Proposal for Update of Clause 33.4.1

Electrical Isolation Requirements

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IEEE 802.3 PoE Plus

July 20, 2005

Contents

A proposed re-write of section 33.4.1

A sentence-by-sentence comparison and discussion

Clause 33.4.1:

33.4.1 Isolation

A network interface device (NID) containing a PSE shall provide electrical isolation between that MDI port, frame ground, and all other non-MDI leads. Power inputs directly connected to the PSE powering circuits are exempt from this isolation. Isolation between multiple PSE ports are described in clause 33.4.1.1.

A NID containing a PD shall provide electrical isolation between that MDI and all other leads, including other MDI instances. Power inputs exclusively connected to that MDI are exempted provided they are inaccessible by the probe of IEC 60950-1:2001 clause 2.1.1.1.

Clause 33.4.1: continued

This electrical isolation shall withstand at least one of the following electrical strength tests:

a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.

b) 2250 Vdc for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.

c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in IEC 60060.

There shall be no insulation breakdown, as defined in Section 5.2.2 of IEC 60950: 2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 Vdc.

Conductive link segments that have different isolation and grounding requirements shall have those requirements provided by the port-to-port isolation of network interface devices (NID).

Clause 33.4.1.1

33.4.1.1 Electrical isolation environments

There are two electrical power distribution environments to be considered that require different electrical isolation properties. They are as follows:

—Environment A:

When a LAN or LAN segment, with all its associated interconnected equipment, is entirely contained within a single low-voltage power distribution system and within a single building.

—Environment B:

When a LAN crosses the boundary between separate power distribution systems or the boundaries of a single building.

Clause 33.4.1.1.1

33.4.1.1.1 Environment A requirements

NID isolation requirements are encompassed within the basic MAU/PHY/medium standard (See 14.3.1.1, TP-PMD, and 40.6.1.1.).

A multi-PSE NID does not require isolation between each PSE port, when connected solely to segments complying with Environment-A requirements. A multi-PD NID requires electrical isolation between each MDI. Multi-port devices with both PSE and PD interfaces require isolation between the PD ports, and between the PD ports and the PSE ports.

A PSE shall switch either the more negative conductor or both conductors.

Clause 33.4.1.1.2

33.4.1.1.2 Environment B requirements

NID isolation requirements are encompassed within the basic MAU/PHY/medium standard (See 14.3.1.1, TP-PMD, and 40.6.1.1.).

A multi-PSE NID must isolate ports connected to Environment-B segments from all other ports. Multi-PD devices require isolation between each MDI.

The requirements for interconnected electrically conducting link segments that are partially or fully external to a single building environment may require additional protection against lightning strikes or other hazards. Protection requirements for such hazards are beyond the scope of this standard. Guidance on these requirements may be found in Section 6 of IEC 60950-1:2001, as well as any local and national codes related to safety.

Clause 33.4.1: Line-by-line

Was: The PSE shall provide electrical isolation between the PI device circuits, including frame ground (if any), and all PI leads.

Propose: A network interface device (NID) containing a PSE shall provide electrical isolation between that MDI port, frame ground, and all other non-MDI leads. Power inputs directly connected to the PSE powering circuits are exempt from this isolation. Isolation between multiple PSE ports are described in clause 33.4.1.1.

Comment: The existing text implies the location of an internal isolation barrier. The modified text defines isolation in terms of unit level performance. This allows the isolation barrier location to be determined by implementation.

Clause 33.4.1: Line-by-line

Was: The PD shall provide electrical isolation between all external conductors, including frame ground (if any), and all PI leads.

Propose: A NID containing a PD shall provide electrical isolation between that MDI and all other leads, including other MDI instances. Power inputs exclusively connected to that MDI are exempted provided they are inaccessible by the probe of IEC 60950-1:2001 clause 2.1.1.1.

Comment: The PD can become a hazard because of a link short to a hazardous voltage. Links are ungrounded, or floating, meaning that such a connection will go undetected and unprotected. Isolation of the PI from accessible I/O protects the user. Protection should also extend to any other equipment metallically connected to the PD. A faulted link will energize all devices connected to a multi-port PSE NID. If a multi-port PD ties two links together, there is the possibility that this fault can propagate amongst NIDs, enlarging the exposure and making it difficult to locate a problem.

See clause 33.5

"a) Direct contact between LAN components and power, lighting, or communications circuits."

Clause 33.4.1: Line-by-line

Was: This electrical isolation shall be in accordance with the isolation requirements between SELV circuits and telecommunication network connections in subclause 6.2 of IEC 60950-1:2001.

Propose: This electrical isolation shall be in accordance with the isolation requirements between SELV circuits, and primary circuits which power the PI.

Comment: This is per IEC60950-1 clause 2.10.3.3 considering floating secondary circuits. Assuming the source 48V is floating, and derived from 240Vac, the traditional 802.3 dielectric tests make sense. See addendum below.

Clause 33.4.1: Line-by-line

Was: This electrical isolation shall withstand at least one of the following electrical strength tests:

a) 1500 Vrms steady-state at 50-60 Hz for 60 seconds, applied as specified in subclause 6.2 of IEC 60950-1:2001.

b) An impulse test consisting of a 1500 V, 10/700us waveform, applied 10 times, with a 60 second interval between pulses, applied as specified in subclause 6.2 of IEC 60950-1:2001.

There shall be no insulation breakdown, as defined in subclause 6.2.2.3 of IEC 60950-1:2001.

Propose: This electrical isolation shall withstand at least one of the following electrical strength tests:

a) 1500 V rms at 50 Hz to 60 Hz for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.

b) 2250 Vdc for 60 s, applied as specified in Section 5.2.2 of IEC 60950-1:2001.

c) A sequence of ten 2400 V impulses of alternating polarity, applied at intervals of not less than 1 s. The shape of the impulses shall be 1.2/50 µs (1.2 µs virtual front time, 50 µs virtual time or half value), as defined in IEC 60060.

There shall be no insulation breakdown, as defined in Section 5.2.2 of IEC 60950: 2001, during the test. The resistance after the test shall be at least 2 MΩ, measured at 500 Vdc.

Comment: Align the isolation requirement to be consistent with clauses 14 and 40. This is an exact duplicate of these clauses. These limits meet the IEC 60950 requirement for the floating secondary derived from 240Vac. The transient requirement is also typical of one used in ac mains systems.

Clause 33.4.1: Line-by-line

Conductive link segments that have different isolation and grounding requirements shall have those requirements provided by the port-to-port isolation of network interface devices (NID).

33.4.1.1 Electrical isolation environments

There are two electrical power distribution environments to be considered that require different electrical

isolation properties. They are as follows:

—Environment A:

When a LAN or LAN segment, with all its associated interconnected equipment, is entirely contained within a single low-voltage power distribution system and within a single building.

—Environment B:

When a LAN crosses the boundary between separate power distribution systems or the boundaries of a single building.

Propose: No change.

Clause 33.4.1.1.1: Line-by-line

33.4.1.1.1 Environment A requirements

Was: Attachment of network segments via NIDs that have multiple instances of a twisted pair MDI requires electrical isolation between each segment and the protective ground of the NID.

Propose: Delete

Comment: No new information.

Was: For NIDs, the requirement for isolation is encompassed within the isolation requirements of the basic MAU/PHY/medium standard. (See 14.3.1.1, TP-PMD, and 40.6.1.1.) Equipment with multiple instances of PSE and/or PD shall meet or exceed the isolation requirement of the MAU/PHY with which they are associated.

Propose: NID isolation requirements are encompassed within the basic MAU/PHY/medium standard (See 14.3.1.1, TP-PMD, and 40.6.1.1.).

Comment: Simplify the sentence structure. Delete the second sentence – it is redundant to the following sentences.

Clause 33.4.1.1.1: Line-by-line

Was: **A multi-port NID complying with Environment A requirements does not require electrical power isolation between link segments.**

Propose: A multi-PSE NID does not require isolation between each PSE port, when connected solely to segments complying with Environment A requirements. A multi-PD NID requires electrical isolation between each MDI. Multi-port devices with both PSE and PD interfaces require isolation between the PD ports, and between the PD ports and the PSE ports.

Comment: Allow the PSE to act like its natural star topology center-point. Force isolation between multiple PIs in a PD-NID to avoid PSE-PSE fault propagation.

Clause 33.4.1.1.1: Line-by-line

Was: **An Environment A PSE shall switch the more negative conductor. It is allowable to switch both conductors.**

Propose: **A PSE shall switch either the more negative conductor or both conductors.**

Comment: **Simplify – it is under environment A heading.**

Clause 33.4.1.1.2: Line-by-line

33.4.1.1.2 Environment B requirements

Was: The attachment of network segments that cross environment A boundaries requires electrical isolation between each segment and all other attached segments as well as to the protective ground of the NID.

Propose: A multi-PSE NID must isolate ports connected to Environment-B segments from all other ports. Multi-PD devices require isolation between each MDI.

Move this below the next paragraph.

Comment: Clarify where things are attached to and eliminate the redundant comment about grounding.

Clause 33.4.1.1.2: Line-by-line

Was: For NIDs, the requirement for isolation is encompassed within the isolation requirements of the basic MAU/PHY/medium standard (See 14.3.1.1, TP-PMD, and 40.6.1.1.). Equipment with multiple instances of PSE and/or PD shall meet or exceed the isolation requirement of the MAU/PHY with which each is associated.

Propose: NID isolation requirements are encompassed within the basic MAU/PHY/medium standard (See 14.3.1.1, TP-PMD, and 40.6.1.1.).

Comment: Simplify the sentence and eliminate discussion about multi-port cases which will be handled by a following sentence.

Clause 33.4.1.1.2: Line-by-line

The requirements for interconnected electrically conducting link segments that are partially or fully external to a single building environment may require additional protection against lightning strikes or other hazards. Protection requirements for such hazards are beyond the scope of this standard. Guidance on these requirements may be found in Section 6 of IEC 60950-1:2001, as well as any local and national codes related to safety.

Comment: No change.

ADDENDUM IEC 60950 2.10.3.3

2.10.3.3 Clearances in secondary circuits

CLEARANCES in SECONDARY CIRCUITS shall comply with the minimum dimensions of table 2K.

For a WORKING VOLTAGE to be used in determining CLEARANCES for SECONDARY CIRCUITS in accordance with table 2K:

– the peak value of any superimposed ripple on a DC VOLTAGE, shall be included;

– the peak value shall be used for non-sinusoidal voltages.

A SECONDARY CIRCUIT derived from an AC MAINS SUPPLY will normally be Overvoltage Category I if the PRIMARY CIRCUIT is Overvoltage Category II; the maximum transients for various AC MAINS SUPPLY voltages in Overvoltage Category I are shown in the column headings of table 2K.

However, a floating SECONDARY CIRCUIT shall be subjected to the requirements for PRIMARY CIRCUIT in tables 2H and 2J unless it is in equipment with a protective earthing terminal and either:

– it is separated from the PRIMARY CIRCUIT by an earthed metal screen; or

– transients on the SECONDARY CIRCUIT are below the permitted maximum value for Overvoltage Category I (for example, due to being attenuated by connecting a component, such as a capacitor, between the SECONDARY CIRCUIT and earth). See 2.10.3.4 for themethod of measuring the transient level.

For the purposes of using table 2K for equipment to be supplied from a DC MAINS SUPPLY that is connected to protective earth and is entirely within a single building, the MAINS TRANSIENT VOLTAGE is considered to be zero.

NOTE 1 The connection to protective earth can be at the source of the DC MAINS SUPPLY or at the equipment location, or both (see ITU-T Recommendation K.27).

For equipment to be supplied from a DC MAINS SUPPLY that is not connected to protective earth, the value of the MAINS TRANSIENT VOLTAGE in the DC MAINS SUPPLY is the same as the MAINS TRANSIENT VOLTAGE in the PRIMARY CIRCUIT from which it is derived.

NOTE 2 For CLEARANCES which are provided for compliance with 2.3.2, table 2K applies.

If the TELECOMMUNICATION NETWORK TRANSIENT VOLTAGE is not known, an assumed transient rating of 800 V peak should be used for TNV-2 CIRCUITS and 1,5 kV peak for TNV-1 CIRCUITS and TNV-3 CIRCUITS.

If the TELECOMMUNICATION NETWORK TRANSIENT VOLTAGE is known, the known value should be used.

If it is known that the incoming transients will be attenuated within the equipment, the value should be determined in accordance with 2.10.3.4 b) and be used.

The effect of transients from a CABLE DISTRIBUTION SYSTEM is not taken into account when determining CLEARANCES (however, see 7.3.1).