

IEEE Standard for Requirements for Time Tags Created by Intelligent Electronic Devices—COMTAG

IEEE Power and Energy Society

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Power System Relaying Committee
of the
IEEE Power and Energy Society

Approved 5 December 2018

IEEE-SA Standards Board

Abstract: Common requirements for associating time tags with data items recorded or transmitted by Intelligent Electronic Devices (IEDs) are established in this standard. Time tag attributes and requirements for describing time tag accuracy are specified in this standard.

Keywords: COMTAG, IED, IEEE C37.237™, IRIG-B, time stamp, time synchronization, time tag

The Institute of Electrical and Electronics Engineers, Inc.
3 Park Avenue, New York, NY 10016-5997, USA

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PDF: ISBN 978-1-5044-5126-0 STD23271
Print: ISBN 978-1-5044-5127-7 STDPD23271

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Mark Adamiak	Mike Dood	Kenneth Martin
Eric Allen	Allen Goldstein	Jay Murphy
Alex Apostolov	Chris Huntley	Craig Preuss
Ed Cenzone	Marc Lacroix	Benton Vandiver

The following members of the individual balloting committee voted on this standard. Balloters may have voted for approval, disapproval, or abstention.

M. Victoria Alonso	Roger Hedding	Craig Preuss
Johann Amsenga	Werner Hoelzl	Charles Rogers
William Bloethe	Gary Hoffman	Daniel Sabin
Christian Boiger	Chris Huntley	Bartien Sayogo
Gustavo Brunello	David Ingram	Veselin Skendzic
Paul Cardinal	Richard Jackson	Jeremy Smith
Rodney Cummings	Piotr Karocki	Jerry Smith
Bill Dickerson	Hubert Kirrmann	Eric Thibodeau
Mike Dood	Jim Kulchisky	Michael Thompson
Neal Dowling	Marc Lacroix	Timothy Tibbals
Dan Dwyer	Kenneth Martin	Joe Uchiyama
Kenneth Fodero	Pierre Martin	James Van De Ligt
Dominick Fontana	John McDonald	Benton Vandiver
Jalal Gohari	R. Murphy	John Vergis
Allen Goldstein	Bruce Muschlitz	Quintin Verzosa
Roman Graf	Michael Newman	John Wang
Randall Groves	Gary Nissen	Philip Winston
Jim Hackett	Lorraine Padden	Sergio Zimath
	Subhash Patel	

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Dong Liu	Annette D. Reilly	Jingyi Zhou

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Introduction

This introduction is not part of IEEE Std C37.237™-2018, IEEE Standard for Requirements for Time Tags Created by Intelligent Electronic Devices—COMTAG.

Event recorders have been standard equipment in many industries, such as commercial aviation, for many years. They have also been used by utilities to analyze events that happened in facilities or on the power system. One of many common substation intelligent electronic devices (IEDs) is a sequence of events (SOE) recorder, which records the status of the different equipment by monitoring binary inputs.

With the introduction of new technologies, IEDs rely on data exchanged by communication systems in addition to physical stimuli. This has made it more challenging to monitor the SOE in the substation automation system. One way to overcome this problem is to use the advanced processing capabilities of the IEDs to record and report the events in more detail, especially internal processing events.

Event data collected by the IEDs meeting this standard will be used to help reduce the potential probability of future incidents in cases where equipment design, maintenance practices, training, or procedures can be modified based on such data.

Events that should be captured by the IEDs for the substation engineer are all the stimuli received or sent from/to other IEDs (such as IEC 61850 GOOSE messages) or from physical measurements, for example:

- Digital status
- Analog values that exceed a predetermined threshold
- Control messages
- Internally generated device events

This standard also addresses the sources of error that can cause the recorded time tag value to be different from the time when the event actually occurred or when the analog quantity was equal to the reported value. Many IEDs in power systems generate records of power system events and time-varying analog quantities. These records generally include time tags.

This standard defines event time. This is the actual point in time, with theoretically perfect accuracy, when some event occurs on the power system or when an analog quantity measurement is taken that is reported as part of an event record. This time will not be the same as the time that a substation IED detects or measures the item. It may, however, be the only meaningful time to the user of data recorded by a substation IED. To enable the classification of when the event of interest occurred, methods are required to report events and analog quantities with time tags that represent the event time as accurately as possible and to state its residual uncertainty.

The accuracy of the measured values themselves is not addressed because this is broadly covered in the literature. Inaccuracy in measured values impacts the apparent accuracy of time tags: for example, both a comparator threshold error and an IED clock offset will affect the reported instant in time when a signal (with finite slew rate) crosses a nominal threshold. Without careful measurement, the effects of these errors are indistinguishable and result in the incorrect interpretation of the time tag.

After measurement, all of the processes used to record or report power system events and measurements add delay. This delay consists of an average value and an uncertainty. The average delay can be characterized and compensated for to correct the reported time tag so that it better matches the event time. Uncertainties, by their nature, cannot be compensated, but it should be possible to tell the user of the data how large these uncertainties might be. This can help the user to evaluate the usefulness of the data and compare it to other sources that might have more or less uncertainty.

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IEEE Standard for Requirements for Time Tags Created by Intelligent Electronic Devices—COMTAG

1. Overview

1.1 Scope

This standard establishes common requirements for associating time tags with data items recorded or transmitted by intelligent electronic devices (IEDs). The standard specifies time tag attributes and requirements for describing time tag accuracy.

1.2 Purpose

This standard establishes consistent requirements for time tagging data items in a power system. This allows information from different sources to be more easily compared, thereby simplifying the process of event reconstruction and IED/system performance evaluation. This will lead to better power system reliability, gained through improved understanding of system operation under stressed conditions and a reduction in the cost of event analysis.

2. Definitions, acronyms, and abbreviations

2.1 Definitions

For the purposes of this document, the following terms and definitions apply. The *IEEE Standards Dictionary Online* should be consulted for terms not defined in this clause.¹

absolute time: Time referred to that international time standard comprising an ensemble of precise atomic clocks maintained by recognized national laboratories.

data item: Sampled analog or digital value, a transition of a digital value, or other designated event with a precisely defined data pattern.

data set: A collection of one or more data items to which a single time tag is associated.

daylight saving time: Time as adjusted to achieve longer evening daylight, especially in summer, by setting the clocks an hour ahead of the standard time.

¹*IEEE Standards Dictionary Online* is available at: <http://dictionary.ieee.org>.