

MOST

Media Oriented Systems Transport

Multimedia and Control
Networking Technology

MOST150 cPHY Sub-Spec Rev. 1.1

Addendum A150

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Document References

All documents which this MOST document has references to are listed here with the actual revision this document is referring to.

Number	Document	Revision
[1]	MOST150 cPHY Automotive Physical Layer Sub-Specification	Rev. 1.1
[2]	MOST150 cPHY Automotive Physical Layer Sub-Spec Errata2	Rev. 1.1E2
[3]	MOST Physical Layer Basic Specification	Rev. 1.0
[4]	MOST150 cPHY Compliance Measurement Guideline	Rev. 1.0

Document History

First version 1.0-00

Change Ref.	Section	Changes
-	-	- First version, no changes

1 Introduction

This document is a supplement to the **MOST150 cPHY Automotive Sub-Specification** [1]. The **MOST150 cPHY Automotive Sub-Specification** [1] specifies data communication over coaxial cable and considers Simplex transmission in ring topology as well as Duplex transmission, which can be applied on a point-to-point configuration (2-node-network). As a further enhancement to [1], this addendum specifies daisy chain topologies.

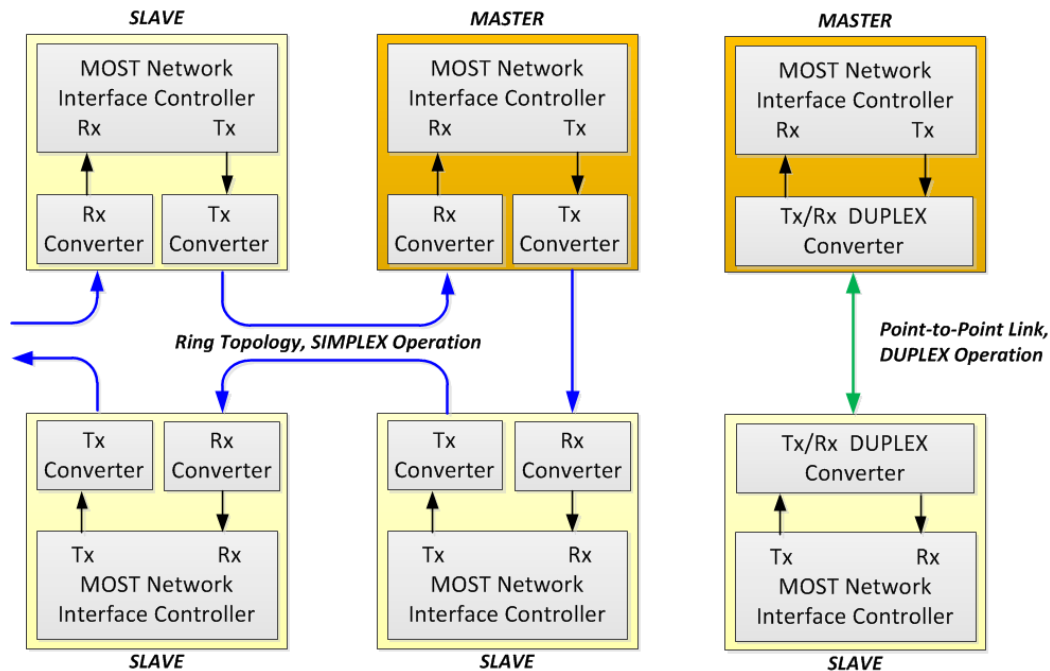


Figure 1-1: Examples for Topology options supported in [1]

Daisy chain topologies require at least one node that features two network ports. In a typical daisy chain topology, the 2-port node(s) are usually terminated by 1-port nodes. Daisy chain topology can be realized using Simplex or Duplex operation.

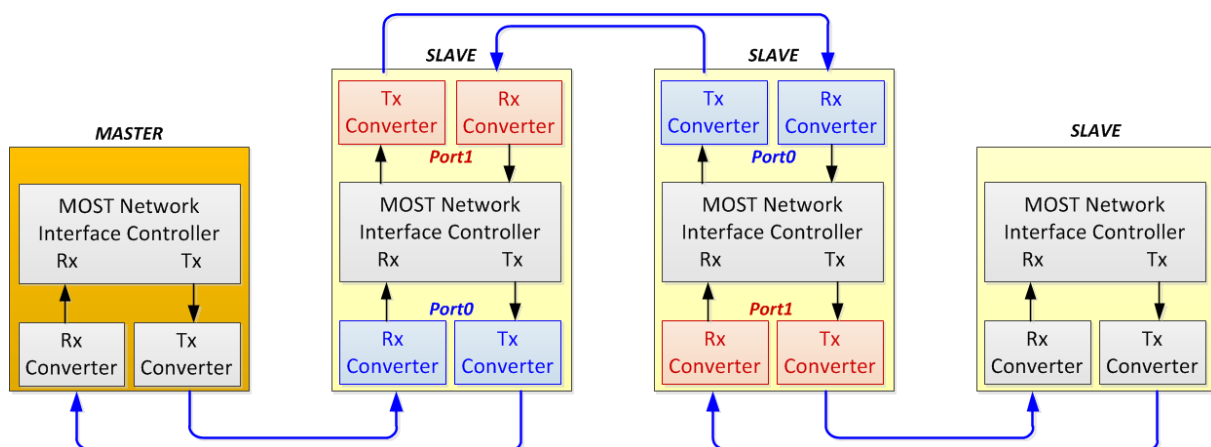


Figure 1-2: Example for Daisy Chain Topology – SIMPLEX Operation

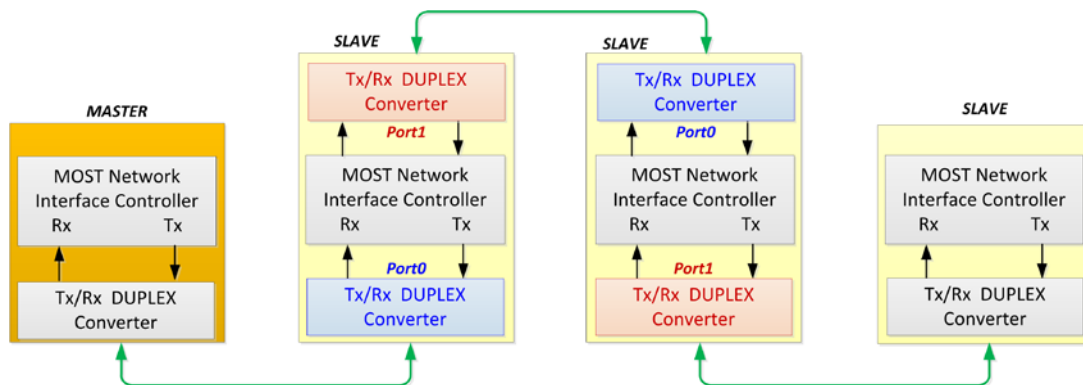


Figure 1-3: Example for Daisy Chain Topology – DUPLEX Operation

Mixed topologies are also possible by enhancing the daisy chain structure with sub-ring elements. To create such sub-ring elements, additional 1-port nodes are included in a daisy chain structure.

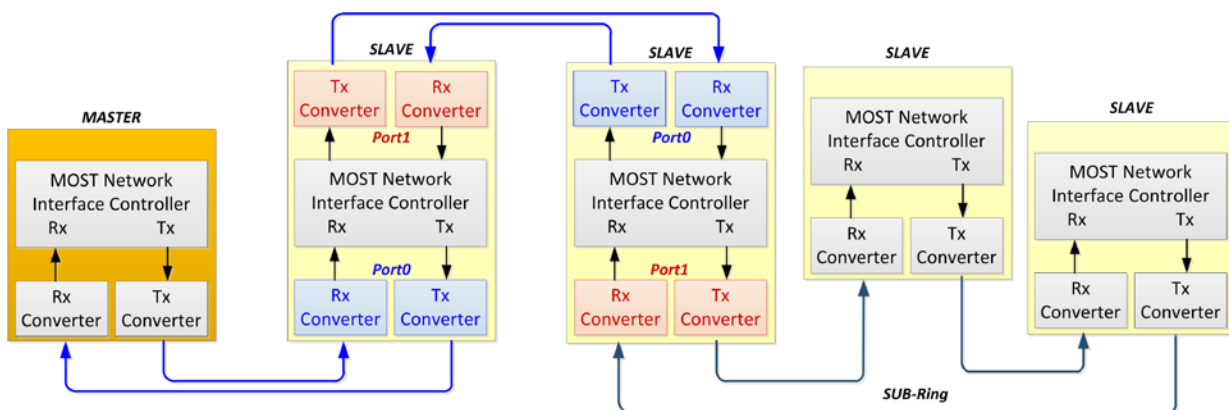


Figure 1-4: Example for Mixed Topology

Note: The given example in Figure 1-4 uses SIMPLEX links only. A mix of SIMPLEX and DUPLEX links is also possible.

2 Content of Addendum

2.1 Daisy Chain Structure

Start and end nodes of a daisy chain topology, as shown in Figure 1-2 and Figure 1-3, have a single network port, while nodes in between need to have 2 ports. Mixed topologies may include further nodes with single network port (see example in Figure 1-4). All specified parameters in [1] are applicable, without exception, for all node-to-node links according to their respective operation mode. The timing of all nodes and ports is synchronized to the Master Clock (embedded in the data stream) generated by the TimingMaster. Individual topologies and arrangements of TimingMaster and TimingSlaves nodes in a network need to be designed to guarantee correct Master Clock propagation through all the nodes in the system in order to ensure their synchronous operation.

2.2 2-Port Nodes

2- port nodes are new components in a network and therefore described below in more detail.

2-Port nodes need to provide 2 Coaxial Transceivers. In this document, they are named Port0 and Port1. Data processing in a 2-port node follows below listed rules (see also Figure 2-1):

- Data received on Port0_Rx is routed through the data processing engine and may be processed by the application before being sent out on Port1_Tx.
- Data received on Port1_Rx is re-timed and bypassed directly to be sent out on Port1_Tx. There is no data flow to or from the application.
- Tx-data on Port0 and on Port1 is synchronized with the same clock. In a TimingMaster node, this is the Master Clock. In the case of a TimingSlave, this clock is derived from the receive section of Port_0. In TimingSlave mode, propagation of the Master Clock is only possible from Port0_Rx to Port1_Tx and to Port0_Tx.

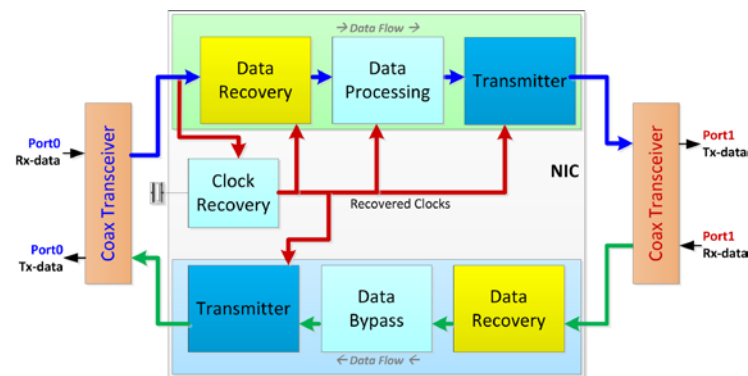


Figure 2-1: Clock Recovery Example

The given clocking structure is beneficial for achieving minimum jitter accumulation in a synchronous network. In order to ensure correct data bypass functionality of the data received on Port1 of a 2-port node, a limitation of the variation of the (propagation) delay between Tx-data on Port1 and Rx-data on Port1 is required. A new parameter called Port1 Delay Drift is introduced.

2.3 Port1 Delay Drift

Based on the definition in [3], the term “Wander” fully describes the spectral nature of the phase variation that contributes to the newly introduced parameter Port1 Delay Drift. *Figure 2-2* gives an example of the composition of Port1 Delay Drift in a daisy chain configuration. The relevant propagation delay consists of delay variations (e.g., over-temperature) accumulated over 2 cable links and 1 NIC. In Simplex operation, we consider delay variation of the two separate cable segments. In Duplex mode, there is only one cable segment and its delay variation has to be counted twice.

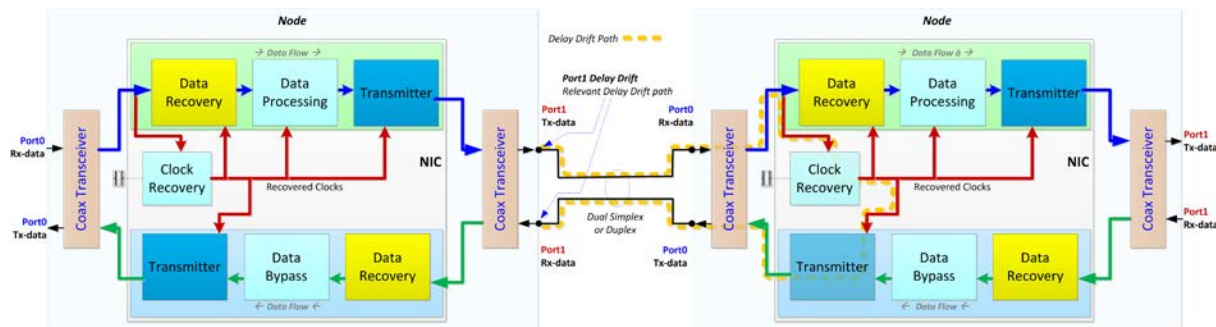


Figure 2-2: Port1 Delay Drift in daisy chain link

When adding a sub-ring element with multiple Single Port nodes to Port1 of a 2-port node, the number of cable links and NICs increases (see example in *Figure 1-4*) and with it the total propagation delay drift observed at Port1. The Port1 Delay Drift parameter for such topologies accumulates variations in propagation delay for (n+1) cable links and (n) NICs; thus, the maximum number of nodes (n) in such sub-ring structures needs to be limited. The corresponding parameter is named “Maximum node count in a sub-ring”.

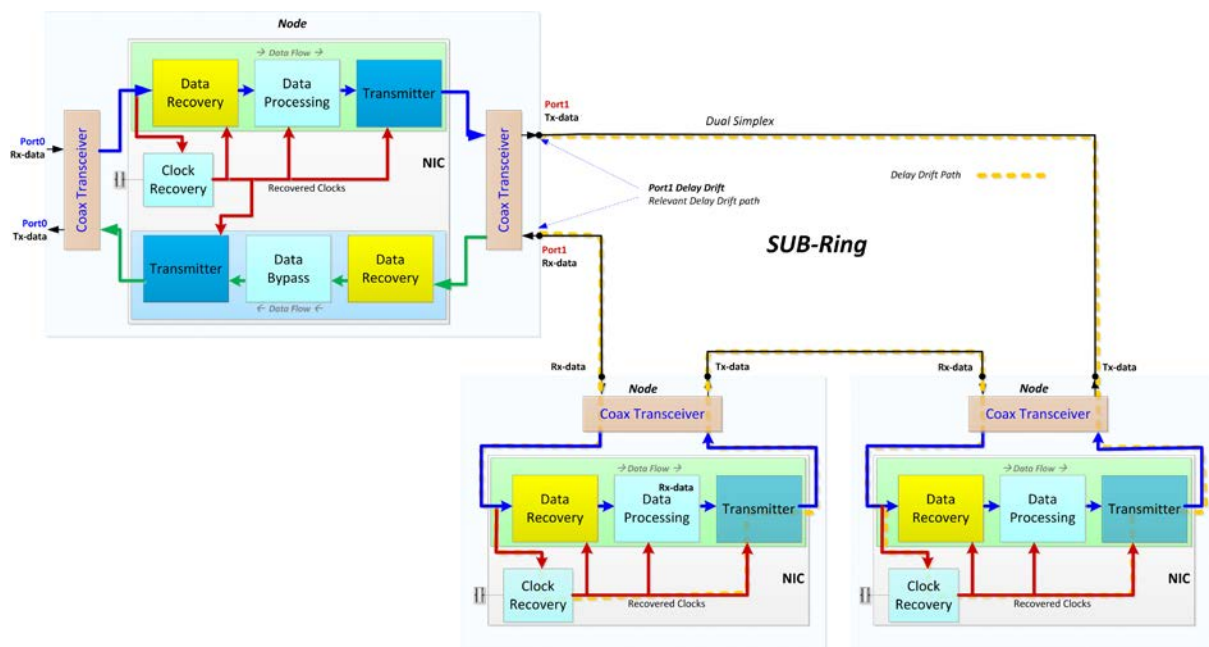


Figure 2-3: Port1 Delay Drift in a sub-ring

For the parameter Port1 Delay Drift, only variations during normal network operation are relevant. At startup or after recovery from failure, the bypass engine at the input of Port1 will be initialized and realigned and the complete budget of propagation delay will be available.

Port1 Delay Drift shall be measured as the drift (Wander) of the mean value of the total propagation delay (including accumulation of all phase/delay variations) between Port1_Tx and Port1_Rx of every 2-port node. Acquisition of mean values eliminates the dynamic jitter contribution; however, this contribution is already covered and handled by the specifications of AJ and TJ link parameters. The “Maximum node count in a sub-ring” further limits the impact of accumulated TJ.

In order to facilitate a detection procedure, Port1 Delay Drift shall be measured between SP2 and SP3 of Port1. The parameter limits will be accordingly adjusted to account for the budget for components between SP2 and SP1, SP3 and SP4.

The new parameters “Port1 Delay Drift” and “Maximum node count in a sub-ring” are added to the Most150 cPHY Sub-Specification in section 8 of [1]:

Port1 Delay Drift

Port1 Delay Drift is the maximal allowed variation of the sum of all static phase (delay) variation measured between the SP3 relative to SP2 of 2-port nodes in a daisy chain. The Port1 Delay Drift must not exceed the maximum value shown in Table 2-1. Further, the maximum number of nodes in a sub-ring must not exceed the maximum value shown in Table 2-1.

System Parameters	Symbol	Condition	Min.	Typ.	Max.	Unit
Port1 Delay Drift	T_{P1DD}	1), 2), 3), 4)	-	-	7.25	ns
Maximum node count in a sub-ring		3), 5)			5	nodes

Notes:

- 1) Only relevant for Port1 of 2-port Nodes in a daisy chain topology.
- 2) Parameter variations due to environmental conditions shall be considered.
- 3) 2-port nodes shall tolerate overall phase variation including Port1 Delay Drift and dynamic phase variations (AJ and accumulated TJ).
- 4) Parameter targets only variations, which happen during uninterrupted operation, variations from startup to startup are not relevant.
- 5) Multiple sub-rings can be added to a daisy chain. However, total number of nodes in the network shall not exceed Node Count specified in [1] (section 8.2).

Table 2-1: System Requirements for daisy chain topologies

2.4 Measurement of Port1 Delay Drift (Informative)

A measurement procedure for Port1 Delay Drift on Simplex configurations can be implemented in a similar fashion as the method defined for Master Delay Tolerance [4]. A measurement procedure for Port1 Delay Drift on Duplex configurations is inherently more challenging as signals, propagating in reverse directions, overlay each other, sharing the same media. More sophisticated equipment is needed to selectively extract and evaluate the phase difference (delay) variations between the signals propagating from and to the Port1 of the DUT.

Alternatively, an evaluation of the accumulated worst-case propagation delay variations for all link components and NICs can be performed instead.

3 Comment

3.1 Reason for Addendum

Enable daisy chain topologies.

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