Chapter 16   Built-in high speed counter of GM6-CPUC

16. Built-in high speed counter of GM6-CPUC

16.1. Introductions

This chapter describes the specification, handling, and programming of built-in high speed counter of GM6-CPUC module. The built-in high speed counter of GM6-CPUC (Hereafter called HSC) has the following features;

- 3 counter functions as followings

- 1-phase up / down counter   : Up / down is selected by user program
- 1-phase up / down counter   : Up / down is selected by external B phase input
- 2-phase up / down counter   : Up / down is automatically selected by the phase difference between phase A and B.

- Multiplication (1, 2, or 4) with 2-phase counter

- 2-phase pulse input multiplied by one : Counts the pulse at the leading edge of phase A.
- 2-phase pulse input multiplied by two : Counts the pulse at the leading / falling edge of phase A.
- 2-phase pulse input multiplied by four : Counts the pulse at the leading / falling edge of phase A and B

16.2. Performance specifications

Items		Specifications
Input signal	Types	Phase A, Phase B, Preset
	Rated level	24VDC (13mA)
	Signal type	Voltage input
Counting range		0 ~ 16,777,215 (Binary 24 bits)
Max. counting speed		50k pps
Up / Down selection	1-phase	Sequence program or B-phase input
	2-phase	Auto-select by phase difference of phase A and B
Multiplication		1, 2, or 4
Preset input		Sequence program or external preset input

16.3. Input specifications

16.3.1. Function of input terminals

Items		Specifications
A / B phase	Rated input	24VDC (13mA)
	On voltage	14VDC or higher
	Off voltage	2.5VDC or lower
Preset input	Rated input	24VDC (10mA)
	On voltage	19VDC or higher
	Off voltage	6V or lower
	On delay time	Less than 1.5ms
	Off delay time	Less than 2ms

16.3.2. Names of wiring terminals

No. of terminal	Input signal
1	A phase input
2	B phase input
3	COM
4	Preset input
5	Preset COM
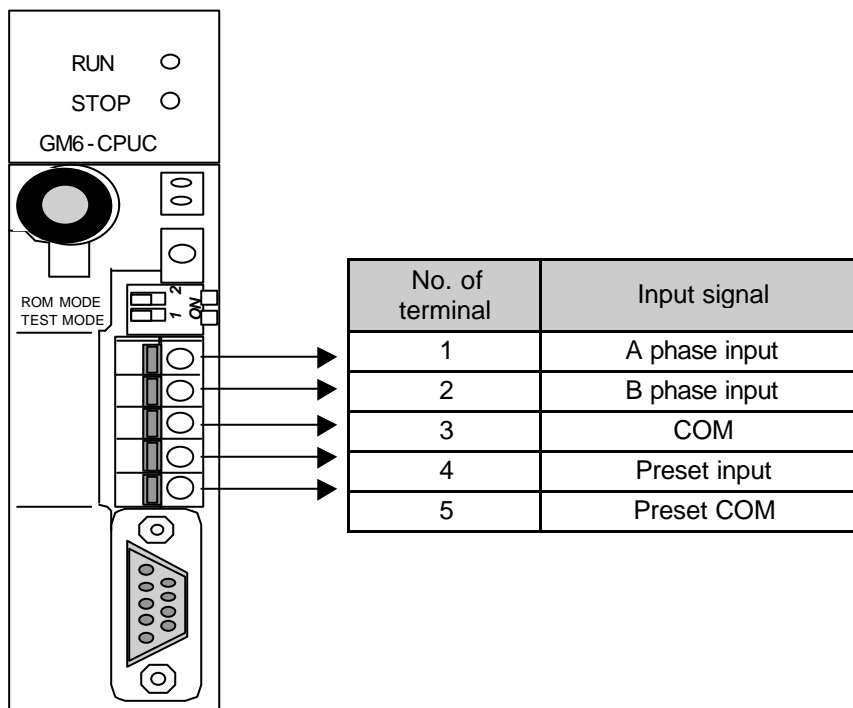
16.3.3. External interface circuit

|	Internal circuit	No. of terminal	Signal type	Operation voltage	
Input	3.3KΩ 820Ω	1	A-phase pulse input 24VDC	ON	14 ~ 26.4 VDC
				OFF	Less than 2.5VDC
		2	B-phase pulse input 24VDC	ON	14 ~ 26.4 VDC
				OFF	Less than 2.5VDC
		3	COM		
Input	3.3KΩ 270Ω	4	Preset input 24V	ON	19 ~ 26.4 V
				OFF	6 V or less
		5	Preset COM		

16.4. Wiring

16.4.1. Wiring instructions

A high speed pulse input is sensitive to the external noise and should be handled with special care. When wiring the built-in high speed counter of GM6-CPUC, take the following precautions against wiring noise.

      1) Be sure to use shielded twisted pair cables. Also provide Class 3 grounding.

      2) Do not run a twisted pair cable in parallel with power cables or other I/O lines which may generate noise.

      3) Before applying a power source for pulse generator, be sure to use a noise-protected power supply.

      4) For 1-phase input, connect the count input signal only to the phase A input; for 2-phase input, connect to phases A and B.

16.4.2. Wiring examples

1) Voltage output pulse generator
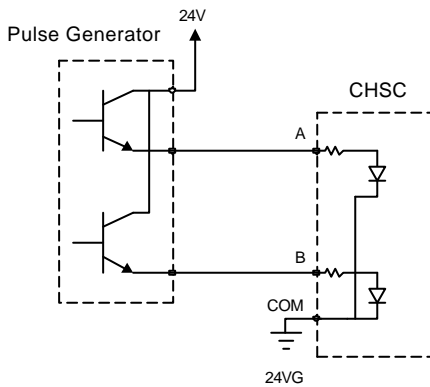
2) Open collector output pulse generator
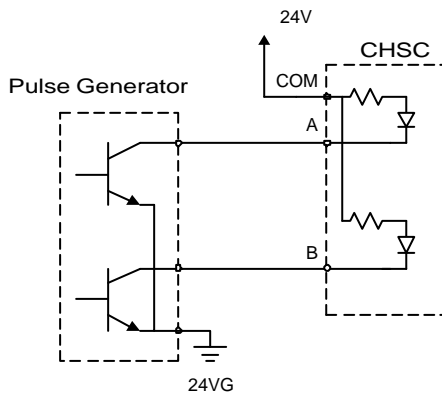
16.5. Programming

16.5.1. Function block (F/B)

CHSC_WR

CHSC_WR

GM1	GM2	GM3	GM4	GM5	GM6
					●

FUNCTION BLOCK	Description

CHSC_WR
 	
BOOL — REQ   DONE — BOOL
 	
BOOL — PHS   STAT — USINT
 	
USINT — MULT
 	
BOOL — U/D_
         I/E
 	
BOOL — CY_R
 	
BOOL — DOWN
 	
BOOL — CT_E
 	
BOOL — PRE_
         I/E
	Input REQ : Request signal of F/B execution
	        PHS : Operation modes selection
	            0 (1-phase counter), 1(2-phase counter)
	        MULT : Assign the multiplication factor
	            (MULT = 1, 2, or 4)
	        U/D_I/E : Assign the count direction (up/down)
	                selector
	            0 : Set by sequence program
	            1 : Set by B-phase input signal
	                (1:up-count, 0:down-count)
	        CY_R : Carry reset signal (1: reset).
	        DOWN : Select the count direction (0:up/1:down)
	            when the counter is set as 1-phase counter
	            and up/down is selected by sequence
	            program. (PHS=0 & U/D_I/E=0)
	        CT_E : Counter enable signal
	            (0 : Counter disable, 1 : Enable)
	        PRE_I/E : Assign PRESET input
	            0 : PRESET by sequence program
	            1 : PRESET by external input at the
	                PRESET terminal
	
	Output
	        DONE : Turns on after the F/B is executed with no
	            error.
	        STAT : Indicate the operation status of F/B

- The MULT input will be dummy input when the HSC is set as 1-phase counter (PHS = 0). When the HSC is set as 2-phase counter, the U/D_I/E and DOWN input will be dummy input. (PHS = 1)

- The current value of HSC will be cleared as 0 when the CT_E (counter enable) is 0.

CHSC_RD

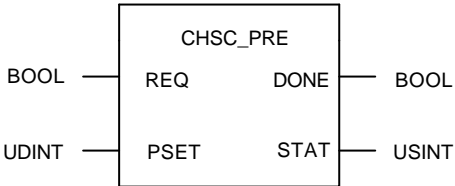**Read the current value and operation status of HSC**

GM1	GM2	GM3	GM4	GM5	GM6
					●

FUNCTION BLOCK	Description

CHSC_RD
 	
BOOL — REQ   DONE — BOOL
 	
STAT — USINT
 	
CNT — UDINT
 	
CY — BOOL
	Input REQ: Request signal for F/B execution
	
	Output
	    DONE : Turns on after the F/B is executed with no error.
	    STAT : Indicates the operation status of F/B
	    CNT : The current value of HSC
	        (0 ~ 16,777,215)
	    CY : Carry flag (0 : OFF, 1 : ON)

CHSC_PRE

Set the preset value of HSC
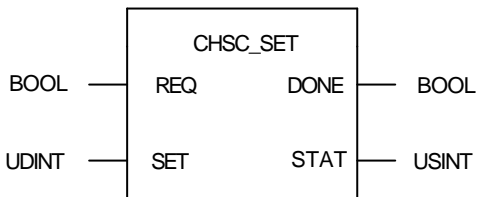
GM1	GM2	GM3	GM4	GM5	GM6
					●

FUNCTION BLOCK	Description
CHSC_PRE BOOL — REQ DONE — BOOL UDINT — PSET STAT — USINT	**Input** REQ : Request signal for F/B execution PSET : Set the preset value (0 ~ 16,777,215) **Output** DONE : Turns on after the F/B is executed with no error. STAT : Indicates the operation status of F/B

- When the PRE_I/E is set as 0 (Preset input by sequence program), the current value of HSC is changed as the assigned preset value with the rising edge of REQ input.
- When the PRE_I/E is set as 1 (Preset input by external preset input), the current value of HSC is changed as the assigned preset value with the rising edge of external preset input. At this time, the REQ input of CHSC_PRE is ignored.
- The CY output is set off while the CHSC_PRE F/B is executing.
- The CHSC_PRE F/B is disabled while the CT_E input of CHSC_WR F/B is 0 (Counter disabled).

CHSC_SET

Assign a setting value to be compared

with the current value of HSC

GM1	GM2	GM3	GM4	GM5	GM6
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FUNCTION BLOCK	Description

CHSC_SET
 	
BOOL — REQ DONE — BOOL
 	
UDINT — SET STAT — USINT
	Input REQ: Request signal for F/B execution
	  SET : Set a setting value (0 ~ 16,777,215)
	
	Output
	  DONE : Turns on after the F/B is executed with no
	    error.
	  STAT : Indicates the operation status of F/B

Run a task program when the current value of HSC reaches to the setting value.

To run a task program, define a high speed counter task program as following figure,

and write a task program.
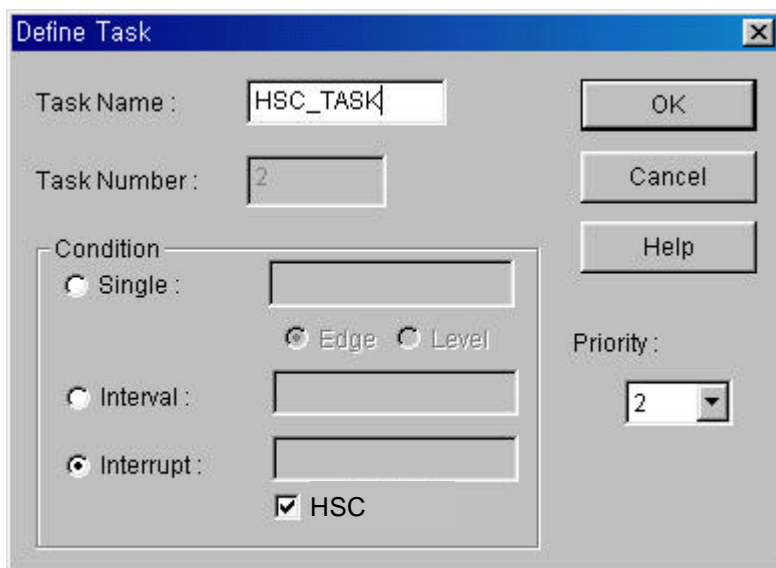
16.5.2 Error code of F/B

The following table shows error codes appear at the STAT output.

Error code	Description
00	No error
01	Built-in high speed counter is not found (GM6-CPUA, GM6-CPUB CPU module)
02	Input data error at MULT input of CHSC_VR (2 Phase Mode 1, 2, 4)
03	PSET (CHSC_PRE) or SET (CHSC_SET) is out of specified range (0 ~ 16,777,215).
04	Execute Preset command while the HSC is disabled status