



INTERNATIONAL TELECOMMUNICATION UNION

ITU-T

TELECOMMUNICATION
STANDARDIZATION SECTOR
OF ITU

G.8271.1/Y.1366.1

Amendment 2
(01/2015)

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

**Network limits for time synchronization in
packet networks**

Amendment 2:

CAUTION !

PREPUBLISHED RECOMMENDATION

This prepublication is an unedited version of a recently approved Recommendation. It will be replaced by the published version after editing. Therefore, there will be differences between this prepublication and the published version.

FOREWORD

The International Telecommunication Union (ITU) is the United Nations specialized agency in the field of telecommunications, information and communication technologies (ICTs). The ITU Telecommunication Standardization Sector (ITU-T) is a permanent organ of ITU. ITU-T is responsible for studying technical, operating and tariff questions and issuing Recommendations on them with a view to standardizing telecommunications on a worldwide basis.

The World Telecommunication Standardization Assembly (WTSA), which meets every four years, establishes the topics for study by the ITU-T study groups which, in turn, produce Recommendations on these topics.

The approval of ITU-T Recommendations is covered by the procedure laid down in WTSA Resolution 1.

In some areas of information technology which fall within ITU-T's purview, the necessary standards are prepared on a collaborative basis with ISO and IEC.

NOTE

In this Recommendation, the expression "Administration" is used for conciseness to indicate both a telecommunication administration and a recognized operating agency.

Compliance with this Recommendation is voluntary. However, the Recommendation may contain certain mandatory provisions (to ensure, e.g., interoperability or applicability) and compliance with the Recommendation is achieved when all of these mandatory provisions are met. The words "shall" or some other obligatory language such as "must" and the negative equivalents are used to express requirements. The use of such words does not suggest that compliance with the Recommendation is required of any party.

INTELLECTUAL PROPERTY RIGHTS

ITU draws attention to the possibility that the practice or implementation of this Recommendation may involve the use of a claimed Intellectual Property Right. ITU takes no position concerning the evidence, validity or applicability of claimed Intellectual Property Rights, whether asserted by ITU members or others outside of the Recommendation development process.

As of the date of approval of this Recommendation, ITU [had/had not] received notice of intellectual property, protected by patents, which may be required to implement this Recommendation. However, implementers are cautioned that this may not represent the latest information and are therefore strongly urged to consult the TSB patent database at <http://www.itu.int/ITU-T/ipr/>.

© ITU 2015

All rights reserved. No part of this publication may be reproduced, by any means whatsoever, without the prior written permission of ITU.

Amendment 2 to Recommendation ITU-T G.8271.1/Y.1366.1 (2013)

Network limits for time synchronization in packet networks: Amendment 2

Summary

Amendment 2 to Recommendation ITU-T G.8271.1/Y.1366.1 (2013) provides the following update:

- Complete the definition of the network limits in terms of dynamic time error components and correction of the MTIE mask.

Amendment 2 to Recommendation ITU-T G.8271.1/Y.1366.1 (2013)

Network limits for time synchronization in packet networks: Amendment 2

1 Clause 7.3 - Network Limits at reference point C

Replace Clause 7.3 with the following:

7.3 Network limit at reference point C

The limits given in this clause represent the maximum permissible levels of phase/time error and noise at interfaces within a packet network in charge of distributing phase/time synchronization according to the applications corresponding to the class 4 mentioned in table 1/G.8271.

The limits applicable to other classes at the reference point C are for further study.

The noise generated by a chain of T-BC is characterized by two main aspects:

- the constant time error produced by the chain, for instance due to various fixed and uncompensated asymmetries (including the PRTC);
- the dynamic time error produced by the various components of the chain (including the PRTC). [This noise can be classified as low or high frequency noise, with components below or above 0.1 Hz respectively.](#)

The network limits applicable at reference point C are expressed in terms of two quantities:

- the maximum absolute time error: $\max |TE|$, which includes ~~all the noise components, i.e.,~~ the constant time error and [the low frequency components of the](#) dynamic time error
- a suitable metric applied to the dynamic time error component (in particular, MTIE and TDEV are used for measuring noise components with frequency lower than 0.1 Hz, and peak-to-peak TE is used for measuring noise components with frequency higher than 0.1 Hz)

The limits given below shall be met for all operating conditions (except during PTP rearrangements and long holdover conditions in the network and during both PTP and the physical layer frequency rearrangements conditions that are for further study; see also examples in Appendix V), regardless of the amount of equipment preceding the interface. In general, these network limits are compatible with the minimum tolerance to time error and noise that all equipment input ports are required to provide. Further guidance about how to design a phase/time distribution network is provided in Appendix V of this Recommendation. The limits are:

- Maximum absolute time error network limit applicable at the reference point C:
 $\max |TE| \leq 1100 \text{ ns.}$

Dynamic [low frequency](#) time error network limit applicable at the reference point C: the specification in terms of MTIE is presented in the figure and table below. The specification in terms of TDEV is for further study.

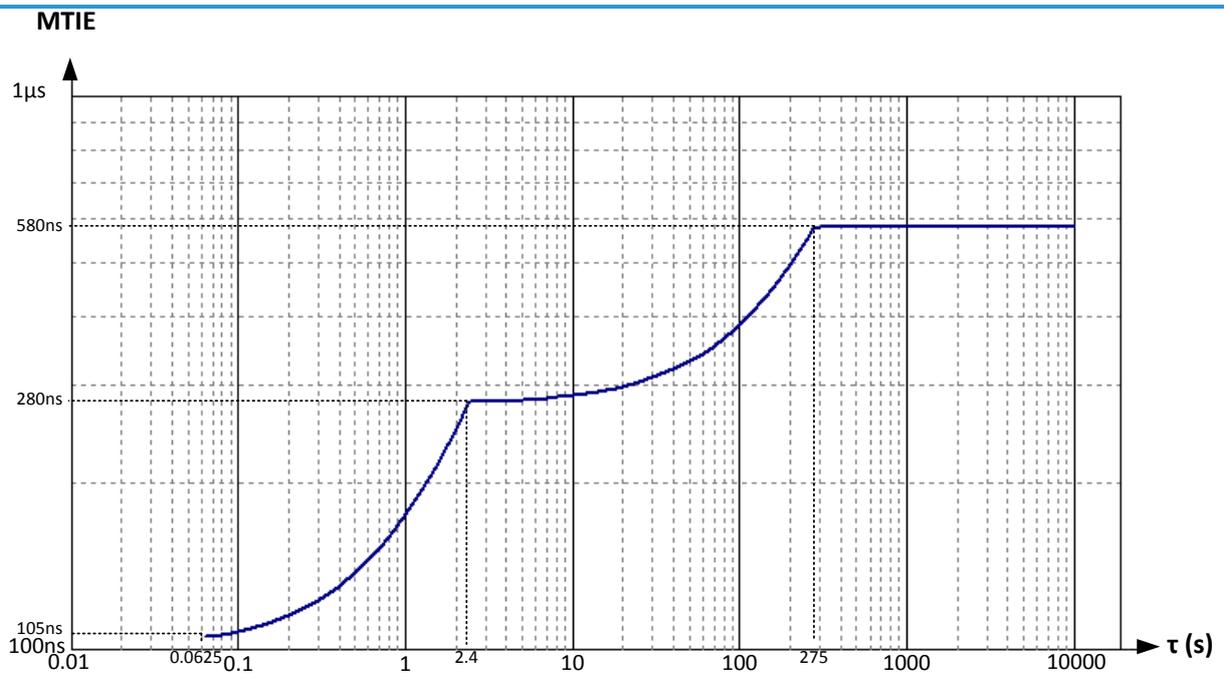
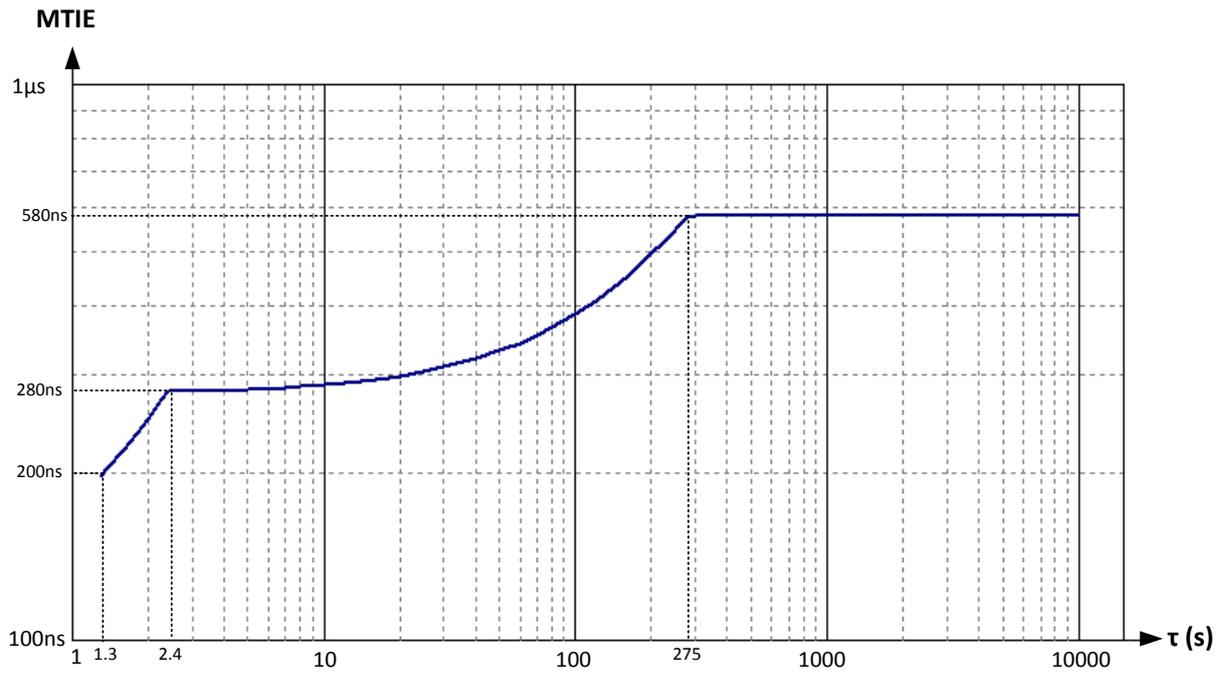


Figure 2 – Dynamic Time Error network limit (MTIE)

Table 1 – Dynamic Time Error network limit expressed in MTIE

MTIE limit (ns)	Observation interval, τ (s)
105	0.0625
$100 + 75\tau$	0.0625 $1.3 < \tau \leq 2.4$
$277 + 1.1\tau$	$2.4 < \tau \leq 275$
580	$275 < \tau \leq 10000$

Note: a Δ first-order low-pass measurement filter with bandwidth of 0.1Hz is applied to the TE samples measured at the packet timing interface prior to evaluating the max |TE|, MTIE and TDEV. Network Limits measurements performed on the 1 PPS test output should also perform a similar filtering on the 1 PPS signal.

Additional details on the test equipment characteristics and measurement period are also for further study.

Note: the above MTIE specification is the result of a number of conservative assumptions that, in theory, may lead to a dynamic component with max |TE| greater than 300 ns and frequency components less than 0.1 Hz. However, the related dynamic noise component has been demonstrated to have max|TE| that is always less than 300 ns under the assumptions made in this recommendation and other related recommendations, e.g. G.8273.2.

The following requirement applies for frequency components higher than 0.1 Hz (a first-order high-pass filter with bandwidth of 0.1Hz should be applied to the TE samples measured at the packet timing interface or to the 1PPS signal), as measured over a 10 000 second interval:

- peak-to-peak TE amplitude < 200 ns

~~The measurement interval is for further study. Editor's note: 60 s has been proposed. A longer period however might be more suitable for this measurement.~~