

# Comments and proposals regarding SC-FEC sublayer indications

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# References

- 100GBASE ZR Draft 802.3ct\_D1p1.pdf, Private Area
- ITU-T G.709 - Interfaces for the optical transport network
- ITU-T G.798 - Characteristics of optical transport network hierarchy equipment functional blocks
- trowbridge\_3cn\_01a\_0119.pdf, IEEE P802.3cn Task Force, Long Beach, January 2019

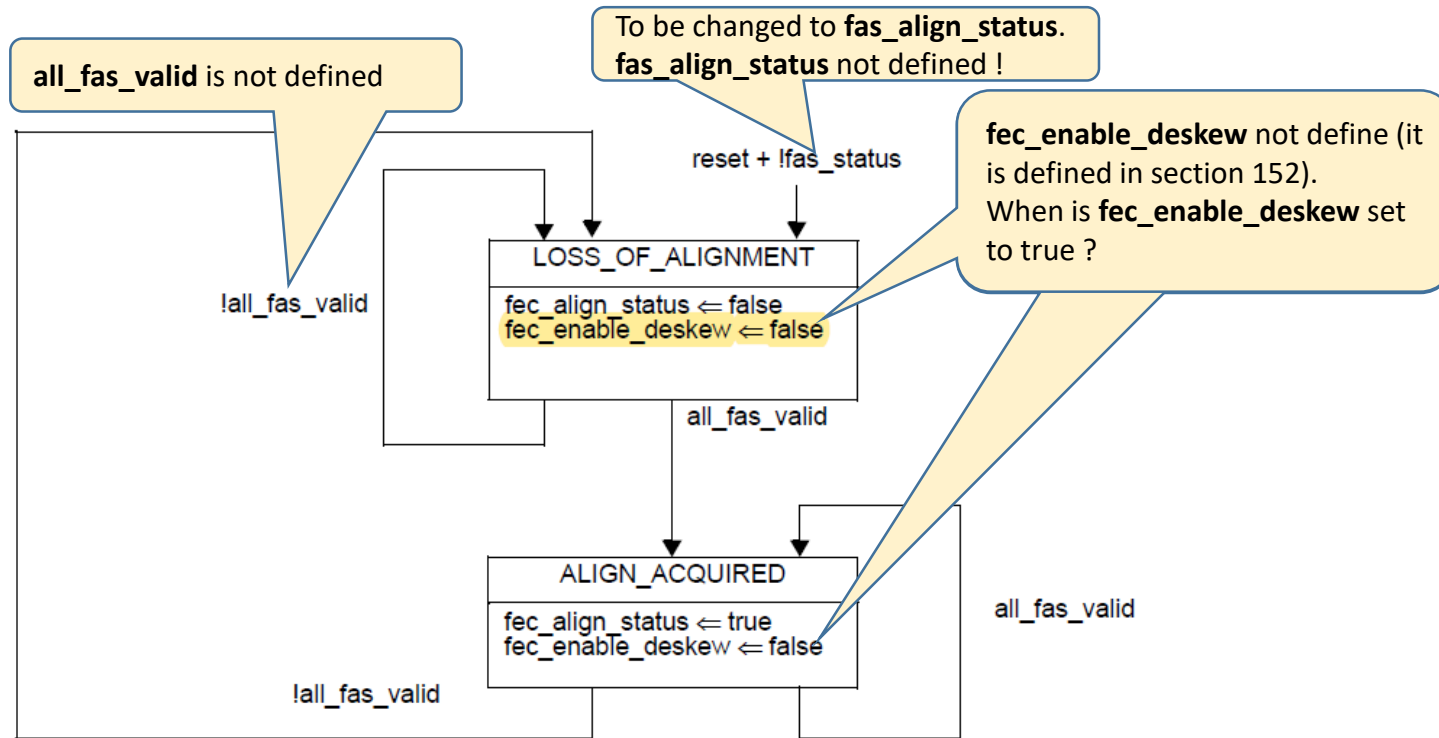
# Introduction

- This contribution is in support of comments against the following D1.1 sections:
  - 153.2.4.1.1: fec\_alignment\_valid variable use or remove option, fec\_align\_status behavior
  - 153.2.4.4: Several issues with Figure 153-8

# Consequent actions

- The SIGNAL\_OK parameter of the FEC:IS\_SIGNAL.indication primitive can take one of two values: OK or FAIL. The value is set to OK when the FEC receive function has identified codeword boundaries as indicated by *fec\_align\_status* equal to true. That value is set to FAIL when the FEC receive function is unable to reliably establish codeword boundaries as indicated by *fec\_align\_status* equal to false. *When SIGNAL\_OK is FAIL, the rx\_bit parameters of the FEC:IS\_UNITDATA\_i.indication primitives are undefined.*
- **fec\_align\_status**: A variable set by the FEC alignment process to reflect the status of FEC lane-to-lane alignment. Set to true when all lanes are synchronized and aligned and set to false when the deskew process is not complete.
- This means that the FEC:IS\_SIGNAL.indication is set FAIL if any of the lanes losses alignment and as a consequence the FEC:IS\_UNITDATA\_i.indication primitives become undefined.

# SC-FEC deskew state diagram



**fec\_enable\_deskew:** A Boolean variable that enables and disables the deskew process. *Received bits may be discarded whenever deskew is enabled.* It is set to true when deskew is enabled and set to false when deskew is disabled.

Assuming `fec_enable_deskew` is set when FAS alignment is lost, communication will be impaired.

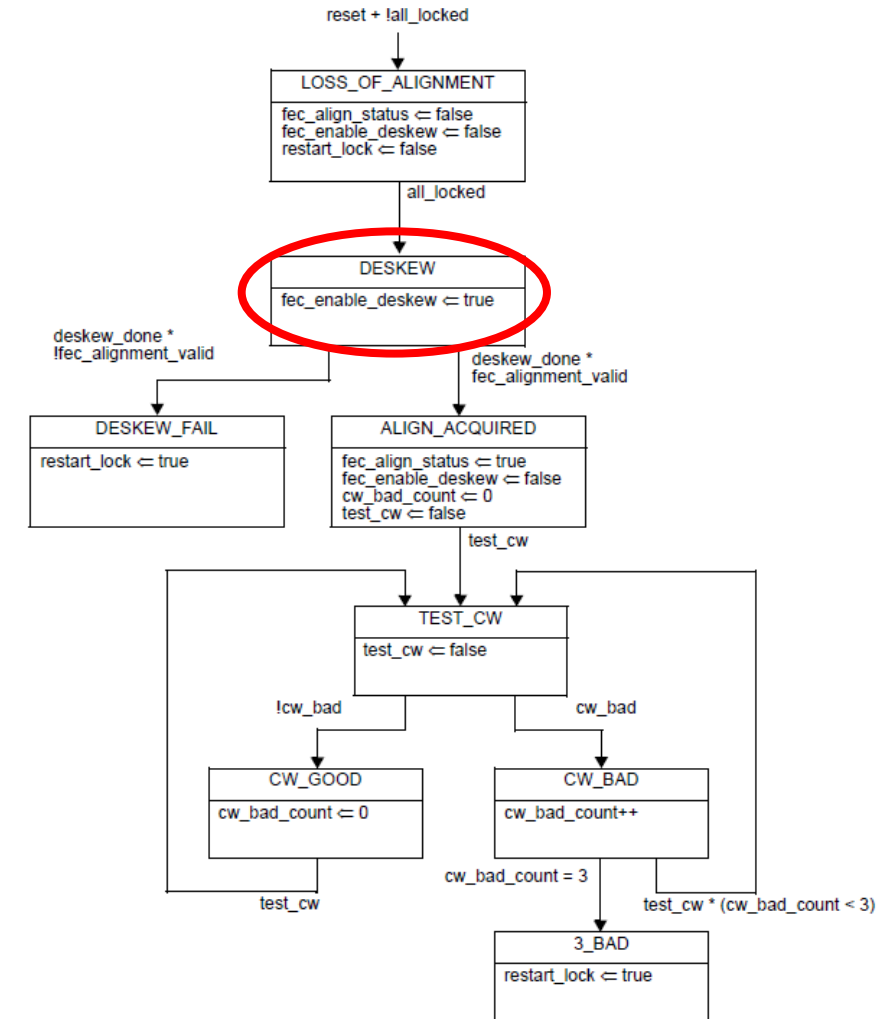


Figure 91-9—FEC alignment state diagram

# Alarm Related procedures: 100GBASE-ZR vs. ITU-T

Procedure	100GBASE-ZR	ITU-T G.709 and G.798
Frame start maintain	Not defined	The frame start shall be maintained during the OOF (alignment loss) state.
Lane ID maintain	Not defined	During an OOR period, the last accepted LLM value has to be maintained as lane marker value.
Consequent actions	Immediate after anomaly (e.g. alignment loss) detection	Only for defects (anomaly that persists for an integration period), per lane integration timer

# Proposal (1):

- Integrate anomaly before applying consequent actions
- Maintain frame start position during loss of alignment
- Maintain lane ID during loss of lane ID alignment
- Advantage:
  - No impairment during the frequent losses
  - For  $\text{BER}=4.62 \times 10^{-3}$ , average every  $\sim 1.5$  minutes.
  - *For 20 lanes:  $\sim 4.5$  sec*
- Alternative:
  - Separate alignment process from lane ID processes
  - Define alignment loss detection process:
    - 5 consecutive occurrences of 3 or more, out of 5 FAS bytes errored
      - Caveat: Does not detect  $\pm 8$  bit jumps
    - Per Lane: On average there will be an alignment loss every:  $\sim 38\text{K}$  years
    - *For 20 lanes:  $\sim 1.9\text{K}$  years*
    - fec\_align\_status influenced by alignment loss only.

# Proposal (2):

- Fix SC-FEC deskew state diagram.
- Consider removing the definition of the `fec_alignment_valid` variable from section 153.2.4.1.1, or use it.
  - It is not used in D1.1 section 153.
  - Note that fixing the SC-FEC deskew state diagram figure may need this variable.
  - Leave it in section 152.5.4.2.1, since section 152 state diagrams refer to section 91 where this variable is used (see this presentation slide 4 Figure 91-9).