148.4.3.4.3 When generated

SIGNAL_STATUS is generated by the PLCA DATA state diagram specified in 148.4.6.

148.4.3.5 Mapping of PLS_DATA_VALID.indication

Map of the primitive PLS_DATA_VALID.indication shall comply with 22.2.1.7.

148.4.3.6 Generation of TX_ER

Generation of TX_ER shall comply with the PLCA Data State Diagram specified in 148.4.6.1.

148.4.3.7 Response to RX_ER indication

Response to RX_ER indication from the MII shall comply with 22.2.1.5.

148.4.4 Requirements for the PHY

PHYs supporting PLCA capability shall comply with the requirements defined in this subclause.

148.4.4.1 PHY response to PLCA commands and notifications

148.4.4.1.1 BEACON request

The BEACON function is specified in 148.4.5.1.

The RS conveys the BEACON request via MII interface.

Upon the reception of this request, the PHY shall encode and transmit a signal communicating the BEACON to other PHYs on the segment so that they generate a BEACON indication.

A BEACON request shall not make the PHY assert the RX_DV signal.

PHYs may map the BEACON request to any suitable line coding as long as the requirements defined this subclause are met.

148.4.4.1.2 COMMIT request

The COMMIT function is specified in 148.4.5.1.

The PLCA Control state diagram generates a COMMIT request by way of the tx_cmd variable as specified in 148.4.5.2. The RS conveys such request via MII interface as defined in 22.2.2.4.

Upon the reception of this request, the RX_DV signal shall not be asserted.

PHYs may map the COMMIT request to any suitable line coding as long as the requirement defined this subclause are met.

148.4.4.2 Mapping of MII signals to PLCA variables

The PLCA RS is required to decode PLCA specific signaling out of the MII.

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148.4.5.2 PLCA Control variables

plca_reset

The plca_reset signal is used to reset the optional PLCA function in the RS. This signal maps to TRUE when aPLCAReset is enabled and to FALSE when aPLCAAdminState is normal, but is further qualified.
Values: TRUE or FALSE

plca_en

The plca_en signal controls the optional PLCA function in the RS. This signal maps to TRUE when aPLCAAdminState is enabled and to FALSE when aPLCAAdminState is disabled.
Values: TRUE or FALSE

CRS

The MII signal CRS.
Values: TRUE or FALSE

RX_DV

The MII signal RX_DV.
Values: TRUE or FALSE

receiving

Defined as: (RX_DV = TRUE) + (rx_cmd = COMMIT).
Values: TRUE or FALSE

tx_cmd

Command for the PLCA DATA State Diagram to convey to the PHY via the MII.
Values: NONE, BEACON or COMMIT

rx_cmd current PLCA command received by the PHY, signaled to the RS via MII. Response to rx_cmd is defined by the PLCA Control state diagram.
Values: NONE, BEACON or COMMIT

TX_EN The MII signal TX_EN.
Values: TRUE or FALSE

local_nodeID

ID representing the PLCA transmit opportunity number assigned to the node. This signal maps to aPLCALocalNodeID.
Values: integer value from 0 to 255.

plca_node_count

Maximum number of PLCA nodes on the mixing segment receiving transmit opportunities before the node with local_nodeID = 0 generates a new BEACON, reflecting the value of aPLCANodeCount. This parameter is only meaningful for the node with local_nodeID = 0, otherwise it is ignored.
Values: integer number from 0 to 255

committed

Internal variable used to synchronize PLCA Control and Data functions.
It is set by PLCA Control state diagram to signal that the current transmit opportunity has been committed and the PLCA DATA state diagram is now allowed to convey MII data to the PHY.
Values: TRUE or FALSE

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Duration: The duration of this timer is implementation dependent and shall be at least to_timer × plca_node_count + beacon_timer.

148.4.6 PLCA Data

148.4.6.1 PLCA Data State Diagram

The PLCA Data state diagram is responsible for detecting when the MAC is ready to send a packet and delaying the transmission until a transmit opportunity is detected.

The PLCA Data function shall conform to the PLCA Data state diagram in Figure 148–4 and associated state variables, functions, timers, and messages.

When PLCA functions are enabled, the PLCA Data state diagram transitions to the IDLE state and waits for the MAC to start a transmission or the PHY to assert carrier sense.

In the former case, the data conveyed by the MAC through the PLS_DATA.request primitive is delayed by switching to HOLD state. In the latter case, CARRIER_ON is signaled through the PLS_CARRIER.indication to have the MAC defer any new transmission, then the RECEIVE state is entered.

The MAC however, might have started a transmission right before a carrier is detected. In this case the Data state diagram switches to the COLLIDE state asserting SIGNAL_STATUS = SIGNAL_ERROR via PLS_SIGNAL.indication primitive to have the MAC perform a backoff and send the packet again later, without actually forwarding any data for the PHY to transmit on the medium.

During the HOLD state, the PLCA Control state diagram is notified via the packetPending variable that data is available to be transmitted and the beginning of the transmission is held in the variable delay line. At the next transmit opportunity, the PLCA Control state diagram allows transmitting the delayed data by setting the "committed" variable to TRUE. In such a case, the PLCA Data state diagram switches to TRANSMIT state to actually deliver the data for the PHY to encode and transmit on the medium.

The variable delay line is a small buffer that aligns a transmission with the transmit opportunity. The variable delay line length is no greater than to_timer × plca_node_count + beacon_timer.

If **plca_txer** is asserted during the HOLD state, the PLCA Data state diagram switches to ABORT state to assert packetPending = FALSE and to wait until the MAC stops sending data. The aborted packet will not be transmitted on the medium.

If another node starts a transmission after meeting its own transmit opportunity, delayed data cannot be held anymore and a collision is triggered by switching to COLLIDE state.

During the COLLIDE state, the PLCA Data state diagram asserts packetPending = FALSE and CARRIER_STATUS = CARRIER_ON via the PLS_CARRIER.indication primitive. When the MAC is done sending the jam bits as described in Clause 4, it waits for the next transmit opportunity by switching to PENDING state.

During the PENDING state, the PLCA Data state diagram asserts packetPending = TRUE and keeps CARRIER_STATUS = CARRIER_ON via the PLS_CARRIER.indication primitive to prevent the MAC from making new transmit attempts until the PLCA Control state diagram signals that a new transmit opportunity is met. At that point, CARRIER_STATUS is set to CARRIER_OFF to have the MAC resend data after waiting one IPG period as described in Clause 4.

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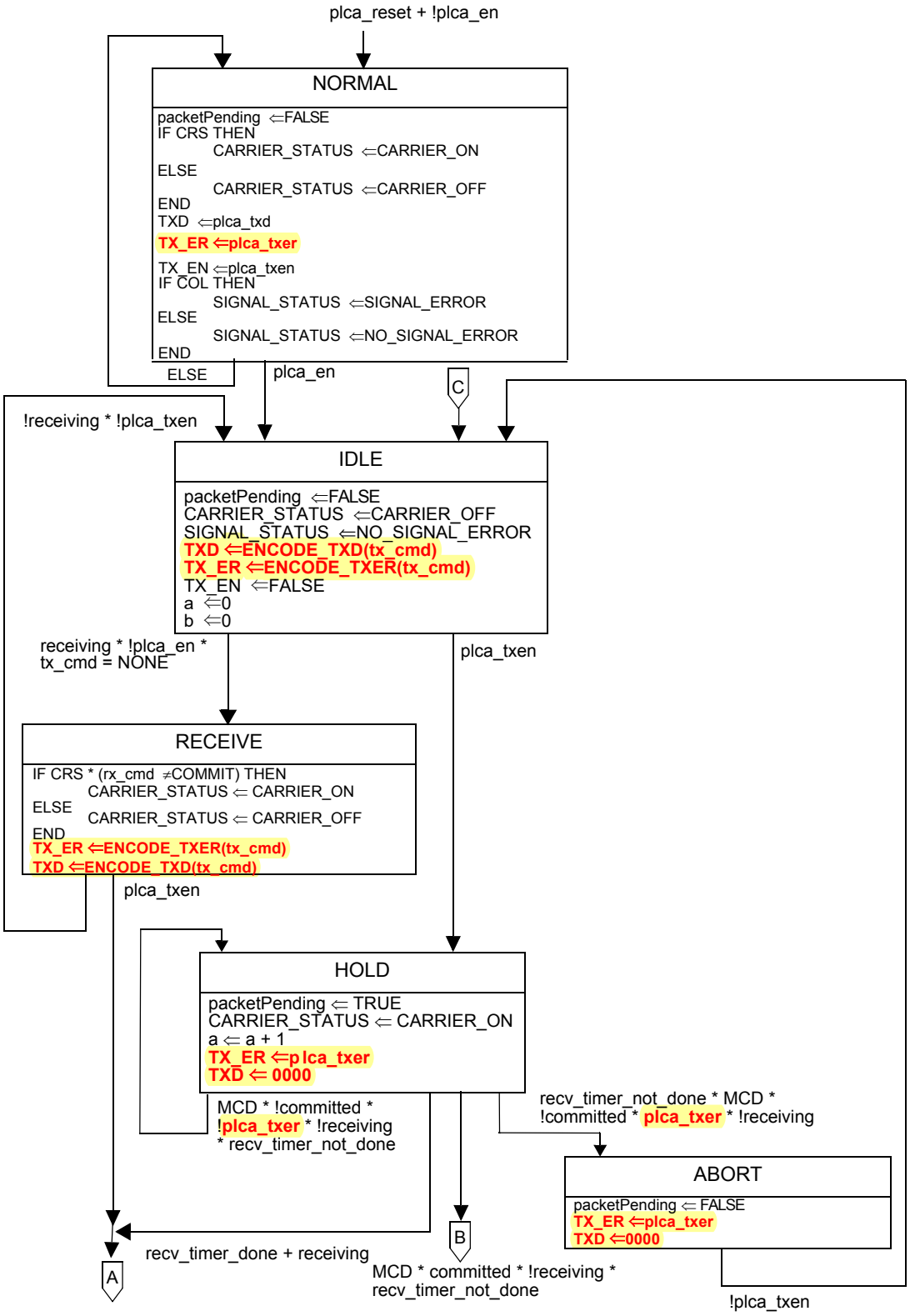

Figure 148–4—PLCA DATA state diagram

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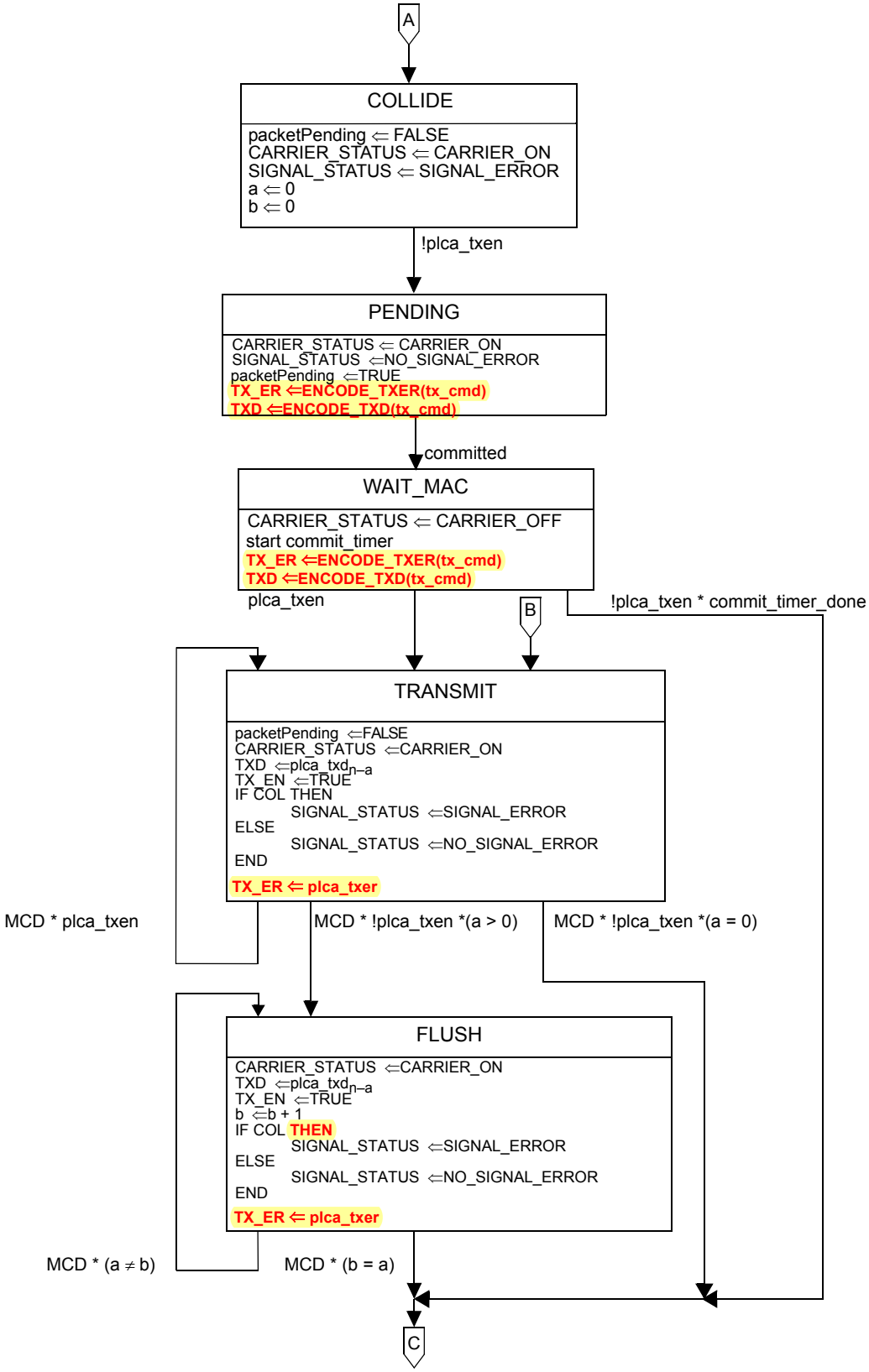

Figure 148–4—PLCA DATA state diagram *(continued)*

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148.4.6.2 PLCA Data variables

plca_reset
See 148.4.5.2.

plca_en
See 148.4.5.2.

plca_txen
See 148.4.3.1.2.

plca_txd
See 148.4.3.1.2

receiving
See 148.4.5.2.

committed
See 148.4.5.2.

packetPending
See 148.4.5.2.

CARRIER_STATUS
See 148.4.3.3.2.

SIGNAL_STATUS
See 148.4.3.4.2

TXD
The MII signals TXD<3:0>.

TX_EN
The MII signal TX_EN.

TX_ER
The MII signal TX_ER.

COL
The MII signal COL.

a
Current delay counter.

b
Flush counter.

MCD
MII Clock Done. Defined as one period of the MII clock elapsed.

plca_txer
The conditions for generating plca_txer are the same as defined in 22.2.1.6 and 22.2.2.5 for the TX_ER MII signal.
Values: TRUE or FALSE

148.4.6.3 Functions

ENCODE_TXER
This function takes as its argument the tx_cmd variable defined in 148.4.5.2.
It returns TRUE if tx_cmd is BEACON or COMMIT. Otherwise it returns the value of the plca_txer variable, defined in 148.4.6.2.

ENCODE_TXD
This function takes as its argument the tx_cmd variable defined in 148.4.5.2. If tx_cmd is BEACON, the return value is the TXD encoding defined in Table 22-1 for the BEACON request. If tx_cmd is COMMIT, the return value is the TXD encoding defined in Table 22-1 for the COMMIT request. Otherwise, the return value is 0000.

148.4.6.4 Timers

For the definition of recv_timer see 148.4.5.4.

commit_timer
Defines the maximum time the PLCA Data state machine is allowed to stay in WAIT_MAC state.
Duration: 288 bit times.

148.5.3.3 Specific RS and PHY specification

Item	Feature	Subclause	Value/Comment	Status	Support
PLCA1	Specific RSs and PHYs that include PLCA capability	148.4.4		M	Yes [ ]
PLCA2	Reception of BEACON request	148.4.4.1.1	PHY initiates a BEACON signal on the medium	M	Yes [ ]
PLCA3	Reception of BEACON request	148.4.4.1.1	Does not cause PHY to assert RX_DV	M	Yes [ ]
PLCA4	Reception of COMMIT request	148.4.4.1.2	PHY shall not assert RX	M	Yes [ ]
PLCA5	Indicate BEACON reception	148.4.4.2.1	Indicate this information to the RS by asserting MII signals	M	Yes [ ]
PLCA6	RS reaction to BEACON indication reception	148.4.4.2.1	PLCA variable rx_cmd is set to the value BEACON	M	Yes [ ]
PLCA7	RS reaction when BEACON indication ceases	148.4.4.2.1	PLCA variable rx_cmd is reset to NONE unless a COMMIT indication is signaled, in which case rx_cmd shall be set as specified in 148.4.4.2.2	M	Yes [ ]
PLCA8	Indicate COMMIT reception	148.4.4.2.2	Indicate this information to the RS by asserting MII signals	M	Yes [ ]
PLCA9	RS reaction to COMMIT indication reception	148.4.4.2.2	PLCA variable rx_cmd is set to the value COMMIT	M	Yes [ ]
PLCA10	RS reaction when COMMIT indication ceases	148.4.4.2.2	PLCA variable rx_cmd is reset to NONE unless a BEACON indication is signaled, in which case rx_cmd shall be set as specified in 148.4.4.2.1	M	Yes [ ]

148.5.3.4 PLCA Control

Item	Feature	Subclause	Value/Comment	Status	Support
CON1	PLCA Control function	148.4.5.1	Conform to Figure 148–3	M	Yes [ ]
CON2	receiving	148.4.5.2	See 148.4.5.2	M	Yes [ ]
~~CON3~~	~~tx_cmd~~	~~148.4.5.2~~	~~See 148.4.5.2~~	~~M~~	~~Yes [ ]~~

148.5.3.5 PLCA Data

Item	Feature	Subclause	Value/Comment	Status	Support
DAT1	PLCA Data function	148.4.6.1	Conforms to Figure 148–4	M	Yes [ ]

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148.5.3.6 PLCA Status

Item	Feature	Subclause	Value/Comment	Status	Support
STS1	PLCA Status function	148.4.7.1	Conforms to Figure 148–5	M	Yes [ ]

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