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IEEE 802.3 DTE Power via MDI

ISOLATION CONSIDERATIONS for MDI POWER SOURCES AND MDI-POWERED DTE

When is a common MDI power source allowed ?

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ISOLATION CONSIDERATIONS

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Three Areas Examined:

1. Operational: No ground loops
2. U.L Safety Requirements
3. Consistency with IEEE 802.3

PREVENTING GROUND LOOPS

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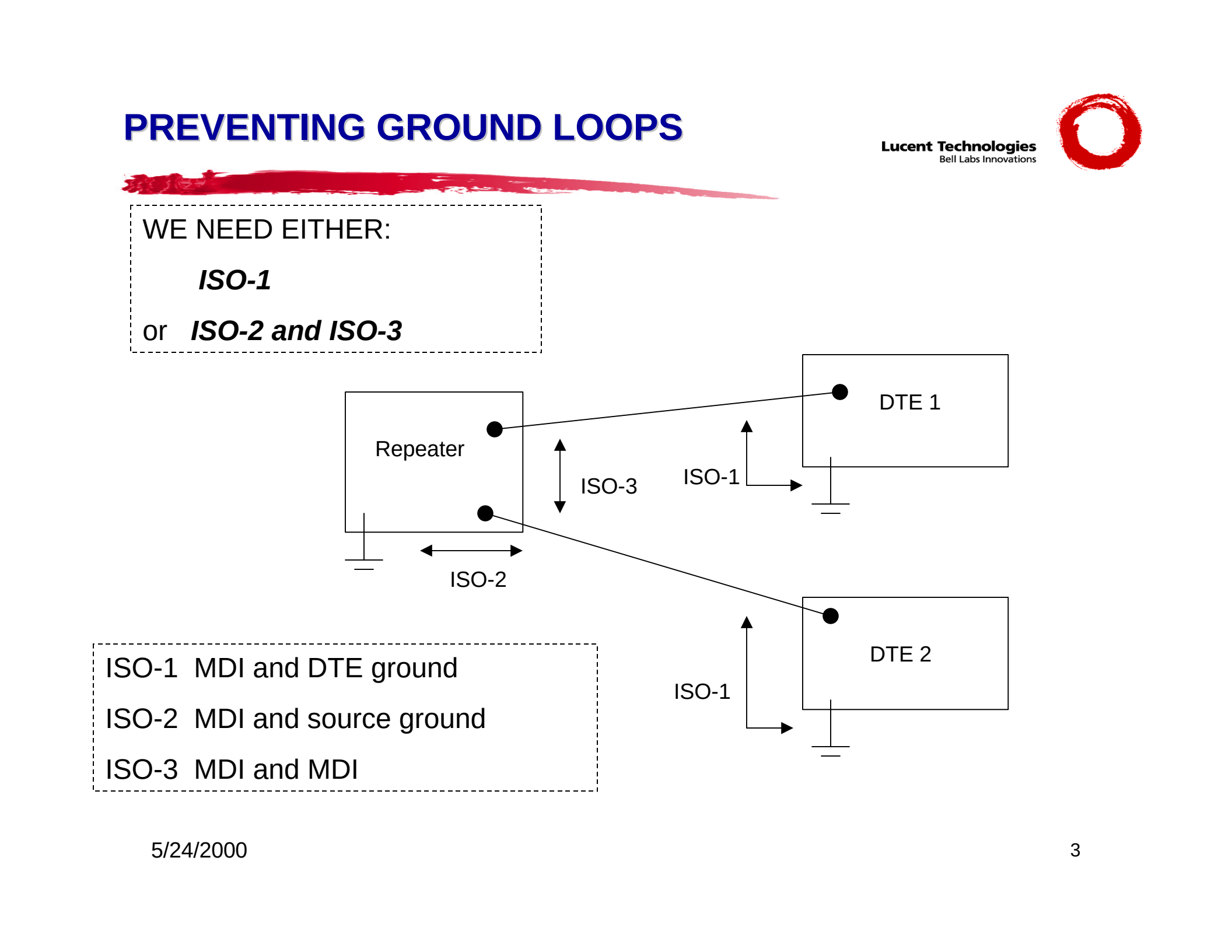

WE NEED EITHER:

ISO-1

or ***ISO-2 and ISO-3***

ISO-1 MDI and DTE ground

ISO-2 MDI and source ground

ISO-3 MDI and MDI

THESE ISOLATIONS ARE ALSO REQUIRED BY OTHER CONCERNS

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- ISO-1 already required by UL-1950 and by IEEE 802.3
- ISO-2 required by 802.3 for Environment A
- ISO-3 required by 802.3 for Environment B

SAFETY REQUIREMENT - U.L.

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- UL-1950, Section 6.3, " Protection of telecommunication network service personnel, and users of other equipment connected to the network, from hazards in the equipment "
- Interpretation: Requires at least 1500 V isolation between all MDI leads and,
  - Protective earth present in DTE and Repeaters
  - Jacks to attached equipment that may not comply

U.L. 6.3.3.1 "…there shall be insulation between circuitry intended to be connected to the TELECOMMUNICATIONS NETWORK and any parts or circuitry that will be earthed in some applications, either within the equipment under test or via other equipment."

U.L. 6.4.2.2 electrical test calls for either a 1500 or a 2500 volt test

802.3 ENVIRONMENT DEFINITIONS

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- Environment A:

  When a LAN or LAN segment, with all associated interconnecting equipment is entirely contained within a single low-voltage power distribution system and within a single building (27.5.3 and 9.7)

- Environment B:

  When a LAN crosses the boundary between separate power distribution systems or the boundary of a building (27.5.3 and 9.7)

802.3 ISOLATION REQUIREMENTS - PMA

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802.3, Section 23, Physical Coding Sublayer (PCS), Physical Medium Attachment (PMA) sublayer and baseband medium, type 100BASE-T4

PMA-to-MDI isolation requirement:

The PHY shall provide electrical isolation between the DTE, or repeater circuits including frame ground, and all MDI leads. This electrical separation shall withstand at least one of …..1500 V rms…2250 V dc…sequence of ten 2400 C impulses…" (23.5.1.1)

802.3 ISOLATION REQUIREMENTS - REPEATERS

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802.3, Sec. 27, Repeater for 100Mb/s baseband networks

- "Network segments that have different isolation and grounding requirements shall have those requirements provided by the port-to-port isolation of the repeater set." (27.4.1)
- Environment A (27.5.3.1)

  "Attachment of network segments via repeater sets requires electrical isolation of 500 V rms ….. between the segment and the protective ground of the repeater unit."

802.3 ISOLATION REQUIREMENTS - REPEATERS (Continued)

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802.3, Sec. 27, Repeater for 100Mb/s baseband networks

- Environment B (27.5.3.2)

  "The attachment of network segments that cross Environment B boundaries requires electrical isolation of 1500 V rms …. between each segment and all other attached segments and also the protective ground of the repeater unit."

  "….interconnected electrically conducting LAN segments that are …. external to a building environment may require additional protection against lightning strike hazards. Such hazards are beyond the scope…. It is recommended that ... be handled by the use of non-electrically conducting segments (e.g., fiber optic)."

802.3 Isolation for 10/100BaseT - Environment A

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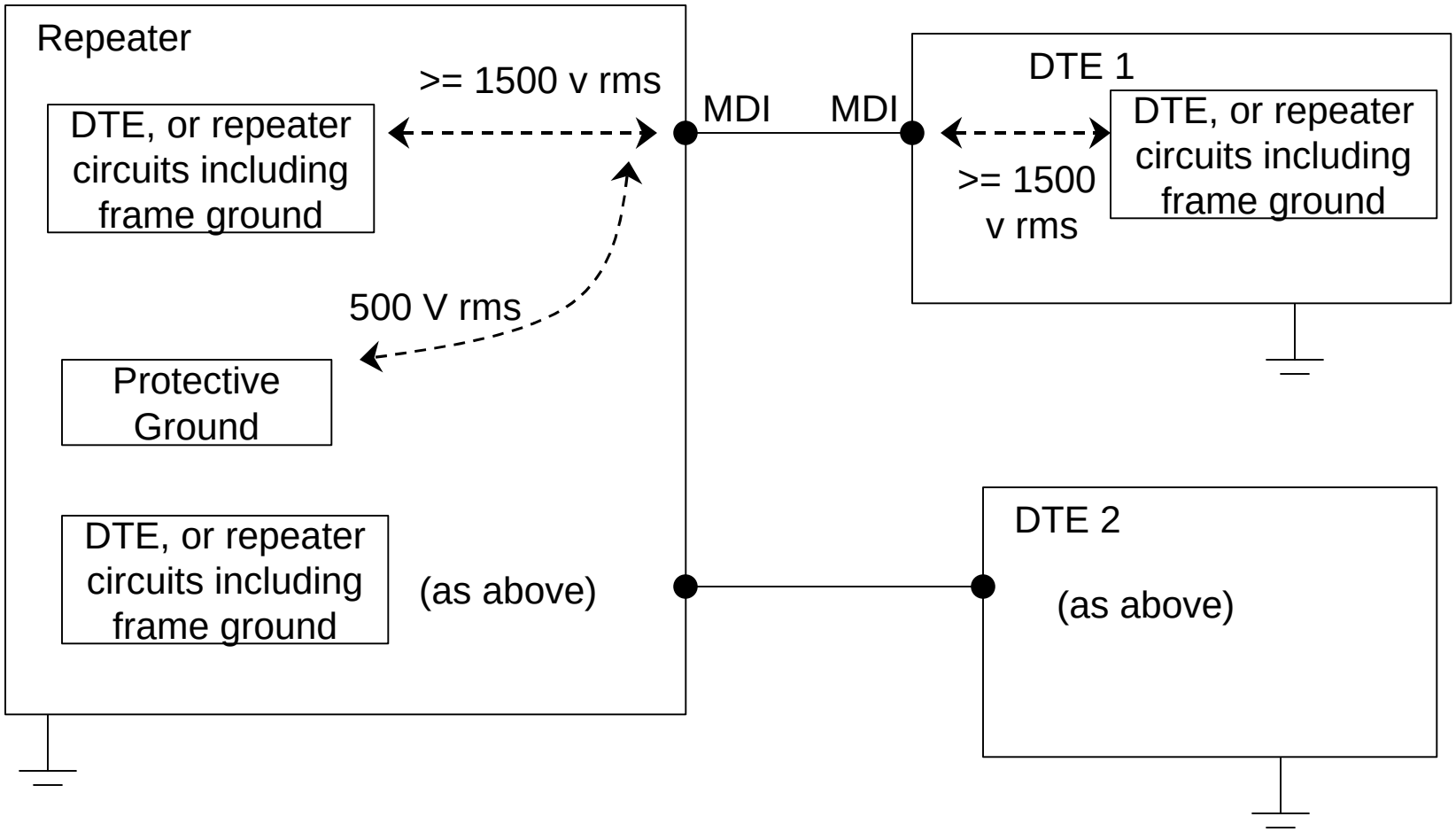

802.3 Isolation for 10/100BaseT - Environment B Segments

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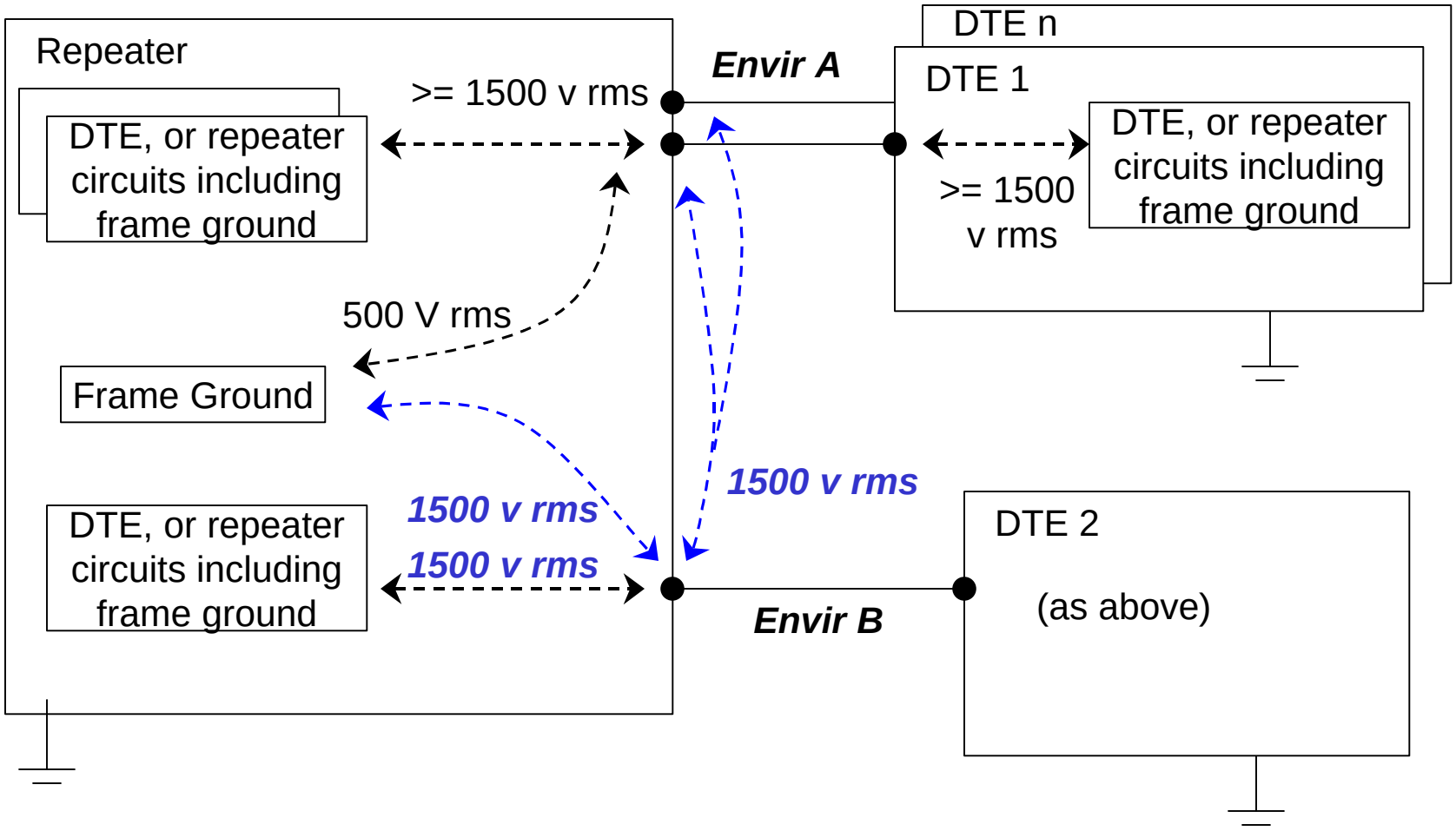

Interpretations/Conclusions

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- DTE Isolation Requirements
  - 1500 v rms (or *similar)* between MDI leads and circuits containing frame ground (802.3)
  - 1500 v (or similar) between MDI leads and protective earth, exposed jacks to other equipment (UL)
- Repeater Isolation Requirements*
  - Environment A segments:
    - DTE isolation called out above
    - 500 v rms from MDI leads to protective ground (superceded)
  - Environment B segments:
    - DTE isolation called out above
    - 1500 v rms from MDI leads to protective ground
    - 1500 v rms from each Environment B segment to <u>all other segments</u>

* With integrated MAU functions (10base-T clauses differentiate)

Conclusions for Power Sources

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- A supply can be common to multiple DTE over segments in a single Environment A
- Isolated (individual) power sources are needed for each DTE on segments that cross Environment A boundaries (Environment B segments)

- Recommendation: IEEE power standard should enable lowest cost solution to the higher volume Environment A segments
  - Enable common supply for Environment A
  - Environment B segments can afford special treatments (isolated supplies, use local powering, use fiber, etc.)

Back-up Slides

802.3 ISOLATION REQUIREMENTS - Repeaters

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802.3, Section 9, Repeater Unit for 10 Mb/s baseband Networks

- "Network elements that have different isolation and grounding requirements shall have those requirements provided by the port-to-port isolation of the repeater set." (9.5.7)
- Environment A:

  "Attachment of network segments via repeaters (sets) possessing internal MAUs requires electrical isolation of 500 V rms …. between the segment and the protective ground of the repeater." (9.7.1)
- Environment B:

  "The attachment of network segments, which cross environment A boundaries, requires electrical isolation of 1500 V rms …. between each segment and all other attached segments and also the protective ground of the repeater unit." (9.7.2)

802.3 ISOLATION REQUIREMENTS MAU

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802.3, Section 14, Twisted pair medium attachment unit (MAU) and baseband medium, type 10BASE-T

- MAU-to-MDI isolation requirement:

  The MAU shall provide isolation between the DTE Physical layer circuits including frame ground and all MDI leads including those not used by 10Base-T….shall withstand at least one of …..1500 V rms…2250 V dc…sequence of ten 2400 C impulses…" (14.3.1)