10GBASE-T Fast Retraining and EEE PCS and PHY Control State Diagram Changes

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Overview

- This presentation provides state diagram and variable changes as part of the suggested remedies for several comments submitted against IEEE P802.3az Draft 3.0.

- Two primary issues are addressed:

  – Issue 1: LPI out-of-sync possible during PCS_Test.

  – Issue 2: PCS state diagram behavior undefined during Fast Retraining.

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Issue 1: LPI Out-of-sync During PCS_Test

- Issue identified by Gavin Parnaby.

- The variable loc_lpi_en is set false in PCS_Test in order to allow the PCS 64/65B Transmit State Diagram to inhibit transitions to LPI (TX_L) during training.

- While the transition to LPI is inhibited, the state diagram does not inhibit the transmission of LP_IDLE to the link partner.

- This can result in the receiver going into LPI while the transmitter is in the normal mode and likely will result in a link fail condition.

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Issue 2: PCS State Diagram Behavior Undefined During Fast Retraining

- EEE Transmit state diagram
  - When in LPI, the state diagram may conflict with fast retraining behavior.
  - For example, suppose the transmitter is in LPI when it detects a link_failure signal from the link partner. Does it send its link_failure signal or continue with quiet/refresh signaling?
  - Fast retraining should take precedence.

- PCS 64B/65B PCS Transmit
  - The state diagram may conflict with fast retraining behavior.
  - Does the state remain in TX_L and then attempt to wake during PCS_Test?
 - State diagram should transition and be held in TX_INIT until training has completed.

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Common Resolution to Issues 1 & 2

- Redefine loc_lpi_en as pcs_data_mode so that it can be used to hold state diagrams when the PHY Control is not in PCS_Data.
  - Set pcs_data_mode to FALSE in PHY Control states SILENT and PMA_INIT_FR and set TRUE in PCS_Data.
  - Update variable, primitive, functional block diagrams, and PHY Control State Diagram reflecting this change.

- PCS 64B/65B PCS Transmit
  - Hold in state TX_INIT when not in PCS_Data.
  - Eliminate transitions dependent on loc_lpi_en since these are no longer needed.

- PCS 64B/65B PCS Receive
  - Hold in state RX_INIT when not in PCS_Data.
  - Results in local faults being sent to RS up through the end of PCS_Test.

- EEE Transmit state diagram
  - Hold in state TX_NORMAL when not in PCS_Data.

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Figure 55-24 PHY Control State Diagram (1 of 2) (Changes in Blue)

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Figure 55-24 PHY Control State Diagram (2 of 2) (Changes in Blue)

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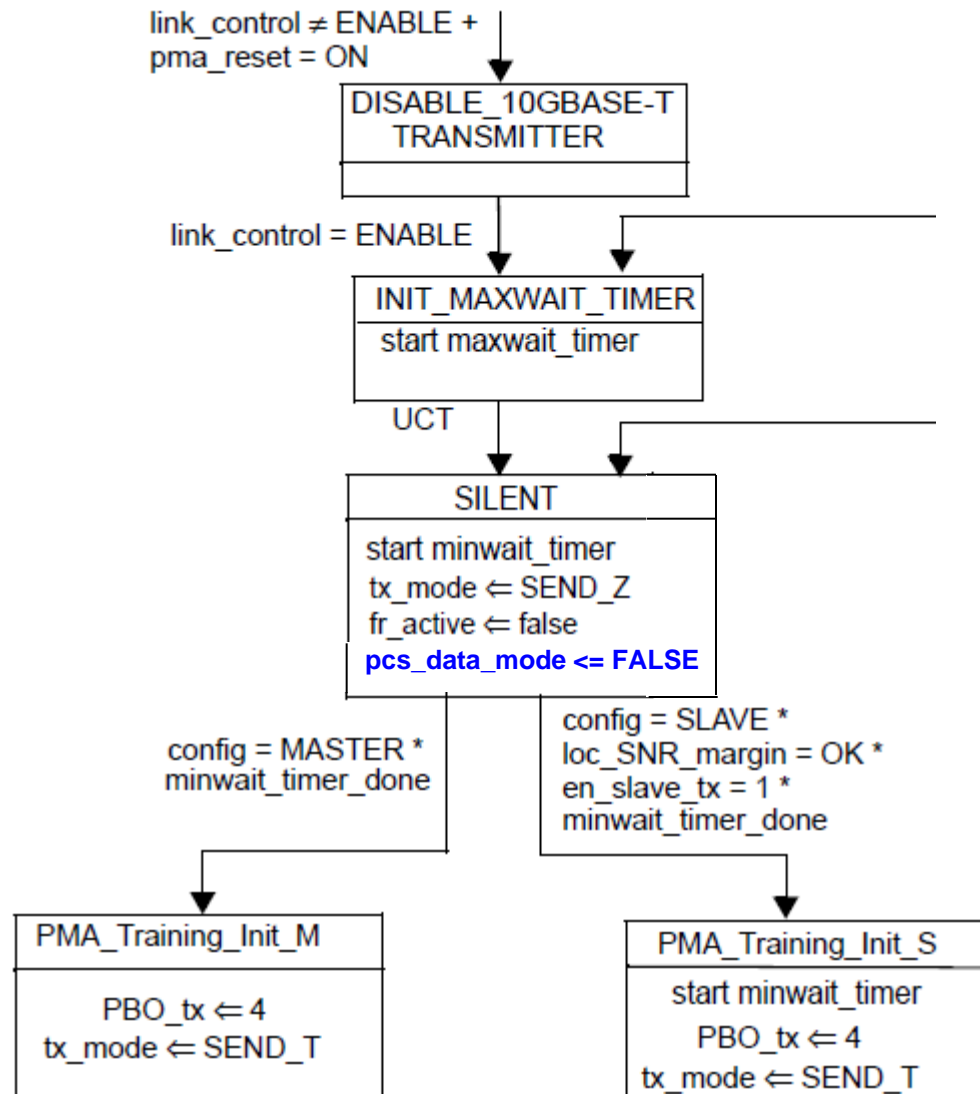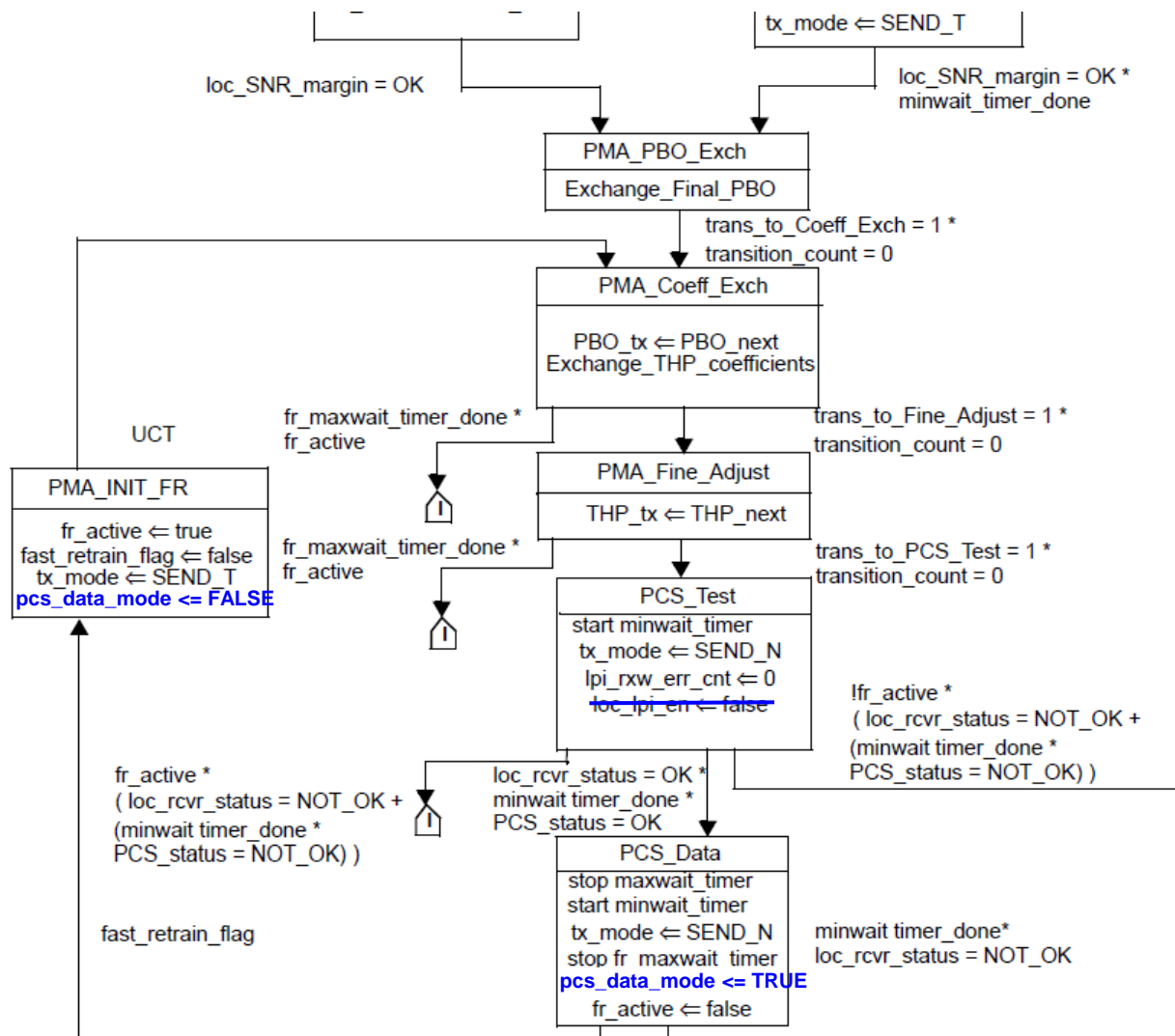
Figure 55-3 Functional Block Diagram (Changes in Blue)

Page 183, line 23 Replace "loc_lpi_en" with "pcs_data_mode"

Add a note to indicate this is only required for EEE and Fast Retraining.

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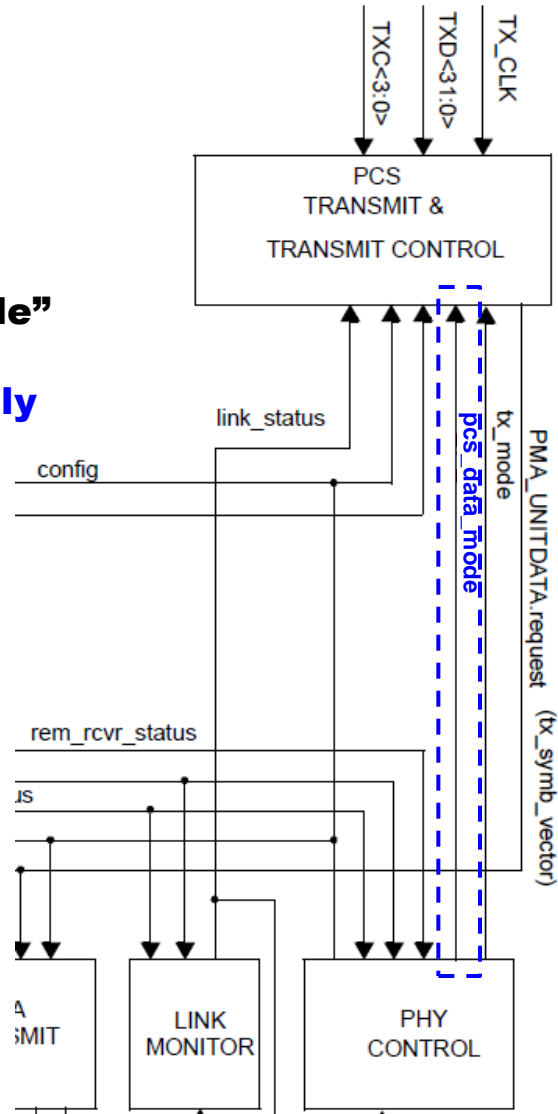
pcs_data_mode Variable Definition

- Page 189, line 26 (Figure 55-5) Replace "loc_lpi_en" with "pcs_data_mode"
- Page 192, line 45 (55.3.2.3) Delete "and loc_lpi_en is TRUE"
- Page 193, line 14 (55.3.4a) Delete "and loc_lpi_en is TRUE"
- Page 206, line 13 (Figure 55-17) Replace "loc_lpi_en" with "pcs_data_mode"

- Page 211, line 9 (55.4.5.1) Change definition of loc_lpi_en to:

    pcs_data_mode

    Generated by the PMA PHY Control function and indicates whether or not the local PHY may transition its PCS state diagrams out of their initialization states. It is passed to the PCS Transmit Control function via the PMA_PCSDATAMODE.indication primitive.

    In the absence of the optional EEE and fast retrain capabilities, the PHY operates as if the value of this variable is TRUE.

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PMA_PCSDATAMODE Primitive Definition

- Page 185, line 37 (55.2.2) Replace "PMA_LOCLPIEN.indication (loc_lpi_en)" with "PMA_PCSDATAMODE.indication (pcs_data_mode)"

- Page 186, line 16 (Fig 55-4) Replace "PMA_LOCLPIEN.indication" with "PMA_PCSDATAMODE.indication"

- Page 188, line 10, Change 55.2.2.11 to:

  55.2.2.11 PMA_PCSDATAMODE.indication

  This primitive indicates whether or not the PCS state diagrams are able to transition from their initialization states. The pcs_data_mode variable is generated by the PMA PHY Control function and indicates whether or not the PCS state diagrams are able to transition from their initialization states. It is passed to the PCS Transmit Control function via the PMA_PCSDATAMODE.indication primitive.
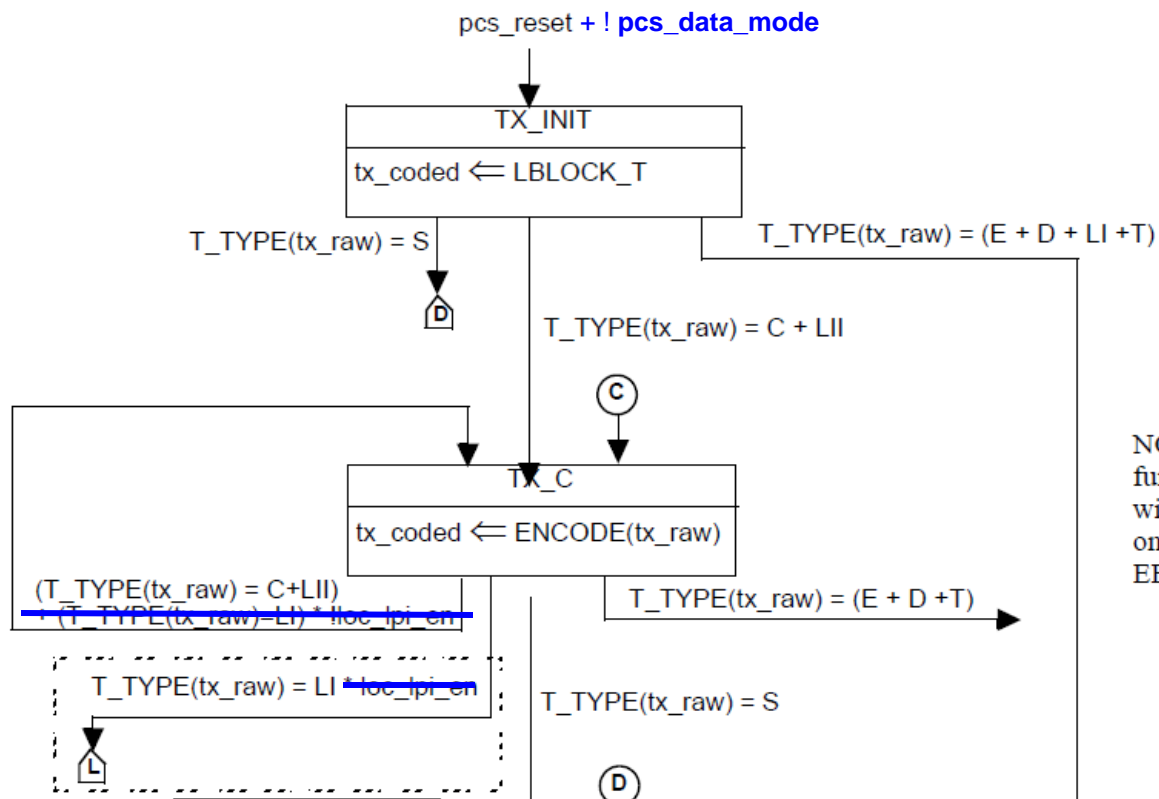
  55.2.2.11.1 Semantics of the primitive

  PMA_PCSDATAMODE.indication (pcs_data_mode)

  55.2.2.11.2 When generated

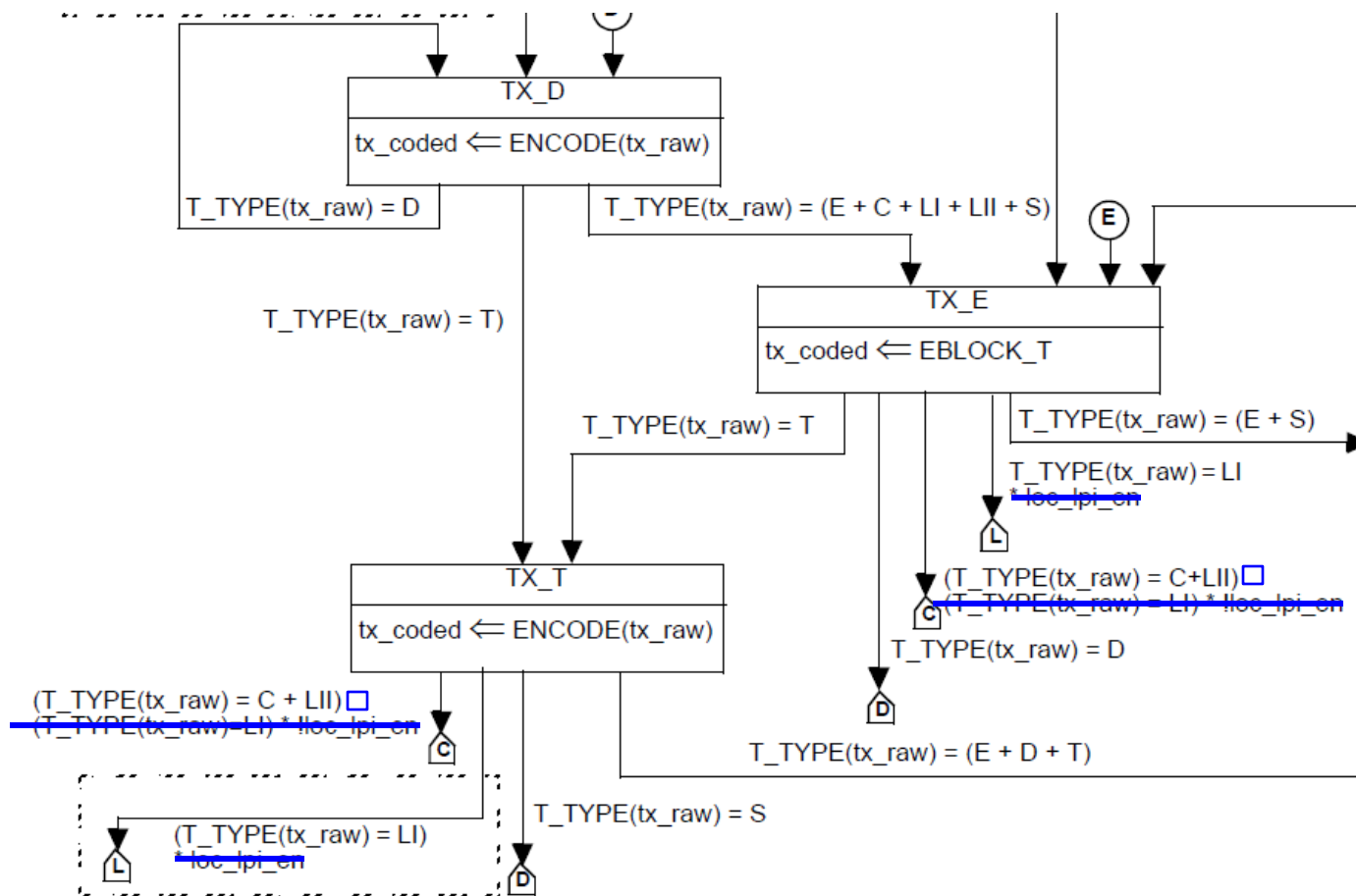 The PMA PHY Control function generates PMA_PCSDATAMODE.indication messages continuously.

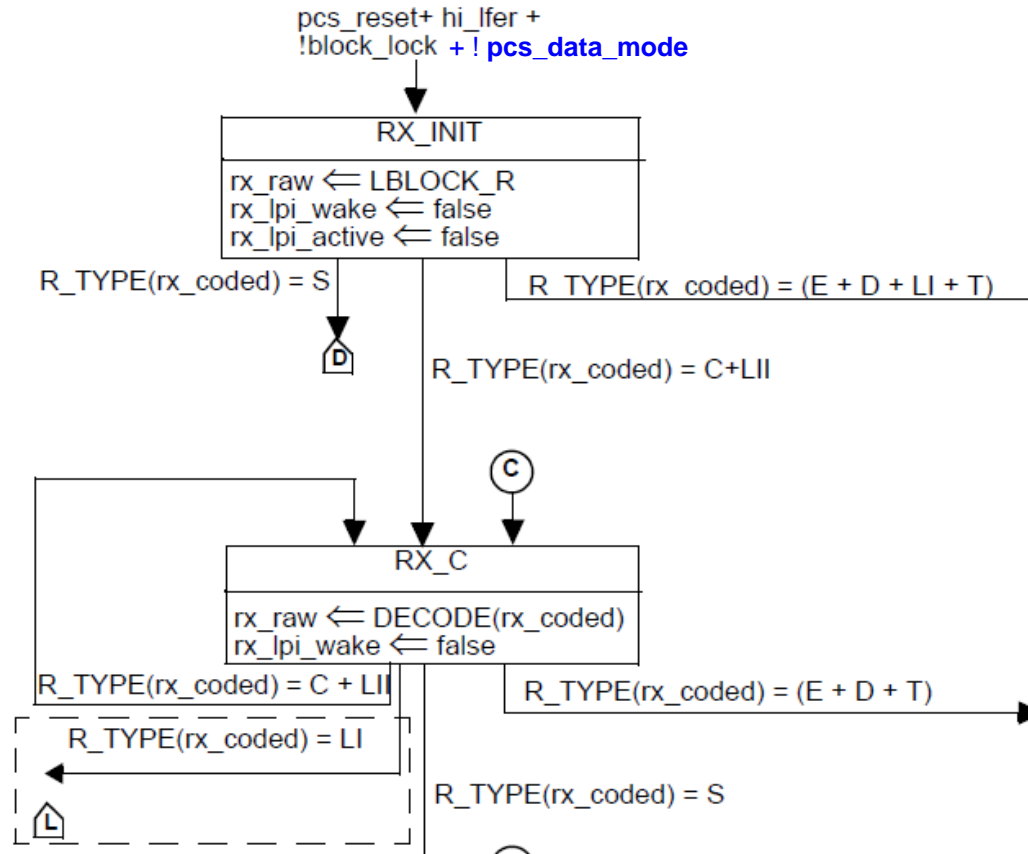# Figure 55-15 PCS 64/65B Transmit State Diagram (1 of 2) (Changes in Blue)

Figure 55-15 PCS 64/65B Transmit State Diagram (2 of 2) (Changes in Blue)

Figure 55-16 PCS 64/65B Receive State Diagram (Change in Blue)

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Figure 55-16b EEE Transmit State Diagram (Change in Blue)

Thank you!

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