33.9 Limit Checking

A comparator provides automatic limit checking by comparing each result to two configurable reference values. This feature can be used to supervise the input signal and detect abnormal input values. The comparator can generate a separate service request.

The two reference values are defined in the select register **BOUNDSELx (x=0-13)** and determine the valid result value band.

The result values can be taken either from the main filter chain or from the auxiliary filter. Please refer to **"Auxiliary Filter" on Page 67**.

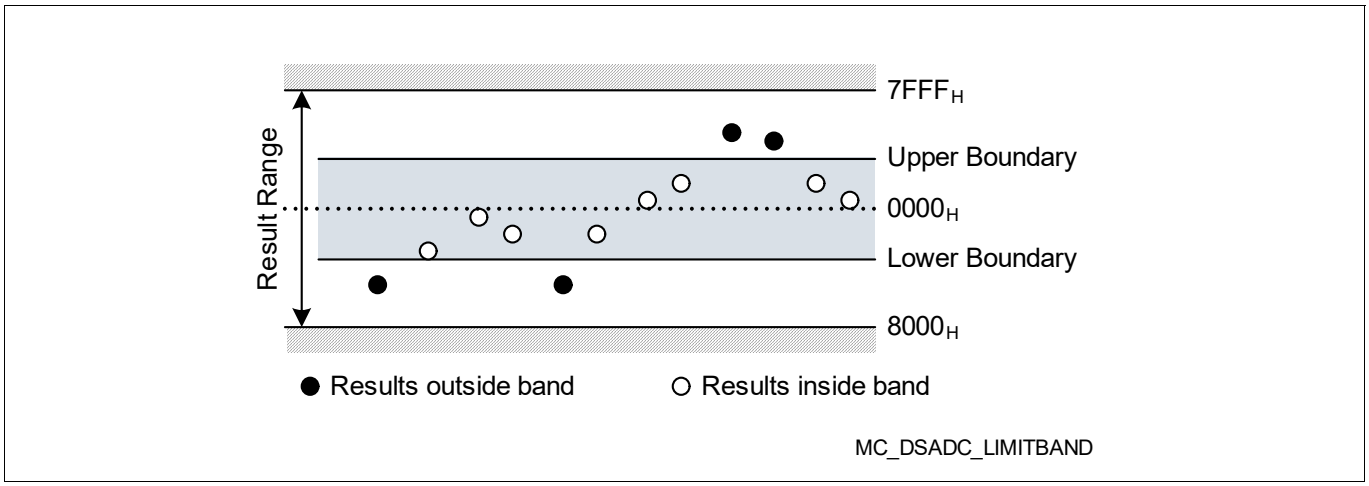

Figure 317 Result Monitoring through Limit Checking

A result value is considered inside the defined band when both of the following conditions are true:

- the value is less than or equal to the selected upper boundary
- the value is greater than or equal to the selected lower boundary

The result range can also be divided into two areas:
To select the lower part as valid band, set the lower boundary to the minimum value (8000_H) and set the upper boundary to the highest intended value.
To select the upper part as valid band, set the upper boundary to the maximum value ($7FFF_H$) and set the lower boundary to the lowest intended value.

The limit checker can generate two types of output:

- Service requests, optionally restricted by the comparators
- Range signals, indicating the result level with respect to the defined limits:
  - Signal SAULx, indicating when the results are above the upper limit
  - Signal SWIBx, indicating when the results are within the defined band
  - Signal SBLLx, indicating when the results are below the lower limit

An alarm event can be generated when a new conversion result becomes available. Alarm events can be restricted to result values that are inside or outside a user-defined band (see **Figure 317**). This feature supports automatic range monitoring and minimizes the CPU load by issuing service requests only under certain conditions. For example, an input value can be monitored and an alarm indicates a certain threshold.

Alarm events can also be suppressed completely. Bitfields SRGA and ESEL in register **FCFGMx (x=0-13)** select the service request generation mode.

The range signals (SAULx, SWIBx, SBLLx) are generated independent of service requests.

Boundary Select Register x

BOUNDSELx (x=0-13)

Boundary Select Register x **(0178_H+x*100_H)** **Application Reset Value: 0000 0000_H**

31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
BOUNDARYU															
rw															

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
BOUNDARYL															
rw															

Field	Bits	Type	Description
BOUNDARYL	15:0	rw	**Lower Boundary Value for Limit Checking** This (two's complement) value is compared to the upper bits of the CIC filter results.
BOUNDARYU	31:16	rw	**Upper Boundary Value for Limit Checking** This (two's complement) value is compared to the upper bits of the CIC filter results.

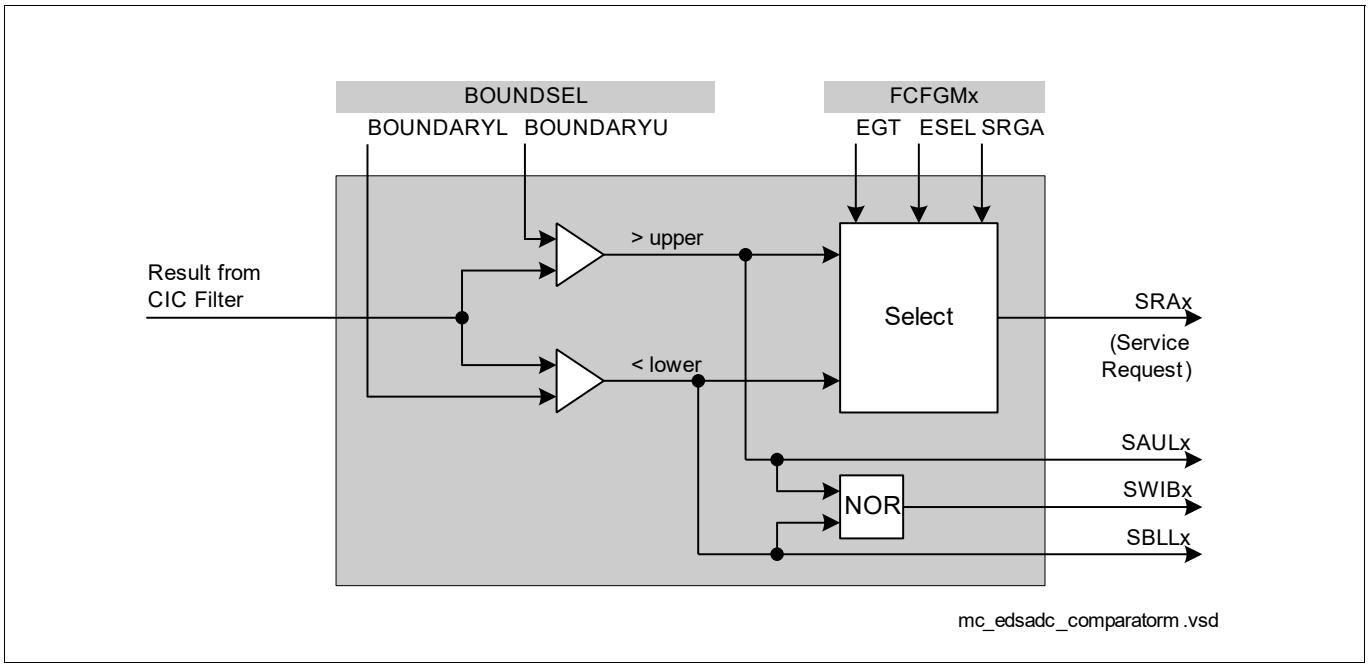

Figure 318 Comparator Structure

Selecting the Boundary Values

The comparator can be fed with result values from either the main CIC filter or from the auxiliary CIC filter. Since these filters generate result values in different formats, also the corresponding boundary values must fit to the selected format.

- The auxiliary CIC filter generates results in a fixed 1Q15 format. Due to the intrinsic gain of the on-chip modulator full-scale ranges from -22 757 to +22 757. When using an external modulator, the full-scale values depend on the gain of the used modulator.
- The main CIC filter generates results in a user-configurable format, where the full-scale value is defined by bitfield GAINCALx.CALTARGET.

For proper operation, the boundary values must relate to the selected filter's data format.

Note: There is no calibration in the auxiliary filter path. Offset and gain error must, therefore, be handled by the application software.
*The respective values can be obtained from registers **GAINCALx (x=0-13)** and **OFFCOMPx (x=0-13)** after calibration.*