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TELECOMMUNICATION
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SERIES G: TRANSMISSION SYSTEMS AND MEDIA, DIGITAL SYSTEMS AND NETWORKS

Packet over Transport aspects – Synchronization, quality and availability targets

SERIES Y: GLOBAL INFORMATION INFRASTRUCTURE, INTERNET PROTOCOL ASPECTS AND NEXT-GENERATION NETWORKS

Internet protocol aspects – Transport

Timing characteristics of primary reference time clocks

Recommendation ITU-T G.8272/Y.1367

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Recommendation ITU-T G.8272/Y.1367

Timing characteristics of primary reference time clocks

Summary

Recommendation ITU-T G.8272/Y.1367 specifies the requirements for primary reference time clocks (PRTCs) suitable for time, phase and frequency synchronization in packet networks. It defines the error allowed at the time output of the PRTC.

These requirements apply under the normal environmental conditions specified for the equipment.

History

Edition	Recommendation	Approval	Study Group	Unique ID*
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Recommendation ITU-T G.8272/Y.1367

Timing characteristics of primary reference time clocks

1 Scope

This Recommendation specifies the requirements for primary reference time clocks (PRTCs) suitable for time, phase and frequency synchronization in packet networks. These requirements apply under the normal environmental conditions specified for the equipment.

A typical PRTC provides the reference signal for time, phase and frequency synchronization for other clocks within a network or section of a network. In particular, the PRTC can also provide the reference signal to the telecom grand master (T-GM) within the network nodes where the PRTC is located.

The PRTC provides a reference time signal traceable to a recognized time standard (e.g., coordinated universal time (UTC)). UTC can be obtained from a UTC time laboratory registered at Bureau International des Poids et Mesures (BIPM) (e.g., a national UTC time lab) or, most commonly, from a global navigation satellite system (GNSS).

This Recommendation defines the PRTC output requirements. The accuracy of the PRTC should be maintained as specified in this Recommendation.

This Recommendation also covers the case where a PRTC is integrated with a T-GM clock. In this case it defines the performance at the output of the combined PRTC and T-GM function, i.e., the precision time protocol (PTP) messages.

2 References

The following ITU-T Recommendations and other references contain provisions which, through reference in this text, constitute provisions of this Recommendation. At the time of publication, the editions indicated were valid. All Recommendations and other references are subject to revision; users of this Recommendation are therefore encouraged to investigate the possibility of applying the most recent edition of the Recommendations and other references listed below. A list of the currently valid ITU-T Recommendations is regularly published. The reference to a document within this Recommendation does not give it, as a stand-alone document, the status of a Recommendation.

[ITU-T G.703] Recommendation ITU-T G.703 (2001), *Physical/electrical characteristics of hierarchical digital interfaces*.

[ITU-T G.810] Recommendation ITU-T G.810 (1996), *Definitions and terminology for synchronization networks*.

[ITU-T G.811] Recommendation ITU-T G.811 (1997), *Timing characteristics of primary reference clocks*.

[ITU-T G.8260] Recommendation ITU-T G.8260 (2012), *Definitions and terminology for synchronization in packet networks*.

[ITU-T G.8271] Recommendation ITU-T G.8271/Y.1366 (2012), *Time and phase synchronization aspects of packet networks*.

[ITU-T G.8273] Recommendation ITU-T G.8273/Y.1368 (2013), *Framework of phase and time clocks*.

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

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3 Definitions

3.1 Terms defined elsewhere

This Recommendation uses the following terms defined elsewhere:

Definitions related to synchronization are contained in [ITU-T G.810] and [ITU-T G.8260].

3.2 Terms defined in this Recommendation

None.

4 Abbreviations and acronyms

This Recommendation uses the following abbreviations and acronyms:

1PPS	1 Pulse-Per-Second
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
MTIE	Maximum Time Interval Error
PRC	Primary Reference Clock
PRTC	Primary Reference Time Clock
PTP	Precision Time Protocol
RF	Radio Frequency
SSU	Synchronization Supply Unit
T-GM	Telecom Grand Master
TDEV	Time Deviation
ToD	Time of Day
UTC	Coordinated Universal Time

5 Conventions

None.

6 Time error, wander and jitter in locked mode

The noise generation of a PRTC is characterized by two main aspects:

– the constant time error (time offset) at its output compared to the applicable primary time standard (e.g., UTC);

– the amount of phase error (wander and jitter) produced at its output.

For characterization of the second aspect described above (phase error) the calculation of the maximum time interval error (MTIE) and the time deviation (TDEV) is useful.

Clause 6.1 defines the time error requirements applicable at the output of the PRTC, which corresponds to the combination of the two aspects described above (constant time error and phase error). No requirement is defined for the constant time error component taken alone; it is combined with the phase error and not separately measurable.

Clauses 6.2 and 6.3 define the wander and jitter requirements applicable at the output of the PRTC, which correspond to the second aspect described above (phase error).

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