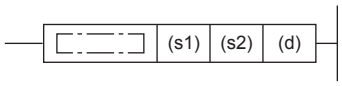
Multiplying 16-bit binary data

*(P)(_U) instruction and MUL(P)(_U) instruction can be used for multiplication of 16-bit binary data.

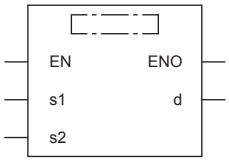
*(P)(_U)

FX5S FX5UJ FX5U FX5UC

These instructions multiply the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text[*1]	
	ENO:=MULTI(EN,s1,s2,d); ENO:=MULTIP(EN,s1,s2,d);	ENO:=MULTI_U(EN,s1,s2,d); ENO:=MULTIP_U(EN,s1,s2,d);

FBD/LD



("MULTI", "MULTIP", "MULTI_U", "MULTIP_U" enters □.)

*1 Supported by engineering tool version "1.035M" and later.

Setting data

■Descriptions, ranges, and data types

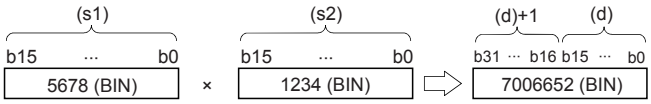
Operand		Description	Range	Data type	Data type (label)
(s1)	*(P)	Multiplicand data or the device where the data to be multiplied by another is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	*(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(s2)	*(P)	Multiplier data or the device where the data by which another is to be multiplied is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	*(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(d)	*(P)	Head device for storing the operation result	—	32-bit signed binary	ANY32_S
	*(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	LZ		K, H	E	$	
(s1)	○	○	○	○	—	—	○	○	—	—	—
(s2)	○	○	○	○	—	—	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

Processing details

- These instructions multiply the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the multiplication result in the device specified by (d).



- When (d) is a bit device, lower-order bit is specified first.

Ex.

Multiplication result when (d) is a bit device

- K1 ... Lower 4 bits (b0 to b3)
- K4 ... Lower 16 bits (b0 to b15)
- K8 ... Lower 32 bits (b0 to b31)

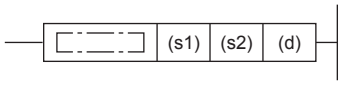
Operation error

Error code (SD0/SD8067)	Description
2820H	The device range specified by (d) exceeds the corresponding device range.

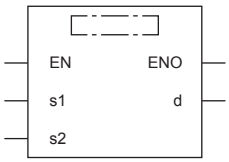
MUL(P)(_U)

FX5S FX5UJ FX5U FX5UC

These instructions multiply the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the result in the device specified by (d).

Ladder diagram	Structured text*1	
	ENO:=MULP(EN,s1,s2,d);	ENO:=MUL_U(EN,s1,s2,d); ENO:=MULP_U(EN,s1,s2,d);

FBD/LD*1



("MULP", "MUL_U", "MULP_U" enters □.)

*1 The MUL instruction is not supported by the ST language and the FBD/LD language. Use MUL of the standard function.
☞ Page 1302 MUL(_E)

Setting data

■Descriptions, ranges, and data types

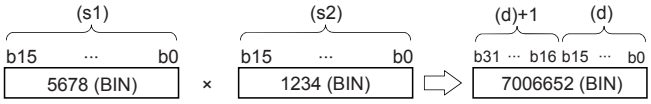
Operand		Description	Range	Data type	Data type (label)
(s1)	MUL(P)	Multiplicand data or the device where the data to be multiplied by another is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	MUL(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(s2)	MUL(P)	Multiplier data or the device where the data by which another is to be multiplied is stored	-32768 to +32767	16-bit signed binary	ANY16_S
	MUL(P)_U		0 to 65535	16-bit unsigned binary	ANY16_U
(d)	MUL(P)	Head device for storing the operation result	—	32-bit signed binary	ANY32_S
	MUL(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	LZ		K, H	E	$	
(s1)	○	○	○	○	—	—	○	○	—	—	—
(s2)	○	○	○	○	—	—	○	○	—	—	—
(d)	○	○	○	○	○	○	○	—	—	—	—

Processing details

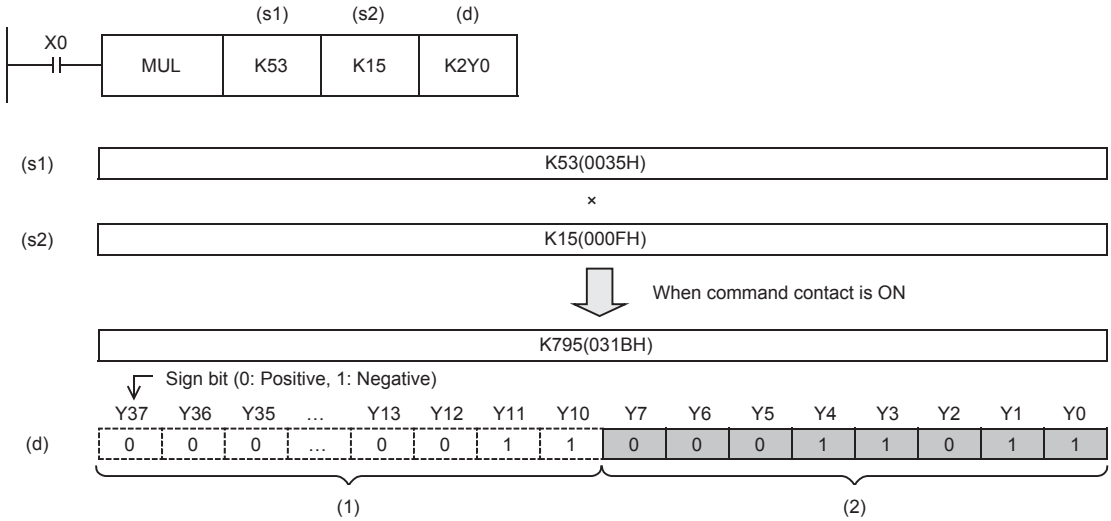
- These instructions multiply the 16-bit binary data in the device specified by (s1) by the 16-bit binary data in the device specified by (s2), and store the multiplication result in the device specified by (d).



• Nibble can be specified ranging from K1 to K8 for (d).

Ex.

For example, when K2 is specified, only the lower-order 8 bits can be obtained out of the product (32 bits).



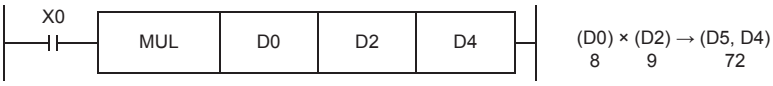
(1): Not output

(2): K2Y0 operation result is output.

■Related flag

Device	Name	Description
SM8304	Zero	When the operation result is 0, the zero flag is turned ON.

Program example



Operation error

Error code (SD0/SD8067)	Description
2820H	The device range specified by (d) exceeds the corresponding device range.