Library of
Connection Elements
ABB Procontic T200

ABB Procontic
Programming System

907 PC 332
Programming and Test Software

ABB Schalt-
und Steuerungstechnik

ABB

Note

The connection elements from the block library expansions 907 PB 360, PB 361 and PB 362 have been integrated into the programming system 907 PC 332.

This connection elements are described in volume 8.

Finding connection elements

In the currently available connection element library, the connection elements are sorted in two different orders. They are sorted:

1. in function groups
2. alphabetically.

Note:
In case of older central units (R101, R201), the processing times of connection elements are 16 % slower than those of central units R302.

ABB Procontic T 200 functions, arranged according to function groups

The following overview summarizes the connection elements in function groups. You will find a detailed description starting with the stated page.

Call name in FBD/LD	Connection element	Page in CE–library
Binary functions		
&	AND	7
/	LOGIC OR, BINARY	15
=1	EXCLUSIVE OR, BINARY	26
MAJ	Majority	63
=	Allocation, binary	25
Latch functions		
=S	Allocation set type	30
=R	Allocation reset type	29
RS	Dominant set latch	79
SR	Dominant reset latch	90
Arithmetic functions, word		
+	Addition, word	11
–	Subraction, word	13
*	Multiplication, word	8
:	Division, word	16
*:	Multiplier with divider	9
BET	Absolute value, conditional	47
!BET	Absolute value, unconditional	3

Call name in FBD/LD	Connection element	Page in CE – library
Arithmetic functions, word		
KPL	Complement, conditional	60
!KPL	Complement, unconditional	6
SFT1L	Shift for 1 bit position to left	80
SFT1R	Shift for 1 bit position right	81
SFT8L	Shift for 8 bit positions to left	82
SFT8R	Shift for 8 bit positions to right	83
=W	Allocation word	31
Arithmetic functions, double word		
+D	Double word addition	12
–D	Double word subtraction	14
*D	Double word multiplication	10
:D	Double word division	20
SQRT	Square root	89
=D	Allocation, double word	28
Comparison functions		
>	Greater than, word	32
>=	Greater than or equal to, word	33
=?	Equal, word	27
<>	Not equal, word	23
<=	Less than or equal, word	22
<	Less than, word	21
>D	Greater than, double word	34
<D	Less than, double word	24

Call name in FBD/LD	Connection element	Page in CE–library
Timer functions		
ESV	On delay timer	52
ASV	Off delay timer	41
MOA	Single shot timer with abortion	66
MOK	Single shot timer, constant	68
PDM	Oscillator with 2 timers	76
ST	Timer setup value allocation	91
Counter functions		
SZ	Counter setup value allocation	93
ZV	Up counter	111
ZG60	Control 07 ZG 60	107
Program control functions		
SPBM	Conditional jump to label	87
MRK	Jump label	70
MA	Label, start	61
ME	Label, end	64
PE	Program end	78
SPE	Absolute end of user program	88
DEF_A	Beginning of user function block definition	51
BE	End of user function block definition	45
IBE	End of interrupt block	56
BA_NP	User function block call without parameters	44
!BA_NP	User function block call without parameters, unconditional	1

Call name in FBD/LD	Connection element	Page in CE–library
Format conversion		
C/W	BCD to binary conversion	48
W/C	Binary to BCD conversion	102
W/D	Word to double word conversion	103
D/W	Double word to word conversion	50
PACK	Pack binary variables in word	72
PACK1	Pack word (function block)	74
UNPACK	Unpacking a word into binary variables	98
UNPACK1	Unpacking a word (function block)	100
Pulse		
I+	Rising edge pulse	53
I–	Falling edge pulse	54
Logic functions with word values		
WAND	Logic AND function, word	104
WOR	Logic OR function, word	105
WXOR	Exclusive OR logic function, word	106
Step chains		
ISCH	Initialization	59
Analog value processing		
ANAI	Read analog values (07 EA 60 ...63)	35
ANAI1	Read analog values (07 EA 60...65)	37
ANAO	Output of analog values	39

Call name in FBD/LD	Connection element	Page in CE–library
Special functions		
	If then	17
	If then, word	19
	If then, double word	18
	NOTBIT	71
Higher Order functions		
AWT	Selection gate	43
BEG	Limiter, conditional	46
!BEG	Limiter, unconditional	2
IDL	Indirect reading, conditional	57
!IDL	Indirect reading, unconditional	4
IDS	Indirect writing, conditional	58
!IDS	Indirect writing, unconditional	5
SIN	Sine 0 to 360 degree	84
SIN1	Sine 0,0 to 360,0 degree	85
COS	Cosine	49
UHR	Clock	95

ABB Procontic T 200 functions, arranged alphabetically according to call names

The following overview summarizes the connection elements in the same order you can find them in the programming software. You will find a detailed description of the according connection element under the stated page.

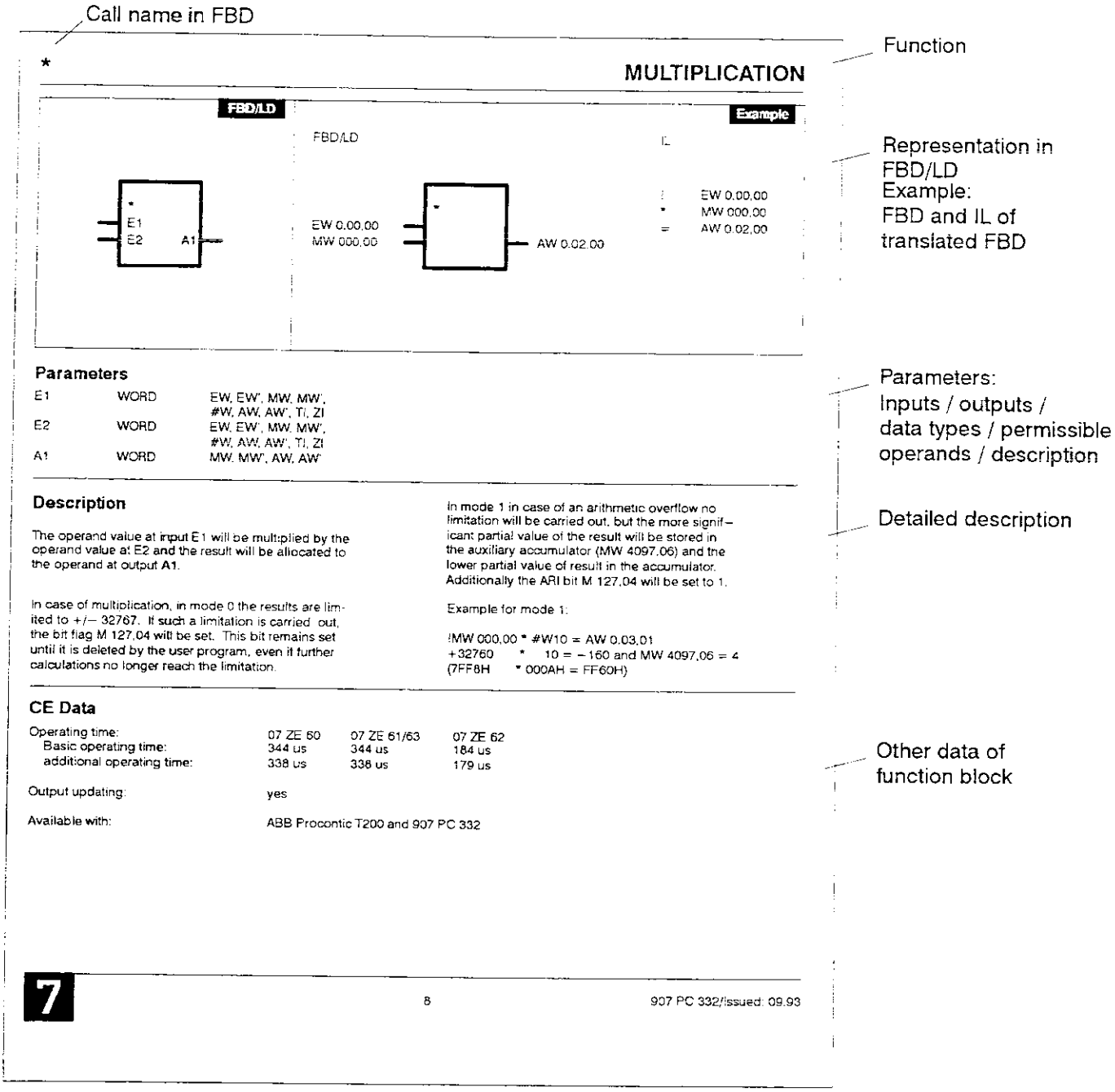
Call name in FBD/LD	Connection element	Page in CE–library
!BA_NP	User function block call without parameters, unconditional	1
BEG	Limiter, unconditional	2
!BET	Absolute value, unconditional	3
!IDL	Indirect reading, unconditional	4
!IDS	Indirect writing, unconditional	5
!KPL	Complement, unconditional	6
&	AND	7
*	Multiplication, word	8
*:	Multiplier with divider	9
*D	Double word multiplication	10
+	Addition, word	11
+D	Double word addition	12
–	Subraction, word	13
–D	Double word subtraction	14
/	Logic or, binary	15
:	Division, word	16
	If then	17
	If then, double word	18
	If then, word	19
:D	Double word division	20
<	Less than, word	21
<=	Less than or equal, word	22
<>	Not equal, word	23
<D	Less than, double word	24

Call name in FBD/LD	Connection element	Page in CE–library
=	Allocation, binary	25
=1	Exclusive or, binary	26
=?	Equal,word	27
=D	Allocation, double word	28
=R	Allocation reset type	29
=S	Allocation set type	30
=W	Allocation word	31
>	Greater than, word	32
>=	Greater than or equal to, word	33
>D	Greater than, double word	34
ANAI	Read analog values (07 EA 60...63)	35
ANAI1	Read analog values (07 EA 60...65)	37
ANAO	Output of analog values	39
ASV	Off delay timer	41
AWT	Selection gate	43
BA_NP	User function block call without parameters	44
BE	End of user function block definition	45
BEG	Limiter	46
BET	Absolute value	47
C/W	BCD to word conversion	48
COS	Cosine	49
D/W	Double word to word conversion	50
DEF_A	Beginning of user function block definition	51

Call name in FBD/LD	Connection element	Page in CE–library
ESV	On delay timer	52
I+	Rising edge pulse	53
I–	Falling edge pulse	54
IBE	End of interrupt block	56
IDL	Indirect reading	57
IDS	Indirect writing	58
ISCH	Initialization of step chains	59
KPL	Complement	60
MA	Label, start	61
MAJ	Majority	63
ME	Label, end	64
MOA	Single shot timer with abortion	66
MOK	Single shot timer, constant	68
MRK	Jump label	70
	NOTBIT	71
PACK	Pack binary variables in word	72
PACK1	Pack word (function block)	74
PDM	Oscillator with 2 timers	76
PE	Program end	78

Call name in FBD/LD	Connection element	Page in CE–library
RS	Dominant set latch	79
SFT1L	Shift for 1 bit position to left	80
SFT1R	Shift for 1 bit position to right	81
SFT8L	Shift for 8 bit positions to left	82
SFT8R	Shift for 8 bit positions to right	83
SIN	Sine 0 to 360 degree	84
SIN1	Sine 0,0 to 360,0 degree	85
SPBM	Conditional jump to label	87
SPE	Absolute end of user program	88
SQRT	Square root	89
SR	Dominant reset latch	90
ST	Timer setup value allocation	91
SZ	Counter setup value allocation	93
UHR	Clock	95
UNPACK	Unpacking a word into binary variables	98
UNPACK1	Unpacking a word (function block)	100
W/C	Binary to BCD conversion	102
W/D	Word to double word conversion	103
WAND	Logic AND function, word	104
WOR	Logic OR function, word	105
WXOR	Exclusive OR logic function, word	106
ZG60	Control 07 ZG 60	107
ZV	Up counter	111

The description of function blocks has the following lay-out:



Further explanations

FBD/LD

Input and output parameters shown in italics cannot be displayed when starting the CE.

Element data

Operating time:
Basic operating time: runtime without doubling
Additional operating time: runtime per doubling

Output updating: specifies whether the output is re–allocated in every cycle. In case of "no", connection to further CEs is not possible.

Note for extended IL
You can call a CE in the extended IL by using
$ <call name in the FBD>
or by using the menu.

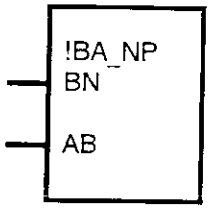
Display the translated IL

The translated IL of the FBD/LD or the extended IL can be displayed by using the menu (call with <space bar> –> 'Display translated IL' in the editor).

USER FUNCTION BLOCK CALL WITHOUT PARAMETERS, UNCONDITIONAL

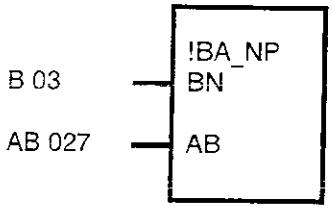
!BA_NP

FBD/LD



Example

FBD/LD



IL

```
!     BA 03
AB    027
```

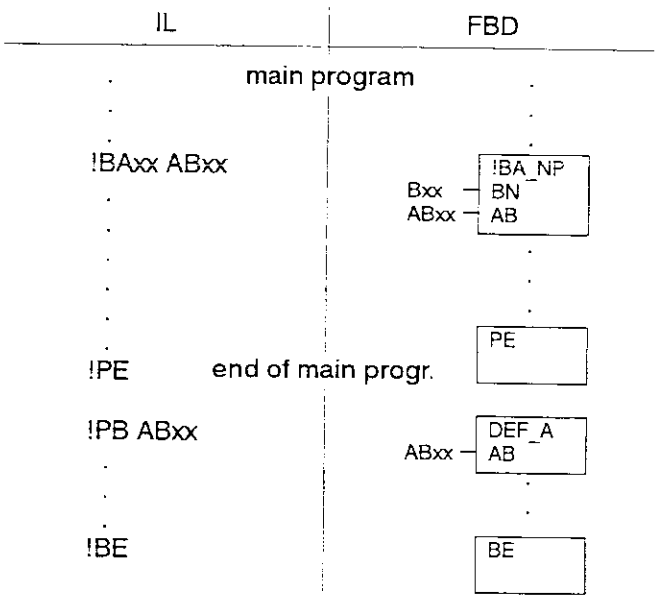
Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
AB	SPECIAL	AB00 ... AB99	Input in FBD: ABxx

Description

User function blocks offer the PLC user the possibility of defining, in one single step, frequently used program parts as a user block and of calling this block then as often as he wants.

The program part represented by the user function block is executed immediately after the function block is called.



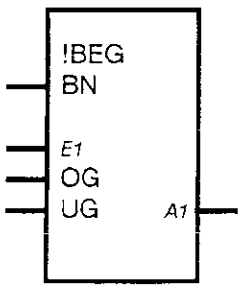
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	33.6 µs	33.6 µs	17.7 µs
Additional operating time:	– – –	– – –	– – –

Output updating: – – –

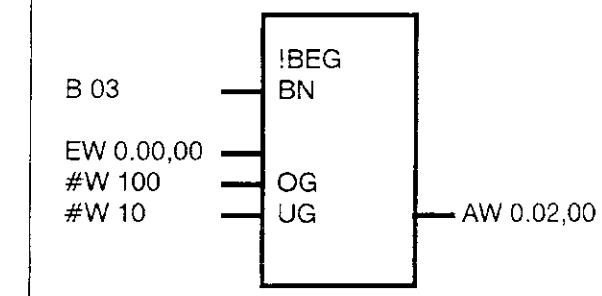
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   BA 03
FB  023
EP  EW 0.00,00
EP  #W 100
EP  #W 10
AP  AW 0.02,00
```

Parameters

BN	SPECIAL	B00 ... B255	input in FBD: Bxx
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	word input
OG	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	upper limit
UG	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	lower limit
A1	WORD	MW, MW', AW, AW'	output

Description

The block !BEG limits a variable input value (E1) to a maximal amplitude between adjustable limiting values (upper limit OG, lower limit UG) and allocates this limited value to an output variable (A1).

CE Data

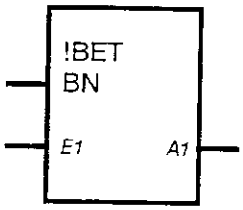
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	20.2 µs	20.2 µs	11.8 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 14 double words of 32 bit each

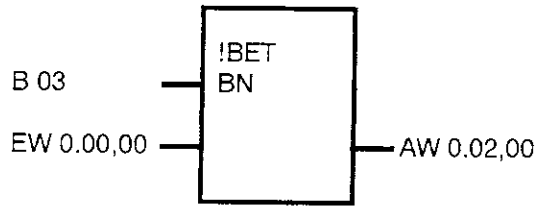
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA   03
FB    022
EP    EW 0.00,00
AP    AW 0.02,00
```

Parameters

BN	SPECIAL	B 00 ... B 255	Input in FBD: Bxx
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	input value
A1	WORD	MW, MW', AW, AW'	amount of input value

Description

The input variable value will be formed and will be allocated to the output variable. In other words, if the input value is negative the output value is positive. If the input value is positive the output value is also positive.

In case of −32768 (8000H) the result is again −32786, because this number is not defined.

CE Data

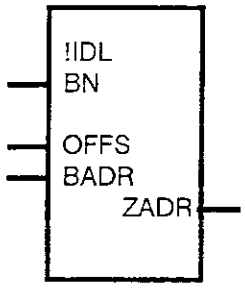
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.8 µs	11.8 µs	5.9 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 5 double words of 32 bit each

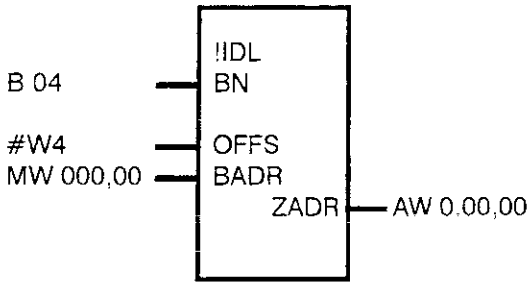
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     BA 04
FB    021
EP    #W4
EPA   MW 000,00
AP    AW 0.00,00
```

Parameters

BN	SPECIAL		Input in FBD: Bxx
OFFS	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	offset, distance
BADR	WORD	EW, EW', MW, MW', AW, AW', TI, ZI	basic address
ZADR	WORD	MW, MW', AW, AW'	destination address

Description

The block transfers the variable content defined by means of the basic address and offset (distance) to the given address. Only distances values between 0 and 127 are allowed.

An allocation out of the flag ranges will not be reported.

```
Source address:  Basic address   MW  00,00
                 + Offset                4
                 ----------------------------
                   Source address MW  00,04
```

CE Data

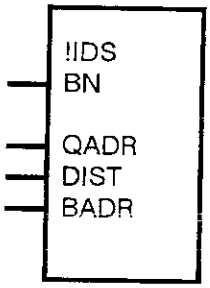
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	10.9 µs	10.9 µs	5.9 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 5 double words of 32 bit each

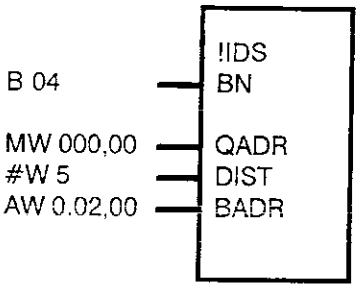
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     BA 04
FB    020
EP    MW 000,00
EPA   AW 0.02,00
EP    #W 5
```

Parameters

BN	SPECIAL		Input in FBD: Bxx
QADR	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	source address
DIST	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	offset
BADR	WORD	EW, EW', MW, MW', AW, AW'	basic address

Description

The block transfers the content of a source address to a target address, calculated from the basic address and distance. Only distance values between 0 and 127 are allowed.

Target address calculation:

```
for inst.:   Basic address  AW 0.02,00
         +   Distance               5
             ------------------------
             Target address AW 0.02,05
```

If the calculated destination address is out of range, no allocation will be performed and the error flag M 127,04 will be set to one.

CE Data

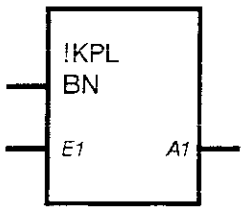
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	20.2 µs	20.2 µs	10.1 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 17 double words of 32 bit each

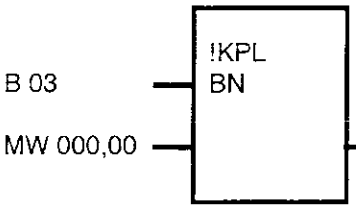
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     BA 03
FB024
EP    MW 000,00
AP    AW 0.02,00
```

Parameters

BN	SPECIAL	B 00 ... B 255	Input in FBDs: Bxx
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	input value
A1	WORD	MW, MW', AW, AW'	1's complement of the input value

Description

The block forms the 1's complement of the input variable (E1) and stores this complement in the output variable (A1).

1's complement:
- every bit is inverted separately
- in case of bit variables the status is inverted

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.6 µs	7.6 µs	4.2 µs
Additional operating time:	– – –	– – –	– – –

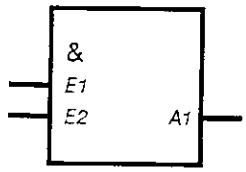
Output updating: yes

Memory allocated once when called: 2 double words of 32 bit each

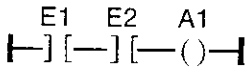
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD

FBD

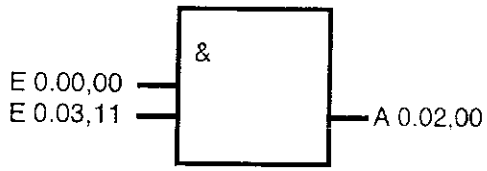


LD



Example

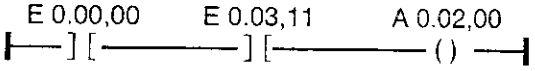
FBD



IL

```
!   E 0.00,00
&   E 0.03,11
=   A 0.02,00
```

LD



Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	operand 1 of the AND function
E2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	operand 2 of the AND function, can be duplicated
A1	BINARY	M, M', A, A', S, T, Z	result of the AND function

Description

Logic AND function of signals at inputs E1 and E2 with result allocation to output A1.

E2 can be duplicated. The inputs and outputs can be inverted.

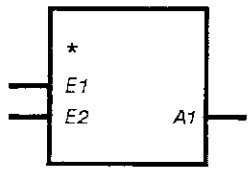
Truth table:

E1	E2	A1
0	0	0
1	0	0
0	1	0
1	1	1

CE Data

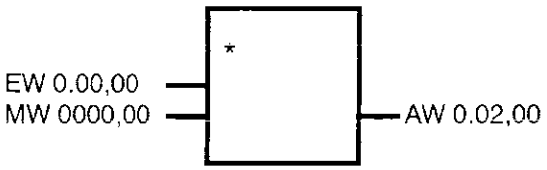
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	7.7 µs	7.7 µs	2.2 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
*   MW 0000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Multiplicant
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Multiplier
A1	WORD	MW, MW', AW, AW'	Result

Description

The operand value at input E1 will be multiplied by the operand value at E2 and the result will be allocated to the operand at output A1.

In case of multiplication, in mode 0 the results are limited to +/− 32767. If such a limitation is carried out, the bit flag M 127,04 will be set. This bit remains set until it is deleted by the user program, even if further calculations no longer reach the limitation.

In mode 1 in case of an arithmetic overflow no limitation will be carried out, but the more significant partial value of the result will be stored in the auxiliary accumulator (MW 4097,06) and the lower partial value of the result in the accumulator. Additionally the ARI bit M 127,04 will be set to 1.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3−22.

Example for mode 1:

```
!MW 000,00 * #W10 = AW 0.03,01
+32760     *   10 = −160 and MW 4097,06 = 4
(7FF8H     * 000AH = FF60H)
```

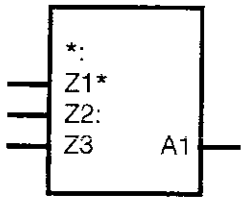
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	289 µs	289 µs	155 µs
Additional operating time:	284 µs	284 µs	150 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

MULTIPLIER WITH DIVIDER

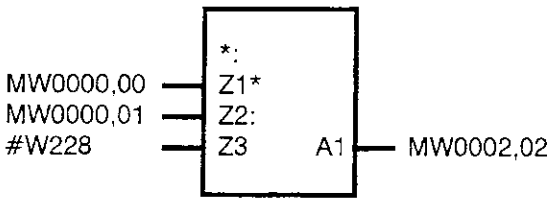
*:

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0003
EP      MW0000,00
EP      MW0000,01
EP      #W228
AP      MW0002,02
```

Parameters

Z1*	WORD	EW, EW', AW, AW' MW, MW', TI, ZI, #W	Multiplicant
Z2:	WORD	EW, EW', AW, AW' MW, MW', TI, ZI, #W	Multiplier
Z3	WORD	EW, EW', AW, AW' MW, MW', TI, ZI, #W	Divisor
A1	WORD	AW, AW', MW, MW'	Result

Description

The value of the operand at the input Z1* is multiplied by the value of the operand at the input Z2: , the intermediate result is divided by the value of the operand at the input Z3 and the end result is allocated to the operand at the output A1.

The end result is checked for a value transgression. The ARI BIT (M 127,04) is set for each overflow. It must be reset by the user after evaluation.

Internally, a 32–bit value is produced on multiplication so that no accuracy is lost during the course of subsequent division. The end result is rounded up if the division remainder is ≥ 0.5. If a number overflow is produced (e.g. when division by 0 is performed), a value transgression is detected.

If the divisor has the value 0, the positive or negative limit value of the range of numbers is allocated to the output. For division by 0 applies:

A1 = −32 767 (8001 H) if the dividend is negative and

A1 = +32 767 (7FFF H) if the dividend is positive.

In both cases a value transgression is detected.

Range of numbers for the inputs and outputs

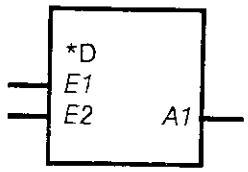
Integer word (16 bits).

Lower limit:	8001 H	−32 767
Upper limit:	7FFF H	+32 767
Not allowed:	8000 H	–––––

CE Data

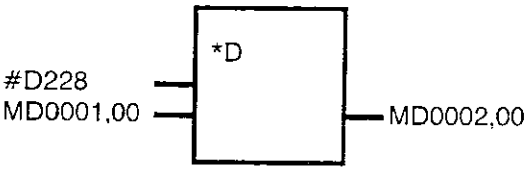
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	664 µs	664 µs	334 µs
Additional operating time:	–––	–––	–––
Output updating:	yes		
Memory allocated once when called:	92 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0007
EP      #D228
EP      MD0001,00
AP      MD0002,00
```

Parameters

E1	DOUBLE WORD	ED, AD MD, MD', #D	Multiplicand
E2	DOUBLE WORD	ED, AD MD, MD', #D	Multiplier
A1	DOUBLE WORD	AD, MD, MD'	Result

Description

The value of the double word operand at the input E1 is multiplied by the value of the double word operand at the input E2. The result is allocated to the operand at output A1.

The result is checked for a value transgression. As a function of the mode bit (M 127,15), the result is limited to +/– 2147483647 in the event of an overflow (mode=0) or the two flags CY (M127,00) and OV (M127,01) are set (mode=1). The ARI BIT (M 127,04) is set for each overflow. It must be reset by the user after evaluation.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3–22.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers for the inputs and outputs

Integer double word (32 bits).

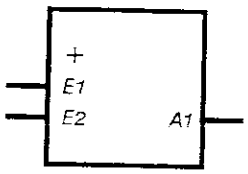
Lower limit:	8000 0001 H	–2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	– – –

CE Data

Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	1166 µs	1166 µs	661 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	88 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

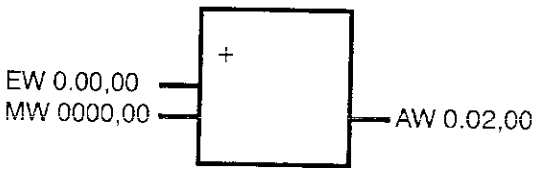
ADDITION, WORD

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
+   MW 0000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	1st summand
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	2nd summand; input can be duplicated
A1	WORD	MW, MW', AW, AW'	Result

Description

The operand value at input E1 will be added to the operand value at E2 and the result will be allocated to the operand at output A1.

In case of addition in mode 0 the results are limited to +/− 32767. If such a limitation is carried out, the bit flag M 127,04 will be set. This bit remains set, even if further calculations no longer reach the limitation, until it is deleted by the user program.
In mode 1 in case of an arithmetic overflow no limitation is carried out; only the Carry (M 127,00) and Overflow (M 127,01) flags will be set. The ARI bit M 127,04 is used as an additional display.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3–22.

Examples for mode 1:

Example 1:

!MW 000,00 + #W 10 = AW 0.03,01
+32760 + 10 = −32766 with Carry bit = 0 and Overflow bit = 1
(7FF8H + 000AH = 8002H)

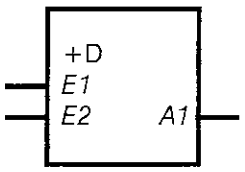
Example 2:

!MW 000,00 + #W −10 = AW 0.03,01
−32760 + −10 = +32766 with Carry bit = 1 and Overflow bit = 1
(8008H + FFF6H = 7FFEH)

CE Data

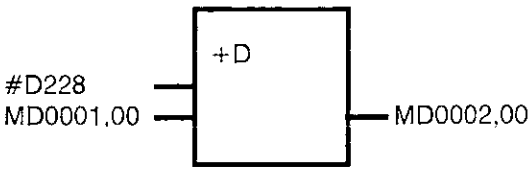
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	27.2 µs	27.2 µs	16.1 µs
Additional operating time:	21.8 µs	21.8 µs	11.8 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0005
EP      #D228
EP      MD0001,00
AP      MD0002,00
```

Parameters

E1	DOUBLE WORD	ED, AD MD, MD', #D	1st summand
E2	DOUBLE WORD	ED, AD MD, MD', #D	2nd summand
A1	DOUBLE WORD	AD, MD, MD'	Result

Description

The value of the double word operand at the input E2 is added to the value of the double word operand at the input E1. The result is allocated to the operand at output A1.

The result is checked for a value transgression. As a function of the mode bit (M 127,15), the result is limited to +/– 2147483647 in the event of an overflow (mode=0) or the two flags CY and OV are set (mode=1). The ARI BIT (M 127,04) is set for each overflow. It must be reset by the user after evaluation.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3–22.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers

Integer double word (32 bits).

In common the following is valid:

Lower limit:	8000 0001 H	–2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	– – –

In particular, for the inputs E1 and E2 the following is valid:

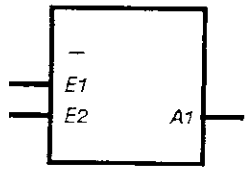
Lower limit:	8000 0000 H	–2 147 483 648

CE Data

Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	35 µs	35 µs	19 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	25 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

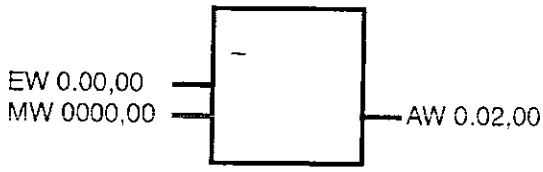
SUBTRACTION, WORD

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
–   MW 0000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Minuend
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Subtrahend
A1	WORD	MW, MW', AW, AW'	Result

Description

The operand value at input E2 will be subtracted from the value at input E1 and the result will be allocated to the operand value at A1.

In case of subtraction, in mode 0 the results are limited to +/– 32767. If such a limitation is carried out, the bit flag M 127,04 will be set. This bit remains set until it is deleted by the user program, even if further calculations no longer reach the limitation.
In mode 1 in case of an arithmetic overflow no limitation is carried out; only the Carry (M 127,00) and Overflow (M 127,01) flags will be set. The ARI bit M 127,04 is used as an additional display.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3–22.

Examples for mode 1:

Example 1:

!MW 000,00 – #W–10 = AW 0.03,01
+32760 – –10 = –32766 with Carry bit = 1 and Overflow bit = 0
(7FF8H – FFF6H = 8002H)

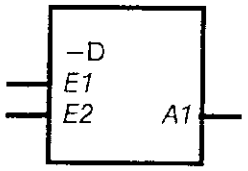
Example 2:

!MW 000,00 – #W 10 = AW 0.03,01
–32760 – 10 = +32766 with Carry bit = 0 and Overflow bit = 1
(8008H – 000AH = 7FFEH)

CE Data

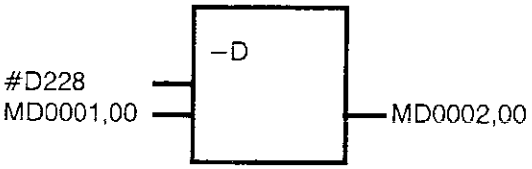
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	28.9 µs	28.9 µs	17.0 µs
Additional operating time:	23.5 µs	23.5 µs	12.6 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0006
EP      #D228
EP      MD0001,00
AP      MD0002,00
```

Parameters

E1	DOUBLE WORD	ED, AD MD, MD', #D	Minuend
E2	DOUBLE WORD	ED, AD MD, MD', #D	Subtrahend
A1	DOUBLE WORD	AD, MD, MD'	Result

Description

The value of the double word operand at the input E2 is subtracted from the value of the double word operand at the input E1. The result is allocated to the operand at output A1.

The result is checked for a value transgression. As a function of the mode bit (M 127,15), the result is limited to +/- 2147483647 in the event of an overflow (mode=0) or the two flags CY and OV are set (mode=1). The ARI BIT (M 127,04) is set for each overflow. It must be reset by the user after evaluation.

For further information on mode 0 and 1 see Section 4, Ch. 3.2.9, page 3-22.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers

Integer double word (32 bits).

In common the following is valid:

Lower limit:	8000 0001 H	-2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	-----

In particular, for the input E1 the following is valid:

Lower limit:	8000 0000 H	-2 147 483 648

and for the input E2 the following:

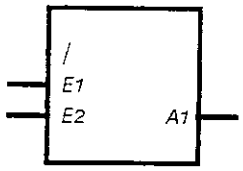
Lower limit:	8000 0001 H 8000 0000 H is not allowed

CE Data

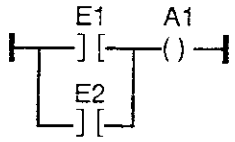
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	35 µs	35 µs	19 µs
Additional operating time:	---	---	---
Output updating:	yes		
Memory allocated once when called:	25 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD

FBD

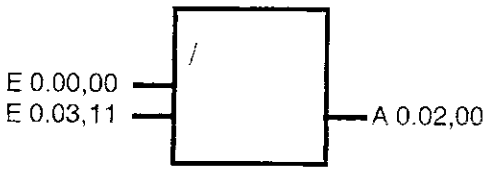


LD



Example

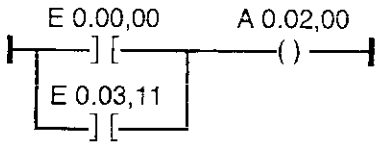
FBD



IL

```
!   E 0.00,00
/   E 0.03,11
=   A 0.02,00
```

LD



Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Operand 1 of the OR function
E2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Operand 2 of the OR function
A1	BINARY	M, M', A, A', S, T, Z	Result of the OR function

Description

Logic OR function of signals at inputs E1 and E2 with result allocation to output A1.

The inputs and outputs can be inverted. The input E2 can be duplicated.

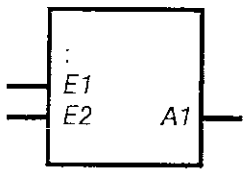
Truth table:

E1	E2	A1
0	0	0
1	0	1
0	1	1
1	1	1

CE Data

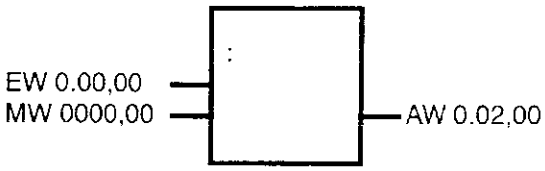
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	2.7 µs	2.7 µs	2.2 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
:   MW 0000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Dividend
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Divisor
A1	WORD	MW, MW', AW, AW'	Result

Description

The operand value at input E1 will be divided by the operand value at input E2 and the result will be allocated to the operand at output A1.

The division result is the part before the comma. No rounding operation (consideration of the figures after the comma) will be carried out.

The ARI bit will be set when a division by 0 is carried out. In this case the accumulator is set to the positive or negative limit respectively (+32767 or −32767).

After every division you will receive the integer component in the accumulator and the remainder in the auxiliary accumulator (MW 4097,06).

Example for mode 1:

```
!MW 000,00 : #W10 = AW 0.03,01
+32761     :  10  = +3276 and MW 4097,06 = 1  (remainder)
(7FF9H     : 000AH = 0CCCH)
```

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	182 µs	182 µs	93 µs
Additional operating time:	177 µs	177 µs	88 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD	Example
is not available	FBD/LD is not available IL

Parameters

Description

IF THEN is a basic library function. The element's name in the library is :=
The element cannot be called in the CE and CE IL Editor. It can be edited in the CE IL Editor.

The programming system uses this element to realize connection lines.

CE Data

Operating time:
Basic operating time: depends on the structure
Additional operating time:

Output updating:

Available with: ABB Procontic T200 and 907 PC 332

FBD/LD	Example
is not available	FBD/LD is not available IL

Parameters

Description

IF THEN DOUBLE WORD is a basic library function. The element's name in the library is :=DW
The element cannot be called in the CE and CE IL Editor.

The programming system uses this element to realize connection lines.

CE Data

Operating time:
Basic operating time: depends on the structure
Additional operating time:

Output updating:

Available with: ABB Procontic T200 and 907 PC 332

FBD/LD	Example
is not available	FBD/LD is not available IL

Parameters

Description

IF THEN WORD is a basic library function. The element's name in the library is :=WO
The element cannot be called in the CE and CE IL Editor.

The programming system uses this element to realize connection lines.

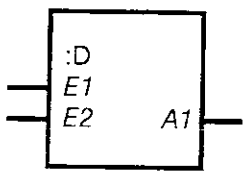
CE Data

Operating time:
Basic operating time: depends on the structure
Additional operating time:

Output updating:

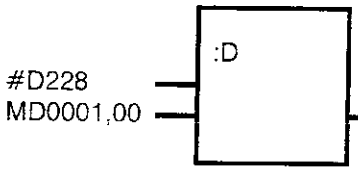
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0008
EP      #D228
EP      MD0001,00
AP      MD0002,00
```

Parameters

E1	DOUBLE WORD	ED, AD MD, MD', #D	Dividend
E2	DOUBLE WORD	ED, AD MD, MD', #D	Divisor
A1	DOUBLE WORD	AD, MD, MD'	Result

Description

The value of the double word operand at the input E1 is divided by the value of the double word operand at the input E2. The result is allocated to the operand at output A1.

The result is checked for a value transgression. The ARI BIT (M 127,04) is set for each overflow. It must be reset by the user after evaluation.

If the result from the division is not an integral number, it is rounded down (e.g.: 5 : 3 = 1).

If the divisor has the value 0, the positive or negative limit value of the range of numbers is allocated to the output. For division by 0 applies:

A1 = −2 147 483 647 (8000 0001 H) if the dividend is negative and

A1 = +2 147 483 647 (7FFF FFFF H) if the dividend is positive.

In both cases a value transgression is detected.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers for the inputs and outputs

Integer double word (32 bits).

Lower limit:	8000 0001 H	−2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	–––––

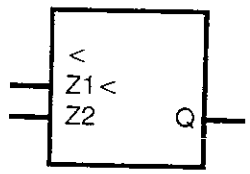
CE Data

Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	419 µs	419 µs	207 µs
Additional operating time:	–––	–––	–––
Output updating:	yes		
Memory allocated once when called:	90 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

LESS THAN

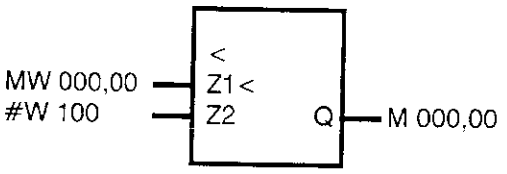
<

FBD/LD



Example

FBD/LD



IL

```
!   MW 000,00
<   #W 100
=   M 000,00
```

Parameters

Z1<	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
Z2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
A1	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1< will be compared with the value of the operand at input Z2. If the value at Z1< is less than the value at Z2, the state 1 will be allocated to the value of the operand at output Q, if Z1< is equal or greater than Z1, the state 0 will be allocated to Q.

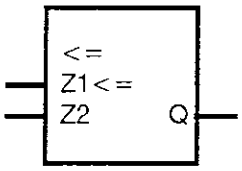
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

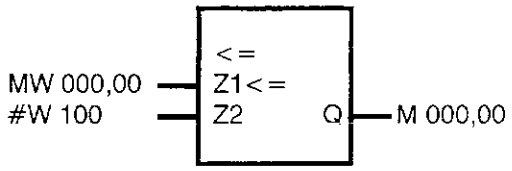
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   MW 000,00
<=  #W 100
=   M 000,00
```

Parameters

Z1<=	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
Z2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
A1	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1<= will be compared with the value of the operand at input Z2. If the value at Z1<= is less than or equal to the value at Z2, the state 1 will be allocated to the value of the operand at output Q, if Z1<= is greater than Z2, the state 0 will be allocated to Q.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	10.3 µs	10.3 µs	7.2 µs
Additional operating time:	– – –	– – –	– – –

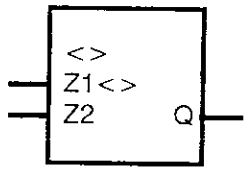
Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

NOT EQUAL, WORD

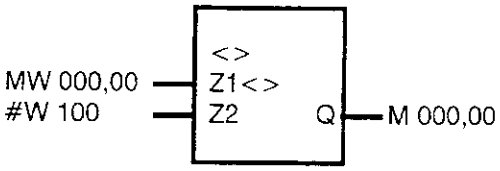
<>

FBD/LD



Example

FBD/LD



IL

```
!   MW 000,00
<>  #W 100
=   M 000,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
A1	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1<> will be compared with the value of the operand at input Z2. If the value at Z1<> is greater or less than at Z2, the state 1 will be allocated to the value of the operand at output Q, if Z1<> is equal Z2, the state 0 will be allocated to Q.

CE Data

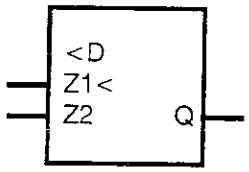
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

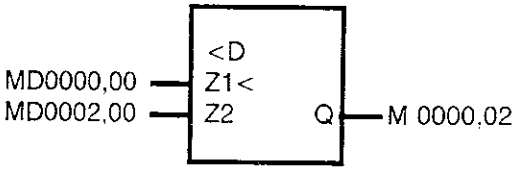
LESS THAN, DOUBLE WORD <D

FBD/LD



Example

FBD/LD



IL

```
IBA    000
       FB 0039
EP     MD0000,00
EP     MD0002,00
AP     M 0000,02
```

Parameters

Z1<	DOUBLE WORD	ED, AD MD, MD', #D	value to be compared
Z2	DOUBLE WORD	ED, AD MD, MD', #D	comparison value
Q	BINARY	A, A', M, M'	result of the comparison

Description

The value of the double word operand at the input Z1< is compared to the value of the double word operand at the input Z2.

If the value at Z1< is less than the value at Z2, the status 1 is allocated to the value of the bit operand at the output Q, but the status 0 is allocated to Q if Z1< is equal to or greater than Z2.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers

Integer double word (32 bits).

In common the following is valid:

Lower limit:	8000 0001 H	–2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	–––––

In particular, for the inputs Z1< and Z2 the following is valid:

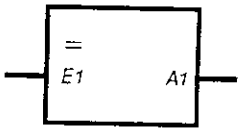
Lower limit:	8000 0000 H	– 2 147 483 648

CE Data

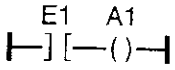
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.8 µs	11.8 µs	6.7 µs
Additional operating time:	–––	–––	–––
Output updating:	yes		
Memory allocated once when called:	13 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD

FBD

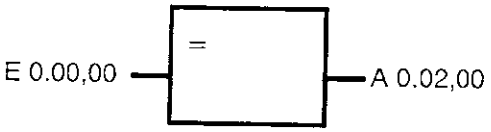


LD



Example

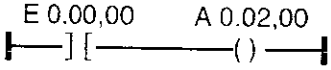
FBD



IL

```
!   E 0.00,00
=   A 0.02,00
```

LD



Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	source
A1	BINARY	M, M', A, A', S, T, Z	target; output can be duplicated

Description

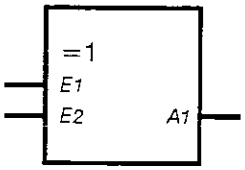
The state of the operand E1 will be allocated to the operand A1.

The output A1 can be duplicated. Inputs and outputs can be inverted.

CE Data

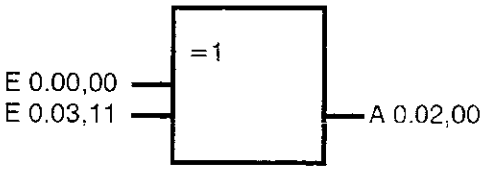
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	5.2 µs	5.2 µs	4.2 µs
Additional operating time:	2.5 µs	2.5 µs	2.0 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   E 0.00,00
X0  E 0.03,11
=   A 0.02,00
```

Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	operand 1 of the XOR function
E2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	operand 2 of the XOR function
A1	BINARY	M, M', A, A', S, T, Z	result of the XOR function

Description

Logic EXCLUSIVE OR function of signals at inputs E1 and E2 with result allocation to output A1.

Truth table:

E1	E2	A1
0	0	0
1	0	1
0	1	1
1	1	0

CE Data

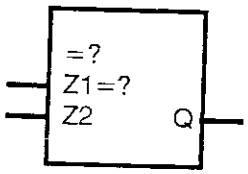
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	2.7 µs	2.7 µs	2.2 µs

Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

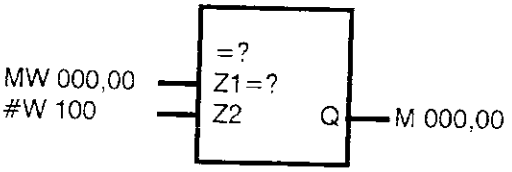
EQUAL, WORD

FBD/LD



Example

FBD/LD



IL

```
!   MW 000,00
=?  #W 100
=   M 000,00
```

Parameters

Z1=?	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
Z2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
Q	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1=? will be compared with the value of the operand at input Z2. If the value at Z1=? is equal to the value at Z2, the state 1 will be allocated to the value of the operand at output Q. If Z1=? is not equal to Z2, the state 0 will be allocated to Q.

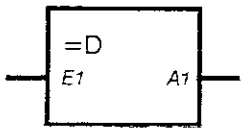
CE Data

	07 ZE 60	07 ZE 61/63	07 ZE 62
Operating time:			
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

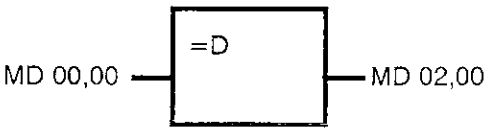
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA   0
ZUWD
      MD 00,00
      MD 02,00
```

Parameters

E1	DOUBLE WORD	ED, AD, MD, MD', #D	Source
A1	DOUBLE WORD	AD, MD, MD'	Target

Description

The value of the operand at the input E1 is allocated to the operand at the output A1.

If the inadmissible value 8000 0000 H should appear at the input for any particular reason, the permissible value 8000 0001 H (−2 147 483 647) will be allocated to the output A1. Therefore, the inadmissible value will be corrected.

The input and the output can neither be duplicated nor negated.

Number range

Integer double word (32 bits)

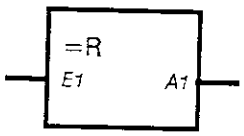
• Low limit:	8000 0001 H	−2 147 483 647
• High limit:	7FFF FFFF H	+2 147 483 647
• Inadmissible value:	8000 0000 H	– – –

CE Data

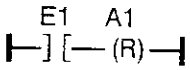
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	10.8 µs	10.8 µs	8.7 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD

FBD

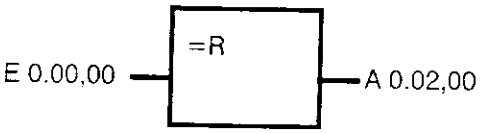


LD



Example

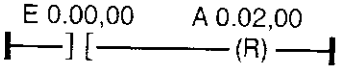
FBD



IL

```
!     E 0.00,00
=R    A 0.02,00
```

LD



Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	RESET input
A1	BINARY	M, M', A, A'	memory variable

Description

A logic 1–signal at input E1 sets the operand at output A1 in state 0.
A logic 0–signal at input E1 has no influence on the operand at output A1.

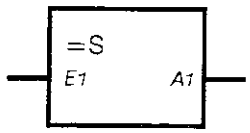
IMPORTANT:
This CE may be used only as output CE. This means that it may not be linked further on the output side to other logic functions.

CE Data

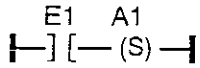
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	5.2 µs	5.2 µs	4.2 µs
Additional operating time:	2.5 µs	2.5 µs	2.0 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

FBD

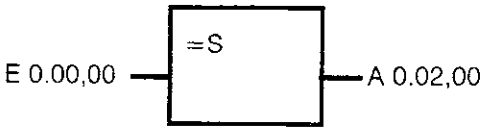


LD



Example

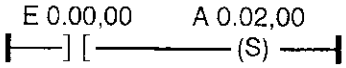
FBD



IL

```
!     E 0.00,00
=S    A 0.02,00
```

LD



Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input
A1	BINARY	M, M', A, A'	memory variable

Description

A logic 1–signal at input E1 sets the operand at output A1 in state 0.

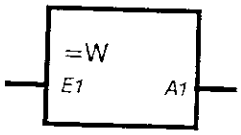
A logic 0–signal at input E1 has no influence on the operand at output A1.

IMPORTANT:
This CE may be used only as output CE. This means that it may not be linked further on the output side.

CE Data

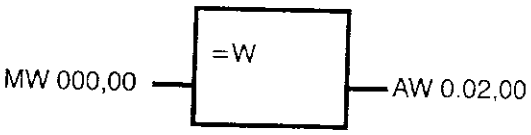
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	5.2 µs	5.2 µs	4.2 µs
Additional operating time:	2.5 µs	2.5 µs	2.0 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!  MW 000,00
=  AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	input WORD
A1	WORD	MW, MW', AW, AW'	output WORD

Description

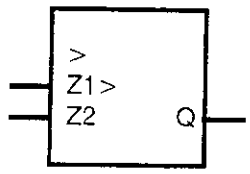
The value of the operand at input E1 will be allocated to the operand at output A1.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	5.4 µs	5.4 µs	4.4 µs
Additional operating time:	2.7 µs	2.7 µs	2.2 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

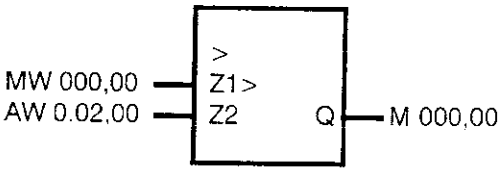
GREATER THAN

FBD/LD



Example

FBD/LD



IL

```
!   MW 000,00
>   AW 0.02,00
=   M 000,00
```

Parameters

Z1>	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
Z2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
Q	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1> will be compared with the value of the operand at input Z2. If the value at Z1> is greater than at Z2, the state 1 will be allocated to the value of the operand at output Q, if Z1> is equal or less than Z2, the state 0 will be allocated to Q.

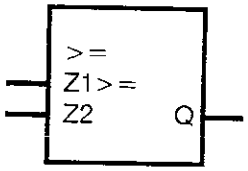
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	7.9 µs	7.9 µs	6.4 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

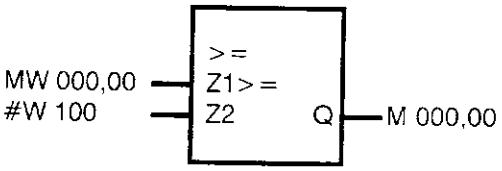
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!    MW 000,00
>=   #W 100
=    M 000,00
```

Parameters

Z1>=	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	value to be compared
Z2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	comparison value
Q	BINARY	M, M', A, A', S, T, Z	result of the comparison

Description

The value of the operand at input Z1>= will be compared with the value of the operand at input Z2. If the value at Z1>= is greater than or equal to the value at Z2, the state 1 will be allocated to the value of the operand at output Q, if Z1>= is less than Z2, the state 0 will be allocated to Q.

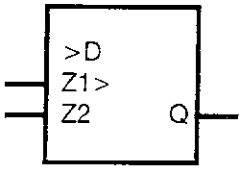
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	8.8 µs	8.8 µs	6.8 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

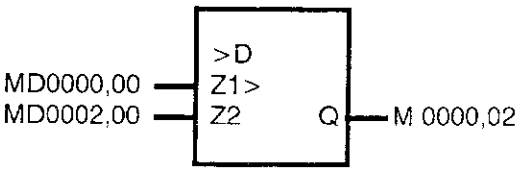
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0038
EP      MD0000,00
EP      MD0002,00
AP      M 0000,02
```

Parameters

Z1>	DOUBLE WORD	ED, AD MD, MD', #D	value to be compared
Z2	DOUBLE WORD	ED, AD MD, MD', #D	comparison value
Q	BINARY	A, A', M, M'	result of the comparison

Description

The value of the double word operand at the input Z1> is compared to the value of the double word operand at the input Z2.

If the value at Z1> is greater than the value at Z2, the status 1 is allocated to the value of the bit operand at the output Q, but the status 0 is allocated to Q if Z1> is equal to or less than Z2.

Inputs and outputs can neither be duplicated nor negated.

Range of numbers

Integer double word (32 bits).

In common the following is valid:

Lower limit:	8000 0001 H	−2 147 483 647
Upper limit:	7FFF FFFF H	+2 147 483 647
Not allowed:	8000 0000 H	-----

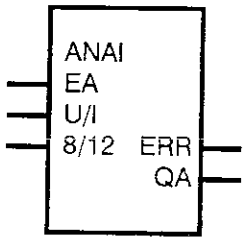
In particular, for the inputs Z1> and Z2 the following is valid:

Lower limit:	8000 0000 H	−2 147 483 648

CE Data

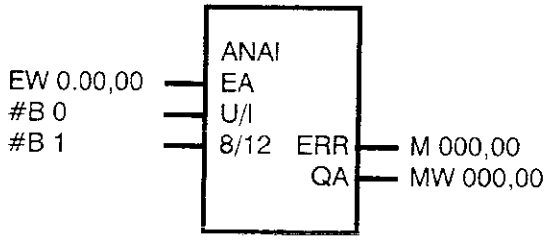
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	11.8 µs	11.8 µs	6.7 µs
Additional runtime:	---	---	---
Output updating:	yes		
Memory allocated once when called:	13 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   00
      FB 010
EP    EW 0.00,00
EP    #B 0
EP    #B 1
AP    M 000,00
AP    MW 000,00
```

Parameters

EA	WORD	EW	Analog input
U/I	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Voltage/current selection
8/12	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	8/12 bits resolution selection
ERR	BINARY	A, A', M, M'	Open–circuit monitoring output for 4–20 mA
QA	WORD	MW, MW', AW, AW'	Analog value output in internal representation

Description

The ANAI block (FB 010) serves to read analog values and convert them into the internal format of ± 100 % = ± 4095 regardless of the connected analog module.
In case of the modules 07 EA 61 and 07 EA 63 a broken wire is also monitored for 4...20 mA current inputs.

EA WORD Analog input
The analog input to be read is specified at the input EA.

U/I BINARY Voltage/current selection

A logic 1–signal at the binary input U/I signifies voltage input. A logic 0–signal at the binary input U/I signifies current input (see also Table 1).

8/12 BINARY 8/12 bits resolution selection
A logic 1–signal at the binary input 8/12 signifies an 8 bit input. A logic 0–signal at the binary input 8/12 signifies a 12 bit input (see also Table 1).

ERR BINARY Output, open–circuit monitoring for 4 – 20 mA
This output only works, when current input is selected (U/I = 0; applies to the 07 EA 61 and 07 EA 63 modules with current inputs of 4...20 mA).
If an open circuit is detected, the ERR output indicates a 1-signal and the QA output is set to 0.
If U/I = 1, i.e. voltage input is selected, the ERR output is always 0.

QA WORD Output, analog value in internal representation
The QA word output shows the converted value of the analog signal (internal representation).
In case of a detected open circuit the output is set to 0.
The conversion of the analog signals by the ANAI block is arranged in Table 2.

Module	Range	Resolution	U/I code	8/12 code
07 EA 60	0 V ... 10 V	8 bits	#B1	#B1
07 EA 61	4 mA ... 20 mA	8 bits	#B0	#B1
07 EA 62	−10 V ... +10 V	12 bits	#B1	#B0
07 EA 63	4 mA ... 20 mA	12 bits	#B0	#B0

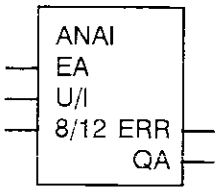


Table 1: U/I code and 8/12 code of the ANAI function block

Module type	Input range	ANAI, input value EA decimal	ANAI, input value EA hexadecimal	ANAI, output value QA decimal	ANAI, output value QA hexadecimal
07 EA 60	0 V ... 10 V	0 ... 255	0000_H ... $00FF_H$	0 ... 4080	0000_H ... $0FF0_H$
07 EA 61	4 mA ... 20 mA	8 ... 255	0008_H ... $00FF_H$	0 ... 4080	0000_H ... $0FF0_H$
	< 3.6 mA	≤ 2	≤ 0002_H	ERR = 1 (open circuit)	
07 EA 62	−10 V ... − 0 V	− 2048 ... − 1	0800_H* ... $0FFF_H$*	− 4096 ... − 2	$F000_H$ ... $FFFE_H$
	+ 0 V ... +10 V	+ 0 ... 2047	0000_H ... $07FF_H$	0 ... 4094	0000_H ... $0FFE_H$
07 EA 63	4 mA ... 20 mA	64 ... 4095	0040_H ... $0FFF_H$	0 ... 4095	0000_H ... $0FFF_H$
	< 3.75 mA	≤ 2	≤ 0002_H	ERR = 1 (open circuit)	

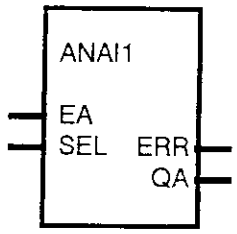
* Here, 0800_H stands for $F800_H = -2048_{DEC}$, $0FFF_H$ stands for $FFFF_H = -1_{DEC}$

Table 2: Conversion of the analog signals by the ANAI block. More detailed tables are in the hardware descriptions of the individual analog input modules.

CE Data

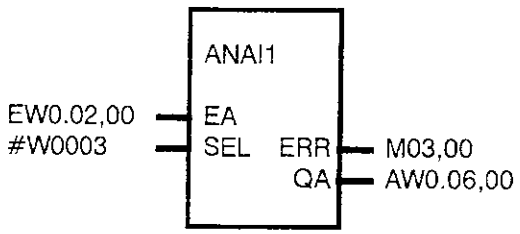
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:			
Voltage input (07 EA 60, 07 EA 62):	17.6 µs	17.6 µs	9.2 µs
Current input (07 EA 61, 07 EA 63):	68.0 µs	68.0 µs	36.1 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	131 double words with 32 bits each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!    BA   00
     FB 051
EP   EW0.02,00
EP   #W0003
AP   M03,00
AP   AW0.06,00
```

Parameters

EA	WORD	EW, EW', MW, MW'	Analog input
SEL	WORD	EW, EW', AW, AW', MW, MW'	Analog module selection
ERR	BINARY	A,A', M, M'	Open-circuit monitoring output (only for 07 EA 61 and 07 EA 63)
QA	WORD	AW, AW', MW, MW'	Analog value output in internal representation

Description

The ANAI1 function block (FB 051) serves to read analog values and convert them into the internal format of ± 100 % = ± 4095, regardless of the connected analog module. In case of the 07 EA 61 and 07 EA 63 modules (current inputs of 4...20 mA), the block additionally offers an open-circuit detection facility.

The ANAI1 function block is suitable for the 07 EA 60...65 analog input modules and can therefore be used as an alternative in place of the ANAI block. ANAI, however, can continued to be used for the 07 EA 60...63 modules. One separate function block is necessary for each analog input.

The function block is an element of the T200 basic library.

EA WORD

The analog input to be read is specified at the EA input.

SEL WORD

The used module type is specified at the SEL input of the function block (SEL code see Table 1). If a number greater than 5 is given to the SEL input, the ERR output is set to 1 and the QA output is set to 0.

ERR BINARY

If an open circuit is detected, the ERR output indicates a 1-signal and the QA output is set to 0. This applies only to the 07 EA 61 and 07 EA 63 modules (with current inputs of 4...20 mA).

QA WORD

The QA word output shows the converted value of the analog signal (internal representation). In case of a detected open circuit the output is set to 0.
The conversion of the analog signals by the ANAI1 block is arranged in Table 2.

Module	Range	Resolution	SEL code
07 EA 60	0 V ... 10 V	8 bits	#W0
07 EA 61	4 mA ... 20 mA	8 bits	#W1
07 EA 62	−10 V ... +10 V	12 bits	#W2
07 EA 63	4 mA ... 20 mA	12 bits	#W3
07 EA 64	0 mA ... 20 mA	8 bits	#W4
07 EA 65	0 mA ... 20 mA	12 bits	#W5

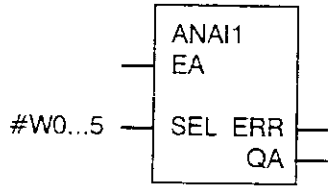


Table 1: SEL input code of the ANAI1 function block

Module type	Input range	ANAI1, input value EA decimal	ANAI1, input value EA hexadecimal	ANAI1, output value QA decimal	ANAI1, output value QA hexadecimal
07 EA 60	0 V ... 10 V	0 ... 255	0000_H ... $00FF_H$	0 ... 4080	0000_H ... $0FF0_H$
07 EA 61	4 mA ... 20 mA	8 ... 255	0008_H ... $00FF_H$	0 ... 4080	0000_H ... $0FF0_H$
	< 3.6 mA	≤ 2	≤ 0002_H	ERR = 1 (open circuit)	
07 EA 62	−10 V ... − 0 V	− 2048 ... − 1	0800_H* ... $0FFF_H$*	− 4096 ... − 2	$F000_H$ ... $FFFE_H$
	+ 0 V ... +10 V	+ 0...2047	0000_H ... $07FF_H$	0 ... 4094	0000_H ... $0FFE_H$
07 EA 63	4 mA ... 20 mA	64 ... 4095	0040_H ... $0FFF_H$	0 ... 4095	0000_H ... $0FFF_H$
	< 3.75 mA	≤ 2	≤ 0002_H	ERR = 1 (open circuit)	
07 EA 64	0 mA ... 20 mA	0 ... 255	0000_H ... $00FF_H$	0 ... 4080	0000_H ... $0FF0_H$
07 EA 65	0 mA ... 20 mA	0 ... 4095	0000_H ... $0FFF_H$	0 ... 4095	0000_H ... $0FFF_H$

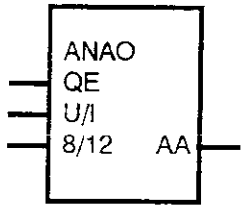
* Here, 0800_H stands for $F800_H = -2048_{DEC}$, $0FFF_H$ stands for $FFFF_H = -1_{DEC}$

Table 2: Conversion of the analog signals by the ANAI1 block. More detailed tables are in the hardware descriptions of the individual analog input modules.

CE Data

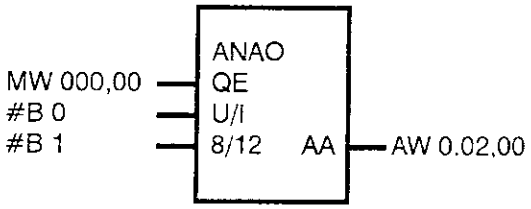
Runtime:			07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	Module	SEL			
	07 EA 60	#W0	5.9 µs	5.9 µs	2.5 µs
	07 EA 61	#W1	50.4 µs	50.4 µs	26.0 µs
	07 EA 62	#W2	12.6 µs	12.6 µs	5.9 µs
	07 EA 63	#W3	73.9 µs	73.9 µs	38.6 µs
	07 EA 64	#W4	12.6 µs	12.6 µs	5.9 µs
	07 EA 65	#W5	14.3 µs	14.3 µs	6.7 µs
Additional runtime:		---	---	---	
Output updating:			yes		
Memory allocated once when called:			142 double words of 32 bits each		
Available as of:			ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   00
      FB 011
EP    MW 000,00
EP    #B 0
EP    #B 1
AP    AW 0.02,00
```

Parameters

QE	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Analog value in internal representation
U/I	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Voltage/current selection
8/12	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	8/12 bits resolution selection
AA	WORD	AW	Value in the analog module's value range

Description

The ANAO function block (FB 011) serves to output analog values and to convert the internal format of ± 100 % = ±4095 into the format of the corresponding analog output module.

QE WORD Analog value in internal representation

The word value to be converted is specified at the input QE.

U/I BINARY Voltage/current selection

A logic 1-signal at the binary input U/I signifies a voltage output. A logic 0-signal at the binary input U/I signifies a current output (see also Table 1).

8/12 BINARY 8/12 bit resolution selection

A logic 1–signal at the binary input 8/12 signifies an 8 bit output. A logic 0–signal at the binary input 8/12 signifies a 12 bit output (see also Table 1).

AA WORD Value in the analog module's value range

The value range of the input value is adapted depending on the connected analog module.

The conversion of the analog signals by the ANAO block is arranged in Table 2.

Module	Range	Resolution	U/I code	8/12 code
07 AA 60	0 V ... 10 V	8 bits	#B1	#B1
07 AA 61	4 mA... 20 mA	8 bits	#B0	#B1
07 AA 62	−10 V ... + 10 V	12 bits	#B1	#B0
07 AA 63	4 mA ... 20 mA	12 bits	#B0	#B0

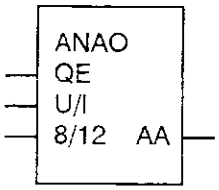


Table 1: U/I code and 8/12 code of the ANAO function block

Module type	Output range	ANAO, input value QE * decimal	ANAO, input value QE * hexadecimal	ANAO, output value AA decimal	ANAO, output value AA hexadecimal
07 AA 60	0 V ... 10 V	0 ... 4080	0000_H ... $0FF0_H$	0 ... 255	0000_H ... $00FF_H$
07 AA 61	4 mA... 20 mA	0 ... 4080	0000_H ... $0FF0_H$	0 ... 255	0000_H ... $00FF_H$
07 AA 62	−10 V... − 0 V	−4096... −2	$F000_H$ ... $FFFE_H$	−2048... −1	$F800_H$ ... $FFFF_H$
	+0 V ... +10 V	+0... 4094	0000_H ... $0FFE_H$	0 ... 2047	0000_H ... $07FF_H$
07 AA 63	4 mA... 20 mA	0 ... 4095	0000_H ... $0FFF_H$	0 ... 4095	0000_H ... $0FFF_H$

* If the input values are beyond the permissible range, the output value is limited to the minimum or maximum value and the mathematical sign remains correctly.

Table 2: Conversion of the analog signals by the ANAO block. More detailed tables are in the hardware descriptions of the individual analog output modules.

CE Data

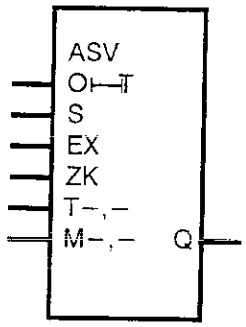
	07 ZE 60	07 ZE 61/63	07 ZE 62
Operating time:			
Basic operating time:	21 µs	21 µs	11 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 42 double words with 32 bits each

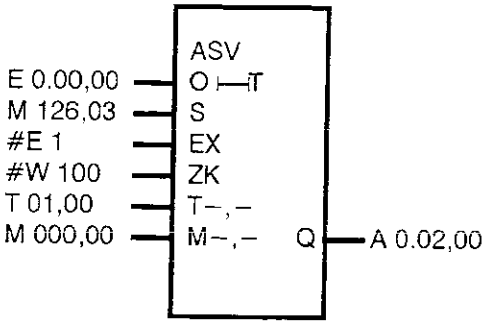
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     M 126,03
=S    T 01,00
      #E 1
      #W 100
!     T 01,00
=R    M 000,00
!     E 0.00,00
&N    M 000,00
=S    M 000,00
!N    E 0.00,00
&     M 000,00
=     T 01,00
!     E 0.00,00
/(N   E 0.00,00
&     M 000,00
)
=     A 0.02,00
```

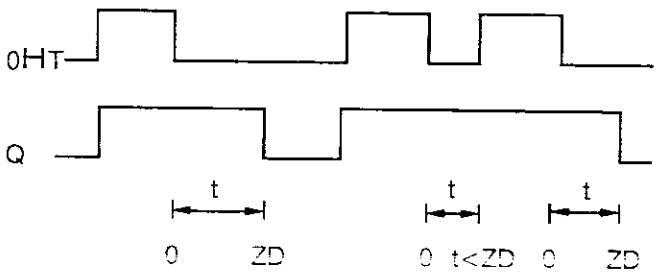
Parameters

O⊢T	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input
EX	SPECIAL	#E1, #E2, #E3	exponent
ZK	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant
T–,–	BINARY	T	timer
M–,–	BINARY	M, M'	auxiliary flag
Q	BINARY	M, M', A, A', S, T, Z	delayed signal

Description

The 1–>0 transition of input O⊢T is delayed by the delay time ZD and is output as 1–>0 signal at output Q. If input O⊢T assumes "1" state before the end of the delay time ZD, the output Q retains 1 level.

Inputs and output can neither be duplicated nor inverted; exception: input S can be inverted.



delay time ZD = EX * ZK

S BINARY

The S input sets the timer to the value of the time constant. Before the start of the time a setting must have taken place. A new setting while the time is running has no influence.

EX SPECIAL
ZK WORD

EX and ZK make up the delay time. The following values are possible for EX:

#E1 = 10 ms; range: 10 ms ... 5 min 27,67 s;
#E1 is only allowed for the times T 00,00...T03,15
#E2 = 100 ms; range: 100 ms ... 54 min 36,7 s;
#E3 = 1 s; range: 1 s ... 9 h 6 min 7 s;

The following values are allowed for ZK: 1...32767.

Exp.: EX = #E2 and ZK = #W 5 make up a delay time of 100 ms * 5 = 500 ms.

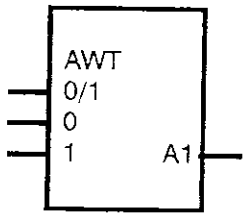
T−,− BINARY
The timer is specified at input T−,−. Possible timers: T 00,00 ... T 15,15.

M−,− BINARY
At M−,− input a flag will be connected, which is used internally. This flag must not be used a second time in the program.

CE Data

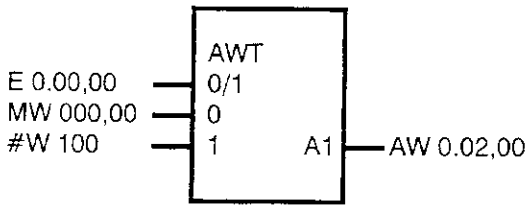
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	49 µs	49 µs	31 µs
additional operating time:	− − −	− − −	− − −
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   00
      FB 0013
EP    E 0.00,00
EP    MW 000,00
EP    #W 100
AP    AW 0.02,00
```

Parameters

0/1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Selection signal
0	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Word variable for signal = 0
1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Word variable for signal = 1
A1	WORD	MW, MW', AW, AW'	Output

Description

A word input is selected as a function of a binary signal and is allocated to a word output.

0/1 BINARY Selection signal
A logic 0–signal at the binary input 0/1 allocates the value of the word operand at input 0 to the word operand at the output A1.
A logic 1–signal at the binary input 0/1 allocates the value of the word operand at input 1 to the word operand at output A1.

CE Data

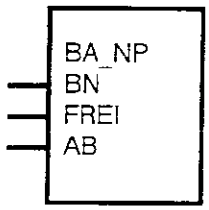
	07 ZE 60	07 ZE 61/63	07 ZE 62
Operating time:			
Basic operating time:	14.7 µs	14.7 µs	8.2 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 7 words with 32 bits each

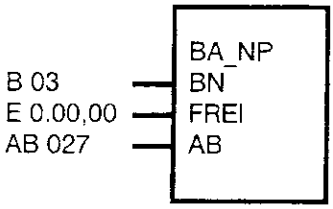
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=     BA 03
AB    027
```

Parameters

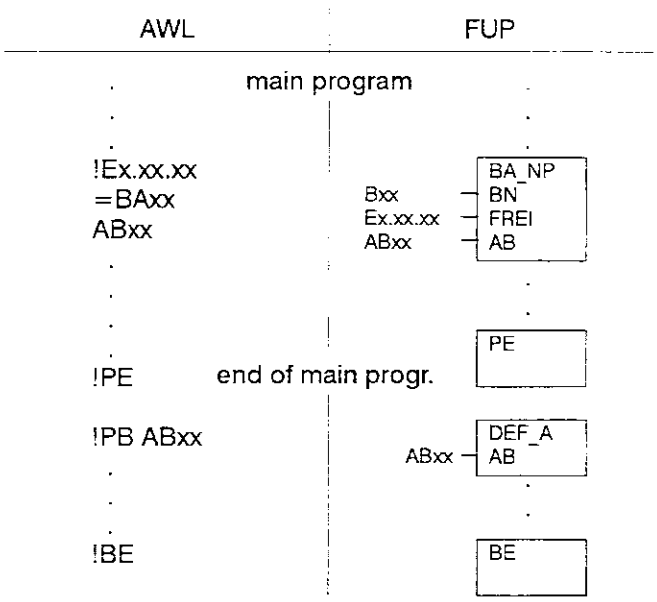
BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
AB	SPECIAL	AB00 ... AB99	Input in FBD: ABxx

Description

User function blocks offer the PLC user the possibility of defining, in one single step, frequently used program parts as a user block and of calling this block then as often as he wants.

The program part represented by the user function block is executed immediately after the function block is called.

The definition of a user function block looks as follows:



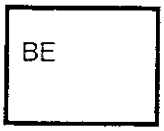
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	38.6 µs	38.6 µs	21.0 µs
additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

Example

FBD/LD



IL

```
!BE
```

Parameters

– – –

Description

The connection element "BE" closes the definition of a user function block.

Example:

```
!PB  AB 00
```

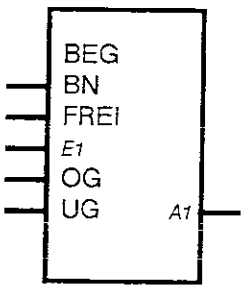
user programmed function block

```
!BE
```

CE Data

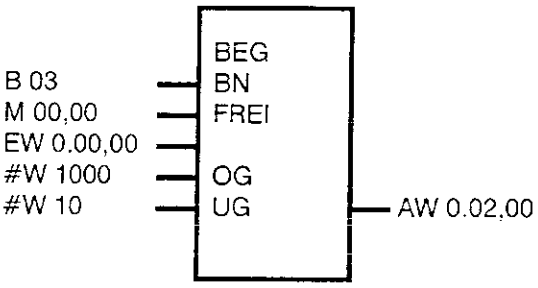
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	24.1 µs	24.1 µs	12.6 µs
additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   M 00,00
=   BA 03
FB  023
EP  EW 0.00,00
EP  #W 100
EP  #W 10
AP  AW 0.02,00
```

Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	word input
OG	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	upper limit
UG	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	lower limit
A1	WORD	MW, MW', AW, AW'	output

Description

If FREI = 1 the block BEG limits a variable input value (E1) to a maximal amplitude between adjustable limiting values (upper limit OG, lower limit UG) and allocates this limited value to an output variable (A1).

If FREI = 0 nothing is performed.

CE Data

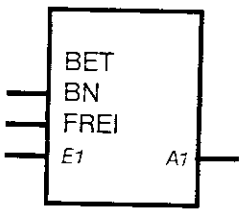
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	21.8 µs	21.8 µs	12.6 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes if FREI = 1

Memory allocated once when called: 14 words of 32 bits each

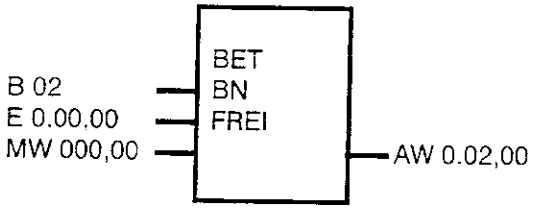
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   E 0.00,00
=   BA 02
FB  022
EP  MW 000,00
AP  AW 0.02,00
```

Parameters

BN	SPECIAL	B 00 ... B 255	input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	any bit variable
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	input value
A1	WORD	MW, MW', AW, AW'	amount of the input value

Description

If FREI = 1, the absolute value of the input variable value will be formed and allocated to the output variable. In other words, if the input value is negative the output value is positive. If the input value is positive the output value is also positive.

In case of −32768 (8000H) the result is again −32768 (8000H), because this number is not defined.

If FREI = 0, no allocation will be performed.

CE Data

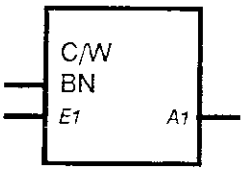
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.8 µs	11.8 µs	5.9 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes if FREI = 1

Memory allocated once when called: 5 double words of 32 bits each

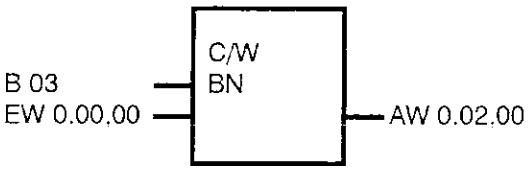
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   BA 03
FB  016
EP  EW 0.00,00
AP  AW 0.02,00
```

Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	word variable containing BCD value
A1	WORD	MW, MW', AW, AW'	word output converted to binary

Description

The input variable will be converted from BCD to binary and output at the output variable.

Whether the input value is a valid BCD member (range 0000 ... 9999), will not be checked. If the input value is invalid, the output value is invalid too.

CE Data

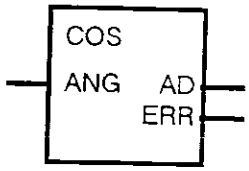
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	37.8 µs	37.8 µs	18.5 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 6 double words of 32 bits each

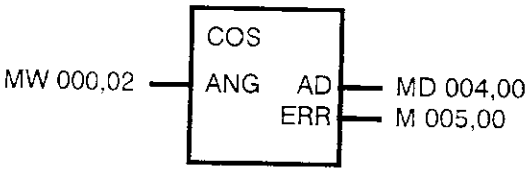
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA     00
  FB 056
EP      MW 000,02
EPA     MW' 371,01
EPA     M' 381,01
!BA     00
  FB 055
EP      MW' 372,01
EP      MW' 372,00
AP      MD 004,00
!       M' 381,01
=       M 005,00
```

Parameters

ANG	WORD	EW, AW, MW, MW', #W	Input angle
AD	DOUBLE WORD	AD, MD, MD'	Cosine of the input value
ERR	BINARY	M, M', A, A', S	Error if the input value is negative or greater than 360

Description

The function cosine generates the cosine of the angle value at the input ANG. The result is available at the output AD, and is in the range between −100 000 ... 100 000. If the value at the input is negative or greater than 360, the value 0 is assigned to the output AD, and the value '1' is assigned to the ERR output.

The maximum error of the result is ±1 units. The connection element COS uses two function blocks, FB56 for the cosine calculation, and FB55 to convert the result to a user−friendly range. This function doesn't work on CPUs older versions than R302.

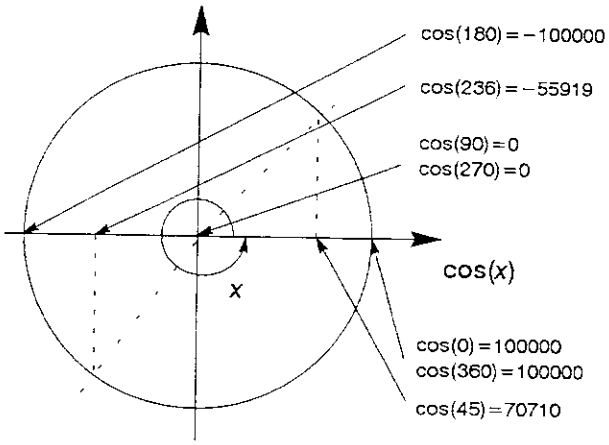
ANG **WORD**
The cosine of the value at the input operand ANG ia generated and is available as a value of the output operand AD.

AD **DOUBLE WORD**
The value of the cosine function is available at the output AD.

ERR **BINARY**
The ERR output indicates whether the value of the input is in the correct range ($0 \leq ANG \leq 360$).

Input $0 \leq ANG \leq 360$
−> ERR = 0 and AD = COS(ANG)
Input ANG < 0 or ANG > 360
−> ERR = 1 and AD = 0

Examples of cos(x) values

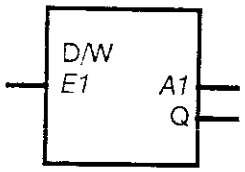


CE Data

Runtime:			
Basic runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
	1168 µs	1168 µs	630 µs
Additional runtime:	−−− µs	−−− µs	−−− µs
Output updating:	yes		
Memory allocated once when called:	75 double words of 32 bits each		
Available as of:	ABB Procontic T200 ZE (version R302 /907 PC 332)		

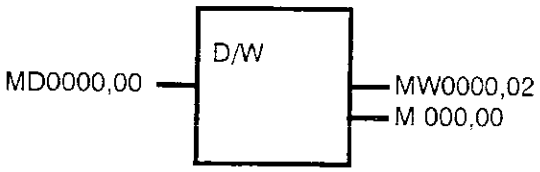
DOUBLE WORD TO WORD CONVERSION

FBD/LD



Example

FBD/LD



IL

```
!BA     000
        FB 0018
EP      MD0000,00
AP      MW0000,02
AP      M 000,00
```

Parameters

E1	DOUBLE WORD	ED, AD MD, MD', #D	Input value
A1	WORD	AW, AW', MW, MW'	Result
Q	BINARY	A, A', M, M'	Overflow

Description

The value of the double word operand at the input E1 is converted to a word value and the result is allocated to the word operand at the output A1.

The result is limited to the number range from −32 767 to +32 767. If limiting took place, a 1 signal is allocated to the binary operand at the output Q. A 0 signal is allocated to the binary operand at the output Q if no limiting took place.

The converted value is set to −32767 (8001 H) if the value of the operand at the input E1 is beyond the number range (8000 0000 H).

The input and the output can neither be duplicated nor negated.

Range of numbers of the input

Integer double word (32 bits).

Lower limit:	8000 0000 H	−2 147 483 648
Upper limit:	7FFF FFFF H	+2 147 483 647

Converted range of the input:

Lower limit:	FFFF 8001 H	−32 767
Upper limit:	0000 7FFF H	+32 767

Range of numbers of the output

Integer word (16 bits).

Lower limit:	8001 H	−32 767
Upper limit:	7FFF H	+32 767

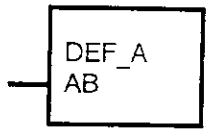
Examples for conversion

E1	decimal	A1	decimal	Q
8000 0000 H	−2147483648	8001 H	−32767	1
8000 0001 H	−2147483647	8001 H	−32767	1
FFFF 8000 H	−32768	8001 H	−32767	1
FFFF 8001 H	−32767	8001 H	−32767	0
FFFF FFFF H	−1	FFFF H	−1	0
0000 0000 H	0	0000 H	0	0
0000 0001 H	+1	0001 H	+1	0
0000 7FFF H	+32767	7FFF H	+32767	0
0000 8000 H	+32768	7FFF H	+32767	1
7FFF FFFF H	+2147483647	7FFF H	+32767	1

CE Data

Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	14.3 µs	14.3 µs	6.7 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	30 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD

IL

```
!PB    AB 03
```

Parameters

AB	SPECIAL	AB00 ... AB99

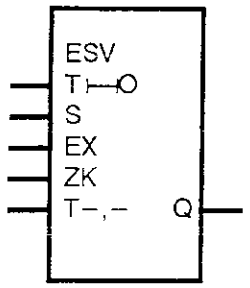
Description

The definition of a user function block "DEF_A" is always located after the end of the main program (!PE). It marks the beginning of a user defined function block which is immediately executed after each call of the respective user function call.

CE Data

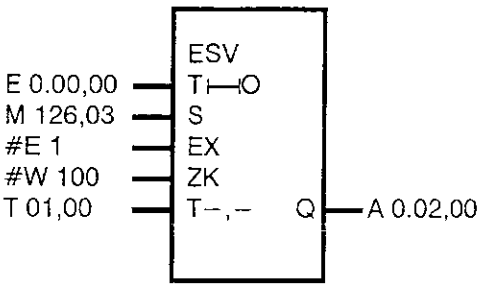
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	1.9 µs	1.9 µs	0.8 µs
additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     M 126,03
=S    T 01,00
      #E 1
      #W 100
!     E 0.00,00
=     T 01,00
!     T 01,00
=     A 0.02,00
```

Parameters

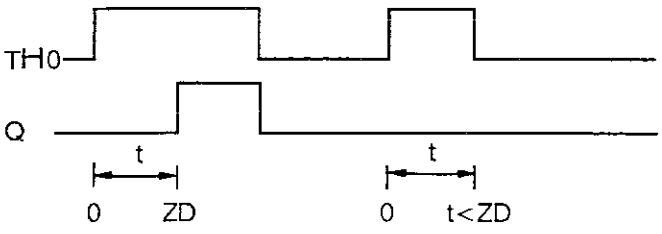
T⊢O	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input
EX	SPECIAL	#E1, #E2, #E3	exponent for time base
ZK	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant
T–,–	BINARY	T	timer
Q	BINARY	M, M', A, A', S, T, Z	delayed signal

Description

The 0–>1 transition of input T⊢O is delayed by the delay time ZD and is output as 0–>1 signal at output Q.

If input T⊢O assumes "0" state before the end of the delay time ZD, the output Q retains 0 level.

Inputs and output can neither be duplicated nor inverted; exception: input S can be inverted.



delay time ZD = EX * ZK

S BINARY

The S input sets the timer to the value of the time constant. Before the start of the time a setting must have taken place. A new setting while the time is running has no influence.

EX SPECIAL
ZK WORD

EX and ZK make up the delay time. The following values are possible for EX:

#E1 = 10 ms; range: 10 ms ... 5 min 27,67 s;
#E1 is only allowed for the times T 00,00 ... T03,15
#E2 = 100 ms; range: 100 ms ... 54 min 36,7 s;
#E3 = 1 s; range: 1 s ... 9 h 6 min 7 s;

The following values are allowed for ZK: 1...32767.

Exp.: EX = #E2 and ZK = #W 5 make up a delay time of 100 ms * 5 = 500 ms.

T–,– BINARY

The timer is specified at input T–,–. Possible timers: T 00,00 ... T 15,15.

CE Data

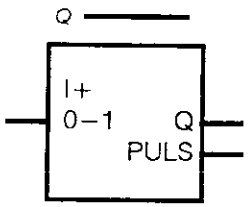
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	31.1 µs	31.1 µs	17.6 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

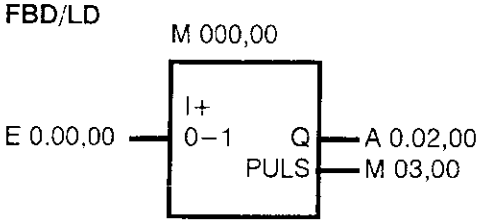
RISING EDGE PULSE

FBD/LD



Example

FBD/LD



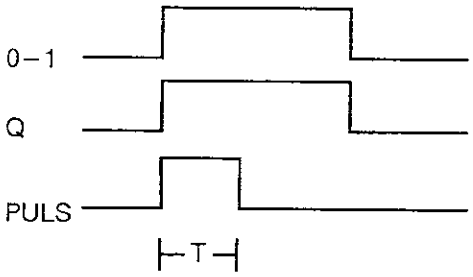
IL

```
!N    E 0.00,00
=R    M 00,00
!     E 0.00,00
&N    M 00,00
=S    M 00,00
=     M 03,00
!     M 00,00
=     A 0.02,00
```

Parameters

0–1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
Q	BINARY	M, M'	auxiliary flag
PULS	BINARY	M, M', A, A', S, T, Z	output signal

Description



T is the PLC program cycle time.

A rising edge pulse at the 0–1 input produces a Pulse with a length of one PLC program cycle at the PULS output.

A flag for internal use has to be given for Q. This flag must not be used again in the program. The state of the flag can be monitored at the Q output and be allocated to another operand.

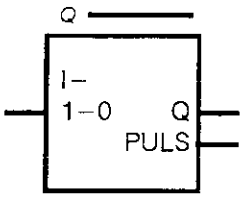
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.8 µs	11.8 µs	6.9 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes

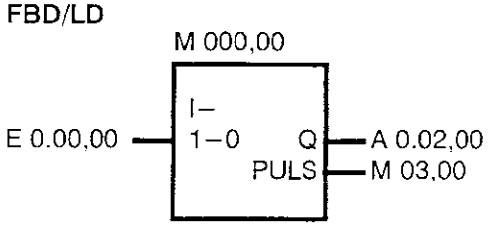
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



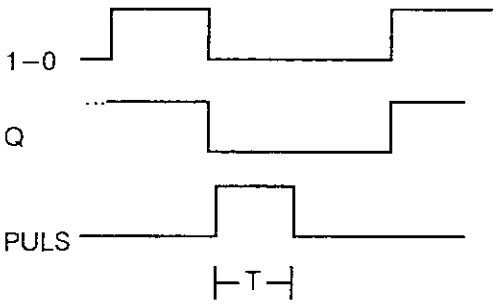
IL

```
!     E 0.00,00
=S    M 000,00
!N    E 0.00,00
&     M 000,00
=R    M 000,00
=     M 003,00
!     M 000,00
=     A 0.02,00
```

Parameters

1–0	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
Q	BINARY	M, M'	auxiliary flag
PULS	BINARY	M, M', A, A', S, T, Z	output signal

Description



T is the PLC program cycle time.

A falling edge at the 1–0 input produces a pulse with a length of one PLC cycle at the PULS output.

A flag for internal use has to be assigned for Q. This flag must not be used again in the program. The flag can be monitored at Q output or allocated to another operand.

Note for users of 907 PC32:
The CE has been changed as compared with 907 PC 32. The output Q for the CE from 907 PC 32 has been set during the first cycle after starting the T200. This is no longer the case in 907 PC 332. This change can be undesirable when transmitting programs written in 907 PC 32 and containing CE I– to 907 PC 332.

You can create your own "I–" using the CE library, which will correspond to the CE from 907 PC 32. Start the CE library. Move the cursor on the CE I– and press <ALT>F2. The CE will be duplicated and a new user CE created. Store the new CE in the group "\". Enter the name "I–".

Move the cursor in the column "Src" of the new CE and press <ENTER>. The instruction list of the CE will be displayed. You can modify now the definition of the IL until it corresponds to the IL from 907 PC 32.

The CE IL of 907 PC 32 looked as follows:

```
!     PP 000   1–0
=R    PP 000   Q
!N    PP 000   1–0
&N    PP 000   Q
=S    PP 000   Q
=     PP 000   PULS
```

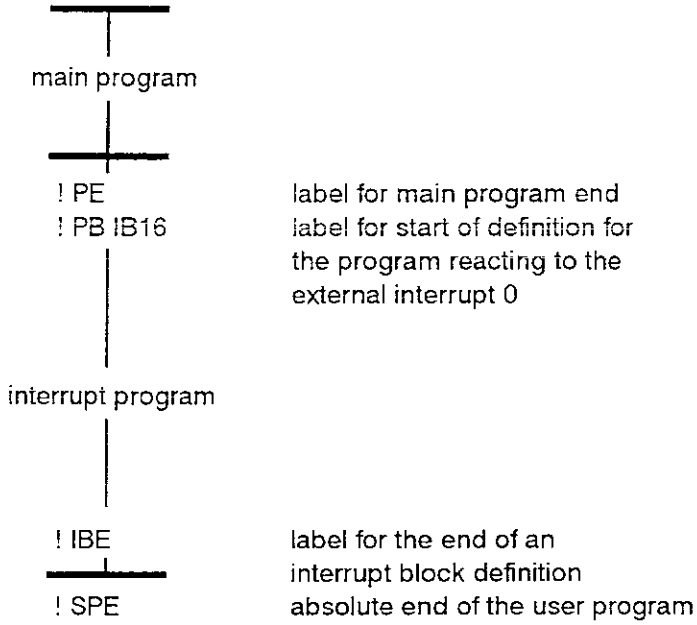
If you enter now the CE I– in the FBD the new CE with the modified IL will be loaded.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.8 µs	11.8 µs	10.1 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

Example



Parameters

– – –

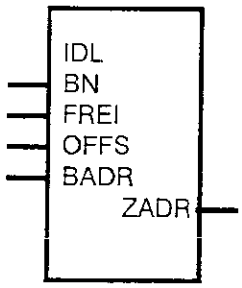
Description

Label indicating the end of definition of an interrupt block. This label must be placed both at the end of the definition of a time–controlled interrupt and also of an external interrupt (when using the module 07 EI 60).

CE Data

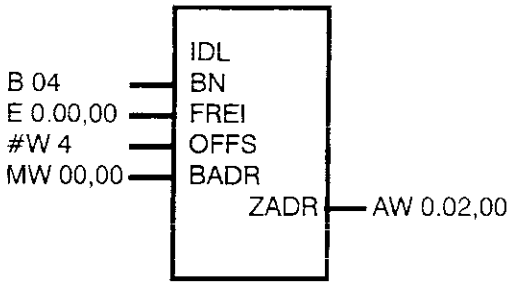
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	22.7 µs	22.7 µs	12.6 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=     BA 04
FB    021
EP    #W 4
EPA   MW 000,00
AP    AW 0.02.00
```

Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enable signal
OFFS	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	offset, distance
BADR	WORD	EW, EW', MW, MW', AW, AW', TI, ZI	basic address
ZADR	WORD	MW, MW', AW, AW'	target address

Description

If FREI = 1 the block transfers the variable content, defined by the basic address and offset (distance), to a given target address. The follwing values are valid for the distance: 0 ... 127.

If FREI = 0 nothing will be performed.

An address beyond the flag areas will not be reported.

Example:

Source address:	Basic address	MW	00,00
	+ Offset		4
	Source address	MW	00,04

CE Data

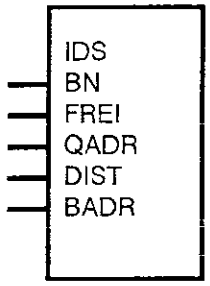
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	12.6 µs	12.6 µs	6.7 µs
additional operating time:	– – –	– – –	– – –

Output updating: yes if FREI = 1

Memory allocated once when called: 5 words of 32 bit each

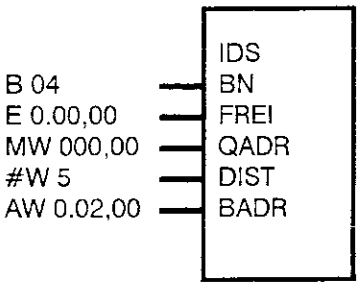
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=     BA 04
FB    020
EP    MW 000,00
EPA   AW 0.02,00
EP    #W 5
```

Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enable signal
QADR	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	source address
DIST	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	offset
BADR	WORD	EW, EW', MW, MW', AW, AW'	basic address

Description

If FREI = 1 the block transfers the content of a source address to a target address, calculated from the basic address and distance. The following values are valid for the distance: 0 ... 127.

Target address calculation:

for inst.:	Basic address	AW 0.02,00
+	Distance	5
	Target address	AW 0.02,05

If the calculated destination address is out of range, no allocation will be performed and the error flag M 127,04 will be set to one.

If FREI = 0 nothing will be performed.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	21.8 µs	21.8 µs	10.9 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes if FREI = 1

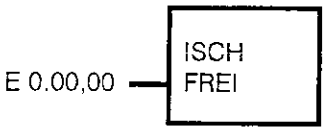
Memory allocated once when called: 17 words of 32 bit each

Available with: ABB Procontic T200 and 907 PC 332

FBD/LD

Example

FBD/LD



IL

```
!     BA 00
FB    004
EP    E 0.00,00
```

Parameters

FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enable signal

Description

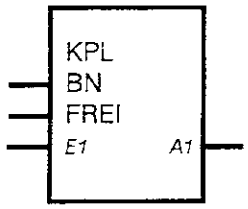
If FREI = 1, in all step chains the step 0 will be set to 1 (S000,00 to S255,00).

If FREI = 0 nothing will be performed.

CE Data

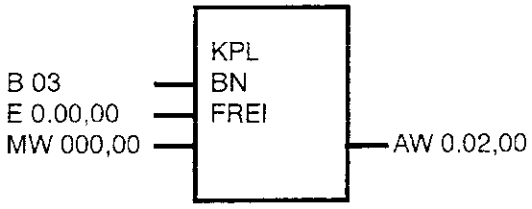
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	1489 µs	1489 µs	714 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Memory allocated once when called:	11 words of 32 bits each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!    E 0.00,00
=    BA 03
FB024
EP   MW 000,00
AP   AW 0.02,00
```

Parameters

BN	SPECIAL	B 00 ... B 255	Input in FBD: Bxx
FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enable signal
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	input
A1	WORD	MW, MW', AW, AW'	1's complement of the input variable

Description

If FREI = 1 the block forms the 1's complement of the input variable (E1) and stores this complement in the output variable (A1).

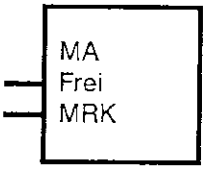
If FREI = 0 nothing is performed.

1's complement:
- every bit is inverted separately
- in case of bit variables the bit status will be inverted

CE Data

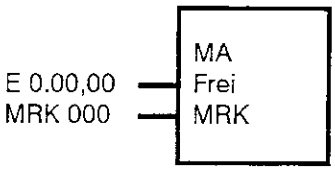
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	9.2 µs	9.2 µs	5.0 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes if FREI = 1		
Memory allocated once when called:	2 double words of 32 bit each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!      E 0.00,00
=MA    MRK 000
```

Parameters

Frei	BINARY	E, E', A, A', M, M' #B0, #B1, S, T, Z	Enable of the conditional block
MRK	LABEL	MRK 000...005	Number of the block

Description

The start of a conditional block is defined with MA (=MA <Nr.>). The affiliated end of the block is identified by ME (!ME MRK <Nr.>).

This program block is processed only if the previous result of the logical combination is 1. Otherwise, this program part is skipped.

Note:
In each segment plan each MA must be affiliated to a ME.

The combination MA/ME can be used any number of times in a program and has the same principle of operation as in ABB Procontic b. However, by specifying a label number, these conditional blocks can be nested in ABB Procontic T200.

The maximum nesting depth is 6, i.e. the maximum number for the label is 5 (MRK 005).

Description of the inputs

Frei BINARY Enable of the conditional block

Frei = 1 All instructions between MA and the affiliated ME are processed.

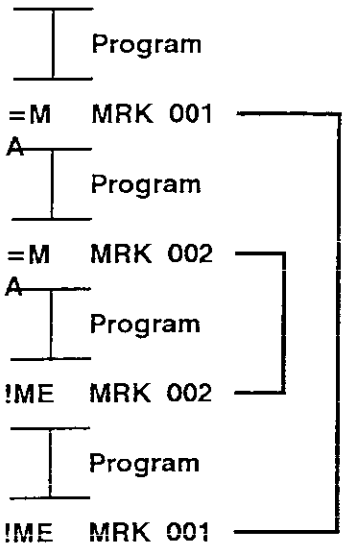
Frei = 0 All instructions between MA and the affiliated ME are skipped.

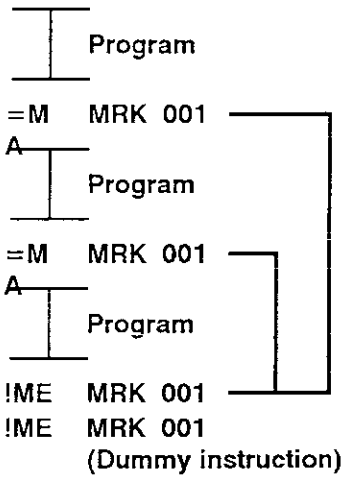
MRK LABEL Number of the block

The variables MRK 000 to MRK 005 can be entered as a label. The label MRK 006 is reserved for connection elements and the label MRK 07 is reserved for the sequential function chart. They must not be used again in the user program.

Examples for the nesting with =MA and !ME

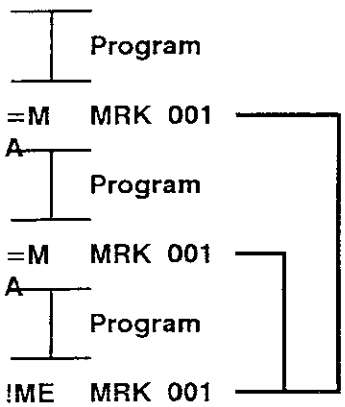
Permitted nesting examples:



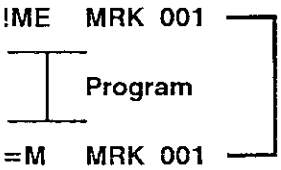


The maximum nesting depth is 6, i.e. the maximum number for the label is 5 (MRK 005).
The label MRK 006 is reserved for Connection Elements (CEs) and the label MRK 007 is reserved for the sequential function chart.

Not permitted nesting examples:



The error message "Too many =MA" appears.

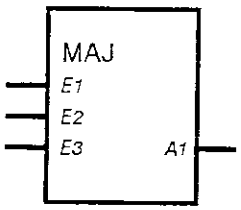


Reverse reference is not allowed.

CE Data

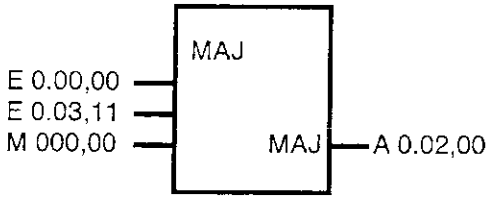
	07 ZE 60	07 ZE 61/63	07 ZE 62
Runtime:			
Basic runtime:	2.8 µs	2.8 µs	1.3 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	– – –		
Memory allocated once when called:	– – –		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   E 0.00,00
&   E 0.03,11
/(  E 0.00,00
&   M 000,00
)
/(  E 0.03,11
&   M 000,00
)
=   A 0.02,00
```

Parameters

E1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Operand 1
E2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Operand 2
E3	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Operand 3
A1	BINARY	M, M', A, A', S, T, Z	Result

Description

The CE creates a majority element.

A logic 1–signal will be allocated to the binary operand at output MAJ, when at least 2 out of 3 binary operands at inputs E1, E2 and E3 have a logic 1–signal.
A logic 0–signal will be allocated to the binary operand at output MAJ, when the above mentioned condition is not fulfilled.

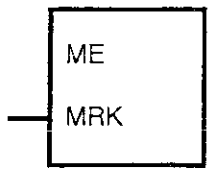
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	22.0 µs	22.0 µs	14.5 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

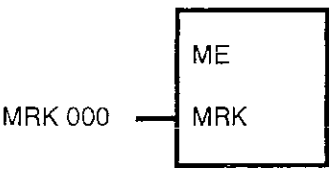
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!ME    MRK 000
```

Parameters

MRK	LABEL	MRK 000...005	Number of the block

Description

The end of a conditional block is defined with ME (!ME <Nr.>). The affiliated start of the block is identified by MA (=MA MRK <Nr.>).

Note:
In each segment plan each MA must be affiliated to a ME.

The combination MA/ME can be used any number of times in a program and has the same principle of operation as in ABB Procontic b. However, by specifying a label number, these conditional blocks can be nested in ABB Procontic T200.

The maximum nesting depth is 6, i.e. the maximum number for the label is 5 (MRK 005).

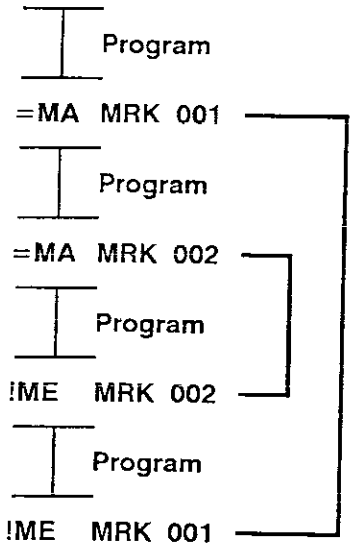
Description of the label

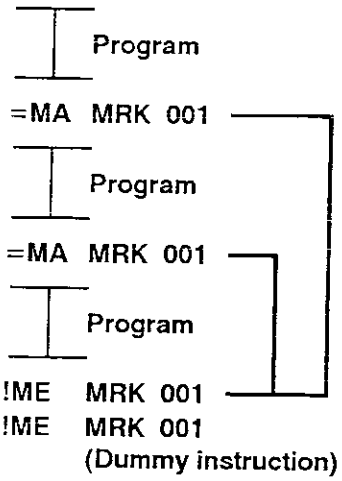
MRK LABEL Number of the block

The variables MRK 000 to MRK 005 can be entered as a label. The label MRK 006 is reserved for Connection Elements (CEs) and the label MRK 07 is reserved for the sequential function chart. They must not be used again in the user program.

Examples for the nesting with =MA and !ME

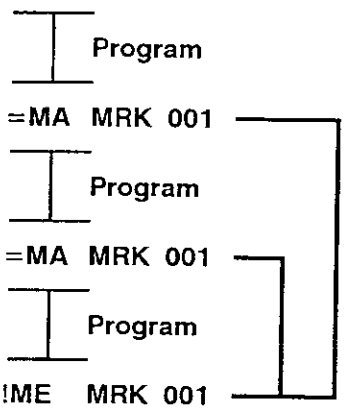
Permitted nesting examples:



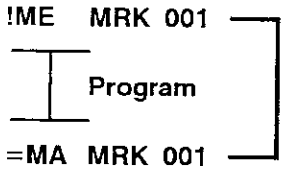


The maximum nesting depth is 6, i.e. the maximum number for the label is 5 (MRK 005).
The label MRK 006 is reserved for Connection Elements (CEs) and the label MRK 007 is reserved for the sequential function chart.

Not permitted nesting examples:



The error message "Too many =MA" appears.

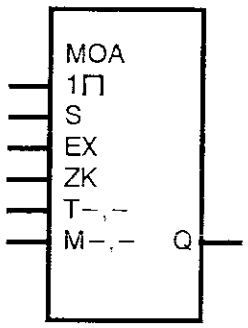


Reverse reference is not allowed.

CE Data

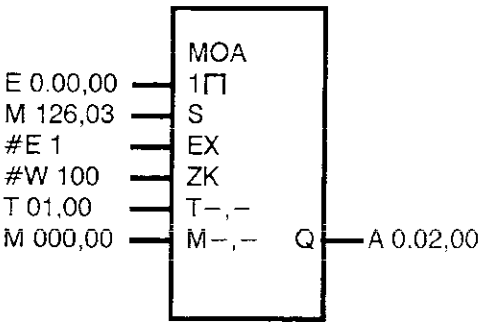
	07 ZE 60	07 ZE 61/63	07 ZE 62
Runtime:			
Basic runtime:	0.9 µs	0.9 µs	0.4 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	– – –		
Memory allocated once when called:	– – –		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     M 126,03
=S    T 01,00
      #E 1
      #W 100
!     E 0.00,00
&N    T 01,00
=S    M 000,00
!     T 01,00
/(N   T 01,00
&N    E 0.00,00
)
=R    M 000,00
!     E 0.00,00
&N    M 000,00
=S    M 000,00
!     M 000,00
=     T 01,00
!     M 000,00
=     A 0.02,00
```

Parameters

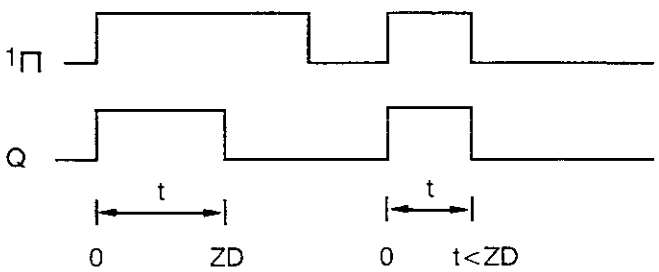
1⊓	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal (start signal)
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input for pulse length
EX	SPECIAL	#E1, #E2, #E3	exponent for time base
ZK	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant
T–,–	BINARY	T	timer for pulse length
M–,–	BINARY	M, M'	auxiliary flag
Q	BINARY	M, M', A, A', S, T, Z	output signal

Description

The 0–>1 transition of the binary input 1⊓ produces a 0–>1 transition at the output Q. If the input 1⊓ remains at 1 level, a 1–>0 transition is output on output Q after duration ZD has elapsed.

The output Q is also set back to 0 level if the input 1⊓ should return to 0 level before expiry of time ZD.

Input S can be inverted. The inputs and the output cannot be duplicated.



pulse length ZD = EX * ZK

S BINARY
The S input sets the timer to the value of the time constant. Before the start of the time a setting must have taken place. A new setting while the time is running has no influence.

EX SPECIAL
ZK WORD
EX and ZK make up the pulse length. The following values are possible for EX:

#E1 = 10 ms; range: 10 ms ... 5 min 27,67 s;
#E1 is only allowed for the times T 00,00 ... T 03,15
#E2 = 100 ms; range: 100 ms ... 54 min 36,7 s;
#E3 = 1 s; range: 1 s ... 9 h 6 min 7 s;

The following values are allowed for ZK: 1...32767.

Exp.: EX = #E2 and ZK = #W 5 make up a pulse length of 100 ms * 5 = 500 ms.

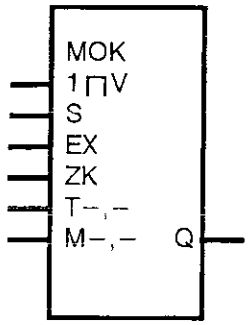
T–,– BINARY
The timer is specified at input T–.–. Possible timers: T 00,00 ... T 15,15.

M BINARY
At M–,– input a flag will be connected, which is used internally. This flag must not be used a second time in the program.

CE Data

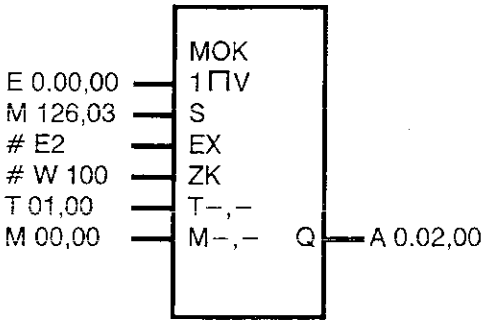
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	51.2 µs	51.2 µs	30.2 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

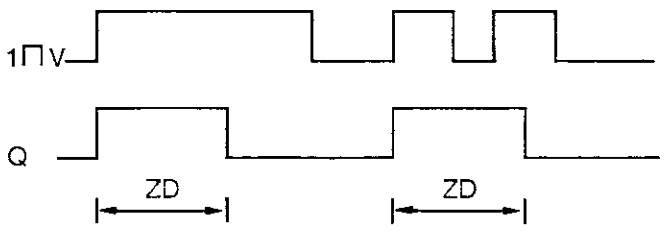
```
!      M 126,03
=S     T 01,00
# E2
#W100
!      M 00,00
&N     T 01,00
=      A 0.02,00
!N     E 0.00,00
&      T 01,00
=R     M 00,00
!      E 0.00,00
&N     M 00,00
=S     M 00,00
!      M 00,00
=      T 01,00
```

Parameters

1⊓V	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input for pulse length
EX	SPECIAL	#E1, #E2, #E3	exponent
ZK	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant
T–,–	BINARY	T	timer for pulse length
M–,–	BINARY	M, M'	auxiliary flag
Q	BINARY	M, M', A, A', S, T, Z	output signal

Description

The 0–>1 transition of the binary input 1⊓V sets the output Q to "1" state. After the pulse length ZD the output Q will assume "0" state. An additional 0–>1 transition at the input 1⊓V before the end of the pulse length ZD will be ignored.



pulse length ZD = EX * ZK

The inputs und the output can neither be duplicated nor inverted. Exception: S can be inverted.

S BINARY set input (impulse length)
The S input sets the timer to the value of the pulse length. Before the start of the time a setting must have taken place. A new setting while the time is running has no influence.

EX SPECIAL exponent
ZK WORD time constant
EX and ZK make up the pulse length. The following values are possible for EX:

#E1 = 10 ms; range: 10 ms ... 5 min 27,67 s;
#E1 is only allowed for the times T 00,00 ... T 03,15
#E2 = 100 ms; range: 100 ms ... 54 min 36,7 s;
#E3 = 1 s; range: 1 s ... 9 h 6 min 7 s;

The following values are allowed for ZK: 1...32767.

Exp.: EX = #E2 and ZK = #W 5 make up a pulse length of 100 ms * 5 = 500 ms.

T−,− BINARY timer
The timer is specified at input T−,−.
Possible timers: T 00,00 ... T 15,15.

M−,− BINARY auxiliary flag
At M−,− input a flag has to be connected, which is used internally. This flag must not be used a second time in the program.

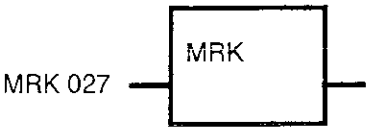
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	39.5 µs	39.5 µs	23.5 µs
Additional operating time:	− − −	− − −	− − −
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

Example

FBD/LD



IL

```
!    MRK 027
```

Parameters

MRK	SPECIAL	MRK00 ... MRK255	jump label number

Description

Jump label MRK definition.

Each jump label (MRK nnn) may occur only once in the program.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	0.9 µs	0.9 µs	0.4 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD	Example
is not available	FBD/LD is not available IL

Parameters

Description

NOTBIT is a basic library function. The element's name in the library is NOTBIT.
The element cannot be called in the CE and CE IL Editor.

The programming system uses this element to realize connection lines.

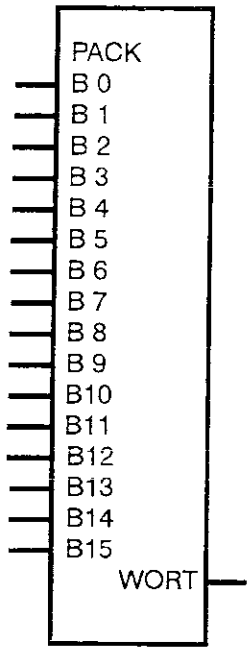
CE Data

Operating time:
Basic operating time: appr. 1...4 µs, depends on structure
additional operating time:

Output updating:

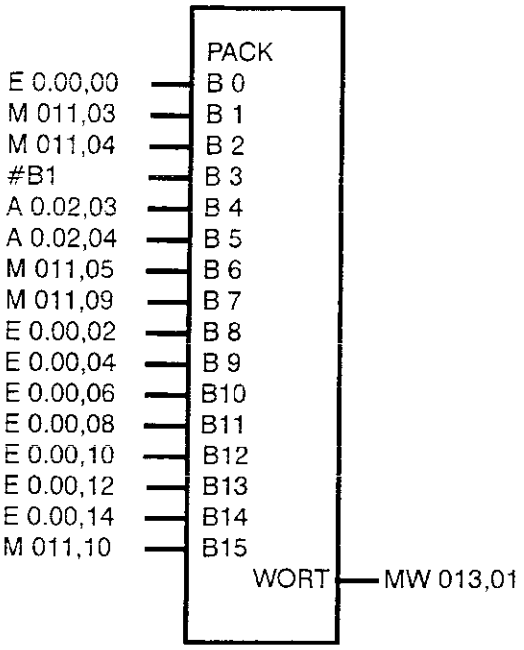
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   E 0.00,00
=   NM'359,00
!   M 011,03
=   M'359,01
!   #B1
=   M'359,02
.   ...
.   ...
.   ...
!   MW'359,00
=   MW 013,01
```

Parameters

B0	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 0 in the word output "WORT"
B1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 1 in the word output "WORT"
B2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 2 in the word output "WORT"
B3	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 3 in the word output "WORT"
B4	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 4 in the word output "WORT"
B5	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 5 in the word output "WORT"
B6	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 6 in the word output "WORT"
B7	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 7 in the word output "WORT"
B8	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 8 in the word output "WORT"
B9	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 9 in the word output "WORT"
B10	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 10 in the word output "WORT"
B11	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 11 in the word output "WORT"
B12	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 12 in the word output "WORT"

B13	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 13 in the word output "WORT"
B14	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 14 in the word output "WORT"
B15	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 15 in the word output "WORT"
WORT	WORD	MW, MW', AW, AW',	16 bits combined in one word

Description

The 16 binary variables applied at the inputs B 0 to B15 are packed into a word variable and are output at the WORT output.

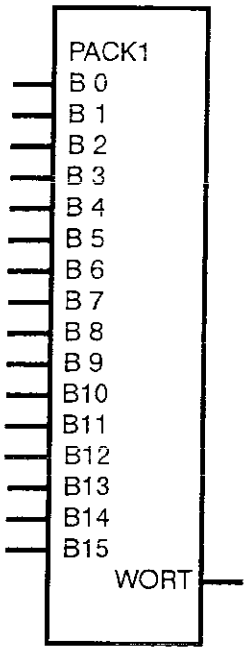
The binary outputs B0 to B15 can be inverted singly.

Important:
The flag MW'359,00 is used for internal purposes. In the program, outside of CE's, this flag must not be used for other purposes.

CE Data

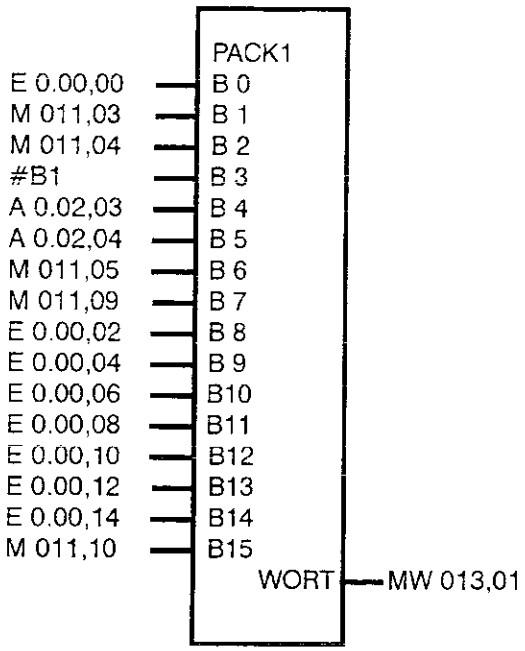
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	65.9 µs	65.9 µs	48.7 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA      000
     FB  0067   PACK1
EP   E   0.00,02
EP   E   0.00,04
EP   E   0.00,06
EP   E   0.00,08
EP   E   0.00,10
EP   E   0.00,12
EP   E   0.00,14
EP   M   011,00
!BA      000
     FB  0068   PACK2
EP   E   0.00,00
EP   M   011,03
EP   M   011,04
EP   #B  1
EP   A   0.02,03
EP   A   0.02,04
EP   M   011,05
EP   M   011,09
EP   MW  0013,01
```

Parameters

B0	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 0 in the word output "WORT"
B1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 1 in the word output "WORT"
B2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 2 in the word output "WORT"
B3	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 3 in the word output "WORT"
B4	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 4 in the word output "WORT"
B5	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 5 in the word output "WORT"
B6	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 6 in the word output "WORT"
B7	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 7 in the word output "WORT"
B8	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 8 in the word output "WORT"
B9	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 9 in the word output "WORT"
B10	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 10 in the word output "WORT"
B11	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 11 in the word output "WORT"
B12	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 12 in the word output "WORT"

B13	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 13 in the word output "WORT"
B14	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 14 in the word output "WORT"
B15	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Bit 15 in the word output "WORT"
WORT	WORD	MW, MW', AW, AW',	16 bits combined in one word

Description

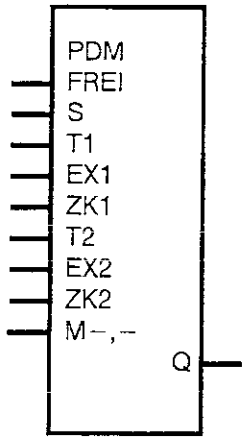
The 16 binary variables applied at the inputs B0 to B15 are packed in a word variable and are output at the WORT output.

The binary inputs B0 to B15 cannot be inverted.

CE Data

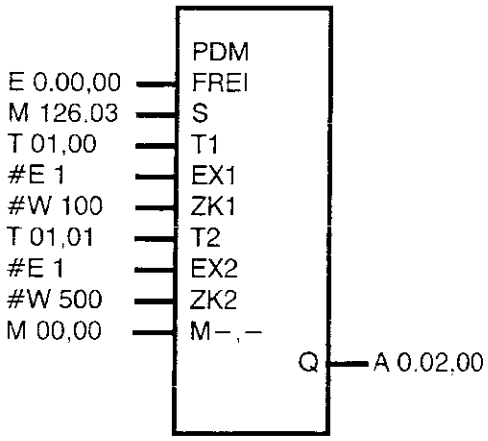
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	65,9 µs	65,9 µs	48,7 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



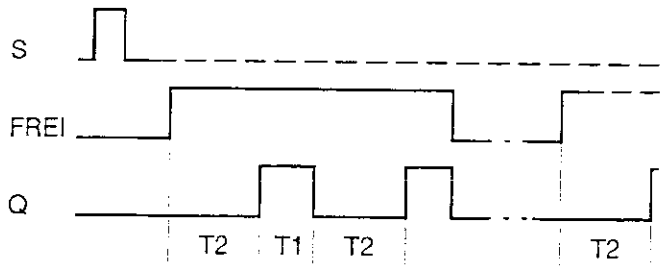
IL

```
!       M 126,03
=S      T 01,00
#E 1
#W100
=S      T01,01
#E 1
#W500
!       E 0.00,00
&N      M 00,00
=       T 01,01
!       T 01,01
=S      M 00,00
!       E 0.00,00
&       M 00,00
=       T 01,00
!       T 01,00
\N      E 0.00,00
=R      M 00,00
!       M 00,00
=       A 0.02,00
```

Parameters

FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enabling block
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input
T1	BINARY	T	timer output ON
EX1	SPECIAL	#E1, #E2, #E3	exponent 1
ZK1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant 1
T2	BINARY	T	timer output OFF
EX2	SPECIAL	#E1, #E2, #E3	exponent 2
ZK2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant 2
M−,−	BINARY	M, M'	auxiliary flag
Q	BINARY	M, M', A, A', S, T, Z	oscillator output

Description



The connection element is an oscillator with two timers, a freely selectable period of oscillation and adjustable duty factor.

Period of oscillation: T = T1 + T2

Duty factor: t = T/T1

FREI BINARY enabling block
FREI input is used for oscillator enabling.

S BINARY set timer
The S input serves to set the timers T1 and T2 to the values of the respective time constants. The latter consists of the associated exponent (EX1, EX2) and the timer setup value (ZK1, ZK2).
Before the start of the oscillator a setting must have been performed; a new setting while the oscillator is running has no influence.

A timer (T–,–) has to be connected to each of the inputs T1 and T2. The inputs ZK are used for input of the time constants.

M–,– BINARY auxiliary flag
At M–,– input a flag has to be connected, which is used internally. This flag must not be used a second time in the program.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	31.1 µs	31.1 µs	20.2 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

Example

FBD/LD

IL

```
!    PE
```

Parameters

– – –

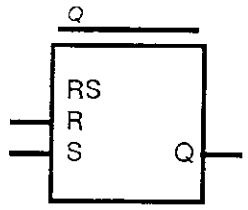
Description

Program end is the flag for the end of the PLC program. Commands that are after the end label will not be processed by the PLC.

CE Data

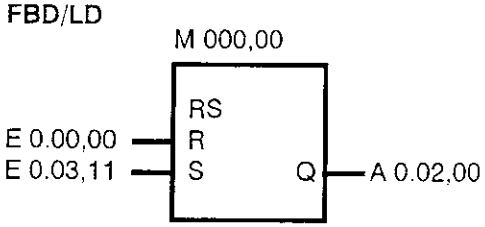
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	9.7 µs	9.7 µs	4.6 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=R    M 000,00
!     E 0.03,11
=S    M 000,00
!     M 000,00
=     A 0.02,00
```

Parameters

R	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Reset input
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Set input
Q	BINARY	M, M', A, A', S, T, Z	Flip-flop output

Description

The operand Q, which takes over the latch function, has to be entered above the CE frame.

R BINARY Reset input

A logic 1-signal at the input R resets the operand Q to 0.

S BINARY Set input

A logic 1-signal at the input S sets the operand Q to 1.

A logic 1-signal simultaneously applied to the inputs S and R sets the operand Q to 1 (dominant set).

A 0-signal at the inputs S or R does not influence the operand Q.

Q BINARY Output

The state of the operand Q will be allocated to the output Q.

The inputs and outputs cannot be duplicated. The inputs R and S can be inverted.

CE Data

	07 ZE 60	07 ZE 61/63	07 ZE 62
Operating time:			
Basic operating time:	11.6 µs	11.6 µs	8.6 µs
Additional operating time:	---	---	---

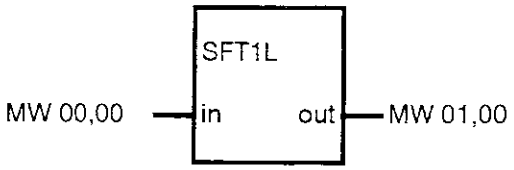
Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

FBD/LD

Example

FBD/LD



IL

```
!BA   000
      FB 0070
EP    in
AP    out
```

Parameters

in	EW, EW', AW, AW', MW, MW',#W	Input value to be shifted for 1 position to left
out	AW, AW', MW, MW'	Output value

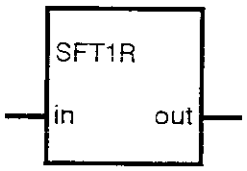
Description

The function SFT1L shifts the content of the word value applied at the input "in" for 1 bit to left. The positions are filled up from right with 0.

CE Data

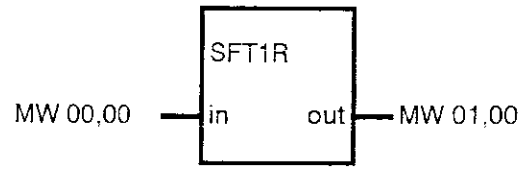
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6,5 µs	6,5 µs	3,5 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	2 double words of 32 bits each		
Vailabel with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   000
      FB 0071
EP    in
AP    out
```

Parameters

in	EW, EW', AW, AW', MW, MW',#W	Input value to be shifted for 1 position to right
out	AW, AW', MW, MW'	output value

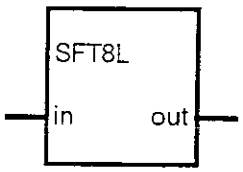
Description

The function SFT1R shifts the content of the word value applied at the input "in" for 1 bit to right. The positions are filled up from left with 0.

CE Data

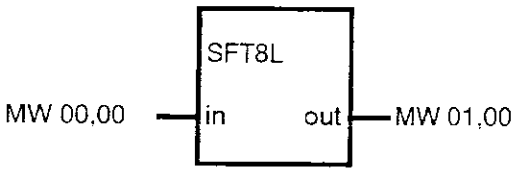
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6,5 µs	6,5 µs	3,5 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	2 double words of 32 bits each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   000
      FB 0072
EP    in
AP    out
```

Parameters

in	EW, EW', AW, AW', MW, MW',#W	Input value to be shifted for 8 positions to left
out	AW, AW', MW, MW'	output value

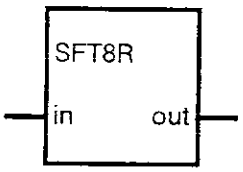
Description

The function SFT8L shifts the content of the word value applied at the input "in" for 8 bits to left. The positions are filled up from right with 0.

CE Data

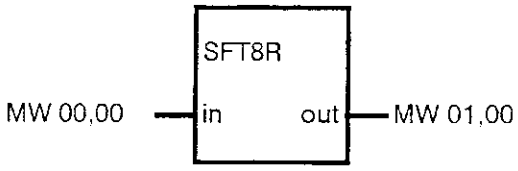
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6,5 µs	6,5 µs	3,5 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	2 double words of 32 bits each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA   000
      FB 0073
EP    in
AP    out
```

Parameters

in	EW, EW', AW, AW', MW, MW',#W	Input value to be shifted for 8 positions to right
out	AW, AW', MW, MW'	output value

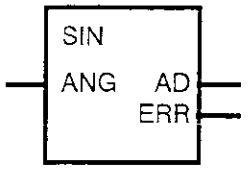
Description

The function SFT8R shifts the content of the word value applied at the input "in" for 8 bits to right. The positions are filled up from left with 0.

CE Data

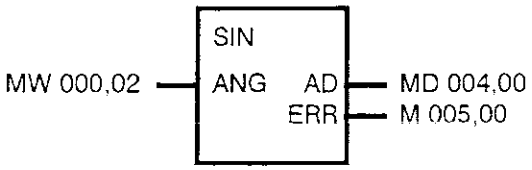
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6,5 µs	6,5 µs	3,5 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	2 double words of 32 bits each		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!BA     00
  FB 054
EP      MW 000,02
EPA     MW' 371,01
EPA     M' 381,01
!BA     00
  FB 055
EP      MW' 372,01
EP      MW' 372,00
AP      MD 004,00
!       M' 381,01
=       M 005,00
```

Parameters

ANG	WORD	EW, AW,MW, MW', #W	Input angle
AD	DOUBLE WORD	AD, MD, MD'	Sine of the input value
ERR	BINARY	M, M', A, A', S	Error if the input value is negative or greater than 360

Description

The function sine generates the sine of the angle value at the input ANG. The result is available at the output AD, and is in the range between −100 000 ... 100 000. If the value at the input is negative or greater than 360, the value 0 is assigned to the output AD, and the value '1' is assigned to the ERR output.

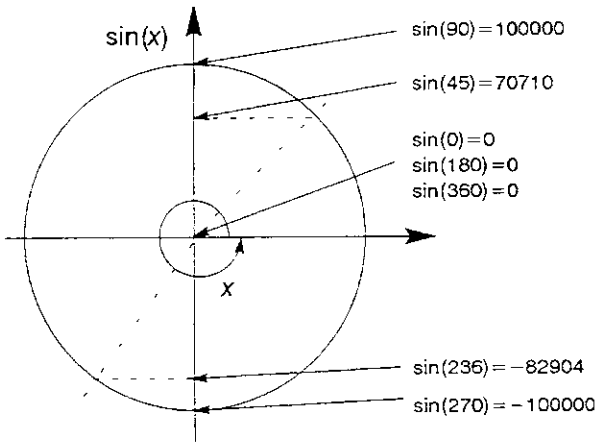
The maximum error of the result is ±1 units.The connection element SIN uses two function blocks, FB54 for the sine calculation, and FB55 to convert the result to a user−friendly range. This function doesn't work on CPUs older versions than R302.

ANG WORD
The sine of the value at the input operand ANG ia generated and is available as a value of the output operand AD.

AD DOUBLE WORD
The value of the sine function is available at the output AD.

ERR BINARY
The ERR output indicates whether the value of the input is in the correct range (0≤ANG≥360).
Input 0 ≤ ANG ≥ 360
−> ERR = 0 and AD = SIN(ANG)
Input ANG < 0 or ANG > 360
−> ERR = 1 and AD = 0

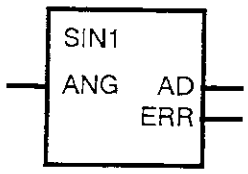
Examples of sine values



CE Data

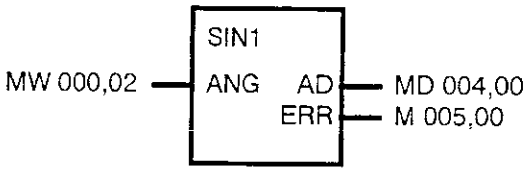
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	1165 µs	1165 µs	622 µs
Additional runtime:	−−− µs	−−− µs	−−− µs
Output updating:	yes		
Memory allocated once when called:	75 double words of 32 bits each		
Available as of:	ABB Procontic T200 from ZE version R302 / 907 PC 332		
Used data ranges:	local:	M: 1	
		MW: 3	

FBD/LD



Example

FBD/LD



IL

See CE def.
in 907 PC 326–SW

Parameters

ANG	WORD	EW, AW, MW, MW', #W	Input angle 0,0 ... 360,0
AD	DOUBLE WORD	AD, MD, MD'	Sine of the input value
ERR	BINÄR	M, M', A, A', S	Error if the input value is negative or greater than 360

Description

The function sine generates the sine of the angle value at the input ANG. The result is available at the output AD, and is in the range between −100 000 ... 100 000. If the value at the input is negative or greater than 360, the value 0 is assigned to the output AD, and the value 1 is assigned to the ERR output.

This function doesn't work on CPUs older versions than R302.

ANG WORD
The sine of the value at the input is generated and is available as a value at the output operand AD.
Input:

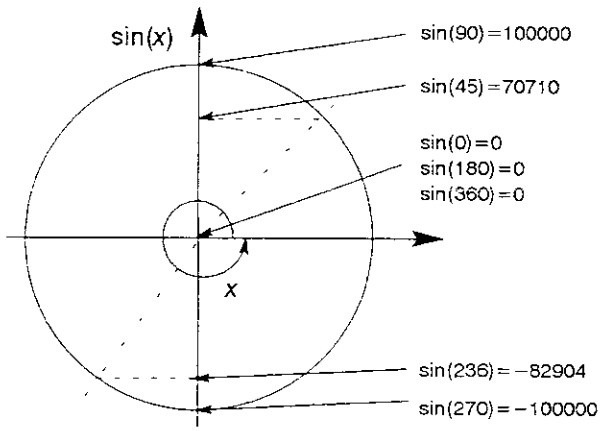
0000 für 0 degree
0001 für 0,1 degree
0010 für 1,0 degree
..
3600 für 360,0 degree

AD DOUBLE WORD
The sine of the value at the input is available at the output AD.

ERR BINARY
The output ERR indicates whether the value at the input is in the correct range ($0 \leq ANG \leq 360$).

Input $0 \leq ANG \leq 360$
−> ERR = 0 and AD = SIN(ANG)
Input ANG < 0 oder ANG > 360
−> ERR = 1 and AD = 0

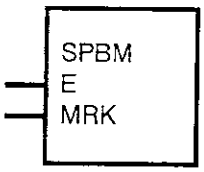
Examples of sine values



CE Data

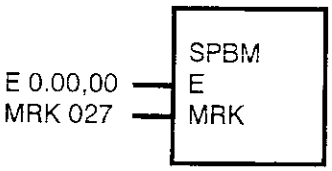
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	2650 µs	2650 µs	1300 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	yes		
Available as of:	ABB Procontic T200 from ZE version R302 / 907 PC 332		
Used data ranges:	Local:		
		M:	–
		MW:	12
Used function blocks:	FB 054	SIN	
	FB 055	SCALE	
	FB 071	SFT1R	
	FB 22		

FBD/LD



Example

FBD/LD



IL

```
!       E 0.00,00
=SPM    MRK 027
```

Parameters

E	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	jump condition BINARY
MRK	SPECIAL	MR000 ... MR255	jump label

Description

Jump to the given label MRK if the binary jump condition E has been fulfilled.

Each jump label (MRK nnn) may occur only once in the program.

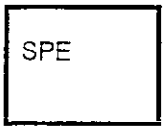
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	121 µs	121 µs	60,5 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD

Example

FBD/LD



IL

```
!    SPE
```

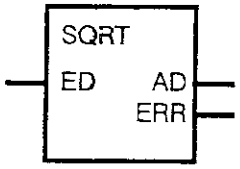
Parameters

Description

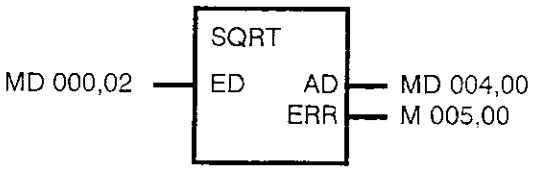
This block is always placed at the absolute end of the user program. It must not be followed by any further instructions.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	9.7 µs	9.7 µs	4.6 µs
additional operating time:	---	---	---
Output updating:	---		
Available with:	ABB Procontic T200 and 907 PC 332		



FBD/LD



IL

```
!BA     00
  FB 052
EP      MD 000,02
EPA     MW' 371,01
EPA     M' 381,01
!BA     00
  FB 053
EP      MW' 372,01
AP      MD 004,00
!       M' 381,01
=       M 005,00
```

Parameters

ED	DOUBLE WORD	ED, AD MD, MD', #D	Input
AD	DOUBLE WORD	AD, MD, MD'	Square root of the input value
ERR	BINARY	M, M', A, A', S	Error if the input value is negative

Description

The function square root generates the square root of the value at the input ED. The result is available at the output AD, and is always *rounded down* to an integer number. The value at the input ED must be positive. If the value at the input is negative, the value 0 is assigned to the output AD, and the value '1' is assigned to the ERR output.

The connection element SQRT uses two function blocks, FB52 for square root calculation, and FB53 to convert a 16bit unsigned integer to a 32bit signed integer. This function doesn't work on CPUs older versions than R302.

ED DOUBLE WORD
The square root of the value at the input operand ED is generated and is available as a value of the output operand AD.

AD DOUBLE WORD
The value of the square root is available at the output AD.

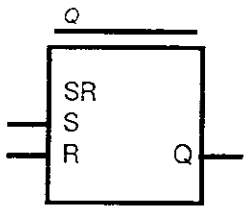
ERR BINARY
The ERR output indicates whether the value of the input operand E is positive ($\geq$0) or negative (<0).

Input ED $\geq$ 0 -> ERR = 0 and AD = square root
Input ED < 0 -> ERR = 1 and AD = 0

CE Data

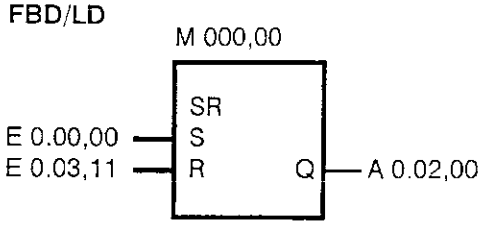
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	361 µs	361 µs	160 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	21 double words of 32 bits each		
Available as of:	ABB Procontic T200 from ZE version R302 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=S    M 000,00
!     E 0.03,11
=R    M 000,00
!     M 000,00
=     A 0.02,00
```

Parameters

S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Set input
R	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Reset input
Q	BINARY	M, M', A, A', S, T, Z	Output

Description

The operand Q, assuming the latch function, has to be entered above the CE frame.

S BINARY Set input

A logic 1–signal at the input S sets the operand Q to 1.

R BINARY Reset input

A logic 1–signal at the input R resets the operand Q to 0.

A logic 1–signal simultaneously applied to the inputs S and R resets the operand Q to 0 (dominant reset). A logic 0–signal at the inputs S or R does not influence the operand Q.

Q BINARY Output

The state of the operand Q will be allocated to the output Q.

The inputs and outputs cannot be duplicated. The inputs S and R can be inverted.

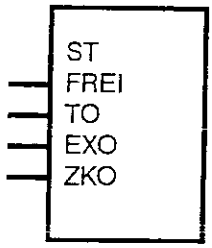
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	11.6 µs	11.6 µs	8.6 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

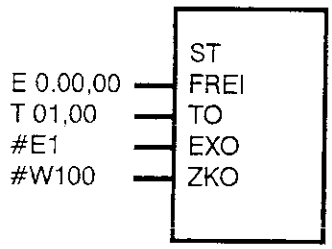
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=S    T 01,00
#E1
#W100
```

Parameters

FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set condition
T	BINARY	T	timer
EX	SPECIAL	#E1, #E2, #E3	time base (#E1 = 10ms, #E2 = 100ms, #E3 = 1000ms)
ZK	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	time constant

Description

If the condition for setting (FREI) is fulfilled, the time constant, which consists of the exponent EXO and the timer setup value ZKO, will be allocated to the timer (T).

Setting of Timer Setup Values

ABB Procontic T200 can operate with up to 256 timers. By means of the software, these timers can be programmed with different timer setup values. Here you will have to distinguish between the allocation of a timer setup value, i. e. the setting of a new setup value, and the start of a timer.

By the sentence

```
=S  T--,--   set new setup value for T--,--
    #E1      select time base of 10 ms
    #W 100   select factor 100 by time basis ( = 1 s)
             range of values: 0001 ... 32767
```

the timer is loaded with a new setup value.

Example:

```
!    M 126,03   first cycle flag
=S   T 00,00
     #E1
     #W 100
=S   T 00,01
     #E2
     #W 333
```

The flag M 126,03 is "1" in the first cycle and releases the following to its setup value allocations. In all following cycles the flag is "0" and the setup value allocations will not be executed. Besides the constant which gives the factor it is also possible to use a word variable.

Example:

```
=S   T 03,09
     #E2
     MW 0100,11   The contents of the word flag
                  define the time factor.
                  Range of values: 0001 ... 32767
```

You can use the following values to address the timers:

T 00,00 .... T 00,15 .... T 15,15
It is possible to use the following time bases as exponents:

#E1 = 10 ms = 0,01 s max. range 10 ms ... 327,67s = 5 min., 27,67 sec only permitted for the timers T 00,00 to T 03,15.

#E2 = 100 ms = 0,1 s max. range 100 ms ... 3276,7 s = 54 min., 36.7 sec

#E3 = 1000 ms = 1 s max. range 1000 ms ... 32767 s = 9 h., 6 min., 7 sec.

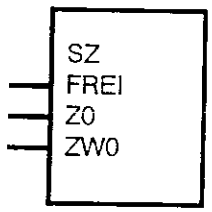
You can use the following values as factors:

#W 0001 ... #W +32767 word constants
<variable> any possible word variable

CE Data

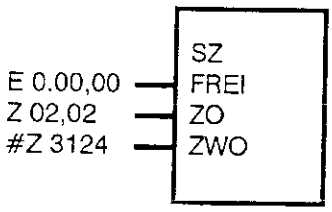
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6.6 µs	6.6 µs	4.1 µs
Additional operating time:	4.0 µs	4.0 µs	1.9 µs
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!     E 0.00,00
=S    Z 02,02
#Z    3124
```

Parameters

FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	enabling block
Z	BINARY	Z	counter
ZW	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI, #Z	counter setup value

Description

If the condition for setting (FREI) is fulfilled, the setup value (ZW) will be allocated to the counter (Z).

Setting of Counter Setup values

ABB Procontic T200 can operate with up to 256 counters. By means of the software, these counters can be programmed with different counter setup values. Here you will have to distinguish between the allocation of a counter setup value, i.e. the setting of a new comparison value, and the counting of the counter's actual value. By the sentence:

```
=S  Z--,--   set new setup value for Z --,--
    #Z 100   setup value = 100
```

the counter will be loaded with a new setup value if the logic result before the allocation is "1". This setup value remains valid until it is overwritten by a new setting or the system is initialized again, i.e. in case of a new system start the setup value has to be allocated again.

Multiple setup value allocation is also possible.

Example of a setup value allocation which is executed once in case of program start :

```
!    M 126,03    first cycle flag
=S   Z 00,00
     #Z 100
=S   Z 00,01
     #Z 333      range of values 0 ... 65535
=S   Z 01,02
     #W470       range of values 0 .... 32767
```

The flag M 126,03 is "1" in the first cycle and releases the following setup value allocations. In all following cycles the flag is "0" and the setup value allocations will not be executed.

Besides the constant which gives the comparison value it is also possible to use a word variable.

Example:

```
=S  Z 03,09
    MW 0100,11
```

The contents of the word flag define the comparison value

Range of values : 0000 ... +65535

In case of an allocation via a word constant only a range up to +32767 is possible, in case of higher setup values the input must be carried out via HEX constants. In case of 907 PC 33, you can carry out a conversion from decimal to HEX by the function <CTRL>W.

The following values can be used as addresses for the counters :

Z 00,00 ... Z 00,15 ... Z 15,15

The following can be used as comparison values (setup values):

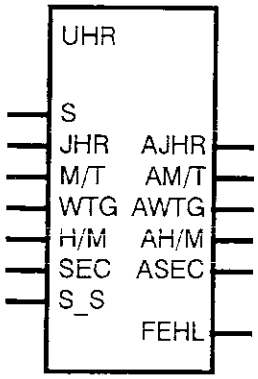
Z 0000 ... # Z 65535

or any possible word variable.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	6.6 µs	6.6 µs	4.1 µs
Additional operating time:	4.0 µs	4.0 µs	1.9 µs
Output updating:	– – –		
Available with:	ABB Procontic T200 and 907 PC 332		

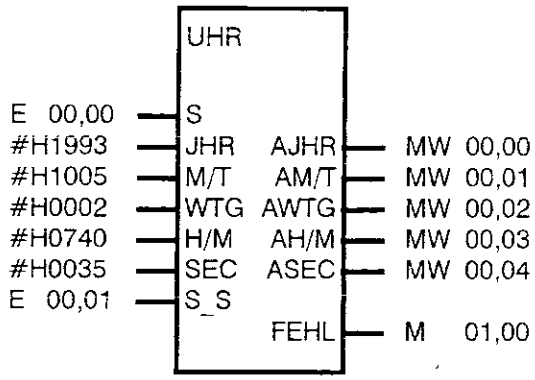
FBD/LD



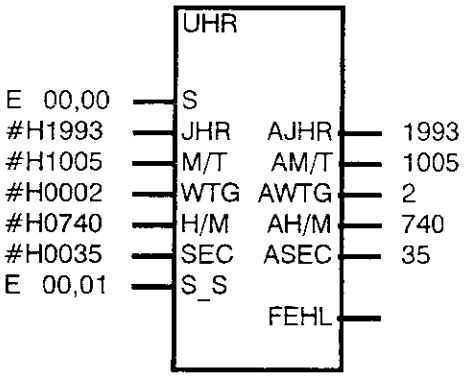
Example

FBD/LD

Set value: Oktober 5th, 1993 / 2. day of the week / 07:40:35



Representation in 907 PC 332 / online test



Output of the current values of the real–time clock.

Parameters

S	BINARY	E, A, M, M', S, T, Z	Time and date are set pulse–triggered
JHR	WORD	#H, #W, EW, AW, MW, MW'	Set input for the years *
M/T	WORD	#H, #W, EW, AW, MW, MW'	Set input for months and days *
WTG	WORD	#H, #W, EW, AW, MW, MW'	Set input for the day of the week *
H/M	WORD	#H, #W, EW, AW, MW, MW'	Set input for hours/minutes *
SEC	WORD	#H, #W, EW, AW, MW, MW'	Set input for the seconds *
S_S	BINARY	E, A, M, M', #B0, S, T, Z	1–pulse effects setting the seconds to full minutes
AJHR	WORD	AW, MW	Years output
AM/T	WORD	AW, MW	Months output/days output
AWTG	WORD	AW, MW	No. of the day of the week output
AH/M	WORD	AW, MW	Hours output/minutes output
ASEC	WORD	AW, MW	Seconds output
FEHL	BINARY	A, M	Error output

* The value at this input is interpreted hexadecimally. See also examples below.

Description

This function block allows users to set and display the current time and the current date as well as to set the seconds to full minutes.

The inputs and outputs can neither be duplicated nor inverted nor negated.

The clock is set by means of the set inputs for the time and date. The values present at the set inputs are adopted by a 1–pulse at the input S. The current time and date are indicated at the block's outputs.

Note:
A pulse of one PLC cycle time is not enough for setting the clock to the values applicated at the time and date inputs.

S BINARY

1–pulse –> the clock is set to the values present at the time and date inputs.

Set inputs for date and time:

In the event of a 1–pulse at the input S, the clock is set to the values preset at the set inputs. If the specified set values are inadmissible, the FEHL output is set to 1. The clock has to be set again.

JHR WORD

Set input for the years.

The clock indicates the years.
Example: #H1993 (hex value) corresponds to #W6547 (decimal) for the year 1993.

M/T WORD

Set input for the months and days.
Example: #1005 (hex value) corresponds to Oct. 5th.
#W4101 (decimal) corresponds to Oct. 5th.

WTG WORD

Set input for the number of the day of the week. 0 corresponds to Sunday, 1 corresponds to Monday etc.
Value range: #H 0...6.

Example:
The clock is set on Wednesday, March 10, 1993. The value 3 has to be entered for WTG (input: #H3 or #W3); in doing so Monday will be the 1st day of the week.

H/M WORD

Set input for the hours and minutes.

The clock operates in 24 hour mode, i.e. it changes from 23:59:59 h to 0:0:0 h.
Example: #H0740 corresponds to 07:40
#W1856 corresponds to 07:40

SEC WORD

Set input for the seconds.

S_S BINARY

Setting is done using a 1–pulse at input S_S depending on the current specification of the seconds (ASEC at CE UHR):
ASEC < 30 sec –> rounded down to 0
ASEC > 30 sec –> rounded up to the next full minute

Outputs for date and time

The outputs are updated all the time. *While* setting the clock the outputs for date and time are *invalid*.

AJHR WORD

The output displays the year with 4 digits. The output is decimal.

AM/T WORD

The output displays month and day. The output is decimal.
Example: AM/T = 1005 corresponds to October 5th.

AWTG WORD

The output indicates the No. of the day of the week. See also under WTG.

AH/M WORD

The output indicates the hours and minutes of the current time. The output is decimal.
Example: AH/M = 740 corresponds to 07:40 h.

ASEC WORD

The output indicates the seconds. The output is decimal.
Example: ASEC = 35 corresponds to 35 seconds.

FEHL BINARY

Errors are indicated at the output FEHL.

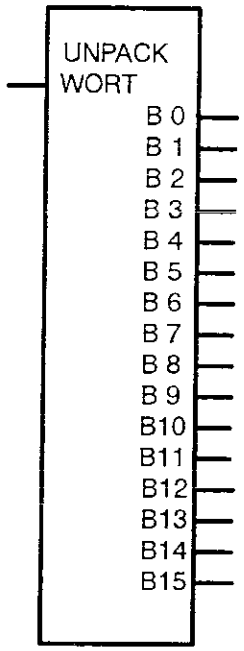
FEHL=0: no error has occured

FEHL=1: erroneous input data

CE Data

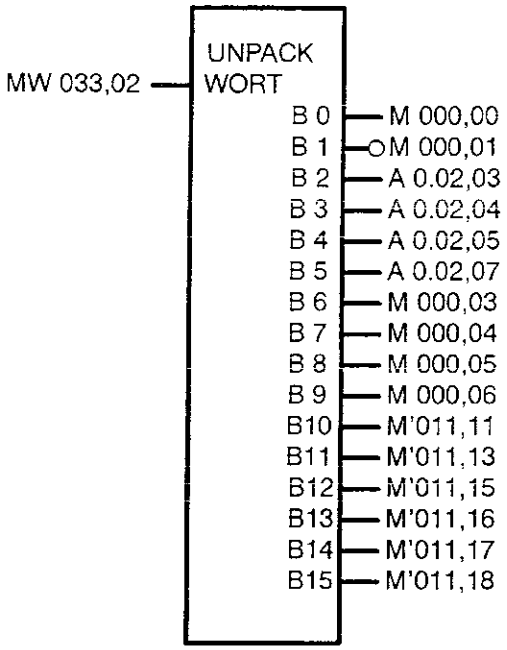
Runtime:	07 ZE 60/61/63	07 ZE 62
Basic runtime:	151 µsec	76 µsec
Additional runtime:	– – –	
Output updating:	yes	
Global flags:	none	
Local flags:	none	
Available as of:	ABB Procontic T200, 07 ZE 6x R302 and 907 PC 332	

FBD/LD



Example

FBD/LD



IL

```
!   MW 033,02
=   MW'359,00
!   M'359,00
=   M 000,00
!   M'359,01
=   NM 000,01
!   M'359,02
=   A 0.02,03
.   ...
.   ...
.   ...
!   M'359,15
=   M'011,18
```

Parameters

WORT	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Word input to be unpacked into individual bits
B0	BINARY	M, M', A, A', S, T, Z	Bit 0 of the input word
B1	BINARY	M, M', A, A', S, T, Z	Bit 1 of the input word
B2	BINARY	M, M', A, A', S, T, Z	Bit 2 of the input word
B3	BINARY	M, M', A, A', S, T, Z	Bit 3 of the input word
B4	BINARY	M, M', A, A', S, T, Z	Bit 4 of the input word
B5	BINARY	M, M', A, A', S, T, Z	Bit 5 of the input word
B6	BINARY	M, M', A, A', S, T, Z	Bit 6 of the input word
B7	BINARY	M, M', A, A', S, T, Z	Bit 7 of the input word
B8	BINARY	M, M', A, A', S, T, Z	Bit 8 of the input word
B9	BINARY	M, M', A, A', S, T, Z	Bit 9 of the input word
B10	BINARY	M, M', A, A', S, T, Z	Bit 10 of the input word
B11	BINARY	M, M', A, A', S, T, Z	Bit 11 of the input word
B12	BINARY	M, M', A, A', S, T, Z	Bit 12 of the input word
B13	BINARY	M, M', A, A', S, T, Z	Bit 13 of the input word
B14	BINARY	M, M', A, A', S, T, Z	Bit 14 of the input word
B15	BINARY	M, M', A, A', S, T, Z	Bit 15 of the input word

Description

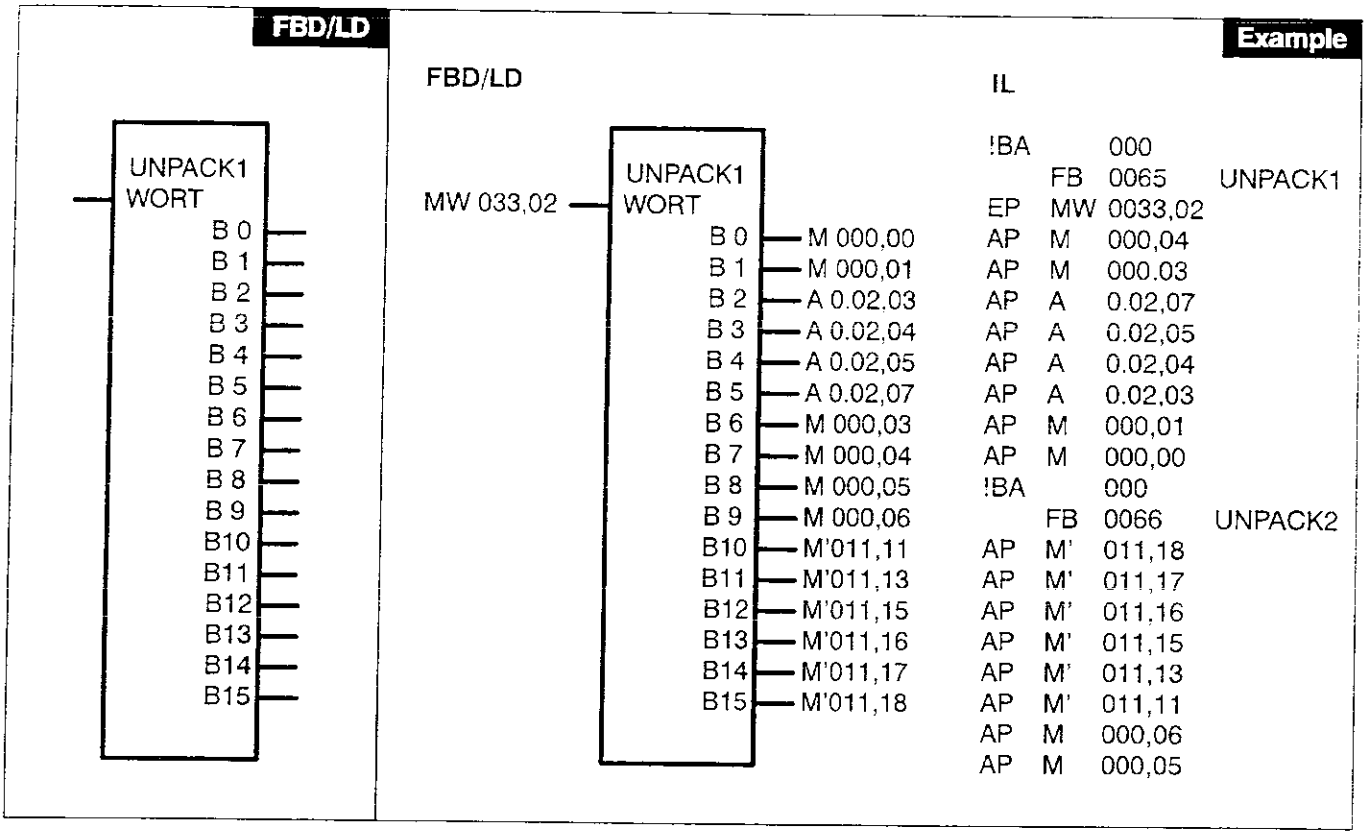
The 16 bits of a word present at the input "WORT" are unpacked and are output to the 16 individual binary outputs B0 to B15.

The binary outputs B0 to B15 can be inverted individually.

Important:
The flag MW'359.00 is used as a local flag. It must no ionger be used outside of CEs.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	65.5 µs	65.5 µs	48.7 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		



Parameter

WORT	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Word input to be unpacked into individual bits
B0	BINARY	M, M', A, A', S, T, Z	Bit 0 of the input word
B1	BINARY	M, M', A, A', S, T, Z	Bit 1 of the input word
B2	BINARY	M, M', A, A', S, T, Z	Bit 2 of the input word
B3	BINARY	M, M', A, A', S, T, Z	Bit 3 of the input word
B4	BINARY	M, M', A, A', S, T, Z	Bit 4 of the input word
B5	BINARY	M, M', A, A', S, T, Z	Bit 5 of the input word
B6	BINARY	M, M', A, A', S, T, Z	Bit 6 of the input word
B7	BINARY	M, M', A, A', S, T, Z	Bit 7 of the input word
B8	BINARY	M, M', A, A', S, T, Z	Bit 8 of the input word
B9	BINARY	M, M', A, A', S, T, Z	Bit 9 of the input word
B10	BINARY	M, M', A, A', S, T, Z	Bit 10 of the input word
B11	BINARY	M, M', A, A', S, T, Z	Bit 11 of the input word
B12	BINARY	M, M', A, A', S, T, Z	Bit 12 of the input word
B13	BINARY	M, M', A, A', S, T, Z	Bit 13 of the input word
B14	BINARY	M, M', A, A', S, T, Z	Bit 14 of the input word
B15	BINARY	M, M', A, A', S, T, Z	Bit 15 of the input word

Description

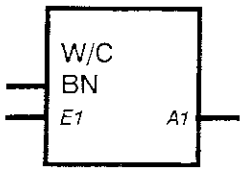
The 16 bits of a word present at the input WORT are unpacked and are output to the 16 individual binary outputs B0 to B15.

The binary outputs B0 bis B15 cannot be inverted.

CE Data

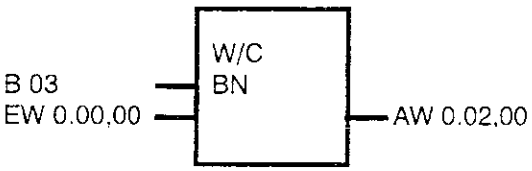
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	65,5 µs	65,5 µs	48,7 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   BA 03
FB  015
EP  EW 0.00,00
AP  AW 0.02,00
```

Parameters

BN	SPECIAL	B00 ... B255	Input in FBD: Bxx
E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Input variable
A1	WORD	MW, MW', AW, AW'	Input variable converted to BCD

Description

The input variable will be converted from binary to BCD and output at the output variable.

If the input value is < 0 or > 9999, no conversion will be done and the ARI flag M 127,04 will be set.
The reset of ARI flag has to be done by user.

CE Data

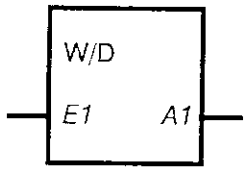
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	53.8 µs	53.8 µs	25.2 µs
Additional operating time:	– – –	– – –	– – –

Output updating: yes

Memory allocated once when called: 9 double words of 32 bit each

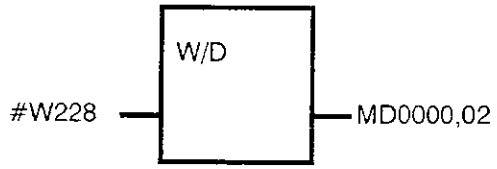
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!BA    000
       FB 0017
EP     #W228
AP     MD0000,02
```

Parameters

E1	WORD	EW, EW', AW, AW' MW, MW', TI, ZI, #W	Input value
A1	DOUBLE WORD	AD, MD, MD'	Result (converted double word)

Description

The value of the word operand at the input E1 is converted to a double word and the result is allocated to the double word operand at the output A1.

The converted value is set to −32768 (FFFF 8000 H) if the value of the operand at the input E1 is beyond the number range (8000H).

The input and the output can neither be duplicated nor negated.

Range of numbers of the input

Integer word (16 bits).

Lower limit:	8000 H	−32 768
Upper limit:	7FFF H	+32 767

Range of numbers of the output

Integer double word (32 bits).

Lower limit:	FFFF 8000 H	−32 768
Upper limit:	0000 7FFF H	+32 767

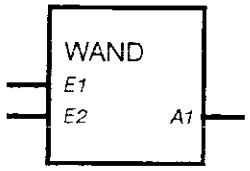
Examples for conversion

Input E1	Output A1	Decimal value
8000 H	FFFF 8000 H	−32 768
FFFF H	FFFF FFFF H	−1
0000 H	0000 0000 H	0
0001 H	0000 0001 H	+1
7FFF H	0000 7FFF H	+32 767

CE Data

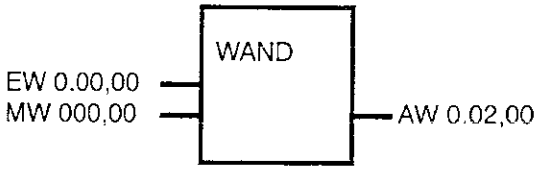
Runtime:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic runtime:	8.4 µs	8.4 µs	4.2 µs
Additional runtime:	– – –	– – –	– – –
Output updating:	yes		
Memory allocated once when called:	14 double words of 32 bits each		
Available as of:	ABB Procontic T200 / 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
&   MW 000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 1 of logical AND combination
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 2 of logical AND combination
A1	WORD	MW, MW', AW, AW'	Result of logical AND combination

Description

Logic AND Function of word signals E1 and E2 with result allocation to A1.

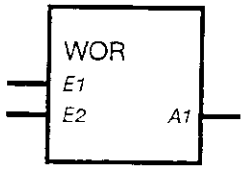
CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	8.1 µs	8.1 µs	6.1 µs
Additional operating time:	2.7 µs	2.7 µs	2.2 µs

Output updating: yes

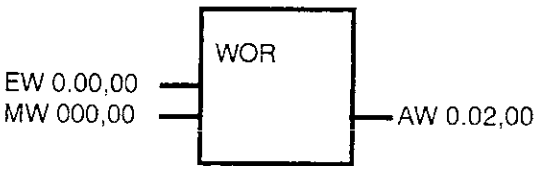
Available with: ABB Procontic T200 and 907 PC 332

FBD/LD



Example

FBD/LD



IL

```
!   EW 0.00,00
\   MW 000,00
=   AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 1 of logical OR combination
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 2 of logical OR combination
A1	WORD	MW, MW', AW, AW'	Result of logical OR combination

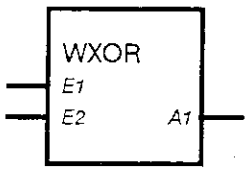
Description

Logic OR function of word signals E1 and E2 with result allocation to A1.

CE Data

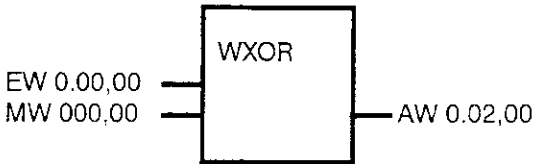
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	8.1 µs	8.1 µs	6.1 µs
Additional operating time:	2.7 µs	2.7 µs	2.2 µs
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!  EW 0.00,00
XO MW 000,00
=  AW 0.02,00
```

Parameters

E1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 1 of logical EXCLUSIVE OR combination
E2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Operand 2 of logical EXCLUSIVE OR combination
A1	WORD	MW, MW', AW, AW'	Result of logical EXCLUSIVE OR combination

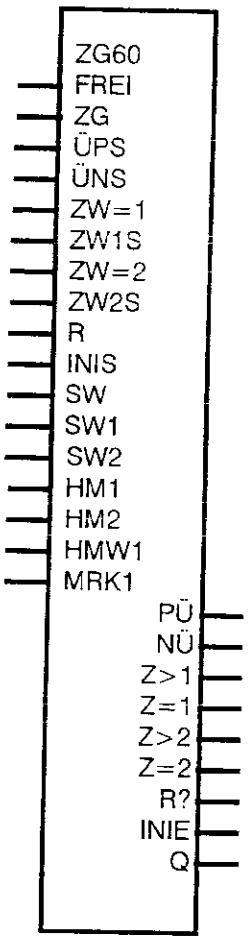
Description

Logic EXCLUSIVE OR function of word signals E1 and E2 with result allocation to A1.

CE Data

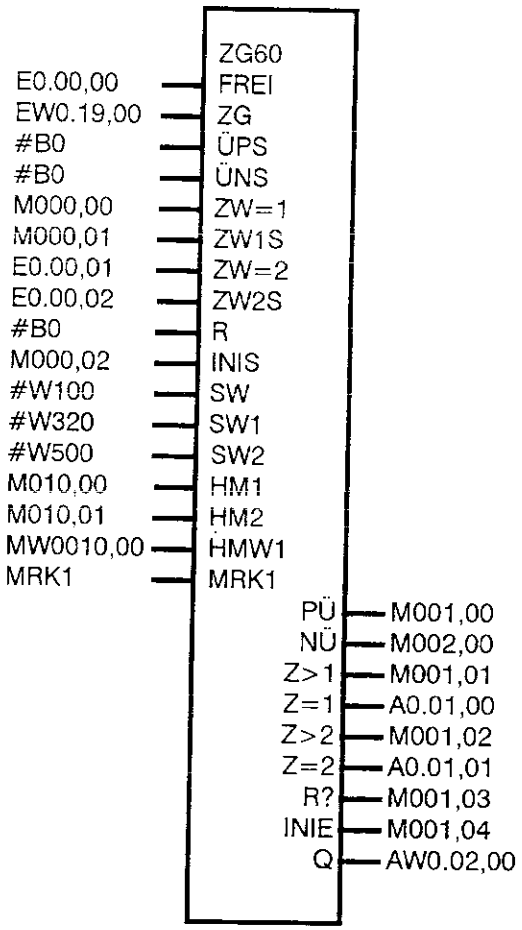
Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	8.1 µs	8.1 µs	6.1 µs
Additional operating time:	– – –	– – –	– – –
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

FBD/LD



Example

FBD/LD



IL

```
!       E0.00,00
=S      M010,00

!N      M010,00
&       M010,01
=BA     00
 FB     20
 EP     MW010,00
 EP     #W4
 EPA    EW0.19,00

        .
        .
        .

!BA     00
 FB     21
 EP     #W1
 EPA    EW0.19,00
 AP     AW0.02,00
```

Parameters

FREI	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Enabling
ZG	WORD	EW	Basic address of the counter
ÜPS	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Overflow bit positive
ÜNS	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Overflow bit negative
ZW=1	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
ZW1S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
ZW=2	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
ZW2S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	
R	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Reset
INIS	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	Initialization
SW	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Setting value
SW1	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Setpoint 1
SW2	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI	Setpoint 2
HM1	BINARY	M, M', A, A'	Auxiliary flag 1
HM2	BINARY	M, M', A, A'	Auxiliary flag 2
HMW1	WORD	MW, MW', AW, AW'	Auxiliary flag 1. WORD
MRK1	SPECIAL	MRK	Auxiliary label
PÜ	BINARY	M, M', A, A', S, T, Z	Positive overflow bit
NÜ	BINARY	M, M', A, A', S, T, Z	Negative overflow bit
Z>1	BINARY	M, M', A, A', S, T, Z	Counter value > Setpoint 1
Z=1	BINARY	M, M', A, A', S, T, Z	Counter value = Setpoint 1
Z>2	BINARY	M, M', A, A', S, T, Z	Counter value > Setpoint 2
Z=2	BINARY	M, M', A, A', S, T, Z	Counter value = Setpoint 2
R?	BINARY	M, M', A, A', S, T, Z	External reset
INIE	BINARY	M, M', A, A', S, T, Z	Initilization concluded
Q	WORD	MW, MW', AW, AW'	Current counter status

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Initializing of 1st cycle:	185.3 µs	185.3 µs	105.5 µs
Initializing of 2nd cycle:	187.8 µs	187.8 µs	107.4 µs
Counter mode:	188.5 µs	188.5 µs	97.7 µs

Output updating: yes

Available with: ABB Procontic T200 and 907 PC 332

Description

The following functions are possible:
- Writing control registers
- Setting a counter value
- Loading comparison values
- Displaying comparison results

FREI BINARY block enabling
- FREI = 1 –> A pulse at the input FREI sets the counter's setting value and the set- points SW1 and SW2. At the same time, the following parameters are adopted: ÜPS, ÜNS, ... INIS.
- FREI = 0 –> No values are set (the old ones are retained). Outputs are updated

Even if no data has to be taken over, it is useful, to connect the FREI input to the system flag M126,03 (impulse during program start).

ZG WORD basic address of the counter
- First allocated address of the 07 ZG 60: EW x.yy,00 e.g. EW 0.19,00

ÜPS BINARY overflow bit positive
- ÜPS = 1 –> Overflow bit PÜ is latching
- ÜPS = 0 –> Overflow bit PÜ is not active

ÜNS BINARY overflow bit negative
- ÜNS = 1 –> Overflow bit NÜ is latching
- ÜNS = 0 –> Overflow bit NÜ is not active

ZW=1 BINARY
- ZW=1 = 1 –>A1 switches to 1 in the event of Q=SW1
- ZW=1 = 0 –>A1 switches to 1 in the event of Q>SW1

ZW1S BINARY
- ZW1S=1 –> ZW=1 is latching
- ZW1S=0 –> ZW=1 is non–latching

ZW=2 BINARY
- ZW=2=1 –>A2 switches to 1 in the event of Q=SW2
- ZW=2=0 –>A2 switches to 1 in the event of Q>SW2

ZW2S BINARY
- ZW2S=1 –> Z=2 is latching
- ZW2S=0 –> Z=2 is non–latching

R BINARY reset
- R = 1 –> External reset is possible
- R = 0 –> External reset is not possible

INIS BINARY initialization
- INIS = 1 –> Writing the setting value registers is enabled
- INIS = 0 –> Writing the setting value registers is disabled; only the control signals ÜPS, ÜNS ... can be written with FREI = 1

SW WORD setting value
- any initial value of the counter

SW1 WORD setpoint 1
- 1st comparison value of the counter

SW2 WORD setpoint 2
- 2nd comparison value of the counter

HM1 BINARY auxiliary flag 1
- bit flag for internal use, which must no longer be used in the program

HM2 BINARY auxiliary flag 2
- Bit flag for internal use, which must no longer be used in the program

HMW1 WORD auxiliary flag 1
- Word flag for internal use, which must no longer be used in the program

MRK1 SPECIAL auxiliary label
- Label for internal use, which must no longer be used in the program

The following statuses can be interrogated at the outputs:

PÜ BINARY positive overflow bit
- optionally latching or not active depending on the setting of the ÜPS

NÜ BINARY negative overflow bit
- optionally latching or not active depending on the setting of the ÜNS

Z>1 BINARY comparison result 1
- The counter value is greater than SW1

Z=1 BINARY comparison result 2
- The counter value is equal to SW1

Z>2 BINARY comparison result 3
- The counter value is greater than SW2

Z=2 BINARY comparison result 4
- The counter value is equal to SW2

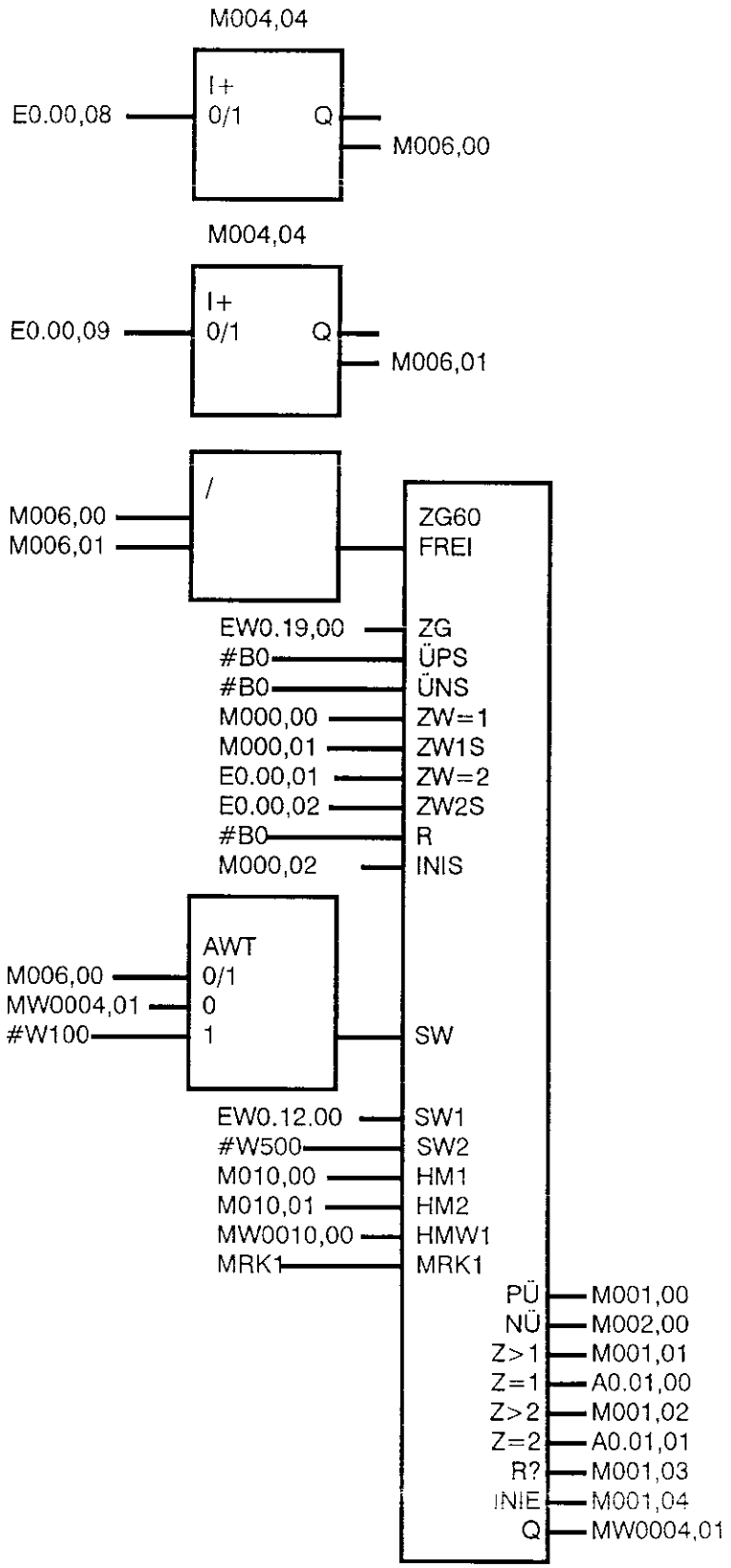
R? BINARY
- External reset via the reset input R is possible

INIE BINARY
- Initialization is concluded

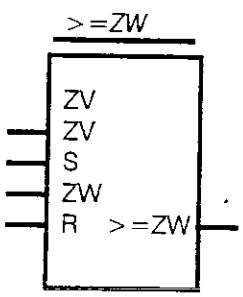
Q WORD current counter status

Important:
- The flags MW 359,00 and MW 359,01 are also used internally.
- All comparisons refer to the number range from 0 to 65535 and no signed comparisons take place.

If optionally all setpoints (SW, SW1, SW2) or only the comparison values (SW1, SW2) shall be initialized, then proceed as follows (E0.00,08 = Initialization for SW, SW1, SW2; E0.00,09 = Initialization for SW1, SW2). E0.00,08 is assigned preference if both signals arrive simultaneously.

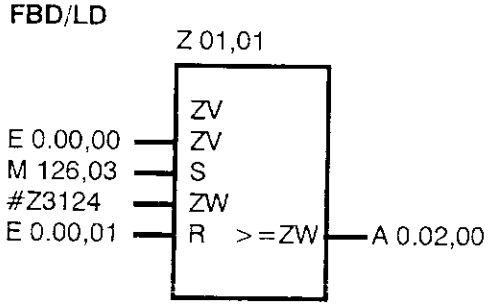


FBD/LD



Example

FBD/LD



IL

```
!     M 126,03
=S    Z 01,01
#Z    3124
!     E 0.00,01
=R    Z 01,01
!     E 0.00,00
=     Z 01,01
!     Z 01,01
=     A 0.02,00
```

Parameters

ZV	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	input signal
S	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	set input (set counter = ZW)
ZW	WORD	EW, EW', MW, MW', #W, AW, AW', TI, ZI, #Z	input constant (counter)
R	BINARY	E, E', M, M', #B0, #B1, A, A', S, T, Z	reset input (reset counter = 0)
>=ZW	BINARY	M, M', A, A', S, T, Z	counter output
>=ZW	BINARY	Z	counter operand

Description

This counter counts up from zero to a given setup value.

S BINARY set input bit
The S input sets the comparison value of the counter to the value of the word constant ZW.

R BINARY reset input bit
The R input resets the counter to 0.

ZV BINARY input signal (counter input)
The ZV input increases with its positive edge the actual value of the counter with the value 1.

>=ZW BINARY counter output
The >=ZW output represents the value 1, when the actual value is greater than or equal to the set comparison value.

The >=ZW output represents the value 0, when the actual value is less than the set comparison value.

CE Data

Operating time:	07 ZE 60	07 ZE 61/63	07 ZE 62
Basic operating time:	50.4 µs	50.4 µs	29.4 µs
Additional operating time:	---	---	---
Output updating:	yes		
Available with:	ABB Procontic T200 and 907 PC 332		

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