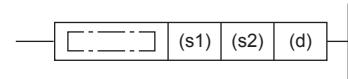


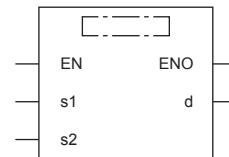
# Measuring the density of 32 bit binary pulses

## DSPD

**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 32-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:=DSPD(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/32-bit unsigned binary | ANY_ELEMENTARY <sup>*1</sup> |
| (s2)    | Measurement time (Unit: ms)                           | -2147483648 to +2147483647 | 32-bit signed binary       | ANY32                        |
| (d)     | Head device number for storing the measurement result | —                          | 32-bit signed binary       | ANY32                        |
| 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,<br>F, B, SB, S | T, ST, C, D, W,<br>SD, SW, R | U□\G□ | Z           | LC |                        | K, H     | E | \$ |        |
| (s1)    | ○ <sup>*1</sup> | ○ <sup>*2</sup>                | ○                            | ○     | ○           | ○  | ○                      | ○        | — | —  | —      |
| (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.

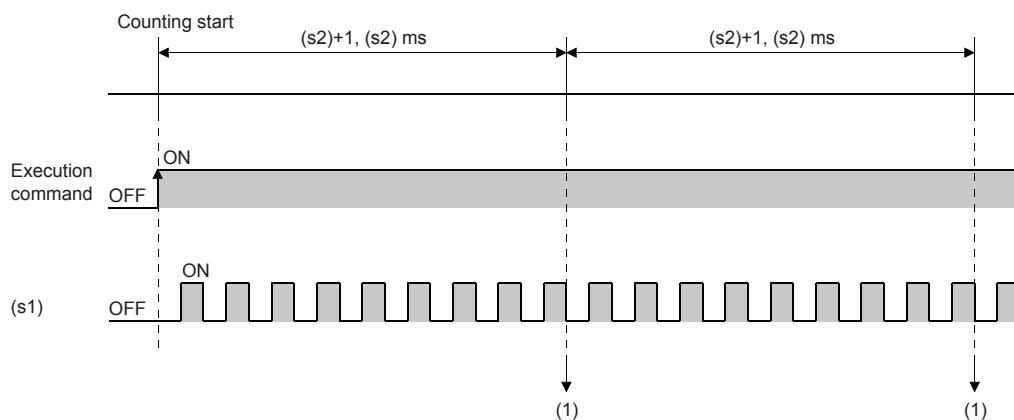
\*2 When a word device is specified, specify one of the channel numbers (CH1 to CH8).

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 32-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)+1 and (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,<br>SD4506 | SD4537,<br>SD4536 | SD4567,<br>SD4566 | SD4597,<br>SD4596 | SD4627,<br>SD4626 | SD4657,<br>SD4656 | SD4687,<br>SD4686 | SD4717,<br>SD4716 |
| Measurement unit time            | SD4517,<br>SD4516 | SD4547,<br>SD4546 | SD4577,<br>SD4576 | SD4607,<br>SD4606 | SD4637,<br>SD4636 | SD4667,<br>SD4666 | SD4697,<br>SD4696 | SD4727,<br>SD4726 |

- The table below shows the related device update timing.

| Function                         | R/W | Update timing                                                                        | Clear                 |
|----------------------------------|-----|--------------------------------------------------------------------------------------|-----------------------|
| Monitor in operation             | R   | • When the DSPD instruction is executed<br>• When the DHIOEN instruction is executed | • Power-on<br>• Reset |
| High-speed counter pulse density | R   | • Each time the measurement unit time elapses                                        | • Power-on<br>• Reset |
| Measurement unit time            | R/W | • When the DSPD instruction is executed                                              | • Power-on<br>• 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 DSPD 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 DSPD 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 DCHMOV instruction while the DSPD instruction is executed, the operation continues, but the pulse density cannot be measured normally.
- When the DSPD 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 2147483647, 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.                |