LRX D01

1185 GB 05 20

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GB USER'S MANUAL OF MICRO PLC LRD…

LRX D01

WARNING!
- Carefully read the manual before the installation or use.
- This equipment is to be installed by qualified personnel, complying to current standards, to avoid damages or safety hazards.
- Before any maintenance operation on the device, remove all the voltages from measuring and supply inputs and short-circuit the CT input terminals.
- The manufacturer cannot be held responsible for electrical safety in case of improper use of the equipment.
- Products illustrated herein are subject to alteration and changes without prior notice. Technical data and descriptions in the documentation are accurate, to the best of our knowledge, but no liabilities for errors, omissions or contingencies arising there from are accepted.
- A circuit breaker must be included in the electrical installation of the building. It must be installed close by the equipment and within easy reach of the operator. It must be marked as the disconnecting device of the equipment: IEC /EN 61010-1 § 6.11.2.
- Clean the device with a soft dry cloth; do not use abrasives, liquid detergents or solvents.

ATTENTION !
- Lire attentivement le manuel avant toute utilisation et installation.
- Ces appareils doivent être installés par un personnel qualifié, conformément aux normes en vigueur en matière d'installations, afin d'éviter de causer des dommages à des personnes ou choses.
- Avant toute intervention sur l'instrument, mettre les entrées de mesure et d'alimentation hors tension et court-circuiter les transformateurs de courant.
- Le constructeur n'assume aucune responsabilité quant à la sécurité électrique en cas d'utilisation impropre du dispositif.
- Les produits décrits dans ce document sont susceptibles d'évoluer ou de subir des modifications à n'importe quel moment. Les descriptions et caractéristiques techniques du catalogue ne peuvent donc avoir aucune valeur contractuelle.
- Un interrupteur ou disjoncteur doit être inclus dans l'installation électrique du bâtiment. Celui-ci doit se trouver tout près de l'appareil et l'opérateur doit pouvoir y accéder facilement. Il doit être marqué comme le dispositif d'interruption de l'appareil : IEC/ EN 61010-1 § 6.11.2.
- Nettoyer l'appareil avec un chiffon doux, ne pas utiliser de produits abrasifs, détergents liquides ou solvants.

ACHTUNG!
- Dieses Handbuch vor Gebrauch und Installation aufmerksam lesen.
- Zur Vermeidung von Personen- und Sachschäden dürfen diese Geräte nur von qualifiziertem Fachpersonal und unter Befolgung der einschlägigen Vorschriften installiert werden.
- Vor jedem Eingriff am Instrument die Spannungszufuhr zu den Messeingängen trennen und die Stromwandler kurzschließen.
- Bei zweckwidrigem Gebrauch der Vorrichtung übernimmt der Hersteller keine Haftung für die elektrische Sicherheit.
- Die in dieser Broschüre beschriebenen Produkte können jederzeit weiterentwickelt und geändert werden. Die im Katalog enthaltenen Beschreibungen und Daten sind daher unverbindlich und ohne Gewähr.
- In die elektrische Anlage des Gebäudes ist ein Ausschalter oder Trennschalter einzubauen. Dieser muss sich in unmittelbarer Nähe des Geräts befinden und vom Bediener leicht zugänglich sein. Er muss als Trennvorrichtung für das Gerät gekennzeichnet sein: IEC/ EN 61010-1 § 6.11.2.
- Das Gerät mit einem weichen Tuch reinigen, keine Scheuermittel, Flüssigreiniger oder Lösungsmittel verwenden.

ADVERTENCIA
- Leer atentamente el manual antes de instalar y utilizar el regulador.
- Este dispositivo debe ser instalado por personal cualificado conforme a la normativa de instalación vigente a fin de evitar daños personales o materiales.
- Antes de realizar cualquier operación en el dispositivo, desconectar la corriente de las entradas de alimentación y medida, y cortocircuitar los transformadores de corriente.
- El fabricante no se responsabilizará de la seguridad eléctrica en caso de que el dispositivo no se utilice de forma adecuada.
- Los productos descritos en este documento se pueden actualizar o modificar en cualquier momento. Por consiguiente, las descripciones y los datos técnicos aquí contenidos no tienen valor contractual.
- La instalación eléctrica del edificio debe disponer de un interruptor o disyuntor. Éste debe encontrarse cerca del dispositivo, en un lugar al que el usuario pueda acceder con facilidad. Además, debe llevar el mismo marcado que el interruptor del dispositivo (IEC/ EN 61010-1 § 6.11.2).
- Limpiar el dispositivo con un trapo suave; no utilizar productos abrasivos, detergentes líquidos ni disolventes.

UPOZORNĚNÍ
- Návod se pozorně pročtěte, než začnete regulátor instalovat a používat.
- Tato zařízení smí instalovat kvalifikovaní pracovníci v souladu s platnými předpisy a normami pro předcházení úrazů osob či poškození věcí.
- Před jakýmkoli zásahem do přístroje odpojte měřicí a napájecí vstupy od napětí a zkratujte transformátory proudu.
- Výrobce nenese odpovědnost za elektrickou bezpečnost v případě nevhodného používání regulátoru.
- Výrobky popsané v tomto dokumentu mohou kdykoli projít úpravami či dalším vývojem. Popisy a údaje uvedené v katalogu nemají proto žádnou smluvní hodnotu.
- Spínač či odpojovač je nutno zabudovat do elektrického rozvodu v budově. Musejí být nainstalované v těsné blízkosti přístroje a snadno dostupné pracovníku obsluhy. Je nutno ho označit jako vypínací zařízení přístroje: IEC/ EN 61010-1 § 6.11.2.
- Přístroj čistěte měkkou utěrkou, nepoužívejte abrazivní produkty, tekutá čistidla či rozpouštědla.

AVERTIZARE!
- Citiţi cu atenţie manualul înainte de instalare sau utilizare.
- Acest echipament va fi instalat de personal calificat, în conformitate cu standardele actuale, pentru a evita deteriorări sau pericolele.
- Înainte de efectuarea oricărei operaţiuni de întreţinere asupra dispozitivului, îndepărtaţi toate tensiunile de la intrările de măsurare şi de alimentare şi scurtcircuitaţi bornele de intrare CT.
- Producătorul nu poate fi considerat responsabil pentru siguranţa electrică în caz de utilizare incorectă a echipamentului.
- Produsele ilustrate în prezentul sunt supuse modificărilor şi schimbărilor fără notificare anterioară. Datele tehnice şi descrierile din documentaţie sunt precise, în măsura cunoştinţelor noastre, dar nu se acceptă nicio răspundere pentru erorile, omiterile sau evenimentele nepreväzute care apar ca urmare a acestora.
- Trebuie inclus un disjunctor în instalaţia electrică a clădirii. Acesta trebuie instalat aproape de echipament şi într-o zonă uşor accesibilă operatorului. Acesta trebuie marcat ca fiind dispozitivul de deconectare al echipamentului: IEC/EN 61010-1 § 6.11.2.
- Curăţaţi instrumentul cu un material textil moale şi uscat; nu utilizaţi substanţe abrazive, detergenţi lichizi sau solvenţi.

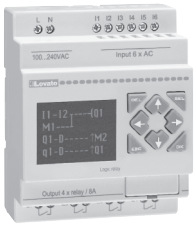
ATTENZIONE!
- Leggere attentamente il manuale prima dell'utilizzo e l'installazione.
- Questi apparecchi devono essere installati da personale qualificato, nel rispetto delle vigenti normative impiantistiche, allo scopo di evitare danni a persone o cose.
- Prima di qualsiasi intervento sullo strumento, togliere tensione dagli ingressi di misura e di alimentazione e cortocircuitare i trasformatori di corrente.
- Il costruttore non si assume responsabilità in merito alla sicurezza elettrica in caso di utilizzo improprio del dispositivo.
- I prodotti descritti in questo documento sono suscettibili in qualsiasi momento di evoluzioni o di modifiche. Le descrizioni ed i dati a catalogo non possono pertanto avere alcun valore contrattuale.
- Un interruttore o disgiuntore va compreso nell'impianto elettrico dell'edificio. Esso deve trovarsi in stretta vicinanza dell'apparecchio ed essere facilmente raggiungibile da parte dell'operatore. Deve essere marchiato come il dispositivo di interruzione dell'apparecchio: IEC/ EN 61010-1 § 6.11.2.
- Pulire l'apparecchio con panno morbido, non usare prodotti abrasivi, detergenti liquidi o solventi.

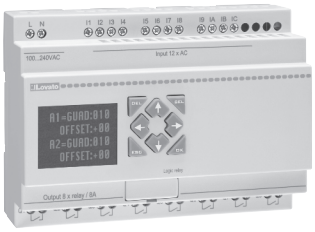
UWAGA!
- Przed użyciem i instalacją urządzenia należy uważnie przeczytać niniejszą instrukcję.
- W celu uniknięcia obrażeń osób lub uszkodzenia mienia tego typu urządzenia muszą być instalowane przez wykwalifikowany personel, zgodnie z obowiązującymi przepisami.
- Przed rozpoczęciem jakichkolwiek prac na urządzeniu należy odłączyć napięcie od wejść pomiarowych i zasilania oraz zewrzeć zaciski przekładnika prądowego.
- Producent nie przyjmuje na siebie odpowiedzialności za bezpieczeństwo elektryczne w przypadku niewłaściwego użytkowania urządzenia.
- Produkty opisane w niniejszym dokumencie mogą być w każdej chwili udoskonalone lub zmodyfikowane. Opisy oraz dane katalogowe nie mogą mieć w związku z tym żadnej wartości umownej.
- W instalacji elektrycznej budynku należy uwzględnić przełącznik lub wyłącznik automatyczny. Powinien on znajdować się w bliskim sąsiedztwie urządzenia i być łatwo osiągalny przez operatora. Musi być oznaczony jako urządzenie służące do wyłączania urządzenia: IEC/ EN 61010-1 § 6.11.2.
- Urządzenie należy czyścić miękką szmatką, nie stosować środkow ściernych, płynnych detergentow lub rozpuszczalnikow.

警告！
- 安装或使用前，请仔细阅读本手册。
- 本设备只能由合格人员根据现行标准进行安装，以避免造成损坏或安全危害。
- 对设备进行任何维护操作前，请移除测量输入端和电源输入端的所有电压，并短接 CT 输入端。
- 制造商不负责因设备使用不当导致的电气安全问题。
- 此处说明的产品可能会有变更，恕不提前通知。 我们竭力确保本文档中技术数据和说明的准确性，但对于错误、遗漏或由此产生的意外事件概不负责。
- 建筑电气系统中必须装有断路器。断路器必须安装在靠近设备且方便操作员触及的地方。必须将断路器标记为设备的断开装置：IEC/EN 61010-1 § 6.11.2.
- 请使用柔软的干布清洁设备；切勿使用研磨剂、洗涤液或溶剂。

ПРЕДУПРЕЖДЕНИЕ!
- Прежде чем приступать к монтажу или эксплуатации устройства, внимательно ознакомьтесь с одержанием настоящего руководства.
- Во избежание травм или материального ущерба монтаж должен существляться только квалифицированным персоналом в соответствии с действующими нормативами.
- Перед проведением любых работ по техническому обслуживанию устройства необходимо обесточить все измерительные и питающие входные контакты, а также замкнуть накоротко входные контакты трансформатора тока (TT).
- Производитель не несет ответственность за обеспечение электробезопасности в случае ненадлежащего использования устройства.
- Изделия, описанные в настоящем документе, в любой момент могут подвергнуться изменениям или усовершенствованиям. Поэтому каталожные данные и описания не могут рассматриваться как действительные с точки зрения контрактов
- Электрическая сеть здания должна быть оснащена автоматическим выключателем, который должен быть расположен вблизи оборудования в пределах доступа оператора. Автоматический выключатель должен быть промаркирован как отключающее устройство оборудования: IEC /EN 61010-1 § 6.11.2.
- Очистку устройства производить с помощью мягкой сухой ткани, без применения абразивных материалов, жидких моющих средств или растворителей.

DİKKAT!
- Montaj ve kullanımdan önce bu el kitabını dikkatlice okuyunuz.
- Bu aparatlar kişilere veya nesnelere zarar verme ihtimaline karşı yürürlükte olan sistem kurma normlarına göre kalifiye personel tarafından monte edilmelidirler
- Aparata (cihaz) herhangi bir müdahalede bulunmadan önce ölçüm girişlerindeki gerilimi kesip akım transformatörlerinede kısa devre yaptırınız.
- Üretici aparatın hatalı kullanımından kaynaklanan elektriksel güvenliğe ait sorumluluk kabul etmez.
- Bu doküманda tarif edilen ürünler her an evrimlere veya değişimlere açıktır. Bu sebeple katalogdaki tarif ve değerler herhangi bir bağlayıcı değeri haiz değildir.
- Binanın elektrik sisteminde bir anahtar veya şalter bulunmalıdır. Bu anahtar veya şalter operatörün kolaylıkla ulaşabileceği yakın bir yerde olmalıdır. Aparatı (cihaz) devreden çıkartma görevi yapan bu anahtar veya şalterin markası: IEC/ EN 61010-1 § 6.11.2.
- Aparatı (cihaz) sıvı deterjan veya solvent kullanarak yumuşak bir bez ile siliniz aşındırıcı temizlik ürünleri kullanmayınız.





Contents

WIRING
This user's manual has been modified to include the description, wiring and programming of base module LRD20R D012 and PC USB - LRD connection cable LRX C03.

These modules can be used only with LRD… micro PLC with firmware ≥3.0 and programming software LRXSW revision level ≥3.

CHAPTER 1: GETTING STARTED

The LRD micro PLC is an electronic device. For safety reasons, 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 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 body 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 is open and exposed. For the open-board models, all electrical components are exposed. For this reason, it is recommended the LRD 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 body injury or considerable damage to property.

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

 Make sure the wiring of the LRD 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, complete functional and safety testing must be conducted. Only run the LRD after all testing and confirmed 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 body 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 body 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 has been fully tested and examined before shipment. Carry out the following examination procedures after unpacking your LRD micro PLC.

- 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 to the power supply if there is any sign of damage.

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

ENVIRONMENTAL PRECAUTIONS

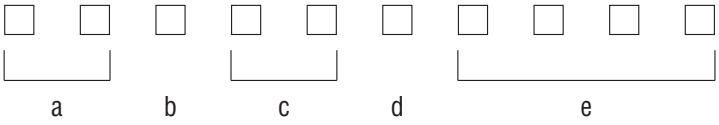
The installation site of the LRD is very important. It relates directly to the functionality and the life span of your LRD. Carefully choose an installation site that meets the following requirements:

- 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 shavings from contacting the LRD
- Avoid electric-magnetic interference (soldering or power machinery)
- Avoid excessive vibration; if vibration cannot be avoided, anti-vibration mounts should be installed to maintain system equilibrium.

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 module with display
E ⇒ Expansion module

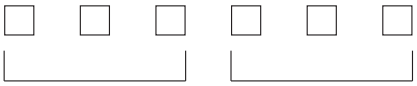
c. 10 ⇒ Base module, 6 digital inputs + 4 digital outputs
12 ⇒ Base module, 8 digital inputs ❶ + 4 digital outputs
20 ⇒ Base module, 12 digital inputs ❷ + 8 digital outputs
02 ⇒ Expansion module, 2 analog outputs
04 ⇒ Expansion module, 4 analog outputs
08 ⇒ Expansion module, 4 digital inputs + 4 digital outputs
P00 ⇒ MODBUS communication module

d. A ⇒ Analog type of inputs or outputs
P ⇒ PT100 sensor inputs
R ⇒ Digital relay outputs
T ⇒ Digital transistor outputs

e. A024 ⇒ Supply voltage 24VAC
A240 ⇒ Supply voltage 100…240VAC
D012 ⇒ Supply voltage 12VDC
D024 ⇒ Supply voltage 24VDC

❶ The D012/D024 version is equipped with 2 digital inputs that can be used as 0…10VDC analog type.
❷ The D012/D024 version is equipped with 4 digital inputs that can be used as 0….10VDC analog type.

CODE COMPOSITION FOR LRD PROGRAMMABLE RELAY ACCESSORIES



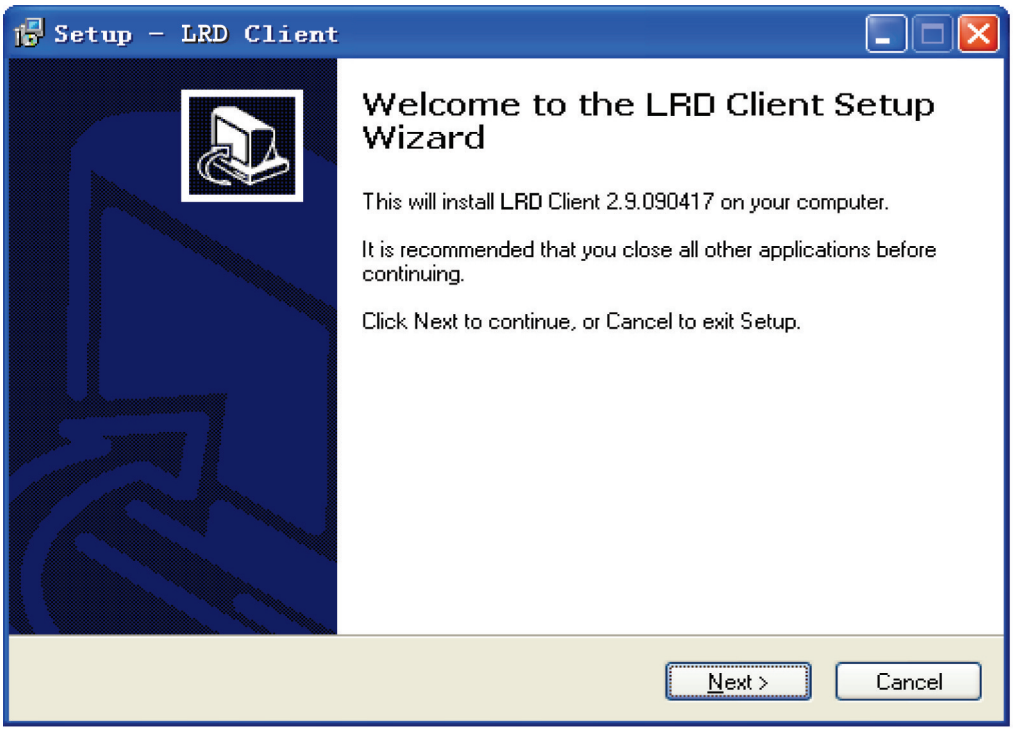
a. LRX ⇒ LRD micro PLC accessory

b. C00 ⇒ Connecting cable for PC RS232 ↔ LRD base module
C03 ⇒ Connecting cable for PC USB ↔ 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

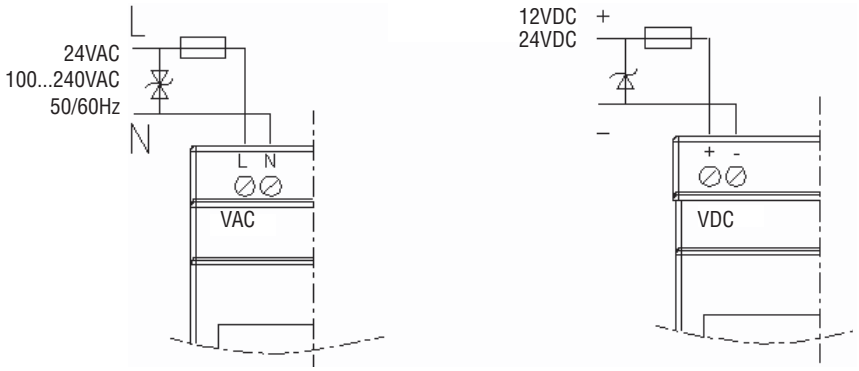
This section is a simple 5-step guide to connecting, programming and operating your new LRD. This is not intended to be the complete instructions for programming and installation of your system. Many steps refer to other sections in the manual for more detailed information.

INSTALL LRXSW SOFTWARE
Install the LRXSW software from CD. For eventual upgrades, contact Customer Service (Tel. +39 035-4282422, email: service@LovatoElectric.com)



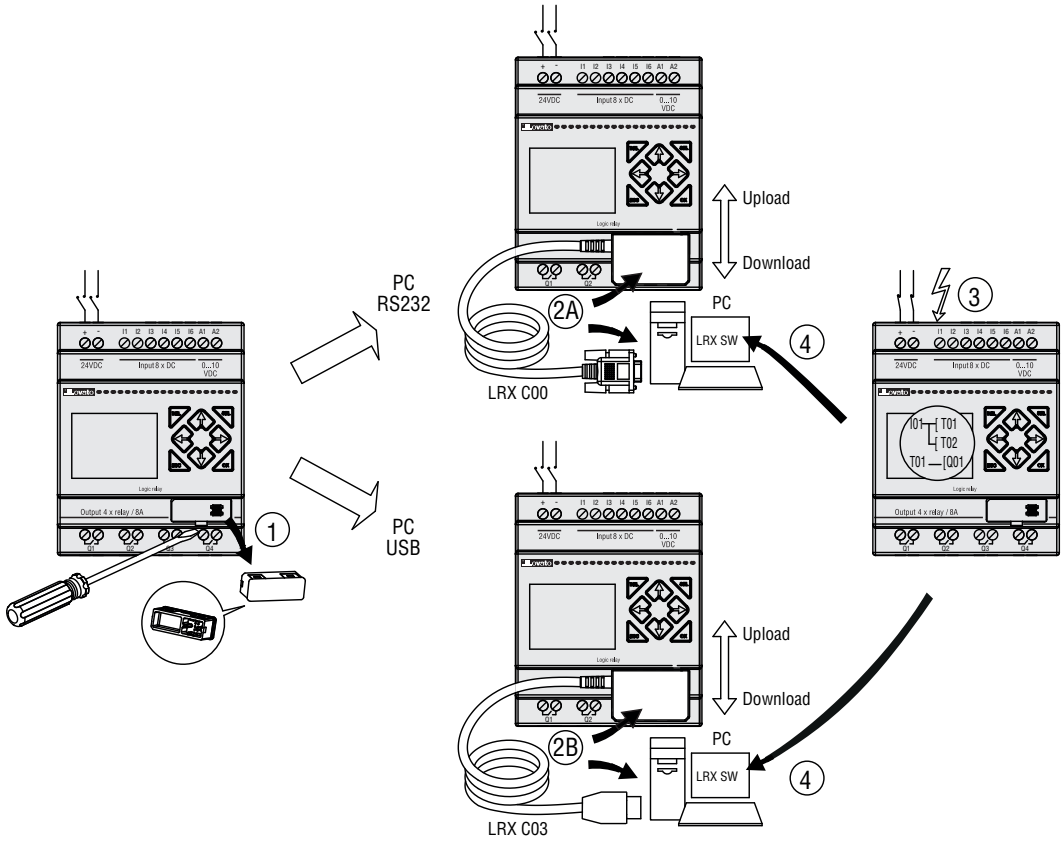
CONNECT POWER TO LRD MICRO PLC

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



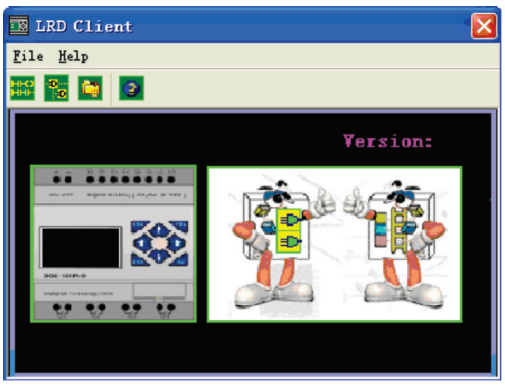
CONNECT PROGRAMMING CABLE LRXC00/LRXC03

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 unit as shown in the figure below. Connect the opposite end of the cable to an RS232 or USB port on the computer, depending on the cable used.

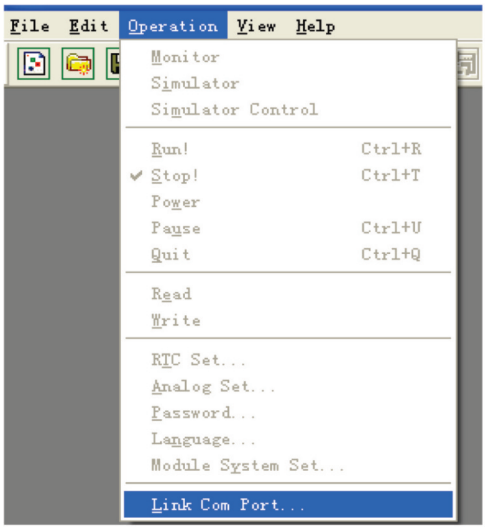


ESTABLISH COMMUNICATION

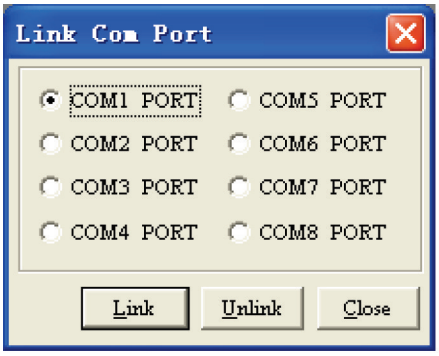
a. Open the LRXSW software and select “New Ladder Document” as shown below.



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



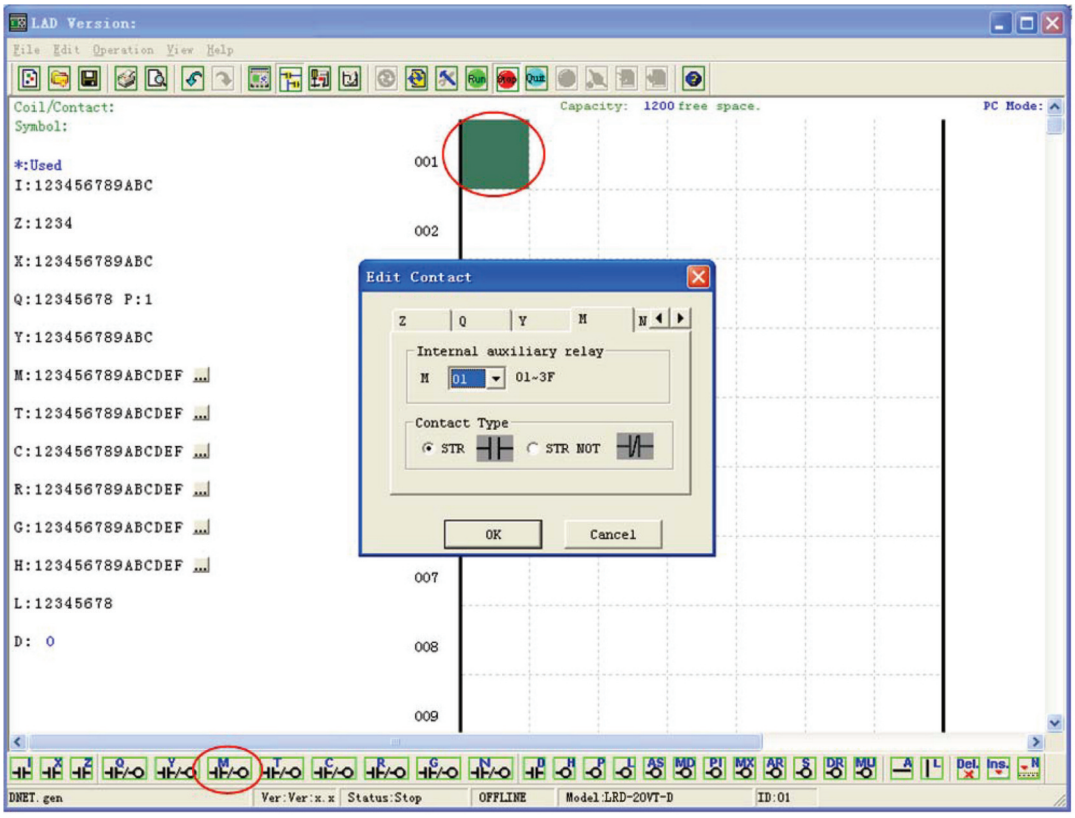
c. Select the correct Com Port number where the programming cable is connected to the computer then press the “Link” button.



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

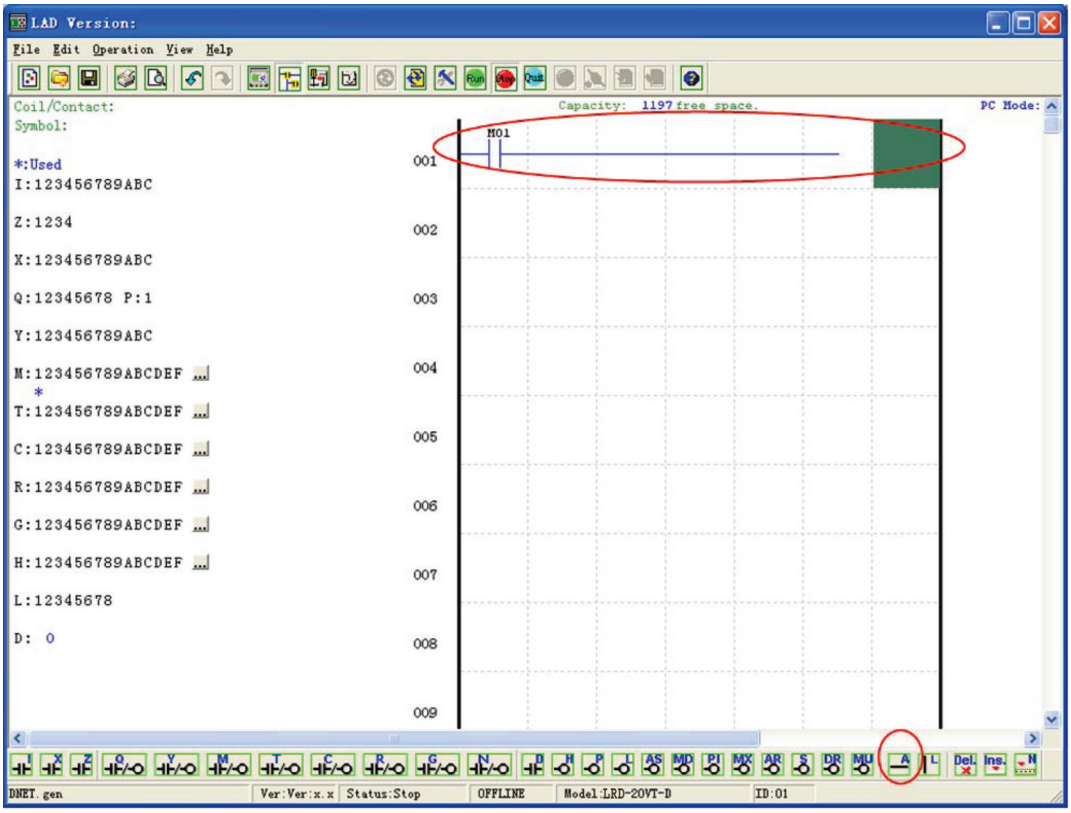
WRITE SIMPLE PROGRAM

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.

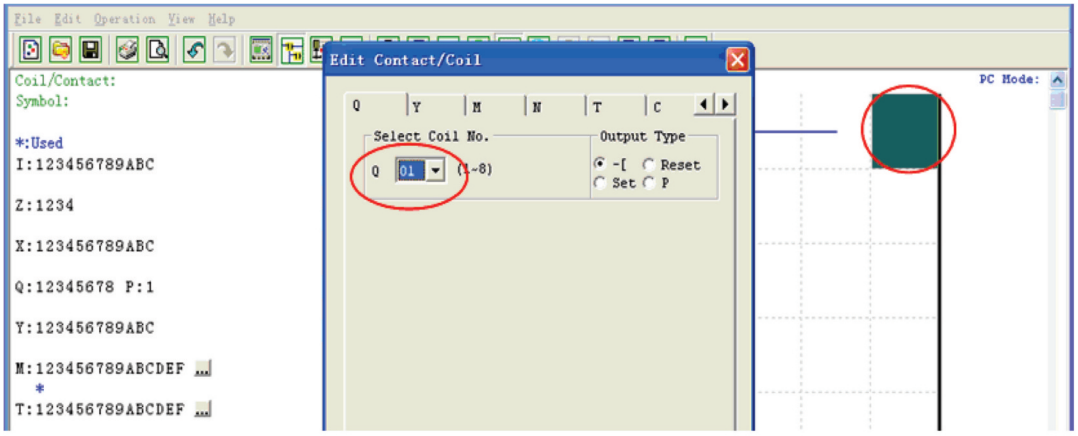


Note: If the ladder toolbar is not visible at the bottom of the screen, select View>>Ladder Toolbar from the menu to enable.

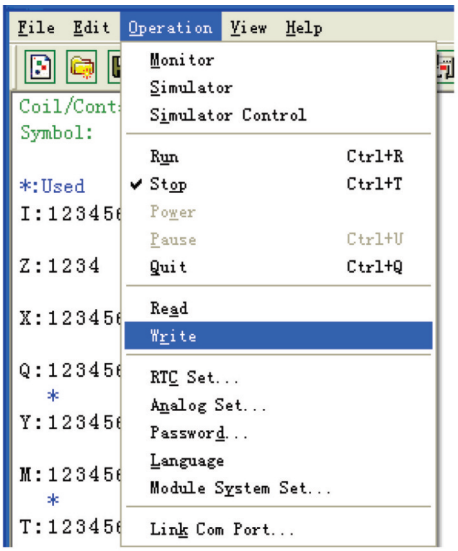
b. Use the “A” key on your keyboard (or the “A” icon on the ladder toolbar) to draw the horizontal circuit line from the M contact to the right most cell, as shown below.



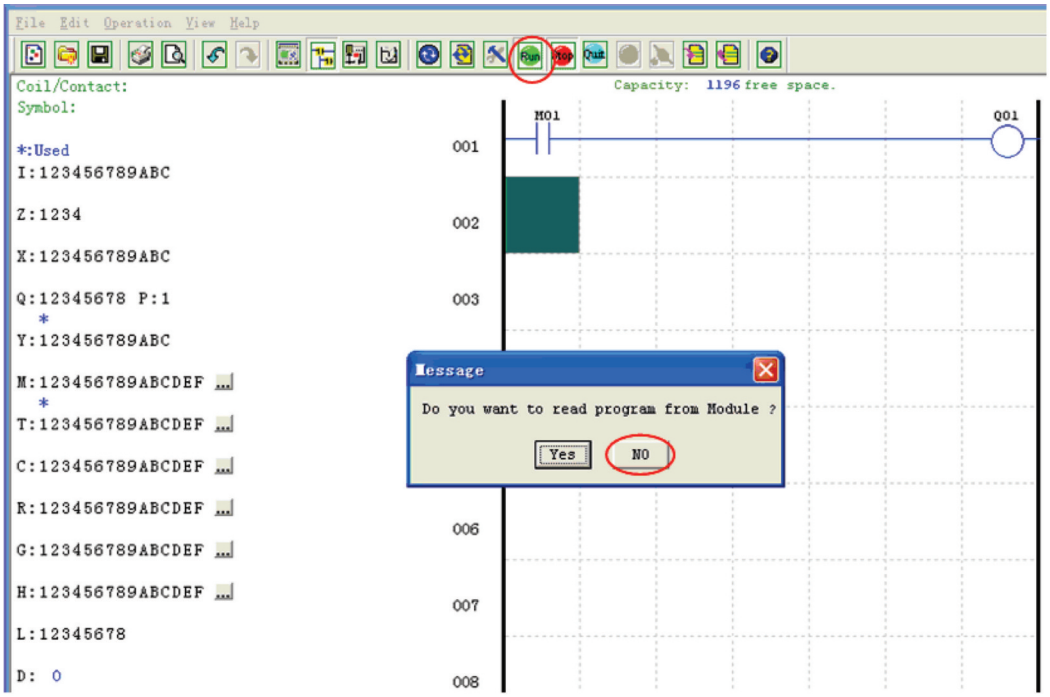
c. Select the “Q” coil icon from the ladder toolbar and drop it on the right most cells. Select Q01 from the dialog and press OK as shown below. See Chapter 4: Ladder Programming instructions for complete instruction set definitions.



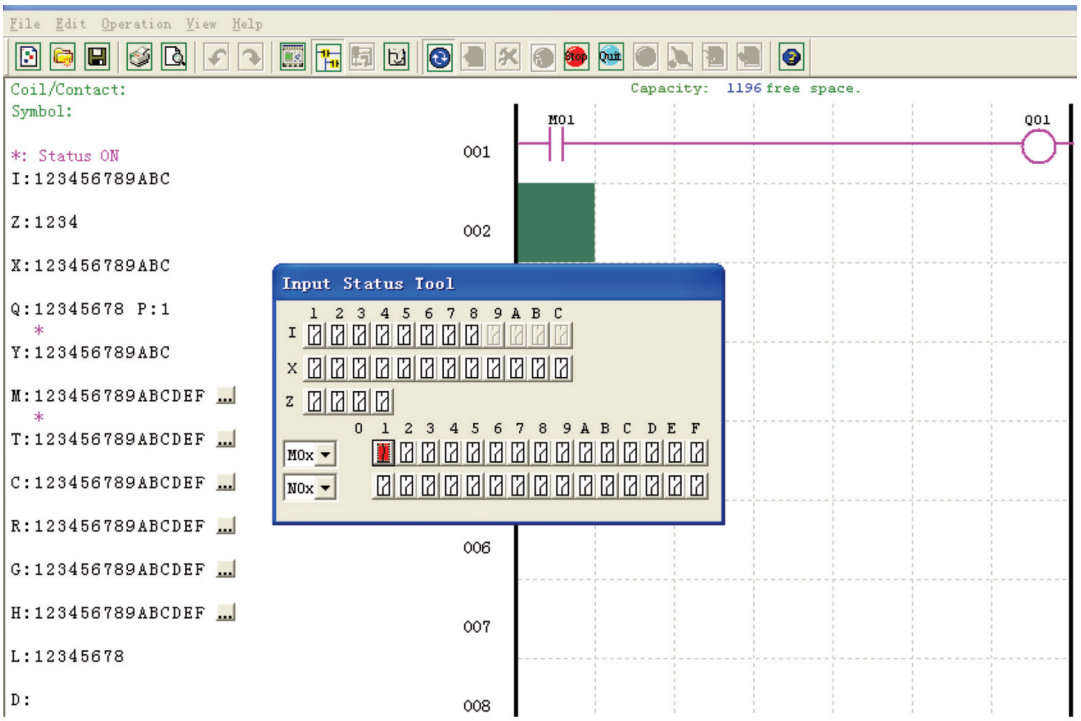
d. Test the simple program. From the Operation menu, select the Write function and write the program to the connected LRD micro PLC as shown below.



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 will be ON. See Chapter 3: Programming Tools for more detailed software information.



CHAPTER 2: INSTALLATION

GENERAL SPECIFICATIONS

LRD is a micro PLC 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	LRD...D012 models: 10.4-14.4VDC; LRD...D024 models: 20.4-28.8VDC; LRD...A024 models: 20.4-28.8VAC 47-63Hz; LRD...A240 models: 85-265VAC 47-63Hz
Power Consumption	LRD12...D024: 125 mA; LRD20RD012: 265mA; LRD20RD024: 185 mA LRD...A024: 290 mA; LRD...A240: 100 mA
Wire Size (all terminals)	0.14...2.5mm^2 / 26...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
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) (IEC/EN 60068-2-70)
Vibration resistance	0.075mm amplitude, 1.0g acceleration (IEC/EN 60068-2-6)
Shock resistance	15g, 11ms (IEC/EN 60068-2-27)
Presence of gas	Absence of corrorive gas
Disturbance immunity Electrostatic discharge	 ±4kV contact; ±8kV in air
Electrical transient (fast-burst)	Power VAC: ±2kV
Radio-frequency disturbance (conducted-induced)	0.15-80MHz 10V/m
Radiated radio-frequency emission	80-1000MHz 10V/m
Electromagnetic disturbance emission	EN 55011 Class B
Certifications	cULus
Compliant with standards	IEC/EN 61131-2, UL508, CSA C22.2 n°142
DISCRETE INPUTS	
Current consumption	3.2mA - 12VDC/24VDC 3.3mA - 24VAC; 1.3mA - 100-240VAC
Input Signal "OFF" Threshold	12VDC: <2.5VDC; 24VDC: < 5VDC; 24VAC: < 6VAC; 100-240VAC: < 40VAC
Input Signal "ON" Threshold	12VDC: >7.5VDC; 24VDC: > 15VDC; 24VAC: >14VAC; 100-240VAC : > 79VAC
Input On delay	12VDC/24VDC: 4ms 24VAC: 4ms 120VAC: 50ms; 240VAC: 25ms
Input Off Delay	12VDC/24VDC: 4ms 24VAC: 4ms 120VAC: 50/45ms 50/60Hz; 240VAC: 90/85ms 50/60Hz
Transistor device compatibility	PNP, 3-wire device only
High Speed Input frequency	1kHz
Standard Input frequency	< 40 Hz
Required protection	Inverse voltage protection required, see wiring details

ANALOG INPUTS	
Resolution	Base unit: 12 bit
Voltage Range acceptable	Base unit: Analog input: 0-10VDC voltage, 12VDC/24VDC when used as discrete input
Input Signal "OFF" Threshold	<2.5VDC (as 12VDC discrete input); <5VDC (as 24VDC discrete input)
Input Signal "ON" Threshold	>7.5VDC (as 12VDC discrete input); >9.8VDC (as 24VDC discrete input)
Insulation	None
Short circuit protection	Yes
Total number available	Base unit: A01-A04
RELAY OUTPUTS	
Contact material	Ag Alloy
Current rating	8A
HP rating	1/3HP at 120V; 1/2HP at 250V
Maximum Load	Resistive: 8A /point Inductive: 4A /point
Maximum operating time	15ms (normal condition)
Life expectancy (rated load)	100,000 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

SPECIFICHE DEL PRODOTTO

Base modules ❷					
Order code	Input Power	Inputs	Outputs	Display and Keypad	Max I/O
LRD12RD024	24VDC	6 digital of which 2 digital/analog	4 Relay	√, Z01-Z04	12 + 24 ❶
LRD12TD024	24VDC	6 digital of which 2 digital/analog	4 Transistor	√, Z01-Z04	12 + 24 ❶
LRD20RD012	12VDC	8 digital of which 4 digital/analog	8 Relay	√, Z01-Z04	20 + 24 ❶
LRD20RD024	24VDC	8 digital of which 4 digital/analog	8 Relay	√, Z01-Z04	20 + 24 ❶
LRD20RD024P1	24VDC	8 digital of which 4 digital/analog	8 Relay	√, Z01-Z04	20 + 24
LRD10RA240	100-240VAC	6 digital	4 Relay	√, Z01-Z04	10 + 24 ❶
LRD20RA240	100-240VAC	12 digital	8 Relay	√, Z01-Z04	20 + 24 ❶
LRD12RA024	24VAC	8 digital	4 Relay	√, Z01-Z04	12 + 24 ❶
LRD20RA024	24VAC	12 digital	8 Relay	√, Z01-Z04	20 + 24 ❶
Expansion modules ❷					
LRE02AD024	24VDC	—	2 analog	—	—
LRE04AD024	24VDC	4 analog	—	—	—
LRE04PD024	24VDC	4 PT100	—	—	—
LRE08RD024	24VDC	4 digital	4 Relay	—	—
LRE08TD024	24VDC	4 digital	4 Transistor	—	—
LRE08RA240	100-240VAC	4 digital	4 Relay	—	—
LRE08RA024	24VAC	4 digital	4 Relay	—	—
LREP00	24VDC	Communications Module, RS485 ModBus RTU slave			
Accessories					
LRXC00	LRD Programming Cable, LRD Programming software for PC RS232 port				
LRXC03	LRD Programming Cable, LRD Programming software for PC USB port				
LRXM00	LRD program backup memory				

❶ If LRD module is with keypad and display, digital inputs Z01-Z04 (4 arrows keys) can be added to Max I/O table quantities. Those values refer to digital I/O of base + expansion modules.
❷ More information about Product Specifications to see "Chapter 7: Product Specifications".

MOUNTING

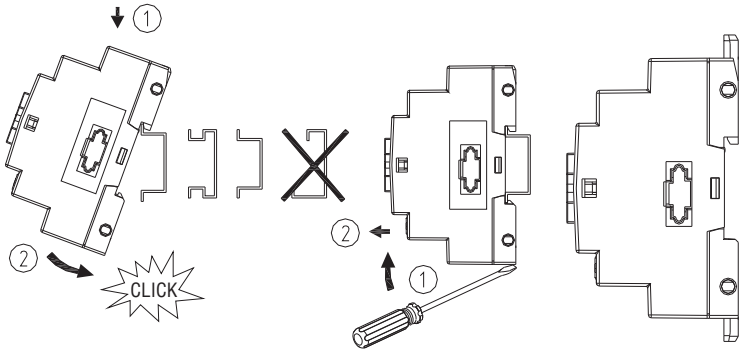
35mm DIN-rail mounting

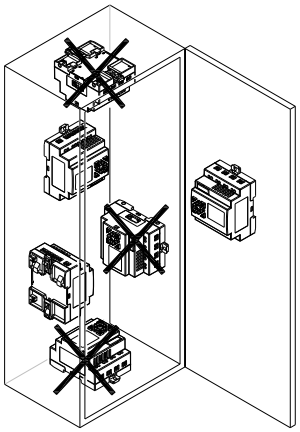
The LRD must always be mounted vertically.

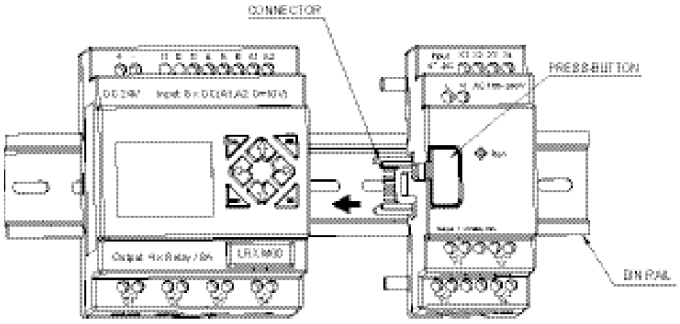
Place the upper end of the LRD inserting the slot on the DIN rail. Slightly press the relay downwards and fasten its lower end on the rail. Check that the LRD is firmly fitted.

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

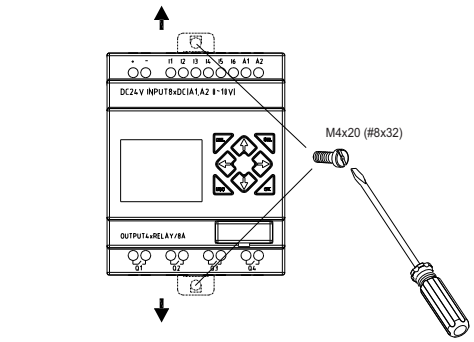
Slide the module on the rail toward the LRD, press the Press-button and connect them together.

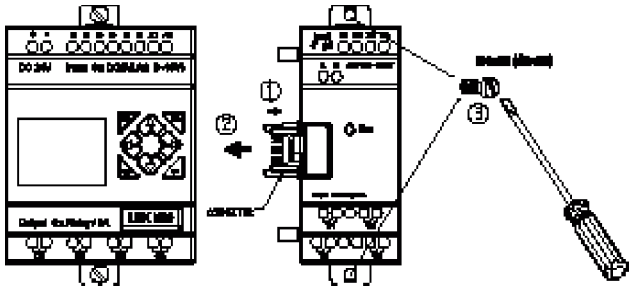






Screw Fixing
Use M4x20 screws to directly mount the LRD as shown. For direct installation of the expansion module, slide the expansion module and connect with the LRD after it is fixed.





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.

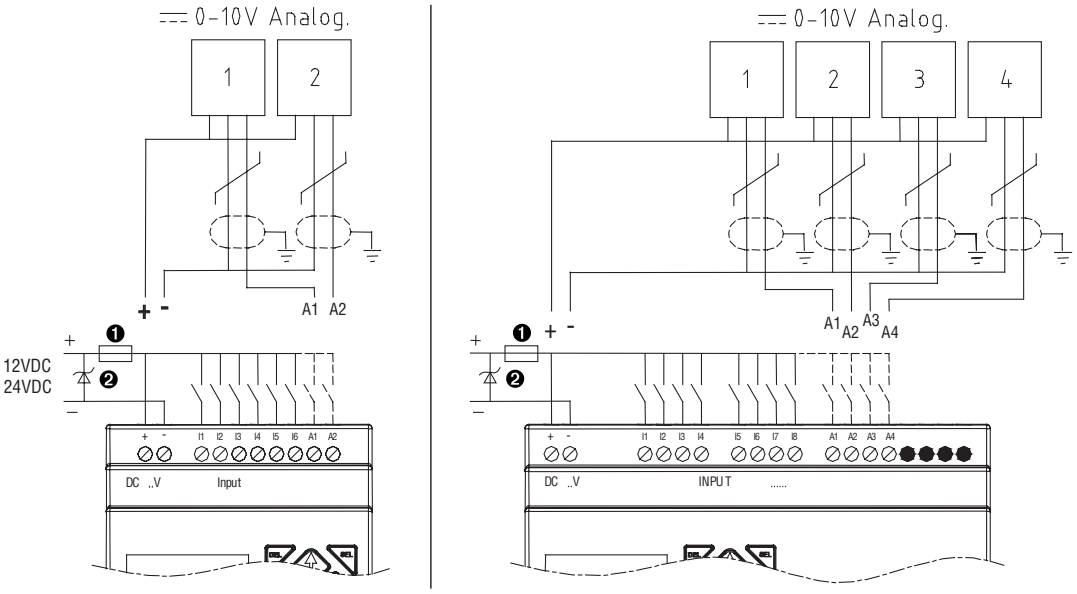
To avoid a short circuit on the load side, it is recommended to connect a fuse between each output terminal and loads.

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

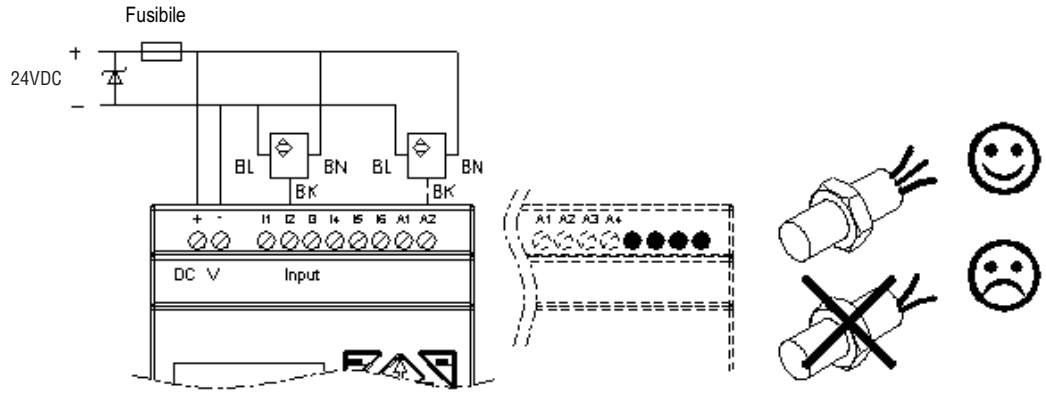
Ø3.5 (0.14in)	C	Nm	0.6
		lbin	5.4

Input 12VDC-24VDC

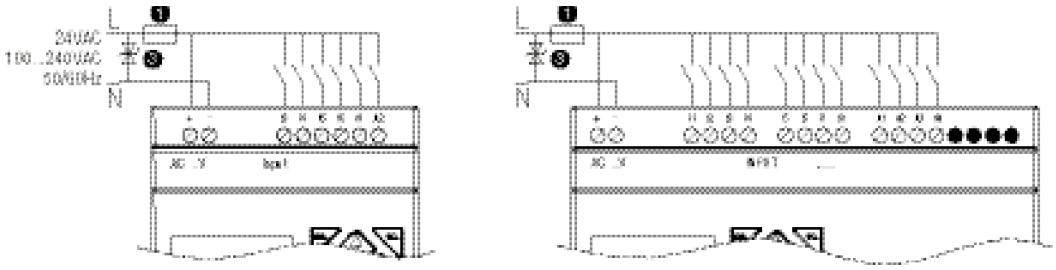


❶ 1A fast acting fuse, automatic circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).

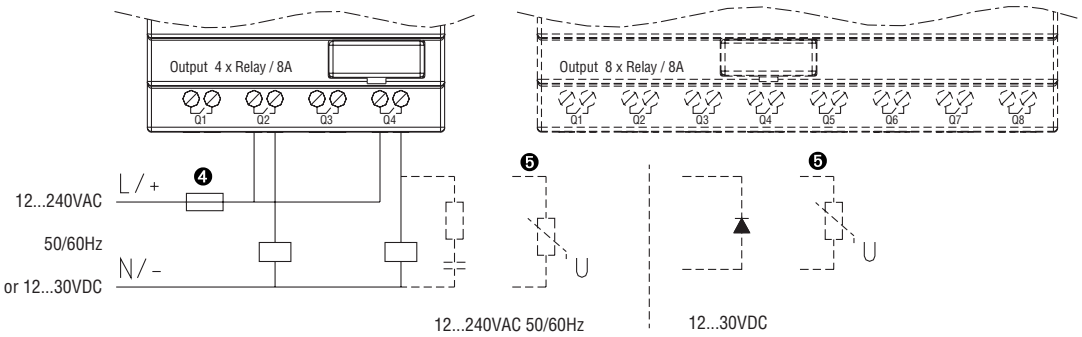
Sensor Connection



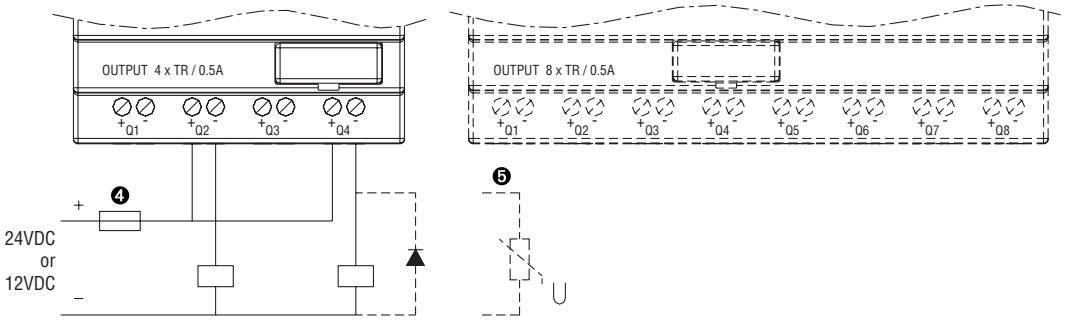
Input 100~240VAC/24VAC



Output (Relay)



Output (Transistor)



❶ 1A fast acting fuse, automatic circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).
❸ Transient voltage surge suppressor (430VAC cut-off voltage for LRD...A240; 43VAC for LRD...A024)
❹ Fuse, automatic circuit breaker and circuit protection.
❺ Inductive load.

CHAPTER 3: PROGRAM TOOLS

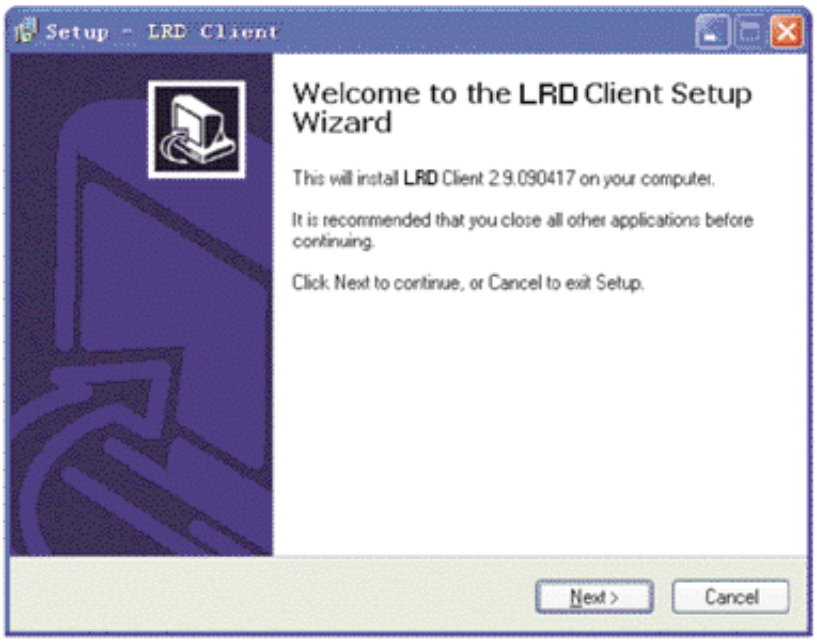
PC PROGRAMMING SOFTWARE "LRXSW"

The LRXSW programming software provides two edit modes, Ladder Logic and Function Block Diagram (FBD). The LRXSW 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 operation during RUN mode.

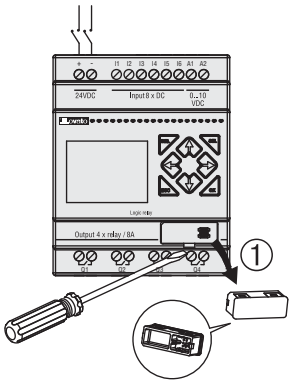
INSTALLING THE SOFTWARE

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

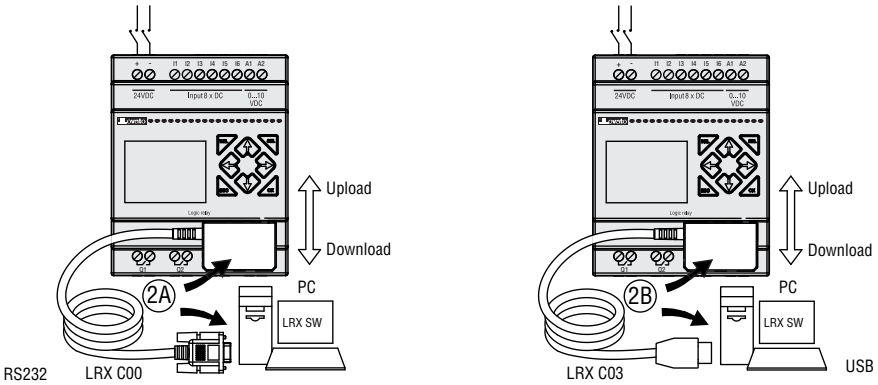


CONNECTING THE SOFTWARE

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 (LRXC00 for PC RS232 or LRXC03 for PC USB) into the LRD as shown in the figure below.



Connect the opposite end of the cable to the PC serial port on the computer depending on the connecting cable used.

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.

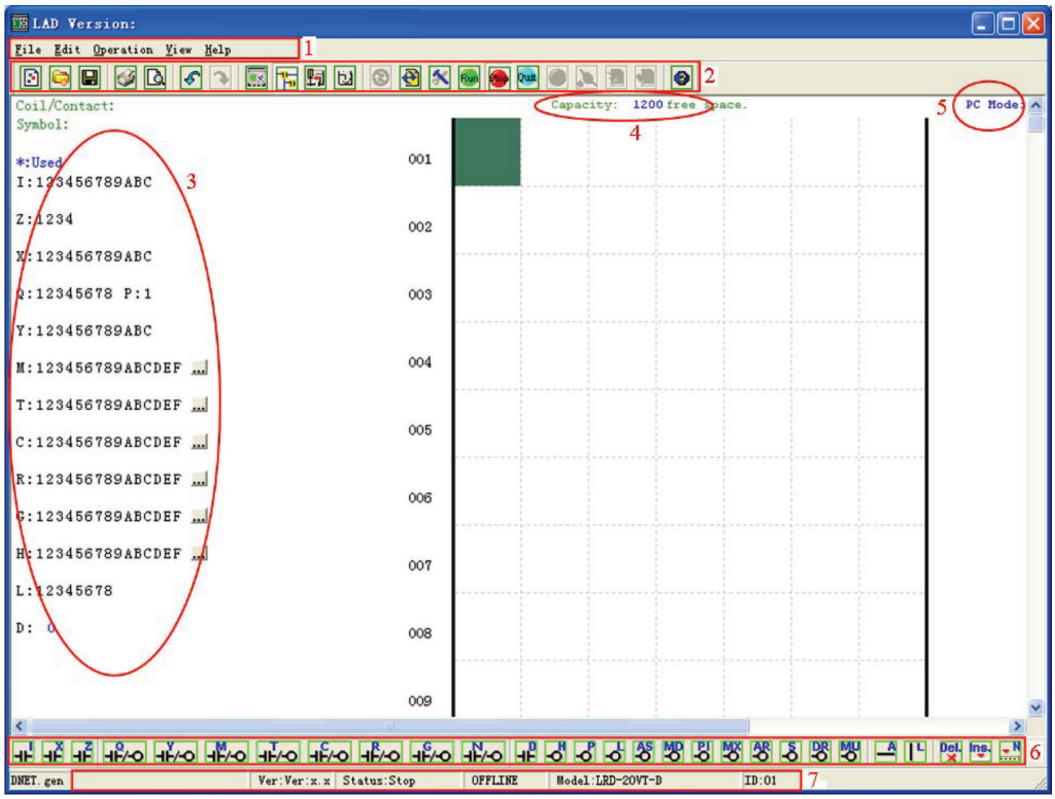
OPEN EXISTING FILE
Select **File —>Open** to choose the type of file to open (Ladder or FBD), and choose the desired program file, and then click Open.

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 required model of LRD, and the number of connected expansion units, if applicable, as shown below.

MENUS, ICONS AND STATUS DISPLAYS

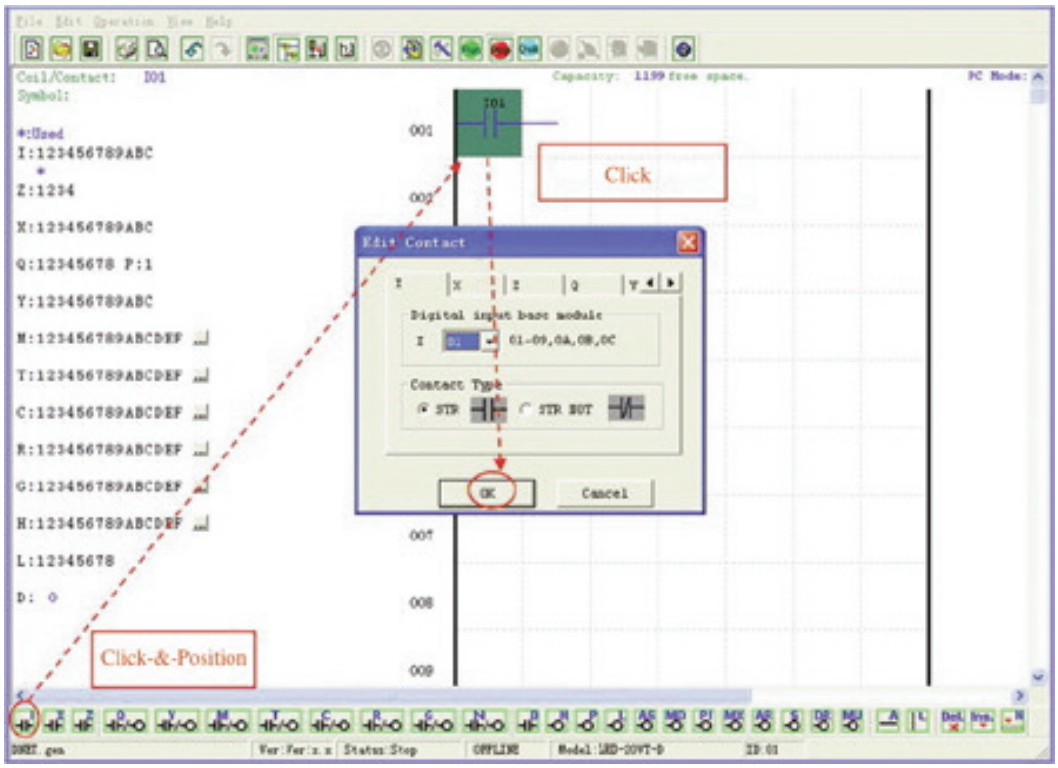
The Ladder programming environment includes the following Menus, Icons and Status Displays

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.
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.

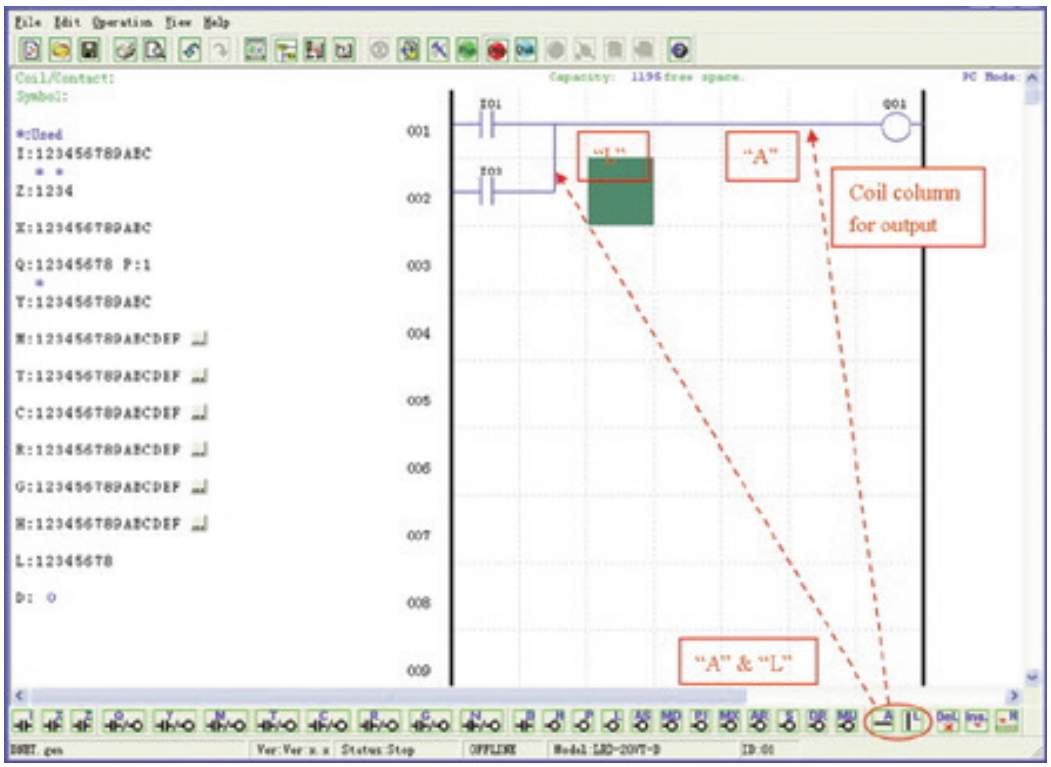


PROGRAMMING

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.

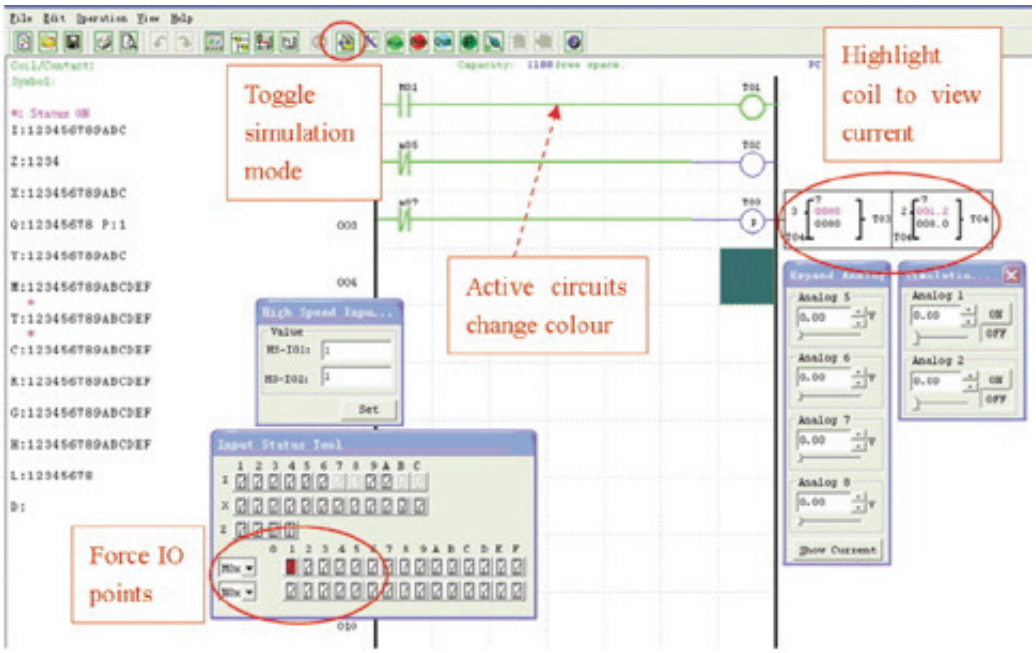


The “A” and “L” keys or icons are used to complete parallel and serial circuits. The right column is for output coils.



SIMULATION MODE

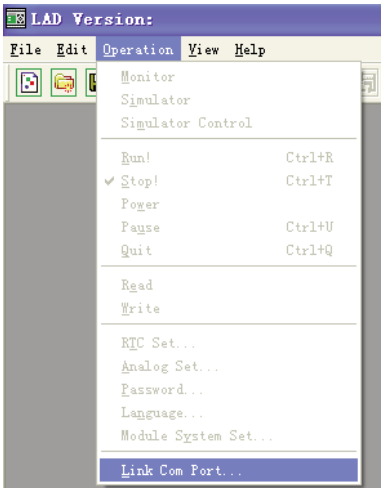
The LRXSW software includes a built-in simulator to test and debug programs easily without the need for downloading to a controller. To activate simulation mode, simply press the red RUN icon. The program below is shown in simulation mode, identifying the significant available features.

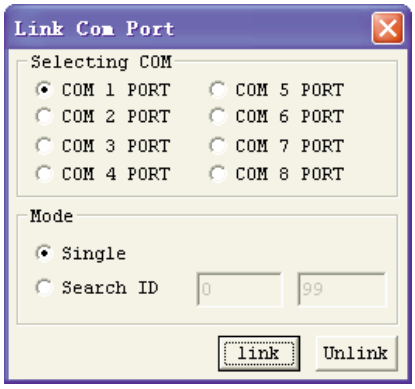


ESTABLISH COMMUNICATION

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

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



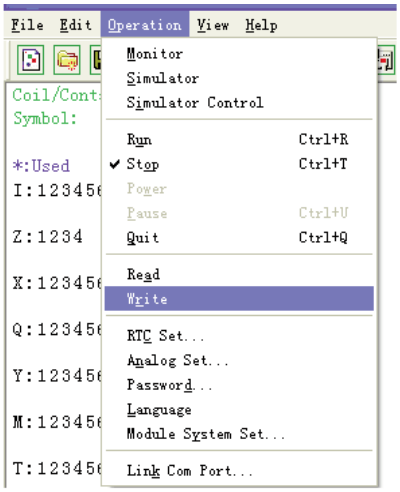


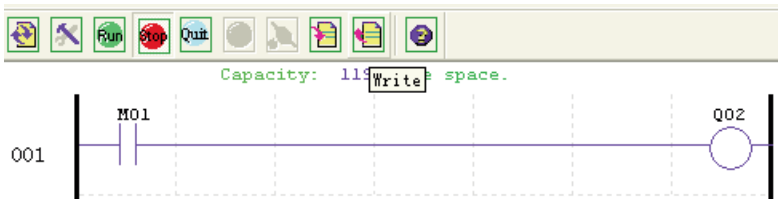
b. Select the correct Com Port number where the programming cable LRXC00 for PC RS232 or LRXC03 for PC USB is connected to the computer then press the “Link” button.

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

WRITING PROGRAM TO LRD MICRO PLC

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

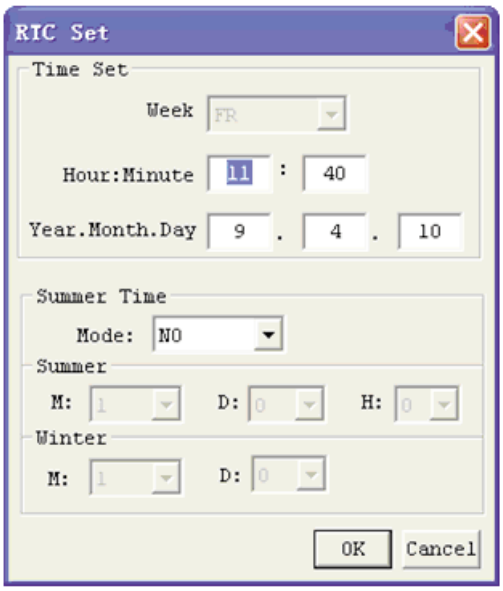




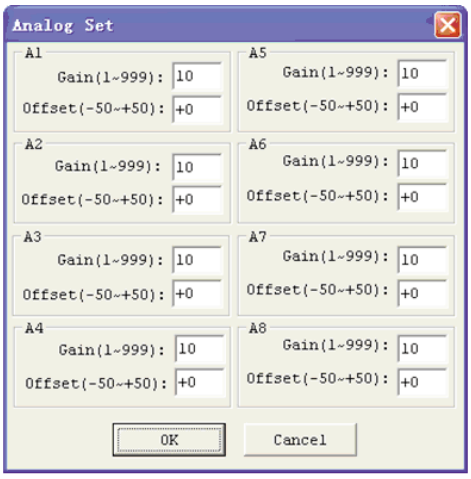
OPERATION MENU

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.
RTC Set - Online function for setup of the Real-time clock/calendar (see dialog below left)



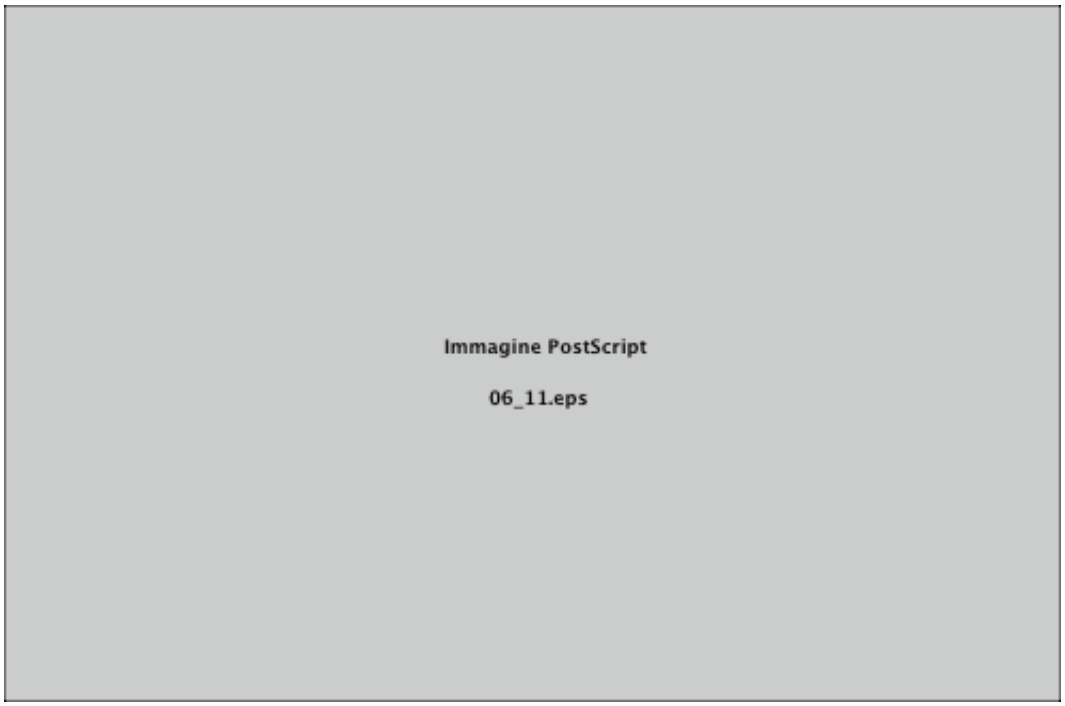
Analog Set - Setup analog input A01-A08 gain and offset (see dialog below right)



Password - Set a password for accessing the current program after upload to the LRD.
Language - Change LRD 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 PC port communication with LRD.

ONLINE MONITORING/EDITING

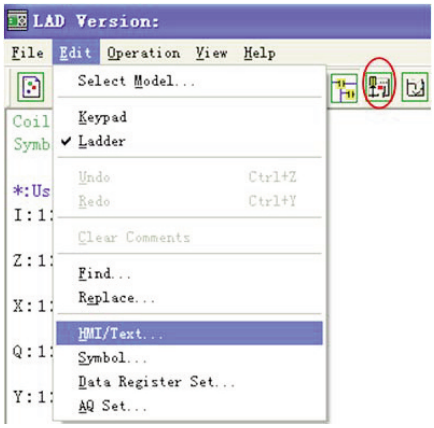
The LRXSW software allows for online monitoring of the currently running program during runtime. Additional online functions include, I/O forcing, and Mode changes (Run/Stop/Quit).

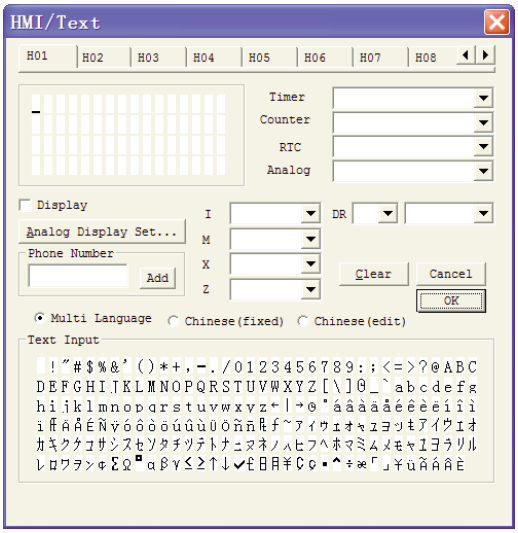


– The LRXSW software does not support runtime logic editing changes. All logic edits to contacts, coils, Timers/Counters, and circuit connecting lines must be written to the connected LRD while in Stop mode.

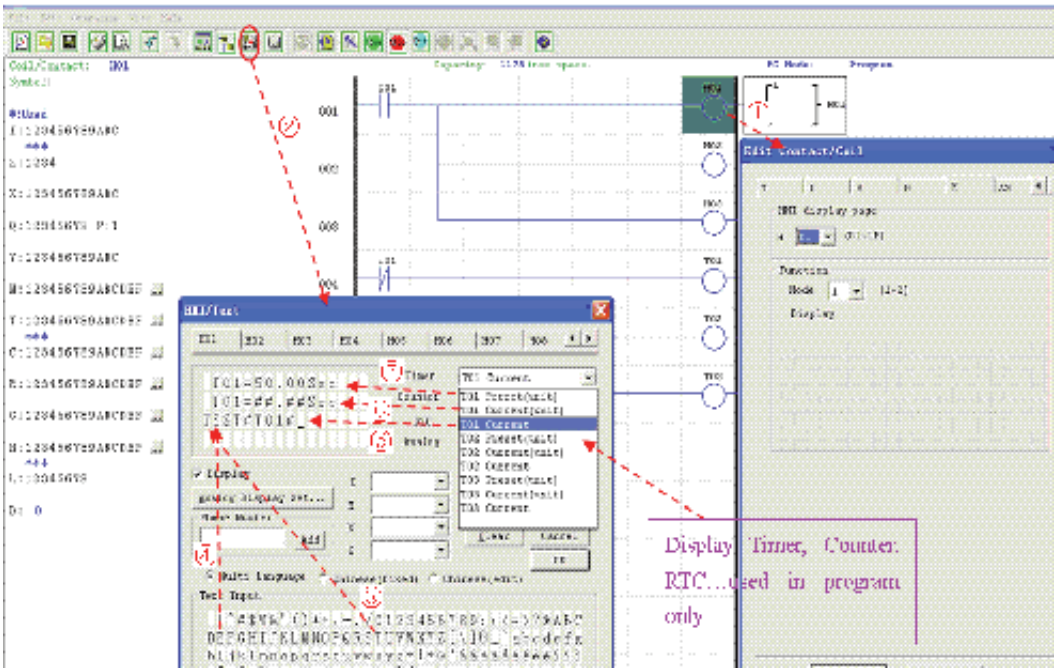
HMI/TEXT

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).



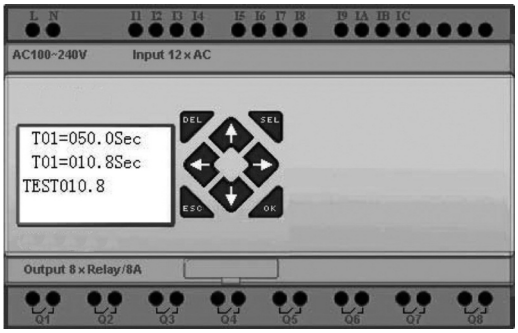


HMI/TEXT setting:



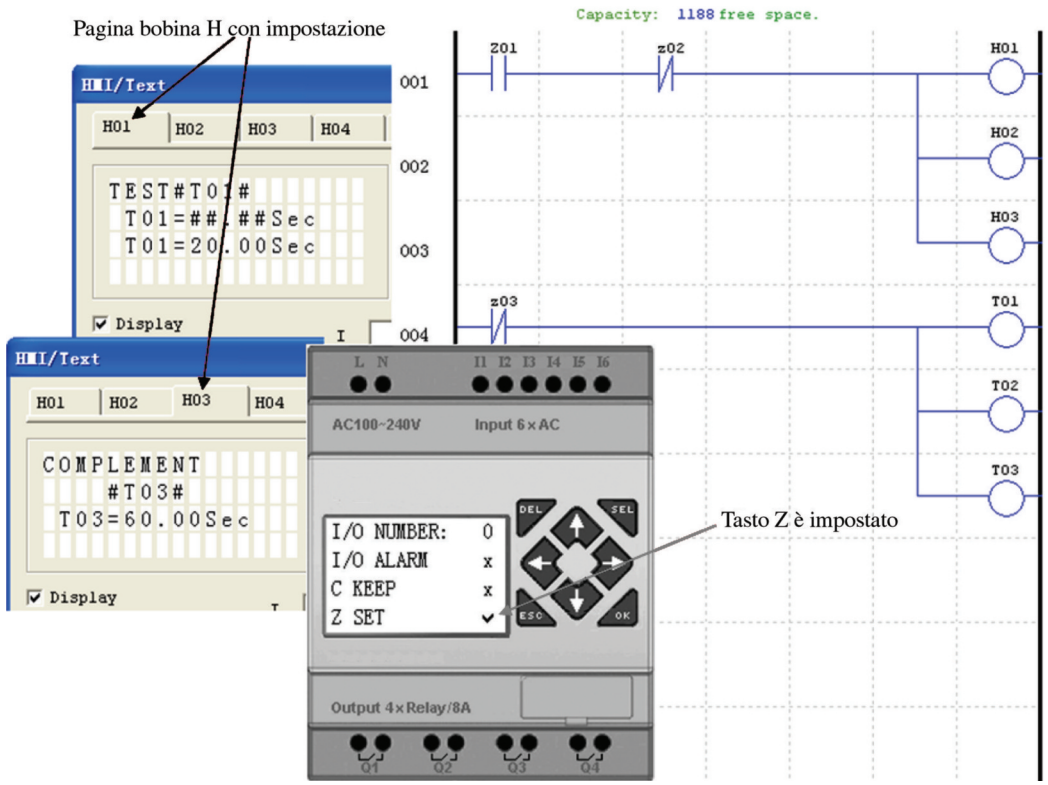
1. Enter H01 coil.
2. Into HMI/TEXT edit frame.
3.-4. Choose the letters “T E S T” from Text Input.
5. Choose T01 current.
6. Choose T01 current (unit).
7. Choose T01 present (unit).

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 will display the first H text as shown below.

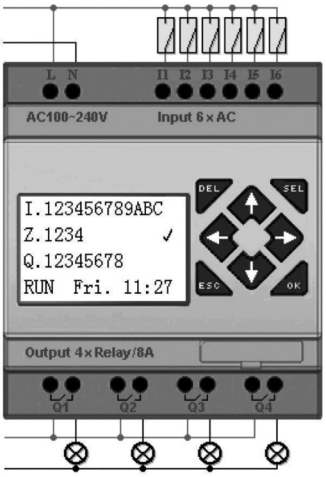


– Press “↑” or “↓” to select the nearest H coil
– Press “SEL”+“↑” or “↓”and “OK” update T01 preset value (In this example, 050.0 can update, T01 preset value depends on HMI/TEXT edit frame setting.)

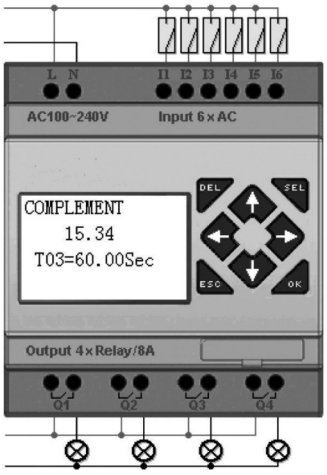
HMI/TEXT Example:

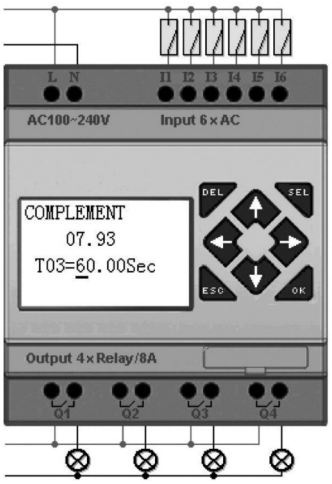


Power ON and RUN (initial display)

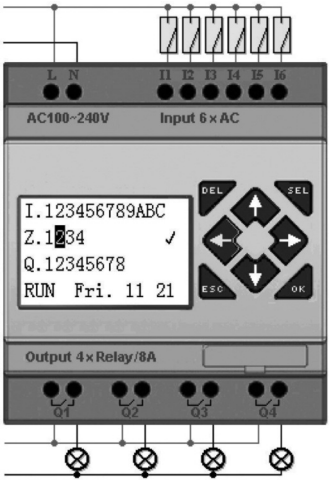


Press "↑" (Z01) and display H03 coil





- 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.



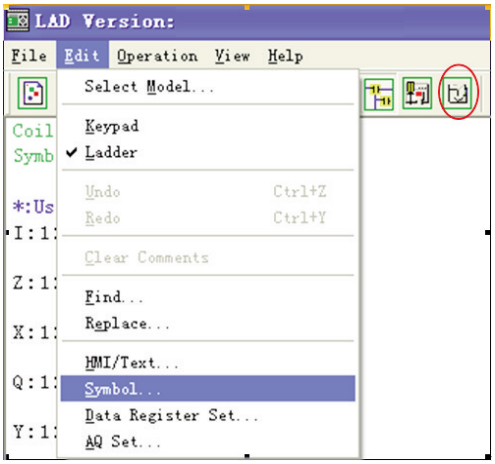
Press "←" to disable H03 coil, and the LCD display changes to initial frame.
Press "↓" to reset Timer (T01°¢T02°¢T03) as program designed.

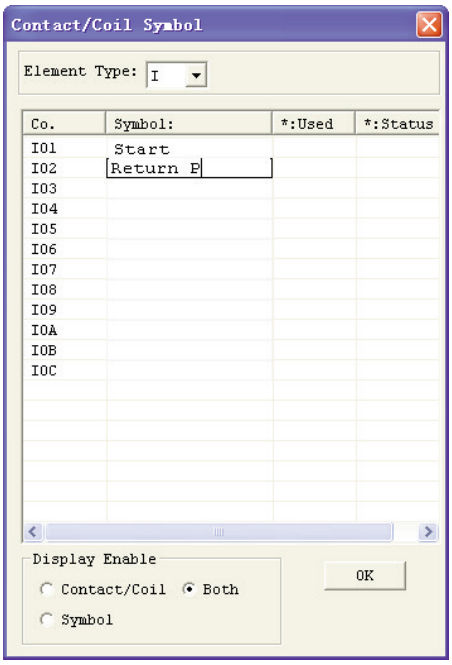
PROGRAM DOCUMENTATION

The LRDSW 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

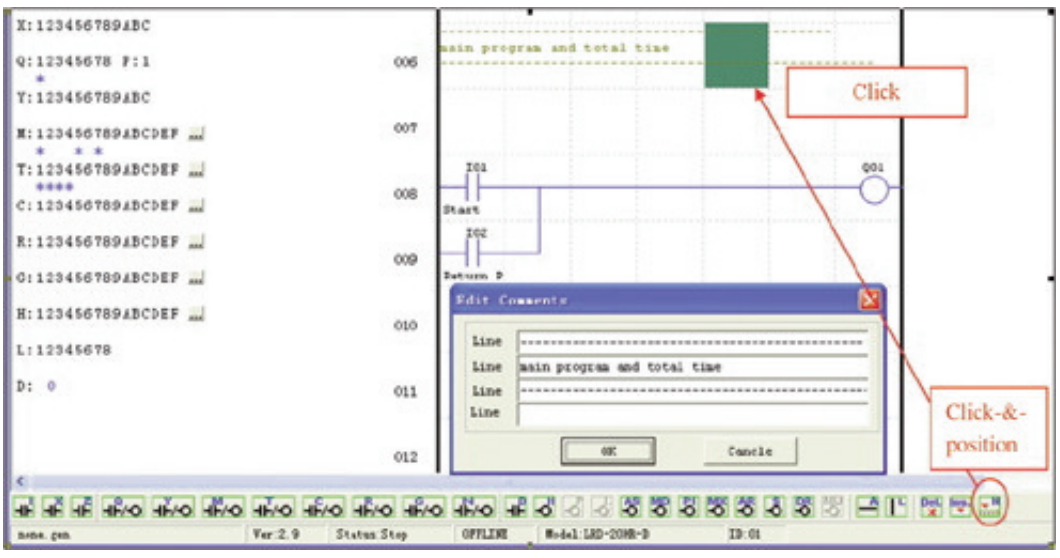
The Symbol editing environment can be accessed through the menu using the **Edit>>symbol…** selection or using the symbol icon on the main toolbar shown below.
The Symbol editing environment allows for documenting all the contact and coil memory types, and selecting display modes as shown below.





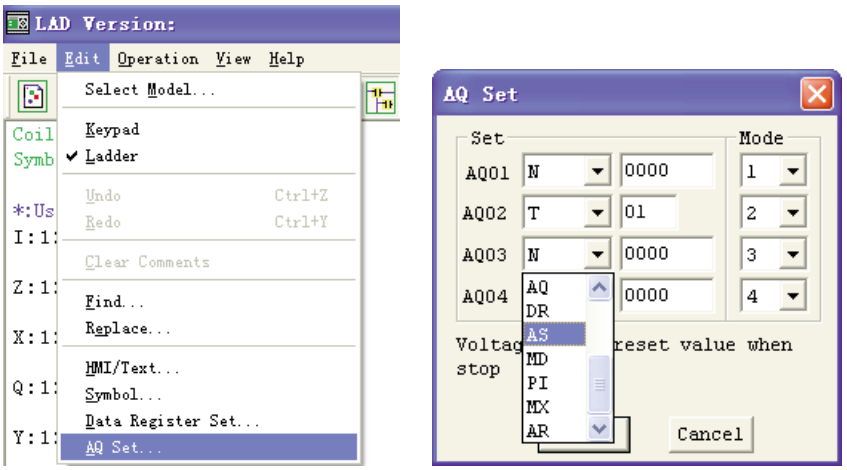
LINE COMMENTS

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.



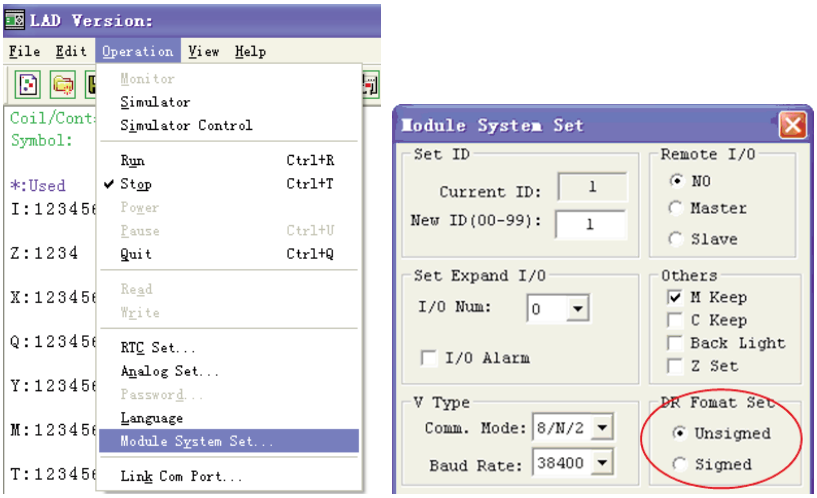
AQ SET

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

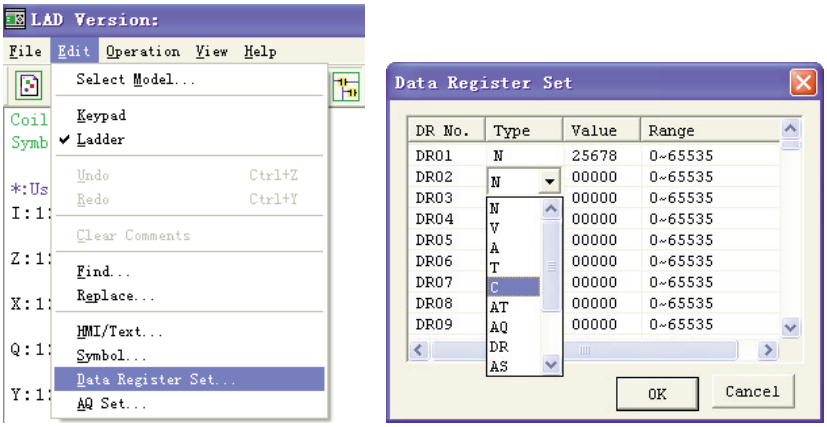


DATA REGISTER SET

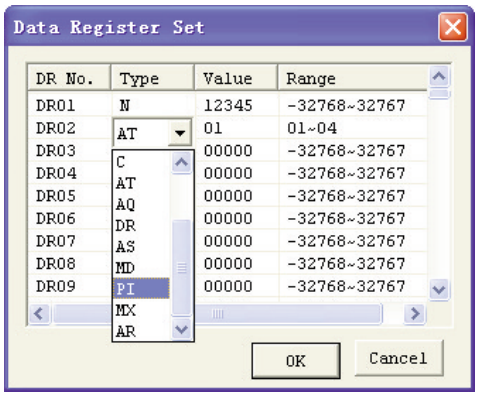
The content of Data Register is either unsigned or signed, it can be set as shown below. Selecting Unsigned, the range of DR is 0~65535, and selecting Signed, the range of DR is -32768~32767.



After the operation above, the Data Register editing environment can be accessed 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.

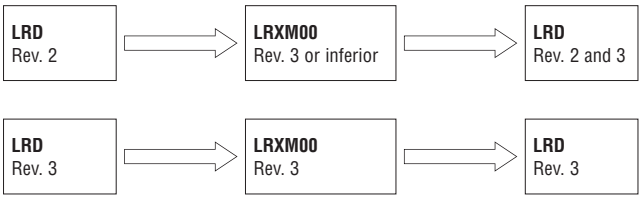


DR is set as signed shown below.

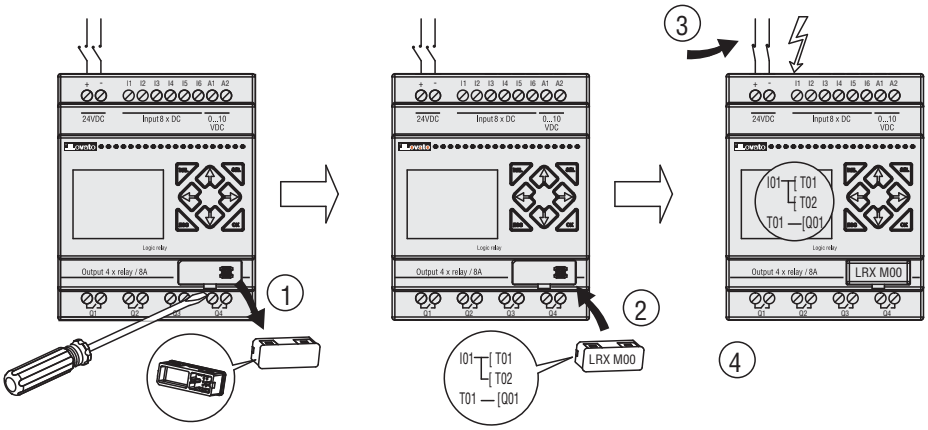


PROGRAM BACKUP MEMORY (LRXM00)
LRMX00 can be used with all LRD versions. There is an icon 3rd on LRD micro PLC, V3.0, and on LRMX00 memory, version 3.

Regarding the use of previous LRXM00 versions to 3 with the LRD rev. V2.0 or V3.0, see next figure:
The optional LRXM00 memory is used to easily transfer programs from one LRD 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.

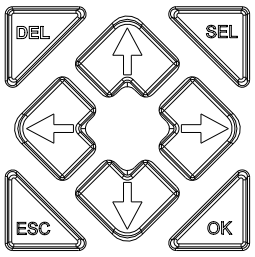


3. From the display keypad on the face of the LRD, select either WRITE or READ to transfer the program to LRXM00 or from the LRXM00 memory to the LRD.
4. Program in different types are not compatible, here are the regulations:
   A-1: 10/12 point type program —— compatible in 20 point type
   A-2: 20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

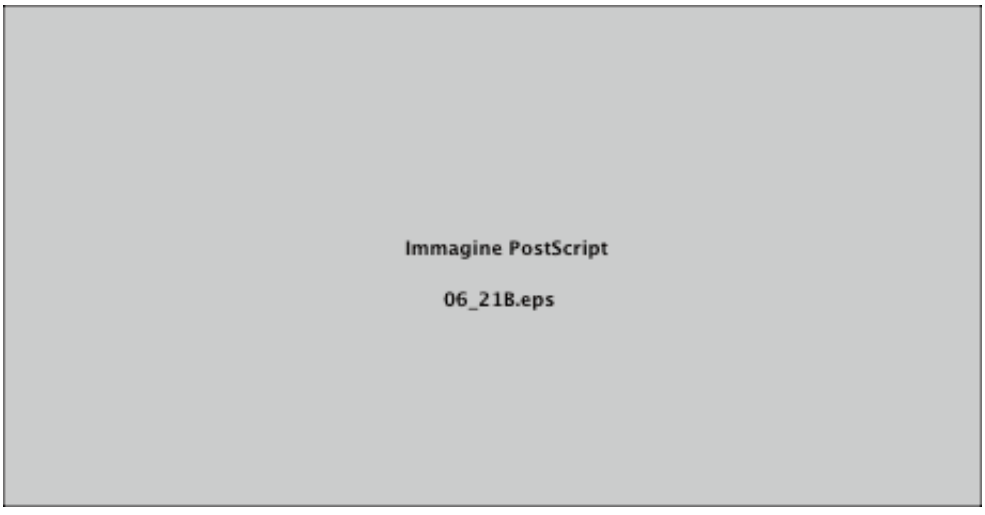
LCD displays 4-line state

– Original screen as power on

Press the button:

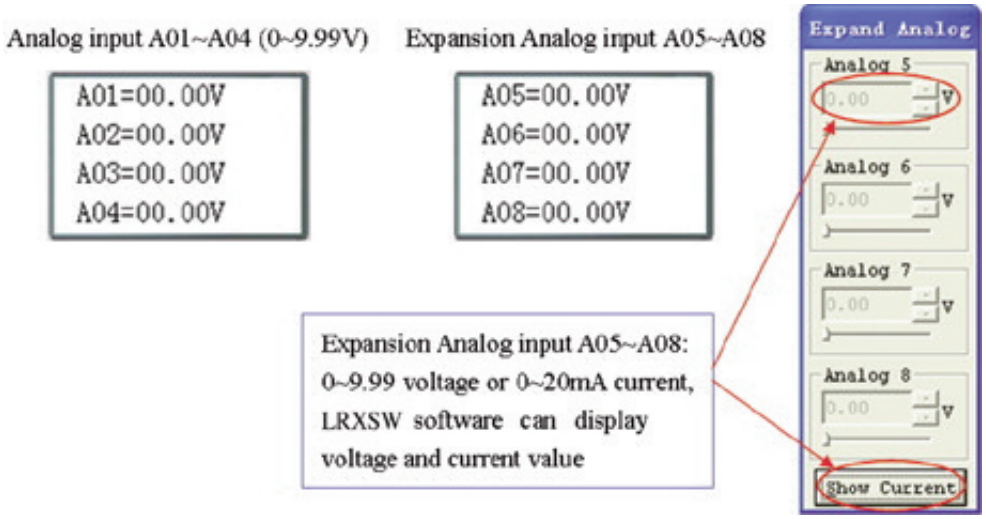
ESC	Enter Main Menu screen
SEL + ↑/↓	Under LADDER Mode, display the state of relays (I ⇔ Z ⇔ Q ⇔ X ⇔ Y ⇔ M ⇔ N ⇔ T ⇔ C ⇔ R ⇔ G ⇔ A ⇔ AT ⇔ AQ) ⇔ Original Screen
↑/↓	Under FBD Mode, display the state of relays (I ⇔ Z ⇔ Q ⇔ X ⇔ Y ⇔ M ⇔ N ⇔ A ⇔ AT ⇔ AQ) ⇔ Original Screen
SEL	H Function will be displayed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

– Expansion State display



– 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	

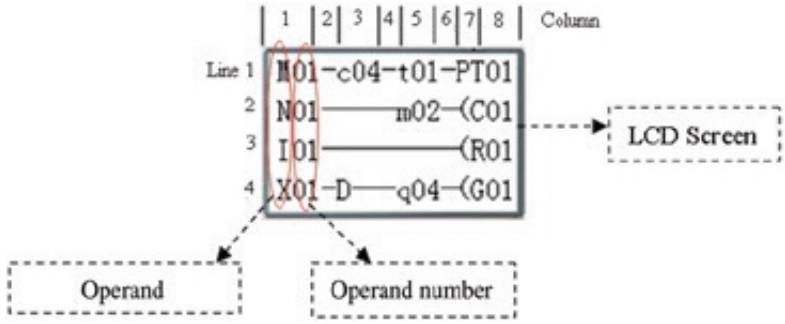
>	LADDER	FBD
	FUN.BLOCK	
	PARAMETER	
	STOP	
	DATA REGISTER	
	WRITE	
	RTC SET	
	PASSWORD	
	LANGUAGE	

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

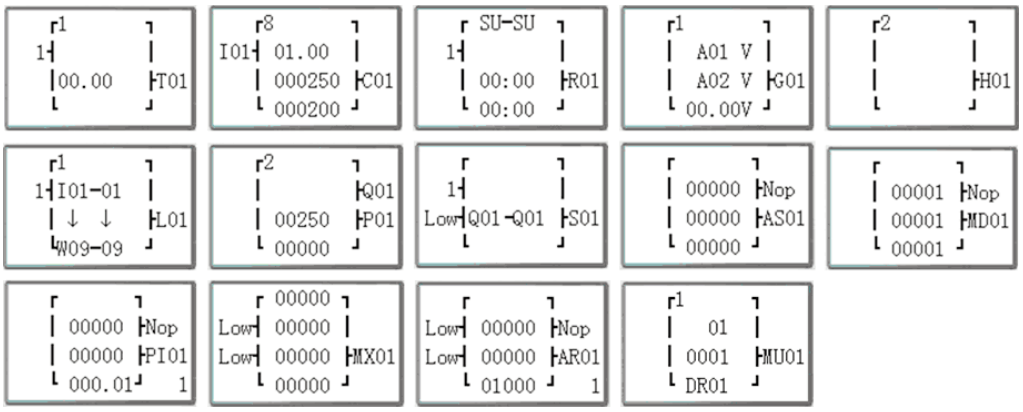


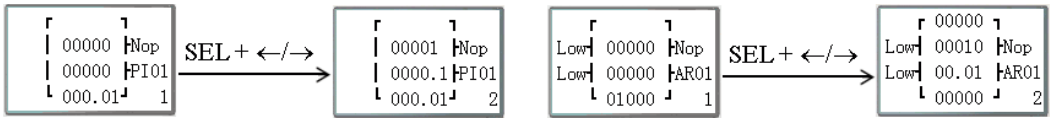
Press the button

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 see appendix A.

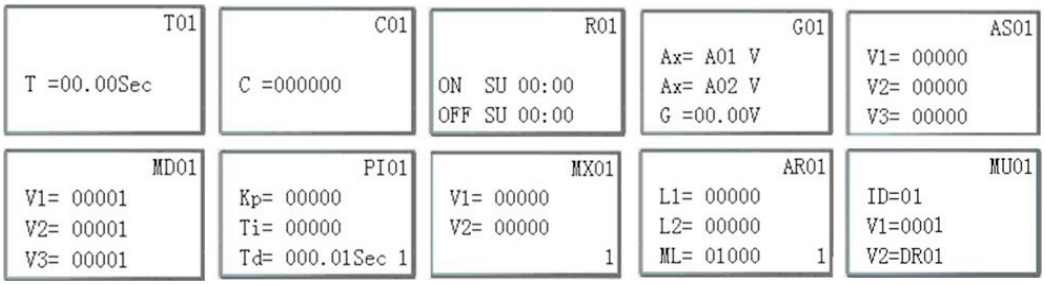
– FUNCTION BLOCK program input
Into FUNCTION BLOCK, cursor flicker on “T”, press “SEL” key, Ladder function block display in sequence:
T→C→R→G→H→L→P→S→AS→MD→PI→MX→AR→MU→T...

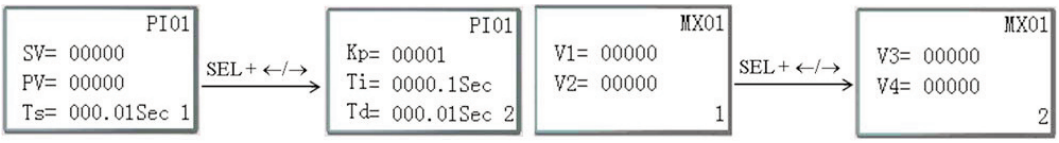




Operation Sample: more detailed see Appendix B.

– 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 LRXM00 or LRXM00 (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)

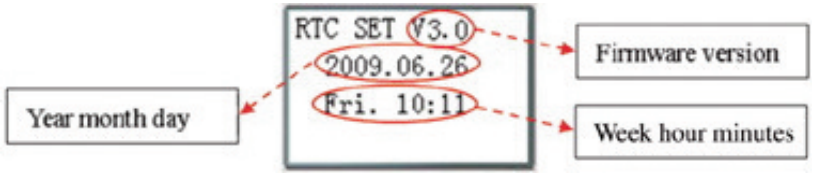
– When DATALINK is selected, ID setting range is 0~7, which should be continuous.
ID=0 default as Master, ID=1~7 default as Slave.

– 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

More detailed at 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.

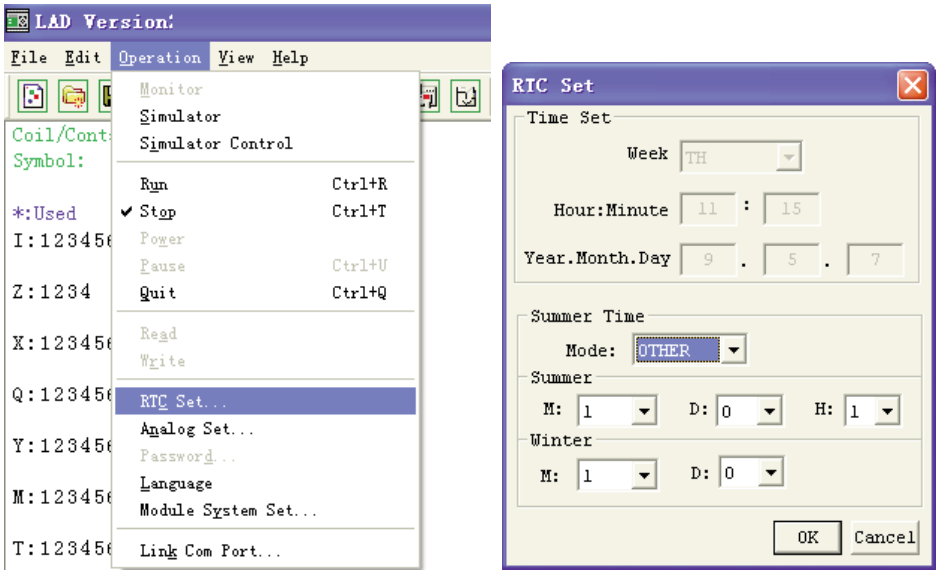
– RTC precision

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

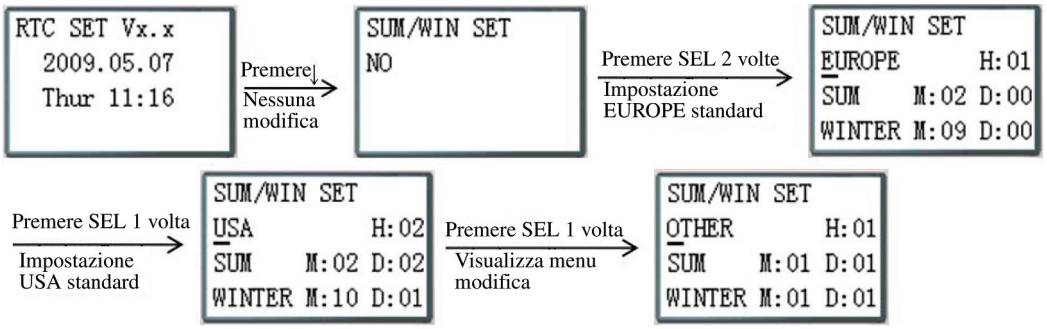
RTC SUMMER/WINTER SETTING
There are 2 fixed Summer/Winter, EUROPE and USA, 1 edit Summer/Winter in LRD.
Edit rule:
1. The last Sunday is defined as 0;
2. Hour range: 1~22;
3. Summer hour and Winter hour are the same.

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

1) PC Client

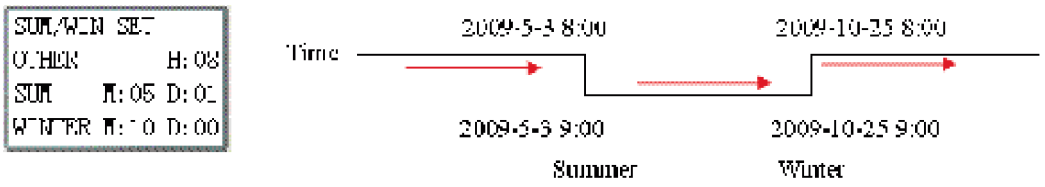


2) Keypad

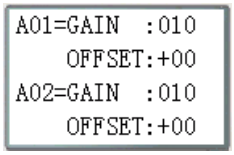


Then pressing "→" selects edit location, pressing "↑", "↓" edit content.

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



6. ANALOG SET



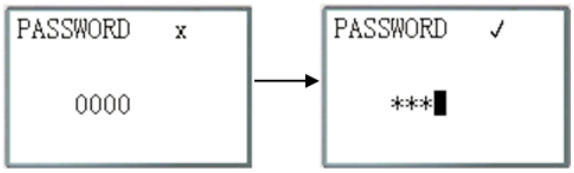
A 1=GAIN : 010	→ GAIN (0~999), default 10
OFFSET : +00	→ OFFSET (-50~+50), default 0
A 2=GAIN : 010	
OFFSET : +00	
A3~A8...Gain + Offset	

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)

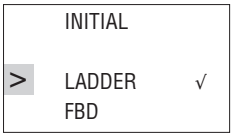
→ English
→ French
→ Spanish
→ Italian

→ 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.

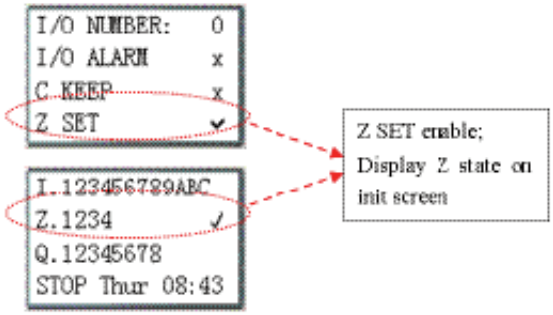
CHAPTER 4: RELAY LADDER LOGIC PROGRAMMING

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)

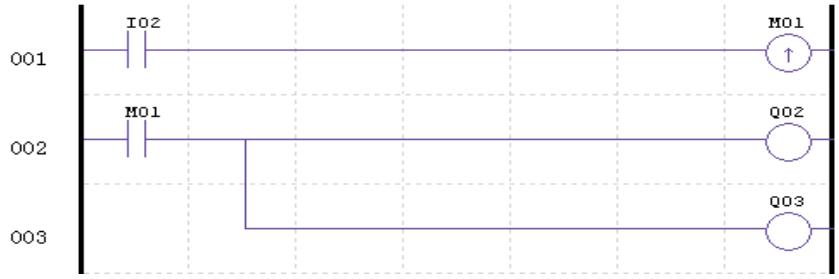
INPUTS (I MEMORY TYPE)
The LRD digital input points are designated I memory types. The number of digital I input points is 6, 8 or 12 depending on each LRD model.

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

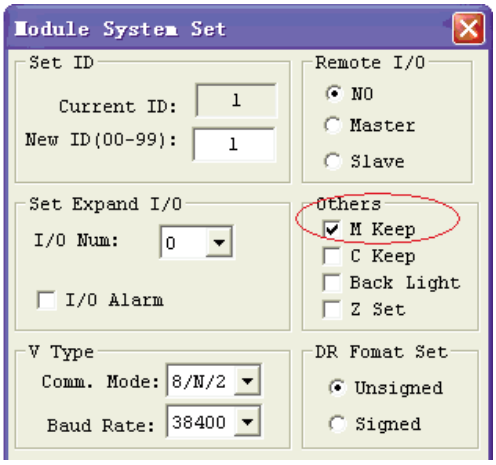


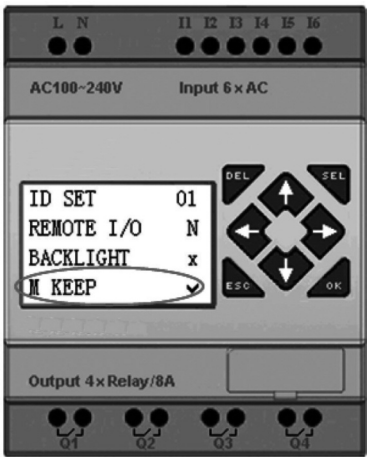
OUTPUTS (Q MEMORY TYPE)
The LRD digital output points are designated Q memory types. The number of digital Q output points is 4 or 8 depending on each LRD model. In this example, output point Q01 will be turned on when input point I01 is activated.

AUXILIARY RELAYS (M MEMORY TYPE)
Auxiliary relays at 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.

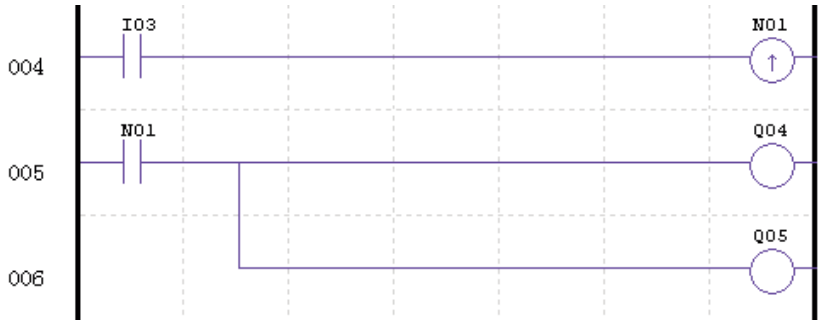




SPECIAL AUXILIARY RELAYS: M31~M3F

Code	Meaning	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	Error channel 1 LRE04P D024
M35	Reserved	Error channel 2 LRE04P D024
M36	Reserved	Error channel 3 LRE04P D024
M37	Reserved	Error channel 4 LRE04P D024
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 as 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)

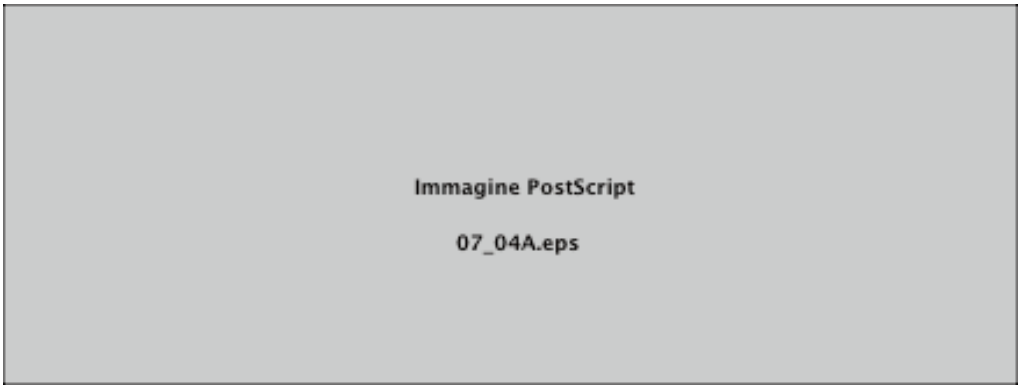
Counter status bits provide the relationship between the current value and the preset value of a selected counter. The counter status bit will be on when the current value is equal or greater than the preset value of a selected counter. In this example, each time the input contact I04 transitions from 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)

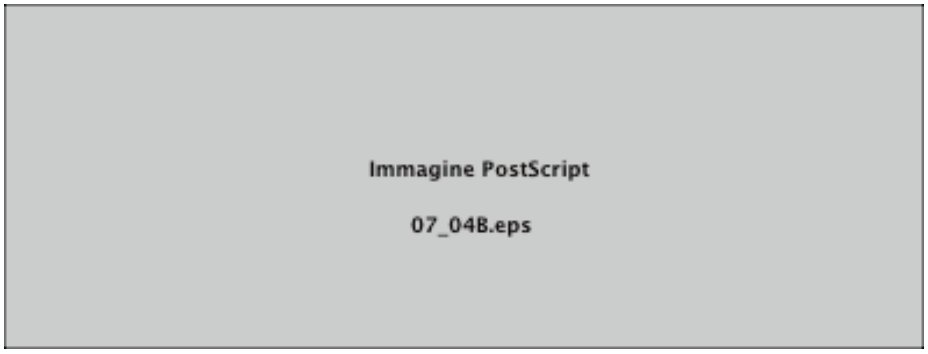
POSITIVE INPUT DIFFERENTIAL INSTRUCTION (ONE-SHOT)

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.



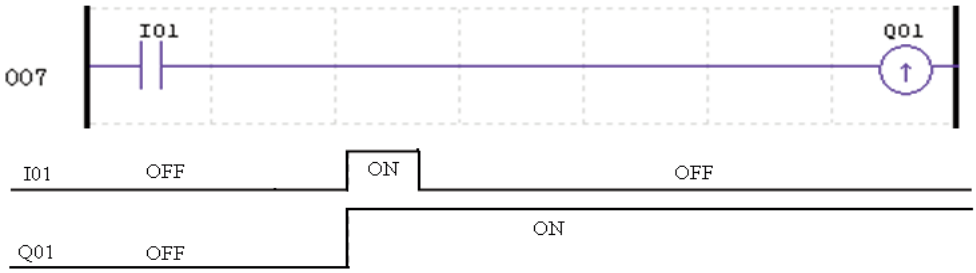
NEGATIVE INPUT DIFFERENTIAL INSTRUCTION (ONE-SHOT)

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.

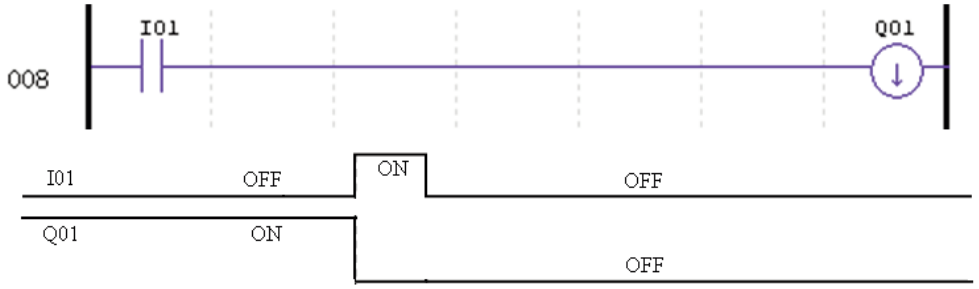


OUTPUT INSTRUCTIONS

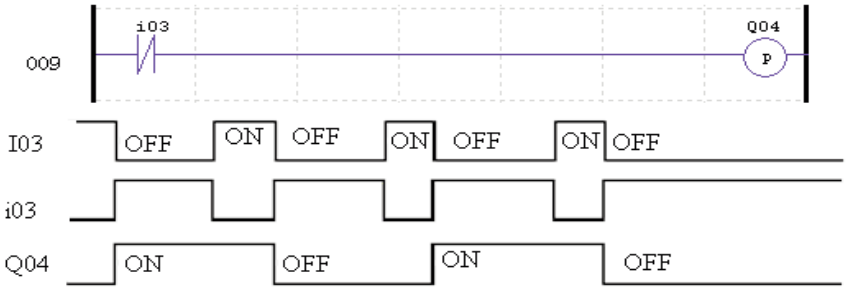
SET OUTPUT INSTRUCTION (LATCH) ( )
A set output instruction, or Latch, turns ON an output coil (Q) or an auxiliary contact (M) when the preceding input contact transitions from OFF to ON. Once the output is ON or set, it will remain ON until it is reset using the Reset output instruction. It is not necessary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



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.



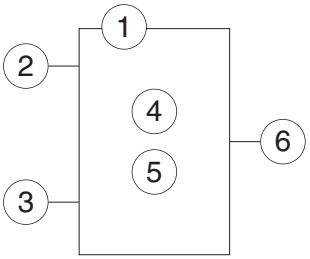
ANALOG MEMORY TYPE

	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 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.



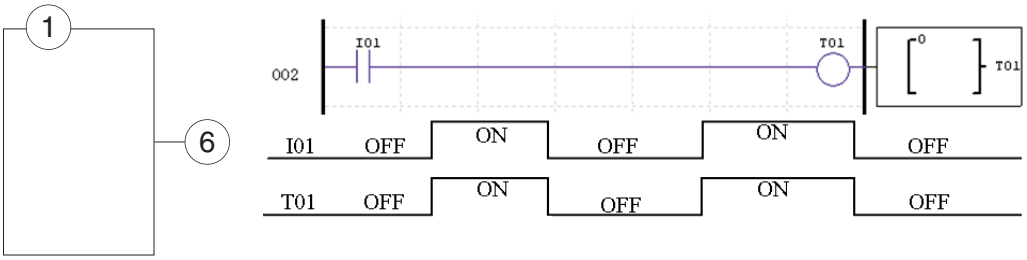
Symbol	Description
1	Timer Mode (0-7)
2	Base tempi temporizzatore Timer Unit 1: 0.01s, range: 0.00 - 99.99 sec 2: 0,1 s, range: 0,0 - 999,9 sec 3: 1 s, range: 0 - 9999 sec 4: 1 min, range: 0 - 9999 min
3	ON: the Timer reset to 0 OFF: the Timer continues timing
4	Timer current value
5	Timer preset value
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
Normally closed 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 after a loss of power to the LRD if the “M-Keep” is active.

TIMER MODE 0 (INTERNAL COIL)

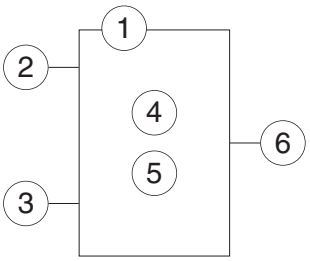
Mode 0 Timer (Internal Coil) used as internal auxiliary coils. No timer preset value. The status of T coil becomes with enable coil as shown below.

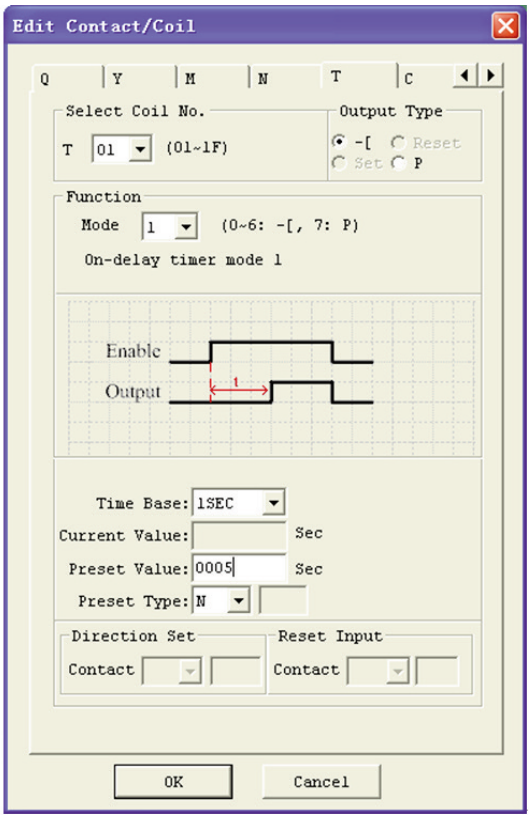


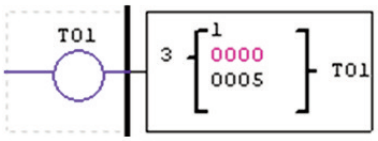
– I01 is enable coil.

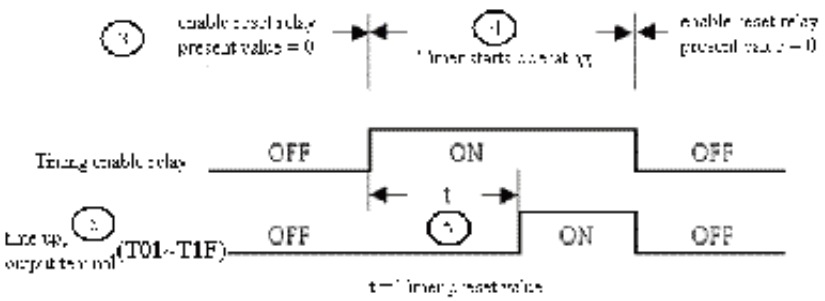
TIMER MODE 1 (ON-DELAY)

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.





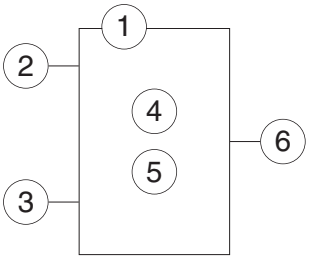


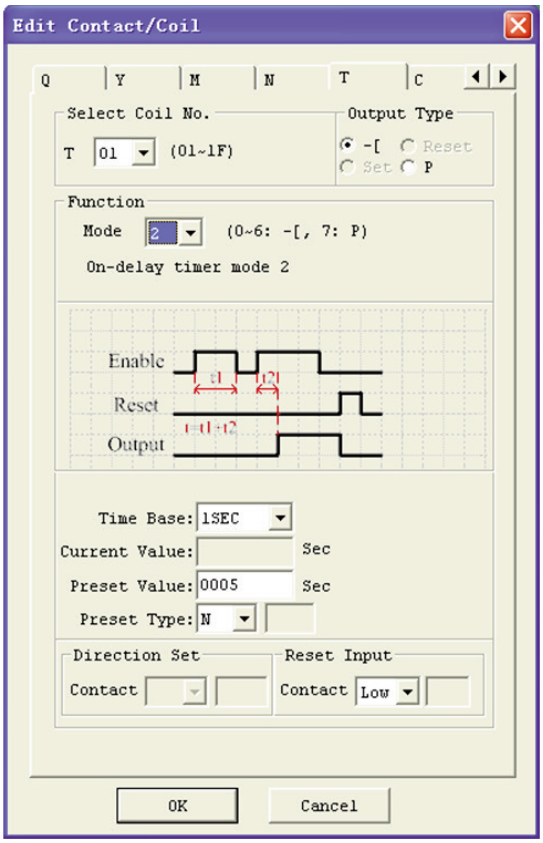


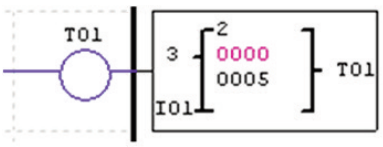
– T0E and T0F keep their current value after a loss of power to the LRD if “M Keep” is active, but the others' reset to 0.

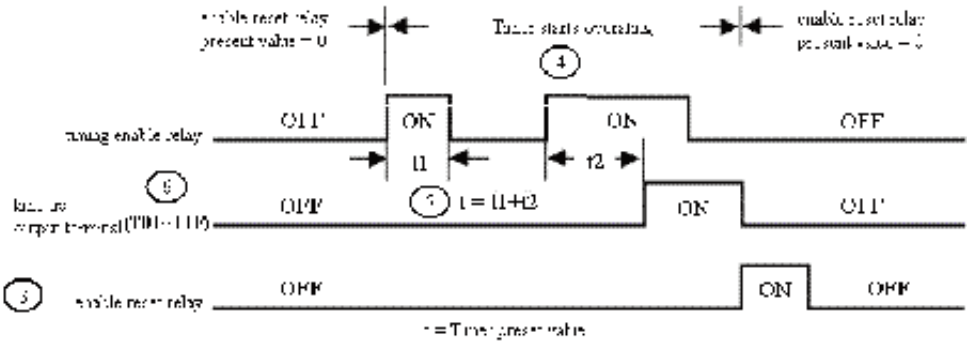
TIMER MODE 2 (ON-DELAY WITH RESET)

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.





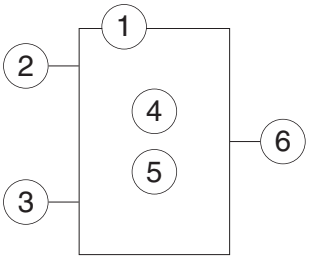


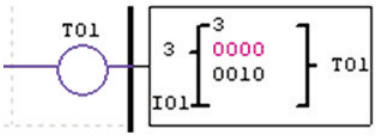


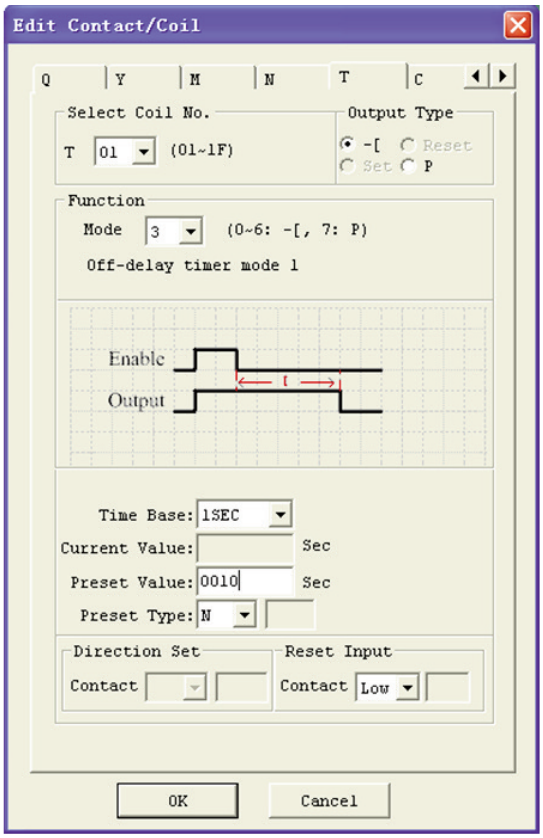
– T0E and T0F keep their current value after a loss of power to the LRD if “M Keep” is active, but the others' reset to 0.

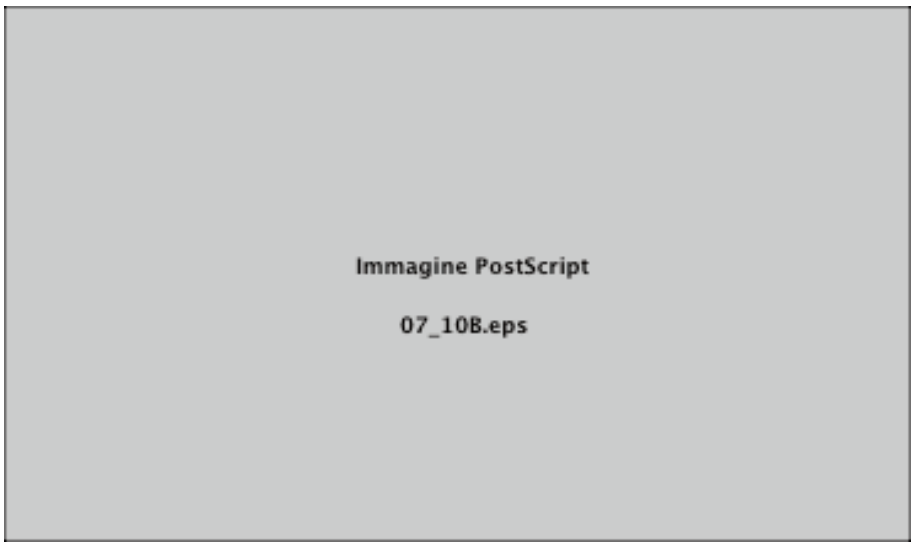
TIMER MODE 3 (OFF-DELAY)

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.





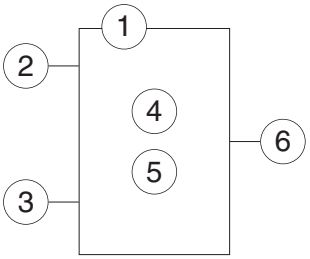


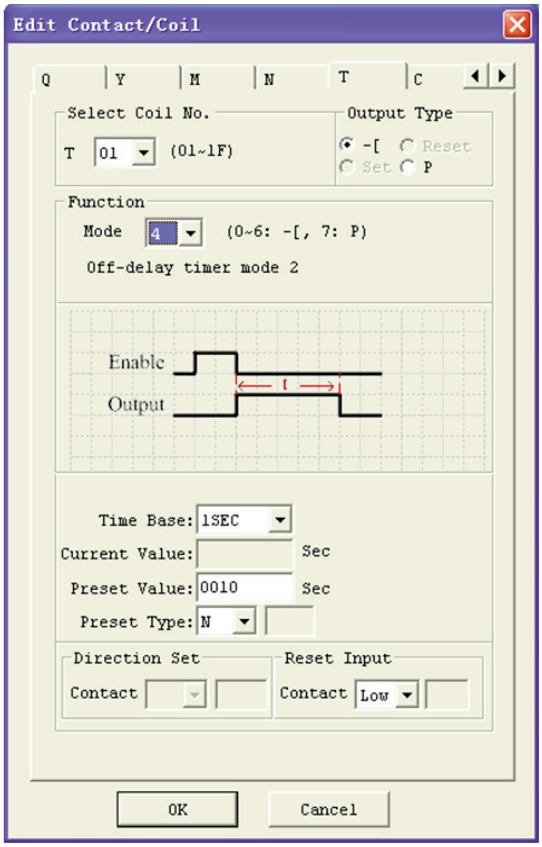


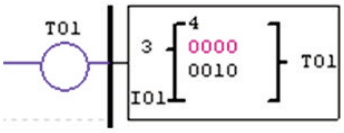
– T0E and T0F keep their current value after a loss of power to the LRD if “M Keep” is active, but the others' reset to 0.

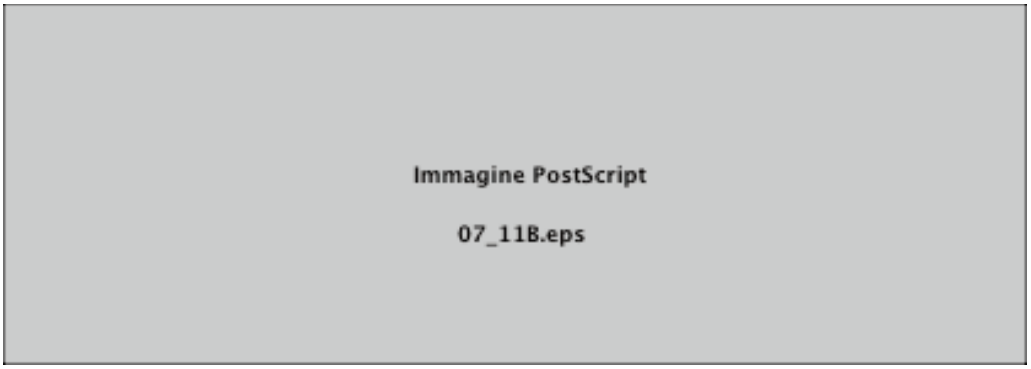
TIMER MODE 4 (OFF-DELAY)

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 true to false transition. Timer status bit T01 will turn OFF when the current time value reaches its preset value of 10 seconds.





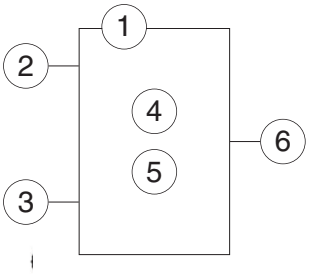


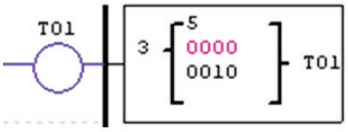


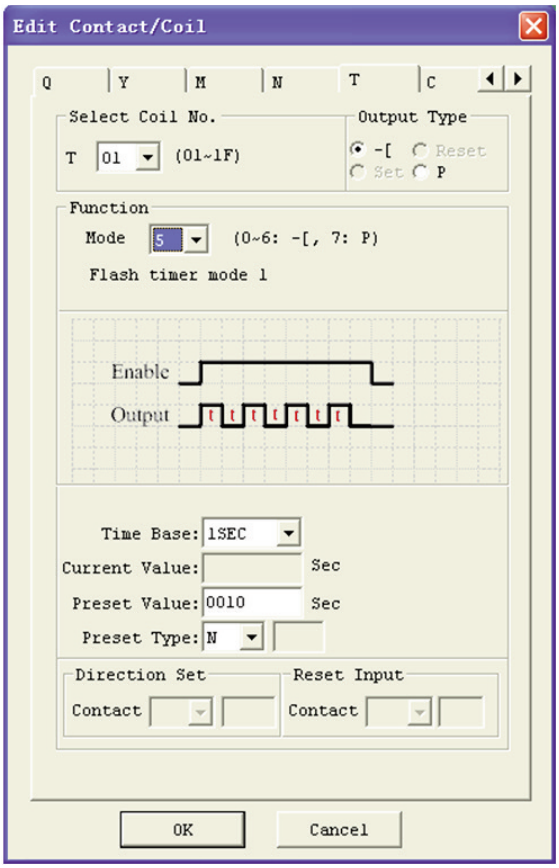
– T0E and T0F keep their current value after a loss of power to the LRD if “M Keep” is active, but the others' reset to 0.

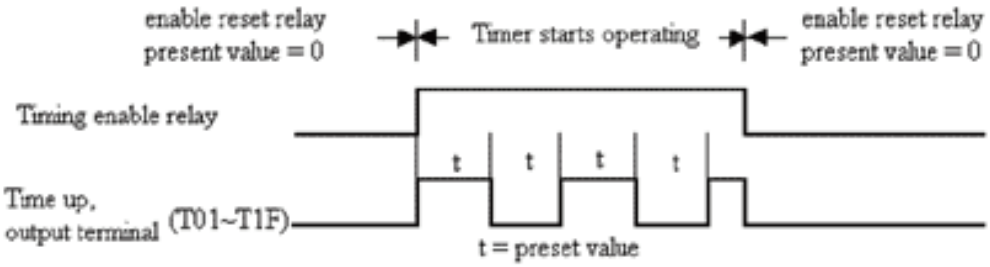
TIMER MODE 5 (FLASH WITHOUT RESET)

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 begins 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.





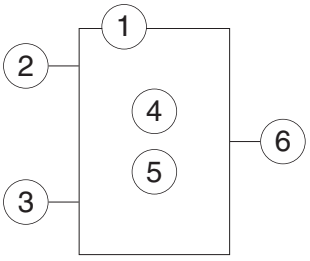


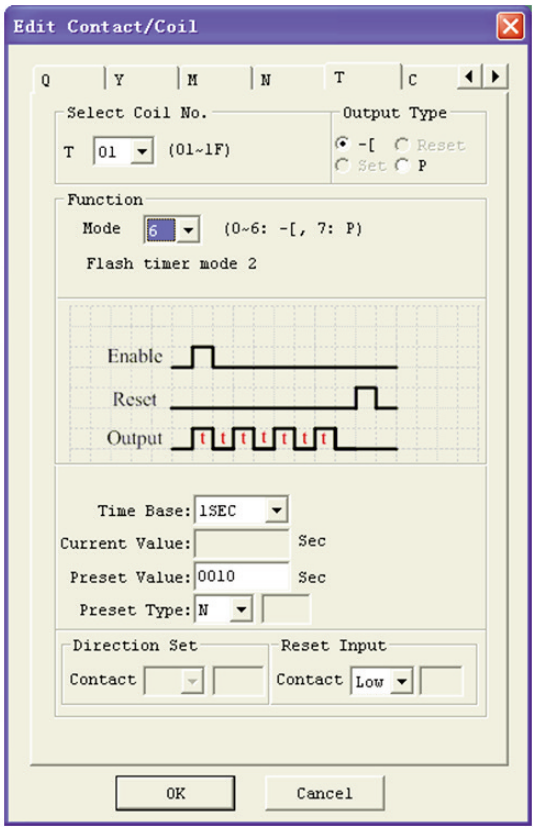


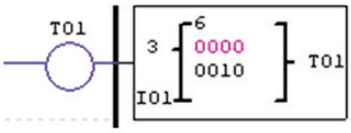
– The current value of Timer cannot be kept after a loss of power to LRD.

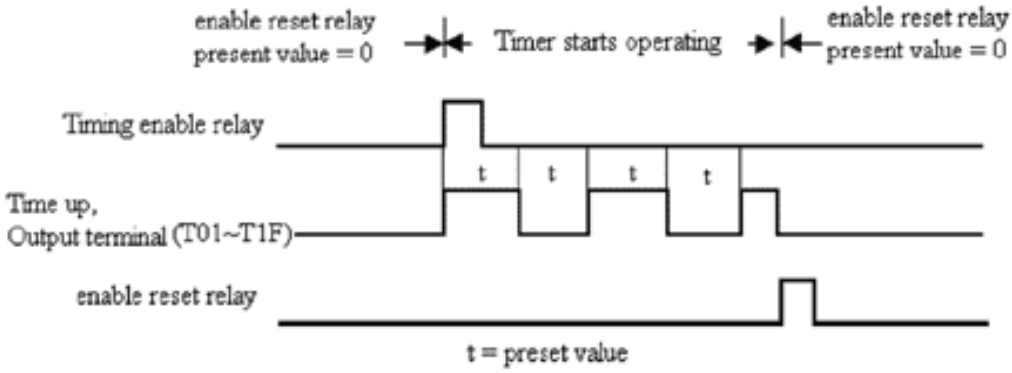
TIMER MODE 6 (FLASH WITH RESET)

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 begins 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.







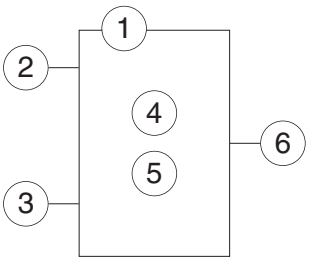


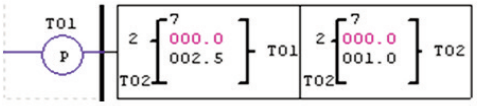
– The current value of Timer cannot be kept on a loss of power to LRD.

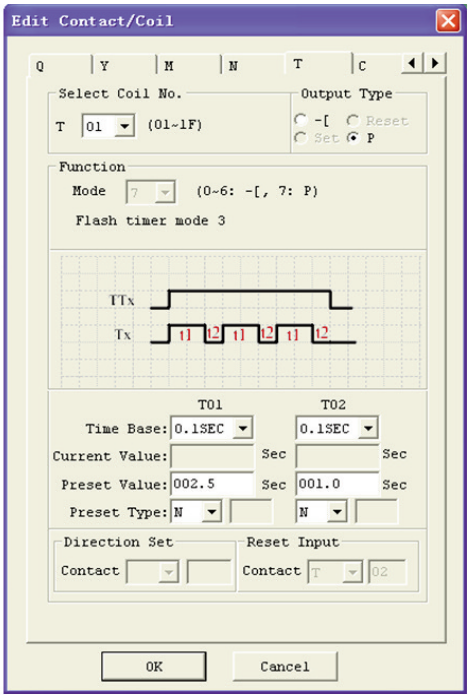
TIMER MODE 7 (FLASH CASCADE WITHOUT RESET)

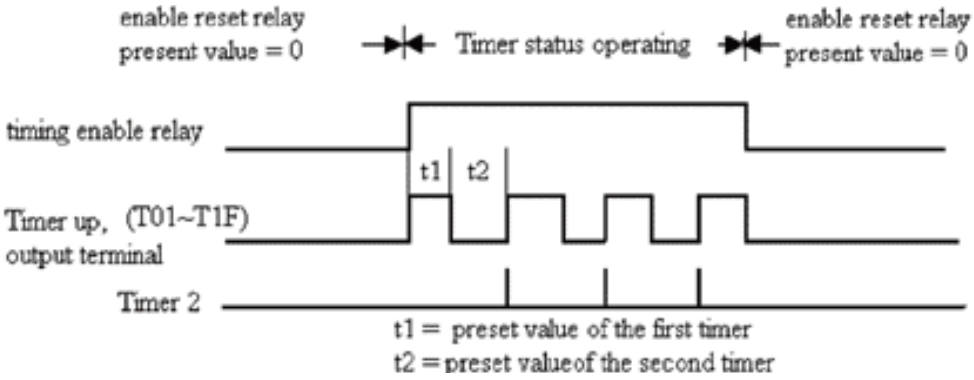
Mode 7 Timer is a Flash Timer which using two Timers in a cascade configuration without reset. The second Timer number follows the first Timer. The cascade configuration connects the timer status bit of first timer to enable the second timer. The second timer will time up to its preset value then flash 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 often 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.





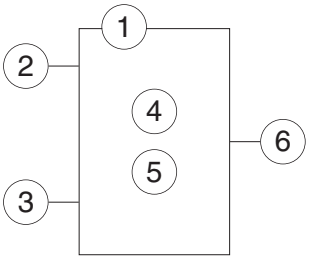




– The current value of Timer cannot be kept on a loss of power to LRD.

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.

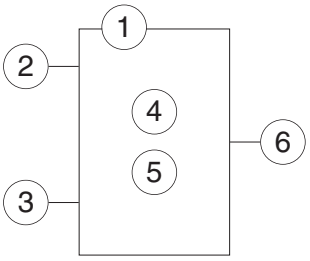


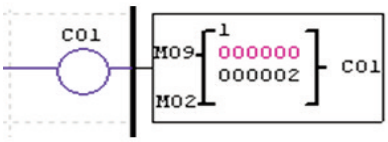
COMMON COUNTER

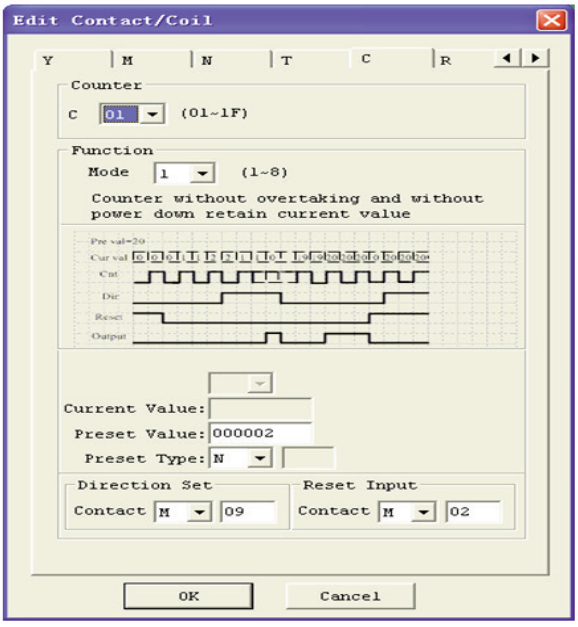
Symbol	Description
1	Counting Mode (0-6)
2	Use (I01~g1F) to set counting up or down OFF: counting up (0, 1, 2, 3……) ON: counting down (……3, 2, 1, 0)
3	Use (I01~g1F) to reset the counting value ON: the counter value reset to 0 OFF: the counter continues to count
4	Counter current Value, range: 0~999999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

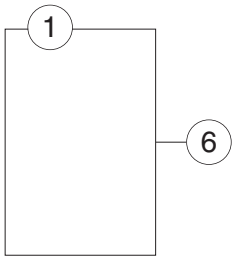


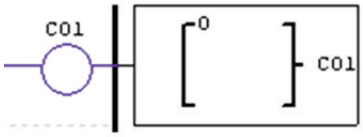


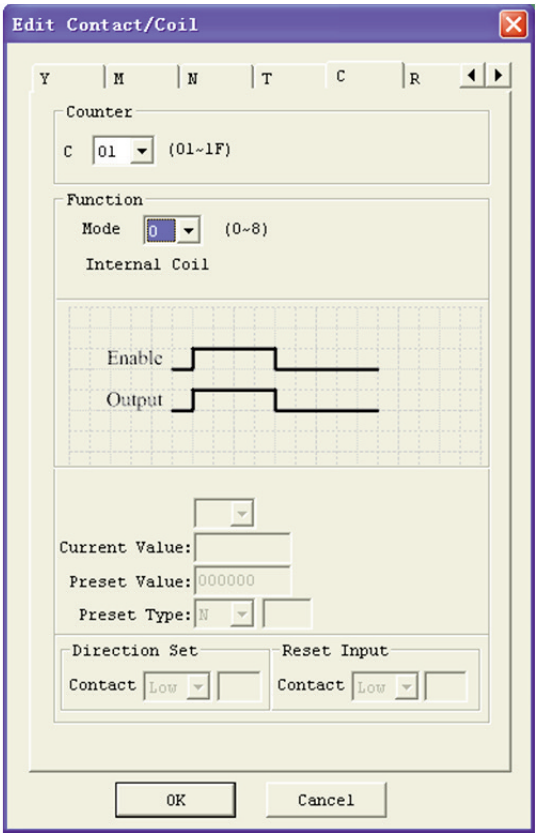


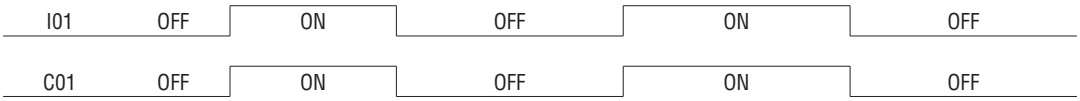
COUNTER MODE 0 (INTERNAL COIL)

Mode 0 Counter (Internal Coil) used as internal auxiliary coils. No counter preset value. 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.



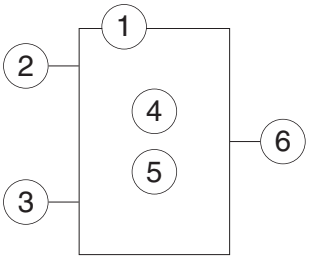


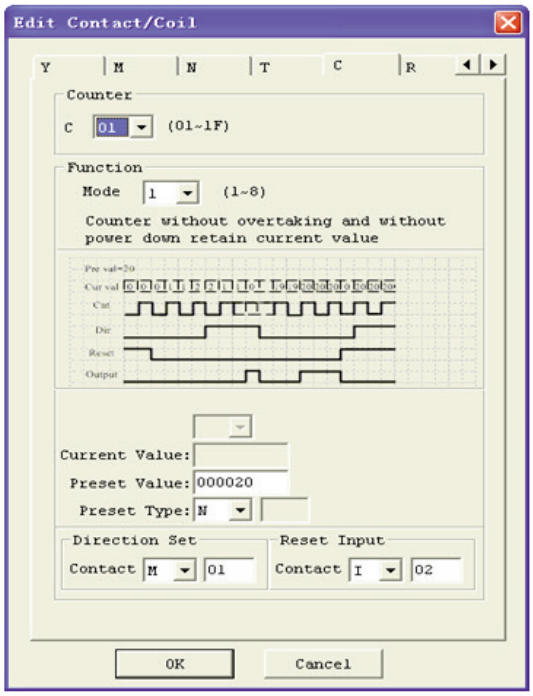


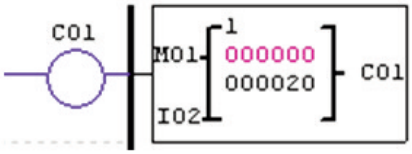


COUNTER MODE 1 (FIXED COUNT, NON-RETENTIVE)

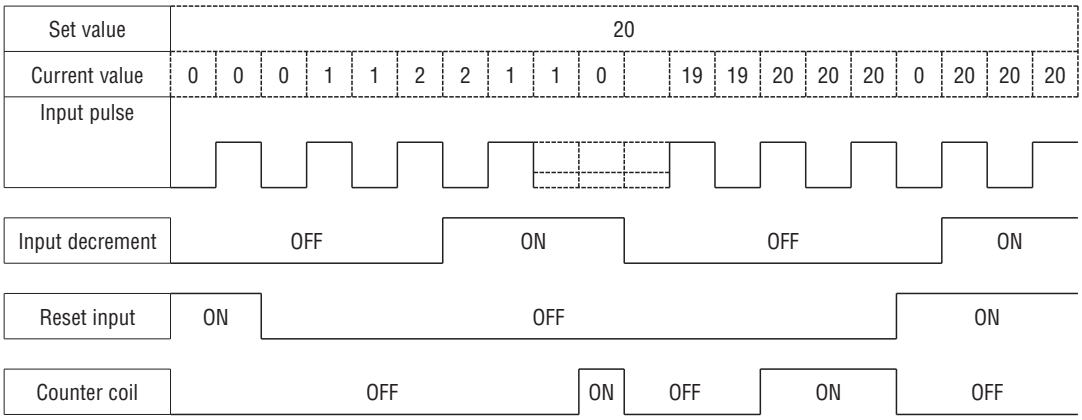
Mode 1 Counter will count up to a fixed preset value and stop counting when the current count is equal to the preset value, or count down to 0 and stop counting when the current count is equal to 0. Additionally, the current count value is non-retentive and will reset to init value on a powering up to the LRD. 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.







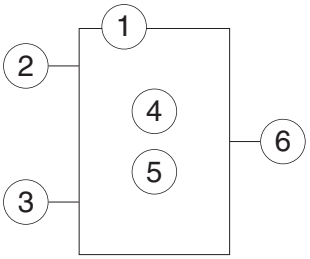
Mode = 1

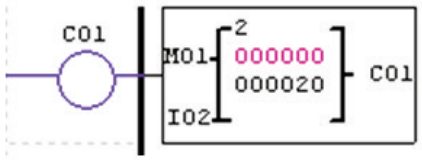


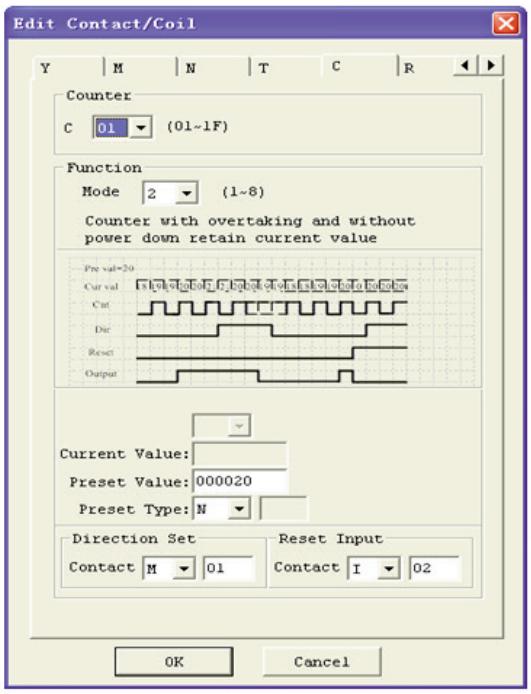
– Under this mode, the counter current value will be init value when the LRD is powered up or switching between RUN and STOP. The init value is 0 if the counter is configured as counting up or else the preset value.

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 will not 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 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.







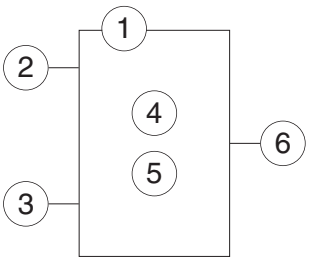
Mode = 2

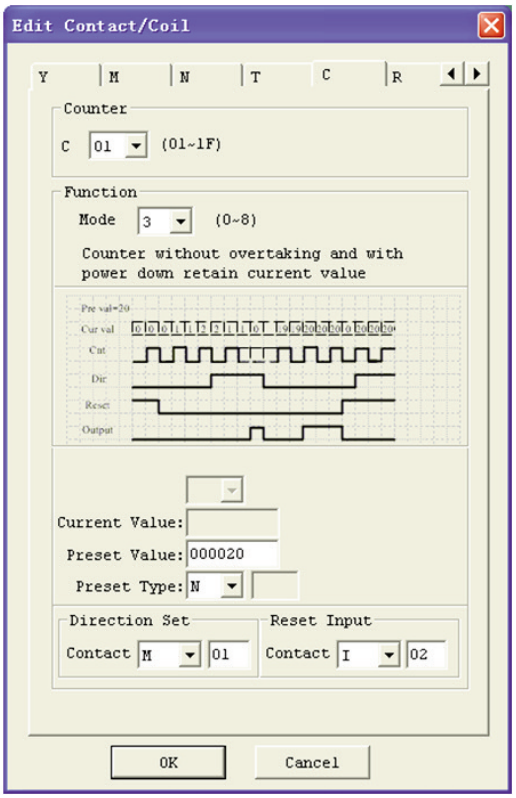
Set value	20																			
Current value	0	19	19	20	20	21	21	20	20	19	19	18	18	0	0	19	19	20	0	20
Input pulse																				
Input decrement	OFF							ON								OFF				ON
Reset input	OFF																			ON
Counter coil	OFF			ON				OFF						ON				OFF		

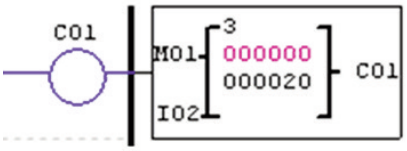
– Under this mode, Counter will continue counting after reaching preset value if it is configured as counter up. But it stops counting when its current value is 0 if it is configured as counter down.
– The counter current value will be init value when the LRD status switches between RUN and STOP or the LRD is powered 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 will not be init value when Counter powers up, but be the value when it is 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 is 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.



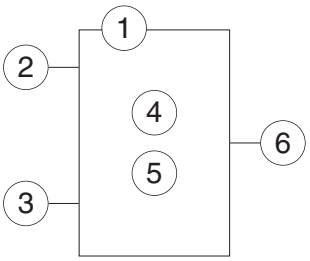


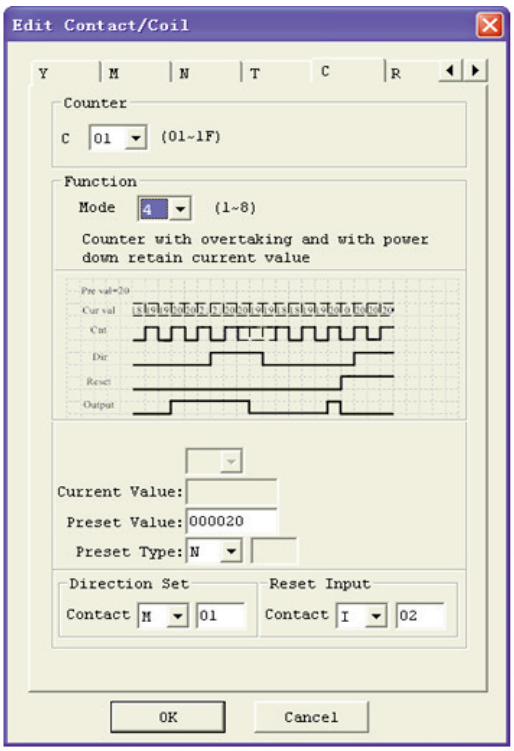


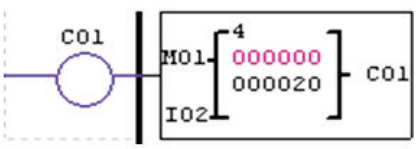
This mode is similar to mode 1, but:
- The current counter value will keep at loss of power when the LRD status is RUN
- The current counter value will keep when the LRD switches between RUN and STOP if C-keep is active.

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. Mode 4 Counter will count up to a fixed preset value and then continue counting after the preset value, but it will not count when the current value equals 0 if it is 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 is not less than 20.





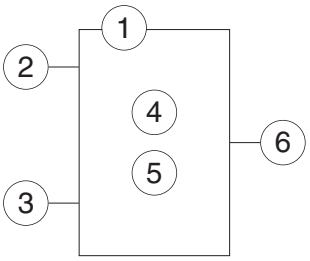


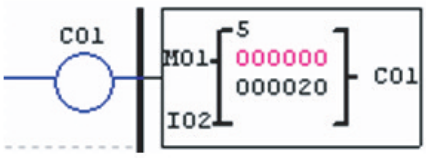
This mode is similar to mode 2, but:
- The current counter value will be kept at loss of power when the LRD status is RUN.
- The current counter value will be kept when the LRD switches between RUN and STOP if "C-keep" is active.

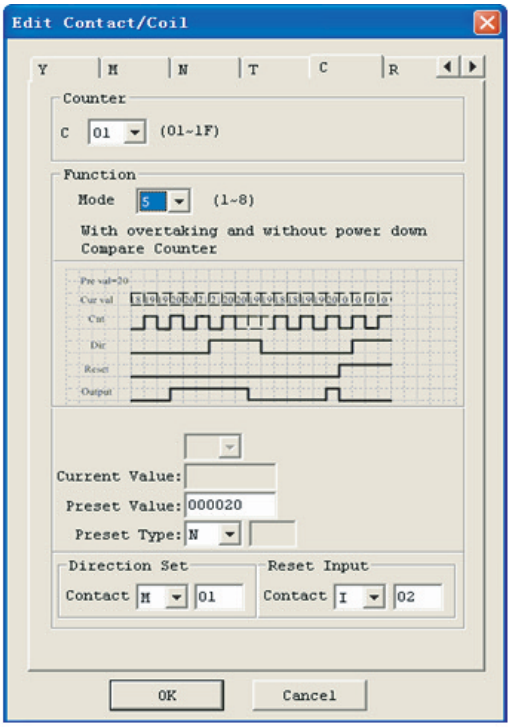
COUNTER MODE 5 (CONTINUOUS COUNT, UP-DOWN COUNT, NON-RETENTIVE)

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. 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.







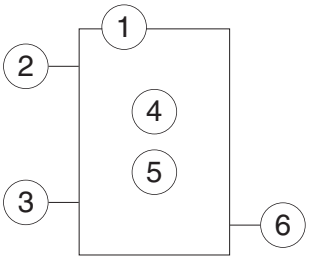
Mode = 5

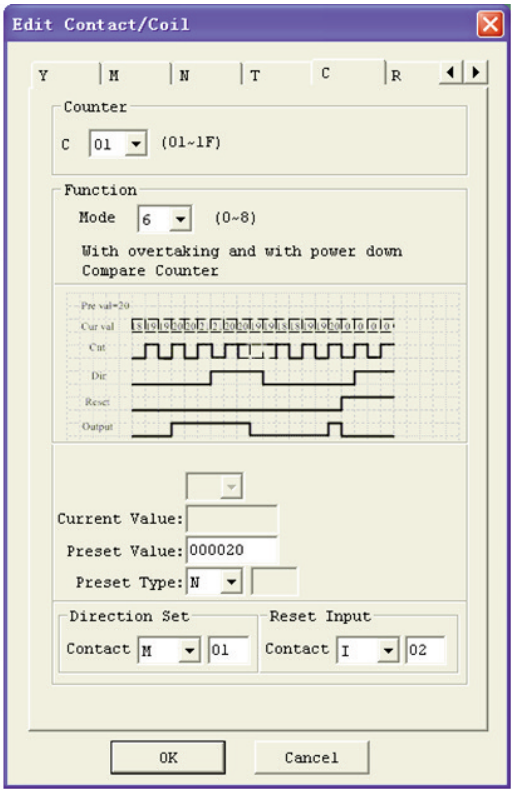
Set value	20																		
Current value	0	19	19	20	20	21	21	20	20	19	19	18	18	19	19	20	0	0	0	0
Input pulse																			
Input decrement	OFF							ON					OFF					ON	
Reset input	OFF																	ON	
Counter coil	OFF							ON					OFF			ON		OFF	

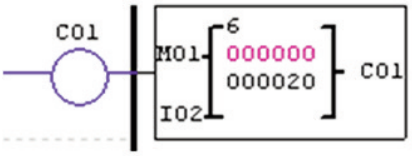
– Under this mode, the count will continue after reaching its preset value.
– The current value is always 0 regardless of the state of its direction bit when the reset is availability.
– The current value is always 0 regardless of the state of its direction bit when the LRD switches between RUN and STOP.

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

Mode 6 Counter 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 is not 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. 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 is not 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																				
Supply voltage	ON						OFF						ON							
Reset input																				
Counter coil																				

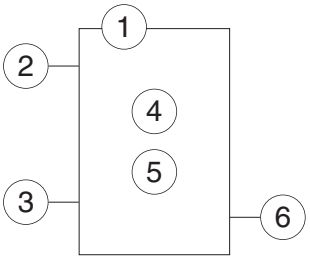
This mode is similar to mode 5, but:
- The current value is kept at loss of power down to the LRD when it status is RUN.
- The current value is kept when the LRD switches between RUN and STOP if “C Keep” is active.

HIGH SPEED COUNTERS (DC VERSION ONLY)

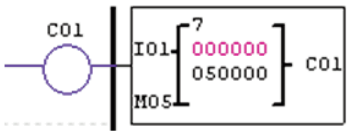
The DC powered version LRD includes two 1 kHz high speed inputs on terminal I01 and I02. These can be used as general purpose DC inputs or can be wired to a high speed input device (encoder, etc.) when configured for high speed counting. They are often used for counting something moving very fast (>40Hz) 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.

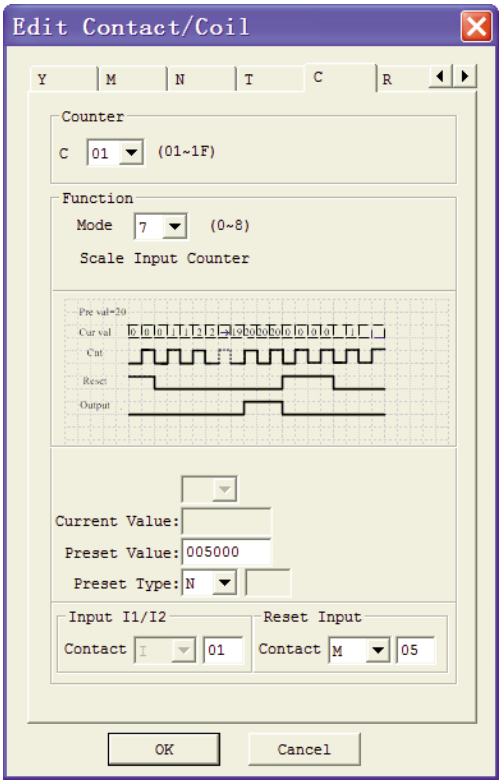
HIGH SPEED COUNTER MODE 7 (DC VERSION ONLY)

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. 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.



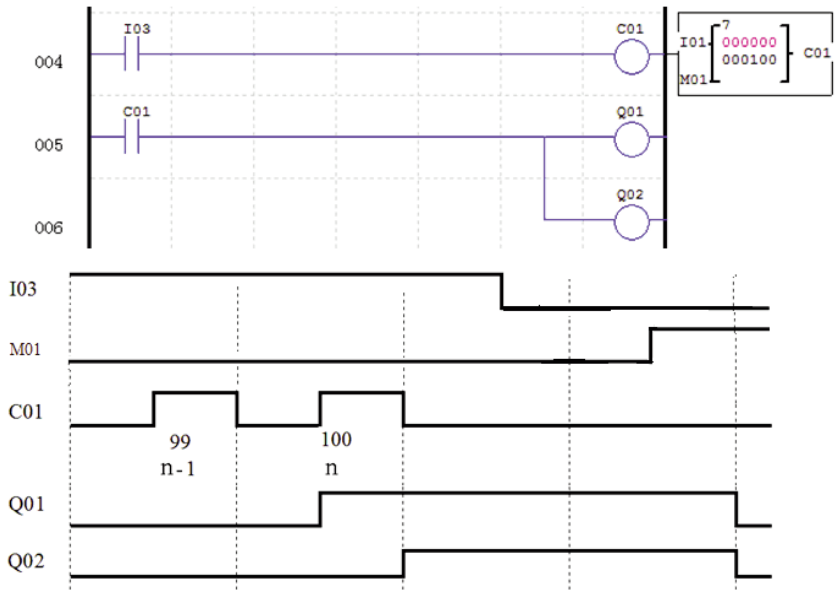
Symbol	Description
1	Counting Mode (7) high speed counting
2	High speed counting input terminal: I01 or I02 only
3	Use (I01~g1F) to Reset the counting value ON: the counter reset to 0 OFF: the counter continues to count
4	Current Count Value, range: 0~999999
5	Preset Value, range: 0~999999
6	Counter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





Mode = 7

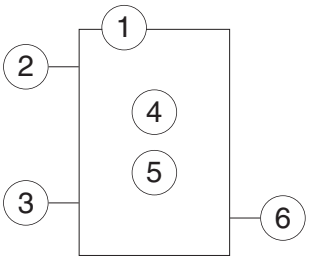
Set value	20											
Current value	0	0	1	1	—	—	49999	50000	50000	50000	0	0
Input pulse												
Reset input	ON					OFF					ON	
Counter coil	OFF							ON			OFF	

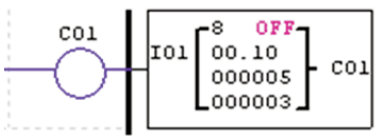


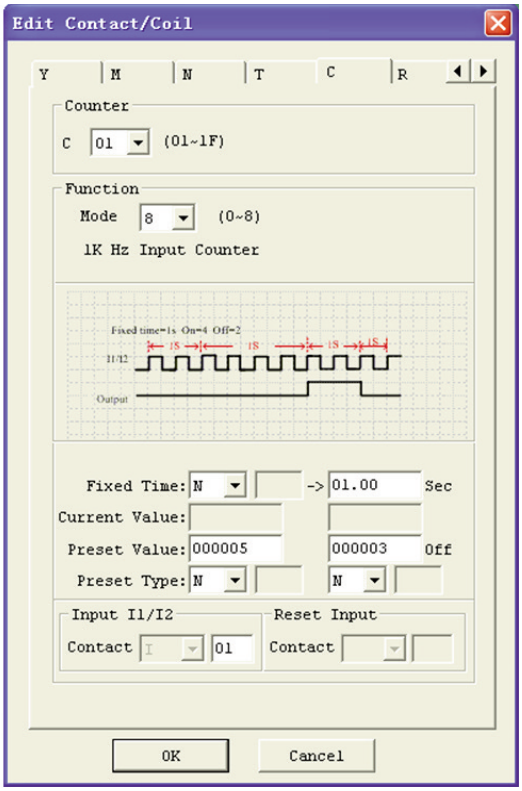
HIGH SPEED COUNTER MODE 8 (DC VERSION ONLY)

The Mode 8 High Speed Counter can use either input terminals I01 or I02 for forward up-counting to 1 kHz maximum at 12VDC or 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.

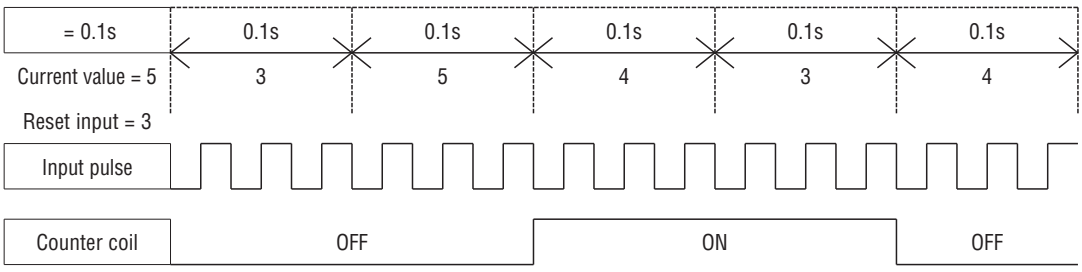
Symbol	Description
1	Counting Mode (8) high speed counting
2	High speed counting input terminal: I01 or I02 only
3	Counting interval time: 0~99.99 sec
4	Counter 'on' preset Value, range: 0~999999
5	Counter 'off' preset Value, range: 0~999999
6	Counter Coil Number (C01~C1F total: 31 counters)





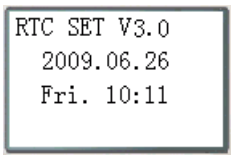


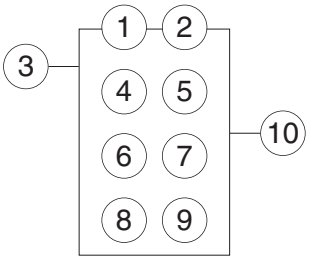
Mode = 8



REAL TIME CLOCK (RTC) INSTRUCTIONS

The LRD 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 LRXSW software.

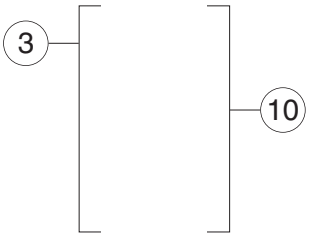


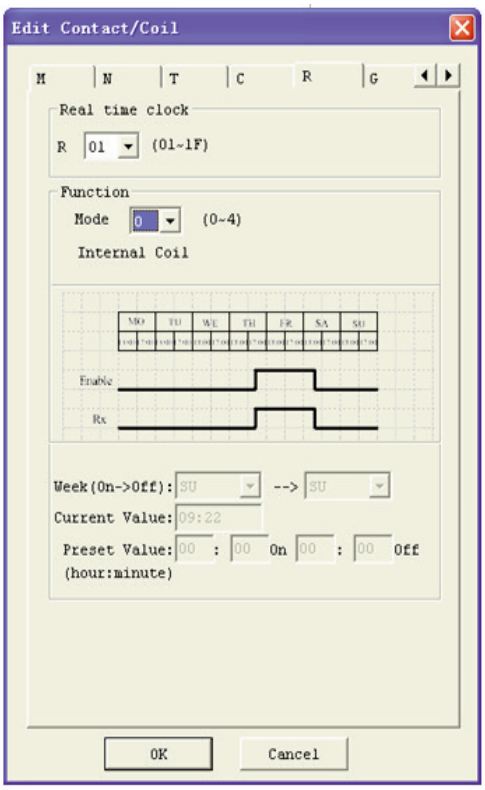


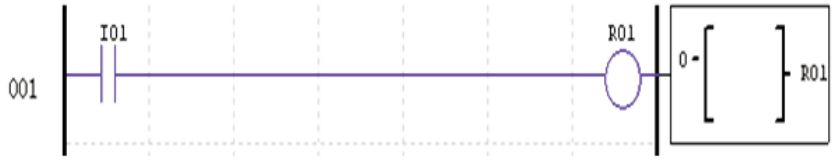
Symbol	Description
1	Input the first week to RTC
2	Input the second week to RTC
3	RTC mode 0~2, 0: internal coil 1: daily, 2: consecutive days
4	RTC displays the hour of present time.
5	RTC displays the minute of present time
6	Set RTC hour ON
7	Set RTC Minutes ON
8	Set RTC Hour OFF
9	Set RTC Minutes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

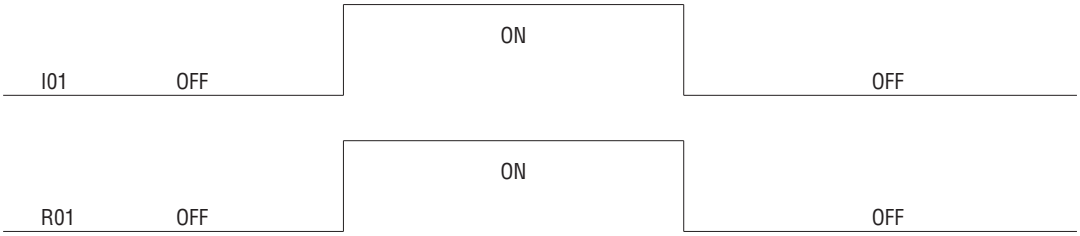
RTC MODE 0 (INTERNAL COIL)

Mode 0 RTC (Internal Coil) used as internal auxiliary coils. No preset value. 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..

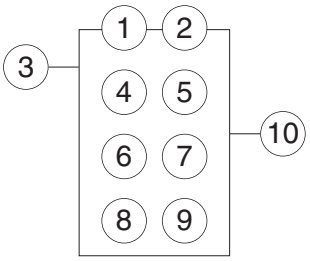


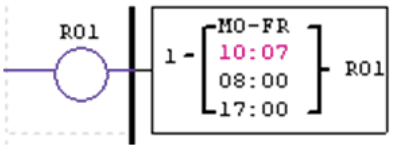


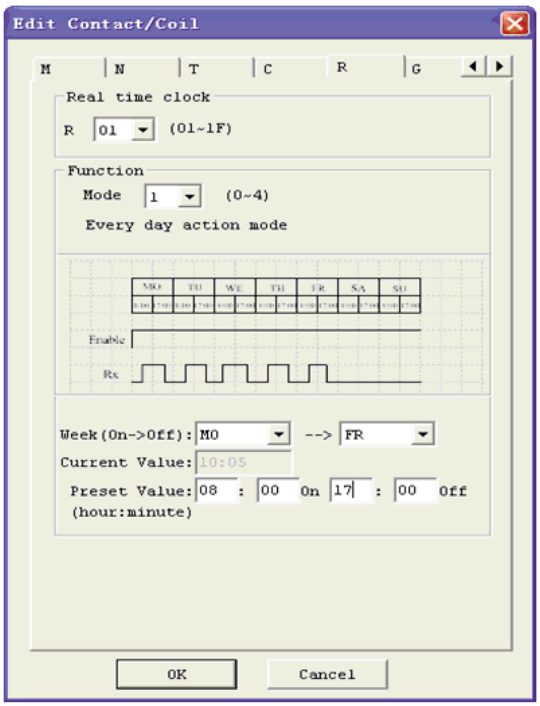


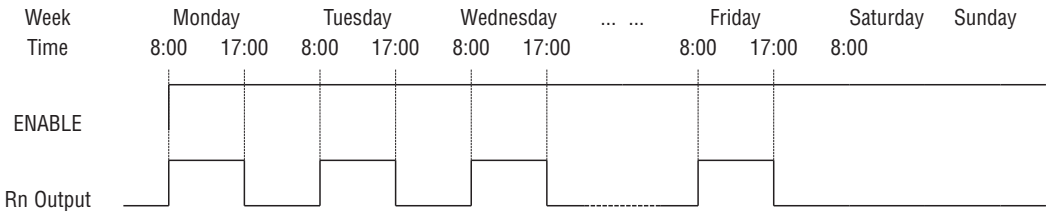


RTC MODE 1 (DAILY)
The Daily Mode 1 allows the Rxx coil to active based on a fixed time across a defined set of days per week. The configuration dialog below (example 1) allows for selection of the number of days per week (i.e. Mon-Fri) and the Day and Time for the Rxx coil to activate ON, and the Day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



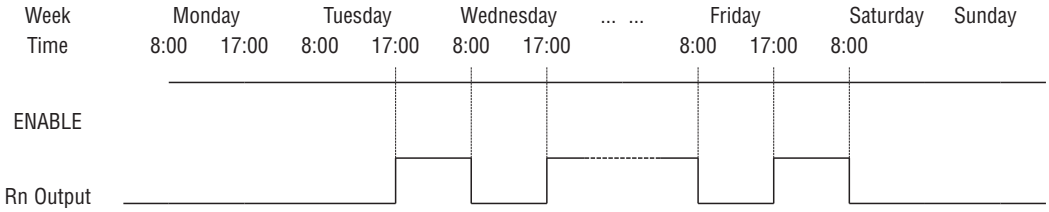






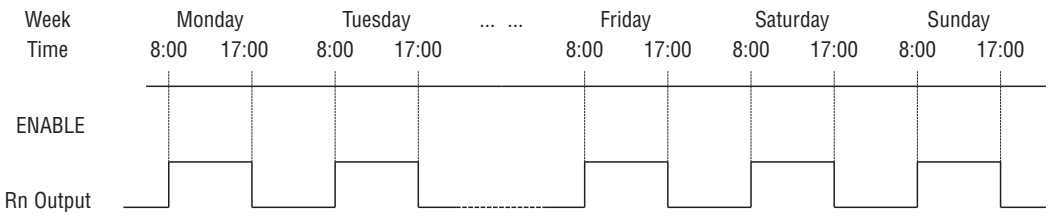
Example 2

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



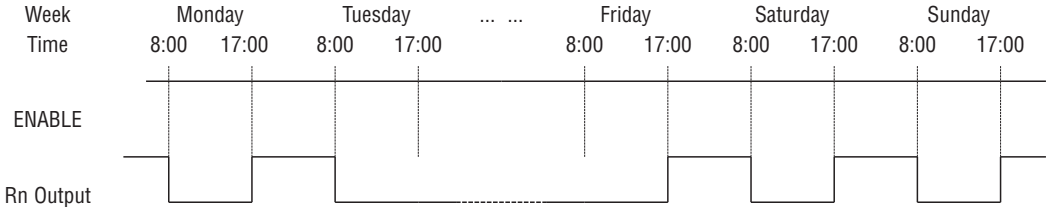
Example 3:

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



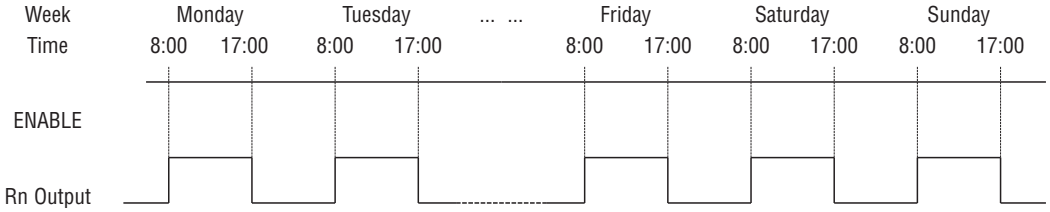
Example 4:

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



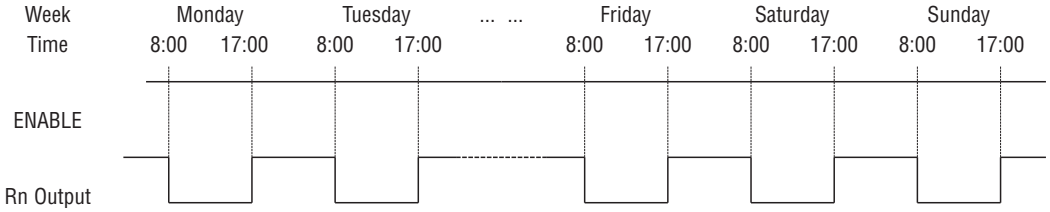
Example 5:

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

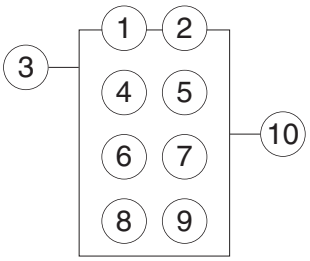


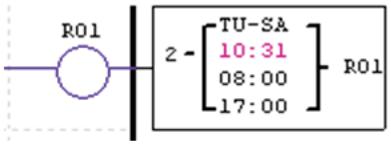
Example 6:

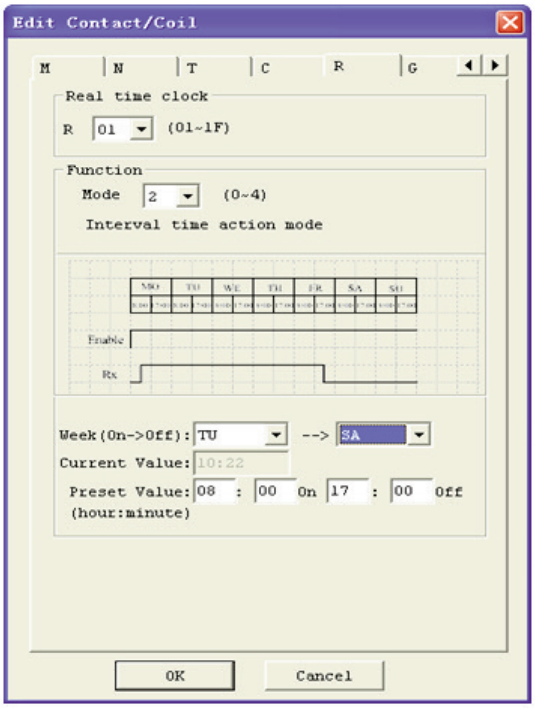
③	1
① : ②	SU-SU
⑥ : ⑦	17:00
⑧ : ⑨	8:00

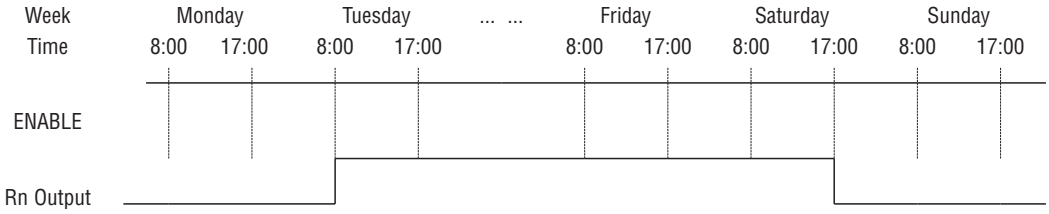


RTC MODE 2 (WEEKLY INTERVAL)
The Interval Time Mode 2 allows the Rxx coil to activate based on time and day per week. The configuration dialog below (example 1) allows for selection of Day and Time for the Rxx coil to activate ON, and Day and Time for the Rxx coil to deactivate OFF.
Example 1:



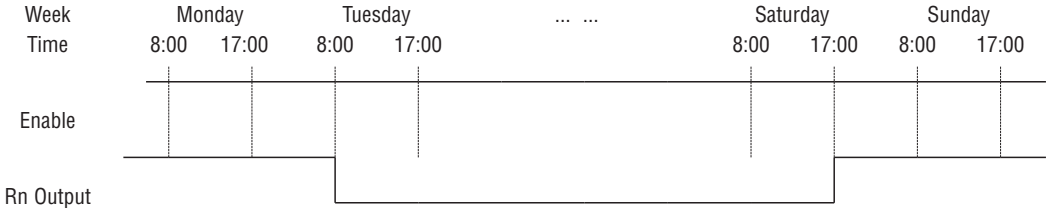






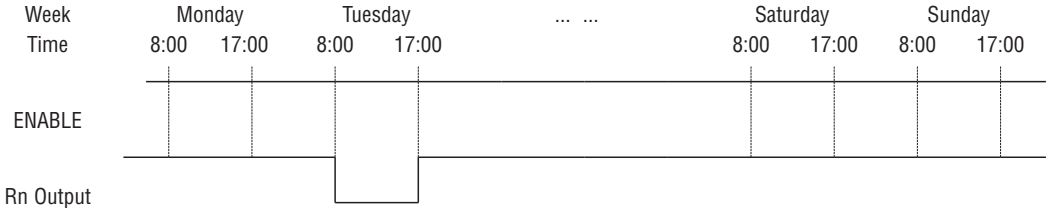
Example 2

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



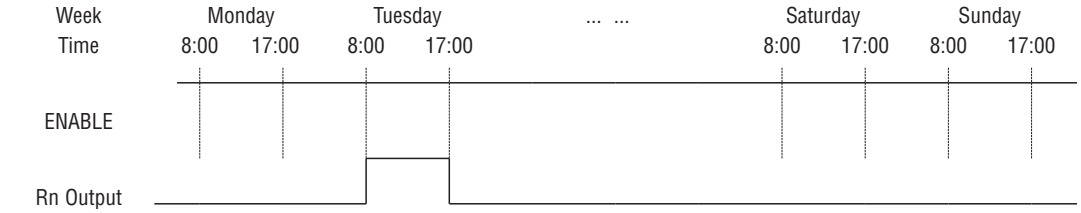
Example 3

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



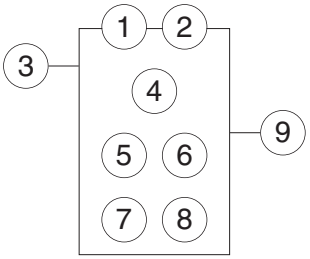
Example 4

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

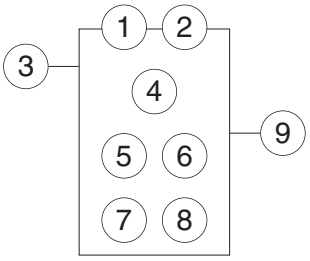


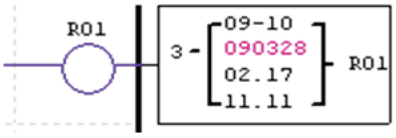
RTC MODE 3 (YEAR-MONTH-DAY)

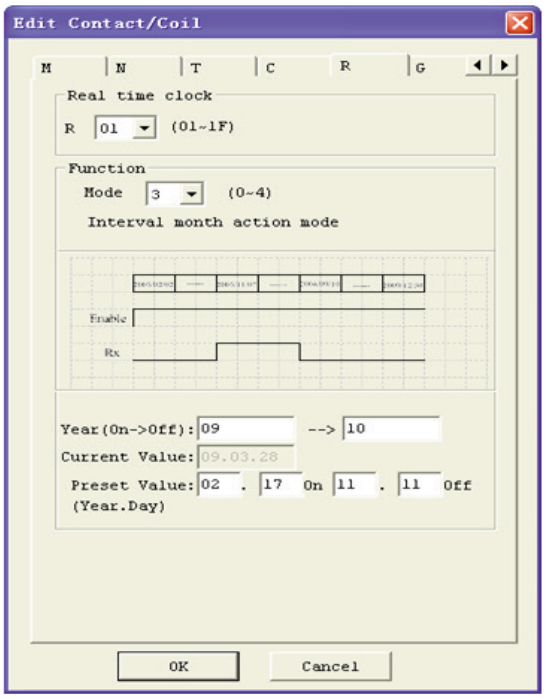
The Year-Month-Day Mode 3 allows the Rxx coil to activate based on Year, Month, and Date. The configuration dialog below (example 1) allows for selection of Year and Date for the Rxx coil to activate ON, and Year and Date for the Rxx coil to deactivate OFF.

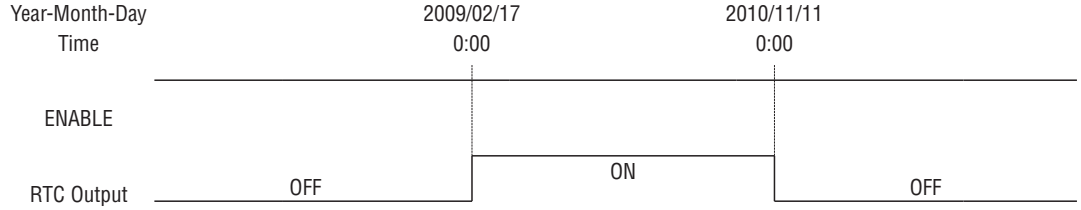


Symbol	Description
1	RTC Year ON
2	RTC Year OFF
3	RTC Mode 3, Year-Month-Day
4	Display RTC present time, Year-Month-Day
5	RTC month ON
6	RTC day ON
7	RTC month OFF
8	RTC day OFF
9	RTC code (R01~R1F, total 31 group)



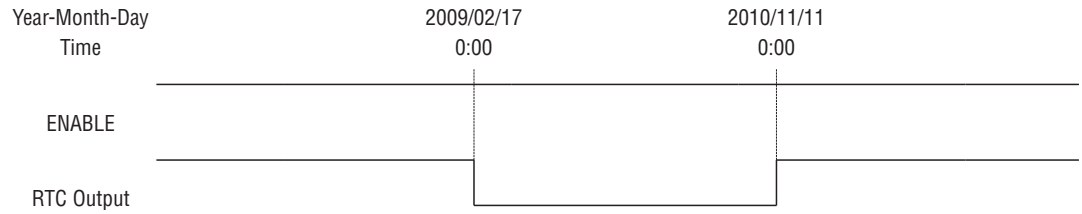






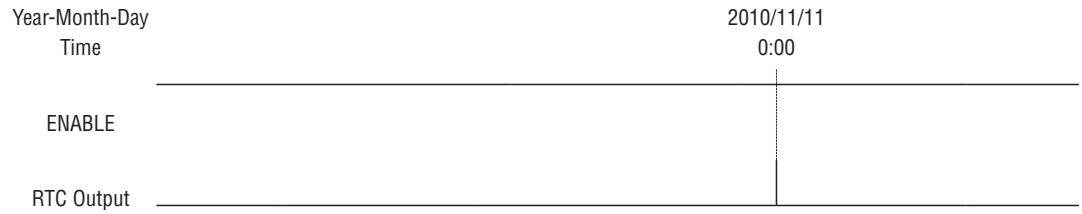
Example 2:

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

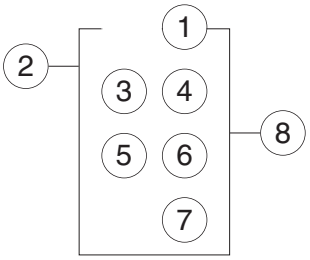


Example 3:

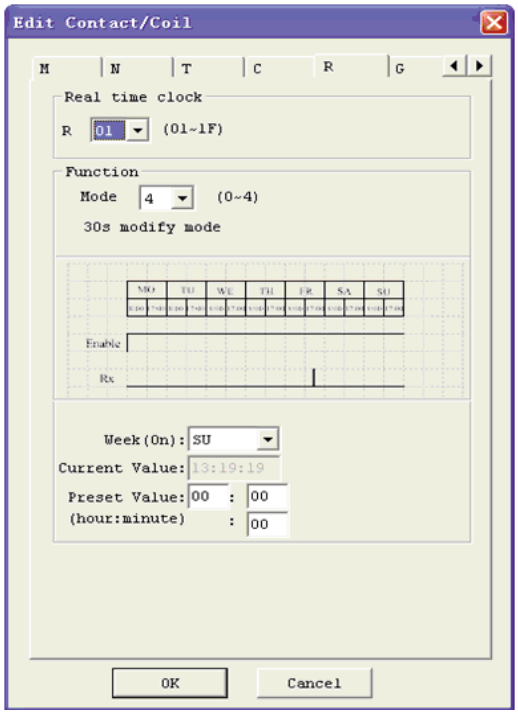
③	3
① / ⑤ / ⑥	2010/11/11
② / ⑦ / ⑧	2010/11/11



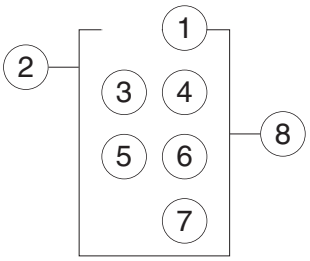
RTC MODE 4 (30-SECOND ADJUSTMENT)
The 30-second adjustment Mode 4 allows the Rxx coil to activate based on week, hour, minute and second. The configuration dialog below shows for selection of week, hour, minute and second for the Rxx coil to activate ON, and 30-second adjustment then Rxx OFF.

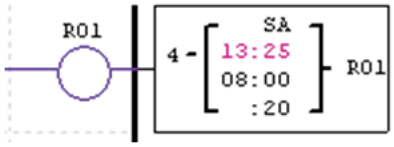


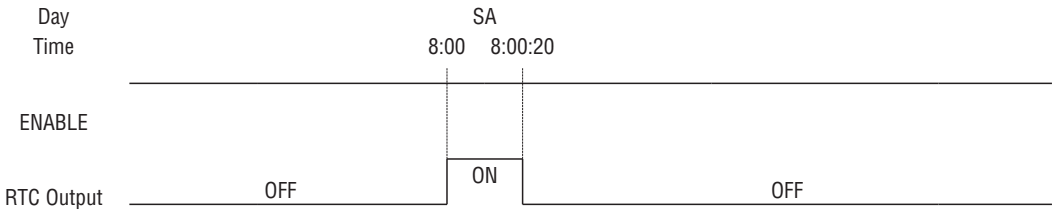
Symbol	Description
1	RTC adjustment week
2	RTC mode 4
3	RTC present hour
4	RTC present minute
5	RTC adjustment hour
6	RTC adjustment minute
7	RTC adjustment second
8	RTC code (R01~R1F, total 31 group)



Example 1: preset second < 30s

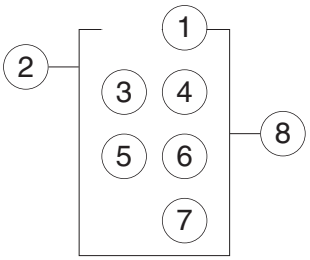


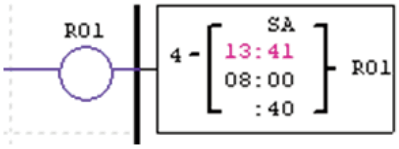


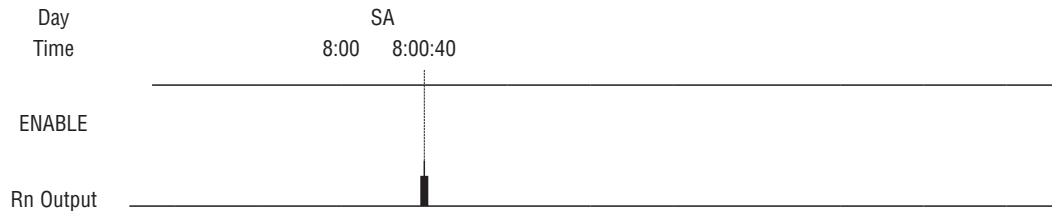


The present time will be 8:00:00 when it achieves 8:00:20 at first time, and RTC status bit R01 will be ON. RTC status bit R01 will be OFF when the present time achieves 8:00:20 at second time. Then time continuous going. So, this means that RTC status bit is ON for 21 seconds.

Example 2: preset second > 30s



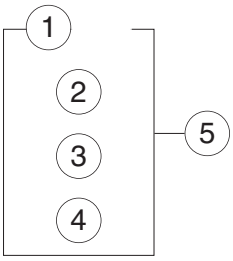




The present time will change to be 8:01:00 when it achieves 8:00:40, and RTC status bit R01 turns ON. Then time is onging on and R01 turns OFF. This means that the RTC status bit will be ON for one pulse.

COMPARATOR INSTRUCTIONS

The LRD 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.

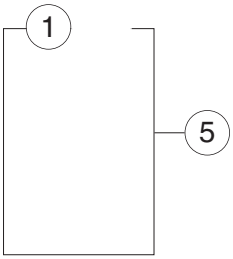


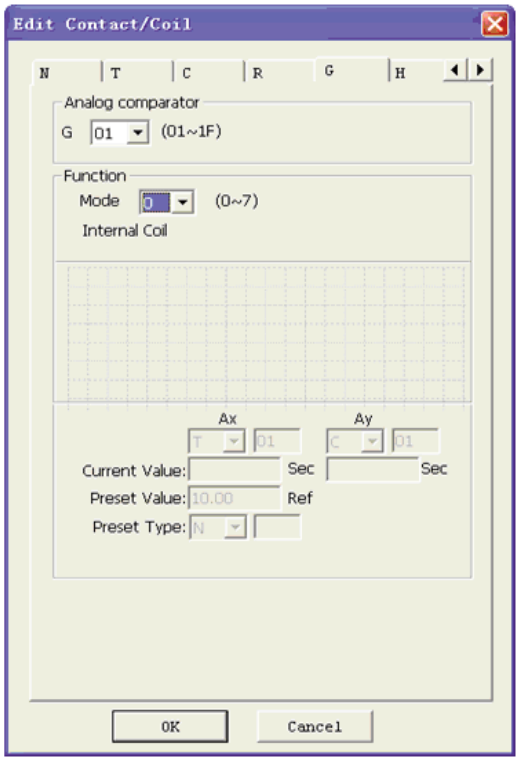
Symbol	Description
1	Comparison Mode (0~7)
2	Ax analog input value (0.00~99.99)
3	Ay analog input value (0.00~99.99)
4	Reference comparative value, could be constant, or other data code
5	Output terminal (G01~G1F)

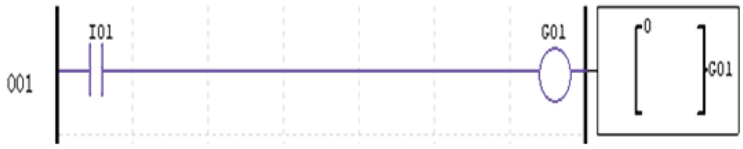
The preset value ②, ③ and ④ can be a constant or other function current value.

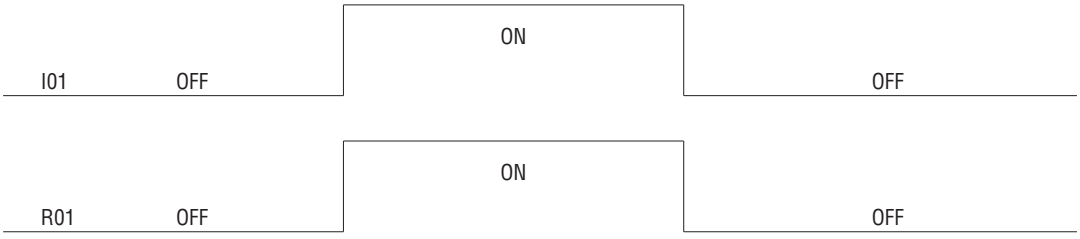
COMPARATOR MODE 0 (INTERNAL COIL)

Mode 0 Comparator (Internal Coil) used as internal auxiliary coils. No preset value. 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.





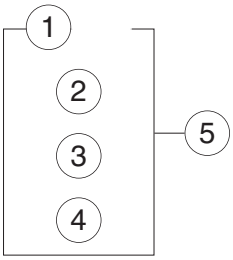


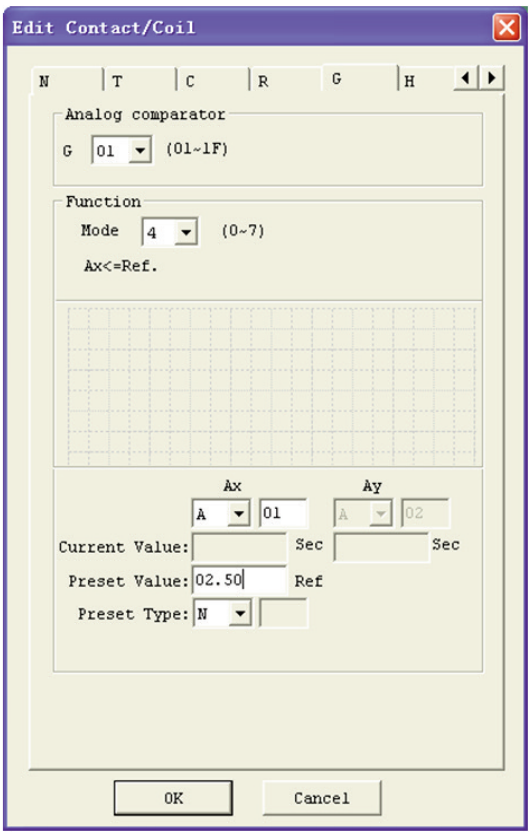


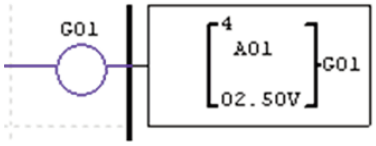
ANALOG COMPARATOR MODE 1~7
(1) Analog Comparator mode 1: *Ay – ④ ≤ Ax ≤ Ay ≤ + ④, ⑤ ON*
(2) Analog Comparator mode 2: *Ax ≤ Ay, ⑤ ON*
(3) Analog Comparator mode 3: *Ax ≤ Ay, ⑤ ON*
(4) Analog Comparator mode 4: *④ ≥ Ax ⑤ ON*
(5) Analog Comparator mode 5: *④ ≥ Ax ⑤ ON*
(6) Analog Comparator mode 6: *④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

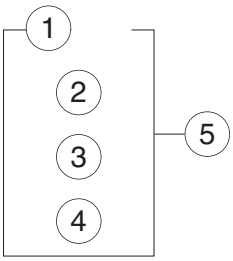


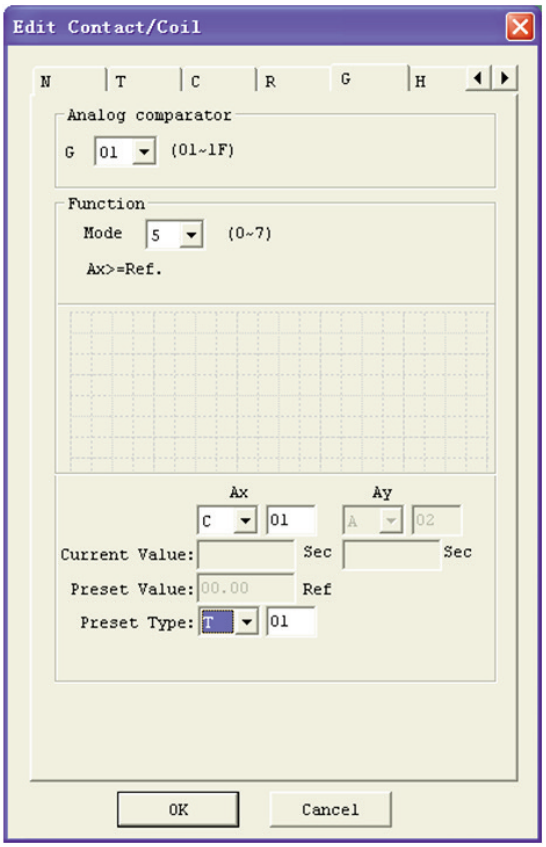


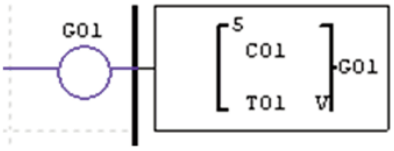


Example 2: Timer/Counter present value Compare

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.



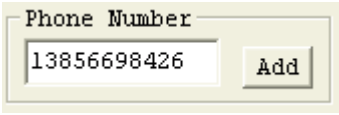




HMI DISPLAY INSTRUCTIONS

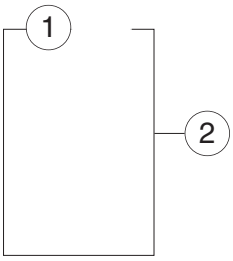
The LRD includes a total of 31 HMI instructions that can be used throughout a program. Each HMI instruction can be configured to display information on the LRD 16_4 character LCD in text, numeric, or bit format for items such as current value and preset value for functions, Input/Output bit status, and 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 LRXSW 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 on the LCD even the Hxx is inactive.

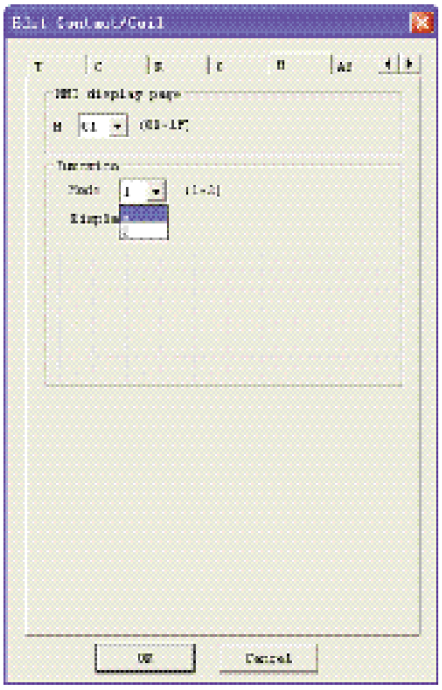
A phone number can be displayed on the screen to alert an operator to call for help. But the phone number field does not dial a modem or allow for a modem connection.

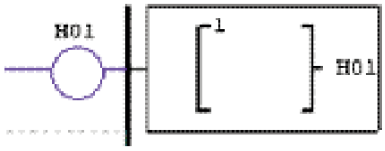


Each HMI instruction has a choice of 2 operation modes. The table below describes each configuration parameter.

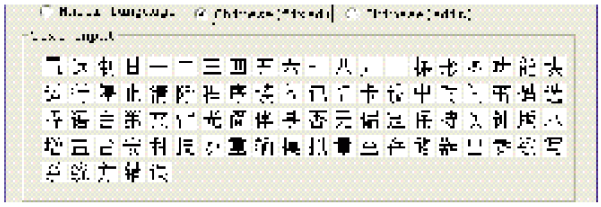
Symbol	Description
1	Display mode (1-2)
2	HMI character output terminal (H01~H1F)







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



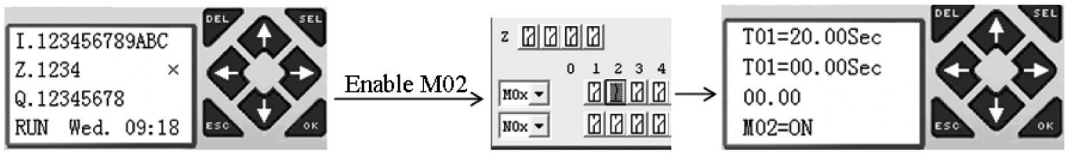
HMI FUNCTION INSTRUCTION

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

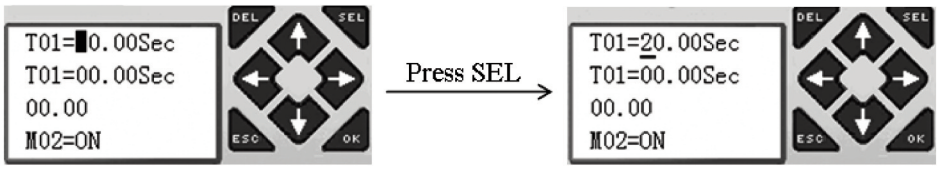
1. HMI scanning state, press SEL into at IO interface

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 MODEL LRD12TD024 ONLY)

The transistor output model LRD 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

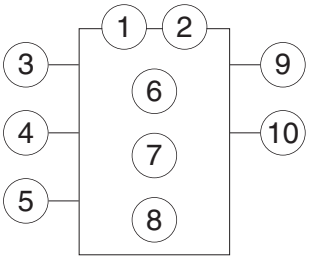
PWM MODE

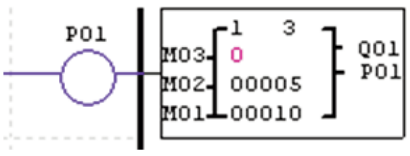
P01 and P02 both can work under this mode. Each PWM has 8 group preset stages which contents Width and Period. The 8 group preset values can be constant or other function current value. Each PWM has 10 parameters for proper configuration. The table below describes each configuration parameter, and lists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

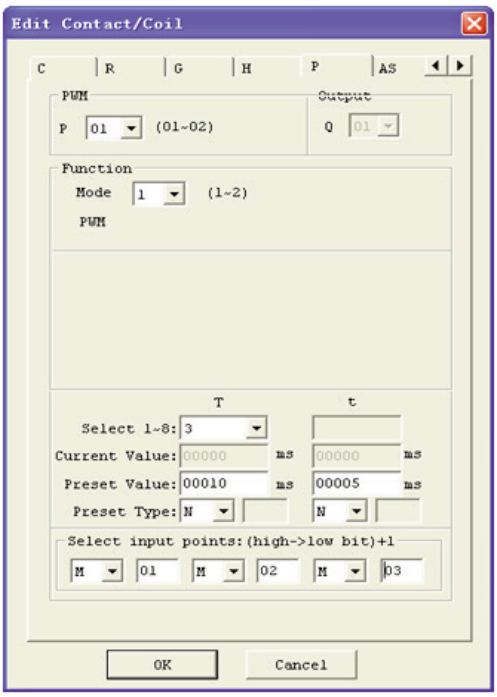
Symbol	Description
–	PWM mode (1)
–	present stages as operating (0~8)
–	Select1 (I01~g1F)
–	Select2 (I01~g1F)
–	Select3 (I01~g1F)
–	Current number of pulse (0~32767)
–	Period of preset stage – (1~32767 ms)
–	Width of preset stage – (1~32767 ms)
–	Output port (Q01~Q02)
–	PWM code (P01~P02)

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

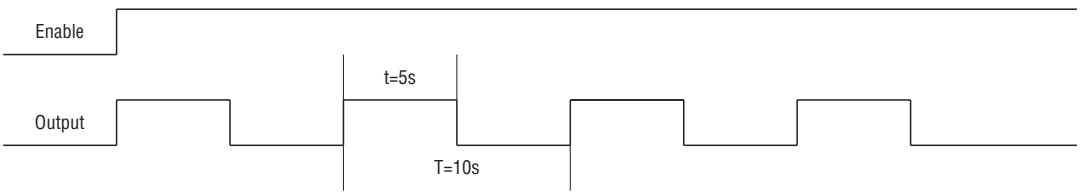
Example:







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



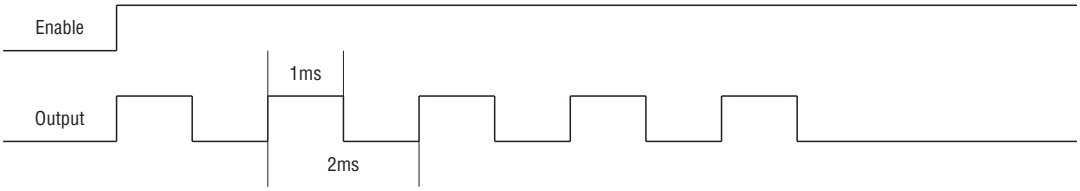
The state of M01, M02 and M03 decide PWM output. PWM stages can be changed by the status of M01, M02 and M03 when P01 is running. ⑥ displays the number of pulse when P01 is running, but ⑥ equals 0 when P01 is disabled.

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)

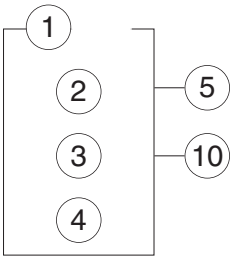
The preset frequency and pulse number can be constant or other function current value. They are variable if the preset are other data code. The PLSY will stop output if it has outputted the number of ④. pulse. PLSY will run again if it is enabled for a second time.

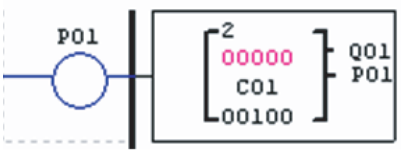
Example:
Parameter setting: ③ = 500Hz ④ = 5, output as shown below:

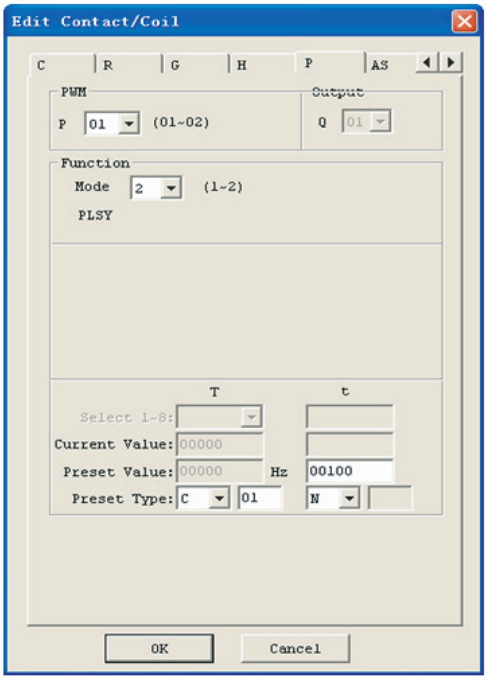


PLSY stops outputting when the number of output pulse is completed.

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



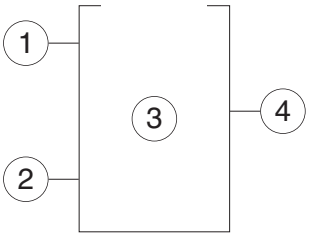




– In the example above, frequency is 1000 if the current value of C01 is bigger than 1000.
– PLSY stops outputting pulse after it has output 100 pulses.
– PLSY will be going on as long as it is enabled if ④ is 0.

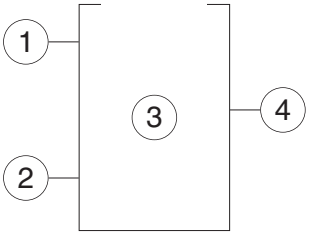
SHIFT (SHIFT OUTPUT)

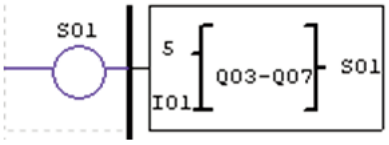
The LRD includes only one SHIFT instruction that can be used throughout a program. This function outputs a series of pulses on selection points depending on SHIFT input pulse. It has 4 parameters for proper configuration. The table below describes each configuration parameter, and lists each compatible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

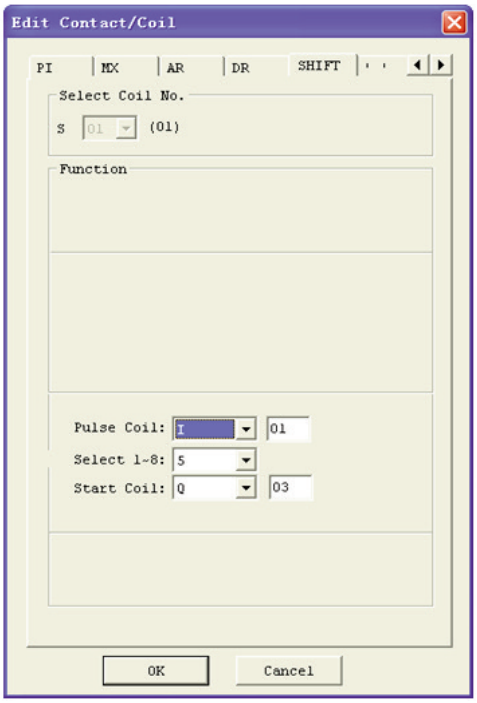


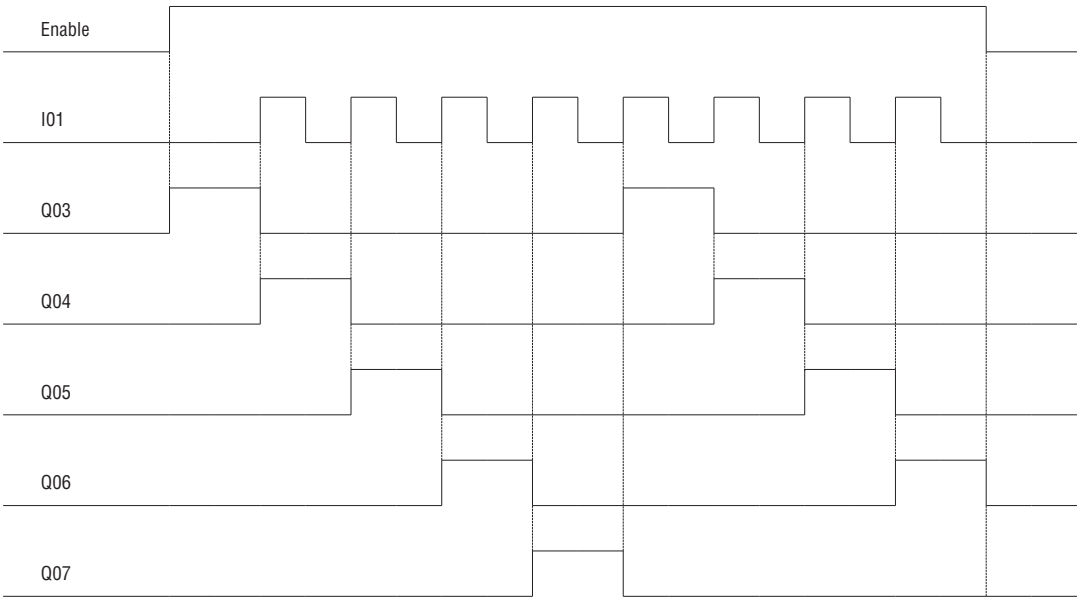
Symbol	Description
1	Preset number of output pulse (1~8)
2	SHIFT input coil (I01~g1F)
3	SHIFT output coils (Q, Y, M, N)
4	SHIFT code (S01)

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 rising edge is coming on and other 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	Meaning
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.

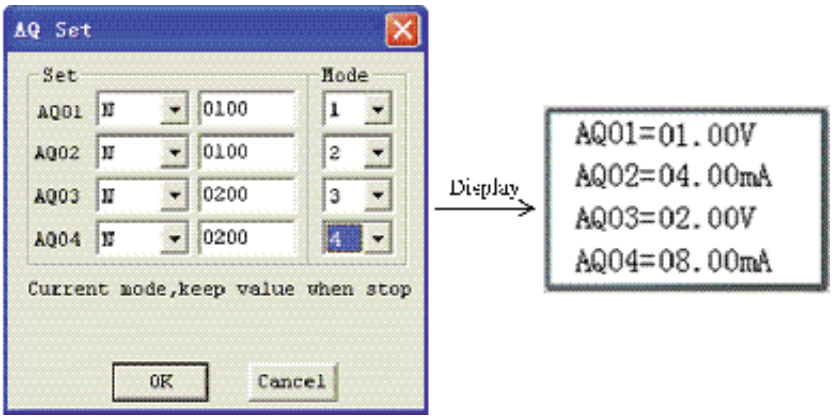
2 number of expansion analog output 2AO; AQ01_AQ04

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

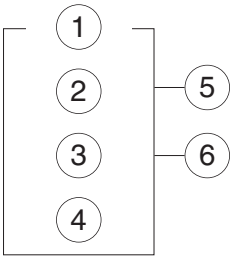
AQ–current_value: 500 = AQ_display_value : 20.00mA

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 includes a total of 31 AS 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.

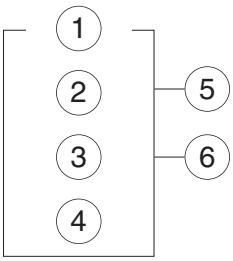


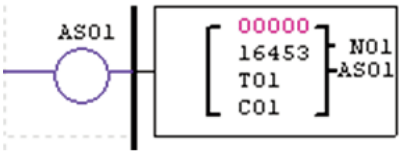
Symbol	Description
1	AS current value (-32768~32767)
2	V1 parameter (-32768~32767)
3	V2 parameter (-32768~32767)
4	V3 parameter (-32768~32767)
5	Error output coil (M, N, NOP)
6	AS code (AS01~AS1F)

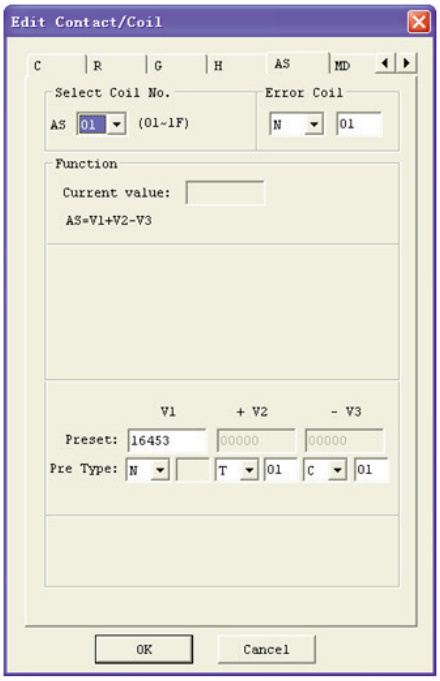
Compute formula: AS = V1 + V2 – V3

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. The current value has no meaning at this time. But it will do nothing if the output coil is NOP. The output coil will turn OFF when the result is right or the function is disabled.

The example below shows how to configure AS function.



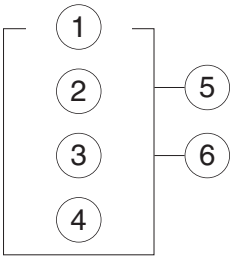




Error output coil N01 will turn ON when the compute result is overflow.

MD (MUL-DIV)

The LRD includes a total of 31 MD 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.

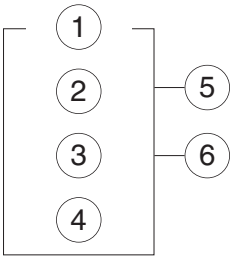


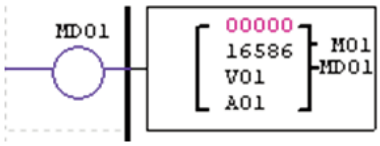
Symbol	Description
1	MD current value (-32768~32767)
2	V1 parameter (-32768~32767)
3	V2 parameter (-32768~32767)
4	V3 parameter (-32768~32767)
5	Error output coil (M, N, NOP)
6	MD code (MD01~MD1F)

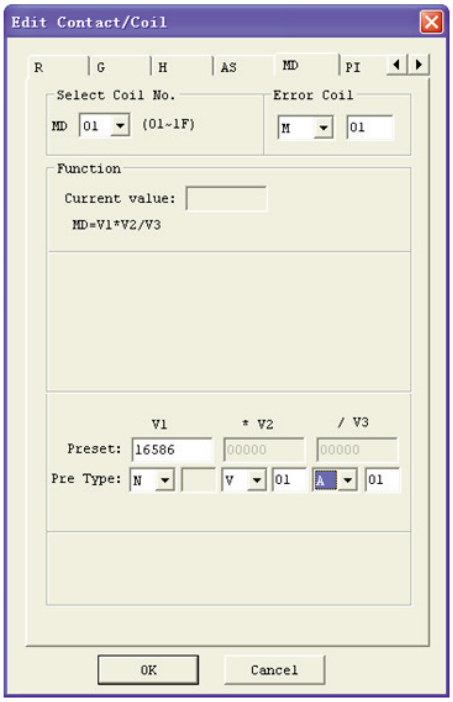
Compute formula: MD = V1 * V2 / V3

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 has no meaning at this time. But it will do nothing if the output coil is NOP. The output coil will turn OFF when the result is right or the function is disabled.

The example below shows how to configure MD function.



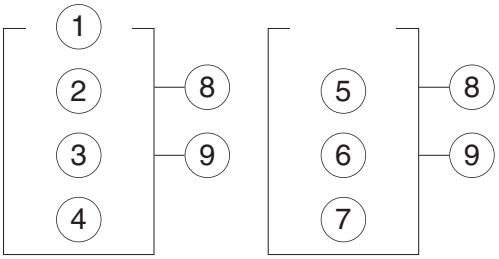




Error output coil M01 will turn ON when the compute result is overflow.

PID (PROPORTION - INTEGRAL - DIFFERENTIAL)

The LRD 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 turn OFF when the result is right or the function is disabled.
PID computes formula:

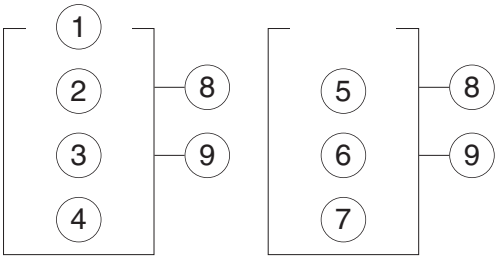
$$EV_n = SV - PV_n$$

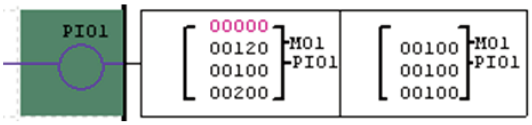
$$PI = K_P \left(EV_n - EV_{n-1}\right) + \frac{T_S}{T_I} EV_n + D_n$$

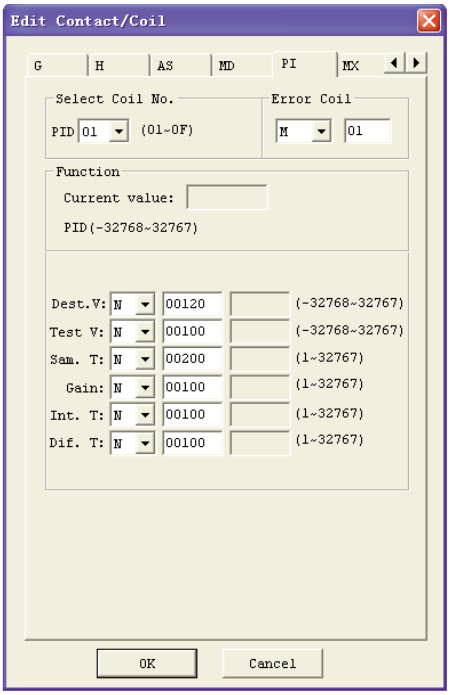
$$D_n = \frac{T_D}{T_S} \left(2PV_{n-1} - PV_n - PV_{n-2}\right)$$

$$PI = \sum PI$$

The example below shows how to configure PID function.

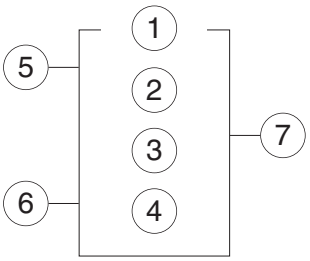






MX (MULTIPLEXER)

The LRD 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.

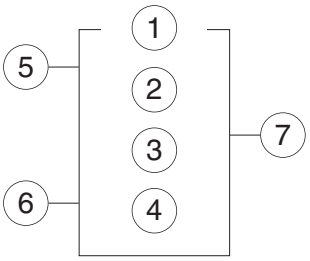


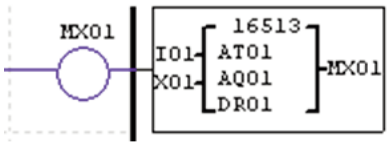
Symbol	Description
1	V1 parameter (-32768~32767)
2	V2 parameter (-32768~32767)
3	V3 parameter (-32768~32767)
4	V4 parameter (-32768~32767)
5	Selection bit 1: S1
6	Selection bit 2: S2
7	MX code (MX01~MX0F)

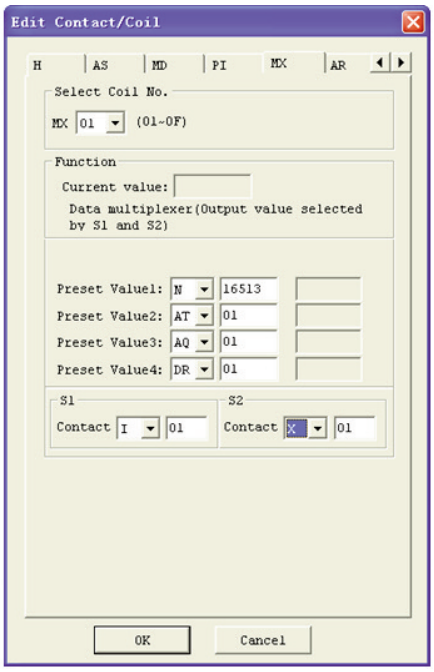
The parameters from ① to ④ can be constant or other function current value. The table below describes the relationship between parameter and MX current value.

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.

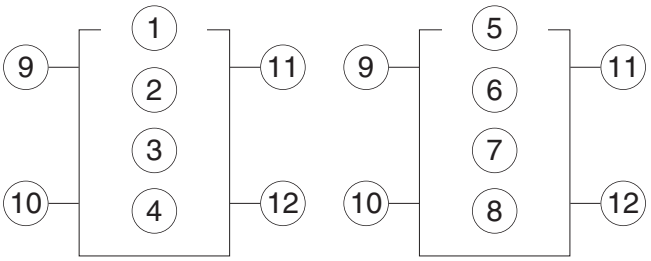






AR (ANALOG-RAMP)

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

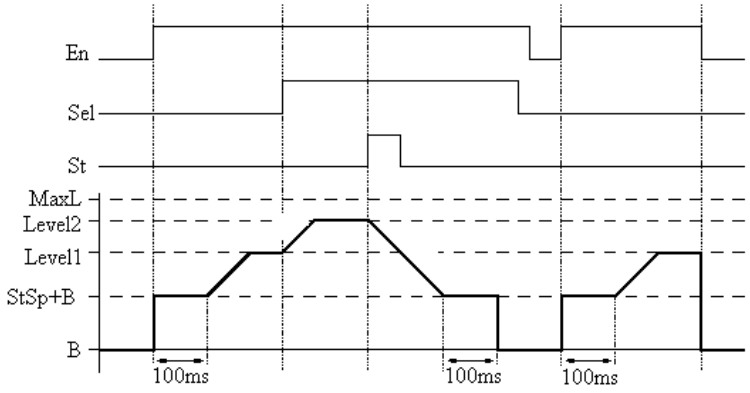
The parameters from ② to ⑧ can be constant or other function current value. The table below describes detailed information of each parameter of AR.

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.

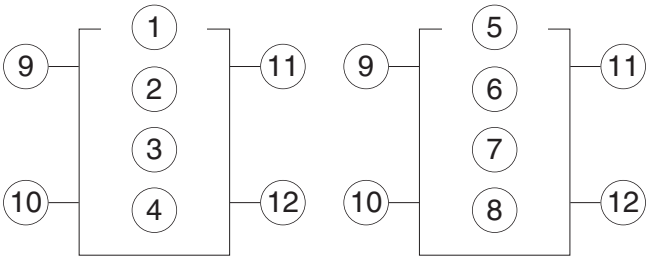
The output coil can be M, N or NOP. The output coil is set when errors happen, but it will do nothing if the output coil is NOP. The current value has no meaning at this time.

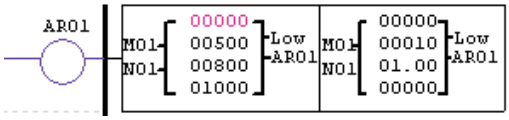
AR will keep the current level at “StSp + Offset "B"” for 100ms when it is enabled. Then the current level runs from StSp + Offset "B" to target level at enactment Rate. If St is set, the current level decreases from current level to level StSp + B at enactment Rate. Then AR holds the level StSp + Offset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

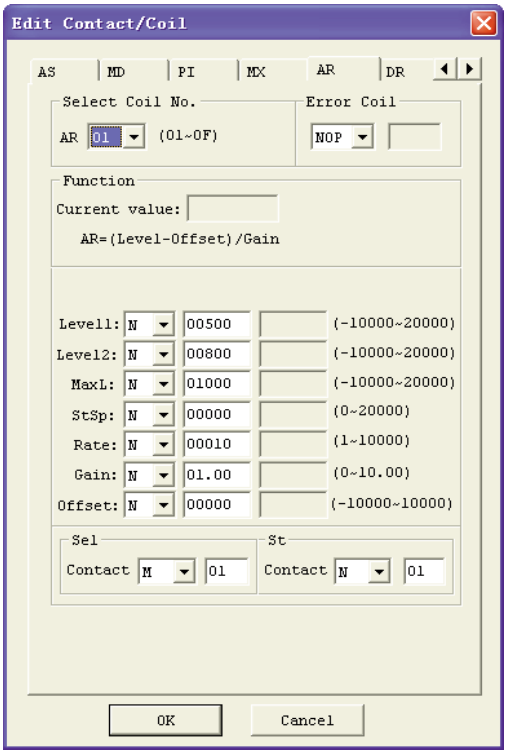
TIMING DIAGRAM FOR AR



The example below shows how to configure AR function.

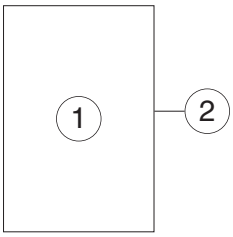






DR (DATA REGISTER)

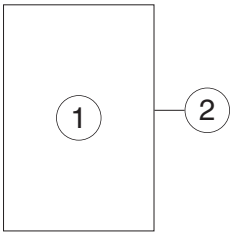
The LRD includes a total of 240 DR instructions that can be used throughout a program. The DR function is transferring data. DR is a temp register. DR sends data from prevention registers to current register when it is enabled. The data can be signed or unsigned by setting DR_SET bit through operation>>module 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.

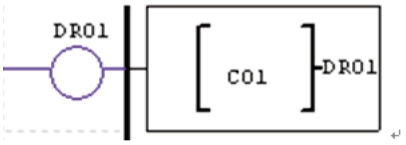


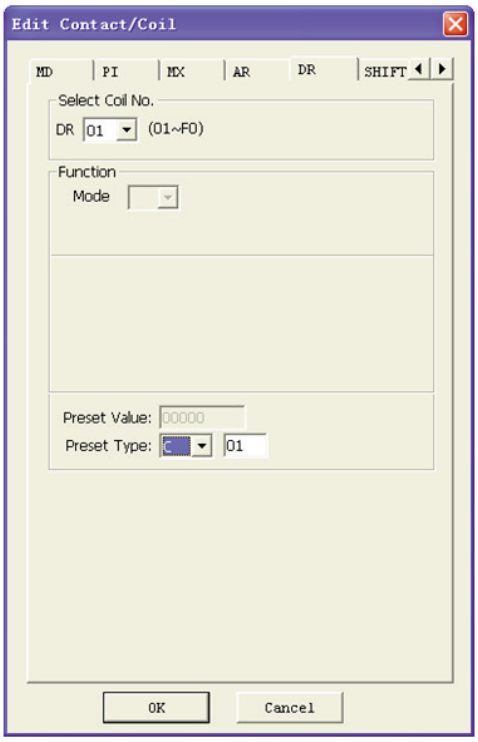
Symbol	Description
1	Preset value: DR_SET = 0, 0~65535 DR_SET = 1,-32768~32767
2	DR code (DR01~DRF0)

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 contents of DRC9 is PLSY total number of pulse and DRD0~DRD3 are output mode registers of AQ01~AQ04, while 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

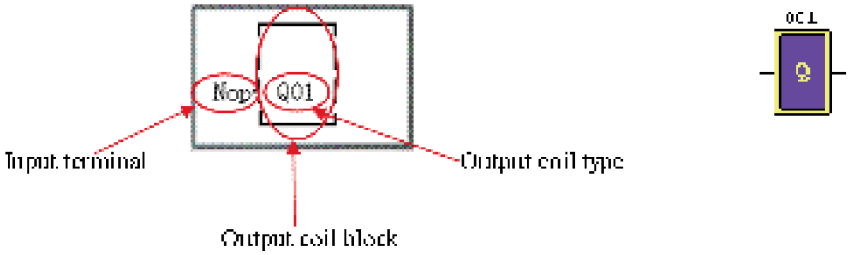
CHAPTER 5: FUNCTION BLOCK DIAGRAM PROGRAMMING

FBD INSTRUCTIONS

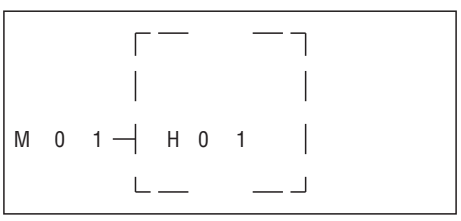
	Input	Output coil	Range
Input	I		12 (I01~I0C)
Keypad input (Digital LRD)	Z		4 (Z01~Z04)
Expansion input (LRE)	X		12 (X01~X0C)
Output (Digital LRD)	Q	Q	8 (Q01~Q08)
Expansion output (LRE)	Y	Y	12 (Y01~Y0C)
Auxiliary coil	M	M	63(M01~M3F)
Auxiliary coil	N	N	63(N01~N3F)
HMI		H	31 (H01~H1F)
PWM		P	2 (P01~P02)
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)

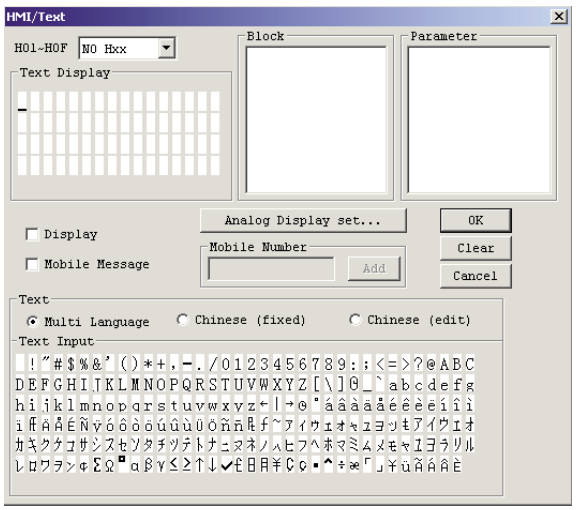
FBD program can only be edited and modified in the LRDSW software and write to LRD controlled equipment via communication cable LRXC00 for PC RS22 or LRXC03 for PC USB. Via controlled equipment, FBD program is available for querying or the parameter of the function block of the program for modifying. The preset value of Block can 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



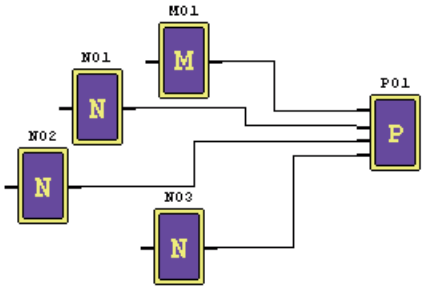
HMI

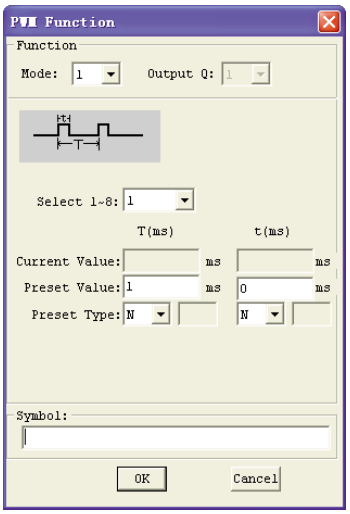


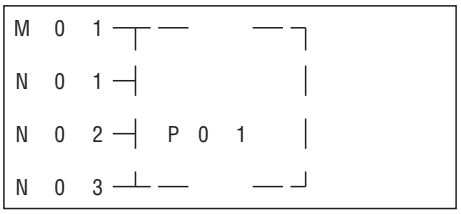


PWM function block (transistor output version LRD...TD024 only)

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

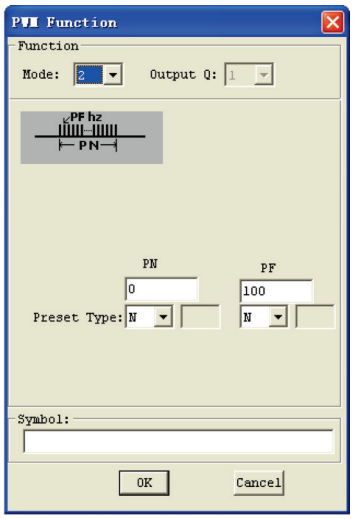


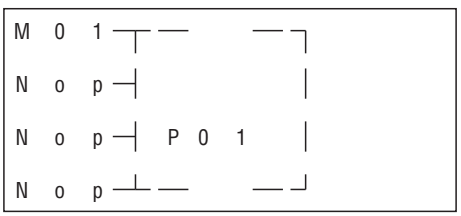




PWM01 Mode: 1
SET 1 Out: 1
TP1=00000
TT1=00001

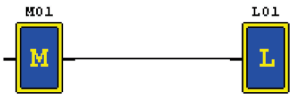
PLSY MODE
The PLSY output terminal Q01 can output preset number of pulse whose frequency is variable from 1 to 1000 Hz.

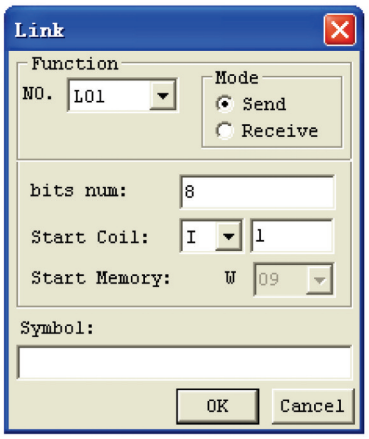




PWM01 Mode: 2
PF=00100
PN=00000

Data Link function block





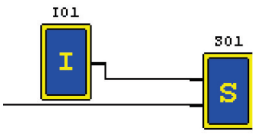
I/O Link01

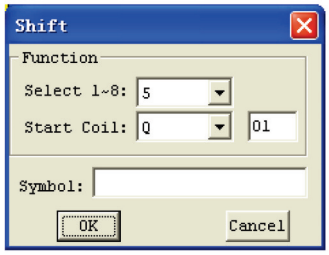
Mode:1 Num:8

I01→W09

I02→W16

SHIFT function block



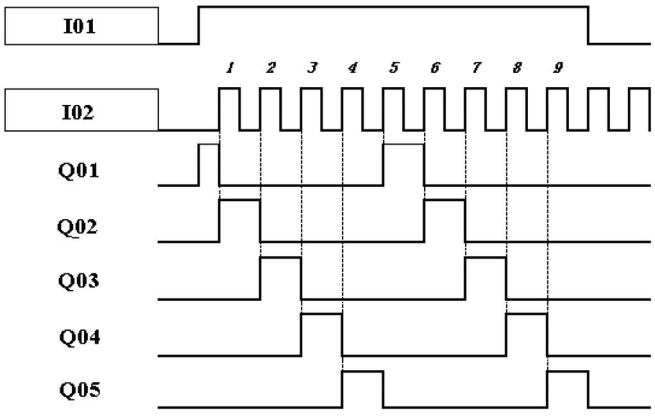


Shift01

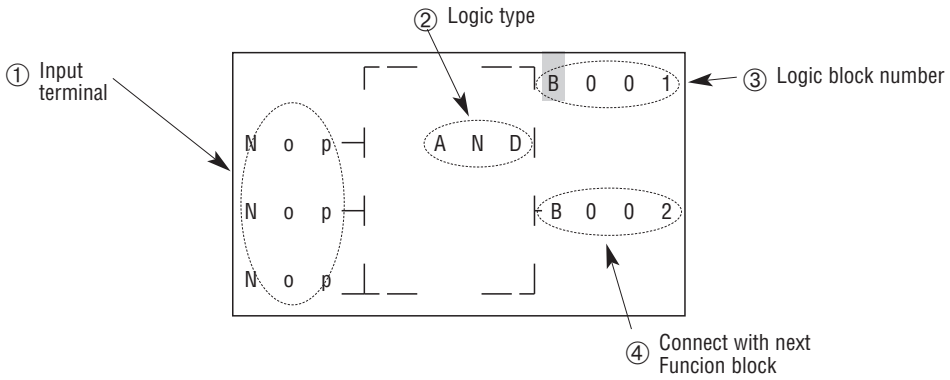
Type:Q01–Q05

Num:5

Timing diagram



LOGIC BLOCK INSTRUCTIONS

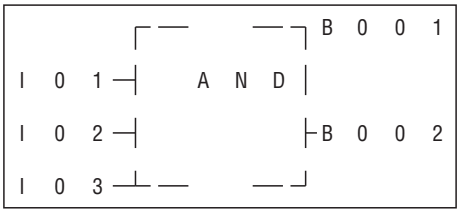


Logic function block source:

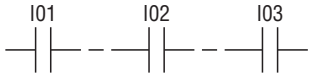
	block	Number (byte)
Total block	260	6000
AND	1	8
AND(EDGE)	1	8
NAND	1	8
NAND(EDGE)	1	8
OR	1	8
NOR	1	8
XOR	1	6
SR	1	6
NOT	1	4
PLUSE	1	4
BOOLEAN	1	12

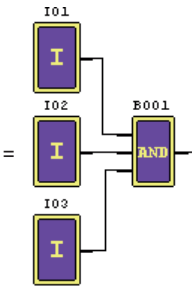
AND Logic Diagram

FBD



LADDER

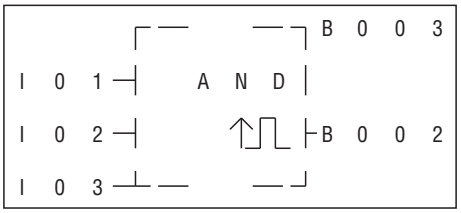




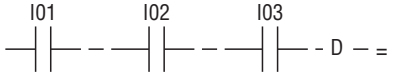
I01 And I02 And I03
Note: The input terminal is NOP which is equivalent to 'High'.

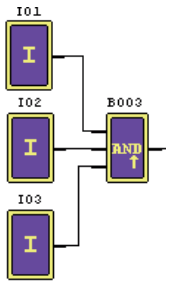
AND (EDGE) Logic Diagram

FBD



LADDER

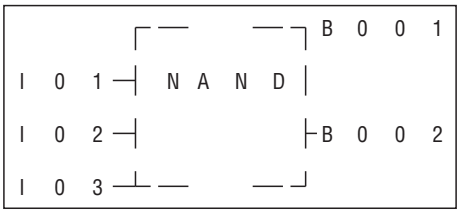




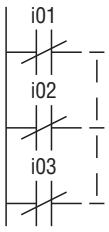
I01 And I02 And I03 And D
Note: The input terminal is NOP which is equivalent to 'High'.

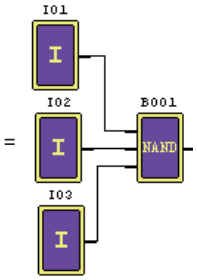
NAND Logic Diagram

FBD



LADDER

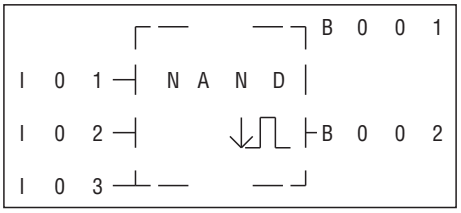




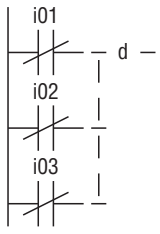
Not(I01 And I02 And I03)
Note: The input terminal is NOP which is equivalent to 'High'.

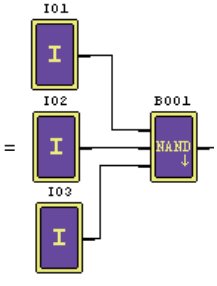
NAND (EDGE) Logic Diagram

FBD



LADDER

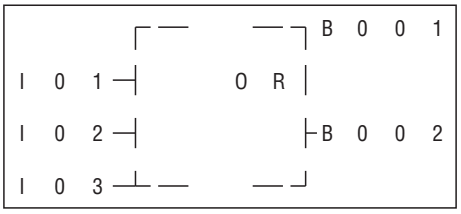




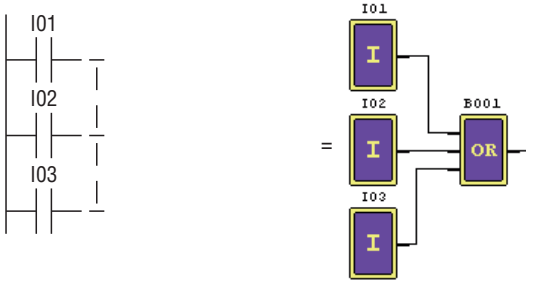
Not(I01 And I02 And I03) And D
Note: The input terminal is NOP which is equivalent to ''High'.

OR Logic Diagram

FBD



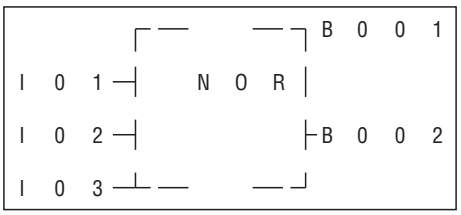
LADDER



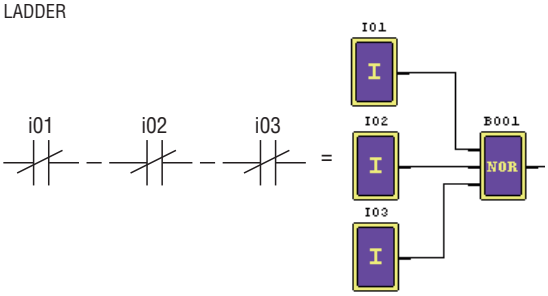
I01 or I02 or I03
Note: The input terminal is NOP which is equivalent to ''Low'.

NOR Logic Diagram

FBD



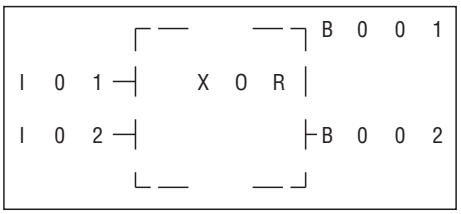
LADDER



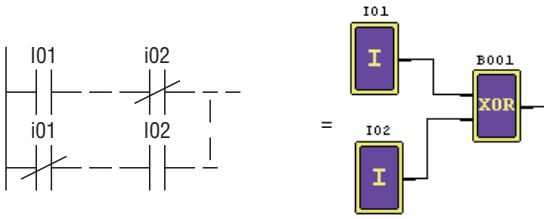
Not (I01 or I02 or I03)
Note: The input terminal is NOP which is equivalent to ''Low'.

XOR Logic Diagram

FBD



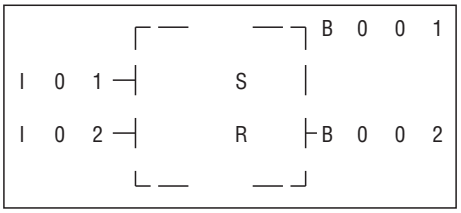
LADDER



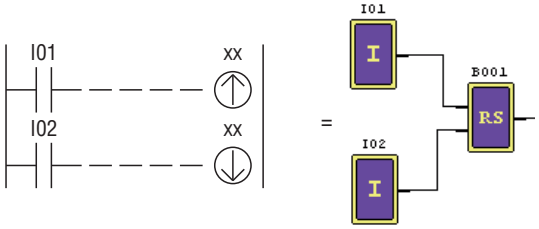
I01 XOR I02
Note: The input terminal is NOP which is equivalent to 'Low'.

SR Logic Diagram

FBD



LADDER



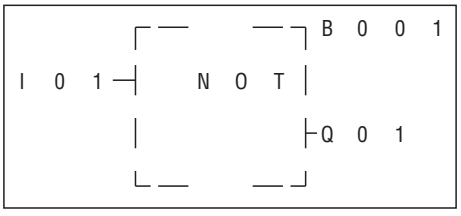
Logic Table

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

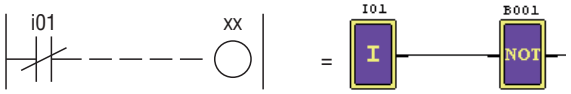
Note: The input terminal is NOP which is equivalent to 'Low'.

NOT Logic Diagram

FBD



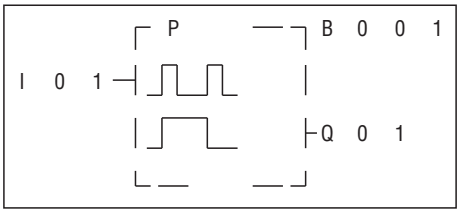
LADDER



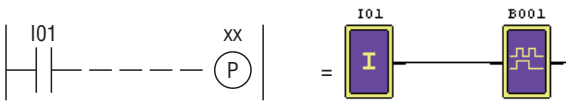
Not I01
Note: The input terminal is NOP which is equivalent to ''High'.

PULSE Logic Diagram

FBD



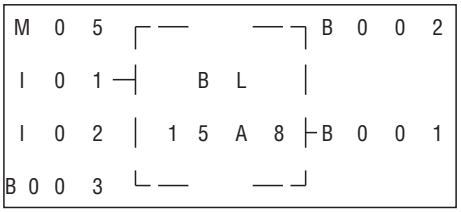
LADDER



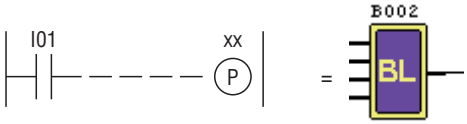
Note: The input terminal is NOP which is equivalent to ''Low'.

BOOLEAN Logic Diagram

FBD

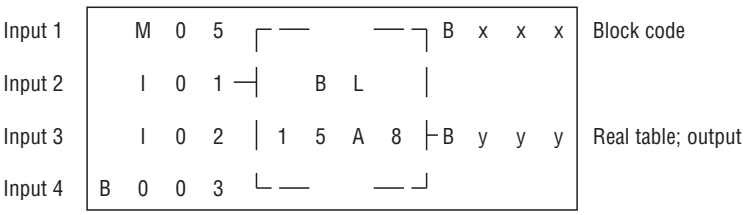


LADDER
NO



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.

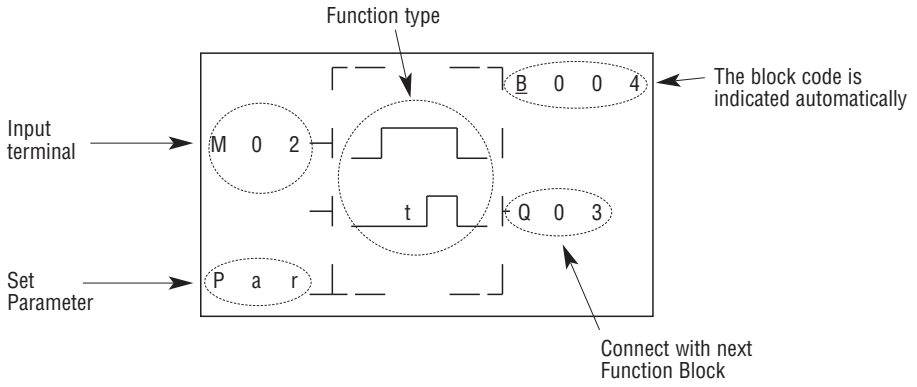
	Function type	number
special function	Timer	250
	Counter	250
	RTC	250
	Analog Comparator	250
adjust-controlling function	AS	250
	MD	250
	PID	30
	MX	250
	AR	30
	DR	240

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 with the block as 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:

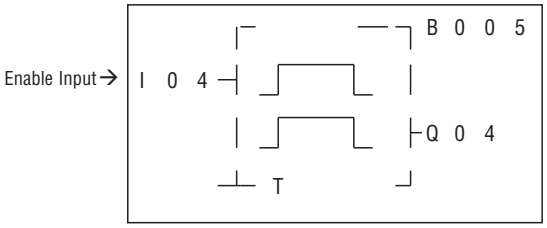


TIMER FUNCTION BLOCK

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

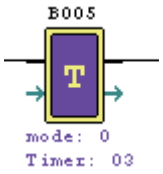
(1) Timer mode 0 (Internal coil Mode)

FBD display



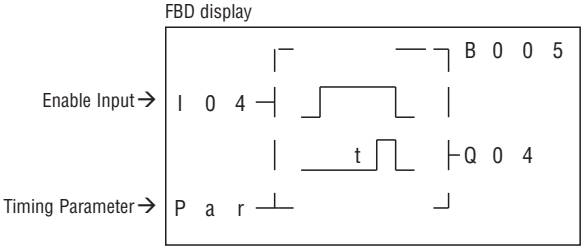
Parameter display

Program display

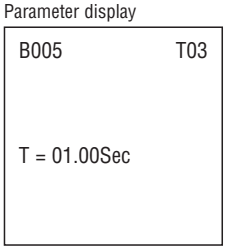


(2) Timer mode 1 (ON-Delay A Mode)

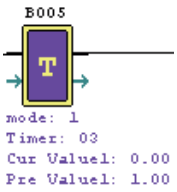
FBD display



Parameter display

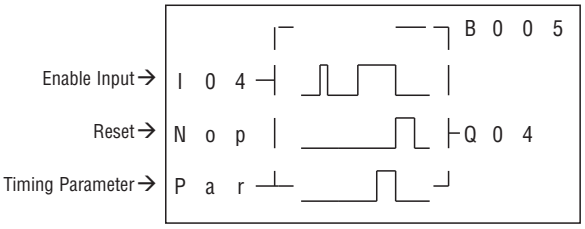


Program display

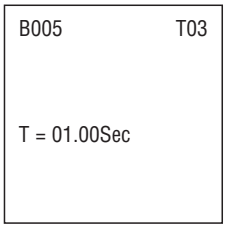


(3) Timer mode 2 (ON-Delay B Mode)

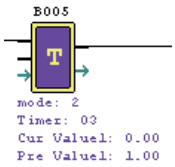
FBD display



Parameter display

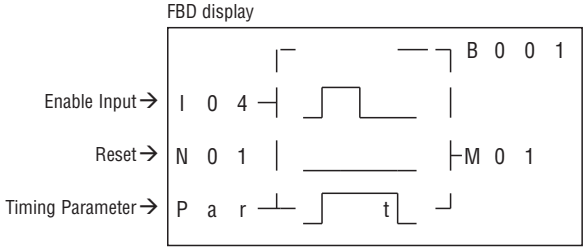


Program display

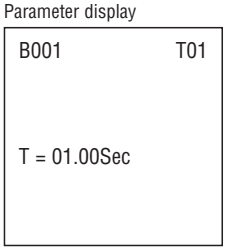


(4) Timer mode 3 (OFF-Delay A Mode)

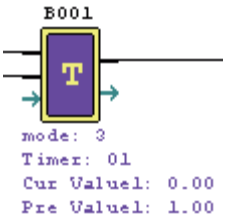
FBD display



Parameter display

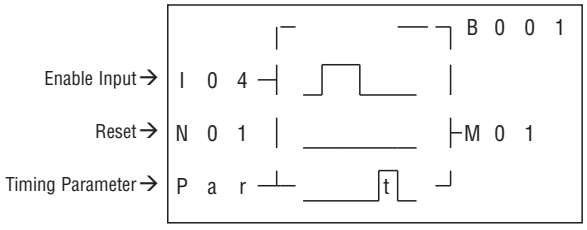


Program display

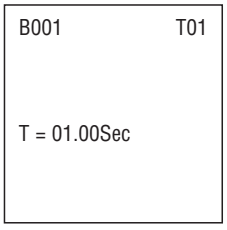


(5) Timer mode 4 (OFF-Delay B Mode)

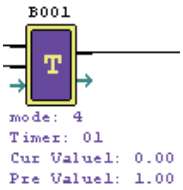
FBD display



Parameter display

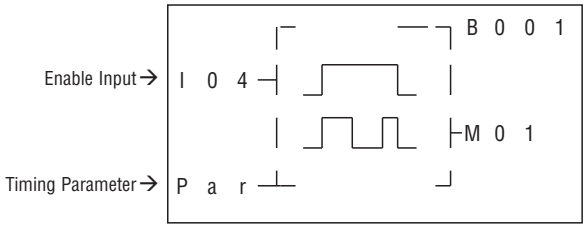


Program display

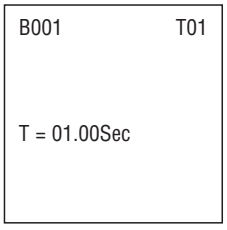


(6) Timer mode 5 (FLASH A Mode)

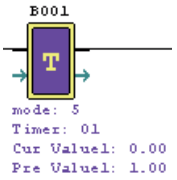
FBD display



Parameter display

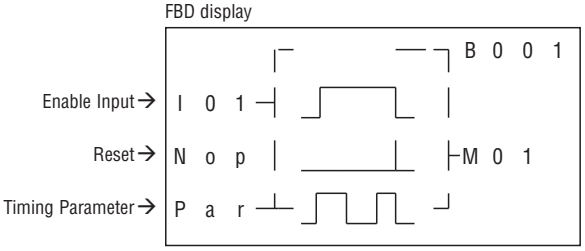


Program display

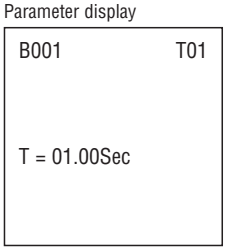


(7) Timer mode 6 (FLASH B Mode)

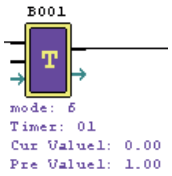
FBD display



Parameter display

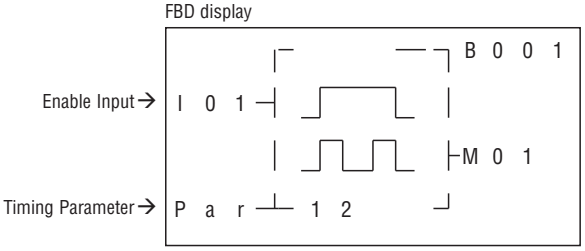


Program display

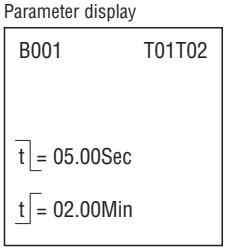


(8) Timer mode 7 (FLASH C Mode)

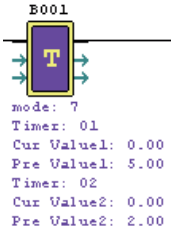
FBD display



Parameter display



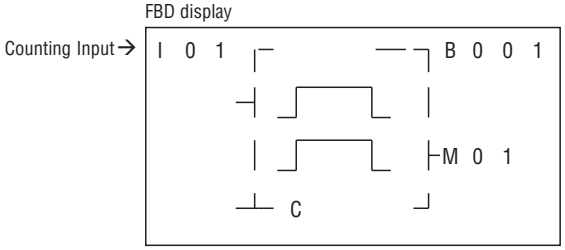
Program display



COMMON COUNTER FUNCTION BLOCK

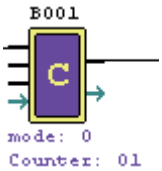
(1) Counter Mode 0

FBD display



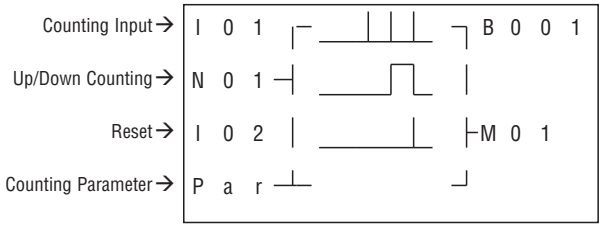
Parameter display

Program display

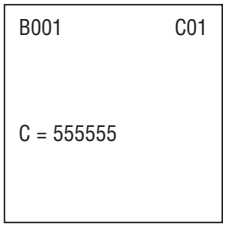


(2) Counter Mode 1

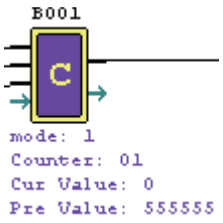
FBD display



Parameter display

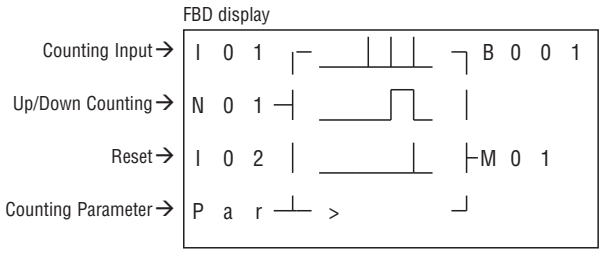


Program display

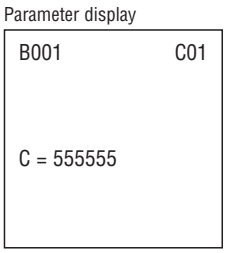


(3) Counter Mode 2

FBD display

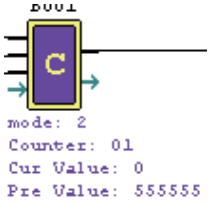


Parameter display



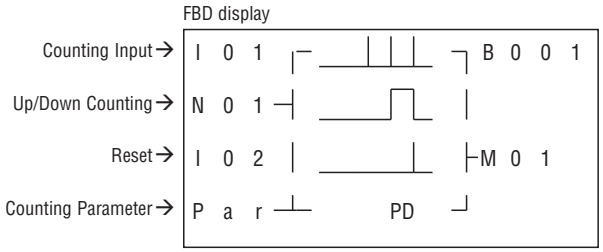
Note: The ">"means the current value appeared will be greater than present value.

Program display

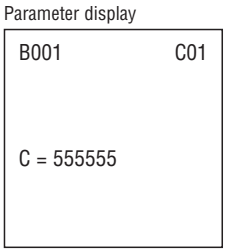


(4) Counter Mode 3

FBD display

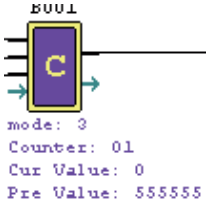


Parameter display

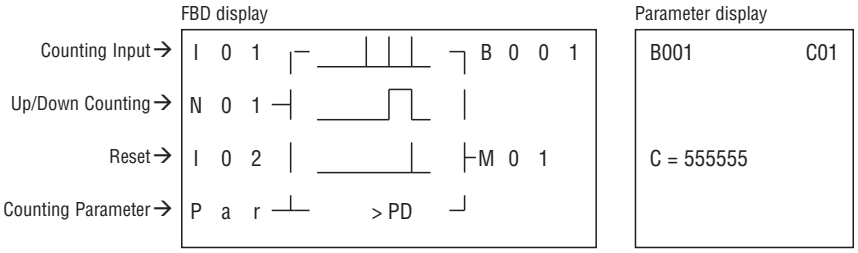


Note: The "PD" means the current value will be retained until the power recovers; Counter keeps current value when the LRD switches between RUN and STOP when C KEEP enable.

Program display

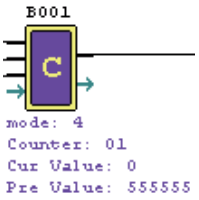


(5) Counter Mode 4

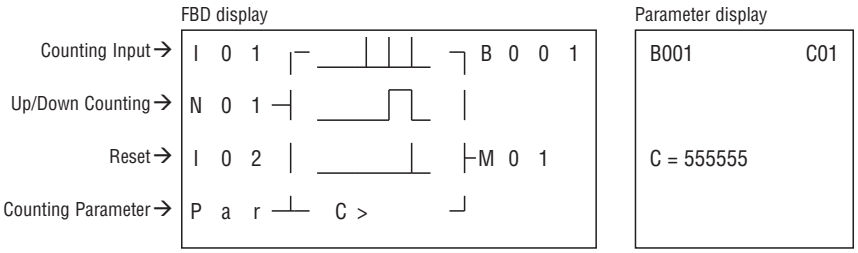


Nota: The ">"means the current value appeared will be greater than present value;
The "PD" means the current value will be retained until the power recovers; Counter keeps current value when the LRD switches between RUN and STOP when C KEEP enable.

Program display

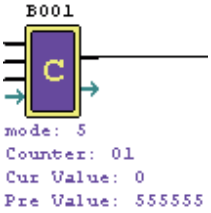


(6) Counter Mode 5

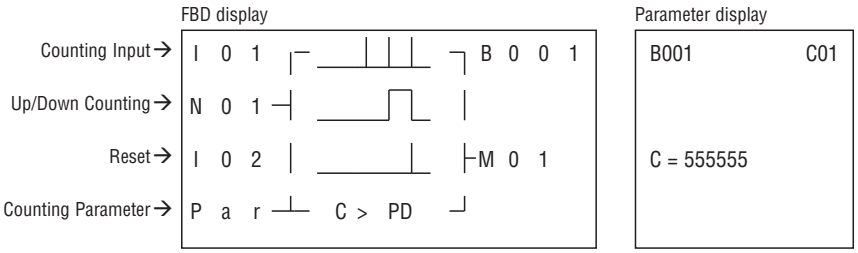


Note: The ">"means the current value appeared will be greater than present value.

Program display

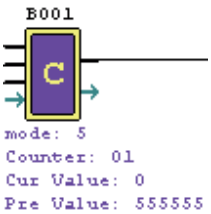


(7) Counter Mode 6



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

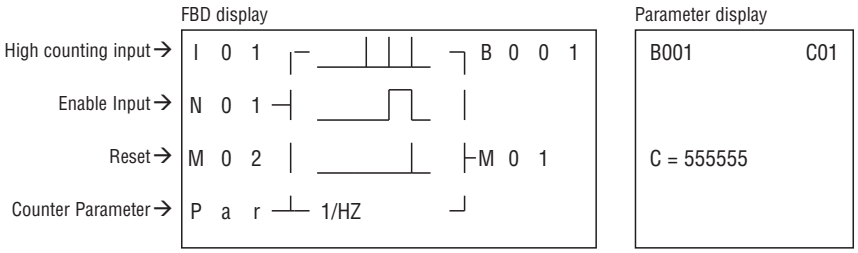
Program display



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

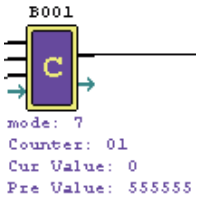
HIGH SPEED COUNTER FUNCTION BLOCK

(1) Counter Mode 7

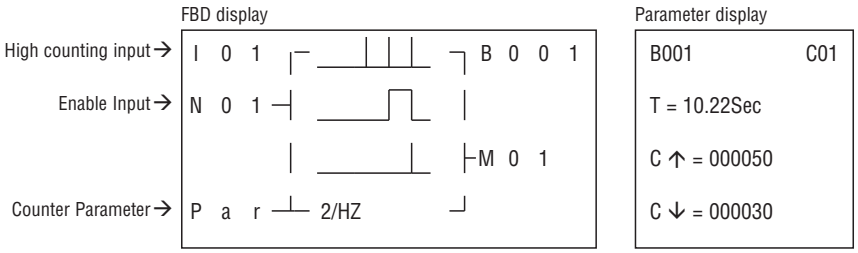


Note: High speed input terminal I01,I02.

Program display

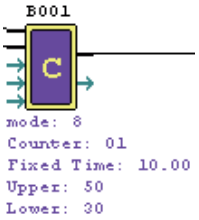


(2) Counter Mode 8



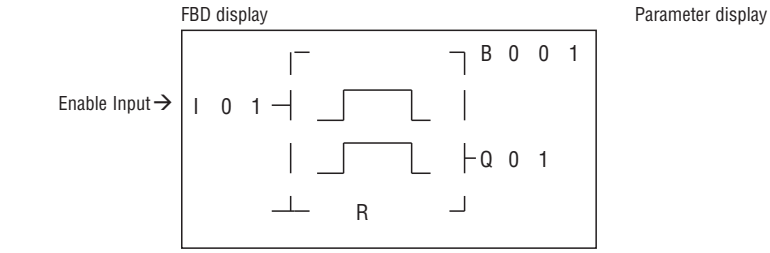
Note: High speed input terminal I01,I02.

Program display



RTC COMPARATOR FUNCTION BLOCK

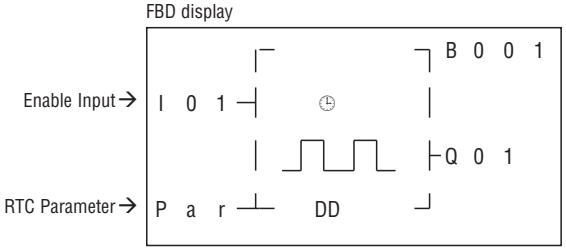
(1) RTC Mode 0 (Internal Coil)



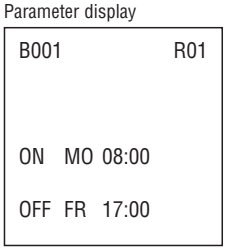
Program display

(2) RTC Mode 1 (Daily)

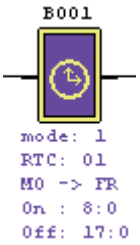
FBD display



Parameter display

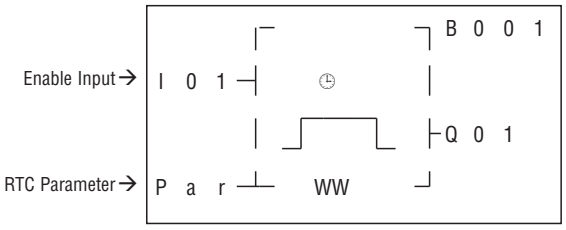


Program display

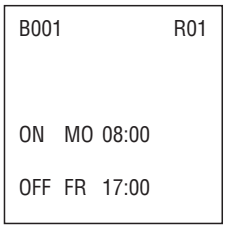


(3) RTC Mode 2 (Continuous)

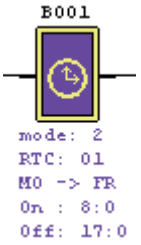
FBD display



Parameter display

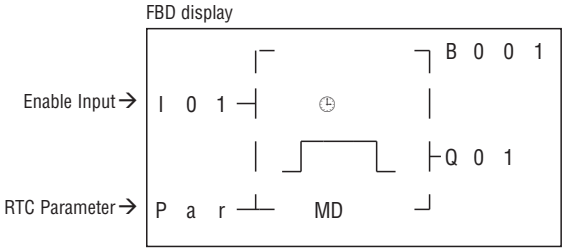


Program display

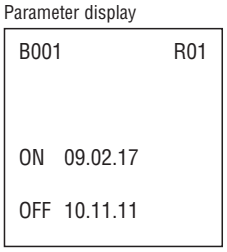


(4) RTC Mode 3 (Year Month Day)

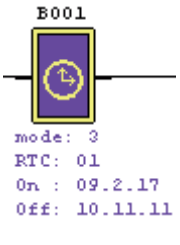
FBD display



Parameter display

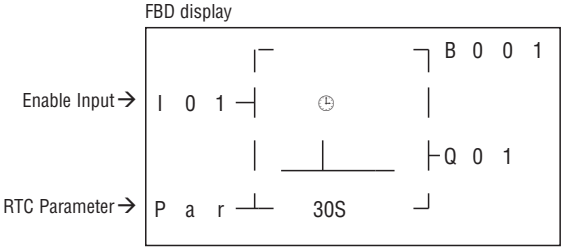


Program display

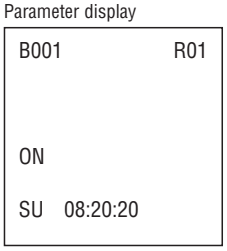


(5) RTC Mode 4 (30-second adjustment)

FBD display



Parameter display

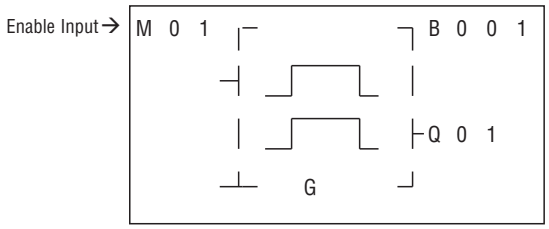


Program display

ANALOG COMPARATOR FUNCTION BLOCK

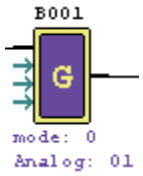
(1) Analog Comparison Mode 0 (Internal coil)

FBD display



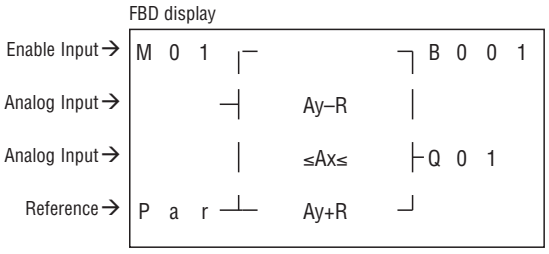
Parameter display

Program display

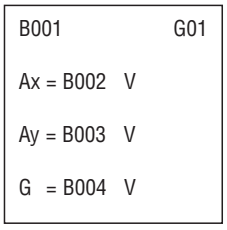


(2) Analog Comparison Mode 1

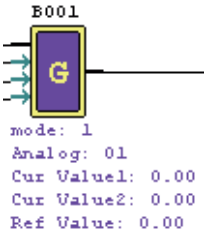
FBD display



Parameter display

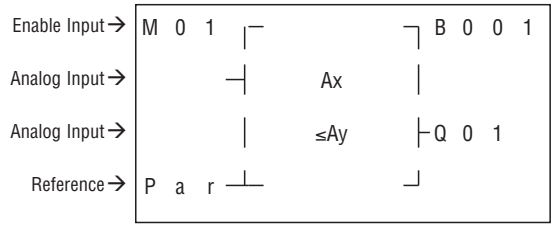


Program display



(3) Analog Comparison Mode 2

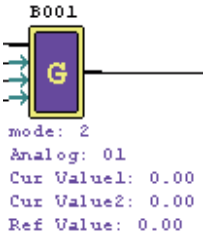
FBD display



Parameter display

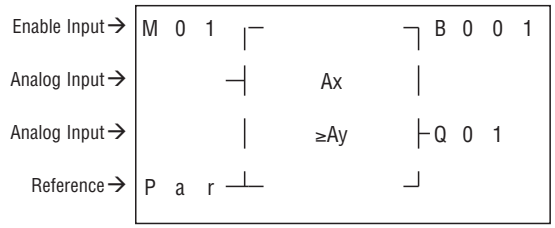
B001	G01
Ax = B002 V	
Ay = B003 V	
G = B004 V	

Program display



(4) Analog Comparison Mode 3

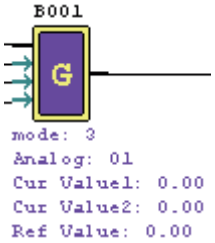
FBD display



Parameter display

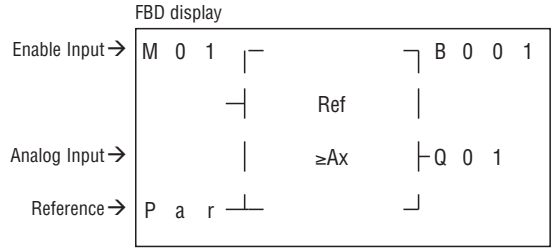
B001	G01
Ax = B002 V	
Ay = B003 V	
G = B004 V	

Program display



(5) Analog Comparison Mode 4

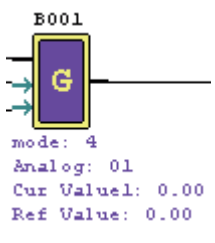
FBD display



Parameter display

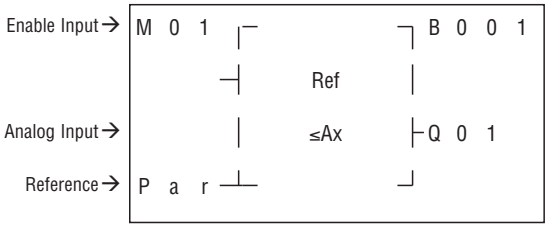
B001	G01
Ax = B002 V	
G = B003 V	

Program display

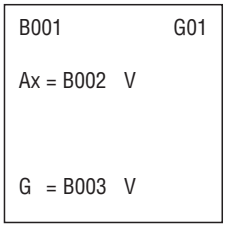


(6) Analog Comparison Mode 5

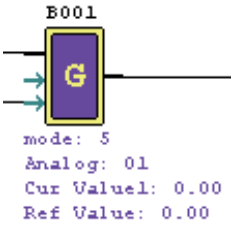
FBD display



Parameter display

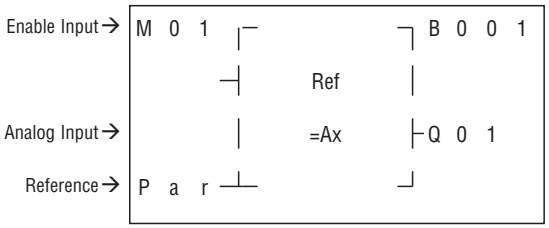


Program display

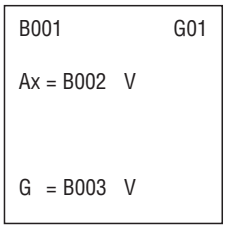


(7) Analog Comparison Mode 6

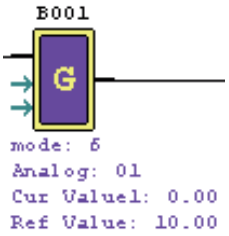
FBD display



Parameter display

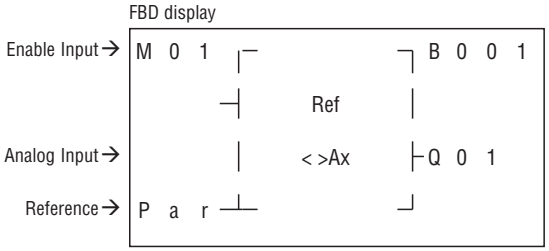


Program display

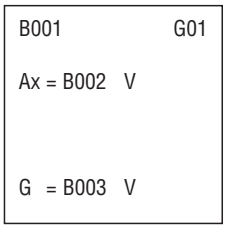


(8) Analog Comparison Mode 7

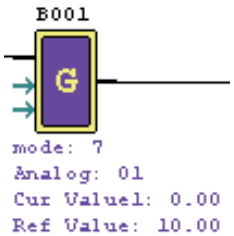
FBD display



Parameter display

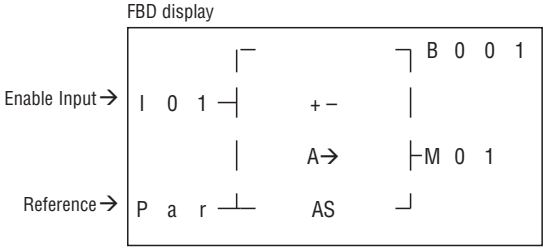


Program display



AS (ADD-SUB) FUNCTION BLOCK

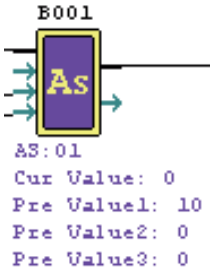
FBD display



Parameter display

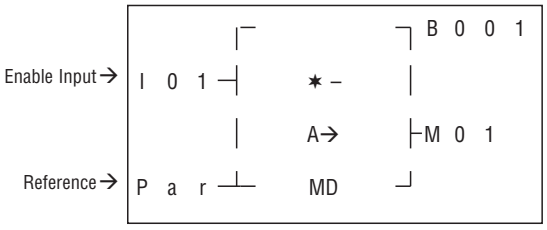
B001	AS01
V1 = 00010	
V2 = B003	
V2 = B003	

Program display



MD (MUL-DIV) FUNCTION BLOCK

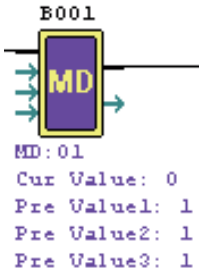
FBD display



Parameter display

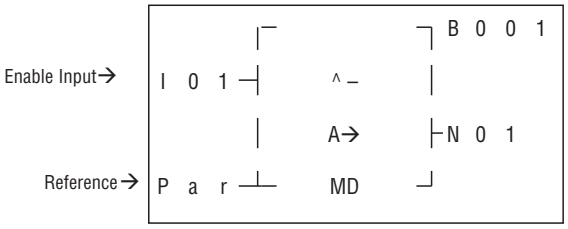
B001	MD01
V1 = 00001	
V2 = 00001	
V2 = 00001	

Program display



PID (PROPORTION- INTEGRAL- DIFFERENTIAL) FUNCTION BLOCK

FBD display



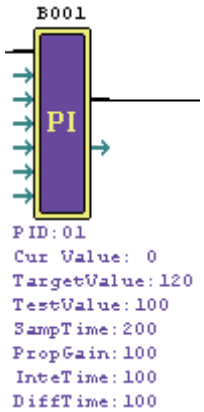
Parameter display

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

SEL+←/→

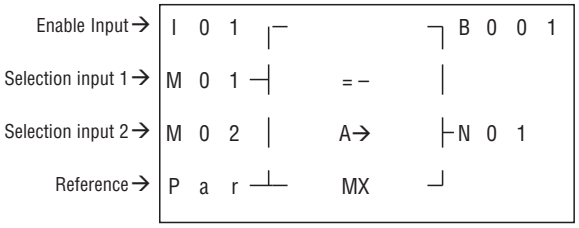
B001	PI01
Kp = 00100%	
Ti = 0010.0Sec	
Td = 001.00Sec	2

Program display

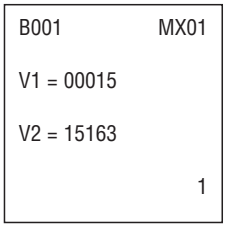


MX (MULTIPLEXER) FUNCTION BLOCK

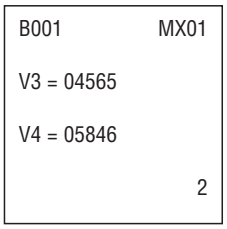
FBD display



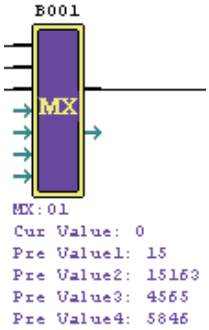
Parameter display



SEL+←/→

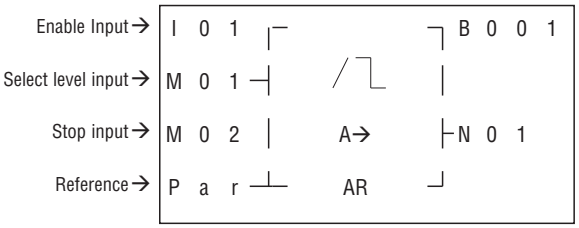


Program display

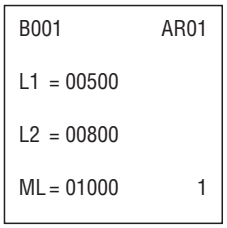


AR (Analog-Ramp) function block

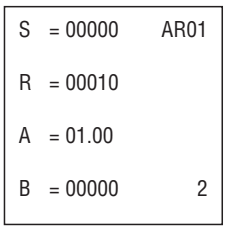
FBD display



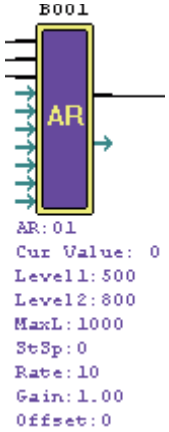
Parameter display



SEL+←/→



Program display



CHAPTER 6: MODBUS LRD20RD024P1 COMMUNICATION

COMMUNICATION'S FUNCTION SUMMARIZATION

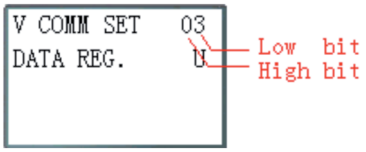
Communication parameter	Communication mode parameter and baud rate
Remote IO function	It can be used to communication between 2 LRD units
I/O Link function	Up to 8 LRD20RD024P1 units can be configured as I/O Link nodes. Each LRD can make used of the I/O information of other LRD for detail, please refer to section I/O Link function
Modbus RTU master	LRD can be used as master
Modbus RTU slave	LRD can be controlled by computer or other controller with Modbus protocol via RS485 port

COMMUNICATION PARAMETER
There are two ways to set communication parameter:
– Setting communication parameter via LRDSW.
– Select Operation → Module System Set, to open the dialog box as show below.

– As the illustration show, you can set Communication Mode and Baud Rate.
– In the table below, list the options which you can choose from.

Communication Mode	8/N/2 Data 8bit, No Parity, 2 Stop bit
	8/E/1 Data 8bit, Even Parity, 1 Stop bit
	8/0/1 Data 8bit, Odd Parity, 1 Stop bit
	8/N/1 Data 8bit, No Parity, 1 Stop bit
Baud Rate	4800 bps 9600 bps 19200 bps 38400 bps 57600 bps 115200 bps

– Set communication format and Baud Rate on LRD.
  i. Press ESC to enter main menu.
  ii. Press UP/DOWN to choose SET menu, and press OK to enter it.
  iii. Press UP/DOWN makes the LCD to display the options as show below.



Content	Data	Meaning
High bit	0	8/N/2 Data 8bit, No Parity, 2 Stop bit
	1	8/E/1 Data 8bit, Even Parity, 1 Stop bit
	2	8/0/1 Data 8bit, Odd Parity, 1 Stop bit
	3	8/N/1 Data 8bit, No Parity, 1 Stop bit
Low bit	0	4800 bps
	1	9600 bps
	2	19200 bps
	3	38400 bps
	4	57600 bps
	5	115200 bps

2. LRD RS485 port default communication parameter:

Baud rate	38400bps
Data bit	8
Stop bit	2
Parity	No
Frame length maximum	128 bytes

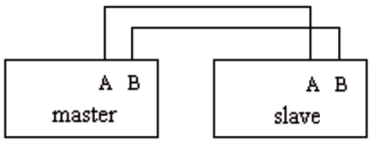
– The communication parameter setting takes effect after power up again.

REMOTE IO FUNCTION

Up to 2 LRD units can be configured as Remote I/O nodes.
The Master can run its programming, but the Slave can't. The Master writes its state of expansion output coil Y to Slaver's output coil Q. The Slaver writes its state of input I to Master's expansion input X.

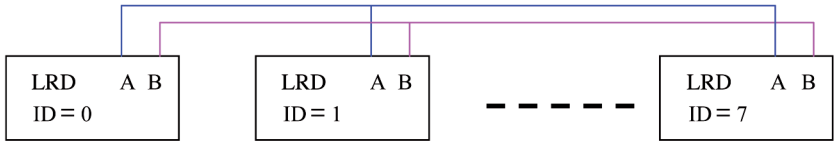
I/O Address	Master	Slave
Inputs	I01~I0C	
Outputs	Q01~Q08	
Expansion Inputs	X01~X0C	I01~I0C
Expansion Output	Y01~Y0C	Q01~Q08

Hardware Configuration:
1. Link 2 LRD20RD024P1 as illustration show below.
2. Set left LRD in the illustration to master.
3. Set another LRD to Slave.



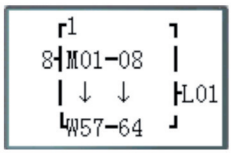
IO LINK FUNCTION

Hardware Configuration:
1. Link LRD as show below.
2. Set the LRD in SET menu to No Remote IO.
3. Set those LRD's ID continuously 00 ,01,02,… The max number of the ID is 07.

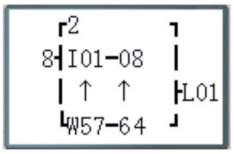


Example:
1. Link 8 20 pointe V type LRD according to the steps as show above.
2. Create a program as show below in those 8 LRD.

3. Set L01 of the LRD which's ID =7 as fellow illustration.



4. L01 of other 7 LRD be set as fellow illustration.



5. Run program. Let I01 of the LRD which's ID = 7 on. And M01~M08 will be on state.
6. You will find M01~M08 of other 7 LRD will be controlled by the M01~M08 of the LRD which's ID=7.

MODBUS RTU MASTER
There are 15 MODBUS functions: MU01~MU0F. Remote IO and Date Link are precedence. The master mode is executed when the system setting is NO Remote IO and ID isn't 0.
There can be a number of communication orders in one program, but only one order can come into possession of communication port at the same time.

Communication function codes:

Mode	Communication function code
1	03 (read register)
2	06 (write single register)
3	10 (write some registers)
4	01 (read coil)
5	05 (write single coil)

The coil used in MODBUS function:

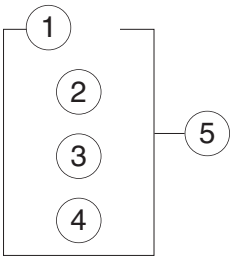
Received (M3D)	M3D is set to ON after received, then check-up for error Transferring data to target address if there is no error
Error flag (M3E)	Communication error flag
Time out flag (M3F)	M3F is set to 1 when the time from after sending to start receiving is longer than setting, and M3D also be set to 1. M3F is automatically reset if M3D reset

The time out time is depending communication baud rate as shown in the table below:

BBaud rate (bps)	Time (ms)
4800? 9600? 19200? 38400	125
57600	100
115200	80

There are 5 parameters in MODBUS function as shown below.

Symbol	Description
①	MODBUS mode (1~5)
②	Communication address: slave ID, range: 0~127
③	Communication content: address and data length: 1？ address is constant, range: 0000~ffff; length must be 1 word 2？ DR code, get address and length from this DR and the next
④	DR code, store sending/receiving data from this DR
⑤	MODBUS code (MU01~MU0F)



Examples:

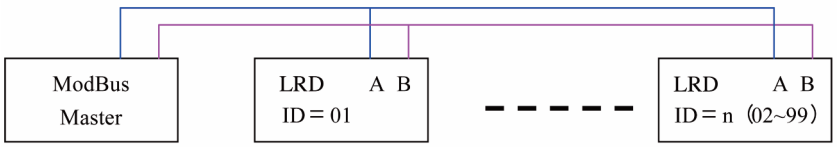
Mode	Display		
1 Read register		Address is constant: 0003, Length ≡ 1, Send: 01 03 00 03 00 01 CRC16;	Receive: 01 03 02 data1 data2 CRC16, data storage: DRE0= (data1<<8) | data2,
		Address is DR03=0001, Length is DR04=0002, Send: 01 03 00 01 00 02 CRC16;	Receive: 01 03 04 data1 data2 data3 data4 CRC16, data storage: DRE0= (data1<<8) | data2, DRE1= (data3<<8) | data4
2 Write single register		Address is constant: 0003, Length ≡ 1, data storage: DRE0=1234(hex: 04D2)？ Send: 01 06 00 03 04 D2 CRC16？	Receive: 01 06 00 03 04 D2 CRC16？
		Address: DR03=0001, data storage: DRE0=1234(hex: 04D2)？ Send: 01 06 00 01 04 D2 CRC16？	Receive: 01 06 00 01 04 D2 CRC16？
3 Write register		Address: 0003？ Length ≡ 1, data storage: DRE0=1234(hex: 04D2)？ Send: 01 10 00 03 00 01 02 04 D2 CRC16？	Receive: 01 10 00 03 00 01 CRC16？
		Address: DR03=0001？ Length: DR04=0002？ data storage: DRE0=1234(hex: 04D2), DRE1=5678(hex: 162E)？ Send: 01 10 00 01 00 02 04 04 D2 16 2E CRC16？	Receive: 01 10 00 01 00 02 CRC16？
4 Read coil		Address: 0003？ Length ≡ 10H, Send: 01 01 00 03 00 10 CRC16？	Receive: 01 01 02 data1 data2 CRC16？？ data storage: DRE0= (data1<<8) | data2？
		Address: DR03=0001？ Length: DR04=0016？ Send: 01 01 00 01 00 10 CRC16？ Max value in DR04 is 400.	Receive: 01 01 02 data1 data2 CRC16？ data storage: DRE0= (data1<<8) | data2？

Mode	Display		
5 Write coil		Address: 0003? data storage: DRE0=65280(hex: FF00) Send: 01 05 00 03 FF 00 CRC16;	Receive: 01 05 00 03 FF 00 CRC16?
		Address: DR03=0001? data storage: DRE0=65280(hex: FF00)? Send: 01 05 00 01 FF 00 CRC16?	Receive: 01 05 00 01 FF 00 CRC16;

SLAVER VIA MODBUS RTU PROTOCOL

Function Description:
LRD can be communication controlled by the computer or other controller with the communication. PC and other controller can read and write I/O and state, Function Block preset value. It also can use to read Function Block current value and control SG Run/Stop mode.

Hardware Configuration:
1. Line some LRD RS485 port A, B as show below.
2. Set LRD the LRD in the SET menu to No Remote IO.
3. Set LRD ID = 01~99, each of those LRD's ID is different.



For the other informations, refer to the instruction I196 on www.lovatoelectric.com

CHAPTER 7: HARDWARE SPECIFICATION

PRODUCT SPECIFICATIONS

	TYPE	Input power				Input point	Output point		Analog input	Analog output	LCD keypad	Expans.	1 kHz High speed input	I/O LINK
		12VDC	100-240 VAC	24VDC	24VAC									
10/12 points	LRD10R A240		■			6	4	Relay			■	■		
	LRD12R A024				■	8	4	Relay			■	■		
	LRD12R D024			■		8❶	4	Relay	2		■	■	■	
	LRD12T D024			■		8❶	4	Transistor	2		■	■	■	■
20 points	LRD20R A024				■	12	8	Relay			■	■		
	LRD20R A240		■			12	8	Relay			■	■		
	LRD20R D012	■				12❶	8	Relay	4		■	■❷	■	
	LRD20R D024			■		12❶	8	Relay	4		■	■	■	
	LRD20R D024P1			■		12❶	8	Relay	4		■	■	■	
Expansion	LRE02A D024			■						2				
	LRE04A D024			■					4					
	LRE04P D024			■					4 (PT100)					
	LRE08R A024				■	4	4	Relay						
	LRE08R A240		■			4	4	Relay						
	LRE08R D024			■		4	4	Relay						
	LRE08T D024			■		4	4	Transistor						

❶ These are LRD with some built-in digital inputs which can be configured and used as analog.
❷ Expansion modues supplied at 24VDC.

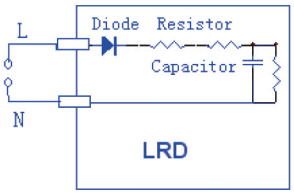
POWER SPECIFICATIONS

STANDARD MODEL

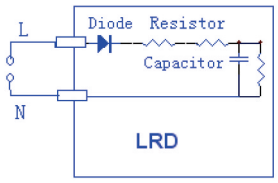
Characteristic	LRD10R A240 LRD20R A240	LRD12R A024 LRD20R A024	LRD20R D012 LRD20R D024 LRD20R D024P1	LRD12R D024 LRD12T D024
Auxiliary power supply	100-240VAC	24VAC	12VDC (LRD20R D012) 24VDC (LRD20R D024)	24VDC
Power supply range	85-265VAC	20.4-28.8VAC	10.4-14.4VDC (LRD20R D012) 20.4-28.8VDC (LRD20R D024)	20.4-28.8VDC
Supply frequency	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
Average current consumption	85...90mA	160...290mA	265mA (LRD20R D012) 90...150mA (LRD20R D024) LRD20R D024P1	75...125mA
Power dissipation	7.5W	7W	5W	4.5W
Conductor section min...max	0.14...2.5mm^2 26...14AWG	0.14...2.5mm^2 26...14AWG	0.14...2.5mm^2 26...14AWG	0.14...2.5mm^2 26...14AWG

INPUT SPECIFICATIONS

LRD...A240 MODEL

Characteristic	LRD10RA240		LRD20RA240	
Input circuitry				
Number	6 (digital input)		12 (digital input)	
Signal current input	120VAC 240VAC	0.66mA 1.3mA	120VAC 240VAC	0.55mA 1.2mA
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 50/60Hz: 50/45ms (120VAC)		Typical 50/60Hz: 50/45ms (120VAC)	
	Typical 50/60Hz: 90/85ms (240VAC)		Typical 50/60Hz: 90/85ms (240VAC)	
	OFF ≥ ON		OFF ≥ ON	
	Typical 50/60Hz: 50/45ms (120VAC)		Typical 50/60 Hz: 50/45ms (120VAC)	
	Typical 50/60Hz: 22/18ms (240VAC)		Typical 50/60 Hz: 22/18ms (240VAC)	

LRD...A024 MODEL

Characteristic	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

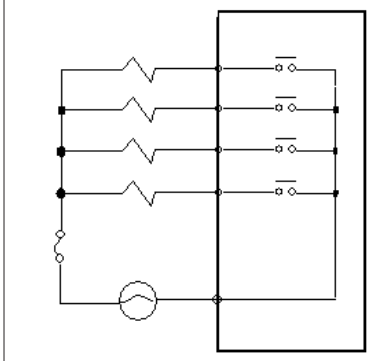
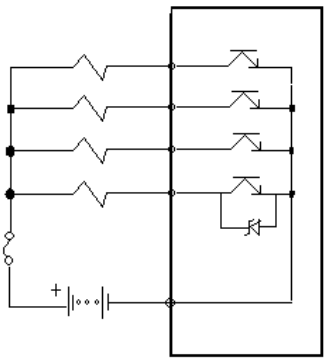
LRD12..D024 MODEL

Characteristic	LRD12RD024 - LRD12TD024			
	Normal digital input	High speed input	Analog input used as normal digital input LRD12: I7, I8 LRD20: I9, IA, IB, IC	Analog input LRD12: A1, A2 LRD20: A1, A2, A3, A4
Input circuitry	I03~I06	I01.I02	I07,I08	
Number of inputs	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	—
	4 ms	0.3 ms	Typical: 4 ms	—
	OFF=>ON	OFF=>ON	OFF=>ON	—
	4 ms	0.5 ms	Typical: 4 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

LRD20RD... MODEL

Characteristic		LRD20RD012 - LRD20RD024 - LRD20RD024P1			
		Normal digital input	High speed input	Analog input used as normal digital input LRD12: I7, I8 LRD20: I9, IA, IB, IC	Analog input LRD12: A1, A2 LRD20: A1, A2, A3, A4
Input circuitry		I03~I08	I01.I02	I09,I0A,I0B,I0C	
Number of inputs		6	2	4	4
Signal current input		3.2mA/12-24VDC	3.2mA/12-24VDC	0.63mA/12-24VDC	<0.17mA/10VDC
ON current input	D012	>1.875mA/7.5VDC	>1.875mA/7.5VDC	>0.163mA/9,8VDC	—
	D024	>1.875mA/15VDC	>1.875mA/15VDC	>0.163mA/9,8VDC	—
OFF current input	D012	<0.625mA/2.5VDC	<0.625mA/2.5VDC	<0.083mA/5VDC	—
	D024	<0.625mA/5VDC	<0.625mA/5VDC	<0.083mA/5VDC	—
Wire length		≤ 100 m	≤ 100 m	≤ 100 m	≤ 30 m (shielded wire)
Response time of input		ON≥OFF	ON≥OFF	ON≥OFF	—
		4ms	0.5ms	Typical: 4ms	—
		OFF≥ON	OFF≥ON	OFF≥ON	—
		4ms	0.3ms	Typical: 4ms	—
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

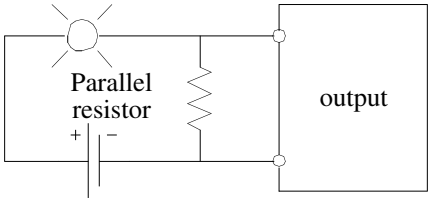
Characteristic		Relay	Transistor
Output circuitry			
External power		Less than 265VAC; 30VDC	23.9~24.1V
Circuitry isolation		Mechanical	Optoisolators
Maximal Load	Resistive	8 A point	0.3 A point
	Inductive	4A point	—
	Light	200 W	10 W/24 VDC
Open drain current		—	<10 μA
Minimum Load		16.7mA	0.2mA
Response time	ON → OFF	15ms	25μs
	OFF → ON	15ms	Less than 0.6 ms

OUTPUT PORT WIRING NOTICE

LIGHT LOAD

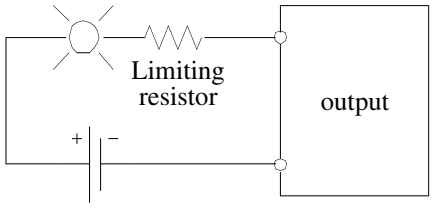
The current value will be 10~20 times of normal value for several 10ms when filament is turning-on. A parallel resistor or limiteing resistor e is added at output port to reduce the concussion current value.

Parallel connection of resistor



The light will be faint because of little current so be careful in choosing the resistor value.

Series connection of resistor

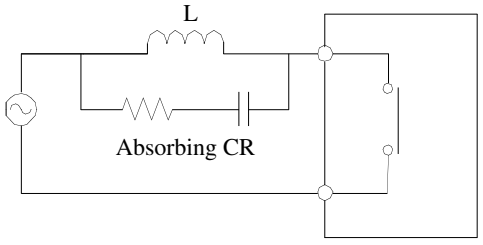


The light will be bright because of high resistor value.

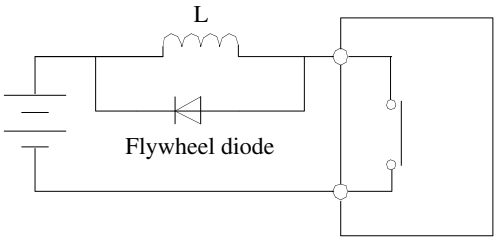
INDUCTANCE LOAD

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.

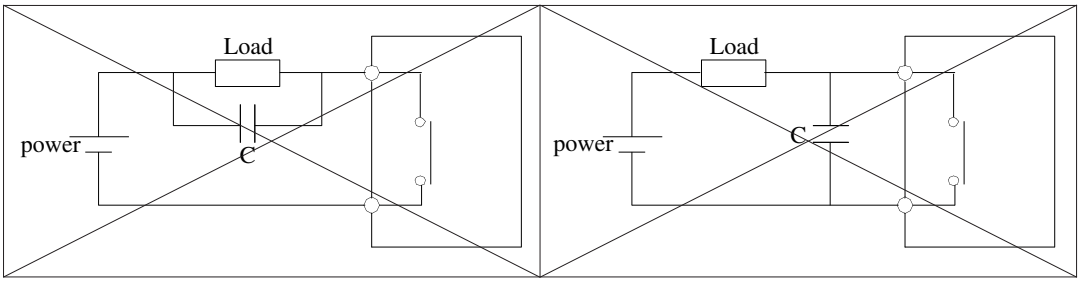
a. AC power, absorbing “CR”



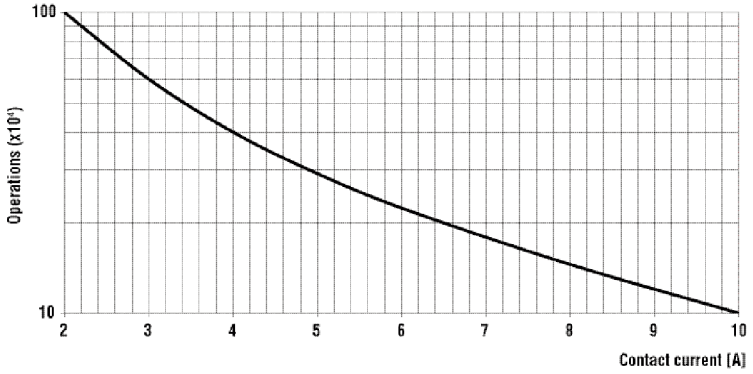
b. DC power,”flywheel diode”



Do not use capacitance alone as absorbing as shown below.



LIFE OF MICRO PLC



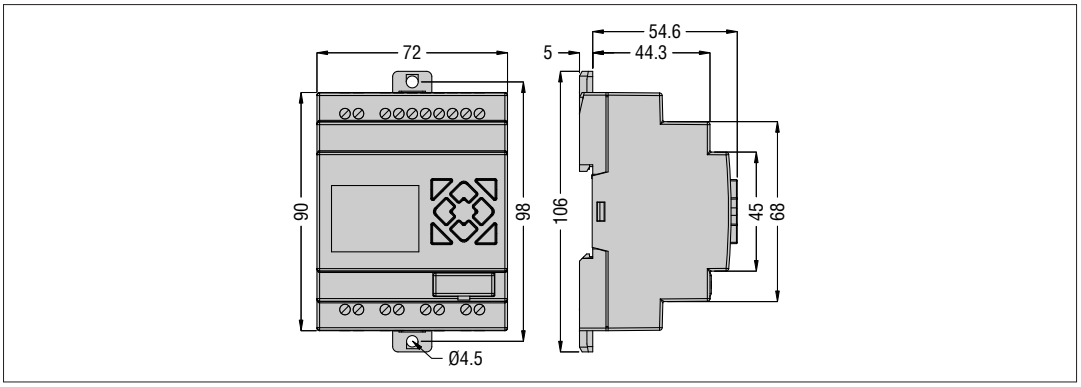
– The data of graph is standard, but the life of relay is influenced by the ambient operating temperature.
– The life is more than 100,000 cycles if the current is less than 2A.

ACCESSORIES

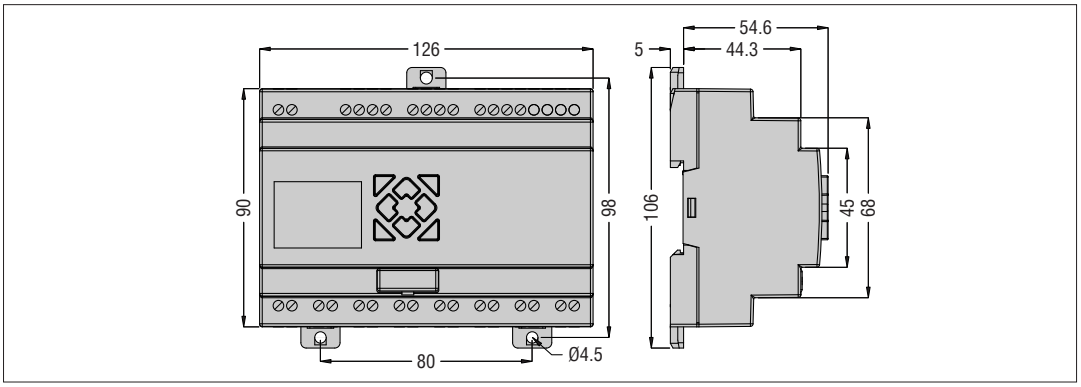
Order code	Description
LRX C00	LRD-PC RS232 connection cable, 1.5m long
LRX C03	LRD-PC USB connection cable, 1.5m long
LRX M00	Program backup memory
LRX SW	LRD program software

DIMENSIONS LRD

10/12 points



20 points

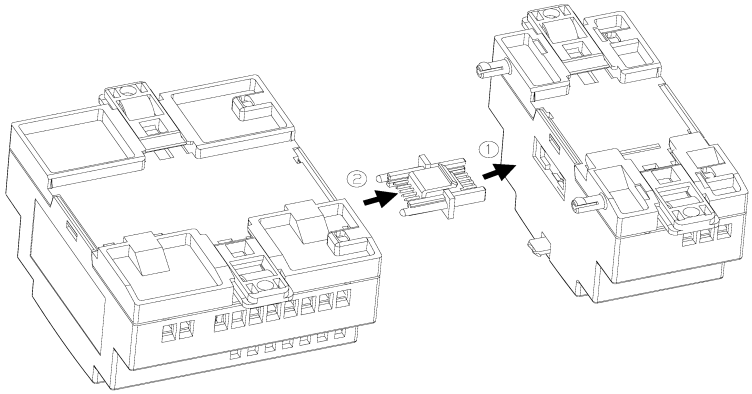


CHAPTER 8: EXPANSION MODULE

Digital Input/Output module: LRE08RD024, LRE08TD024, LRE08RA024, LRE08AA240
Analog module: LRE02AD024, LRE04AD024, LREO4PD024.
Communication module: LREP00
All LRD can connect expansion modules. The sequence of these expansion modules to connect with LRD is: digital, analog and communication.
Digital input modules are 2 types: version 1.2 and version ≥3.0. Both can be used with LRD.
Analog modules can be used only with LRD having firmware ≥V.3.0 and LRXSW programming software revision ≥3.0.
Maximum configuration: LRD + 3 modules LRE08… + 2 modules LRE02AD024 + 1 LRE04PD024 + 1 module LRE04AD024 + 1 module LREP00.

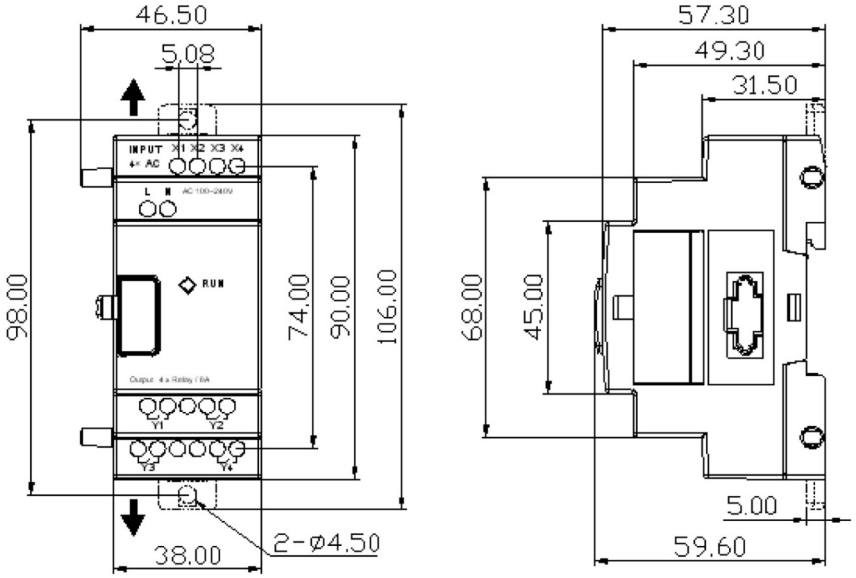
ATTENTION: When more than one analog module is fitted, the LRE04AD024 type must be the last of the analog modules for correct operation.

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



EXPANSION MODULE DIMENSIONS

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



EXPANSION MODULE DESCRIPTION

EXPANSION MODULE INSTALLATION

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

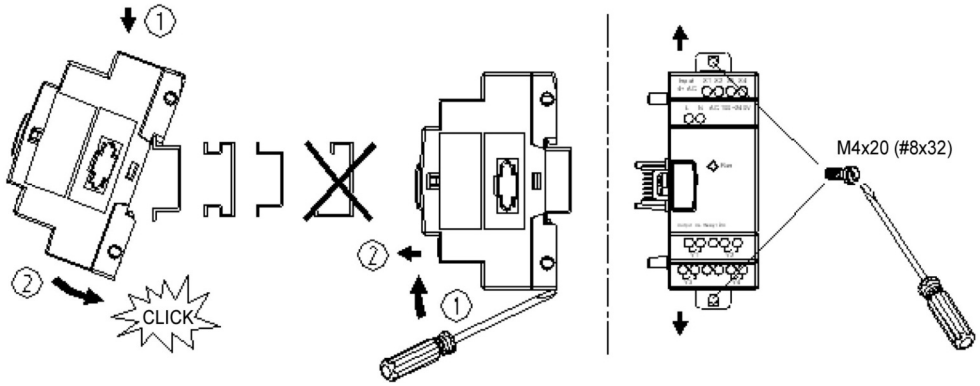
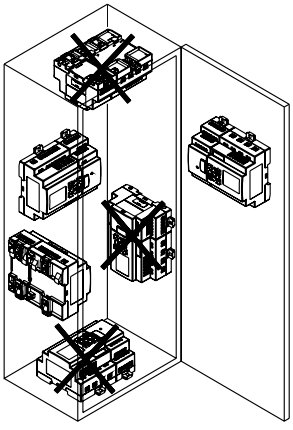


Immagine PostScript

10_04_GB.eps



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

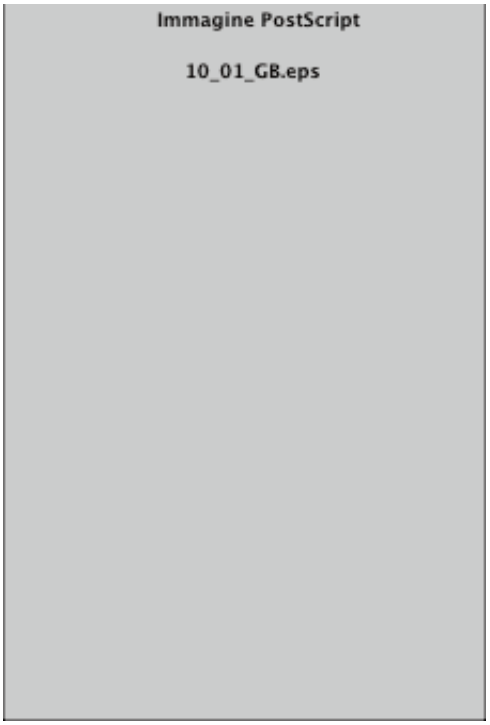
– Power down before equipment maintenance.

LRD PROGRAMMING OF EXPANSION MODULES

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

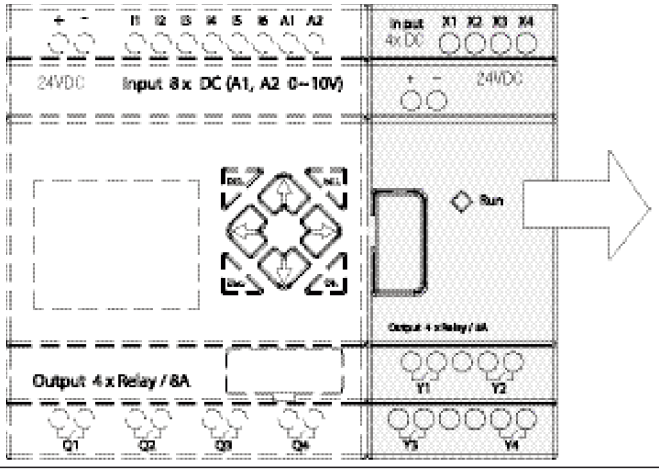
1) By keypad

2) By LRXSW software



EXPANSION DISPLAY STATE

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.

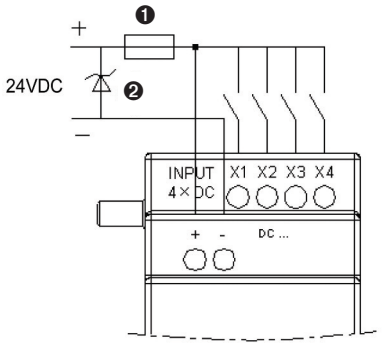


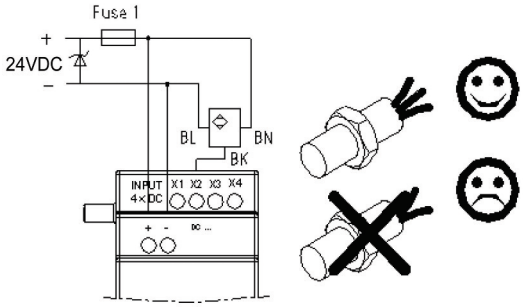
◆	LED constantly on LRE in Run mode
✳	Flashing LED (3Hz) Abnormal LRE conditions for: - data transfer error - connection error

WIRING OF DIGITAL I/O EXPANSION MODULE

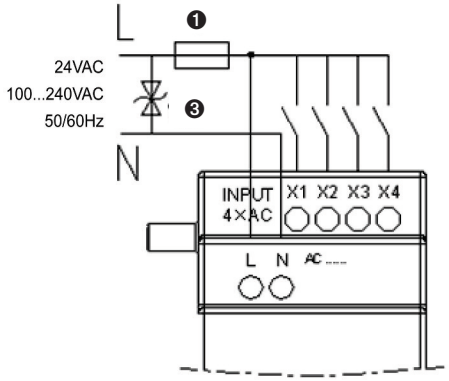
The modules are LRE08RA024, LRE08D024, LRE08TD024.
Maximum configuration: LRD + 3 modules LRE08… + 2 modules LRE02AD024 + 1 LRE04PD024 + 1 module LRE04AD024 + 1 module LREP00.

1) 24V DC power input - LRE08RD024 / LRE08TD024

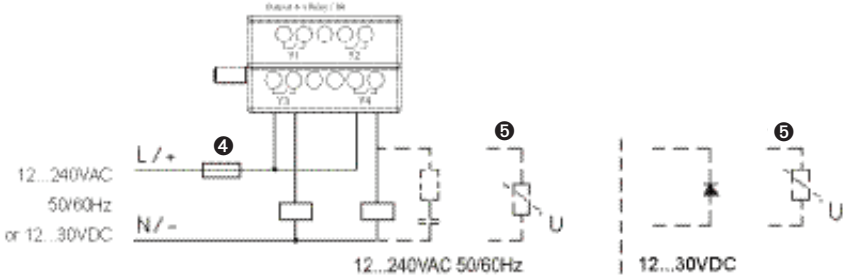




2) 24VAC / 100~240VAC power input - LRE08RA024 / LRE08RA024



3) Relay output - LRE08R...



4) Transistor output - LRE08T...

❶ 1A fast acting fuse, circuit-breaker or circuit protector.
❷ Surge suppressor (43VDC cut-off voltage).
❸ Surge suppressor (430VAC cut-off voltage for LRD... A240; 43VAC per LRD... A024).
❹ Fuse, circuit-breaker or circuit protector.
❺ 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 type. 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 type.

WIRING OF ANALOG EXPANSION MODULE
The modules are LRE02AD024, LRE04AD024, LRE4PD024.

The maximum number of analog expansion modules to install on the LRD is:
1) 2 modules LRE02AD024
2) 1 module LRE04AD024
3) 1 module LRE04PD024.
Maximum configuration: LRD + 3 modules LRE08… + 2 modules LRE02AD024 + 1 LRE04PD024 + 1 module LRE04AD024 + 1 module LREP00.
ATTENTION: When more than one analog module is fitted, the LRE04AD024 type must be the last of the analog modules for correct operation.

The current mode value of the 2+2 analog outputs is viewed as follows:

```
A Q 0 1 = 0 0 . 0 0 m A
A Q 0 2 = 0 0 . 0 0 m A
A Q 0 3 = 0 0 . 0 0 m A
A Q 0 4 = 0 0 . 0 0 m A
```

The voltage and current mode value of the 4 analog inputs is viewed as follows i.e. “V” is always displayed even when current mode is selected and is actually “mA”.

```
A 0 5 = 0 0 . 0 0 V
A 0 6 = 0 0 . 0 0 V
A 0 7 = 0 0 . 0 0 V
A 0 8 = 0 0 . 0 0 V
```

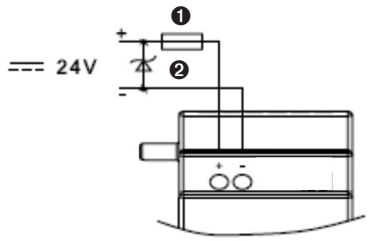
The current mode value of the 4 PT100 inputs is viewed as follows:

```
A T 0 1 = 0 0 0 0 . 0 °C
A T 0 2 = 0 0 0 0 . 0 °C
A T 0 3 = 0 0 0 0 . 0 °C
A T 0 4 = 0 0 0 0 . 0 °C
```

Error output coil (out-of-limits value or sensor not installed)

Output coil	AT number	
M34	AT01	Error channel 1 LRE04PD024
M35	AT02	Error channel 2 LRE04PD024
M36	AT03	Error channel 3 LRE04PD024
M37	AT04	Error channel 4 LRE04PD024

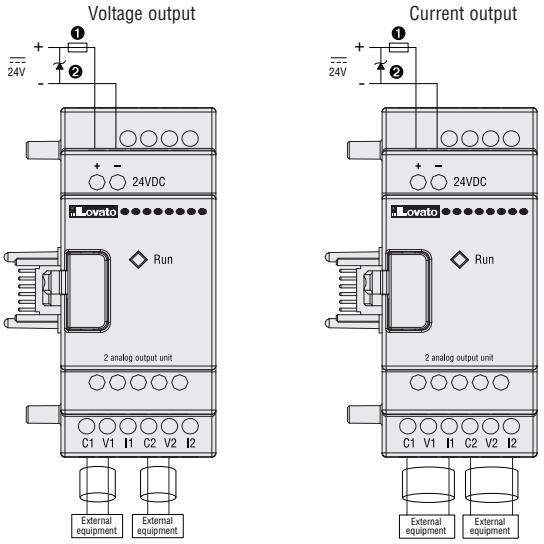
24VDC input power supply



❶ 1A fast acting fuse, circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).

Wiring of LRE02AD024 module

❶ 1A fast acting fuse, circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).



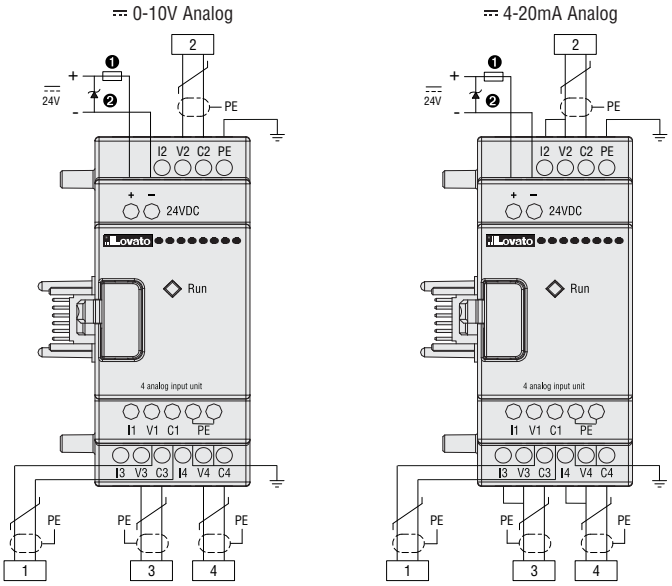
The output mode can be set by LRD… base module with DR register values (current mode):

Number	Meaning	Data definition
DRD0	Output mode AQ01	0: Voltage mode AQ output value is 0 when LRD is in STOP mode.
DRD1	Output mode AQ02	1: Current mode AQ output value is 0 when LRD is in STOP mode.
DRD2	Output mode AQ03	0: Voltage mode AQ maintains the output value when LRD is in STOP mode.
DRD3	Output mode AQ04	1: Current mode AQ maintains the output value when LRD is in STOP mode.

N.B. The value is considered as 0 if DR is out of the 0~3 range.

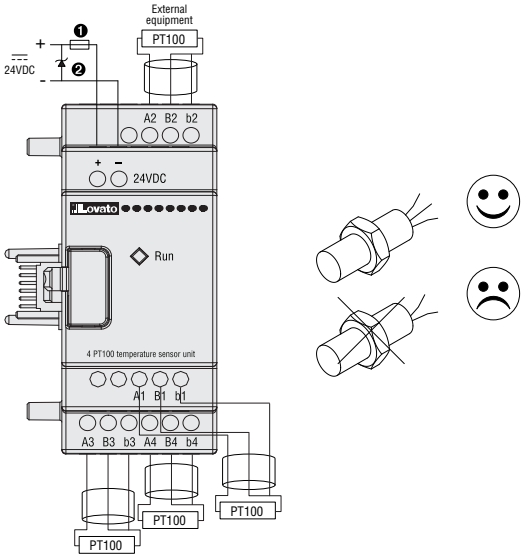
Wiring of LRE04AD024 module

❶ 1A fast acting fuse, circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).



Characteristics		Specifications (Analog output unit, 2 voltage/current output channels)	
		Voltage	Current
Analog output range		0~10V Impedance of the external load should be more than 500Ω	0~20mA Impedance of the external load should be less than 500Ω
Resolution		10mV	40µA
Digital output		0.00V~10.00V	0.00mA~20.00mA
Accuracy		±2,5%	±2.5%
Total number of channels		2	2
Terminal block	C1~C2	V1~V2 or I1~I2 input available	
	V1~V2	Voltage output terminal; output of the voltage signal from V and C	—
	I1~I2	—	Current output terminal; output of the voltage signal from I and C
	+	+24VDC power supply input terminals(+)	
	–	+24VDC power supply input terminals(-)	
Auxiliary power supply		24VDC	
Ambient operating temperature		-20°C…+55°C	

Wiring of LRE04PD024 module



❶ 1A fast acting fuse, circuit breaker and circuit protection.
❷ Transient voltage surge suppressor (43VDC cut-off voltage).

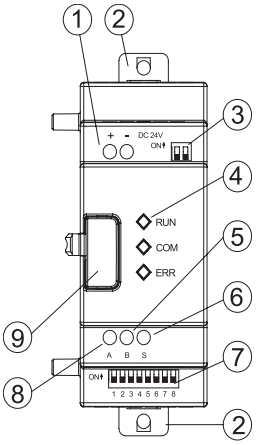
When the temperature is out of the -100°C…+600°C range limits, error output coils M34, M35, M36 and M37, which correspond to channel 1, channel 2, channel 3 and channel 4, will be activated (ON).

Characteristics		Specifications (Analog input unit,4 PT100 temperature sensor input channel)
Input temperature range		-100°C…+600°C
Digital output		-100.0°C…+600.0°C
Resolution		0.1°C
Accuracy		±1%
Total number of channels		4
Terminal block	A1~A4	Terminal A - Heat sensor (PT100) signal input
	B1~B4	Terminal B - Heat sensor (PT100) signal input
	b1~b4	Terminal b - Heat sensor (PT100) signal input
	+	+24V DC power supply input (+)
	–	+24V DC power supply input (-)
Auxiliary power supply		24VDC
Ambient operating temperature		-20°C…+55°C

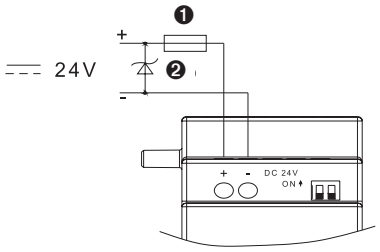
COMMUNICATION MODULE

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. Refer to instructions manual I196... for communications details using LREP00.

LREP00 CONFIGURATION

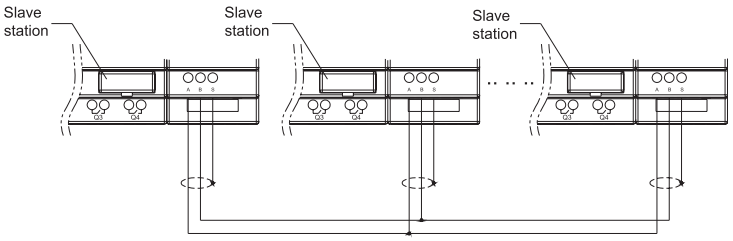


① - Power supply
② - 35mm DIN rail clip or screw fixing using M4x15mm type.
③ - 2-bit switch SW2 (terminal resistance selection with both at ON)
④ - LREP00 status indication LED - RUN
⑤ - RS485 serial port – B terminal
⑥ - RS485 serial port - Screen
⑦ - 8-bit switch SW1-1 to SW1-8 for LREP00 configuration
⑧ - RS485 serial port – A terminal
⑨ - Expansion release button



❶ - 1A fast acting fuse, circuit breaker and circuit protection.
❷ - Transient voltage surge suppressor (43VDC cut-off voltage).

Connection of LREP00 modules by RS485 interface



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.

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

* 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 trouble shooting

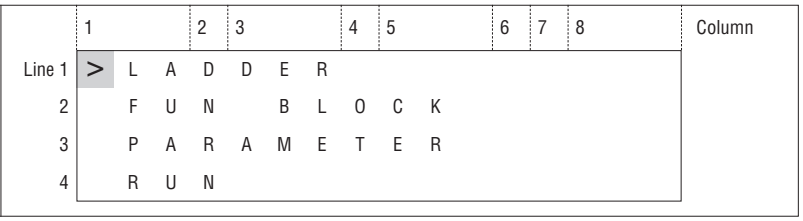
Error code	State indication	Error type and reason	Manage method	Remark
56H	The error LED light flashes slowly (2Hz)	The connection between LRD and COMM module is improper	Check connection among LRD, IO module and COMM module.	The problem is connection with the module before it if there are many expansion modules.
55H	The error LED light is ON	LRD set error: IO number set is different from factual.	Check LRD setting	
51H_54H	The error LED light flashes slowly (2Hz)	ModBus order error: Data frames, function code, address of register, CRC, invalid data, verifying error, etc.	Check 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 module is credible: control environment noise.	

Refer to I196 - LREP00 user manual for more details.

APPENDIX: KEYPAD PROGRAMMING

APPENDIX A: KEYPAD PROGRAMMING IN LADDER MODE

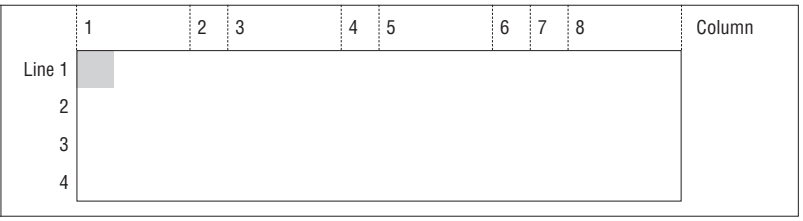
Operation Sample:



Step 1:

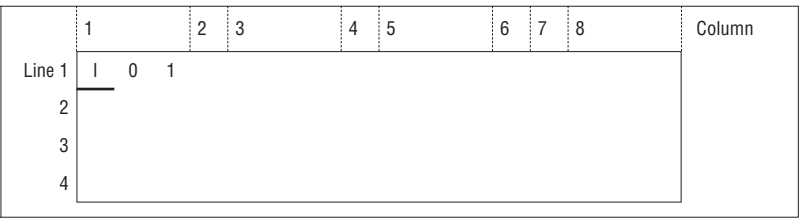
Press 'OK'.

Enter LADDER edit.



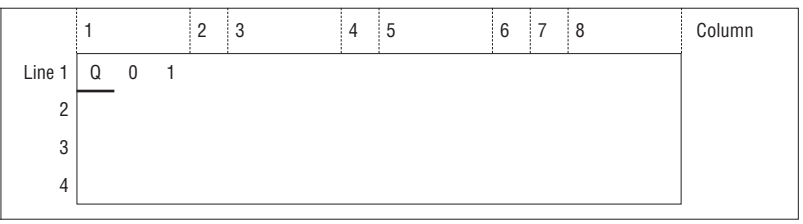
Step 2 :

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



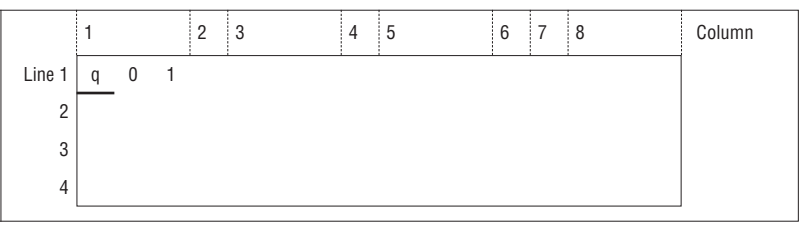
Step 3 :

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



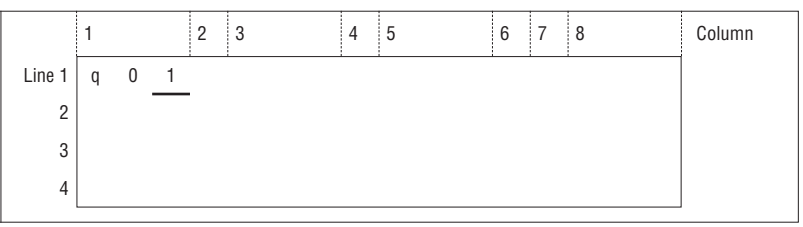
Step 4 :

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



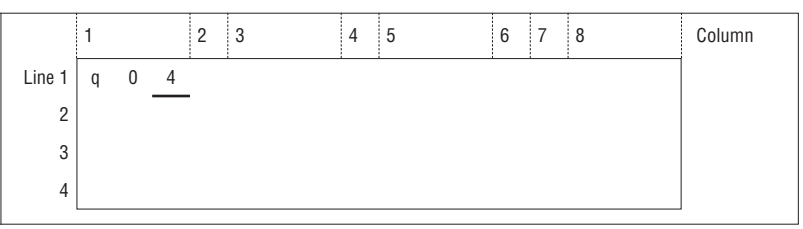
Step 5 :

Press '→' 2 times.



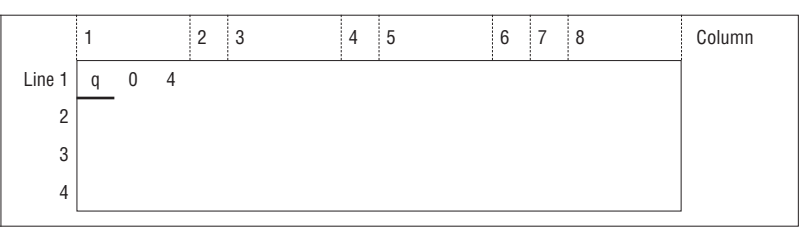
Step 6 :

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



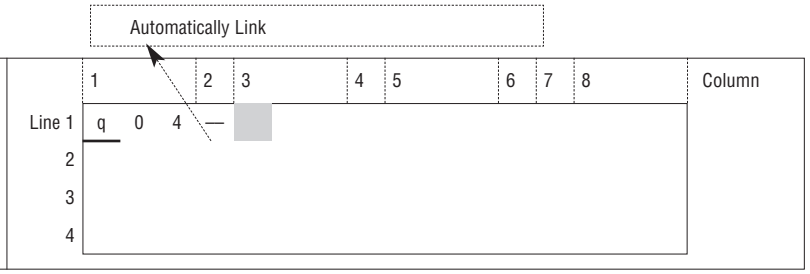
Step 7 :

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



Step 7 :

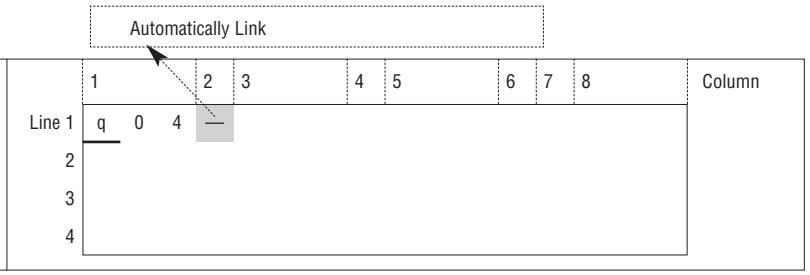
Press 'OK'; the cursor moves to character in column 3 automatically.



or

Step 7 :

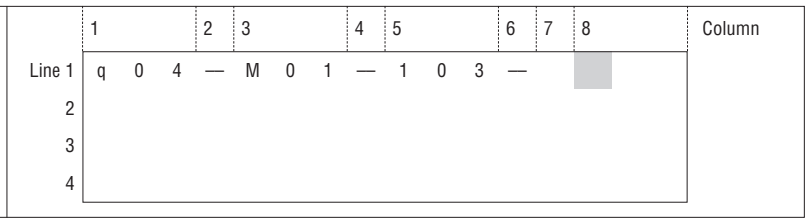
Press '→'; the cursor moves to the link location in column 2 automatically.



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

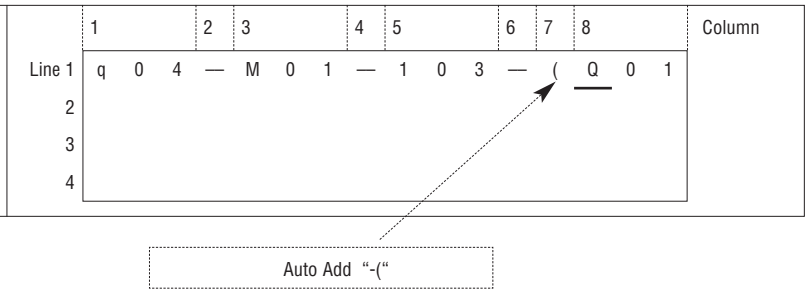
Step 8 :

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



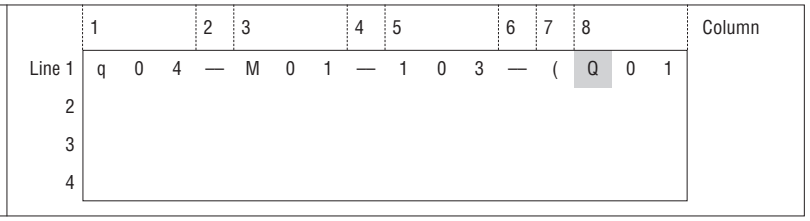
Step 9 :

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



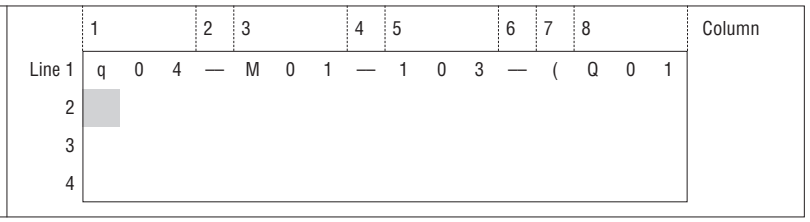
Step 10 :

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



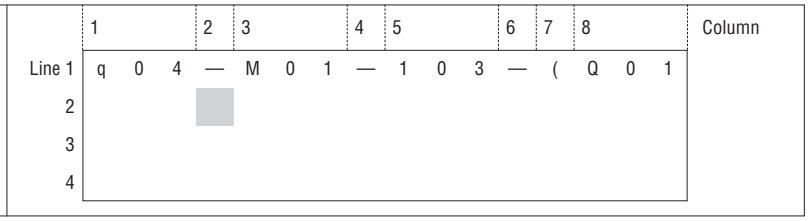
Step 11 :

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



Step 12 :

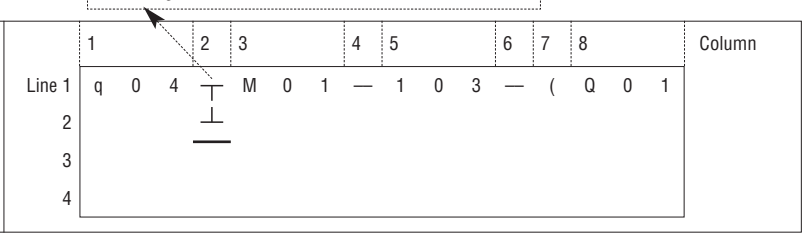
Press '→' 3 times to move the cursor to column 2.
Note: Never press 'SEL' before completing all operations.



Change Wire ' ⊣' to ' I '

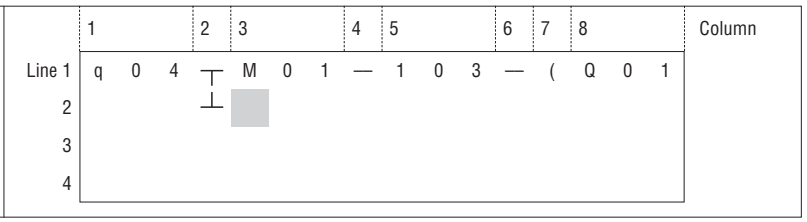
Step 13 :

Press 'SEL'
(A vertical line emerges)



Step 14 :

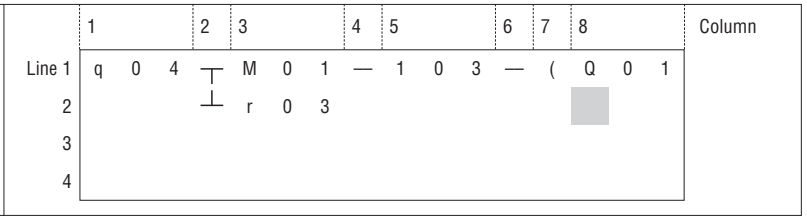
Press 'OK'. Move the cursor to character in column 3.



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

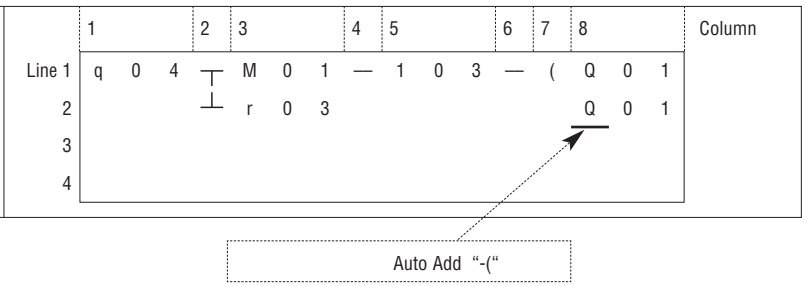
Step 15 :

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



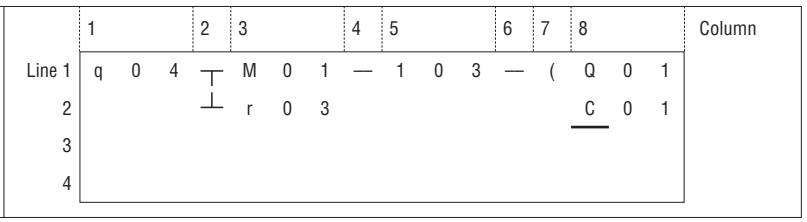
Step 16 :

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



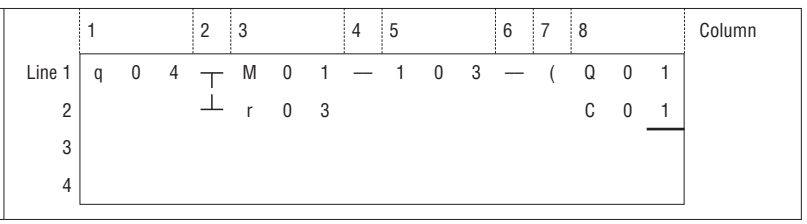
Step 17 :

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



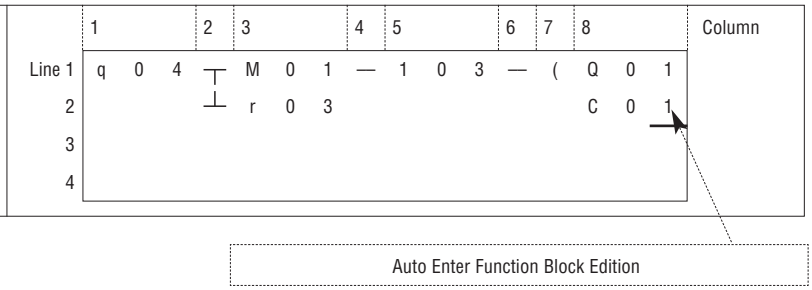
Step 18 :

Press '→' 2 times.



Step 19 :

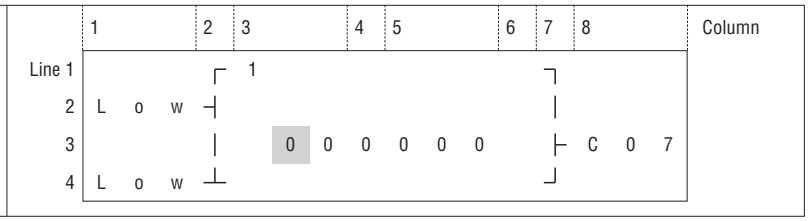
Press '↑' for 6 times
Digit 1 where the cursor is located will change to 7.



Auto Enter Function Block Edition

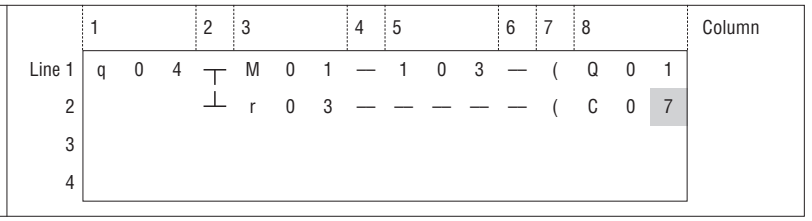
Step 20 :

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

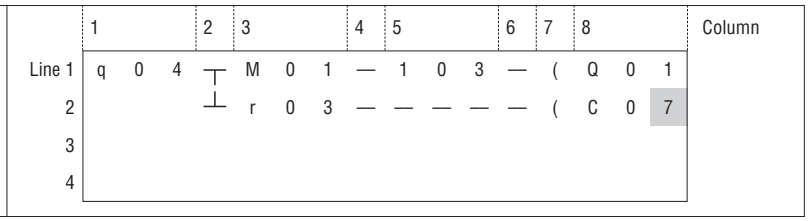


Step 21 :

Press 'ESC' back to LADDER edition screen.

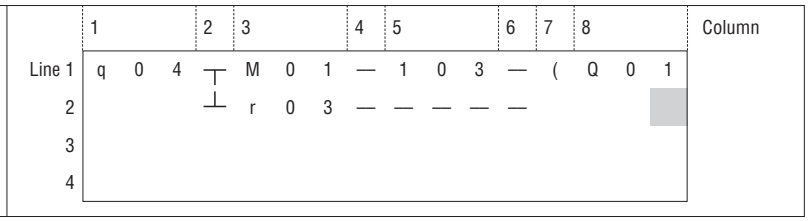


Delete the Program Element



Step 22:

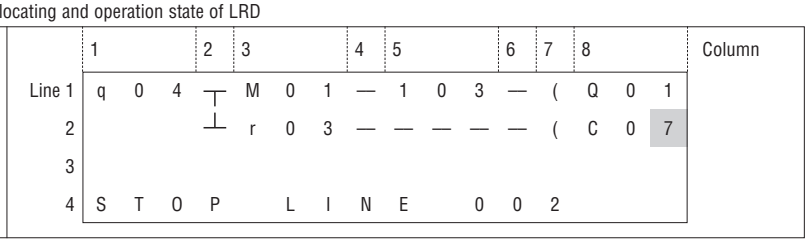
Press 'DEL' to delete element C07 (the cursor location.



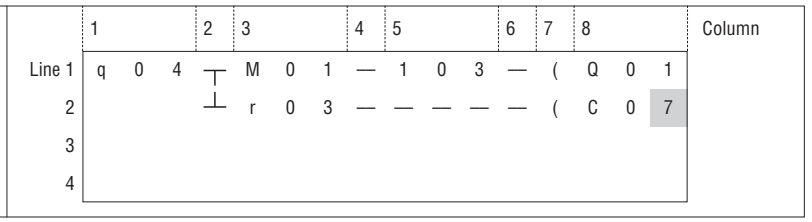
Display the present Line the cursor locating and operation state of LRD

Step 23:

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

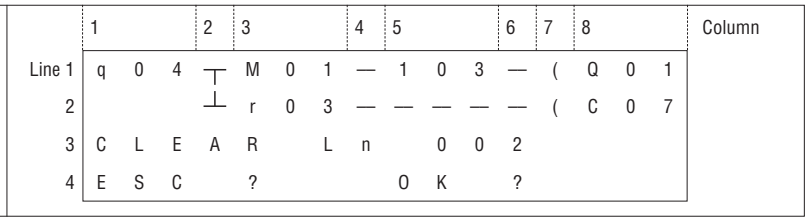


Delete the whole Line

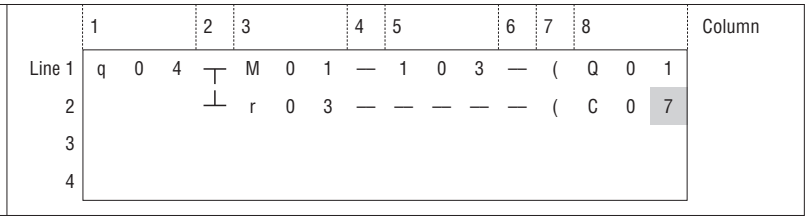


Step 24:

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

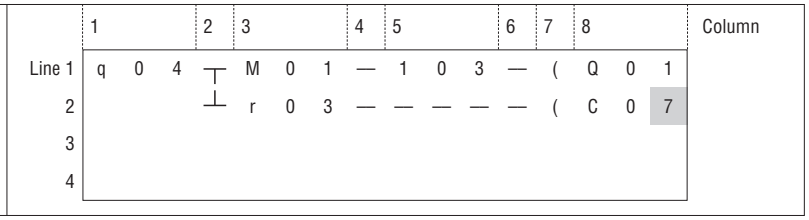


Insert a whole line.

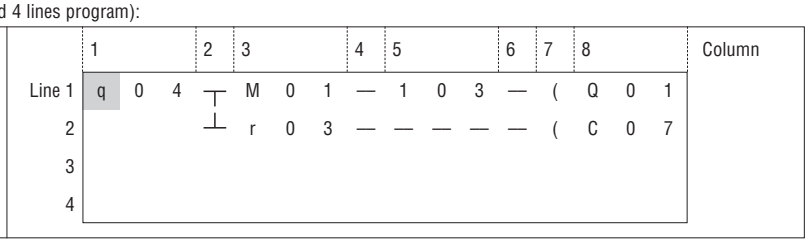


Step 25:

Press“SEL+OK”
(at the same time)

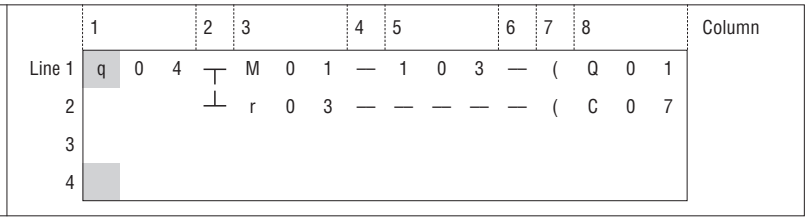


Turn page (move upward/ downward 4 lines program):

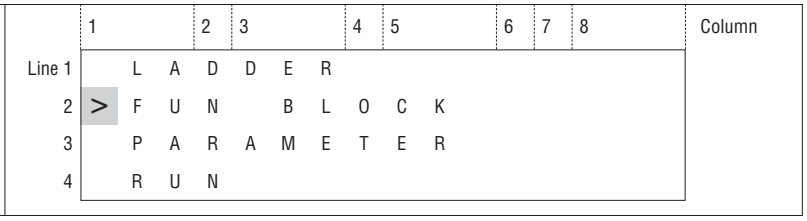


Step 26:

Press 'SEL+↑/↓'
(at the same time)



APPENDIX B: KEYPAD PROGRAMMING IN LADDER FUNCTION BLOCK

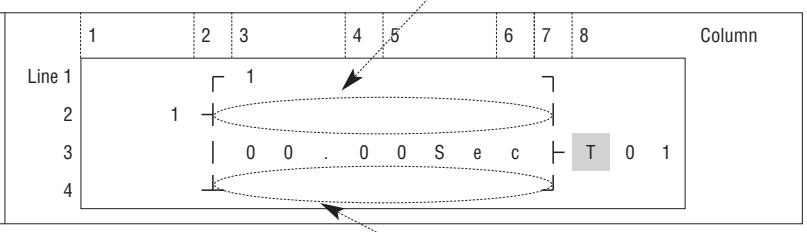


Present action area
The present value will appear when LRD is under 'RUN' mode.

Step 1:

Press 'OK'

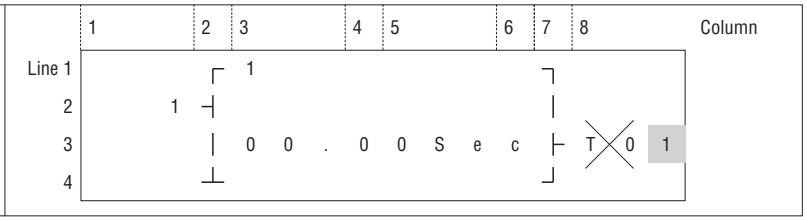
(Enter FUNCTION BLOCK edition)



Preset action value area

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

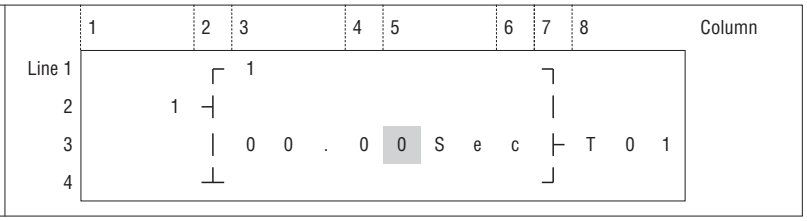
If T02 is required to be changed, Press '↑' or '↓' and 'SEL' to execute.



Step 2: Preset the target value

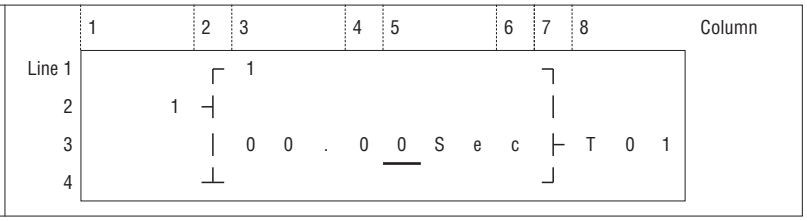
Step 2-1:

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



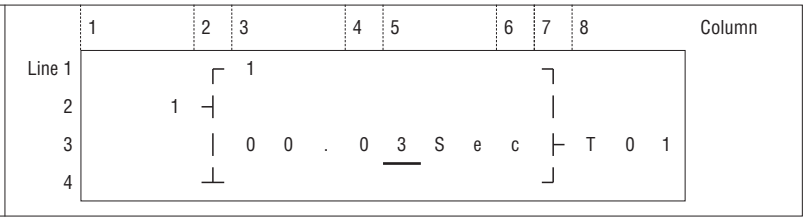
Step 2-2:

Press 'SEL' and begin input the target value.



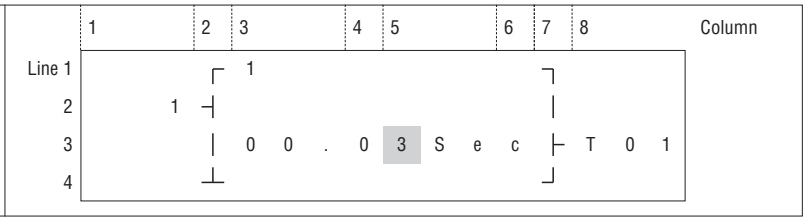
Step 2-3:

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



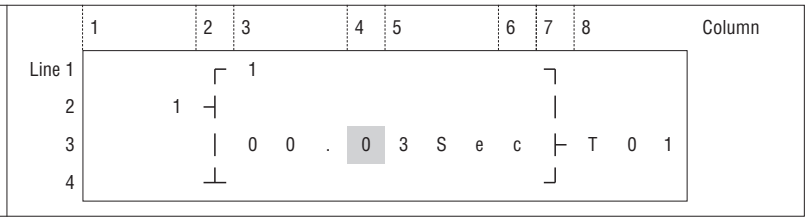
Step 2-4:

Press 'OK'
(Save the input data).



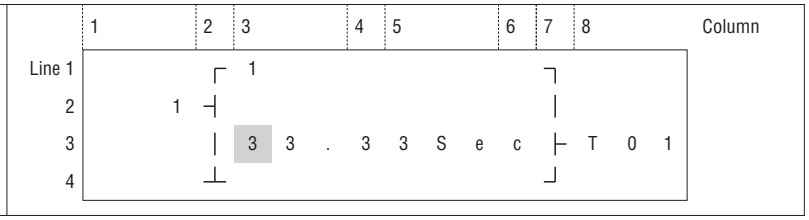
Step 2-5:

Press '←'



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

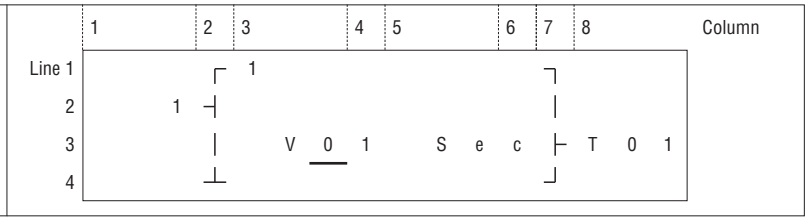
Step 2-6:



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:

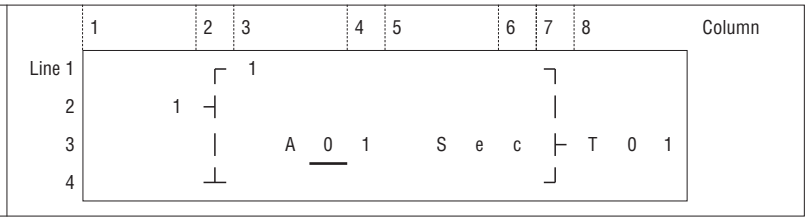
Press 'SEL'



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

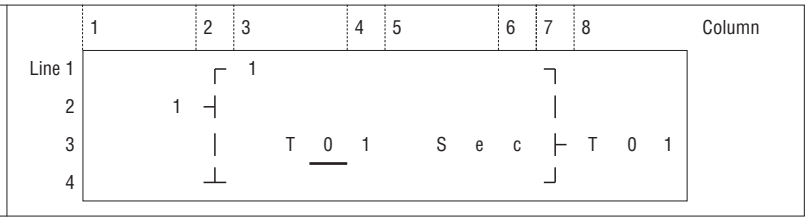
Step 2-3B:

Press 'SEL'



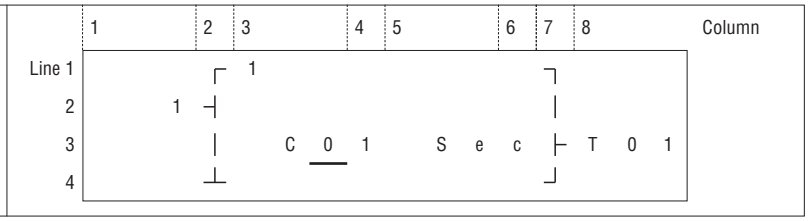
Step 2-3C:

press 'SEL'



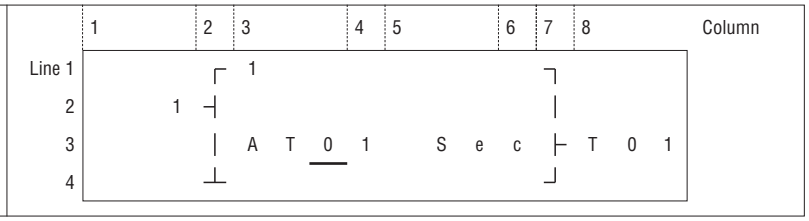
Step 2-3D:

Press 'SEL'



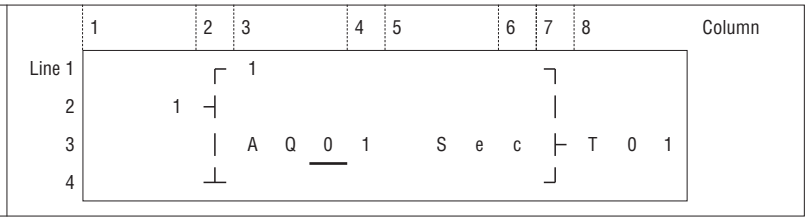
Step 2-3E:

Press 'SEL'



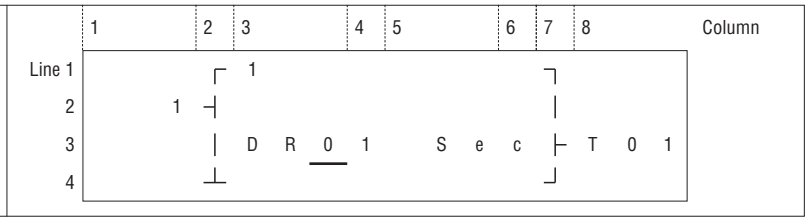
Step 2-3F:

Press 'SEL'



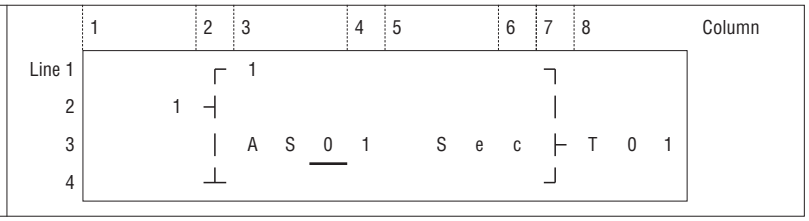
Step 2-3G:

Press 'SEL'



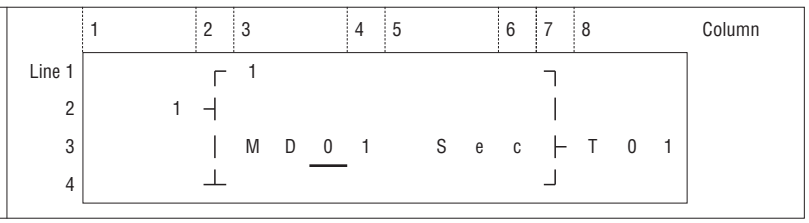
Step 2-3H:

Press 'SEL'



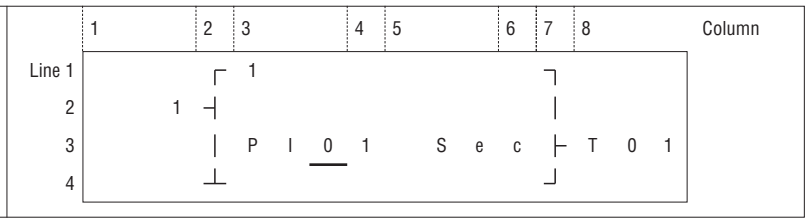
Step 2-3I:

Press 'SEL'



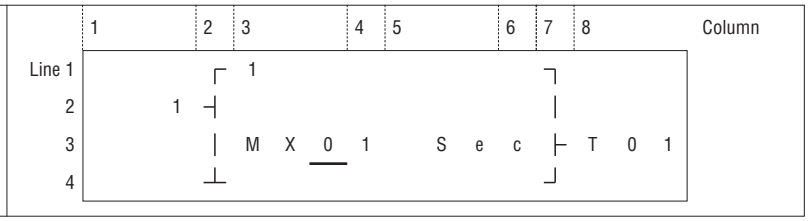
Step 2-3J:

Press 'SEL'



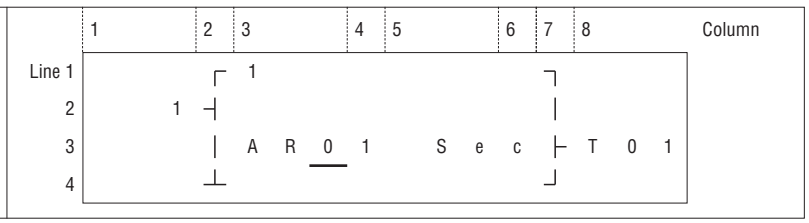
Step 2-3K:

Press 'SEL'



Step 2-3L:

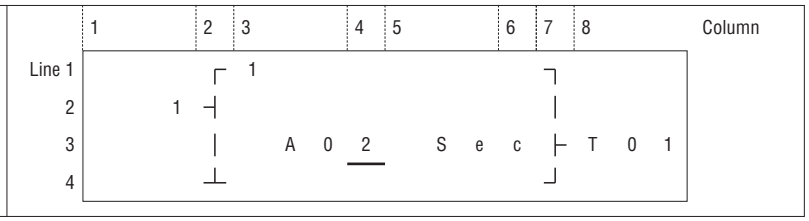
Press 'SEL'



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

Step 2-4B:

Press '→', press '↑'

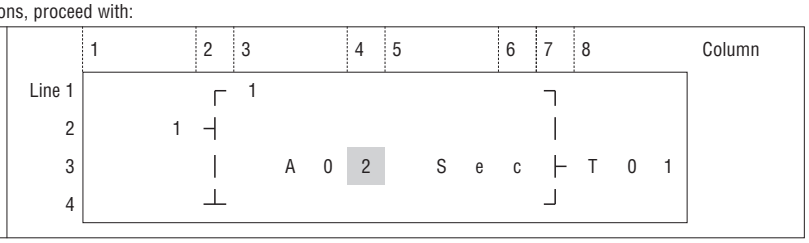


Repeat Step 2-4B (key '↓' is also active), to change parameters and/or values of A01-A08, C01-C1F, T01-T1F and V01-V08.
After having made all the modifications, proceed with:

Step 2-5B:

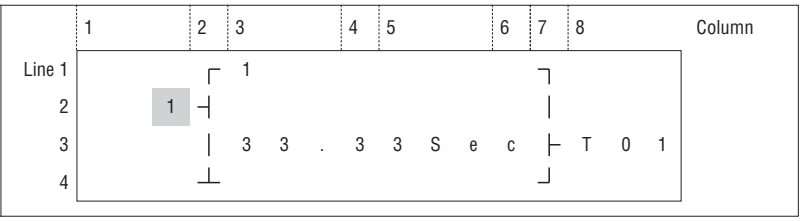
press 'OK'

Save the present data.



Step 2-7:

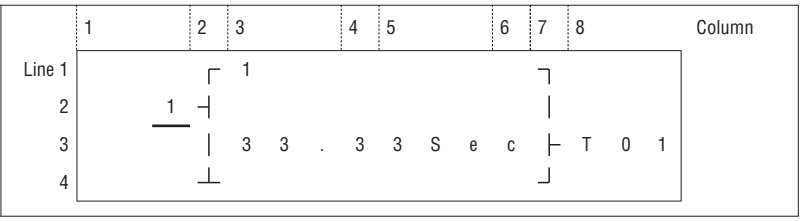
Press '↑'



Step 2-8:

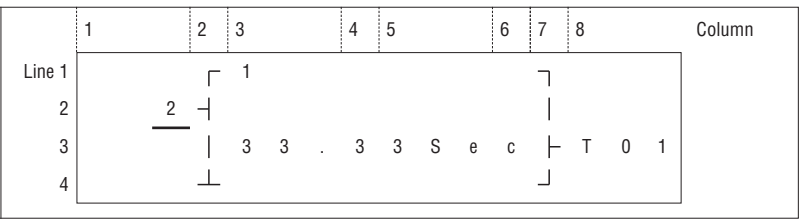
Press 'SEL'

(begin to edit data).



Step 2-9:

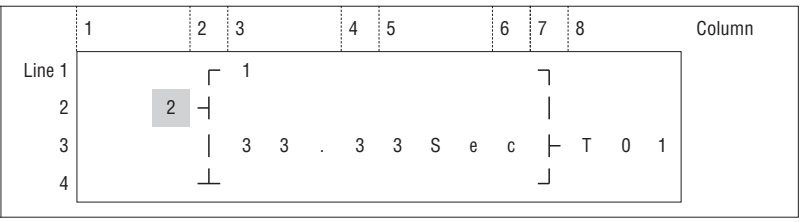
Press '↑'
Press 'SEL' then ' ↑' or '↓'
to change '1' to ' 2'.



Step 2-10:

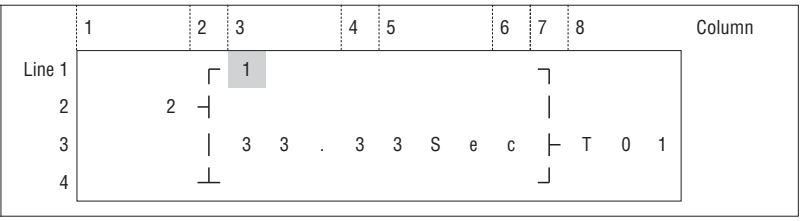
Press 'OK'

(save the input data)



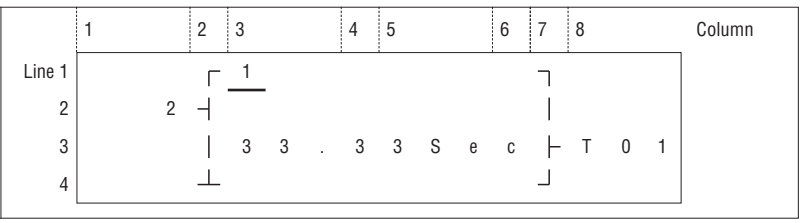
Step 2-11:

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



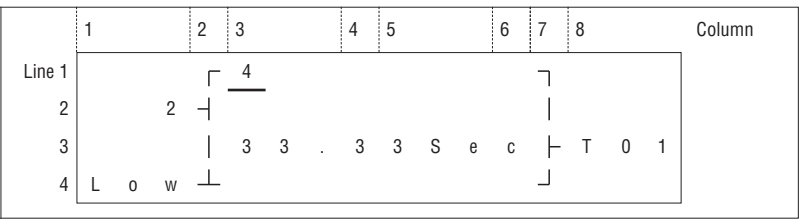
Step 2-12:

Press 'SEL'
(begin to edit data)



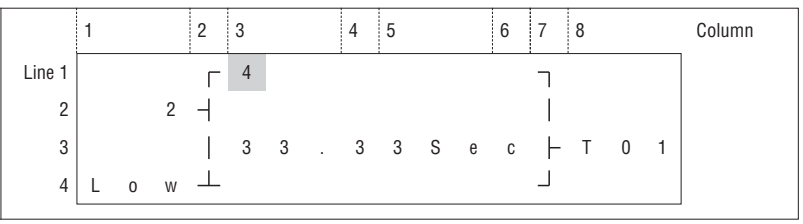
Step 2-13:

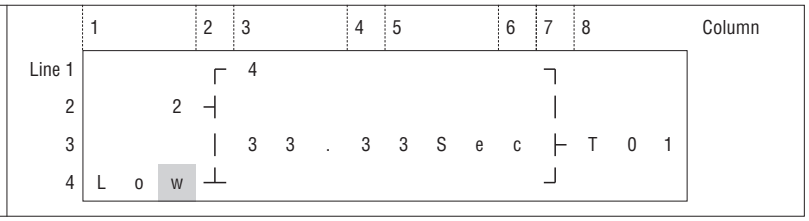
Press '↑' for 3 times
Press 'SEL' then '↑' or '↓' to
change 1 to 4.



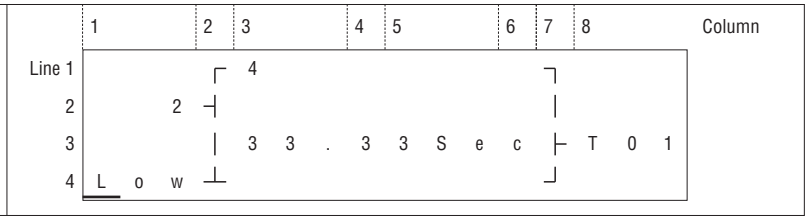
Step 2-14:

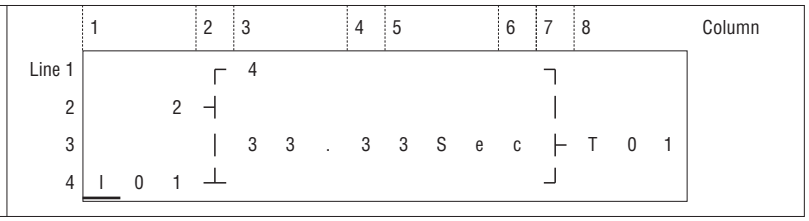
Press 'OK'
(save input data).



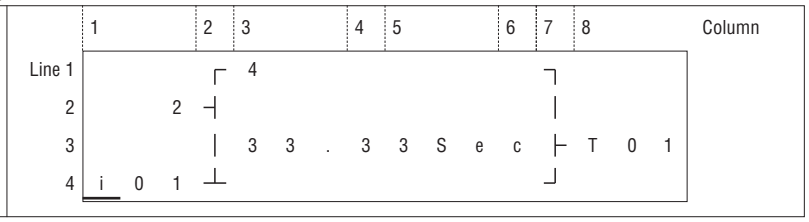
Step 2-15: Press '↓' for 3 times (this step leads to editing the reset input)	

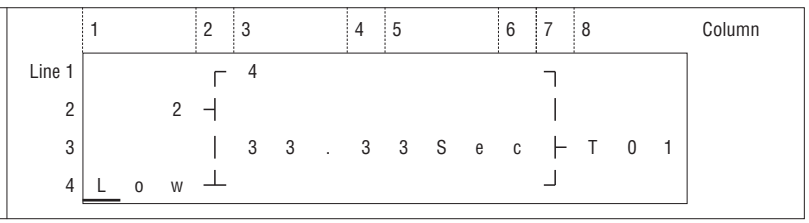
Edit action program and set the reset input.

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

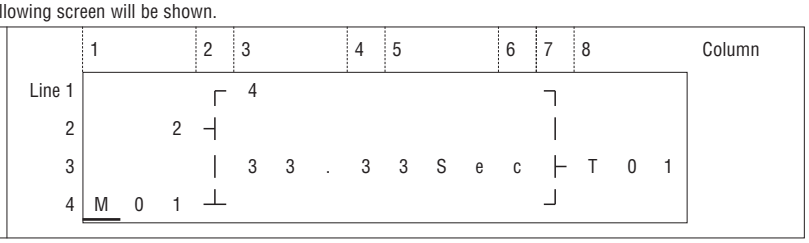
Step 2-16A: Press 'SEL' (Begin to modify)	

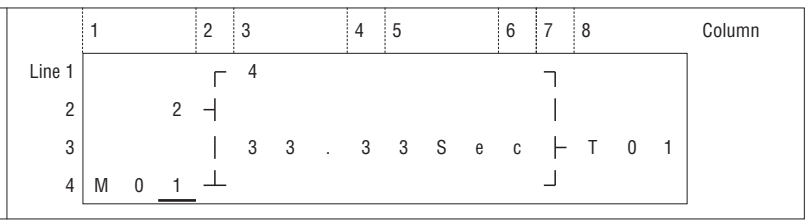
Repeat the step 2-16A, the following screen will be shown in turn:

Step 2-16B: Press 'SEL'	

Step 2-16C: Press 'SEL'	

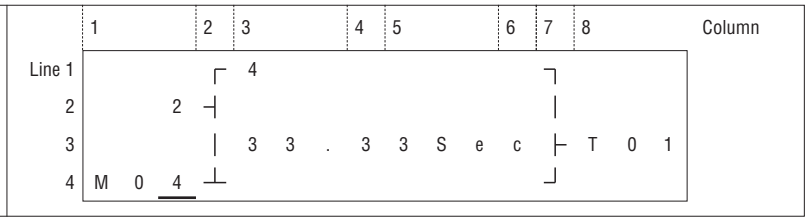
Next to step 2-16A, then '↑', the following screen will be shown.

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.	

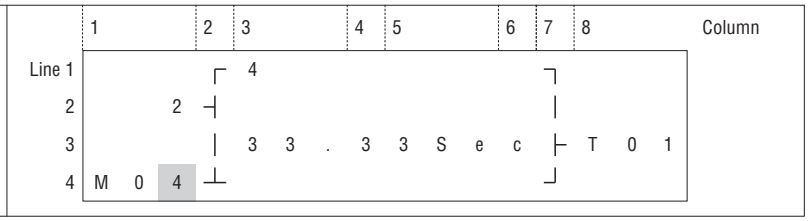
Step 2-19:

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



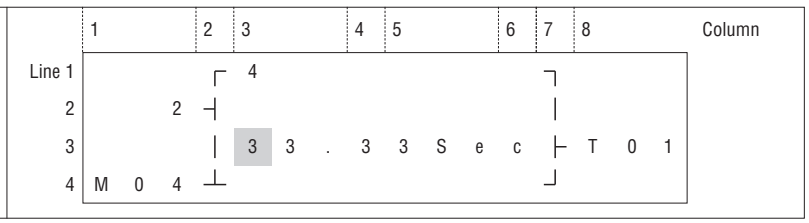
Step 2-20:

Press 'OK' to save the input data.



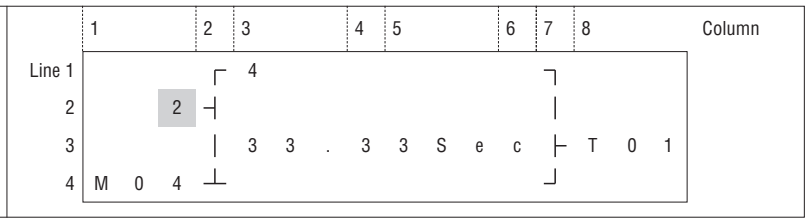
Step 2-21:

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



Step 2-22:

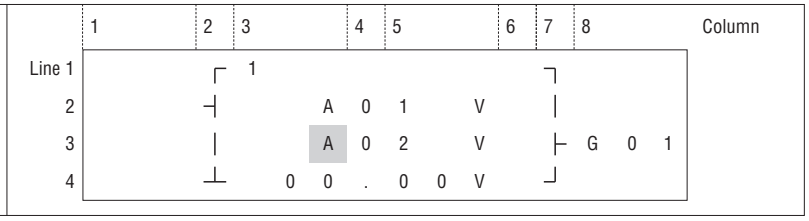
Press '↑' then move the cursor to position '2' and repeat step 2-8.



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

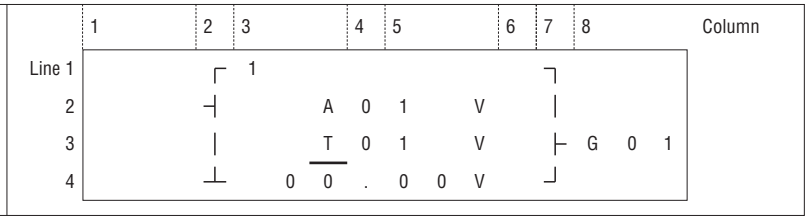
Step 2-23:

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



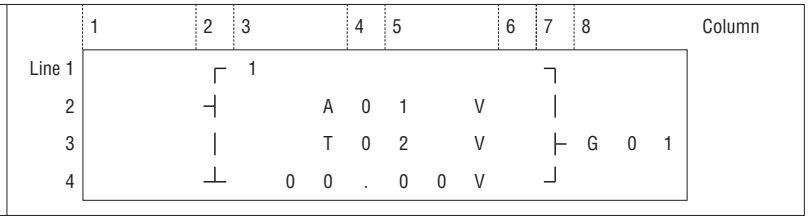
Step 2-24:

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



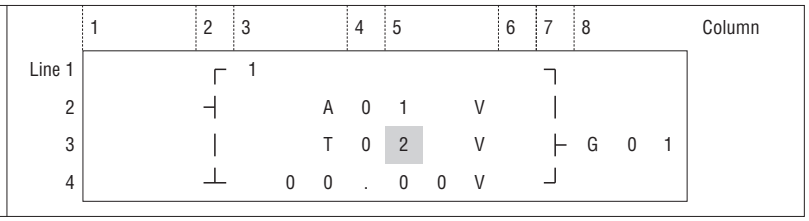
Step 2-25:

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

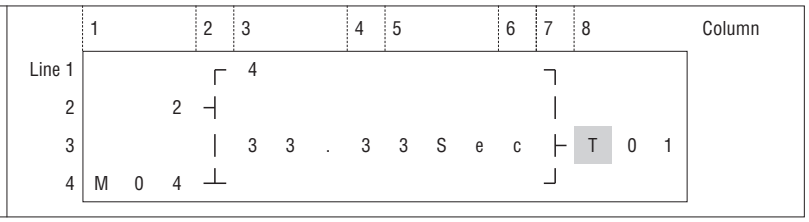


Step 2-26:

Press 'OK' to save the present data.

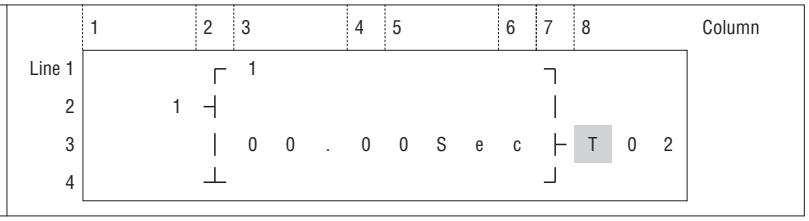


Continue to input Function Block

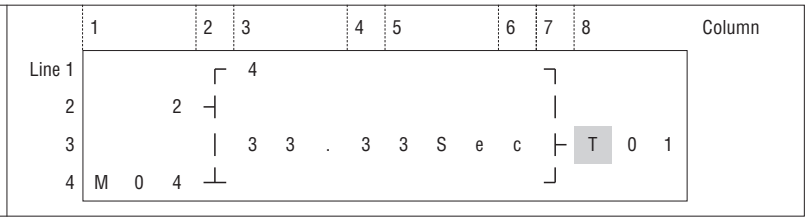


Step 1:

Press 'SEL' and '↑' (Simultaneously)

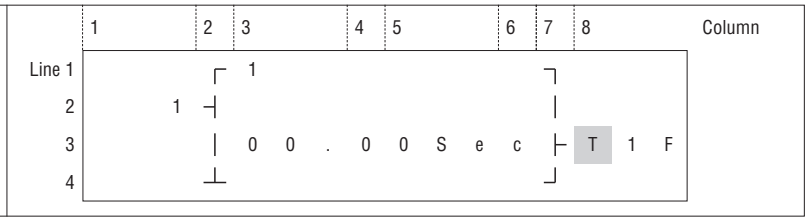


Last Function Block



Step 1-2:

Press 'SEL' and '↓' (Simultaneously)

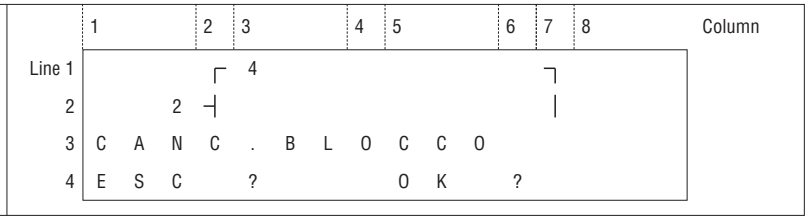


DELETE FUNCTION BLOCK

Step 1-3:

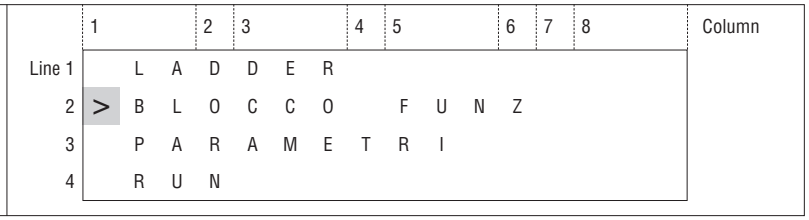
Press 'SEL' and 'DEL' (Simultaneously)

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

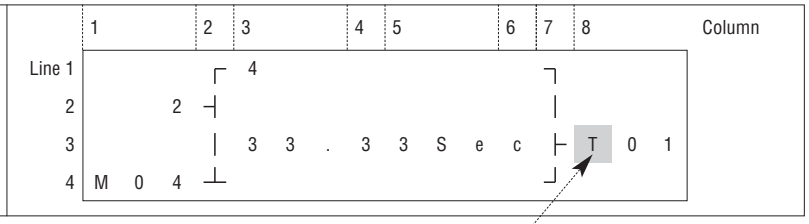


BACK TO MAIN MENU:

Press 'ESC'



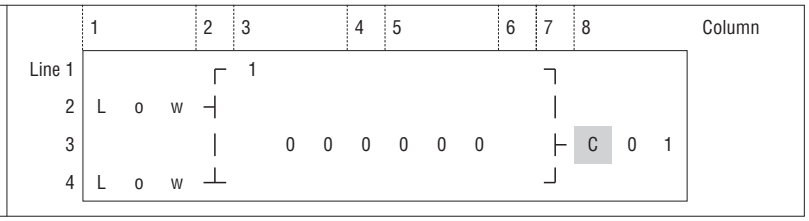
CHANGE FUNCTION BLOCK CATEGORY:



Move the cursor to change to T, C, R, G, H, L, P, S, AS, MD, PI, MX, AR

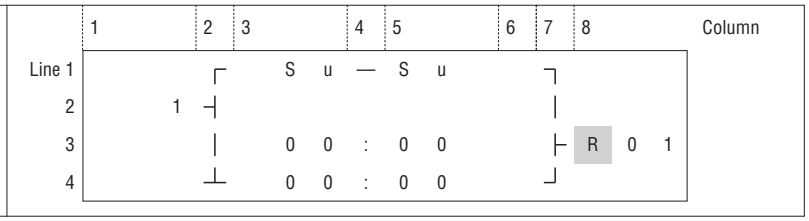
Step 1:

Press 'SEL'



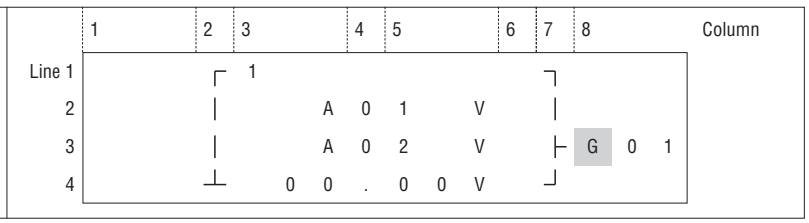
Step 2:

Press 'SEL'



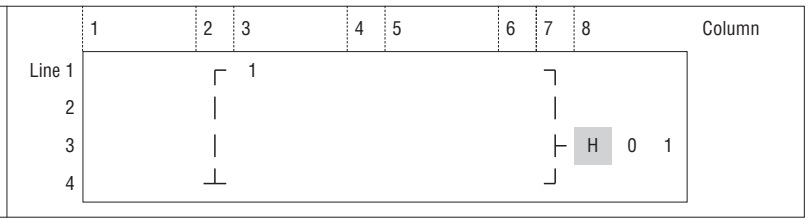
Step 3:

Press 'SEL'



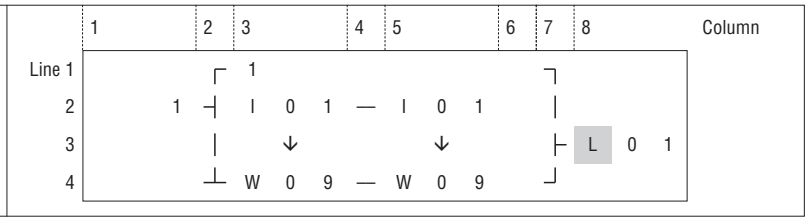
Step 4:

Press 'SEL'



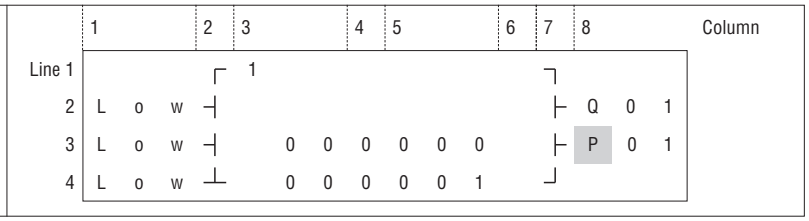
Step 5:

Press 'SEL'



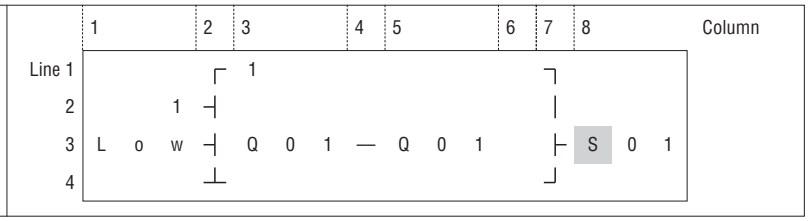
Step 6:

Press 'SEL'



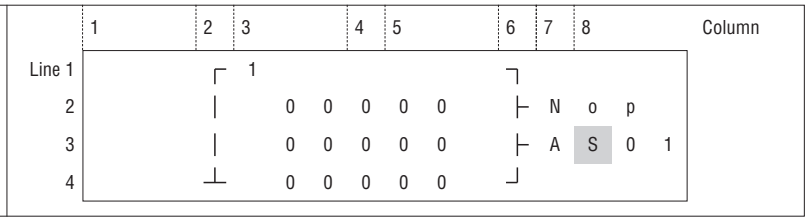
Step 7:

Press 'SEL'



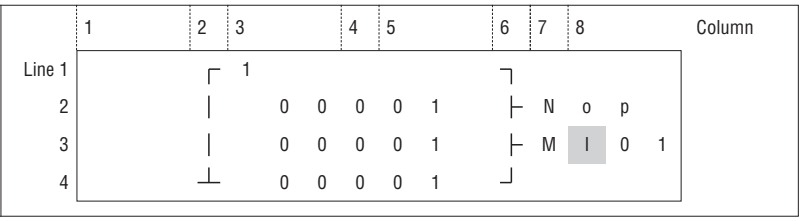
Step 8:

Press 'SEL'



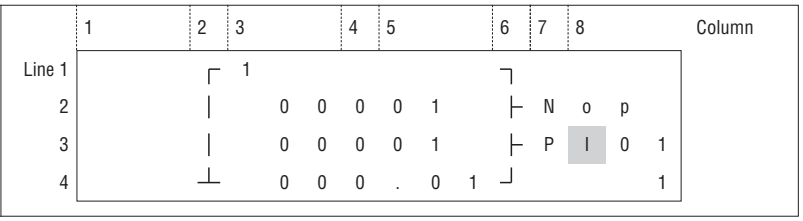
Step 9:

Press 'SEL'



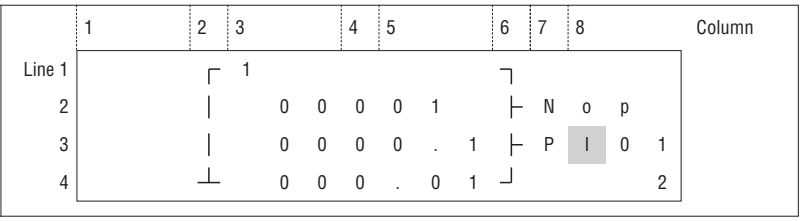
Step 10A:

Press 'SEL'



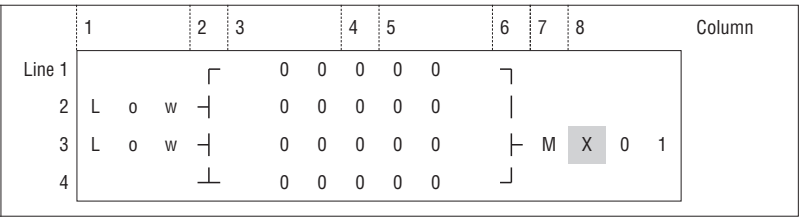
Step 10B:

Press 'SEL and then →'



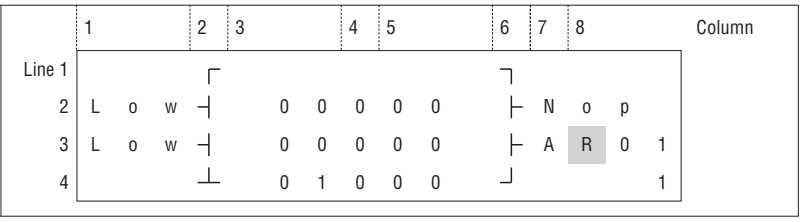
Step 11:

Press 'SEL'



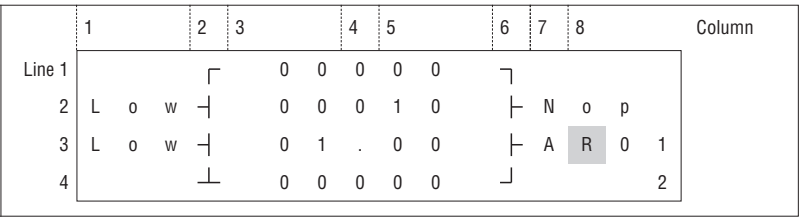
Step 12A:

Press 'SEL'



Step 12B:

Press 'SEL and then →'



Step 13:

Press 'SEL'