



# **LXI Timestamped Data Extended Function**

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## ***Revision history***

<b><i>Revision</i></b>	<b><i>Description</i></b>
1.0 May 10, 2022	Editorial Change Updated Legal Issues, Trademarks, Patents, and Licensing Policies verbiage
1.0 Nov 8, 2016	Initial Release

# 1 Overview

## 1.1 Introduction

LXI Timestamping Data enables the capability of marking a LAN event at a point in time – events such as triggering, measuring, or connecting channels. You can understand what happened in time sequence in your test programs.

This capability is recommended when implementing the LXI Clock Synchronization Extended Function., which can provide accurate clock relationships between various LXI Devices.

## 1.2 Purpose and Scope of this Document

### 1.2.4 Purpose

Each LXI Extended Function has its own document with unique section numbering that, if merged with the LXI Specification Core document, would produce a contiguous representation of the entire LXI Specification.

This document supplies the requirements for LXI conformance to the LXI Timestamped Data Extended Function.

### 1.2.5 Scope

This document defines a common set of **RULES** and **RECOMMENDATIONS** for constructing a conformant LXI Device with one or more Extended Functions. Whenever possible these specifications use existing industry standards.

The original LXI Device Specification included both requirements for all LXI Devices and a number of Extended Functions in a single document. Common information remains in the LXI Device Specification and specific information related to the Extended Function moves to separate documents.

## 1.3 Definition of Terms

This document contains both normative and informative material. Unless otherwise stated the material in this document shall be considered normative.

**NORMATIVE:** Normative material shall be considered in determining whether an LXI Device is conformant to this standard. Any section or subsection designated as a **RULE** or **PERMISSION** is normative.

**INFORMATIVE:** Informative material is explanatory and is not considered in determining the conformance of an LXI Device. Any section or subsection designated as **RECOMMENDATION**, **SUGGESTION**, or **OBSERVATION** is informative. Unless otherwise noted examples are informative.

**RULE:** Rules **SHALL** be followed to ensure compatibility for LAN-based devices. A rule is characterized by the use of the words **SHALL** and **SHALL NOT**. These words are not used for any other purpose other than stating rules.

**RECOMMENDATION:** Recommendations consist of advice to implementers that will affect the usability of the final device. Discussions of particular hardware to enhance throughput would fall

under a recommendation. These should be followed to avoid problems and to obtain optimum performance.

**PERMISSION:** Permissions are included to clarify the areas of the specification that are not specifically prohibited. Permissions reassure the reader that a certain approach is acceptable and will cause no problems. The word **MAY** is reserved for indicating permissions.

**OBSERVATION:** Observations spell out implications of rules and bring attention to things that might otherwise be overlooked. They also give the rationale behind certain rules, so that the reader understands why the rule must be followed. Any text that appears without heading should be considered as description of the specification.

## 1.4 Additional LXI Conformance Requirements

### 1.4.4 Extended Functions

#### 1.4.4.1 General Description

The LXI Standard consists of the LXI Device Specification, required for all LXI Devices. In addition, it includes all optional Extended Functions.

#### LXI Extended Functions

Extended Functions come in the form of external documents. Each Extended Function document will have sections numbered as though they were part of the LXI Device Specification, but the documents are separate to simplify maintenance of the standard and to add new Extended Functions without altering the LXI Device Specification. The [Guide to LXI Documentation](#) identifies the Extended Function documents.

#### 1.4.4.2 Conformance Requirements

The rules in this document define the conformance requirements for this Extended Function. In addition to the requirements for all LXI Devices found in the *LXI Device Specification*, an Extended Function may require conformance to another Extended Function. All these requirements are detailed in the following Rule.

##### 1.4.4.2.6 RULE – LXI Timestamped Data Conformance Requirements

The rules in this document define the conformance requirements for this Extended Function. In addition to the requirements for all LXI Devices found in the LXI Device Specification, there may be cases where an Extended Function requires conformance to another Extended Function. All requirements follow below:

#### LXI Device Specification Document:

- All LXI Devices shall conform to the rules found in Section 1.4 and all subsections
- A Function element with the FunctionName attributes of “LXI Timestamped Data” and version “1.0” in the LXIExtendedFunction element of the LXI identification document as described by section 10.2.5.

#### LXI Clock Synchronization Document:

- Include all rules

#### LXI Timestamped Data (this document):

- Include all rules



## 3 LXI Device Synchronization and Events

Section 3 of the LXI Device Specification summarizes the various methods of synchronization and triggering available for LXI Devices.

### 3.2 LXI Clock Synchronization Using IEEE 1588

#### 3.2.11 RULE – Generation of Timestamps

LXI Device generating timestamps based upon an IEEE 1588 clock shall provide information as to the accuracy of the timestamps that they supply. As a minimum, this information shall be available as part of the documentation that accompanies each LXI Device (whether printed or electronic).

##### 3.2.11.1 Recommendation – Precision of Timestamps

Timestamps should be derived from the IEEE 1588 clock with a precision that is consistent with the event or data acquisition process and the resolution of the clock. For example if the measurement front-end bandwidth is 1 Hz then the timestamp precision should be better than 1 second. If the measurement front-end bandwidth is 1 GHz then the timestamp precision should be better than 1 nanosecond or whatever the local clock supports

##### 3.2.11.2 Recommendation – Precision of Timestamps

The precision of the timestamp should be available via a driver call

### 3.6 RULE – Data Timestamps

LXI Devices shall assign a timestamp to all measurement data. See Section 6.5 of the *LXI Device Specification* concerning driver requirements associated with LXI Timestamped Data.

For all LXI Devices implementing IEEE 1588, all such timestamps shall be derived from the local IEEE 1588 synchronized real-time clock. LXI Devices implementing any part of the standard LXI API (see Section 6 of the *LXI Device Specification* document) shall return a valid data timestamp value.

#### 3.6.1.1.1 Permission – Circumstances Under Which Data Timestamps May Be Zero

Data timestamp values may be zero under the following circumstances:

- The LXI Device does not implement IEEE 1588, or
- The LXI Device is overloaded, and cannot capture timestamps fast enough. This condition should be considered a non-fatal error, or
- Vendors may implement an option to disable the collection of timestamps in an LXI Device. In this case, the LXI Device shall collect timestamps by default, and users must explicitly disable the functionality.

Note: See Section 3.2.11 for timestamp specifications based on IEEE 1588 clocks.

### ***Observation – Access to Timestamps***

The timestamps associated with data are included with the transmission of that data to other devices.

### ***Observation – Timestamps for Captured Data***

The reporting of data and timestamps logically can either be by data-timestamp pairs, or (if the data is a time series) by a starting timestamp and a time increment.