



Application Note EA 44-1/250602

The Cause of Uneven Error Rates in EA Subchannels



The demultiplexer in the EA 44 operates with a half-clock system, i.e. to demultiplex a 44 GBit/s signal, a 22 GHz clock signal must be applied. Figure 1 shows the optimal timing arrangement for the internal decision threshold.

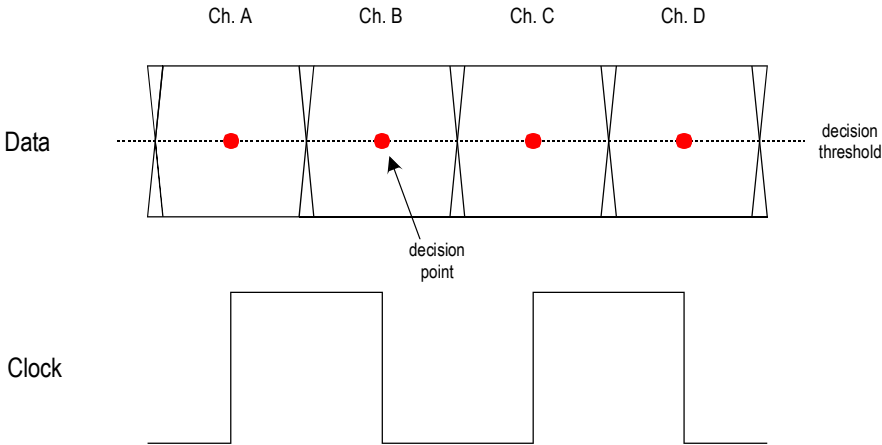


Figure 1: Optimal setting for the internal decision threshold

In this example, the demultiplexer switches at the rising edge of the clock for channels A and C, and the falling edges for channels B and D. The optimal position of the switching point is in the centre of the data eye.

If the switching point moves towards the edge of the data eye, the subchannels will start to display errors (Figure 2). The number of errors will be more or less the same in all channels if the data signal and clock signal are symmetrical.

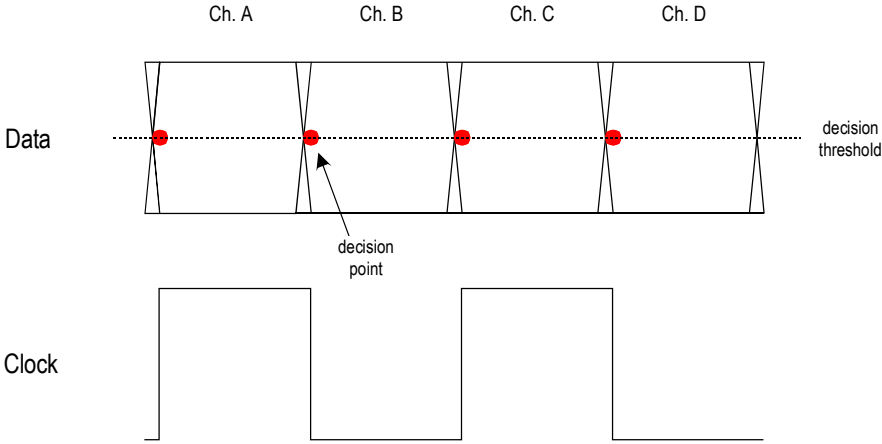


Figure 2: Timing at the internal decision threshold with a shifted clock signal

In the case where the data signal is not symmetrical compared to the clock ratio (Figure 3), the channels A and C (for example) could be error free, whereas B and D would display a lot of errors. The same will occur with a clock signal which does not have a 50% duty ratio.

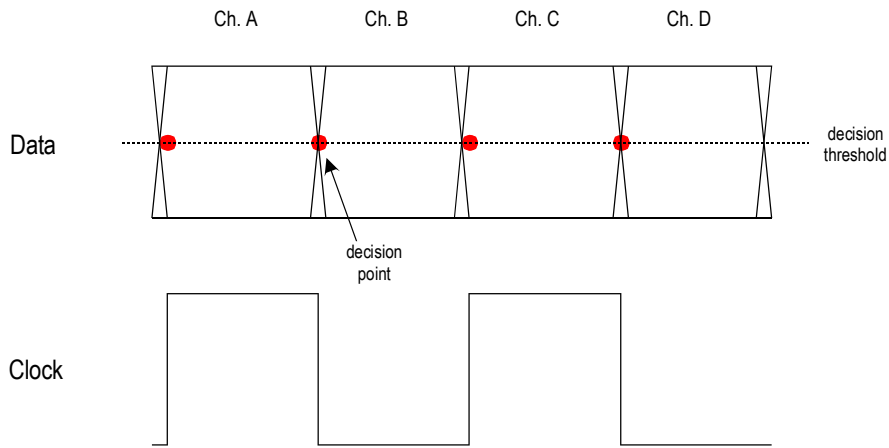


Figure 3: Timing at the internal decision threshold with a shifted clock signal and asymmetric data signal.

Similar problems can occur if the crossing points of following data eyes are not at the same level. In Figure 4, channels A and C would be error free, whereas B and D would display errors.

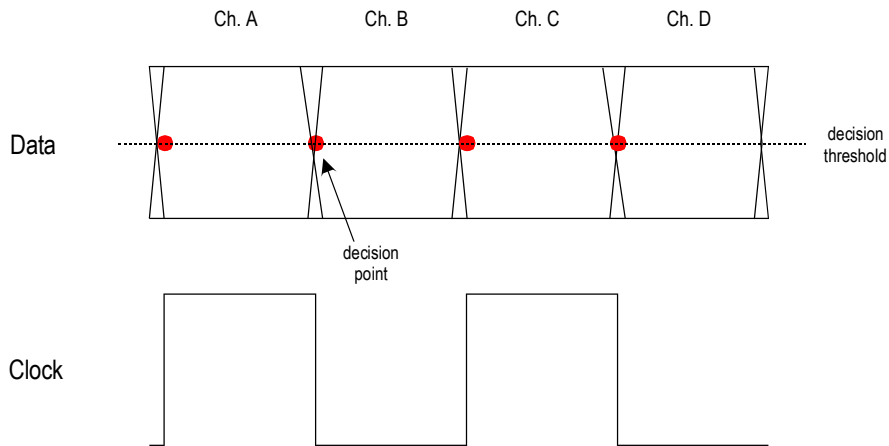


Figure 4: Timing at the internal decision threshold with shifted clock signal and asymmetric data signal (shifted crossings)

These distortions in the data and clock signals can appear in the signals that are fed into the demultiplexer. Alternatively, they may arise from the input amplifier stage of the amplifier. If the jitter and amplitude of the signals are greater than the sensitivity threshold of the demultiplexer, they will have no consequences. If they become smaller, some errors could appear in the subchannels, as described above.

In order to avoid such problems, the signals applied should always be appreciably larger than the sensitivity limit of the instrument.