

DFE differences between Annex 178A and Clause 180

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2 March 2026

Clause 178A DFE

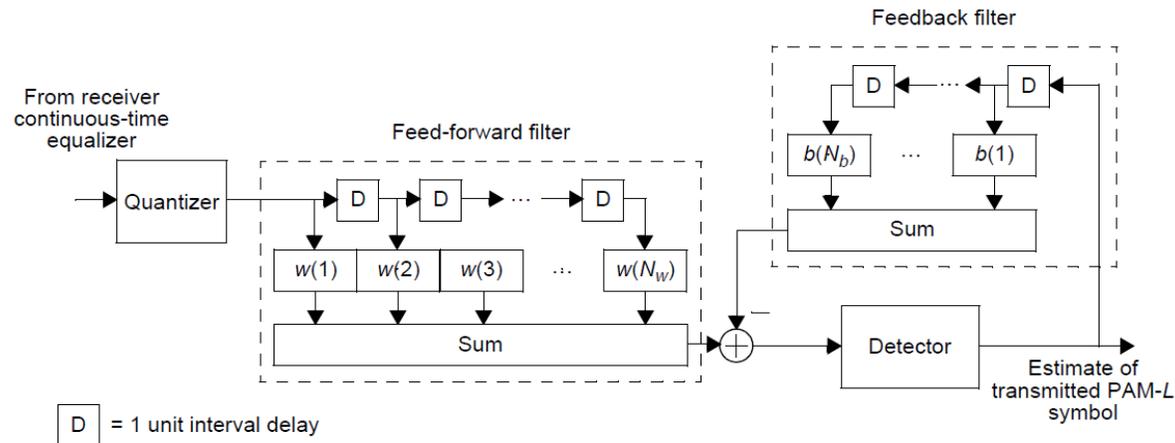


Figure 178A-9—Receiver discrete-time equalizer

- As the caption says, this is a discrete-time equalizer
 - I would prefer “Sampler” over “Quantizer”; it samples the analog waveform at discrete T-spaced time intervals
- This is the DFE described in most literature and textbooks.
 - Often preceded by a matched filter or sampler is clocked at T/2.
- There is no eye diagram. There is simply one sample per UI.

Clause 180 DFE

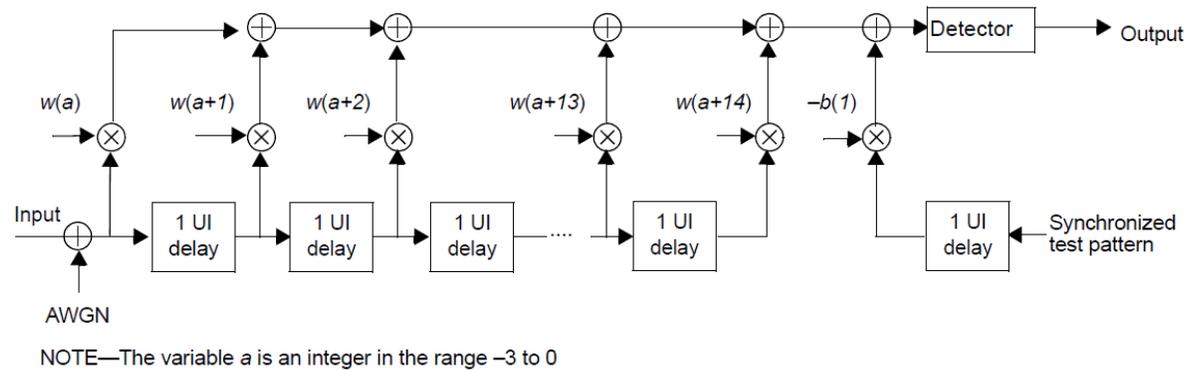


Figure 180–10—TDECQ reference equalizer functional model

- From 180.9.6.3 Reference equalizer:
“The reference equalizer is a 15-tap, T-spaced, feed-forward equalizer (FFE), followed by a 1-tap decision feedback equalizer (DFE)”
- There is no classic figure of a DFE given in Clause 180
 - Though not explicit, the use of the DFE implies a continuous time equalizer

Eye Diagram

- The description of the TDECQ computation relies on a continuous-time receive eye diagram
 - Clause 180.9.6.4 speaks of zero crossings and “two vertical histograms [that] are measured through the eye diagram”
- The only way to have such an eye diagram is to remain in continuous time until the slicer
- The feedback filter must also be continuous time (unlike a classic DFE)

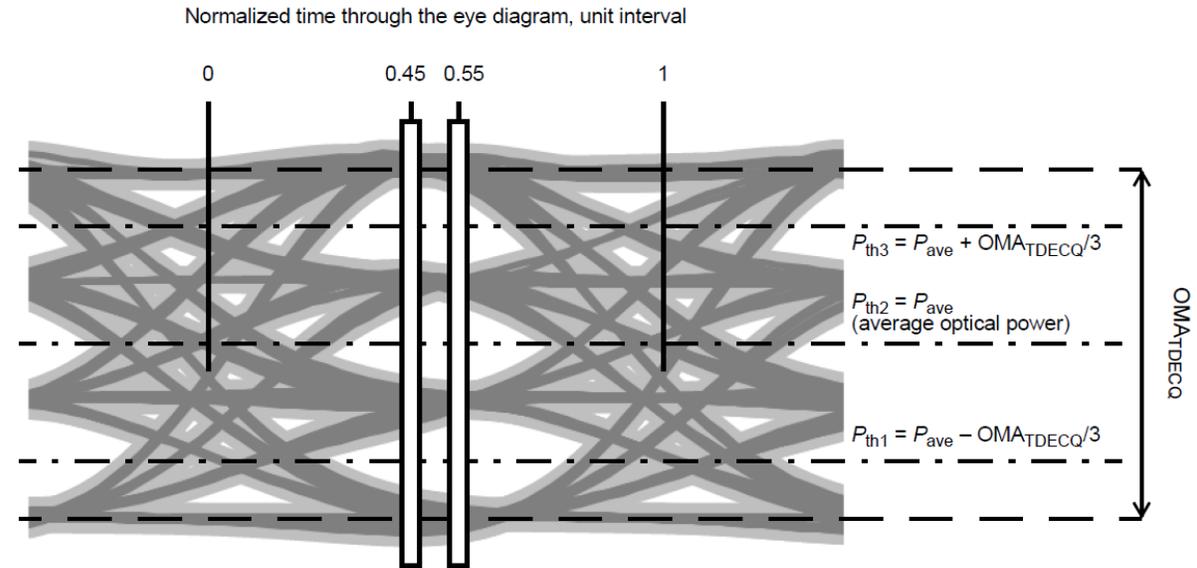
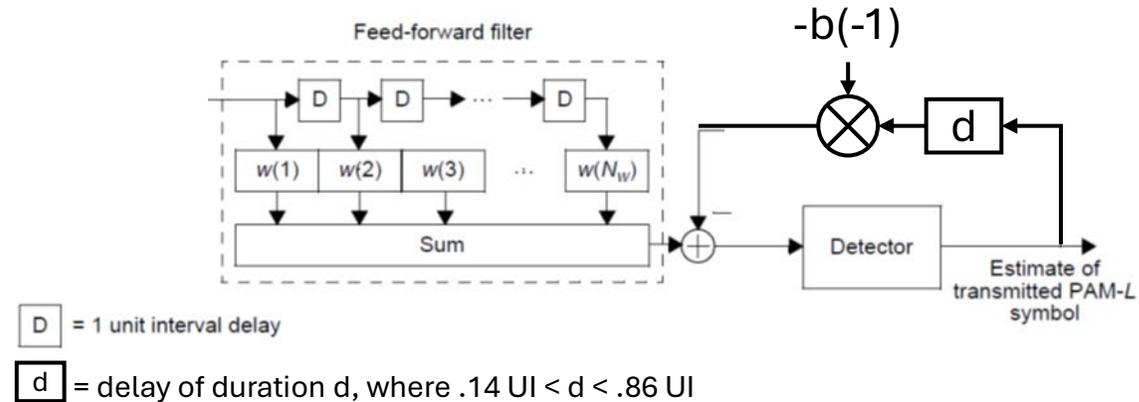


Figure 180-11—Illustration of the TDECQ measurement

Implied Clause 180 DFE



- The signal in this block diagram is continuous time.
- The eye diagram is measured at the input to the detector
- The detector output changes once per symbol period and holds its value until the next decision instance 1 UI later.
- The delay d in the feedback path is not 1 UI for the continuous-time feedback
 - It is bounded by $.14 \text{ UI} < d < .86 \text{ UI}$ to ensure that the feedback changes value before the left vertical histogram slice or after the right vertical histogram slice
 - This representation is consistent with the TDECQ description but does not imply an implementation

Other points

- Describing the reference equalizer as a “feedforward equalizer followed by a feedback equalizer” is not standard terminology
 - A DFE is normally described as a transversal feedforward filter , a decision element, and a transversal feedback filter – that is, the DFE includes the feedforward section
- The eye diagram of Figure 180-11 should show a discontinuity where the feedback level changes value.