

**Interpretation Number:** 2-03/01  
**Topic:** Carrier Extend (/R/)  
**Relevant Clauses:** 36.2.4.15  
**Classification:** Unambiguous

### **Interpretation Request**

It appears that the text in IEEE 802.3-2000 Section 36.2.4.15 d) (Carrier\_Extend) contradicts Figure 36-7b (PCS receive state diagram, part b). Subclause 36.2.4.15 reads as follows:

“36.2.4.15 Carrier\_Extend (/R/)

d) EPD3: The second /R/ following the /T/ in the End\_of\_Packet delimiter /T/R/R//. This /R/ is used, if necessary, to pad the only or last packet of a burst of packets so that the subsequent // is aligned on an even-numbered code-group boundary. When used for this purpose, Carrier\_Extend is emitted from, and interpreted by, the PCS. An EPD of /T/R/R/ results in one /R/ being delivered to the PCS client (see 36.2.4.14.1).”

The text above seems to imply that carrier extensions for the purpose of byte alignment are not sent to the PCS client (i.e., the RS); a PCS-generated /T/R/R/ sequence used to align a succeeding // on an even boundary will be converted to a /T/R/ sequence by the receiving PCS, prior to delivery to the PCS client. The obvious inference is that carrier extension due to byte alignment is transparent to the PCS client, which makes intuitive sense from a layering point of view.

However, Figure 36-7b clearly indicates (as marked by the superimposed arrow) that the PCS layer must assert carrier extension to the PCS client in the case of byte alignment. A transition out of the Receive state to the TRR+Extend state is made when any /T/R/R/ sequence is received by the PCS, whether this is due to normal carrier extension or due to carrier extension for the purpose of byte alignment. Within the latter state, the carrier extend indication is sent to the PCS client.

Please clarify the apparent differences between the text and the figure. Also, please provide the underlying intent of the standard with regard to reporting carrier extensions generated by the PCS to the remote MAC/RS layers.

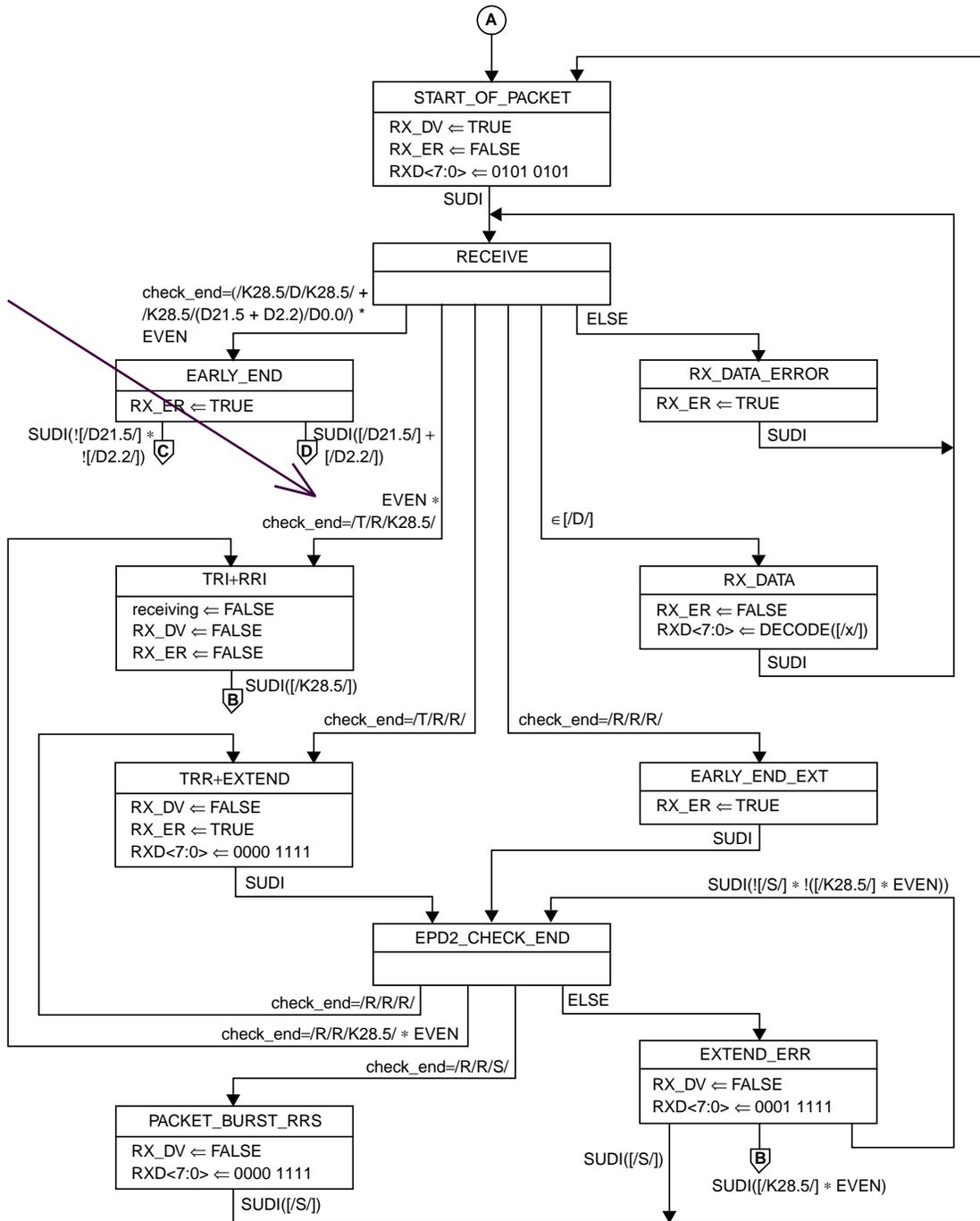
---

### **Interpretation for IEEE std 802.3-2000**

The 4th sentence of subclause 36.2.4.15 ‘Carrier\_Extend (/R/)’ Item d), clearly states that ‘An EPD of /T/R/R/ results in one /R/ being delivered to the PCS client’.

The inference therefore ‘that carrier extensions for the purpose of byte alignment are not sent to the PCS client’ is incorrect.

Further, the standard clearly shows in Table 35-2 ‘Permissible encoding of RXD<7:0>,RX\_ER, and RX\_DV’ that Carrier\_Extend /R/ is encoded as



RX\_DV = 0, RX\_ER = 1 and RXD<7:0> = 0x0F on the GMII. The transition marked in Figure 36-7b of the interpretation request, which results from receiving a /T/R/R/, will result in the encoding RX\_DV = False, RX\_ER = True and RXD<7:0> = 00001111 on the GMII.

Since the text requires an EPD of /T/R/R/ to result in one /R/ being delivered to the PCS client and the Figure 36-7b shows a /R/ being delivered to the PCS Client, encoded as required by Table 35-2, there appears to be no differences between the text and the figure. Attention is also drawn to subclause 1.2.1 'State diagram conventions' which states 'The state diagrams contain the authoritative statement of the functions they depict; when apparent conflicts between descriptive text and state diagrams arise, the state diagrams are to take precedence.'

Carrier Extend has to be asserted in this case as the Receive PCS has no knowledge of the duplex mode the MAC is operating in, nor has it knowledge if the /T/R/R/ it has received is the start of Carrier Extension or simply present for code-group alignment.