

LXI Timestamped Data Extended Function

Revision 1.0

May 10, 2022

.

[LXI Timestamped Data Extended Function 1](#_Toc103161176)

[*Notices* 3](#_Toc103161177)

[*Revision history* 5](#_Toc103161178)

[1 Overview 6](#_Toc103161179)

[1.1 Introduction 6](#_Toc103161180)

[1.2 Purpose and Scope of this Document 6](#_Toc103161181)

[1.2.4 Purpose 6](#_Toc103161182)

[1.2.5 Scope 6](#_Toc103161183)

[1.3 Definition of Terms 6](#_Toc103161184)

[1.4 Additional LXI Conformance Requirements 8](#_Toc103161185)

[1.4.4 Extended Functions 8](#_Toc103161186)

[3 LXI Device Synchronization and Events 9](#_Toc103161187)

[3.2 LXI Clock Synchronization Using IEEE 1588 9](#_Toc103161188)

[3.2.11 RULE – Generation of Timestamps 9](#_Toc103161189)

[3.6 RULE – Data Timestamps 9](#_Toc103161190)

**Notices**

**Notice of Rights.** All rights reserved. This document is the property of the LXI Consortium.  It may be reproduced, unaltered, in whole or in part, provided the LXI copyright notice is retained on every document page.

**Notice of Liability.** The information contained in this document is subject to change without notice. “Preliminary” releases are for specification development and proof-of-concept testing and may not reflect the final “Released” specification.

The LXI Consortium, Inc. makes no warranty of any kind with regard to this material, including but not limited to, the implied warranties of merchantability and fitness for a particular purpose. The LXI Consortium, Inc. shall not be liable for errors or omissions contained herein or for incidental or consequential damages in connection with the furnishing, performance, or use of this material.

**LXI Standards Documents** are developed within the LXI Consortium and LXI Technical Working Groups sponsored by the LXI Consortium Board of Directors. The LXI Consortium develops its standards through a consensus development process modeled after the American National Standards Institute, which brings together volunteers representing varied viewpoints and interests to achieve the final product. Volunteers are not necessarily members of the Consortium and serve without compensation. While the LXI Consortium administers the process and establishes rules to promote fairness in the consensus development process, the LXI Consortium does not exhaustively evaluate, test, or verify the accuracy of any of the information contained in its standards.

Use of an LXI Consortium Standard is wholly voluntary. The LXI Consortium and its members disclaim liability for any personal injury, property or other damage, of any nature whatsoever, whether special, indirect, consequential, or compensatory, directly or indirectly resulting from the publication, use of, or reliance upon this, or any other LXI Consortium Standard document.

The LXI Consortium does not warrant or represent the accuracy that the use of the material contained herein is free from patent infringement. LXI Consortium Standards documents are supplied “as is”. The existence of an LXI Consortium Standard does not imply that there are no other ways to produce, test, measure, purchase, market, or provide other goods and services related to the scope of the LXI Consortium Standard. Furthermore, the viewpoint expressed at the time a standard is approved and issued is subject to change brought about through developments in the state of the art and comments received from users of the standard. Users are cautioned to check to determine that they have the latest edition of any LXI Consortium Standard.

In publishing and making this document available, the LXI Consortium is not suggesting or rendering professional or other services for, or on behalf of, any person or entity. Nor is the LXI Consortium undertaking to perform any duty owed by any other person or entity to another. Any person utilizing this, and any other LXI Consortium Standards document, should rely upon the advice of a competent professional in determining the exercise of reasonable care in any given circumstances.

This specification is the property of the LXI Consortium, a Delaware 501c3 corporation, for the use of its members.

**Interpretations** Occasionally questions may arise regarding the meaning of portions of standards as they relate to specific applications. When the need for interpretations is brought to the attention of LXI Consortium, the Consortium will initiate action to prepare appropriate responses. Since LXI Consortium Standards represent a consensus of concerned interests, it is important to ensure that any interpretation has also received the concurrence of a balance of interests. For this reason, LXI Consortium and the members of its working groups are not able to provide an instant response to interpretation requests except in those cases where the matter has previously received formal consideration. Requests for interpretations of this standard may be sent to [interpretations@lxistandard.org](mailto:interpretations@lxistandard.org) using the form “*Request for Interpretation of an LXI Standard Document*”. This document plus a list of interpretations to this standard are found on the LXI Consortium’s Web site: [http://www.lxistandard.org](http://www.lxistandard.org/)

**Legal Issues, Trademarks, Patents, and Licensing Policies.** These items are addressed specifically in the document “LXI *Consortium Trademark, Patent, and Licensing Policies*” found on the LXI Consortium’s Web site: <http://www.lxistandard.org> .

**Conformance** The LXI Consortium draws attention to the document “*LXI Consortium Policy for Certifying Conformance to LXI Consortium Standards*” found on the LXI Consortium’s Web site: <http://www.lxistandard.org> .That document specifies the procedures that must be followed to claim conformance with this standard.

**Comments for Revision** Comments for revision of LXI Consortium Standards are welcome from any interested party, regardless of membership affiliation with LXI Consortium. Suggestions for changes in documents should be in the form of a proposed change of text, together with appropriate supporting comments. Comments on standards should be addressed to:

Executive Director  
LXI Consortium  
www.lxistandard.org

[ExecDir@lxistandard.org](mailto:ExecDir@lxistandard.org)

**LXI is a registered trademark of the LXI Consortium**

**Revision history**

|  |  |
| --- | --- |
| ***Revision*** | ***Description*** |
| 1.0  May 10, 2022 | Editorial Change  Updated Legal Issues, Trademarks, Patents, and Licensing Policies verbiage |
| 1.0  Nov 8, 2016 | Initial Release |

# Overview

## 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.

## Purpose and Scope of this Document

### 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.

### 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.

## 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.

## Additional LXI Conformance Requirements

### Extended Functions

#### 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***](http://www.lxistandard.org/Specifications/Specifications.aspx) identifies the Extended Function documents.

#### 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.

##### 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

# LXI Device Synchronization and Events

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

## LXI Clock Synchronization Using IEEE 1588

### 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

## 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.

## 