

Numerically Controlled Re-sampler

bc004

The Binary Core Numerically Controlled Re-sampler (NCR) efficiently performs both filtering and up-/down-sampling of a finely tuneable and dynamically modifiable factor.

The up-sampler can be used for spectral shaping before digital-to-analog conversion, thus increasing the system bandwidth agility. The down-sampler is very well suited for anti-aliasing filtering and synchronous re-sampling after analog-to-digital conversion.

Features

- Up-sampling and down-sampling modes available.
- Finely tunable re-sampling factor. In the up-sampling mode

$$\eta_{\text{up}} = \frac{f_{\text{out}}}{f_{\text{in}}} = \frac{512}{q}$$

In the down-sampling mode

$$\eta_{\text{down}} = \frac{f_{\text{in}}}{f_{\text{out}}} = \frac{512}{q}$$

The parameter q , with $1 \leq q \leq 512$, can be dynamically set by the user.

- User-definable filter impulse response.
- Efficiency and control on the FPGA resource utilization (logic elements, memory blocks and embedded multipliers).

Typical applications

A typical use for the Binary Core NCR in up-sampling mode is shown in the diagram of Figure 1, where the input data can be asynchronous with respect to the local oscillator, and the parameter q is controlled by the filling status of an input FIFO. In Figure 2 a typical use of the down-sampler is represented, where the parameter q is dynamically controlled, e.g., by a timing recovery algorithm.

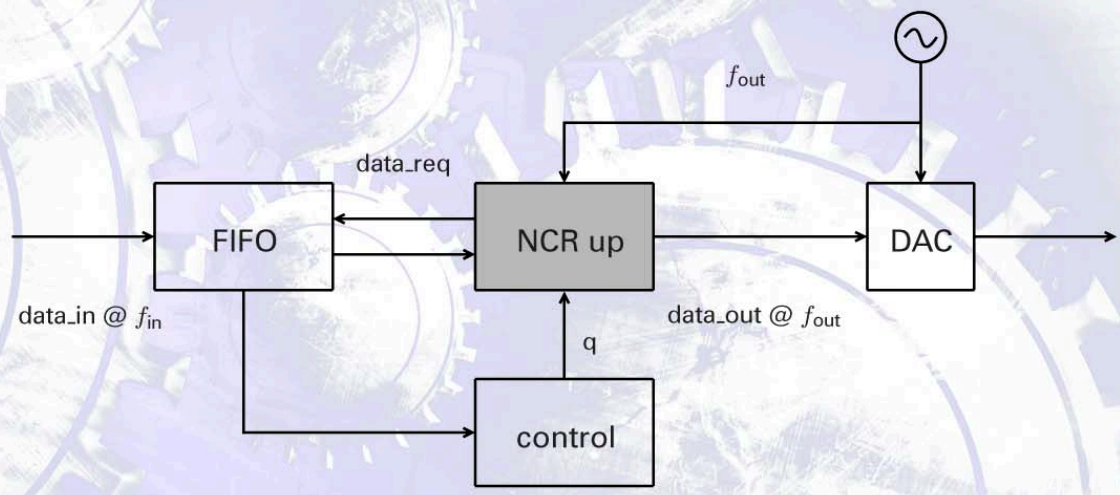


Figure 1: Up-sampler typical use

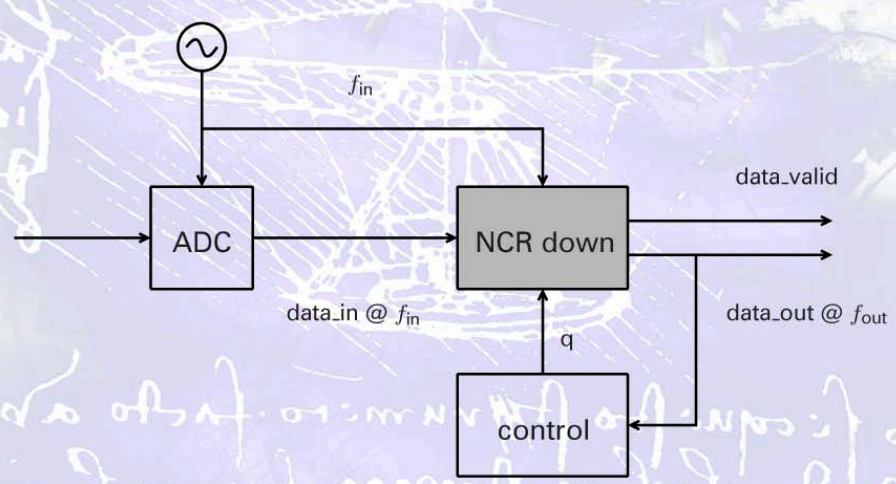


Figure 2: Down-sampler typical use