

201.5.2.10 PHY Link Synchronization

If the optional Clause 98 Auto-Negotiation function is disabled or not implemented, then the Link Synchronization function shall establish the start of PHY PMA training as defined in 201.5.2.7.

When operating, the Link Synchronization function is the data source for the PMA Transmit function (see 201.5.2.3), and uses a signal, SEND_S. This signal is used by the LEADER and FOLLOWER to discover the link partner and synchronize the start of PMA training. The structure of the Link Synchronization signaling is shown in Figure 201–24.

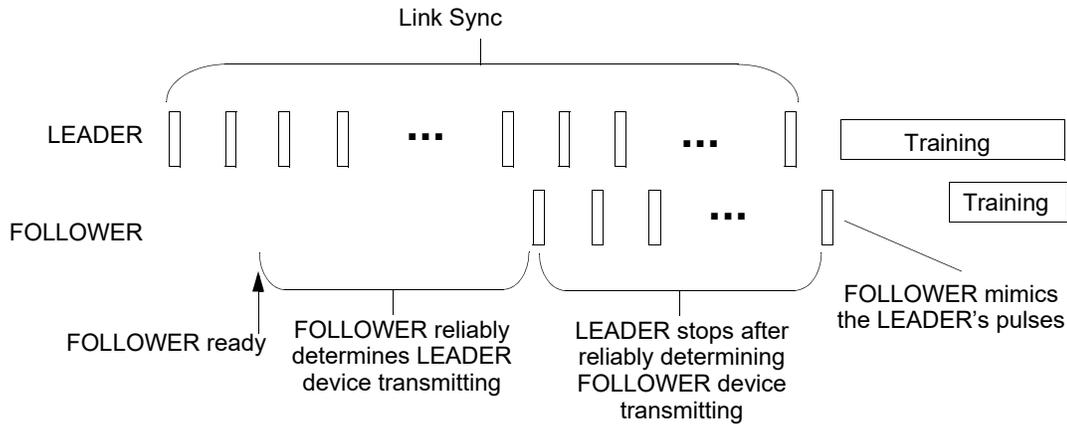


Figure 201–24—Link Synchronization signaling structure

A SEND_S pulse is defined to be a 4-bit pulse of 1001 mapped to DME symbols. The polarity of the DME symbols can be of either polarity and can vary between SEND_S pulses. At the LEADER, each DME symbol time is nominally 25.6/3 ns (8.533 ns) ± 50 ppm. At the FOLLOWER each DME symbol time is nominally 25.6/3 ns +1/–20%. The large tolerance is to accommodate crystal-less implementations at the FOLLOWER. See 201.5.2.3.1 for details on the DME symbols.

At the LEADER, SEND_S signal is defined to be a periodic signal with a SEND_S pulse (34.133 ns) followed by 116 DME symbol periods of quiet for a total of 120 DME symbol periods (1024 ns) per interval.

When the FOLLOWER detects a sufficient number of the LEADER's SEND_S pulses to determine that the LEADER is active, the FOLLOWER outputs one SEND_S pulse 435 +90/–10 ns after the detection of the LEADER's most-recent SEND_S pulse. For each subsequent SEND_S pulse detected from the LEADER, the FOLLOWER outputs one SEND_S pulse with timing as shown in Figure 201–25. This pattern repeats until the LEADER detects a sufficient number of the FOLLOWER's SEND_S pulses to determine that the FOLLOWER is active. Then, the LEADER enters the SILENT_WAIT state and stops transmitting SEND_S pulses as shown in Figure 201–26. Likewise, after the FOLLOWER determines that the LEADER has stopped transmitting SEND_S pulses, the FOLLOWER also enters the SILENT_WAIT state.

The SEND_S pulse timing is shown in Figure 201–25.

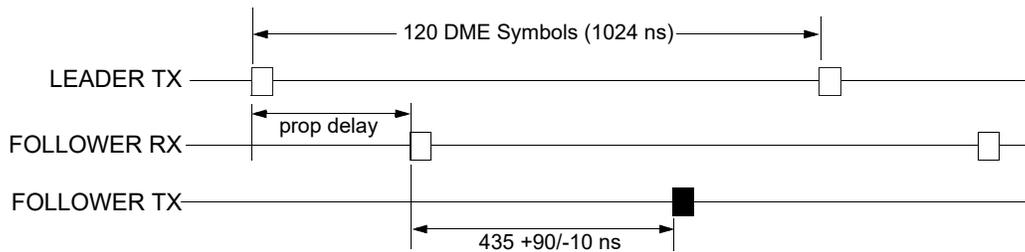


Figure 201–25—Link Synchronization timing

201.5.2.10.1 State diagram variables

force_config

This variable indicates whether the PHY operates as a LEADER or as a FOLLOWER. The variable takes on one of the following values:

LEADER: This value is continuously asserted when the PHY operates as a LEADER.

FOLLOWER: This value is continuously asserted when the PHY operates as a FOLLOWER.

force_phy_type

This variable indicates what speed the PHY is to operate when Auto-Negotiation is disabled or not implemented. The variable takes on one of the following values:

10G+100M: If Auto-Negotiation is disabled or not implemented and 10G+100MBASE-T1/V1 is selected.

5G+100M: If Auto-Negotiation is disabled or not implemented and 5G+100MBASE-T1/V1 is selected.

2.5G+100M: If Auto-Negotiation is disabled or not implemented and 2.5G+100MBASE-T1/V1 is selected.

100M+10G: If Auto-Negotiation is disabled or not implemented and 100M+10GBASE-T1/V1 is selected.

100M+5G: If Auto-Negotiation is disabled or not implemented and 100M+5GBASE-T1/V1 is selected.

100M+2.5G: If Auto-Negotiation is disabled or not implemented and 100M+2.5GBASE-T1/V1 is selected.

Other values are implementation-dependent and beyond the scope of this clause.

link_status

The link_status parameter is set by PMA Link Monitor and passed to the PCS via the PMA_LINK.indication primitive. This variable takes the values of OK or FAIL.

mr_autoneg_enable:

see 98.5.1.

mr_main_reset

see 98.5.1.

power_on

see 98.5.1.

quiet_detect

A Boolean variable indicating whether the link partner has ceased sending SEND_S pulses.

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TRUE:	No SEND_S pulses have been detected at the specified times (for LEADER or FOLLOWER see Figure 201–25) within the preceding 5.1 μ sec.	1 2 3
FALSE:	At least one send_s pulse has been detected at the specified times (for LEADER or FOLLOWER see Figure 201–25) within the preceding 5.1 μ sec	4 5 6 7
send_s_sigdet		8
	A Boolean variable indicating whether sufficient SEND_S pulses were detected with proper spacing. The definition of a sufficient pulses is implementation dependent.	9 10
	Values:	11
	TRUE: Sufficient SEND_S pulses have been detected.	12
	FALSE: Sufficient SEND_S pulses have not been detected.	13 14
single_send_s_detect		15
	A Boolean variable indicating whether a SEND_S pulse has been detected.	16
	Values:	17
	TRUE: SEND_S pulse detected.	18
	FALSE: No SEND_S pulse detected.	19 20
sync_link_control		21
	This variable indicates the data source for the PMA Transmit function.	22
	Values:	23
	DISABLE: The data source is the PHY Link Synchronization function (sync_tx_symb).	24
	ENABLE: The data source is PMA_UNITDATA.request (tx_symb).	25 26 27

201.5.2.10.2 State diagram timers

break_link_timer_[HSM]		28 29 30
	see 98.5.2.	31 32
follower_delay_timer		33
	This timer is used to control the offset between the FOLLOWER detecting a SEND_S pulse from the LEADER and the FOLLOWER transmitting its SEND_S pulse reply as shown in Figure 201- 25. Duration: 435 +90/-10 nsec.	34 35 36 37
leader_pause_timer		38
	This timer is used to control the quiet time between SEND_S pulses from the LEADER. Duration: 116 DME symbol times (990.867 nsec).	39 40 41
link_fail_inhibit_timer		42
	see 98.5.2.	43 44
pulse_timer		45
	This timer is used to output the SEND_S pulse. Duration: 4 DME symbol times (33.133 nsec).	46 47
sigdet_wait_timer		48
	This timer is used to control the wait time after transmitting or detecting the end of SEND_S. The timer shall expire 5 μ s \pm 0.15 μ s after being started.	49 50 51 52 53 54

201.5.2.10.3 Messages

sync_tx_symb

The value of sync_tx_symb is set by the Link Synchronization state diagram and indicates the symbols sent from the PHY Link Synchronization block to PMA Transmit. The Link Synchronization block generates sync_tx_symb synchronously with every transmit clock cycle.

Values:

SEND_S: Transmit the SEND_S signal defined in 201.5.2.10.

SEND_Z: Transmit a zero value.

201.5.2.10.4 State diagrams

The PHY Link Synchronization state diagram is shown in Figure 201–26.

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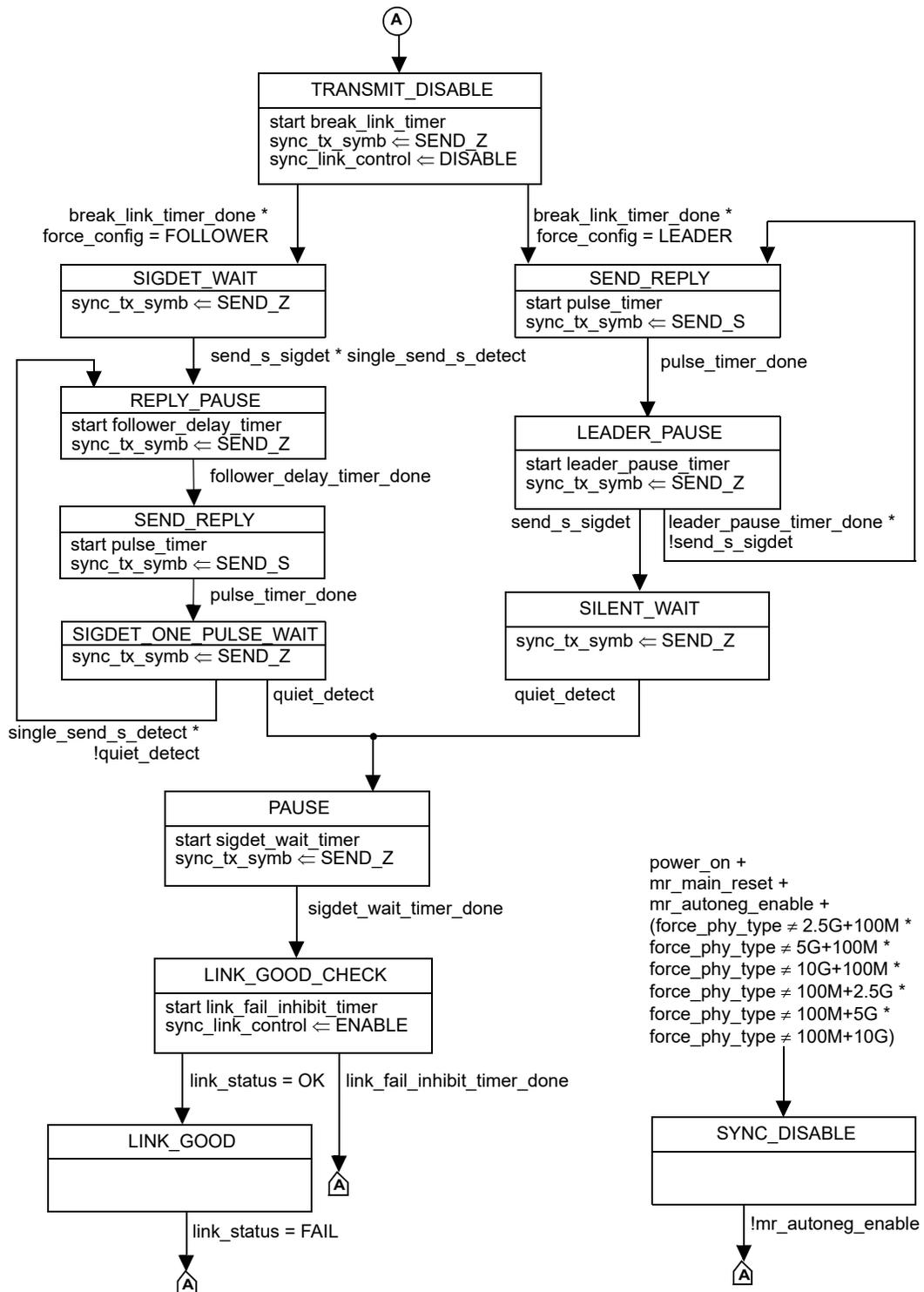


Figure 201-26—PHY Link Synchronization state diagram

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