

1646™

**IEEE Standard Communication
Delivery Time Performance
Requirements for Electric Power
Substation Automation**

IEEE Power Engineering Society

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Substation Committee



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IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation

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**Substation Committee
of the
Power Engineering Society**

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Abstract: A standard defining communication delivery times of information to be exchanged within and external to substation integrated protection, control, and data acquisition systems is described. Communication capabilities and system capabilities to deliver data on time are also specified.

Keywords: automatic control, data acquisition, SCADA, supervisory control, communication, intelligent electronic devices, IED, distributed processing, communication message delivery performance measures

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Introduction

(This introduction is not part of IEEE Std 1646-2004, IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation.)

This standard applies to systems used to communicate between intelligent electronic devices (IEDs) for substation integrated protection, control and data acquisition. The requirements of this standard are in addition to those contained in standards for individual devices (e.g., relays, switchgear).

This standard applies to a rapidly changing technology. It is anticipated that frequent revision may be desirable.

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IEEE Standard Communication Delivery Time Performance Requirements for Electric Power Substation Automation

1. Overview

1.1 Scope

This standard defines communication delivery times of information to be exchanged within and external to substation integrated protection, control, and data acquisition systems.

1.2 Purpose

Utilities will use communication performance requirements as part of a procurement specification to develop new substation automation systems, or to modify existing substation automation systems. Vendors will use communication performance requirements to build open system communication interfaces for intelligent electronic devices for substation automation.

1.3 IEEE 1646 is communication protocol and data model neutral

IEEE 1646 is a specification of communication delivery time performance requirements, other than for time synching; it does not specify an underlying protocol nor does it specify the data model used to exchange information. End users must consider the bandwidth available for communication within an electric power substation, between substations, and between substations and other entities. End users must also select a comprehensive data model describing the semantics of the information to be exchanged.

1.4 Document organization

In addition to the overview, described in this clause, normative references are described in Clause 2 and definitions, acronyms and abbreviations are defined in Clause 3.

Communication delivery time performance requirements are described in Clause 4 to specify the measurable criteria for complying with this standard. Clause 5 and Clause 6 describe the communication capabilities and system capabilities required to deliver data within specified times.

Two informative annexes are part of this standard.

- Annex A (informative) Bibliography
Describes references that are commonly used in power system engineering and communications between intelligent electronic devices.
- Annex B (informative) Example applications
Summarizes example applications for protection, distribution, local control, EMS/DMS/SCADA, and planning and maintenance functions.

2. References

This standard shall be used in conjunction with the following normative publications. When the referenced standard is superseded by an approved revision, the revision shall apply.

IEEE Std 1588™-2002, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.¹

3. Definitions, acronyms, and abbreviations

3.1 Definitions

For the purposes of this standard, the following terms and definitions apply. *The Authoritative Dictionary of IEEE Standards, Seventh Edition [B7]*, should be referenced for terms not defined in this clause. The following conventions are used for cross-referencing:

Contr: Refers to a term that has an opposed or substantively different meaning.

See: Refers to a related term that has a similar, but not synonymous meaning.

Syn: Indicates that the term has the same meaning as another term, which is referenced.

3.1.1 adjacent component protection: Protection of power system equipment at one substation based on data measured at others, e.g., line differential protection and teleprotection.

3.1.2 alarm processing: Alarm analysis procedures to improve presentation of alarm data. It ranges from updating alarm lists and producing group alarms up to more intelligent evaluations.

3.1.3 asynchronous transmission: In data communications, a method of transmission in which sending and receiving of data is controlled by control characters rather than by a timing sequence.

3.1.4 automatic switching sequences: Automatic sequential operation of groups of power system devices to reduce operator workload and/or switching time and to avoid unsuccessful or unnecessary switching attempts.

3.1.5 availability of data: State in which data are where the user needs them, when the user needs them, and how the user needs them.

3.1.6 breaker: A device that connects and disconnects power circuits, with fault-interrupting capability; *Syn*: **circuit breaker**.

3.1.7 breaker (health) monitoring: A function that measures a breaker's parameters for decisions on needed maintenance or repair.

¹ IEEE publications are available from the Institute of Electrical and Electronics Engineers, Inc., 445 Hoes Lane, Piscataway, NJ 08854, USA (<http://standards.ieee.org/>).