8.18 Pulse Related Instruction

Instruction correspondence table for CPU module built-in positioning and high-speed pulse input/output module

The table for instructions corresponding to the CPU module and the high-speed pulse input/output module are shown below.

○: Supported, —: Not supported

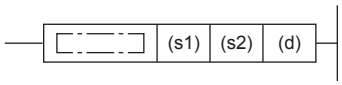
Instruction	CPU module	High-speed pulse input/output module
SPD	○	—
DSPD	○	—
PLSY [For the FX3 compatible operand specification]	○	—
PLSY [For the FX5 operand specification]	○	—
DPLSY [For the FX3 compatible operand specification]	○	—
DPLSY [For the FX5 operand specification]	○	—
PWM	○	○
DPWM	○	○

Measuring the density of 16 bit binary pulses

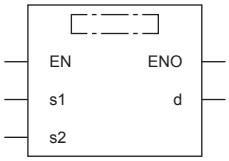
SPD

FX5S FX5UJ FX5U FX5UC

This instruction counts the number of times the device input specified by (s1) turns off → on only for the time (in 16-bit data units) specified by (s2) × 1ms and stores the operation result in the device specified by (d). The high-speed pulse input/output module is not supported.

Ladder diagram	Structured text
	ENO:=SPD(EN,s1,s2,d);

FBD/LD



Setting data

■Descriptions, ranges, and data types

Operand	Description	Range	Data type	Data type (label)
(s1)	Pulse input	—	Bit/Word	ANY_ELEMENTARY*1
(s2)	Measurement time (Unit: ms)	-32768 to +32767	16-bit signed binary	ANY16
(d)	Head device number for storing the measurement result	—	16-bit signed binary	ANY16
EN	Execution condition	—	Bit	BOOL
ENO	Execution result	—	Bit	BOOL

*1 Digit specified bit type label cannot be used.

■Applicable devices

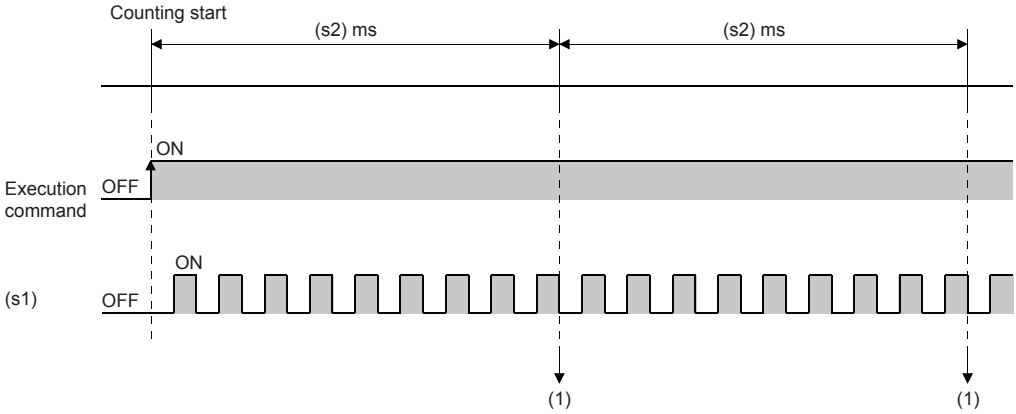
Operand	Bit	Word			Double word		Indirect specification	Constant			Others
	X, Y, M, L, SM, F, B, SB, S	T, ST, C, D, W, SD, SW, R	U□\G□	Z	LC	LZ		K, H	E	$	
(s1)	○*1	○*2	○	○	—	—	○	○	—	—	—
(s2)	○	○	○	○	—	—	○	○	—	—	—
(d)	—	○	—	○	—	—	○	—	—	—	—

*1 Only X can be used for a bit device. Designate with the following range.
- FX5S/FX5UJ CPU module: X0 to X7
- FX5U/FX5UC CPU module: X0 to X17
Note that bit device digit designation cannot be used.

*2 When a word device is specified, specify one of the channel numbers (CH1 to CH8).
When FX3 compatible function of a high-speed counter is valid, a channel number cannot be specified. Only X can be used for a bit device.
If the channel numbers is specified in (s1), an error occurs.

Processing details

- This instruction counts the number of times the device input specified by (s1) turns off → on only for the time (in 16-bit data units) specified by (s2) × 1ms and stores the operation result in the device specified by (d).



(1): The elapsed time is judged using the 1ms interrupt and the counted result is stored in (d).

- The channel number of the high-speed counter specified by (s1) interlocks with the channel number in which parameters are set.
- When a word device is specified by (s1), this instruction counts the number of pulses by the high-speed counter setting of the channel number corresponding to each word device.
- When a bit device is specified by (s1), the following input assignment devices (shaded area) are valid.
- When the high-speed counter FX3 compatibility function is enabled, only the 1-phase 1-input pulse input mode (S/W) (general-purpose input assignment of the 1-phase 1-input counter (switching S/W up or down)) is enabled.

[FX5S/FX5UJ CPU module]

General-purpose input assignment of the 1-phase 1-input counter (switching S/W up or down)

U/D: UP/DOWN pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	U/D(A)	P					E									
CH2		U/D(A)	P					E								
CH3			U/D(A)	P					E							
CH4				U/D(A)	P					E						
CH5					U/D(A)	P					E					
CH6						U/D(A)	P					E				
CH7							U/D(A)	P					E			
CH8								U/D(A)	P					E		

General-purpose input assignment of the 1-phase 1-input counter (switching H/W up or down)

C: Pulse input, D: Direction input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	C(A)	D(B)	P				E									
CH2		C(A)	D(B)	P				E								
CH3			C(A)	D(B)	P				E							
CH4				C(A)	D(B)	P				E						
CH5					C(A)	D(B)	P				E					
CH6						C(A)	D(B)	P				E				
CH7							C(A)	D(B)	P				E			
CH8								C(A)	D(B)	P				E		

General-purpose input assignment of the 1-phase 2-input counter

U: UP pulse input, D: DOWN pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	U(A)	D(B)	P				E									
CH2		U(A)	D(B)	P				E								
CH3			U(A)	D(B)	P				E							
CH4				U(A)	D(B)	P				E						
CH5					U(A)	D(B)	P				E					
CH6						U(A)	D(B)	P				E				
CH7							U(A)	D(B)	P				E			

General-purpose input assignment of the 2-phase 2-input counter

A: A phase pulse input, B: B phase pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	A	B	P				E									
CH4				A	B	P				E						
CH6						A	B	P				E				
CH7							A	B	P				E			

If one of X1, X2, X4, X5, X7 is specified as a device, an error occurs.

[FX5U/FX5UC CPU module]

General-purpose input assignment of the 1-phase 1-input counter (switching S/W up or down)

U/D: UP/DOWN pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	U/D(A)								P	E						
CH2		U/D(A)									P	E				
CH3			U/D(A)										P	E		
CH4				U/D(A)											P	E
CH5					U/D(A)				P	E						
CH6						U/D(A)					P	E				
CH7							U/D(A)						P	E		
CH8								U/D(A)							P	E

If one of X10 to X17 is specified as a device, an error occurs.

General-purpose input assignment of the 1-phase 1-input counter (switching H/W up or down)

C: Pulse input, D: Direction input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	C(A)	D(B)							P	E						
CH2			C(A)	D(B)							P	E				
CH3					C(A)	D(B)							P	E		
CH4							C(A)	D(B)							P	E
CH5									C(A)	D(B)	P	E				
CH6											C(A)	D(B)	P	E		
CH7													C(A)	D(B)	P	E
CH8															C(A)	D(B)

If one of X1, X3, X5, X7, X11, X13, X15, X17 is specified as a device, an error occurs.

General-purpose input assignment of the 1-phase 2-input counter

U: UP pulse input, D: DOWN pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	U(A)	D(B)							P	E						
CH2			U(A)	D(B)							P	E				
CH3					U(A)	D(B)							P	E		
CH4							U(A)	D(B)							P	E
CH5									U(A)	D(B)	P	E				
CH6											U(A)	D(B)	P	E		
CH7													U(A)	D(B)	P	E
CH8															U(A)	D(B)

If one of X1, X3, X5, X7, X11, X13, X15, X17 is specified as a device, an error occurs.

General-purpose input assignment of the 2-phase 2-input counter

A: A phase pulse input, B: B phase pulse input, P: Preset input (reset), E: Enable input (start)

	X0	X1	X2	X3	X4	X5	X6	X7	X10	X11	X12	X13	X14	X15	X16	X17
CH1	A	B							P	E						
CH2			A	B							P	E				
CH3					A	B							P	E		
CH4							A	B							P	E
CH5									A	B	P	E				
CH6											A	B	P	E		
CH7													A	B	P	E
CH8															A	B

If one of X1, X3, X5, X7, X11, X13, X15, X17 is specified as a device, an error occurs.

- The table below shows the related devices.

Function	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8
Monitor in operation	SM4500	SM4501	SM4502	SM4503	SM4504	SM4505	SM4506	SM4507
High-speed counter pulse density	SD4507, SD4506	SD4537, SD4536	SD4567, SD4566	SD4597, SD4596	SD4627, SD4626	SD4657, SD4656	SD4687, SD4686	SD4717, SD4716
Measurement unit time	SD4517, SD4516	SD4547, SD4546	SD4577, SD4576	SD4607, SD4606	SD4637, SD4636	SD4667, SD4666	SD4697, SD4696	SD4727, SD4726

- The table below shows the related device update timing.

Function	R/W	Update timing	Clear
Monitor in operation	R	• When the SPD instruction is executed • When the HIOEN instruction is executed	• Power-on • Reset
High-speed counter pulse density	R	• Each time the measurement unit time elapses	• Power-on • Reset
Measurement unit time	R/W	• When the SPD instruction is executed	• Power-on • Reset

Precautions

- The maximum input frequency of turning the inputs ON and OFF is shown below:

■FX5S/FX5UJ CPU module

Used input number	Maximum input frequency
X0, X1, X3, X4	100 kHz
X2, X5, X6, X7	10 kHz

■FX5U-32M□/ FX5UC-32M□ CPU module

Used input number	Maximum input frequency
X0 to X5	200 kHz
X6, X7	10 kHz

■FX5U-64M□/FX5U-80M□/FX5UC-64M□/FX5UC-96M□ CPU module

Used input number	Maximum input frequency
X0 to X7	200 kHz
X10 to X17	10 kHz

- When the SPD instruction is used, the UP/DOWN pulse input, preset input and enable input operate in accordance with the contents set by the parameters of the high-speed counter.
- When the measurement time is changed while the SPD instruction is executed, the changed time is applied every time the measurement time ends.
- When the current value of the high-speed counter is overwritten, a preset input is executed, or the high-speed counter is reset by the DHCMOV instruction while the SPD instruction is executed, the operation continues, but the pulse density cannot be measured normally.
- When the SPD instruction is used, pulses per unit time which exceeds the ring length of the high-speed counter cannot be input. When pulses are input, the pulse density cannot be measured normally.
- The measurement time specified by (s2) overwrites the value stored in the SD device specified for the measurement unit time.
- When the measurement time specified by (s2) is outside the range from 1 to 32767, the specified measurement time is rounded into “1” with the sign.

Operation error

Error code (SD0/SD8067)	Description
1810H	The input specified in (s1) is already used by another instruction.
3405H	An unavailable bit device is set in (s1).
	A channel number other than 1 to 8 is specified in (s1).
	When FX3 compatible function of a high-speed counter is valid and a channel number is specified to (s1).
3600H	The channel number or device number in which parameters are not set in (s1) is specified.