

Position Interface Unit

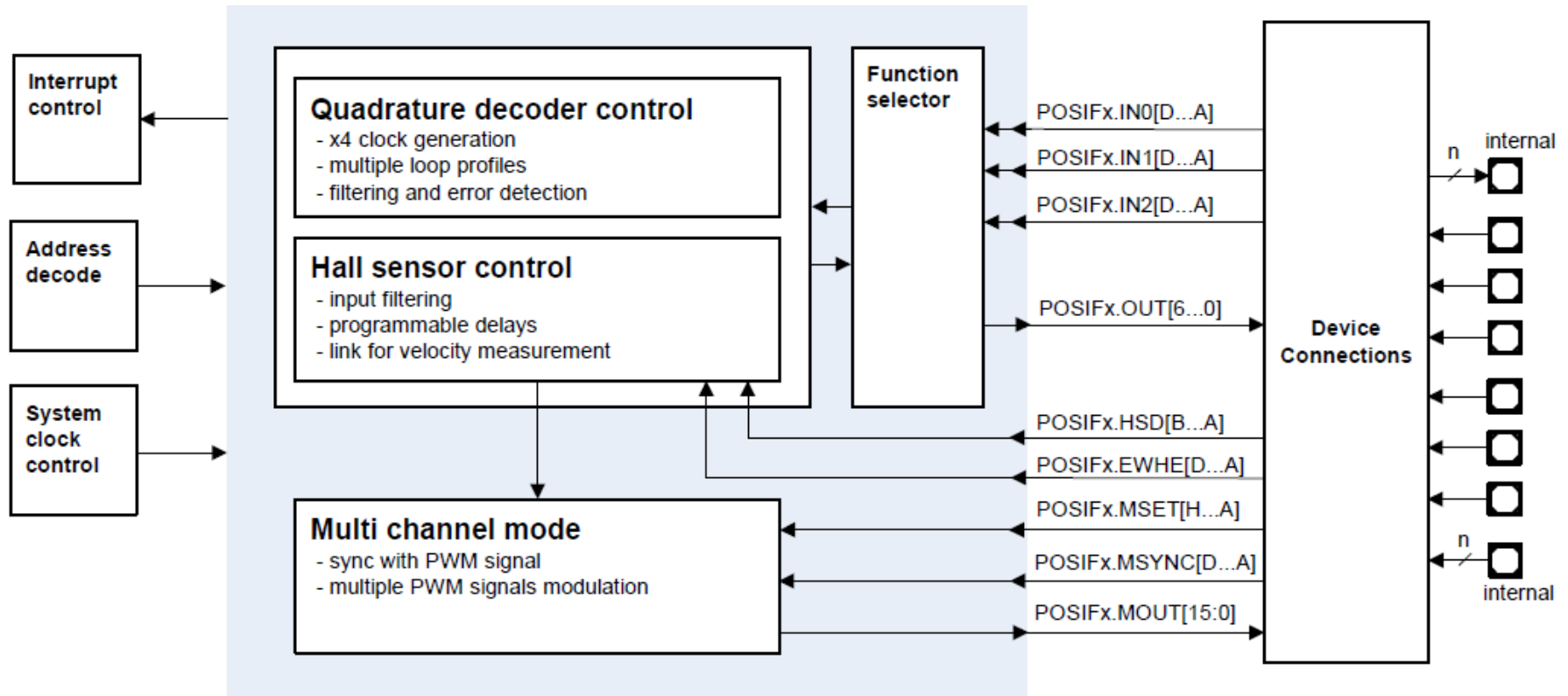
POSIF



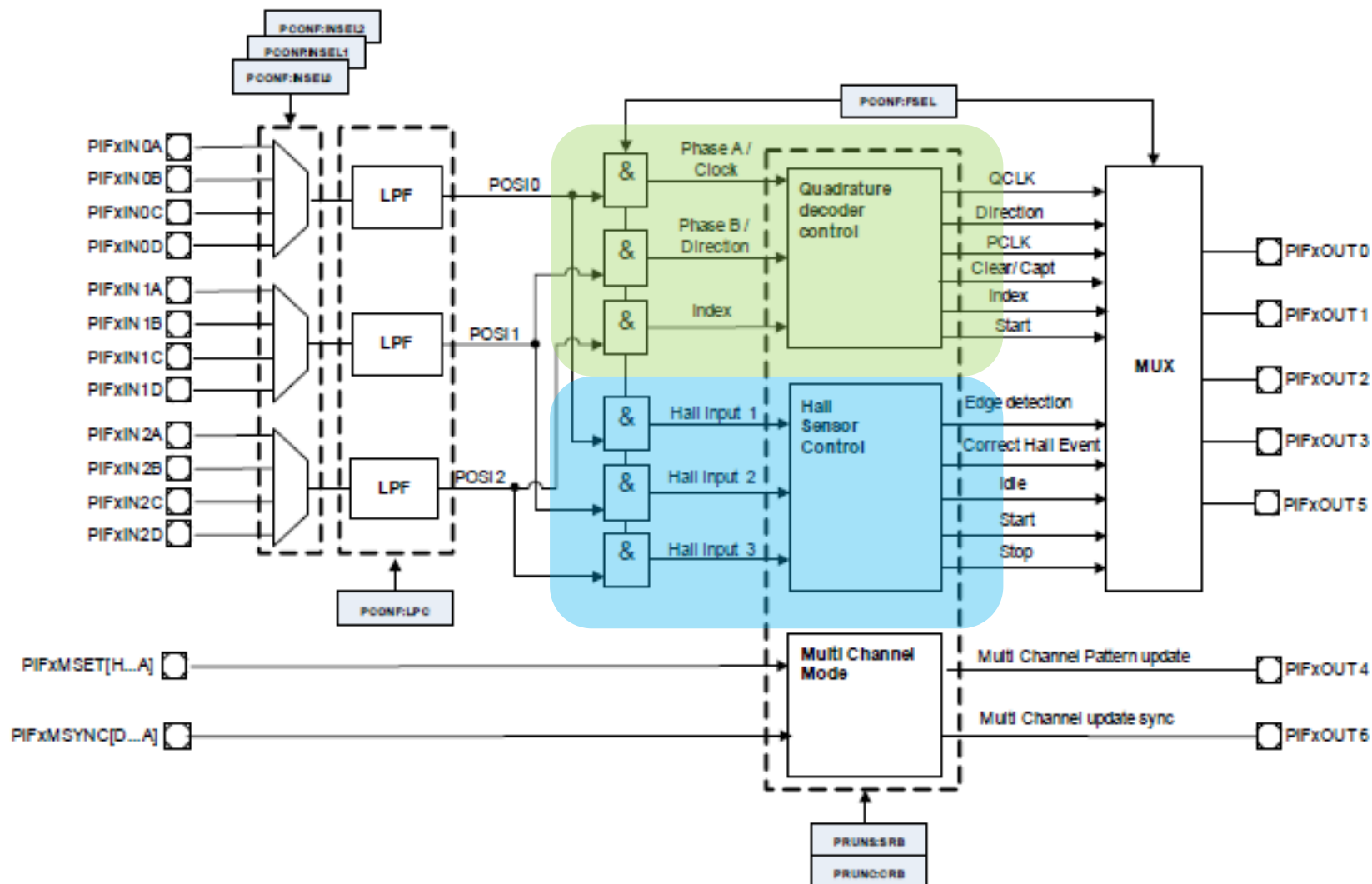
Position Interface (POSIF) – Key features

Modes in POSIF

- Quadrature Decoder Mode
- Hall Sensor Mode
- Multi Channel Mode



POSIF – Function Selector



POSIF – Function Selector

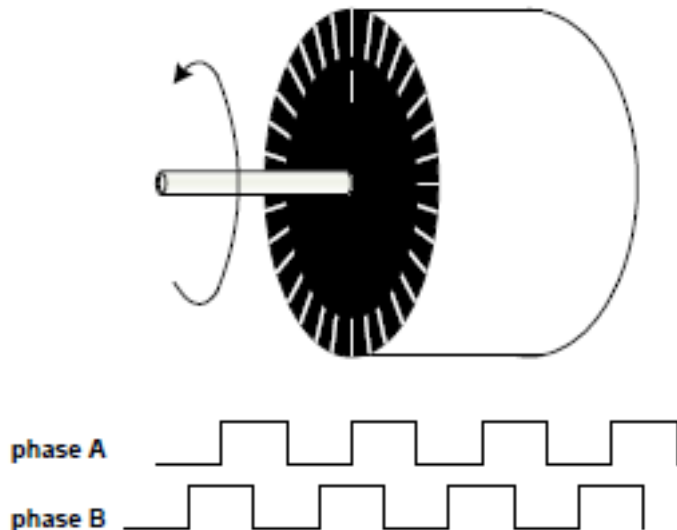
Field	Bits	Type	Description
FSEL	[1:0]	rw	Function Selector 00 _B Hall Sensor Mode enabled 01 _B Quadrature Decoder Mode enabled 10 _B Stand alone Multi Channel Mode enabled 11 _B Quadrature Decoder and Stand alone Multi Channel Mode enabled

Pin	I/O	Hall Sensor Mode	Quadrature Decoder Mode	Multi-Channel Mode (stand-alone)
POSIFx.IN0[D...A]	I	Hall Input 1	Encoder Phase A or Clock	Not used
POSIFx.IN1[D...A]	I	Hall Input 2	Encoder Phase B or Direction	Not used
POSIFx.IN2[D...A]	I	Hall Input 3	Index/Zero marker	Not used
POSIFx.HSD[B...A]	I	Hall pattern sample delay	Not used	Not used
POSIFx.EWHE[D...A]	I	Wrong hall event emulation	Not used	Wrong hall event emulation
POSIFx.MSET[H...A]	I	Multi-Channel next pattern update set	Not used	Multi-Channel next pattern update set
POSIFx.MSYNC[D...A]	I	Multi-Channel pattern update synchronization	Not used	Multi-Channel pattern update synchronization

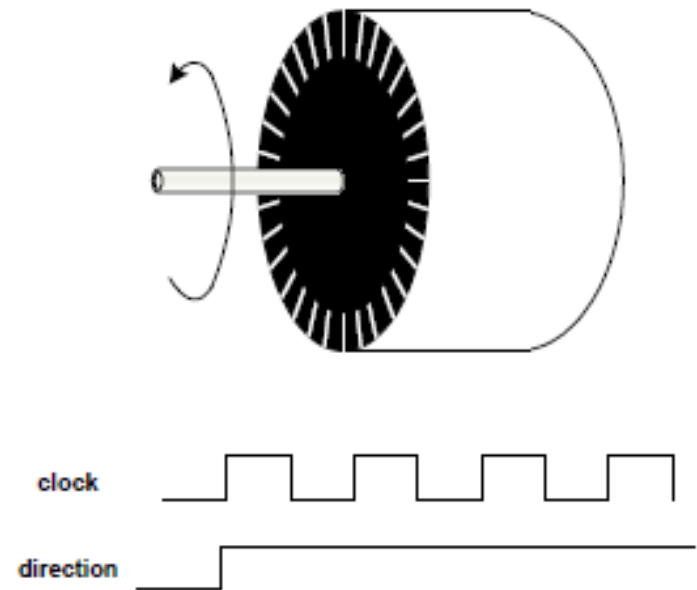
POSIF – Quadrature Decoder

Mode

- Standard Quadrature Mode
- Direction Count Mode

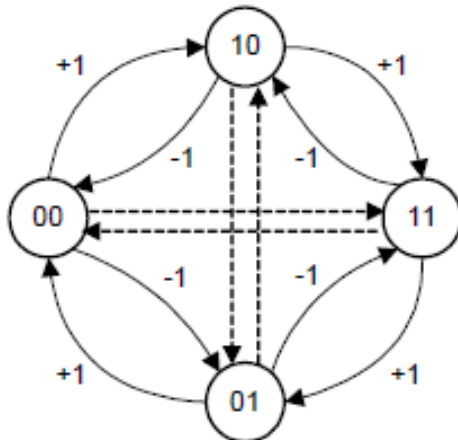
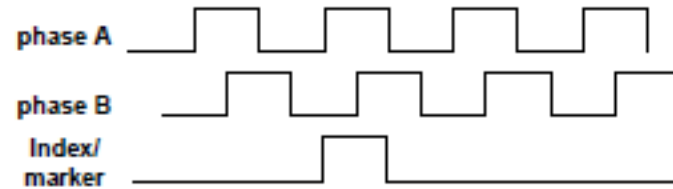
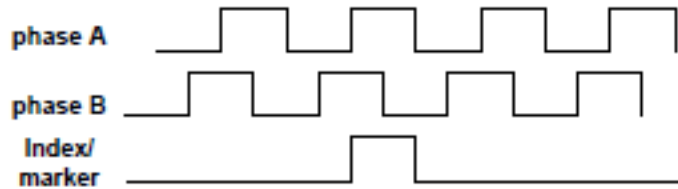
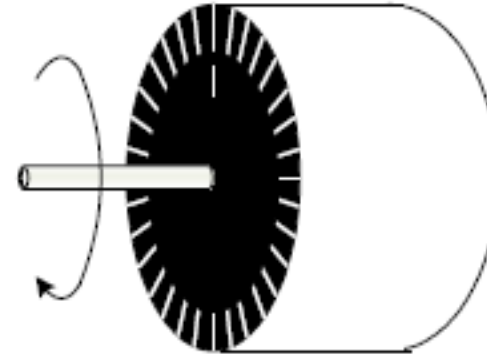
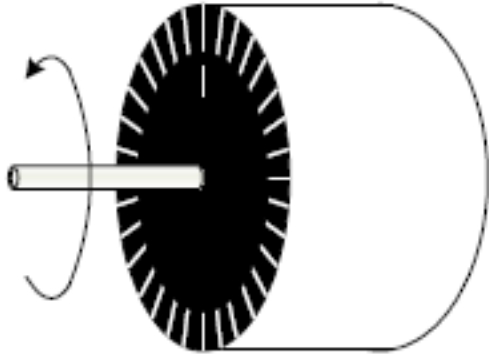


Standard Quadrature Mode
Two Phase information

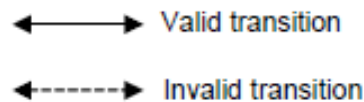


Direction Count Mode
Count & Direction information

POSIF – Quadrature Decoder



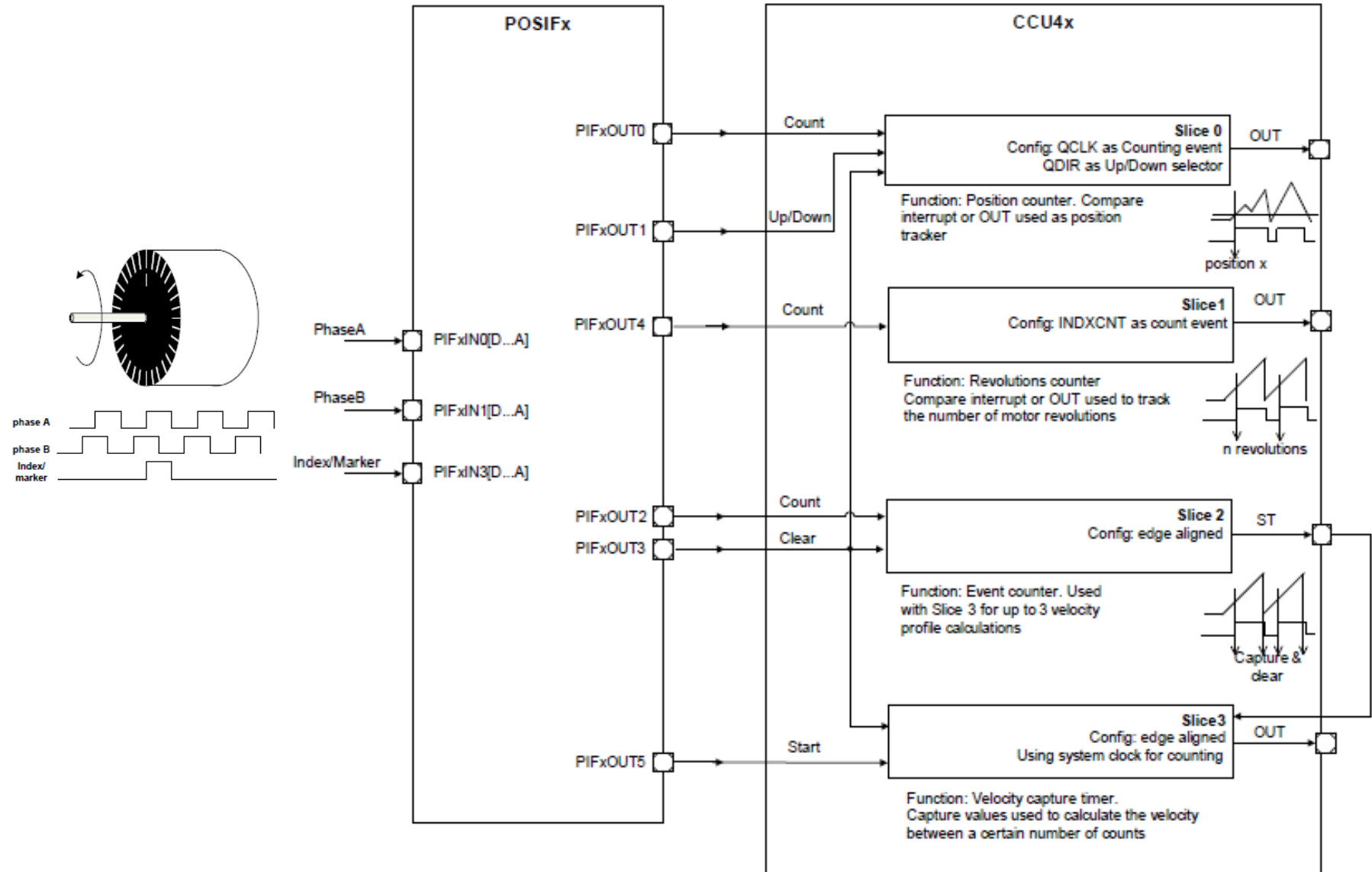
BA



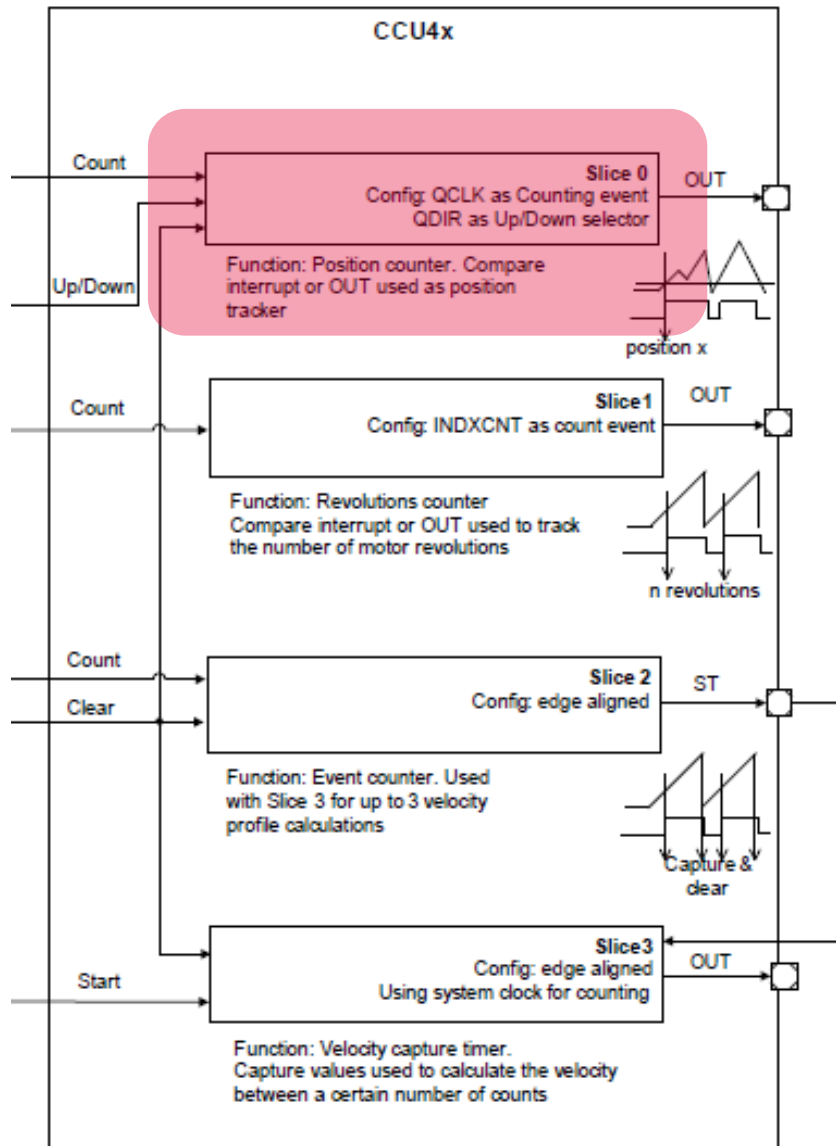
- For a valid transition, it will increment or decrement the count based on the direction

Setting POSIF as Encoder interface

1x POSIF, 4x CCU4 slices



Example for a 1000 count encoder



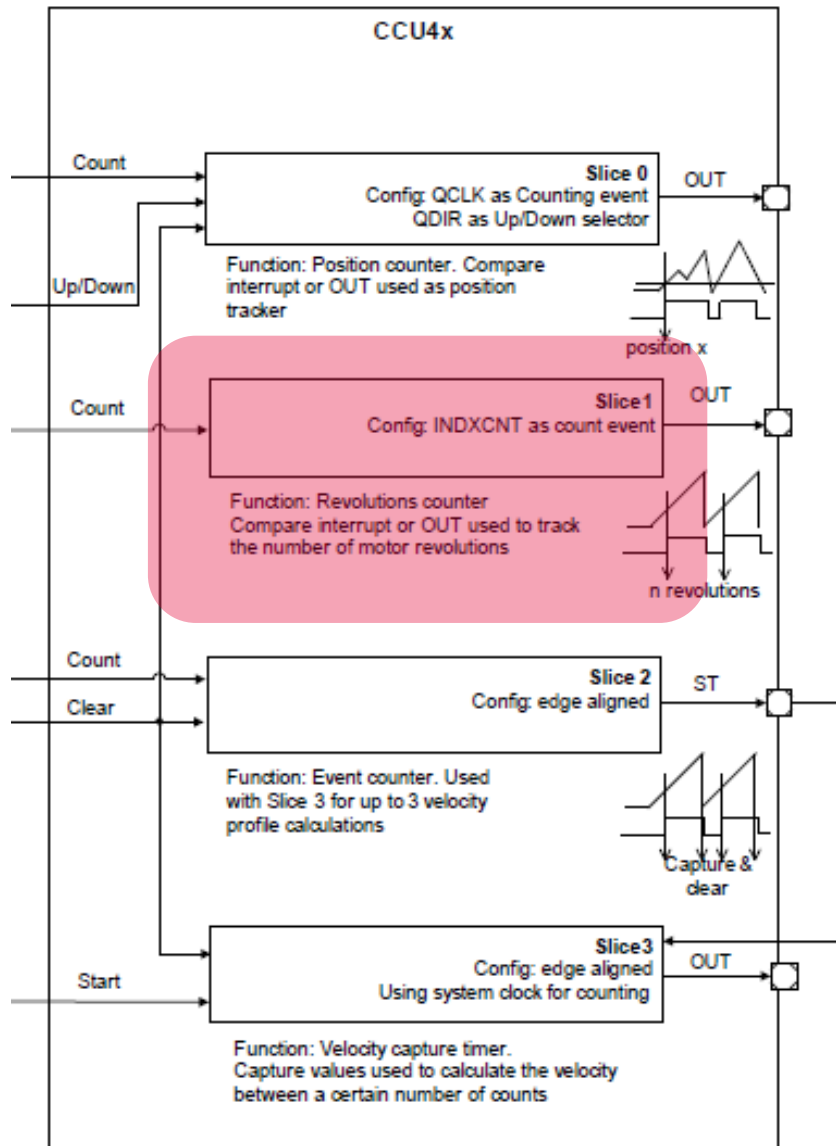
Position Counter

It will count from 0 to 999.

When the count is 500, the motor is at 180°C position.

When the count is 250, the motor is at 90°C position.

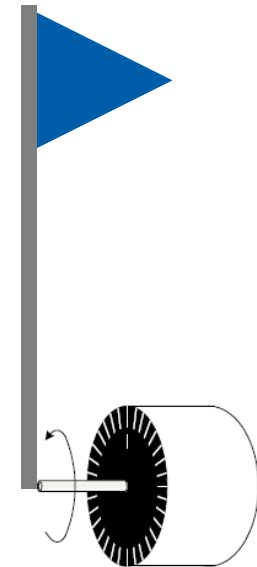
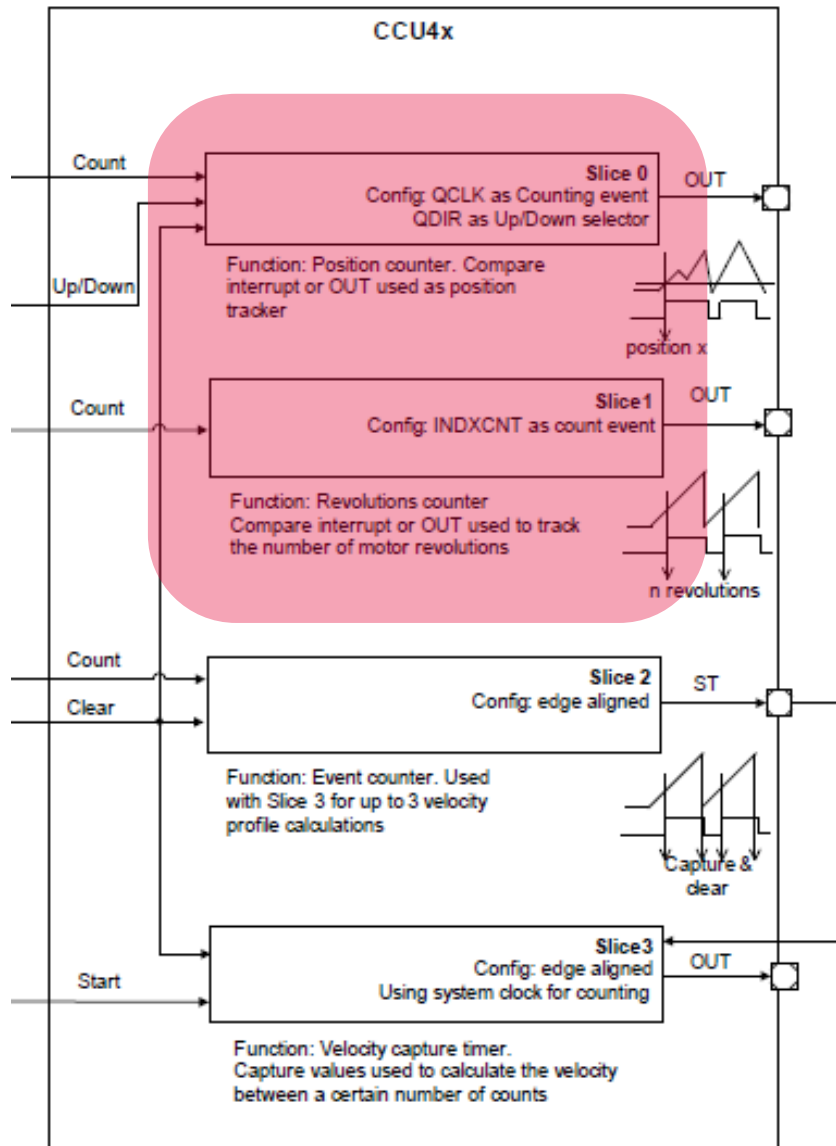
Example for a 1000 count encoder



Revolutions Counter

It will count the number of complete revolutions

Example for a 1000 count encoder

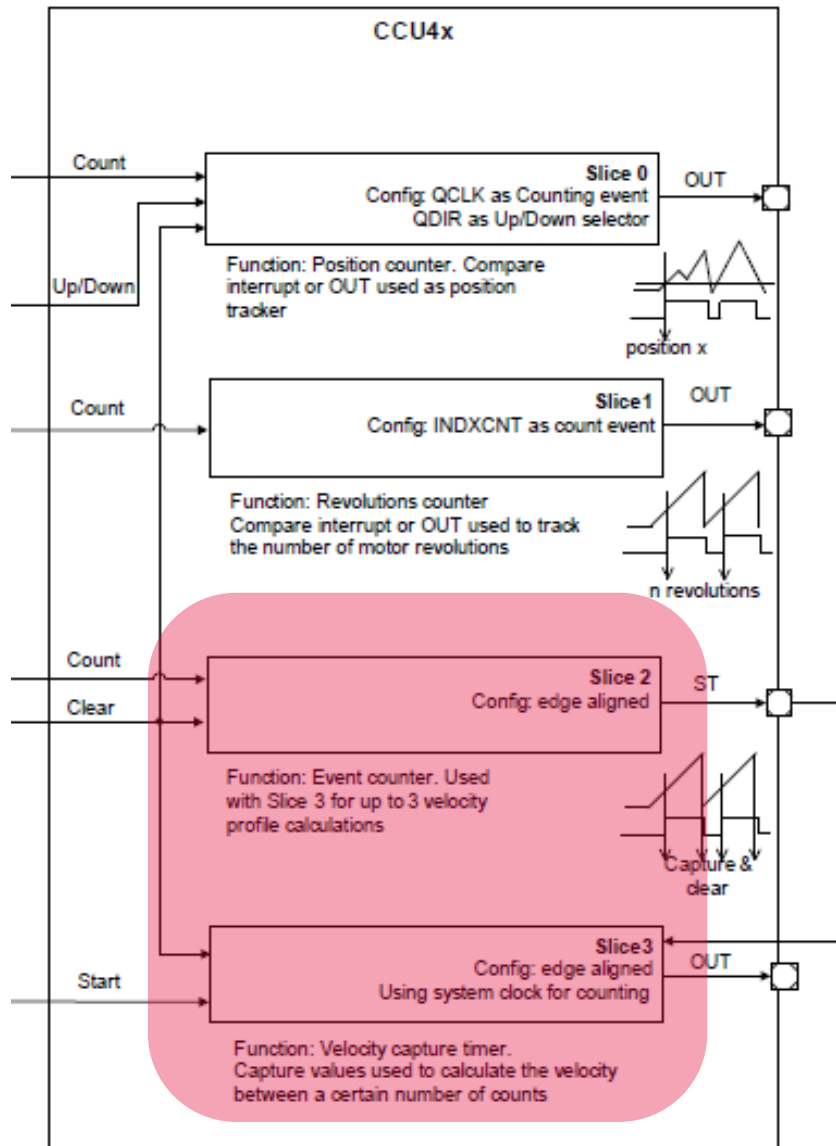


It take 5500 counts to reach end of line.

Revolution counter = 5

Position counter = 500

Example for a 1000 count encoder



Event Counter

It will stop Slice3 when the compare event occurred

For e.g. to detect time to reach 180°C, the Compare value can be setup to 500.

Velocity Capture Timer

The timer will start 0, 1us, 2us, 3us.....

When 180°C has reached, Slice2 will stop Slice3.

Speed

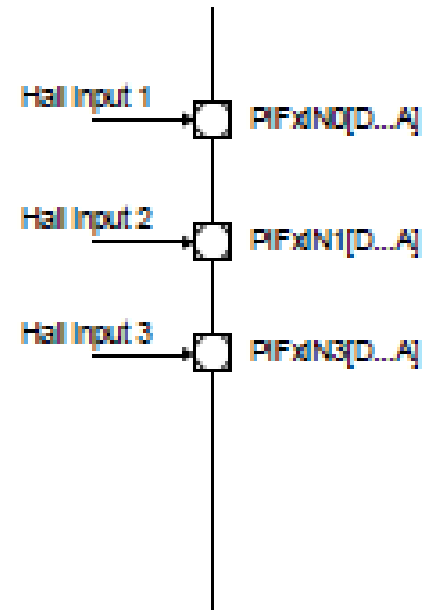
Distance to move 180°C / Time captured

Hall Sensor Mode

- Detection of any modification in the Hall input
- Delay between the detection and sampling of the Hall inputs
- Compare the input against the expected Hall Pattern
- Update of a new multi channel pattern

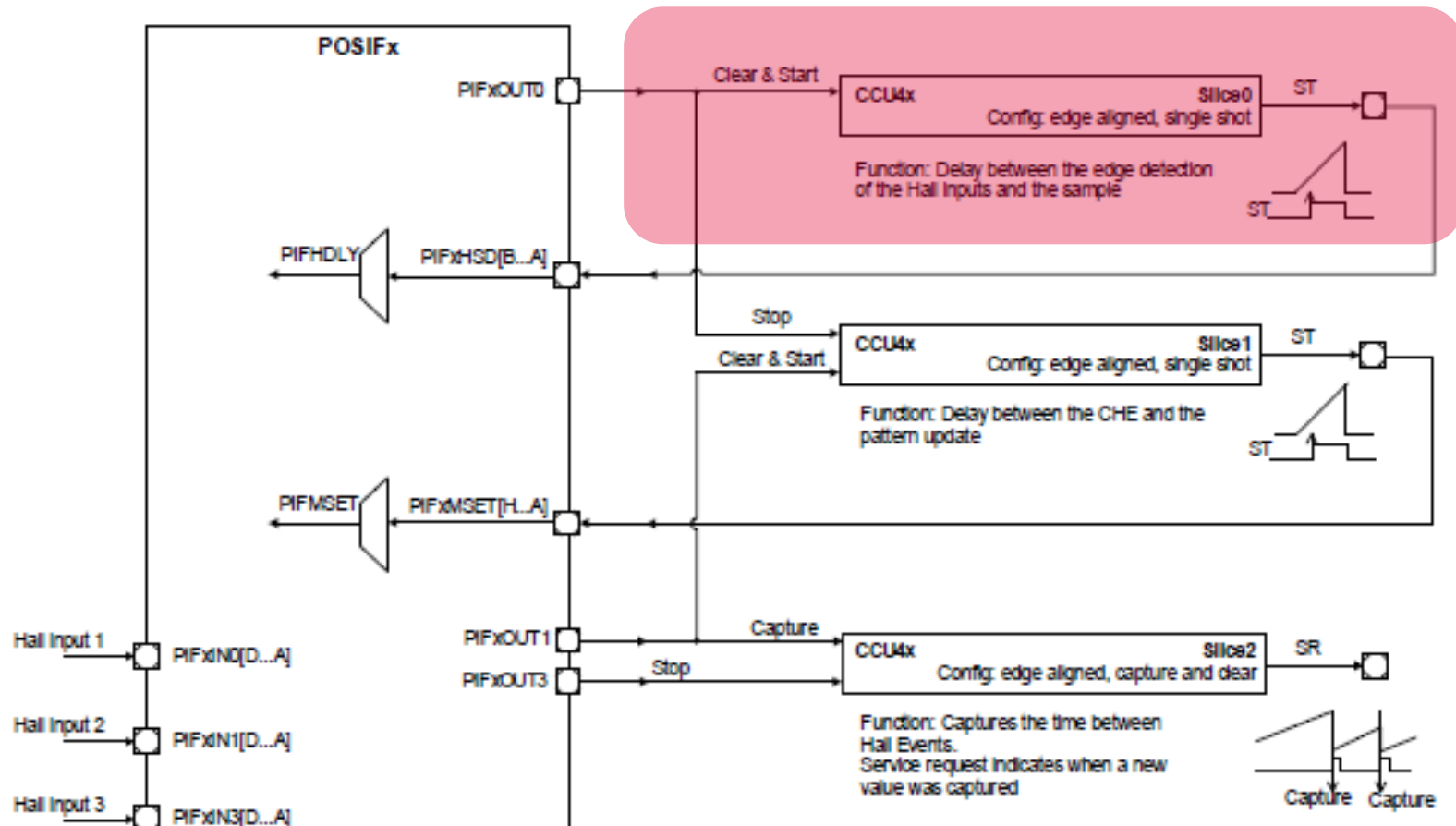


Hall Sensor Mode



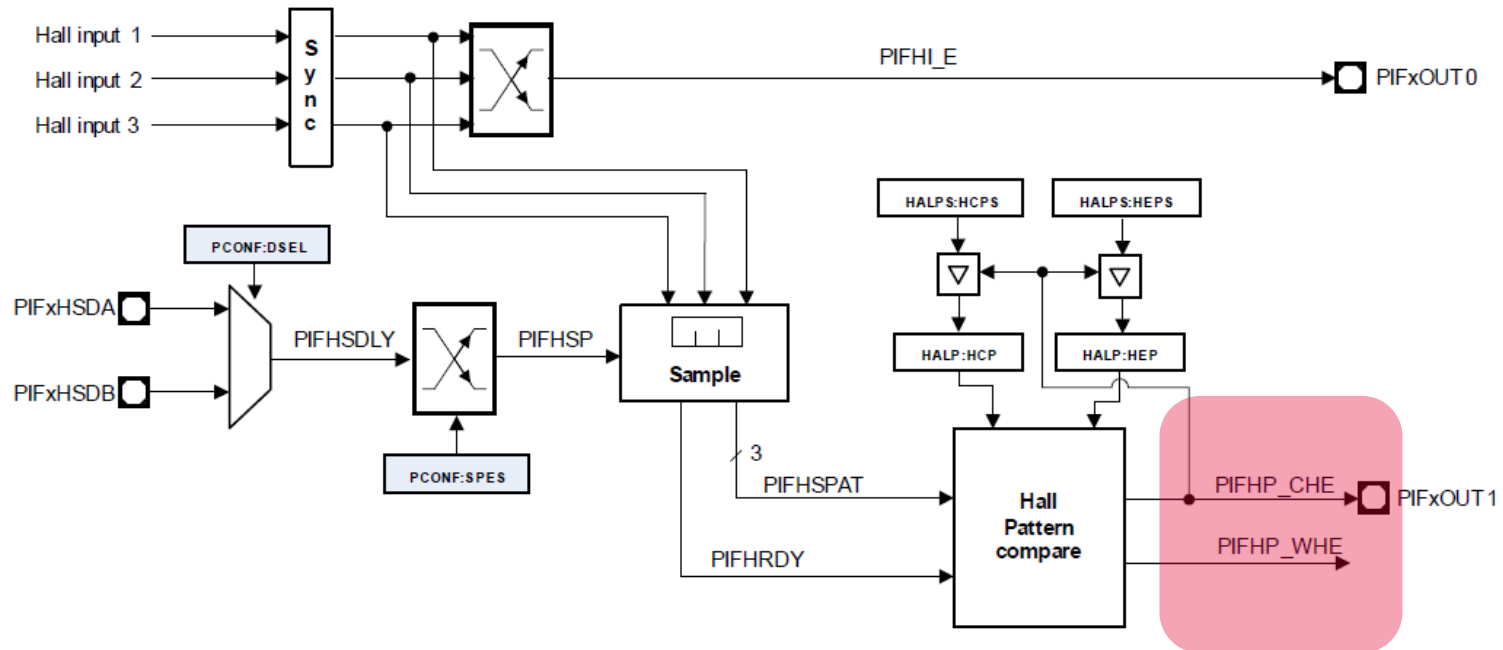
- A transition in any of the three hall input signals indicate a change in the hall state.

Hall Sensor Mode



Noise spike on the hall signal inputs might result in false event.
A flexible delay filter by Slice0 wait for the signal to be stable before reading the transition value

Hall Sensor Mode

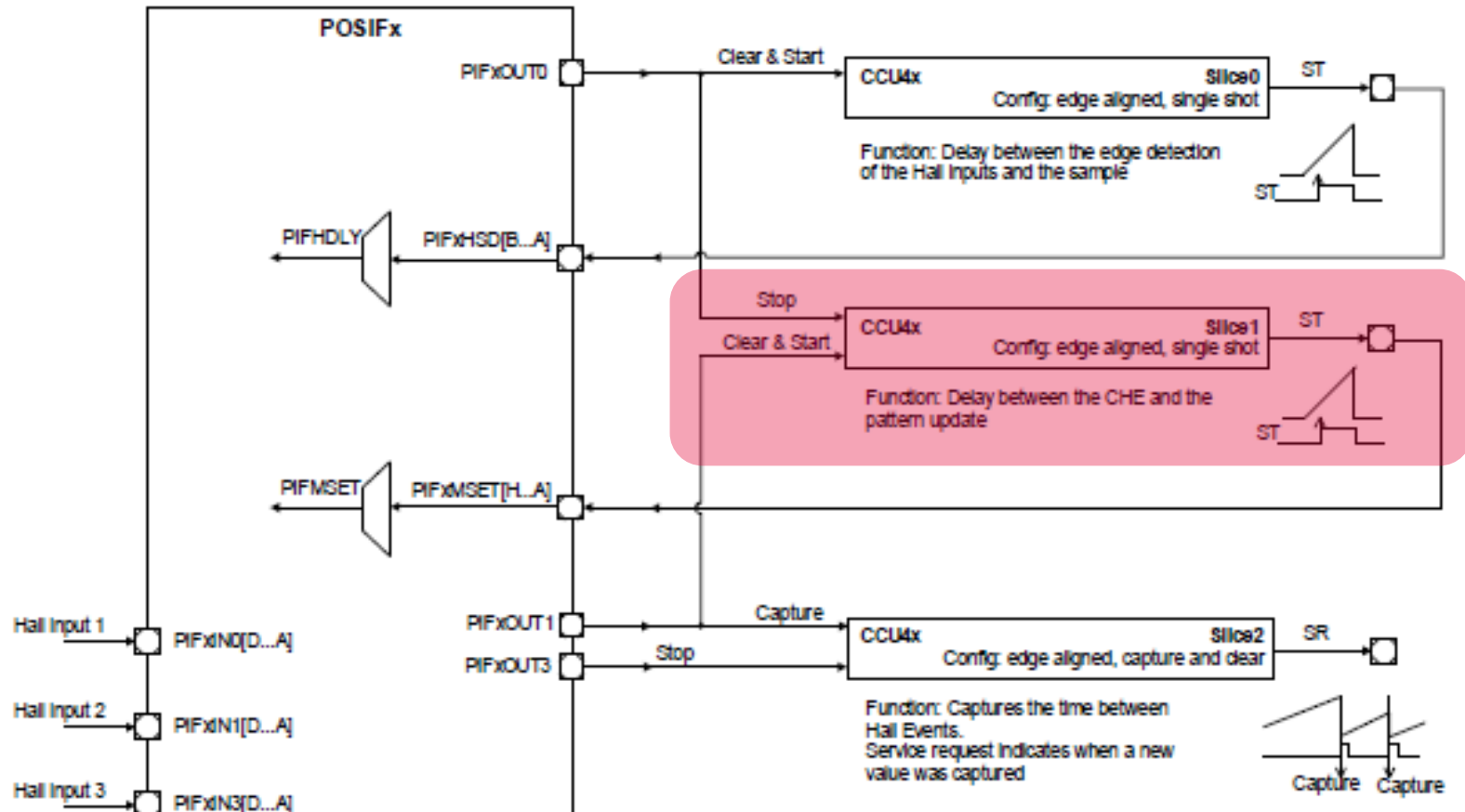


- When the sampled value matches the Expected Hall Pattern, a pulse is generated in the PIFxOUT1 pin
- When the sampled value doesn't match the values either in Current Hall Pattern or Expected Hall Pattern, a Wrong Hall Event signal is generated.

Hall Sensor Mode

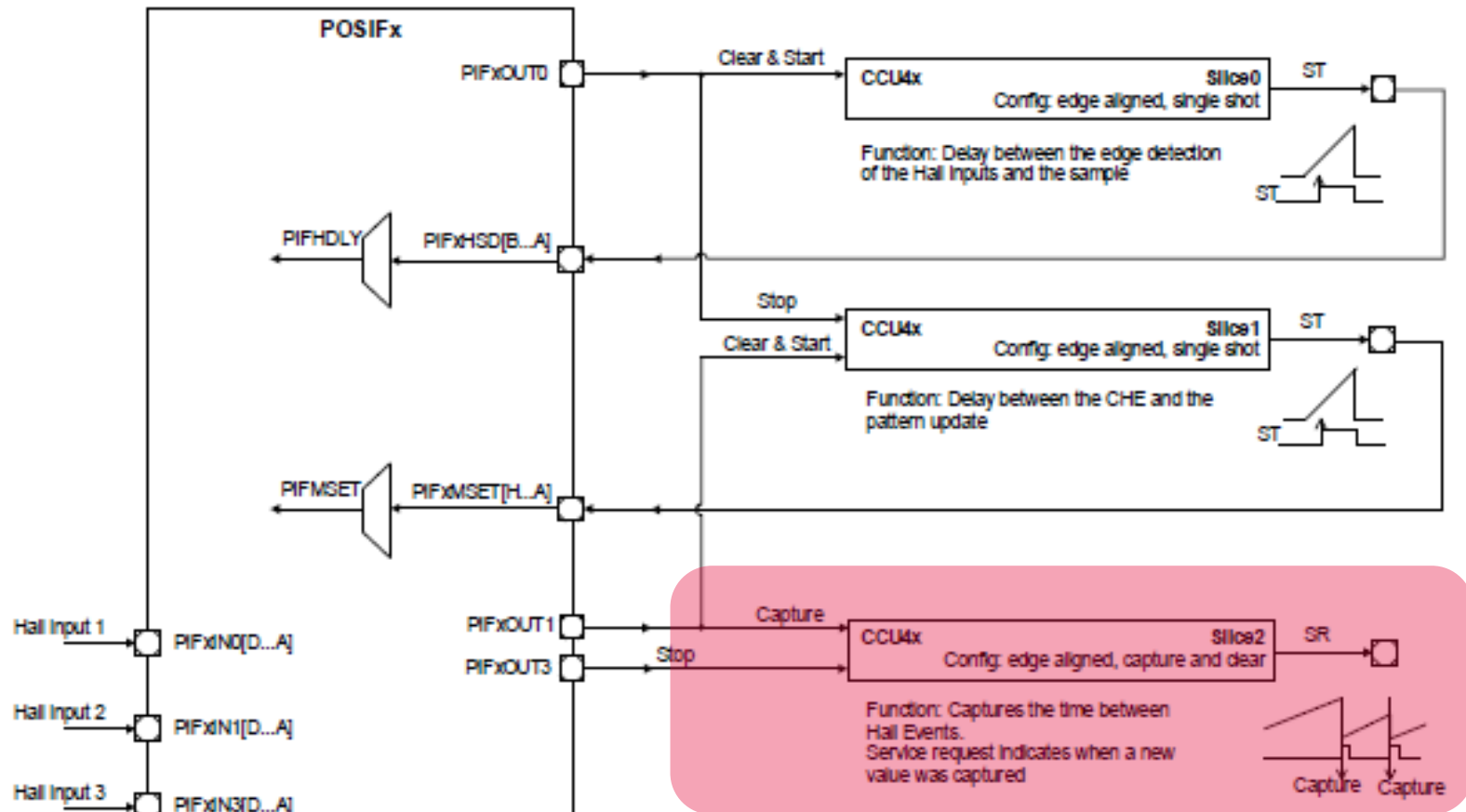
- After the Correct Hall Event is detected, a delay can be generated between this detection and the update of the Multi-Channel pattern.
- The delay for the update of the Multi-Channel pattern can be controlled directly by a CCU4 slice.

Hall Sensor Mode



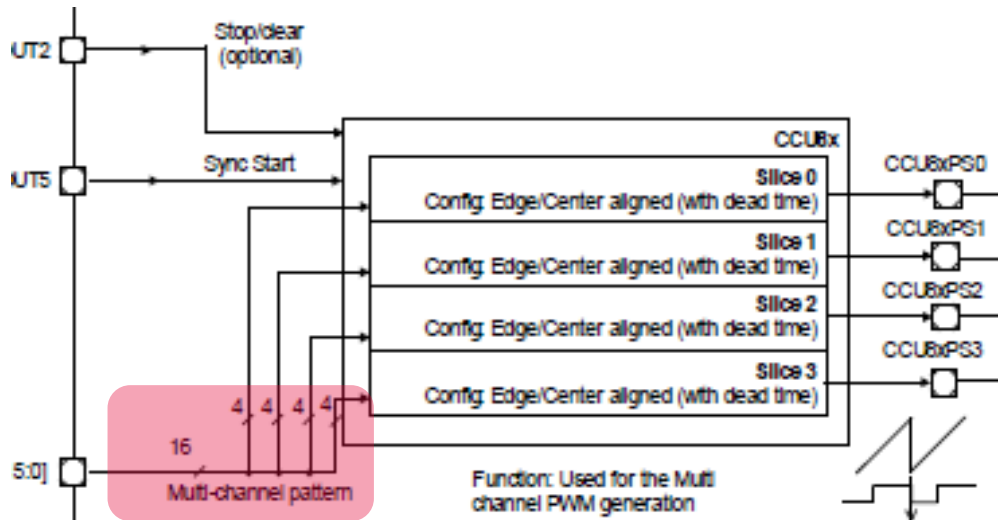
To support Phase delay/advance feature
The actual switching of the outputs can take place after a delay when the transition event is detected

Hall Sensor Mode



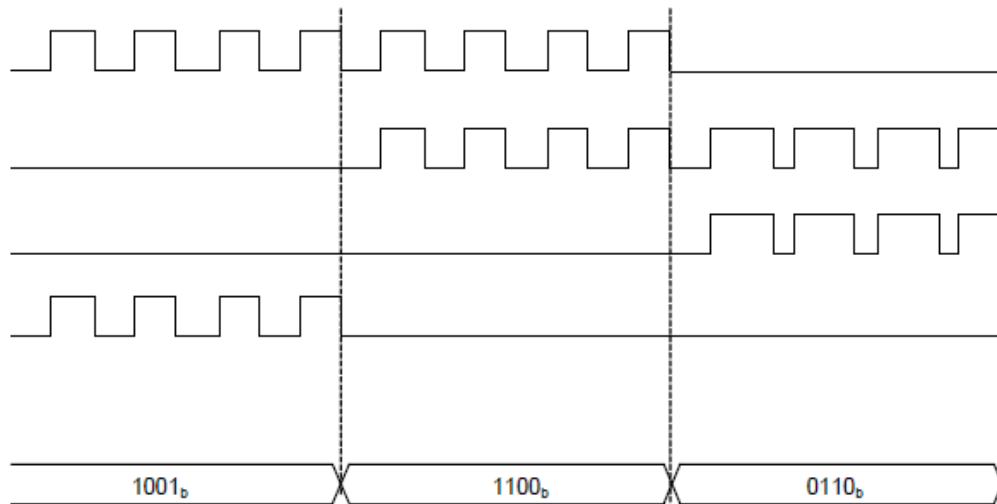
Capture the time between hall events to compute the speed

Hall Sensor Mode

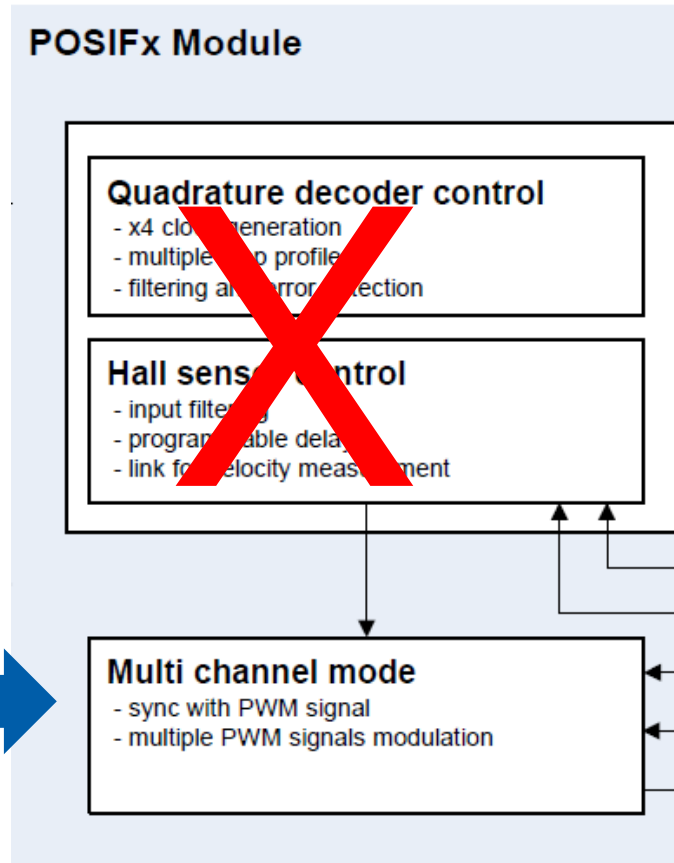


When the Correct Hall Event is detected, multi channel pattern needs to be updated

The update of multi channel pattern needs to be synchronized with the PWM signal



Stand-Alone Multi-Channel Mode



- Software instruction
- External signal
- Other internal hardware signal

Concurrent update of parallel channels
For CCU4 & CCU8

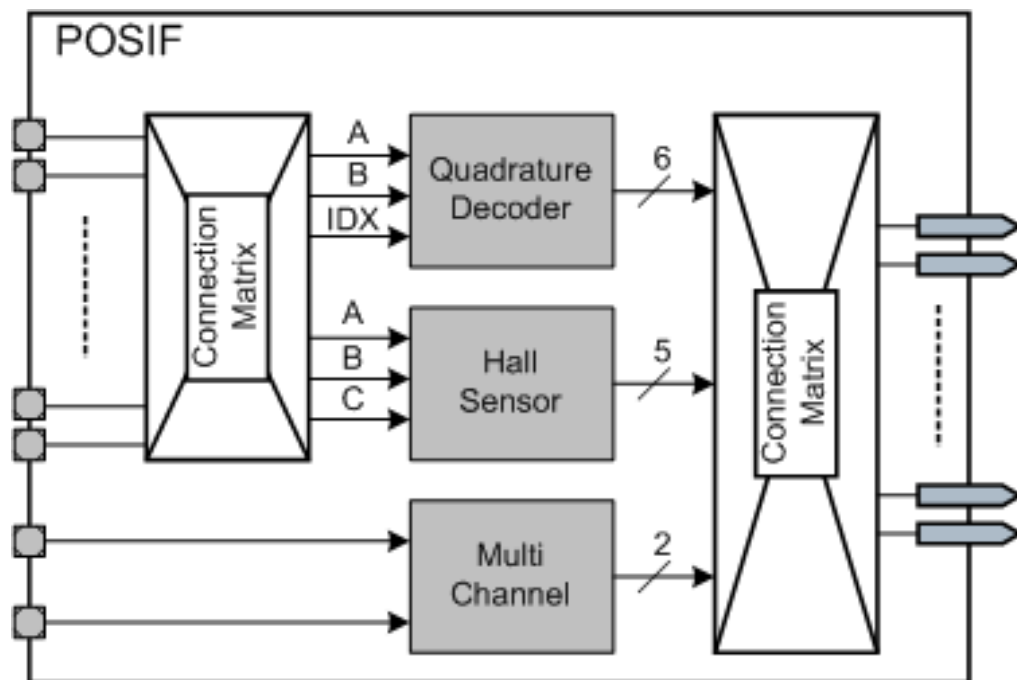
Backup slide



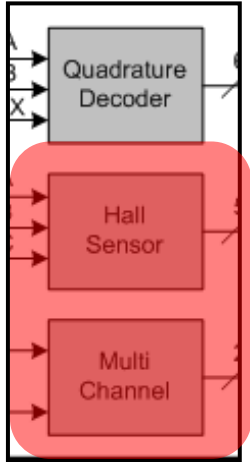
Function Selector

Function Selector

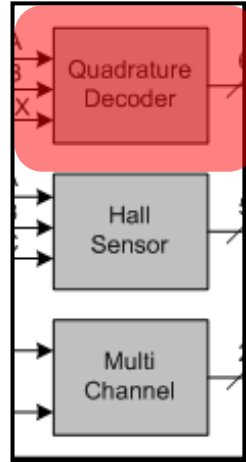
- 00_B Hall Sensor Mode enabled
- 01_B Quadrature Decoder Mode enabled
- 10_B Stand alone Multi Channel Mode enabled
- 11_B Quadrature Decoder and Stand alone Multi Channel Mode enabled



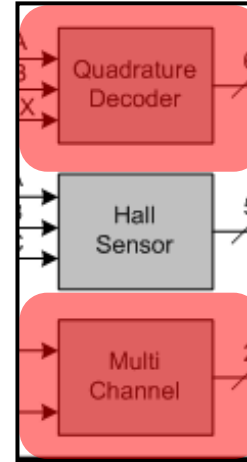
Function Selector



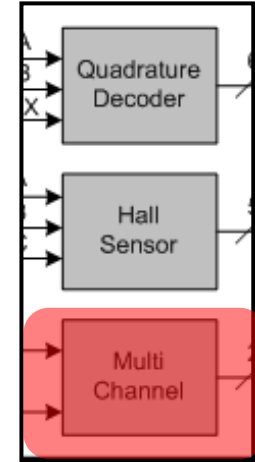
Hall
Sensor
Mode



Quadrature
Decoder
Mode

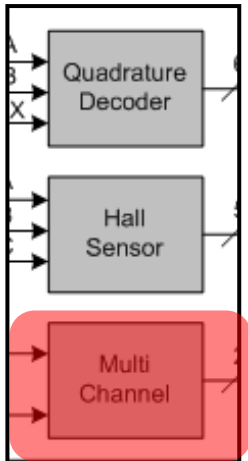
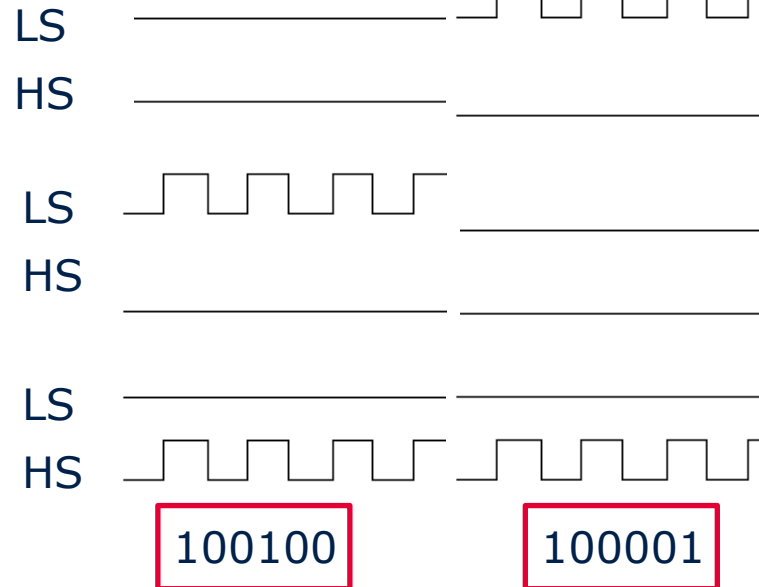
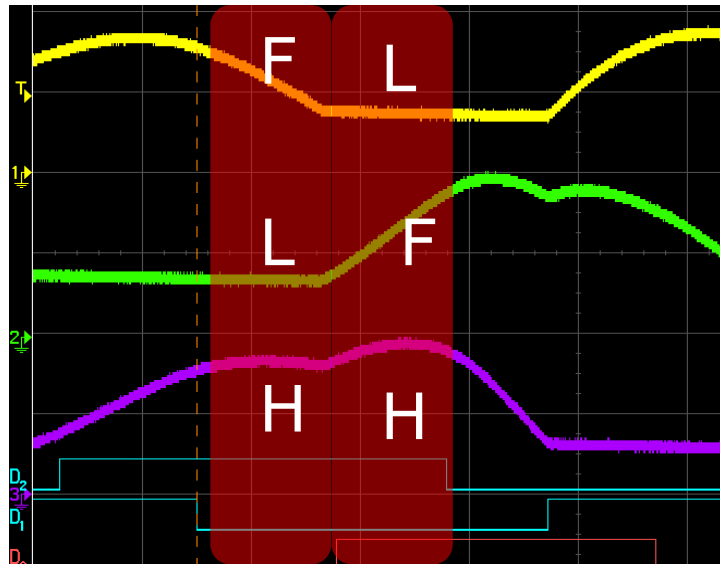


Quadrature
Decoder &
Standalone
Multi Channel
Mode



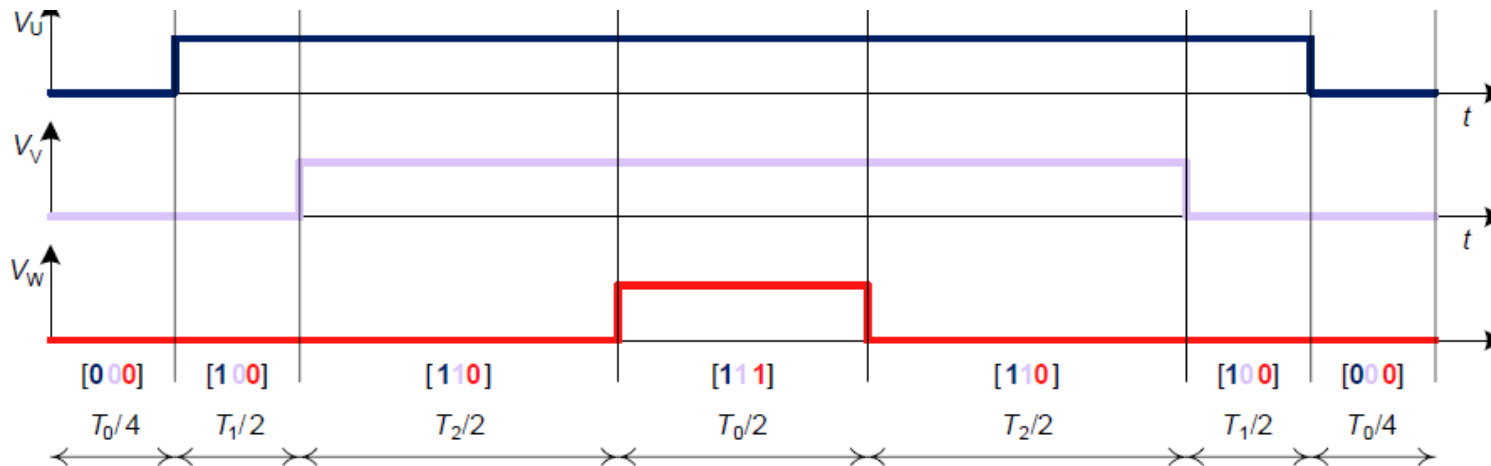
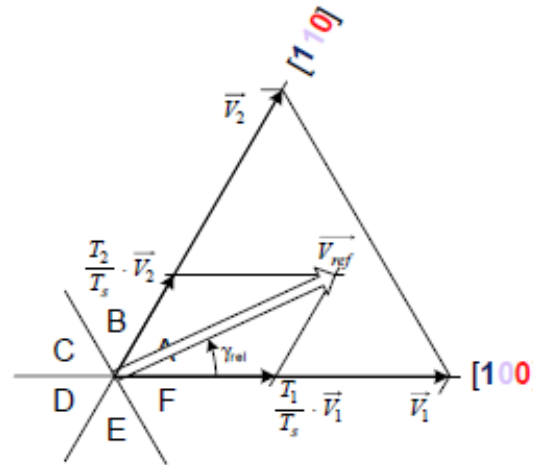
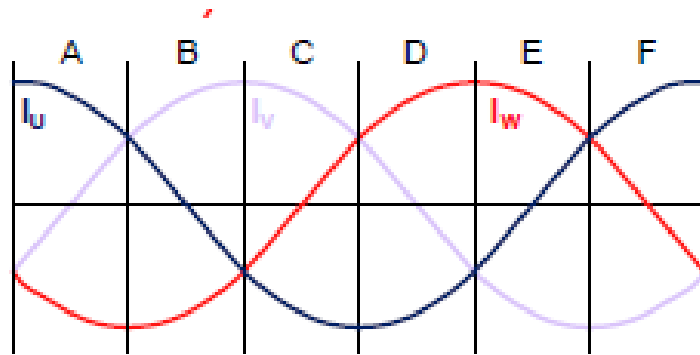
Standalone
Multi Channel
Mode

Block Commutation



Multi Channel Mode is useful for simultaneous switching of parallel signals such as Block Commutation

Space Vector PWM (Sinewave)



All the three phase are switch on all the time, only the duty cycles changes to generate the vectors. Thus, MCM is not required

Application usage for Posif

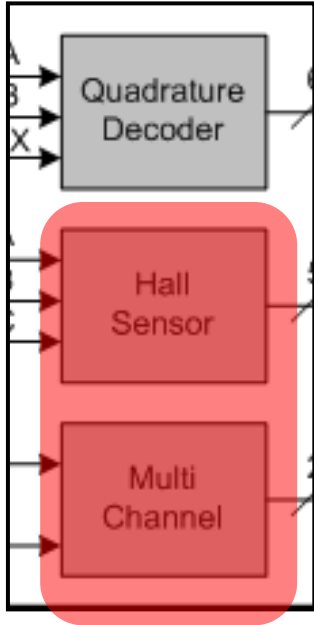


Application

- 1 Hall Sensor Block Commutation
- 2 Hall Sensor Space Vector PWM (Sinewave)
- 3 Encoder Block Commutation
- 4 Encoder Space Vector PWM (Sinewave)
- 5 Sensorless Block Commutation
- 6 Sensorless Space Vector PWM (Sinewave)

Application

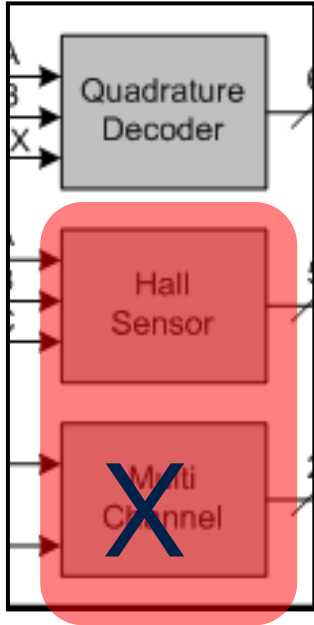
Hall Sensor Mode enabled



■ Hall Sensor Block Commutation

Application

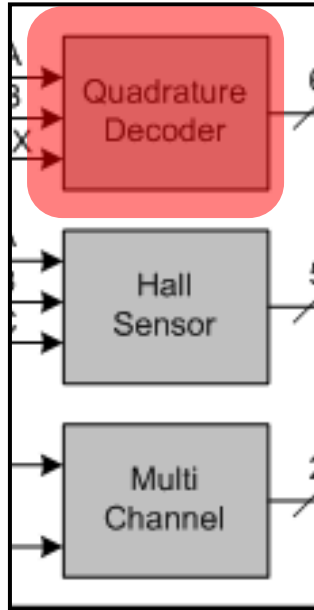
Hall Sensor Mode enabled



- Hall Sensor Space Vector PWM (Sinewave)

Application

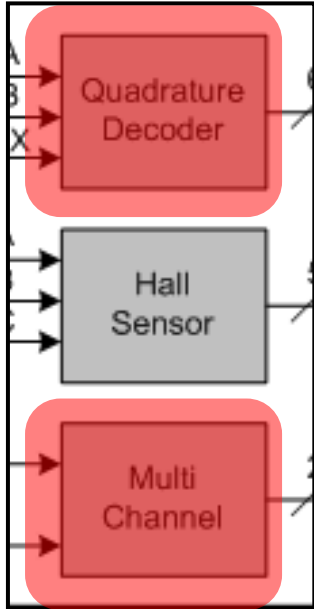
Quadrature Decoder Mode enabled



- Encoder Space Vector PWM (Sinewave)

Application

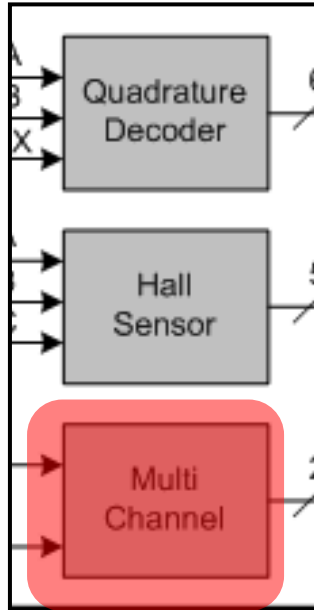
Quadrature Decoder and Stand alone Multi Channel Mode enabled



■ Encoder Block Commutation

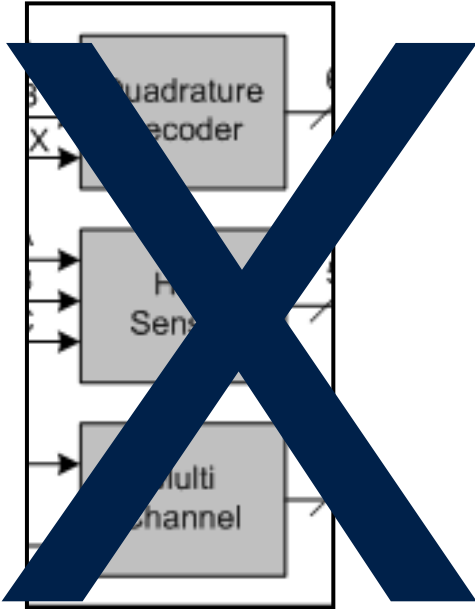
Application

Stand alone Multi Channel Mode enabled



■ Sensorless Block Commutation

Application Posif not used



CCU8
only

- Sensorless Space Vector PWM (Sinewave)



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