ENDA

ENDA PLC PROGRAM
MANUAL

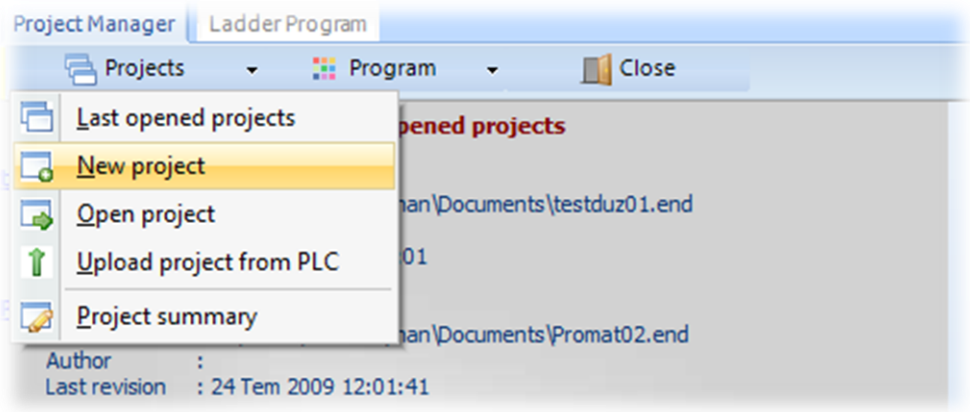
[EDITOR PROGRAM MANUAL]

Contents

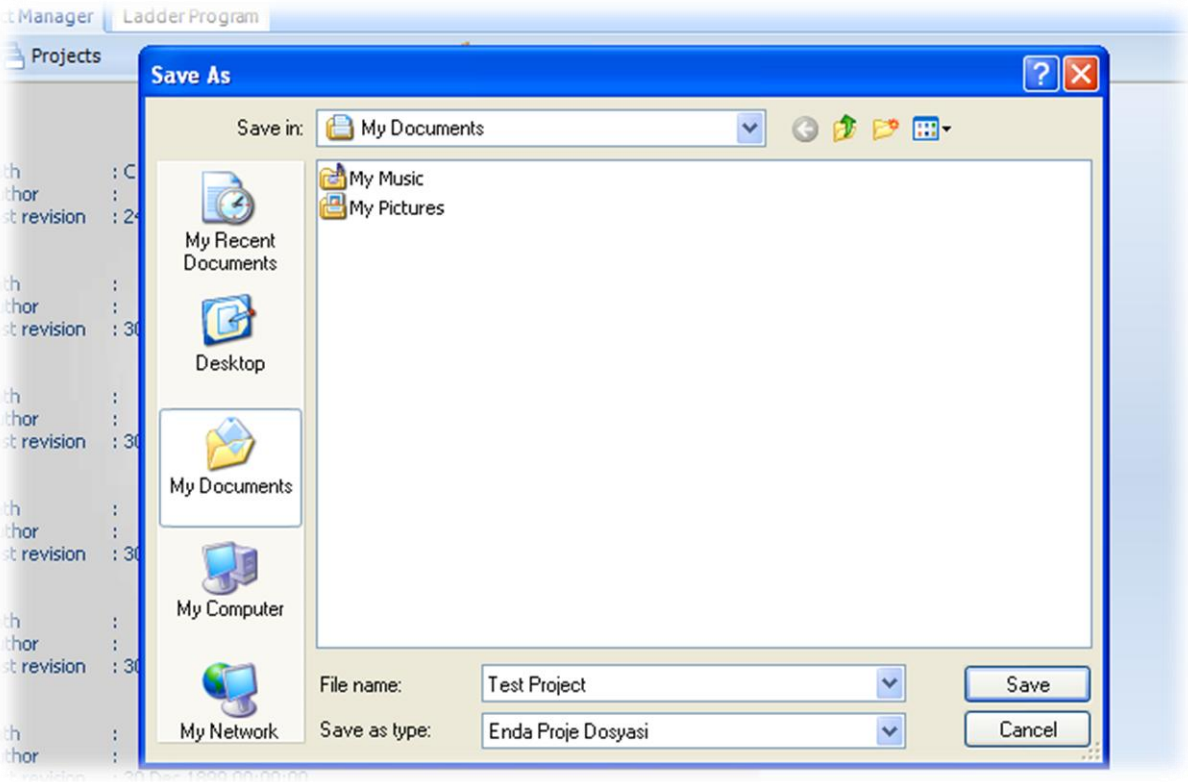
Project Management

Creating New Project

Click on “New Project” under the Projects tab. If there is already open project, program will close and save project.



Enter the name of your project, location and click Save button.



Program will create new sheet and switch to editor view.

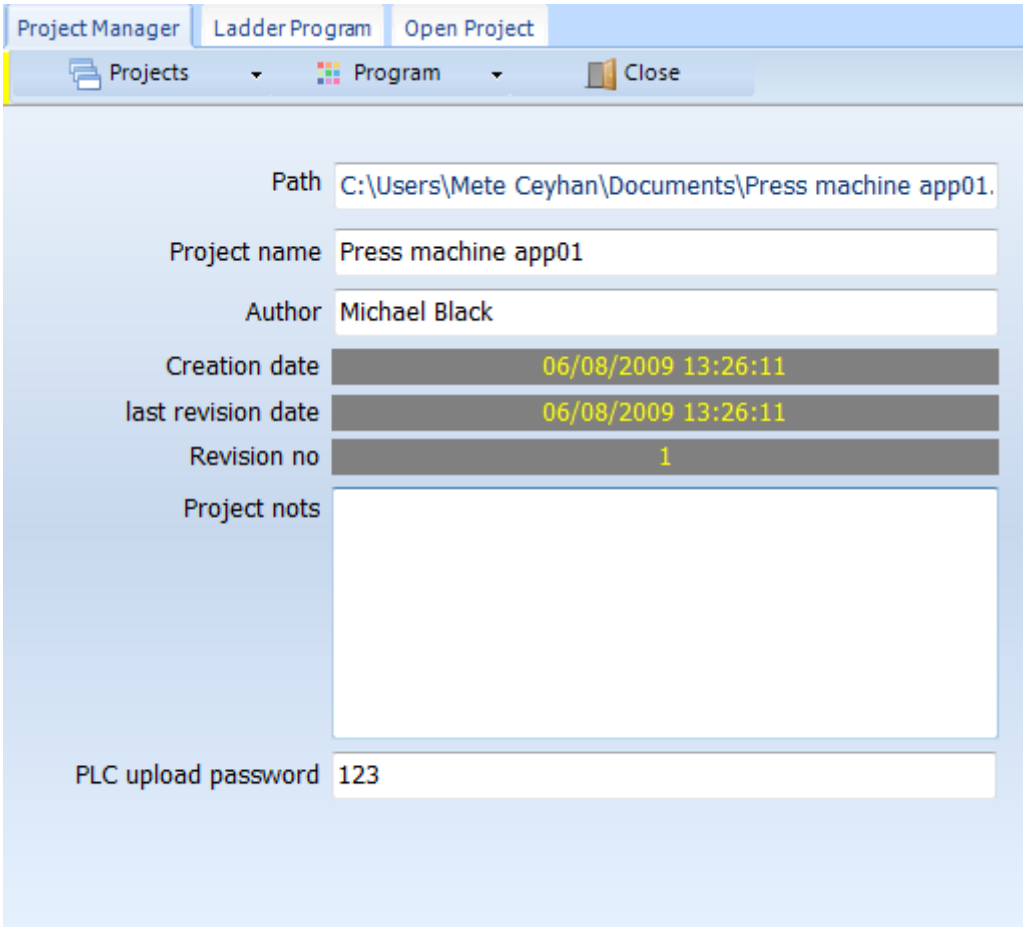
Project list

User can select a project from last opened project list. There are seems data which project file path, project author name and last edited project date.

Project Summary

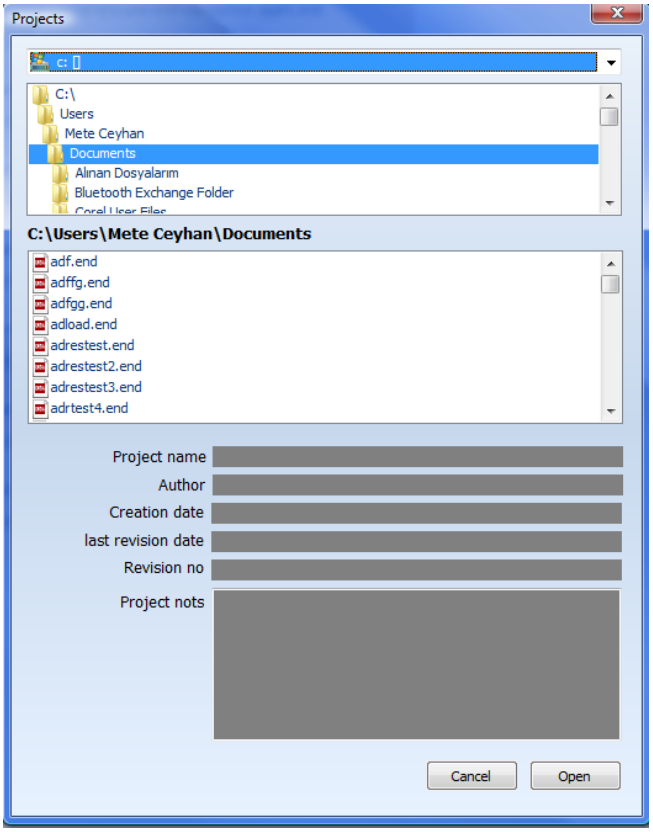
Click on “Project summary” under Project menu. The new window shows data about project properties. Data list ;

a. Path : The project file location on PC.
b. Project name : The project name which seems on shortcuts.
c. Author : Project author name.
d. Creation date : The project creation date on PC.
e. Last revision date : Project last edited date.
f. Revision no : This number increment every project changes.
g. Project notes : User notes about project.
h. PLC upload password : User can restricted access to project from PLC memory with this password. Password can be any character.



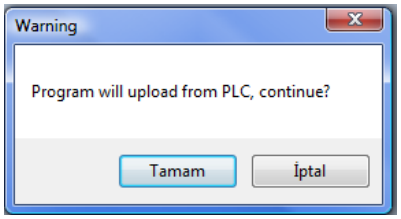
Opening existing projects

Click on “Open Project” under the Projects menu. Following window shows up. User can select file and select open button.

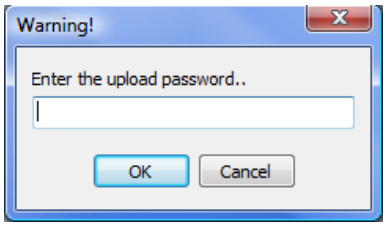


Uploading project from PLC memory

Click on “Upload project from PLC memory” under the Projects menu. The user must know the password before upload the program. Program will prompt the user,



The user have to enter right password. Save as window show up after entering the right password, otherwise user prompted and window closes.

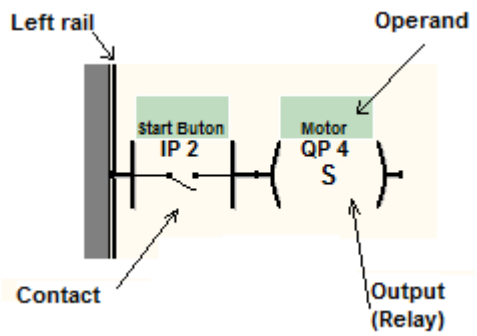


Ladder editor

Programming structure

Use the Ladder Editor to create the Ladder diagram that comprises your control application. Ladder diagrams are composed of contacts, coils, and function block elements.

In a Ladder diagram, the contacts represent input conditions. They lead power from the left Ladder rail to the right rail. This is why the first element in a net must always touch the left rail.



Every command takes parameters depend on its type. This parameters called operands in different types listed as below.

PLC Operands

Operand	Address range	Quantity	Value range	Name	Description
IP	0..255	256	0/1	Input	PLC digital input
QP	0..255	256	0/1	Output	PLC digital output
MB	0..1023	1024	0/1	Memory Bit	Bit operands
CN	0..255	256	0/1	Counter	Counter contacts
SB	0..255	256	0/1	System bits	PLC system contacts
TM	0..127	128	0/1	Timer	Timer contacts
MI	0..1023	1024	-2147483648..2147483647	Memory Integer	32 bit integer operands
MF	0..127	128	-1.5 x 10^45 .. 3.4 x 10^38	Memory float	32 bit float operands
SI	0..255	256	-2147483648..2147483647	System integer	System registers
TV	0..127	128	-2147483648..2147483647	Timer Value	Timer current values
MW	0..511	512	0..65535	Memory Word	16bit word registers
#				Constant	Constant values.

PLC Commands

There are several commands in editor library. They used to making scenario of application logic. They are divided in logic, math, communication, counter, timer and bit operations groups.

Commands have got different operands to depend to type. Editor program make this filter automatically and opens the operand window to enter the parameters.

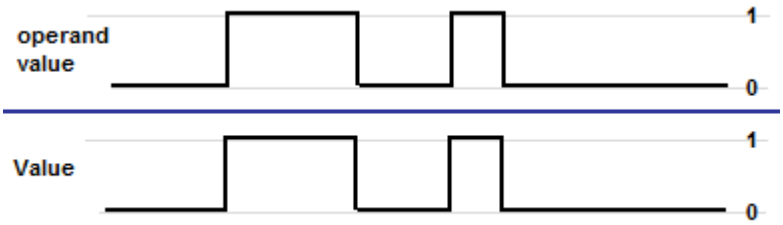
Commands divided two main group which named logic/compare or operation/out.

Logic commands

Normally open contact

Icon	Name	Type	Operands	Out type
┤ ├	Normally open contact	Logic	IP, QP, MB, SB, TM, CN	Logical 0/1

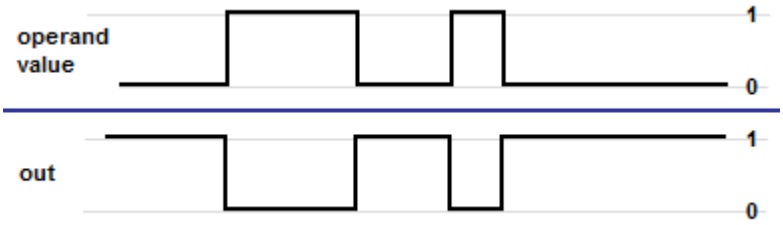
Description
Its out set when it's input and operand value is 1 (High) and next commands (which connected this command) can work.



Normally close contact

Icon	Name	Type	Operands	Out type
┤/├	Normally close contact	Logic	IP, QP, MB, SB, TM, CN	Logical 0/1

Description
It inversion of NO. Its out reset when it's input 1 (Set) and operand value is 0 (Low) and next commands (which connected this command) can work.



Horizontal and vertical connections

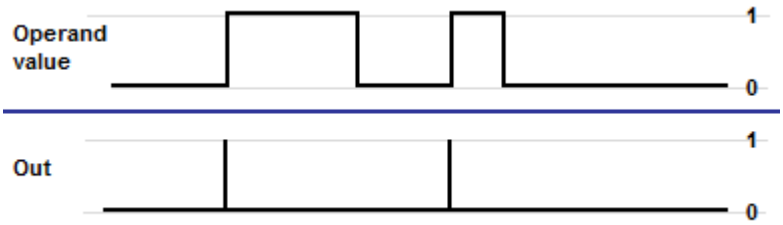
Icon	Name	Type	Operands	Out type
	Connections	Logical	-	Logical 0/1

Description
It's used for making logical connections between commands.

Rise detection contact

Icon	Name	Type	Operands	Out type
	Rise	Logical	IP, QP, MB, SB, TM, CN	Logical 0/1

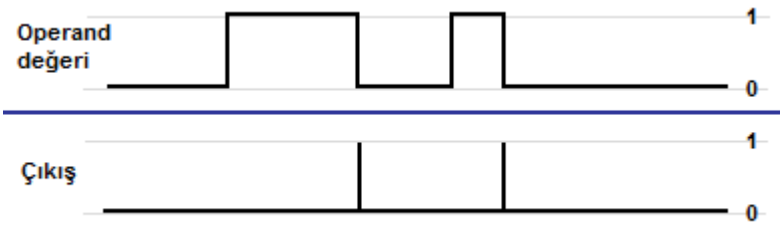
Description
It's out sets when it's operand value change 0 to 1 . It's out reset after next scan.



Fall detection contact

Icon	Name	Type	Operands	Out type
	Fall	Logical	IP, QP, MB, SB, TM, CN	Logical 0/1

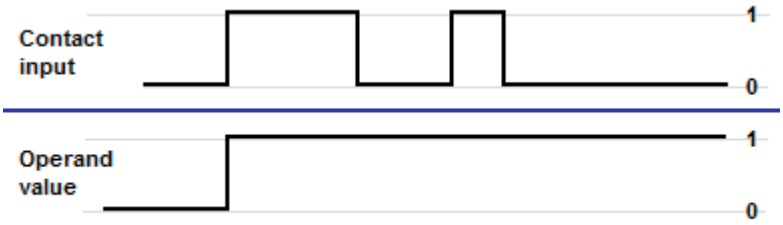
Description
It's out sets when it's operand value change 1 to01 . It's out reset after next scan.



Set Out

Icon	Name	Type	Operands	Out type
-(S)-	Set	Logical	QP, MB, SB	Logical 0/1

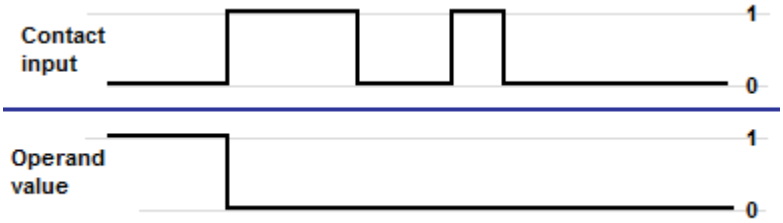
Description
It is no operation when it's input 0. It sets it's operand value if it's input 1.



Reset Out

Icon	Name	Type	Operands	Out type
-(R)-	Reset	Logical	QP, MB, SB	Logical 0/1

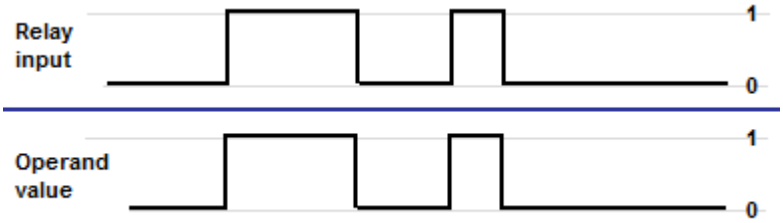
Description
It is no operation when it's input 0. It resets it's operand value if it's input 1.



Direct out

Icon	Name	Type	Operands	Out type
-( )-	Direct out	Logical	QP, MB, SB	Logical 0/1

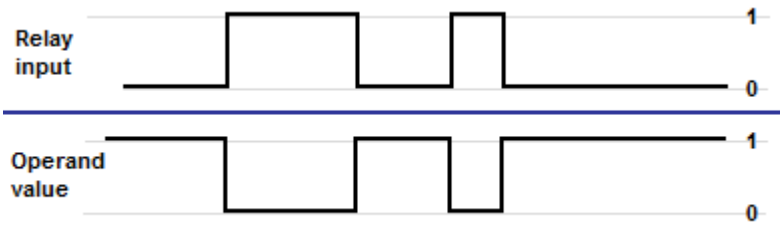
Description
It sets operand value when its input 1, it reset operand value when it's input 0.



Not direct out

Icon	Name	Type	Operands	Out type
-(/)-	Not direct Out	Logical	QP, MB, SB	Logical 0/1

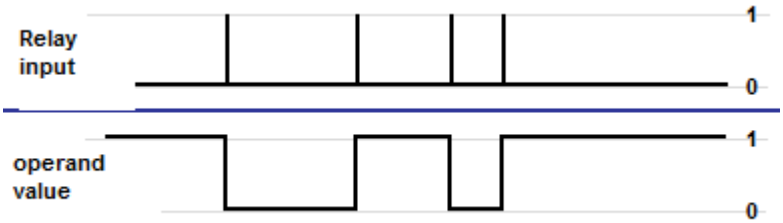
Description
It sets operand value when its input 0, it reset operand value when it's input 1.



Set/Reset Out

Icon	Name	Type	Operands	Out type
S/R	Flip/Flop Out type	Logical	QP, MB, SB	Logical 0/1

Description
It inverse its operand value when its input 1. No operation when its input 0.

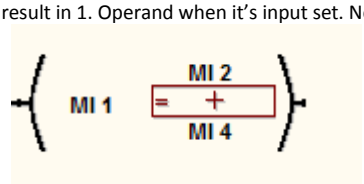


Mathematic commands

Addition

Icon	Name	Type	Operands	Out type
+	Addition command	Mat.	MI,MF,SI,MW	Numerical

Description
Its add 2. And 3. Operand values and stores the result in 1. Operand when it's input set. No operation when it's input reset.

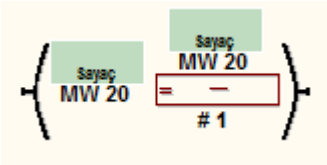


MI1 = MI2 + MI4

Subtraction

Icon	Name	Type	Operands	Out type
−	Subtraction command	Mat.	MI,MF,SI,MW	Numerical

Description
Its subtract 3. operand value from 2. Operand value and stores the result in 1. Operand when it's input set. No operation when it's input reset.

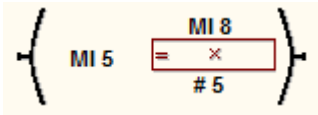


MW20 = MI20 - 1

Multiplication

Icon	Name	Type	Operands	Out type
×	Multiplication command	Mat.	MI,MF,SI,MW	Numerical

Description
Its multiply 2. operand value and 3. Operand value and stores the result in 1. Operand when it's input set. No operation when it's input reset.

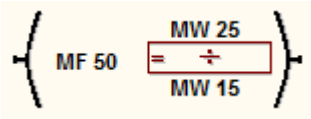


MI5 = MI8 X 5

Dividing

Icon	Name	Type	Operands	Out type
÷	Dividing command	Mat.	MI,MF,SI,MW	Numerical

Description
Its divide 2. operand value by 3. Operand value and stores the result in 1. Operand when it's input set. No operation when it's input reset.

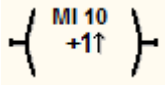


MF50 = MW25 / MW15

Increment

Icon	Name	Type	Operands	Out type
+1↑	Increment command	Mat.	MI,MF,MW	Numerical

Description
It increment it's operand value when it's input 1. No operation when it's input reset.

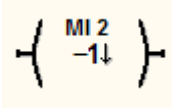


MI10 = MI10 + 1

Decrement

Icon	Name	Type	Operands	Out type
−1↓	Decrement command	Mat.	MI,MF,MW	Numerical

Description
It decrement it's operand value when it's input 1. No operation when it's input reset.

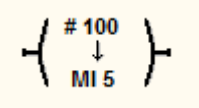


MI2 = MI2 - 1

Store value

Icon	Name	Type	Operands	Out type
A=X	Storing value command	Mat.	MI,MF,SI,MW,#	Numerical

Description
It sets the 1. Operand value to 2. Operand value when it's input 1. No operation when it's input reset.



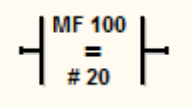
MI5 = 100

Compare commands

Equal

Icon	Name	Type	Operands	Out type
⊣=⊢	Equal command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If two values equal it set output otherwise it resets it's output.

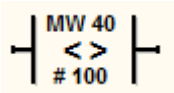


MF100 = 20

Not equal

Icon	Name	Type	Operands	Out type
<>	Not equal command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If two values not equal it set output otherwise it resets it's output.

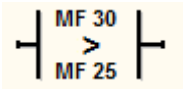


MF40 <> 100

Greater than

Icon	Name	Type	Operands	Out type
>	Greater than command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If 1.value greater then the other it set output otherwise it resets it's output.

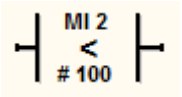


MF30 > MF25

Less than

Icon	Name	Type	Operands	Out type
<	Less than command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If 1.value less then the other it set output otherwise it resets it's output.

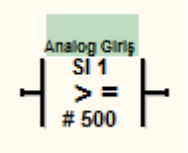


MI2 < 100

Greater or equal to

Icon	Name	Type	Operands	Out type
>=	Greater or equal command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If 1.value greater or equal then the other it set output otherwise it resets it's output.

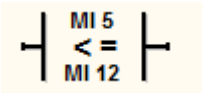


SI1 >= 500

Less or equal to

Icon	Name	Type	Operands	Out type
<=	Less or equal to command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 1. Operand value and 2. Operand value when it's input 1. If 1.value less or equal then the other it set output otherwise it resets it's output.

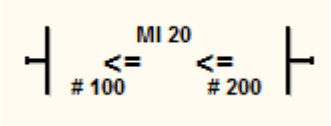


MI5 <= MI12

Within range

Icon	Name	Type	Operands	Out type
<...<	Within range command	Compare	MI,MF,SI,MW,#	Numerical

Description
It compares 3 operand value when it's input 1. If 2. Operand value between 1. And 3. Value it set it's output. Otherwise reset it's output.



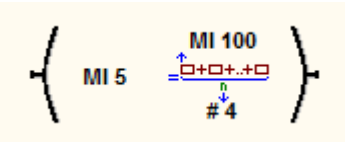
100 <= MI20 <= 200

Vectorial operations

Vectorial addition (Summing)

Icon	Name	Type	Operands	Out type
Σ	Sum command	Vector	MI,MF,SI,MW,#	Numerical

Description
Its sum up vector which start 2. Operand value and length 3. Operand value. It stores result to 1. Operand when its input value set. No operation when it's input reset.

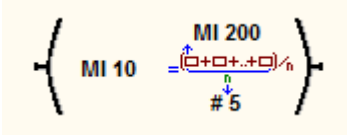


MI5=MI100 + MI101 + MI102 + MI103

Avarage

Icon	Name	Type	Operands	Out type
	Avarage command	Vector	MI,MF,SI,MW,#	Numerical

Description
It average vector which start 2. Operand value and length 3.operand value. It stores result to 1.operand when its input value set. No operation when it's input reset.

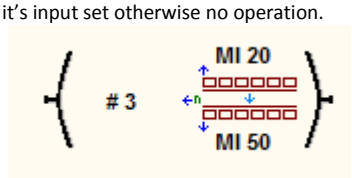


MI10=(MI200 + MI201 + MI202 + MI203 + MI204) / 5

Vector copy

Icon	Name	Type	Operands	Out type
	Vector copy command	Vector	MI,MF,SI,MW,#	Numerical

Description
It copies source vector to target vector as given length. 2. Operands is source vector start adress. 3. Operand is target vector address. First operand value is length of vector. It works when it's input set otherwise no operation.

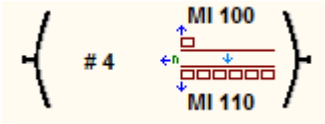


MI50 = MI20
MI51 = MI21
MI52 = MI22

Store vector

Icon	Name	Type	Operands	Out type
	Store vector command	Vector	MI,MF,SI,MW,#	Numerical

Description
It fills vector as given length. It fills vector which given start address 3. Operand value length first operand value with second operand value. It works when it's input set otherwise no operation.



MI110 = MI100
MI111 = MI100
MI112 = MI100
MI113 = MI100

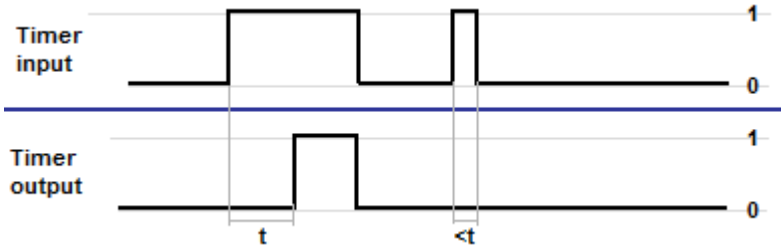
Timers

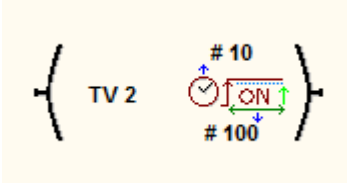
OnDelay Timer

Icon	Name	Type	Operands	Out type
ON	OnDelay Timer	Timer	TM,TV,MI,MW,#	Numerical

Description

It makes delay between start time and out time. First operand gives timer operand number. There are 128 timers available. Second operand time base in (ms). Third operand is period length In (ms).





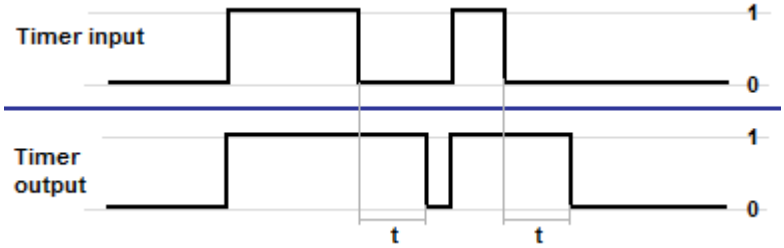
TM2 = Delay time= 10 x 100 = 1000ms (1s)

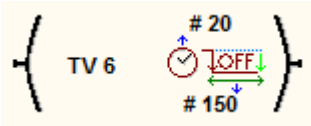
Off Delay Timer

Icon	Name	Type	Operands	Out type
OFF	Off Delay Timer	Timer	TM,TV,MI,MW,#	Numerical

Description

It makes delay between stop time and out time. First operand gives timer operand number. There are 128 timers available. Second operand time base in (ms). Third operand is period length In (ms).





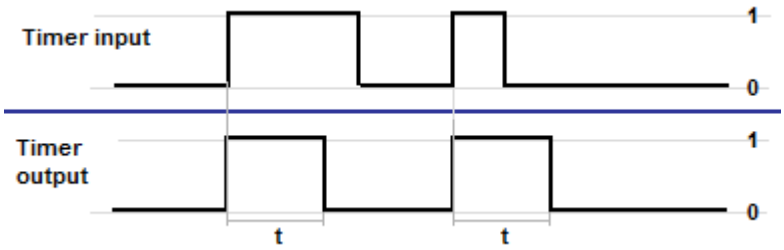
TM6 = DelayTime= 20 x 150 = 3000ms (3s)

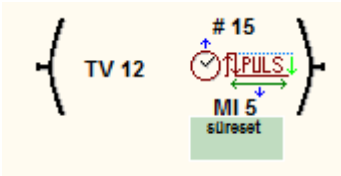
Puls Timer

Icon	Name	Type	Operands	Out type
PULS	Puls Timer	Timer	TM,TV,MI,MW,#	Numerical

Description

It makes delay between start-stop time and out time. First operand gives timer operand number. There are 128 timers available. Second operand time base in (ms). Third operand is period length In (ms).





TM12 = DelayTime= 15 x MI5 ms

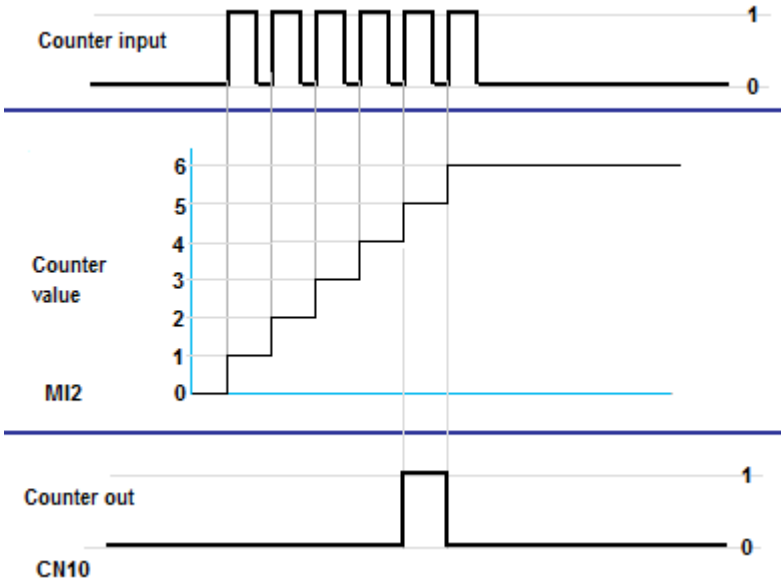
Counters

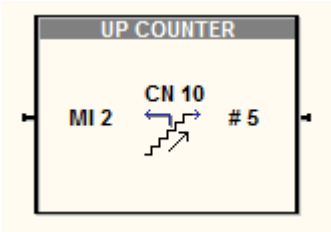
UpCounter

Icon	Name	Type	Operands	Out type
	UpCounter	Counter	TM,TV,MI,MW,#	Numerical

Description

Operand 1: Counter set value. The CN Counter will set when counter set value equal to counter current value.
Operand 2: Current counter value.
Operand 3: Counter no. There are 256 counter available.





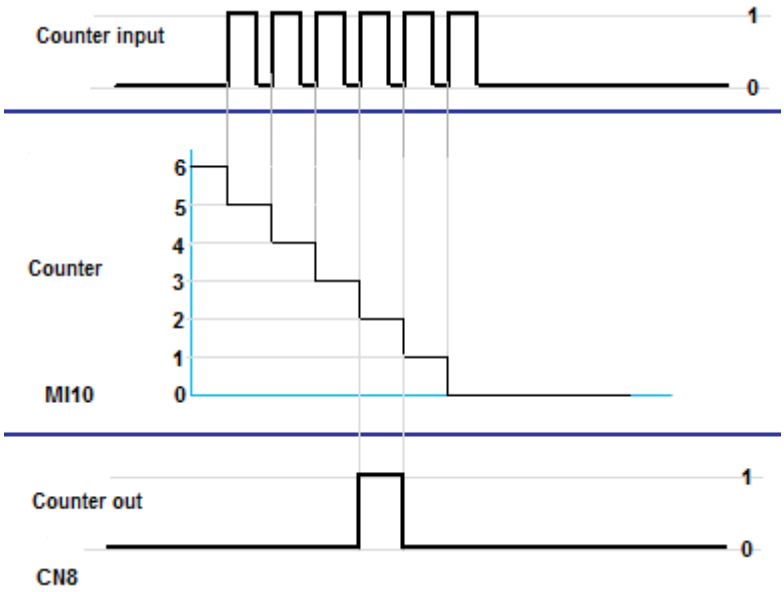
MI2 increases when counter input set. CN10 set while MI2=5.

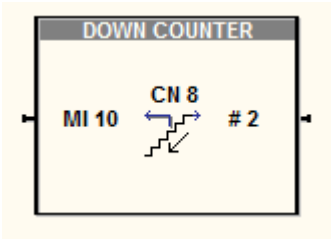
Down Counter

Icon	Name	Type	Operands	Out type
	DownCounter	Counter	TM,TV,MI,MW,#	Numerical

Description

Operand 1: Counter set value. The CN Counter will set when counter set value equal to counter current value.
Operand 2: Current counter value.
Operand 3: Counter no. There are 256 counter available.





MI2 decreases when counter input set. CN10 set while MI2=5.

Communication

Modbus RTU Slave

Icon	Name	Type	Operands	Out type
MOD	ModBUS Slave	Comm	TM,TV,MI,MW,#	Numerical

Description

Operand 1: PLC port number. 1:RS232, 2:RS485
Operand 2: Device network number. 1.255
Operand 3: Baudrate.4800..115200
Operand 4: Parity. No Parity=0, Even=1, Odd=2
Operand 5: Data bit 5,6,7,8
Operand 6: Stop bit 1,2

This function must call once in a program. It can call with SB0 power on bit

Function block

Encoder function

Icon	Name	Type	Operands	Out type
	Encoder	FB	MI,MB,#	Numerical

Description

Operand 1: Encoder multiply
Operand 2:Encoder divider
Operand 3: Encoder Enable/disable address. Count operation can enable/disable in run time.
Operand 4: Encoder set value. This value compares with counter value. The result written in result value address.
Operand5: Encoder counter value address.
Operand6: Encoder counter direction. On left rotating will 0, otherwise will be 1
Operand7: Compare result value address.
Encoder Set < Encoder counter => Compare result = 2
Encoder Set = Encoder counter => Compare result = 1
Encoder Set > Encoder counter => Compare result = 0

Example : If the system take 2mm when the counter equal 139
Multiply value =2
Divider value = 139

Encoder Reset

Icon	Name	Type	Operands	Out type
RST	Encoder Reset	FB	MI,MB,#	Numerical

Description

The encoder counter value reset when this command call.

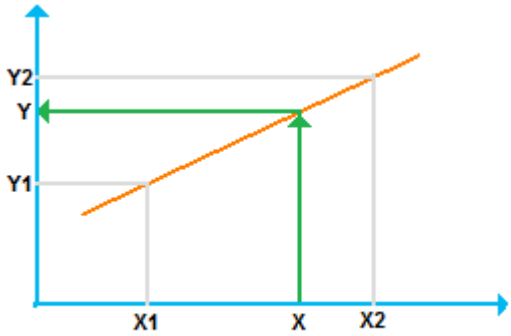
Linear function

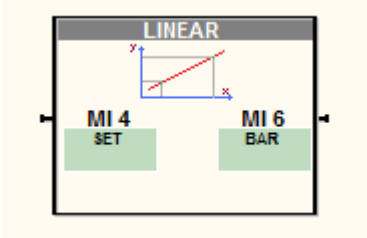
Icon	Name	Type	Operands	Out type
	Lineer	FB	MI,MW,#	Numerical

Description

At least two points describes a line. This function calculate any point at any line. This function useful for conversion between analog values.

Operand 1: Input X1 point
Operand 2: Input Y1 point
Operand 3: Input X2 point
Operand 4: Input X4 point
Operand 5: Input X value
Operand 6: Output Calculated Y Value.





RTC set function

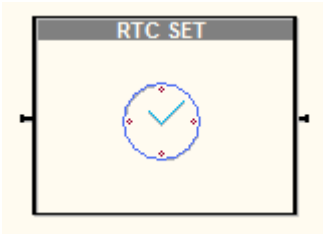
Icon	Name	Type	Operands	Out type
RTC SET	RTC Set	FB	MI,MW,#	Numerical

Description

This function sets the RTC.

Operand 1: Hour (0..23)
Operand 2: Minute (0..59)
Operand 3: Second (0..59)
Operand 4: Day (1..31)
Operand 5:Month(1..12)
Operand 6: Year (09..99) 2 digits.
Operand 7: Week of day (0=Sunday)

This function should call after rising edge commands.



Puls Out function

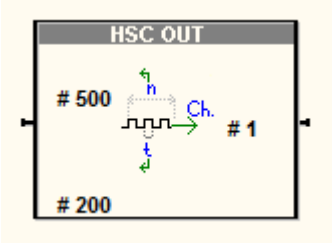
Icon	Name	Type	Operands	Out type
PULS	Puls Out	FB	MI,MW,#	Numerical

Description

This function drives servo/step motor driver. This function works on transistor out PLC modul.

Operand 1: Output channel number.
Operand 2: Puls count.
Operand 3: Puls frequency.

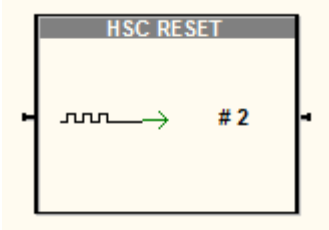
This function should call after rising edge commands.



Puls Out reset

Icon	Name	Type	Operands	Out type
RST	Puls Reset	FB	MI,MW,#	Numerical

Description
The puls output process will stop after this function called.
Operand 1: Output channel number.

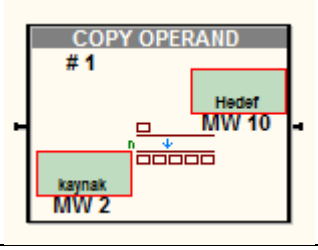


Copy operand function

Icon	Name	Type	Operands	Out type
RST	Puls Reset	FB	MI,MW,#	Numerical

Description
This function copy vector to another vector as given length.

Operand 1: The length of vector.
Operand 2: The start address of source vector.
Operand 3: Offset value of source vector start address.
Operand 4: The start address of target vector.
Operand 5: Offset value of target vector start address.



Bit operation function blocks

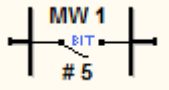
Test Bit

Icon	Name	Type	Operands	Out type
	Test bit	Bit	MW,#	Logic

Description

This command tests the bit of register.
Operand 1: The register to test
Operand 2:Bit number to test

Example ;



It tests the 5. bit in MW1 register.

Set Bit

Icon	Name	Type	Operands	Out type
	Set bit	Bit	MW,#	Logic

Description

This command set a bit of the register.
Operand 1: The register of bit.
Operand 2: The bit number to set
Example ;

It sets the bit number 7 in MW1 register.

Reset Bit

Icon	Name	Type	Operands	Out type
	Set bit	Bit	MW,#	Logic

Description

This command reset a bit of the register.
Operand 1: The register of bit.
Operand 2: The bit number to reset
Example ;

It resets the bit number 7 in MW1 register.

Direct Out Bit

Icon	Name	Type	Operands	Out type
-(b)-	Direct bit	Bit	MW,#	Logic

Description

It sets bit of register when its input 1, it resets bit of register when it's input 0.
Operand 1: The register of bit.
Operand 2: The bit number to direct command
Example ;

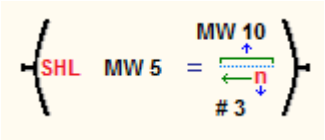
It sets the bit number 3in register MW15 when input in on, otherwise it resets this bit.

Shift Left

Icon	Name	Type	Operands	Out type
-SHL-	Shifts left	Bit	MW,#	Logic

Description

This command shifts left the register bits as given step and puts 0 to the new places on the right. The result stores in to new address.
Operand 1: Result address.
Operand 2: The register number
Operand 3: Shift left step number
Example ;



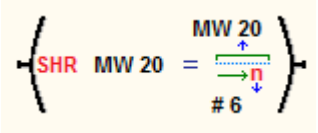
This command shifts the bits of MW10 register to the left 3 times. The result stores in MW5 address. The carry bit move to command result.

Shift Right

Icon	Name	Type	Operands	Out type
-SHR-	Shifts right	Bit	MW,#	Logic

Description

This command shifts right the register bits as given step and puts 0 to the new places on the left. The result stores in to new address.
Operand 1: Result address.
Operand 2: The register number
Operand 3: Shift right step number
Example ;



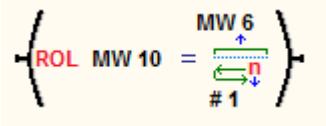
This command shifts the bits of MW20 register to the right 6 times. The result stores in MW20 address. The carry bit move to command result.

Rotate left

Icon	Name	Type	Operands	Out type
·ROL·	Rotates left	Bit	MW,#	Logic

Description

This command shifts left the register bits as given step and puts carry bits to the new places on the right. The result stores in to new address.
Operand 1: Result address.
Operand 2: The register number
Operand 3: Rotate left step number
Example ;



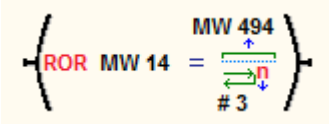
This command shifts the bits of MW6 register to the left 1 times. The result stores in MW10 address. The carry bit move to right place. The result is the same if the step number is 16. (MW register is 16 bit)

Rotate right

Icon	Name	Type	Operands	Out type
·ROR·	Rotates right	Bit	MW,#	Logic

Description

This command shifts right the register bits as given step and puts carry bits to the new places on the left. The result stores in to new address.
Operand 1: Result address.
Operand 2: The register number
Operand 3: Rotate left step number
Example ;

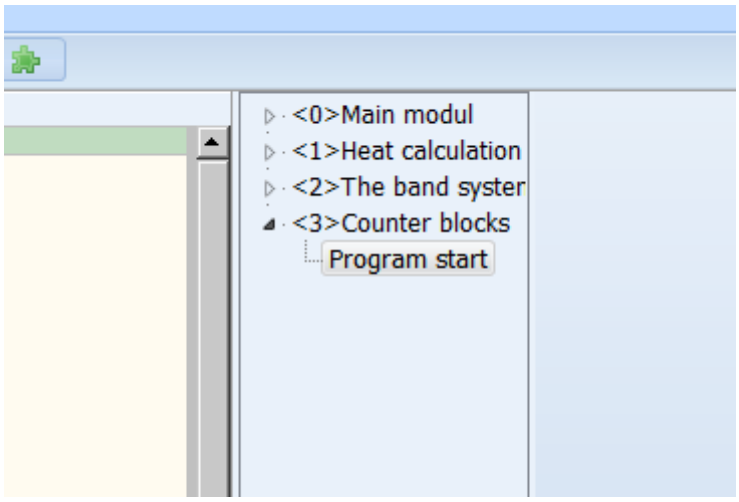


This command shifts the bits of MW494 register to the left 3 times. The result stores in MW14 address. The carry bit move to left place. The result is the same if the step number is 16. (MW register is 16 bit)

Subroutines

Using subroutines makes the program compact and simple. User can define 128 subroutines in a program. Use  icons to add/remove subroutines to program. The PLC program runs in Main modul. The user can call the subroutine in any place of program.

The system gives a number to the subroutines. User can call the subroutine with Call command.



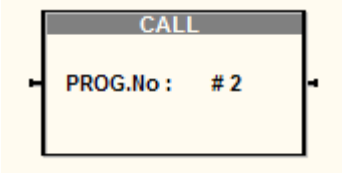
CALL command

Icon	Name	Type	Operands	Out type
CALL	Call	FB	MI,MW,#	FB

Description

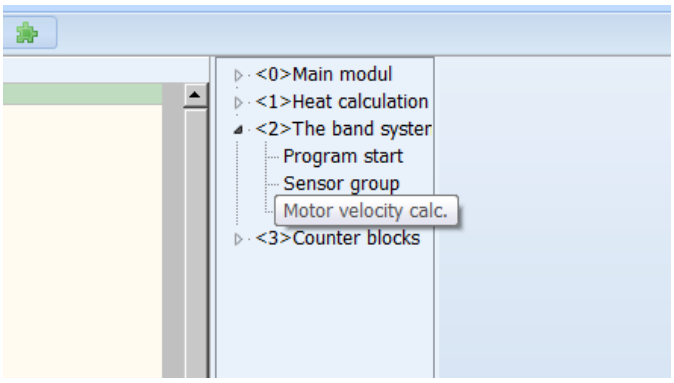
This command calls the subroutine. The program flow goes to subroutine. It continues from call command after finish the subroutine.

Operand 1: The subroutine number to call.



Program labels

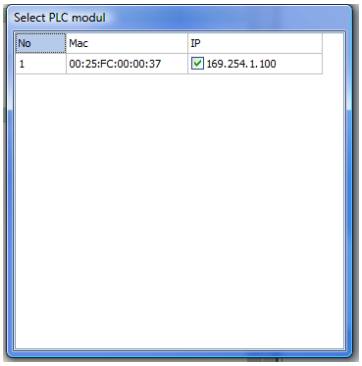
The label makes the program easily understand. Also user can jump faster in program sections when click on the label shortcuts. The label can insert to the cursor with  icons. User can renamed the label.



Program downloading

The program can download to the plc with Ethernet port. The download steps are ;

1) Click on  icon on the icon bar. It shows the list of the PLCs which are connected to the network.
2) Select the PLC with click on check box in the list. User can read the MAC address of PLC in the list and same address written on the PLC modul label.



3) Program shows the PLC version number and “PLC ready” comments on messages window after the connection successfully.
4) Use  button for download the program. This command Stops the PLC program and downloads program.
5) After download there is “Download Succesfull” message appear on the message window.
6) User can run the program with  button.

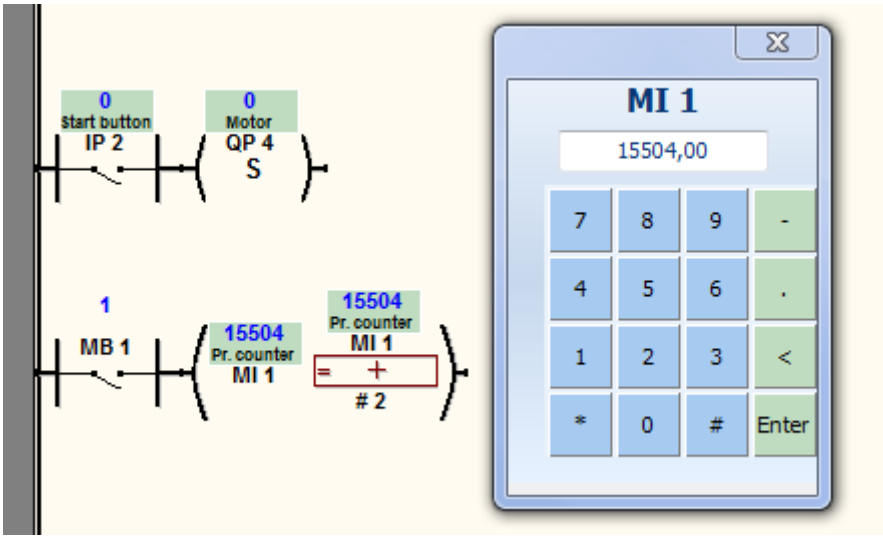
Use the  button check the PLC connection at any time. The user can skip 1. And 2. Steps on other download operations unless PLC power off-on.

Program analysis

User can make link to the plc for watch the register current values. There are two ways to watch variables.

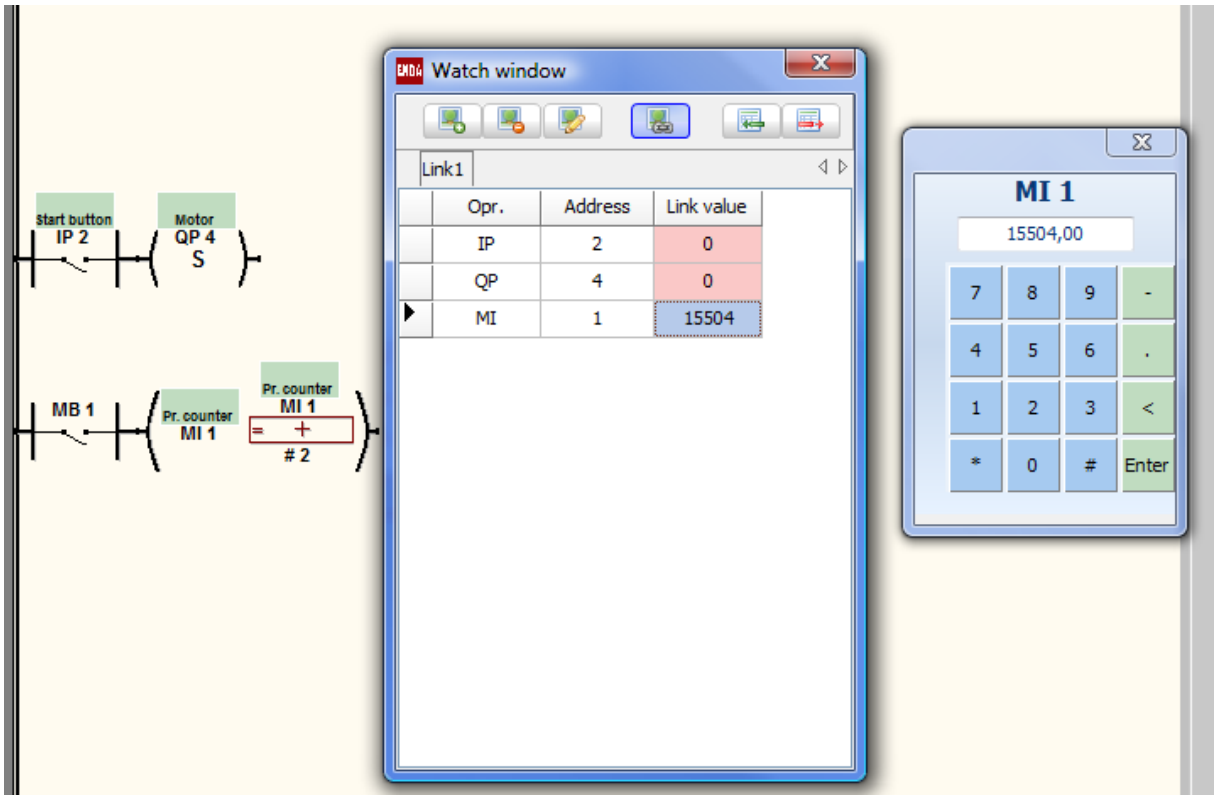
Ladder link

Press on  button after download and run the program. The editor switches to link mode. The values monitored with blue captions in the commands. User can change any value with click on label.



Watch window

Click on  button. The watch window appears. User can define any operands in list and wacth or modify the values of registers.



User can add new tabs, renames sections in watch window. Click on “Link value” column to modify the value.