

# Subtracting 32-bit binary data

D-(P)(\_U) instruction and DSUB(P)(\_U) instruction can be used for subtraction of 32-bit binary data.

## D-(P)(\_U) [using two operands]

**FX5S    FX5UJ    FX5U    FX5UC**

These instructions subtract the 16-bit binary data in the device specified by (d) and the 16-bit binary data in the device specified by (s), and store the result in the device specified by (d).

Ladder diagram	Structured text
	Not supported ☞ Page 228 D-(P)(_U) [using three operands]

FBD/LD
Not supported. ☞ Page 228 D-(P)(_U) [using three operands]

## Setting data

### ■Descriptions, ranges, and data types

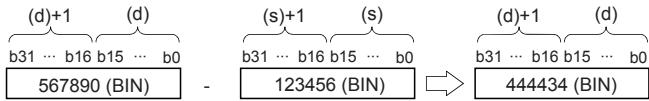
Operand	Description	Range	Data type	Data type (label)
(s)	D-(P)	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
	D-(P)_U	0 to 4294967295	32-bit unsigned binary	ANY32_U
(d)	D-(P)	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
	D-(P)_U	0 to 4294967295	32-bit unsigned binary	ANY32_U

### ■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		K, H	E	\$	
(s)	○	○	○	○	○	○	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

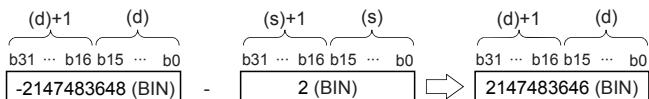
## Processing details

- These instructions subtract the 32-bit binary data in the device specified by (d) and the 32-bit binary data in the device specified by (s), and store the subtraction result in the device specified by (d).

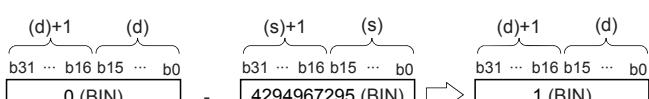
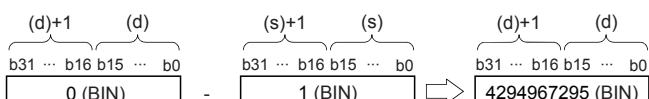


- When underflow or overflow occurs in the operation result, the following processing is executed. In this case, the carry flag (SM700, SM8022) does not turn ON.

In case of D-(P)



In case of D-(P)\_U



## Operation error

There is no operation error.

## D-(P)(\_U) [using three operands]

**FX5S    FX5UJ    FX5U    FX5UC**

These instructions subtract the 32-bit binary data in the device specified by (s1) and the 32-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text
	ENO:=DMINUS(EN,s1,s2,d); ENO:=DMINUS_U(EN,s1,s2,d); ENO:=DMINUSP(EN,s1,s2,d); ENO:=DMINUSP_U(EN,s1,s2,d);
<b>FBD/LD</b>	

("DMINUS", "DMINUSP", "DMINUS\_U", "DMINUSP\_U" enters □.)

### Setting data

#### ■Descriptions, ranges, and data types

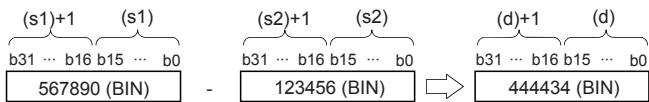
Operand		Description	Range	Data type	Data type (label)
(s1)	D-(P)	Minuend data or the head device where the data from which another is to be subtracted is stored	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
	D-(P)_U		0 to 4294967295	32-bit unsigned binary	ANY32_U
(s2)	D-(P)	Subtrahend data or the head device where the data to be subtracted from another is stored	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
	D-(P)_U		0 to 4294967295	32-bit unsigned binary	ANY32_U
(d)	D-(P)	Head device for storing the operation result	—	32-bit signed binary	ANY32_S
	D-(P)_U		—	32-bit unsigned binary	ANY32_U
EN		Execution condition	—	Bit	BOOL
ENO		Execution result	—	Bit	BOOL

#### ■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		K, H	E	\$	
(s1)	○	○	○	○	○	○	○	○	—	—	—
(s2)	○	○	○	○	○	○	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

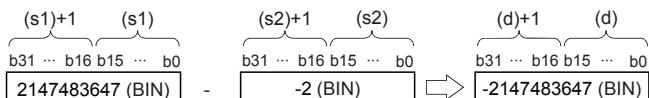
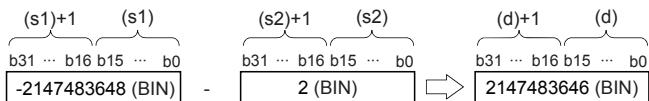
## Processing details

- These instructions subtract the 32-bit binary data in the device specified by (s1) and the 32-bit binary data in the device specified by (s2), and store the subtraction result in the device specified by (d).

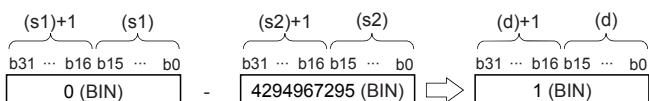
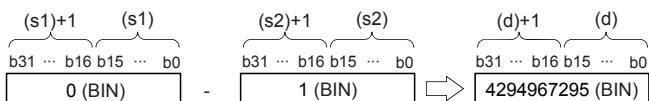


- When underflow or overflow occurs in the operation result, the following processing is executed. In this case, the carry flag (SM700, SM8022) does not turn ON.

In case of D-(P)



In case of D-(P)\_U



## Operation error

There is no operation error.

## DSUB(P)(\_U)

**FX5S    FX5UJ    FX5U    FX5UC**

These instructions subtract the 32-bit binary data in the device specified by (s1) and the 32-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text
	ENO:=DSUB(EN,s1,s2,d); ENO:=DSUBP(EN,s1,s2,d); ENO:=DSUBP_U(EN,s1,s2,d);
<b>FBD/LD</b>	

### Setting data

#### ■ Descriptions, ranges, and data types

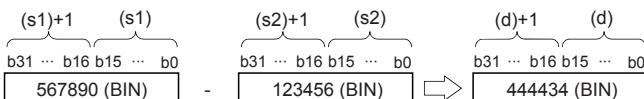
Operand	Description	Range	Data type	Data type (label)
(s1) DSUB(P)	Minuend data or the head device where the data from which another is to be subtracted is stored	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
		0 to 4294967295	32-bit unsigned binary	ANY32_U
(s2) DSUB(P)_U	Subtrahend data or the head device where the data to be subtracted from another is stored	-2147483648 to +2147483647	32-bit signed binary	ANY32_S
		0 to 4294967295	32-bit unsigned binary	ANY32_U
(d) DSUB(P)	Head device for storing the operation result	—	32-bit signed binary	ANY32_S
		—	32-bit unsigned binary	ANY32_U
EN	Execution condition	—	Bit	BOOL
ENO	Execution result	—	Bit	BOOL

#### ■ 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		K, H	E	\$	
(s1)	○	○	○	○	○	○	○	○	—	—	—
(s2)	○	○	○	○	○	○	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

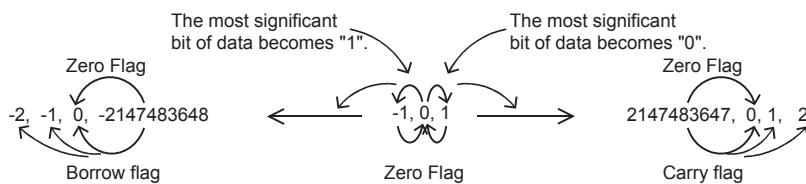
### Processing details

- These instructions subtract the 32-bit binary data in the device specified by (s1) and the 32-bit binary data in the device specified by (s2), and store the subtraction result in the device specified by (d).



## ■Relationship between the flag operation and the sign (positive or negative) of a numeric value

Device	Name	Description
SM700, SM8022	Carry	When the operation result exceeds the upper limit of the data setting range, the carry flag is turned ON.
SM8020	Zero	When the operation result is 0, the zero flag is turned ON.
SM8021	Borrow	When the operation result is less than the lower limit of the data setting range, the borrow flag is turned ON.



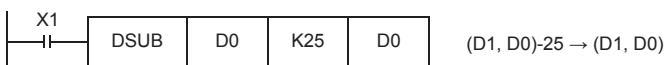
## Precautions

### ■When the DSUB instruction is used

When specifying word devices, a device is specified for the lower-order 16-bits first, and then a word device with the next device number is set for the higher-order 16 bits. To prevent number overlap, it is recommended to always specify an even number.

### ■When specifying the same device in the source and destination

The same device number can be specified for both the source and the destination. In this case, note that the subtraction result changes in every operation cycle if a continuous operation type SUB instruction is used.



### ■Difference between DSUB(P) instruction, D-(P) instruction, and DDEC(P) instruction in a program for subtracting "-1"

When DSUB(P) instruction is used to subtract 1 from the contents of D0 every time X1 turns from OFF to ON, SUB(P) instruction is similar to D-(P) instruction and DDEC(P) instruction described later except for the contents shown in the table below:

		DSUB(P) instruction	D-(P) instruction, DDEC(P) instruction
Flag (zero, borrow or carry)		Operates	Does not operate
Operation result (s)-1=(d)		$-2147483648 \rightarrow 0 \rightarrow -1 \rightarrow -2 \rightarrow \dots$	$-2147483648 \rightarrow +2147483647 \rightarrow +2147483646 \rightarrow \dots$

## Operation error

There is no operation error.