

## 102. EPoC PHY Link

### 102.1 PHY Link overview and architecture

### 102.2 Downstream PHY Link

#### 102.2.1 DS PHY Link physical layer

#### 102.2.2 DS preamble

#### 102.2.3 DS frame

#### 102.2.4 DS PHY Link FEC

#### 102.2.5 DS State Diagrams

##### 102.2.5.1 Constants

###### EPFHtp

TYPE: integer

This value represents the PHY Link message type for the EPoC PHY Frame Header message block

VALUE: 0x0A

###### FPMBtp

TYPE: integer

This value represents the PHY Link message type for the FEC Parity message block

VALUE: 0x0C

###### MaxMBlen

TYPE: integer

This constant represents the maximum number of bits in the downstream PHY Link frame minus the length of the FEC Pointer message block and excluding FEC Parity.

VALUE: 2824

###### TMBtp

TYPE: integer

This value represents the PHY Link message type for the the Timestamp message block

VALUE: 0x09

##### 102.2.5.2 Counters

###### TmStmp

TYPE: 32 bit unsigned

This counter holds the value of the local Timestamp. The counter is advanced by the OFDM clock (1/204.8) and rolls over to zero from 0xFFFFFFFF. At the CLT the counter shall track the transmit clock, while at the CNU the counter shall track the receive clock. For accuracy of receive clock, see {ref}. Changing the value of this variable while running using Layer Management is highly undesirable and is unspecified.

TYPE: 32 bit unsigned

### 102.2.5.3 Variables

BEGIN	TYPE: boolean This variable is used when initiating operation of the functional block state diagram. It is set to TRUE following initialization and every reset.	1 2 3 4 5 6 7
DS_CID	TYPE: 2 bit unsigned integer This variable represents the downstream Configuration ID value as described in 102.2.3.1.1.	8 9 10
FCP	TYPE: Integer This variable represents the beginning of the first FEC codeword in the current downstream PHY Link frame as described in 102.2.3.1.3.	11 12 13 14
FmLen	TYPE: integer This variable represents the total number of bits transmitted in the current PHY Link frame.	15 16 17 18
PhyDA	TYPE: 15 bit unsigned integer This variable represents the CNU_ID of the intended recipient of the EPoC frame.	19 20 21
PhyDA_Fifo	TYPE: bit array This variable holds the CNU_IDs to which the PHY Link frame and each PHY Link Instruction is to be sent. For any single PHY Link Frame there is one entry for the frame and one entry for each instruction.	22 23 24 25 26 27
PhyTD	TYPE: bit array This variable represents a bit array corresponding to data to be sent over the PHY Link. This variable is used to accumulate payload of outgoing PHY Link message blocks, for example to set the Timestamp Message Block.	28 29 30 31 32
PhyTxFifo	TYPE: bit array This variable holds a series of PHY Instructions to be transmitted in the next PHY frame. Each entry in the fifo includes Opcode, Count, Variable Group Index and Data fields for each instruction.	33 34 35 36 37 38
RF_ID	TYPE: 8 bit integer This variable represents the Response Frame ID as described in 102.2.3.1.1.	39 40 41
RT	TYPE: boolean This variable represents the Response Type as described in 102.2.3.1.1.	42 43 44 45
StrtOfFm	TYPE: boolean When this variable transitions from FALSE to TRUE it indicates the beginning of an OFDM frame.	46 47 48 49
tmpDA	TYPE: 15 bit unsigned integer This variable represents the CNU_ID of the intended recipient of the EPoC message blocks included in the PHY Link frame.	50 51 52 53 54

TxEnable		1
	TYPE: boolean	2
	This variable enables the device to transmit onto the media when TRUE. It is set to FALSE following initialization and every reset.	3
		4
		5
TxPre		6
	TYPE: boolean	7
	When TRUE this variable indicates the PHY Link should be sending the preamble pattern as defined in 102.2.2.	8
		9
US_CID		10
	TYPE: 2 bit integer	11
	This variable represents the upstream Configuration ID value as described in 102.2.3.1.1.	12

#### 102.2.5.4 Functions

CRC32(x)		13
	This function returns a 32 bit CRC of the bit array n (See 3.2.9).	14
		15
LEN(x)		16
	This function returns the length of variable x.	17
		18
POP()		19
	This function removes one record from the PhyTxFifo.	20
		21
PUSH()		22
	This function returns one record from the PhyTxFifo	23
		24
Send(x)		25
	This function transfers the contents of variable x to the PHY Link FEC Encoder block. When the transfer is complete the variable length is zero.	26
		27
		28

#### 102.2.5.5 Timers

#### 102.2.5.6 Messages

#### 102.2.5.7 State diagrams

The CLT PHY Link transmit process shall conform to the state diagram shown in Figure 102–1.

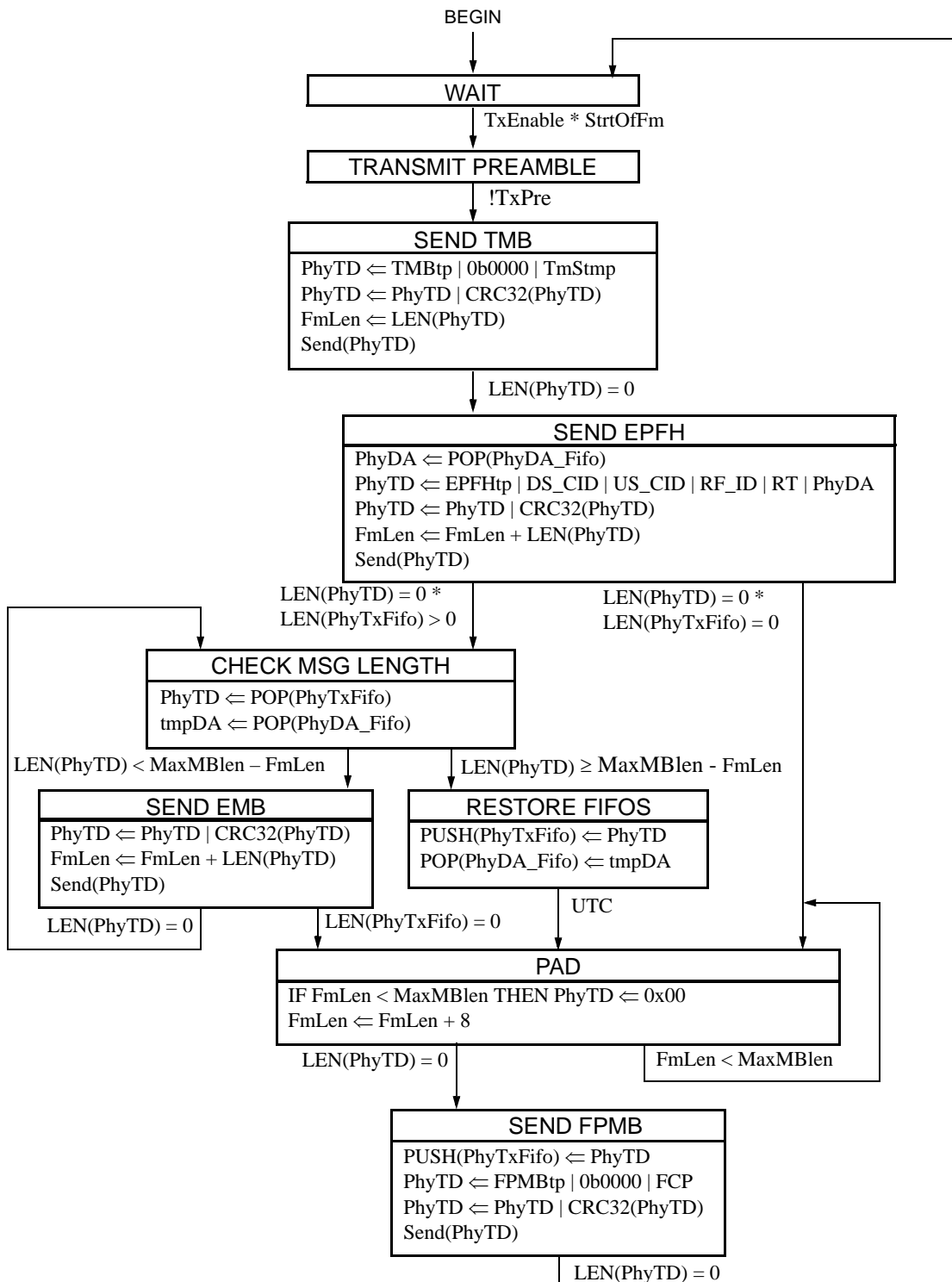


Figure 102–1—CLT PHY Link transmit process state diagram

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<b>102.3 Upstream PHY Link</b>	1
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<b>102.3.1 US PHY Link physical layer</b>	3
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<b>102.3.2 US frame</b>	5
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<b>102.3.3 US PHY Link FEC</b>	7
	8
<b>102.3.4 US state diagrams</b>	9
	10
<b>102.3.4.1 Constants</b>	11
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EPFHtp	13
See 102.2.5.1.	14
	15
<b>102.3.4.2 Counters</b>	16
	17
US_FmCnt	18
TYPE: 9-bit unsigned	19
This counter tracks the OFDMA symbols within the superframe. When ProbeDur is FASLE	20
this counter is modulo 261, when ProbeDura is True it is modulo 262. Symbol zero is the first	21
symbol in the Probe Period.	22
	23
<b>102.3.4.3 Variables</b>	24
	25
CNU_ID	26
TYPE: 15-bit integer that carries the value of the CNU_ID assigned by the CLT to the CNU	27
during PHY Discovery process (see 102.4.1.6).	28
	29
PhyDA	30
See 102.2.5.3.	31
	32
PhyTD	33
See 102.2.5.3.	34
	35
PhyTxFifo	36
See 102.2.5.3.	37
	38
RF_ID	39
See 102.2.5.3.	40
	41
RT	42
See 102.2.5.3.	43
	44
TxEnable	45
See 102.2.5.3.	46
	47
PhyDiscCmplt	48
TYPE: boolean	49
When TRUE this variable indicates the CNU has completed the PHY Discovery process and is	50
allowed to transmit in the OFDMA MAC and PHY Link data paths.	51
	52
<b>102.3.4.4 Functions</b>	53
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CRC32()	55
See 102.2.5.4.	56

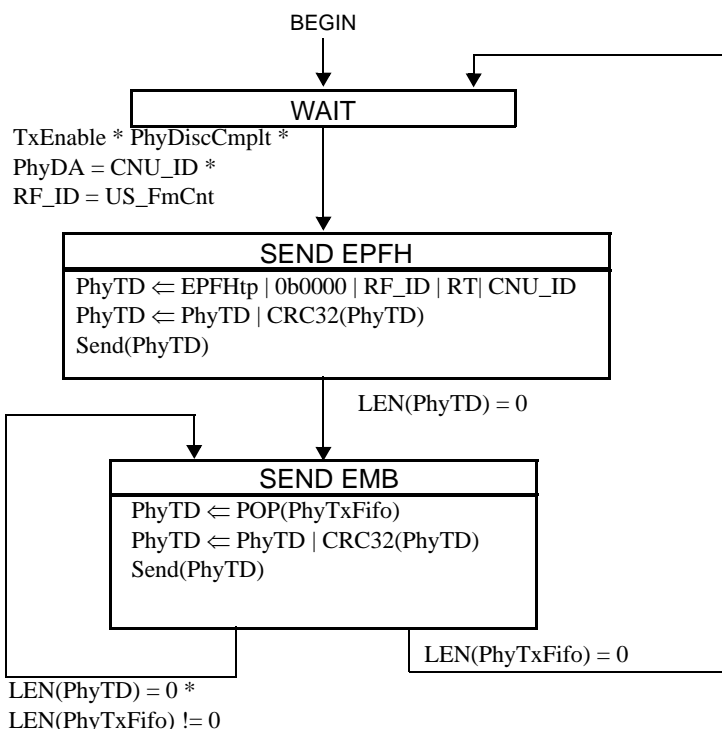
- LEN() 1  
 See 102.2.5.4. 2
- POP() 3  
 See 102.2.5.4. 4
- RndDly(r) 5  
 This function is used to compute a random integer number uniformly distributed between 0 6  
 and r. The randomly generated number is then returned by the function. 7  
8
- Send() 9  
 See 102.2.5.4. 10

**102.3.4.5 Timers** 11  
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**102.3.4.6 Messages** 13  
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**102.3.4.7 State diagrams** 17  
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The CNU PHY Link transmit process shall conform to the state diagram shown in Figure 102–2. 21  
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**Figure 102–2—CNU PHY Link transmission control state diagram**

<b>102.4 PHY Discovery, Fine Ranging and Wideband Probing</b>	1
	2
<b>102.4.1 PHY Discovery</b>	3
	4
<b>102.4.1.6 CNU_ID allocation</b>	5
	6
<b>102.4.1.7 PHY Discovery State Diagrams</b>	7
	8
<b>102.4.1.7.1 Constants</b>	9
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Pad176	11
TYPE: 176 binary	12
This constant holds 176 bits of padding.	13
Value: 0	14
	15
<b>102.4.1.7.2 Variables</b>	16
	17
LocalTS	18
TYPE: 32 bit integer	19
This variable holds the local time, in OFDM clocks, for the CNU.	20
	21
MAC	22
TYPE: 48-bit hex	23
This vairable holds the MAC address of the CNU.	24
	25
PdRndDly	26
TYPE: integer	27
This variable indicates the random delay, in PHY Discovery Opportunities, selected by the PHY to avoid contention during the PHY Discovery window.	28
	29
PdData	30
TYPE: bit array	31
This variable holds the data to be transmitted in the PHY Discovery window.	32
	33
PhyDiscOpp	34
TYPE: set	35
The set of upto 16 PHY Discovery opportunity slot in each Probe Period as defined by TBD.	36
	37
PhyDiscCmplt	38
See 102.3.4.3.	39
	40
PhyDiscStrt	41
TYPE: integer	42
This variable indicates when a PHY Discovery window opens relative to LocalTS.	43
	44
ProbeDur	45
TYPE: boolean	46
This variable determines the number of Symbols in the Probe Period. When ProbeDur is FALSE there are five symbols in the Probe Period, when this variable is TRUE there are six symbols in the Probe Period.	47
	48
PrbSymTm	49
TYPE: Integer	50
This variable represents the symbol time of the Probe Period in OFDM clocks. It is calculated by multiplying $4095 * (5 + \text{ProbeDur})$ .	51
	52
TxEnable	53
See 102.2.5.3.	54

102.4.1.7.3 Counters

102.4.1.7.4 Functions

CRC32()

See 102.2.5.4.

PD\_Pre

This function returns the PHY Discovery preamble as described in 102.4.1.5.

102.4.1.7.5 Timers

102.4.1.7.6 Messages

102.4.1.7.7 State Diagrams

The CNU PHY Discovery Response transmit process shall conform to the state diagram shown in Figure 102–3.

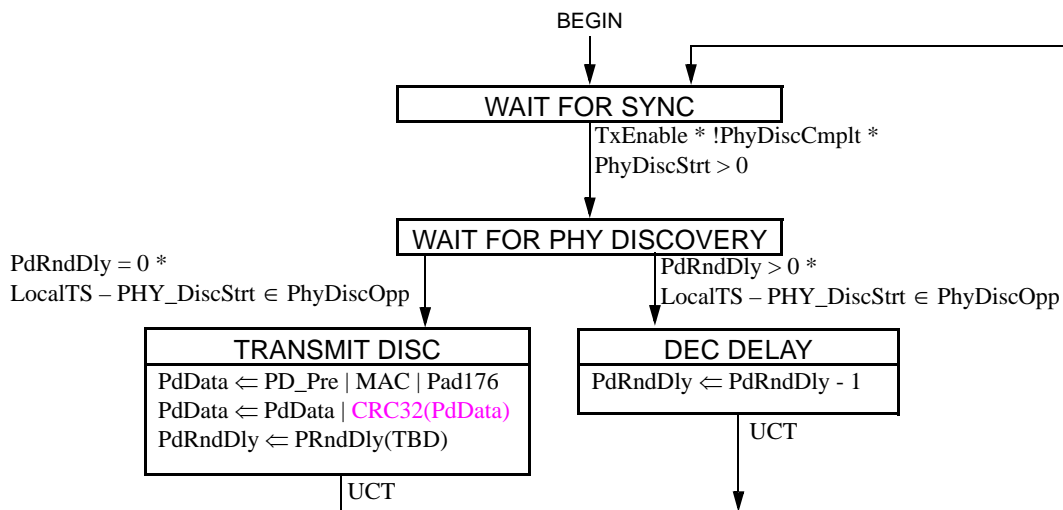


Figure 102–3—CNU PHY Discovery response transmission control state diagram