PLC Programmable Logic Controller

User Manual

Preface

This is the book introducing Flexem PLC basic function usage manual.
It is specially made for the electric engineer with some base, and the must reference book of Flexem PLC and Flexlogic. From Flexem PLC basic products,Flexlogic basic ideas and operation, it introduces Flexlogic software usage, PLC program writing, and how to use Flexlogic software to write programs and used in automation controlling devices nimbly. It is very suitable for our PLC reference book and especially good for electric engineers.

Safety Notice

Please read this manual and other user manuals before making PLC installation, running, maintenance. Please use it after knowing the operation method, safety info and all notice.

1. Design Notice

A. Please be sure to design safe electricity before using to ensure the controlling system can be work safely after external power off or PLC faculty.

B. The module probably will get fire when loading electricity is overburden or load short circuit leads to long-time over electricity. You need design safety wire or circuit break installation devices.

C. Please you must set emergency braking circuit, protection circuit, forward and reverse operation interlock circuit, and position upper limit and lower limit interlock switch to prevent machines breakage.

D. Please design external protection circuit and safety institute for heavy accidents output signal to enable devices running safely

E. Programmable PLC CPU may lead to all output closing when it tests the system abnormally.

It may lead to output is out of controlling when the controller is with electricity faculty. And you need design external controlling circuit to ensure the devices running normally.

F. When the output module such as PLC relay and transistors breaks, then the output will not be ON or OFF status.

G. PLC design is applicable to indoor electricity environment, and the power system shall be with anti-lightening protection devices. And make sure the lightening voltage not to the

power source input ports or signal input ports of the PLC to avoid breaking the devices.

2. Installation and Wiring Notice

A. Please do not use PLC under following cases: dust, oil, conductive dust, corrosive gas, flammable gas, high-temperature, dew and rain, vibration and lashing occasion. Electricity shock, fire and mis-handling will also lead to products breakage.

B. Only the professional engineers who ever got electricity devices training with rich knowledgeable electricity experience can install this product.

C. PLC is open devices, and please be sure to install in the cabinet with the locks, only the operator who got the electricity devices training with rich electricity can open and install the cabinet.

D. Please be sure to disconnect all the external power before operating the module dismantling and concerned wiring work. Otherwise it may lead to module faculty, devices mishandling and electric shock.

E. You need cover the terminal of the products well after wiring work finished and before connecting power. The cable terminals shall be with isolation protection, and be sure there is enough distance between different cables installing to the terminals, otherwise it may lead to an electric shock or devices breakage.

F. Do not let the metal dices and wire dices fall into the ventilation of the controller when doing screws holes processing and wiring, which may lead fire, faculty or mishandling. Installation and wiring must be stable, and the bad contact may cause mishandling. The devices external wiring specification and installation shall comply with the local wiring specification requirement. Please check the wiring in this manual.

G.The module top is with the label of preventing abnormal articles, and it prevents wrings into the module. Please do not remove the label during wiring. But please remove the label in order for fine heat disperse before system running.

H. Enough size of cables can be used for grounding for the devices in order to guarantee devices and operation engineers' safety. Please check the wiring chapter in this manual.

I. Please do not bundle the controlling cables, communication cables, and main electricity cables.Lines shall be at least 100mm, otherwise noise may cause mishandling.

J. Please select shielded cable during high frequency signal input or output during heavy disturbing application fields to improve system anti-interface capability.

3. Notice of Starting and Maintenance

A. Only those professional maintenance people with enough electricity knowledge who get electricity devices training can do the products running maintenance.

B. Please do not touch the drill, otherwise it may cause mishandling or electricity shortage.

C. Please you must disconnect all the external power supply switches when clearing the module or re-fix the screw terminals in the terminals line.

D. You must disconnect all external supplying power source during modules dismantling, communication line connecting or dismantling. Otherwise it may lead to electricity shortage and mishandling etc.

E. Please read carefully the user manual before doing the operation of online modification n, force output, RUN, STOP. And please make concerned operation after confirming the safety.Please treat the waste products as industrial waste.

Catalogue

1.PLC Introduction

PLC(Programmable Logic Controller) is one digital calculation and operation system especially made and designed for industrial using.
It mainly read the external input signal such as button, sensor, switch and pulse wave status, then execute logic, order, timing and calculation with micro-processer according to those input signal status or number according to the pre-writen software stored, to generate correspondent output signal such as relay switches, mechanic devices operation control. You can edit/modify program and monitor devices status, to maintain on-site program and machine testing adjustment.

1.1 Basic Control Principles

1.1.1 PLC Working Principle

PLC uses circulation scanning way including input signal scanning, user program execution,output signal refresh, internal processing and communication processing.
You can use programming software writing the control logic between input ports and output ports and download those to PLC before running PLC.You can first scan input port signal to read it to the PLC and finish calculation and logic process according to the control program. Calculation and logic process results will change the output value, and change the value of the output points into electricity signal output and control various mechanic devices running.
Cycle scanning working mode is used in PLC running process, you can collect controlling and operate the devices through continuous execution of input points cycling, user program execution, output points refreshing to collect control and operate the devices.

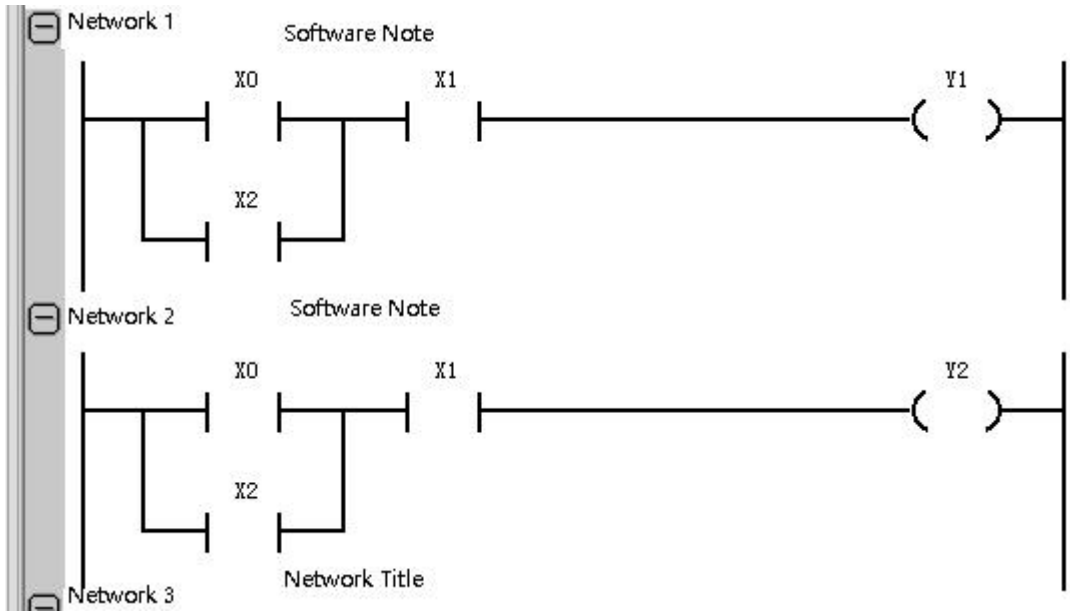
1.1.2User Program Control Principal

The input counts of the PLC are called contacts in the user program,the functions of the contacts are same as the switch contacts , and it represents conduction or shutoff.
In the PLC, input storage is one soft components,when the input point is high electric level, the correspondent soft components are conducting state, and they join logic calculation and influence output value in the user program.Output points are called line circle, and it represents output conduction or shutoff. The soft components correspondent to the output points are decided by input points and logic calculation controlling results. During refreshing output, the soft components value is changed to electricity signal into the output points transistors or relay output, then further to finish the control of the devices.

1.2Programming Language

The software supports ladder programming language.
The programming method of the ladder in the PLC is one designing method of electricity principle design according to the relay control system. The components used in the design

such as button X, middle relay M, time relay T, counter C, contactor are similar as timer's electric components.



1-1

As indicated in 1-1, the execution order is calculated step by step by user program network. "Network" is one group of components of related line, please refer to the 2 network as above. Execute calculation starts from 1st network, then further to 2nd, 3rd,…until to the last network. Calculation to each network from left to right, step by step make components" Contractor" status logic calculation, until to the right side output to components "line circle",or make a choice to decide whether execute one operation according to logic.

As indicated in 1-1, the executing logic to each network: first load input point X0 value as current value, then load input point X2 value, make X2 value and current value calculation, the calculation result became current value, then load X1 value and calculate the current value, the calculation result will control the output point Y0 can be energy flow conduction at the end.

2.Products Specifications

2.1 Products Specifications

FL3 - 32 M R - AC
(1) (2) (3) (4) (5)

No	Item	Illustrations
(1)	Products	FL3: Flexem L3 series PLC
(2)	IO points	20:20 points 24:24 points32:32 points 40:40points.....

（3）	Module Type	M： Main Machine Blank: Expanding Module
（4）	Output Type	R: Relay Output； T:Transistor NPN Output
（5）	Working Voltage	AC:220V working voltage

2.2 Products Model List and Basic Info

Type	Model	Products Info
Main PLC	FL3-20MR-AC	20 point main machine： 12DI （including 2-point 100KHz high speed input），8DO(relay), Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-20MT-AC	20 point main machine： 12DI （including 2-point 100KHz high speed input),8DO(transistor,Including 2-point 100KHzhigh speed pulse output); Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports network communication expanding, 8digital/analog/temperature module Expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-24MR-AC	24 point main machine： 12DI （including 2-point 100KHz high speed input）， 12DO(relay)； Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding,8-digital/analog/temperature module Expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-24MT-AC	24 point main machine： 12DI （including 2-point 100KHz high speed input）， 12DO(transistor， including 2-point 100KHz high speed input); Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-32MR-AC	32 point main machine： 16DI （including 2-point 100KHz high speed input),16DO(relay),Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 1 BD board expanding, 220VAC working voltage.

	FL3-32MT-AC	32 point main machine：16DI（including 2-point 100KHz high speed input),16DO(transistor，including 2-point 100KHz high speed input); Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-40MR-AC	40 point main machine：24DI（including 2-point 100KHz high speed input),16DO(relay),Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 2 BD board expanding, 220VAC working voltage.
	FL3-40MT-AC	40 point main machine:24DI（including 2-point 100KHz high speed input),16DO(transistor,including 2-point 100KHz high speed input); Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module expanding, 1 BD board expanding, 220VAC working voltage.
	FL3-48MR-AC	48 point main machine：24DI（including 2-point 100KHz high speed input），24DO(relay), Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 2 BD board expanding, 220VAC working voltage.
	FL3-48MT-AC	48 point main machine:24DI（including 2-point 100KHz high speed input),24DO(transistor,including 2-point 100KHz high speed input); Standard USB programming port, 2 serial ports, 1 Ethernet port, It supports IOT communication expanding, 8 digital/analog/temperature module Expanding, 2 BD board expanding, 220VAC working voltage.
IOT Module	FL3-4G	FL3 series 4G IOT module, left expanding
	FL3-2G	FL3 series 2G IOT module, left expanding
	FL3-WiFi	FL3 series wifi IOT module, left expanding
	FL3-NET	FL3 series Ethernet IOT module, left expanding
Digital Module	FL3-0800	8 counts Input, right expanding
	FL3-0008T	8 transistor output, right expanding
	FL3-0008R	8 relay output,right expanding

	FL3-0404T	4 counts input, 4 transistor output, right expanding
Analog Module	FL3-2AD2DA	2 AI input,2 AI output, right expanding
	FL3-4AD	4 AI input, right expanding
Temperature Module	FL3-4PT	4 thermal resistance input temperature module,right expanding
	FL3-4TC	4 thermal couple input temperature module,right expanding
Analog Board	FL3-2AD-BD	2 AI input, BD slot installed into the PLC
	FL3-2AD-BD	2 AO input, BD slot installed into the PLC

2.3 Parameters

Model		FL3-20MT-AC	FL3-24MT-AC	FL3-32MT-AC	FL3-40MT-AC	FL3-48MT-AC
Input		12 Counts	12 Counts	16 Counts	24 Counts	24 Counts
Output		8 Counts	12 Counts	16 Counts	16 Counts	24 Counts
High-speed Counting		2 count 100KHz				
High-Speed Pulse	Transistor	2 count 100KHz				
Expand	IO Expand Module	Max 8 Sets				
	BD Expand Board	1 set			2 sets	
	IOT Communication Board	1 set（ optional FL3-2G/4G/WiFi/NET module）				
Communication Ports	Micro USB	It supports upload and download, online monitoring.				
	RS232/RS485	2sets，RS232/485 optional，serial ports communication，Baud rate：4800~921600Bps				
	Ethernet	1 set，Modbus Tcp Slave				
Calendar		Optional			Built-in	
Wiring Structure		Dismantle terminal platform				
Power Supply	Power Consume	32W	33.0W	34.2 W	36W	38W
	Voltage	AC85~264V,(z), with over voltage protection				
DC24V output		24V,±8%,Max500mA , with over current protection				
Instant power shortage permit		Within 100ms				

Withstand voltage test	L,N terminal grounding terminals 1500VAC, 1 minute	
Noise immunity	1500Vp-p，pulse width 1μS	
Anti-vibration	5~13.2Hz Amplitude 7mm，13Hz~100Hz accelerating 2G， X,Y,Z 3-axis 20 times	
Shockproof	Semi sinusoid, accelerating 15G, continuous 11ms, X,Y,Z 3-axis 6 times.	
Corrosion-proof	Three-proofing wet film spraying thickness ≥20μm	
CE Certificate	Confirm to EN61131-2:2007 standard	
Environment Temperature	Working temperature：-10℃~60℃ Storage temperature：-20℃~70℃	
Environment Humidity	5%~95%(non-condensate)	
Altitude	≤2000m	
Radiation Way	Natural Cooling	
Mechanic Structure	Engineering Plastics	
Dimension （WXHXD)	125mm ×90mm × 83mm	172mm ×90mm × 83mm
Edit Software	FlexLogic	

Note:
FL3-20MT-AC,FL3-24MT-AC,FL3-32MT-AC,FL3-40MT-AC,FL3-48MT-AC means transistor output and above is parameters of transistor output parameters.
FL3-20MR-AC,FL3-24MR-AC,FL3-32MR-AC,FL3-40MR-AC,FL3-48MR-AC means relay output.

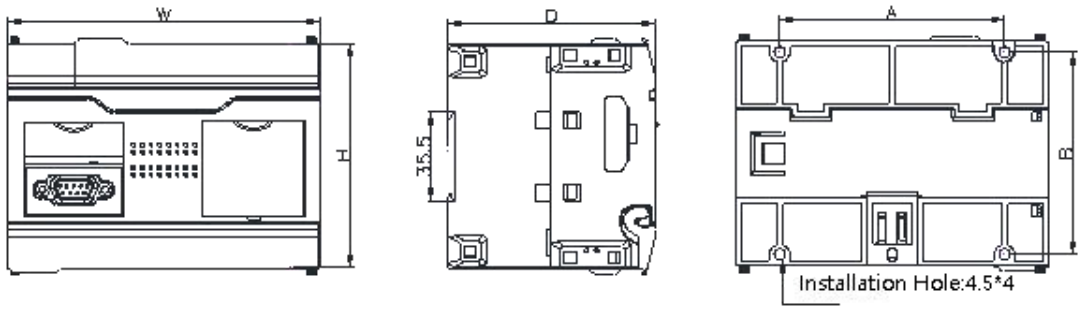
2.4 General Specifications

Item		FL3 Series
Program Execution Way		Circle Cycling, Interrupt command, sequence program control
Input Output Control		Refresh
Programming		Ladder, standard C, combined using
CPU		ARM 32-bit Cortex M3
User Program Capacity		150KB
Power Failure Holding Capacity		2K Bytes
Scanning Time		Empty Program< 1ms
Command Type	Basic Control/Step Ladder Graphic	Order Control 17 items/step ladder control 2 items
	Application Command	Application Command: 260 items
Calculation Execution Speed		Basic Command 0.1μs/function Command （ON status 5μs/OFF status 0.5μs）
Input/Output Counts	Expand DI Input Counts	X0~X370 8 Decimal number ,256 counts
	Expand DO Output Counts	Y0~Y370 8 Decimal number ,256 counts
	Expand AI Input Counts	AI0~AI255 8 Decimal number ,256 counts
	Expand AO Output Counts	AO0~AQ255 8 Decimal number ,256 counts
Auxiliary relay	General Using	M0-M2047， 2048 Count， software can set power shortage protection and 1 system defaults M500-M1023
	Specific Using	SM000~SM511， 512 counts
Status Relay S		S0-S999, 1000 counts software can set power shortage range 1 system default S500-S999
Timer T	100ms	T0~T199 200 counts(timer 0.1~3276.7S) of T192~T199 is Cumulative T250~T255 6 counts (timer 0.1~3276.7S) electricity shortage holding
	10ms	T200~T245 46 counts （timer: 0.01~327.67 S）
	1ms	T246~T249 4 counts （timer:0.001~32.767 S), electricity shortage holding
Counter C	16Bit	200 counts,C0~C199 ,of C100~C199 defaults electricity shortage holding （software can be set）

	32Bit	56 counts，C200~C255，of C220~C255 defaults electricity shortage holding （software can be set）
Data Register D	General Using	D0~D4095 (4096 counts) software can set electricity shortage holding area(the systems defaults 0200-0511 (312 counts）
	Specific Using	SD0~D511 (512 counts)
Indicator	Data V0,Z0	V0~V7 (8 counts),Z0~Z7 (8 counts)
	LBL,CJ Instruction Branch	L0~L127 total 127 counts
	CALL Instruction Subprogram	P0~P127 total 127 counts
	Input Interrupt I	I0~I 11 total 12 counts
	Timer Interrupt I	I16~I18 total 3 counts
Constant	10-bit Constant （K）	16-bit:-32767-32768 ~ 32767； 32-bit-2,47,483,648 ~ 2,147,483,647
	16-bit Constant （H）	16-bit 0000 ~ FFFF； 32-bit:-0000,0000 ~ FFFF,FFFF
	32-bit floating Counts （F）	It is mainly used for pointed application command operation values.
Program Downloading		USB port/serial port/Ethernet Port/IOT Transmission
Storage Temperature （℃）		-20℃~70℃
Work Temperature （℃）		-10℃~60℃
Environment Humidity(%)		5%~95%（non-condensate）
Altitude		≤2000m
Heat-dissipating		Natural Cooling
Input Voltage		AC85~264V
Power Frequency		50~60（Hz）
24V Input		24V,±8%，Max500mA
Power Protection		Isolated power source input, lightening and surging protect
Instant Power Down Permission		Within 100mS
Components		95% components are importing with good quality
CE&RoHS		Confirms to EN61000-6-2;2005,EN6100-6-4:2007 standard，RoHS,Lightening±1KV，Group Pulse±2KV；Static Contact: 4KV,Air Discharge: 8KV

3.Mechanic Design Reference

3.1 Installation Size



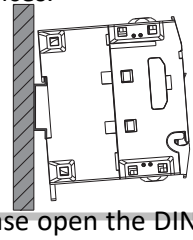
Size:

Model	Counts	Slide-way(mm)	Screw Installation Size		Dimension
			A(mm)	B(mm)	W x H x D(mm)
FL3-20MT(R)-AC	20	35	90m	81	125mm×90mm×83mm
FL3-24MT(R)-AC	24				
FL3-32MT(R)-AC	32				
FL3-40MT(R)-AC	40		137m	81	172mm×90mm×83mm
FL3-48MT(R)-AC	48				

3.2 Installation Location

- Do not dismantle anti-foreign matter paper during installation, and try to avoid foreign matters falling into the machine during installation to cause faculty and short circuit. Please you must dismantle anti-foreign matter paper after installation before getting electricity, to avoid faculty caused by machine over-heating.
- Please use normal wall-mounted installation to avoid machine inside temperature too hot, please left at least 300mm space above and below as heat dissipation space.
- PLC main machine and other devices or obstacles left at least 50mm space, and please try to keep distance from drive devices, high frequency high voltage devices.

3.3 Installation Method



- The products mainly use DIN rail installation or M4 screw direct wall-mounted installation. Below is each module's installation ways.

Main Machine DIN Slideway（DIN46277,width 35mm）Installation

1) DIN Slideway is fixed to the installation board inside the cabinet and please open the DIN clapper at the bottom of the module.

2) Please stuck the module slot onto the DIN slide-way.

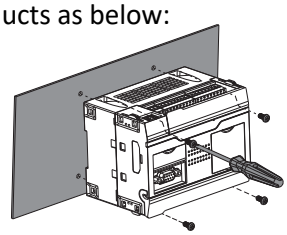
3) Rotate the module to the DIN slide-way, and close DIN clapper.

4) Check carefully DIN clapper whether fixed to the slide-way.

Note: When CPU using environment vibration is large or vertical installation, using DIN slide-way blocker maybe helpful to ensure modules keeping connection status.

Main PLC Wall-mounted Installation

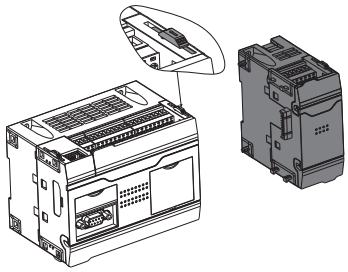
Please fix the products into the installation level in the cabinet by using M4 screws to go through the 4 holes onto the products as below:



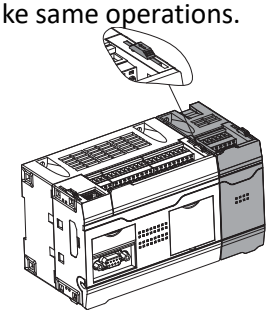
Left (Right) Expanding Module Installation

(1) Please unlock the main machine's left(right) side locks as indicated in the photos, then aim the main machine connection to the expanding module, lock the expanding module by pushing lock reversely.

(2) Add expansion IO module after expanding module, and make same operations.



Unlock Expansion IO Module



Lock Expansion Module

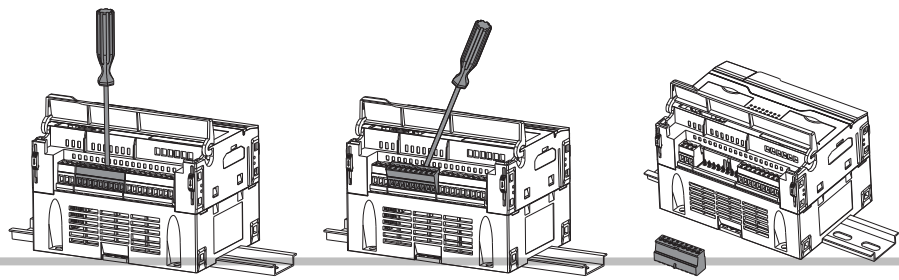
Dismantle Terminal Block Connectors

(1) Disconnect system and main machine power to ensure main unit, devices and power source disconnect, then open the cover of the connector.

(2) Check the top of the connectors and find the slot which can insert screwdrivers blades, pry up the connectors top and separate it from CPU. Connectors will be separated from the clamping position. Catch the connectors and dismantle connectors from CPU.

(3) Insert the screwdriver into the card slot, pry up connectors top to separate from CPU. The connectors will be separated from the clamping position.

(4) Catch the connectors and dismantle them from CPU.



Install Terminals Connectors

(1) Disconnect the system and main machine power to ensure the main machine, devices and power are disconnected, then open the cover of the connector.

(2) Align the connectors and the pins in the machine.

(3) Align the connectors wiring edge to the inner side of connectors seat edge.

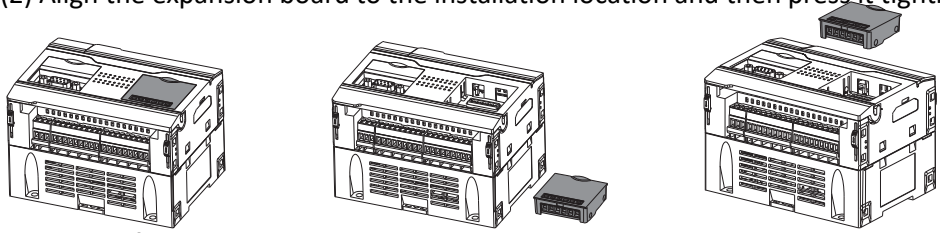
(4) Press and rotate the connectors until to clip into right place.

Note: Check carefully and ensure connectors align correctly and completely connected.

BD Expanding Module Installation

(1) Open the cover by screw or hand as indicated in the right photo.

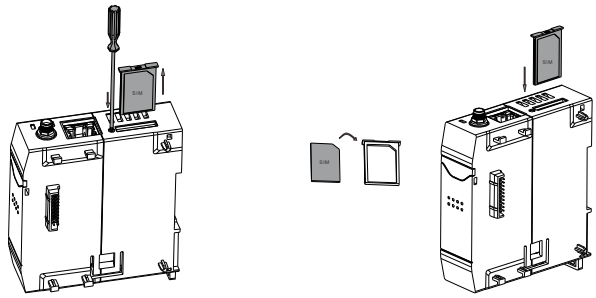
(2) Align the expansion board to the installation location and then press it tightly.



SIM Card of FL3-4G Installation

(1) Press the dot SIM card slot by screw or other sharp objects, then take out SIM card catto.

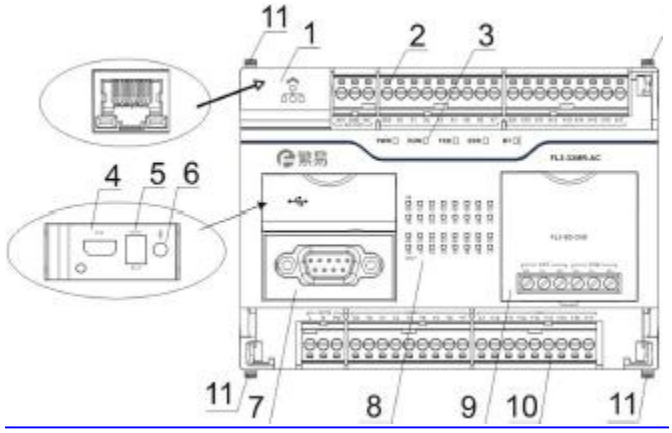
(2) Insert SIM card into the catto, then insert SIM card into card slot.



4.Electric Design Reference

The list is FL3 programmable controller main module input and output terminals setting. Although this programmable controller output format is with relay output and transistor output, the terminals setting are same.

4.1 Products Components



Each component name and function are as below:

1. Ethernet ports(as slave ports): Ethernet port communication connection.

2. Input power(24V),input signal dismantle terminals strip， X-point input signal connection terminal strips. 220V power input terminal,Y-point output signal connection terminal strips.

3. Running status indication light：

1） PWR： power indication light

2） RUN： running indication light （it will be on always during normal running）

3) TXD： serial ports communication indication light （it will be always lightening during normal running）

4） ERR: error indication light

ERR light not on: module normal working.

ERR light blinks: module is not authorized and it needs to be returned to factory for maintanance

ERR light on always: module is with serious application mistakes, it needs to do program initialization or update the firmware, if the problem is not solved, you need return it to factory for maintenance

5） BT: Blue-tooth indication light(in reserve)

4. System Micro USB downloading port: user program downloading port

5. RUN/STOP Switches: dial below means entering “RUN”, dial above means “STOP”.

6. Bluetooth Pairing Switches:

7. Serial Communication PORT 1/PORT 2, RS232/RS485 can be set select able by software.

8. Main Machine Input/Output Status Indication Light: all X point and Y point status indication light.

9. Expanding BD expanding board (optional)

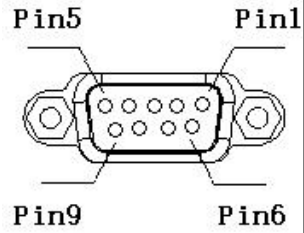
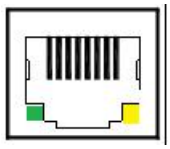
10.Input Power(220V/AC), Output Signal Dismantle Terminal Strips

11.Expanding Module Installation Buckle

Left side/right side expanding module installation buckles: through the module installation buckles, you can install the left side/right side expanding module fixed on each side of the main PLC.

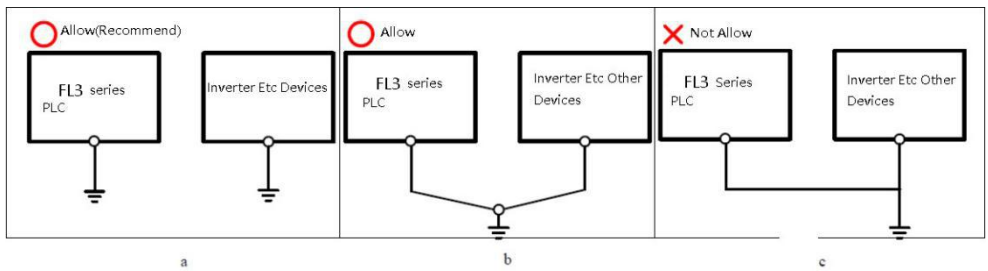
4.2 Communication Ports Definition

FL3 series main machines equips 2 serial ports(Port 1 and Port 2 including 1 DB9PIN female ports),Port1 and Port2 hardware standard is R232 /RS485.
The signal pin definition is as below:

	DB 9Pin (Port1/Port2)	Pin1	Port1 RS485-（B）
		Pin2	Port1 RS232 Rx
		Pin3	Port1 RS232 Tx
		Pin4	Port2 RS485-（B）
		Pin5	GND
		Pin6	Port1 RS485+（A）
		Pin7	Port2 RS232 Rx
		Pin8	Port2 RS232 Tx
		Pin9	Port2 RS485+（A）
	RJ45(EtherNet)	Default IP address is 192.168.100.120. Subnet Mask: 255.255.255. Network:192.168.100.100 Modbus Tcp Slave Port: 502, Station No.:1 If you need set address changing range, you can get PLC networking then modify it under software programming column list-View-Tool-Projects Managing-System Setting-Ethernet Communication Parameters Setting.	

4.3 Electric Wiring

FL3 series products are with functional grounding terminals FG, please do the wiring according to following situation:
When there is PD(potential difference) between FL3 main machine and other devices, you can ground it according to **a** way. If on-site condition does not allow the grounding per a way, you can ground as **b** way. If the difference is too far and hard to ground as single point, please do not put FG of FL3 main machine grounding.

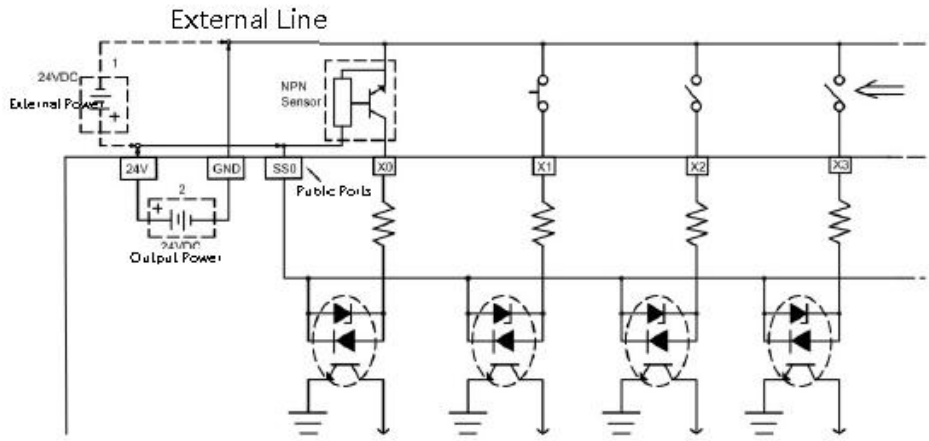


4.4. Input Specifications

FL3 series programmable logic controller input signal specifications are as below:

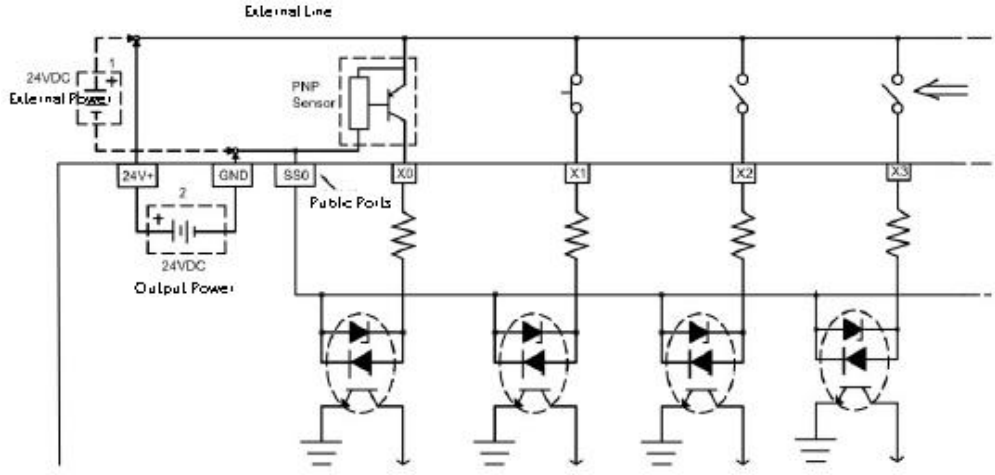
Item		High-speed Input Counts	General Input Counts
Signal Input		Leaking type/Sourcing type:exchange through internal common ports and external wiring	
Electrical Parameters	Input Voltage	24V(12-36V)	24V(12-36V)
	Input Impedance	3.3K	2.7K
	Input as ON	Over 7.9mA（24V）	Over 6.5Ma(24v)
	Input as OFF	Less than 2.0mA	
Filter Waves Function	Number Filters	Input points are with filters function, time can be set between 0 to 60ms (REFF instruction setting),other IO ports are hardware filters.	
	Hardware Filters	X0-X5 About 2.5uS hardware filter waves	X6-X17 About 1mS hardware filter waves
High-speed Function		100KHz	–
Isolation Way		Each Channel Opto-couplers isolation	
Input Action Instruction		LED light is on when imputing"ON"	
Input Public Ports		1 group(various input points) share one public NO, each public NO can be separated.	

FL3 series programmable logic controller basic unit input signal circuit and external wiring are as below: The location will be different according to different modules.
Leaking type connection digraph, inside common block points SS0/SS1 connects to 24V power +, External line connects 24V power-.



Leaking Type Input Circuit Digraph

Source Type Input Connection Digraph Internal Common Terminals SS0/SS1 connecting to 24V-, external common line connects 24V power+.



Source Type Input Circuit Diagrah

Note:

1） Basic unit SS0 and SS1 two pubic ports are without any concerned electricity.

2）X0~X7,X10~X13 supports sourcing or leaking type (you can choose though correspondent SS public ports GND or 24v+).

3）24VDC external power and main machine input 24VDC(MaxSOOmA),you can not connect simultaneously, and must select one according to the application needs.

4.5 Output Specifications

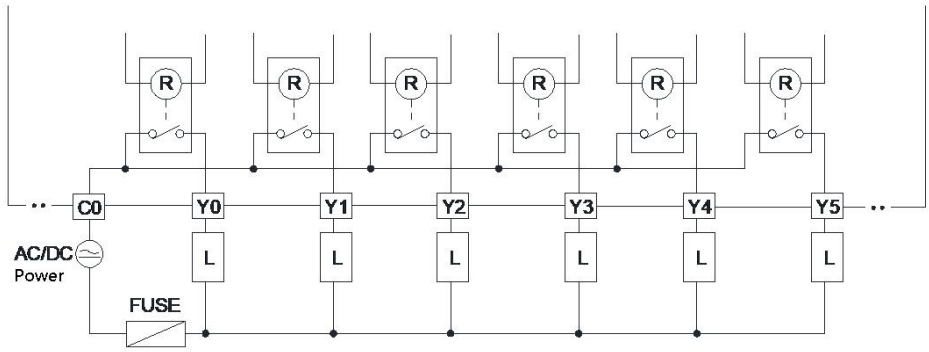
Item		Relay Output Ports	Transistor Output Ports
Circuit Power/Voltage		250V AC/30V DC	48V DC
Circuit Isolation		Relay Mechanic Isolation	Optocoupler Isolation
Action Instruction		Output points close, LED light is on	
Electricity Leaking during Circuit Open		0	Below 0.05mA
Minimum Loading		1mA 5V DC	0.1mA 5V DC
Maximum Output Electricity	Resistive Load	5A /1 count 10A/group	3A 30V DC
ON correspondent time		Below 10ms	High speed output: 5uS
OFF correspondent time		Below 5ms	General Output: 0.1mS
High-speed Output Frequency		—	100K
Output Public Ports		1 group (multi output counts) share one pubic ports, each public ports can be isolated from each other.	

FL3 series PLC output can be classified as relay type and transistor type, the working parameters difference are too much, and you need clarify it before using to avoid the breakage of misusing.

And you can connect different power circuit.

Relay output circuit structure and connection:

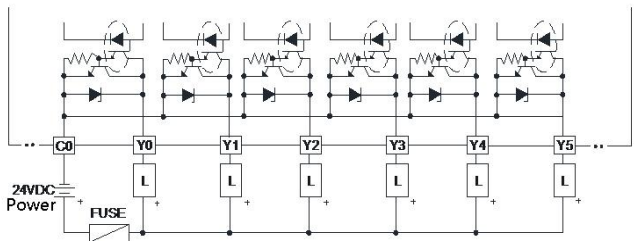
Relay counts can be used to AC or DC loading power, each relay can provide SA electricity at the maximum, FL3 output ports maximum electricity limits 10A, and the machines action life can achieve 200 million times, and the connection life is low, and the life is different according to different working voltage, loading type and contacts electricity.



Relay Output Circuit

Transistor ports NPN output circuit structure and connection digraph.

FL3-PLC transistor only provides single ports NPN output models.



Transistor Output Circuit

4.6 Wiring Terminals Definition

Here it lists the settings of input and output terminals main machine of programmable logic controllers. Although the programmable logic controller output is with relay output and transistor output but the terminals settings are same.

DC OUT Max500mA			X0~X7 Input Counts									X10~X13 Input Counts								
24V	GND	NC	SS0	X0	X1	X2	X3	X4	X5	X6	X7	SS1	X10	X11	X12	X13	.	.	.	.
FL3-20MT-AC(12DI 8DO)																				
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7									

AC IN 220VAC	Y0~Y7 Output Counts	Empty Terminals

DC OUT Max500mA			X0~X7 Input Counts									X10~X13 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7	SS1	X10	X11	X12	X13	.	.	.	.
FL3-20MR-AC(12DI 8DO)																				
L	N	PG	C0	Y0	Y1	Y2	Y3	.	C1	Y4	Y5	Y6	Y7	.	.	.	.	.	.	.
AC IN 220VAC			Y0~Y3 input counts						Y4~Y7 output counts					Empty Terminals						

DC OUT Max500mA			X0~X7 Input Counts									X10~X13 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7	SS1	X10	X11	X12	X13	.	.	.	.
FL3-24MT-AC(12DI 12DO)																				
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	C1	Y10	Y11	Y12	Y13	.	.	.	.
AC IN 220VAC			Y0~Y7 Output Counts									Y10~Y13 Output Counts								

DC OUT Max500mA			X0~X7 Input Counts									X10~X13 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7	SS1	X10	X11	X12	X13	.	.	.	.
FL3-24MR-AC(12DI 12DO)																				
L	N	PG	C0	Y0	Y1	Y2	Y3	.	C1	Y4	Y5	Y6	Y7	.	C2	Y10	Y11	Y12	Y13	.
AC IN 220VAC			Y0~Y3 Output Counts						Y4~Y7 Output Counts						Y10~Y13 Output Counts					

DC OUT Max500mA			X0~X7 Input Counts									X10~X17 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7	SS1	X10	X11	X12	X13	X14	X15	X16	X17

FL3-32MR-AC/FL3-32MT-ACC(16DI 16DO)																			
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7	C1	Y10	Y11	Y12	Y13	Y14	Y15	Y16	Y17
AC IN 220VAC			Y0~Y7 Output Counts									Y10~Y17 Output Counts								

FL3-40MT-AC/FL3-40MR-ACC(24DI 16DO)										
DCOUT Max500mA			X0~X7 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
AC IN 220VAC			Y0~Y7 Output Counts								
DCOUT Max500mA			X10~X17Input Counts								
24V	GND	.	SS1	X10	X11	X12	X13	X14	X15	X16	X17
L	N	PG									
DCOUT Max500mA			X20~X27Input Counts								
24V	GND	.	SS2	X20	X21	X22	X23	X24	X25	X26	X27
L	N	PG									

FL3-48MT-AC/FL3-48MR-AC(24DI 24DO)										
DCOUT Max500mA			X0~X7 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
AC IN 220VAC			Y0~Y7 Output Counts								
DCOUT Max500mA			X10~X17 Input Counts								
24V	GND	.	SS0	X0	X1	X2	X3	X4	X5	X6	X7
L	N	PG	C0	Y0	Y1	Y2	Y3	Y4	Y5	Y6	Y7
AC IN 220VAC			Y10~Y17 Output Counts								
DCOUT Max500mA			X20~X27 Input Counts								
24V	GND	.	SS2	X20	X21	X22	X23	X24	X25	X26	X27
L	N	PG	C2	Y20	Y21	Y22	Y23	Y24	Y25	Y26	Y27
AC IN 220VAC			Y20~Y27 Output Counts								

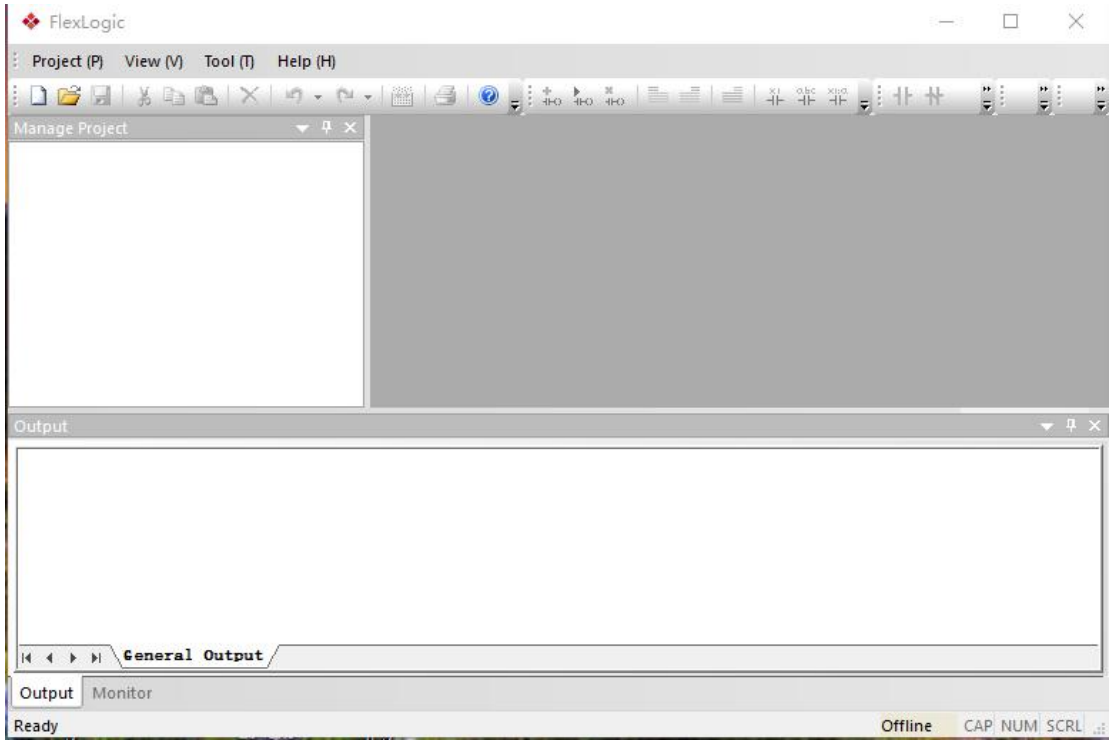
Wiring terminals functions list:

FL3 series main PLC terminals function				
Terminal	Illustration		Terminal	Illustration
L	Input power 220VAC		24V	Output 24VDC+ port
N	Input power zero line		GND	Output 24VDC- port
PG	Grounding		·	Empty terminals without connection
C0/C1/C2	Y output public counts		SS0/SS1/SS2	X input public counts
Y0-Y27	Y output counts		X0-X27	X input counts

5.Fast Start

1st Step: Start Programming Environment

After Flexlogic installation finished, click “Flexlogic” icon to start the software from start-up menu or the systematic desktop. The main interface is as below in 3-1:

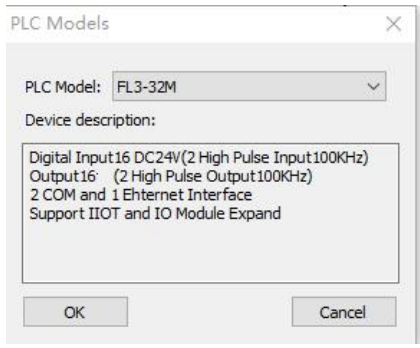


3-1

2nd Step: Establish the Project

First you need create one project for the written program after starting programming environment.

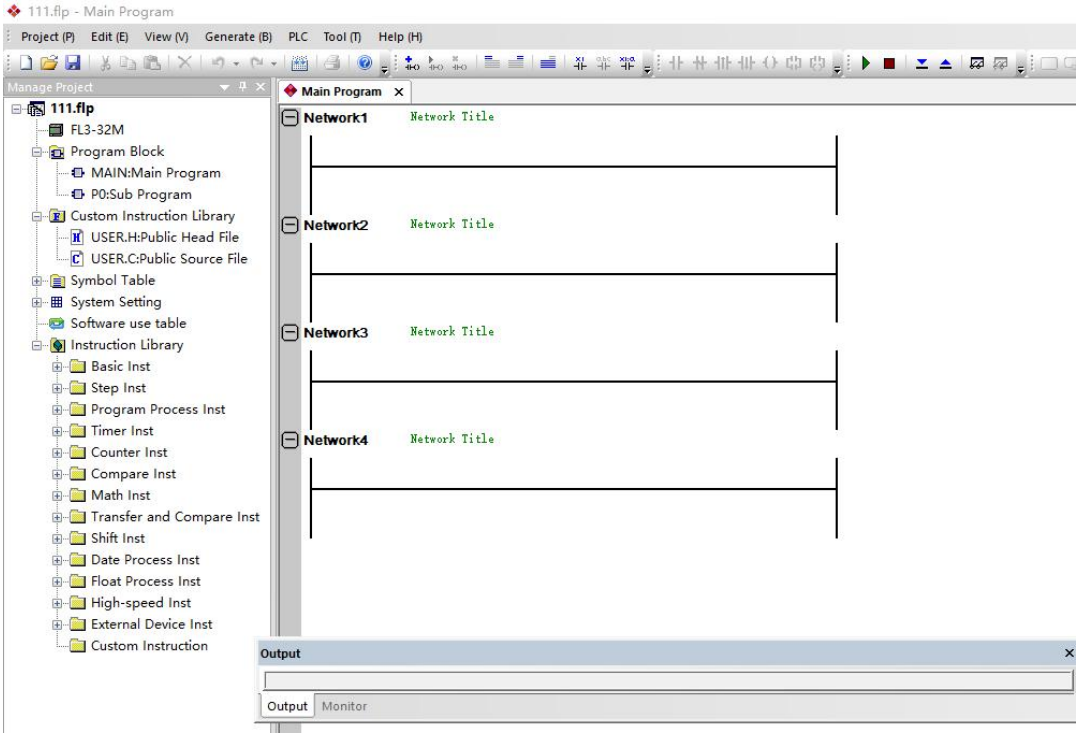
Please click “Create New Projects”menu of “Projects”, then one dialogue will be popped up as below as 3-2:



3-2

Please select PLC type as FL3-32M, defaults editor as ladder diagram, after finishing selection, click “OK” button of the dialog, then one new project will be created, and it will default main software is

open and enter program edition status as indicated in 3-3 as below:



3-3

Note: Please refer to concerned chapter about the detailed project managing functions operation.

3rd Step: Edit Ladder Diagram

Please click software edition area, blue area means editable software area, after selecting edition area, please write the instruction. Then we will edit one ladder graph which makes Y0 to blink with 1 second.

3-4

Note: SM13 is systematic specific bit soft components, and the function is to vibrate with 1s frequency. Please refer to files contents or the symbol table lists of the software projects managing.

4th Step: Save the Projects

Please save the projects after ladder digraph edition is finished, and click “project” menu, choose “save the project”, or click “ ” button in the tool menu, then choose projects catalogue, and name the project. The saving project name is .flp.

5th Step: Edit the Projects

Please compile before downloading the saving ladder digraph to the PLC. Click” Generate” B

button, choose" Compile", or click the menu  in the tool list. The software will compile automatically and generate executable files package.

6th Step: Download the Program

Please connect PLC and PC with USB line, click "PLC"menu, choose" Download Program", or click tool list  button, the following dialogue will be popped out as 3-5

3-5

Please select "Download Project", operate as the indication.

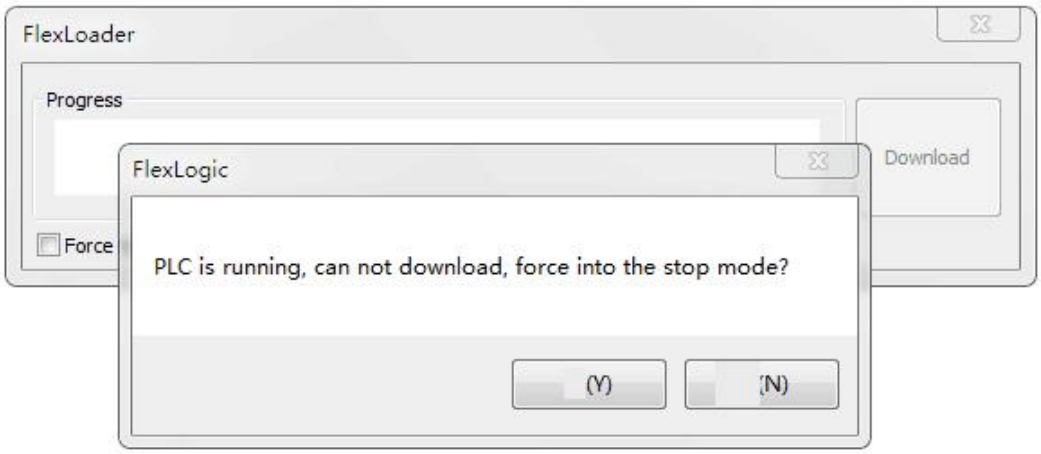


Photo 3-6

After downloading finished, it will indicate whether it will enter RUNNING module mandatorily,"Yes",PLC will enter RUNNING status, please click program stop button in the tool list if you want to stop current program.

In order to testify the written program, we need monitor PLC internal address value, there are 2 monitoring way in Flexlogic software.

1. Ladder Digraph Monitoring

After clicking "PLC" menu, please select" start monitoring",or click tool list  then you can see Y0 and 1s non-stop blinking.

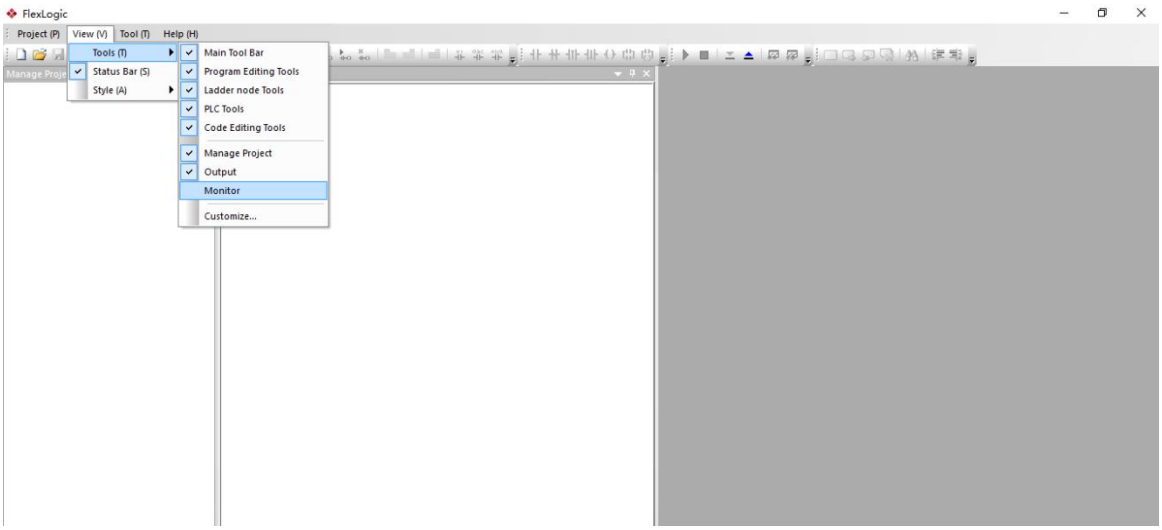
Photo3-7

If you want to stop monitoring, then you can click”PLC menu”, select” stop monitoring”, or click tool list button.

1. Monitor Free

Please select”View(V)”Tools(T)””Monitor”,then you can open free monitoring view.

The monitoring view defaults as open status.



3-8

User can set freely the monitoing address they want in monitoring page, or setting address value as 3-9

Photo 3-9

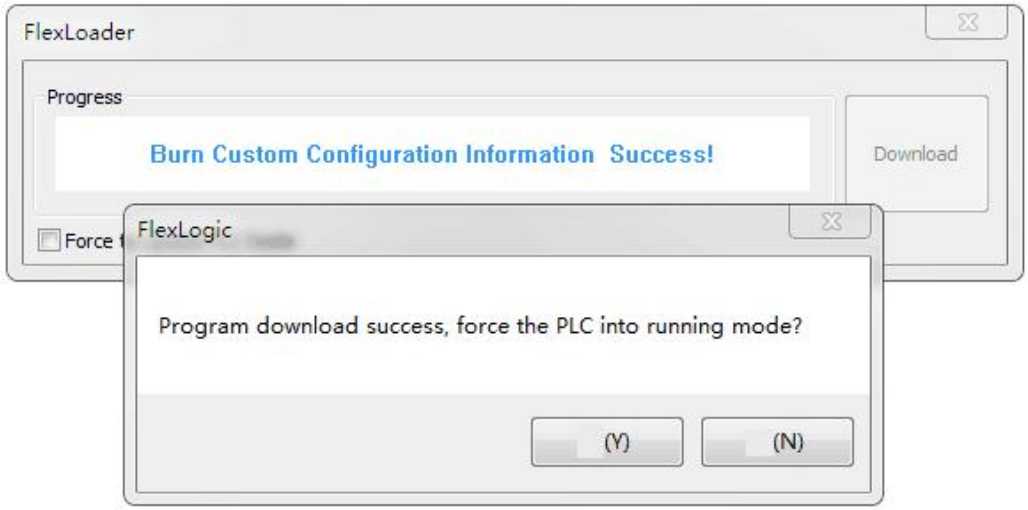
Address Value Type Explanation:

FlexLogic uses data width and data type to describe one address value.

Data width includes 3 types: bit, word, double-words.

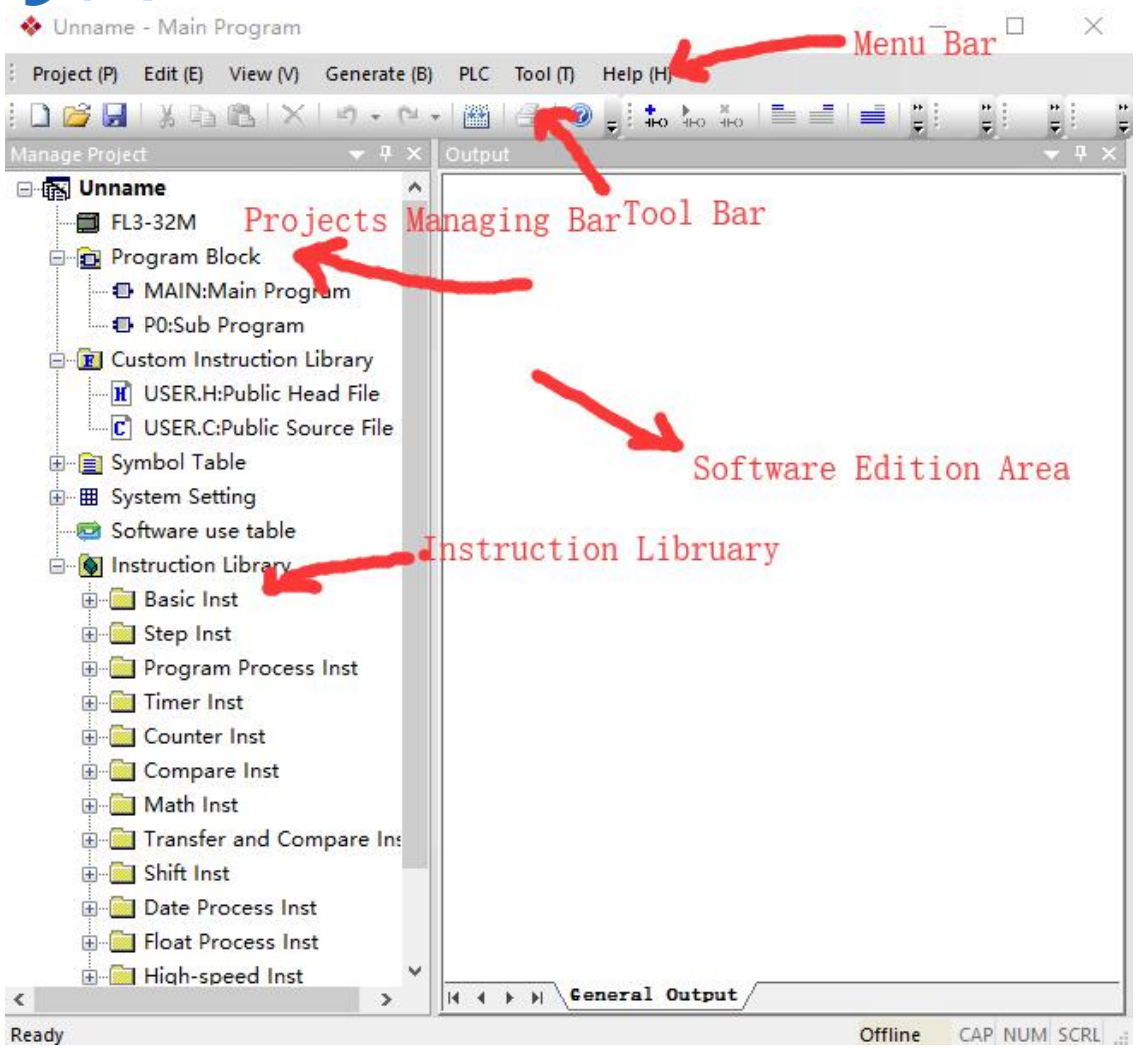
Data type includes 5 types: with symbol, without symbol, binary, hexadecimal, floating-point type.

6.Programming Environment



6.1Summarization

Flexlogic main interfaces includes 7 sections: menu bar, tool bar, projects managing bar, instruction library, message view, status bar and software edition area. The main interface is as below in 6-1.



6-1

6.2Menu Bar

The menu bar includes project, edit, view, generate, PLC, tool, help bars. The menu will be popped up when you click correspondent option. Exact functions explanation is as below in 6-1.

Project	“Project” sub menu includes concerned instruction of related projects managing.
Edit	“Edit” sub menu includes ladder digraph edition, user self-defined instruction edition Etc option.
View	“View”sub menu includes software interface setting.
Generate	The compile option of “Generate” sub menu can execute compile operation to the files.
PLC	“PLC” sub menu includes PLC operation such as downloading and monitoring etc,

Tool	"Tool"sub menu software option can be indicating software program title, network title and network note, you can also select symbol and address indicate or not by symbol index.
Help	"Help" sub menu can help check help file and software version info.

6.3Tool Bar

Several tool bars are provided by this software, including fast visit of usual operating commands buttons. Those operations can be finished through using menu or predefined keyboard shortcuts.

Tool bar locates the below side of the menu. It defaults all tool bars are visible. If you want to hide or indicate some tool bar, please click the mouse right button at any tool bar. And select/cancel select any tool bar in the popping menu.

One short description text will be shown if you put the mouse cursor on any icon (but do not click it), it is called tool indication. Those tools indication includes current icon name.

Standard Tool Bar

Standard tool bar includes the basic functions of editing PLC program.

For example:

New Project, Open Project, Save Project, Cut, Copy, Paste, Delete, Cancel/Recovery, Edit, Print, About.

Network Edit Tool Bar

Network edit tool bars include basic instructions and operations of editing programs, add network, insert network, delete network, indicating program title

 , indicating network notes,address and symbols.

Add/Insert/Delete Network

Those operations can be done in the tool bar list, and you can select the operation under edition menu. Click" Add Network", one network will be added at the end of the program automatically.

Make the cursor stay in one network, click"Insert Network", one network will be added above this network. Click "Delete Network", you can delete the chosen network directly.

In addition, if you want to select whole network, click the left gray area of the network tile, and you can choose various network by dragging. You can also select those operations under "Tool-software" menu.

Ladder Digraph Edition Tool Bar

Ladder digraph editing tool bar includes the most commands, the indication and correspondent keyboard shortcuts will occur when the cursor stays on this icon.

PLC Operating Tool Bar

In this tool bar, users can click the icons to operate for PLC including run,stop, download monitor, upload monitor etc.

Assist Function Tool Bar

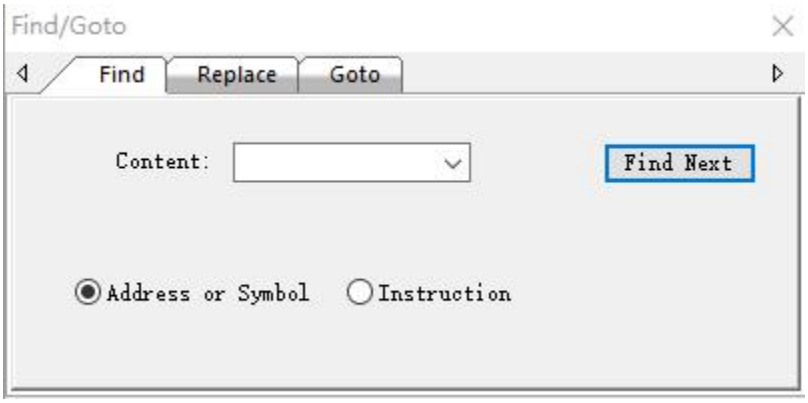
Tool Bar includes set and cancel label, jump to next/previous label, delete all labels, check, insert/delete TAB separator.

Label Set/Cancel/Jump

You can use label operation button to mark it and jump when editing user defined codes.

Check

Click ”Check  ” icon, the popping window will be popped up as below 6-2:

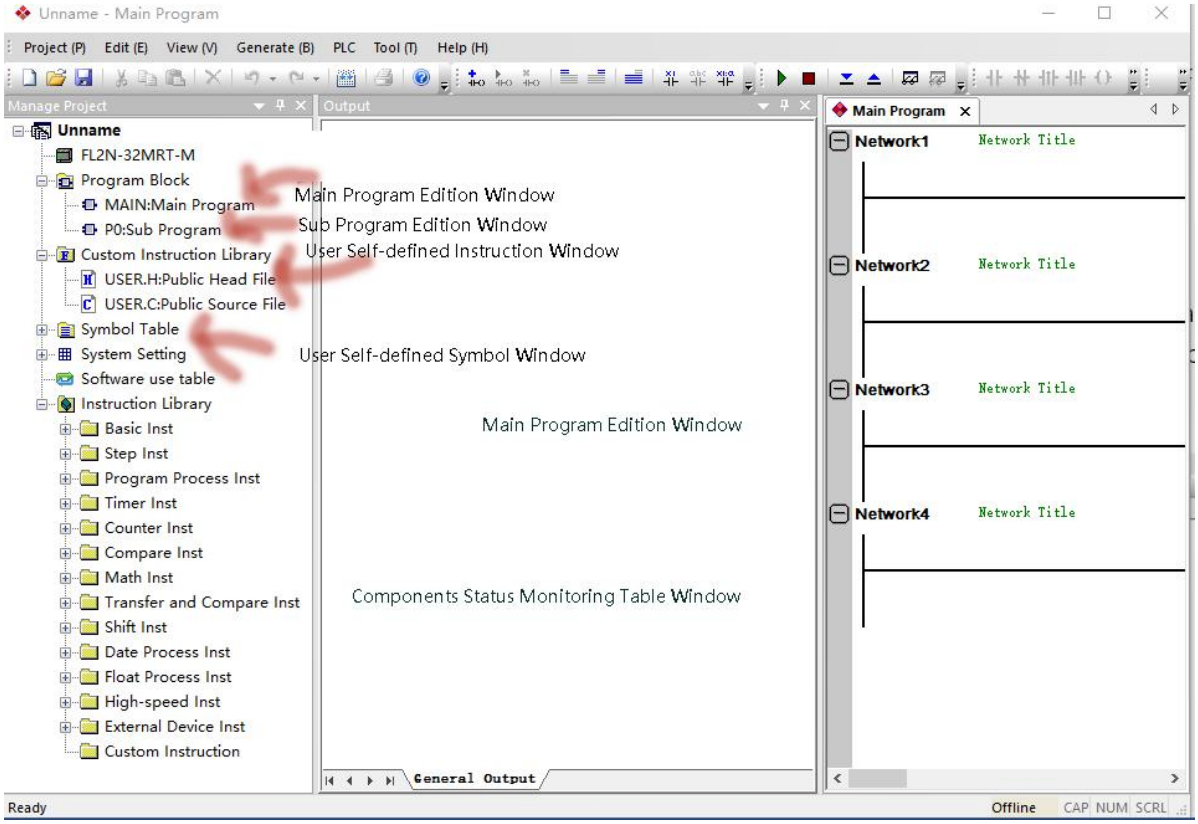


6-2

You can find all addresses, symbols and instructions of the program through “Find” button,and also can position to the network position through transfer function directly.

6.4Working Area

The working area includes main program program edition window, sub-program edition window,components status monitoring window, self-defined instruction window and self-defined symbol window.

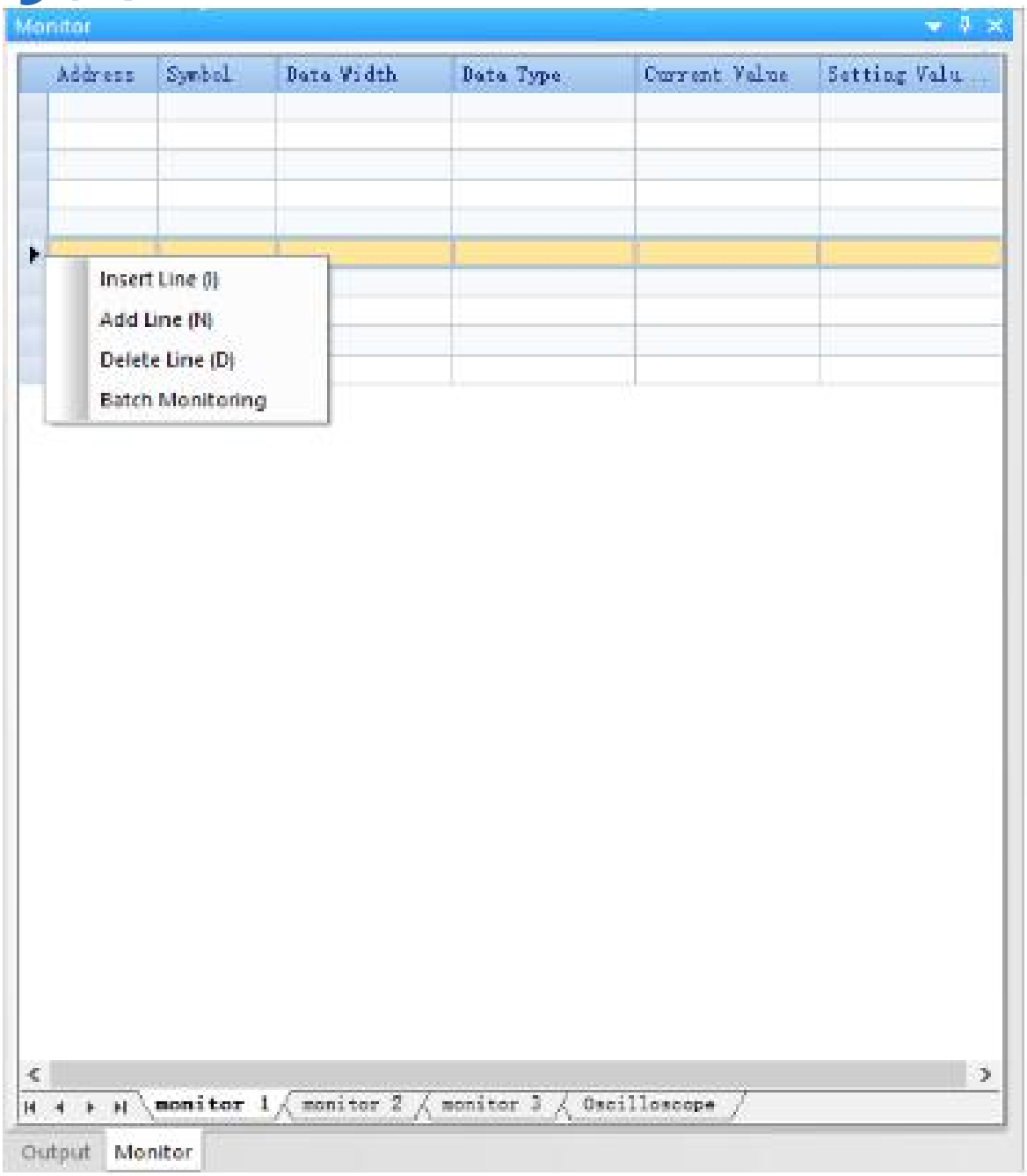


6-4

6.5Monitoring Table Window

Monitoring table is mainly used for in-time software components value monitoring under monitoring model, which is helpful for program testing. The monitoring table includes components address, symbols, data width, data type and current value, you can change software components value by imputing setting value. All soft components setting value is input as decimal scale/system.

The monitoring table is as below 6-4,"insert","add","delete","batch" option can be indicated when you click mouse right button.



6-4

Soft Components Monitoring

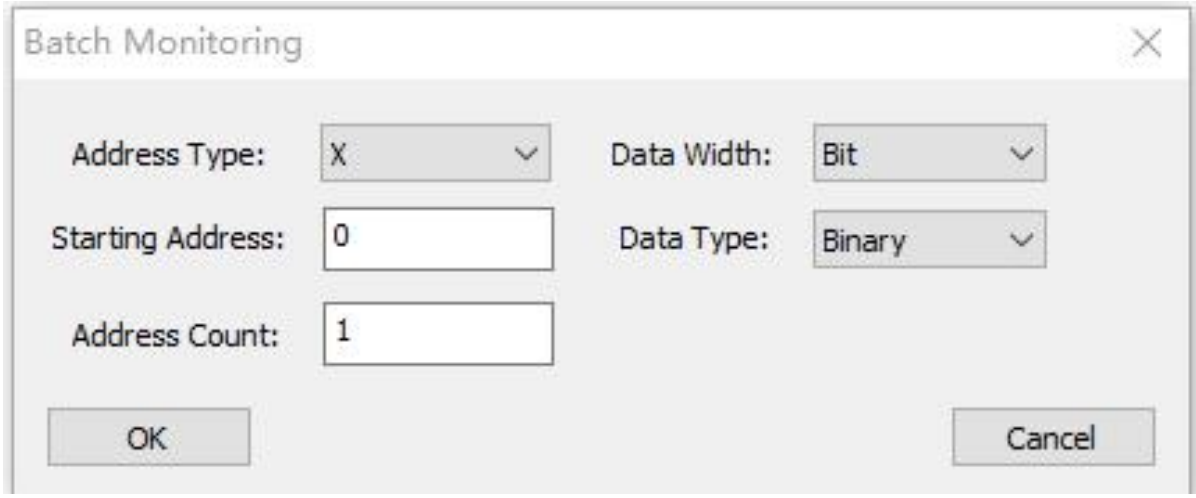
You can see soft components symbol, data wideth, type and current value by inputing monitoring components address, and input the components value in the setting value.

Add/Insert the List

You can select “insert the line”,”add the line”,”delete the line”,”batch monitoring”by right clicking any position popping dialogue.

Batch Monitoring

Batching monitoring means you can add one same type components to monitor, the address range can be selected.



6-5

6.6 Information Output Window

6-6

Information output window can provide the results of executing Flexlogic operation. The output results of executing coding is listed as above 6-6.

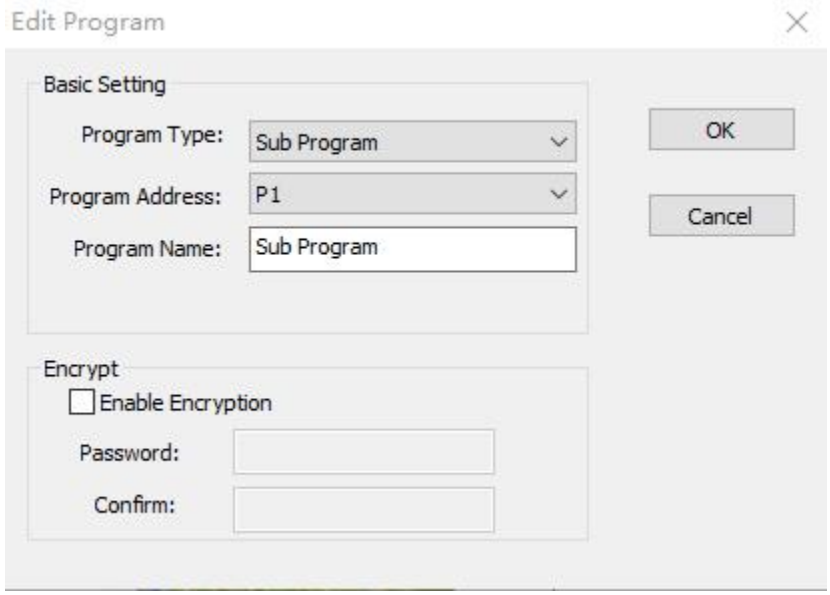
6.7 Status Bar

Status bar is used to provide common properties information for clients. After entering monitor status, status bar will indicate current PLC running status.

7.Projects Management

7.1 Edit Program

Program is the organization way of user program, and there are 3 program types-main program, sub program, interrupt program, see below 7-1.



7-1

Main Program

Main program is the entrance of the user program, when PLC is running, PLC will scan and execute main programs continuously.

Sub Program

Sub program is convenient for users to design the module, and users can use sub program when needed.

Interrupt Program

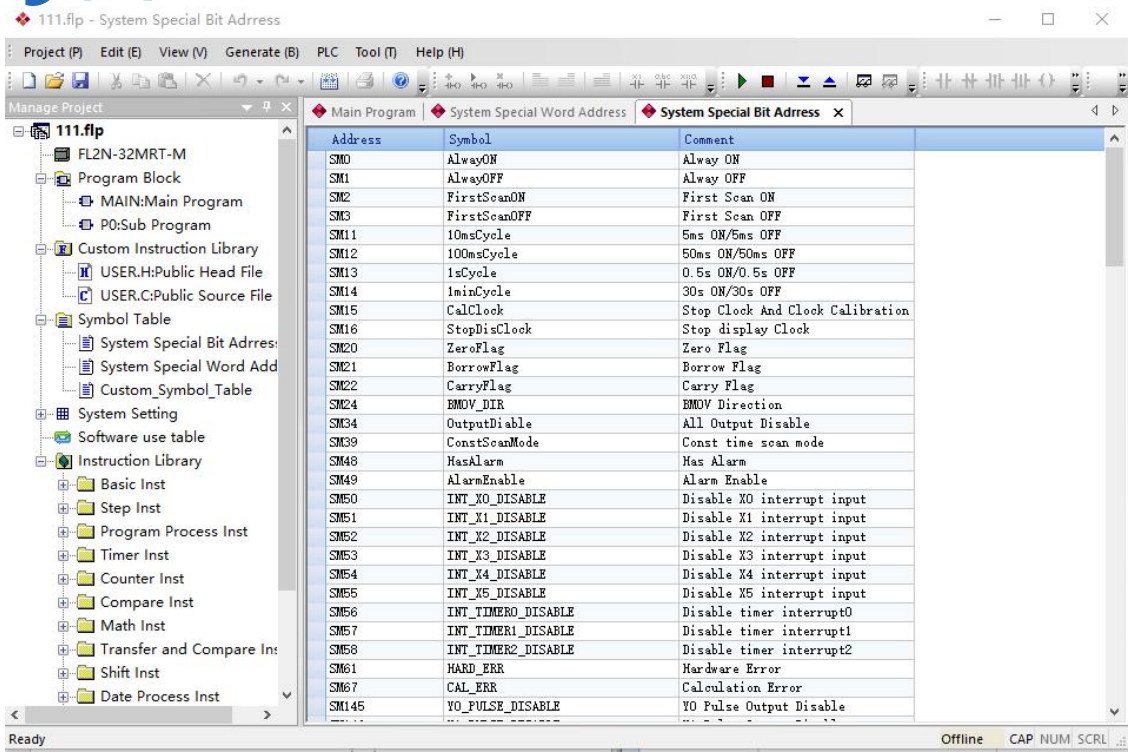
Interrupt program is the program when there is specific event occurs in the system. For example when it is on the rising edge of X0, if users have rising edge program of X0, the system will adjust this interrupt program automatically.

7.2 User self-defined Instruction Macro Library

You can use C to program in FlexLogic software，the detailed user manual can be checked on 11th chapter: self-defined instruction.

7.3 Symbol Table

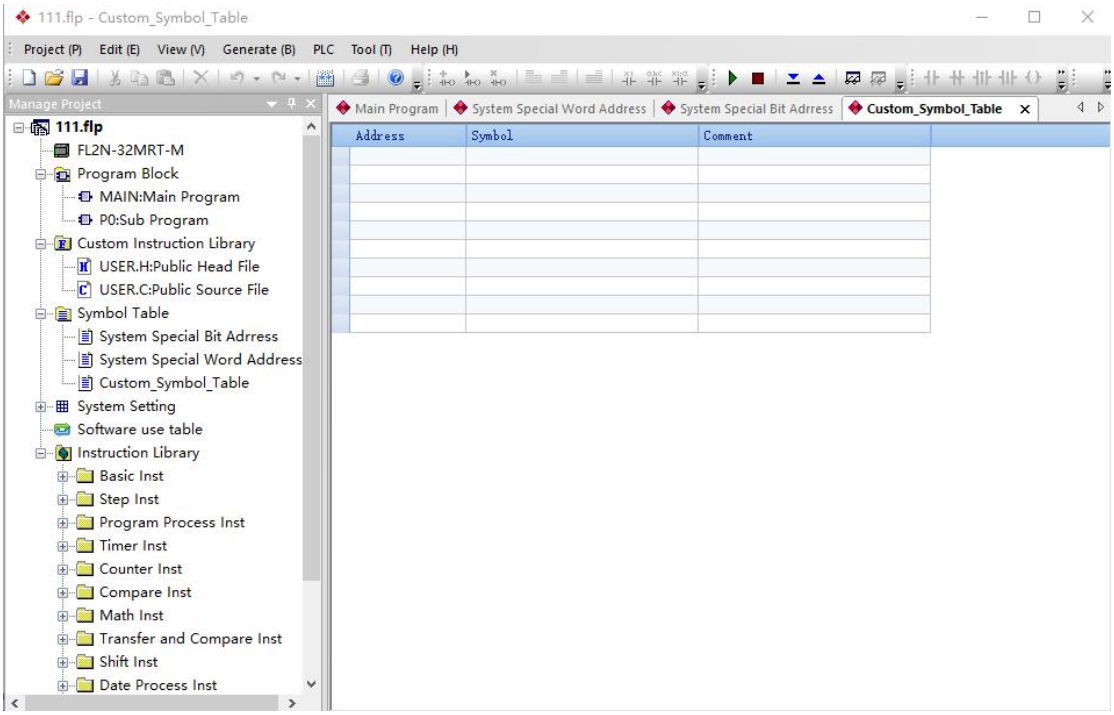
7.3.1. It lists the specific bit register and word register in the symbol list, and you can check in the software table list directly, or also can check in the specific register in the help menu as 7-2 below:


111.flp - System Special Bit Adrress
Project (P) Edit (E) View (V) Generate (B) PLC Tool (T) Help (H)
Manage Project
111.flp
FL2N-32MRT-M
Program Block
MAIN:Main Program
P0:Sub Program
Custom Instruction Library
USER.H:Public Head File
USER.C:Public Source File
Symbol Table
System Special Bit Adrres
System Special Word Add
Custom_Symbol_Table
System Setting
Software use table
Instruction Library
Basic Inst
Step Inst
Program Process Inst
Timer Inst
Counter Inst
Compare Inst
Math Inst
Transfer and Compare Ins
Shift Inst
Date Process Inst
Main Program
System Special Word Address
System Special Bit Adrress
Address Symbol Comment
SM0 AlwayON Alway ON
SM1 AlwayOFF Alway OFF
SM2 FirstScanON First Scan ON
SM3 FirstScanOFF First Scan OFF
SM11 10msCycle 5ms ON/5ms OFF
SM12 100msCycle 50ms ON/50ms OFF
SM13 1sCycle 0.5s ON/0.5s OFF
SM14 1minCycle 30s ON/30s OFF
SM15 CalClock Stop Clock And Clock Calibration
SM16 StopDisClock Stop display Clock
SM20 ZeroFlag Zero Flag
SM21 BorrowFlag Borrow Flag
SM22 CarryFlag Carry Flag
SM24 BMOV_DIR BMOV Direction
SM34 OutputDiable All Output Disable
SM39 ConstScanMode Const time scan mode
SM48 HasAlarm Has Alarm
SM49 AlarmEnable Alarm Enable
SM50 INT_X0_DISABLE Disable X0 interrupt input
SM51 INT_X1_DISABLE Disable X1 interrupt input
SM52 INT_X2_DISABLE Disable X2 interrupt input
SM53 INT_X3_DISABLE Disable X3 interrupt input
SM54 INT_X4_DISABLE Disable X4 interrupt input
SM55 INT_X5_DISABLE Disable X5 interrupt input
SM56 INT_TIMER0_DISABLE Disable timer interrupt0
SM57 INT_TIMER1_DISABLE Disable timer interrupt1
SM58 INT_TIMER2_DISABLE Disable timer interrupt2
SM61 HARD_ERR Hardware Error
SM67 CAL_ERR Calculation Error
SM145 Y0_PULSE_DISABLE Y0 Pulse Output Disable
Ready
Offline
CAP NUM SCRL

7-2

7.3.2. You can use software to set your own symbols and notes.

The symbol table is with symbol name, address and notes. The address is equal to soft components name. The symbol table is mainly used for modifying address(soft components symbols).The symbol name can be used to replace address in the programming, and it can be one alias of the address to make the program more understanding and visualization. Notes are the description for the address meaning, which is helpful for user's understanding for the program. Symbols defining rules: A~Z, a~z, 0~9, underline, characters mixed combination. The symbol name cannot begin with number and also cannot be separate number. Name is without any capital and small letter, and the length cannot be over 16 English characters, and you can not use components characters+number as program and variable name. The name cannot include space, and you cannot use same name as key words, the retain key words includes basic data type name, instruction name and the operational symbol of the instruction sheet language.



7-3

7.4 System Setting

System setting includes serial ports setting,poweroff saving setting, BD expanding module setting, FlexBus expanding module setting.

Serial Port Setting

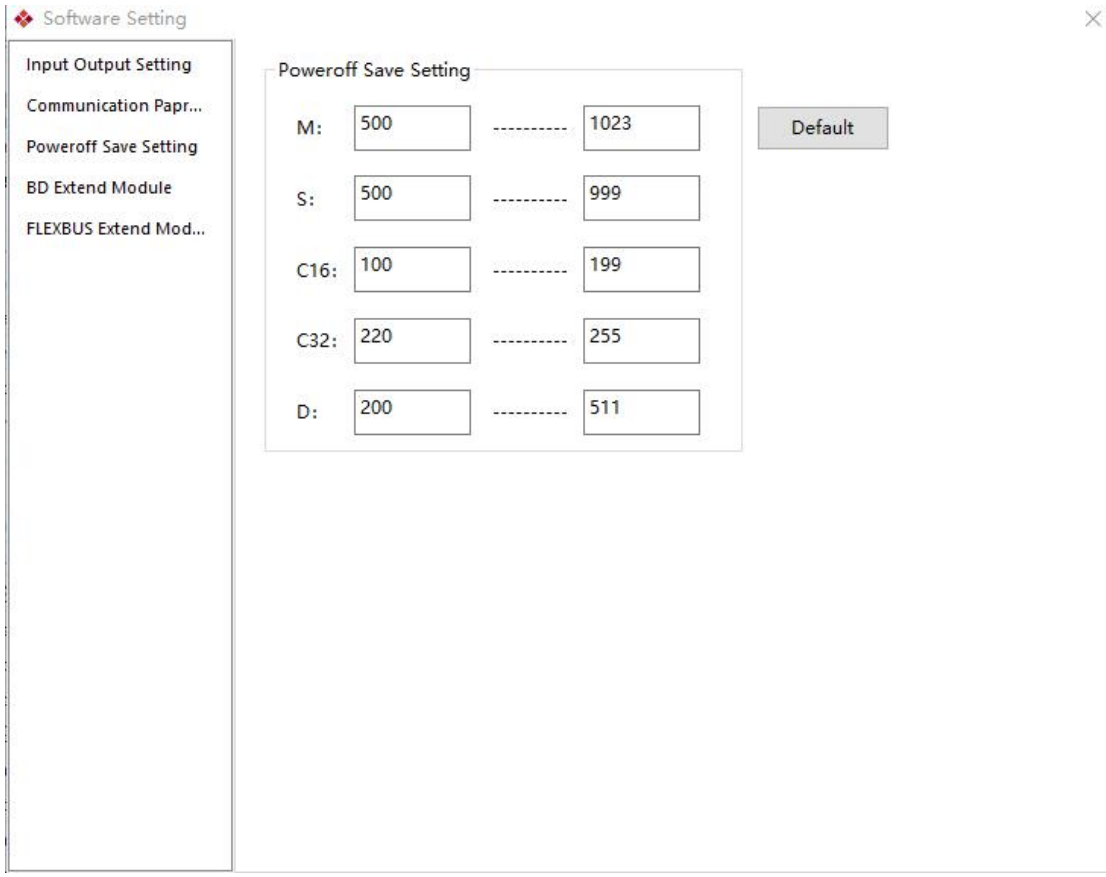
Port	Communication Protocol	Working	Baud Rate (Range)
PORT1	FLEXEM MODBUS RTU FX2N SLAVE USER CUSTOM	RS232/RS485	4800——921600

PORT2	FLEXEM MODBUS RTU FX2N SLAVE USER CUSTOM	RS232/RS485	4800——921600

The detailed protocols introduction and communication ways can be referred to Chapter 10-communication.

Poweroff Saving Setting

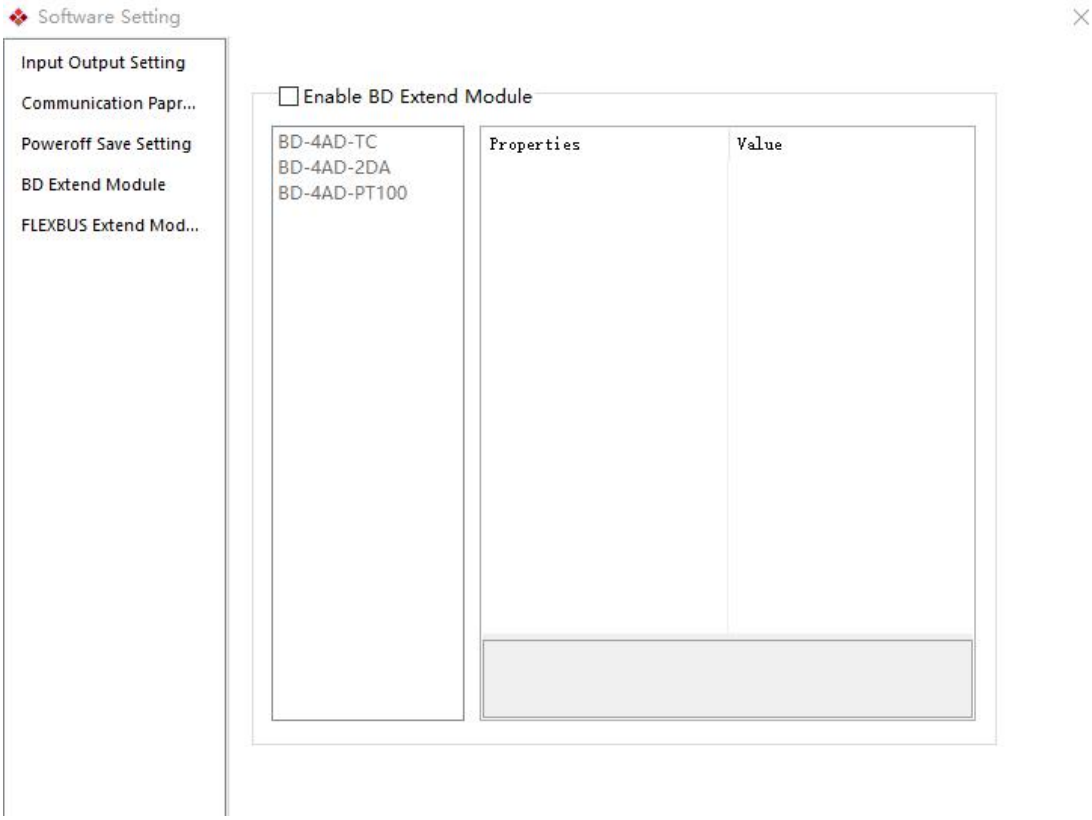
In poweroff saving setting, you can set for the data type needing to be saved and address range as below 7-4. You can also adjust the setting according to the need.



7-4

BD Extend Module Setting

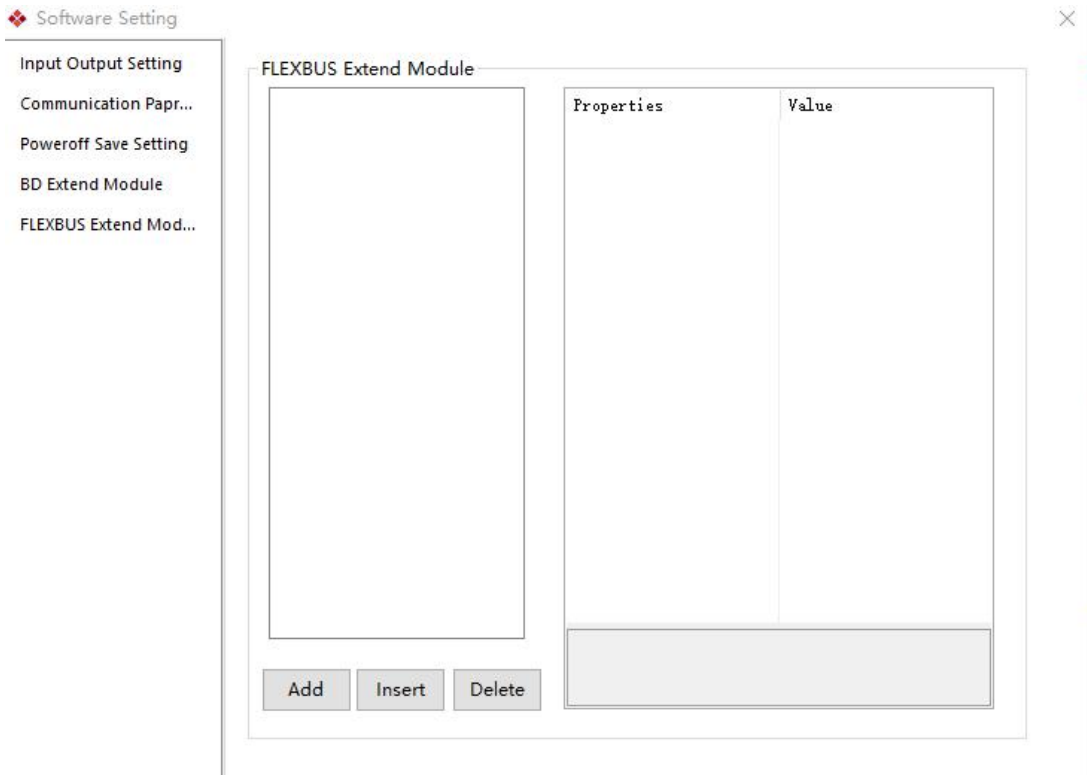
PLC main body can connect one BD extend module, and set BD extend module type and parameters as below 7-5:



7-5

FlexBus Extend Module Setting

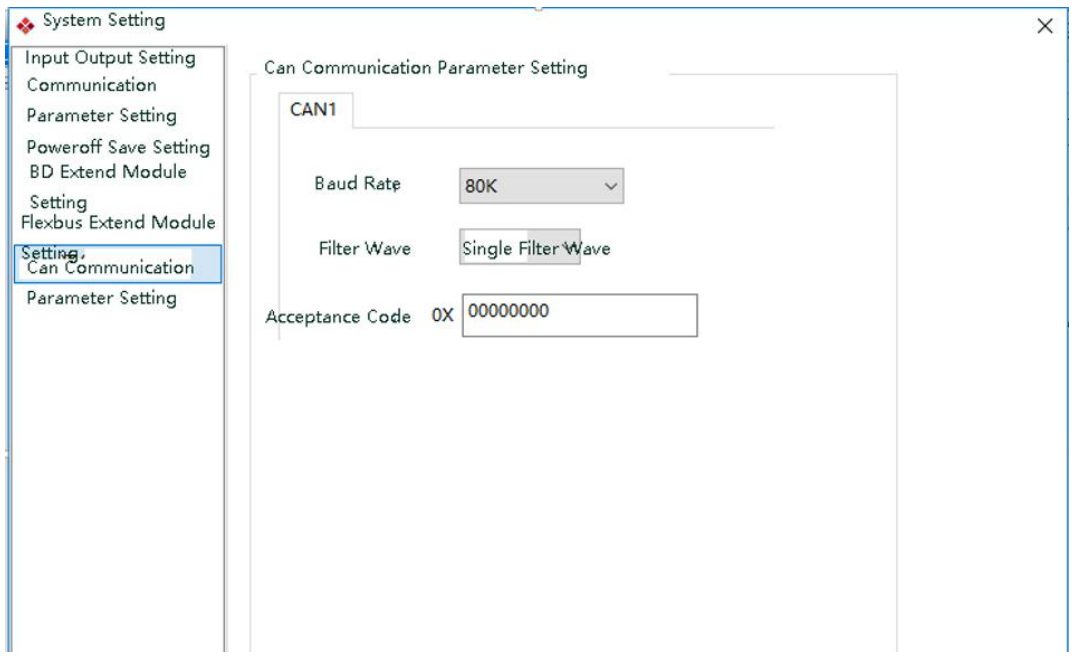
PLC can connect various FlexBus extend module, main PLC right can expand at most 8 FlexBus extend module, you can configure this module here and set correspondent parameters as 7-6.



7-6

CAN Communication Setting

You can set CAN communication parameters here as below7-7.

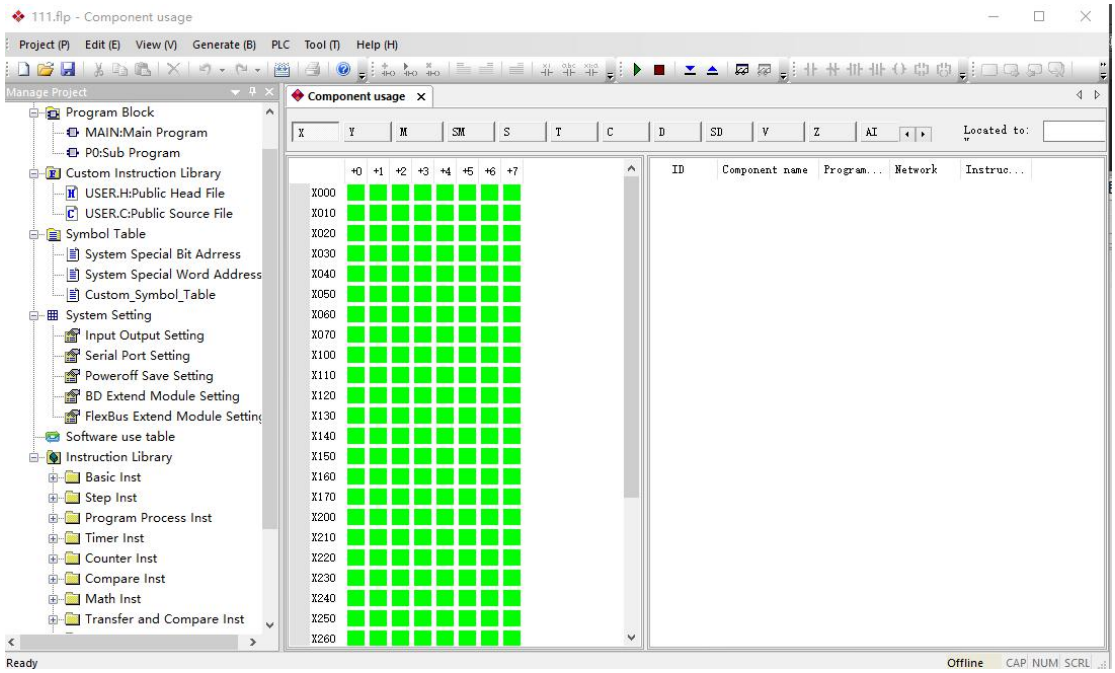


7-7

Note: Only the PLC with CAN port can have this set up interface

7.5 Soft Components Using List

You can check the soft components using condition by using soft components, and position soft components location in the project. The window is as below in 7-8. Please check soft components introduction in Chapter 8: Soft Components Instruction.



7-8

8.Program Edition

Ladder Digraph Working Principle and Components

Ladder Digraph （LD） is one kind of graphics language similar to ladder digraph in the electricity.

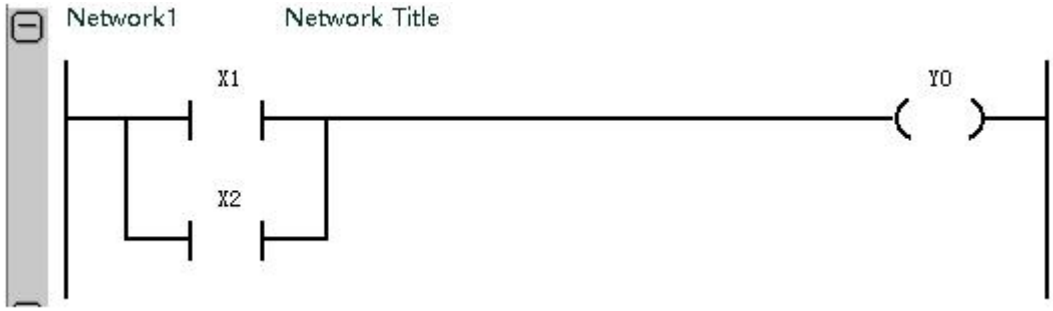
One ladder digraph program is made of various logic network. Network is made of various graphics components connecting to each other, and those graphics components are basic elements of grouping ladder program.

Connection

Similar with electricity digraph, in the ladder digraph, there are 2 relations with various components or the components grouping block: in series and in parallel. Each is as below 8-1, 8-2.

8-1 Components in series

Components in parallel



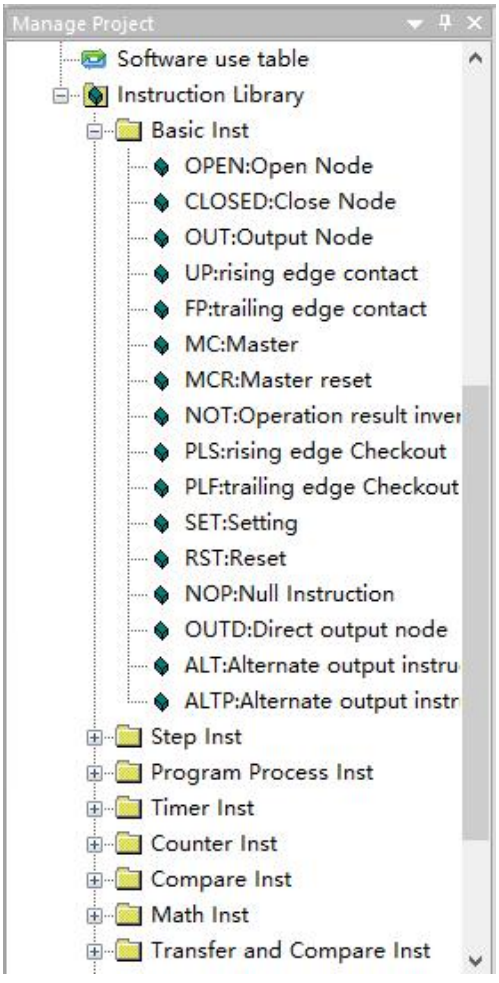
8-2 Components in parallel

How to Input Ladder Digraph Instruction

Please select the striping in the network entering edition status as 8-3 below:

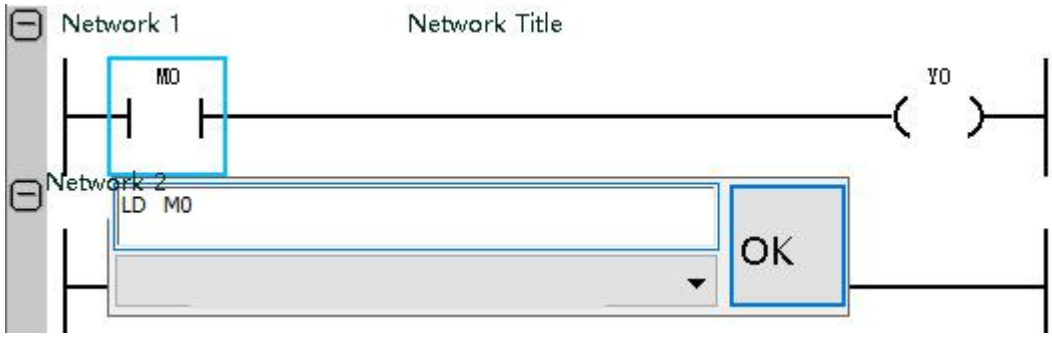
8-3

You can choose the creation node in the project management TAB page, double click to create node,or dragging node to strip-line as 8-4 below:



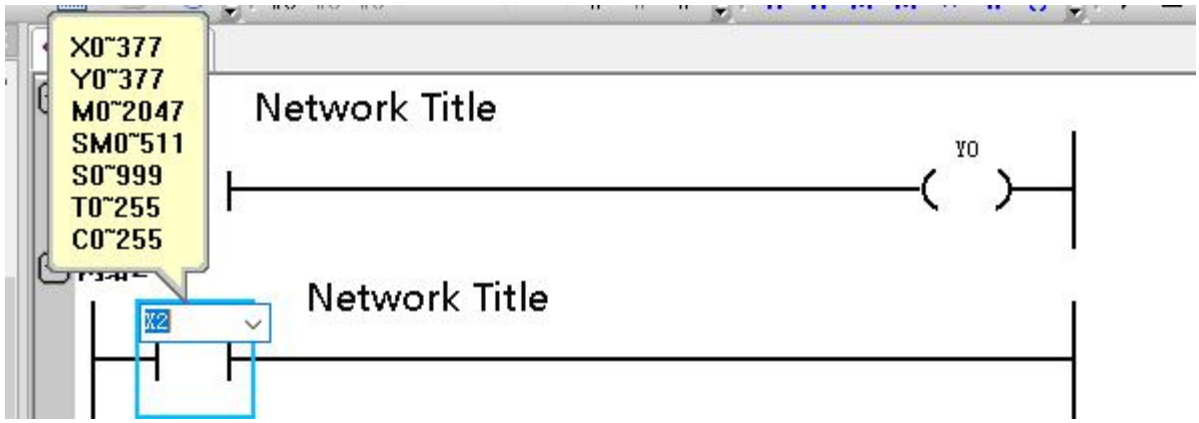
8-4

In addition, you can write instruction under middle stripe-line through writing instruction, click"Enter"or click "OK" , then you can speed input speed and save instruction finding time as 8-5 below:



8-5

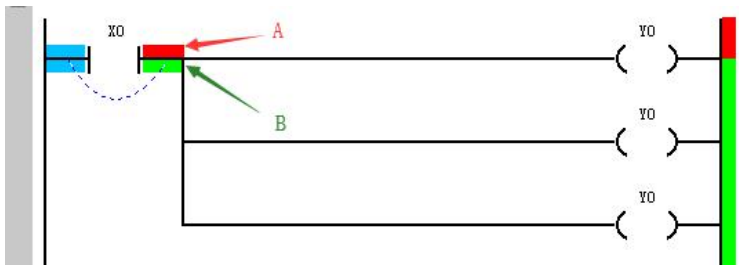
You can put cursor staying on the target address, then soft components type and range indication Of this instruction can be popped up as below 8-7.



8-7

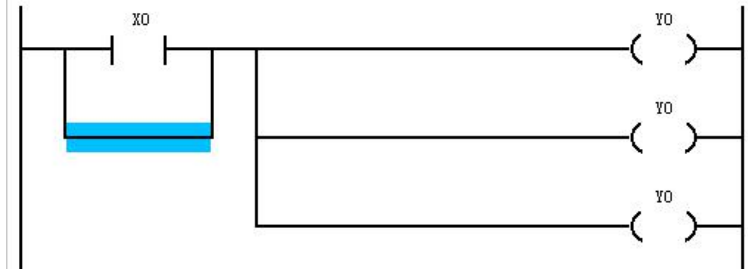
How to Create Parallel Connection?

Click the start position of parallel, drag it slowly, and the parallel point create or output point location will be indicate as high brightness. The green color means creating parallel below the line, the red color means create parallel above as indicated in 8-8.



8-8

When dragging to B point, the parallel branch effect is as below 8-9.



8-9

You can create new point casually after creating parallel branch.

How to create output points in complex network?

Clicking the location of creating output point, dragging to connect the curve line to the right green vertical block (B location),(you can also drag it to the right red vertical block(A location), then can create one output branch as 8-8 below:

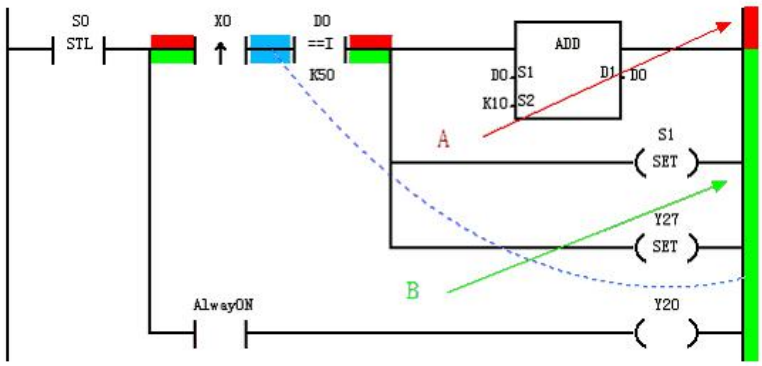
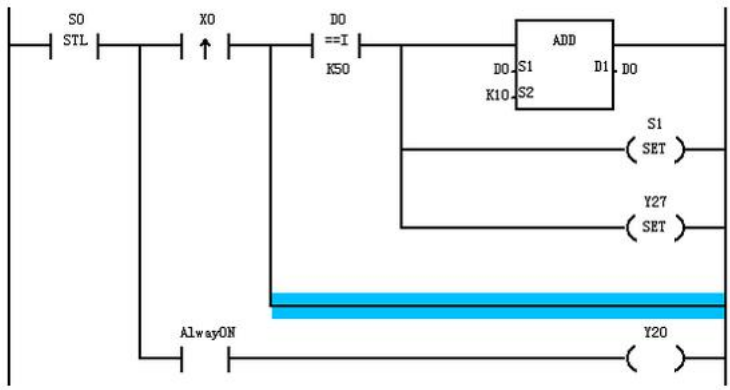


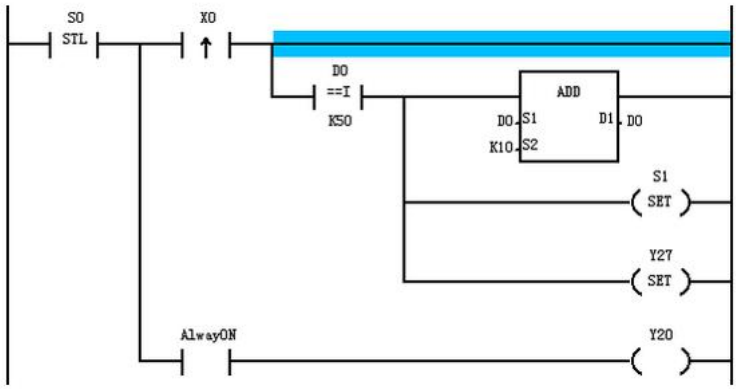
Photo 8-8

After creating good effect in B point, you can add output point on it as 8-9 below:



8-9

After creating point in A, you can add output point in the new branch, then the instruction calculation order will be ahead as 8-12 below:



8-12

9.Sub Program and Method of Calling

9.1Summarization

The software can provide main program, sub program, and interrupt program.

Main program: main program can only be with one which is provided by software, the main program is the program of PLC application program starting execution.

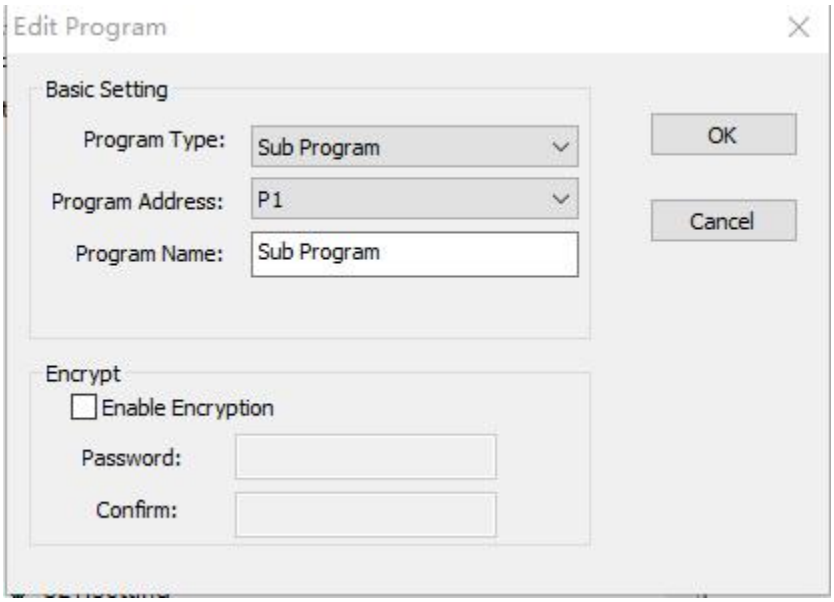
Sub Program: various sub programs can be indicated in one project, which cannot be over 127 programs. Sub program can be adjusted by main program or other sub programs, to finish some common or repeating using function,sub program can only be written by ladder digraph or instruction list and it cannot write by order function.

Interrupt Sub Program: there are many sub programs in one project, which cannot be more than 21 programs. Sub programs can be used by main programs or other programs to finish some common or repeating functions. Sub programs can only be written by ladder digraph or instruction list, and cannot be written by order function digraph.

The purpose of using sub program is to make software Segmented block, and you can reuse it after writing common function block into sub-program. Program block can be used when needed through using smaller software program and PLC can also be used effectively. All program blocks do not need execute cycling every time, when main program uses sub programs and execute, the sub program will execute all instructions until the end. Then the system will return the controlling right to the main program of using sub-program network,

9.2 Establish Sub-program

Click “Manage Project” window button by right keyboard, select”Insert SUB Program” or “Insert INT Program”, after finishing, you can default program as one more meaningful name through program properties dialogue. The operation of establishing sub-program is as 9-1 below:



9-1

After inserting new program node in the project tree, you can edit for it after clicking and open this program.

10.Soft Components Illustration

10.1 Soft Components Specification Illustration

Soft components type of Flexem PLC supporting as below table 10-1:

Components	Type	Range	Notes
Output Relay Y	Bit Elements	Y0-Y377	Output Bit Elements
Input Relay X	Bit Elements	X0-X377	Input Bit Elements
Middle Relay M	Bit Elements	M0-M2047	Middle Relay
Specific Register SM	Bit Elements	SM0-SM511	System Specific Register
Status Register S	Bit Elements	S0-S999	Step Control Zone Bit
Timing Switch T	Bit Elements	T0-T255	Timer Zone Bit
Counting Switch C	Bit Elements	C0-C255	Timer Zone Bit
Data Register D	Word Elements	D0-D4095	Data Register
Specific Register SD	Word Elements	SD0-SD511	System Specific Register
Timer T	Word Elements	T0-T255	Timer Current Value
Timer C	Word Elements	C0-C199	16-bit Timer Current Value
Timer C	Double-word Elements	C200-C255	32-bit Timer Current Value

Table 10-1

10.2Input Relay X

Input terminals are the the window of PLC receiving signal from external switch,inside the programmable logic controller, the input relay X connecting to the programmable logic controller is one of optical isolated electric relay, and it is with numerous normally open contact and normally closed contact,and those contacts can be used casually in the PLC.

Input relay stands for the components of PLC external inputting signal status, you can detect the external signal status through imputing X terminals, 0 standards for external signal open, 1 standards for external signal closure. Program command cannot drive or modify input relay status, and the contact signal (normally open and normally closure) can be used unlimited in the user program.

Relay signal is recognized by X0, X1, …..X7, X10, X11, and the serial number is listed with octal mode.

The timer signal of the controller, external interrupt signal, pulse capture function is input from X0~X7 ports. You can refer to following table 10-2.

Table 10-2

Model	Input	Output	Notes
FL3-20M▲-AC	X0-X7,X10-X13	Y0-Y7	▲R: output as relay. ▲T: output as NPN transistor All model input includes 2 point 100KHZ high pulse input. Transistor model includes transistor includes 2 point 100KHZ high pulse output. ： Y0-Y1
FL3-24M▲-AC	X0-X7,X10-X13	Y0-Y7,Y10-Y13	
FL3-32M▲-AC	X0-X7,X10-X17	Y0-Y7,Y10-Y17	
FL3-40M▲-AC	X0-X7,X10-X17X 20-X27	Y0-Y7,Y10-Y17	
FL3-48M▲-AC	X0-X7,X10-X17X 20-X27	Y0-Y7,Y10-Y17 ， Y20-Y27	

10.3Output Relay Y

Usage and Functions

Output terminals are the window of PLC sending signals to the external load. Output relay external output uses contact(relay contact, controllable silicon, transistor etc output elements) to connect this output in the PLC. Output relay is directly related to the soft components of the hardware terminal ports of external user controlling devices. After finishing scanning user program each time, PLC will transfer Y relay components status to PLC hardware ports, 0 standards for external ports open, 1 standards for output terminals closure.

Y relay NO is marked by Y0, Y1,…Y7, Y10, Y11 etc symbol, and the number is numbered by octal mode. Y relay components can be used unlimited times in the user program.

The example can be referred to table 10-2.

Output Type

According to different output components, in hardware, it can be clarified relay type, transistor type,controllable silicon etc. If there is output expanding module ports, you can

make the serial NO according to main module.

Relay Output: it can drive DC and AC, with strong loading capability, but the response speed is slow and low.Transistor output: with fast response speed and high frequency, it can only drive DC and cannot drive AC. Controllable silicon output: only some specific PLC is with controllable silicon.Flexem PLC output type includes relay output and NPN transistor output.

10.4 Assist Relay M/SM

Assist Relay M components are used for the middle variable values in the user program execution process. Such as the assist relay in the actual electrical control system is used for status information transfer, and also you can group many M variables into word variables M variables and external ports are without any direct relation, but you can copy program language X to M, or connect with external world when copying M to Y. One M variables can be used unlimited.

Assist Relay M is recognized by M0, M1,…,M2047 etc symbol, and the serial NO is numbered as Decimal mode. SM0-SM511 is system specially variables, used for PLC user program and system status communication,part of M variables are with power-off saving function as 10-3 in below table:

M Counts	General Usage	Specific Usage
2560 counts	M0-M2047 （2048） ※1	SM0-SM511 (512 Counts)

10-3

※1. Non poweroff holding area. You can change to the poweroff holding area by using parameters setting.

※2．Poweroff holding area. You can change to non poweroff holding area by using parameters.

Assist relay, assist relay during poweroff holding area can be distributed in the PLC, and you can adjust by parameters setting.

Large number of specific assist relay in the PLC are with specified functions as below:

1)Contact utilization specific assist relay, driving coils for PLC system, and the user programmer can only be read.Such as:

SM0：Running monitor(getting through in running), used to drive the need signal command.

SM2：Initial pulse(It can get through instantly before starting using)，and it is mainly used for executing only one-time initial command.

SM12：100ms time pulse to produce fixed Interval flip signal.

2）Using the coil drive type specific assistant relay, drive the coil for user program, and used for PLC working status and execution model controlling such as:

SM34 ： All output prohibit

SM39 ： Constant cycling

10.5 Status Relay S

Status relay S is used for stepping program design and execution, and simplify programming design by using STL step ladder instruction controlling stepping controls status S changing, to simplify programming design.

If STL programming way is not used, S can be made as M variables. Status S variables can be identified by S0,S1,…S999 etc symbols. The serial number is numbered as Decimal mode, and part of S variables are with power failure holding function.

10.6 Timer T

Timer is used for timing function. Each timer is with coil, contact, timer register,when timer circle getting electricity, the timer is counting. When timer starts timing, and the timer value achieves preset timer value. The contact action, a contact(NO contact) closes, b contact(NC contact)disconnect.

When the circle loses power(invalid energy flow),the timer contacts recover initial status, the timer value will be cleared automatically. Also there are part of timer with accumulation, poweroff holding feature，and it will maintain the value before power failure after restarting the power.

Timer T is marked by T0,T1, ….T255 etc symbol, the serial NO is numbered by decimal mode.

Timer is with different timing step such 1ms,10ms,100ms etc as listed in the table 10-4 below:

Soft Components	Timer	Timer Range（unit：s）	Counts	Power Failure	Scanning
T0-T191	100ms	0.1-3276.7	182	No	Yes
T192-T199	100ms	0.1-3276.7	8	No	No
T200-T245	10ms	0.01-327.67	46	No	Yes
T246-T249	1ms	0.001-32.767	4	Yes	Yes
T250-T255	100ms	0.1-3276.7	6	Yes	Yes

Table 10-4

Prompt:

It shall not be used for timer Number but data register for value storage.

10.7Counter C

Counter is used for timing function, and each counter is with circles, contacts, timing register. When timer circle driving signal is from “OFF→ON”,timer reader adds 1, when the timer achieves preset timer value, the contact action, a contact(NO contact)closes, b contact(NC contact) disconnect.When clearing the timer value, output a contacts then disconnect, b contacts(NC contacts)closes. Part of the timer is with poweroff holding, accumulation feature. It will remain the value before poweroff after power on.

Timer is identified by C0, C1,…,C255， the order is numbered by decimal system.

Timer is with 16bit and 32bit width, there is Unidirectional counting type, Incremental and subtract counting type and Biphasic counting type etc,part of timer counting value is with poweroff holding feature, and you can choose suitable counter according to your needs.

Counter Number

16-bit counter 0~32,767 counter	32-bit counter -2,147，483,648~+2，147483647

General Using	Power Failure Holding	Power Shortage Holding	Specific Using	High-speed Counter
C0~C99 (100counts) ※1	C100~C199 (100counts) ※2	C200~C219 (20counts) ※1	C220~C234 (15counts) ※3	C235~C255 (21counts)※1, ※2

Table 10-5

※1. Non poweroff holding area. You can change to poweroff holding area through parameters setting.

※2. Poweroff holding area. You can change to non poweroff holding area through parameters setting.

※3. You can choose not to change poweroff holding feature through setting parameters.

32-bit Counter Adding/ Reducing Assistant Relay Number List

SM200	C200_DIR	C200 Direction Control	SM228	C228_DIR	C228 Direction Control
SM201	C201_DIR	C201 Direction Control	SM229	C229_DIR	C229 Direction Control
SM202	C202_DIR	C202 Direction Control	SM230	C230_DIR	C230 Direction Control
SM203	C203_DIR	C203 Direction Control	SM231	C231_DIR	C231 Direction Control
SM204	C204_DIR	C204 Direction Control	SM232	C232_DIR	C232 Direction Control
SM205	C205_DIR	C205 Direction Control	SM233	C233_DIR	C233 Direction Control
SM206	C206_DIR	C206 Direction Control	SM234	C234_DIR	C234 Direction Control
SM207	C207_DIR	C207 Direction Control	SM235	C235_DIR	C235 Direction Control
SM208	C208_DIR	C208 Direction Control	SM236	C236_DIR	C236 Direction Control
SM209	C209_DIR	C209 Direction Control	SM237	C237_DIR	C237 Direction Control
SM210	C210_DIR	C210 Direction Control	SM238	C238_DIR	C238 Direction Control
SM211	C211_DIR	C211 Direction Control	SM239	C239_DIR	C239 Direction Control
SM212	C212_DIR	C212 Direction Control	SM240	C240_DIR	C240 Direction Control
SM213	C213_DIR	C213 Direction Control	SM241	C241_DIR	C241 Direction Control
SM214	C214_DIR	C214 Direction Control	SM242	C242_DIR	C242 Direction Control

SM215	C215_DIR	C215 Direction Control	SM243	C243_DIR	C243 Direction Control
SM216	C216_DIR	C216 Direction Control	SM244	C244_DIR	C244 Direction Control
SM217	C217_DIR	C217 Direction Control	SM245	C245_DIR	C245 Direction Control
SM218	C218_DIR	C218 Direction Control	SM246	C246_DIR	C246Direction Monitor
SM219	C219_DIR	C219 Direction Control	SM247	C247_DIR	C247 Direction Monitor
SM220	C220_DIR	C220 Direction Control	SM248	C248_DIR	C248 Direction Monitor
SM221	C221_DIR	C221 Direction Control	SM249	C249_DIR	C249 Direction Monitor
SM222	C222_DIR	C222 Direction Control	SM250	C250_DIR	C250 Direction Monitor
SM223	C223_DIR	C223 Direction Control	SM251	C251_DIR	C251 Direction Monitor
SM224	C224_DIR	C224 Direction Control	SM252	C252_DIR	C252 Direction Monitor
SM225	C225_DIR	C225 Direction Control	SM253	C253_DIR	C253 Direction Monitor
SM226	C226_DIR	C226 Direction Control	SM254	C254_DIR	C254 Direction Monitor
SM227	C227_DIR	C227 Direction Control	SM255	C255_DIR	C255 Direction Monitor

Table10-6

※C235~C255 is high-speed counting, C235~C245 is one-way counting, C246~C250 is one-way and two-way counting, C251~C255 is Bidirectional counting.

Counter Feature

Item	16-bit Counter	32-bit Counter
Counter Direction	Count up	Reciprocal countdown
Set Value	1~32767	-2147483~+2147483674
Appointed Set Value	Constant K or data register	Data registers shall be with 2 registers
Current Value Changing	No changing after count up	Changing after count up(Circulation Counter)
Output Counts	Action holding after count up	Action holding after count up, reset after Reciprocal countdown.
Reset Actions	Counter current value is 0 after executing RST command, output counts recover.	

Current Register	16-bit	32-bit

Table 10-7

High-speed Counter

In Flexem PLC, 21 counter timer C235~C255 shares 4 high-speed input ports X0,X1,X3,X4,some input ports can only provides one high-speed counter.Those 21 counter is 32-bit add/subtract counter(see below table). Different type high-speed counter can be used at the same time, as there high-speed is too fast, the input cannot be conflicts.

Input Counter		X0	X1	X2	X3	X4	X5	X6	X7
Single-phase single count input	C235	U/D							
	C236		U/D						
	C237			U/D					
	C238				U/D				
	C239					U/D			
	C240						U/D		
	C241	U/D	R						
	C242		U/D	R					
	C243			U/D	R				
	C244	U/D	R					S	
	C245			U/D	R				S
Single-phase single count input	C246	U	D						
	C247	U	D	R					
	C248				U	D	R		
	C249	U	D	R				S	
	C250				U	D	R		S
Bidirectional Counting Input	C251	A	B						
	C252	A	B	R					
	C253				A	B	R		
	C254	A	B	R				S	
	C255				A	B	R		S

Table 10-8

[U] :Up Counter Input [D]:Down Counter [A]:A-phase Input [B]:B-phase Input [R]:Reset Input

[S]: Set-up Input

High-speed counter running established on the basis of interruption, which means events triggering is without any relation of scanning time. When it counts with external high-speed pulse, the line circle of high-speed counter in the ladder diagram shall always get into electricity to show the input counts related already been used, other high-speed counter treatment cannot conflict with it, and you can use SM0 to drive counter's line coils. Those counters are 32-bit up-and-down counters, and it can be divided into 3 types according to different up-and-down counting ways. See as table 10-9:

Item	One-way Single Counting Input	One-way Single Counting Input	Double-way Double Counting Input
Specified way of counting	According to SM235-SM245 start, C235-C245 makes up-down counting	According to up counting input or down counting action, counter makes add/substract counting automatically	A-phase input is on, B-phase input is OFF→ON， up counting, ON→OFF, down counting.
Monitoring of Counting	——	Through monitoring SM246-SM255, you can know （OFF） or （ON） situation.	

Table 10-9

In various high-speed counter, you can decide the time of interrupting reset input and counting starts.

Prompt:

Counter NO can not be as counter but can be used as data register for data memory.

10.8Register D/SD

Data Register D

Register is used as data calculation and storage, such as the calculation for timer, counter, analog parameters calculation etc. Each register width is 16bit. If it uses 32bit instruction, the neighbouring registers will be grouped into 32bit register automatically. Lower address is low byte, and higher address is high byte.

The calculating data of PLC instruction is processed by signed number， to 16bit register, bit15 is signed bit （0 means positive number， 1 means negative number）

For 32bit register, high byte bit15 is sign bit, and the value range is-32 , 768 ~+32， 767.

When you need process 32bit data, you can group 2 D registers into 32bit double words, for example, when you visit D100 by 32bit formats, you can make D101 register of high address as high byte, simultaneously you can make high byte bit 15 as double words sign bit, you can process-2 , 147 , 483 , 648-2 ,147 , 483 , 647 values.

Register uses D0, D1,…,D4095 as symbol and numbered as decimal system as table 10-10 as below:

Tabel10-11

General Using	Poweroff Retain	General Using	Specific Using
D0~D199 (200Counts) ※1	D200~D511 (312counts) ※2	D512~D4095 (3584counts) ※1	SD0~D511 (512counts)

※1： Non poweroff retain area, it can be changed into poweroff retain area by setting parameters.

※2： Poweroff retain area, it can be changed into non poweroff retain area by setting parameters.

10.9Indicator L,P,I

Indicator（L）used for the entrance address of jumping branch.
Indicator（P）sub-program setup address symbol
Indicator（I）used for setup address symbol of program interruption, and the number uses decimal number as table 10-12:

Sub-branch	Sub-program	Input Interruption	Timing Interruption
L0~L127 Total 127 counts	P0~P127 Total 127 counts	I0:X0 rising edge interruption I1:X0falling edge interruption I2:X1rising edge interruption I3:X1falling edge interruption I4:X2rising edge interruption I5:X2falling edge interruption I6:X3rising edge interruption I7:X3falling edge interruption I8:X4rising edge interruption I9:X4falling edge interruption I10:X5rising edge interruption I11:X5falling edge interruption Total 12counts	I16 I17 I18 Total 3 counts
Suitable for LBL,CJ instructions	Suitable for CALL instructions		

Table 10-12

10.10Constant K,H,F

FlexLogic programmable logic controller can use 5 types of values according to different usage and purpose, the functions are as table 10-13 below:

Type	Illustration in the Programming
Decimal Number(DEC)	Timer and counter setup value（K constant）assist relay (M), timer(T),counter(C),status S NO(soft components number)appointed instruction operation value and instruction action（K constant）
Hexadecimal (HEX)	It mainly used in the appointed instruction operation value and appointed action(H constant) as decimal number.
Binary(BIN)	You can appoint the value of the timer, counter or data register with decimal number or Hexadecimal. But inside the programmable logic controller, those numbers are processed by binary. Moreover, those soft components will change into decimal number automatically(also it can switch to Hexadecimal when it monitors in the external devices.
Octal (OTC)	Input relay and output relay soft components number can be distributed as octal value.Then you can carry the number of ［0-7 , 10-17 ， … 70-77 , 100-107］ ［8 , 9］ is non existing in octal number.
BCD	BCD standards for decimal 0-9 value by 4-bit binary. The process is very easy, therefore,you can use it into BCD output digital switch value or display& control of seven segment.
BIN Floating Number	Programmable logic controller is with high precision float calculation function, and inside it can use BIN floating number for floating calculation.
Decimal Floating Number	Decimal floating number is mainly only used for monitoring and convenient for reading.

Table 10-13

Constant K

[K] stands for the symbol of decimal system. It is mainly used for appointing timer or counter set-up value or the value in the application instruction operation value. In 16bit instruction value，constant K's value is -32768 ~ 32767, in 32bit instruction value，constant K value is-2,147,483,648 ~ 2,147,483,647.

Constant H

[H] is the symbol of hexadecimal value. It is mainly used for appointing instruction operation value. Constant H value is 0000 ~ FFFF, in 32bit instruction， constant K value is 0000,0000 ~ FFFF,FFFF。

Constant F

[F] is the symbol of 32-bit floating number, and it is mainly used for the operation value of appointing instruction manual.

11.Instruction Detailed Manual

11.1 Basic Instruction

Constant open [LD] instruction

Function: contacts logic calculation starts.

Ladder diagram as 11-1indication:

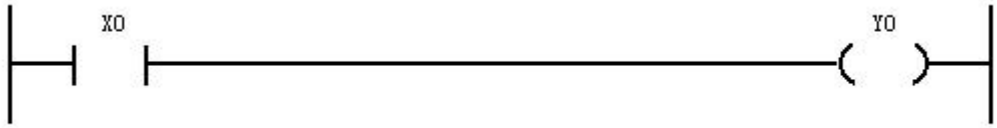


Photo 11-1

Instruction illustration: Logic calculation starts through constant contacts.

Applicable soft components： X,Y,M,SM,S,T,C

Constant off [LDI] instruction

Function: contacts logic calculation starts.

Ladder diagram as 11-2 indication:

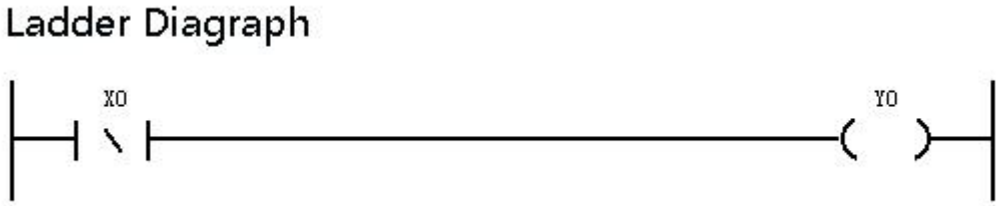


Photo11-2

Instruction Illustration: Logic calculation starts through Constant off [LDI] instruction.

Applicable Soft Components: X,Y,M,SM,S,T,C

Output Point [OUT] Instruction

Function： Coil driven

Ladder diagram is as 11-3 shown

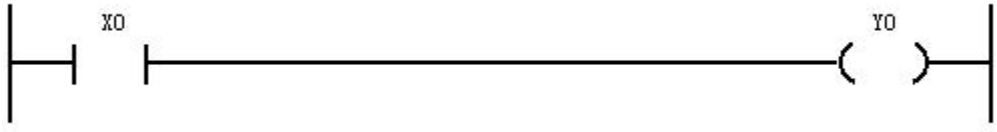


Photo 11-3

Instruction Illustration: OUT command is the wiring driven command to output relay,assist

relay, status, timer, counter.

Applicable soft components: Y,M,SM,S,T,C

Rising Edge Trigger[LDP] Command

Function: rising edge tests calculation starts.

Ladder digraph is as photo 11-4 shown

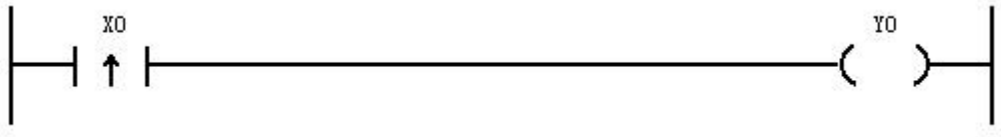


Photo 11-4

Instruction Illustration: LDP instruction is the trigger command of starting rising edge, and it only connects one cycling period under command software rising edge（OFF→ON changing).

Applicable soft components： X,Y,M,S,SM,T,C

Falling Edge Trigger[LDF] Command

Function: falling edge tests calculation starts.

Ladder digraph is as 11-5 shown:

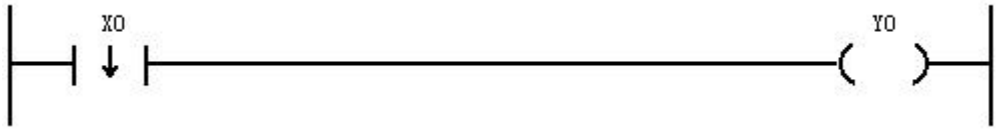


Photo 11-5

Instruction Illustration: LDF command is the contact command of falling edge testing, and it only connects one cycling period during command software falling edge(ON→OFF changing).

Applicable components： X,Y,M,SM,S,T,C

Master Control[MC] Contact

Function: public serial contacts connection.

Ladder digraph is as 11-6 shown:

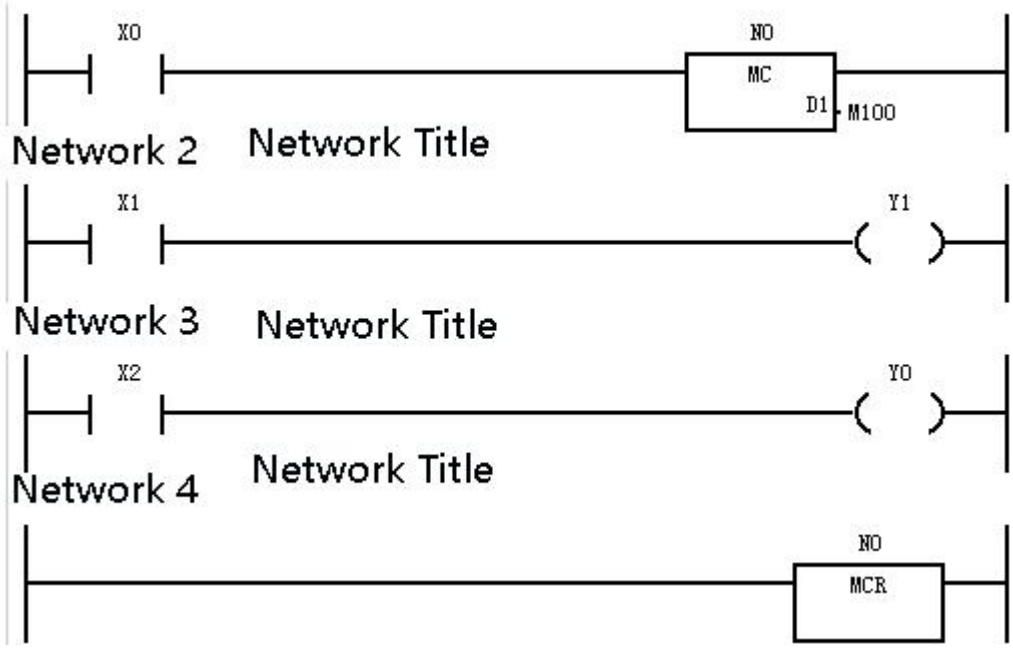


Photo 11-6

Instruction Illustration

1.Master Control MC return circuit totally is with 8(N0~N7).Each master control MC N command is correspondent with same number of master control return circuit termination command MCR N （ It needs to ensure MCR N instruction is after MC N instruction).

2.When master control input X0=1，this command is without execution（as MC N command is not existing). When master control input X0=0， there will be following situation for the master control return action starts from MC N instruction to same number MCR N instruction:

(a) Accumulative timer or counter, OUT command driven maintaining soft components will keep same status. Non-accumulative timer or counter,OUT command driven general soft components, all status are cleared as O, and other commands is without any execution.

In above program, X0 gets through, then it will execute MC to MCR instruction. X0 disconnects, there will be following situation: status maintaining, accumulative timer, counter, soft components driven by OUT commands. And it will change into disconnected soft components: non-accumulative timer, counter, and the soft components driven by OUT command. Through changing soft components Y,M, you can use master control command(MC) multiple times. But if you use same soft components, there will be double circle coils output as OUT command.

Applicable soft components： Y,M

Master Control Reset [MCR] Instruction

Function: public serial contacts clearance

Ladder digraph is as 11-7 shown:

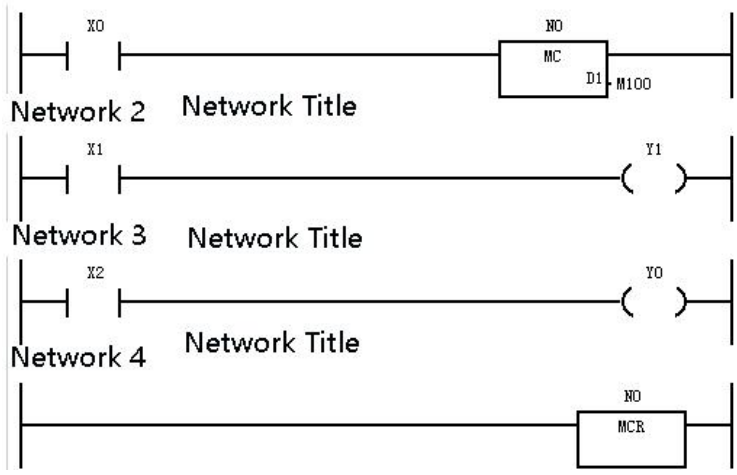


Photo 11-7

Instruction Illustration:

In above program, X0 connects, it will execute MC to MCR command, X0 disconnects, there will be following situation: status maintaining-accumulative timer, counter, and the soft components driven by OUT commands. It changes into disconnecting soft components: non-accumulative timer, counter and the soft components driven by OUT commands.

Applicable soft components: non.

Calculation Converse [NOT] Command

Function: calculation results converse.

Ladder digraph is as 11-8 shown

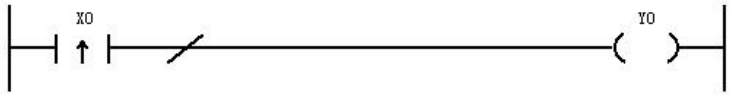


Photo 11-8

Command Illustration:

NOT command is the command to reverse calculation results before executing NOT command.

It does not need appoint soft components NO.

The calculation result before executing NOT command	The calculation result after executing NOT command.
OFF	ON
ON	OFF

Applicable soft components: none

Rising edge test [PLS] commands

Function: rising edge slight output.

Ladder digraph is as 11-9 below

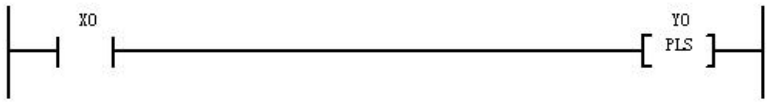


Photo11-9

Command illustration: when using PLS commands, soft components Y,M acts only within one scanning period when the drive input as ON. For example, when the drive input maintains ON， you can make PLC RUN→STOP→RUN,one RUN after PLS, this is because when it is on STOP,M600 maintains action.

Applicable soft components：Y,M

Falling edge tests [PLF] Command

Function: falling edge slight output.

Ladder digraph is as 11-10 shown

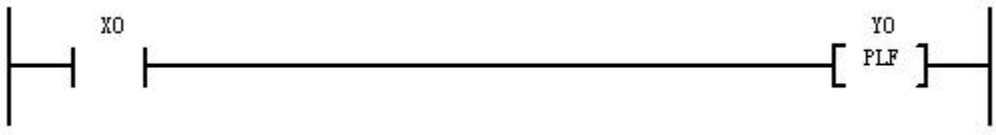


Photo 11-10

Instruction Illustration: Soft components Y,M acts within one cycling period only during drive input as OFF when using PLF command.

Applicable soft components：Y,M

[SET] Command

Function: action maintains

Ladder digraph is as 11-11 shown

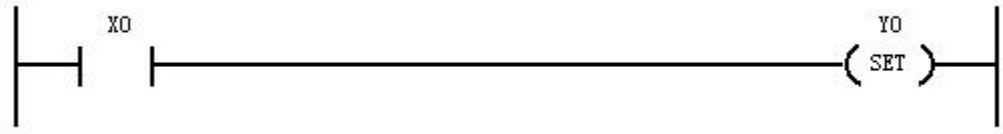


Photo 11-11

Command Illustration: in above program, once X0 connects, even if it disconnects, Y0 still remains action, same to M,S.

Applicable soft component： Y,M,SM,S

Reset [RST] Command

Function: it clears action maintaining, current value and clear the register.

Ladder digraph is as 11-12 shown:

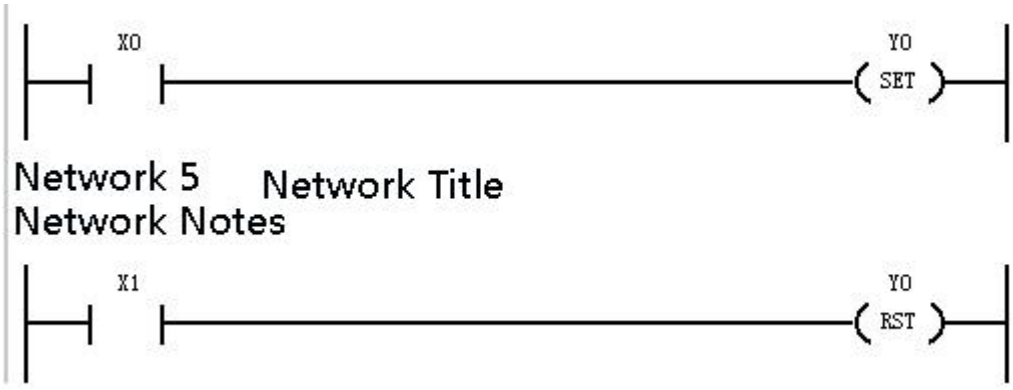


Photo 11-12

Command Illustration: Once X1 gets through, even if it disconnects, Y0 remains not driven, and same to M,S. To same soft components, SET, RST can be used multiple times, sequence can also be casually and at last execution is effective. In addition, you can also use RST command to register.(You can get same results by using constant K0 transfer command).

Applicable soft components： Y,M,S

NOP [NOP] Command

Function: non action.

Ladder digraph is as 11-13 shown:

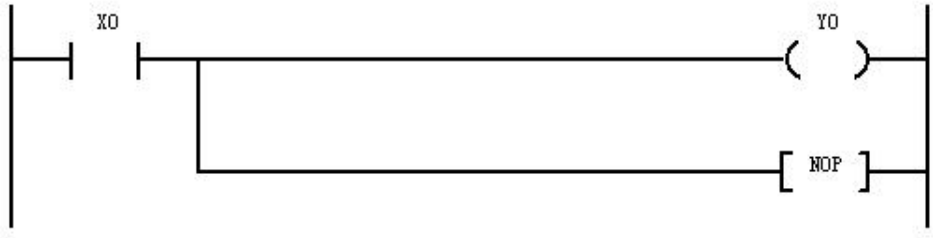


Photo 11-13

Command Illustration: All commands become NOP when you clear all programs. If NOP commands are added between general commands, then PLC will continue working without noticing NOP commands. If NOP commands are added in the program, then you can reduce

step changing but the program shall be with margin. In addition, if you change the written command into NOP command, then the circuit will change, please take notice.

Applicable soft components: non

Immediate output command[OUTD]

Function: circle line driven.

Ladder digraph is as 11-14 shown:

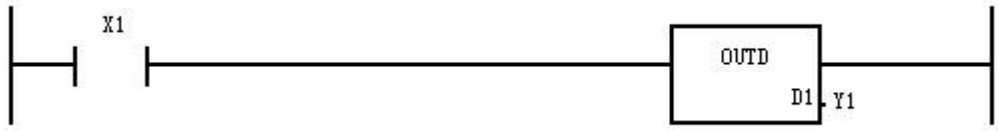


Photo 11-14

Command illustration: direct output command can operate to output window without cycling period.

Applicable soft components： Y

Alternative command[ALT]（continuous execution）/[ALTP]（pulse execution type）

Function: you can reverse the components status when energy is effective.

Ladder digraph is as 11-15 shown:

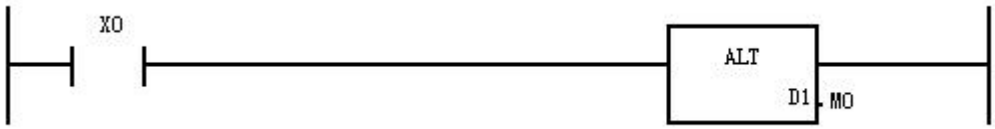


Photo 11-15

Command Illustration: M0 acts once X0 changes one status.

Applicable soft components: Y,M,SM,S

11.2 Step Ladder Digraph Command

Step ladder digraph starts：[STL] commands

Function: step ladder diagram starts.

Ladder digraph is as 11-16 shown

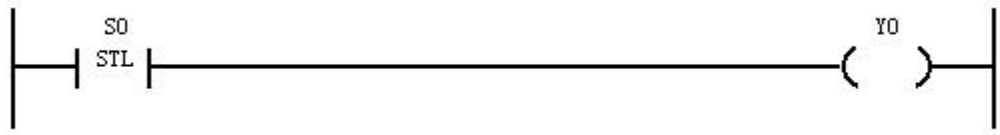


Photo 11-16

Command Illustration: step command uses internal soft components(S) status to execute procedure step control command on sequence control program.

Applicable soft components： S

Return RESET [RET] Command

Function: step ladder digraph ends.

Ladder digraph is as photo 11-17 shown:

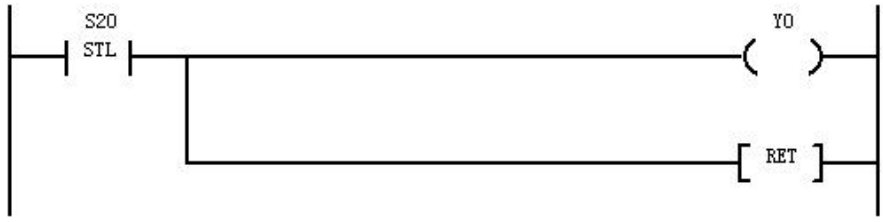


Photo 11-17

Command Illustration： step ladder digraph ends

Applicable soft components: none.

11.3 Program Flowchart Commands

Symbol [LBL] command

Function: It defines CJ commands jumping location.

Ladder diagram is as 11-18 Shown:

Condition Jumping [CJ] Command

Function: the command makes CJ,CJP command starting to indicator(L) end. It can shorten cycling time(cycling period) and execute using double coils program.

Ladder digraph is as 11-19 shown:

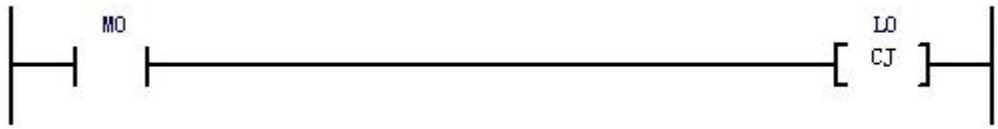


Photo 11-19

Command Illustration: when the condition is ok, it can jump LBL instruction to execute in appointing location.

Applicable soft components： L0-L255

Sub Program using[CALL](Continuous execution)/[CALLP]（pulse execution type）

Function： you can use sub-program.

Ladder digraph is as photo 11-20(main program), photo 11-21(sub program) shown

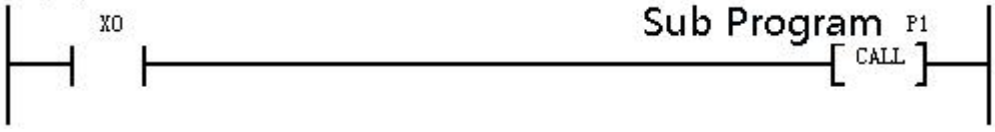


Photo11-20

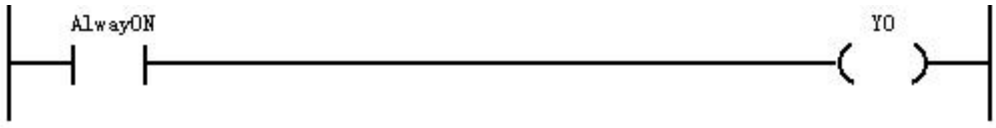


Photo 11-21

Command Illustration: If X0 gets through in above program, then sub-program P1 will be used, after sub program execution, then you can return to main programs to finish the sentence.

Applicable soft components: non.

Monitoring Timer[WDT](continuous execution type)/[WDTP]

(Pulse execution type)

Function: in sequence controlling program, executing monitoring timer refresh command is WDT

command.

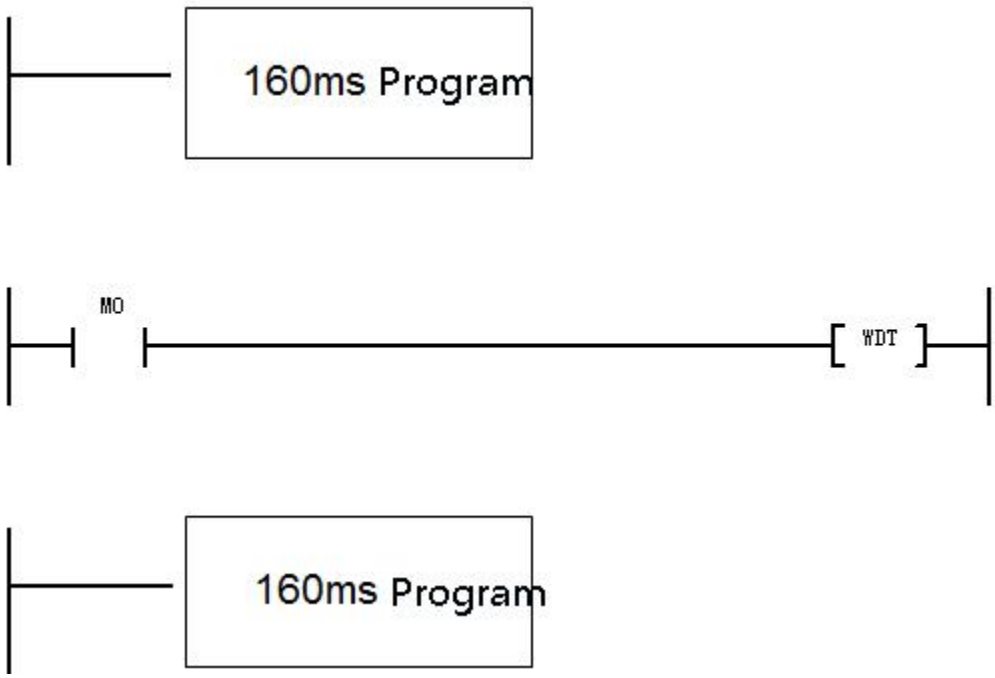


Photo 11-22

Manual Illustration:

This program scanning time is 320ms, and you can split the program into 2 section by using WDT instruction, and make each section program scanning time below 200ms. There is timer to monitor user program execution overtime or not in PLC system.If it is overtime,user program execution will be stopped and alarm starts, the monitoring timer will be reset by executing WDT instruction.When you make monitoring timer restarts time counting,overtime faults will be avoided. If user program execution is over complicated(such as too much circulation calculation),then probably running overtime faults will occur during execution. If it is necessary in program, you can use WDT instruction(You can insert the command between FOR~NEXT command), If program cycling time is over SD0 value （it

defaults 200ms), you can insert WDT command in the program to divide each program into the set-up value below 200ms or modify SD0 set-up value according to concerned needs.

Applicable soft components: none.

11.4Timer Command[TMR]

Function: timer accumulates timer pulse of 1ms, 10ms, 100ms in the plc, output contact acts when the timer achieves set-up value.

Ladder digraph is as 11-23 shown:

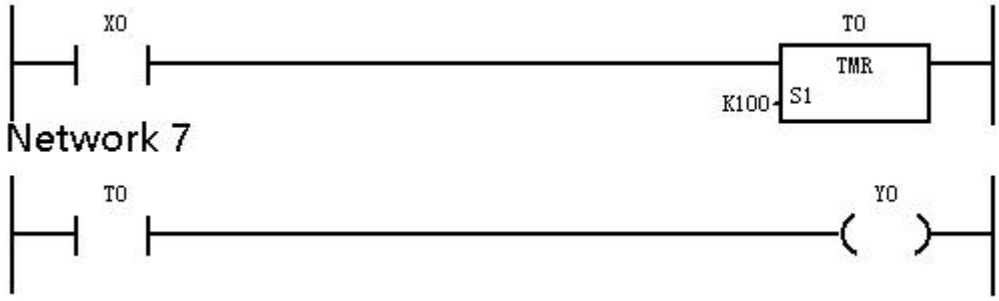


Photo11-23

Applicable soft components:

Timer	T0~T255
S1	K/H/D/SD

11.5Counter Command[CNT]

Function: output contact acts when it achieves set-up value.

Ladder digraph is as 11-24 shown:

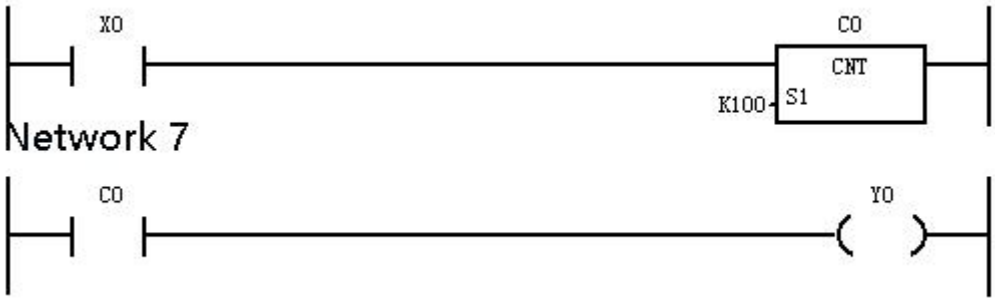


Table 11-24

Applicable Soft Components:

Timer	C0~C255
S1	K/H/D/SD

11.6 Comparison Command

Single word equal [LD] command Written type:

Function: it makes BIN comparison for data source contents, when S1 value equals S2 value, it will execute segmental calculation.

Ladder digraph is as 11-25 shown

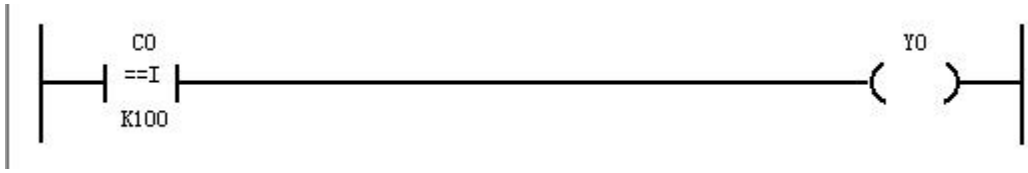


Photo 11-25

Command Illustration:

In above program, it will drive Y0 when C0 current value is 100. When data source top digit(b15) 1,you can make this value as negative number to comparison.

Applicable soft components： T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-32768~65535

Double word equal[LDD=] command

Written type:

Function: You can make BIN comparison for data source contents(32 bit),when S1 and S2 current value equals, then it will execute segmental calculation.

Ladder digraph is as photo 11-26 shown:

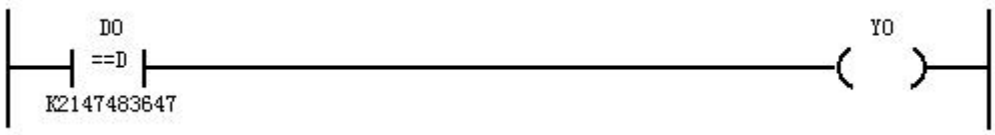


Photo 11-26

Command illustration: in above program, when D0 current value is 2147483647, it will drive Y0, when the data source high bit (b31) is 1, you can make the value as negative number in comparison, 32-bit counter（C200~）comparison must process as 32-bit command. It you appoint 16-bit command, it will cause the program faults or running faults.

Applicable soft components：

T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS,-2147483648~2147483647

Single word is not equal[LD<>] Command

Written type:

Function: When you make BIN comparison to data source contents (16-bit), S1 value is not equal to S2 value, then segmental calculation will be executed.

Ladder digraph is as 11-27 shown

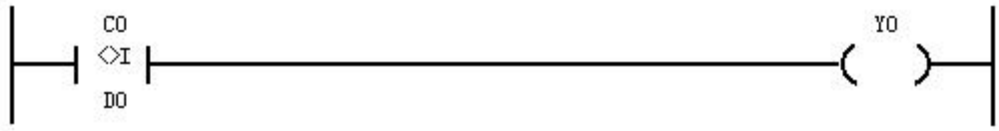
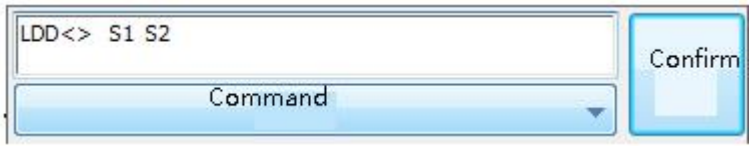


Photo 11-27

Command Illustration: in above program, it will drive Y0 when C0 current value is not equal to C1.When the data source high bit（b15)is 1,you can make comparison as this value as negative number. Applicable soft components:T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-32768~65535

Double words are not equal to [LDD<>] command

Written type:



Function: you can do BIN comparison to data source contents(32 bit),when S1 and S2 value is not equal, and execute segmental calculation.

Ladder digraph as 11-28 shown:

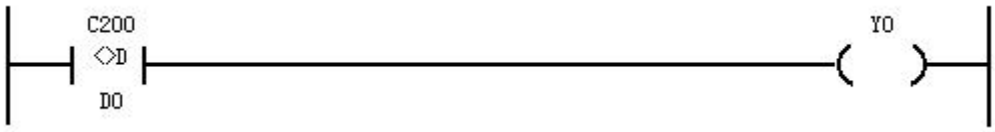


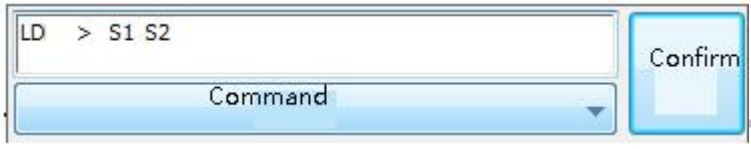
Photo 11-28

Command Illustration: in above program, it will drive Y0 when C200 current value is not equal to D0, when data source high bit（b31) is 1, you can make the value as negative number for comparison,32 bit counter(C200~) comparison must process as 32-bit command. If you appoint 16-bit command, it will cause program fault or running fault.

Applicable soft components: T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-2147483648~2147483647

Single word over [LD>] command

Written Type:



Function： You can do BIN comparison to data source contents, when S1>S2 current value, you can execute segmental calculation

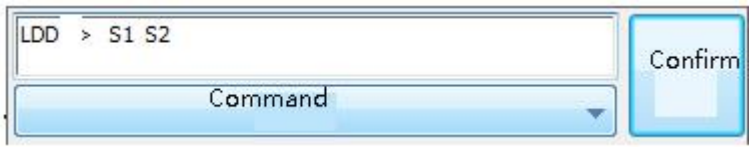
Ladder digraph is as photo 11-29 shown:

Photo 11-29

Command Illustration: in above program, when D0 current value is over 12345, it will drive Y0, when data source high bit(b15) is 1, you can make this value as negative number for comparison. Applicable soft components:T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-32768~65535

Double words over[LDD>] command

Written type:



Function:

You can do BIN comparison to data source contents (32 bit),when S1>S2 current value, you can execute segmental calculation.

Ladder digraph is as 11-30 shown:

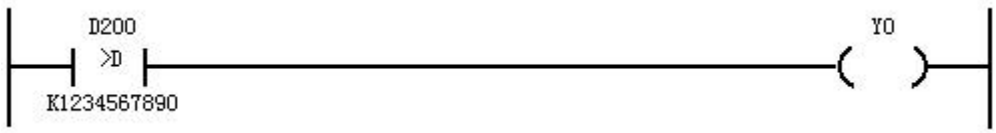


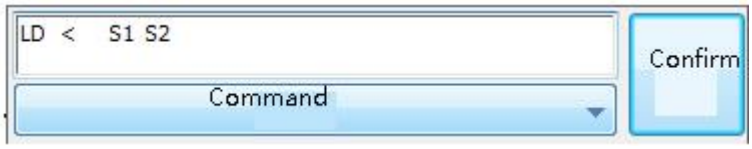
Photo 11-30

Command Illustration: in above program, when C200 current value is over 1234567890, it will drive Y0. When data source high bit(b31) is 1, you can compare the value as negative value. 32-bit counter(C200~) comparison, you must process with 32bit command. If you appoint 16-bit command, it will lead to program fault or running fault.

Applicable soft components： T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-2147483648~2147483647

Single word less [LD<] Command

Written Type:



Function： you can make BIN comparison to data contents(16-bit), when S1<S2 current value,it will execute segmental calculation.

Ladder digraph shown

Ladder digraph as 11-31 shown

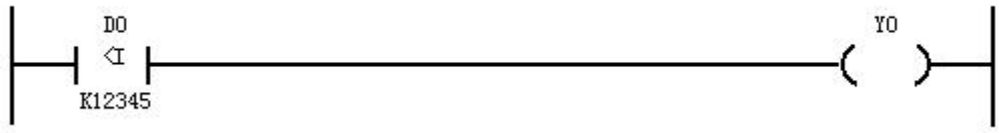


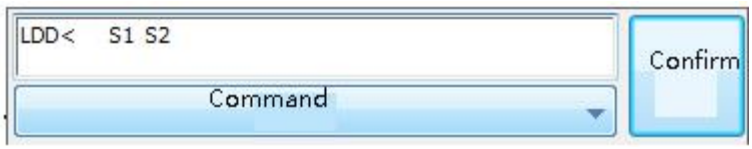
Photo 11-31

Command Illustration: in above program, when D0 current value is less than 12345, it will drive Y0,when the data source highest bit(b15) is 1, you can make this value as negative number for comparison.

Applicable soft components: T,C,D,SD,V,Z,KnX, KnY,KnM, KnSM, KnS,-32768~65535

Double words less [LDD<] command

Written command



Function：when you make BIN comparison to data source content(32 bit), and S1<S2 current value， you can execute segmental calculation.

Ladder digraph as 11-32 shown

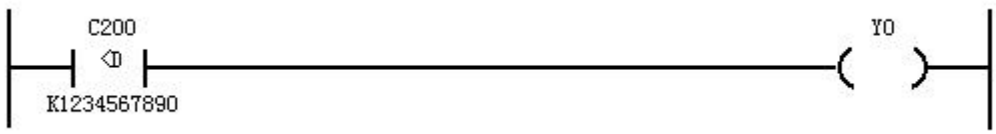


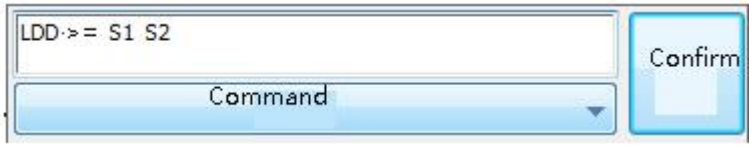
Photo 11-32

Command Illustration: in above program, when C200 current value is less than 1234567890, it will drive Y0, when data source highest bit(b31) is 1, you can compare the value as negative value.When making 32-bit counter（C200~)comparison, you must process by 32-bit command.If appointing 16-bit command, it will cause program fault or running fault.

Applicable soft components： T,C,D,SD,V,Z,KnX, KnY, KnM,
KnSM,KnS,-2147483648~2147483647

Single word over or equal [LD>=]command

Written type:



Function: you can do BIN comparison to data source(16-bit), when S1≥S2 current value, you can execute segmental calculation.

Ladder digraph is as 11-33 shown:

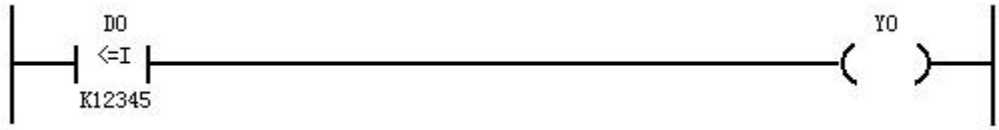


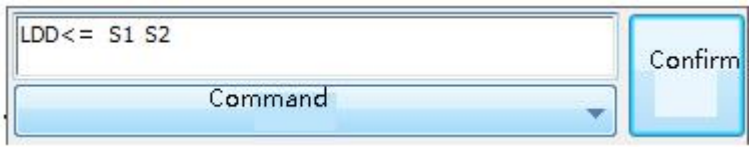
Photo 11-33

Command Illustration: in above program, when D0 current value is equal or more than 12345, you can drive Y0, when data source highest bit(b15) is 1, you can make the value as negative number for comparison.

Applicable soft components： T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-32768~65535

Double words more or equal [LDD>=] Command

Written format:



Function: you can make BIN comparison to data source contents(32 bit), when S1>S2 current value, you can execute segmental calculation.

Ladder digraph is as photo 11-34 shown:

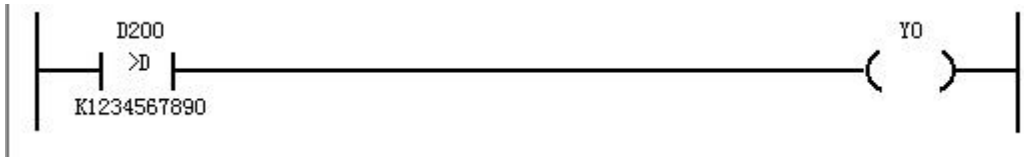


Photo 11-34

Command Illustration:

In above program, when C200 current value is over or equal to 1234567890, it will drive Y0,when data source highest bit(b31) is 1, you can make this value as negative number for comparison.

32-bit counter(C200~) comparison， you must process it with 32-bit command,

If you appoint 16-bit command, it will cause program fault or running fault.

Applicable soft components：

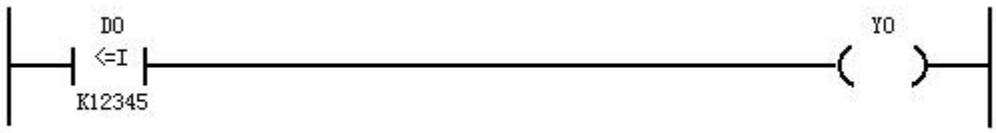
T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS,-2147483648~2147483647

Single word is less or equal[LD<] command

Written type:

Function, when you make BIN comparison to data source contents(16-bit), when S1<=S2current value, segmental calculation will be executed.

Ladder digraph is as 11-35 shown



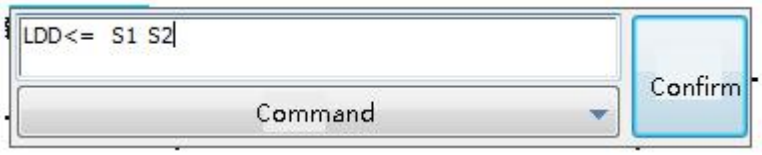
Photot 11-35

Command Illustration: in above command, when D0 current value is less or equal to 12345, it will drive Y0, when data source highest bit(b15) is 1, you can make this value as negative number for comparison.

Applicable soft components： T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS,-32768~65535

Double words less or equal [LDD<=] Command

Writen type:



Function: you can make BIN comparison to data source contents(32 bit), when S1<=S2 current value， then you can execute segmental calculation.

Ladder digraph is as 11-36 shown

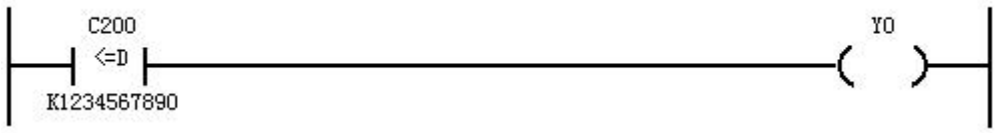


Photo 11-36

Command Illustration: in above program, when C200 current value is less or equal to 1234567890,it will drive Y0, when data source highest bit(b31) is 1, then you can make the value as negative number for comparison； 32-bit counter(C200~) comparison, you must use 32-bit command to process. If you appoint 16-bit command, then it will cause program faults or running faults.

Applicable soft components: T,C,D,SD,V,Z,KnX, KnY, KnM, KnSM, KnS,-2147483648~2147483647

11.7Number Calculation Command

BIN Add Operation

bit command： [ADD](continuous execution type)/[ADDP] （pulse execution type）

32-bit command： [DADD](continuous execution type)/[DADDP] （pulse execution type）

Function: 2 source data can be transferred to target after binary arithmetic operation.
Each data highest position is plus symbol(0) bit and negative symbol(1) bit, those da ta can be executed add operation as algebra format.
Ladder digraph is as 11-37

Photo 11-37
Command Illustration: if the calculation is 0, then 0(SM20) mark will be set. If the calculation result is over 32,767（16bit operation or 2,147,483,647）（32bit calculation, carry symbol (SM21) will reset,if the calculation result is less than -32,768（16bit calculation or -2,147,483,648（32bit calculation borrowing symbol(SM22) will reset, when you operate 32bit calculation,variable address in the command is low 16bit address, then the neighboring high NO list address unit is 16bit, please prevent repeat or covering during program.
Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S3	KnY,KnM,KnSM,KnS,T,C,D

BIN Deduct Calculation
16-bit command:[SUB](continuous execution type)/[SUBP]（Pulse execution type）
32-bit command:[DSUB](continuous execution type)/[DSUBP](pulse execution type)
Function: S1 appointed soft components contents, you can deduct S2 appointed software components contents by algebra, and the result will be stored into the soft components designed by D.
Ladder digraph is as 11-38 shown

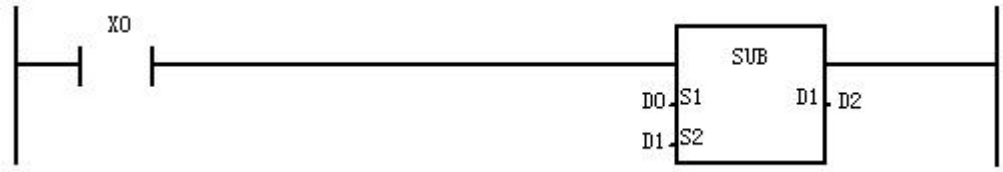


Photo 11-38
Command Illustration: if the calculation result is 0, then 0 symbol (SM20) will reset, if the calculation result is over 32,767（16bit calculation or -2,147,483,647（32bit operation，carry symbol (SM21)will reset； if the calculation result is -32,768（16bit calculation or -2,147,483,648)（32bit calculation， borrow symbol (SM22) will reset, when you make 32bit Calculation,and the variable address in the command is low 16bit address, and the neighboring high NO list address unit is high 16bit,please prevent repetition or mistake covering.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

BIN Multiply Operation

16-bit Command: [MUL](continuous execution type) /[MULP](pulse execution type)

32-bit command: [DMUL](continuous execution type)/[DMULP](pulse execution type)

Function: each soft components contents multiply can be stored into target address appointed soft components(low bit) with 32-bit data format and soft components(high bit).

Ladder digraph is as photo 11-40 shown:

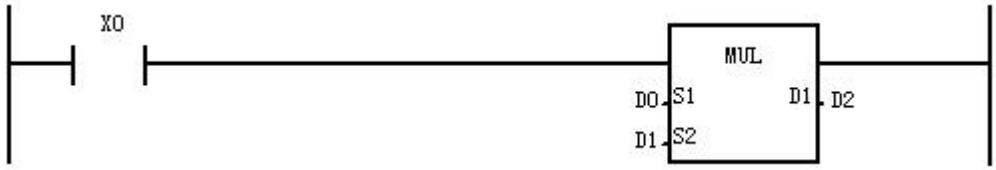


Photo 11-40

Command Illustration: when making operation of 32bit,the variable address in the command is low 16bit address, the neighbor high list NO address unit is high 16bit, please prevent repeat or mistaken covering during programming. And the calculation result can only be 32bit, to over 32bit range calculation, it is better using floating calculation command for calculation.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

BIN Division Calculation

16-bit Command:[DIV](continuous execution type)/[DIVP](pulse execution type)

32-bit Command:[DDIV](continuous execution type)/[DDIVP](pulse execution type)

Function: S1 appointed soft components content is dividend, S2 appointed soft components content is divisor.

D appointed soft components and the next NO of soft components will be stored in quotient and remainder.

Ladder digraph is as photo 11-41 shown:

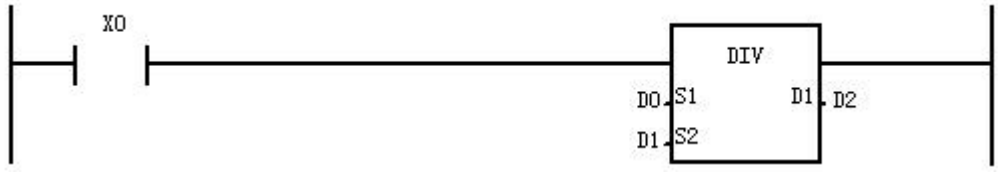


Photo 11-41

Command Illustration: when operating 32bit calculation the S1 and S2 variable address in the command is low 16bit address, then the neighbor high NO address unit is high 16bit,

please prevent repeat or mistaken covering during programming. The quotient calculated will be stored in D, D+1 unit, and the remainder will be stored into D+2,D+3 address unit. If the divisor S2 is 0, the fault calculation will occur, if appointing byte components （KnX/KnY/KnM/KnS apponiting as D), then the remainder will not be available. If the dividend is negative number, then the remainder is also negative number.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

BIN plus 1

16-bit command： [INC](continuous execution type)/[INCP](pulse execution type)

32-bit command： [DINC](continuous execution type)/[DINCP](pulse execution type)

Function: command execute once, then S1 appointed soft components content will add 1.

Ladder digraph is as 11-41 shown

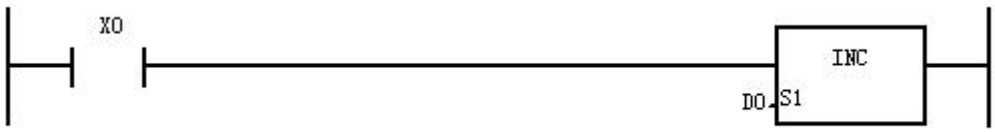


Photo 11-41

Command Illustration: in continuous execution command, each cycling period will execute adding 1 calculation. 16-bit calculation, 2,767 adding 1 changes to -32,768； 32-bit calculation， 2,147,483,647 adding 1 changes to -2,147,483,648. The command will not refresh to 0 symbol, carry symbol and borrow symbol.

Applicable soft components: KnY,KnM,KnSM,KnS,T,C,D.

BIN Minus 1

16-bit command： [DEC](continuous execution type) /[DECP](pulse execution type)

32-bit command:[DDEC](continuous execution type) /[DDECP](pulse execution type)

Function: Command execute one time, then S1 appointed soft components content will reduce 1.

Ladder digraph is as 11-42 shown

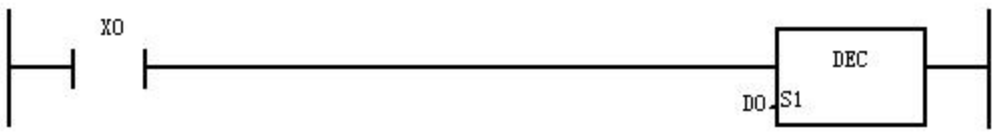


Photo 11-42

Command Illustration:in continuous execution command, each cycling period will execute minus 1 calculation. 16-bit calculation, -32,768 minus 1 changing to 32,767； 32-bit calculation， -2,147,483,648 minus 1 changing to 2,147,483,647. This command will not refresh to 0 symbol, carry symbol and borrow symbol.

Applicable soft components: KnY,KnM,KnSM,KnS,T,C,D

Logic and 16-bit command：[WAND](continuous execution type)/[WANDP]（pulse execution type）

32-bit Command：[DAND](Continuous execution type)/[DANDP]（pulse execution type）

Function: The soft components contents of each source appointed start logic calculation, the results available will be stored into the soft components appointed by target address. And the ladder digraph is as photo 11-43 shown:

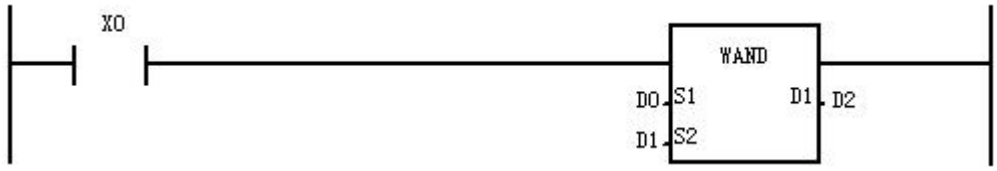


Photo 11-43

Command Illustration： 1^1=1,0^1=0,1^0=0,0^0=0.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

Logic or 16-bit command：[WOR](continuous execution type)/[WORP](pulse execution type)

32-bit command： [DOR](continuous execution type)/[DORP](pulse execution type)

Function: Each soft components contents appointed starts logic or calculation, the results available will be stored into the soft components appointed by target address.

Ladder digraph is as 11-44 shown

Command Illustration: 1v1=1,0v1=1,1v0=1,0v0=0

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

Logic or 16-bit command：[WXOR](continuous execution type)/[WXORP]（pulse execution type）

32-bit command：[DXOR](continuous execution type)/[DXORP](pulse execution type)

Function: each soft component contents appointed by each source process logic or calculation, the Results available will be stored in the soft components appointed by target address. Ladder digraph is as photo 11-45shown:

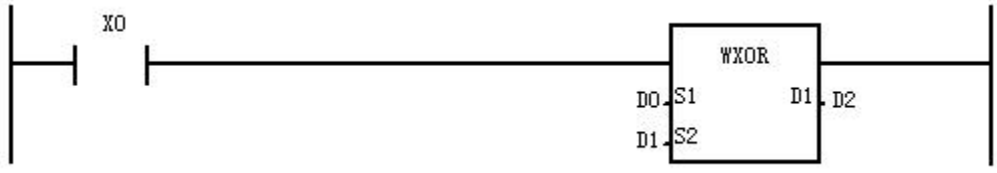


Photo11-45

Command Illustration:1(1=0,0(1=1,1(0=1,0(0=0

Available soft components

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D
D	KnY,KnM,KnSM,KnS,T,C,D

Complementary calculation:

16-bit command：[NEG](continuous execution type)/[NEGP](pulse execution type)

32-bit command：[DNEG](continuous execution type)/[DNEGP](pulse execution type)

Function: please negate in the appointed soft components contents(0→1，1→0), after plus 1 to store the results into previous soft components.

Ladder digraph is as photo 11-46 shown

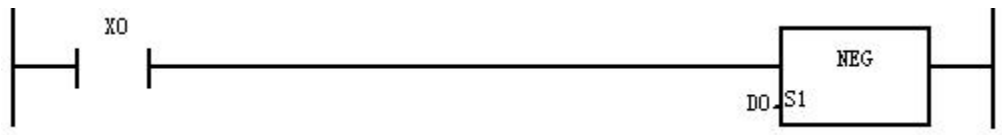


Photo11-46

Command Illustration: using continuous execution type command to execute such command calculation in each cycling period, please pay attention.

Applicable soft components: KnY,KnM,KnSM,KnS,T,C,D

11.8 Transfer and comparison command

Word comparison command

16-bit command：[CMP](continuous execution type)/[CMPP](pulse execution type)

32-bit command：[DCMP](continuous execution type)/[DCMPP](pulse execution type)

Function: by comparing source S1 and source S2 contents, please drive D, D+1,D+2 (by algebra format) according to comparison results.

Ladder digraph is as photo 11-47 shown:

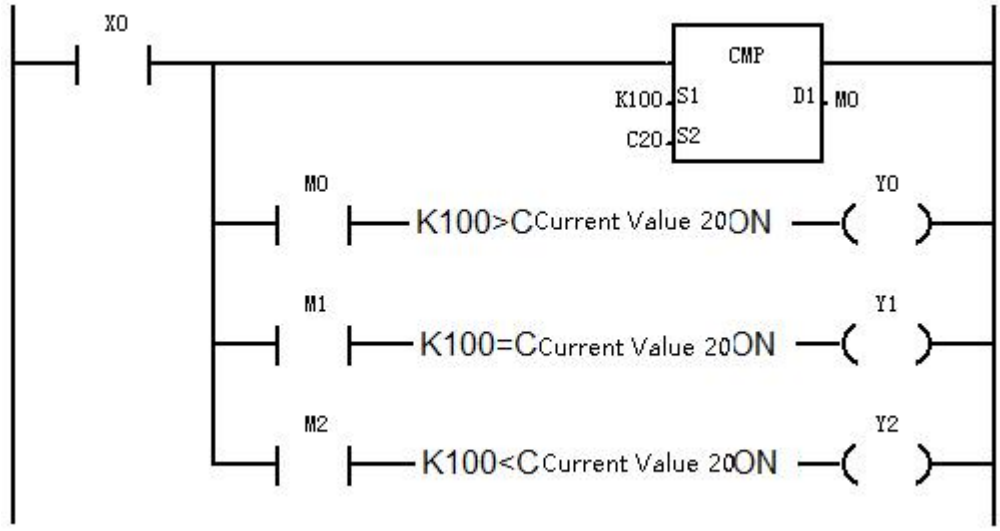


Photo11-47

Command Illustration: all source data will be processed as binary. Reset command can be used if you want to clear comparison results when the command is not executing.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
D	Y,M,S

Area Comparison Command

16-bit command：[ZCP](continuous execution type)/[ZCPP](pulse execution type)

32-bit command：[DZCP](continuous execution type)/[DZCPP](pulse execution type)

Function:

You can compare S3 and source S1 and source S2 contents, you can drive D,D+1,D+2 according to comparison results,the size and comparison are progressed according to algebra format.

Ladder digraph is as photo 11-48 shown:

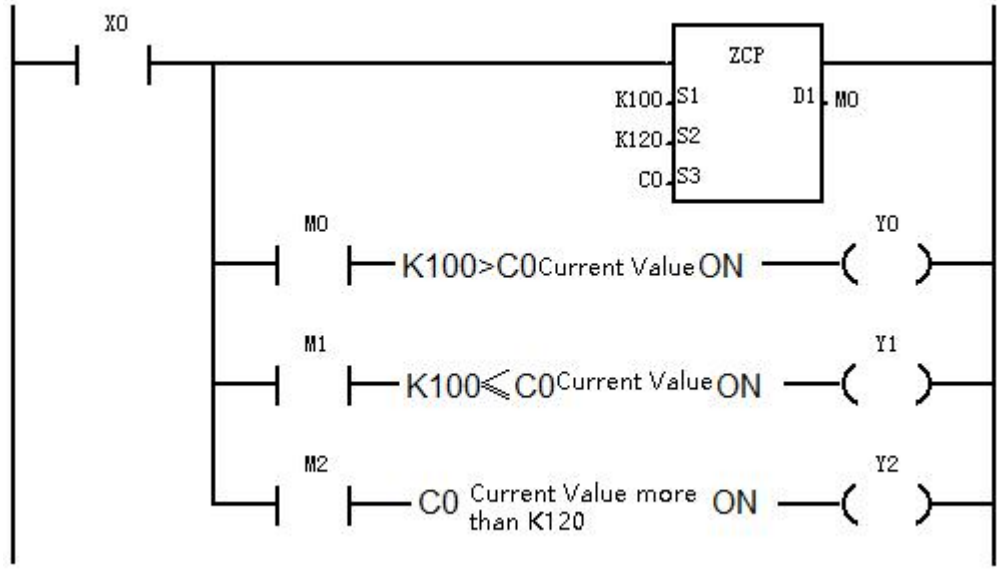


Photo 11-48

Command Illustration:algebra format to compare. (-10<2) source S1 contents shall not be more than S2 contents. You can compare above and below 2 counts comparison value and source data contents, correspondent the size area, then M0, M1, M2 acts.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
S2	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
S3	K,H,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
D	Y,M,S

Transfer Command:

16-bit command: [MOV](continuous execution type)/[MOVP](pulse execution type)

32-bit command: [DMOV](continuous execution type)/[DMOVP](pulse execution type)

Function: Transfer the data according to original type.

Ladder digraph is as photo 11-49 shown:

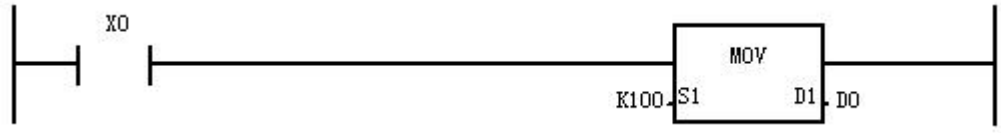


Photo 11-49

Command Illustration: when transferring the source contents to target X0 as OFF, data will not change. And constant K100 will be changed to BIN code automatically.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnS,T,C,D,V,Z
D1	KnY,KnM,KnSM,KnS,T,C,D,V,Z

Location Move

16-bit command：[SMOV](continuous execution type)/[SMOVP](Pulse execution type)

Function: data allocation and integration command,please transfer source data(BIN) BCD changing value S3 bit part to target D2-bit,and then change it into BIN code.

Ladder diagram is as photo 11-50 shown:

Photo11-50

Command Illustration： driving SM168 executing SMOV command, convert the BCD code of D1, D2, do bit move as 4unit according to original format.

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
S2	K(1~4)
S3	K(1~4)
D1	KnH,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
D2	K(1~4)

Negate Transfer

16-bit command： [CML](continuous execution type)/[CMLP](pulse execution type)

32-bit command: [DCML](continuous execution type)/[DCMLP](pulse execution type)

Function: transfer the data after negate the data.

Ladder digraph is as photo 11-51 shown:

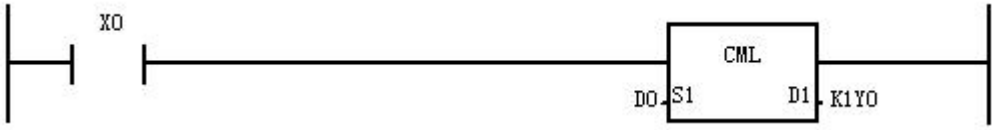


Photo 11-51

Command Illustration: after negate the source data and then transfer the source data to target address.When you use constant K in the source data, you can change to binary automatically.You can use it by output PLC data and do logic reverse output. Constant K100 will be changed to BIN code automatically.

Applicable soft components:

S1	K,H,KnH,KnX,KnY,KnM,KnSM,KnS,T,C,D,V,Z
D1	KnY,KnM,KnS,T,C,D,V,Z

Transfer by batch

16-bit command：[SMOV](continuous execution type)/[SMOVP](pulse execution type)

Function: transfer the soft components appointed by source n-count data to target appointed soft components by batch （transfer in possible range when it is over soft components no list range).

Ladder digraph is as photo 11-52 shown

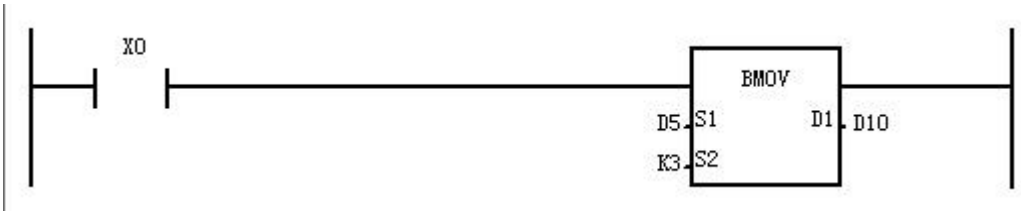


Photo11-52

Command Illustration: with bit appointed(KnY,KnM) components appointed by bit, source and target shall use same bits, and transfer direction reverse when executing command during SM in working status(ON).

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D
S2	D,SD,-32768~65535
D	KnY,KnM,KnSM,KnS,T,C,D,SD

Multi- counts Transfer:

16-bit command：[FMOV](continuous execution type)/[FMOVP](Pulse execution type)

32-bit command：[DFMOV](continuous execution type)/[FMOVP](Pulse execution type)

Function:

Transfer the soft components contents to the target appointed soft components n-count soft components,n-count soft components contents are same.

Ladder diagram as photo 11-53 shown:

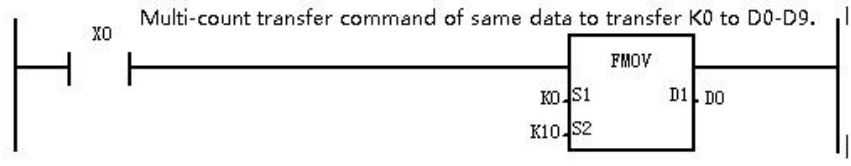


Photo 11-53

Command Illustration:you can transfer the command to possible range if it is over target soft components.

Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	-32768~65535
D	KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z

Exchange:

16-bit command： [XCH](continuous execution type/[XCHP](pulse execution type)

32-bit command：[DXCH](continuous execution type)/[DXCHP](pulse execution type)

Function: data between targets exchanges.

Ladder digraph is as photo 11-54 shown:

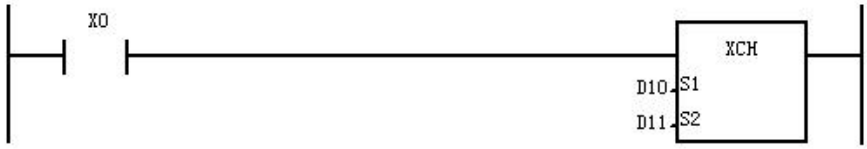


Photo 11-54

Command Illustration: if continuous execution type command is used,each cycling period can do data exchanging, please take notice. When SM160 is ON, and S1,S2 is same soft components, low 8 bit and high 8 bit can be exchanged, 32-bit command is also same. When SM160 is ON status， S1 and S2 soft components number are different, fault symbol SM67changes to ON status,this command cannot execute. When this expanding function and SWAP command action is same, please use SWAP command in general situation.

Available soft components:

S1	KnY,KnM,KnSM,KnS,T,C,D,V,Z
S2	KnY,KnM,KnSM,KnS,T,C,D,V,Z

BCD code command

16-bit command：[BCD]（continuous execution type）/[BCDP](pulse execution type)

32-bit command：[DBCD]（continuous execution type）/[DBCDP](pulse execution type)

Function: source（BIN）→target (BCD) transfer command.

Ladder digraph is as photo 11-55 shown

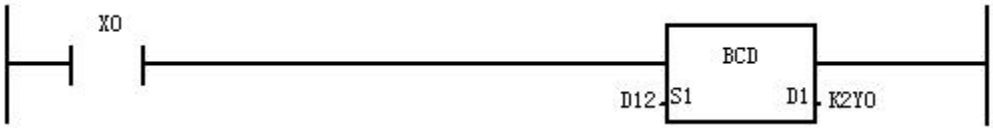


Photo 11-55

Command illustration: using BCD,BCDP command, if BCD exchanging result is over 0-9999, faults will occur. When using DBCD,DBCDP command,if BCD exchanging result is over 0-99999999,faults will occur.

Applicable Soft Components

-32767~65535,KnH,KnY,KnM,KnSM,KnS,T,C,D,V,Z
KnY,KnM,KnSM,KnS,T,C,D,V,Z

BIN code command

16-bit command：[BCD]（continuous execution type）/[BCDP](pulse execution type)

32-bit command：[DBCD]（continuous execution type）/[DBCDP](pulse execution type)

Function: source（BCD）→target（BIN) conversion transfer command.

Ladder digraph is as photo 11-56 shown:

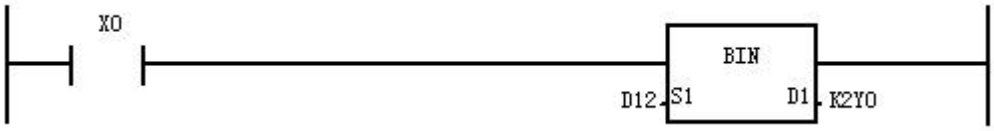


Photo 11-56

Command Illustration: PLC getting BCD numeral switch set-up value using. When source data is not BCD code, then SM67 will happen(calculation fault),SM68（calculation fault) will not work. As constant K will convert to binary automatically, so it will not become this command applicable components.

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
D1	KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z

Floating Number Transfer

[DEMOV]（continuous execution type)/[DEMOVP](pulse execution type)

Function： Floating Number Transfer

Ladder digraph is as photo 11-57 shown

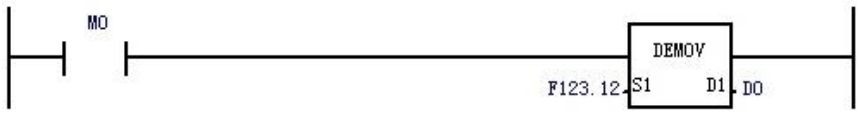


Photo 11-57

Command Illustration: when you transfer source content to target, M0 is OFF,data is not changing. Float number F123.12will be changed into BIN code automatically.

Applicable soft components:

S1	K,H,KnX,KnY,KnM,KnS,T,C,D,V,Z
D1	KnY,KnM,KnSM,KnS,T,C,D,V,Z

11.9Shift Order Command

Circulating Right Shift Command

16-bit command： [ROR](continuous execution type)/[RORP]（pulse execution type）

32-bit command： [DROR](continuous execution type)/[DRORP]（pulse execution type)

Function: turn 16-bit or 32-bit data information circulating to right.

Ladder digraph is as photo 11-58 shown

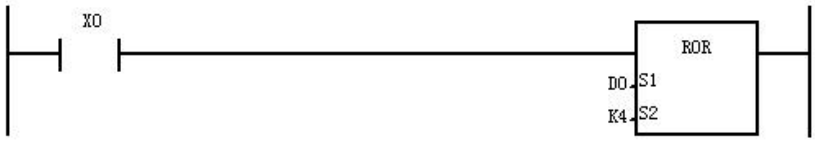
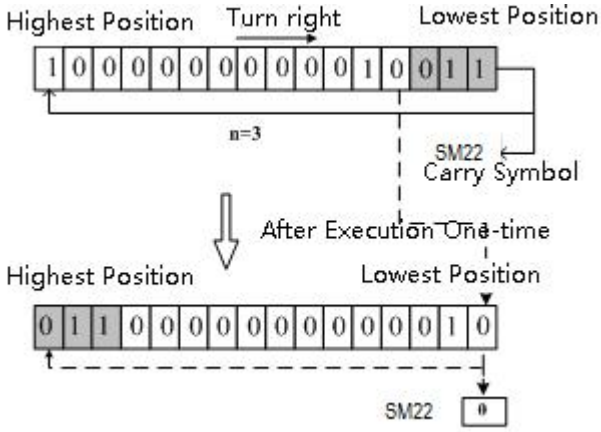


Photo 11-58

Command Illustration:



Each time X0 changes OFF→ON，then it will return to n-bit, finally stored into n-location and finally It will be stored into carry portion. Continuous execution type command will do the return action in each cycling period. In appointed soft components condition, only K4(16-bit command) and K8(32-bit command) is effective(such asK4Y0，K8M0).

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K(0~16)

Circulating left shift command

17-bit Command: [ROL](continuous execution type) /[ROLP](pulse execution type)

18-32-bit Command: [DROL](continuous execution type)/[DROLP](pulse execution type)

Function: Making 16-bit or 32-bit data information circulating from the left side.

Ladder digraph is as photo 11-59 shown

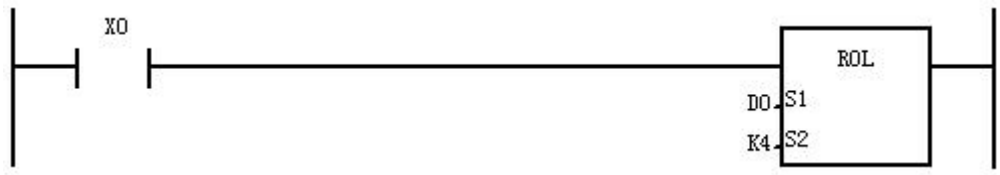
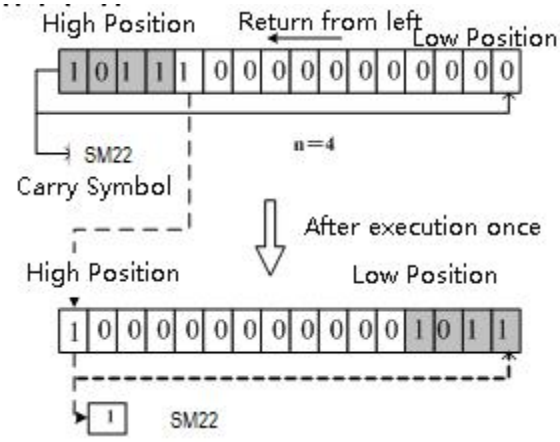


Photo11-59

Command Illustration:



Each time X0 from OFF→ON changing once，it will return to n-location，and finally it will be stored into carry portion. Each cycling period will process return action for continuous execution type command. In appointed soft components condition, only command K4(16-bit command) and K8（32-bit command) is effective（such as K4Y0，K8M0).

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K(0~16)

Right shift command with carry circulation:

16-bit command：[RCR](continuous execution type)/[RCRP]（pulse execution type）

32-bit command：[DRCR](continuous execution type)/[DRCRP]（pulse execution type）

Function: you can make 16-bit or 32-bit data information circulating from right side.

Ladder digraph is as photo 11-60 shown:

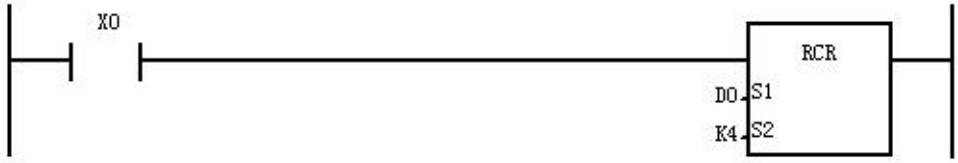


Photo 11-60

Command Illustration: Each time X0 changes from OFF→ON， then it will return to n position,finally it will be returned into carry symbol. As it has carry symbol in returning circuits, so if driving SM22 before executing returning command, then you can send the command to target address. In continuous execution command, each cycling period can do returning calculation. 32-bit command is same too. In appointed soft components condition, only K4（16-bit command） and K8（32-bit command) is effective (such as K4Y0，K8M0).

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K(0~16)

Left shift command with accessory circulation

16-bit command：[RCL](continuous circulation type)/[RCLP]（Pulse execution type）

32-bit command：[DRCL](continuous circulation type)/[DRCLP]（Pulse execution type）

Function: It makes 16-bit or 32-bit data information circulating from left.

Ladder digraph is as photo 11-61 shown

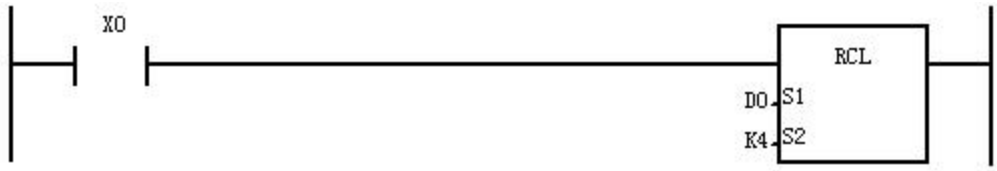


Photo11-61

Command Illustration: each time X0 from OFF→ON changes once, then it will return to n position, and then it will be stored into the carry symbol. As there is carry symbol in return circuit, so it will drive SM22 before executing return command. You can send it to target address, in continuous execution command, each cycling period do return calculation. 32-bit command is also same, in appointed soft components condition, only K4(16-bit command) and K8(32-bit command) is effective such as applicable soft components(K4Y0,K8M0):

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K(0~16)

Right shift

16-bit command：[SFTR]](continuous execution type)/[SFTRP](pulse execution type)

Function: the S4-bit right shift command to S3-bit bit components(the length of moveable register).（S4-bit move will execute when command is in execution).

Ladder digraph is as photo 11-62 shown:

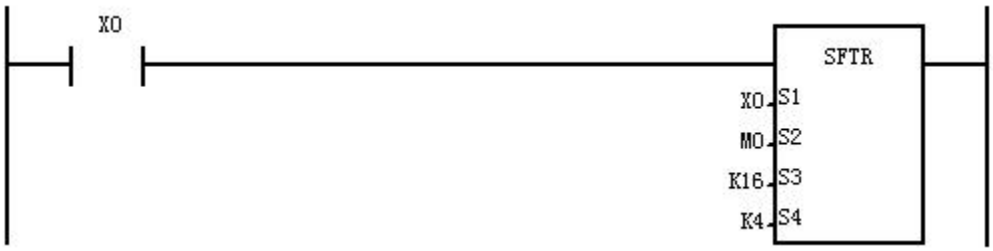
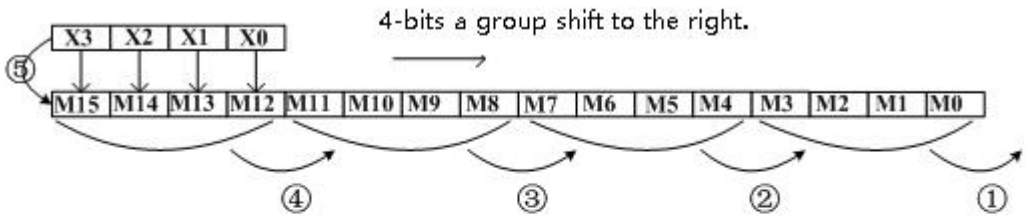


Photo 11-62

Command Illustration



①M3~M0 → Spilling over
②M7~M4 →M3~M0
③M11~M8 →M7~M4
④M15~M12→M11~M8
⑤X3~X0 → M15~M12

Using pulse execution command, drive input each time changes OFF→ON,S4-bit moves. As continuous execution command each cycling period executes moving, each moving moves 1-bit, S4 is 1.

Applicable soft components:

S1	X,Y,M,SM,S
S2	Y,M,SM,S
S3	K(0~1024)
S4	K(0~1024)

And S4≤S3≤1024

Location shift to the left

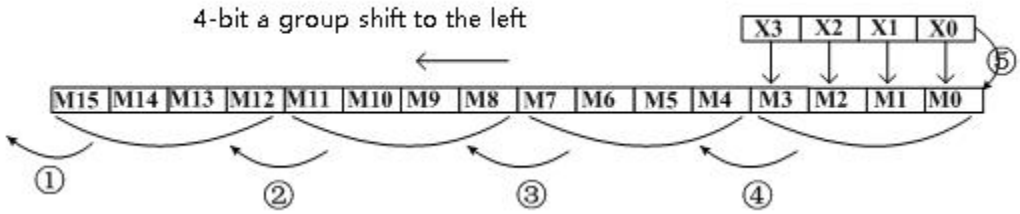
16-bit command： [SFTL](continuous execution type)/[SFTLP](pulse execution type）

Function: Make S4-bit left shift command to S3-bit bit components(moving register's length)（Execute S4-bit moving during command execution).

Ladder digraph is as photo 11-63 shown:

Photo 11-63

Command Illustration:



① M15～M12 → Spill Over
② M11～M8 → M15～M12
③ M7～M4 → M11～M8
④ M3～M0 → M7～M4
⑤ X3～X0 → M3～M0

Using pulse execution type command, drive input changes from OFF→ON each time,you will execute S4-bit moving. As continuous execution type command each scanning period execute moving, each time moving 1-bit condition, S4 is 1.

Applicable soft components:

S1	X,Y,M,SM,S
S2	Y,M,SM,S
S3	K(0~1024)
S4	K(0~1024)

S4≤S3≤1024

Words right shift

16-bit command： [WSFR]](continuous execution type) /[WSFRP] （pulse execution type）

Function: using word as unit, make right commands of S4 words to S3 word soft components.

Ladder digraph is as photo 11-64 shown:

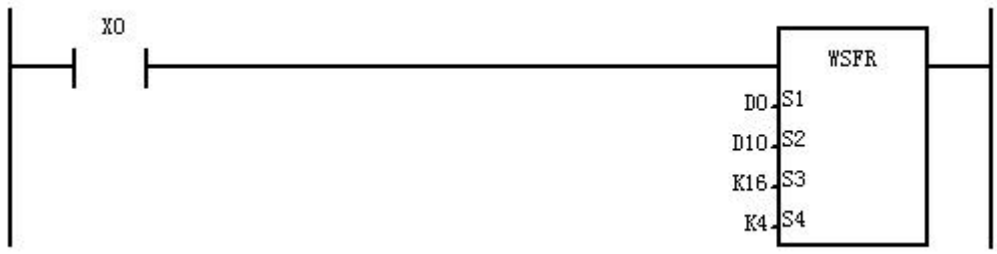
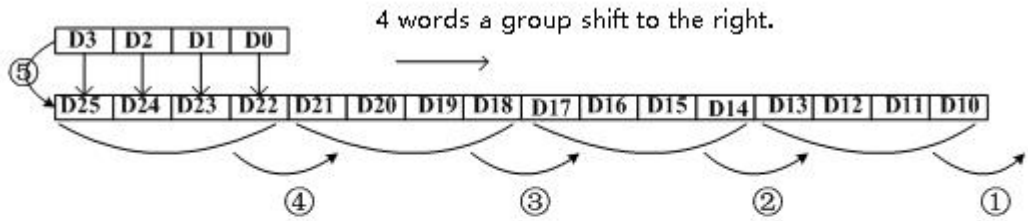


Photo 11-64

Command Illustration:



①D13~D10 → Spill Out
②D17~D14 →D13~D10
③D21~D18 →D17~D14
④D25~D22 →D21~D18
⑤D3~ D0 →D25~D22

In pulse execution command, drive input each time from OFF→ON then execute S4 words moving.

Applicable soft components:

S1	T,C,D,SD
S2	T,C,D,SD
S3	K （0~1024）
S4	K （0~1024）

S4≤S3≤1024

Word left shift

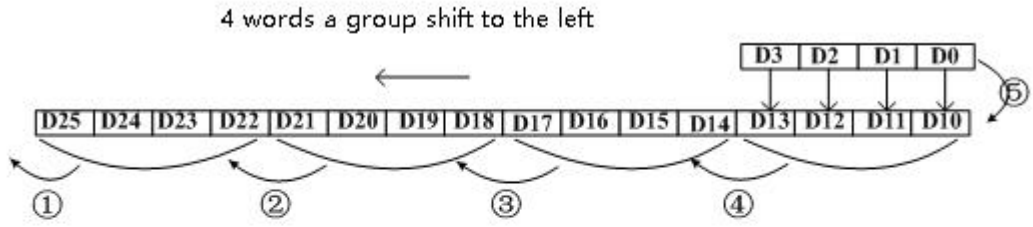
Bit command： [WSFL](continuous execution type)/[WSFLP](pulse execution type)

Function: Using word as unit, make S4 word left shift command to S3word word soft components.

Ladder digraph is as photo 11-65 shown:

Photo 11-65

Command Illustration:



① D25~D22 → Spill Over
② D21~D18 → D25~D22
③ D17~D14 → D21~D18
④ D13~D10 → D17~D14
⑤ D3~ D0 → D13~D10

In pulse execution command， drive input each time from OFF→ON then execute S4 words moving

Applicable soft components

S1	T,C,D,SD
S2	T,C,D,SD
S3	K（0~1024）
S4	K（0~1024）

S4≤S3≤1024

Bit shift written:

16-bit command:[SFWR](continuous execution type)/[SFWRP](pulse execution type)

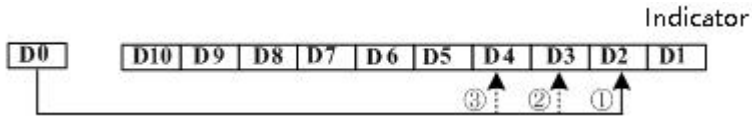
Function:

You can control first input first output data written command.

Ladder digraph is as photo 11-66 shown:

Photo 11-66

Command Illustration



In above program, when X0 changes from X0 from OFF→ON， D0 contents will be stored in D2， Indicator D1(make D1 reset to 0 in advance) contents changes to 1. When D0 contents change, X0 again from OFF→ON,then this D0 contents will be stored into D3,indicator D1 contents change into 2,and so on. （in continuous execution, each cycling period will be stored in sequence).If D1 contents are over S3 set-up value, then SM22 acts.

Applicable soft components:

S1	T,C,D,SD,V,Z
S2	T,C,D,SD
S3	K(0~1024)

Bit shift Read

16-bit command: [SFWR](continuous execution type)/[SFWRP](pulse execution type).

Function: control the first input and first output data read command.

Ladder digraph is as photo 11-67shown

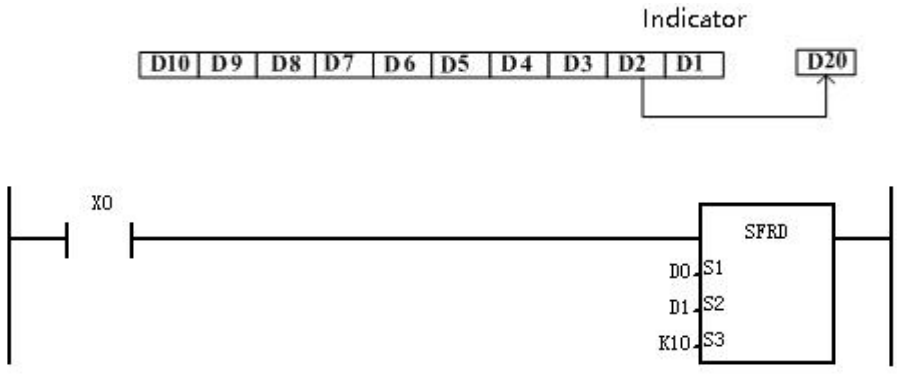


Photo 11-67

Command Illustration:

In above program, when X0 changes OFF→ON， D2 contents will be transferred to D20， simultaneously,indicator D1 contents become less， the data in the left moves to the right by word. （Continuous execution type will execute bit moving in each cycling period and the

data read usually from D2, when the indicator content is 0, then it will not process, simultaneously 0 count shows SM20 acts. This time read cannot change D10 contents.

Applicable soft components:

S1	T,C,D,SD,V,Z
S2	T,C,D,SD
S3	K(0~1024)

11.10 Data-bit process command

Batch reset

16-bit command: [ZRST](continuous execution type)/[ZRSTP](pulse execution type)

Function: using same specification of soft components whole area reset.

Ladder digraph is as photo 11-68 shown:

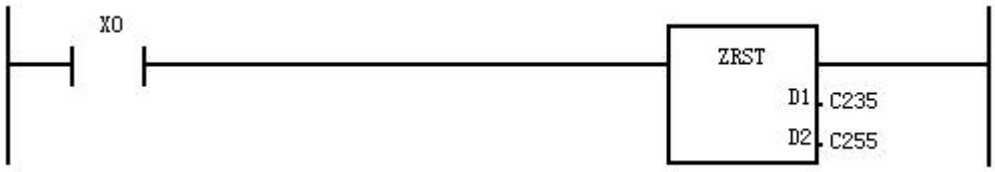


Photo11-68

Command Illustration: D1, D2 appointed to same specified soft components. This command is executed by 16-bit. But D1, D2 can appoint 32-bit counter, and it cannot appoint mixing.This command can execute by 16-bit, but D1, D2 can appoint 32-bit counter, and it cannot appoint mixing. D1 is 16-bit counter and D2 is 32-bit counter.

Applicable soft components:

D1	Y,M,SM,S,T,C,D,SD
D2	Y,M,SM,S,T,C,D,SD

Decode

16-bit command: [DECO](continuous execution type)/[DECOP](pulse execution type)

Function: The binary number in the source address will be changed into decimal number, and the decoding drive's n bit is ON from target address.

Ladder digraph is as photo 11-69 shown:

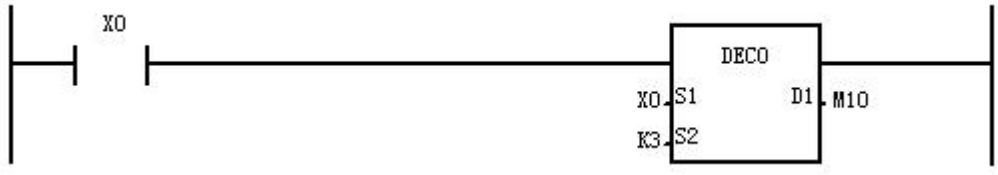
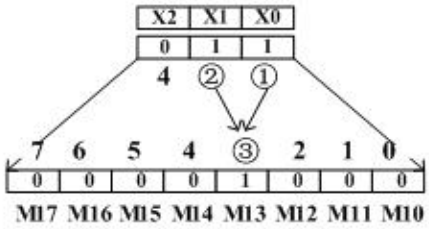


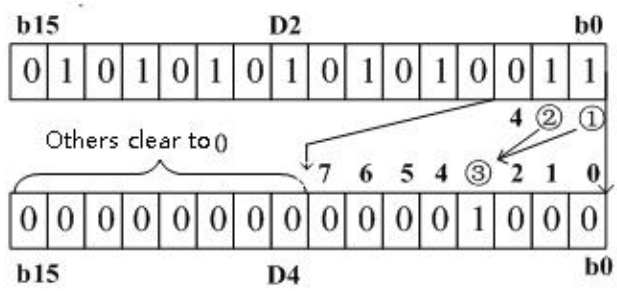
Photo11-69

Command Illustration:

《S1 is bit element 》S2≤8



《S1 is word soft compoennts 》S2≤4



In above left photo, source address S1 binary is 011, changes to decimal system is 3,through DECO decode command drives M13 as ON. S2 stands for S2 bit effective for source address ad target address is 2 S2th power. When source address is word soft components, the decode is source address low S1 bit, S2=0 not processing, calculation will occur faults over range.

Applicable soft components:

S1	K,X,Y,,M,SM,S,T,C,D,SD,V,Z
S2	bit：0~8　word：0~4
D1	Y,M,SM,S,T,C,D,SD

Coding

16-bit command：[ENCO]（continuous execution type）/[ENCOP]（pulse execution type）

Function: coding（you can calculate ON position of the data and transfer it into BIN data).

Ladder digraph is as photo 11-70 shown:

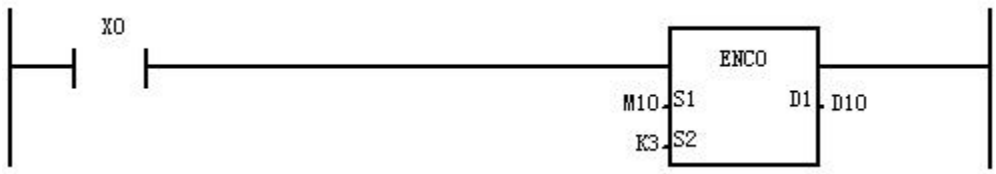
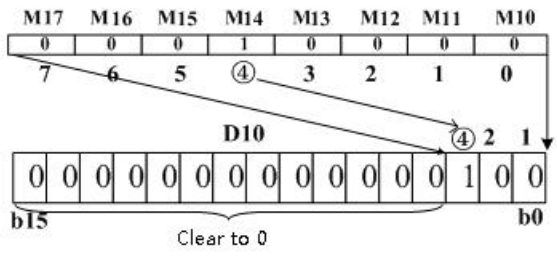


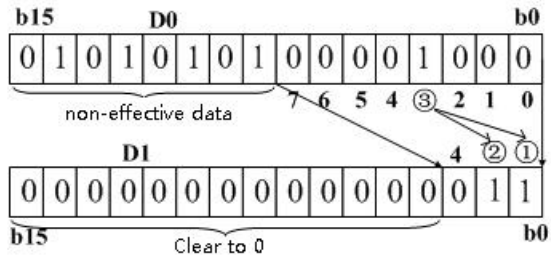
Photo 11-70

Command Illustration:

《S1 is bit soft components 》S2≤8



《S1 is word soft components 》S2≤4



If multiple bits are 1 in the source address,then you can ignore low position, in addition, when source address is 0, calculation faults will occur. When drive input is OFF, then the manual will not be executed, coding output will not change. When n=8, if the S1 of coding command is not bit components, then the counts are 256.

Applicable soft components

S1	Y,M,SM,S,T,C,D,SD
S2	Bit：0~8　Word：0~4
D1	K,X,Y,,M,SM,S,T,C,D,SD,V,Z

ON Bit Counting

16-bit Command：[SUM]（continuous execution type）/[SUMP](pulse execution type)

32-bit Command：[DSUM]（continuous execution type）/[DSUMP](pulse execution type)

Function: 1 in the source address will be stored in the target address.

Ladder digraph is as photo 11-71 shown

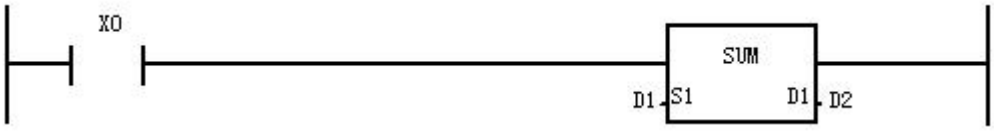


Photo11-71

Command Illustration: using DSUM and DSUMP command,（D1，D0）1 in the 32-bit is written into D2, at same time D3 is 0.

Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z

ON-bit Judging

16-bit command：[BON](continuous execution type)/[BONP]（pulse execution type）

32-bit command：[DBON]](continuous execution type)/[DBONP]（pulse execution type）

Function: check the soft components appointed location is ON or OFF command.

Ladder digraph is as photo 11-72 shown:

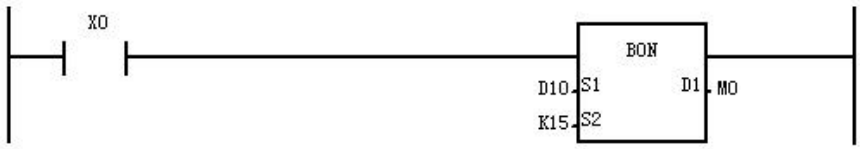


Photo11-72

Command Illustration

D10 S2=15bit is 1(ON)， M0 acts. X0 is OFF then M0 did not change.

Applicable soft components

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	16bit: 0~15　32bit: 0~31
S3	Y,M,SM,S

Average Value

16-bit command：[MEAN]（continuous execution type）/[MEANP]（pulse execution type）

32-bit command：[DMEAN]（continuous execution type）/[DMEANP]（continuous execution type）

Function: the command of data average value.

Ladder digraph is as photo 11-73 shown:

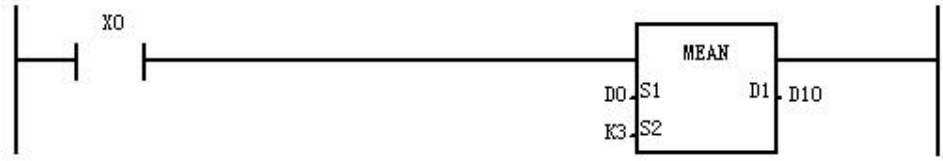


Photo 11-73

Command Illustration： store S2 counts source data average value(algebra and divided byS2) into the target address, and delete the remainder. When it is over soft components NO, get S2 little value in possible range. When S2 is out of 1-64, faults will occur.

Applicable soft components:

S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	1~64
D1	KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z

Signal Alarming Reset

16-bit command： [ANS] （continuous execution type）

Function: It is used for the convenient command of driving signal annunciator.

Ladder digraph is as photo 11-74 shown:

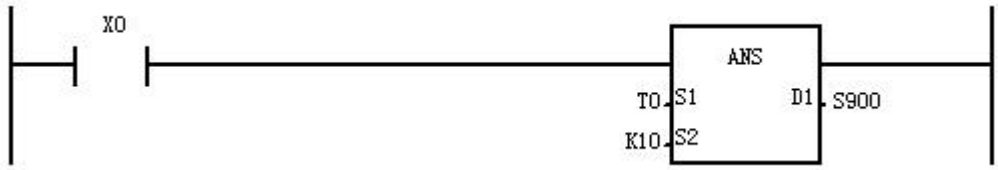


Photo11-74

Command Illustration:

If X0 connection is over 1 second, then S900 will be reset, X0 disconnects then D900 keeps action status. Less than 1 second X0 disconnects, then S900 is not acting. If SM49(signal alarm is effective)

In advance as ON, then the minimum ON status NO of alarm S900-S999 will be stored into SM49(ON status minimum number). In addition, when any of the S900~S999 is ON, then SM48 (alarm action is ON).

Applicable soft components

S1	T
S2	-32768~65535
S3	S

Signal alarm reset

16-bit command： [ANR](continuous execution type)/[ANRP](pulse execution type)

Function: Signal alarming reset command.

Ladder digraph is as photo 11-75.

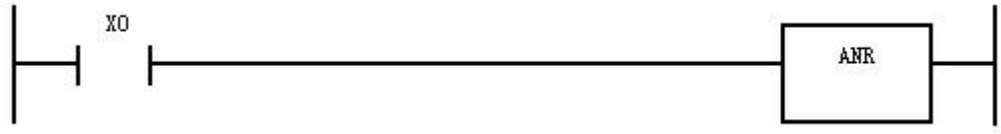


Photo 11-75

Command Illustration: if X0 gets through, then alarm S900~S999 alarming counts of action is reset,if simultaneously there are many alarm counts acts, then the newest alarming count will be reset. If X0 connects again, then the next NO status will be reset, if using ANR command, then reset by sequence in each cycling period.

Applicable soft components: none.

Integrator Extraction

16-bit command：[SQR](continuous execution type)/[SQRP](pulse execution type)

32-bit command：[DSQR](continuous execution type)/[DSQRP](pulse execution type)

Function: The Command of Square Root Algorithm

Function: the command of square root algorithm.

Ladder digraph is as photo 11-76 shown

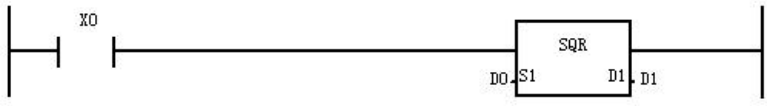


Photo 11-76

Command Illustration: it is effective only S1 is positive number, if negative number, the calculation symbolSM67 will work and the command will not be executed. Deleting decimal integrator of the calculation results, after deleting,borrow symbol SM21 will act. If the calculation results is 0,0 bit symbol SM20 will act.

Applicable soft components:

S1	D,SD,-32768~65535
S2	D,SD

Word floating number:

16-bit command：[FLT]（continuous execution type）/[FLTP]（pulse execution type）

32-bit command：[DFLT]（continuous execution type）/[DFLTP]（pulse execution type）

Function: the conversion command of BIN integrator and binary floating number.

Ladder digraph is photo 11-77 shown

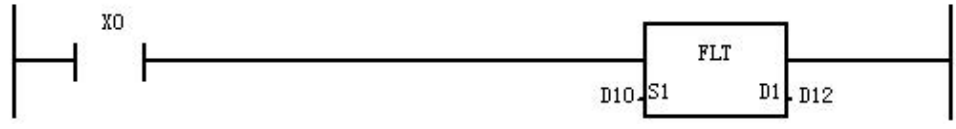


Photo11-77

Command Illustration:constant K, H will be converted automatically in each floating calculation command,so you cannot use it in FLT command, this command's reverse transformation command is INT.

Applicable soft components:

S1	D,SD
S2	D,SD

Byte Conversion:

16-bit command：[SWAP](continuous execution type)/[SWAPP](pulse execution type)

32-bit command：[DSWAP](continuous execution type)/[DSWAPP](pulse execution type)

Function: exchange of high-low byte.

Ladder digraph is as photo 11-78 shown:

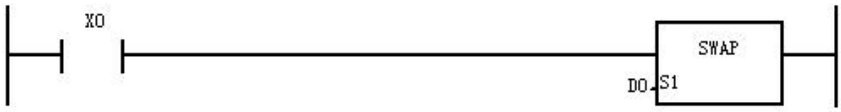


Photo 11-78

Command Illustration: 16-bit command, low 8-bit and high 8-bit exchanges, 32-bit command, low 8-bit and high 8-bit exchanges, each calculation period will exchange when this command is executed as continuous execution type. Such command is same as XCH command expanding function.

Applicable soft components: T,C,D,SD,V,Z,KnY,KnM,KnSM,KnS

Proportion Conversion:

16-bit command：[SCALE](continuous execution type)/[SCALEP](pulse execution type)

32-bit command:[DSCALE](continuous execution type)/[DSCALEP](pulse execution type)

Floating number command:[DESCALE]（continuous execution type）/[DESCALEP]（pulse execution type）

Ladder digraph is as photo 11-79 shown:

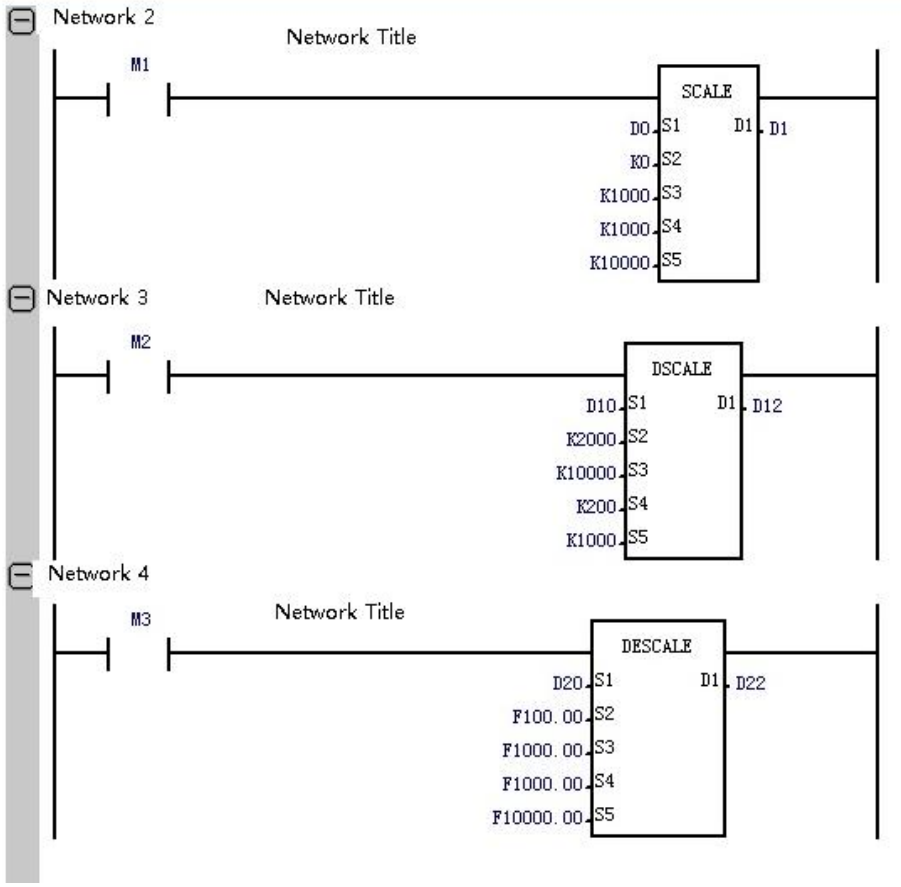


Photo 11-79

Command Illustration: D1 = (S1 -S2)/(S3-S2)* (S5-S4) + S4

Applicable Soft Components

Parameter	Operation Number	Description	Optional Value
S1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Input Value	
S2	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Lower Limit of Input Value	
S3	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Upper Limit of Input Value	
S4	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Lower Limit of Output Value	
S5	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Upper Limit of Output Value	

D1	KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z	Output Value	When output value is less than lower limit of the output value,output value is output value lower limit. When output value is more than upper limit of the output value,output value is output value upper limit.

11.11Floating Number Process Command

Floating number comparison of binary

32-bit command: [DECMP](continuous execution type)/[DECMPP](pulse execution type)

Function: compare the binary floating number of two source data, output correspondent results according to size comparison.

Ladder digraph is as photo 11-80 shown:

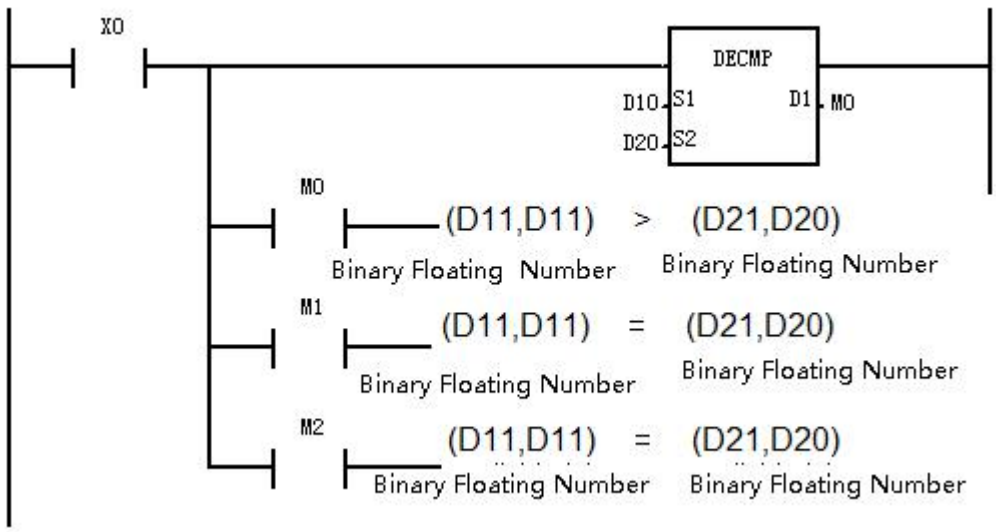


Photo 11-80

Command Illustration: Constant K,H are appointed as source data, and converted into binary floating number automatically.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
D1	Y,M,SM,S

Floating number area comparison

32-bit command： [DEZCP](continuous execution type)/[DEZCPP](pulse execution type)

Function: Compare S3 and source S1 and S2 contents, and drive D, D+1, D+2 according to comparison results.

Ladder digraph is as photo 11-81 shown:

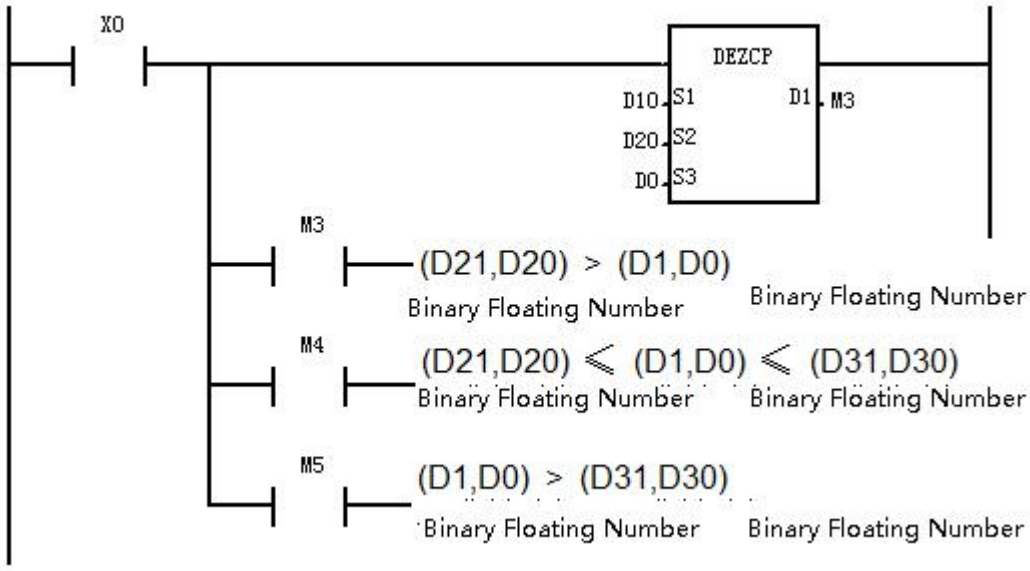


Photo 11-81

Command Illustration: Constant K,H are appointed source data,it will be converted into binary floating number.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
S3	D,SD,-214783648~2147483647
D	Y,M,SM,S

Binary floating number converts to decimal floating number

32-bit command：[DEBCD](continuous execution type)/[DEBCDP]（pulse execution type）

Function: convert the binary floating number in the components appointed by the source data into decimal floating number to store into the target address.

Ladder digraph is as photo 11-83 shown

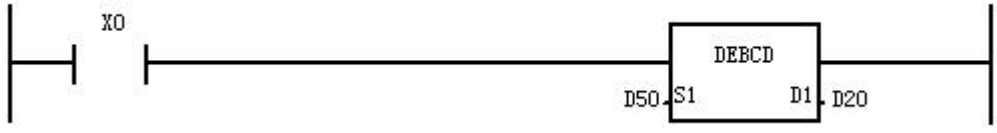


Photo 11-83

Command Illustration: floating number calculation executes as binary floating number in programmable logic controller. But ass binary floating number is the value of uneasy judging value,so it can be changed into decimal floating number external devices monitor.

Applicable soft components:

S1	D,SD
D1	D,SD

Decimal floating number converting to binary floating number

32-bit command：[DEBIN](continuous execution type)/[DEBINP](pulse execution type)

Function: You can convert the decimal floating number in the components appointed by source data into binary floating number to be stored into the target address.

Ladder diagram is as photo 11-84shown

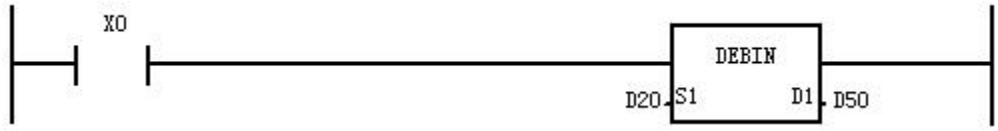


Photo 11-84

Command Illustration: by using DEBIN command, you can convert the value containing decimal point into binary floating number.

Applicable soft components:

S1	D,SD
D1	D,SD

Floating number add command

32-bit command：[DEADD](continuous execution type)/[DEADD](Pulse execution type)

Function: binary floating number adding in the two data source can be regraded as binary floating number to store into the target address.

Ladder digraph is as photo 11-85 shown:

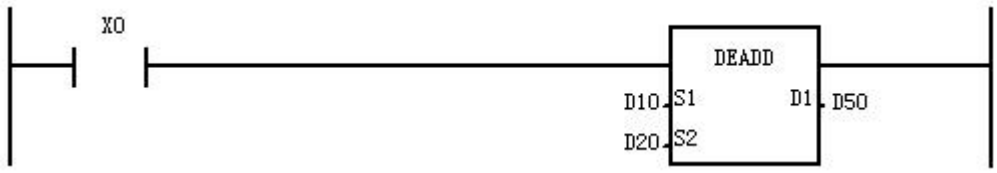


Photo11-85

Command Illustration:Constant will be converted into binary floating number automatically when the constant is appointed as source data. Source data and target address can be appointed as same component no. At this time, if using continuous execution type command, then it will be added in each calculation period.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
D1	D,SD

Float number deduction command:

32-bit command：[DESUB](continuous execution type)/[DESUBP](pulse execution type)

Function: Binary floating number in the S1 appointed components deducts the binary floating number in S2 appointed components, and store the results into target address as binary floating number.

Ladder digraph is as photo 11-86 shown:

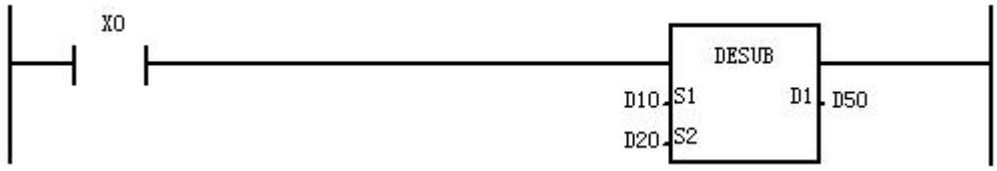


Photo11-86

Command Illustration:

Constant will be converted into binary floating number automatically when constant is appointed source data. Source data and target address can be appointed as same components number. At this time, if using continuous execution command, then it will be in deduction in each calculation period.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
D1	D,SD

Binary floating number multiplication

32-bit command：[DEMUL](continuous execution type)/[DEMULP](pulse execution type）

Function:

Store the two source data multiplying binary floating number as binary floating value into target address.

Ladder digraph is as photo 11-87 shown:

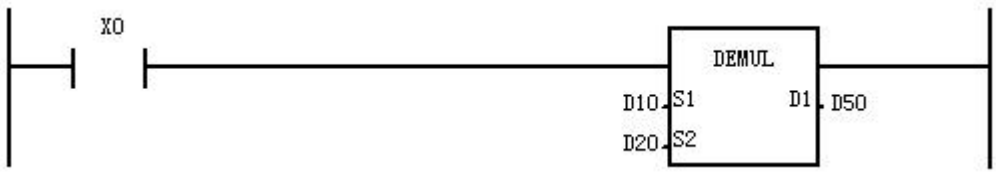


Photo 11-87

Command Illustration: constant will be converted into binary floating number when constant is appointed as source data.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
D1	D,SD

Binary floating number division:

32-bit command：[DEDIV](continuous execution type)/[DEDIVP]（pulse execution type）

Function:

The binary floating number in the components appointed by S1 divided by the binary floating number in the components appointed by S2, and make the result as binary floating value store into the target address.

Ladder digraph is as photo 11-88 shown

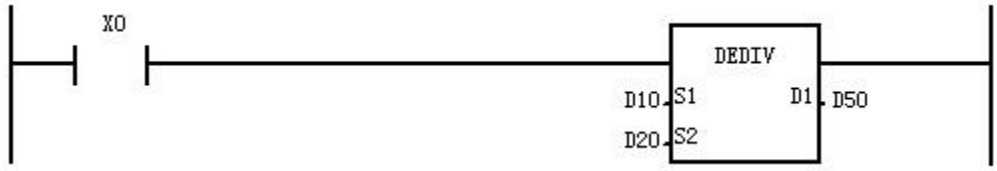


Photo 11-88

Command Illustration: constant will be converted into binary floating number automatically when it is appointed as source data. When the dividend is 0,then the calculation fault occurs,and the command cannot be executed.

Applicable soft components:

S1	D,SD,-214783648~2147483647
S2	D,SD,-214783648~2147483647
D1	D,SD

Floating Number Square Calculating

32-bit command：[DESOR](continuous execution type)/[DESORP](pulse execution type)

Function: Binary floating number square root calculation in the components appointed by source data as binary floating number to be stored into the target address.

Ladder digraph is as photo 11-89 shown:

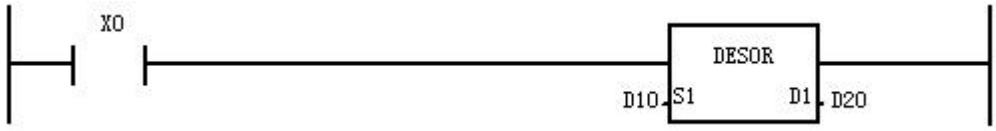


Photo11-89

Command Illustration: constant will be converted into binary floating number automatically when the constant is appointed as source data. When the calculation result is 0, 0 symbol will act, and the source data content is effective when the source data contents only with positive number, when it is negative number, calculation fault SM67 command acts, command will not execute.

Applicable soft components:

S1	D,SD
D1	D,SD

Binary floating number BIN integrator changing

16-bit command：[INT](continuous execution type)/[INTP](pulse execution type)

32-bit command: [DINT](continuous execution type)/[DINTP](pulse execution type)

Function: You can convert the binary floating number in the components appointed by source data into BIN integrator to store into the target address.

Ladder digraph is as photo 11-90 shown:

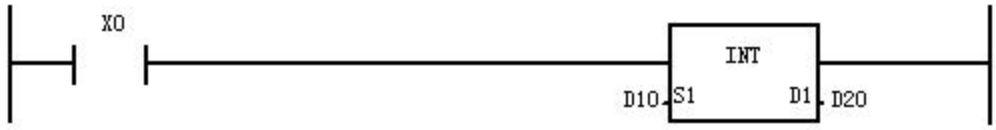


Photo 11-90

Command Illustration: this command is FLT command anti-changing, when the calculation result is 0, 0 symbol as ON. When the exchanging is less than 1, the borrow symbol is ON. The calculation result occurs spilling out over correspondent range, carry symbol is ON.
16-bit calculation：-32768~32767
32-bit calculation: -2147483648~2147483647
Applicable soft components:

S1	D,SD
D1	D,SD

Floating number sinusoidal command

32-bit command：[DESIN](continuous execution type)/[DESINP](pulse execution type)
Function: source data appointed angle(RAD) SIN value to be transferred to target address.
Ladder digraph as photo 11-91shown:

Photo 11-91

Command Illustration: the source data, SIN results are binary floating number format. RAD(curvature)value = angle×π/180°, If angle 360° correspondent curvature = 360°×π/180° = 2π.
Applicable soft components:

S1	D,SD
D1	D,SD

Floating number cosine command
Bit command：[DECOS](continuous execution type)/[DECOSP](pulse execution type)
Function: the angle(RAD) COS value appointed by source data is conveyed to the tar get address.
Ladder digraph is as photo 11-92shown:

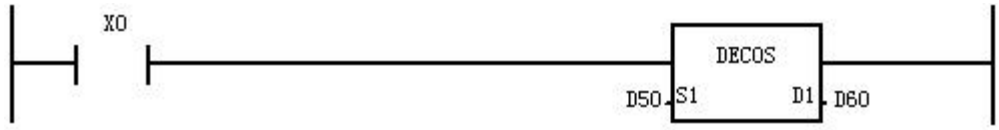


Photo 11-92

Command Illustration: the calculated source data, COS results are binary floating number format.RAD(arc) value=angle*×π/180°，if angle 360° correspondent arc = 360°×π/180° = 2π.

Applicable soft components:

S1	D,SD
D1	D,SD

Floating number secant command

32-bit command: [DETAN](continuous execution type)/[DETANP]（pulse execution type）

Function: source data appointed angle(RAD) TAN value is sent to target address.

Ladder digraph is as photo 11-93shown:

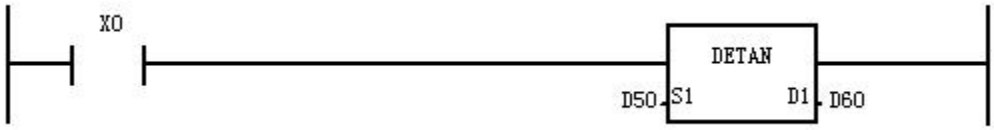


Photo11-93

Command Illustration: source data calculated, TAN result is binary floating number format. RAD(ARC) value=angle*π/180°,angle 360°correspondent arc=360°×π/180° = 2π.

Applicable soft components:

S1	D,SD
D1	D,SD

11.12 High-speed process command

Input/output REF/REFP

16-bit command：[REF](continuous execution type)/[REFP](pulse execution type)

Function: refresh the appointed input/output components.

Ladder digraph is as photo 11-94 shown

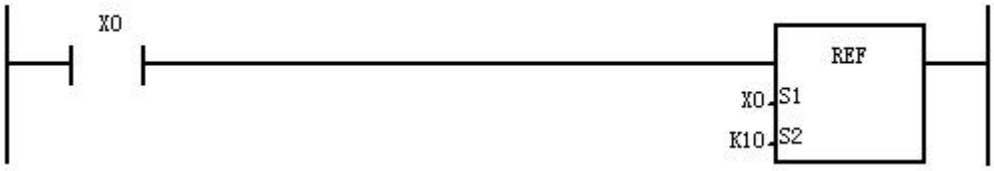


Photo 11-94

Command Illustration: immediately update the S2 components status of S1 address starting. In normal situation, input port X status reading starts before each time program starts executing cycling. Output port Y status refresh will start after each program execution scanning finish(execute to END), then IO process will have certain delay. If the newest input information in the application and wish to output calculation results, you can use immediate refresh command REF.

● Can be used between FOR~NEXT manual, CJ manual etc.

●Can be used to interrupt sub-program to execute input and output refresh to get the newest information and output the calculation result in time.

●Actual input ports status delaying is decided by input components wave filtering time,X0 ~ X7 is with number filtering function,filtering time between 0 ~ 60ms range can set （FNC51（REFF manual）,other IO port is hardware filtering wave, wave filtering time is about 10ms. The exact parameters can be referred to the user manual of programmable logic controller.

●Actual output port status changing delay is decided by output components(relay) correspondent time. Output contact in the output refresh will act after output relay (transistor) answering time. Relay output answering time delays about 10ms(maximum 20ms), transistor output high-speed output is about 10ms, and general output is about 0.5ms.

Applicable soft components:

S1	X,Y
S2	K(0~1024)

Filter wave adjust REFF/REFFP

16-bit command： [REFF](continuous execution type)/[REFFP](pulse execution type)

Function: input refresh(with filter set-up)

Ladder digraph is as photo 11-95 shown:

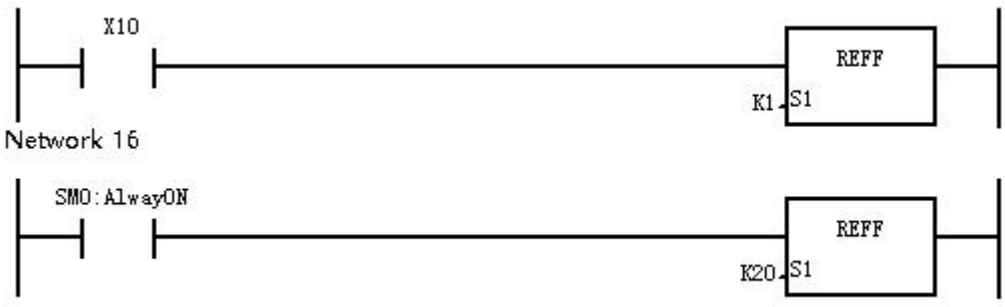


Photo 11-95

Command Illustration:

Generally programmable logic controller input is set as about 10ms C-R filter to prevent node point vibration or noise influence. Considering using none contact input in order not mixing noise,in order to process high-speed input, above filter becomes trouble. In such PLC, input X0-X7 uses number filter which can be changed to 0~60ms through command.

Actually this input is set up with minimum C-R filter wave,when it cannot achieve 50us(X0,X1 is 20us) x0 is ON, REFF command execute in each cycling period. REFFP commands,only execute during C0 changed from OFF→ON.

X0 is OFF, such command will not execute， X0~X7input filter wave changes to10ms,(input processing value).

When using interrupting indicator or using high-speed counter X0~X7, or using SPD command, the input filter correspondent to those command input filter will change to 50us automatically （X0， X1 is 20μs).But if general program uses the input NO used by those high-speed processing indicator, then it will become to 10ms or REFF command appointed filter time.

Applicable soft components：K：0~1024

Pulse density SPD

16-bit command：[SPD](continuous execution type)

Function: please count S1 appointed input pulse in S2 appointed time, and store the result into D1 appointed soft components.

Ladder digraph is as photo 11-96 shown

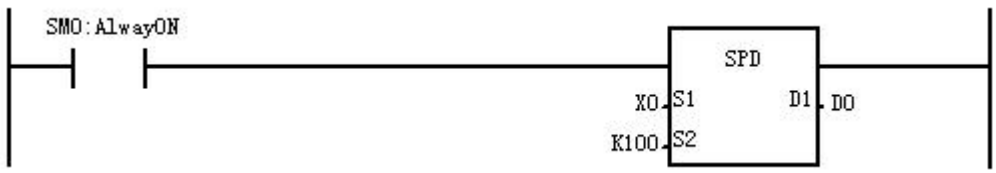


Photo 11-96

Command Illustration: you can get pulse density in D1 through repeat operation(whirling speed as proportional value). D1 occupies 3 count soft components. In above ladder digraph program,during program execution, D1 counts for X0's D1OFF→ON.After 100ms,the results will be stored into D0, after D1 reset，again counting for X0's action. D2 is used for testing rest time.

Applicable soft components:

S1	X
S2	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	T,C,D,SD,V,Z

Pulse output PLSY/DPLSY

16-bit command：[PLSY](continuous execution type)

32-bit command：[DPLSY](continuous execution type)

Function: the command of appointed frequency producing rated pulse.

Ladder digraph is as photo 11-97shown:

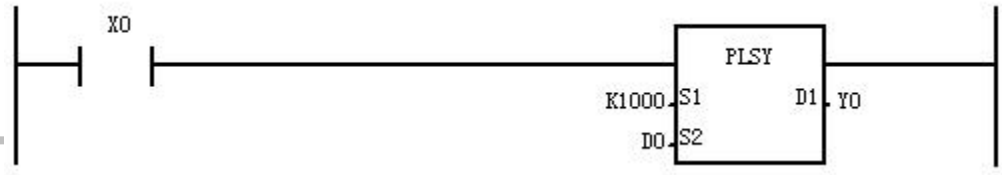


Photo 11-97

Command Illustration: you can output highest 4-line high-speed pulse, correspondent PLC output counts are Y0,Y1,Y2,Y3. Each high-speed pulse maximum output frequency is 200K,but 4-line pulse frequency sum cannot be over 300K. X0 is OFF, then output interrupt, again set ON, then it will act from initial status. When deliver continuous pulse, X0 is OFF, Y0 is also OFF, pulse occupation is 50%ON,50%OFF, Output control is not influenced by cycling period, and processed by interruption.

Applicable soft components:

S1	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
S2	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	Y

Pulse width adjust PWM

16-bit command：[PWM](continuous execution type)

Function: pulse width adjust.

Ladder digraph is as photo 11-98 shown

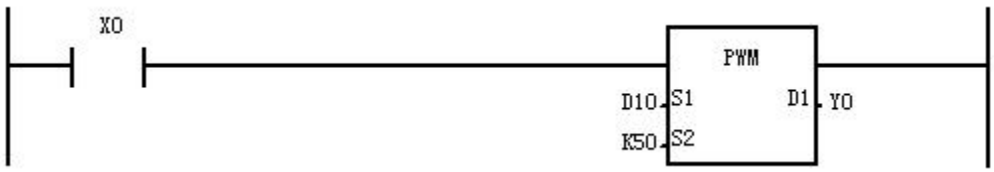


Photo 11-98

Command Illustration: as relay is not suitable for high frequency action, only transistor output type PLC suitable to this command. The manual function is the pulse width appointed by S1,the pulse period of S2 appointed, and output pulse continuously by D1 appointed ports. S1 is set output pulse width, it must be with S1 ≤ S2, and the set-up range is 0~32,767ms,S2 is set-up pulse output period, It must be S1 ≤ S2， set-up value is 1~32,767ms, PLSY or PLSR manual appointed output number cannot be used repeatedly.

Appointed soft components:

S1	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
S2	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	Y

Pulse output with plus and deduction PLSR/DPLSR

16-bit command： [PLSR] (continuous execution type)

32-bit command： [DPLSR](continuous execution type)

Function:

Pulse output command transferred by accelerating&deduction function. To appointed high frequency, you can process acceleration, and after achieving appointed output pulse, you can process deduction.

Ladder digraph is as photo 11-99 shown:

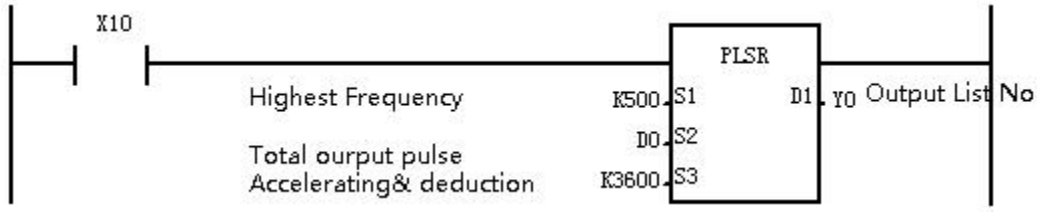


Photo 11-99

Command Illustration: As relay is not suitable for high frequency action, only transistor output PLC is suitable for this command. This function is the pulse output command transferred by accelerating and deduction function.S1 is the set-up output pulse highest frequency, the set-up range is 10~100,000Hz,S2 is set-up output pulse. 16bit command, the set-up range is 110~32,767, 32bit command, set-up range is 110~2,147,483,647,If the set-up pulse is less than 110, you cannot output pulse normally, S3 is set-up add&deduct time, range: 50 ~ 5000 (ms)， deduction time and accelerating time is same, ms unit,please take notice during set-up.

Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S3	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
D	Y

Segmenting Pulse Output PLST/DPLST

16-bit command：[PLST](continuous execution type)

32-bit command：[DPLST](continuous execution type)

Function: the command of rated pulse by appointed frequency, accelerating&deduction time.

Ladder digraph shown:

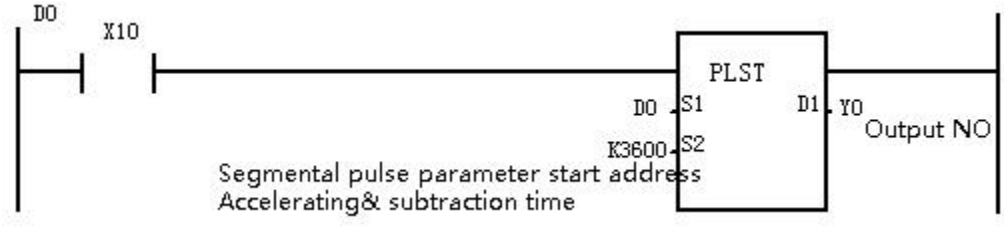


Photo11-100

Command Illustration: as relay is not suitable for high frequency action, only transistor output type PLC is suitable for this command. The command of fixed pulse with appointed frequency and accelerating&deduction time. S1 is segmental pulse parameters starting address, and is one area of Dn as start-up address.

(16-bit command):D0 set up the highest frequency of the 1st pulse, D1 set up the number of 1st pulse,D2set up 2nd pulse highest frequency, D3 set up 2nd pulse number， ..... with Dn set up (n+2)/2-phase pulse highest frequency, Dn+1 set up (n+2)/2 phase pulse number， set-up value is 0 shows segment end，total set up (n+2)/2-1pulse:phase is not limited. Set up range: 10~100,000Hz， action can be referred to below photo.

(32-bit command): D0(double words)set up 1st stage pulse highest frequency,D2(double words) set up 1st stage pulse number,D4(double words)set up 2nd pulse highest frequency,D6(double words)set up 2nd pulse number， ..... with Dn set up (n+4)/4phase pulse highest frequency, Dn+2 set up (n+4)/4 phase pulse number， set-up value is 0 shows segmental ending,total set up(n+4)/4-1phase pulse: phase is not limited. Set up range is 10~100,000Hz. S2 is set-up accelerating&deduction time,range: 50 ~ 5000 (ms)， deduction time and accelerating time is same， ms unit， please take care when setting up.

Applicable soft components:

S1	D
S2	K,D
D	Y

Changable pulse output PLSV/DPLSV

16-bit command: [PLSV](continuous execution type).

32-bit command: [DPLSV](continuous execution type).

Function: such command is changeable pulse output command with whirling way.

Ladder digraph is as below:

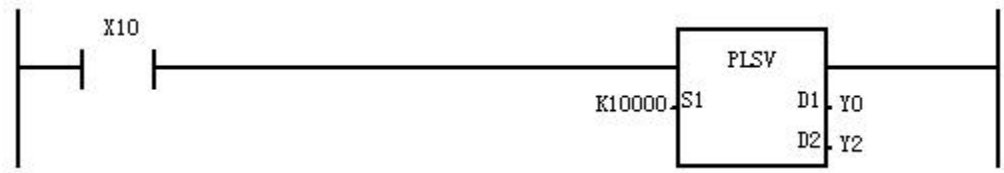


Photo11-101

Command Illustration: S1 is pulse output frequency.16bit command,range is 1 ~ 32,767Hz, －1 ~ －32,768Hz ,32bit command， range is 1 ~ 100,000Hz, －1 ~ －100,000Hz, Inside the negative number shows negative direction command signal. D1is the start-up address of pulse output, only appoint Y0 or Y1. Programmable logic controller output must use transistor output way. D2 is the signal output start-up address of whirling direction. Corresponding to S1 situation and act as below:

[+(Positive)]→D2： ON

[+(Positive)]→D2： OFF

Applicable soft components:

S1	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	Y
D2	Y,M,SM,S

Pulse Width Modulation Control Pulse width PWMR

16-bit command：[PWMR](continuous execution type)

Function:Pulse Width Modulation Control Pulse width PWMR

Ladder digraph shown:

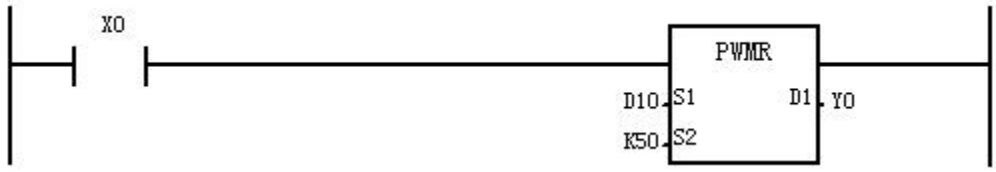


Photo 11-102

Command Illustration: as relay is not suitable for high frequency action, only transistor output type PLC is suitable to such command.This command function is the continuous output pulse with S1 appointed pulse frequency, S2 appointed duty ratio, and the continuous output pulse appointed by D1. Inside: S1 is set-up output pulse frequency, set-up range is 0~65535hz, S2 is set-up duty ration: s2/1000, set-up range 0~1000, PLSY or PLSR command appointed output number cannot be used repeatedly.

Applicable soft components:

S1	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
S2	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	Y

Pulse Width Modulation Control Pulse width PWMR

PWMY/DPWMY

16-bit command：[PWMY]（continuous execution type）

32-bit command：[DPWMY]（continuous execution type）

Function: the pulse width modulation control.

Ladder digraph is shown:

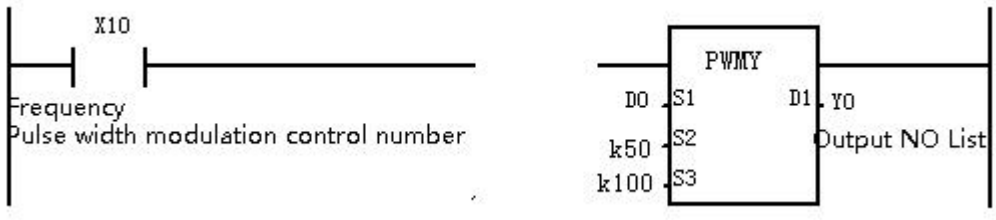


Photo11-103

Command Illustration:As relay is not suitable for high frequency action, only transisto r output type PLC is suitable for such command.Command function is with S1 appoi nted pulse frequency, S2 appointed ration and output S3 pulse as D1 appointed por t.Inside S1 is set-up output pulse frequency, and set-up range is 16-bit command 0~ 65535hz,32-bit command 0~2147483647.S2 is set-up duty ratio s2/1000, set-up rang e is 0~1000, S3 is set-up output pulse number, 16-bit command 0~65535hz,32-bit co mmand 0~2147483647. The output number od PLSY or PLSR appointed by the com mand cannot be used repeatably.

Applicable soft components:

S1	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
S2	k,T,C,D,SD,V,Z,KnX,KnY,KnM,KnSM,KnS
D1	Y

Back to basic ZRN/DZRN

16-bit command: [ZRN](continuous execution type)

32-bit command: [DZRN](continuous execution type)

Function: the command is when PLC and servo driver work, using appointed pulse speed and pulse to output port. Please you can make execution institute move to (DOG), until meeting origin point satisfying condition.

Ladder digraph shown:

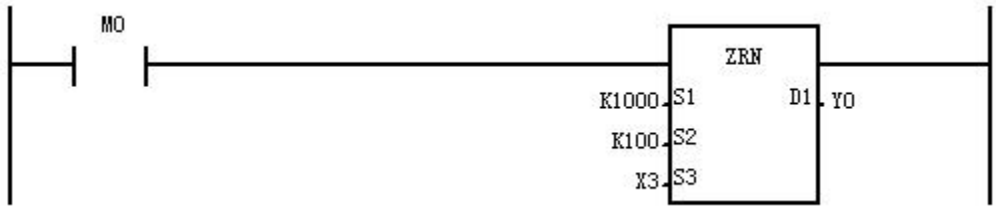


Photo 11-104

Command Illustration: S1 is the set-up speed of origin point returning action.16bit command, range is 10～32,767Hz; 32bit command, range is 10～100,000Hz; S2 origin signal is ON climbing speed, range is 10～32,767Hz; S3 origin signal (DOG) input, although XYMS signal is ok, but only X signal in time is better, D1 is pulse output set-up address. Only can appoint Y0~Y3. Relative position controlling command DRVI and, absolute position controlling command in execution, controller will calculate the positive pulse or reverse pulse, And store it into the register[SD141 , SD140] (Y000) and [SDl43 , SD142] (Y001). But the register data must execute original counts returning command ZRN during sudden power-off and initial running, then write the data of machines action original location. Such command action is when M0 changes to ON, PLC from Y0 high speed output ports, starts as 1000Hzdeliver pulse, then command step motor to back forward to original points, It command step motor back forward, when meeting DOG signal is ON (then DOG slide to DOG contact) , output frequency is 0Hz, climb with low speed, until DOG signal changes to OFF, Y0 stops pulse output, to current register writing 0 (Y000: [SD141, SD140], Y001: [SD143 , SD142]) 0 . When execution ending symbol (SM29) is ON, pulse output monitor (Y000 : [M8147] , Y00l: [M8148]) changes to OFF.

Please refer to below photo:

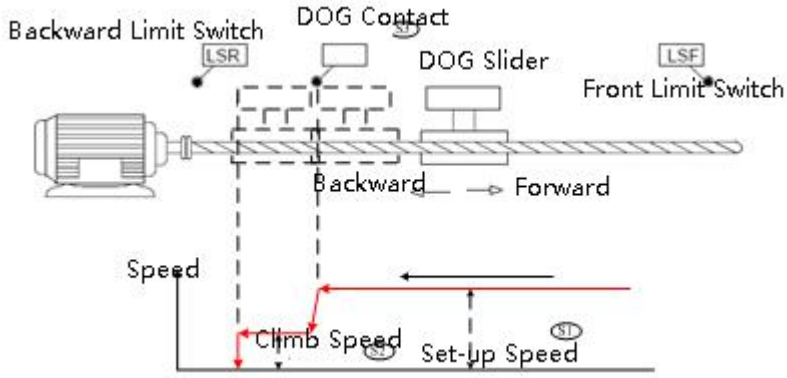


Photo 11-105

In such command execution, the system variables referred:

1. SD141（high position）, SD140（low position）] : Y000 output current value register (using32-bit).

2. SD143（high position）, SD142（low position）] : Y001 output current value register(using 32 bit）

3. SM145 : Y000 pulse output stop（immediately stop）

4. SM146 : Y001 pulse output stop（immediately stop）

5. SM147 : Y000 pulse output monitor（BUSY/READY）

6. SM148 : Y001 pulse output monitor (BUSY/READY）

As servo driver is with power failure hold function to location information, such command no need process each time powering on, In command execution, only single way moving(backward moving direction), so returning action must start before DOG signal.

Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S3	X,Y,M,SM,S
D	Y

Double words segmental counting command
32-bit command：DHSCT double word command
Function：segmental counting interruption.
Ladder digraph is as below

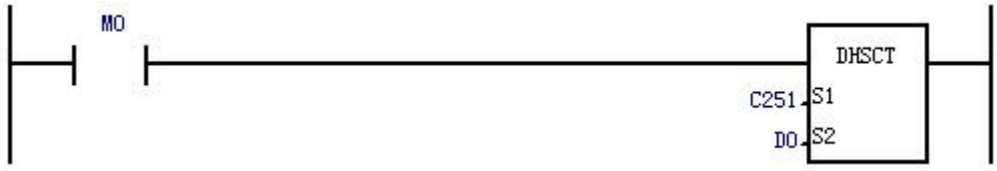


Photo 11-106

S1: Counter

S2： phase set-up address， double words, fill in different value in the segment address, the last phase fill0, it shows phase ending. 16 phase can be input at the most.

Note： At most 6 DHSCT command can be used in one program and the counter cannot be same.

Related documents:

Counter	Interrupting Address	Pulse current phase
C235	I35	SD235
C236	I36	SD236
…	…	…
…	…	…
C255	I55	SD255

Using method：testing target：please count in input number X0,when it counts to 20, 40,100, one interruption will be used when counting to 20, 40,100, and moreover lighten Y1,Y2,Y3.

1： Below digraph is established

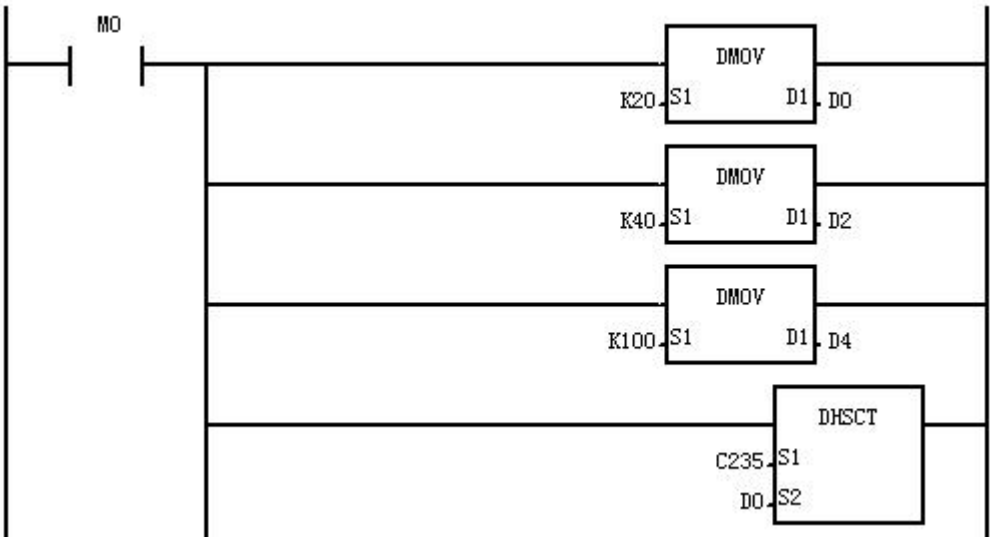


Photo 11-107

2:Establish the program to process C235 counter interruption..

1)Click“Insert INT Program” in program block

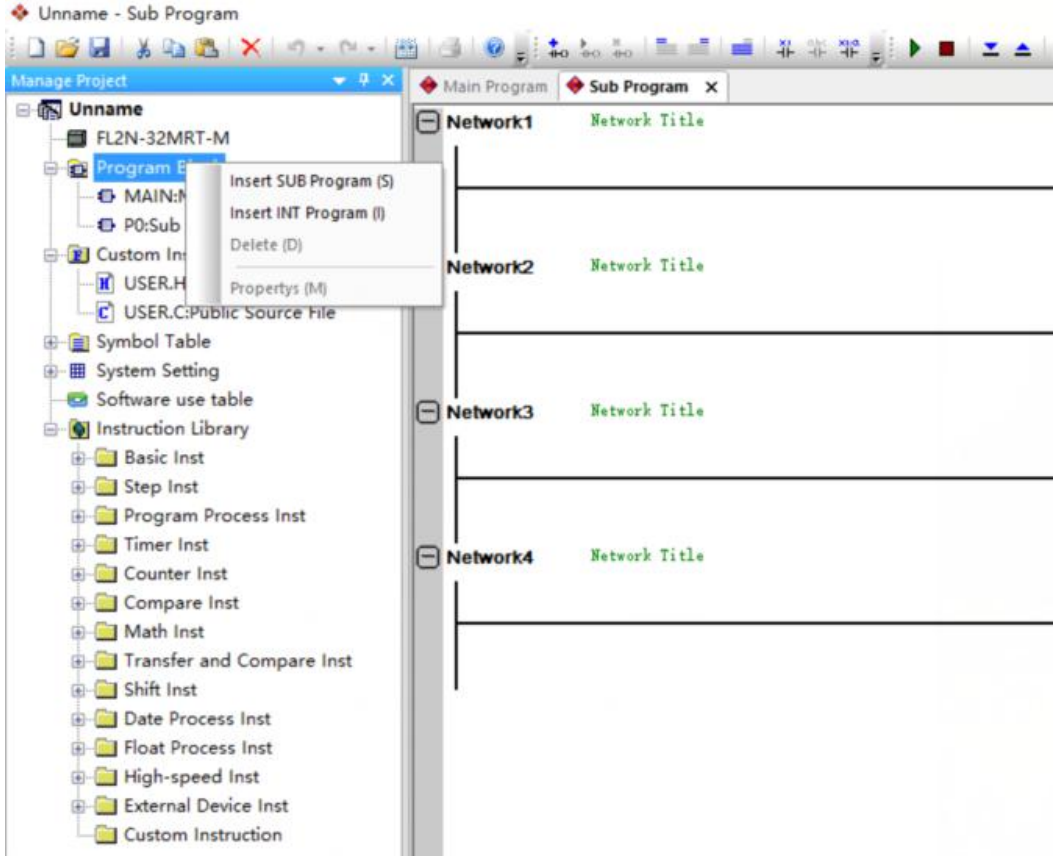


Photo 11-108

2) Choose I35：C235 DHST Instruction INT

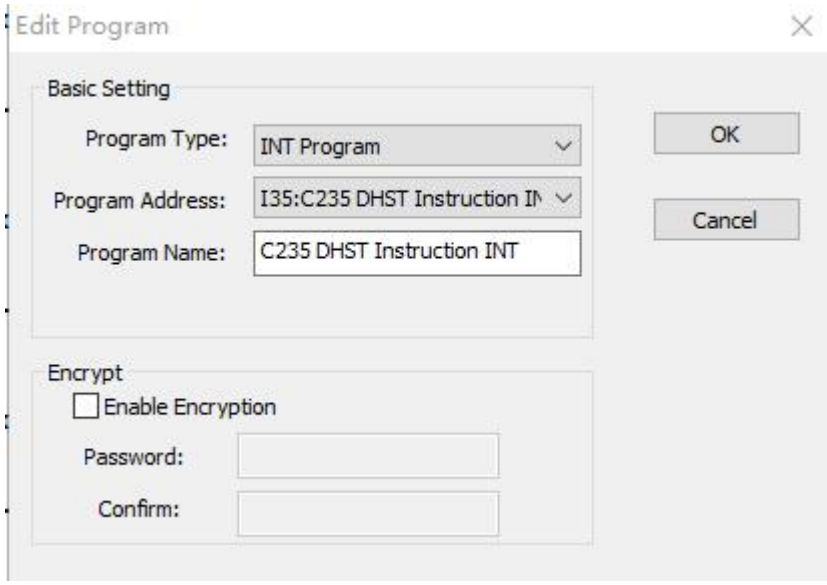


Photo 11-109

Interruption program will be established after confirmation.

c)writing Interruption program as below：

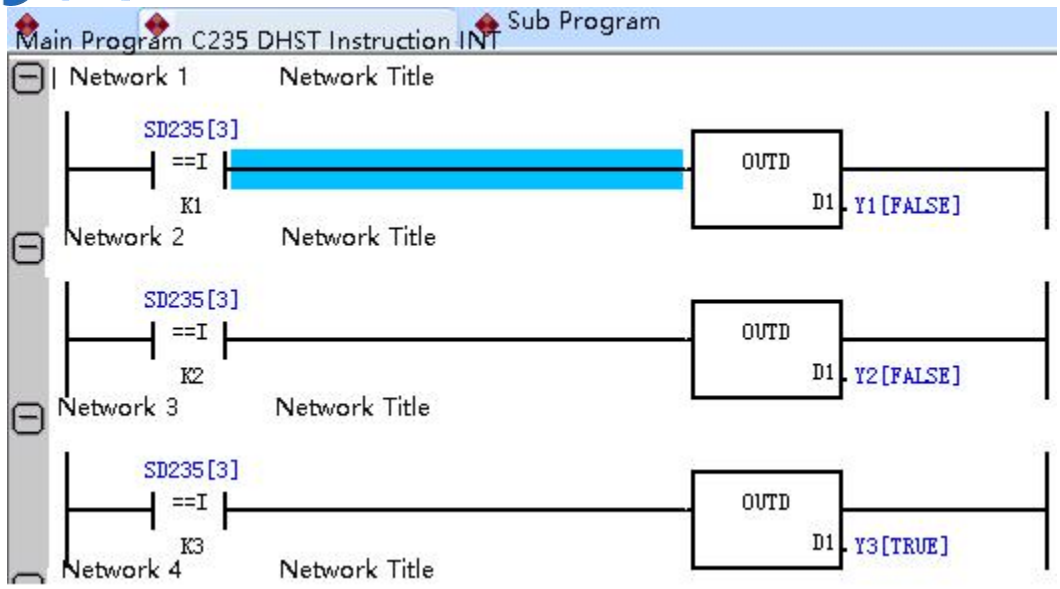


Photo 11-110

Inside OUTD command is direct output command，and you can light Y count quickly without influenced by cycling period.

Counting Process: when X0 is with pulse input, C235 starts counting, when counting to 1st phase number[D0， D1] double words, then it will add 1 to SD235, then SD235 value is 1, after using interruption program I35, I35 interruption according to SD235 value to judge current counting to which phase, and light different output counts separately.

Bring DOG searching origin to DSZR

16-bit command: [DSZR](continuous execution type)

Function: such command is when PLC and server matches working, using appointed pulse speed and pulse output ports, making execution institute moves to action origin points(DOG), until making origin signal satisfying conditions.

Ladder digraph is as below:

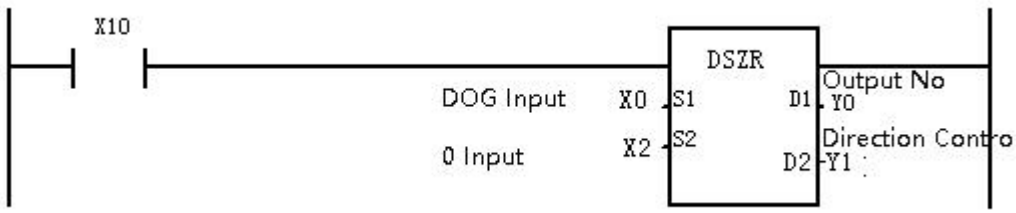


Photo 11-111

Command Illustration:

1.S1 appointed input signal (DOG) input, although XYMS signal is ok, only X signal timing is the best. Such approximating signal logic is labeled by approximating signal logic reverse symbol, shown as following table list:

Signal Input	Logic Reverse Symbol	

X0	SM345	OFF positive logic： input as ON, approximating signal is ON ON negative logic: output as OFF, approximating signal is ON
X1	SM355	
X2	SM365	
X3	SM375	

2. S2 is 0 signal input port, the 0 signal logic is symbolized by 0 signal logic reverse symbol as following table

3. Note： If 0 signal and approximating signal symbolized as same input, 0 signal logic acts according to approximating signal logic.

Signal Input Ports	Logic Reverse Symbol	
X0	SM346	OFF positive logic：input as ON, approximating signal is ON ON negative logic: output as OFF, approximating signal is ON
X1	SM356	
X2	SM366	
X3	SM376	

4. D1is the set-up address of pulse output, only appointing Y0-Y3.

5. D2 is the output of rotating way signal.ON rotates positively， OFF rotates reversely.

Origin counts return direction is appointed by following soft components:

Signal Output Ports	Origin counts return direction symbol	
Y0	SM342	ON will return to origin point under rotation positively. OFF will return to origin point under rotation reversely.
Y1	SM352	
Y2	SM362	
Y3	SM372	

Clearance Signal Output

This command is with the function of output clearance after return counts stopping.If you need this function action, you need open signal clearance output symbol as shown below:

Signal clearance soft components: user can appoint 1 position, when signal clearance signal output symbol is 1, then it also correspondent 1 signal clearance soft components appointed function effective symbol location. User set up signal clearance soft components such as table b set as 0 using default signal clearance soft components.

a.Defaulted signal clearance soft components without using signal clearance soft components function.

Signal Output Ports	Output Symbol of Signal Clearance	Soft components appointing Function is effective for signal clearance soft components	Signal clearance soft components NO
Y0	SM341=ON	SM464=OFF	Y4
Y1	SM351=ON	SM465=OFF	Y5
Y2	SM361=ON	SM466=OFF	Y6
Y3	SM371=ON	SM467=OFF	Y7

b.By using the appointed function of signal clearance soft components, user can define signal clearance soft components by user themselves.

Signal Output Ports	Signal Clearance Output Symbol	Signal clearance soft components appointing function is effective	Signal clearance soft components appointed soft components
Y0	SM341=ON	SM464=ON	SD464
Y1	SM351=ON	SM465=ON	SD465
Y2	SM361=ON	SM466=ON	SD466
Y3	SM371=ON	SM467=ON	SD467

Origin point return speed

You can set up origin point returning speed, size is base speed<=return point speed<=highest speed

Signal Output Ports	Base Speed	Return Speed Set-up	Highest Speed	
Y0	SD342	SD346	SD343	Default：50,000(hz)
Y1	SD352	SM356	SD353	
Y2	SD362	SM366	SD363	
Y3	SD372	SM376	SD373	

Climbing speed

Set-up climbing speed

Signal Output Ports	Base Speed	Climbing Speed	Highest Speed	
Y0	SD342	SD345	SD343	Default：1,000(hz)
Y1	SD352	SM355	SD353	
Y2	SD362	SM365	SD363	
Y3	SD372	SM375	SD373	

Applicable soft components

S1	X,Y,M,SM,S
S2	X,Y,M,SM,S
D1	Y
D2	Y

DOG search functions sample：

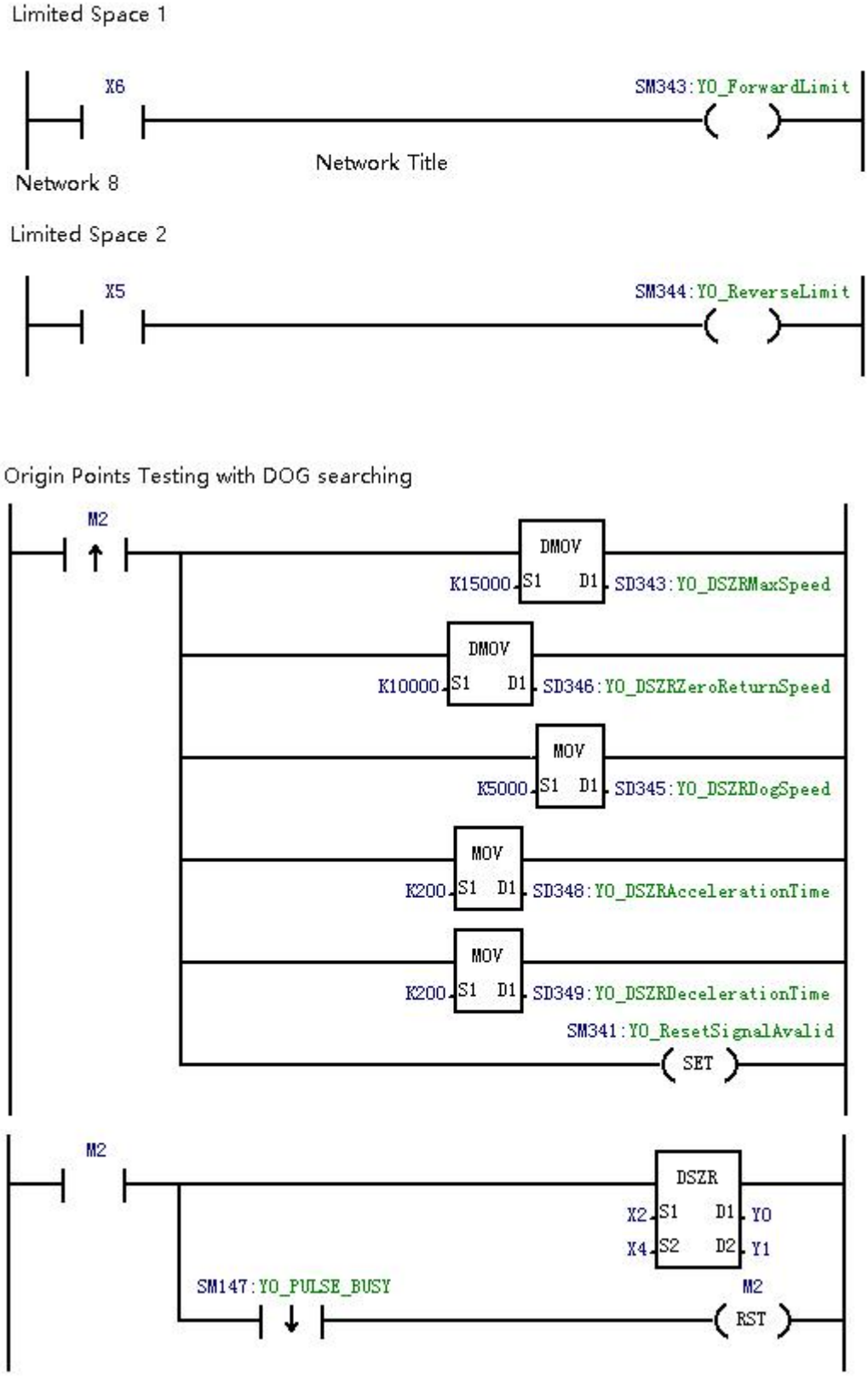


Photo 11-112

Relative position control DRVI/DDRVI

16-bit command：[DRVI]（continuous execution type）

32-bit command：[DDRVI]（continuous execution type）

Function: single speed position controlling with relative drive ways.

Ladder digraph is as shown:

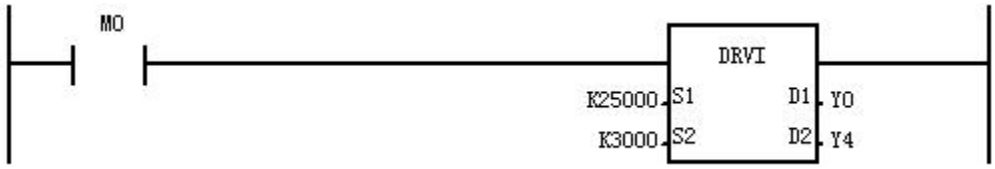


Photo11-113

Command Illustration:

S1 is appointed output pulse. 16bit command, range is－32768 ~ 32,767, 32bit command，range is -2,147,483,648 ~ 2,147,483,647. Negative number means negative direction.

S2 is appointed output frequency pulse， 16bit command， range is 10 ~ 32767Hz,32bit command,range is 10 ~ 100,000Hz.

D1is pulse output ports, only can appoint Y0 or Y1.

D2is output ports or variables in the running direction, when the output is ON status, it means positive running, otherwise it means negative running.

Output pulse number is correspondent current value register as correspondent location

Output to［Y000］, current register is [SDI41（high bytes）, SDI40（low bytes）]（using 32-bit）

Output to［Y00I］, current register is [SDI43（high bytes）, SDI42（low bytes）]（using 32-bit）

Output to［Y002］, current register is [SDI51（high bytes）, SDI50（low bytes）]（using 32-bit）

Output to［Y003］, current register is [SDI53（high bytes）, SDI52（low bytes）]（using 32-bit）

In the process of command execution, even by changing operation contents, it is hard to show in current running. It is only effective in next command execution, if during command execution, command driven contact is OFF, it will stop by low speed. At this time the execution symbol SM29 will not act, when the command driven contact changes to OFF, when the pulse output symbolSM147（Y000),SM148（Y001), SM149（Y002), SM150（Y003）is ON， It will not accept command again driven.

Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
D1	Y
D2	Y,M,SM,S

Absolute position control DRV/DDRVA

16-bit command：[DRVA]（continuous execution type）

32bit command：[DDRVA]（continuous execution type）

Function: Execute single speed controlling with absolute driven ways.

Ladder digraph is as shown:

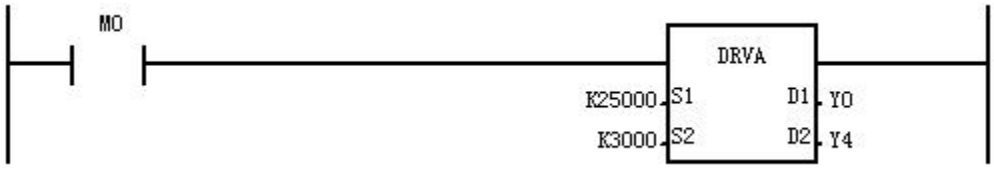


Photo 11-114

Command Illustration: Actual output pulse actually is S1-SD register accumulating value.
S1 is appointed target location(absolute location). 16bit command， range is －32768 ~ 32,767；32bit command，range is -2,147,483,648 ~ 2,147,483,647.
When D1 = ［Y0］，it is correspondent to [SDl41（high bytes）, SDl40（low bytes）] （using 32-bit）
is absolute position.
If D1 = ［Y1］, correspondent [SDl43（high bytes）, SDl42（low bytes）] （using 32-bit）
is absolute
Position.
If D1 = ［Y2］, correspondent [SDl51（high bytes), SDl50（low bytes)] （using 32-bit）is absolute Position.
If D1 = ［Y3］，correspondent [SDl53（high bytes), SDl52（low bytes)] （using 32-bit）is absolute Position.
The negative number stands for negative direction, when in reverse direction, current register value decreases.
S2 is appointed output pulse frequency, range is 10 ~ 32,767Hz（16bit command）,or 10 ~ 100,000Hz（32bit command).
D1is pulse output ports, it can only appoint Y0 or Y1.
S2 running direction output port or bit variables, and you can decide according to S1 and current Location differential value. When the output is ON status,it means positive running, otherwise it is reverse running. In the process of command execution, even if the operation contents changed, it will not show in current running, Only effective in next command execution.
In the command execution process, command driven contact is OFF, then it will stop step by step. Then the execution finishing symbol SM29 will not act.
When command driven contact is OFF, and pulse output interruption symbol SM147（Y000）and SM148（Y001）is ON, it will not accept command's again driven.
Applicable soft components:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
S2	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z
D1	Y
D2	Y,M,SM,S

Ladder pulse output PLSTR/DPLSTR
16-bit command：[PLSTR]（continuous execution type）

32bit command：[DPLSTR]（continuous execution type）

Ladder digraph

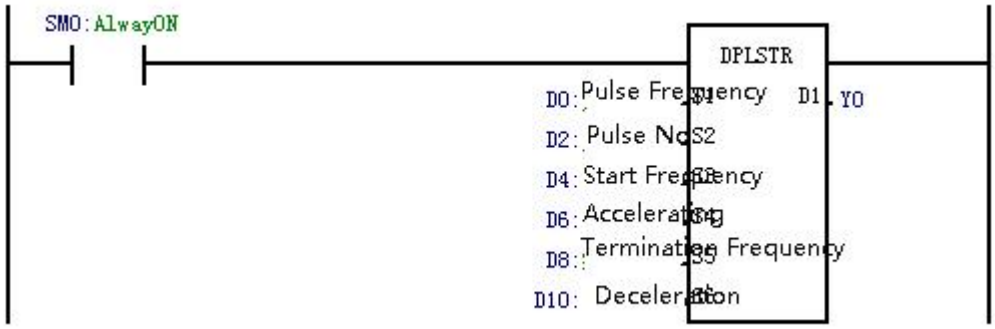


Photo 11-115

Command Illustration:

As relay is not suitable for high frequency action, only transistor output PLC is suitable for this command. This function is ladder pulse output command with accelerating and decelerating function. Inside,

S1 is set-up output frequency frequency, 16bit command, range is －32768 ~ 32,767,32bit command,range is -2,147,483,648 ~ 2,147,483,647.

S2 is set-up output pulse number，16bit command，range is －32768 ~ 32,767, 32bit command，range is -2,147,483,648 ~ 2,147,483,647.

S3 is the set-up frequency,16bit command, range is － 32768 ~ 32,767, 32bit command,range is -2,147,483,648 ~ 2,147,483,647。

S4 is set-up accelerating&decelerating time,range is 50 ~ 5000 (ms)

S5 is termination frequency，16bit command，range is －32768 ~ 32,767；32bit command，range is -2,147,483,648 ~ 2,147,483,647。

S6 is decelerating time, range: 50 ~ 5000 (ms)

Applicable soft components table:

S1	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
S2	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
S3	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
S4	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
S5	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
S6	K,KnX,KnY,KnM,KnSM,KnS,T,C,D,SD,V,Z,AI,AQ
D	Y

Pulse stop PSTOP

16-bit command：[PSTOP](continuous execution type)

The command to stop the pulse output immediately.

Ladder digraph

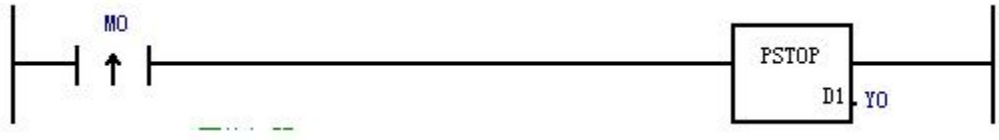


Photo 11-116

Command Illustration: D1: Output ports NO of appointed stopping pulse ports.

11.13External Device Command

Modbus read command MBUSRB

Ladder digraph is as shown:

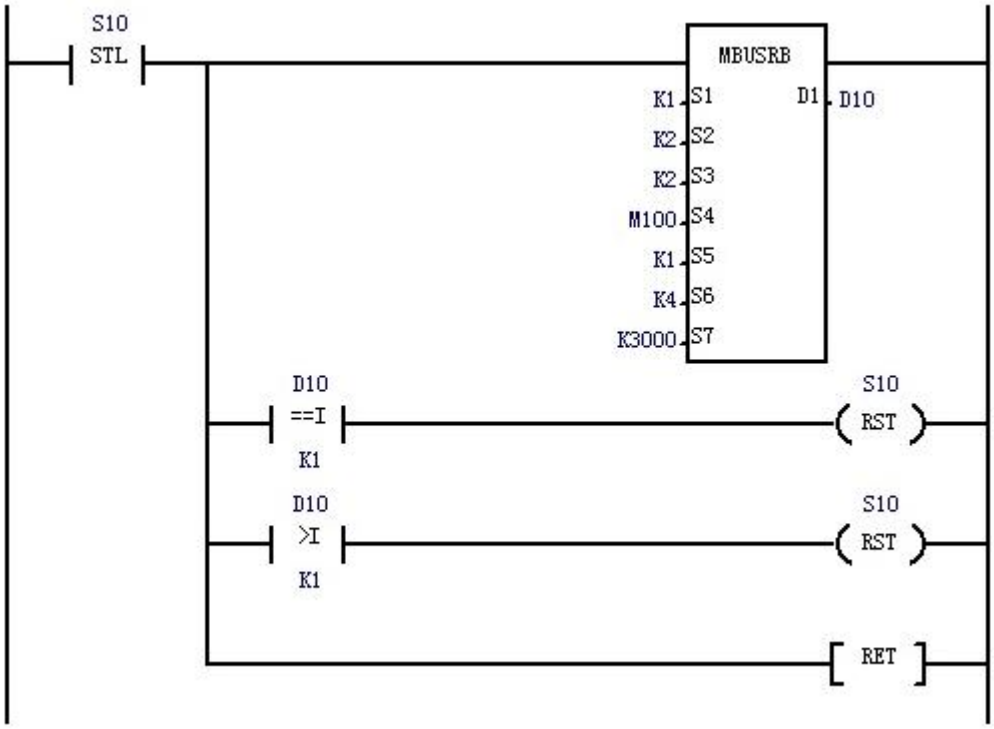


Photo11-117

Command Illustration: the digital number of reading Modbus sub-station.

Applicable soft components:

Parameter	Operator	Description	Note
S1	D,K	Ports NO	Applicable address 1, 2
S2	D,K	Station NO	0-255
S3	D,K	Function Code	1(can be readable or written)or 2 (only read)
S4	M	Read bit Storage Address	

S5	D,K	Modbus Address	
S6	D,K	Reader NO	
S7	D,K	Overtime Time	
D1	D	Fault Code	

Note： fault code illustration

ERR=1 successful communication

ERR=2 overtime

ERR=3 fault station no

ERR=4 function code is not correct

ERR=5 testing fault

ERR=101 function code fault

ERR=102 non-supportive address

Modebus written command MBUSWB

Ladder digraph shown:

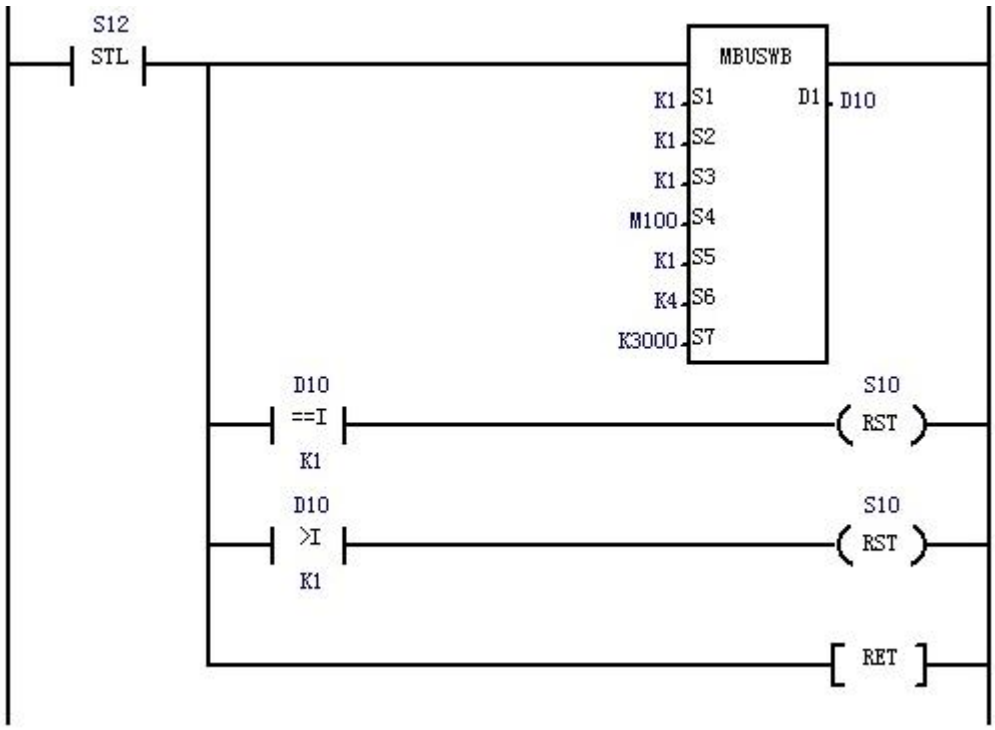


Photo 11-118

Command Illustration: The sub-station analog quantity of writing into modulus substation.

Applicable soft components

Parameter	Operator	Description	Notes
S1	D,K	Ports NO	Optional address 1， 2
S2	D,K	Station NO	0-255
S3	D,K	Function Code	5(single)， 15(multiple)

S4	D,K	Digital quantity written storage address.	
S5	M	Modbus address	
S6	D,K	Read Number	
S7	D,K	Overtime time	
D1	D	Fault code	

Note: Fault Code Illustration

ERR=1 Communication Successfully

ERR=2 Overtime

ERR=3 Station No fault

ERR=4 Function Code is not correct

ERR=5 Testing fault

ERR=101 Function code fault

ERR=102 Non-supportive address

Modbus read manual MBUSRW

Ladder digraph shown

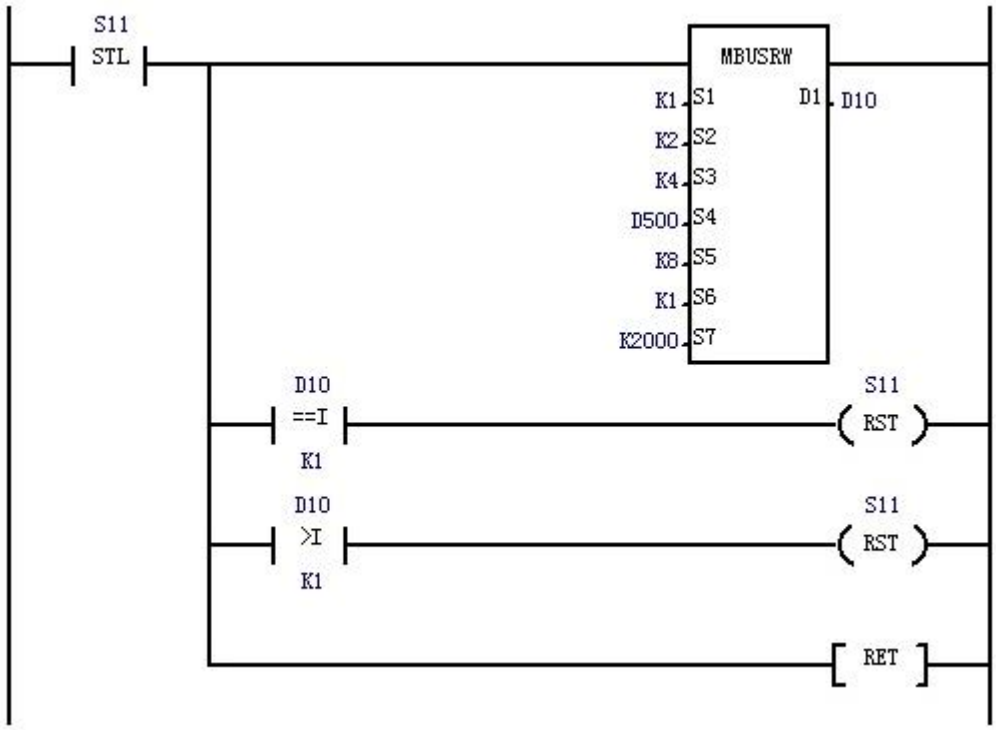


Photo 11-119

Command Illustration:Read Modbus sub-station analog quantity

Applicable soft components:

Parameter	Operator	Description	Note
S1	D,K	Port NO	Applicable address 1, 2

S2	D,K	Station NO	0-255
S3	D,K	Function Code	3(readable or writable) or 4（only readable）
S4	D	Read Analog Quantity Store Address	
S5	D,K	Modbus Address	
S6	D,K	Read NO	
S7	D,K	Overtime Time	
D1	D	Fault Code	

Note：fault code illustration:

ERR=1 communication successfully

ERR=2 overtime

ERR=3 station no fault

ERR=4 function code is not correct

ERR=5 testing fault

ERR=101 function code fault

ERR=102 non supportive address

Modbus Writen Command MBUSWW

Ladder digraph shown

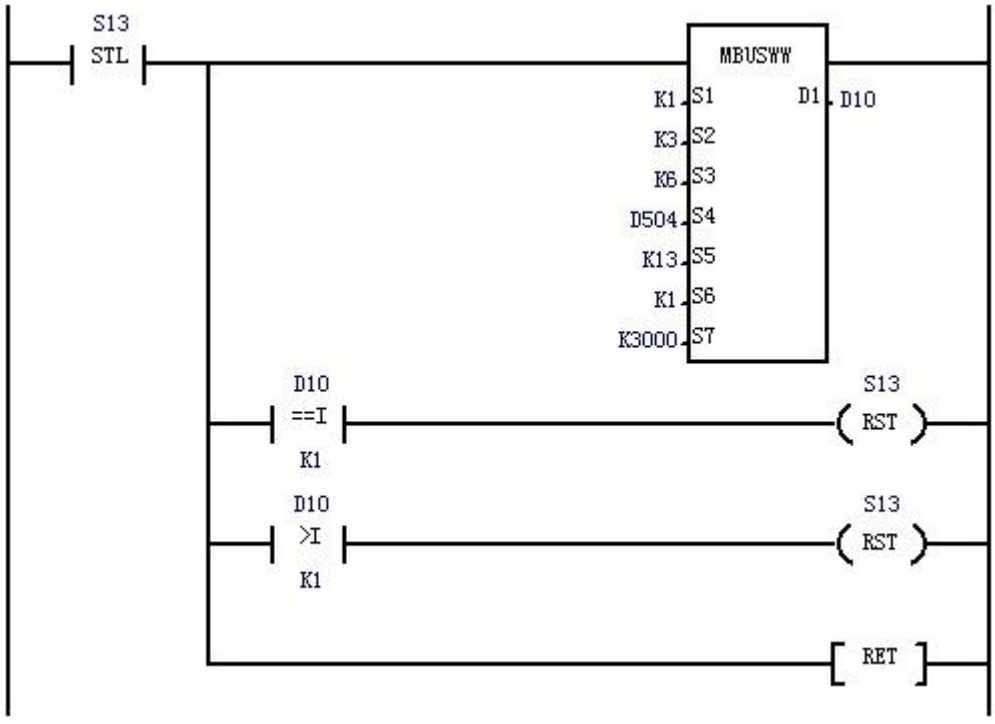


Photo 11-120

Command Illustration：write Modbus sub-station analog quantity

Applicable soft components

Parameter	Operator	Description	Note
S1	D,K	Port NO	Address applicable 1，2
S2	D,K	Station NO	0-255
S3	D,K	Function Code	6(single word),16（multiple words）
S4	D	Writen analog storage address	
S5	D,K	Modbus address	
S6	D,K	Read NO	
S7	D,K	Overtime time	
D1	D	Fault code	

Note: Fault code Illustration
ERR=1 Communication Successfully
ERR=2 Overtime
ERR=3 Station NO fault
ERR=4 Function code not correct
ERR=5 Testing fault
ERR=101 Function code fault
ERR=102 Non supportive address

Port set-up command SETPORT
Ladder digraph shown:

Photo11-121

Command Illustration:
Dynamic setting communication port parameters including baud rate, data bit, stop bit, testing bit and station no.
Applicable soft components

Parameter	Operator	Description	Notes
S1	D,K	Port NO	Applicable value 1，2
S2	D,K	Baud Rate	0-1200，1-2400，2-4800，3-9600，4-19200， 5-38400，6-57600，7-115200，8-187500
S3	D,K	Working mode	0-232，1-485-4w, 2-485-2w
S4	D,K	Data bit	6，7，8
S5	D,K	Stop bit	1-stop bit1　2-stop bit 2
S6	D,K	Test bit	0-no test 1-odd test 2-even test
S7	D,K	Station NO	MODBUS sub-station is effective

EEROM read command EEREAD

Ladder digraph shown

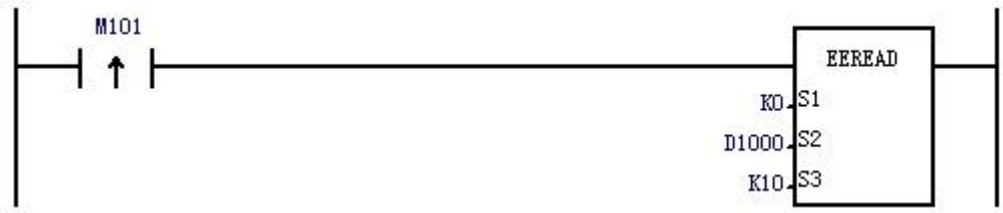


Photo11-122

Command Illustration: read EEROM data

Applicable soft components:

Parameter	Operator	Description	Note
S1	D,K	EEROM address	Applicable range 0~499
S2	D	Storage&placing address of data reading	
S3	D,K	Read data length, unit is word	

EEROM Write Command EEWRITE

Ladder digraph shown

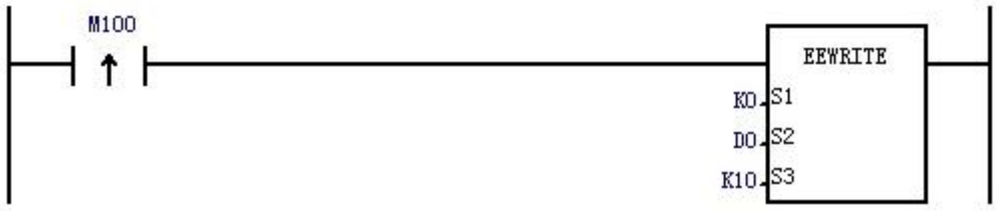


Photo11-123

Command Illustration: when writing EEROM, the written data will not loss with power failure.

Note: As data is stored into the FLASH of the chip, you can not write frequently, otherwise it may cause chip broken.

Applicable soft components:

Parameter	Operator	Description	Note
S1	D,K	EEROM address	Applicable range: 0~499
S2	D	The first address of data storage	
S3	D,K	The length of data storage,unit is word.	

PID Calculation Command

Command Illustration: please use PIDT and PIDR command to realize PID adjusting function.

Ladder digraph is shown as below:

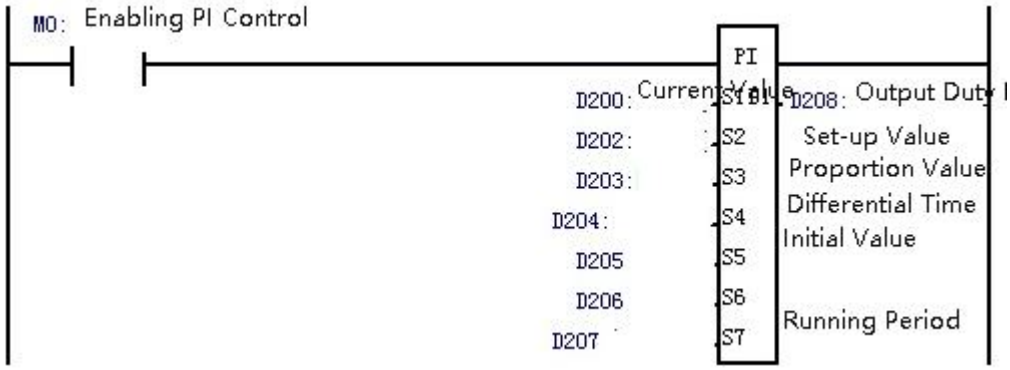


Photo11-124

Command Illustration: Using this command to adjust proportional scoring.

Applicable soft components

Parameter	Operator	Description	Note
S1	D,K	Current Value	
S2	D,K	Set-up Value	
S3	D,K	Proportional Value	
S4	D,K	Differential Time(hundred ms)	

S5	D,K	Initial Value(permillage, 500 stands for 50%)	
S6	D,K	Non working area	
S7	D,K	Running Period	
D1	D	Output duty circle（permillage, 500 stands for 50%）	

BACNET Switching Value Command

Ladder digraph shown as below:

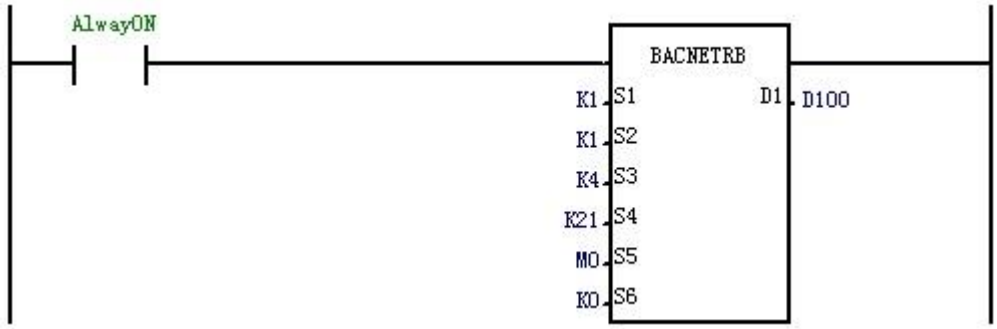


Photo 11-125

Command Illustration: You can set reading BACNET server switch data according to parameter setting.

Applicable soft components:

Parameter	Operator	Description	Optional Value
S1	D,K	PLC Ports	K1, K2
S2	D,K	Device Object Instance	
S3	D,K	Object Type	3:OBJECT_BINARY_INPUT 4:OBJECT_BINARY_OUTPUT
S4	D,K	Object Instance	
S5	Y,M	The storage address of read value	
S6	D,K	Cycle Time	
D1	D	Fault code Error	ERR=0 normal ERR=1 communication successfully ERR=2 overtime

BACNET switch written command

Ladder digraph shown

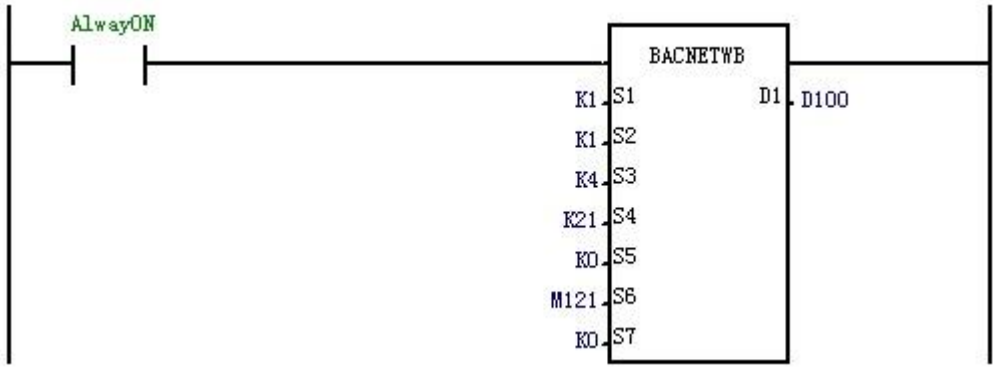


Photo 11-126

Command Illustration: write BACNET server switch data according to parameter setting.

Applicable soft components:

Parameter	Operator	Description	Optional Value
S1	D,K	PLC Port	K1， K2
S2	D,K	Device Object Instance	
S3	D,K	Object Type	3:OBJECT_BINARY_INPUT 4:OBJECT_BINARY_OUTPUT
S4	D,K	Object Instance	
S5	D,K	Advance Level	0~15
S6	Y,M	Local Address of written value	
S7	D,K	Cycle Time	
D1	D	Error	ERR=0 normal ERR=1 successful communication ERR=2 overtime

BACNET read analog quantity command

Ladder digraph shown as below:

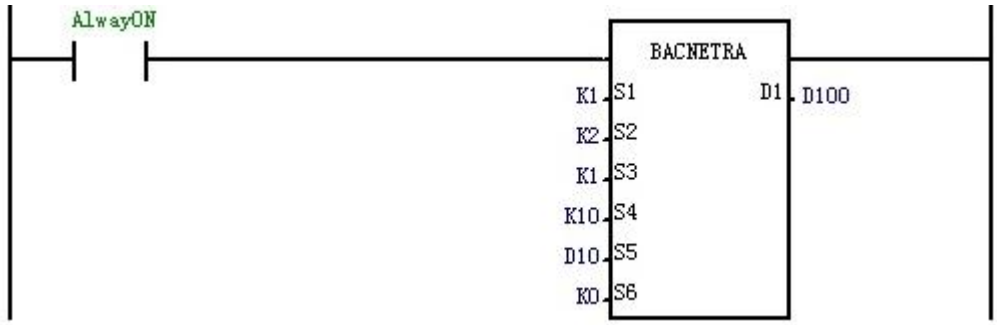


Photo 11-127

Command Illustration: Read BACNET server analog quantity according to parameters setting.

Applicable soft components

Parameter	Operator	Description	Optional Value
S1	D,K	PLC Ports	K1， K2
S2	D,K	Device Object Instance	
S3	D,K	Object Type	0:OBJECT_ANALOG_INPUT 1:OBJECT_ANALOG_OUTPUT
S4	D,K	Object Instance	
S5	D	Read value storage address,floating type	
S6	D,K	Cycle Time	
D1	D	Error	ERR=0 normal ERR=1 communication successfully ERR=2 overtime

BACNET Analog written command

Ladder digraph shown as below

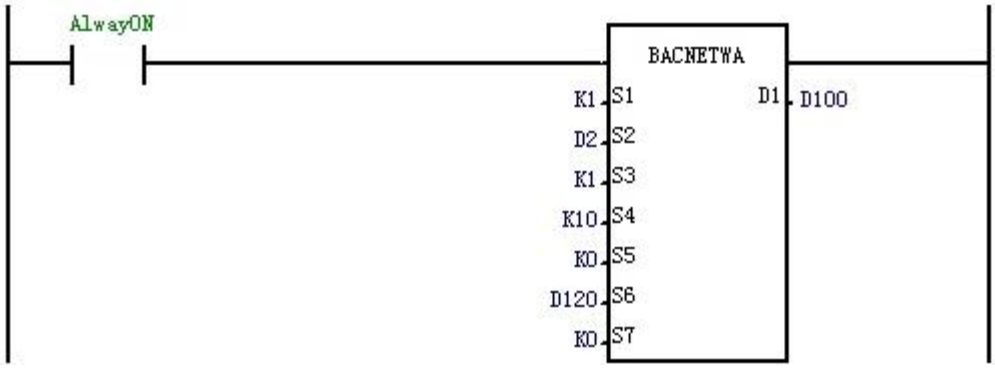


Photo 11-128

Command Illustration: Write BACNET server analog quantity data according to parameter setting.

Applicable soft components:

Parameter	Operator	Description	Optional Value
S1	D,K	PLC ports	K1， K2
S2	D,K	Device Object Instance	
S3	D,K	Object Type	0:OBJECT_ANALOG_INPUT 1:OBJECT_ANALOG_OUTPUT
S4	D,K	Object Instance	
S5	D,K	Advance Level	0~15
S6	D	Writen value local address,floating type.	
S7	D,K	Cycle Time	
D1	D	Error	ERR=0 Normal ERR=1 Successful Communication ERR=2 Overtime

PIDT PID self-defined command

Ladder digraph as shown below:

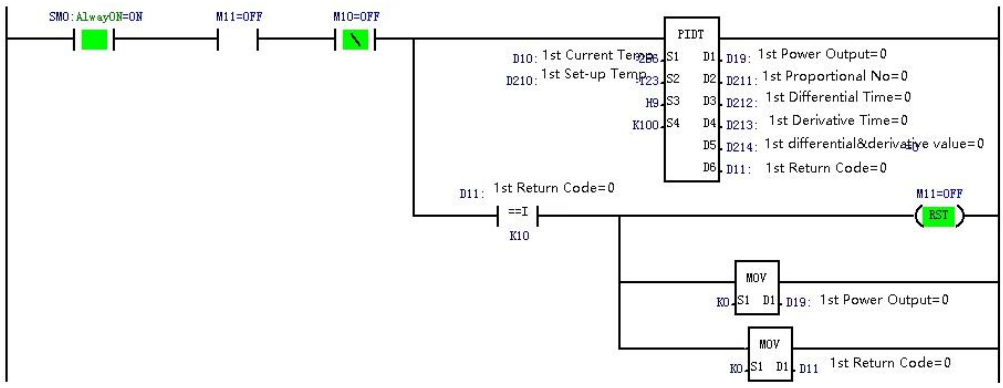


Photo11-129

Command Illustration: in above ladder digraph, when M11 is reset, PIDT command will start running,after self-tuning finished, D11 changes to 10, reset M11, and you will end self-tuning command running.

Applicable soft components:

Parameter	Operator	Description	Optional Value
S1	D	Current sampling value of controlled volume	

S2	D,K	By using set-up critical value by critical oscillatory,phase step oscillatory is invalid.	
S3	D,K	Self-defined model setup	
S4	D,K	Self-defined command running period unit:10ms(require it is same with PIDR command running period)	
D1	D	Self-defined output power per millage (0-1000)	
D2	D	Proportional ratio	
D3	D	Differential Time(x100ms)	
D4	D	Derivative Time (x100ms)	
D5	D	Differential Separation threshold value	
D6	D	Return Code	Return to 10 stands for successful definition

Note* 1)

S3 is PID self-defined model setting word by using hexadecimal, used to set up PID self-defined command model, total 16-bit, each 4 bit is with different meaning

D	C	B	A

ABCD stands for 4 hexadecimal system.

A: Get value of 0~A, used for set up output power ration of parameters running, such as 9 stands for 90%, A stands for definition of full power output.

B: Get value of 0~1, used for set up definition way, 0 stands for using 0 vibration,1 stands for step response.

C: Get value of 0~2, used for set up system running requirement, 0 stands for classic PID wave, 1 stands for allowing less overshoot, 2 stands for not allowing overshoot.

D: Non using at the moment

Note* 2)

D6 return code can check definition status, D6 etc 10 stands for definition succeed.

PIDR PID running Command

Ladder digraph is shown as below

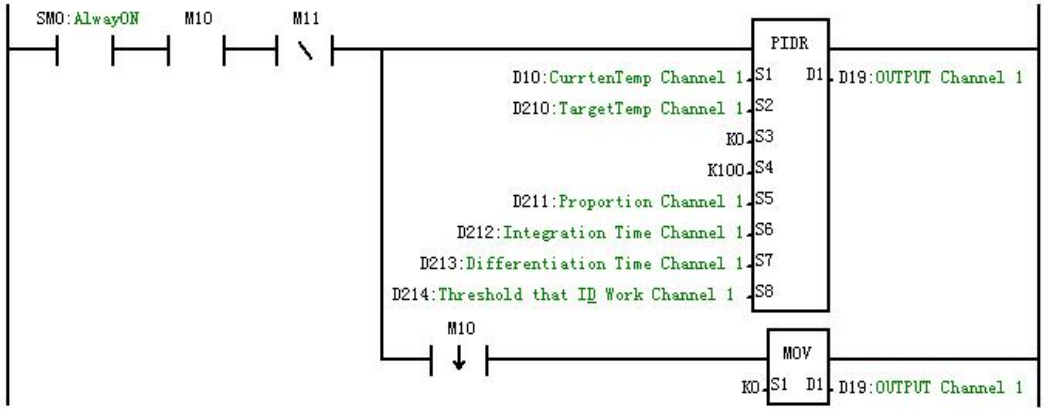


Photo 11-130

Command Illustration:

In above ladder digraph, when M10 is reset, PIDR command will be run starting as set-up parameters. Calculation results will be output to D19.

Applicable soft components:

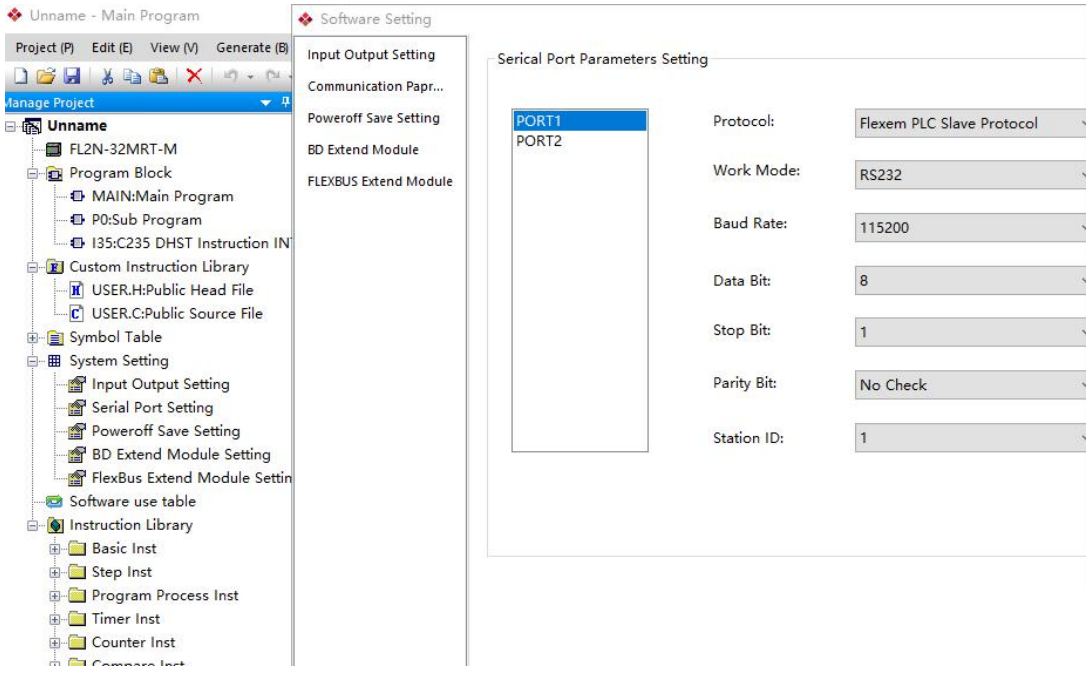
Parameter	Operator	Description	Optional Value
S1	D,K	Current sampling value prospered by controlled volume	
S2	D,K	Controller volume set-up value	
S3	D,K	Retain value，set as 0	
S4	D,K	PIDR command running period unit 10m(required same as PIDT command running period)	
S5	D,K	Proportional ratio	
S6	D,K	Integral Time(x100ms)	
S7	D,K	Differential Time(x100ms)	
S8	D,K	Integral separation threshold value ,when |S1-S2|<(S2*S8/1000),integral and differential item makes effect of adjusting	S8=0，non integral function S8=1000，non integral separation function and always with integral function

D1	D	Output Power per-millage (0~1000)	

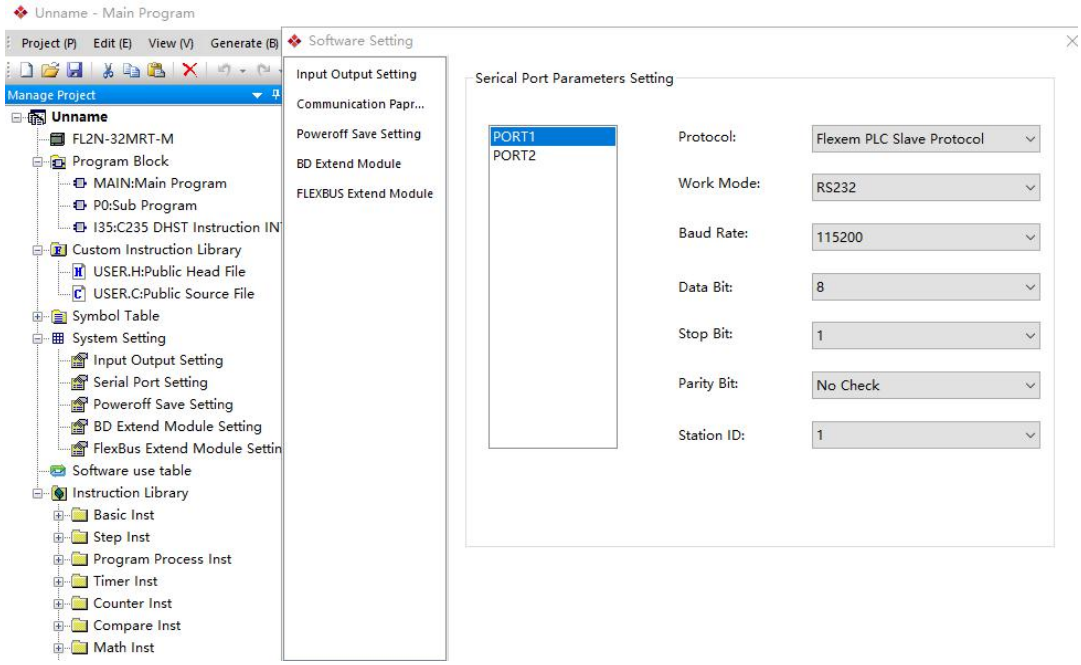
12.Communication

12.1Communication Parameter Setting

You can click"serial port setting" in "Manage Product" to set up serial port parameters.



After clicking "serial port setting" , following dialogue will be popped up,and you can modify the communication parameter in the dialogue.



2 ports of PLC defaults supporting Flexem modbus communication protocol
Communication parameter set up as below：

Serial Ports	Protocol	Working Way	Baud Rate	Data Bit	Calibrate	Stop Bit	Station No
PORT1	Flexem Modbus Communication Protocol	RS232/ RS485	115200	8	None	1	1
PORT2	Flexem Modbus Communication Protocol	RS232/ RS485	115200	8	None	1	1

12.2 Modbus address mapping table

MODBUS communication protocol address set up as following table:

Components	Type	Range	Protocol Address	Function Code
Y	Bit Components	Y0-Y377	0001-0256	1,5,15
X	Bit Components	X0-X377	1201-1456	1,5,15
M	Bit Components	M0-M2047	2001-4048	1,5,15

SM	Bit Components	SM0-SM511	4401-4912	1,5,15
S	Bit Components	S0-S999	6001-7000	1,5,15
T	Bit Components	T0-T255	8001-8256	1,5,15
C	Bit Components	C0-C255	9201-9456	1,5,15
D	Word Components	D0-D4095	0001-4096	3,6,16
SD	Word Components	SD0-SD511	8001-8512	3,6,16
T	Word Components	T0-T255	9001-9256	3,6,16
C	Word Components	C0-C199	9501-9700	3,6,16
C	Double Worlds Components	C200-C255	9701-9756	3, 16

12.3 CAN Interface User Manual

12.3.1 Structure definition

Structure definition of sending message

```
typedef struct
{
  u32 StdId;//used to set up standard symbol, and the value range is 0-0x7FF
  u32 ExtId;///used to set up expandable symbol, and value range is 0-0x1FFFFFFF
  u8 IDE;///used to set up message symbol type, and value range is CAN_ID_STD,CAN_ID_EXT
  u8 RTR;//used to set up transferring message type.
                //Data frames：CAN_RTR_DATA，Distance frames：CAN_RTR_REMOTE
  u8 DLC;//Frame length of delivering message, value range：0-0x8
  u8 Data[8];//data transfer} CanTxMsg;
```

Receiving message structure definition, and the variable meaning is same as sending message,

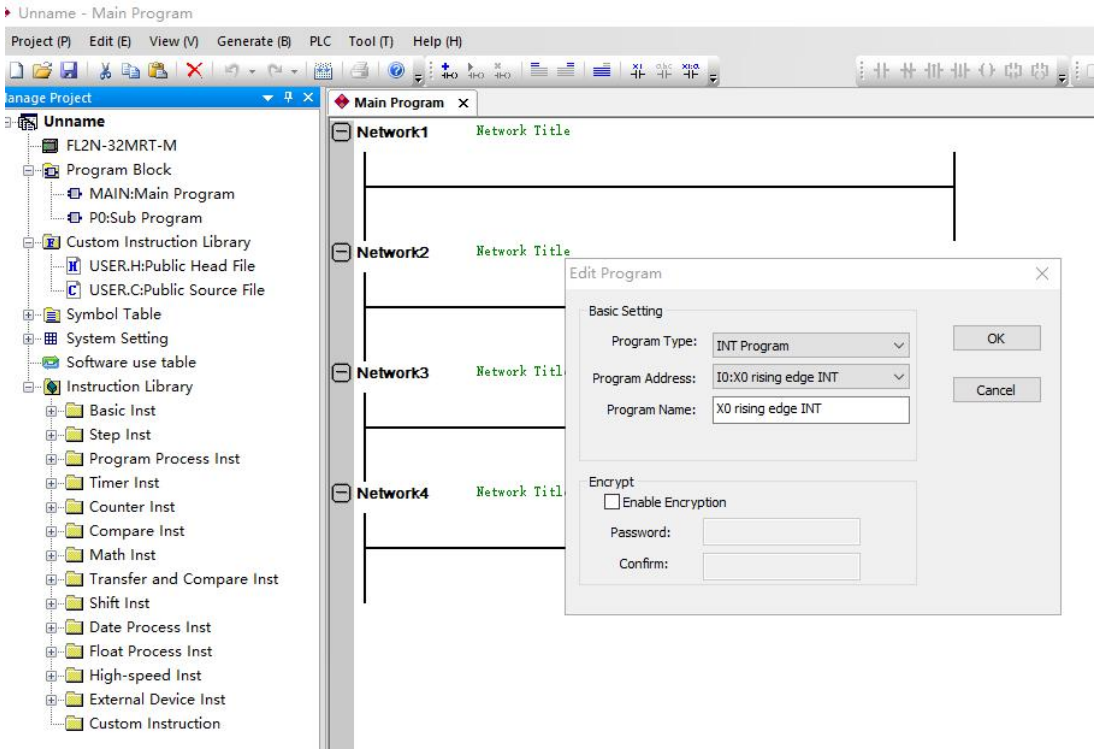
```
typedef struct
{
  u32 StdId;
  u32 ExtId;
  u8 IDE;
  u8 RTR;
  u8 DLC;
  u8 Data[8];
} CanRxMsg;
```

12.3.2 User Interface Function

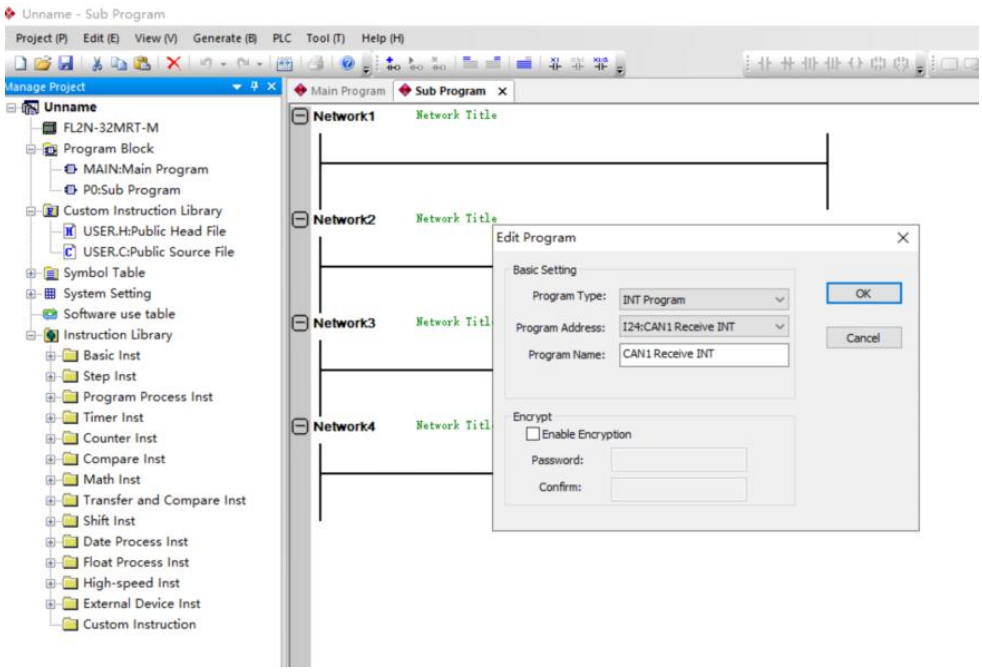
```
/**
  * @Parameter1    can:    appointed port NO，optional value is CAN1
  * @Parameter 2    TxMsg: the definition of sending frame.
  * Return value：failure 0    succeed 1
  */
u8 CANXMT(u8 can,CanTxMsg *TxMsg);

/**
  * @Parameter1    can:    appointed port NO, optional as CAN1
  * @Parameter2    RxMsg:    the definition of sending frame.
  * Return Value：Failure 0 Succeed 1
  */

u8 CANRCV(u8 can,CanRxMsg *RxMsg);
```

12.4 Interruption Process

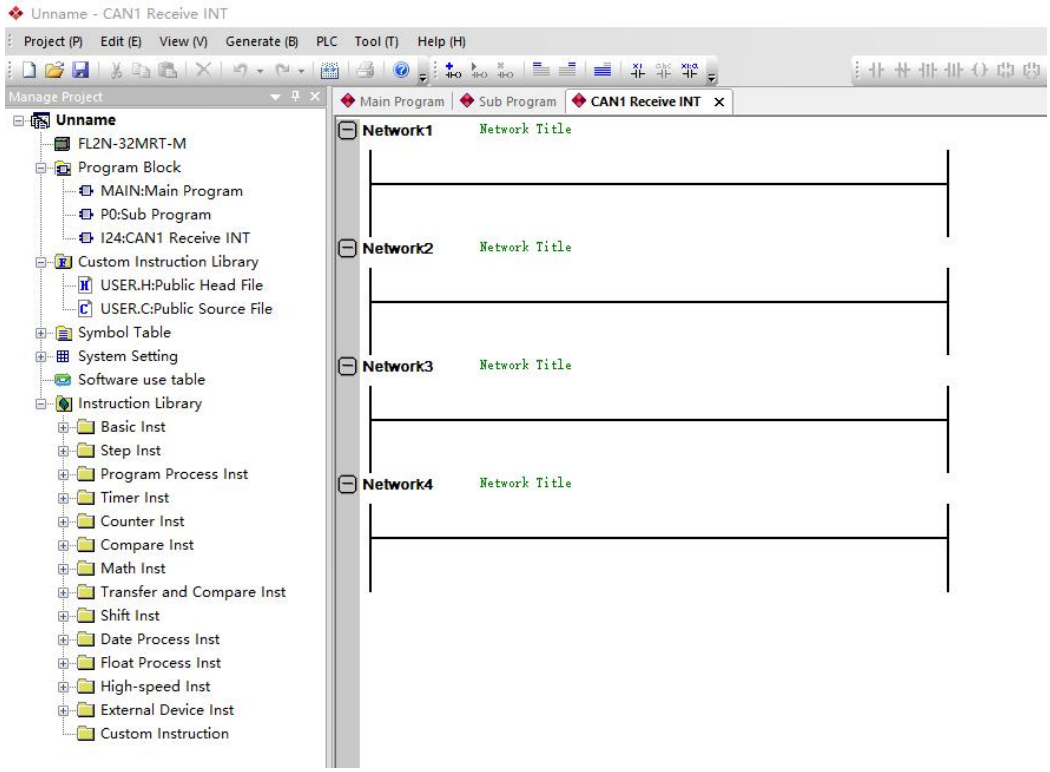
The system will trigger one interruption once receiving one CAN frame, You can add interruption processing program in the project as following step.
Click right keyboard of the “Program Block” in “Manage Project”,choose” insert SUB program”.



Please select I24：CAN reception interrupts.



After creating “INT Program, establishing one C self-defined function to receive CAN message.



Exact function refers to the example.

12.5 Communication Parameters Setting

Double click CAN communication parameters setting in “System setting” under”manage project”.

You can change CAN communication port baud rate here.

12.6 Hardware Interface Definition

Serial Port Hardware Connection Definition

Port	Wiring Way	Line No
PORT1	RS232/RS485	1:B- 2:Rx 3:Tx 5:GND 6:A+
PORT2	RS232/RS485	4:B- 5:GND 7:Rx 8:Tx 9:A+

13.Self-defined Command

User Self-defined Command

You can use C language directly in FlexLogic software for programming,now we use one simple sample to illustrate how to use self-defined command.

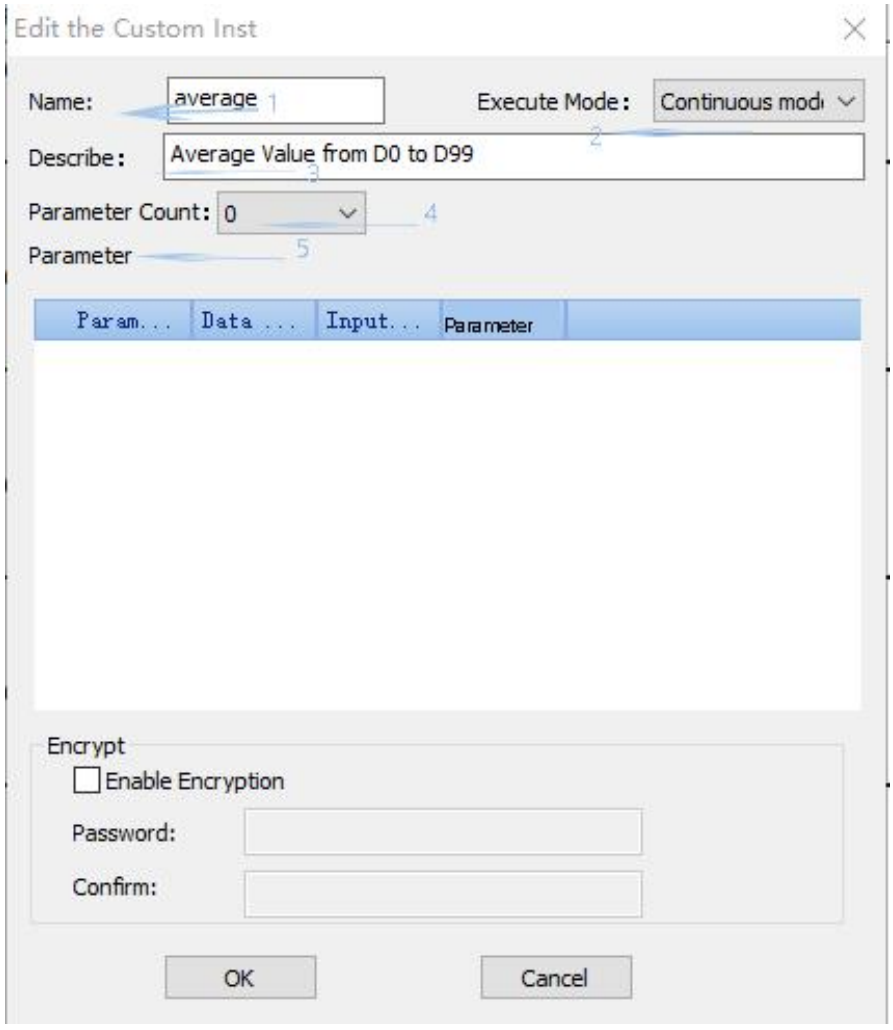
Target: Put the average value of into D100.

Method:

1） Add user self-defined command

In “Project Manage”, click” custom Instruction Library" by right key， click”Add Custom Inst(N)” entering next stage:

2） Fill self-defined command parameter:



After 1st stage finished, following dialogue will be popped, and the parameter meaning illustration is as below:

1.Command Name: It is similar to the ADD, SUB manual in the ladder digraph, and here

make “average”.

2. The command name must be standard C function.

3. Execution way: it is classified as continuous execution type and pulse execution type, and correspondent to general command and pulse command.

Continuous execution means continuous execution when meeting the condition.

Pulse execution means execution only one time when meeting the condition, as the rising edge execution meeting conditions.

4. Command description： Illustration characters of the command.

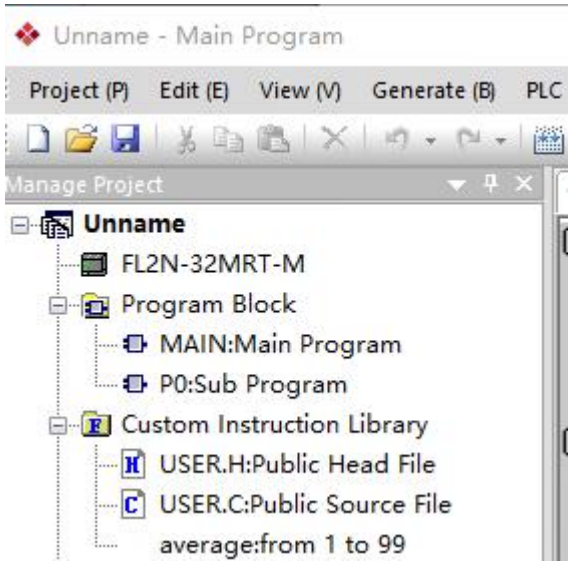
5. Parameters NO: the input/output parameter number of the command, such as Mitshubishi ADD command is with 3 parameters. Here you do not need consider repeat using, and the parameter can be chosen 0 directly.

6. Parameters setting： you need select different parameter types if you choose multiply parameters.

After all selection finished, click” confirm”.

3） Edit self-defined instruction code

After finishing 2nd stage, you can see there is already average command in the user=defined command library, click command, then you can write the code.



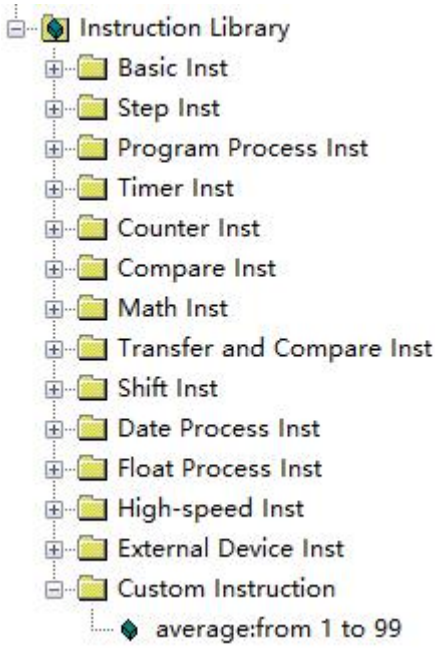
After finishing code writing, you can see below photo:

```
1  #include "sys_include.h"
2  #include "USER.H"
3  void   MacroEntry(u32 en,FAddr *a)//The function definition, can not be modified
4  {
5     if(en)//if enable
6   {// TODO: Add Custom Instruction processing Code
7
8     }
9  }
10
```

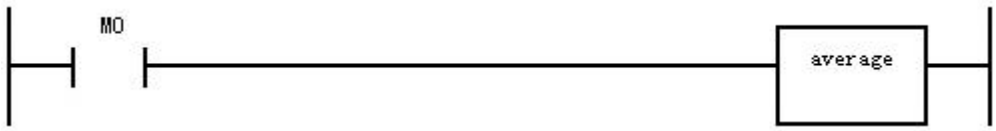
Please note if(en) in the red circle， and please execute it after meeting conditions.

4）Using “Custom Instruction” Command

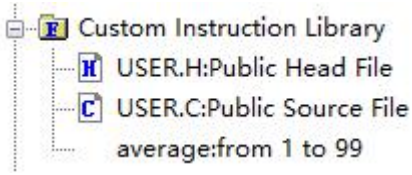
You can see one more"average" Command in user “Custom Instruction” in “Instruction Library”.



Now you can use this command like using other commands to establish the ladder digraph as below”



When M0 is ON， average command will calculate the average value from D0 to D99 and send it to D100.Finally, you can use USER H: Public Head File in the custom instruction library as below:



```
#include "sys_include.h"
#ifndef USER_H
#define USER_H
//Read internal register X's state
BOOL  GET_X(int n);
//Setting, reset, read internal register M's state
BOOL  GET_M(int n);
void  SET_M(int n);
void  RST_M(int n);
//Setting, reset, read internalregister Y's state
BOOL  GET_Y(int n);
void  SET_Y(int n);
void  RST_Y(int n);
//read, write D as WORD
short GET_D(int n);
void  SET_D(int n,short val);
//read, write D as DWORD
int   GET_DD(int n);
void  SET_DD(int n,int val);
//read, write D as float
float GET_FD(int n);
void  SET_FD(int n,float val);
//Direct Read  X input point
BOOL  GETD_X(int n);
//Direct read, setting, reset Y output point
BOOL  GETD_Y(int n);
void  SETD_Y(int n);
void  RSTD_Y(int n);
/**   Get system timer clock   /ms
  *   return:The current value of system clock
  */
u32  GetSysTick();
/**   Get the period of time from a point to current  /ms
  *   return: The pased time
```

Appendix:Command List

Classification	FNC	Byte	Function
A	ALT	16 bit	Alternate output command (continuous execution type)
	ALTP	16 bit	Alternate output command (pulse execution type)

	(D)ADD	(32)16 bit	BIN addition(continuous execution type)
	(D)ADDP	(32)16 bit	BIN addition(pulse execution type)
	ANS	16 bit	Signal alarm set
	ANR	16 bit	Signal alarm reset
B	BMOV	16 bit	Transfer by Batch
	(D)BCD	(32)16 bit	BCD transfer (continuous execution type)
	(D)BCDP	(32)16 bit	BCD transfer (pulse execution type)
	(D)BIN	(32)16 bit	BIN transfer (continuous execution type)
	(D)BINP	(32)16 bit	BIN transfer (pulse execution type)
	(D)BON	(32)16 bit	ON bit judge (continuous execution type)
	(D)BONP	(32)16 bit	ON bit judge (pulse execution type)
C	CLOSED	16 bit	Break Contact
	CJ	16 bit	Conditional jump(continuous execution type)
	CJP	16 bit	Conditional jump(pulse execution type)
	CALL	16 bit	Sub program transfer(continuous execution type)
	CALLP	16 bit	Sub program transfer(pulse execution type)
	CNT	16 bit	Counter command

	(D)CMP	(32)16 bit	Comparison command(continuous execution type)
	(D)CMPP	(32)16 bit	Comparison command(pulse execution type)
	(D)CML	(32)16 bit	Negate transfer(continuous execution type)
	(D)CMLP	(32)16 bit	Negate transfer(pulse execution type)
D	DI	16 bit	Interruption prohibit
	(D)DIV	(32)16 bit	Integer division (continuous execution type)
	(D)DIVP	(32)16 bit	Integer division (pulse execution type)
	(D)DEC	(32)16 bit	BIN deduct 1 command(continuous execution type)
	(D)DECP	(32)16 bit	BIN deduct 1 command(pulse execution type)
	DAND	32 bit	Double words logic and command(continuous execution type)
	DANDP	32 bit	Double words logic and command (pulse execution type)
	DOR	32 bit	Double words logic and Command (continuous execution type)
	DORP	32 bit	Double words logic and command (pulse execution type)
	(D)DECO	(32)16 bit	Decode Command
	DXOR	32 bit	Double words logic and command

	DXORP	32 bit	Double words logic or command
	DHSCT	32 bit	Double words segmental counting
	DSZR	32 bit	Origin counts return with DOG searching
	DRVI	32 bit	Relative position control command
	DRVA	32 bit	Absolute position control command
E	DECMP	32 bit	Floating number comparison command(continuous execution type)
	DECMP	32 bit	Floating number non-stop command (pulse execution type)
	DEZCP	32 bit	Floating number area command(continuous execution type)
	DEZCPP	32 bit	Floating number area command(pulse execution type)
	DEBCD	32 bit	Binary number changing to floating number command(continuous execution type)
	DEBCDP	32 bit	Floating number changing to binary number command(pulse execution type)
	DEBIN	32 bit	Decimal system changing to binary floating number command(continuous execution type)

	DEBINP	32 bit	Binary number changing to decimal floating number command(pulse execution type)
	DEADD	32 bit	Floating number addition Command (continuous execution type)
	DEADD	32 bit	Floating number addition Command (pulse execution type)
	DESUB	32 bit	Floating number subtraction Command (continuous execution type)
	DESUBP	32 bit	Floating number subtraction Command (pulse execution type)
	DEMUL	32 bit	Floating number multiplication Command (continuous execution type)
	DEMULP	32 bit	Floating number multiplication Command (pulse execution type)
	DEDIV	32 bit	Floating number division Command (continuous execution type)
	DEDIVP	32 bit	Floating number division Command (pulse execution type)
	DESOR	32 bit	Floating number extraction Command (continuous execution type)
	DESORP	32 bit	Floating number extraction Command (pulse execution type)
	DINT	32 bit	Binary floating changing to single word integer command(continuous execution type)

	DINTP	32 bit	Binary floating changing to single word integer command(pulse execution type)
	DESIN	32 bit	Floating number sinusoidal command(continuous execution type)
	DESINP	32 bit	Floating number sinusoidal command(pulse execution type)
	DECOS	32 bit	Floating number cosine (continuous execution type)
	DECOSP	32 bit	Floating number cosine (pulse execution type)
	DETAN	32 bit	Floating number tangent command(continuous execution type)
	DETANP	32 bit	Floating number tangent command (pulse execution type)
E	EI	16 bit	Interrupt interception
	ENCO	16 bit	Code(continuous execution type)
	ENCOP	16 bit	Code(pulse execution type)
F	FP	16 bit	Falling edge contact
	FOR	16 bit	Circulation starts
	(D)FMOV	(32)16 bit	Multiple sending(continuous execution type)
	(D)FMOVP	(32)16 bit	Multiple sending(pulse execution type)
	(D)FLT	(32)16 bit	BIN Integer→Binary floating number changing(continuous execution type)

	(D)FLTP	(32)16 bit	BIN Integer→Binary floating number changing(pulse execution type)
I	(D)INC	(32)16 bit	BIN add 1(continuous execution type)
	(D)INCP	(32)16 bit	BIN add 1(pulse execution type)
	INT	16 bit	Binary floating number→BIN integer changing(continuous execution type)
	INTP	16 bit	Binary floating number→BIN integer changing(pulse execution type)
L	LD=	16 bit	Single word equal
	LDD=	32 bit	Double words equal
	LD<>	16 bit	Single word not equal
	LDD<>	32 bit	Double words not equal
	LD>	16 bit	Single word more
	LDD>	32 bit	Double words more
	LD<	16 bit	Single word less
	LDD<	32 bit	Double words less
	LD>=	16 bit	Single word more and equal
	LDD>=	32 bit	Double words more and equal
	LD<=	16 bit	Single word less equal
	LDD<=	32 bit	Double words less and equal
	LBJ	16 bit	Sign
	MC	16 bit	Master Control

M	MCR	16 bit	Master Control Reset
	(D)MUL	(32)16 bit	BIN multiplication (continuous execution type)
	(D)MULP	(32)16 bit	BIN multiplication (pulse execution type)
	(D)MOV	(32)16 bit	Transfer (continuous execution type)
	(D)MOVP	(32)16 bit	Transfer (pulse execution type)
	(D)MEAN	(32)16 bit	Average value (continuous execution type)
	(D)MEANP	(32)16 bit	Average value (pulse execution type)
N	NOT	16 bit	Calculation negate
	NOP	16 bit	No action
	NEXT	16 bit	Circulation finish
	(D)NEG	(32)16 bit	Complementing (continuous execution type)
	(D)NEGP	(32)16 bit	Complementing (pulse execution type)
O	OPEN	16 bit	Normally open contact
	OUT	16 bit	Output contact
	OUTD	16 bit	Direct output contact
	PLS	16 bit	Rising edge test
	PLF	16 bit	Falling edge test
	(D)PLSY	(32)16 bit	Pulse output

P	PWM	16 bit	Width adjust
	PLSR	16 bit	Pulse output with Acceleration & deceleration
	(D)PLST	(32)16 bit	Segmental pulse output
	(D)PLSV	(32)16 bit	Changeable pulse output
	PWMR	16 bit	Width adjust
	PID	16 bit	PID Calculation
R	RET	16 bit	Step Ladder Digraph finish
	(D)ROR	(32)16 bit	Circulating right moving command (Continuous execution type)
	(D)RORP	(32)16 bit	Circulating right moving command (Pulse execution type)
	(D)ROL	(32)16 bit	Circulating left moving command (Continuous execution type)
	(D)RCR	(32)16 bit	Circulating right moving command With carry command(Continuous execution type)
	(D)RCRP	(32)16 bit	Circulating right moving command With carry command(pulse execution type)
	(D)RCL	(32)16 bit	Circulating left moving command With carry command(Continuous execution type)
	(D)RCLP	(32)16 bit	Circulating left moving command With carry command(pulse execution type)

	REF	16 bit	Input output refresh(Continuous execution type)
	REFP	16 bit	Input output refresh(pulse execution type)
	REFF	16 bit	Filter adjustment(continuous execution type)
	REFFP	16 bit	Filter adjustment(pulse execution type)
S	SET	16 bit	Set
	STL	16 bit	Step ladder digraph starts
	(D)SUB	(32)16 bit	Integer deduction command (continuous execution type)
	(D)SUBP	(32)16 bit	Integer deduction command (pulse execution type)
	SMOV	16 bit	Trans location sending command (continuous execution type)
	SMOVP	16 bit	Trans location sending command (pulse execution type)
	SFTR	16 bit	Bit right moving (continuous execution type)
	SFTRP	16 bit	Bit right moving (pulse execution type)
	SFTL	16 bit	Bit left moving (continuous execution type)
	SFTLP	16 bit	Bit left moving (pulse execution type)
	SFWR	16 bit	Trans location writing (continuous execution type)

	SFWRP	16 bit	Trans location writing (pulse execution type)
	SFRD	16 bit	Trans location Reading (continuous execution type)
	SFRDP	16 bit	Trans location Reading (pulse execution type)
	(D)SUM	(32)16 bit	Single word ON bit statistics (continuous execution type)
	(D)SUMP	(32)16 bit	Single word ON bit statistics (pulse execution type)
	(D)SQR	(32)16 bit	Integer square (continuous execution type)
	(D)SQRP	(32)16 bit	Integer square (pulse execution type)
	(D)SWAP	(32)16 bit	Up and low byte changing (continuous execution type)
	(D)SWAPP	(32)16 bit	Up and low byte changing (pulse execution type)
	SPD	16 bit	Pulse Density
T	TMR	16 bit	Timer Command
U	UP	16 bit	Rising Edge Contact
W	WDT	16 bit	Monitoring Timer (continuous execution type)
	WDTP	16 bit	Monitoring Timer (pulse execution type)
	WAND	16 bit	Logic and Command (continuous execution type)

	WANDP	16 bit	Logic and Command (pulse execution type)
	WOR	16 bit	Logic and Command (continuous execution type)
	WORP	16 bit	Logic and Command (pulse execution type)
	WXOR	16 bit	Word logic or Command (continuous execution type)
	WXORP	16 bit	Word logic or Command (pulse execution type)
X	(D)XCH	(32)16 bit	Single word exchanging command(continuous execution type)
	(D)XCHP	(32)16 bit	Single word exchanging command (pulse execution type)
Z	(D)ZCP	(32)16 bit	Interval comparison command (continuous execution type)
	(D)ZCPP	(32)16 bit	Interval comparison command (pulse execution type)
	ZRST	16 bit	Batch reset (continuous execution type)
	ZRSTP	16 bit	Batch reset (pulse execution type)
	(D)ZRN	(32)16 bit	Origin point return