# IEEE802.3 4P Task Force
# Base Line proposal for updating clause 33.4.9
# With 10GBaseT Midspan PSE Requirements
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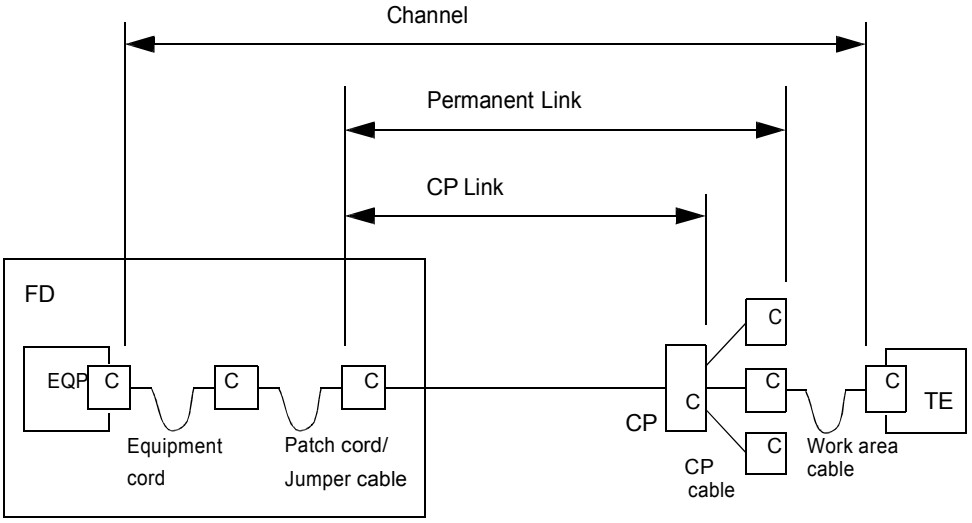
**Previous presentations on the Subject:**

http://www.ieee802.org/3/bt/public/may14/darshan_2_0514.pdf

http://www.ieee802.org/3/4PPOE/public/jul13/langner_1_0713.pdf

### 33.4.9 Midspan PSE device additional requirements

The cabling specifications for 100 Ω balanced cabling are described in ISO/IEC 11801-2002. Cable conforming to ANSI/TIA-568-C.2 also meets these requirements. Some cable category specifications that only appear in earlier editions are also supported. The configuration of "channel" and "permanent link" is defined in Figure 33–24. Type 2,3 and 4 Midspan PSE cabling system requirements are specified in 33.1.4.1. (Editor Note: 33.1.4.1 will be updated accordingly to reflect Type 4 cabling requirements)




FD = floor distributor; EQP = equipment; C = connection (mated pair);
CP = consolidation point; TO = telecommunications outlet;
TE = terminal equipment

**Figure 33–24—Floor distributor channel configuration**

ISO/IEC 11801 defines in 5.6.1 two types of Equipment interface to the cabling system: "Interconnect model" and the "cross-connect model." An equivalent "Interconnect model" and "cross-connect model" can be found in ANSI/TIA-568-C.0, 4.2. See Figure 33–25.

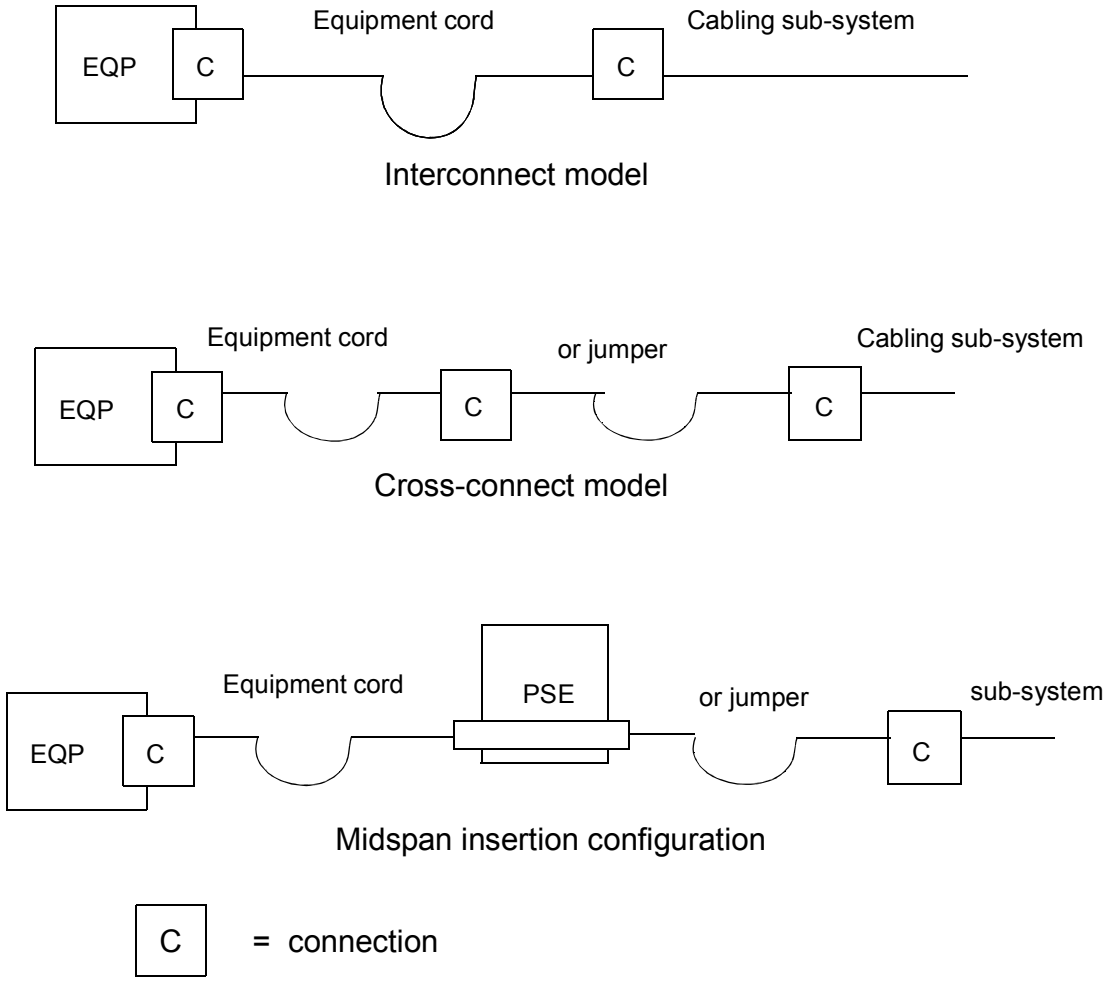



**Figure 33–25—Interconnect model, cross-connect model, and midspan insertion configuration**

The insertion of a Midspan PSE at the Floor Distributor (FD) shall comply with the following guidelines:

a) If the existing FD configuration is of the "Interconnect model" type, the Midspan PSE can be added, provided it does not increase the length of the resulting "channel" to more than specified 100 m as defined in ISO/IEC 11801 or ANSI/TIA-568-C.0.

b) If the existing FD configuration is of the "Cross-connect model" type, the Midspan PSE needs to be installed instead of one of the connection pairs in the FD. In addition, the installation of the Midspan PSE shall not increase the length of the resulting "channel" to more than specified 100 m as defined in ISO/IEC 11801 or ANSI/TIA-568-C.0.

Configurations with the Midspan PSE in the cabling channel shall not alter the transmission requirements of the "permanent link." A Midspan PSE shall not provide DC continuity between the two sides of the segment for the pairs that inject power.

The requirements for the two pair Category 5 channel are found in 25.4.6. The specification of Midspan PSE operation on a two pair cable is beyond the scope of this document.

NOTE—Appropriate terminations may be applied to the interrupted pairs on both sides of the Midspan device.

### 33.4.9.1 "Connector" or "telecom outlet" Midspan PSE device transmission requirements

The Midspan PSE equipment to be inserted as "connector" or "telecom outlet" shall meet the following transmission parameters. These parameters should be measured using the test procedures of ISO 11801:2002 or ANSI/TIA-568-C.2 for connecting hardware.

There are ~~four~~ six types of Midspan PSEs defined with respect to transmission requirements:

1) 10BASE-T/100BASE-TX connector or telecom outlet Midspan PSE
2) 10BASE-T/100BASE-TX work area or equipment cable Midspan PSE
3) 1000BASE-T connector or telecom outlet Midspan PSE
4) 1000BASE-T work area or~~f~~ equipment cable Midspan PSE
5) 10GBASE-T connector or telecom outlet Midspan PSE
6) 10GBASE-T work area of equipment cable Midspan PSE

(insert the following header and renumber the existing sections)

#### 33.4.9.1.1 Transmission parameters for Midspan PSEs within a link segment

In order to maintain the transmission parameters for a link segment, the transmission parameters of the Midspan PSE are defined. These include insertion loss, delay parameters, nominal impedance, NEXT loss, FEXT, and return loss. In addition, for 10GBASE-T operation, the requirements for the alien crosstalk coupled "between" link segments is specified.

#### 33.4.9.1.1.1 Near End Crosstalk (NEXT)

NEXT loss is a measure of the unwanted signal coupling from a transmitter at the near-end into neighboring pairs measured at the near-end. NEXT loss is expressed in dB relative to the received signal level.

For up to 1000BASE-T operation: NEXT loss for Midspan PSE devices shall meet the values determined by Equation (33–18) when measured for the transmit and receive pairs from 1 MHz to 100 MHz. However, for frequencies that correspond to calculated values greater than 65 dB, the requirement reverts to the minimum requirement of 65 dB.

$$\{NEXT_{conn}\}_{db} \geq 40 - 20\log_{10}\left(\frac{f}{100}\right) \qquad \text{(33-18)}$$

For 10GBASE-T operation: NEXT loss for Midspan PSE devices shall meet the values determined by Equation (33–18-1) and Equation (33-18-2) when measured for the transmit and receive pairs from 1 MHz to 500 MHz. However, for frequencies that correspond to calculated values greater than 75 dB, the requirement reverts to the minimum requirement of 75 dB.

$$\{NEXT_{conn}\}_{db} \geq 54 - 20\log_{10}\left(\frac{f}{100}\right) \quad \text{for } 1 \leq f \leq 250 \quad \text{(33-18-1)}$$

$$\{NEXT_{conn}\}_{db} \geq 46.04 - 40\log_{10}\left(\frac{f}{250}\right) \quad \text{for } 250 < f \leq 500 \quad \text{(33-18-2)}$$

where

*NEXTconn* is the Near End Crosstalk loss

f is the frequency expressed in MHz

*(Note to Editor: Equations 33-18-1 and 33-18-2 above can be combined into a single, multi-frequency equation reference, in accordance with IEEE style, for inclusion in the 802.3bt draft)*

### 33.4.9.1.~~2~~ 1.1 Insertion loss

Insertion loss is a measure of the signal loss between the transmitter and receiver, expressed in dB relative to the received signal level.
For up to 1000BASE-T operation: Insertion loss for Midspan PSE devices shall meet the values determined by Equation (33–19) when measured for the transmit and receive pairs from 1 MHz to 100 MHz.

~~However, f~~For frequencies that correspond to calculated values less than 0.1 dB, the requirement reverts to the maximum requirement of 0.1 dB.

$$\{IL_{conn}\}_{db} \leq 0.04x\sqrt{f} \qquad (33\text{-}19)$$

For 10GBASE-T operation: Insertion loss for Midspan PSE devices shall meet the values determined by Equation (33–19-1) when measured for the transmit and receive pairs from 1 MHz to 500 MHz.

$$\{IL_{conn}\}_{db} \leq 0.02x\sqrt{f} \qquad (33\text{-}19\text{-}1)$$

where

| | |
|---|---|
| *ILconn* | is the insertion loss |
| $f$ | is the frequency expressed in MHz |

### 33.4.9.1.~~3~~ 1.3 Return loss

Return loss is a measure of the reflected energy caused by impedance mismatches in the cabling system and is expressed in dB relative to the reflected signal level.
Return loss for Midspan PSE devices shall meet or exceed the values specified in Table 33–20. ~~when measured for the transmit and receive pairs from 1 MHz to 100 MHz.~~

**Table 33–20—Connector return loss**

| Midspan PSE Type~~s~~ | Frequency | Return loss |
|---|---|---|
| 10/100/1000BASE-T | 1 MHz ≤ $f$ < 20 MHz | 23 dB |
| | 20 MHz ≤ $f$ ≤ 100 MHz | 14 dB |
| 10GBASE-T | $1 \leq f \leq 79$ | 30 |
| | $79 < f \leq 500$ | $28-20\log(f/100)$ |

#### 33.4.9.1.1.7 Maximum Link Delay

The propagation delay contribution of the Midspan PSE device shall not exceed 2.5 ns from 1 MHz to the highest referenced frequency.

#### 33.4.9.1.1.8 Maximum Link Delay Skew

The propagation delay skew of the Midspan PSE device shall not exceed 1.25 ns from 1 MHz to the highest referenced frequency.

### 33.4.9.1.2 Coupling parameters between link segments

Midspan PSEs intended for operation with 10GBASE-T (types 5 & 6 in Clause 33.4.9.1) are additionally required to meet the following parameters for coupling signals between ports relating to different link segments. Noise coupled between the disturbed duplex channel in a link segment and the disturbing duplex channels in other link segments is referred to as alien crosstalk noise. To ensure the total alien NEXT loss and alien FEXT loss coupled between link segments is limited, multiple disturber alien near-end crosstalk (MDANEXT) loss and multiple disturber alien FEXT (MDAFEXT) loss is specified.

#### 33.4.9.1.2.1 Multiple disturber power sum alien near-end crosstalk (PSANEXT) loss

PSANEXT loss for 10GBASE-T capable Midspan PSE devices shall meet or exceed the values determined using the equations shown in Table 33-20-3 for all specified frequencies. Calculations that result in PSANEXT loss values greater than 67 dB shall revert to a requirement of 67 dB minimum.

Table 33-20-3

| Frequency (MHz) | PSANEXT loss (dB) |
|---|---|
| $1 \le f \le 500$ | $70.5 - 20\log(f/100)$ |

#### 33.4.9.1.2.2 Multiple disturber power sum alien far-end crosstalk (PSAFEXT)

PSAFEXT loss for 10GBASE-T capable Midspan PSE devices shall meet or exceed the values determined using the equations shown in Table 33-20-4 for all specified frequencies. Calculations that result in PSANEXT loss values greater than 67 dB shall revert to a requirement of 67 dB minimum.

Table 33-20-4

| Frequency (MHz) | PSANEXT loss (dB) |
|---|---|
| $1 \le f \le 500$ | $67 - 20\log(f/100)$ |

**Notes:**
Clause 3.2.2 and other parts of Endspan PSE will be addressed in separate work.