

**OMC System Software
High-performanceHMI
VFLDBuilder
User Manual
IM41S62-E**

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VFLDBuilder User Manual

Section 1 Overview

Ladder Diagram (LD) derives from relay control schematic diagram. The most important functions of Ladder Diagram are logic operation and interlock control. As one of the standard languages, Ladder Diagram is not only used as programming language for programmable controller, but also widely used in many other fields, for example, Sport Control System, Distributed Control System, PC Control, SCADA, etc.

VFLDBuilder is one of the main control strategy configuration tools of the High-performanceHMI software package, which provides function of Ladder Diagram programming and debugging.

Section 2 Software Features

VFLDBuilder conforms to IEC61131-3 standard. By combining with function block library, it provides powerful functions of graphical logic processing and interlock control, making it convenient for program editing and debugging, and supports single program compiling and online download.

Features of the Ladder Diagram Builder:

- Ladder Diagram supports all contacts, coils, jumps and some system function blocks of standard type.
- Ladder Diagram program can be divided into segments which are not related to each other, and each segment has an auto-numbered label and a editable text description.
- Ladder Diagram supports the jump to the beginning of the segment corresponding with the label.
- There is no special restriction for the placements of elements except left/right convergence.
- Upward parallel branches and cross without connection are not permitted in the ladder diagram.
- The maximum amount of program elements in each segment (excluding amount of links) is 32.

Section 3 Function Overview

VFLDBuilder is mainly used to can deal with switch signal processing, interlock control and simple sequence control logic.

VFLDBuilder serves as an integrated development environment for ladder diagram program. It provides four main functions: edit, compile, online and debug.


1. **Edit:** edit the elements (segment, contact, coil, jump and function block), zoom the view, search & replace, print, import & export, etc.
2. **Compile:** Compile the diagram and create relevant files, prompt succeed or error messages (it can locate the relevant element).
3. **Online:** Communicate with controllers to debug the program logic after the program is complete and downloaded.
4. **Debug:** Debug the program, variables and function blocks in online state.
 - Program debugging: display the value of analog variables and Boolean variables in real time and mark them with different colors, making it convenient for observation.
 - Variables debugging: display status and value of the tags in real time, and modify the tag status and value.
 - Function block debugging: display and modify the relevant parameters of function block in real time, close or activate input / output pins real timely.

Section 4 Configuration Steps

Step of configuration is:

Start VFExplorer → Select the control domain that required to add custom program → Lock the controller that required to add custom program → Create a LD program → Start up VFLDBuilder → Program → Save → Compile → Download → Debug

Section 5 New LD Program

Open VFExplorer and select the control station in the configuration tree in the left pane. Select “Open from Configuration Server” in the right-click menu. Select the “Custom Program” and select “New” in its right-click menu, or click the  button in tool bar. Pop out New Custom Program dialog box. Enter Name, Type (LD) and Description, as shown below.

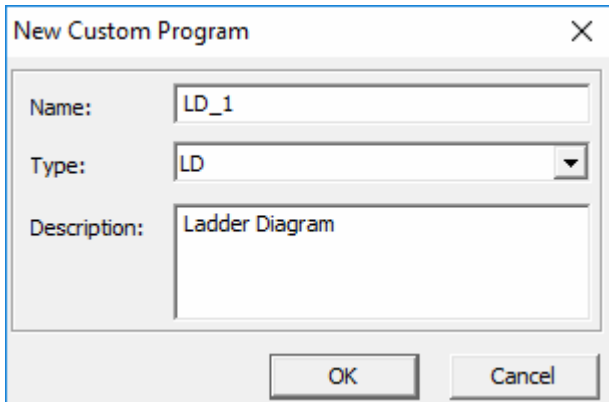


Figure 5-1 New Custom Program dialog box

Click “OK” to create new LD program, as shown below.

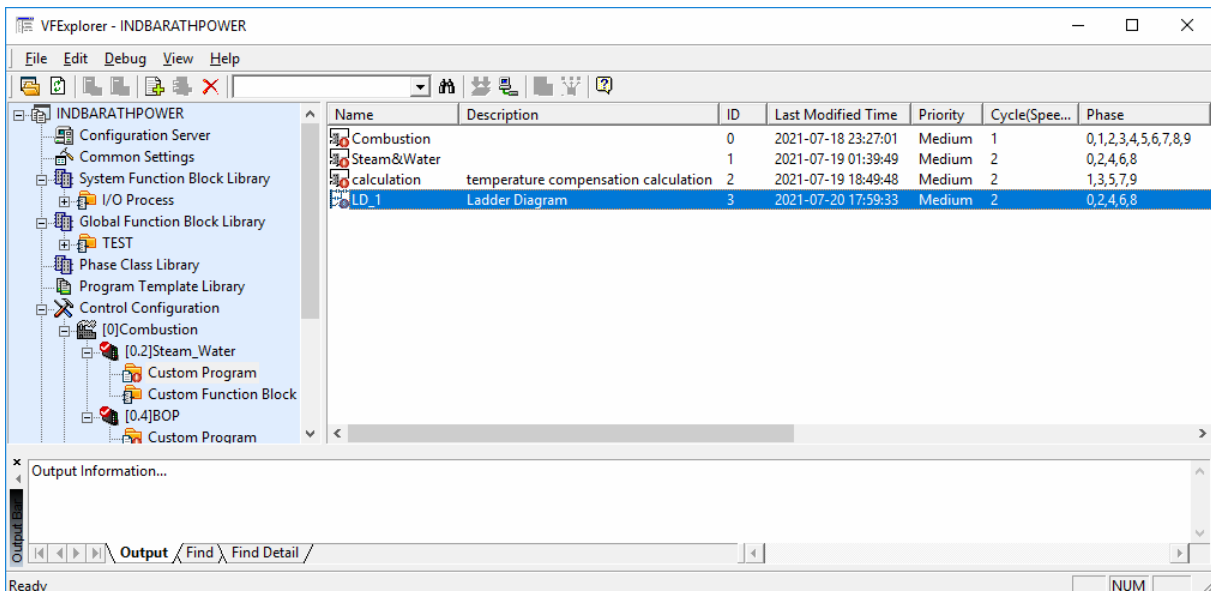


Figure 5-2 VFExplorer software interface

Select the new built program and double-click to open VFLDBuilder.

LD program can set Phase and Cycle. Select any program and select “Properties” in its right-click menu. Pop out Custom Program Properties dialog box. Cycle can choose Fast Cycle, 1 Multiple, 2 Multiple, 5 Multiple and 10 Multiple. Start Phase can choose from 0~9. Priority can choose Low,

Medium and High. (Only when controller type is FCU711-S, The program priority can be configured. Details see *Config Explorer User Manual*.)

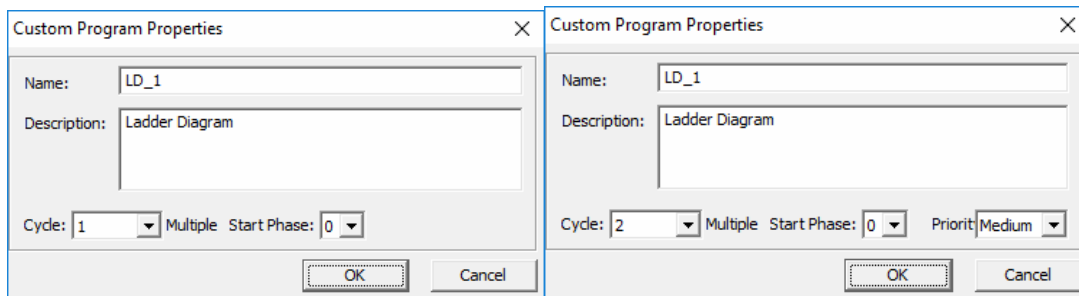


Figure 5-3 Custom Program Properties setting dialog box (left graph adopts controller FCU712-S and the right graph adopts controller FCU711-S)

Note:

1. When select Fast Cycle, Start Phase cannot be chosen, as shown below.

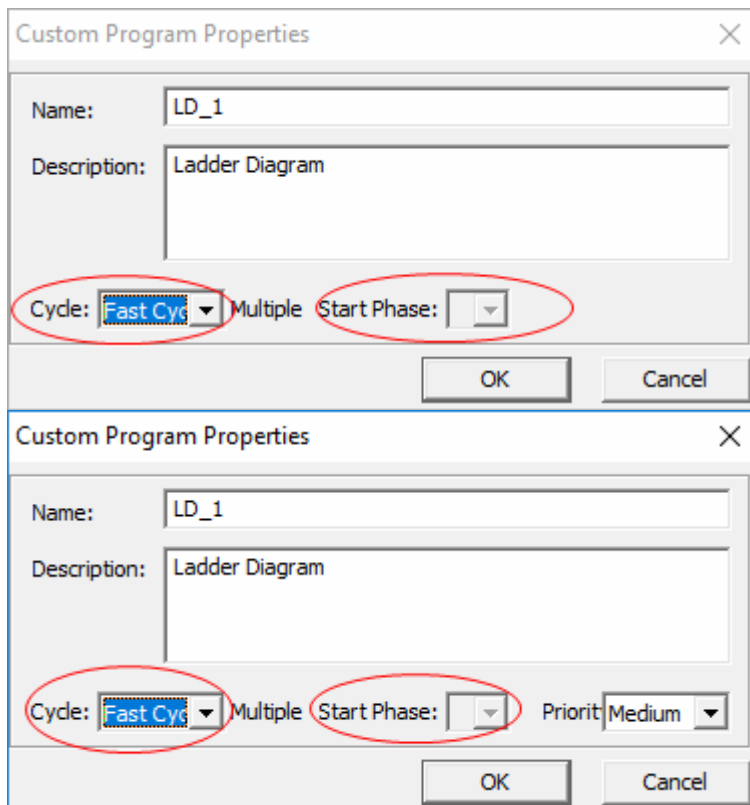


Figure 5-4 Select Fast Cycle (left graph adopts controller FCU712-S and the right graph adopts controller FCU711-S)

2. A control station can build at most 250 programs. Program name cannot contain " ' / \ , : and blank.
3. Program name can contain 1~64 English characters or 1~32 Chinese characters.
4. Program description can contain 0~128 English characters or 0~64 Chinese characters.
5. Program name and description can be modified.

Section 6 Interface Introduction

6.1 Main Interface

The main interface of the VFLDBuilder is shown in Figure 6-1.

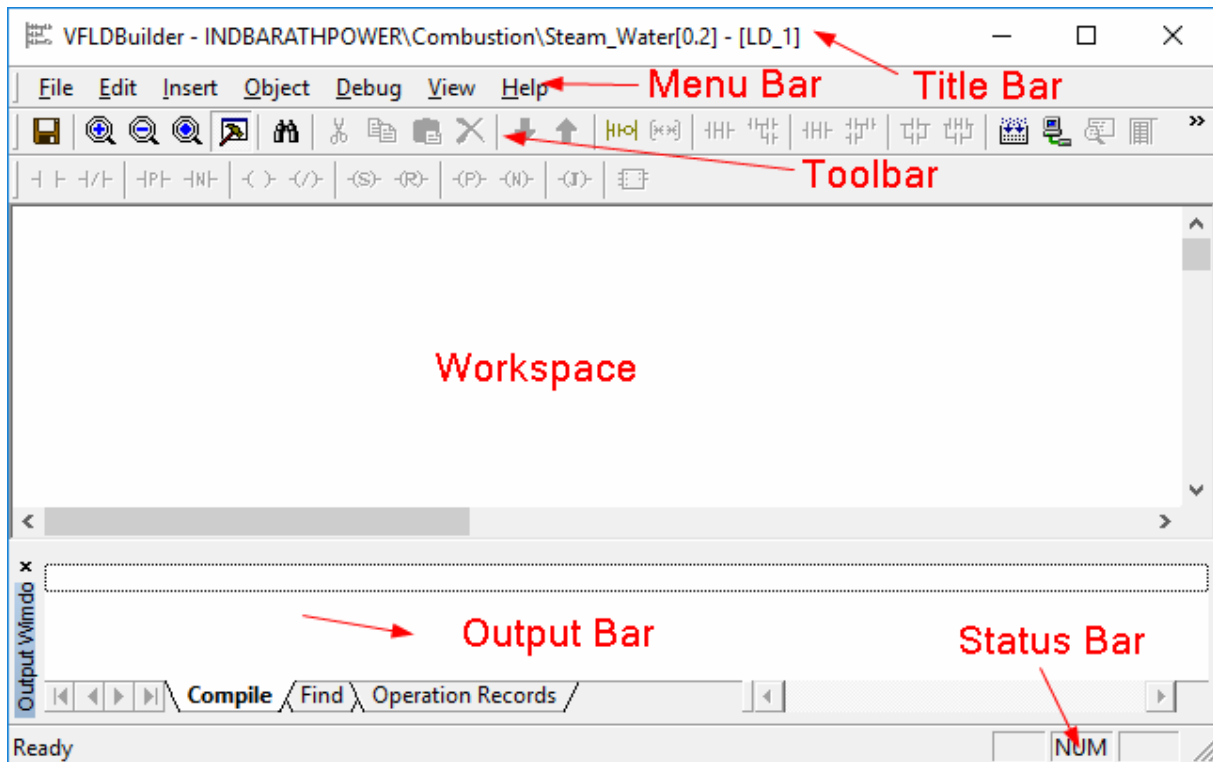


Figure 6-1 Main interface of VFLDBuilder



















1. **Title Bar** -- display the title of the program
2. **Menu Bar** -- contain 7 items: Files, Edit, Insert, Object, Debug, View, Help. Each menu contains several submenus.
3. **Toolbar** -- list the most frequently used items of the menu in the form of icons, making it convenient for operation. Click the menu **View/Tool bar** to decide whether to show the bar or not.
4. **Workspace** -- area for programming
5. **Output Bar** -- at the bottom of the main interface including "Compile", "Find" and "Operation Records". Double-clicking the items in this area can locate correlated information. Click the menu **View/Output Bar** to decide whether to show the bar or not.
6. **Status Bar** -- display current operation information and prompt messages. Click the menu **View/Status Bar** to decide whether to show the bar or not.

6.2 Introduction to Menu Bar & Toolbar

Instructions to main menu are shown in following table:

Table 6-1 Introduction to Menu Bar and Toolbar

Menu	Item	Shortcut Key	Function
File	<u>S</u> ave Ctrl+S		Save current control configuration
	E <u>x</u> port		Export current configuration program
	I <u>m</u> port		Import a configuration program
	<u>P</u> rint Ctrl+P		Print
	P <u>r</u> int P <u>r</u> ev <u>iew</u>		Print preview
	P <u>r</u> int S <u>e</u> ttings		Set print properties
	P <u>r</u> int F <u>ooter</u> S <u>e</u> ttings		Set print information of footer
	E <u>x</u> it		Exit VFLDBuilder
Edit	C <u>u</u> t Ctrl+X		Cut selected segment
	<u>C</u> opy Ctrl+C		Copy selected segment
	<u>P</u> aste Ctrl+V		Paste the segment on clipboard
	<u>D</u> elete Delete		Delete selected elements
	<u>F</u> ind and Replace Ctrl+F		Search and replace the string
Insert	I <u>n</u> sert A New Segment		Insert a new segment or insert segment framework in segment
	I <u>n</u> sert A New Element to the Left		Insert a new element to the left
	I <u>n</u> sert A New Element to the Right		Insert a new element to the right
	I <u>n</u> sert A New Element Below		Insert a new element below
	I <u>n</u> sert A New Element to the Left of Multi-elements		Insert a new element to the left of multiple elements
	I <u>n</u> sert A New Element to the Right of Multi-elements		Insert a new element to the right of multiple elements
	I <u>n</u> sert A New Element Below Multi-elements		Insert a new element below multiple elements
Object	S <u>e</u> gment A <u>n</u> notation		Add or edit segment description
	N <u>o</u> rmally O <u>p</u> en C <u>o</u> ntact		Set the selected element as normally-open contact
	N <u>o</u> rmally C <u>l</u> osed C <u>o</u> ntact		Set the selected element as normally-closed contact
	P <u>o</u> sitive T <u>r</u> ansition-sensing C <u>o</u> ntact		Set the selected element as positive jump contact
	N <u>e</u> gative T <u>r</u> ansition-sensing C <u>o</u> ntact		Set the selected element as negative jump contact
	C <u>o</u> il		Set the selected element as normal coil
	N <u>e</u> gated c <u>o</u> il		Set the selected element as negated coil
	P <u>o</u> sitive T <u>r</u> ansition-sensing C <u>o</u> il		Set the selected element as positive jump coil
	N <u>e</u> gative T <u>r</u> ansition-sensing C <u>o</u> il		Set the selected element as negative jump coil
	S <u>e</u> t C <u>o</u> il		Set the selected element as set coil

Menu	Item	Shortcut Key	Function
	Reset Coil		Set the selected element as reset coil
	Jump Coil		Set the selected element as transition coil
	Function Block		Set the selected element as function block
	Reference Variable		Link variables to the selected elements
	Segment Move up		Shift the segment up
	Segment Move down		Shift the segment down
	Function Block Settings		Set the function block
	Activate Input		Activate or close the input of function block
	Activate Output		Activate or close the output of function block
	Auto Upgrade		Upgrade the function block used in the program.
<u>D</u> ebug	Compile F7		Compile current program logic
	Online F5		Connect to controller
	Program Debug		Debug the program
	Function Block Debug		Debug the parameters of the function block in real time
	Variable Debug		Debug the tags in real time
	Add to Debug List		Add the selected tags or tags linked with function block into the variable debug window
	Activate Input		Activate or close the input of function block
	Activate Output		Activate or close the output of function block
	Activate All Input Parameters		Activate all input parameters
	Activate All Output Parameters		Activate all output parameters
	Display Non-BOOL Tag		Show / hide non-bool tag names when debugging program
<u>V</u> iew	Zoom In		Zoom in the view of program logic
	Zoom Out		Zoom out the view of program logic
	Standard View		revert to standard view
	Output Bar		Show / hide the output window
	<u>T</u> oolbar		Show / hide the tool bar
	<u>S</u> tatus Bar		Show / hide the status bar
<u>H</u> elp	<u>A</u> bout		Show the program information, version number and copyright

Section 7 Program Instructions

7.1 Data Type

Table 7-1 table of system data type

Sign	Length(bit)	Instruction
BOOL	8	ON, OFF
SINT	8	-128 ~ 127
USINT	8	0~ 255
INT	16	-32768 ~ 32767
UINT	16	0~65535
DINT	32	-2147483648~2147483647
UDINT	32	0~4294967295
REAL	32	Float value

7.2 Tag Type

Table 7-2 System tag type list

Tag Type	Description
AI	Analog input
AO	Analog output
DI	Digital input
DO	Digital output
NA	Customized analog variable
ND	Customized digital variable
NN	Customized integer variable
PA	Analog exchange variables between pages
PD	Digital exchange variables between pages
PN	Integer exchange variables between pages

7.3 New Program

Select corresponding controller in the configuration tree on the left of the VFExplorer, then choose

"Open from Configuration Server" to lock the controller. Select the node "Custom Program" under the controller, then choose "New" on right click menu, as shown in Figure 7-1.

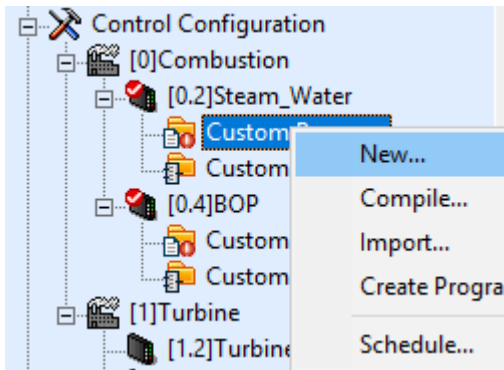


Figure 7-1 New program

The new program dialog box will pop up, as shown in Figure 7-2.

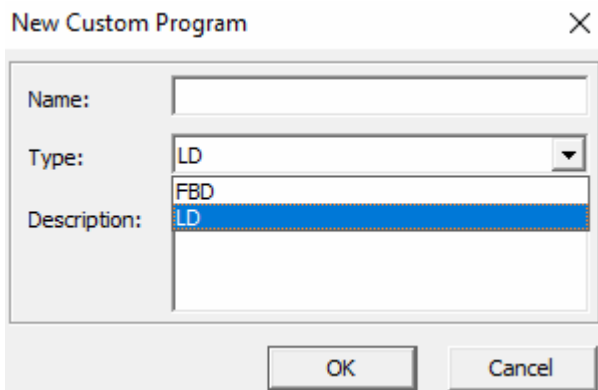


Figure 7-2 New custom program dialog box

Choose "LD" in "Type", and input program name and description, then click "OK" to create a new LD program.

Start the VFLDBuilder by double clicking the new program, or clicking "Edit" on the right-click menu, as shown in Figure 7-3.

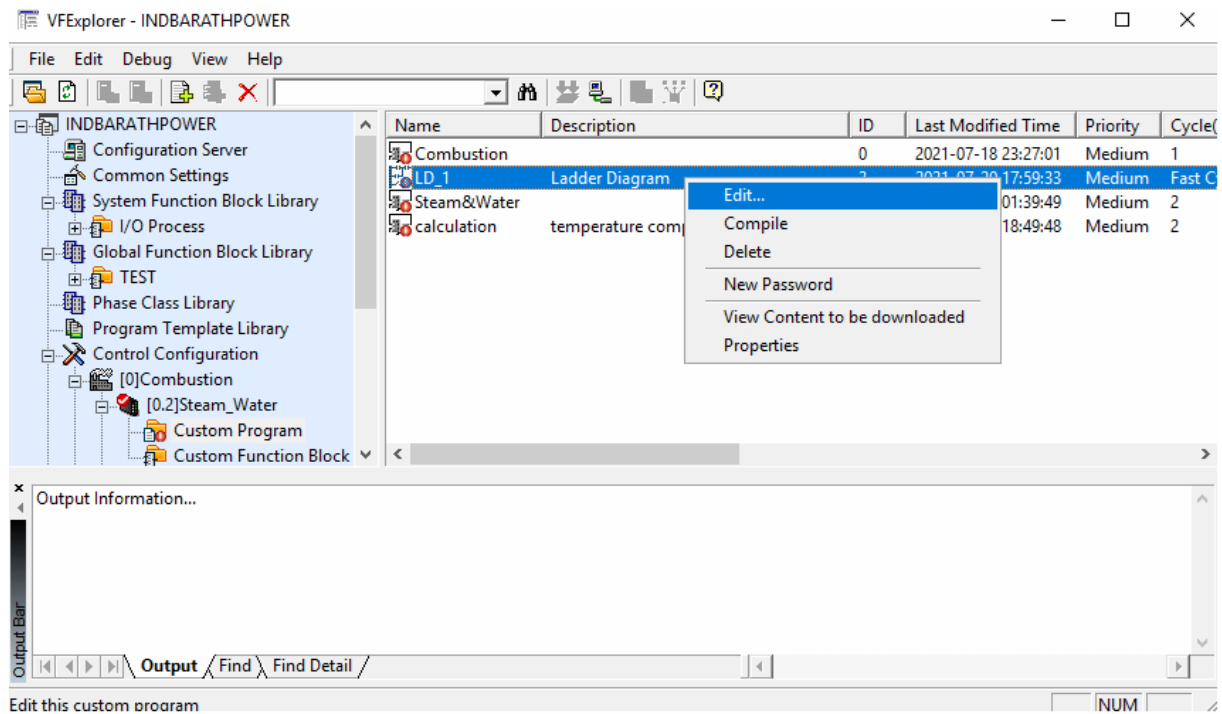


Figure 7-3 Starting program

7.4 Program Settings

Properties and password of the LD program can be set by right-click menu, as shown in Figure 7-3. For more details, please refer to *Config Explorer User Manual*.

7.5 Edit

7.5.1 Element and Basic Logic


Basic elements and their definitions

Basic elements of the ladder diagram programming software (VFLDBuilder) include convergence, linkages, contacts, coils and function blocks.

- 2 types of convergence: left convergence, right convergence.
- 4 types of contact: normally-open contact, normally-closed contact, positive transition-sensing contact, negative transition-sensing contact.
- 7 types of coil: General\negated coil, set\reset coil, positive\negative transition coil, jump coil.

The symbol and definition of each element are shown in Table 7-3.

Table 7-3 basic elements and their definitions


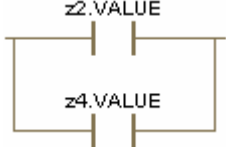
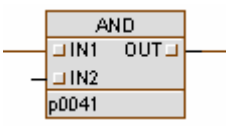
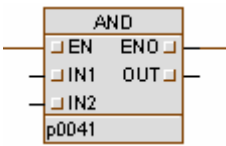
Element		Symbol	Definition
convergence	Left convergence		Left limit of the LD network, always ON.

Element		Symbol	Definition
	Right convergen ce		Right limit of the LD network, no status defined.
linkage	horizontal		Transfer the status of the left element to the right element, which are directly connected to it. ON or OFF.
	Vertical		Includes a horizontal line and one vertical line or more on both sides. If the status of all left-connected elements is OFF, its status will be OFF, otherwise ON. Its status will be copied to the right element directly connected to it.
Static contact	Normally open contact		If the status of the correlated BOOL variables is ON, the status of the left linkage will be copied to the right linkage; otherwise the status of the right linkage will be OFF.
	Normally closed contact		If the status of the correlated BOOL variables is OFF, the status of the left linkage will be copied to the right linkage; otherwise the status of the right linkage will be OFF.
Jump contact	Positive transition-s ensing contact		When the status of the variable transition from OFF to ON, the status of the right linkage equals the status of right linkage, else the status of the right linkage will be OFF.
	Negative transition-s ensing contact		When the status of the variable transition from ON to OFF, the status of the right linkage equals the status of right linkage, otherwise the status of the right linkage will be OFF.
Instant coil	Coil		Copy the status of left linkage to correlated variables and right linkage
	Negated coil		Copy the status of left linkage to right linkage. Negate the status of the left linkage, then copy it to correlated variables.
Lock coil	Set coil		If the status of the left linkage is ON, the correlated variables will be set as ON, otherwise variables will hold the value until reset by reset coil.
	Reset coil		If the status of the left linkage is ON, the correlated variables will be set as OFF, otherwise variable value will hold the value until set by set coil.
Transitio n coil	Positive transition-s ensing coil		When the status of the left linkage transition from OFF to ON, the variable will be set as ON, otherwise variable will be OFF.
	Negative transition-s ensing coil		When the status of the left linkage transition from ON to OFF, the variable will be set as ON, otherwise variable will be OFF
Jump coil	Jump coil		Jump to the designated segment below.
Function block	Function block		Import simple function block: counter, trigger, and analog arithmetic, etc.

Basic logic

In the ladder diagram, the relation between contact, coil, jump or function block is simply series connection (AND) or parallel connection (OR). For details, please refer to Table 7-4.

Table 7-4 Basic logic

Form	Logic	Description
	AND	Z1 AND Z2, and assign the result to the right linkage.
	OR	Z1 OR Z2, and assign the result to the right linkage.
	The function block parameters IN1 and OUT are connected with horizontal linking line	The value of input parameter IN1 is assigned by left connected element. The value of output parameter OUT is assigned to downstream element.
	The function block parameters EN and ENO are connected with horizontal linking line	Whether the function block can run or not is decided by the value of upstream horizontal linking. If the value of EN is ON, the function will run, otherwise it won't.

**Tip:**

Elements in the ladder diagram are automatically arranged, and dragging is not allowed.

7.5.2 Add Segment

Click the icon  on the tool bar or the menu **Insert/Insert New Segment** to create a new ladder diagram.

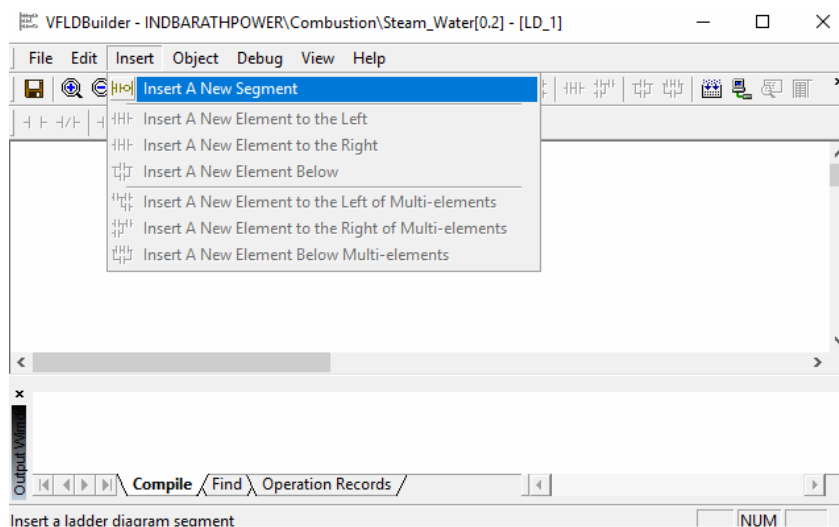
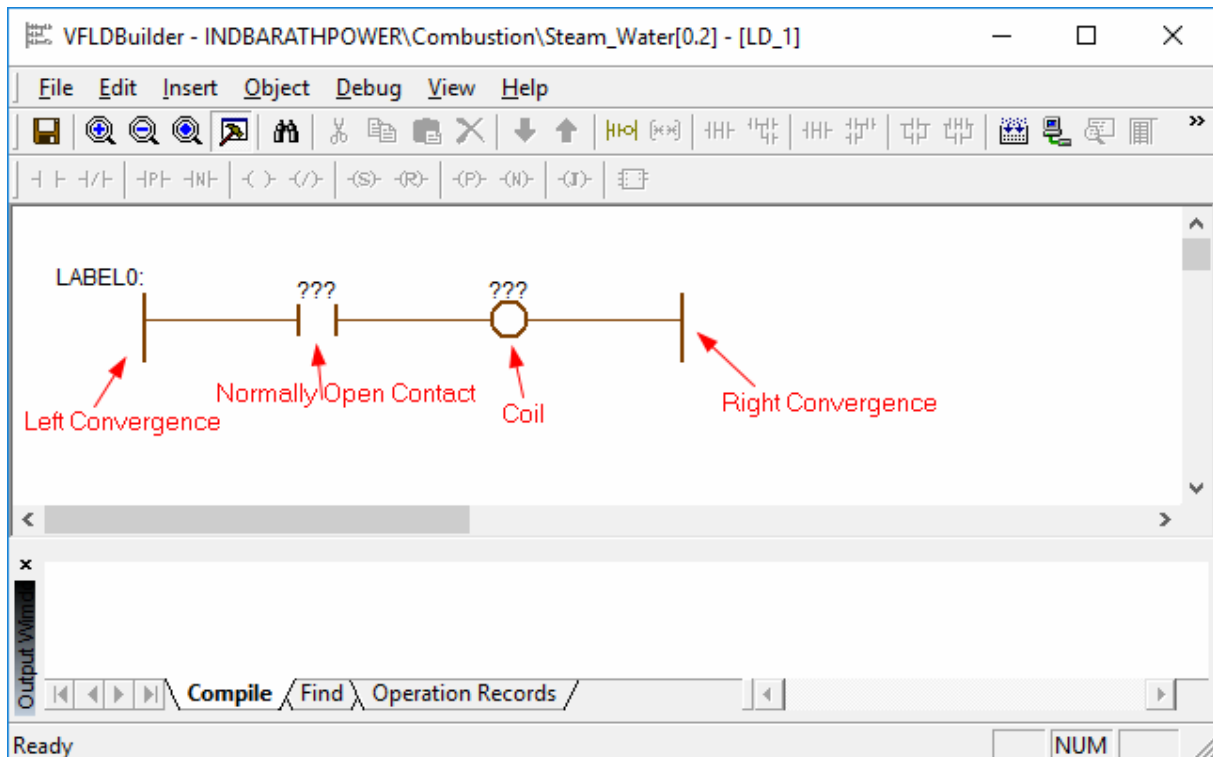


Figure 7-4 Add a new segment

A simple standard segment will appear on the program page, as shown in Figure 7-5.

**Figure 7-5 New standard segment**

A standard segment consists of the left convergence, a normally-open contact, a general coil and the right convergence.

Select the left convergence, then choose "Insert New segment" to add a standard segment below the existing segment.

7.5.3 Segment Annotation

Double click the right convergence or the left convergence, and the segment annotation dialog box will pop up.

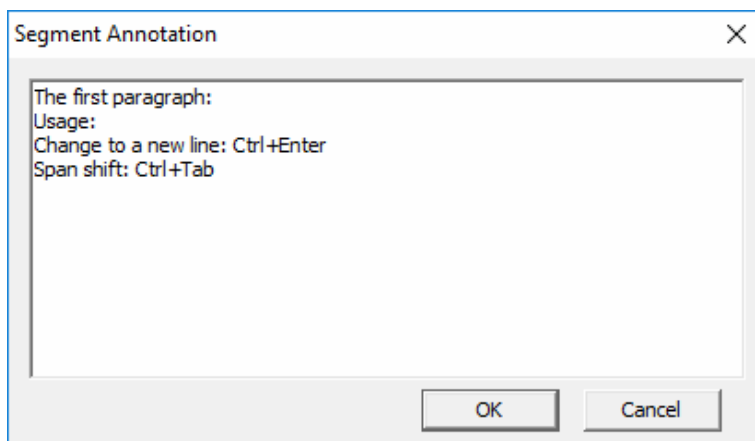
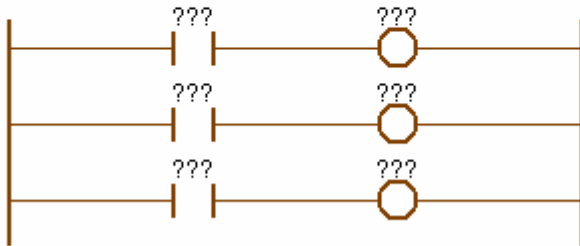



Figure 7-6 Segment annotation dialog box

Add or modify the existing segment annotation in the comment box, then click "OK" to complete the operation (Use "Ctrl+Enter" to jump to a new line when editing in the annotation box).

LABEL0: The first paragraph:
 Usage:
 Change to a new line: Ctrl+Enter
 Span shift: Ctrl+Tab

**Figure 7-7 Segment annotation**


Double click the annotation, or choose the left/right convergence then click the button  on the tool bar, the segment comment dialog box will pop up, then add/modify the comment is available.


7.5.4 Element Operation

Add contact and coil

There are 7 methods to add an element (One method is adding a new segment in the existing segment, will not be described here)

Inert a new element to the left

Select any element except the left convergence, click the icon  on the tool bar or choose menu **Insert/Inert A New Element to the Left**, then a new element will be inserted into the left side of the selected element and the cursor will select the new element automatically.

For example, select the first contact in a standard segment, then click the icon  on the tool bar, as shown in Figure 7-8.

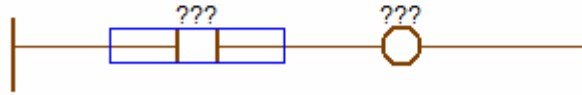


Figure 7-8 Before new contact is left inserted

A new contact will appear to the left of the selected element automatically, and the cursor will select the new element automatically, as shown in Figure 7-9.

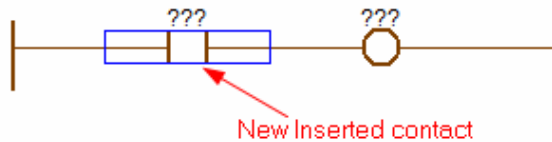




Figure 7-9 New inserted element

Inert a new element to the right

Select any element except the right convergence, click the icon  on the tool bar or choose menu **Insert/Inert A New Element to the Right**, then a new normally-open contact or general coil will be inserted into the right side of the selected element and the cursor will select the new element automatically

For example, select a coil in a standard segment, then click the icon  on the tool bar, as shown in Figure 7-10.

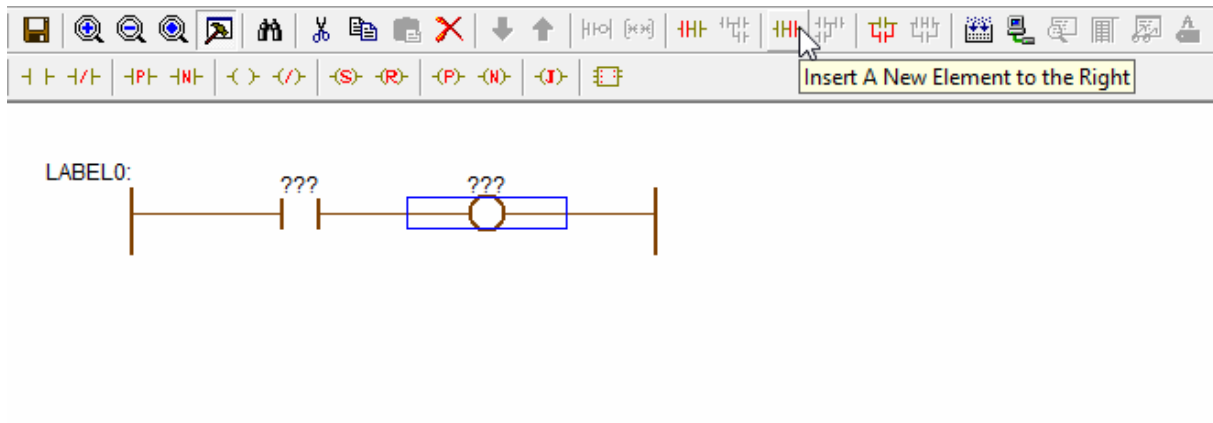


Figure 7-10 Before new element is right inserted

A new coil will appear to the right of the selected contact automatically, and the cursor will select the new element automatically, as shown in Figure 7-11.

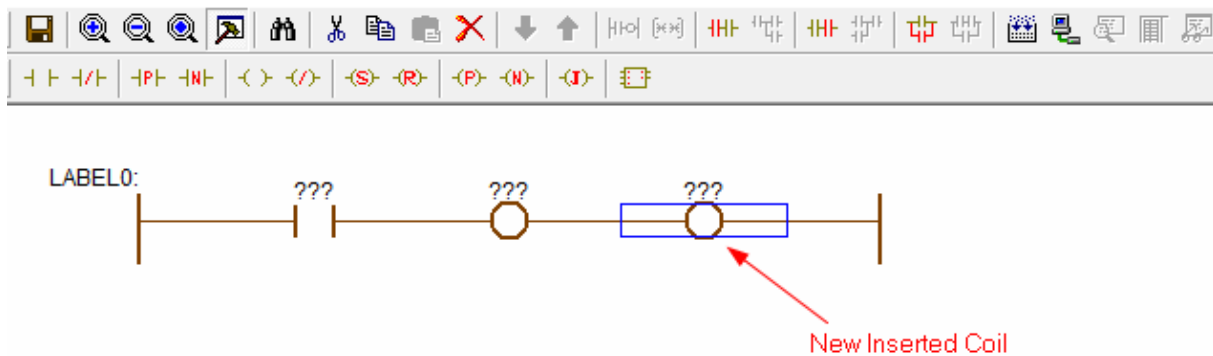




Figure 7-11 New inserted element

Inert a new element below

Select any element except the convergence, click the icon  on the tool bar or choose menu **Insert/Inert a New Element Below**, then a new normally-open contact or general coil will be inserted below the selected element and the cursor will select the new element automatically.

For example, select a normally-open contact, then click the icon  on the Toolbar, as shown in Figure 7-12.

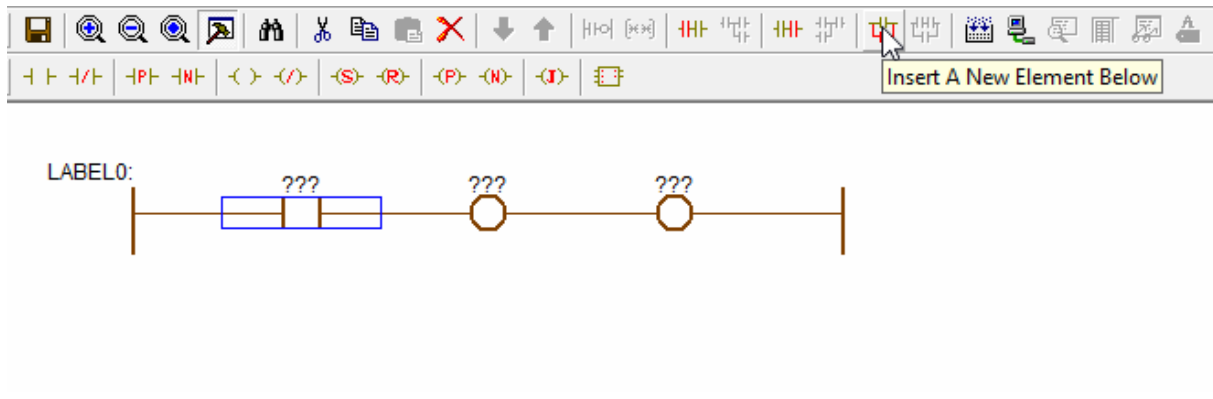


Figure 7-12 Before new element is below inserted

A new contact will appear below the selected contact automatically, and the cursor will select the new element automatically, as shown in Figure 7-13

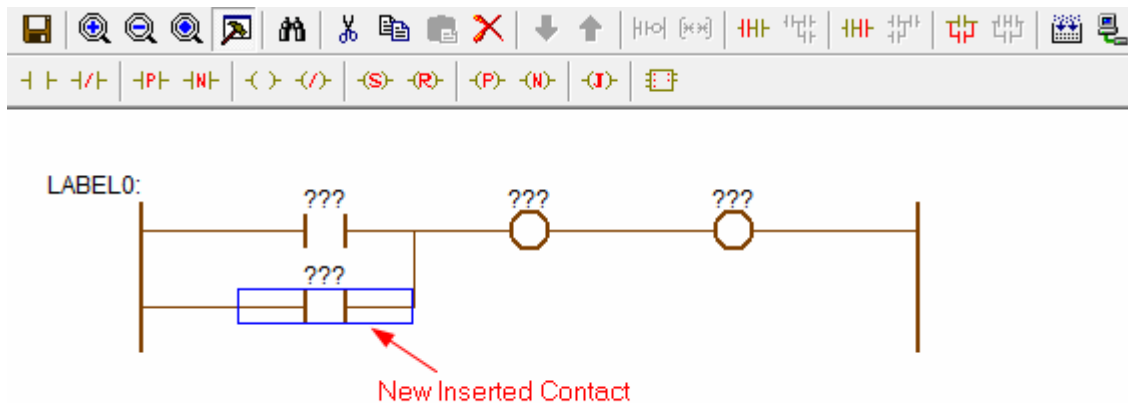



Figure 7-13 New inserted element

Insert a new element to the left of multiple elements

Using Ctrl key to select 2 parallel elements with common connection point to the left, then click the icon  on the tool bar, or menu **Insert/Insert A New Element to the Left of multi-elements**, a normally-open contact will be inserted into the left of the selected elements, and the cursor will select the new element automatically.

Select 2 elements, then click the icon  on the tool bar shown in following figure.

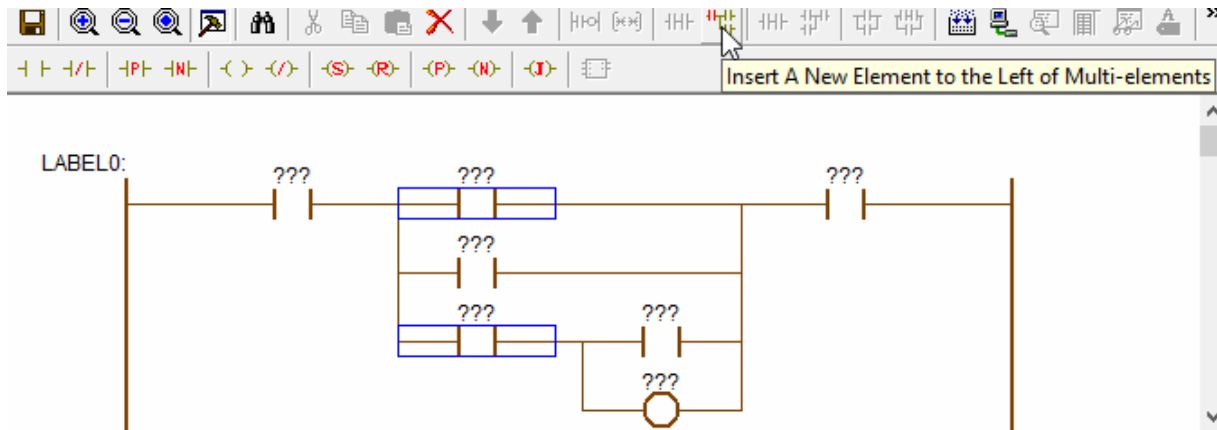


Figure 7-14 Before the new element is inserted into the left of multiple elements

A new element will appear on the left of the selected multiple elements, and the cursor will automatically select the new element, as shown in Figure 7-15.

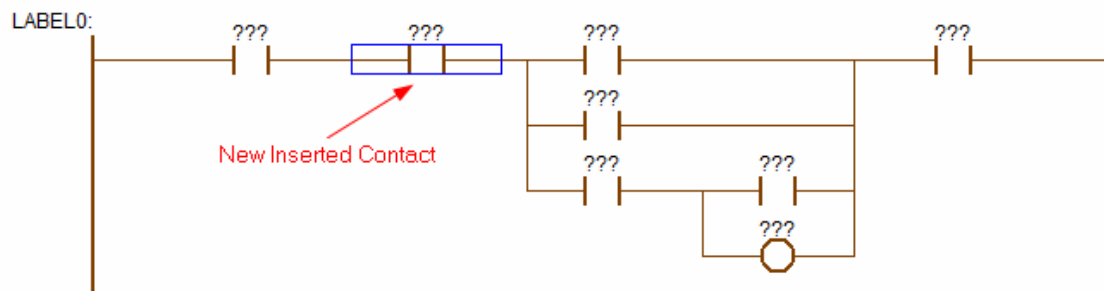



Figure 7-15 New inserted element

Insert a new element to the right of multiple elements

Using Ctrl key to select 2 parallel elements with common connection point in the right, then click the icon  on the tool bar, or menu **Insert/Insert A New Element to the Right of Multi-elements**, a normally open contact or coil will be inserted into the right of the selected elements, and the cursor will select the new element automatically.

Select 2 elements, then click the icon  on the tool bar, as shown in Figure 7-16.

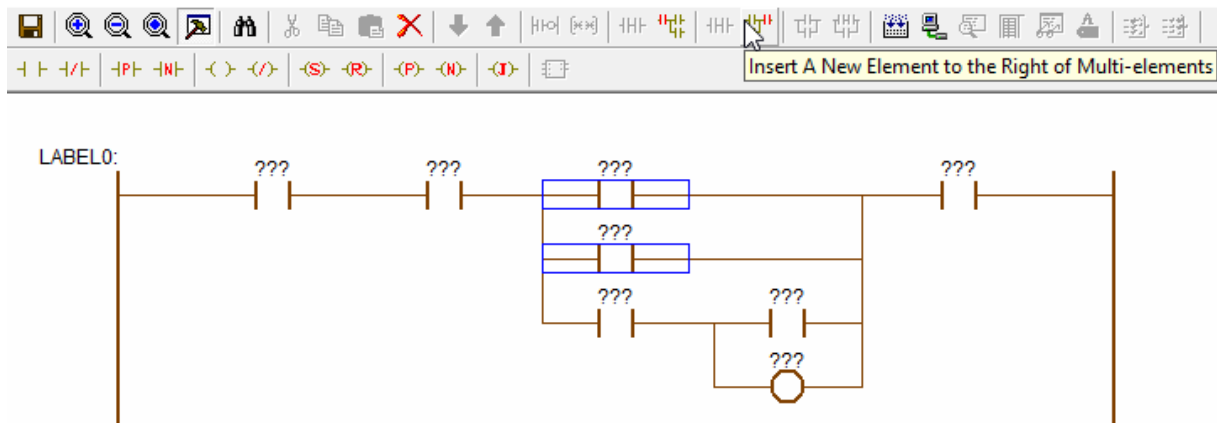


Figure 7-16 before the new element is inserted into the right of multiple elements

A new element will appear on the right of the selected multiple elements, and the cursor will automatically select the new element, as shown in Figure 7-17.

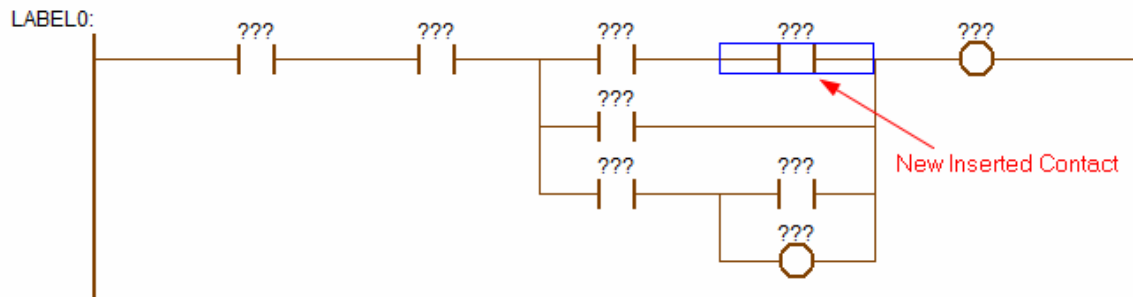



Figure 7-17 New inserted element

Insert a new element below multiple elements

Using Ctrl key to select 2 serial elements which can insert element below, then click the icon  on the tool bar, or menu **Insert/ Insert A New Element Below Multi-elements**, a normally open contact or coil will be inserted below the selected elements, and the cursor will select the new element automatically

Select 2 required contacts, then click the icon  on the tool bar, as shown in Figure 7-18

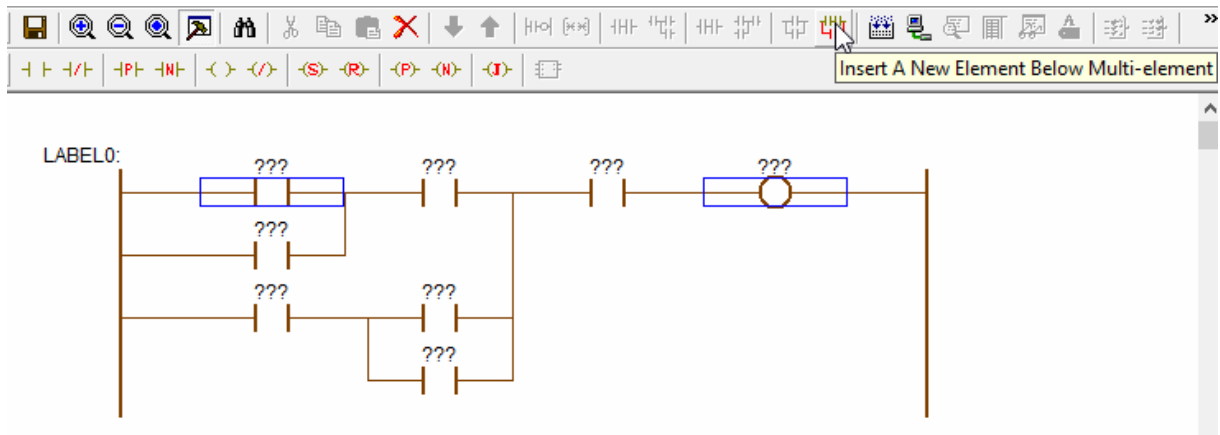


Figure 7-18 before insert a new element below multiple elements

A new element will appear below the selected multiple elements, and the cursor will automatically select the new inserted element, as shown in Figure 7-19.

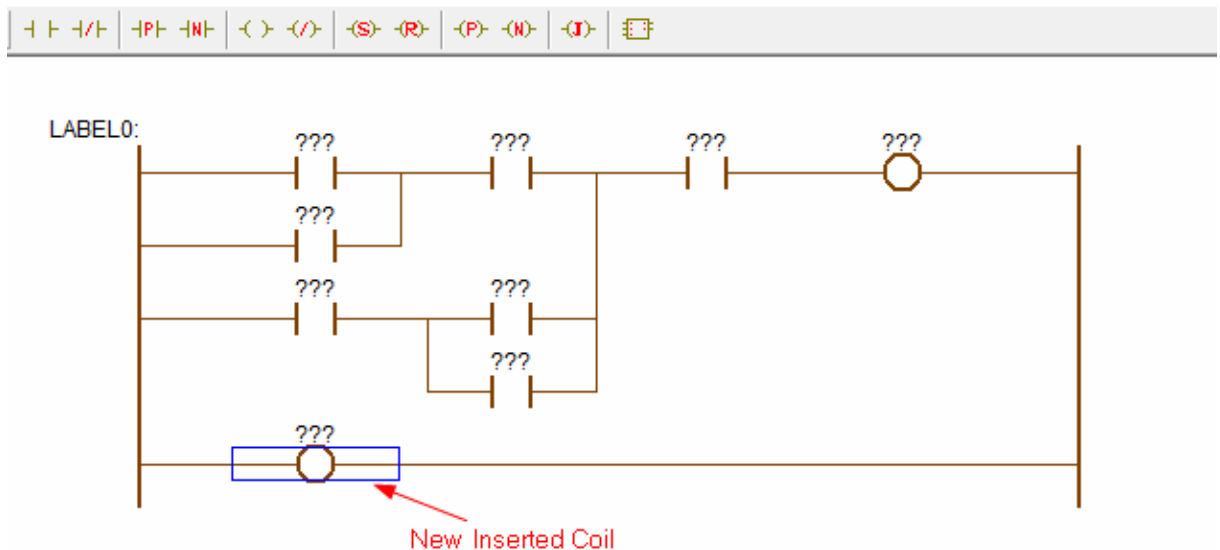



Figure 7-19 New inserted element

Modify Element Type

Some element types (contact, coil, function block) can transform to each other. The transformation method: select the element, and click corresponding item on the tool bar or menu to modify element type.

For example, change the selected element to Set Coil, just select the element, and then click the icon  on the tool bar, as shown in Figure 7-20.

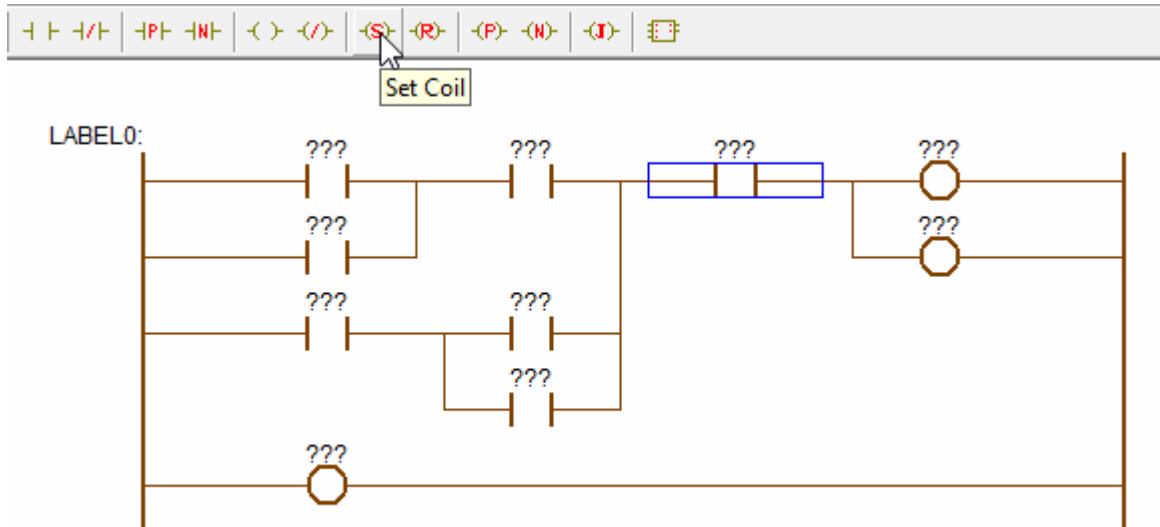


Figure 7-20 Modify element type

The element changed to set coil successfully, as shown in Figure 7-21.

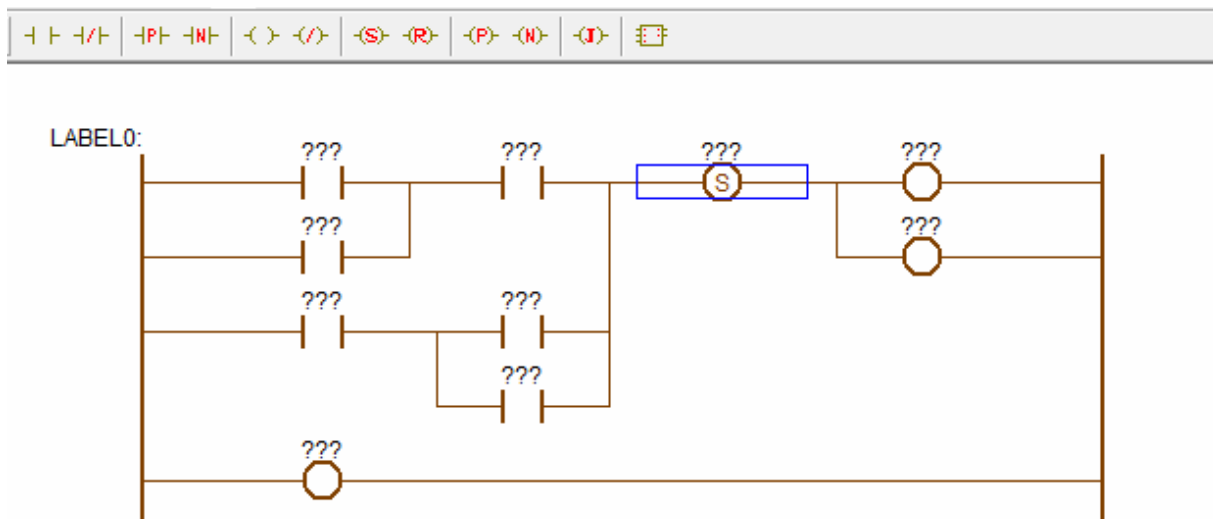


Figure 7-21 after changing the element type



Tips:

Batch operation is available in type modification: using Ctrl key to select multiple elements, then click the required element type on the tool bar to change the element type.

7.5.5 Tag Operation

The Contact and coil must be connected with tags, otherwise program compilation will fail. There are 2 methods to associate tags with contact or coil: using tag selector or filling the tag name directly.

Tag selector

Double click the contact or coil, and tag selector will pop up, as shown in Figure 7-22.

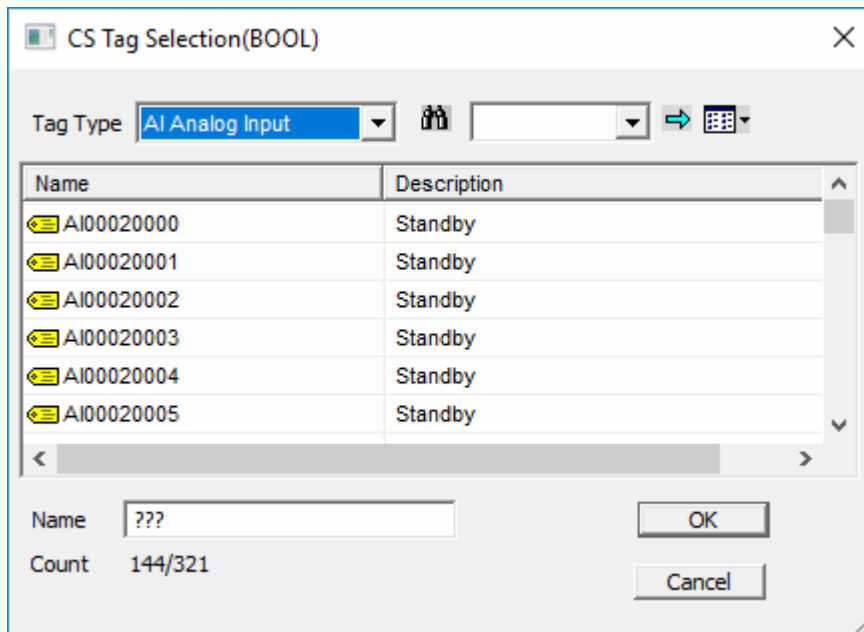


Figure 7-22 Tag selector

Select the required tag in the tag selector, then click "OK" to associate the tag with element in Ladder program.

Tag selector supports the function of search. Input part of tag information (part of strings in tag name or description) to find and locate the tag.



Tip:

The associated tag of contact or coil is BOOL, so the tag selected in the tag selector should be BOOL, otherwise it will prompt "Tag types are inconsistent" and fail to link.

Fill tag name directly

Double click "???" on the top of element (contact or coil) or existing tag name, fill tag name, then press Enter key to input the tag, press ESC key (or click other place) to cancel.

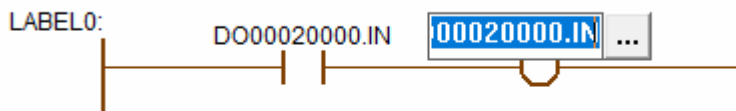


Figure 7-23 fill tag name directly




Tips:

Tags quoted in the ladder diagram can't be deleted from the "tag table", but the name and description can be modified and will be refreshed in certain situation (for example when compiling the program).

7.5.6 Function Block Operation

Add a function block

Select any element except the convergence, then click the icon  on the tool bar, as shown in Figure 7-24.

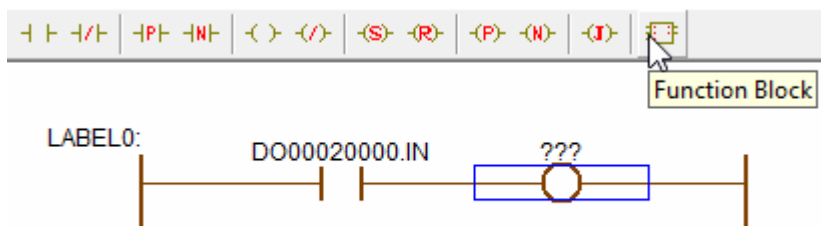


Figure 7-24 Select an element and set it as function block

Window of "Function Block Selection" will pop up, as shown in Figure 7-25

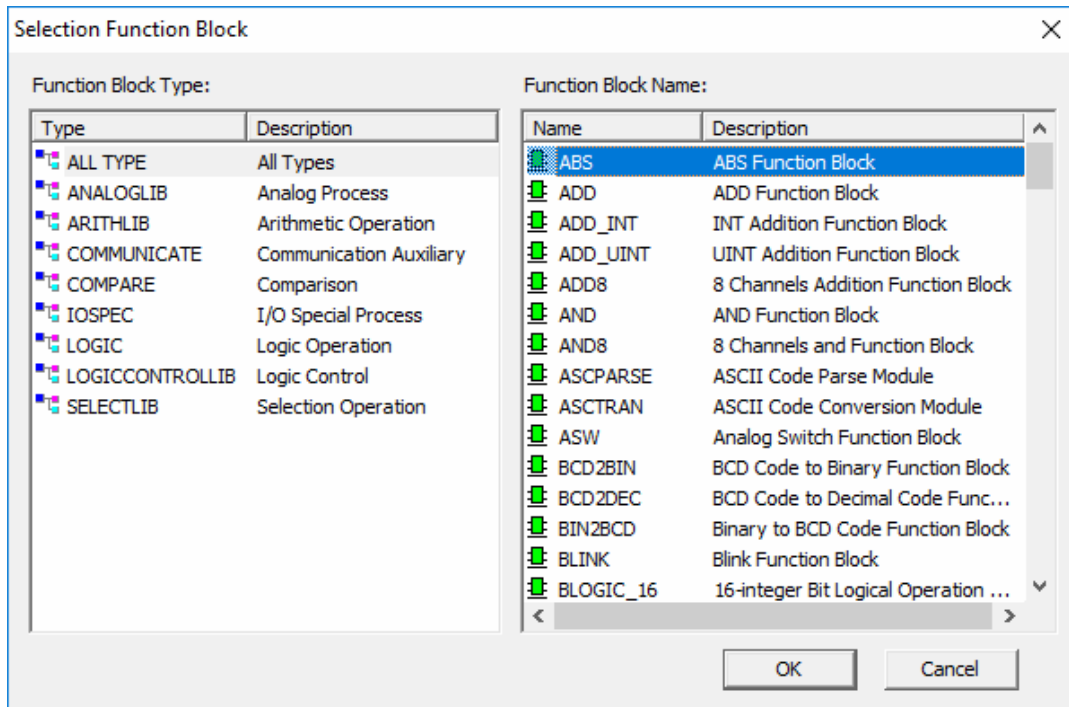


Figure 7-25 “Function Block Selection” interface

In the “Function Block Selection”, select required function block and click "OK" to add a function block, as shown in Figure 7-26.

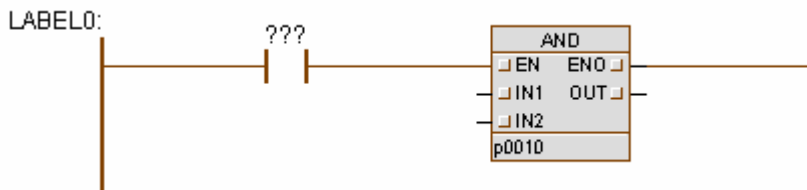


Figure 7-26 Add a function block

Edit the function block

Double click the function block and the interface of “Analog Switch Module Properties Settings” will pop up, as shown in Figure 7-27.

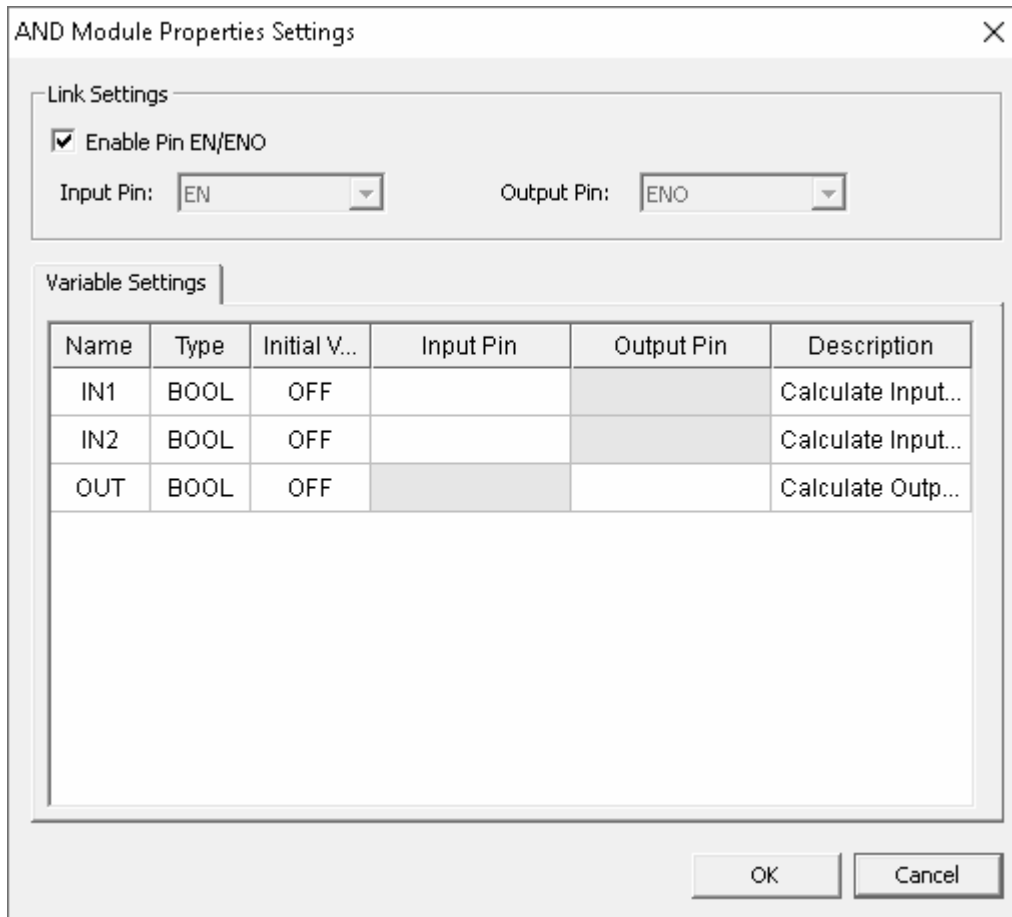


Figure 7-27 Module properties settings interface

Connection settings

Select "Enable Pin EN/ENO", and the function block will be linked to the horizontal line via pins EN and ENO, as shown in Figure 7-28

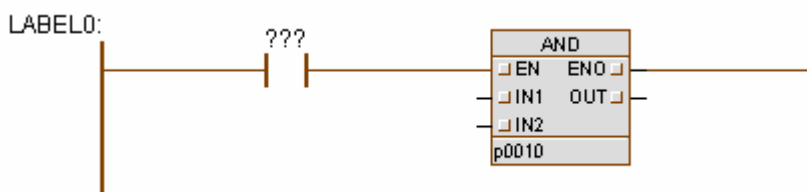


Figure 7-28 Function block linked to the horizontal line via pins EN/ENO

If "Enable Pin EN/ENO" is not selected, "Input Pin" and "Output Pin" are able to be operated, as shown in Figure 7-29. The function block will be linked to the horizontal line via these two I/O pins, as shown in Figure 7-30

AND Module Properties Settings

Link Settings

☐ Enable Pin EN/ENO

Input Pin: Output Pin:

Variable Settings

Name	Type	Initial V...	Input Pin	Output Pin	Description
IN1	BOOL	OFF			Calculate Input...
IN2	BOOL	OFF			Calculate Input...
OUT	BOOL	OFF			Calculate Outp...

OK Cancel

Figure 7-29 Input/Output Pin able to be operated



Tip:

"Link Settings" of some function blocks are unable to be operated.

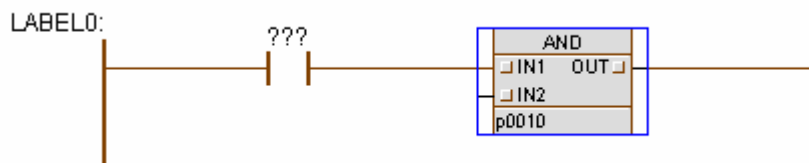


Figure 7-30 Function block linked to the horizontal line via "Input Pin" and "Output Pin"

Variable settings

Name: Name of function block, cannot be modified.

Type: Data type of the function block parameter, cannot be modified.

Initial value: Initial value of the function block parameter, can be modified.

Description: Description of the function block parameter, cannot be modified.

Input pin: Connected to the tag or constant of suitable data type, cannot be set.

Output pin: Connected to the tag of suitable data type, constant is not supported, cannot be set.

There are 3 methods to set the I/O pins of parameter:


1. Double click the pin of function block in the LD editing area, and input tag or constant directly, then press "Enter", or click the button  on the right to select tags in the tag selector, as shown in Figure 7-31.



Figure 7-31 Edit the I/O pins directly

2. Click the I/O pins in the module properties settings interface, pop out the CS Tag Selection dialog box, as shown below.

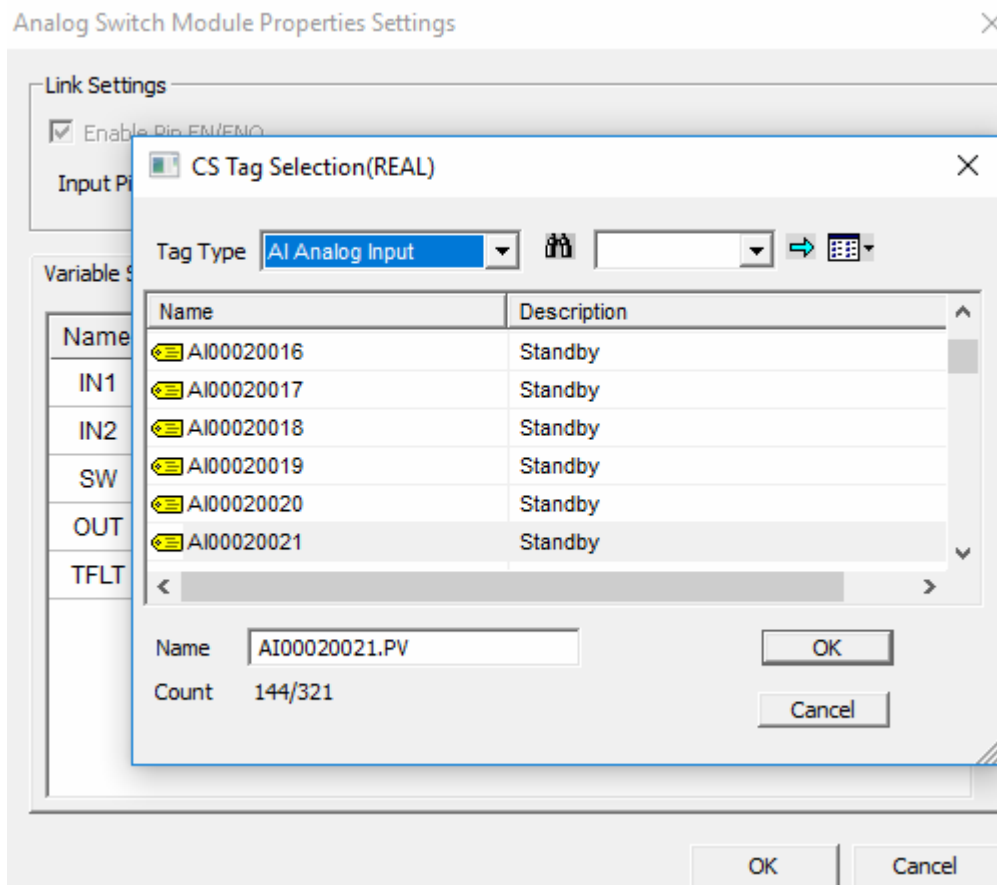


Figure 7-32 Select tags in module properties setting interface

3. Click the I/O pins in the module properties settings interface, and input the tag and constant manually, as shown in Figure 7-33.

Analog Switch Module Properties Settings

Link Settings

☒ Enable Pin EN/ENO

Input Pin: Output Pin:

Variable Settings

Name	Type	Initial V...	Input Pin	Output Pin	Description
IN1	REAL	0.0000	AI00020021.PV		Input 1
IN2	REAL	0.0000			Input 2
SW	BOOL	OFF			Select Switch:...
OUT	REAL	0.0000			Output
TFLT	REAL	0.0000			Filter Coefficient

OK Cancel

Figure 7-33 Input tags in the module properties settings interface manually

For example, set the function block ADD as follows, and the result is shown as follows.

Analog Switch Module Properties Settings

Link Settings

☒ Enable Pin EN/ENO

Input Pin: Output Pin:

Variable Settings

Name	Type	Initial V...	Input Pin	Output Pin	Description
IN1	REAL	0.0000	50		Input 1
IN2	REAL	0.0000	AI00020021.PV		Input 2
SW	BOOL	OFF			Select Switch:...
OUT	REAL	0.0000			Output
TFLT	REAL	0.0000		AI00020004.IN	Filter Coefficient

OK Cancel

Figure 7-34 Addition module properties settings

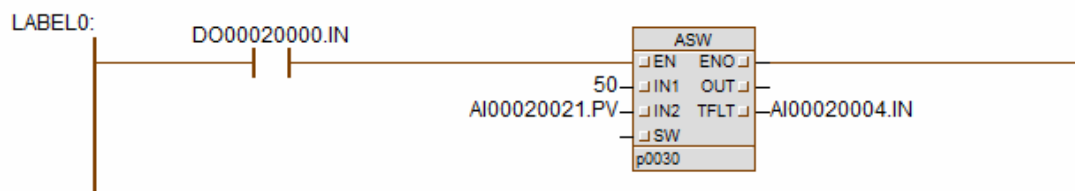


Figure 7-35 Effect of function block ADD properties settings



Tips:

- If the color of I/O pins in the "Variable Settings" is grey, it indicates that setting is unavailable.
- Input pin EN and out pin ENO must be used in pairs. When EN = ON, function block will run; when EN = OFF, function block won't run.
- If there is no BOOL variable in I/O parameters, only EN/ENO can be connected to horizontal line.
- EN/ENO of some function blocks can't be connected to horizontal line, for example the function block TIMER.

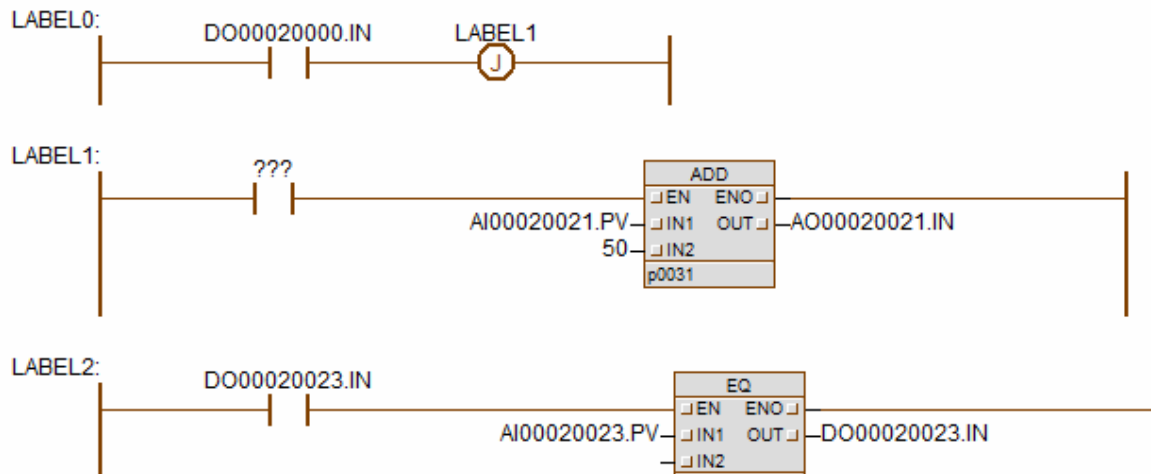


Figure 7-38 Jump coil after being set

In addition, click the "???" of the jump coil and input the designated segment directly, same as input tag name. .




Tip:

One segment can only have one jump, and can only jump downwards.

7.5.8 Find and Replace

Ladder diagram program combines the function of "Find" and "Replace" together, "Replace" can be carried out while searching. Tags and segment descriptions can be searched and replaced.

Click the icon  on the tool bar, the "Find and Replace" dialog box will pop up, as shown in Figure 7-39.

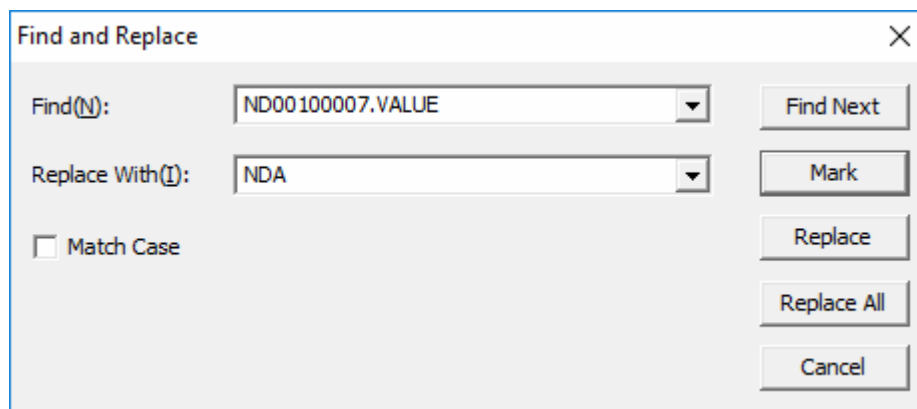


Figure 7-39 Search and Replace


- **Match Case:** Decide whether to distinguish the capital and lowercase when searching.
- **Find Next:** find and locate the first matched element below current selected element;

if there is no element selected, program will be searched from beginning


- **Mark All:** find all matched elements, and display the information in the “Find” page in output window
- **Replace:** replace current selected element with the string in the box "Replace with".
- **Replace All:** replace all the matched strings in the program with the string in the box of "Replace With"

7.5.9 Delete

Delete elements

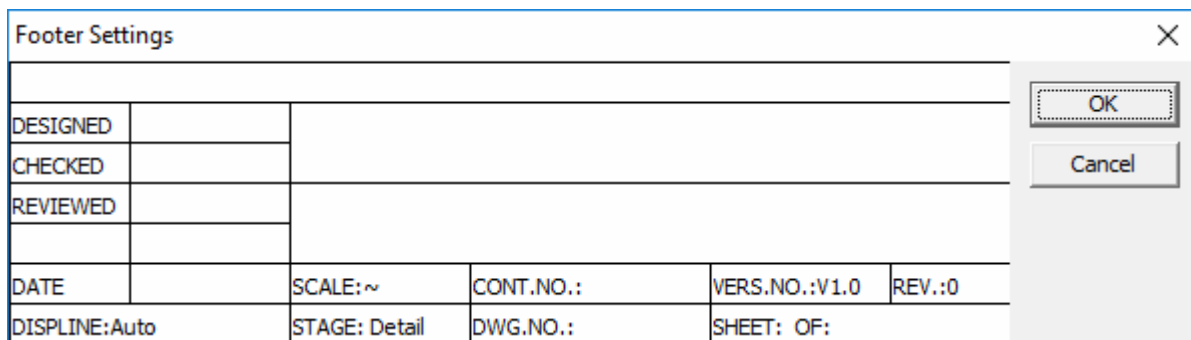
Select a single or multiple elements (using Ctrl key), and click the icon  on tool bar or press the key "Delete" on the keyboard, then the delete confirmation dialog box will pop up, select “Yes” to delete the selected elements and the correlated tag information, segment label and function block.

Delete a segment

Select the left/right convergence, then click the icon  on tool bar or in the menu, the confirmation dialog box will pop up, and select “Yes” to delete selected segment and correlated segment comment.

7.5.10 Print

VFLDBuilder supports the function of general print and print preview. The settings of page and footer print information are also available. Click the menu **File/Print Footer Settings**, and the footer settings interface will pop up, as shown in Figure 7-40.




DESIGNER							
CHECKED							
REVIEWED							
DATE							
SCALE:~		CONT.NO.:		VERS.NO.:V1.0		REV.:0	
DISPLINE:Auto		STAGE: Detail		DWG.NO.:		SHEET: OF:	

Figure 7-40 Footer Settings

In footer settings interface, detailed information including program name, designer, checker, version information etc. can be set. Click one item to set the details, and click "OK" to complete setting. Printed footer is same as set.

7.6 Save and Compile

Click the icon  or menu **File/Save** to save current program.

Click the icon  or menu **Debug/Compile** to compile the current program, and the result will be displayed in output window when compiled successfully, as shown in Figure 7-41

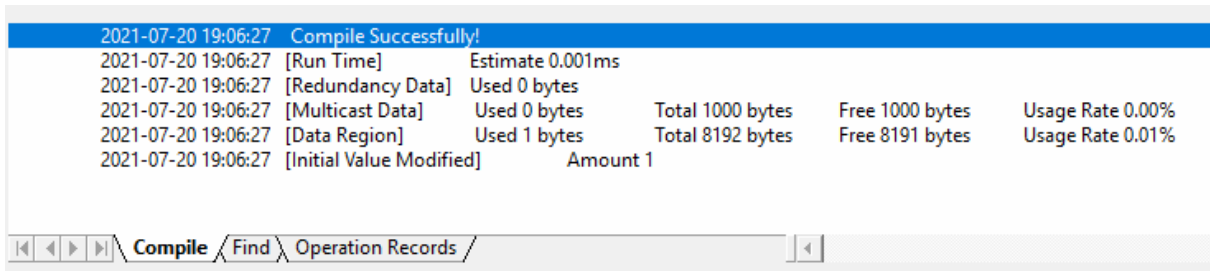


Figure 7-41 Compile success information

Output window will display compile failure information if compilation fails. Double click the error information to locate the error in program.

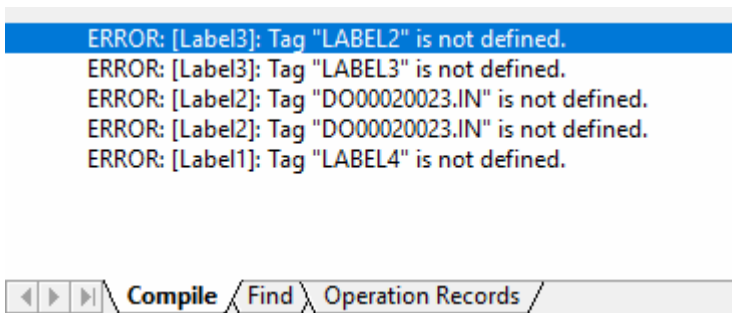


Figure 7-42 compile failure information

For more detailed compilation information, refer to the appendix.




Attention:

Logic error with correct syntax cannot be detected, for example, TIMER won't run because of being jumped.

7.7 Online Debug

Ladder diagram program can be downloaded into controller by VFExplorer after being completed and compiled successfully. Open Ladder program to implement online debug.

7.7.1 Online

Click the icon "Online"  on the tool bar or select menu **Debug/Online** to implement online connection. Three situations may appear after connection


- Connected successfully: no prompt; relevant information of program including running status and running time will be displayed in the title bar.

- Program need download: program is not downloaded after being modified, thus cannot be connected.
- Failed to connect controller: Normally caused by failing to communicate with controller.

7.7.2 Debug

Program debugging

The real-time data of variables and parameters will be marked by different color in program debugging, making it convenient for observation. The colors are set in “Common Default Settings” of VFSysBuilder (including colors of contact and coil when ON or OFF and circuit when open or connected); Analog value is displayed in blue.

In online state, click the icon  on the tool bar or menu **Debug/ Program Debug**, and the program will enter program debugging status.

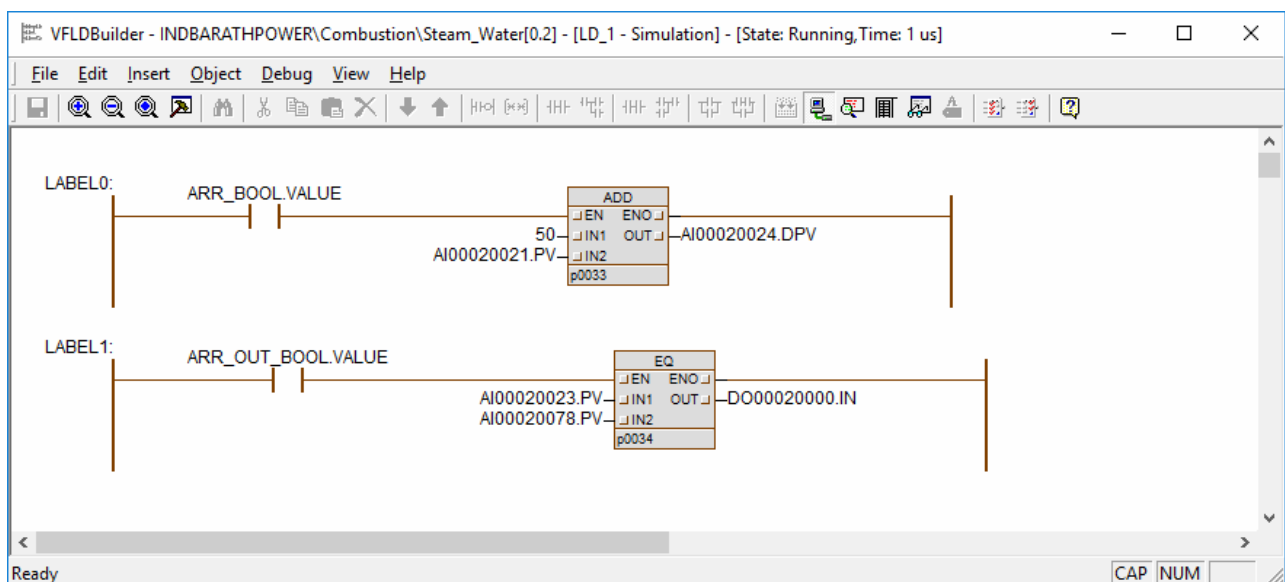
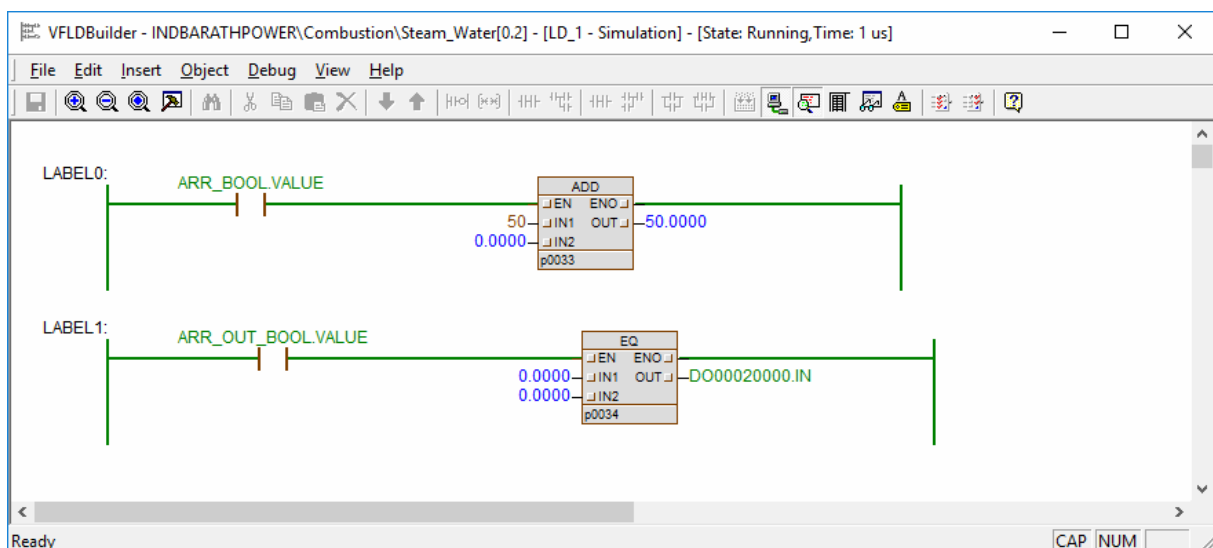


Figure 7-43 Connected successfully before program debugging



Unforce status modification window will pop up, as shown in Figure 7-47

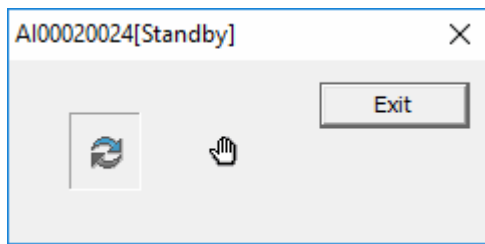



Figure 7-47 Modify Force/ Unforce status of the tag

Click  to set the tag in force status.




Tip:

When variable debugging window is not displayed, double click contact or coil in online state, meanwhile, add the linked tag to variable debugging window.

Function block debugging

Real-time value of function block parameters can be supervised or modified in function block debugging status.

In online state, click  on the tool bar or menu **Debug/Function Block Debug**, the function block debugging window will pop up. Real-time information of the selected function block's inner parameters will be displayed in function block debugging window. Double click the column "Real-time Value") to modify the real-time value of parameter requires modification. P.S.: The real-time value of input/output pins can't be modified here if they are connected to tags (modified in variable debugging window.)

Function Block Parameter Table			
Name	Type	Real-time Value	Description
IN1	REAL	50.0000	Calculate Input...
IN2	REAL	0.0000	Calculate Input...
OUT	REAL	50.0000	Calculate Outp...
K1	REAL	1.0000	Input 1 Offset C...
K2	REAL	1.0000	Input 2 Offset C...
C1	REAL	0.0000	Input 1 Offset
C2	REAL	0.0000	Input 2 Offset

Figure 7-48 Modify function block parameters



Tip:

When function block debugging window is not displayed, double click the function block in online state.

7.8 Locate Output

Double click the output information of “Compile”, “Find” and “Operation Records” in output window to locate relevant elements

1. Error information of compilation is shown in appendix.
2. “Find” page in output window displays searched and labeled information, double click a specific line to locate the place of searched and labeled information. Detailed searching and locating information is shown in appendix.
3. In LD programming process, some specific operations such as “Add”, “Delete”, “Modify” to elements will be recorded and displayed in the “record” page in output window, making it convenient for user to find, track and locate. Double click a specific information line to locate relevant place of the recorded operation. Operation record information is shown in appendix.

7.9 Export/Import

System provides import and export functions for program reuse and backup. Completed program can be exported, and exported program can be imported.

Export

Click menu **File/Export**, dialog box of export will pop up.

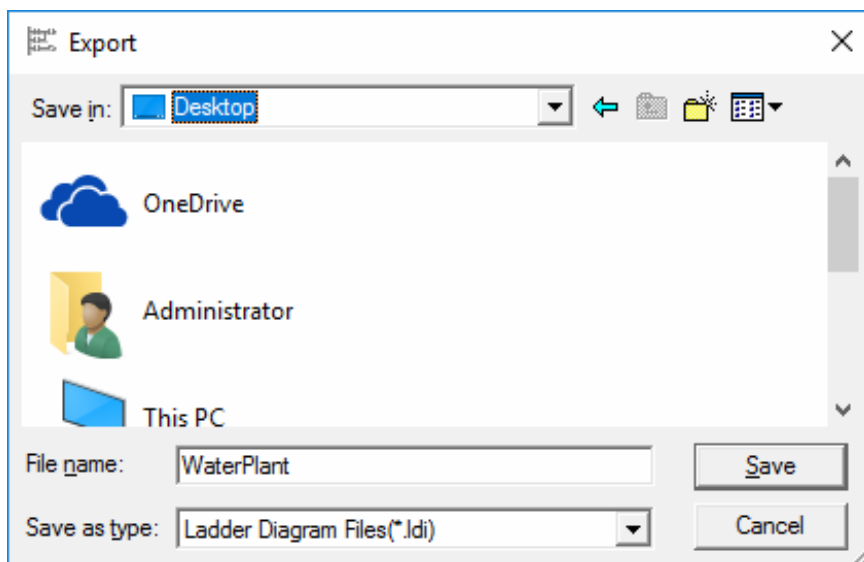


Figure 7-49 Dialog box of exported file saving path

Select saving path, input correct file name and click “Save” to save current program as ladder diagram file.

Import

Click menu **File/Import**, and the dialog box of imported file selection will pop up.

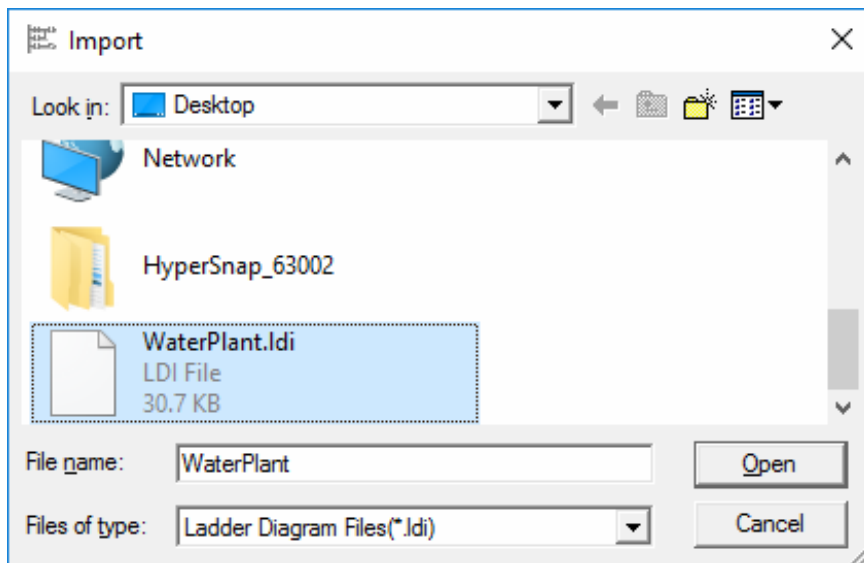


Figure 7-50 Dialog box of imported file selection

Select a ladder diagram file, click "Open" and an import confirmation prompt will pop up. Click "OK" to import existing ladder diagram file.

Section 8 Appendix

Table 8-1 Compile information and processing method

Description	Processing method	Double click to locate element
Error:[Label%d]: Segment label "XXX" is invalid	Check if label of segment linked to jump coil exists	Correlated jump coil
Error:[Label%d]:Tag "XX X" is write-protect.	Check if there is any DI tag assignment among tags linked to coil or function block	Correlated coil or function block
Error:[Label%d]: "XXX" data type doesn't match.	Check if type of tags linked to contacts or coils is BOOL	Correlated contact or coil
Error:[Label%d]:Tag "XX X" is not defined	Check if linked tag of related element doesn't exist	Correlated element
Error: [Label%d]: "XXX" is not tag	Check if linked tag of related element doesn't exist	Correlated contact or coil
Error:[Label%d]:"%s" is not legal constant	Check if parameters of related function block is legal	Correlated function block
Error:[Label%d]: "XXX" data type doesn't match	Check if type of tags linked to relevant parameter of related function block matches parameter type	Correlated function block
Create redundant list failed!	Delete some function blocks with redundant data.	NO
Create multicast list failed!	Delete some function blocks with multicast data.	NO
Load C2BIN.dll failed!	Reinstall system software	NO
C2BIN initialization failed!	Reinstall system software	NO
C2BIN initializing ArmGCCProgCmdLine.cfg failed!	Reinstall system software	NO
Obtain C2BIN compile interface failed!	Reinstall system software	NO
Compile ladder diagram to C code failed!	Check if configuration path is correct or reinstall system software	NO
Compile successfully!	NO	NO
[Runtime].....	NO	NO
[Redundant data].....	NO	NO
[Multicast data].....	NO	NO
[Code area].....	NO	NO
[Data area].....	NO	NO
[Initial value update].....	NO	NO

Table 8-2 Find information

Description	Locate element
Looking for "XXX"	NO
[Lable XXX]: Contact type tag name XXX	Locate the contact

Description	Locate element
[Lable XXX]: Coil type (Non-jump coil) tag name XXX	Locate the coil
[Lable XXX]: Jump coil segment name XXX	Locate the jump coil
[Label XXX]: function block pin XXX	Locate the function block
Find XXX items in total	NO
Can't find "XXX".	NO

Table 8-3 Operation record information

Operation	Description	Locate element
Add New Segment	Add a new segment in segment [Label XXX].	Left convergence of the segment
	Exceed XXX elements limit of the segment, and adding new element failed!	
	Add new segment [Label%d].	
	Reach canvas limit!	NO
Insert A New Element to the Left	Insert element to the left of the segment [Label XXX].	the new inserted element
	Exceed XXX elements limit of the segment, and insert element to the left failed!	NO
Insert A New Element to the Right	Insert element in the right of the segment [Label XXX].	the new inserted element
	Exceed XXX elements limit of the segment, and insert element to the right failed!	NO
Insert A New Element below	Insert element below the segment [Label XXX].	the new inserted element
	Exceed XXX elements limit of the segment, and insert element below failed!	NO
	Reach canvas limit!	NO
Change element type	Element in segment [Label XXX] is changed from "XXX" to "XXX".	the selected element
	Function block memory is full and can't add function block!	NO
	Can't obtain function block label!	NO
	Reach canvas limit!	NO
	One segment can only have one jump coil!	NO
	Transition contact and transition coil memory is full and can't add transition contact or transition coil!	NO
Delete element	Delete element in segment [Label XXX].	NO
Delete segment	Delete: segment [Label XXX].	NO
Cut segment	Cut: segment [Labe XXX] [].	NO
Copy segment	Copy: segment [Label XXX] [].	Locate the copied segment

Operation	Description	Locate element
Paste segment	Paste: segment [Label XXX]. Paste: segment [Label XXX] is replaced by segment [Label XXX].	Locate the pasted segment
Modify tag linked to element	Tag linked to element in the segment [Label XXX] is modified from "XXX" to "XXX".	the element
Editing function block	Input/output connection of parameter XXX of function block XXX in segment [Label XXX] is canceled.	The function block
	Initial value of parameter XXX of function block XXX in segment [Label XXX] is modified from "XXX" to "XXX".	
	Input pin of parameter XXX of function block XXX in segment [Label XXX] is modified from "XXX" to "XXX".	
	Output pin of parameter XXX of function block XXX in segment [Label XXX] is modified from "XXX" to "XXX".	
	Parameter XXX of function block XXX in segment [Label XXX] is set as Input/output connection.	
Insert/Modify annotation	Comment of segment [Label XXX] is modified.	left convergence of the segment

Section 9 Revision

Table 9-1 Retrofit list of the version

Document Version	Applicable Product Version	Remarks
V1.0 (20230301)	OMC High-performanceHMI V4.70.00.00	First release
V1.1 (20230830)	OMC High-performanceHMI V5.10.00.00-M	Updated screenshots.