IEEE P802.3at Power via MDI Enhancements 350uH Ad Hoc November 7th call

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Ad Hoc Call participants

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Issue

- Clause 25 incorporates TP-PMD by reference

  25.2 Functional specifications

  The 100BASE-TX PMD (and MDI) is specified by incorporating the FDDI TP-PMD standard, ANSI X3.263: 1995 (TP-PMD), by reference, with the modifications noted below.

- Subclause 9.1.7 of ANSI X3.263: 1995
  - Specifies a worst case droop of transformer
    - Minimum 350 uH with any DC bias between 0 mA and +8 mA
- Normative for 100BASE-T PHYs
  - Not listed in 25.2 modifications to X3.263
- PoE+ increases DC current imbalance in transformer
  - This in combination with the 350 uH minimum is an issue
    - See DC Current Imbalance - Steve Ellsworth http://www.ieee802.org/3/poep_study/public/mar05/ellsworth_1_0305.pdf#Page=7

ANSI X3.263-1995 (TP-PMD)

9.1.7 Worst case droop of transformer

Baseline Wander tracking by the receiver is dependent on the worst case droop that can be produced by a transmitter. Droop is directly related to the Open Circuit Inductance (OCL) which varies with temperature, manufacturing tolerance, and bias current.

Worst case Baseline Wander Frames vary the transformer bias which causes the droop to change with data content. This variation must be accounted for by the receiver to track the Baseline Wander over long frames. Variation in inductance caused by bias of the transformer can be on the order of 2:1.

The minimum inductance measured at the transmit pins of the AOI shall be greater than or equal to 350 uH with any DC bias current between 0 mA and +8 mA injected as shown in figure 13.

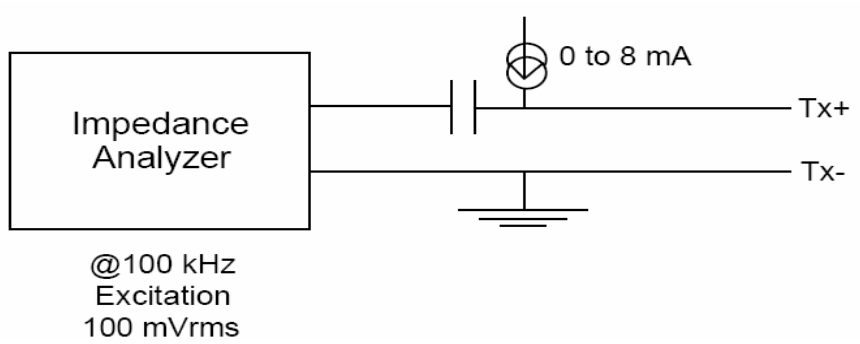


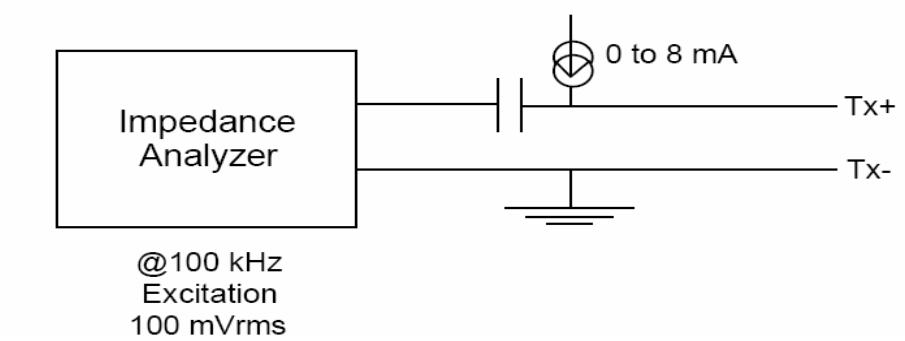
Figure 13

Problem

- Baseline wander can cause bit errors
  - Inductance requirement is one fix
    - But this is an implementation approach
  - Other approaches may now be available
    - But due to standard inductance still has to be met
- BER performance is actual requirement
  - And meeting BER is all that should matter
    - Implementation to achieve this not of interest
      - Should not be mandated by standard

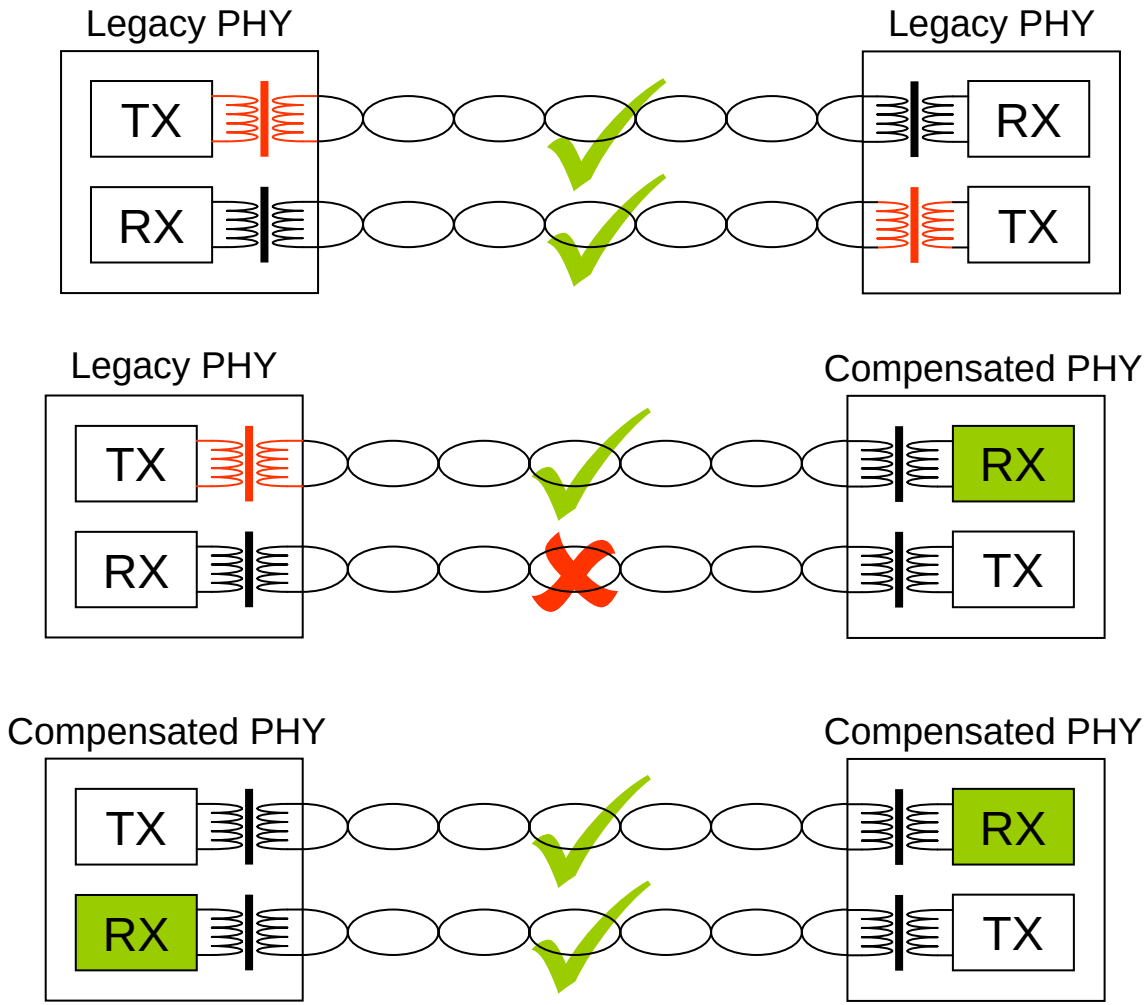
But if only it was that easy …

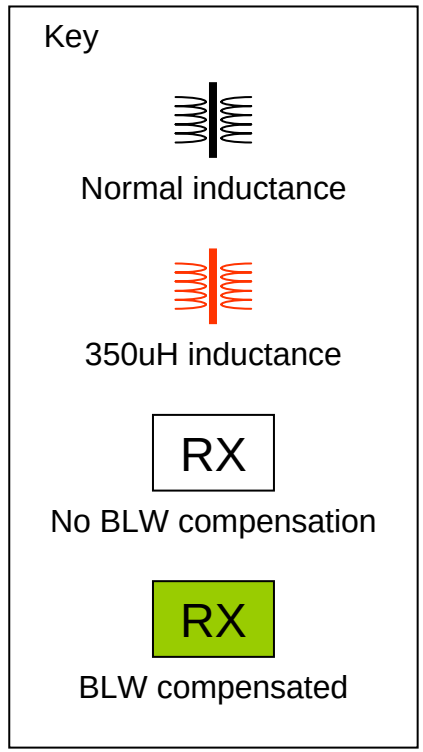
- High inductance is specified for Transmit side
  - This is what we want to remove need for



- BER is usually specified for Receiver
  - Using complaint transmitter
  - And worse case channel
- Compensation for BLW implemented in receiver

Problem is mixed configuration

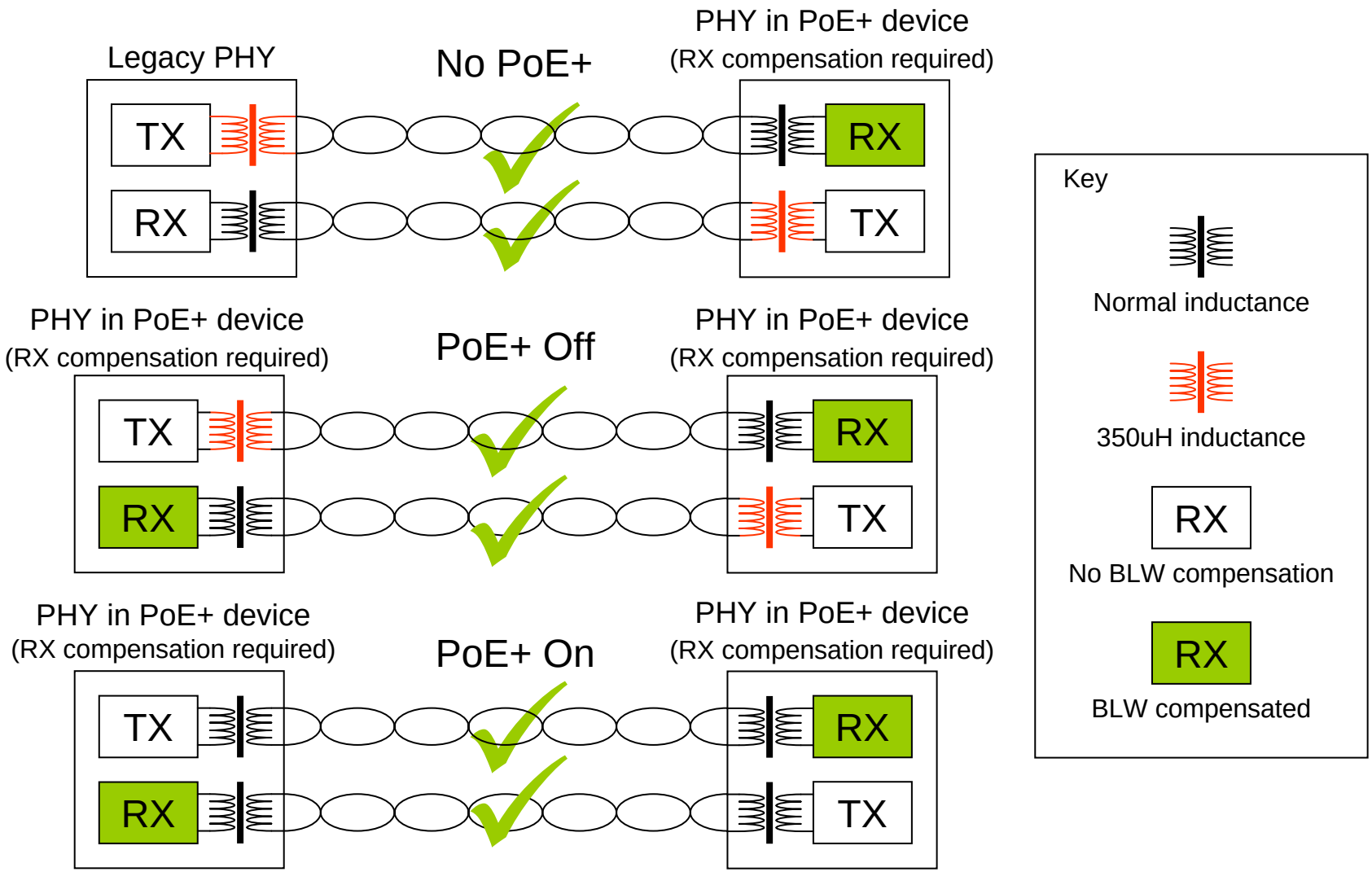




Proposed approach

- Can’t just remove requirement for 350uH and replace with RX baseline wander compensation
  - Legacy PHY to compensated PHY problem
- Limit solution to PoE+
  - Use PoE+ operation as detection of RX compensation
  - At PHY used in a PoE+ device would therefore:
    - Require RX baseline wander compensation
    - Require 350uH TX inductance when not supplying power
    - Not require 350uH TX inductance when supplying power

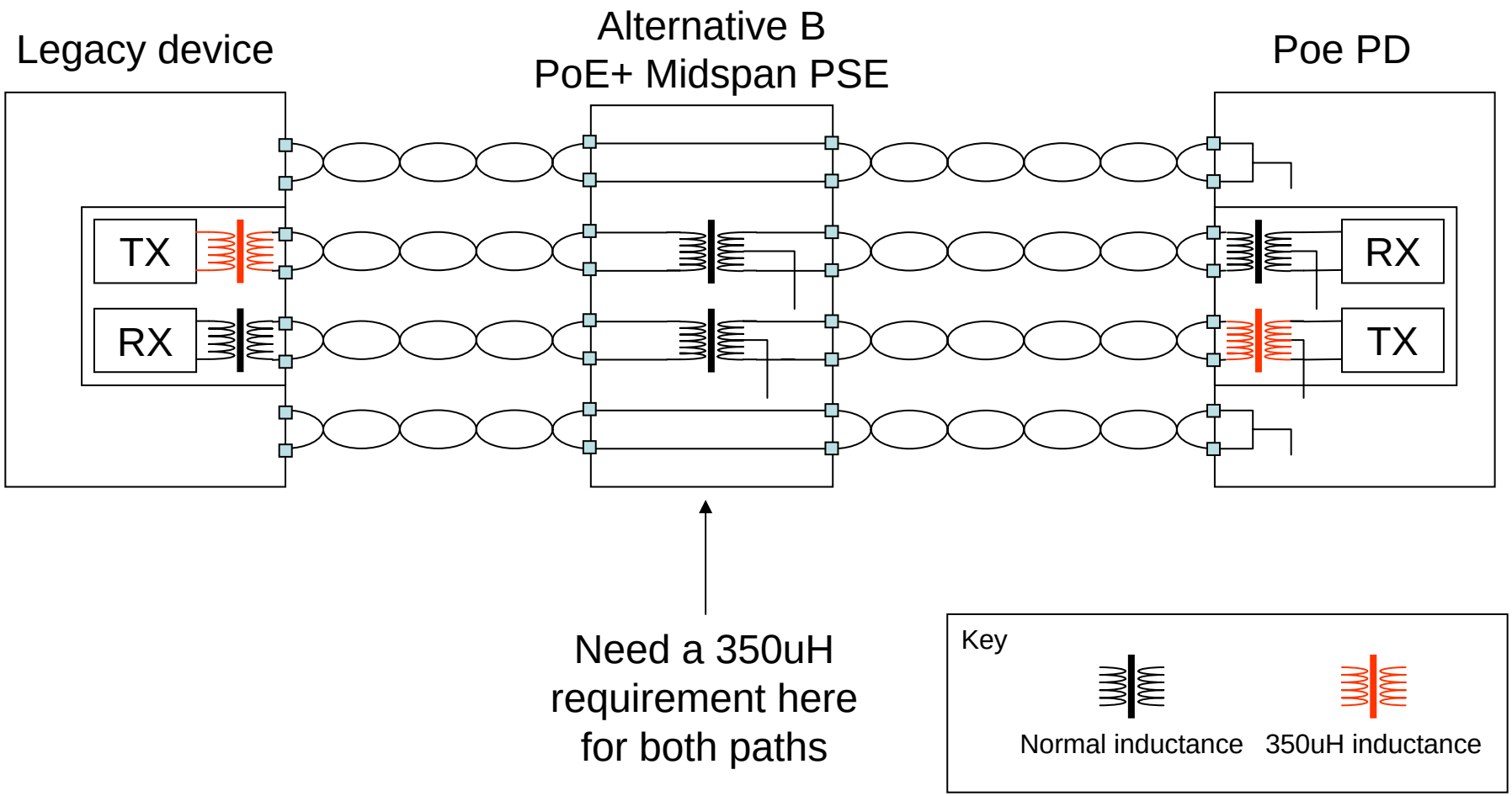
Mixed configuration



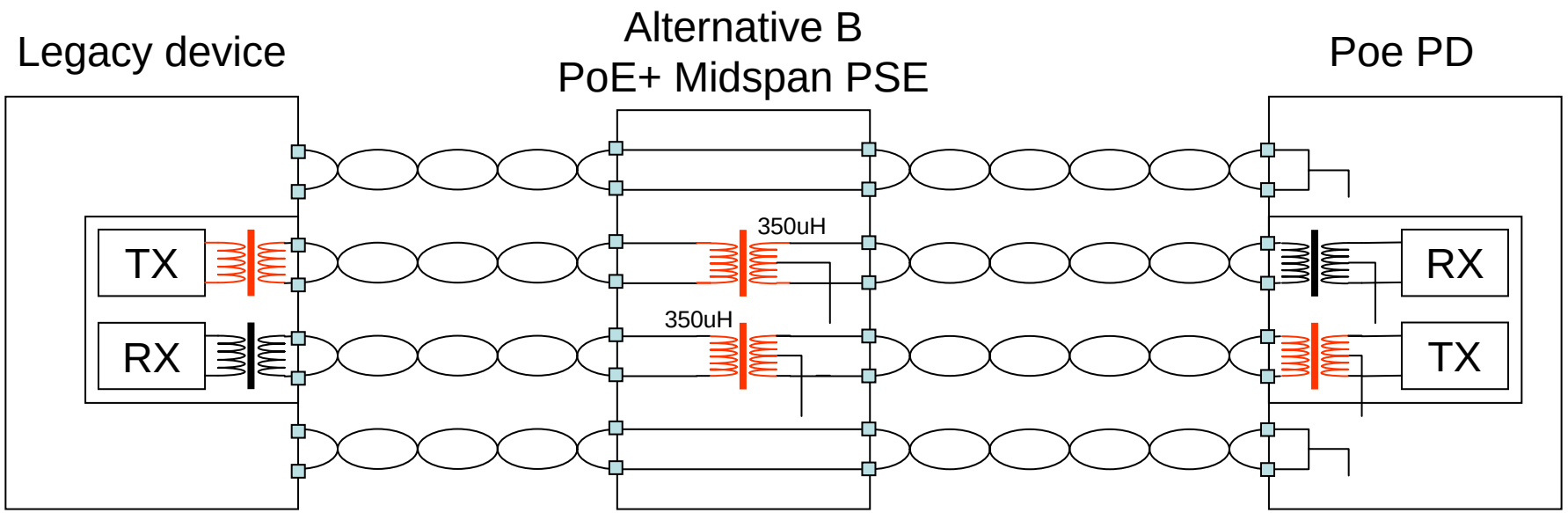
Alternative B midspan issues

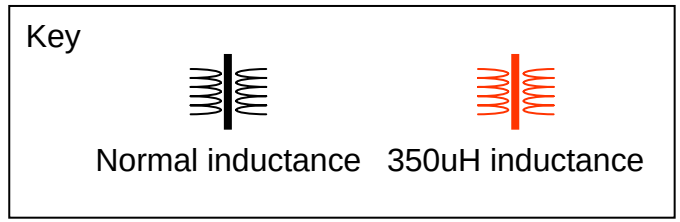
- [1] Need to meet 350uH requirement
  - This is not called out in channel specification
    - Require Midspan to meet a channel will cover this
  - ANSI X3.263-1995 (TP-PMD) specifies the 350uH
    - Will need to ensure this applies to Alternative B Midspan
- [2] Alternative B Midspan and PoE+ PD
  - Based on above proposal PoE+ PD would not need to meet 350uH on TX when being powered from Midspan
    - Midspan can't support RX Compensation
      - Unless it has a back to back PHY configuration
    - Midspan can't supply inductance missing from TX
  - Solutions ?

Alternative B midspan problem 1

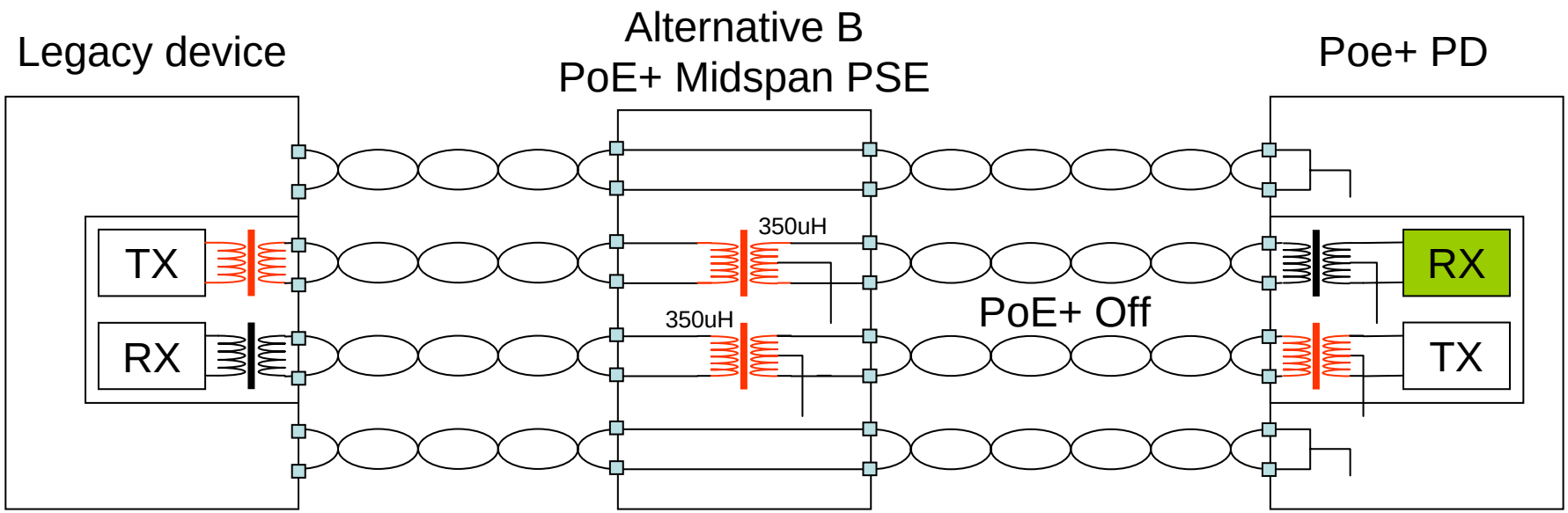


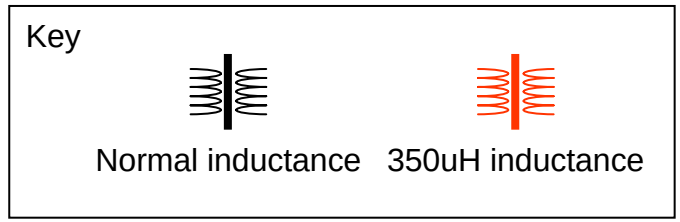
Alternative B midspan problem 1





Alternative B midspan problem 2





Alternative B midspan problem 2