



SEND_S Synchronization without Optional Autoneg

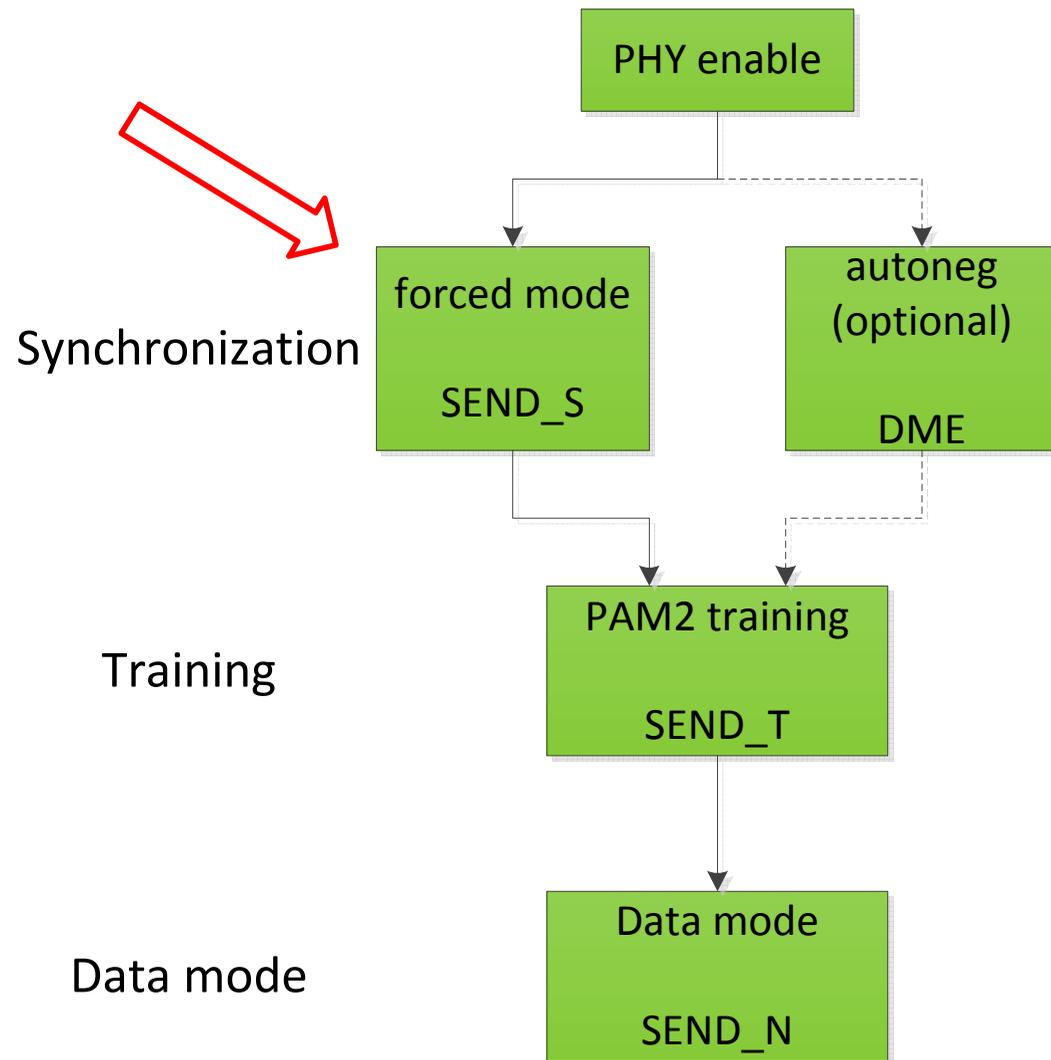
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Introduction

- Based on 802.3ch Objectives, “7. Support *optional* Auto-Negotiation”, an alternative way to initiate the training sequence between two PHY’s is required.
- In 1000BASE-T1, this is achieved by the “PHY Link Synchronization” states.
 - 97.4.2.6 PHY Link Synchronization
 - “If the optional Clause 98 Auto-Negotiation function is disabled or not implemented, then the Link Synchronization function is responsible for establishing the start of PHY PMA training as defined in 97.4.2.4.”
 - We also denote these as the SEND_S states.
- In certain applications when the speeds and MASTER/SLAVE configurations are pre-determined, the SEND_S link synchronization may be preferred.
- We propose to adopt the same PHY link synchronization states for multi-Gig PHY as well.
 - A brief overview is provided
 - A list of changes from 97.4.2.4 is highlighted

Startup Sequence

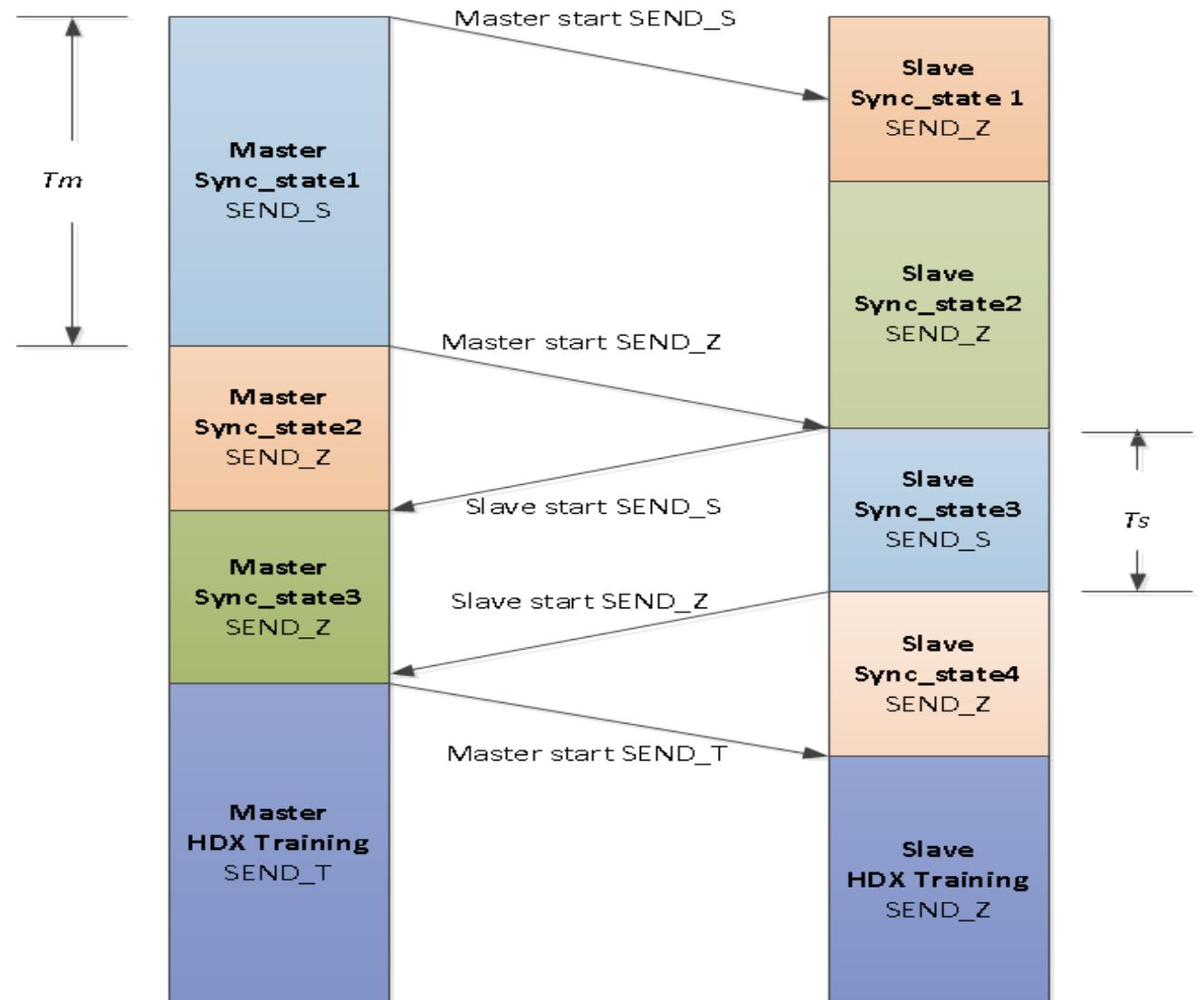


TX Mode	Definition
SEND_Z	Send all zeros
DME (*)	Differential Manchester encoding for autoneg
SEND_S	Send special periodic PAM2 sequences with good correlation properties
SEND_T	Send PAM2 training sequence
SEND_N	Send normal data

(*) Assuming mGig Auto PHY adopts Clause 98 single pair autoneg as well

Synchronization Method

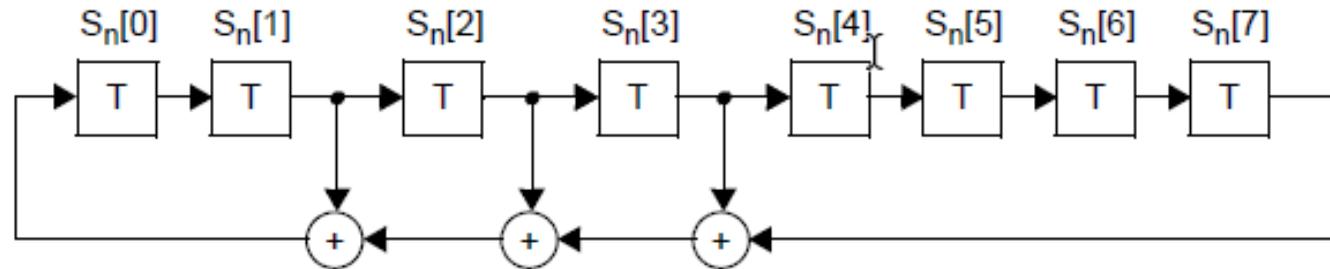
- Copied from 802.3bp contribution
 - http://www.ieee802.org/3/bp/public/jul14/wang_3bp_01_0714.pdf
- MASTER side initiates with “SEND_S” periodic PAM2 signals, then goes to SEND_Z (silent).
- SLAVE side acknowledges with its own “SEND_S” periodic PAM2 signal, then goes to SEND_Z.
- MASTER side detects SLAVE SEND_S signal and initiates the normal training sequence by transmitting SEND_T.



(T_m , T_s are within a few us)

SEND_S Signaling

MASTER PHY SEND_S PN sequence generator



SLAVE PHY SEND_S PN sequence generator

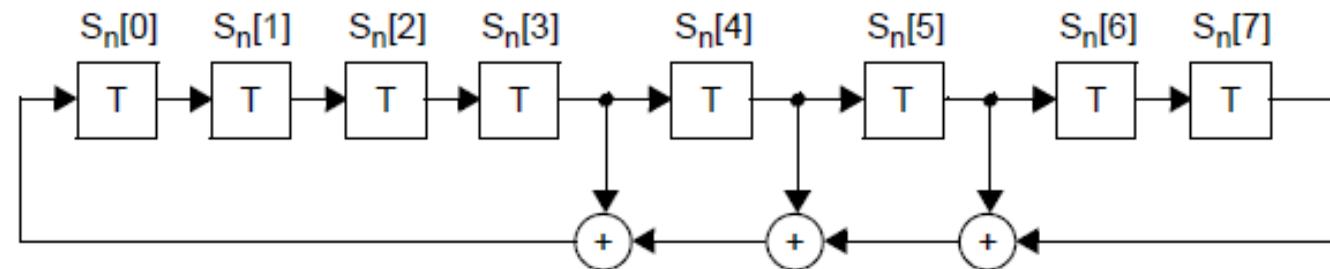
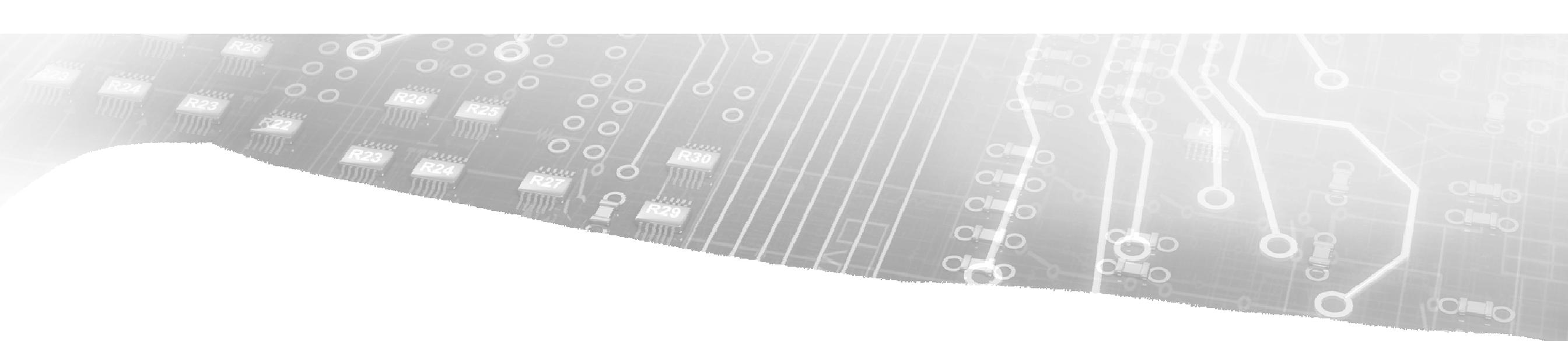


Figure 97-24—SEND_S PN sequence generator by linear feedback shift registers S_n

- The bit $S_n[0]$ is mapped to the transmit symbol T_n as follows:
- If $S_n[0] = 0$ then $T_n = +1$, if $S_n[0] = 1$ then $T_n = -1$.
- Period of the SEND_S PN sequences = 255.

Change List for Clause 149 and Clause 150

- Starting from a copy of “97.4.2.6 Link Synchronization”
- Changes
 1. Replace all references to clause numbers, equation numbers, and figure numbers accordingly
 2. xx.4.2.6.1 State diagram variables
 - force_phy_type: Add 2.5G-T1, 5G-T1, 10G-T1 (We probably need better names for these values)
 3. xx.4.2.6.2 State diagram timers
 - send_s_timer expiration changed from 1.0us±0.04us to TBD
 - sigdet_wait_timer expiration changed from 4us±0.1us to TBD
 4. Figure 97-25
 - State “SYNC_DISABLE” entry condition changed to:
 - Clause 149: “force_phy_type ≠5G-T1 + force_phy_type ≠10G-T1”
 - Clause 150: “force_phy_type ≠2.5G-T1”



THANK YOU

