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GB USER'S MANUAL OF PROGRAMMABLE LOGIC LRD RELAYS

LRX D01

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SUMMARY OF CHANGES

This user manual is modified by firmware V3.0 and LRXSW programming software ver. 3. LRD V3.0 adds some new functions with firmware version V3.0 to strong LRD function. The upgrade content is shown as the 2 tables below simply. More information about idiographic function to see function instruction.

EDIT AND DISPLAY

	LRD V3.0	LRD V2.x
Ladder	300 lines	200 lines
FBD	260 blocks	99 blocks
LCD	4 lines * 16 characters	4 lines * 12 characters

CONTACT AND FUNCTION BLOCK

	input	output	LRD V3.0	LRD V2.x
Auxiliary relay M	M	M	63(M01~M3F)	15(M1~MF)
Auxiliary relay N	N	N	63(N01~N3F)	Ladder: NO FBD: 15(N1~NF)
temperature input	AT		4(AT01~AT04)	No
analog output		AQ	4(AQ01~AQ04)	No
PWM		P	2(P01~P02, P01 adds PLSY mode)	1(P1: PWM)
HMI			31(H01~H1F)	15(H1~HF)
Timer	T	T	Ladder: 31(T01~T1F) FBD: 250(T01~TFA)	15(T1~TF)
Counter	C	C	Ladder: 31(C01~C1F) FBD: 250(C01~CFA)	15(C1~CF)
RTC	R	R	Ladder: 31(R01~R1F) FBD: 250(R01~RFA)	15(R1~RF)
Analog Comparator	G	G	Ladder: 31(G01~G1F) FBD: 250(G01~GFA)	15(G1~GF)
AS (Add-Sub)	No	No	Ladder: 31(AS01~AS1F) FBD: 250(AS01~ASFA)	No
MD (Mul-Div)			Ladder: 31(MD01~MD1F) FBD: 250(MD01~MDFA)	No
PID			Ladder: 15(PI01~PI0F) FBD: 30(PI01~PI1E)	No
MX (Multiplexer)			Ladder: 15(MX01~MX0F) FBD: 250(MX01~MXFA)	No
AR (Analog Ramp)			Ladder: 15(AR01~AR0F) FBD: 30(AR01~AR1E)	No
DR (Data Register)			240(DR01~DRF0)	No
MU (MODBUS)			Ladder: 15(MU01~MU0F) FBD: 250(MU01~MUFA)	No
Block	B	B	Logic function: BOOLEAN	No
			260(B001~B260)The capability of each block is alterable, and the total capability of block is 6000bytes	99(B01~B99)The capability of each block is fixed
LRXM00 (version 3)			LRXM00 (ver. 3) can be used with all versions of LRD	LRXM00 cannot be used with LRD V3.x

CHAPTER 1: GETTING STARTED

The LRD Relay is an electronic device. For safety reasons, please carefully read and follow the paragraphs with "WARNING" or "CAUTION" symbols. They are important safety precautions to be aware of while transporting, installing, operating, or examining the LRD Controller.

 WARNING: Personal injury may result from improper operation.

 CAUTION: The LRD relay may be damaged by improper operation.

PRECAUTION FOR INSTALLATION

 Compliance with the installation instructions and the user manual is absolutely necessary. Failure to comply could lead to improper operation, equipment damage or in extreme cases even death, serious bodily injury or considerable damage to property.

 When installing the open-board models, insure that no wiring or foreign materials can fall into the exposed circuits and components. Damage to equipment, fire, or considerable damage to property could result.

 Always switch off power before you wire, connect, install, or remove any module.

 The wiring for the LRD relay is open and exposed. For the open-board models, all electrical components are exposed. For this reason, it is recommended the LRD relay be installed in an enclosure or cabinet to prevent accidental contact or exposure to the electrical circuits and components.

 Never install the product in an environment beyond the limits specified in this user manual such as high temperature, humidity, dust, corrosive gas, vibration, etc.

PRECAUTION FOR WIRING

 Improper wiring and installation could lead to death, serious bodily injury or considerable damage to property.

 The LRD relay should only be installed and wired by properly experienced and certified personnel.

 Make sure the wiring of the LRD relay meets all applicable regulations and codes including local and national standards and codes.

 Be sure to properly size cables for the required current rating.

 Always separate AC wiring, DC wiring with high-frequency switching cycles, and low-voltage signal wiring.

PRECAUTION FOR OPERATION

 To insure safety with the application of the LRD relay, complete functional and safety testing must be conducted. Only run the LRD after all testing and confirming safe and proper operation is complete. Any potential faults in the application should be included in the testing. Failure to do so could lead to improper operation, equipment damage or in extreme cases even Death, serious bodily injury or considerable damage to property.

 When the power is on, never contact the terminals, exposed conductors or electrical components. Failure to comply could lead to improper operation, equipment damage or in extreme cases even death, serious bodily injury or considerable damage to property.

 It is strongly recommended to add safety protection such as an emergency stop and external interlock circuit in case the LRD relay operation must be shut down immediately.

EXAMINATION BEFORE INSTALLATION

Every LRD relay has been fully tested and examined before shipment. Please carry out the following examination procedures after unpacking your LRD relay.

- Check to see if the model number of the LRD matches the model number that you ordered.
- Check to see whether any damage occurred to the LRD during shipment. Do not connect the LRD relay to the power supply if there is any sign of damage.

Contact Customer Service (Tel. +39 035 4282422 - E-mail: service@LovatoElectric.com) if you find any abnormal conditions as mentioned above.

ENVIRONMENTAL PRECAUTIONS

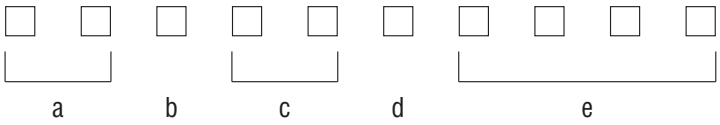
The installation site of the LRD relay is very important. It relates directly to the functionality and the life span of your LRD. Please carefully choose an installation site that meets the following requirements:

- Mount the unit vertically
- Environment temperature: -20°C...55°C (-4°F...131°F)
- Avoid placing LRD close to any heating equipment
- Avoid dripping water, condensation, or humid environment
- Avoid direct sunlight
- Avoid oil, grease, and gas
- Avoid contact with corrosive gases and liquids
- Prevent foreign dust, flecks, or metal scraps from contacting the LRD relay
- Avoid electric-magnetic interference (soldering or power machinery)
- Avoid excessive vibration; if vibration cannot be avoided, an anti-rattle mounting device should be installed to reduce vibration.

DISCLAIM OF LIABILITY

We have reviewed the contents of this publication to ensure consistency with the hardware and software described. Since variance cannot be precluded entirely, we cannot guarantee full consistency. However, the information in this publication is reviewed regularly and any necessary corrections are included in subsequent editions.

LRD - MODEL IDENTIFICATION



a. LR ⇒ Programmable relay series LR...

b. D ⇒ Base model with display
E ⇒ Expansion module

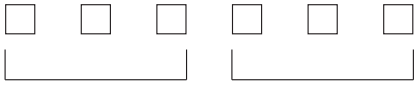
c. 10 ⇒ Base module, 6 digital inputs + 4 digital outputs
12 ⇒ Base module, 8 digital inputs ❶ + 4 digital outputs
20 ⇒ Base module, 12 digital inputs ❷ + 8 digital outputs
08 ⇒ Expansion module, 4 digital inputs + 4 digital outputs
P00 ⇒ MODBUS communication module

d. R ⇒ Digital relay outputs
T ⇒ Digital transistor outputs

e. A240 ⇒ Supply voltage 100…240VAC
D024 ⇒ Supply voltage 24VDC
A024 ⇒ Supply voltage 24VAC

❶ The D024 version is equipped with 2 digital inputs that can be used as 0…10VDC analog type.
❷ The D024 version is equipped with 4 digital inputs that can be used as 0….10VDC analog type.

CODE COMPOSITION FOR LRD PROGRAMMABLE RELAY ACCESSORIES



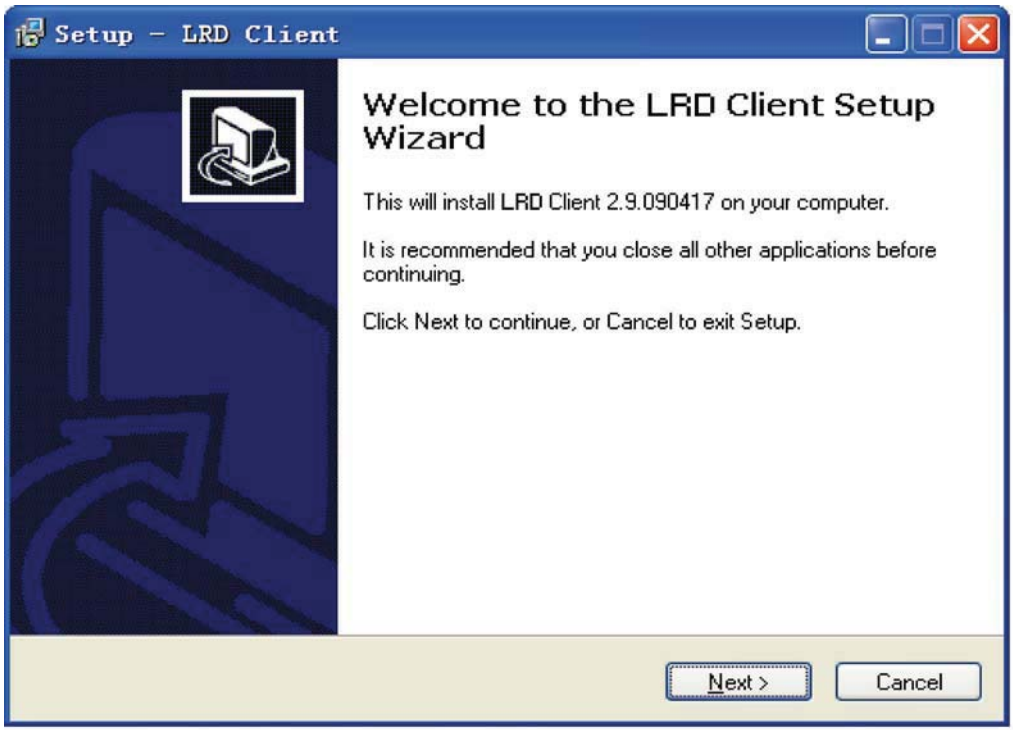
a. LRX ⇒ LRD programmable relay accessory

b. C00 ⇒ Connecting cable for PC ↔ LRD base module
D00 ⇒ User's manual Italian edition (paper)
D01 ⇒ User's manual English edition (paper)
D02 ⇒ User's manual Spanish edition (paper)
D03 ⇒ User's manual French edition (paper)
M00 ⇒ Program backup memory
SW ⇒ Programming and supervision software (CD-ROM)

QUICK START SETUP

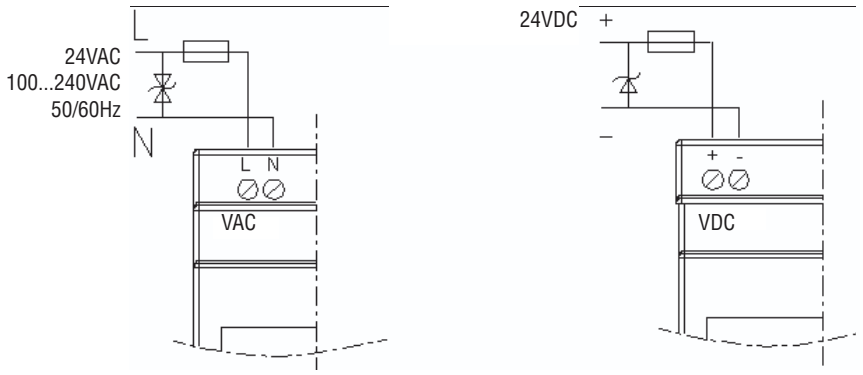
This section is a simple 5-steps guide to connecting, programming and operating your new LRD relay. This is not intended to be the complete instructions for programming and installation of your system. Many steps refer to other sections in the manual for more detailed information.

INSTALL LRXSW SOFTWARE
Install the LRXSW Software from CD or from the free internet download at Customer Service (Tel. +39 035-4282422, e-mail: service@LovatoElectric.com)



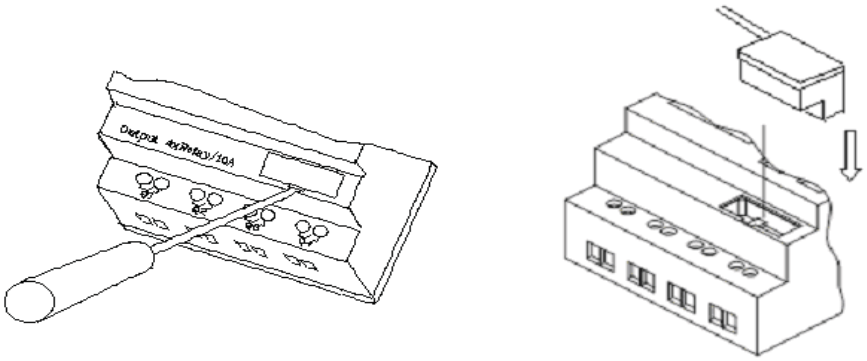
CONNECT POWER TO LRD RELAY

Connect power to the LRD Relay using the below wiring diagrams for AC or DC supply for the applicable modules. See “Chapter 2: Installation” for complete wiring and installation instructions.



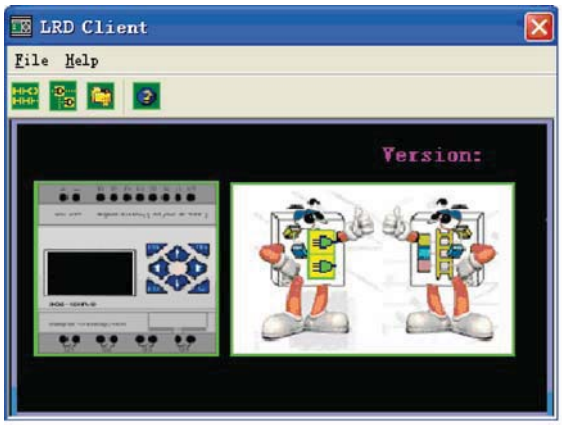
CONNECT PROGRAMMING CABLE LRXC00

Remove the plastic connector cover from the LRD using a flathead screwdriver as shown in the figure below. Insert the plastic connector end of the programming cable into the LRD relay as shown in the figure below. Connect the opposite end of the cable to an RS232 serial port on the computer.

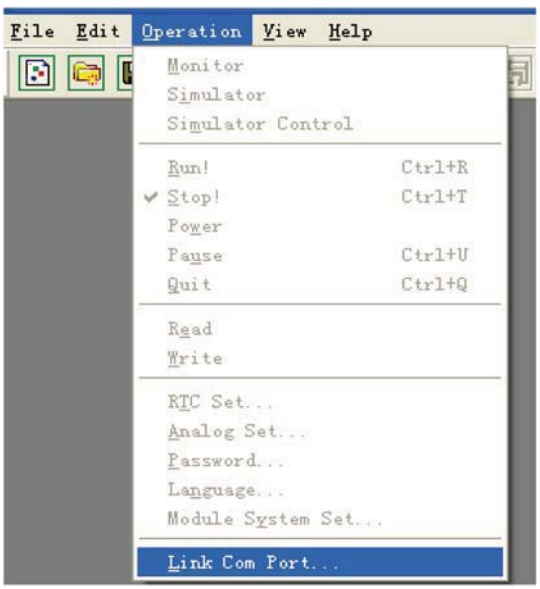


ESTABLISH COMMUNICATION

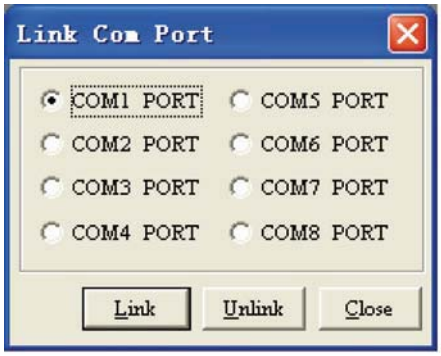
a. Open the LRXSW software and select “New Ladder Document” as shown below.



b. Select “Operation/Link Com Port…” as shown below.



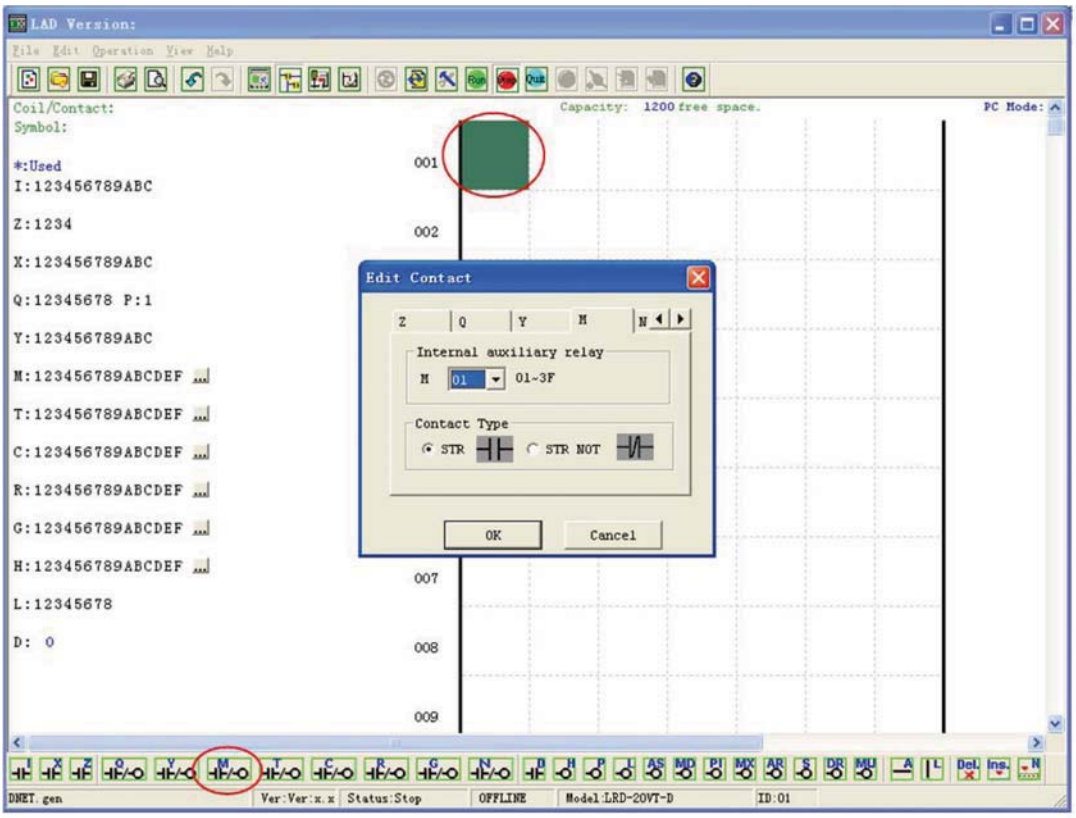
c. Select the correct Com Port number where the programming cable is connected to the computer then press the “Link” button.



d. The LRXSW will then begin to detect the connected LRD relay to complete its connection.

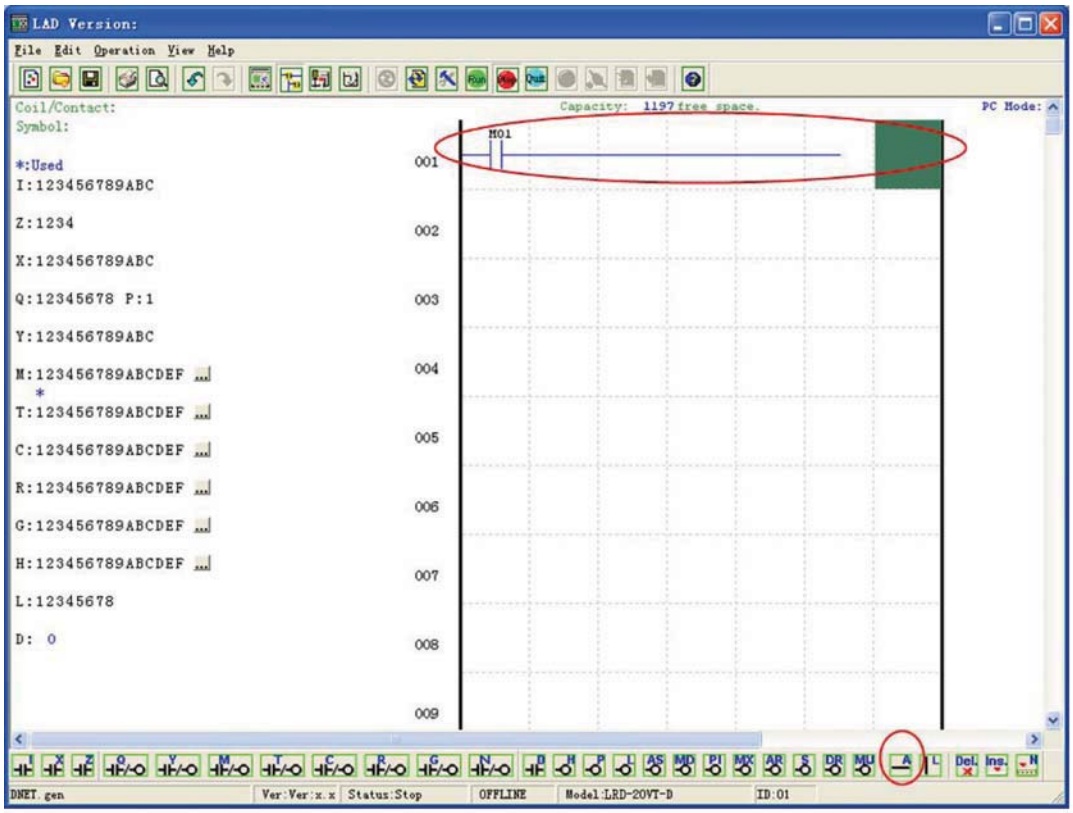
WRITE SIMPLE PROGRAM

a. Write a simple one rung program by clicking on the leftmost cell at line 001 of the programming grid, then click on the “M” contact icon on the ladder toolbar, as shown below. Select M01 and press the OK button. See Chapter 4: Ladder Programming instructions for complete instruction set definitions.

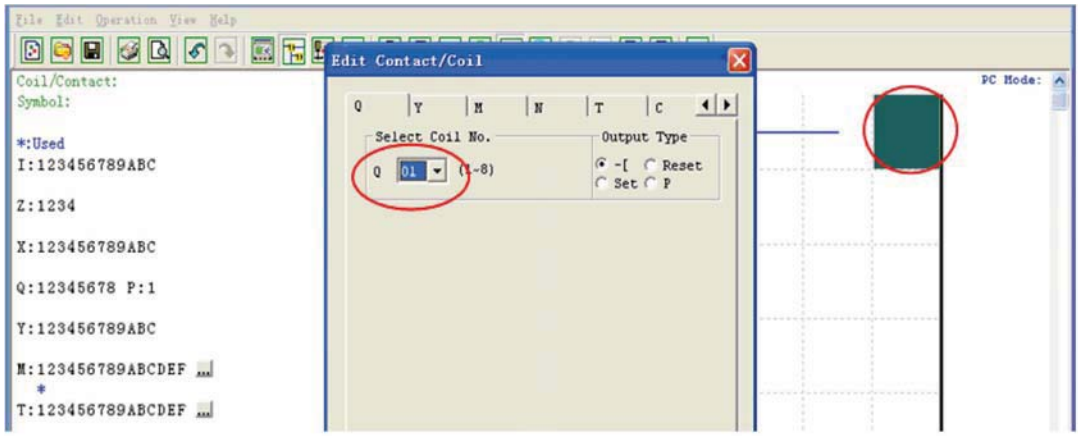


Note: If the ladder toolbar is not visible at the bottom of the screen, select View>>Ladder Toolbar from the menu to enable.

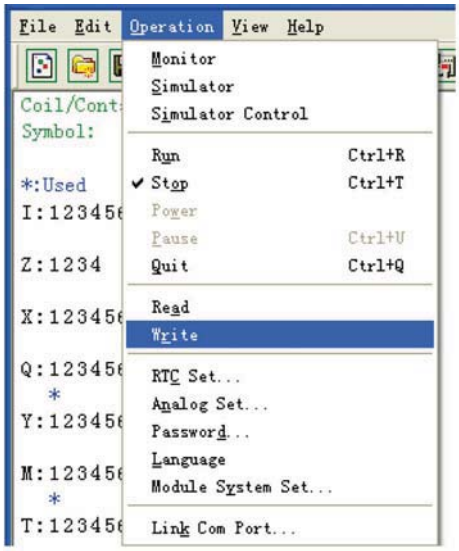
b. Use the “A” key on your keyboard (or the “A” icon on the ladder toolbar) to draw the horizontal circuit line from the M contact to the right most cell, as shown below.



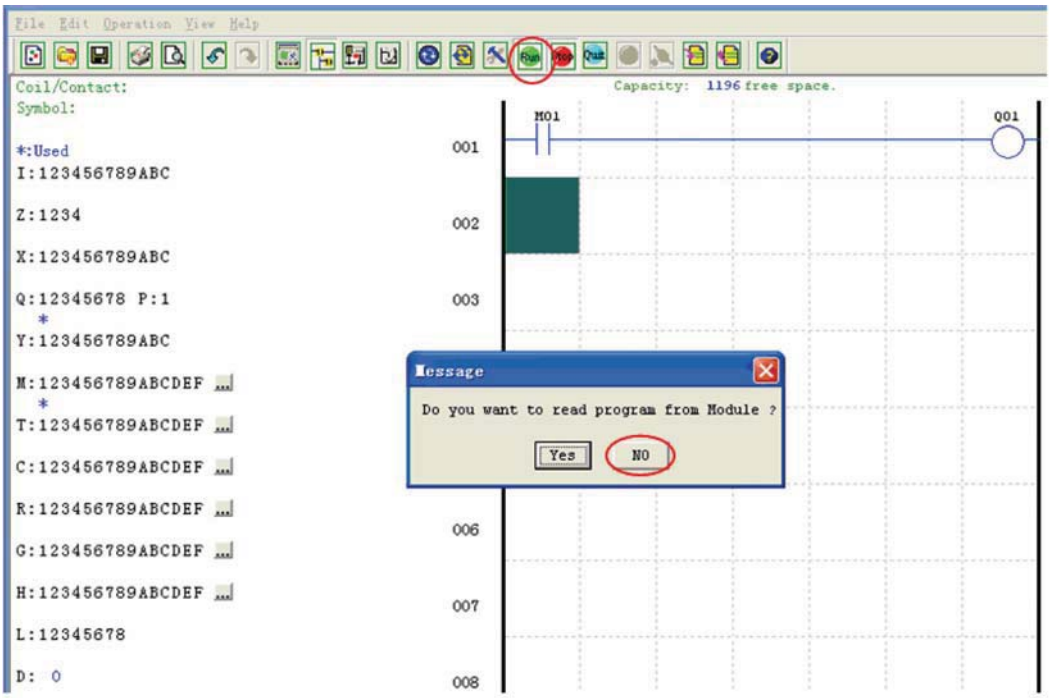
c. Select the “Q” coil icon from the ladder toolbar and drop it on the right most cells. Select Q01 from the dialog and press OK as shown below. See Chapter 4: Ladder Programming instructions for complete instruction set definitions.



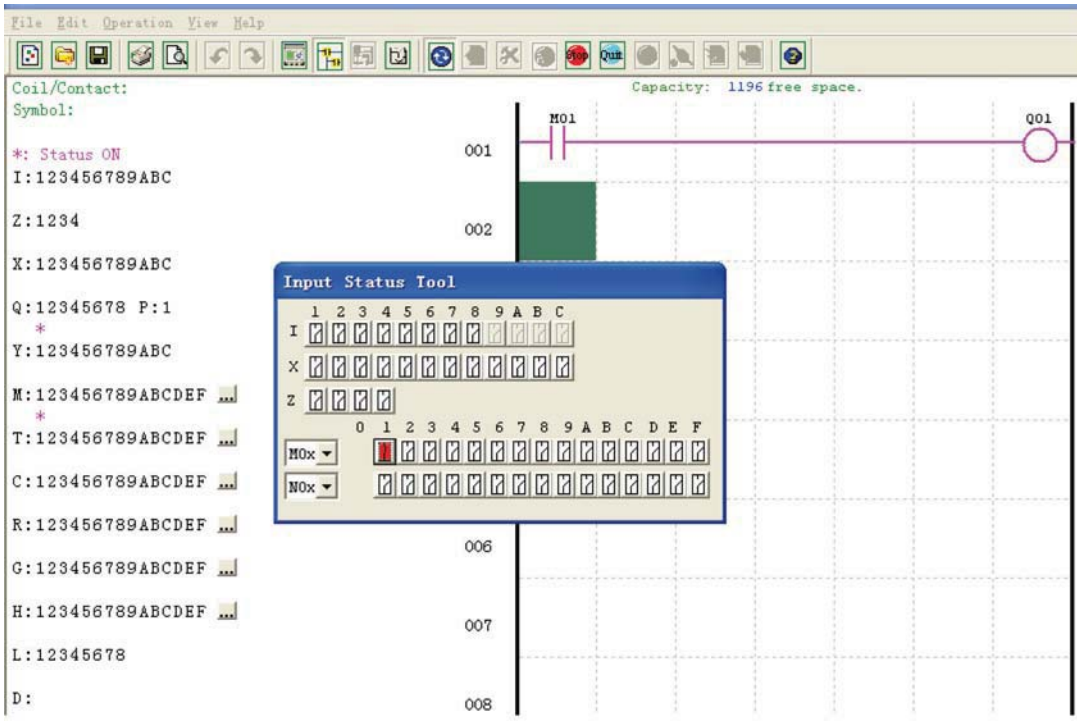
d. Test the simple program. From the Operation menu, select the Write function and write the program to the connected LRD relay as shown below.



e. Select the RUN icon from the toolbar, and select “No” when the pop-up message asks “Do you want to read program from module?”, as shown below.



f. On the Input Status dialog, click on M01 to activate the contact M01 which will turn ON the Output Q01 as shown below. The highlighted circuit will show active and the first Output (Q01) on the connected LRD relay will be ON. See Chapter 3: Programming Tools for more detailed software information.



CHAPTER 2: INSTALLATION

GENERAL SPECIFICATIONS

LRD is a miniature Relay with a maximum of 44 I/O points and can be programmed in Relay Ladder Logic or FBD (Function Block Diagram) program. The LRD can expand to its maximum I/O count by adding 3 groups of 4-input and 4-output modules.

POWER SUPPLY	
Input Power Voltage Range	24V DC Models: 20.4-28.8V 12V DC Models: 10.4~14.4V AC Models: 85-265V 24V AC Models: 20.4-28.8V
Power Consumption	24VDC: 12-point :125mA - 20-point: 185mA 12VDC: 12-point: 195mA - 20-point: 265mA 100-240VAC: 100mA 24VAC: 290mA
Wire Size (all terminals)	26 to 14 AWG
PROGRAMMING	
Programming languages	Ladder/Function Block Diagram
Program Memory	300 Lines or 260 Function Blocks
Programming storage media	Flash
Execution Speed	10ms/cycle
LCD Display	4 lines x 16 characters
TIMERS	
Maximum Number	Ladder: 31; FBD: 250
Timing ranges	0.01s-9999min
COUNTERS	
Maximum Number	Ladder: 31; FBD: 250
Highest count	999999
Resolution	1
RTC (REAL TIME CLOCK)	
Maximum Number	Ladder: 31; FBD: 250
Resolution	1min
Time span available	week, year, month, day, hour, minutes
Compare Instructions (Analog, Analog*gain + Offset, Timer, Counter, Temperature Input (AT), Analog Output (AQ), AS, MD, PI, MX, AR and DR Values)	
ANALOG COMPARE	
Maximum Number	Ladder: 31; FBD: 250
Compare versus other inputs	Analog, Timer, Counter, Temperature Input (AT), Analog Output (AQ), Analog*gain + Offset, AS, MD, PI, MX, AR , DR , or Numeric values
AMBIENT CONDITIONS	
Enclosure Type	IP20
Maximum Vibration	1G according to IEC/EN 60068-2-6
Operating Temperature Range	-20°...55°C (-4°...131°F)
Storage Temperature Range	-40°...70°C (-40°...158°F)
Maximum Humidity	90% (Relative, non-condensing)
Vibration	0.075mm amplitude, 1.0g acceleration
Weight	8-point: 190g 10,12-point: 230g 20-point: 345g
Certifications	cULus, CE
DISCRETE INPUTS	
Current consumption	3.2mA - 24VDC 4mA - 12VDC 1.3mA - 100-240VAC 3.3mA - 24VAC
Input Signal "OFF" Threshold	24VDC: < 5VDC; 12VDC: < 2.5VDC 100-240VAC : < 40VAC 24VAC: <6VAC
Input Signal "ON" Threshold	24VDC: > 15VDC; 12VDC: > 7.5VDC 100-240VAC : > 79VAC 24VAC: >14VAC
Input On delay	24, 12VDC: 5ms 240VAC: 25ms; 120VAC: 50ms 24VAC: 5ms
Input Off Delay	24, 12VDC: 3ms 240VAC: 90/85ms 50/60Hz ; 120VAC: 50/45ms 50/60Hz 24VAC: 3ms
Transistor device compatibility	NPN, 3-wire device only
High Speed Input frequency	1kHz
Standard Input frequency	< 40 Hz
Required protection	Inverse voltage protection required

ANALOG INPUTS	
Resolution	Basic unit: 12 bit Expansion unit: 12bit
Voltage Range acceptable	Basic unit: Analog input: 0-10VDC voltage, 24VDC when used as discrete input; Expansion unit: Analog input: 0-10VDC voltage or 0-20mA current
Input Signal "OFF" Threshold	< 5VDC (as 24VDC discreet input)
Input Signal "ON" Threshold	> 9.8VDC (as 24VDC discreet input)
Isolation	None
Short circuit protection	Yes
Total number available	Basic unit: A01-A04 Expansion unit: A05-A08
RELAY OUTPUTS	
Contact material	Ag Alloy
Current rating	8A
HP rating	1/3HP@120V 1/2HP@250V
Maximum Load	Resistive: 8A /point Inductive: 4A /point
Maximum operating time	15ms (normal condition)
Life expectancy (rated load)	100k operations
Minimum load	16.7mA
TRANSISTOR OUTPUTS	
PWM max. output frequency	1.0kHz (0.5ms on,0.5ms off)
Standard max. output frequency	100Hz
Voltage specification	10-28.8VDC
Current capacity	1A
Maximum Load	Resistive: 0.5A/point Inductive: 0.3A/point
Minimum Load	0.2mA

PRODUCT SPECIFICATIONS

Moduli base						
Order code	Input Power	Inputs	Outputs	Display & Keypad		Max I/O
LRD12RD024	24VDC	6 DC, 2 Analog	4 Relay	√, Z01-Z04		36 + 4 *1
LRD12TD024	24VDC	6 DC, 2 Analog	4 Transistor	√, Z01-Z04		36 + 4 *1
LRD20RD024	24VDC	8 DC, 4 Analog	8 Relay	√, Z01-Z04		44 + 4 *1
LRD20TD024	24VDC	8 DC, 4 Analog	8 Transistor	√, Z01-Z04		44 + 4 *1
LRD10RA240	100-240VAC	6 DC	4 Relay	√, Z01-Z04		34+ 4 *1
LRD20RA240	100-240VAC	12 DC	8 Relay	√, Z01-Z04		44 + 4 *1
LRD12RA024	24VAC	8 DC	4 Relay	√, Z01-Z04		36 + 4 *1
LRD20RA024	24VAC	12 DC	8 Relay	√, Z01-Z04		44 + 4 *1
Expansion Modules						
LRE08RD024	24VDC	4 DC	4 Relay	N/A		N/A
LRE08TD024	24VDC	4 DC	4 Transistor	N/A		N/A
LRE08RA240	100-240VAC	4 DC	4 Relay	N/A		N/A
LRE08RA024	24VAC	4 DC	4 Relay	N/A		N/A
LREP00	24VDC	Communications Module, RS485 ModBus RTU slaver				
Accessories						
LRXC00	LRD Programming Cable, LRD Programming software					
LRXM00	LRD program backup memory					

*1 If module with keypad and display, Max IO can be added keypad input Z01-Z04.
2 More information about Product Specifications to see "chapter 6: Product Specifications".

MOUNTING

35mm DIN-rail Mounting

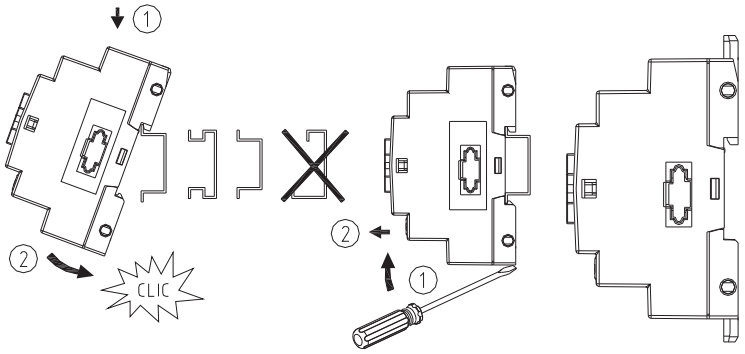
The LRD relay must always be mounted vertically.

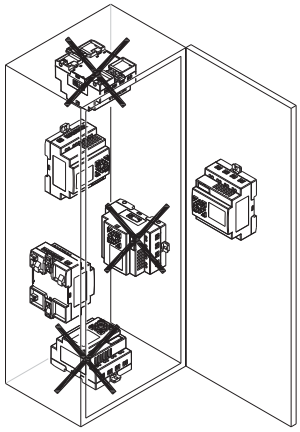
Place the upper end of the LRD relay inserting the slot on the DIN rail. Slightly press the relay downwards and fasten its lower end on the rail.

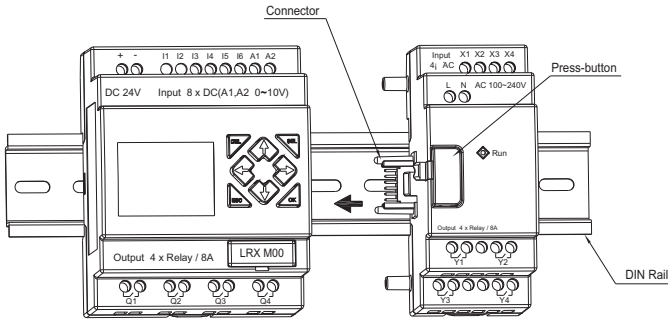
Check that the LRD is firmly fitted.

Insert the connector in the expansion module and fit the module on the DIN rail as previously described.

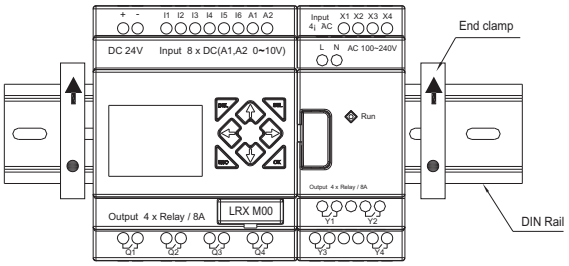
Slide the module on the rail toward the LRD relay, press the Press-button and connect them together.





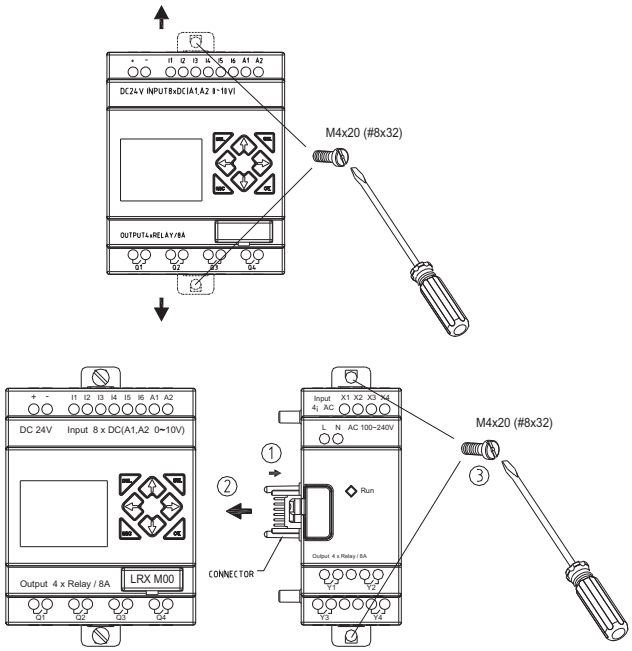


It is recommended to apply a DIN-rail end clamp to hold the LRD in place.



Screw Fixing

Use M4x20 screws to directly mount the LRD as shown. For direct installation of the expansion module, slide the expansion module and connect with the Master after the Master is fixed.



WIRING

WARNING: The I/O signal cables must be routed parallel to the power cable, or in the same cable trays to avoid the signal interference.

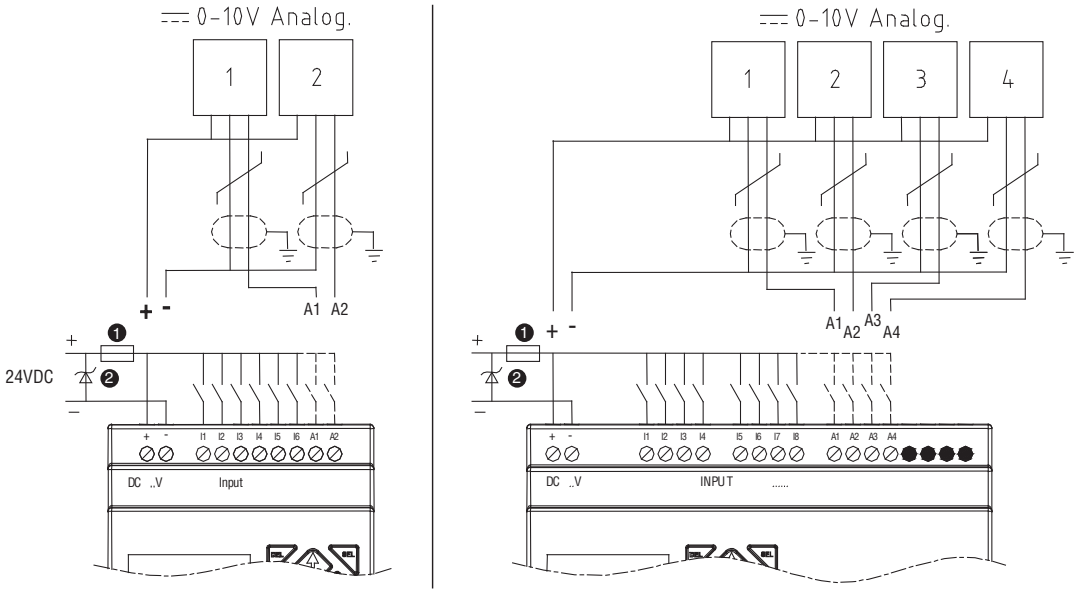
To avoid a short circuit on the load side, it is recommended to connect a fuse between each output terminals and loads.

WIRE SIZE AND TERMINAL TORQUE

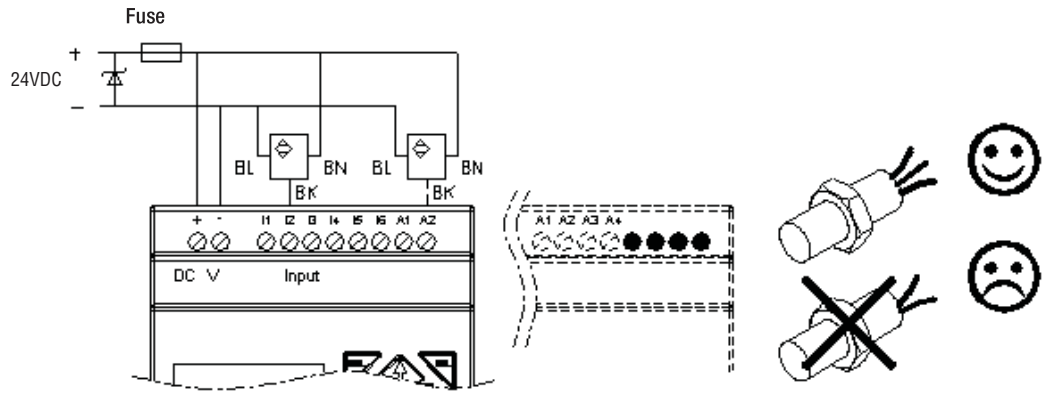
mm^2	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

Ø3.5 (0.14in)	C	Nm	0.6
		lbin	5.4

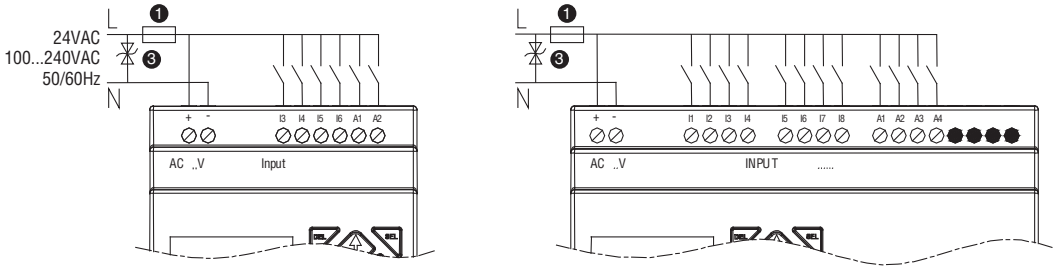
Input 24VDC



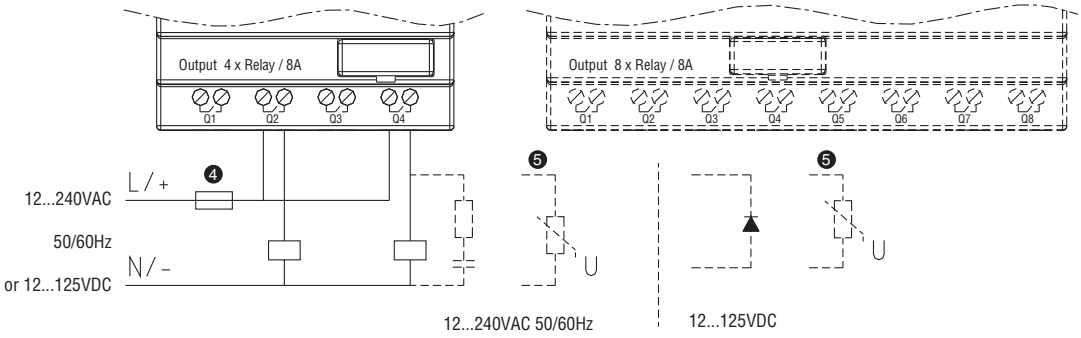
Sensor Connection



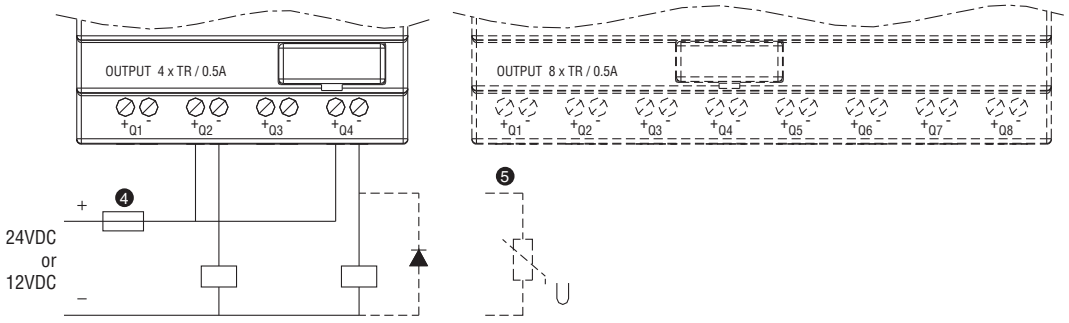
Input 100~240VAC/24VAC



Output (Relay)



Output (Transistor)



1 - 1A quick fuse, disconnect switch and circuit protections
2 - Transitory over-current surge suppressor (36VDC cut-off voltage)
3 - Transitory over-current surge suppressor (400VAC cut-off voltage)
4 - Fuse, disconnect switch and circuit protections
5 - Inductive load.

CHAPTER 3: PROGRAM TOOLS

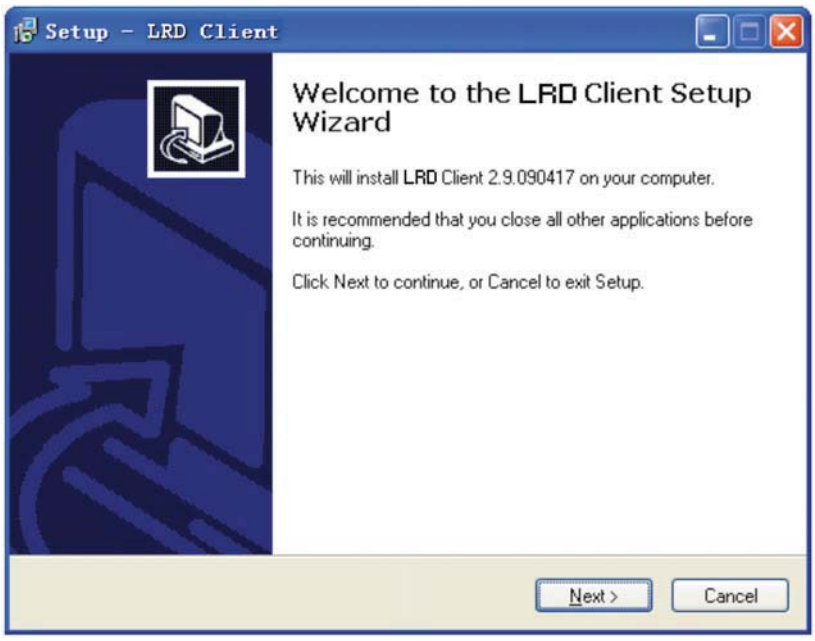
PC PROGRAMMING SOFTWARE "LRXSW"

The LRD Client programming software provides two edit modes, Ladder Logic and Function Block Diagram (FBD). The LRD Client software includes the following features:

1. Easy and convenient program creation and editing.
2. Programs can be saved on a computer for archiving and reuse. Programs can also be uploaded directly from a LRD and saved or edited.
3. Enables users to print programs for reference and review.
4. The Simulation Mode allows users to run and test their program before it is loaded to the controller.
5. Real-time communication allows the user to monitor and force I/O on the LRD relay operation during RUN mode.

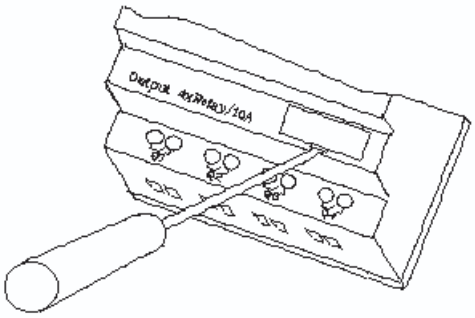
INSTALLING THE SOFTWARE

Install the LRD Client Software from CD or from the free internet download contact Customer Service (Tel. +39 035 4282422 - email: service@LovatoElectric.com).

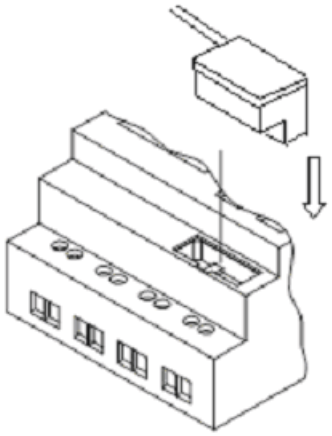


CONNECTING THE SOFTWARE

Remove the plastic connector cover from LRD using a flathead screwdriver as shown in the figure below.

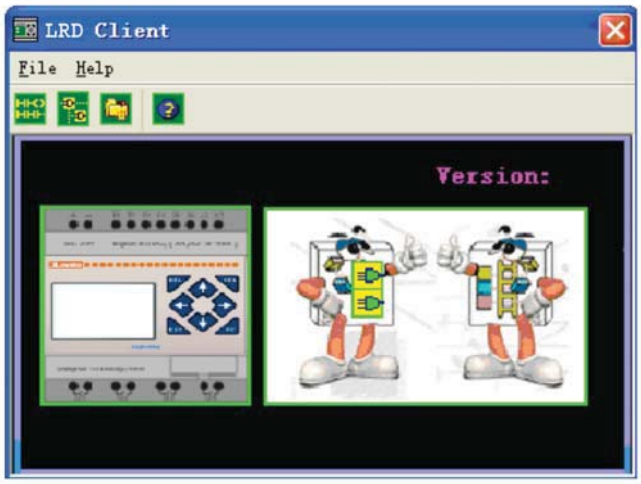


Insert the plastic connector end of the programming cable into the LRD relay as shown in the figure below.



Connect the opposite end of the cable to an RS232 serial port on the computer. In case the computer does not have one, connect the LRX C00 cable to a RS232-USB converter, compatible with USB2.0 or higher.

START SCREEN
Run the LRXSW software and the below Start screen will be displayed. From this screen, you can perform the following functions

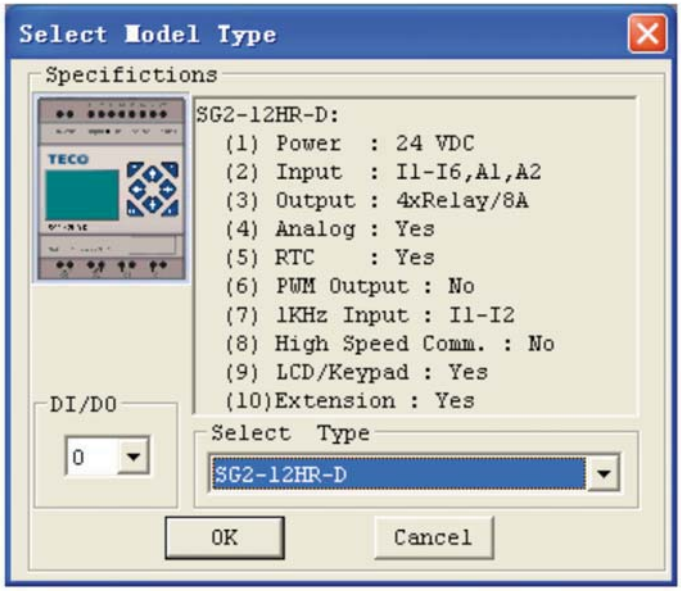


NEW LADDER PROGRAM
Select **File —>New —>New LAD** to enter the development environment for a new Ladder program.

NEW FBD PROGRAM
Select **File —>New —>New FDB** to enter the development environment for a new FBD (Function Block Diagram) program.

OPEN EXISTING FILE
Select **File —>Open** to choose the type of file to open (Ladder or FBD), and choose the desired program file, and then click Open.

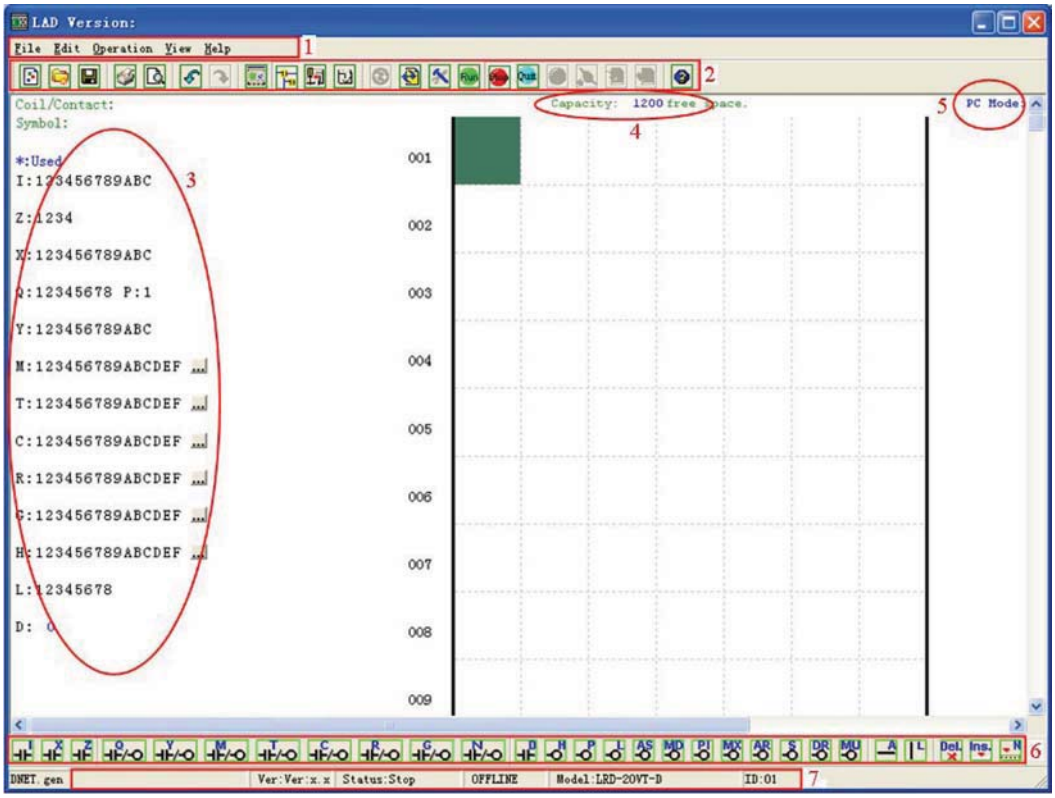
LADDER LOGIC PROGRAMMING ENVIRONMENT
The Ladder Logic Programming Environment includes all the functions for programming and testing the LRD using the Ladder Logic programming language. To begin a new program select **File —>New**, and select the desired model of LRD, and the number of connected expansion units if applicable, as shown below.



MENUS, ICONS AND STATUS DISPLAYS

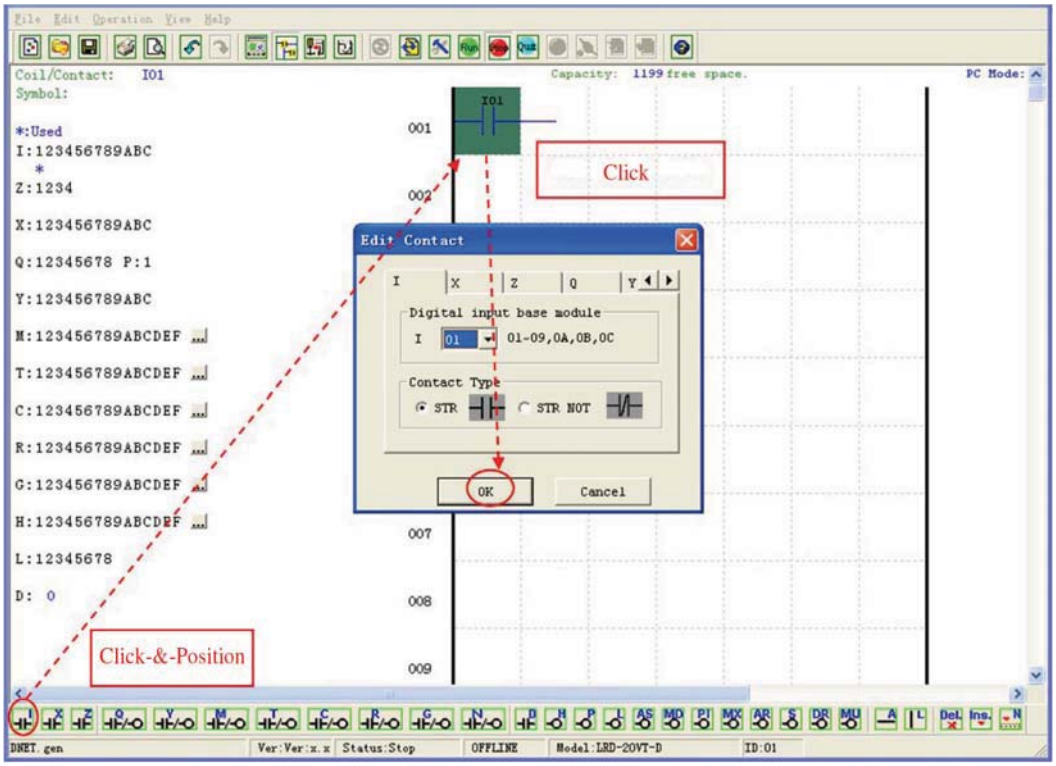
The Ladder programming environment includes the following Menus, Icons and Status Displays

1. MENU BAR - Five menu selections for program development and retrieval, editing, communication to connected controllers, configuration of special functions and viewing preference selections.
2. MAIN TOOLBAR - (From Left to Right)
   Icons for create a new program, open a program, save a program and print a program.
   Icons for Keypad, Ladder view, HMI/Text edit and Symbol (comments) edit.
   Icons for Monitor, Simulator, Simulator Controller, Controller Mode changes (Run, Stop, and Quit), and Read/Write programs from/to the LRD relay.
3. Usage List - List for all memory types and addresses used with the current open program. Used addresses are designated by a "*" symbol below each address.
4. Amount of free programming memory available.
5. Current Mode - operation mode of the controller, or simulator, from the connected PC.
6. Ladder Toolbar - Icons for selecting and entering all available Ladder Logic instructions.
7. Status Bar - Status of current open project and connect LRD relay.

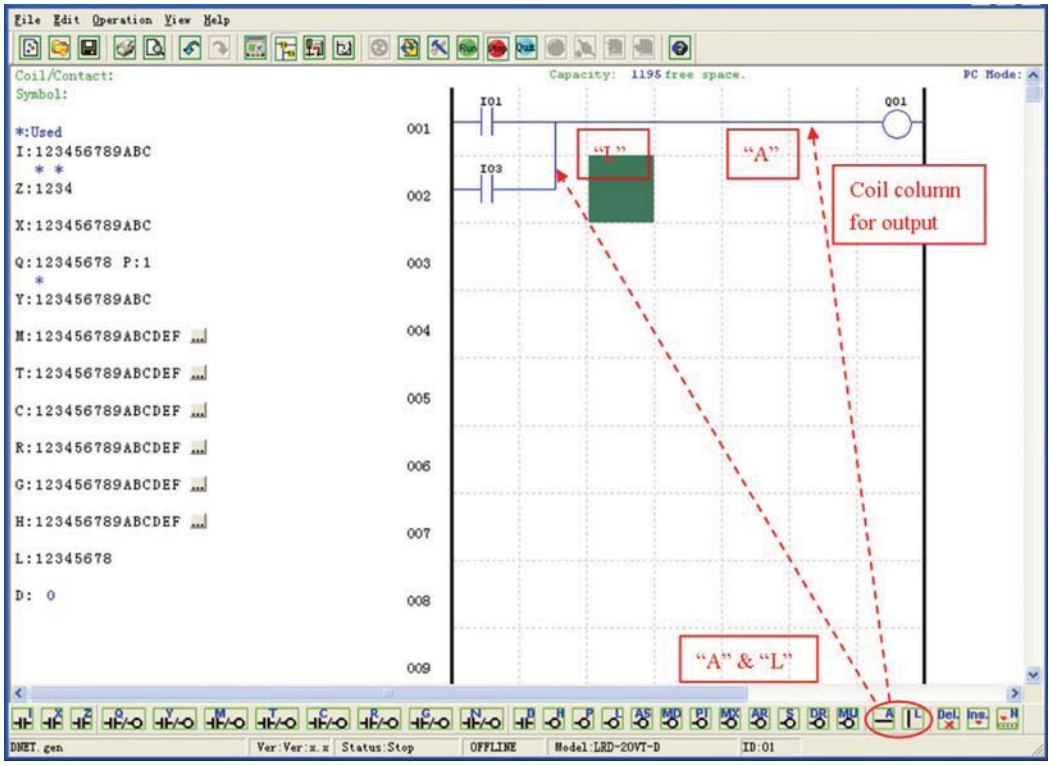


PROGRAMMING

The LRXSW software can be programmed by either position of instructions or by using keyboard entry commands. Below is an example of some common methods of entering programming instructions.

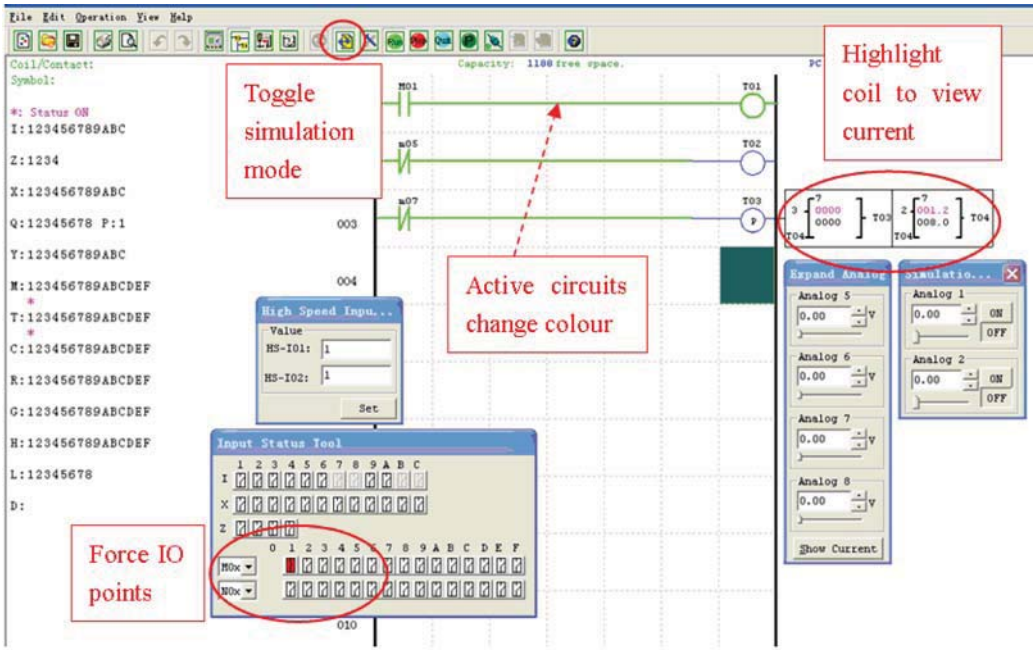


The “A” and “L” keys or icons are used to complete parallel and serial circuits. The right column is for output coils.



SIMULATION MODE

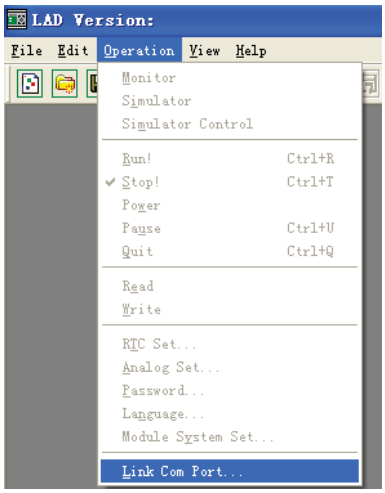
The LRXSW software includes a built-in simulator to test and debug programs easily without the need for downloading to a controller. To activate simulation mode, simply press the red RUN icon. The program below is shown in simulation mode, identifying the significant available features.

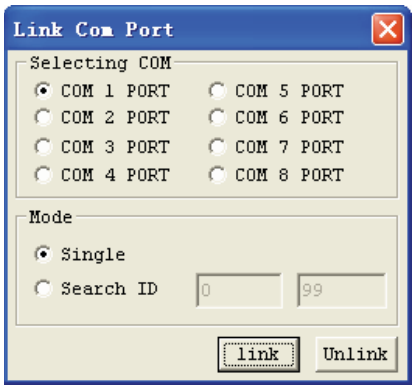


ESTABLISH COMMUNICATION

The following is the simple procedure for establishing communication between PC and the LRD relay.

a. Select “Operation/Link Com Port…” as shown below.



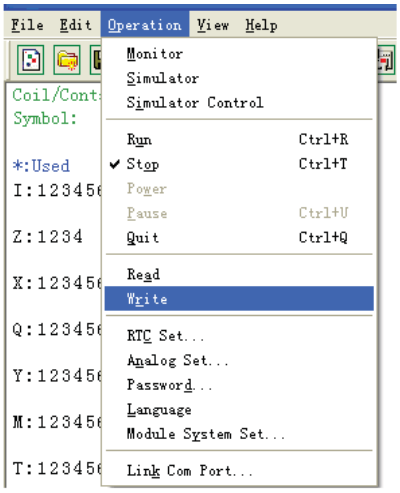


b. Select the correct Com Port number where the programming cable is connected to the computer then press the “Link” button.

c. The LRXSW software will then begin to detect the connected LRD relay to complete its connection.

WRITING PROGRAM TO LRD RELAY

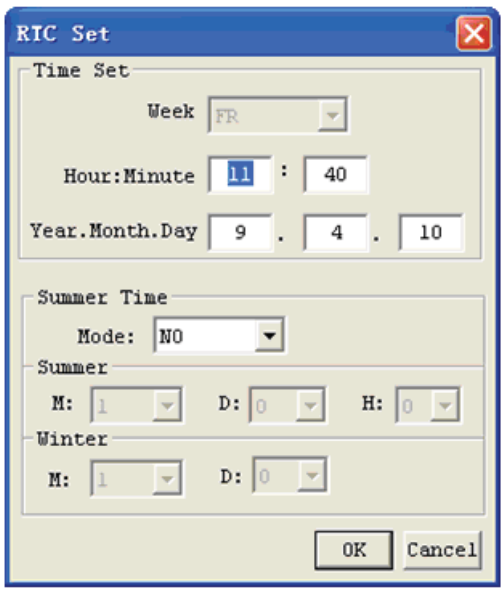
From the Operation menu, select the Write function and write the program to the connected LRD relay as shown below, or press Write button to write program to connected LRD relay as shown below.



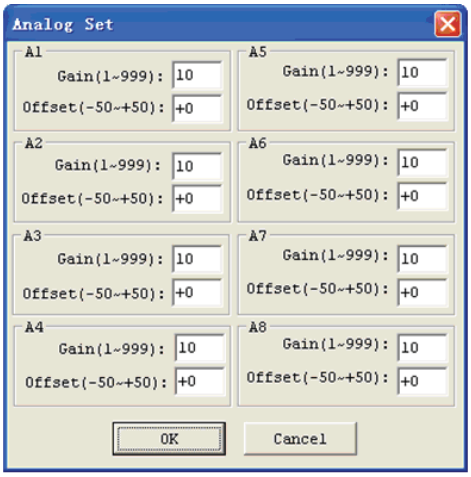
OPERATION MENU

The Operation menu, includes several system configuration functions for both online and offline setup. The following explains the details of each function.

Monitor - Online function for runtime monitor and editing when connected to a controller
Simulator - Offline function for testing and debugging a program.
Simulator Control - Self-motion simulator control
Run-Stop-Quit - Mode change selections for both runtime editing and simulation mode.
Read-Write - Reading and writing programs to and from a connected LRD relay.
RTC Set - Online function for setup of the Real-time clock/calendar (see dialog below left)



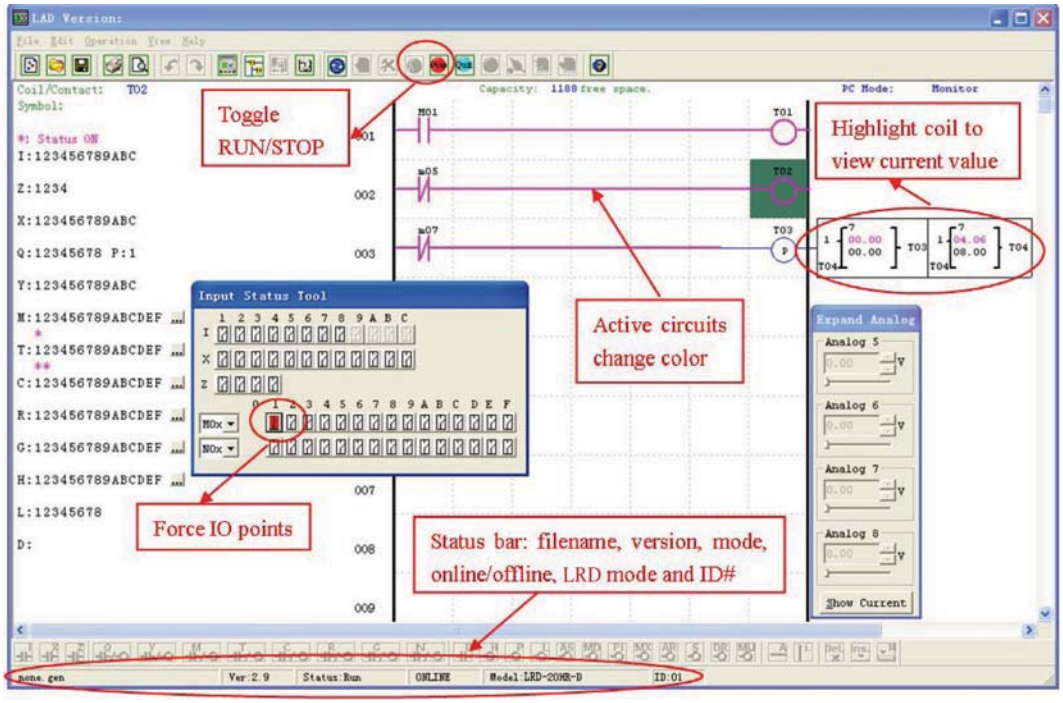
Analog Set - setup analog input A01-A08 gain and offset (see dialog below right)



Password - Set a password for accessing the current program after upload to the LRD relay
Language - Change LRD relay menu language
Module System Set - Dialog for changing important system setup functions including Module ID, Remote I/O preferences, Expansion I/O settings, and Retentive memory preferences (Keeping) for (C) Counters, (M) Auxiliary Coils, and (Z) keypad input set and the LCD Backlight.
Link Com Port - Select the port communication with LRD relay.

ONLINE MONITORING/EDITING

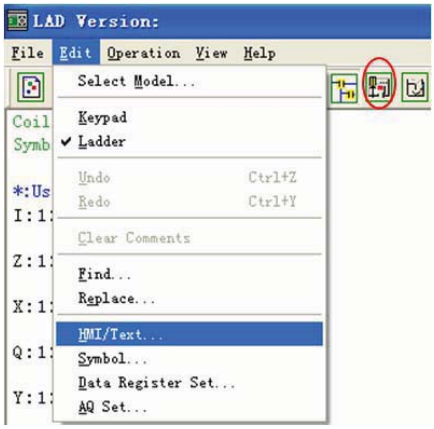
The LRXSW software allows for online monitoring of the currently running program during runtime. Additional online functions include, I/O forcing, and Mode changes (Run/Stop/Quit).

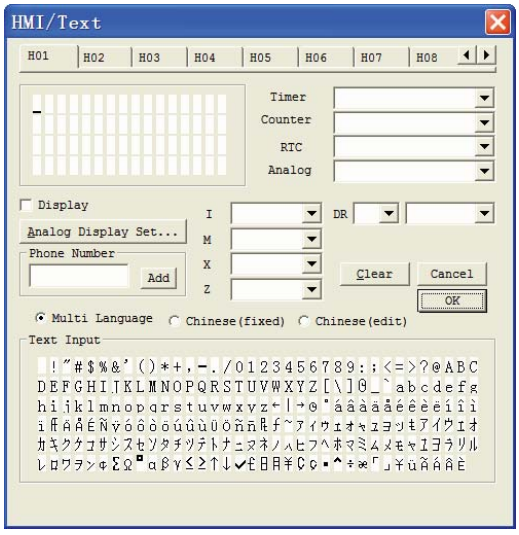


– The LRXSW software does not support runtime logic editing changes. All logic edits to contacts, coils, Timers/Counters, and circuit connecting lines must be written to the connected LRD relay while in Stop mode.

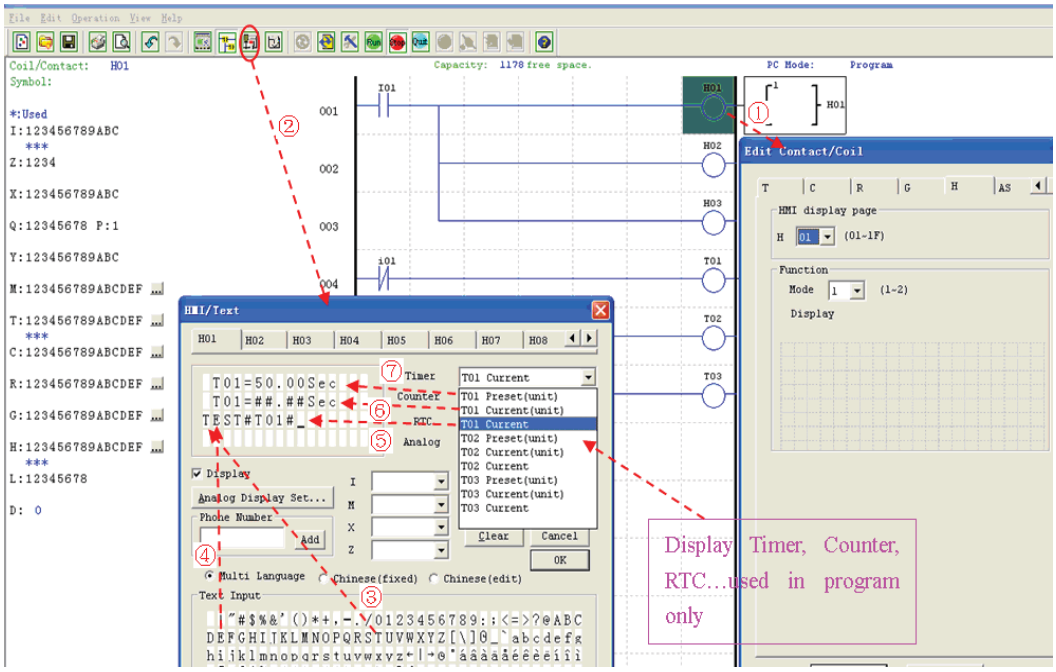
HMI/TEXT

This function block can display information on 16_4 LCD screen. Information displaying can be present value or target value of Counter, Timer, RTC and Analog comparator etc. Under running mode, to modify the target value of timer, counter and analog comparator via HMI is available. HMI can display the status of input terminal (I, Z, X) and Auxiliary terminal M, N (only FBD).



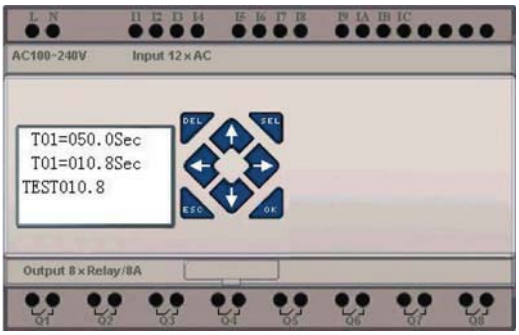


HMI/TEXT setting:



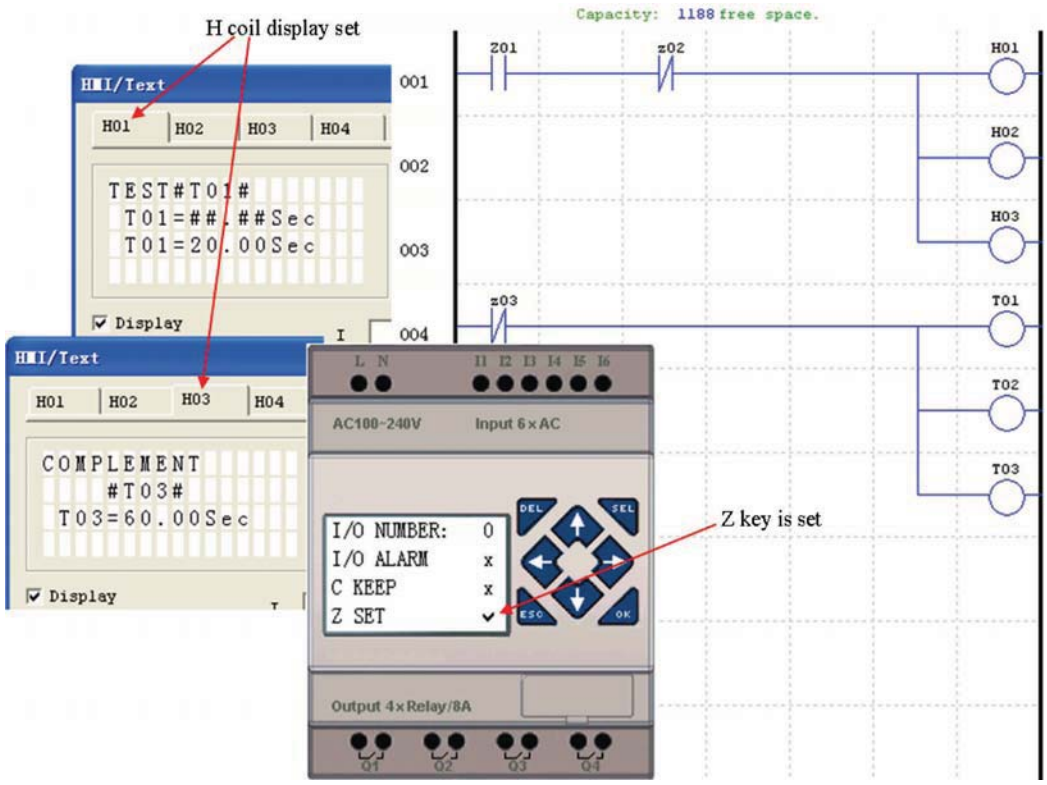
1. Enter H01 coil.
2. Into HMI/TEXT edit frame.
3.-4. Choose the letters “T E S T” from Text Input.
5. Choose T01 current.
6. Choose T01 current (unit).
7. Choose T01 present (unit).

The user can modify T01 preset value when H coil enable and display on LCD.
Download to LRD, and I01 turn ON, or press “SEL” if the H coil is set to mode 1, then the LRD LCD will display the first H text as shown below.

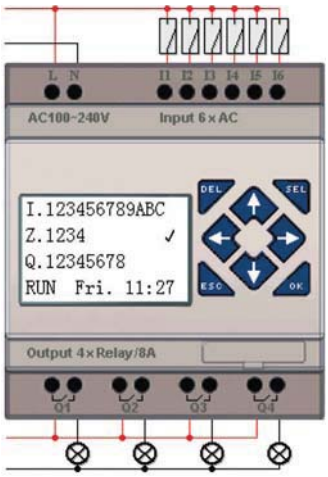


– Press “↑” or “↓” to select the nearest H coil
– Press “SEL”+“↑” or “↓”and “OK” update T01 preset value (In this example, 050.0 can update, T01 preset value depends on HMI/TEXT edit frame setting.)

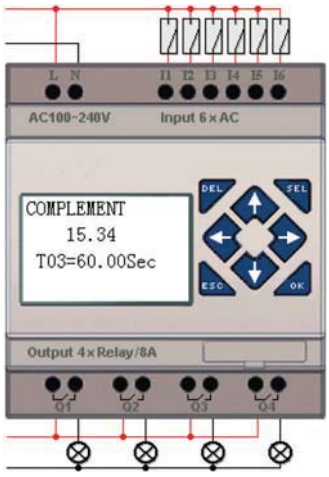
HMI/TEXT Example:

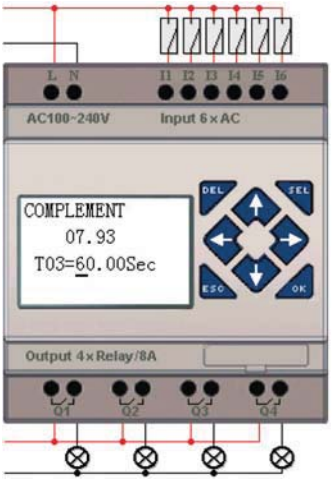


Power ON and RUN (initial display)

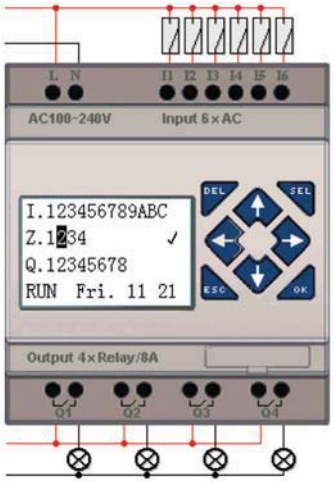


Press "↑" (Z01) and display H03 coil





- Press "SEL" to display cursor.
- Press "↑", "↓", "←", "→" to move cursor.
- Press "SEL" again to select modified position.
- Press ""↑", "↓" to change number and press "←", "→" to move cursor.
- Press "OK" to make sure the modify value is confirmed.



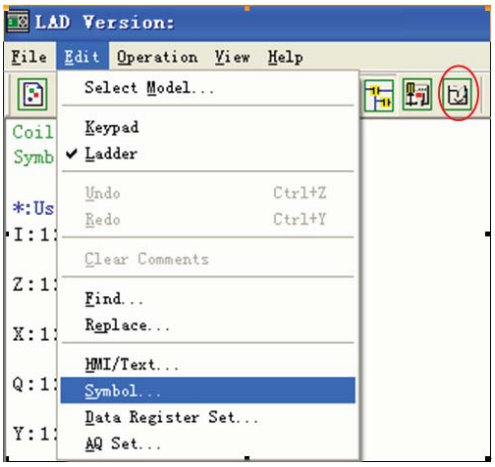
Press "←" to disable H03 coil, and the LCD display changes to initial frame.
Press "↓" to reset Timer (T01°¢T02°¢T03) as program designed.

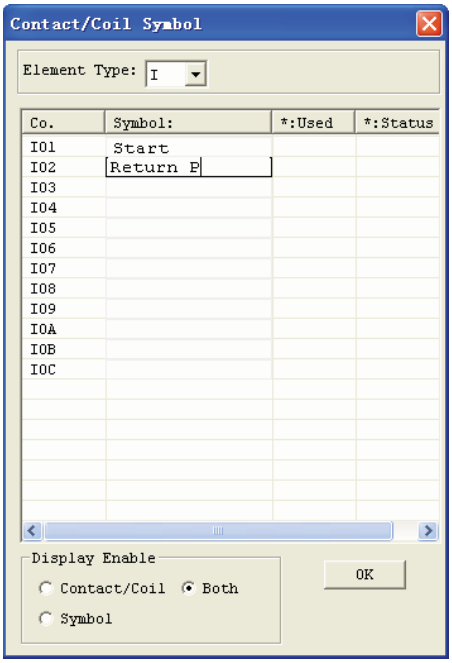
PROGRAM DOCUMENTATION

The LRD Client software includes the ability to document a program using Symbols and Line Comments. Symbols are used to label each I/O address up to a length of 12 characters. Line Comments are used to document sections of a program. Each Line Comment can have up to 4 lines with each line containing up to 50 characters in length. Below are examples of entering Symbols and Line Comments.

SYMBOL...

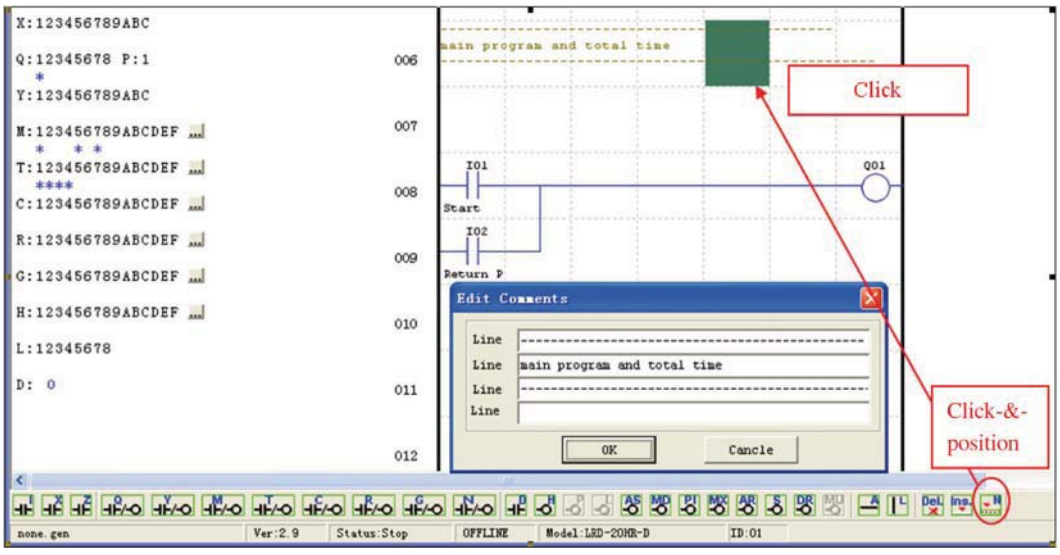
The Symbol editing environment can be access through the menu using the **Edit>>symbol...** selection or using the symbol icon on the main toolbar shown below.
The Symbol editing environment allows for documenting all the contact and coil memory types, and selecting display modes as shown below.





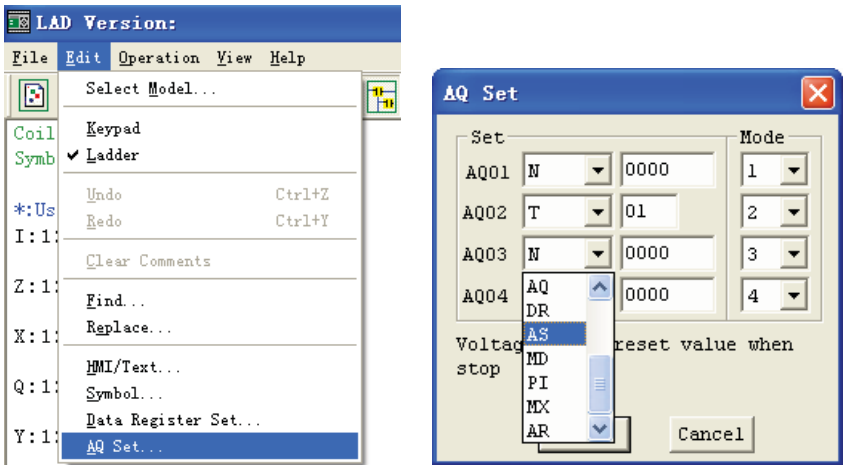
LINE COMMENTS

The Line Comment editor is accessed by clicking the "N" icon on the Ladder Toolbar. After clicking on the "N" icon, to drag the line number you want to comment and release, and then type the desired comments and press OK.



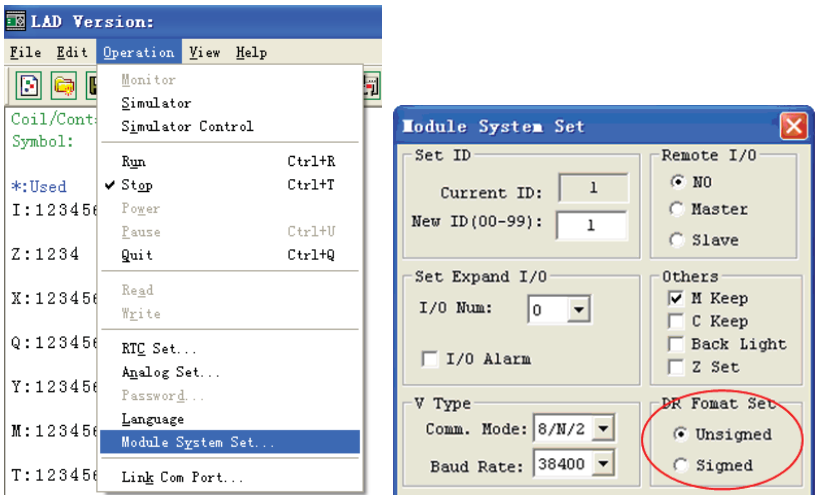
AQ SET…

The AQ editing environment can be access through the menu using the Edit>> AQ Set… selection shown below. The range of AQ is 0~1000 if the output mode of AQ is voltage mode. And the range is 0~500 if the output mode is current mode. The preset value of AQ can be set as either a constant or a code of other data. The output mode of AQ and preset value are set as below. More information about output mode and displaying to see: Chapter 4: Relay Ladder Logic Programming

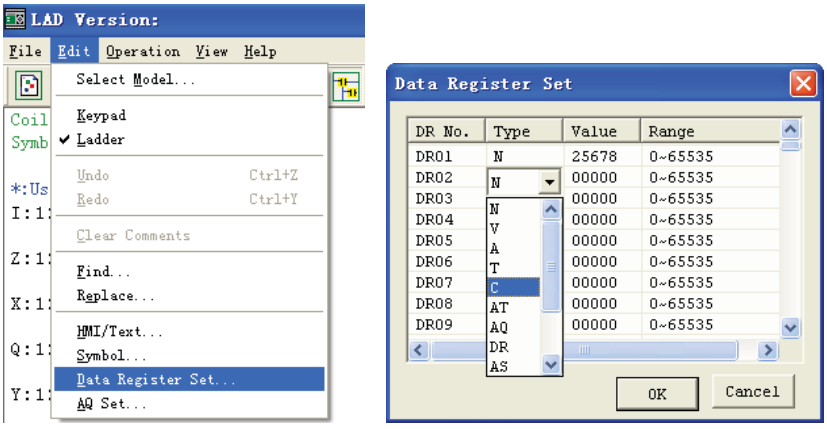


DATA REGISTER SET…

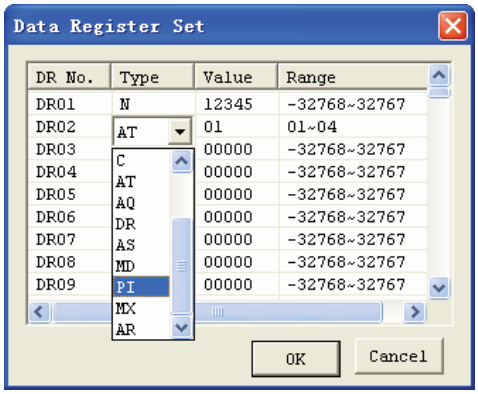
The content of Data Register is either unsigned or sign, it can be set as shown below. Selecting Unsigned, the range of DR is 0~65535; and selecting Signed, the range of DR is -32768~32767.



After the operating above, the Data Register editing environment can be access through the menu using the **Edit>> Data Register Set…** selection shown below. The preset value of DR can be set as either a constant or a code of other data type.

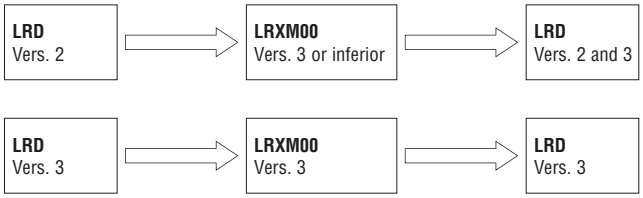


DR is set as signed shown below.

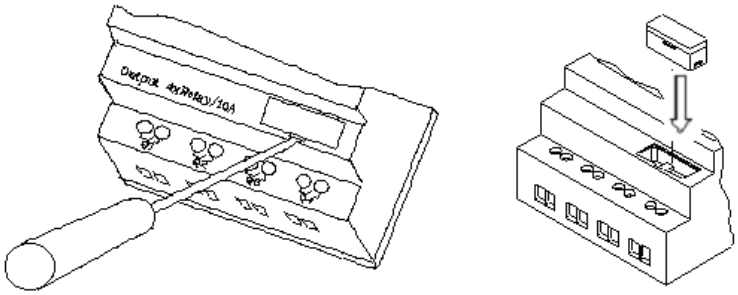


PROGRAM BACKUP MEMORY (LRXM00)
LRMX00 can be used with all LRD versions. There is an icon 3rd on LRD relay, V3.0, and on LRMX00 memory, version 3.

About to use PM05 and PM05 (3rd) with LRDV2/3, see next figure:
The optional LRXM00 memory is used to easily transfer programs from one LRD relay to another.



The LRXM00 memory plugs into the same connector as the programming cable (see procedure below).
1. Remove the plastic connector cover from LRD using a flathead screwdriver as shown in the figure below left.
2. Insert the LRXM00 memory onto the connector as shown below right.

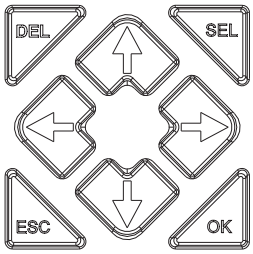


3. From the display keypad on the face of the LRD relay, select either WRITE or READ to transfer the program to LRXM00 or from the LRXM00 memory to the LRD relay.
4. Program in different types are not compatible, here are the regulations:
   A-1: 10/12 point type program —— available in 20 point type
   A-2: 20 point type program —— unavailable in 10/12 point type
   B-1: AC type program —— available in DC type
   B-2: DC type program —— unavailable in AC type
   C-1: Relay type program —— available in Transistor type
   C-2: Transistor type program —— unavailable in Relay type
   D-1: LRD V2.0 program —— available LRD V3.0 type
   D-2: LRD V3.0 program —— unavailable LRD V2.0 type

LCD DISPLAY AND KEYPAD

KEYPAD

Most LRD CPU units include the built-in LCD Display and Keypad. The keypad and display are most often used for changing timer/counter set points, controller mode changes (Run/Stop), uploading/downloading to the PM05 memory cartridge, and updating the RTC (Real Time Clock/Calendar). Although, logic programming can be performed from the keypad and display, it is highly recommended to only perform logic changes using the LRDSW software. Below is an overview of the basic keypad and display functions.

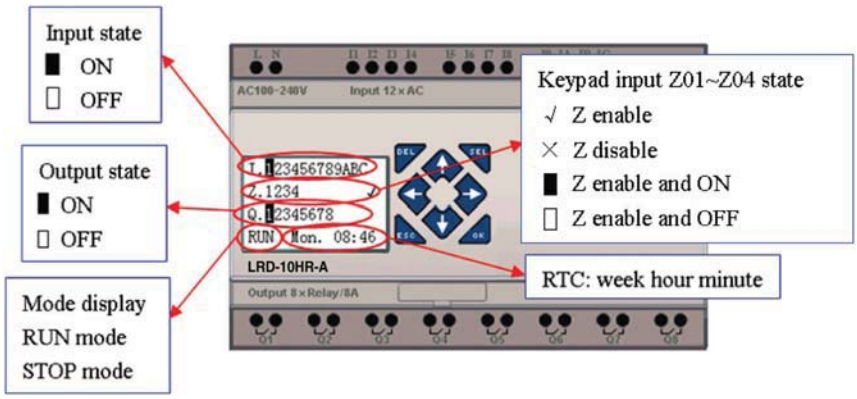


Select (SEL) - Used to select the available memory and instruction types for editing. Holding the Select button will display all "H" HMI/Text messages on the LCD.
OK - Used to accept the selection displayed of an instruction or function. It is also used to select any of the Main Menu options on the LCD. Note: Press the "SEL" and "OK" simultaneously to insert a rung above the current active cursor position.
Escape - Used to exit a selected display screen and go to the previous screen. When in a ladder display screen, press the ESC to display the main menu.
Delete - Used to delete an instruction or rung from the ladder program.
The 4 navigation buttons (↑←↓→) are used to move the cursor throughout the functions of the LRD display or active program. The 4 buttons also can be set programmable input coils Z01-Z04 ('↑'= Z01, '←'=Z02, '↓'=Z03, '→' =Z04).

ORIGINAL SCREEN

LCD displays 4-line state

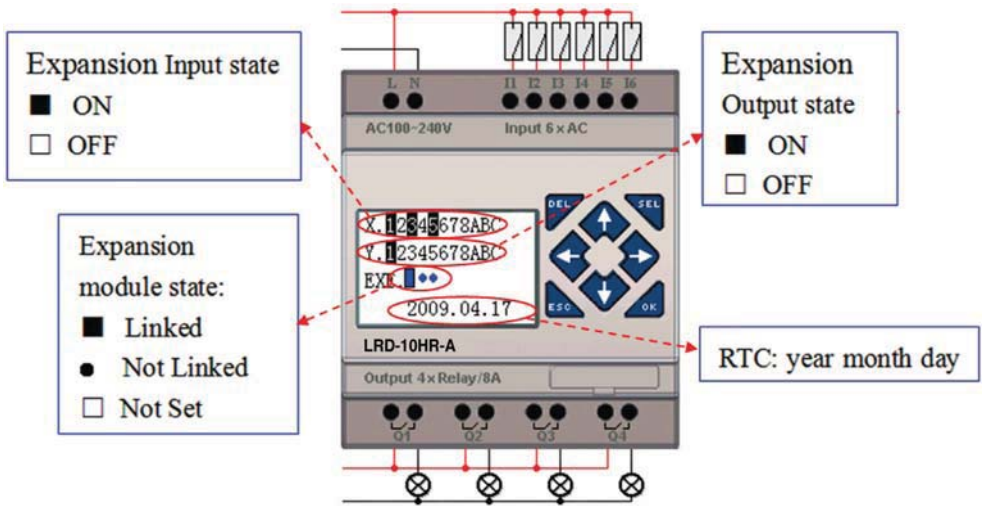
– Original screen as power on



Press the button:

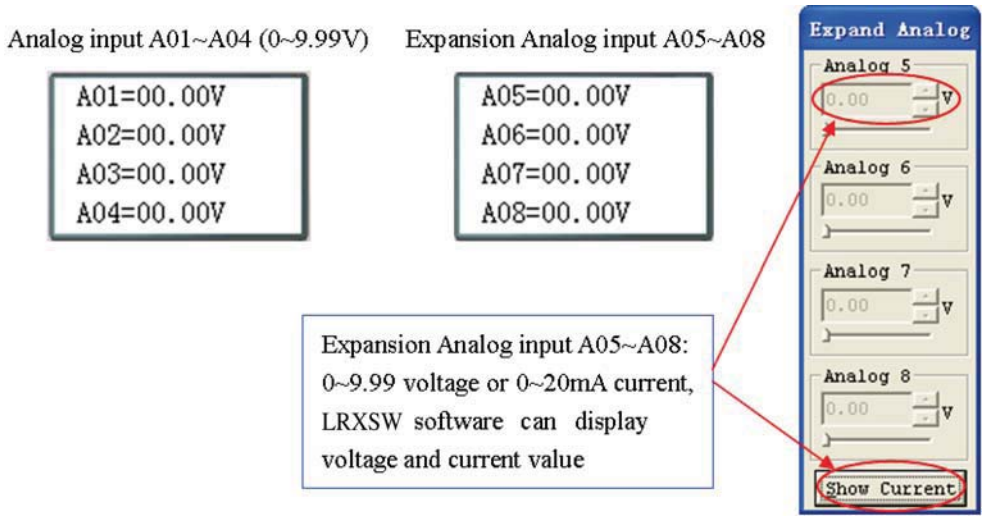
ESC	Enter Main Menu screen
SEL + ↑/↓	Under LADDER Mode, display the state of relays (I ⇔ Z ⇔ Q ⇔ X ⇔ Y ⇔ M ⇔ N ⇔ T ⇔ C ⇔ R ⇔ G ⇔ A ⇔ AT ⇔ AQ) ⇔ Original Screen
↑/↓	Under FBD Mode, display the state of relays (I ⇔ Z ⇔ Q ⇔ X ⇔ Y ⇔ M ⇔ N ⇔ A ⇔ AT ⇔ AQ) ⇔ Original Screen
SEL	H Function will be displayed whose mode is 1 as the button is pressed.
SEL+OK	Enter RTC setting screen

– Expansion display State



– Expansion module setting: refer to Main Menu “SET”

– Other Display State
Ladder edit mode: Coil I, Z, X, Q, Y, M, N, T, C, R, G, D, Analog input A01~A04, Expansion Analog input A05~A08, temperature analog input AT01~AT04, analog output AQ01~AQ04;
FBD edit mode: Coil I, Z, X, Q, Y, M, N, Analog input A01~A04, Expansion Analog input A05~A08, temperature analog input AT01~AT04, analog output AQ01~AQ04;



LCD DISPLAY MAIN MENU
(1) The Main Menu as LRD under 'STOP' Mode. Into ladder main function to press ESC after power on when the user program is ladder type or empty program. Into FBD main function to press ESC after power on when the user program is FBD type or empty program.

> LADDER FUN. BLOCK PARAMETER RUN	> FBD PARAMETER RUN DATA REGISTER
DATA REGISTER CLEAR PROG. WRITE > READ	CLEAR PROG. WRITE READ > SET
SET RTC SET ANALOG SET > PASSWORD	RTC SET ANALOG SET PASSWORD > LANGUAGE
ANALOG SET PASSWORD LANGUAGE > INITIAL	ANALOG SET PASSWORD LANGUAGE > INITIAL

Menu		Description
>	LADDER	Ladder edit
	FUN.BLOCK	Ladder function block (timer/counter/RTC …) edit
	FBD	FBD display
	PARAMETER	FBD block or LADDER function block parameter display
	RUN	RUN or STOP
	DATA REGISTER	DR display
	CLEAR PROG.	Clear the user program and the password
	WRITE	Save user program to LRXM00 (ver. 3)
	READ	Read user Program from LRXM00 (ver. 3)
	SET	System setting
	RTC SET	RTC setting
	ANALOG SET	Analog setting
	PASSWORD	Password setting
	LANGUAGE	Select the language
	INITIAL	initially set Edit method

(2) The Main Menu as LRD under 'RUN' Mode.

> LADDER FUN. BLOCK PARAMETER STOP	> FBD PARAMETER STOP DATA REGISTER
DATA REGISTER WRITE RTC SET > PASSWORD	WRITE RTC SET PASSWORD > LANGUAGE
WRITE RTC SET PASSWORD > LANGUAGE	

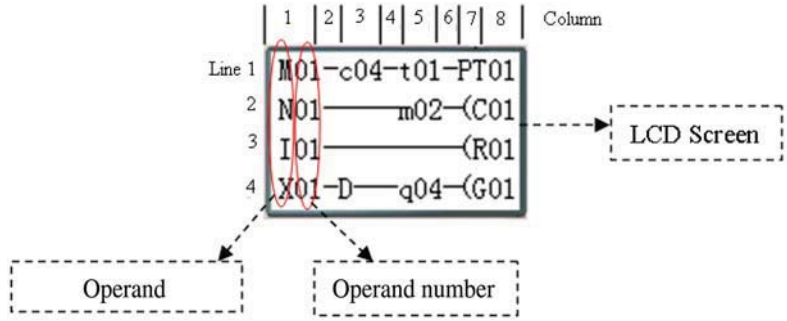
>	LADDER	FBD
	FUN.BLOCK	
	PARAMETER	
	STOP	
	DATA REGISTER	
	WRITE	
	RTC SET	
	PASSWORD	
	LANGUAGE	

Press the button

↑↓	Move the Cursor to select Main Menu
OK	Confirm the selected Function
ESC	Skip to Initial Screen

– LRD can be modified, edited, cleared and read user program only when it is under STOP Mode.
– As the program is modified, LRD will automatically backup it to FLASH.

– Main Menu LADDER

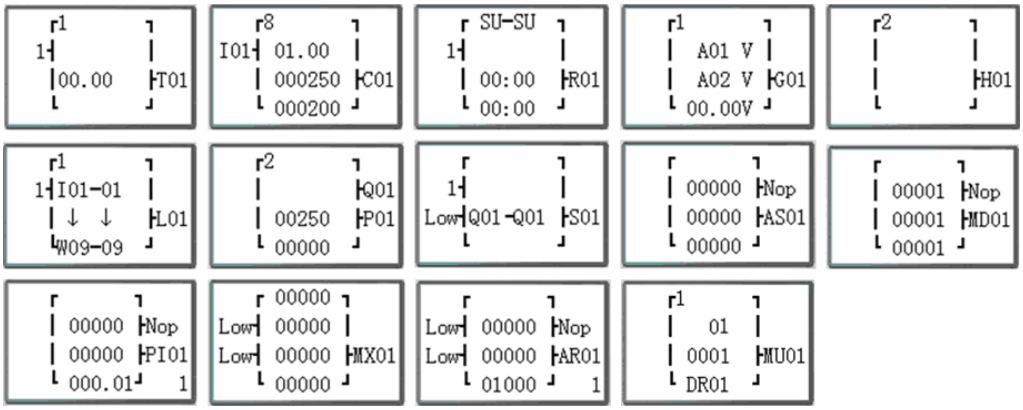


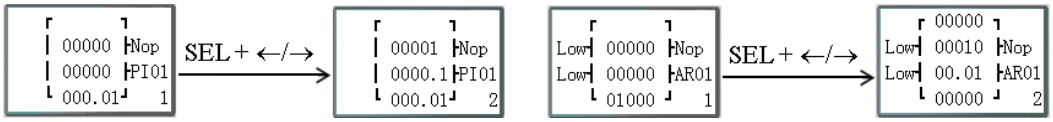
Press the button

Button	Description
SEL	1. Ixx ⇨ ixx ⇨ — ⇨ space ⇨ Ixx (only for digital and character position of 1, 3, 5 column.) 2. Qxx ⇨ space ⇨ Qxx (only for digital and character position of 8 column.). 3. ⊤ ⇨ space ⇨ ⊤ (all available but the 2,4,6 column of the first line)
SEL, then ↑/↓	1. I ⇔ X ⇔ Z ⇔ Q ⇔ Y ⇔ M ⇔ N ⇔ D ⇔ T ⇔ C ⇔ R ⇔ G ⇔ I (When the cursor located at 1, 3, 5 Column). 2. Q ⇔ Y ⇔ M ⇔ N ⇔ T ⇔ C ⇔ R ⇔ G ⇔ H ⇔ L ⇔ P ⇔ S ⇔ AS ⇔ MD ⇔ PI ⇔ MX ⇔ AR ⇔ DR ⇔ MU ⇔ Q (When the cursor located at 8 Column) 3. (⇔ ⇔ ⇔ P ⇔ (When the cursor located at 7 Column, and the 8 Column is set as Q, Y, M, N) 4. (⇔ P ⇔ (When the cursor located at 7 Column, and the 8 Column is set as T)
SEL, then ←/→	Confirm the input data and move the cursor
↑/↓←/→	move the cursor
DEL	Delete an instruction
ESC	1. Cancel the Instruction or action under Edition. 2. Back to Main Menu after query the program (save program).
OK	1. Confirm the data and automatically save, the cursor moves to next input position. 2. When the cursor is on Column 8, Press the button to automatically enter the function block and set the parameters (such as T/C)
SEL + DEL	Delete a Line of Instruction.
SEL + ESC	Display the number of the Lines and operation state of LRD (RUN/STOP)
SEL + ↑/↓	Skip up/ down every 4-line program.
SEL + OK	Insert a space line

Operation Sample: more detailed to see appendix A.

– FUNCTION BLOCK program input
Into FUNCTION BLOCK, cursor flicker on “T”, press “SEL” key, Ladder function block display in sequence:
T→C→R→G→H→L→P→S→AS→MD→PI→MX→AR→MU→T...

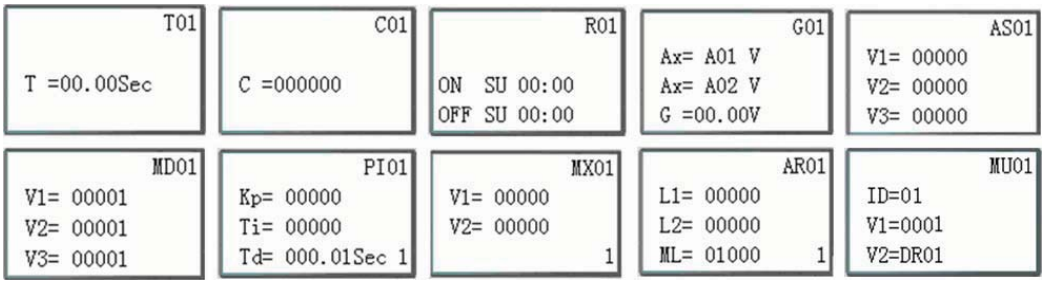


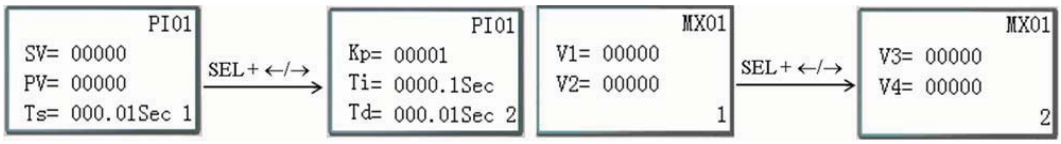


Operation Sample: more detailed to see Appendix B.

– PARAMETER

Under Ladder mode, press “SEL” key, function block display in sequence:
T→C→R→G→AS→MD→PI→MX→AR→MU→T...





Under FBD mode, Press “SEL” key, Block displays in sequence.

– RUN or STOP

(1) RUN Mode

(2) STOP Mode

↑/↓	Move the cursor
OK	Execute the instruction, then back to main menu
ESC	Back to main menu

– DATA REGISTER

Displaying preset value when the LRD is STOP status and displaying current value when the LRD is RUN status.

↑↓←→	Move the cursor
OK	Ensure the edit
SEL	Enter edit (edit DR display number or DR preset value)
‘SEL’ then ‘SEL’	Edit DR preset value type
‘SEL’ then ‘↑/↓‘	1. Edit DR display number (only first line) 2. Edit DR preset value
ESC	1. Cancel edit. 2. Back to main menu (save DR preset data)
SEL + ↑/↓	Tip-up/down page

– Other Menu Items

(1) CLEAR PROGRAM (Clear RAM, EEPROM and Password at the same time)

(2) WRITE: save the program (RAM) to PM05 (3rd) program spare cartridge
(3) READ: read the program from the PM05 or PM05 (3rd) program spare cartridge to LRD (RAM)

(1) - (3) Now press

↑/↓	Move the cursor
OK	Execute the instruction
ESC	Back to main menu

(4) SET (system setting)

ID SET	01
REMOTE I/O	N
BACKLIGHT	X
M KEEP	✔

I)O NUMBER:	0
I/O ALARM	✔
C KEEP	X
Z SET	X

V COMM SET	03
DATA REG.	U

content	default		
ID SET	01	→	ID setting (00~99)
REMOTE I/O	N	→	Remote I/O Mode (N: none M: Master S: Slave)
BACK LIGHT	X	→	Back light mode (√: always light x: light for 10s after pressed.)
M KEEP	√	→	M: non-Volatile (√:Volatile x: Non- Volatile)
I/O NUMBER	0	→	Setting expansion I/O module number (0~3)
I/O ALARM	√	→	Siren setting when is not available to Expansion I/O Points (√:Yes _:No)
C KEEP	X	→	In stop/run switching, Counter Present Value Keeping (√:Yes x:No)
Z SET	X	→	Enable or disable keypad input Z01-Z04 (√:enable x:disable)
V COMM SET	03	→	Setting the form and baud rate of RS-485
DATA REG.	U	→	Setting the Data Register type (U: 16bit-unsiged S: 16bit-sign)

– M KEEP function is available for keeping M status and current value of T0E/T0F when power is re-supplied after loss.

Now press

↑↓←→	Move the cursor
SEL	Begin to edit.
‘ SEL’ quindi ‘←/→‘	Move the cursor for 'ID SET' item and 'V COMM SET' item
‘SEL’ quindi ‘↑/↓‘	1. ID SET = 00~99 ; I/O NUMBER = 0~3 2. REMOTE I/O = N⇔M⇔S⇔N 3. BACK LIGHT ; C KEEP ; Z SET = x⇔√ 4. M KEEP; I/O ALARM = √⇔x 5. V COMM SET = (0~3)(0~5) 6. DATA REG. = U⇔S
OK	Confirm the Edition Data
ESC	1. Cancel the setting when pressed 'SEL' 2. Back to Main Menu(save edit data)

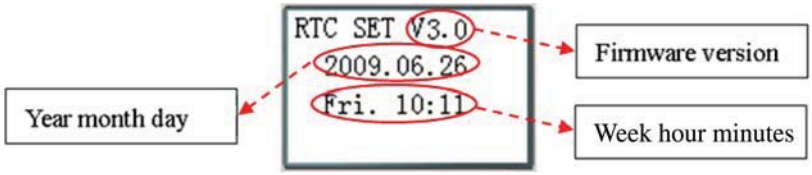
– When DATALINK is selected, ID setting range is 0~7, which should be continuous.
ID=0 default as Master, ID=1~7 default as Slave.

– When REMOTE I/O is selected, the distribution of the remote I/O is as follows:

	Master		Slave
Remote Input	X01~X0C	←	I01~I0C
Remote Output	Y01~Y08	→	Q01~Q08

– The high bit of V COMM SET detects the form of RS-485, and the low bit detects the baud rate of RS-485.
More detailed to see chapter 4: Relay Logic Programming: Data Link/Remote IO Instruction

(5) RTC SET



Now press

↑↓	Enter RTC setting or Summer/Winter setting
SEL	Begin to input parameters
‘SEL’ then ‘←/→‘	Move the Cursor
‘SEL’ then ‘↑/↓‘	1. year=00~99, month=01~12, day=01~31 2. week: MO⇔TU⇔WE⇔TH⇔FR⇔SA⇔SU‘⇔MO 3. hour = 00~23 , minutes = 00~59
‘SEL’ then ‘SEL’	Summer/Winter setting: NO - EUROPE - USA - OTHER - NO …
OK	Save the Input Data
ESC	1. Cancel the Input Data when press 'SEL'. 2. Back to Main Menu.

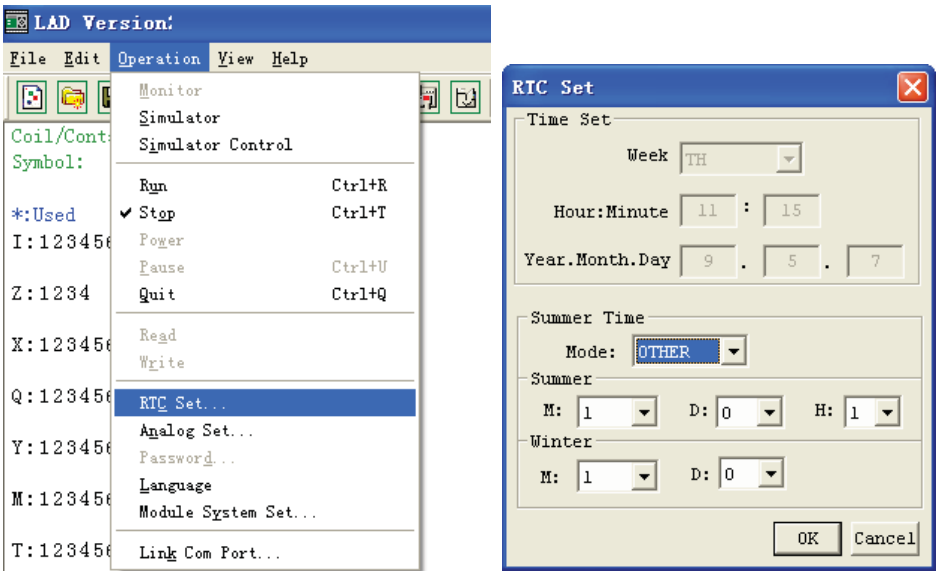
– RTC precision

Temperature	Error
+25°	±3 s/day
-20°C/+50°C	±6 s/day

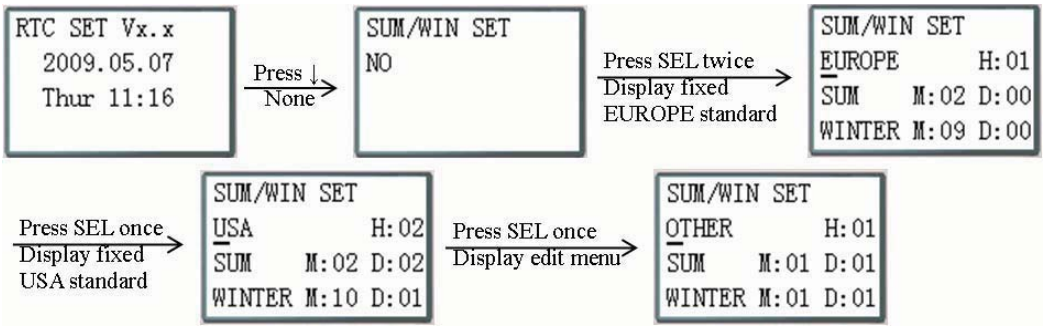
RTC SUMMER/WINTER SETTING
There are 2 fixed Summer/Winter, EUROPE and USA, 1 edit Summer/Winter in LRD.
Edit rule:
1. The last Sunday is defined as 0;
2. Hour range: 1~22;
3. Summer hour and Winter hour are the same.

Summer/Winter can be set through the two methods as shown below.

1) PC Client

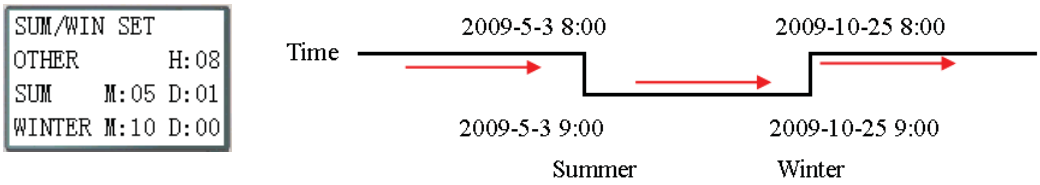


2) Keypad

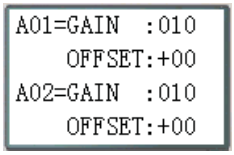


Then pressing "→" selects edit location, pressing "↑", "↓" edit content.

Example:
Year 2009, SUM M: 05 D: 01 → 32009-5-3; M: 10 D: 00 → 2009-10-25.



6. ANALOG SET



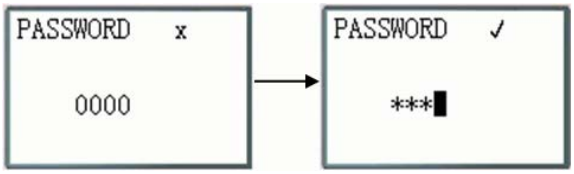
A 1=GAIN : 010	→ GAIN (0~999), default 10
OFFSET : +00	→ OFFSET (-50~+50), default 0
A 2=GAIN : 010	
OFFSET : +00	
A3~A8...Gain + Offset	

Now press

↑↓	1. Move the Cursor downward 2. Switch the setting screen from A01/A02í A03/A04í A50/A06 í A07/A08
SEL	Begin to input parameters
'SEL' then '←/→'	Move the Cursor
'SEL' then '↑/↓'	1. GAIN =000 ~ 999 2. OFFSET=(-50 ~ +50)
OK	Save the Input Data
ESC	1. Cancel the Input Data when press 'SEL'. 2. Back to Main Menu (save edit data).

– V01 = A01*A01_GAIN + A01_OFFSET …… V08 = A08*A08_GAIN + A08_OFFSET

7. PASSWORD (setting password)



Now press

SEL	1. Begin to input numeral 2. When the password is ON, it will not display 0000, but ****.
'SEL' then '←/→'	Move the cursor
'SEL' then '↑/↓'	Data changed 0~F
OK	Save the input data, not 0000 or FFFF, as the PASSWORD is ON.
ESC	1. Cancel the Input Data when press 'SEL'. 2. Back to Main Menu.

– A Class: Password number is set to 0001~9FFF.
B Class: Password number is set to A000~FFFE.
Password number = 0000 or FFFF is disabled Password function, Default setting: 0000.

A/B Class password Description (√£∫cannot use under password protected)

Menu	A Class	B Class
LADDER	√	√
FUN.BLOCK	√	√
FBD	√	√
PARAMETER		√
RUN/STOP		√
DATA REGISTER		√
CLEAR PROG.	√	√
WRITE	√	√
READ	√	√
SET		√
RTC SET		
ANALOG SET		√
LANGUAGE		√
INITIAL	√	√

8. LANGUAGE (Selection menu language)

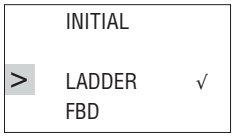
→ English
→ French
→ Spanish
→ Italian

→ German
→ Portuguese
→ Simplified Chinese

Now press

↑↓	Vertically move the Cursor
OK	Select the language the cursor located
ESC	Back to Main Menu

9. INITIAL (select Ladder Logic and Function Block Diagram (FBD))



Now press

↑↓	Vertically move the Cursor
OK	Select the mode the cursor located
ESC	Back to Main Menu

⚠ The origin program will be cleared as the change of edition method.

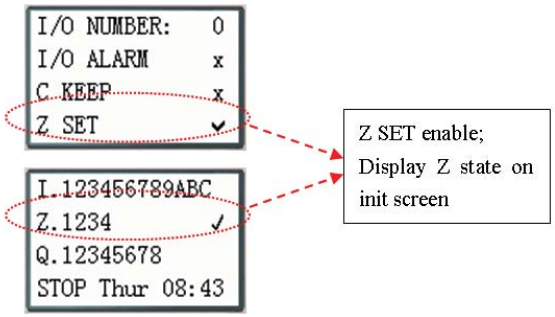
CHAPTER 4: RELAY LADDER LOGIC PROGRAMMING

COMMON MEMORY TYPES

	General output	SET output	RESET output	PULSE output	NO contact	NC contact	Number
Symbol	[			P			(NO/NC)
Input contact					I	i	12 (I01-I0C / i01-i0C)
Keypad input					Z	z	4 (Z01-Z04 / z01-z04)
Output coil	Q	Q	Q	Q	Q	q	8 (Q01-Q08 / q01-q08)
Auxiliary relay	M	M	M	M	M	m	63 (M01-M3F / m01-m3F)
Auxiliary relay	N	N	N	N	N	n	63 (N01-N3F / n01-n3F)
Counter	C				C	c	31 (C01-C1F / c01-c1F)
Timer	T			T	T	t	31 (T01-T1F / t01-t1F)

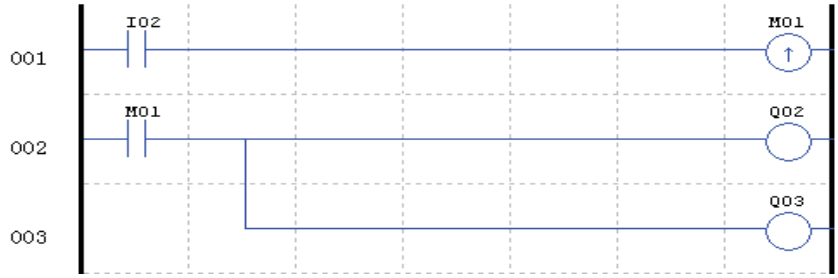
INPUTS (I MEMORY TYPE)
The LRD digital input points are designated I memory types. The number of digital I input points is 6, 8 or 12 depending on each LRD model.

KEYPAD INPUTS (Z MEMORY TYPE)
The LRD keypad input points are designated Z memory types. The number of digital Z input points is 4.

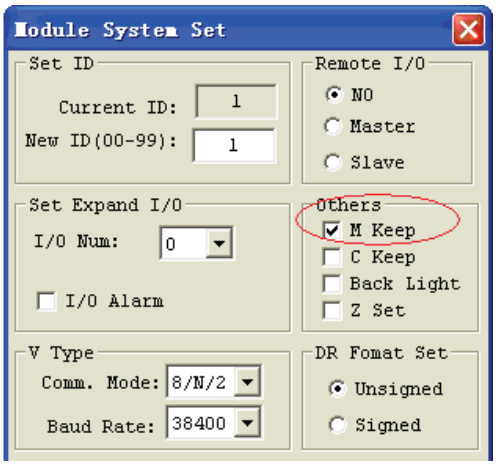


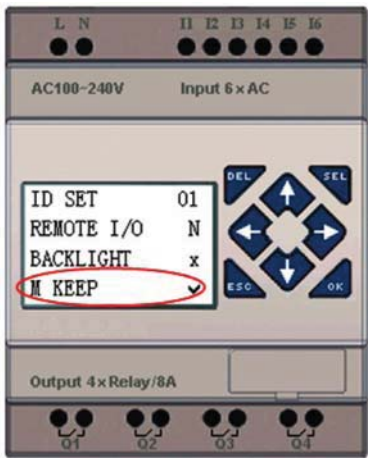
OUTPUTS (Q MEMORY TYPE)
The LRD digital output points are designated Q memory types. The number of digital Q output points is 4 or 8 depending on each LRD model. In this example, output point Q01 will be turned on when input point I01 is activated.

AUXILIARY RELAYS (M MEMORY TYPE)
Auxiliary relays ate digital internal memory bits used to control a ladder logic program. The auxiliary relays are not physical inputs or outputs that can be wired to any external device, switches, sensors, relays, lamps, etc. The number of Auxiliary Relays M is 63. Since auxiliary relays are internal bits within the CPU, they can be programmed as digital inputs (contacts) or digital outputs (coils). In the first rung of this example, auxiliary relay M01 is being used as an output coil and will energize when input I02 turns on. In the second rung auxiliary relay M01 is being used as an input and when energized, will turn on outputs Q02 and Q03.



– The state of auxiliary relays “M01~M3F” will be kept when the LRD powers down if “M Keep” is active. “M Keep” can be set by the two ways below.





SPECIAL AUXILIARY RELAYS: M31~M3F

Code	Signification	Description
M31	User program upstart flag	Outputting ON during the first scanning period; and used as normal auxiliary relay at other scan period.
M32	1s blinking output	0,5 s ON, 0,5 s OFF
M33	Summer/Winter output	Summer time turn ON, winter time turn OFF, used as normal auxiliary relay.
M34	Reserved	
M35	Reserved	
M36	Reserved	
M37	Reserved	
M38~M3C	Reserved	
M3D	Received	MODBUS function using
M3E	Error flag	
M3F	Time out	

AUXILIARY RELAYS (N MEMORY TYPE)
Auxiliary relays N is the same to auxiliary relays M, but it cannot be kept when the LRD powers down.
In the first rung of this example, auxiliary relay N01 is being used as an output coil and will energize when input I03 turns on. In the second rung auxiliary relay N01 is being used as an input and when energized, will turn on outputs Q04 and Q05.

TIMERS AND TIMER STATUS BITS (T MEMORY TYPE)
Timer status bits provide the relationship between the current value and the preset value of a selected timer. The timer status bit will be on when the current value is equal or greater than the preset value of a selected timer. In this example, when input I03 turns on, timer T01 will start. When the timer reaches the preset of 5 seconds timer status contact T01 turns on. When T01 turns on, output Q04 will turn on. Turning off I03 will reset the Timer.

COUNTERS AND COUNTER STATUS BITS (C MEMORY TYPE)

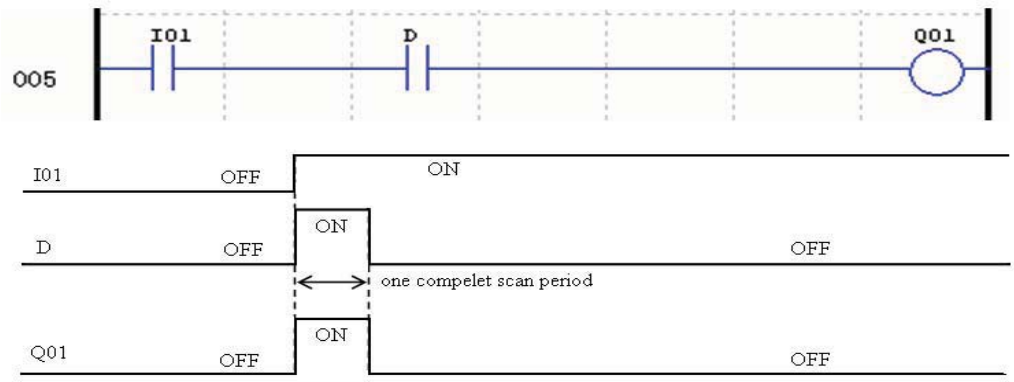
Counter status bits provide the relationship between the current value and the preset value of a selected counter. The counter status bit will be on when the current value is equal or greater than the preset value of a selected counter. In this example, each time the input contact I04 transitions from off to on, the counter (C01) increments by one. When the counter reaches the preset of 2 counts, the counter status contact C01 turns on. When C01 turns on, output Q05 will turn on. When M02 turns on counter C01 will reset. If M09 is turned on, the counter will change from a count-up to a count-down counter.

SPECIALTY MEMORY TYPES

	General output	SET output	RESET output	PULSE output	NO contact	NC contact	Number
Symbol	[			P			(NO/NC)
					Lo	Hi	Used in function block
Expansion input coil					X	x	12 (X01-X0C / x01-x0C)
Expansion output coil	Y	Y	Y	Y	Y	y	12 (Y01-Y0C / y01-y0C)
Differential (one shot)					D	d	
RTC	R				R	r	31 (R01-R1F / r01-r1F)
Analog comparator	G				G	g	31 (G01-G1F / g01-g1F)
HMI	H						31 (H01-H1F)
PWM	P						2 (P01-P02)
DATA LINK	L						8 (L01-L08)
SHIFT	S						1 (S01)

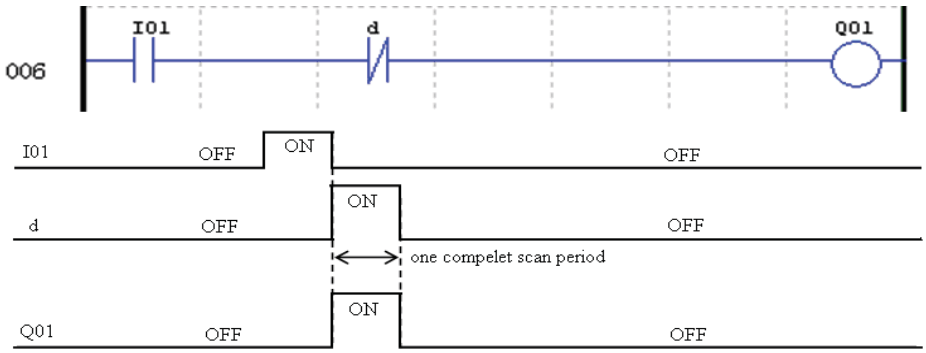
POSITIVE INPUT DIFFERENTIAL INSTRUCTION (ONE-SHOT)

A positive input differential instruction, or One-Shot, holds its status ON for one CPU scan when the preceding series contact transitions from OFF to ON. This transition from OFF to ON is called a Positive Input Differential.



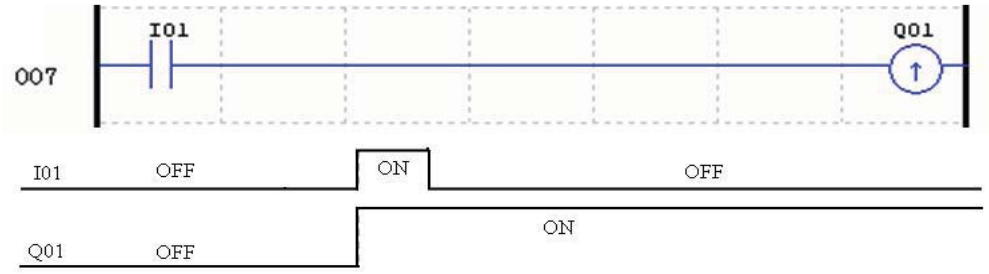
NEGATIVE INPUT DIFFERENTIAL INSTRUCTION (ONE-SHOT)

A negative input differential instruction, or One-Shot, holds its status ON for one CPU scan when the preceding series contact transitions from ON to OFF. This transition from ON to OFF is called a Negative Input Differential.

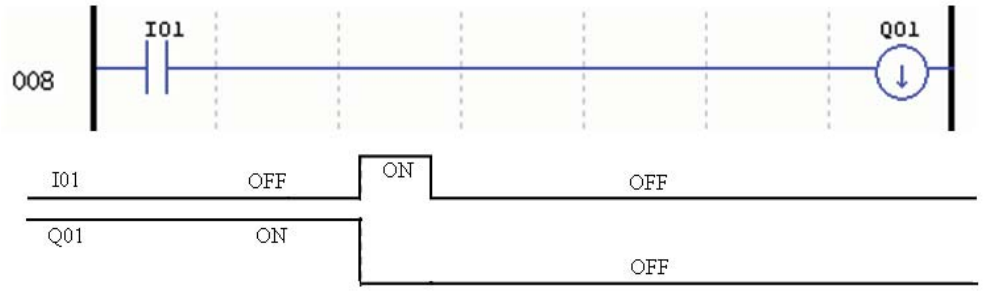


OUTPUT INSTRUCTIONS

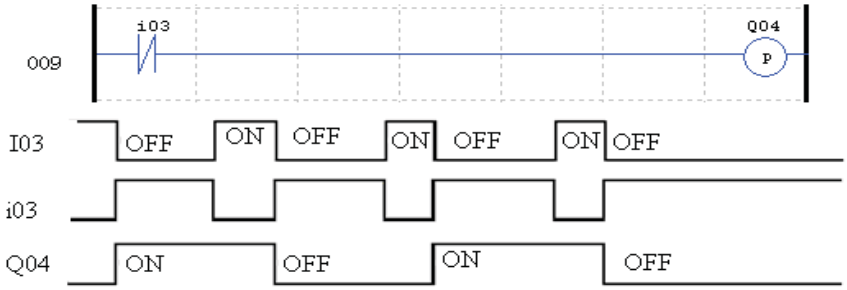
SET OUTPUT INSTRUCTION (LATCH) ( )
A set output instruction, or Latch, turns ON an output coil (Q) or an auxiliary contact (M) when the preceding input contact transitions from OFF to ON. Once the output is ON or set, it will remain ON until it is reset using the Reset output instruction. It is not necessary for the preceding input contact controlling the Set output instruction to remain ON.



RESET OUTPUT INSTRUCTION (UNLATCH) ( )
A reset output instruction, or Unlatch, turns OFF a previous set output coil (Q) or an auxiliary contact (M) when the preceding input contact transitions from OFF to ON. Once the output is OFF or reset, it will remain OFF until it if reset using another output instruction. It is not necessary for the preceding input contact controlling the Reset output instruction to remain ON.



PULSE OUTPUT INSTRUCTION (FLIP-FLOP) (P)
A pulse output instruction, or Flip-Flop, turns ON a coil (Q) or an auxiliary contact (M) when the preceding input contact transition from OFF to ON. Once the output is ON, it will remain ON until the preceding input contact transitions from OFF to ON a second time. In the example below, when Pushbutton I03 is pressed and released Motor Q04 will turn on and remain on. When Pushbutton I03 is pressed again, Motor Q04 will turn off and remain off. The pulse output instruction (P) will "flip-flop" its state from ON to OFF at each press of Pushbutton I03.



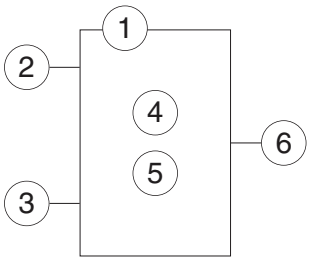
ANALOG MEMORY TYPE

	Analog input	Analog output	number
Analog input	A		8 (A01~A08)
Analog input parameter	V		8 (V01~V08)
Temperature input	AT		4 (AT01~AT04)
Analog output		AQ	4 (AQ01~AQ04)
Add-Subtract control	AS	AS	31 (AS01~AS1F)
Multiply-Divide control	MD	MD	31 (MD01~MD1F)
PID contrl	PID	PID	15 (PI01~PI0F)
Data Multiplexer control	MX	MX	15 (MX01~MX0F)
Analog Ramp control	AR	AR	15 (AR01~AR0F)
Data Register	DR	DR	240 (DR01~DRF0)
MODBUS			15 (MU01~MU0F)

Analog value (A01~A08, V01~V08, AT01~AT04, AQ01~AQ04) and current value of functions (T01~T1F, C01~C1F, AS01~AS1F, MD01~MD1F, PI01~PI0F, MX01~MX0F, AR01~AR0F, and DR01~DRF0) can be used as other function's preset value. And the parameter preset value is its limit value when the current value of those functions is bigger or less than parameter limit value.

TIMER INSTRUCTION

The LRD includes a total of 31 separate Timers that can be used throughout a program. T0E and T0F keep their current value after a loss of power to the LRD relay if "M Keep" is active, but the other Timers' current value is non-retentive. Each Timer has a choice of 8 operation modes, 1 for a pulse Timer and 7 for general purpose Timer. Additionally, each Timer has 6 parameters for proper configuration. The table below describes each configuration parameter and lists each compatible memory type for configuring Timers.



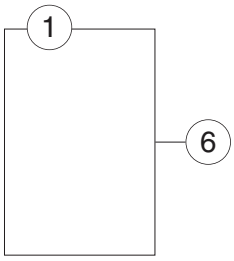
Symbol	Description
1	Timer Mode (0-7)
2	Base tempi temporizzatore Timer Unit 1: 0.01s, range: 0.00 - 99.99 sec 2: 0,1 s, range: 0,0 - 999,9 sec 3: 1 s, range: 0 - 9999 sec 4: 1 min, range: 0 - 9999 min
3	ON: the Timer reset to 0 OFF: the Timer continues timing
4	Timer current value
5	Timer preset value
6	Timer code(T01~T1F total: 31 Timers)

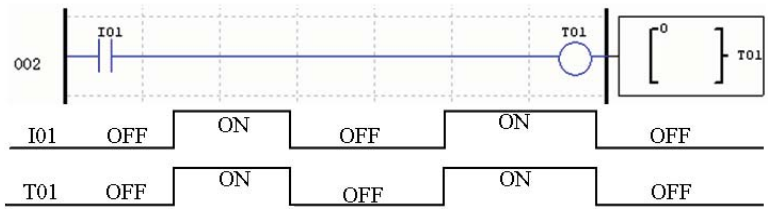
Compatible Instructions	Range
Input	I01-I0C/i01-i0C
Keypad input	Z01-Z04/z01-z04
Output	Q01-Q08/q01-q08
Auxiliary coil	M01-M3F/m01-m3F
Auxiliary coil	N01-N3F/n01-n3F
Expansion input	X01-X0C/x01-x0C
Expansion outut	Y01-Y0C/y01-y0C
RTC	R01-R1F/r01-r1F
Counter	C01-C1F/c01-c1F
Timer	T01-T1F/t01-t1F
Analog comparator	G01-G1F/g01-g1F
Normal close contact	AI

– The preset value of Timer could be a constant or other function current value.
– The current value of T0E and T0F will be kept when LRD on a loss of power if the "M-Keep" is active.

TIMER MODE 0 (INTERNAL COIL)

Mode 0 Timer (Internal Coil) used as internal auxiliary coils. No timer preset value. The status of T coil becomes with enable coil as shown below.

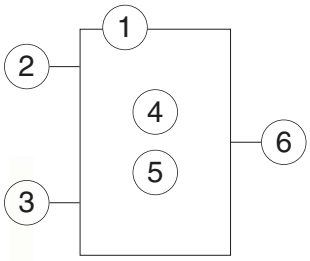


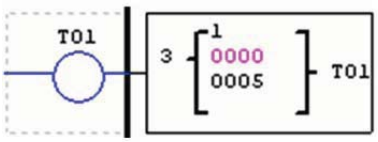


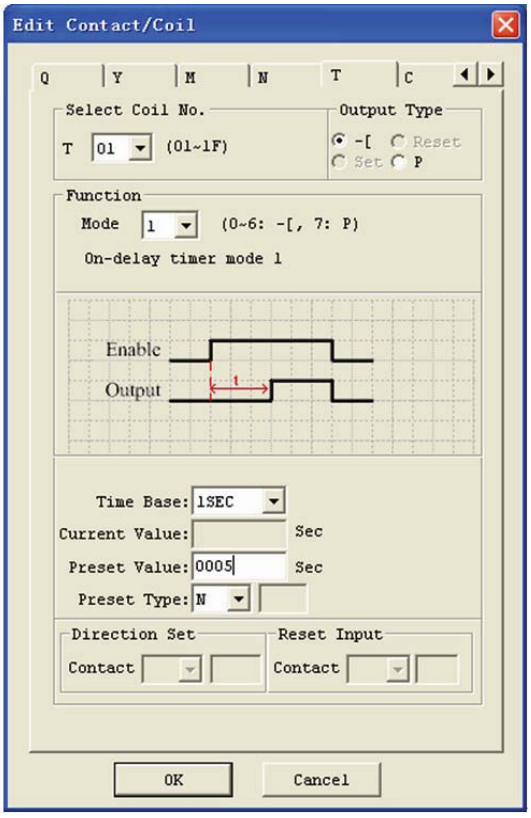
– I01 is enable coil.

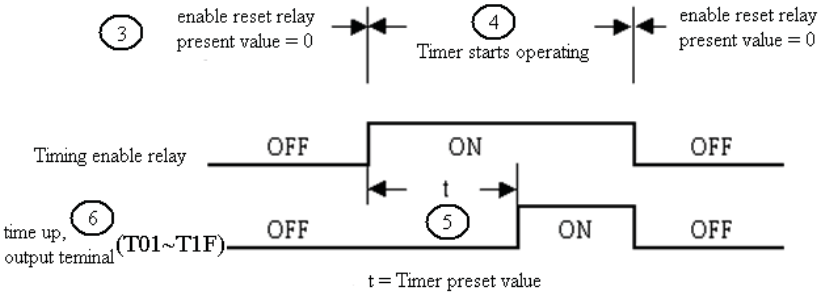
TIMER MODE 1 (ON-DELAY)

Mode 1 Timer (ON-Delay) will time up to a fixed value and stop timing when the current time is equal to the preset value. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, the timer will stop timing when it reaches the preset value of 5 seconds. Timer status bit T01 will be ON when the current value is 5.





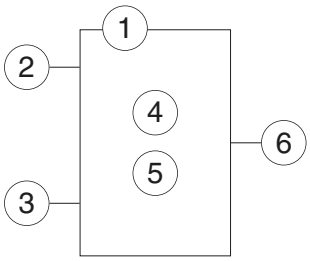


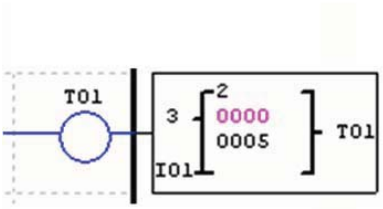


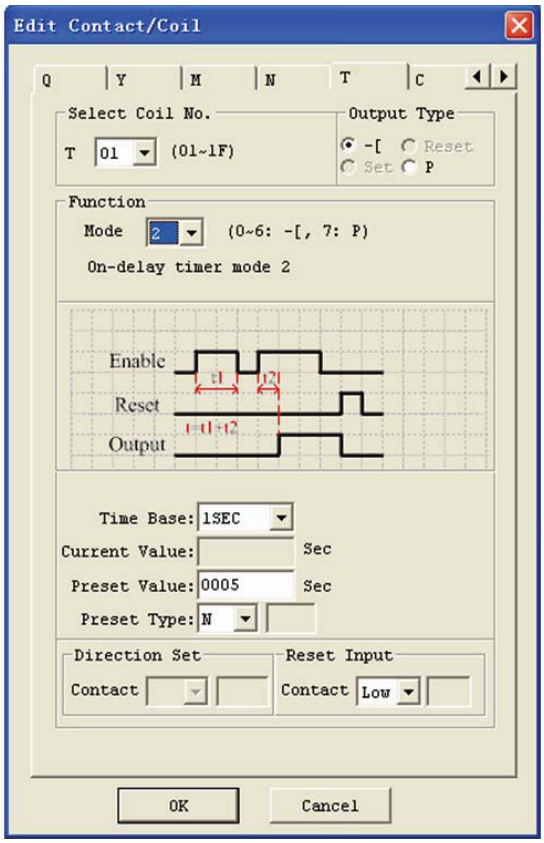
– T0E and T0F keep their current value after a loss of power to the LRD relay if “M Keep” is active, but the others’ reset to 0.

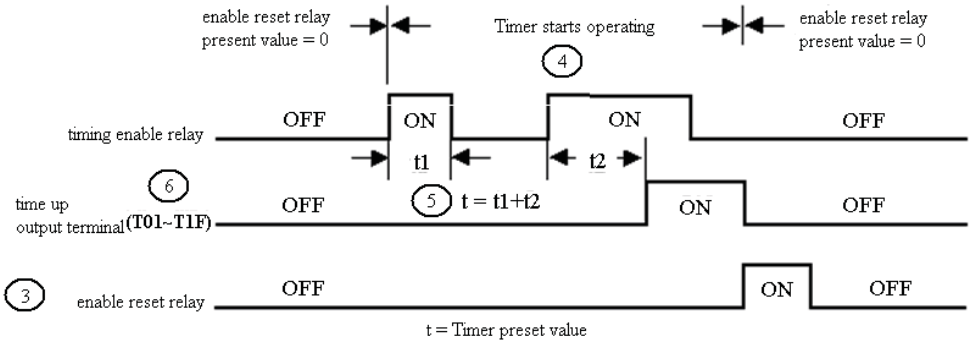
TIMER MODE 2 (ON-DELAY WITH RESET)

Mode 2 Timer is an ON-Delay with reset that will time up to a fixed preset value and stop timing when the current time is equal to the preset value. Additionally, the Timer current value will be kept when Timer is disabled. In the example below, the Timer will stop timing when it reaches its preset value of 5 seconds. Timer status bit T01 will be ON when the current value is 5. The timer reset input is input I01. The timer current value will reset to 0, and Timer status bit T01 will turn off when I01 is ON.





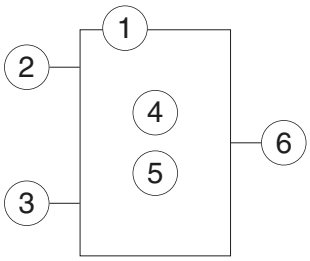


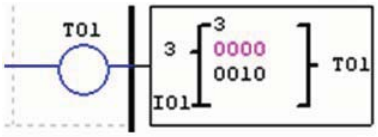


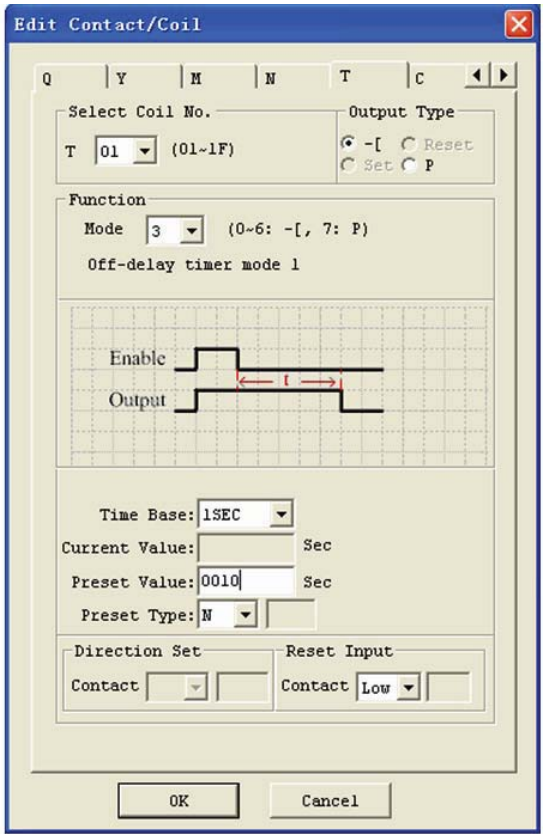
– T0E and T0F keep their current value after a loss of power to the LRD relay if “M Keep” is active, but the others' reset to 0.

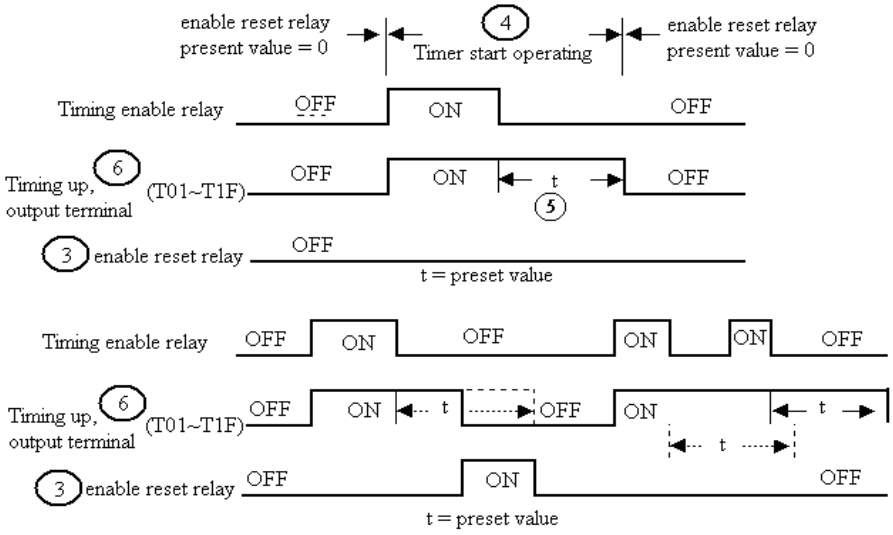
TIMER MODE 3 (OFF-DELAY)

Mode 3 Timer is an OFF-Delay with reset that will time up to a fixed preset value and stop timing when the current time is equal to the preset value. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, the timer reset input is Input I01.Timer status bit T01 will be ON immediately when its rung is true. The timer will only begin timing up when its rung changes to false. Timer status bit T01 will turn OFF when the current time value reaches its preset value of 10 seconds.





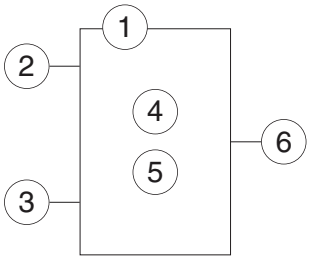


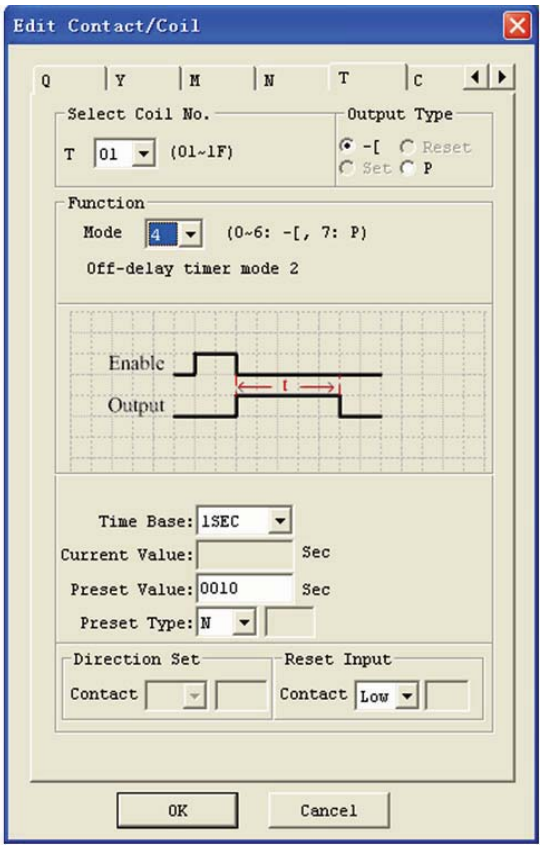


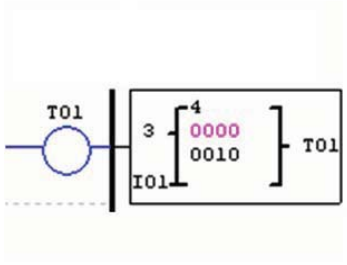
– T0E and T0F keep their current value after a loss of power to the LRD relay if “M Keep” is active, but the others' reset to 0.

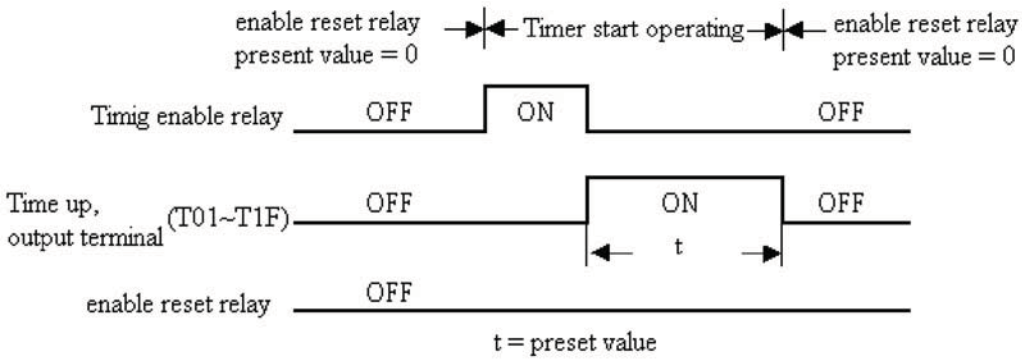
TIMER MODE 4 (OFF-DELAY)

Mode 4 Timer is an OFF-Delay with reset that will time up to a fixed preset value and stop timing when the current time is equal to the preset value. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, the timer reset input is Input I01. The timer status bit T01 will turn ON only after its rung transitions from true to false. Timer status bit T01 will turn OFF when the current time value reaches its preset value of 10 seconds.





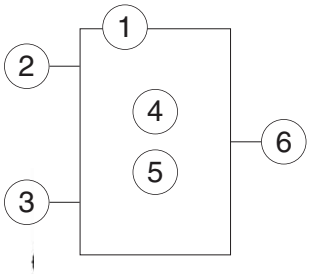


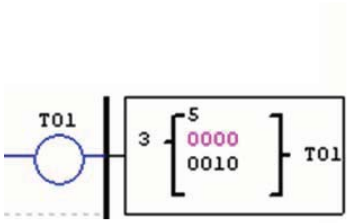


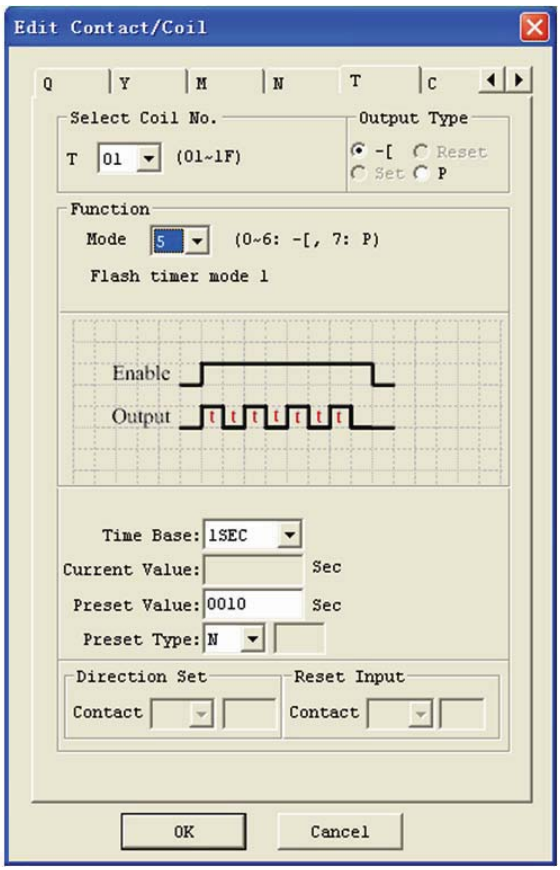
– T0E and T0F keep their current value after a loss of power to the LRD relay if “M Keep” is active, but the others' reset to 0.

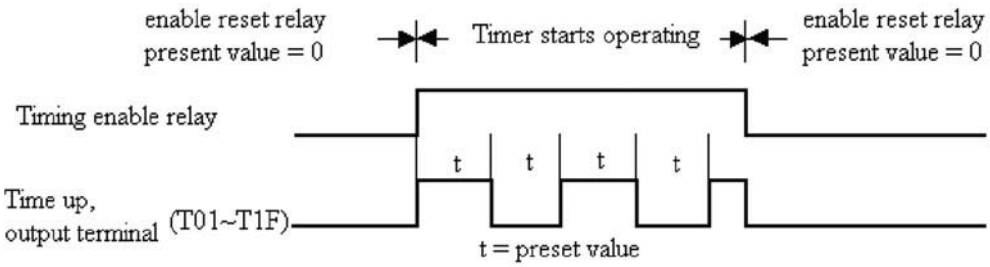
TIMER MODE 5 (FLASH WITHOUT RESET)

Mode 5 Timer is a Flash timer without reset that will time up to a fixed preset value and then change the state of its status bit. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, timer status bit T01 will be ON immediately when its rung is true and begin its timing sequence. Timer status bit T01 will turn OFF when the current time value reaches its preset of 10 seconds. This Flash sequence of the Timer status bit T01 will continue as long as its rung remains true.





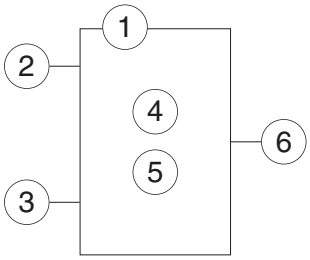


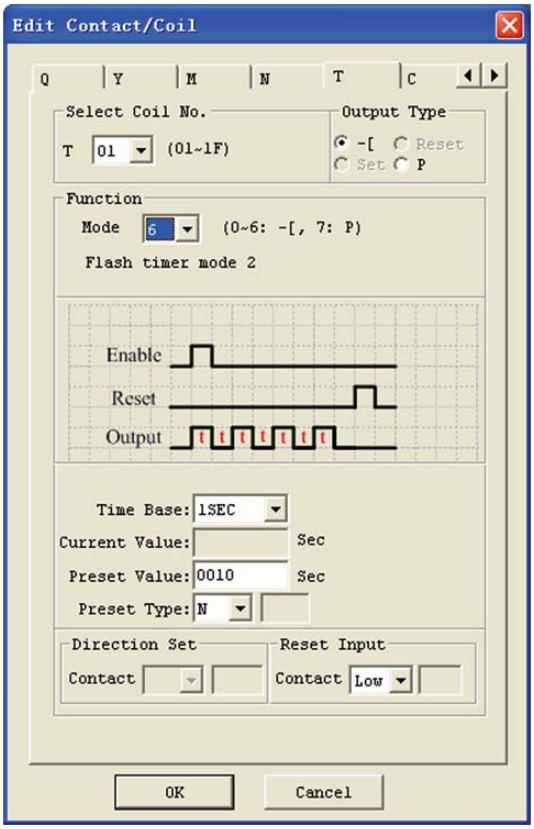


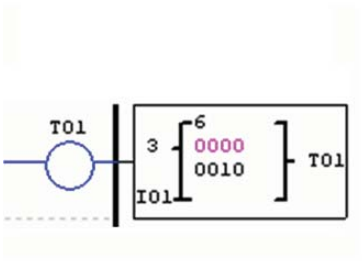
– The current value of Timer cannot be kept on a loss of power to LRD.

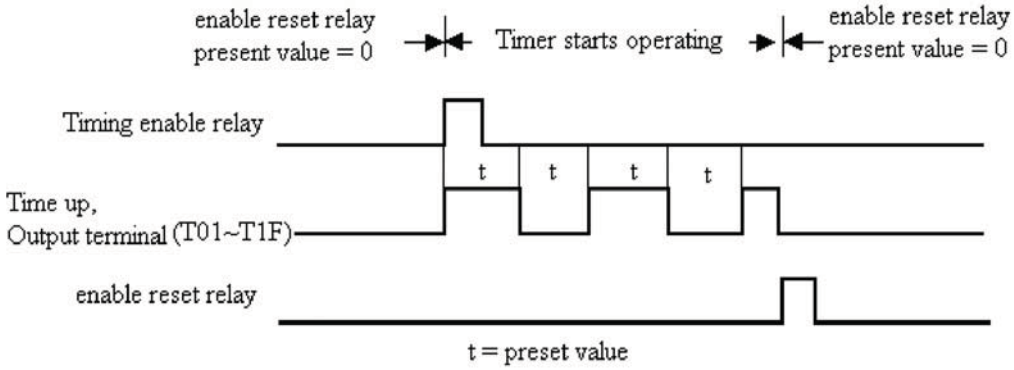
TIMER MODE 6 (FLASH WITH RESET)

Mode 6 Timer is a Flash timer with reset that will time up to a fixed preset value and then change the state of its status bit. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, the timer reset input is Input I01. Timer status bit T01 will be ON immediately when its rung is true and begin its timing sequence. Timer status bit T01 will turn OFF when the current time value reaches its preset of 10 seconds. This Flash sequence of the timer status bit T01 will continue as long as its rung remains true.







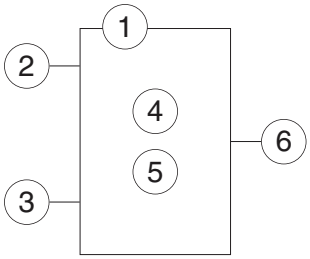


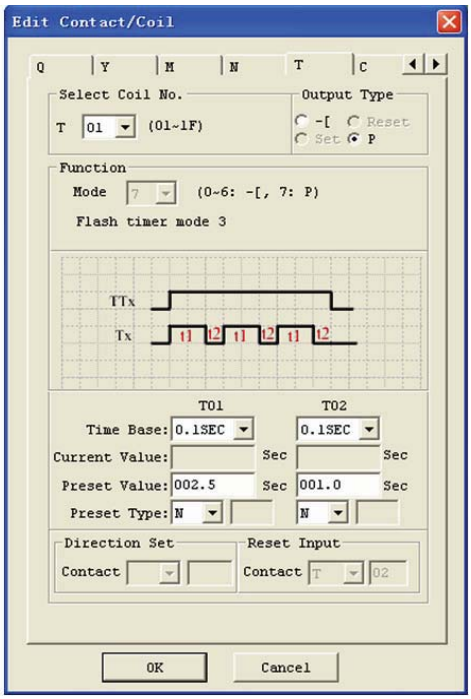
– The current value of Timer cannot be kept on a loss of power to LRD.

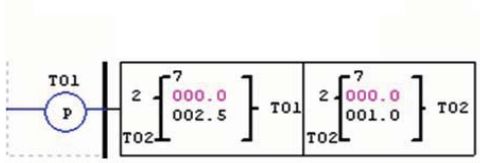
TIMER MODE 7 (FLASH CASCADE WITHOUT RESET)

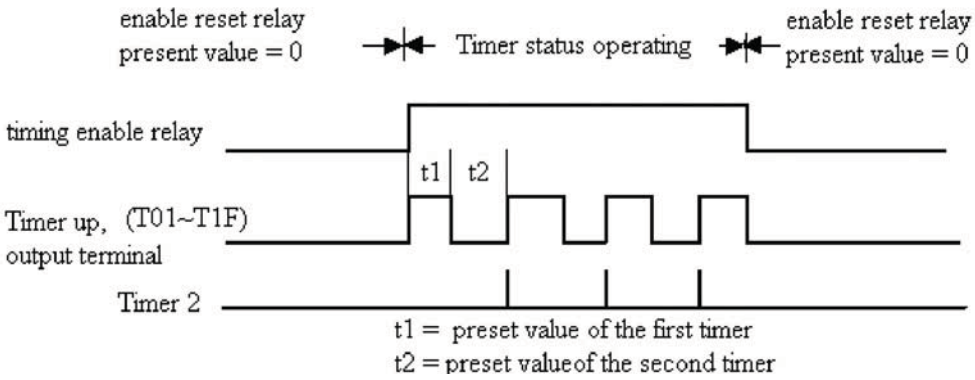
Mode 7 Timer is a Flash Timer which using two Timers in a cascade configuration without reset. The second Timer number follows the first Timer. The cascade configuration connects the timer status bit of first timer to enable the second timer. The second timer will time up to its preset value then flash and its timer status bit will enable the first timer. Additionally, the Timer current value will reset to zero when Timer is disabled. In the example below, timer status T01 will be ON after it completes its timing sequence of 2.5 seconds. Timer 2 will then begin its timing sequence of 1 second. When the current time value of Timer 2 reaches its preset of 1 second, its status bit T02 will flash and Timer 1 will begin timing again. This type of cascade timer is of ten used in combination with a counter in applications where it is necessary to count the number of time cycles completed.

The two Timers used in Timer Mode 7 cannot be reused as Timers for other modes in the same program.





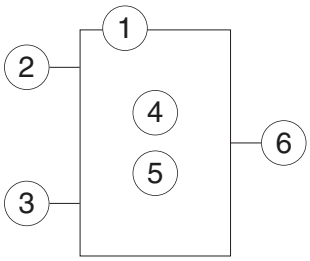




– The current value of Timer cannot be kept on a loss of power to LRD.

COUNTER INSTRUCTIONS

The LRD includes a total 31 separate counters that can be used throughout a program. Each counter has a choice of 9 operation modes, 1 for pulse counter, 6 for general purpose counting and 2 for high speed counting. Additionally, each counter has 6 parameters for proper configuration. The tables below describe each configuration parameter and lists each compatible memory type for configuring counters.

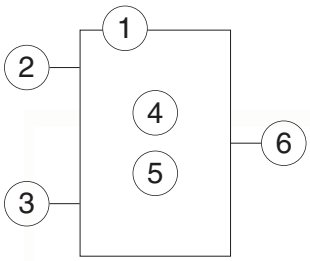


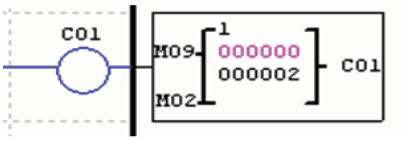
COMMON COUNTER

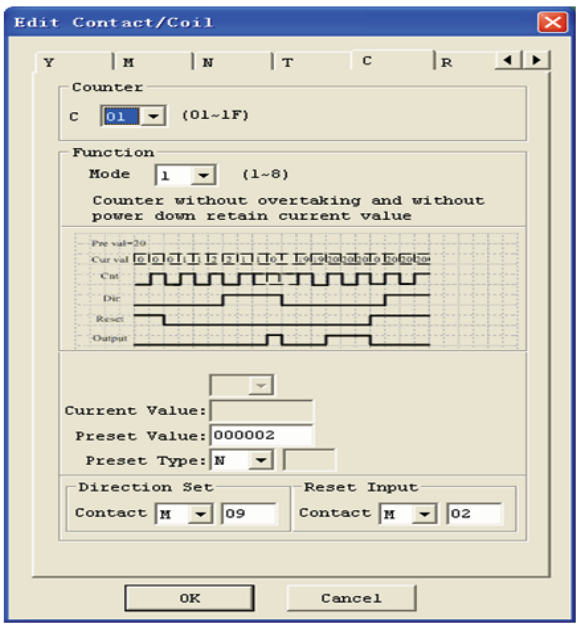
Symbol	Description
1	Counting Mode (0-6)
2	Use (I01~g1F) to set counting up or down OFF: counting up (0, 1, 2, 3……) ON: counting down (……3, 2, 1, 0)
3	Use (I01~g1F) to reset the counting value ON: the counter value reset to 0 OFF: the counter continues to count
4	Counter current Value, range: 0~999999
5	Counter preset Value, range: 0~999999
6	Counter Code (C01~C1F total: 31 Counters)

Compatible Instructions	Range
Input	I01-I0C/i01-i0C
Keypad input	Z01-Z04/z01-z04
Output	Q01-Q08/q01-q08
Auxiliary coil	M01-M3F/m01-m3F
Auxiliary coil	N01-N3F/n01-n3F
Expansion input	X01-X0C/x01-x0C
Expansion output	Y01-Y0C/y01-y0C
RTC	R01-R1F/r01-r1F
Counter	C01-C1F/c01-c1F
Timer	T01-T1F/t01-t1F
Analog comparator	G01-F1F/g01-g1F
Normal close contact	Lo

– The preset value of Counter could be a constant or other function current value.
The figure below shows the relationship among the numbered block diagram for a Counter, the ladder diagram view, and the software Edit Contact/Coil dialog box.

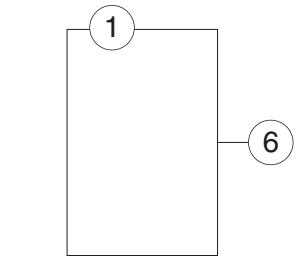


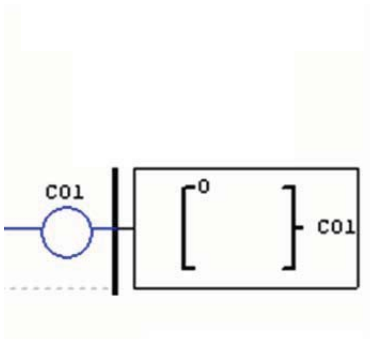


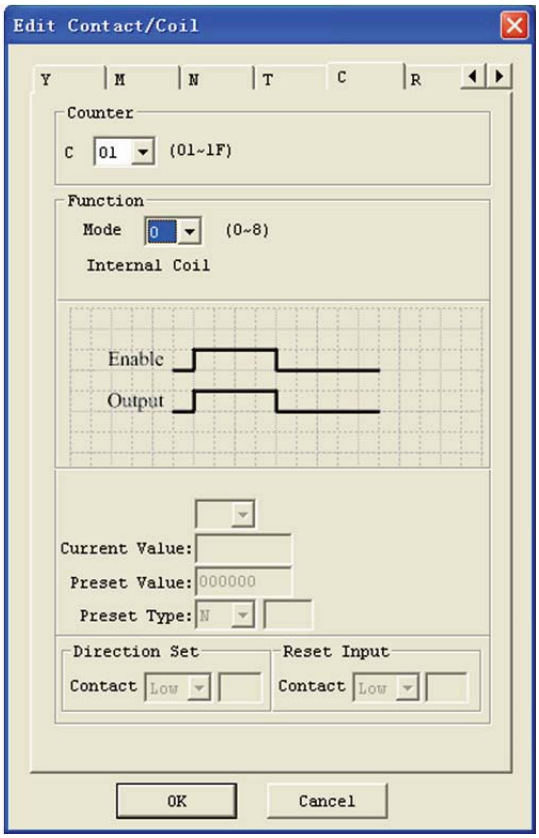


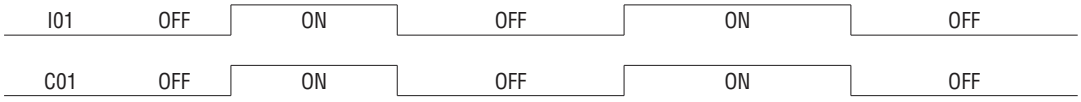
COUNTER MODE 0 (INTERNAL COIL)

Mode 0 Counter (Internal Coil) used as internal auxiliary coils. No counter preset value. In the example below shows the relationship among the numbered block diagram for a mode 0 counter, the ladder diagram view, and the software Edit Contact/Coil dialog box..



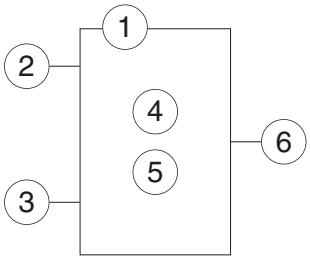


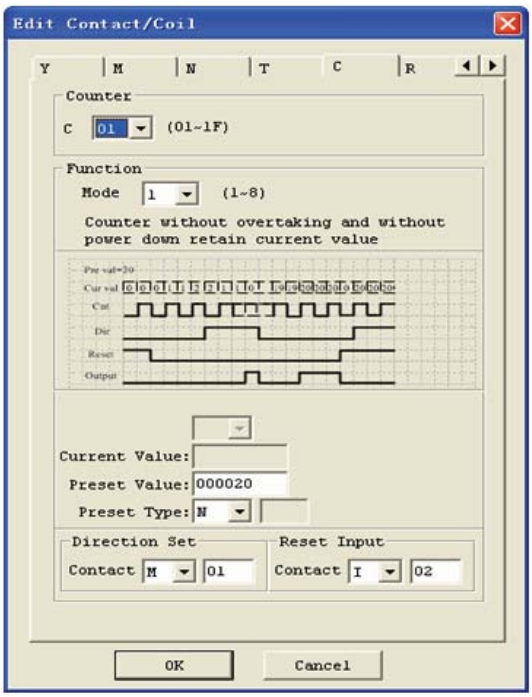


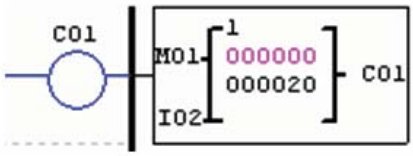


COUNTER MODE 1 (FIXED COUNT, NON-RETENTIVE)

Mode 1 Counter will count up to a fixed preset value and stop counting when the current count is equal to the preset value, or count down to 0 and stop counting when the current count is equal to 0. Additionally, the current count value is non-retentive and will reset to init value on a powering up to the LRD relay. In the example below, the counter will stop counting when it reaches the preset value of 20. Counter status bit C01 will be ON when the current value is 20.







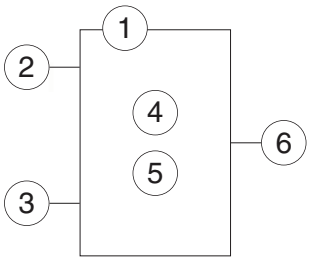
Mode = 1

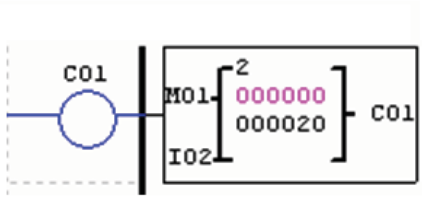
Set value	20																			
Current value	0	0	0	1	1	2	2	1	1	0		19	19	20	20	20	0	20	20	20
Input pulse																				
Input decrement	OFF							ON				OFF						ON		
Reset input	ON							OFF										ON		
Counter coil	OFF										ON	OFF				ON		OFF		

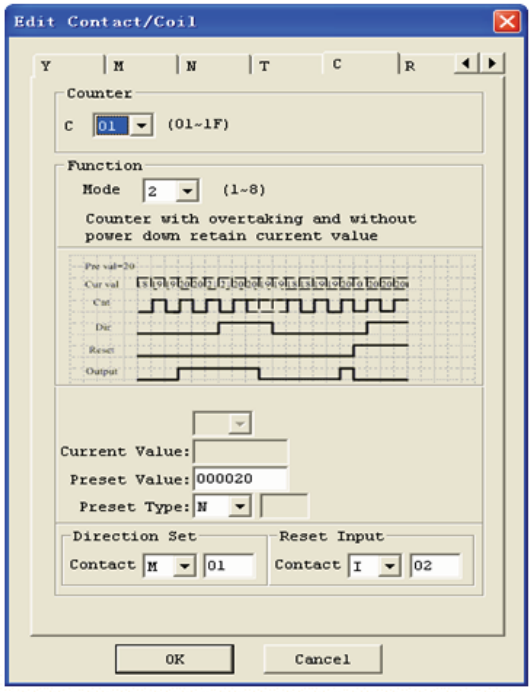
– Under this mode, the counter current value will be init value when the LRD is power up or switching between RUN and STOP. The init value is 0 if the counter is configured as counting up or else the preset value.

COUNTER MODE 2 (CONTINUOUS COUNT, NON-RETENTIVE)

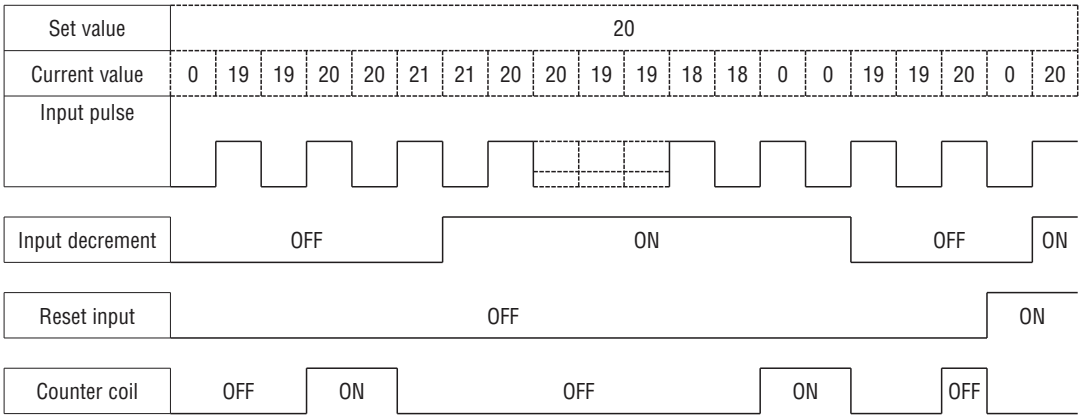
Mode 2 Counter will count up to a fixed preset value and continue counting after the preset value, but it won't count when the current value equals 0 if it is configured as down Counter. Additionally, the current count value is non-retentive and will reset to init value on a powering up to the LRD relay or switching between RUN and STOP. In the example below, the counter will continue counting after its preset value of 20. Counter status bit C01 will be ON when the current value is 20.







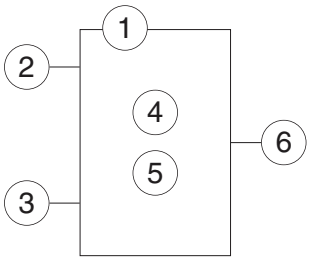
Mode = 2

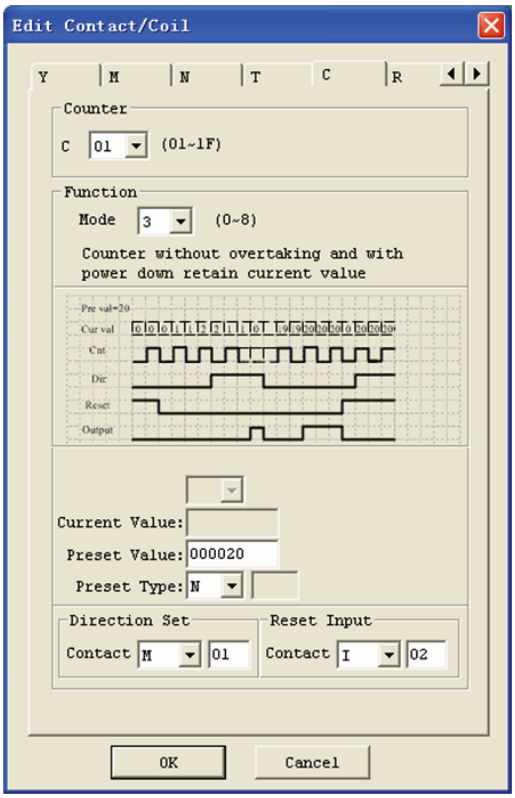


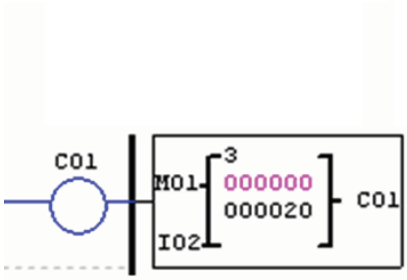
– Under this mode, Counter will continue counting after reaching preset value if it's configured as counter up. But it stops counting when its current value is 0 if it is configured as counter down.
– The counter current value will be init value when the LRD status switches between RUN and STOP or the LRD is power up. If the counter is configured as counting up, the init value is 0 or else, it is the preset value.

COUNTER MODE 3 (FIXED COUNT, RETENTIVE)

Mode 3 Counter operation is similar to Mode 1 except its current count value is retentive when Counter powers down. So, the current value won't be init value when Counter powers up, but be the value when it powering down. Mode 3 Counter will count up to a fixed preset value and stop counting at that value, or stop counting when its current value is 0 if it's configured as down counter. Additionally, the current count value is retentive when the LRD switches between RUN and STOP if "C Keep" is active. In the example below, the counter will stop counting when it reaches the preset value of 20. Counter status bit C01 will be ON when the current value is 20.



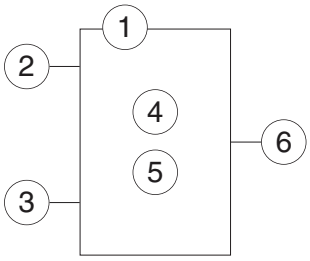


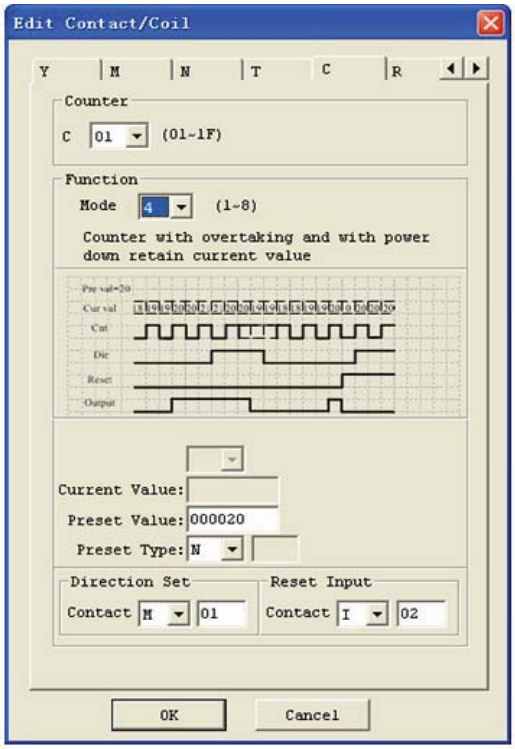


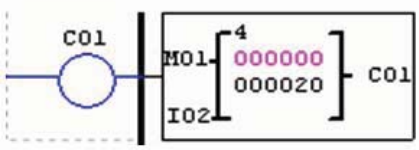
This mode is similar to mode 1, but:
- The current counter value will keep on a loss of power when the LRD status is RUN;
- The current counter value will keep when the LRD switches between RUN and STOP if C-keep is active.

COUNTER MODE 4 (CONTINUOUS COUNT, RETENTIVE)

Mode 4 Counter operation is similar to Mode 2 except its current count value is retentive. The current count value is retentive and will keep its current count after a loss of power to the LRD relay. Mode 4 Counter will count up to a fixed preset value and then continue counting after the preset value, but it won't count when the current value equals 0 if it's configured as down Counter. Additionally, the current count value is retentive when the LRD switches between RUN and STOP if "C Keep" is active. In the example below, the counter will continue counting after its preset value of 20. Counter status bit C01 will be ON when the current value isn't less than 20.





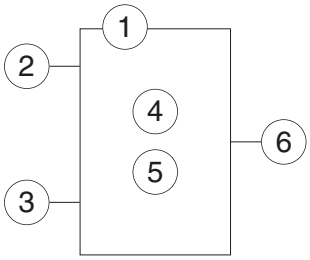


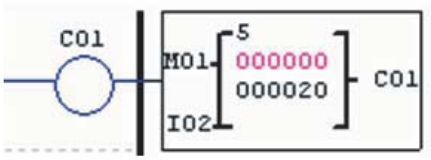
This mode is similar to mode 2, but:
- The current counter value will be kept on a loss of power when the LRD status is RUN;
- The current counter value will be kept when the LRD switches between RUN and STOP if "C-keep" is active.

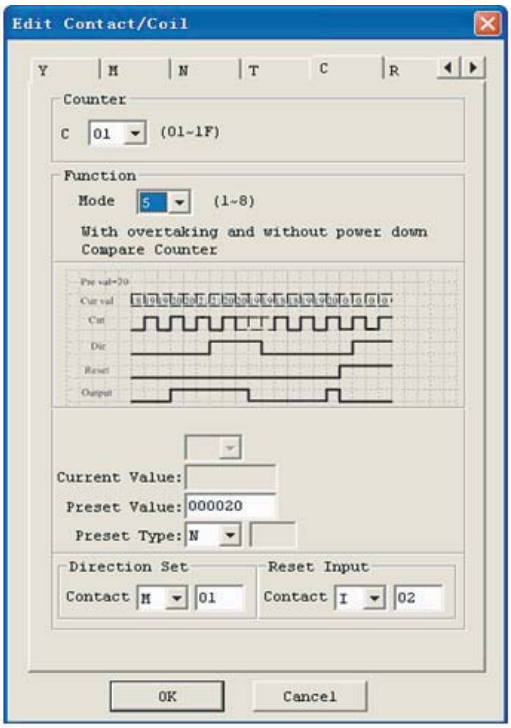
COUNTER MODE 5 (CONTINUOUS COUNT, UP-DOWN COUNT, NON-RETENTIVE)

Mode 5 Counter operation is similar to Mode 2 except its current count value is continuous and non-retentive. The status bit is fixed to the non-zero preset value regardless of the state of the direction bit. Its status bit will be ON when the counter current value is not less than its preset value, and will be OFF when the current value is less than its preset value.

The Mode 5 Counter will count up to a fixed preset value and continue counting after the preset value. Additionally, the current count value is non-retentive and will reset to 0 on a loss of power to the LRD relay. Additionally, the Mode 5 counter is always reset to zero, and the current value also is always 0 when the LRD switches between RUN and STOP unrelated to the state of its direction bit. In the example below, the counter will continue counting after its preset value of 20. Counter status bit C01 will be ON when the current value is 20.







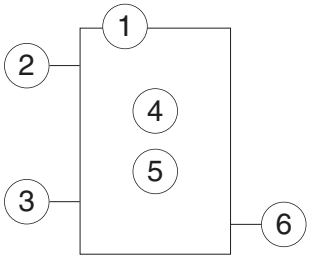
Mode = 5

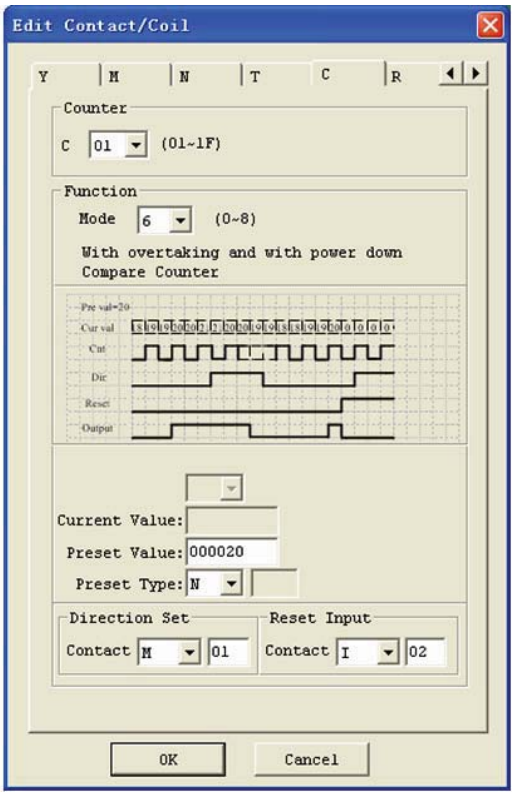
Set value	20																			
Current value	0	19	19	20	20	21	21	20	20	19	19	18	18	19	19	20	0	0	0	0
Input pulse																				
Input decrement	OFF							ON					OFF					ON		
Reset input	OFF																	ON		
Counter coil	OFF			ON							OFF					ON		OFF		

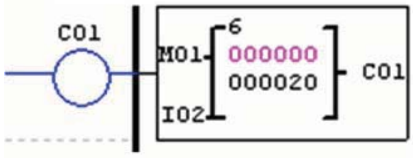
– Under this mode, the count will continue after reaching its preset value;
– The current value is always 0 regardless of the state of its direction bit when the reset is availability;
– The current value is always 0 regardless of the state of its direction bit when the LRD switches between RUN and STOP.

COUNTER MODE 6 (CONTINUOUS COUNT, UP-DOWN COUNT, RETENTIVE)

Mode 6 Counter's operation is similar to Mode 4 except its current count value is continuous and retentive. The status bit is fixed to the non-zero preset value regardless of the state of the direction bit. Its status bit will be ON when the counter current value isn't less than its preset value, and will be OFF when the current value is less than its preset value. Additionally, the Mode 6 counter is always reset to zero, unrelated to the state of its direction bit. The current count value is retentive and will keep its current count after a loss of power to the LRD relay. And Counter will keep current value if "C Keep" is active. In the example below, the counter will continue counting after its preset value of 20. Counter status bit C01 will be ON when the current value isn't less than 20.

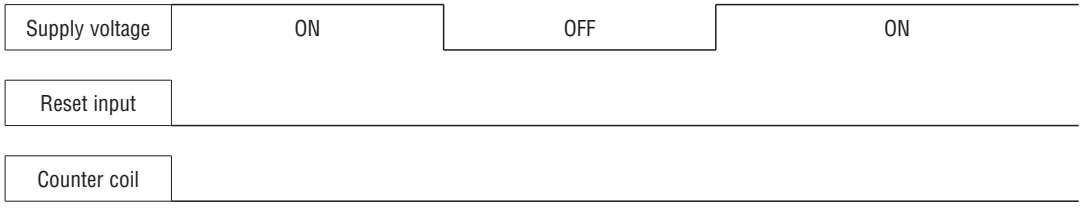






Mode = 6

Set value	20																				
Current value Mode 1&2&5	0	1	1	2	2	3							0	1	1	2	2	3			
Current value Mode 3&4&6	0	1	1	2	2	3							3	4	4	5	5	6			
Input pulse																					



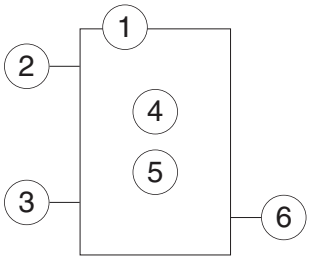
This mode is similar to mode 5, but:
- The current value is kept on a loss of power down to the LRD when it status is RUN;
- The current value is kept when the LRD switches between RUN and STOP if "C Keep" is active.

HIGH SPEED COUNTERS (DC VERSION ONLY)

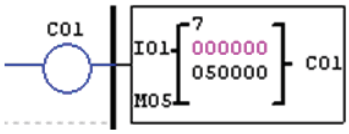
The DC powered version LRD relays include two 1 KHz high speed inputs on terminal I01 and I02. These can be used as general purpose DC inputs or can be wired to a high speed input device (encoder, etc.) when configured for high speed counting. They are often used for counting something moving very fast (>40Hz) or used as a speed reference on a machine. The high speed counters are configured using the same software Edit Contact/Coil dialog box, except selecting Counter Mode 7 or Mode 8.

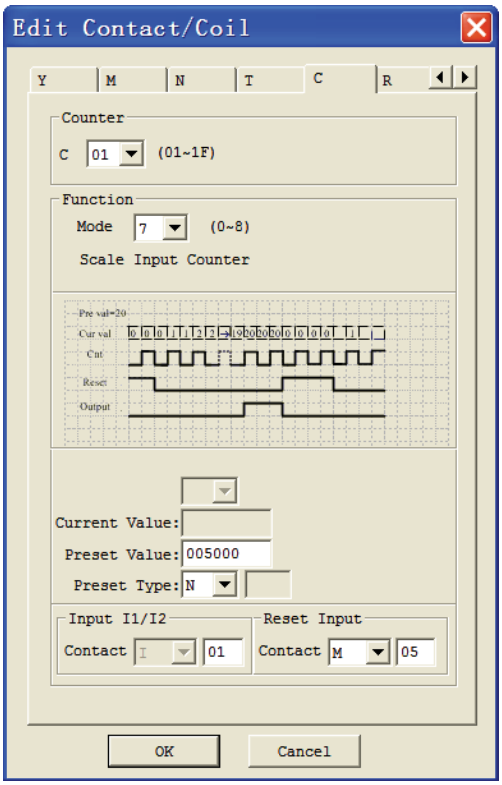
HIGH SPEED COUNTER MODE 7 (DC POWERED VERSIONS ONLY)

The Mode 7 High Speed Counter can use either input terminals I01 or I02 for forward up-counting to 1 KHz maximum at 24VDC high speed input signal. The selected Counter Coil (C01-C1F) will turn ON when the pulse count reaches preset value and remain ON. The counter will reset when the preceding rung is inactive or the Reset Input is active. In the example below shows the relationship among the numbered block diagram for a Mode 7 Counter, the ladder diagram view, and the software Edit Contact/Coil dialog box.



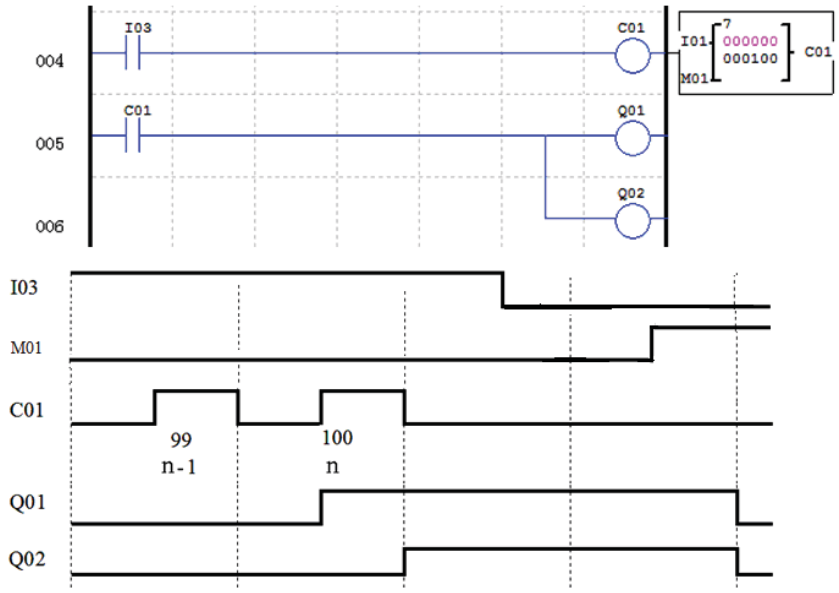
Symbol	Description
1	Counting Mode (7) high speed counting
2	High speed counting input terminal: I01 or I02 only
3	Use (I01~g1F) to Reset the counting value ON: the counter reset to 0 OFF: the counter continues to count
4	Current Count Value, range: 0~999999
5	Preset Value, range: 0~999999
6	Counter Coil Number (C01~C1F total: 31 counters)





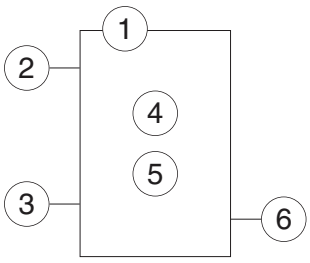
Mode = 7

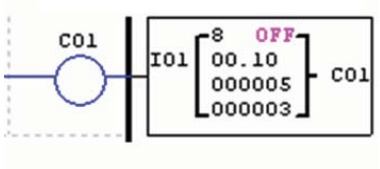
Set value	20											
Current value	0	0	1	1	—	—	49999	50000	50000	50000	0	0
Input pulse												
Reset input	ON					OFF						ON
Counter coil		OFF							ON		OFF	

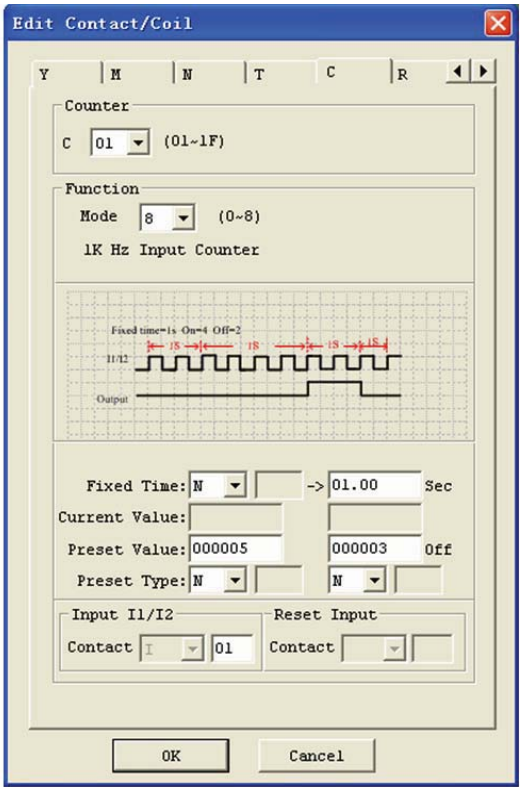


HIGH SPEED COUNTER MODE 8 (DC POWERED VERSIONS ONLY)
The Mode 8 High Speed Counter can use either input terminals I01 or I02 for forward up-counting to 1 KHz maximum at 24VDC high speed input signal. The selected Counter Coil (C01-C1F) will turn ON when the pulse count reaches the target "Preset ON" value and remain ON until the pulse count reaches the target "Preset OFF" value. The counter will reset when the preceding rung is inactive. The table below describes each configuration parameter for High Speed Counter Mode 8.

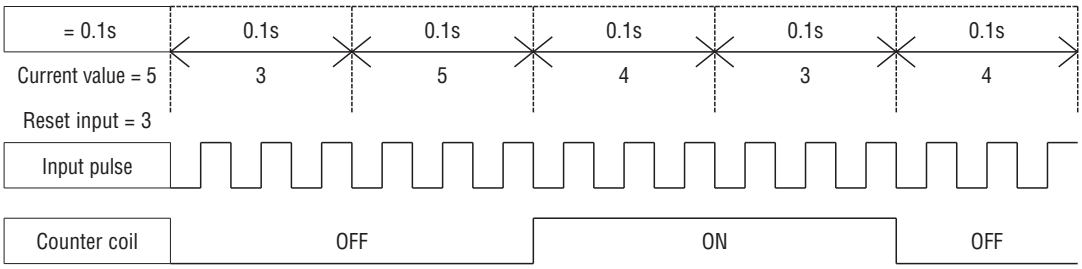
Symbol	Description
1	Counting Mode (8) high speed counting
2	High speed counting input terminal: I01 or I02 only
3	Counting interval time: 0~99.99 sec
4	Counter 'on' preset Value, range: 0~999999
5	Counter 'off' preset Value, range: 0~999999
6	Counter Coil Number (C01~C1F total: 31 counters)





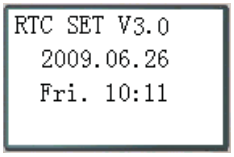


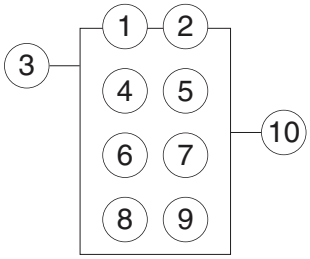
Mode = 8



REAL TIME CLOCK (RTC) INSTRUCTIONS

The LRD relay includes a total of 31 separate RTC instructions that can be used throughout a program. Each RTC instruction has a choice of 5 operation modes, and has 10 parameters for proper configuration. The initial clock/calendar setting for each connected LRD is set using the **Operation»RTC Set** menu selection from the LRD Client software.

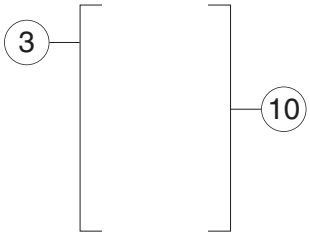


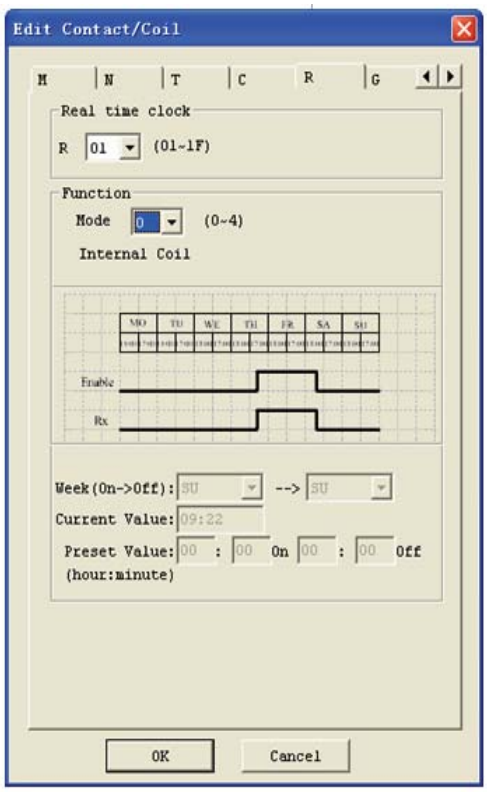


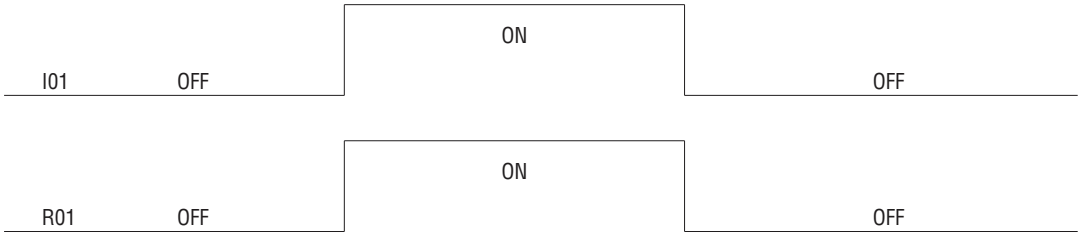
Symbol	Description
1	Input the first week to RTC
2	Input the second week to RTC
3	RTC mode 0~2, 0: internal coil 1:daily, 2:consecutive days
4	RTC displays the hour of present time.
5	RTC displays the minute of present time
6	Set RTC hour ON
7	Set RTC Minute ON
8	Set RTC Hour OFF
9	Set RTC Minute OFF
10	RTC Coil Number (R01~R1F Total: 31 RTC)

RTC MODE 0 (INTERNAL COIL)

Mode 0 RTC (Internal Coil) used as internal auxiliary coils. No preset value. In the example below shows the relationship among the numbered block diagram for a Mode 0 RTC, the ladder diagram view, and the software Edit Contact/Coil dialog box..



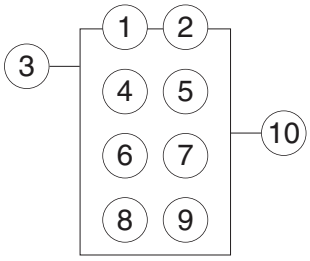


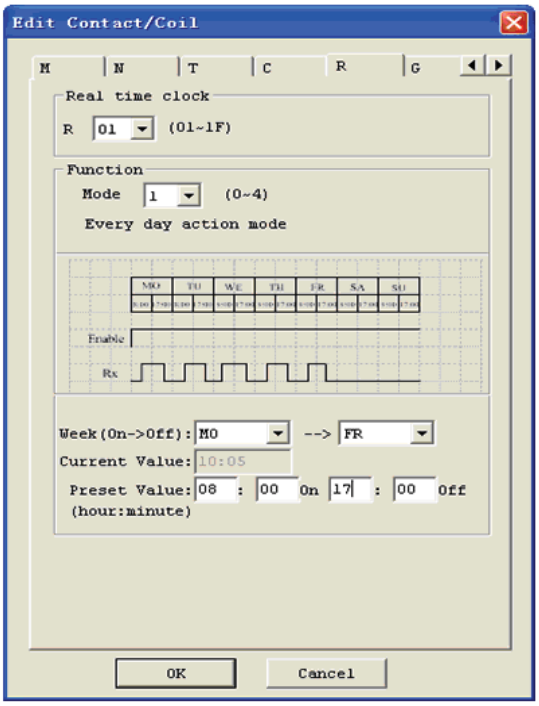


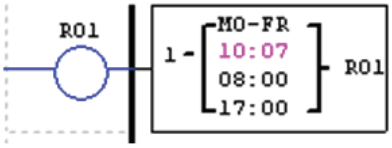
RTC MODE 1 (DAILY)

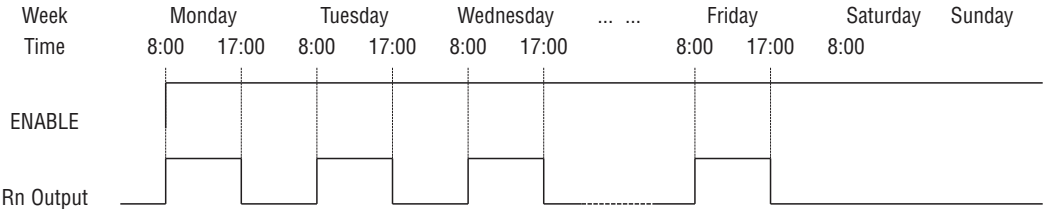
The Daily Mode 1 allows the Rxx coil to active based on a fixed time across a defined set of days per week. The configuration dialog below (example 1) allows for selection of the number of days per week (i.e. Mon-Fri) and the Day and Time for the Rxx coil to activate ON, and the Day and Time for the Rxx coil to deactivate OFF.

Example 1:



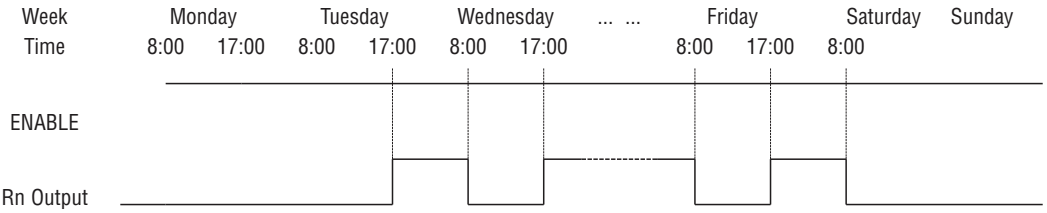






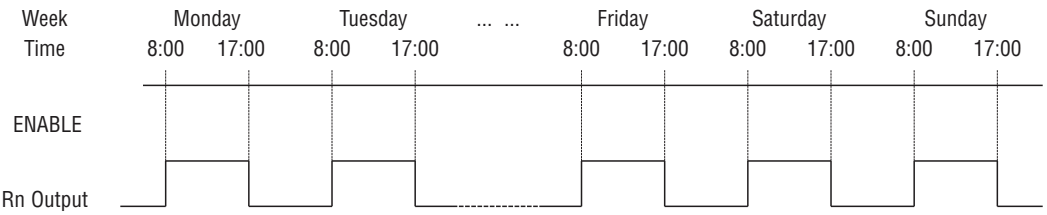
Example 2

③	1
① : ②	TU-FR
⑥ : ⑦	17:00
⑧ : ⑨	8:00



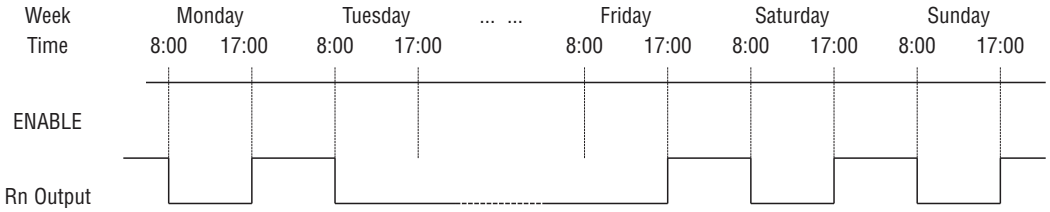
Example 3:

③	1
① : ②	FR-TU
⑥ : ⑦	8:00
⑧ : ⑨	17:00



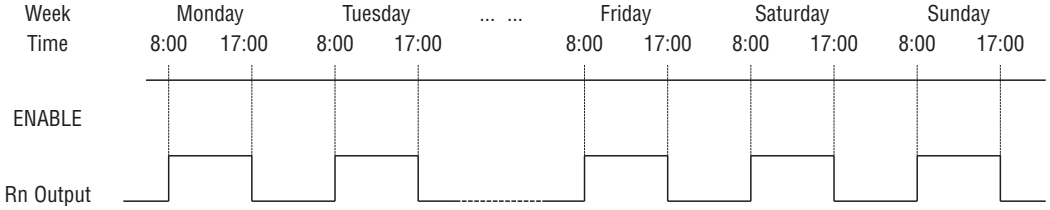
Example 4:

③	1
① : ②	FR-MO
⑥ : ⑦	17:00
⑧ : ⑨	8:00



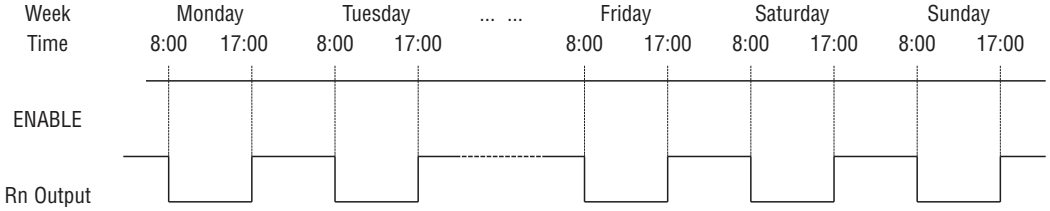
Example 5:

③	1
① : ②	SU-SU
⑥ : ⑦	08:00
⑧ : ⑨	17:00



Example 6:

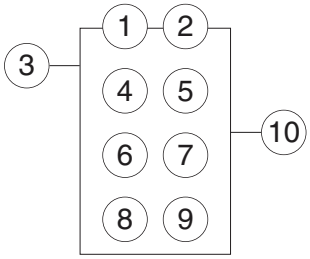
③	1
① : ②	SU-SU
⑥ : ⑦	17:00
⑧ : ⑨	8:00

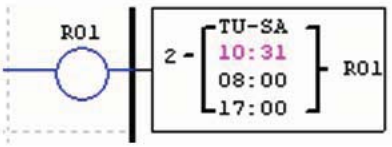


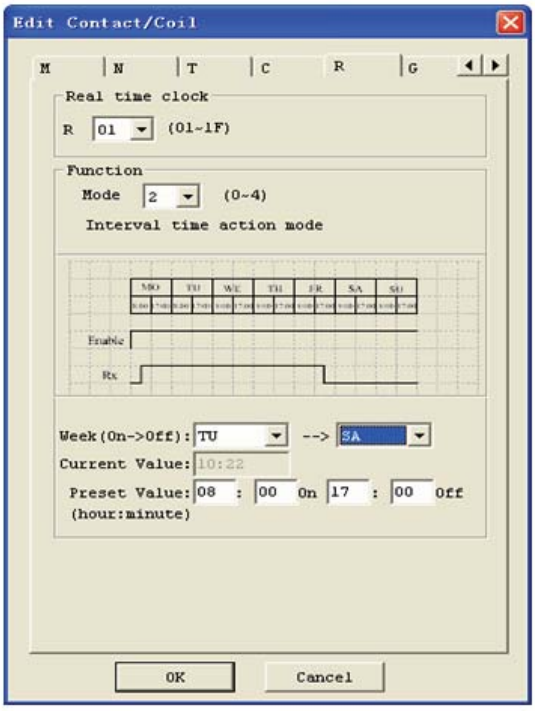
RTC MODE 2 (INTERVAL WEEKLY)

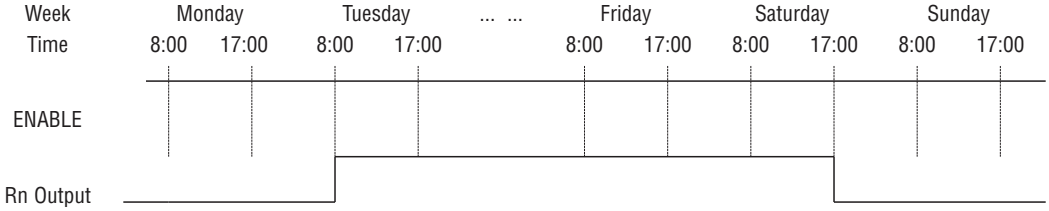
The Interval Time Mode 2 allows the Rxx coil to activate based on time and day per week. The configuration dialog below (example 1) allows for selection of Day and Time for the Rxx coil to activate ON, and Day and Time for the Rxx coil to deactivate OFF.

Example 1:



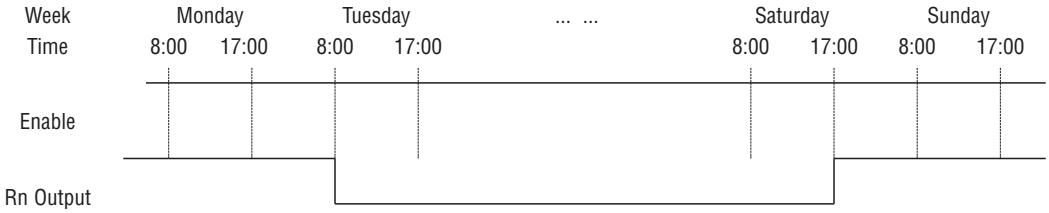






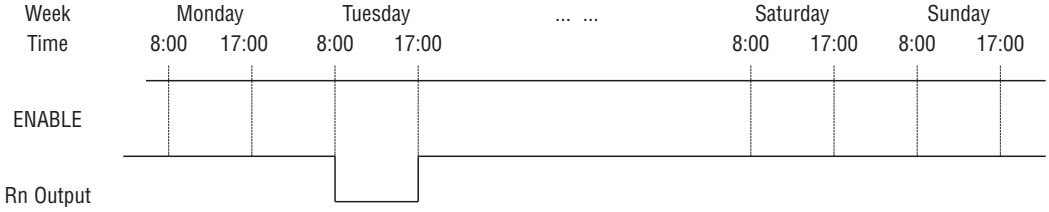
Example 2

③	2
① : ②	SA-TU
⑥ : ⑦	17:00
⑧ : ⑨	08:00



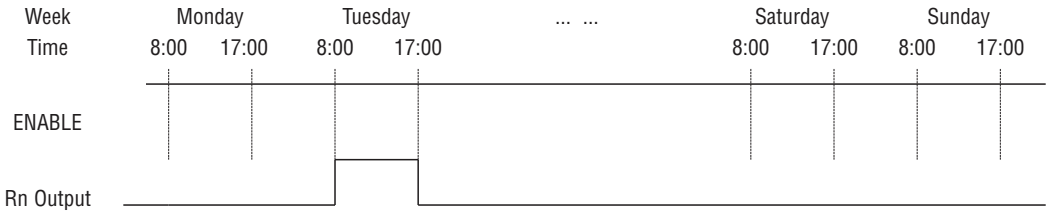
Example 3

③	2
① : ②	WE-WE
⑥ : ⑦	17:00
⑧ : ⑨	08:00

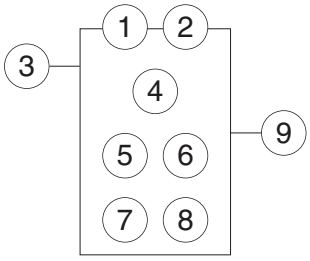


Example 4

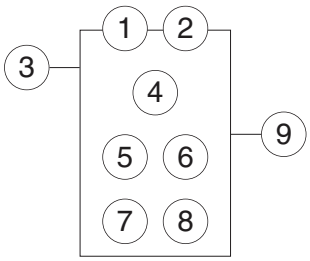
③	2
① : ②	WE-WE
⑥ : ⑦	08:00
⑧ : ⑨	17:00

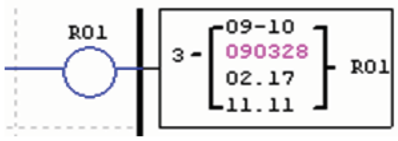


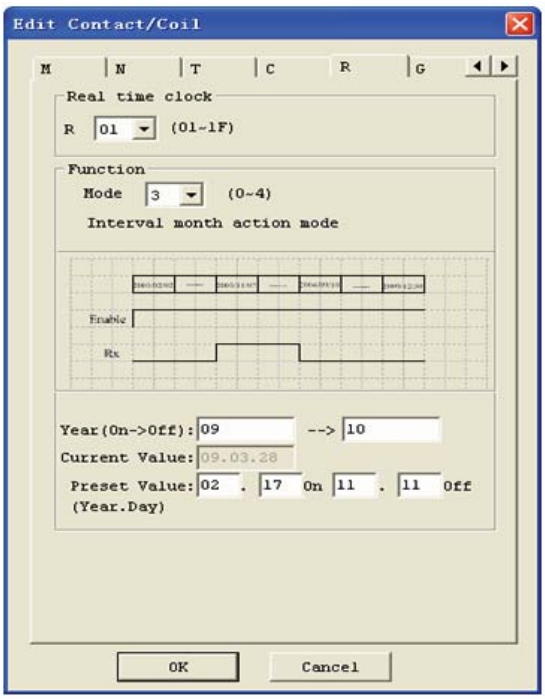
RTC MODE 3 (YEAR-MONTH-DAY)
The Year-Month-Day Mode 3 allows the Rxx coil to activate based on Year, Month, and Date. The configuration dialog below (example 1) allows for selection of Year and Date for the Rxx coil to activate ON, and Year and Date for the Rxx coil to deactivate OFF.

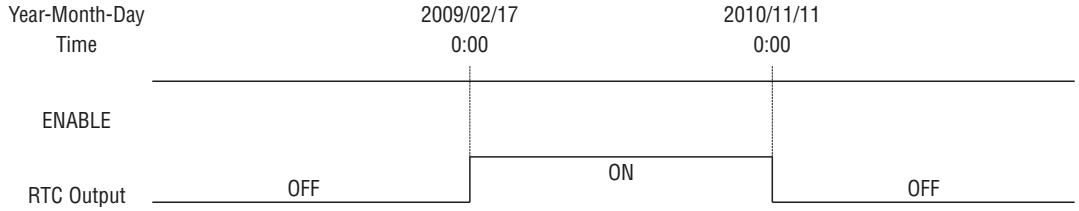


Symbol	Description
1	RTC Year ON
2	RTC Year OFF
3	RTC Mode 3, Year-Month-Day
4	Display RTC present time, Year-Month-Day
5	RTC month ON
6	RTC day ON
7	RTC month OFF
8	RTC day OFF
9	RTC code (R01~R1F, total 31 group)



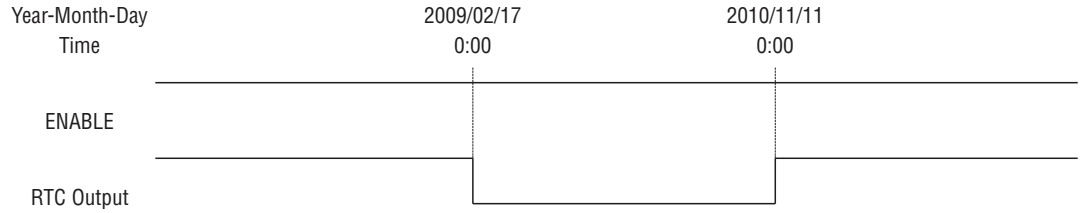






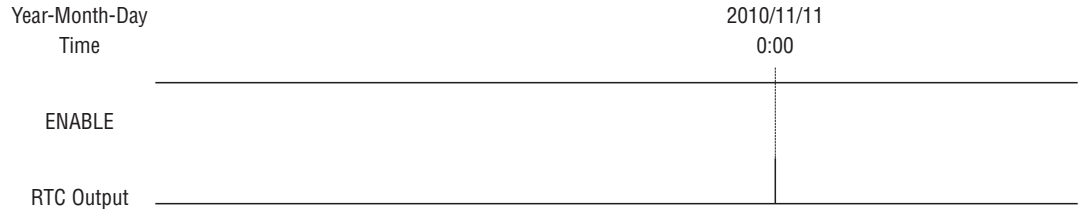
Example 2:

③	3
① / ⑤ / ⑥	2010/11/11
② / ⑦ / ⑧	2009/02/17

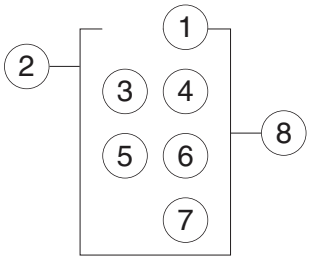


Example 3:

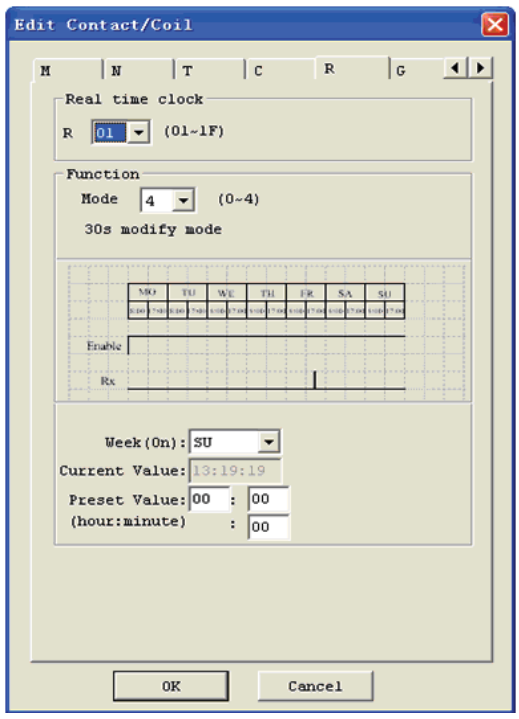
③	3
① / ⑤ / ⑥	2010/11/11
② / ⑦ / ⑧	2010/11/11



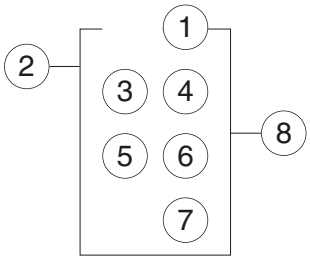
RTC MODE 4 (30-SECOND ADJUSTMENT)
The 30-second adjustment Mode 4 allows the Rxx coil to activate based on week, hour, minute and second. The configuration dialog below shows for selection of week, hour, minute and second for the Rxx coil to activate ON, and 30-second adjustment then Rxx OFF.

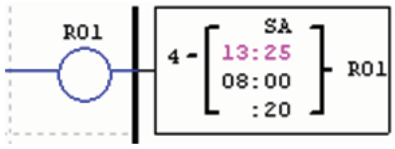


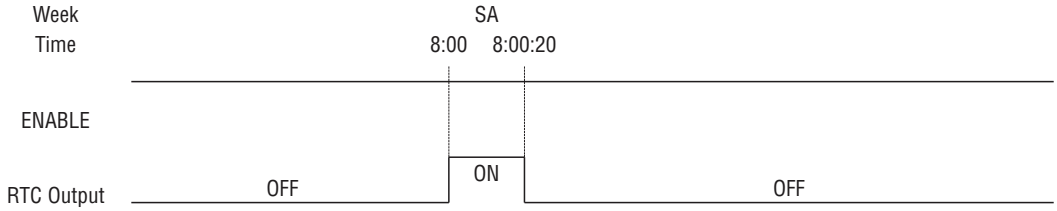
Symbol	Description
1	RTC adjustment week
2	RTC mode 4
3	RTC present hour
4	RTC present minute
5	RTC adjustment hour
6	RTC adjustment minute
7	RTC adjustment second
8	RTC code (R01~R1F, total 31 group)



Example 1: preset second < 30s

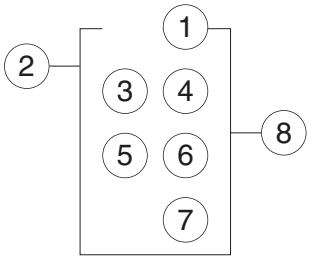


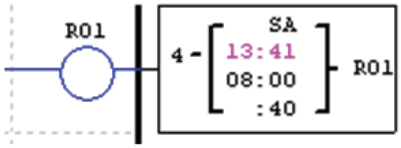


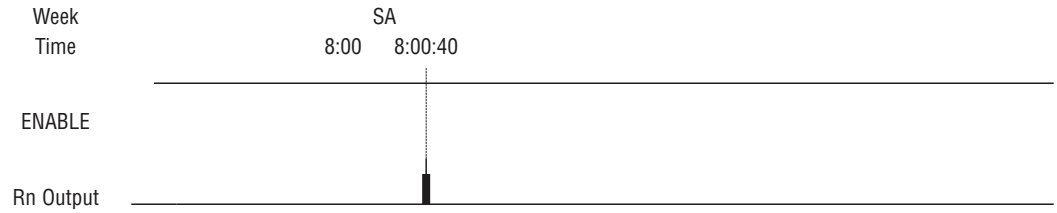


The present time will be 8:00:00 when it achieves 8:00:20 at first time, and RTC status bit R01 will be ON. RTC status bit R01 will be OFF when the present time achieves 8:00:20 at second time. Then time continuous going. So, this means that RTC status bit is ON for 21 seconds.

Example 2: preset second > 30s



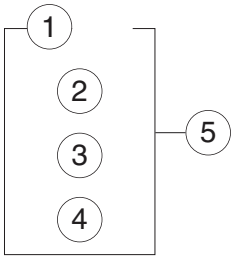




The present time will change to be 8:01:00 when it achieves 8:00:40, and RTC status bit R01 turns ON. Then time is onging on and R01 turns OFF. This means that the RTC status bit will be ON for one pulse.

COMPARATOR INSTRUCTIONS

The LRD relay includes a total of 31 separate comparator instructions that can be used throughout a program. Each comparator has a choice of 8 operation modes. Additionally, each comparator has 5 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring Comparators.

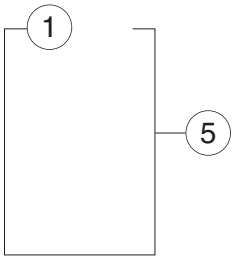


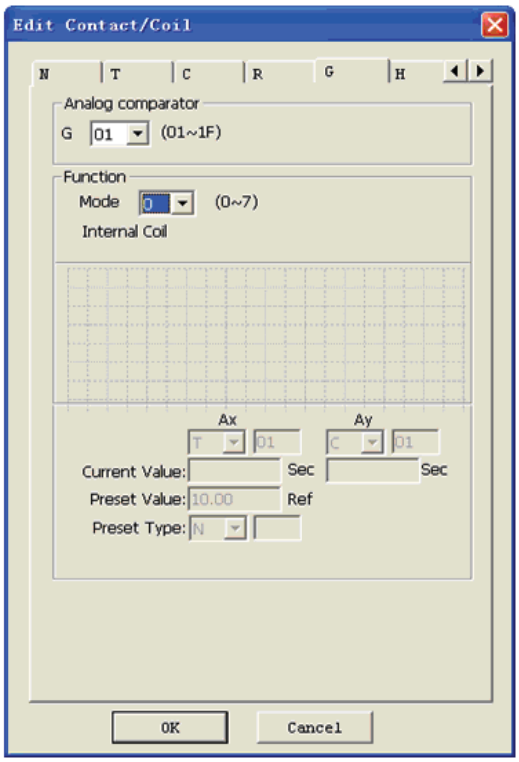
Symbol	Description
1	Comparison Mode (0~7)
2	Ax analog input value (0.00~99.99)
3	Ay analog input value (0.00~99.99)
4	Reference comparative value, could be constant, or other data code
5	Output terminal (G01~G1F)

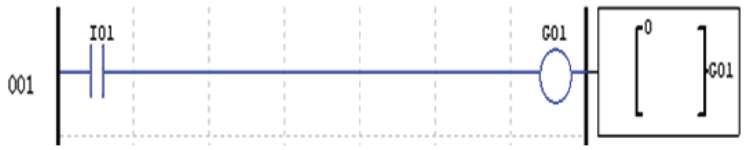
The preset value ②, ③ and ④ can be a constant or other function current value.

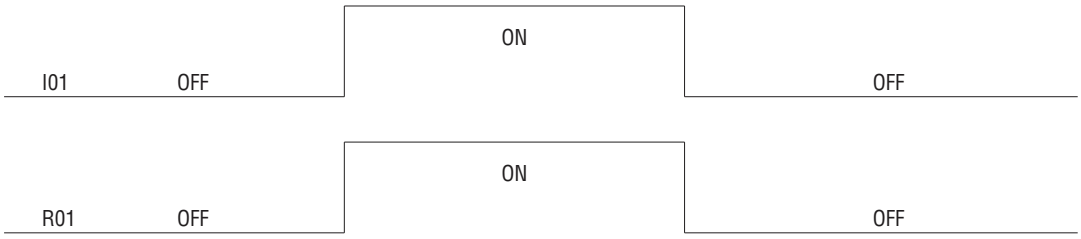
COMPARATOR MODE 0 (INTERNAL COIL)

Mode 0 Comparator (Internal Coil) used as internal auxiliary coils. No preset value. In the example below shows the relationship among the numbered block diagram for a Mode 0 Comparator, the ladder diagram view, and the software Edit Contact/Coil dialog box.





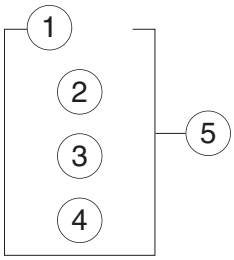


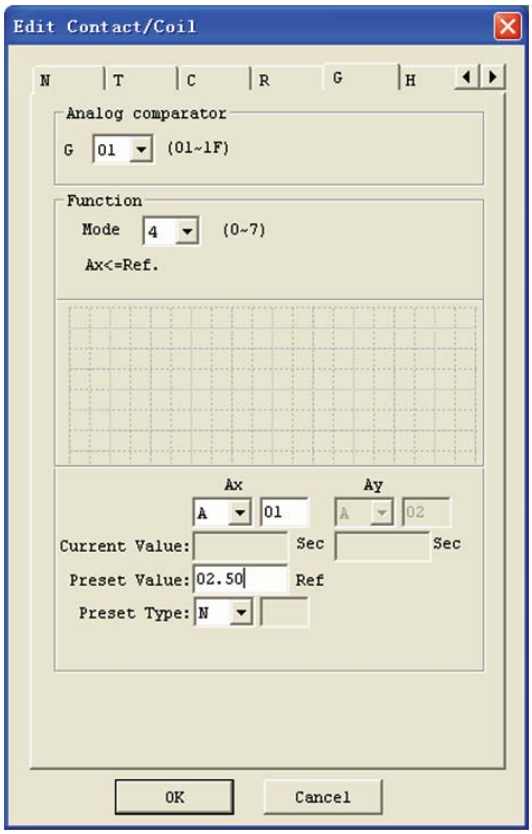


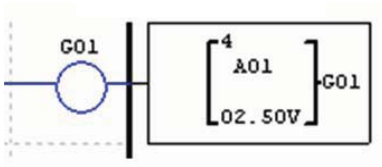
ANALOG COMPARATOR MODE 1~7
(1) Analog Comparator mode 1: *Ay – ④ ≤ Ax ≤ Ay ≤ + ④, ⑤ ON;*
(2) Analog Comparator mode 2: *Ax ≤ Ay, ⑤ ON;*
(3) Analog Comparator mode 3: *Ax ≤ Ay, ⑤ ON;*
(4) Analog Comparator mode 4: *④ ≥ Ax ⑤ ON;*
(5) Analog Comparator mode 5: *④ ≥ Ax ⑤ ON;*
(6) Analog Comparator mode 6: *④ ≥ Ax ⑤ ON;*
(7) Analog Comparator mode 7: *④ ≥ Ax ⑤ ON;*

Example 1: Analog Signal Compare

In the example below, Mode 4 is the selected function that compares the value of analog input A01 to a constant value (N) of 2.50. Status coil G01 turns ON when A01 is not less than constant 2.50.

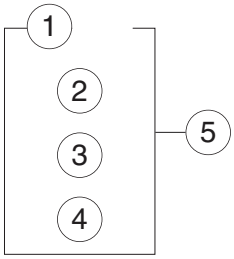


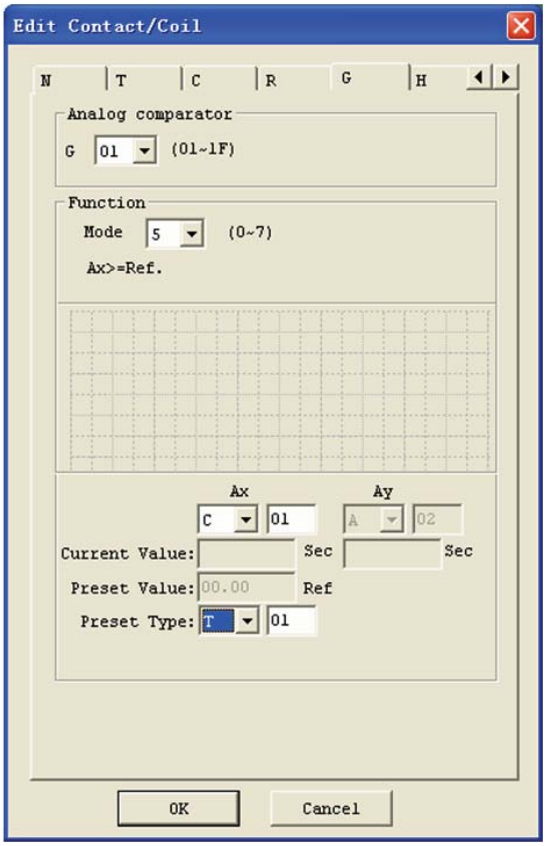


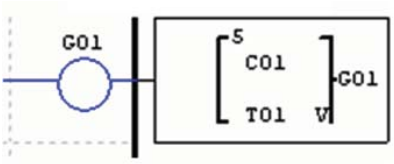


Example 2: Timer/Counter present value Compare

The Comparator instruction can be used to compare Timer, Counter, or other function values to a constant value or each other. In this example below, Mode 5 is the selected function that compares the value of Counter (C01) with the value of Timer (T01). Status coil G01 turns ON if present value of C01 is not less than present value of T01.



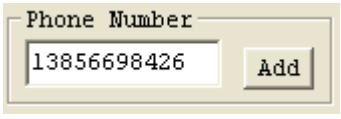




HMI DISPLAY INSTRUCTIONS

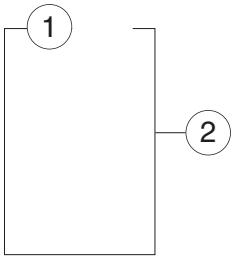
The LRD relay includes a total of 31 HMI instructions that can be used throughout a program. Each HMI instruction can be configured to display information on the LRD 16_4 character LCD in text, numeric, or bit format for items such as current value and preset value for functions, Input/Output bit status, and text. There are three kinds of text in HMI. They are Multi Language, Chinese (fixed) and Chinese (edit), Multi Language is shown in the adjacent example. Each HMI instruction can be configured separately using the Edit>>HMI/Text menu selection from the LRD Client software. In the adjacent example, HMI instruction H01 is configured to display the value of T01, and some descriptive text. Allows the SEL button on the LRD keypad to activate the selected message onto the LCD even the Hxx is inactive.

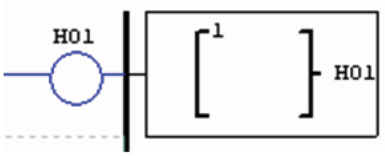
A phone number can be displayed on the screen to alert an operator to call for help. But the phone number field does not dial a modem or allow for a modem connection.

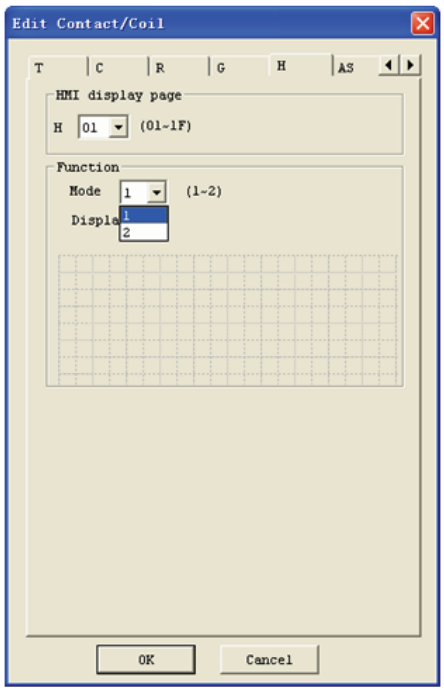


Each HMI instruction has a choice of 2 operation modes. The table below describes each configuration parameter.

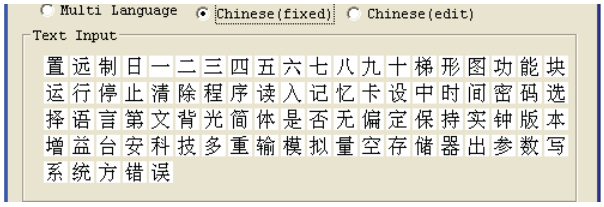
Symbol	Description
1	Display mode (1-2)
2	HMI character output terminal (H01~H1F)

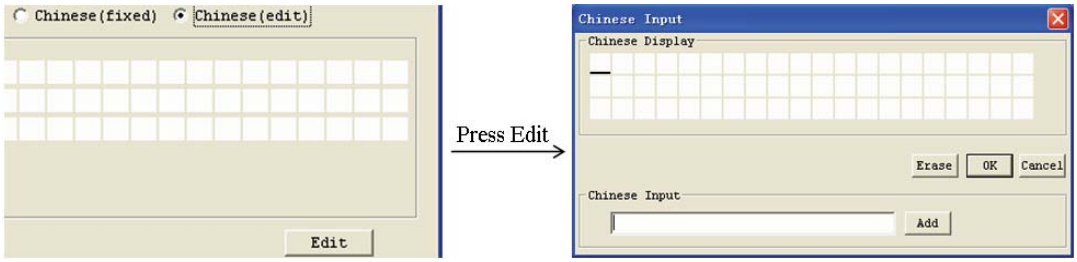






The Chinese (fixed) and Chinese (edit) are shown below. The total number of Chinese (edit) is 60.



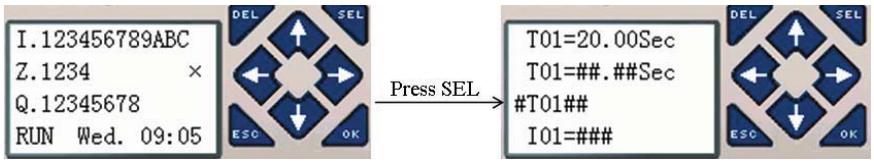


HMI FUNCTION INSTRUCTION

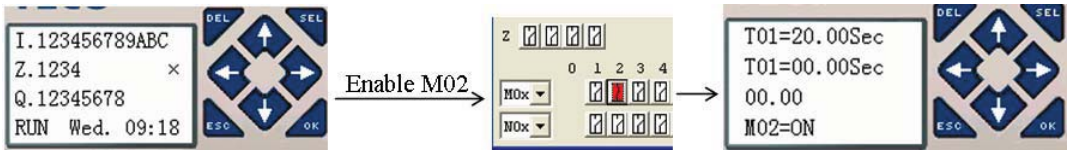
1. HMI can display character, built-in Chinese, user-defined Chinese and GSM telephone number. This information cannot be edited through keypad.
2. HMI can display function current value (T, C, R, G and DR, classifying units and un-units). This information cannot be edited through keypad.
3. HMI can display preset value of function (T, C, R, G and DR). This information can be edited through keypad.
4. HMI display state of coil (I, X, Z, M and N (only FBD)), state of M and N can be edited through keypad.

HMI STATUS

1. HMI scanning state, press SEL into at IO interface

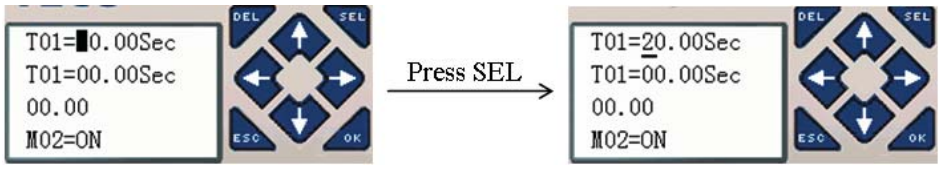


2. HMI running state, HMI is enabled at IO interface



3. HMI edit preparing state, press SEL when HMI is scanning or running state, flicker cursor will show if there is edited content.

4. HMI editing state, press SEL again under status 3



KEYPAD INSTRUCTION

ESC	Abrogate operation
SEL	Into status 3 if there is edited content at status 1 or 2 Into status 4 Change preset type under status 4
↑↓	Under status 4, change data and number, function preset data; change coil state
(SEL+↑↓)	Not in status 4, move cursor up and down Under status 2, find the nearest enabled HMI Under status 1, find the nearest HMI whose mode is 1
← →	Move cursor lift and right
OK	Validate editing and store automatic

PWM OUTPUT INSTRUCTION (DC TRANSISTOR OUTPUT MODELS ONLY)

The transistor output model LRD relay includes the capability to provide a PWM (Pulse Width Modulation) output on terminal Q01 and Q02. The PWM instruction is able to output up to an 8-stage PWM waveform. It also provides a PLSY (Pulse output) output on terminal Q01, whose pulse number and frequency can be changed. The table below describes number and mode of PWM.

	Mode	Output
P01	PWM, PLSY	Q01
P02	PWM	Q02

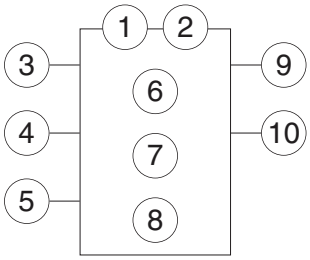
PWM MODE

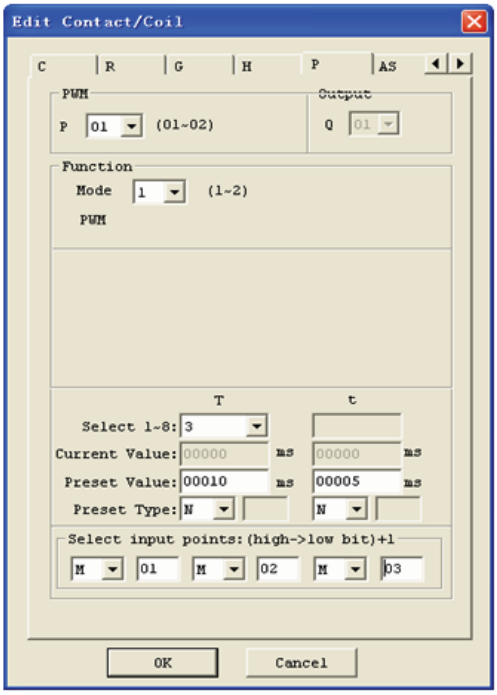
P01 and P02 both can work under this mode. Each PWM has 8 group preset stages which contents Width and Period. The 8 group preset values can be constant or other function current value. Each PWM has 10 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring PWM.

Symbol	Description
–	PWM mode (1)
–	present stages as operating (0~8)
–	Select1 (I01~g1F)
–	Select2 (I01~g1F)
–	Select3 (I01~g1F)
–	Current number of pulse (0~32767)
–	Period of preset stage – (1~32767 ms)
–	Width of preset stage – (1~32767 ms)
–	Output port (Q01~Q02)
–	PWM code (P01~P02)

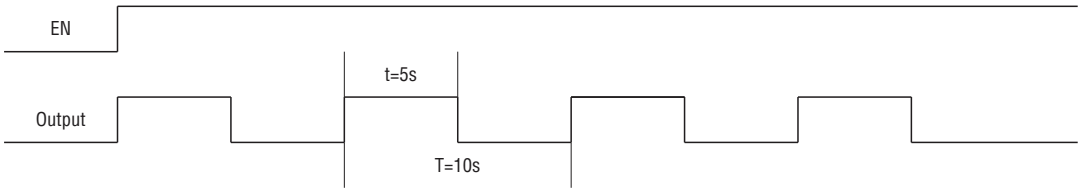
Enable	Select3	Select2	Select1	stage	PWM Output
OFF	X	X	X	0	OFF
ON	OFF	OFF	OFF	1	Preset stage 1
ON	OFF	OFF	ON	2	Preset stage 2
ON	OFF	ON	OFF	3	Preset stage 3
ON	OFF	ON	ON	4	Preset stage 4
ON	ON	OFF	OFF	5	Preset stage 5
ON	ON	OFF	ON	6	Preset stage 6
ON	ON	ON	OFF	7	Preset stage 7
ON	ON	ON	ON	8	Preset stage 8

Example:





The state of M01, M02 and M03 are 010, so PWM output pulse is like this as setting above:



The state of M01, M02 and M03 decide PWM output. PWM stages can be changed by the status of M01, M02 and M03 when P01 is running. _ displays the number of pulse when P01 is running, but _ equals 0 when P01 is disabled.

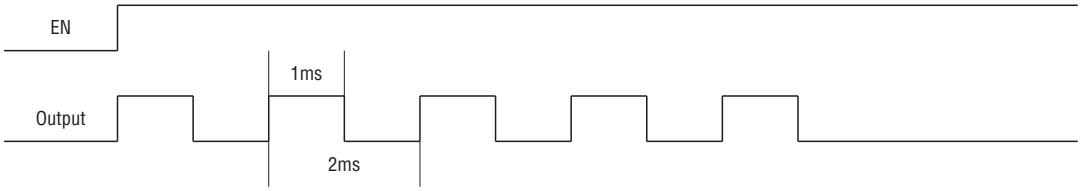
PLSY MODE

Only P01 can work under this mode, and the output is Q01. PLSY has 6 parameters for proper configuration. The table below describes the information of PLSY parameters.

Symbol	Description
1	PLSY mode (2)
2	Total number of pulse (storing in DRC9)
3	Preset frequency of PLSY (1~1000Hz)
4	Preset pulse number of PLSY(0~32767)
5	Output port (Q01)
6	PWM code (P01)

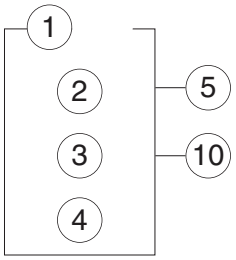
The preset frequency and pulse number could be constant or other function current value. They are variable if the preset are other data code. The PLSY will stop output if it has outputted the number of ④. pulse. PLSY will run again if it is enabled for a second time.

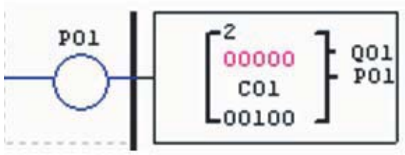
Example:
Parameter setting: ③ = 500Hz ④ = 5, output as shown below:

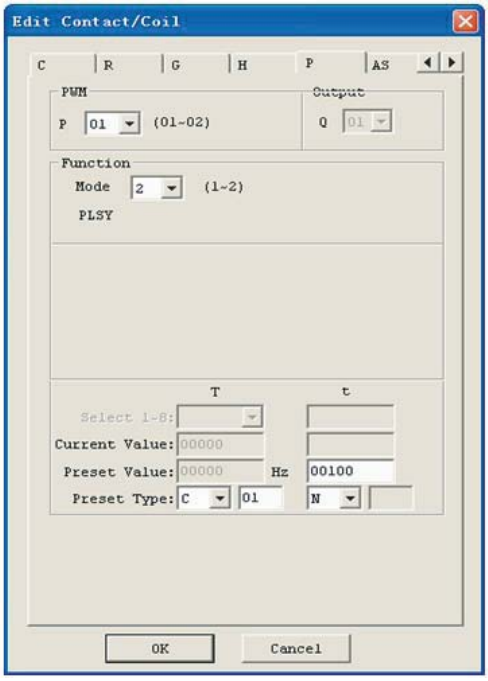


PLSY stops outputting when the number of output pulse is completed.

In the example below, the frequency is other data code (C01). So the wave's frequency will change following the current value of C01.



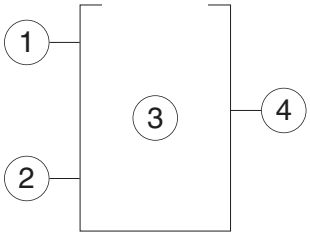




– In the example above, frequency is 1000 if the current value of C01 is bigger than 1000.
– PLSY stops outputting pulse after it has output 100 pulses.
– PLSY will be going on as long as it is enabled if ④ is 0.

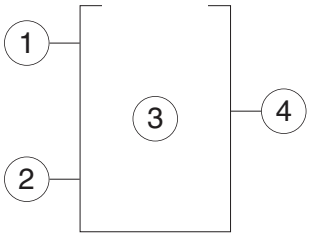
SHIFT (SHIFT OUTPUT)

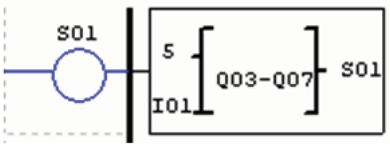
The LRD relay includes only one SHIFT instruction that can be used throughout a program. This function output a serial of pulse on selection points depending on SHIFT input pulse. It has 4 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring SHIFT.

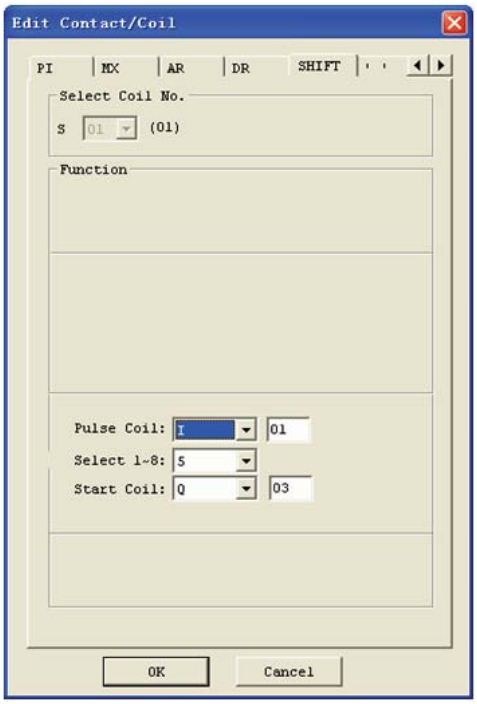


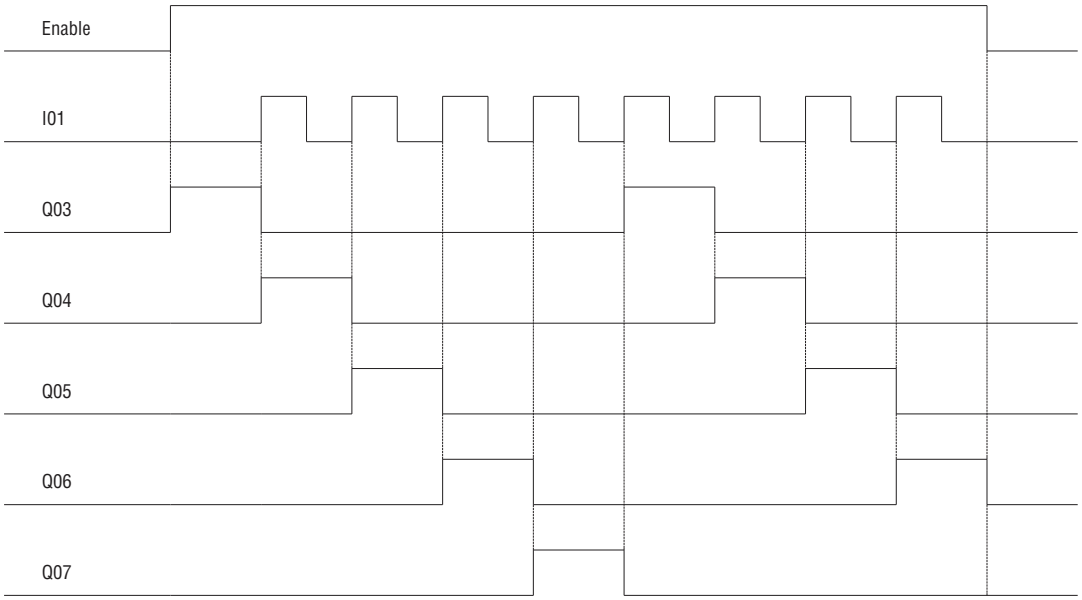
Symbol	Description
1	Preset number of output pulse (1~8)
2	SHIFT input coil (I01~g1F)
3	SHIFT output coils (Q, Y, M, N)
4	SHIFT code (S01)

In the example below, ① = 5, ② = I01, ③: Q03~Q07.









Q03 is ON, and from Q04 TO Q07 are OFF when ENABLE is active. Q04 turns ON when I01's rising edge coming on, and others points turn OFF. The next coil turns ON at each rising edge of SHIFT input, and others turn OFF.

AQ (ANALOG OUTPUT)

The default output mode of AQ is 0-10V voltage, the corresponding value of AQ is 0~1000. It also can be set as 0-20mA current, the corresponding value of AQ is 0~500. The output mode of AQ is set by the current value of DRD0~DRD3 as shown below.

Number	Signification
DRD0	Setting the output of AQ01
DRD1	Setting the output of AQ02
DRD2	Setting the output of AQ03
DRD3	Setting the output of AQ04

Mode	DRD0~DRD3 data definition
1	0: voltage mode, AQ output value is 0 under STOP mode
2	1: current mode, AQ output value is 0 under STOP mode
3	2: voltage mode, AQ keeps output value under STOP mode
4	3: current mode, AQ keeps output value under STOP mode

It will be considered as 0 if the value of DR is not in the range of 0~3. That means the output mode of AQ is mode 1. AQ displays preset value (constant of code of other data) under STOP mode, displays current value under RUN mode. AQ preset value can be a constant or other function current value.

AQ DISPLAY

AQ displays the preset value under STOP mode, and displays the current value under RUN mode.

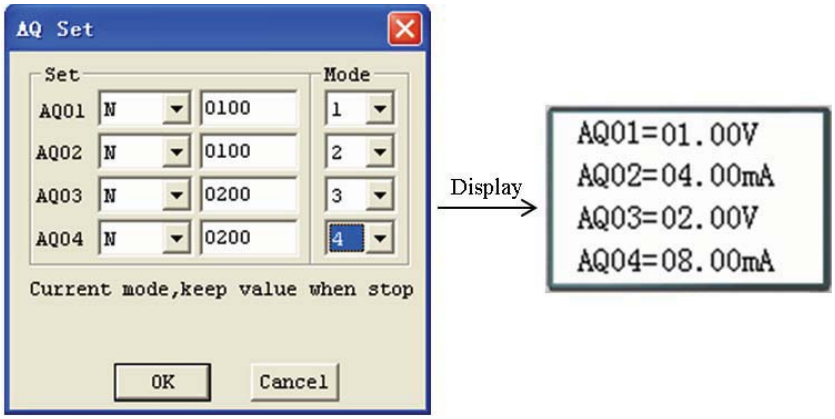
2 number of expansion analog output 2AO; AQ01_AQ04

A Q 0 1 = 0 1 . 2 3 V	
A Q 0 2 = 0 8 . 9 2 m A	0 ~ 10VDC voltage mode (AQ value: 0_1000), depending on DRD0
A Q 0 3 = A 0 1 V	0 ~ 20mA current mode (AQ value: 0_500), depending on DRD1
A Q 0 4 = D R 3 F m A	

The value will be considered if in over-flow when writing AQ preset value or current value through PC communication. So, output mode information should have been written before preset value.

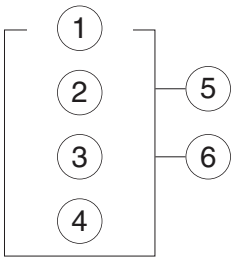
AQ–current_value: 500 = AQ_display_value : 20.00mA

AQ current value is different from display value, and current value is used in operation and storage. AQ display is shown below.



AS (ADD-SUBTRACT)

The LRD relay includes a total of 31AS instructions that can be used throughout a program. The ADD-SUB Addition and/or Subtraction function enables simple operations to be carried out on integers. There are 6 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring AS.

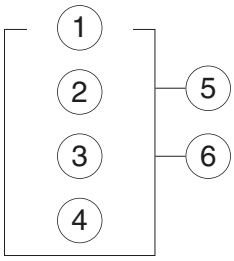


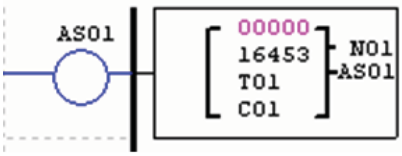
Symbol	Description
1	AS current value (-32768~32767)
2	V1 parameter (-32768~32767)
3	V2 parameter (-32768~32767)
4	V3 parameter (-32768~32767)
5	Error output coil (M, N, NOP)
6	AS code (AS01~AS1F)

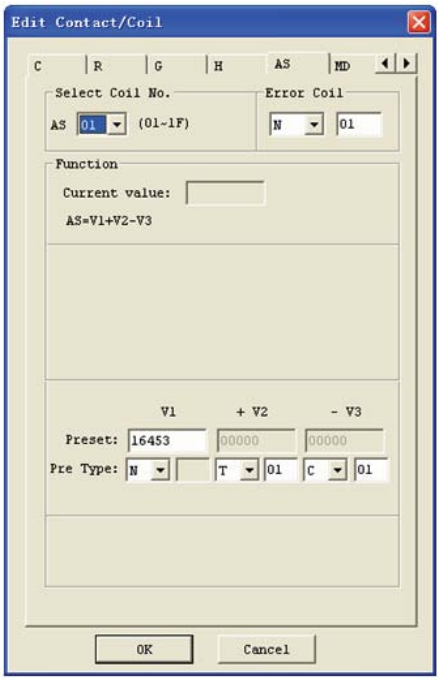
Compute formula: AS = V1 + V2 – V3

AS current value is the result of compute. Parameters V1, V2, and V3 can be a constant or other function current value. The output coil will be set to 1 when the result is overflow. And the current value is no meaning at this time. But it will do nothing if the output coil is NOP. The output coil will turns OFF when the result is right or the function is disabled.

The example below shows how to configure AS function.



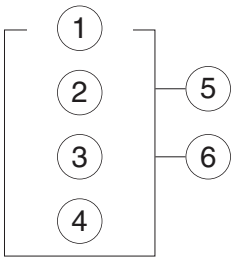




Error output coil N01 will turn ON when the compute result is overflow.

MD (MUL-DIV)

The LRD relay includes a total of 31MD instructions that can be used throughout a program. The MUL-DIV Multiplication and Division function enables simple operations to be carried out on integers. There are 6 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring MD.

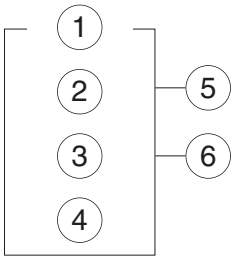


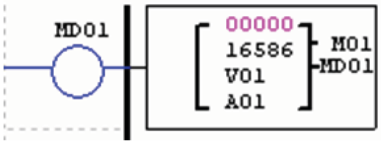
Symbol	Description
1	MD current value (-32768~32767)
2	V1 parameter (-32768~32767)
3	V2 parameter (-32768~32767)
4	V3 parameter (-32768~32767)
5	Error output coil (M, N, NOP)
6	MD code (MD01~MD1F)

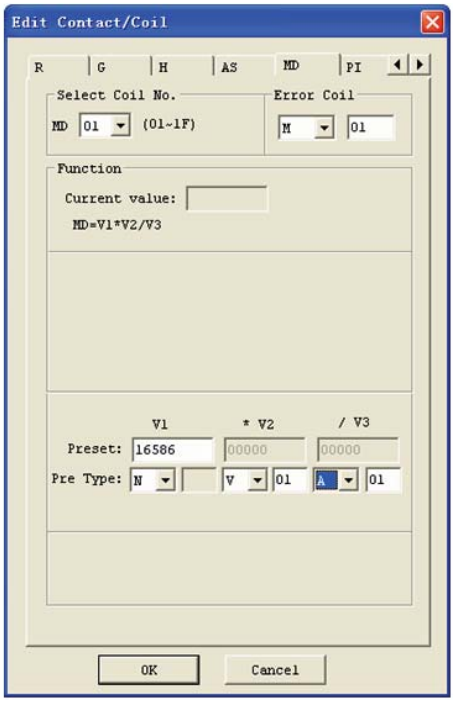
Compute formula: MD = V1 * V2 / V3

MD current value is the result of compute. Parameters V1, V2, and V3 can be a constant or other function current value. The output coil will be set to 1 when the result is overflow. And the current value is no meaning at this time. But it will do nothing if the output coil is NOP. The output coil will turns OFF when the result is right or the function is disabled.

The example below shows how to configure MD function.



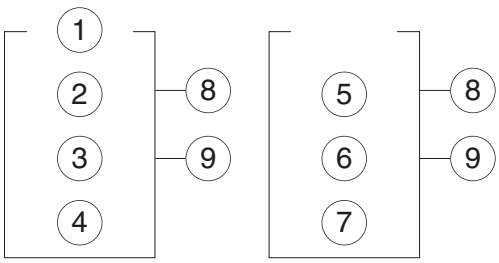




Error output coil M01 will turn ON when the compute result is overflow.

PID (PROPORTION- INTEGRAL- DIFFERENTIAL)

The LRD relay includes a total of 15 PID instructions that can be used throughout a program. The PID function enables simple operations to be carried out on integers. There are 9 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring PID.



Symbol	Description
1	PI: PID current value (-32768~32767)
2	SV: target value (-32768~32767)
3	PV: measure value (-32768~32767)
4	T_S: sampling time (1~32767 * 0.01s)
5	K_P: Proportion (1~32767 %)
6	T_I: Integral time (1~32767 * 0.1s)
7	T_D: Differential time (1~32767 * 0.01s)
8	Error output coil (M, N, NOP)
9	PID code (PI01~PI0F)

The parameters ① and ② can be constant or other function current value. The error coil will turn ON when either T_S or K_P is 0. But it will do nothing if the output coil is NOP. The output coil will turns OFF when the result is right or the function is disabled.
PID computes formula:

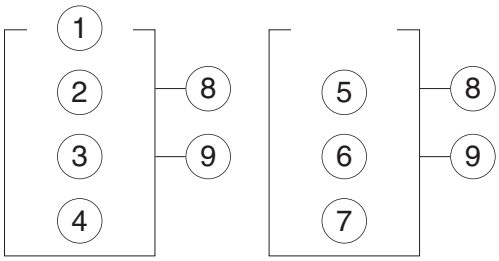
$$EV_n = SV - PV_n$$

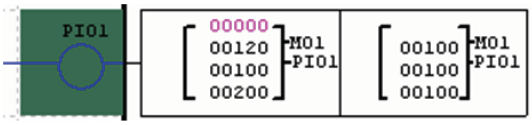
$$PI = K_P \left(EV_n - EV_{n-1}\right) + \frac{T_s}{T_I} EV_n + D_n$$

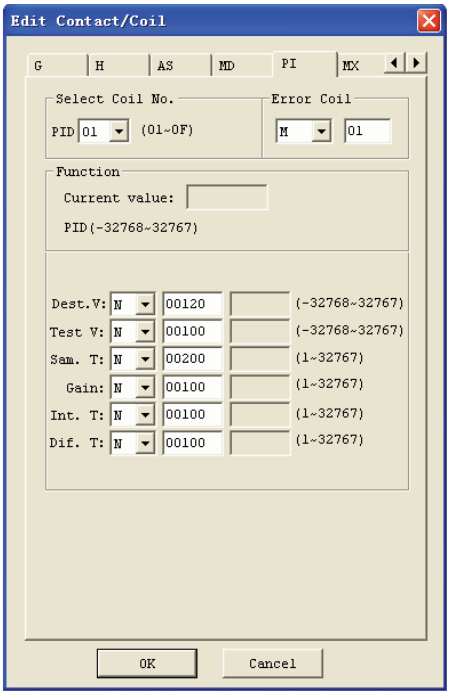
$$D_n = \frac{T_D}{T_S}\left(2PV_{n-1} - PV_n - PV_{n-2}\right)$$

$$PI = \sum PI$$

The example below shows how to configure PID function.

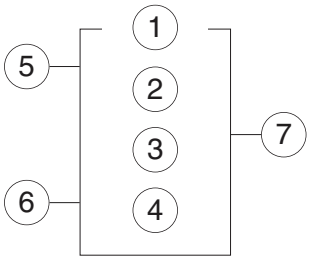






MX (MULTIPLEXER)

The LRD relay includes a total of 15 MX instructions that can be used throughout a program. This special function transmits 0 or one of 4 preset values to MX current value memory. The MX function enables simple operations to be carried out on integers. There are 7 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring MX.

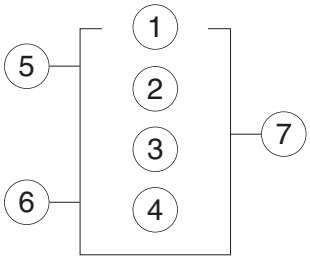


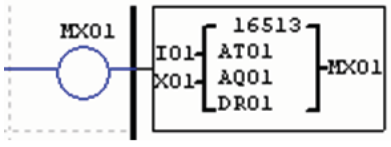
Symbol	Description
1	V1 parameter (-32768~32767)
2	V2 parameter (-32768~32767)
3	V3 parameter (-32768~32767)
4	V4 parameter (-32768~32767)
5	Selection bit 1: S1
6	Selection bit 2: S2
7	MX code (MX01~MX0F)

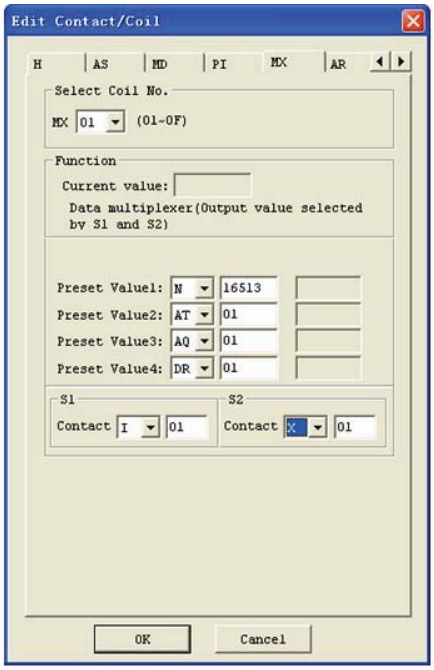
The parameters from ① to ④ can be constant or other function current value. The table below describes the relationship between parameter and MX current value.

disable	MX = 0;
enable	S1=0,S2=0: MX = V1; S1=0,S2=1: MX = V2; S1=1,S2=0: MX = V3; S1=1,S2=1: MX = V4;

The example below shows how to configure MX function.

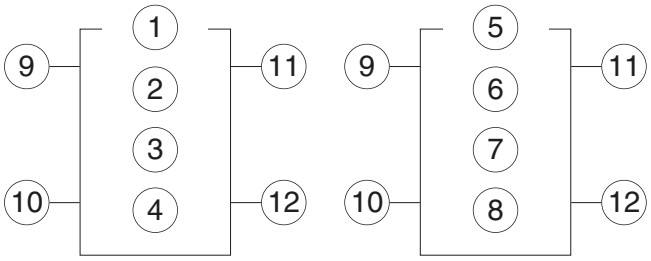






AR (ANALOG-RAMP)

The LRD includes a total of 15 AR instructions that can be used throughout a program. The AR function enables simple operations to be carried out on integers. Analog Ramp instruction allows AR current level to be changed by step from starting level to target level at a specified rate. There are 12 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring AR.



Symbol	Description
1	AR current value: 0~32767
2	Level 1:-10000~20000
3	Level 2:-10000~20000
4	MaxL (max level):-10000~20000
5	start/stop level (StSp): 0~20000
6	stepping rate (rate): 1~10000
7	Proportion (A): 0~10.00
8	Excursion (B): -10000~10000
9	Level selection coil (Sel)
10	Stop selection coil (St)
11	Error output coil (M, N, NOP)
12	AR code (AR01~AR0F)

AR_current_value = (AR_curret_level – B) / A

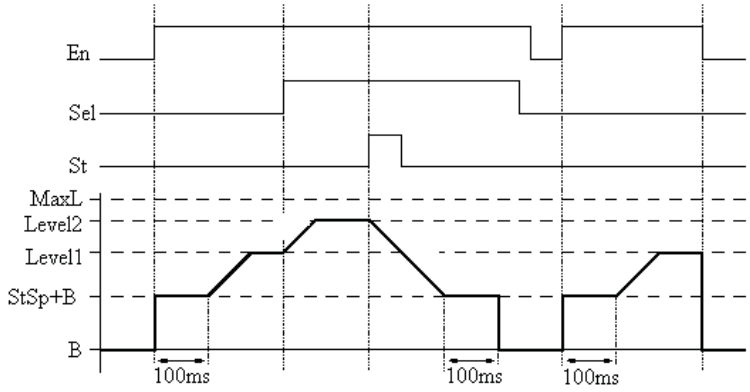
The parameters from ② to ⑧ can be constant or other function current value. The table below describes detailed information of each parameter of AR.

Sel	Selection level Sel = 0: target level = Level1 Sel = 1: target level = Level2 MaxL is used as target level if the selected level is bigger than MaxL.
St	Selection stop coil. The St state goes from 0 to 1 and will start the current level decrease at start/stop level (StSp + excursion “B”), and then keep this level for 100ms. Then AR current level is set to B which will make AR current value equal 0.
Output coil	The output coil turns ON when A is 0.

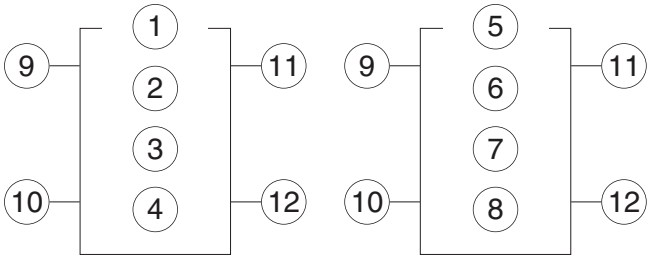
The output coil can be M, N or NOP. The output coil is set when errors happen, but it will do nothing if the output coil is NOP. And the current value is no meaning at this time.

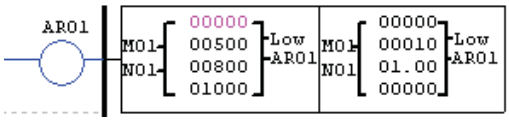
AR will keep the current level at “StSp + Offset "B"” for 100ms when it is enabled. Then the current level runs from StSp + Offset "B" to target level at enactment Rate. If St is set, the current level decreases from current level to level StSp + B at enactment Rate. Then AR holds the level StSp + Offset "B" for 100ms. After 100ms, AR current level is set to offset "B", which makes AR current value equal 0.

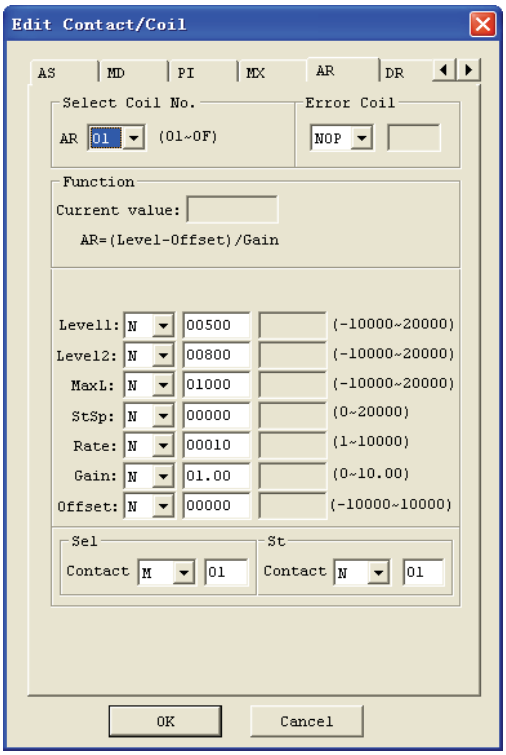
TIMING DIAGRAM FOR AR



The example below shows how to configure AR function.

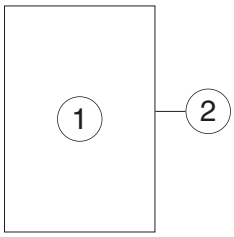






DR (DATA REGISTER)

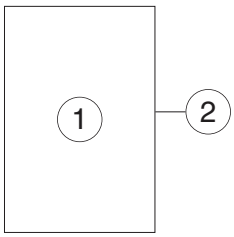
The LRD includes a total of 240 DR instructions that can be used throughout a program. The DR function is transferring data. DR is a temp register. DR sends data from prevention registers to current register when it is enabled. The data can be signed or unsigned by setting DR_SET bit through operation>>module system set menu selection from the LRDSW. There are 2 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible memory type for configuring DR.

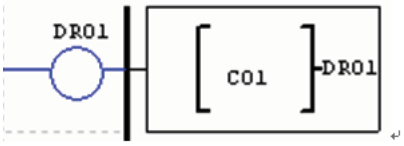


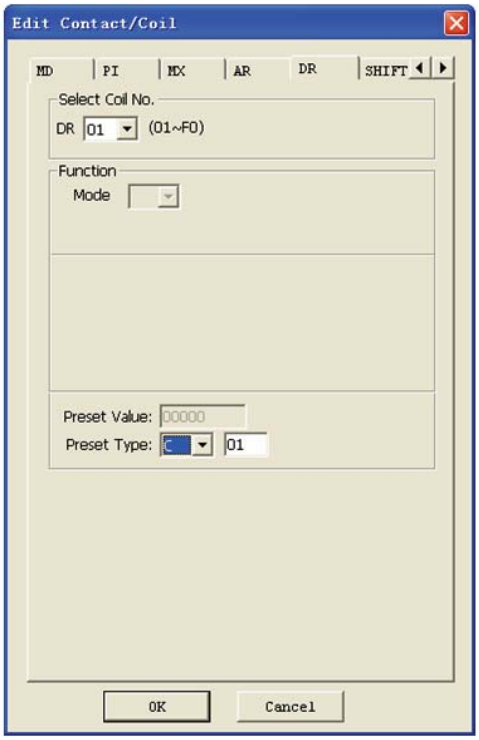
Symbol	Description
1	Preset value: DR_SET = 0, 0~65535 DR_SET = 1,-32768~32767
2	DR code (DR01~DRF0)

The parameter ① can be a constant or other function current value.

The example below shows how to configure DR function.







STOP	RUN (DR01 = C01 current value)
DR01= C01 DR02= 00000 DR03= 00000 DR04= 00000	DR01= 00009 DR02= 00000 DR03= 00000 DR04= 00000

The data registers from DR65 to DRF0 will be kept when the LRD powers down. The last 40 DR that from DRC9 to DRF0 are special data register as shown below. The content of DRC9 is PLSY total number of pulse, and DRD0~DRD3 are output mode registers of AQ01~AQ04, and DRCA~ DRCF, DRD4~ DRF0 are reserved.

DRC9	PLSY total number
DRCA~DRCF	reserved
DRD0	AQ01 output mode register
DRD1	AQ02 output mode register
DRD2	AQ03 output mode register
DRD3	AQ04 output mode register
DRD4~DRF0	reserved

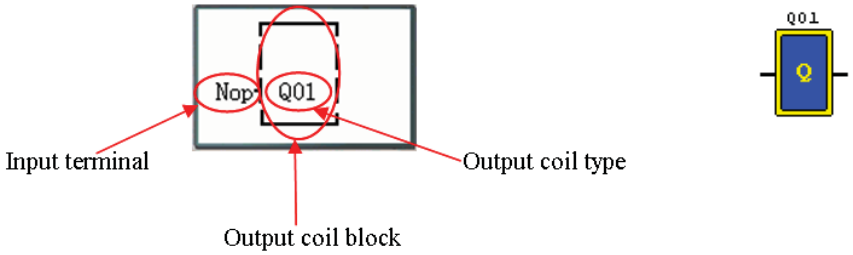
CHAPTER 5: FUNCTION BLOCK DIAGRAM PROGRAMMING

FBD INSTRUCTIONS

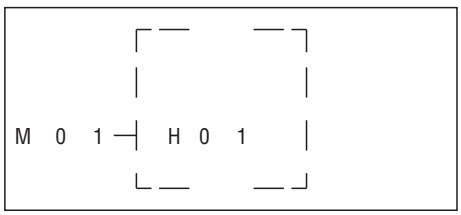
	Input	Output coil	Range
Input	I		12 (I01~I0C)
Keypad input	Z		4 (Z01~Z04)
Expansion input	X		12 (X01~X0C)
Output	Q	Q	8 (Q01~Q08)
Expansion output	Y	Y	12 (Y01~Y0C)
Auxiliary coil	M	M	63(M01~M3F)
Auxiliary coil	N	N	63(N01~N3F)
HMI		H	31 (H01~H1F)
PWM		P	2 (P01~P02)
SHIFT		S	1 (S01)
I/O LINK		L	8 (L01~L08)
Logic/Function Block	B	B	260 (B001~B260)
Normal ON	Hi		
Normal OFF	Lo		
No connection	Nop		
Analog input	A		8 (A01~A08)
Analog input parameter	V		8 (V01~V08)
Analog output		AQ	4(AQ01~AQ04)
Analog temperature input	AT		4(AT01~AT04)

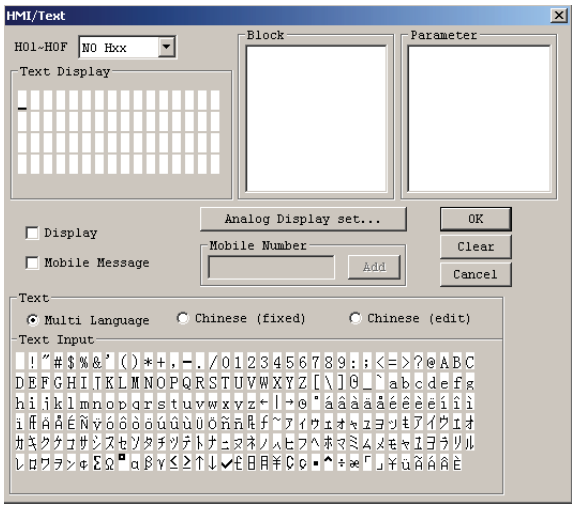
FBD program can only be edited and modified in the LRDSW software and write to LRD controlled equipment via communication cable. Via controlled equipment, FBD program is available for querying or the parameter of the function block of the program for modifying. The preset value of Block could be a constant or other block code. That means the preset value of this block is other block current value.
Each FBD block size is not restricted, it depends on its function.

COIL BLOCK INSTRUCTION



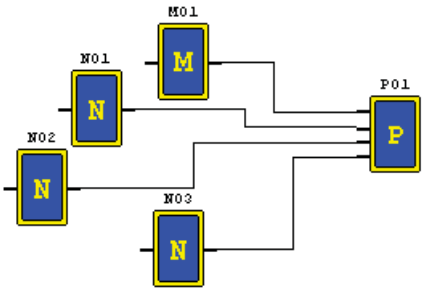
HMI

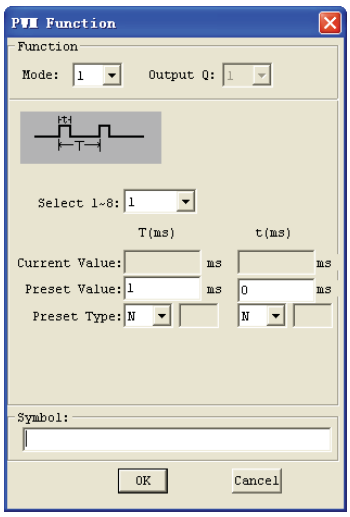


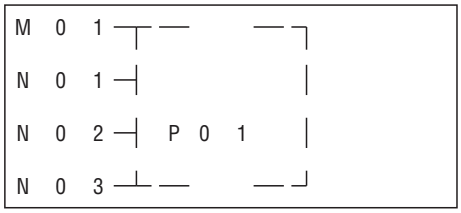


PWM function block (only transistor output version)

PWM MODE
The PWM output terminal Q01 or Q02 can output 8 PWM waveforms.

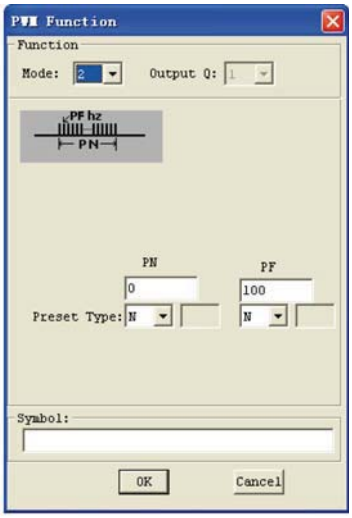


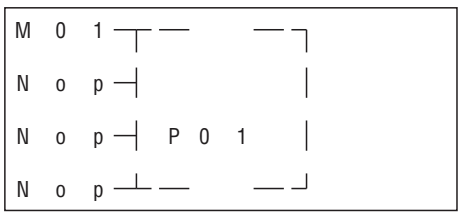




PWM01 Mode: 1
SET 1 Out: 1
TP1=00000
TT1=00001

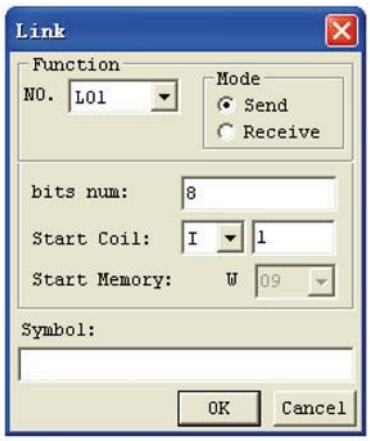
PLSY MODE
The PLSY output terminal Q01 can output preset number of pulse whose frequency is variable from 1 to 1000 Hz.





PWM01 Mode: 2
PF=00100
PN=00000

Data Link function block



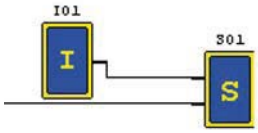
I/O Link01

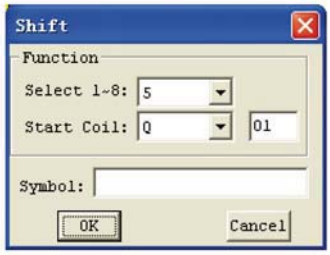
Mode:1 Num:8

I01→W09

I02→W16

SHIFT function block



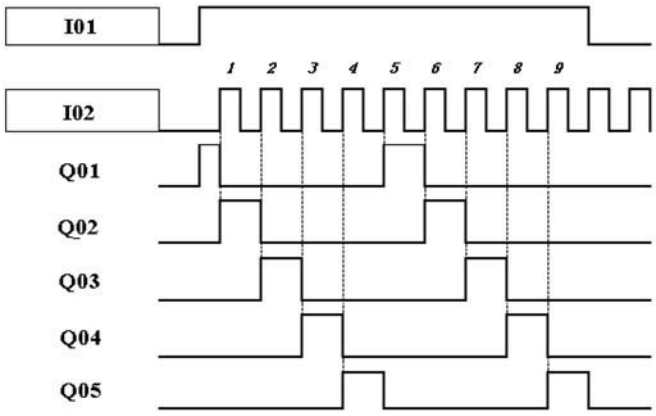


Shift01

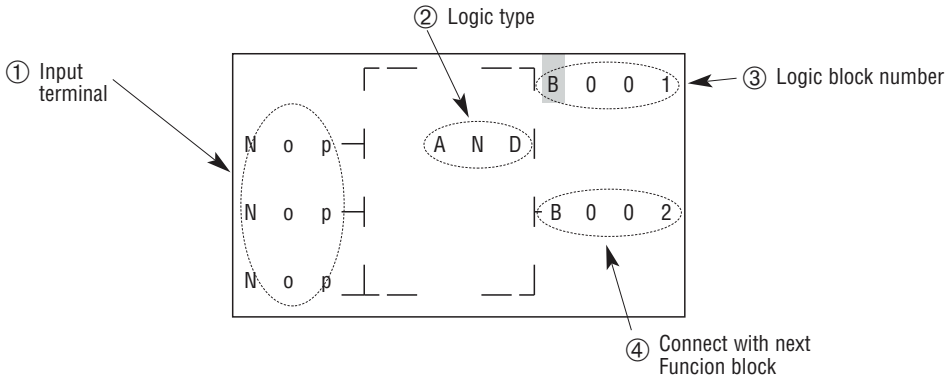
Type:Q01–Q05

Num:5

Timing diagram



LOGIC BLOCK INSTRUCTIONS

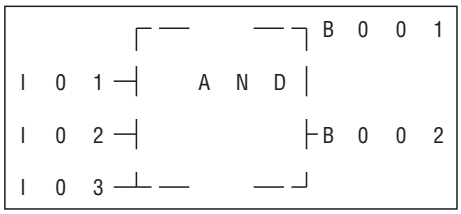


Logic function block source:

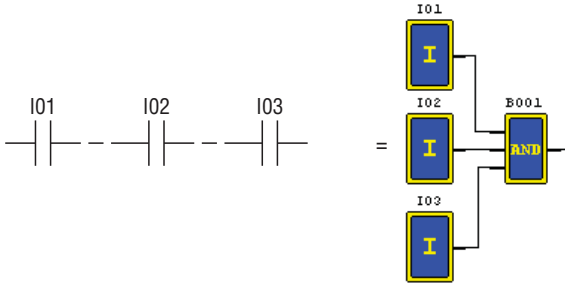
	block	Number(byte)
Total block	260	6000
AND	1	8
AND(EDGE)	1	8
NAND	1	8
NAND(EDGE)	1	8
OR	1	8
NOR	1	8
XOR	1	6
SR	1	6
NOT	1	4
PLUSE	1	4
BOOLEAN	1	12

AND LOGIC DIAGRAM

FBD



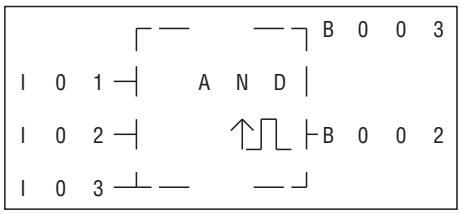
LADDER



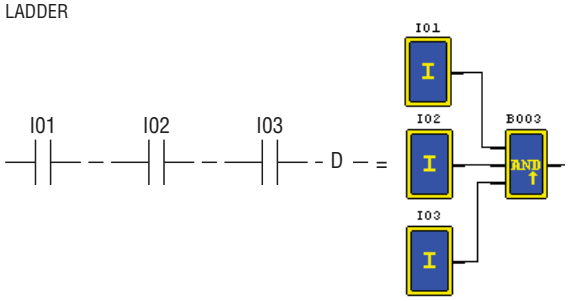
I01 And I02 And I03
Note: The input terminal is NOP which is equivalent to 'High'

AND (EDGE) LOGIC DIAGRAM

FBD



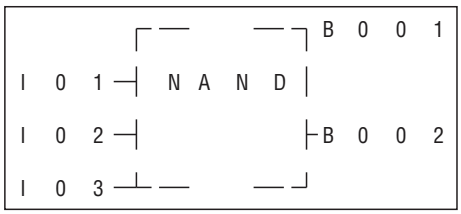
LADDER



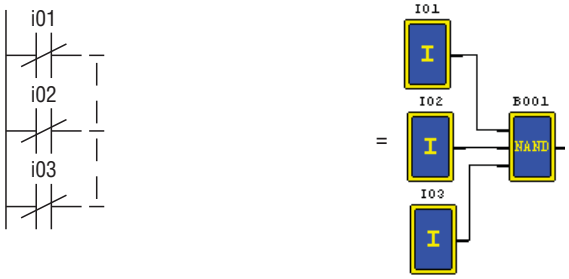
I01 And I02 And I03 And D
Note: The input terminal is NOP which is equivalent to 'High'

NAND Logic Diagram

FBD



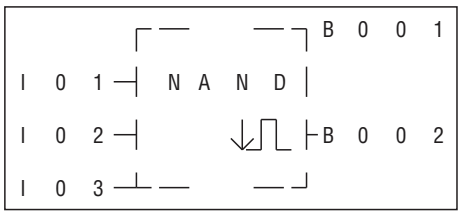
LADDER



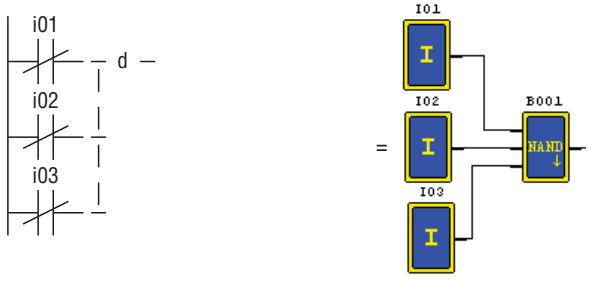
Not(I01 And I02 And I03)
Note: The input terminal is NOP which is equivalent to 'High'

NAND (EDGE) Logic Diagram

FBD



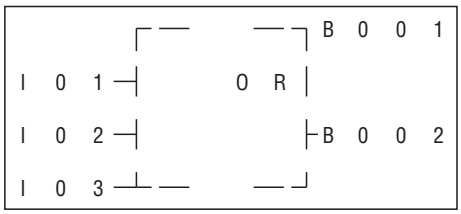
LADDER



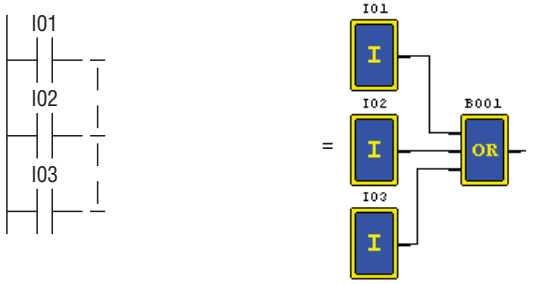
Not(I01 And I02 And I03) And D
Note: The input terminal is NOP which is equivalent to ''High'

OR Logic Diagram

FBD



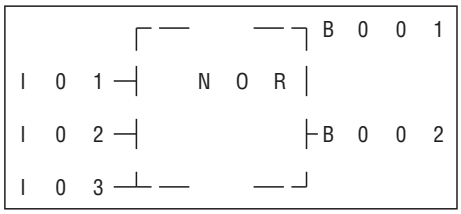
LADDER



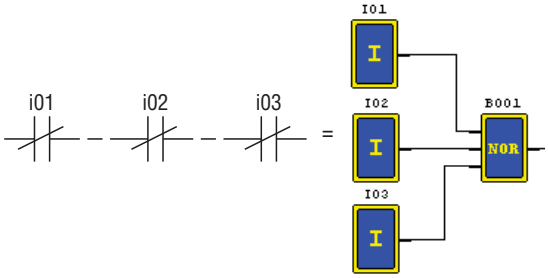
I01 or I02 or I03
Note: The input terminal is NOP which is equivalent to ''Low'

NOR Logic Diagram

FBD



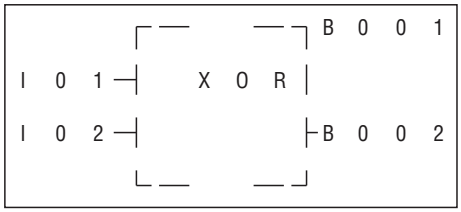
LADDER



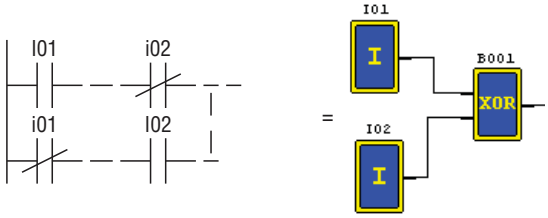
Not (I01 or I02 or I03)
Note: The input terminal is NOP which is equivalent to ''Low'

XOR Logic Diagram

FBD



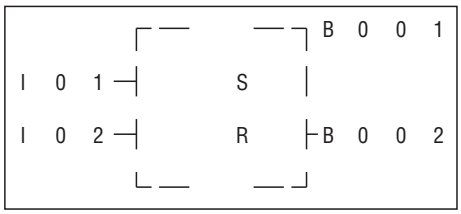
LADDER



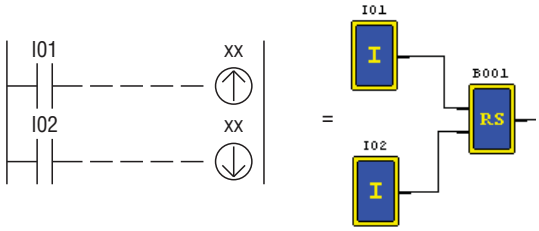
I01 XOR I02
Note: The input terminal is NOP which is equivalent to 'Low'

SR Logic Diagram

FBD



LADDER



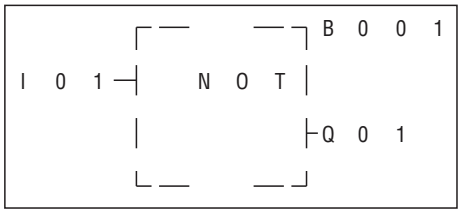
Logic Table

I01	I02	B001
0	0	holding
0	1	0
1	0	1
1	1	0

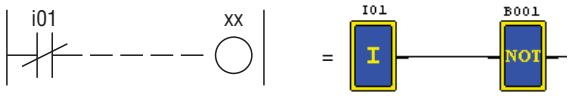
Note: The input terminal is NOP which is equivalent to 'Low'

NOT Logic Diagram

FBD



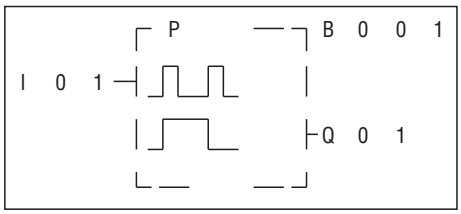
LADDER



Not I01
Note: The input terminal is NOP which is equivalent to ''High'

Pulse Logic Diagram

FBD

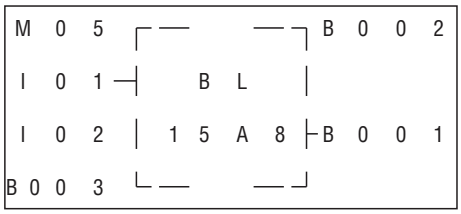


LADDER

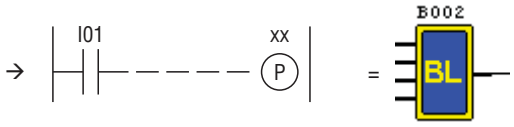
Note: The input terminal is NOP which is equivalent to ''Low'

BOOLEAN Logic Diagram

FBD

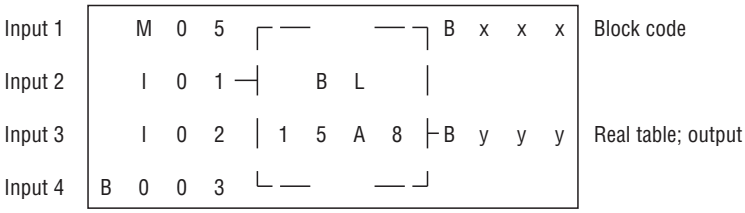


LADDER
NO



Note: The input terminal is NOP which is equivalent to ''Low"

Description:



The relationship between input and real table is shown below.

Input 1	Input 2	Input 3	Input 4	Output (edit)	Example	Real table
0	0	0	0	0/1	0	8
1	0	0	0	0/1	0	
0	1	0	0	0/1	0	
1	1	0	0	0/1	1	
0	0	1	0	0/1	0	A
1	0	1	0	0/1	1	
0	1	1	0	0/1	0	
1	1	1	0	0/1	1	
0	0	0	1	0/1	1	5
1	0	0	1	0/1	0	
0	1	0	1	0/1	1	
1	1	0	1	0/1	0	
0	0	1	1	0/1	1	1
1	0	1	1	0/1	0	
0	1	1	1	0/1	0	
1	1	1	1	0/1	0	

FUNCTION BLOCK

Function Block includes three types of function: special function, adjust-controlling function and communication function. Function type and number are shown in the table below.

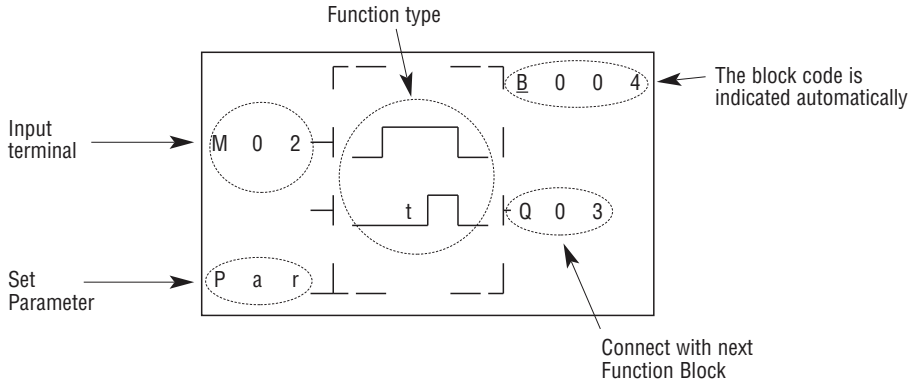
	Function type	number
special function	Timer	250
	Counter	250
	RTC	250
	Analog Comparator	250
adjust-controlling function	AS	250
	MD	250
	PID	30
	MX	250
	AR	30
	DR	240

The capability of each block is alterable; it depends on the type of function. There are a total of 260 blocks, and the total capability of block area is 6000 bytes. For example, the block is Timer mode 7, the block size is 12 bytes.

Source table:

	Block	Number (byte)	Timer	Counter	RTC	Analog comparator	AS	MD	PID	MX	AR	DR
Total source	260	6000	250	250	250	250	250	250	30	250	30	240
Timer mode 0	1	5	1									
Timer mode 1~6	1	10	1									
Timer mode 7	1	12	2									
Counter mode 0	1	5		1								
Counter mode 1~7	1	14		1								
Counter mode 8	1	16		1								
RTC mode 0	1	5			1							
RTC mode 1~4	1	11			1							
Analog mode 0	1	5				1						
Analog mode 1~7	1	12				1						
AS	1	11					1					
MD	1	11						1				
PID	1	17							1			
MX	1	17								1		
AR	1	23									1	
DR	1	6										1

Function display:

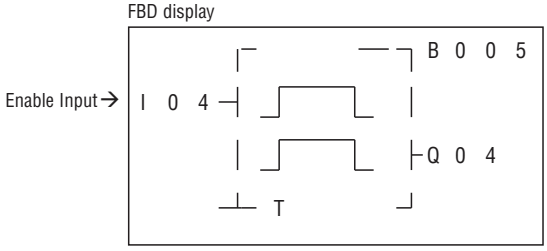


TIMER FUNCTION BLOCK

T0E and T0F keep their current value after a loss of power to the LRD relay if “M Keep” is active. But the other Timers current value is 0.

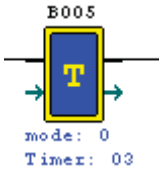
(1) Timer mode 0 (Internal coil Mode)

FBD display



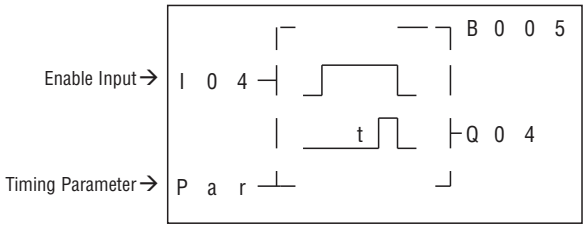
Parameter display

Program display

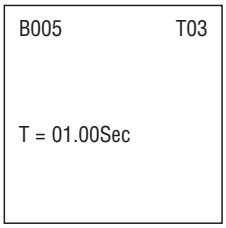


(2) Timer mode 1 (ON-Delay A Mode)

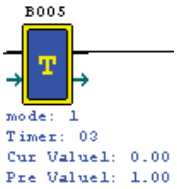
FBD display



Parameter display

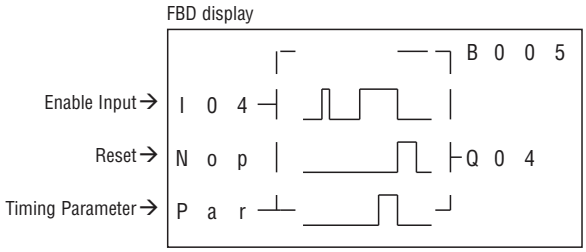


Program display

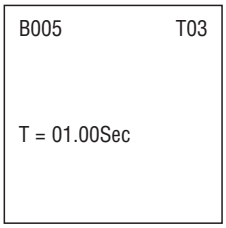


(3) Timer mode 2 (ON-Delay B Mode)

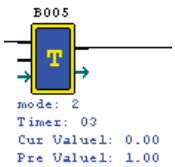
FBD display



Parameter display

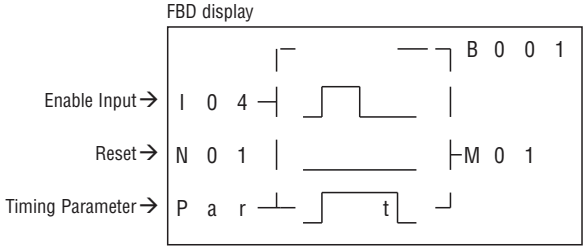


Program display

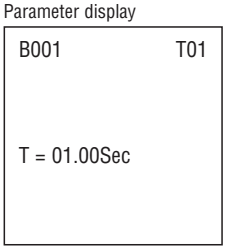


(4) Timer mode 3 (OFF-Delay A Mode)

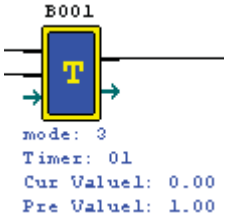
FBD display



Parameter display

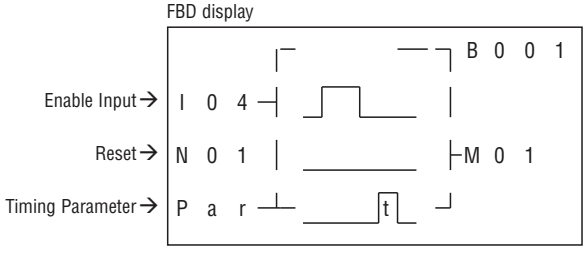


Program display

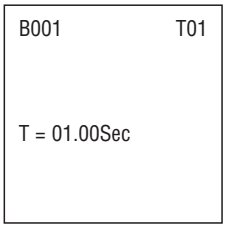


(5) Timer mode 4 (OFF-Delay B Mode)

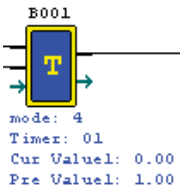
FBD display



Parameter display

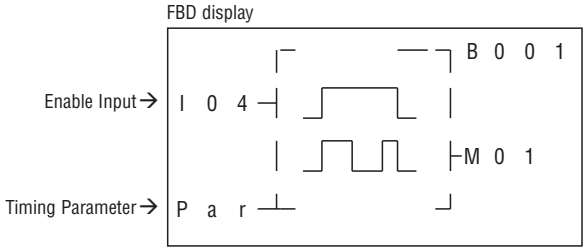


Program display

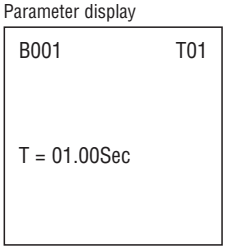


(6) Timer mode 5 (FLASH A Mode)

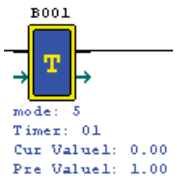
FBD display



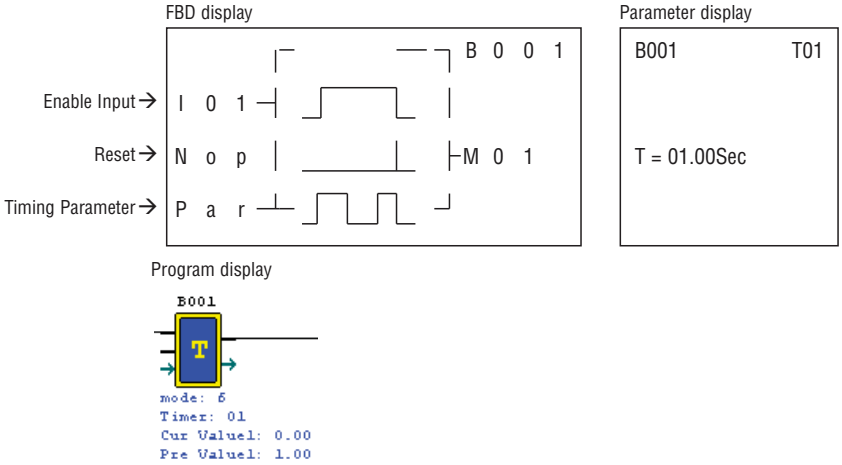
Parameter display



Program display

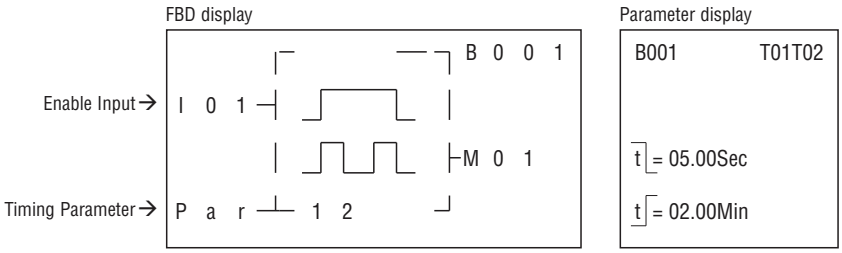


(7) Timer mode 6 (FLASH B Mode)

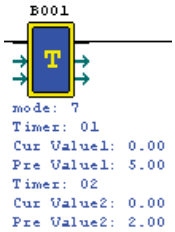


Program display

(8) Timer mode 7 (FLASH C Mode)

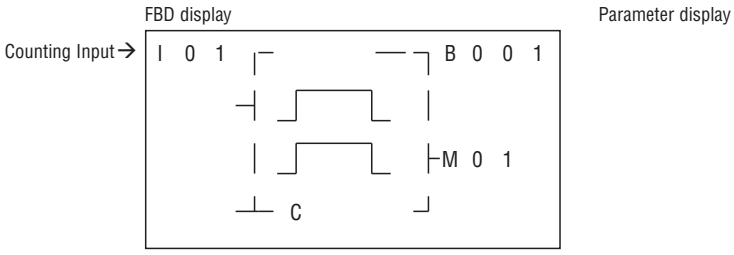


Program display

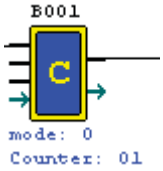


COMMON COUNTER FUNCTION BLOCK

(1) Counter Mode 0

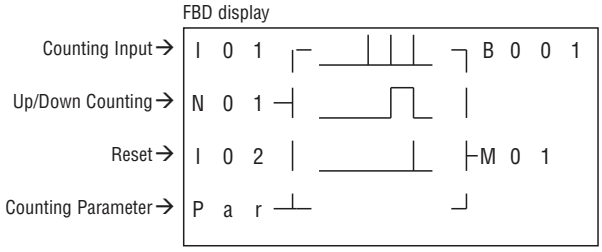


Program display

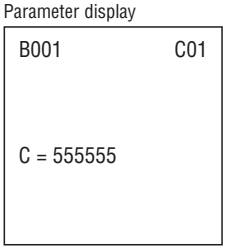


(2) Counter Mode 1

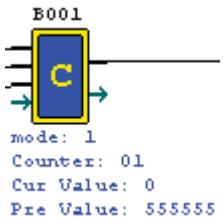
FBD display



Parameter display

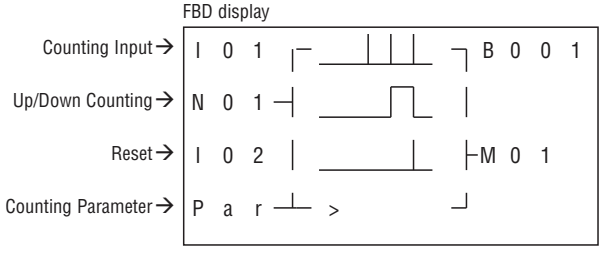


Program display

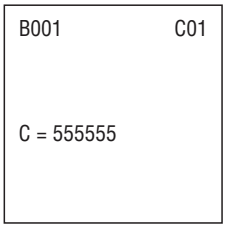


(3) Counter Mode 2

FBD display

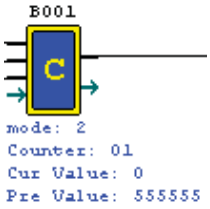


Parameter display



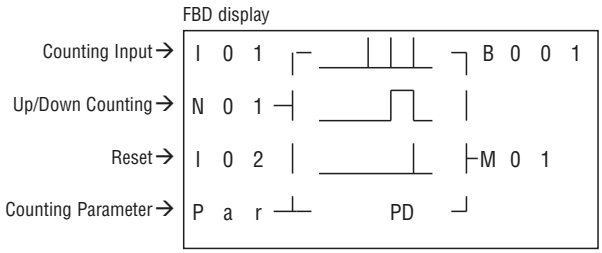
Note: The ">"means the current value appeared will be greater than present value.

Program display

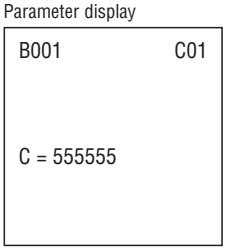


(4) Counter Mode 3

FBD display

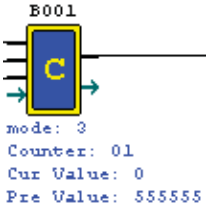


Parameter display

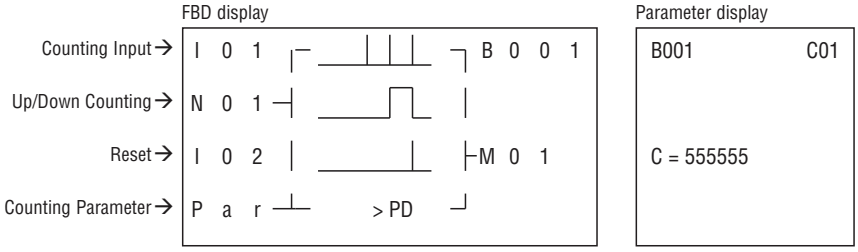


Note: The "PD" means the current value will be retain until the power recovers; Counter keeps current value when the LRD switches between RUN and STOP when C KEEP enable

Program display

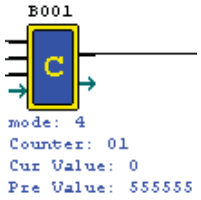


(5) Counter Mode 4

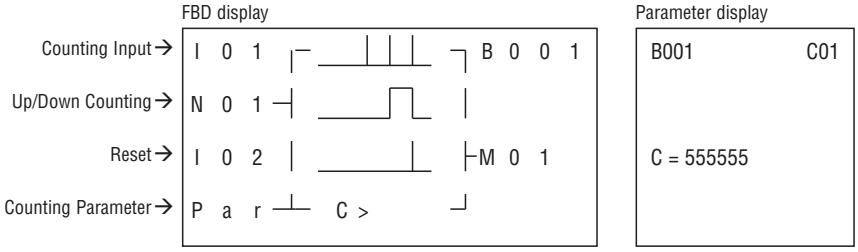


Nota: The ">"means the current value appeared will be greater than present value;
The "PD" means the current value will be retain until the power recovers; Counter keeps current value when the LRD switches between RUN and STOP when C KEEP enable.

Program display

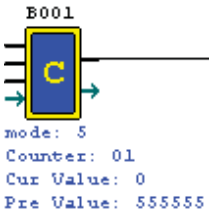


(6) Counter Mode 5

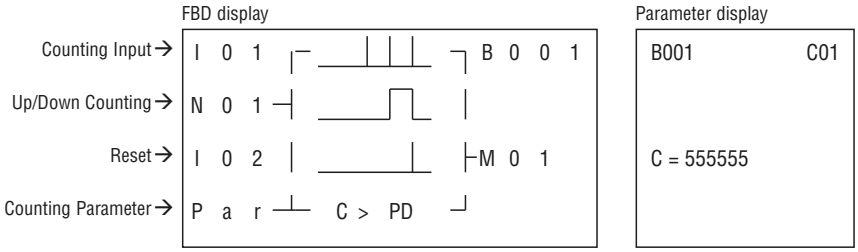


Note: The ">"means the current value appeared will be greater than present value.

Program display

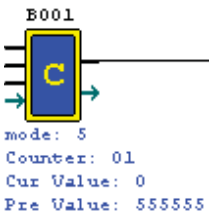


(7) Counter Mode 6



Note: The ">"means the current value appeared will be greater than present value;
The "PD" means the current value will be retain until the power recovers; Counter keeps current value when the LRD switches between RUN and STOP when C KEEP enable.

Program display

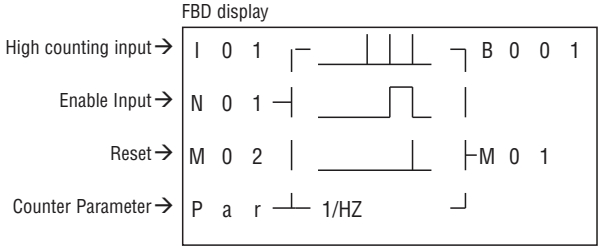


Note: Only first 31 Counter functions can keep their current value after a loss of power to the LRD relay.

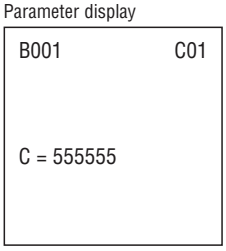
HIGH SPEED COUNTER FUNCTION BLOCK

(1) Counter Mode 7

FBD display

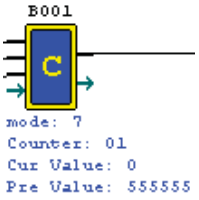


Parameter display



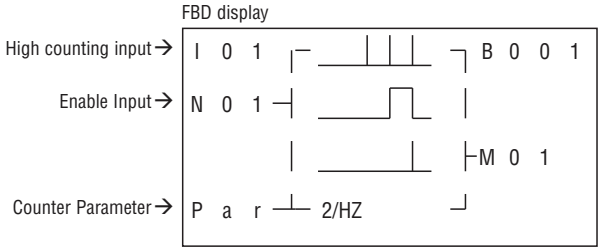
Note: High speed input terminal I01,I02

Program display

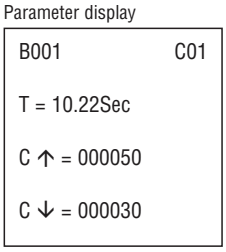


(2) Counter Mode 8

FBD display

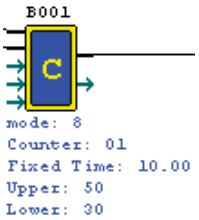


Parameter display



Note: High speed input terminal I01,I02

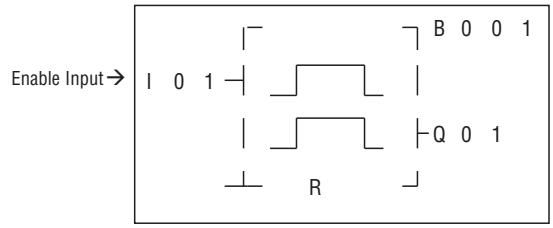
Program display



RTC COMPARATOR FUNCTION BLOCK

(1) RTC Mode 0 (Internal Coil)

FBD display

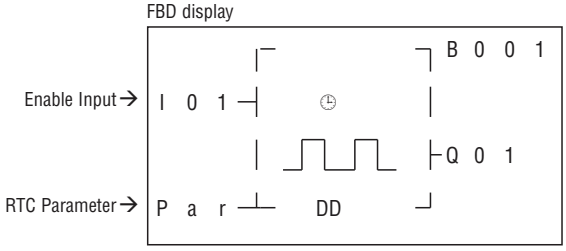


Parameter display

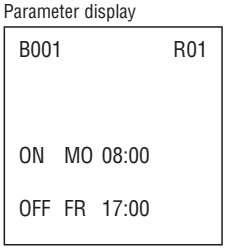
Program display

(2) RTC Mode 1 (Daily)

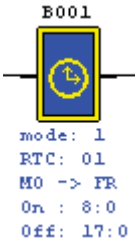
FBD display



Parameter display

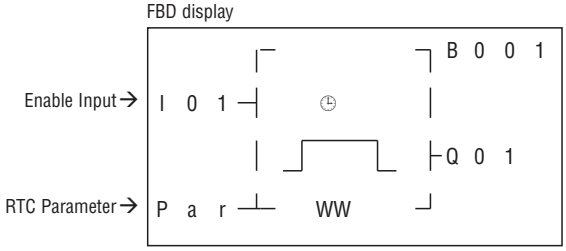


Program display

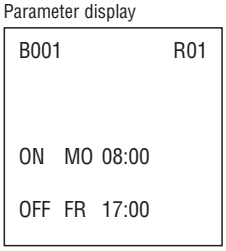


(3) RTC Mode 2 (Continuous)

FBD display



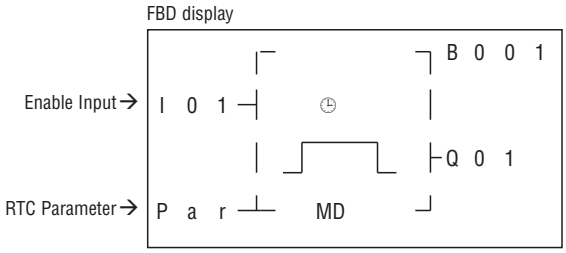
Parameter display



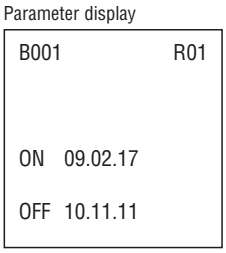
Program display

(4) RTC Mode 3 (Year Month Day)

FBD display



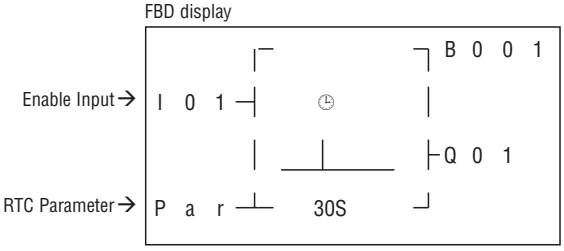
Parameter display



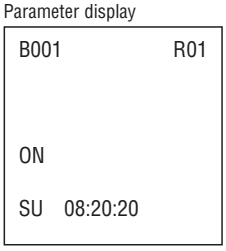
Program display

(5) RTC Mode 4 (30-second adjustment)

FBD display



Parameter display

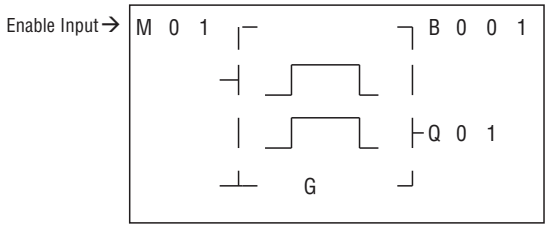


Program display

ANALOG COMPARATOR FUNCTION BLOCK

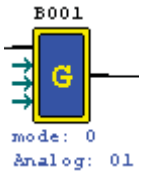
(1) Analog Comparison Mode 0 (Internal coil)

FBD display



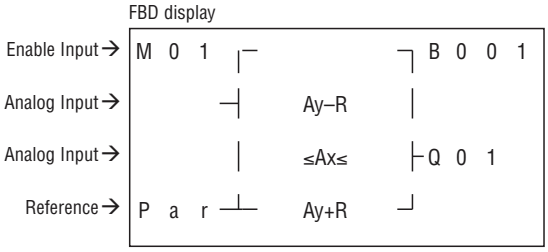
Parameter display

Program display

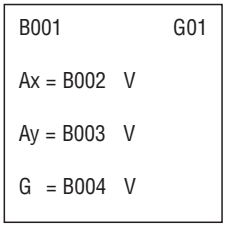


(2) Analog Comparison Mode 1

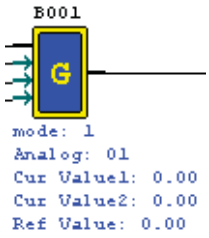
FBD display



Parameter display

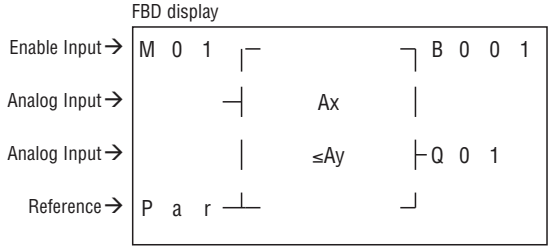


Program display



(3) Analog Comparison Mode 2

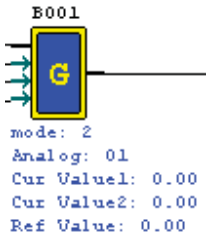
FBD display



Parameter display

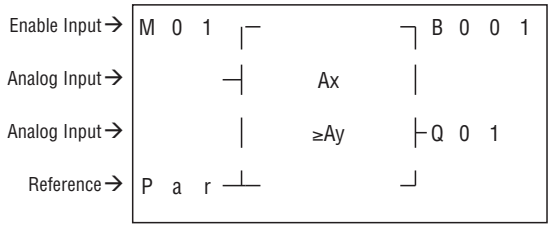
B001	G01
Ax = B002 V	
Ay = B003 V	
G = B004 V	

Program display



(4) Analog Comparison Mode 3

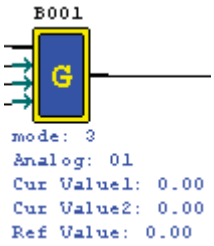
FBD display



Parameter display

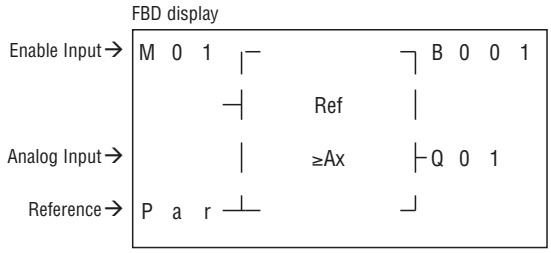
B001	G01
Ax = B002 V	
Ay = B003 V	
G = B004 V	

Program display



(5) Analog Comparison Mode 4

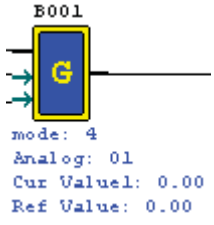
FBD display



Parameter display

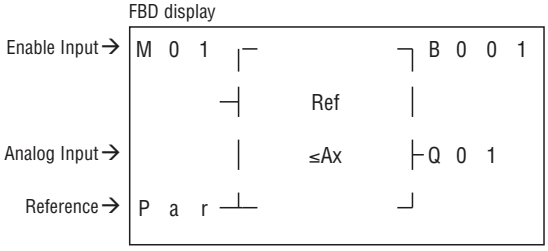
B001	G01
Ax = B002 V	
G = B003 V	

Program display

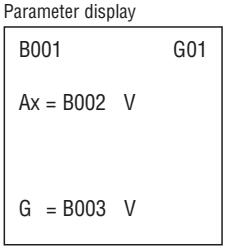


(6) Analog Comparison Mode 5

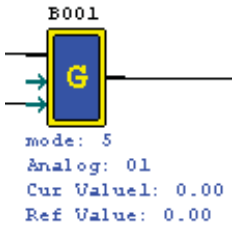
FBD display



Parameter display

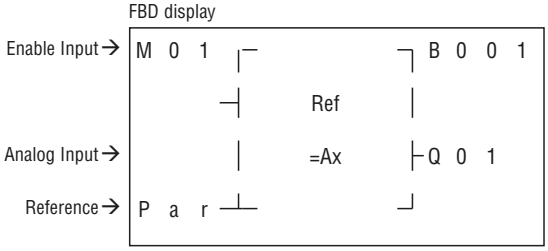


Program display

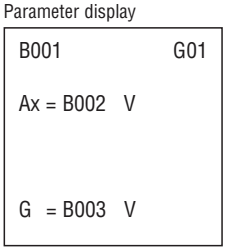


(7) Analog Comparison Mode 6

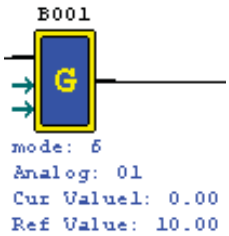
FBD display



Parameter display

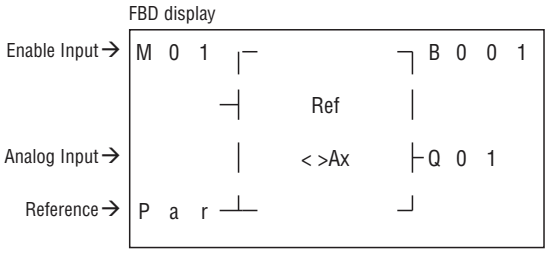


Program display

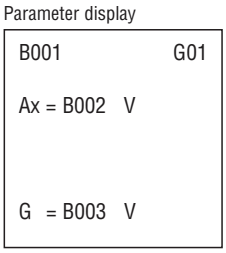


(8) Analog Comparison Mode 7

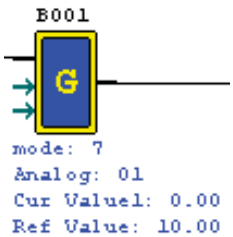
FBD display



Parameter display

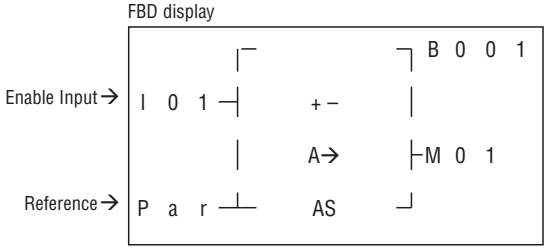


Program display



AS (ADD-SUB) FUNCTION BLOCK

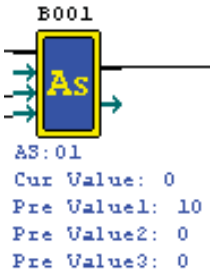
FBD display



Parameter display

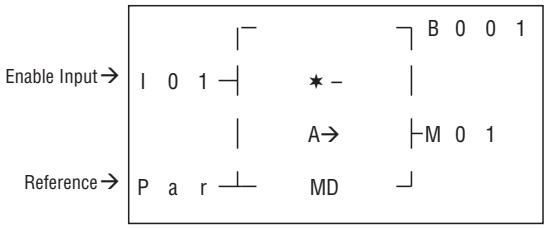
B001	AS01
V1 = 00010	
V2 = B003	
V2 = B003	

Program display



MD (MUL-DIV) FUNCTION BLOCK

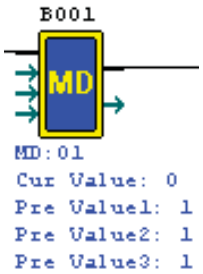
FBD display



Parameter display

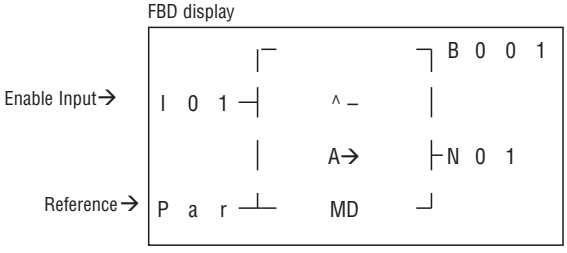
B001	MD01
V1 = 00001	
V2 = 00001	
V2 = 00001	

Program display



PID (PROPORTION- INTEGRAL- DIFFERENTIAL) FUNCTION BLOCK

FBD display



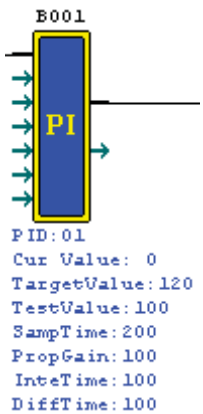
Parameter display

B001	PI01
SV = 00120	
PV = 00100	
Ts = 002.00Sec	1

SEL+←/→

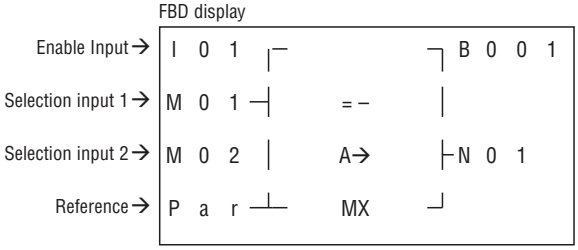
B001	PI01
Kp = 00100%	
Ti = 0010.0Sec	
Td = 001.00Sec	2

Program display

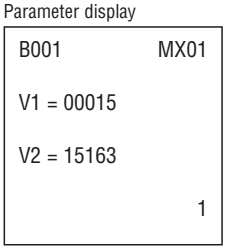


MX (MULTIPLEXER) FUNCTION BLOCK

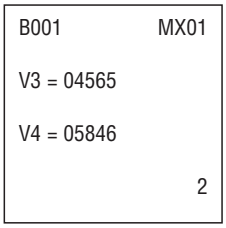
FBD display



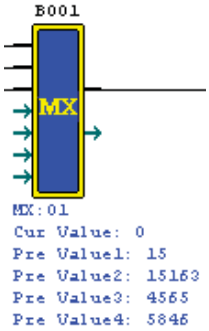
Parameter display



SEL+←/→

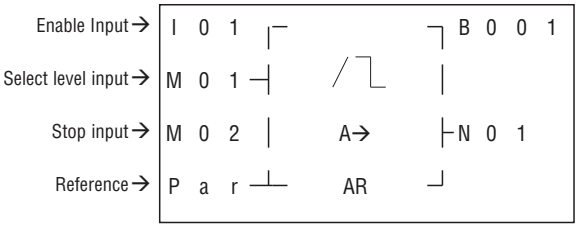


Program display

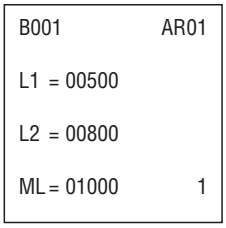


AR (Analog-Ramp) function block

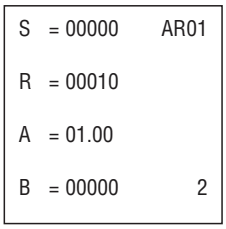
FBD display



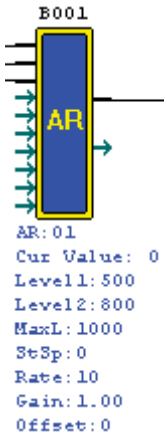
Parameter display



SEL+←/→



Program display



CHAPTER 6: HARDWARE SPECIFICATION

INSTALLATION SPECIFICATION

Mode of user program		Ladder & FBD
Mode of user program		Ladder & FBD
Ambient conditions	Operation temperature	-20°...55°C (-4°...131°F)
	Storage temperature	-40°...70°C (-40°...158°F)
	Maximum Humidity	90% (Relative, non-condensing)
	Operation Gas	No corrosive gases
Main machine	Maximum Vibration	0.075mm amplitude, 1.0g acceleration according to IEC/EN 60068-2-6
	Maximum Concussion	peak value 15g, 11ms according to IEC/EN 60068-2-27
Maximum Noise	Electrostatic discharge	Contact ±4kV air discharge ±8kV
	Electrical fast transients/bursts	Power AC: ±2kV DC: ±1kV
	Conducted radio-frequency common mode	0.15~80MHz 10V/m
	Radiated rado.frequency electromagnetic field	80~1000MHz 10V/m
	Electromagnetic interference	EN55011 class B
Installation	Enclosure Type	IP20
	Operating position	Screw fixing or on 35mm DIN rail
	Direction	On vertical plane; see chapter 2
Wiring		AWG 14/2.6 mm^2
Size		72x90x59.6 mm(WxLxH) on DIN rail 72x106x59.6 mm (WxLxH) screw fixed

PRODUCT SPECIFICATIONS

	MODE	Input power			Input point	Output point		Analog input	RTC	LCD keypad	Expans.	1 KHz High speed input	I/O LINK
		100-240 VAC	24VDC	24VAC									
10/12 points													
	LRD10R A240	■			6	4	Relay	0	■	■	■		
	LRD12R D024		■		8*	4	Relay	2	■	■	■	■	
	LRD12T D024		■		8*	4	Transistor	2	■	■	■	■	■
	LRD12R A024			■	8	4	Relay	0	■	■	■		
20 points	LRD20R A240	■			12	8	Relay	0	■	■	■		
	LRD20R 024		■		12*	8	Relay	4	■	■	■	■	
	LRD20T D024		■		12*	8	Transistor	4	■	■	■	■	■
	LRD20R A024			■	12	8	Relay	0	■	■	■		
Expansion	LRE08R A240	■			4	4	Relay	0					
	LRE08R D024		■		4	4	Relay	0					
	LRE08T D024		■		4	4	Transistor	0					
	LRE08R A024			■	4	4	Relay	0					

* There are analog input points in.

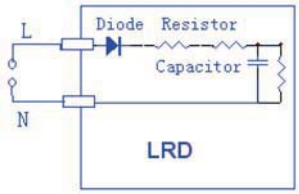
POWER SPECIFICATIONS

Normal model machine Specifications

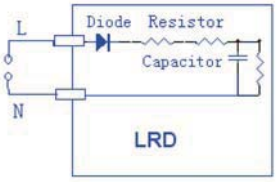
Content	LRD10R A240 LRD20R A240	LRD12R A024 LRD20R A024	LRD20R D024 LRD20T D024	LRD12R D024 LRD12T D024
Power range	100-240VAC	24VAC	24VDC	24VDC
Voltage Rating	85-265VAC	20.4-28.8VAC	20.4-28.8VDC	20.4-28.8VDC
Frequency Rating	50/60Hz	50/60Hz	—	—
Frequency range	47-63Hz	47-63Hz	—	—
Instantaneous power down time allowable	10ms (half cycle) / 20 times (IEC/EN 61131-2)	10ms (half cycle) / 20 times (IEC/EN 61131-2)	1ms/10 times (IEC/EN 61131-2)	1ms/10 times (IEC/EN 61131-2)
Fuse	Need connect a fuse or breaker of 1A current	Need connect a fuse or breaker of 1A current	Need connect a fuse or breaker of 1A current	Need connect a fuse or breaker of 1A current
Isolation	None	None	None	None
Current average	85..90mA	160..290mA	90..150mA	75..125mA
Power dissipation	7.5W	7W	5W	4.5W
Conductor section min...max	24...14AWG 0.14...2.5mm^2	24...14AWG 0.14...2.5mm^2	24...14AWG 0.14...2.5mm^2	24...14AWG 0.14...2.5mm^2
Weight	LRD10: 230g LRD20: 345g	LRD12: 230g LRD20: 345g	345g	230g
Reference standards	IEC/EN 61131-2, UL508, CSA C22.2 N° 14-95, CE			

INPUT SPECIFICATIONS

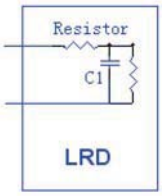
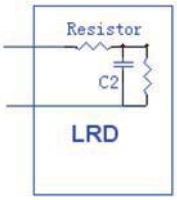
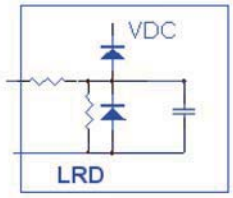
LRD...A240 MODEL

Content	LRD10RA240		LRD20RA240	
Input circuitry				
Number	6 (digital input)		12 (digital input)	
Signal current input	110 VAC 220 VAC	0.66 mA 0.55 mA	110 VAC 220 VAC	1.3 mA 1.2 mA
ON current input	> 79 VAC /0.41 mA		> 79 VAC /0.4 mA	
OFF current input	< 40 VAC/0.28 mA		< 40 VAC/0.15 mA	
Wire length	≤ 100 m		≤ 100 m	
Response time of input	On ≥ Off		On ≥ Off	
	Typical 50/60 Hz: 50/45 ms (110 VAC)		Typical 50/60 Hz: 50/45 ms (110 VAC)	
	Typical 50/60 Hz: 90/85 ms (220 VAC)		Typical 50/60 Hz: 90/85 ms (220 VAC)	
	Off ≥ On		Off ≥ On	
	Typical 50/60 Hz: 50/45 ms (110 VAC)		Typical 50/60 Hz: 50/45 ms (110 VAC)	
	Typical 50/60 Hz: 22/18 ms (220 VAC)		Typical 50/60 Hz: 22/18 ms (220 VAC)	

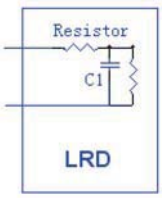
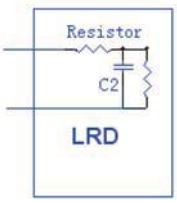
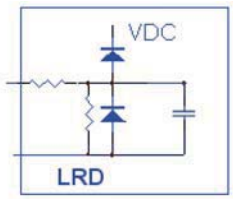
LRD...A024 MODEL

Content	LRD12RA024	LRD20RA024
Input circuitry		
Number	6 (digital input)	12 (digital input)
Signal current input	3 mA	3 mA
ON current input	> 14 VAC /3 mA	> 14 VAC /3 mA
OFF current input	< 6 VAC/0.85 mA	< 6 VAC/0.85 mA
Wire length	≤ 100 m	≤ 100 m
Response time of input	On ≥ Off	On ≥ Off
	Typical 50/60 Hz: 90/90 ms	Typical 50/60 Hz: 90/90 ms
	Off ≥ On	Off ≥ On
	Typical 50/60 Hz: 90/90 ms	Typical 50/60 Hz: 90/90 ms

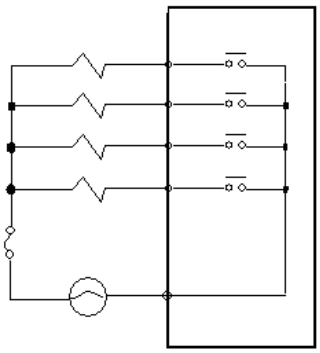
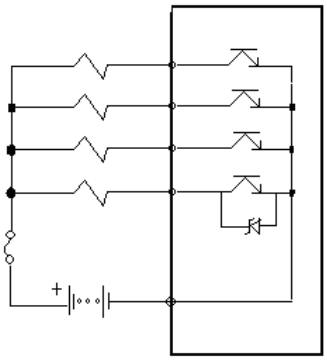
LRD12..D024 MODEL

Content	LRD12RD024 - LRD12TD024			
	Normal digital input	High speed input	Analog input used as normal digital input	Analog input
			Used as digital LRD12: I7, I8 LRD20: I9, IA, IB, IC	Used as analog LRD12: A1, A2 LRD20: A1, A2, A3, A4
Input circuitry	I03~I06 	I01.I02 	I07,I08 	
Number	4	2	2	2
Signal current input	3.2 mA/24 VDC	3.2 mA/24 VDC	0.63 mA/24 VDC	< 0.17 mA/10 VDC
ON current input	>1.875 mA/15 VDC	>1.875 mA/15 VDC	>0.161 mA/9.8 VDC	—
OFF current input	< 0.625 mA/5 VDC	< 0.625 mA/5 VDC	< 0.085 mA/5 VDC	—
Wire length	≤ 100 m	≤ 100 m	≤ 100 m	≤ 30 m (shielded wire)
Response time of input	On=>Off	On=>Off	On=>Off	—
	3 ms	0.3 ms	Typical: 5 ms	—
	Off=>On	Off=>On	Off=>On	—
	5 ms	0.5 ms	Typical: 3 ms	—
Input voltage	—	—	—	0~10 VDC
Precision class	—	—	—	0.01 VDC
Bit of conversion	—	—	—	10
Error	—	—	—	±2%±0.12 VDC
Conversion time	—	—	—	1 cycle
Sensor resistance	—	—	—	<1 kohm

LRD20..D024 MODEL

Content	LRD20RD024 - LRD20TD024			
	Normal digital input	High speed input	Analog input used as normal digital input	Analog input
			Used as digital LRD12: I7, I8 LRD20: I9, IA, IB, IC	Used as analog LRD12: A1, A2 LRD20: A1, A2, A3, A4
Input circuitry	I03~I08 	I01.I02 	I09,I0A,I0B,I0C 	
Number	6	2	4	4
Signal current input	3.1 mA/24 VDC	3.1 mA/24 VDC	0.63 mA/24 VDC	< 0.17 mA/10 VDC
ON current input	>1.875 mA/15 VDC	>1.875 mA/15 VDC	>0.163 mA/9.8 VDC	—
OFF current input	< 0.625 mA/5 VDC	< 0.625 mA/5 VDC	< 0.083 mA/5 VDC	—
Wire length	≤ 100 m	≤ 100 m	≤ 100 m	≤ 30 m (shielded wire)
Response time of input	On=>Off	On=>Off	On=>Off	—
	5 ms	0.5 ms	Typical: 5 ms	—
	Off=>On	Off=>On	Off=>On	—
	3 ms	0.3 ms	Typical: 3 ms	—
Input voltage	—	—	—	0~10 VDC
Precision class	—	—	—	0.01 VDC
Bit of conversion	—	—	—	8
Error	—	—	—	±2%±0.12 VDC
Conversion time	—	—	—	1 cycle
Sensor resistance	—	—	—	<1 kohm

OUTPUT SPECIFICATIONS

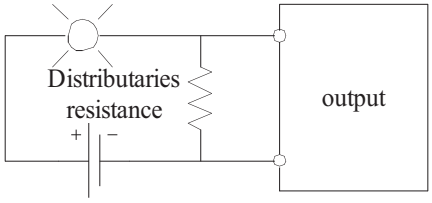
Content		Relay	Transistor
Output circuitry			
Extern power		Less than AC265, DC30	23.9~24.1V
Circuitry isolation		Mechanical	Photocouplers
Maximal Load	Resistive	8 A point	0.3 A point
	Inductive	4A point	—
	Light	200 W	10 W/24 VDC
Open drain current		—	<10 μA
Minimum Load		—	—
Response time	ON → OFF	15ms	25μs
	OFF → ON	15ms	Less than 0.6 ms

OUTPUT PORT WIRING NOTICE

LIGHT LOAD

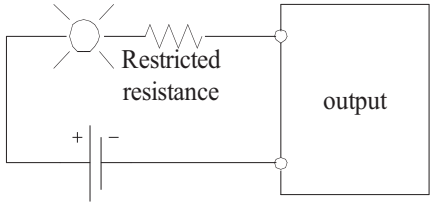
The current value will be 10~20 times of normal value for several 10ms when filament is turning-on. A distributaries resistance or restricted current resistance is added at output port to reduce the concussion current value.

distributaries resistance



There is a little current makes light shine faintness, so the value of resistance must be careful.

restricted current resistance

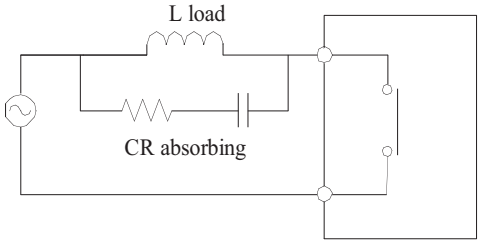


The brightness will be described if the resistance value is too big.

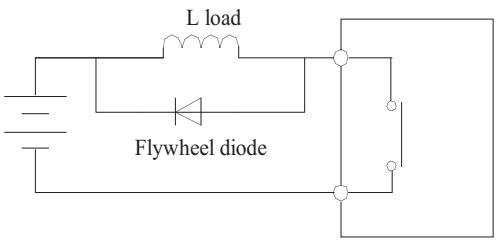
INDUCTANCE LOAD

There will be a concussion voltage (KV) when the inductance load switches between ON and OFF, especially relay model. The methods of different power mode for absorbing the concussion voltage are shown below.

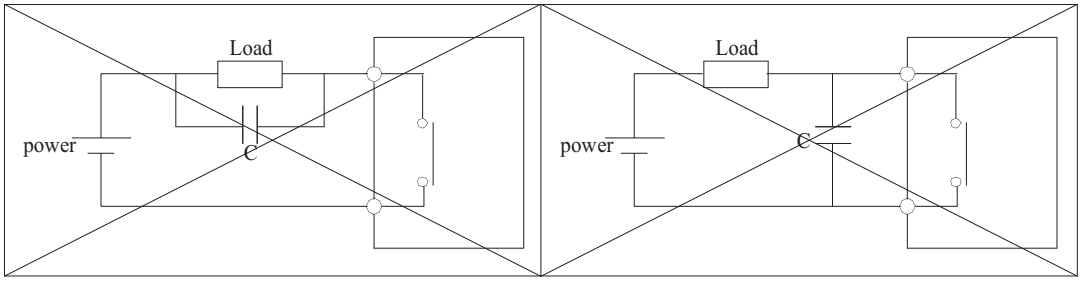
a. AC power,¨CR absorbing



b. DC power,¨flywheel diode

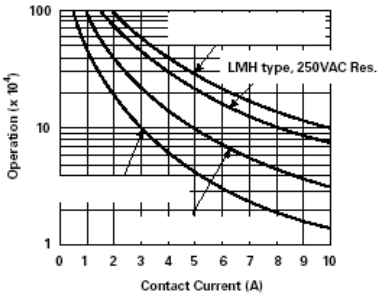


Do not use capacitance alone as absorbing as shown below.



LIFE OF RELAY

Life Expectancy



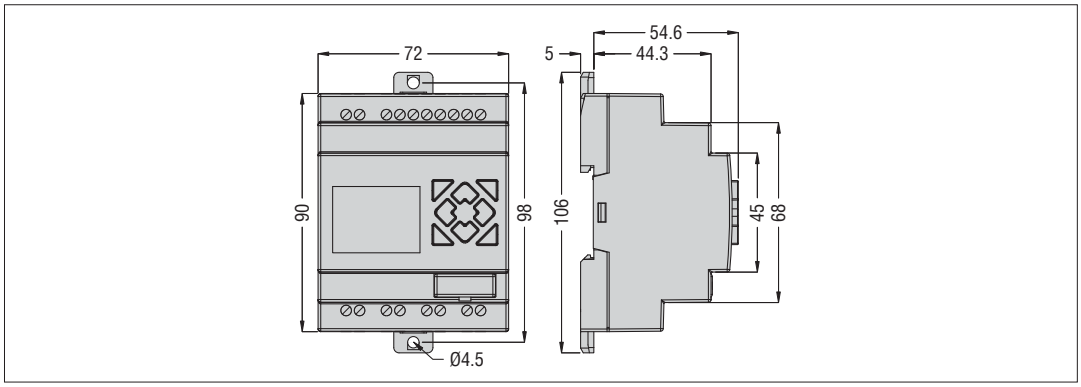
– The data of picture above is standard, but the life of relay is influenced by the ambient operating temperature.
– The life is more than 100k times if the current is less than 2A.

ACCESSORY

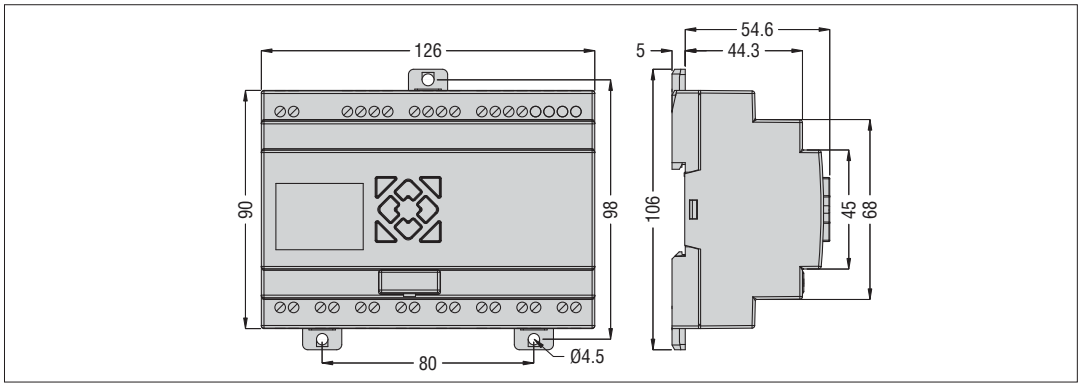
MODE	Description
LRXM00	Program backup memory
LRXSW	LRD program software

DIMENSIONS LRD

10/12 points



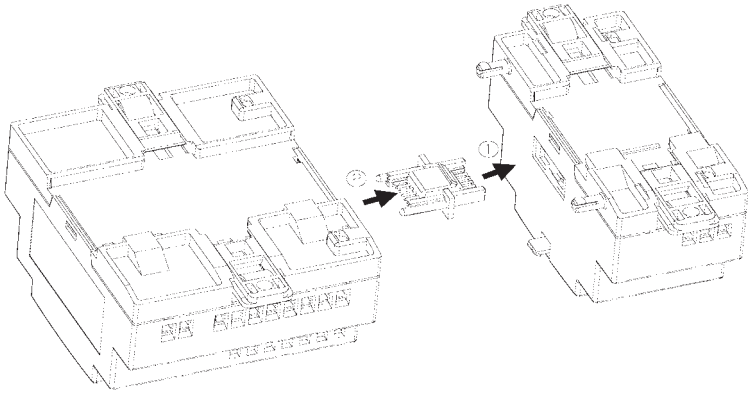
20 points



CHAPTER 7: EXPANSION MODULE

Digital Input/Output module: LRE08RD024, LRE08TD024, LRE08RA024, LRE08AA240
Communication module: LREP00, DNET, PBUS, TCP/IP
All LRD can connect expansion modules. The sequence of these expansion modules connects with LRD is: digital, analog and communication.
The digital models have 2 types: version 1.2 and version 3.0. Both can connect with LRD.

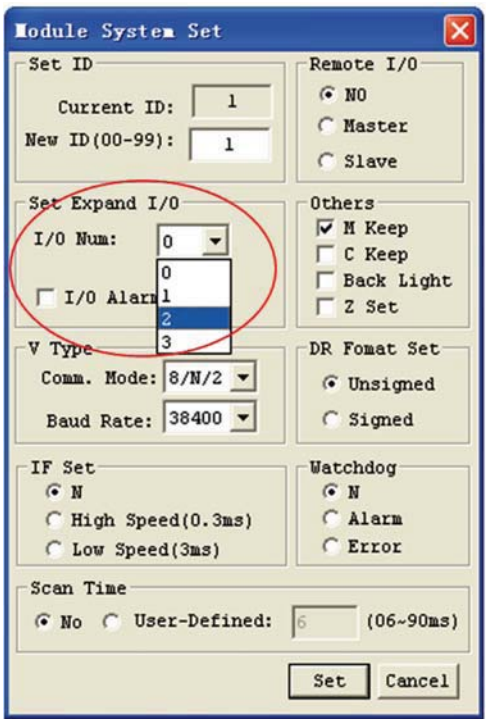
– The method of all expansion modules connecting with LRD is the same as shown above.



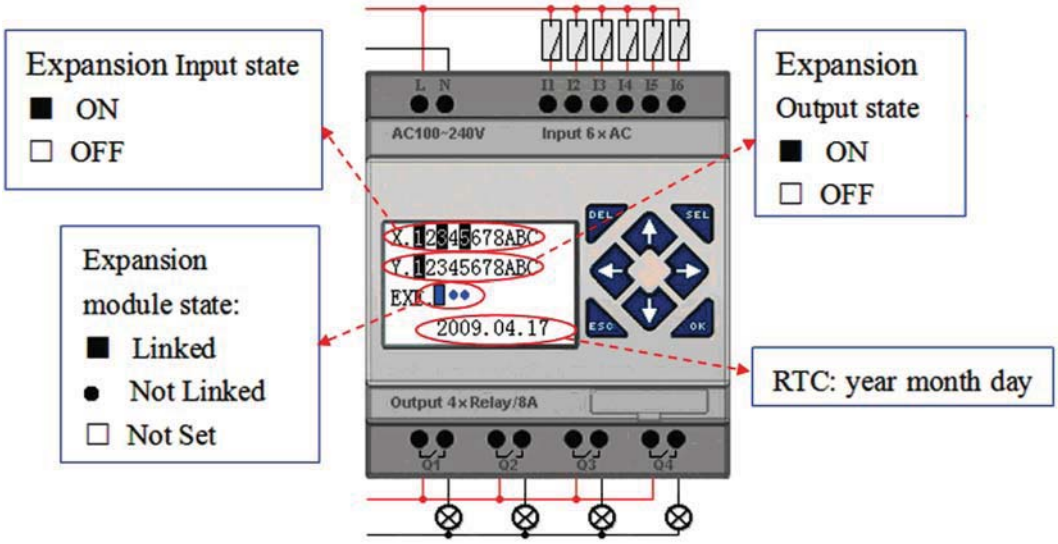
DIGITAL IO MODULE
The LRD must set the number of expansion IO when connected together. The method of setting IO number is shown below.

1) Keypad

2) LRXSW software

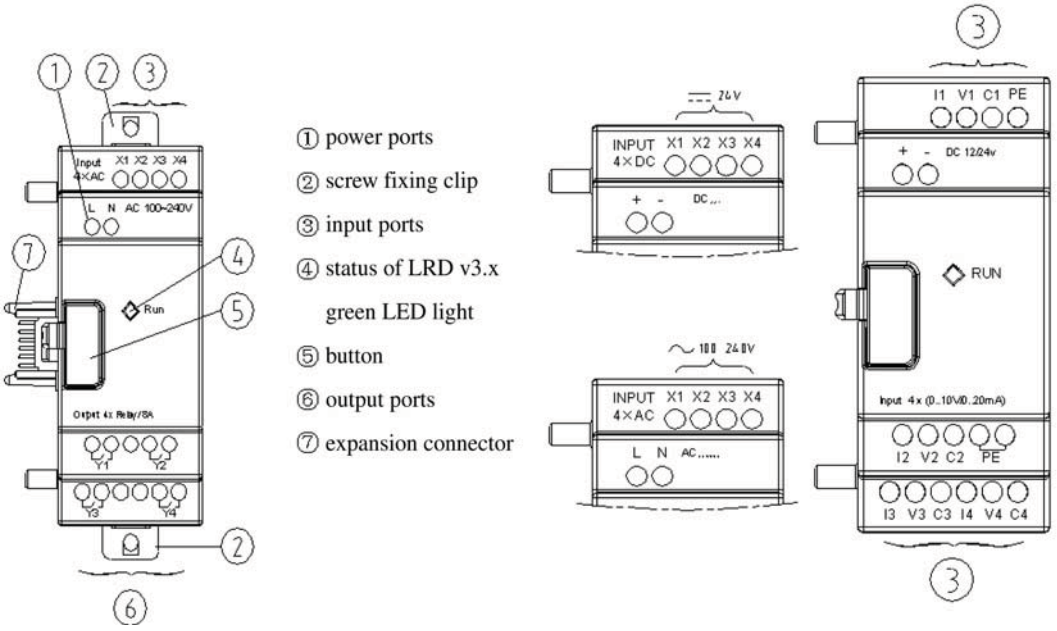


EXPANSION DISPLAY STATE



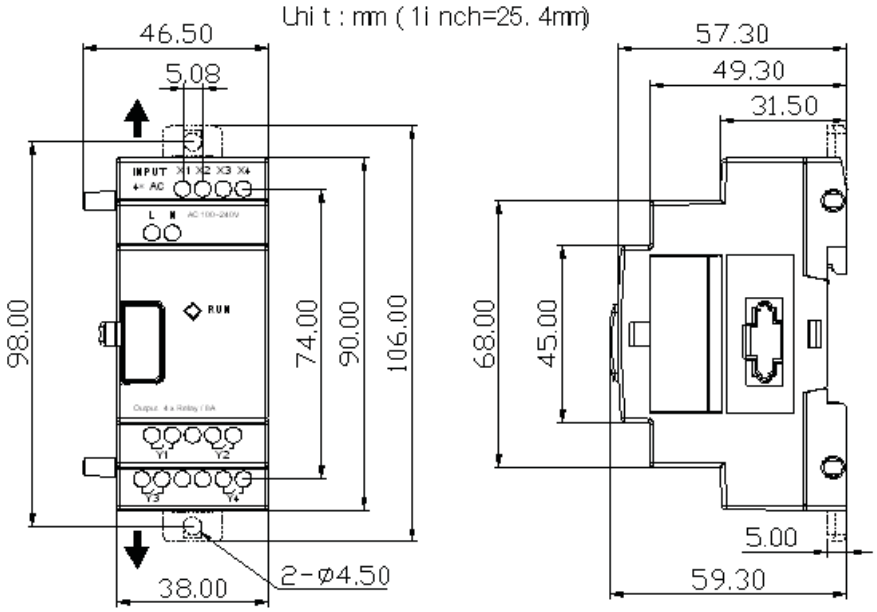
INSTALLATION AND WIRING

Type of expansion module: LRE08RD024, LRE08TD024, LRE08RA024, LRE08RA240



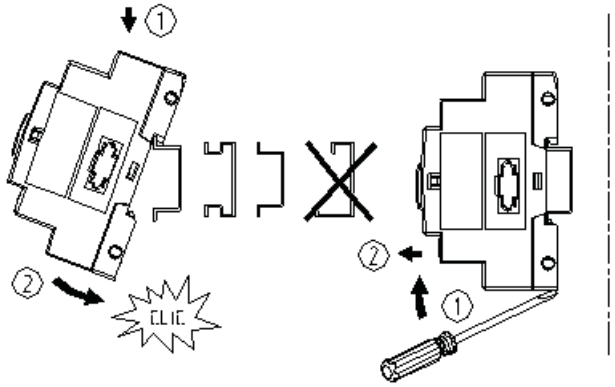
EXPANSION MODULE DIMENSIONS

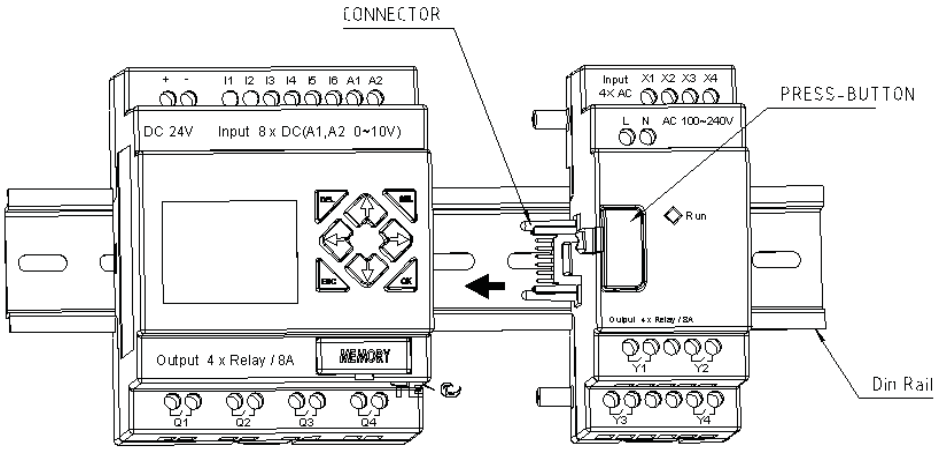
– All the expansion modules have the same size as shown below.

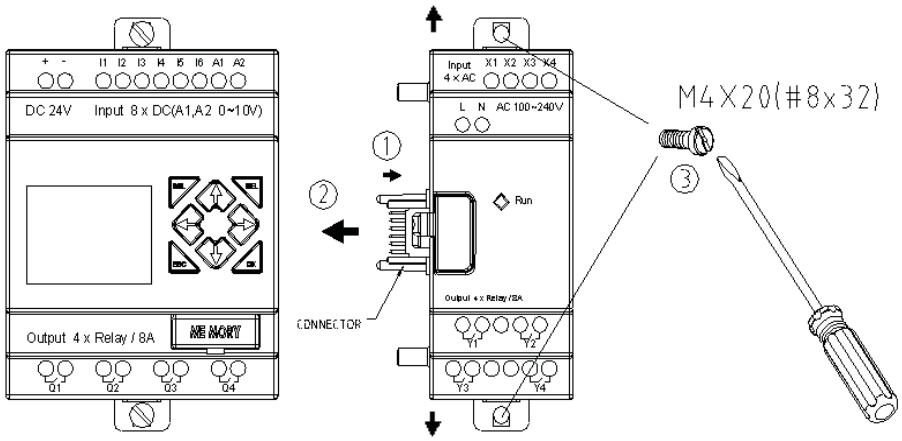


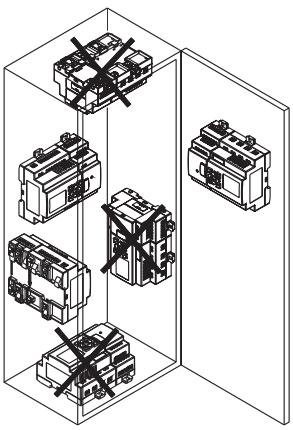
INSTALLATION

– All the expansion modules' installation method is the same as shown below.









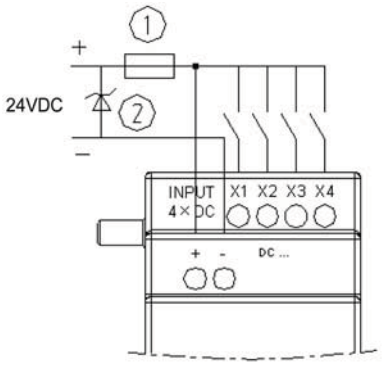
mm²	0.14...1.5	0.14...0.75	0.14...2.5	0.14...2.5	0.14...1.5
AWG	26...16	26...18	26...14	26...14	26...16

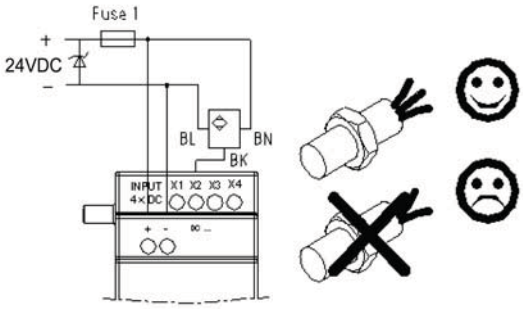
Ø3.5 (0.14in)	C	Nm	0.6
		lbin	5.4

– Power down before equipment maintenance.

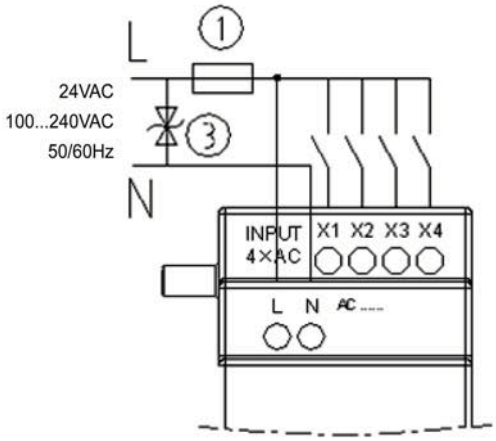
WIRING

1) 24V DC power input

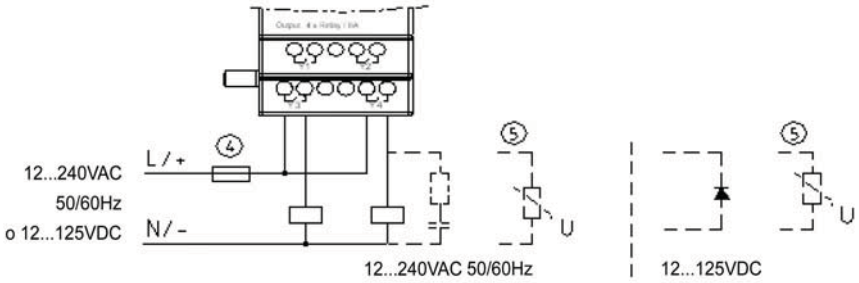




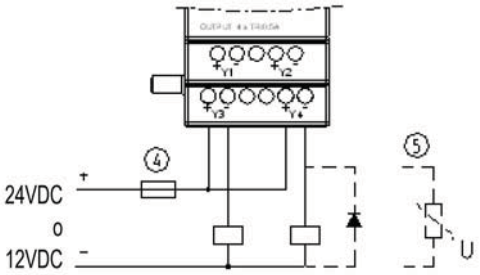
2) 24V/100~240V AC power input



3) Relay output



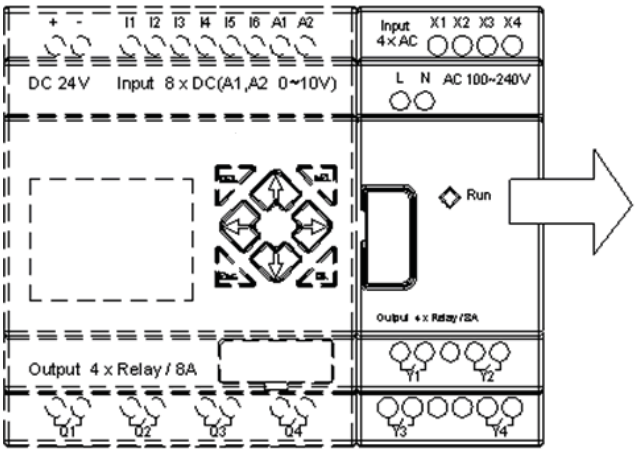
4) Transistor output



① 1A quick-blowing fuse, circuit-breaker or circuit protector
② Surge suppressor (36V DC)
③ Surge suppressor (400V AC)
④ Fuse, circuit-breaker or circuit protector
⑤ Inductive load

– AC inductive load needs parallel connect Surge suppressor to dampen noise if the LRD output is relay. DC inductive load needs parallel connect commute diode if the LRD output is relay. The commute diode inverted voltage should be more than 5~10 times the load voltage, and the positive current should be more than load current. Inductive load needs parallel connect commute diode if the LRD output is transistor.

Digital IO module and Analog module both have indicator light. The state of indicator light is the same.
The state of indicator light is shown below.



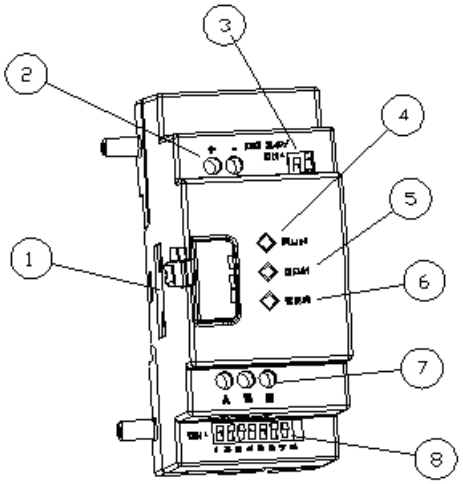
◆	LED constantly on LRE in Run mode
✳	Flashing LED (5Hz) Abnormal LRE conditions for: - data transfer error - connection error

COMMUNICATION MODULE

MODBUS MODULE LREP00

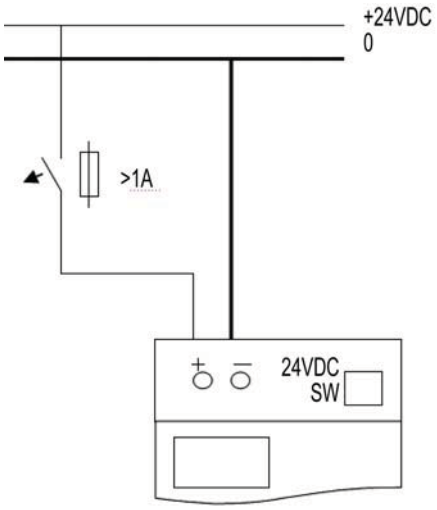
LREP00 module makes LRD capable of communicating with other controller as master/slave mode. LREP00 works as RTU slave node, responds to RTU master node request, but it cannot communicate initiatively. LREP00 makes the scan period of LRD become long, it is different from difference communication order. Normally, the extend time is less than 20ms, but it will be 100ms if the order is to rework the preset value of function.

LREP00MBUS CELL CONFIGURATION



①: Connecting port
②: Power supply
③: SW2, 2-bit switch (terminal resistance selection)
④: RUN LED indicator
⑤: COMM. Communication LED indicator
⑥: Error LED indicator
⑦: RS485 port
⑧: SW1, 8-bit switch (set format of communication)

CONNECTION WITH POWER SOURCE
LREP00 uses 24VDC



COMMUNICATION SETTING
The LREP00 communication baud rate and format can be set by 8-bit switch (DIP) SW1.

Baud rate
SW1-3~SW1-1 set communication baud rate is 57.6K, 38.4K, 19.2K, 9.6K, 4.8K as shown below.

SW1-6	SW1-3	SW1-2	SW1-1	Baud rate (Kbps)
OFF	OFF	OFF	OFF	4.8
OFF	OFF	OFF	ON	9.6
OFF	OFF	ON	OFF	19.2
OFF	OFF	ON	ON	38.4
OFF	ON	*	*	57.6
ON	*	*	*	38.4

* can be ON or OFF

VERIFYING BIT AND STOP BIT SETTING
SW1-4, sets stop bit and verifying bit
SW1-5, sets verifying format (available if SW1-4 = 1)
SW1-6, assembled set
SW1-7 - SW1-8, reserved

More information as shown below:

SW1-8	SW1-7	SW1-6	SW1-5	SW1-4	Stop bit, verifying bit, assembled set
*	*	OFF	*	OFF	2 stop bits, no verifying bit
*	*	OFF	OFF	ON	1 stop bit, 1 odd verifying bit
*	*	OFF	ON	ON	1 stop bit, 1 even verifying bit
*	*	ON	*	*	SW1-1 - SW1-5 are inefficient, communication format is default as 38.4Kbps, 2 stop bits, no verifying bit

* can be ON or OFF

State indication and troubles hooting

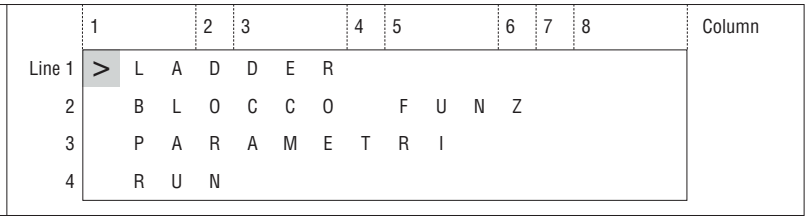
Error code	State indication	Error type and reason	Manage method	Remark
56H	The error LED light flashes slowly (2Hz)	The connection between LRD and COMM. Mode is improper	Check connection among LRD, IO mode and COMM. Mode	The question is connection with the mode before it if there are many expansion modes.
55H	The error LED light is ON	LRD set error: IO number set is different from factual.	Check-up LRD set	
51H_54H	The error LED light flashes slowly (2Hz)	ModBus order error: data frames, function code, address of register, CRC , data invalid verifying error, etc.	Check-up the order and communication set according COMM. protocol	
59H	The error LED light flashes quickly (5Hz)	COMM. data error: Verifying bit error, Length of data respond error, CRC error	Make sure the connection between LRD and COMM. Mode is credible, control environment noise.	

More information see LREP00 user manual.

APPENDIX: KEYPAD PROGRAMMING

APPENDIX A: KEYPAD PROGRAMMING IN LADDER MODE

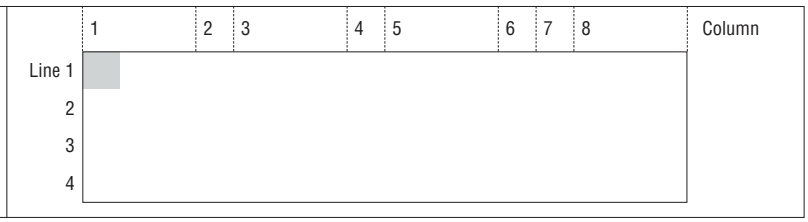
Operation Sample:



Step 1:

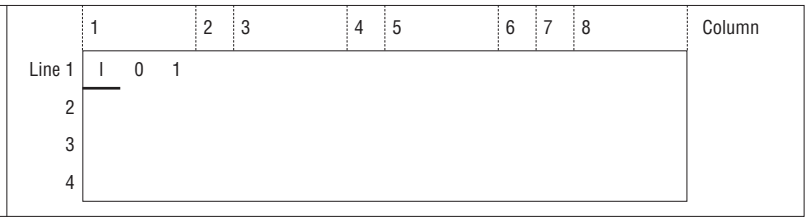
Press 'OK'.

Enter LADDER edit.



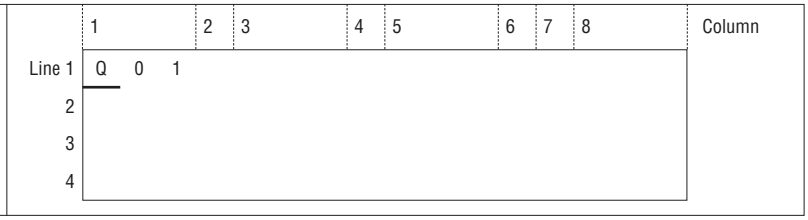
Step 2 :

When the cursor is located at the character or digit press 'SEL' to show I01.



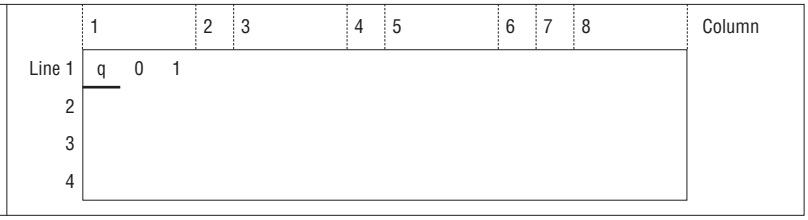
Step 3 :

Press '↑' 3 times.
Press '↑' or '↓' and the digit where the cursor is located will change from I to G.



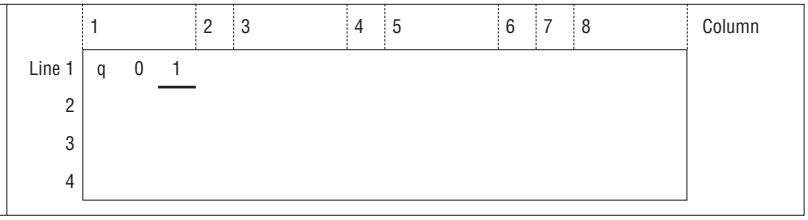
Step 4 :

Press 'SEL'
start /end modifying parameter: contact stare from NO (Q) to NC (q).



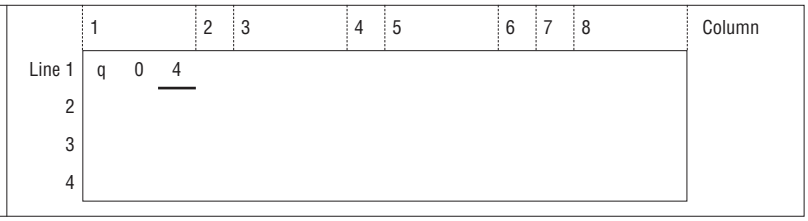
Step 5 :

Press '→' 2 times.



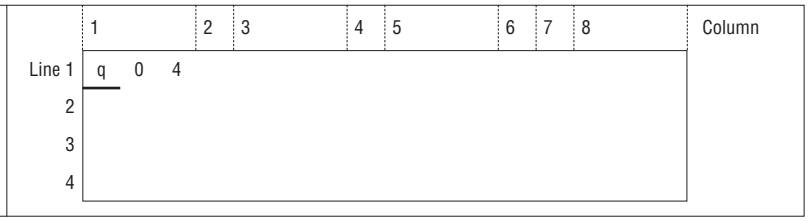
Step 6 :

Press '↑' for 3 times.
Press '↑' or '↓';
the digit where the cursor is located will change from 1 to 4.



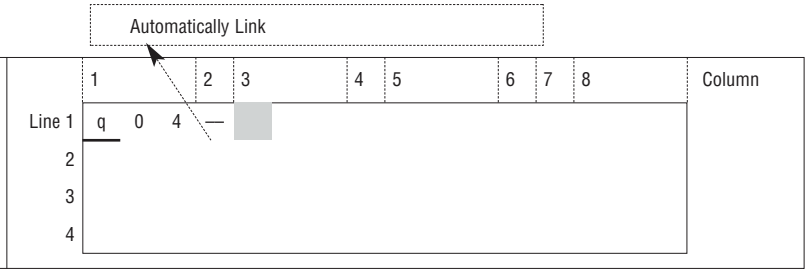
Step 7 :

Press '←' 2 times to move the cursor to 1.



Step 7 :

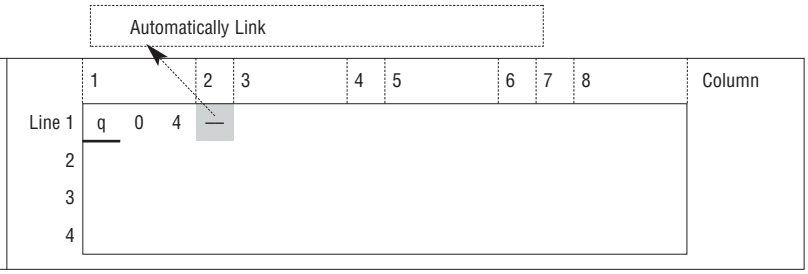
Press 'OK'; the cursor moves to character in column 3 automatically.



or

Step 7 :

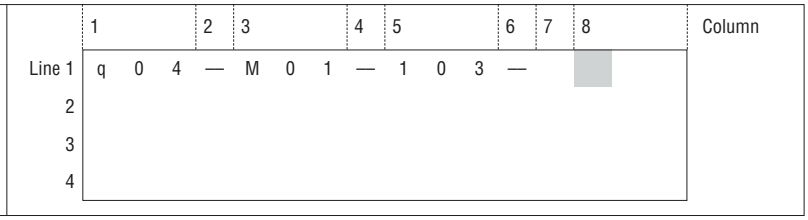
Press '→'; the cursor moves to the link location in column 2 automatically.



Repeat steps 1~7, and input M01, I03 Instruction to columns 3, 5.

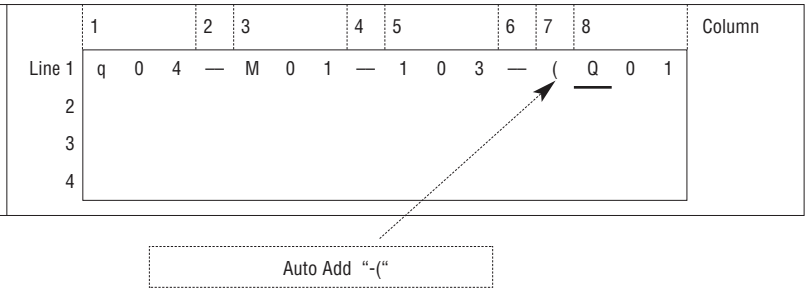
Step 8 :

Press 'OK' in Column 5.
The cursor moves to the character in column 8)



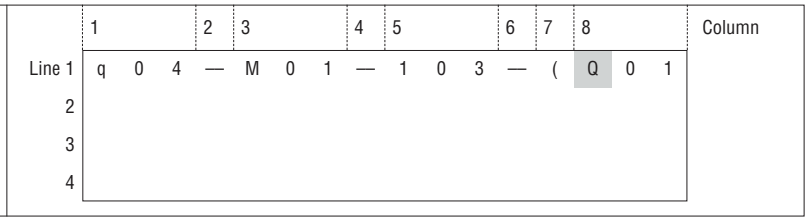
Step 9 :

Press 'SEL'
When the cursor is located at the character and digit, press 'SEL' again to show ' (Q01'.



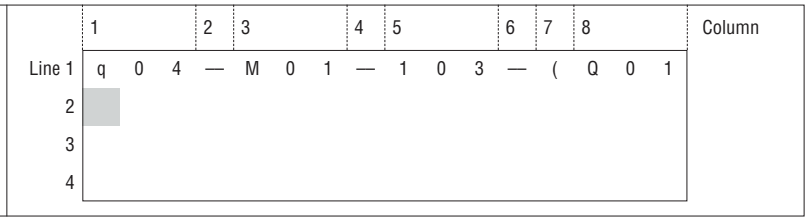
Step 10 :

Press 'OK' to save the input program data; the position of the cursor will not move.



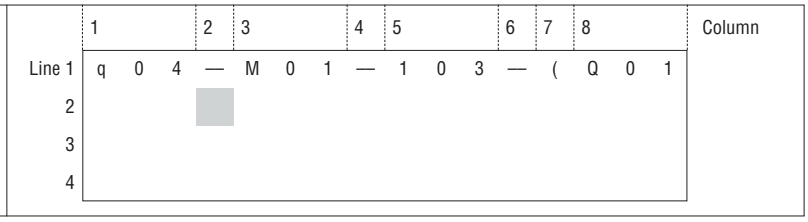
Step 11 :

Press '→' 3 times to move the cursor to column 1 and Line 2.



Step 12 :

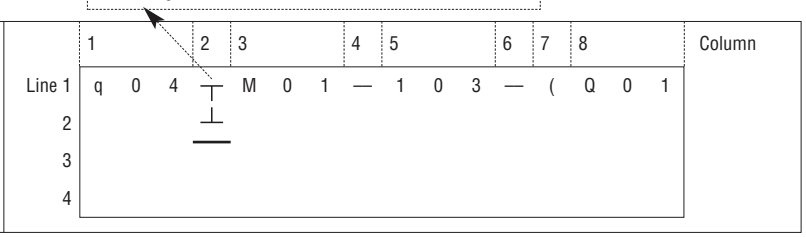
Press '→' 3 times to move the cursor to column 2.
Note: Never press 'SEL' before completing all operations.



Change Wire ' ⊣' to ' I '

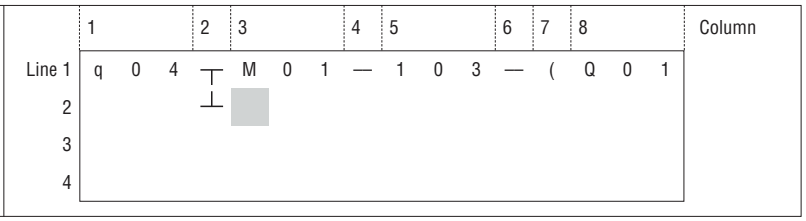
Step 13 :

Press 'SEL'
(A vertical line emerges)



Step 14 :

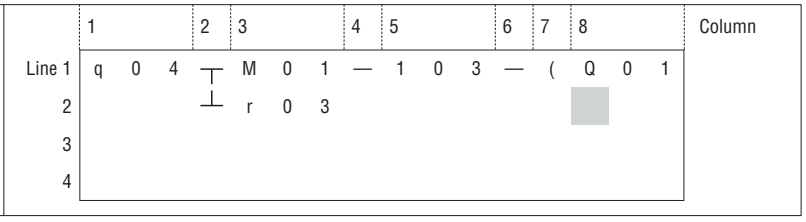
Press 'OK'. Move the cursor to character in column 3.



Repeat the step 1~7 and move the cursor to 'r0 3' , ' _' at Line 2 and column 3~6.

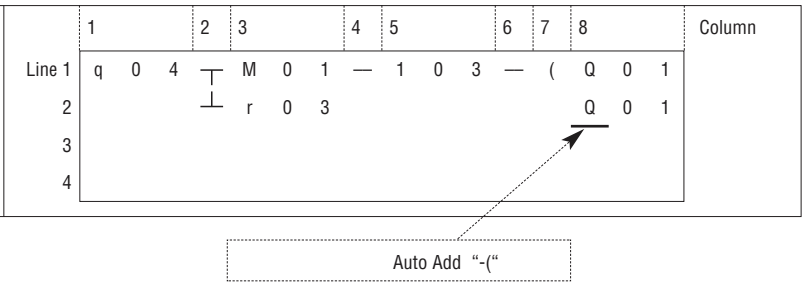
Step 15 :

Press 'OK' and move the cursor to the character in Column 8.



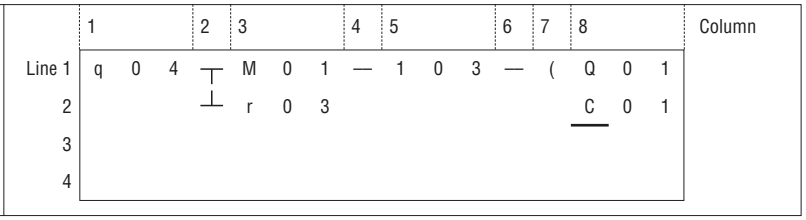
Step 16 :

Press 'SEL'.
When the cursor is located at a digit or character, press 'SEL' and 'Q01' is viewed.



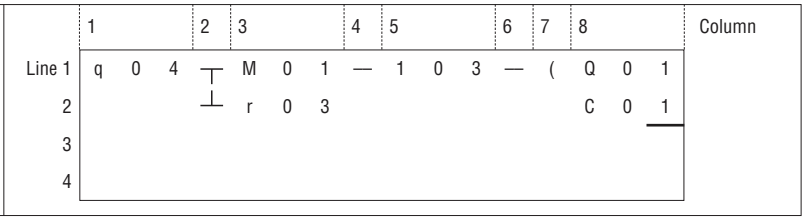
Step 17 :

Press '↑' for 5 times.
Press 'SEL' then '↑' or '↓'
to change character Q to C.)



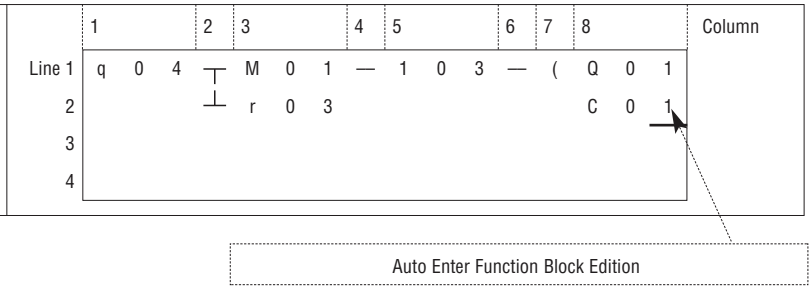
Step 18 :

Press '→' 2 times.



Step 19 :

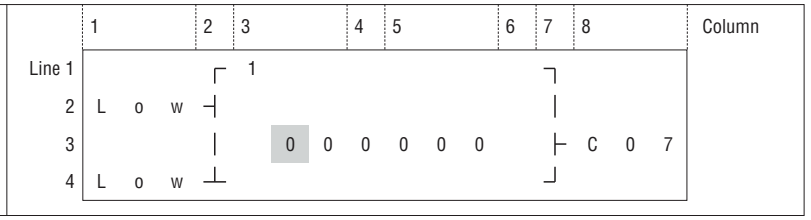
Press '↑' for 6 times
Digit 1 where the cursor is located will change to 7.



Auto Enter Function Block Edition

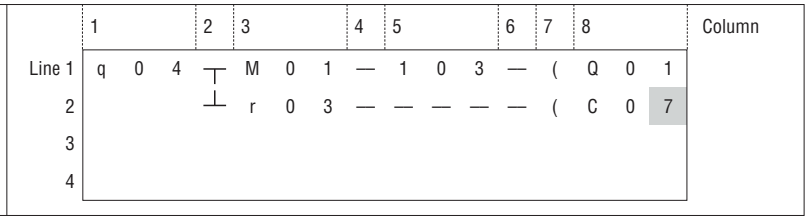
Step 20 :

Press 'OK'
Automatic shift to FUNCTION BLOCK to permit setting of the counter input parameter.

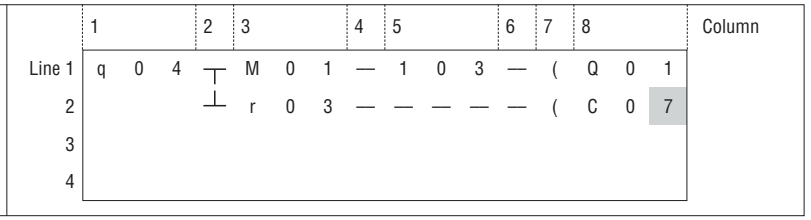


Step 21 :

Press 'ESC' back to LADDER edition screen.

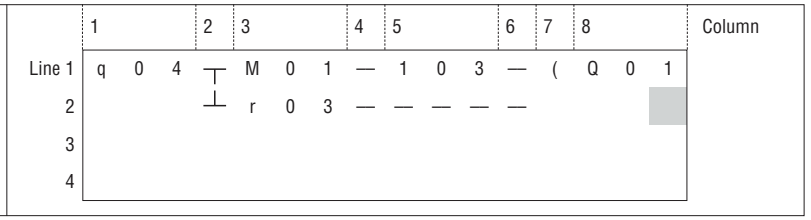


Delete the Program Element



Step 22:

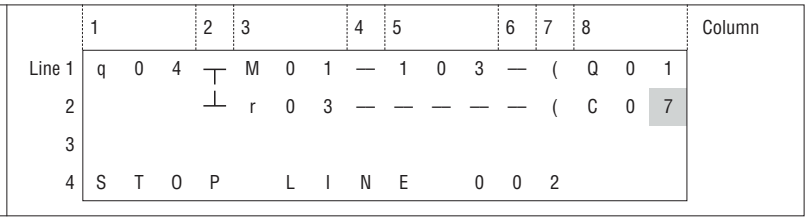
Press 'DEL' to delete element C07 (the cursor location.



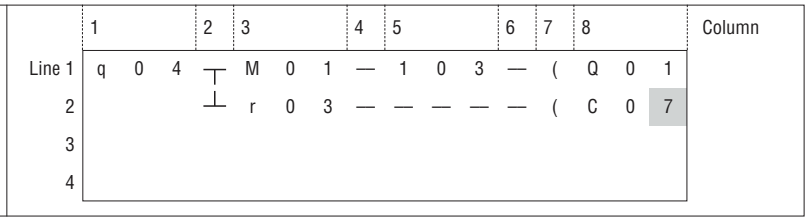
Display the present Line the cursor locating and operation state of LRD

Step 23:

Press 'SEL' and 'ESC' (simultaneously).
Line 4 displays where the cursor is located and LRD operation state.



Delete the whole Line



Step 24:

Press 'SEL+DEL' (Simultaneously)
('ESC' Cancel , 'OK' Execute)

	1			2	3			4	5			6	7	8			Column
Line 1	q	0	4	⊤	M	0	1	—	1	0	3	—	(	Q	0	1	
2				⊥	r	0	3	—	—	—	—	—	(	C	0	7	
3	C	L	E	A	R		L	n		0	0	2					
4	E	S	C		?				O	K		?					

Insert a whole line.

	1			2	3			4	5			6	7	8			Column
Line 1	q	0	4	⊤	M	0	1	—	1	0	3	—	(	Q	0	1	
2				⊥	r	0	3	—	—	—	—	—	(	C	0	7	
3																	
4																	

Step 25:

Press“SEL+OK”
(at the same time)

	1			2	3			4	5			6	7	8			Column
Line 1	q	0	4	⊤	M	0	1	—	1	0	3	—	(	Q	0	1	
2				⊥	r	0	3	—	—	—	—	—	(	C	0	7	
3																	
4																	

Turn page (move upward/ downward 4 lines program):

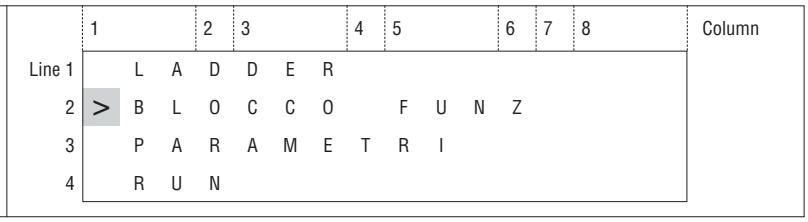
	1			2	3			4	5			6	7	8			Column
Line 1	q	0	4	⊤	M	0	1	—	1	0	3	—	(	Q	0	1	
2				⊥	r	0	3	—	—	—	—	—	(	C	0	7	
3																	
4																	

Step 26:

Press 'SEL+↑/↓'
(at the same time)

	1			2	3			4	5			6	7	8			Column
Line 1	q	0	4	⊤	M	0	1	—	1	0	3	—	(	Q	0	1	
2				⊥	r	0	3	—	—	—	—	—	(	C	0	7	
3																	
4																	

APPENDIX B: KEYPAD PROGRAMMING IN LADDER FUNCTION BLOCK

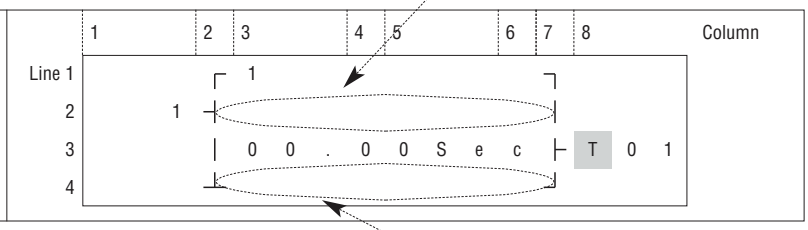


Present action area
The present value will appear when LRD is under 'RUN' mode.

Step 1:

Press 'OK'

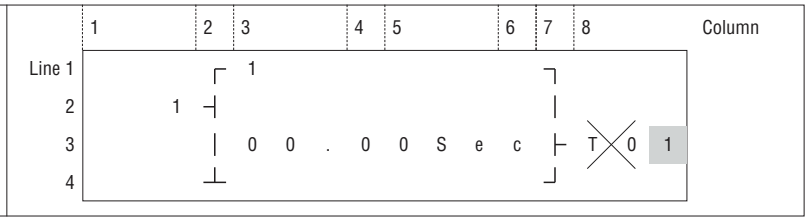
(Enter FUNCTION BLOCK edition)



Preset action value area

Never press '→' to move to the digital position.

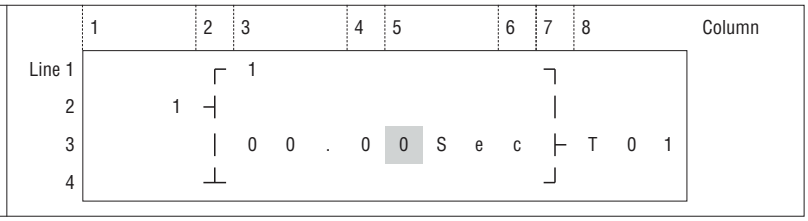
If T02 is required to be changed, Press '↑' or '↓' and 'SEL' to execute.



Step 2: Preset the target value

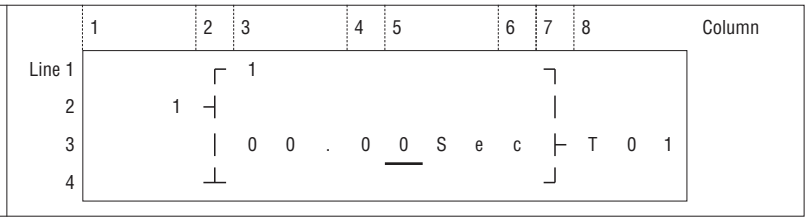
Step 2-1:

Press '←' then move the cursor to the preset action area



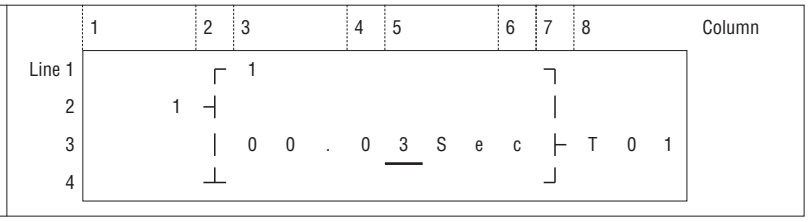
Step 2-2:

Press 'SEL' and begin input the target value.



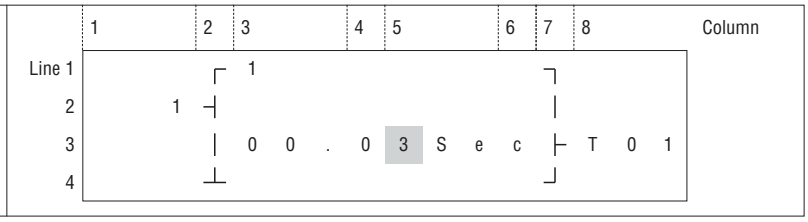
Step 2-3:

Press '↑' for 3 times.
Press 'SEL' then '↑' or '↓'
The digit '0' to '3'.



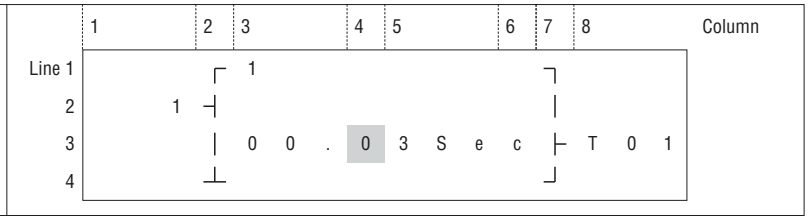
Step 2-4:

Press 'OK'
(Save the input data).



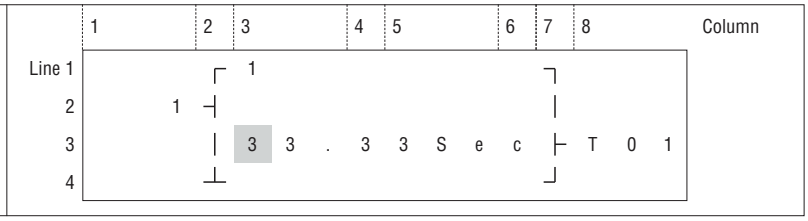
Step 2-5:

Press '←'



Repeat Step 2-2 ~ step 2-4 for 3 times, to enter the following screen:

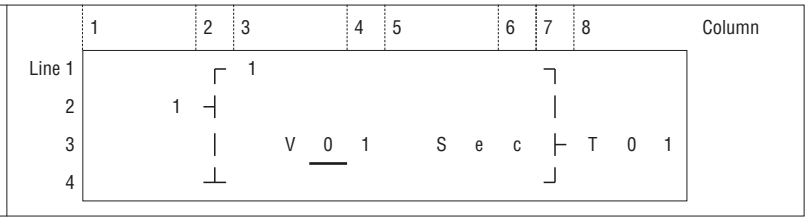
Step 2-6:



As the present value of the timer, counter, analog input (A01-A08) and analog gain value (V01-V08) is set as the preset value of them. Next to the Step 2-2, to execute the following operation:

Step 2-3A:

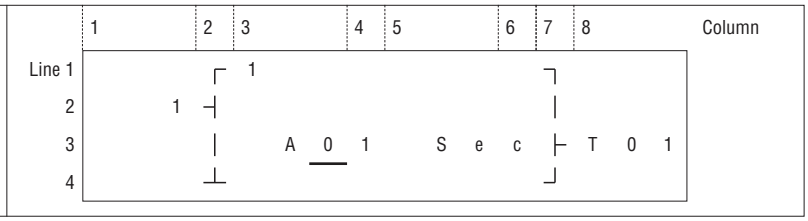
Press 'SEL'



Repeat the step 2-3A, the following screen will be shown in turn:

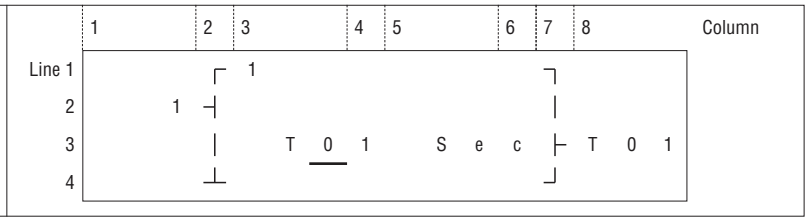
Step 2-3B:

Press 'SEL'



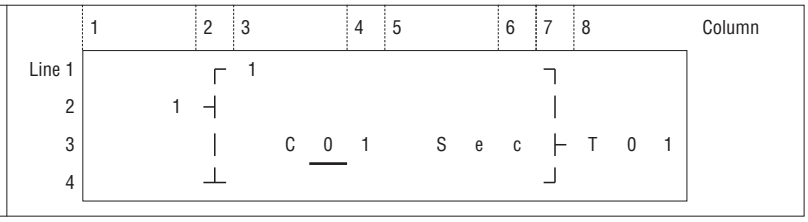
Step 2-3C:

press 'SEL'



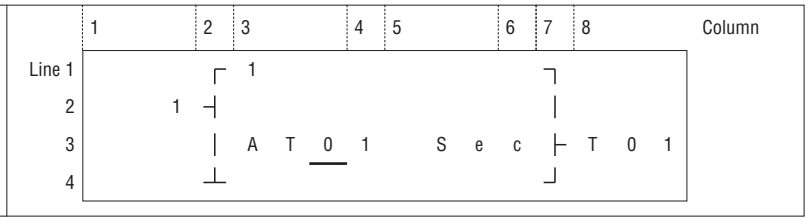
Step 2-3D:

Press 'SEL'



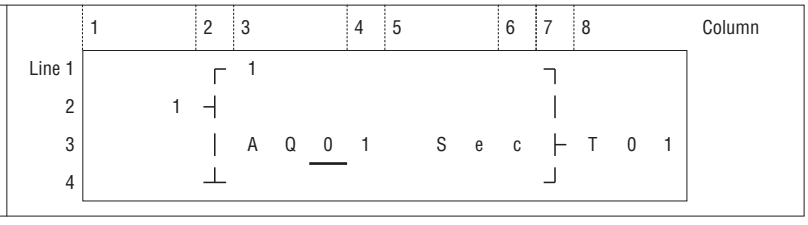
Step 2-3E:

Press 'SEL'



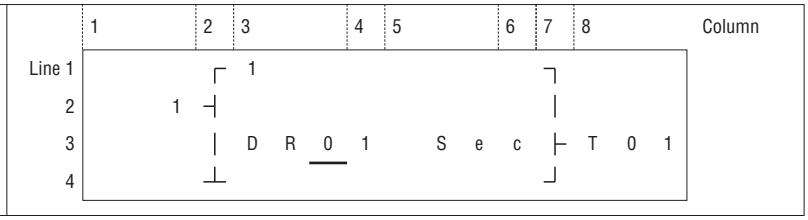
Step 2-3F:

Press 'SEL'



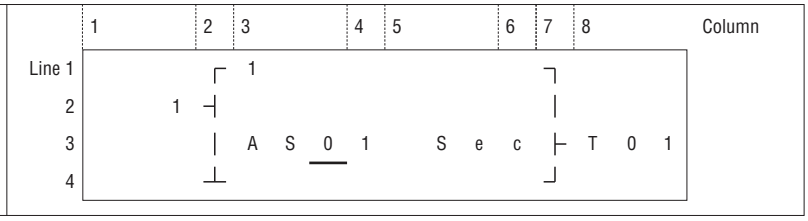
Step 2-3G:

Press 'SEL'



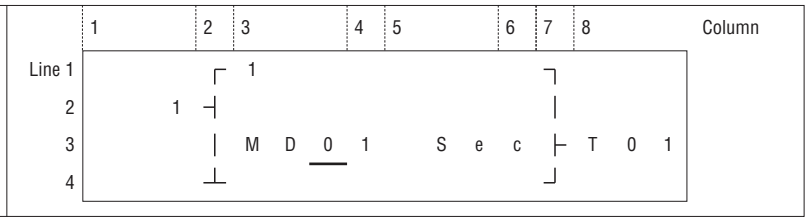
Step 2-3H:

Press 'SEL'



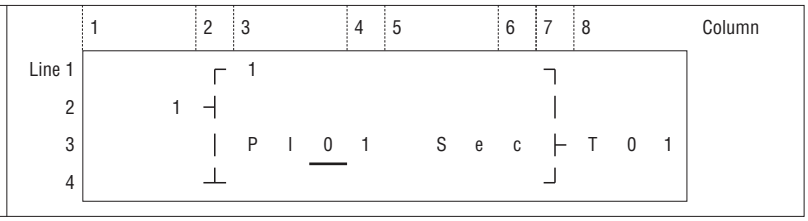
Step 2-3I:

Press 'SEL'



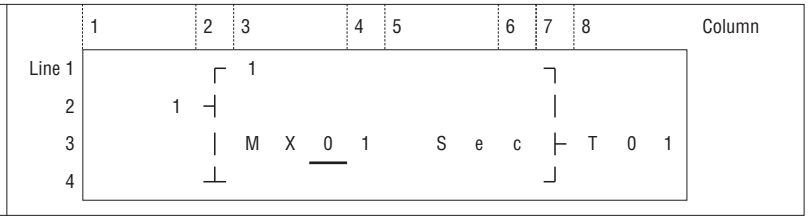
Step 2-3J:

Press 'SEL'



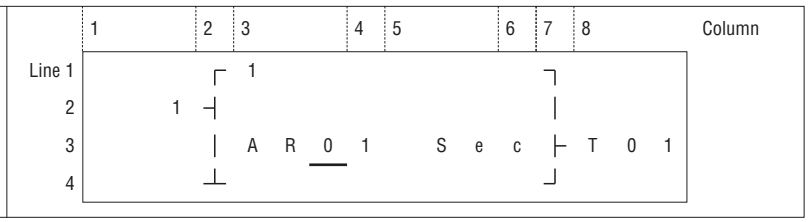
Step 2-3K:

Press 'SEL'



Step 2-3L:

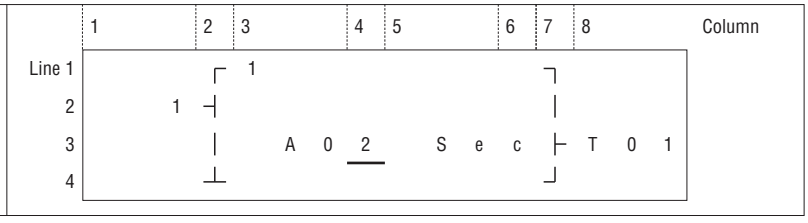
Press 'SEL'



Next to step 2-3B, the following screen will be shown.

Step 2-4B:

Press '→', press '↑'

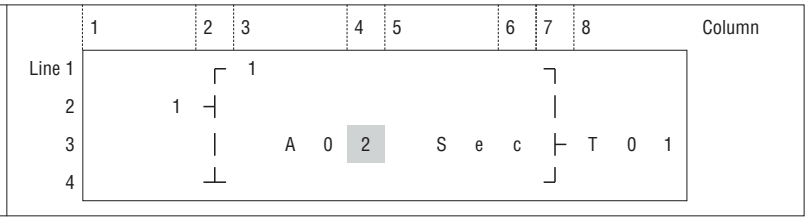


Repeat Step 2-4B (key '↓' is also active), to change parameters and/or values of A01-A08, C01-C1F, T01-T1F and V01-V08.
After having made all the modifications, proceed with:

Step 2-5B:

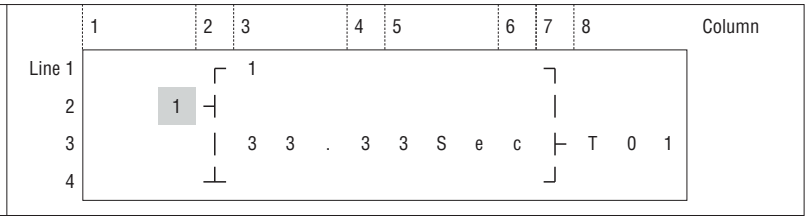
press 'OK'

Save the present data.



Step 2-7:

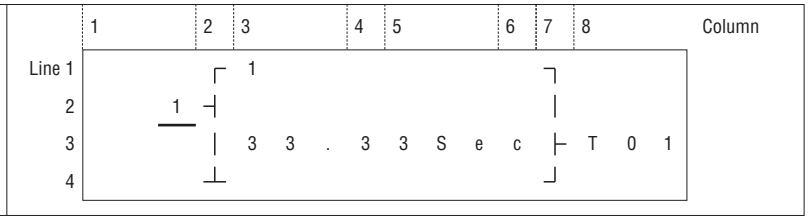
Press '↑'



Step 2-8:

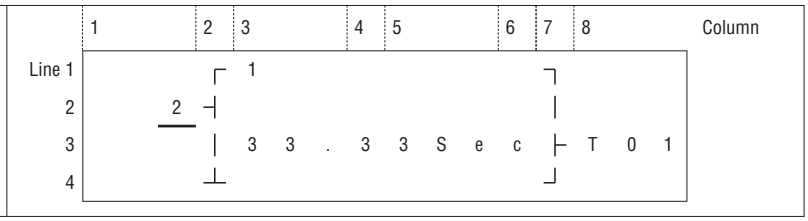
Press 'SEL'

(begin to edit data).



Step 2-9:

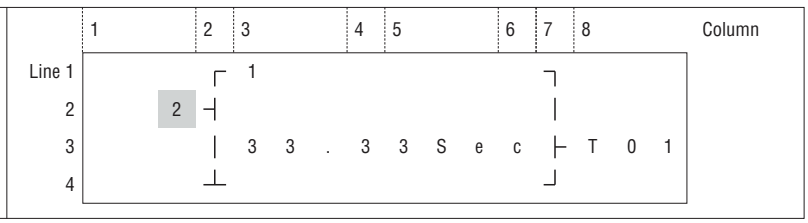
Press '↑'
Press 'SEL' then ' ↑' or '↓'
to change '1' to ' 2'.



Step 2-10:

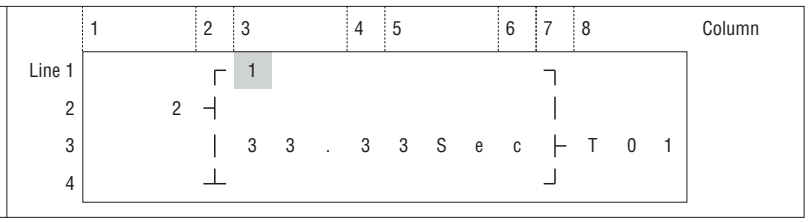
Press 'OK'

(save the input data)



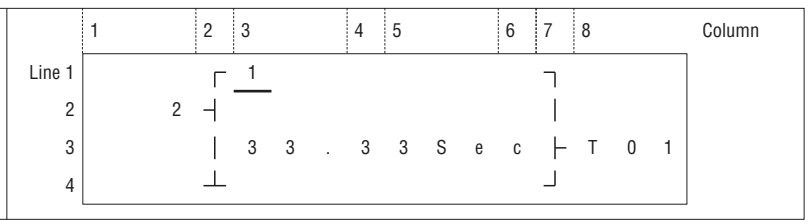
Step 2-11:

Press '↑' then move the cursor
to position '1'.



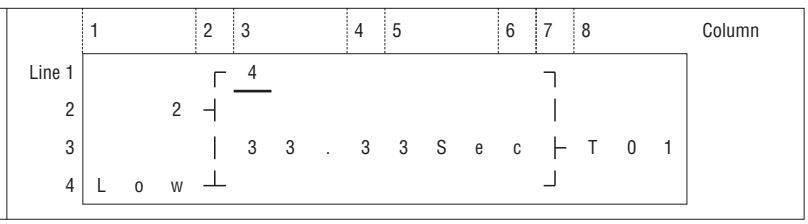
Step 2-12:

Press 'SEL'
(begin to edit data)



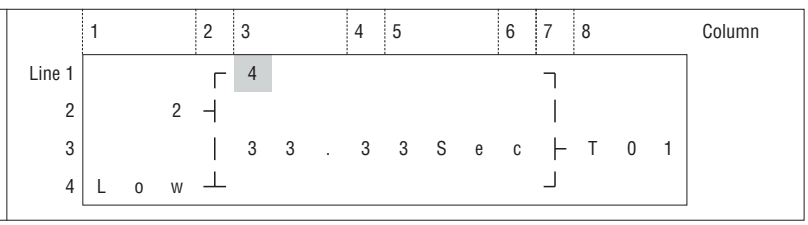
Step 2-13:

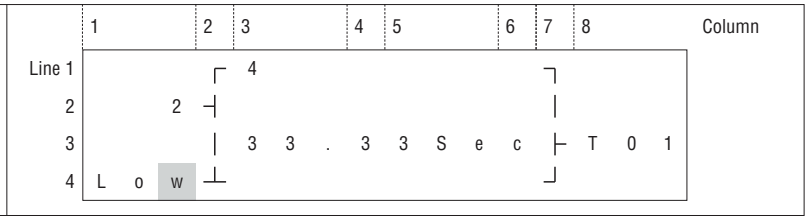
Press '↑' for 3 times
Press 'SEL' then '↑' or '↓' to
change 1 to 4.



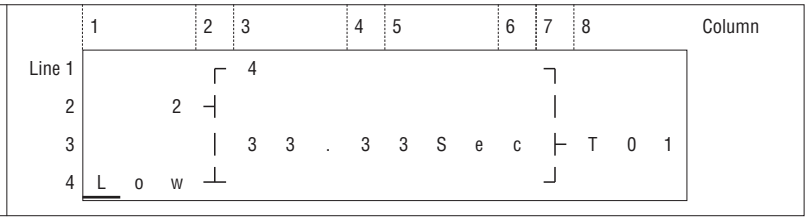
Step 2-14:

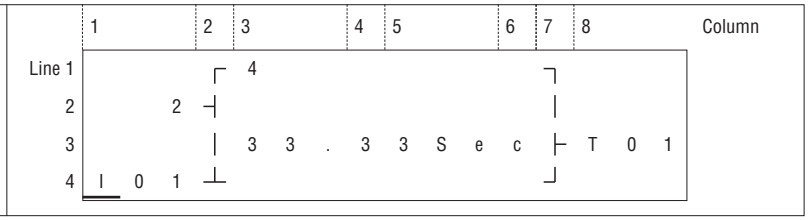
Press 'OK'
(save input data).



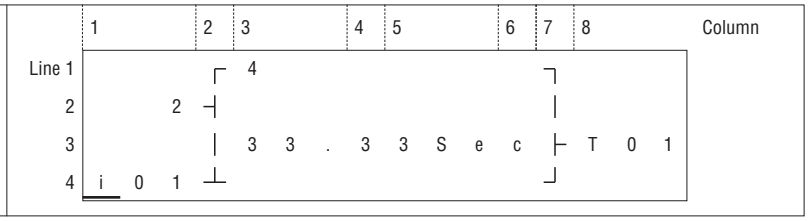
Step 2-15: Press '↓' for 3 times (this step leads to editing the action relay)	

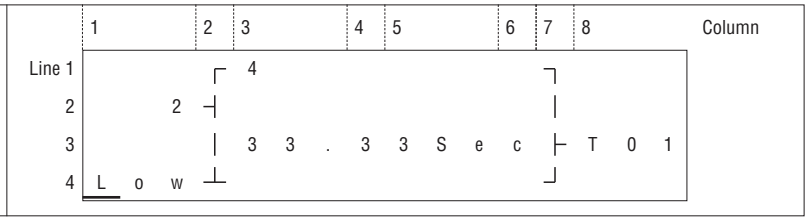
Edit action program and preset the action relay

Step 2-16: Press '→' 2 times. Press 'SEL' (Begin to modify)	

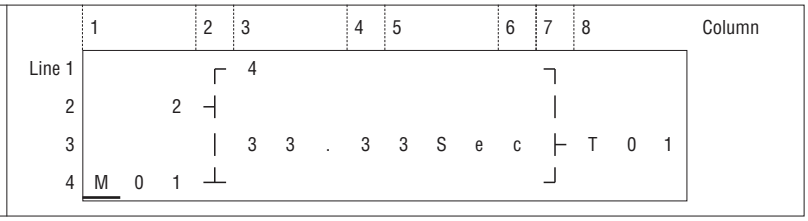
Step 2-16A: Press 'SEL' (Begin to modify)	

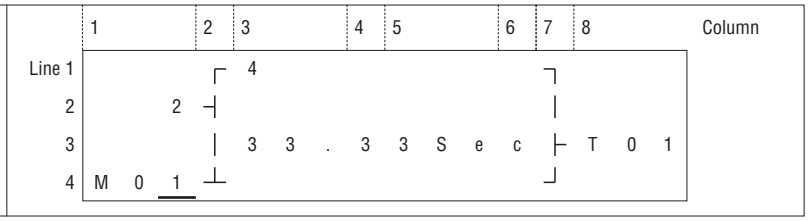
Repeat the step 2-16A, the following screen will be shown in turn:

Step 2-16B: Press 'SEL'	

Step 2-16C: Press 'SEL'	

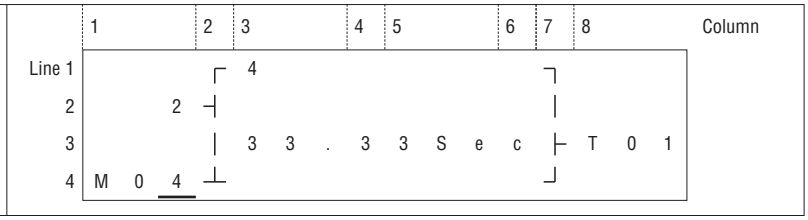
Next to step 2-16A, then '↑', the following screen will be shown.

Step 2-17: Press '↑' for 5 times to change I to M.	

Step 2-18: Press '→' 2 times to move the cursor to digital location.	

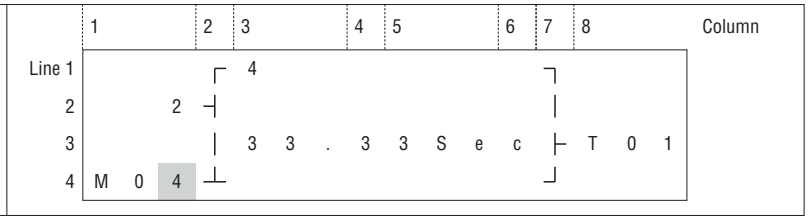
Step 2-19:

Press '↑' for 3 times.
Press 'SEL' then '↑ or ↓' to change '1' to '4'.



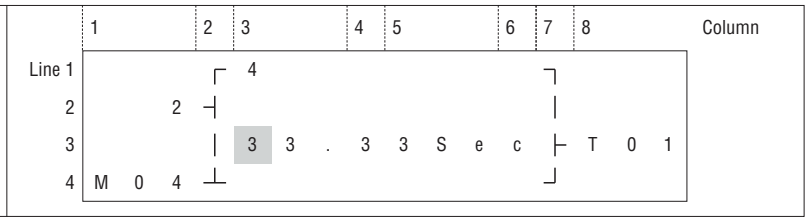
Step 2-20:

Press 'OK' to save the input data.



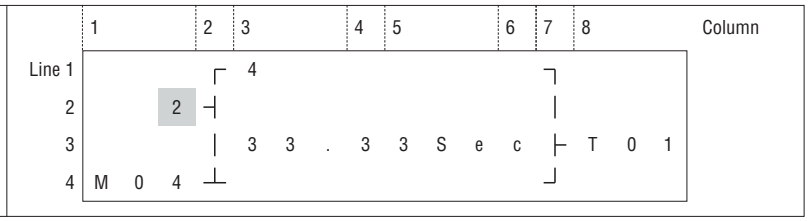
Step 2-21:

Press '↑' then move the cursor to preset action value area and repeat Step 2-1.



Step 2-22:

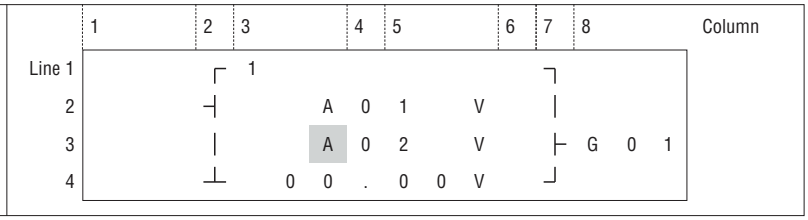
Press '↑' then move the cursor to position '2' and repeat step 2-8.



The detailed operation of modifying the analog comparator Ax, Ay:

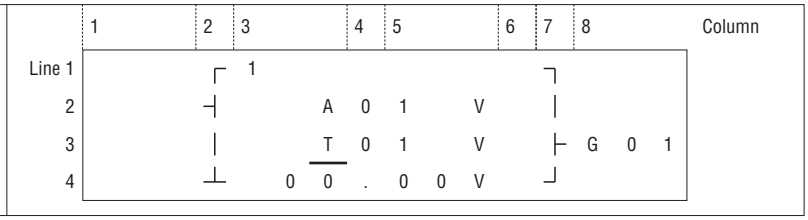
Step 2-23:

Press '←', press 'SEL' and then '↑' or '↓' to select A01-A08.



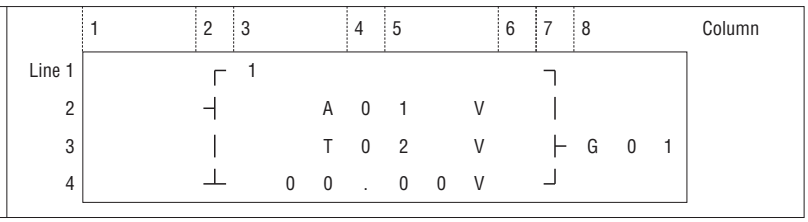
Step 2-24:

Press '←' and then 'SEL'
Press 'SEL' again and select A02 - T01 - C01-AT01-AQ01-DR01-AS01- MD01-PI01-MX01-AR01-00.00- V01-A01.



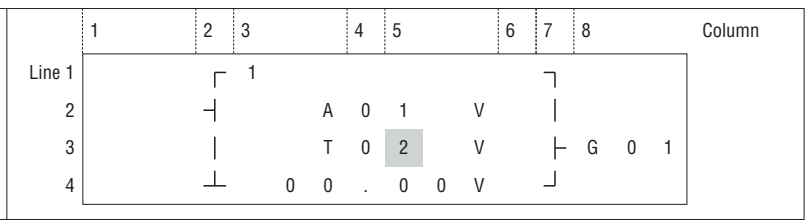
Step 2-25:

Press '→' and then '↑'.
Select T01~T1F, C01~C1F, A01~A08, V01~V08…

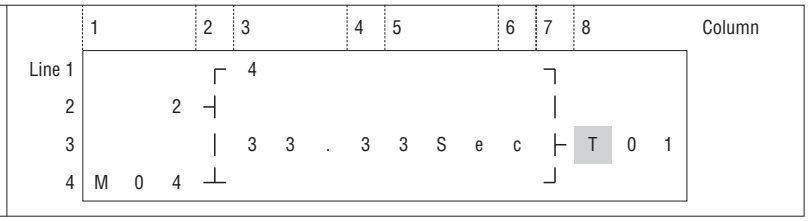


Step 2-26:

Press 'OK' to save the present data.

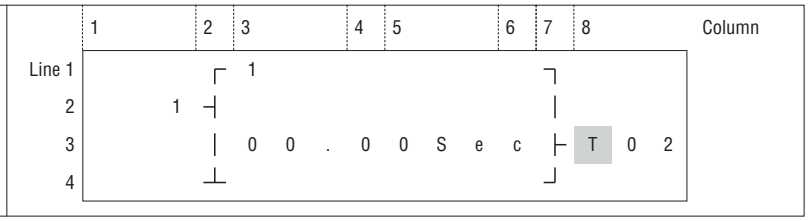


Continue to input Function Block

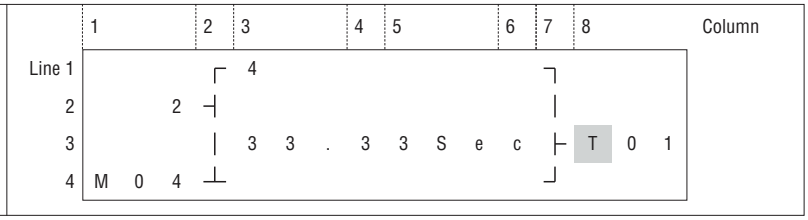


Step 1:

Press 'SEL' and '↑' (Simultaneously)

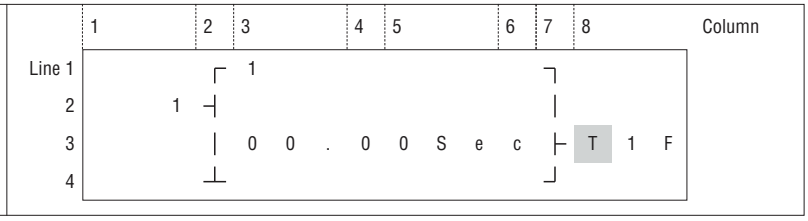


Last Function Block



Step 1-2:

Press 'SEL' and '↓' (Simultaneously)

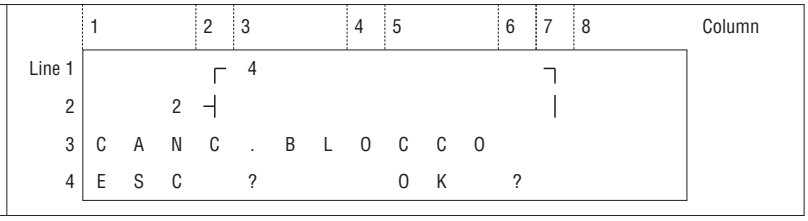


DELETE FUNCTION BLOCK

Step 1-3:

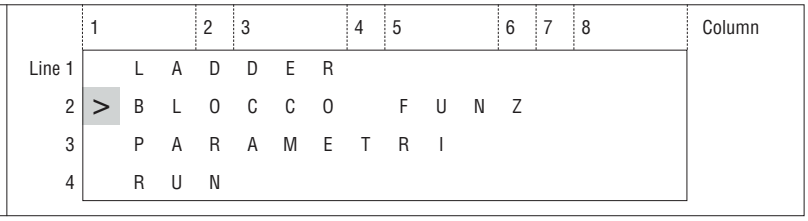
Press 'SEL' and 'DEL' (Simultaneously)

Press 'ESC': Cancel or 'OK': Execute)

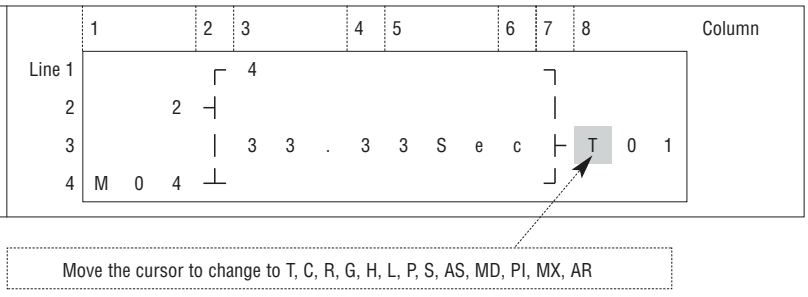


BACK TO MAIN MENU:

Press 'ESC'

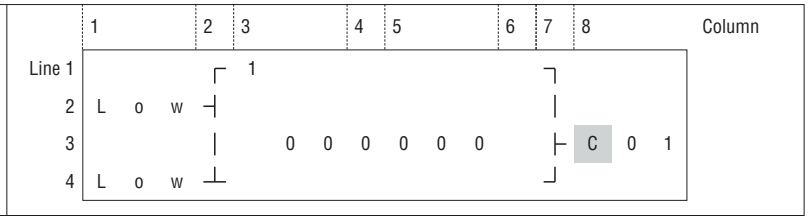


CHANGE FUNCTION BLOCK CATEGORY:



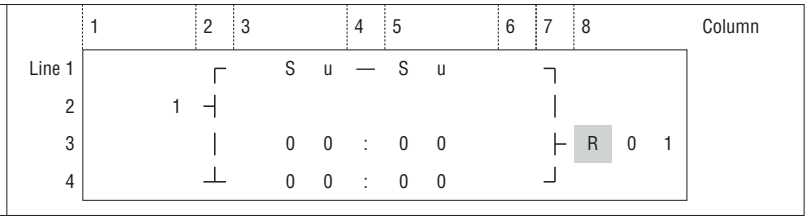
Step 1:

Press 'SEL'



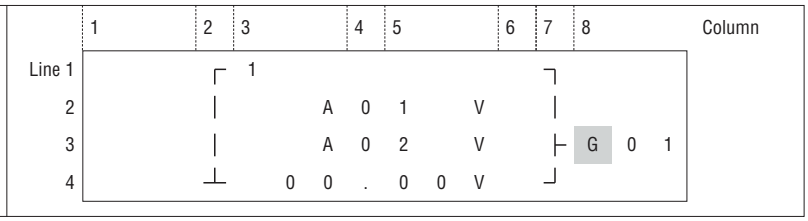
Step 2:

Press 'SEL'



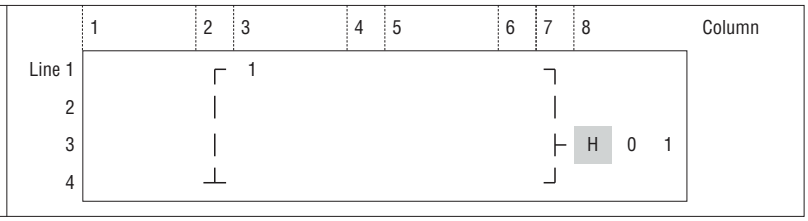
Step 3:

Press 'SEL'



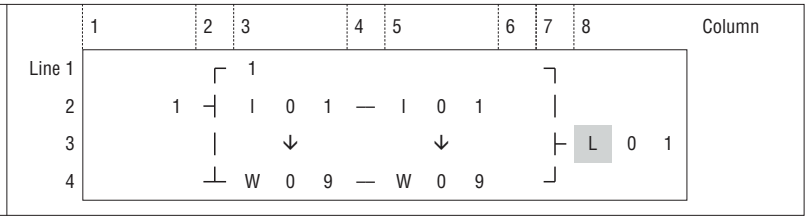
Step 4:

Press 'SEL'



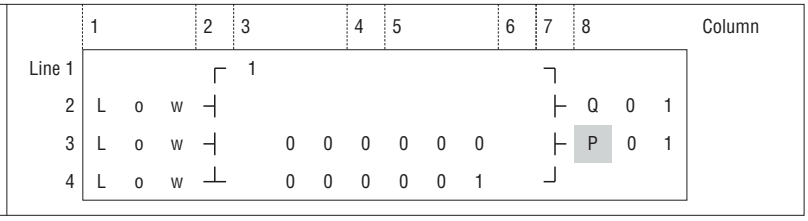
Step 5:

Press 'SEL'



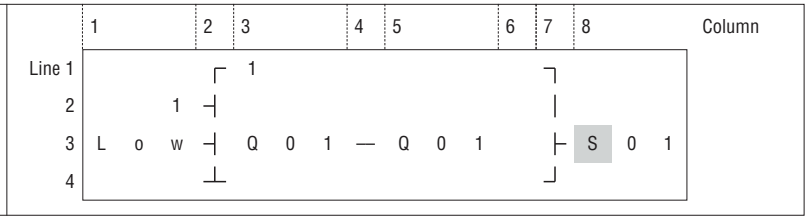
Step 6:

Press 'SEL'



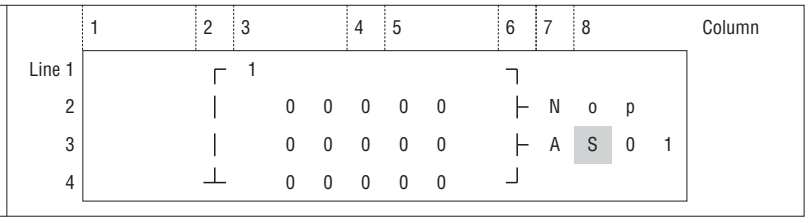
Step 7:

Press 'SEL'



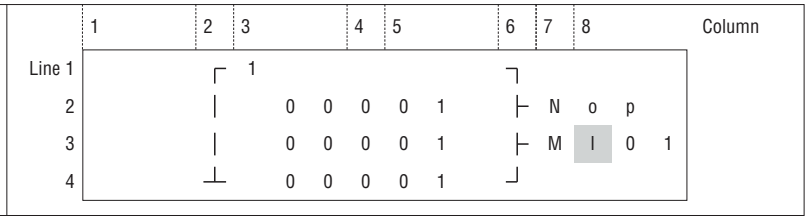
Step 8:

Press 'SEL'



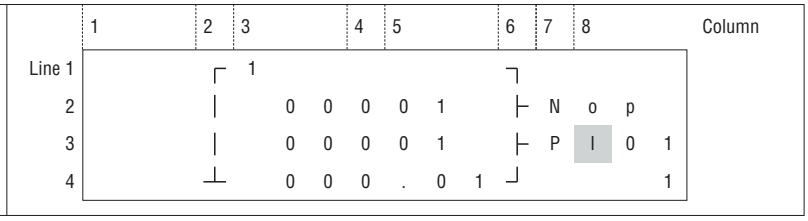
Step 9:

Press 'SEL'



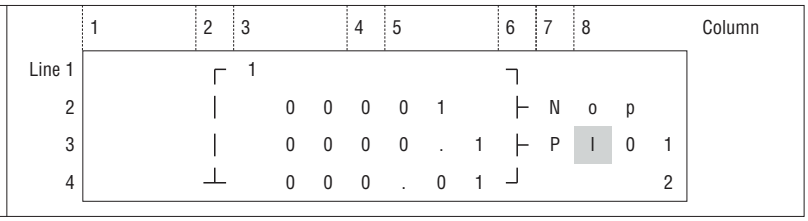
Step 10A:

Press 'SEL'



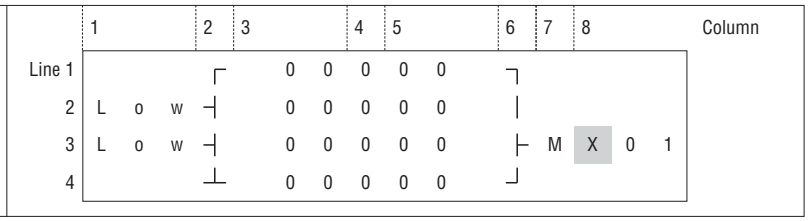
Step 10B:

Press 'SEL and then →'



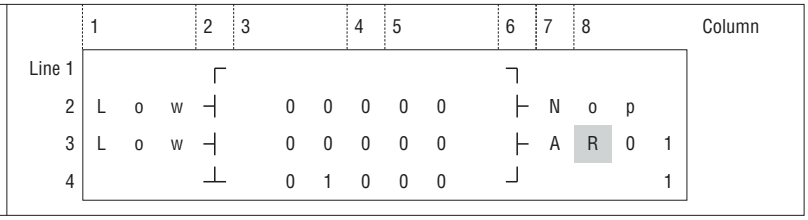
Step 11:

Press 'SEL'



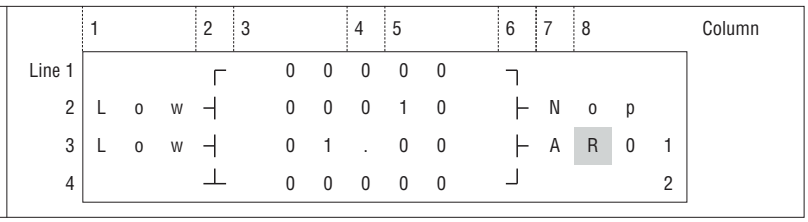
Step 12A:

Press 'SEL'



Step 12B:

Press 'SEL and then →'



Step 13:

Press 'SEL'