Midspan Power Insertion Using Tranformer Coupling

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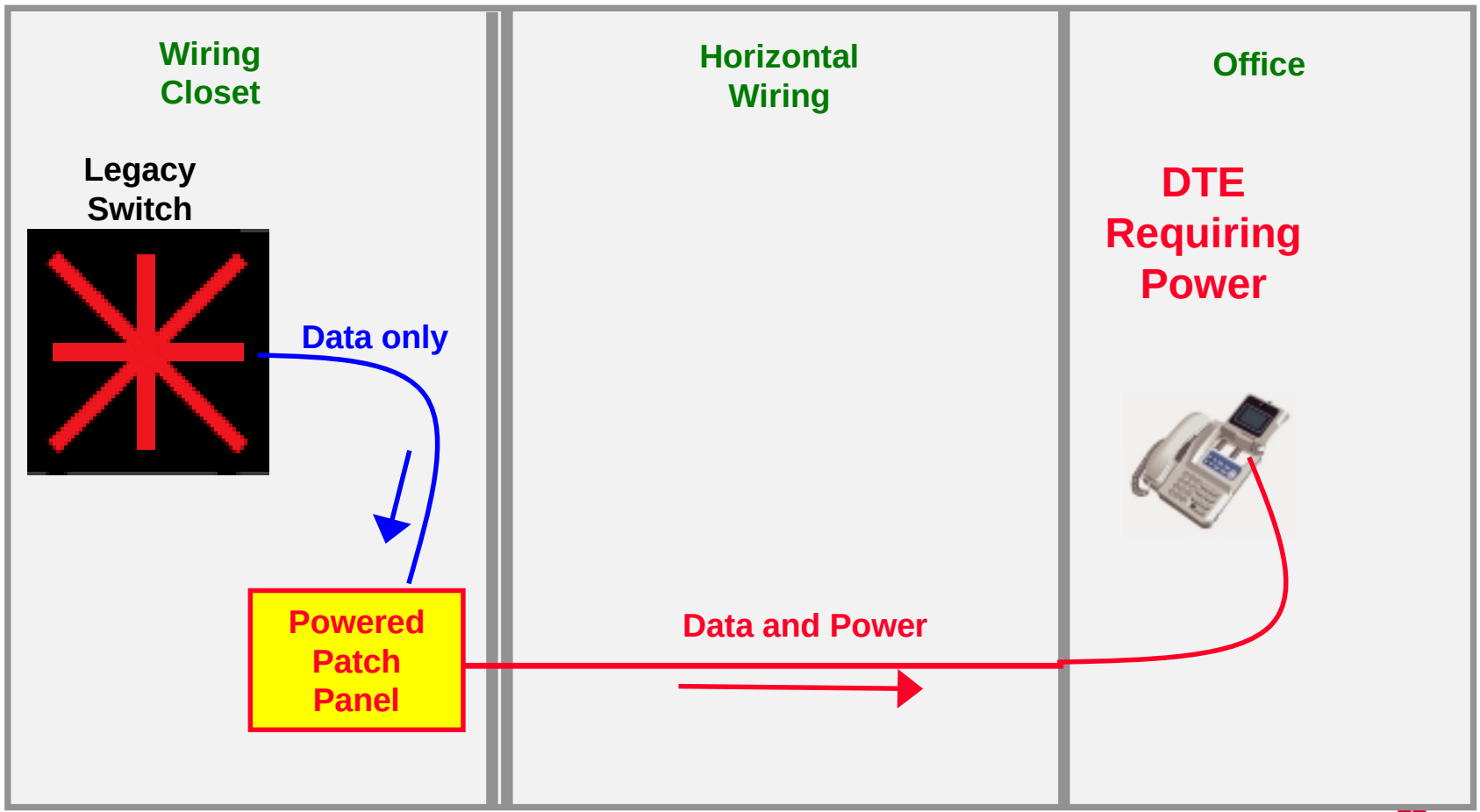
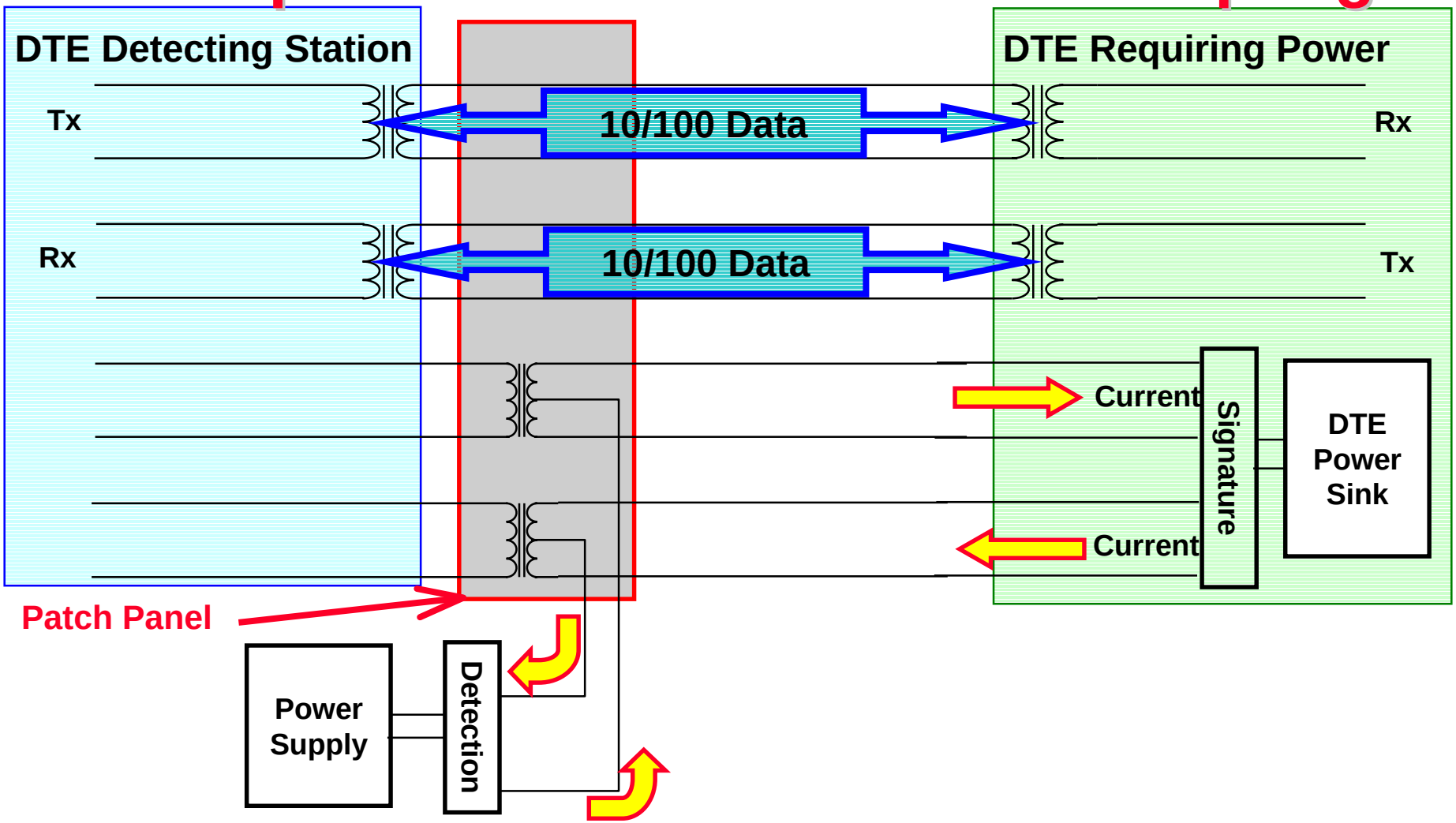
Mid-Span Power Insertion Via a Powered Patch Panel



Mid-Span Power: Transformer Coupling



Potentially Compatible with 10BASE-T, 100BASE-TX, and 1000BASE-T

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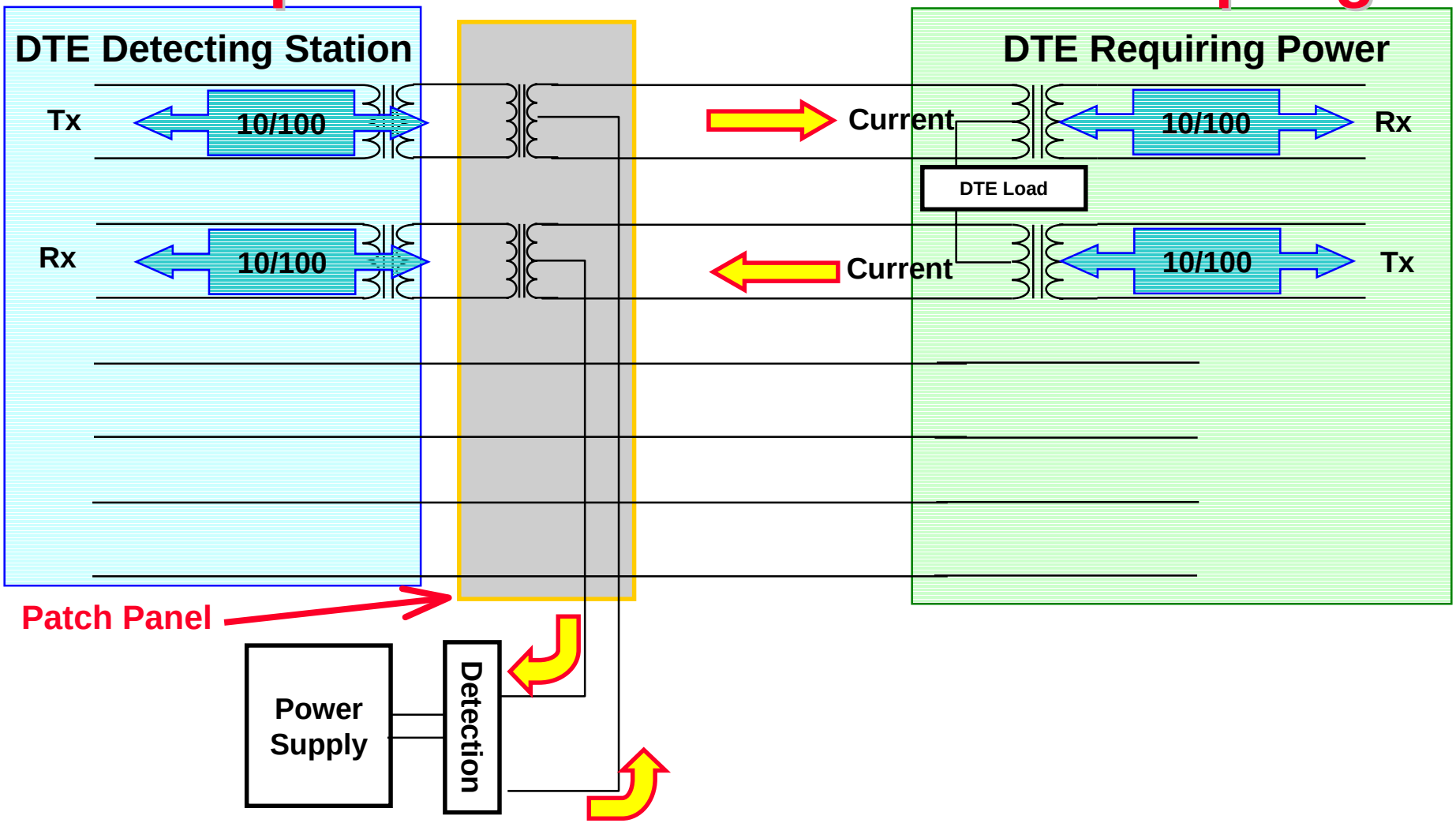
Mid-Span Power: Transformer Coupling



Potentially Compatible with 10BASE-T, 100BASE-TX, and 1000BASE-T

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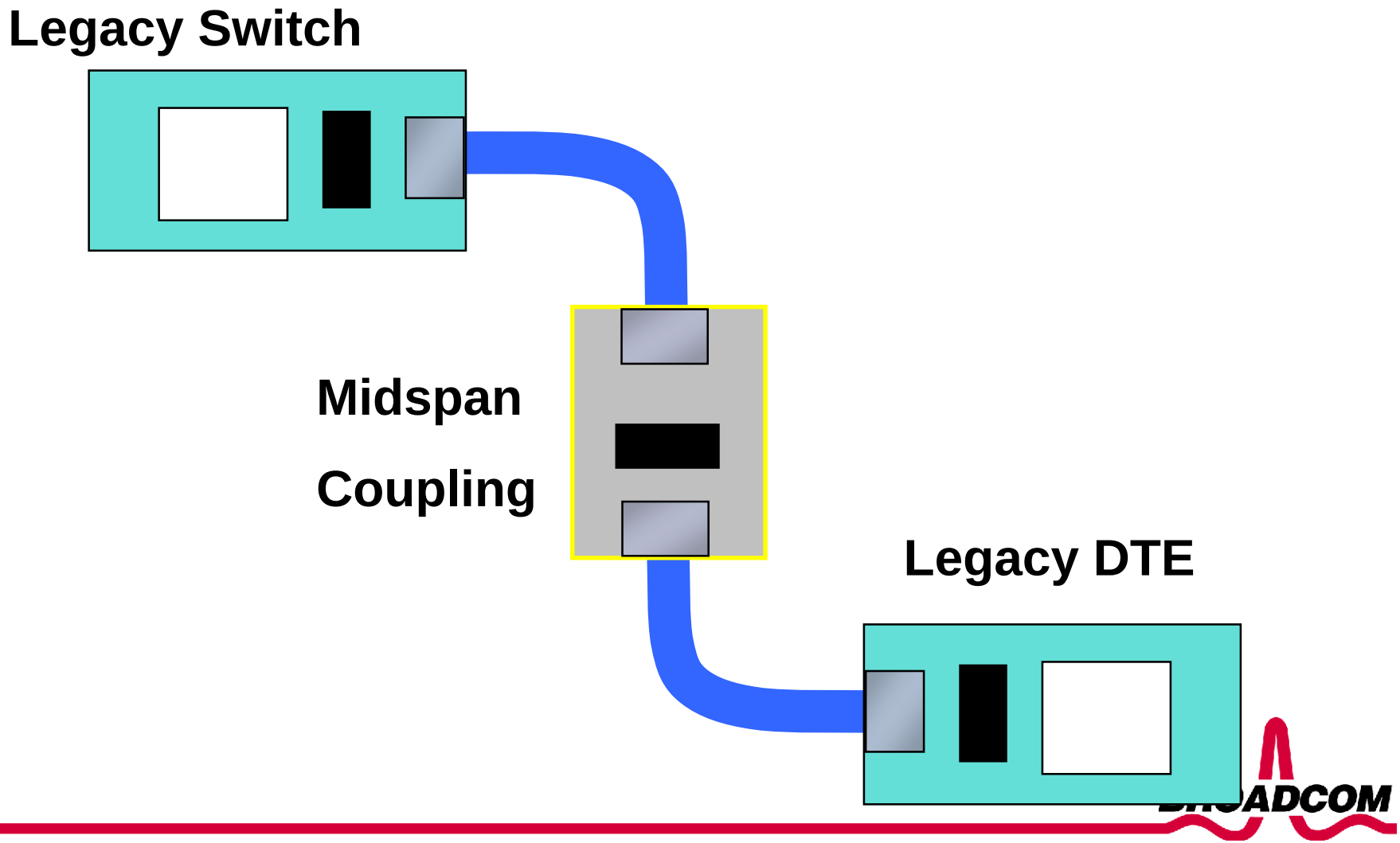
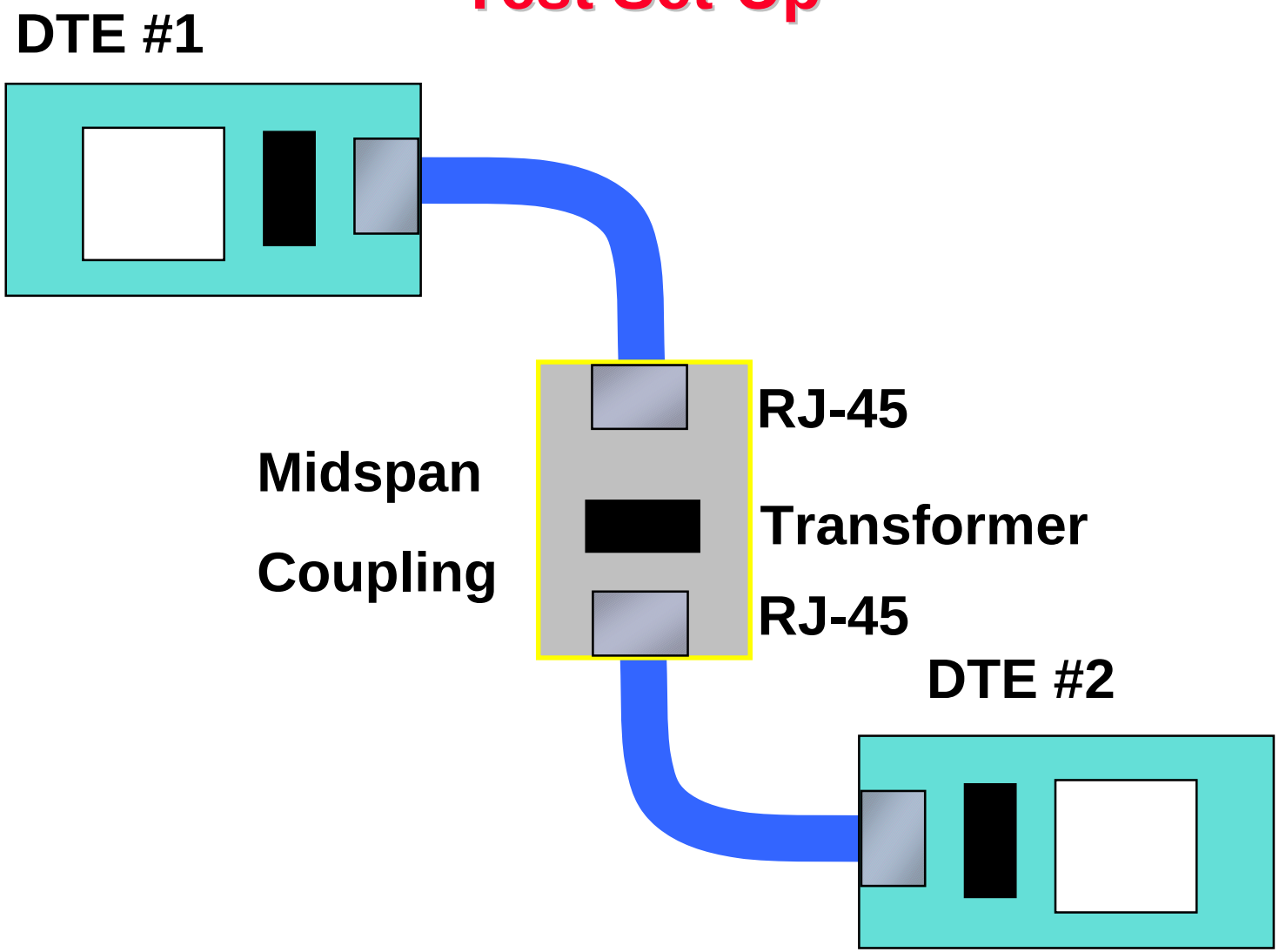
Question: What is the Effect of a Midspan Power Insertion Point (Transformer Coupling) on Legacy Equipment that do NOT Accept Power?



Mid-Span Power Insertion Test Set-Up



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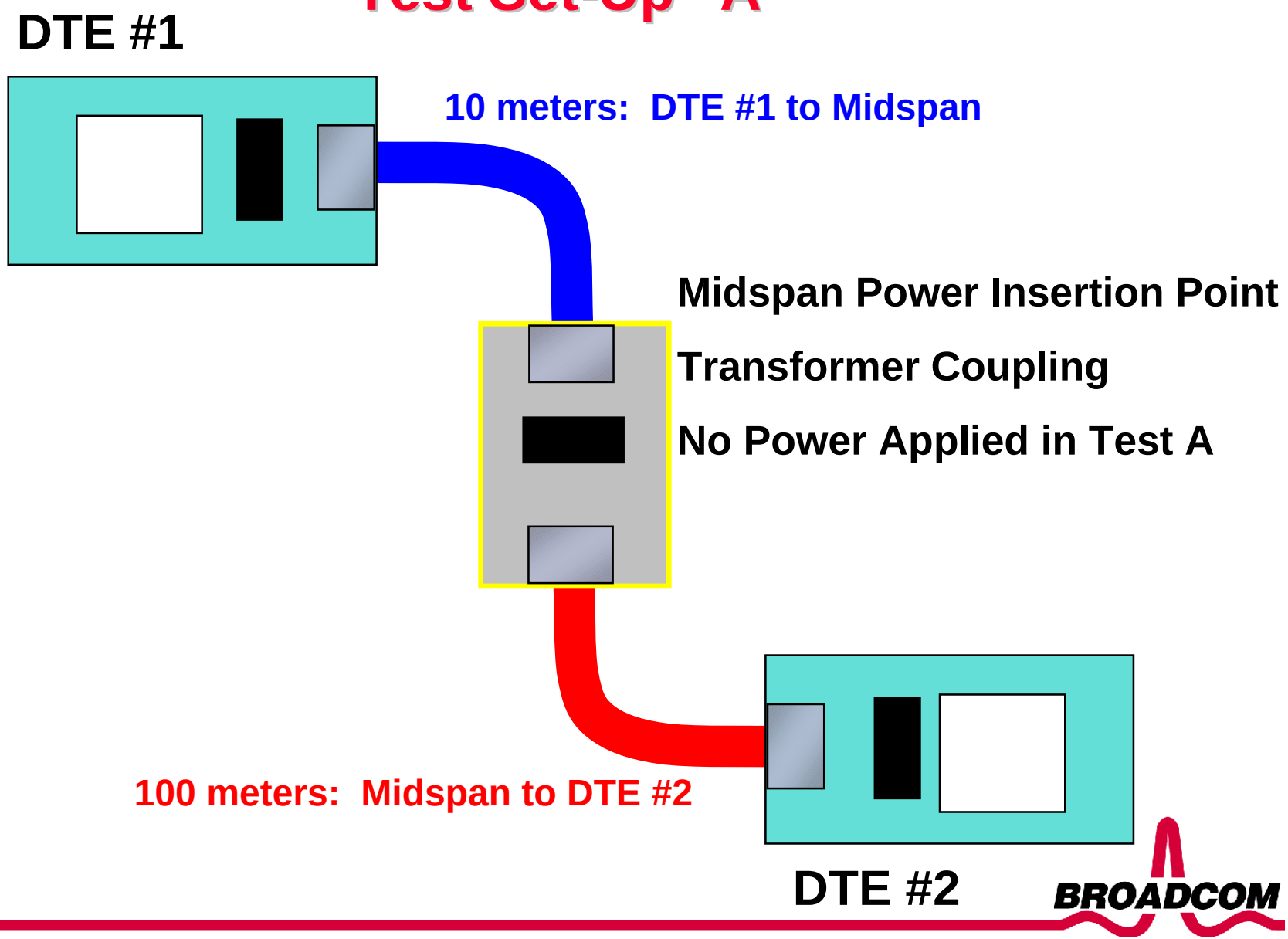
Mid-Span Power Insertion
Test Set-Up "A"



Midspan Power Test A

- **Goal: Determine effect of midspan power insertion point (transformer coupling) on "legacy" PHY's that would not support DTE power**
  - ➢Does the midspan coupling cause unacceptable link performance with older PHYs?

Setup

- **10m from DTE #1 to midspan power insertion point**
- **Midspan power insertion point contains transformer coupling of 100BASE-TX data pairs**
  - ➢**Transformer loss at midspan is 0.3dB**
- **100m from midspan power insertion point to DTE**
  - ➢**110 meters total from DTE #1 to DTE#2**
- **BER measured with transformer coupling in line**

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Measured BER with 115m and midspan transformer coupling (0.3dB loss)

DTE # 1 PHY	DTE # 2 PHY	Bytes Transferred	Errors	BER
Intel (82558) Intel NIC	BRCM 0.5u PHY 3Com NIC	16,482,147,374	0	<7.6E-12
Lucent 0.5u 3Com NIC	BRCM 0.5u PHY 3Com NIC	47,045,878,603	0	<2.7E-12
Level 1 LXT970 D-Link NIC	BRCM 0.5u PHY 3Com NIC	19,155,998,554	0	<6.5E-12
National PHY+ Twister	BRCM 0.5u PHY 3Com NIC	771,986,112	0	<2.5E-12
BRCM Gigabit (BCM5400)	BRCM Gigabit (BCM5400)	8,354,670,844,092	0	<1.5E-14

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Midspan Power Test #A Conclusions

- **Good link performance is possible using:**
  - ➢midspan transformer coupling
  - ➢10/100 PHY's available in 1997
  - ➢100 meter links
  - ➢with some margin

- **1000BASE-T transmission is possible using:**
  - ➢midspan transformer coupling
  - ➢100 meter links
  - ➢with some margin

- **BER measured was <7.6x10^{-12}**

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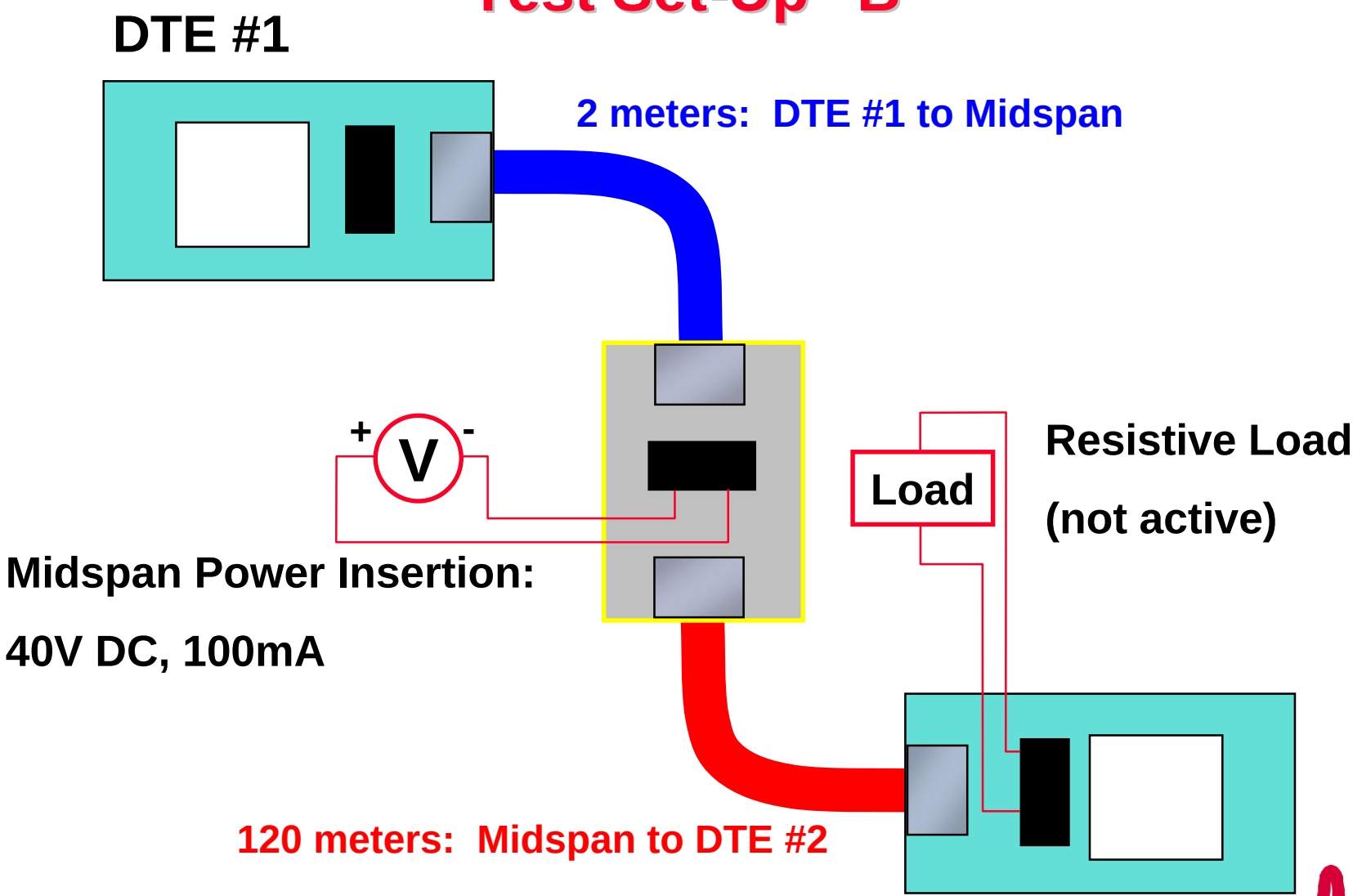
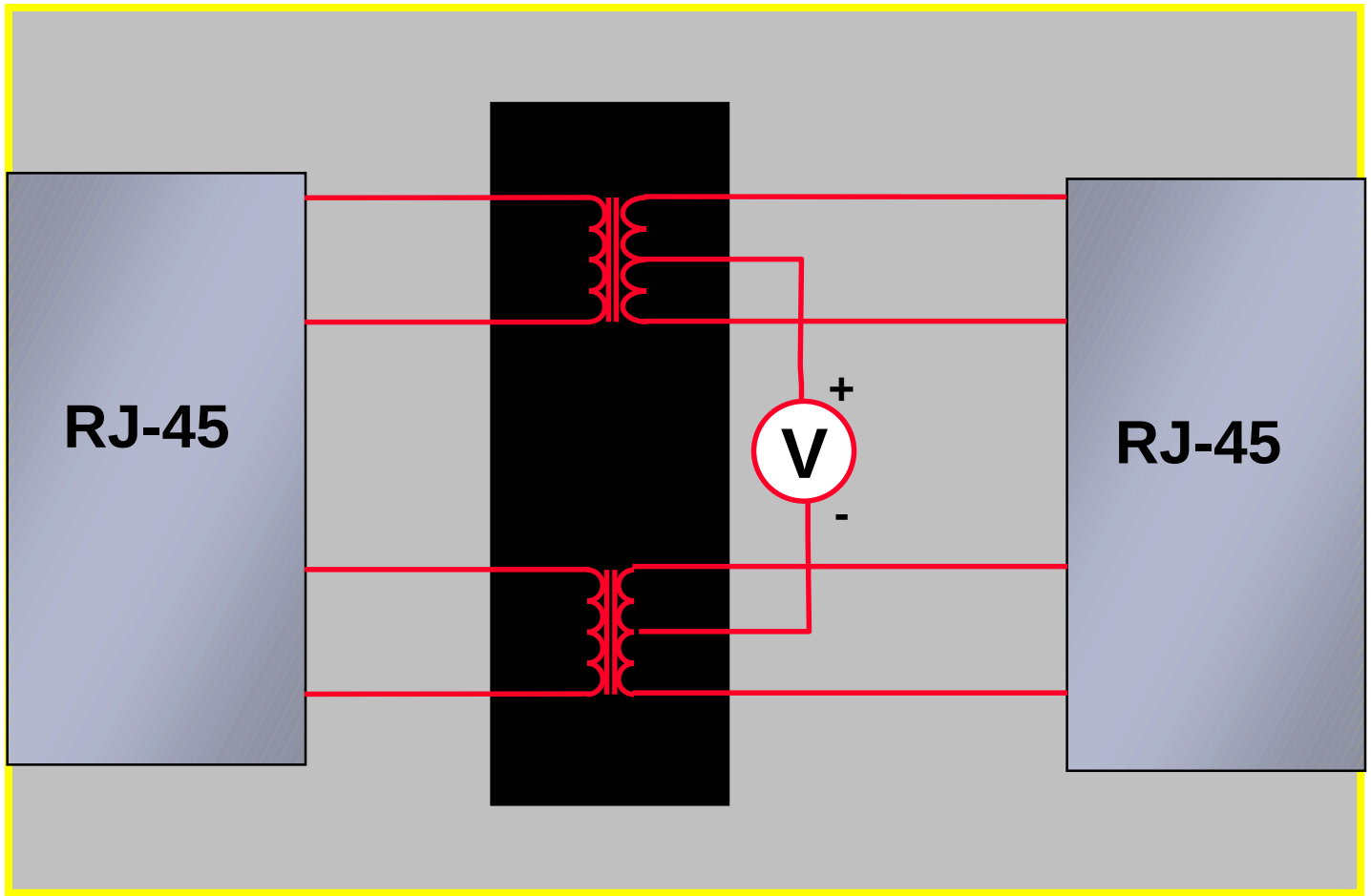
Mid-Span Power Insertion
Test Set-Up "B"



Mid-Span Power Insertion Test Set-Up



Midspan Coupling

Midspan Power Test B

- **Goal: Determine effect of midspan power insertion point (transformer coupling) on 1000BASE-T PHY's**
  - ➢Include effect of current through the transformer windings
  - ➢Is midspan power insertion via in-line transformer coupling compatible with 1000BASE-T?

Setup

- **2m from DTE #1 to midspan power insertion point**
- **Midspan power insertion point contains transformer coupling of 100BASE-TX data pairs**
  - ➢**Transformer loss at midspan is 0.3dB**
  - ➢**40V, 100mA applied at midspan**
- **100m from midspan power insertion point to DTE**
  - ➢**122 meters total from DTE #1 to DTE #2**
  - ➢**Resistive load on DTE #2**
- **BER measured with power applied**

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Measured BER with:

122 meters
Mid-span transformer coupling (0.3dB loss)
Power off and on (100mA)

DTE # 1 PHY	DTE # 2 PHY	Power	Bytes Transferred	Errors	BER
BRCM Gigabit (BCM5401)	BRCM Gigabit (BCM5401)	OFF	901,025,540,460	0	<1.4E-13
BRCM Gigabit (BCM5401)	BRCM Gigabit (BCM5401)	ON	6,922,394,632,080	2	3.6E-14

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Midspan Power Test B Conclusions

- **1000BASE-T transmission is possible using:**
  - ➢Midspan transformer coupling
  - ➢>100 meter links
  - ➢Power applied
  - ➢with some margin

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Recommendation

- **Include 1000BASE-T support as a requirement for DTE powering scheme**

- **Even if power is not applied, any midspan power insertion point should allow 1000BASE-T data to pass through**

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