72.6.1.10 Transmitter Output Waveform

The 10GBASE-KR transmitter includes programmable equalization to compensate for frequency-dependent loss in the backplane channel and facilitate data recovery at the receiver. This equalization may be accomplished with a three-tap finite impulse response (FIR) structure as shown in Figure 72–X. The actual implementation of the transmit equalizer, including the incorporation of additional taps, is beyond the scope of this standard.

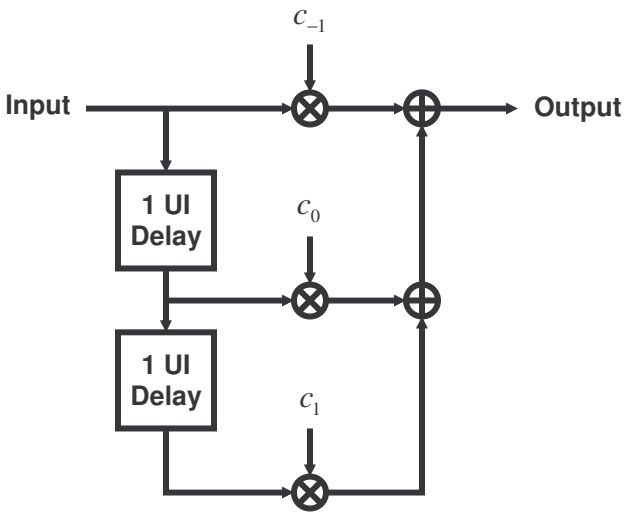

Figure 72–X–Transmit Equalizer Example

Transmit equalizer performance is specified in terms of V_{ss}, R_{pre}, R_{pst}, D_{main}, D_{pre}, and D_{pst} as defined in 72.6.1.11. For all possible configurations of the transmit equalizer,

a) R_{pst} shall not be less than 3.25 for any c_1 decrement request that returns status "minimum" with pre-cursor equalization disabled (R_{pre} no greater than 1.38).
b) R_{pst} shall not be greater than 1.08 for any c_1 increment request that returns status "maximum" with pre-cursor equalization disabled (R_{pre} no greater than 1.08).
c) R_{pre} shall not be less than 1.39 for any c_{-1} decrement request that returns status "minimum" with post-cursor equalization disabled (R_{pst} no greater than 1.13).
d) R_{pre} shall not be greater than 1.08 for any c_{-1} increment request that returns "maximum" with post-cursor equalization disabled (R_{pst} no greater than 1.08 dB).
e) With both pre- and post-cursor equalization disabled (R_{pre} no greater than 1.08 and R_{pst} no greater than 1.08), the value of V_{ss} shall be no greater than 100 mV for any c_0 decrement request that returns status "minimum".
f) For adjacent post-cursor settings (k) and (k−1) resulting from a single increment or decrement operation on tap c_{-1}, D_{pst} shall be greater than 0 and less than 0.0263.
g) For adjacent pre-cursor settings (k) and (k−1) resulting from a single increment or decrement operation on tap c_1, D_{pre} shall be greater than 0 and less than 0.0263.
h) Adjacent main tap settings (k) and (k−1) resulting from a single increment or decrement operation on tap c_0, D_{main} shall be greater than 0 and less than 50 mV.

i) For any tested transmitter state (k), the magnitude of V_{ss} shall not be less than 40 mV.

72.6.1.11 Transmitter Output Waveform Measurement Requirements

The transmitter output waveform shall be verified with the square wave test pattern defined in 49.2.8 with n greater than or equal to 8.

The transmitter output waveform test is based on three voltages, V_{pre}, V_{pst}, and V_{ss}, which shall be measured as shown in Figure 72–X and described below.

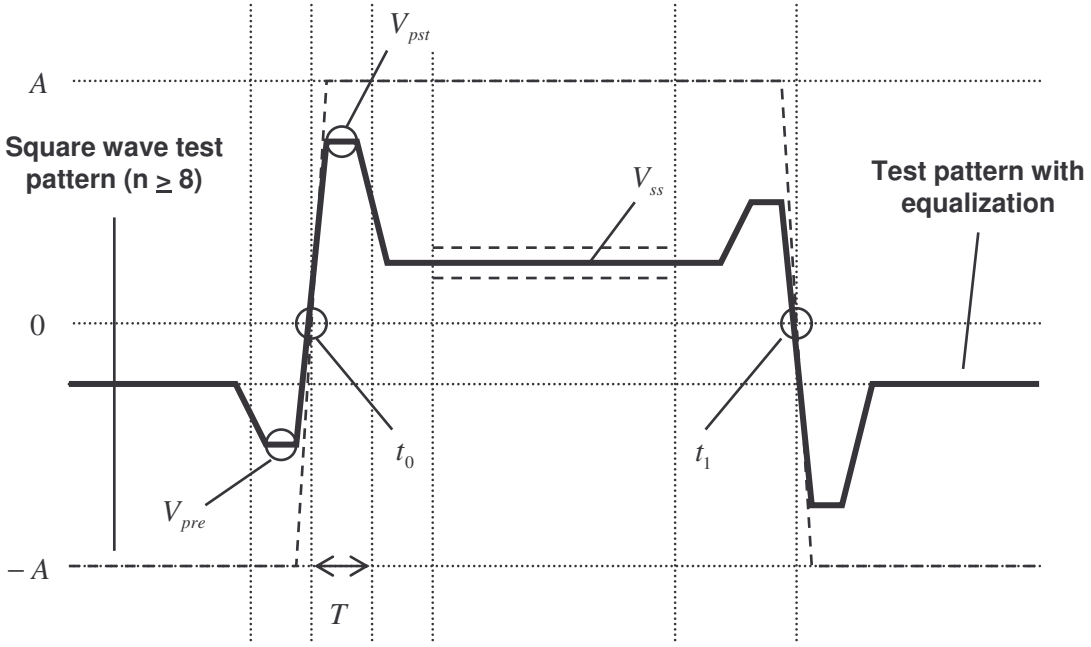

Figure 72–X–Transmitter Output Waveform

where:

A = peak differential transmit output amplitude
T = symbol period
t_0 = zero-crossing point of the rising edge of the AC-coupled signal
t_1 = zero-crossing point of the falling edge of the AC-coupled signal
V_{pre} = minimum voltage measured in the interval t_0–T to t_0
V_{pst} = maximum voltage measured in the interval t_0 to t_0+T
V_{ss} = steady-state voltage measured as the average voltage in the interval t_0+2T to t_1–2T

From these voltages, the pre- and post-cursor equalization ratios R_{pre} and R_{pst} are derived.

$$R_{pre} = -\frac{V_{pre}}{V_{ss}}$$

$$R_{pst} = \frac{V_{pst}}{V_{ss}}$$

The pre- and post-cursor step sizes may also be derived from these voltage measurements. For adjacent pre-cursor states $V_{pre}(k)$ and $V_{pre}(k-1)$ resulting from a single increment or decrement operation on tap c_1, the step-size D_{pre} is defined to be:

$$D_{pre} = \left| \frac{V_{pre}(k) - V_{pre}(k-1)}{2\left(V_{pst}(k) - V_{pre}(k) - V_{ss}(k)\right)} \right|$$

Similarly, for adjacent post-cursor states $V_{pst}(k)$ and $V_{pst}(k-1)$ resulting from a single increment or decrement operation on tap c_{-1}, the step-size D_{pst} is defined to be:

$$D_{pst} = \left| \frac{V_{pst}(k) - V_{pst}(k-1)}{2\left(V_{pst}(k) - V_{pre}(k) - V_{ss}(k)\right)} \right|$$

Measurements of D_{pre} and D_{pst} require that the peak-peak differential output amplitude be constant (within 3%) between states (k) and (k-1). Given that the peak differential output voltage A = Vpst−Vpre−Vss, the c_0 tap shall be adjusted to yield that same value of A over all tested transmitter states (k). This value 2A shall be within the peak-peak differential output voltage range specified in Table 72-5.

For adjacent transmitter states (k) and (k−1) resulting from a single increment or decrement operation on tap c_0, the step-size D_{main} is defined to be:

$$D_{main} = \left| V_{ss}(k) - V_{ss}(k-1) \right|$$