Current calculation for IEEE 802.3da Draft 1.0

Peter Fischer / BKS Kabel-Service AG

2/14/2024

Agenda

- Current table 169-1
- Mixing segment figure 169-1
- Calculations System Type 1
- Calculations System Type 0
- New proposed table

Current table 169-1

Table 169–1—System Power Types

Contact	24V Nominal MPSE	50V Max MPSE
System type	0	1
$V_{MPSE(max)}$ (V)[a]	30	50
$V_{MPSE(min)}$ (V)	26	45
$I_{PI(max)}$ (mA)[b]	TBD	TBD
$P_{Type\ (min)}$ (W)[c]	TBD	TBD
$V_{MPD(min)}$ (V)	18	34
$P_{MPD(max)}$ (W)[d]	1	2

[a]VMPSE(max) is the maximum allowed voltage provided by the MPSE at TC3 over the full range of operating conditions.

[b]$I_{PI(max)}$ is the maximum current flowing at the MPSE and MPD TC3 interface except during inrush or an overload condition. $I_{PI(max)}$ may be exceeded during inrush or an overload (see Table TBD). Users are cautioned to be aware of the ampacity of cabling, as installed, and local codes and regulations (see Table TBD).

[c]$P_{Type(min)}$ is the minimum average available output power at MPSE TC3.

[d]$P_{MPD(max)}$ is the maximum average allowed power draw at MPD TC3.

- Which numbers to put in TBD's?

Reference point is always TC3.

Mixing segment figure 169-1

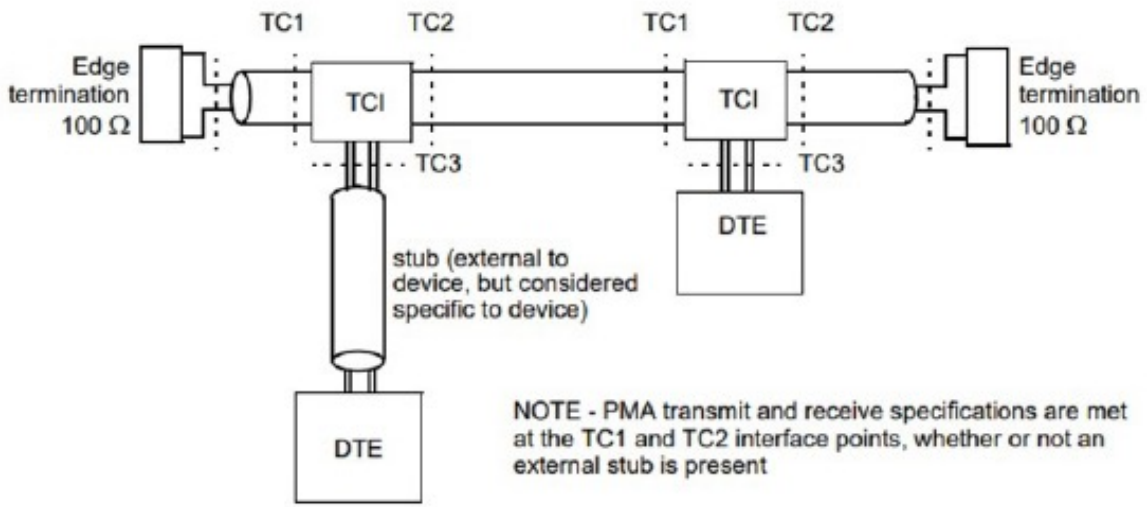
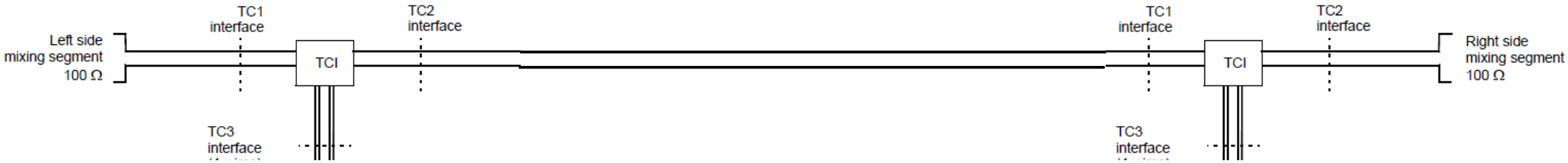


Figure 169–1—Mixing segment and reference points

- One of the above DTE's is representing the MPSD
- In worst case, the other DTE is representing a cluster with all MPD's
- Losses in the stub(s) are not considered

Mixing segment figure 169-1



MPSE

MPDs (16)

Case System 1 ($V_{MPSE(max)}$ 50V):

$V_{MPSE(min)}$ = 45 V

$V_{MPD(min)}$ = 34 V

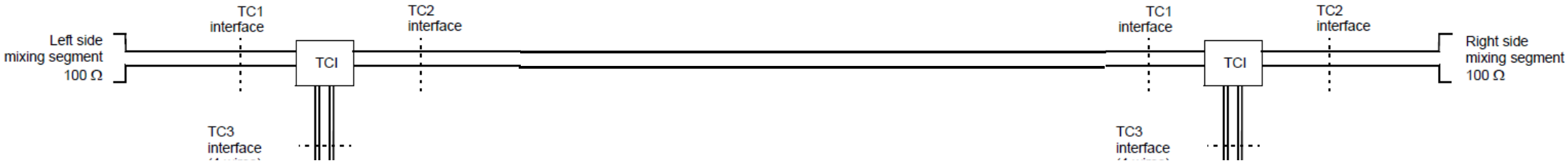
$P_{MPD(max)}$ = 2 W

$P_{MPD(total)}$ = 32 W

$I_{PI(max)}$ = TBD mA

$P_{Type(min)}$ = TBD W

Calculations Case 1

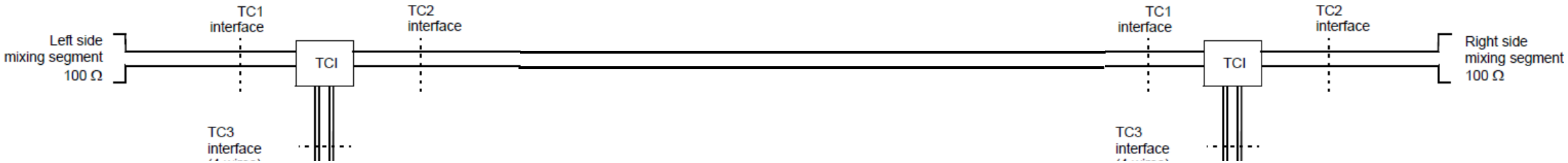


MPSE MPDs (16)

$I_{PI(max)\ total} = P_{MPD(total)} / V_{MPD(min)} = 32\ W / 34V = 941.176\ mA$

→ $I_{PI(max)} = I_{PI(max)\ total} / 16 = 941.176\ mA / 16 = 58.823\ mA$

Calculations Case 1



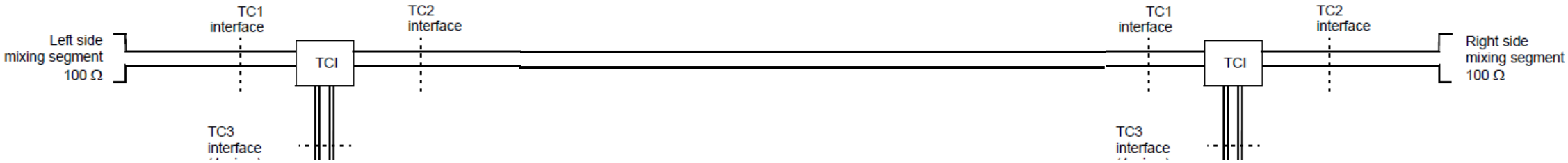
MPSE MPDs (16)

To calculate $P_{Type(min)}$, we must consider the losses on the cable. The dc loop resistance of the mixing segment is 12 Ω.

$P_{Loss\ Mixing\ Segment} = (I_{PI(max)\ total})^2 * R_{DC\ Loop} = (941.176\ mA)^2 * 12\ \Omega = 10.63\ W$

$P_{Type(min)} = P_{MPD(total)} + P_{Loss\ Mixing\ Segment} = 32\ W + 10.63\ W = 42.63\ W$

Mixing segment figure 169-1



MPSE

MPDs (16)

Case System 0 ($V_{MPSE(max)}$ 24V):

$V_{MPSE(min)}$ = 30 V

$V_{MPD(min)}$ = 26 V

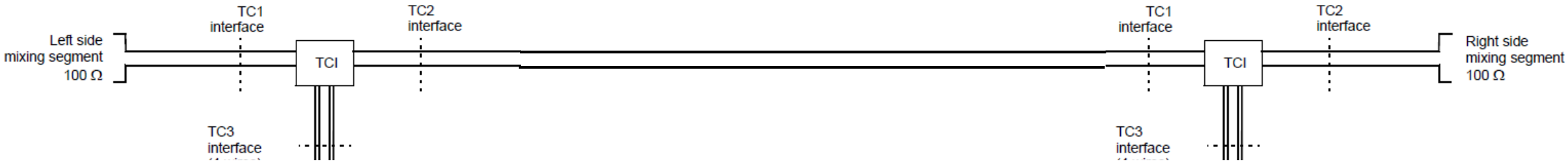
$P_{MPD(max)}$ = 1 W

$P_{MPD(total)}$ = 16 W

$I_{PI(max)}$ = TBD mA

$P_{Type(min)}$ = TBD W

Calculations Case 2

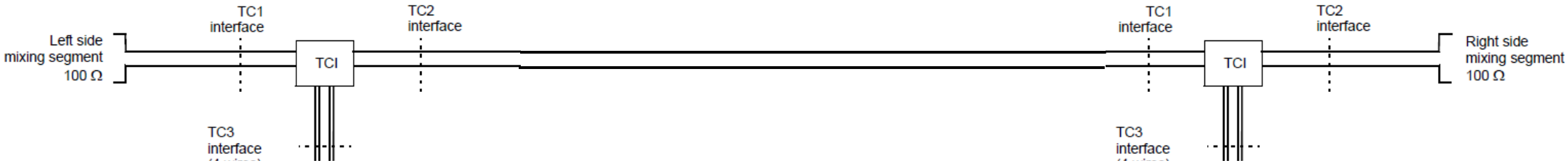


MPSE MPDs (16)

$I_{PI(max)\ total} = P_{MPD(total)} / V_{MPD(min)} = 16\ W / 18\ V = 888.889\ mA$

→ $I_{PI(max)} = I_{PI(max)\ total} / 16 = 888.889\ mA / 16 = 55.556\ mA$

Calculations Case 1



MPSE MPDs (16)

To calculate $P_{Type(min)}$, we must consider the losses on the cable. The dc loop resistance of the mixing segment is 12 Ω.

$P_{Loss\ Mixing\ Segment} = (I_{PI(max)\ total})^2 * R_{DC\ Loop} = (888.889\ mA)^2 * 12\ \Omega = 9.481\ W$

$P_{Type(min)} = P_{MPD(total)} + P_{Loss\ Mixing\ Segment} = 16\ W + 9.481\ W = 25.481\ W$

New proposed table

Contact	24V Nominal MPSE	50V Max MPSE
System Type	0	1
$V_{MPSE(max)}$ (V)	30	50
$V_{MPSE(min)}$ (V)	26	45
$I_{PI(max)}$ (mA)	**58.8**	**55.5**
$P_{Type\ (min)}$ (W)	**42.6**	**25.5**
$V_{MPD\ (min)}$ (V)	18	34
$P_{MPD\ (max)}$ (W)	1	2

The proposal is to add the above red marked values to the table 169-1.