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IEEE Guide for Designing a Time Synchronization System for Power Substations

IEEE Power and Energy Society

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Substations Committee

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IEEE Guide for Designing a Time Synchronization System for Power Substations

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Substations Committee
of the
IEEE Power and Energy Society

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Abstract: The design, installation, and monitoring of time synchronization systems in power utility substations is covered. This includes time sources such as Global Positioning Satellite (GPS) and time distribution systems such as Inter-Range Instrumentation Group Format B (IRIG-B), Network Time Protocol (NTP) or Simple Network Time Protocol (SNTP), and IEEE Std C37.238™. The time source and the intelligent electronic device (IED) are assumed to have accurate clocks.

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Introduction

This introduction is not part of IEEE Std 2030.101–2018, IEEE Guide for Designing a Time Synchronization System for Power Substations.

Time synchronization is an important part of modern electric utility power system design and operation, but it is critical to the emerging requirements for smart grid operation.

The purpose of this document is to provide guidance in the design of time synchronization systems for electric utility power substations to help ensure that they are adequately designed, tested, and maintained in order to support the present and future applications that rely on accurate and reliable time.

This guide is intended for time synchronization system design and includes many different recommendations that could be implemented, should the designer choose to do so. Manufacturers of satellite clocks, intelligent electronic devices (IEDs), or other time synchronization system components and equipment are not expected to claim conformance to this guide (although this guide may provide manufacturers with product features that might be useful to designers using this guide). There is no planned certification of time synchronization systems to this guide.

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1. Overview

1.1 Scope

This guide covers the design, installation, and monitoring of time synchronization systems in power utility substations. This includes time sources such as Global Positioning Satellite (GPS), and time distribution systems such as Inter-Range Instrumentation Group Format B (IRIG-B), Network Time Protocol (NTP) or Simple Network Time Protocol (SNTP), and IEEE Std C37.238™ plus IEC/IEEE 61850-9-3. This guide assumes that the time source and the intelligent electronic device (IED) have accurate clocks.

1.2 Purpose

Time synchronization is now critical to the smart grid, with substations using legacy systems and new standards for network time synchronization, a guide is needed to help ensure adequate system design is undertaken to support the applications relying on accurate and reliable time.

2. Normative references

The following referenced documents are indispensable for the application of this document (i.e., they must be understood and used, so each referenced document is cited in text and its relationship to this document is explained). For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments or corrigenda) applies.

IEC 61588-2009, IEC/IEEE Precision Clock Synchronization Protocol for Network Measurement and Control Systems.[1,2]

IEEE Std 1588™-2008, IEEE Standard for a Precision Clock Synchronization Protocol for Networked Measurement and Control Systems.[3,4]

[1]IEC publications are available from the International Electrotechnical Commission (http://www.iec.ch) and the American National Standards Institute (http://www.ansi.org/).
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