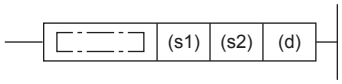
Subtracting clock data

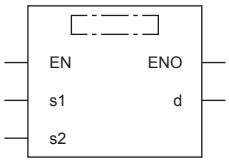
TSUB(P)

FX5S FX5UJ FX5U FX5UC

These instructions subtract the time data stored in the device numbers starting from (s2) from the clock data stored in the device numbers starting from (s1), and store the result to the device numbers starting from (d).

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

FBD/LD



Setting data

■Descriptions, ranges, and data types

Operand	Description	Range	Data type	Data type (label)
(s1)	Head device number where the clock data that is subtracted is stored	—	16-bit signed binary	ANY16_ARRAY (Number of elements: 3)
(s2)	Head device number where the subtracting time value (or clock data value) is stored	—	16-bit signed binary	ANY16_ARRAY (Number of elements: 3)
(d)	Head device number where the resultant clock data (or time value) is stored	—	16-bit signed binary	ANY16_ARRAY (Number of elements: 3)
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 subtract the time data stored in the device numbers starting from (s2) from the clock data stored in the device numbers starting from (s1), and store the result to the device numbers starting from (d).

(s1)	hour	(0 to 23)	-	(s2)	hour	(0 to 23)	⇨	(d)	hour	(0 to 23)
(s1)+1	minute	(0 to 59)		(s2)+1	minute	(0 to 59)		(d)+1	minute	(0 to 59)
(s1)+2	second	(0 to 59)		(s2)+2	second	(0 to 59)		(d)+2	second	(0 to 59)

Ex.

When subtracting 3:50:10 from 10:40:20

(s1)	10	-	(s2)	3	⇨	(d)	6
(s1)+1	40		(s2)+1	50		(d)+1	50
(s1)+2	20		(s2)+2	10		(d)+2	10

- If the remainder is a negative time value, the borrow flag turns on. The actual result will be the remainder plus 24:00:00. For example, if a time value of 10:42:12 is subtracted from another time value of 4:50:32, the remainder is -6:08:20. However, the actual subtraction result will be 18:08:20.

(s1)	4	-	(s2)	10	⇨	(d)	18
(s1)+1	50		(s2)+1	42		(d)+1	8
(s1)+2	32		(s2)+2	12		(d)+2	20

- If the result is 0 (0:00:00), the zero flag turns on.
- The table below shows the related devices.

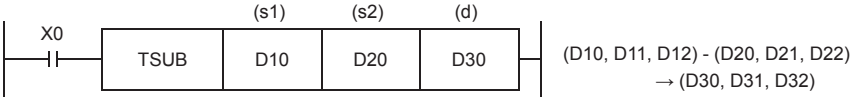
Device	Name	Description
SM8020	Zero	If the result is 0:00:00, this special relay turns on.
SM8021	Borrow	If the execution result of the TSUB(P) instruction is less than 0:00:00, this special relay turns on.

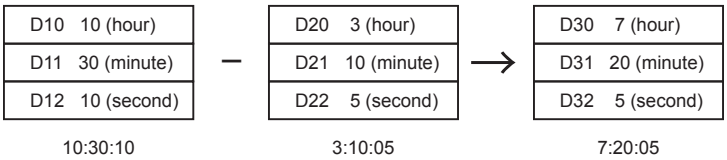
Precautions

- These instructions occupy three points for each of three devices starting from device number specified by (s1), (s2), and (d) respectively. Make sure that these devices are not used by other machine controls.
- When using the time value (hour, minute, second) of the built-in real time clock in the CPU module for the operation, use the TRD(P) operation to read the special register values first. Then specify the word devices where the read values are stored to each operand.

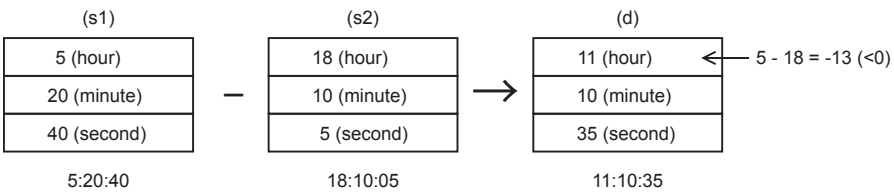
Program example

In the program shown below, when X0 is set to ON, the time obtained by subtracting the D20 to D22 time data from the D10 to D12 clock data is stored in D30 to D32.





- When the operation result is smaller than "00:00:00"



Operation error

Error code (SD0/SD8067)	Description
2820H	The device range specified by (s1), (s2), and (d) exceeds the corresponding device range.
3405H	Any of values specified by (s1) and (s2) is outside the following range. 0 to 23
	Any of values specified by (s1)+1, (s2)+1, (s1)+2, and (s2)+2 is outside the following range. 0 to 59