



Figure 201-22—CRC16

Table 201-8—MDIO/PMA control variable mapping

MDIO control variable	PMA register name	Register/bit number	PMA control variable
Reset	PMA/PMD control 1 register/ MultiGBASE-T1/V1 PMA control register	1.0.15 / 1.2309.15	pma_reset
Transmit disable	MultiGBASE-T1/V1 PMA control register	1.2309.14	PMA_transmit_disable

Table 201-9—MDIO/PMA status variable mapping

MDIO status variable	PMA register name	Register/bit number	PMA status variable
Receive fault	MultiGBASE-T1/V1 PMA status register	1.2310.1	PMA_receive_fault

### 201.5.2.7 PHY Control function, LS\_PATH

PHY Control generates the control actions that are needed to bring the PHY into a mode of operation during which frames can be exchanged with the link partner. PHY Control shall comply with the state diagram in Figure 201-25.

During PMA training (TRAINING and COUNTDOWN states in Figure 201-25), PHY Control information is exchanged between link partners with a 65-bit Infocfield, which is XORed with bits 195 to 259 of the PMA training frame, see 201.4.5. The Infocfield is also denoted IF. The link partner is not required to decode every IF transmitted but is required to decode IFs at a rate that enables the correct actions prior to the PAM2 to PAM4 transition.

The 65-bit Infocfield shall include the fields in 201.5.2.7.2 through 201.5.2.7.6, also shown in Figure 201-23 and Figure 201-24. Infocfield shall be transmitted at least 128 times with each change to octets 6 to 8.

#### 201.5.2.7.1 Infocfield notation

For all the Infocfield notations in the following subclauses, Reserved<bit location> represents any unused values and shall be set to zero on transmit and ignored when received by the link partner. The Infocfield is

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PMA\_state = 00

C/D	octet 1	octets 2/3/4	octet 5	octets 6/7/8
1	0x5A	Reserved	Message	PHY Capability Bits

**Figure 201–23—Infield TRAINING format, LS\_PATH**

PMA\_state = 01

C/D	octet 1	octets 2/3/4	octet 5	octets 6/7/8
1	0x5A	Reserved	Message	Reserved

**Figure 201–24—Infield COUNTDOWN format, LS\_PATH**

transmitted following the notation where the LSB of each octet is sent first and the octets are sent in increasing number order (that is, the LSB of Oct1 is sent first).

**201.5.2.7.2 Start of Frame Delimiter**

The start of Frame Delimiter consists of 9 bits [C/D<0>, Octet 1<7:0>] and shall use the hexadecimal value 0x15A.

**201.5.2.7.3 Message Field**

The Message Field is one octet. For the LEADER, this field is represented by Oct5{PMA\_state<7:6>, loc\_rcvr\_status<5>, en\_follower\_tx<4>, reserved<3:0>}. For the FOLLOWER, this field is represented by Oct5{PMA\_state<7:6>, loc\_rcvr\_status<5>, timing\_lock\_OK<4>, reserved<3:0>}.

The two state-indicator bits PMA\_state<7:6> shall communicate the state of the transmitting transceiver to the link partner. PMA\_state<7:6> = 00 indicates TRAINING, and PMA\_state<7:6> = 01 indicates COUNTDOWN.

All possible Message Field settings are listed in Table 201–5 for the LEADER and Table 201–6 for the FOLLOWER. Any other value shall not be transmitted and shall be ignored at the receiver. The Message Field setting for the first transmitted PMA frame shall be the first row of Table 201–5 for the LEADER and the first or second row of Table 201–6 for the FOLLOWER. Moreover, for a given Message Field setting, the next Message Field setting shall be the same Message Field setting or the Message Field setting corresponding to a row below the current setting. When loc\_rcvr\_status = OK the Infield variable is set to loc\_rcvr\_status<5> = 1 and set to 0 otherwise.

**201.5.2.7.4 PHY capability bits**

When PMA\_state<7:6> = 00, then [Oct6<7:0>, Oct7<7:0>, Oct8<7:0>] contains the PHY capability bits. Each octet is sent LSB first. See Table 201–10 for the details.

The format of PHY capability bits is Oct8<2:1> = InterleaverDepth[1:0], Oct8<4:3> = PrecodeSel[1:0], Oct8<7> = OAMen, Oct6<7:0> = VendorSpecificData[7:0], and Oct7<7:0> = VendorSpecificData[15:8].

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**Table 201–10—PHY capability bits, LS\_PATH**

octet 6								octet 7								octet 8							
0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7	0	1	2	3	4	5	6	7
VendorSpecificData															Reserved	InterleaverDepth	PrecodeSel	Reserved	Reserved	OAMen			

OAMen indicates 100M+MultiGBASE-T1/V1 OAM capability enable, respectively. The PHY shall indicate the support of these two optional capabilities by setting the corresponding capability bits.

The optional 100M+MultiGBASE-T1/V1 OAM capability shall be enabled only if both PHYs set the capability bit OAMen = 1. InterleaverDepth indicates the requested data mode interleaving depth. PrecodeSel indicates the requested precoder, available for 10G only.

The capability bit values shall be considered as valid only when the loc\_rcvr\_status bit is 1.

The remaining bits shall be reserved and set to 0.

**201.5.2.7.5 Reserved fields**

When PMA\_state<7:6> is equal to 00 or 01, then [Oct2<7:0>, Oct3<7:0>, Oct4<7:0>] contains a reserved field.

When PMA\_state<7:6> is equal to 01, then [Oct6<7:0>, Oct7<7:0>, Oct8<7:0>] contains a reserved field.

All Infocfield fields denoted reserved are reserved for future use.

**201.5.2.7.6 PMA MDIO function mapping**

The MDIO capability described in Clause 45 defines several variables that provide control and status information for and about the PMA. Mapping of MDIO control variables to PMA control variables is shown in Table 201–8. Mapping of MDIO status variables to PMA status variables is shown in Table 201–9.

**201.5.2.8 PHY Control function, HS\_PATH and LS\_PATH**

**201.5.2.8.1 Startup Sequence**

The startup sequence shall comply with the state diagram description given in Figure 201–25. If the Auto-Negotiation function is not implemented, or disabled (mr\_autoneg\_en = FALSE), PMA\_CONFIG is predetermined to be LEADER or FOLLOWER via management control during initialization or via default hardware setup. The Auto-Negotiation function is optional for MultiG+100M/100M+MultiGBASE-T1/V1 PHYs. If the Auto-Negotiation function is implemented and enabled, Auto-Negotiation is the source of control (via link\_control) and LEADER-FOLLOWER configuration; however, if Auto-Negotiation is either not enabled or is not implemented, the Link Synchronization function is the source of control (via sync\_link\_control) and LEADER-FOLLOWER configuration.

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