PMD & MDIO

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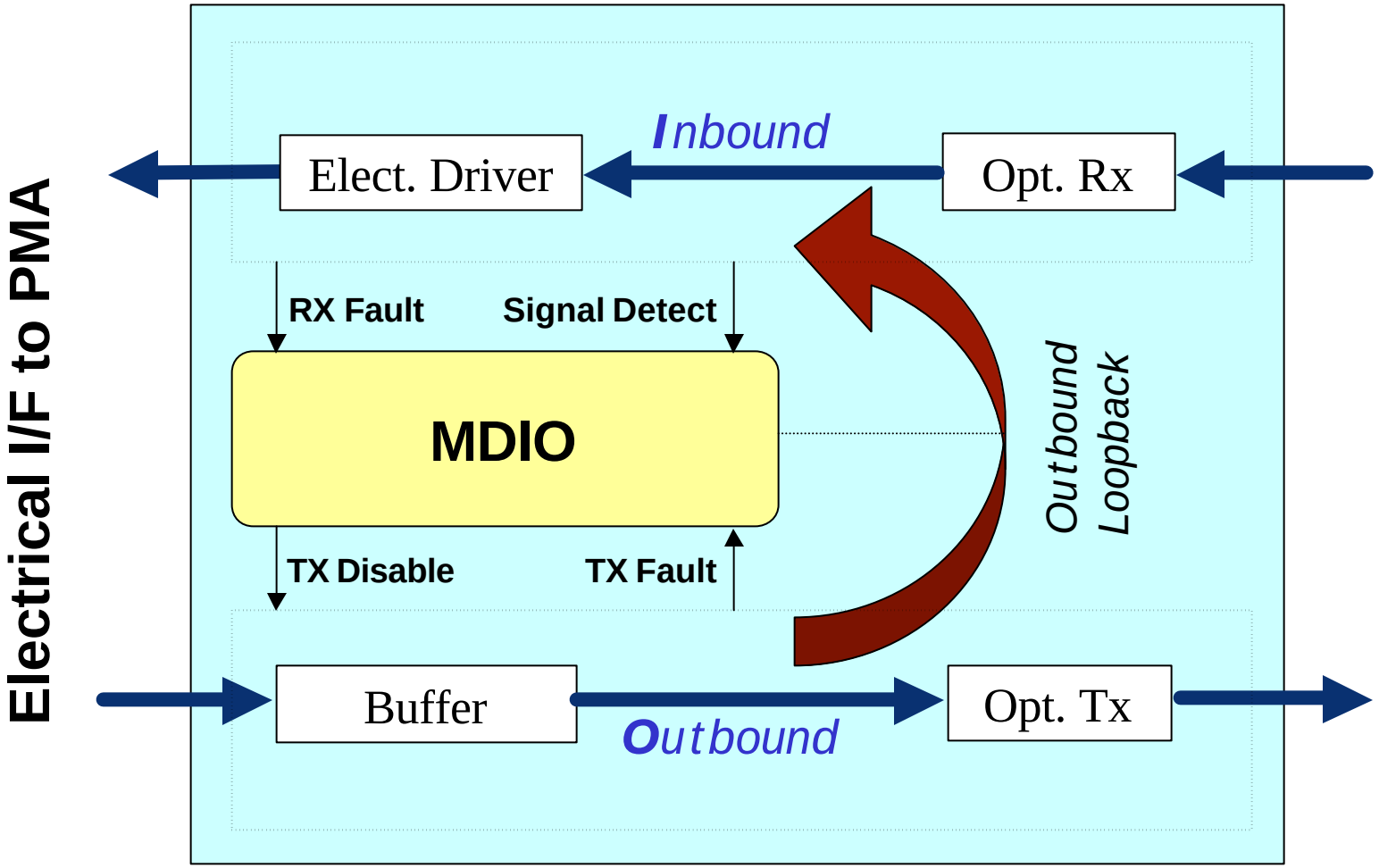
Agenda

- **Block Diagram**
- **Signal Definitions (functions)**
  - Required VS Optional
  - Loopback
  - Fault
  - Transmit Disable
  - Signal Detect

Managed PMD

(Optical Transceiver)



Required Signals

I_SD (yes)

~~**I_TxDbl (no)**~~

Optional Signals

~~Inbound Loopback (no)~~

Outbound Loopback (yes, 52.1.10)

~~I_Tx_Fault (combined, 52.1.8)~~

I_Rx_Fault (yes, 52.1.8)

O_Tx_Fault (yes, 52.1.7)

~~O_Rx_Fault (combined, 52.1.7)~~

~~O_SD (no)~~

O_TxDbl (yes, 52.1.6)

Signal Definitions -- Loopback

Inbound *AND* Outbound Loopback:

- **O_Tx <- I_Rx**
- **I_Tx <- O_Rx**

Inbound Loopback:

- **O_Tx <- I_Rx**
- **I_Tx <- I_Rx**

Outbound Loopback:

- **I_Tx <- O_Rx**
- **O_Tx <- O_Rx**

Signal Definitions -- Fault

Rx_Fault

Tx_Fault

52. Addendum for MDIO

Note: the subclause numbering has nothing to do with the existing clause 52 in any draft....

Editor's note: *to be removed prior to final publication*

References:
None

Definitions:
None

Abbreviations:

WAN	Wide Area Network
WIS	WAN Interface Sublayer

Revision History:

Draft 0.9, August 2000	Initial draft for review by P802.3ae Editors.
Draft 1.0, September 2000	Initial draft for IEEE P802.3ae Task Force review.

Remote Loopback / Local Loopback

Tx Disable

Fault

52.1 Overview

52.1.1 Physical Medium Dependent (PMD) sublayer service interface

The following specifies the services provided by the 10GBASE-SR/LR/ER/SW/LW/EW PMDs. These PMD sublayers are described in an abstract manner and do not imply any particular implementation.

The PMD Service Interface supports the exchange of encoded and scrambled 64b/66b characters between PMA entities. In the case of the 10GBASE-SW/LW/EW PMD types, these characters are SONET framed by the WIS and scrambled again. The PMD translates the encoded characters to and from signals suitable for the specified medium.

The following primitives are defined:

PMD_UNITDATA.request

PMD_UNITDATA.indicate

PMD_SIGNAL.indicate

52.1.1.1 PMD_UNITDATA.request

This primitive defines the transfer of data (in the form of encoded characters) from the PMA to the PMD.

52.1.1.1.1 Semantics of the service primitive

PMD_UNITDATA.request (tx_bit)

The data conveyed by PMD_UNITDATA.request is a continuous sequence of encoded characters. The tx_bit parameter can take one of two values: ONE or ZERO.

52.1.1.1.2 When generated

The PMA continuously sends the appropriate encoded characters to the PMD for transmission on the medium, at a nominal 10.3125 GBaud signaling speed for 10GBASE-SR/LR/ER ~~and 10GBASE-ER~~ PMDs types and 9.95328 GBaud signaling speed for 10GBASE-SW/LW/EW PMDs~~and 10GBASE-EW~~.

52.1.1.1.3 Effect of receipt

Upon receipt of this primitive, the PMD converts the specified encoded characters into the appropriate signals on the MDI.

52.1.1.2 PMD_UNITDATA.indicate

This primitive defines the transfer of data (in the form of encoded characters) from the PMD to the PMA.

52.1.1.2.1 Semantics of the service primitive

PMD_UNITDATA.indicate (rx_bit)

The data conveyed by PMD_UNITDATA.indicate is a continuous sequence of encoded characters. The rx_bit parameter can take one of two values: ONE or ZERO.

52.1.1.2.2 When generated

The PMD continuously sends encoded characters to the PMA corresponding to the signals received from the MDI when O_loop is not active or O_loop is not implimented, and from PMD_UNITDATA.request when O_loop is active.

Note: O_loop is an optional function.

52.1.1.2.3 Effect of receipt

The effect of receipt of this primitive by the client is unspecified by the PMD sublayer.

52.1.1.3 PMD_SIGNAL_DETECT

52.1.1.4 SIGNAL.indicate

This primitive is generated by the PMD to indicate the status of the signal being received from the MDI. If the MDIO interface is implemented, the I_SD_ability register bit shall be set to 1.

52.1.1.4.1 Semantics of the service primitive

PMD_SIGNAL.indicate(SIGNAL_DETECT)

The SIGNAL_DETECT parameter can take on one of two values: OK or FAIL, indicating whether the PMD is detecting light at the receiver (OK) or not (FAIL). When SIGNAL_DETECT = FAIL, then rx_bit is undefined, but consequent actions based on PMD_UNITDATA.indicate, where necessary, interpret rx_bit as a logic ZERO.

Note: SIGNAL_DETECT = OK does not guarantee that rx_bit is known good. It is possible for a poor quality link to provide sufficient light for a SIGNAL_DETECT = OK indication and still not meet the 10^{-12} BER objective.

52.1.1.4.2 When generated

The PMD generates this primitive to indicate a change in the value of SIGNAL_DETECT.

52.1.1.4.3 Effect of receipt

If the MDIO interface is implemented, then I_SD shall be continuously set to the value of SIGNAL_DETECT. The effect of receipt of this primitive by the client is unspecified by the PMD sublayer.

52.1.2 Medium dependent interface (MDI)

The MDI, a physical interface associated with a PMD for 10GBASE-SR/LR/ER/SW/LW/EW is comprised of optical medium connection.

defined at the output of the fiber optic cabling (TP3) connected to the receiver receptacle defined in 52.12.2. Unless specified otherwise, all receiver measurements and tests defined in 52.7 are made at TP3.

Figure 52–1—Block diagram

52.1.3 PMD transmit function

The PMD Transmit function shall convey the bits requested by the PMD service interface message PMD_UNITDATA.request(tx_bit) to the MDI according to the optical specifications in this clause. The higher optical power level shall correspond to tx_bit = ONE.

52.1.4 PMD receive function

When O_loop is not implimented or O_loop is not active, the PMD Receive function shall convey the bits received from the MDI according to the optical specifications in this clause to the PMD service interface using the message PMD_UNITDATA.indicate(rx_bit). The higher optical power level shall correspond to rx_bit = ONE.

When O_loop is active, the PMD shall convey the bits received from PMD_UNITDATA.request to the PMD service interface using the message PMD_UNITDATA.indicate(rx_bit).

52.1.5 PMD signal detect function

The PMD Signal Detect function shall report to the PMD service interface, using the message PMD_SIGNAL.indicate(SIGNAL_DETECT) which is signaled continuously. PMD_SIGNAL.indicate is intended to be an indicator of optical signal presence. If the MDIO interface is implemented, then I_SD shall be continuously set to the value of SIGNAL_DETECT.

The value of the SIGNAL_DETECT parameter shall be generated according to the conditions defined in Table 38-1. The PMD receiver is not required to verify whether a compliant 10GBASE-SR/LR/LW/SW/ER/EW signal is being received. This standard imposes no response time requirements on the generation of the SIGNAL_DETECT parameter..

Table 52–1—SIGNAL_DETECT value definition

Receive Conditions	Signal Detect Value
Input_optical_power ≤ -30 dBm	FAIL
(Input_optical_power ≥ Receive sensitivity AND compliant 10GBASE-SR/LR/LW/SW/ER/EW signal input) OR O_Loop	OK
All other conditions	Unspecified

As an unavoidable consequence of the requirements for the setting of the SIGNAL_DETECT parameter, implementations must provide adequate margin between the input optical power level at which the SIGNAL_DETECT parameter is set to OK, and the inherent noise level of the PMD due to cross talk, power supply noise, etc.

Various implementations of the Signal Detect function are permitted by this standard, including implementations which generate the SIGNAL_DETECT parameter values in response to the amplitude of the modulation of the optical signal and implementations which respond to the average optical power of the modulated optical signal.

52.1.6 PMD transmit disable function

The transmit disable function is optional. When asserted, this function shall turn off the optical tranmitter so that it meets the requiremnents of the Average Launch Power of OFF Transmitter in Table 52-4.

If an outbound_transmit_fault (optional) is detected, then the transmit disable function shall also be asserted.

If a clause 45 MDIO interface is supported, then this function shall map to the O_TxDbl_0 bit as specified in 45.2.1.6.4.

52.1.7 PMD outbound_TX_fault detection function (optional)

The outbound_TX_fault detection function is optional. The faults detected by this function are implementation specific.

If an outbound_TX_fault is detected, then the transmitter shall be disabled according to PMD transmitt disable function.

If a clause 45 MDIO interface is supported, then this function maps to the O_TX_Fault bit as specified in 45.2.1.4.4.

52.1.8 PMD inbound_RX_fault detection function (optional)

The inbound_RX_fault function is optional. The faults detected by this function are implementation specific.

If an inbound_RX_fault is detected, then SIGNAL_DETECT shall be set to and held at FAIL as long as the inbound_RX_fault persists.

If a clause 45 MDIO interface is supported, then this function maps to the IRxFault function as specified in 45.2.1.4.5.

52.1.9 PMD outbount loopback (O_Loop) function (optional)

The outbount loopback (O_Loop) function is optional. If a clause 45 MDIO interface is supported, then this function maps to the O_Loop as specified in 45.2.1.4.2.

When the O_Loop function is active, the bits received from the PMD service interface using the message PMD_UNITDATA.request(tx_bit) shall be conveyed to the PMD service interface using the message PMD_UNITDATA.inidcate(rx_bit), and SIGNAL_DETECT shall be set to OK.

52.1.10 PMD outbount loopback (O_Loop) function (optional)

The outbount loopback (O_Loop) function is optional. If a clause 45 MDIO interface is supported, then this function maps to the O_Loop as specified in 45.2.1.4.2.