802.3da Multidrop Mixing Segment Specifications

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10 Mb/s SPMD Enhancement TG

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168.6 Mixing segment characteristics

10BASE-T1M PHYs are designed to operate over media that meet the requirements specified in this subclause. The 10BASE-T1M mixing segment (1.4.331) is a single balanced pair of conductors that may have more than two MDIs attached.

Figure 168–x shows an example mixing segment with reference points. The mixing segment specifications in 168.6 are referenced to these designated points and are to be met without the MDI or other loads attached. The mixing segment specifications are based on a trunk-stub configuration. Other configurations may be possible, provided they meet the electrical parameters in this 168.6. The example configuration assumes that the trunk comprises TBD m of 1.02mm (18 AWG) 100 Ω cabling and the stubs are 100 Ω balanced pairs of conductors up to 30 cm long. The trunk is terminated at each end into 100 Ω, at a point designated the 'edge termination'. One end of the stub is designated the trunk connection (TC) and the other designated the 'MDI attachment point'.

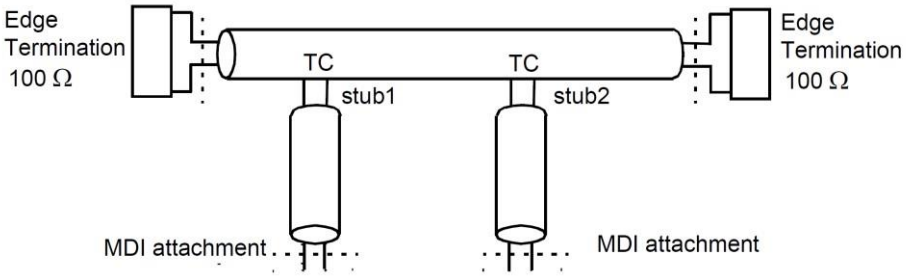

Figure 168–x Mixing segment and reference points

Editor's Note (to be removed prior to Working Group ballot):
The need for additional specifications to be considered to assess MDI attachments with compensation are needed; see.
https://www.ieee802.org/3/da/public/102021/Koczwara_3da_01_102021.pdf
The need for additional specifications to be considered to assess the IL and Mode Conversion of the trunk/stub connection point with and without the inductive compensation to be considered; see.https://www.ieee802.org/3/da/public/0522/Koczwara_3da_01_20220523.pdf -(option 3 and

168.6.1 Insertion loss and delay

The mixing segment insertion loss is specified by independently meeting the requirements specified in this section for trunks and stubs. The stub time delay is specified to limit reflective resonances.

The mixing segment insertion loss, without the MDI or other loads attached, shall meet the values determined using Equation (168–xxa) between edge termination attachment points. The reference impedance is 100 Ω.

$$IL \geq TBD \qquad \text{Equation (168–xxa)}$$

$$0.3 \leq f(MHz) \leq 40$$

Editor's Note (to be removed prior to Working Group ballot):
Consider 147.7.1 Insertion loss equation (147–3) as starting point.

The insertion loss of each stub, between MDI attachment point and trunk connection point (TC), shall meet the values determined using Equation (168–xxb). The reference impedance is 100 Ω.

$$IL \leq 0.15 \text{ dB} \qquad \text{Equation (168–xxb)}$$

$$0.3 \leq f(\text{MHz}) \leq 40$$

The time delay of each stub, between MDI attachment point and trunk connection point (TC), shall meet the values determined using Equation (168–xxc) at a frequency of 10 MHz. The reference impedance is 100 Ω.

$$\text{time delay} \leq 1.6 \text{ ns} \qquad \text{Equation (168–xxc)}$$

168.6.2 Return loss

The mixing segment at any MDI attachment point, without the MDI or other loads attached, shall meet the return loss values determined using Equation (168–xxd). The reference impedance is 50 Ω.

$$RL \geq \text{TBD} \qquad \text{Equation (168–xxd)}$$

$$0.3 \leq f(\text{MHz}) \leq 40$$

The mixing segment at edge terminations, without the MDI or other loads attached, shall meet the return loss values determined using Equation (168–xxe). The reference impedance is 100 Ω.

$$RL \geq \text{TBD} \qquad \text{Equation (168–xxe)}$$

$$0.3 \leq f(\text{MHz}) \leq 40$$

Editor's Note (to be removed prior to Working Group ballot):
Consider 147.7.2 return loss equation (147–4) as starting point.

168.6.3 Mode conversion loss replace all of section with: TBD

The differential to common mode conversion requirement applies to unshielded link segments and depends on the electromagnetic noise environment. The requirements of Table 168–xx shall be met based on the local environment as described by the electromagnetic classifications given in Table 146–7, E1 or E2.

The requirements of Table 168–xxa shall be met at any MDI attachment without the MDI or other loads attached. The reference impedance is 50 Ω.

The requirements of Table 168–xxa shall be met between or at edge termination attachment points without the MDI or other loads attached. The reference impedance is 100 Ω.

Table 168–xxa—Differential to common mode conversion

	Frequency (MHz)	E_1	E_2
Mode Conversion	TBD ≤ f ≤ TBD	≥ TBD	≥ TBD

Editor's Note (to be removed prior to Working Group ballot):
Contributions for mode conversion of UTP cabling are needed.

Editor's note: request contributions to define mode conversion parameters OR otherwise, given editorial license to wording of the note

Trunk: TCL, TCTL
MDI Attach: TCL

Possible editor's note: This section requires contributions to specify which mode conversion measurements (e.g., TCL, TCTL, ELTCTL) are made at which points - at or between MDI attachment points, and at or between edge connections. Example text which might be improved may be found in IEEE Std 802.3-2022 at 147.8.3. Contributions are solicited, and may also consider 146.7.1.4 through 146.7.1.6, 97.6.1.4, and IEEE P802.3ck-D3.x at XXXXX

168.6.4 Coupling attenuation

The coupling attenuation requirement applies to shielded mixing segments and depends on the electromagnetic noise environment. The requirements in Table 168-xxb shall be met based on the local environment as described by the electromagnetic classifications given in Table 146–7, E1, E2, or E3.

Table 168–xxb—Coupling attenuation

Frequency (MHz)	(dB)		
	E_1	E_2	E_3
TBD to TBD	≥ TBD	≥ TBD	≥ TBD

Editor’s Note (to be removed prior to Working Group ballot):
Contributions for shielded cabling coupling attenuation are needed

Possible editor's note: This section requires contributions to specify which mode conversion measurements (e.g., TCL, TCTL, ELTCTL) are made at which points - at or between MDI attachment points, and at or between edge connections. Example text which might be improved may be found in IEEE Std 802.3-2022 at 147.8.3. Contributions are solicited, and may also consider 146.7.1.4 through 146.7.1.6, 97.6.1.4, and IEEE P802.3ck-D3.x at XXXXX