

97

97.6 PHY Link Synchronization

If the optional Clause 98 auto-negotiation function is disabled or not implemented then the Link Synchronization unit is responsible for establishing the start of PHY PMA training as defined in 97.4.2.5. The PHY Link Synchronization utilizes the Technology Dependent Interface and the services primitives defined in 98.4.1 but with Auto-Negotiation replaced by Link Synchronization.

When operating, the Link Synchronization unit is the source of symbols to the PMD and generates a signal, SEND\_S, used by the master and slave to discover the link partner and synchronize the start of PMA training.

PMA\_LINK.request(link\_control) disables the PHY during synchronization and enables the PHY upon successful completion of synchronization. AN\_LINK.indication(link\_status) indicates the PHY link status.

Link Synchronization employs the SEND\_S signal to achieve synchronization prior to link training. If the PHY is configured as MASTER, Link Synchronization shall employ Equation (97-nn) as the PN sequence generator.

$$p_M(x) = x^8 + x^4 + x^3 + x^2 + 1 \quad (97-nn)$$

If the PHY is configured as SLAVE, Link Synchronization shall employ Equation (97-nn1) as PN sequence generator.

$$p_S(x) = x^8 + x^6 + x^5 + x^4 + 1 \quad (97-nn1)$$

The period of both PN sequences is 255.

An implementation of MASTER and SLAVE PHY SEND\_S PN sequence generators by linear-feedback shift registers is shown in Figure 97-mm. The bits stored in the shift register delay line at time n are denoted by  $S_n[7:0]$ . At each symbol period, the shift register is advanced by one bit, and one new bit represented by  $S_n[0]$  is generated. **The PN sequence generator shift registers shall be reset to a non-zero value upon entering into TRANSMIT DISABLE state. The receiver should not assume a continuous PN sequence is provided between separate periods of SEND\_S.**

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  $T_n = -1$ .

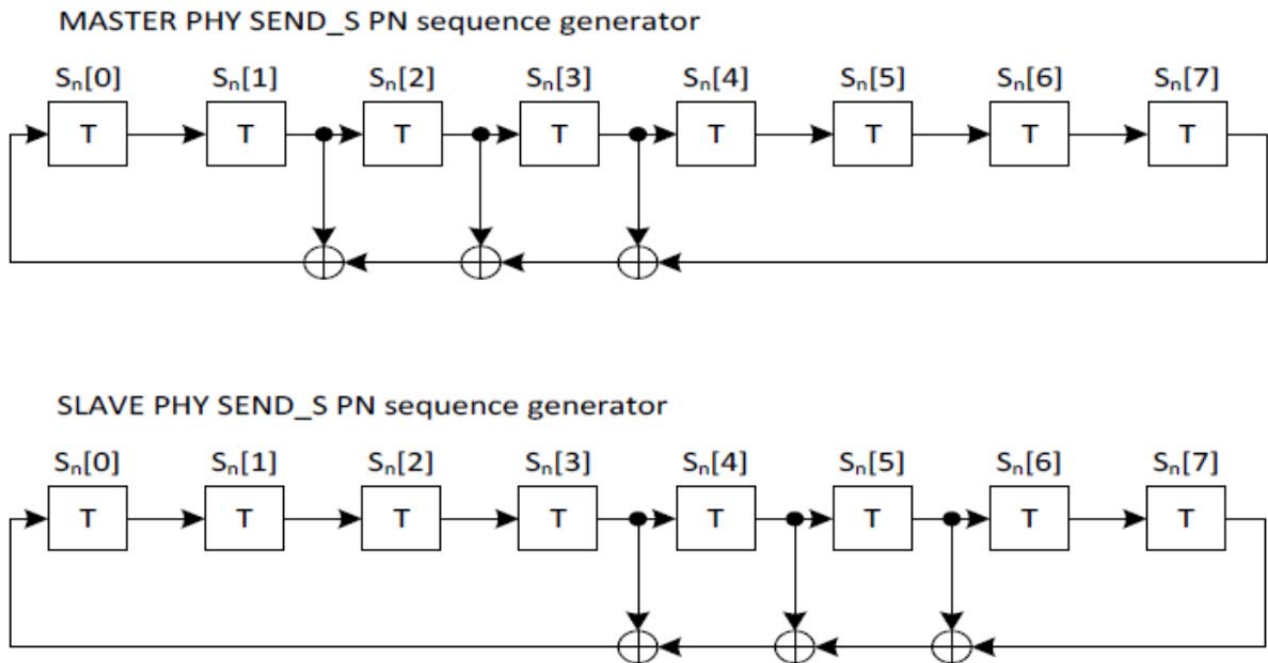


Figure 97-mm --- SEND\_S PN sequence generator by linear feedback shift registers  $S_n$

The synchronization state diagram in this section shall be used to synchronize 1000BASE-T1 PHYs prior to 1000BASE-T1 link training. If Clause 98 Auto-Negotiation function is enabled, then the Auto-Negotiation function shall be used as the mechanism for PHY synchronization and the synchronization state diagram remains in the DISABLE state.

### 97.6.1.1 State diagram variables

**config**

specifies whether the PHY operates as a MASTER PHY or as a SLAVE. The parameter config can take on one of the following two values of the form:

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

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

**link\_control**

Determines whether the PMD is driven by the PMA or the PHY Link Synchronization unit.

Values:

DISABLE; PHY Link Synchronization unit sources symbols to the PMD.

ENABLE; PMA sources symbols to the PMD.

**link\_status**

see 97.2.1

**mr\_autoneg\_enable**

see 98.5.1

**mr\_main\_reset**

see 98.5.1

**power\_on**

see 98.5.1

**send\_s\_sigdet**

SEND\_S pattern detected. This variable shall be set FALSE no later than 400ns after the signal goes quiet on the MDI.

Values:

TRUE: SEND\_S pattern detected

FALSE: SEND\_S pattern not detected

**sync\_tx\_mode**

PHY Link Synchronization sends code-groups according to the value assumed by this variable.

Values:

SEND\_S: This value is continuously asserted to enable transmission of 255 PN sequence.

SEND\_Z: This value is asserted to disable transmission.

### 97.6.2 State diagrams

Change instances of "tx\_mode" to "sync\_tx\_mode"