

**Agilent**  
E5818A LXI Class-B Trigger Box

Data Sheet



## Features

- **Remote access to instruments via LAN**
- **IEEE 1588 Time Synchronization**
- **Output trigger at precise timing**
- **Input trigger at precise timing**
- **Peer-to-peer messaging**
- **Supports DHCP Protocol**
- **Built-in Web Access**
- **Battery supported RTC**
- **Multiple Triggering Options**
- **High precision TCXO**
- **Simplifies event correlation**

## Introduction

The Agilent E5818A LXI Class-B Trigger Box is a device for handling the IEEE 1588 Precision Time Protocol (PTP) synchronization over the Ethernet and for managing the precision trigger control signals to the legacy instrument that are not compliant with LXI standards. The IEEE 1588 PTP synchronization is performed over the Ethernet by the LXI trigger box.

The E5818 LXI trigger box utilizes LXI and IEEE 1588 to record and control asynchronous events via TTL signal input and output ports.

E5818A Front and Rear Panel Displays



## IEEE 1588 Benefits

The E5818 is adopting the IEEE 1588 precision time protocol (PTP) synchronization over the Ethernet network in nanosecond range accuracy with minimal network and local clock computing resources. IEEE 1588 provides synchronization accuracy as it meets current user requirements and future user requirements. It is using multicast communications to synchronize time between modules within a system.

A new IEEE 1588 device on the network listens for the master clock to send out its clock specification. Every device on the network compares its specification to the master. IEEE 1588 works best during asynchronous events and asynchronous control. IEEE 1588 brings a common sense of time to all LXI Class-B and devices.

IEEE 1588 is designed to fill a niche, which is not well served by either of the two dominant protocols, NTP and GPS. IEEE 1588 is designed for local systems that require a very high degree of accuracy which goes beyond what can be provided by NTP. It is also designed for applications that cannot bear the cost of a GPS receiver at each node, or for which GPS signals are inaccessible.<sup>1</sup>

IEEE 1588 can accommodate a wide range of systems and is designed for supporting industrial network protocols.

<sup>1</sup> From John C. Eidson, *Measurement, Control and Communication Using IEEE 1588*.

## LXI Class-B Benefits

The E5818A LXI Trigger Box is the world's first LXI Class-B triggering device for precise synchronization of non-LXI Class-B instruments over LAN.

The E5818 provides a new type of synchronization by using the IEEE 1588 standard for a PTP, which enables precise time triggering and stamping of events in the nanosecond range. The new synchronization is crucial, especially in automated test systems that involve multiple distributed devices with asynchronous events.

The E5818 is able to support peer-to-peer messaging and multicast communication which can improve test time, especially when heavy data usage occur between devices.

The E5818 also provides ease of use as it has the built-in web access to communicate E5818 from a supported web browser (Internet Explorer 6.0 or higher or Firefox 2.0 or higher). You can use this web access function to configure and upgrade the E5818 in LAN environment.

Compared to GPIB, LXI, and PXI, the E5818 reduces the overall overhead costs.

Furthermore, the E5818 provides a more cost-effective solution for demanding industries. The E5818 reduces the test system setup time as it uses standard drivers such as IVI drivers, reusing the existing instruments and software, improving the system throughput via LAN and distributed intelligence, reducing the size of the system and building a versatile system to address future

www.DataSheet4U.com

## Application

The E5818 is compatible with SCPI and can be configured via a web browser. For greater flexibility, it also comes system-ready with a bundled IVI driver so that users can easily automate measurements and triggers in the programming environment of their choice, such as Agilent VEE, Microsoft Visual Basic, C and LabVIEW.

The robust design of the E5818 trigger box guarantees reliable operations for demanding industries such as aviation, automotive, test and measurement and telecommunication industries.








## Product Specifications

GENERAL REQUIREMENTS	
Minimum System Requirements for Agilent IO Libraries Suite	<ul style="list-style-type: none"> <li>• Windows 2000/XP/Vista</li> <li>• 450 MHz Pentium II (1 GHz 32-bit is recommended for Vista)</li> <li>• 128 MB RAM (512 MB or greater is recommended for Vista) (OS and Microsoft.NET Framework may require additional resources)</li> <li>• 400 MB free disk space</li> </ul>
Minimum System Requirements (Client Computers)	<ul style="list-style-type: none"> <li>• Available 10BASE-T/100BASE-TX LAN port</li> </ul>
Supported Web Browser	<ul style="list-style-type: none"> <li>• For E5818 web access: Internet Explorer 6.0 or higher, or Firefox 2.0 or higher (Internet Explorer 7.0 is recommended for Vista)</li> </ul>
Supported Standards	<ul style="list-style-type: none"> <li>• VXI-11 Protocol</li> <li>• IEEE-488.2 Compatible</li> <li>• 10BASE-T/100BASE-TX Networks</li> <li>• EIA-232</li> <li>• LXI Standard Revision 1.1</li> <li>• IEEE 1588 — 2002</li> </ul>
Programming Language	<ul style="list-style-type: none"> <li>• SCPI Command</li> <li>• IVI-COM</li> <li>• Web Controller</li> </ul>
GENERAL CHARACTERISTICS	
Time Stamp Input	Input has TTL compatible logic levels
Time Trigger Output	Output provides TTL compatible logic levels
Periodic Trigger of 1 Pulse Per Second (1PPS)	For synchronization diagnostic use only. Issuing 1 Hz signal at 1 TTL output level (rising edge).
LAN	Allows communication with an external controller
AC Input	<b>Input Voltage Range:</b> 100-240 V $\pm$ 10% @ 47 to 63 Hz <b>Power:</b> 25 VA peak (7.5 Watt typical)
Protection Class	Protection Class 1
Connectors	9-pin RS-232 (for debugging purposes), RJ-45 LAN, BNC Connectors
Power Cord	US/Canada: P/N: 8120-1378 (UL Listed, CSA Certified) 10A/250V. All other cord sets: Appropriate foreign country approval associated with cord for per country of use.
Dimensions	<b>With bumper:</b> 227.3 mm (W) X 237.4 mm (L) X 59.3 mm (H) <b>Without bumper:</b> 212.3 mm (W) X 230.4 mm (L) X 43.25 mm (H)
Weight	3.085 kg
Rack Mount Kit Dimensions	<b>Full rack:</b> 242.8 mm (W) X 238.05 mm (L) X 43.25 mm (H) <b>Half rack:</b> 27.5 mm (W) X 226.2 mm (L) X 43.25 mm (H)
Non-volatile Memory Battery	Lithium Manganese Dioxide, approximate lifetime 5 years at 25 °C
User Memory Clear	Statement: <ul style="list-style-type: none"> <li>• All user-configurable data may be erased from the system without trace for security purposes</li> <li>• All LAN configurations can be reset through the LAN Reset button</li> <li>• All Trigger Box configurations are stored in a flash file system and can be deleted. However, once deleted from the system, the user has to restart all the applications manually.</li> </ul>
BNC Protection circuit	All BNCs will have its own set of overcurrent protection circuits
Indicators	PWR, LAN, 1588
Safety Compliance	Certified by: IEC 61010-1:2001/EN 61010-1:2001, CAN/CSA-C22.2 No. 61010-1-04, IEC 61326-2002/EN 61326:1997+A1:1998+A3:2003
Warranty	1 year

<b>GENERAL SYSTEM SPECIFICATIONS</b>	
<b>Input Characteristics</b>	
Input Impedance	15M Ohm
Input Threshold:	
Voltage Threshold High	+2.3 V
Voltage Threshold Low	+0.8 V
Minimum Pulse Width	20 ns
<b>Output Characteristics</b>	
Output Impedance	50 Ohm nominal
Output Threshold:	
Output High	1.7 V typical for 50 Ohm load; 4.3 V typical for 1M Ohm load
Output Low	0 V typical for 50 Ohm load; 0 V typical for 1M Ohm load
Output Current	+/-24 $\mu$ A, max
Square Wave Rise/Fall Time	(10 to 90%) for 50 Ohm load: 0.95 ns min, 1.15 ns max
Internal Timer Resolution	20 ns
<b>TCXO Characteristics</b>	
Frequency	50 MHz
Initial Accuracy	+/-2.0 ppm
Aging Per Year	+/-1.0 ppm
Temperature Stability (0 to 55 °C)	+/-2.5 ppm (-30 to 75%)
<b>1588 Synchronization Accuracy</b> <sup>1</sup>	
1.5 m Ethernet Direct Connection	+/-2 ns mean, 10 ns standard deviation
Via Hirschmann Boundary Clock <sup>2</sup>	+/-3 ns mean, 17 ns standard deviation
Via Switch <sup>3</sup>	+/-12 ns mean, 11 ns standard deviation
<p><sup>1</sup> The master unit was configured to connect to an external clock source for greater accuracy. The slave unit clock is based on the TCXO. A sync interval for E5818 and boundary clock was set to 1 s. Ethernet connection speed is 100 Mb/s. For E5818 connection using switch and boundary clock, no 1588 traffic was present as the network is isolated. Measurements were taken in room temperature for a duration of 8 hours for each configuration.</p> <p><sup>2</sup> Hirschmann MM3-4TX1-RT with PTP precision between 2 modules &lt; 80 ns</p> <p><sup>3</sup> DLink - DES1005D switch used</p>	
<b>TIME STAMP SYSTEM SPECIFICATIONS</b>	
Time Stamp Latency	62 ns
Time Stamp Input	2 ports
Event Log File	5000 data
Time Stamp Resolution	Min: 100 $\mu$ s Max: not applicable
Time Stamp Polarity	Rising or Falling Edge
Minimum Pulse Width	20 ns

<b>TIME TRIGGER SYSTEM SPECIFICATIONS</b>	
Time Trigger Latency	67 ns
Trigger Pulse Width	1 $\mu$ s
Time Trigger Output	2 ports
Event Log File	5000 data
Periodic Trigger	Supported
Programmability	Yes (SW)
Trigger Polarity	Rising or Falling Edge
Trigger Offset	12 hours (max)
Trigger Period	Min: 100 $\mu$ s Max: 12 hours
<b>MINIMUM TRIGGER PERIOD AND TIMESTAMP RESOLUTION SETTINGS <sup>4</sup></b>	
TTL1/TTL2 <sup>5</sup>	100 $\mu$ s
EXT1/EXT2 <sup>5</sup>	400 $\mu$ s
TTL1/TTL2 + peer-to-peer LAN message <sup>6</sup>	4.5 ms
EXT1/EXT2 + peer-to-peer LAN message <sup>6</sup>	1 ms
TTL(n) + EXT(n), with n ranging from 1 to 2 <sup>7</sup>	200 $\mu$ s
TTL(n) + EXT(n), with n ranging from 1 to 2 + peer-to-peer LAN message <sup>8</sup>	7 ms
TTL1 + TTL2 + EXT1 + EXT2 <sup>9</sup>	300 $\mu$ s
TTL1 + TTL2 + EXT1 + EXT2 + peer-to-peer LAN message <sup>10</sup>	14 ms
<p><sup>4</sup> Test is carried out on a network without P2P LAN messages from other LXI devices besides the device under test. Measurements were taken in room temperature for duration of 12 hours for each configuration. These are the typical values for the setting</p> <p><sup>5</sup> A single port, either TTL or EXT of each the E5818, is being exercised</p> <p><sup>6</sup> A single port, either TTL or EXT of each the E5818, is being exercised, and peer-to-peer LAN message (WOR) generation upon any event happening</p> <p><sup>7</sup> A combination of either two ports of TTL or EXT of the E5818 is being exercised</p> <p><sup>8</sup> A combination of either two ports of TTL or EXT of the E5818 is being exercised, and peer-to-peer LAN message (WOR) generation upon any event happening</p> <p><sup>9</sup> All four ports of the E5818 are being exercised</p> <p><sup>10</sup> All four ports of the E5818 are being exercised, and peer-to-peer LAN message (WOR) generation upon any event happening</p>	
<b>EXTERNAL TRIGGER SYSTEM SPECIFICATIONS</b>	
LXI LAN packets	Based on LAN0 to LAN7 or custom event ID with same domain
<b>LAN MESSAGING SYSTEM SPECIFICATIONS</b>	
External Trigger	Based on Time Stamp 0 or Time Stamp 1
<b>TRIGGER OUTPUT RESPONSE TIMES</b>	
Delay from EXT source to TTL Output	300 $\mu$ s
Delay for Trigger relating to LAN Event source or LAN Event output	Unknown

<b>ENVIRONMENTAL SPECIFICATIONS</b>	
Operating Environment	0 °C to 55 °C — Indoor use, Pollution Degree 2
Installation Category	II (mains input)
Altitude (operating)	2000 m
Operating Humidity	Up to 90% at 40 °C non-condensing
Storage Humidity	Up to 90% at 65 °C non-condensing
Storage Temperature	-40 °C to +70 °C
Operating State	Continuous
Connection to Supply Mains	Detachable cord
Degree of Mobility	Portable (Bench and Cabinet)
<b>SUPPORTED LANGUAGES AND APPLICATIONS</b>	
Applications (with Agilent Intuilink)	Microsoft Excel 97 and 2000 Microsoft Word 97 and 2000 Check the web for latest supported applications
Software Development	Visual Basic 5.0/6.0 Visual C++ 5.0/6.0 Visual Studio Agilent VEE 5.0 or greater BASIC for Windows Visual Studio.NET
<b>SUPPLEMENTARY INFORMATION</b>	
Maximum Number of Simultaneous LXI Peer-to-peer Connections	8
<b>SAFETY</b>	
    	



### Agilent Email Updates

[www.agilent.com/find/emailupdates](http://www.agilent.com/find/emailupdates)  
Get the latest information on the products and applications you select.



### Agilent Direct

[www.agilent.com/find/agilentdirect](http://www.agilent.com/find/agilentdirect)  
Quickly choose and use your test equipment solutions with confidence.



[www.agilent.com/find/open](http://www.agilent.com/find/open)  
Agilent Open simplifies the process of connecting and programming test systems to help engineers design, validate and manufacture electronic products. Agilent offers open connectivity for a broad range of system-ready instruments, open industry software, PC-standard I/O and global support, which are combined to more easily integrate test system development.



[www.lxistandard.org](http://www.lxistandard.org)  
LXI is the LAN-based successor to GPIB, providing faster, more efficient connectivity. Agilent is a founding member of the LXI consortium.

## Remove all doubt

Our repair and calibration services will get your equipment back to you, performing like new, when promised. You will get full value out of your Agilent equipment throughout its lifetime. Your equipment will be serviced by Agilent-trained technicians using the latest factory calibration procedures, automated repair diagnostics and genuine parts. You will always have the utmost confidence in your measurements.

Agilent offers a wide range of additional expert test and measurement services for your equipment, including initial start-up assistance, onsite education and training, as well as design, system integration, and project management.

For more information on repair and calibration services, go to:

[www.agilent.com/find/removealldoubt](http://www.agilent.com/find/removealldoubt)

## www.agilent.com

For more information on Agilent Technologies' products, applications or services, please contact your local Agilent office. The complete list is available at:

[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

### Americas

Canada	(877) 894-4414
Latin America	305 269 7500
United States	(800) 829-4444

### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 112 929
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Thailand	1 800 226 008

### Europe & Middle East

Austria	0820 87 44 11
Belgium	32 (0) 2 404 93 40
Denmark	45 70 13 15 15
Finland	358 (0) 10 855 2100
France	0825 010 700*
Germany	01805 24 6333**
Ireland	1890 924 204
Israel	972-3-9288-504/544
Italy	39 02 92 60 8484
Netherlands	31 (0) 20 547 2111
Spain	34 (91) 631 3300
Sweden	0200-88 22 55
Switzerland (French)	41 (21) 8113811(Opt 2)
Switzerland (German)	0800 80 53 53 (Opt 1)
United Kingdom	44 (0) 118 9276201

Other European Countries:

[www.agilent.com/find/contactus](http://www.agilent.com/find/contactus)

Revised: October 24, 2007

Product specifications and descriptions in this document subject to change without notice.

© Agilent Technologies, Inc. 2007, 2008  
Printed in USA, March 15, 2008  
5989-7290EN

