Digital
Human Machine Interface

Pro-face

Logic Relay

PRO-iO

Manual

Digital
Digital Electronics Corporation

Preface

Thank you for purchasing Pro-face's PRO-iO unit. The PRO-iO is an easy-to-use logic relay control unit that contains a variety of useful features. Also, the PRO-iO Editor software lets you easily modify all your ladder logic data (Calendar, timer, counter, input/output) and makes this unit useful in fields as diverse as Factory Automation (Machine assembly, etc.), Building Automation (Electric power control, air conditioning, etc.) as well as in agriculture, amusement parks, and other areas.

Please read this manual carefully as it explains, step by step, how to use the PRO-iO unit correctly and safely. Also, be sure to read this manual to fully understand the PRO-iO unit's correct installation procedures and features.

<Note>

1) It is forbidden to copy the contents of this manual, in whole or in part, except for the user's personal use, without the express permission of Digital Electronics Corporation of Japan.

2) The information provided in this manual is subject to change without notice.

3) This manual has been written with care and attention to detail. However, should you find any errors or omissions, please contact Digital Electronics Corporation and inform them of your findings.

4) Please be aware that Digital Electronics Corporation shall not be held liable by the user for any damages, losses or third party claims arising from any uses of this product.

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CHAPTER 3 OPERATING THE PRO-iO UNIT

CHAPTER 4 PRO-iO EDITOR

Essential Safety Precautions

This manual includes procedures that must be followed to operate the PRO-iO unit correctly and safely. Be sure to read this manual and any related materials thoroughly to understand the correct operation and functions of this unit.

Safety Icons

Throughout this manual the following icons are provided next to PRO-iO operation procedures requiring special attention, and provide essential safety information. These icons indicate the following levels of danger:

DANGER	Indicates situations where severe bodily injury, death or major equipment damage will occur.
WARNING	Indicates situations where severe bodily injury, death or major equipment damage can occur.
CAUTION	Indicates situations where bodily injury or machine damage can occur.

DANGERS

- **An emergency stop circuit and an interlock circuit should be constructed outside of this unit. Constructing these circuits inside this unit may cause a runaway situation, system failure, or an accident due to unit failure.**
- **A breakdown or malfunction in the output relay can lead to the output signal remaining ON or OFF. To prevent a unit malfunction, be sure to install an external circuit or device that will monitor the signal status and guarantee system operation safety.**
- **Systems using this unit should be designed so that output signals which would cause a serious accident are monitored from outside the unit.**

⚠ DANGERS

- **This unit is designed to be a general-purpose device for general industries and is neither designed nor produced to be used with equipment or systems in potentially life-threatening conditions. If you are considering using this unit for special purposes, including nuclear power control devices, electric power devices, aerospace equipment, medical life support equipment, or transportation vehicles, please contact your local PRO-iO distributor.**

⚠ WARNINGS

- **Whenever installing or dismantling wiring, and conducting maintenance or inspections, be sure to disconnect power to this unit to prevent the possibility of electric shock or fire.**
- **Do not disassemble or remodel this unit, since it may lead to an electric shock or fire.**
- **Do not use this unit in an environment that contains flammable gases, since an explosion may occur.**
- **Do not use this unit in an environment that is not specified in either the Installation Guide or this Manual. Otherwise, an electric shock, malfunction or other failure may occur.**
- **Because of the possibility of an electric shock or malfunction, do not touch any power terminals while the unit is operating.**

⚠ CAUTIONS

- **Communication cables or I/O signal lines must be wired separately from the main circuit (high-voltage, high-current line), high-frequency lines such as inverter lines, and power lines. Otherwise, a malfunction may occur due to noise.**
- **Be sure to install this unit according to directions in the Installation Guide and this Manual. Improper installation may cause the unit to malfunction or fail.**

CAUTIONS

- **Be sure to wire this unit according to directions in the Installation Guide and this Manual. Improper wiring may cause the unit to malfunction or fail.**
- **Do not allow foreign substances, including chips, wire pieces, water or liquids to enter inside this unit's case. Otherwise, a malfunction, failure, electric shock, or fire may occur.**
- **Be sure this unit is operated only by personnel trained in control system programming and design.**
- **Do not touch this unit with wet hands or wipe it with a wet cloth. Doing so may cause an electric shock or a fire.**
- **Be sure to install a fuse, breaker etc. in each of the power, input and output circuits. Failure to do so can lead to a fire if an overload occurs.**
- **Power and voltage specifications vary depending on the PRO-iO unit's model. Be sure to carefully read the directions in the Installation Guide and this Manual before turning ON this unit's power.**
- **When disposing of this unit, be sure to do so according to your country's standards for industrial waste disposal.**

■ To Prevent PRO-iO Unit Damage

- Do not operate this unit either in direct sunlight or excessively dusty or dirty environments.
- Because this unit is a precision instrument, do not store or use it in locations where excessive shocks or vibration may occur.
- Do not cover this unit's ventilation holes, or operate it in an environment that may cause it to overheat.
- Do not operate this unit in locations where sudden temperature changes can cause condensation to form inside the unit.
- Do not use paint thinner or organic solvents to clean this unit.

Documentation Conventions

The list below describes the documentation conventions used in this manual.

Symbol	Meaning
	Indicates important information or procedures that must be followed for correct and risk-free software/device operation.
	Provides useful or important supplemental information.
***1**	Indicates useful or important supplemental information.
Reference	Refers to useful or important supplemental information.
1), 2)	Indicates steps in a procedure. Be sure to perform these steps in the order given.

About PRO-iO

The features of each PRO-iO unit (No. of Input/Output points, Calendar, Analog Comparator, REMANENZ, Online Monitoring Mode) will vary depending on the model. For how to identify your PRO-iO unit's model number,

Reference *"Model Identification"*

Model	Voltage	No. of Input/ Output points	Calendar	Analog Comparator	REMANENZ	Online Monitoring Mode
DR1-A101BD	24VDC	6 / 4	No	No	No	No
DR1-B121BD	24VDC	8 / 4	Yes	Yes	Yes	Yes
DR1-A201BD	24VDC	12 / 8	No	No	No	No
DR1-B201BD	24VDC	12 / 8	Yes	Yes	Yes	Yes
DR1-A101FU	100VAC to 240VAC	6 / 4	No	No	No	No
DR1-B101FU	100VAC to 240VAC	6 / 4	Yes	No	Yes	Yes
DR1-A201FU	100VAC to 240VAC	12 / 8	No	No	No	No
DR1-B201FU	100VAC to 240VAC	12 / 8	Yes	No	Yes	Yes

- **For PRO-iO unit feature differences,**
  Reference *"3.1.4 Feature Differences"*
- **Even though circuit programming is possible using only the PRO-iO main unit, the easy-to-use PRO-iO software is recommended.**
- **You can test and debug logic programs via the PRO-iO Editor's Simulation feature before actually downloading the program to your PRO-iO unit.**

About PRO-iO Editor

PRO-iO Editor is a Windows®-based, easy-to-use software that has the following features:

- 3 edit modes:
  - Ladder Logic
  - Electrical Circuit Diagram Method
  - PRO-iO Symbols
- Simulation feature (The PRO-iO main unit is not required to determine if the ladder program operates correctly)
- Monitor PRO-iO unit operation via the PC (PRO-iO Editor), for DR1-B***** PRO-iO units
- Transfer circuit data from the PC to the PRO-iO unit, or vice-versa
- Program Validation Check Feature (Between the PRO-iO main unit and PRO-iO Editor)
- Creating Display Messages
- Automatic insertion of connecting lines

For PRO-iO Editor details,

Reference *"CHAPTER 4 PRO-iO EDITOR"*

Optional Items

The following tables describe PRO-iO related software and optional items. Please note that all optional items are sold separately.

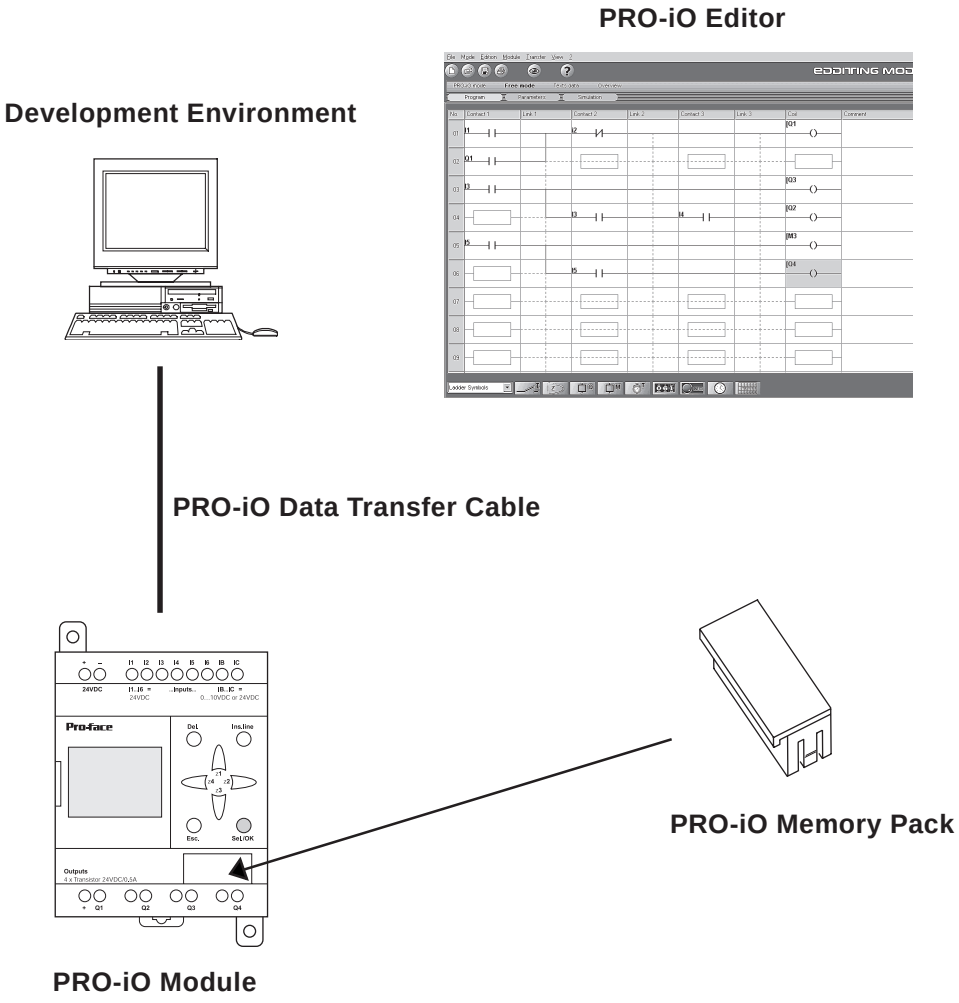
■ Related Software

Name	Model	Description
PRO-iO Editor	DR1-SFT01J	Logic Program Development

■ Options

Name	Model	Description
PRO-iO Data Transfer Cable	DR1-CBL01	For connecting the PRO-iO unit to the PC to transfer logic programs.
PRO-iO Memory Pack	DR1-MEM01	To backup logic programs. It is also possible to copy backed up logic programs to other PRO-iO units.

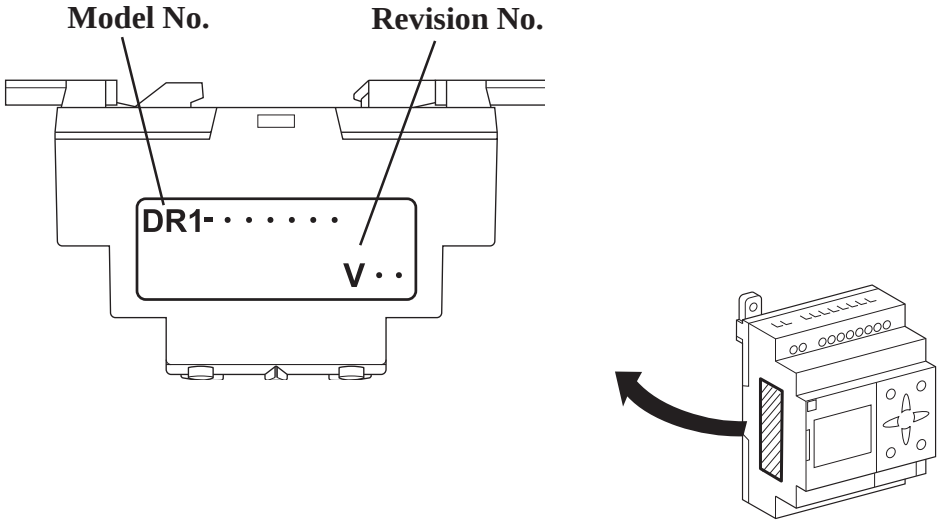
■ Product Usage Environment



Model Identification

Model identification information can be found on your PRO-iO unit's label.

Model and revision no. information will be in the following locations:



UL/c-UL (CSA) Application Notes

Pro-face's PRO-iO units are UL/c-UL (CSA) listed products.

(**UL File No. E220851**)

The PRO-iO unit conforms to the following standards:

- UL 508 Electrical Control System for Industry

- CAN/CSA-C22.2, No.142-M1987 Electrical Control System for Industry

DR1-A101BD (UL Registration Model No. : DR1-A101BD)

DR1-B121BD (UL Registration Model No. : DR1-B121BD)

DR1-A201BD (UL Registration Model No. : DR1-A201BD)

DR1-B201BD (UL Registration Model No. : DR1-B201BD)

DR1-A101FU (UL Registration Model No. : DR1-A101FU)

DR1-B101FU (UL Registration Model No. : DR1-B101FU)

DR1-A201FU (UL Registration Model No. : DR1-A201FU)

DR1-B201FU (UL Registration Model No. : DR1-B201FU)

<**Notes**>

- Pro-face's PRO-iO unit is designed to be used only when installed in other equipment.
- If the unit is installed in an area with no air conditioning system, be sure to install it on a DIN rail or in a vertical panel using screw attachment holes. Also, be sure the unit is installed so it is at least 100 mm away from any adjacent structures or devices. If these requirements are not met, the heat generated by the unit's internal components may cause it to fail to meet UL standard requirements.
- The power supply connected to the I/O unit must be a UL/c-UL (CSA) approved Class 2 power supply or Class 2 transformer[*1].

  When the PRO-iO units under load are operated with a single power supply, the amount of current consumption and full-load current of the I/O units must be within the rated load of the Class 2 power supply unit or Class 2 power supply transformer. Be aware that the number of points which can be turned ON simultaneously may be limited, depending on the amount of load and the load current value.

**1 Class 2 power supplies and Class 2 transformers should not exceed an output of 30V, and at 8A or less, should not exceed 100VA. (National Electrical Code)*

CE Marking Notes

Pro-face's PRO-iO units are CE Marked units that conform to EMC directives EN55011 Class A and EN61000-6-2.

The following PRO-iO unit models comply with EMC directives:

DR1-A101BD

DR1-B121BD

DR1-A201BD

DR1-B201BD

DR1-A101FU

DR1-B101FU

DR1-A201FU

DR1-B201FU

<**Caution**>

While this unit is officially marked as conforming to the relevant EMC directives, it is the user's final application of this unit in a larger system (I.e., the machinery, wiring, control panel, installation method, etc.) that will determine if this unit maintains or loses this conformance marking. Therefore, it is strongly advised that the user investigate and confirm whether their overall system (I.e. all related machinery and equipment) also conforms with these EMC directives.

For details regarding CE Marking, please contact your local PRO-iO distributor.

Chapter 1 PRO-iO (Hardware)

1. General Specifications
2. Part Names and Functions
3. Dimensions

1.1 General Specifications

1.1.1 Electrical (Power)

■ DR1-****BD (DC Power)

Rated Voltage	24VDC
Allowable Voltage Range	19.2VDC to 30VDC
Allowable Voltage Drop	1ms or less
Current Consumption	DR1-*1**BD 83mA DR1-*201BD 130mA
In-Rush Current	30A or less
Insulation Endurance	1500VAC 5mA for 1 minute (Between output terminals and DIN Rail)
Insulation Resistance	100MΩ or higher at 500VDC (Between output terminals and DIN Rail)

■ DR1-**01FU (AC Power)

Rated Voltage	100VAC to 240VAC
Allowable Voltage Range	85VAC to 264VAC
Rated Frequency	50Hz / 60Hz
Allowable Frequency Range	47Hz to 63Hz
Allowable Voltage Drop	10ms or less
Current Consumption	DR1-*101FU 50mA (100V) 27mA (240V) DR1-*201FU 80mA (100V) 40mA (240V)
In-Rush Current	30A or less
Insulation Endurance	1500VAC 5mA for 1 minute (Between output terminals and DIN Rail)
Insulation Resistance	100MΩ or higher at 500VDC (Between output terminals and DIN Rail)

1.1.2 Environmental

Ambient Operating Temperature	0^{o}C to 55^{o}C (Includes unit's display)
Storage Temperature	-25^{o}C to $+70^{o}$C
Ambient Humidity	95%RH or less (No condensation, wet bulb temperature: 39^{o}C)
Storage Humidity	95%RH or less (No condensation, wet bulb temperature: 39^{o}C)
Pollution Degree	Level 2
Atmospheric Pressure (Operating Altitude)	800hPa to 1114hPa (At 2000m or less)
Vibration Endurance	IEC68-2-6 Compliant 10Hz to 57Hz 0.075mm 57Hz to 150Hz $9.8m/s^2$ X, Y, Z directions 10 times each (80 minutes)
Shock Endurance	IEC68-2-27 Compliant ($147m/s^2$, 3 times in X, Y, and Z directions)
Electrostatic Discharge Immunity	Contact discharge 4kV (IEC61000-4-2 level 2)
Electric Field Endurance	IEC61000-4-3 level 3
First Transient Endurance	IEC61000-4-4 level 3
Surge Endurance	IEC61000-4-5 level 3

1.1.3 Structural

Ratings	Equivalent to IP20
Cooling Method	Natural air circulation
Weight	DR1-*1**** : 290g or less DR1-*2**** : 350g or less
External Dimensions	DR1-*1**** W72mm[2.83in.] x D110mm[4.33in.] x H61mm[2.40in.] or less (Main unit only, including projections)
	DR1-*2**** W126mm[4.96in.] x D110mm[4.33in.] x H61mm[2.40in.] or less (Main unit only, including projections)

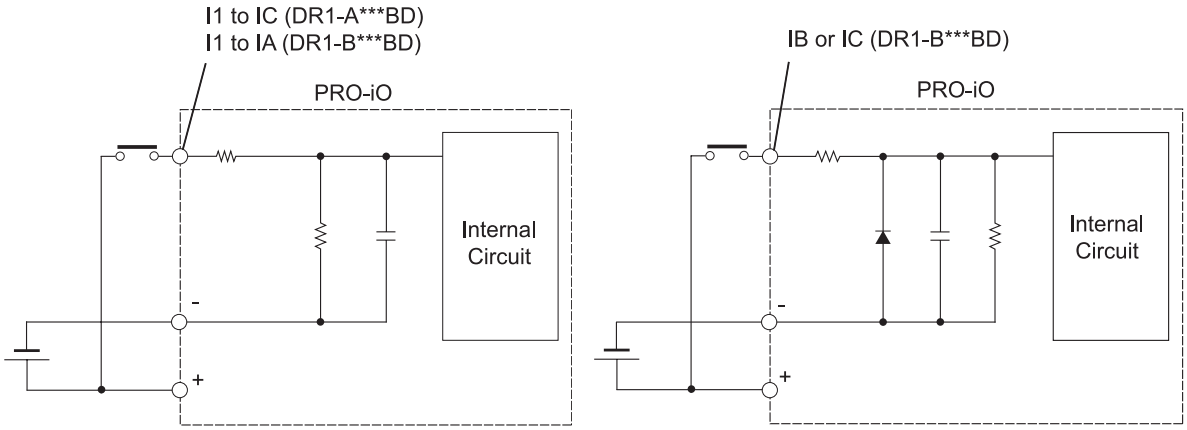
1.1.4 DC Input (DR1-****BD)

Input Points		DR1-A***BD: I1 to IC DR1-B***BD: I1 to IA	DR1-B***BD: IB, IC[*1]
Input Voltage		24VDC	
Allowable Voltage Range		19.2VDC to 30VDC	
Rated Current		3mA (24VDC)	0.62mA (24VDC)
Input Impedance		8kΩ (at ON)	38kΩ (at ON)
No. of Input Points		6 Points (DR1-A101BD)	
		8 Points (DR1-B121BD)	
		12 Points (DR1-*201BD)	
Operating Voltage	**ON Voltage**	15VDC or more (1.8mA or more)	9.9VDC or more (0.16mA or more)
	OFF Voltage	5VDC or less (0.5mA or less)	5VDC or less (0.08mA or less)
Input Delay	**OFF -> ON**	0.3ms (Fast) / 3ms (Slow)[*2]	3ms (Fixed)
	ON -> OFF	0.5ms (Fast) / 5ms (Slow)[*2]	5ms (Fixed)
Input Signal Display		via LCD	
Insulation Method		No insulation between input points, and between input points and power supply	

**1 Terminals IB and IC can also be used as analog inputs.*

**2 This setting is common for all points.*

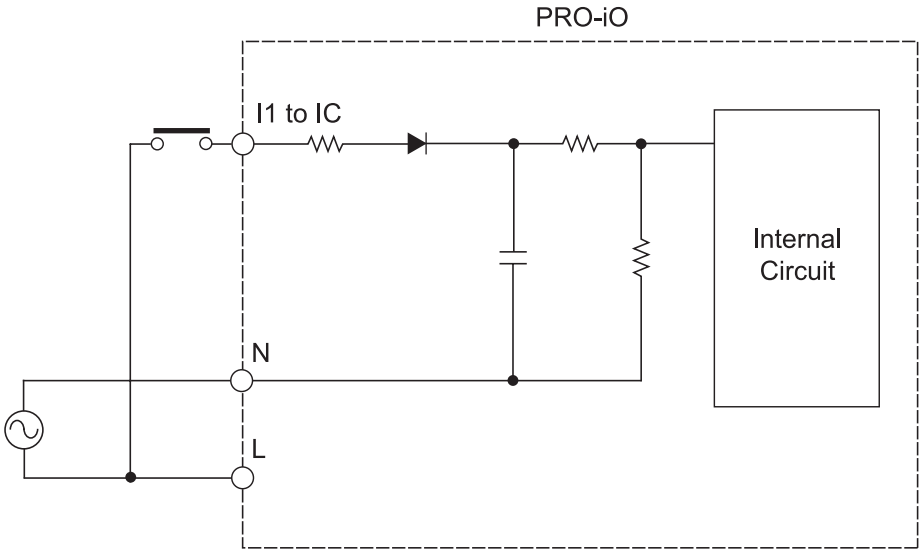
■ DR1-****BD Input Circuit (DC Input)



1.1.5 AC Input (DR1-****FU)

PRO-iO Unit Model		DR1-*101FU	DR1-*201FU
Input Voltage		100VAC to 240VAC	
Allowable Voltage Range		85VAC to 264VAC	
Frequency Range		47Hz to 63Hz	
Rated Current		0.6mA (100VAC) 1.4mA (240VAC)	0.9mA (100VAC) 2.0mA (240VAC)
No. of Input Points		6 Points	12 Points
Operating Voltage	ON Voltage	79VAC or more (0.4mA or more)	
	OFF Voltage	40VAC or less (0.3mA or less)	
Input Delay	OFF -> ON	50ms (100VAC) / 22ms (240VAC)	
	ON -> OFF	50ms (100VAC) / 90ms (240VAC)	
Input Signal Display		via LCD	
Insulation Method		No insulation between input points, and between input points and power supply	

■ DR1-**01FU Input Circuit (AC Input)

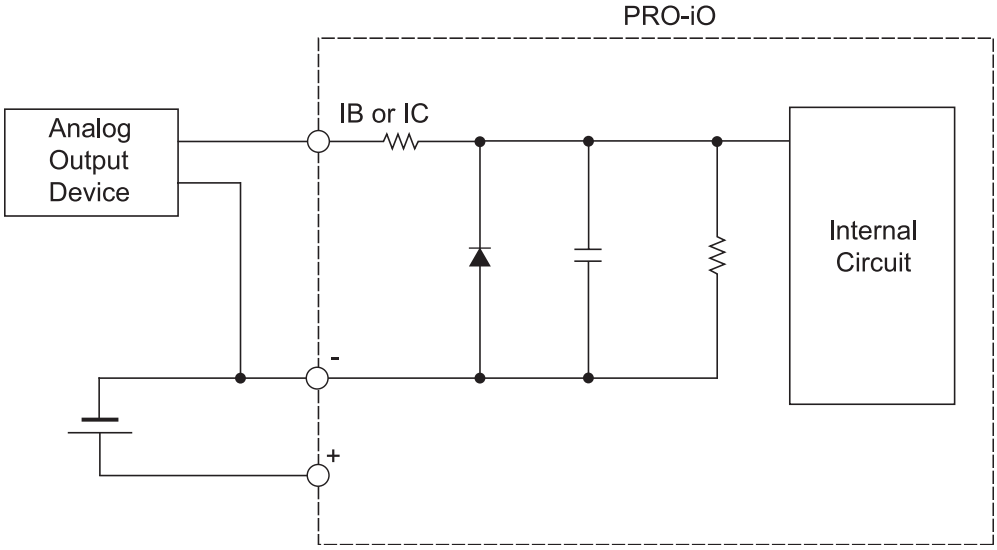


1.1.6 Analog Comparator Input (DR1-B121BD, DR1-B201BD)

No. of Input Channels	2 (IB and IC)
Input Voltage Range	0V to 10V
Resolution	8 bits (0V to 10V)
Accuracy	Full-scale value ± 1.6% (at 25°C) Full-scale value ± 2.9% (at 55°C)*1
Absolute Max Input	30VDC (Voltage)
Input Filter	None
Input Impedance	62.5kΩ
Insulation Method	No insulation between analog inputs, and between analog input section and power supply

**1 This accuracy may not be possible if there is a large amount of noise.*

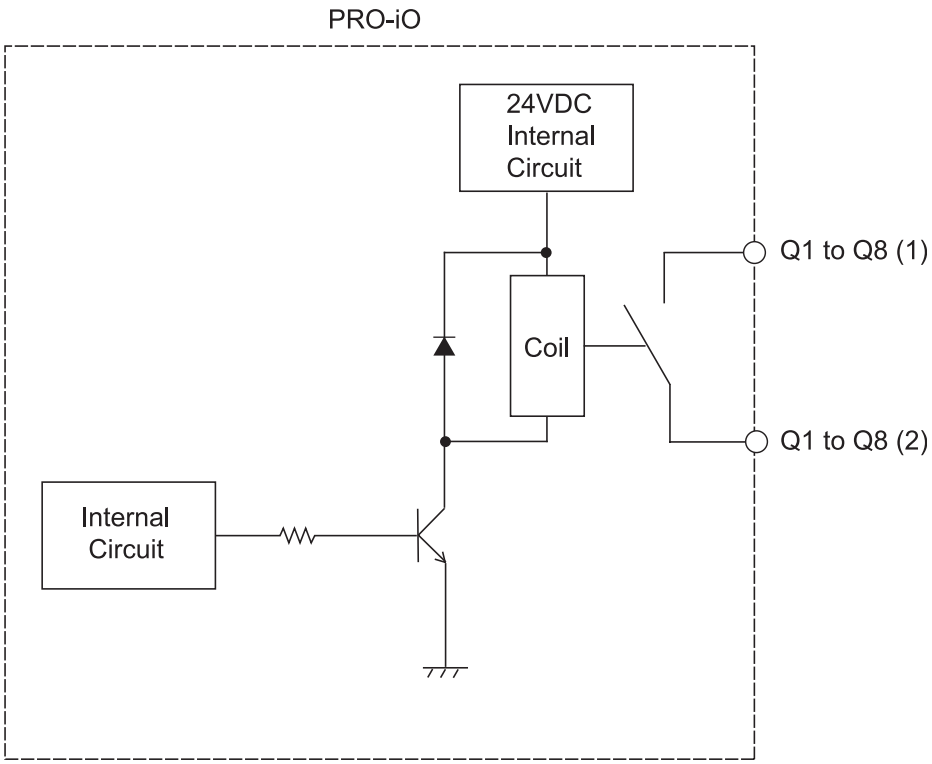
■ Analog Input Circuit



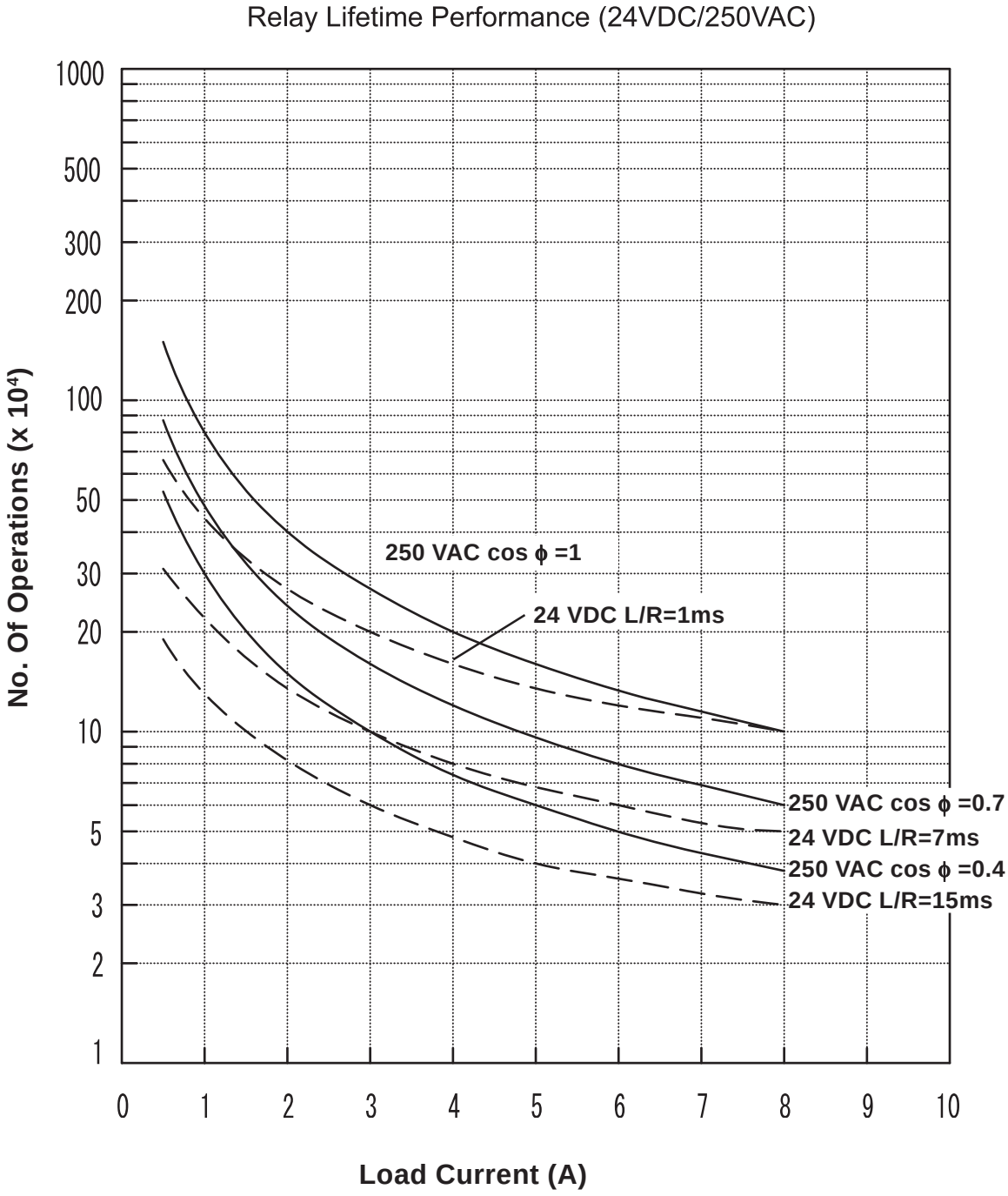
1.1.7 Relay Output

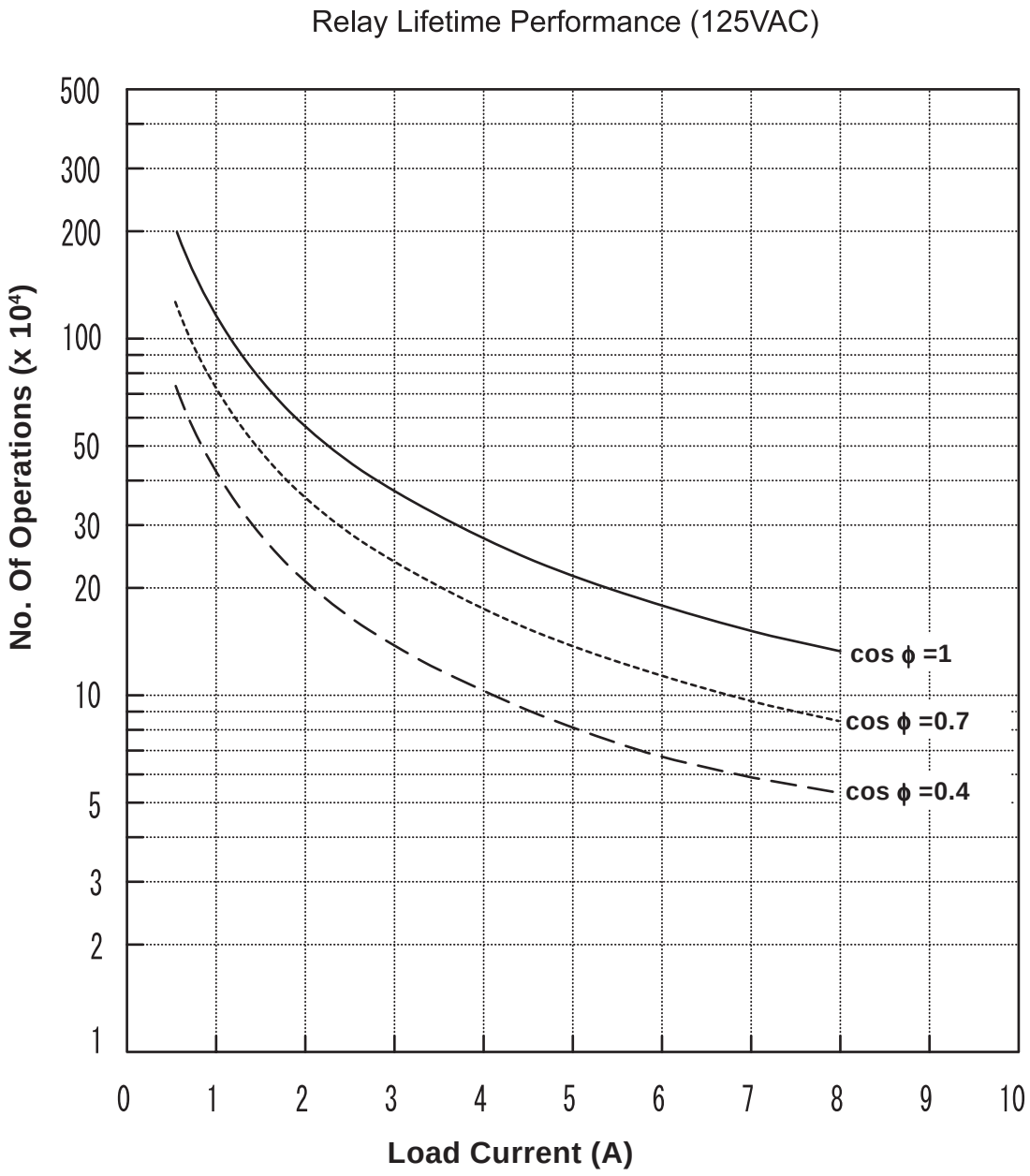
Rated Output Voltage		5VDC to 30VDC, 24VAC to 250VAC
No. of Output Points		4 Points (DR1-*1****)
		8 Points (DR1-*2****)
Load Current		8A/24VDC, 250VAC
Common		Independent Common
Mechanical Life		20 million operations
Electrical Life		100,000 operations at contact rated load (See relay durability curve on the next page)
Min. Open/Close Load		17V, 5mA
Built-in Fuse		None
Voltage Endurance		2.5kV (IEC947-1)
Output Signal Display		via LCD
Short Circuit Protection		None
Over Voltage and Over Current Protection		None
Output Delay	**OFF -> ON**	10ms or less
	ON -> OFF	5ms or less

■ Relay Output Circuit

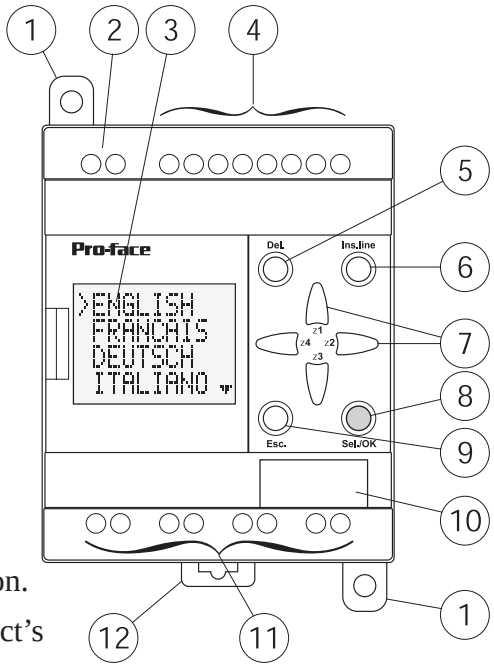


■ Relay Durability Curves




Relay Lifetime Performance (125VAC)
No. Of Operations (x 10⁴)
500
300
200
100
50
30
20
10
5
3
2
1
0
1
2
3
4
5
6
7
8
9
10
Load Current (A)
cos ϕ =1
cos ϕ =0.7
cos ϕ =0.4

1.2 Part Names and Functions



(1) **Unit attachment tab** (Retracting type)
Used to fasten the main unit to a solid panel.

(2) **Power terminals**

(3) **LCD display screen**

(4) **Input terminals**[*1]

(5) **Del. key (Delete key)**
Deletes a contact or a coil.

(6) **Ins.line key** (Line insert key)
Inserts a rung (a line connecting two instructions)

(7) **Z keys**
Used to move the cursor's position. They can also function as a contact's open/close button when creating/modifying a logic program. For details regarding settings,
Reference *"3.3 Display Screen and Menu Screen"*

(8) **Sel./OK key**
Registers the desired operation or selection.

(9) **Esc. key** (Escape key)
Cancels a setting selection, or returns to the next higher level menu.

(10) **PRO-iO Data Transfer Cable and PRO-iO Memory Pack Connector**

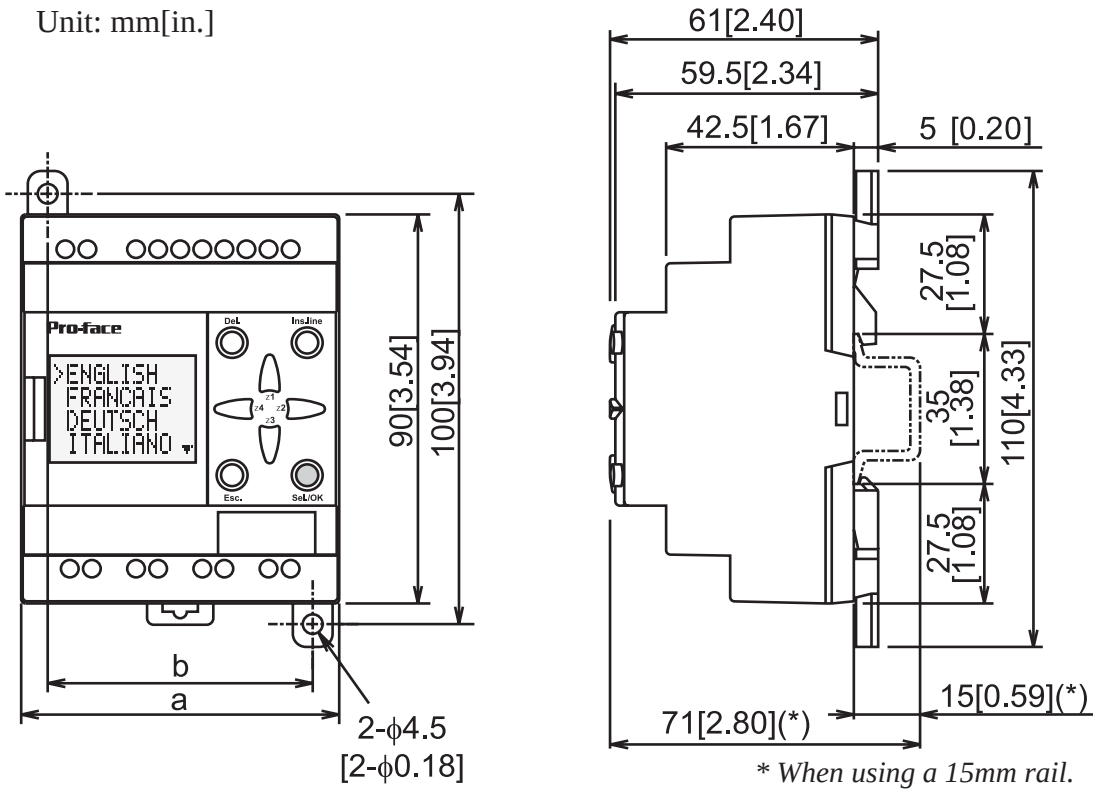
(11) **Relay Output Terminals**
Depending on the model, there are 4 (Q1 to Q4) or 8 (Q1 to Q8) output terminals.

(12) **DIN Rail detachment hook**
Used when detaching the main unit from a DIN Rail.

**1 IB and IC are used as input terminals in the analog comparator feature. For details,*
Reference *"2.2.4 Analog Connection (DR1-B121BD)", "2.2.5 Analog Connection (DR1-B201BD)"*
When the analog comparator feature is not used, IB and IC can be used as normal input terminals. However, their input specifications differ from terminals I1 to IA. For details,
Reference *"1.1.4 DC Input (DR1-****BD)"*

1.3 Dimensions

Unit: mm[in.]



** When using a 15mm rail.*

External dimensions for “a” and “b” vary depending on the model, as shown below:

	DR1-*1****	DR1-*2****
a	72 [2.83]	126 [4.96]
b	60 [2.36]	110 [4.33]

When fastening the PRO-iO unit to a panel, extend the unit’s attachment tabs and attach the unit to the panel using attachment screws. When fastening the PRO-iO unit to a DIN rail, retract the unit’s attachment tabs.

Chapter 2 Installation and Wiring

This chapter explains the PRO-iO unit's installation and wiring procedures.

2.1 Installation

⚠ WARNING

Before installation, be sure to disconnect power to this unit to prevent the possibility of electric shock.

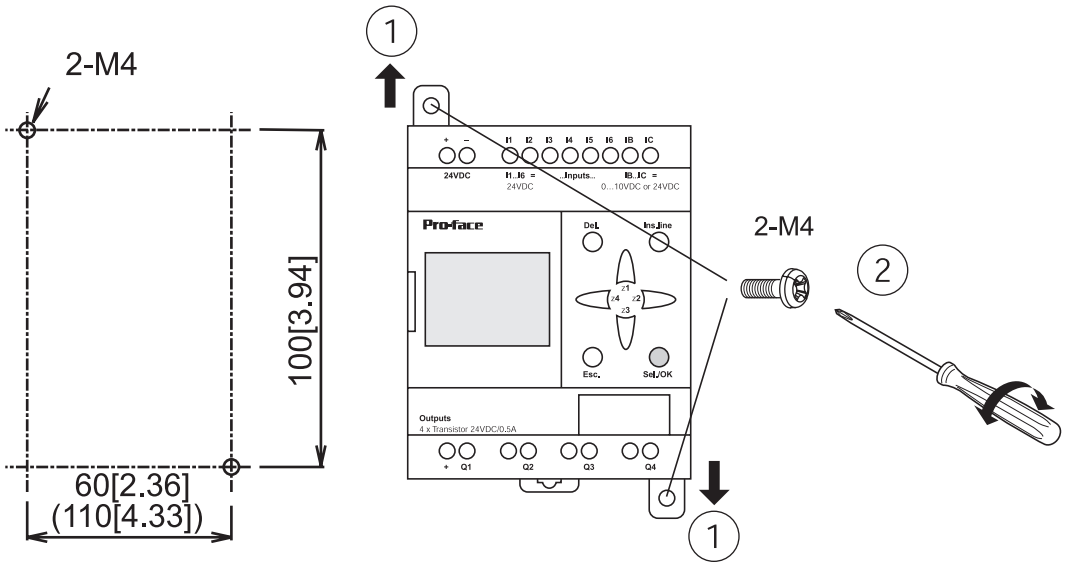
2.1.1 Direct Installation (To a panel)

Create two M4 size attachment screw holes using the dimensions shown below, and position the unit so that its unit attachment tabs (Top and bottom) align with the attachment screw holes. Secure the unit in place using M4 attachment screws. The attachment tabs are 5 mm thick.

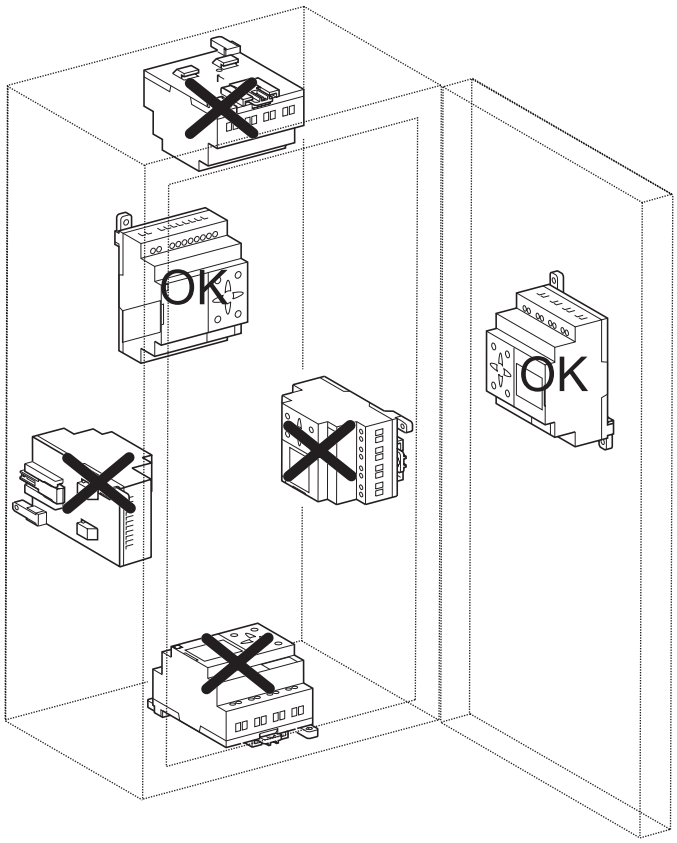
Reference *"1.3 Dimensions"*

The necessary torque is 1.2 N•m to 1.4 N•m. The value in () indicates measurements for DR1-*2**** PRO-iO units.

Unit: mm[in.]

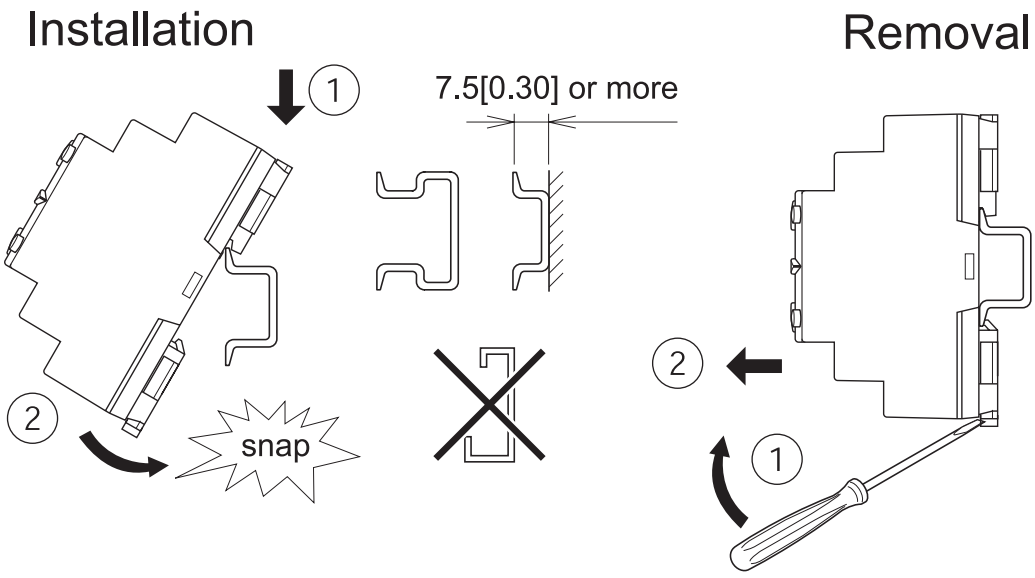


■ Panel Installation Direction



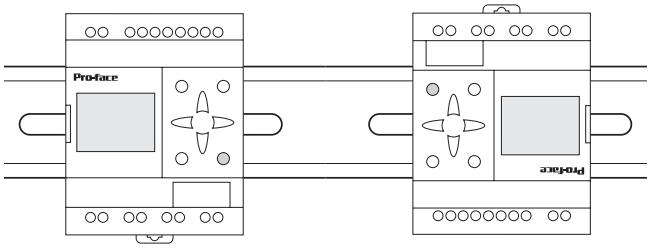
2.1.2 DIN Rail Installation

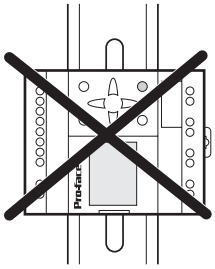
Confirm that the DIN rail detachment hook is raised and the unit is held securely.



Note: **When attaching the PRO-iO unit to a panel, extend the unit's attachment tabs and attach the unit to the panel using attachment screws. When attaching the PRO-iO unit to a DIN rail, retract the unit's attachment tabs.**

■ DIN Rail Installation Direction





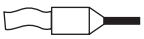
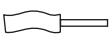
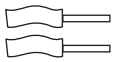
2.2 Wiring

⚠ WARNING

Before wiring, be sure to disconnect power to this unit to prevent the possibility of electric shock.

■ Wiring

The following types of wires can be used for wiring:

Wire Type	Blade-type Terminal	Lay Wire	Simple Wires	
				
mm^2	0.14 to 1.5	0.14 to 2.5	0.14 to 2.5	0.14 to 1.5
AWG*1	——	26 to 14	26 to 14	26 to 16

**1 AWG stands for "American Wire Gauge" and indicates conductor thickness.*

- ***Peel back the wire's plastic covering to expose approximately 8mm of bare wire.***
- ***When using a lay wire, Pro-face recommends you install a blade-type terminal connector.***
- ***The torque required is 0.4N•m.***

2.2.1 DC Power Units

The following 4 PRO-iO units use DC power:

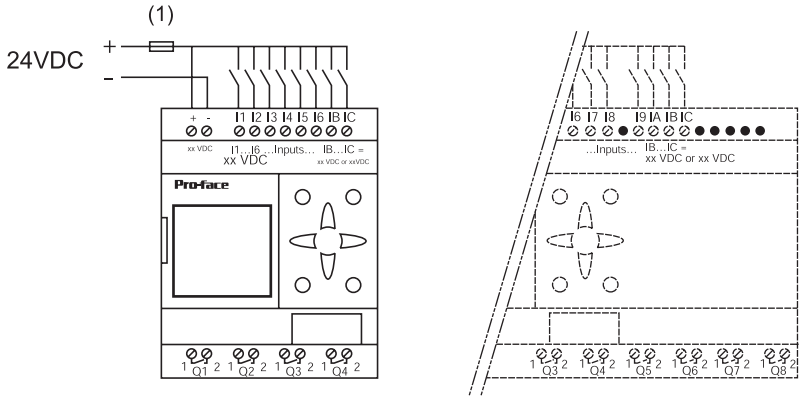
DR1-A101BD

DR1-B121BD

DR1-A201BD

DR1-B201BD

Be sure to perform the PRO-iO unit wiring as shown in the wiring diagram below.



(1) 1A Fuse (Fast-break type)

2.2.2 AC Power Units

The following 4 PRO-iO units use AC power:

DR1-A101FU

DR1-B101FU

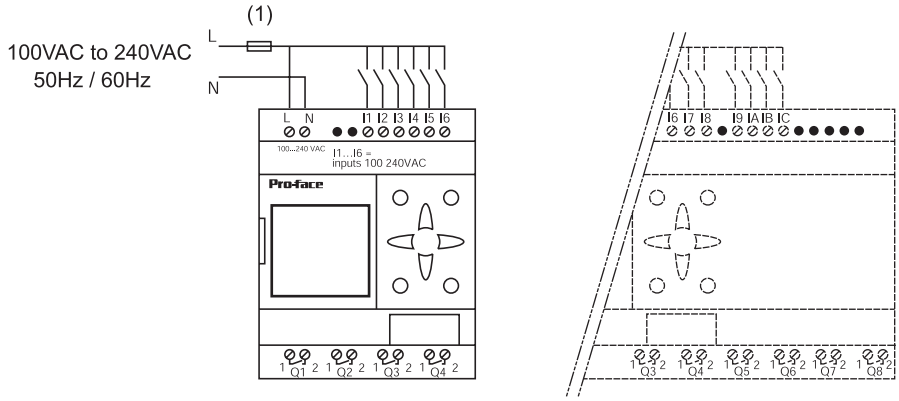
DR1-A201FU

DR1-B201FU

⚠ WARNING

There are two AC input terminals: L (Live, not grounded) and N (Neutral, grounded). Be sure to connect the L terminal to the power supply's non-earthed terminal, and the N terminal to the power supply's earthed terminal. In case of a power supply fault (AC line and earth line being shorted), the fuse connected to the L terminal will break and stop the flow of power.

Be sure to perform the PRO-iO unit wiring as shown in the wiring diagram below.



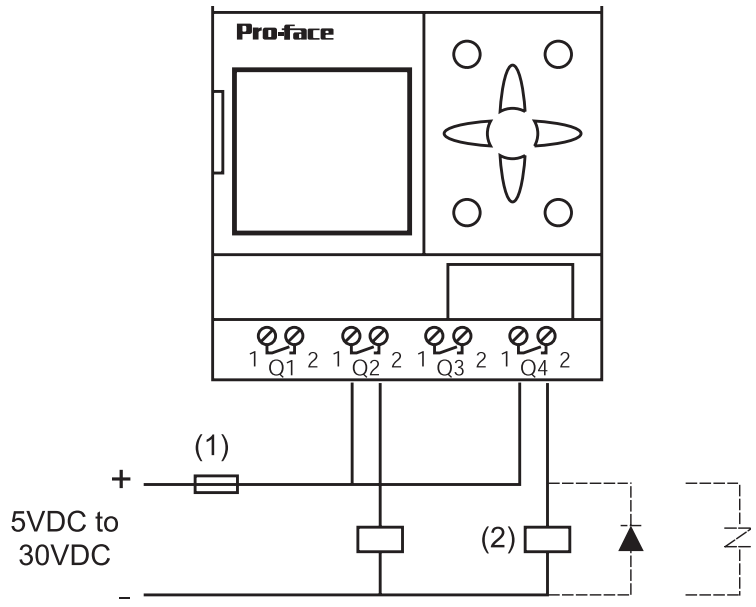
(1) 1A Fuse (Fast-break type)

2.2.3 Relay Output Wiring

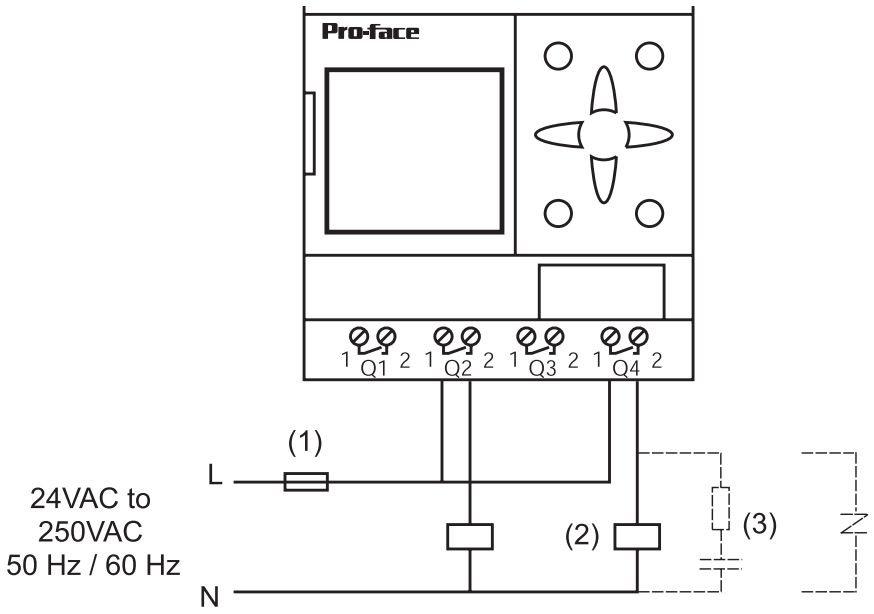
When operating devices with inductive loads, such as magnets and valves, be sure to use a diode or a varistor for DC power units, and a surge killer or a varistor for AC power units.

Also, to protect the power supply and output, Pro-face recommends you connect a fuse.

■ DC Power Units



■ AC Power Units



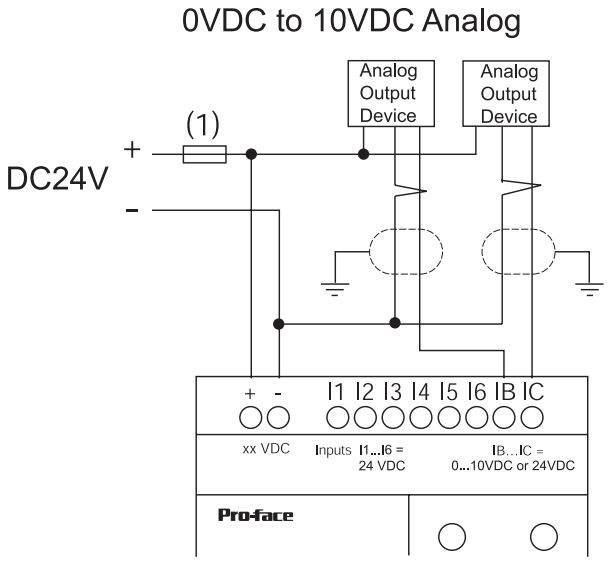
(1) Fuse (Up to 16A) or circuit breaker.

(2) When opening / closing the inductance load, be sure to connect a diode, surge killer, etc. parallel to the load.

(3) Surge killer.

2.2.4 Analog Connection (DR1-B121BD)

The DR1-B121BD PRO-iO unit's analog connection diagram is shown below. Connect the analog output lines to terminals IB and IC as shown in the diagram.



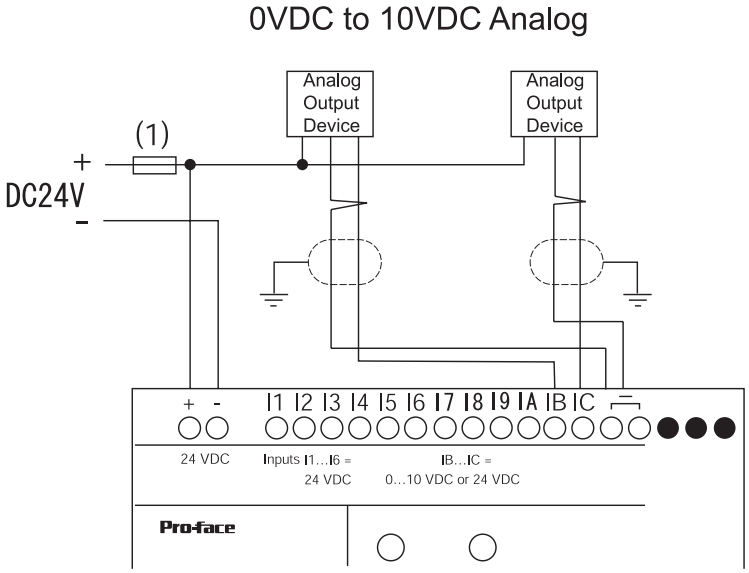
Do not use negative voltages for the analog inputs IB and IC. Doing so can damage the internal circuit.

When connecting the PRO-iO unit to an Analog Output Device, be sure to design the cable (Length, etc.) according to the Analog Output Device's Operation Manual output specifications.

(1) 1A Fuse (Fast-break type)

2.2.5 Analog Connection (DR1-B201BD)

The DR1-B201BD PRO-iO unit's analog connection diagram is shown below. Connect the analog output lines to terminals IB and IC as shown in the diagram.



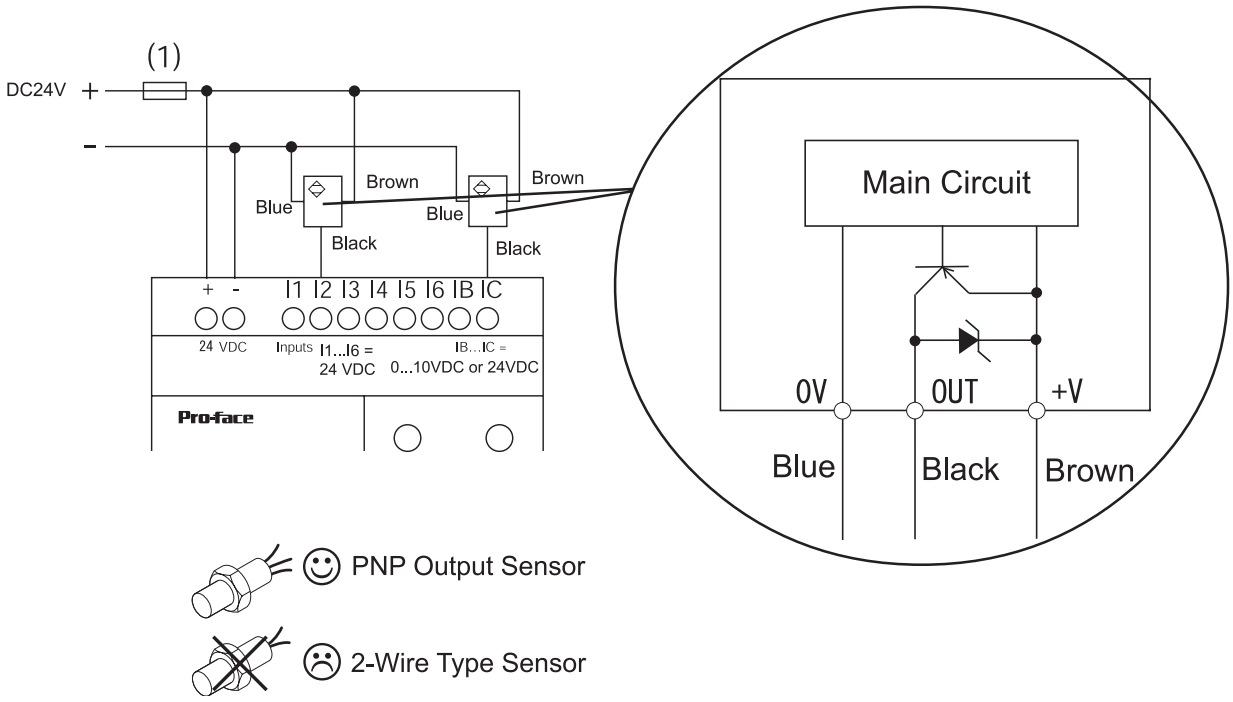
Do not use negative voltages for the analog inputs IB and IC. Doing so can damage the internal circuit.

When connecting the PRO-iO unit to an Analog Output Device, be sure to design the cable (Length, etc.) according to the Analog Output Device's Operation Manual output specifications.

(1) 1A Fuse (Fast-break type)

2.2.6 Sensor Connection (DR1-B121BD)

The DR1-B121BD PRO-iO unit's PNP output sensor connection diagram is shown below.



When connecting directly to this unit's input circuit, be sure to use a PNP output-type sensor. You cannot connect directly using a 2-Wire type sensor or a NPN-type sensor.

(1) 1A Fuse (Fast-break type)

■ Example NPN-type Sensor Connection

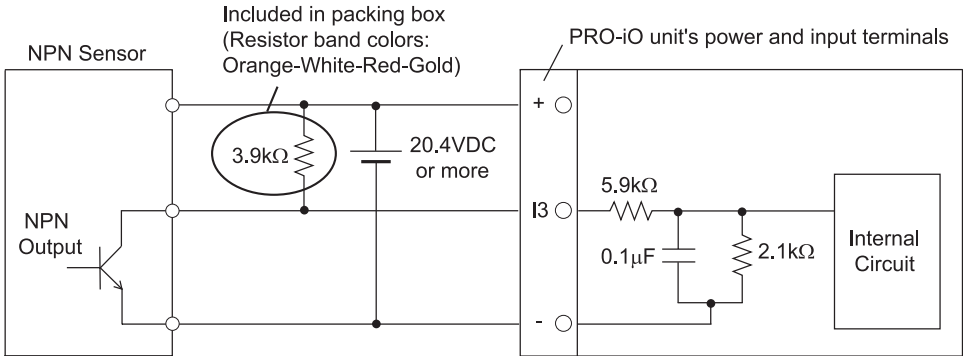
To connect an NPN sensor to the PRO-iO unit, first connect the appropriate resistor using external wiring, as shown in the following circuit diagrams. After that, connect the resistor. Be sure that the logic program's input logic is reversed from a standard PNP sensor.

For DR1-****BD units, the following resistors are included in the package:

12 3.9kΩ resistors (Band colors: Orange-White-Red-Gold)

2 36kΩ resistors (Band colors: Orange-Blue-Orange-Gold)

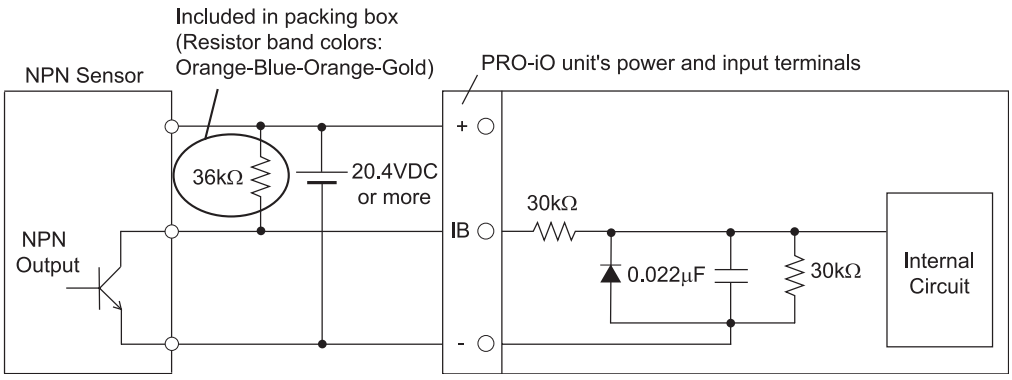
◆ When connecting an NPN sensor to a DR1-A***BD unit's I1 to IC input terminals, or to a DR1-B***BD unit's I1 to IA input terminals



Important

- ***The above circuit's input logic is reversed from the PNP.***
- ***When an NPN sensor is connected, use an external resistance of 3.9kΩ and 1/2W or more.***

◆ When connecting an NPN sensor to a DR1-B***BD unit's IB or IC input terminals



Important

- ***The above circuit's input logic is reversed from the PNP.***
- ***When an NPN sensor is connected, use an external resistance of 36kΩ and 1/4W or more.***

Memo

Chapter 3 Operating the PRO-iO Unit

♦ **Logic Program Creation**

PRO-iO Unit Program Creation
Reference *"CHAPTER 3 OPERATING THE PRO-iO UNIT"*

PRO-iO Editor Software Program Creation
Reference *"CHAPTER 4 PRO-iO EDITOR"*

3.1 Basic Operation and Commands

3.1.1 Basic Operation

Initial Settings and Logic Program Editing are performed via the PRO-iO unit front face's operation keys. The function of each key is explained below:

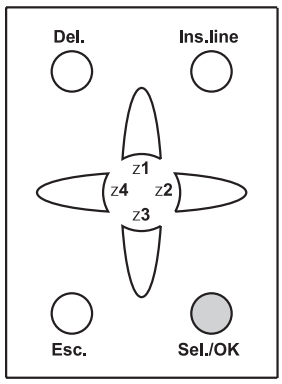
Sel./OK : Registers the desired operation or selection.

Esc. : Cancels a setting selection, or returns to the next higher-level menu.

Z1, Z2, Z3, Z4: Used to move the cursor's position or to select a menu option.

Del. : Deletes a contact or a coil.

Ins.line : Inserts a rung (A line connecting two instructions).



3.1.2 Contacts / Coils

■ Contacts

Symbol	Number	Description
I	I1 to IC[*1]	a contact (Physical input)
i	i1 to iC[*1]	b contact (Physical input)
Q	Q1 to Q8[*2]	a contact (Physical output)
q	q1 to q8[*2]	b contact (Physical output)
Z	Z1 to Z4	a contact (Z key)
z	z1 to z4	b contact (Z key)
M	M1 to MF	a contact (Auxiliary coil)
m	m1 to mF	b contact (Auxiliary coil)
T	T1 to TA[*3]	a contact (Timer)
t	t1 to tA[*3]	b contact (Timer)
C	C1 to CA[*3]	a contact (Counter)
c	c1 to cA[*3]	b contact (Counter)
A	A1 to A8	a contact (Analog comparator)
a	a1 to a8	b contact (Analog comparator)
	 1 to  4[*4]	a contact (Calendar)
	 1 to  4[*4]	b contact (Calendar)

1 Applies to DR1-*201 PRO-iO units (12 points). The DR1-B121BD PRO-iO unit has 8 input points, and the DR1-*101** PRO-iO unit has 6. For how to identify your PRO-iO unit's model number,*

Reference *"Preface - Model Identification"*

2 Applies to DR1-*201 PRO-iO units (8 points). The DR1-*1*1** PRO-iO unit has 4 output points.*

3 Applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range is 8 points.*

4 Applies to PRO-iO units equipped with the calendar function. (DR1-B*** PRO-iO units)*

■ Coils

Device	Symbol	Number	Description
Q	⌈	⌈Q1 to ⌈Q8[*1]	Normal coil
	⌋⌈	⌋⌈Q1 to ⌋⌈Q8[*1]	Reverse when condition is true (Rising)
	S	SQ1 to SQ8[*1]	Set coil
	R	RQ1 to RQ8[*1]	Reset coil
M	⌈	⌈M1 to ⌈MF	Normal coil
	⌋⌈	⌋⌈M1 to ⌋⌈MF	Reverse when condition is true (Rising)
	S	SM1 to SMF	Set coil
	R	RM1 to RMF	Reset coil
T	TT	TT1 to TTA[*2]	Timer start coil
	TR	RT1 to RTA[*2]	Timer reset coil
C	CC	CC1 to CCA[*2]	Counter coil
	CR	CR1 to CRA[*2]	Counter reset coil
	DC	DC1 to DCA[*2]	Count direction designation coil
X	TX	TX1 to TX6[*3]	Text show coil
	RX	RX1 to RX6[*3]	Text hide coil

1 Applies to DR1-*201 PRO-iO units (8 points). For DR1-*1*1** PRO-iO units, the range is 4 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

2 Applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range is 8 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

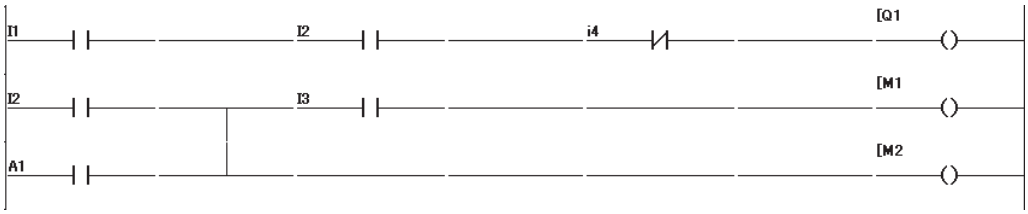
3 Applies to DR1-B*** PRO-iO units (6 points). For DR1-A***** PRO-iO units, the range is 4 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

3.1.3 Maximum Number of Program Lines

The Maximum Number of Program Lines varies depending on the PRO-iO unit's model number, as shown in the table below.

PRO-iO Unit Model	Maximum Number of Program Lines
DR1-A101BD	60 Rungs
DR1-B121BD	
DR1-A101FU	
DR1-B101FU	
DR1-A201BD	80 Rungs
DR1-B201BD	
DR1-A201FU	
DR1-B201FU	

A program rung can have a maximum of three contacts and one coil. Depending on the PRO-iO unit model, a maximum of 60 or 80 rungs may be used. The following example program consists of three (3) rungs:



3.1.4 Feature Differences

Feature	DR1-A*****	DR1-B*****
Timer	Up to 8	Up to 10
Counter	Up to 8	Up to 10
Calendar Retention Time	Not available	150 hours*1
Text	Up to 4	Up to 6
Save Data (Power outage backup)	Only program	Program, M1 to MF, T1, T2, C1 to C5*2
Online Monitoring Mode	Not available	Possible
Send Program	Unit must be in "STOP" mode, and transfer status should be "READY"	Unit operation not required

**1 When the PRO-iO units switched ON continuously for 1 hour or more. After 150 hours of power OFF, the PRO-iO unit will start in "RUN" mode when restarting.*

**2 To hold (retain) data after the PRO-iO unit's power supply has been turned OFF, use the Menu screen's [CONFIG.| REMANENZ] feature.*

Reference *"3.3 Display Screen and Menu Screen", "5.2 Module Configuration"*

3.2 Initial Settings

Switching ON the PRO-iO unit's power for the first time, or switching ON power after the unit has been switched OFF for 150 hours causes the Initial Settings screen to appear.

Depending on the model, the available setting items may differ.

Model	Setting Items
DR1-A*****	Display language
DR1-B*****	Display language + current time

■ Setting the Display Language

Press the **Z1** and **Z3** keys to scroll through the list of languages, and register your selection by pressing **Sel./OK**. Next, press the Esc. key to switch to the Time Settings screen.

At this time, JAPANESE is not available for the screen display language. Select a language from the list displayed.

Note:

- **You can also enter language settings via the [CONFIG.] menu's [LANGAUGE] feature.**
- **If the language is set to "Ini" (The default setting), the Display Language and Time Setting screen will be displayed each time you start up your PRO-iO unit.**

■ Setting the Current Time

Press the **Z2** and **Z4** keys to move to a setting item (**WINTER**, **TH**, and **15:17** in the example below) and press the **Sel./OK** key to select it. Next, use the **Z1** and **Z3** keys to change the values. Register the new values by pressing **Sel./OK**. Use the **Z2** and **Z4** keys to change hour and minute values.

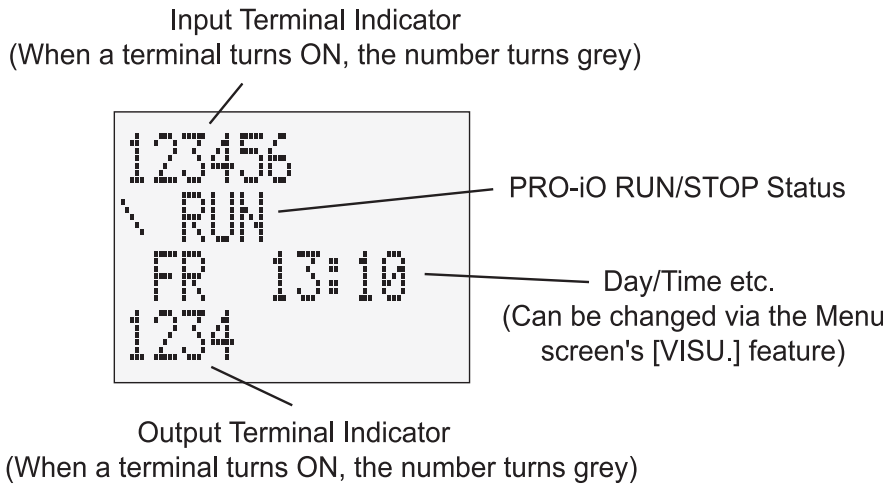
Note:

- **You can also enter time settings via the "TIME SET" feature (DR1-B***** units).**
- **"SUMMER" represents summer daylight saving time and "WINTER" represents winter daylight saving time. Use this setting only in countries that have adopted daylight saving time. In countries that have not adopted daylight saving time, be sure to select either "SUMMER" or "WINTER".**

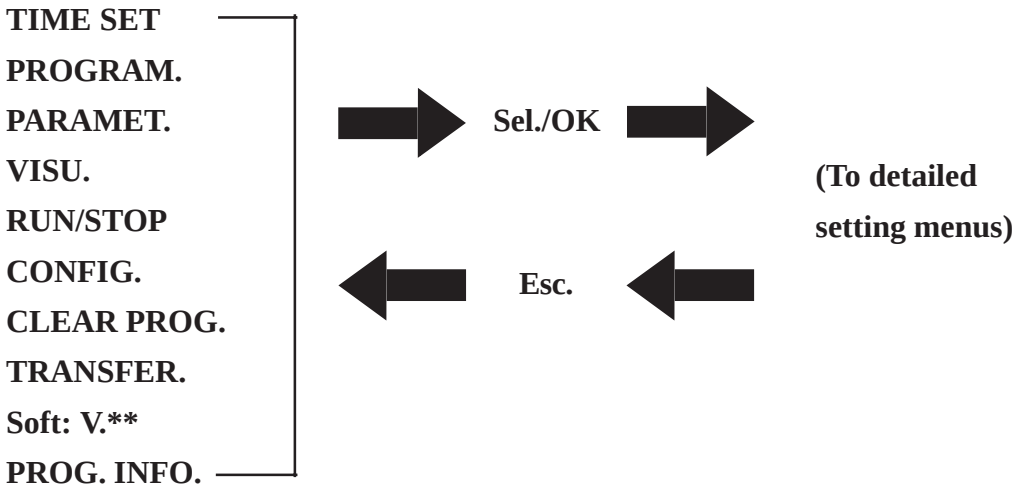
After registering time settings, press the **Esc.** key to return to the PRO-iO start screen. By default, the current Input Status will be displayed at the top of the display screen, followed by RUN/STOP status, Day / Time, and Output Status.

3.3 Display Screen and Menu Screen

The PRO-iO display screen displays the following RUN/STOP status and time information. To display the menu screen, press the **Sel./OK** button. This screen allows the following items to be set.



Press the **Z1** and **Z3** keys to scroll through the Menu Screen's setting items (**TIME SET** to **TRANSFER**). To call up a setting item's detailed settings, scroll to that item and press **Sel./OK**. To return from the setting item's detailed menu, press **Esc.**



■ Menu Screen

TIME SET : Summer time, winter time, day of the week, hour and minute settings. (Available only with DR1-B***** PRO-iO units.)

"SUMMER" represents summer daylight saving time and "WINTER" represents winter daylight saving time. Use this setting only in countries that have adopted daylight saving time. In countries that have not adopted daylight saving time, be sure to select either "SUMMER" or "WINTER".

PROGRAM. : Logic program monitoring can be performed in RUN mode. Logic program creation/update can be performed in STOP mode.

PARAMET. : Timer and Counter parameters can be changed in RUN mode.

VISU. : Designates the parameters to be displayed on the screen (E.g., Day / Time, time elapsed, etc.). Only one parameter can be selected at a time.

RUN/STOP : Select whether to run or stop the PRO-iO unit.

CONFIG : Designates the following settings:

- **PASSWORD** : Designates the password needed to access the logic program. Press the **Sel./OK** key to enable setting mode.Then, press the **Sel./OK** key again, select the password using the **Z1** to **Z4** keys, and press the **Sel./OK** key a final time to register the setting. Deleting the password will require the same password to be entered again. A valid password can be any four digit number (0000 to 9999).
- **LANGUAGE** : Designates the language to be used. The INI feature initializes the language and time settings. (It will be necessary to restart the unit)
- **FILT** : Designates the input filter time. The unit is designed only for a DC input filter. Select either SLOW (3ms to 5ms), or FAST (0.3ms to 0.5ms). However, the input filter time is fixed as SLOW (3ms to 5ms) for IB and IC terminals.
- **Zx=Keys** : Designates whether the **Z1** to **Z4** keys on the panel's front face will be used in the logic program. Selecting "Yes" designates these keys can be used for input.
- **REMANENZ** : After turning OFF the power supply, select the data you want to retain from the following: M1 to MF, T1 to T2, and C1 to C5. (This feature is available only with DR1-B***** PRO-iO units)

CLEAR PROG. : Select if the logic program is to be deleted or not.

TRANSFER. : Logic program transfer direction is to be selected from one of the following four types:

(1) **Modul. -> PC** : From the PRO-iO unit to the PC (PRO-iO Editor).

(2) **PC -> Modul.** : From the PC (PRO-iO Editor) to the PRO-iO unit.

When using [Modul. -> PC] and [PC -> Modul.] options with DR1-A** PRO-iO units, you must first set the transfer status to [READY] before you can transfer a program.***

Reference *"5.4 Program Transfer"*

(3) **Modul. -> Mem** : From the PRO-iO unit to the memory pack.

(4) **Mem -> Modul.** : From the memory pack to the PRO-iO unit.

Soft: V.** : Identifies the Software's version. (Available only with DR1-B***** PRO-iO units)

PROG. INFO : Identifies the Software's version and basic programming information.(Available only with DR1-A***** PRO-iO units)

3.4 Logic Program Editing

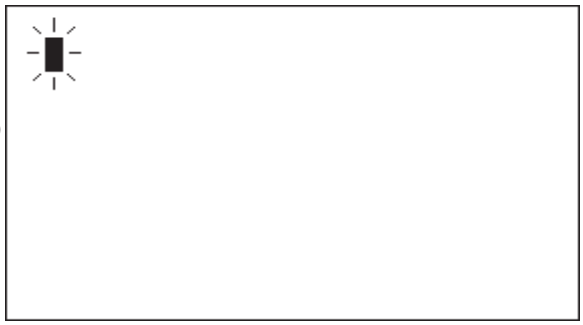
Select **PROGRAM** from the menu screen, and press **Sel./OK**.

Programming is possible only when the PRO-iO unit is in STOP mode.

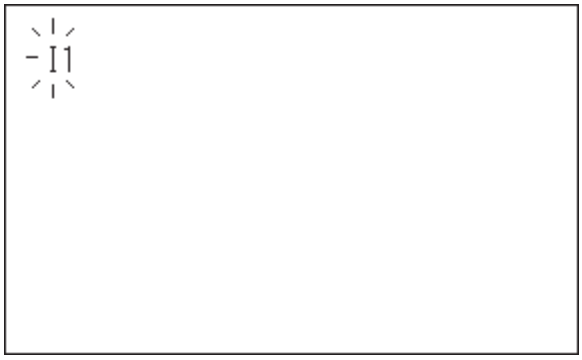
3.4.1 Inserting/Deleting Contacts

■ Inserting contacts

(1) To insert contacts in your program, first move the cursor to the position that is blinking.

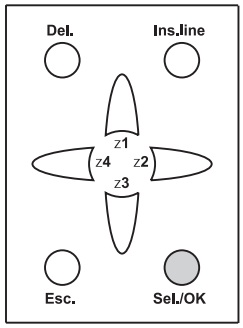


(2) Pressing the **Sel./OK** key displays [**I1**]. You can change the instructions (to M, T, C, etc.) via the **Z1** and **Z3** keys. Next, pressing the Z2 key causes the number (E.g., I1's "1") to blink. Select the desired number using the **Z1** and **Z3** keys.
Press the **Esc.** key to cancel a selection.



■ Deleting contacts

Position the cursor on the contact you want to delete, and press the **Del.** key. Pressing the **Del.** key twice succesively deletes the entire ladder line.



■ Changing/updating contacts

Position the cursor on the contact you want to change/update, and press **Sel./OK**. The rest of the procedure is the same as that for inserting contacts.

3.4.2 Inserting/Deleting AND, OR Statements

■ Inserting AND

After using the previous page's contact entry method, press the **Z2** key. This causes the cursor to jump to the next position on the line (See **fig.1**). This contact will automatically be an AND.

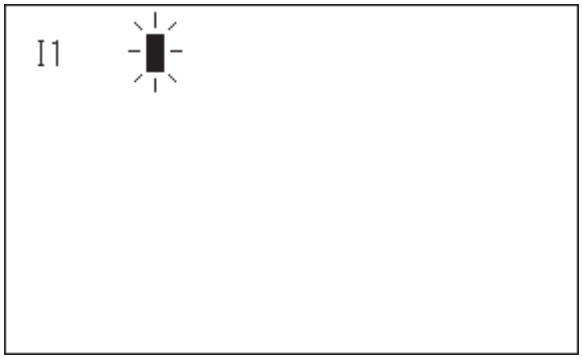


fig. 1

■ Inserting OR

Moving the cursor to the position indicated in **fig.2** causes the [●] symbol to blink. Press **Sel./OK** and the cursor will change from a [●] symbol to a [+].Next, press the Z1 key to create a single OR line. Similarly, you can move the cursor to the right of I4 and create another OR.

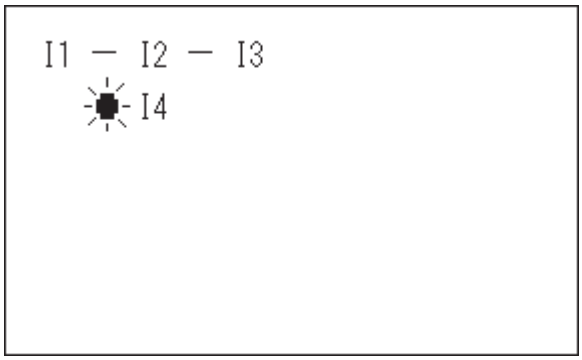


fig. 2

■ Deleting AND, OR

AND: Use the same procedure explained in "*Deleting Contacts*".
OR: Position the cursor as indicated in **fig.3**, and press the **Del.** key.

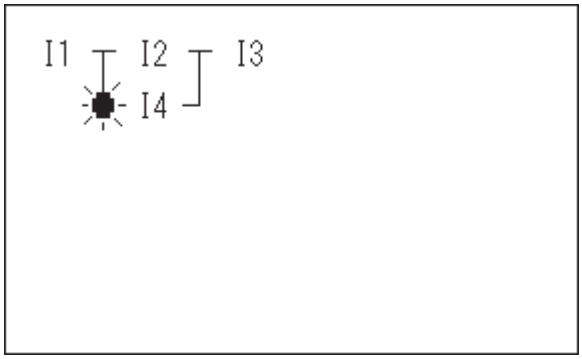
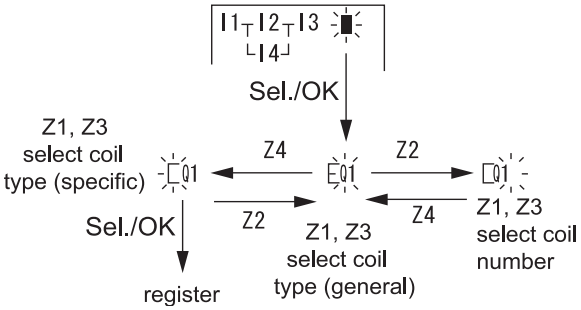


fig. 3

3.4.3 Inserting/Deleting Coils

■ Inserting coils

Insert the coil (Output, auxiliary coil, timer, counter, text) in right-most point in the row. Selection / Setup is as shown here.



■ Deleting coils

Position the cursor on the coil you want to delete, and press the **Del.** key.

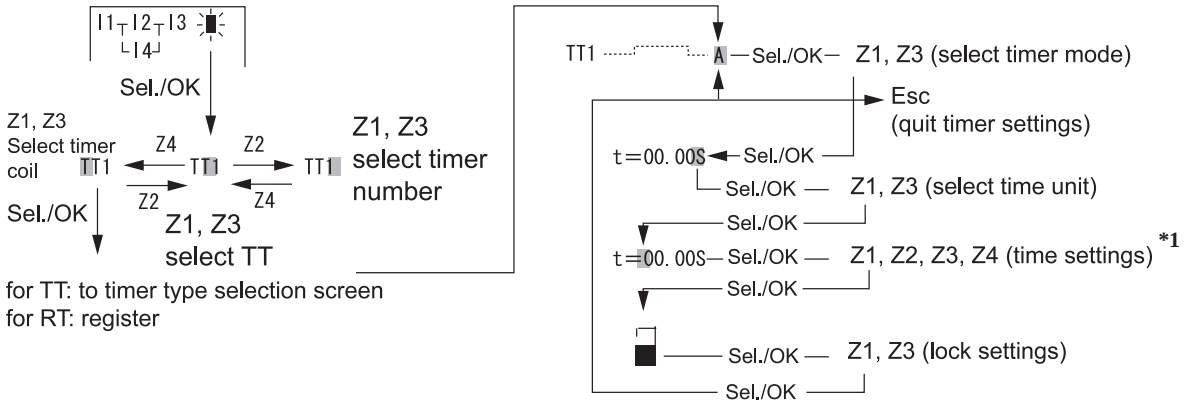
■ Changing/Updating coils

Position the cursor on the coil you want to change/update, and press **Sel./OK**. Then, follow the procedure for inserting coils.

3.4.4 Timers

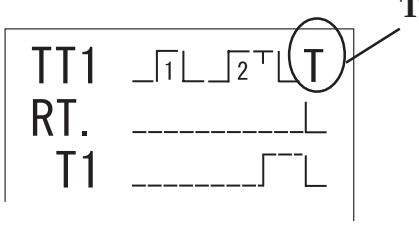
When inserting a timer, be sure to place the timer coil, and use that contact. Selection / Setup is as shown below.

Reference *"4.6 Creating Timers"*



Do not use the following screen's timer mode (T) when performing timer settings.

The symbol "T" is displayed here

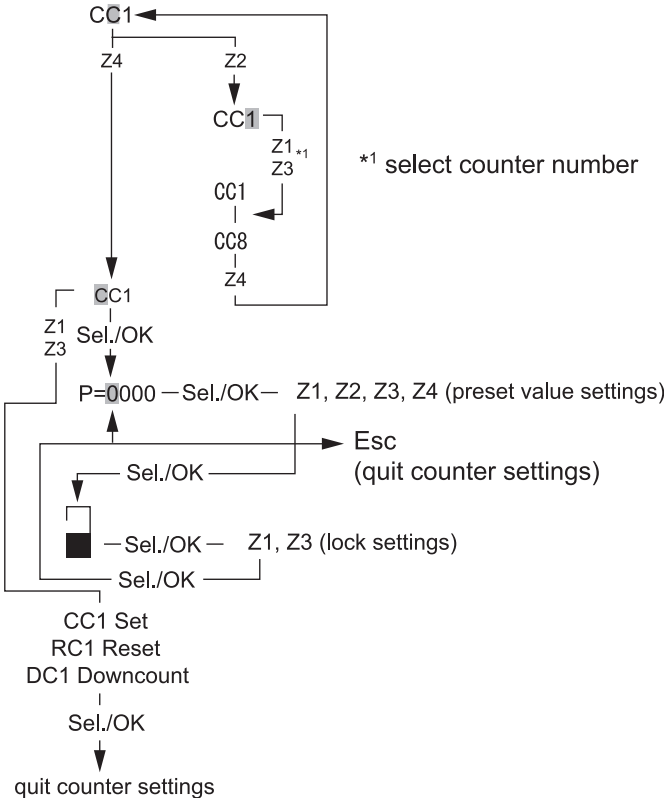


**1 The margin of error is comparatively high when the preset value is less than 1 second.*

3.4.5 Counters

Selection / Set up is as shown below.

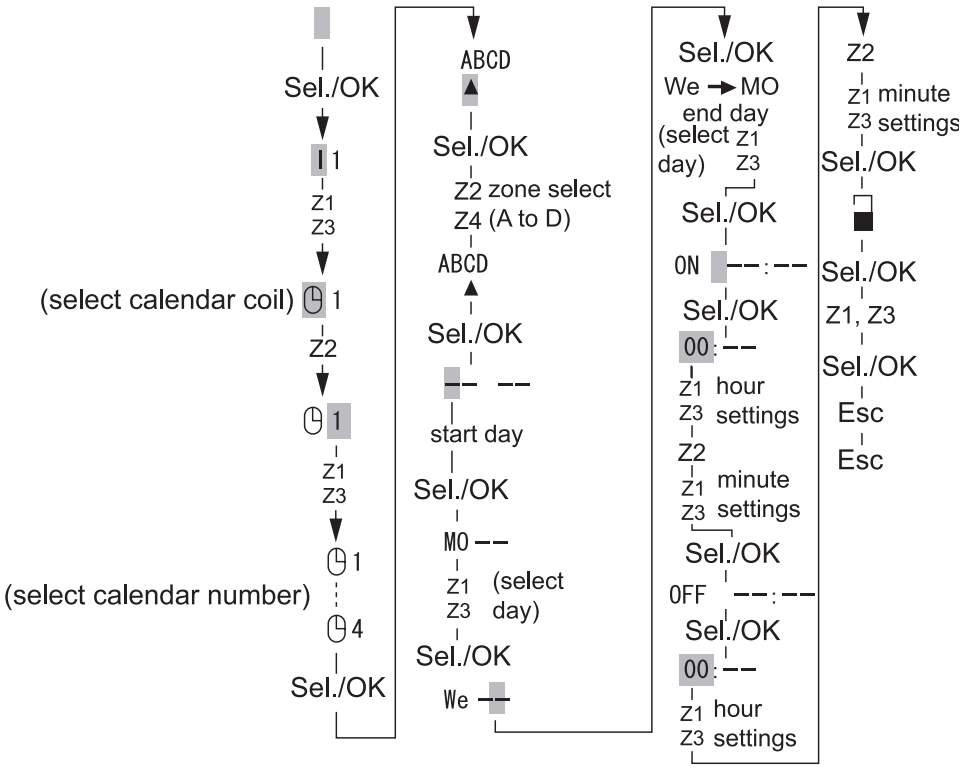
Reference *"4.7 Creating Counters"*



3.4.6 Calendars

The diagram below shows the setup procedure, starting from inserting a contact.

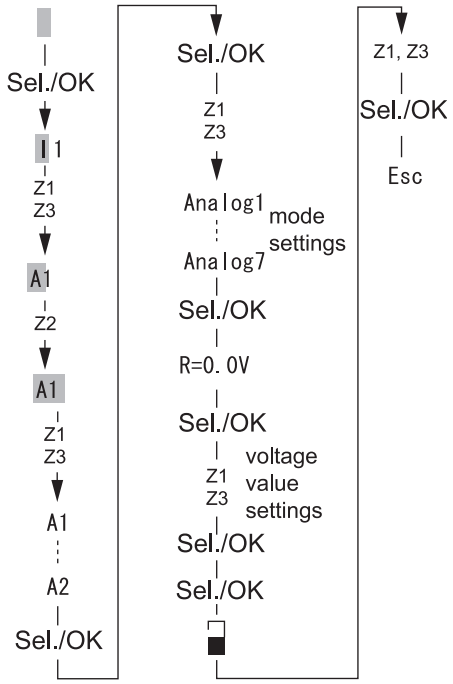
Reference *"4.9 Creating Calendars"*



3.4.7 Analog Comparators

The diagram below shows the setup procedure, starting from inserting a contact.

Reference *"4.8 Creating Analog Comparators"*



3.4.8 Text

Text (Numbers, characters) can be displayed on the PRO-iO unit's display screen. However, it is not possible to input text via the PRO-iO unit's operation keys.

For text entry, please use the PRO-iO Editor software.

Reference *"4.10 Creating Text"*

Chapter

4 PRO-iO Editor

♦ Logic Program Creation

PRO-iO Unit Program Creation

Reference *"CHAPTER 3 OPERATING THE PRO-iO UNIT"*

PRO-iO Editor Software Program Creation

Reference *"CHAPTER 4 PRO-iO EDITOR"*

4.1 Overview

The chart below shows PRO-iO Editor Organization.

- PRO-iO mode
  - Program (Programming can be done in the same way as when using the PRO-iO unit)
  - Parameters (Parameters are displayed as is done on the PRO-iO unit)
  - Simulation (Logic program simulation can be performed in the same way as when using the PRO-iO unit)
- Free mode
  - Program
    - PRO-iO Symbols
    - Ladder Symbols
    - Electrical Symbols

    Programming can be done using any of these symbols*1
  - Parameters (Displays a list of parameters used in the logic program)
  - Simulation (Logic program simulation is performed)
- Text data
  - Inputs/Outputs (Displays a list of comments for the Inputs/Outputs used in the logic program)
- Overview
  - PRO-iO Symbols
  - Ladder Symbols
  - Electrical Symbols

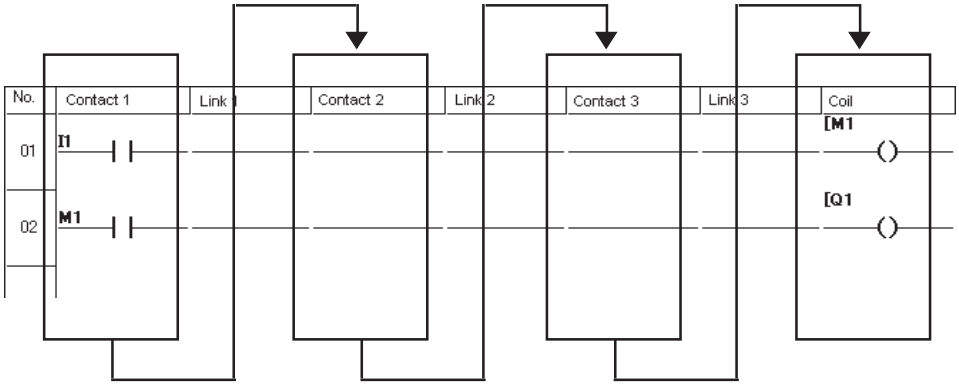
  Displays the logic program using the selected type of symbol display*1

*1 For symbol details,

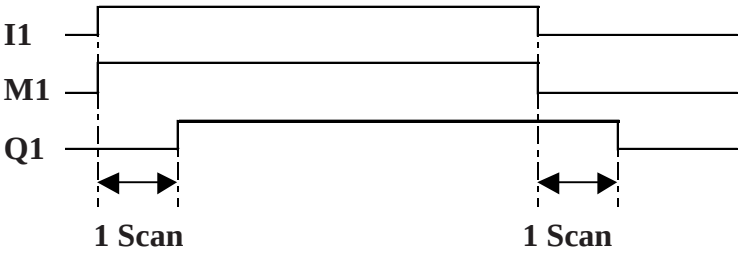
Reference *"4.1.2 Display Symbols"*

4.1.1 Logic Program Execution

The logic program you create will be executed as follows. All contacts present in the “Contact 1” column (From the first rung to the last rung, from top to bottom) will be processed first. Then, all contacts present in the “Contact2” column will be processed. Finally, processing continues with the “Contact3” and “Coil” columns. Logic program execution can be understood via the following illustration.



In the above logic program, coil M1 turns ON when input I1 turns ON. However, output Q1 turns ON after a delay of one scan interval.

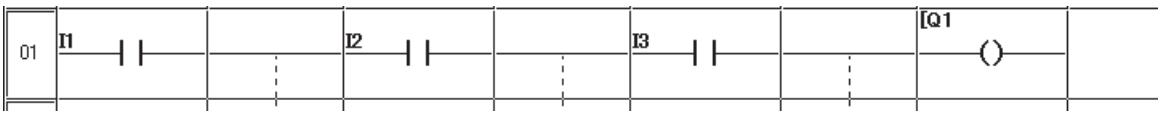


4.1.2 Display Symbols

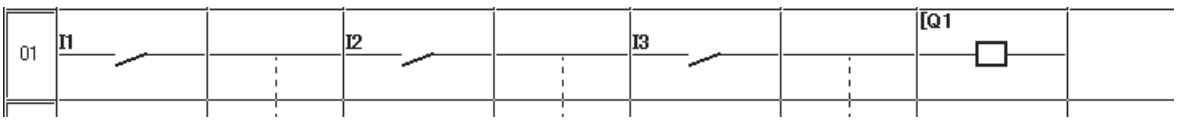
When using PRO-iO Editor to create logic program data, the following symbols are available in **Free mode**’s **Program** and **Overview** features:

PRO-iO Symbols

Ladder Symbols



Electrical Symbols



4.1.3 Contacts / Coils

■ Contacts

Symbol	Number	Description
I	I1 to IC[*1]	a contact (Physical input)
i	i1 to iC[*1]	b contact (Physical input)
Q	Q1 to Q8[*2]	a contact (Physical output)
q	q1 to q8[*2]	b contact (Physical output)
Z	Z1 to Z4	a contact (Z key)
z	z1 to z4	b contact (Z key)
M	M1 to MF	a contact (Auxiliary coil)
m	m1 to mF	b contact (Auxiliary coil)
T	T1 to TA[*3]	a contact (Timer)
t	t1 to tA[*3]	b contact (Timer)
C	C1 to CA[*3]	a contact (Counter)
c	c1 to cA[*3]	b contact (Counter)
A	A1 to A8	a contact (Analog comparator)
a	a1 to a8	b contact (Analog comparator)
	1 to 4[*4]	a contact (Calendar)
	1 to 4[*4]	b contact (Calendar)

1 Applies to DR1-*201 PRO-iO units (12 points). The DR1-B121BD PRO-iO unit has 8 input points, and the DR1-*101** PRO-iO unit has 6. For how to identify your PRO-iO unit's model number,*

Reference *"Preface - Model Identification"*

2 Applies to DR1-*201 PRO-iO units (8 points). The DR1-*1*1** PRO-iO unit has 4 output points.*

3 Applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range is 8 points.*

4 Applies to PRO-iO units equipped with the calendar function. (DR1-B*** PRO-iO units)*

■ Coils

Device	Symbol	Number	Description
Q	⌐	⌐Q1 to ⌐Q8*1	Normal coil
	⌐↑	⌐↑Q1 to ⌐↑Q8*1	Reverse when condition is true (Rising)
	S	SQ1 to SQ8*1	Set coil
	R	RQ1 to RQ8*1	Reset coil
M	⌐	⌐M1 to ⌐MF	Normal coil
	⌐↑	⌐↑M1 to ⌐↑MF	Reverse when condition is true (Rising)
	S	SM1 to SMF	Set coil
	R	RM1 to RMF	Reset coil
T	TT	TT1 to TTA*2	Timer start coil
	TR	RT1 to RTA*2	Timer reset coil
C	CC	CC1 to CCA*2	Counter coil
	CR	CR1 to CRA*2	Counter reset coil
	DC	DC1 to DCA*2	Count direction designation coil
X	TX	TX1 to TX6*3	Text show coil
	RX	RX1 to RX6*3	Text hide coil

1 Applies to DR1-*201 PRO-iO units (8 points). For DR1-*1*1** PRO-iO units, the range is 4 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

2 Applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range is 8 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

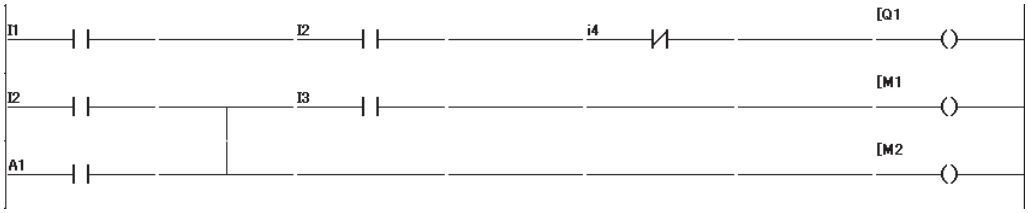
3 Applies to DR1-B*** PRO-iO units (6 points). For DR1-A***** PRO-iO units, the range is 4 points. For how to identify your PRO-iO unit's model number,*
Reference *"Preface - Model Identification"*

4.1.4 Maximum Number of Program Lines

The Maximum Number of Program Lines varies depending on the PRO-iO unit's model number, as shown in the table below.

PRO-iO Unit Model	Maximum Number of Program Lines
DR1-A101BD	60 Rungs
DR1-B121BD	
DR1-A101FU	
DR1-B101FU	
DR1-A201BD	80 Rungs
DR1-B201BD	
DR1-A201FU	
DR1-B201FU	

A program rung can have a maximum of three contacts and one coil. Depending on the PRO-iO unit model, a maximum of 60 or 80 rungs may be used. The following example consists of three (3) rungs.



4.1.5 Feature Differences

Feature	DR1-A*****	DR1-B*****
Timer	Up to 8	Up to 10
Counter	Up to 8	Up to 10
Calendar Retention Time	Not available	150 hours*1
Text	Up to 4	Up to 6
Save Data (Power outage backup)	Only program	Program, M1 to MF, T1, T2, C1 to C5*2
Online Monitoring Mode	Not available	Possible
Send Program	Unit must be in "STOP" mode, and transfer status should be "READY"	Unit operation not required

**1 When the PRO-iO unit is switched ON continuously for 1 hour or more. After 150 hours of power OFF, the PRO-iO unit will start in "RUN" mode when restarting.*

**2 To hold (retain) data after the PRO-iO unit's power supply has been turned OFF, use the Menu screen's [CONFIG.| REMANENZ] feature.*

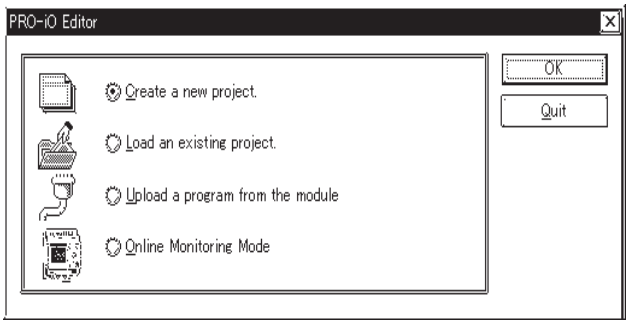
Reference *"3.3 Display Screen and Menu Screen", "5.2 Module Configuration"*

4.2 Startup and Initial Settings

Before creating a logic program via the PRO-iO Editor software, be sure to select the PRO-iO unit's model, and enter the initial settings (Language and calendar). Also, you can select either Japanese or English to be the PRO-iO Editor Screen Display Language from the [View] menu's [PRO-iO Editor Language] selection.

4.2.1 Selecting Files and Unit Type

When the PRO-iO Editor program is started, the following screen appears. Click on the desired selection, and click [OK].



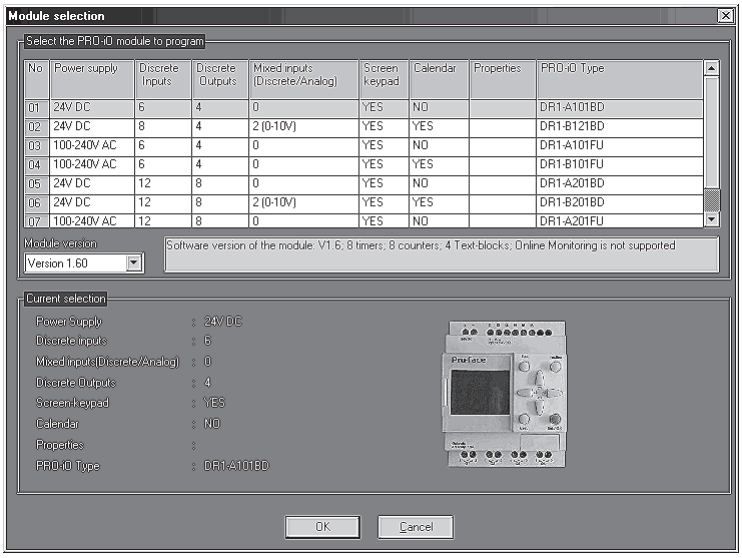
Note: **You can choose [New], [Open], [Save] and [Save As] from the [File] menu.**

If you choose [New] from the file menu, or [Create a new project] from the above menu, the following **Module Selection** screen will appear. Select the PRO-iO unit model.

For how to identify your PRO-iO unit's model number,

Reference *"Preface - Model Identification"*

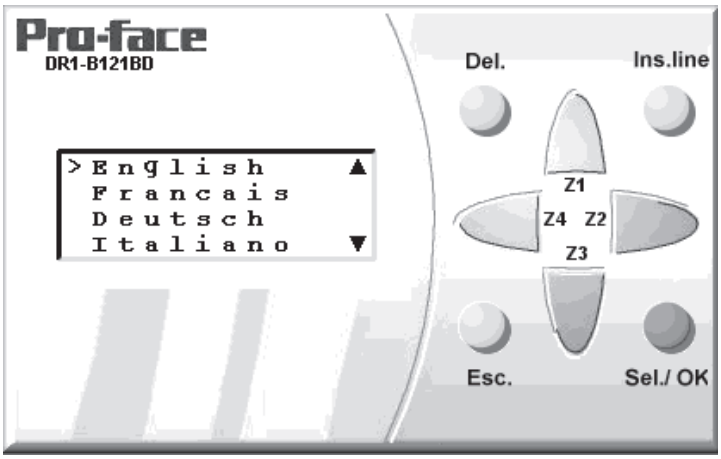
After selecting the PRO-iO unit model, click [OK].



4.2.2 Initial Settings

After selecting the type of PRO-iO unit, the following screen will appear. Use the following explanations to set the language and calendar features.

If desired, clicking the “Free mode” selection will cancel these two setting screens.

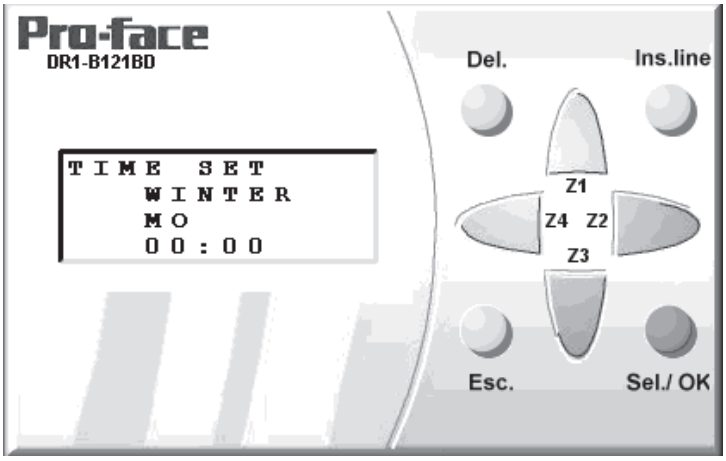


■ Entering Settings

1) Click on the Z1 and Z3 keys to select the desired language, and press Sel./OK. (Japanese cannot be selected in PRO-iO mode.)

2) Click on the [Esc.] key.

3) The following Calendar setting screen will appear. (For DR1-B***** PRO-iO units only.)



4) After clicking the Z2 key, click the Sel./OK button. Then, clicking the Z1 and Z3 keys sets the season/date selections.

Note: **“SUMMER” represents summer daylight saving time and “WINTER” represents winter daylight saving time. Use these settings only in countries that have adopted daylight saving time. In countries that have not adopted daylight saving time, be sure to select either “SUMMER” or “WINTER”.**

5) After clicking Sel./OK again, click on any of the Z keys (Z1 to Z4) to set the time (Hours and minutes). Click the Sel./OK one more time to enter the settings.

6) Click the [Esc.] key to return to the Start menu.

4.3 Creating Contacts and Lines

The following explanation describes the types of contacts and lines (Wires) available, as well as their setup procedure.

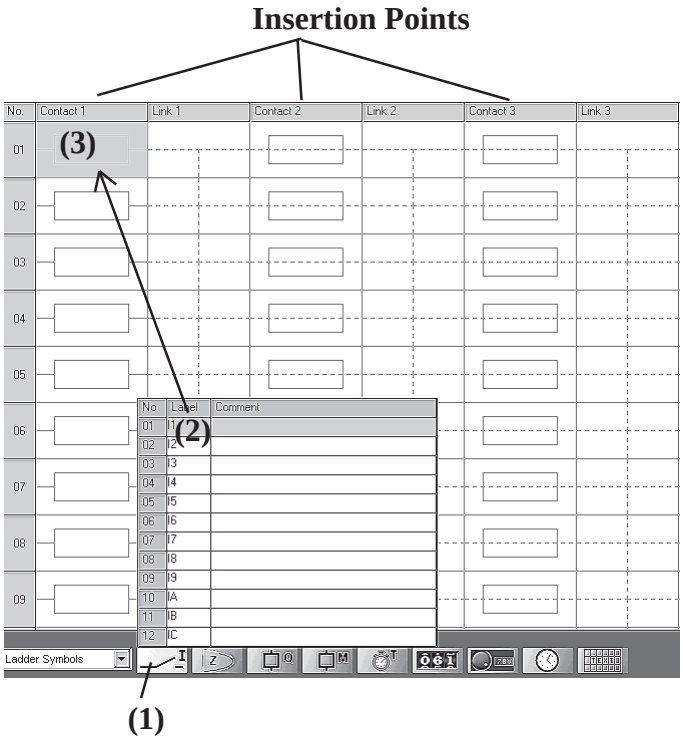
4.3.1 Placing Contacts

The following “a” and “b” contacts can be used.

Discrete Input		**“Z” key**		**Discrete Output**	
Auxiliary Coil		**Timer**		**Counter**	
Calendar		**Analog Comparator**			

■ Setup Procedure

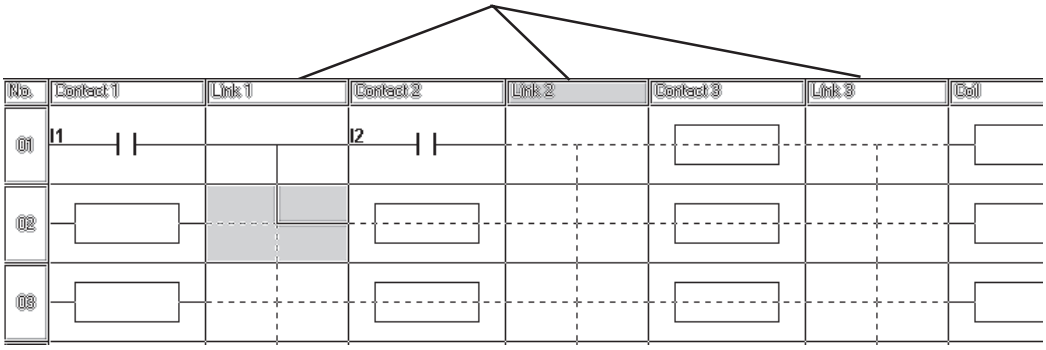
1) Place the mouse cursor over the desired icon (1).
2) Click on the desired number (2) and drag that number (Row) to the desired area on the screen (3) (see figure).
3) When using a “b” type contact, right-click the mouse and choose “Normally Closed”.



4.3.2 Creating Lines

Simply click on the dotted portion of the area where you wish to create/delete a line (Wire). When a contact and a coil are placed in the same rung, the line connecting them is created automatically. Use the link area to create additional branch lines.

Line branch creation areas



4.4 Creating Coils

The following explanation describes the types of coils available, as well as their setup procedure.

4.4.1 Placing Coils

The following types of coils can be used:

Discrete Output 

Auxiliary Coil 

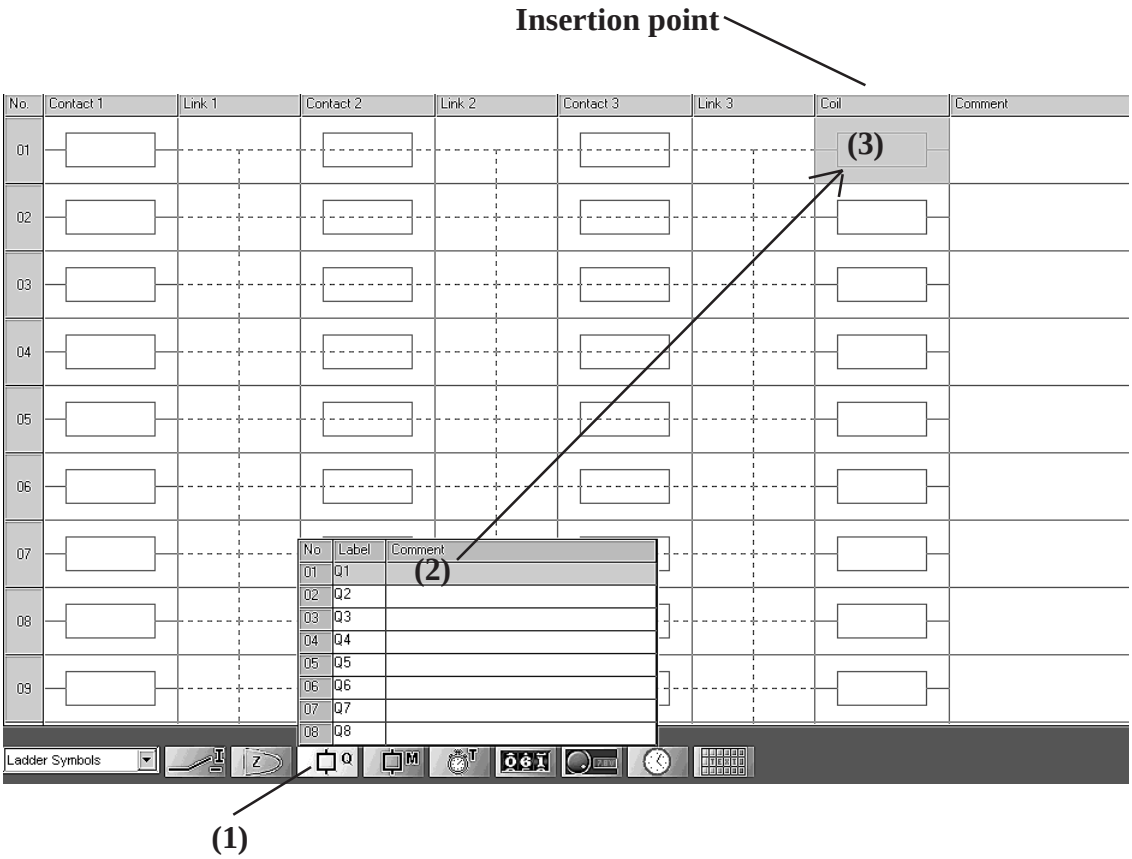
Timer 

Counter 

Text 

■ Setup Procedure

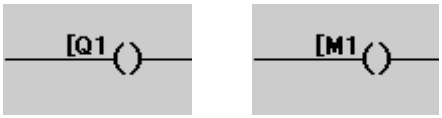
1) Place the mouse cursor over the desired icon (1).
2) Click on the desired number (2) and drag that number (Row) to the desired area on the screen (3) (See figure).
3) If you wish to change the type of coil, right-click the mouse and choose another type.



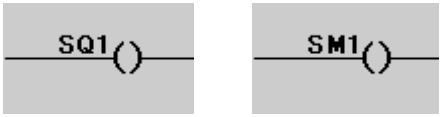
4.5 Coil Types

The following types of coils are available. Right-click on a normal coil to select the coil type.

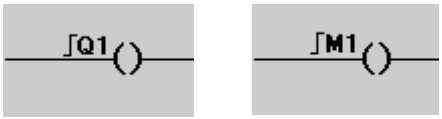
Normal Coil



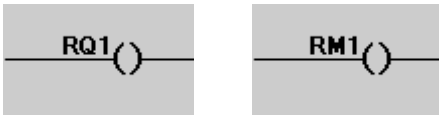
Set Coil



Reverse on Trigger



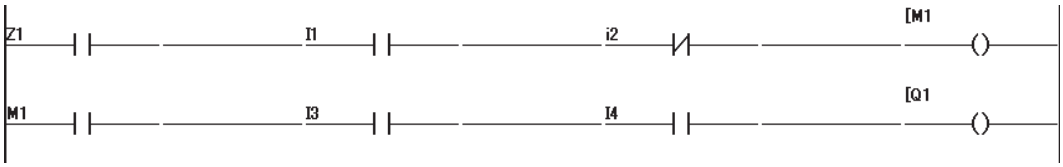
Reset Coil



■ Using a Normal Coil

When coil "activation" conditions change from "0" to "1", the coil turns ON. The Auxiliary Coil (M) is often referred to as an "Internal Relay" or an "Internal Auxiliary Relay". It is used internally by the logic program. It cannot produce direct output.

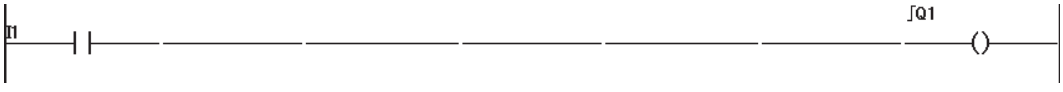
When a relay's ON, OFF conditions exceed 3, the following type of Auxiliary Coil is temporarily used.

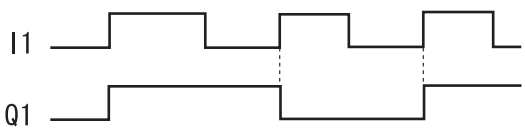


■ Using a "Reverse on Trigger" Coil

When coil "activation" conditions change from "0" to "1", the coil's condition is reversed.

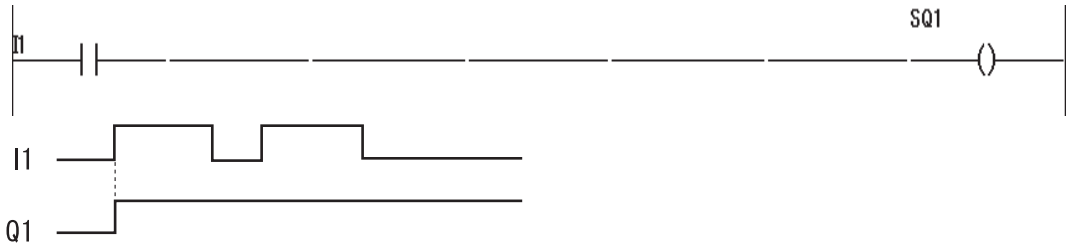
In the following example, after the program starts and the trigger ("I1") changes from "0" to "1", Q1 changes to "1". Next, when the trigger (I1) changes from "0" to "1" again, Q1 changes back to "0".





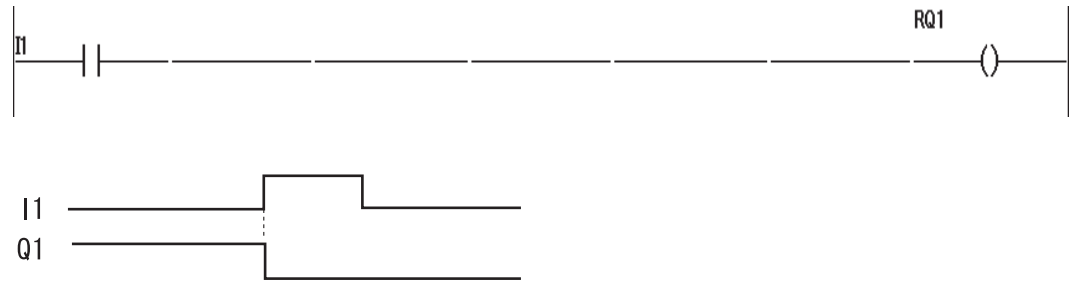
■ Using a Set Coil

When coil “activation” conditions change from “0” to “1”, the coil is turned (Set to) “ON”.



■ Using a Reset Coil

When coil “activation” conditions change from “0” to “1”, the coil is turned (Set to) “OFF”.



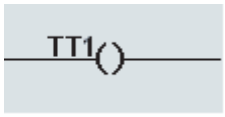
4.6 Creating Timers

The following explanation describes the types of timers available, as well as their setup procedure.

4.6.1 Types of Timers

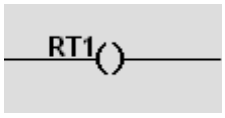
The following types of timers are available. To use the Timer Reset feature, place a timer Start icon on the desired power line, right-click the mouse and choose "Reset input".

Timer Start



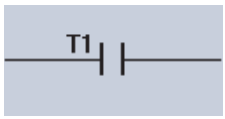
When the coil turns from OFF to ON, or from ON to OFF, the Timer begins counting. Seven types of counting methods are available.

Timer Reset



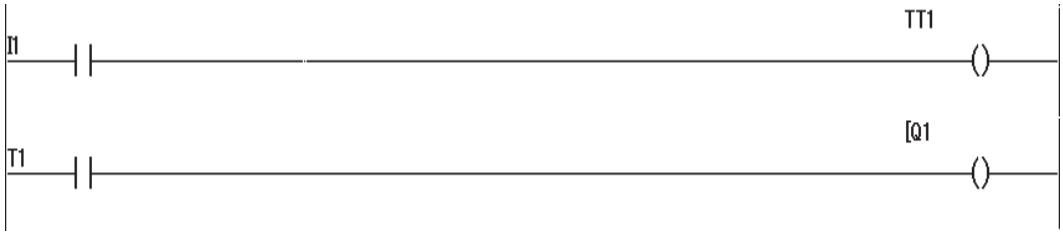
When the coil changes from OFF to ON, the timer's current value is reset.

Timer Contact



Depending on the timer type, this contact turns ON or OFF. See the following section for an explanation of the seven timer types.

A Timer contact is used to show when "Time Up" has occurred. In the following example diagram, turning ON input I1 will turn ON output Q1 after the time designated by the timer is up.



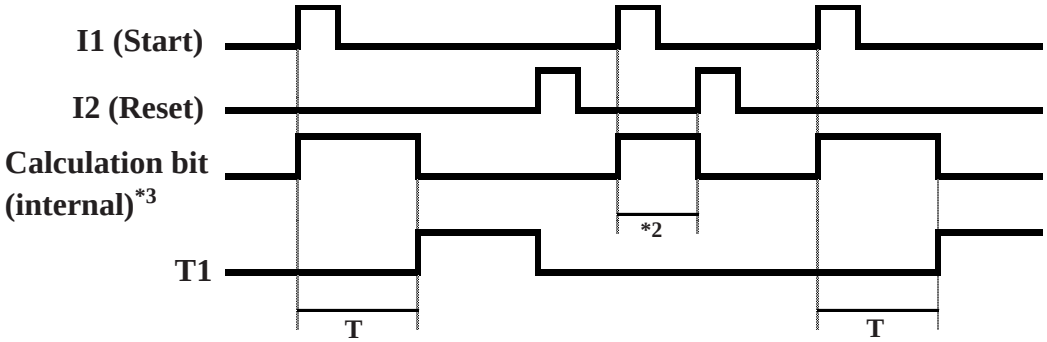
4.6.2 Using Timers (7 types)

PRO-iO has a total of 7 different types of timers. The following pages explain how to set up each type of timer. To start a timer, Timer Start Coils TT1 to TTA[*1] are used, and to reset a coil, Timer Reset Coils RT1 to RTA[*1] are used.
Use contacts T1 to TA[*1] ("a" contact) or t1 to tA[*1] ("b" contact) to designate if Time Up has occurred. In the following example diagram, turning ON input I2 resets timer TT1.

The above example is used to explain each of the following 7 types of timers.

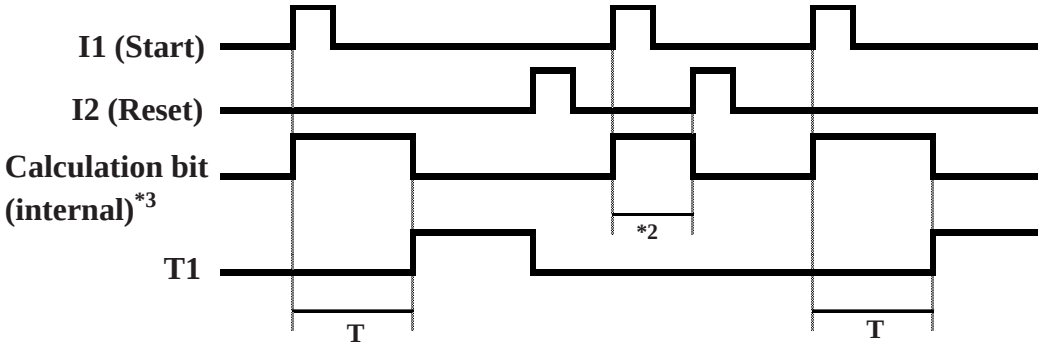
■ Feature A : ON Delay Timer

Timer counts after start signal (I1) turns ON and continues while I1 is ON. After timer reaches preset, timer's coil turns ON. (Timer is reset if I1 turns OFF, or if reset signal (I2) turns ON.)



■ Feature a : Trigger ON Delay Timer (ON/OFF via pulse)

Timer counts after start signal (I1) turns ON and stays ON until reset signal (I2) turns ON. Timer's coil turns ON when timer reaches preset. (Timer value not cleared until I2 turns ON.)



1 This applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range will be 8 points. For how to identify your PRO-iO unit's model number,*

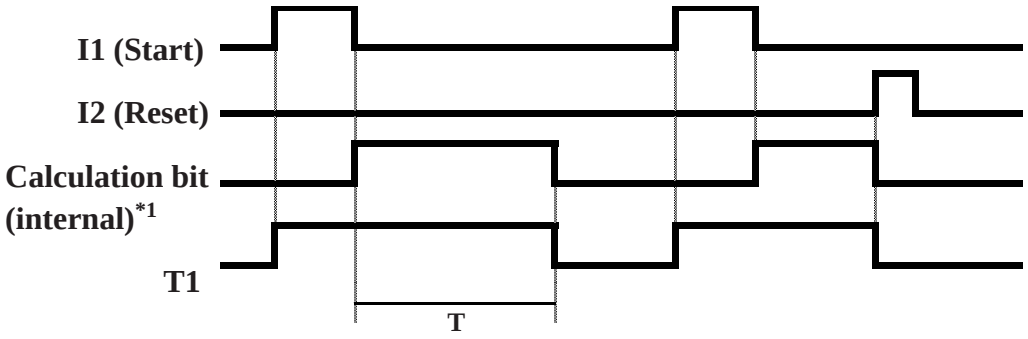
Reference *"Preface - Model Identification"*

**2 The timer calculation value is less than the timer preset value.*

**3 The calculation bit value cannot be displayed via the PRO-iO unit or PRO-iO Editor.*

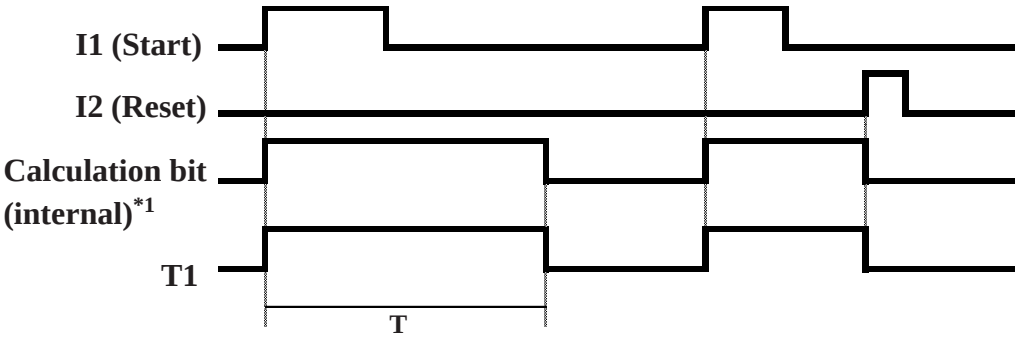
■ Feature C: OFF Delay Timer

Timer counts after start signal (I1) turns OFF and continues while I1 is OFF. After timer reaches preset, timer's coil turns OFF. (Timer is reset if I1 turns ON.)



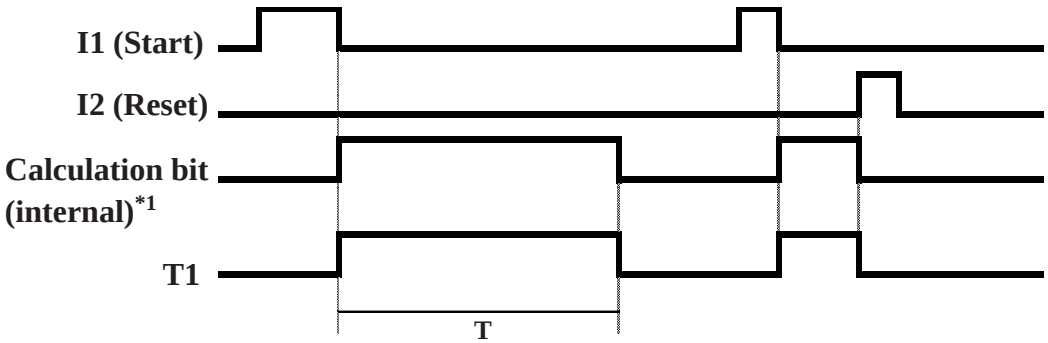
■ Feature B: ON Pulse Timer

Timer counts and timer's coil turns ON after start signal (I1) turns ON. Timer's coil turns OFF after timer reaches preset, or after reset signal (I2) turns ON. (Timer's value is reset after counting starts.)



■ Feature W: OFF Pulse Timer

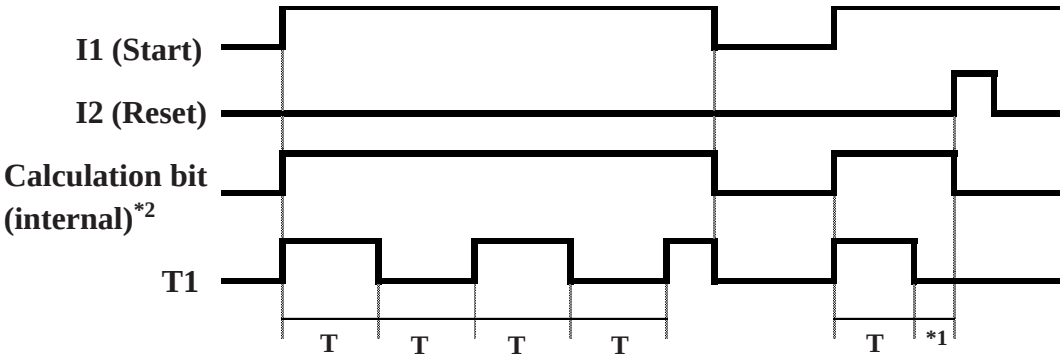
Timer counts and timer's coil turns ON after start signal (I1) turns OFF. Timer's coil turns OFF after timer reaches preset or after reset signal (I2) turns ON. (Timer's value is reset when counting starts.)



**1 The calculation bit value cannot be displayed via the PRO-iO unit or PRO-iO Editor.*

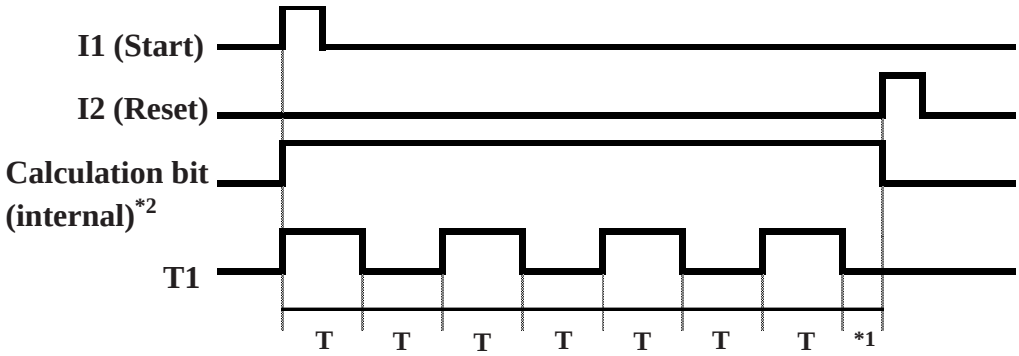
■ Feature D: Blinking Relay

While start signal (I1) is ON, the timer's coil turns alternately ON and OFF for a preset interval. (If I1 turns OFF during blinking/counting, timer will turn OFF and timer value is reset.)



■ Feature d: Blinking Timer (ON/OFF)

After start signal (I1) turns ON, the timer's coil turns alternately ON and OFF. After reset signal (I2) turns ON, timer coil turns OFF until I1 turns ON again. (Timer value is not cleared until I2 turns ON.)

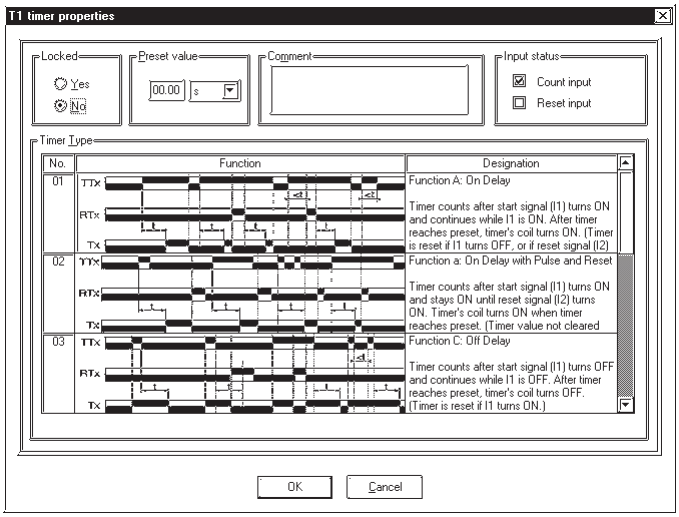


**1 The timer calculation value is less than the timer preset value.*

**2 The calculation bit value cannot be displayed via the PRO-iO unit or PRO-iO Editor.*

4.6.3 Timer (Time) Settings

There are 7 types of timers. If you double-click on a timer coil, the following dialog box will appear. This dialog box is used to select features and enter preset (time) values.



Locked : This feature designates if the PRO-iO unit's Menu's PARAM feature can be used to modify data or not. If you wish to modify data using the PRO-iO unit, select "No".
Select "Yes" if you do not wish this data to be changed.

Preset value : Sets the time and unit.

Time Unit	Time Range
s (Seconds)	00.01 seconds to 99.99 seconds*1
S (Seconds)	000.1 seconds to 999.9 seconds*1
M:S (Minutes:Seconds)	00 minutes 01seconds to 99 minutes 59 seconds
H:M (Hours:Minutes)	00 hours 01 minute to 99 hours 59 minutes

**1 The margin of error is comparatively high when the preset value is less than 1 second.*

Comment : Allows you to enter a comment.

Input Status : This box needs to be checked if you have already inserted a "Count input" or "Reset input" into the program.

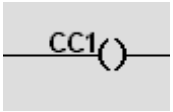
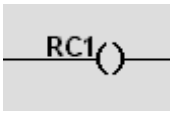
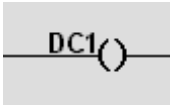
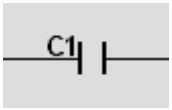
4.7 Creating Counters

The following explanation describes the types of counters available, as well as their setup procedure.

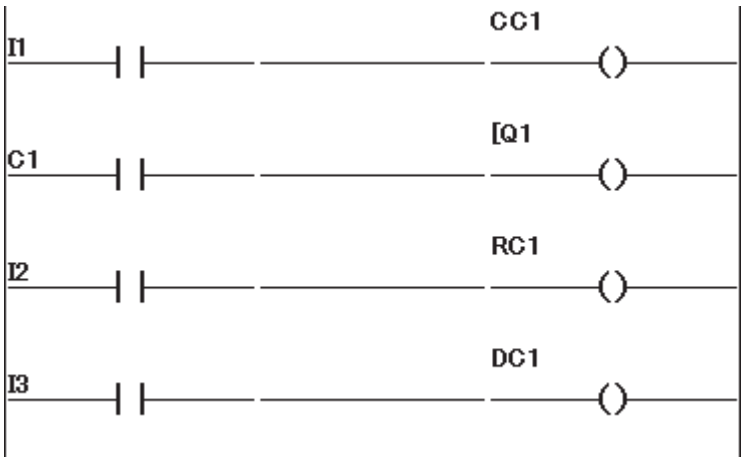
4.7.1 Types of Counters

The following types of counters are available. A Counter or a Counter coil's turning from OFF to ON increments the count. Counters include the following coils and contacts.

In order to use reset coils and count down coils, first place a counter coil. Right-click on the counter coil, and select either [Reset input] or [Direction input].

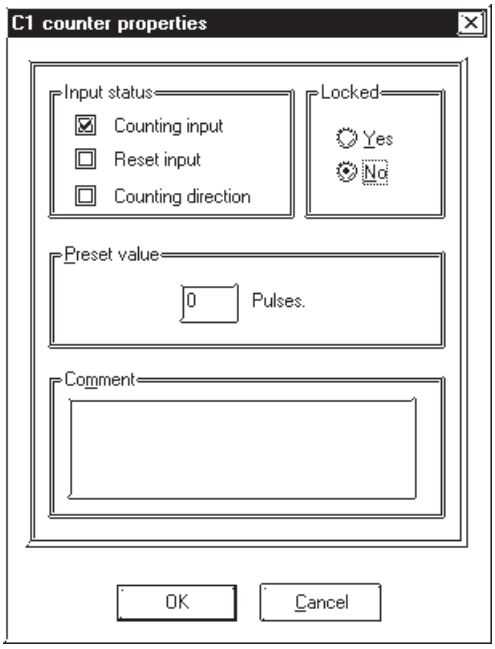
Counting		**An OFF to ON change increments the count**
Reset		**When this coil turns ON, the count value is reset.**
Direction		**When this coil turns ON, count down mode is started.**
Counter Contact		**This closes when the count value is greater than or equal to the preset value.**

The following diagram is a simple example of counter operation.



4.7.2 Counter (Pulse Count) Settings

Double-clicking on the Counter coil will call up the following menu. Enter the desired counter preset value (Pulse count) in this menu.



Input Status : If Counting input, Reset input or Counting direction have been previously input, these check boxes are checked.

Locked : This feature designates if the PRO-iO unit's Menu's PARAM feature can be used to modify data or not. If you wish to be able to modify data using the PRO-iO unit, select "No". Select "Yes" if you do not wish this data to be changed.

Preset value : Designates the pulse count. (Count Range: 0 to 9999)

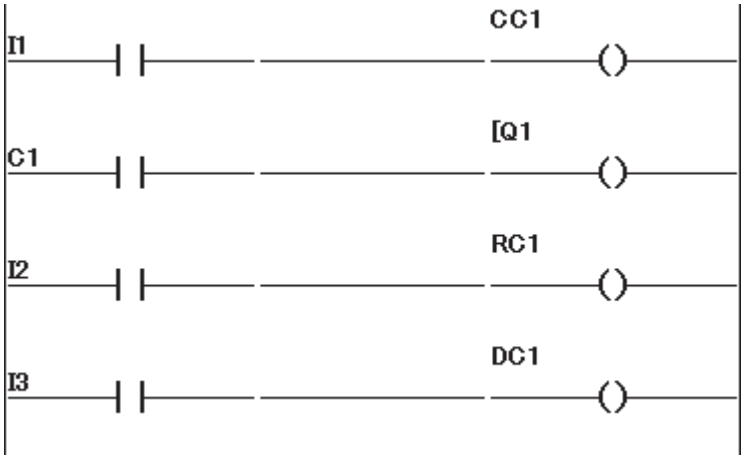
Comment : Allows you to enter a comment.

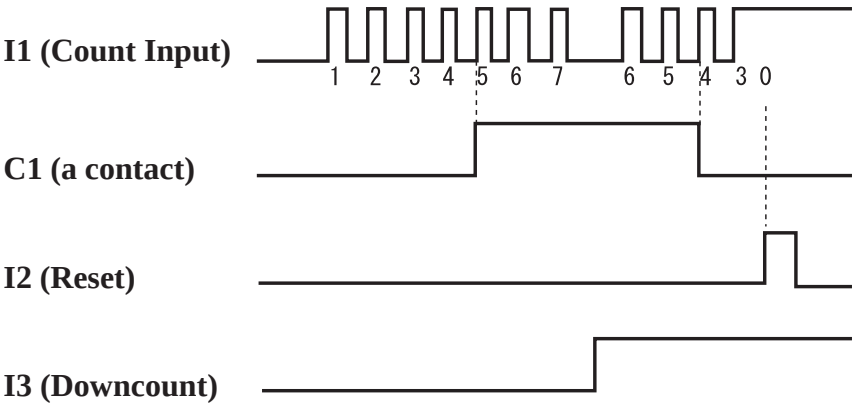
4.7.3 Counter Operation Example

When the Count Direction Designation coil DC1 to DCA[*1] is “0” (OFF), upcounting is performed. When this value is “1” (ON), downcounting is performed.

Contacts C1 to CA[*1] (“a” contact) or c1 to cA[*1] (“b” contact) are used to designate if the count preset value has been reached.

The following program example uses a preset value of “5”.





The counter will continue to operate in the interval 0 to 9999 after the preset value has been reached.

1 This applies to DR1-B*** PRO-iO units (10 points). For DR1-A***** PRO-iO units, the range is 8 points. For how to identify your PRO-iO unit’s model number,* Reference *“Preface - Model Identification”*

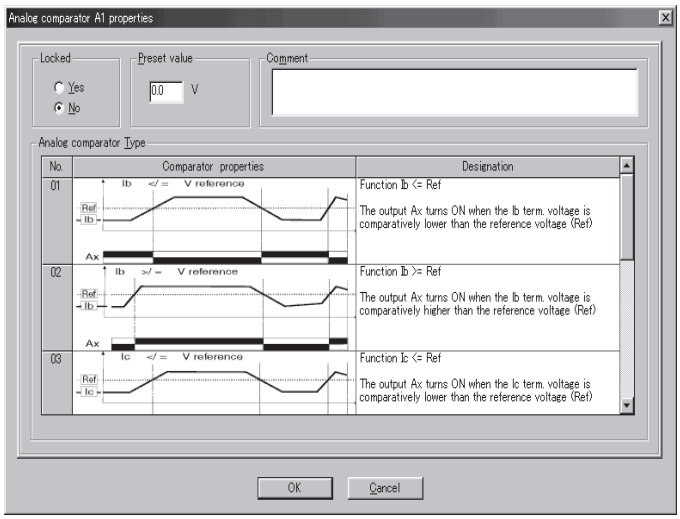
4.8 Creating Analog Comparators

The following explanation describes the types of Analog Comparators available, as well as their setup procedure.

The analog comparator function compares analog input values, and sends the result via the relay output. The analog comparator can be used as a contact. When using a “b” type contact, right-click the mouse and choose a “b” contact.

4.8.1 Analog Comparator (Preset) Settings

Double-click on the Analog Comparator contact to call up the following screen. 7 different modes can be selected. Also, the type of contact selected (“a” type: A1 to A8, “b” type: a1 to a8) designates the selection of modes available.



Locked : This feature designates if the PRO-iO unit’s Menu’s PARAM feature can be used to modify data or not. If you wish to be able to modify data using the PRO-iO unit, select “No”. Select “Yes” if you do not wish this data to be changed.

Preset value : Designates the Comparator (Ref) setting.

Comment : Allows you to enter a comment.

4.8.2 Analog Comparator Operation Example

Each of an analog comparator's contacts (A1 to A8, a1 to a8) can be selected from the following seven (7) analog comparator modes (01 to 07):

Fig. 1

- **01: Ib <= Ref: The output Q1 turns ON when the Ib term voltage is comparatively lower than the reference voltage (Ref) (fig. 1)**

  03: Ic <= Ref: The output Q1 turns ON when the Ic term. voltage is comparatively lower than the reference voltage (Ref)

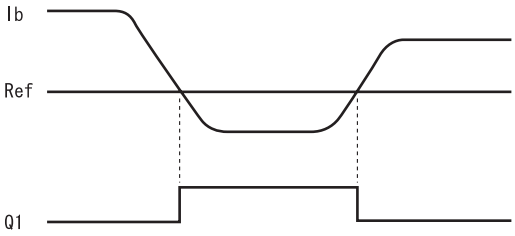


Fig. 2

- **02: Ib >= Ref : The output Q1 turns ON when the Ib term. voltage is comparatively higher than the reference voltage (Ref) (fig. 2)**

  04: Ic >= Ref : The output Q1 turns ON when the Ic term. voltage is comparatively higher than the reference voltage (Ref)

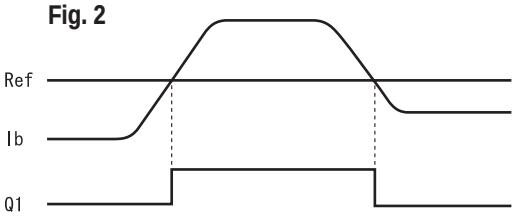


Fig. 3

- **05: Ib <= Ic : The output Q1 turns ON when the Ib term. voltage is comparatively lower than the Ic term. voltage (fig. 3)**

  06: Ib >= Ic : The output Q1 turns ON when the Ib term. voltage is comparatively higher than the Ic term. voltage

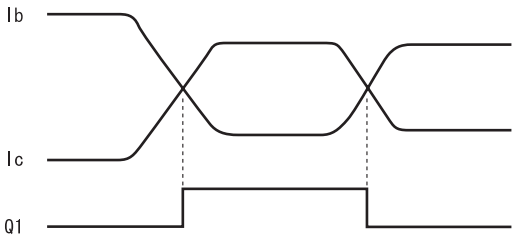
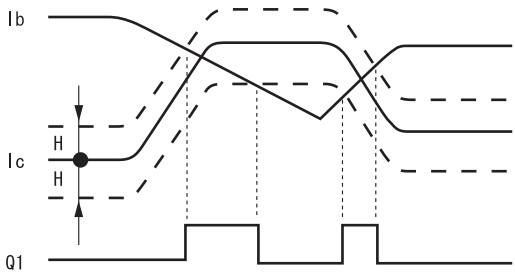


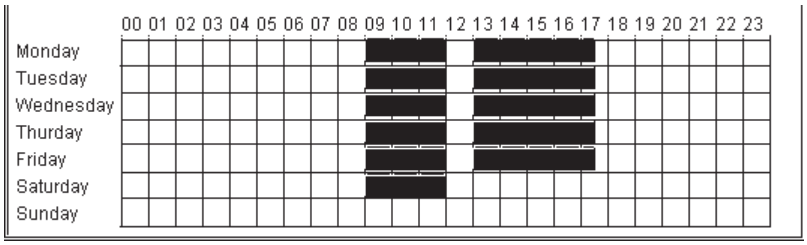
Fig. 4

- **07: Ic-H <=I b<=Ic+H : The output Q1 turns ON when Ib term. voltage is higher than (Ic term. voltage - preset value) and lower than (Ic term. voltage + preset value) (fig. 4)**



4.9 Creating Calendars

The following explanation describes the types of Calendars available, as well as their setup procedure. Calendars are used as a contact. When using a “b” type contact, right-click the mouse and choose a “b” contact.



4.9.1 Calendar Settings

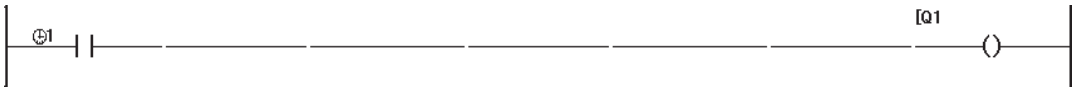
PRO-iO has 4 types of 1-week calendars, with each calendar having 4 channels (A to D). During a specified period, an “a” contact can be turned ON up to four times.

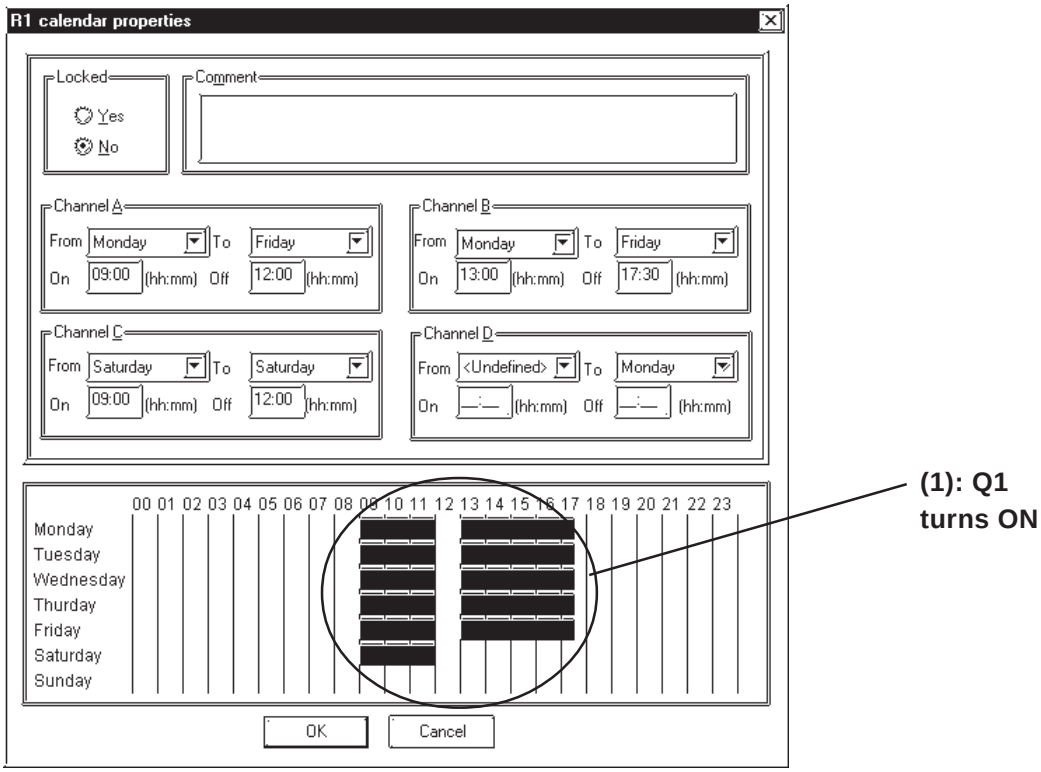
In the example below, Q1 is turned ON during the set periods.

Channel A: Monday to Friday (09:00 to 12:00)

Channel B: Monday to Friday (13:00 to 17:30)

Channel C: Saturday (09:00 to 12:00)

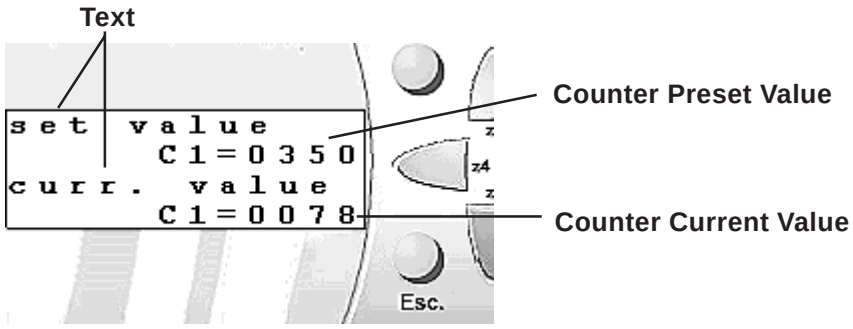




When entering ON / OFF time settings, enter values from 00:00 to 23:59. If you wish to set the ON time from 21:00 to 05:00, set the time from 21:00 to 05:00 to OFF, then right-click on the calendar contact and select [Normally Closed] (“b” contact).

4.10 Creating Text

The following explanation describes the types of text features available, as well as their setup procedure. This feature can be used to display text (Characters and numbers) in the PRO-iO unit's screen.



4.10.1 Text Coil Types

Text coils have the following two types. A Text Hide coil can be selected by placing a Text Display coil, right-clicking the mouse and choosing the "Reset Input" feature.

Text Display coil TX1()

Text Hide coil RX1()

■ Text Display

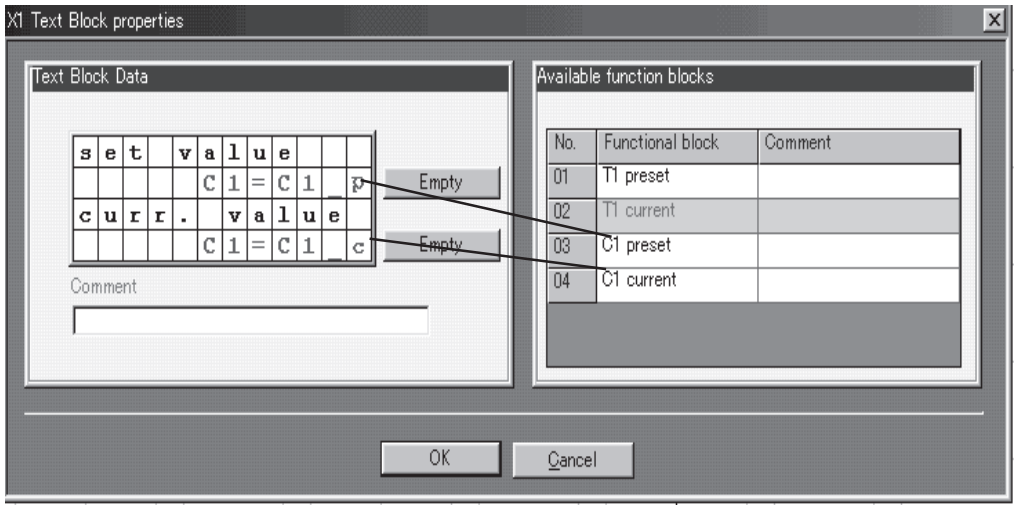
The Timer, Counter and Analog Comparator's current and preset values can be displayed via the Text Coil.

■ Text Coil Settings

Double-clicking the Text coil calls up the following dialog box.

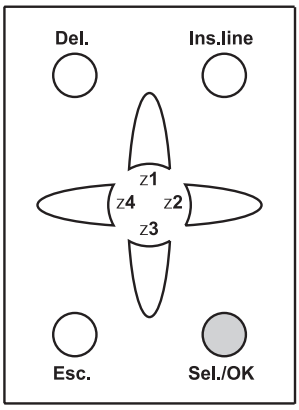
You can enter text directly into rows 1 and 3.

You can also drag and drop data from Rows 2 and 4 in the "Available function blocs" window to the "Content of the Text-Block" window. The "Empty" keys are used to delete entries.



4.11 Using the “Z” Keys

The four arrow keys on the face of the PRO-iO unit are called “Z” keys (Z1 to Z4). These keys can be set to operate like pushbuttons and are used in the program as contacts.



Important

When using a Z key as a contact, the PRO-iO unit’s menu screen (CONFIG./Zx=Keys) must also be set.

Reference *“3.3 Display Screen and Menu Screen”, “5.2 Module Configuration”*

In the following example, pushing Z1 turns Q1 ON, and releasing Z1 turns Q2 ON.

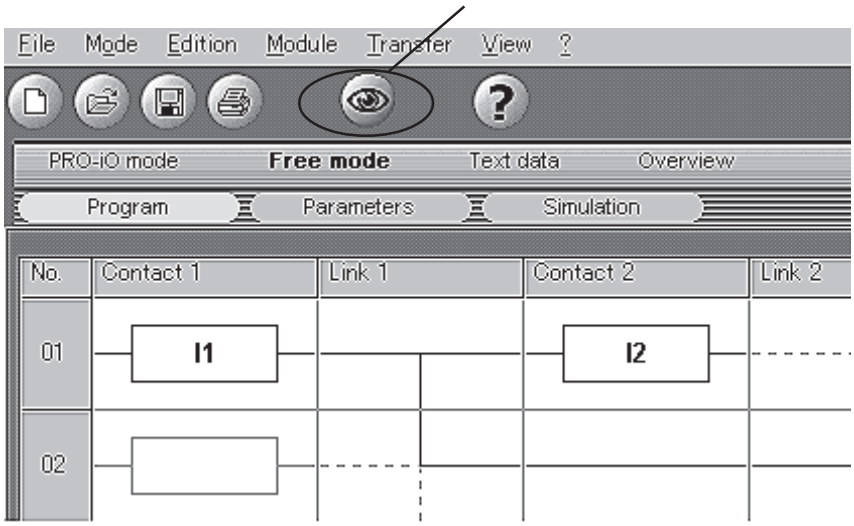
Memo

Chapter 5 Program Transfer

5.1 Validating Programs

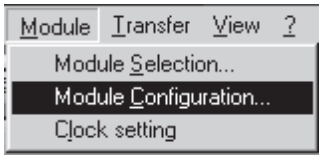
Clicking the PRO-iO Editor main screen's  icon checks the validity of your logic program. If this icon turns red, it means your ladder program contains error(s).

Program Validation

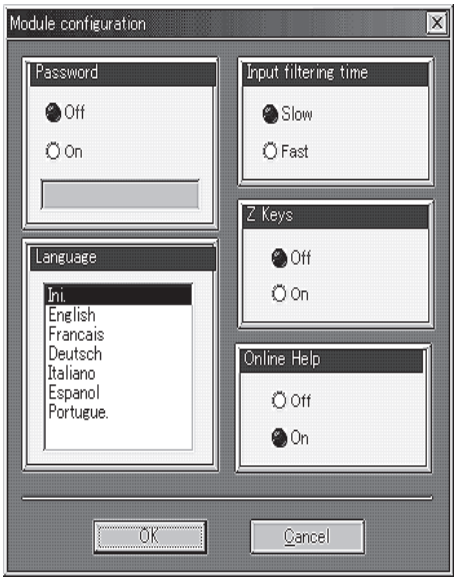


5.2 Module Configuration

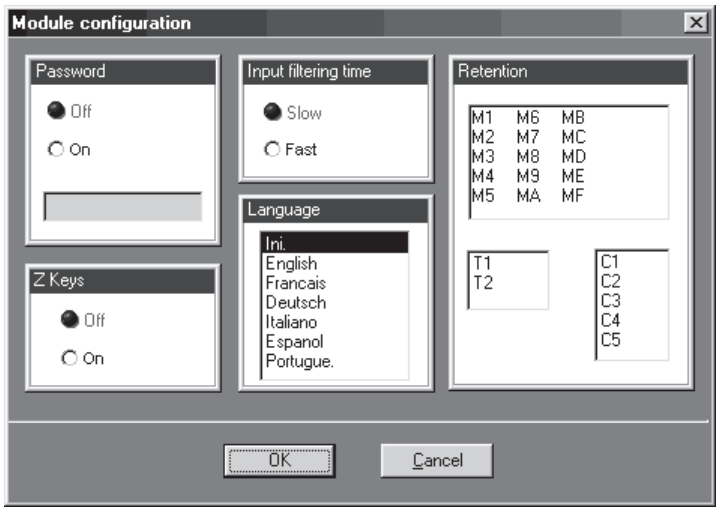
You can enter PRO-iO unit module settings via the [**Module**] menu's [**Module Configuration**] feature. To identify your PRO-iO unit model number, Reference *"Preface - Model Identification"*



DR1-A***



DR1-B***



■ Setting Items

Password : Designates the password needed to access the logic program. Deleting the password will require the same password to be entered again. A valid password can be any four digit number (0000 to 9999).

Language : Designates the language to be used. The INI feature initializes the language and time settings. (It will be necessary to restart the unit)

Input filtering time: Designates the input filter time. The unit is designed only for a DC input filter. Select either SLOW (3ms to 5ms), or FAST (0.3ms to 0.5ms). However, the input filter time is fixed as SLOW (3ms to 5ms) for IB and IC terminals.

Z Keys : Designates whether the **Z1** to **Z4** keys on the panel's front face will be used in the logic program. Selecting "Yes" designates these keys can be used for input.

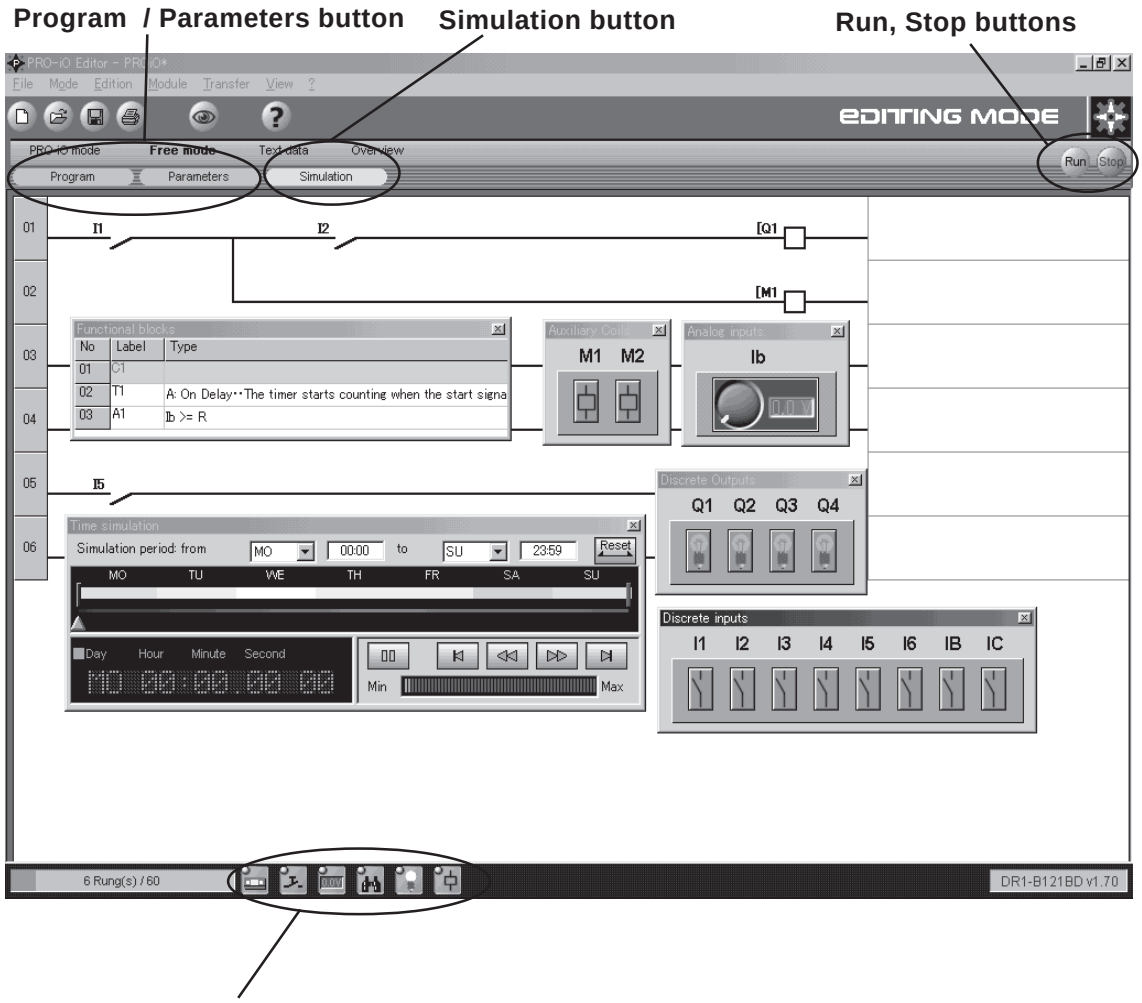
Online Help : Leave the default setting (**On**) unchanged.

Retention : After turning OFF the power supply, select the data you want to retain from the following: M1 to MF, T1 to T2, and C1 to C5. (This feature is available only with DR1-B***** PRO-iO units)

5.3 Simulation

Clicking the PRO-iO Editor main screen's Simulation icon allows you to simulate the operation of your program. You can control start and stop of the simulation via the Run and Stop buttons in the upper right corner of the PRO-iO Editor screen.

You can quit Simulation mode by pressing the **Program** or **Parameters** tab.



Note:

- **Clicking on the PRO-iO Editor main screen's lower icon bar displays that feature's dialog box.**
- **A simulation is only trial operation. Simulation results may not match actual operation results.**

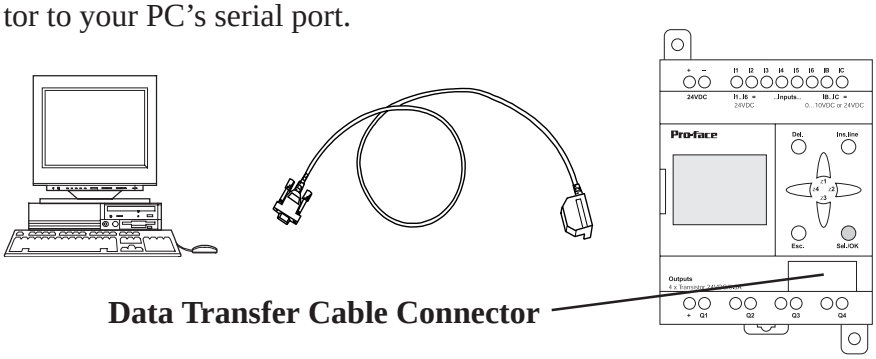
5.4 Program Transfer

5.4.1 Connecting the Data Transfer Cable

⚠ WARNINGS

- **Do not disassemble or remodel this unit. Doing so may cause an electric shock or fire.**
- **Do not use this unit in an environment that contains flammable gases. Doing so may cause an explosion.**
- **Do not touch this unit with wet hands or wipe it with a wet cloth. Doing so may cause an electric shock or a fire.**

Connect the optional PRO-iO Data Transfer Cable (DR1-CBL01)'s serial connector to your PC's serial port.



Note:

- **Do not use excessive force when connecting the Data Transfer Cable, and be sure the connector is connected at the correct angle. Failure to attach the connector correctly may damage the PRO-iO unit and/or the connector.**
- **Do not disconnect the Data Transfer Cable during data transfer. This may cause a communication error.**

5.4.2 Preparing to Transfer (Main Unit Settings)

When using DR1-A***** PRO-iO units, you must first set the unit's transfer status to "READY" before you can transfer a program. However, this is not necessary for DR1-B***** PRO-iO units.

Reference *"Preface - Model Identification"*

Important ***Before setting the program transfer status to "READY", be sure that the PRO-iO unit is in "STOP" mode.***

■ Setting Transfer Status

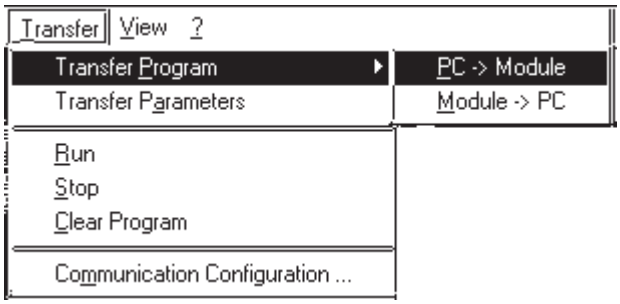
1. Press the PRO-iO unit front face's **Sel./OK** key. This displays the menu screen.
2. Use the **Z1** and **Z3** keys to scroll through the menu, and select the **TRANSFER** menu option. Press **Sel./OK** to register your selection.
3. Select **PC -> Modul.** if writing data to the PRO-iO unit, or **Modul. -> PC** if reading data from the PRO-iO unit, and press **Sel./OK** to register your selection.
4. In the following **Change Prog** confirmation message box, select **YES** and press **Sel./OK** to register your selection.
5. "**READY**" now displays on the PRO-iO unit screen. The PRO-iO unit is now ready for data transfer.

5.4.3 Program Transfer

Selecting the PRO-iO unit main screen **Transfer** menu's **Transfer Program** feature enables data transfer.

You can select one of the following program transfer directions:

1. **PC -> Module** : From the PC (PRO-iO Editor) to the PRO-iO unit.
2. **Module -> PC** : From the PRO-iO unit to the PC (PRO-iO Editor).



When transferring logic programs, be sure to leave the Communication Configuration dialog box (displayed when selecting the [Transfer] menu's [Communication Configuration] feature) default settings unchanged. Changing these settings may disable communication between the PRO-iO unit and the PC (PRO-iO Editor).

5.5 Backup (PRO-iO Memory Pack)

The optional PRO-iO Memory Pack (DR1-MEM01) can be used to store backup copies of ladder programs.

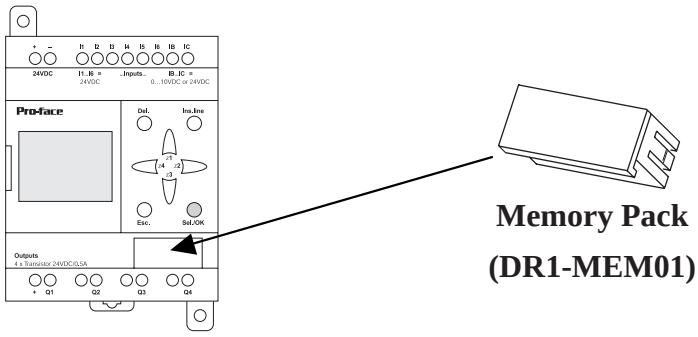
CAUTIONS

- **Do not drop the PRO-iO Memory Pack unit, or subject it to excessive vibration.**
- **Do not allow water to enter the PRO-iO Memory Pack unit.**
- **Do not touch the connector terminals. Doing so can cause an electric shock.**
- **Do not disassemble or remodel the PRO-iO Memory Pack .**

You can transfer ladder programs from the PRO-iO memory pack to the PRO-iO unit and vice-versa, via the PRO-iO unit's **Transfer** menu.

Select from one of the following program transfer directions:

1. **Modul -> Mem** : From the PRO-iO unit to the PRO-iO memory pack.
2. **Mem -> Modul** : From the PRO-iO memory pack to the PRO-iO unit.



Important

Be sure to disconnect power to the PRO-iO unit when installing the PRO-iO Memory Pack.

Note:

- **You can also transfer program data stored in the PRO-iO Memory Pack to other PRO-iO units.**
- **The PRO-iO Memory Pack is an Electrically Erasable Programmable Read Only Memory (EEPROM). You can write data to the Memory Pack for approximately 100,000 times.**

■ Backup Items

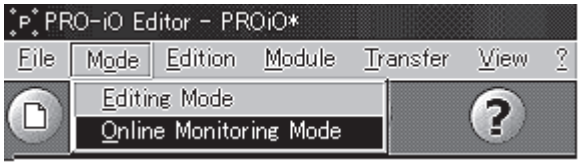
The following items will be saved in the PRO-iO Memory Pack (The same as the items set via the Main menu's CONFIG. feature):

- Logic Program
- Password
- PRO-iO Unit Screen Language
- Input Filter Time
- If the "Use the Z Keys as contacts" setting is enabled/disabled.
- Data saved when power is switched OFF. (Timer's current value and counter's current value cannot be saved)

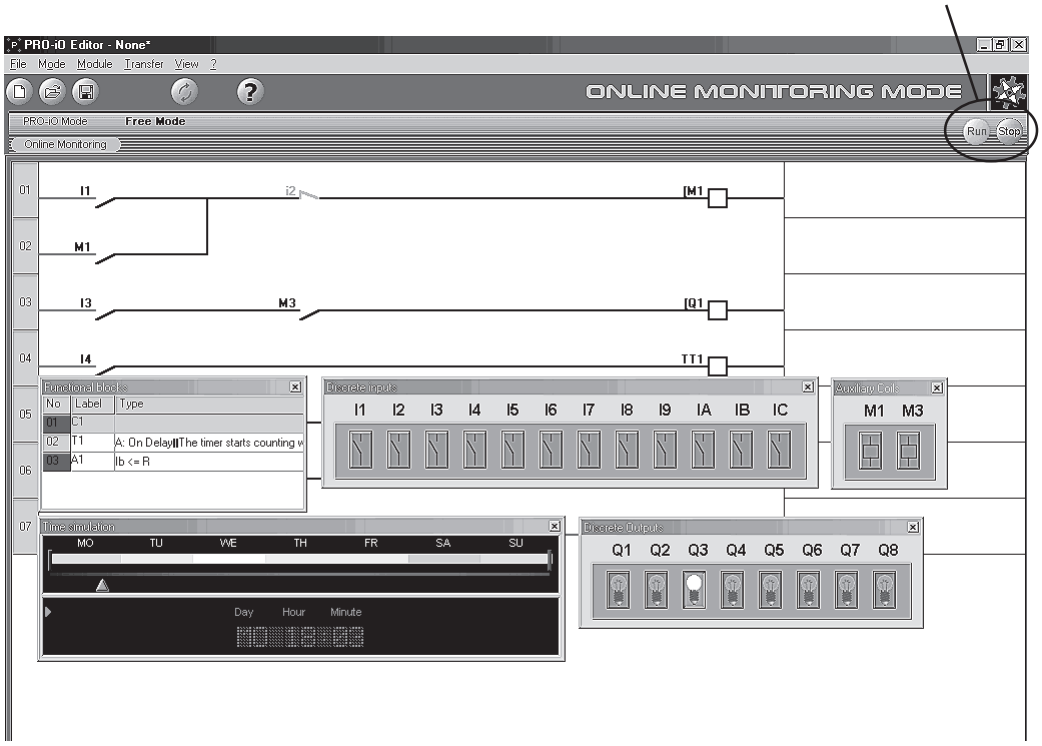
5.6 Online Monitoring Mode

It is possible to monitor a PRO-iO unit's operation using a PC. This feature is available only with DR1-B***** PRO-iO units. To do this, connect the PRO-iO unit to your PC using the PRO-iO Data Transfer Cable, and select the PRO-iO Editor [Mode] menu's [Online Monitoring Mode] feature.

You can quit Online Monitoring mode by selecting PRO-iO Editor [Mode] menu's [Editing Mode] feature.



Run, Stop buttons



PRO-iO Editor RUN and STOP buttons operate in synch with the PRO-iO unit's RUN/STOP button. However, the PRO-iO Editor's RUN and STOP buttons operate differently from the simulation function's RUN/STOP button.

Discrete Output Coils and Auxiliary Coils turn OFF when switching from Online Monitoring Mode to Editing Mode.

Chapter 6 Error Messages

The following table contains error messages associated with PRO-iO operation, as well as their possible cause and solution.

6.1 Error Messages

■ PRO-iO Error Messages

Message	Cause	Solution
ERR. RUN MODE	A function was accessed that can only be accessed when the PRO-iO unit is in STOP mode.	Set the Main menu's RUN/STOP feature to STOP.
NO PARAMET	The PARAMET function was accessed when no parameter existed.	Confirm that the element's parameter values can be set.
	The VISU function was accessed when no displayable element existed.	
PROGRAM INCOMPAT	The program to be transferred does not meet PRO-iO unit specifications. (E.g., the Calendar function is being used in the program even though the PRO-iO unit is not equipped with the calendar function.)	Check the type of program you are transferring to the PRO-iO unit. Be sure to select only a program that meets PRO-iO unit specifications.
TRANSF. ERR	Connection to the PC was broken during data transfer.	Check the connection between the PRO-iO unit and the PC.
	The Memory Pack was not set up correctly when transferring the program.	Confirm that the Memory Pack has been correctly set up.

■ PRO-iO Editor Error Messages

Type	Message	Solution
Warning	No right cell link.	No connection exists between this element and the element to the bottom. Check that the rung is correctly created.
Warning	No left cell link.	No connection exists between this element and the element to the left. Check that the rung is correctly created.
Warning	No top cell link.	No connection exists between this element and the element to the top. Check that the rung is correctly created.
Warning	No bottom cell link.	No connection exists between this element and the element to the bottom. Check that the rung is correctly created.
Warning	The Timer Preset Value has not been set.	Set the Timer Preset Value. Reference 4.6.3 Timer (Time) Settings
Warning	The Calendar has not been programmed.	Set the Weekday and Time. Reference 4.9.1 Calendar Settings
Warning	The Counter Preset Value has not been set.	Set the Counter Preset Value. Reference 4.7.2 Counter (Pulse Count) Settings
Warning	Information Text ** called an unreferenced function block.	In the logic program, confirm the function block you referenced actually exists. This function block may have been deleted from the logic program.
Warning	The Analog Comparator Preset Value has not been defined.	Set the Analog Comparator Preset Value. Reference 4.8.1 Analog Comparator (Preset) Settings

■ PRO-iO Editor Error Messages (Continued)

Type	Message	Solution
Warning	The Reset Input Pin is not connected.	Set up / place the designated instruction's Reset Coil.
Warning	Module configuration turns OFF Z keys.	When using Z keys as contacts in a logic program, be sure to peform the necessary settings on the PRO-iO unit. Reference 3.3 Display Screen and Menu Screen.
Warning	The Input ** is already being used by the Analog Comparator.	IB or IC contact is already being used by the Analog Comparator Input. Use a different contact.
Warning	I* is already being used as an ON/OFF switch.	IB or IC contact is already being used by the Analog Comparator Input. Use a different contact.
Warning	The coil is used more than once.	Please check the designated coil.
Error	The selected module does not support this feature.	Please check the selected module's features, as well as the features used in the logic program.

Memo

Chapter 7 FAQ

The following table contains Frequently Asked Questions about the PRO-iO Logic Relay.

7.1 Frequently Asked Questions (FAQ)

Problem	Solution/Reason
How do I connect the Data Transfer Cable?	The Data Transfer Cable connector's cover is below the PRO-iO unit's Sel./OK key. Open this cover and connect the Data Transfer Cable.
How do I connect the Memory Pack?	The Memory Pack's cover is below the PRO-iO unit's Sel./OK key. Open this cover and connect the Memory Pack.
How do I use the Memory Pack?	The Memory Pack allows you to back up your logic programs. Backed up logic programs can then be written to a new PRO-iO unit.
When backing up data on the Memory Pack, can I also back up the hold status?	Hold data settings can be backed up. However, you cannot back up device internal numeric data.
How do I confirm the PRO-iO unit's model number?	The label attached to the side of the PRO-iO unit indicates the model number.
How do I confirm the PRO-iO unit's version number?	The label attached to the side of the PRO-iO unit indicates the version number.
Will turning OFF the PRO-iO unit's power erase the logic program?	Since the logic program is written to the PRO-iO unit's EEPROM, it will not be erased.
Will turning the PRO-iO unit's power OFF for long periods of time cause any problem?	If the PRO-iO unit's power supply is turned OFF for 150 hours or more, the date and time will be reset. However, other stored data (Logic programs, etc.) will not be affected.
My PRO-iO unit contains hold (Retained) data. How long will the data be saved after power is switched OFF?	Since the data is written to the PRO-iO unit's EEPROM, it will not be erased.
What is "Online Monitoring Mode"?	This mode monitors the PRO-iO unit's "RUN" condition. You can monitor the status of a running (Currently executing) logic program.

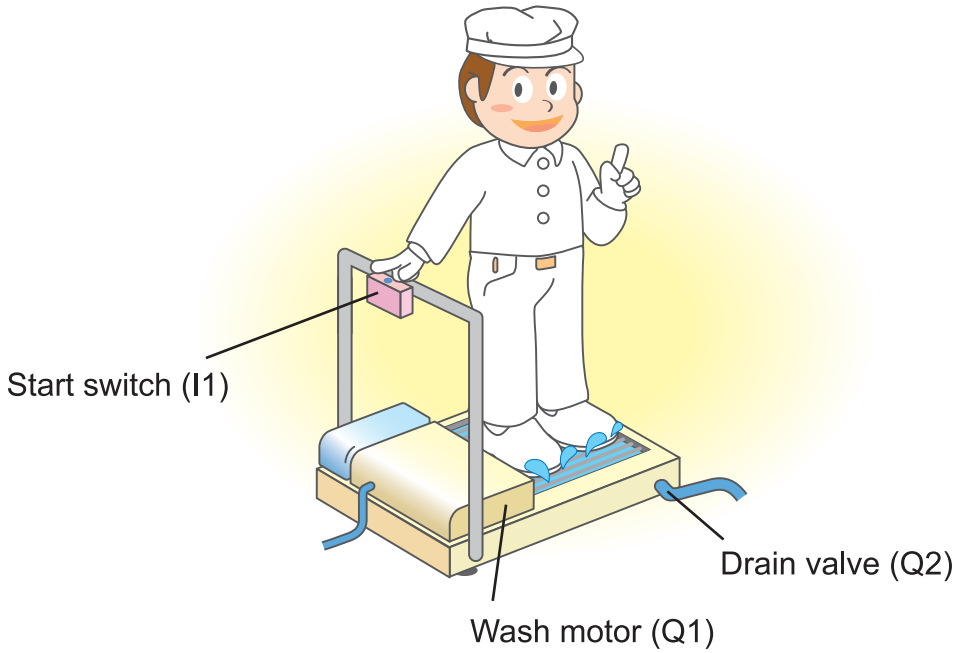
Frequently Asked Questions (FAQ)

Problem	Solution/Reason
What is "Upload Module from Program"?	It means that you are transferring the program stored in the PRO-iO unit to the PC.
Some parameters cannot be accessed.	Some of the parameters are not accessible. Be sure to read the manual carefully to understand which element attributes cannot be changed. E.g., the counter function block's counting direction (Up or down) cannot be changed. This type of element is accessible only via the wiring diagram.
	In order to access a parameter, press the Z2 and Z4 keys and select the parameter (Z1 and Z3 keys can only be used to change a parameter's value). Next, press Sel./OK and change the selected parameter's value via the Z1 and Z3 keys.
The Z1 and Z3 keys do not work when I try to change a parameter.	In order to switch to edit mode, be sure to press Sel./OK first. The parameter display will begin to blink, and the Z1 and Z3 keys will become functional.
Even though the Main menu's RUN/STOP feature was set to STOP using the Sel./OK button, the PRO-iO unit does not stop.	Be sure to read the display's message again and confirm if the menu you selected was correct.
In an 80-line logic program, it takes a lot of time to move to the last line. How can this be done faster?	Holding the Z1 or Z3 keys down allows you to scroll through the ladder program 4 lines at a time.
The Sel./OK key is disabled when I want to change a ladder line.	Be sure to confirm that the PRO-iO unit is completely stopped. Change/Update is not possible in RUN mode.
When trying to change ladder lines, a blank screen is displayed. Does this mean program data is lost?	This may occur when blank lines are included at the beginning of the logic program. Press the Z3 key and check if there are ladder lines lower in the program.
If the PRO-iO unit is operated continuously for 1 hour, what will be the timer function's margin of error?	The standard margin of error will be as follows: For DR1-****BD PRO-iO units: approx. 0.097% For DR1-****FU PRO-iO units: approx. 0.194%
What happens when the counter's value exceeds 9999?	The counter's value cannot exceed 9999.
What happens when the counter's value becomes less than 0?	The counter's value cannot become less than 0.
When I select a logic program contact, I can't see the analog function block. Is this normal?	The selected module may not have an analog input function. Be sure to confirm your module's model number.
When I select a logic program contact, I can't see the calendar function block. Is this normal?	The selected module may not have a calendar function. Be sure to confirm your module's model number.

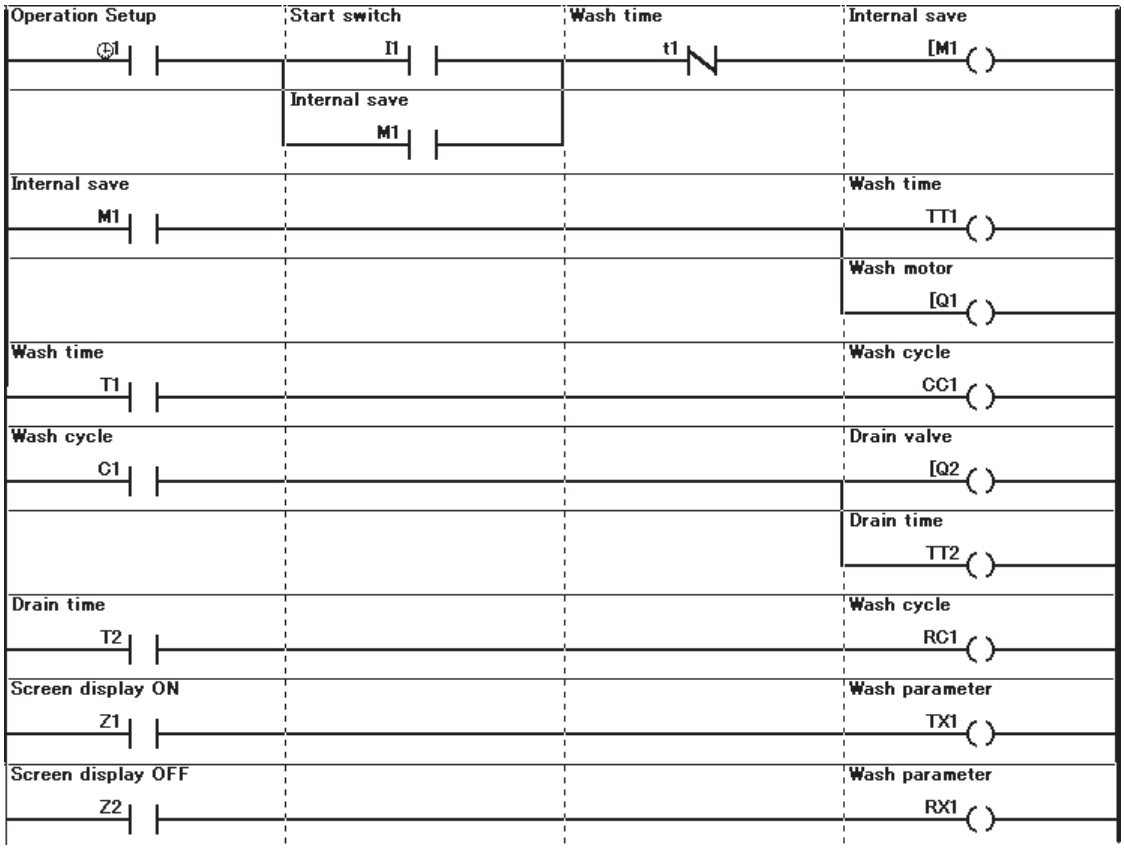
Problem	Solution/Reason
I created a logic program using a module equipped with the calendar feature. Is it possible to transfer data from a module not having the calendar function to the Memory Pack?	Yes, this is possible if the logic program does not have a calendar function block.
Can I input text via the PRO-iO unit?	This is not possible. Instead, use the PRO-iO Editor software.
The Z keys are being used as Open/Close contact buttons in a logic program. However, when I want to confirm the operation, the Z keys are disabled.	The PRO-iO unit Menu menu's CONFIG|ZX=Keys option may be set to "NO". Be sure to select "YES" for this option.
I am unable to access PRO-iO functions since I forgot my password.	You will need to delete the password settings. Do the following: On the password screen, press the Z1, Z2, Z3 and Z4 keys simultaneously. Note: This will also clear the current program.

Memo

Chapter 8 Program Example - Automatic Shoe Cleaner



■ Logic Program



■ Program Overview

The Automatic Shoe Cleaner performs the following four functions:

(1) Operates only on the specified date and for the specified time period.

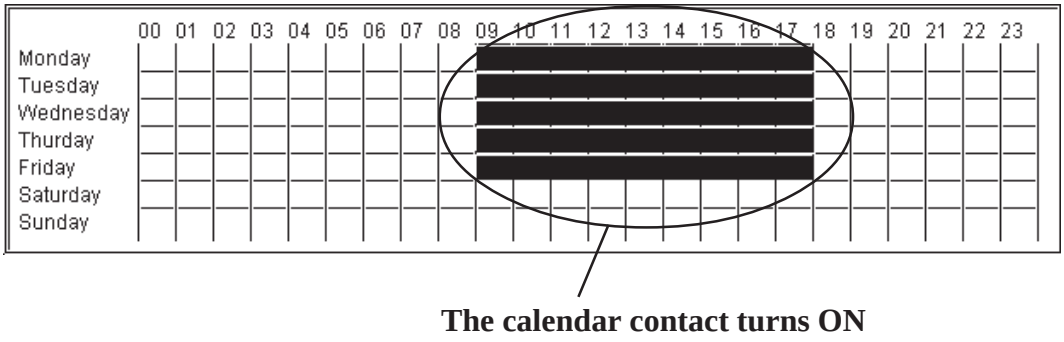
(2) Automatically washes shoe soles for a fixed length of time.

(3) Automatically drains wash water after the specified number of wash cycles is completed.

(4) The wash time and the number of wash cycles completed can be seen on the PRO-iO screen.

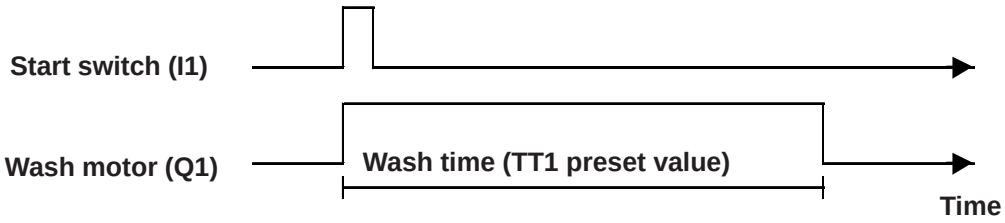
(1) Operates only on the specified date and for the specified time period

The automatic shoe cleaner is set to operate from Monday to Friday, from 9:00 to 18:00 (via calendar feature).

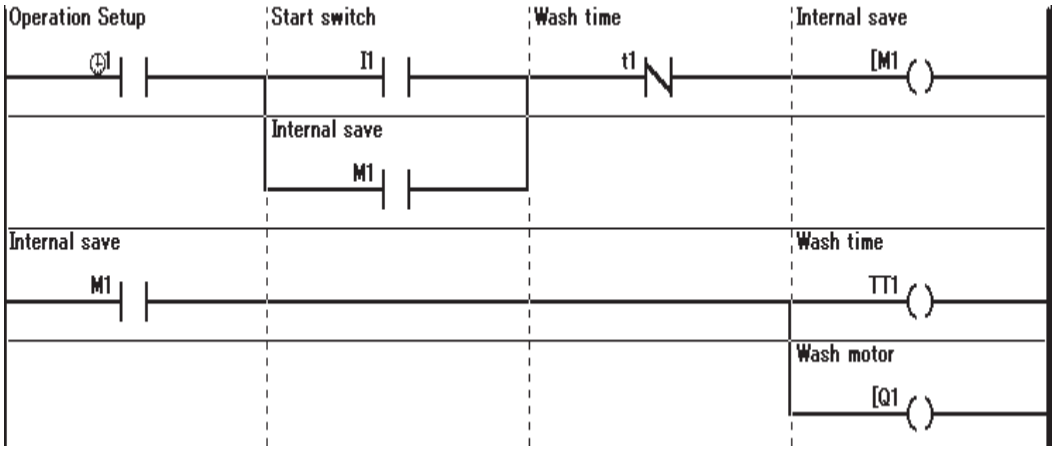


(2) Automatically washes shoe soles for a fixed length of time

The wash motor (Q1) operates when the start button (I1) is pressed. The wash motor then stops automatically when the wash time (TT1) elapses.

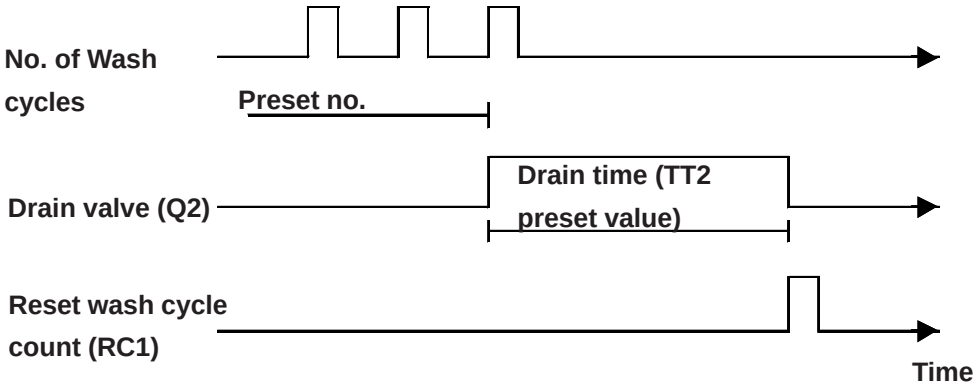


<Start-switch-based automatic wash program>

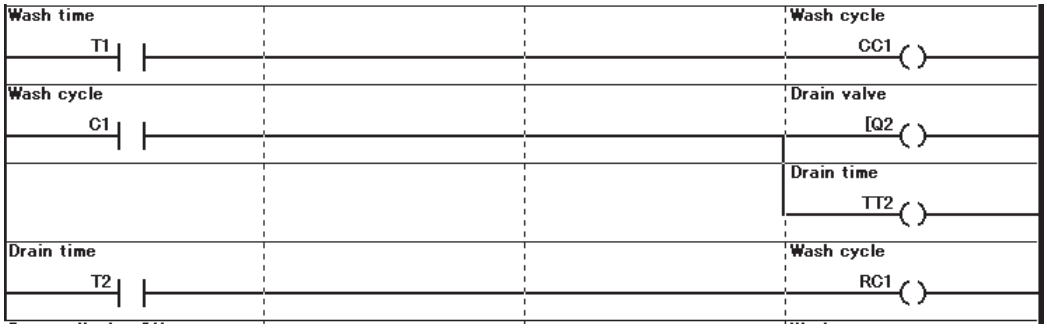


(3) Automatically drains wash water after the specified number of wash cycles is completed

When the wash cycle (CC1) value approaches the preset value, the drain valve (Q2) opens and remains so for the time period specified for the drain time (TT2), after which the water is drained.

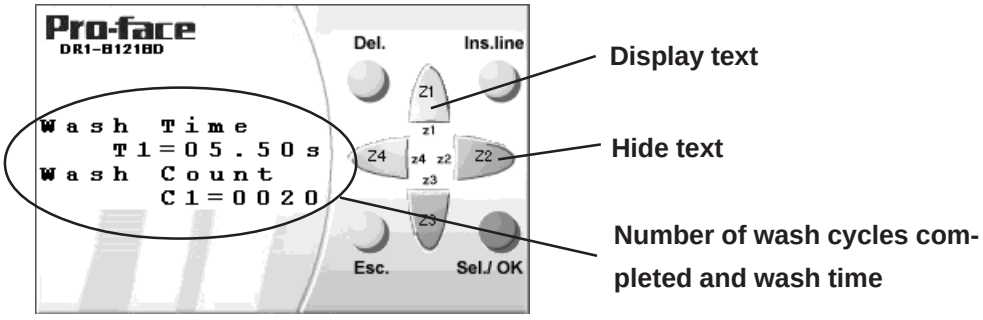


<Automatic drain control logic program>

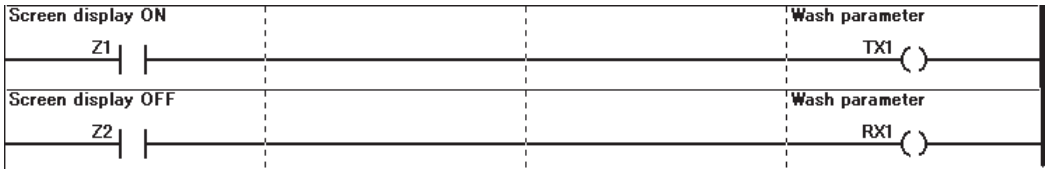


(4) The wash time and the number of wash cycles completed can be seen on the PRO-iO screen

You can display the number of wash cycles completed (CC1) and the wash time (TT1) on the PRO-iO screen using the Text feature. Clicking Z1 displays the number of wash cycles completed and the wash time. Clicking Z2 takes you back to the main PRO-iO screen.



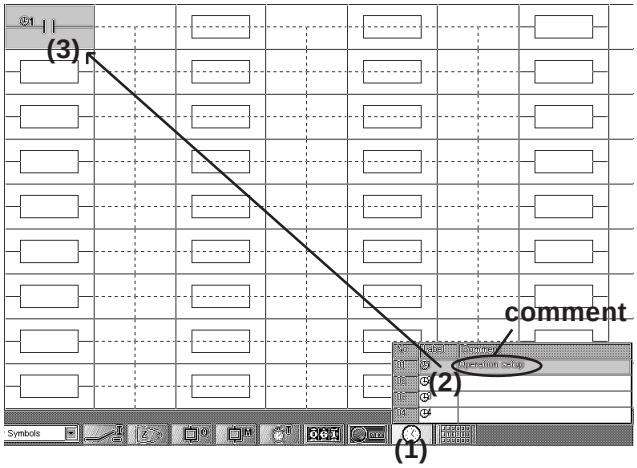
<Z-key-based text display logic program>



■ Creating the program

(1) Operates only on the specified date and for the specified time period

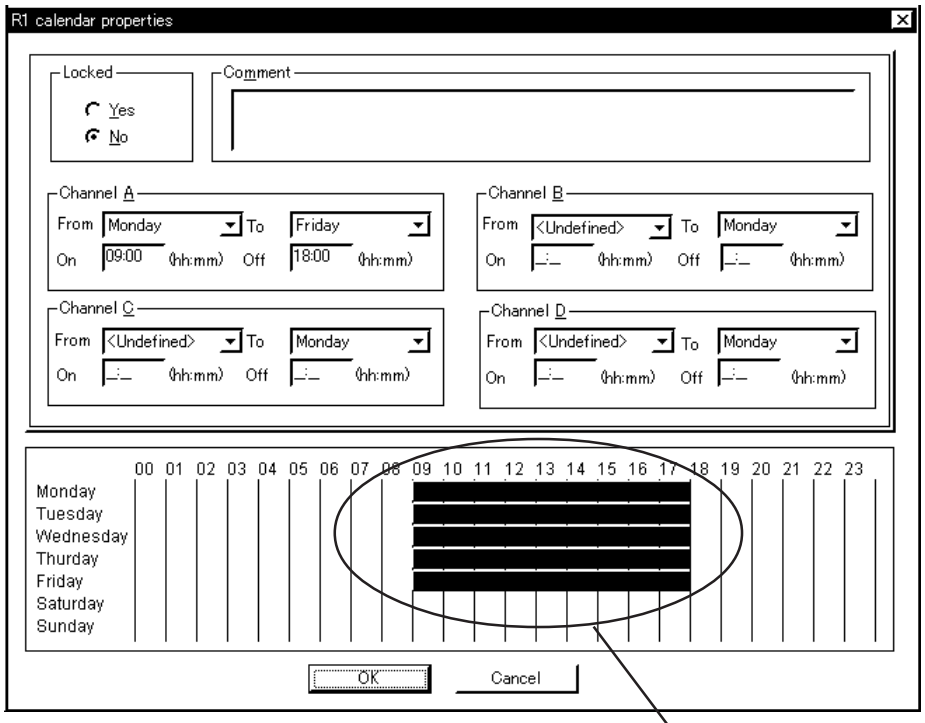
1. Position the mouse pointer on the calendar icon (1).
2. Click on ⏲1 (2), drag to the desired position (3) and release to place it in the ladder program.



Note: **Entering comments in the I/O "Comment" area (2) can be helpful during debugging. Comment data can also be collected in a "Text Data" screen.**

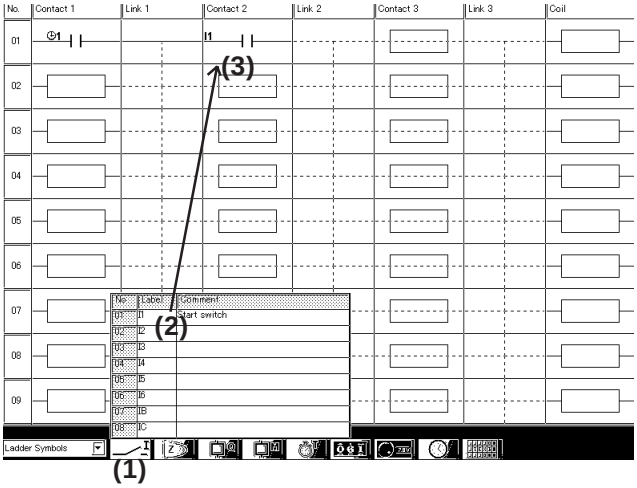
3. Designate the ON date and time for the calendar contact. Double-click on the contact, or right-click on the calendar contact and select [Properties]. The following dialog box will appear.

   Enter Channel A settings as follows:
   Channel A:
   From Monday To Friday
   On 09:00 (hh:mm) Off 18:00 (hh:mm)



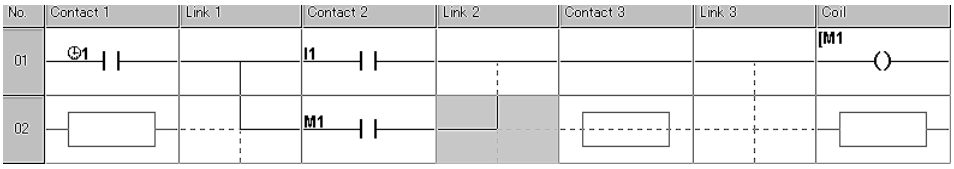
Red section indicates time when ⏲1 contact turns ON

(2) Automatically washes shoe soles for a fixed length of time

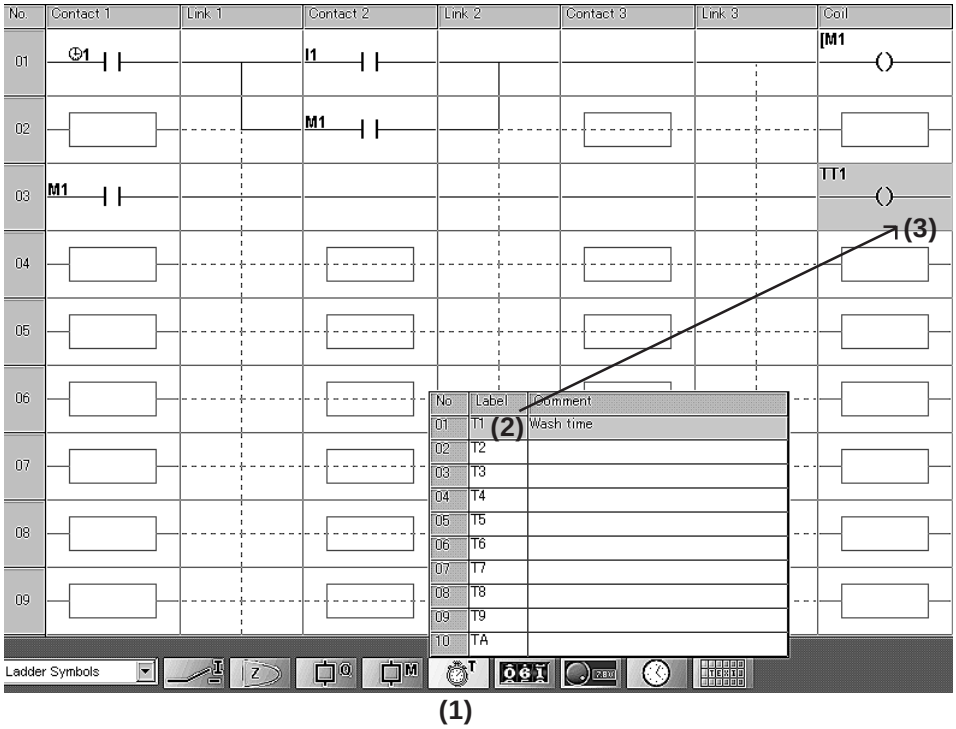


1. Position the mouse pointer on the icon (1).
2. Click on I1 (2), drag to the desired position ((3)) and release to place it in the ladder program.
3. Repeat steps 1 and 2 for auxiliary coil M1.

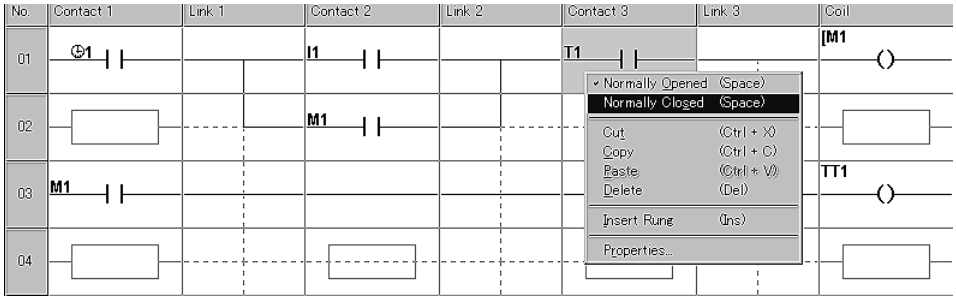
4. Next, click on the dotted lines to create connecting lines.



5. Repeat steps 1 and 2 to insert the auxiliary coil M1 and the timer coil TT1 in rung no.3 (see below).



6. Place the timer coil contact T1 you created in step 5, in rung no.1. Right-click on the contact and select [Normally Closed].

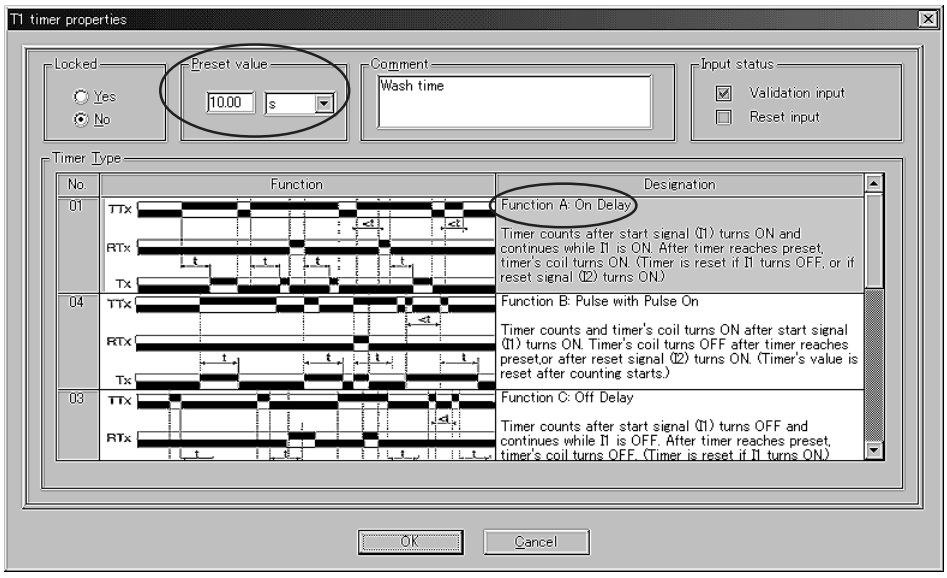


7. Designate when the timer coil starts. To do this, double-click on the timer coil, or right-click the timer coil and select [Properties].

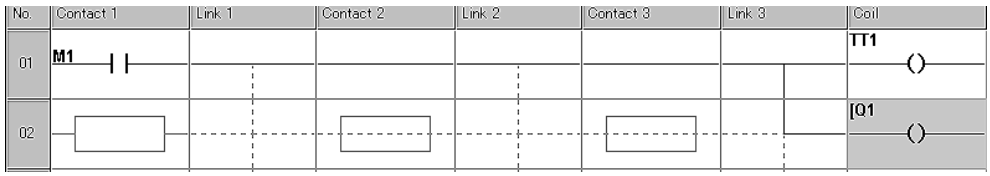
   Set the Preset value and Designation, as shown below:

   Preset value: 10.00s

   Designation: Function A: On Delay



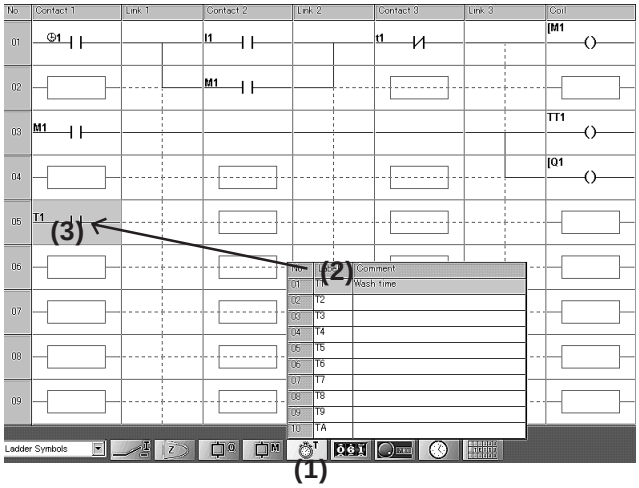
8. Next, click on the dotted lines to create connecting lines, and place the discrete output Q1.



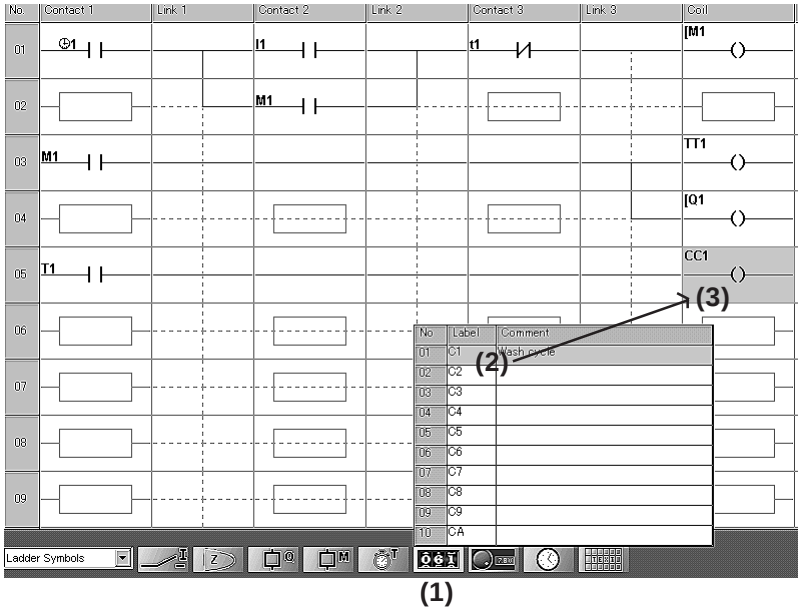
(3) Automatically drains wash water after the specified number of wash cycles is completed

1. Position the mouse pointer on the icon (1).

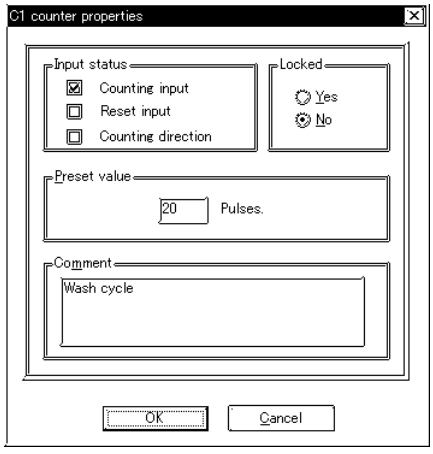
2. Click on T1 (2), drag to the desired position (3) and release to place it in the ladder program.



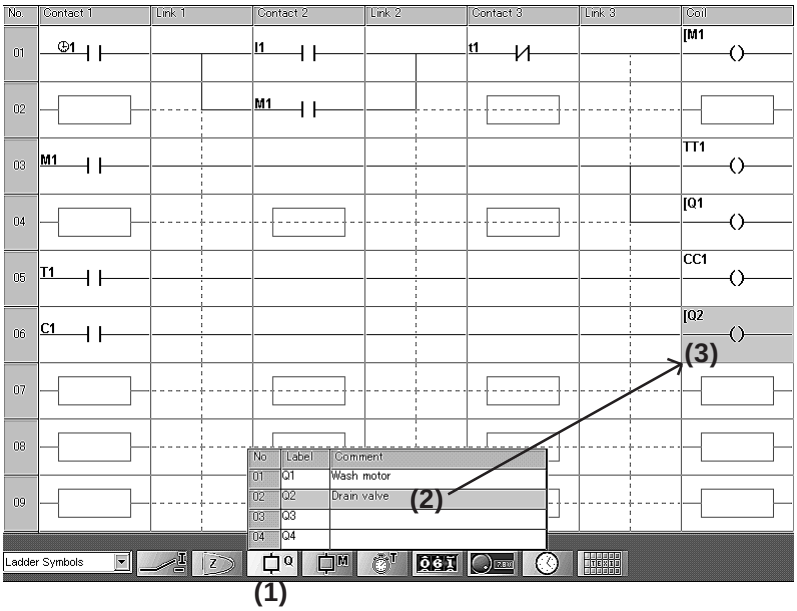
3. Repeat steps 1 and 2 to insert the counter coil CC1.



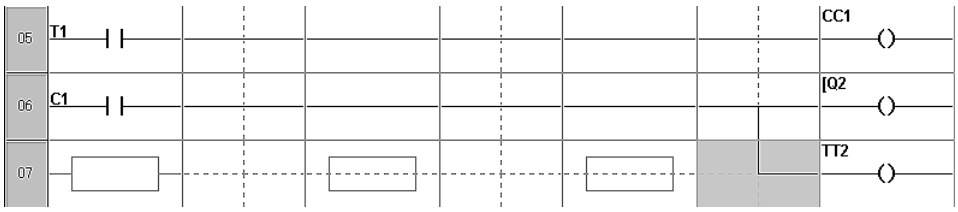
4. Designate the counter pulse count. To do this, double-click on the counter coil, or right-click on the counter coil and select [Properties]. The following dialog box will appear.
   Set the preset value as follows:
   Preset value: 20 Pulses (Wash cycle)



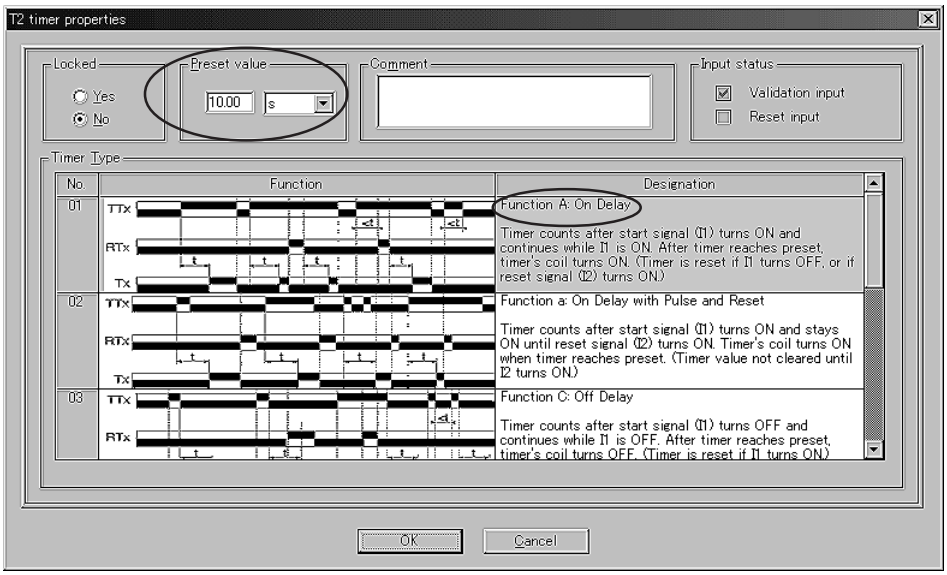
5. Repeat steps 1 and 2 to insert the counter contact C1 and the discrete output coil Q2 in rung no. 6.



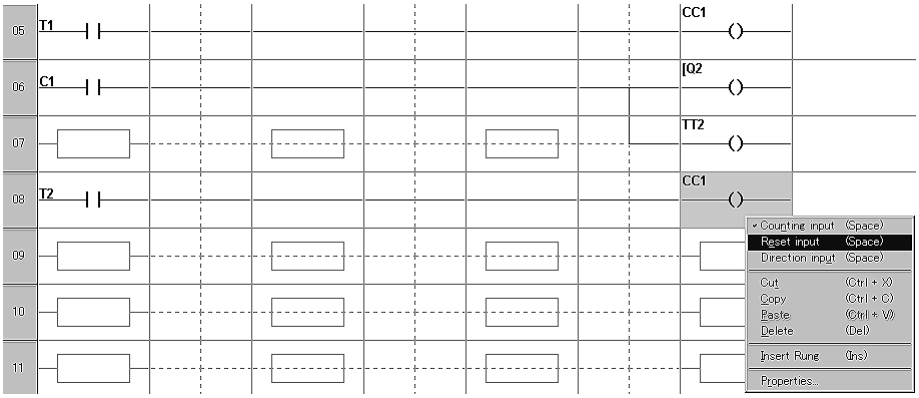
6. Next, click on the dotted lines to create connecting lines, and place the timer coil TT2.



7. Designate when the timer coil starts. To do this, double-click on the timer coil, or right-click on the timer coil and select [Properties].
   Set the Preset value and designation as shown below:
   Preset value: 10.00s (Wash time)
   Designation: Function A: On Delay



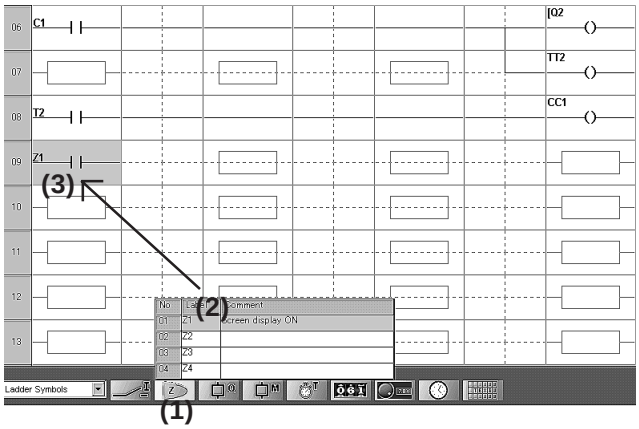
8. Place the timer coil contact T2 and the counter coil CC1 you created in step 6, in rung no. 8. Right-click on the counter coil CC1, and select [Reset input].



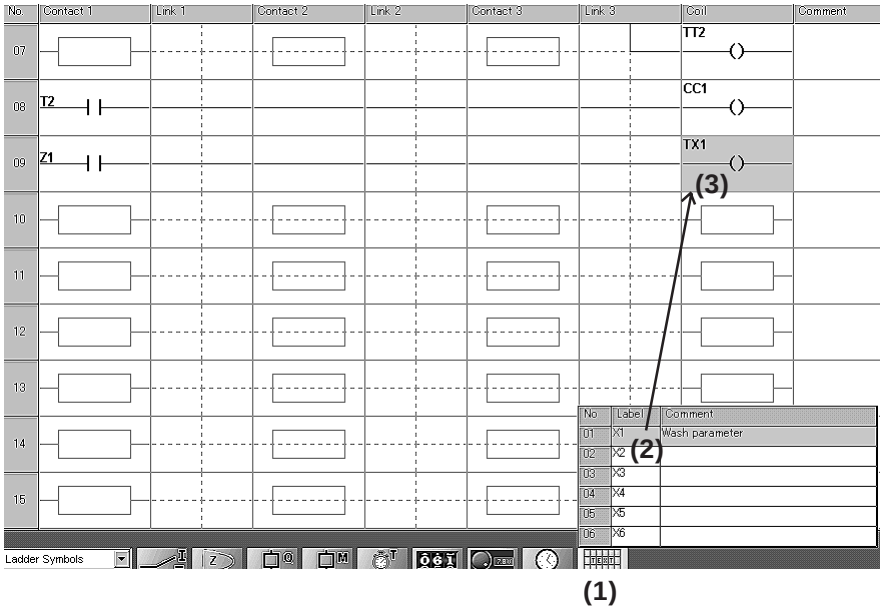
(4) The wash time and the number of wash cycles completed can be seen on the PRO-iO screen

1. Position the mouse pointer on the icon (1).

2. Click on Z1 (2), drag to the desired position (3) and release to place it in the ladder program.



3. Repeat steps 1 and 2 to insert the text coil TX1.



4. When the text coil starts, designate the parameter to be displayed on the PRO-iO screen. To do this, double-click the text coil, or right-click on the text coil and select [Properties]. The following dialog box will appear.

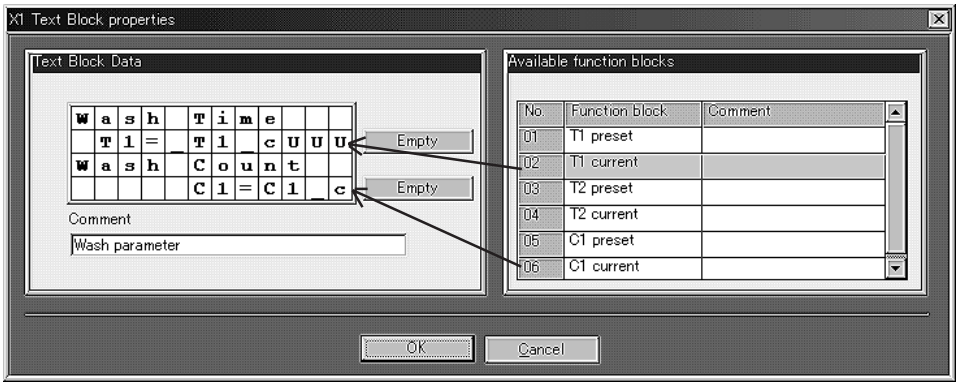
   Enter the text in rows 1 and 3. Then, select the necessary parameter from the “Available function blocks” window on the right, and drag and drop it into row 2. Similarly, select the necessary parameter from the “Available function blocks” window on the right, and drag and drop it into row 4.

   Row 1: Enter “Wash Time” via the keyboard.

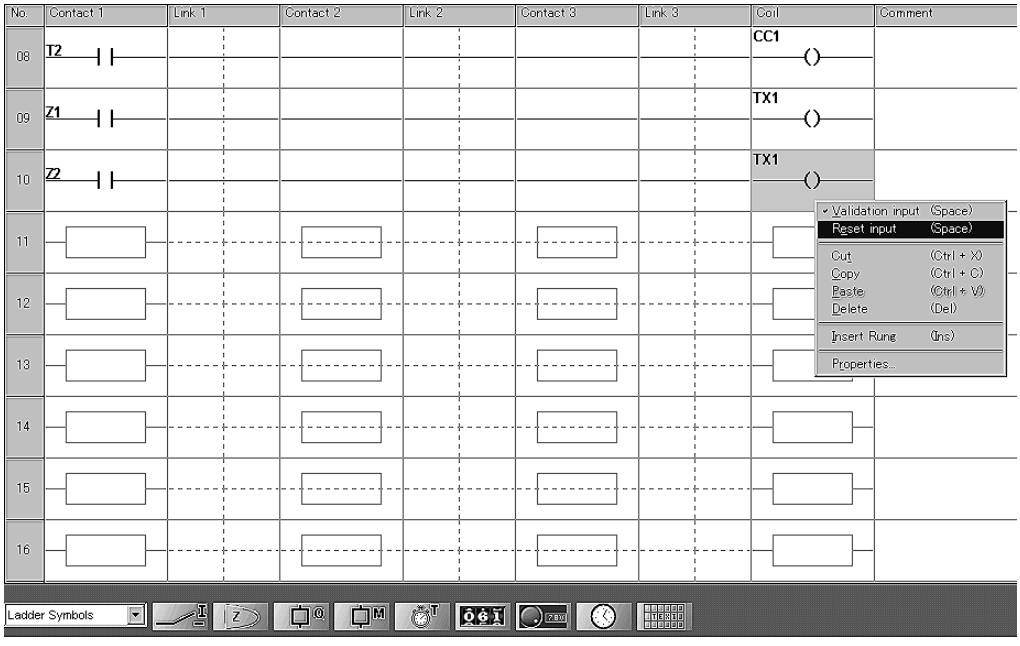
   Row 2: Select “T1 current” from the “Available function blocks” window, and drag and drop it into row 2.

   Row 3: Enter “Wash Count” via the keyboard.

   Row 4: Select “C1 current” from the “Available function blocks” window, and drag and drop it into row 4.

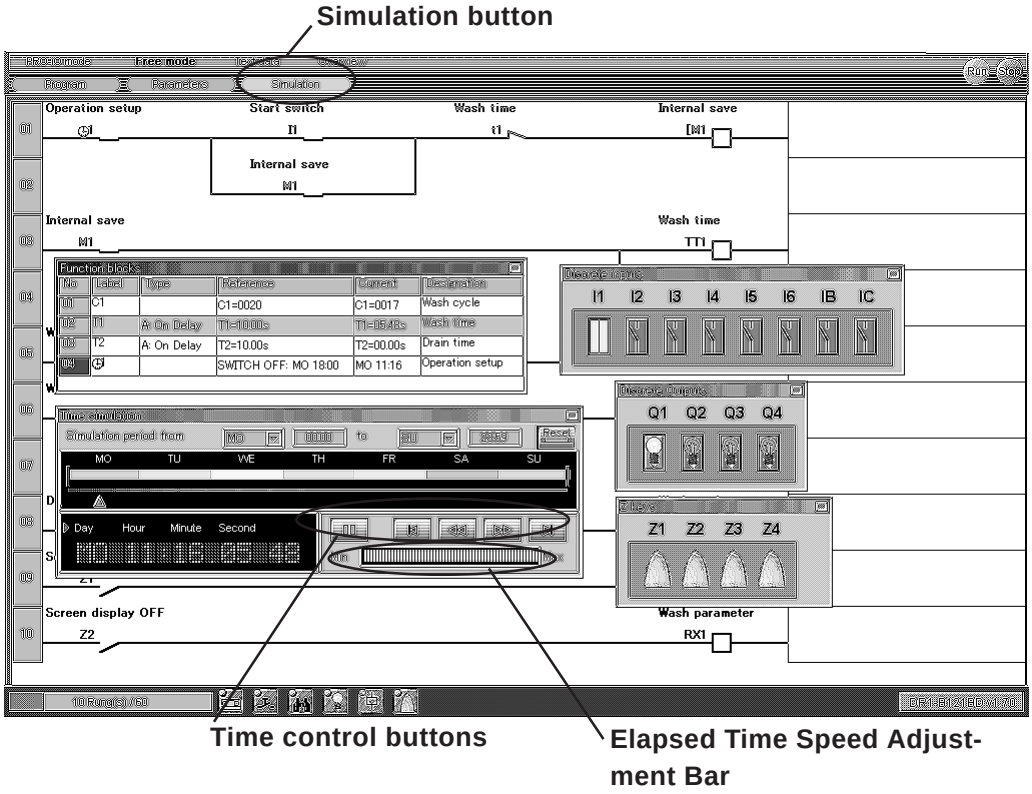


5. Repeat steps 1 and 2 to insert the Z-key contact Z2 and the text coil TX1 in rung no.10. Right-click on the text coil TX1, and select [Reset input].



■ Using the Simulation Feature

1. The Simulation feature allows you to check that your logic program operates as expected. Click on the Simulation button at the top of the screen to call up the Simulation screen.



2. Click on the Run button in the screen's upper-right corner to start the simulation. Follow the steps below to check your logic program's operation.

   (1) When the time displayed in the "Time simulation" dialog box's time zone is between Monday to Friday, 09:00 to 18:00, clicking the "Discrete inputs" show/hide dialog box's I1 contact turns the wash motor Q1 ON. The wash motor Q1 turns OFF automatically after 10 seconds.

Note: **The rate (speed) at which time elapses can be controlled via the time control buttons and the elapsed time speed adjustment bar.**

   (2) The drain valve Q2 turns ON when the number of wash cycles com pleted reaches 20. Drain valve Q2 turns OFF automatically after 10 seconds.

   (3) Note that the above operation check was performed in the [Free mode | Simulation] mode. However, to check the PRO-iO screen wash time and number of wash cycles completed display, it will be necessary to switch to [PRO-iO mode | Simulation] mode.

   To switch to [PRO-iO mode | Simulation] mode, click on **PRO-iO mode** in the screen's upper-left corner, and click on the Run button in the screen's upper-right corner. Doing so will check your logic program in PRO-iO mode.

Click on the “Z keys” show/hide dialog box’s Z1 key. The PRO-iO screen image now displays the wash time and number of wash cycles completed.

Click on the Z2 key to return to the main PRO-iO screen.

PRO-iO mode / Simulation