a member of the HP BenchLink family of PC/basic instrument connectivity solutions, and takes full advantage of the Windows interface to easily transfer screen images or trace data via HP-IB or RS-232 interfaces.

HP BenchLink Spectrum Analyzer makes it easy to capture, analyze and document measurement results in your PC. HP has done all the programming for you. You'll be able to transfer screen images—you can transfer a picture of the spectrum analyzer screen to your PC for viewing, annotation, storage, or printing. HP BenchLink Spectrum Analyzer provides convenient annotation tools, and Windows makes it easy to cut and paste your annotated image into other applications like word processing, presentation, and graphics packages or E-mail. You can also save your image in PCX, TIF, GIF, and BMP formats. You'll find documenting measurement results to be fast and simple.

- **Trace data**—HP BenchLink Spectrum Analyzer transfers the trace frequency/amplitude pairs of data from your spectrum analyzer to your PC for further review and analysis. Once the trace data is captured, you can use pan and zoom and trace markers in BenchLink to analyze the trace. Additionally, the frequency/amplitude pairs of trace data can be easily copied as comma-separated-values to spreadsheets or other analysis programs using files or the Windows clipboard.

The software runs on Windows 3.1, Windows 3.11, Windows 95, and Windows NT 4.0 and includes a complete context-sensitive on-line help system. System requirements are IBM PC compatible with at least 486-25 MHz processor, 8 MB ram, and 2 MB disk space available.

**Ordering Information**
- E4444A BenchLink Spectrum Analyzer Software

**Remote Operation Software**

iPanels software for Windows 95/NT provides remote operation for HP8590 series spectrum analyzers (with HP-IB or RS-232 interface). The virtual HP8590 series instrument panel created on your PC monitor is easily controlled with a mouse as if you were sitting in front of the analyzer. Remote functionality through modem or LAN varies for different analyzer models and options. Contact Hamilton Software for analyzer compatibility and product details.

Hamilton Software
2270 Northpoint Parkway
Santa Rosa, CA 95407
800.704.0085
707.542.2700
http://www.hansoft.com

Hamilton Software is solely responsible for their products and services. HP disclaims any and all liabilities for and makes no warranties, expressed or implied, with respect to these products or services, including without limitation the implied warranties of merchantability and fitness for a particular purpose. Distribution of these products or information concerning these products does not constitute HP’s endorsement of Hamilton Software or its products or services.