802.3dj D1.3
Comment Resolution
Common Track

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Introduction

- This slide package was assembled by the 802.3dj editorial team to provide background and detailed resolutions to aid in comment resolution.
- Specifically, these slides are for the various common track comments.

PMD service interface

In support of comment #275

CC 177, 182, 183

Matt Brown (Alphawave Semi)

Comment #275 (part 1)

Cl **177** *SC* **177.3.** *P* **308** *L* **44** # 275

Ran, Adee Cisco

Comment Type **TR** *Comment Status* **X**

The statement that the PMD service interface is in instance of the inter-sublayer service interface is misleading.

The service interface semantics in 116.3.3.1.1 state that tx_symbol and rx_symbol are either from a set of two values (NRZ) or from a set of four values (PAM4).

In this interface (which is the service interface below the inner FEC), the tx_symbol parameters are PAM4 symbol streams, but contrary to what's written here, the rx_symbol are not PAM4 symbol streams - they are converted to PAM4 symbols by the inner FEC's decoding function.

The final sentence of this paragraph states that rx_symbol "may include an implementation-dependent set of values that are beyond the scope of this standard" which is an awkward way of saying it is not PAM4 symbols. In fact, 177.5.4 states that the decoder requires "a higher resolution than two bits for each received PAM4 symbols" (sic), so "more than PAM4" is a requirement, not "may".

A similar problem exists in the definitions of the PMD service interfaces in 182.3 and 183.3, and in 185.3 (this PMD uses the inner FEC in 184 - but there is no definition of the interface below the inner FEC in clause 184).

SuggestedRemedy

Separate this paragraph into two, one for transmit direction and one for receive direction.

In the transmit direction, the service interface primitives (PMD:IS_UNITDATA_i.request and PMD:IS_SIGNAL.indication) are as defined in the generic inter-sublayer service interface (as written in D1.3).
In the receive direction, PMD:IS_SIGNAL.indication is as defined by the generic inter-sublayer service interface, but PMD:IS_UNITDATA_i.indication is modified from that service interface, in that the rx_symbol parameters are taken from a set of more than four values, as generated by the PMD's service interface. The size of this set is implementation dependent.

Apply similar changes in the PMD service interface definitions in 182.3, 183.3, and 185.3.

Proposed Response *Response Status* **O**

177.3 Service interface below the Inner FEC

The service interface below the Inner FEC is the PMD service interface.

The PMD service interface is an instance of the inter-sublayer service interface defined in 116.3 for 200GBASE-R and 400GBASE-R, in 169.3 for 800GBASE-R, and 174.3 for 1.6TBASE-R. For PMD:IS_UNITDATA_*i*.request in the transmit direction and PMD:IS_UNITDATA_*i*.indication in the receive direction, where $i = 0$ to $n-1$, the tx_symbol and rx_symbol parameters are PAM4 symbol streams with a nominal signaling rate of 113.4375 GBd. The value of n is 1 for 200GBASE-R, 2 for 400GBASE-R, 4 for 800GBASE-R, and 8 for 1.6TBASE-R. Each instance of tx_symbol and rx_symbol takes one of four (PAM4) values: 0, 1, 2, or 3. In order to support the Inner FEC soft-decision decoder (see 177.5.4), rx_symbol may include an implementation-dependent set of values that are beyond the scope of this standard.

The PMD provides signal status information to the Inner FEC using the PMD:IS_SIGNAL.indication(SIGNAL_OK) primitive. The SIGNAL_OK parameter takes one of four values: OK, READY, IN_PROGRESS, and FAIL. When SIGNAL_OK is IN_PROGRESS or FAIL, the rx_symbol parameters are undefined.

The Inner FEC sublayer provides signal status information to the PMD using the PMD:IS_SIGNAL.request(SIGNAL_OK) primitive (see Figure 177–2). The SIGNAL_OK parameter takes one of four values according to Table 177–2. When the value of SIGNAL_OK is IN_PROGRESS or FAIL, the corresponding tx_symbol parameters on all lanes are unspecified.

177.5.4 Inner FEC decode

The Inner FEC decoder is a soft-decision decoder that requires a higher resolution than two bits for each received PAM4 symbols. The resolution is implementation specific and is beyond the scope of this standard. The decoder evaluates the incoming codeword and determines the most likely codeword value.

The service interface parameters are defined in term of values, not bits. This should be restated to that effect. Need to align the wording used for the service interface and the decoder.

Comment #275 (part 2)

The “Service interface below the Inner FEC” as specified in 177.3 is the PMD service interface for DR-2 (specified in 182.3) and FR4/LR4 (specified in 183.3). These are all identical.

In fact, we might have specified this interface in one location, e.g., in 182.3, and pointed there from the others, e.g., 177.3 and 183.3 point to 182.3. The one difficulty in reuse is that 182.3 and 177.3 defines interfaces 1, 2, 4, and 8 lane interfaces, whereas 182.3 defines only a 4 lane interface.

182.3 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the PMD. The service interface for this PMD is described in an abstract manner and does not imply any particular implementation. The PMD service interface supports the exchange of encoded data between the PMD and the PMD client. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 116.3 for 200GBASE-R and 400GBASE-R, in 169.3 for 800GBASE-R, and 174.3 for 1.6TBASE-R. For PMD:IS_UNITDATA_*i*.request in the transmit direction and PMD:IS_UNITDATA_*i*.indication in the receive direction, where $i = 0$ to $n-1$, the tx_symbol and rx_symbol parameters are parallel PAM4 symbol streams with a nominal signaling rate of 113.4375 GBd. The number of parallel streams, n, is 1 for 200GBASE-DR1-2, 2 for 400GBASE-DR2-2, 4 for 800GBASE-DR4-2, and 8 for 1.6TBASE-DR8-2. Each instance of tx_symbol and rx_symbol takes on one of four (PAM4) values: 0, 1, 2, or 3. In order to support the Inner FEC soft-decision decoder (see 177.5.4), rx_symbol may take on an implementation-dependent set of values beyond the scope of this standard.

The SIGNAL_OK parameter of the PMD:IS_SIGNAL.indication primitive corresponds to the variable training_status of the inter-sublayer training function, as defined in 178B.14.2.1. When SIGNAL_OK is either IN_PROGRESS or FAIL, the rx_symbol parameters of PMD:IS_UNITDATA_i.indication on all lanes are unspecified.

The SIGNAL_OK parameter of the PMD:IS_SIGNAL.request provides the status from ISLs above the PMD.

183.3 Physical Medium Dependent (PMD) service interface

This subclause specifies the services provided by the PMD. The service interface for this PMD is described in an abstract manner and does not imply any particular implementation. The PMD service interface supports the exchange of encoded data between the PMD and the PMD client. The PMD translates the encoded data to and from signals suitable for the specified medium.

The PMD service interface is an instance of the inter-sublayer service interface defined in 169.3. For PMD:IS_UNITDATA_*i*.request in the transmit direction and PMD:IS_UNITDATA_i.indication in the receive direction, where $i = 0$ to $n-1$, the tx_symbol and rx_symbol parameters are parallel PAM4 symbol streams with a nominal signaling rate of 113.4375 GBd. The number of parallel streams, n, is 4. Each instance of tx_symbol and rx_symbol takes on one of four (PAM4) values: 0, 1, 2, or 3. In order to support the Inner FEC soft-decision decoder (see 177.5.4), rx_symbol may take on an implementation-dependent set of values beyond the scope of this standard.

The SIGNAL_OK parameter of the PMD:IS_SIGNAL.indication primitive corresponds to the variable training_status of the inter-sublayer training (ILT) function, as defined in 178B.14.2.1. When SIGNAL_OK is either IN_PROGRESS or FAIL, the rx_symbol parameters of PMD:IS_UNITDATA_i.indication on all lanes are unspecified.

The SIGNAL_OK parameter of the PMD:IS_SIGNAL.request provides the status from ISLs above the PMD.

Comment #275 (part 3)

116.3.3.2 IS_UNITDATA_*i*.indication

The IS_UNITDATA_*i*.indication (where $i = 0$ to $n - 1$) primitive is used to define the transfer of multiple streams of data units from the sublayer to the next higher sublayer, where n is the number of parallel streams of data units.

116.3.3.2.1 Semantics of the service primitive

IS_UNITDATA_0.indication(rx_symbol)
IS_UNITDATA_1.indication(rx_symbol)
...
IS_UNITDATA_n–1.indication(rx_symbol)

The data conveyed by IS_UNITDATA_0.indication to IS_UNITDATA_n–1.indication consists of n parallel continuous streams of encoded symbols, one stream for each lane. Depending on the specific instance of the inter-sublayer service interface each of the rx_symbol parameters can either take one of two values: zero or one; or take one of four values: zero, one, two, or three.

116.3.3.2.2 When generated

The sublayer continuously sends n parallel symbol streams IS_UNITDATA_*i*.indication(rx_symbol) to the next higher sublayer, each at a nominal signaling rate defined by a specific instance of the inter-sublayer service interface.

116.3.3.2.3 Effect of receipt

The effect of receipt of this primitive is defined by the sublayer that receives this primitive.

As specified in 116.3.3.2.1 for IS_UNITDATA_i.indication, the rx_symbol parameter can take on one of two sets of values:

For PAM4: 0, 1, 2, 3

For NRZ: 0, 1

It doesn’t allow for the soft-information needed for the inner FEC as current implied in the PMD service interface specification for DR-2, FR, and LR.

Comment #275 (part 4)

185.3.1.2 PMD:IS_UNITDATA.indication

The PMD:IS_UNITDATA.indication primitive defines the transfer of four analog signals from the 800GBASE-LR1 PMD to the 800GBASE-LR1 Inner FEC that are the outputs of the coherent DP-16QAM receiver (see 185.5.3.)

185.3.1.2.1 Semantics of the primitive

PMD:IS_UNITDATA.indication(rx_signal_xi, rx_signal_xq, rx_signal_yi, rx_signal_yq)

The PMD:UNITDATA.indication primitive conveys four analog signals, representing the in-phase (I) and quadrature (Q) components for each of the polarizations (X and Y), via the rx_signal_xi, rx_signal_xq, rx_signal_yi, rx_signal_yq parameters, respectively.

185.3.1.2.2 When generated

The 800GBASE-LR1 PMD generates PMD:IS_UNITDATA.indication continuously.

185.3.1.2.3 Effect of receipt

The 800GBASE-LR1 Inner FEC processes the four analog signals as defined in 184.5.

The service interface defined for 800GBASE-LR1 PMD is defined quite differently from the the service interface for DR-2, FR4, and LR4.

The interface is analog signals, not detected or digitized symbols.

No related changes are required here.

Comment #275 (part 5)

Proposal:

Modify 182.3 to clarify that rx_symbol is not the same as defined in 116.3 and modify the definition of rx_symbol stating it is more than four levels. Also, align some wording with 116.3.

Modify 177.3 and 183.3 to point to 182.3 instead of repeating.

Modify 177.5.4 to align the wording there.

182.3 Physical Medium Dependent (PMD) service interface

…

The PMD service interface is an instance of the inter-sublayer service interface defined in 116.3 for 200GBASE-R and 400GBASE-R, in 169.3 for 800GBASE-R, and 174.3 for 1.6TBASE-R, except that the rx_symbol parameter is redefined.

For PMD:IS_UNITDATA_i.request in the transmit direction and PMD:IS_UNITDATA_i.indication in the receive direction, where i = 0 to n–1, the tx_symbol and rx_symbol parameters are parallel PAM4 symbol streams with a nominal signaling rate of 113.4375 GBd. The number of parallel streams, n, is 1 for 200GBASE-DR1-2, 2 for 400GBASE-DR2-2, 4 for 800GBASE-DR4-2, and 8 for 1.6TBASE-DR8-2. ~~Each instance of tx_symbol and rx_symbol takes on~~ Each of the tx_symbol parameters takes one of four (PAM4) values: 0, 1, 2, or 3. ~~In order to support the Inner FEC soft-decision decoder (see 177.5.4), rx_symbol may take on an implementation-dependent set of values beyond the scope of this standard.~~ Each of the rx_symbol parameters takes a set of four or more implementation-specific values to support the Inner FEC soft-decision decoder (see 177.5.4).

Rewrite 177.3 as follows:

177.3 Service interface below the Inner FEC

The service interface below the Inner FEC is the PMD service interface defined in 182.3.

Modify 177.5.4 as follows:

177.5.4 Inner FEC decode

The Inner FEC decoder is a soft-decision decoder that requires a higher resolution than ~~two bits for each received PAM4 symbols~~ four values for each received PAM4 symbol. The resolution is implementation specific and is beyond the scope of this standard. The decoder evaluates the incoming codeword and determines the most likely codeword value.

Rewrite 183.3 as follows:

183.3 Physical Medium Dependent (PMD) service interface

The PMD service interface is the service interface as defined 182.3 for 800GBASE-DR4-2.

Reset variables

In support of comments 2, 88, 89, 90

Clause 45, 177, 184, 178, 179

Eugene Opsasnick (Broadcom)

Comments 88, 89

Cl **177** *SC* **177.6.2.1** *P* **320** *L* **53** # 88

Opsasnick, Eugene Broadcom

Comment Type **T** *Comment Status* **D** *reset variable*

FEC_reset is referred to in the definition of the "reset" variable, but FEC_reset is not defined except through a cross-reference to 45.2.1.1.1. The MDIO control variable table (Table 177-6) should instead be used for the cross reference to CL 45 registers).

SuggestedRemedy

Remove the cross-reference text "(see 45.2.1.1.1)" from the definition of reset in 177.6.2.1.

Add the definition of "FEC_reset" to the list of variables in 177.6.2.1 as: "Boolean variable that is true when set by a management entity and is false otherwise".

Add FEC_reset to the MDIO control variables table (Table 177-6) in subclause 177.10 with cross-references to 177.6.2.1 and 45.2.1.1 and the MDIO register bit number, 1.0.15.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Editorial slides with topic "Reset variable" are provided in the following contribution:
<URL>/brown_3dj_04_2501. For task force discussion.

Cl **184** *SC* **184.6.2.2** *P* **530** *L* **47** # 89

Opsasnick, Eugene Broadcom

Comment Type **T** *Comment Status* **D** *reset variable*

FEC_reset is referred to in the definition of the "reset" variable, but FEC_reset is not defined except through a cross-reference to 45.2.1.1.1. The MDIO control variables table (Table 184-4) already has a cross reference to 184.6.2.2 as well as CL 45 and the MDIO register bit number,

SuggestedRemedy

Remove the cross-reference text "(see 45.2.1.1.1)" from the definition of reset in 184.6.2.2.

Add the definition of "FEC_reset" to the list of variables in 184.6.2.2 as: "Boolean variable that is true when set by a management entity and is false otherwise".

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Editorial slides with topic "Reset variable" are provided in the following contribution:
<URL>/brown_3dj_04_2501. For task force discussion.

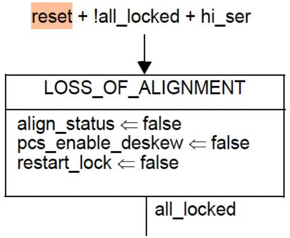
Reset variables (background #1 - CL 175)

PCS_reset

Boolean variable that is true when set by a management entity and is false otherwise.

reset

Boolean variable that controls the resetting of the PCS sublayer. It is true whenever a reset is necessary including when PCS_reset is true and during power on.



Control variable	Variable reference	MDIO register/bit number	MDIO register/bit reference
PCS_reset	175.2.6.2.2	3.0.15	45.2.3.1

Clause 175 resets:

PCS_reset: management reset

reset: Logical-OR of PCS_reset or "any other necessary condition".

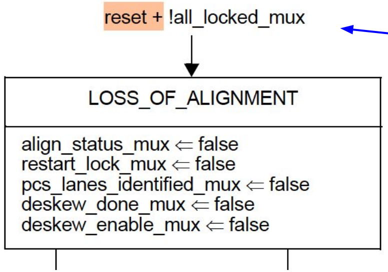
"reset" is used in state diagrams.

"PCS_reset" is listed in the MDIO table. It points to the definition and Clause 45.2.3.1, MDIO bit 3.0.15 (PCS reset).

Reset variables (background #2 - CL 176)

PMA_reset
A Boolean variable that is true when set by a management entity and is false otherwise.

reset
A Boolean variable that controls the resetting of the PMA sublayer. It is true whenever a reset is necessary including when initiated by PMA_reset and during power on.



PMA_reset			

Clause 176 resets:

PMA_reset: management reset

reset: Logical-OR of PMA_reset or "any other necessary condition".

"reset" is used in state diagrams.

"PMA_reset" is listed in the MDIO table but MDIO table is not yet complete. Should be updated to point to the definition and 45.2.1.1, MDIO register bit 1.0.15 (PMA/PMD reset).

Reset variables - Comment 88, Clause 177

FEC_reset

A Boolean variable that is true when set by a management entity and is false otherwise.

reset

A Boolean variable that controls the resetting of the Inner FEC sublayer. It is true whenever a reset is necessary including when initiated by FEC_reset (see 45.2.1.1.1) and during power on.

reset + !signal_ok
+restart_inner_fec_sync

INNER_FEC_SYNC_INIT

sync_flow<x> ⇐ false
test_cw ⇐ false

Table 177–6—Inner FEC control variables and MDIO mapping

Control variable	Variable reference	MDIO Register/bit number	MDIO register/bit reference
Inner FEC enable lane 0		1.2400.0	45.2.1.213a

Clause 177 resets:

FEC_reset: Definition is missing. It should be added to 177.6.2.1.

reset: Uses FEC_reset. The cross-reference to CL 45 can be removed since the new convention is to reference CL 45 in the MDIO table.

“reset” is used in state diagrams.

“FEC_reset” is not listed in the MDIO table and should be added to point to its definition and 45.2.1.1, MDIO register bit 1.0.15 (PMA/PMD reset).

Reset variables - Comment 89, Clause 184

FEC_reset

A Boolean variable that is true when set by a management entity and is false otherwise.

reset

A Boolean variable that controls the resetting of the Inner FEC. It is true whenever a reset is necessary including when initiated by FEC_reset (see 45.2.1.1.1) and during power on.

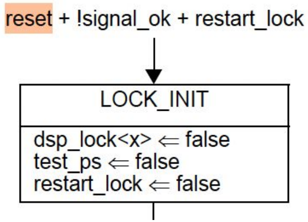


Table 184–4—Inner FEC control variables and MDIO mapping

Control variable	Variable reference	MDIO Register/bit number	MDIO register/bit reference
FEC_reset	184.6.2.2	1.0.15	45.2.1.1

Clause 184 resets:

FEC_reset: Definition is missing. It should be added to 184.6.2.2.

reset: Uses FEC_reset. The cross-reference to CL 45 can be removed since the new convention is to reference CL 45 in the MDIO table.

"reset" is used in state diagrams.

"FEC_reset" is already listed in the MDIO table. No change needed to the table or references.

Comment 90

Cl **179** *SC* **179.14** *P* **400** *L* **10** # 90

Opsasnick, Eugene Broadcom

Comment Type **TR** *Comment Status* **D** *reset variable*

In Table 179-20, the variable PMD_reset has a variable reference to subclause 178B.14.2.1; however, that subclause does not define "PMD_reset".

SuggestedRemedy

Suggest adding a subclause to CL 179 (perhaps 179.8.10) to define the PMD_reset variable similar to 180.5.6, 181.5.6, 182.5.6, 183.5.6, and 185.5.6 and 187.5.6 with title "PMD reset function" and subclause text:
"If the variable PMD_reset is asserted, the PMD shall be reset as defined in 45.2.1.1.1.".

And change the cross-reference in Table 179-20 from 178B.14.2.1 to this new subclause in Clause 179.

A similar subclause should also be added as 178.8.10 titled "PMD reset function" withthe same text as above.

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.

Editorial slides with topic "Reset variable" are provided in the following contribution:
<URL>/brown_3dj_04_2501. For task force discussion.

Reset variables - Comment 90, Clause 179 (and 178), part 1/2

- PMD clauses do not have state diagrams
  - The “reset” variable is not used in these clauses like the logic clauses, but a management reset (PMD_reset) should be defined.
- Optical PMD clauses do have a subclause that defines PMD_reset.
  - 180.5.6, 181.5.6, 182.5.6, 183.5.6, 185.5.6, and 187.5.6 are all identical.

180.5.6 PMD reset function

If the variable PMD_reset is asserted, the PMD shall be reset as defined in 45.2.1.1.1.

Table 180–20—PMD control variables and MDIO mapping

Control variable	Variable reference	MDIO register/bit number	MDIO register/bit reference
PMD_reset	180.5.6	1.0.15	45.2.1.1
PMD_global_transmit_disable	180.5.7	1.9.0	45.2.1.8

Reset variables - Comment 90, Clause 179 (and 178), part 2/2

- Clause 179 does not have a definition of PMD_reset, but does have an MDIO table entry for it.
  - However, the referenced subclause, 178B.14.2.1, defines “reset”, but not PMD_reset. Note that the definition of “reset” in 178B.14.2.1 refers to “AUI_reset”.

Table 179–20—PMD control variables and MDIO mapping

Control variable	Variable reference	MDIO register/bit number	MDIO register/bit reference
PMD_reset	178B.14.2.1	1.0.15	45.2.1.1

- Suggested remedy:
  - Add subclause 179.8.10 with same wording as in 180.5.6 (see previous slide)
  - Add subclause 178.8.10 with same wording as in 180.5.6.
  - Change variable reference for PMD_reset in Table 179-20 from 178B.14.2.1 to be 179.8.10.
- In addition:
  - Update Annex 178B.14.2.1 to add definition of AUI_reset and “AUI_reset” should replace “reset” in Table 178B-6.

Comment 2

Cl **184** *SC* **184.9** *P* **535** *L* **15** # 2

Marris, Arthur — Cadence Design Systems

Comment Type **TR** *Comment Status* **D** *reset variable*

Make FEC_reset reference Inner FEC control register 1.2400

SuggestedRemedy

In Table 184-4 make the MDIO bit 1.2400.0 and reference 45.2.1.213a
Change variable name from "FEC_reset" to "Inner_FEC_reset" and also on page 530 line 47
In Table 45–177a delete rows "Inner FEC enable lane 1" to "Inner FEC enable lane 7" and in the row for "1.2400.0" change "enable" to "reset"
On page 530 line 47 for the reset variable change the cross reference from "45.2.1.1.1" to "45.2.1.213a"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Editorial slides with topic "Reset variable" are provided in the following contribution: <URL>/brown_3dj_04_2501. For task force discussion.

Comment #2 address two distinct issues:

1. Changing “FEC_reset” to “Inner_FEC_reset”

   FEC_reset does not need to be changed to “Inner_FEC_reset”. The Inner FEC logic in CL 184 can use the “FEC_reset” name for its management reset.

   No other changes to page 530, line 47 (definition of reset in 184.6.2.2) or Table 184-4 (MDIO mapping table) are needed. FEC_reset can refer to Table 45-4, in 45.2.1.1, bit 1.0.15 as shown in remedy to comment 89.

2. Update Table 45-177a to remove enables and add “Inner_FEC_reset”

   The eight Inner FEC enable bits should be removed from Table 177-6 (addressed in comment #147). Therefore, Table 45-177a can be removed in whole.

PCS Block Error Ratio Stress

Comment #167

Annex 174A

Matt Brown (Alphawave Semi)

Comment #167 (part 1)

Cl **174A** *SC* **174A.7.1.4** *P* **667** *L* **20** # 167

Bruckman, Leon Nvidia

Comment Type **TR** *Comment Status* **D** *KER stress*

It is not clear what is "stress" or where is it applied in the lane.

SuggestedRemedy

In point a) change: "with no stress applied to any lane"
to "with no stress applied to the receiver of any lane"
InPoint b) change: "with stress applied only to lane i"
to: "with stress applied only to the receiver of lane i"

Proposed Response *Response Status* **W**

PROPOSED ACCEPT IN PRINCIPLE.
Pending review of slides with topic "Block error ratio stress" in the following editorial contribution:
<URL>/brown_3dj_03_2501

174A.7.1.1 Test configuration

The configuration for a PHY test using the PCS is illustrated in Figure 174A–4.

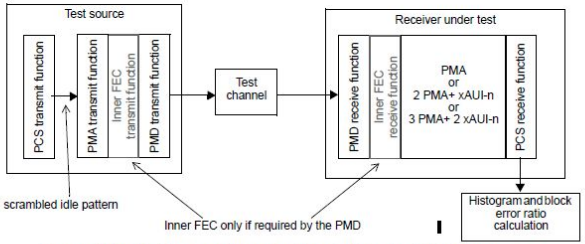


Figure 174A–4—Test configuration for a PHY using PCS counters

174A.7.1.3 PCS error histogram measurement

An error histogram using PCS counters is measured using the following method:

a) At the transmitting device generate a scrambled idle test pattern in the PCS.
b) At the receiving PCS measure symbol errors using the defined PCS counters. The total number of codewords analyzed, FEC_cw_counter, should be sufficiently large to reliably verify that the expected block error ratio is met, either by direct measurement or statistical projection. The projection should provide an accurate prediction of the value of $H_m(k)$ that would be observed over longer-term testing or at least provide an upper bound on the value.
c) Calculate the measured histogram $H_m(k)$.

A measured error histogram $H_m(k)$ is calculated as follows:

— For k in the range 0 to 15, $H_m(k)$ = FEC_codeword_error_bin_k / FEC_cw_counter
— $H_m(16)$ = FEC_uncorrected_cw_counter / FEC_cw_counter

174A.7.1.4 PCS block error ratio method

The following method is used to calculate the block error ratio using FEC bin counters provided in the PCS.

a) Measure the error histogram $H_{mu}(k)$ with no stress applied to any lane.
b) Measure the error histogram $H_{ms}^{(i)}(k)$ for each lane i with stress applied only to lane i.
c) Calculate the composite error histogram $H_{ms}(k)$ as follows.
d) Initialize H_{ms}(k) to $H_{ms}^{(0)}(k)$.
e) Iteratively, for each lane $i > 0$, assign the result of Equation (174A–5) and Equation (174A–6) to $H_{ms}(k)$ substituting $H_{ms}(k)$ for $H_x(k)$ for $H_{ms}^{(i)}(k)$ for $H_y(k)$, and optionally (for better accuracy) deconvolve $H_{mu}(k)$ from H_{ms}(k).
f) Calculate the error histogram $H_a(k)$ for the added BER using Equation (174A–3) with BER = BER_{added}.
g) Assign the result of Equation (174A–5) and Equation (174A–6) to $H_{ms}(k)$ substituting $H_{ms}(k)$ for $H_x(k)$ and $H_a(k)$ for $H_y(k)$.
h) The measured block error ratio is equal to $H_{ms}(16)$.

The measured codeword error ratio is expected be less than 1.45×10^{-11}.

Comment #167 (part 1)

In addition to the concern expressed in the comment, the current wording does not tie in well with the histogram measurement method for Hm(k) in the previous subclause nor is it clear what stress is to be applied.

Proposed changes…

Rewrite steps a) and b) as follows:

174A.7.1.4 PCS block error ratio method

The following method is used to calculate the block error ratio using FEC bin counters provided in the PCS.

a) Measure the error histogram ~~Hmu(k)~~ Hm(k) with no stress applied to the receive input on any lane and assign Hm(k) to Hmu(k).

b) Measure the error histogram ~~Hms(i)(k)~~ Hm(k) for each lane i with stress, as specified for the PMD or AUI component, applied only to the receive input on lane i and assign Hm(k) to Hms(i)(k).

ILT Clock switch

In support of comment #124

Leon Bruckman, Nvidia
Jeff Slavick, Broadcom
Adee Ran, Cisco

Comment #124

Cl **178B** *SC* **178B.14.2.1** *P* **783** *L* **13** # 124

Slavick, Jeff Broadcom

Comment Type **TR** *Comment Status* **X**

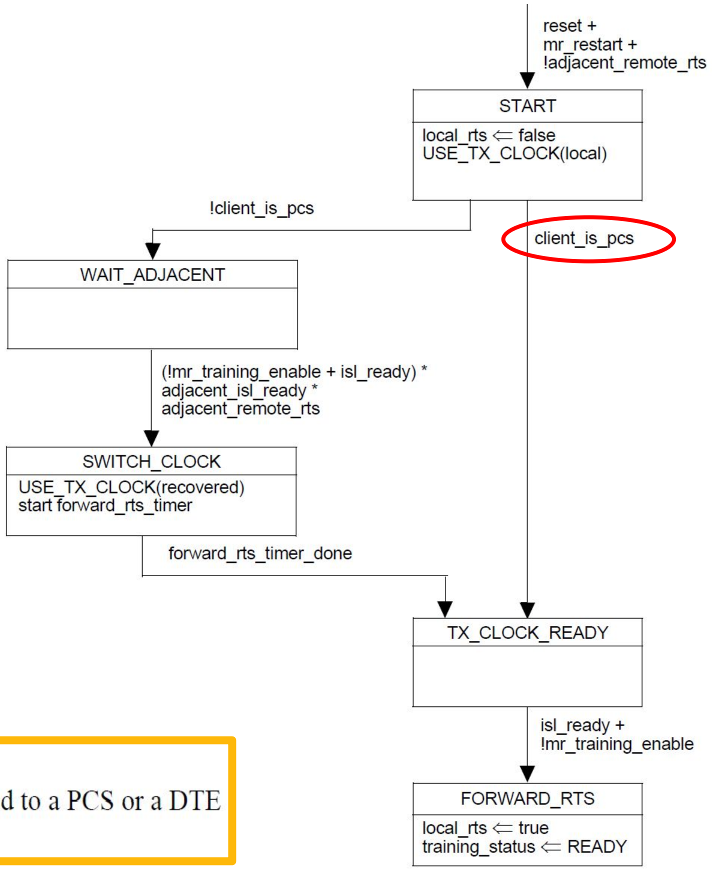
"other" interface is a bit ambigous and the listed situations are the typical use case but does not cover all use cases. As a remote PCS (after a XS) could do either local or clock forwarding modes.

SuggestedRemedy

Rename client_is_pcs to be "uses_local_clock_only" and update the definition to be "Boolean variable that indicates if the PMA will never swap to a forwarded clock. For example this will be true for the first PMA below the RS."

Replace both uses of client_is_pcs with uses_local_clock_only in Fig 178B-7

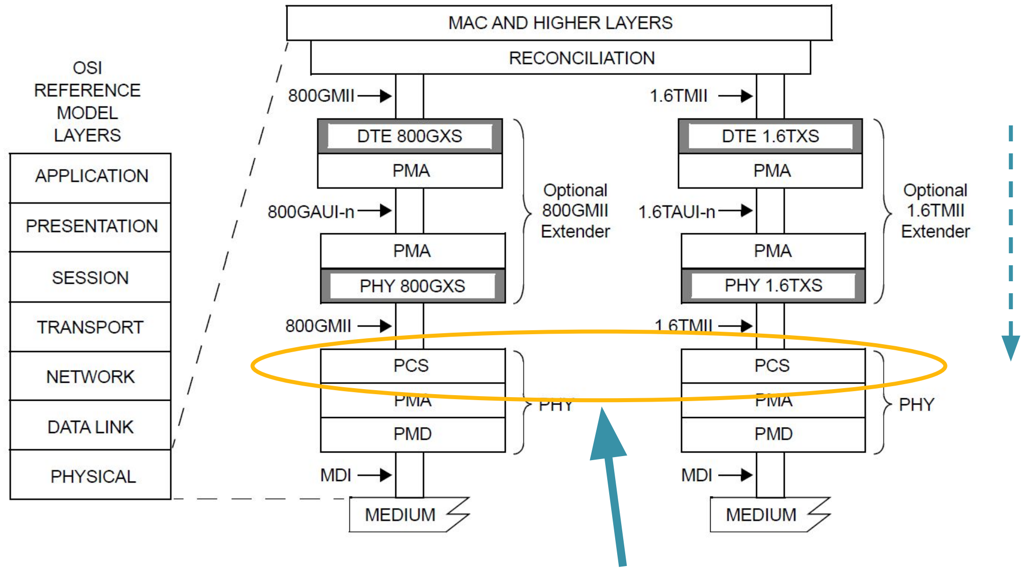
Proposed Response *Response Status* **O**



client_is_pcs

Boolean variable that is true for an interface when its other interface is attached to a PCS or a DTE XS, and false otherwise.

XGMII extender



When tx_mode = DATA
the PCS transmit path may use the clock
recovered from the PMA above the XS
- or -
use local clock + rate adaptation (idles)

Variable name

- The name of the variable should be a description of the effect, rather than an (incorrect) assumption of when it is set.
- Rename **client_is_pcs** to **uses_recovered_clock**
- Makes adjustments in the state diagram (logic inversion)

Proposed response

- ACCEPT IN PRINCIPLE
- Rename “client_is_pcs” to “uses_recovered_clock” (logic inverse) and update the definition to be "Boolean variable set to true to indicate that the AUI component or PMD uses a clock recovered from another interface to drive its output when tx_mode = data. Otherwise it is set to false."
- In Figure 178B-7 change:
  - “client_is_pcs” to “!uses_recovered_clock”
  - and “!client_is_pcs” to “uses_recovered_clock”
- Add MDIO variable to configure uses_recovered_clock

Polarity inversion

In support of comment #144

Leon Bruckman, Nvidia
Jeff Slavick, Broadcom
Adee Ran, Cisco

Comment #144

Cl **178B** *SC* **178B.14.3.5** *P* **790** *L* **27** # 144

Slavick, Jeff Broadcom

Comment Type **TR** *Comment Status* **X**

Fig 178B-9 needs to clarify the transitions out of TEST_MARKER.

SuggestedRemedy

Change the transition from TEST_MARKER to INVALID_MARKER to be "(!valid_marker * !inverse_valid_marker) + (polarity_correction * inverse_valid_marker)"

Change the transition from TEST_MARKER to POLARITY_INVERT to be "!polarity_correction * inverse_marker_valid"

Proposed Response *Response Status* **O**

178B.10 Polarity detection and correction

When training starts for each lane, the variable polarity_correction is set to false. If inverted frame markers are detected during the frame lock process, the polarity_correction variable is set to true.

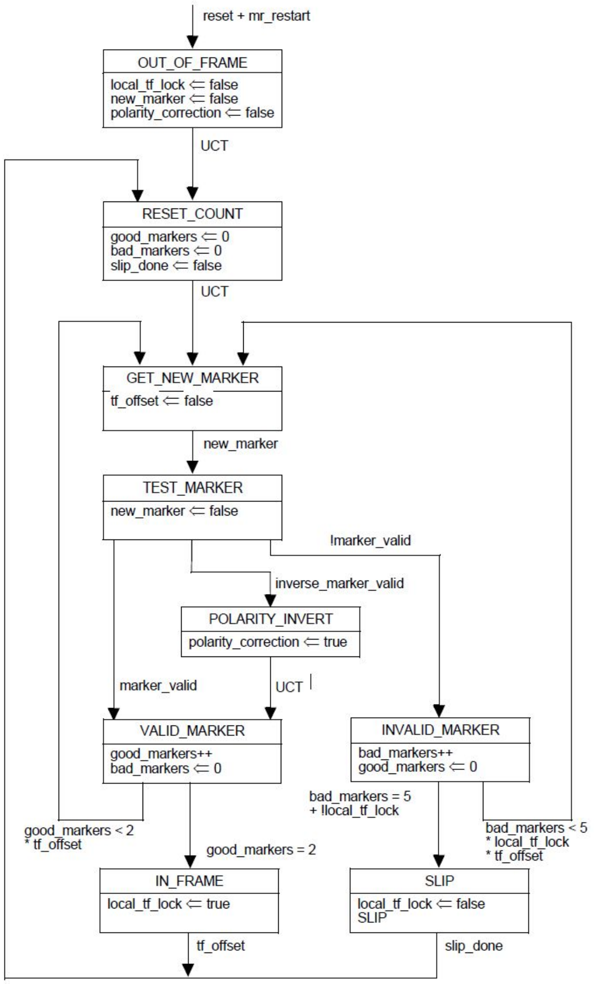
The state of the polarity_correction variable persists until training restarts.

If polarity_correction is true, the lane input shall be corrected by mapping the received PAM4 symbols 0, 1, 2, and 3 to PAM4 symbols 3, 2, 1, and 0, respectively.

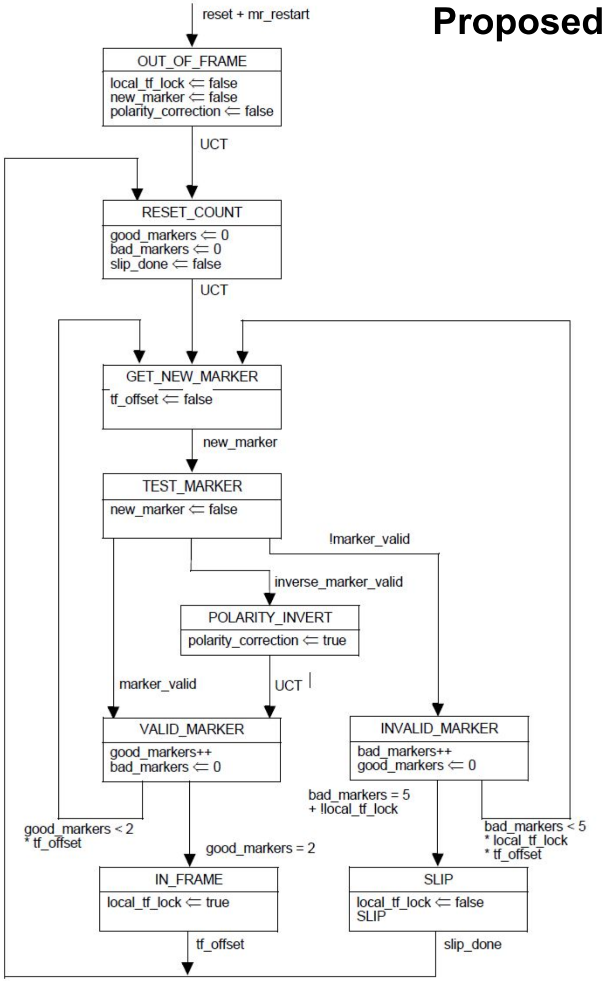
NOTE—Polarity detection and correction is not available when training is disabled.

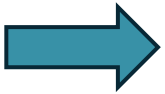
polarity_correction

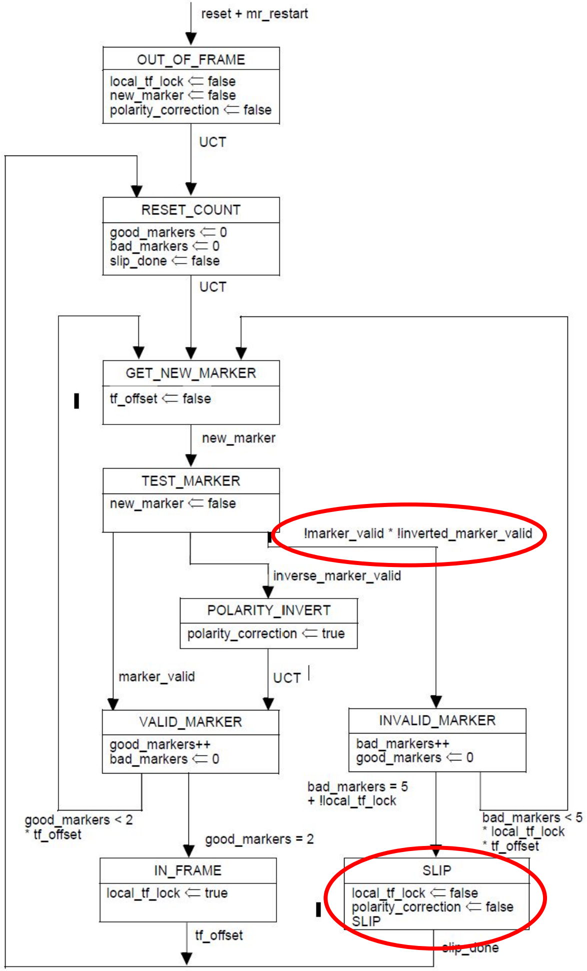
Boolean variable that is set to true when an inverted marker is detected. Otherwise it is set to false.



Proposed response – Option 1



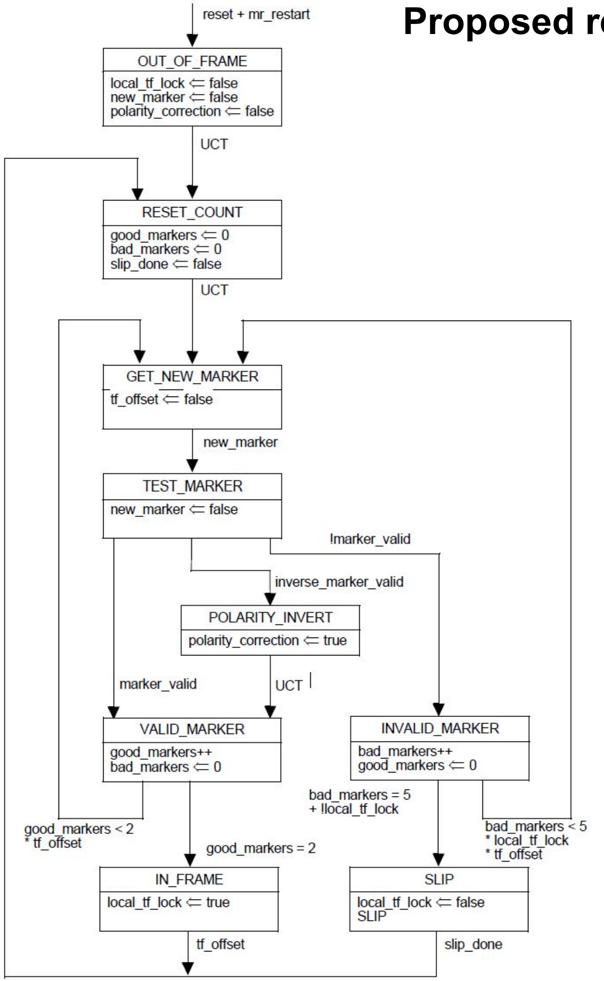


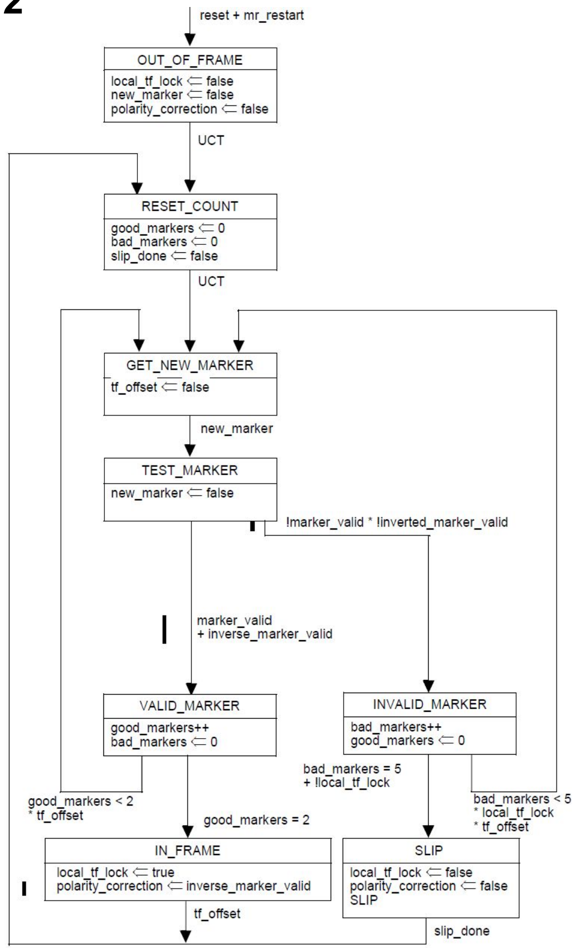


Proposed response – Option 1

- ACCEPT IN PRINCIPLE
- Replace Figure 178B-9 with the right figure in slide 3 of bruckman_dj_03_01_20_2025
- In 178B.10 page 779 line 44 (Polarity detection and correction):
  - Change: “If polarity_correction is true, the lane input shall be corrected”
  - To: “If polarity_correction is true and local_tf_lock is true, the lane input shall be corrected”
  - Change: “The state of the polarity_correction variable persists until training restarts.”
  - To: “The state of the polarity_correction variable persists after training completes, correcting the polarity of the data received when tx_mode is set to DATA.”

Proposed response – Option 2





Proposed response – Option 2

- ACCEPT IN PRINCIPLE
- Replace Figure 178B-9 with the right figure in slide 5 of bruckman_dj_03_01_20_2025
- In 178B.14.3 page 786 line 35 (polarity_correction definition):
  - Change: “Boolean variable that is set to true when an inverted marker is detected. Otherwise it is set to false.”
  - To: “Boolean variable that is set to true when inverted markers are detected upon acquiring training frame lock. Otherwise it is set to false.”
- In 178B.10 page 779 line 43 (Polarity detection and correction):
  - Change: “The state of the polarity_correction variable persists until training restarts.”
  - To: “The state of the polarity_correction variable persists after training completes, correcting the polarity of the data received when tx_mode is set to DATA.”

Options comparison

- Value of polarity_correction if one marker is inverted and the second marker is not (extremely low probability):
  - For option 1: polarity_correction = TRUE
  - For option 2: polarity_correction = FALSE
- Option 1 has minor changes compared to D1.3
- Option 2 puts the FSM back to the Cl136 format but adds in the polarity invert functionality without adding states