Chapter 17

COUNTERS

Edition 2

Overview

This chapter describes the COUNTERS class of Function Blocks which provide a range of general purpose counting functions including up, down and combined up/down counters.

UP_COUNTER FUNCTION BLOCK

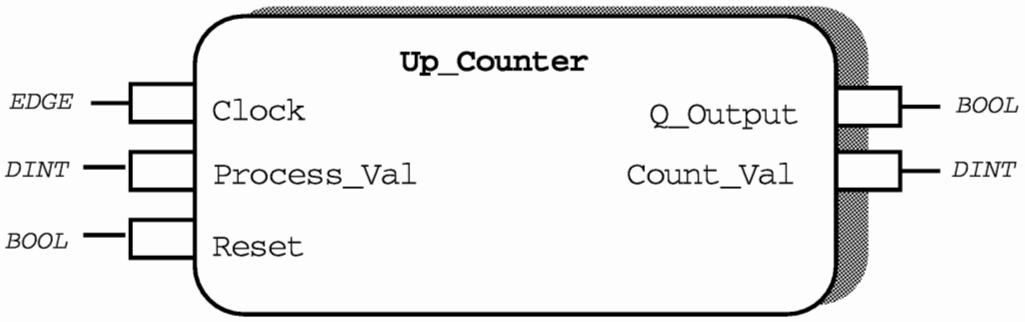


Figure 17-1 Up_Counter Function Block

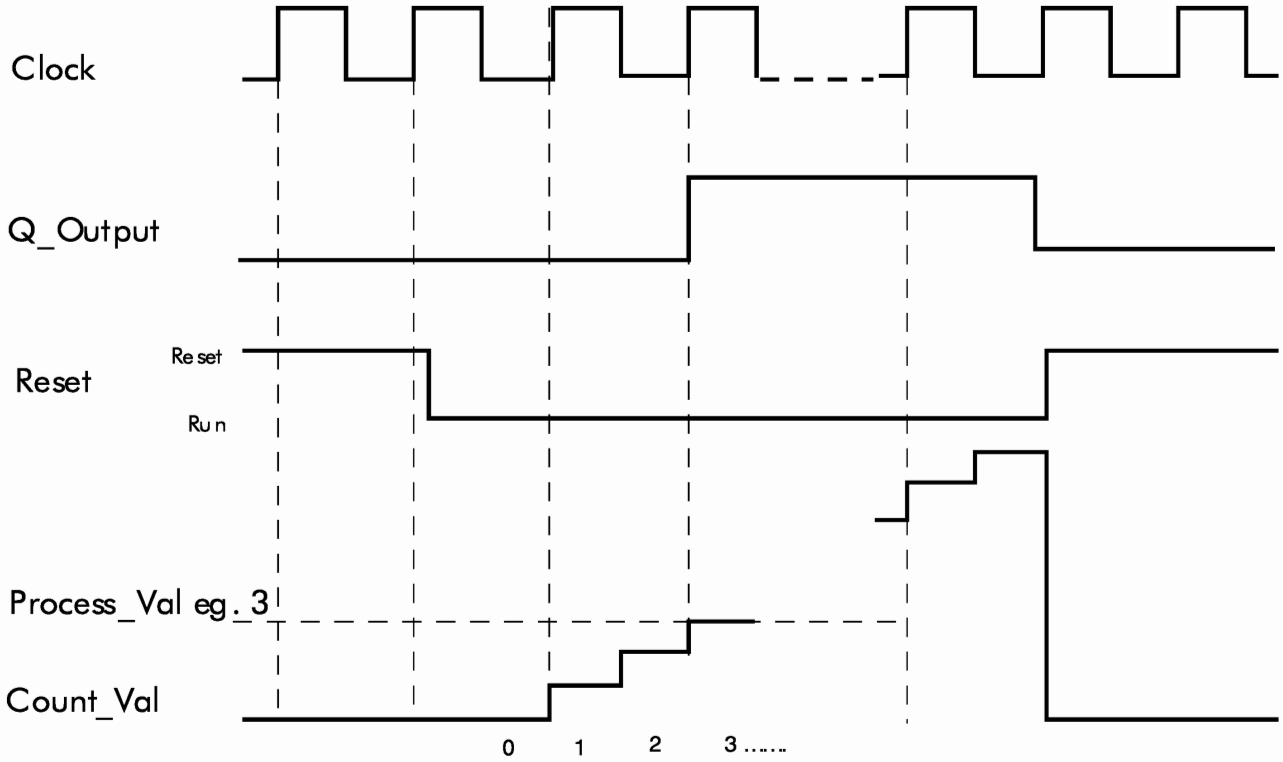
Functional Description

The Up_Counter function block increments a counter each time its input changes from logic 0 to logic 1. The block has two modes of operation, which are defined by the parameter Reset. The value of the count is held in Count_Val. In both modes of operation if Count_Val is less than Process_Val, Q_Output will be equal to Off (0) and if Count_Val is equal to or greater than Process_Val, Q_Output will equal On (1).

Modes of Operation

Run (0): In Run mode the value of Count_Val is incremented each time Clock is changed from Tock (0) to Tick (1). The rate of change must be less than twice the task duration time, because it is necessary to reset Clock from Tick (1) to Tock (0) between counts.

Reset (1): In Reset mode Count_Val is reset to 0 and counting is inhibited.



Function Block Attributes

Type: 72 16
Class:.....COUNTERS
Default Task: .....Task_1
Short List: .....Reset, Process_Val, Q_Out, Count_Val
Memory Requirements: .....12 Bytes
Execution Time; .....19.3 µ Secs

Parameter Attributes

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Clock	**BOOL**	Tock (0)	Oper	Oper	Senses	Tock (0) Tick (1)
Process_Val	**DINT**	0	Oper	Oper	High Limit Low Limit	2,147,483,646 0
Reset	**BOOL**	Run (0)	Oper	Oper	Senses	Run (0) Reset (1)
Q_Output	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Count_Val	**DINT**	0	Oper	Block	High Limit Low Limit	2,147,483,646 0

Table 17-1 Up_Counter Parameter Attributes

DN_COUNTER FUNCTION BLOCK

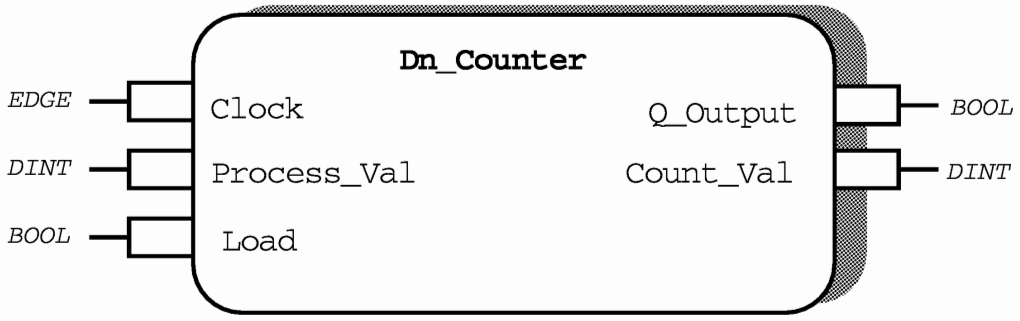


Figure 17-2 Dn_Counter Function Block

Functional Description

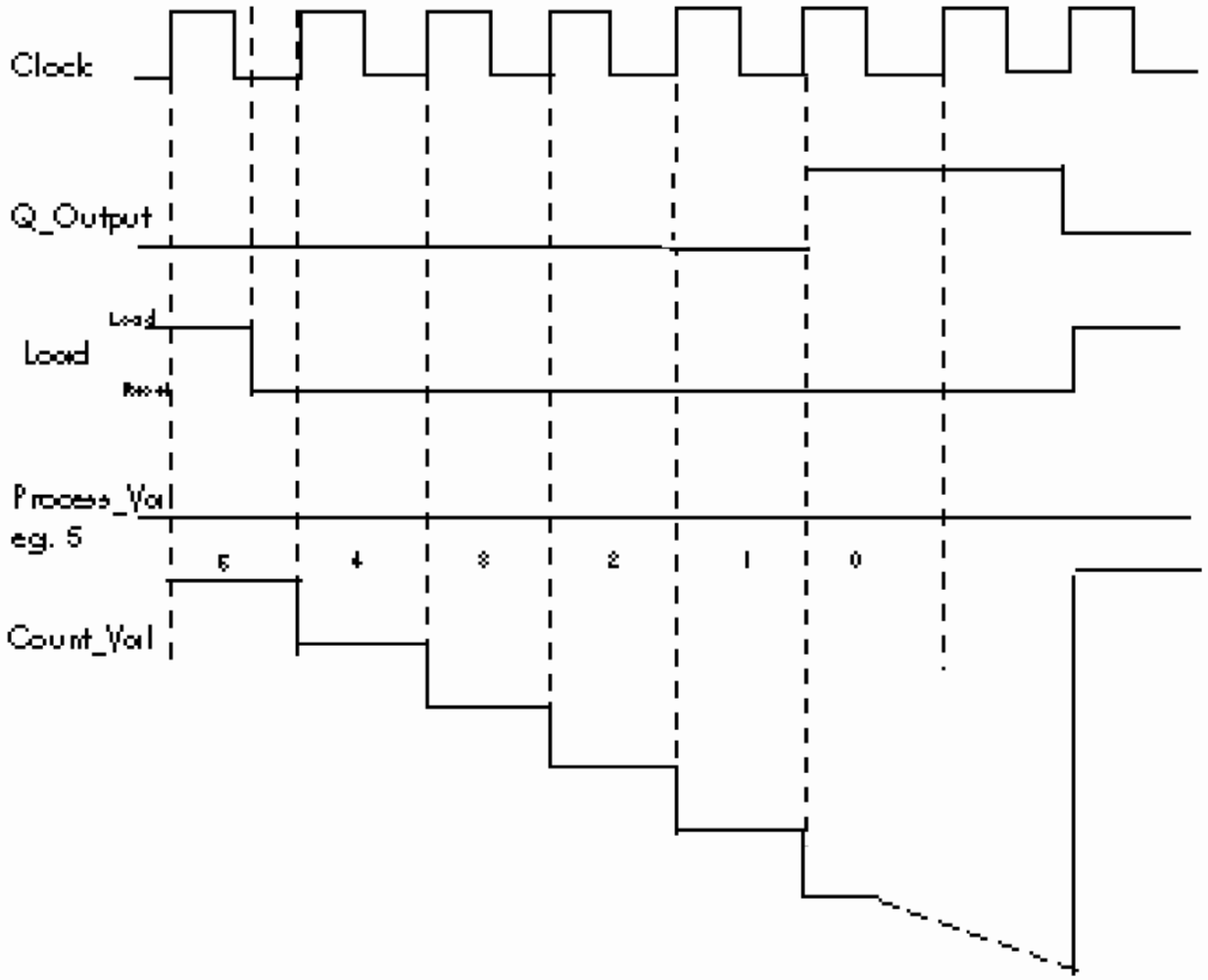
The Dn_Counter function block decrements a counter each time its input changes from logic 1 to logic 0. The function block has two modes of operation, which are defined by the parameter Load.

Modes of Operation

Run (0): In Run mode the value of Count_Val is decremented each time the input to Clock is changed from Tock (0) to Tick (1). If Count_Val is greater than 0, Q_Output will equal Off (0). If Count_Val is equal to 0 or is negative, Q_Output will equal On (1).

> **Note:-** That the rate of change of the input to Clock must be less than twice the task duration time, because it is necessary to reset Clock from Tock (1) to Tick (0) between counts.

Load (1): In Load mode the value input to Process_Val is loaded into Count_Val to form the initial value for the count. If Process_Val (and Count_Val) is greater than 0, Q_Output will equal Off (0). If Process_Val (and Count_Val) is equal to 0 or is negative, Q_Output will equal On (1).



Function Block Attributes

Type..... 72 32

Class: ..... COUNTERS

Default Task: ..... Task_1

Short List: ..... Load, Process_Val, Q_Output, Count_Val

Memory Requirements: ..... 12 Bytes

Execution Time: ..... 18.2 µ Secs

Parameter Attributes

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Clock	**BOOL**	Tock (0)	Oper	Oper	Senses	Tock (0) Tick (1)
Process_Val	**DINT**	0	Oper	Oper	High Limit Low Limit	2,147,483,646 0
Reset	**BOOL**	Run (0)	Oper	Oper	Senses	Run (0) Reset (1)
Q_Output	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Count_Val	**DINT**	0	Oper	Block	High Limit Low Limit	2,147,483,646 0

Table 17-2 Dn_Counter Parameter Attributes

UP_DN_COUNT FUNCTION BLOCK

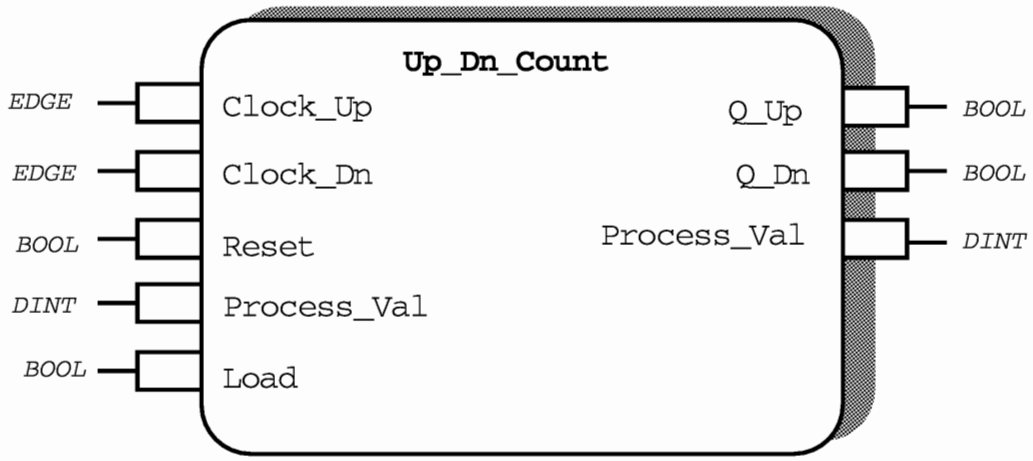


Figure 17-3 Up_Dn_Count Function Block

Functional Description

The **Up_Dn_Count** function block counts up on the positive edge of **Clock_Up** and counts down on the positive edge of **Clock_Dn.** The value of the count is held in **Count_Val.** The block has four modes of operation, which are defined by the parameters Reset and Load. In all modes of operation the following relationships exist between the values of **Count_Val, Process_Val** and 0:

If **Count_Val** is greater than or equal to **Process_Val, Q_Up** will equal On (1). If **Count_Val** is less than **Process_Val, Q_Up** will equal Off (0).

If **Count_Val** is greater than 0, **Q_Dn** will equal Off (0). If Count_Val is less than or equal to 0, **Q_Dn** will equal On (1).

See timing diagram for **Up_Counter** and **Dn_Counter.**

Modes of Operation

{i} Reset = Run (0) and Load = Run (0)

The value of **Count_Val** is incremented once when **Clock_Up** is changed from Tock (0) to Tick (1) and is decremented once when **Clock_Dn** is changed from Tock (0) to Tick (1). Note that the rate of change of the input signal must be less than twice the task duration time, because it is necessary to reset the clocks from Tick (1) to Tock (0) between counts.

{ii} Reset = Run (0) and Load = Load (1)

The value of **Process_Val** is loaded into **Count_Val.** Changes to **Clock_Up** or **Clock_Dn** will not affect the value of **Count_Val**

{iii} Reset = Reset (1) and Load = Run (0)

The value of **Count_Val** is reset to and held at 0. Changes to **Clock_Up** or **Clock_Dn** will not affect the value of Count_Val

{iv} Reset = Reset (1) and Load = Load (1)

The value of **Count_Val** is reset to and held at 0. Changes to **Clock_Up** or **Clock_Dn** will not affect the value of **Count_Val**

Function Block Attributes

Type:.....72 48

Class:..... COUNTERS

Default Task: ..... Task_1

Short List: ..... Process_Val, Q_Up, Q_Dn, Count_Val

Memory Requirements: ..... 16 Bytes

Execution Time: ..... 33.5 µ Secs

Parameter Attributes

Name	Type	Cold Start	Read Access	Write Access	Type Specific Information	
Clock_Dn	**BOOL**	Tock (0)	Oper	Oper	Senses	Tock (0) Tick (1)
Clock_Up	**BOOL**	Tock (0)	Oper	Oper	Senses	Tock (0) Tick (1)
Count_Val	**DINT**	0	Oper	Block	High Limit Low Limit	Same as Process_Val Same as Process_Val
Load	**BOOL**	Run (0)	Oper	Oper	Senses	Run (0) Load (1)
Process_Val	**DINT**	0	Oper	Oper	High Limit Low Limit	2,147,483,646 --2,147,483,646
Q_Dn	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Q_Up	**BOOL**	Off (0)	Oper	Block	Senses	Off (0) On (1)
Reset	**BOOL**	Run (0)	Oper	Oper	Senses	Run (0) Reset (1)

Table 17-3 Up_Dn_Count Parameter Attributes