32 bit binary pulse width modulation
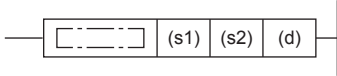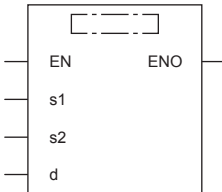
DPWM

`FX5S` `FX5UJ` `FX5U` `FX5UC`

This instruction outputs the pulse (in 32-bit data units) of the ON time (in 32-bit data units) specified by (s1) and the period specified by (s2) to the output destination specified by (d).

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

FBD/LD

Setting data

■Descriptions, ranges, and data types

Operand	Description	Range	Data type	Data type (label)
(s1)	ON time or the device number storing the ON time	1 to 2147483647	32-bit unsigned binary	ANY32
(s2)	Period or the device number storing the period	1 to 2147483647	32-bit unsigned binary	ANY32
(d)	Channel number or device number from which pulses are to be output	—	Bit/16-bit unsigned binary	ANY_ELEMENTARY[*1]
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)	○	○	○	○	○	○	○	○	—	—	—
(s2)	○	○	○	○	○	○	○	○	—	—	—
(d)	○[*1]	○[*2]	○[*2]	○[*2]	—	—	○	○[*2]	—	—	—

*1 Only Y can be used for a bit device.
   When a bit device is specified, specify one of Y0 to Y7. The high-speed pulse input/output module bit device (Y) cannot be specified.
   If Y is specified, outputs are enabled when there is an unused channel number in the parameter setting and the specified Y number is not used.
   The nibble of a bit device cannot be specified.
*2 When a word device or constant is specified, specify one of the CH numbers.
   Specify K1 to K4 (axis 1 to 4) for the CPU module, and K5 to K12 (axis 5 to 12) for the high-speed pulse input/output module.

Processing details

- This instruction outputs the pulse of the ON time specified by (s1) and the period specified by (s2) to the output destination specified by (d).
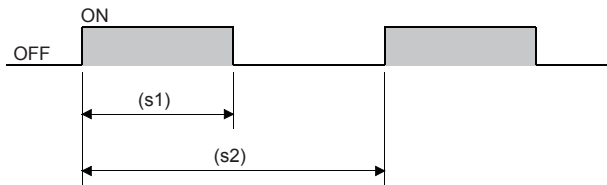
- Time with a unit selected on the parameter setting screen (μs or ms) can be specified by (s1) and (s2).
- The pulse output destination channel number selected on the parameter setting screen can be specified by (d).
- This instruction stores the number of pulses, pulse width, and period output from each channel to an SD device. The pulse width and period are stored in the units set by the parameters. When 0 is specified in the pulse output, pulses are output without any limitation.

Pulse output destination channel	Number of output pulses	R/W	Initial value	Timing of reflection on operation	Timing of clearing to initial value
CH1	SD5301, SD5300	R/W	0	• When the DHCMOV instruction is executed[*1] • When the DPWM instruction is executed • END processing	STOP/PAUSE→RUN
CH2	SD5317, SD5316				
CH3	SD5333, SD5332				
CH4	SD5349, SD5348				
CH5	SD5365, SD5364				
CH6	SD5381, SD5380				
CH7	SD5397, SD5396				
CH8	SD5413, SD5412				
CH9	SD5429, SD5428				
CH10	SD5445, SD5444				
CH11	SD5461, SD5460				
CH12	SD5477, SD5476				

Pulse output destination channel	ON time	R/W	Initial value	Timing of reflection on operation	Timing of clearing to initial value
CH1	SD5303, SD5302	R/W	0[*2]	• When the DHCMOV instruction is executed[*1] • When the DPWM instruction is executed[*3] • END processing	STOP/PAUSE→RUN
CH2	SD5319, SD5318				
CH3	SD5335, SD5334				
CH4	SD5351, SD5350				
CH5	SD5367, SD5366				
CH6	SD5383, SD5382				
CH7	SD5399, SD5398				
CH8	SD5415, SD5414				
CH9	SD5431, SD5430				
CH10	SD5447, SD5446				
CH11	SD5463, SD5462				
CH12	SD5479, SD5478				

Pulse output destination channel	Period	R/W	Initial value	Timing of reflection on operation	Timing of clearing to initial value
CH1	SD5305, SD5304	R/W	0[*2]	• When the DHCMOV instruction is executed[*1] • When the DPWM instruction is executed[*3] • END processing	STOP/PAUSE→RUN
CH2	SD5321, SD5320				
CH3	SD5337, SD5336				
CH4	SD5353, SD5352				
CH5	SD5369, SD5368				
CH6	SD5385, SD5384				
CH7	SD5401, SD5400				
CH8	SD5417, SD5416				
CH9	SD5433, SD5432				
CH10	SD5449, SD5448				
CH11	SD5465, SD5464				
CH12	SD5481, SD5480				

*1   When the DHCMOV instruction is used, the latest value can be read. A writable device can be updated immediately.
*2   Parameter setting values are set to an SD device at STOP to RUN.
*3   When this instruction is executed, the pulse width and period specified (s1) and (s2) are set to an SD device.
• After the pulse output is started from each channel, the pulse output monitor turns on.

Pulse output destination channel	Pulse output monitor	R/W	Initial value	ON timing	OFF timing
CH1	SM5300	R	OFF	• When the DHIOEN instruction is executed • When the DPWM instruction is executed	• Power on • Reset • RUN→STOP/PAUSE • When the specified number of pulses are output. • The drive contact is turned off
CH2	SM5301				
CH3	SM5302				
CH4	SM5303				
CH5	SM5304				
CH6	SM5305				
CH7	SM5306				
CH8	SM5307				
CH9	SM5308				
CH10	SM5309				
CH11	SM5310				
CH12	SM5311				

• This instruction stores the number of pulses output from each channel.

Pulse output destination channel	Monitoring the current number of output pulses	R/W	Initial value	Timing of reflection on operation	Timing of clearing to initial value
CH1	SD5307, SD5306	R/W	0	• When the DHCMOV instruction is executed → An SD device is updated • END processing	• Power-on • Reset • STOP/PAUSE→RUN
CH2	SD5323, SD5322				
CH3	SD5339, SD5338				
CH4	SD5355, SD5354				

• The number of output pulses set to an SD device is valid for this instruction as well. The setting values are always read and updated.

• When the specified number of output pulses is equal to or less than the number of pulses which have already been output, pulse output stops after outputting pulses which are being output.

• When the specified number of output pulses is larger than the number of pulses which have already been output, pulse output stops after outputting set number of pulses.

• When the number of output pulses is set from the no limitation output setting (number of output pulses is 0), the number of output pulses is not updated (because outputting pulses continues or stops in the no limitation output).

• The maximum number of output pulses which can be output when the DPWM instruction is executed once (= maximum value which can be set to an SD device) is "2147483647"

• The ON time and period can be set during the pulse output. Setting values are always read and updated.

• When the number of output pulses is 0 (no limitation output setting), the monitor of the current number of output pulses is set to 0.

- When the number of output pulses is specified, the output pulses are monitored. When the DPWM output is executed several times, the monitor of the number of output pulses is an integrated value.
- The monitor of the current number of output pulses can be changed during the pulse output.
- The monitor of the current number of output pulses is updated when the number of pulses is counted at the falling edge of pulses in the positive logic and at the rising edge of pulses in the negative logic.
- When the output always remains ON or OFF, the monitor of the current number of output pulses does not change.
- The maximum value of the monitor of the current number of output pulses is "FFFFFFFFH". After the current number of output pulses reaches the maximum value, the monitor of the current number of output pulses starts to count again from "0".

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Precautions

- Specify the ON time by (s1) and the period by (s2) so that [(s2)-(s1)] is equal to or larger than 3 μs.
- When a negative value is specified for the ON time by (s1) and the period by (s2), an operation error occurs. (In 16-bit instruction PWM, no error occurs.)
- Specify the ON time by (s1) and the period by (s2) so that they are equal or larger than the following values.
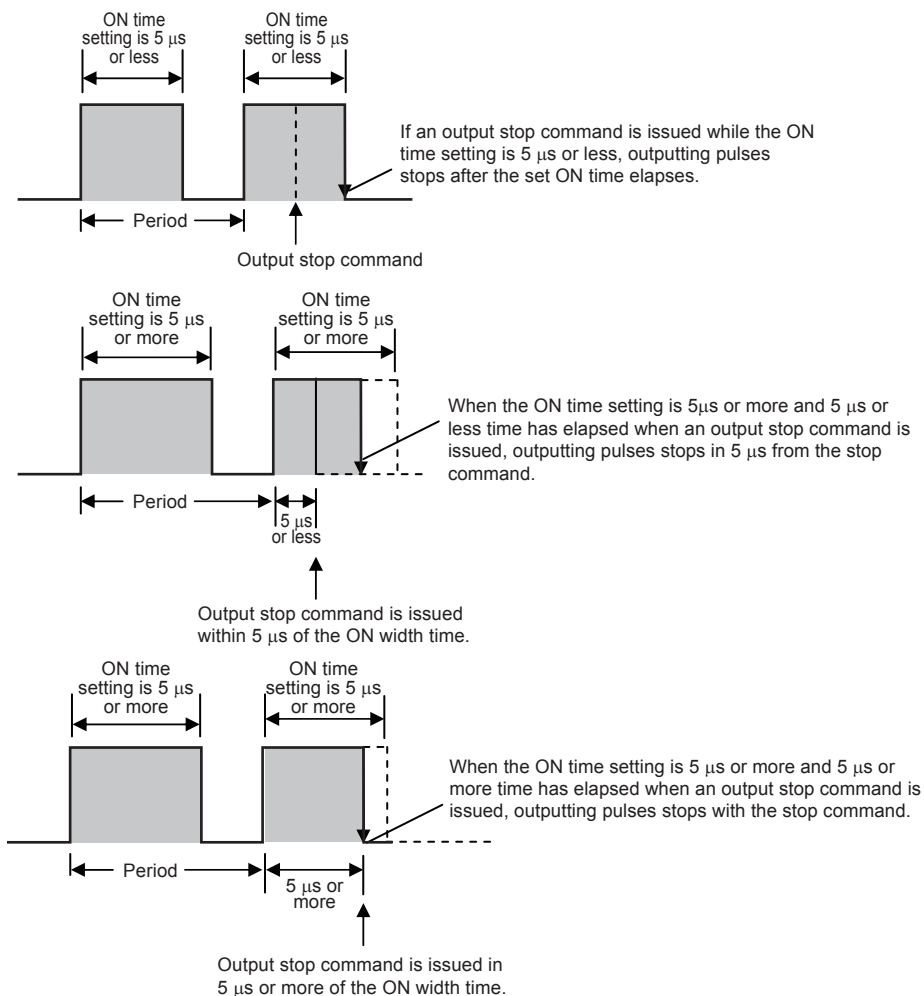
[FX5S/FX5UJ CPU module]

Output number	(s1) ON time	(s2) Period
CPU module		
Y0 to Y2	2 μs more	5 μs more
Y3 to Y7	200 μs more	400 μs more

[FX5U/FX5UC CPU module and high-speed pulse input/output module]

Output number		(s1) ON time	(s2) Period
CPU module	High-speed pulse input/ output module		
Y0 to Y3	Y0 to Y2	2 μs more	5 μs more
Y4 to Y7	—	200 μs more	400 μs more

- When a channel number that is not selected for the DPWM output in the parameter setting is specified for (d), this instruction is not executed. An operation error occurs.
- Do not specify the channel numbers of the high-speed pulse input/output module (5 to 12) in a program with interrupt priority set to "1".
- Operations when the DPWM output is stopped (while the output pulse is on)

ON time setting is 5 μs or less / ON time setting is 5 μs or less / Period / Output stop command

If an output stop command is issued while the ON time setting is 5 μs or less, outputting pulses stops after the set ON time elapses.

ON time setting is 5 μs or more / ON time setting is 5 μs or more / Period / 5 μs or less / Output stop command is issued within 5 μs of the ON width time.

When the ON time setting is 5μs or more and 5 μs or less time has elapsed when an output stop command is issued, outputting pulses stops in 5 μs from the stop command.

ON time setting is 5 μs or more / ON time setting is 5 μs or more / Period / 5 μs or more / Output stop command is issued in 5 μs or more of the ON width time.

When the ON time setting is 5 μs or more and 5 μs or more time has elapsed when an output stop command is issued, outputting pulses stops with the stop command.

• Operations when the DPWM output is stopped (while the output pulse is off)

If an output stop command is issued while the OFF time setting is 5 μs or less, outputting pulses stops after the set OFF time elapses.

When the OFF time setting is 5 μs or more and 5 μs or less time has elapsed when an output stop command is issued, outputting pulses stops in 5 μs from the stop command.

When the OFF time setting is 5 μs or more and 5 μs or more time has elapsed when an output stop command is issued, outputting pulses stops with the stop command.

• The PWM output stops when SM8034 is on, and starts when SM8034 is off.
• PWM output does not stop, even if a pulse stop command for positioning is driven.
• When specifying the number of output pulses, executing the DPWM instruction, and then outputting pulses again after the pulse output stops due to the completion of output of the specified number of pulses, turn OFF the contact which drove the DPWM instruction. When driving PWM output by the DHIOEN instruction, use the DHIOEN instruction to turn PWM output off.
• When the period setting is equivalent to the ON time setting, the output always remains ON. The output ON state continues even after "Period × Number of output pulses" is finished in this condition.

Operation error

Error code (SD0/SD8067)	Description
1810H	The output destination specified by (d) is already used by another instruction (positioning instruction). (The PWM output is not executed.)
	A Y device is specified as the output destination specified by (d), and there is no unused channel number in the parameter setting
2221H	The parameter set value is out of range.
3405H	Y10 or later is specified as the output destination specified by (d). (The PWM output stops.)
3580H	An instruction that cannot be used in an interrupt program is used.
3600H	A channel number that is not selected in the parameter setting are specified for the output destination specified by (d). (The PWM output is not executed.)
3611H(CH1) 3612H(CH2) 3613H(CH3) 3614H(CH4) 3615H(CH5) 3616H(CH6) 3617H(CH7) 3618H(CH8) 3619H(CH9) 361AH(CH10) 361BH(CH11) 361CH(CH12)	The ON time specified by (s1) is larger than the period specified by (s2). (The PWM output stops.)
	In (s1) and (s2), a negative value is specified. (The PWM output stops.)
	Values of an SD device for setting pulse width and period of this instruction are incorrect. (The PWM output stops.)
	The ON time or period is less than "1".
	The SD device specified for the number of output pulses stores a value outside the available range (0 to 2147483647).